Site Plan Review
Valley Road Solar, LLC
221 Valley Street
Pembroke, Massachusetts

MAY 2019

PREPARED FOR

SunRaise Investments, LLC

PREPARED BY

SWCA Environmental Consultants

SWCA®
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Sound Science. Creative Solutions.®

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May 3, 2019

Matthew Heins
Planning Board
Town of Pembroke
100 Center Street,
Pembroke, MA 02359

Re: Valley Road, LLC Solar Project
221 Valley Street
Pembroke, Massachusetts

Dear Mr. Heins:

On behalf of Valley Road Solar, LLC, (hereafter, "VRS"), a wholly-owned subsidiary of SunRaise Developments, LLC, SWCA Environmental Consultants, (hereafter, "SWCA"), is submitting this application for Site Plan Review for a proposed solar facility at 221 Valley Street in Pembroke. This site is currently the location of J&J Family Farms, LLC, which is an active agriculture site. The proposed project by VRS will use a total of 26.15-acres on the 112-acre parcel, and generate 6.14 MW Direct current (DC) of energy.

This project is classified as a Large-Scale Ground-Mounted Solar Photovoltaic Installation and the associated application has been prepared in compliance with Sections II through V of the Site Plan Rules and Regulations Governing the Issuance of Site Plan Approval. The project has also been developed in accordance with the Town of Pembroke's Zoning Bylaws, specifically Section V.12, Solar Photovoltaic Installations. In addition, SWCA has submitted a Notice of Intent to the Pembroke Conservation Commission (Commission) on May 03, 2019.

VRS is requesting a waiver to the preparation of the Development Impact Statement and the Traffic Impact Study as outlined in Section 4.22 and Section 6.0, respectively, of the Site Plan Rules and Regulations Governing the Issuance of Site Plan Approval. During the construction phase of this project increased traffic may occur, but there will be no daily vehicle trips associated with the project once constructed. Therefore, we request the waiver to the traffic study. As the project does not include the construction of multi-family residence, does not include a building that is 5,000 square feet or more, and will not generate more than 250 vehicle trips per day, the waiver to the development impact statement is also requested.

SWCA is submitting one original and 2 copies of the Town of Pembroke Application for Site Plan Approval. Six sets of the engineering drawings (Sheet Plans) are being provided at 24 x 36 and 4 sets are being provided at 11 x 17. We appreciate the Planning Board's time in reviewing this application and look forward to presenting this project. If you have any questions regarding this application, please do not hesitated to contact me.

Sincerely,

Valerie Miller
Team Lead, Natural Resources

SITE PLAN REVIEW
VALLEY ROAD SOLAR, LLC
221 VALLEY STREET
PEMBROKE, MASSACHUSETTS

Prepared for

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SWCA Project No. 50506

May 2019

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1.0 INTRODUCTION

On behalf of Valley Road Solar, LLC (hereafter, "VRS"), SWCA Environmental Consultants (hereafter, "SWCA") has prepared this Site Plan Review application for a proposed 6.14 MW Direct Current (DC) and energy storage development to be installed at 221 Valley Street (Map F4 Lot 2), Pembroke, in Plymouth County in the Town of Pembroke, Massachusetts. A copy of the Site Plan Application is presented in Appendix A.

The proposed project is to be constructed on approximately 26.15 acres of the 112-acre site owned by J&J Family Farms, LLC. Access to the array is proposed through construction of a gravel access driveway off of an existing gravel access road off of Valley Street. The proposed solar project will be located within the Residential A zoning district, which is an "As of right" development in this district per the Town of Pembroke Zoning Bylaws, Town of Pembroke Zoning Bylaws, Article V § 12. The location of the project is shown in Figure 1 (USGS Topographic Map), Figure 2 (Orthophotograph) and on Sheet 1.0 of the Permitting Plan Set.

The Applicant understands that the proposed project is classified as a Large-Scale Ground-Mounted Solar Photovoltaic Installation, subject to the Town of Pembroke Zoning Bylaws and Site Plan Review process. SWCA is submitting three hard copies of the Site Plan Review application and six full size (24 x 36) plus four reduced size (11 x 18) sets of the Site Plans to the Planning Board Assistant in the Town Planning Division. Appendix A provides the site plan application form and Appendix B provides a copy of the certified list of abutters within 300 feet of the parcel.

VRS is requesting a waiver to the preparation of the Development Impact Statement and the Traffic Impact Study as outlined in Section 4.22 and Section 6.0, respectively, of the Site Plan Rules and Regulations Governing the Issuance of Site Plan Approval. During the construction phase of this project increased traffic may occur, but there will be no daily vehicle trips associated with the project once constructed. Therefore, we request the waiver to the traffic study. As the project does not include the construction of multi-family residence, does not include a building that is 5,000 square feet or more, and will not generate more than 250 vehicle trips per day, the waiver to the development impact statement is also requested.

The Applicant has entered an exclusive solar use rights and Site Lease Agreement for the development, construction and operation of this project and this agreement serves as the owner's approval for the construction of this project on their property (Appendix C).

2.0 SITE DESCRIPTION

2.1 General Site Description

The 26.15-acre limited lease area comprising the proposed site is part of a larger farm property consisting of managed woodlands and agricultural activities, including cranberry bogs. There is a well-maintained network of gravel roads, drainage channels, water diversion structures, agricultural ponds, and cranberry bogs. The site perimeter is wooded and is bounded by wetlands and residential properties on all sides of the property. Sheet 2.0 illustrates existing conditions at the site.

Four Bordering Vegetated Wetlands (BVW) were delineated by SWCA in October 2018, which are shown on Sheet 2.0. A Notice of Intent requesting permission to perform work within the 100-foot

Buffer Zone to the aforementioned wetlands has been submitted to the Pembroke Conservation Commission on May 03, 2019. The solar array is proposed for the bogs and upland area in the central part of the lease area.

2.2 Special Resources

SWCA reviewed publicly available GIS databases as part of our site evaluation to determine if the project coincides with any sensitive environmental areas or resources.

SWCA reviewed MassGIS to determine if the project is located within or near areas designated by the Natural Heritage Endangered Species Program (NHESP) as Priority Habitats of Rare Species, Estimated

As part of evaluating resource areas at the site, SWCA also reviewed the Massachusetts Geographic Information System (MassGIS) FEMA National Flood Hazard Layer for the Town of Pembroke and determined that the project area is outside of the 100-year Floodplain (Figure 3); therefore, as defined by the Massachusetts Wetlands Protection Act, 310 CMR 10.57, there is no Bordering Land Subject to Flooding present on the site. There is also no isolated land subject to flooding at the site.

Habitats of Rare Wildlife, Certified Vernal Pools, Potential Vernal Pools, Areas of Critical Environmental Concern (ACEC) or Outstanding Resource Waters (ORWs). NHESP maps do not show any priority habitats within or near the project area (Figure 4), or any mapped certified vernal pool habitat. A potential vernal pool is shown in the northwest area of the parcel and is outside of the proposed project area. Because the proposed project area does not coincide with NHESP Priority Habitats for Rare Species, no further action is required under the WPA, 310 CMR 10.59.

An Area of Critical Environmental Concern (ACEC) is a designated area in Massachusetts that receives special recognition because of the quality, uniqueness, and significance of its natural and/or and cultural resources. Outstanding Resource Waters (ORW) are watershed areas that have been classified as an outstanding resource under the Massachusetts Surface Water Quality Standards as determined by their important socioeconomic, recreational, ecological and/or aesthetic values. ACEC and ORW are identified so that they may be protected and maintained. SWCA determined that there are no ACEC or ORW within or near the project area.

The site is not located within a Historic District and does not have any other designation as a historically significant property.

3.0 PROPOSED WORK

The 26.15-acre total limit of work is comprised of a 20.28-acre total developed area and a 5.87-acre shade management area. The only work proposed in any resource area is 43,848 square feet (1.01-acres) of development area in the 100-foot Buffer Zones to Wetland B, Wetland C and Wetland D, and 144,098 square feet (3.31-acres) of shade management vegetation cutting in the 100-foot Buffer Zones to Wetland C and Wetland D. These areas are illustrated on Sheet 4.0. The general sequence of work is detailed in in the notes on Sheet 3.0 of the site plan and will be phased to minimize the extent of un-stabilized disturbance areas. These phases include:

- Install Sediment and Erosion Controls
- Install Stabilized Construction Entrance
- Construct Access Road

- Grading and Clearing
- Install Solar Array (including equipment pad and fencing)
- Final Tracking and Stabilization
- Operations and Maintenance

3.1 Sediment and Erosion Control

Sediment and Erosion control methods for the site include structural and stabilization practices. Stabilization practices will be implemented to cover exposed soil so that discharge of sediment is minimized and will typically include the application of a New England moist mix and a pollinator/wildflower seed mix (Sheet 5.0). Stabilization practices reduce the time soil is exposed to the elements, therefore, reducing the possibility of erosion. An adequate stockpile of erosion control materials will be maintained at the construction site in the event of an emergency.

Structural practices involve the construction of devices to divert and limit runoff. These practices limit the amount of storm water entering a disturbed area or trap sediment prior to storm water leaving a site. As shown in Detail 3 on Sheet 5.0 of the site plan, the typical structural practice will include a 2’ x 2’ (minimum) wood strand berm.

In order to further minimize sediment loss on the site, a general construction sequence plan has been developed. Prior to conducting work associated with this project, the contractor shall be required to obtain all copies of permit applications and approvals that outline conditions governing the proposed work. The contractor will also review the drawings prepared for the project. The contractor will then follow the general sequence of work as outlined below:

- The contractor will place all erosion and sedimentation control systems in accordance with the drawings, or as may be dictated by site conditions, in order to maintain the intent of the specifications and permits. Deficiencies or changes on the drawings shall be corrected or implemented as site conditions change. Changes during construction shall be noted and posted on the drawings (Site Plans).
- The intent is to direct all water from disturbed areas through sedimentation controls prior to leaving construction boundaries. There shall be no discharge of untreated construction runoff from this site.
- The contractor shall maintain temporary erosion and sedimentation control systems as dictated by site conditions, indicated in the construction documents, or as directed by governing authorities or owner to control sediment until final stabilization.
- The contractor shall respond to any maintenance or additional work ordered by owner or governing authorities immediately, if required, and always within 7 days.
- The contractor shall incorporate permanent erosion control features, permanent slope stabilization, and vegetation into the project plans at the earliest practical time to minimize the need for temporary controls.
- Tree and vegetation-clearing and any rough grading shall only occur if the disturbed soil surface can be stabilized within 48 hours of clearing. Tree and vegetation clearing shall be scheduled in conjunction with weather forecast such that no more than 1/4" of rain is to be expected within 48 hours of any clearing or grading activity.

- Any area disturbed within the limit of work, but not within the limits of the solar array footprint are to be seeded with seed mixes as identified on Sheet 5.0.
- The contractor shall stabilize all disturbed areas within 48 hours after final grading. In the event that it is not practical to seed areas, slopes must be stabilized with geotextile fabric or other means to reduce the erosive potential of the area.

3.2 Access Road Construction

Once the initial sediment and erosion controls are in place, a stabilized construction entrance and access road will need to be constructed. The proposed access road will tie into the existing internal gravel access road maintained by J&J Family Farms, LLC. The proposed access road will be 16-feet wide and will be constructed within the larger of the two cranberry bogs on the site.

The construction sequence for the access road construction will begin with the installation of a stabilized construction entrance, consisting of a 3" minimum depth of gravel. Gravel size will range from 2" to 2.5" diameter clean stone. Filter fabric will be placed beneath the gravel when site conditions warrant such.

The access road will be constructed with a six-inch layer of coarse crushed gravel, topped with a six-inch layer of crushed gravel. The road will have a maximum of 2:1 side slopes tied into the existing surrounding grade, which will be seeded with a New England Conservation/ Wildlife Seed mix.

3.3 Clearing and Grading

The predominance of the development area is proposed within existing cranberry bogs operational areas. Approximately 6.16 acres of the proposed development area to be cleared and graded are currently forested. Within the 100-foot wetland buffer 18,269 square feet (0.42-acres) of new development area and 144,098 square feet (3.31-acres) of shade management vegetation cutting are proposed. The Town of Pembroke Conservation Commission will require a fee of $548.07 (18,269 * $.03/Sf = $548.07) for identified development work within the buffer. No development or shade management is proposed within wetlands. Valley Road Solar, LLC will also provide mitigation for the number of trees cut at a ratio of 3:1.

For purposes of calculating the tree replacement value, the current configuration proposes 3.73 acres of forest tree removal within the 100-foot wetland buffers (this includes both development and shade management). One metric for calculating the tree replacement is using the USDA *New England Forest: Baseline for New England Forest Health Monitoring* report. This report establishes that a healthy NE forest on average contains 202 live trees with a dhb greater than 5-inches, per acre. The final tree count and replacement numbers will be coordinated with the Town of Pembroke.

The contractor will fill in all the bog ditches and regrade the southern development area so that water will sheet flow away from wetlands towards exist bog drainage culverts. Bog edges will be graded so as not exceed 10% where transition is required between bog and non-bog area solar panels.

3.4 Solar Array Installation

Installation of the solar array will include the driving of piles, mounting and wiring of panels, the construction of two equipment pads, and a perimeter security fence. The depth of pile driving will be determined during the time of work. A ballast system will be employed if necessary where site conditions

merit such. Typical layouts for the panels and mounting system are detailed in Detail 9 on Sheet 5.0 of site plan.

The two equipment pads will each be constructed of a 12" thick concrete slab (with a 4" surface reveal) placed on top of a 12" thick crushed road sub-grade road base. The details of the equipment pads are included in Detail 8 on Sheet 5.0 of site plan. The locations of the pads are shown on Sheet 3.0 of site plan.

Once all panels are mounted and equipment pads are constructed, a 7' tall chain-link security fence (including the 6-inch gap off the ground) will be installed around the entire perimeter of the array, at a 12' offset from the panels to provide an internal maintenance corridor. The array and fence area will total 17.72-acres.

3.5 Stormwater Management

Civil Design Group, LLC (CDG) was retained by SWCA to prepare the Stormwater Management Report (Appendix D) for this project. As detailed in their report, the project includes the construction of a new solar array farm, a 400± lineal foot gravel driveway with electrical infrastructure within a 20± acre limit of work area. The site perimeter is wooded and is bounded by wetlands and residential properties on all sides of the property.

According to FEMA flood insurance rate maps community panel number 25023C0217J, effective date July 17, 2012, the area of the site to be redeveloped lies within Zone X, which is defined as areas determined to be outside the 0.2% (500-year) annual chance floodplain.

The stormwater report compared the pre-development and post-development hydrologic characteristics of the site, and outlined measures to mitigate flow and maintain water quality from the site in accordance with the municipality and the Massachusetts Department of Environmental Protection (DEP's) requirements.

The results of the report show that there will be no increase in run-off resulting from this project. Grading is designed to create sheet flow which drains to an existing culvert near Jeff's Pond.

3.6 Future Operations and Management

Operations and maintenance (Appendix G) shall begin once the Utility has provided approval to operate for the solar system.

Access to the site shall be provided from the existing access road. Locks shall be installed on all new gates. Access shall be provided to the Pembroke Fire Department with the use of a Knox Box located outside the exterior gates.

The owner will proactively monitor system performance and operations daily for regular expected performance and performance irregularities, and all alerts from the System DAS and/or inverters.

The following tasks will be conducted during inspections that take place twice a year:

1. Repairs to the solar energy collecting and distribution equipment will be made as needed. For the inverters, this will include:

a. Evaluating the inverters and equipment following installation to confirm proper installation.

b. Confirm the inverters are secure and properly grounded.

c. Confirm the termination is to manufacturer specifications.

d. Confirm all wires are color coded correctly and remain protected from physical damage.

e. Confirm the equipment is free from debris, moisture, rust and damage.

f. Confirm the inverters seals are intact.

g. Confirm Arc shields are installed.

h. Confirm placards are installed.

i. Maintain service clearance to the inverters and maintain access to all filters.

j. Confirm the coolant pressure is acceptable.

k. Confirm the ground fault fuses are intact and check any fault codes that are displayed.

l. Evaluate any thermal anomalies observed.

m. Annually, an IV Curve Trace will be conducted and inferred scans.

2. Inspections of the perimeter fence, solar array and connecting infrastructure will be made by the maintenance contractor during each visit.

3. Repairs to the security fence shall be made as necessary.

4. The fence panels will be maintained at approximately 6-inches off the ground to permit movement of ground dwelling animals.

5. Access roads will be maintained as needed.

6. Any erosion in the access roads shall be repaired and stabilized.

7. The seed mix proposed for use beneath the panels is a custom pollinator/wildflower seed mix, which includes low growing plant species. The area beneath the panels will be cut once a year. Any large woody vegetation or vegetation that has self-seeded and blocks sun from the panels will be removed, as needed.

4.0 SITE PLAN APPROVAL (ARTICLE V)

All site plans are stamped and signed by a Professional Engineer licensed in the Commonwealth of Massachusetts. Site engineering, Professional Land Survey, and Stormwater Plans were prepared by SWCA. The site plan and supporting materials have been designed to meet the relevant standards outlined in Town of Pembroke's Zoning Bylaw Article V § 6-12, to ensure that the proposed solar array is developed:

1. *In a manner which considers community needs, to include protection for abutting land owners, traffic safety and access, adequate waste disposal, drainage, parking, and environmental protection.*

2. *In conformity with state and local laws and regulations, including zoning, earth removal, signs, subdivision control, wetlands, flood plain and watershed protection, and water resource protection provisions.*

4.1 Impact Standards (Article V § 6)

No building, structure, premises, or land shall be used except in conformance with the following:

A. *No noise, vibration, or flashing is normally perceptible (without instruments) above street noise at any point more than three hundred and fifty feet from the premises.*

Noise may increase to an above-normal level during portions of construction, but no new permanent noise sources will result from this project.

B. *Smoke density does not exceed No. 2 of the Ringlemann Scale for more than ten percent of the time, and at no time exceeds No. 3 on that scale.*

Not applicable.

C. *All cinders, dust, fumes, gases, odors, and electromagnetic interferences are effectively confined to the premises*.

Not applicable.

4.2 Site Plan Approval (Article V § 7.E)

The site plan and supporting materials comply with and meet the "Standards for Review" under Article V § 7.E., as follows:

1. *Protection of the abutting properties, the neighborhood, and the community, to minimize any detrimental or offensive use of the site.*

In that the development area is a limited-lease area within the parcel, there will be no detrimental or offensive uses to abutters, the neighborhood, nor the community.

2. *Convenience and safety of vehicular and pedestrian movement within the site and in relation to the abutting ways and properties.*

Not applicable. This is a privately-owned parcel which is not open to pedestrian foot or vehicular traffic.

3. *Adequacy of the methods of disposal of sewage, refuse and other waste, of the methods of drainage of surface water, of the protection of wetlands, water resource protection areas, floodplains, watersheds, aquifers, and well areas.*

There will be no new methods of sewage or waste disposal. A Notice of Intent has been submitted to the Pembroke Conservation Commission to seek approval for work proposed in the 100-foot Buffer Zone to wetlands identified on the site. The site is not in any floodplains or well-areas.

4. *Provisions for lighting, off-street parking, loading and unloading of vehicles, and internal traffic control.*

   The proposed lighting complies with Article V § 8.J(3), in that the only lighting will be low intensity lighting "serving primarily as markers or as low-level illumination for entrances and exits…"

5. *Compliance with the provisions of the Massachusetts' General Laws, the rules and regulations of local, state and federal agencies, and the zoning bylaws and the town bylaws of the Town of Pembroke.*

   This standard has been met.

6. *Failure to comply with the provisions of paragraphs (1) through (5), above, shall result in denial of the application for site plan approval.*

   This standard is acknowledged and complied with.

7. *Renewable or alternative energy research and development facilities and renewable or alternative energy manufacturing facilities, subject to Site Plan review by the Planning Board, pursuant to section V.7. Site Plan Approval and subject to Standard for Review of Sub-Section E. Said Site Plan Approval shall be "expedited" application and permitting process under which said facilities may be sited within one (1) year from date of initial application to the date of final approval by the Planning Board. For the purposes of this section Renewable Energy shall be defined in Section II.*

   The subject property is entirely within the Residential A district, and the proposed project may be permitted through the Site Plan Review (SPR) process as provided by Article V § 12, As-of-Right Zoning By-law for the Town of Pembroke. The site is not located within any other Town of Pembroke zoning districts.

   Contact information for the property owner, applicant, developer, engineer and agent or legal representative of the array are provided on the Site Plan Application form. The site plans depict existing and proposed conditions including natural land features, the location of all wetlands and waterbodies within 100 feet of the development, existing buildings and other existing features. A landscape plan is provided on Sheet 4.0 (Grading and Erosion Control) of the Site Plan.

4.3 Prevention of Light Pollution (Article V § 8)

It is the intent of this section to encourage, through the regulation of the lighting practices and systems which will (i) reduce light pollution, light trespass and glare in order to preserve and enhance the natural, scenic, and aesthetic qualities or Pembroke, (ii) conserve energy and decrease lighting cost without decreasing night time safety, security, and productivity, and (iii)

preserve the night sky as a natural resource to enhance nighttime enjoyment of property within Pembroke.

The proposed lighting complies with Article V § 8.J(3), in that the only lighting will be low intensity lighting "serving primarily as markers or as low-level illumination for entrances and exits…"

4.4 Compliance with the General Requirements for Solar Voltaic Installations (Article V § 12)

The subject property is entirely within the Residential A district, and the proposed project may be permitted through the Site Plan Review (SPR) process as provided by Article V § 12, As-of-Right Zoning By-law for the Town of Pembroke. The site is not located within any other Town of Pembroke zoning districts.

The Applicant understands that the purpose of the SPR process is to ensure the "creation of new solar photovoltaic installations by providing standards for the placement, design, construction, operation, monitoring, modification and removal of such installations that address public safety, minimize impacts on scenic, natural and historic resources and to provide adequate financial assurance for the eventual decommissioning of such installations." The following general requirements for solar voltaic installations have been met:

Article V § 12.D.1(a-h): ***General Requirements for all Solar Photovoltaic Installations***

a. Site plan review. No large-scale ground mounted solar facility shall be constructed, installed or modified as provided in this section without first obtaining site plan review approval by the Pembroke Planning Board in compliance with subsection D.7 of this section.

This requirement is being met by the submissions of this site plan application.

b. Minimum Area. Large-scale ground mounted solar photovoltaic installations shall be located within Residence A District on parcels containing a minimum of three (3) contiguous acres of uplands.

This requirement has been met. The parcel is 112-acres, the majority of which is contiguous uplands.

c. Monitoring and maintenance. The solar facility shall comply with subsection D.14 of this section.

This requirement has been met. Please see Appendix G (Operation and Maintenance Plan) for more details.

d. Site control. The applicant shall submit with its application for site plan review, documentation of actual or prospective control of the project site sufficient to allow for installation and use of the proposed facility. Notice of change of ownership shall be given to the planning board in compliance with subsection D.8 of this section.

This requirement has been met. Please see Appendix C (Lease Agreement) for more details.

e. Parcels without frontage. Projects for landlocked parcels shall be allowed as long as the following conditions can be met.

Not applicable. This parcel has frontage, and the limited-lease area will be accessed by an existing access road.

f. Financial surety. The applicant shall provide a financial surety in compliance with subsection D.15.3 of this section, if so required by the Planning Board.

This requirement has been met. Please see Appendix F (Decommissioning Plan) for more details.

g. Compliance with laws, ordinances and regulations. The construction and operation of all large-scale ground mounted solar facilities shall be consistent with all applicable local, state and federal requirements, including but not limited to all applicable safety, construction, electrical and communications requirements.

This requirement will be met. A Stormwater Management Report has been developed, and is included in Appendix D (Stormwater Report). A Notice of Intent for work proposed in the 100-foot Buffer Zone to wetlands identified on the site has been submitted to the Town of Pembroke Conservation Commission and MassDEP.

h. Proof of liability insurance. The applicant shall be required to provide evidence of liability insurance in an amount sufficient to cover loss or damage to persons and structures occasioned by the failure of the facility.

This is provided in Appendix H.

Article V § 12.D.4: Compliance with Laws, Ordinances and Regulations

The construction and operation of all solar photovoltaic installations shall be consistent with all applicable local, state and federal requirements, including but not limited to all applicable safety, construction, electrical, and communications requirements. All buildings and fixtures forming part of a solar photovoltaic installation shall be constructed in accordance with the State Building Code.

These requirements will be met, and a Building Permit will be filed.

Article V § 12.D.5: Building Permit

No solar facility installation shall be constructed, installed or modified as provided in this section without first obtaining a building permit.

A building permit will be filed for upon Site Plan Approval and the receipt of an Order of Conditions from the Pembroke Conservation Commission.

Article V § 12.D.7: Site Plan Review

Large-scale ground-mounted solar photovoltaic installations shall undergo site plan review by the Planning Board prior to construction, installation or modification as provided in this Bylaw.

This requirement is being met through submittal of this Site Plan Review application.

Article V § 12.D.8: Site Control

The project proponent shall submit documentation of actual or prospective access and control of the project site sufficient to allow for construction and operation of the proposed large-scale ground-mounted solar photovoltaic installation.

This requirement has been met. See Appendix C (Lease Agreement) for more details.

Article V § 12.D.9: Operation & Maintenance Plan

The project proponent shall submit a plan for the operation and maintenance of the large-scale ground-mounted solar photovoltaic installation, which shall include measures for maintaining safe access to the installation, storm water controls, as well as general procedures for operational maintenance of the installation.

This requirement has been met. See Appendix D (Stormwater Management Report) and Appendix G (Operations and Maintenance)

Article V § 12.D.10: Utility Notification

No large-scale ground-mounted solar photovoltaic installation shall be constructed until evidence has been given to the Planning Board that the utility company that operates the electrical grid where the installation is to be located has been informed of the solar photovoltaic installation owner and operator's intent to install an interconnected customer-owned generator. Off-grid systems shall be exempt from this requirement.

This requirement has been met. Please see Appendix E (Interconnection Service Agreement).

Article V § 12.D.11: Dimension, Density and Screening Requirements

a. Minimum Setback Requirements

For all large-scale ground-mounted solar photovoltaic installations, front, side and rear setbacks shall be as follows:

1. *Front yard: The front yard depth shall be at least fifty (50) feet.*

   Requirement met.

2. *Side yard: Each side yard shall have a depth of at least fifty (50) feet.*

   Requirement met.

3. *Rear yard: The rear yard depth shall be at least thirty (30) feet; provided, however, that where the lots abuts a Conservation/Recreation or Residential district, the rear yard shall not be less than fifty (50) feet.*

   Requirement met

b. *Screening*

1. *Screening of large-scale ground-mounted solar voltaic installations shall consist of landscaping, fence, grassed earthen berm, or some combination of these screening devices. If utilizing a natural buffer, it shall be maintained above the highest level of the solar panels. When a screen consists of plant materials, said materials shall provide screening at the time of planting and be a type that shall be expected to form a year-round dense screen.*

This requirement is being met because the development area is a small limited-lease area within the larger parcel and will not be visible to abutters.

2. *Abutting residential uses: When a large-scale ground-mounted solar voltaic installation is directly abutting existing residential uses, such screening shall consist of:*
   b. For project site of greater than five acres: Minimum of one hundred (100) feet of vegetation buffer with fifty (50) feet being undisturbed closest to the residential property, and the other fifty (50) feet being allowed to be selectively cleared.

This requirement is being met because the development area is a small limited-lease area within the larger parcel and will not be visible to abutters.

Article V § 12.D.12: Design Standards

a. Lighting

Lighting of solar photovoltaic installations shall be consistent with local, state, and federal law. Lighting of other parts of the installation, such as appurtenant structures, shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties. Where feasible, lighting of the solar photovoltaic installation shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.

The proposed lighting complies with Article V § 8.J(3), in that the only proposed lighting will be for safety and operational purposes. Motion activated safety lighting will be installed at each of the three equipment pads. Safety lighting will be between 7 feet and 9 feet in height. Fixtures will be shielded and provided full cut-off to minimize light pollution.

b. Signage

Signs on all ground-mounted solar photovoltaic installations shall comply with the Town of Pembroke's Sign Bylaw. A sign consistent with the Town's Sign Bylaw shall be required to identify the owner and provide 24-hour emergency contact phone number. Solar photovoltaic installations shall not be used for displaying any advertising except for reasonable identification of the manufacturer or operator of the solar photovoltaic installation.

Signage consisting of owner and emergency contact information will be placed at entrance gates. Signage will be approximately 28"x20" and will conform to Town signage requirements.

c. Utility Connections

Reasonable efforts, as determined by the Planning Board, shall be made to place all utility connections from the solar photovoltaic installation underground, depending on appropriate soil conditions, shape, and topography of the site and any requirements of the local utility. Electrical transformers for utility interconnections may be above ground if required by the local utility.

Requirement met. See Appendix E.

d. Visual Impacts

Ground-mounted solar photovoltaic installation shall be designed to minimize visual impacts including preserving natural vegetation to the maximum extent possible, blending in equipment with the surroundings, and adding vegetative buffers to provide an effective visual barrier from adjacent roads and to screen abutting residential properties, whether developed or not. Landscaping shall be maintained by the owner/operator of the large-scale ground-mounted solar photovoltaic installation. Siting shall be such that the view of the large-scale ground-mounted solar photovoltaic installation from other areas.

This requirement is being met because the development area is a small limited-lease area within the larger parcel and will not be visible to abutters.

Article V § 12.D.13: Safety and Environmental Standards

a. Emergency Services

The ground-mounted photovoltaic installation owner or operator shall provide a copy of the project summary, electrical schematic, emergency response plan and site plan to the Fire Department at the same time as the application is submitted to the Planning Board and the Fire Department shall be afforded the opportunity to comment on the proposed project prior to the closing of the public hearing. Upon request, the owner or operator shall cooperate with local emergency services in developing an emergency response plan. All means of shutting down the solar photovoltaic installation shall be clearly marked. The owner or operator shall identify in writing to the Fire Department and Planning Board a responsible person for public inquiries throughout the life of the installation, and shall update such information as necessary.

This requirement has been met.

b. Land Clearing, Soil Erosion and Habitat Impacts

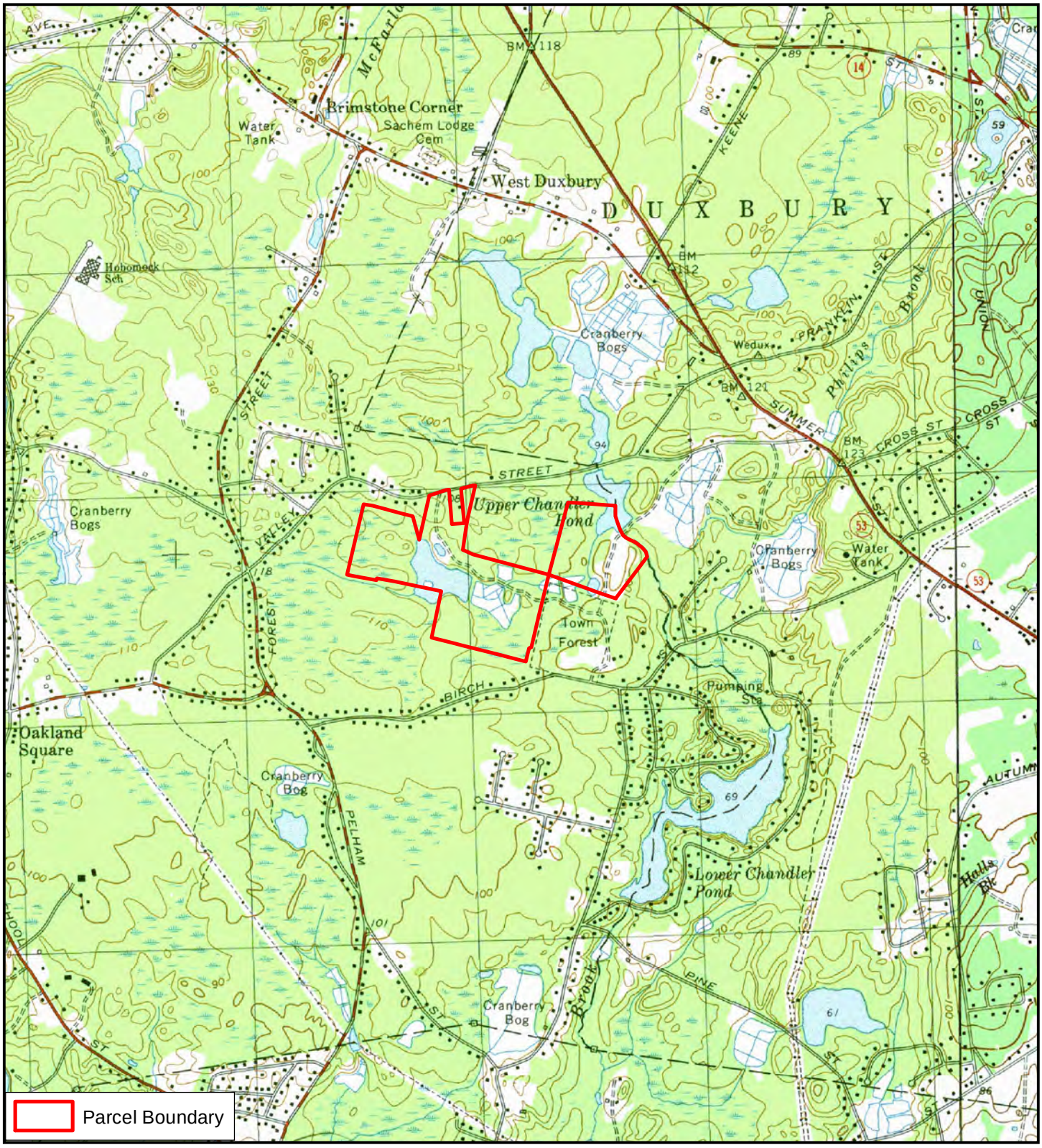
The facility shall be designed to minimize impacts to agricultural land and should be compatible with continued agricultural use to the maximum extent possible. The facility shall be designed to minimize impacts to environmentally sensitive land. Clearing of natural vegetation shall be limited to what is necessary for the construction, operation and maintenance of the large-scale ground-mounted solar photovoltaic installation or otherwise prescribed by applicable laws, regulations, and bylaws. In no event shall clear cutting of forest exceed five (5) acres. The design shall minimize the use of concrete and other impervious materials to the maximum extent possible. Locating large-scale ground-mounted solar photovoltaic installation on grades in excess of 15% shall be avoided to the maximum extent feasible.

The only impacts to environmentally sensitive land will be 144,098 square feet (3.31-acres) of shade management vegetation cutting in the 100-foot Buffer Zones of wetland identified on the site. A Notice of Intent has been filed with the Pembroke Conservation Commission for this work.

5.0 SUMMARY

On behalf of Valley Road Solar, LLC, SWCA Environmental Consultants has prepared this Site Plan Application for 221 Valley Street in Pembroke, MA to propose a 6.14 MW DC Solar Voltaic and Energy Storage Installation. The proposed project is to be constructed on approximately 26.15 acres of the 112-acre site owned by J&J Family Farms, LLC. Access to the array is proposed through construction of a gravel access driveway off of an existing gravel access road off of Valley Street. The proposed solar project will be located within the Residential A zoning district, which is an "As of right" development in this district per the Town of Pembroke Zoning Bylaws, Article V § 12.

FIGURES:



SWCA ENVIRONMENTAL CONSULTANTS

Figure 1. Project Locus

221 Valley Street
Pembroke, MA

03 May 2019
SWCA Project No.: 50506

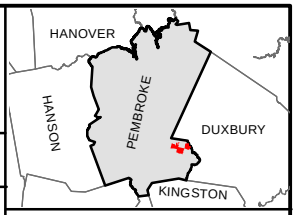
Data Source: Office of Geographic Information (MassGIS)

USGS Topographic Quadrangle Images

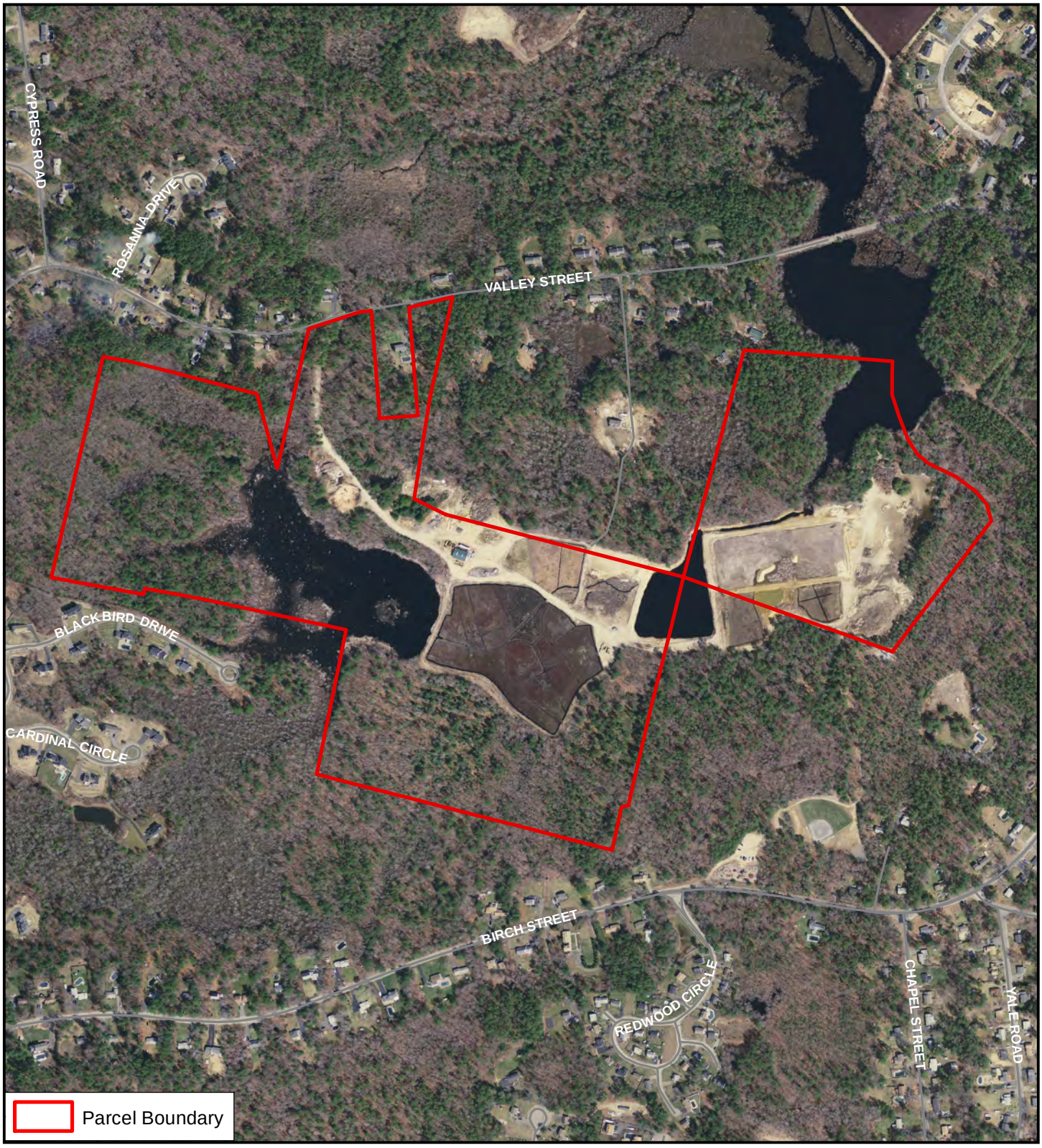
USGS Hanover Quadrangle

0 0.25 0.5 Mile

N



Latitude 42.0397° N
Longitude 70.7733° W



SWCA ENVIRONMENTAL CONSULTANTS

Figure 2. Orthophotograph

221 Valley Street
Pembroke, MA

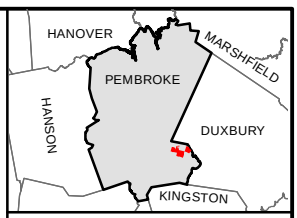
03 May 2019
SWCA Project No.: 50506

Data Source: Office of Geographic Information (MassGIS)

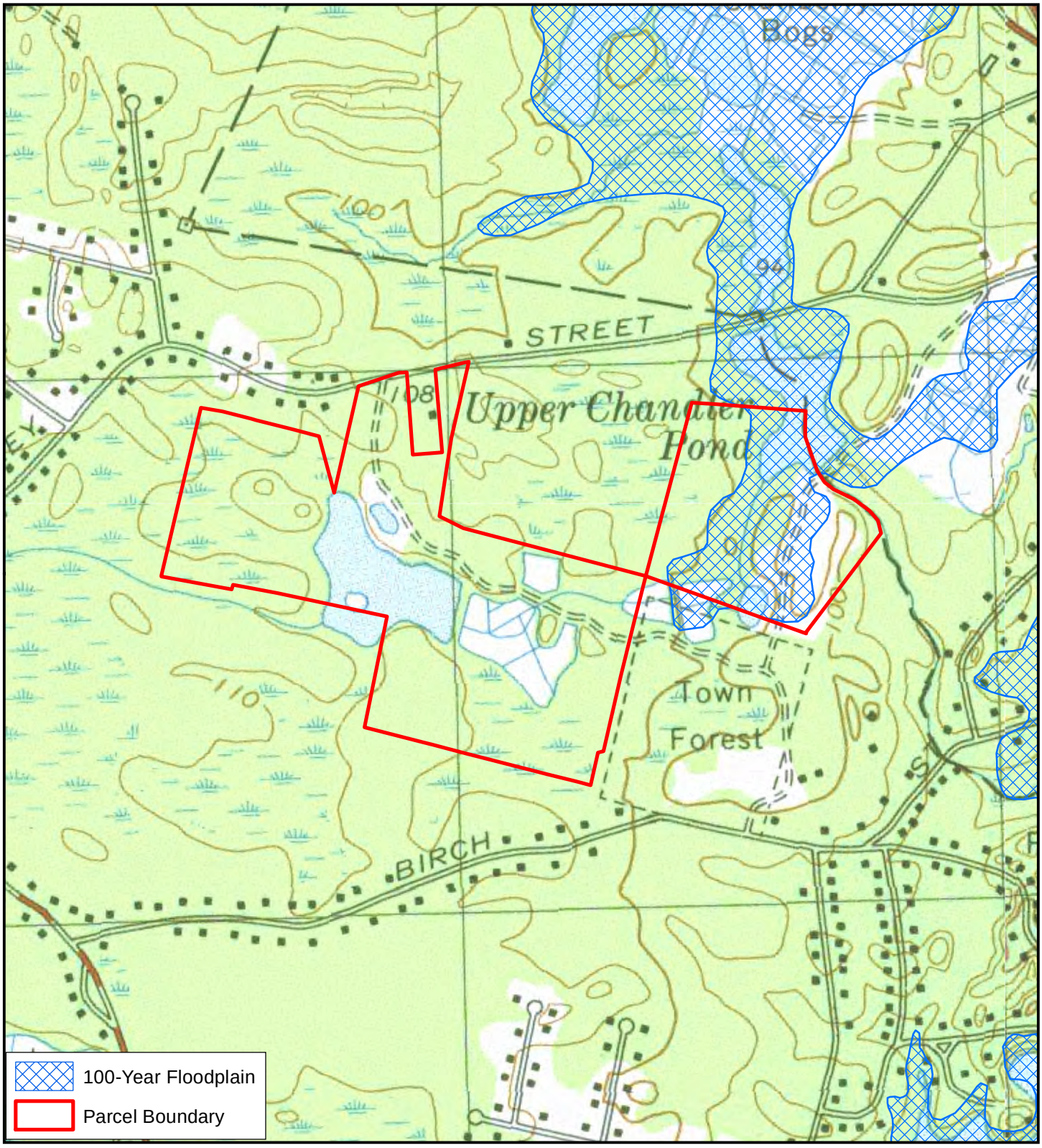
USGS Color Ortho Imagery (2013/2014)

0 350 700 Feet

N



Latitude 42.0397° N
Longitude 70.7733° W



SWCA ENVIRONMENTAL CONSULTANTS

Figure 3. 100-Year Floodplain

221 Valley Street
Pembroke, MA

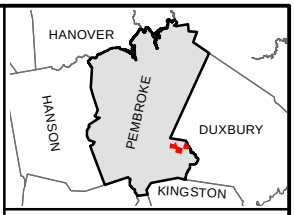
03 May 2019
SWCA Project No.: 50506

Data Source: Office of Geographic Information (MassGIS)

FEMA National Flood Hazard Layer - 2017

0 500 1,000 Feet

N



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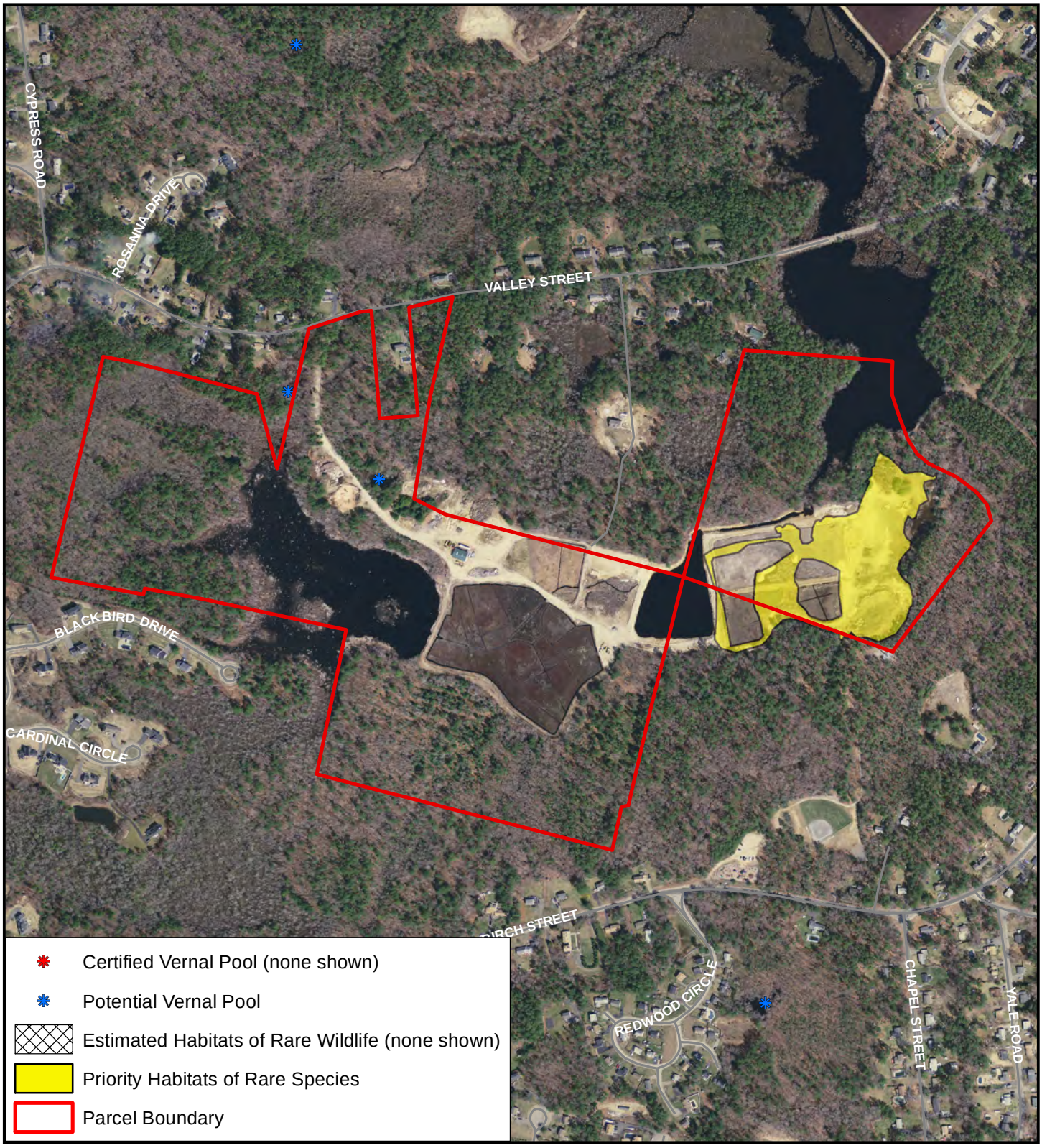
Longitude 70.7733° W



SWCA ENVIRONMENTAL CONSULTANTS

Figure 4. NHESP

221 Valley Street
Pembroke, MA

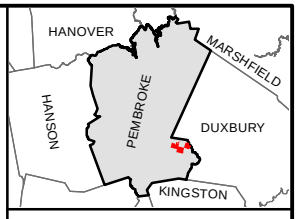
03 May 2019
SWCA Project No.: 50506

Data Source: Office of Geographic Information (MassGIS)

NHESP Priority Habitats of Rare Species (2017)
NHESP Estimated Habitats of Rare Wildlife (2017)
NHESP Certified Vernal Pools (CURRENT DATE 2019)
NHESP Potential Vernal Pools

0 350 700 Feet

N



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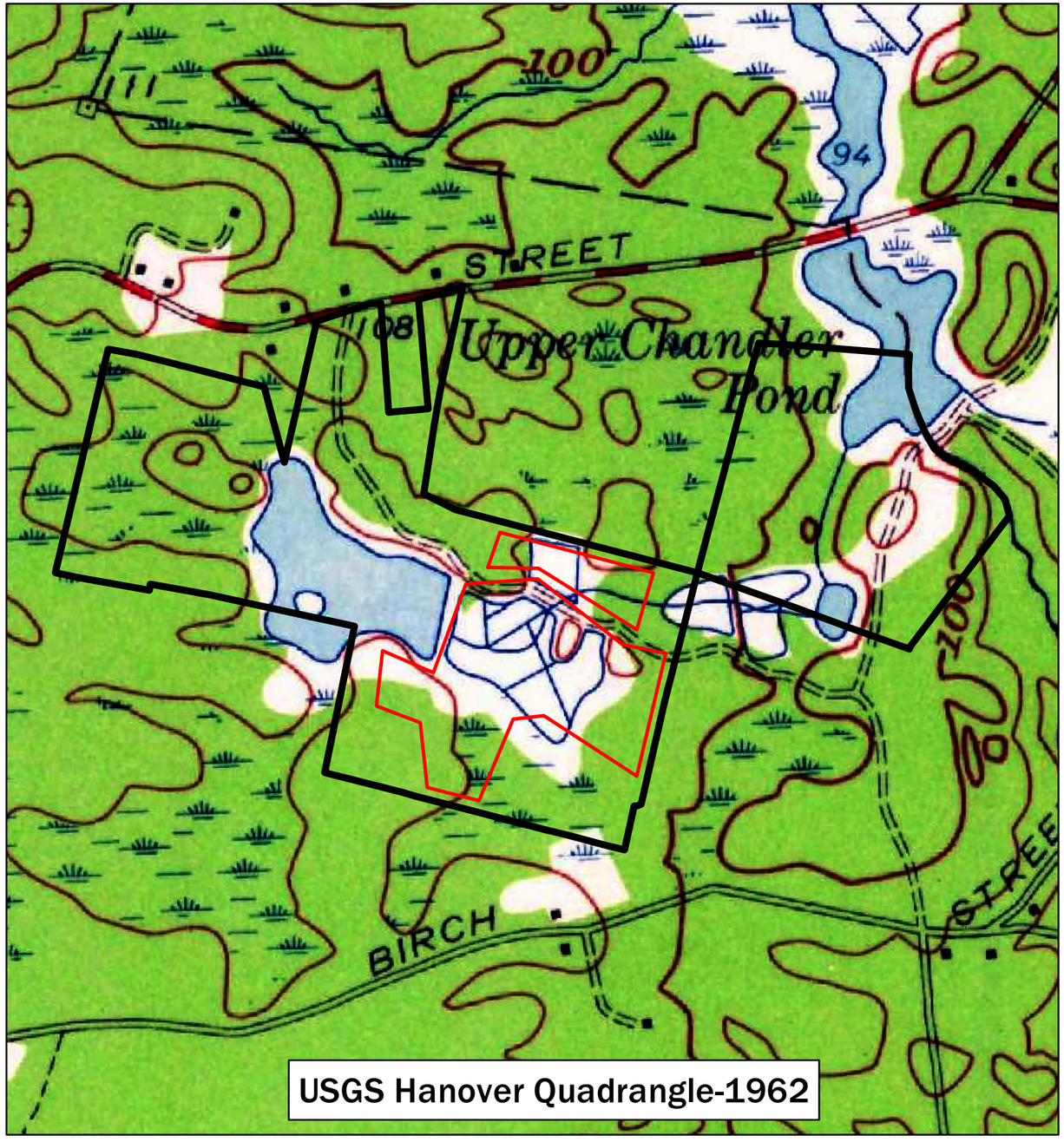
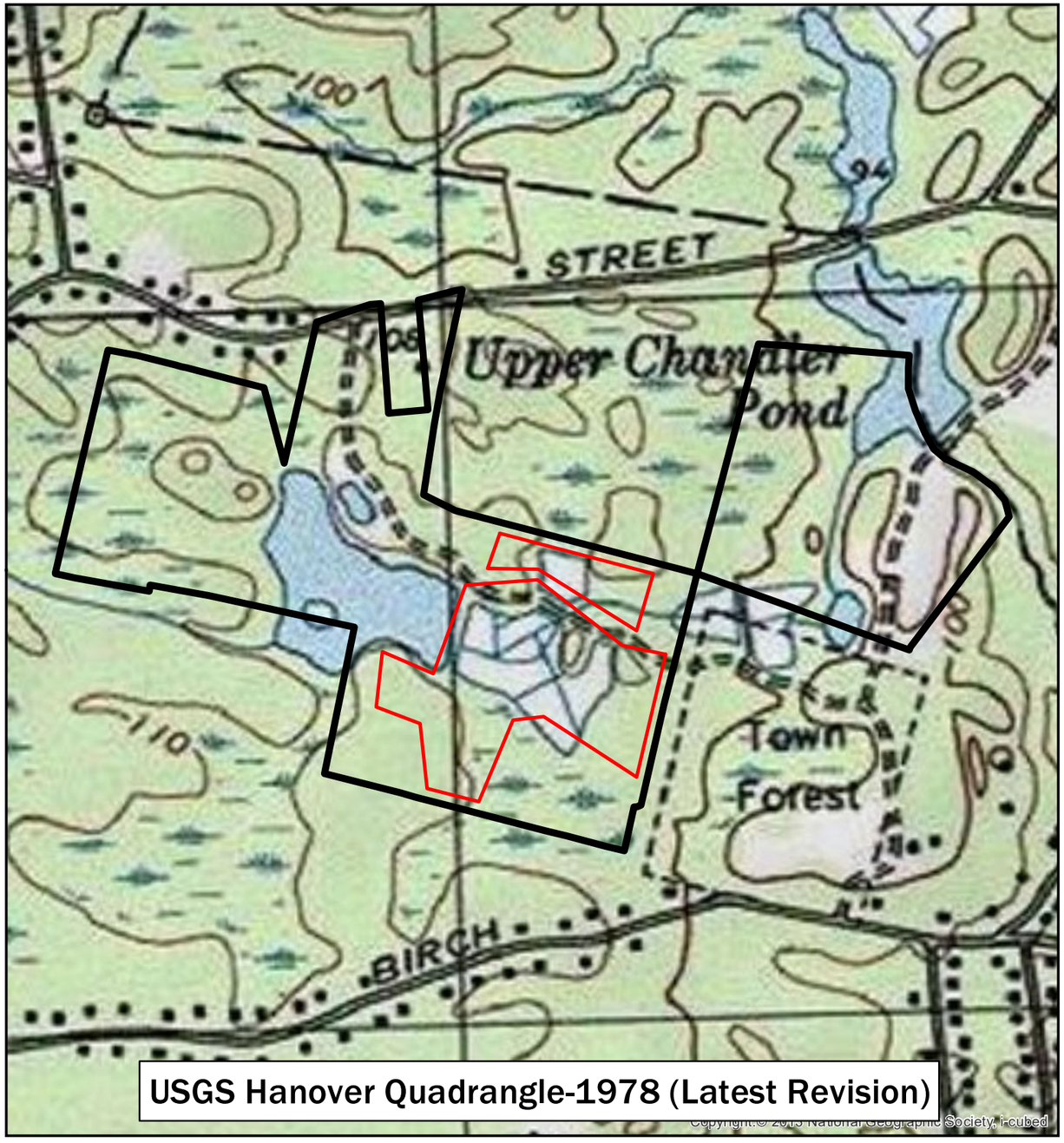
Longitude 70.7733° W



USGS Hanover Quadrangle-1962



USGS Hanover Quadrangle-1978 (Latest Revision)

SWCA®
ENVIRONMENTAL CONSULTANTS

Figure 6. Historic Topographic Maps

Valley Road Solar, LLC
221 Valley Street
Pembroke, MA

SWCA Project No.: 50506

Legend

Limit of Request

Property Boundaires

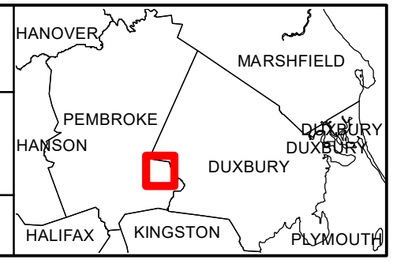
N

0 300 600 1,200 Feet

Latitude 42.039411° N
Longitude -70.771785° W

Data Sources: Office of Geographic Information (MassGIS)

13 Mar 2019



APPENDIX A

Site Plan Review Application Form

TOWN OF PEMBROKE
APPLICATION FOR SITE PLAN APPROVAL

Submit to Town Clerk with $1,000.00 Filing Fee and Complete Site Plans as required in Section V. 7., Site Plan Approval of the Zoning By-laws.

Name of Applicant: Valley Road Solar, LLC

Address: 200 Marcy Street, Suite 102, Portsmouth, NH 03801

Telephone: 603.969.8492 E-Mail pat@sunraiseinvestments.com

If applicant is not the owner complete the following. NOTICE: written permission of the owner is required for a complete application.

Name of Property Owner: J&J Family Farms, LLC

Address: P.O.Box 205, Kingston, MA 02364

Telephone: _____ E-Mail: _____

Property Address: 221 Valley Street, Pembroke, MA

Assessors Map(s) and lot(s) number: F4/2 Zoning District: Residential A

Explain current us of property, attach additional information if needed: agricultural/horticultural

Explain proposed use of property, attach additional information if needed: 6.14 MW DC Solar Voltaic Installation

	By-law Requirement	Existing Condition	Proposed Condition
Site Size (Sq. ft.)	130,680	4.356e+6	1,139,094
Structure Coverage	N/A	N/A	N/A
Frontage	50 ft.	50 ft	50 ft.
Sideyard Setbacks	50 ft.	50 ft.	50 ft.
Rearyard Setbacks	30 ft.	30 ft.	30 ft.
Sideline Buffers (ft.)	N/A	N/A	N/A
Rearline Buffer	N/A	N/A	N/A
Frontline Buffer	N/A	N/A	N/A
Parking Spaces (No)	N/A	N/A	N/A

Anticipated Traffic: (Vehicle number per day)

Trucks: N/A Autos: N/A Employee Autos: N/A

APPENDIX B

Abutter Information

FEE – $25.00

BOARD OF ASSESSORS
100 CENTER STREET
PEMBROKE, MASSACHUSETTS
02359

RECEIVED
APR 25 2019
BOARD OF ASSESSORS
PEMBROKE, MA

Pd ck# 722 $25.00

REQUEST FOR CERTIFIED ABUTTERS LIST

ZBA - 300 ft.	**(Within the Town of Pembroke)**	_____
PLANNING - 300 ft.	**(Within the Town of Pembroke)**	X
CONSERVATION - 100 ft.	**(Within the Town of Pembroke)**	_____
CONSERVATION OTHER	**(Within the Town of Pembroke)**	_____
DIRECT ABUTTERS	**(Within the Town of Pembroke)**	_____
OTHERS	**(Within the Town of Pembroke)**	_____

Please note if your requested radius crosses the Pembroke town line you must go to that other town for more information to complete the radius.

DATE : 4.23.2019

APPLICANT: Joshua Surette-SWCA Environmental Consultants

ADDRESS : 15 Research Drive, Amherst, MA 01002

TELEPHONE : 413.256.0202

LOCATION OF PROPERTY: ~~235 Valley Road~~ 221 Valley St.

MAP/PARCEL : F4/2

BOOK : ~~38976~~ 50798 **PAGE :** ~~97~~ 199 **CERTIFICATE :** _____

RECORD OWNER(S) : J&J Family Farms, LLC

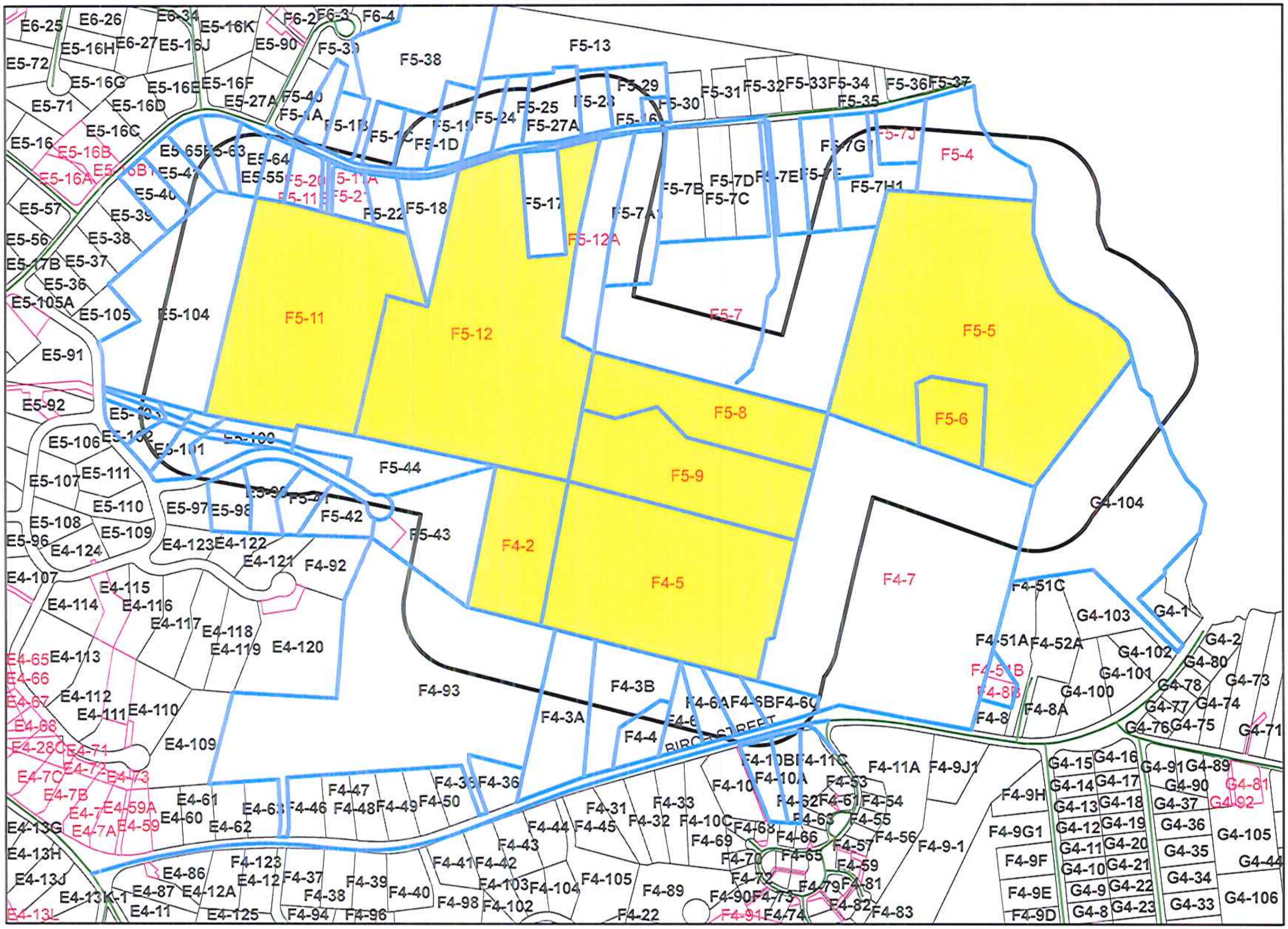
On this 26th day of April, 2019

WE HEREBY CERTIFY THIS LIST OF ABUTTERS

Elizabeth A. Bates
Mary C. Cruise
Elaine R. Bridi

PEMBROKE BOARD OF ASSESSORS

F4-2 300ft 4/26/19



Pembroke abutters only

Patriot Properties

Town of Pembroke

04/26/2019

9:14:29AM

Abutters List

Filter Used: DataProperty.AccountNumber in (6287,5868,5859,5866,5865,5867,5832,5860,5842,5843,5845,5846,5847,5831,8064,7811,5740,5794,5795,5793,5782,5760,5796,5730,5731,5834,5856,5838,5837,5836,5835,7836..

Town of Pembroke
Abutters List

Subject Parcel ID: ***F4-2 300ft***

Subject Property Location:

ParcelID	Location	Owner	Co-Owner	Mailing Address	City	State	Zip
E5-100	18 BLACKBIRD DRIVE	ADLEMAN RANDALL J.		18 BLACKBIRD DRIVE	PEMBROKE	MA	02359
E5-101	8 BLACKBIRD DRIVE	FALZONE ANTHONY	FALZONE LARISSA	8 BLACKBIRD DRIVE	PEMBROKE	MA	02359
E5-102	30 BLUEJAY WAY	GABRIEL JEFFREY M.	GABRIEL AMY E.	30 BLUEJAY WAY	PEMBROKE	MA	02359
E5-103	24 BLUEJAY WAY	HAYES MARK P.	HAYES MARY E. JULIANO	24 BLUEJAY WAY	PEMBROKE	MA	02359
E5-104	16 BLUEJAY WAY	TOWN OF PEMBROKE		100 CENTER STREET	PEMBROKE	MA	02359
E5-40	149 VALLEY STREET	DUNLEAVY NANCY M.	DUNLEAVY KAREN A.	149 VALLEY STREET	PEMBROKE	MA	02359
E5-41	155 VALLEY STREET	CLEMENTS STEPHEN JR	CLEMENTS SARAH	155 VALLEY STREET	PEMBROKE	MA	02359
E5-55	183 VALLEY STREET	VOYE EDWARD P	VOYE DIANE L	183 VALLEY STREET	PEMBROKE	MA	02359
E5-63	165 VALLEY STREET	DOYLE FAMILY TRUST	PAUL DOYLE TRUSTEE	165 VALLEY STREET	PEMBROKE	MA	02359
E5-64	177 VALLEY STREET	DUNLEAVY TRUST	DUNLEAVY WILLIAM B. SR.	177 VALLEY STREET	PEMBROKE	MA	02359
E5-65	159 VALLEY STREET	SYLVESTER KAREN		P.O. BOX 275	NORTH PEMBROK	MA	02358
E5-98	15 BLACKBIRD DRIVE	BRADLEY JEFFREY G.	BRADLEY JENNIFER L.	15 BLACKBIRD DRIVE	PEMBROKE	MA	02359
E5-99	23 BLACKBIRD DRIVE	GAGNON SCOTT	O`KEEFE KELLY M.	23 BLACKBIRD DRIVE	PEMBROKE	MA	02359
F4-10A	137 BIRCH STREET	BUCKLER JOHN M JR	BUCKLER JOANNE	137 BIRCH STREET	PEMBROKE	MA	02359
F4-10B	139 BIRCH STREET	DUPUIS ANTHONY W	DUPUIS ANN M	139 BIRCH STREET	PEMBROKE	MA	02359
F4-2	221 VALLEY STREET	J&J FAMILY FARM, LLC		82 WAPPING ROAD	KINGSTON	MA	02364
F4-3A	92 BIRCH STREET	D`ANDREA MICHAEL V.	TAYLOR CHRISTIE L.	92 BIRCH STREET	PEMBROKE	MA	02359
F4-3B	98 BIRCH STREET	GOGUEN EILEEN A.		27 FEENEY ROAD	NORWOOD	MA	02062
F4-4	110 BIRCH STREET	DASILVA EDUARDO		110 BIRCH STREET	PEMBROKE	MA	02359
F4-6	118 BIRCH STREET	SZYMANIAK JEFFREY B.	SZYMANIAK TARA S.	118 BIRCH STREET	PEMBROKE	MA	02359
F4-6A	130 BIRCH STREET	BURKE SCOTT	BURKE KELI	130 BIRCH STREET	PEMBROKE	MA	02359
F4-6B	138 BIRCH STREET	D`ATTANASIO TRACEY PEARSON		138 BIRCH STREET	PEMBROKE	MA	02359
F4-6C	140 BIRCH STREET	MALAGUTI WILLIAM A	MALAGUTI BEVERLY J	140 BIRCH STREET	PEMBROKE	MA	02359
F4-7	160 BIRCH STREET	TOWN, OF PEMBROKE		100 CENTER STREET	PEMBROKE	MA	02359
F4-93	OFF CARDINAL CIRCLE	TOWN OF PEMBROKE	CONSERVATION	100 CENTER STREET	PEMBROKE	MA	02359
F5-16	260 VALLEY STREET	SULLIVAN DANIEL J.	SULLIVAN CAROLYN	260 VALLEY STREET	PEMBROKE	MA	02359
F5-17	235 VALLEY STREET	KELLEY FAMILY IRREVOCABLE T	KELLEY JEFFREY R., TR	235 VALLEY STREET	PEMBROKE	MA	02359
F5-18	215 VALLEY STREET	FEENEY JOHN P.	FEENEY LISA M.	215 VALLEY STREET	PEMBROKE	MA	02359
F5-19	220 VALLEY STREET	REID ROBERT C.		272 THOMPSON STREET	HALIFAX	MA	02338
F5-1A	190 VALLEY STREET	AHRENS NICHOLAS D.		190 VALLEY STREET	PEMBROKE	MA	02359
F5-1B	196 VALLEY STREET	DONOVAN KEVIN R.	RUSSIAN SHARON L.	196 VALLEY STREET	PEMBROKE	MA	02359
F5-1C	206 VALLEY STREET	BAILEY FREDERIC C.	BAILEY BETH ANN	206 VALLEY STREET	PEMBROKE	MA	02359
F5-1D	210 VALLEY STREET	COBB DANIEL P.	COBB ERIN M.	210 VALLEY STREET	PEMBROKE	MA	02359
F5-20	189 VALLEY STREET	COYNE JOHN T.	COYNE EMILY P.	189 VALLEY STREET	PEMBROKE	MA	02359
F5-21	197 VALLEY STREET	LYNCH WILLIAM C.	ROGERS LYNCH KAREN S.	197 VALLEY STREET	PEMBROKE	MA	02359
F5-22	207 VALLEY STREET	MCKENNA MICHAEL		207 VALLEY STREET	PEMBROKE	MA	02359
F5-24	228 VALLEY STREET	MARCHIONNE ALBERT J. JR.		228 VALLEY STREET	PEMBROKE	MA	02359
F5-25	230 VALLEY STREET	SCAVONE BRIAN	AFTAHI NOOSHA	230 VALLEY STREET	PEMBROKE	MA	02359
F5-28	248 VALLEY STREET	THORNTON ASHLEY T.	THORNTON SHARON	248 VALLEY STREET	PEMBROKE	MA	02359
F5-29	268 VALLEY STREET	LORE THOMAS J.	LORE JENNIFER J.	268 VALLEY STREET	PEMBROKE	MA	02359

Town of Pembroke
Abutters List

Subject Parcel ID: ***F4-2 300ft***

Subject Property Location:

ParcelID	Location	Owner	Co-Owner	Mailing Address	City	State	Zip
F5-38	200 VALLEY STREET	DAMEL REALTY TRUST	LESLIE C. DAMON TRUSTE	200 VALLEY STREET	PEMBROKE	MA	02359
F5-41	29 BLACKBIRD DRIVE	DIDOMENICO PETER S.		29 BLACKBIRD DRIVE	PEMBROKE	MA	02359
F5-42	37 BLACKBIRD DRIVE	BECKER DANIEL P.	BECKER HEATHER R.	37 BLACKBIRD DRIVE	PEMBROKE	MA	02359
F5-43	40 BLACKBIRD DRIVE	LETOURNEAU DOUGLAS		40 BLACKBIRD DRIVE	PEMBROKE	MA	02359
F5-44	32 BLACKBIRD DRIVE	TOWN OF PEMBROKE	CONSERVATION COMMISS	100 CENTER STREET	PEMBROKE	MA	02359
F5-7	279 VALLEY STREET	CHANDLER ROBERT	DAVIS JULIE E.	279 VALLEY STREET	PEMBROKE	MA	02359
F5-7A1	261 VALLEY STREET	HARLING FAMILY LIVING TRUST	HARLING NIGEL	261 VALLEY STREET	PEMBROKE	MA	02359
F5-7F	291 VALLEY STREET	RIPLEY DAVID R.	RIPLEY LAURA M.	291 VALLEY STREET	PEMBROKE	MA	02359
F5-7G1	295 VALLEY STREET	LOGAN BRIAN E.	LOGAN LAUREN K.	295 VALLEY STREET	PEMBROKE	MA	02359
F5-7H1	303 VALLEY STREET	ZAGWYN CONRAD J.	ZAGWYN PATRICIA A.	303 VALLEY STREET	PEMBROKE	MA	02359
F5-7J1	305 VALLEY STREET	COLI MARCOS	COLI MARIA	27 STANDISH STREET	PEMBROKE	MA	02359
G4-104	230 BIRCH STREET	MARTIN GORDON L.	MARTIN GERALDINE A.	230 BIRCH STREET	PEMBROKE	MA	02359

Parcel Count: **52**

End of Report

18 BLACKBIRD DRIVE E5-100
LUC: 101
ADLEMAN RANDALL J.
18 BLACKBIRD DRIVE
PEMBROKE, MA 02359

8 BLACKBIRD DRIVE E5-101
LUC: 101
FALZONE ANTHONY
FALZONE LARISSA
8 BLACKBIRD DRIVE
PEMBROKE, MA 02359

30 BLUEJAY WAY E5-102
LUC: 101
GABRIEL JEFFREY M.
GABRIEL AMY E.
30 BLUEJAY WAY
PEMBROKE, MA 02359

24 BLUEJAY WAY E5-103
LUC: 101
HAYES MARK P.
HAYES MARY E. JULIANO
24 BLUEJAY WAY
PEMBROKE, MA 02359

16 BLUEJAY WAY E5-104
LUC: 930
TOWN OF PEMBROKE
100 CENTER STREET
PEMBROKE, MA 02359

149 VALLEY STREET E5-40
LUC: 101
DUNLEAVY NANCY M.
DUNLEAVY KAREN A.
149 VALLEY STREET
PEMBROKE, MA 02359

155 VALLEY STREET E5-41
LUC: 101
CLEMENTS STEPHEN JR
CLEMENTS SARAH
155 VALLEY STREET
PEMBROKE, MA 02359

183 VALLEY STREET E5-55
LUC: 101
VOYE EDWARD P
VOYE DIANE L
183 VALLEY STREET
PEMBROKE, MA 02359

165 VALLEY STREET E5-63
LUC: 101
DOYLE FAMILY TRUST
PAUL DOYLE TRUSTEE
165 VALLEY STREET
PEMBROKE, MA 02359

177 VALLEY STREET E5-64
LUC: 101
DUNLEAVY TRUST
DUNLEAVY WILLIAM B. SR. & SANDRA
177 VALLEY STREET
PEMBROKE, MA 02359

159 VALLEY STREET E5-65
LUC: 101
SYLVESTER KAREN
P.O. BOX 275
NORTH PEMBROKE, MA 02358

15 BLACKBIRD DRIVE E5-98
LUC: 101
BRADLEY JEFFREY G.
BRADLEY JENNIFER L.
15 BLACKBIRD DRIVE
PEMBROKE, MA 02359

23 BLACKBIRD DRIVE E5-99
LUC: 101
GAGNON SCOTT
O'KEEFE KELLY M.
23 BLACKBIRD DRIVE
PEMBROKE, MA 02359

137 BIRCH STREET F4-10A
LUC: 101
BUCKLER JOHN M JR
BUCKLER JOANNE
137 BIRCH STREET
PEMBROKE, MA 02359

139 BIRCH STREET F4-10B
LUC: 101
DUPUIS ANTHONY W
DUPUIS ANN M
139 BIRCH STREET
PEMBROKE, MA 02359

221 VALLEY STREET F4-2
LUC: 071
J&J FAMILY FARM, LLC
82 WAPPING ROAD
KINGSTON, MA 02364

92 BIRCH STREET F4-3A
LUC: 101
D'ANDREA MICHAEL V.
TAYLOR CHRISTIE L.
92 BIRCH STREET
PEMBROKE, MA 02359

98 BIRCH STREET F4-3B
LUC: 101
GOGUEN EILEEN A.
27 FEENEY ROAD
NORWOOD, MA 02062

110 BIRCH STREET F4-4
LUC: 101
DASILVA EDUARDO
110 BIRCH STREET
PEMBROKE, MA 02359

118 BIRCH STREET F4-6
LUC: 101
SZYMANIAK JEFFREY B.
SZYMANIAK TARA S.
118 BIRCH STREET
PEMBROKE, MA 02359

130 BIRCH STREET F4-6A
LUC: 101
BURKE SCOTT
BURKE KELI
130 BIRCH STREET
PEMBROKE, MA 02359

138 BIRCH STREET F4-6B
LUC: 101
D'ATTANASIO TRACEY PEARSON
138 BIRCH STREET
PEMBROKE, MA 02359

140 BIRCH STREET F4-6C
LUC: 101
MALAGUTI WILLIAM A
MALAGUTI BEVERLY J
140 BIRCH STREET
PEMBROKE, MA 02359

160 BIRCH STREET F4-7
LUC: 930
TOWN, OF PEMBROKE
100 CENTER STREET
PEMBROKE, MA 02359

OFF CARDINAL CIRCLE F4-93
LUC: 932
TOWN OF PEMBROKE
CONSERVATION
100 CENTER STREET
PEMBROKE, MA 02359

260 VALLEY STREET F5-16
LUC: 101
SULLIVAN DANIEL J.
SULLIVAN CAROLYN
260 VALLEY STREET
PEMBROKE, MA 02359

235 VALLEY STREET F5-17
LUC: 101
KELLEY FAMILY IRREVOCABLE TRUST
KELLEY JEFFREY R., TR
235 VALLEY STREET
PEMBROKE, MA 02359

215 VALLEY STREET F5-18
LUC: 101
FEENEY JOHN P.
FEENEY LISA M.
215 VALLEY STREET
PEMBROKE, MA 02359

220 VALLEY STREET F5-19
LUC: 101
REID ROBERT C.
272 THOMPSON STREET
HALIFAX, MA 02338

190 VALLEY STREET F5-1A
LUC: 101
AHRENS NICHOLAS D.
190 VALLEY STREET
PEMBROKE, MA 02359

F4-2 50798/199 300 ft 4/26/19

196 VALLEY STREET F5-1B
LUC: 101
DONOVAN KEVIN R.
RUSSIAN SHARON L.
196 VALLEY STREET
PEMBROKE, MA 02359

206 VALLEY STREET F5-1C
LUC: 101
BAILEY FREDERIC C.
BAILEY BETH ANN
206 VALLEY STREET
PEMBROKE, MA 02359

210 VALLEY STREET F5-1D
LUC: 101
COBB DANIEL P.
COBB ERIN M.
210 VALLEY STREET
PEMBROKE, MA 02359

189 VALLEY STREET F5-20
LUC: 101
COYNE JOHN T.
COYNE EMILY P.
189 VALLEY STREET
PEMBROKE, MA 02359

197 VALLEY STREET F5-21
LUC: 101
LYNCH WILLIAM C.
ROGERS LYNCH KAREN S.
197 VALLEY STREET
PEMBROKE, MA 02359

207 VALLEY STREET F5-22
LUC: 101
MCKENNA MICHAEL
207 VALLEY STREET
PEMBROKE, MA 02359

228 VALLEY STREET F5-24
LUC: 101
MARCHIONNE ALBERT J. JR.
228 VALLEY STREET
PEMBROKE, MA 02359

230 VALLEY STREET F5-25
LUC: 101
SCAVONE BRIAN
AFTAHI NOOSHA
230 VALLEY STREET
PEMBROKE, MA 02359

248 VALLEY STREET F5-28
LUC: 101
THORNTON ASHLEY T.
THORNTON SHARON
248 VALLEY STREET
PEMBROKE, MA 02359

268 VALLEY STREET F5-29
LUC: 101
LORE THOMAS J.
LORE JENNIFER J.
268 VALLEY STREET
PEMBROKE, MA 02359

200 VALLEY STREET F5-38
LUC: 101
DAMEL REALTY TRUST
LESLIE C. DAMON TRUSTEE
200 VALLEY STREET
PEMBROKE, MA 02359

29 BLACKBIRD DRIVE F5-41
LUC: 101
DIDOMENICO PETER S.
29 BLACKBIRD DRIVE
PEMBROKE, MA 02359

37 BLACKBIRD DRIVE F5-42
LUC: 101
BECKER DANIEL P.
BECKER HEATHER R.
37 BLACKBIRD DRIVE
PEMBROKE, MA 02359

40 BLACKBIRD DRIVE F5-43
LUC: 101
LETOURNEAU DOUGLAS
40 BLACKBIRD DRIVE
PEMBROKE, MA 02359

32 BLACKBIRD DRIVE F5-44
LUC: 932
TOWN OF PEMBROKE
CONSERVATION COMMISSION
100 CENTER STREET
PEMBROKE, MA 02359

279 VALLEY STREET F5-7
LUC: 101
CHANDLER ROBERT
DAVIS JULIE E.
279 VALLEY STREET
PEMBROKE, MA 02359

261 VALLEY STREET F5-7A1
LUC: 101
HARLING FAMILY LIVING TRUST
HARLING NIGEL
261 VALLEY STREET
PEMBROKE, MA 02359

291 VALLEY STREET F5-7F
LUC: 101
RIPLEY DAVID R.
RIPLEY LAURA M.
291 VALLEY STREET
PEMBROKE, MA 02359

295 VALLEY STREET F5-7G1
LUC: 101
LOGAN BRIAN E.
LOGAN LAUREN K.
295 VALLEY STREET
PEMBROKE, MA 02359

303 VALLEY STREET F5-7H1
LUC: 101
ZAGWYN CONRAD J.
ZAGWYN PATRICIA A.
303 VALLEY STREET
PEMBROKE, MA 02359

305 VALLEY STREET F5-7J1
LUC: 104
COLI MARCOS
COLI MARIA
27 STANDISH STREET
PEMBROKE, MA 02359

230 BIRCH STREET G4-104
LUC: 101
MARTIN GORDON L.
MARTIN GERALDINE A.
230 BIRCH STREET
PEMBROKE, MA 02359

F4-2
50798/199
300 ft
4/26/19

APPENDIX C

Lease Agreement

LAND LEASE AGREEMENT FOR SOLAR PROJECT

COVER SHEET

Owner:	**J&J Farm, LLC**
Tenant:	**Valley Road Solar, LLC**
Property Address:	**Off 235 Valley Street Pembroke, MA**
Effective Date:	**April 12, 2019**
End of Feasibility Period:	**April 12, 2020**
Commencement Date:	**To be determined**
Rent:	[redacted]
Deposit:	[redacted]
Term:	**240 months (20 years) from Commercial Operation Date**
Date of End of Initial Term:	**To be determined**
Date to Notify of Intent to Extend:	**6 months prior to expiration of Initial Term**
Renewal Terms:	[redacted]
Owner Address for Notice:	**P.O. Box 205, Kingston, MA 02364-0205**
Tenant Address for Notice:	**P.O. Box 1340, Portsmouth, NH 03802**

LAND LEASE AGREEMENT FOR SOLAR PROJECT

This Land Lease Agreement (the "Agreement" and as the "Lease") is made and entered into as of the Effective Date (as such term is hereinafter defined), by and between **J&J Farm, LLC,** having a mailing address of P.O. Box 205, Kingston, MA 02364-0205 ("Owner"), and **Valley Road Solar, LLC**, a New Hampshire limited liability company having place of business at 26 Market Square, Portsmouth, NH 03801 ("Tenant"). The Tenant and the Owner are sometimes referred to individually as a "Party" and collectively as the "Parties."

Background

WHEREAS, Owner owns a parcel of real property located off of Valley Street, Pembroke, Massachusetts, being identified on the Town of Pembroke's Tax Map F4 as Lot 2 Parcel ID F4-2 and being described in Exhibit A attached hereto and made part hereof (the "Property"); and

WHEREAS, Tenant desires to lease from Owner a portion of the Property for the purposes of constructing and operating a solar array project (the "Project") described herein, and Owner has agreed to lease such portion of the Property to Tenant for such purpose; and

WHEREAS, the Parties desire to set forth herein the terms and provisions pursuant to which Owner shall lease the portion of the Property described herein to Tenant, and Tenant shall lease such portion of the Property from Owner and utilize the same for the purposes set forth herein; and

WHEREAS, the Parties acknowledge that the Property has been used as a cranberry bog, and that the Owner intends to continue to utilize a portion of the Property for the cultivation of cranberries;

NOW, THEREFORE,

In consideration of the premises and the mutual covenants and agreements contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, and intending to be legally bound, the Parties hereto agree as follows:

Section 1. **Lease of Premises.** Owner hereby demises and leases to Tenant, and Tenant hereby leases from Owner, for the purposes described herein, the portion of the Property as described in Exhibit B attached hereto and by this reference made a part hereof (the "Premises"), which Premises are depicted on the Site Plan that is attached hereto as Exhibit C, and by this reference made a part hereof, together with the right, in common with others, to use the Easements, as that term is hereinafter defined, TO HAVE AND TO HOLD the Premises together with all rights, privileges, easements and appurtenances thereunto belonging and attaching, unto Tenant. This Lease is made upon the covenants and agreements hereinafter set forth with which the Parties hereto respectively agree to observe and comply during the Term (as such term is hereinafter defined). The Tenant and Owner acknowledge that the exact location of the Premises is subject to change pending the results of Tenant's feasibility studies during the Feasibility Period, as the same is hereinafter defined, [redacted]

[redacted] In the event that the Premises or Easements as depicted on Exhibit C must be adjusted based upon the results of Tenant's feasibility studies or due to the requirements of electric utilities or permitting authorities, then the Owner shall cooperate with Tenant to amend this Lease prior to the expiration of the Feasibility Period to provide Tenant with such area as is necessary, in Tenant's reasonable discretion, for the installation and operation of an approximately [redacted] MW DC Solar Facility, even if such cooperation slightly decreases the area of Owner's retained possessory interest, provided that the Premises and Easements shall not be adjusted in such a way as to prevent the Landlord's continued use of the remaining Property for sufficient agricultural purposes so as to maintain its agricultural property tax classification.

Section 2. **Term.** The term of this Agreement (together with extensions thereof, the "Term") shall be twenty (20) years (the "Initial Term"), commencing on the date on which Tenant obtains all necessary permits or authorizations from the utility providers to operate the Project and to sell electricity (the "Commencement Date") and expiring on the twentieth (20th) anniversary of the date on which the Project first exports commercial quantities of power to the electrical grid (the "Commercial Operation Date", unless otherwise terminated at an earlier date in accordance with the terms of this Agreement. Tenant shall provide to Owner written notice of the Commencement Date and the Commercial Operation Date. Provided Tenant is not in default of the terms of this Lease, Tenant shall have the right to extend this Lease for three (3) options (each an "Option") for terms of five (5) years each (each an "Option Term"). Tenant shall exercise each Option by giving written notice of its intent to extend the term of this Lease to Owner not more than twelve (12) months nor less than six (6) months prior to the expiration of the then current term of the Lease.

Section 3. **Rent.**

(a) [redacted] Rent shall be made payable in monthly installments. If, prior to the Commencement Date a determination is made that the Baseline System Size must be decreased to less than the estimated Baseline System Size, Rent shall decrease by multiplying the applicable Rent Rate Per Megawatt by the actual Baseline System Size as installed.

(b) Rent for each renewal term shall be increased to a Rent Rate [redacted], which Rent shall otherwise be made payable in accordance with Section 3(a).

(c) All Rent is subject to the provisions herein.

Section 4. **Feasibility and Permitting Period.**

(a) Owner acknowledges receipt of a non-refundable deposit of [redacted] (the "Deposit") prior to the Effective Date hereof. In exchange for the Tenant's payment of the Deposit, Tenant and its representatives, agents, contractors, subcontractors, are hereby granted the right for a period commencing on the Effective Date and terminating on the first anniversary of this Agreement (the "Initial Feasibility Period," and collectively with any extensions thereof pursuant to Section 4(c) hereof, the "Feasibility Period"), at Tenant's sole cost and expense, to enter upon the Property and conduct such analyses, tests, reviews,

inspections and studies (collectively, the "Tests") as Tenant deems necessary to determine the Property's suitability for Tenant's intended use thereof; to obtain any and all permits, licenses, agreements and entitlements necessary for Tenant's intended use of the Property; and to develop, design, engineer, construct, monitor, install, own, operate and maintain the Solar Facility, as the same is hereinafter defined. Such Tests may include, but are not limited to, surveys, soil tests, environmental evaluations, solar assessments, and such other Tests as Tenant deems necessary or desirable. Upon Owner's request, Tenant shall provide Owner with copies of all such surveys, soil tests, environmental evaluations, and such other Tests as Tenant shall cause to be performed. In addition, Tenant may obtain an abstract or preliminary title report regarding the Property from a title insurance company of its choice (the "Title Report"). The Parties hereto covenant and agree that notwithstanding anything to the contrary set forth herein, Tenant shall not be liable to Owner or any third Party on account of or otherwise with regard to any pre-existing defect, condition or encumbrance on or with respect to the Property, title to the Property and/or any improvements located on the Property, regardless of whether or such defect, condition or encumbrance is disclosed by the Tests or the Title Report. Owner shall reasonably cooperate with Tenant for Tenant to obtain title insurance for the Property establishing good and marketable leasehold title to the Premises subject only to such title exceptions as are acceptable to Tenant and its lenders.

(b) During the Feasibility Period and throughout the Term, Owner shall cooperate with Tenant and shall execute all documents required to assist Tenant in obtaining all permits and to permit Tenant's intended use of the Premises and the Easements in compliance with zoning, land use, utility service and building laws, rules, ordinances, permits, approvals, variances and regulations. Owner shall not take any action that would adversely affect Tenant's ability to obtain or maintain any governmental approval. Owner shall cooperate with Tenant and promptly take such actions as are reasonably necessary to enable Tenant to make such filings and take such actions as are necessary to obtain any desired zoning and land use approvals and/or building permits regarding the Project and the Premises and the Easements. Tenant shall provide Owner with drafts of any documents that it intends to submit in connection with obtaining approvals necessary for the Project for Owner's review. Owner shall provide its comments on any such documents within three (3) business days of Tenant's deliver of the same, after which time Owner shall be deemed to have approved the same. Tenant may incorporate such comments at its discretion. Owner will provide to Tenant, in writing, support for the Project in order for Tenant to use during the permitting process.

(c) Tenant shall have the option to extend the Initial Feasibility Period in exchange for payments (collectively, the "Feasibility Extension Payments"), which Feasibility Extension Payments shall be paid as follows:

i. At the expiration of the Initial Feasibility Period, Tenant shall have the option to extend the Feasibility Period for an additional six (6) months (the "First Feasibility Extension Period") in exchange for payment of a Feasibility Extension Payment of [redacted] (the "First Feasibility Extension Payment"), to be made payable on the first day of the First Feasibility Extension Period;

ii. At the expiration of the First Feasibility Extension Period, Tenant shall have the option to extend the Feasibility Period for an additional six (6) months (the "Second Feasibility Extension Period") in exchange for payment of a Feasibility Extension Payment of [redacted] (the "Second Feasibility Extension Payment"), to be made payable on the first day of the Second Feasibility Extension Period.

iii. At the expiration of the Second Feasibility Extension Period, Tenant shall have the option to extend the Feasibility Period for an additional six (6) months (the "Third Feasibility Extension Period") in exchange for payment of a Feasibility Extension Payment of [redacted] (the "Third Feasibility Extension Payment"), to be made payable on the first day of the Third Feasibility Extension Period.

(d) In addition to making the Feasibility Extension Payments hereinabove described, Tenant shall exercise each option to extend the Feasibility Extension Period by providing written notice thereof to Owner at least ten (10) days prior to expiration of the then-current Feasibility Period, provided that: (i) Tenant is diligently and in good faith seeking to obtain the Approvals (as such term is hereinafter defined); and (ii) a required Approval has not been rejected without an opportunity to appeal.

(e) If, in the sole and absolute discretion of Tenant, the Property is not suitable for Tenant's intended use thereof, or Tenant determines that the construction and operation of the Project on the Property would not be economically feasible or in Tenant's best interest, or if Tenant is unsuccessful in obtaining the permits necessary for Tenant's intended use of the Property, then Tenant shall have the right at any time prior to the Commencement Date to terminate this Agreement by providing written notice thereof to Owner. Upon and after such termination, neither Owner nor Tenant shall have any further obligation or liability under this Agreement except as otherwise expressly provided herein. If Tenant terminates this agreement, Owner shall be entitled to retain the Feasibility Extension Payments, if any. Upon and after such termination, neither Owner nor Tenant shall have any further obligation or liability under this Agreement except as otherwise expressly provided herein.

(f) If the state of title to the Property as set forth in the Title Report indicates any liens, claims or encumbrances which may interfere with Tenant's use and operation of the Premises and/or the Easements, except for liens arising as a result of Ch. 61A and 61B of the Massachusetts General Laws, Tenant shall have the right but not the obligation to either (i) require Owner to discharge such liens, claims and/or encumbrances, or (ii) terminate this Lease by providing written notice thereof to Owner. For the avoidance of doubt, Tenant may ask Owner to remove any Ch 61A or 61B liens with regards to the Premises only in which case the Tenant shall be responsible to pay any roll-back taxes assessed by the town of Pembroke. Notwithstanding the foregoing, liens associated with any mortgages granted by Owner on Owner's fee interest may remain in place so long as Owner obtains from each such mortgagee holding a mortgage upon Owner's fee interest a Subordination, Non-Disturbance and Attornment Agreement reasonably acceptable to Tenant and Tenant's lenders.

(g) Tenant shall pay for all costs incurred by it in connection with the Tests and the Title Report and its permitting and approval activities with regard to the Premises and the Easements and its general due diligence review of the Property.

(h) Tenant agrees to promptly, to the extent reasonably practicable under the circumstances, repair any damage to the Property that is caused by the Tests and restore the Property to the condition it was in immediately prior to such Tests.

(h) The provisions of Section 4(f) - (g) shall survive the termination of this Lease for a period of one (1) year, notwithstanding anything in this Lease to the contrary.

Section 5. **Use**

(a) Tenant is hereby granted the sole right to use the Premises for the purpose of constructing, installing, removing, replacing, reconstructing, maintaining and operating a solar array project, including solar panels, equipment, equipment shelters, tracking systems, canopy bays, and buildings, electronics equipment, battery storage technology and/or system, generators and other equipment, improvements and such other personal property, fencing and landscaping around the perimeter of the Premises or the portion thereof within which such Project shall be located (the "Solar Compound"), and a gate to the Solar Compound, all as described and depicted in Exhibit C attached hereto, as the same may be amended in accordance with the terms hereof (collectively, the "Solar Facility"). Owner hereby consents to the making of all such improvements. Any and all such materials installed by Tenant in, on or under the Property shall be deemed the personal property of Tenant, and shall not become fixtures or deemed a permanent part of the Property. Tenant shall have the right to alter, replace, expand, enhance and upgrade the Solar Facility within the Premises at any time during the term of this Lease. Tenant shall cause the construction of and all modifications to the Solar Facility to occur in material compliance with all applicable local, state and federal laws, rules, regulations, ordinances, permits, approvals and variances.

(b) Tenant shall use the Premises and such other areas of the Property as identified and depicted on the attached Exhibit B, as the same may be amended in accordance with the terms hereof, for solar energy conversion, the collection and transmission of electrical energy to and from the Project, and for related and incidental purposes and activities, including but not limited to: (a) locating, constructing, installing, operating, maintaining, improving, repairing, relocating, and removing the Project on and from the Premises; (b) parking in designated areas of the Property; (c) accessing the Premises and the Project (including but not limited to access for lifting, rigging, and material-handling equipment); (d) installing gates, fences, and such other security measures as may be necessary or desirable in Tenant's sole determination, to secure the Project; and (e) installing, maintaining, using, and repairing on the Premises, inverters, electrical wires and cables required for the transmission of electrical energy.

(c) This Agreement includes the right of ingress and egress to and from the Project over and across the Property for the purposes of installing, operating, maintaining, improving, repairing, relocating, and removing the Project on the Premises and to run wires and conduit from the Project to the electrical panel and other areas within the Property and to obtain access to other utility services made available by the Owner. This right of access granted by Owner, includes but is not limited to access for lifting, rigging and material-handling equipment, ingress to and egress from the Project on, over, and across the Property. The Tenant agrees to maintain the Property, subject to this Lease and specifically utilized for purposes of ingress and egress, during the Term of this Lease in its original condition, normal wear and tear excepted, and agrees to restore any damage done to said Property by the Tenant during the Term of this Lease Agreement. Access to the premises by the Tenant's employees, contractors or agents shall conform to the Owner's reasonable rules and guidelines regarding safety and site access for maintenance and similar workers, if any, which rules and guidelines shall not unreasonably impair Tenant's use of the Property as a Solar Facility. Tenant shall be responsible for ensuring that its employees, contractors or agents conform to the Owner's reasonable rules and guidelines.

(d) Tenant shall keep and maintain the Solar Facility now or hereafter located on the Premises in good condition and repair, and shall maintain and operate the Solar Facility in material compliance with all applicable federal, state and local laws, rules, regulations, ordinances, permits, approvals and variances, normal wear and tear and casualty not caused by Tenant or any employee, agent, contractor or representative thereof excepted.

(e) Tenant may fence the Premises or the Solar Compound, provided that such fencing shall be installed so as to maintain reasonable access around the Premises or Solar Compound by

Owner. Tenant shall have the right to clear and thereafter to keep clear the Premises and the Easements of all trees, bushes, rocks, crops and other vegetation using mechanical means and to grade both the Premises and the Easements as necessary for the installation and operation of the Project. No pesticides or herbicides shall be used at any time. During the construction of the Solar Facility only, Tenant shall have the right to use Owner's retained property immediately adjacent to the Premises in connection with the construction of the Solar Facility at the Premises. If the construction or maintenance of the Solar Facility results in damage to any adjacent lands of Owner (other than as permitted or otherwise contemplated herein), Tenant shall repair such damage to the condition of such lands the reasonable satisfaction of the Owner.

(f) Tenant will pay for all utilities services used by Tenant at the Premises. If the Premises do not have utilities services thereat, Tenant shall have the right to cause utilities services to be installed at the Premises, at Tenant's sole expense, and to improve, at Tenant's sole expense, the present utilities services to the Premises (including, but not limited to, the installation of emergency power generators, power lines and utility poles). Tenant shall provide Owner a plan depicting such utilities services for Owner's review and approval, which shall not be unreasonably withheld provided that the placement of utility poles and lines does not materially interfere with Owner's other tenants' operations. Owner agrees to use reasonable efforts to assist Tenant in acquiring the necessary utilities services to the Premises.

(g) As partial consideration for the Rent paid pursuant to this Lease, Owner hereby grants to Tenant and its successors and assigns, during the Term, easements in, under and across the Property: (i) for ingress, egress and access to the Premises, by foot and motor vehicles (including trucks), (ii) to install utilities services at the Premises, (iii) to install storm water management systems; (iv) to install and maintain equipment, underground and/or overhead utility wires and distribution, collection and transmission lines; underground and/or overhead control, communications and radio relay systems and telecommunication equipment and lines; energy storage facilities; interconnection and/or switching facilities, circuit breakers and transformers; lines, poles, cables, conduits, wires, fiber, conduit, footings, foundations, crossarms, guy lines and anchors drainage lines, pipes, and any related or associated improvements, fixtures, facilities, appliances, machinery or equipment to accommodate Tenant's permitted use of the Premises hereunder extending from the nearest public right-of-way, over and across any property of Owner to the Premises, (v) to capture, use and convert the unobstructed solar resources over and across the Property; and (vi) for electromagnetic, visual, view, light, noise, vibration, electrical, or other effects attributable to the Solar Facility (collectively, the "Easements"). The Easements shall be located on the Property in the areas described in Exhibit B and depicted in Exhibit C hereto, as the same may be amended in accordance with the terms hereof. The Easements granted hereunder shall be appurtenant to and a part of the Tenant's leasehold interest in the Premises and shall continue so long as this Lease is in effect. In the event that any utility company requires an easement not otherwise located with the area of the Easements to provide utilities services to Tenant, Owner agrees to grant such necessary easement to said utility company. Such additional easements in favor of the utility companies shall be located within the Property in an area(s) that is/are mutually approved by and acceptable to Owner, Tenant and such utility companies.

(h) The Easements are non-exclusive easements to and for the benefit of Tenant and its agents, employees, successors, assigns and business visitors. Tenant shall have the right to construct, maintain and repair a roadway over the aforementioned Easements, including such work as may be necessary for slope and drainage, and to install such poles, wires, pipes, cables, conduits and related appurtenances as shall be necessary for the proper conduct of Tenant's business at the Premises and for electricity, water, telephone and gas services. If Owner or other tenants, employees, agents, contractors or invitees of Owner damage or disturb the Easements, then Owner or Owner's other tenants, employees, agents, contractors and invitees shall share in the reasonable and proportionate costs incurred to repair such Easements. Owner represents and warrants to the

best of Owner's knowledge that Tenant's intended use of the Premises and the Easements does not conflict with any agreements, restrictions, covenants, conditions, easements or licenses, whether or not of record, that affect the Premises and/or the Easements.

(i) Tenant shall have 24-hours-a-day, 7-days-a-week access to the Premises and the Easements (the "Access") at all times during the Initial Term of this Lease and any Renewal Terms. Tenant shall have the right to park its vehicles on Owner's Property when Tenant is constructing, removing, replacing and/or servicing its Solar Facility, provided that such parking does not unreasonably interfere with Owner's use of the Property. Subject to Owner's reasonable approval of the location of Tenant's staging and storage area for construction materials, Tenant shall have the right to set up and store staging equipment and to store construction materials on the Property when Tenant is constructing, removing, replacing and/or servicing its Solar Facility, provided that such staging and storage does not unreasonably interfere with Owner's use of the Property.

Section 6. **Assignment.**

(a) Upon notice to Owner, Tenant shall have the right to assign or transfer its rights under this Agreement, in whole or in part, to any person or any business entity at any time, subject to the assignee assuming all of Tenant's obligations hereunder. After delivery by Tenant to Owner of an instrument of assumption by an assignee wherein such assignee assumes all of the obligations of Tenant under this Agreement, Tenant will thereafter be relieved of all liabilities and obligations pursuant to this Agreement.

(b) Subject to the terms of Section 10 hereof, Owner may assign its rights and obligations under this Agreement to its successor in interest in and to the Property without the prior consent of Tenant. The Parties hereto covenant and agree that notwithstanding any sale, conveyance, transfer or other disposition of the Property or any part thereof or interest therein or this Lease or any part thereof or interest therein to any Party other than Tenant, by transfer of fee title to the Property or a part thereof, by the granting of leasehold interest in and to or an easement over the Property or any part thereof, or by any encumbrance of the Property or any part thereof, by any sale, assignment or other disposition of this Lease or any part thereof or any right and/or interest therein, or otherwise, the Property, the Premises and the Easements shall remain subject to the Lease and the terms and provisions hereof and Tenant's rights, title, interests and remedies hereunder for the entire Term of this Lease. Owner agrees to acknowledge this "No Fixture" provision in any Notice of Lease requested by Tenant, which Notice of Lease may be recorded at Tenant's sole discretion. Owner shall notify Tenant in writing no fewer than fourteen (14) days before any transfer of all or any portion of the Property. Any such notice shall identify the transferee, the portion of the Property to be transferred, and the proposed date of the transfer. This Agreement shall survive any transfer.

Section. 7. **Transfer Warranty.** The Parties hereto covenant and agree that all sales, leases and transfers of the Property or any part thereof, and the granting of any easement encumbering or interest in and to the Property or any part thereof, shall during the Term be subject to this Lease and Tenant's rights and options hereunder and shall not adversely affect Tenant's use of the Premises and the Easements as contemplated hereby.

Section 8. **Taxes.**

(a) Tenant shall pay all real and personal property taxes assessed to the Premises; however, Owner shall reimburse Tenant for all taxes and fees not directly attributable to the Project ("Non-Project Taxes") within thirty (30) days after receipt of an invoice for such amounts, which shall include reasonable supporting documentation. For the sake of clarity, Project Taxes

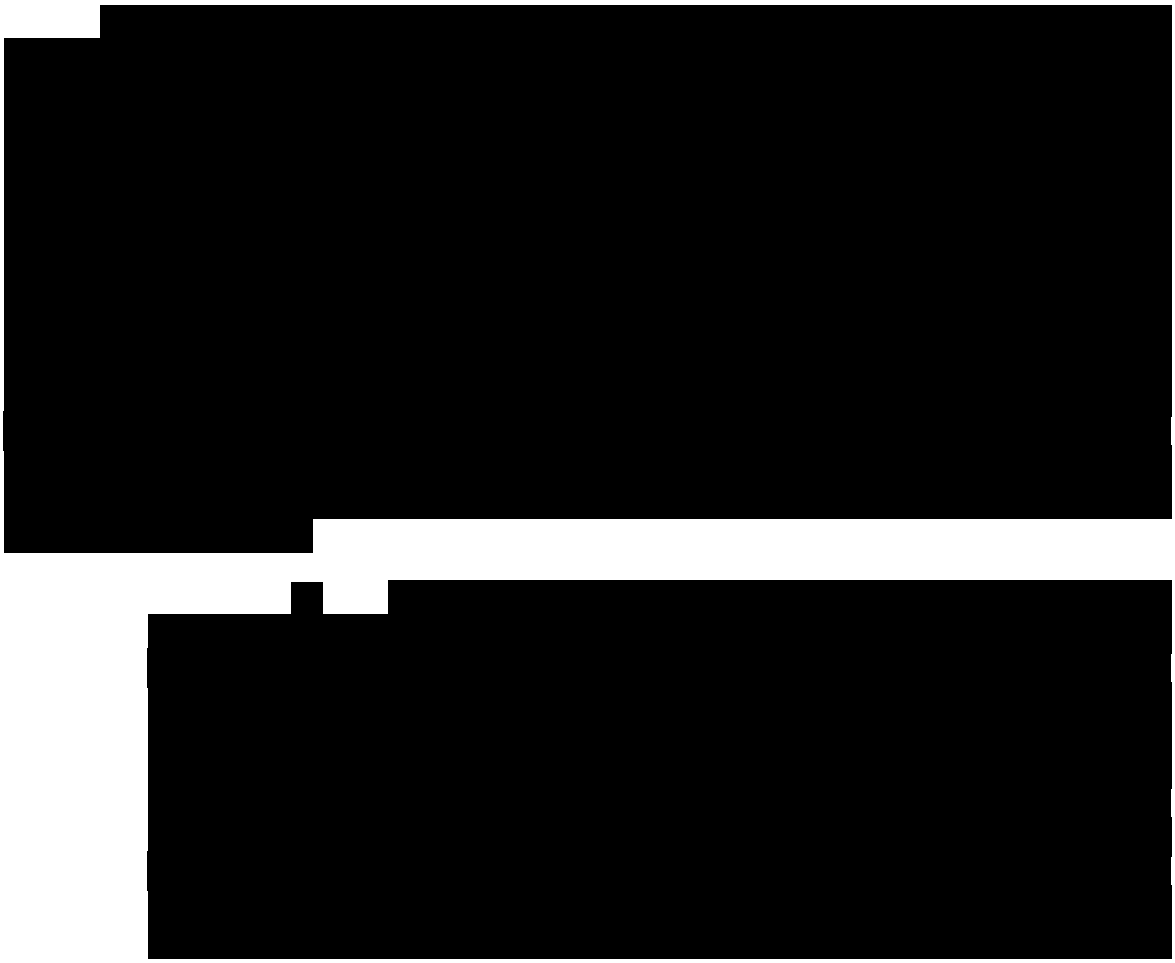
for which the Tenant shall be responsible include any increase over the 2019-2020 in the taxes directly attributable to the real property to Tenant's use of the Premises.

(b) Owner and Tenant shall work together to have the appropriate taxing authority send any tax documents related to Tenant's installation or use of the Premises directly to Tenant so that Tenant can pay such tax amounts directly to the applicable taxing authority. Owner shall promptly submit to Tenant (i) any tax bills directly related to the Premises in sufficient time to allow Tenant to make such payment at least ten (10) days before its due date and (ii) an invoice and a copy of any real property tax bill along with any other reasonable supporting documentation which will allow Tenant to verify the portion of the real property taxes which are applicable to the Premises.

(c) If Owner fails to reimburse Tenant for all Non-Project Taxes within thirty (30) days after receipt of an invoice as described in paragraph (a), Tenant may deduct from the amount paid (including interest thereon at a rate of eighteen (18%) percent per annum or the maximum permitted rate, if lesser, and penalties, if any) from the Rent otherwise due to Owner.

(d) If Owner fails to any tax bills directly related to the Premises in sufficient time to allow Tenant to make such payment at least ten (10) days before its due date as described in paragraph (b), Tenant may deduct from the amount paid (including interest thereon at a rate of eighteen (18%) percent per annum or the maximum permitted rate, if lesser, and penalties, if any) from the Rent otherwise due to Owner, which shall include any increase over the 2019-2020 in the taxes directly attributable to the real property to Tenant's use of the Premises.

(e) If Tenant fails to reimburse Owner for all Project Taxes within thirty (30) days after receipt of an invoice as described in paragraph (a), Owner may upon 90 days notice to Tenant terminate this lease and seek remedy in court.



[redacted]

Section 10. **Removal of Solar Facility.** Upon written request of Owner given to Tenant within ten (10) days of the expiration or earlier termination of this Agreement, or at Tenant's option, all personal property and trade fixtures of Tenant, specifically including, but not limited to, the Solar Facility, shall be removed by Tenant from the Premises within One Hundred Twenty (120) days after the expiration or earlier termination of this Agreement. Tenant shall have the right at any time during the Term of this Lease to remove the Solar Facility from the Premises without the consent of the Owner.

Section 11. **Right of First Negotiation.**

(a) If at any time during the Term Owner elects to offer the Property for sale, provided that the Commonwealth of Massachusetts does not elect to purchase the Property pursuant to a right of first refusal, if applicable, Owner will give Tenant written notice of the intent to sell and agrees to negotiate in good faith with Tenant for Tenant's purchase of the Property, and either Party may obtain an appraisal in connection with the negotiations.

(b) If the negotiations do not result in a mutually acceptable purchase and sale agreement within 30 days of the written notice of intent to sell Owner shall have the right to list or market the Property to third Parties and complete any eventual sale in connection therewith, which sale shall at all times be subject to this Lease.

Section 12. **Insurance.** Each of Owner and Tenant (or its contractor) shall, at its own cost and expense, maintain, with a company or companies licensed or qualified to do business in the Commonwealth of Massachusetts commercial general liability insurance with limits not less than $1,000,000 for injury to or death of one or more persons in any one occurrence and $1,000,000 for damage or destruction to property in any one occurrence. Each of Owner and Tenant shall also, at its own cost and expense, maintain, with a company or companies licensed or qualified to do business in the Commonwealth of Massachusetts umbrella policies with limits not less than $5,000,000 per

occurrence. Each Party shall be an additional insured under the other Party's policy. For the avoidance of doubt, Tenant's property insurance shall cover the Project, and Owner's property insurance shall cover the Premises and Property

Section 13. **Termination.** Tenant may terminate this Agreement at any time, in its sole discretion, by giving written notice thereof to Owner not less than 30 days prior to the Commencement Date. Further, this Agreement may be terminated by Tenant immediately, at any time, upon giving written notice to Owner, if: (a) Tenant cannot obtain all governmental certificates, permits, variances, leases or other approvals (each an "Approval"; collectively, the "Approvals") and/or any easements required for the installation and operation of the Solar Facility at the Premises as contemplated hereunder, or (b) any Approval is canceled, terminated, or expires or lapses, or (c) Owner fails to deliver to Tenant any non-disturbance agreement or subordination agreement required hereunder, or (d) Owner fails to have proper ownership of the Property and/or authority to enter into this Agreement, or (e) Tenant determines that the Property contains Hazardous Substances (as such term is defined in Section 15 hereof) and such Hazardous Substances were not introduced to the Property by Tenant and that Tenant is unwilling to take such risks associated with such Hazardous Substances notwithstanding the Indemnification of Owner as provided herein, or (f) Owner is in default hereunder and fails to cure such default within the periods specified in and otherwise in accordance with the terms of Section 18 hereof. Any termination of this Agreement pursuant to this Section 13 shall not constitute a waiver of Tenant's rights under Section 14 of this Agreement.

Section 14. **Indemnity.** Owner and Tenant each agree to indemnify and hold harmless the other Party from and against any and all claims, losses, liabilities, obligations, damages, cost and expenses, including reasonable attorney fees (collectively, the "Losses"), to the extent caused by or arising out of (a) the acts or omissions in the operations or activities on the Property, the Premises and/or the Easements by the indemnifying Party or the employees, agents, contractors, licensees, tenants (other than Tenant if Owner is the indemnifying Party) and/or subtenants of the indemnifying Party, or (b) a breach of or default by the indemnifying Party under this Lease that has not been cured in accordance with the terms hereof. Notwithstanding the foregoing, this indemnification shall not extend to Losses exclusively arising from the negligence or intentional misconduct of the indemnified Party. The indemnifying Party's obligations under this section are contingent upon (i) its receiving prompt written notice of any event giving rise to an obligation to indemnify the other Party hereto, and (ii) the indemnified Party's granting such indemnifying Party the right to control the defense and settlement of the matter for which indemnification is being given, provided that no such settlement shall be agreed to or otherwise effective unless the same has been approved in advance by the indemnified Party, such approval not be unreasonably withheld, and the indemnified Party shall have the right to participate in such defense with counsel selected by the indemnified Party, and all costs and expenses of such counsel selected by the indemnified Party shall be borne exclusively by the indemnified Party.

Section **15. Hazardous Substances.**

(a) Owner hereby represents warrants that it has not caused or suffered to be caused and has no actual knowledge of any substance, chemical or waste (collectively, the "Hazardous Substances") on the Property that is identified as hazardous, toxic or dangerous in any applicable federal, state or local law or regulation.. Owner agrees to promptly provide Tenant with any and all environmental reports, studies or information, including communications with any state or federal environmental agencies, concerning the Premises in its possession or control upon execution of this Lease Agreement. Owner has not introduced or used and shall not introduce or use any Hazardous Substance on the Property in violation of any applicable local, state or federal law. Owner shall be responsible for, and shall promptly conduct any investigation and remediation as required by any applicable local, state or federal environmental laws, all spills or other releases of

any Hazardous Substance caused by Owner, or any employee, agent, contractor, representative or affiliate thereof, that have occurred or may occur on the Property during the Term of this Lease.

(b) Tenant hereby represents and warrants that it shall not use the Premises as a storage site for Hazardous Substances, except minimal quantities used in the ordinary course of Tenant's business in accordance with all applicable local, state and federal environmental laws and regulations.

(c) Owner shall, without limitation, defend, indemnify and hold harmless Tenant from and against any and all Environmental claims or losses. In addition, any successor owner of the Owner's fee interest in the Premises shall be deemed to additionally assume the indemnification obligations of Owner, but such assumption shall not release Owner from its indemnification obligations hereunder.

Section 16. **Casualty/Condemnation.**

(a) If there is a condemnation of the Premises, the Easements and/or the Property (or a portion thereof which is sufficient to render the Premises and/or the Easements unsuitable for Tenant's purposes), including, without limitation, a transfer of the Premises, the Easements and/or the Property or a part thereof by consensual deed in lieu of condemnation, then this Lease shall, at the option of Tenant, terminate upon transfer of title to the condemning authority, without further liability to either Party hereunder (except as otherwise expressly provided herein). The Rent due hereunder shall be prorated to the date of taking, and Owner shall reimburse to Tenant the portion of the then current Annual Rent attributable to the period subsequent to such taking. Tenant and Owner shall be entitled to pursue their own separate condemnation awards with respect to any such taking (which award to Tenant may include, where applicable, the value of the Solar Facility, moving expenses, prepaid rent to the extent not reimbursed to Tenant by Owner, and business dislocation expenses).

(b) If the Premises, the Easements and/or the Property are damaged or destroyed to an extent sufficient to render the Premises and/or the Easements unsuitable for Tenant's purposes, Tenant shall have the right, but not the obligation, to elect to not rebuild, replace or repair any improvement and to terminate this Lease as of the date that such damage or destruction occurred, without prejudice to or otherwise affecting any rights or remedies that Tenant may have hereunder or at law or in equity, and the Annual Rent due hereunder shall be prorated to such date of termination.

(c) Notwithstanding anything in this Agreement to the contrary, in the event of any casualty to or condemnation of the Property or any portion thereof during such time as any Security Instrument (as such term is hereinafter defined) shall remain unsatisfied, the Financing Entity in whose favor such Security Instrument has been granted shall be entitled to receive all insurance proceeds and/or condemnation awards (up to the amount of the indebtedness secured by such Security Instrument) otherwise payable to Tenant and apply such proceeds in accordance with the terms of the Security Instrument, and shall further have the right, but not the obligation, to restore the Property in the event that the same is damaged or destroyed.

Section 17. **Quiet Enjoyment.**

(a) Subject to Owner's right to access the Premises pursuant to Section 9, Owner covenants that Tenant, upon paying the Rent and performing the covenants hereof on the part

of Tenant to be performed, shall and may peaceably and quietly have, hold and enjoy the Premises and the Easements and all related appurtenances, rights, privileges and easements throughout the Term hereof without any lawful hindrance by Owner and any person claiming by, through or under Owner, including other parties holding leasehold interests in the Property.. Except in cases of emergency, Owner shall not have access to the Premises unless accompanied by Tenant personnel.

(b) The Solar Facility shall be the exclusive property of and owned by Tenant. Owner covenants and agrees that neither the Solar Facility nor any part of the improvements constructed, erected or placed by Tenant on the Premises or the Easements shall become or be considered as being affixed to or a part of the Premises or the Easements, any and all provisions and principles of law to the contrary notwithstanding, it being the specific intention of Owner that the Solar Facility and all improvements of every kind and nature constructed, erected or place by Tenant on the Premises and the Easements shall be and remain the property of Tenant. Notwithstanding, Owner and their heirs and assigns shall have the right to use the Easements in common with Tenant so long as such use does not unreasonably interfere with Tenant's operation of the Solar Facility. Owner agrees and acknowledges that none of Tenant's assets and properties, including, without limitation, the Solar Facility and Tenant's trade fixtures, shall become the property of Owner upon termination or expiration of the Lease. Owner hereby waives any and all lien rights and/or security interests it may have, statutory or otherwise, in or otherwise with regard to the Solar Facility or any portion thereof.

(c) If Owner owns or otherwise controls land adjacent to the Premises, the Easements or the Property, Owner agrees for itself and all future holders of the Property and/or such adjacent land that no use shall be made of the Property and/or such adjacent land during the Term hereof that would materially interfere with Tenant's use of the Premises and the Easements as described herein, including, without limitation, the operation of any solar facilities by any Party other than Tenant or its successors or assigns hereunder.

(d) Owner hereby represents and warrants to Tenant that: (i) Owner is the fee owner of the Premises and the Easements and the lands immediately adjacent thereto which comprise the Easements and rights of way granted to Tenant hereunder except for an existing mortgage to Farm Credit East, ACA, 67 Bedford Street, P.O. Box 720, Middleboro, MA 02364 (the "Fee Mortgage"), (ii) to the best of Owner's knowledge such ownership is free and clear of all liens (except for liens arising as a result of Ch. 61A and 61B of the Massachusetts General Laws) claims and encumbrances other than those which do not interfere with Tenant's use of and operations at the Premises and the Easements; (iii) Owner has the lawful right and authority to execute this Lease and to grant the leasehold interests, easements, rights of way and other rights described herein; (iv) the Property (including the Premises and the Easements), and all improvements located thereon (other than improvements constructed by Tenant), are in substantial compliance with all laws, rules, regulations and ordinances, including, but not limited to, building, life/safety, disability and other laws, codes and regulations of applicable governmental authorities. and (v) Owner has obtained and delivered to Tenant or will obtain and deliver to Tenant the consents of all Parties other than Owner that hold any encumbrance upon or interest in the Premises and/or the Easements to the existence, execution and delivery of this Lease, the granting of a leasehold interest in the Premises and the granting of the Easements to Tenant in accordance with the terms hereof, and Tenant's and its successors and assigns utilization of the Premises and the Easements for the purposes described herein, together with a non-disturbance and attornment agreement as required by Section 22 of this Lease.

Section 18. **Default.** Notwithstanding anything contained herein to the contrary (other than the terms of Section 21 below), and without waiving any other rights granted at law or in equity, if either Party is in default under this Lease for a period of (i) 10 days following receipt of notice of

default from the non-defaulting Party with respect to a default which may be cured solely by the payment of money, or (ii) 90 days following receipt of notice of default from the non-defaulting Party with respect to a default which may not be cured solely by the payment of money, then, in either event, the non-defaulting Party may pursue any remedies available to it against the defaulting Party under applicable local, state and federal law or in equity, subject to the terms of Section 14 (b) hereof. If a non-monetary default may not reasonably be cured within such 90 day period, the Lease may not be terminated if the defaulting Party commences action to cure the default within such 90 day period and proceeds with due diligence to fully cure the default as soon as reasonably practicable thereafter. If Tenant terminates this Agreement as a result of an Owner default, Owner shall pay to Tenant a termination payment equal to the fair market value of Tenant's remaining leasehold interest, as determined by appraisal (the "Termination Payment").

Section 19. **Collateral Assignment.**

(a) Tenant may collaterally assign, pledge, mortgage and/or grant a security interest to and/or otherwise encumber in favor of any third Party (each, a "Financing Entity"; collectively, the "Financing Entities"), as security for any loan or other financing relationship, all of Tenant's right, title and interest in: (i) this Agreement, (ii) the Premises, (iii) the Easements, (iv) the Solar Facility, and (v) any other personal property owned by Tenant and located at the Property, all without the consent of Owner. Tenant shall also have the right to obtain, at its sole expense, a title insurance policy insuring its leasehold interest in and to the Premises and its easement interest in the Easements.

(b) Financing Entity may: (i) enforce its rights under its leasehold mortgage and/or other loan and security documents (each, a "Security Instrument"; collectively the "Security Instruments") that encumber or otherwise convey a security or other interests in and to the property and assets of Tenant, including, but not limited to, Tenant's leasehold interest in the Premises and easement interest in the Easements and its rights, title and interests in and to this Agreement, the Solar Facility, and all other improvements, equipment and other personal property of Tenant located at the Premises and within the Easements, (ii) acquire title to Tenant's interest in the Premises and the Easements under this Agreement in any lawful way, (iii) pending foreclosure of such Security Instruments, take possession of the Premises and the Easements, and (iv) obtain, at such Financing Entity's or Tenant's sole expense, a title insurance policy insuring those Security Instruments in favor of the Financing Entity that encumber Tenant's leasehold interest in the Premises and easement interest in the Easements. In connection with a Financing Entity's acquisition of such a title insurance policy, Owner shall promptly execute and deliver to the title company that is issuing such policy such landowner affidavits and/or certificates that the title company may reasonably request. If a Financing Entity shall acquire title to Tenant's interest in this Agreement by whatever lawful means, including, without limitation, by foreclosure or otherwise, then the Financing Entity may freely assign this Agreement without Owner's consent, provided such assignee assumes all of Tenant's obligations under this Agreement.

(c) Owner may pledge the Rent or otherwise encumber its interest in this Agreement to any third Party, as security for any loan or other financing, without the consent of Tenant. This Agreement shall run with the Property and shall be binding upon and inure to the benefit of the Parties hereto and their respective successors, personal representatives, heirs and assigns.

Section 20. **Estoppel Certificates.**

(a) Owner shall from time to time, within ten (10) days after receipt of Tenant's written request therefor, deliver to Tenant a written statement (to be prepared by Tenant and provided with the request) addressed to Tenant and/or to any Financing Entity (as specified by Tenant) (each an "Estoppel Certificate") certifying:

(i) That the Agreement is unmodified and in full force and effect (or if modified, a brief description of such modification and that this Agreement as so modified is in full force and effect);

(ii) That the Agreement attached to the Estoppel Certificate is a true and correct copy of this Agreement, and all amendments hereto;

(iii) That to the knowledge of Owner, Tenant has not previously assigned or hypothecated its rights or interests under this Agreement, except as described in such Estoppel Certificate with as much specificity as Owner is able to provide;

(iv) The term of this Agreement and the Annual Rent then in effect and any additional charges pursuant to this Lease;

(v) The date through which Tenant has paid the Rent;

(vi) That Tenant is not in default under any provision of this Agreement (or if in default, the nature thereof in reasonable detail) and a statement as to any outstanding obligations on the part of Tenant and Owner; and

(vii) Such other matters as are reasonably requested by Tenant.

(b) Without in any way limiting Tenant's rights and remedies arising out of Owner's failure to timely provide an Estoppel Certificate as required by this Section 20, such failure by Owner to deliver an Estoppel Certificate in accordance with the terms hereof shall be conclusive evidence that: (i) this Agreement is in full force and effect, without modification except as may be represented by Tenant; (ii) that there are no uncured defaults by Tenant or Owner hereunder; and (iii) the Annual Rent for the then current month has not been paid in advance by Tenant.

Section. 21. **Mortgage Protection.** The following provisions shall be effective at any time that Owner has received notice that Tenant has mortgaged its leasehold interest under this Lease and/or granted a security interest in the Solar Facility and/or any other assets or property of Tenant located at the Premises and within the Easements:

(a) After receipt by Tenant of a notice of default under this Lease and the expiration of any applicable cure period hereunder, Owner shall deliver to each Financing Entity that holds a Security Instrument an additional notice (the "Financing Entity Notice") which specifies the default by Tenant and states that Tenant's cure period has expired without such default being cured. Tenant shall be exclusively responsible for providing to Owner written notification of the notice addresses for each Financing Entity that holds or is otherwise a Party to a Security Instrument. Each such Financing Entity shall thereupon have the right, but shall not in any manner whatsoever be obligated, to cure such default within the applicable time periods set forth below in this Section 21, and without the payment of any default charges, fees, late charges or interest that might otherwise be payable by Tenant hereunder, except a late fee of 5% for any delinquent payment and interest of 1% per month beginning one month after a delinquent payment was due. Owner shall not terminate the Lease or exercise its other rights or remedies under the Lease:

(i) If such default can be cured other than by the payment of money exclusively and within thirty (30) days after the Financing Entities' receipt of such Financing Entity Notice one of more of the Financing Entities (A) cures such default, or (B) if such

default reasonably requires more than thirty (30) days to cure, commences to cure said default and diligently prosecutes the same to completion; or

(ii) If such default can only be cured by the payment of money and within fifteen (15) days after the Financing Entities' receipt of such Financing Entity Notice one of more of the Financing Entities cures such default.

(b) Owner hereby agrees and acknowledges that the Financing Entities that hold or are otherwise Parties to the Security Instruments shall have the right to access the Premises and the Easements and exercise any other rights of Tenant under this Lease to the extent necessary to cure, pursuant to this Section 21, default by Tenant under this Lease. Owner hereby agrees to accept performance by any of the Financing Entities of all cures, conditions and covenants under this Lease as though performed by Tenant.

(c) If the Financing Entities or any of them commence enforcement of their rights and remedies under the Security Instruments, then upon the acquisition by the Financing Entities or any of them of Tenant's rights, title and interests in and to the Lease, such Financing Entities shall cure all outstanding defaults of Tenant under the Lease that are reasonably capable of being cured by the Financing Entities within the time periods set forth in Section 21(a)(i) and (ii) above (excluding any bankruptcy or insolvency of Tenant), and: (i) Owner shall treat such Financing Entities as the tenant(s) and Tenant(s) under the Lease, (ii) such Financing Entities shall own and may exercise all rights, title and interests (including, without limitation, any security or other deposits or other impound payments), and shall be deemed to have assumed all obligations of, Tenant under the Lease, and (iii) the Lease will continue and remain in full force and effect in accordance with the terms hereof. If the Financing Entities cure all outstanding defaults by Tenant under the Lease but do not acquire all of Tenant's rights, title and interests under the Lease, or if the Financing Entities commence enforcement of their rights and remedies under the Security Instruments, and thereafter Tenant cures such defaults (which cure Owner is hereby be obligated to accept) and the Financing Entities then terminate their enforcement actions, then the Lease shall remain in full force and effect between Owner and Tenant.

(d) No modification or termination of the Lease shall be effective without the prior written consent of the Financing Entities that hold or are otherwise Parties to the Security Instruments. No notice of default by Owner to Tenant shall be effective unless a copy thereof is delivered concurrently to each Financing Entity that holds or is otherwise a Party to a Security Instrument (provided that Tenant has delivered to Owner the most recent notice addresses for such Financing Entities). Owner agrees that no default or termination of the Lease shall occur solely as a result of any of the Financing Entities enforcing their respective remedies under the Security Instruments.

(e) In connection with any foreclosure or similar action relating to the personal property of Tenant, the Financing Entities, or their respective representatives, may enter the Premises and the Easements solely for the purpose of timely removal of such personal property and other purposes incidental to implementing such action, without liability therefore, provided that such activities by the Financing Entities shall not unreasonably interfere with or disturb Owner or any other tenants of Owner, and the Financing Entities shall pay for any physical damage to the Premises, the Easements and/or the Property actually caused by the Financing Entities or their respective representatives in removing such personal property from the Premises and the Easements.

(f) The Parties hereto agree and acknowledge that if the Lease is rejected or disaffirmed as part of any bankruptcy, reorganization or insolvency proceeding commenced with respect to Tenant, Owner shall, at the request of the Financing Entities or any of them, enter into a new lease

of the Premises and a new grant of the Easements with such requesting Financing Entities for the then balance of the Term of the Lease, provided that such Financing Entities cure Tenant's then outstanding monetary defaults under the Lease (excluding any bankruptcy or insolvency) and undertake to cure all outstanding non-monetary defaults by Tenant under the Lease within thirty (30) days after the commencement date of such new lease, provided further that if such non-monetary defaults cannot be cured within thirty days, such Financing Entities shall commence to cure such defaults within said 30 day period and diligently thereafter complete such cure within a reasonable period of time not to exceed 90 days, and such new lease shall contain the same rent, covenants, terms and conditions as set forth in the Lease. The provisions of this Section 21(f) shall survive the termination of the Lease and shall continue in full force and effect thereafter.

(g) Owner shall also provide Lessee with any further assurances and shall execute any Notices of Lease, Owner's Consents to financing (which shall be in substantially similar form as that provided in Exhibit D attached hereto and made part hereof), estoppel certificates, consents to assignments or additional documents that may be reasonably necessary for recording purposes or otherwise reasonably requested by Tenant or Tenant's Financing Entities.

Section 22. **Subordination and Non-Disturbance.**

(a) Tenant acknowledges that prior to the Commencement Date, Owner may have granted, and on or after the Commencement Date Owner may grant, a mortgage(s), deed(s) of trust or other security instrument (collectively, the "Fee Mortgages"; individually, a "Fee Mortgage") which encumber some or all of the Premises and/or the Easements to certain institutions or persons (collectively, the "Fee Mortgagees"; individually, a "Fee Mortgagee").

(b) With regard to each Fee Mortgage that is in effect and/or of record on or prior to the recordation of the Notice of Lease (as such term is hereinafter defined), Owner will request from the Fee Mortgagee thereunder that such Fee Mortgagee execute and deliver to Tenant a subordination, attornment and non-disturbance agreement among Owner, such Fee Mortgagee and Tenant pursuant to which: (i) Tenant confirms that this Lease is subordinated to the Fee Mortgage granted to such Fee Mortgagee and Tenant will attorn to such Fee Mortgagee in the event that the Fee Mortgagee acquires title to the Property; and (ii) such Fee Mortgagee agrees to honor the Lease, and that the Lease shall remain in full force and effect and shall not be terminated, and Tenant shall be permitted to exercise all of its rights and remedies thereunder, as long as Tenant is not in default under the Lease, even in the event of foreclosure under the Fee Mortgage to which such Fee Mortgagee is a Party (each a "SAND Agreement"; collectively, the "SAND Agreements"). If Owner fails to deliver to Tenant on or prior to the recordation of the NOL a SAND Agreement for each Fee Mortgage that is in effect and/or of record on or prior to the recordation of the NOL, then Tenant shall have the right, in its sole discretion, to terminate this Lease by proving written notice thereof to Owner, and upon such termination neither of the Parties hereto shall have any further obligations or liabilities hereunder.

(c) With regard to each Fee Mortgage that is in effect and/or of record after the recordation of the NOL, Tenant shall promptly enter into a SAND Agreement with Owner and the Fee Mortgagee thereunder. If Tenant fails to deliver such SAND Agreement to Owner, then Owner shall have the right, in its sole discretion, to terminate this Lease by proving written notice thereof to Tenant, and upon such termination neither of the Parties hereto shall have any further obligations or liabilities hereunder.

(d) The Parties hereto covenant and agree that notwithstanding anything to the contrary set forth herein, the form and terms of each SAND Agreement shall be mutually approved by and acceptable to Owner, Tenant, Tenant's Leasehold Mortgagee and the Fee Mortgagee that is a Party to such SAND Agreement.

Section 23. **Memorandum of Lease**. At Tenant's request, Owner shall at this time or at any time on or before the Commencement Date execute, acknowledge and deliver to Tenant for recording a Memorandum/Notice of Lease (the "NOL") substantially in the form of Exhibit "D" attached hereto, which may be modified to incorporate any revisions to Exhibits B and C in accordance with the terms hereof. In the event of an amendment to the Exhibits B and C following recording of the NOL, Owner agrees to execute, acknowledge and deliver to Tenant a revised NOL for recording. Owner hereby grants to Tenant permission to insert the Commencement Date of this Agreement into the NOL after execution of the NOL and to record the NOL in the Plymouth County Land Records, in the Massachusetts Land Court, if the Property is now or hereafter registered pursuant to M.G.L.Ch.185 §1 *et seq.*

Section 24. **Miscellaneous.**

(a) Owner represents and warrants that each person executing this Agreement on behalf of Owner represents individually that such person has the authority to execute this Agreement on behalf of Owner.

(b) Tenant warrants and represents that it is duly authorized to do business in the state in which the Property is located and that the undersigned representative of Tenant is fully authorized by Tenant to enter into this Agreement on behalf of Tenant.

(c) This Agreement sets forth and contains the entire agreement between the Parties hereto regarding the subject matter hereof, and supersedes all prior discussions, agreements and negotiations between the Parties with regard to the subject matter hereof.

(d) The Parties may sign this Agreement in multiple counterparts, each of which, when executed, shall be deemed to be an original instrument, and all of which, taken together, shall constitute one and the same agreement.

(e) The terms and conditions of this Agreement shall extend to and bind the heirs, personal representatives, successors and assigns of Owner and Tenant.

(f) The prevailing Party in any action or proceeding in court to enforce the terms of this Agreement shall be entitled to receive its reasonable attorneys' fees and other reasonable enforcement costs and expenses from the non-prevailing Party.

(g) Notices, requests, and other communication shall be in writing and sent by United States Mail, postage prepaid, certified or registered with return receipt requested, or by any nationally recognized overnight courier service for priority delivery, to the respective addresses set forth below. Any such notice shall be deemed given when deposited in the United States Mail or delivered to such courier service. Notices shall be sent to:

For Tenant:
Valley Road Solar, LLC
PO Box 1340
Portsmouth, NH 03802

For Owner:

J&J FARM, LLC
P.O. Box 205
Kingston, MA 02364-0205

(i) This Agreement shall be governed by and construed in accordance with the laws of the state in which the Property is located, without giving effect to the conflicts of laws rules of such state.

(j) Neither Tenant nor Owner shall disclose the financial or other terms of this Agreement to third Parties (other than either Party's employees, attorneys, lenders and accountants) without the express written consent of the non-disclosing Party hereto.

(k) Owner's recourse against any Financing Entity shall be expressly limited to such Financing Entity's interest in this Agreement.

(l) All Exhibits attached hereto and the terms and provisions thereof are incorporated herein by this reference for all purposes. The Parties agree and acknowledge that Exhibit A (the legal description of the Property) and Exhibit B (the description of the Premises and the Easements) and/or Exhibit C (the description of the Solar Facility), may be attached to this Lease and the NOL in preliminary form. Accordingly, the Parties agree that upon preparation of the final exhibits to be used in Tenant's applications for the Approvals, the same shall also be attached to and shall constitute the final Exhibits A, B, and/or C as the case may be, to this Lease and the NOL, provided that such final Exhibits shall substantially conform to the preliminary Exhibits and that any deviations therefrom shall be approved by Owner, which approval shall not be unreasonably withheld.

(m) Owner is not represented by any broker or any other leasing agent in connection with the transactions contemplated by this Lease. Owner shall be responsible for and shall pay when due any commissions, fees and/or other payments to such agent, and agrees to indemnify and hold Tenant harmless from all claims by such broker or anyone claiming through such broker with regard to such commissions, fees and payments. If Tenant is represented by any broker or any other leasing agent in connection with the transactions contemplated by this Lease, Tenant shall be responsible for and shall pay when due all commissions, fees and/or other payments to such agent, and agrees to indemnify and hold Owner harmless from all claims by such broker or anyone claiming through such broker with regard to such commissions, fees and payments.

(n) This Agreement may not be amended, supplemented or restated except by a written instrument that has been executed and delivered by each of the Parties hereto.

(o) The effective date of this Lease is the date of execution by the last Party to sign the Lease (the "Effective Date").

(p) The waiver by any Party hereto of a breach of any provision of this Lease shall not bar or be construed as a waiver of any subsequent breach by any Party. A delay in enforcing a Party's' rights shall not constitute or operate to act as a waiver of any breach.

(q) If any provision of this Lease is found by a court of competent jurisdiction to be unenforceable or illegal, such findings shall not impair the remaining provisions of this Lease and the remainder of this Lease shall be enforceable as if such illegal or invalid provision had not been contained within this Lease.

[This Space Left Blank Intentionally; Signatures Appear on the Next Page]

IN WITNESS WHEREOF, the Parties do hereby execute this Agreement as of the 12th day of APRIL, 2019.

OWNER:

J&J FARM, LLC

Jennifer Mathias, Manager

TENANT:

VALLEY ROAD SOLAR, LLC

By: _____
Robert Lambert, Senior Vice President

[Signature Page]

EXHIBIT "A"

LEGAL DESCRIPTION OF PROPERTY

[to be updated at a later date]

Assessor's ID: Map F4, Lot 2

Recording Information: Plymouth County Registry of Deeds Book 38976, Page 97

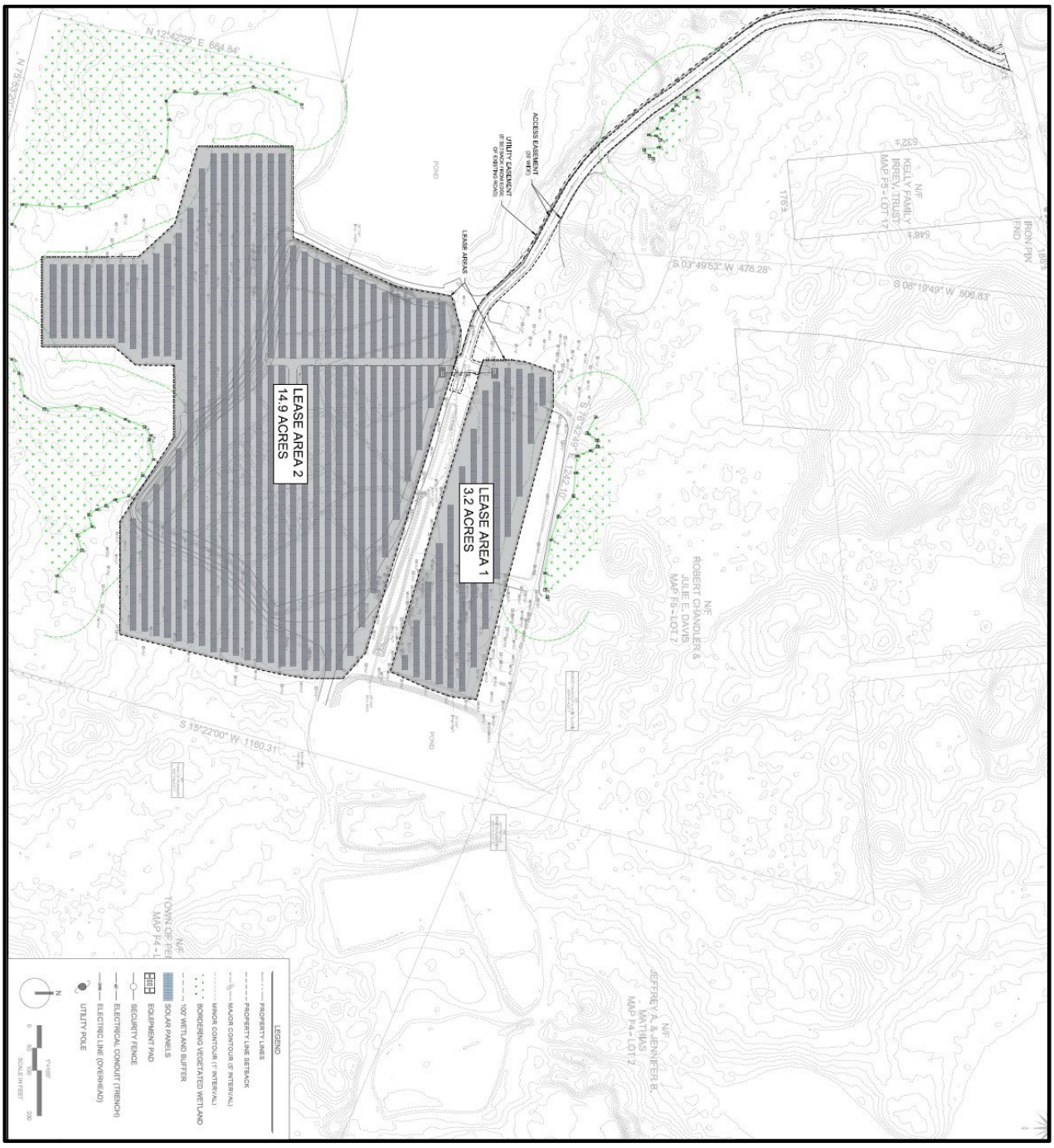
EXHIBIT "B"

PROPOSED DESCRIPTION OF THE PREMISES AND THE EASEMENTS

[to be updated at a later date]

EXHIBIT "C"

PROPOSED DEPICTION OF THE SOLAR FACILITY*



*Location of Premises and Easements subject to adjustment pursuant to Section 1 of the Lease.

EXHIBIT "D"

MEMORANDUM/NOTICE OF LEASE

NOTICE OF LEASE

This Notice of Lease is by and between J&J FARMS, LLC, JENNIFER MATHIAS, Manager a Massachusetts Limited Liability Company with a mailing address of at P.O. Box 205, Kingston, MA 02364-0205 ("Landlord" or "Owner") and **SUNRAISE DEVELOPMENT, LLC,** a limited liability company, with its principal place of business at PO Box 1340, Portsmouth, NH 03802 (the "Tenant" or "Tenant") (Collectively Landlord or Owner and Tenant or Tenant collectively referred to herein as the "Parties").

Landlord and Tenant wish to enter into this Notice of Lease to be recorded in the Plymouth County Registry of Deeds in accordance with or M.G.L.Ch. 183 §4 *et seq*.

NOW, THEREFORE, the Parties hereto agree as follows:

The Leases. The Parties to the Lease are J&J Farm, LLC as Landlord, and SunRaise Development, LLC as Tenant. The Lease has an effective date of _____.

1. The Assignment: SunRaise Development, LLC assigned its interest to the Lease to _____ [SPE name], by assignment dated _____.

2. Premises. Landlord leased to Tenant, and Tenant leased from Landlord, as further identified in the Leases certain portions of _____ for Tenant's exclusive use, along with easements for solar, utilities, access & egress as more fully set forth in the Lease.

The Premises encompasses portions of that certain real property identified as City Tax Map _____. Metes and bounds description of the underlying fee title, which comprises our locus Premises is derived from the following deed(s):

a. The Deed includes all of the parcels that were transferred Owner in 38976, Page 97.

3. Term, Renewals and Extensions. The term of each this Agreement is effective upon the Effective Date thereof, and has a term of twenty (20) years from the Commencement Date or until the earlier termination of the Agreement pursuant to early termination provisions (the "Initial Term"). After the Initial Term, the Tenant shall have the option to renew the Agreement for three additional five (5) year terms (**"**Renewal Term**"),** by a written notice from the Owner to the Tenant at least one hundred and eighty (180) days prior to the expiration of the Initial Term. The Initial Term and the subsequent Renewal Term, if any, are referred to collectively as the "Term**.**

4. Notices. The addresses set forth for the parties in the Lease are as follows:

If to Landlord:

If to Tenant:

5. No Fixture. The System, as defined in the Lease, installed and operated by Tenant at the Premises shall not be deemed a fixture. The System is Tenant's personal property and Owner, or any successor and/or assign, has no right, title or interest in the system.

6. Reference to Lease. This Notice of Lease is not intended to modify or amend any of the terms of the Lease. To the extent that any provision of this Notice of Lease is inconsistent with the Lease, the terms of the Lease shall control.

SIGNATURE PAGE FOLLOWS

IN WITNESS WHEREOF, the parties hereto have set their hands and seal as of the ____ day of _____ 2019.

OWNER:
J&J FARM, LLC
By:

_____
Jennifer B. Mathias, Manager

STATE OF _____
COUNTY OF _____, ss.

At _____ in said County, this _____ day of _____, 2019 personally appeared Jennifer B. Mathias as she is manager of J&J FARM, LLC and she acknowledged the within instrument, by her signed, to be her the free act and deed of the Limited Partnership.

Before me,

_____
Notary Public
My Commission Expires:

TENANT

By VALLEY ROAD SOLAR, LLC,
it's Managing Member

By: _____
Robert Lambert, Managing Member

STATE OF NEW HAMPSHIRE
COUNTY OF _____, ss.

On this _____ day of ____, 2019 personally appeared Robert Lambert, duly authorized Managing Member of SunRaise Development, LLC, the Managing Member of _____, LLC and he/she acknowledged the within instrument, by him/her signed, to be his free act and deed and the free act and deed of _____ LLC.

Before me,

_____
Notary Public

My Commission Expires:

EXHIBIT "E"

OWNER'S CONSENT TO FINANCE FORM

OWNER'S CONSENT TO
LEASEHOLD MORTGAGE DEED AND SECURITY AGREEMENT

THIS OWNER'S CONSENT TO LEASEHOLD MORTAGE DEED AND SECURITY AGREEMENT (the "Owner's Consent") is made as of the ____ day of _____, 2019, by and among J&J FARM, LLC. a Massachusetts Limited Liability Company JENNIFER B. MATHIAS, Manager with a mailing address of P.O. Box 205, Kingston, MA 02364-0205 (hereinafter referred to as "Owner"), **_____ [LENDER NAME]**, _____[ENTITY TYPE] with its principal place of business at_____("LENDER").

W I T N E S S E T H:

WHEREAS, Owner is the owner of a certain property located at or near Valley Street in the Town of Pembroke, County of Plymouth, State of Massachusetts, described in that certain deed to Owner recorded in Book 38976, Page 97 of the Plymouth County Registry of Deeds (the "Premises"); and

WHEREAS, the Owner and SunRaise Development, LLC ("SunRaise") as Tenant entered into a Solar Energy Facility Site Lease Agreement (the "Lease") dated as of _____, 2019 leasing the Premises to SunRaise, as amended by Assignment and Assumption of Lease of near or even date herewith; and

WHEREAS, pursuant to the assignment, SunRaise has assigned the Lease to _____ [SPE Name] ("Tenant") and Tenant has accepted such assignment; and

WHEREAS, contemporaneously herewith Tenant and LENDER have entered into certain financing transactions for the construction of solar arrays to be located on the Premises (the "Construction"), and in connection therewith the Tenant has granted to LENDER a certain leasehold mortgage and security interest in all of the Tenant's presently owned and hereafter acquired rights, rental income, and interests in and to the Premises and the Lease, including, but not limited to, subleases, accounts receivable concerning the Premises, machinery, equipment and fixtures, and the proceeds thereof (hereinafter referred to as the "Collateral"), which leasehold mortgage is more fully set forth on Schedule A attached hereto and incorporated herein by reference; and

WHEREAS, as a condition of said financing transactions, LENDER has required Tenant to obtain from the Owner this Owner's Consent;

NOW, THEREFORE, in consideration of the foregoing and for other good and valuable consideration, the receipt of which is hereby acknowledged, the parties hereto agree as follows:

1. Owner acknowledges and confirms its consent to the assignment of the Lease from SunRaise to Tenant and agrees to treat Tenant as "Tenant" for all purposes under the Lease.

2. Owner hereby waives in favor of LENDER any lien, claim or interest including but not limited to any Owner's lien or right to distress for rent, which Owner may have or hereafter acquire as to the Collateral whether presently installed on the Premises or hereafter to be installed on the Premises.

3. The Owner hereby acknowledges receipt of notice of the Tenant's assignment and grant of a security interest in its rights as Tenant under the Lease pursuant to certain leasehold mortgages granted by Tenant to LENDER now and upon completion of Construction (hereinafter collectively the "Leasehold Mortgage") and consents to such assignments of and grants of security interests in the Lease and to the Leasehold Mortgage. The Owner further agrees that, after the Tenant's default under any Leasehold Mortgage, which is not cured within any applicable grace or cure period, and LENDER's exercise of its rights under a Leasehold Mortgage, LENDER or its nominee, or assignee shall have the right of quiet enjoyment of the Premises subject to the provisions of the Lease on the condition of its performance, as assignee, of the Tenant's outstanding and continuing obligations under the Lease. LENDER shall have the right to assign such Lease to an assignee, subject to the written consent of the Owner, which shall not be unreasonably withheld or delayed, provided such assignee assumes in writing all of the obligations of Tenant under the Lease.

4. Owner agrees that so long as any Leasehold Mortgage remains outstanding the following provisions shall apply notwithstanding any provisions to the contrary in the Lease:

A. Owner shall give to LENDER, as the case may be, as holder of the Leasehold Mortgage a written notice of any default by Tenant under the Lease, either (i) as provided in the Lease for a notice of default to Tenant, or (ii) in any event, not less than thirty (30) days prior to any termination of the Lease for failure to pay the rent and not less than sixty (60) days prior to any termination of the Lease for failure to perform other obligations thereunder. No notice of termination shall be deemed to have been duly carried out unless and until such notice is given in accordance with the terms of this Owner's Consent.

B. In case Tenant shall be in default under the Lease, beyond any applicable grace or cure period, LENDER, as the holder of the Leasehold Mortgage shall, within the period and otherwise as herein provided, have the right to remedy such default or cause the same to be remedied, and Owner shall accept such performance by or at the insistence of such holder as if the same had been made by Tenant. Notwithstanding the foregoing, if a non-monetary default cannot reasonably be cured within such sixty (60) day period, LENDER shall be given a reasonable additional period of time, not to exceed 120 days to cure such default so long as LENDER is diligently proceeding to effect such cure.

C. No event of default in respect of the performance or work required to be performed, or of acts to be done, or of conditions to be remedied under either of the Leases or as provided in subsection A. hereunder shall be grounds for termination as against LENDER as the holder of a Leasehold Mortgage if steps shall, in good faith, have been commenced within the time permitted therefor to rectify the same and shall be prosecuted to completion with diligence and continuity.

D. Anything contained in the Lease to the contrary notwithstanding, upon the occurrence of an event of default other than an event of default due to a default in the payment of rent, which is not cured within any applicable grace or cure period, Owner shall take no action to effect a termination of the Lease without first giving to LENDER as holder of the Leasehold Mortgage written notice thereof as provided in subsection A and a reasonable time thereafter within which to either (i) obtain possession of the Premises (including possession by a receiver), or (ii) institute, prosecute and complete foreclosure proceedings or otherwise acquire

Tenant's interest under the Lease with diligence. LENDER as holder, or an assignee of holder, upon obtaining possession or acquiring Tenant's interest under the Lease, shall be required promptly to cure all defaults then reasonably susceptible of being cured by such holder. Provided however, that: (i) such holder shall not be obligated to continue such possession or to continue such foreclosure proceedings after such defaults shall have been cured; (ii) nothing herein contained shall preclude Owner, subject to the provisions of this Owner's Consent, from exercising any rights or remedies under the Lease with respect to any other default by Tenant during the pendency of such foreclosure proceedings; and (iii) such holder shall agree with Owner in writing to comply during the period of such forbearance with such of the terms, conditions and covenants of the Lease as are reasonably susceptible of being complied with by such holder. Any default by Tenant not reasonably susceptible of being cured by such holder on account of insolvency or voluntary and involuntary bankruptcy or reorganization proceedings, receivership, or an assignment for the benefit of creditors or the like shall be deemed to have been waived by Owner upon completion of such foreclosure proceedings or upon such acquisition of Tenant's interest in the Lease, except that any of such events of default which are reasonably susceptible of being cured after such completion and acquisition shall then be cured with reasonable diligence. Such holder, or its designee, or other purchaser in foreclosure proceedings may become the legal owner and holder of the Lease through such foreclosure proceedings or by an outright assignment of the Lease in lieu of foreclosure.

E. In the event of the termination of the Lease prior to the expiration of the term thereof, Owner shall serve upon LENDER as the holder of such Leasehold Mortgage written notice that the Lease has been terminated together with a statement of any and all sums which would at that time be due under the Lease but for such termination, and of all other defaults, if any, under the Lease then known to Owner. Such holder, or its designee, shall thereupon have the option to obtain a new lease in accordance with and upon the following terms and conditions:

Such new lease shall be entered into at the reasonable cost to the tenant thereunder, shall be effective as of the date of the termination of the Lease, and shall be for the remainder of the term of the Lease and at the rent and upon all the agreements, terms, covenants and conditions thereof, including any applicable rights of renewal. Such new lease shall require the tenant thereunder to perform any unfulfilled obligation of Tenant under the Lease which is reasonably susceptible of being performed by such tenant.

F. Anything herein contained to the contrary notwithstanding, the provisions of this Article shall inure only to the benefit of LENDER and any other holders of the Leasehold Mortgage.

G. No agreement between Owner and Tenant, nor any election by Tenant under the term of said Lease, reducing the terms of the Lease or canceling or surrendering the Lease shall be effective without the prior written consent of LENDER as the holder of the Leasehold Mortgage.

H. LENDER as holder of a Leasehold Mortgage may assign such Lease, subject to the written consent of the Owner, which shall not be unreasonably withheld or delayed, and shall thereupon be released from all liability for performance or

observance of covenants and conditions in such Lease contained on Tenant's part to be performed and observed from and after the date of such assignment, provided that the assignee from such holder shall have assumed such Lease, except as provided in Section 3 hereof.

5. Owner acknowledges that the Lease is in full force and effect, that to its knowledge the Tenant is not in default thereunder and that to the knowledge of Owner, Owner knows no reason or state of facts now existing which would give rise to a default thereunder or to any charge, lien or claim against Tenant.

6. During the term of the Lease and for a period of ninety (90) days following receipt of written notice by LENDER from Owner of a default by Tenant and the expiration of all applicable grace or cure periods, Owner further consents that LENDER , its employees, agents, servants, independent contractors, successors or permitted assigns shall have access to the Premises with respect to the removal of the Collateral from the Premises and the sale of the Collateral, or the sale of the Collateral on the Premises, by LENDER , its employees, agents, servants, independent contractors, successors or permitted assigns, at no expense or cost to the Owner, upon the surrender of the Collateral by the Tenant to LENDER or the default by Tenant in its obligations to LENDER .

7. Any notice, demand or request required or permitted to be given hereunder shall be in writing and shall be deemed to have been sufficiently given for all purposes when given by (i) hand delivery, (ii) overnight United States mail or recognized overnight commercial courier or delivery service (such as UPS or Federal Express), (iii) certified mail, return receipt requested, or (iv) registered mail to the parties at their respective addresses set forth below, or at such other address as any of them may from time to time hereafter designate by notice given to the other parties as herein provided. Any such notice, demand or request will be deemed received two (2) business days after it is deposited in the United States mail or with a commercial courier or delivery service as aforesaid, and in the case of hand delivery, upon acceptance at the office of the addressee.

To LENDER:

To Owner: J&J Farm, LLC
c/o

Jennifer B. Mathias
P.O. Box 205
Kingston, MA 02364-0205

8. This Owner's Consent shall be binding upon and shall inure to the benefit of Owner, its successors and assigns, and to the benefit of LENDER and CNB, its successors and assigns.

9. This Owner's Consent may be executed in one or more counterparts, all of which when taken together shall be considered one and the same agreement and shall become effective when counterparts have been signed by each party and delivered to the other parties, it being understood that all parties need not sign the same counterpart.

10. The provisions of this Owner's Consent apply solely to the _____ in its capacity as Owner of the Premises and do not in any manner affect or limit the actions it may take in its sovereign capacity, including without limitation by exercise of its inherent police power, power of taxation or power of eminent domain [in event Owner is a municipality].

[Remainder of page intentionally blank – signature pages to follow]

OWNER:
J&J FARMS, LLC
By:

_____
Jennifer B. Mathias, Manager

STATE OF Massachusetts
County of Plymouth, ss. _____, 2019

Personally appeared before me the above named Jennifer B. Mathias as Manager of J&J Family Farms, LLC, who acknowledged the foregoing instrument to be the free act and deed of the LLC.

Before me,

_____
Notary Public/Attorney at Law

_____
Print Name

LENDER

By: _____
_____
Its: _____

STATE OF _____
County of _____, ss _____ ____, 2019

Personally appeared before me the above named _____, the _____ of _____ who acknowledged the foregoing instrument to be his free act and deed in his said capacity, and the free act and deed of _____.

Before me,

_____
Notary Public/Attorney at Law

_____
Print Name

SCHEDULE A
TO
OWNER'S CONSENT

$____.-- Leasehold Mortgage to _____, Inc.

APPENDIX D

Stormwater Report

STORMWATER MANAGEMENT REPORT

FOR

PROPOSED SOLAR ENERGY FACILITY

221 VALLEY STREET
PEMBROKE, MA 02359

PREPARED FOR:

SWCA ENVIRONMENTAL CONSULTANTS
15 RESEARCH DRIVE
AMHERST, MA 01002

PREPARED BY:

CIVIL DESIGN GROUP, LLC
21 HIGH STREET, SUITE 207
NORTH ANDOVER, MA 01845

DATE: APRIL 16, 2019

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II. LIST OF FIGURES

III. HYDROLOGICAL CALCULATIONS

IV. APPENDIX

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1.0 SITE LOCATION AND DESCRIPTION

Civil Design Group, LLC (CDG) has been retained by SWCA Environmental Consultants to prepare this Stormwater Management Report for the construction of a proposed solar energy facility located at 221 Valley Street, Pembroke, Massachusetts (refer to Figure 1). The project includes the construction of a new solar array farm, a 400± lineal foot gravel driveway with electrical infrastructure within a 20± acre limit of work area. The site perimeter is wooded and is bounded by wetlands and residential properties on all sides of the property.

According to FEMA flood insurance rate maps community panel number 25023C0217J, effective date July 17, 2012, the area of the site to be redeveloped lies within Zone X, which is defined as areas determined to be outside the 0.2% (500-year) annual chance floodplain. Based on available MassGIS information, the site does lie within a resource/buffer area, however, the site is not located within an area mapped for rare and endangered species or certified vernal pools as mapped by the State of Massachusetts' Natural Heritage and Endangered Species Program (NHESP) or within an Area of Critical Environmental Concern (ACEC) or within an aquifer protection zone.

This study presents a comparative analysis of the pre-development and post-development hydrologic characteristics of the site, and outlines measures to mitigate flow and maintain water quality from the site in accordance with the municipality and the Massachusetts Department of Environmental Protection (DEP's) requirements.

2.0 METHODOLOGY

Northeast Regional Climate Center (Cornell Rates) was utilized to source the precipitation values and Technical Release 55 (TR-55) methodology was utilized to determine weighted curve numbers (CNs) for each pre and post-development subcatchment area. Weighted CNs are based on ground cover type and hydrologic soil groups (HSGs). The times of concentration (Tc's) for each of the existing and proposed watersheds have been calculated. The areas that do not show a Tc travel path resulted in travel times of less than 6 minutes. CN and Tc values were then utilized to generate hydrographs using HydroCad 10.0, an industry standard software package that develops a hydrologic model based on the SCS method and computes peak discharges from rainfall runoff for urban and rural watersheds.

3.0 SOILS

According to the Natural Resources Conservation Service Web Soil Survey (Figure 2), underlying soils within the vicinity of the site are classified as follows:

1 Water
6A Scarboro muck – HSG A
55A Freetown coarse sand – HSG B/D
253B Hinckley loamy sand – HSG A
253C Hinckley loamy sand – HSG A
256B Deerfield loamy find sand – HSG A
320B Birchwood sand – HSG B/D
665B Udipsamments – HSG A

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As indicated above, the site is comprised of HSG A and HSG B soils with the exception of the 'water' classification which no longer is applicable as the existing pond has apparently been drained. The proximate land surrounding the former pond appears to be predominately HSG A soils, therefore the limit of work area has been divided up into HSG A and HSG B for both the existing and proposed conditions for the purposes of generating peak flow rates.

4.0 POINTS OF ANALYSIS

Points of Analysis (POAs) are discharge points or lines that convey runoff from the study area via overland flow or through drain pipes. The pre-development and post-development areas of disturbance drain to four (4) POA's listed and described below and shown on Figures 3 and 4.

TABLE-1: POINTS OF ANALYSIS

POINT OF ANALYSIS	DESCRIPTION
POA-1	Two (2) existing culverts that outlet to the adjacent pond to the east
POA-2	A comparison line along a portion of the site's westerly property line
POA-3	A comparison line along a portion of the site's southerly property line
POA-4	A comparison line along the a portion of the sites easterly property.

5.0 EXISTING DRAINAGE WATERSHEDS

The existing watersheds are delineated based on topography, physical characteristics and drainage networks within the site limits and collect and direct stormwater towards the POAs. The total study area for the site is 19.9± acres and is divided into eight (8) pre-development watersheds as described below:

Subcatchment EX-1: The 10.9-acre watershed is comprised of Bog, woods, meadow, and dirt road areas. Runoff travels via overland flow in a northerly direction through a series of existing drainage culverts and stormwater basins towards POA-1.

Subcatchment EX-2: The 3.5-acre watershed is comprised of Bog, meadow, and dirt road areas. Runoff travels via overland flow in an easterly direction towards POA-1.

Subcatchment EX-3: The 0.4-acre watershed is comprised of water and dirt road areas. Runoff travels via overland flow in an easterly direction through an existing stormwater basin and drainage culvert towards POA-1.

Subcatchment EX-4: The 0.5-acre watershed is comprised of woods and dirt road areas. Runoff travels via overland flow in an easterly direction towards POA-1.

Subcatchment EX-5: The 0.3-acre watershed is comprised of water and dirt road areas. Runoff does not appear to have an outlet from the basin within this watershed, however, any overflow runoff would discharge towards POA-1.

Subcatchment EX-6: The 1.2-acre watershed is comprised of wooded areas. Runoff travels via overland flow in a southwesterly direction towards POA-2.

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Subcatchment EX-7: The 1.3-acre watershed is comprised of wooded areas. Runoff travels via overland flow in a southerly direction towards POA-3.

Subcatchment EX-8: The 1.5-acre watershed is comprised of wooded and dirt road areas. Runoff travels via overland flow in an easterly direction towards POA-4.

6.0 PROPOSED DRAINAGE WATERSHEDS

Similar to the existing watersheds, the proposed watersheds are delineated based on topography, physical characteristics and drainage networks within the site limits and collect and direct stormwater towards the POAs. This area is divided into eight (8) post-development watersheds described below:

Subcatchment PR-1: The 12.1-acre watershed is comprised of meadow, and dirt/gravel road areas. Runoff travels via overland flow in a northerly direction through a series of existing drainage culverts and stormwater basins towards POA-1.

Subcatchment PR-2: The 3.5-acre watershed is comprised of meadow, and dirt road areas. Runoff travels via overland flow in an easterly direction towards POA-1.

Subcatchment PR-3: The 0.7-acre watershed is comprised of meadow, water and dirt road areas. Runoff travels via overland flow in an easterly direction through an existing stormwater basin and drainage culvert towards POA-1.

Subcatchment PR-4: The 0.4-acre watershed is comprised of meadow and dirt road areas. Runoff travels via overland flow in an easterly direction towards POA-1.

Subcatchment PR-5: The 0.3-acre watershed is comprised of water and dirt road areas. Runoff does not appear to have an outlet from the basin within this watershed, however, any overflow runoff would discharge towards POA-1.

Subcatchment PR-6: The 0.5-acre watershed is comprised of meadow areas. Runoff travels via overland flow in a southwesterly direction towards POA-2.

Subcatchment PR-7: The 1.1-acre watershed is comprised of meadow areas. Runoff travels via overland flow in a southerly direction towards POA-3.

Subcatchment PR-8: The 1.3-acre watershed is comprised of meadow areas. Runoff travels via overland flow in an easterly direction towards POA-4.

7.0 PEAK FLOW RATE MITIGATION

The stormwater management system is designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates for the 2-year, 10-year, and 100-year, 24-hour Type III storm events. Peak flow rates for the pre-development and post-development conditions are illustrated below:

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TABLE 2: PEAK FLOW RATE COMPARISON

POINT OF ANALYSIS	2-YEAR STORM EVENT (3.35"/24-HR)		10-YEAR STORM EVENT (4.95"/24-HR)		100-YEAR STORM EVENT (8.68"/24-HR)	
	PRE (CFS)	POST (CFS)	PRE (CFS)	POST (CFS)	PRE (CFS)	POST (CFS)
POA-1	*1.43*	**0.92**	*3.71*	**3.70**	*12.73*	**12.33**
POA-2	*0.11*	**0.11**	*0.64*	**0.50**	*2.66*	**1.80**
POA-3	*0.03*	**0.03**	*0.53*	**0.53**	*3.50*	**3.17**
POA-4	*0.00*	**0.00**	*0.01*	**0.00**	*0.47*	**0.19**

8.0 COMPLIANCE WITH THE MASSACHUSETTS DEP STORMWATER HANDBOOK

This study presents a comparative analysis of the pre-development and post-development hydrologic characteristics of the site, and outlines the proposed measures to mitigate flow, provide groundwater recharge, and improve water quality from the site. The best management practices (BMPs) outlined in this report include measures to meet the municipal and the Massachusetts Department of Environmental Protection (DEP) requirements. Below is a summary of how the design complies with each applicable DEP standard.

Standard 1: No new stormwater conveyances may discharge untreated directly to or cause erosion in wetlands or waters of the Commonwealth.

The proposed stormwater conveyance system does not include any new *untreated* discharges. The overland and subsurface drainage connection points will remain consistent with the existing condition.

Standard 2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

As indicated above and within the supporting HydroCad calculations, the stormwater management system is designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

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

The proposed equipment pad and gravel access driveway will be directed towards qualified pervious areas, which in part are defined as having maximum curve numbers of 39 and 61 for soil groups A and B, respectively. As indicated in the Hydrocad modelling, both areas sheet drain to lands that are below the curve numbers noted above. Therefore, this standard is assumed to be met under Low Impact Development Site Design Credits 2 and 3.

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

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The proposed equipment pad and gravel access driveway will be directed towards qualified pervious areas, which in part are defined as having maximum curve numbers of 39 and 61 for soil groups A and B, respectively. As indicated in the Hydrocad modelling, both areas sheet drain to lands that are below the curve numbers noted above. Therefore, this standard is assumed to be met under Low Impact Development Site Design Credits 2 and 3.

Standard 5: For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

Not applicable.

Standard 6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

Not applicable.

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

Not applicable.

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

The submitted plans outline and depict measures to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities.

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

An Operation and Maintenance Plan (O&M) has been developed that outlines maintenance requirements to ensure longevity of BMP's. See Appendix A.

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

The proposed stormwater management system does not include any illicit discharges.

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9.0 SUMMARY

The stormwater management system for the proposed redevelopment includes measures for collecting, conveying, treating and controlling stormwater runoff from the site. Post-development peak runoff rates have been attenuated for the 2, 10 and 100-year storm events. Comprehensive computations and calculations with supporting figures and plans are attached.

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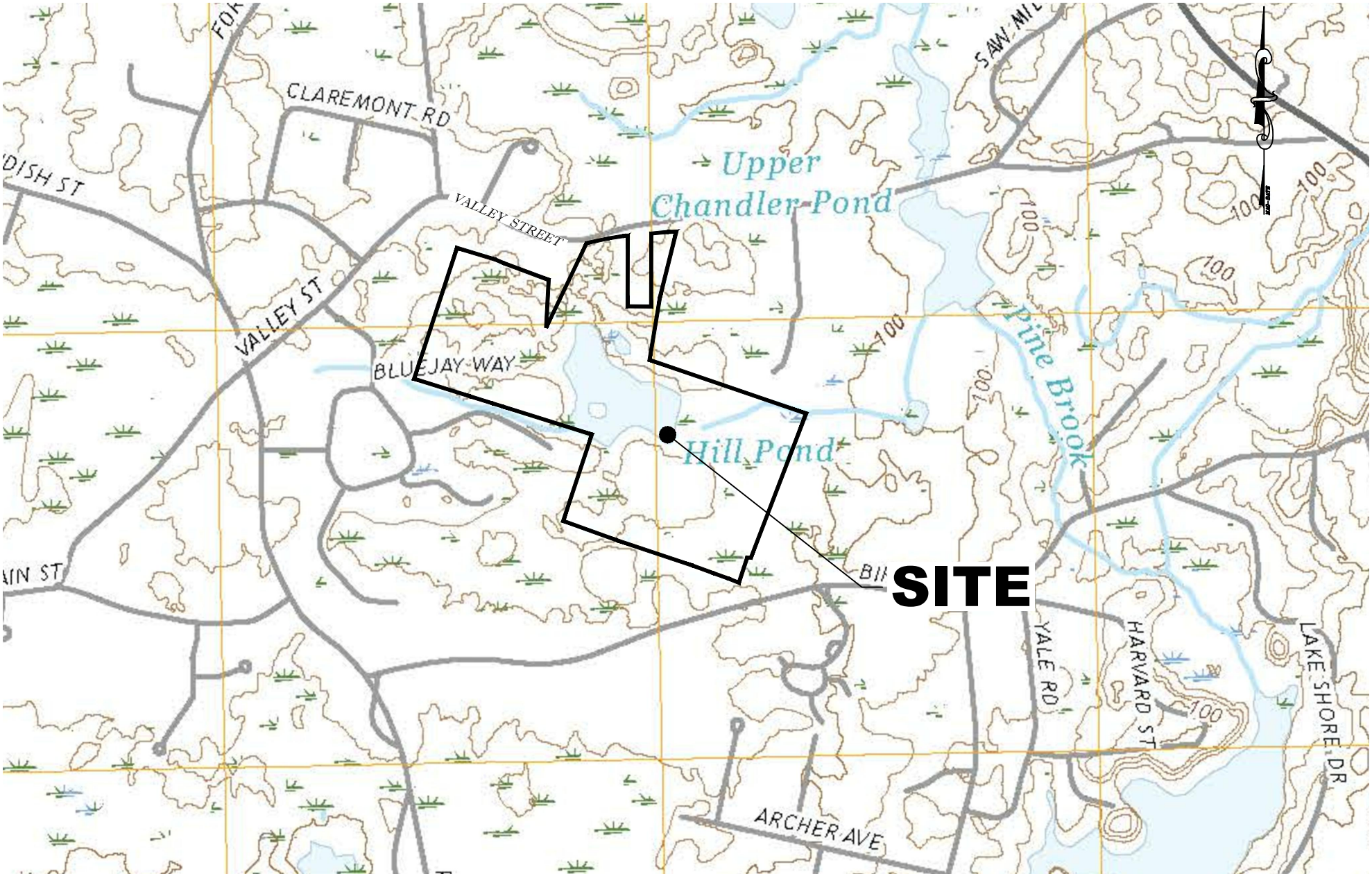


500 0 250 500 1000

GRAPHIC SCALE IN FEET

SOURCE: USGS TOPO 2018
QUADRANGLE: HANOVER, MA

CLIENT:

SWCA®
ENVIRONMENTAL CONSULTANTS

235 VALLEY STREET
PEMBROKE, MA 02359

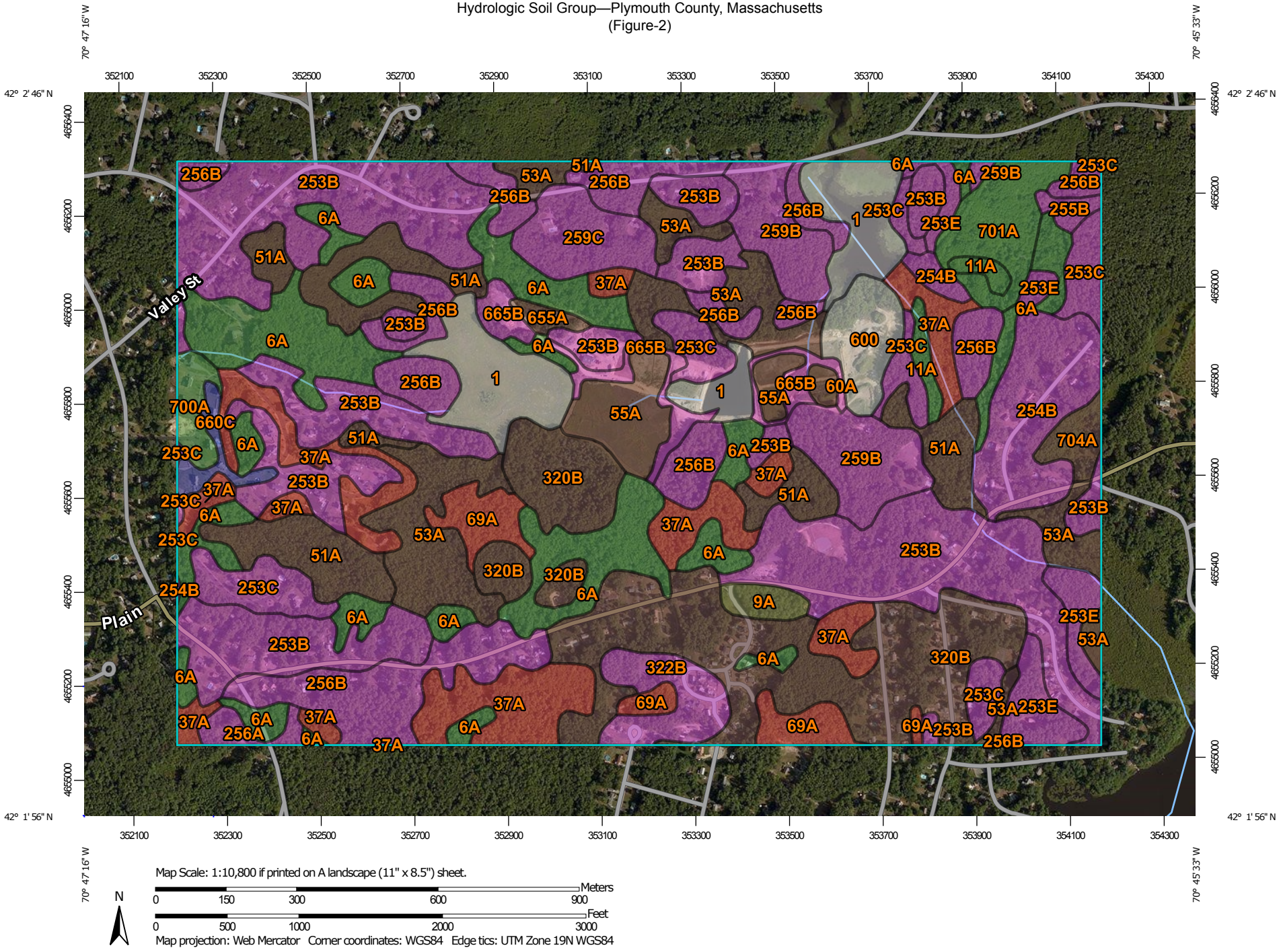
CIVIL DESIGN GROUP, LLC

21 HIGH STREET SUITE 207
NORTH ANDOVER, MA 01845
www.cdgengineering.com
p: 978-794-5400 f: 978-965-3971

FIGURE-1
USGS PLAN

04/12/2019

Hydrologic Soil Group—Plymouth County, Massachusetts
(Figure-2)



Map Scale: 1:10,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 150 300 600 900

Feet: 0 500 1000 2000 3000

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

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

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 11, Sep 7, 2018

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

Date(s) aerial images were photographed: Aug 26, 2014—Sep 4, 2014

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		27.7	4.6%
6A	Scarboro muck, coastal lowland, 0 to 3 percent slopes	A/D	62.3	10.2%
9A	Birdsall silt loam, 0 to 3 percent slopes	C/D	3.0	0.5%
11A	Rainberry coarse sand, 0 to 3 percent slopes	A/D	3.4	0.6%
37A	Massasoit - Mashpee complex, 0 to 3 percent slopes	D	42.1	6.9%
51A	Swansea muck, 0 to 1 percent slopes	B/D	33.5	5.5%
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D	35.2	5.8%
55A	Freetown coarse sand, 0 to 3 percent slopes, sanded surface	B/D	11.5	1.9%
60A	Swansea coarse sand, 0 to 2 percent slopes	B/D	1.2	0.2%
69A	Mattapoisett loamy sand, 0 to 3 percent slopes, extremely stony	D	11.3	1.9%
253B	Hinckley loamy sand, 3 to 8 percent slopes	A	119.0	19.6%
253C	Hinckley loamy sand, 8 to 15 percent slopes	A	21.6	3.6%
253E	Hinckley loamy sand, 15 to 35 percent slopes	A	12.4	2.0%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	20.8	3.4%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	1.7	0.3%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	2.6	0.4%
256B	Deerfield loamy fine sand, 3 to 8 percent slopes	A	49.5	8.1%
259B	Carver loamy coarse sand, 3 to 8 percent slopes	A	22.1	3.6%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
259C	Carver loamy coarse sand, 8 to 15 percent slopes	A	10.6	1.7%
320B	Birchwood sand, 3 to 8 percent slopes	B/D	65.5	10.8%
322B	Poquonock sand, 3 to 8 percent slopes	A	9.3	1.5%
600	Pits, gravel		8.6	1.4%
655A	Udorthents, wet substratum, 0 to 3 percent slopes	B/D	1.7	0.3%
660C	Udorthents, 8 to 15 percent slopes, gravelly	B	3.0	0.5%
665B	Udipsamments, 0 to 8 percent slopes	A	9.0	1.5%
700A	Udipsamments, wet substratum, 0 to 3 percent slopes	A/D	4.1	0.7%
701A	Rainberry coarse sand, 0 to 3 percent slope, sanded surface, inactive	A/D	11.7	1.9%
704A	Freetown and Swansea coarse sands, 0 to 3 percent slopes, sanded surface and inactive	B/D	3.7	0.6%
Totals for Area of Interest			**608.0**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

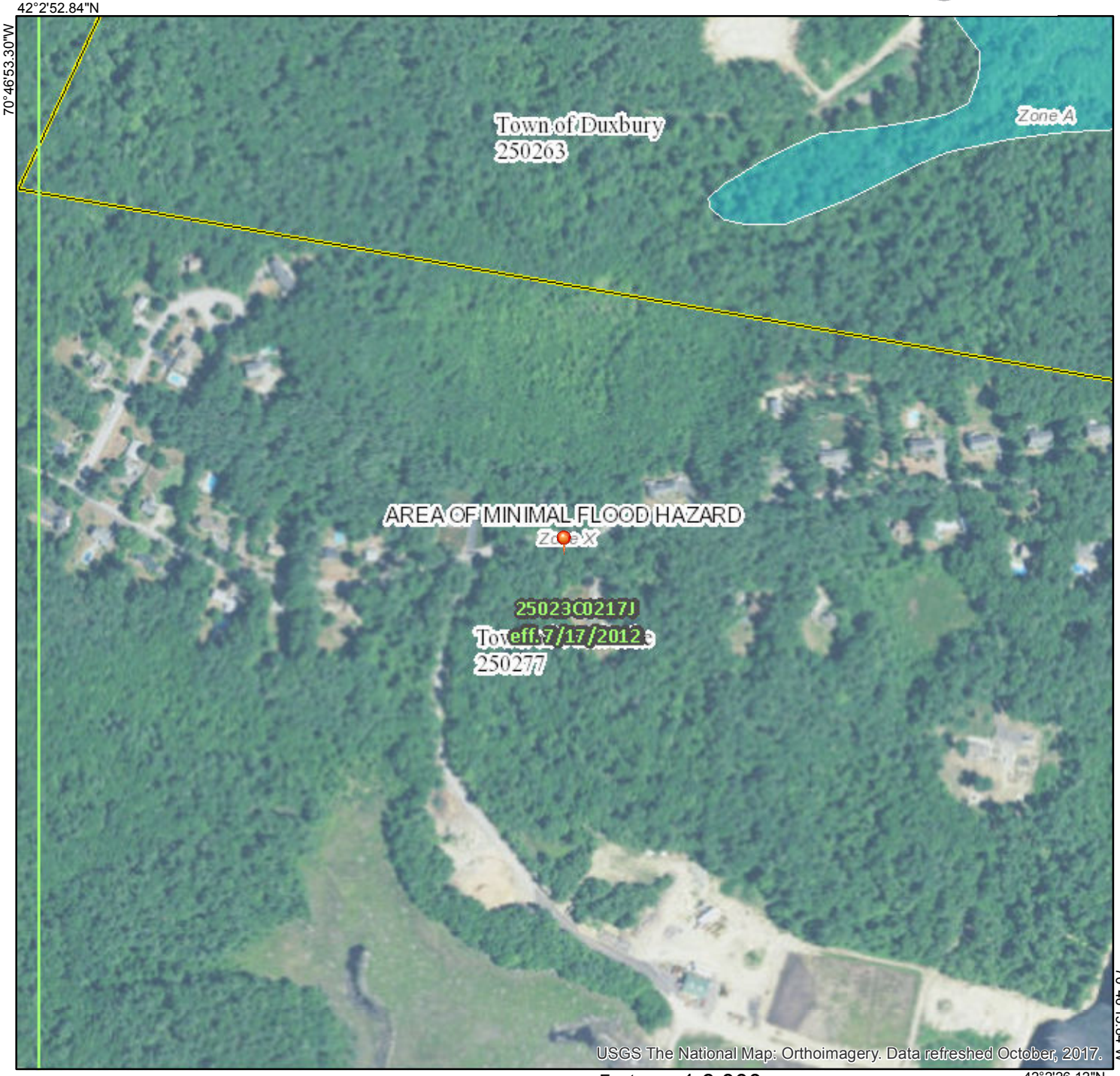
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

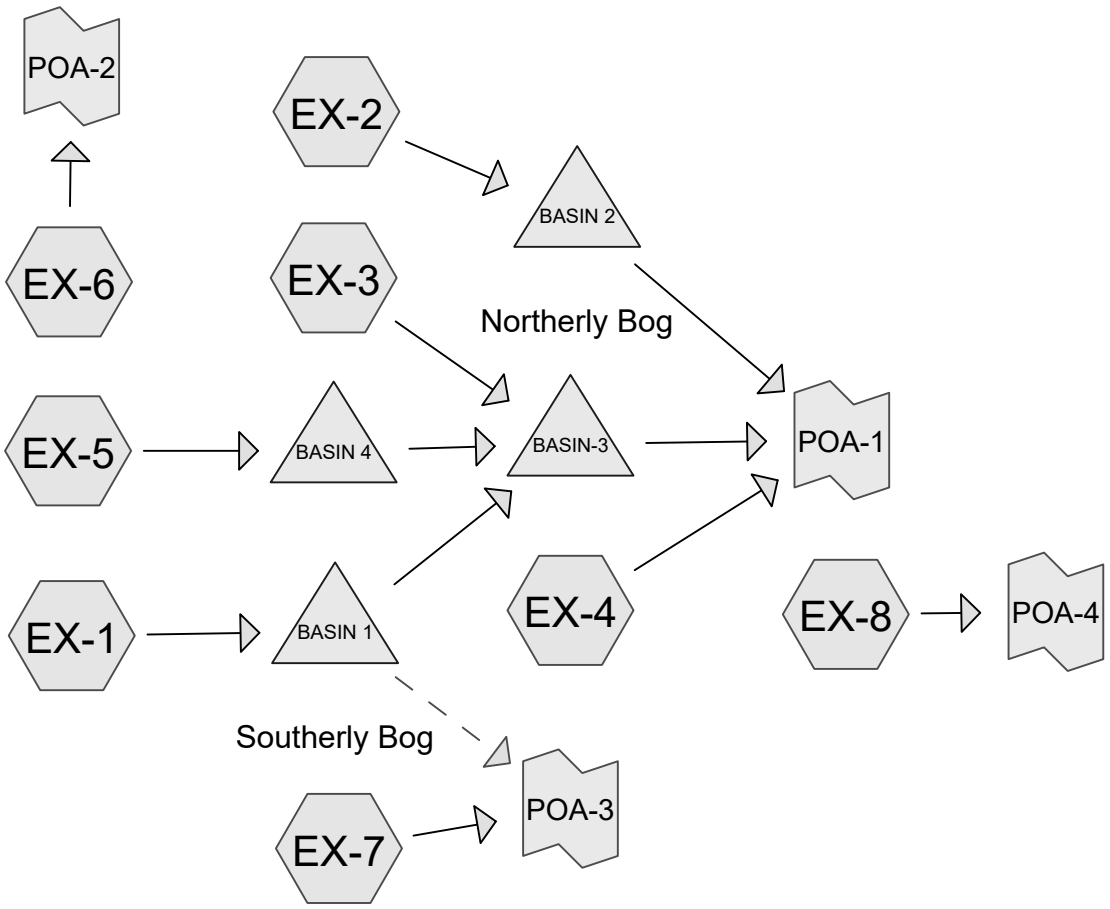
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/14/2019 at 4:31:03 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



Subcat Reach Pond Link

Routing Diagram for Existing Conditions

Prepared by {enter your company name here}, Printed 4/15/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.013	30	BOG, HSG A (EX-1, EX-2)
7.831	58	BOG, HSG B (EX-1, EX-2)
1.767	72	Dirt roads, HSG A (EX-1, EX-2, EX-3, EX-4, EX-5, EX-8)
0.537	82	Dirt roads, HSG B (EX-1, EX-3, EX-5)
1.745	30	Meadow, non-grazed, HSG A (EX-1, EX-2)
0.588	58	Meadow, non-grazed, HSG B (EX-1)
0.155	98	Water Surface, 0% imp, HSG A (EX-3, EX-5)
0.101	98	Water Surface, 0% imp, HSG B (EX-3, EX-5)
1.830	30	Woods, Good, HSG A (EX-1, EX-4, EX-7, EX-8)
4.335	55	Woods, Good, HSG B (EX-1, EX-6, EX-7)
19.902	**53**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
6.510	HSG A	EX-1, EX-2, EX-3, EX-4, EX-5, EX-7, EX-8
13.392	HSG B	EX-1, EX-2, EX-3, EX-5, EX-6, EX-7
0.000	HSG C	
0.000	HSG D	
0.000	Other	
19.902		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=475,024 sf 0.00% Impervious Runoff Depth>0.32"
Flow Length=1,058' Tc=47.7 min CN=56/0 Runoff=0.92 cfs 0.290 af

Subcatchment EX-2: Runoff Area=152,177 sf 0.00% Impervious Runoff Depth>0.08"
Flow Length=821' Tc=11.0 min CN=46/0 Runoff=0.03 cfs 0.023 af

Subcatchment EX-3: Runoff Area=31,883 sf 0.00% Impervious Runoff Depth>1.52"
Tc=6.0 min CN=80/0 Runoff=1.23 cfs 0.093 af

Subcatchment EX-4: Runoff Area=22,034 sf 0.00% Impervious Runoff Depth>0.63"
Flow Length=197' Tc=8.8 min CN=64/0 Runoff=0.27 cfs 0.027 af

Subcatchment EX-5: Runoff Area=10,964 sf 0.00% Impervious Runoff Depth>1.81"
Tc=6.0 min CN=84/0 Runoff=0.51 cfs 0.038 af

Subcatchment EX-6: Runoff Area=53,931 sf 0.00% Impervious Runoff Depth>0.29"
Flow Length=241' Tc=27.1 min CN=55/0 Runoff=0.11 cfs 0.030 af

Subcatchment EX-7: Runoff Area=57,220 sf 0.00% Impervious Runoff Depth>0.14"
Tc=6.0 min CN=49/0 Runoff=0.03 cfs 0.015 af

Subcatchment EX-8: Runoff Area=63,701 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=294' Tc=18.5 min CN=33/0 Runoff=0.00 cfs 0.000 af

Pond BASIN 1: Southerly Bog Peak Elev=103.70' Storage=1,897 cf Inflow=0.92 cfs 0.290 af
Discarded=0.17 cfs 0.161 af Primary=0.44 cfs 0.124 af Secondary=0.00 cfs 0.000 af Outflow=0.60 cfs 0.285 af

Pond BASIN 2: Northerly Bog Peak Elev=103.00' Storage=13 cf Inflow=0.03 cfs 0.023 af
Discarded=0.03 cfs 0.023 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.023 af

Pond BASIN 4: Peak Elev=105.40' Storage=867 cf Inflow=0.51 cfs 0.038 af
Discarded=0.03 cfs 0.028 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.028 af

Pond BASIN-3: Peak Elev=97.08' Storage=15 cf Inflow=1.23 cfs 0.216 af
Discarded=0.00 cfs 0.000 af Primary=1.21 cfs 0.216 af Outflow=1.21 cfs 0.216 af

Link POA-1: Inflow=1.43 cfs 0.242 af
Primary=1.43 cfs 0.242 af

Link POA-2: Inflow=0.11 cfs 0.030 af
Primary=0.11 cfs 0.030 af

Link POA-3: Inflow=0.03 cfs 0.015 af
Primary=0.03 cfs 0.015 af

Link POA-4: Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 19.902 ac Runoff Volume = 0.515 af Average Runoff Depth = 0.31"
100.00% Pervious = 19.902 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EX-1:

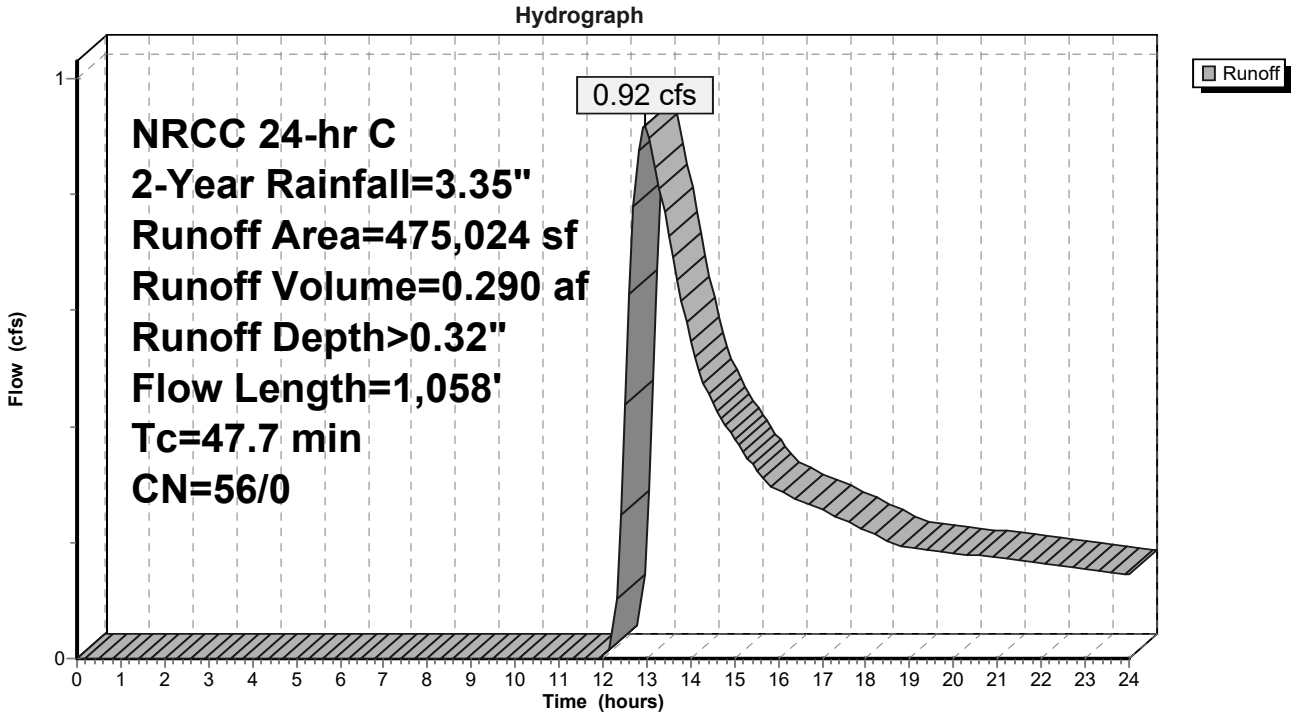
Runoff = 0.92 cfs @ 12.94 hrs, Volume= 0.290 af, Depth> 0.32"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

	Area (sf)	CN	Description
*	25,526	30	BOG, HSG A
	16,620	30	Meadow, non-grazed, HSG A
	2,355	30	Woods, Good, HSG A
	7,570	72	Dirt roads, HSG A
*	293,382	58	BOG, HSG B
	25,619	58	Meadow, non-grazed, HSG B
	91,668	55	Woods, Good, HSG B
	12,284	82	Dirt roads, HSG B
	475,024	56	Weighted Average
	475,024	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4	50	0.0080	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
9.1	406	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.2	602	0.0010	0.47		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
47.7	1,058	Total			

Subcatchment EX-1:



Summary for Subcatchment EX-2:

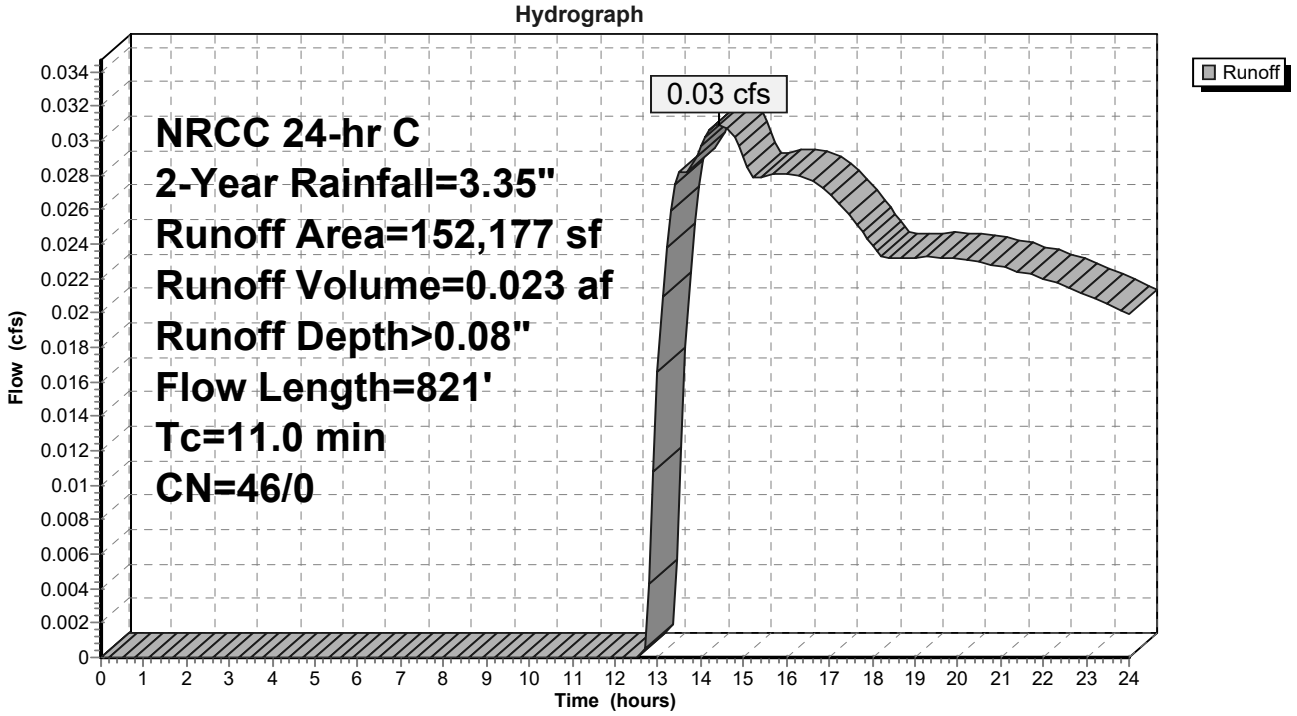
Runoff = 0.03 cfs @ 14.44 hrs, Volume= 0.023 af, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

	Area (sf)	CN	Description
*	18,585	30	BOG, HSG A
	59,403	30	Meadow, non-grazed, HSG A
	26,462	72	Dirt roads, HSG A
*	47,727	58	BOG, HSG B
	152,177	46	Weighted Average
	152,177	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.0340	0.45		**Sheet Flow,** Fallow n= 0.050 P2= 3.35"
5.0	493	0.0120	1.64		**Shallow Concentrated Flow, Bog** Grassed Waterway Kv= 15.0 fps
4.2	278	0.0120	1.10		**Shallow Concentrated Flow, Drained Pond** Nearly Bare & Untilled Kv= 10.0 fps
11.0	821	Total			

Subcatchment EX-2:



Summary for Subcatchment EX-3:

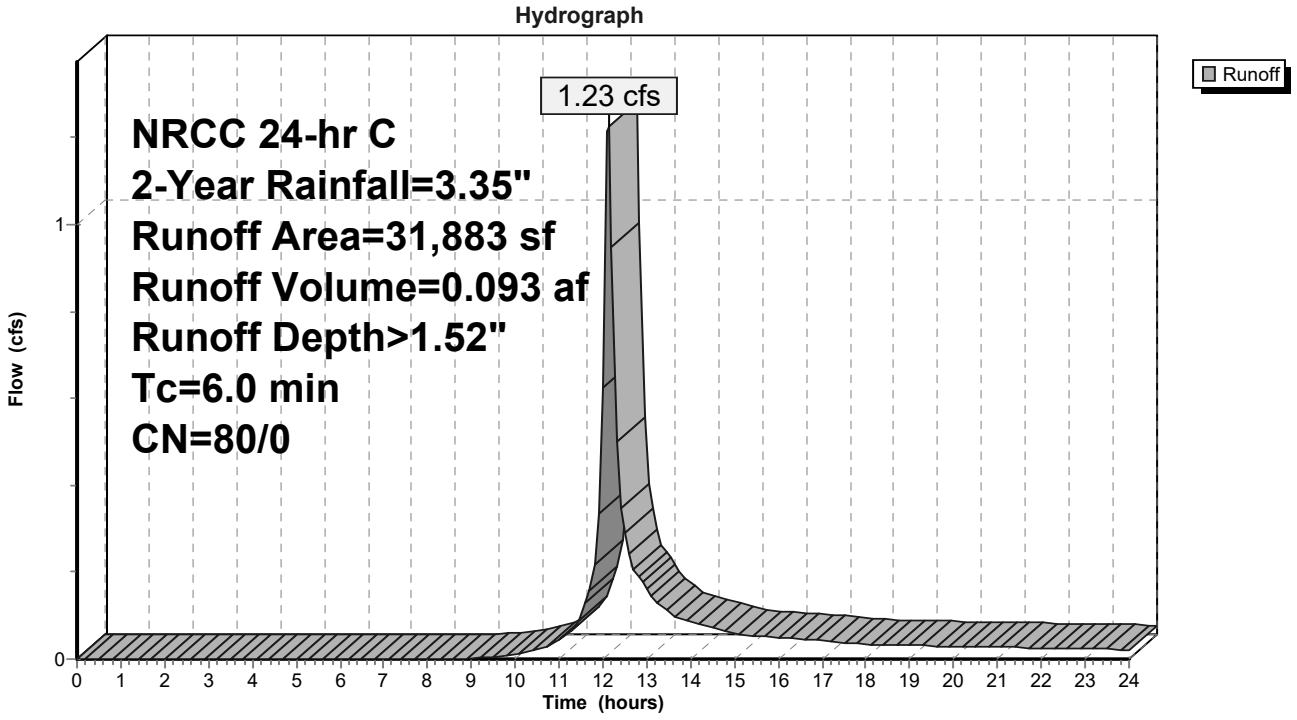
Runoff = 1.23 cfs @ 12.12 hrs, Volume= 0.093 af, Depth> 1.52"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
18,270	72	Dirt roads, HSG A
6,021	98	Water Surface, 0% imp, HSG A
5,480	82	Dirt roads, HSG B
2,112	98	Water Surface, 0% imp, HSG B
31,883	80	Weighted Average
31,883	80	100.00% Pervious Area

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

Subcatchment EX-3:



Summary for Subcatchment EX-4:

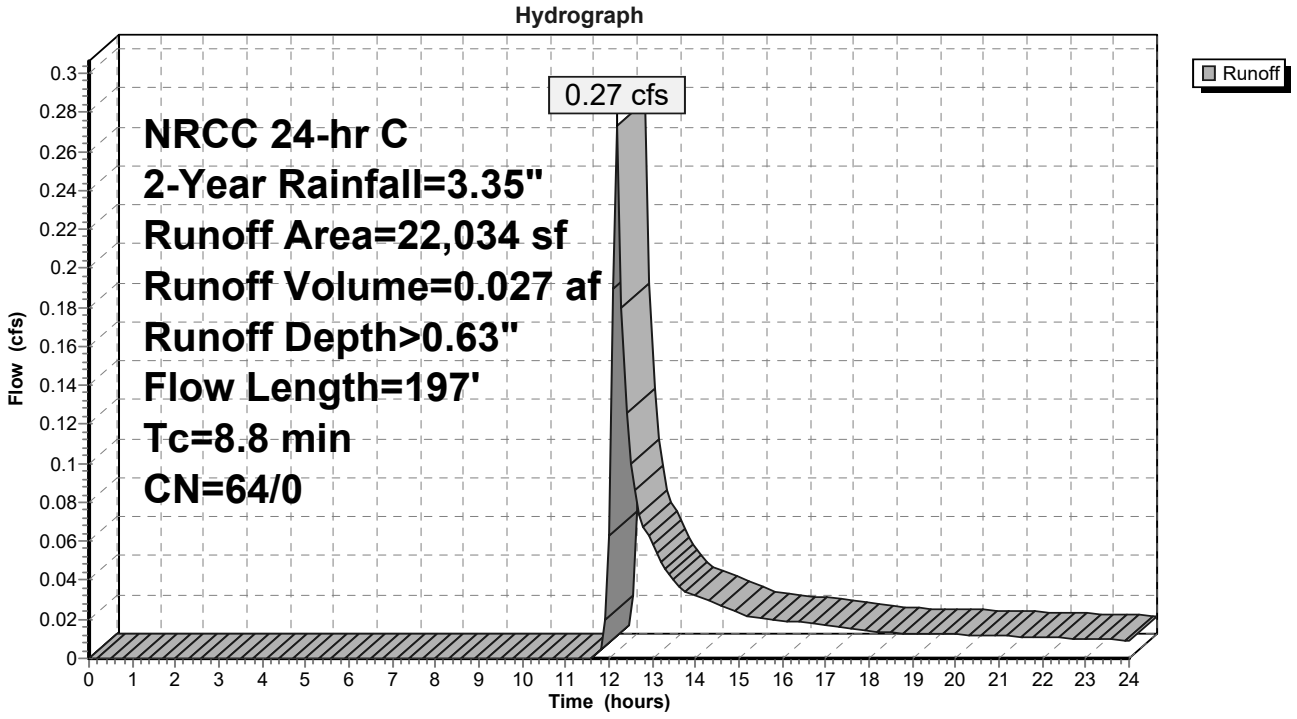
Runoff = 0.27 cfs @ 12.20 hrs, Volume= 0.027 af, Depth> 0.63"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
17,694	72	Dirt roads, HSG A
4,340	30	Woods, Good, HSG A
22,034	64	Weighted Average
22,034	64	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	34	0.0290	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
1.2	163	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.8	197	Total			

Subcatchment EX-4:



Summary for Subcatchment EX-5:

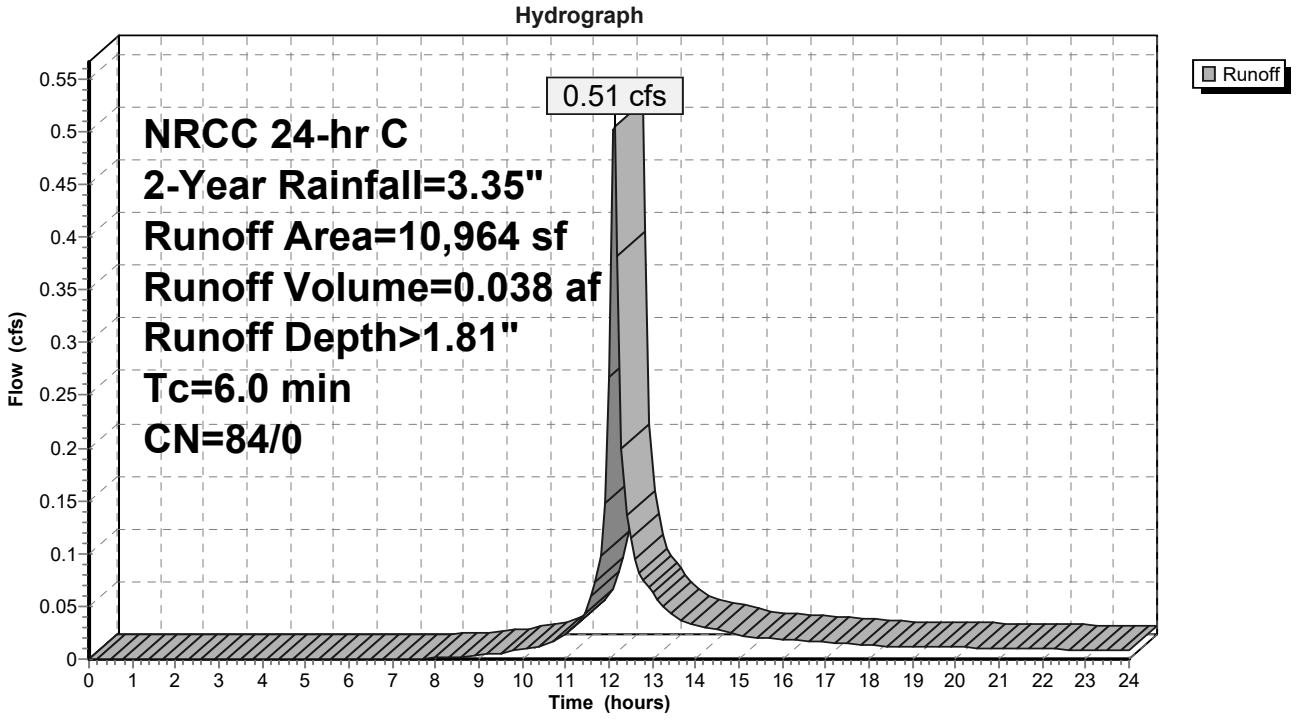
Runoff = 0.51 cfs @ 12.12 hrs, Volume= 0.038 af, Depth> 1.81"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
2,303	72	Dirt roads, HSG A
747	98	Water Surface, 0% imp, HSG A
5,627	82	Dirt roads, HSG B
2,287	98	Water Surface, 0% imp, HSG B
10,964	84	Weighted Average
10,964	84	100.00% Pervious Area

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

Subcatchment EX-5:



Summary for Subcatchment EX-6:

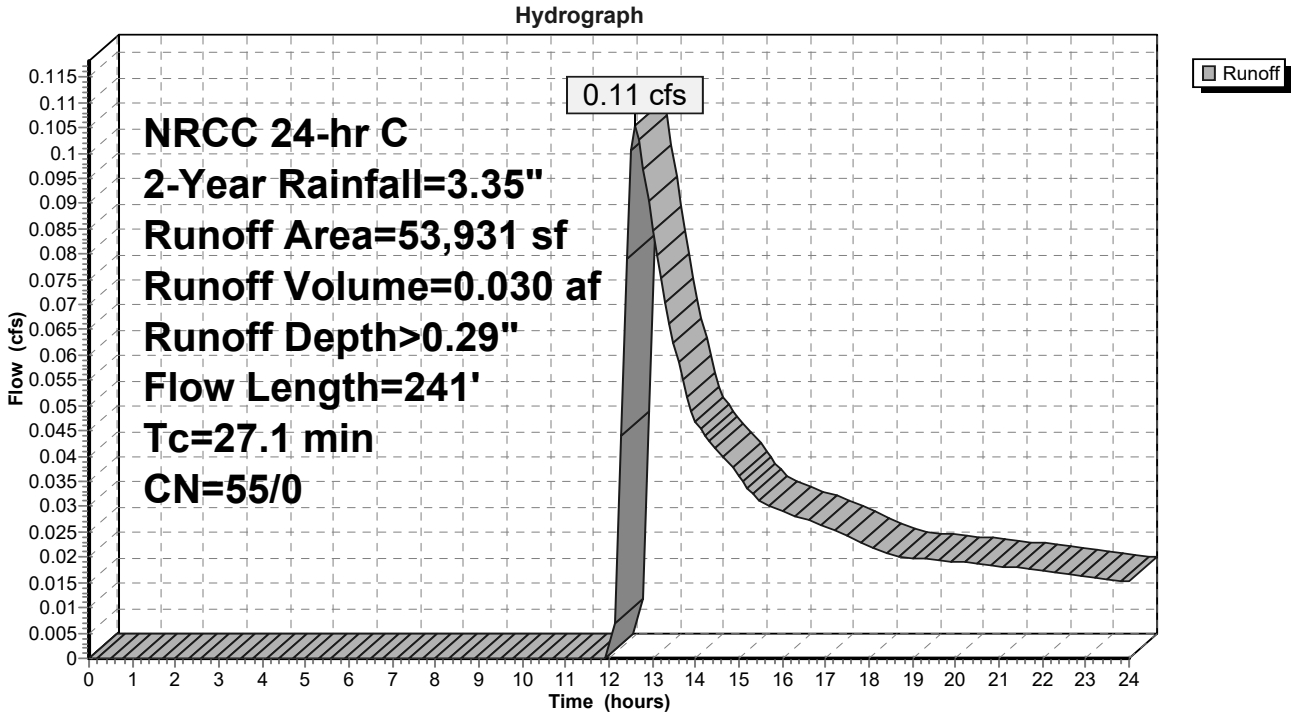
Runoff = 0.11 cfs @ 12.61 hrs, Volume= 0.030 af, Depth> 0.29"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
53,931	55	Woods, Good, HSG B
53,931	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	50	0.0040	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.2	191	0.0230	0.76		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
27.1	241	Total			

Subcatchment EX-6:



Summary for Subcatchment EX-7:

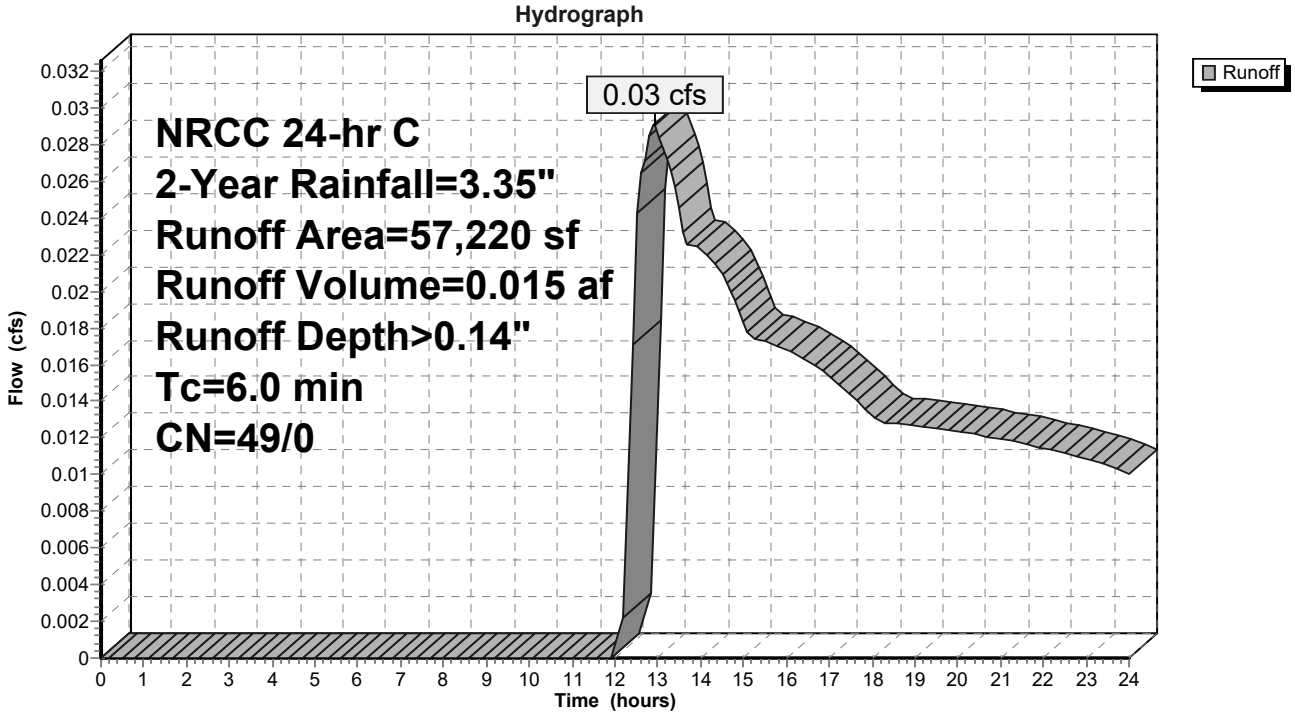
Runoff = 0.03 cfs @ 12.92 hrs, Volume= 0.015 af, Depth> 0.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
13,981	30	Woods, Good, HSG A
43,239	55	Woods, Good, HSG B
57,220	49	Weighted Average
57,220	49	100.00% Pervious Area

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

Subcatchment EX-7:



Summary for Subcatchment EX-8:

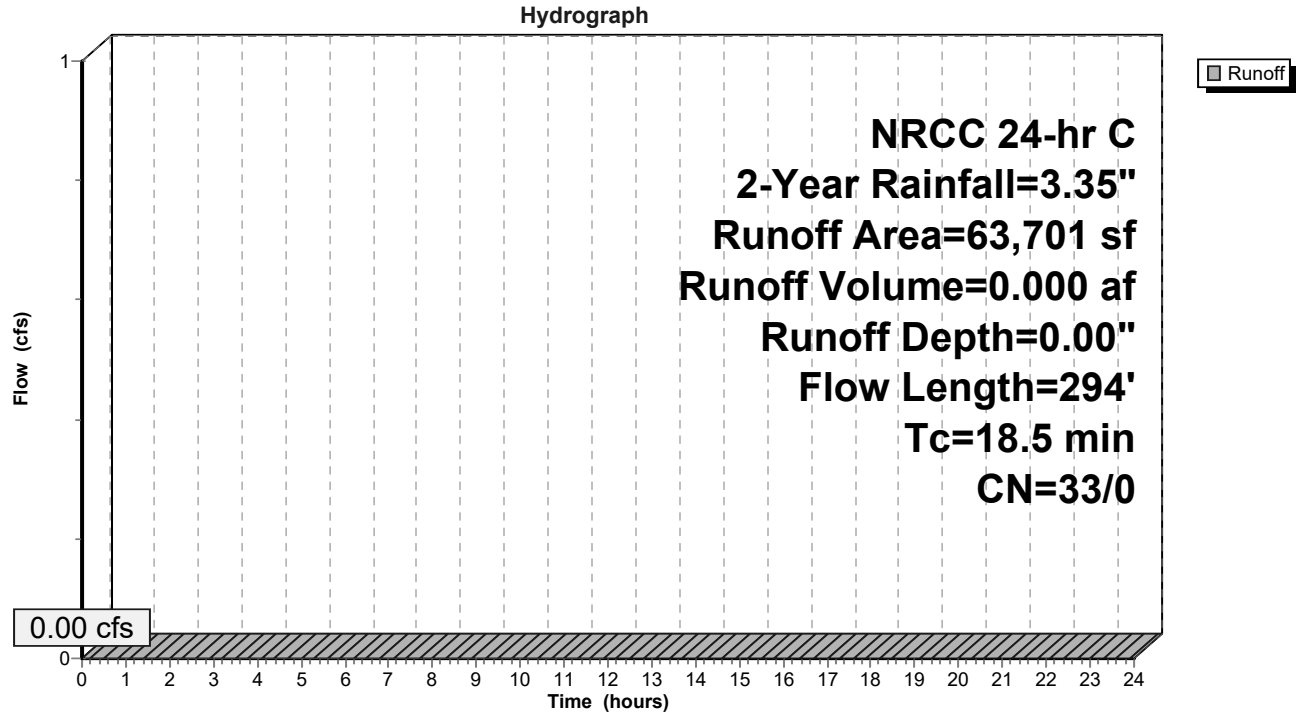
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
59,020	30	Woods, Good, HSG A
4,681	72	Dirt roads, HSG A
63,701	33	Weighted Average
63,701	33	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
6.4	244	0.0160	0.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.5	294	Total			

Subcatchment EX-8:



Summary for Pond BASIN 1: Southerly Bog

Inflow Area = 10.905 ac, 0.00% Impervious, Inflow Depth > 0.32" for 2-Year event
Inflow = 0.92 cfs @ 12.94 hrs, Volume= 0.290 af
Outflow = 0.60 cfs @ 13.83 hrs, Volume= 0.285 af, Atten= 34%, Lag= 53.8 min
Discarded = 0.17 cfs @ 12.60 hrs, Volume= 0.161 af
Primary = 0.44 cfs @ 13.83 hrs, Volume= 0.124 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 103.70' @ 13.83 hrs Surf.Area= 7,150 sf Storage= 1,897 cf

Plug-Flow detention time= 49.6 min calculated for 0.285 af (98% of inflow)
Center-of-Mass det. time= 41.7 min (1,025.7 - 984.1)

Volume	Invert	Avail.Storage	Storage Description
#1	103.43'	665,382 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.43	7,150	0	0
104.99	7,150	11,154	11,154
105.00	319,409	1,633	12,787
106.00	323,115	321,262	334,049
107.00	339,551	331,333	665,382

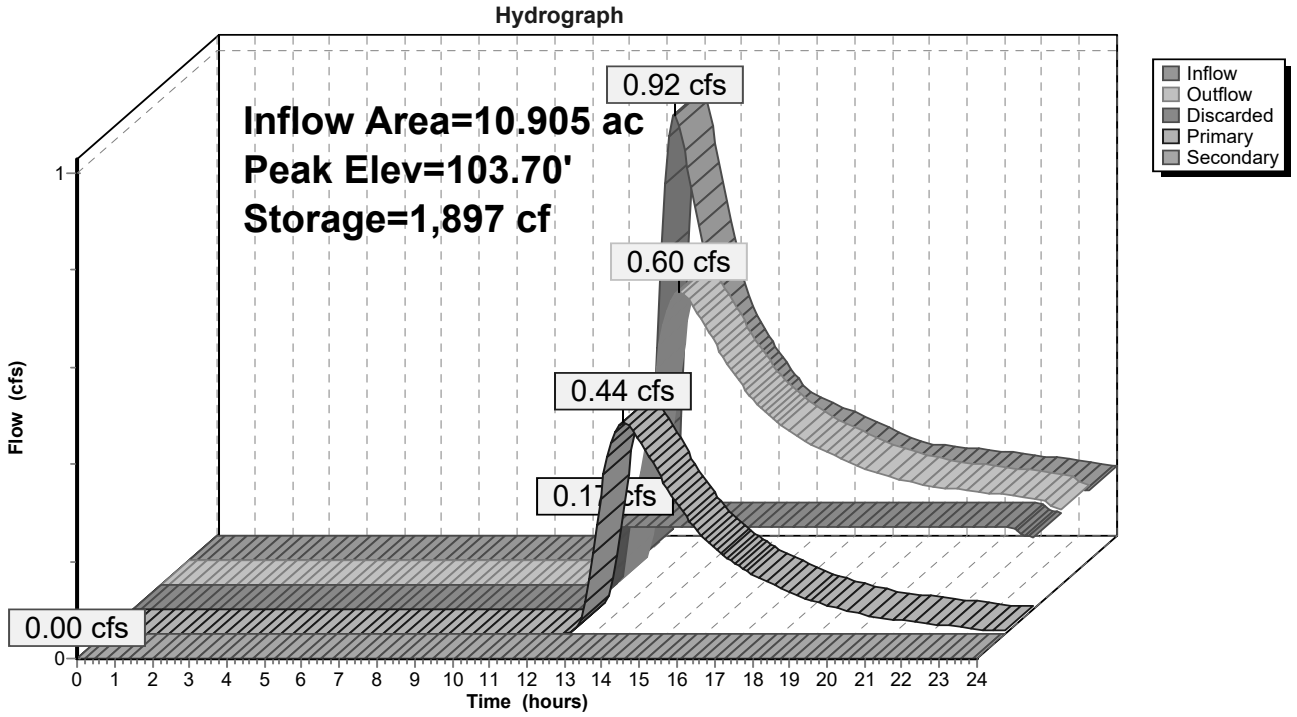
Device	Routing	Invert	Outlet Devices
#1	Primary	103.43'	**24.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 103.43' / 102.84' S= 0.0236 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	106.80'	**120.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Discarded	103.43'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.17 cfs @ 12.60 hrs HW=103.47' (Free Discharge)
3=Exfiltration (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.43 cfs @ 13.83 hrs HW=103.70' (Free Discharge)
1=Culvert (Inlet Controls 0.43 cfs @ 1.75 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.43' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BASIN 1: Southerly Bog



Summary for Pond BASIN 2: Northerly Bog

Inflow Area = 3.494 ac, 0.00% Impervious, Inflow Depth > 0.08" for 2-Year event
Inflow = 0.03 cfs @ 14.44 hrs, Volume= 0.023 af
Outflow = 0.03 cfs @ 14.55 hrs, Volume= 0.023 af, Atten= 0%, Lag= 6.9 min
Discarded = 0.03 cfs @ 14.55 hrs, Volume= 0.023 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 103.00' @ 14.55 hrs Surf.Area= 73,180 sf Storage= 13 cf

Plug-Flow detention time= 7.0 min calculated for 0.022 af (99% of inflow)
Center-of-Mass det. time= 4.0 min (1,091.9 - 1,087.9)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	74,280 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

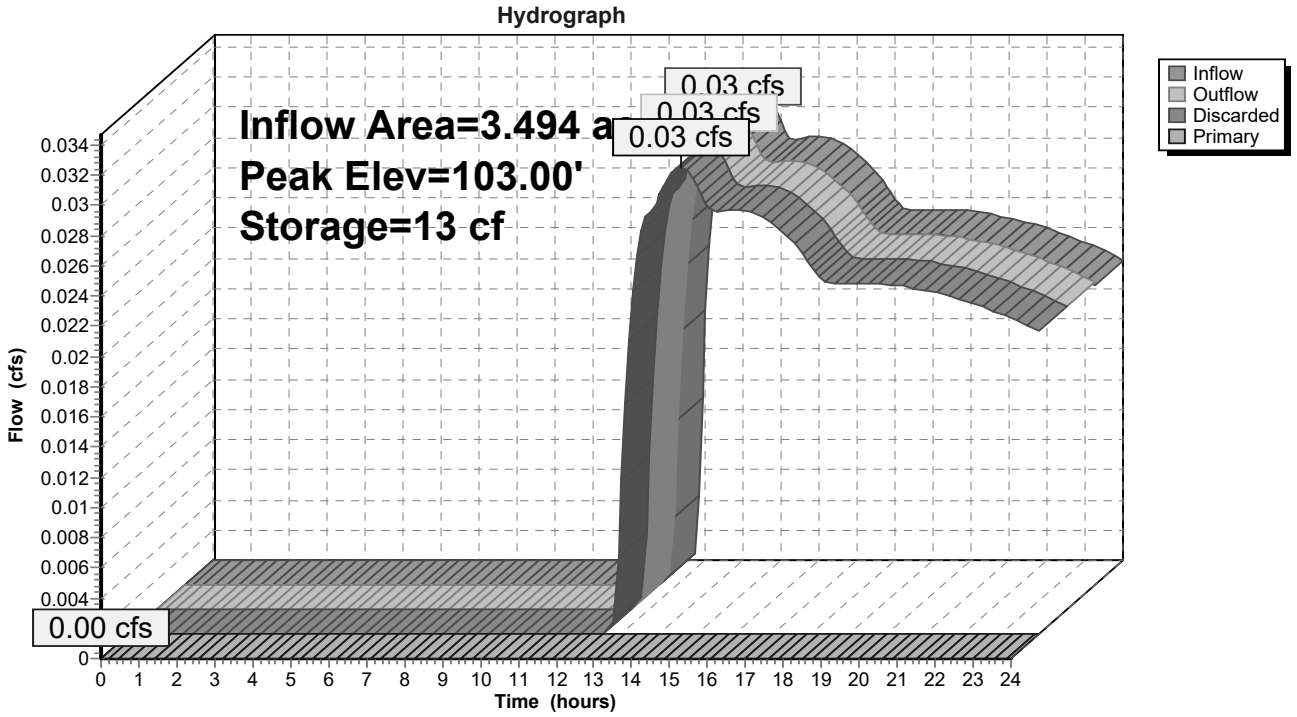
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	73,180	0	0
104.00	75,380	74,280	74,280

Device	Routing	Invert	Outlet Devices
#1	Primary	103.50'	**15.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	103.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.73 cfs @ 14.55 hrs HW=103.00' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 1.73 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 2: Northerly Bog



Summary for Pond BASIN 4:

Inflow Area = 0.252 ac, 0.00% Impervious, Inflow Depth > 1.81" for 2-Year event
Inflow = 0.51 cfs @ 12.12 hrs, Volume= 0.038 af
Outflow = 0.03 cfs @ 14.06 hrs, Volume= 0.028 af, Atten= 94%, Lag= 116.7 min
Discarded = 0.03 cfs @ 14.06 hrs, Volume= 0.028 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 105.40' @ 14.06 hrs Surf.Area= 1,348 sf Storage= 867 cf

Plug-Flow detention time= 293.1 min calculated for 0.028 af (74% of inflow)
Center-of-Mass det. time= 194.9 min (1,031.5 - 836.7)

Volume	Invert	Avail.Storage	Storage Description
#1	104.00'	4,520 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

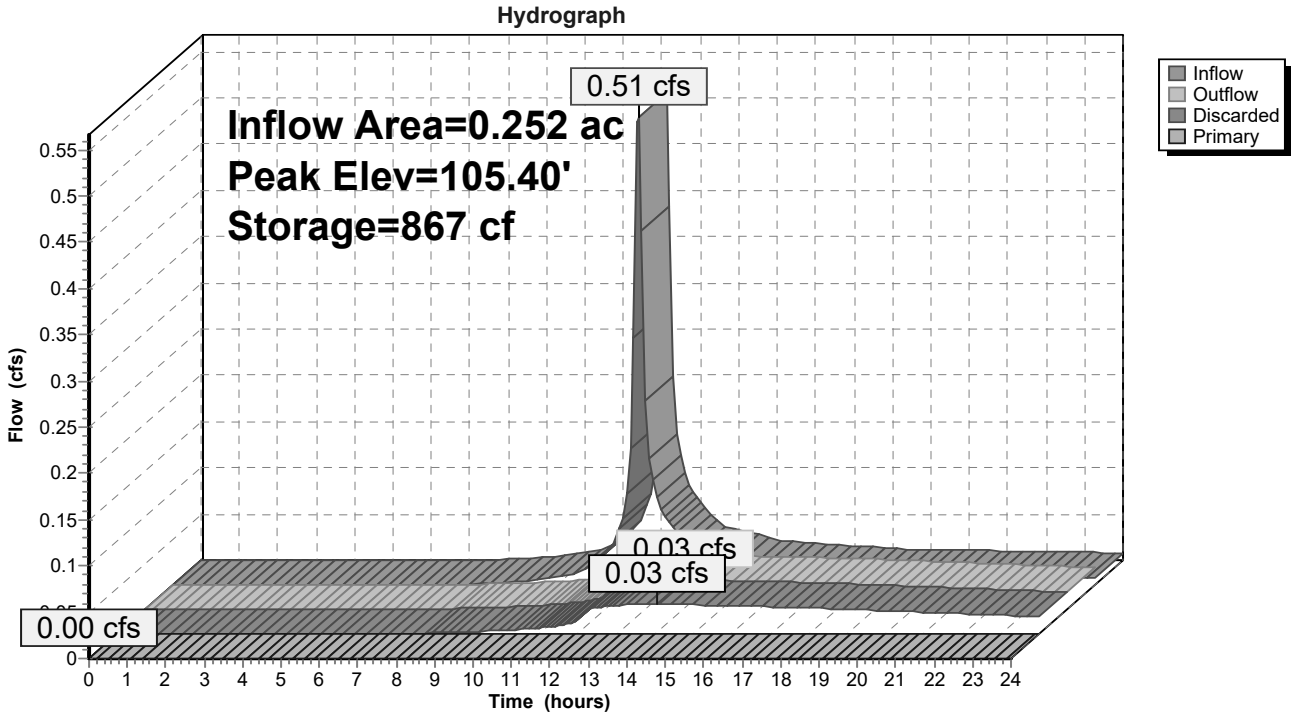
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.00	75	0	0
105.00	797	436	436
106.00	2,168	1,483	1,919
107.00	3,035	2,602	4,520

Device	Routing	Invert	Outlet Devices
#1	Primary	107.20'	**30.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	104.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 14.06 hrs HW=105.40' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 4:


Hydrograph
Inflow Area=0.252 ac
Peak Elev=105.40'
Storage=867 cf
0.51 cfs
0.03 cfs
0.03 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5 0.55
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Summary for Pond BASIN-3:

Inflow Area = 11.889 ac, 0.00% Impervious, Inflow Depth > 0.22" for 2-Year event
Inflow = 1.23 cfs @ 12.12 hrs, Volume= 0.216 af
Outflow = 1.21 cfs @ 12.12 hrs, Volume= 0.216 af, Atten= 1%, Lag= 0.3 min
Discarded = 0.00 cfs @ 12.12 hrs, Volume= 0.000 af
Primary = 1.21 cfs @ 12.12 hrs, Volume= 0.216 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 97.08' @ 12.13 hrs Surf.Area= 46 sf Storage= 15 cf

Plug-Flow detention time= 0.3 min calculated for 0.216 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (900.8 - 900.5)

Volume	Invert	Avail.Storage	Storage Description
#1	96.30'	25,553 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

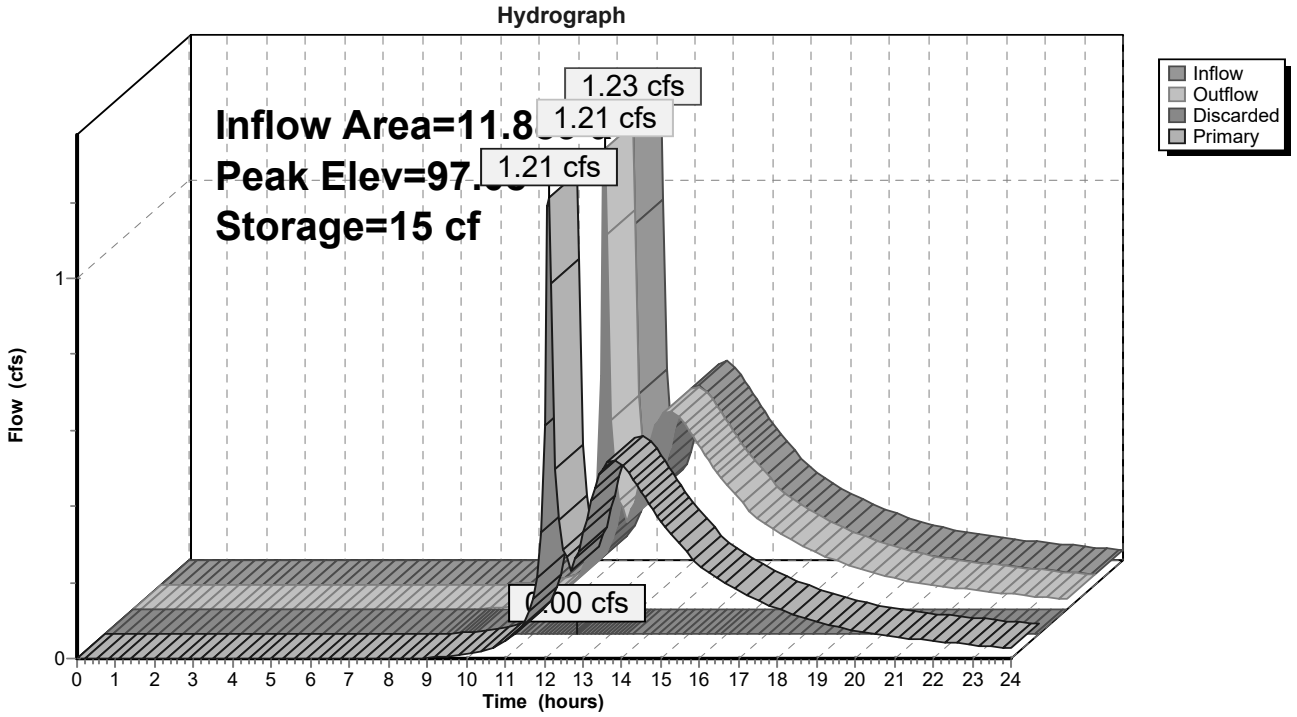
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.30	0	0	0
97.00	35	12	12
98.00	183	109	121
99.00	412	298	419
100.00	807	610	1,028
101.00	2,661	1,734	2,762
102.00	4,620	3,641	6,403
103.00	5,817	5,219	11,621
104.00	6,957	6,387	18,008
105.00	8,132	7,545	25,553

Device	Routing	Invert	Outlet Devices
#1	Primary	96.31'	**36.0" Round Culvert** L= 81.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 96.31' / 96.30' S= 0.0001 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Primary	105.50'	**35.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	96.30'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 12.12 hrs HW=97.06' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=1.13 cfs @ 12.12 hrs HW=97.06' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.13 cfs @ 1.25 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN-3:

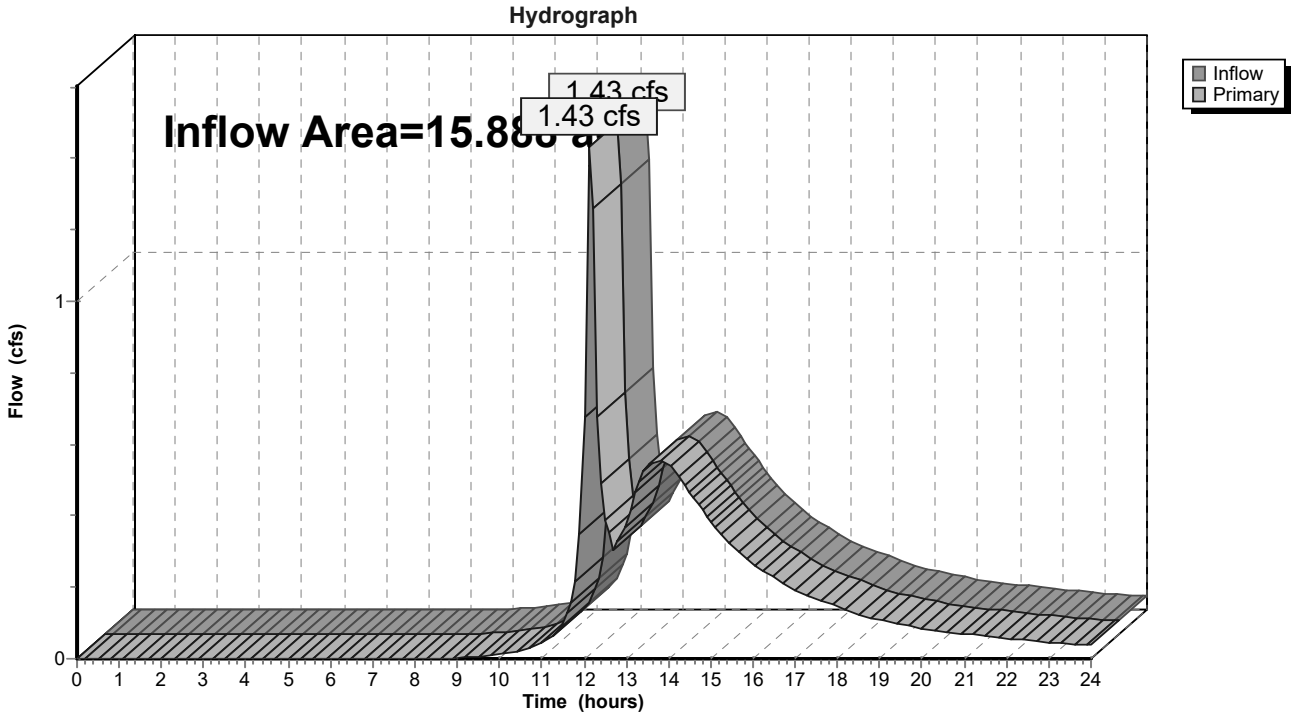

Hydrograph
Inflow
Outflow
Discarded
Primary
1.23 cfs
1.21 cfs
1.21 cfs
Inflow Area=11.8
Peak Elev=97.
Storage=15 cf
0.00 cfs
Flow (cfs)
Time (hours)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Summary for Link POA-1:

Inflow Area = 15.888 ac, 0.00% Impervious, Inflow Depth > 0.18" for 2-Year event
Inflow = 1.43 cfs @ 12.14 hrs, Volume= 0.242 af
Primary = 1.43 cfs @ 12.14 hrs, Volume= 0.242 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-1:

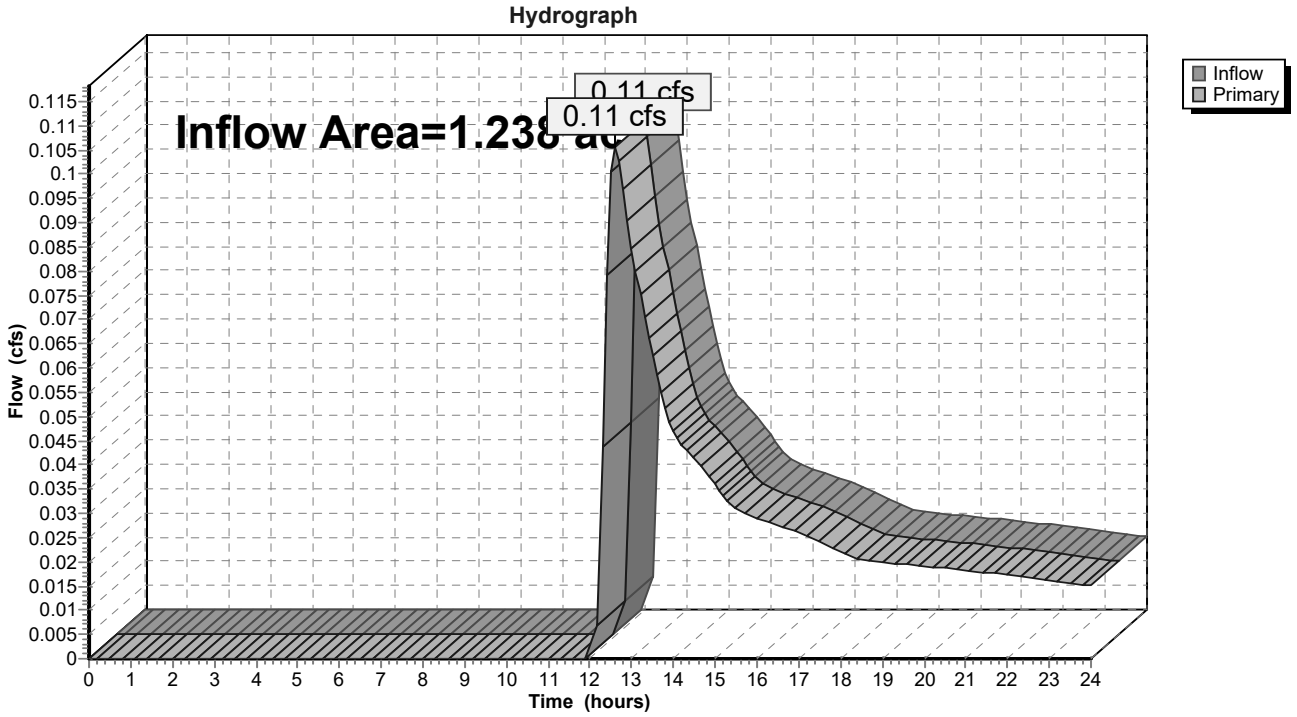


Summary for Link POA-2:

Inflow Area = 1.238 ac, 0.00% Impervious, Inflow Depth > 0.29" for 2-Year event
Inflow = 0.11 cfs @ 12.61 hrs, Volume= 0.030 af
Primary = 0.11 cfs @ 12.61 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-2:

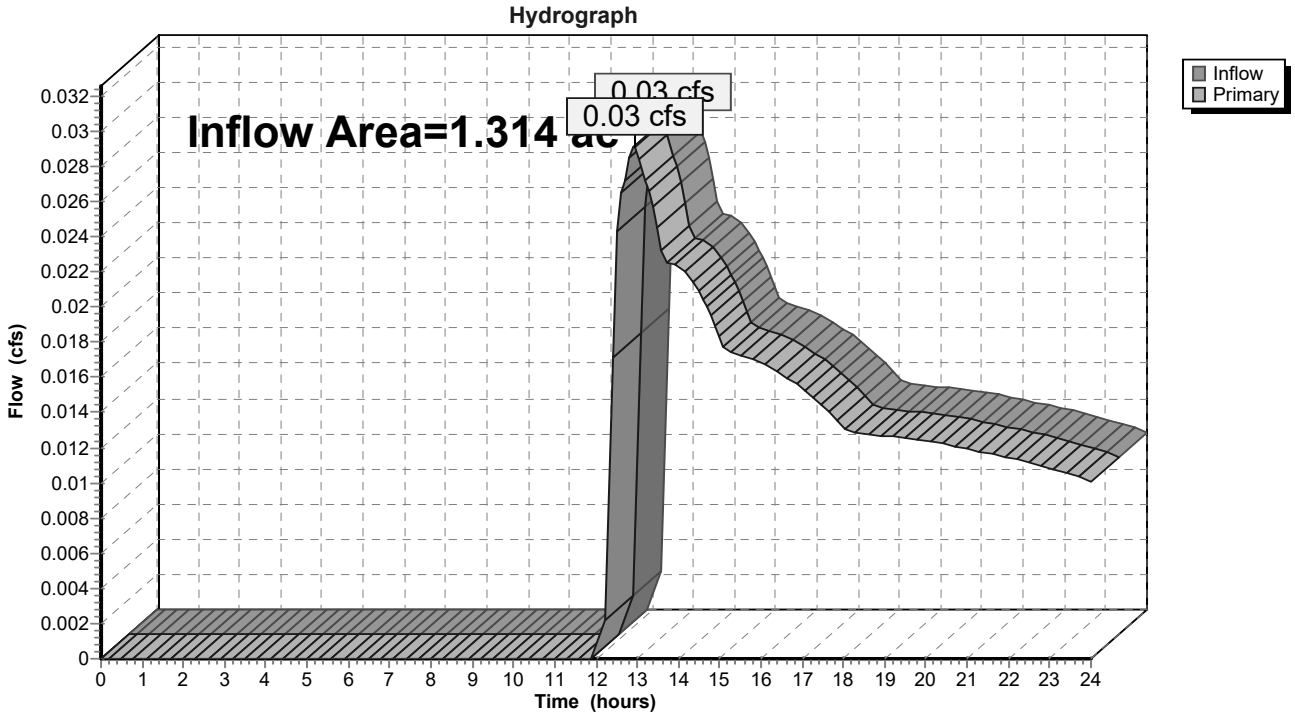


Summary for Link POA-3:

Inflow Area = 1.314 ac, 0.00% Impervious, Inflow Depth > 0.14" for 2-Year event
Inflow = 0.03 cfs @ 12.92 hrs, Volume= 0.015 af
Primary = 0.03 cfs @ 12.92 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-3:

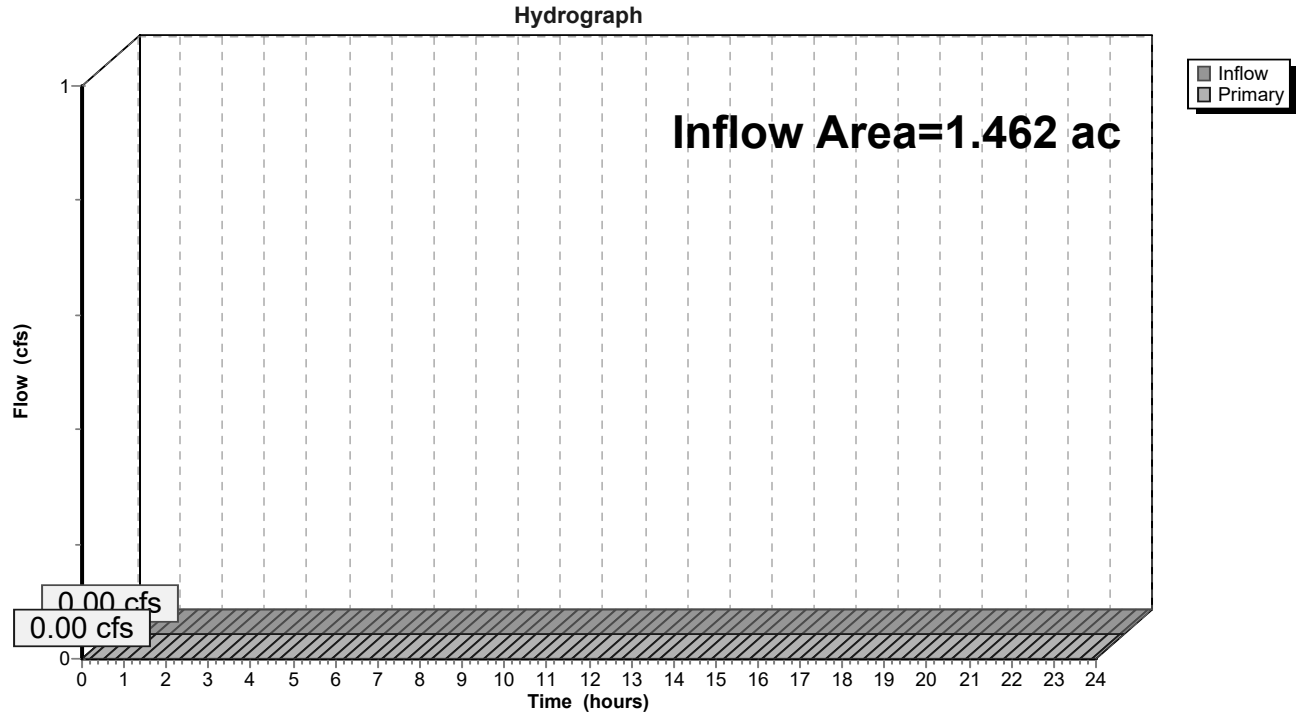


Summary for Link POA-4:

Inflow Area = 1.462 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-4:



Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=475,024 sf 0.00% Impervious Runoff Depth>1.00"
Flow Length=1,058' Tc=47.7 min CN=56/0 Runoff=4.47 cfs 0.905 af

Subcatchment EX-2: Runoff Area=152,177 sf 0.00% Impervious Runoff Depth>0.47"
Flow Length=821' Tc=11.0 min CN=46/0 Runoff=0.68 cfs 0.137 af

Subcatchment EX-3: Runoff Area=31,883 sf 0.00% Impervious Runoff Depth>2.85"
Tc=6.0 min CN=80/0 Runoff=2.31 cfs 0.174 af

Subcatchment EX-4: Runoff Area=22,034 sf 0.00% Impervious Runoff Depth>1.55"
Flow Length=197' Tc=8.8 min CN=64/0 Runoff=0.77 cfs 0.065 af

Subcatchment EX-5: Runoff Area=10,964 sf 0.00% Impervious Runoff Depth>3.22"
Tc=6.0 min CN=84/0 Runoff=0.89 cfs 0.068 af

Subcatchment EX-6: Runoff Area=53,931 sf 0.00% Impervious Runoff Depth>0.94"
Flow Length=241' Tc=27.1 min CN=55/0 Runoff=0.64 cfs 0.097 af

Subcatchment EX-7: Runoff Area=57,220 sf 0.00% Impervious Runoff Depth>0.62"
Tc=6.0 min CN=49/0 Runoff=0.53 cfs 0.068 af

Subcatchment EX-8: Runoff Area=63,701 sf 0.00% Impervious Runoff Depth>0.04"
Flow Length=294' Tc=18.5 min CN=33/0 Runoff=0.01 cfs 0.004 af

Pond BASIN 1: Southerly Bog Peak Elev=104.20' Storage=5,517 cf Inflow=4.47 cfs 0.905 af
Discarded=0.17 cfs 0.166 af Primary=3.34 cfs 0.711 af Secondary=0.00 cfs 0.000 af Outflow=3.51 cfs 0.877 af

Pond BASIN 2: Northerly Bog Peak Elev=103.00' Storage=244 cf Inflow=0.68 cfs 0.137 af
Discarded=0.58 cfs 0.136 af Primary=0.00 cfs 0.000 af Outflow=0.58 cfs 0.136 af

Pond BASIN 4: Peak Elev=105.88' Storage=1,672 cf Inflow=0.89 cfs 0.068 af
Discarded=0.05 cfs 0.045 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.045 af

Pond BASIN-3: Peak Elev=97.54' Storage=53 cf Inflow=3.60 cfs 0.885 af
Discarded=0.00 cfs 0.001 af Primary=3.59 cfs 0.884 af Outflow=3.59 cfs 0.885 af

Link POA-1: Inflow=3.71 cfs 0.949 af
Primary=3.71 cfs 0.949 af

Link POA-2: Inflow=0.64 cfs 0.097 af
Primary=0.64 cfs 0.097 af

Link POA-3: Inflow=0.53 cfs 0.068 af
Primary=0.53 cfs 0.068 af

Link POA-4: Inflow=0.01 cfs 0.004 af
Primary=0.01 cfs 0.004 af

Total Runoff Area = 19.902 ac Runoff Volume = 1.518 af Average Runoff Depth = 0.92"
100.00% Pervious = 19.902 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EX-1:

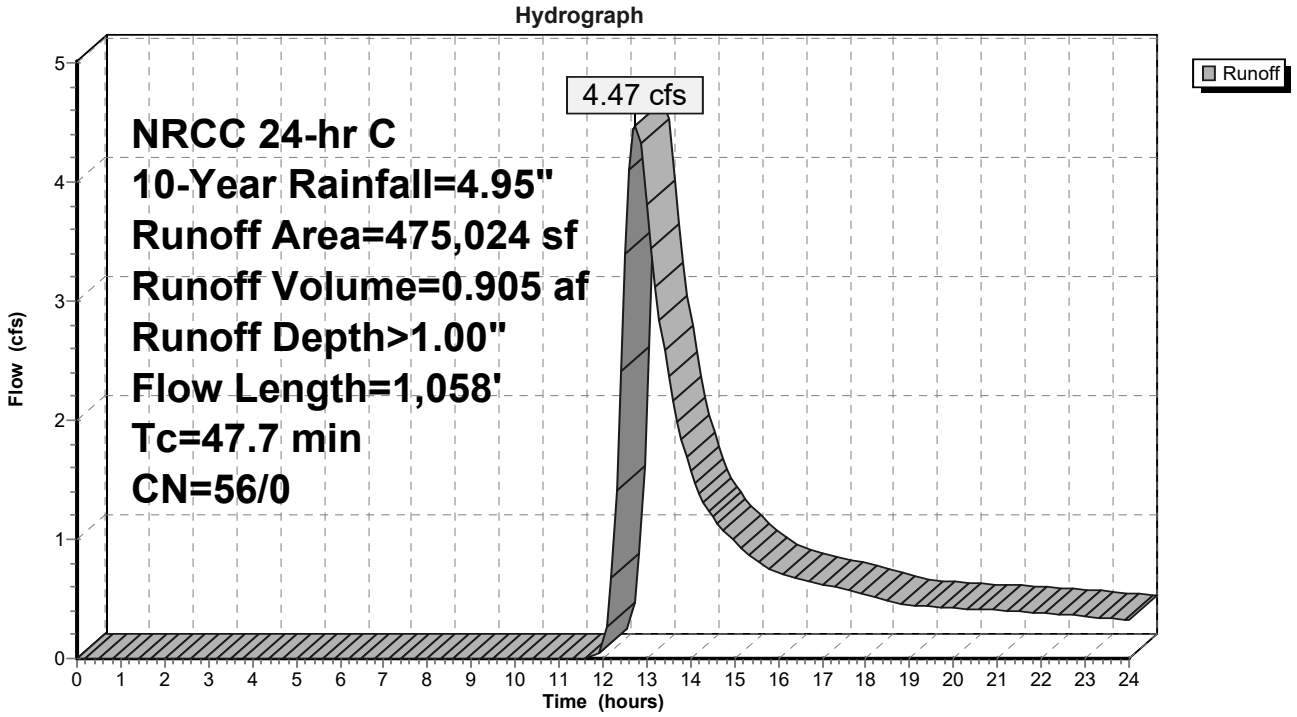
Runoff = 4.47 cfs @ 12.75 hrs, Volume= 0.905 af, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

	Area (sf)	CN	Description
*	25,526	30	BOG, HSG A
	16,620	30	Meadow, non-grazed, HSG A
	2,355	30	Woods, Good, HSG A
	7,570	72	Dirt roads, HSG A
*	293,382	58	BOG, HSG B
	25,619	58	Meadow, non-grazed, HSG B
	91,668	55	Woods, Good, HSG B
	12,284	82	Dirt roads, HSG B
	475,024	56	Weighted Average
	475,024	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4	50	0.0080	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
9.1	406	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.2	602	0.0010	0.47		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
47.7	1,058	Total			

Subcatchment EX-1:



Summary for Subcatchment EX-2:

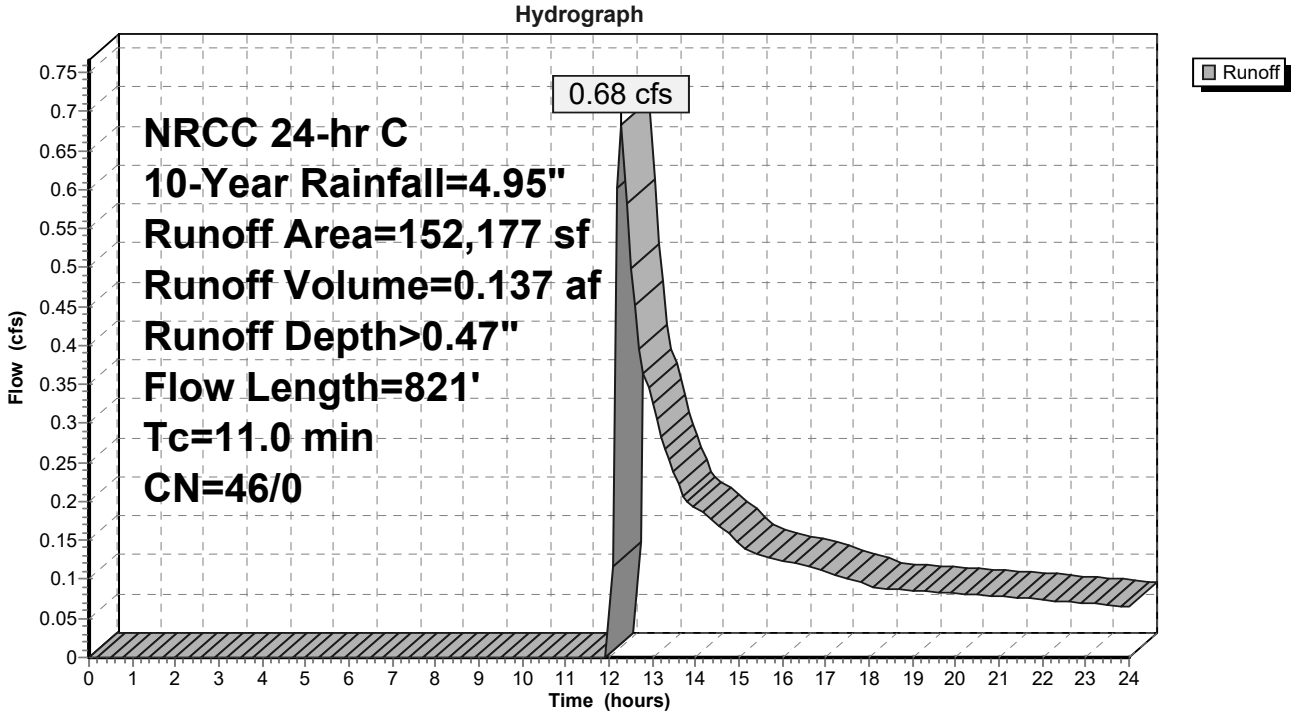
Runoff = 0.68 cfs @ 12.29 hrs, Volume= 0.137 af, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

	Area (sf)	CN	Description
*	18,585	30	BOG, HSG A
	59,403	30	Meadow, non-grazed, HSG A
	26,462	72	Dirt roads, HSG A
*	47,727	58	BOG, HSG B
	152,177	46	Weighted Average
	152,177	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.0340	0.45		**Sheet Flow,** Fallow n= 0.050 P2= 3.35"
5.0	493	0.0120	1.64		**Shallow Concentrated Flow, Bog** Grassed Waterway Kv= 15.0 fps
4.2	278	0.0120	1.10		**Shallow Concentrated Flow, Drained Pond** Nearly Bare & Untilled Kv= 10.0 fps
11.0	821	Total			

Subcatchment EX-2:



Summary for Subcatchment EX-3:

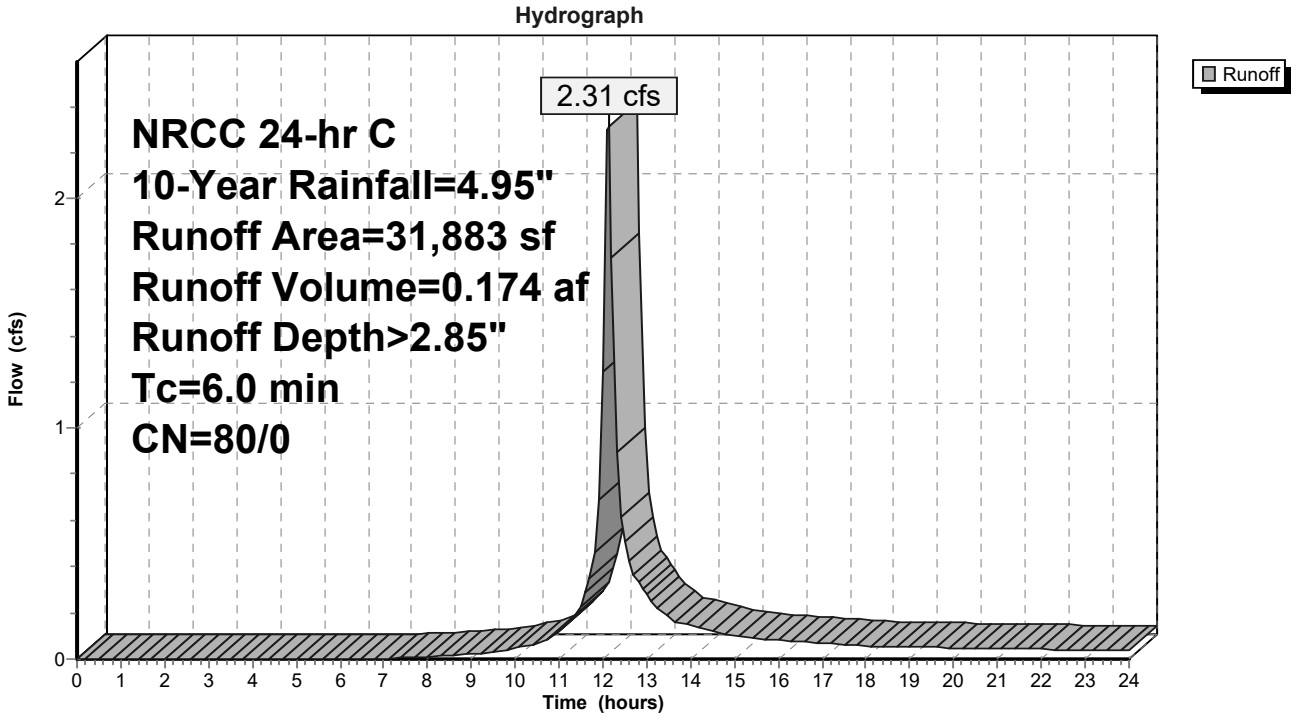
Runoff = 2.31 cfs @ 12.12 hrs, Volume= 0.174 af, Depth> 2.85"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
18,270	72	Dirt roads, HSG A
6,021	98	Water Surface, 0% imp, HSG A
5,480	82	Dirt roads, HSG B
2,112	98	Water Surface, 0% imp, HSG B
31,883	80	Weighted Average
31,883	80	100.00% Pervious Area

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

Subcatchment EX-3:



Summary for Subcatchment EX-4:

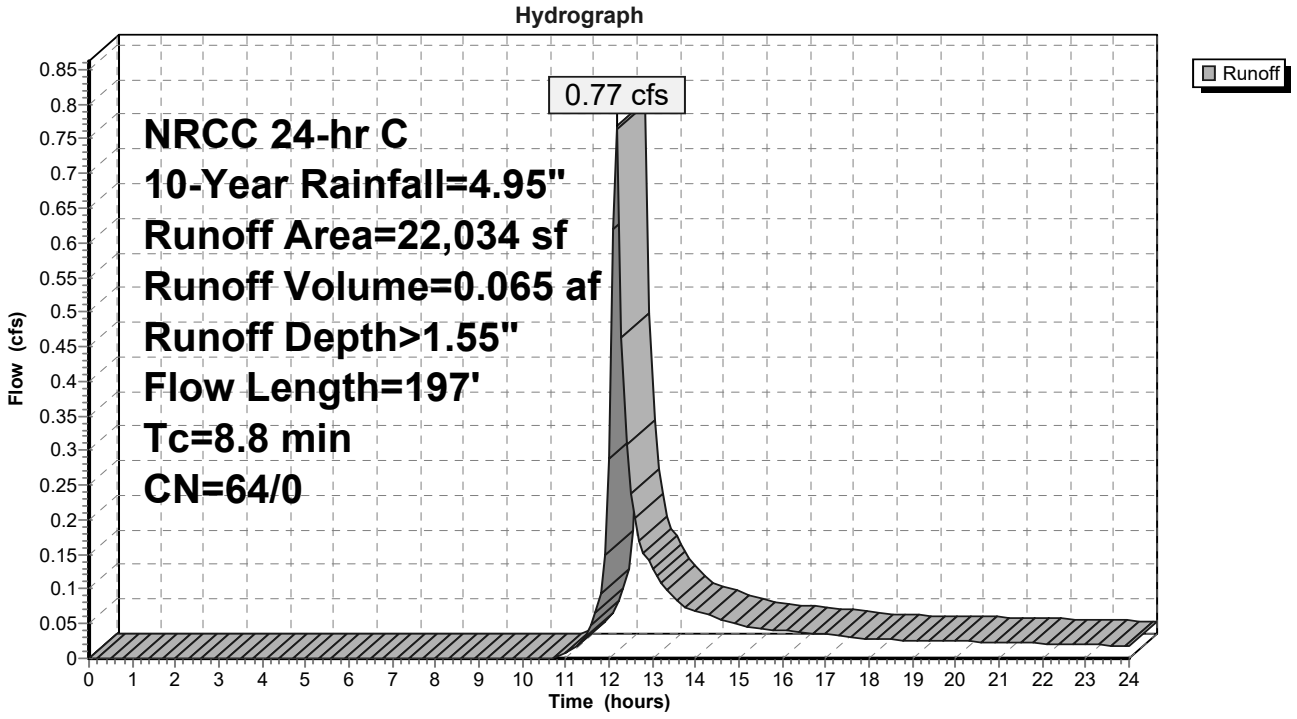
Runoff = 0.77 cfs @ 12.18 hrs, Volume= 0.065 af, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
17,694	72	Dirt roads, HSG A
4,340	30	Woods, Good, HSG A
22,034	64	Weighted Average
22,034	64	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	34	0.0290	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
1.2	163	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.8	197	Total			

Subcatchment EX-4:



Summary for Subcatchment EX-5:

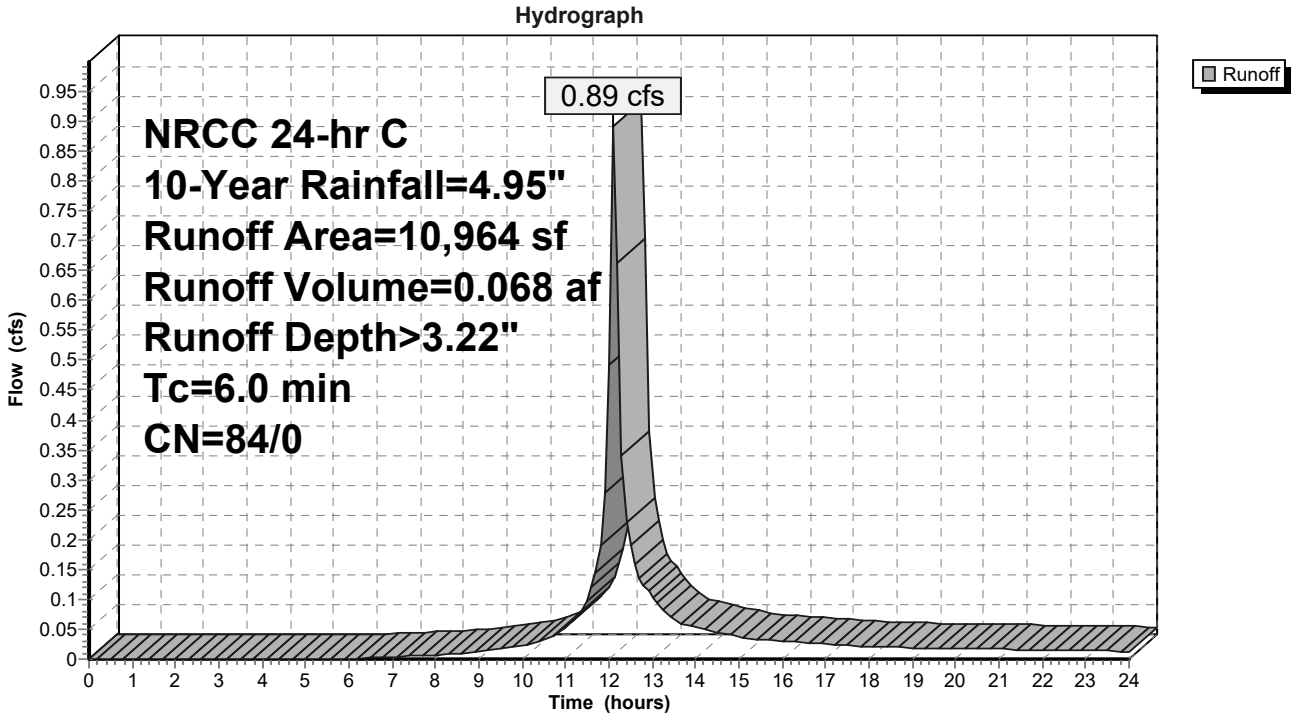
Runoff = 0.89 cfs @ 12.11 hrs, Volume= 0.068 af, Depth> 3.22"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
2,303	72	Dirt roads, HSG A
747	98	Water Surface, 0% imp, HSG A
5,627	82	Dirt roads, HSG B
2,287	98	Water Surface, 0% imp, HSG B
10,964	84	Weighted Average
10,964	84	100.00% Pervious Area

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

Subcatchment EX-5:



Summary for Subcatchment EX-6:

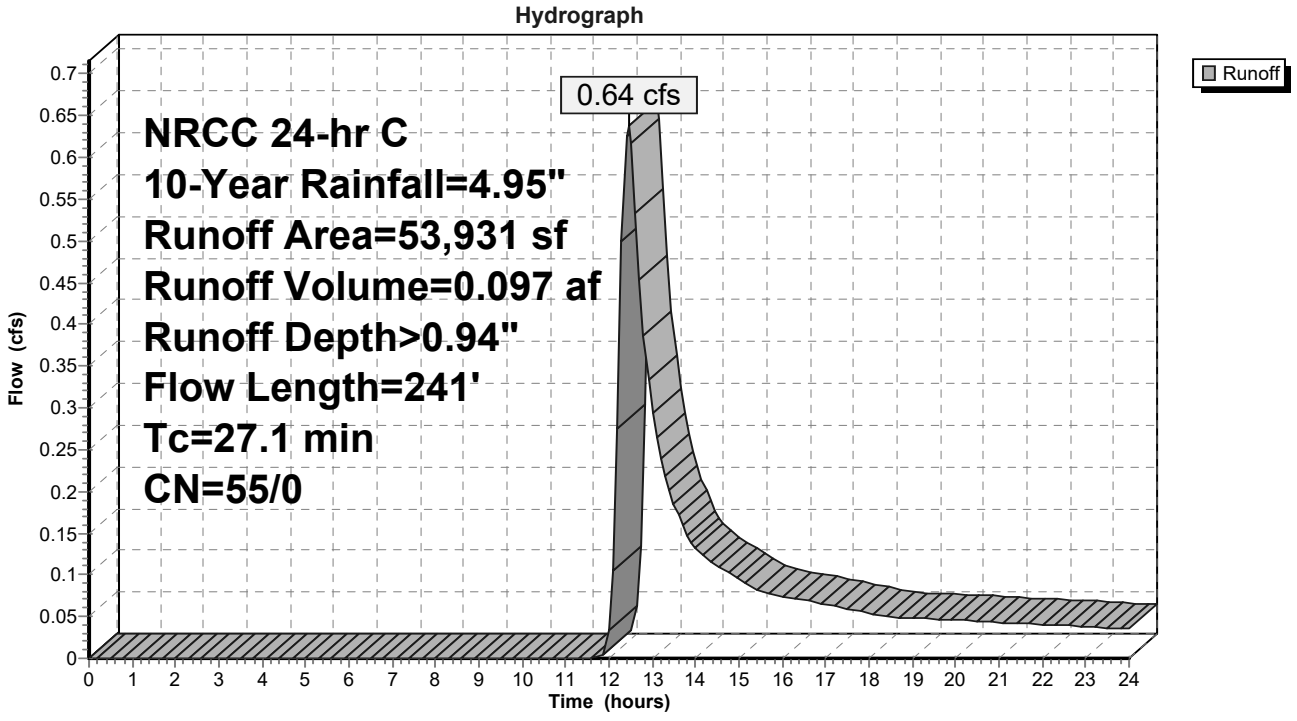
Runoff = 0.64 cfs @ 12.44 hrs, Volume= 0.097 af, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
53,931	55	Woods, Good, HSG B
53,931	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	50	0.0040	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.2	191	0.0230	0.76		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
27.1	241	Total			

Subcatchment EX-6:



Summary for Subcatchment EX-7:

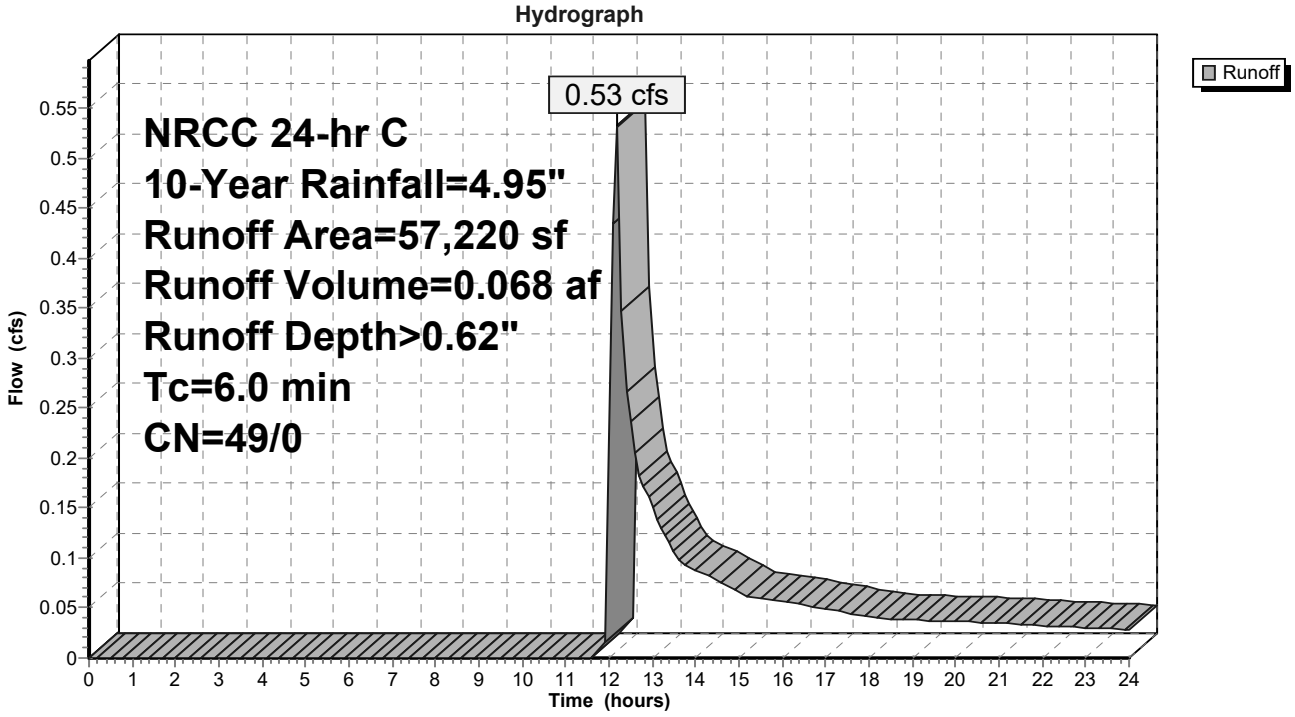
Runoff = 0.53 cfs @ 12.18 hrs, Volume= 0.068 af, Depth> 0.62"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
13,981	30	Woods, Good, HSG A
43,239	55	Woods, Good, HSG B
57,220	49	Weighted Average
57,220	49	100.00% Pervious Area

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

Subcatchment EX-7:



Summary for Subcatchment EX-8:

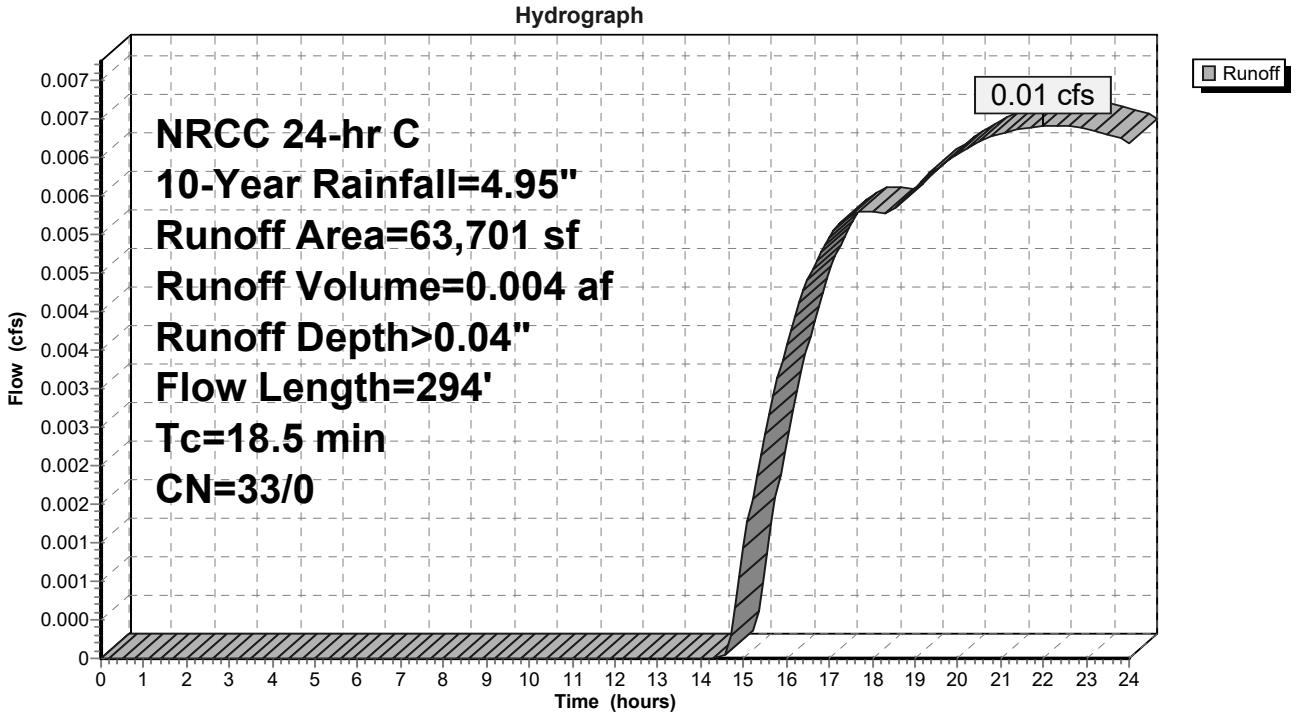
Runoff = 0.01 cfs @ 22.02 hrs, Volume= 0.004 af, Depth> 0.04"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
59,020	30	Woods, Good, HSG A
4,681	72	Dirt roads, HSG A
63,701	33	Weighted Average
63,701	33	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
6.4	244	0.0160	0.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.5	294	Total			

Subcatchment EX-8:



Summary for Pond BASIN 1: Southerly Bog

Inflow Area = 10.905 ac, 0.00% Impervious, Inflow Depth > 1.00" for 10-Year event
Inflow = 4.47 cfs @ 12.75 hrs, Volume= 0.905 af
Outflow = 3.51 cfs @ 13.09 hrs, Volume= 0.877 af, Atten= 21%, Lag= 20.5 min
Discarded = 0.17 cfs @ 12.30 hrs, Volume= 0.166 af
Primary = 3.34 cfs @ 13.09 hrs, Volume= 0.711 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 104.20' @ 13.09 hrs Surf.Area= 7,150 sf Storage= 5,517 cf

Plug-Flow detention time= 40.3 min calculated for 0.874 af (97% of inflow)
Center-of-Mass det. time= 25.2 min (958.6 - 933.4)

Volume	Invert	Avail.Storage	Storage Description
#1	103.43'	665,382 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.43	7,150	0	0
104.99	7,150	11,154	11,154
105.00	319,409	1,633	12,787
106.00	323,115	321,262	334,049
107.00	339,551	331,333	665,382

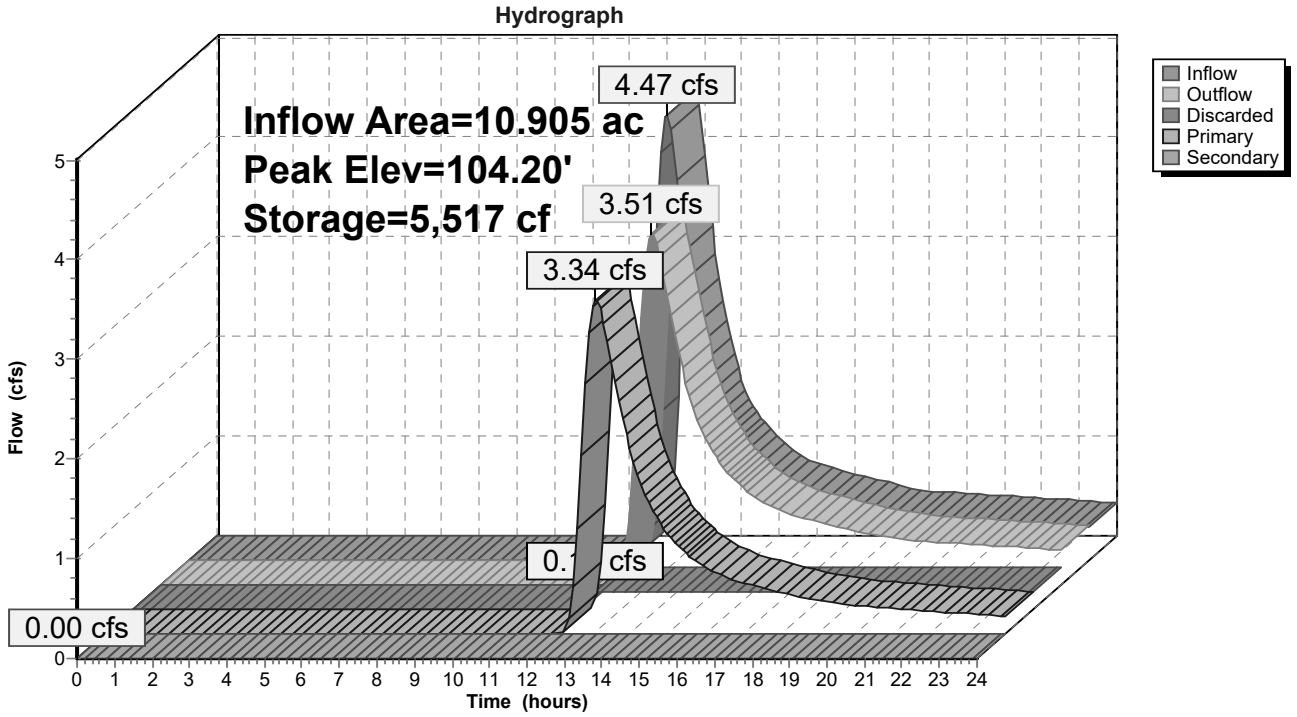
Device	Routing	Invert	Outlet Devices
#1	Primary	103.43'	**24.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 103.43' / 102.84' S= 0.0236 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	106.80'	**120.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Discarded	103.43'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.17 cfs @ 12.30 hrs HW=103.50' (Free Discharge)
3=Exfiltration (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=3.34 cfs @ 13.09 hrs HW=104.20' (Free Discharge)
1=Culvert (Inlet Controls 3.34 cfs @ 2.99 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.43' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BASIN 1: Southerly Bog



Summary for Pond BASIN 2: Northerly Bog

Inflow Area = 3.494 ac, 0.00% Impervious, Inflow Depth > 0.47" for 10-Year event
Inflow = 0.68 cfs @ 12.29 hrs, Volume= 0.137 af
Outflow = 0.58 cfs @ 12.43 hrs, Volume= 0.136 af, Atten= 16%, Lag= 8.4 min
Discarded = 0.58 cfs @ 12.43 hrs, Volume= 0.136 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 103.00' @ 12.43 hrs Surf.Area= 73,187 sf Storage= 244 cf

Plug-Flow detention time= 7.0 min calculated for 0.136 af (99% of inflow)
Center-of-Mass det. time= 4.8 min (967.8 - 963.0)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	74,280 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

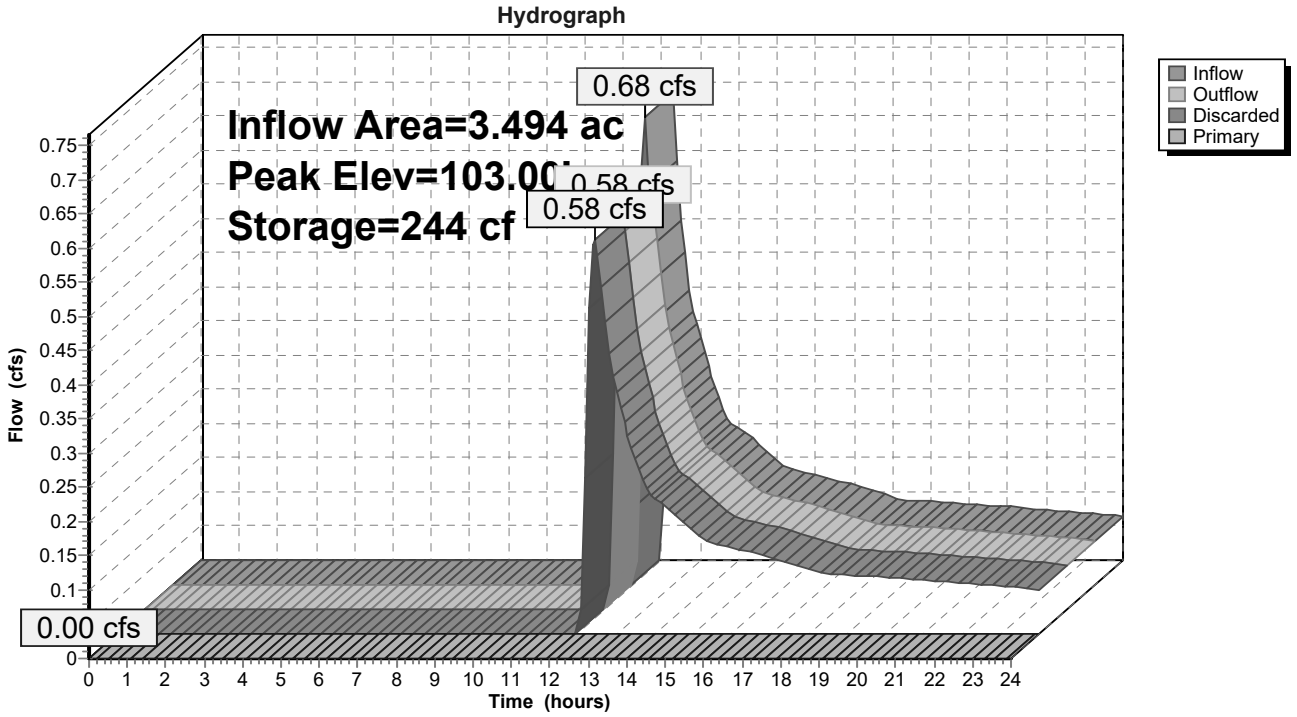
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	73,180	0	0
104.00	75,380	74,280	74,280

Device	Routing	Invert	Outlet Devices
#1	Primary	103.50'	**15.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	103.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.73 cfs @ 12.43 hrs HW=103.00' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 1.73 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 2: Northerly Bog



Summary for Pond BASIN 4:

Inflow Area = 0.252 ac, 0.00% Impervious, Inflow Depth > 3.22" for 10-Year event
Inflow = 0.89 cfs @ 12.11 hrs, Volume= 0.068 af
Outflow = 0.05 cfs @ 14.35 hrs, Volume= 0.045 af, Atten= 95%, Lag= 134.0 min
Discarded = 0.05 cfs @ 14.35 hrs, Volume= 0.045 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 105.88' @ 14.35 hrs Surf.Area= 2,006 sf Storage= 1,672 cf

Plug-Flow detention time= 321.1 min calculated for 0.045 af (67% of inflow)
Center-of-Mass det. time= 214.6 min (1,033.0 - 818.4)

Volume	Invert	Avail.Storage	Storage Description
#1	104.00'	4,520 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

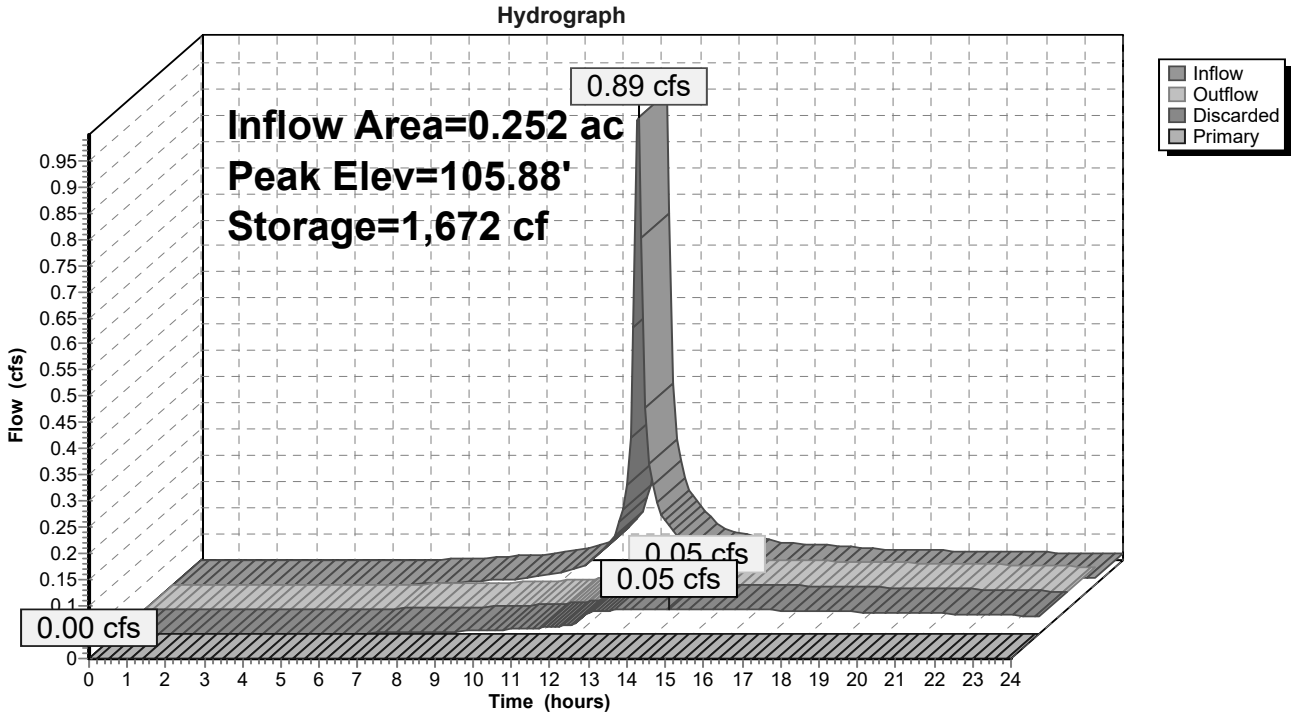
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.00	75	0	0
105.00	797	436	436
106.00	2,168	1,483	1,919
107.00	3,035	2,602	4,520

Device	Routing	Invert	Outlet Devices
#1	Primary	107.20'	**30.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	104.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 14.35 hrs HW=105.88' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 4:


Hydrograph
Inflow
Outflow
Discarded
Primary
0.89 cfs
Inflow Area=0.252 ac
Peak Elev=105.88'
Storage=1,672 cf
0.05 cfs
0.05 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Pond BASIN-3:

Inflow Area = 11.889 ac, 0.00% Impervious, Inflow Depth > 0.89" for 10-Year event
Inflow = 3.60 cfs @ 13.07 hrs, Volume= 0.885 af
Outflow = 3.59 cfs @ 13.07 hrs, Volume= 0.885 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 13.07 hrs, Volume= 0.001 af
Primary = 3.59 cfs @ 13.07 hrs, Volume= 0.884 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 97.54' @ 13.07 hrs Surf.Area= 115 sf Storage= 53 cf

Plug-Flow detention time= 0.2 min calculated for 0.885 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (909.9 - 909.7)

Volume	Invert	Avail.Storage	Storage Description
#1	96.30'	25,553 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

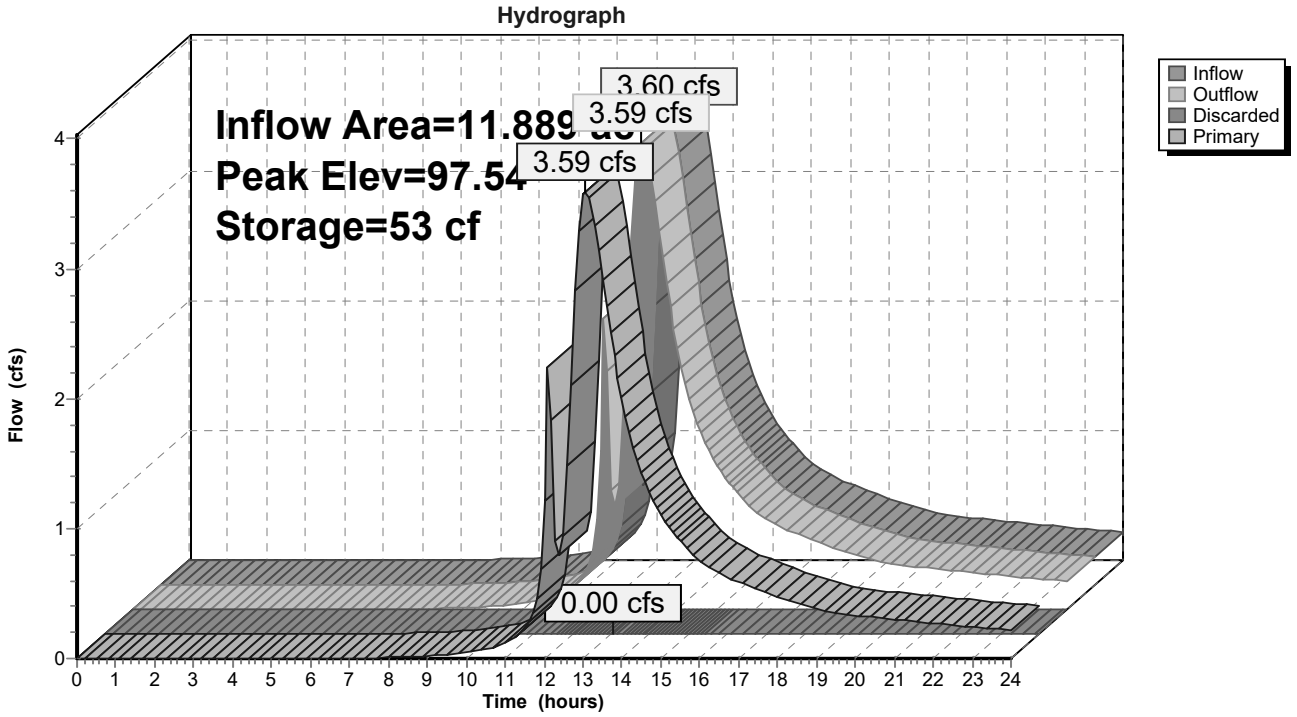
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.30	0	0	0
97.00	35	12	12
98.00	183	109	121
99.00	412	298	419
100.00	807	610	1,028
101.00	2,661	1,734	2,762
102.00	4,620	3,641	6,403
103.00	5,817	5,219	11,621
104.00	6,957	6,387	18,008
105.00	8,132	7,545	25,553

Device	Routing	Invert	Outlet Devices
#1	Primary	96.31'	**36.0" Round Culvert** L= 81.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 96.31' / 96.30' S= 0.0001 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Primary	105.50'	**35.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	96.30'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 13.07 hrs HW=97.54' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=3.58 cfs @ 13.07 hrs HW=97.54' (Free Discharge)
└**1=Culvert** (Barrel Controls 3.58 cfs @ 1.94 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN-3:

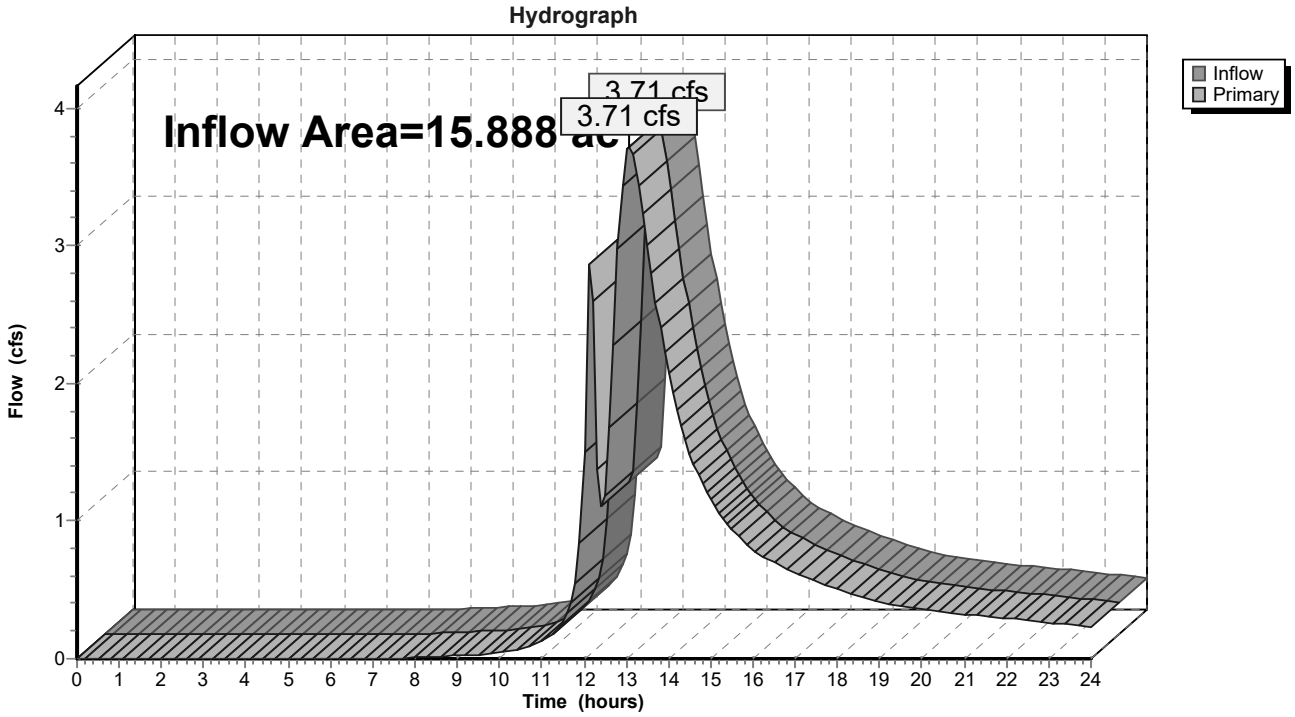

Hydrograph
Inflow Area=11.889 ac
Peak Elev=97.54
Storage=53 cf
3.60 cfs
3.59 cfs
3.59 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Summary for Link POA-1:

Inflow Area = 15.888 ac, 0.00% Impervious, Inflow Depth > 0.72" for 10-Year event
Inflow = 3.71 cfs @ 13.05 hrs, Volume= 0.949 af
Primary = 3.71 cfs @ 13.05 hrs, Volume= 0.949 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-1:

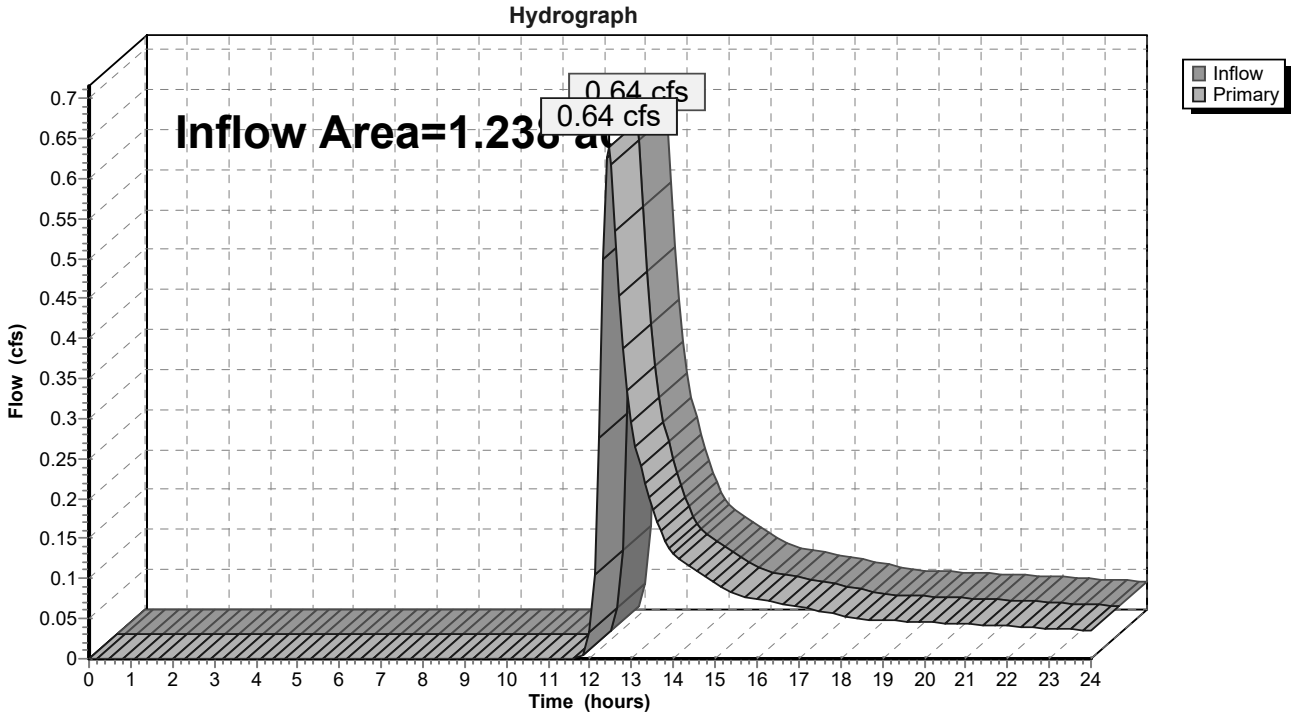


Summary for Link POA-2:

Inflow Area = 1.238 ac, 0.00% Impervious, Inflow Depth > 0.94" for 10-Year event
Inflow = 0.64 cfs @ 12.44 hrs, Volume= 0.097 af
Primary = 0.64 cfs @ 12.44 hrs, Volume= 0.097 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-2:

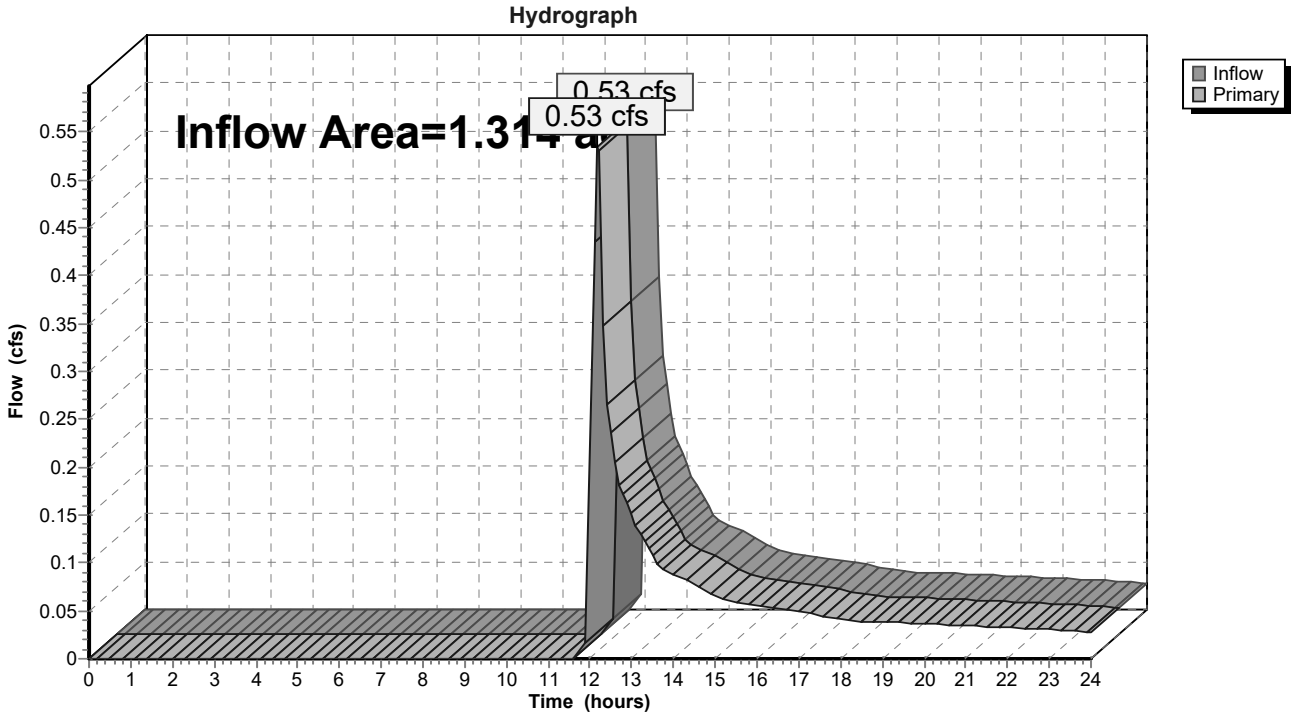


Summary for Link POA-3:

Inflow Area = 1.314 ac, 0.00% Impervious, Inflow Depth > 0.62" for 10-Year event
Inflow = 0.53 cfs @ 12.18 hrs, Volume= 0.068 af
Primary = 0.53 cfs @ 12.18 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-3:

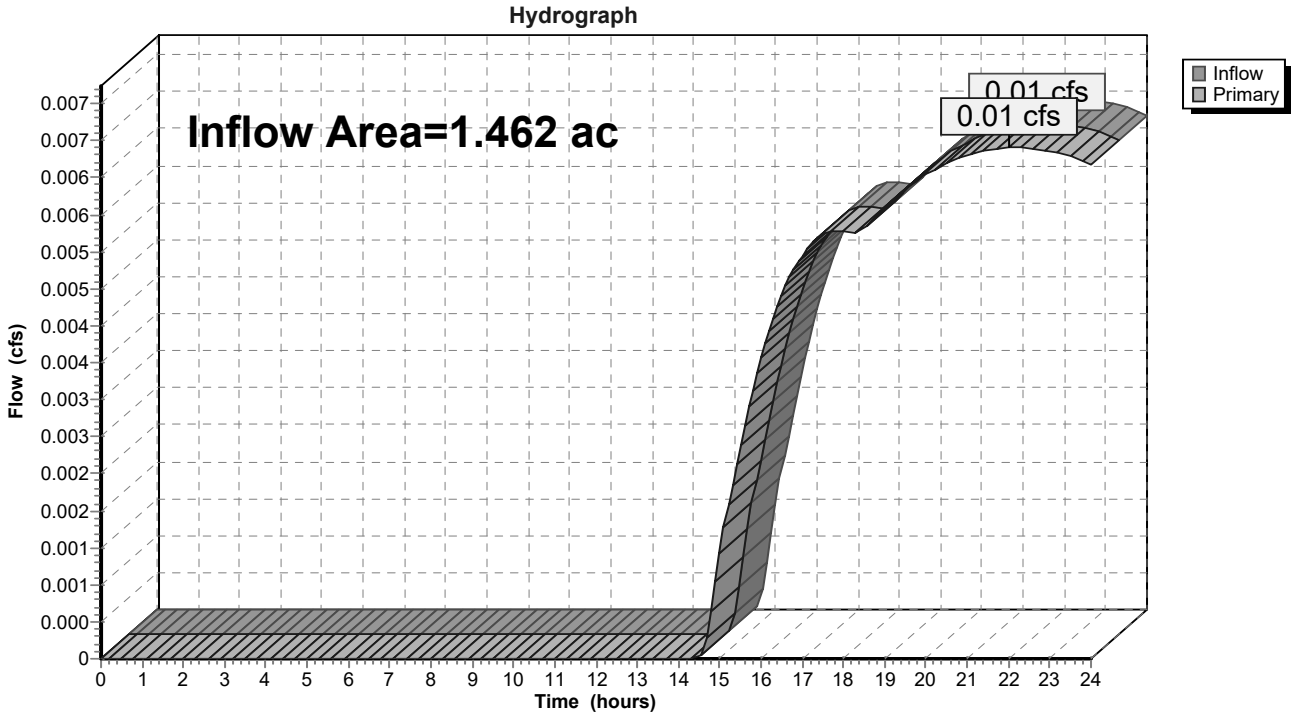


Summary for Link POA-4:

Inflow Area = 1.462 ac, 0.00% Impervious, Inflow Depth > 0.04" for 10-Year event
Inflow = 0.01 cfs @ 22.02 hrs, Volume= 0.004 af
Primary = 0.01 cfs @ 22.02 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-4:



Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=475,024 sf 0.00% Impervious Runoff Depth>3.33"
Flow Length=1,058' Tc=47.7 min CN=56/0 Runoff=17.80 cfs 3.023 af

Subcatchment EX-2: Runoff Area=152,177 sf 0.00% Impervious Runoff Depth>2.21"
Flow Length=821' Tc=11.0 min CN=46/0 Runoff=7.09 cfs 0.644 af

Subcatchment EX-3: Runoff Area=31,883 sf 0.00% Impervious Runoff Depth>6.26"
Tc=6.0 min CN=80/0 Runoff=4.96 cfs 0.382 af

Subcatchment EX-4: Runoff Area=22,034 sf 0.00% Impervious Runoff Depth>4.32"
Flow Length=197' Tc=8.8 min CN=64/0 Runoff=2.23 cfs 0.182 af

Subcatchment EX-5: Runoff Area=10,964 sf 0.00% Impervious Runoff Depth>6.75"
Tc=6.0 min CN=84/0 Runoff=1.81 cfs 0.141 af

Subcatchment EX-6: Runoff Area=53,931 sf 0.00% Impervious Runoff Depth>3.23"
Flow Length=241' Tc=27.1 min CN=55/0 Runoff=2.66 cfs 0.334 af

Subcatchment EX-7: Runoff Area=57,220 sf 0.00% Impervious Runoff Depth>2.56"
Tc=6.0 min CN=49/0 Runoff=3.50 cfs 0.280 af

Subcatchment EX-8: Runoff Area=63,701 sf 0.00% Impervious Runoff Depth>0.85"
Flow Length=294' Tc=18.5 min CN=33/0 Runoff=0.47 cfs 0.103 af

Pond BASIN 1: Southerly Bog Peak Elev=105.00' Storage=12,254 cf Inflow=17.80 cfs 3.023 af
Discarded=6.19 cfs 0.383 af Primary=11.27 cfs 2.586 af Secondary=0.00 cfs 0.000 af Outflow=17.46 cfs 2.969 af

Pond BASIN 2: Northerly Bog Peak Elev=103.08' Storage=5,982 cf Inflow=7.09 cfs 0.644 af
Discarded=1.73 cfs 0.642 af Primary=0.00 cfs 0.000 af Outflow=1.73 cfs 0.642 af

Pond BASIN 4: Peak Elev=106.79' Storage=3,894 cf Inflow=1.81 cfs 0.141 af
Discarded=0.07 cfs 0.072 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.072 af

Pond BASIN-3: Peak Elev=98.51' Storage=243 cf Inflow=12.07 cfs 2.968 af
Discarded=0.01 cfs 0.002 af Primary=12.06 cfs 2.965 af Outflow=12.06 cfs 2.967 af

Link POA-1: Inflow=12.73 cfs 3.147 af
Primary=12.73 cfs 3.147 af

Link POA-2: Inflow=2.66 cfs 0.334 af
Primary=2.66 cfs 0.334 af

Link POA-3: Inflow=3.50 cfs 0.280 af
Primary=3.50 cfs 0.280 af

Link POA-4: Inflow=0.47 cfs 0.103 af
Primary=0.47 cfs 0.103 af

Total Runoff Area = 19.902 ac Runoff Volume = 5.090 af Average Runoff Depth = 3.07"
100.00% Pervious = 19.902 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EX-1:

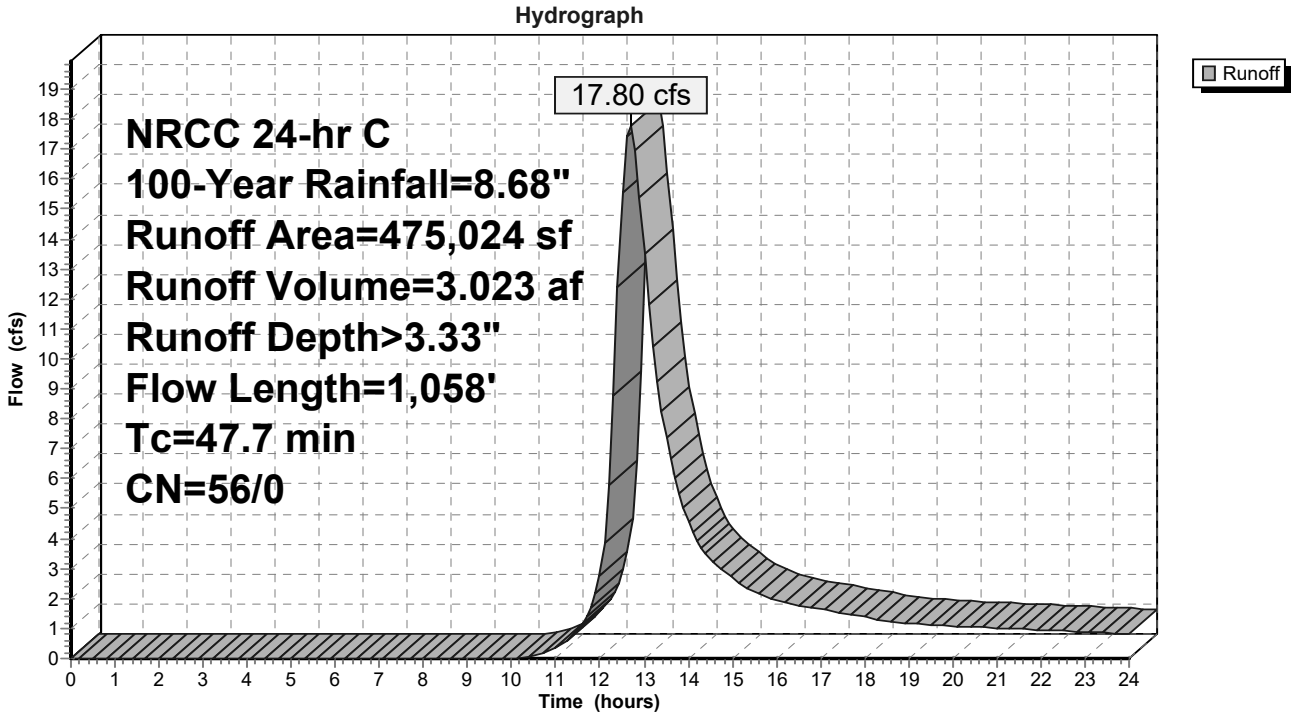
Runoff = 17.80 cfs @ 12.68 hrs, Volume= 3.023 af, Depth> 3.33"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

	Area (sf)	CN	Description
*	25,526	30	BOG, HSG A
	16,620	30	Meadow, non-grazed, HSG A
	2,355	30	Woods, Good, HSG A
	7,570	72	Dirt roads, HSG A
*	293,382	58	BOG, HSG B
	25,619	58	Meadow, non-grazed, HSG B
	91,668	55	Woods, Good, HSG B
	12,284	82	Dirt roads, HSG B
	475,024	56	Weighted Average
	475,024	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4	50	0.0080	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
9.1	406	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
21.2	602	0.0010	0.47		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
47.7	1,058	Total			

Subcatchment EX-1:



Summary for Subcatchment EX-2:

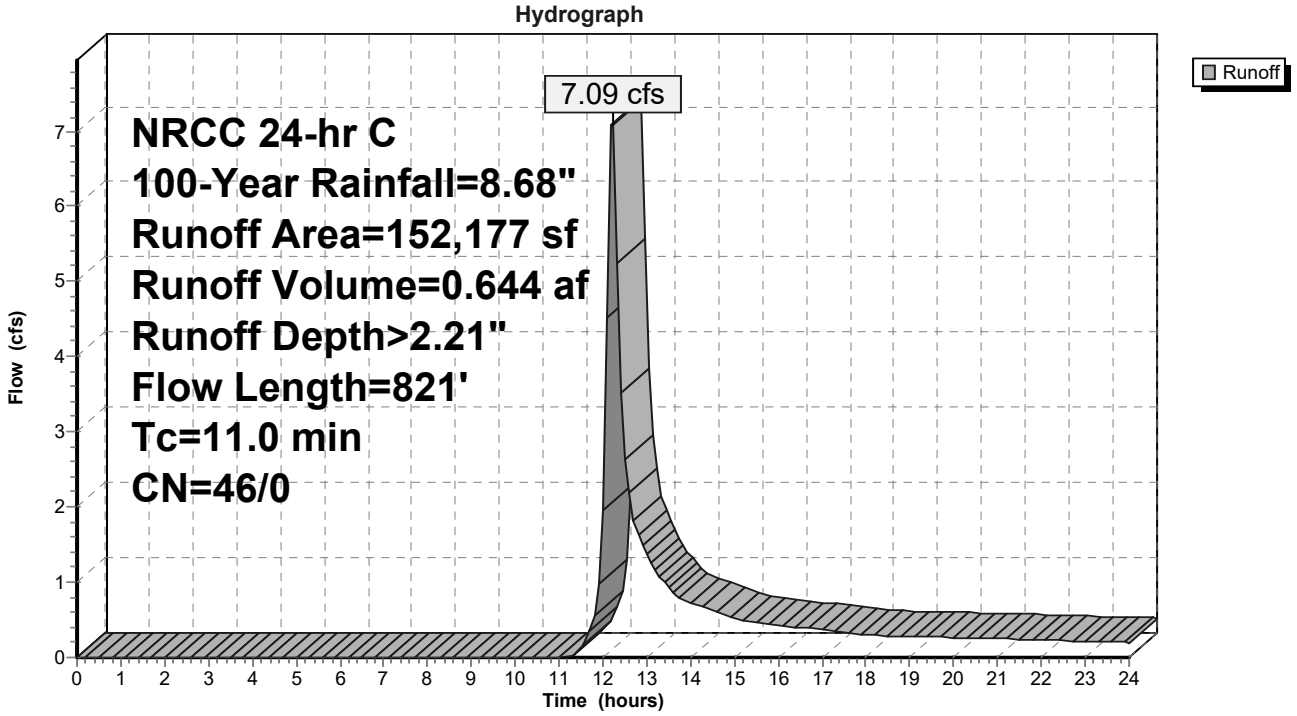
Runoff = 7.09 cfs @ 12.21 hrs, Volume= 0.644 af, Depth> 2.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

	Area (sf)	CN	Description
*	18,585	30	BOG, HSG A
	59,403	30	Meadow, non-grazed, HSG A
	26,462	72	Dirt roads, HSG A
*	47,727	58	BOG, HSG B
	152,177	46	Weighted Average
	152,177	46	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.0340	0.45		**Sheet Flow,** Fallow n= 0.050 P2= 3.35"
5.0	493	0.0120	1.64		**Shallow Concentrated Flow, Bog** Grassed Waterway Kv= 15.0 fps
4.2	278	0.0120	1.10		**Shallow Concentrated Flow, Drained Pond** Nearly Bare & Untilled Kv= 10.0 fps
11.0	821	Total			

Subcatchment EX-2:



Summary for Subcatchment EX-3:

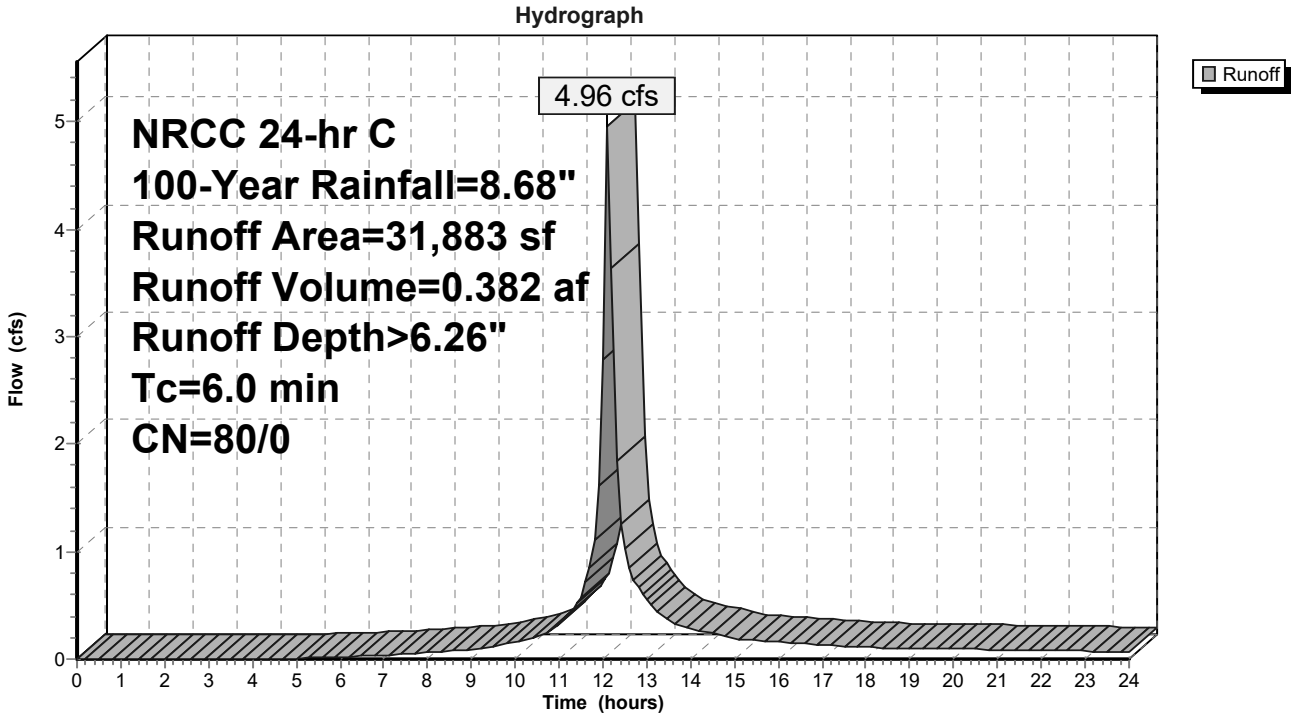
Runoff = 4.96 cfs @ 12.11 hrs, Volume= 0.382 af, Depth> 6.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
18,270	72	Dirt roads, HSG A
6,021	98	Water Surface, 0% imp, HSG A
5,480	82	Dirt roads, HSG B
2,112	98	Water Surface, 0% imp, HSG B
31,883	80	Weighted Average
31,883	80	100.00% Pervious Area

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

Subcatchment EX-3:



Summary for Subcatchment EX-4:

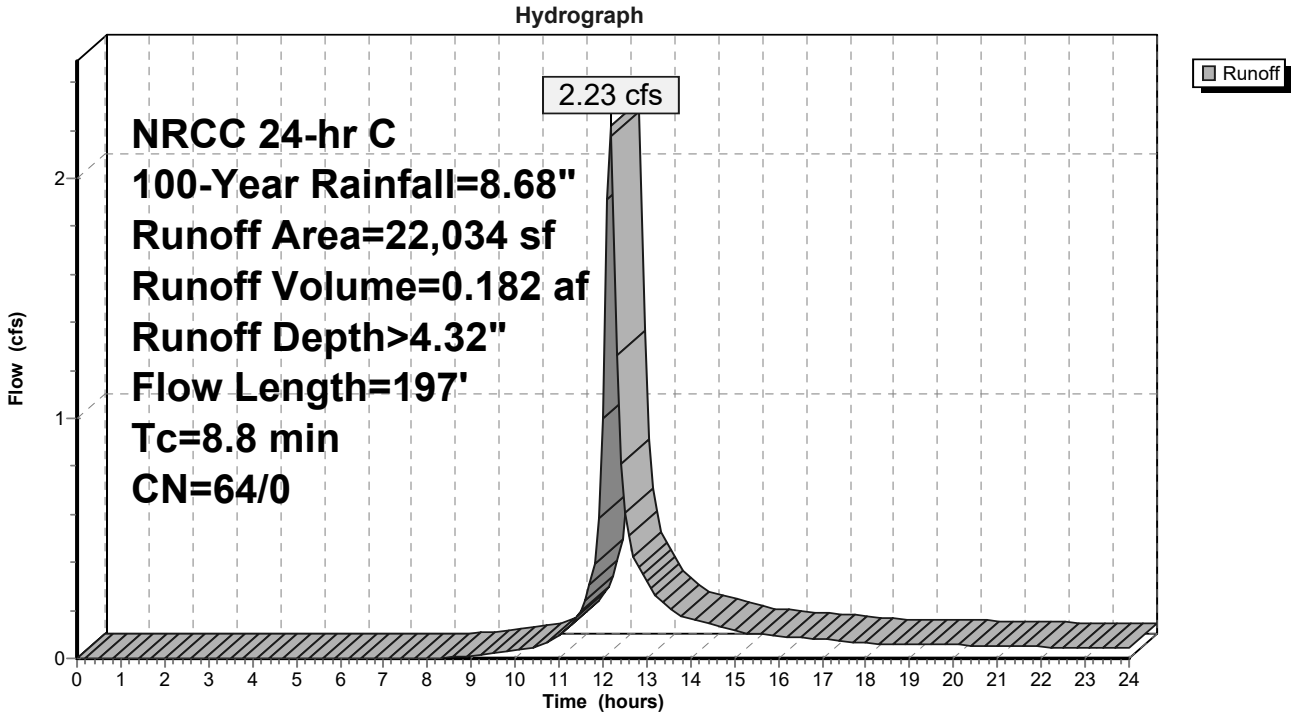
Runoff = 2.23 cfs @ 12.17 hrs, Volume= 0.182 af, Depth> 4.32"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
17,694	72	Dirt roads, HSG A
4,340	30	Woods, Good, HSG A
22,034	64	Weighted Average
22,034	64	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	34	0.0290	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
1.2	163	0.0210	2.33		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.8	197	Total			

Subcatchment EX-4:



Summary for Subcatchment EX-5:

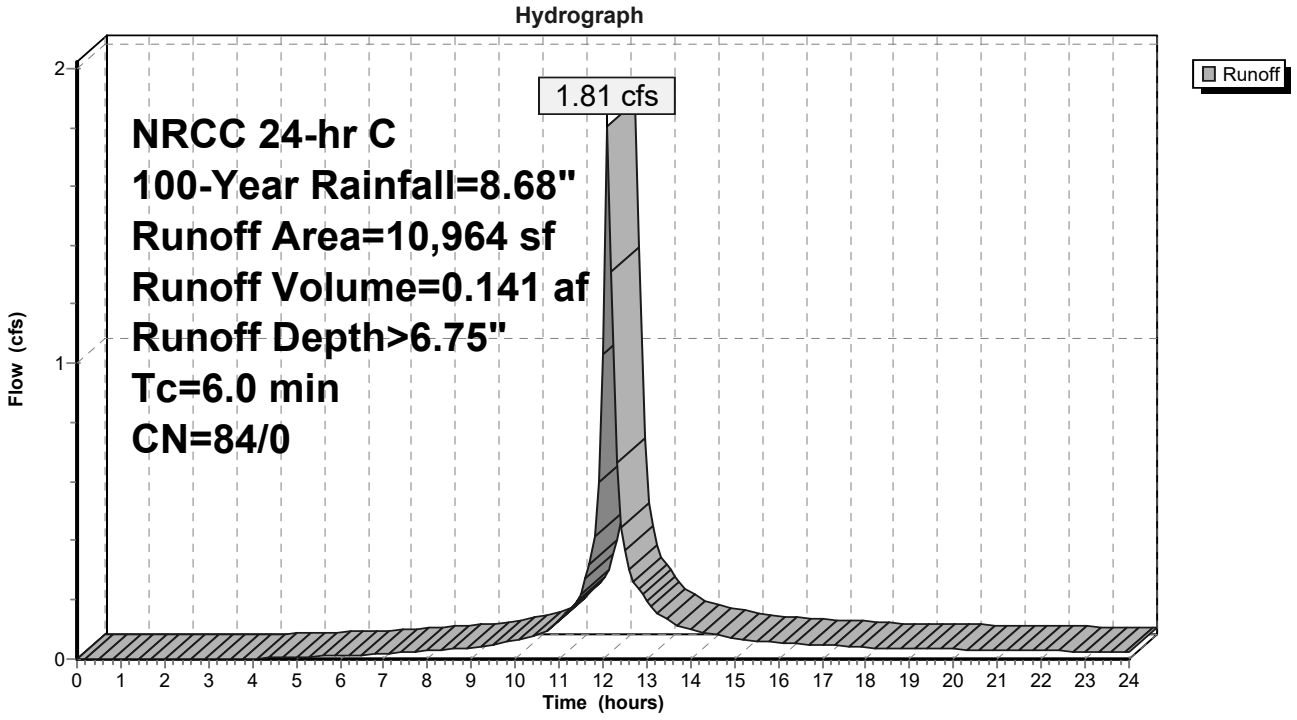
Runoff = 1.81 cfs @ 12.11 hrs, Volume= 0.141 af, Depth> 6.75"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
2,303	72	Dirt roads, HSG A
747	98	Water Surface, 0% imp, HSG A
5,627	82	Dirt roads, HSG B
2,287	98	Water Surface, 0% imp, HSG B
10,964	84	Weighted Average
10,964	84	100.00% Pervious Area

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

Subcatchment EX-5:



Summary for Subcatchment EX-6:

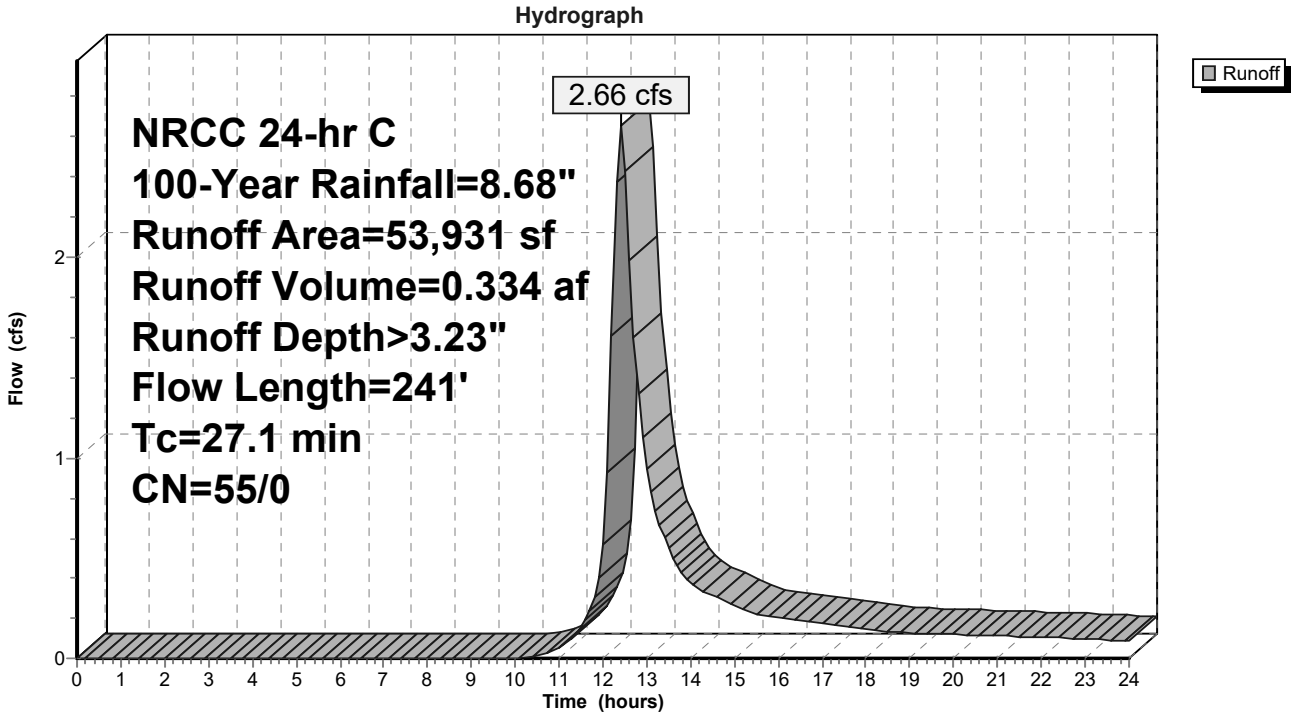
Runoff = 2.66 cfs @ 12.41 hrs, Volume= 0.334 af, Depth> 3.23"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
53,931	55	Woods, Good, HSG B
53,931	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.9	50	0.0040	0.04		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
4.2	191	0.0230	0.76		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
27.1	241	Total			

Subcatchment EX-6:



Summary for Subcatchment EX-7:

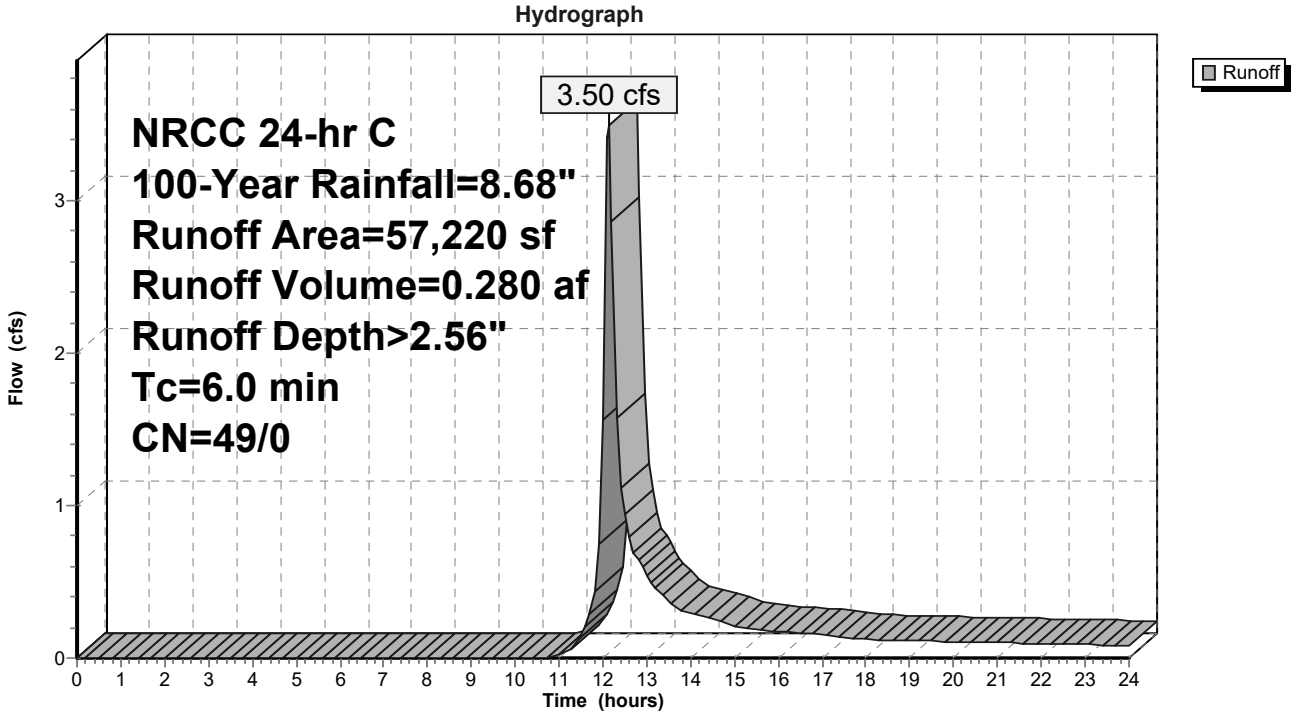
Runoff = 3.50 cfs @ 12.13 hrs, Volume= 0.280 af, Depth> 2.56"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
13,981	30	Woods, Good, HSG A
43,239	55	Woods, Good, HSG B
57,220	49	Weighted Average
57,220	49	100.00% Pervious Area

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

Subcatchment EX-7:



Summary for Subcatchment EX-8:

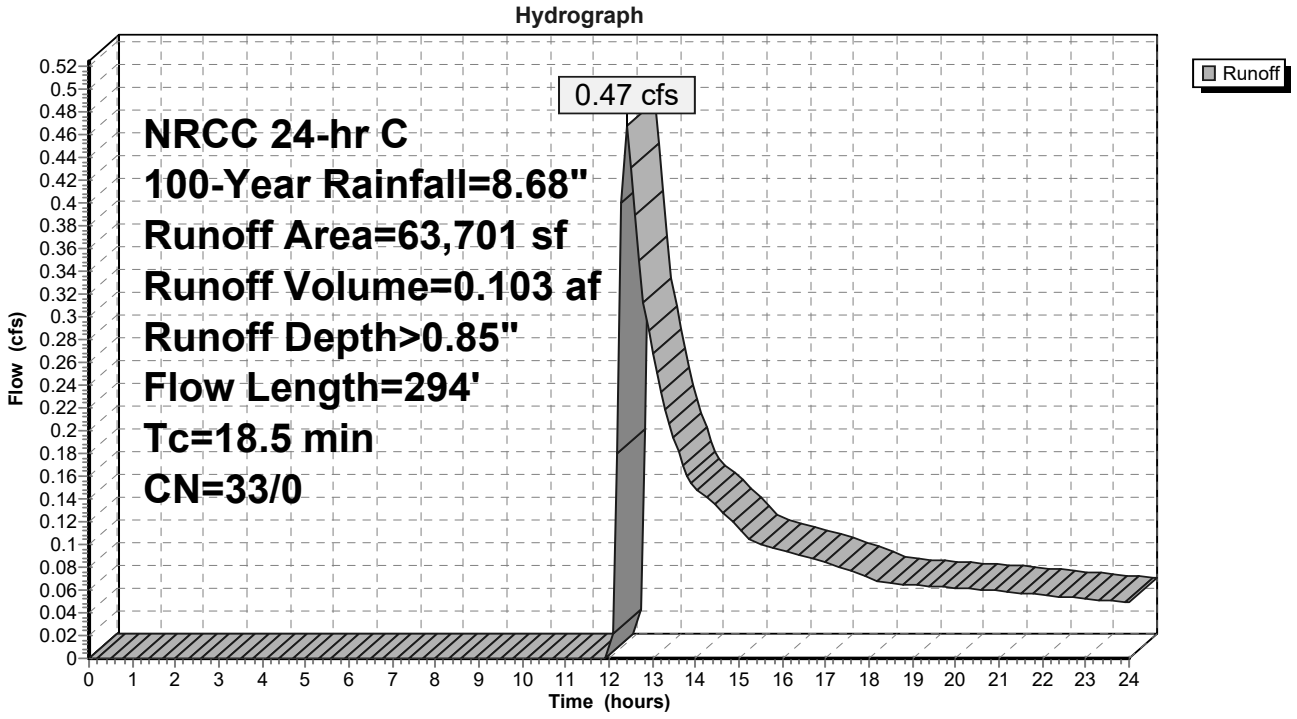
Runoff = 0.47 cfs @ 12.42 hrs, Volume= 0.103 af, Depth> 0.85"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
59,020	30	Woods, Good, HSG A
4,681	72	Dirt roads, HSG A
63,701	33	Weighted Average
63,701	33	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.35"
6.4	244	0.0160	0.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.5	294	Total			

Subcatchment EX-8:



Summary for Pond BASIN 1: Southerly Bog

Inflow Area = 10.905 ac, 0.00% Impervious, Inflow Depth > 3.33" for 100-Year event
Inflow = 17.80 cfs @ 12.68 hrs, Volume= 3.023 af
Outflow = 17.46 cfs @ 12.76 hrs, Volume= 2.969 af, Atten= 2%, Lag= 4.7 min
Discarded = 6.19 cfs @ 12.76 hrs, Volume= 0.383 af
Primary = 11.27 cfs @ 12.76 hrs, Volume= 2.586 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 105.00' @ 12.76 hrs Surf.Area= 262,257 sf Storage= 12,254 cf

Plug-Flow detention time= 24.7 min calculated for 2.969 af (98% of inflow)
Center-of-Mass det. time= 15.0 min (907.7 - 892.7)

Volume	Invert	Avail.Storage	Storage Description
#1	103.43'	665,382 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.43	7,150	0	0
104.99	7,150	11,154	11,154
105.00	319,409	1,633	12,787
106.00	323,115	321,262	334,049
107.00	339,551	331,333	665,382

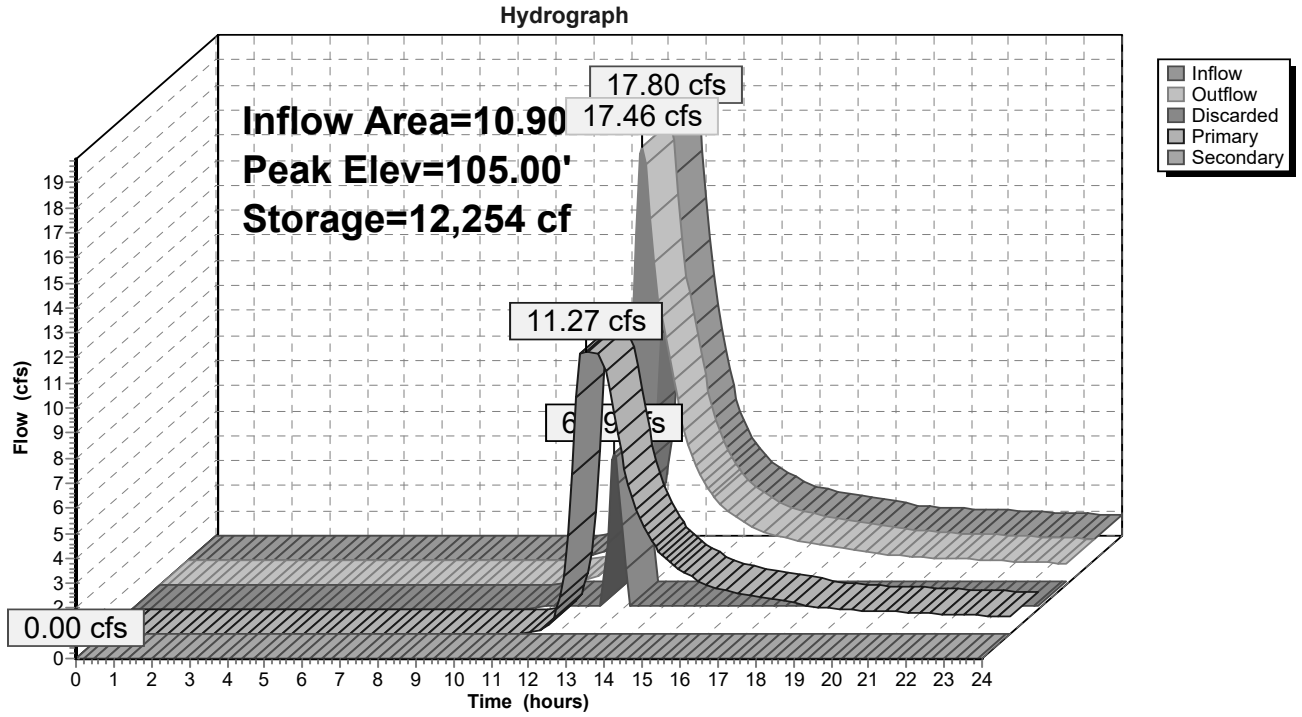
Device	Routing	Invert	Outlet Devices
#1	Primary	103.43'	**24.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 103.43' / 102.84' S= 0.0236 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	106.80'	**120.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Discarded	103.43'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=6.05 cfs @ 12.76 hrs HW=105.00' (Free Discharge)
3=Exfiltration (Exfiltration Controls 6.05 cfs)

Primary OutFlow Max=11.27 cfs @ 12.76 hrs HW=105.00' (Free Discharge)
1=Culvert (Inlet Controls 11.27 cfs @ 4.26 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.43' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BASIN 1: Southerly Bog



Summary for Pond BASIN 2: Northerly Bog

Inflow Area = 3.494 ac, 0.00% Impervious, Inflow Depth > 2.21" for 100-Year event
Inflow = 7.09 cfs @ 12.21 hrs, Volume= 0.644 af
Outflow = 1.73 cfs @ 12.75 hrs, Volume= 0.642 af, Atten= 76%, Lag= 32.4 min
Discarded = 1.73 cfs @ 12.75 hrs, Volume= 0.642 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 103.08' @ 12.75 hrs Surf.Area= 73,360 sf Storage= 5,982 cf

Plug-Flow detention time= 25.1 min calculated for 0.642 af (100% of inflow)
Center-of-Mass det. time= 23.5 min (917.2 - 893.7)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	74,280 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

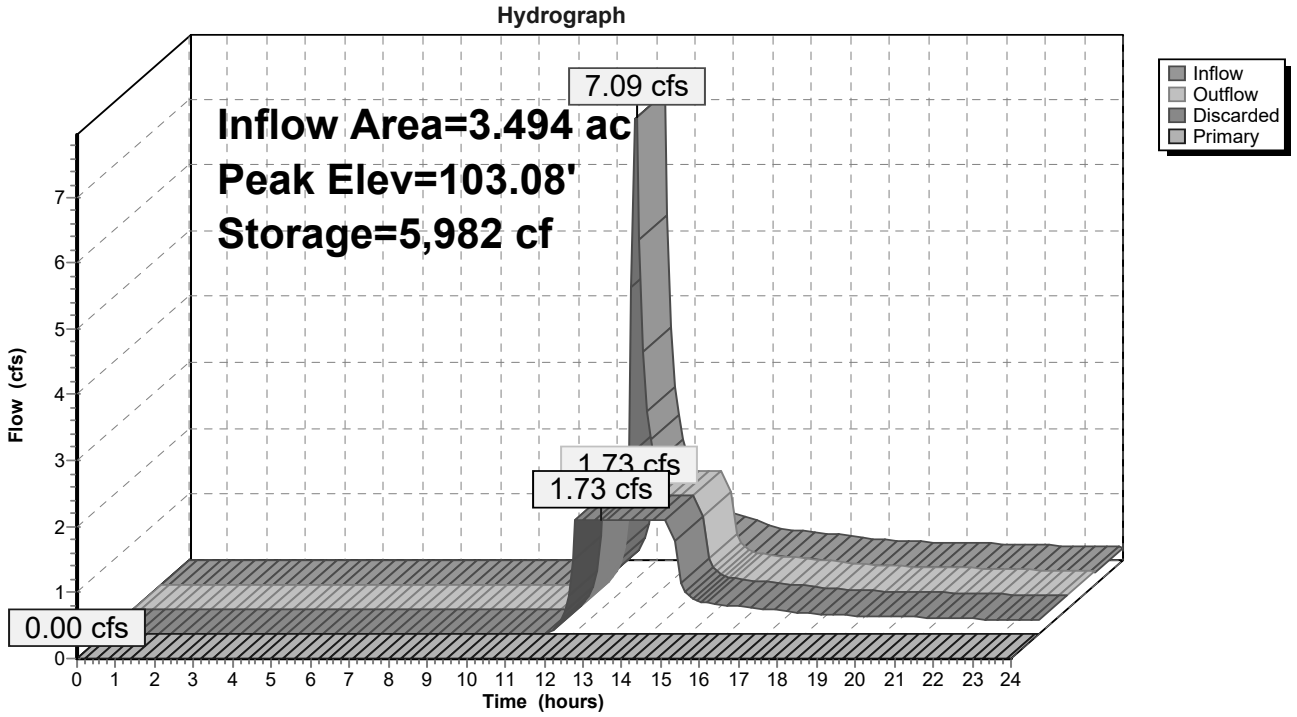
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	73,180	0	0
104.00	75,380	74,280	74,280

Device	Routing	Invert	Outlet Devices
#1	Primary	103.50'	**15.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	103.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.73 cfs @ 12.75 hrs HW=103.08' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 1.73 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 2: Northerly Bog



Summary for Pond BASIN 4:

Inflow Area = 0.252 ac, 0.00% Impervious, Inflow Depth > 6.75" for 100-Year event
Inflow = 1.81 cfs @ 12.11 hrs, Volume= 0.141 af
Outflow = 0.07 cfs @ 15.05 hrs, Volume= 0.072 af, Atten= 96%, Lag= 176.0 min
Discarded = 0.07 cfs @ 15.05 hrs, Volume= 0.072 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 106.79' @ 15.05 hrs Surf.Area= 2,850 sf Storage= 3,894 cf

Plug-Flow detention time= 351.2 min calculated for 0.072 af (51% of inflow)
Center-of-Mass det. time= 227.9 min (1,023.4 - 795.5)

Volume	Invert	Avail.Storage	Storage Description
#1	104.00'	4,520 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

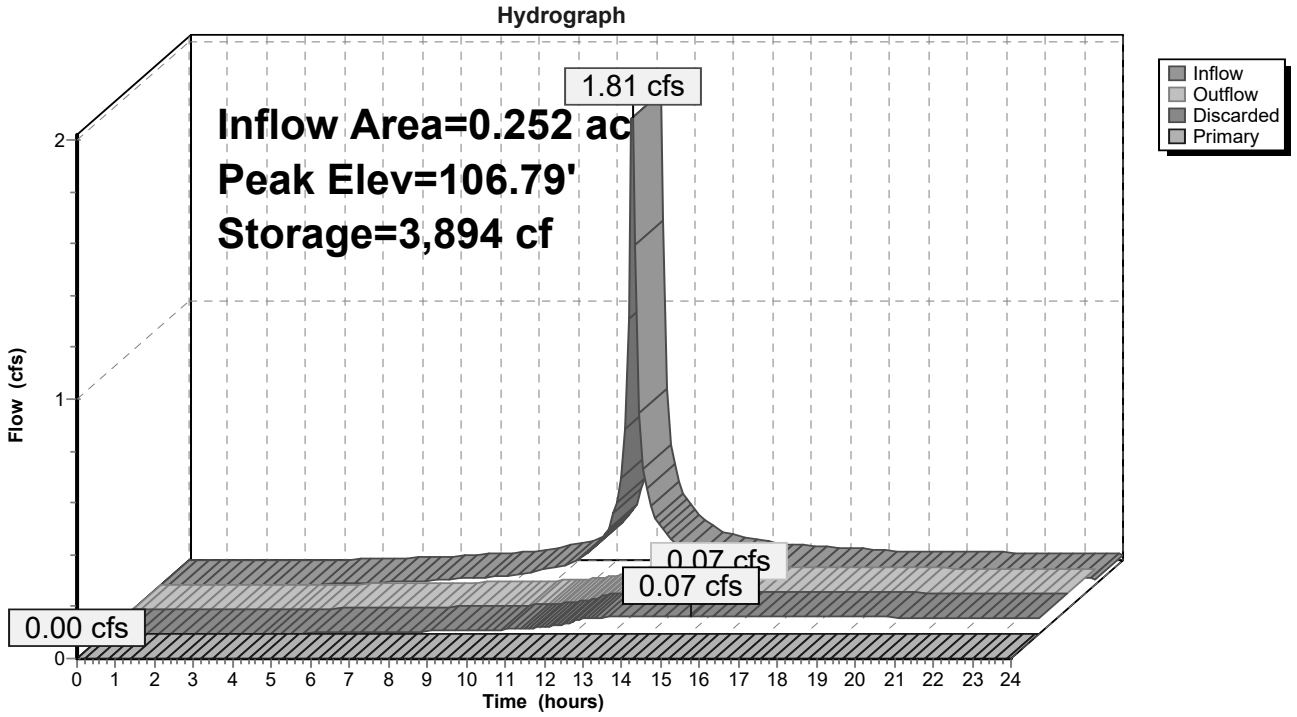
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.00	75	0	0
105.00	797	436	436
106.00	2,168	1,483	1,919
107.00	3,035	2,602	4,520

Device	Routing	Invert	Outlet Devices
#1	Primary	107.20'	**30.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	104.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.07 cfs @ 15.05 hrs HW=106.79' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 4:


Hydrograph
Inflow
Outflow
Discarded
Primary
1.81 cfs
Inflow Area=0.252 ac
Peak Elev=106.79'
Storage=3,894 cf
0.07 cfs
0.07 cfs
0.00 cfs
Flow (cfs)
0
1
2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hours)

Summary for Pond BASIN-3:

Inflow Area = 11.889 ac, 0.00% Impervious, Inflow Depth > 3.00" for 100-Year event
Inflow = 12.07 cfs @ 12.60 hrs, Volume= 2.968 af
Outflow = 12.06 cfs @ 12.60 hrs, Volume= 2.967 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.60 hrs, Volume= 0.002 af
Primary = 12.06 cfs @ 12.60 hrs, Volume= 2.965 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 98.51' @ 12.60 hrs Surf.Area= 299 sf Storage= 243 cf

Plug-Flow detention time= 0.3 min calculated for 2.967 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (895.6 - 895.4)

Volume	Invert	Avail.Storage	Storage Description
#1	96.30'	25,553 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

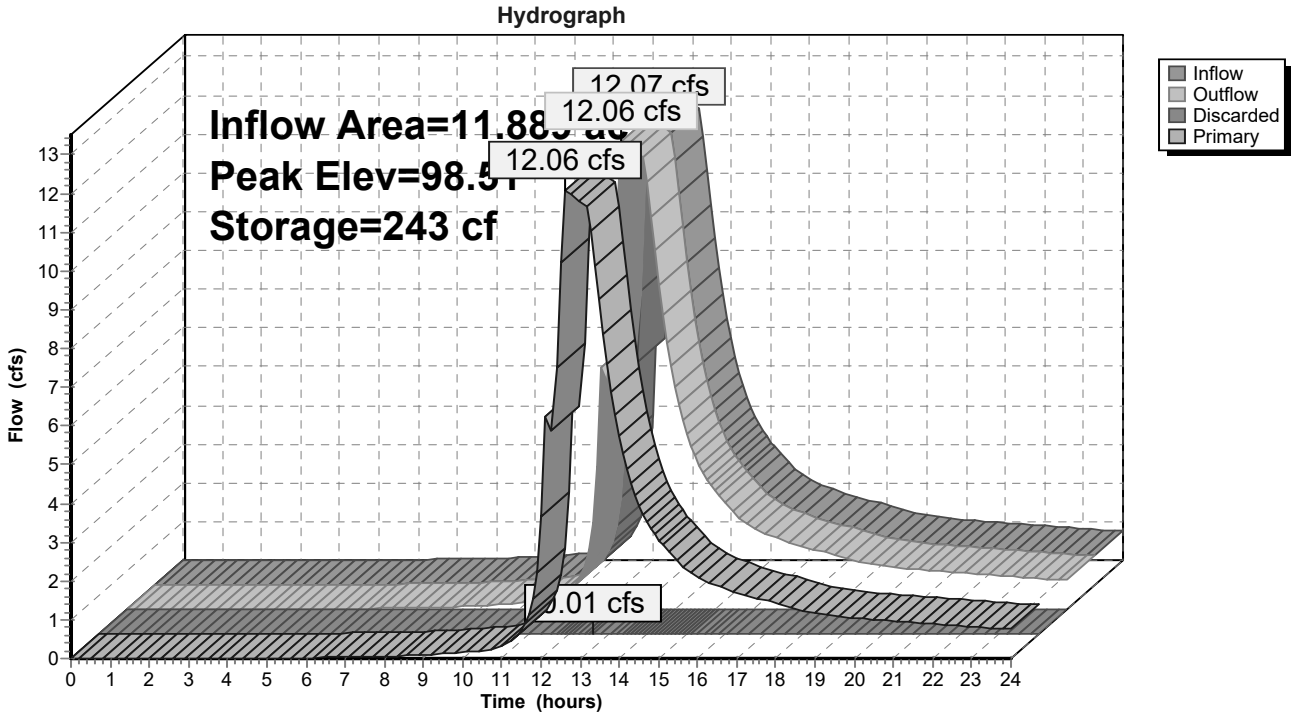
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.30	0	0	0
97.00	35	12	12
98.00	183	109	121
99.00	412	298	419
100.00	807	610	1,028
101.00	2,661	1,734	2,762
102.00	4,620	3,641	6,403
103.00	5,817	5,219	11,621
104.00	6,957	6,387	18,008
105.00	8,132	7,545	25,553

Device	Routing	Invert	Outlet Devices
#1	Primary	96.31'	**36.0" Round Culvert** L= 81.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 96.31' / 96.30' S= 0.0001 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Primary	105.50'	**35.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	96.30'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.60 hrs HW=98.51' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=12.06 cfs @ 12.60 hrs HW=98.51' (Free Discharge)
└**1=Culvert** (Barrel Controls 12.06 cfs @ 3.03 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN-3:

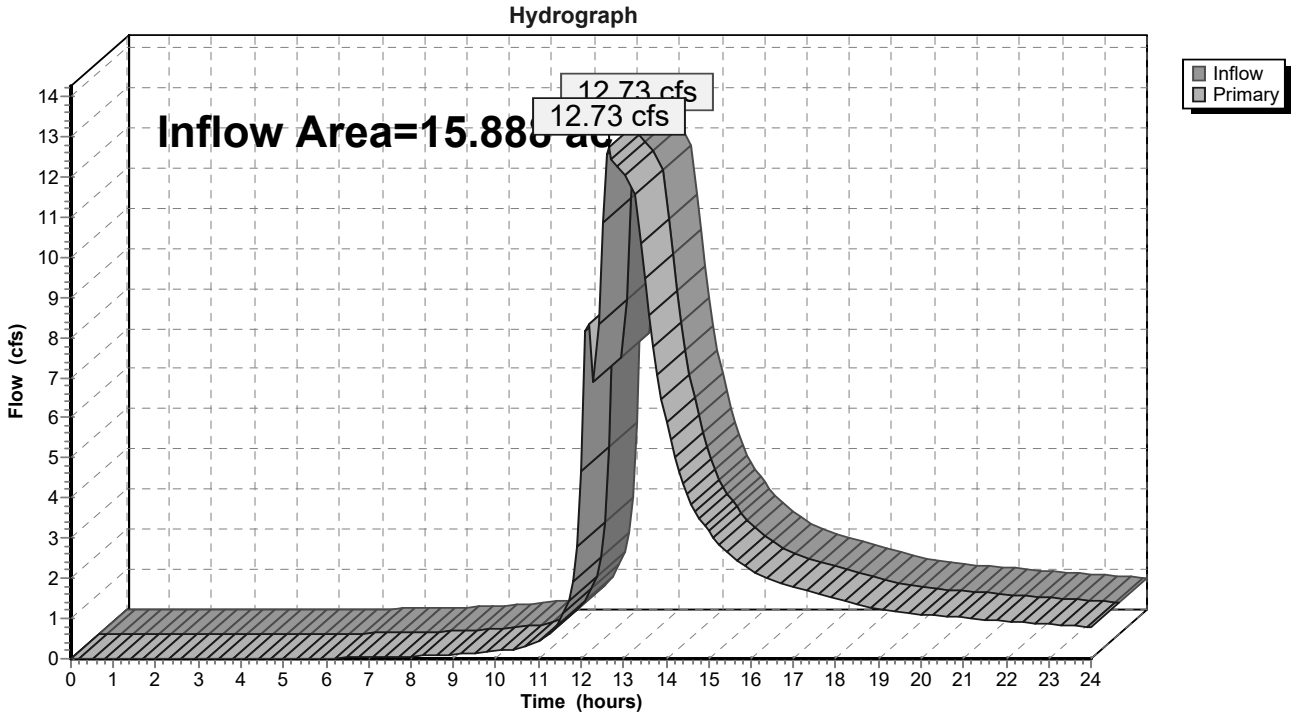

Hydrograph
Inflow Area=11.88
Peak Elev=98.5
Storage=243 cf
12.07 cfs
12.06 cfs
12.06 cfs
0.01 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)

Summary for Link POA-1:

Inflow Area = 15.888 ac, 0.00% Impervious, Inflow Depth > 2.38" for 100-Year event
Inflow = 12.73 cfs @ 12.64 hrs, Volume= 3.147 af
Primary = 12.73 cfs @ 12.64 hrs, Volume= 3.147 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-1:

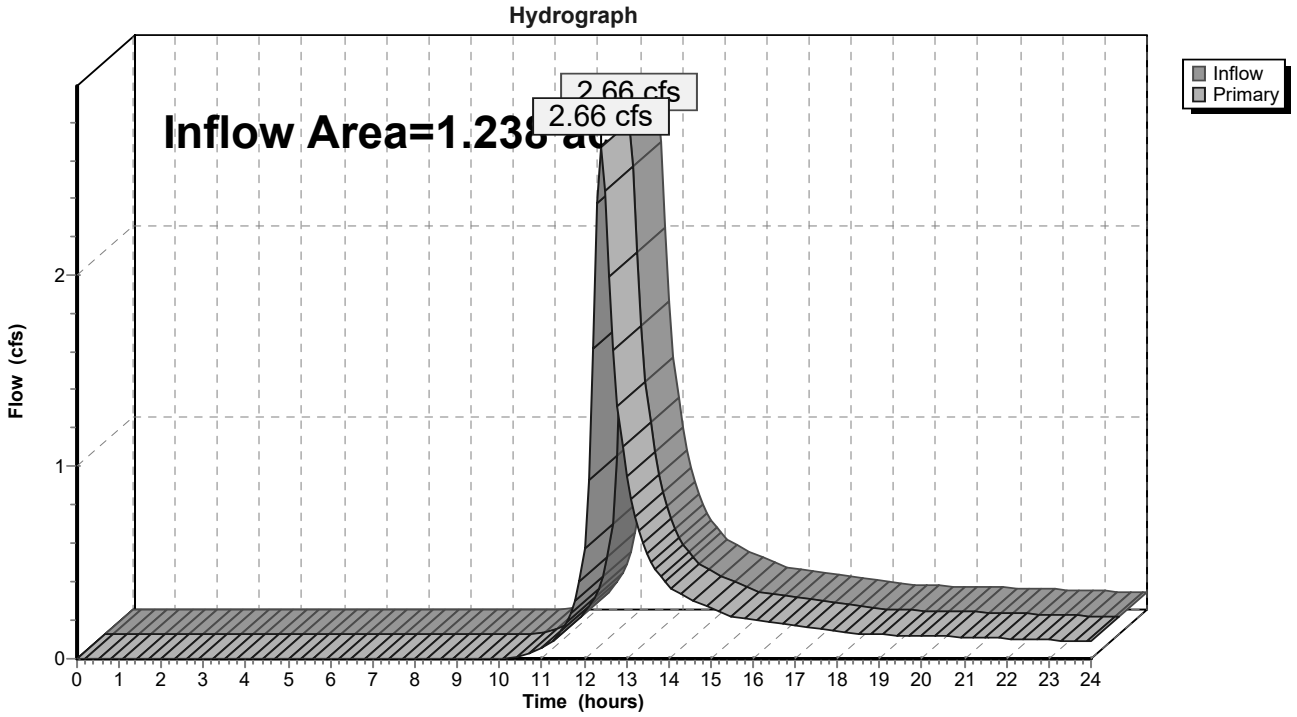


Summary for Link POA-2:

Inflow Area = 1.238 ac, 0.00% Impervious, Inflow Depth > 3.23" for 100-Year event
Inflow = 2.66 cfs @ 12.41 hrs, Volume= 0.334 af
Primary = 2.66 cfs @ 12.41 hrs, Volume= 0.334 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-2:

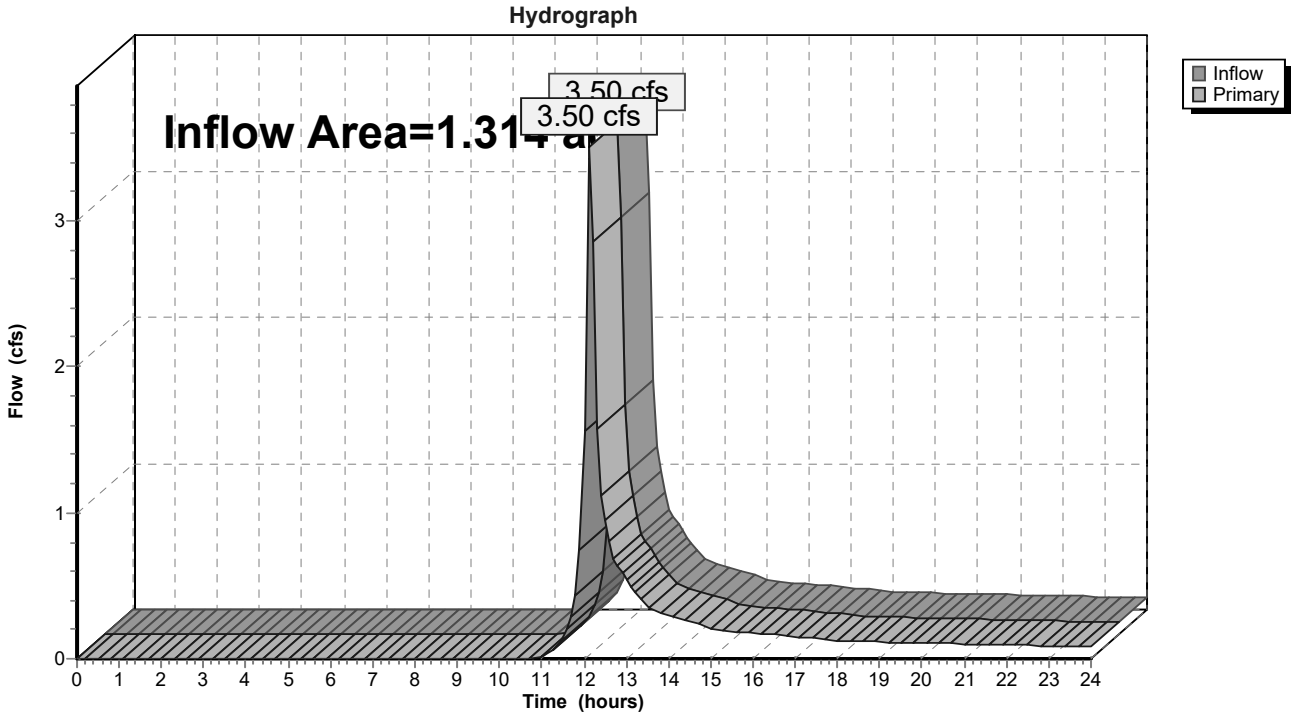


Summary for Link POA-3:

Inflow Area = 1.314 ac, 0.00% Impervious, Inflow Depth > 2.56" for 100-Year event
Inflow = 3.50 cfs @ 12.13 hrs, Volume= 0.280 af
Primary = 3.50 cfs @ 12.13 hrs, Volume= 0.280 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-3:

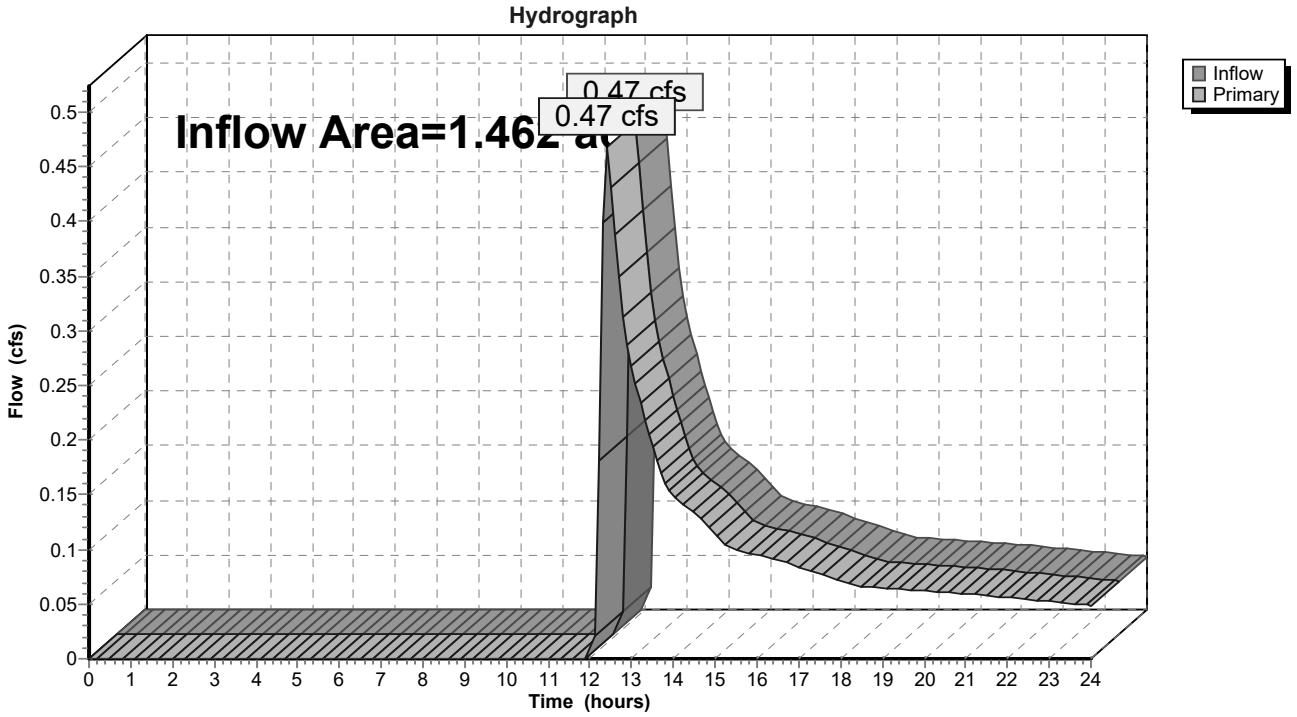


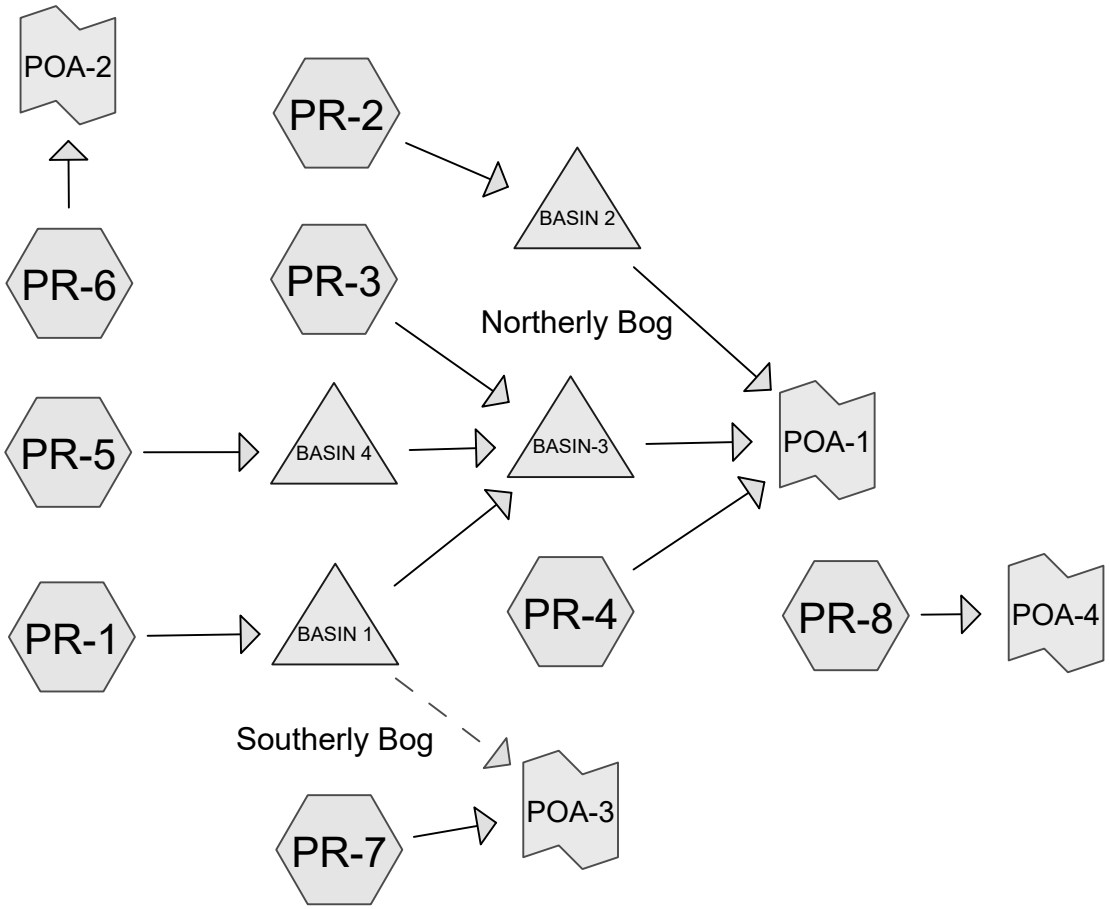
Summary for Link POA-4:

Inflow Area = 1.462 ac, 0.00% Impervious, Inflow Depth > 0.85" for 100-Year event
Inflow = 0.47 cfs @ 12.42 hrs, Volume= 0.103 af
Primary = 0.47 cfs @ 12.42 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-4:





Subcat Reach Pond Link

Routing Diagram for Proposed Conditions
Prepared by {enter your company name here}, Printed 4/15/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.678	72	Dirt roads, HSG A (PR-1, PR-2, PR-3, PR-4, PR-5)
0.269	82	Dirt roads, HSG B (PR-1, PR-3, PR-5)
5.677	30	Meadow, non-grazed, HSG A (PR-1, PR-2, PR-3, PR-4, PR-7, PR-8)
13.022	58	Meadow, non-grazed, HSG B (PR-1, PR-2, PR-6, PR-7)
0.155	98	Water Surface, 0% imp, HSG A (PR-3, PR-5)
0.101	98	Water Surface, 0% imp, HSG B (PR-3, PR-5)
19.902	**51**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
6.510	HSG A	PR-1, PR-2, PR-3, PR-4, PR-5, PR-7, PR-8
13.392	HSG B	PR-1, PR-2, PR-3, PR-5, PR-6, PR-7
0.000	HSG C	
0.000	HSG D	
0.000	Other	
19.902		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1: Runoff Area=526,067 sf 0.00% Impervious Runoff Depth>0.29"
Flow Length=979' Tc=45.5 min CN=55/0 Runoff=0.87 cfs 0.291 af

Subcatchment PR-2: Runoff Area=152,619 sf 0.00% Impervious Runoff Depth>0.01"
Flow Length=751' Tc=16.4 min CN=41/0 Runoff=0.01 cfs 0.004 af

Subcatchment PR-3: Runoff Area=29,839 sf 0.00% Impervious Runoff Depth>1.26"
Tc=6.0 min CN=76/0 Runoff=0.94 cfs 0.072 af

Subcatchment PR-4: Runoff Area=17,129 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=36/0 Runoff=0.00 cfs 0.000 af

Subcatchment PR-5: Runoff Area=10,964 sf 0.00% Impervious Runoff Depth>1.81"
Tc=6.0 min CN=84/0 Runoff=0.51 cfs 0.038 af

Subcatchment PR-6: Runoff Area=23,951 sf 0.00% Impervious Runoff Depth>0.39"
Flow Length=195' Tc=13.7 min CN=58/0 Runoff=0.11 cfs 0.018 af

Subcatchment PR-7: Runoff Area=49,157 sf 0.00% Impervious Runoff Depth>0.16"
Tc=6.0 min CN=50/0 Runoff=0.03 cfs 0.015 af

Subcatchment PR-8: Runoff Area=57,206 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=236' Tc=14.7 min CN=30/0 Runoff=0.00 cfs 0.000 af

Pond BASIN 1: Southerly Bog Peak Elev=103.69' Storage=1,836 cf Inflow=0.87 cfs 0.291 af
Discarded=0.17 cfs 0.162 af Primary=0.41 cfs 0.123 af Secondary=0.00 cfs 0.000 af Outflow=0.58 cfs 0.285 af

Pond BASIN 2: Northerly Bog Peak Elev=103.00' Storage=3 cf Inflow=0.01 cfs 0.004 af
Discarded=0.01 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.004 af

Pond BASIN 4: Peak Elev=105.40' Storage=867 cf Inflow=0.51 cfs 0.038 af
Discarded=0.03 cfs 0.028 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.028 af

Pond BASIN-3: Peak Elev=97.00' Storage=12 cf Inflow=0.94 cfs 0.195 af
Discarded=0.00 cfs 0.000 af Primary=0.92 cfs 0.194 af Outflow=0.92 cfs 0.195 af

Link POA-1: Inflow=0.92 cfs 0.194 af
Primary=0.92 cfs 0.194 af

Link POA-2: Inflow=0.11 cfs 0.018 af
Primary=0.11 cfs 0.018 af

Link POA-3: Inflow=0.03 cfs 0.015 af
Primary=0.03 cfs 0.015 af

Link POA-4: Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 19.902 ac Runoff Volume = 0.438 af Average Runoff Depth = 0.26"
100.00% Pervious = 19.902 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment PR-1:

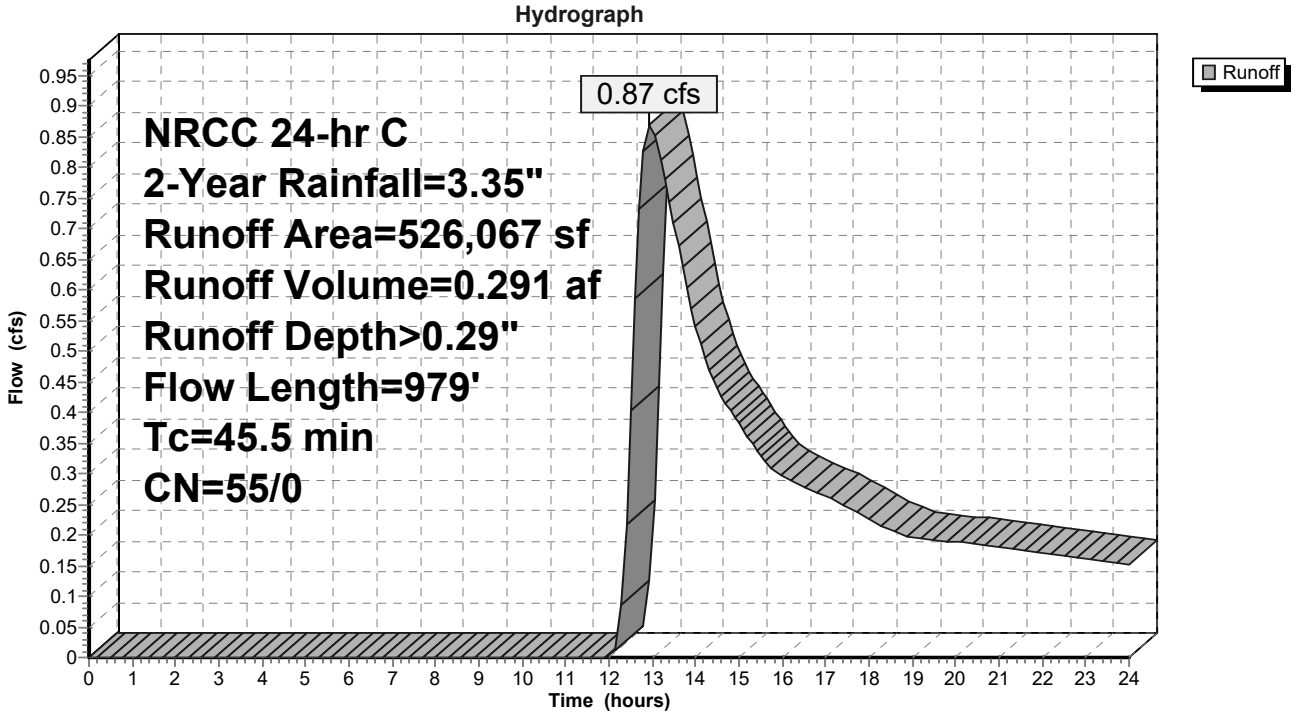
Runoff = 0.87 cfs @ 12.94 hrs, Volume= 0.291 af, Depth> 0.29"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
63,573	30	Meadow, non-grazed, HSG A
4,170	72	Dirt roads, HSG A
457,715	58	Meadow, non-grazed, HSG B
609	82	Dirt roads, HSG B
526,067	55	Weighted Average
526,067	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.35"
5.6	335	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
28.3	594	0.0025	0.35		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
45.5	979	Total			

Subcatchment PR-1:



Summary for Subcatchment PR-2:

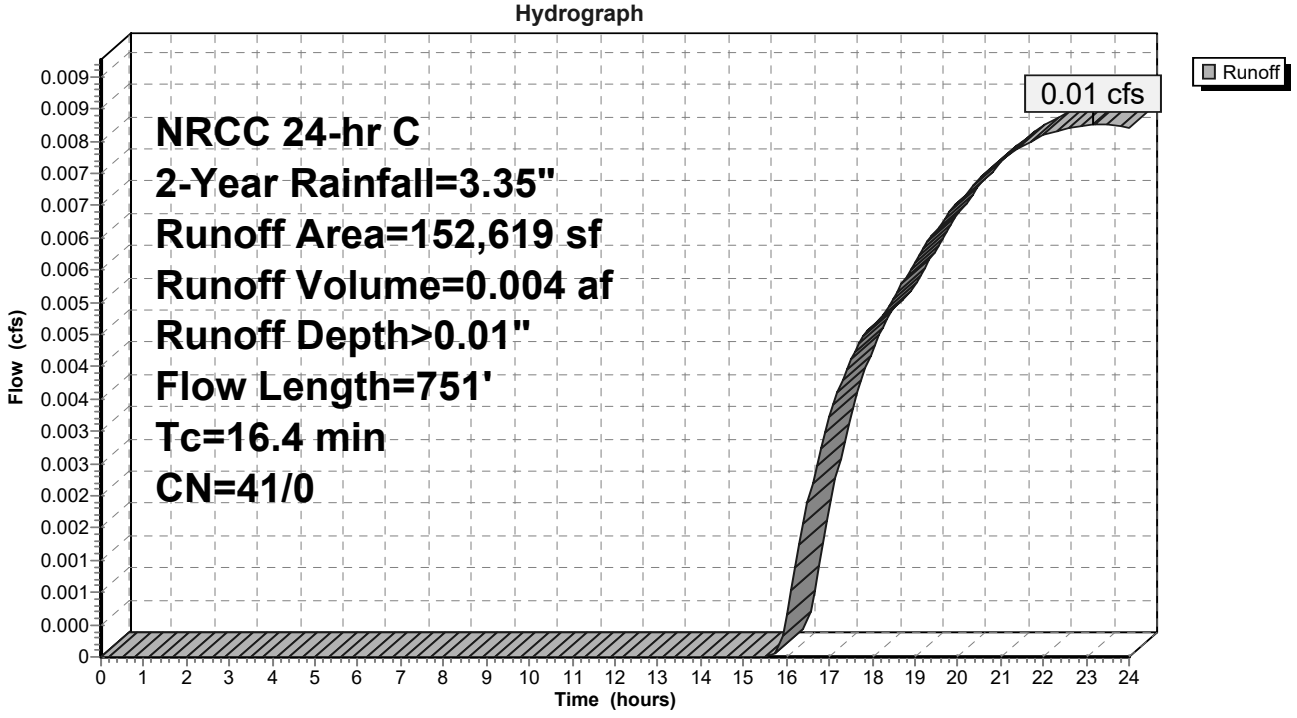
Runoff = 0.01 cfs @ 23.18 hrs, Volume= 0.004 af, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
94,623	30	Meadow, non-grazed, HSG A
7,838	72	Dirt roads, HSG A
50,158	58	Meadow, non-grazed, HSG B
152,619	41	Weighted Average
152,619	41	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.0340	0.45		**Sheet Flow,** Fallow n= 0.050 P2= 3.35"
14.6	701	0.0130	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.4	751	Total			

Subcatchment PR-2:



Summary for Subcatchment PR-3:

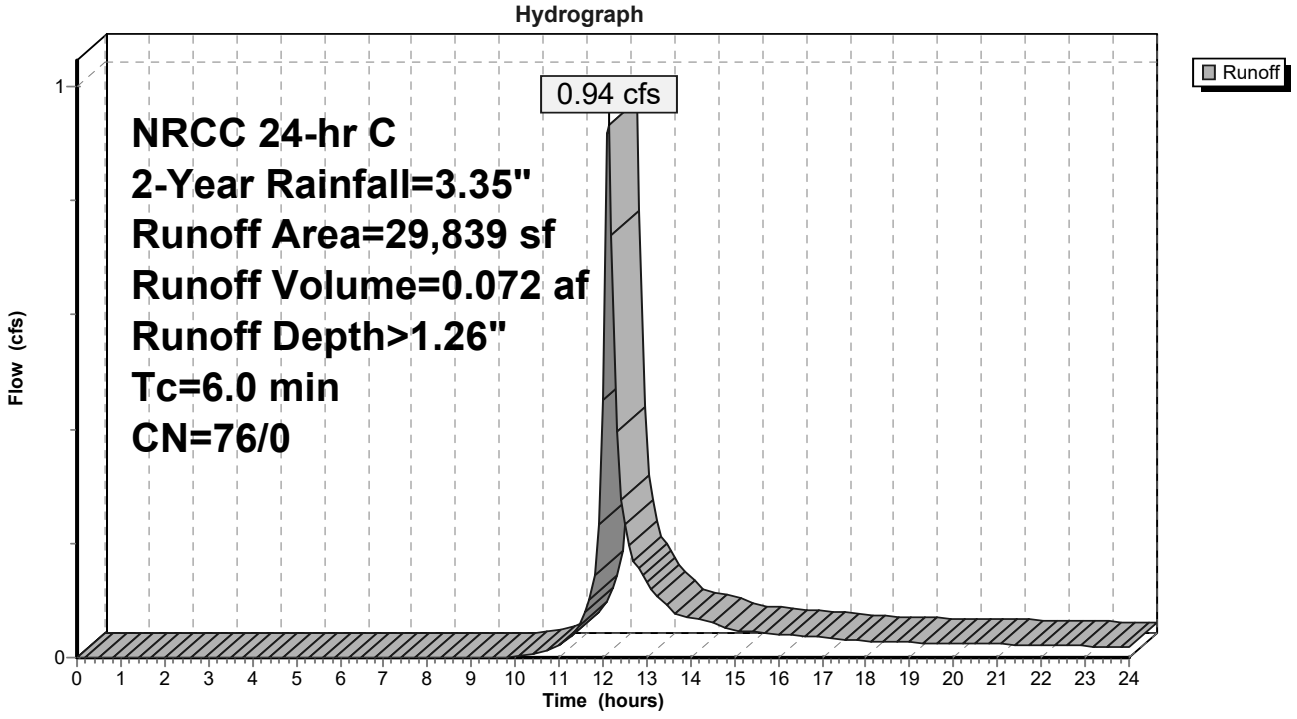
Runoff = 0.94 cfs @ 12.12 hrs, Volume= 0.072 af, Depth> 1.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
12,670	72	Dirt roads, HSG A
6,021	98	Water Surface, 0% imp, HSG A
3,556	30	Meadow, non-grazed, HSG A
5,480	82	Dirt roads, HSG B
2,112	98	Water Surface, 0% imp, HSG B
29,839	76	Weighted Average
29,839	76	100.00% Pervious Area

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

Subcatchment PR-3:



Summary for Subcatchment PR-4:

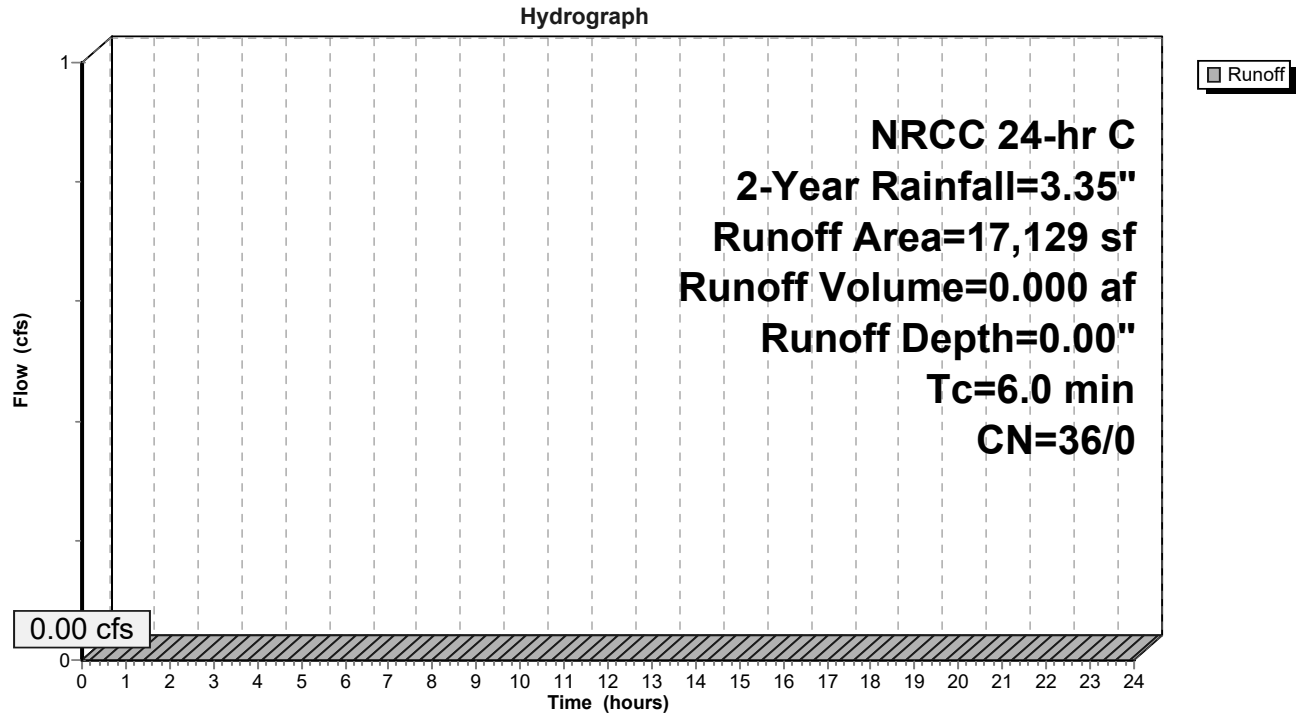
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
2,539	72	Dirt roads, HSG A
14,590	30	Meadow, non-grazed, HSG A
17,129	36	Weighted Average
17,129	36	100.00% Pervious Area

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

Subcatchment PR-4:



Summary for Subcatchment PR-5:

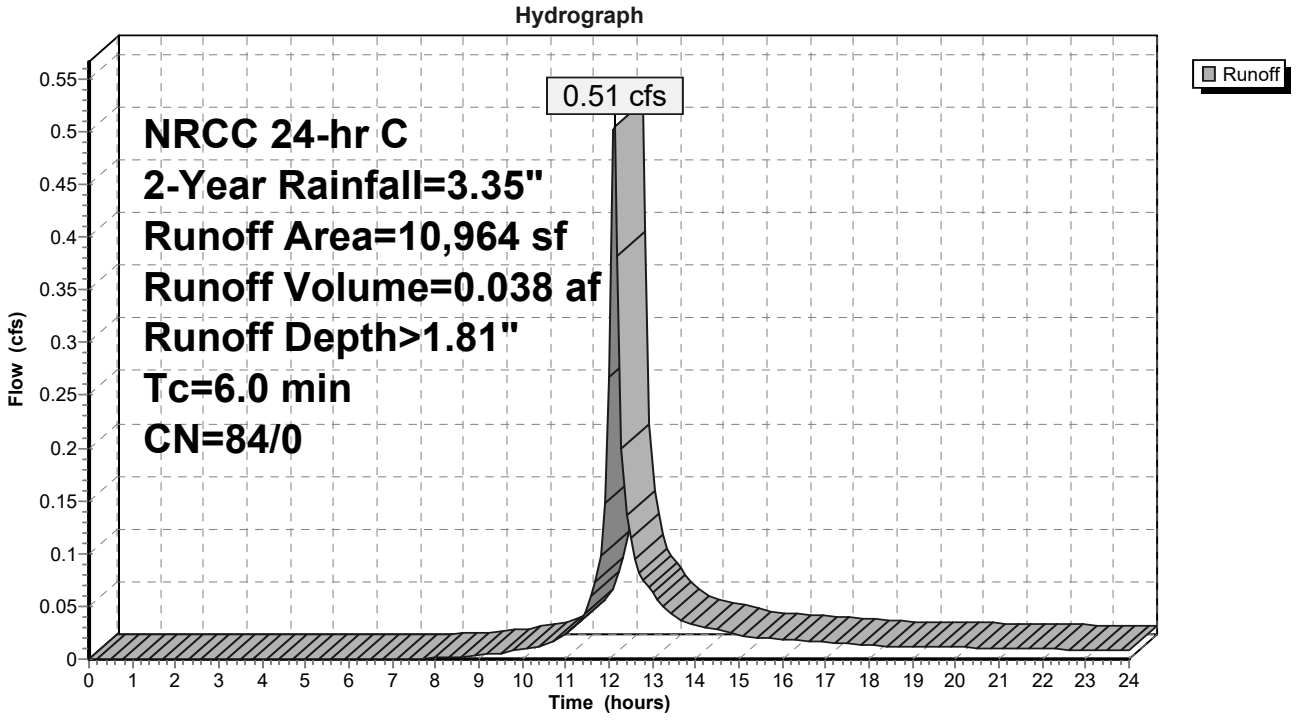
Runoff = 0.51 cfs @ 12.12 hrs, Volume= 0.038 af, Depth> 1.81"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
2,303	72	Dirt roads, HSG A
747	98	Water Surface, 0% imp, HSG A
5,627	82	Dirt roads, HSG B
2,287	98	Water Surface, 0% imp, HSG B
10,964	84	Weighted Average
10,964	84	100.00% Pervious Area

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

Subcatchment PR-5:



Summary for Subcatchment PR-6:

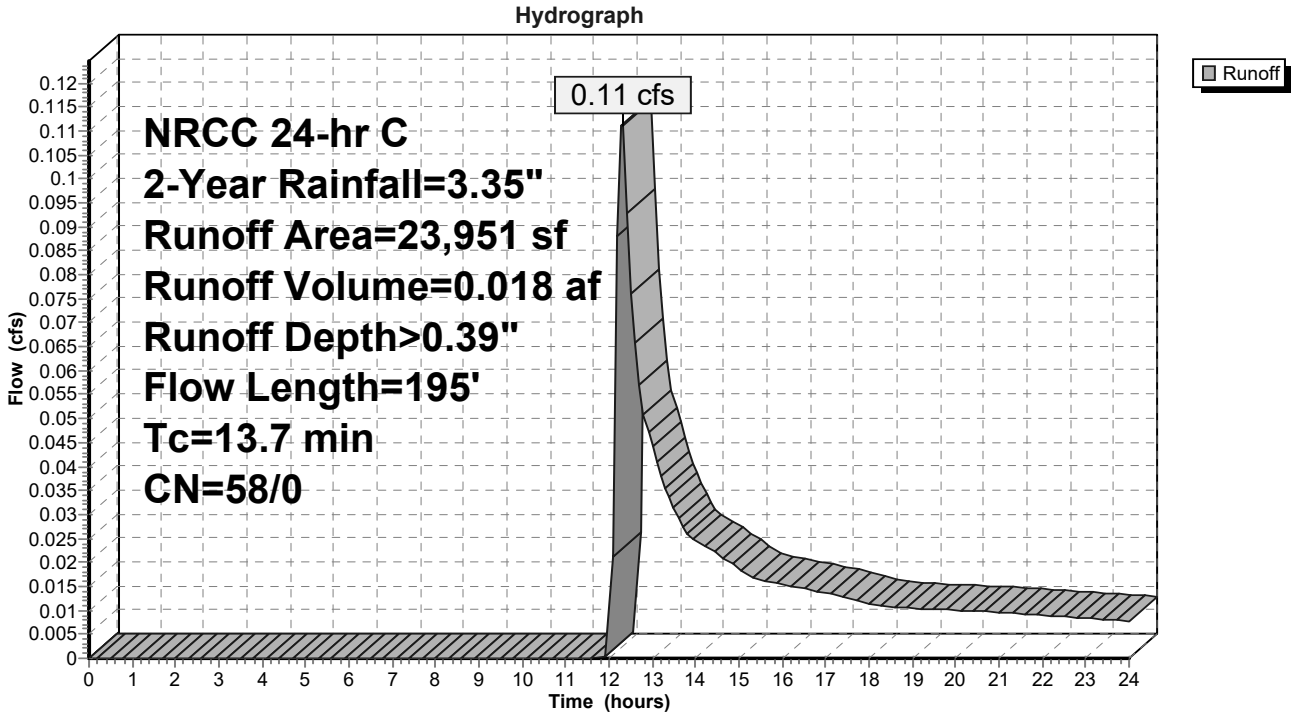
Runoff = 0.11 cfs @ 12.31 hrs, Volume= 0.018 af, Depth> 0.39"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
23,951	58	Meadow, non-grazed, HSG B
23,951	58	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.35"
2.1	145	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	195	Total			

Subcatchment PR-6:



Summary for Subcatchment PR-7:

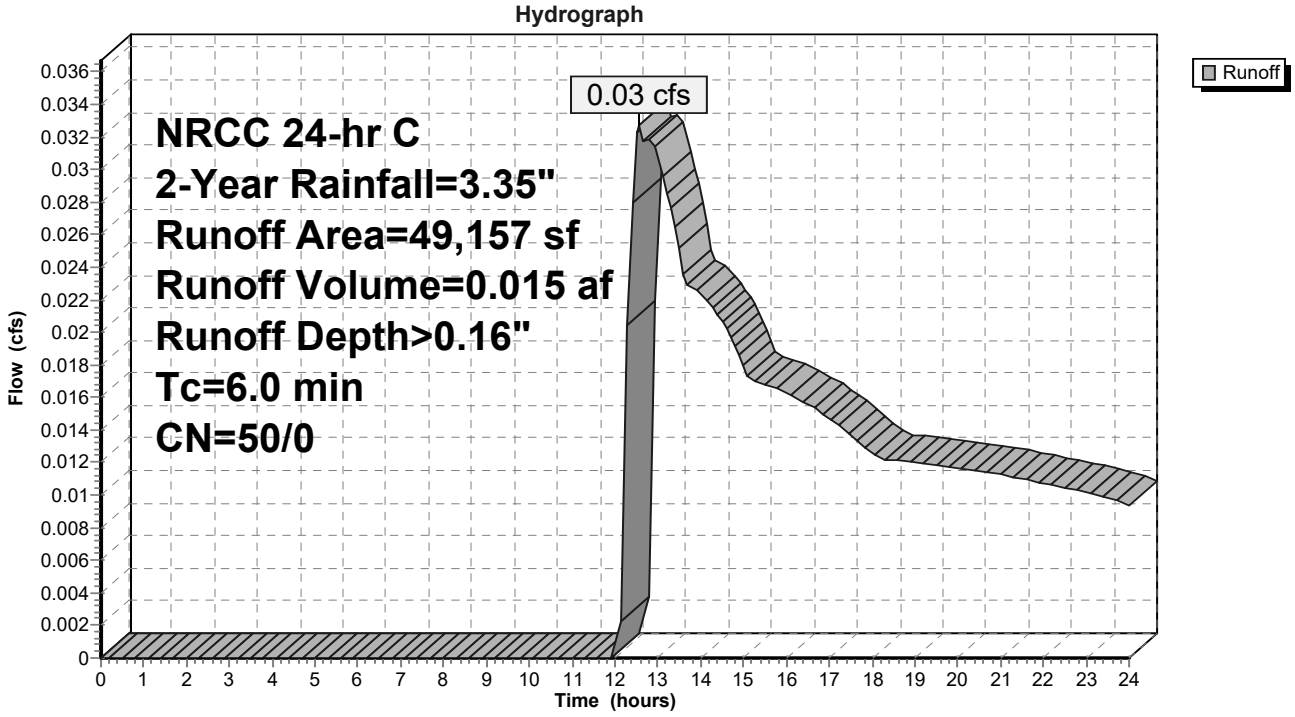
Runoff = 0.03 cfs @ 12.55 hrs, Volume= 0.015 af, Depth> 0.16"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
13,721	30	Meadow, non-grazed, HSG A
35,436	58	Meadow, non-grazed, HSG B
49,157	50	Weighted Average
49,157	50	100.00% Pervious Area

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

Subcatchment PR-7:



Summary for Subcatchment PR-8:

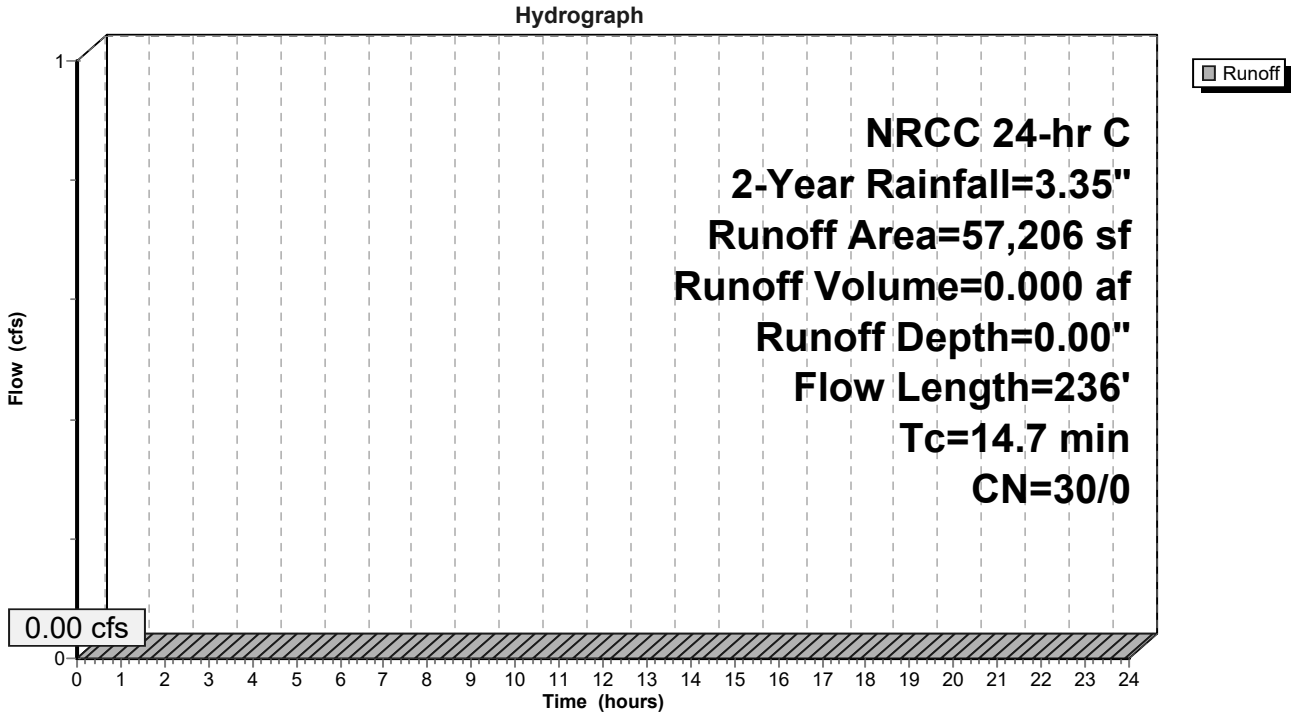
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 2-Year Rainfall=3.35"

Area (sf)	CN	Description
57,206	30	Meadow, non-grazed, HSG A
57,206	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.35"
3.1	186	0.0210	1.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	236	Total			

Subcatchment PR-8:



Summary for Pond BASIN 1: Southerly Bog

Inflow Area = 12.077 ac, 0.00% Impervious, Inflow Depth > 0.29" for 2-Year event
Inflow = 0.87 cfs @ 12.94 hrs, Volume= 0.291 af
Outflow = 0.58 cfs @ 13.88 hrs, Volume= 0.285 af, Atten= 34%, Lag= 56.7 min
Discarded = 0.17 cfs @ 12.60 hrs, Volume= 0.162 af
Primary = 0.41 cfs @ 13.88 hrs, Volume= 0.123 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 103.69' @ 13.88 hrs Surf.Area= 7,150 sf Storage= 1,836 cf

Plug-Flow detention time= 50.3 min calculated for 0.285 af (98% of inflow)
Center-of-Mass det. time= 41.3 min (1,031.7 - 990.4)

Volume	Invert	Avail.Storage	Storage Description
#1	103.43'	665,382 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.43	7,150	0	0
104.99	7,150	11,154	11,154
105.00	319,409	1,633	12,787
106.00	323,115	321,262	334,049
107.00	339,551	331,333	665,382

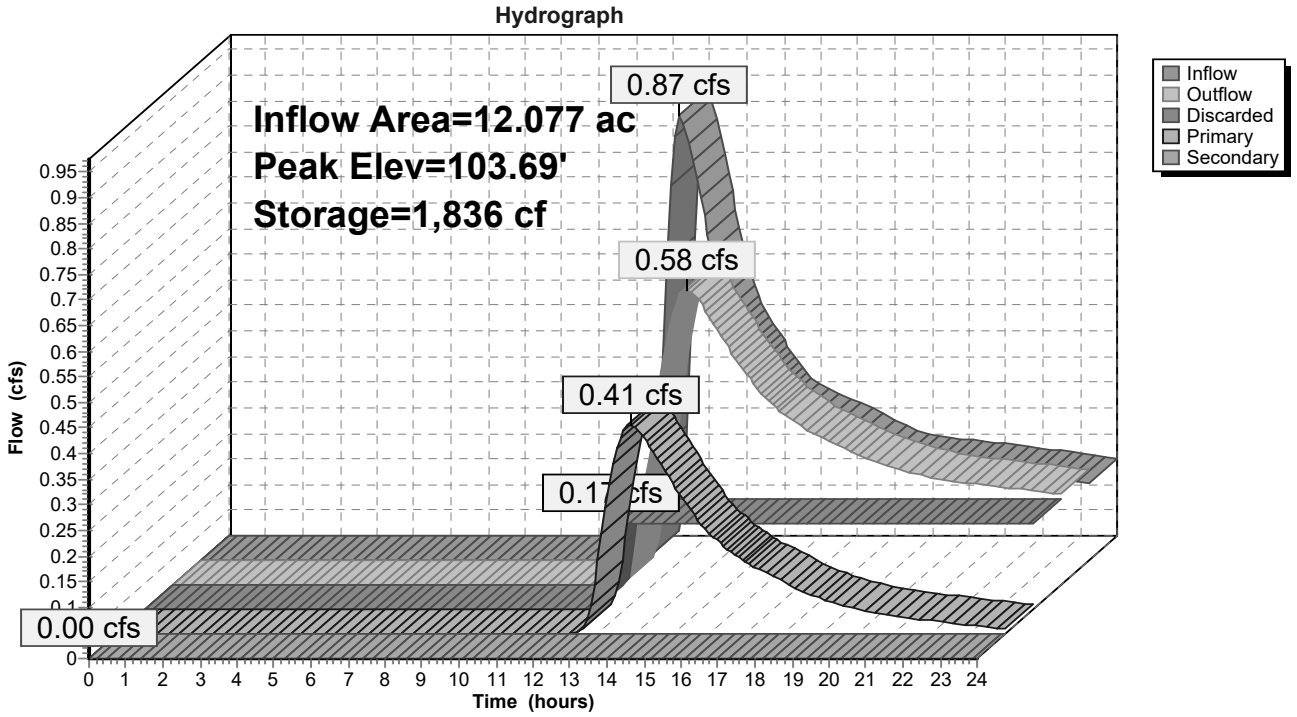
Device	Routing	Invert	Outlet Devices
#1	Primary	103.43'	**24.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 103.43' / 102.84' S= 0.0236 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	106.80'	**120.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Discarded	103.43'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.17 cfs @ 12.60 hrs HW=103.47' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.41 cfs @ 13.88 hrs HW=103.69' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.41 cfs @ 1.72 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.43' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 1: Southerly Bog



Summary for Pond BASIN 2: Northerly Bog

Inflow Area = 3.504 ac, 0.00% Impervious, Inflow Depth > 0.01" for 2-Year event
Inflow = 0.01 cfs @ 23.18 hrs, Volume= 0.004 af
Outflow = 0.01 cfs @ 23.28 hrs, Volume= 0.004 af, Atten= 0%, Lag= 6.1 min
Discarded = 0.01 cfs @ 23.28 hrs, Volume= 0.004 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 103.00' @ 23.28 hrs Surf.Area= 73,180 sf Storage= 3 cf

Plug-Flow detention time= 7.0 min calculated for 0.004 af (98% of inflow)
Center-of-Mass det. time= 3.2 min (1,245.0 - 1,241.8)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	74,280 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

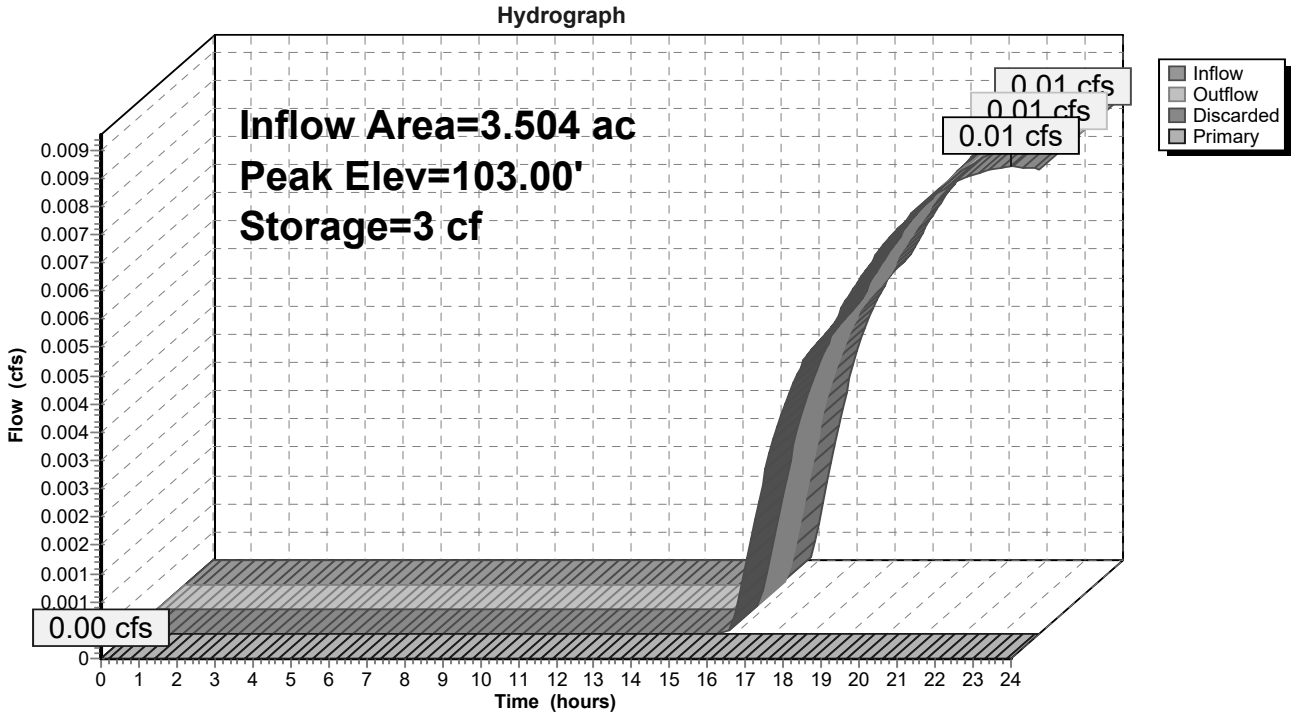
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	73,180	0	0
104.00	75,380	74,280	74,280

Device	Routing	Invert	Outlet Devices
#1	Primary	103.50'	**15.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	103.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.73 cfs @ 23.28 hrs HW=103.00' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 1.73 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 2: Northerly Bog



Summary for Pond BASIN 4:

Inflow Area = 0.252 ac, 0.00% Impervious, Inflow Depth > 1.81" for 2-Year event
Inflow = 0.51 cfs @ 12.12 hrs, Volume= 0.038 af
Outflow = 0.03 cfs @ 14.06 hrs, Volume= 0.028 af, Atten= 94%, Lag= 116.7 min
Discarded = 0.03 cfs @ 14.06 hrs, Volume= 0.028 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 105.40' @ 14.06 hrs Surf.Area= 1,348 sf Storage= 867 cf

Plug-Flow detention time= 293.1 min calculated for 0.028 af (74% of inflow)
Center-of-Mass det. time= 194.9 min (1,031.5 - 836.7)

Volume	Invert	Avail.Storage	Storage Description
#1	104.00'	4,520 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

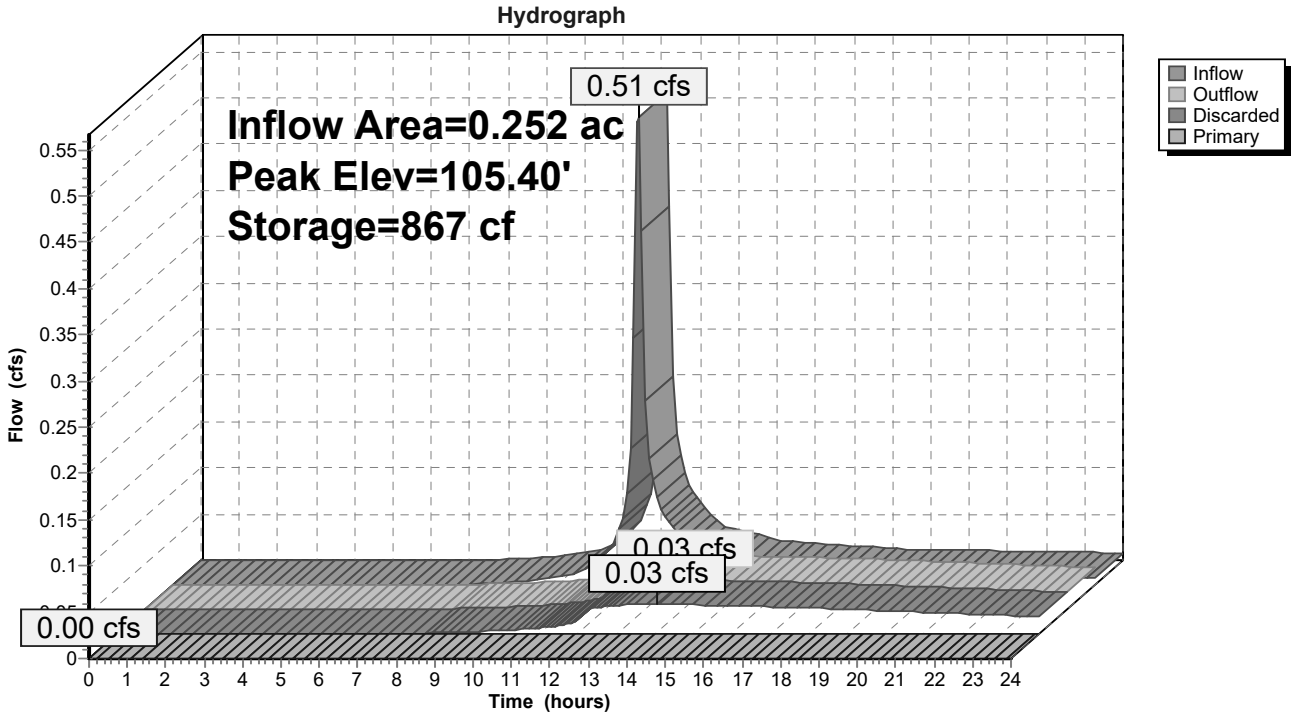
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.00	75	0	0
105.00	797	436	436
106.00	2,168	1,483	1,919
107.00	3,035	2,602	4,520

Device	Routing	Invert	Outlet Devices
#1	Primary	107.20'	**30.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	104.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 14.06 hrs HW=105.40' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 4:


Hydrograph
Inflow
Outflow
Discarded
Primary
0.51 cfs
Inflow Area=0.252 ac
Peak Elev=105.40'
Storage=867 cf
0.03 cfs
0.03 cfs
0.00 cfs
Flow (cfs)
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hours)

Summary for Pond BASIN-3:

Inflow Area = 13.014 ac, 0.00% Impervious, Inflow Depth > 0.18" for 2-Year event
Inflow = 0.94 cfs @ 12.12 hrs, Volume= 0.195 af
Outflow = 0.92 cfs @ 12.13 hrs, Volume= 0.195 af, Atten= 1%, Lag= 0.3 min
Discarded = 0.00 cfs @ 12.13 hrs, Volume= 0.000 af
Primary = 0.92 cfs @ 12.13 hrs, Volume= 0.194 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 97.00' @ 12.13 hrs Surf.Area= 35 sf Storage= 12 cf

Plug-Flow detention time= 0.3 min calculated for 0.195 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (917.6 - 917.4)

Volume	Invert	Avail.Storage	Storage Description
#1	96.30'	25,553 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

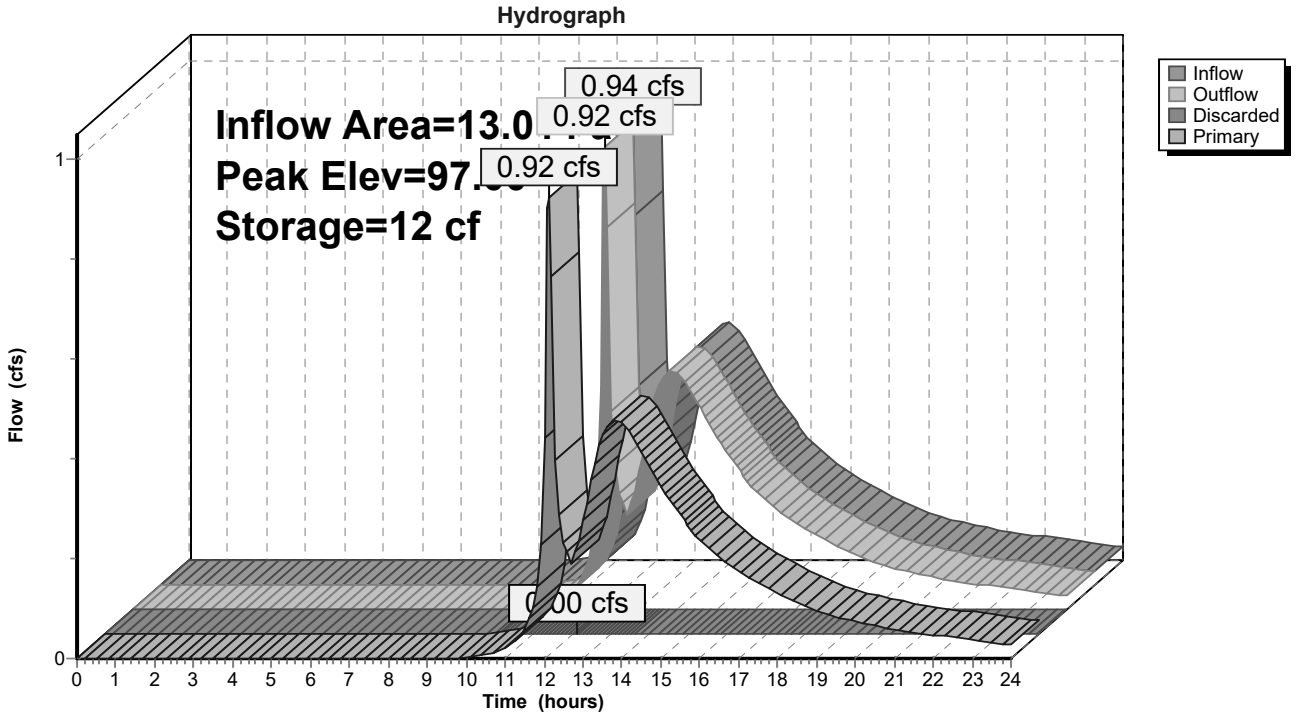
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.30	0	0	0
97.00	35	12	12
98.00	183	109	121
99.00	412	298	419
100.00	807	610	1,028
101.00	2,661	1,734	2,762
102.00	4,620	3,641	6,403
103.00	5,817	5,219	11,621
104.00	6,957	6,387	18,008
105.00	8,132	7,545	25,553

Device	Routing	Invert	Outlet Devices
#1	Primary	96.31'	**36.0" Round Culvert** L= 81.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 96.31' / 96.30' S= 0.0001 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Primary	105.50'	**35.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	96.30'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 12.13 hrs HW=96.97' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.86 cfs @ 12.13 hrs HW=96.97' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.86 cfs @ 1.12 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN-3:

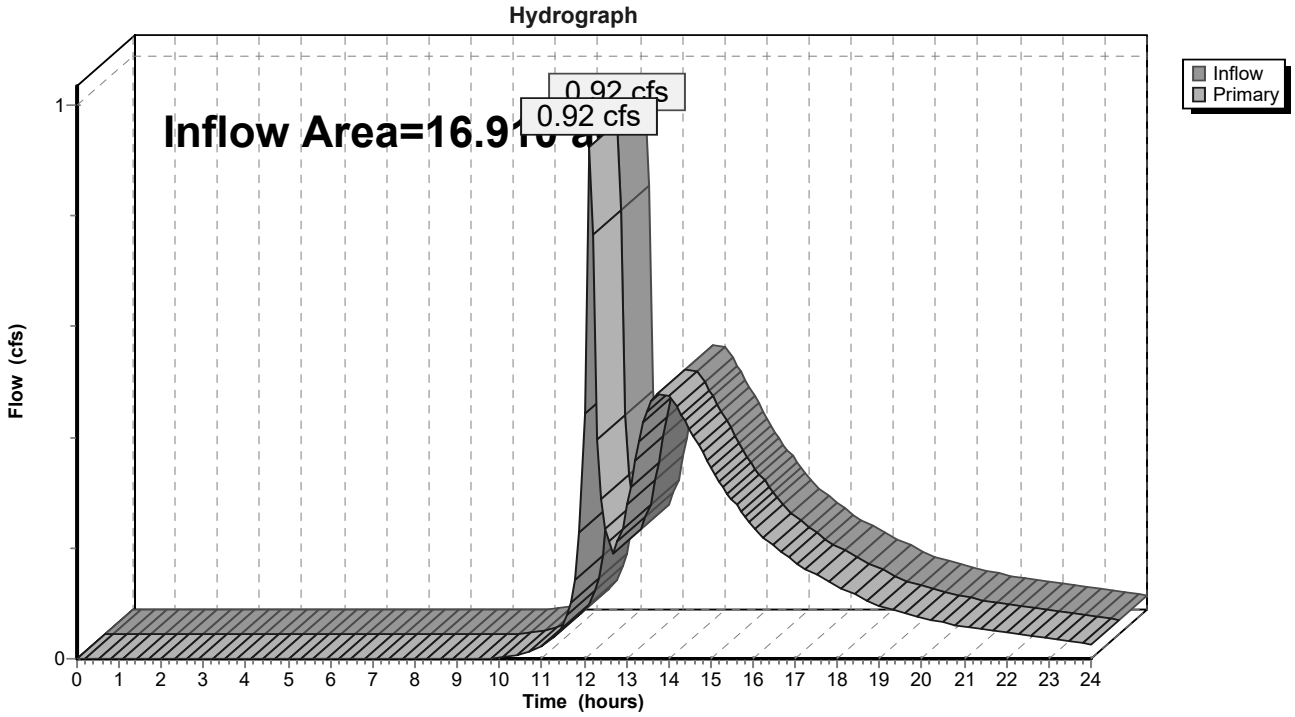

Hydrograph
Inflow
Outflow
Discarded
Primary
0.94 cfs
0.92 cfs
0.92 cfs
Inflow Area=13.0
Peak Elev=97.
Storage=12 cf
0.00 cfs
Flow (cfs)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hours)

Summary for Link POA-1:

Inflow Area = 16.910 ac, 0.00% Impervious, Inflow Depth > 0.14" for 2-Year event
Inflow = 0.92 cfs @ 12.13 hrs, Volume= 0.194 af
Primary = 0.92 cfs @ 12.13 hrs, Volume= 0.194 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-1:

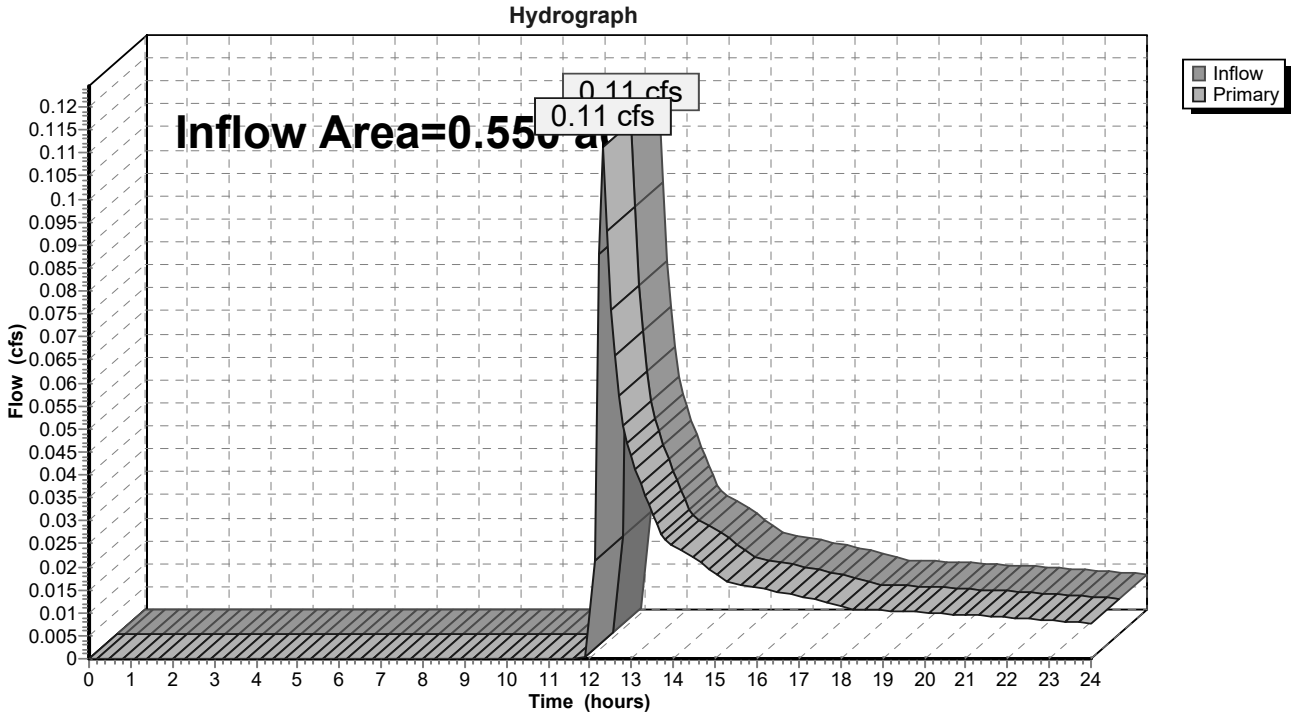


Summary for Link POA-2:

Inflow Area = 0.550 ac, 0.00% Impervious, Inflow Depth > 0.39" for 2-Year event
Inflow = 0.11 cfs @ 12.31 hrs, Volume= 0.018 af
Primary = 0.11 cfs @ 12.31 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-2:

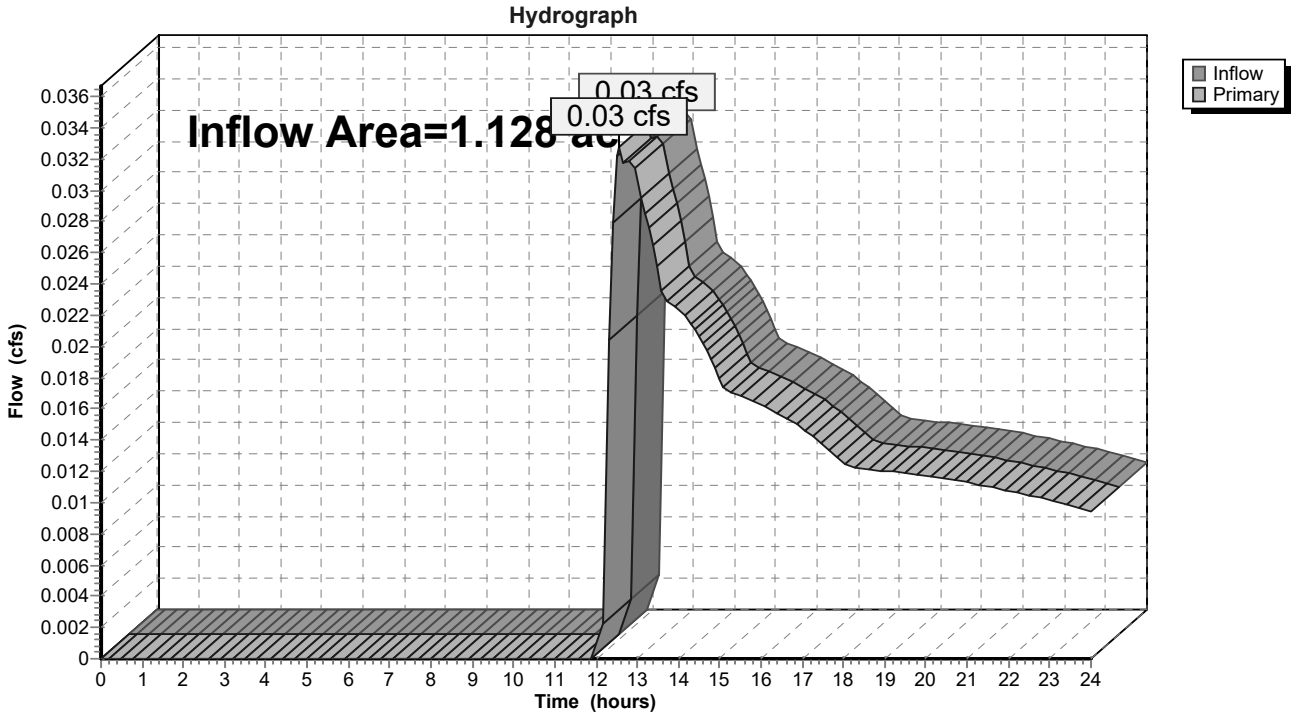


Summary for Link POA-3:

Inflow Area = 1.128 ac, 0.00% Impervious, Inflow Depth > 0.16" for 2-Year event
Inflow = 0.03 cfs @ 12.55 hrs, Volume= 0.015 af
Primary = 0.03 cfs @ 12.55 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-3:

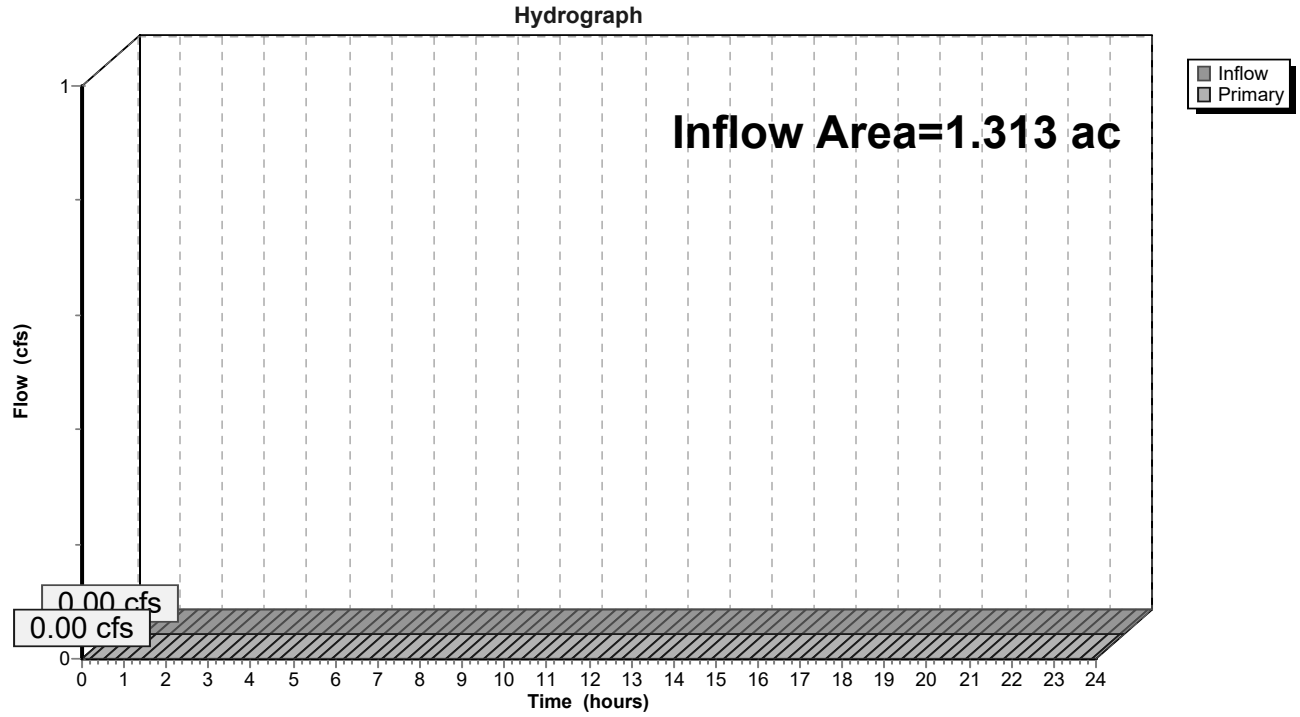


Summary for Link POA-4:

Inflow Area = 1.313 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-4:



Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1: Runoff Area=526,067 sf 0.00% Impervious Runoff Depth>0.94"
Flow Length=979' Tc=45.5 min CN=55/0 Runoff=4.67 cfs 0.943 af

Subcatchment PR-2: Runoff Area=152,619 sf 0.00% Impervious Runoff Depth>0.26"
Flow Length=751' Tc=16.4 min CN=41/0 Runoff=0.17 cfs 0.075 af

Subcatchment PR-3: Runoff Area=29,839 sf 0.00% Impervious Runoff Depth>2.49"
Tc=6.0 min CN=76/0 Runoff=1.90 cfs 0.142 af

Subcatchment PR-4: Runoff Area=17,129 sf 0.00% Impervious Runoff Depth>0.10"
Tc=6.0 min CN=36/0 Runoff=0.00 cfs 0.003 af

Subcatchment PR-5: Runoff Area=10,964 sf 0.00% Impervious Runoff Depth>3.22"
Tc=6.0 min CN=84/0 Runoff=0.89 cfs 0.068 af

Subcatchment PR-6: Runoff Area=23,951 sf 0.00% Impervious Runoff Depth>1.14"
Flow Length=195' Tc=13.7 min CN=58/0 Runoff=0.50 cfs 0.052 af

Subcatchment PR-7: Runoff Area=49,157 sf 0.00% Impervious Runoff Depth>0.67"
Tc=6.0 min CN=50/0 Runoff=0.53 cfs 0.063 af

Subcatchment PR-8: Runoff Area=57,206 sf 0.00% Impervious Runoff Depth>0.00"
Flow Length=236' Tc=14.7 min CN=30/0 Runoff=0.00 cfs 0.000 af

Pond BASIN 1: Southerly Bog Peak Elev=104.22' Storage=5,621 cf Inflow=4.67 cfs 0.943 af
Discarded=0.17 cfs 0.166 af Primary=3.46 cfs 0.747 af Secondary=0.00 cfs 0.000 af Outflow=3.63 cfs 0.913 af

Pond BASIN 2: Northerly Bog Peak Elev=103.00' Storage=71 cf Inflow=0.17 cfs 0.075 af
Discarded=0.17 cfs 0.075 af Primary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.075 af

Pond BASIN 4: Peak Elev=105.88' Storage=1,672 cf Inflow=0.89 cfs 0.068 af
Discarded=0.05 cfs 0.045 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.045 af

Pond BASIN-3: Peak Elev=97.56' Storage=55 cf Inflow=3.70 cfs 0.890 af
Discarded=0.00 cfs 0.001 af Primary=3.70 cfs 0.889 af Outflow=3.70 cfs 0.889 af

Link POA-1: Inflow=3.70 cfs 0.892 af
Primary=3.70 cfs 0.892 af

Link POA-2: Inflow=0.50 cfs 0.052 af
Primary=0.50 cfs 0.052 af

Link POA-3: Inflow=0.53 cfs 0.063 af
Primary=0.53 cfs 0.063 af

Link POA-4: Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 19.902 ac Runoff Volume = 1.347 af Average Runoff Depth = 0.81"
100.00% Pervious = 19.902 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment PR-1:

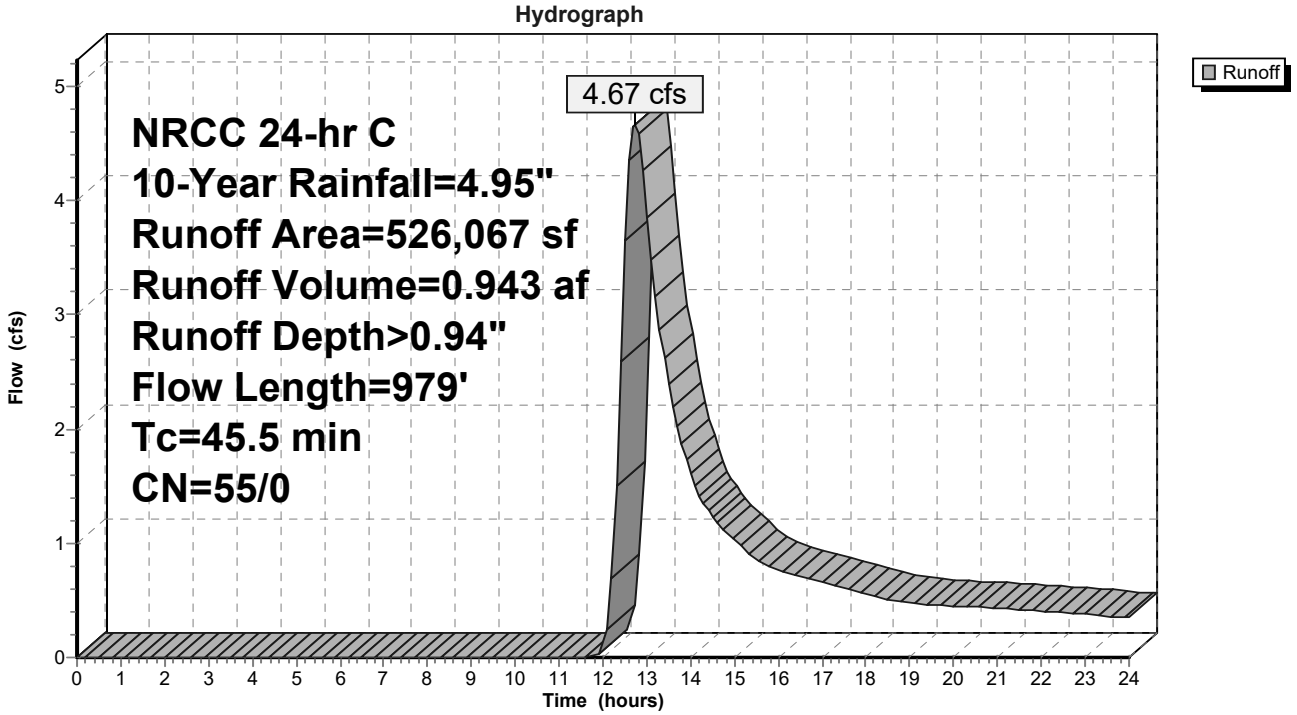
Runoff = 4.67 cfs @ 12.73 hrs, Volume= 0.943 af, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
63,573	30	Meadow, non-grazed, HSG A
4,170	72	Dirt roads, HSG A
457,715	58	Meadow, non-grazed, HSG B
609	82	Dirt roads, HSG B
526,067	55	Weighted Average
526,067	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.35"
5.6	335	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
28.3	594	0.0025	0.35		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
45.5	979	Total			

Subcatchment PR-1:



Summary for Subcatchment PR-2:

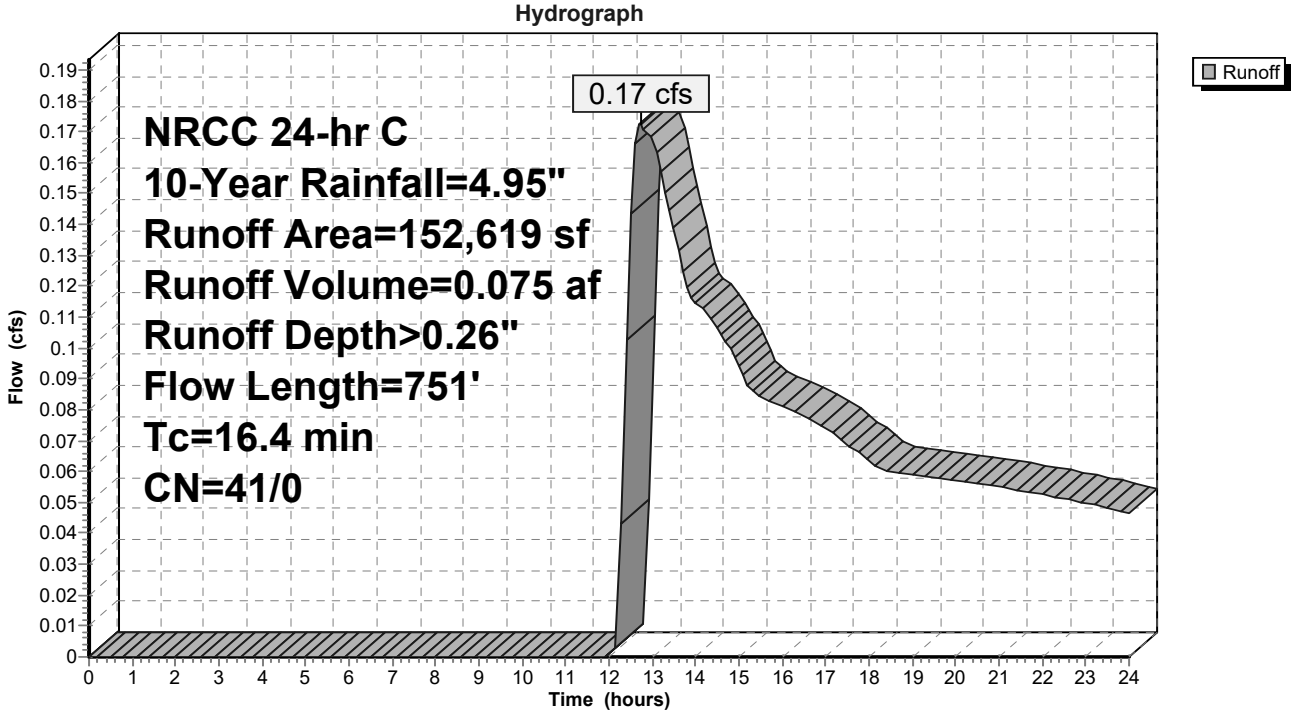
Runoff = 0.17 cfs @ 12.73 hrs, Volume= 0.075 af, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
94,623	30	Meadow, non-grazed, HSG A
7,838	72	Dirt roads, HSG A
50,158	58	Meadow, non-grazed, HSG B
152,619	41	Weighted Average
152,619	41	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.0340	0.45		**Sheet Flow,** Fallow n= 0.050 P2= 3.35"
14.6	701	0.0130	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.4	751	Total			

Subcatchment PR-2:



Summary for Subcatchment PR-3:

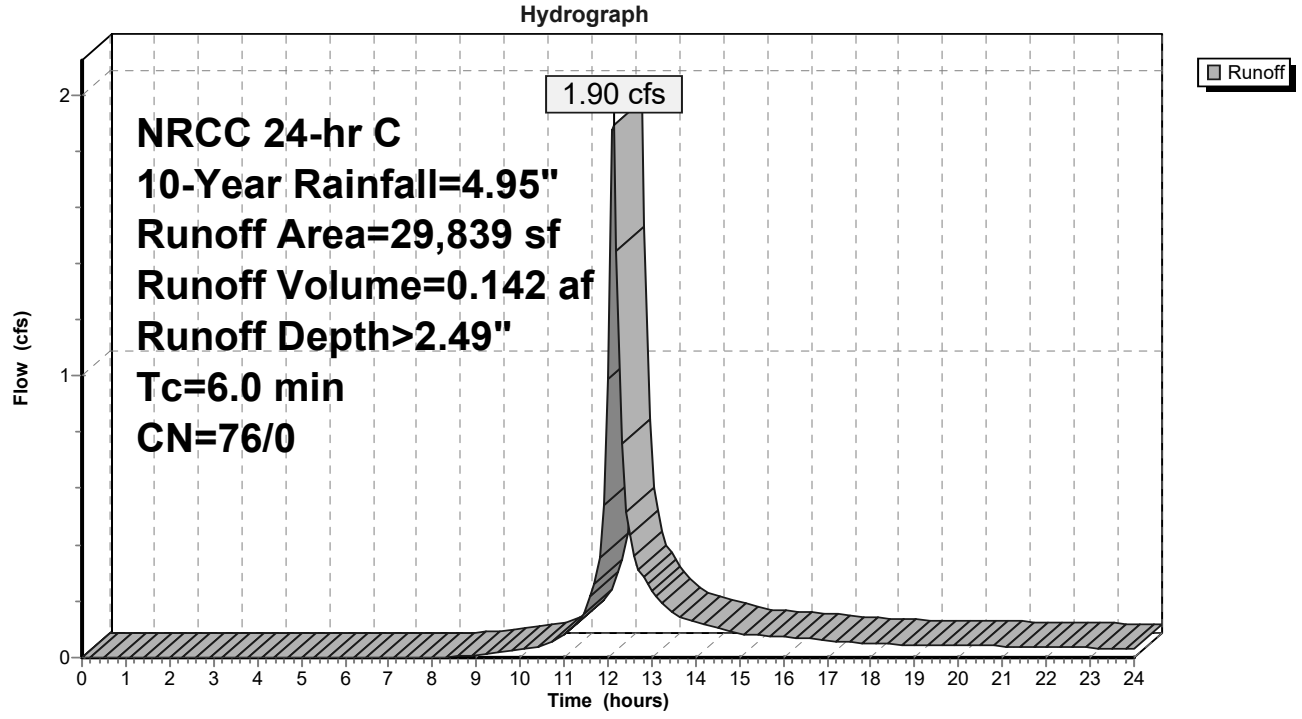
Runoff = 1.90 cfs @ 12.12 hrs, Volume= 0.142 af, Depth> 2.49"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
12,670	72	Dirt roads, HSG A
6,021	98	Water Surface, 0% imp, HSG A
3,556	30	Meadow, non-grazed, HSG A
5,480	82	Dirt roads, HSG B
2,112	98	Water Surface, 0% imp, HSG B
29,839	76	Weighted Average
29,839	76	100.00% Pervious Area

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

Subcatchment PR-3:



Summary for Subcatchment PR-4:

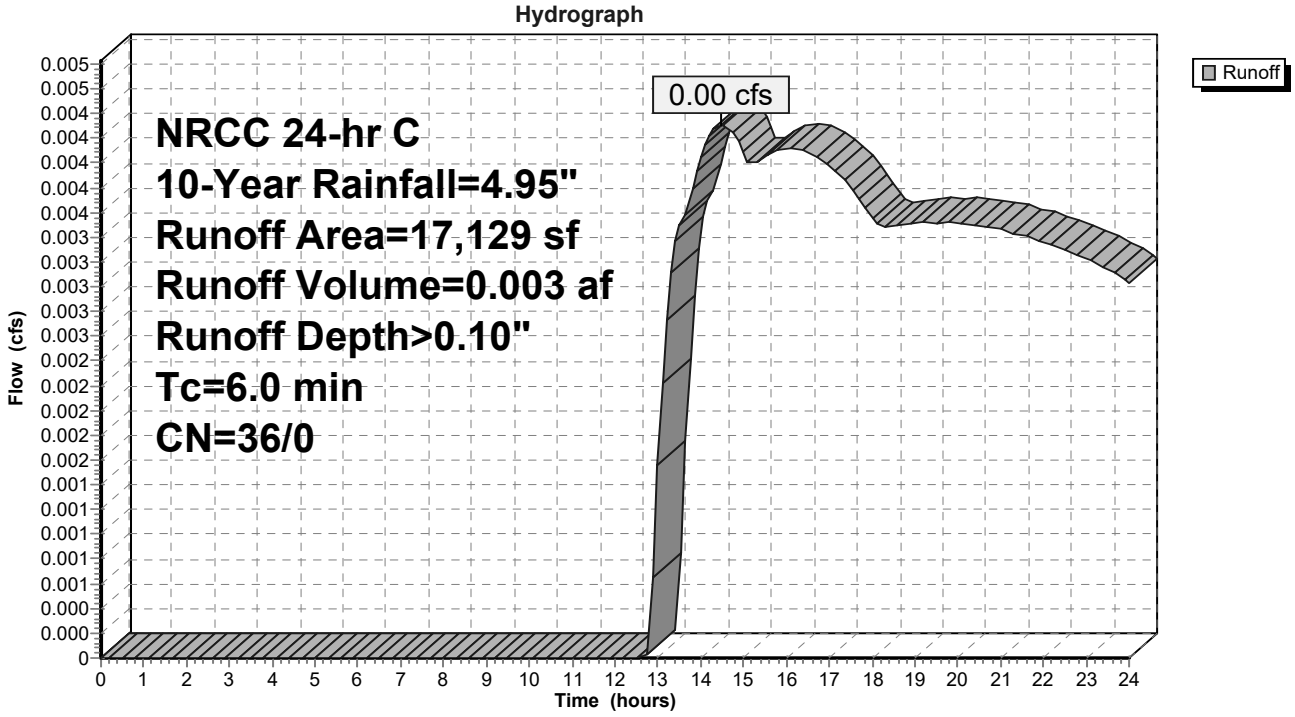
Runoff = 0.00 cfs @ 14.49 hrs, Volume= 0.003 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
2,539	72	Dirt roads, HSG A
14,590	30	Meadow, non-grazed, HSG A
17,129	36	Weighted Average
17,129	36	100.00% Pervious Area

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

Subcatchment PR-4:



Summary for Subcatchment PR-5:

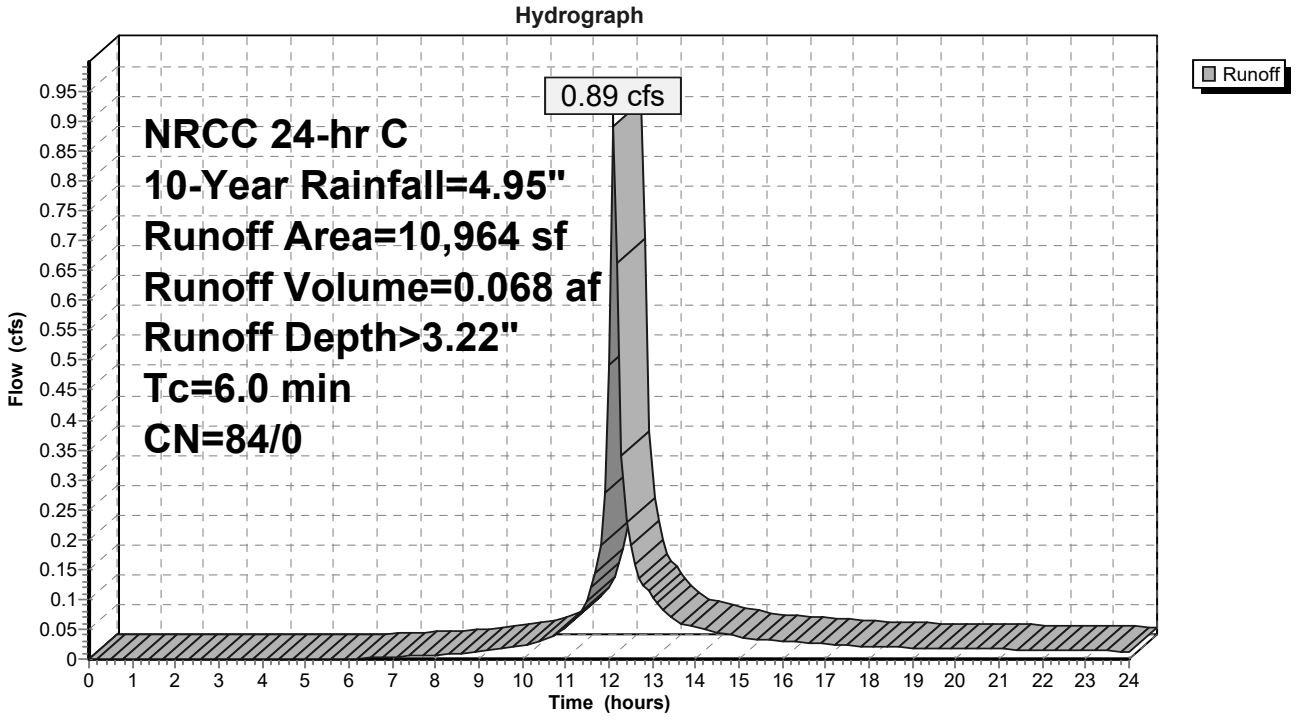
Runoff = 0.89 cfs @ 12.11 hrs, Volume= 0.068 af, Depth> 3.22"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
2,303	72	Dirt roads, HSG A
747	98	Water Surface, 0% imp, HSG A
5,627	82	Dirt roads, HSG B
2,287	98	Water Surface, 0% imp, HSG B
10,964	84	Weighted Average
10,964	84	100.00% Pervious Area

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

Subcatchment PR-5:



Summary for Subcatchment PR-6:

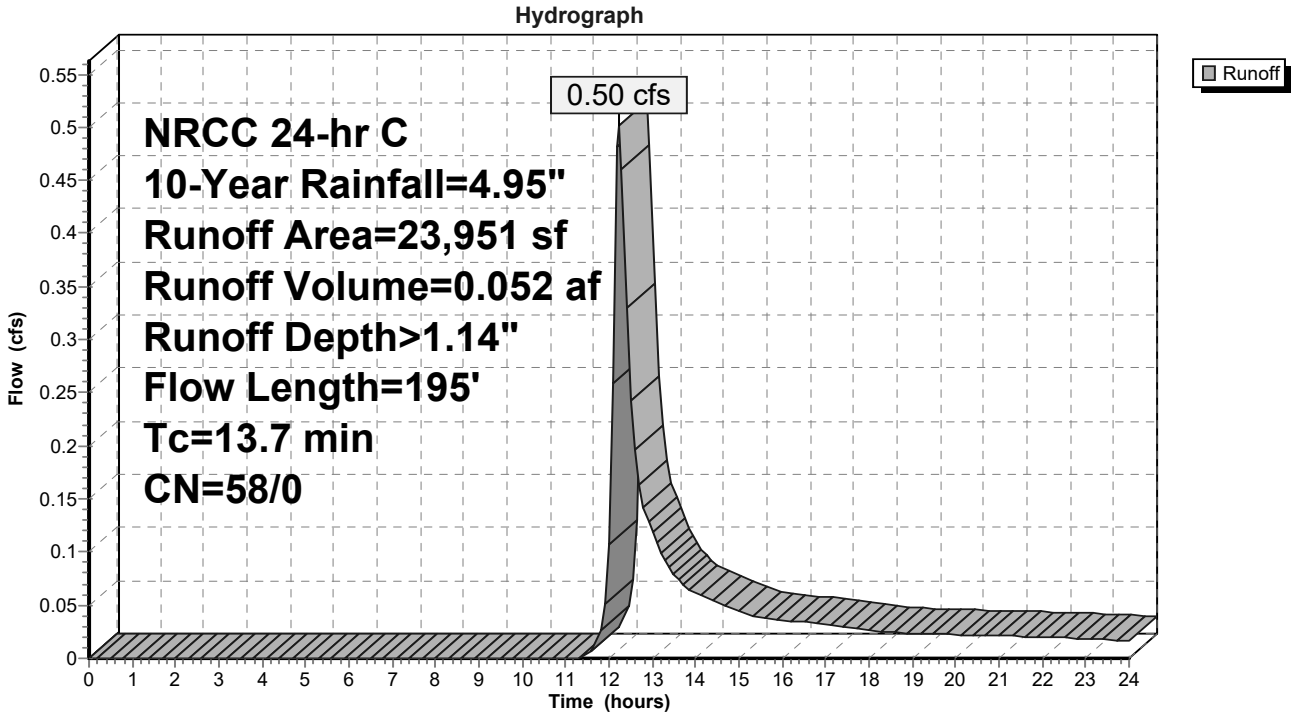
Runoff = 0.50 cfs @ 12.24 hrs, Volume= 0.052 af, Depth> 1.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
23,951	58	Meadow, non-grazed, HSG B
23,951	58	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.35"
2.1	145	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	195	Total			

Subcatchment PR-6:



Summary for Subcatchment PR-7:

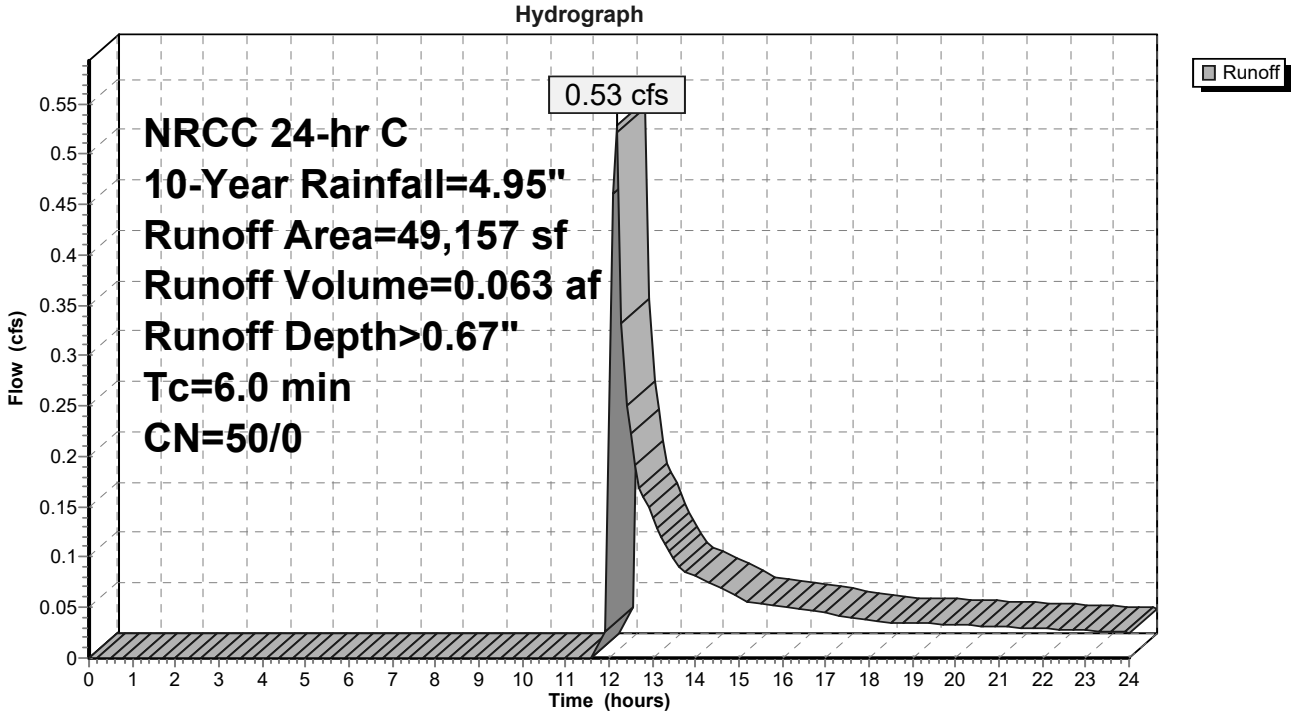
Runoff = 0.53 cfs @ 12.17 hrs, Volume= 0.063 af, Depth> 0.67"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
13,721	30	Meadow, non-grazed, HSG A
35,436	58	Meadow, non-grazed, HSG B
49,157	50	Weighted Average
49,157	50	100.00% Pervious Area

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

Subcatchment PR-7:



Summary for Subcatchment PR-8:

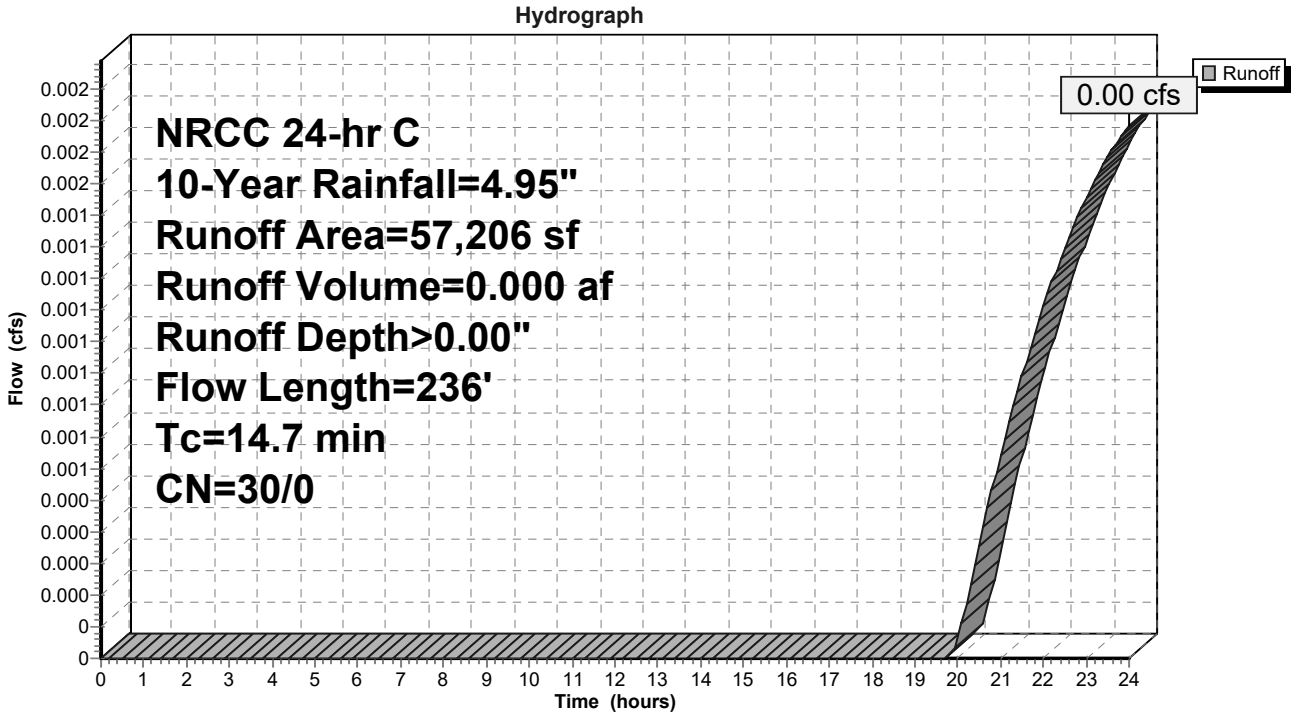
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 10-Year Rainfall=4.95"

Area (sf)	CN	Description
57,206	30	Meadow, non-grazed, HSG A
57,206	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.35"
3.1	186	0.0210	1.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	236	Total			

Subcatchment PR-8:



Summary for Pond BASIN 1: Southerly Bog

Inflow Area = 12.077 ac, 0.00% Impervious, Inflow Depth > 0.94" for 10-Year event
Inflow = 4.67 cfs @ 12.73 hrs, Volume= 0.943 af
Outflow = 3.63 cfs @ 13.07 hrs, Volume= 0.913 af, Atten= 22%, Lag= 20.2 min
Discarded = 0.17 cfs @ 12.30 hrs, Volume= 0.166 af
Primary = 3.46 cfs @ 13.07 hrs, Volume= 0.747 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 104.22' @ 13.07 hrs Surf.Area= 7,150 sf Storage= 5,621 cf

Plug-Flow detention time= 40.0 min calculated for 0.913 af (97% of inflow)
Center-of-Mass det. time= 24.6 min (960.5 - 935.9)

Volume	Invert	Avail.Storage	Storage Description
#1	103.43'	665,382 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.43	7,150	0	0
104.99	7,150	11,154	11,154
105.00	319,409	1,633	12,787
106.00	323,115	321,262	334,049
107.00	339,551	331,333	665,382

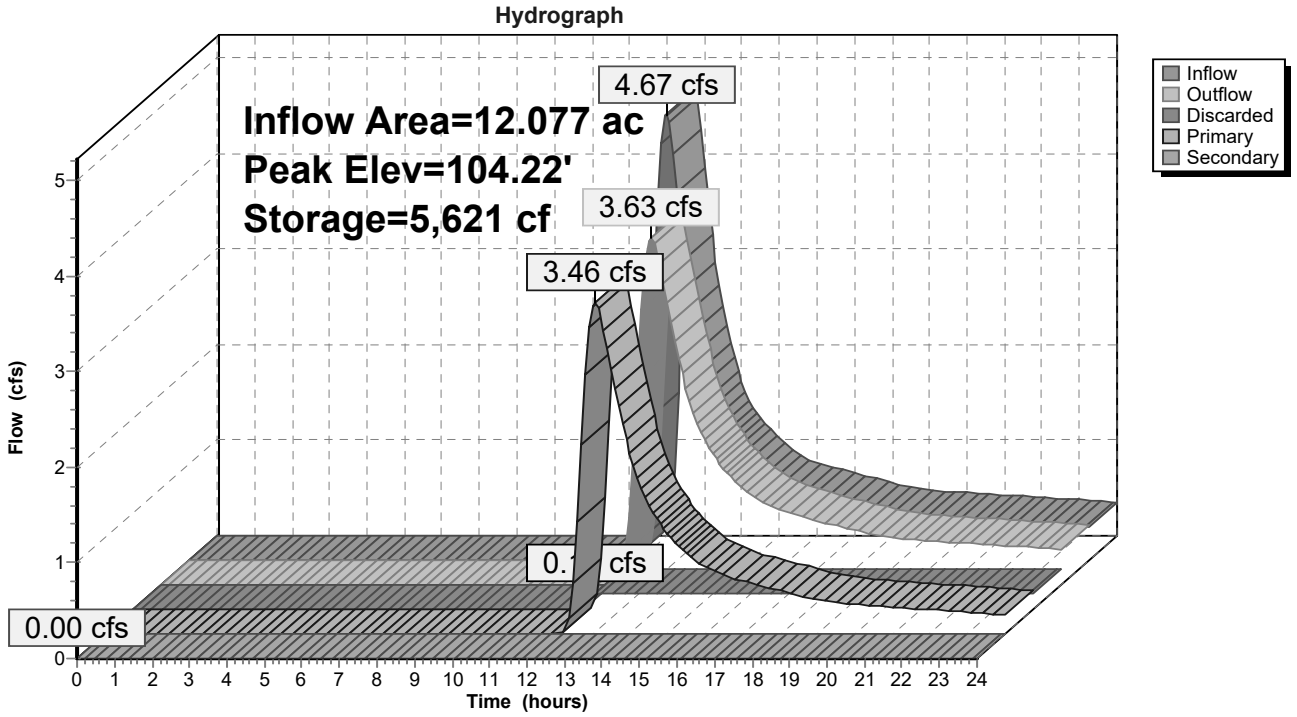
Device	Routing	Invert	Outlet Devices
#1	Primary	103.43'	**24.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 103.43' / 102.84' S= 0.0236 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	106.80'	**120.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Discarded	103.43'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.17 cfs @ 12.30 hrs HW=103.50' (Free Discharge)
3=Exfiltration (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=3.45 cfs @ 13.07 hrs HW=104.21' (Free Discharge)
1=Culvert (Inlet Controls 3.45 cfs @ 3.02 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.43' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BASIN 1: Southerly Bog



Summary for Pond BASIN 2: Northerly Bog

Inflow Area = 3.504 ac, 0.00% Impervious, Inflow Depth > 0.26" for 10-Year event
Inflow = 0.17 cfs @ 12.73 hrs, Volume= 0.075 af
Outflow = 0.17 cfs @ 12.98 hrs, Volume= 0.075 af, Atten= 3%, Lag= 14.9 min
Discarded = 0.17 cfs @ 12.98 hrs, Volume= 0.075 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 103.00' @ 12.98 hrs Surf.Area= 73,182 sf Storage= 71 cf

Plug-Flow detention time= 7.0 min calculated for 0.075 af (99% of inflow)
Center-of-Mass det. time= 4.5 min (1,020.2 - 1,015.8)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	74,280 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

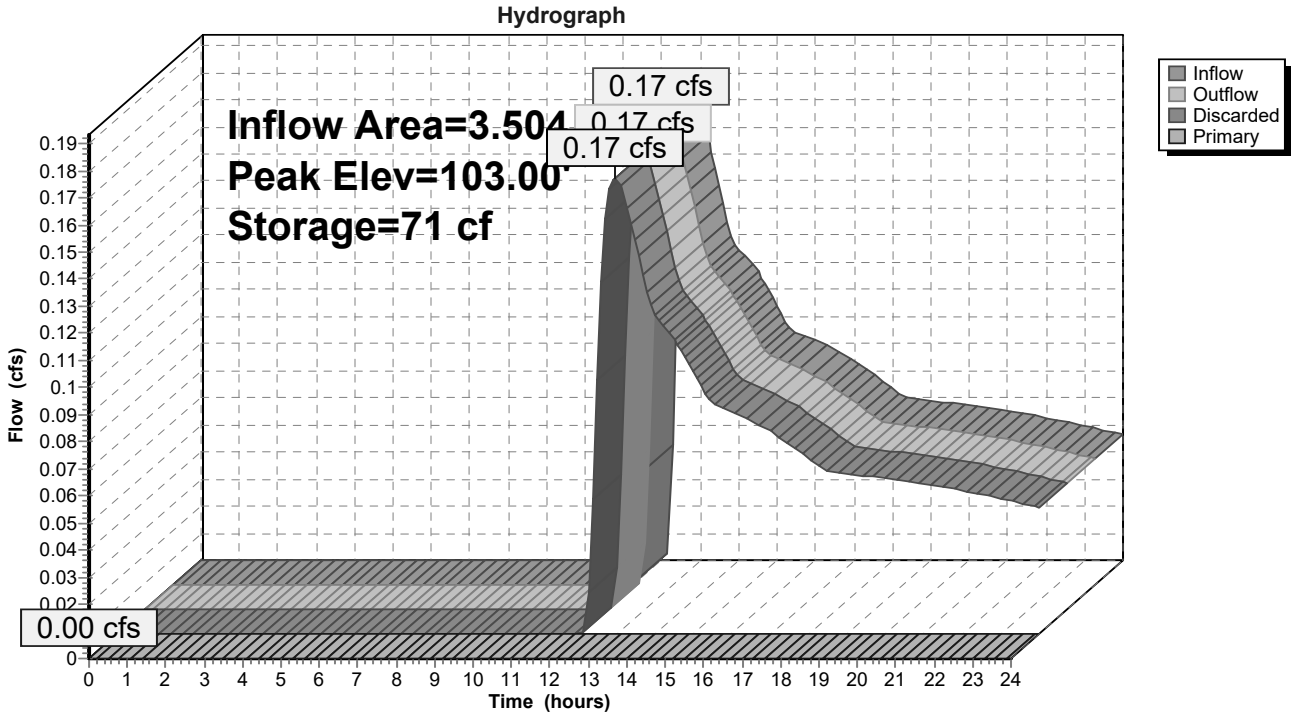
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	73,180	0	0
104.00	75,380	74,280	74,280

Device	Routing	Invert	Outlet Devices
#1	Primary	103.50'	**15.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	103.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.73 cfs @ 12.98 hrs HW=103.00' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 1.73 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 2: Northerly Bog



Summary for Pond BASIN 4:

Inflow Area = 0.252 ac, 0.00% Impervious, Inflow Depth > 3.22" for 10-Year event
Inflow = 0.89 cfs @ 12.11 hrs, Volume= 0.068 af
Outflow = 0.05 cfs @ 14.35 hrs, Volume= 0.045 af, Atten= 95%, Lag= 134.0 min
Discarded = 0.05 cfs @ 14.35 hrs, Volume= 0.045 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 105.88' @ 14.35 hrs Surf.Area= 2,006 sf Storage= 1,672 cf

Plug-Flow detention time= 321.1 min calculated for 0.045 af (67% of inflow)
Center-of-Mass det. time= 214.6 min (1,033.0 - 818.4)

Volume	Invert	Avail.Storage	Storage Description
#1	104.00'	4,520 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

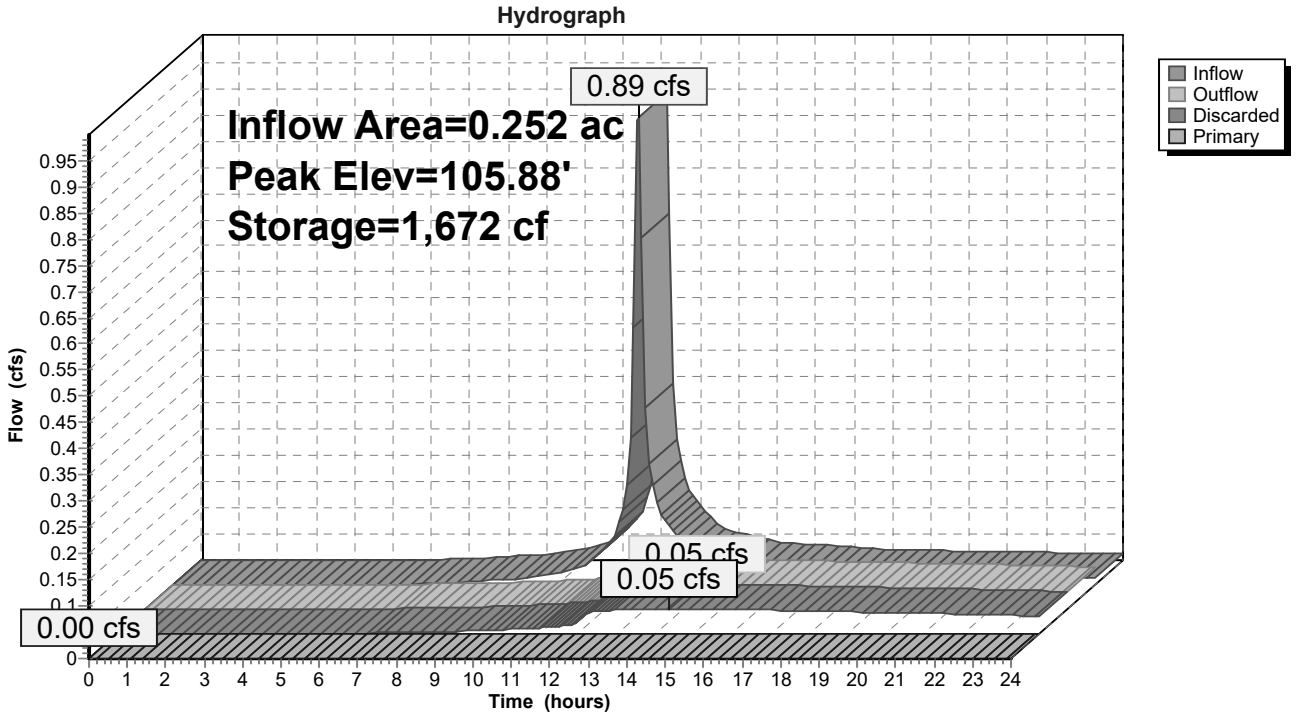
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.00	75	0	0
105.00	797	436	436
106.00	2,168	1,483	1,919
107.00	3,035	2,602	4,520

Device	Routing	Invert	Outlet Devices
#1	Primary	107.20'	**30.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	104.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 14.35 hrs HW=105.88' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 4:


Hydrograph
Inflow
Outflow
Discarded
Primary
0.89 cfs
Inflow Area=0.252 ac
Peak Elev=105.88'
Storage=1,672 cf
0.05 cfs
0.05 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Pond BASIN-3:

Inflow Area = 13.014 ac, 0.00% Impervious, Inflow Depth > 0.82" for 10-Year event
Inflow = 3.70 cfs @ 13.05 hrs, Volume= 0.890 af
Outflow = 3.70 cfs @ 13.05 hrs, Volume= 0.889 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 13.05 hrs, Volume= 0.001 af
Primary = 3.70 cfs @ 13.05 hrs, Volume= 0.889 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 97.56' @ 13.05 hrs Surf.Area= 117 sf Storage= 55 cf

Plug-Flow detention time= 0.2 min calculated for 0.886 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (918.5 - 918.3)

Volume	Invert	Avail.Storage	Storage Description
#1	96.30'	25,553 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

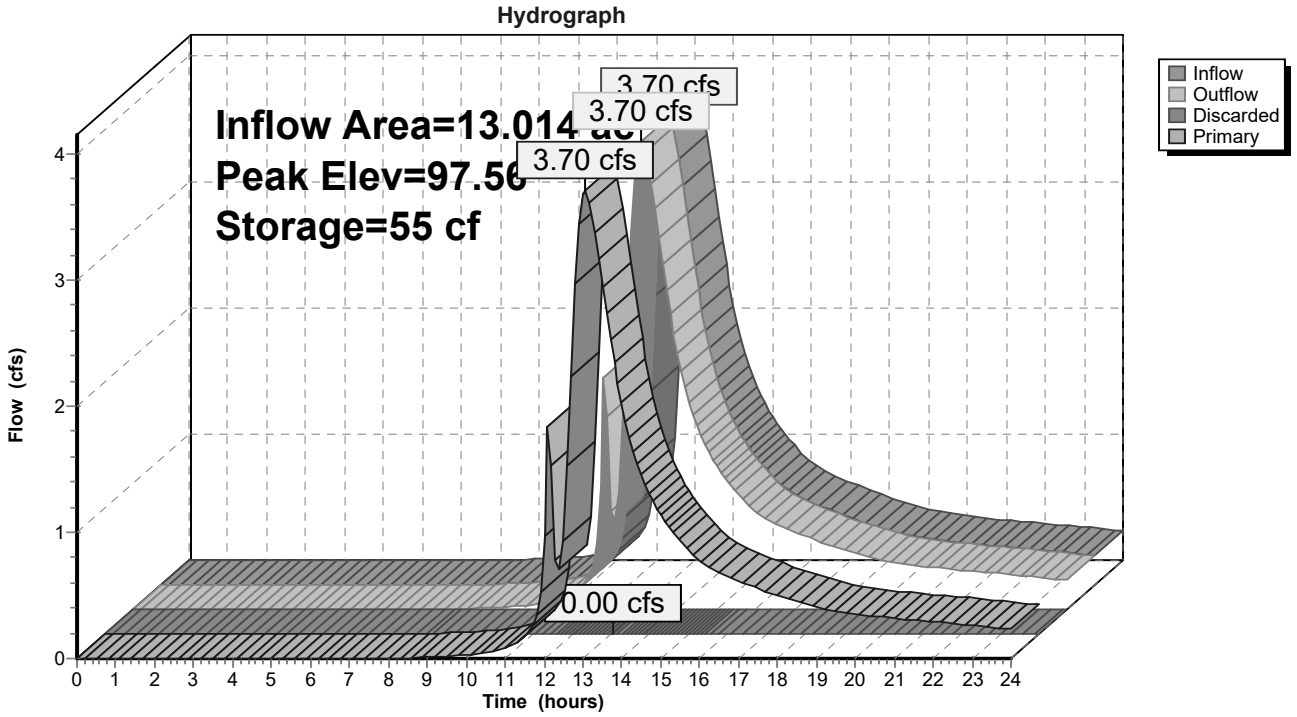
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.30	0	0	0
97.00	35	12	12
98.00	183	109	121
99.00	412	298	419
100.00	807	610	1,028
101.00	2,661	1,734	2,762
102.00	4,620	3,641	6,403
103.00	5,817	5,219	11,621
104.00	6,957	6,387	18,008
105.00	8,132	7,545	25,553

Device	Routing	Invert	Outlet Devices
#1	Primary	96.31'	**36.0" Round Culvert** L= 81.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 96.31' / 96.30' S= 0.0001 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Primary	105.50'	**35.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	96.30'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 13.05 hrs HW=97.55' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=3.66 cfs @ 13.05 hrs HW=97.55' (Free Discharge)
└**1=Culvert** (Barrel Controls 3.66 cfs @ 1.96 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN-3:

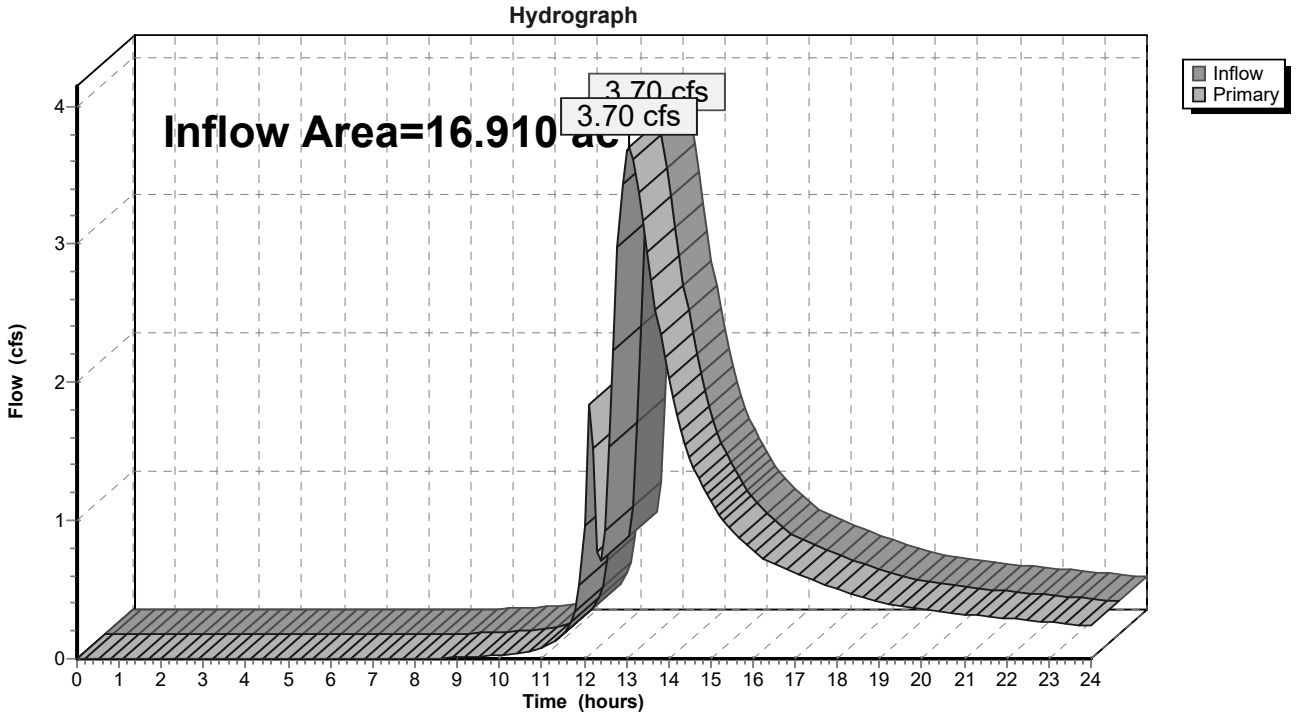

Hydrograph
Inflow Area=13.014 ac
Peak Elev=97.56
Storage=55 cf
3.70 cfs
3.70 cfs
3.70 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Summary for Link POA-1:

Inflow Area = 16.910 ac, 0.00% Impervious, Inflow Depth > 0.63" for 10-Year event
Inflow = 3.70 cfs @ 13.05 hrs, Volume= 0.892 af
Primary = 3.70 cfs @ 13.05 hrs, Volume= 0.892 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-1:

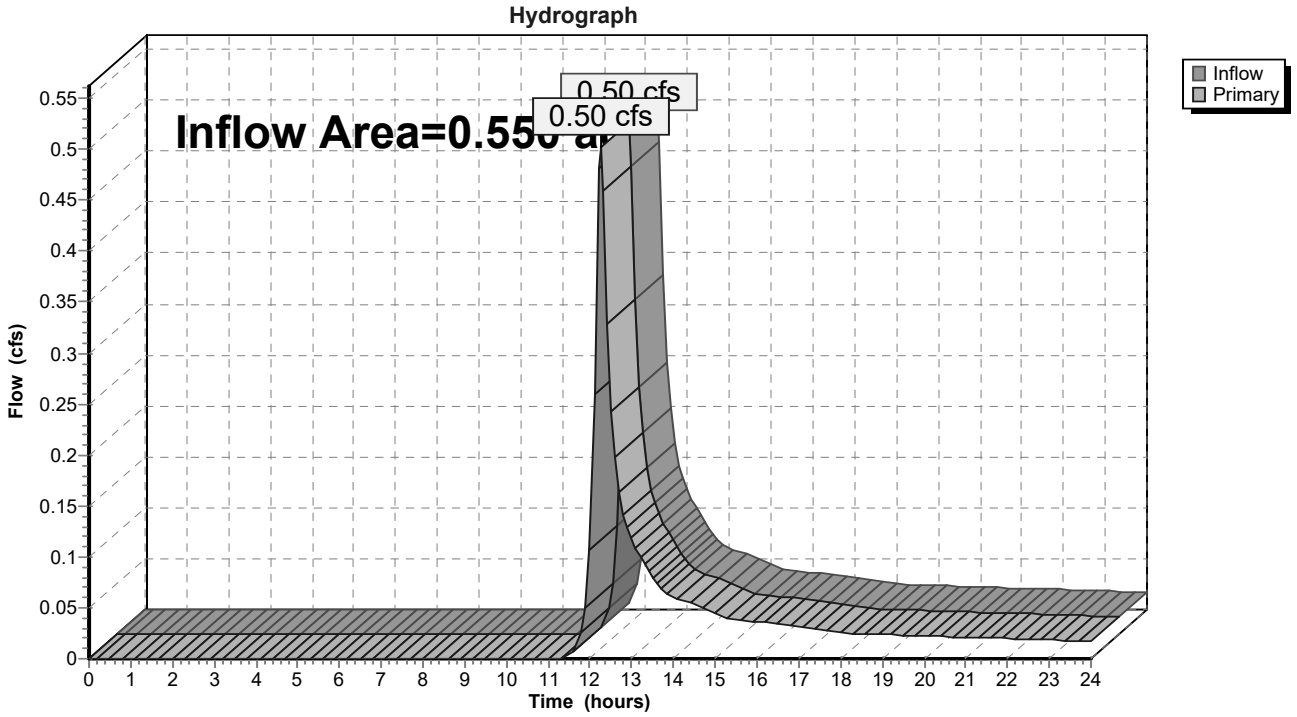


Summary for Link POA-2:

Inflow Area = 0.550 ac, 0.00% Impervious, Inflow Depth > 1.14" for 10-Year event
Inflow = 0.50 cfs @ 12.24 hrs, Volume= 0.052 af
Primary = 0.50 cfs @ 12.24 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-2:

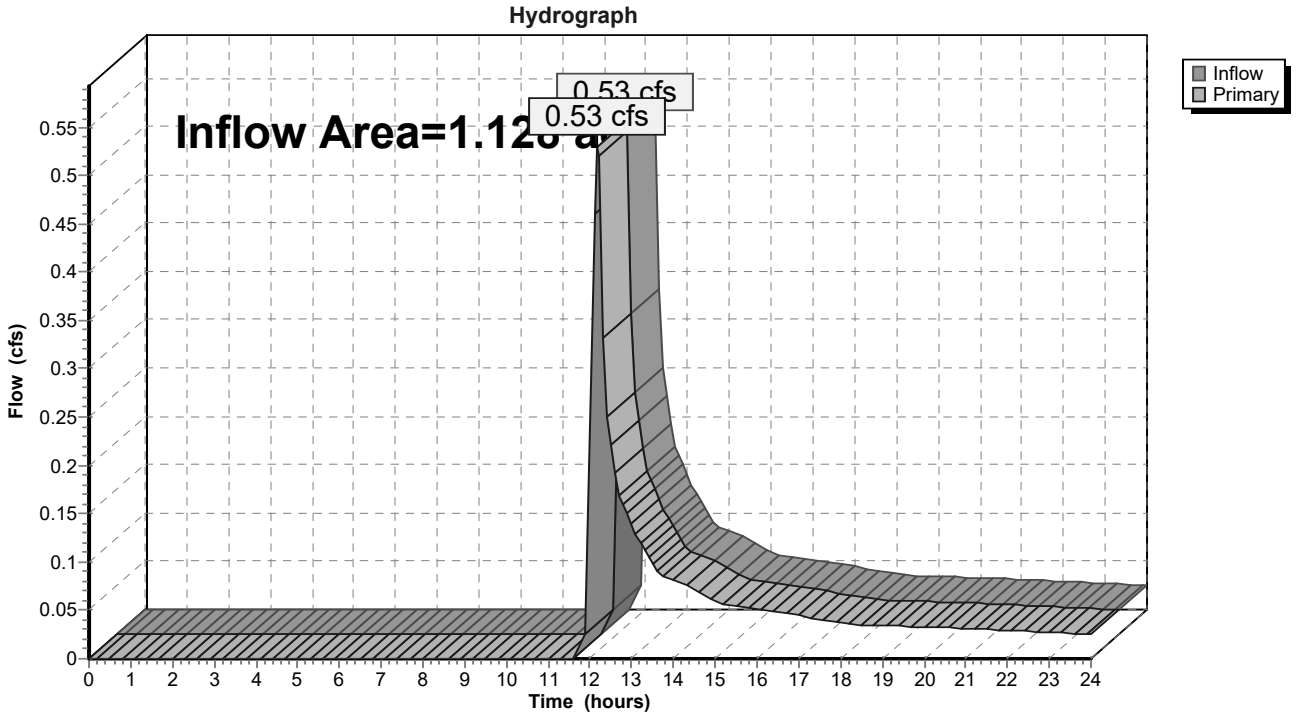


Summary for Link POA-3:

Inflow Area = 1.128 ac, 0.00% Impervious, Inflow Depth > 0.67" for 10-Year event
Inflow = 0.53 cfs @ 12.17 hrs, Volume= 0.063 af
Primary = 0.53 cfs @ 12.17 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-3:

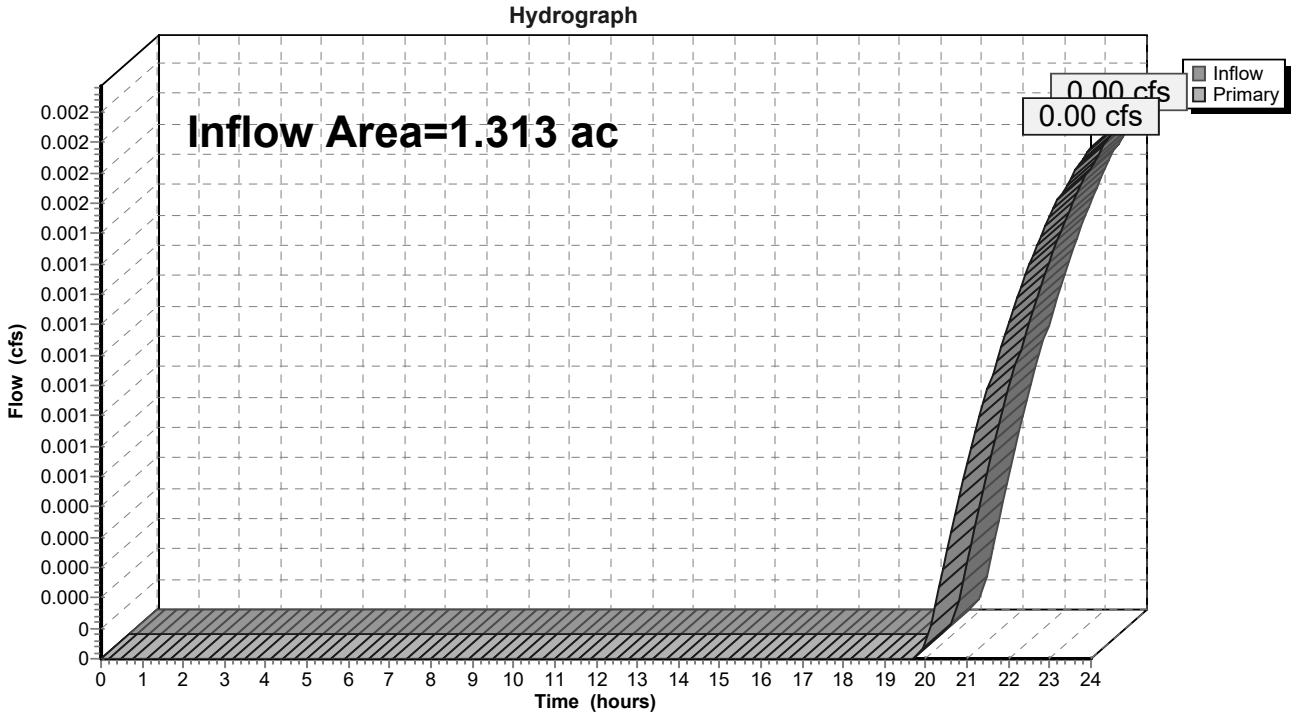


Summary for Link POA-4:

Inflow Area = 1.313 ac, 0.00% Impervious, Inflow Depth > 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-4:



Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1: Runoff Area=526,067 sf 0.00% Impervious Runoff Depth>3.21"
Flow Length=979' Tc=45.5 min CN=55/0 Runoff=19.42 cfs 3.233 af

Subcatchment PR-2: Runoff Area=152,619 sf 0.00% Impervious Runoff Depth>1.66"
Flow Length=751' Tc=16.4 min CN=41/0 Runoff=4.01 cfs 0.484 af

Subcatchment PR-3: Runoff Area=29,839 sf 0.00% Impervious Runoff Depth>5.78"
Tc=6.0 min CN=76/0 Runoff=4.34 cfs 0.330 af

Subcatchment PR-4: Runoff Area=17,129 sf 0.00% Impervious Runoff Depth>1.14"
Tc=6.0 min CN=36/0 Runoff=0.31 cfs 0.038 af

Subcatchment PR-5: Runoff Area=10,964 sf 0.00% Impervious Runoff Depth>6.75"
Tc=6.0 min CN=84/0 Runoff=1.81 cfs 0.141 af

Subcatchment PR-6: Runoff Area=23,951 sf 0.00% Impervious Runoff Depth>3.60"
Flow Length=195' Tc=13.7 min CN=58/0 Runoff=1.80 cfs 0.165 af

Subcatchment PR-7: Runoff Area=49,157 sf 0.00% Impervious Runoff Depth>2.67"
Tc=6.0 min CN=50/0 Runoff=3.17 cfs 0.251 af

Subcatchment PR-8: Runoff Area=57,206 sf 0.00% Impervious Runoff Depth>0.58"
Flow Length=236' Tc=14.7 min CN=30/0 Runoff=0.19 cfs 0.064 af

Pond BASIN 1: Southerly Bog Peak Elev=105.00' Storage=12,954 cf Inflow=19.42 cfs 3.233 af
Discarded=7.73 cfs 0.454 af Primary=11.29 cfs 2.721 af Secondary=0.00 cfs 0.000 af Outflow=19.02 cfs 3.175 af

Pond BASIN 2: Northerly Bog Peak Elev=103.04' Storage=2,753 cf Inflow=4.01 cfs 0.484 af
Discarded=1.73 cfs 0.482 af Primary=0.00 cfs 0.000 af Outflow=1.73 cfs 0.482 af

Pond BASIN 4: Peak Elev=106.79' Storage=3,894 cf Inflow=1.81 cfs 0.141 af
Discarded=0.07 cfs 0.072 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.072 af

Pond BASIN-3: Peak Elev=98.52' Storage=248 cf Inflow=12.03 cfs 3.051 af
Discarded=0.01 cfs 0.002 af Primary=12.22 cfs 3.048 af Outflow=12.23 cfs 3.050 af

Link POA-1: Inflow=12.33 cfs 3.086 af
Primary=12.33 cfs 3.086 af

Link POA-2: Inflow=1.80 cfs 0.165 af
Primary=1.80 cfs 0.165 af

Link POA-3: Inflow=3.17 cfs 0.251 af
Primary=3.17 cfs 0.251 af

Link POA-4: Inflow=0.19 cfs 0.064 af
Primary=0.19 cfs 0.064 af

Total Runoff Area = 19.902 ac Runoff Volume = 4.706 af Average Runoff Depth = 2.84"
100.00% Pervious = 19.902 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment PR-1:

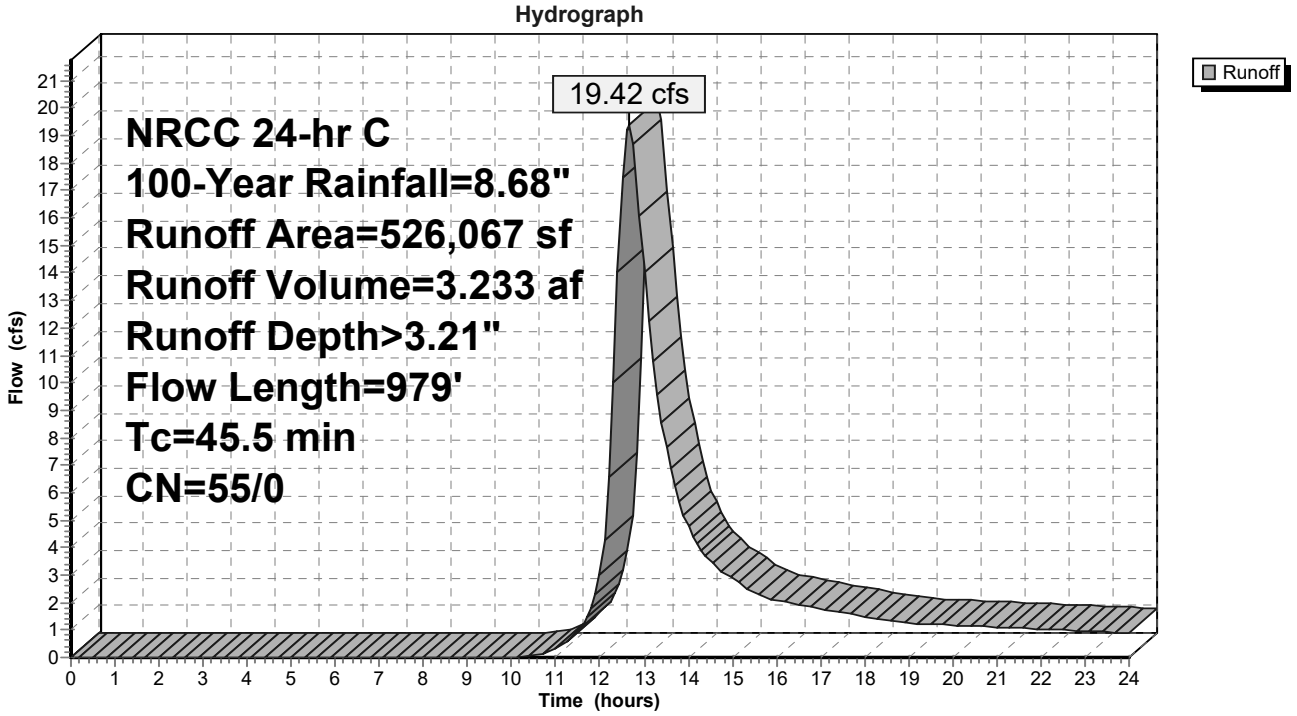
Runoff = 19.42 cfs @ 12.65 hrs, Volume= 3.233 af, Depth> 3.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
63,573	30	Meadow, non-grazed, HSG A
4,170	72	Dirt roads, HSG A
457,715	58	Meadow, non-grazed, HSG B
609	82	Dirt roads, HSG B
526,067	55	Weighted Average
526,067	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.35"
5.6	335	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
28.3	594	0.0025	0.35		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
45.5	979	Total			

Subcatchment PR-1:



Summary for Subcatchment PR-2:

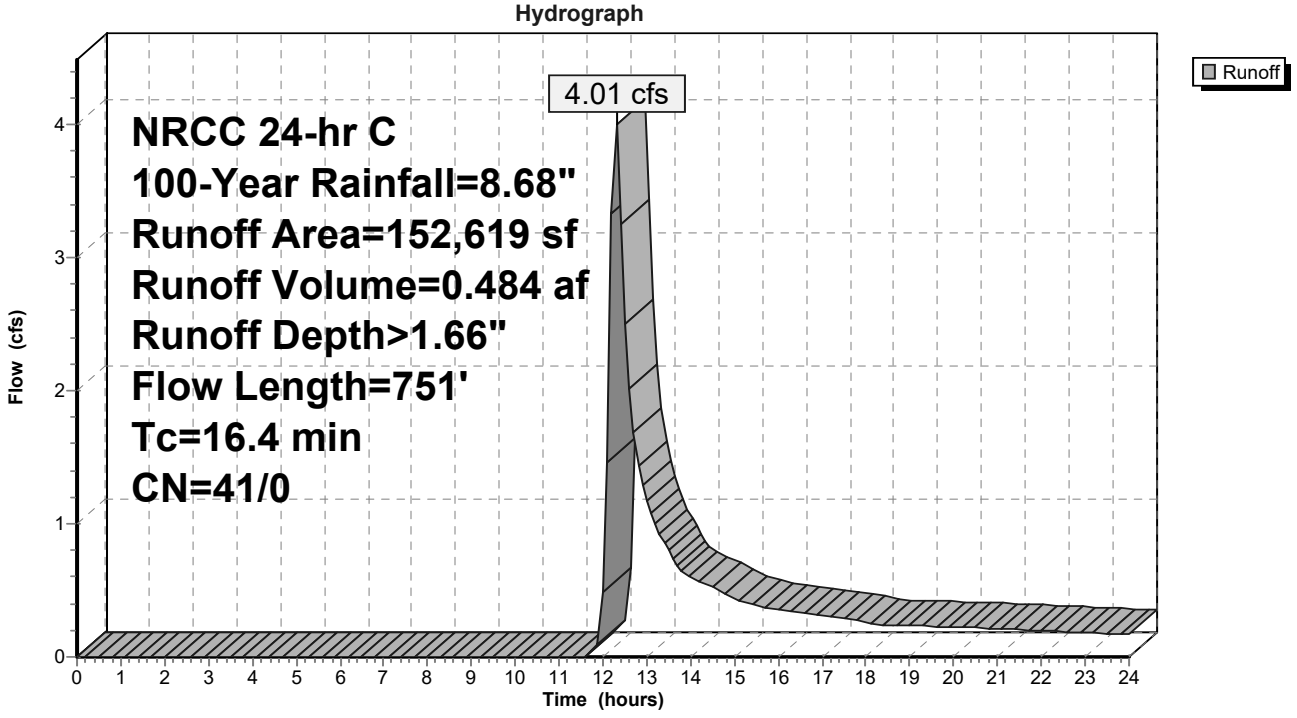
Runoff = 4.01 cfs @ 12.30 hrs, Volume= 0.484 af, Depth> 1.66"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
94,623	30	Meadow, non-grazed, HSG A
7,838	72	Dirt roads, HSG A
50,158	58	Meadow, non-grazed, HSG B
152,619	41	Weighted Average
152,619	41	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	50	0.0340	0.45		**Sheet Flow,** Fallow n= 0.050 P2= 3.35"
14.6	701	0.0130	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.4	751	Total			

Subcatchment PR-2:



Summary for Subcatchment PR-3:

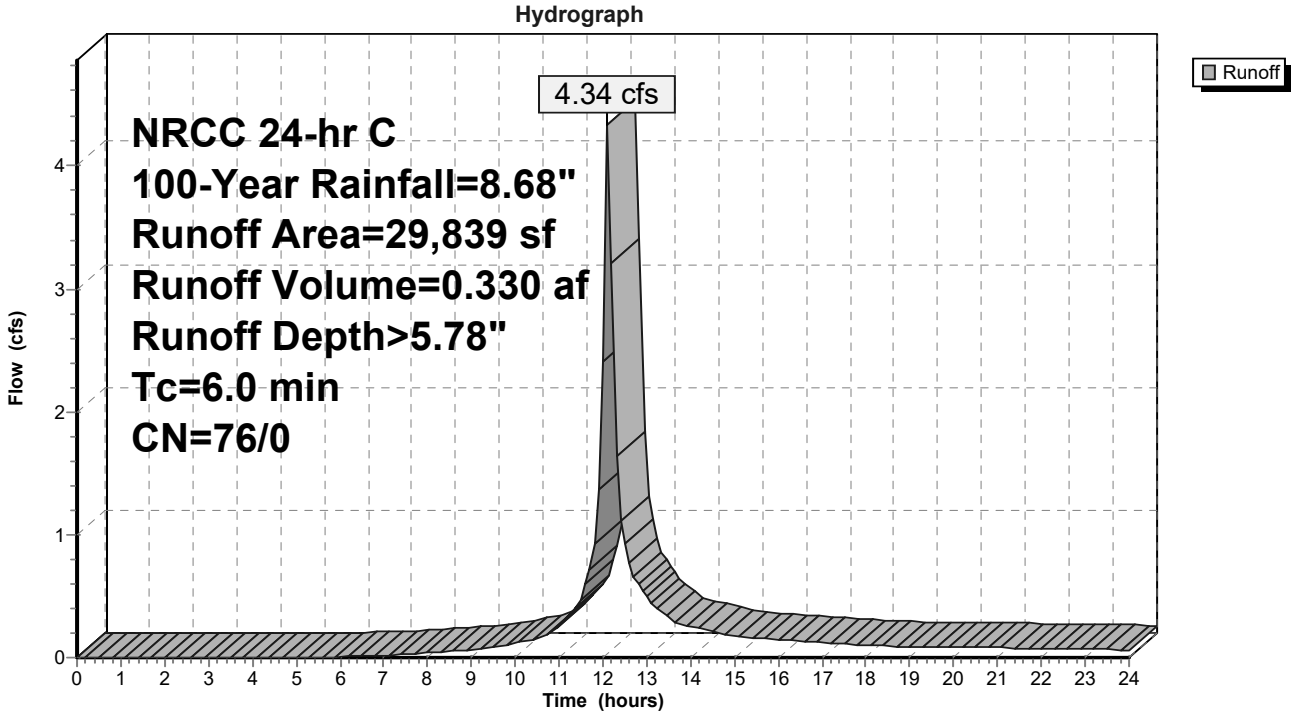
Runoff = 4.34 cfs @ 12.11 hrs, Volume= 0.330 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
12,670	72	Dirt roads, HSG A
6,021	98	Water Surface, 0% imp, HSG A
3,556	30	Meadow, non-grazed, HSG A
5,480	82	Dirt roads, HSG B
2,112	98	Water Surface, 0% imp, HSG B
29,839	76	Weighted Average
29,839	76	100.00% Pervious Area

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

Subcatchment PR-3:



Summary for Subcatchment PR-4:

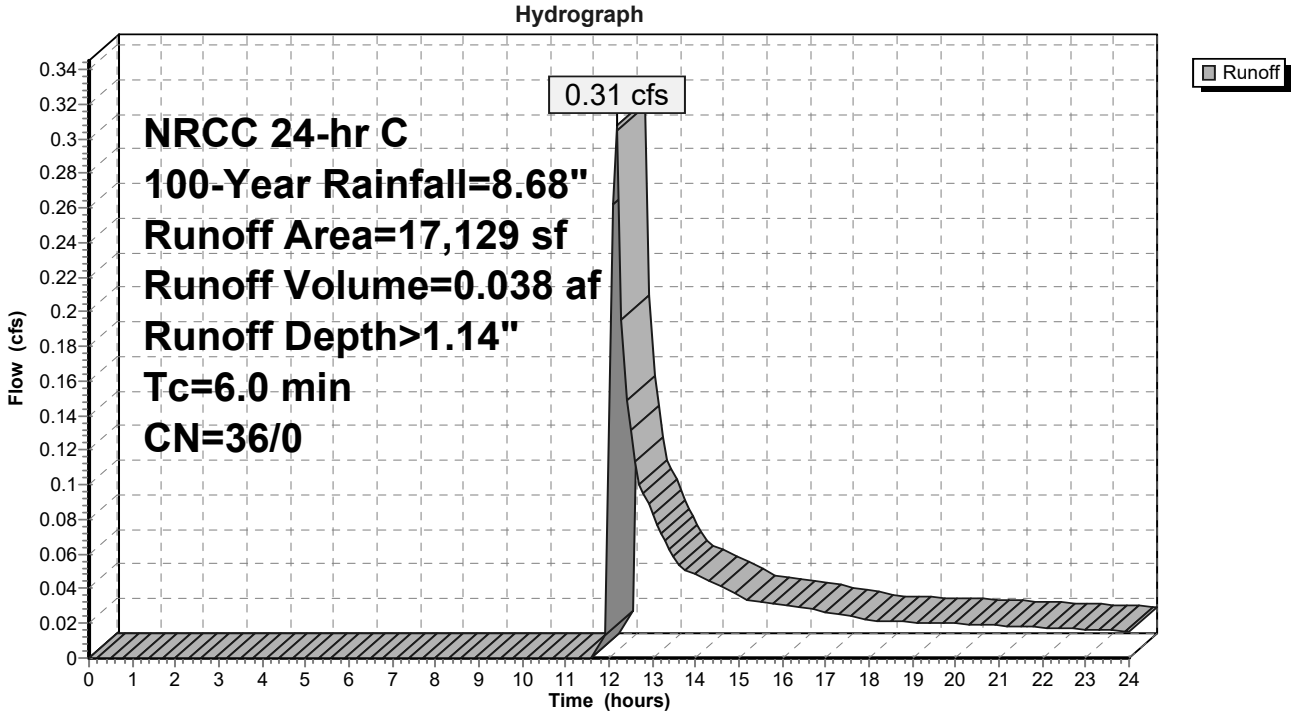
Runoff = 0.31 cfs @ 12.18 hrs, Volume= 0.038 af, Depth> 1.14"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
2,539	72	Dirt roads, HSG A
14,590	30	Meadow, non-grazed, HSG A
17,129	36	Weighted Average
17,129	36	100.00% Pervious Area

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

Subcatchment PR-4:



Summary for Subcatchment PR-5:

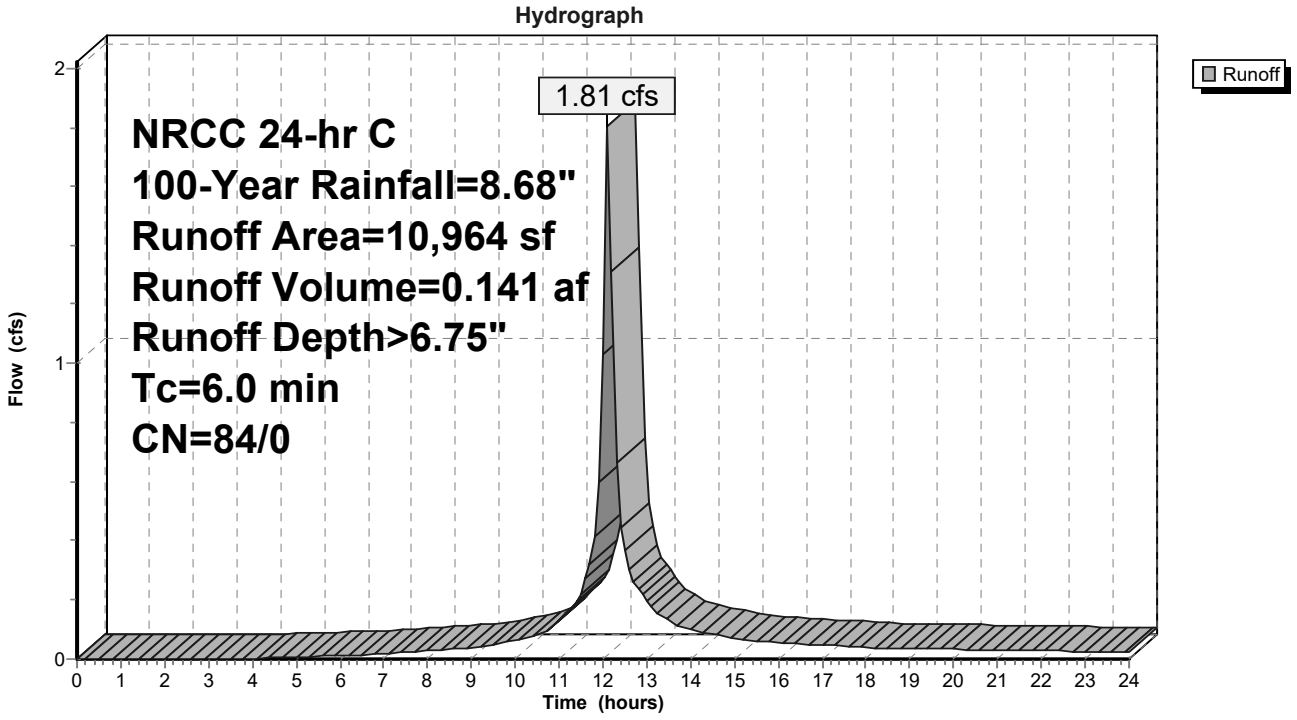
Runoff = 1.81 cfs @ 12.11 hrs, Volume= 0.141 af, Depth> 6.75"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
2,303	72	Dirt roads, HSG A
747	98	Water Surface, 0% imp, HSG A
5,627	82	Dirt roads, HSG B
2,287	98	Water Surface, 0% imp, HSG B
10,964	84	Weighted Average
10,964	84	100.00% Pervious Area

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

Subcatchment PR-5:



Summary for Subcatchment PR-6:

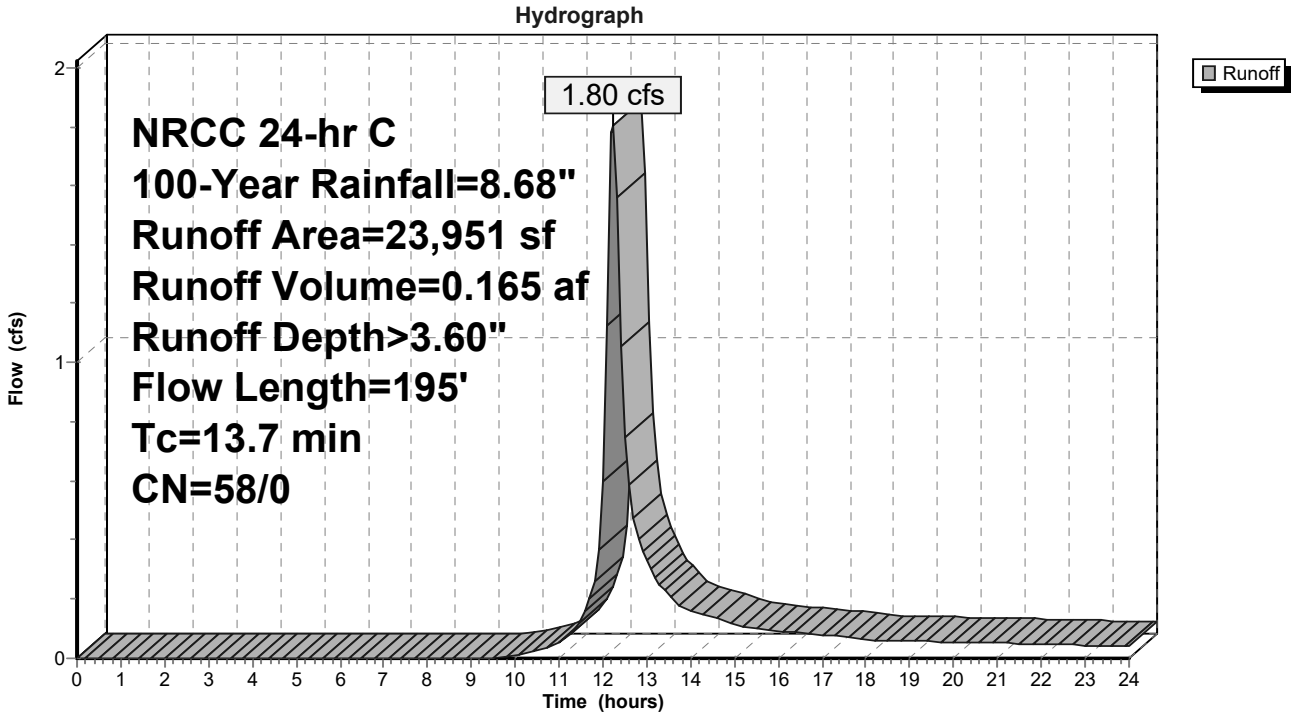
Runoff = 1.80 cfs @ 12.22 hrs, Volume= 0.165 af, Depth> 3.60"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
23,951	58	Meadow, non-grazed, HSG B
23,951	58	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.35"
2.1	145	0.0270	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	195	Total			

Subcatchment PR-6:



Summary for Subcatchment PR-7:

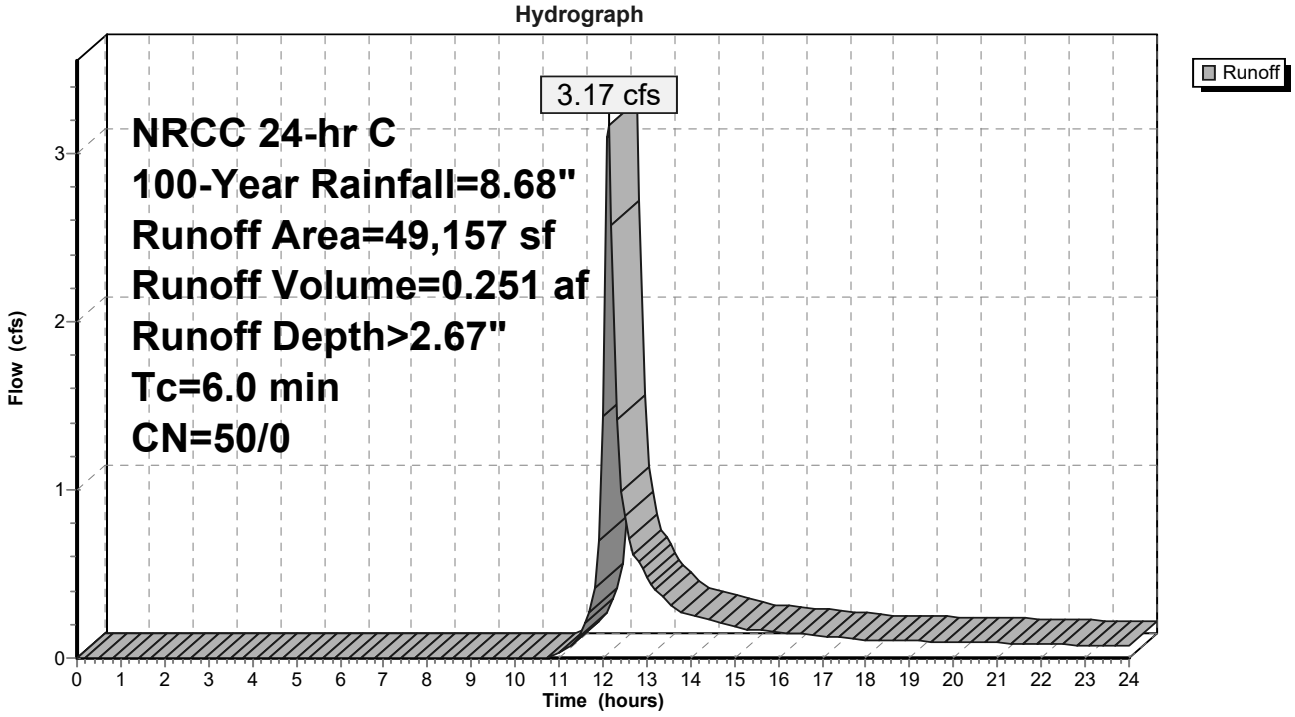
Runoff = 3.17 cfs @ 12.13 hrs, Volume= 0.251 af, Depth> 2.67"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
13,721	30	Meadow, non-grazed, HSG A
35,436	58	Meadow, non-grazed, HSG B
49,157	50	Weighted Average
49,157	50	100.00% Pervious Area

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

Subcatchment PR-7:



Summary for Subcatchment PR-8:

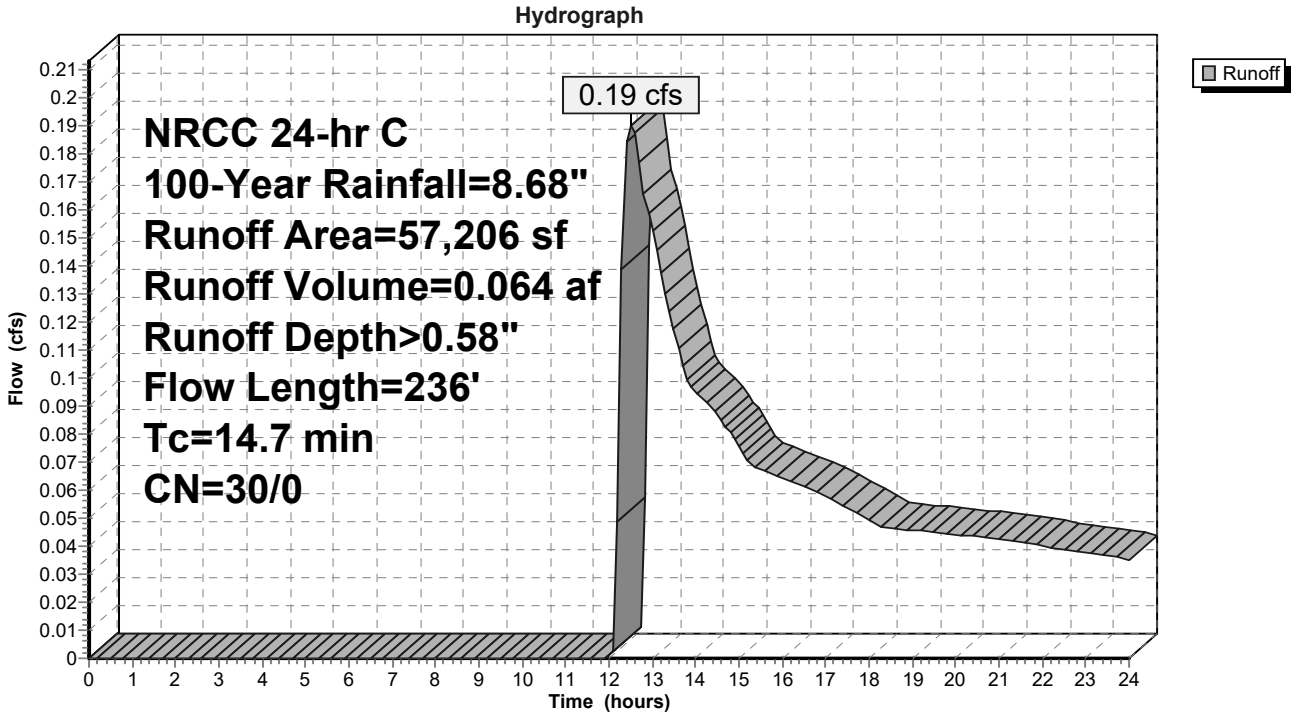
Runoff = 0.19 cfs @ 12.52 hrs, Volume= 0.064 af, Depth> 0.58"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-24.00 hrs, dt= 0.10
NRCC 24-hr C 100-Year Rainfall=8.68"

Area (sf)	CN	Description
57,206	30	Meadow, non-grazed, HSG A
57,206	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	50	0.0080	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.35"
3.1	186	0.0210	1.01		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	236	Total			

Subcatchment PR-8:



Summary for Pond BASIN 1: Southerly Bog

Inflow Area = 12.077 ac, 0.00% Impervious, Inflow Depth > 3.21" for 100-Year event
Inflow = 19.42 cfs @ 12.65 hrs, Volume= 3.233 af
Outflow = 19.02 cfs @ 12.75 hrs, Volume= 3.175 af, Atten= 2%, Lag= 5.7 min
Discarded = 7.73 cfs @ 12.75 hrs, Volume= 0.454 af
Primary = 11.29 cfs @ 12.74 hrs, Volume= 2.721 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 105.00' @ 12.74 hrs Surf.Area= 319,411 sf Storage= 12,954 cf

Plug-Flow detention time= 23.8 min calculated for 3.162 af (98% of inflow)
Center-of-Mass det. time= 14.4 min (908.0 - 893.5)

Volume	Invert	Avail.Storage	Storage Description
#1	103.43'	665,382 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.43	7,150	0	0
104.99	7,150	11,154	11,154
105.00	319,409	1,633	12,787
106.00	323,115	321,262	334,049
107.00	339,551	331,333	665,382

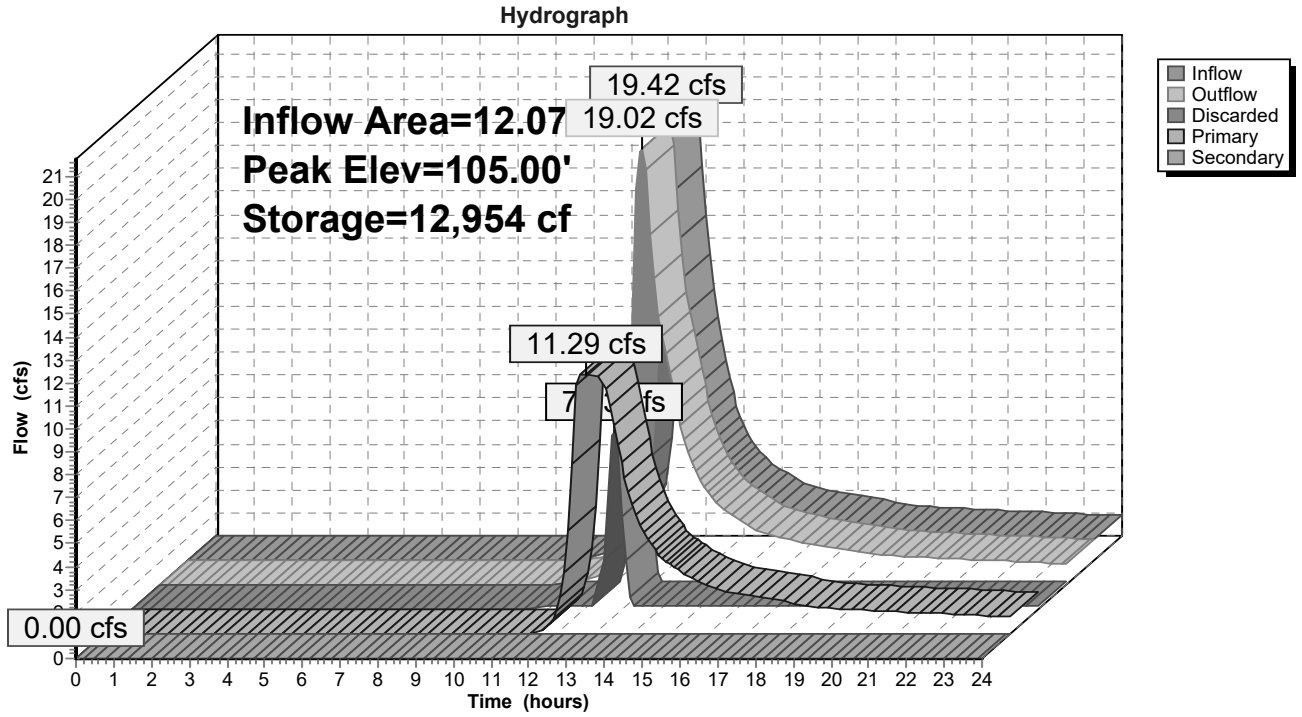
Device	Routing	Invert	Outlet Devices
#1	Primary	103.43'	**24.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 103.43' / 102.84' S= 0.0236 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Secondary	106.80'	**120.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Discarded	103.43'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=7.54 cfs @ 12.75 hrs HW=105.00' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 7.54 cfs)

Primary OutFlow Max=11.29 cfs @ 12.74 hrs HW=105.00' (Free Discharge)
↑**1=Culvert** (Inlet Controls 11.29 cfs @ 4.27 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.43' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 1: Southerly Bog



Summary for Pond BASIN 2: Northerly Bog

Inflow Area = 3.504 ac, 0.00% Impervious, Inflow Depth > 1.66" for 100-Year event
Inflow = 4.01 cfs @ 12.30 hrs, Volume= 0.484 af
Outflow = 1.73 cfs @ 12.69 hrs, Volume= 0.482 af, Atten= 57%, Lag= 23.7 min
Discarded = 1.73 cfs @ 12.69 hrs, Volume= 0.482 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 103.04' @ 12.69 hrs Surf.Area= 73,263 sf Storage= 2,753 cf

Plug-Flow detention time= 12.1 min calculated for 0.480 af (99% of inflow)
Center-of-Mass det. time= 10.3 min (926.6 - 916.3)

Volume	Invert	Avail.Storage	Storage Description
#1	103.00'	74,280 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

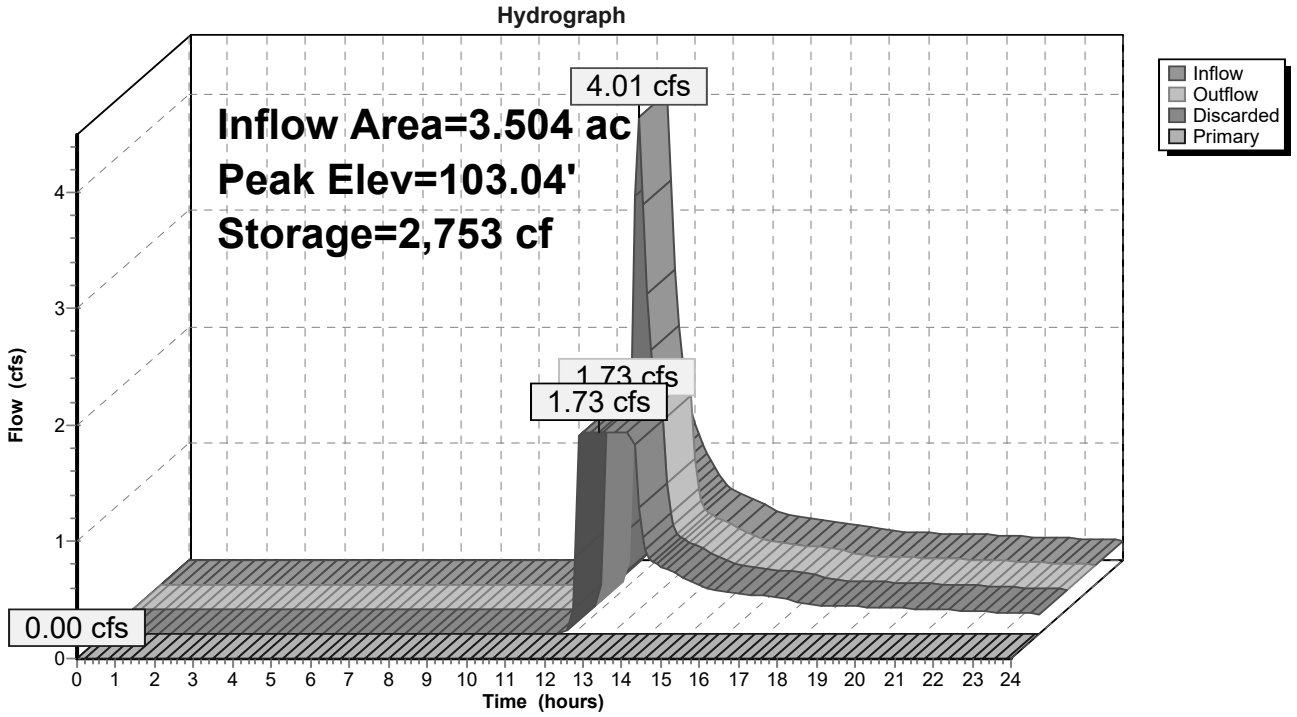
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	73,180	0	0
104.00	75,380	74,280	74,280

Device	Routing	Invert	Outlet Devices
#1	Primary	103.50'	**15.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	103.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.73 cfs @ 12.69 hrs HW=103.04' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 1.73 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=103.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN 2: Northerly Bog



Summary for Pond BASIN 4:

Inflow Area = 0.252 ac, 0.00% Impervious, Inflow Depth > 6.75" for 100-Year event
Inflow = 1.81 cfs @ 12.11 hrs, Volume= 0.141 af
Outflow = 0.07 cfs @ 15.05 hrs, Volume= 0.072 af, Atten= 96%, Lag= 176.0 min
Discarded = 0.07 cfs @ 15.05 hrs, Volume= 0.072 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 106.79' @ 15.05 hrs Surf.Area= 2,850 sf Storage= 3,894 cf

Plug-Flow detention time= 351.2 min calculated for 0.072 af (51% of inflow)
Center-of-Mass det. time= 227.9 min (1,023.4 - 795.5)

Volume	Invert	Avail.Storage	Storage Description
#1	104.00'	4,520 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

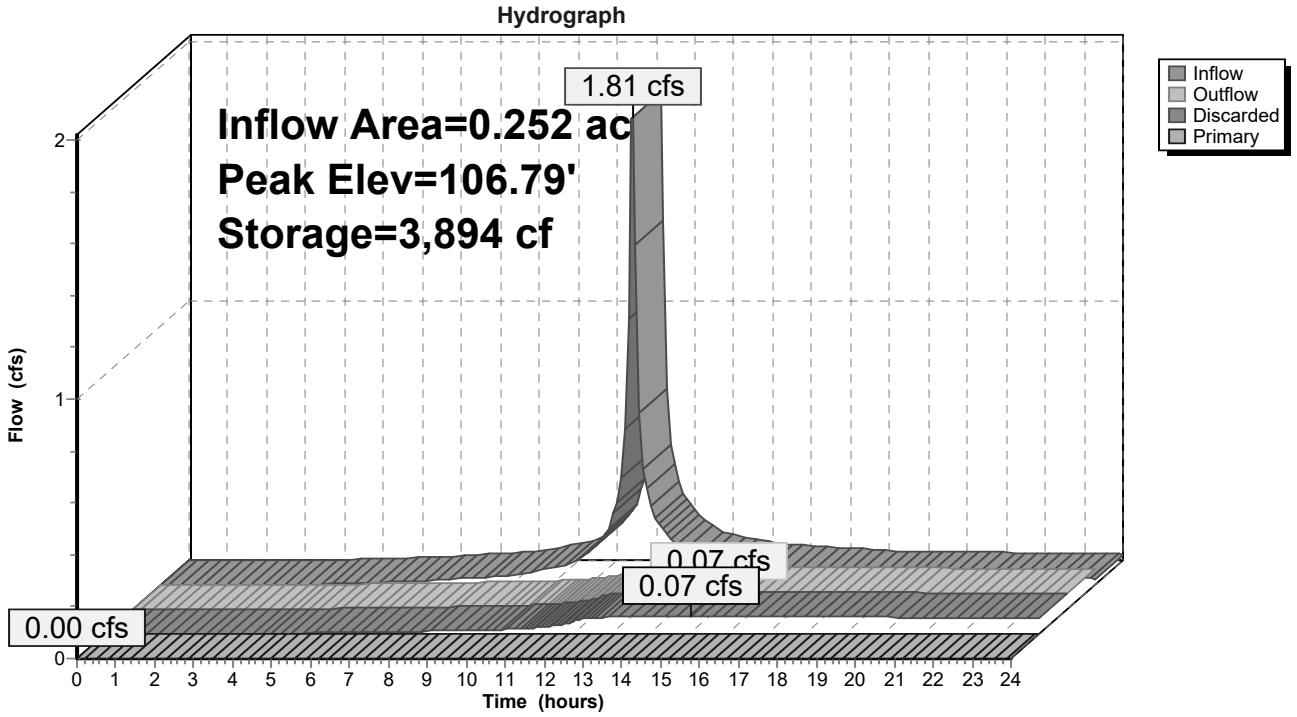
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.00	75	0	0
105.00	797	436	436
106.00	2,168	1,483	1,919
107.00	3,035	2,602	4,520

Device	Routing	Invert	Outlet Devices
#1	Primary	107.20'	**30.0' long x 30.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	104.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.07 cfs @ 15.05 hrs HW=106.79' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond BASIN 4:


Hydrograph
Inflow
Outflow
Discarded
Primary
1.81 cfs
Inflow Area=0.252 ac
Peak Elev=106.79'
Storage=3,894 cf
0.07 cfs
0.07 cfs
0.00 cfs
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Summary for Pond BASIN-3:

Inflow Area = 13.014 ac, 0.00% Impervious, Inflow Depth > 2.81" for 100-Year event
Inflow = 12.03 cfs @ 12.60 hrs, Volume= 3.051 af
Outflow = 12.23 cfs @ 12.61 hrs, Volume= 3.050 af, Atten= 0%, Lag= 0.9 min
Discarded = 0.01 cfs @ 12.61 hrs, Volume= 0.002 af
Primary = 12.22 cfs @ 12.61 hrs, Volume= 3.048 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Peak Elev= 98.52' @ 12.61 hrs Surf.Area= 303 sf Storage= 248 cf

Plug-Flow detention time= 0.3 min calculated for 3.050 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (902.2 - 902.0)

Volume	Invert	Avail.Storage	Storage Description
#1	96.30'	25,553 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

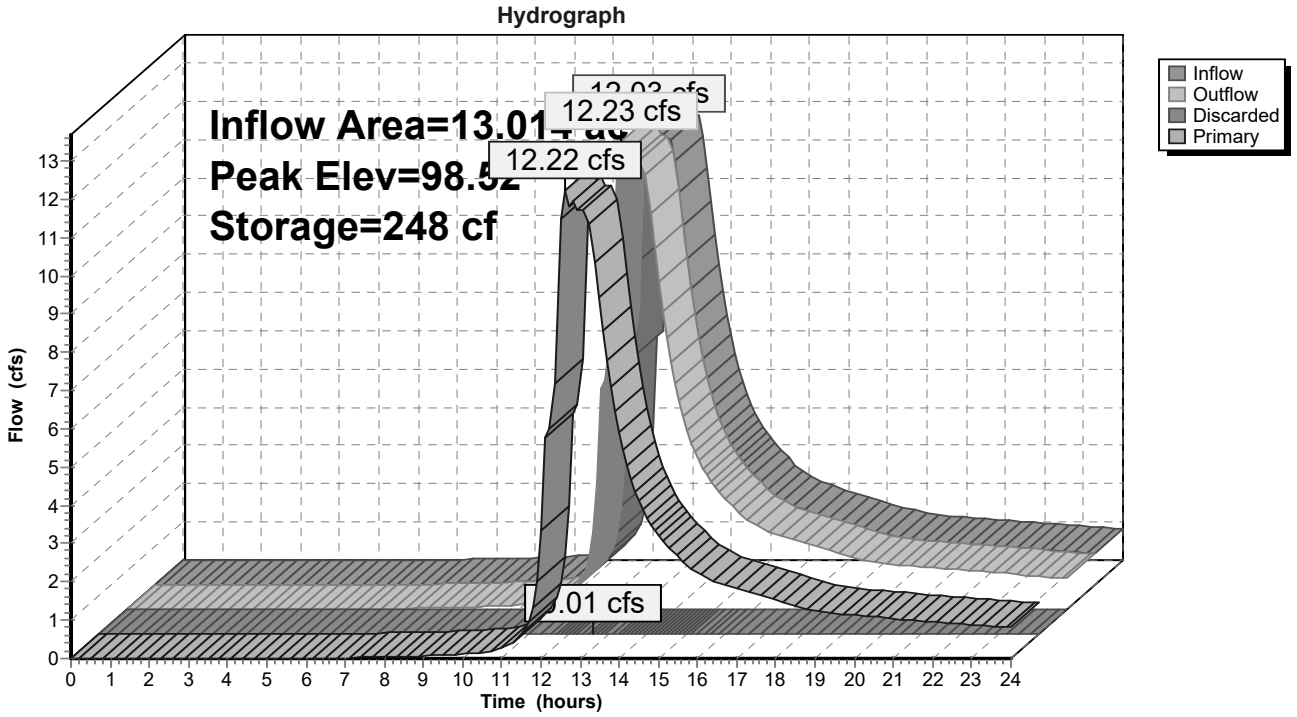
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.30	0	0	0
97.00	35	12	12
98.00	183	109	121
99.00	412	298	419
100.00	807	610	1,028
101.00	2,661	1,734	2,762
102.00	4,620	3,641	6,403
103.00	5,817	5,219	11,621
104.00	6,957	6,387	18,008
105.00	8,132	7,545	25,553

Device	Routing	Invert	Outlet Devices
#1	Primary	96.31'	**36.0" Round Culvert** L= 81.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 96.31' / 96.30' S= 0.0001 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Primary	105.50'	**35.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	96.30'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.61 hrs HW=98.52' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=12.15 cfs @ 12.61 hrs HW=98.52' (Free Discharge)
└**1=Culvert** (Barrel Controls 12.15 cfs @ 3.04 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN-3:

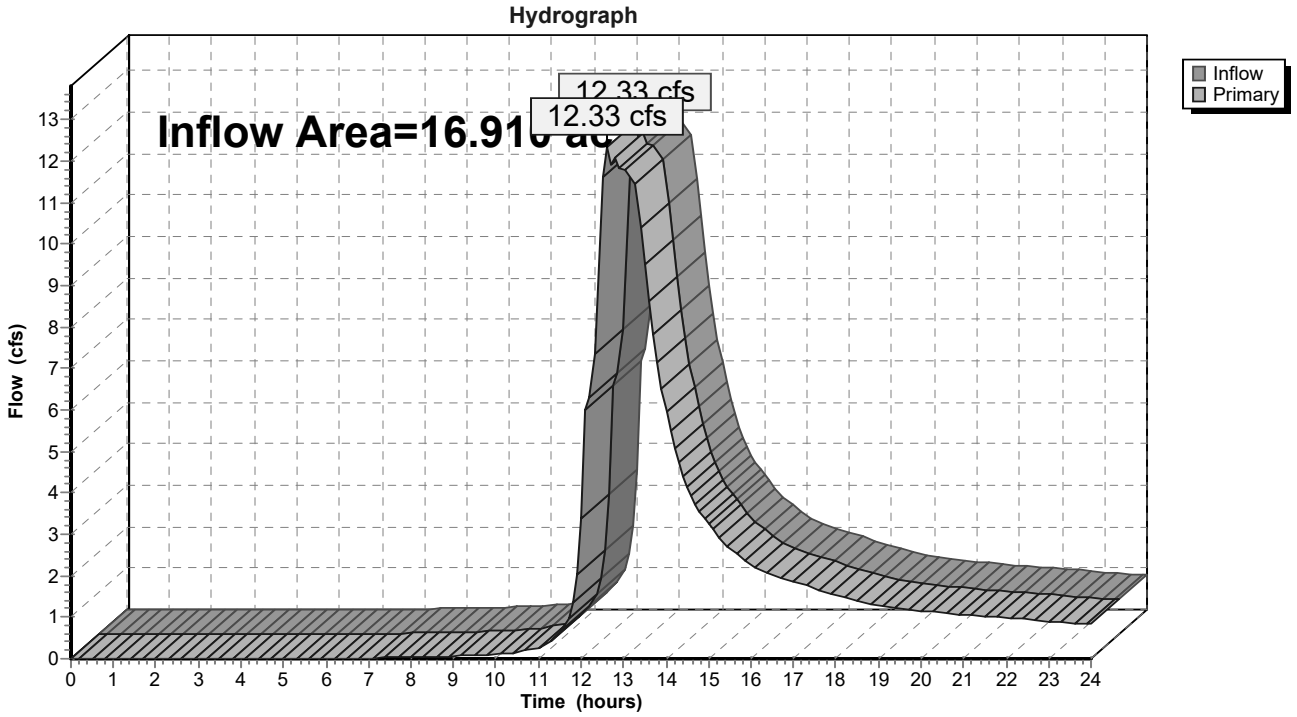

Hydrograph
Inflow
Outflow
Discarded
Primary
12.23 cfs
12.22 cfs
Inflow Area=13.01
Peak Elev=98.52
Storage=248 cf
Flow (cfs)
Time (hours)

Summary for Link POA-1:

Inflow Area = 16.910 ac, 0.00% Impervious, Inflow Depth > 2.19" for 100-Year event
Inflow = 12.33 cfs @ 12.61 hrs, Volume= 3.086 af
Primary = 12.33 cfs @ 12.61 hrs, Volume= 3.086 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-1:

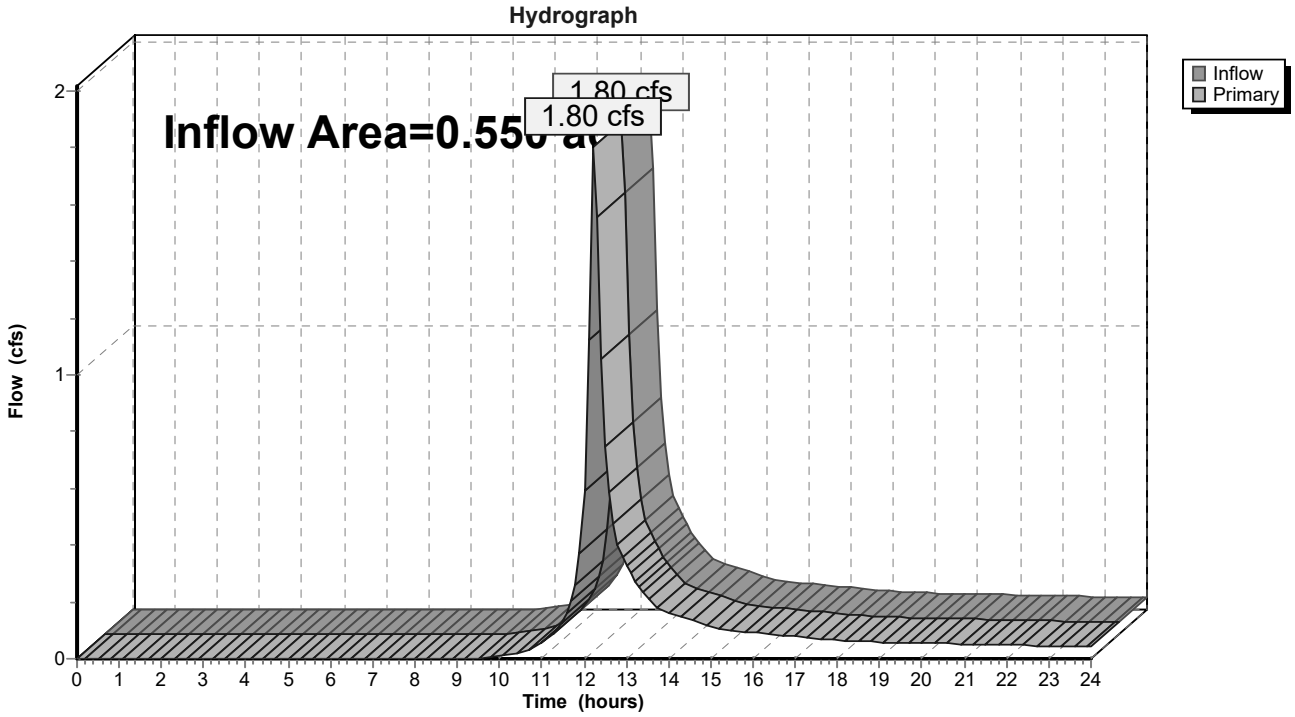


Summary for Link POA-2:

Inflow Area = 0.550 ac, 0.00% Impervious, Inflow Depth > 3.60" for 100-Year event
Inflow = 1.80 cfs @ 12.22 hrs, Volume= 0.165 af
Primary = 1.80 cfs @ 12.22 hrs, Volume= 0.165 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-2:

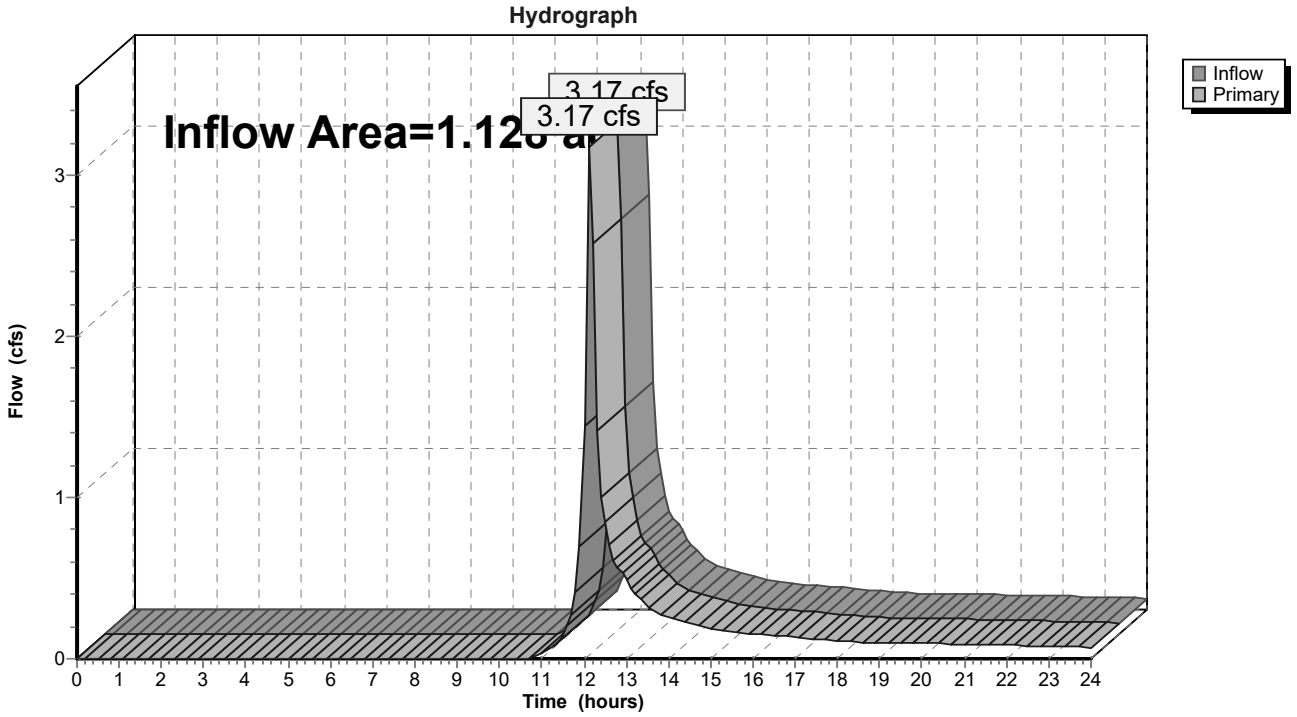


Summary for Link POA-3:

Inflow Area = 1.128 ac, 0.00% Impervious, Inflow Depth > 2.67" for 100-Year event
Inflow = 3.17 cfs @ 12.13 hrs, Volume= 0.251 af
Primary = 3.17 cfs @ 12.13 hrs, Volume= 0.251 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-3:

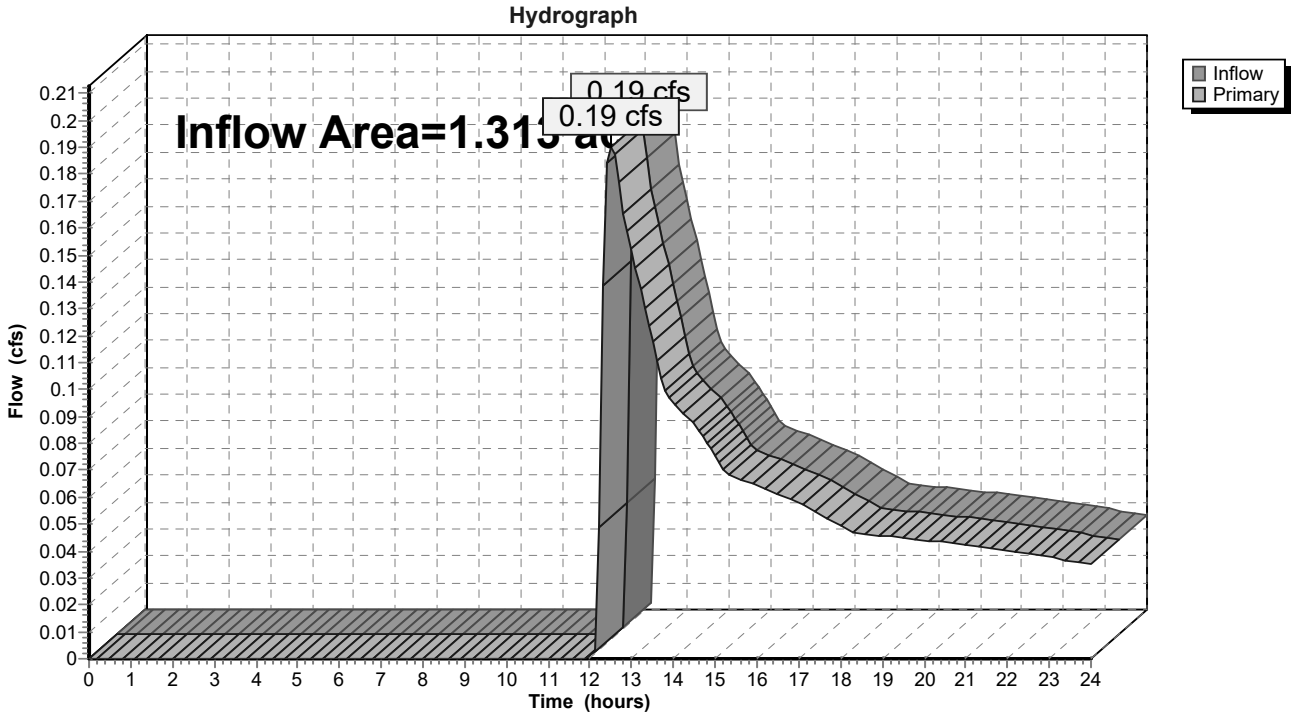


Summary for Link POA-4:

Inflow Area = 1.313 ac, 0.00% Impervious, Inflow Depth > 0.58" for 100-Year event
Inflow = 0.19 cfs @ 12.52 hrs, Volume= 0.064 af
Primary = 0.19 cfs @ 12.52 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs

Link POA-4:

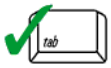


Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

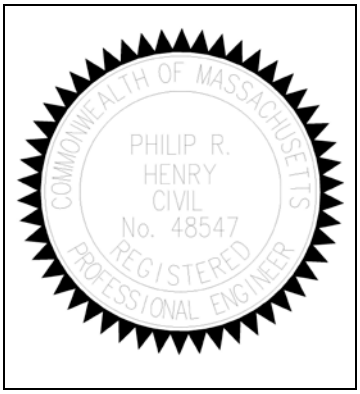
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



04/15/2019
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☒ LID Site Design Credit Requested:

- ☐ Credit 1
- ☒ Credit 2
- ☒ Credit 3

☒ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☐ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☒ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☒ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☒ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

OPERATION AND MAINTENANCE PLAN

FOR

PROPOSED SOLAR ENERGY FACILITY

235 VALLEY STREET
PEMBROKE, MA 02359

PREPARED FOR:

SWCA ENVIRONMENTAL CONSULTANTS
15 RESEARCH DRIVE
AMHERST, MA 01002

PREPARED BY:

CIVIL DESIGN GROUP, LLC
21 HIGH STREET, SUITE 207
NORTH ANDOVER, MA 01845

DATE: APRIL 16, 2019

TABLE OF CONTENTS

p: 978-794-5400 f: 978.965.3971 www.cdgengineering.com

OPERATION AND MAINTENANCE PLAN

1.0 INTRODUCTION

In accordance with the standards set forth by the Massachusetts Department of Environmental Protection (MADEP) Stormwater Management Policy, Civil Design Group, LLC has prepared the following Operations and Maintenance (O&M) Plan for the solar energy facility located at 235 Valley Street, Pembroke, MA.

PROPERTY INFORMATION

PROPERTY ADDRESS	LANDOWNER & STORMWATER MANAGEMENT SYSTEM OWNER
235 VALLEY STREET PEMBROKE, MA	Owner: TBD
	Contact: TBD
	Phone: TBD
	Email: TBD

The landowner shall be responsible for the long-term operation and maintenance of the site and the stormwater management system, and shall be responsible for record keeping of inspections, maintenance and repairs. If the site owner changes, the new site owner shall assume all responsibilities outlined in this O&M plan. The site owner shall hire a qualified professional to conduct scheduled inspections and maintain records in accordance with the inspection schedule outline enclosed within this document.

Site Engineer: Civil Design Group, LLC
Address: 21 High Street, Suite 207, North Andover, MA 01845
Office Phone: 978-794-5400
Contact: Philip Henry, P.E.

2.0 LONG TERM POLLUTION PREVENTION PLAN (LTPPP)

In accordance with Standard #4 from the MADEP Stormwater Management Policy, the following LTPPP has been prepared as part of this O&M Plan. The purpose of the LTPPP is to identify potential pollutant sources in stormwater discharges and implement prevention measures prior to affecting downstream resource areas.

Housekeeping:
The site shall be kept in a clean and working order. Substances and materials to be used on site that are consistent with the nature of business shall be protected from the elements by storing indoors or in containers with appropriate lids. Proper disposal and care shall be followed when disposing of empty containers.

Solid Waste:
Solid waste materials shall be stored in the dumpsters provided on site. The dumpster enclosure shall be kept closed when not in use and the trash shall not be left outside of the enclosure. The owner shall contract with a waste management company to properly dispose of waste material. The dumpsters shall be emptied on a regular basis.

Pet Waste Management:
Pet waste is not anticipated based on the proposed use of the site.

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Petroleum Products:
Petroleum products shall be stored in sealed containers and clearly labeled. Petroleum storage tanks shall be located a minimum of 100 linear feet from wetland resource areas, drainage ways, inlets and surface waters unless stored within a building. Petroleum storage tanks shall be equipped with a secondary means of containment designed to provide a containment volume that is equal to 110% of the volume of the largest tank unless otherwise required. Drip pans or other form of containment shall be provided for all dispensers. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers, Herbicides and Pesticides:
Fertilizers, herbicides and pesticides shall be used in the minimum amounts recommended by the manufacturer and applied to limit contact with stormwater. These products shall be stored in containers indoors.

Paints and Cleaning Solvents:
Paints and containers shall be properly stored in their original containers. Disposal of these products and their containers shall be in accordance with the manufacturer's recommendations.

Spill Prevention and Response:
In the event of a spill of a hazardous substance the following response action items shall be followed in order to prevent or minimize discharge to the stormwater management system.

1. Spills shall be immediately addressed.
2. Spills of hazardous substances shall be remediated using the manufacturers' protocol for cleanup.
3. Vehicular and fuel spills shall be remediated in accordance to local and state regulations.
4. The following equipment and materials shall be present on site and shall be clearly identifiable:
    a. Absorbent materials, brooms, dust pans, mops, rags, gloves, goggles, trash containers, etc.
5. Spills that are toxic or hazardous in nature shall be reported to the MADEP and professional emergency contractor.
6. The owner shall designate individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel shall be posted in the material storage area and in the management office.

3.0 STORMWATER MANAGEMENT SYSTEM

The components of the stormwater management system shall be inspected, monitored and maintained in accordance with the following to ensure that the on-site stormwater management/BMP facilities for the project function as intended. Routine inspection and proper maintenance of these individual components is essential to providing the long-term enhancement of both the quality and quantity of the runoff from the site.

The stormwater management Best Management Practices (BMP's) are comprised of existing culverts and basins designed to collect and convey runoff from developed areas in accordance with the Massachusetts DEP's Stormwater Management Policy.

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Detention/Infiltration Basins

Detention/Infiltration basins are stormwater runoff impoundments that are constructed over permeable soils. Runoff from the design storm is stored until it exfiltrates through the soil of the basin floor.

- Inspection Frequency: Quarterly (after every major storm during 1st 3 months of operation)
- Cleaning Threshold(s): bi-annually
- Equipment: Mow bi-annually
- Considerations Inspect side slopes (interior and exterior) for evidence of erosion or lack of grass cover and stabilize as needed

Solar Array

The lawn areas beneath the solar array shall be kept in good condition. Periodic inspections of the perimeter fence, solar array, and connecting infrastructure will be made by the maintenance contractor. Repairs to the security fence, including fence within the 100-foot buffer zone to wetlands, shall be made as needed. Erosion in access roads shall be repaired and stabilized. Trees growth within close proximity of the array will be maintained so that no vegetation is taller than a height which will shade the panels. This will be accomplished by selective cutting of the taller trees. Forest cover will be maintained to the greatest extent possible, while accomplishing the height limitation. No tree cutting will be done in jurisdictional areas, other than what is permitted.

Record Keeping and Annual Reports

Records shall be maintained by the owner at their offices as described above and shall document all maintenance to the stormwater management system and shall bear the signature of the individual supervising the work.

4.0 SNOW MANAGEMENT AND DEICING CONTROL

The Owner shall contract with a company to properly clear and remove snow. The contractor shall be responsible for maintaining all roads, driveways, pedestrian access onsite as well as along the right-of-way frontage. Snow shall be piled in the designated areas snow storage areas to the extent practicable. Snow shall be removed from the site if the capacity of the designated areas is reached, and disposed of in accordance with applicable regulations and requirements.

Deicing chemicals shall be kept indoors in a safe location and shall be clearly labeled. Deicing solutions such as calcium chloride, rock salt and/or sand may be used unless otherwise restricted by the municipality. Deicing methods shall be used in conjunction with snow removal to maintain safe pedestrian and vehicular access.

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5.0 ILLICIT DISCHARGE STATEMENT

The stormwater management system is *not* intended to convey any illicit discharges and or pollutants and as such, control measures that are identified within this report shall be strictly adhered to in order to minimize the risk of contamination. Any unknown existing illicit discharges that are discovered as part of the redevelopment of the subject site shall be eliminated in accordance with local, state and federal regulations.

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APPENDIX-A

OPERATION AND MAINTENANCE REPORT FORM

STORMWATER DIVISION
OF CIVIL DESIGN GROUP, LLC

21 High Street, Suite 207
North Andover, MA 01845
Tel 978.794.5400
www.cdgengineering.com

STORMWATER INSPECTION REPORT

Site:	Solar Energy Facility	**Date:**	
Address:	235 Valley Street, Pembroke, MA	**Time:**	
Inspector:		**Weather:**	

STORMWATER BASINS

Unit #	Sediment (inches)	Oil (inches)	Trash	Grate	Last Cleaned	Attention Recommended
BASIN/ OUTLETS						
BASIN/ OUTLET						
BASIN/ OUTLET						

APPENDIX E

Interconnection Service Agreement

Exhibit G – Interconnection Service Agreement

1. **Parties.** This Interconnection Service Agreement ("Agreement"), dated as of 9/7/2018 ("Effective Date") is for application number "**MA-25997242**" **(Case #00178143)** and is entered into, by and between **Massachusetts Electric Company (doing business as National Grid)**, a **Massachusetts Corporation** with a principal place of business at **40 Sylvan Rd, Waltham, MA 02451** (hereinafter referred to as the "Company"), and **SunRaise Development, LLC,** a **Limited Liability Corporation** with a principal place of business (or residence) at **200 Marcy St, Suite 102, Portsmouth, NH 03801**("Interconnecting Customer"). (The Company and Interconnecting Customer are collectively referred to as the "Parties"). Terms used herein without definition shall have the meanings set forth in Section 1.2 of the Interconnection Tariff which is hereby incorporated by reference.

2. **Basic Understandings.** This Agreement provides for parallel operation of an Interconnecting Customer's Facility with the Company EPS to be installed and operated by the Interconnecting Customer **235 Valley St Pembroke, MA 02359**. A description of the Facility is located in Attachment 1. If the Interconnecting Customer is not the Customer, an Agreement between the Company and the Company's Retail Customer, attached as Exhibit H to the Interconnection Tariff, must be signed and included as an Attachment to this Agreement. If neither the Interconnecting Customer nor the Landowner of the property where the Facility is sited, a Landowner Consent Agreement, attached as Exhibit I to the Interconnection Tariff, must be signed and included as an Attachment to this Agreement, unless the Company, in its sole discretion, waives this requirement.

The Interconnecting Customer has the right to operate its Facility in parallel with the Company EPS immediately upon successful completion of the protective relays testing as witnessed by the Company and receipt of written notice from the Company that interconnection with the Company EPS is authorized ("Authorization Date").

3. **Term.** This Agreement shall become effective as of the Effective Date. The Agreement shall continue in full force and effect until terminated pursuant to Section 4 of this Agreement.

4. **Termination.**

4.1. This Agreement may be terminated under the following conditions.

4.1.(a) The Parties agree in writing to terminate the Agreement.

4.1.(b) The Interconnecting Customer may terminate this agreement at any time by providing sixty (60) days written notice to Company.

4.1.(c) The Company may terminate this Agreement upon the occurrence of an Event of Default by the Interconnecting Customer as provided in Section 18 of this Agreement.

4.1.(d) The Company may terminate this Agreement if the Interconnecting Customer either: (1) fails to energize the Facility within 12 months of the Authorization Date; or, (2) permanently abandons the Facility. Failure to operate the Facility for any consecutive 12 month period after the Authorization Date shall constitute permanent abandonment unless otherwise agreed to in writing between the Parties.

4.1.(e) The Company, upon 30 days' notice, may terminate this Agreement if there are any changes in Department regulations or state law that have a material adverse effect on the Company's ability to perform its obligations under the terms of this Agreement.

4.2. **Survival of Obligations**. The termination of this Agreement shall not relieve either Party of its liabilities and obligations, owed or continuing at the time of termination. Sections 5, 10, 12, 13, and 25 as it relates to disputes pending or for wrongful termination of this Agreement shall survive the termination of this Agreement.

4.3. **Related Agreements**. Any agreement attached to and incorporated into this Agreement shall terminate concurrently with this Agreement unless the Parties have agreed otherwise in writing. The System Modifications construction schedule from the Detailed Study shall be deemed a part of the signed Interconnection Service Agreement. If the Interconnection Service Agreement is signed prior to a Detailed Study, the Interconnection Service Agreement shall apply the construction schedule once it is signed.

5. **General Payment Terms**. The Interconnecting Customer shall be responsible for the System Modification costs and payment terms identified in Attachment 3of this Agreement and any approved cost increases pursuant to the terms of the Interconnection Tariff. Interconnecting Customers shall not be required to pay any costs related to Company infrastructure upgrades or System Modifications upon execution of the Interconnection Service Agreement (or once the Interconnecting Customer receives the construction schedule). Interconnecting Customers shall have 120 Business Days from the date of

execution of an Interconnection Service Agreement to pay 25 percent of those costs; if an Interconnecting Customer pays such cost within the 120 Business Day Time Frame, the Interconnecting Customer shall have an additional 120 Business Days from the date of first payment to pay the remainder of the costs. If the system modifications exceed $25,000, the Interconnecting Customer is eligible for a payment plan, including a payment and construction schedule with milestones for both parties, and any such payment plan shall be set forth in Attachment 3. The payment plan may include a payment schedule different than the 120 Business Day payment schedule requirements set forth in this paragraph above.

Construction estimates are valid for 60 Business Days from when they are delivered to the Interconnecting Customer. If an Interconnecting Customer payment is not received within 60 Business Days of receiving the Interconnection Service Agreement in the Expedited Process, or the Impact Study in the Standard Process, the Company has the right to reassess construction costs and Time Frames. In the event that the Interconnecting Customer fails to pay the Company within the Time Frame required by this provision, the Company will require the Interconnecting Customer to reapply for interconnection. Further, any fees paid will not be refunded. The construction schedule will commence once the Interconnecting Customer's financial payment has been made in full or as otherwise provided in Attachment 3. The Company's obligation to the construction schedule (as it appears in either the Interconnection Service Agreement or the Detailed Study, if the Interconnecting Customer has opted to sign the Interconnection Service Agreement without a Detailed Study) begins on the next Business Day after the Company receives full payment for such construction or as otherwise provided in Attachment 3.

5.1. **Cost or Fee Adjustment Procedures**. The Company will, in writing, advise the Interconnecting Customer in advance of any cost increase for work to be performed up to a total amount of increase of 10% only. All costs that exceed the 10% increase cap will be borne solely by the Company. Interconnecting Customers who elected to execute an Interconnection Services Agreement following the completion of the Impact Study but prior to the commencement of any Design Studies, pursuant to Section 3.4(e) of the Interconnection Tariff, shall be responsible for any System Modifications costs, ±25%, as identified by the Company in the Impact Study. Any such changes to the Company's costs for the work shall be subject to the Interconnecting Customer's consent. The Interconnecting Customer shall, within thirty (30) Business Days of the Company's notice of increase, authorize such increase and make payment in the amount up to the 10% increase cap, or the Company will suspend the work and the corresponding agreement will terminate.

5.2. **Final Accounting**. An Interconnecting Customer may request a final accounting report of any difference between (a) Interconnecting Customer's cost responsibility under this Agreement for the actual cost of the System Modifications, and (b) Interconnecting Customer's previous aggregate payments to the Company under the Interconnection Service Agreement for such System Modifications within 120 Business days after completion of the construction and installation of the System Modifications described in an attached exhibit to the Interconnection Service Agreement. Upon receipt of such a request from an Interconnecting Customer, the Company shall have 120 Business days to provide the requested final accounting report to the Interconnecting Customer. To the extent that Interconnecting Customer's cost responsibility in the Interconnection Service Agreement exceeds Interconnecting Customer's previous aggregate payments, the Company shall invoice Interconnecting Customer and Interconnecting Customer shall make payment to the Company within 45 Business Days. To the extent that Interconnecting Customer's previous aggregate payments exceed Interconnecting Customer's cost responsibility under this agreement, the Company shall refund to Interconnecting Customer an amount equal to the difference within forty five (45) Business Days of the provision of such final accounting report.

6. **Operating Requirements**.

6.1. **General Operating Requirements**. Interconnecting Customer shall operate and maintain the Facility in accordance with the applicable manufacturer's recommended maintenance schedule, in compliance with all aspects of the Company's Interconnection Tariff. The Interconnecting Customer will continue to comply with all applicable laws and requirements after interconnection has occurred. In the event the Company has reason to believe that the Interconnecting Customer's installation may be the source of problems on the Company EPS, the Company has the right to install monitoring equipment at a mutually agreed upon location to determine the source of the problems. If the Facility is determined to be the source of the problems, the Company may require disconnection as outlined in Section 7.0 of this Interconnection Tariff. The cost of this testing will be borne by the Company unless the Company demonstrates that the problem or problems are caused by the Facility or if the test was performed at the request of the Interconnecting Customer.

6.2. **No Adverse Effects; Non-interference**. Company shall notify Interconnecting Customer if there is evidence that the operation of the Facility could cause disruption or deterioration of service to other Customers served from the same Company EPS or if operation of the Facility could cause damage to Company EPS or Affected Systems. The deterioration of service could be, but is not limited to, harmonic injection in excess of IEEE Standard 1547-2003, as well as voltage fluctuations caused by large step changes in loading at the Facility. Each Party will notify the other of any emergency or hazardous condition or occurrence with its equipment or facilities which could affect safe operation of the other Party's equipment or facilities. Each Party shall use reasonable efforts to provide the other Party with advance notice of such conditions.

The Company will operate the EPS in such a manner so as to not unreasonably interfere with the operation of the Facility. The Interconnecting Customer will protect itself from normal disturbances propagating through the Company EPS, and such normal disturbances shall not constitute unreasonable interference unless the Company has deviated from Good Utility Practice. Examples of such disturbances could be, but are not limited to, single-phasing events, voltage sags from remote faults on the Company EPS, and outages on the Company EPS. If the Interconnecting Customer demonstrates that the Company EPS is adversely affecting the operation of the Facility and if the adverse effect is a result of a Company deviation from Good Utility Practice, the Company shall take appropriate action to eliminate the adverse effect.

6.3. **Safe Operations and Maintenance**. Each Party shall operate, maintain, repair, and inspect, and shall be fully responsible for, the facility or facilities that it now or hereafter may own unless otherwise specified in this Agreement. Each Party shall be responsible for the maintenance, repair and condition of its respective lines and appurtenances on their respective side of the PCC. The Company and the Interconnecting Customer shall each provide equipment on its respective side of the PCC that adequately protects the Company's EPS, personnel, and other persons from damage and injury.

6.4. **Access**. The Company shall have access to the disconnect switch of the Facility at all times.

6.4.(a) **Company and Interconnecting Customer Representatives**. Each Party shall provide and update as necessary the telephone number that can be used at all times to allow either Party to report an emergency.

6.4. (b) **Company Right to Access Company-Owned Facilities and Equipment**. If necessary for the purposes of the Interconnection Tariff and in the manner it describes, the Interconnecting Customer shall allow the Company access to the Company's equipment and the Company's facilities located on the Interconnecting Customer's or Customer's premises. To the extent that the Interconnecting Customer does not own all or any part of the property on which the Company is required to locate its equipment or facilities to serve the Interconnecting Customer under the Interconnection Tariff, the Interconnecting Customer shall secure and provide in favor of the Company the necessary rights to obtain access to such equipment or facilities, including easements if the circumstances so require. In addition to any rights and easements required by the Company in accordance with the above provision, the Interconnecting Customer shall obtain an executed Landowner Consent Agreement (Exhibit I) from the Landowner, unless the Company, in its sole discretion, waives this requirement.

6.4. (c) **Right to Review Information**. The Company shall have the right to review and obtain copies of Interconnecting Customer's operations and maintenance records, logs, or other information such as, unit availability, maintenance outages, circuit breaker operation requiring manual reset, relay targets and unusual events pertaining to Interconnecting Customer's Facility or its interconnection with the Company EPS. This information will be treated as customer-confidential and only used for the purposes of meeting the requirements of Section 4.2.4 in the Interconnection Tariff.

7. **Disconnection**.

7.1. **Temporary Disconnection**.

7.1.(a) **Emergency Conditions**. Company shall have the right to immediately and temporarily disconnect the Facility without prior notification in cases where, in the reasonable judgment of Company, continuance of such service to Interconnecting Customer is imminently likely to (i) endanger persons or damage property or (ii) cause a material adverse effect on the integrity or security of, or damage to, Company EPS or to the electric systems of others to which the Company EPS is directly connected. Company shall notify Interconnecting Customer promptly of the emergency condition. Interconnecting Customer shall notify Company promptly when it becomes aware of an emergency condition that affects the Facility that may reasonably be expected to affect the Company EPS. To the

extent information is known, the notification shall describe the emergency condition, the extent of the damage or deficiency, or the expected effect on the operation of both Parties' facilities and operations, its anticipated duration and the necessary corrective action.

7.1.(b) Routine Maintenance, Construction and Repair. Company shall have the right to disconnect the Facility from the Company EPS when necessary for routine maintenance, construction and repairs on the Company EPS. The Company shall provide the Interconnecting Customer with a minimum of seven calendar days planned outage notification consistent with the Company's planned outage notification protocols. If the Interconnecting Customer requests disconnection by the Company at the PCC, the Interconnecting Customer will provide a minimum of seven days' notice to the Company. Any additional notification requirements will be specified by mutual agreement in the Interconnection Service Agreement. Company shall make an effort to schedule such curtailment or temporary disconnection with Interconnecting Customer.

7.1.(c) Forced Outages. During any forced outage, Company shall have the right to suspend interconnection service to effect immediate repairs on the Company EPS; provided, however, Company shall use reasonable efforts to provide the Interconnecting Customer with prior notice. Where circumstances do not permit such prior notice to Interconnecting Customer, Company may interrupt Interconnection Service and disconnect the Facility from the Company EPS without such notice.

7.1.(d) Non-Emergency Adverse Operating Effects. The Company may disconnect the Facility if the Facility is having an adverse operating effect on the Company EPS or other Customers that is not an emergency, and the Interconnecting Customer fails to correct such adverse operating effect after written notice has been provided and a maximum of 45 days to correct such adverse operating effect has elapsed.

7.1.(e) Modification of the Facility. Company shall notify Interconnecting Customer if there is evidence of a material modification to the Facility and shall have the right to immediately suspend interconnection service in cases where such material modification has been implemented without prior written authorization from the Company.

7.1.(f) Re-connection. Any curtailment, reduction or disconnection shall continue only for so long as reasonably necessary. The Interconnecting Customer and the Company shall cooperate with each other to restore the Facility and the Company EPS, respectively, to their normal operating state as soon as reasonably practicable following the cessation or remedy of the event that led to the temporary disconnection.

7.2. Permanent Disconnection.

7.2.(a) The Interconnecting Customer has the right to permanently disconnect at any time with 30 days written notice to the Company.

8. Metering. Metering of the output from the Facility shall be conducted pursuant to the terms of the Interconnection Tariff.

9. Assignment. Except as provided herein, Interconnecting Customer shall not voluntarily assign its rights or obligations, in whole or in part, under this Agreement without Company's written consent. Any assignment Interconnecting Customer purports to make without Company's written consent shall not be valid. Company shall not unreasonably withhold or delay its consent to Interconnecting Customer's assignment of this Agreement. Notwithstanding the above, Company's consent will not be required for any assignment made by Interconnecting Customer to an Affiliate or as collateral security in connection with a financing transaction. In all events, the Interconnecting Customer will not be relieved of its obligations under this Agreement unless, and until the assignee assumes in writing all obligations of this Agreement and notifies the Company of such assumption.

10. Confidentiality. Company shall maintain confidentiality of all Interconnecting Customer confidential and proprietary information except as otherwise required by applicable laws and regulations, the Interconnection Tariff, or as approved by the Interconnecting Customer in the Simplified or Expedited/Standard Application form or otherwise.

11. Insurance Requirements.

11.1. General Liability.

11.1.(a) In connection with Interconnecting Customer's performance of its duties and obligations under the Interconnection Service Agreement, Interconnecting Customer shall maintain, during the term of the Agreement, general liability insurance with a combined single limit of not less than:

11.1.(a)(i) Five million dollars ($5,000,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than five (5) MW.

Exhibit G – Interconnection Service Agreement

11.1.(a)(ii) Two million dollars ($2,000,000) for each occurrence and five million dollars ($5,000,000) in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than one (1) MW and less than or equal to five (5) MW;

11.1.(a)(iii) One million dollars ($1,000,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than one hundred (100) kW and less than or equal to one (1) MW;

11.1.(a)(iv) Five hundred thousand dollars ($500,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than ten (10) kW and less than or equal to one hundred (100) kW, except for as provide below in subsection 11.1(b).

11.1.(b) Pursuant to 220 CMR §18.03(2), no insurance is required for Interconnecting Customers with facilities eligible for Class 1 Net Metering (facilities less than or equal to sixty (60) kW). However, the Company recommends that the Interconnecting Customer obtain adequate insurance to cover potential liabilities.

11.1.(c) Any combination of General Liability and Umbrella/Excess Liability policy limits can be used to satisfy the limit requirements stated above.

11.1.(d) The general liability insurance required to be purchased in this Section 11 may be purchased for the direct benefit of the Company and shall respond to third party claims asserted against the Company (hereinafter known as "Owners Protective Liability"). Should this option be chosen, the requirement of Section 11.2(a) will not apply but the Owners Protective Liability policy will be purchased for the direct benefit of the Company and the Company will be designated as the primary and "Named Insured" under the policy.

11.1.(e) The insurance hereunder is intended to provide coverage for the Company solely with respect to claims made by third parties against the Company.

11.1.(f) In the event the Commonwealth of Massachusetts, or any other governmental subdivision thereof subject to the claims limits of the Massachusetts Tort Claims Act, G.L. c. 258 (hereinafter referred to as the "Governmental Entity") is the Interconnecting Customer, any insurance maintained by the Governmental Entity shall contain an endorsement that strictly prohibits the applicable insurance company from interposing the claims limits of G.L. c. 258 as a defense in either the adjustment of any claim, or in the defense of any lawsuit directly asserted against the insurer by the Company. Nothing herein is intended to constitute a waiver or indication of intent to waive the protections of G.L. c. 258 by the Governmental Entity.

11.1.(g) Notwithstanding the requirements of section 11.1(a) through (f), insurance for certain Governmental Entity facilities may be provided as set forth in section 11.1(g)(i) and (ii) below. Nothing herein changes the provision in subsection 11.1(a)(iv) that exempts Class I Net Metering facilities (less than or equal to 60 kW) from the requirement to obtain insurance. In addition, nothing shall prevent the Governmental Entity from obtaining insurance consistent with the provisions of subsection 11.1(a) through (f), if it is able and chooses to do so.

11.1.(g)(i) For solar photovoltaic (PV) facilities with a Gross Nameplate Rating in excess of 60 kW up to 500 kW, the Governmental Entity is not required to obtain liability insurance. Any liability costs borne by the Company associated with a third-party claim for damages in excess of the claims limit of the Massachusetts Tort Claims Act, M.G.L. c. 258, and market-based premium-related costs, if any, borne by the Company associated with insurance for such third-party claims shall be recovered annually on a reconciling basis in Company rates in a manner that shall be reviewed and approved by the Department.

11.1.(g)(ii) For (a) PV facilities with a Gross Nameplate Rating in excess of 500 kW up to 5 MW, (b) wind facilities with a Gross Nameplate Rating in excess of 60 kW up to 5 MW, and (c) highly efficient combined heat and power facilities with a Gross Nameplate Rating of in excess of 60 kW up to 5 MW, the Governmental Entity is not required to obtain liability insurance, subject to the requirements of the following paragraph.

The Company shall either self-insure for any risk associated with possible third-party claims for damages in excess of the Massachusetts Tort Claims Act limit, or obtain liability insurance for such third-party claims, and the Company is authorized to charge and collect from the Governmental Entity its pro-rata allocable share of the cost of so doing, plus all reasonable administrative costs. The coverage and cost may vary with the size and type of facility, and may change (increase or decrease) over time, based on insurance market conditions, and such cost shall be added to, and paid for as part of the Governmental Entity's electric bill.

Exhibit G – Interconnection Service Agreement

11.2. **Insurer Requirements and Endorsements**. All required insurance shall be carried by reputable insurers qualified to underwrite insurance in Massachusetts having a Best Rating of "A-". In addition, all insurance shall:

11.2.(a) Include Company as an additional insured;

11.2.(b) Contain a severability of interest clause or cross-liability clause;

11.2.(c) Provide that Company shall not incur liability to the insurance carrier for payment of premium for such insurance; and

11.2.(d) Provide for thirty (30) calendar days' written notice to Company prior to cancellation, termination, or material change of such –insurance;

11.2.(e) Provided that to the extent the Interconnecting Customer is satisfying the requirements of subpart (d) of this paragraph by means of a presently existing insurance policy, the Interconnecting Customer shall only be required to make good faith efforts to satisfy that requirement and will assume the responsibility for notifying the Company as required above.

11.2.(f) If the requirement of clause (a) in the paragraph above prevents Interconnecting Customer from obtaining the insurance required without added cost or due to written refusal by the insurance carrier, then upon Interconnecting Customer's written Notice to Company, the requirements of clause (a) shall be waived.

11.3. **Evidence of Insurance**. Evidence of the insurance required shall state that coverage provided is primary and is not in excess to or contributing with any insurance or self-insurance maintained by Interconnecting Customer.

The Interconnecting Customer is responsible for providing the Company with evidence of insurance in compliance with the Interconnection Tariff on an annual basis.

Prior to the Company commencing work on System Modifications, and annually thereafter, the Interconnecting Customer shall have its insurer furnish to the Company certificates of insurance evidencing the insurance coverage required above. The Interconnecting Customer shall notify and send to the Company a certificate of insurance for any policy written on a "claims-made" basis. The Interconnecting Customer will maintain extended reporting coverage for three years on all policies written on a "claims-made" basis.

In the event that an Owners Protective Liability policy is provided, the original policy shall be provided to the Company

11.4. **Self Insurance**. If Interconnecting Customer has a self-insurance program established in accordance with commercially acceptable risk management practices. Interconnecting Customer may comply with the following in lieu of the above requirements as reasonably approved by the Company:

11.4.(a) Interconnecting Customer shall provide to Company, at least thirty (30) calendar days prior to the Date of Initial Operation, evidence of such program to self-insure to a level of coverage equivalent to that required.

11.4.(b) If Interconnecting Customer ceases to self-insure to the standards required hereunder, or if Interconnecting Customer is unable to provide continuing evidence of Interconnecting Customer's financial ability to self-insure, Interconnecting Customer agrees to promptly obtain the coverage required under Section 11.1.

11.4.(c) This section shall not allow any Governmental Entity to self-insure where the existence of a limitation on damages payable by a Government Entity imposed by the Massachusetts Tort Claims Act, G.L. c. 258, or similar law, could effectively limit recovery (by virtue of a cap on recovery) to an amount lower than that required in Section 11.1(a).

11.5. All insurance certificates, statements of self-insurance, endorsements, cancellations, terminations, alterations, and material changes of such insurance shall be issued and submitted to the following:

National Grid
Attention: **Risk Management**
300 Erie Blvd West
Syracuse, NY 13202

12. **Indemnification**. Except as the Commonwealth is precluded from pledging credit by Section 1 of Article 62 of the Amendments to the Constitution of the Commonwealth of Massachusetts, and except as the Commonwealth's cities and towns are precluded by Section 7 of Article 2 of the Amendments to the Massachusetts Constitution from pledging their

credit without prior legislative authority, Interconnecting Customer and Company shall each indemnify, defend and hold the other, its directors, officers, employees and agents (including, but not limited to, Affiliates and contractors and their employees), harmless from and against all liabilities, damages, losses, penalties, claims, demands, suits and proceedings of any nature whatsoever for personal injury (including death) or property damages to unaffiliated third parties that arise out of or are in any manner connected with the performance of this Agreement by that Party except to the extent that such injury or damages to unaffiliated third parties may be attributable to the negligence or willful misconduct of the Party seeking indemnification.

13. **Limitation of Liability**. Each Party's liability to the other Party for any loss, cost, claim, injury, liability, or expense, including court costs and reasonable attorney's fees, relating to or arising from any act or omission in its performance of this Agreement, shall be limited to the amount of direct damage or liability actually incurred. In no event shall either Party be liable to the other Party for any indirect, incidental, special, consequential, or punitive damages of any kind whatsoever.

14. **Amendments and Modifications**. No amendment or modification of this Agreement shall be binding unless in writing and duly executed by both Parties.

15. **Permits and Approvals**. Interconnecting Customer shall obtain all environmental and other permits lawfully required by governmental authorities for the construction and operation of the Facility. Prior to the construction of System Modifications the Interconnecting Customer will notify the Company that it has initiated the permitting process. Prior to the commercial operation of the Facility the Interconnecting Customer will notify the Company that it has obtained all permits necessary. Upon request the Interconnecting Customer shall provide copies of one or more of the necessary permits to the Company.

16. **Force Majeure**. For purposes of this Agreement, "Force Majeure Event" means any event:

16.1. That is beyond the reasonable control of the affected Party; and

16.2. That the affected Party is unable to prevent or provide against by exercising commercially reasonable efforts, including the following events or circumstances, but only to the extent they satisfy the preceding requirements: acts of war or terrorism, public disorder, insurrection, or rebellion; floods, hurricanes, earthquakes, lightning, storms, and other natural calamities; explosions or fire; strikes, work stoppages, or labor disputes; embargoes; and sabotage. If a Force Majeure Event prevents a Party from fulfilling any obligations under this Agreement, such Party will promptly notify the other Party in writing, and will keep the other Party informed on a continuing basis of the scope and duration of the Force Majeure Event. The affected Party will specify in reasonable detail the circumstances of the Force Majeure Event, its expected duration, and the steps that the affected Party is taking to mitigate the effects of the event on its performance. The affected Party will be entitled to suspend or modify its performance of obligations under this Agreement, other than the obligation to make payments then due or becoming due under this Agreement, but only to the extent that the effect of the Force Majeure Event cannot be mitigated by the use of reasonable efforts. The affected Party will use reasonable efforts to resume its performance as soon as possible. In no event will the unavailability or inability to obtain funds constitute a Force Majeure Event.

17. **Notices**.

17.1. Any written notice, demand, or request required or authorized in connection with this Agreement ("Notice") shall be deemed properly given on the date actually delivered in person or five (5) Business Days after being sent by certified mail, e-mail or fax with confirmation of receipt and original follow-up by mail, or any nationally-recognized delivery service with proof of delivery, postage prepaid, to the person specified below:

If to Company:
National Grid
Attn: **Distributed Generation**
40 Sylvan Rd
Waltham, MA 02451
E-mail: **Distributed.Generation@nationalgrid.com**

If to Interconnecting Customer:
SunRaise Development, LLC
Attn: **Bobby Lambert**
200 Marcy St, Suite 102
Portsmouth, NH 03801
E-mail: **bob@sunraiseinvestments.com & matt@sunraiseinvestments.com**
Phone: **603-767-5913**

Exhibit G – Interconnection Service Agreement

17.2. A Party may change its address for Notices at any time by providing the other Party Notice of the change in accordance with Section 17.1.

17.3. The Parties may also designate operating representatives to conduct the daily communications, which may be necessary or convenient for the administration of this Agreement. Such designations, including names, addresses, email addresses, and phone numbers may be communicated or revised by one Party's Notice to the other.

18. Default and Remedies.

18.1. Defaults. Any one of the following shall constitute "An Event of Default."

18.1.(a) One of the Parties shall fail to pay any undisputed bill for charges incurred under this Agreement or other amounts which one Party owes the other Party as and when due, any such failure shall continue for a period of thirty (30) days after written notice of nonpayment from the affected Party to the defaulting Party, or

18.1.(b) One of the Parties fails to comply with any other provision of this Agreement or breaches any representation or warranty in any material respect and fails to cure or remedy that default or breach within sixty (60) days after notice and written demand by the affected Party to cure the same or such longer period reasonably required to cure (not to exceed an additional 90 days unless otherwise mutually agreed upon), provided that the defaulting Party diligently continues to cure until such failure is fully cured.

18.2. **Remedies**. Upon the occurrence of an Event of Default, the affected Party may at its option, in addition to any remedies available under any other provision herein, do any, or any combination, as appropriate, of the following:

18.2.(a) Continue to perform and enforce this Agreement;

18.2.(b) Recover damages from the defaulting Party except as limited by this Agreement;

18.2.(c) By written notice to the defaulting Party terminate this Agreement;

18.2.(d) Pursue any other remedies it may have under this Agreement or under applicable law or in equity.

19. **Entire Agreement**. This Agreement, including any attachments or appendices, is entered into pursuant to the Interconnection Tariff. Together the Agreement and the Interconnection Tariff represent the entire understanding between the Parties, their agents, and employees as to the subject matter of this Agreement. Each Party also represents that in entering into this Agreement, it has not relied on any promise, inducement, representation, warranty, agreement or other statement not set forth in this Agreement or in the Company's Interconnection Tariff.

20. **Supersedence**. In the event of a conflict between this Agreement, the Interconnection Tariff, or the terms of any other tariff, Exhibit or Attachment incorporated by reference, the terms of the Interconnection Tariff, as the same may be amended from time to time, shall control. In the event that the Company files a revised tariff related to interconnection for Department approval after the effective date of this Agreement, the Company shall, not later than the date of such filing, notify the signatories of this Agreement and provide them a copy of said filing.

21. **Governing Law**. This Agreement shall be interpreted, governed, and construed under the laws of the Commonwealth of Massachusetts without giving effect to choice of law provisions that might apply to the law of a different jurisdiction.

22. **Non-waiver**. None of the provisions of this Agreement shall be considered waived by a Party unless such waiver is given in writing. The failure of a Party to insist in any one or more instances upon strict performance of any of the provisions of this Agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provisions or the relinquishment of any such rights for the future, but the same shall continue and remain in full force and effect.

23. **Counterparts**. This Agreement may be signed in counterparts.

24. **No Third Party Beneficiaries**. This Agreement is made solely for the benefit of the Parties hereto. Nothing in the Agreement shall be construed to create any rights in or duty to, or standard of care with respect to, or any liability to, any person not a party to this Agreement.

25. **Dispute Resolution**. Unless otherwise agreed by the Parties, all disputes arising under this Agreement shall be resolved pursuant to the Dispute Resolution Process set forth in the Interconnection Tariff.

26. **Severability**. If any clause, provision, or section of this Agreement is ruled invalid by any court of competent jurisdiction, the invalidity of such clause, provision, or section, shall not affect any of the remaining provisions herein.

Exhibit G – Interconnection Service Agreement

27. Signatures. IN WITNESS WHEREOF, the Parties hereto have caused two (2) originals of this Agreement to be executed under seal by their duly authorized representatives.

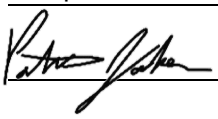
SunRaise Development, LLC:		National Grid:	
Name:	Patrick Jackson	Name:	Jeffrey Crompton
Title:	Manager	Title:	Senior Energy Integration Consultant
Date:	September 7, 2018	Date:	9/7/2018
Signature:		Signature:	

Exhibit G – Interconnection Service Agreement

Attachment 1: Description of Facilities, including demarcation of Point of Common Coupling

Interconnecting Customer has proposed a 4,998 kW photovoltaic (PV) generating system at 235 Valley Street, Pembroke, MA 02359. ("Facility") The proposed Facility is an Independent Power Producer (IPP). The Facility will interconnect to the National Grid electric system via the distribution feeder 910W25 which originates at the 13.8 kV Water Street Substation in Pembroke, MA.

Description of proposed design/configuration: The three-phase 4,998 kW photovoltaic (PV) generating system consists of:

- Three (3) Customer owned 1,666 kW Schneider CS1666 for a total of 4,998 kW of inverter based PV
- Three (3) Customer owned 2,000 kVA wye-ground delta interface transformer [13.8kV/575V, 5.75% impedance, X/R of 7.5] each grounded through a 20Ω neutral grounding reactor.
- One (1) Customer owned 15 kV rated pad mounted switchgear with an SEL 651R relay assembly.
- One (1) Customer owned 15 kV rated gang operated load break disconnect switch, lockable and visible when open, accessible to Company personnel 24/7

Metering: The Company will install one (1) pole-mounted primary meter. Please refer to ESB 750 and ESB 756 for service installation and primary meter installation. Interconnecting Customer has expressed an interest in the Facility participating in the Solar Massachusetts Renewable Target ("SMART") program when that program is fully in effect. As the Department of Public Utilities has not yet approved the SMART tariffs, this ISA does not include the revenue grade meters or related metering equipment, installation work or costs that are likely to be required for the Facility to participate in the SMART program. Additional meter requirements and cost will be determined after approval of the SMART Tariff. The Customer will be responsible for meeting all relevant requirements included in the approved SMART Tariff.

PCC: The Point of Common Coupling ("PCC") will be designated as the Company's side of the Customer's pole-mounted primary meter at Pole #37-3. The Company's Design Personnel will specify the exact location of the Company's facilities and installation details. The Customer shall provide unencumbered direct access to the Company's facilities along an accessible plowed driveway or road, where the equipment is not behind the Customer's locked gate. In those cases where Company equipment is required to be behind the Customer's locked gate, double locking, with both the Company's and Customer's locks shall be employed.

Should the Customer elect to move forward with the Project, the Company's Design Personnel will specify the exact location of the Company's facilities and installation details. The Customer shall be responsible for obtaining all easements and permits required for any line extension not on public way in accordance with the Company's requirements.

The Customer shall provide unencumbered direct access to the Company's facilities along an accessible plowed driveway or road, where the equipment is not behind the Customer's locked gate. In those cases where Company equipment is required to be behind the Customer's locked gate, double locking, with both the Company's and Customer's locks shall be employed.

Attachment 2: Description of System Modifications

National Grid's System Modifications required for the interconnection of the Facility are as follows:

On the Customer's property:

- Install one (1) primary revenue metering assembly
- Install one (1) gang operated load break
- Install one (1) recloser
- Install three (3) 45'-0" poles
- Install approximately 150' of 1/0 overhead conductor

On the Company's property:

- Reconductor approximately ~3,500' circuit feet from single phase 1/0 AAAC to three phase 477 AAC spacer from Pole 53 Forest to Pole 38 Valley Street.
- Install one (1) recloser at Pole 19 Standish Street capable of live line reclose blocking. Installation includes two poles, three line disconnect switches, and three phase 10 kVA transformer bank.
- Install one (1) recloser at Pole 15-51 Valley Street capable of live line reclose blocking. Installation includes two poles, three line disconnect switches, and three phase 10 kVA transformer bank.
- Install three (3) line regulators at pole 21 Hobomock Street and add settings. Installation includes three poles, three line disconnect switches, and the removal of one pole
- Remove three (3) 100T fuses at Pole 31 Lake Street
- Remove one (1) 65T fuse at Pole 15 Forest Street

Exhibit G – Interconnection Service Agreement

At the Water Street Substation:

- Install Ground Fault Detection (3V0) on the Water Street Substation transformers T910
- Substation modifications to breaker settings

It will be the responsibility of the Interconnecting Customer, at its sole cost and expense, to secure and obtain in favor of itself and the Company, the following: any and all rights, consents, permits, approvals, and easements (free and clear from any encumbrances), as are required for the Company's System Modifications on any Interconnecting Customer-owned property or any third-party owned property ("Third Party Rights and Approvals"). The Interconnecting Customer shall use the Company's standard form when obtaining all Third Party Rights and Approval, as applicable. The Company will seek to obtain, at the Interconnecting Customer's sole cost and expense, any and all rights, consents, permits, approvals, and easements for the System Modifications on any Company owned property or within any public roadway as the Company determines necessary in its sole discretion ("Other Rights and Approvals"; together with Third Party Rights and Approvals referred to as "System Modification Required Approvals"). The Interconnecting Customer will fully cooperate with the Company in obtaining the Other Rights and Approvals. The Company shall not be required to accept any System Modification Required Approvals that are not in form or on terms satisfactory to the Company in its sole discretion, or that impose additional liabilities or costs on the Company. The Company shall not be required to appeal or challenge the denial of any System Modification Required Approvals or the imposition of any unsatisfactory term or condition. The Company shall not be obligated to commence the construction of the System Modifications unless and until it has received all System Modification Required Approvals in accordance with this provision, and Sections 6.4 and 15 of this Agreement, above, and the Company's Terms and Conditions for Distribution Service, tariff M.D.P.U. No. 1320, as amended from time to time.

Attachment 3: Costs of System Modifications and Payment Terms

The estimated known costs for Total System Modifications associated with the interconnection of the facility are $[redacted], itemized as follows:

- System modifications on Customer's property, on the Company's distribution system and at the Water Street Substation are: [redacted] (includes capital, removal, and O&M costs) and detailed below:
  - Cost for the required system modifications on the Customer's property [redacted] (includes capital, removal, and O&M costs)
  - Cost for the required system modifications on the Company's distribution system is [redacted] (includes capital, removal, and O&M costs)
  - Cost for the facility specific system modifications at Water Street Substation T910 (MECo) distribution level is [redacted] (includes capital, removal, and O&M costs)
  - Cost for the facility specific system modifications at Water Street Substation T910 (NEP) transmission level is [redacted] (includes capital, removal, and O&M costs)
- Witness testing, engineering review, EMS Integration and implementation of protective device settings: [redacted]
- Tax gross-up adder: [redacted] (*A 2019 tax rate of 16.52% is expected to apply to contributions in aid of construction ("CIAC") payments received by Massachusetts Electric Company from the Interconnecting Customer and a 2019 tax rate of 12.54% is expected to apply to CIAC payments received by New England Power Company for interconnections placed in service prior to 2020. The calculation of the tax gross-up adder is included in this cost estimate on the basis of tax guidance published by the Internal Revenue Service, but tax rates and decisions are ultimately subject to IRS discretion. By signing this agreement, the Interconnecting Customer understands and agrees that the tax has been estimated for convenience and that the Interconnecting Customer remains liable for all tax due on CIAC payments, payable upon the Company's demand.*)

To the extent that the Company's terms and conditions and/or tariffs allow, the Company will refund the appropriate portion of system modification costs to the interconnecting Customer as required by the applicable tariff.

The system modification costs were developed by the Company with a general understanding of the project and based upon information provided by the Interconnecting Customer in writing and/or collected in the field. The cost estimates were prepared using historical cost data, data from similar projects, and other assumptions, and while they are presumed valid for 60 business days from the date of the Impact Study, the Company reserves the right to adjust those estimated costs as authorized under this Agreement, the Tariff, or by law and to require the Interconnecting Customer to pay any such additional costs.

Exhibit G – Interconnection Service Agreement

Payment Terms:

System Modifications Costs may be paid in full, or in two scheduled payments:

- The first payment of 25% of the estimated cost or [redacted] is due within 120 business days from the day of execution of this agreement. Upon receipt of the first payment, the Company will initiate the detailed design.
- The last payment of 75% of total cost or [redacted] is due no later than 120 business days after the first payment is due or received, whichever is earlier.
- The Company is not required to begin construction until all payments are received.

Nothing herein shall prevent the Interconnecting Customer from making any payment, or the full payment, due to the Company earlier than the dates provided above. Funds received may be immediately expended or committed as determined by the Company in its sole discretion.

Attachment 4: Special Operating Requirements

1. Interconnecting Customer shall adhere to the following standards which are incorporated in their entirety by reference:

   a. National Grid's Standards for Interconnecting Distributed Generation (M.D.P.U. 1320), available at: https://www.nationalgridus.com/non_html/shared_interconnectStds.pdf

   b. Electric System Bulletin 750 "Specifications for Electrical Installations". ESB 750, available at: http://www.nationalgridus.com/non_html/shared_constr_esb750.pdf

   c. Electric System Bulletin 756 "Requirements for Parallel Generation Connected to a National Grid-Owned EPS". ESB756C, available at: www.nationalgridus.com/non_html/shared_constr_esb756.pdf

2. Interconnecting Customer shall adhere to the requirements identified in the Impact Study dated 9/4/2018.
3. Interconnecting Customer shall provide Compliance Documentation, including photographs, as requested by, and to the satisfaction of, the Company.
4. Interconnecting Customer may not be allowed to operate with the local EPS in an abnormal state. To ensure the safe and reliable operation of National Grid's EPS, National Grid may disconnect the Customer at the PCC when abnormal system conditions develop and/or circuit reconfiguration takes place on the EPS.
5. Interconnecting Customer may only generate onto the feeder referenced in the Impact Study. For systems with redundant relaying, National Grid's Regional Control Center must first give permission to the customer to allow the operation of their system.
6. Per section 6.4 of this agreement, Interconnecting Customer shall provide an external AC UTILITY DISCONNECT, accessible at all times by National Grid personnel.
7. Interconnecting Customer's AC UTILITY DISCONNECT switch shall be labeled "AC UTILITY DISCONNECT".
8. The AC UTILITY DISCONNECT shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The visible break requirement can be met by opening the enclosure to observe the contact separation. The Company shall have the right to open this disconnect switch in accordance with the Interconnection Tariff. The switch has to be installed at the DR output on the current carrying lines. Shunt mechanisms are not permitted.
9. If the AC UTILITY DISCONNECT switch is not adjacent to the meter and/or PCC, Interconnecting Customer shall provide a permanent plaque locating the switch.
10. All plaques as described in NEC 705.10, 705.12 (7), 690.56, 692.4 and 705.70 shall be installed, as applicable.

Exhibit G – Interconnection Service Agreement

11. All Interconnecting Customer-Owned meters shall be labeled "CUSTOMER-OWNED METER"

12. Interconnecting Customer shall install a permanent plaque or directory at the revenue meter and at the PCC with a warning about the generator(s) installed.

13. Interconnecting Customer shall be responsible for providing necessary easements and/or environmental and/or municipal permits, as requested by Company.

14. For systems greater than 60kW, Interconnecting Customer shall provide a means of communication to the National Grid revenue meter. This may be accomplished with an analog/POTS (Plain Old Telephone Service) phone line (capable of direct inward dial without human intervention or interference from other devices such as fax machines, etc.), or – in locations with suitable wireless service, a wireless meter. Feasibility of wireless service must be demonstrated by Interconnecting Customer, to the satisfaction of National Grid. If approved, a wireless-enabled meter will be installed, at the customer's expense. If and when National Grid's retail tariff provides a mechanism for monthly billing for this service, the customer agrees to the addition of this charge to their monthly electric bill. Interconnecting Customer shall have the option to have this charge removed, if and when a POTS phone line to National Grid's revenue meter is provided.

15. For systems with redundant relaying, Company witness testing will be required. Customer shall develop, and provide for approval, a functional test procedure, including settings for relaying scheme. Witness test plan must be approved by Company prior to scheduling Company personnel for witness test.

16. Interconnecting Customer's protection scheme submitted for review must meet National Grid's specific protection requirements. Interconnecting Customer shall submit a PE stamped one-line, including relay settings, that meets the requirements specified within this document to National Grid for review and approval, before a Witness Test plan can be reviewed. Please refer to "Standard Process Completion Documentation Checklist", per Company's website for additional required documentation.

17. For photovoltaic (PV) interconnections, and in order to minimize the impact on the EPS and area customers, Interconnecting Customer shall maintain the reactive contribution of the Facility between a 99% leading and lagging power factor at the PCC.

18. Interconnecting Customer shall not contribute to greater than a 3.0% change in voltage on the Company's EPS under any conditions.

19. Interconnecting Customer shall provide a large scale site one-line, to be installed near the PCC, identifying locations of all electrical equipment and their disconnecting means. This shall be developed with assistance from the Company.

20. Interconnecting Customer shall provide and maintain suitable 24-hour access to Company equipment. Access to Company equipment shall be free from vegetation, at level grade, and to Company satisfaction.

Attachment 5: Agreement between the Company and the Company's Retail Customer

If the Company's Retail Customer (account holder) is not the owner (and/or operator) of the Facility, then Exhibit H - Agreement Between the Company and the Company's Retail Customer - shall be signed by the Company's Retail Customer and executed by the Company, and shall be considered part of this Interconnection Service Agreement. It shall be the responsibility of the Interconnecting Customer to notify the Company if the Exhibit H associated with this application changes.

Exhibit G – Interconnection Service Agreement

Attachment 6: Landowner Consent Agreement

The Landowner Consent Agreement ("Exhibit I") must be executed when the Facility will be located on property owned by a party other than the Customer or Interconnecting Customer ("Landowner"). The Interconnecting Customer shall obtain and deliver to the Company Exhibit I, executed by the Landowner, and shall provide any additional title documentation requested by the Company. Exhibit I is incorporated herein by reference, and shall be considered an attachment to this Agreement. Exhibit I is in addition to any other System Modification Required Approvals required by the Company in accordance with this Agreement. It is the Interconnecting Customer's responsibility to notify the Company if the Landowner changes, and, if determined necessary by the Company, as a condition to continued interconnection to the Company's EPS, to provide an updated executed Exhibit I.

Attachment 7 - Appendix A: System Modifications Construction Schedule

Above is an estimated construction schedule. This schedule is conceptual, and shows the duration of the facility's milestones from a "start-date" to an "in-service" date, in calendar days. This conceptual schedule is based upon assumptions and knowledge regarding the project, the site, and activities as of the date of the impact study. These estimations of construction time frames and total duration do not include any time that the Company's performance is on hold, delayed, or interrupted, including, without limitation, while waiting on information or on the performance of obligations by the Interconnecting Customer and/or third parties (including, without limitation, Verizon), as a result of unknown environmental and/or permitting issues, events of force majeure, and/or as a result of required transmission outages.

The start-date for this construction schedule is deemed to have occurred once : (1) the Interconnection Service Agreement ("ISA") has been executed (i.e., signed) by both National Grid ("Company") and the Interconnecting Customer ("Customer"); and (2) the first payment has been submitted by the Customer to the Company, provided , however, that the Company shall not be required to provide any services or order any equipment without receiving adequate payment therefore from the Interconnecting Customer nor will it be required to initiate any construction before it has received full payment from the Interconnecting Customer.

Total Duration: 65 weeks*
The duration represents the estimated-total number of weeks National Grid will work on this project.

Milestone	Estimated duration	Responsible party
Start	First Payment	Customer
Review and accept construction plans for major interconnection equipment (e.g., pole(s), recloser(s), and equipment layout, etc.).	5 Weeks	National Grid
Design service connection facilities and distribution system modifications.	18 Weeks	National Grid
Design service connection facilities and substation system modifications.	42 Weeks	National Grid
Secure required permits/easements and petition for National Grid work.	12 Weeks	Customer & National Grid
Schedule Coordination	6 Weeks	National Grid
Submit final payment.	As per ISA	Customer
Construct service connection facilities and distribution upgrades.	18 Weeks	National Grid
Construct service connection facilities and substation upgrades.	23 Weeks	National Grid
Complete all functional tests and verifications, including third-party electrical inspection.	Three (3) Weeks	Customer & National Grid
Facility in-service.	One (1) Week	Customer & National Grid

APPENDIX F

Decommissioning Plan

SWCA ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.®

Amherst Office
15 Research Drive
Amherst, Massachusetts 01002
Tel 413.256.0202 Fax 413.256.1092

April 29, 2019

Pat Jackson
Valley Road Solar, LLC
200 Marcy Street
Portsmouth, NH 03801
via email: pat@sunraiseinvestments.com

Re: Decommissioning Estimate
Valley Road Solar, LLC
Pembroke, MA

Dear Mr. Jackson:

In preparation for the Town of Pembroke Planning Board's review of the solar project located at 221 Valley Street, we have prepared an opinion of probable costs for decommissioning your proposed facility. According to V(3.6) "Performance Guarantee" of the Pembroke Zoning Bylaws,

> *Performance Guarantee: The Board, at its discretion, may require or accept a bank or certified check from the applicant/controller of the land/project, in an amount acceptable to the board, as a guarantee of performance of unfinished work to the development.*

If the site were to be decommissioned the major steps would be removal of the panels, racking system, and fence, disassembly of the electrical network, removal of any cast-in-place concrete pads and the access road, followed by fine grading and seeding of the former array area. This estimate is based on a 17.72-acre array (inside the fenceline), rated at 6.14 MW(DC), with an access road area of approximately 0.25 acres, and three proposed equipment pads.

Table 1. Proposed Decommissioning Costs for Valley Road Solar, LLC

Task Description	One-Phase Quantity	Unit	Unit Cost	One-Phase Task Cost
Remove Panels and pack for shipping	17.72	AC	$800	$14,176
Pull racking, posts, fence and haul off	17.72	AC	$1,200	$21,264
Remove concrete equipment pads	3	EA	$2,000	$6,000
Disassemble wiring, conduit, inverters	6.14	MW	$4,000	$24,560
Excavate access road bed and haul off	0.25	AC	$12,500	$3,125
Fine grade site, stabilize, and seed	17.72	AC	$750	$13,290
Potential Site Restoration Costs:				$82,415

This opinion is based on our own work with several solar projects in Massachusetts and submittals or correspondence by other applicants available in the public record. There is no allowance for the salvage value of the project components. In our experience there is a significant perceived salvage value to the array infrastructure, but it is not included in case market conditions are poor.

During the preparation of this opinion we reviewed predicted decommissing costs for over ten sites in the state, these ranged in size from 1.5 to 7 MW. The $/MW removal costs ranged from $7,500 to $29,000. Taking the normalized average of these values (total costs over total generation) results in an average removal cost of $17,000 per MW. The cost per MW for this site is approximately $13,425. As another check, the cost of $82,415 applied to a restoration area of 17.72 acres indicates a cost of approximately $4,650/acre which is reasonable from a sitework and restoration perspective.

We propose these figures and specifically the cost of $82,415 be used in your discussion with the Town to establish a financial surety for the project. Our preference is that SunRaise and the Town of Pembroke agree to the details of this surety, its timing, and the type of instrument to be executed. We will certainly review this opinion with you and the Town to facilitate the discussion. If you have any questions or require additional information please do not hesitate to contact me by phone at (603) 558-1142, or by email at kevin.mccaffery@swca.com.

Sincerely,

Kevin A. McCaffery, PE
Senior Civil Engineer

APPENDIX G

Operations and Maintenance Plan

SWCA ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.®

Amherst Office
15 Research Drive
Amherst, Massachusetts 01002
Tel 413.256.0202 Fax 413.256.1092

OPERATIONS AND MAINTENANCE (O&M) PLAN

Valley Road Solar, LLC Solar Development
221 Valley Street,
Pembroke, Massachusetts

Operations and maintenance shall begin once the Utility has provided approval to operate for the solar system. Access to the site shall be provided from the existing access road. Locks shall be installed on all new gates. Access shall be provided to the Pembroke Fire Department with the use of a Knox Box located outside the exterior gate.

The owner will proactively monitor system performance and operations daily for regular expected performance and performance irregularities, and all alerts from the System DAS and/or inverters.

The following tasks will be conducted during inspections that take place twice a year:

1. Repairs to the solar energy collecting and distribution equipment will be made as needed. For the inverters, this will include:
    a. Evaluating the inverters and equipment following installation to confirm proper installation.
    b. Confirm the inverters are secure and properly grounded.
    c. Confirm the termination is to manufacturer specifications.
    d. Confirm all wires are color coded correctly and remain protected from physical damage.
    e. Confirm the equipment is free from debris, moisture, rust and damage.
    f. Confirm the inverters seals are intact.
    g. Confirm Arc shields are installed.
    h. Confirm placards are installed.
    i. Maintain service clearance to the inverters and maintain access to all filters.
    j. Confirm the coolant pressure is acceptable.
    k. Confirm the ground fault fuses are intact and check any fault codes that are displayed.
    l. Evaluate any thermal anomalies observed.
    m. Annually, an IV Curve Trace will be conducted and inferred scans.
2. Inspections of the perimeter fence, solar array and connecting infrastructure will be made by the maintenance contractor during each visit.
3. Repairs to the security fence shall be made as necessary.
4. The fence panels will be maintained at approximately 6-inches off the ground to permit movement of ground dwelling animals.
5. Access roads will be maintained as needed.
6. Any erosion in the access roads shall be repaired and stabilized.

The seed mix proposed for use beneath the panels is a custom pollinator/wildflower seed mix, which includes low growing plant species. The area beneath the panels will be cut once a year. Any large woody vegetation or vegetation that has self-seeded and blocks sun from the panels will be removed, as needed.

APPENDIX H

Liability Insurance

Client#: 449597 SUNRAINVES1

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 4/04/2019

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer any rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Mike Petro
Marsh & McLennan Agency LLC Marsh & McLennan Ins. Agency LLC PO Box 85638 San Diego, CA 92186	PHONE (A/C, No, Ext): 858 587-7593 FAX (A/C, No): 858 909-9789 E-MAIL ADDRESS: mike.petro@marshmma.com

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Great Northern Insurance Company	20303
INSURER B : Federal Insurance Company	20281
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
Valley Road Solar, LLC
26 Market Square
Portsmouth, NH 03801

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE / X OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY / PRO-JECT / LOC OTHER:	X	X	37115538	11/12/2018	11/12/2019	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$1,000,000 $1,000,000 $10,000 $1,000,000 $2,000,000 $2,000,000
B	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY / SCHEDULED AUTOS HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY			73591596	11/12/2018	11/12/2019	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$1,000,000 $ $ $
B	X UMBRELLA LIAB / X OCCUR EXCESS LIAB / CLAIMS-MADE DED / RETENTION $			79762955	11/12/2018	11/12/2019	EACH OCCURRENCE AGGREGATE	$10,000,000 $10,000,000
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N: N (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		71756416	09/15/2018	09/15/2019	X PER STATUTE / OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $1,000,000 $1,000,000 $1,000,000
A	Property			37115538	11/12/2018	11/12/2019		

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

RE: 235 Valley St, Pembroke, MA 02359

Proof of coverage.

CERTIFICATE HOLDER

Valley Road Solar, LLC
26 Market Square
Portsmouth, NH 03801

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE