STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

BR BENSON MINES SOLAR PROJECT

TOWN OF CLIFTON
ST. LAWRENCE COUNTY, NEW YORK

IN COMPLIANCE WITH THE

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION GENERAL PERMIT GP-0-20-001
FOR
STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

Prepared for:

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1.0 Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared by TRC for BR Project 1, LLC, (hereinafter “Owner/Operator”) a Single Purpose Project Holding Company formed by the New York State Research and Development Authority (NYSERDA) pursuant to Public Authorities Law section 1902 (5), Owner/Operator in regard to construction activities associated with the BR Benson Mines Solar Project (the Project).

The purpose of this SWPPP is to establish requirements and instructions for the management of construction-related stormwater discharges from the Project Site. Erosion and sediment controls have been designed and shall be installed and maintained to minimize the discharge of pollutants and prevent a violation of the water quality standards.

2.0 Regulatory Requirements

This SWPPP has been prepared in accordance with the “New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity” General Permit GP-0-20-001, effective January 29, 2020 through January 28, 2025. The NYSDEC requires coverage under GP-0-20-001 for any “construction activities involving soil disturbances of one or more acres; including disturbances of less than one acre that are part of a larger common plan of development or sale that will ultimately disturb one or more acres of land; excluding routine maintenance activity that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility.”

The Project is classified as a commercial-scale solar project. Per Table 2 of GP-0-20-001 Appendix B, the Project involves construction activities that require the preparation of a SWPPP that includes post-construction stormwater management practices designed in conformance with Part III.B.2 of the permit. A copy of the General Permit GP-0-20-001 is provided in Appendix B of this SWPPP. Section 10 of this SWPPP details the original stormwater analysis and design performed for the Project and submitted in the February 2022 SWPPP, as well as an alternative design based on changes to hydrologic soil group classification as of July 2022.

The Project shall comply with all applicable local, state, Adirondack Park Agency (APA) and federal regulations. Agency consultation information obtained to date is contained within Appendix E. Agency correspondence and notifications obtained during construction shall be included in Appendix D of the SWPPP.

3.0 Permit Coverage Information

This SWPPP serves as the minimum requirements necessary to address soil exposure and stormwater management during construction activities. This SWPPP is a living document that may be amended for unforeseen circumstance and or substantive changes to the Project. If unanticipated site conditions warrant changes or additions to existing practices, the Owner/Operator and the Contractor(s), in consultation with the Qualified Inspector or Project Engineer, will be required to implement those measures in accordance with the New York State Standards and Specifications for Erosion and Sediment Control (SSESC) and the New York State Stormwater Management Design Manual 2015 (SMDM) and amendments to the SWPPP shall be made as appropriate. The SWPPP and associated documentation must be kept current to ensure the erosion and sediment control practices are accurately documented.

In accordance with GP-0-20-001, documented site inspections will be performed to ensure the required erosion and sediment control measures have been installed properly and are in good condition. Inspections will occur for the duration of construction, until earth-disturbing construction activities have ceased, and final stabilization has been achieved.

4.0 SWPPP Amendments

This SWPPP has been prepared in accordance with the General Permit, SSESC and the SMDM. The SWPPP and associated documents must be kept current at all times. Amendments to the SWPPP and associated documents, including construction drawings, should be made:

- Whenever the current provisions are ineffective in minimizing impacts to the stormwater discharge from the Project Site;
- Whenever there is a change in design or construction activities and sequencing that has or could have an impact to the stormwater discharge; and
- To address deficiencies or issues identified during monitoring and inspection.

Refer to GP-0-20-001 for additional information on SWPPP amendment procedures and requirements. Amendments to the SWPPP shall be documented in Appendix N.

5.0 Project Site Information

The Project Site is located in the Town of Clifton, St. Lawrence County, New York. The Project Site is located within the NYSDEC Region 6 jurisdiction and the Newton Falls and Oswegatchie United States Geological Survey (USGS) 7.5 Minute Topographic Quadrangles. The Project Site location is depicted in Figure 1 of Appendix E.

The Project proposes the installation of approximately 113 acres of solar arrays and associated Project components. The general scope of work for the Project which may result in soil disturbance includes, but is not limited to, site clearing, grading, horizontal directional drilling (HDD), and installation of the solar arrays and perimeter fencing, electric collection lines, inverter pads, access roads, culverts, stormwater management practices, and erosion and sediment controls.

The existing groundcover of the Project Site is composed primarily of sparce forest land, gravel, and mine tailings material. The site topography ranges from relatively flat to steep, generally sloping to the south.

A review if the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) Cultural Resource Information System (CRIS) database indicates the Project is not located within an archaeologically sensitive area and does not contain sites that are listed or eligible for listing on the National or State Registers of Historic Places. Consultations with SHPO concurred the Project will not impact properties listed or eligible for listing for the New York State and National Registers of Historic Places. The Project is not located within an area of significant natural communities or rare plant or animal species. Refer to the Construction Drawings in SWPPP Appendix F, and Appendix E for additional Project Site land cover, environmental resources and consultation information, and topographic information.

The Project ultimately discharges to Little River (NYSDEC Class D) and associated tributaries located north and west of the Project Site and to an existing ponded wetland located southwest of the Project Site. The Project Site does not directly discharge into Little River, does not discharge to a 303(d) waterbody segment listed in Appendix E of GP-0-20-001, and is not located within a restricted watershed listed in Appendix C of GP-0-20-001, an AA or AA-s watershed, or a Sole Source Aquifer.

A review of the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel 361173B (effective May 15, 1986) indicated the Project is located within Zone C, an area outside any mapped flood hazard areas.

5.1 Soils Classification

Review of the United States Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey indicated the predominant soil series mapped within the Project Site are Dawson-Fluvaquents-Loxley complex, frequently flooded, Hydrologic Soil Group (HSG) rating A/D; Colton-Duxbury-Adams complex, HSG rating A; Berkshire loam, very boulder, HSG rating B; Potsdam-Tunbridge-Crary complex, very boulder, HSG rating C; Udorthents, mine waste, HSG rating C; and Tunbridge-Lyman complex, very rocky, very bouldery, HSG rating B. The Soil Conservation Service defines the HSGs as follows:

- Type A Soils: Soils having a high infiltration rate (low runoff potential).
- Type B Soils: Soils having a moderate infiltration rate.
- Type C Soils: Soils having a slow infiltration rate.
- Type D Soils: Soils having a very slow infiltration rate (high runoff potential).

For soils assigned to a dual hydrologic group, the first letter refers to drained areas and the second refers to undrained areas. In project areas of unknown soil type or areas not within agricultural land, the more conservative soil classification is assumed.

Refer to Appendix E for the USDA NRCS Soil Resource Report for the Project Site.

Geotechnical exploration of the Project Site was completed in July 2021. The exploration included completing 16 borings and collecting the soil samples for classification and laboratory testing. In addition, physical and engineering evaluations of the soils were completed, and recommendations were provided based on the soils present at the Project Site. Refer to Appendix E for the Geotechnical Engineering Report.

Soil infiltration testing was conducted at the Project Site in September of 2021. Soils were visually classified by texture, color, relative density, consistency, moisture, etc. Six infiltration tests were completed at three test pit locations (two tests per location), advanced to depths of approximately six feet below ground surface. Test borings and infiltration testing were performed in conformance with the SMDM. Infiltration at the Project ranged from 0 inches per hour to 27 inches/19 minutes (approximately 85 inches/hour). The results of the Infiltration Testing are provided in Appendix E.

5.2 Rainfall Information

Project specific rainfall information for the 90% rainfall event was obtained from Figure 4.1 of the SMDM. The 90% rainfall event is used to determine the volume (WQv) of runoff generated from the 90^{th} percentile (90%) rainfall event. Rainfall data for the 1-, 10-, and 100-year rainfall events was obtained from the Northeast Regional Climate Center's Extreme Precipitation Tables. These values were used to evaluate the pre- and post-development stormwater hydraulic and hydrologic characteristics. Table 1, below, details the 24-hour rainfall amounts for the Project Site.

Table 1 – Rainfall Event Quantities

Rainfall Event	24-Hour Rainfall Amount (inches)
90%	1.00
1-Year	1.98
2-Year	2.31
10-Year	3.28
100-Year	5.43

The precipitation information obtained from the Northeast Regional Climate Center is included in Appendix E.

6.0 Contract Documents

The Contractor is responsible for the implementation of this SWPPP, as well as the installation, construction, repair, replacement, inspection and maintenance of erosion and sediment control practices. Each Contractor shall sign the Contractor Certification Form provided in Appendix C prior to the commencement of construction activities.

This SWPPP and associated documentation, including but not limited to, a copy of the GP-0-20-001, NOI, NYSDEC NOI Acknowledgement Letter, Contractor Certification Form, Construction Drawings, inspection reports, and permit eligibility forms, must be maintained in a secure location for the duration of the Project.

7.0 Personnel Contact List

The Construction Personnel Contact List for the Project is provided in Appendix C. The listed personnel are responsible for ensuring compliance with the SWPPP and associated permit conditions. Personnel responsibilities include, but are not limited to, the following:

- Implement the SWPPP;
- Oversee maintenance practices identified in the SWPPP;
- Conduct or provide for inspection and monitoring activities;
- Identify potential erosion, sedimentation, and pollutant sources during construction and ensure issues are addressed appropriately and in a timely manner;
- Identify necessary amendments to the SWPPP and ensure proper implementation; and,

- Document activities associated with the implementation of this SWPPP and supporting documents.

Refer to GP-0-20-001 for information regarding specific personnel responsibilities.

8.0 SWPPP Construction Requirements and Sequencing

This section provides the Owner/Operator and the Contractor with a suggested order of construction that will minimize erosion and the transport of sediments. The individual objectives of the construction techniques described herein shall be considered an integral component of the Project design. The construction sequence is not intended to prescribe definitive construction methods and should not be interpreted as a construction specification document.

The Contractor shall follow the general principles outlined below throughout the construction phase:

- Protect and maintain existing vegetation wherever possible;
- Locate and flag/mark sensitive resource areas such as 100-foot wetland protection buffers;
- Locate and flag/mark the Limits of Disturbance (LOD);
- Minimize the area of disturbance;
- To the extent possible, route unpolluted flows around disturbed areas;
- Install approved erosion and sediment control devices as early as possible;
- Minimize the time disturbed areas are left un-stabilized; and,
- Maintain erosion and sediment control devices in proper condition.

The Contractor should use the suggested construction sequence and techniques as a general guide and modify the suggested methods and procedures as required to best suit seasonal and site-specific physical constraints for the purpose of minimizing the environmental impact due to construction.

The Project is anticipated to involve three stages of work; site preparation, construction, and site restoration. Prior to the commencement of construction activities, temporary erosion and sediment control measures shall be installed per the Construction Drawings provided in Appendix F. The Project stages are detailed below.

Stage 1: Project Site Preparation

- Obtain all necessary permits and approvals for construction;
- Establish access to the Project Site including the stabilized construction entrances and access roads;
- Stake/flag construction limits, staging/storage areas, concrete washout locations, environmentally sensitive areas, and other associated work areas;
- Mark existing utilities and infrastructure;

- Conduct tree clearing and vegetation management, if necessary, in accordance with the Project Landscaping Plan (Appendix F)
- Conduct grading of work areas, as required; and,
- Install the erosion and sediment controls as detailed on the Final Erosion and Sediment Control Plans.

Stage 2: Construction

- Install permanent stormwater management practices;
- Install solar array racking systems and security fencing;
- Install solar panels and inverters; and
- Completed trenching for collection lines.

Stage 3: Project Site Restoration

- Remove and dispose of Project related waste material at an approved disposal facility;
- Prepare soils as needed (restoration of original grade, de-compaction, soil amendments, etc.), and seed and mulch all disturbed areas. Restore disturbed soils per NYSDEC standards and specifications and in accordance with the Project Landscaping Plan (Appendix F);
- Remove the temporary erosion and sediment controls when 80% of natural vegetative cover has been achieved and erosion issues are no longer present; and
- Submit the NOT Form to the NYSDEC in accordance with the General Permit.

The Project is not anticipated to disturb greater than five acres at any one time. Should greater than five acres of soil disturbance be required, a Phasing Plan will be prepared for the Project, detailing the phases of construction and the anticipated amount of cut and fill for each phase. Written authorization is required prior to disturbing greater than five acres in accordance with the General Permit and as outlines in Section 12.2, below.

9.0 Stormwater Management and Pollution Controls

Prior to the commencement of construction activities, temporary erosion and sediment controls shall be installed to prevent erosion of the soils and prevent water quality degradation in wetlands and waterbodies. Erosion and sediment controls will be utilized to limit, control, and mitigate construction related impacts. The stormwater management and pollution controls shall include practices that involve runoff control, soil stabilization practices, and sediment control.

The erosion and sediment controls utilized at the Project Site must be installed and maintained in accordance with GP-0-20-001, the SSESC and the SMDM. Improper installation of practices may result in an increase in water quality impacts to nearby waterbodies or sedimentation impacts to undisturbed lands. Deviations from the SSESC and SMDM standards should be discussed with the Qualified Inspector/Qualified Professional prior to utilizing the alternative practice. If the alternative practice is acceptable, documentation is required to detail the reasoning for the alternative practice and to provide evidence that the alternative design is equivalent to the technical standard. The SWPPP shall be amended as appropriate to incorporate the alternative practice. In the event that an alternative practice fails and a standard SSESC practice is required, the Contractor shall install the required practice upon approval from the Qualified Inspector/ Qualified Professional and Owner/Operator. The SWPPP shall be amended as appropriate to document changes to the practice.

The following sections detail potential stormwater contamination sources due to construction related activities and the temporary and permanent erosion and sediment controls to be utilized throughout the construction of the Project to mitigate impacts. Refer to the SSESC and SMDM for additional guidance on installation, maintenance and removal.

9.1 Potential Impacts for Stormwater Contamination

Construction activities and processes that result in either increased stormwater runoff or the potential to add pollutants to runoff are subject to the requirements of this SWPPP. These activities may include areas of land disturbed by grading, excavation, construction, or material storage. Water that comes in contact with the surface of the Project Site as a result of precipitation (snow, hail, rain, etc.) is classified as stormwater associated with the Project and is subject to the requirements of this SWPPP.

Construction activities that may negatively impact stormwater include, but are not limited to, the following:

- <u>Tree Clearing and Vegetation Removal</u>: Removal of vegetation can expose and weaken soils and may result in erosion.
- <u>Construction Site Entrance</u>: Vehicles leaving the Project Site can track soils onto public roadways.
- <u>Grading Operations</u>: Exposed soils have the potential for erosion and sedimentation when not stabilized.
- <u>Fugitive Dust</u>: Dust generated by vehicles or from strong winds during a drought period can be deposited in wetlands, waterways, and other environmentally sensitive areas, or may negatively impact the air quality.
- <u>General Site Construction Activities</u>: Maintenance and heavy use of access roads can expose soils, creating significant erosion potential. Soil stockpiling from site excavations and grading may promote erosion and sedimentation. Dewatering activities may result in concentrated flows and has the potential to increase erosion.
- <u>Construction Vehicles and Equipment</u>: Refueling of vehicles may result in spilling or dripping gasoline and diesel fuel onto the ground. On-site maintenance of excavating equipment may result in hydraulic oil, lubricants, or antifreeze dripping onto the ground. Sediment tracking and the spread of invasive species may occur if construction vehicles are improperly maintained. Ruts caused by equipment can create paths for concentrated water flows.
- <u>Waste Management Practices</u>: Typical construction projects often generate significant quantities of solid waste, such as wrappings, personnel-generated trash and waste, and construction debris.

Proper utilization of staging and storage areas, stockpiling areas, and erosion and sediment controls will mitigate potential impacts to the stormwater. Refer to Section 10.1 for additional information on spill prevention and waste management procedures for the Project.

9.2 Protection of Existing Vegetation

Natural vegetation shall be preserved to the maximum extent practicable. Preserving natural vegetation will reduce soil erosion and maintain the inherent integrity of the Project Site. Protection practices may include barrier fencing to prevent equipment and vehicle traffic in vegetated and environmentally sensitive areas. If vegetation removal is required in the marked wetland buffers, no soil disturbing techniques are to be used, (i.e. grubbing, stump removal); vegetation may only be removed by use of hand-tools in these areas and any slash/ cuttings left in place.

9.3 Temporary Erosion and Sediment Controls

Temporary erosion and sediment controls shall be utilized to reduce erosion, sedimentation, and pollutants in stormwater discharges, and to prevent impacts to undisturbed areas, natural resources, wetlands, waterbodies, and downstream areas. Both stabilization techniques and structural methods will be utilized, as needed, to meet these objectives.

Temporary erosion and sediment control measures shall be applied during construction to:

- Minimize soil erosion and sedimentation through the stabilization of disturbed areas and removal of sediment from construction site discharges.
- Preserve existing vegetation to the maximum extent practicable and establish permanent vegetation on exposed soils following the completion of soil disturbance activities.
- Minimize the area and duration of soil disturbance through site preparation activities and construction sequencing.

Table 2, below, lists the erosion and sediment controls anticipated to be utilized at the Project Site.

Table 2 - Proposed Erosion and Sediment Control Measures

Construction Road Stabilization	Concrete Truck Washout
Dust Control	Site Pollution Prevention
Stabilized Construction Access	Temporary Access Waterway Crossing
Winter Stabilization	Check Dam
Earth Dike	Perimeter Dike/Swale
Rock Outlet Protection	Subsurface Drain
Anchored Stabilization Matting	Armored Slope and Channel Protection

Landgrading	Loose Stabilization Blankets
Mulching	Permanent Construction Area Planting
Soil Restoration	Temporary Construction Area Seeding
Topsoiling	Cofferdam Structures
Compost Filter Sock	Geotextile Filter Bag
Silt Fence	Straw Bale Dike

The standards and specifications for the erosion and sediment control measures listed in Table 2 are provided in Appendix G. Refer to the SSESC and SMDM for the Standards and Specifications of alternate measures and practices, as needed. The temporary erosion and sediment control measures not detailed in the SSESC or SMDM are detailed below.

9.3.1 Temporary Stockpiling

Temporary stockpiling of granular material (gravel, excavated spoils, select backfill, topsoils, etc.) is expected on-site throughout the construction process. Stockpiling of materials is not permitted in areas where health or safety risks are present, or where impacts to water quality may occur. Stockpiling is not permitted in wetland or wetland buffer areas.

Stockpile areas shall be contained and protected with the proper erosion and sediment controls such as silt fencing and mulch. Soil stockpiles shall be stabilized with vegetation, geotextile fabric, or plastic covers if not utilized for seven days.

Stockpile areas should be inspected and maintained as needed or directed by the Project Engineer (or Qualified Inspector/Qualified Professional).

9.3.2 Temporary Spoil Stockpiling

Spoil material shall be segregated, conserving topsoil for revegetation and disposing of the inorganic sub-soils. Spoils shall be free of construction debris including foreign chunks of concrete, and other construction-related materials.

A spoil disposal plan shall be developed prior to excavation, including the proposed quantities of spoil and the proposed location(s) and procedures for disposal. Spoils shall not be disposed of within wetlands, waterbodies, agricultural areas, or other environmentally sensitive areas. Excess topsoil is encouraged to be spread within the immediate disturbed areas, including agricultural areas, if the material is free of rocks. Inorganic spoils shall be buried and capped with the previously stripped, native topsoil to ensure revegetation. Additional topsoil may be required to adequately cover the spoil area. If additional space is needed for on-site disposal, the SWPPP shall be amended as appropriate. For spoils needing to be disposed of off-site, the disposal plan shall detail the location of the spoil disposal at an authorized facility off-site.

If the disposal plan does not detail the spoil stockpiling or disposal information, the SWPPP shall be amended as appropriate to document the necessary procedures. The amendment shall include the anticipated amount of spoils, the spoil stockpiling location, and the disposal method and location.

9.3.3 Timber Matting

Timber ("swamp") matting is often utilized to distribute vehicle loads on agricultural, lawn, and wetland areas. The matting aids in reducing rutting, soil compaction, and restoration activities in protected areas. Poorly drained upland soils, such as wetland transitional areas, may be matted to reduce rutting and sediment tracking.

An additional benefit of matting in wetlands is that mats can be arranged to act as a containment surrounding excavations. This may be especially helpful in standing water situations were conventional erosion and sediment controls are not practicable. The Contractor should be cognizant of the hydrology of the area by recognizing water staining and bank full indicators. The Qualified Inspector can assist in this identification.

Headers and stringers shall be used in deeper or open water wetlands to allow wetland inundation under the matted drivable surface. The SWPPP specified wetland access does not account for poorly drained or poorly structured soils that are not wetlands. Transitional areas may experience severe rutting due to high traffic associated with the installation of the wetland access matting. Additional matting is recommended to reduce track out and restoration efforts, however it is not required for access.

Submerged wetland matting can create a "pumping" effect as vehicles pass, resulting in disturbed wetland soils, turbidity and sedimentation. This disturbance is a violation of the associated wetland permits. Although the presence of matting in this situation is still better than the alternative, pumping mats will require additional stabilization and sediment control practices not planned for in the Construction Drawings. Matting will need to be re-installed, or access will be shut down until water recedes to eliminate the erosion concern.

Timber matting may be utilized by the Contractor as necessary or as directed by the Owner/Operator or Qualified SWPPP Inspector for construction of the Project. Refer to Appendix G for additional information regarding timber matting.

9.3.4 Construction Access Systems

Temporary construction access systems may be utilized to prevent or reduce impacts to sensitive areas, such as soft soil or wetlands. The construction access systems may include, but are not limited to, the use of portable mats, plastic roads, slash matting, or access during frozen weather conditions.

Portable mats are reusable mats typically composed of fiberglass or high-density polyethylene (HDPE). The mats may be used in wetland areas or in areas of soft soils to prevent rutting and soil disturbance impacts.

Plastic road mats are composed of linking HDPE mats using a one-inch polyvinyl chloride (PVC) stringer. The mats are utilized to protect wetlands and prevent rutting by distributing the vehicle load across the roadway surface.

Access during frozen conditions may occur once the ground freezes. Snow cover may be packed down or removed for access. The frozen ground conditions will not experience rutting or sediment tracking. Periodic inspection of ground conditions is recommended to ensure frozen ground conditions are present.

Alternative construction access systems shall be approved by the Owner/Operator and the Qualified Professional prior to use. The alternate system shall be documented in the SWPPP amendments.

9.3.5 Horizontal Directional Drilling (HDD)

To avoid unnecessary disturbance or impact to the roadways, horizontal directional drilling (HDD) will be utilized for the installation of electric collection lines at the crossing of State Route 3 from the solar array to the substation. The HDD process involves drilling boreholes with a fluid mixture, primarily composed of water and bentonite, a naturally occurring clay. The drilling fluid aids in the removal of cuttings from the borehole, stabilizes the borehole, and acts as a coolant and lubricant throughout the drilling process. The bentonite-water mixture is not classified as a toxic or hazardous substance, however, if released into waterbodies, bentonite has the potential to temporarily reduce water quality, and therefore, adversely impact fish and other aquatic species.

To protect public health and safety and natural resources, the Contractor shall establish operational procedures and responsibilities for the prevention, containment, and cleanup of inadvertent releases associated with the proposed HDD. The operational procedures should:

1. Minimize the potential for an inadvertent release of drilling fluids associated with HDD activities;
2. Provide for the timely detection of inadvertent returns;
3. Protect environmentally sensitive areas (streams, wetlands, etc.) while responding to an inadvertent release;
4. Ensure an organized, timely and “minimum-impact” response in the event of an inadvertent return and release of drilling fluids; and,
5. Ensure that all appropriate notifications are made immediately.

The Contractor shall comply with the Owner’s/Operator’s operational procedures for HDD. The Inadvertent Return Plan, provided in Appendix M, shall be followed in the event of an unintentional discharge (i.e., frac-out) during the HDD process.

9.4 Temporary Stabilization for Frozen Conditions

Winter stabilization standards apply to construction activities with ongoing soil disturbance and exposure between November 15th and April 1st. Temporary winter stabilization measures shall be employed prior to frozen conditions, as detailed in the SSESC.

Erosion and sediment control measures shall be inspected to ensure proper performance and winter stabilization function. Repairs should be made as necessary to prevent erosion and sedimentation during thawing or rain events.

10.0 Post-Construction Stormwater Management

The SMDM details a five-step process for the site planning and Stormwater Management Practice (SMP) selection. The steps include the following:

1. Site planning to preserve natural site features and reduce impervious cover.
2. Calculate the Water Quality Volume (WQv) of the Project Site.
3. Meet the Runoff Reduction Volume (RRv) through runoff reduction techniques and SMPs with RRv capacity.
4. Use standard SMPs, where applicable, to treat the WQv not reduced through RRv techniques and SMPs with RRv capacity.
5. Design for peak volume and runoff rates, where required.

The five steps have been classified as Site Planning to Preserve Natural Features, Water Quality Volume, Runoff Reduction Volume, Channel Protection Volume, and Overbank Flood and Extreme Storm Attenuation. These items will be addressed in the sections below.

10.1 Design Justification

The proposed Project will result in greater than one acre of soil disturbance and results in an increase in impervious surface, therefore post-construction stormwater management practices are required for the Project.

The WQv and stormwater quantity requirements shall be met by projects requiring post-construction stormwater controls. The SMDM details the stormwater management practices that may be implemented at the Project Site to aid in the reduction of stormwater effects to newly developed areas. Effects from new development may include changes in runoff volume, flow rates, timing of runoff, habitat destruction, and degradation of receiving waterbodies and downstream areas.

The Project has been classified as a new development project with an increase of approximately 3.06 acres of new impervious cover and 0.54 acres of redeveloped existing impervious cover. The SMDM defines new development as any land disturbance that is not classified as a redevelopment activity. The SMDM defines redevelopment as the disturbance and reconstruction of existing impervious area, including impervious areas removed from the Project Site within the last five years.

The following site constraints were considered when determining the appropriate stormwater management practices to be implemented on the Project Site:

- Practices cannot impact existing structures or utilities;
- Project Site use limitations;
- Poor infiltration rates of less than 0.5 in/hr;
- Seasonable high groundwater table;
- Shallow depth to bedrock;

- The proposed new development conditions need to mimic the existing runoff patterns to the maximum extent practicable.

The peak runoff rates for the pre-development and post-development conditions have been analyzed to aid in maintaining the pre-development runoff rates. Regulating the runoff rate will minimize the impacts to adjacent and downstream properties and waterbodies and minimize impacts to the stormwater runoff quality.

10.2 Stormwater Quality Analysis

10.2.1 Water Quality Volume (WQv) Analysis

The Project requires treatment of the WQv, which is intended to improve water quality by capturing and treating runoff from small, frequent storm events. The NYSDEC has defined WQv as the volume of runoff generated from the 90th percentile (90%) rainfall event. Practices sized to treat the WQv will capture and treat 90% of all 24-hour rainfall events. The WQv is determined using the following equation:

$$WQ_v = \frac{P * R_v * A}{12}$$

Where:

- WQv = Water Quality Volume (acre-feet)
- P = 90% Rainfall Event Number
- Rv = 0.05 + 0.009(I), where I is percent impervious cover
- A = Site Area (acres)

The 90% rainfall event number has been obtained from Figure 4.1 of the SMDM. The WQv is directly correlated to the amount of impervious cover at the Project Site. The calculated WQv for each subcatchment within the Project Site is detailed in Table 3, below.

Table 3 – Calculated WQv

Subcatchment Number	Calculated Water Quality Volume (WQv)	
	ft^3	ac-ft
1	9,339	0.214
2	0	0
3	0	0
4	2,206	0.051
5	0	0
6	0	0
Total WQv	11,545	0.265

*New/Redeveloped impervious areas are limited to Subcatchments 1 & 4.

10.2.2 Runoff Reduction Volume (RRv) Analysis

The RRv is intended to reduce the WQv through infiltration, groundwater recharge, reuse, recycle, evaporation/evapotranspiration of the post-development runoff in order to replicate the pre-development hydrology. Replication of the pre-development hydrology includes maintaining pre-construction infiltration, peak runoff flow, discharge volume and minimizing concentrated flow through the use of runoff control techniques.

The RRv is determined using the following equation:

$$RR_v = \frac{[(P)(R_v^*)(A_i]}{12}$$

Where:

- RRv = Minimum Runoff Reduction Volume (acre/feet)
- P = 90% Rainfall Event Number
- Rv^* = 0.05 + 0.009(I), where I is 100% impervious
- A_i = Impervious cover targeted for runoff reduction, calculated as A_i = (S)(A_{ic})
- S = Specific Runoff Reduction Factor (per HSG)
- A_{ic} = Total area of new impervious cover

The runoff reduction techniques have been selected based on the proposed Project use type and the existing site constraints as detailed in Section 10.1, above.

New development Projects that cannot achieve 100% runoff reduction for the WQv due to site limitations, must direct runoff from newly constructed impervious areas to runoff reduction or SMP practices, unless infeasible. The percentage of reduction required is determined from the specific reduction factor (S), which is based on the site's HSG. Table 4, below, details the specific reduction factors per HSG.

Table 4 - RRv Reduction by Soil Type

HSG	Specific Reduction Factor (S)
A	0.55
B	0.40
C	0.30
D	0.20

The minimum RRv calculated for the Project Site is 0.089 ac-ft. The Project utilizes vegetated swales and infiltration basins to achieve 0.244 ac-ft of RRv. The total RRv is met by fully infiltrating the WQv where practical and installing vegetated swales for runoff reduction where infiltrative practices are infeasible.

10.2.3 Stormwater Management Practice (SMP) Analysis

The stormwater management plan must demonstrate that green infrastructure planning and design options were evaluated in order to meet the RRv requirement. The SMDM details acceptable runoff reduction techniques to meet the RRv requirement. The runoff reduction techniques utilized for the Project include:

- Vegetated Open Swale: The natural drainage paths, or properly designed vegetated channels, can be used instead of constructing underground storm sewers or concrete open channels to increase the time of concentration, reduce the peak discharge, and provide infiltration. This practice will be utilized throughout the site to provide runoff reduction and pretreatment for infiltration basins.

10.3 Post-Construction Stormwater Control Practices Utilized

Stormwater runoff for the Project will be collected and conveyed to stormwater quality and quantity control practices. The following practices have been incorporated into the Project Site stormwater management plan for the Project.

- Dry Detention Basins: Dry detention basins are proposed to attenuate discharge for runoff from the proposed solar array in locations that do not include proposed impervious and for large storm attenuation after the proposed dry swale. Runoff will be directed to these basins via vegetated bypass swales on the upstream side of proposed access roads. Small storm events will be infiltrated through the basin floors and large events will be discharged via outlet control weirs to match pre-developed discharge rates.
- Infiltration Basin (I-2): Infiltration basins are proposed to provide water quality treatment and capture channel protection runoff. These basins are sized to completely infiltrate the WQv and 1-year storms and to provide discharge control for larger storm events.
- Dry Swale (O-1): A dry swale is proposed to provide water quality treatment at the west end of the north array access road. This dry swale will be constructed by berming across the proposed vegetated swale to provide 12-inches of ponding depth, which will discharge the water quality storm over approximately 60 minutes. Overflow will continue to a downstream detention basin to provide discharge control for larger storm events.

The total developed site will be 119 acres, including 3.6 acres of new and redeveloped impervious cover. The total contributing drainage area for the Project Site, which includes off-site areas, is approximately 461 acres.

The composite WQv for the Project Site was calculated to be 0.265 acre-feet for the new development area. The minimum RRv for the Project Site was calculated to be 0.089 acre-feet. A portion of the required WQv has been reduced by RRv techniques. The Project utilizes infiltration basins, a dry swale and approximately 6,300 linear feet of vegetated swales to achieve a combined total of 0.239 acre-feet of WQv treatment and 0.244 acre-feet of RRv reduction. Detailed WQv and RRv calculations are provided in Appendix L. Full treatment of the WQv is infeasible due to shallow bedrock on the eastern portion of the Project Site, but minimum RRV has been achieved.

The proposed WQv and RRv practices indicate that the NYSDEC water quality requirements have been met. Negative impacts on the quality of the receiving waters are not anticipated as a result of the proposed Project.

10.4 Stormwater Quantity Analysis

The SMDM requires the Project to meet the following separate stormwater quantity criteria:

- Channel Protection Volume (Cpv): The Cpv requirement is designed to protect stream channels from erosion by providing 24 hours of extended detention for a 1-year, 24-hour storm event.
- Overbank Flood Control (Qp): The Qp requirement is designed to prevent an increase in frequency and magnitude of out-of-bank flooding generated by urban development. The overbank control requires storage to attenuate the post-development 10-year, 24-hour peak discharge rate to pre-development rates.
- Extreme Flood Control (Qf): The Qf requirement is designed to prevent the increased risk of flood damage from large storm events, maintain boundaries of the pre-development 100-year floodplain, and protect the physical integrity of the stormwater management practices. The extreme flood control requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate to pre-development rates.

Stormwater runoff was estimated using HydroCAD, Version 10.0. HydroCAD software is based on methodologies developed by the USDA NRCS, namely “Urban Hydrology for Small Watersheds”, Technical Release 55 and Technical Release 20 (TR-50 and TR-20, respectively), in conjunction with other hydrologic and hydraulic calculations. Based on site specific information, including land cover, slopes, soils, and rainfall data, the program calculates inflow and outflow hydrographs for subcatchments, reach routing, and pond routing.

For the HydroCAD analysis, the Project Site was divided by watershed and drainage systems, which contribute to the overall stormwater network. The watersheds and drainage systems were classified by the following components:

- Subcatchment: Utilized to model the runoff from a given area of land.
- Pond: Used to model a reservoir, dam, catch basin, manhole, drywell, storage chamber, vault, or other impoundment that fills with water. Ponds may empty through a weir, culvert, orifice, or other outlet device.
- Reach: Used to perform independent routing through an open channel or overland flows.
- Link: A multi-purpose node used to link a hydrograph to another system.

The pre-development and post-development conditions for the Project Site were divided into subcatchments, which depict the watershed conditions, methods of collection, conveyance, points of discharge and topography. In addition, the drainage pattern, drainage structures, soil types, and ground covers are utilized to analyze the rate of runoff in the existing and proposed conditions. The subcatchments include off-site contributing areas as determined by the site topography and site features. The pre-development Project Site was divided into six subcatchments and the post-development Project Site was divided into eleven subcatchments. Post-development subcatchments were further divided for culvert sizing and channel modeling as indicated in the HydroCAD reports included in the appendices.

In order to compare the pre-development and post-development runoff conditions, study points were selected across the Project Site. The overall bounds of the study area and study points remain unchanged from the pre-development condition. The following study points were selected for the Project Site in both the pre-development and post-development conditions:

Study Point 1 (SP1):

Study Point 1 is located southwest of the proposed facility. The associated Study Area includes the majority of the proposed solar array. Pre-developed runoff flows southwest to an existing containment berm associated with the former land use. No discharge will occur from this berm in the post-developed condition. Post-developed runoff from the array area is directed to bypass swales on the upstream side of access roads which discharge to dry detention basins. Access roads are superelevated to direct downstream runoff to infiltration basins and a dry swale via vegetated swales. Runoff from areas south of the proposed access roads discharge via overland flow to the existing detention associated with the containment berm.

Post-developed total runoff will decrease for all modeled storm events, but peak runoff rates will increase slightly in the 1-, 10- and 100-year storms. However, the downstream containment provides +/- 7.7 million cubic feet of storage and no downstream impacts are anticipated.

Study Point 2 (SP2):

Study Point 2 is located northwest of the proposed facility. The associated Study Area includes a small portion of the proposed array, an existing gravel drive north of the proposed facility, and the east half of an existing off-site transfer station. The majority of the contributing area is off-site and will not be disturbed for construction. Runoff discharges via overland flow to an existing infiltration basin associated with the transfer station. In the post-developed condition, the contributing area will be modified slightly to eliminate berms within the solar array to facilitate panel installation. Runoff patterns, rates and volumes will be consistent with pre-developed conditions. No new impervious areas or treatment practices are proposed for this Study Area.

Study Point 3 (SP3):

Study Point 3 is located east of the proposed facility. The associated Study Area discharges via overland flow to an existing infiltration basin east of the proposed facility. Except for the removal of a small portion of existing gravel road, there will be limited change in land cover and a slight increase in contributing area from pre- to post-development. This increase results in a very minor change in total discharge (0.5% or less) and a decrease in peak discharge rates. No new impervious areas or treatment practices are proposed for this Study Area.

Study Point 4 (SP4):

Study Point 4 is located at the inlet of an existing culvert north of the proposed driveway entrance. This 48” corrugated metal pipe (CMP) crosses NYS Route 3 and discharges east into the Little River. The associated Study Area includes an existing gravel access road from NYS Route 3 to the Project Site. The majority of the Study Area is comprised of offsite contributing areas. Runoff discharges via overland flow to existing swales and road ditches to the existing Study Point. This existing road will be redeveloped and expanded to accommodate the proposed facility. Except for road impacts and limited clearing, the majority of the land cover will match pre-developed conditions.

The new/redeveloped road on the west portion of this Study Area will flow to a vegetated swale on the downstream side of the road and be conveyed to an infiltration basin. This basin will provide full infiltration of WQv and Cpv and attenuate discharge for larger storm events. The east portion of this Study Area is underlain by shallow bedrock and is infeasible for infiltrative treatment practices to meet full WQv and Cpv. Development of areas to provide alternative treatment would require significant impacts to a stream buffer and existing wooded areas due to site topography. Vegetated swales will be installed where feasible to meet minimum RRv. Post-development runoff rates will decrease, and total runoff volumes will increase slightly from existing conditions, but there are no anticipated downstream impacts.

Study Point 5 (SP5):

Study Point 5 is located east of the proposed facility. The associated Study Area includes a small area that discharges via overland flow to a former sand borrow area associated with the former land use. This area is self-contained and infiltrates all contributing runoff. Post-developed conditions will be with consistent with pre-developed with a slight decrease in contributing area. No new impervious areas or treatment practices are proposed for this Study Area.

Study Point 6 (SP6):

Study Point 6 is located at the inlet of an existing culvert northeast of the project. This 24” reinforced concrete pipe (RCP) crosses NYS Route 3 and discharges east into the Little River. The associated Study Area includes a small area that discharges via overland flow to a former sand borrow area associated with the former land use. Post-developed conditions will be with consistent with pre-developed with the exception of limited removal of existing gravel drives and tree clearing associated installation of the proposed underground collection line from the solar array. No new impervious areas or treatment practices are proposed for this Study Area.

The pre- and post-development conditions were evaluated at each study point for the 1-, 10- and 100-year storm events. Table 5, below, details the pre- and post-development peak discharge rates for each study point and storm event analyzed.

Table 5 - Peak Discharge Rate (cfs) Comparison

Study Point	1-Year Rainfall Event		10-Year Rainfall Event		100-Year Rainfall Event	
	Pre-	Post-	Pre-	Post-	Pre-	Post-
1	8.68	8.82	47.47	53.92	149.99	157.65
2	3.92	2.08	15.38	8.63	39.56	22.85
3	1.33	1.21	14.04	13.05	46.60	43.75
4	0.32	0.42	9.86	9.50	53.97	48.49
5	2.01	0.99	8.36	5.12	21.94	14.48
6	1.53	1.53	9.29	9.29	29.33	29.33
Total	**17.79**	**15.05**	**104.40**	**99.51**	**341.39**	**316.55**

The runoff model demonstrates that the proposed Project will not alter the hydrologic or hydraulic characteristics of the Project Site, therefore negative impacts to downstream areas due to this Project are not anticipated. Subcatchment mapping and the HydroCAD model are provided for the pre-development condition in Appendix J, and for the post-development condition in Appendix K.

10.5 Alterative Stormwater Design

The stormwater runoff analysis and design of the proposed stormwater management practices detailed in Sections 10.1 through 10.4 above are based on HSGs obtained from the NRCS soil database. The database lists soil type "807 - Udorthents, Mine Waste" as HSG C soil, however, infiltration testing within that soil type yielded infiltration rates much higher than what is expected from an HSG C soil. As such, NYSDEC approved use of a runoff CN based on an HSG A soil group for this soil. Refer to Appendix E for the NRCS Soil Resource Report and the Infiltration Testing Results.

Both the pre- and post-development runoff models were re-evaluated using HSG A to determine the runoff CN for the mine waste soil for all land cover types. The soil group for "741C -Potsdam-Tunbridge-Crary Complex", also an HSG C soil, was remained unchanged for the re-evaluation.

Preliminary results from the alternative pre- and post-development models are provided in Appendix P. As expected, the use of HSG A and corresponding CN for the mine waste soil reduces the peak rate and volume of runoff at all Study Points effected by the change.

The Project has been designed conservatively through the use of HSG C soils, however based on consultation with the NYSDEC, the Project developer may design the Project with the HSG A soils as evaluated in this alterative design. Should the alterative stormwater design be selected for use at the Project, evaluation of the originally proposed stormwater management practices as shown in the Construction Drawings in Appendix F and sized as detailed in Appendices J though L will be required to confirm feasibility and applicability. Additional refinements to the Project design would be completed, as necessary, once the Project is auctioned for development by NYSERDA.

11.0 Construction Pollution Prevention

Proper material storage, handling, and disposal practices shall be implemented during construction to reduce the risk of exposure of materials and hazardous substances to stormwater and environmental resources. The storage, handling, and disposal procedures to be enforced by the Owner/Operator, Contractor(s) and the Qualified Inspector are described below.

11.1 Management of Spills and Releases

The Owner/Operator must be notified in the event of a non-stormwater (fuel, oil, chemical, etc.) spill or release to ensure proper reporting and clean up. The Owner/Operator shall proceed as appropriate in accordance with the Owner/Operator's, local, state, and federal environmental policies and procedures.

A spill or release shall be reported to the NYSDEC Spill Hotline (1-800-457-7362), as applicable, within two hours of the release. The Contractor is responsible for retaining documentation containing the NYS spill number and spill information to provide to the

Owner/Operator and the Qualified Inspector. The Contractor is responsible for the cleanup and response actions, in accordance with the on-site spill prevention procedures manual. Contaminated soil shall be removed from the Project Site and disposed of in accordance with the product specific Safety Data Sheets (SDS) and environmental guidance.

Potential pollutant sources are likely to be stored on the construction site. Bulk petroleum storage (1,100 gallon above ground tank and/or 110 below ground tank) and chemical storage (185 gallon above ground tank and/or any below ground tank) shall not be present onsite. Construction materials typically present on construction sites, as noted in the National Pollutant Discharge Elimination System (NPDES) Construction General Permit, include, but are not limited to, the following:

- Building Products: Asphalt sealants, copper flashing, roofing materials, adhesives, concrete admixtures, and gravel and/or mulch stockpiles;
- Chemicals: Pesticides, herbicides, insecticides, fertilizers, and landscape materials;
- Petroleum Products: Diesel fuel, oil, hydraulic fluids, gasoline, etc.;
- Hazardous or Toxic Waste: Paints, caulks, sealants, fluorescent light ballasts, solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids;
- Sanitary Facilities: Portable toilets; and,
- Construction Debris: Fill, vegetative debris, stumps, and construction waste.

Specific quantities cannot be estimated until construction methodology and contractor(s) are secured for construction.

Spill cleanup and response guidance is provided in Appendix H of this SWPPP.

11.2 Construction Housekeeping

The Owner/Operator or the Contractor shall coordinate with local fire officials regarding on-site fire safety and emergency response. The Contractor shall keep the Construction Supervisor and the Qualified Inspector/Qualified Professional aware of chemicals and waste present on site. The Contractor shall periodically conduct safety inspections at the Project Site to identify housekeeping issues and employ spill prevention procedures.

11.2.1 Material Stockpiling

Material resulting from clearing and grubbing, grading, and other construction activities, or new material delivered to the Project Site, shall be stockpiled upslope of disturbed areas. The stockpile areas shall have the proper erosion and sediment controls installed to prevent the migration of sediments and materials. Materials shall be properly stored and kept away from water resources and environmentally sensitive areas, including, but not limited to, wetlands, streams, storm drains, and ditches.

11.2.2 Staging, Storage, and Marshalling Areas

Construction materials and equipment should be stored in designated staging areas as indicated on the Construction Drawings or as directed by the Project Engineer (or Qualified Inspector). The staging, storage, and marshalling areas should be located in an area that minimizes impacts to stormwater quality.

Chemicals, solvents, fertilizers, and other toxic materials must be stored in waterproof containers and must be kept in the proper storage facilities, except during use or application. Runoff containing such materials must be collected and disposed of at an approved solid waste or chemical disposal facility.

Bulk storage of materials will be staged at the Project marshalling yard per SDS specification and Environmental Health and Safety Standards, whichever is more restrictive. Contractor marshalling yards may be associated with other projects not covered under this SWPPP and General Permit. If the marshalling area is associated with this SWPPP, the yard shall be inspected by the Qualified Inspector until Project related activities have ceased. A Qualified Inspector shall inspect the marshalling yard to assess for environmental impacts prior to and throughout its use. If additional marshalling yards are required, they must abide by this SWPPP and GP-0-20-001. Amendments shall be made to the SWPPP, as necessary, for the additional marshalling areas.

11.2.3 Equipment Cleaning and Maintenance

All on-site construction vehicles, including employee vehicles, shall be monitored for leaks and shall receive regular preventative maintenance to reduce the risk of leakage. Any equipment leaking oil, fuel, or hydraulic fluid shall be repaired immediately or removed from the Project Site. Construction equipment and Contractor personal vehicles shall be parked, refueled and serviced at least 100 feet from a wetland, waterbody, or other ecologically sensitive area, at an upland location away from conveyance channels, unless approved by the Qualified Inspector/Qualified Professional.

Where there is no reasonable alternative, refueling may occur within these setbacks, but only under the observation of the Qualified Inspector or Trained Contractor and after proper precautions are taken to prevent an accidental spill. The Contractor shall take precautions to ensure that drips, spills, or seeps do not enter the ground. The use of absorbent towels and/or a portable basin beneath the fuel tank is recommended. Refueling activities shall be performed under continual surveillance with extreme care. In the event of a release, the spill shall be promptly cleaned up in accordance with the spill response and clean up procedures.

Petroleum products and hydraulic fluids that are not in vehicles shall be stored in tightly sealed containers that are clearly labeled. All gasoline and fuel storage vessels with greater than a 25-gallon capacity must have secondary containment constructed of an impervious material and be capable of holding 110% of the vessel capacity.

11.2.4 Concrete Washout Areas

Designated concrete washout areas should be provided as needed to allow concrete trucks to wash out or discharge surplus concrete and wash water on site. The concrete washout areas shall be a diked impervious area, located a minimum of 100 feet from a drainage way, waterbody, or wetland area. The concrete washout areas should be designed to prevent contact between the concrete wash and stormwater. The concrete washout areas shall have the proper signage to indicate the location of the facility. The Contractor is responsible for the maintenance of the concrete washout areas. Waste collected at the concrete washout areas shall be disposed of as non-hazardous construction waste material.

The washout facility should have sufficient volume to contain the concrete waste resulting from washout and a minimum freeboard of 12 inches. The washout areas should not be filled beyond 95% capacity and shall be cleaned out once 75% capacity has been met unless a new facility has been constructed. Refer to the SSESC and SMDM for guidance on the construction and use of concrete washout areas.

11.3 Waste Management

The Contractor shall comply with all required regulations governing the on-site management and off-site disposal of solid and hazardous waste generated during construction of the Project. Substances and materials with the potential to pollute surface and groundwaters must be handled, controlled and contained as appropriate to ensure they do not discharge from the Project Site.

A solid waste management program will be implemented to support proper solid waste disposal and recycling practices. Solid waste and debris that cannot be recycled, reused, or salvaged shall be stored in on-site containers for off-site disposal. The containers shall be emptied periodically by a licensed waste transport service and hauled away from the site for proper disposal. No loose materials shall be allowed at the Project Site and all waste material shall be disposed of promptly and properly. The burning of crates, waste, and other refuse is not permitted.

If a hazardous material spill occurs, it must be contained and disposed of immediately. Contaminated soil shall be removed from the Project Site and disposed of in accordance with product specific SDS and associated guidelines. Reporting spills to the NYSDEC may be required per 17 New York Code, Rules and Regulations (NYCRR) 32.3 and 32.4, and the Environmental Conservation Law (ECL) 17-1734.

12.0 Maintenance Inspections and Reporting Requirements

12.1 Pre-Construction Inspection

A site assessment shall be conducted by the Qualified Inspector prior to commencement of construction activities to ensure erosion and sediment controls have been adequately and appropriately installed. The Contractor is responsible for contacting the Qualified Inspector for the pre-construction inspection following the installation of the erosion and sediment control measures.

12.2 Construction Phase Inspections

A Qualified Inspector shall conduct regular site inspections for the implementation of this SWPPP through final stabilization of the Project Site. Inspections shall occur at an interval of once every seven calendar days unless greater than five acres of soil is disturbed at any one time or if the Project Site directly discharges to a 303(d) waterbody segment or is located in one of the watersheds listed in Appendix C of GP-0-20-001, in which inspections shall occur at least twice per every seven calendar days. The two inspections shall be separated by a minimum of two full calendar days. Written authorization from the NYSDEC is required prior to disturbance of greater than five acres. The written authorization shall be documented in Appendix D of the SWPPP. If a portion of the Project Site is permanently stabilized, inspections can cease in that area as long as the condition has been documented by amending the SWPPP.

The Qualified Inspector shall conduct site inspections to assess the performance of the erosion and sediment controls and identify areas requiring modification or repair. The Qualified Inspector shall complete an inspection report following each inspection.

The Owner/Operator and the Contractor(s) must ensure the erosion and sediment control practices implemented at the Project Site have been maintained in accordance with GP-0-20-001, the SSESC and SMDM. The trained Contractor shall regularly inspect the erosion and sediment control practices and pollution prevention measures to ensure they are being maintained in effective operating condition at all times. Corrective actions to the identified deficiencies shall be made within a reasonable time frame.

The Qualified Inspector/Qualified Professional shall inspect the debris removal on a continual basis during construction to ensure proper management and disposal. When construction and restoration are complete, the Contractor is responsible for ensuring the Project Site is free of all construction debris and materials.

12.3 Temporary Construction Activity Suspension

The Contractor must temporarily stabilize all disturbed areas prior to temporary suspension of construction activities. For construction sites where soil disturbance activities have been temporarily suspended and the appropriate temporary stabilization measures have been installed and applied to all disturbed areas, the Qualified Inspector shall begin conducting site inspections in accordance with Part IV.C.2 of GP-0-20-001. The trained Contractor may cease the regular maintenance inspections until soil disturbance activities resume.

The Owner/Operator must notify the NYSDEC Division of Water (DOW) Program contact at the Regional Office in writing prior to reducing the frequency of inspections. Correspondence with the NYSDEC DOW shall be included in Appendix D of this SWPPP.

12.4 Partial Project Completion

Construction sites where soil disturbance activities have been shut down with partial Project completion, the Qualified Inspector can stop conducting inspections once all disturbed areas have achieved final stabilization in conformance with this SWPPP.

The Owner/Operator must notify the NYSDEC DOW Program contact at the Regional Office in writing prior to shut down. Correspondence with the NYSDEC DOW shall be included in Appendix D of this SWPPP.

If soil disturbance activities have ceased for two years from the date of shutdown, the Owner/Operator shall have the Qualified Inspector complete a final inspection to certify final stabilization has been achieved and all temporary erosion and sediment control measures have been removed. The Owner/Operator shall complete the NOT form and submit the form to the NYSDEC. A copy of the completed NOT shall be included in Appendix A of this SWPPP.

12.5 Reporting Requirements

Inspection and maintenance reports shall be prepared in accordance with GP-0-20-001 from the commencement of construction activities until the NOT has been submitted to the NYSDEC. The Qualified Inspector shall provide a copy of the completed inspection report to the Owner/Operator and the Contractor(s) within one business day of inspection. A copy of the inspection report shall be included in Appendix O of the on-site SWPPP. A blank SWPPP Inspection Form is provided in Appendix O.

12.6 Post-Construction Operation and Maintenance Record Archiving

Post-construction stormwater operation and maintenance (O&M) activities shall be performed in accordance with the O&M Manual provided in Appendix I of this SWPPP and the requirements outlined in the Section 3.5 of the SMDM. Post-construction operation and maintenance shall occur once stormwater management practices have been installed and are in operation, and the disturbed areas have achieved final stabilization.

12.7 Records Archiving

The Owner/Operator shall retain a copy of the SWPPP, permit coverage forms and associated documentation that were prepared in conjunction with GP-0-20-001 for a period of at least five years from the date that the NYSDEC received the competed NOT.

Appendix A – SWPPP Permit Coverage Forms

- Notice of Intent (NOI) -

- SWPPP Preparer Certification Form -

- Owner/Operator Certification Form -

- NYSDEC NOI Acknowledgement Letter for Permit Coverage -

- Notice of Termination (NOT) Form -

Appendix A – Notice of Intent (NOI)

0644089821

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR (for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-15-002

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)

Owner/Operator Contact Person Last Name (NOT CONSULTANT)

Owner/Operator Contact Person First Name

Owner/Operator Mailing Address

City

State

Zip -

Phone (Owner/Operator) - -

Fax (Owner/Operator) - -

Email (Owner/Operator)

FED TAX ID

- (not required for individuals)

Project Site Information

Project/Site Name

Street Address (NOT P.O. BOX)

Side of Street
○ North ○ South ○ East ○ West

City/Town/Village (THAT ISSUES BUILDING PERMIT)

State: N Y Zip: - County DEC Region

Name of Nearest Cross Street

Distance to Nearest Cross Street (Feet)

Project In Relation to Cross Street
○ North ○ South ○ East ○ West

Tax Map Numbers
Section-Block-Parcel

Tax Map Numbers

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you **must** go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site, go to the tool boxes on the top and choose "i"(identify). Then click on the center of your site and a new window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)

Y Coordinates (Northing)
4

2. What is the nature of this construction project?

○ **New Construction**

○ **Redevelopment with increase in impervious area**

○ **Redevelopment with no increase in impervious area**

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use

- ◯ FOREST
- ◯ PASTURE/OPEN LAND
- ◯ CULTIVATED LAND
- ◯ SINGLE FAMILY HOME
- ◯ SINGLE FAMILY SUBDIVISION
- ◯ TOWN HOME RESIDENTIAL
- ◯ MULTIFAMILY RESIDENTIAL
- ◯ INSTITUTIONAL/SCHOOL
- ◯ INDUSTRIAL
- ◯ COMMERCIAL
- ◯ ROAD/HIGHWAY
- ◯ RECREATIONAL/SPORTS FIELD
- ◯ BIKE PATH/TRAIL
- ◯ LINEAR UTILITY
- ◯ PARKING LOT
- ◯ OTHER

Post-Development Future Land Use

- ◯ SINGLE FAMILY HOME
- ◯ SINGLE FAMILY SUBDIVISION — Number of Lots
- ◯ TOWN HOME RESIDENTIAL
- ◯ MULTIFAMILY RESIDENTIAL
- ◯ INSTITUTIONAL/SCHOOL
- ◯ INDUSTRIAL
- ◯ COMMERCIAL
- ◯ MUNICIPAL
- ◯ ROAD/HIGHWAY
- ◯ RECREATIONAL/SPORTS FIELD
- ◯ BIKE PATH/TRAIL
- ◯ LINEAR UTILITY (water, sewer, gas, etc.)
- ◯ PARKING LOT
- ◯ CLEARING/GRADING ONLY
- ◯ DEMOLITION, NO REDEVELOPMENT
- ◯ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
- ◯ OTHER

***Note**: for gas well drilling, non-high volume hydraulic fractured wells only

4. In accordance with the larger common plan of development or sale, enter the total project site area; the total area to be disturbed; existing impervious area to be disturbed (for redevelopment activities); and the future impervious area constructed within the disturbed area. (Round to the nearest tenth of an acre.)

Total Site Area	**Total Area To Be Disturbed**	**Existing Impervious Area To Be Disturbed**	**Future Impervious Area Within Disturbed Area**
.	.	.	.

5. Do you plan to disturb more than 5 acres of soil at any one time? ◯ **Yes** ◯ **No**

6. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	**B**	**C**	**D**
%	%	%	%

7. Is this a phased project? ◯ **Yes** ◯ **No**

8. Enter the planned start and end dates of the disturbance activities.

Start Date / / - **End Date** / /

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.

Name

9a. Type of waterbody identified in Question 9?

- ○ Wetland / State Jurisdiction On Site (Answer 9b)
- ○ Wetland / State Jurisdiction Off Site
- ○ Wetland / Federal Jurisdiction On Site (Answer 9b)
- ○ Wetland / Federal Jurisdiction Off Site
- ○ Stream / Creek On Site
- ○ Stream / Creek Off Site
- ○ River On Site
- ○ River Off Site
- ○ Lake On Site
- ○ Lake Off Site
- ○ Other Type On Site
- ○ Other Type Off Site

9b. How was the wetland identified?

- ○ Regulatory Map
- ○ Delineated by Consultant
- ○ Delineated by Army Corps of Engineers
- ○ Other (identify)

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-15-002? ○ **Yes** ○ **No**

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-15-002? ○ **Yes** ○ **No**

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters? ○ **Yes** ○ **No**
If no, skip question 13.

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey? ○ **Yes** ○ **No**
If Yes, what is the acreage to be disturbed?

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area? ○ **Yes** ○ **No**

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)? ○ **Yes** ○ **No** ○ **Unknown**

16. What is the name of the municipality/entity that owns the separate storm sewer system?

17. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ **Yes** ○ **No** ○ **Unknown**

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law? ○ **Yes** ○ **No**

19. Is this property owned by a state authority, state agency, federal government or local government? ○ **Yes** ○ **No**

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.) ○ **Yes** ○ **No**

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)? ○ **Yes** ○ **No**

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)? ○ **Yes** ○ **No**
If No, skip questions 23 and 27-39.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual? ○ **Yes** ○ **No**

0251089825

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

- ○ **Professional Engineer (P.E.)**
- ○ **Soil and Water Conservation District (SWCD)**
- ○ **Registered Landscape Architect (R.L.A)**
- ○ **Certified Professional in Erosion and Sediment Control (CPESC)**
- ○ **Owner/Operator**
- ○ **Other**

SWPPP Preparer

Contact Name (Last, Space, First)

Mailing Address

City

State Zip -

Phone - -

Fax - -

Email

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-15-002. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name **MI**

Last Name

Signature

Date / /

25. Has a construction sequence schedule for the planned management practices been prepared? ○ **Yes** ○ **No**

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

- ○ **Check Dams**
- ○ **Construction Road Stabilization**
- ○ **Dust Control**
- ○ **Earth Dike**
- ○ **Level Spreader**
- ○ **Perimeter Dike/Swale**
- ○ **Pipe Slope Drain**
- ○ **Portable Sediment Tank**
- ○ **Rock Dam**
- ○ **Sediment Basin**
- ○ **Sediment Traps**
- ○ **Silt Fence**
- ○ **Stabilized Construction Entrance**
- ○ **Storm Drain Inlet Protection**
- ○ **Straw/Hay Bale Dike**
- ○ **Temporary Access Waterway Crossing**
- ○ **Temporary Stormdrain Diversion**
- ○ **Temporary Swale**
- ○ **Turbidity Curtain**
- ○ **Water bars**

Biotechnical

- ○ **Brush Matting**
- ○ **Wattling**

Vegetative Measures

- ○ **Brush Matting**
- ○ **Dune Stabilization**
- ○ **Grassed Waterway**
- ○ **Mulching**
- ○ **Protecting Vegetation**
- ○ **Recreation Area Improvement**
- ○ **Seeding**
- ○ **Sodding**
- ○ **Straw/Hay Bale Dike**
- ○ **Streambank Protection**
- ○ **Temporary Swale**
- ○ **Topsoiling**
- ○ **Vegetating Waterways**

Permanent Structural

- ○ **Debris Basin**
- ○ **Diversion**
- ○ **Grade Stabilization Structure**
- ○ **Land Grading**
- ○ **Lined Waterway (Rock)**
- ○ **Paved Channel (Concrete)**
- ○ **Paved Flume**
- ○ **Retaining Wall**
- ○ **Riprap Slope Protection**
- ○ **Rock Outlet Protection**
- ○ **Streambank Protection**

Other

Post-construction Stormwater Management Practice (SMP) Requirements

Important: Completion of Questions 27-39 is not required if response to Question 22 is No.

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.

- ○ **Preservation of Undisturbed Areas**
- ○ **Preservation of Buffers**
- ○ **Reduction of Clearing and Grading**
- ○ **Locating Development in Less Sensitive Areas**
- ○ **Roadway Reduction**
- ○ **Sidewalk Reduction**
- ○ **Driveway Reduction**
- ○ **Cul-de-sac Reduction**
- ○ **Building Footprint Reduction**
- ○ **Parking Reduction**

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual (2010 version).

- ○ All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).

- ○ Compacted areas were considered as impervious cover when calculating the **WQv Required**, and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout).

Total WQv Required

☐☐☐.☐☐☐ **acre-feet**

29. Identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity in Table 1 (See Page 9) that were used to reduce the Total WQv Required(#28).

Also, provide in Table 1 the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use Tables 1 and 2 to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

Table 1 - Runoff Reduction (RR) Techniques and Standard Stormwater Management Practices (SMPs)

	Total Contributing Area (acres)		Total Contributing Impervious Area(acres)
RR Techniques (Area Reduction)			
○ Conservation of Natural Areas (RR-1)	.	and/or	.
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)	.	and/or	.
○ Tree Planting/Tree Pit (RR-3)	.	and/or	.
○ Disconnection of Rooftop Runoff (RR-4)	.	and/or	.
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			.
○ Rain Garden (RR-6)			.
○ Stormwater Planter (RR-7)			.
○ Rain Barrel/Cistern (RR-8)			.
○ Porous Pavement (RR-9)			.
○ Green Roof (RR-10)			.
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			.
○ Infiltration Basin (I-2)			.
○ Dry Well (I-3)			.
○ Underground Infiltration System (I-4)			.
○ Bioretention (F-5)			.
○ Dry Swale (O-1)			.
Standard SMPs			
○ Micropool Extended Detention (P-1)			.
○ Wet Pond (P-2)			.
○ Wet Extended Detention (P-3)			.
○ Multiple Pond System (P-4)			.
○ Pocket Pond (P-5)			.
○ Surface Sand Filter (F-1)			.
○ Underground Sand Filter (F-2)			.
○ Perimeter Sand Filter (F-3)			.
○ Organic Filter (F-4)			.
○ Shallow Wetland (W-1)			.
○ Extended Detention Wetland (W-2)			.
○ Pond/Wetland System (W-3)			.
○ Pocket Wetland (W-4)			.
○ Wet Swale (O-2)			.

Table 2 - Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Alternative SMP	Total Contributing Impervious Area(acres)
○ **Hydrodynamic**	.
○ **Wet Vault**	.
○ **Media Filter**	.
○ **Other**	.

Provide the name and manufacturer of the Alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Name

Manufacturer

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29.

Total RRv provided

. **acre-feet**

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28).

○ **Yes** ○ **No**

If Yes, go to question 36.
If No, go to question 32.

32. Provide the Minimum RRv required based on HSG.
[Minimum RRv Required = (P)(0.95)(Ai)/12, Ai=(S)(Aic)]

Minimum RRv Required

. **acre-feet**

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?

○ **Yes** ○ **No**

If Yes, go to question 33.
Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. Identify the Standard SMPs in Table 1 and, if applicable, the Alternative SMPs in Table 2 that were used to treat the remaining total WQv(=Total WQv Required in 28 - Total RRv Provided in 30).

Also, provide in Table 1 and 2 the total impervious area that contributes runoff to each practice selected.

Note: Use Tables 1 and 2 to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question 29.

WQv Provided

___ . ___ **acre-feet**

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - RRv provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a). ___ . ___

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)? ○ **Yes** ○ **No**

If Yes, go to question 36.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv) required and provided or select waiver (36a), if applicable.

CPv Required ___ . ___ **acre-feet**

CPv Provided ___ . ___ **acre-feet**

36a. The need to provide channel protection has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (37a), if applicable.

Total Overbank Flood Control Criteria (Qp)

Pre-Development ___ . ___ **CFS**

Post-development ___ . ___ **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development ___ . ___ **CFS**

Post-development ___ . ___ **CFS**

37a. The need to meet the Qp and Qf criteria has been waived because:

- ○ Site discharges directly to tidal waters or a fifth order or larger stream.
- ○ Downstream analysis reveals that the Qp and Qf controls are not required

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed?

○ **Yes** ○ **No**

If Yes, Identify the entity responsible for the long term Operation and Maintenance

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required(#28). (See question 32a) This space can also be used for other pertinent project information.

40. Identify other DEC permits, existing and new, that are required for this project/facility.

- ○ Air Pollution Control
- ○ Coastal Erosion
- ○ Hazardous Waste
- ○ Long Island Wells
- ○ Mined Land Reclamation
- ○ Solid Waste
- ○ Navigable Waters Protection / Article 15
- ○ Water Quality Certificate
- ○ Dam Safety
- ○ Water Supply
- ○ Freshwater Wetlands/Article 24
- ○ Tidal Wetlands
- ○ Wild, Scenic and Recreational Rivers
- ○ Stream Bed or Bank Protection / Article 15
- ○ Endangered or Threatened Species(Incidental Take Permit)
- ○ Individual SPDES
- ○ SPDES Multi-Sector GP NYR
- ○ Other
- ○ None

41. Does this project require a US Army Corps of Engineers Wetland Permit? ○ Yes ○ No
If Yes, Indicate Size of Impact. .

42. Is this project subject to the requirements of a regulated, traditional land use control MS4? ○ Yes ○ No
(If No, skip question 43)

43. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ○ Yes ○ No

44. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned. NYR

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name

MI

Print Last Name

Owner/Operator Signature

Date

/ /

Appendix A – SWPPP Preparer Certification Form

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

SWPPP Preparer Certification Form

SPDES General Permit for Stormwater Discharges From Construction Activity (GP-0-20-001)

Project Site Information

Project/Site Name

Owner/Operator Information

Owner/Operator (Company Name/Private Owner/Municipality Name)

Certification Statement – SWPPP Preparer

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-20-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First name	MI	Last Name

Signature　　　　　　　　　　　　　　　Date

Appendix A – Owner/Operator Certification Form

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Owner/Operator Certification Form

SPDES General Permit For Stormwater Discharges From Construction Activity (GP-0-20-001)

Project/Site Name: ____

eNOI Submission Number: ______________________________________

eNOI Submitted by: ☐ **Owner/Operator** ☐ **SWPPP Preparer** ☐ **Other**

Certification Statement - Owner/Operator

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Owner/Operator First Name M.I. Last Name

____

Signature

____

Date

Appendix A – NYSDEC NOI Acknowledgement Letter for Permit Coverage

Appendix A – Notice of Termination (NOT) Form

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505
(NOTE: Submit completed form to address above)

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Owner or Operator Information

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person: | 4a.Telephone:

4b. Contact Person E-Mail:

II. Project Site Information

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

III. Reason for Termination

9a. □ All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP. ***Date final stabilization completed** (month/year): ________________________________

9b. □ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR ___ ___ ___ ___ ___ ___
(Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under the general permit)

9c. □ Other (Explain on Page 2)

IV. Final Site Information:

10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices? □ yes □ no (If no, go to question 10f.)

10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed? □ yes □ no (If no, explain on Page 2)

10c. Identify the entity responsible for long-term operation and maintenance of practice(s)?

____

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit? □ yes □ no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

□ Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.

□ Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).

□ For post-construction stormwater management practices that are privately owned, a mechanism is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record.

□ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university or hospital), government agency or authority, or public utility; policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? ______________________________
(acres)

11. Is this project subject to the requirements of a regulated, traditional land use control MS4? □ yes □ no

(If Yes, complete section VI - "MS4 Acceptance" statement

V. Additional Information/Explanation:

(Use this section to answer questions 9c. and 10b., if applicable)

VI. MS4 Acceptance - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative (Note: Not required when 9b. is checked -transfer of coverage)

I have determined that it is acceptable for the owner or operator of the construction project identified in question 5 to submit the Notice of Termination at this time.

Printed Name:

Title/Position:

Signature:	Date:

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

VII. Qualified Inspector Certification - Final Stabilization:	
I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.	
Printed Name:	
Title/Position:	
Signature:	Date:
VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):	
I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.	
Printed Name:	
Title/Position:	
Signature:	Date:
IX. Owner or Operator Certification	
I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.	
Printed Name:	
Title/Position:	
Signature:	Date:

(NYS DEC Notice of Termination - January 2015)

Appendix B – General Permit GP-0-20-001

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

From

CONSTRUCTION ACTIVITY

Permit No. GP- 0-20-001

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

of the Environmental Conservation Law

Effective Date: January 29, 2020

Expiration Date: January 28, 2025

John J. Ferguson

Chief Permit Administrator

1-23-20

Authorized Signature

Date

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

PREFACE

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System ("NPDES")* permit or by a state permit program. New York administers the approved State Pollutant Discharge Elimination System (SPDES) program with permits issued in accordance with the New York State Environmental Conservation Law (ECL) Article 17, Titles 7, 8 and Article 70.

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of "*construction activity*", as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a *point source* and therefore, pursuant to ECL section 17-0505 and 17-0701, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. The *owner or operator* cannot wait until there is an actual *discharge* from the *construction site* to obtain permit coverage.

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

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

Table of Contents

Part 1. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application

This permit authorizes stormwater *discharges* to *surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;

2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State.*

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

B. Effluent Limitations Applicable to Discharges from Construction Activities

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part I.B.1. (a) – (f) of this permit. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part I.B.1.(a) – (f) of this permit and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in the *Stormwater Pollution Prevention Plan* (“SWPPP”) the reason(s) for the

deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

a. **Erosion and Sediment Controls.** Design, install and maintain effective erosion and sediment controls to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such controls must be designed, installed and maintained to:

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

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

   (iii) *Minimize* the amount of soil exposed during *construction activity*;

   (iv) *Minimize* the disturbance of *steep slopes*;

   (v) *Minimize* sediment *discharge*s from the site;

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

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

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

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

b. **Soil Stabilization**. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that *directly discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. See Appendix A for definition of *Temporarily Ceased*.

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

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

(i) *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. This applies to washing operations that use clean water only. Soaps, detergents and solvents cannot be used;

(ii) *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, hazardous and toxic waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use) ; and

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

e. **Prohibited *Discharge*s.** The following *discharge*s are prohibited:

(i) Wastewater from washout of concrete;

(ii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

(iii) Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance;

(iv) Soaps or solvents used in vehicle and equipment washing; and

(v) Toxic or hazardous substances from a spill or other release.

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

C. Post-construction Stormwater Management Practice Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must select, design, install, and maintain the practices to meet the *performance criteria* in the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015, using sound engineering judgment. Where post-construction stormwater management practices ("SMPs") are not designed in conformance with the *performance criteria* in the Design Manual, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must design the practices to meet the applicable *sizing criteria* in Part I.C.2.a., b., c. or d. of this permit.

a. Sizing Criteria for New Development

(i) Runoff Reduction Volume ("RRv"): Reduce the total Water Quality Volume ("WQv") by application of RR techniques and standard SMPs with RRv capacity. The total WQv shall be calculated in accordance with the criteria in Section 4.2 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: Construction activities that cannot meet the criteria in Part I.C.2.a.(i) of this permit due to site limitations shall direct runoff from all newly constructed impervious areas to a RR technique or standard SMP with RRv capacity unless infeasible. The specific site limitations that prevent the reduction of 100% of the WQv shall be documented in the SWPPP.

For each impervious area that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered infeasible.

In no case shall the runoff reduction achieved from the newly constructed impervious areas be less than the Minimum RRv as calculated using the criteria in Section 4.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (“Cpv”): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site discharges directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria (“Qp”): Requires storage to attenuate the post-development 10-year, 24-hour peak discharge rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria (“Qf”): Requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site discharges directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

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

(i) Runoff Reduction Volume (RRv): Reduce the total Water Quality Volume (WQv) by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24 hour design storm over the post-developed watershed and shall be calculated in accordance with the criteria in Section 10.3 of the Design Manual.

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

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 10.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (Cpv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

c. Sizing Criteria for Redevelopment Activity

(i) Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* shall be addressed by one of the following options. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C of this permit) shall calculate the WQv in accordance with Section 10.3 of the Design Manual. All other *redevelopment activities* shall calculate the WQv in accordance with Section 4.2 of the Design Manual.

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

(2) Capture and treat a minimum of 25% of the WQv from the disturbed, *impervious area* by the application of standard SMPs; or reduce 25% of the WQv from the disturbed, *impervious area* by the application of RR techniques or standard SMPs with RRv capacity., or

(3) Capture and treat a minimum of 75% of the WQv from the disturbed, *impervious area* as well as any additional runoff from tributary areas by application of the alternative practices discussed in Sections 9.3 and 9.4 of the Design Manual., or

(4) Application of a combination of 1, 2 and 3 above that provide a weighted average of at least two of the above methods. Application of this method shall be in accordance with the criteria in Section 9.2.1(B) (IV) of the Design Manual.

If there is an existing post-construction stormwater management practice located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 – 4 above.

(ii) Channel Protection Volume (Cpv): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iii) *Overbank* Flood Control Criteria (Qp): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iv) Extreme Flood Control Criteria (Qf): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site

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

Construction projects that include both New Development and Redevelopment Activity shall provide post-construction stormwater management controls that meet the sizing criteria calculated as an aggregate of the Sizing Criteria in Part I.C.2.a. or b. of this permit for the New Development portion of the project and Part I.C.2.c of this permit for Redevelopment Activity portion of the project.

D. Maintaining Water Quality

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

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

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

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

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

If there is evidence indicating that despite compliance with the terms and conditions of this general permit it is demonstrated that the stormwater *discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if the Department determines that a modification of the permit is necessary to prevent a violation of *water quality standards*, the authorized *discharge*s will no longer be eligible for coverage under this permit. The Department may require the *owner or operator* to obtain an individual SPDES permit to continue discharging.

E. Eligibility Under This General Permit

1. This permit may authorize all *discharges* of stormwater from *construction activity* to *surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph F. of this Part.

2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater *discharge*s; including stormwater runoff, snowmelt runoff, and surface runoff and drainage, from *construction activities*.

3. Notwithstanding paragraphs E.1 and E.2 above, the following non-stormwater discharges are authorized by this permit: those listed in 6 NYCRR 750-1.2(a)(29)(vi), with the following exception: “Discharges from firefighting activities are authorized only when the firefighting activities are emergencies/unplanned”; waters to which other components have not been added that are used to control dust in accordance with the SWPPP; and uncontaminated *discharge*s from *construction site* de-watering operations. All non-stormwater discharges must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with *water quality standards* in Part I.D of this permit.

4. The *owner or operator* must maintain permit eligibility to *discharge* under this permit. Any *discharges* that are not compliant with the eligibility conditions of this permit are not authorized by the permit and the *owner or operator* must either apply for a separate permit to cover those ineligible *discharges* or take steps necessary to make the *discharge* eligible for coverage.

F. Activities Which Are Ineligible for Coverage Under This General Permit

All of the following are **not** authorized by this permit:

1. *Discharge*s after *construction activities* have been completed and the site has undergone *final stabilization*;

2. *Discharge*s that are mixed with sources of non-stormwater other than those expressly authorized under subsection E.3. of this Part and identified in the SWPPP required by this permit;

3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII.K. of this permit;

4. *Construction activities* or *discharges* from *construction activities* that may adversely affect an *endangered or threatened species* unless the *owner or*

operator has obtained a permit issued pursuant to 6 NYCRR Part 182 for the project or the Department has issued a letter of non-jurisdiction for the project. All documentation necessary to demonstrate eligibility shall be maintained on site in accordance with Part II.D.2 of this permit;

5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;

6. *Construction activities* for residential, commercial and institutional projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

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

   c. Which disturb one (1) or more acres of land designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

7. *Construction activities* for linear transportation projects and linear utility projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

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

   c. Which disturb two (2) or more acres of land designated on the current USDA Soil Survey as Soil Slope Phase "D" (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

8. *Construction activities* that have the potential to affect an *historic property*, unless there is documentation that such impacts have been resolved. The following documentation necessary to demonstrate eligibility with this requirement shall be maintained on site in accordance with Part II.D.2 of this permit and made available to the Department in accordance with Part VII.F of this permit:

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

        - 1-5 acres of disturbance - 20 feet
        - 5-20 acres of disturbance - 50 feet
        - 20+ acres of disturbance - 100 feet, or

    b. DEC consultation form sent to OPRHP, and copied to the NYS DEC Agency Historic Preservation Officer (APO), and
        (i) the State Environmental Quality Review (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP's agreement with the resolution; or
        (ii) documentation from OPRHP that the *construction activity* will result in No Impact; or
        (iii) documentation from OPRHP providing a determination of No Adverse Impact; or
        (iv) a Letter of Resolution signed by the owner/operator, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA); or

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

(i) No Affect
(ii) No Adverse Affect
(iii) Executed Memorandum of Agreement, or

d. Documentation that:

(i) SHPA Section 14.09 has been completed by NYS DEC or another state agency.

9. *Discharges* from *construction activities* that are subject to an existing SPDES individual or general permit where a SPDES permit for *construction activity* has been terminated or denied; or where the *owner or operator* has failed to renew an expired individual permit.

Part II. PERMIT COVERAGE

A. How to Obtain Coverage

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a regulated, traditional land use control MS4 must first prepare a SWPPP in accordance with all applicable requirements of this permit and then submit a completed Notice of Intent (NOI) to the Department to be authorized to discharge under this permit.

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then have the SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the “MS4 SWPPP Acceptance” form signed in accordance with Part VII.H., and then submit that form along with a completed NOI to the Department.

3. The requirement for an *owner or operator* to have its SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.F. (Change of *Owner or Operator*) or where the *owner or operator* of the *construction activity* is the *regulated, traditional land use control MS4* . This exemption does not apply to *construction activities* subject to the New York City Administrative Code.

B. Notice of Intent (NOI) Submittal

1. Prior to December 21, 2020, an owner or operator shall use either the electronic (eNOI) or paper version of the NOI that the Department prepared. Both versions of the NOI are located on the Department's website (http://www.dec.ny.gov/). The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the following address:

   NOTICE OF INTENT
   NYS DEC, Bureau of Water Permits
   625 Broadway, 4th Floor
   Albany, New York 12233-3505

2. Beginning December 21, 2020 and in accordance with EPA's 2015 NPDES Electronic Reporting Rule (40 CFR Part 127), the *owner or operator* must submit the NOI electronically using the *Department's* online NOI.

3. The *owner or operator* shall have the SWPPP preparer sign the "SWPPP Preparer Certification" statement on the NOI prior to submitting the form to the Department.

4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

C. Permit Authorization

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.

2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied all of the following criteria:

   a. project review pursuant to the State Environmental Quality Review Act ("SEQRA") have been satisfied, when SEQRA is applicable. See the Department's website (http://www.dec.ny.gov/) for more information,

   b. where required, all necessary Department permits subject to the *Uniform Procedures Act ("UPA")* (see 6 NYCRR Part 621), or the equivalent from another New York State agency, have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators* of *construction activities* that are required to obtain *UPA* permits must submit a preliminary SWPPP to the appropriate DEC Permit Administrator at the Regional Office listed in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,

c. the final SWPPP has been prepared, and

d. a complete NOI has been submitted to the Department in accordance with the requirements of this permit.

3. An *owner or operator* that has satisfied the requirements of Part II.C.2 above will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

   a. For *construction activities* that are not subject to the requirements of a *regulated, traditional land use control MS4*:

      (i) Five (5) business days from the date the Department receives a complete electronic version of the NOI (eNOI) for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.; or

      (ii) Sixty (60) business days from the date the Department receives a complete NOI (electronic or paper version) for *construction activities* with a SWPPP that has not been prepared in conformance with the design criteria in technical standard referenced in Part III.B.1. or, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C., the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, or;

      (iii) Ten (10) business days from the date the Department receives a complete paper version of the NOI for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives both a complete electronic version of the NOI (eNOI) and signed "*MS4* SWPPP Acceptance" form, or

(ii) Ten (10) business days from the date the Department receives both a complete paper version of the NOI and signed "MS4 SWPPP Acceptance" form.

4. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department. The *owner or operator* shall not *commence construction activity* on the future or additional areas until their authorization to *discharge* under this permit goes into effect in accordance with Part II.C. of this permit.

D. General Requirements For Owners or Operators With Permit Coverage

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination ("NOT") has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-20-001), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, responsible contractor's or subcontractor's certification statement (see Part III.A.6.), and all documentation necessary to demonstrate eligibility with this permit at the *construction site* until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land* *use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:

a. The *owner or operator* shall have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016.

c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

d. The *owner or operator* shall install any additional site-specific practices needed to protect water quality.

e. The *owner or operator* shall include the requirements above in their SWPPP.

4. In accordance with statute, regulations, and the terms and conditions of this permit, the Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements or consistent with Part VII.K..

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

6. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*, the *owner or operator* shall notify the

regulated, traditional land use control MS4 in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *regulated, traditional land use control MS4*, the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *regulated, traditional land use control MS4* prior to commencing construction of the post-construction stormwater management practice.

E. Permit Coverage for Discharges Authorized Under GP-0-15-002

1. Upon renewal of SPDES General Permit for Stormwater Discharges from *Construction Activity* (Permit No. GP-0-15-002), an *owner or operator* of *a construction activity* with coverage under GP-0-15-002, as of the effective date of GP- 0-20-001, shall be authorized to *discharge* in accordance with GP- 0-20-001, unless otherwise notified by the Department.

   An *owner or operator* may continue to implement the technical/design components of the post-construction stormwater management controls provided that such design was done in conformance with the technical standards in place at the time of initial project authorization. However, they must comply with the other, non-design provisions of GP-0-20-001.

F. Change of Owner or Operator

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, in writing, of the requirement to obtain permit coverage by submitting a NOI with the Department. For *construction activities* subject to the requirements of a *regulated, traditional land use control MS4,* the original *owner or operator* must also notify the MS4, in writing, of the change in ownership at least 30 calendar days prior to the change in ownership.

2. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.B.1. of this permit. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

3. Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or*

operator was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. A SWPPP shall be prepared and implemented by the *owner or operator* of each *construction activity* covered by this permit. The SWPPP must document the selection, design, installation, implementation and maintenance of the control measures and practices that will be used to meet the effluent limitations in Part I.B. of this permit and where applicable, the post-construction stormwater management practice requirements in Part I.C. of this permit. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*. A copy of the completed, final NOI shall be included in the SWPPP.

2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the *pollutants* in stormwater *discharges* and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.

3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.

4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP, including construction drawings:

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

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

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

d. to document the final construction conditions.

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

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

   The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

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

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

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Where erosion and sediment control practices are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must demonstrate *equivalence* to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

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

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

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

d. A construction phasing plan and sequence of operations describing the intended order of *construction activities*, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance;

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

f. A temporary and permanent soil stabilization plan that meets the requirements of this general permit and the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of *final stabilization*;

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

h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6. of this permit, to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule shall be in accordance with the requirements in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016;

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

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

l. Identification of any elements of the design that are not in conformance with the design criteria in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. Post-construction stormwater management practice component – The *owner or operator* of any construction project identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the applicable *sizing criteria* in Part I.C.2.a., c. or d. of this permit and the *performance criteria* in the technical standard, New York State Stormwater Management Design Manual dated January 2015

   Where post-construction stormwater management practices are not designed in conformance with the *performance criteria* in the technical standard, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

   The post-construction stormwater management practice component of the SWPPP shall include the following:

   a. Identification of all post-construction stormwater management practices to be constructed as part of the project. Include the dimensions, material specifications and installation details for each post-construction stormwater management practice;

b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;

c. A Stormwater Modeling and Analysis Report that includes:
   (i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points;

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

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

   (iv) Summary table, with supporting calculations, which demonstrates that each post-construction stormwater management practice has been designed in conformance with the *sizing criteria* included in the Design Manual;

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

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

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

e. Infiltration test results, when required; and

f. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the applicable *sizing criteria* in Part I.C.2. b., c. or d. of this permit and the *performance criteria,* Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.f. above.

C. Required SWPPP Components by Project Type

Unless otherwise notified by the Department, *owners or operators* of *construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1 of this permit. *Owners or operators* of the *construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3 of this permit.

Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures) and all post-construction stormwater management practices identified in the SWPPP are inspected and maintained in accordance with Part IV.B. and C. of this permit.

2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York or protect the public health and safety and/or the environment.

B. Contractor Maintenance Inspection Requirements

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

begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

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

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

C. Qualified Inspector Inspection Requirements

The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. and IV.B. of this permit **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- New York State Erosion and Sediment Control Certificate Program holder
- Registered Landscape Architect, or
- someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, with the exception of:

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

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

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

d. *construction activities* located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:

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

   b. For construction sites where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part II.D.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

   c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to reducing the frequency of inspections.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization,* and all temporary, structural erosion and sediment control measures have been removed*;* and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice" certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.B.1 of this permit.

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

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization,* all points of *discharge* to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site*, and all points of *discharge* from the *construction site*.

4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

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

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

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

e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site* which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;

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

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

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

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

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

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

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

5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the *qualified inspector.* Pursuant to Part II.D.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

Part V. TERMINATION OF PERMIT COVERAGE

A. Termination of Permit Coverage

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.B.1 of this permit. The NOT form shall be one which is associated with this permit, signed in accordance with Part VII.H of this permit.

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:

   a. Total project completion - All *construction activity* identified in the SWPPP has been completed; <u>and</u> all areas of disturbance have achieved *final stabilization*; <u>and</u> all temporary, structural erosion and sediment control measures have been removed; <u>and</u> all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;

b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; <u>and</u> all areas disturbed as of the project shutdown date have achieved *final stabilization*; <u>and</u> all temporary, structural erosion and sediment control measures have been removed; <u>and</u> all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;

c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.F. of this permit.

d. The *owner or operator* obtains coverage under an alternative SPDES general permit or an individual SPDES permit.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice certification statements on the NOT, certify that all the requirements in Part V.A.2.a. or b. of this permit have been achieved.

4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *regulated, traditional land use control MS4* sign the "MS4 Acceptance" statement on the NOT in accordance with the requirements in Part VII.H. of this permit. The *regulated, traditional land use control MS4* official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The *regulated, traditional land use control MS4* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector*'s final site inspection certification(s) required in Part V.A.3. of this permit.

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:

a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record,

d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility; the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

Part VI. REPORTING AND RETENTION RECORDS

A. Record Retention

The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the Department receives a complete NOT submitted in accordance with Part V. of this general permit.

B. Addresses

With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.B.1 of this permit), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate DOW Water (SPDES) Program contact at the Regional Office listed in Appendix F.

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply

The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water

Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

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

B. Continuation of the Expired General Permit

This permit expires five (5) years from the effective date. If a new general permit is not issued prior to the expiration of this general permit, an *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the terms and conditions of this general permit, if it is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, until a new general permit is issued.

C. Enforcement

Failure of the *owner or operator,* its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to $37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

D. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate

The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

F. Duty to Provide Information

The *owner or operator* shall furnish to the Department, within a reasonable specified time period of a written request, all documentation necessary to demonstrate eligibility and any information to determine compliance with this permit or to determine whether cause exists for modifying or revoking this permit, or suspending or denying coverage under this permit, in accordance with the terms and conditions of this permit. The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

G. Other Information

When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any of the documents required by this permit , or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or *impervious area*), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department using the contact information in Part II.A. of this permit. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

H. Signatory Requirements

1. All NOIs and NOTs shall be signed as follows:

    a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(i) the chief executive officer of the agency, or

(ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part VII.H.1. of this permit;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of *equivalent* responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position) and,

c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.

3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.

4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person.

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

I. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

J. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

K. Requirement to Obtain Coverage Under an Alternative Permit

1. The Department may require any owner or operator authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any discharger authorized by a general permit to apply for an individual SPDES permit, it shall notify the discharger in writing that a permit application is required. This notice shall

include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the owner or operator to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from owner or operator receipt of the notification letter, whereby the authorization to discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Permit Administrator at the Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Department, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. When an individual SPDES permit is issued to a discharger authorized to *discharge* under a general SPDES permit for the same *discharge*(s), the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

L. Proper Operation and Maintenance

The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

M. Inspection and Entry

The *owner or operator* shall allow an authorized representative of the Department, EPA, applicable county health department, or, in the case of a *construction site* which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the owner’s or operator's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment), practices or operations regulated or required by this permit.

4. Sample or monitor at reasonable times, for purposes of assuring permit compliance or as otherwise authorized by the Act or ECL, any substances or parameters at any location.

N. Permit Actions

This permit may, at any time, be modified, suspended, revoked, or renewed by the Department in accordance with 6 NYCRR Part 621. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions

Definitions of key terms are included in Appendix A of this permit.

P. Re-Opener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with construction activity covered by this permit, the owner or operator of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Any Department initiated permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

Q. Penalties for Falsification of Forms and Reports

In accordance with 6NYCRR Part 750-2.4 and 750-2.5, any person who knowingly makes any false material statement, representation, or certification in any application, record, report or other document filed or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished in accordance with ECL §71-1933 and or Articles 175 and 210 of the New York State Penal Law.

R. Other Permits

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

APPENDIX A – Acronyms and Definitions

Acronyms

APO – Agency Preservation Officer
BMP – Best Management Practice
CPESC – Certified Professional in Erosion and Sediment Control
Cpv – Channel Protection Volume
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 et seq)
DOW – Division of Water
EAF – Environmental Assessment Form
ECL - Environmental Conservation Law
EPA – U. S. Environmental Protection Agency
HSG – Hydrologic Soil Group
MS4 – Municipal Separate Storm Sewer System
NOI – Notice of Intent
NOT – Notice of Termination
NPDES – National Pollutant Discharge Elimination System
OPRHP – Office of Parks, Recreation and Historic Places
Qf – Extreme Flood
Qp – Overbank Flood
RRv – Runoff Reduction Volume
RWE – Regional Water Engineer
SEQR – State Environmental Quality Review
SEQRA - State Environmental Quality Review Act
SHPA – State Historic Preservation Act
SPDES – State Pollutant Discharge Elimination System
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
UPA – Uniform Procedures Act
USDA – United States Department of Agriculture
WQv – Water Quality Volume

Definitions

<u>All definitions in this section are solely for the purposes of this permit.</u>

Agricultural Building – a structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products; excluding any structure designed, constructed or used, in whole or in part, for human habitation, as a place of employment where agricultural products are processed, treated or packaged, or as a place used by the public.

Agricultural Property –means the land for construction of a barn, *agricultural building*, silo, stockyard, pen or other structural practices identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State” prepared by the Department in cooperation with agencies of New York Nonpoint Source Coordinating Committee (dated June 2007).

Alter Hydrology from Pre to Post-Development Conditions - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer - means a sewer that is designed to collect and convey both “sewage” and “stormwater”.

Commence (Commencement of) Construction Activities - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for “*Construction Activity(ies)*” also.

Construction Activity(ies) - means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Construction Site – means the land area where *construction activity(ies)* will occur. See definition for “*Commence (Commencement of) Construction Activities”* and “*Larger Common Plan of Development or Sale” also.*

Dewatering – means the act of draining rainwater and/or groundwater from building foundations, vaults or excavations/trenches.

Direct Discharge (to a specific surface waterbody) - means that runoff flows from a *construction site* by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a *construction site* to a separate storm sewer system and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

Discharge(s) - means any addition of any pollutant to waters of the State through an outlet or *point source*.

Embankment –means an earthen or rock slope that supports a road/highway.

Endangered or Threatened Species – see 6 NYCRR Part 182 of the Department's rules and regulations for definition of terms and requirements.

Environmental Conservation Law (ECL) - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

Equivalent (Equivalence) – means that the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 and Section 70-0117 of the ECL authorizing a category of discharges.

Groundwater(s) - means waters in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Historic Property – means any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State or National Registers of Historic Places.

Impervious Area (Cover) - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Infeasible – means not technologically possible, or not economically practicable and achievable in light of best industry practices.

Larger Common Plan of Development or Sale - means a contiguous area where multiple separate and distinct *construction activities* are occurring, or will occur, under one plan. The term “plan” in “larger common plan of development or sale” is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that *construction activities* may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same “common plan” is not concurrently being disturbed.

Minimize – means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a *combined sewer*; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

Natural Buffer –means an undisturbed area with natural cover running along a surface water (e.g. wetland, stream, river, lake, etc.).

New Development – means any land disturbance that does not meet the definition of Redevelopment Activity included in this appendix.

New York State Erosion and Sediment Control Certificate Program – a certificate program that establishes and maintains a process to identify and recognize individuals who are capable of developing, designing, inspecting and maintaining erosion and sediment control plans on projects that disturb soils in New York State. The certificate program is administered by the New York State Conservation District Employees Association.

NOI Acknowledgment Letter - means the letter that the Department sends to an owner or operator to acknowledge the Department's receipt and acceptance of a complete Notice of Intent. This letter documents the owner's or operator's authorization to discharge in accordance with the general permit for stormwater discharges from *construction activity*.

Nonpoint Source - means any source of water pollution or pollutants which is not a discrete conveyance or *point source* permitted pursuant to Title 7 or 8 of Article 17 of the Environmental Conservation Law (see ECL Section 17-1403).

Overbank –means flow events that exceed the capacity of the stream channel and spill out into the adjacent floodplain.

Owner or Operator - means the person, persons or legal entity which owns or leases the property on which the *construction activity* is occurring; an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications; and/or an entity that has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions.

Performance Criteria – means the design criteria listed under the "Required Elements" sections in Chapters 5, 6 and 10 of the technical standard, New York State Stormwater Management Design Manual, dated January 2015. It does not include the Sizing Criteria (i.e. WQv, RRv, Cpv, Qp and Qf) in Part I.C.2. of the permit.

Point Source - means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, or landfill leachate collection system from which *pollutants* are or may be discharged.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq .

Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

Redevelopment Activity(ies) – means the disturbance and reconstruction of existing impervious area, including impervious areas that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

Regulated, Traditional Land Use Control MS4 - means a city, town or village with land use control authority that is authorized to discharge under New York State DEC's

SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s) or the City of New York's Individual SPDES Permit for their Municipal Separate Storm Sewer Systems (NY-0287890).

Routine Maintenance Activity - means *construction activity* that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that stabilizes the transition between the road shoulder and the ditch or *embankment*,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or *embankment*,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

Site limitations – means site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical site limitations include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of site limitations shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – means the criteria included in Part I.C.2 of the permit that are used to size post-construction stormwater management control practices. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), *Overbank* Flood (Qp), and Extreme Flood (Qf).

State Pollutant Discharge Elimination System (SPDES) - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

Steep Slope – means land area designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%) , or Soil Slope Phase E or F, (regardless of the map unit name), or a combination of the three designations.

Streambank – as used in this permit, means the terrain alongside the bed of a creek or stream. The bank consists of the sides of the channel, between which the flow is confined.

Stormwater Pollution Prevention Plan (SWPPP) – means a project specific report, including construction drawings, that among other things: describes the construction activity(ies), identifies the potential sources of pollution at the *construction site*; describes and shows the stormwater controls that will be used to control the pollutants (i.e. erosion and sediment controls; for many projects, includes post-construction stormwater management controls); and identifies procedures the *owner or operator* will implement to comply with the terms and conditions of the permit. See Part III of the permit for a complete description of the information that must be included in the SWPPP.

Surface Waters of the State - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporarily Ceased – means that an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

Temporary Stabilization - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Loads (TMDLs) - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and *nonpoint source*s. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet *water quality standards*, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for *point source* discharges, load allocations (LAs) for *nonpoint source*s, and a margin of safety (MOS).

Trained Contractor - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* is responsible for the day to day implementation of the SWPPP.

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part 621 of the Environmental Conservation Law (ECL), Article 70.

Water Quality Standard - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B – Required SWPPP Components by Project Type

Table 1
Construction Activities that Require the Preparation of a SWPPP That Only Includes Erosion and Sediment Controls

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:

- Single family home not located in one of the watersheds listed in Appendix C or not *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions with 25% or less impervious cover at total site build-out and not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E
- Construction of a barn or other *agricultural building*, silo, stock yard or pen.

The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:

All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains
- Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects
- Pond construction
- Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an impervious cover
- Cross-country ski trails and walking/hiking trails
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are not part of residential, commercial or institutional development;
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path or walking path.
- Slope stabilization projects
- Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics

Table 1 (Continued) Construction Activities that Require the Preparation of a SWPPP That Only Includes Erosion and Sediment Controls

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Spoil areas that will be covered with vegetation
- Vegetated open space projects (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) excluding projects that *alter hydrology from pre to post development* conditions,
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre to post development* conditions
- Demolition project where vegetation will be established, and no redevelopment is planned
- Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*
- Structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State”, excluding projects that involve soil disturbances of greater than five acres and construction activities that include the construction or reconstruction of impervious area
- Temporary access roads, median crossovers, detour roads, lanes, or other temporary impervious areas that will be restored to pre-construction conditions once the construction activity is complete

Table 2

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family home that disturbs five (5) or more acres of land
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes duplexes, townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Breweries, cideries, and wineries, including establishments constructed on agricultural land
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other *agricultural building* (e.g. silo) and structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State” that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional development; includes hospitals, prisons, schools and colleges
- Industrial facilities; includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW’s, water treatment plants, and water storage tanks
- Office complexes
- Playgrounds that include the construction or reconstruction of impervious area
- Sports complexes
- Racetracks; includes racetracks with earthen (dirt) surface
- Road construction or reconstruction, including roads constructed as part of the construction activities listed in Table 1

Table 2 (Continued)

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Parking lot construction or reconstruction, including parking lots constructed as part of the construction activities listed in Table 1
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover,* and constructed as part of an over-head electric transmission line project, wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a residential, commercial or institutional development
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a highway construction or reconstruction project
- All other construction activities that include the construction or reconstruction of *impervious area* <u>or</u> *alter the hydrology from pre to post development* conditions, <u>and</u> are not listed in Table 1

APPENDIX C – Watersheds Requiring Enhanced Phosphorus Removal

Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

- Entire New York City Watershed located east of the Hudson River **-** Figure 1
- Onondaga Lake Watershed **-** Figure 2
- Greenwood Lake Watershed **-**Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

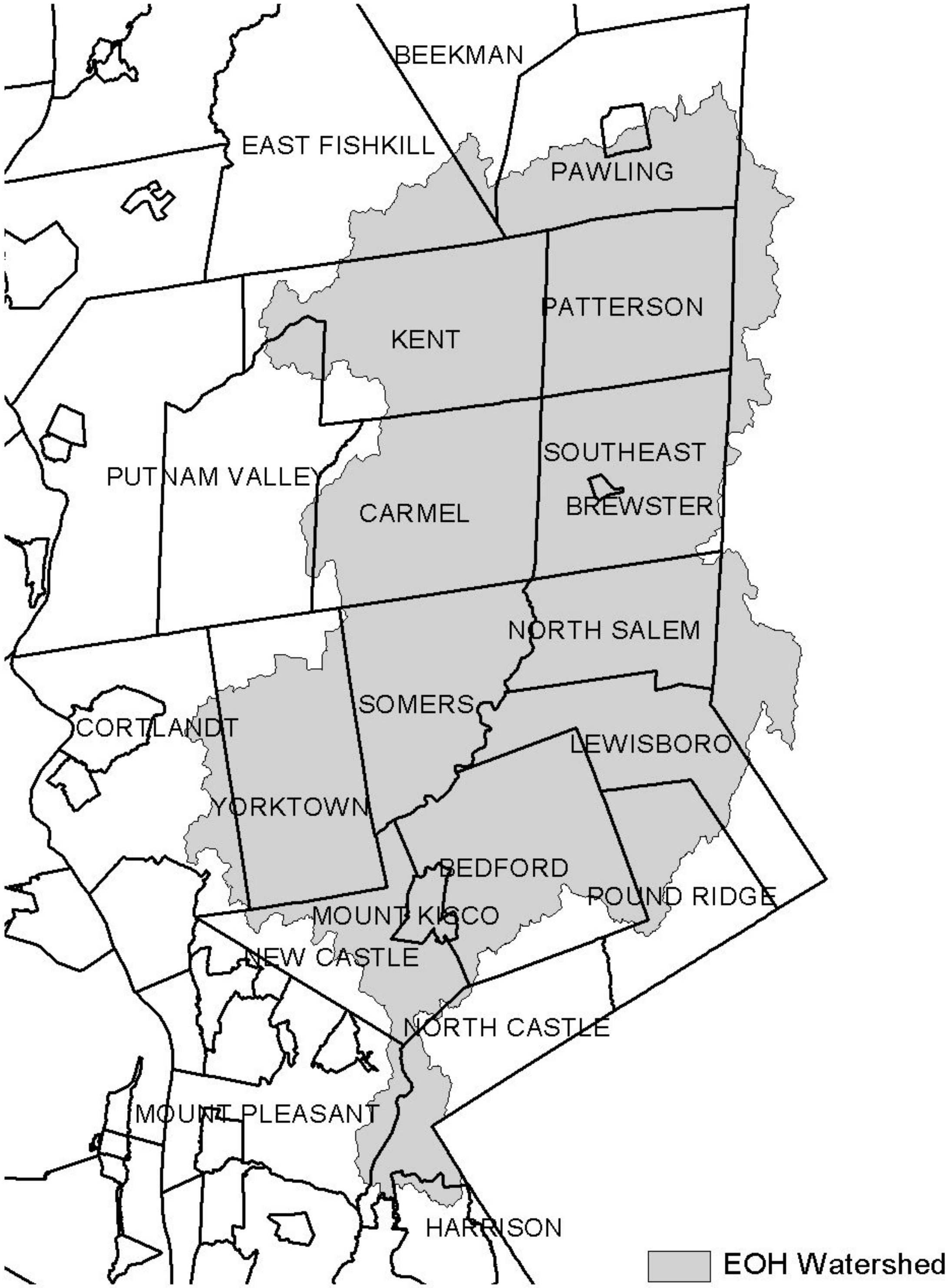


Figure 2 - Onondaga Lake Watershed

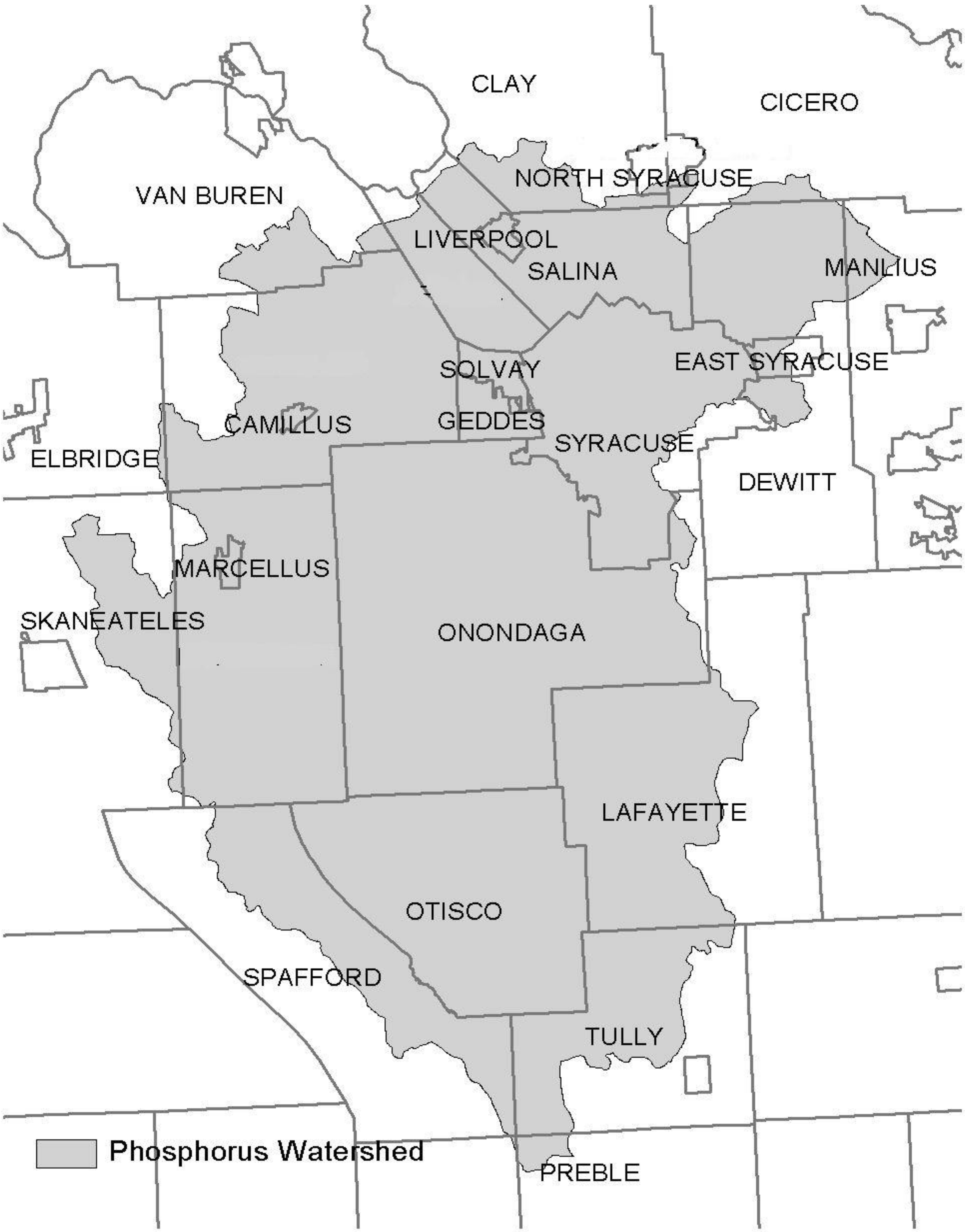


Figure 3 - Greenwood Lake Watershed

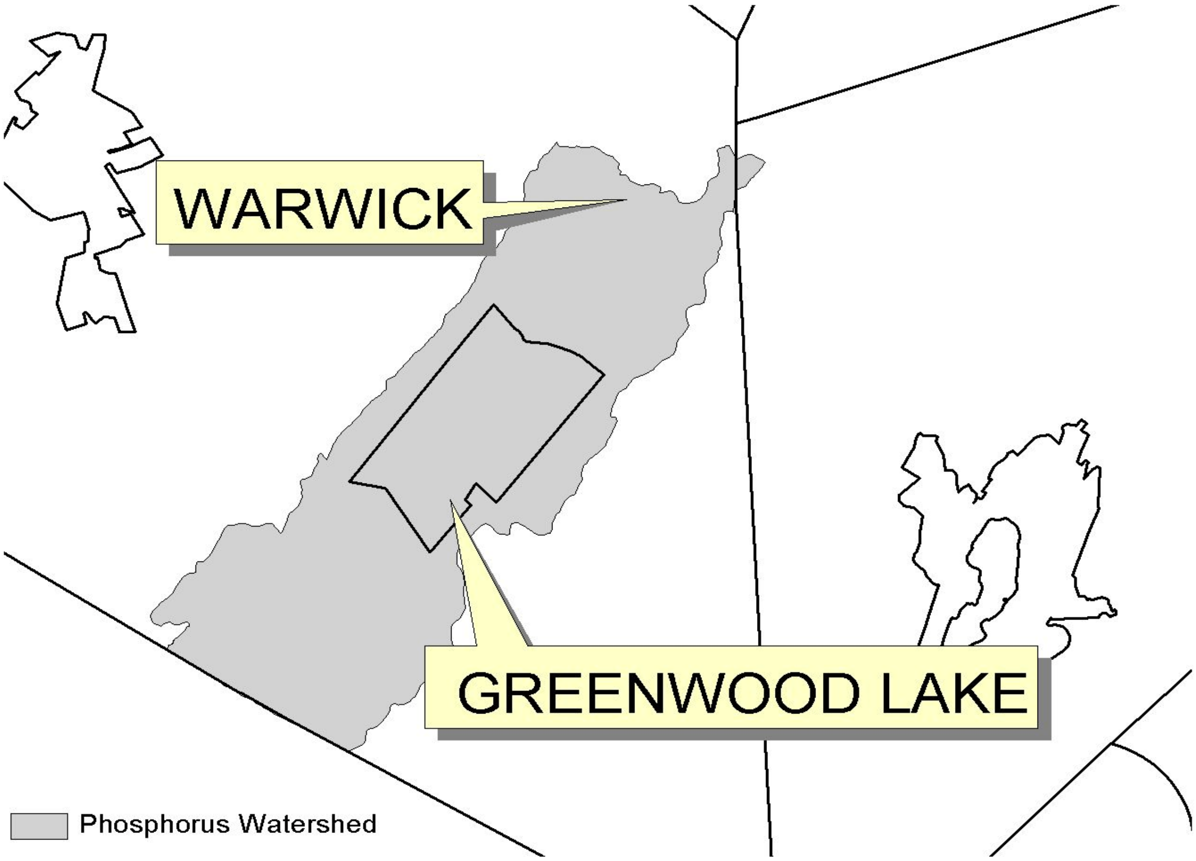


Figure 4 - Oscawana Lake Watershed

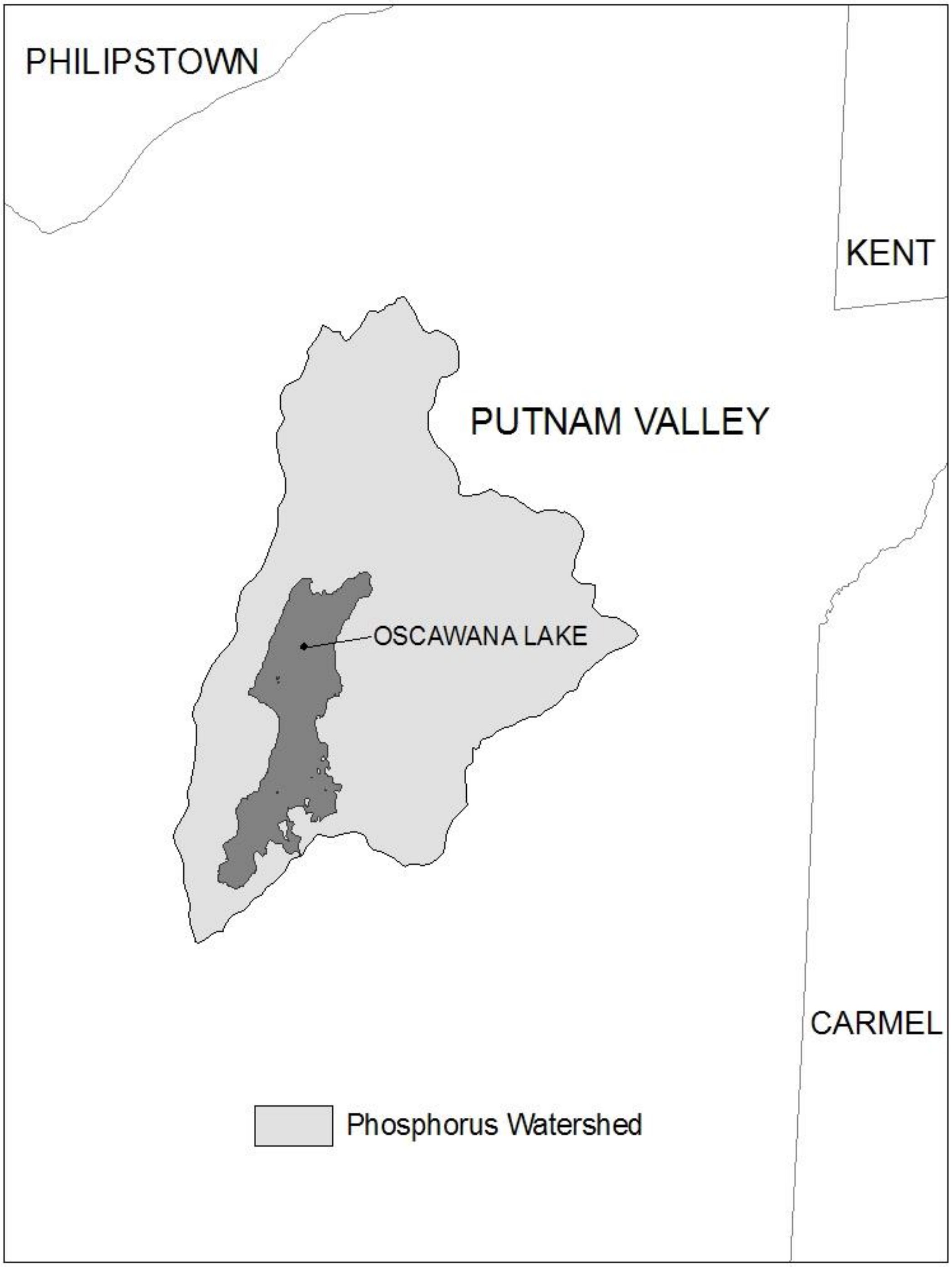
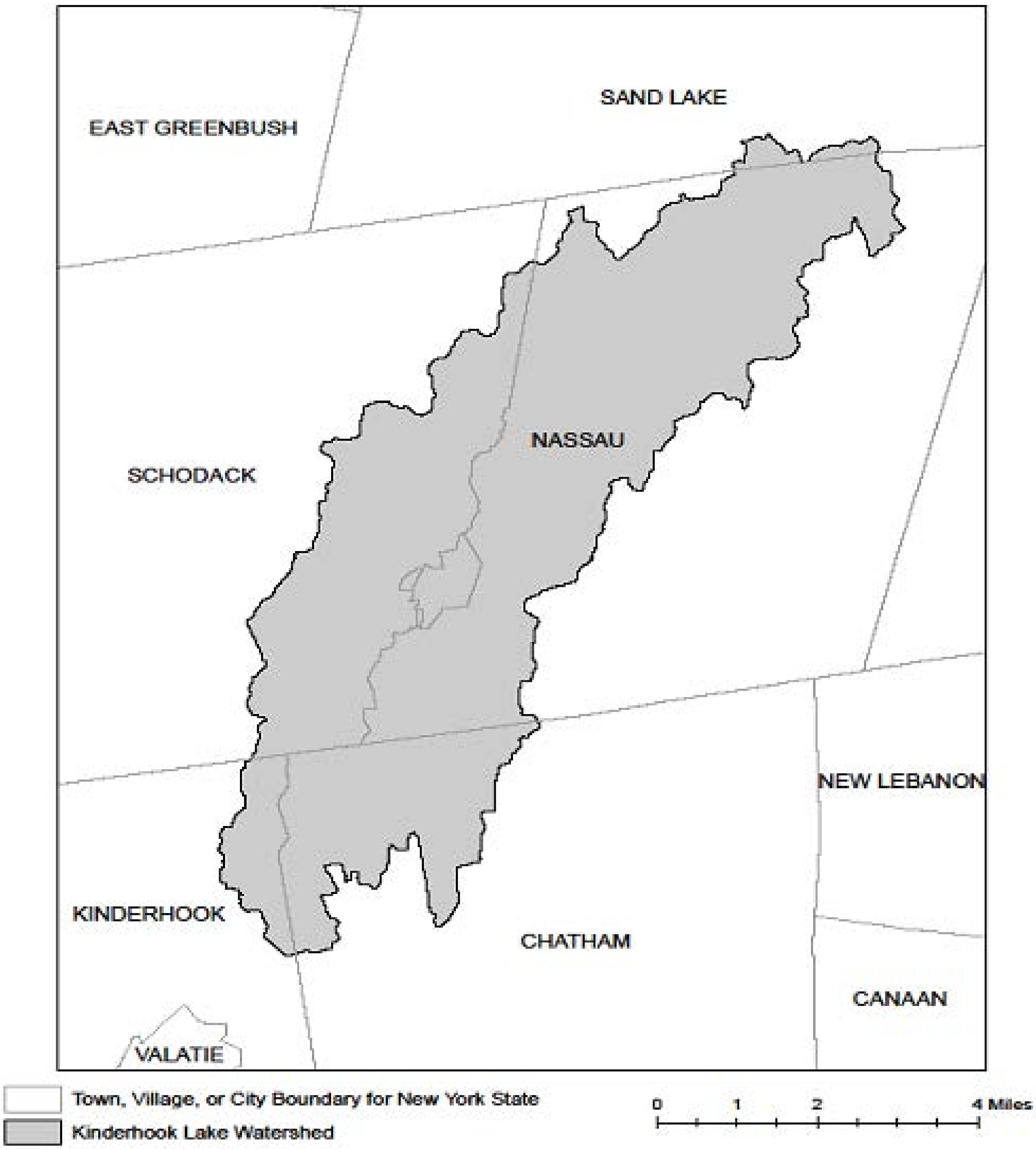


Figure 5 - Kinderhook Lake Watershed



APPENDIX D – Watersheds with Lower Disturbance Threshold

Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.

Entire New York City Watershed that is located east of the Hudson River **-** See Figure 1 in Appendix C

APPENDIX E – 303(d) Segments Impaired by Construction Related Pollutant(s)

List of 303(d) segments impaired by pollutants related to *construction activity* (e.g. silt, sediment or nutrients). The list was developed using ”The Final New York State 2016 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy” dated November 2016. *Owners or operators* of single family home and single family residential subdivisions with 25% or less total impervious cover at total site build-out that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the New York State Stormwater Management Design Manual (“Design Manual”), dated January 2015.

COUNTY	WATERBODY	POLLUTANT
Albany	Ann Lee (Shakers) Pond, Stump Pond	Nutrients
Albany	Basic Creek Reservoir	Nutrients
Allegany	Amity Lake, Saunders Pond	Nutrients
Bronx	Long Island Sound, Bronx	Nutrients
Bronx	Van Cortlandt Lake	Nutrients
Broome	Fly Pond, Deer Lake, Sky Lake	Nutrients
Broome	Minor Tribs to Lower Susquehanna (north)	Nutrients
Broome	Whitney Point Lake/Reservoir	Nutrients
Cattaraugus	Allegheny River/Reservoir	Nutrients
Cattaraugus	Beaver (Alma) Lake	Nutrients
Cattaraugus	Case Lake	Nutrients
Cattaraugus	Linlyco/Club Pond	Nutrients
Cayuga	Duck Lake	Nutrients
Cayuga	Little Sodus Bay	Nutrients
Chautauqua	Bear Lake	Nutrients
Chautauqua	Chadakoin River and tribs	Nutrients
Chautauqua	Chautauqua Lake, North	Nutrients
Chautauqua	Chautauqua Lake, South	Nutrients
Chautauqua	Findley Lake	Nutrients
Chautauqua	Hulburt/Clymer Pond	Nutrients
Clinton	Great Chazy River, Lower, Main Stem	Silt/Sediment
Clinton	Lake Champlain, Main Lake, Middle	Nutrients
Clinton	Lake Champlain, Main Lake, North	Nutrients
Columbia	Kinderhook Lake	Nutrients
Columbia	Robinson Pond	Nutrients
Cortland	Dean Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Dutchess	Fall Kill and tribs	Nutrients
Dutchess	Hillside Lake	Nutrients
Dutchess	Wappingers Lake	Nutrients
Dutchess	Wappingers Lake	Silt/Sediment
Erie	Beeman Creek and tribs	Nutrients
Erie	Ellicott Creek, Lower, and tribs	Silt/Sediment
Erie	Ellicott Creek, Lower, and tribs	Nutrients
Erie	Green Lake	Nutrients
Erie	Little Sister Creek, Lower, and tribs	Nutrients
Erie	Murder Creek, Lower, and tribs	Nutrients
Erie	Rush Creek and tribs	Nutrients
Erie	Scajaquada Creek, Lower, and tribs	Nutrients
Erie	Scajaquada Creek, Middle, and tribs	Nutrients
Erie	Scajaquada Creek, Upper, and tribs	Nutrients
Erie	South Branch Smoke Cr, Lower, and tribs	Silt/Sediment
Erie	South Branch Smoke Cr, Lower, and tribs	Nutrients
Essex	Lake Champlain, Main Lake, South	Nutrients
Essex	Lake Champlain, South Lake	Nutrients
Essex	Willsboro Bay	Nutrients
Genesee	Bigelow Creek and tribs	Nutrients
Genesee	Black Creek, Middle, and minor tribs	Nutrients
Genesee	Black Creek, Upper, and minor tribs	Nutrients
Genesee	Bowen Brook and tribs	Nutrients
Genesee	LeRoy Reservoir	Nutrients
Genesee	Oak Orchard Cr, Upper, and tribs	Nutrients
Genesee	Tonawanda Creek, Middle, Main Stem	Nutrients
Greene	Schoharie Reservoir	Silt/Sediment
Greene	Sleepy Hollow Lake	Silt/Sediment
Herkimer	Steele Creek tribs	Silt/Sediment
Herkimer	Steele Creek tribs	Nutrients
Jefferson	Moon Lake	Nutrients
Kings	Hendrix Creek	Nutrients
Kings	Prospect Park Lake	Nutrients
Lewis	Mill Creek/South Branch, and tribs	Nutrients
Livingston	Christie Creek and tribs	Nutrients
Livingston	Conesus Lake	Nutrients
Livingston	Mill Creek and minor tribs	Silt/Sediment
Monroe	Black Creek, Lower, and minor tribs	Nutrients
Monroe	Buck Pond	Nutrients
Monroe	Cranberry Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Monroe	Lake Ontario Shoreline, Western	Nutrients
Monroe	Long Pond	Nutrients
Monroe	Mill Creek and tribs	Nutrients
Monroe	Mill Creek/Blue Pond Outlet and tribs	Nutrients
Monroe	Minor Tribs to Irondequoit Bay	Nutrients
Monroe	Rochester Embayment - East	Nutrients
Monroe	Rochester Embayment - West	Nutrients
Monroe	Shipbuilders Creek and tribs	Nutrients
Monroe	Thomas Creek/White Brook and tribs	Nutrients
Nassau	Beaver Lake	Nutrients
Nassau	Camaans Pond	Nutrients
Nassau	East Meadow Brook, Upper, and tribs	Silt/Sediment
Nassau	East Rockaway Channel	Nutrients
Nassau	Grant Park Pond	Nutrients
Nassau	Hempstead Bay	Nutrients
Nassau	Hempstead Lake	Nutrients
Nassau	Hewlett Bay	Nutrients
Nassau	Hog Island Channel	Nutrients
Nassau	Long Island Sound, Nassau County Waters	Nutrients
Nassau	Massapequa Creek and tribs	Nutrients
Nassau	Milburn/Parsonage Creeks, Upp, and tribs	Nutrients
Nassau	Reynolds Channel, west	Nutrients
Nassau	Tidal Tribs to Hempstead Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Silt/Sediment
Nassau	Tribs to Smith/Halls Ponds	Nutrients
Nassau	Woodmere Channel	Nutrients
New York	Harlem Meer	Nutrients
New York	The Lake in Central Park	Nutrients
Niagara	Bergholtz Creek and tribs	Nutrients
Niagara	Hyde Park Lake	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Oneida	Ballou, Nail Creeks and tribs	Nutrients
Onondaga	Harbor Brook, Lower, and tribs	Nutrients
Onondaga	Ley Creek and tribs	Nutrients
Onondaga	Minor Tribs to Onondaga Lake	Nutrients
Onondaga	Ninemile Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Middle, and tribs	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Onondaga	Onondaga Lake, northern end	Nutrients
Onondaga	Onondaga Lake, southern end	Nutrients
Ontario	Great Brook and minor tribs	Silt/Sediment
Ontario	Great Brook and minor tribs	Nutrients
Ontario	Hemlock Lake Outlet and minor tribs	Nutrients
Ontario	Honeoye Lake	Nutrients
Orange	Greenwood Lake	Nutrients
Orange	Monhagen Brook and tribs	Nutrients
Orange	Orange Lake	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Oswego	Lake Neatahwanta	Nutrients
Oswego	Pleasant Lake	Nutrients
Putnam	Bog Brook Reservoir	Nutrients
Putnam	Boyd Corners Reservoir	Nutrients
Putnam	Croton Falls Reservoir	Nutrients
Putnam	Diverting Reservoir	Nutrients
Putnam	East Branch Reservoir	Nutrients
Putnam	Lake Carmel	Nutrients
Putnam	Middle Branch Reservoir	Nutrients
Putnam	Oscawana Lake	Nutrients
Putnam	Palmer Lake	Nutrients
Putnam	West Branch Reservoir	Nutrients
Queens	Bergen Basin	Nutrients
Queens	Flushing Creek/Bay	Nutrients
Queens	Jamaica Bay, Eastern, and tribs (Queens)	Nutrients
Queens	Kissena Lake	Nutrients
Queens	Meadow Lake	Nutrients
Queens	Willow Lake	Nutrients
Rensselaer	Nassau Lake	Nutrients
Rensselaer	Snyders Lake	Nutrients
Richmond	Grasmere Lake/Bradys Pond	Nutrients
Rockland	Congers Lake, Swartout Lake	Nutrients
Rockland	Rockland Lake	Nutrients
Saratoga	Ballston Lake	Nutrients
Saratoga	Dwaas Kill and tribs	Silt/Sediment
Saratoga	Dwaas Kill and tribs	Nutrients
Saratoga	Lake Lonely	Nutrients
Saratoga	Round Lake	Nutrients
Saratoga	Tribs to Lake Lonely	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Schenectady	Collins Lake	Nutrients
Schenectady	Duane Lake	Nutrients
Schenectady	Mariaville Lake	Nutrients
Schoharie	Engleville Pond	Nutrients
Schoharie	Summit Lake	Nutrients
Seneca	Reeder Creek and tribs	Nutrients
St.Lawrence	Black Lake Outlet/Black Lake	Nutrients
St.Lawrence	Fish Creek and minor tribs	Nutrients
Steuben	Smith Pond	Nutrients
Suffolk	Agawam Lake	Nutrients
Suffolk	Big/Little Fresh Ponds	Nutrients
Suffolk	Canaan Lake	Silt/Sediment
Suffolk	Canaan Lake	Nutrients
Suffolk	Flanders Bay, West/Lower Sawmill Creek	Nutrients
Suffolk	Fresh Pond	Nutrients
Suffolk	Great South Bay, East	Nutrients
Suffolk	Great South Bay, Middle	Nutrients
Suffolk	Great South Bay, West	Nutrients
Suffolk	Lake Ronkonkoma	Nutrients
Suffolk	Long Island Sound, Suffolk County, West	Nutrients
Suffolk	Mattituck (Marratooka) Pond	Nutrients
Suffolk	Meetinghouse/Terrys Creeks and tribs	Nutrients
Suffolk	Mill and Seven Ponds	Nutrients
Suffolk	Millers Pond	Nutrients
Suffolk	Moriches Bay, East	Nutrients
Suffolk	Moriches Bay, West	Nutrients
Suffolk	Peconic River, Lower, and tidal tribs	Nutrients
Suffolk	Quantuck Bay	Nutrients
Suffolk	Shinnecock Bay and Inlet	Nutrients
Suffolk	Tidal tribs to West Moriches Bay	Nutrients
Sullivan	Bodine, Montgomery Lakes	Nutrients
Sullivan	Davies Lake	Nutrients
Sullivan	Evens Lake	Nutrients
Sullivan	Pleasure Lake	Nutrients
Tompkins	Cayuga Lake, Southern End	Nutrients
Tompkins	Cayuga Lake, Southern End	Silt/Sediment
Tompkins	Owasco Inlet, Upper, and tribs	Nutrients
Ulster	Ashokan Reservoir	Silt/Sediment
Ulster	Esopus Creek, Upper, and minor tribs	Silt/Sediment
Warren	Hague Brook and tribs	Silt/Sediment

303(d) Segments Impaired by Construction Related Pollutant(s)

Warren	Huddle/Finkle Brooks and tribs	Silt/Sediment
Warren	Indian Brook and tribs	Silt/Sediment
Warren	Lake George	Silt/Sediment
Warren	Tribs to L.George, Village of L George	Silt/Sediment
Washington	Cossayuna Lake	Nutrients
Washington	Lake Champlain, South Bay	Nutrients
Washington	Tribs to L.George, East Shore	Silt/Sediment
Washington	Wood Cr/Champlain Canal and minor tribs	Nutrients
Wayne	Port Bay	Nutrients
Westchester	Amawalk Reservoir	Nutrients
Westchester	Blind Brook, Upper, and tribs	Silt/Sediment
Westchester	Cross River Reservoir	Nutrients
Westchester	Lake Katonah	Nutrients
Westchester	Lake Lincolndale	Nutrients
Westchester	Lake Meahagh	Nutrients
Westchester	Lake Mohegan	Nutrients
Westchester	Lake Shenorock	Nutrients
Westchester	Long Island Sound, Westchester (East)	Nutrients
Westchester	Mamaroneck River, Lower	Silt/Sediment
Westchester	Mamaroneck River, Upper, and minor tribs	Silt/Sediment
Westchester	Muscoot/Upper New Croton Reservoir	Nutrients
Westchester	New Croton Reservoir	Nutrients
Westchester	Peach Lake	Nutrients
Westchester	Reservoir No.1 (Lake Isle)	Nutrients
Westchester	Saw Mill River, Lower, and tribs	Nutrients
Westchester	Saw Mill River, Middle, and tribs	Nutrients
Westchester	Sheldrake River and tribs	Silt/Sediment
Westchester	Sheldrake River and tribs	Nutrients
Westchester	Silver Lake	Nutrients
Westchester	Teatown Lake	Nutrients
Westchester	Titicus Reservoir	Nutrients
Westchester	Truesdale Lake	Nutrients
Westchester	Wallace Pond	Nutrients
Wyoming	Java Lake	Nutrients
Wyoming	Silver Lake	Nutrients

APPENDIX F – List of NYS DEC Regional Offices

Region	COVERING THE FOLLOWING COUNTIES:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) PERMIT ADMINISTRATORS	DIVISION OF WATER (DOW) WATER (SPDES) PROGRAM
1	NASSAU AND SUFFOLK	50 CIRCLE ROAD STONY BROOK, NY 11790 TEL. (631) 444-0365	50 CIRCLE ROAD STONY BROOK, NY 11790-3409 TEL. (631) 444-0405
2	BRONX, KINGS, NEW YORK, QUEENS AND RICHMOND	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4997	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4933
3	DUTCHESS, ORANGE, PUTNAM, ROCKLAND, SULLIVAN, ULSTER AND WESTCHESTER	21 SOUTH PUTT CORNERS ROAD NEW PALTZ, NY 12561-1696 TEL. (845) 256-3059	100 HILLSIDE AVENUE, SUITE 1W WHITE PLAINS, NY 10603 TEL. (914) 428 - 2505
4	ALBANY, COLUMBIA, DELAWARE, GREENE, MONTGOMERY, OTSEGO, RENSSELAER, SCHENECTADY AND SCHOHARIE	1150 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2069	1130 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2045
5	CLINTON, ESSEX, FRANKLIN, FULTON, HAMILTON, SARATOGA, WARREN AND WASHINGTON	1115 STATE ROUTE 86, PO BOX 296 RAY BROOK, NY 12977-0296 TEL. (518) 897-1234	232 GOLF COURSE ROAD WARRENSBURG, NY 12885-1172 TEL. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROADAVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7070

Appendix C – Construction Personnel Contact List

- Construction Contact List -

- Contractor Certification Form -

Appendix C – Construction Contact List

SWPPP Construction Contact List

Name	Title/Role	Company	Phone Number
	Project Engineer		
	Project Field Construction Coordinator		
	Project Environmental Engineer		
	Division Environmental Engineer (Spill Reporting)		
	SWPPP Preparer		
	Qualified Inspector		

Appendix C – Contractor Certification Form

Contractor Certification Form

Stormwater Pollution Prevention Plan (SWPPP)
State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity
GP-0-20-001

Benson Mines Solar
Town of Clifton, St. Lawrence County, New York

All Contractors and Subcontractors performing construction activities shall sign the following certification before they commence construction activities. A copy of the certification shall be included in Appendix A of the on-site SWPPP. All Contractors and Subcontractors must identify at least one trained person from their company, who has met the requirements of a *Trained Contractor* as defined in GP-0-20-001, that will be responsible for the implementation of the SWPPP.

> "I hereby certify under penalty of the law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the Qualified Inspector during a site inspection. I also understand that the Owner or Operator must comply with the terms and conditions of the most current version of the New York State SPDES General Permit for Stormwater Discharges from Construction Activities (GP-0-20-001) and that is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations."

____

____
Name of Construction Company

____
Address of Construction Company — Telephone Number

____
Printed Name of Authorized Representative — Title

____
Signature of Authorized Representative — Date

____
Printed Name of Trained Contractor(s) — Title(s)

Type of construction services to be provided: ____________________

____

____

Appendix D – Agency Correspondence and Notifications

- NYSDEC Solar Panel Construction Stormwater Permitting/SWPPP Guidance -

Appendix D – NYSDEC Solar Panel Construction Stormwater Permitting/SWPPP Guidance

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water, Bureau of Water Permits
625 Broadway, Albany, New York 12233-3505
P: (518) 402-8111 | F: (518) 402-9029
www.dec.ny.gov

MEMORANDUM

TO: Regional Water Engineers

FROM: Robert Wither, Chief, South Permit Section

SUBJECT: Solar Panel Construction Stormwater Permitting/SWPPP Guidance

DATE: April 6, 2018

Issue

The Department is seeing an increase in the number of solar panel construction projects across New York State. This has resulted in an increase in the number of questions on Construction General Permit (CGP) and Stormwater Pollution Prevention Plan (SWPPP) requirements from design professionals because the current CGP (GP-0-15-002) does not include a specific reference to the SWPPP requirements for solar panel projects in Tables 1 and 2 of Appendix B. To address this issue, the Division of Water (DOW) has developed the following guidance on CGP/SWPPP requirements for the different types of solar panel projects.

Scenario 1

The DOW considers solar panel projects designed and constructed in accordance with the following criteria to be a "*Land clearing and grading for the purposes of creating vegetated open space (i.e. recreational parks, lawns, meadows, fields)*" type project as listed in Table 1, Appendix B of the CGP. Therefore, the SWPPP for this type of project will typically just need to address erosion and sediment controls.

1. Solar panels are constructed on post or rack systems and elevated off the ground surface,
2. The panels are spaced apart so that rain water can flow off the down gradient side of the panel and continue as sheet flow across the ground surface*,
3. For solar panels constructed on slopes, the individual rows of solar panels are generally installed along the contour so rain water sheet flows down slope*,
4. The ground surface below the panels consist of a well-established vegetative cover (see "Final Stabilization" definition in Appendix A of the CGP),
5. The project does not include the construction of any traditional impervious areas (i.e. buildings, substation pads, gravel access roads or parking areas, etc.),
6. Construction of the solar panels will not alter the hydrology from pre-to post development conditions (see Appendix A of the CGP, for definition of "Alter the hydrology…"). Note: The design professional shall perform the necessary site assessment/hydrology analysis to make this determination.

*Refer to Maryland's "Stormwater Design Guidance- Solar Panel Installations" attached for guidance on panel installation.
**See notes below for additional criteria.

Scenario 2

If the design and construction of the solar panels meets all the criteria above, except for item 6, the project will fall under the "*All other construction activities that include the construction or reconstruction of impervious area or alter the hydrology from pre-to post development conditions, and are not listed in Table 1*" project type as listed in Table 2, Appendix B of the CGP. Therefore, the SWPPP for this type of project must address post-construction stormwater practices designed in accordance with the sizing criteria in Chapter 4 of the NYS Stormwater Management Design Manual, dated January 2015 (Note: Chapter 10 for projects in NYC EOH Watershed). The Water Quality Volume (WQv)/Runoff Reduction Volume (RRv) sizing criteria can be addressed by designing and constructing the solar panels in accordance with the criteria in items 1 – 4 above, however, the quantity control sizing criteria (Cpv, Qp and Qf) from Chapter 4 (or 10) of the Design Manual must still be addressed, unless one of the waiver criteria from Chapter 4 can be applied. **See notes below for additional criteria.

**** Notes**

- Item 1: For solar panel projects where the panels are mounted directly to the ground (i.e. no space below panel to allow for infiltration of runoff), the SWPPP must address post-construction stormwater management controls designed in accordance with the sizing criteria in Chapter 4 of the NYS Stormwater Management Design Manual, dated January 2015 (Note: Chapter 10 for projects in NYC EOH Watershed).

- Item 5: For solar panel projects that include the construction of traditional impervious areas (i.e. buildings, substation pads, gravel access roads or parking areas, etc.), the SWPPP must address post-construction stormwater management controls for those areas of the project. This applies to both Scenario 1 and 2 above.

cc: Carol Lamb-Lafay, BWP
Dave Gasper, BWP

Maryland Department of the Environment

Stormwater Design Guidance – Solar Panel Installations

Revisions to Maryland's stormwater management regulations in 2010 require that environmental site design (ESD) be used to the maximum extent practicable (MEP) to mimic natural hydrology, reduce runoff to reflect forested wooded conditions, and minimize the impact of land development on water resources. This applies to any residential, commercial, industrial, or institutional development where more than 5,000 square feet of land area is disturbed. Consequently, stormwater management must be addressed even when permeable features like solar panel installations exceed 5,000 square feet of land disturbance.

Depending on local soil conditions and proposed imperviousness, the amount of rainfall that stormwater requirements are based on varies from 1.0 to 2.6 inches. However, addressing stormwater management does not mean that structural or micro-scale practices must be constructed to capture and treat large volumes of runoff. Using nonstructural techniques like disconnecting impervious cover reduces runoff by promoting overland filtering and infiltration. Commonly used with smaller or narrower impervious areas like driveways or open roads, the Disconnection of Non-Rooftop Runoff technique (see pp. 5.61 to 5.65 of the **2000 Maryland Stormwater Design Manual**[1]) is a low cost alternative for treating runoff in situations like rows of solar panels.

When non-rooftop disconnection is used to treat runoff, the following factors should be considered:

- The vegetated area receiving runoff must be equal to or greater in length than the disconnected surface (e.g., width of the row of solar panels)
- Runoff must sheet flow onto and across vegetated areas to maintain the disconnection
- Disconnections should be located on gradual slopes (≤ 5%) to maintain sheetflow. Level spreaders, terraces, or berms may be used to maintain sheetflow conditions if the average slope is steeper than 5%. However, installations on slopes greater than 10% will require an engineered plan that ensures adequate treatment and the safe and non-erosive conveyance of runoff to the property line or downstream stormwater management practice.
- Disconnecting impervious surfaces works best in undisturbed soils. To minimize disturbance and compaction, construction vehicles and equipment should avoid areas used for disconnection during installation of the solar panels.
- Groundcover vegetation must be maintained in good condition in those areas receiving disconnected runoff. Typically this maintenance is no different than other lawn or landscaped areas. However, areas receiving runoff should be protected (e.g., planting shrubs or trees along the perimeter) from future compaction.

Depending on the layout and number of panels installed, the disconnection of non-rooftop runoff technique may address some or all of the stormwater management requirements for an individual project. Where the imperviousness is high or there is other infrastructure (e.g., access roads, transformers), additional runoff may need to be treated. In these situations, other ESD techniques or micro-scale practices may be needed to provide stormwater management for these features.

Example 1 – Using Non-Rooftop Disconnection Where the Average Slope ≤ 5%

Several rows of solar panels will be installed in an existing meadow. The soils within the meadow are hydrologic soil group (HSG) B and the average slope does not exceed 5%. Each row of panels is 10 feet wide and the distance between rows is 20 feet. The rows of solar panels will be installed according to Figure 1 below. In this scenario, the disconnection length is the same as the distance between rows (20 feet) and is greater than the width of each row (10 feet). Therefore, each row of panels is adequately disconnected and the runoff from 1.0 inch of rainfall is treated.

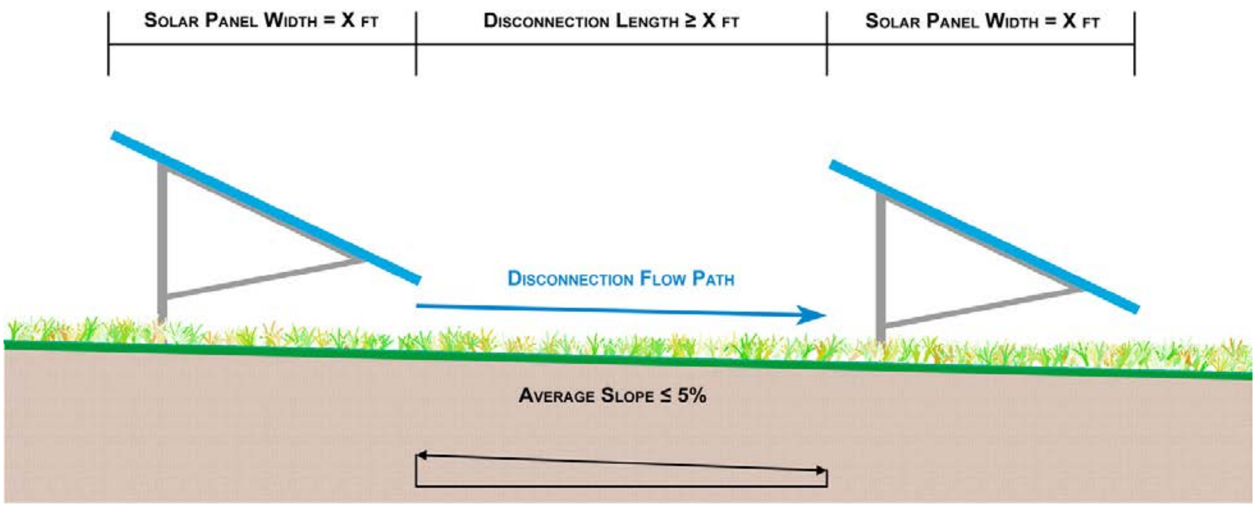


Figure 1. Typical Installation - Slope ≤ 5%

Example 2 – Using Non-Rooftop Disconnection Where the Average Slope ≥ 5% but ≤ 10%

Several rows of solar panels will be installed in an existing meadow. The soils within the meadow are hydrologic soil group (HSG) B and the average slope is greater than 5% but less than 10%. Each row of panels is 10 feet wide and the distance between rows is 20 feet. The rows of solar panels will be installed as shown in Figure 2 below. The disconnection length is the same as the distance between rows (20 feet) and is greater than the width of each row (10 feet). However, in this example, a level spreader (typically 1 to 2-foot wide and 1 foot deep) has been located at the drip edge of each row of panels to dissipate energy and maintain sheetflow.

Discussion

To meet State and local stormwater management requirements, ESD must be used to the MEP to reduce runoff to reflect forested conditions. While all reasonable options for implementing ESD must be investigated, minimally, the runoff from 1 inch of rainfall must be treated. In each of the examples above, there may be additional opportunities to implement ESD techniques or practices and reduce runoff that should be explored. However, simply disconnecting the runoff from the solar panel arrays captures and treats the runoff from 1.0 inch of rainfall. Where imperviousness is low and soil conditions less optimal (e.g., HSG C or D), this may be sufficient to completely address stormwater management requirements. In more dense applications or in sandy soils, additional stormwater management may be required.

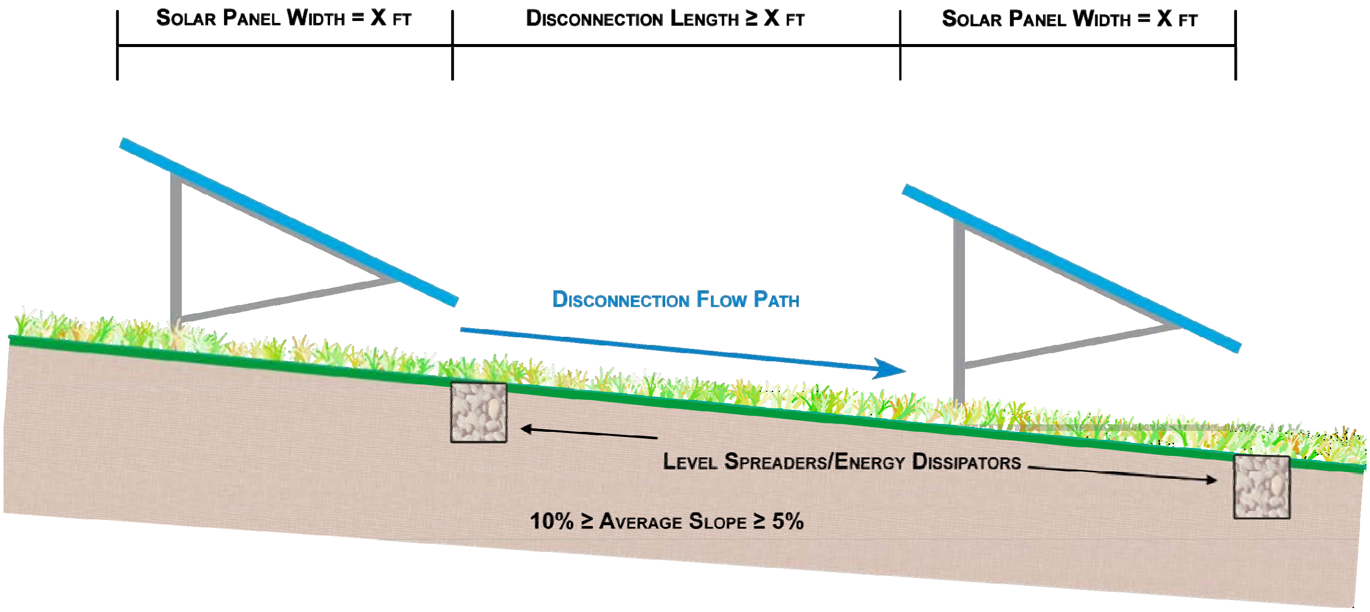


Figure 2. Typical Installation – Slope ≥ 5% but ≤ 10%

Conclusion

The primary purpose of Maryland's stormwater management program is to mimic natural hydrologic runoff characteristics and minimize the impact of land development on water resources. Any land development project that exceeds 5,000 square feet of disturbance, including solar panel projects, must address stormwater management. However, for solar panels, stormwater management may be provided in a cost-effective manner by disconnecting each row of panels and directing runoff over the vegetated areas between the individual rows.

Resources

[1] 2000 Maryland Stormwater Design Manual, Volumes I and II, MDE, October 2000 (http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/MarylandStormwaterDesignManual/Pages/Programs/WaterPrograms/SedimentandStormwater/stormwater_design/index.aspx)

Appendix E – Environmental Background Information

- Figure 1: Site Location Map -

- Figure 2: Environmental Resource Map -

- Environmental and Cultural Resource Information -

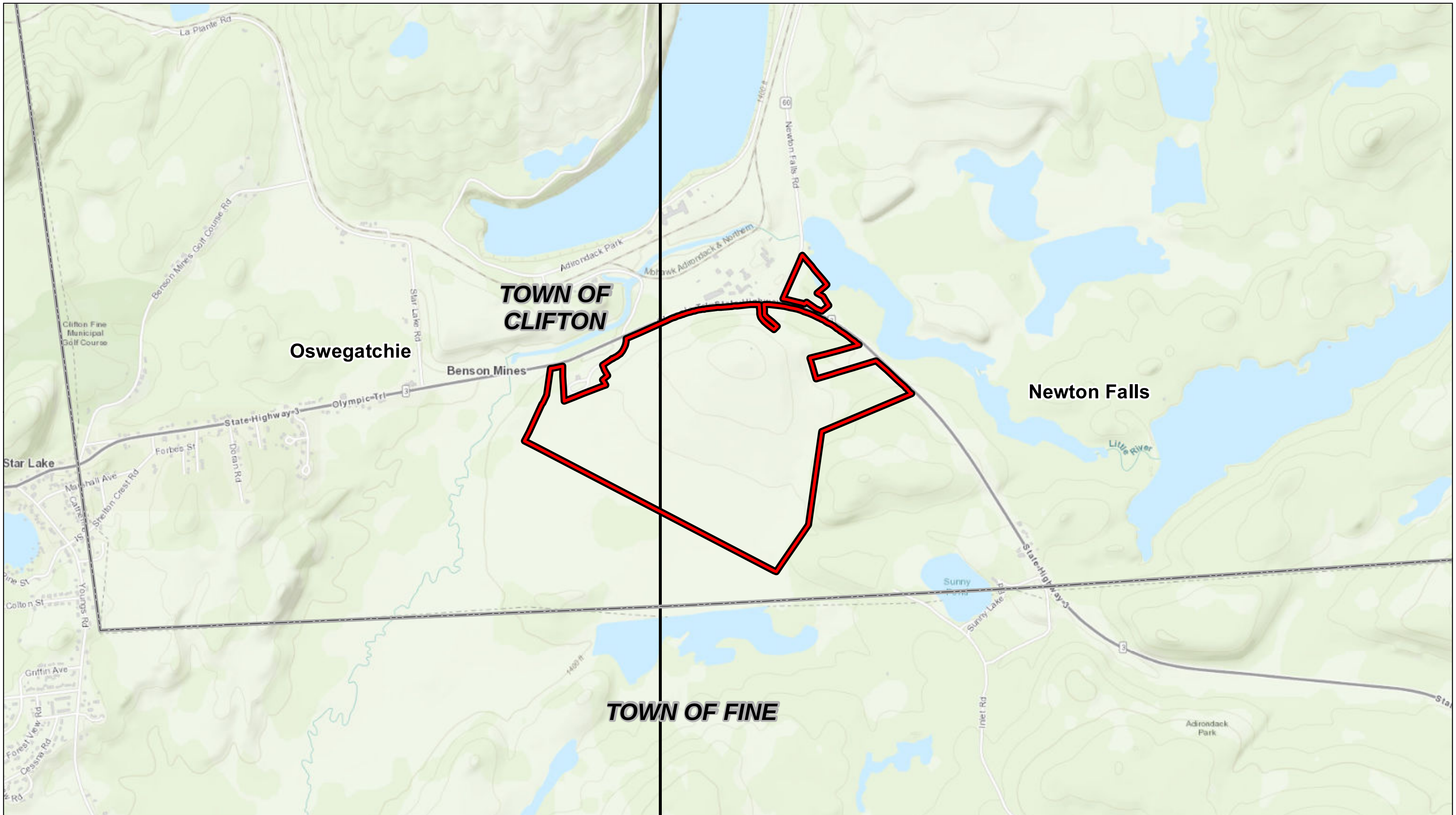
- USDA NRCS Soil Resource Report –

- Geotechnical Engineering Report -

- Infiltration Testing Results -

- Northeast Regional Climate Center's Extreme Precipitation Tables -

Appendix E – Figure 1: Site Location Map



SITE BOUNDARY

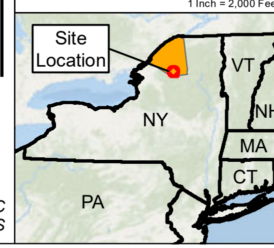
MUNICIPAL BOUNDARY

USGS 24K TOPO QUAD BOUNDARY

Data: TRC
Base Map: USGS

N

0 1,000 2,000
Feet
1:24,000
1 Inch = 2,000 Feet



PROJECT:
BR BENSON MINES SOLAR PROJECT
TOWN OF CLIFTON
ST. LAWRENCE COUNTY, NY

TITLE:
SITE LOCATION MAP

DRAWN BY:	J. FREDENBURG	PROJECT NO:	430156.OPPL.0000 PHASE 2D
CHECKED BY:	C. KNIFFEN	**FIGURE 1**	
APPROVED BY:	A. BELL		
DATE:	NOVEMBER 2021		

TRC
10 MAXWELL DRIVE
CLIFTON PARK, NY 12065

Appendix E – Figure 2: Environmental Resource Map

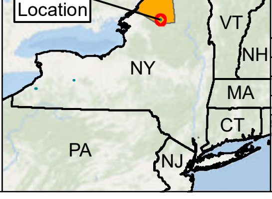
- PROJECT SITE
- TRC DELINEATED STREAM
- TRC DELINEATED WETLAND
- STREAM (NYSDEC)
- STREAM (NHD)
- WETLANDS (NWI)
- WATERBODIES (NHD)
- SSURGO SOILS (NRCS)
- INDEX CONTOUR
- MUNICIPAL BOUNDARY

NOTE: THERE ARE NO MAPPED FEMA SPECIAL FLOOD HAZARD AREAS IN THE VICINITY OF THE STUDY AREA.

Data: NYSDEC, ADIRONDACK PARK AGENCY, USFWS NWI, USGS NHD, FEMA
Base Map: Esri and its contributors, "World Imagery (Clarity)"

N

0 200 400
Feet
1:9,600
1 Inch = 800 Feet



PROJECT: BR BENSON MINES SOLAR PROJECT
TOWN OF CLIFTON
ST. LAWRENCE COUNTY, NY

TITLE: **ENVIRONMENTAL RESOURCE MAP**

DRAWN BY:	J. FREDENBURG	PROJECT NO:	416121
CHECKED BY:	C. KNIFFEN	**FIGURE 2**	
APPROVED BY:	A. BELL		
DATE:	NOVEMBER 2021		

TRC
10 MAXWELL DRIVE
CLIFTON PARK, NY 12065

Appendix E – Environmental and Cultural Resource Information

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Environmental Resource Mapper

Base Map: Topographical | Using this map

Search

Tools

Layers and Legend

- [x] All Layers
- [x] Unique Geological Features
- [x] Waterbody Classifications for Rivers/Streams
- [x] Waterbody Classifications for Lakes
- [x] State Regulated Freshwater Wetlands (Outside of the Adirondack Park)
  - State Regulated Wetland Checkzone
- [x] Imperiled Mussels
  - Mussel Screening Ponded Waters
  - Mussel Screening Streams
- [x] Significant Natural Communities
  - Natural Communities Near This Location
- [x] Rare Plants or Animals
- [ ] Base Flood Elevation Plus 72/75 Inches Sea-level Rise
- [ ] Limit to Moderate Wave Action

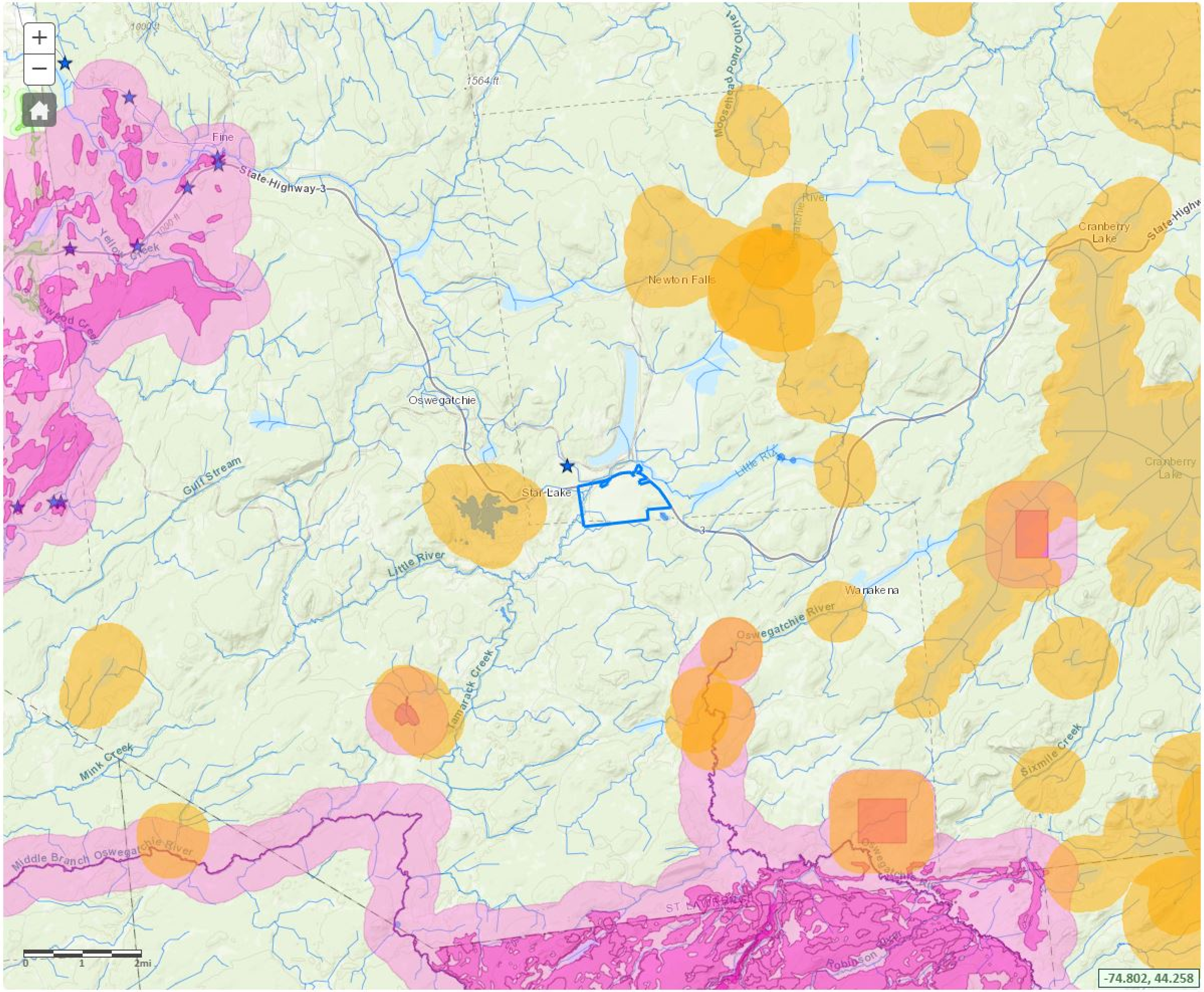
Other Wetland Layers

Reference Layers

Tell Me More...

Need A Permit?

Contacts



NEW YORK STATE OF OPPORTUNITY. | Parks, Recreation, and Historic Preservation

ANDREW M. CUOMO
Governor

ERIK KULLESEID
Commissioner

June 14, 2021

Karen Mack
Operations Manager
TRC
1356 Washington St
Suite A
Bath, ME 04530

Re: DEC
BR Benson Mines Solar Project/20 MW/179 of 255 Acres
New York State Route 3, Towns of Clifton and Fine, St. Lawrence County, NY
21PR03849

Dear Karen Mack:

Thank you for requesting the comments of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the project in accordance with the New York State Historic Preservation Act of 1980 (Section 14.09 of the New York Parks, Recreation and Historic Preservation Law). These comments are those of the OPRHP and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8) and its implementing regulations (6 NYCRR Part 617).

Based upon this review, it is the opinion of OPRHP that no properties, including archaeological and/or historic resources, listed in or eligible for the New York State and National Registers of Historic Places will be impacted by this project.

If further correspondence is required regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

Roger Daniel Mackay

R. Daniel Mackay

Deputy Commissioner for Historic Preservation
Division for Historic Preservation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New York Ecological Services Field Office
3817 Luker Road
Cortland, NY 13045-9385
Phone: (607) 753-9334 Fax: (607) 753-9699
http://www.fws.gov/northeast/nyfo/es/section7.htm

In Reply Refer To: June 09, 2021
Consultation Code: 05E1NY00-2021-SLI-2942
Event Code: 05E1NY00-2021-E-09196
Project Name: BR Benson Mines Solar

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.). This list can also be used to determine whether listed species may be present for projects without federal agency involvement. New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list.

Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the ESA, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC site at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list. If listed, proposed, or candidate species were identified as potentially occurring in the project area, coordination with our office is encouraged. Information on the steps involved with assessing potential impacts from projects can be found at: http://www.fws.gov/northeast/nyfo/es/section7.htm

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq*.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the Services wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the ESA. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

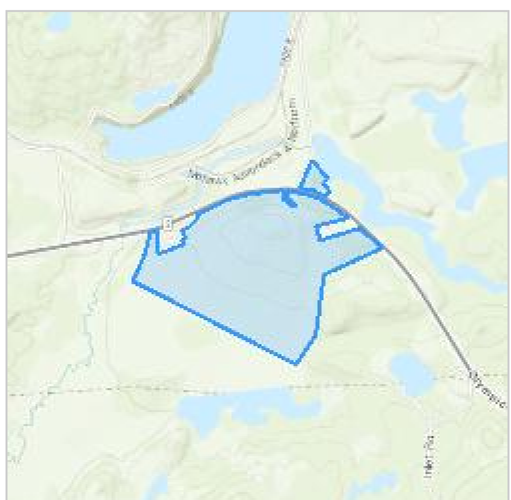
New York Ecological Services Field Office
3817 Luker Road
Cortland, NY 13045-9385
(607) 753-9334

Project Summary

Consultation Code: 05E1NY00-2021-SLI-2942
Event Code: 05E1NY00-2021-E-09196
Project Name: BR Benson Mines Solar
Project Type: Guidance
Project Description: The New York State Energy Research and Development Authority (NYSERDA) is seeking approvals for the construction of a solar energy generation facility: BR Benson Mines Solar Project (the “Project”), in the Town of Clifton, St. Lawrence County, New York (see Figures 1 and 2). The Project is to be sited on a former tailings pile from the prior iron ore mine that was closed in the 1970's. The Project will consist of ground-mounted, solar photovoltaic panels in a tracking configuration. The construction of the solar array system will involve driving posts approximately 6 to 10 feet into the ground, or at depths appropriate for frost conditions, every 12 to 16-foot intervals and mounting panels racks to the posts. The solar array system will occupy approximately 179 acres of the approximately 255-acre Study Area (Figure 2) that is contained within the 612.4-acre Project parcels. The solar array system will be connected to the electric power grid via the Star Lake Substation to the north of State Route 3 and adjacent to the Project parcels. Access to the site will be constructed off New York State Route 3.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@44.16187335,-74.99930036128461,14z



Counties: St. Lawrence County, New York

Endangered Species Act Species

There is a total of 0 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Fish and Wildlife, New York Natural Heritage Program
625 Broadway, Fifth Floor, Albany, NY 12233-4757
P: (518) 402-8935 | F: (518) 402-8925
www.dec.ny.gov

July 20, 2021

Nancy Vlahos, Project Manager
TRC
10 Maxwell Drive, Suite 200
Clifton Park, NY 12065

Re: BR Benson Mines Solar Project
County: St Lawrence   Town/City: Clifton

Dear Nancy Vlahos:

In response to your recent request, we have reviewed the New York Natural Heritage Program database with respect to the above project.

Enclosed is a report of rare or state-listed animals and plants, and significant natural communities that our database indicates occur in the vicinity of the project site.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our database. We cannot provide a definitive statement as to the presence or absence of all rare or state-listed species or significant natural communities. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

The presence of the plants and animals identified in the enclosed report may result in this project requiring additional review. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the NYS DEC Region 6 Office, Division of Environmental Permits, at dep.r6@dec.ny.gov.

Sincerely,

Heidi Krahling
Environmental Review Specialist
New York Natural Heritage Program

590

The following rare plants, rare animals, and significant natural communities have been documented at the project site, or in its vicinity.

We recommend that potential impacts of the proposed project on these species or communities be addressed as part of any environmental assessment or review conducted as part of the planning and approval process, such as reviews conducted under SEQR. Field surveys of the project site may be necessary to determine the status of a species at the site, particularly for sites that are currently undeveloped and may still contain suitable habitat. Final requirements of the project to avoid, minimize, or mitigate potential impacts are determined by the lead permitting agency or the government body approving the project.

The following plant is listed as Threatened by New York State, and so is a vulnerable natural resource of conservation concern.

COMMON NAME	*SCIENTIFIC NAME*	*NY STATE LISTING*	*HERITAGE CONSERVATION STATUS*
Vascular Plants			
Pink Shinleaf	*Pyrola asarifolia ssp. asarifolia*	Threatened	Imperiled in NYS

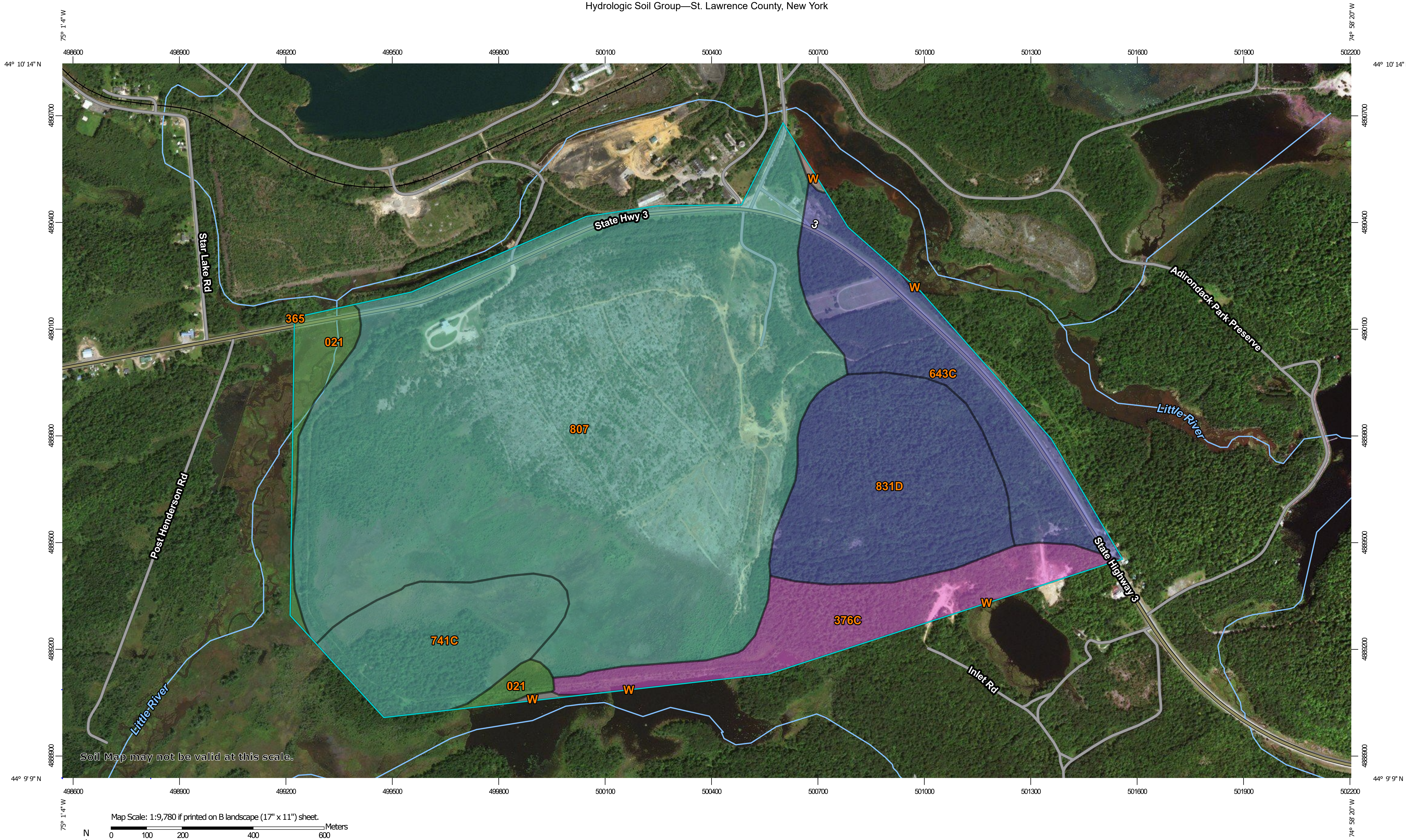
Documented at the southwestern edge of the project site. 2015-09-04: The habitat is a wetland (poorly drained area at base of gradually sloping iron mine tailings) with sparse to moderate shrub cover and dense ground cover. Pyrola asarifolia was often found growing on sphagnum hummocks. The hydrology is saturated throughout the growing season. The soil is sandy loam to sandy clay loam. 16783

This report only includes records from the NY Natural Heritage database. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the rare animals and plants in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.guides.nynhp.org, from NatureServe Explorer at www.natureserve.org/explorer, and from USDA's Plants Database at http://plants.usda.gov/index.html (for plants).

Appendix E – USDA NRCS Soil Resource Report



Map Scale: 1:9,780 if printed on B landscape (17" x 11") sheet.

N

0 100 200 400 600 Meters

0 450 900 1800 2700 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

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

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

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

Soil Survey Area: St. Lawrence County, New York
Survey Area Data: Version 22, Sep 1, 2021

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

Date(s) aerial images were photographed: Aug 18, 2012—Sep 21, 2016

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
021	Dawson-Fluvaquents-Loxley complex, frequently flooded	A/D	15.8	2.6%
365	Naumburg-Croghan complex	A/D	0.0	0.0%
376C	Colton-Duxbury-Adams complex, 3 to 15 percent slopes	A	45.3	7.4%
643C	Berkshire loam, 3 to 15 percent slopes, very bouldery	B	58.9	9.6%
741C	Potsdam-Tunbridge-Crary complex, 3 to 15 percent slopes, very bouldery	C	46.4	7.5%
807	Udorthents, mine waste	C	370.4	60.1%
831D	Tunbridge-Lyman complex, 15 to 35 percent slopes, very rocky, very bouldery	B	78.1	12.7%
W	Water		1.3	0.2%
Totals for Area of Interest			**616.4**	**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

Appendix E – Geotechnical Engineering Report

16000 Commerce Pkwy.
Suite B
Mount Laurel, NJ 08054

T 856.273.1224
TRCcompanies.com

August 24, 2021

Ms. Tracy Darougar
New York State Energy Research & Development Authority (NYSERDA)
17 Columbia Circle
Albany, NY 12203

Re: Geotechnical Engineering Report
Proposed Benson Mines Solar Array
Benson Mines
Town of Clifton, St. Lawrence County, NY
TRC Project No.: 444154.0GEI

Dear Ms. Darougar:

TRC Engineers, Inc. (TRC) is pleased to present our Geotechnical Engineering Report for this project. Our work was initiated in accordance with your authorization to proceed (Task Work Order # 167102) on May 4, 2021 and completed in general accordance with our agreed scope of work presented in our revised proposal, submitted March 18, 2021. A summary of our geotechnical exploration activities, findings and recommendations is summarized below.

1.0 INTRODUCTION

This report presents the results of our geotechnical exploration for the proposed photovoltaic (PV) solar array structures to be constructed at the Benson Mines solar project site located along Olympic Trail in the Town of Clifton, New York. The purpose of our exploration was to evaluate the geologic and subsurface conditions to reduce uncertainty with respect to anticipated foundation and site construction, and to provide preliminary geotechnical recommendations for design of the proposed project.

1.1 Project Description

The site is located within a 229.3-acre portion of the former Benson Mine parcel with the majority of the site located south of State Highway 3 (Olympic Trail) in the Town of Clifton, St. Lawrence County, New York. A proposed point of interconnect will be located on the north side of State Highway 3 adjacent to the existing substation. Based on our experience with similar projects, we assume that the proposed photovoltaic arrays would preferably be mounted on posts driven into the ground. The anticipated post loads have not been provided but are assumed to be typical for such construction. It is assumed that existing grades will remain relatively unchanged.

1.2 Scope of Services

Our scope of services was presented in Task 2F of TRC's Permitting Plan dated March 18, 2021. To accomplish this work, we have provided the following services:

- Exploration of subsurface conditions by drilling fifteen (15) borings onsite within proposed solar array areas, including one (1) boring in the vicinity of the proposed substation area, and retrieving soil samples for classification & laboratory testing.
- Evaluation of the physical and engineering properties of the subsurface soils based on visually classifying the samples by a member of our geotechnical staff.
- Engineering analysis to evaluate the proposed foundation systems for the support of the ground-mounted PV solar array.
- Preparation of this report to summarize our findings and to present our conclusions and recommendations regarding the following:

    - General assessment of the impact of subsurface conditions on development of solar array project at this site
    - Foundation support alternatives for the proposed solar array structures assuming post foundations, or alternative system, if applicable.
    - Preliminary bearing capacity and other parameters for use in foundation design by others.
    - Recommended geotechnical-related parameters for use in foundation design by others.
    - Anticipated excavation conditions and presence of potential rock or other refusal conditions or obstructions, if applicable.
    - Suitability of on-site soils for reuse in back fills and requirements for imported fills.
    - Recommendations for placement, compaction and testing of fills, if applicable.
    - Preliminary soil parameters pressures (both above and below ground water table) for active, at rest and passive conditions and L-Pile soil parameters for use in foundation design by others.
    - Anticipated ground water conditions and impacts on the design and construction.
    - Frost penetration depth.
    - Corrosivity concerns on buried steel and concrete.
    - Preliminary Seismic Site Class Parameters.
    - Other construction-related concerns, as warranted based on available site subsurface information and any available preliminary design information, details.

2.0 SITE CONDITIONS

2.1 Site Reconnaissance, Boring Stakeout and Exploration

TRC's geotechnical engineer performed a site reconnaissance in conjunction with test boring stakeout. Test boring locations were staked in the field using a cellphone-based GPS app at the approximate locations selected by TRC, as modified, and approved by NYSERDA, and as shown on the attached Figure 1, Boring Locations and Wetland Resources plan. The site consists of re-vegetated and re-claimed area of the former Benson Mine with no observed subsurface or overhead utility conflicts identified. The proposed array is also surrounded by existing woodlands and bounded by wetlands. Prior to drilling, the Dig Safely New York on-call notification system was contacted to check the presence of public utilities in the area of the proposed testing borings.

The test boring work was performed during the period from July 6 to July 8, 2021 by TRC's drilling subcontractor, CME Associates, Inc., using an ATV-mounted drill rig. Split spoon sampling was performed continuously through the upper 10 ft and at 5 ft intervals thereafter to the completion depths in general accordance with ASTM D 1586. Boring depths were typically terminated at 20 ft below existing ground surface (bgs) at each location with the exceptions of B-13 and B-15, which were advanced to depths of 27 ft and 22 ft bgs, respectively. Upon completion, all test borings were backfilled to the approximate existing ground surface with the auger cuttings. Copies of the test boring logs are attached along with a copy of the approximate test boring location plan.

2.2 Geology

According to available geological data, the surficial geology at the project site consists of mine dump deposits (tailing). Locally, the site is underlain predominantly by Glacial and Alluvial Deposits of the Quarternary Age, near a contact with biotite and/or hornblende granite gneiss and other metasedimentary rock of the Middle Proterozoic.

2.3 Subsurface Conditions

The test borings revealed that the project site is generally covered with a surficial layer of topsoil approximately 3 to 7 inches thick. Below the surficial topsoil, the subsurface consisted of FILL primarily containing sandy soils with varying amounts of silt. Standard Penetration Test (SPT) N-values indicate that the relative density of these soils ranges from "very loose" to "medium dense". Laboratory test results indicate that the fine-grained (silt) content of this layer ranges from approximately 1% to 25%. Natural moisture contents range from approximately 5% to 23%.

A silt/clayey silt fill layer was encountered in test boring B-15 from a depth of 23 ft to the termination depth of 27 ft bgs. SPT N-values indicate the consistency of the clay layer is "very soft".

2.4 Ground Water

Groundwater was encountered during drilling or immediately after completion at the time of the field investigation in four (4) of the fifteen (15) test borings, at depths ranging from approximately 7.3 ft to 17.9 ft bgs. Groundwater and/or the development of perched water conditions is not anticipated within typical excavation depths for foundations or utilities other than during wet periods. The groundwater conditions are representative of the conditions at the date and time of this study and are not representative of daily, seasonal, long term fluctuations, development of perched conditions, or ponding of water in low lying areas during wet periods. For design purposes, ground water shall be conservatively taken as the highest recorded water level, typically at depths greater than 13 ft. However, perched water conditions should be expected at shallower depths, particularly in low-lying areas or adjacent to the existing wetlands.

3.0 CORROSION EVALUATION AND THERMAL RESTIVITY

3.1 Corrosion Evaluation

To evaluate the corrosion potential of the subsurface soils at the site, TRC submitted five (5) composite soil samples at depths of approximately 0-5 ft bgs, collected from test boring locations during our subsurface exploration to an analytical laboratory for pH, resistivity, soluble sulfate, and chloride content testing. The results are summarized in Table 1, below.

Table 1. Results of Corrosivity Testing

Sample	Boring No.	Chloride (mg/kg)*	Sulfate (mg/kg)*	pH	Resistivity (ohm-cm)**	Estimated Corrosivity To Steel Based on Resistivity	Estimated Corrosivity to Concrete Based on Sulfate
Bulk 1	B-1 and B-5	12	22	7.9	22,540	Very Mildly Corrosive	Negligible
Bulk 2	B-3 and B-4	10	15	7.9	30,380	Very Mildly Corrosive	Negligible
Bulk 3	B-6, B-7, and B-9	12	20	7.4	23,520	Very Mildly Corrosive	Negligible
Bulk 4	B-8, B-11, and B-12	10	18	7.8	24,500	Very Mildly Corrosive	Negligible
Bulk 5	B-13 to B-15	15	24	7.8	19,500	Very Mildly Corrosive	Negligible

* *mg/kg = milligrams per kilogram*
** *ohm-cm = ohm-centimeter*

Many factors can affect the corrosion potential of soil including soil moisture content, resistivity, permeability, and pH, as well as chloride and sulfate concentration. In general, soil resistivity, which is a measure of how easily electrical current flows through soils, is the most influential factor. Based on classification developed by William J. Ellis (1978), the approximate relationship between soil corrosiveness was developed as shown in Table 2 below.

Table 2. Relationship Between Soil Resistivity and Soil Corrosivity

Soil Resistivity (ohm-cm)*	Classification of Soil Corrosiveness
0 to 900	Very Severely Corrosive
900 to 2,300	Severely Corrosive
2,300 to 5,000	Moderately Corrosive
5,000 to 10,000	Mildly Corrosive
10,000 to >100,000	Very Mildly Corrosive

** ohm-cm = ohm-centimeter*

Chloride and sulfate ion concentrations and pH appear to play secondary roles in affecting corrosion potential. High chloride levels tend to reduce soil resistivity and break down otherwise protective surface deposits, which can result in corrosion of buried metallic improvements or reinforced concrete structures. Sulfate ions in the soil can lower the soil resistivity and can be highly aggressive to Portland cement concrete (PCC) by combining chemically with certain constituents of the concrete, principally tricalcium aluminate. This reaction is accompanied by expansion and eventual disruption of the concrete matrix. Soils containing high sulfate content could also cause corrosion of the reinforcing steel in concrete. Table 4.2.1 of the American Concrete Institute (ACI, 2008) provides requirements for concrete exposed to sulfate-containing solutions as summarized in Table 3.

Table 3. Relationship Between Sulfate Concentration and Sulfate Exposure (Table 4.2.1 of ACI)

Water-Soluble Sulfate (SO4) in soil (ppm)*	Sulfate Exposure
0 to 1,000	Negligible
1,000 to 2,000	Moderate
2,000 to 20,000	Severe
over 20,000	Very Severe

* *ppm = parts per million*

Acidity is an important factor of soil corrosivity. The lower the pH (the more acidic the environment), the higher will the soil corrosivity be with respect to buried metallic structures. As soil pH increases above 7 (the neutral value), the soil is increasingly more alkaline and less corrosive to buried steel structures due to protective surface films which form on steel in high pH environments. A pH between 5 and 8.5 is generally considered relatively passive from a corrosion standpoint.

The laboratory electrical resistivity test completed on the composite samples of surficial soils indicates value of 19,500 and 30,380 ohm-centimeters, which would be indicative of very mildly corrosive potential to buried metallic improvements. Based on these results and the resistivity correlations presented in Table 2, the corrosion potential to buried metallic improvements may be characterized as very mildly corrosive.

Based on our previous experience and Table 4.2.1 of the ACI, it is our opinion that sulfate exposure to PCC may be considered negligible for the existing near surface fill materials sampled.

4.0 FOUNDATIONS AND EARTHWORK

4.1 Site Seismic Coefficients

The site classification and mapped acceleration parameters are used in determining the Seismic Design Category which is in turn used for determining seismic design requirements for structures. According to the 2018 International Building Code, the site class is within “Site Class E” based on the soil profiles. The maximum considered earthquake ground motions in this area for 0.2 sec. and 1.0 sec. spectral responses are approximately 34.1% g and 8.2 % g, respectively. For Site Class E, the corresponding 0.2 and 1.0 sec. design spectral response acceleration parameters S_{DS} and S_{D1} are 48.8 % g and 23.0 % g, respectively.

4.2 Foundations

Based on our experience with similar structures, a foundation system consisting of driven posts is assumed for support of the proposed ground-mounted photovoltaic arrays. Based on the results of the test borings, driven posts are feasible and could be supported in the fill soils encountered at this project. It should be noted that considering that the on-site soils consist of unconsolidated fill soils of highly variable density , some long term non-uniform settlements should be anticipated.

4.2.1 Driven Post Support System

All posts should be driven to bear at sufficient depths required to provide adequate axial uplift, and lateral resistances as determined by the racking manufacturers and/or designers.

Recommended geotechnical parameters for use in design analysis, included in Table 4 below, can be utilized for evaluation of posts or piles for support of the PV solar array, or other foundation system design analysis, as required. We recommend that lateral and uplift resistance of soils be reduced by 50% above a depth of 4 ft below the ground surface to account for disturbance resulting from construction as well as to account for the negative impacts due to frost and thaw action. A minimum factor of safety of 2 is recommended for compression loads; a factor of safety equal to 3 should be used for determining allowable uplift capacity of piles; a factor of safety equal to 1.5 should be used for transient (wind/seismic) loading conditions.

Table 4. Summary of Unfactored Soil Parameters for Design (reduce by 50% for upper 4 ft)

Soil Description	LPILE Soil Type	Relative Density	Total (Submerged) Unit Weight (pcf*)	Friction Angle (degrees)	Soil Modulus Above/Below Water Table, k (pci**)	Allowable Skin Friction in Compression /Uplift (psf/ft) for steel/soil****	Allowable End Bearing Capacity (ksf***)
SAND or Silty SAND	Sand	"Loose"	115 (52.6)	28	25 / 20	90 / 45	1.0

* *pcf – pounds per cubic foot*
** *pci – pounds per cubic inch*
*** *ksf – kips per square foot*
**** *triangular distribution over the length of embedded post*

We recommend that the installation of each pile size or system utilized should be monitored and documented by qualified geotechnical personnel under the direct supervision of a professional engineer registered in the State of New York. Prior to or during construction, we recommend that tension and lateral load tests be conducted on a minimum of three to four piles for each size or system to verify the adequacy of the design. Testing should be performed in general accordance with ASTM 3689 and ASTM 3966 or in accordance with standard practice in the industry. The test locations should coincide with the test boring locations based on the variability of the subsurface conditions. The test piles should be installed with the same means and methods used to install production piles. In the event that the means and methods or embedment depths of pile installation are revised following initial pile testing, additional pile tests should be performed to verify that sufficient resistance can be achieved with the revised means, methods, and embedment. The results should be reviewed and approved by a qualified geotechnical engineer.

4.2.3 Shallow Foundations

Shallow foundation systems such as rigid mats can be considered for support of electrical equipment. Mats supporting electrical equipment can be designed for an allowable bearing capacity of 1,000 psf when constructed in accordance with the general recommendations presented in the *Earthwork* section of this report. A vertical subgrade modulus of 75 pci may be used in foundation mat design. Foundation subgrades for supporting electrical equipment or other ancillary structures subjected to freezing temperatures during construction and/or the life of the structure should be established at least 4 ft below adjacent grades or otherwise protected against frost action. Alternatively, to resist frost heave, light loaded mat slabs constructed at grade should be provided a coarse aggregate similar to AASHTO #57 aggregate below the slab that extends to frost depth. To guard against a punching type shear failure, minimum widths of continuous footings should be 24 in. As mentioned earlier, there is a potential for on-grade equipment to undergo non-uniform total and differential settlements which may exceed 1 inch, due to the presence of loose unconsolidated fill soils.

Shallow excavations for foundation slabs and construction of utilities may encounter perched groundwater in low lying areas or during wet periods. If perched groundwater or surface runoff are encountered, sumps and pumps will be sufficient to control groundwater and provide stable working conditions.

4.3 Earthwork

Based on our understanding of the proposed construction, significant grading and earthwork operations are not anticipated unless material removal and replacement would be considered for support of equipment foundations. The following recommendations are provided based on the site soils encountered.

Any existing subsurface utilities which conflict with the proposed development should be removed or relocated, where applicable. In areas of backfill placement and/or construction of shallow foundations, all topsoil and organic or otherwise deleterious material should be removed before foundation construction or new fill placement. Any obstructions that would interfere with new foundation construction must be removed in their entirety from a foundation location. After stripping residual topsoil and excavation to the proposed bearing elevations for shallow mat foundations, the exposed subgrade areas should be vigorously densified with as large a vibratory compactor as is practical to improve overall performance and reduce impacts of settlements within the loose fill soil stratum. The entire area of the proposed access and construction roadways should also be densified with as large a vibratory compactor as is practical to improve overall stability for construction equipment. Loose or unstable areas identified during the course of excavation should be densified in-place or excavated and replaced with compacted load bearing fill.

The surficial fill soils are suitable for re-use as fill/backfill, however, they contain varying fine-grained (silt) content and may be slightly sensitive to moisture and disturbance, especially during wet periods. Therefore, they may lose strength when wet or disturbed by construction equipment and could be difficult to work with during cold or wet weather. Some moisture conditioning of the onsite soils used for backfilling should be anticipated prior to fill placement. Once a subgrade has been prepared, construction traffic should be controlled in such a fashion as to minimize subgrade disturbance.

Imported load-bearing fill, if required, should consist of well-graded granular material similar to SW-GW as identified by the Unified Soil Classification System (USCS) which is not excessively moist and is free from ice and snow, roots, surface coatings, sod, loam, clay, rubbish, other deleterious or organic matter, and any particles larger than 4 inches in diameter. Alternatively, an AASHTO No. 57 coarse aggregate layer could be considered.

All backfills fills should be placed in layers not exceeding 8 in. loose thickness. This criterion may be modified in the field depending on the conditions present at the time of construction and on the compaction equipment used. Load-bearing fills for the support of foundations should be compacted to not less than 98% of maximum dry density (ASTM D 698). All fills and backfills if utilized for areas of the solar array posts or piles, should be compacted to not less the 95% of maximum dry density. Fills in paved areas, if planned, or areas supporting access roads should be compacted to not less than 95% of maximum dry density. Fills in landscaped areas should be compacted to at least 90% of maximum dry density.

The sidewalls of any confined excavations deeper than 4 ft must be sloped, benched, or adequately shored per OSHA 29 CFR 1926 regulations. Trench boxes and/or sheeting could be used in conjunction with open cut slopes to permit access to confined excavations. The onsite predominantly sandy soils are classified as Type C soils according to OSHA 29 CFR 1926. Open excavations in the natural soils should not be steeper than 1.5H: 1V if dry and 2H: 1V if submerged.

4.4 Trench Backfill

Bedding and pipe embedment materials to be used around underground utility or electrical conduit pipes should be well graded sand or gravel conforming to the pipe manufacturer's recommendations and should be placed and compacted in accordance with project specifications, local requirements, or governing jurisdiction. General fill to be used above pipe embedment materials should be placed and compacted in accordance with the recommendations contained in this section.

Utility trenches located adjacent to footings or foundations should not extend below an imaginary 1:1 (horizontal:vertical) plane projected downward from the foundation bearing surface to the bottom edge of the trench. Where utility trenches will cross beneath footing bearing planes, the footing concrete should be deepened to encase the pipe, or the utility trench should be backfilled with sand/cement slurry or lean concrete within the foundation-bearing plane.

4.5 Gravel Access Roadways

After stripping of the existing topsoil and placement of any fill needed for site grading, a layer of a medium duty non-woven geotextile fabric or triaxial geogrid should be installed directly over the existing subgrade with adjacent rolls lapped in accordance with manufacturer's recommendations. A layer of aggregate similar in gradation to AASHTO #2 stone material should be placed directly over the geotextile/geogrid in a single 12-inch thick layer and densified using a vibratory roller. To mitigate lateral displacement and reduce rutting due to continuous truck traffic during construction, it would be beneficial to place approximately 1 inch of screenings ($^1/_8$ to ¼ inch crushed aggregate) at the surface of the AASHTO #2 layer. During construction, the access road may need to be occasionally re-graded and re-densified. Any electric cables crossing below the roadway should be installed in heavy duty rigid steel conduits or installed a minimum 3 ft below finished grade to prevent damage to the cables.

4.6 Surface Drainage

Positive surface water drainage gradients at least 2 percent should be provided to direct surface water away from foundations and mat slabs towards suitable discharge facilities. Ponding of surface water should not be allowed on or adjacent to structures, slabs-on-grade, or pavements. Any rain runoff should be directed away from foundation and slabs-on-grade such as equipment pads, as applicable.

In addition, considering the on-site soils are highly erodible, a sufficiently thick velocity dissipater, such as layer of coarse drainage aggregate of at least 3 to 4 inches in size, should be placed along water flow paths to dissipate concentrated flow of runoff water in order to minimize surface erosion.

4.7 Plans, Specifications, and Construction Review

We recommend that TRC perform a plan review of the geotechnical aspects of the project design, including driven post design and load test reports performed by others, for general conformance with our recommendations. In addition, subsurface materials encountered in the relatively small diameter, widely spaced borings may vary significantly from other subsurface materials on the site. Therefore, we also recommend that a representative of our firm observe and confirm the geotechnical specifications of the project construction. This will allow us to form an opinion about the general conformance of the project plans and construction with our recommendations. In addition, our observations during construction will enable us to note subsurface conditions that may vary from the conditions encountered during our investigation and, if needed, provide supplemental recommendations. For the above reasons, our geotechnical recommendations are contingent upon geotechnical observation and testing services by qualified geotechnical professionals during construction to confirm that site conditions do not vary considerably from the conditions previously observed. These services are not included as part of TRC's current scope of work.

4.8 Construction Observation

A qualified geotechnical professional should observe the geotechnical aspects of the earthwork for general conformance with our recommendations including site preparation, selection of fill materials, pile installation, and the placement and compaction of fill. To facilitate your construction schedule and if you wish TRC to perform these services, we request sufficient notification (72 hours) for site visits. The project plans and specifications should incorporate all recommendations contained in the text of this report. These services are not included as part of TRC's current scope of work.

5.0 LIMITATIONS

This report has been prepared New York State Energy Research and Development Authority (NYSERDA)., specifically for design of the proposed solar array and associated development to be constructed at the project site located in Clinton, NY, as identified herein. Transfer of this report or included information is at the sole discretion of NYSERDA. TRC's contractual relationship remains with NYSERDA and limitations stated herein remain applicable regardless of end user. The opinions, conclusions, and recommendations presented in this report have been formulated in accordance with accepted geotechnical engineering practices that exist in the area at the time this report was written. No other warranty, expressed or implied, is made or should be inferred.

The opinions, conclusions and recommendations contained in this report are based upon the information obtained from our investigation, which includes data from a limited number of widely separated discrete locations, visual observations from our site reconnaissance, and review of other geotechnical data provided to us, along with local experience and engineering judgment. An attempt has been made to provide for normal contingencies; however, the possibility remains that differing or unexpected conditions may be encountered during construction. If this should occur, or if additional or contradictory data are revealed in the future, TRC should be notified so that modifications to this report can be made, if necessary. TRC is not responsible for any conclusions or opinions drawn from the data included herein, other than those specifically stated, nor are the recommendations presented in this report intended for direct use as construction specifications.

TRC should be retained to review the geotechnical aspects of the final plans and specifications for conformance with our recommendations. The recommendations provided in this report are based on the assumption that TRC will be retained to provide observation and testing services during construction to confirm that conditions are similar to that assumed for design and to form an opinion as to whether the work has been performed in accordance with the project plans and specifications. If we are not retained for these services, TRC cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of TRC's report by others. Furthermore, TRC will cease to be the Geotechnical Engineer-of-Record at the time another consultant is retained for follow up service to this report, if applicable.

The opinions presented in this report are valid as of the present date for the property evaluated. Changes in the condition of the property will likely occur with the passage of time due to natural processes and/or the works of man. In addition, changes in applicable standards of practice can occur as a result of legislation and/or the broadening of knowledge. Furthermore, geotechnical issues may arise that were not apparent at the time of our investigation. Accordingly, the opinions presented in this report may be invalidated, wholly or partially, by changes outside of our control. Therefore, this report is subject to review and should not be relied upon after a period of three years. Similarly, this report should not be used, nor are its recommendation applicable, for any other properties or alternate developments.

We trust this report contains the information you require and thank you for the opportunity to work on this project. Please consider our firm for future geotechnical services as needed.

Sincerely,

TRC Engineers, Inc.

James P. Benjamin

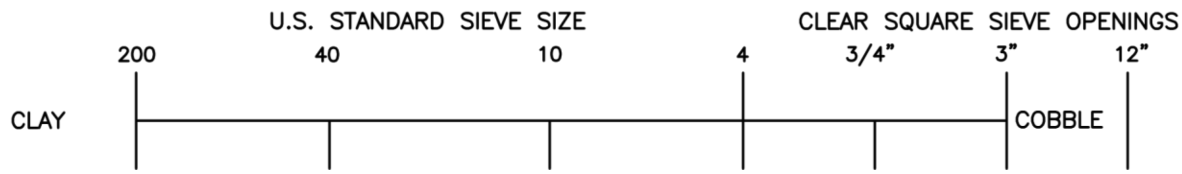
James P. Benjamin, PE*
Geotechnical Project Manager
*NJ, PA

Petro W. Kazaniwsky, PE
Chief Geotechnical Engineer
NY License #: 081310

SILTS AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

PRIMARY DIVISIONS			SOIL TYPE		SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (Less than 5% Fines)	GW		Well graded gravels, gravel–sand mixtures, little or no fines
			GP		Poorly graded gravels or gravel–sand mixtures, little or no fines
		GRAVEL WITH FINES	GM		Silty gravels, gravel–sand–silt mixtures, plastic fines
			GC		Clayey gravels, gravel–sand–clay mixtures, plastic fines
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (Less than 5% Fines)	SW		Well graded sands, gravelly sands, little or no fines
			SP		Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES	SM		Silty sands, sand–silt–mixtures, non–plastic fines
			SC		Clayey sands, sand–clay mixtures, plastic fines
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50 %		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL		Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50 %		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH		Inorganic clays of high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT		Peat and other highly organic soils

DEFINITION OF TERMS



FIGURES

Adirondack Park
Class: C(TS)
Mohawk Adirondack & Northern
Newton Falls Rd
Olympic Trl
State Highway 3
Class: D
Little River
Class: C(T)
W-EES-1
W-EES-2
W-EES-3
W-EES-4
W-EES-5
W-EES-6
W-EES-7
S-EES-1
B-01
B-02
B-03
B-04
B-05
B-06
B-07
B-08
B-09
B-10
B-11
B-12
B-13
B-14
B-15
STUDY AREA
PROPOSED BORING LOCATION
DELINEATED INTERMITTENT STREAM CENTERLINE
DELINEATED WETLAND AREA
PUB
PEM
PSS
MAPPED STREAM (NYSDEC)
MAPPED STREAM (NHD)
MAPPED WETLANDS (ADIRONDACK PARK AGENCY)
MAPPED WETLANDS (NWI)
MAPPED WATERBODIES (NHD)
MUNICIPAL BOUNDARY
Data: NYSDEC, ADIRONDACK PARK AGENCY, USFWS NWI, USGS NHD, FEMA
Base Map: Esri and its contributors, "World Imagery (Clarity)"
N
0 200 400
Feet
1:7,200
1 Inch = 600 Feet
Site Location
VT
NH
NY
MA
CT
PA
NJ
PROJECT:
BR BENSON MINES SOLAR PROJECT
TOWN OF CLIFTON
ST. LAWRENCE COUNTY, NY
TITLE:
BENSON MINES GEOTECH BORING LOCATIONS AND WETLAND RESOURCES
DRAWN BY: J. FREDENBURG
CHECKED BY: B. ROONEY
APPROVED BY: V. VLAHOS
DATE: JUNE 2021
PROJECT NO: 416121
FIGURE 1
TRC
10 MAXWELL DRIVE
CLIFTON PARK, NY 12065

FIELD DATA

TEST BORING LOGS

TEST BORING LOG

PROJECT: BENSON MINES SOLAR PROJECT
LOCATION: CLIFTON, ST. LAWRENCE CO., NY

BORING	**B-01**
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED DRY

DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR		0 HR

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/06/2021
DATE COMPLETED	07/06/2021

DEPTH	A	B				C	DESCRIPTION	PP	REMARKS
	S-1	1	1	3	6	2.0	***BROWN F/M SAND, TR TO SM SILT (FILL)***		BULK SAMPLE 1 COLLECTED 0-5 FT
	S-2	8	10	14	13				
5	S-3	6	8	11	13				
	S-4	8	8	8	8		***ORANGE-BROWN TO BROWN F/M SAND, SM SILT (FILL)***		
10	S-5	5	5	5	5	13.0			
15	S-6	5	5	5	4		***GRAY F/M SAND, TR SILT (FILL)***		
20	S-7	4	5	5	4	20.0			
							END OF BORING AT 20'		
25									
30									
35									

DRN. WHM
CKD. JPB

NEW PROJECTS TEST BORING LOG 444154.0GEI BENSON MINES SOLAR.GPJ SITE BLAUVELT.GDT 8/13/21

TEST BORING LOG

PROJECT: BENSON MINES SOLAR PROJECT
LOCATION: CLIFTON, ST. LAWRENCE CO., NY

BORING	**B-02**
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR		0 HR

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/06/2021
DATE COMPLETED	07/06/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.7 ***TOPSOIL***		BULK SAMPLE 1 COLLECTED 0-5 FT
	S-1	1 2 5 8				
	S-2	9 12 11 9				
5	S-3	7 9 10 7				
	S-4	6 9 8 7				
10	S-5	2 5 9 9		***ORANGE BROWN TO GRAY F/M SAND, TR SILT (FILL)***		
15	S-6	6 6 6 5				
20	S-7	5 5 6 5		20.0		
				END OF BORING AT 20'		
25						
30						
35						

DRN.	WHM
CKD.	JPB

TEST BORING LOG

TRC

PROJECT: BENSON MINES SOLAR PROJECT

LOCATION: CLIFTON, ST. LAWRENCE CO., NY

BORING	**B-03**
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR		0 HRS

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/07/2021
DATE COMPLETED	07/07/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
	S-1	2 4 5 3		*LIGHT BROWN TO ORANGE BROWN F/M SAND, TR TO SM SILT, ORANGE BROWN MOTTLING (FILL)*		BULK SAMPLE 2 COLLECTED 0-5 FT
	S-2	3 1 1 1		4.0		
5	S-3	3 2 6 9				
	S-4	10 9 6 6				
10	S-5	9 16 10 8				
				ORANGE BROWN TO GRAY F/M SAND, TR SILT (FILL)		
15	S-6	7 9 10 12				
20	S-7	8 8 9 9		20.0		
				END OF BORING AT 20'		
25						
30						
35						

DRN.	WHM
CKD.	JPB

NEW PROJECTS TEST BORING LOG 444154.0GEI BENSON MINES SOLAR.GPJ SITE BLAUVELT.GDT 8/13/21

TEST BORING LOG

BORING	B-04
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

PROJECT: BENSON MINES SOLAR PROJECT

LOCATION: CLIFTON, ST. LAWRENCE CO., NY

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR		0 HRS

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/06/2021
DATE COMPLETED	07/06/2021

DEPTH	A	B				DESCRIPTION	PP	REMARKS
0.2						***TOPSOIL***		BULK SAMPLE 2 COLLECTED 0-5 FT
2.0	S-1	3	3	8	18	***BROWN SILTY F/M SAND (FILL)***		POSSIBLE COBBLE
4.0	S-2	21	24	21	16	***GRAY F/M SAND, TR SILT (FILL)***		
	S-3	8	7	6	6			
	S-4	6	5	6	5			
	S-5	4	6	7	9			
	S-6	8	11	12	9			
20.0	S-7	8	9	8	9	***GRAY F/M SAND, TR SILT (FILL)***		
						END OF BORING AT 20'		

DEPTH scale: 5, 10, 15, 20, 25, 30, 35

DRN.	WHM
CKD.	JPB

TRC TEST BORING LOG

BORING	B-05
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

PROJECT: BENSON MINES SOLAR PROJECT

LOCATION: CLIFTON, ST. LAWRENCE CO., NY

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME
14.5'	NR		1 HRS

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	22.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/06/2021
DATE COMPLETED	07/06/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
	S-1	1 4 7 6				
	S-2	6 10 8 9				
5	S-3	7 6 6 5		***BROWN F/M SAND, TR TO SM SILT (FILL)***		
	S-4	4 5 7 6				
10	S-5	6 6 6 6				
				13.0		
15	S-6	3 2 2 2				
	S-7	1 1 1 1		***GRAY F/M/C SAND, TR SILT (FILL)***		
20	S-8	1 1 1 1				
	S-9	2 1 2 3		22.0		
				END OF BORING AT 22'		
25						
30						
35						

DRN. WHM

CKD. JPB

TEST BORING LOG

PROJECT: BENSON MINES SOLAR PROJECT

LOCATION: CLIFTON, ST. LAWRENCE CO., NY

BORING	**B-06**
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR		0 HRS

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/07/2021
DATE COMPLETED	07/07/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
0.3				***TOPSOIL***		
	S-1	1 2 2 7		***BROWN F/M SAND, TR TO SM SILT (FILL)***		
2.0						
	S-2	9 9 8 6				
5	S-3	6 10 9 8				
	S-4	8 8 10 9				
10	S-5	8 7 8 6		***ORANGE BROWN TO GRAY F/M SAND, TR SILT (FILL)***		
15	S-6	4 6 7 6				
20	S-7	5 6 5 6				
20.0				***END OF BORING AT 20'***		
25						
30						
35						

DRN. WHM

CKD. JPB

TEST BORING LOG

PROJECT: BENSON MINES SOLAR PROJECT
LOCATION: CLIFTON, ST. LAWRENCE CO., NY

BORING	**B-07**
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR		0 HRS

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/07/2021
DATE COMPLETED	07/07/2021

DEPTH	A	B				C	DESCRIPTION	PP	REMARKS
							0.5 ***TOPSOIL***		BULK SAMPLE 2 COLLECTED 0-5 FT
	S-1	WOH	1	2	6		***ORANGE BROWN F/M SAND, TR TO SM SILT (FILL)*** 2.0		
	S-2	8	8	7	7				
5	S-3	4	4	9	12				
	S-4	12	11	12	12				
10	S-5	6	5	5	6		***ORANGE BROWN TO GRAY F/M SAND, TR TO SM SILT (FILL)***		
15	S-6	3	5	6	6				
20	S-7	5	5	5	6		20.0		
							END OF BORING AT 20'		
25									
30									
35									

DRN.	WHM
CKD.	JPB

TEST BORING LOG

BORING	B-08
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

PROJECT: BENSON MINES SOLAR PROJECT

LOCATION: CLIFTON, ST. LAWRENCE CO., NY

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR		0 HRS

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/08/2021
DATE COMPLETED	07/08/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.5 ***TOPSOIL***		BULK SAMPLE 5 COLLECTED 0-5 FT
	S-1	1 5 7 7				
	S-2	6 6 6 6				
5	S-3	6 4 4 4				
	S-4	3 4 4 3				
10	S-5	5 4 4 4		***ORANGE BROWN TO GRAY F/M SAND (FILL)***		
15	S-6	3 3 4 4				
20	S-7	4 2 3 5		20.0		SEAM OF SILT
				END OF BORING AT 20'		
25						
30						
35						

DRN.	WHM
CKD.	JPB

NEW PROJECTS TEST BORING LOG 444154.0GEI BENSON MINES SOLAR.GPJ SITE BLAUVELT.GDT 8/13/21

TEST BORING LOG

PROJECT: BENSON MINES SOLAR PROJECT
LOCATION: CLIFTON, ST. LAWRENCE CO., NY

BORING	**B-09**
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED 17.9 '			
DEPTH	HOUR	DATE	ELAPSED TIME
17.9'	NR		0 HRS

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/08/2021
DATE COMPLETED	07/08/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
	S-1	WOH 2 4 6	2.0	***ORANGE BROWN F/M/C SAND, SM GRAVEL, TR SILT (FILL)***		BULK SAMPLE 3 COLLECTED 0-5 FT
	S-2	7 6 7 6				
5	S-3	5 6 8 9				
	S-4	8 8 8 7				SEAM OF SILT
10	S-5	8 7 7 5		***BROWN TO GRAY F/M SAND, SM SILT (FILL)***		
15	S-6	4 3 5 6				
20	S-7	4 4 3 4	20.0			
				END OF BORING AT 20'		
25						
30						
35						

DRN. WHM
CKD. JPB

NEW PROJECTS TEST BORING LOG 444154.0GEI BENSON MINES SOLAR.GPJ SITE BLAUVELT.GDT 8/13/21

TEST BORING LOG

PROJECT: BENSON MINES SOLAR PROJECT
LOCATION: CLIFTON, ST. LAWRENCE CO., NY

BORING	**B-10**
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR		0 HRS

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/07/2021
DATE COMPLETED	07/07/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
0.5				***TOPSOIL***		BULK SAMPLE 3 COLLECTED 0-5 FT
2.0	S-1	1 5 5 4		***BROWN F/M SAND, TR TO SM SILT (FILL)***		
	S-2	5 6 9 8				
5	S-3	9 10 12 13		***BROWN F/M SAND, TR TO SM SILT (FILL)***		
8.0	S-4	13 14 13 10				
10	S-5	6 4 4 4				
15	S-6	5 5 6 5		***BROWN TO GRAY F/M SAND, TR TO SM SILT (FILL)***		
20 / 20.0	S-7	5 5 5 4				
				END OF BORING AT 20'		
25						
30						
35						

DRN.	WHM
CKD.	JPB

TEST BORING LOG

BORING	B-11
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

PROJECT: BENSON MINES SOLAR PROJECT

LOCATION: CLIFTON, ST. LAWRENCE CO., NY

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR		0 HRS

METHOD OF ADVANCING BOREHOLE

a	FROM 0.0 '	TO 10.0 '		
d	FROM 10.0 '	TO 20.0 '		

DRILLER JOHN W.
HELPER BRYAN C.
INSPECTOR N. LAM
DATE STARTED 07/06/2021
DATE COMPLETED 07/06/2021

DEPTH	A	B				DESCRIPTION	PP	REMARKS
	S-1	1	3	11	6	*BROWN F/M/C SAND, SM F/ GRAVEL TR SILT (FILL)* 2.0		BULK SAMPLE 5 COLELCTED 0-5 FT
	S-2	5	4	5	6			
5	S-3	4	5	5	5			
	S-4	4	5	5	5			
10	S-5	4	4	5	5	*ORANGE BROWN F/M SAND (FILL)*		
15	S-6	3	3	3	3			
20	S-7	3	2	2	3	20.0		
						END OF BORING AT 20'		
25								
30								
35								

DRN. WHM
CKD. JPB

NEW PROJECTS TEST BORING LOG 444154.0GEI BENSON MINES SOLAR.GPJ SITE BLAUVELT.GDT 8/13/21

TEST BORING LOG

PROJECT: BENSON MINES SOLAR PROJECT
LOCATION: CLIFTON, ST. LAWRENCE CO., NY

BORING	**B-12**
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR		0 HRS

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/08/2021
DATE COMPLETED	07/08/2021

DEPTH	A	B				DESCRIPTION	PP	REMARKS
						0.3 ***TOPSOIL***		BULK SAMPLE 5 COLLECTED 0-5 FT
	S-1	WOH	1	6	4	***ORANGE BROWN F/M SAND, TR TO SM SILT (FILL)*** 2.0		
	S-2	3	4	6	6			
5	S-3	5	6	5	6			SEAM OF SILT
	S-4	8	5	8	5			
10	S-5	5	6	6	6	***ORANGE BROWN TO GRAY F/M SAND, SM SILT (FILL)***		
15	S-6	5	4	5	4			
20	S-7	3	4	4	4	20.0		
						END OF BORING AT 20'		
25								
30								
35								

DRN.	WHM
CKD.	JPB

TEST BORING LOG

PROJECT: BENSON MINES SOLAR PROJECT
LOCATION: CLIFTON, ST. LAWRENCE CO., NY

BORING	**B-13**
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME
13.5'	NR		0 HRS

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	27.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/07/2021
DATE COMPLETED	07/07/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
0.2				***TOPSOIL***		BULK SAMPLE 4 COLLECTED 0-5 FT
2.0	S-1	WOH 1 4 5		***BROWN F/M SAND, TR TO SM SILT (FILL)***		
	S-2	4 4 5 5				
5	S-3	4 5 7 7				
	S-4	7 6 4 4		***BROWN TO GRAY F/M SAND, SM SILT (FILL)***		SEAM OF SILT
10	S-5	4 5 3 4				
13.0						
15	S-6	3 1 2 1		***GRAY F/M SAND, SM SILT (FILL)***		
20	S-7	2 3 1 2				
	S-8	2 2 1 2				
23.0						
25 (25.0)	S-9	2 2 1 2		***GRAY SILT***		
27.0	S-10	WOH/1.0' 2 1		***GRAY CLAYEY SILT***		
				END OF BORING AT 27'		
30						
35						

DRN. WHM
CKD. JPB

NEW PROJECTS TEST BORING LOG 444154.0GEI BENSON MINES SOLAR.GPJ SITE BLAUVELT.GDT 8/13/21

TEST BORING LOG

PROJECT: BENSON MINES SOLAR PROJECT
LOCATION: CLIFTON, ST. LAWRENCE CO., NY

BORING	**B-14**
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR		0 HRS

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	20.0 '

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/07/2021
DATE COMPLETED	07/07/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
	S-1	WOH 1 2 4		***BROWN F/M SAND, TR TO SM SILT (FILL)*** 2.0		BULK SAMPLE 4 COLLECTED 0-5 FT
	S-2	6 8 11 10				
5	S-3	4 7 10 9				
	S-4	9 7 6 6		***ORANGE BROWN F/M SAND, TR TO SM SILT (FILL)***		
10	S-5	7 7 8 5		13.0		
15	S-6	3 2 3 4		***GRAY F/M SAND, SM SILT (FILL)***		SEAM OF SILT
20	S-7	6 4 4 3		20.0		
				END OF BORING AT 20'		
25						
30						
35						

DRN. WHM
CKD. JPB

NEW PROJECTS TEST BORING LOG 444154.0GEI BENSON MINES SOLAR.GPJ SITE BLAUVELT.GDT 8/13/21

TEST BORING LOG

PROJECT: BENSON MINES SOLAR PROJECT
LOCATION: CLIFTON, ST. LAWRENCE CO., NY

BORING	**B-15**
G.S. ELEV.	
FILE	444154.0GEI
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME
7.3'	NR		0.5 HRS

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '	
d	FROM	10.0 '	TO	22.0 '	

DRILLER	JOHN W.
HELPER	BRYAN C.
INSPECTOR	N. LAM
DATE STARTED	07/07/2021
DATE COMPLETED	07/07/2021

DEPTH	A	B				C	DESCRIPTION	PP	REMARKS
									BULK SAMPLE 4 COLLECTED 0-5 FT
	S-1	WOH	2	4	4		***BROWN TO GRAY F/M SAND, TR TO SM SILT (FILL)***		
	S-2	6	6	6	4				
5	S-3	3	3	3	3		6.0		
	S-4	2	2	2	2		***GRAY F/M SAND, TR TO SM SILT (FILL)***		
10	S-5	2	2	2	2				
15	S-6	2	1	1	2				
20	S-7	2	1	1	3		20.0		PEAT
	S-8	1	6	10	10		***GRAY F/M SAND, TR TO SM SILT (FILL)*** 22.0		
							END OF BORING AT 22'		
25									
30									
35									

DRN. WHM
CKD. JPB

NEW PROJECTS TEST BORING LOG 444154.0GEI BENSON MINES SOLAR.GPJ SITE BLAUVELT.GDT 8/13/21

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Silt with High Plasticity
	Silt with Low Plasticity
	Silty Sand
	Poorly-graded Sand
	Poorly-graded Sand with Silt
	Topsoil

Symbol	Description
Misc. Symbols	
▽	Water table first encountered
▼	Water table first reading after drilling
▼	Water table second reading after drilling
▼	Water table third reading after drilling
NR	Not Recorded
MH	Moh's Hardness
Sample Type	
	Split Barrel

Lab Symbols

FINES = Fines %

LL = Liquid Limit %

PI = Plasticity Index %

U_c = Unconfined Compressive Strength

W/V = Unit Weight

Notes:

COLUMN A) Soil sample number.

COLUMN B) FOR SOIL SAMPLE (ASTM D 1586): indicates number of blows obtained for each 6 ins. penetration of the standard split-barrel sampler. FOR ROCK CORING (ASTM D2113): indicates percent recovery (REC) per run and rock quality designation (RQD). RQD is the % of rock pieces that are 4 ins. or greater in length in a core run.

COLUMN C) Strata symbol as assigned by the geotechnical engineer.

DESCRIPTION) Description including color, texture and classification of subsurface material as applicable (see Descriptive Terms). Estimated depths to bottom of strata as interpolated from the borings are also shown.

DESCRIPTIVE TERMS: F = fine M = medium C = coarse

RELATIVE PROPORTIONS:

-Descriptive Term-	-Symbol-	-Est. Percentages-
Trace	TR	1-10
Trace to Some	TR to SM	10-15
Some	SM	15-30
Silty, Sandy, Clayey, Gravelly	-	30-40
And	and	40-50

REMARKS) Special conditions or test data as noted during investigation. Note that W.O.P. indicates water observation pipes.

* Free water level as noted may not be indicative of daily, seasonal, tidal, flood, and/or long term fluctuations.

METHODS AND TOOLS FOR **ADVANCING BOREHOLES**

a - Continuous Sampling

b - Finger type rotary cutter head 6 in. diameter (open hole)

d - Drilled in casing 3 3/8 in. ID; 8 in. OD (hollow-stem auger)

e - Drilled in casing 2 1/2 in. ID; 6 1/4 in. OD (hollow-stem auger)

f - Driven flush joint casing (BW) - 2 3/8 in. ID; 2 7/8 in. OD (300 lb. hammer, 18 in. drop)

g - Driven flush joint casing (NW) - 3 in. ID; 3 1/2 in. OD (300 lb. hammer, 18 in. drop)

h - Tricone Roller Bit - 2 3/8 in. or 2 7/8 in.

i - Drilling Mud (Slurry Method)

c_1 - Double tube diamond core barrel (BX) : core size: 1.6 in.
hole size: 2.36 in.

c_2 - Double tube diamond core barrel (NX) : core size: 2.0 in.
hole size: 2.98 in.

c_3 - 4 in. thin walled diamond bit

c_4 - 6 in. thin walled diamond bit

METHODS AND TOOLS FOR **TESTING AND SAMPLING SOILS AND/OR ROCKS**

Penetration test and split-barrel sampling of soils, ASTM D1586

140 lb. hammer, 30 in. drop. recording number of blows obtained for each 6 in. penetration usually for a total of 18 in. penetration of the standard 2 in. O.D. and 1 3/8 in. I.D. split-barrel sampler. Penetration resistance (N) is the total number of blows required for the second and third 6 in. penetration.

Thin walled tube sampling, ASTM D1587

Samples are obtained by pressing thin-walled steel, brass or aluminum tubes into soil. Standard thin-walled steel tubes:

O.D. in.	2	3
I.D. in.	1.94	2.87

Diamond core drilling, ASTM D2113

Diamond core drilling is used to recover intact samples of rock and some hard soils generally with the use of a:

BWM double tube core barrel
NWM double tube core barrel

LABORATORY DATA

SUMMARY OF LABORATORY TEST DATA

Project Name: Benson Mines Solar Project
Client Name: NYSERDA
TRC Project #: 444154.0GEI

SAMPLE IDENTIFICATION			USCS (Group)	Moisture Content (%)	GRAIN SIZE DISTRIBUTION			
Boring #	Sample #	Depth (ft)			Gravel (%)	Sand (%)	Silt (%)	Clay (%)
B-1	S-3	4.0-6.0	SM	12.5	0.1	82.0	17.9	
B-3	S-2	2.0-4.0	SP-SM	7.6	0.0	91.2	8.8	
B-4	S-3	4.0-6.0	SP-SM	7.7	0.0	90.5	9.5	
B-5	S-6	13.0-15.0	SP-SM	22.6	0.3	90.8	8.9	
B-6	S-4	6.0-8.0	SP-SM	5.1	0.0	92.5	7.5	
B-8	S-3	4.0-6.0	SP	4.7	0.0	99.5	0.5	
B-9	S-5	8.0-10.0	SM	8.5	0.0	84.7	15.3	
B-11	S-1	0.0-2.0	SP-SM	4.5	20.2	73.9	5.9	
B-11	S-2	2.0-4.0	SP	5.7	0.5	98.8	0.7	
B-12	S-6	13.0-15.0	SM	12.2	0.0	75.4	24.6	
B-13	S-4	6.0-8.0	SM	17.3	0.0	74.9	25.1	
B-15	S-5	8.0-10.0	SM	23.4	0.0	86.0	14.0	

DRAWN BY: TBT 07/22/21

CHECKED BY: JPB 07/22/21

SUMMARY OF LABORATORY TEST DATA

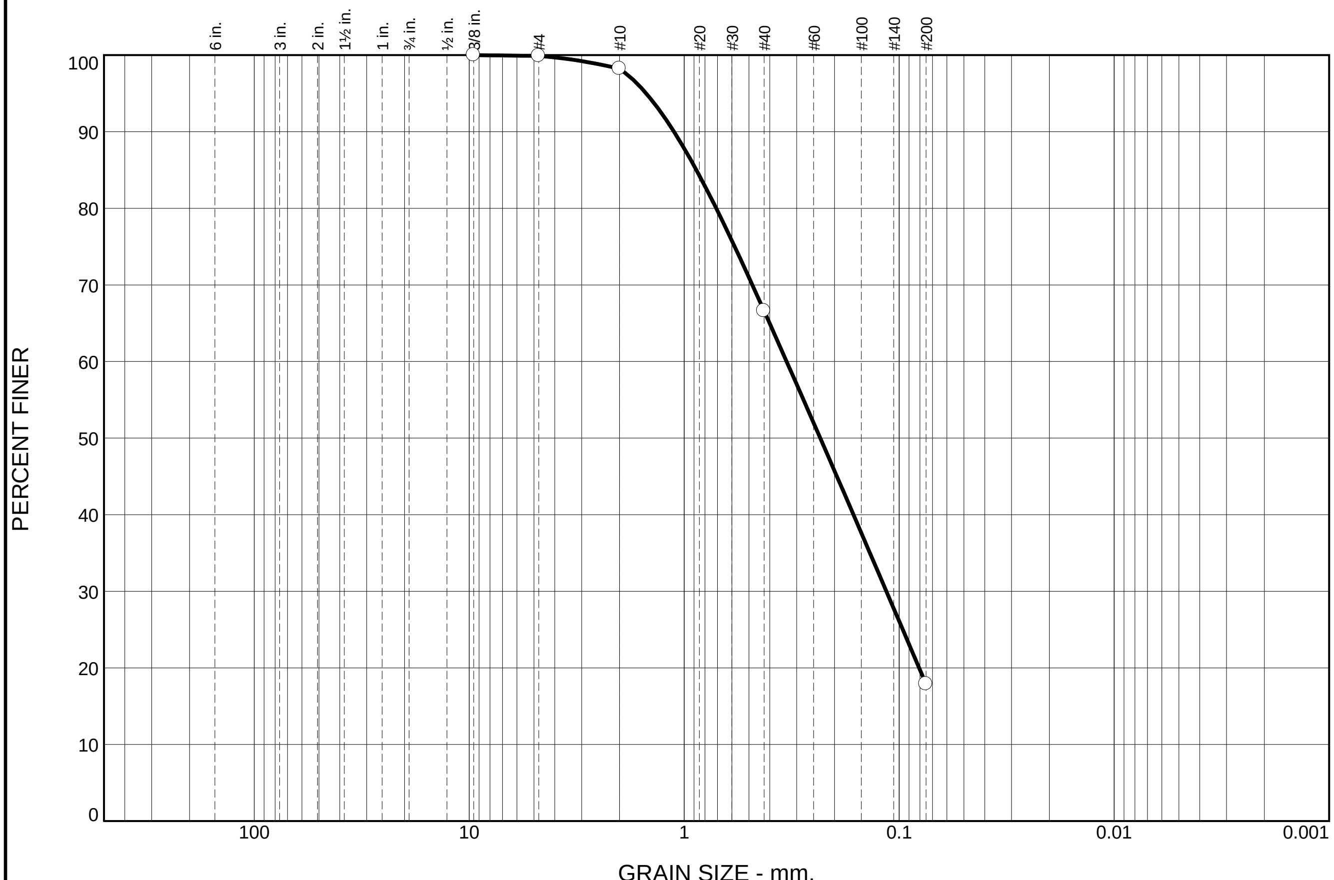
Project Name: Benson Mines Solar Project
Client Name: NYSERDA
TRC Project #: 444154.0GEI

CORROSIVITY ANALYSIS OF SOILS						
Specimen Identification			pH Analysis (ASTM G51)	Water Soluble Sulfates (ASTM D516), mg/kg	Chlorides (ASTM D512), mg/kg	Resistivity (ASTM G57), ohm-cm
Boring #	Sample #	Depth (ft)				
B-1 & S-5	BULK	0.0-5.0	7.9	22	12	22,540
B-3 & S-4	BULK	0.0-5.0	7.9	15	10	30,380
B-6, B-7 & B-9	BULK	0.0-5.0	7.4	20	12	23,520
B-8, B-11, & B-12	BULK	0.0-5.0	7.8	18	10	24,500
B-13, B-14 & B-15	BULK	0.0-5.0	7.8	24	15	19,500

DRAWN BY: TBT 07/22/21

CHECKED BY: JPB 07/22/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.1	1.7	31.6	48.7	17.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.8776	0.3339	0.2329	0.1147				

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY SAND	07/19/21	SM	12.5

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

○ **Source of Sample:** B-1 **Depth:** 4.0-6.0 FT **Sample Number:** S-3

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

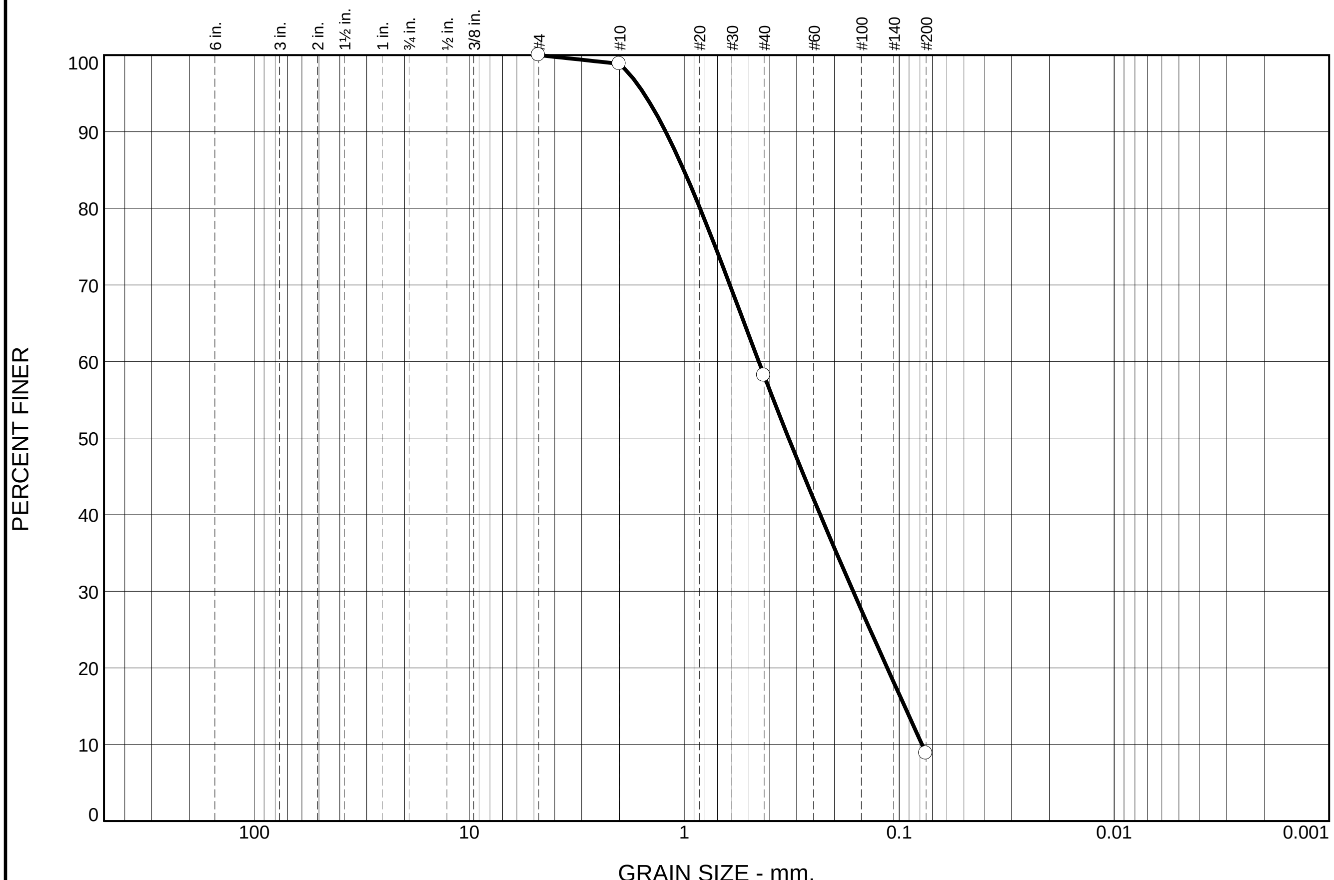
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 1

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

Particle Size Distribution Report



% +3"	% Gravel Coarse	% Gravel Fine	% Sand Coarse	% Sand Medium	% Sand Fine	% Fines Silt	% Fines Clay
0.0	0.0	0.0	1.1	40.7	49.4	8.8	

LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
		1.0045	0.4500	0.3267	0.1637	0.0944	0.0783	0.76	5.75

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
BROWN SAND WITH SILT	07/19/21	SP-SM	7.6

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

Source of Sample: B-3 **Depth:** 2.0-4.0 FT **Sample Number:** S-2

Remarks:
SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

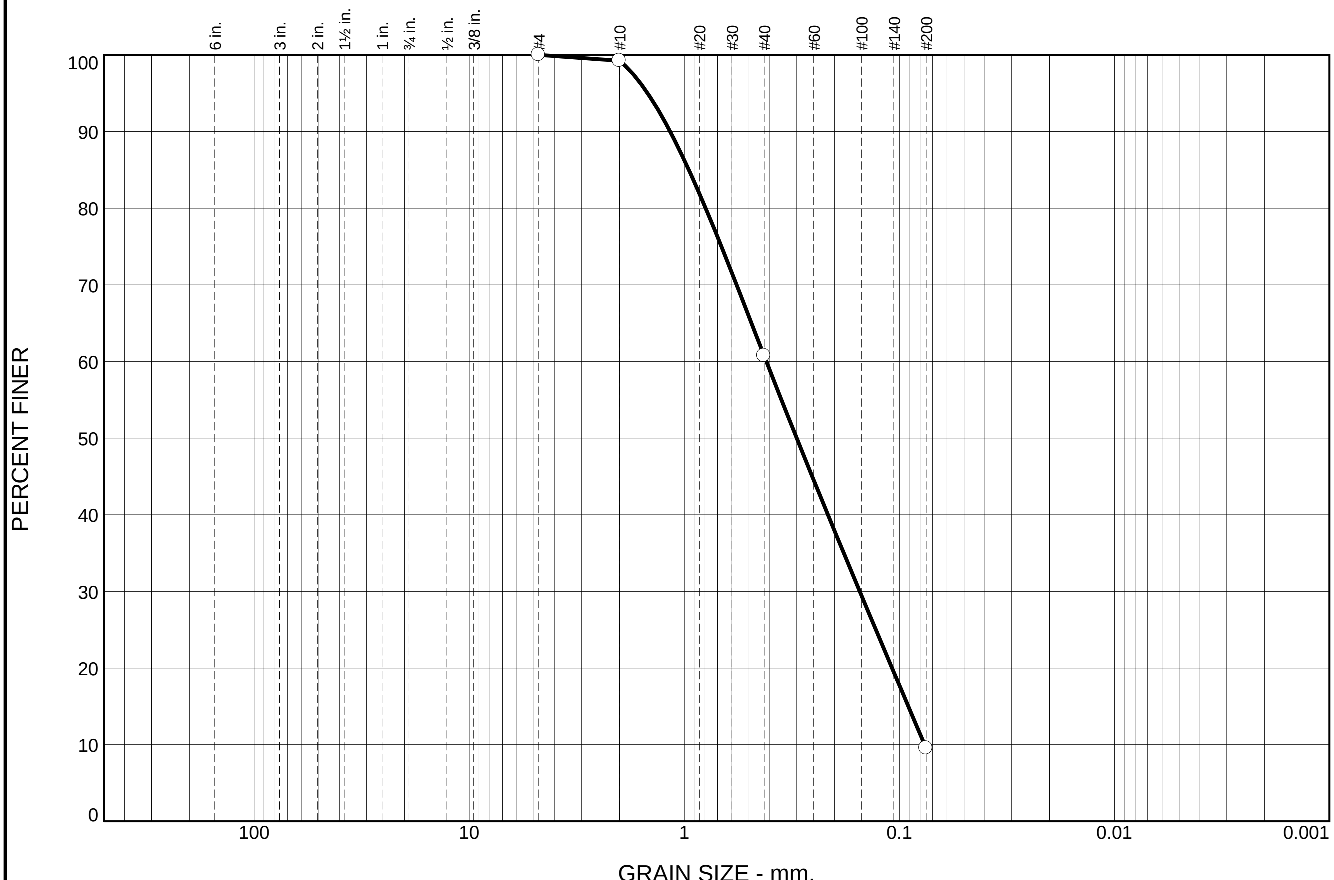
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 2

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.8	38.5	51.2	9.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.9515	0.4151	0.2998	0.1526	0.0907	0.0762	0.74	5.45

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SAND WITH SILT	07/19/21	SP-SM	7.7

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

○ **Source of Sample:** B-4 **Depth:** 4.0-6.0 FT **Sample Number:** S-3

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

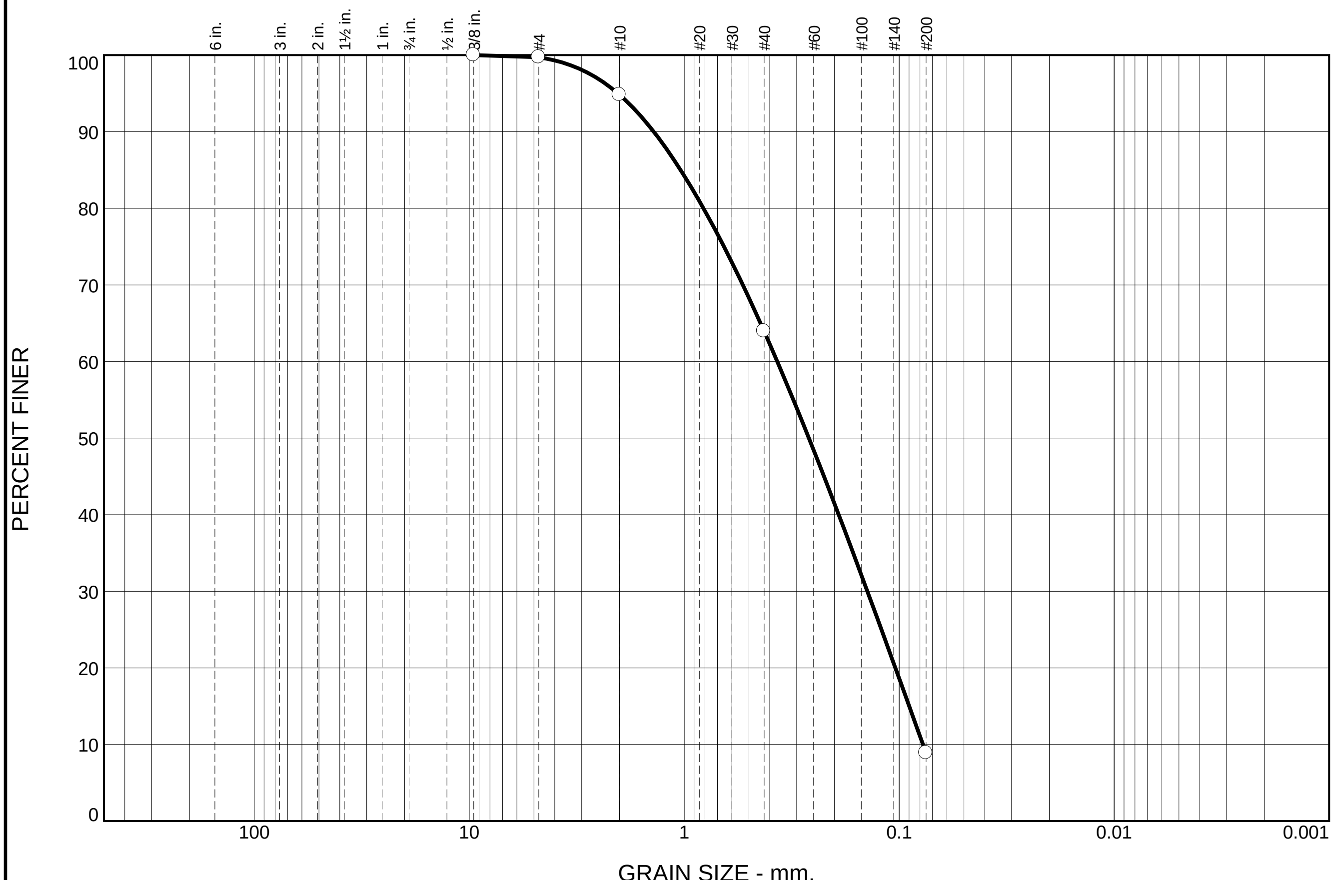
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 3

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.3	4.9	30.9	55.0	8.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.0391	0.3691	0.2631	0.1406	0.0898	0.0775	0.69	4.76

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ GRAY SAND WITH SILT	07/19/21	SP-SM	22.6

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

○ **Source of Sample:** B-5 **Depth:** 13.0-15.0 FT **Sample Number:** S-6

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

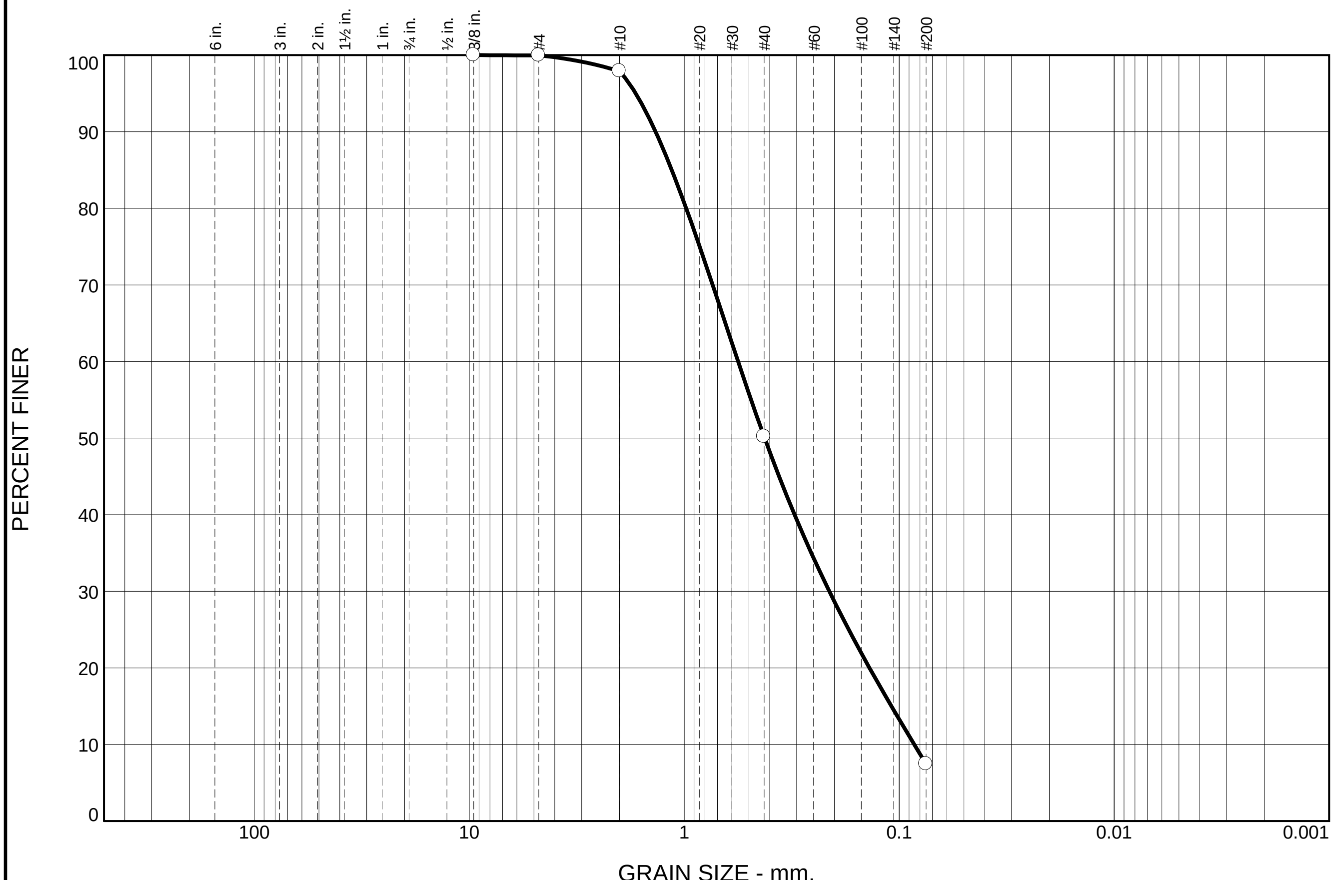
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 4

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	2.1	47.7	42.7	7.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.1424	0.5614	0.4226	0.2113	0.1086	0.0851	0.93	6.60

	MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○	BROWN SAND WITH SILT	07/19/21	SP-SM	5.1

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

○ **Source of Sample:** B-6 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

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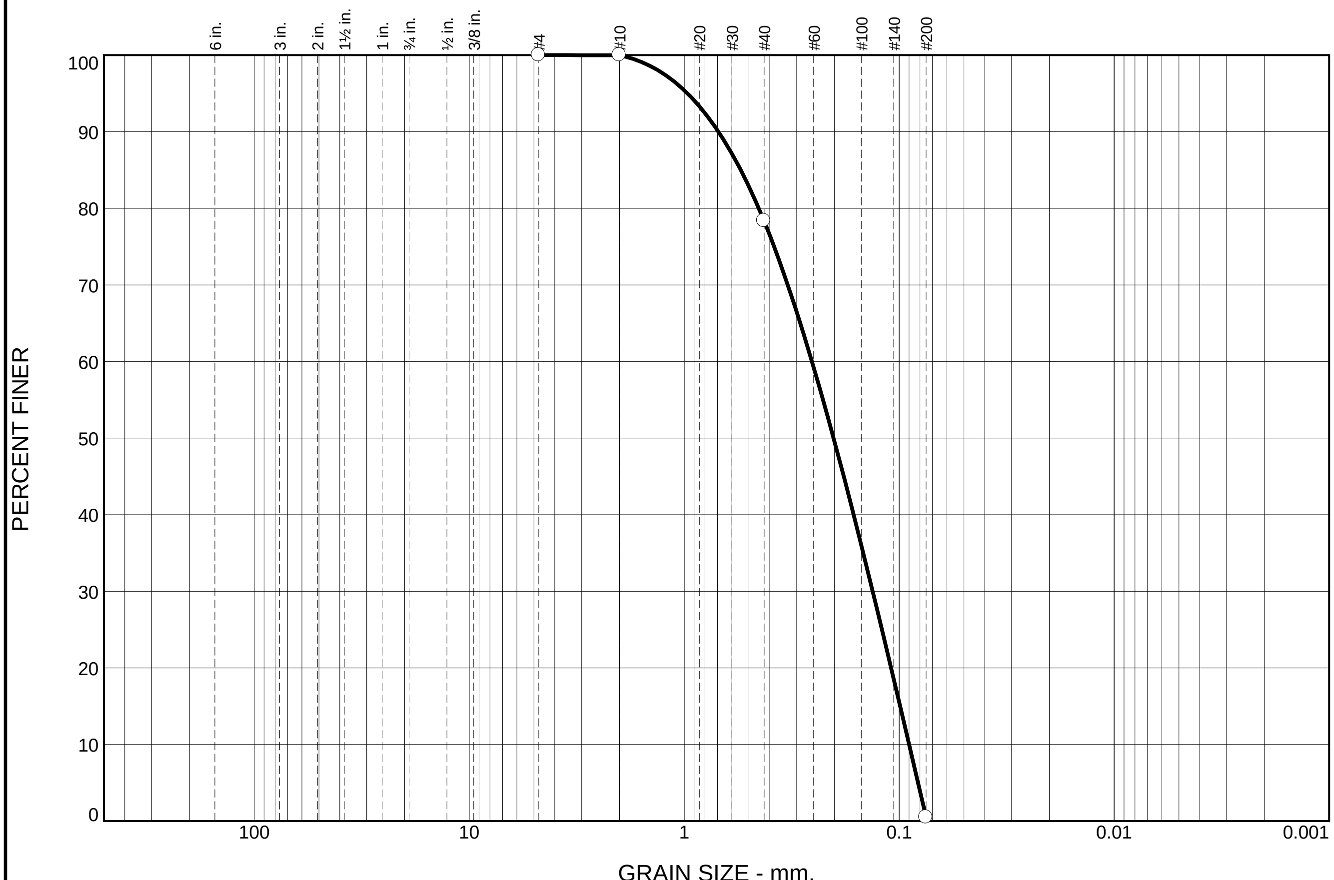
Figure 5

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

Particle Size Distribution Report



% +3"	% Gravel Coarse	% Gravel Fine	% Sand Coarse	% Sand Medium	% Sand Fine	% Fines Silt	% Fines Clay
○ 0.0	0.0	0.0	0.0	21.7	77.8	0.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.5456	0.2546	0.2020	0.1328	0.0990	0.0899	0.77	2.83

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SAND	07/19/21	SP	4.7

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

○ **Source of Sample:** B-8 **Depth:** 4.0-6.0 FT **Sample Number:** S-3

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

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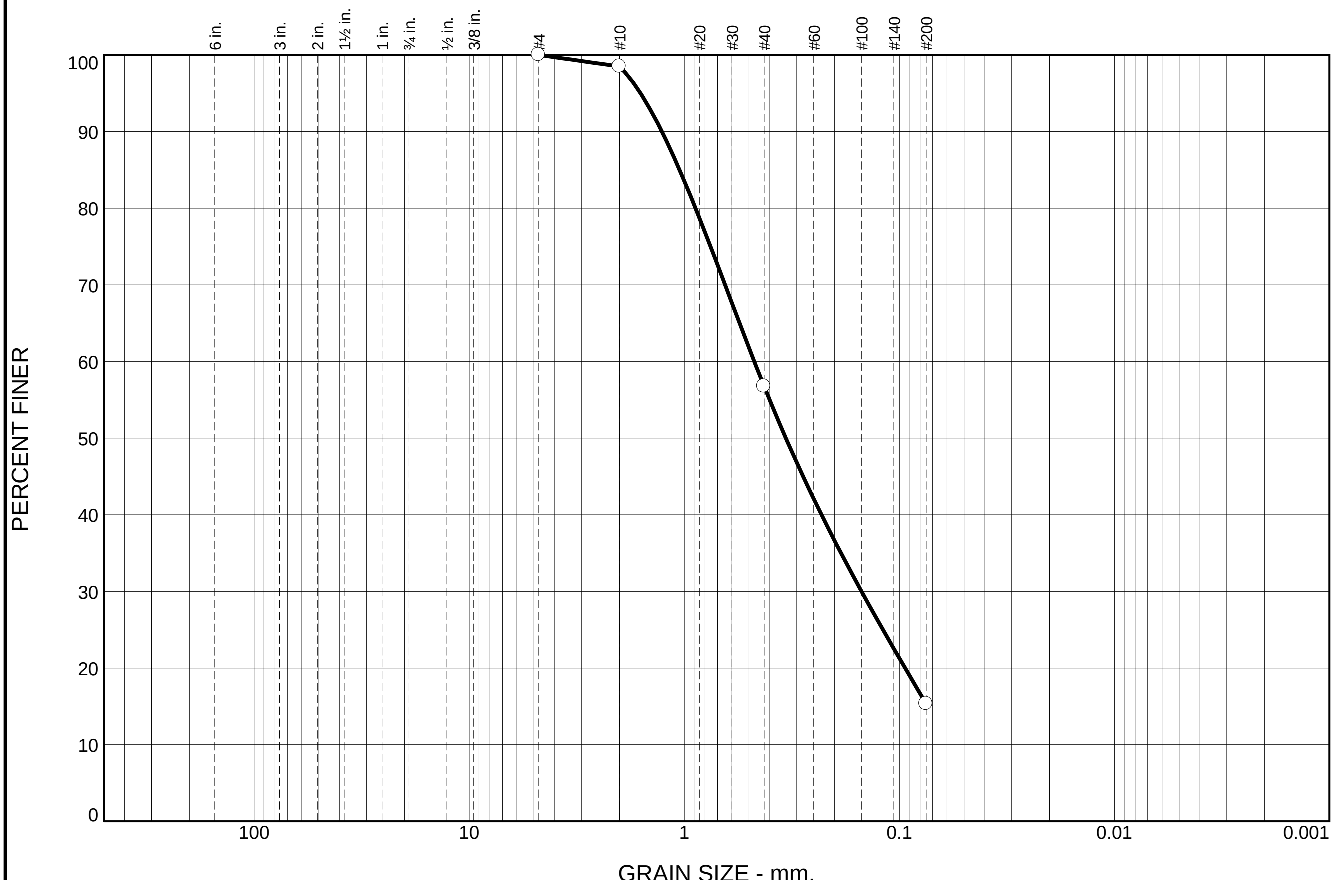
Figure 6

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	1.5	41.7	41.5	15.3	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.0510	0.4723	0.3368	0.1498				

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY SAND	07/19/21	SM	8.5

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

○ **Source of Sample:** B-9 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

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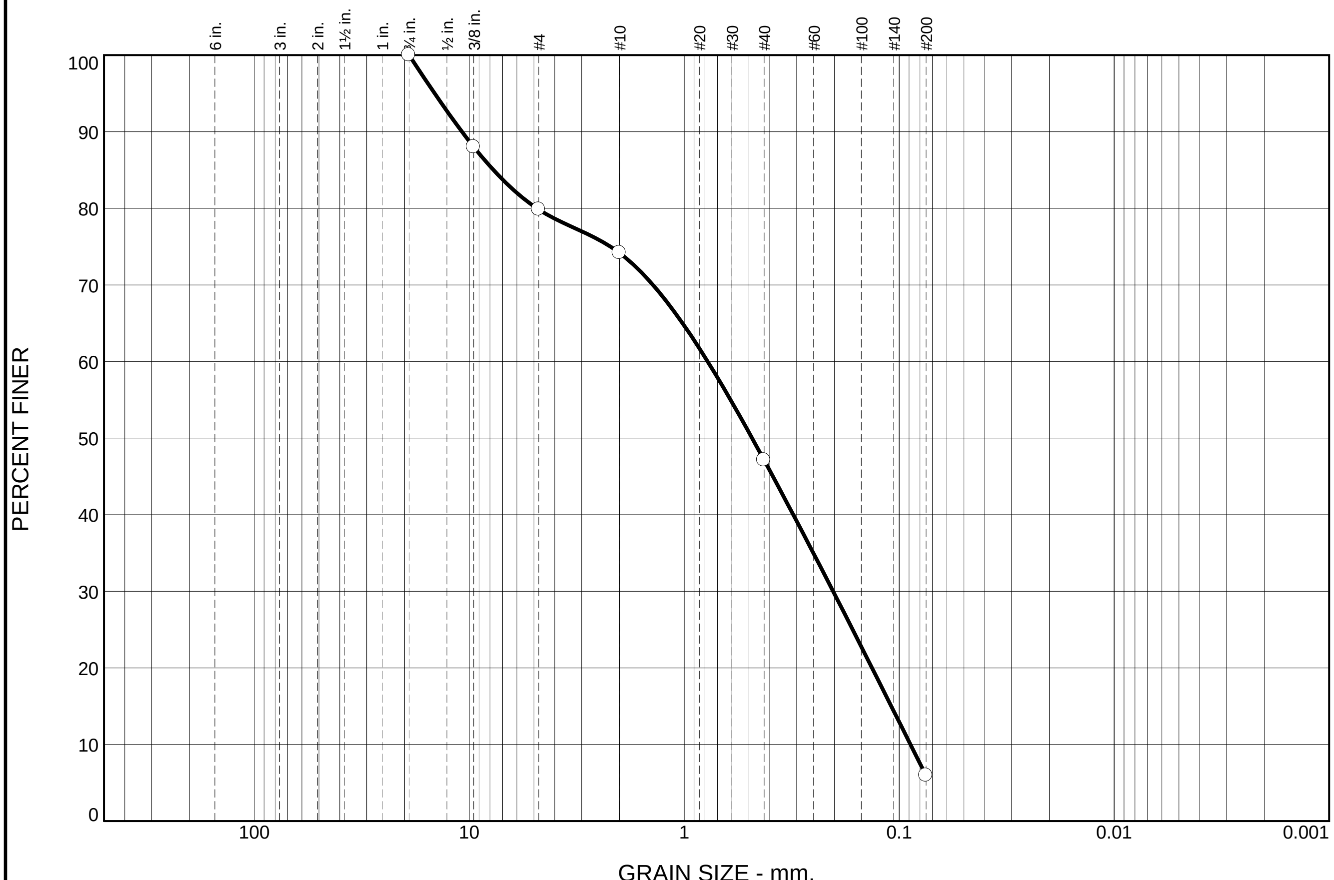
Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

Figure 7

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	20.2	5.6	27.1	41.2	5.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			7.7117	0.7774	0.4833	0.2029	0.1088	0.0886	0.60	8.77

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SAND WITH SILT AND GRAVEL	07/19/21	SP-SM	4.5

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

○ **Source of Sample:** B-11 **Depth:** 0.0-2.0 FT **Sample Number:** S-1

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

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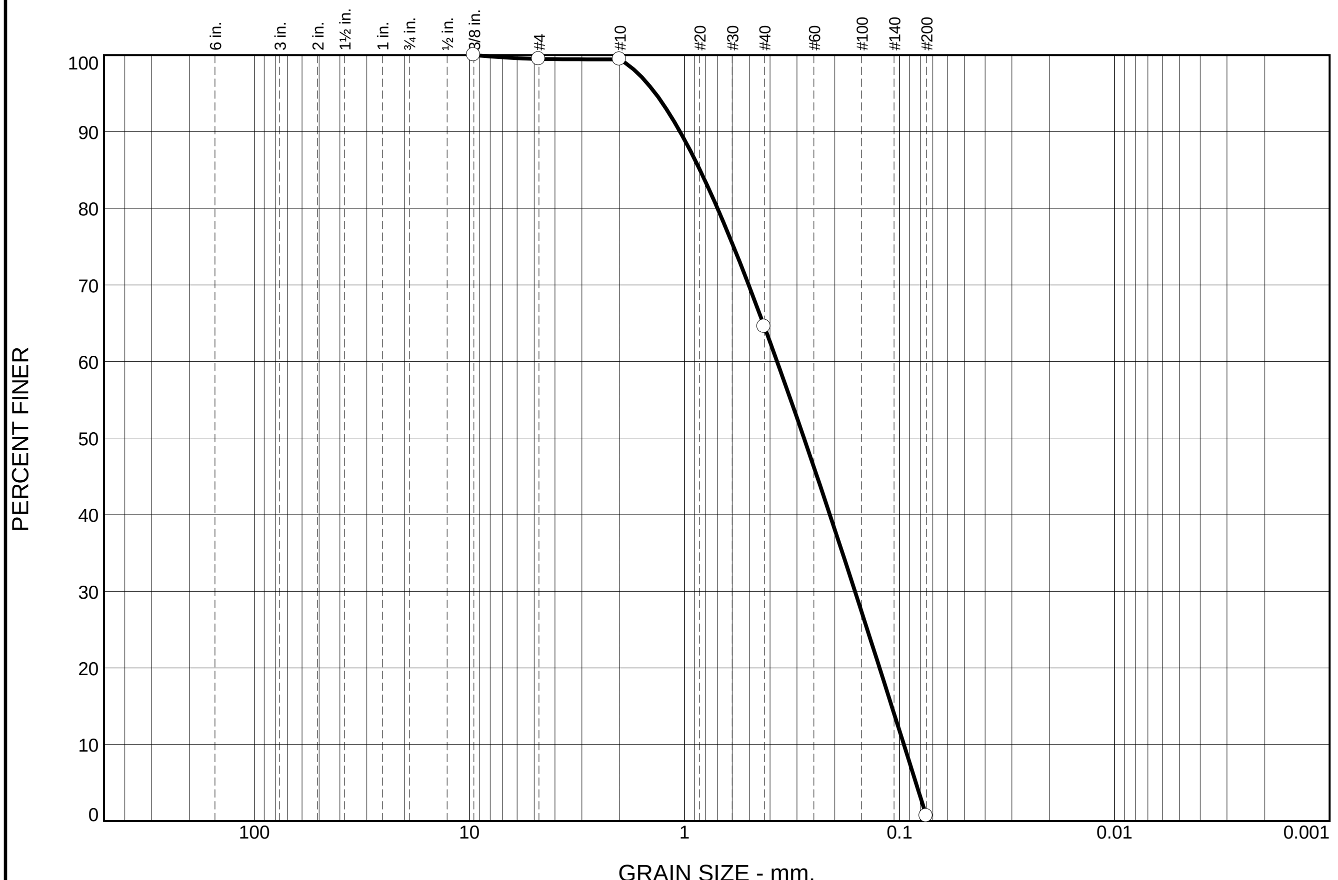
Figure 8

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.5	0.1	34.9	63.8	0.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.8468	0.3710	0.2781	0.1611	0.1087	0.0955	0.73	3.89

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SAND	07/19/21	SP	5.7

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

○ **Source of Sample:** B-11 **Depth:** 2.0-4.0 FT **Sample Number:** S-2

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

TRC Engineers, Inc.

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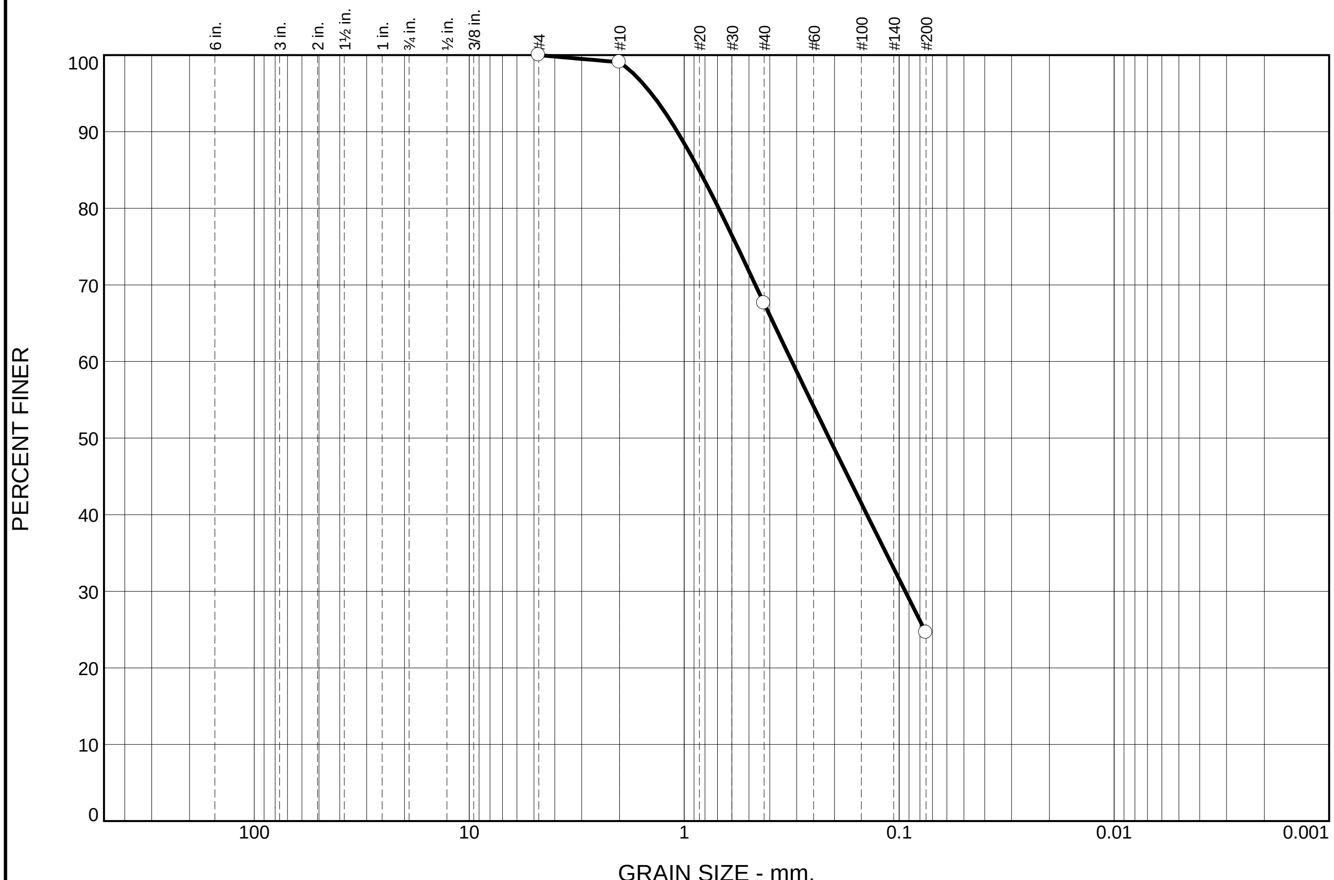
Figure 9

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.9	31.5	43.0	24.6	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.8528	0.3156	0.2118	0.0937				

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY SAND	07/19/21	SM	12.2

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

○ **Source of Sample:** B-12 **Depth:** 13.0-15.0 FT **Sample Number:** S-6

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

TRC Engineers, Inc.

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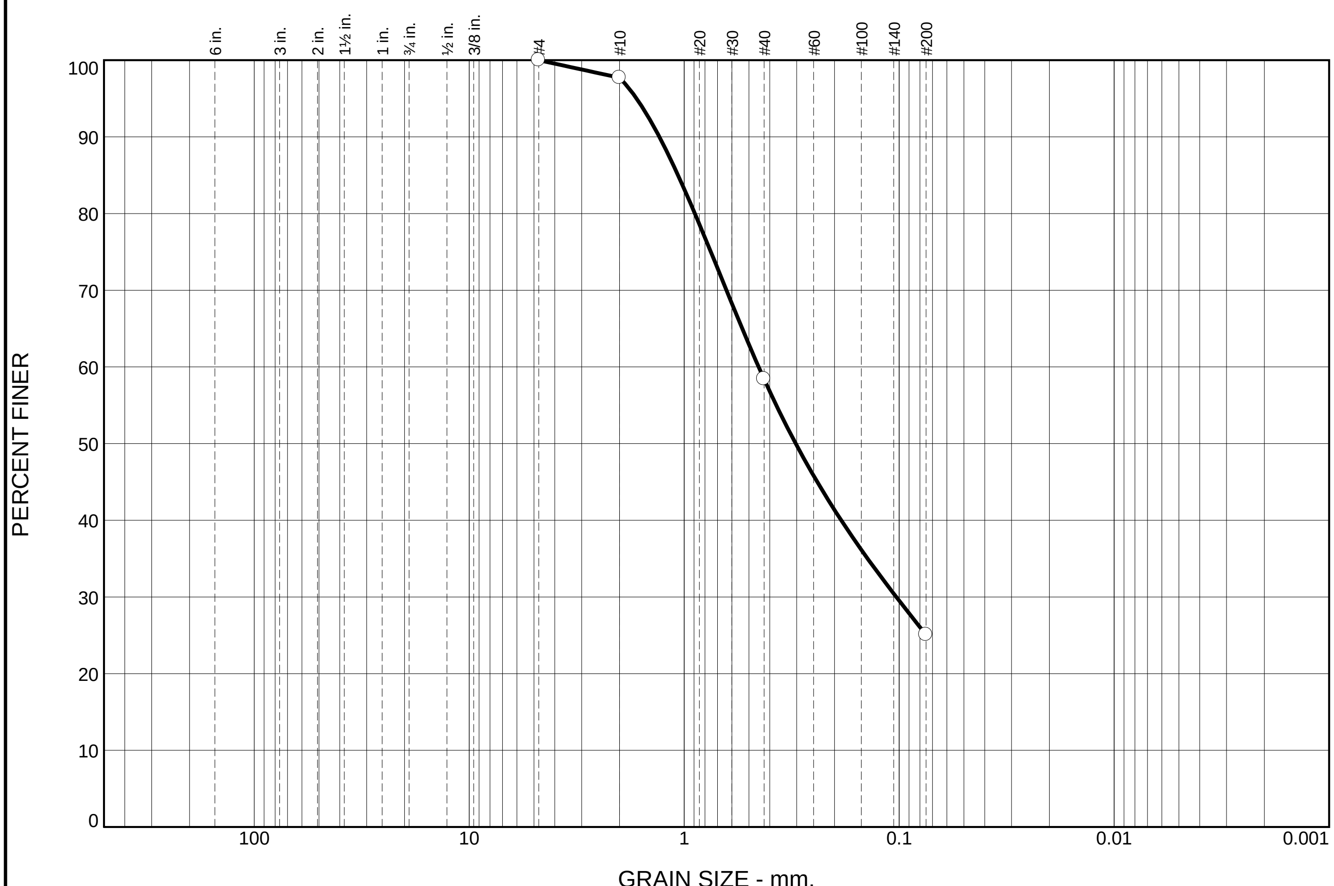
Figure 10

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	2.3	39.3	33.3	25.1	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.0683	0.4505	0.3028	0.1031				

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY SAND	07/19/21	SM	17.3

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

○ **Source of Sample:** B-13 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

TRC Engineers, Inc.

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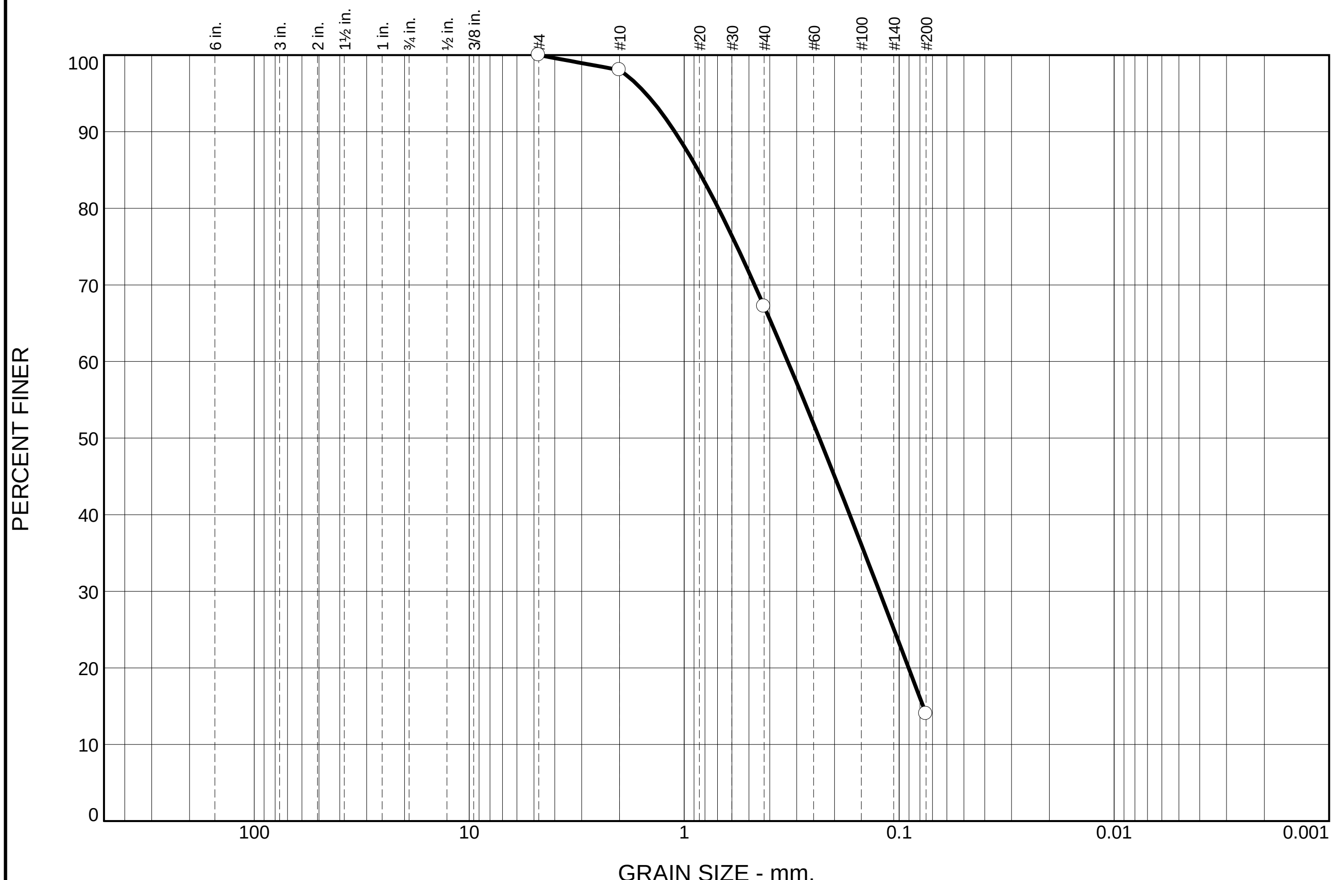
Figure 11

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	1.9	30.9	53.2	14.0	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.8623	0.3298	0.2353	0.1236	0.0774			

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ GRAY-BROWN SILTY SAND	07/19/21	SM	23.4

Project No. 444154.0GEI **Client:** NYSERDA

Project: BENSON MINES SOLAR PROJECT, ST. LAWRENCE CO., NY

○ **Source of Sample:** B-15 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS & VISUAL CLASSIFICATION

TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 12

Tested By: CWZ 07/19/21 **Checked By:** JPB 07/19/21

KE CORROSION

3028 ALDON AVE. LAS VEGAS, NV 89121

702-340-1186 KDE@KECORROSION.COM

CLIENT
TRC Solutions, Inc.
1600 Commerce Parkway, Suite B
Mount Laurel, NJ 08054

PROJECT NO: 444154.0GEI Phase200 Lab

PROJECT
Benson Mines Solar Project

DATE: July 21, 2021

LAB ID: 21-0098

Sample By: Client

Analyzed By: Kurt D. Ergun

RESULTS FOR CORROSIVITY ANALYSIS OF SOILS

	Bulk 1	Bulk 2	Bulk 3	Bulk 4
Sample No:	Bulk 1	Bulk 2	Bulk 3	Bulk 4
Sample Location:	B-1 & B-5	B-3 & B-4	B-6,B-7,B-9	B-13,B-14,B-15
Sample Depth:	0.0-5.0	0.0-5.0	0.0-5.0	0.0-5.0
Laboratory Testing Methods				
pH Analysis, ASTM G51	7.87	7.87	7.38	7.8
Water Soluble Sulfates, ASTM D516(mg/kg)	22	15	20	18
Chlorides, ASTM D512 (mg/kg)	12	10	12	10
Resistivity, ASTM G57 (ohm-cm)	22540	30380	23520	24500

Kurt D. Ergun
Chemist

Note: The tests were performed in accordance with applicable ASTM, AASHTO, or AWWA methods. Test results submitted are only applicable to samples tested at referenced locations and are not indicative of the results of similar materials.

KE CORROSION

3028 ALDON AVE. LAS VEGAS, NV 89121

702-340-1186 KDE@KECORROSION.COM

CLIENT
TRC Solutions, Inc.
1600 Commerce Parkway, Suite B
Mount Laurel, NJ 08054

PROJECT NO: 444154.0GEI Phase200 Lab

PROJECT
Benson Mines Solar Project

DATE: July 21, 2021

LAB ID: 21-0098

Sample By: Client

Analyzed By: Kurt D. Ergun

RESULTS FOR CORROSIVITY ANALYSIS OF SOILS

Sample No:	Bulk 5
Sample Location:	B-8,B-11,B-12
Sample Depth:	0.0-5.0
Laboratory Testing Methods	
pH Analysis, ASTM G51	7.84
Water Soluble Sulfates, ASTM D516(mg/kg)	24
Chlorides, ASTM D512 (mg/kg)	15
Resistivity, ASTM G57 (ohm-cm)	19500

Kurt D. Ergun
Chemist

Note: The tests were performed in accordance with applicable ASTM, AASHTO, or AWWA methods. Test results submitted are only applicable to samples tested at referenced locations and are not indicative of the results of similar materials.

Appendix E – Infiltration Testing Results

Benson Mines Solar Project: Test Pits and Infiltration Testing

TRC Project #: 444154.0GEI

Date: 09/23/2021 & 09/24/2021

Weather: 71°F, Overcast & 68°F, Sunny

Logged By: Charles Zielke

Test Pits (09/23/2021):

TP-1: **Shifted to 44° 09' 48.2" N, 74° 59' 28.8" W**

Depth	Description
0" – 3"	Dark Yellowish Brown (10YR 4/6) Loose Sand, Roots
3" – 5"	Yellowish Brown (10YR 5/4) Loose Sand, Minor Roots
5" – 36"	Dark Yellowish Brown (10YR 4/4) Loose Sand
36" – 96"	Yellowish Brown (10YR 5/8) Loose Sand
96" – 108+"	Gray (10YR 5/1) Weak Subangular Sandy Loam, Few Faint Redoximorphic Features

*No Ledge, Groundwater Evidence of Redoximorphic Features at 96"

TP-2: **44° 09' 37.03" N, 75° 00' 02.84" W**

Depth	Description
0" – 5"	Brown (10YR 5/3) Loose Sand, Roots
5" – 15"	Yellowish Brown (10YR 5/4) Weak Granular loamy Sand
15" – 20"	Brownish Yellow (10YR 6/8) Loose Sand
20" – 31"	Strong Brown (7.5YR 5/8) Loose Sand
31" – 40"	Dark Yellowish Brown (10YR 4/4) Weak Subangular Sandy Loam
40" – 104"+	Gray (7.5YR 5/1) Loose Sand Common Distinct Redoximorphic Features

*No Ledge, Redoximorphic Features at 48" and Groundwater Weep

Benson Mines Solar Project: Test Pits and Infiltration Testing

TRC Project #: 444154.0GEI

Date: 09/23/2021 & 09/24/2021

Weather: 71°F, Overcast & 68°F, Sunny

Logged By: Charles Zielke

TP-2B: **44° 09' 38.3" N, 75° 00' 01.6" W**

Depth	Description
0" – 3"	Dark Yellowish Brown (10YR 4/6) Loose Sand, Roots
3" – 6"	Gray (10YR 6/1) Loose Sand, Minor Roots
6" – 48"	Yellowish Brown (10YR 5/4) loose Sand
48" – 72"	Dark Yellowish (10YR 4/4) Weak Subangular Sandy Loam
72" – 96"	Dark Yellowish Brown (10YR 4/6) Loose Sand
96" – 108"+	Very Dark Gray (10YR 3/1) Weak Subangular Sandy Loam, Common Distinct Redoximorphic Features

*No Ledge, Evidence of Redoximorphic Features at 96" and Groundwater Weep

TP-3:

Depth	Description
0" – 5"	Dark Brown (10YR 3/3) Loose Sand, Roots
5" – 17"	Brown (10YR 4/3) Loose Loamy Sand
17" – 29"	Dark Grayish Brown (10YR 4/2) Loose Sand
29" – 40"	Brown (7.5YR 5/3) Loose Sand
40" – 46"	Dark Grayish Brown (10YR 4/2) Weak Subangular Sandy Loam
46" – 66"	Yellowish Brown (10YR 5/6) Loose Sand
66" – 96"+	Dark Gray (10YR 4/1) Loose Sandy Loam, Many Prominent Redoximorphic Features

*No Ledge, Evidence of Redoximorphic Features at 66"

Benson Mines Solar Project: Test Pits and Infiltration Testing

TRC Project #: 444154.0GEI

Date: 09/23/2021 & 09/24/2021

Weather: 71°F, Overcast & 68°F, Sunny

Logged By: Charles Zielke

Infiltration Testing (09/24/2021): Presoak Completed 09/23/2021

Infiltration testing performed in general accordance with NYS 2015 Stormwater Design Manual, Appendix D with 4" diameter casing, with presoaking 24 hours prior to running tests. Casing refilled to ~24" depth. All tests ran at 6 feet below existing ground surface elevation. Infiltration rates are calculated in inches per hour. Results are as follows:

TP-1:	**Test A**
Test 1	Drained 13 inches in 19 minutes = 41.05 in/hr
Test 2	Drained 12 inches in 20 minutes = 36.0 in/hr
Test 3	Drained 19 inches in 20 minutes = 57.0 in/hr
Test 4	Drained 18 inches in 20 minutes = 54.0 in/hr
Test 5	Drained 21 inches in 20 minutes = 63.0 in/hr

TP-1:	**Test B**
Test 1	Drained 27 inches in 19 minutes = 85.26 in/hr
Test 2	Drained 27 inches in 20 minutes = 81.0 in/hr
Test 3	Drained 26 inches in 20 minutes = 78.0 in/hr
Test 4	Drained 26 inches in 20 minutes = 78.0 in/hr
Test 5	Drained 27 inches in 20 minutes = 81.0 in/hr
Test 6	Drained 24 inches in 20 minutes = 72.0 in/hr

Benson Mines Solar Project: Test Pits and Infiltration Testing

TRC Project #: 444154.0GEI

Date: 09/23/2021 & 09/24/2021

Weather: 71°F, Overcast & 68°F, Sunny

Logged By: Charles Zielke

TP-2B:	**Test A**
Test 1	Drained 10 inches in 20 minutes = 30.0 in/hr
Test 2	Drained 24 inches in 20 minutes = 72.0 in/hr
Test 3	Drained 20 inches in 20 minutes = 60.0 in/hr
Test 4	Drained 23 inches in 20 minutes = 69.0 in/hr
Test 5	Drained 20 inches in 20 minutes = 60.0 in/hr

TP-2B:	**Test B**
Test 1	Drained 23.5 inches in 19 minutes = 74.2 in/hr
Test 2	Drained 20 inches in 20 minutes = 60.0 in/hr
Test 3	Drained 23 inches in 20 minutes = 69.0 in/hr
Test 4	Drained 24 inches in 20 minutes = 72.0 in/hr
Test 5	Drained 21 inches in 20 minutes = 63.0 in/hr

TP-3:	**Test A**
Test 1	Drained 0 inches in 60 minutes = 0 in/hr
Test 2	Drained 0.5 inches in 60 minutes = 0.50 in/hr
Test 3	Drained 0.25 inches in 60 minutes = 0.25 in/hr
Test 4	Drained 0.25 inches in 60 minutes = 0.25 in/hr
Test 5	Drained 0.25 inches in 60 minutes = 0.25 in/hr

Benson Mines Solar Project: Test Pits and Infiltration Testing

TRC Project #: 444154.0GEI

Date: 09/23/2021 & 09/24/2021

Weather: 71°F, Overcast & 68°F, Sunny

Logged By: Charles Zielke

TP-3:	**Test B**
Test 1	Drained 0 inches in 60 minutes = 0.0 in/hr
Test 2	Drained 0.5 inches in 60 minutes = 0.50 in/hr
Test 3	Drained 0.5 inches in 60 minutes = 0.50 in/hr
Test 4	Drained 0.25 inches in 60 minutes = 0.25 in/hr
Test 5	Drained 0.25 inches in 60 minutes = 0.25 in/hr

Appendix E – Northeast Regional Climate Center's Extreme Precipitation Tables

Extreme Precipitation Tables

Northeast Regional Climate Center

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

Smoothing	Yes
State	New York
Location	
Longitude	74.996 degrees West
Latitude	44.163 degrees North
Elevation	0 feet
Date/Time	Tue, 20 Jul 2021 13:52:11 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.27	0.42	0.52	0.68	0.85	1.04	**1yr**	0.73	0.94	1.18	1.41	1.68	1.98	2.25	**1yr**	1.75	2.17	2.62	3.17	3.69	**1yr**
2yr	0.31	0.48	0.59	0.78	0.98	1.21	**2yr**	0.85	1.09	1.38	1.65	1.96	2.31	2.61	**2yr**	2.04	2.51	2.96	3.56	4.10	**2yr**
5yr	0.37	0.57	0.72	0.96	1.23	1.52	**5yr**	1.06	1.36	1.72	2.06	2.42	2.82	3.18	**5yr**	2.49	3.06	3.54	4.19	4.79	**5yr**
10yr	0.41	0.64	0.81	1.11	1.44	1.80	**10yr**	1.25	1.61	2.04	2.43	2.84	3.28	3.69	**10yr**	2.90	3.55	4.05	4.75	5.39	**10yr**
25yr	0.49	0.77	0.99	1.36	1.80	2.26	**25yr**	1.56	2.02	2.56	3.03	3.51	4.01	4.50	**25yr**	3.55	4.33	4.85	5.60	6.30	**25yr**
50yr	0.55	0.89	1.13	1.59	2.13	2.68	**50yr**	1.84	2.38	3.04	3.58	4.13	4.66	5.23	**50yr**	4.13	5.03	5.56	6.34	7.09	**50yr**
100yr	0.63	1.01	1.31	1.85	2.53	3.19	**100yr**	2.18	2.82	3.62	4.24	4.85	5.43	6.09	**100yr**	4.81	5.85	6.38	7.18	7.98	**100yr**
200yr	0.72	1.18	1.52	2.18	3.00	3.79	**200yr**	2.59	3.35	4.29	5.01	5.69	6.33	7.08	**200yr**	5.61	6.81	7.31	8.13	8.99	**200yr**
500yr	0.86	1.42	1.85	2.69	3.77	4.76	**500yr**	3.26	4.19	5.39	6.25	7.04	7.76	8.65	**500yr**	6.87	8.32	8.77	9.59	10.52	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.23	0.35	0.43	0.58	0.71	0.88	**1yr**	0.62	0.86	0.98	1.18	1.42	1.85	2.05	**1yr**	1.64	1.97	2.40	2.81	3.48	**1yr**
2yr	0.30	0.46	0.57	0.77	0.95	1.09	**2yr**	0.82	1.06	1.21	1.50	1.80	2.25	2.55	**2yr**	1.99	2.45	2.89	3.50	4.02	**2yr**
5yr	0.34	0.52	0.65	0.89	1.13	1.29	**5yr**	0.97	1.26	1.44	1.80	2.15	2.64	2.99	**5yr**	2.34	2.87	3.36	4.01	4.59	**5yr**
10yr	0.37	0.57	0.71	0.99	1.28	1.47	**10yr**	1.10	1.44	1.65	2.00	2.45	2.97	3.32	**10yr**	2.63	3.19	3.75	4.44	5.05	**10yr**
25yr	0.42	0.64	0.80	1.14	1.50	1.74	**25yr**	1.30	1.71	1.96	2.33	2.91	3.47	3.81	**25yr**	3.07	3.66	4.34	5.06	5.74	**25yr**
50yr	0.47	0.71	0.89	1.27	1.71	1.98	**50yr**	1.48	1.94	2.23	2.60	3.32	3.92	4.38	**50yr**	3.47	4.21	4.84	5.58	6.31	**50yr**
100yr	0.52	0.78	0.98	1.42	1.94	2.26	**100yr**	1.68	2.21	2.54	2.92	3.79	4.42	4.93	**100yr**	3.91	4.74	5.41	6.16	6.94	**100yr**
200yr	0.57	0.86	1.09	1.58	2.20	2.58	**200yr**	1.90	2.52	2.89	3.23	4.32	4.97	5.56	**200yr**	4.40	5.34	6.04	6.81	7.64	**200yr**
500yr	0.65	0.97	1.25	1.82	2.59	3.09	**500yr**	2.23	3.02	3.42	3.71	5.15	5.83	6.52	**500yr**	5.16	6.27	7.01	7.74	8.67	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.30	0.46	0.56	0.75	0.92	1.05	**1yr**	0.80	1.03	1.19	1.47	1.74	2.09	2.40	**1yr**	1.85	2.30	2.77	3.34	3.86	**1yr**
2yr	0.32	0.50	0.61	0.83	1.03	1.16	**2yr**	0.89	1.13	1.30	1.63	1.91	2.38	2.72	**2yr**	2.10	2.62	3.04	3.66	4.19	**2yr**
5yr	0.39	0.61	0.75	1.03	1.31	1.52	**5yr**	1.13	1.49	1.70	2.09	2.49	2.99	3.37	**5yr**	2.64	3.24	3.74	4.39	5.00	**5yr**
10yr	0.47	0.72	0.89	1.25	1.61	1.87	**10yr**	1.39	1.83	2.11	2.63	3.05	3.56	4.00	**10yr**	3.15	3.85	4.38	5.06	5.72	**10yr**
25yr	0.59	0.90	1.12	1.60	2.11	2.46	**25yr**	1.82	2.40	2.80	3.51	4.01	4.48	5.04	**25yr**	3.97	4.85	5.42	6.12	6.86	**25yr**
50yr	0.74	1.13	1.41	2.02	2.72	3.03	**50yr**	2.35	2.96	3.49	4.39	4.91	5.35	6.02	**50yr**	4.74	5.79	6.34	7.06	7.86	**50yr**
100yr	0.90	1.36	1.70	2.46	3.38	3.72	**100yr**	2.91	3.64	4.34	5.48	6.05	6.39	7.17	**100yr**	5.65	6.90	7.44	8.14	9.02	**100yr**
200yr	1.09	1.64	2.08	3.01	4.20	4.58	**200yr**	3.62	4.47	5.40	6.87	7.47	7.63	8.52	**200yr**	6.76	8.20	8.72	9.39	10.35	**200yr**
500yr	1.42	2.11	2.72	3.95	5.61	6.03	**500yr**	4.84	5.89	7.24	9.28	9.84	9.67	10.73	**500yr**	8.56	10.31	10.77	11.34	12.42	**500yr**

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Appendix F – Construction Drawings

Appendix G – Standards and Specifications for Erosion and Sediment Controls

STANDARD AND SPECIFICATIONS FOR CONSTRUCTION ROAD STABILIZATION

Definition & Scope

The stabilization of temporary construction access routes, on-site vehicle transportation routes, and construction parking areas to control erosion on temporary construction routes and parking areas.

Conditions Where Practice Applies

All traffic routes and parking areas for temporary use by construction traffic.

Design Criteria

Construction roads should be located to reduce erosion potential, minimize impact on existing site resources, and maintain operations in a safe manner. Highly erosive soils, wet or rocky areas, and steep slopes should be avoided. Roads should be routed where seasonal water tables are deeper than 18 inches. Surface runoff and control should be in accordance with other standards.

Road Grade – A maximum grade of 12% is recommended, although grades up to 15% are possible for short distances.

Road Width – 12 foot minimum for one-way traffic or 24 foot minimum for two-way traffic.

Side Slope of Road Embankment – 2:1 or flatter.

Ditch Capacity – On-site roadside ditch and culvert capacities shall be the 10 yr. peak runoff.

Composition – Use a 6-inch layer of NYS DOT sub-base Types 1,2,3, 4 or equivalent as specified in NYSDOT Standard Specifications.

Construction Specifications

1. Clear and strip roadbed and parking areas of all vegetation, roots, and other objectionable material.

2. Locate parking areas on naturally flat areas as available. Keep grades sufficient for drainage, but not more than 2 to 3 percent.

3. Provide surface drainage and divert excess runoff to stabilized areas.

4. Maintain cut and fill slopes to 2:1 or flatter and stabilized with vegetation as soon as grading is accomplished.

5. Spread 6-inch layer of sub-base material evenly over the full width of the road and smooth to avoid depressions.

6. Provide appropriate sediment control measures to prevent offsite sedimentation.

Maintenance

Inspect construction roads and parking areas periodically for condition of surface. Top dress with new gravel as needed. Check ditches for erosion and sedimentation after rainfall events. Maintain vegetation in a healthy, vigorous condition. Areas producing sediment should be treated immediately.

STANDARD AND SPECIFICATIONS FOR CONCRETE TRUCK WASHOUT

Definition & Scope

A temporary excavated or above ground lined constructed pit where concrete truck mixers and equipment can be washed after their loads have been discharged, to prevent highly alkaline runoff from entering storm drainage systems or leaching into soil.

Conditions Where Practice Applies

Washout facilities shall be provided for every project where concrete will be poured or otherwise formed on the site. This facility will receive highly alkaline wash water from the cleaning of chutes, mixers, hoppers, vibrators, placing equipment, trowels, and screeds. Under no circumstances will wash water from these operations be allowed to infiltrate into the soil or enter surface waters.

Design Criteria

Capacity: The washout facility should be sized to contain solids, wash water, and rainfall and sized to allow for the evaporation of the wash water and rainfall. Wash water shall be estimated at 7 gallons per chute and 50 gallons per hopper of the concrete pump truck and/or discharging drum. The minimum size shall be 8 feet by 8 feet at the bottom and 2 feet deep. If excavated, the side slopes shall be 2 horizontal to 1 vertical.

Location: Locate the facility a minimum of 100 feet from drainage swales, storm drain inlets, wetlands, streams and other surface waters. Prevent surface water from entering the structure except for the access road. Provide appropriate access with a gravel access road sloped down to the structure. Signs shall be placed to direct drivers to the facility after their load is discharged.

Liner: All washout facilities will be lined to prevent leaching of liquids into the ground. The liner shall be plastic sheeting with a minimum thickness of 10 mils with no holes or tears, and anchored beyond the top of the pit with an earthen berm, sand bags, stone, or other structural appurtenance except at the access point.

If pre-fabricated washouts are used they must ensure the capture and containment of the concrete wash and be sized based on the expected frequency of concrete pours. They shall be sited as noted in the location criteria.

Maintenance

- All concrete washout facilities shall be inspected daily. Damaged or leaking facilities shall be deactivated and repaired or replaced immediately. Excess rainwater that has accumulated over hardened concrete should be pumped to a stabilized area, such as a grass filter strip.
- Accumulated hardened material shall be removed when 75% of the storage capacity of the structure is filled. Any excess wash water shall be pumped into a containment vessel and properly disposed of off site.
- Dispose of the hardened material off-site in a construction/demolition landfill. On-site disposal may be allowed if this has been approved and accepted as part of the projects SWPPP. In that case, the material should be recycled as specified, or buried and covered with a minimum of 2 feet of clean compacted earthfill that is permanently stabilized to prevent erosion.
- The plastic liner shall be replaced with each cleaning of the washout facility.
- Inspect the project site frequently to ensure that no concrete discharges are taking place in non-designated areas.

STANDARD AND SPECIFICATIONS FOR DUST CONTROL

Definition & Scope

The control of dust resulting from land-disturbing activities, to prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage, health hazards, and traffic safety problems.

Conditions Where Practice Applies

On construction roads, access points, and other disturbed areas subject to surface dust movement and dust blowing where off-site damage may occur if dust is not controlled.

Design Criteria

Construction operations should be scheduled to minimize the amount of area disturbed at one time. Buffer areas of vegetation should be left where practical. Temporary or permanent stabilization measures shall be installed. No specific design criteria is given; see construction specifications below for common methods of dust control.

Water quality must be considered when materials are selected for dust control. Where there is a potential for the material to wash off to a stream, ingredient information must be provided to the NYSDEC.

No polymer application shall take place without written approval from the NYSDEC.

Construction Specifications

A. **Non-driving Areas** – These areas use products and materials applied or placed on soil surfaces to prevent airborne migration of soil particles.

Vegetative Cover – For disturbed areas not subject to traffic, vegetation provides the most practical method of dust control (see Section 3).

Mulch (including gravel mulch) – Mulch offers a fast effective means of controlling dust. This can also include rolled erosion control blankets.

Spray adhesives – These are products generally composed of polymers in a liquid or solid form that are mixed with water to form an emulsion that is sprayed on the soil surface with typical hydroseeding equipment. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations for the specific soils on the site. In no case should the application of these adhesives be made on wet soils or if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators and others working with the material.

B. **Driving Areas** – These areas utilize water, polymer emulsions, and barriers to prevent dust movement from the traffic surface into the air.

Sprinkling – The site may be sprayed with water until the surface is wet. This is especially effective on haul roads and access route to provide short term limited dust control.

Polymer Additives – These polymers are mixed with water and applied to the driving surface by a water truck with a gravity feed drip bar, spray bar or automated distributor truck. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations. Incorporation of the emulsion into the soil will be done to the appropriate depth based on expected traffic. Compaction after incorporation will be by vibratory roller to a minimum of 95%. The prepared surface shall be moist and no application of the polymer will be made if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators working with the material.

Barriers – Woven geo-textiles can be placed on the driving surface to effectively reduce dust throw and particle migration on haul roads. Stone can also be used for construction roads for effective dust control.

Windbreak – A silt fence or similar barrier can control air currents at intervals equal to ten times the barrier height. Preserve existing wind barrier vegetation as much as practical.

Maintenance

Maintain dust control measures through dry weather periods until all disturbed areas are stabilized.

STANDARD AND SPECIFICATIONS FOR SITE POLLUTION PREVENTION

Definition & Scope

A collection of management practices intended to control non-sediment pollutants associated with construction activities to prevent the generation of pollutants due to improper handling, storage, and spills and prevent the movement of toxic substances from the site into surface waters.

Conditions Where Practice Applies

On all construction sites where the earth disturbance exceeds 5,000 square feet, and involves the use of fertilizers, pesticides, petroleum based chemicals, fuels and lubricants, as well as sealers, paints, cleared woody vegetation, garbage, and sanitary wastes.

Design Criteria

The variety of pollutants on a particular site and the severity of their impacts depend on factors such as the nature of the construction activity, the physical characteristics of the construction site, and the proximity of water bodies and conveyances to the pollutant source.

1. All state and federal regulations shall be followed for the storage, handling, application, usage, and disposal of pesticides, fertilizers, and petroleum products.

2. Vehicle and construction equipment staging and maintenance areas will be located away from all drainage ways with their parking areas graded so the runoff from these areas is collected, contained and treated prior to discharge from the site.

3. Provide sanitary facilities for on-site personnel.

4. Store, cover, and isolate construction materials including topsoil, and chemicals, to prevent runoff of pollutants and contamination of groundwater and surface waters.

5. Develop and implement a spill prevention and control plan. The plan should include NYSDEC's spill reporting and initial notification requirements.

6. Provide adequate disposal for solid waste including woody debris, stumps, and other construction waste and include these methods and directions in the construction details on the site construction drawings. Fill, woody debris, stumps and construction waste shall not be placed in regulated wetlands, streams or other surface waters.

7. Distribute or post informational material regarding proper handling, spill response, spill kit location, and emergency actions to be taken, to all construction personnel.

8. Refueling equipment shall be located at least 100 feet from all wetlands, streams and other surface waters.

STANDARD AND SPECIFICATIONS FOR STABILIZED CONSTRUCTION ACCESS

Definition & Scope

A stabilized pad of aggregate underlain with geotextile located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area. The purpose of stabilized construction access is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction access shall be used at all points of construction ingress and egress.

Design Criteria

See Figure 2.1 on page 2.31 for details.

Aggregate Size: Use a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.

Thickness: Not less than six (6) inches.

Width: 12-foot minimum but not less than the full width of points where ingress or egress occurs. 24-foot minimum if there is only one access to the site.

Length: As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum would apply).

Geotextile: To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single-family residence lot. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

Criteria for Geotextile: The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties as shown:

Fabric Properties[3]	Light Duty[1] Roads Grade Subgrade	Heavy Duty[2] Haul Roads Rough Graded	Test Method
Grab Tensile Strength (lbs)	200	220	ASTM D1682
Elongation at Failure (%)	50	60	ASTM D1682
Mullen Burst Strength (lbs)	190	430	ASTM D3786
Puncture Strength (lbs)	40	125	ASTM D751 Modified
Equivalent	40-80	40-80	US Std Sieve
Opening Size			CW-02215
Aggregate Depth	6	10	-

[1]Light Duty Road: Area sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Acceptable materials are Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

[2]Heavy Duty Road: Area sites with only rough grading, and where most travel would be multi-axle vehicles. Acceptable materials are Trevira Spunbond 1135, Mirafi 600X, or equivalent.

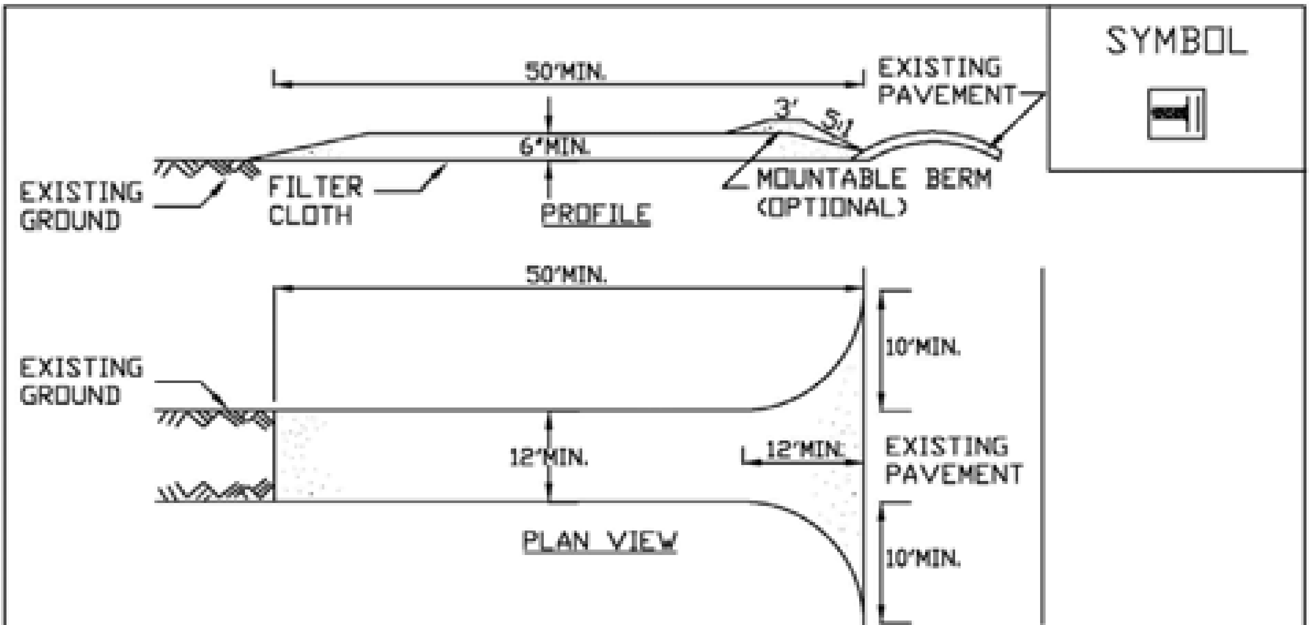
[3]Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

Maintenance

The access shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.

Figure 2.1
Stabilized Construction Access



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ACCESS SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STABILIZED CONSTRUCTION ACCESS

STANDARD AND SPECIFICATIONS FOR TEMPORARY ACCESS WATERWAY CROSSING

Definition & Scope

A temporary access waterway crossing is a structure placed across a waterway to provide access for construction purposes for a period of less than one year. Consideration should be given to stream flow capacity and velocity anticipated during the period of time that the temporary structures will be in place. Temporary access crossings shall not be utilized to maintain traffic for the general public. The purpose of the temporary access waterway crossing is to provide safe, environmentally sound access across a waterway for construction equipment by establishing minimum standards and specifications for the design, construction, maintenance, and removal of the structure. This standard and specification may represent a channel constriction, thus, the temporary nature of waterway access crossing must be stressed. They should be planned to be in service for the shortest practical period of time and removed as soon as their function is completed.

Conditions Where Practice Applies

This standard and specification for temporary access waterway crossings is applicable in non-tidal waterways. It provides designs based on waterway geometry rather than the drainage area contributing to the point of crossing.

The principal consideration for development of the standard and specifications is concern for erosion and sediment control, tracking soil into waterways, blocking fish passage and destruction of aquatic habitat. Structural utility and safety must also be considered when designing temporary access waterway crossings to withstand expected loads.

The three types of standard temporary access waterway crossings are bridges, culverts, and fords.

General Requirements

1. <u>In-Stream Excavation</u>: In-Stream excavation shall be limited to only that necessary to allow installation of the standard methods as presented in Subsection "Temporary Access Waterway Crossing Methods."

2. <u>Elimination of Fish Migration Barriers</u>: Of the two basic methods presented in Subsection "Temporary Access Waterway Crossing Methods," bridges pose the least potential for creating barriers to aquatic migration. The construction of any specific crossing method as presented in Subsection "Temporary Access Waterway Crossing Methods," shall not cause a significant water level difference between the upstream and downstream water surface elevations. Fish spawning or migration within waterways generally occurs between October 1 to May 31 for water classified for trout and from March 15 to July 15 for other streams. Fish spawning or migration dates can vary across New York and restrictions imposed by the NYS Department of Environmental Conservation may vary and must be checked.

3. <u>Crossing Alignment</u>: The temporary waterway crossing shall be at right angles to the stream. Where approach conditions dictate, the crossing may vary 15 degrees from a line drawn perpendicular to the centerline of the stream at the intended crossing location.

4. <u>Road Approaches</u>: The centerline of both roadway approaches shall coincide with the crossing alignment centerline for a minimum distance of 50 feet from each bank of the waterway being crossed. If physical or right-of-way restraints preclude the 50 feet minimum, a shorter distance may be provided. All fill materials associated with the roadway approach shall be limited to a maximum height of 2 feet above the existing flood plain elevation.

5. <u>Surface Water Diverting Structure</u>: A water diverting structure such as a swale shall be constructed (across the roadway on both roadway approaches) 50 feet (maximum) on either side of the waterway crossing. This will prevent roadway surface runoff from directly entering the waterway. The 50 feet is measured from the top of the waterway bank. Design criteria for this diverting structure shall be in accordance with the "Standard and Specification" for

the individual design standard of choice. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is not required.

6. Road Width: All crossings shall have one traffic lane. The minimum width shall be 12 feet with a maximum width of 20 feet.

7. Time of Operation: All temporary crossing shall be removed within 14 calendar days after the structure is no longer needed. Unless prior written approval is obtained, all structures shall be removed within one year from the date of the installation.

8. Materials

A. Aggregate: There shall be no earth or soil materials used for construction within the waterway channel. NYS DOT specifications for coarse aggregate designation No. 4 (2" to 4"), also referenced as AASHTO designation No. 1, shall be the minimum acceptable aggregate size for temporary crossings. Larger aggregates will be allowed.

B. Filter Cloth: Filter cloth is a fabric consisting of either woven or nonwoven plastic, polypropylene, or nylon used to distribute the load, retain fines, allow increased drainage of the aggregate and reduce mixing of the aggregate with the subgrade soil. The designer shall specify the appropriate filter fabric/cloth for a specific use.

Temporary Access Waterway Crossing Methods

The following criteria for erosion and sediment control shall be considered when selecting a specific temporary access waterway crossing standard method:

1. Site aesthetics: Select a standard design method that will least disrupt the existing terrain of the stream reach. Consider the effort that will be required to restore the area after the temporary crossing is removed.

2. Site location: Locate the temporary crossing where there will be the least disturbance to the soils of the existing waterway banks. When possible, locate the crossing at a point receiving minimal surface runoff.

3. Physical site constraints: The physical constraints of a site may preclude the selection of one or more of the standard methods.

4. Time of year: The time of year may preclude the selection of one or more of the standard methods due to fish spawning or migration restrictions.

5. Vehicular loads and traffic patterns: Vehicular loads, traffic patterns, and frequency of crossing should be considered in choosing a specific method.

6. Maintenance of crossing: The standard methods will require various amounts of maintenance. The bridge method should require the least maintenance, whereas the ford method will probably require more intensive maintenance.

7. Removal of the Structure: Ease of removal and subsequent damage to the waterway should be primary factors in considering the choice of a standard method.

Temporary Access Bridge (Figure 2.2 on page 2.36)

A temporary access bridge is a structure made of wood, metal, or other materials, which provides access across a stream or waterway.

Considerations:

1. This is the preferred method for temporary access waterway crossings. Normally, bridge construction causes the least disturbance to the waterway bed and banks when compared to the other access waterway crossings.

2. Most bridges can be quickly removed and reused.

3. Temporary access bridges pose the least chance for interference with fish migration when compared to the other temporary access waterway crossings.

4. Span width will be limited by the length of the bridging material and weight of equipment that will drive over the temporary bridge. Spans of over 10 feet are difficult to construct.

5. Restrictions and Permits: A permit from the New York State Department of Environmental Conservation, Division of Environmental Permits, Regional Permit Administrator, will be needed to install and remove temporary access culverts in streams with a classification of C(T) and higher. Installation and removal may not be permitted during the period of time from the start of trout spawning until the eggs have hatched. In some instances, restrictions may also be applied to bass spawning waters.

Construction Specifications:

1. Restriction: Construction, use, or removal of a temporary access bridge will not normally have any time of year restrictions if construction, use, or

removal does not disturb the stream or its banks.

2. Bridge Placement: A temporary bridge structure shall be constructed at or above bank elevation to prevent the entrapment of floating materials and debris.

3. Abutments: Abutments shall be placed parallel to and on stable banks.

4. Bridge Span: Bridges shall be constructed to span the entire channel. If a footing, pier, or bridge support is constructed within the waterway, a stream- disturbance permit may be required.

5. Stringers: Stringers shall either be logs, saw timber, pre-stressed concrete beams, metal beams, or other approved materials.

6. Deck Material: Decking shall be of sufficient strength to support the anticipated load. All decking members shall be placed perpendicular to the stringers, butted tightly, and securely fastened to the stringers. Decking materials must be butted tightly to prevent any soil material tracked onto the bridge from falling into the waterway below.

7. Run Planks (optional): Run planking shall be securely fastened to the length of the span. One run plank shall be provided for each track of the equipment wheels. Although run planks are optional, they may be necessary to properly distribute loads.

8. Curbs or Fenders: Curbs or fenders may be installed along the outer sides of the deck. Curbs or fenders are an option, which will provide additional safety.

9. Bridge Anchors: Bridges shall be securely anchored at only one end using steel cable or chain. Anchoring at only one end will prevent channel obstruction in the event that floodwaters float the bridge. Acceptable anchors are large trees, large boulders, or driven steel anchors. Anchoring shall be sufficient to prevent the bridge from floating downstream and possibly causing an obstruction to the flow.

10. Stabilization: All areas disturbed during installation shall be stabilized within 14 calendar days of that disturbance in accordance with the Standard and Specification for Temporary Construction Area Seeding on page 4.58.

Bridge Maintenance Requirements

1. Inspection: Periodic inspection shall be performed by the user to ensure that the bridge, streambed, and streambanks are maintained and not damaged.

2. Maintenance: Maintenance shall be performed, as needed to ensure that the structure complies with the standard and specifications. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of outside of the floodplain and stabilized.

Bridge Removal and Clean-Up Requirements

1. Removal: When the temporary bridge is no longer needed, all structures including abutments and other bridging materials shall be removed within 14 calendar days. In all cases, the bridge materials shall be removed within one year of installation.

2. Final Clean-Up: Final clean-up shall consist of removal of the temporary bridge from the waterway, protection of banks from erosion, and removal of all construction materials. All removed materials shall be stored outside the waterway floodplain.

3. Method: Removal of the bridge and clean-up of the area shall be accomplished without construction equipment working in the waterway channel.

4. Final Stabilization: All areas disturbed during removal shall be stabilized within 14 calendar days of that disturbance in accordance with the Standard and Specifications for Permanent Construction Area Planting on page 4.42.

Temporary Access Culvert (Figure 2.3 on page 2.37)

A temporary access culvert is a structure consisting of a section(s) of circular pipe, pipe arches, or oval pipes of reinforcing concrete, corrugated metal, or structural plate, which is used to convey flowing water through the crossing.

Considerations

1. Temporary culverts are used where a) the channel is too wide for normal bridge construction, b) anticipated loading may prove unsafe for single span bridges, or c) access is not needed from bank to bank.

2. This temporary waterway crossing method is normally preferred over a ford type of crossing, since disturbance to the waterway is only during construction and removal of the culvert.

3. Temporary culverts can be salvaged and reused.

Construction Specifications

1. Restrictions and Permits: A permit from the New York State Department of Environmental

Conservation, Division of Environmental Permits, Regional Permit Administrator, will be needed to install and remove temporary access culverts in streams with a classification of C(T) and higher. Installation and removal may not be permitted during the period of time from the start of trout spawning until the eggs have hatched. In some instances, restrictions may also be applied to bass spawning waters.

2. Culvert Strength: All culverts shall be strong enough to support their cross sectional area under maximum expected loads.

3. Culvert Size: The size of the culvert pipe shall be the largest pipe diameter that will fit into the existing channel without major excavation of the waterway channel or without major approach fills. If a channel width exceeds 3 feet, additional pipes may be used until the cross sectional area of the pipes is greater than 60 percent of the cross sectional area of the existing channel. The minimum size culvert that may be used is 12-inch diameter pipe.

4. Culvert Length: The culvert(s) shall extend a minimum of one foot beyond the upstream and downstream toe of the aggregate placed around the culvert. In no case shall the culvert exceed 40 feet in length.

5. Filter Cloth: Filter cloth shall be placed on the streambed and streambanks prior to placement of the pipe culvert(s) and aggregate. The filter cloth shall cover the streambed and extend a minimum six inches and a maximum one foot beyond the end of the culvert and bedding material. Filter cloth reduces settlement and improves crossing stability.

6. Culvert Placement: The invert elevation of the culvert shall be installed on the natural streambed grade to minimize interference with fish migration (free passage of fish).

7. Culvert Protection: The culvert(s) shall be covered with a minimum of one foot of aggregate. If multiple culverts are used, they shall be separated by at least 12 in. of compacted aggregate fill. At the minimum, the bedding and fill material used in the construction of the temporary access culvert crossings shall conform with the aggregate requirements cited in the General Requirements subsection.

8. Stabilization: All areas disturbed during culvert installation shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for Permanent Construction Area Plantings.

Culvert Maintenance Requirements

1. Inspection: Periodic inspection shall be performed to ensure that the culverts, streambed, and streambanks are not damaged, and that sediment is not entering the stream or blocking fish passage or migration.

2. Maintenance: Maintenance shall be performed, as needed in a timely manner to ensure that structures are in compliance with this standard and specification. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of and stabilized outside the waterway flood plain.

Culvert Removal and Clean-Up Requirements

1. Removal: When the crossing has served its purpose, all structures, including culverts, bedding, and filter cloth materials shall be removed within 14 calendar days. In all cases, the culvert materials shall
be removed within one year of installation. No structure shall be removed during the spawning season (generally October 1 through May 31 for trout waters and March 15 through July 15 for other waters).

2. Final Clean-Up: Final clean-up shall consist of removal of the temporary structure from the waterway, removal of all construction materials, restoration of original stream channel cross section, and protection of the streambanks from erosion. Removed material shall be stored outside of the waterway floodplain.

3. Method: Removal of the structure and clean-up of the area shall be accomplished without construction equipment working in the waterway channel.

4. Final Stabilization: All areas disturbed during culvert removal shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for Permanent Construction Area Plantings.

NOTE: Any temporary access crossing shall conform to the technical requirements of this Standard and Specifications as well as any specific requirement imposed by the New York State Department of Environmental Conservation and the US Army Corps of Engineers. Permits may be required for streambank disturbance.

Figure 2.2
Temporary Access Bridge

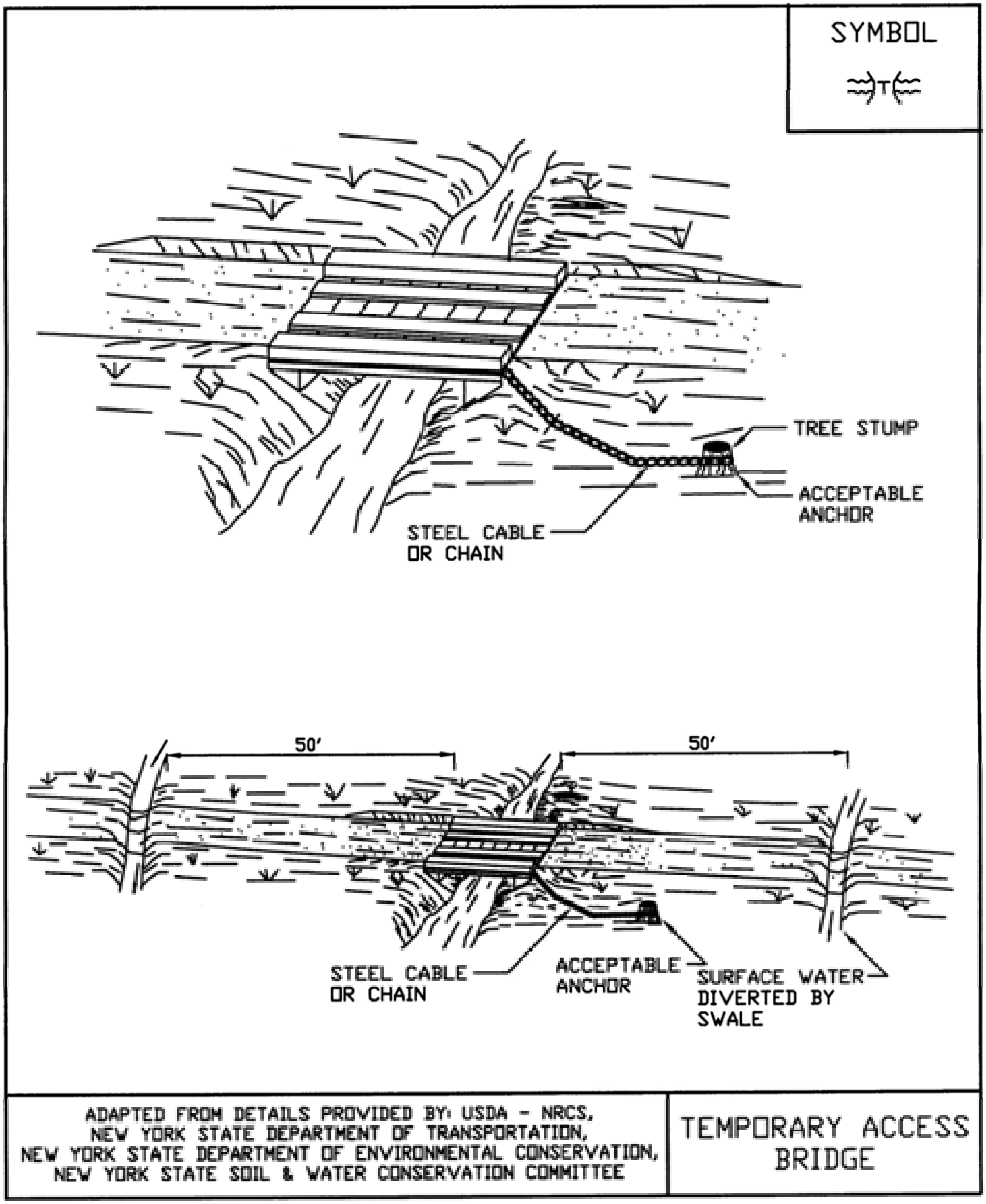
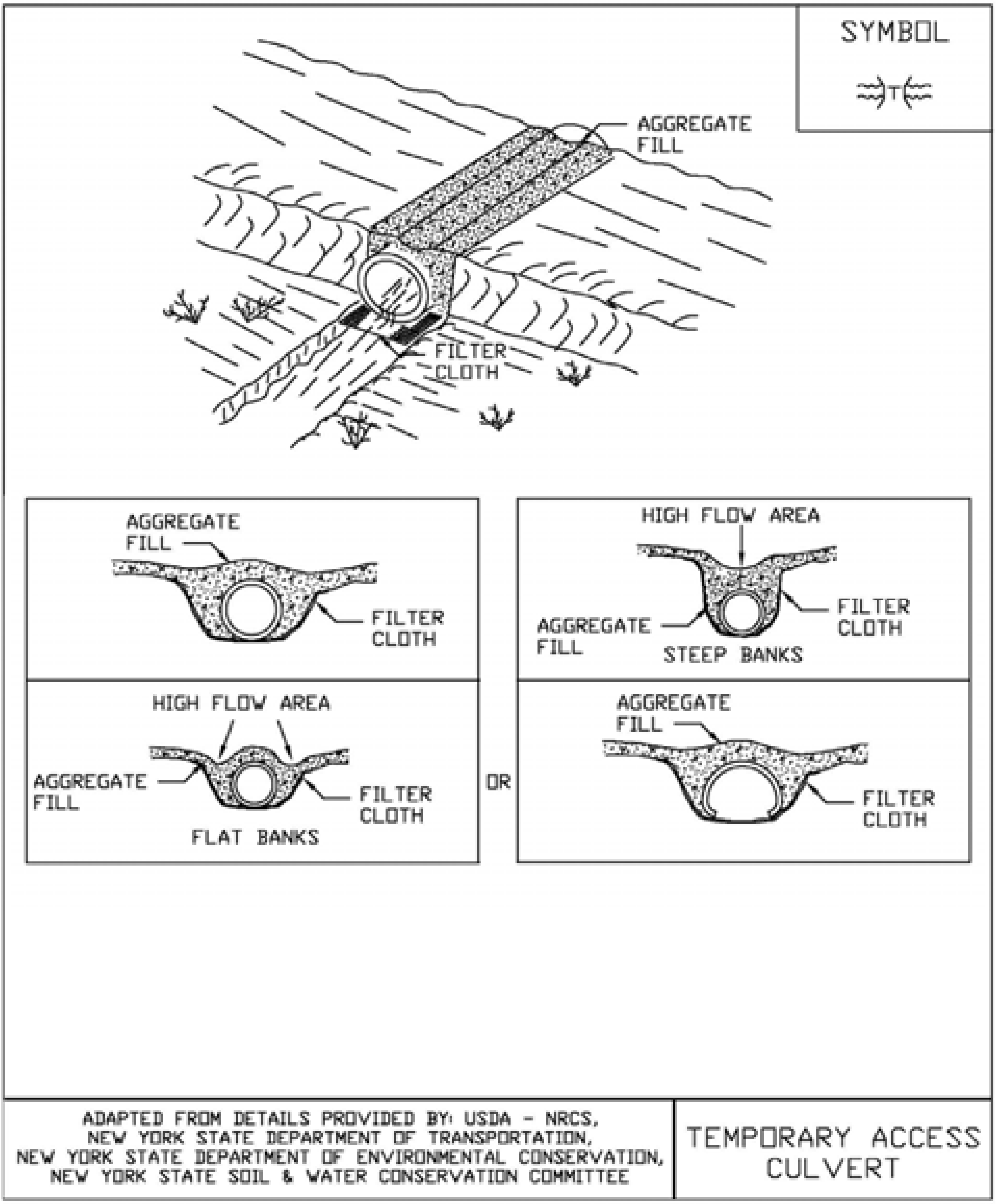


Figure 2.3
Temporary Access Culvert



STANDARD AND SPECIFICATIONS FOR WINTER STABILIZATION

Definition & Scope

A temporary site specific, enhanced erosion and sediment control plan to manage runoff and sediment at the site during construction activities in the winter months to protect off-site water resources.

Conditions Where Practice Applies

This standard applies to all construction activities involved with ongoing land disturbance and exposure between November 15th to the following April 1st.

Design Criteria

1. Prepare a snow management plan with adequate storage for snow and control of melt water, requiring cleared snow to be stored in a manner not affecting ongoing construction activities.

2. Enlarge and stabilize access points to provide for snow management and stockpiling. Snow management activities must not destroy or degrade installed erosion and sediment control practices.

3. A minimum 25 foot buffer shall be maintained from all perimeter controls such as silt fence. Mark silt fence with tall stakes that are visible above the snow pack.

4. Edges of disturbed areas that drain to a waterbody within 100 feet will have 2 rows of silt fence, 5 feet apart, installed on the contour.

5. Drainage structures must be kept open and free of snow and ice dams. All debris, ice dams, or debris from plowing operations, that restrict the flow of runoff and meltwater, shall be removed.

6. Sediment barriers must be installed at all appropriate perimeter and sensitive locations. Silt fence and other practices requiring earth disturbance must be installed before the ground freezes.

7. Soil stockpiles must be protected by the use of established vegetation, anchored straw mulch, rolled stabilization matting, or other durable covering. A barrier must be installed at least 15 feet from the toe of the stockpile to prevent soil migration and to capture loose soil.

8. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures should be initiated by the end of the next business day and completed within three (3) days. Rolled erosion control blankets must be used on all slopes 3 horizontal to 1 vertical or steeper.

9. If straw mulch alone is used for temporary stabilization, it shall be applied at double the standard rate of 2 tons per acre, making the application rate 4 tons per acre. Other manufactured mulches should be applied at double the manufacturer's recommended rate.

10. To ensure adequate stabilization of disturbed soil in advance of a melt event, areas of disturbed soil should be stabilized at the end of each work day unless:

    a. work will resume within 24 hours in the same area and no precipitation is forecast or;

    b. the work is in disturbed areas that collect and retain runoff, such as open utility trenches, foundation excavations, or water management areas.

11. Use stone paths to stabilize access perimeters of buildings under construction and areas where construction vehicle traffic is anticipated. Stone paths should be a minimum 10 feet in width but wider as necessary to accommodate equipment.

Maintenance

The site shall be inspected frequently to ensure that the erosion and sediment control plan is performing its winter stabilization function. If the site will not have earth disturbing activities ongoing during the "winter season", **all** bare exposed soil must be stabilized by established vegetation, straw or other acceptable mulch, matting, rock, or other approved material such as rolled erosion control products. Seeding of areas with mulch cover is preferred but seeding alone is not acceptable for proper stabilization.

Compliance inspections must be performed and reports filed properly in accordance with the SWPPP for all sites under a winter shutdown.

STANDARD AND SPECIFICATIONS FOR CHECK DAM

Definition & Scope

Small barriers or dams constructed of stone, bagged sand or gravel, or other durable materials across a drainageway to reduce erosion in a drainage channel by reducing the velocity of flow in the channel.

Conditions Where Practice Applies

This practice is used as a **temporary** and, in some cases, a **permanent** measure to limit erosion by reducing velocities in open channels that are degrading or subject to erosion or where permanent stabilization is impractical due to short period of usefulness and time constraints of construction.

Design Criteria

Drainage Area: Maximum drainage area above the check dam shall not exceed two (2) acres.

Height: Not greater than 2 feet. Center shall be maintained 9 inches lower than abutments at natural ground elevation.

Side Slopes: Shall be 2:1 or flatter.

Spacing: The check dams shall be spaced as necessary in the channel so that the crest of the downstream dam is at the elevation of the toe of the upstream dam. This spacing is equal to the height of the check dam divided by the channel slope.

Therefore:

$$S = \frac{h}{s}$$

Where:
S = spacing interval (ft.)
h = height of check dam (ft.)
s = channel slope (ft./ft.)

Example:

For a channel with a 4% slope and 2 ft. high stone check dams, they are spaced as follows:

$$S = \frac{2\ \text{ft}}{0.04\ \frac{\text{ft}}{\text{ft}}} = 50\ \text{ft}$$

For stone check dams: Use a well graded stone matrix 2 to 9 inches in size (NYS – DOT Light Stone Fill meets these requirements).

The overflow of the check dams will be stabilized to resist erosion that might be caused by the check dam. See Figure 3.1 on page 3.3 for details.

Check dams should be anchored in the channel by a cutoff trench 1.5 ft. wide and 0.5 ft. deep and lined with filter fabric to prevent soil migration.

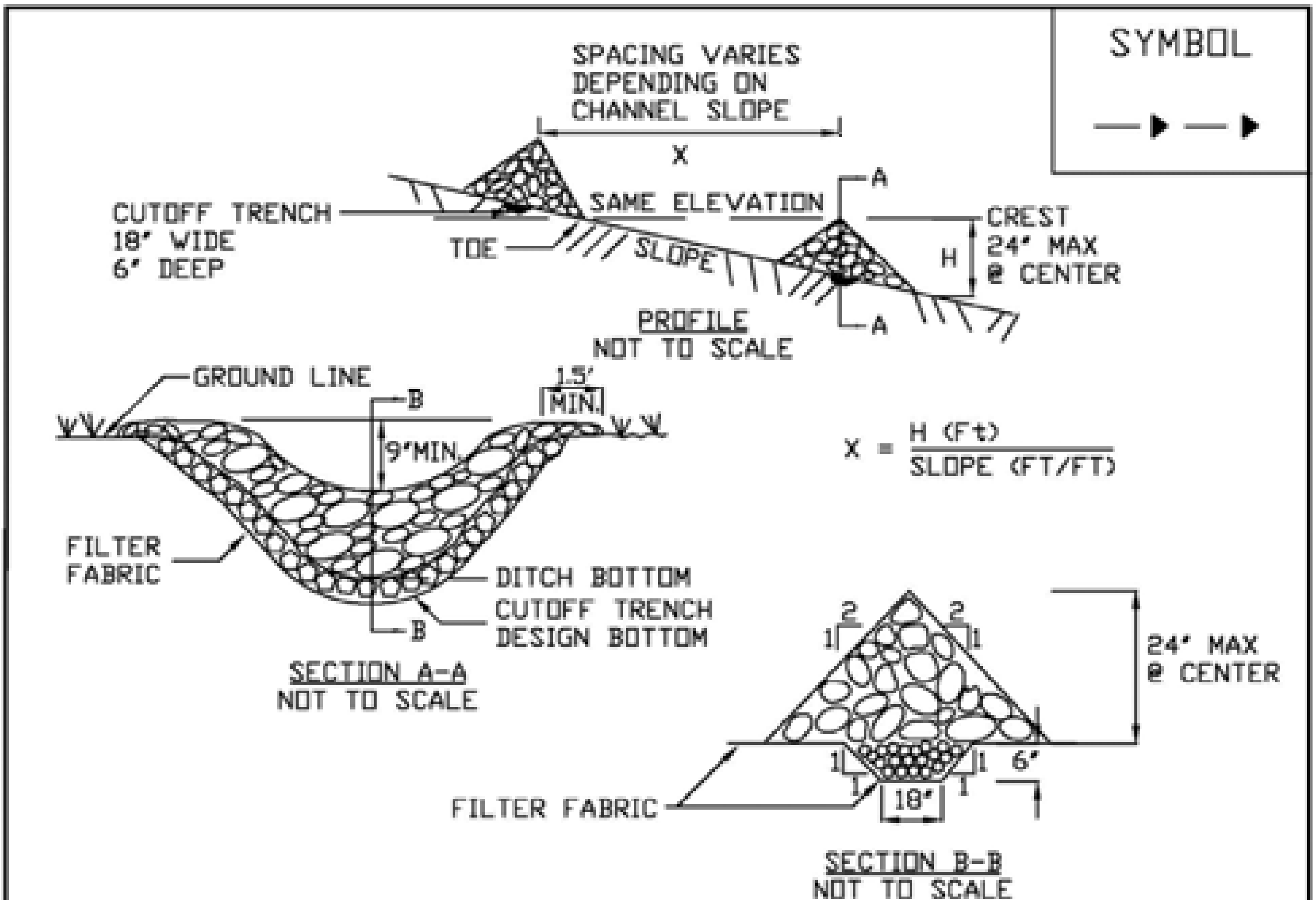
For filter sock or fiber roll check dams: The check dams will be anchored by staking the dam to the earth contact surface. The dam will extend to the top of the bank. The check dam will have a splash apron of NYS DOT #2 crushed stone extending a minimum 3 feet downstream from the dam and 1 foot up the sides of the channel. The compost and materials for a filter sock check dam shall meet the requirements shown in the standard for Compost Filter Sock on page 5.7.

Maintenance

The check dams should be inspected after each runoff event. Correct all damage immediately. If significant erosion has occurred between structures, a liner of stone or other suitable material should be installed in that portion of the channel or additional check dams added.

Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam.

Figure 3.1
Stone Check Dam Detail



CONSTRUCTION SPECIFICATIONS

1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN.
2. SET SPACING OF CHECK DAMS TO ASSUME THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

MAXIMUM DRAINAGE AREA 2 ACRES.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STONE CHECK DAM

STANDARD AND SPECIFICATIONS FOR EARTH DIKE

Definition & Scope

A **temporary** berm or ridge of compacted soil, located in such a manner as to channel water to a desired location. Its purpose is to direct runoff to a sediment trapping device, thereby reducing the potential for erosion and off site sedimentation. Earth dikes can also be used for diverting clean water away from disturbed areas.

Conditions Where Practice Applies

Earth dikes are often constructed across disturbed areas and around construction sites such as graded parking lots and subdivisions. The dikes shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 3.5 on page 3.15 for details.

General

	Dike A	Dike B
Drainage Area	<5 Ac	5-10 Ac
Dike Height	18 in.	36 in.
Dike Width	24 in.	36 in.
Flow Width	4 ft.	6 ft.
Flow Depth in Channel	8 in.	15 in.
Side Slopes	2:1 or flatter	2:1 or flatter
Grade	0.5% Min. 10% Max.	0.5% Min. 10% Max.

For drainage areas larger than 10 acres, refer to the Standard and Specifications for Diversion on page 3.9.

Stabilization

Stabilization of the dike shall be completed within 2 days of installation in accordance with the standard and specifications for seed and straw mulch or straw mulch only if not in seeding season. The flow channel shall be stabilized as per the following criteria:

Type of Treatment	Channel Grade[1]	Flow Channel	
		A (<5 Ac.)	B (5-10 Ac.)
1	0.5-3.0%	Seed & Straw Mulch	Seed & Straw Mulch
2	3.1-5.0%	Seed & Straw Mulch	Seed and cover with RECP, sod, or lined with plastic or 2” stone
3	5.1-8.0%	Seed and cover with RECP, Sod, or line with plastic or 2 in. stone	Line with 4-8 in. rip-rap or, geotextile
4	8.1-10%	Line with 4-8 in. rip-rap or geotextile	Site Specific Design

1 In highly erodible soils, as defined by the local approving agency, refer to the next higher slope grade for type of stabilization.

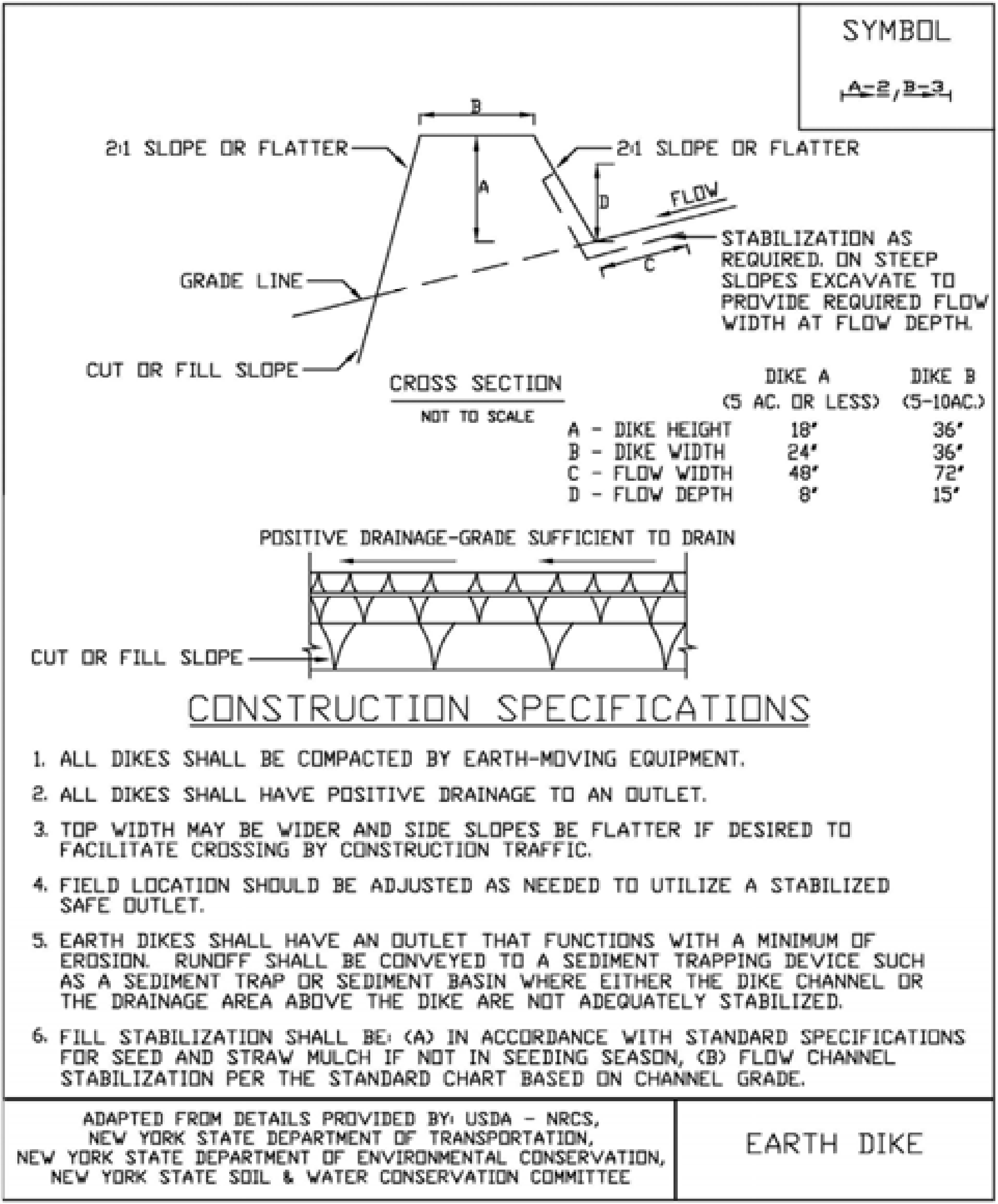
Outlet

Earth dikes shall have an outlet that functions with a minimum of erosion.

Runoff shall be conveyed to a sediment trapping device until the drainage area above the dike is adequately stabilized.

The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.

Figure 3.5
Earth Dike Detail



STANDARD AND SPECIFICATIONS FOR PERIMETER DIKE/SWALE

Definition & Scope

A **temporary** ridge of soil formed by excavating an adjoining swale located along the perimeter of the site or disturbed area. Its purpose is to prevent off site storm run-on from entering a disturbed area and to prevent sediment laden storm runoff from leaving the construction site or disturbed area.

Conditions Where Practice Applies

Perimeter dike/swale is constructed to divert flows from entering a disturbed area, or along tops of slopes to prevent flows from eroding the slope, or along base of slopes to direct sediment laden flows to a trapping device.

The perimeter dike/swale shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 3.14 on page 3.36 for details.

The perimeter dike/swale shall not be constructed outside property lines or setbacks without obtaining legal easements from affected adjacent property owners. A design is not required for perimeter dike/swale. The following criteria shall be used:

Drainage area – Less than 2 acres (for drainage areas larger than 2 acres but less than 10 acres, see earth dike or construction ditch; for drainage areas larger than 10 acres, see standard and specifications for diversion).

Height – 18 inches minimum from bottom of swale to top of dike evenly divided between dike height and swale depth.

Bottom width of dike – 2 feet minimum.

Width of swale – 2 feet minimum.

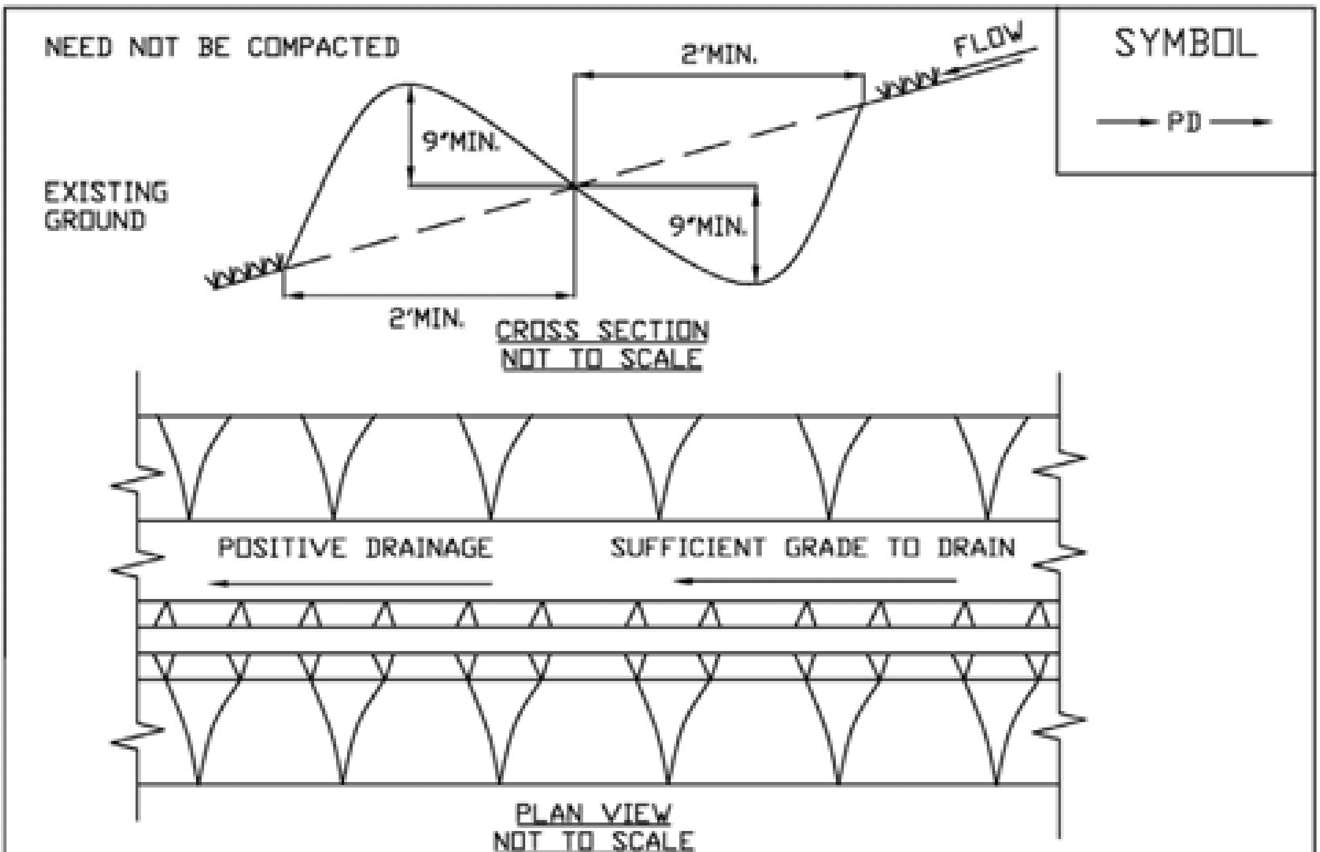
Grade – Dependent upon topography, but shall have positive drainage (sufficient grade to drain) to an adequate outlet. Maximum allowable grade not to exceed 8 percent.

Stabilization – The disturbed area of the dike and swale shall be stabilized within 2 days of installation, in accordance with the standard and specifications for construction ditch (page 3.4).

Outlet

1. Perimeter dike/swale shall have a stabilized outlet.
2. Diverted runoff from a protected or stabilized upland area shall outlet directly onto an undisturbed stabilized area.
3. Diverted runoff from a disturbed or exposed upland area shall be conveyed to a sediment trapping device such as a sediment trap, sediment basin, or to an area protected by any of these practices.
4. The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.

Figure 3.14
Perimeter Dike/Swale Detail



CONSTRUCTION SPECIFICATIONS

1. ALL PERIMETER DIKE/SWALE SHALL HAVE UNINTERRUPTED POSITIVE GRADE TO AN OUTLET.
2. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSIVE VELOCITY.
4. THE SWALE SHALL BE EXCAVATED OR SHAPED TO LINE GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED IN THE STANDARD.
5. STABILIZATION OF THE AREA DISTURBED BY THE DIKE AND SWALE SHALL BE DONE IN ACCORDANCE WITH THE STANDARD AND SPECIFICATIONS FOR TEMPORARY SEEDING AND MULCHING, AND SHALL BE DONE WITHIN 2 DAYS.
6. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

MAX. DRAINAGE AREA LIMIT: 2 ACRES

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	PERIMETER DIKE OR SWALE

STANDARD AND SPECIFICATIONS FOR ROCK OUTLET PROTECTION

Definition & Scope

A **permanent** section of rock protection placed at the outlet end of the culverts, conduits, or channels to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach.

Conditions Where Practice Applies

This practice applies where discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This applies to:

1. Culvert outlets of all types.
2. Pipe conduits from all sediment basins, dry storm water ponds, and permanent type ponds.
3. New channels constructed as outlets for culverts and conduits.

Design Criteria

The design of rock outlet protection depends entirely on the location. Pipe outlet at the top of cuts or on slopes steeper than 10 percent, cannot be protected by rock aprons or riprap sections due to re-concentration of flows and high velocities encountered after the flow leaves the apron.

Many counties and state agencies have regulations and design procedures already established for dimensions, type and size of materials, and locations where outlet protection is required. Where these requirements exist, they shall be followed.

Tailwater Depth

The depth of tailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. If the tailwater depth is less than half the diameter of the outlet pipe, and the receiving stream is wide enough to accept divergence of the flow, it shall be classified as a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example. If the tailwater depth is greater than half the pipe diameter and the receiving stream will continue to confine the flow, it shall be classified as a Maximum Tailwater Condition; see Figure 3.17 on page 3.43 as an example. Pipes which outlet onto flat areas with no defined channel may be assumed to have a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example.

Apron Size

The apron length and width shall be determined from the curves according to the tailwater conditions:

Minimum Tailwater – Use Figure 3.16 on page 3.42
Maximum Tailwater – Use Figure 3.17 on page 3.43

If the pipe discharges directly into a well defined channel, the apron shall extend across the channel bottom and up the channel banks to an elevation one foot above the maximum tailwater depth or to the top of the bank, whichever is less.

The upstream end of the apron, adjacent to the pipe, shall have a width two (2) times the diameter of the outlet pipe, or conform to pipe end section if used.

Bottom Grade

The outlet protection apron shall be constructed with no slope along its length. There shall be no overfall at the end of the apron. The elevation of the downstream end of the apron shall be equal to the elevation of the receiving channel or adjacent ground.

Alignment

The outlet protection apron shall be located so that there are no bends in the horizontal alignment.

Materials

The outlet protection may be done using rock riprap, grouted riprap, or gabions. Outlets constructed on the bank of a stream or wetland shall not use grouted rip-rap, gabions or concrete.

Riprap shall be composed of a well-graded mixture of rock size so that 50 percent of the pieces, by weight, shall be larger than the d_{50} size determined by using the charts. A well-graded mixture, as used herein, is defined as a mixture composed primarily of larger rock sizes, but with a sufficient mixture of other sizes to fill the smaller voids between the rocks. The diameter of the largest rock size in such a mixture shall be 1.5 times the d_{50} size.

Thickness

The minimum thickness of the riprap layer shall be 1.5 times the maximum rock diameter for d_{50} of 15 inches or less; and 1.2 times the maximum rock size for d_{50} greater than 15 inches. The following chart lists some examples:

D_{50} (inches)	d_{max} (inches)	Minimum Blanket Thickness (inches)
4	6	9
6	9	14
9	14	20
12	18	27
15	22	32
18	27	32
21	32	38
24	36	43

Rock Quality

Rock for riprap shall consist of field rock or rough unhewn quarry rock. The rock shall be hard and angular and of a quality that will not disintegrate on exposure to water or weathering. The specific gravity of the individual rocks shall be at least 2.5.

Filter

A filter is a layer of material placed between the riprap and the underlying soil surface to prevent soil movement into and through the riprap. Riprap shall have a filter placed under it in all cases.

A filter can be of two general forms: a gravel layer or a plastic filter cloth. The plastic filter cloth can be woven or non-woven monofilament yarns, and shall meet these base requirements: thickness 20-60 mils, grab strength 90-120 lbs; and shall conform to ASTM D-1777 and ASTM D-1682.

Gravel filter blanket, when used, shall be designed by comparing particle sizes of the overlying material and the base material. Design criteria are available in Standard and Specification for Anchored Slope and Channel Stabilization on page 4.7.

Gabions

Gabions shall be made of hexagonal triple twist mesh with heavily galvanized steel wire. The maximum linear dimension of the mesh opening shall not exceed 4 ½ inches and the area of the mesh opening shall not exceed 10 square inches.

Gabions shall be fabricated in such a manner that the sides, ends, and lid can be assembled at the construction site into a rectangular basket of the specified sizes. Gabions shall be of single unit construction and shall be installed according to manufacturer's recommendations.

The area on which the gabion is to be installed shall be graded as shown on the drawings. Foundation conditions shall be the same as for placing rock riprap, and filter cloth shall be placed under all gabions. Where necessary, key, or tie, the structure into the bank to prevent undermining of the main gabion structure.

Maintenance

Once a riprap outlet has been installed, the maintenance needs are very low. It should be inspected after high flows for evidence of scour beneath the riprap or for dislodged rocks. Repairs should be made immediately.

Design Procedure

1. Investigate the downstream channel to assure that nonerosive velocities can be maintained.

2. Determine the tailwater condition at the outlet to establish which curve to use.

3. Use the appropriate chart with the design discharge to determine the riprap size and apron length required. It is noted that references to pipe diameters in the charts are based on full flow. For other than full pipe flow, the parameters of depth of flow and velocity must be used to adjust the design discharges.

4. Calculate apron width at the downstream end if a flare section is to be employed.

Design Examples are demonstrated in Appendix B.

Construction Specifications

1. The subgrade for the filter, riprap, or gabion shall be prepared to the required lines and grades. Any fill required in the subgrade shall be compacted to a density of approximately that of the surrounding undisturbed material.

2. The rock or gravel shall conform to the specified grad-

ing limits when installed respectively in the riprap or filter.

3. Filter cloth shall be protected from punching, cutting, or tearing. Any damage other than an occasional small hole shall be repaired by placing another piece of cloth over the damaged part or by completely replacing the cloth. All overlaps, whether for repairs or for joining two pieces of cloth shall be a minimum of one foot.

4. Rock for the riprap or gabion outlets may be placed by equipment. Both shall each be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The rock for riprap or gabion outlets shall be delivered and placed in a manner that will ensure that it is reasonably homogenous with the smaller rocks and spalls filling the voids between the larger rocks. Riprap shall be placed in a manner to prevent damage to the filter blanket or filter cloth. Hand placement will be required to the extent necessary to prevent damage to the permanent works.

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

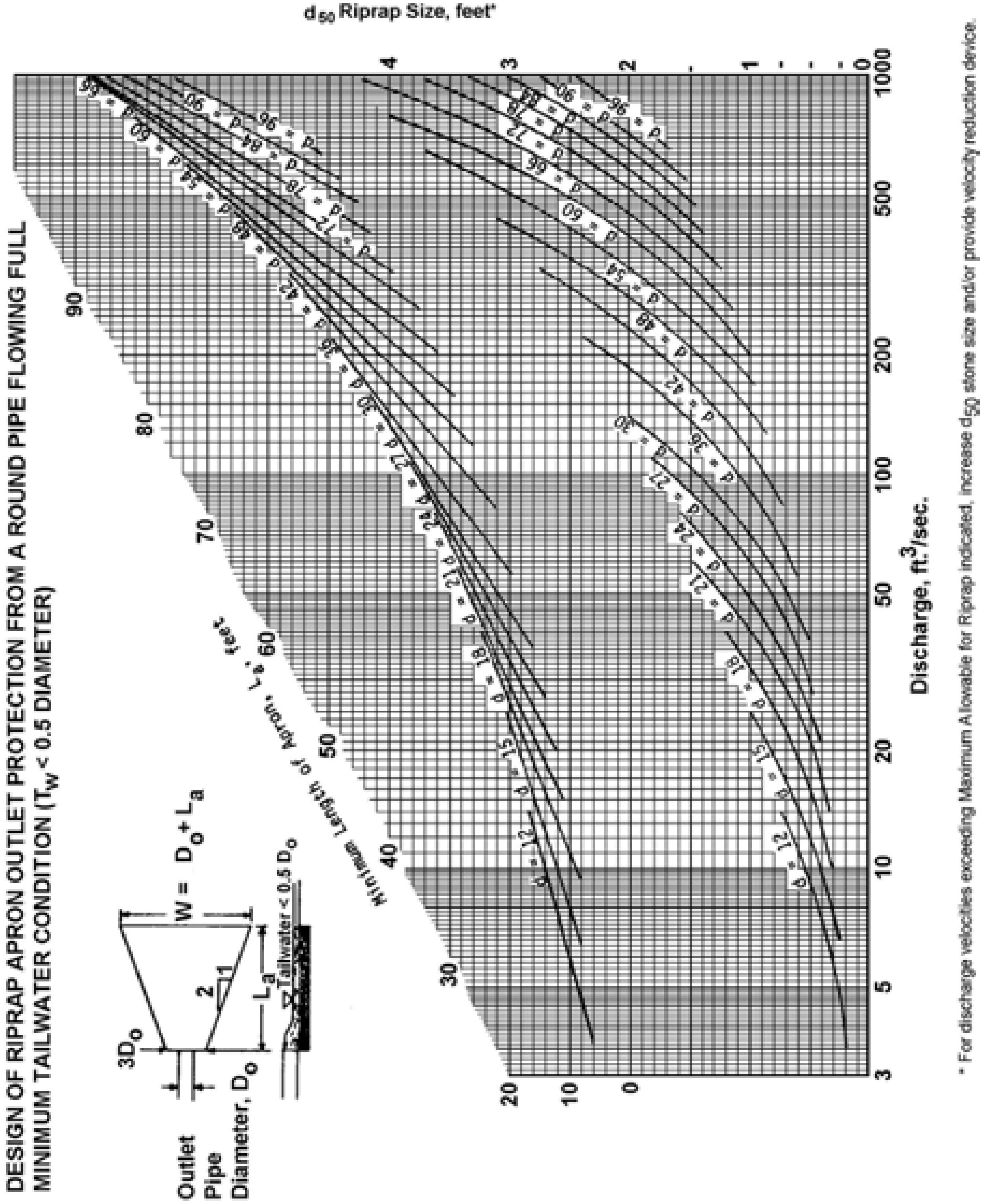


Figure 3.17
Outlet Protection Design—Maximum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full, Maximum Tailwater Condition: $T_w \geq 0.5D_o$) (USDA - NRCS)

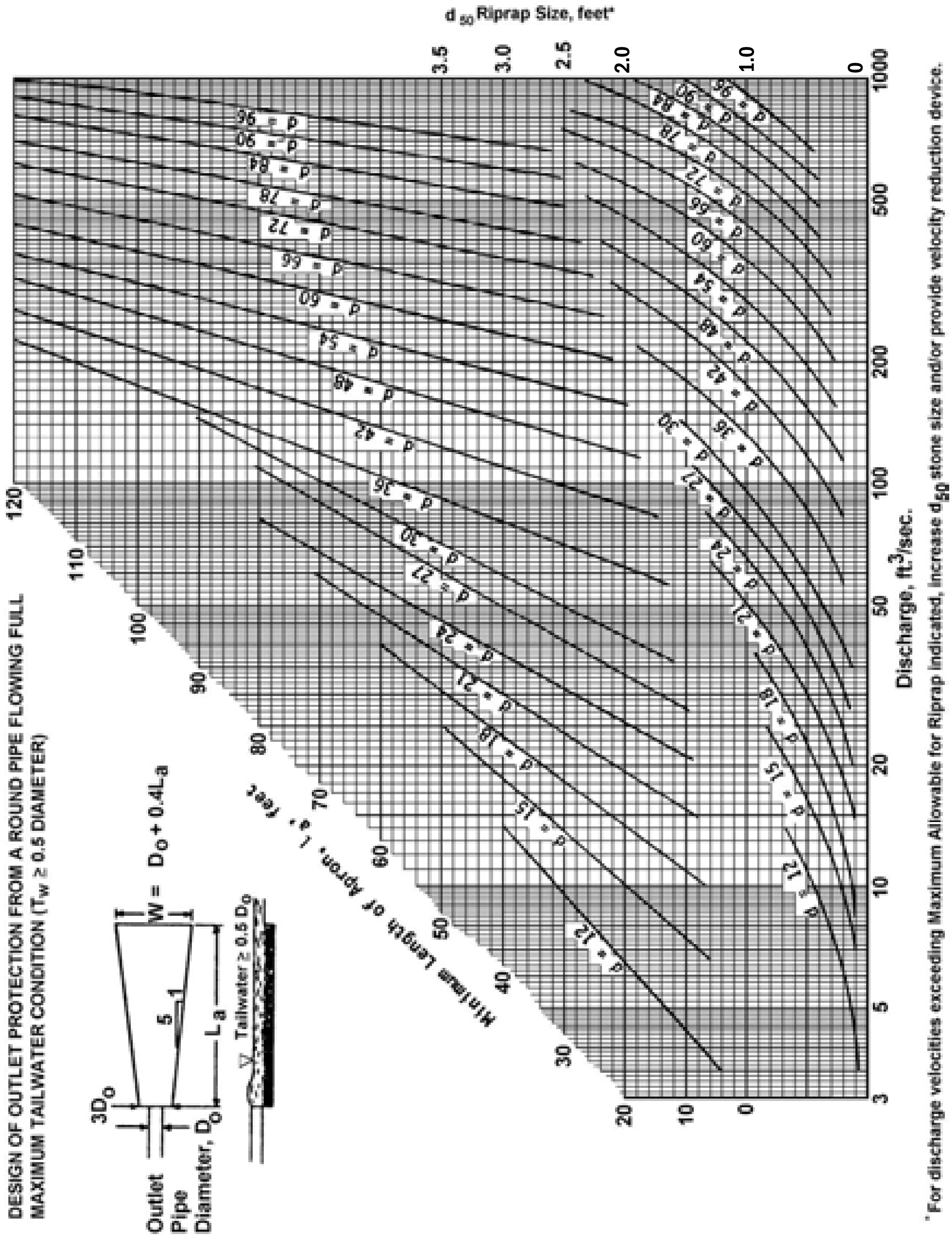


Figure 3.18
Riprap Outlet Protection Detail (1)

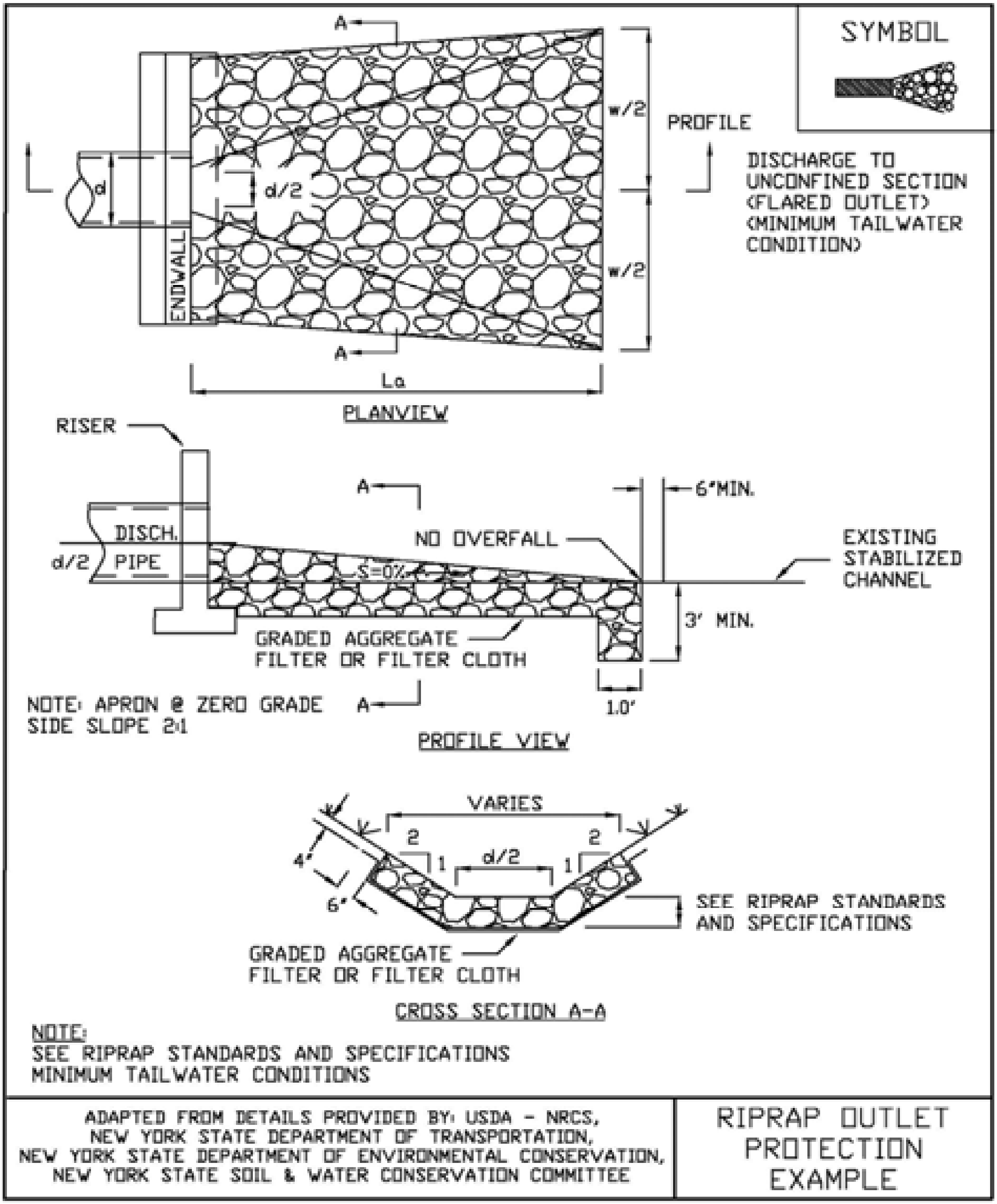


Figure 3.19
Riprap Outlet Protection Detail (2)

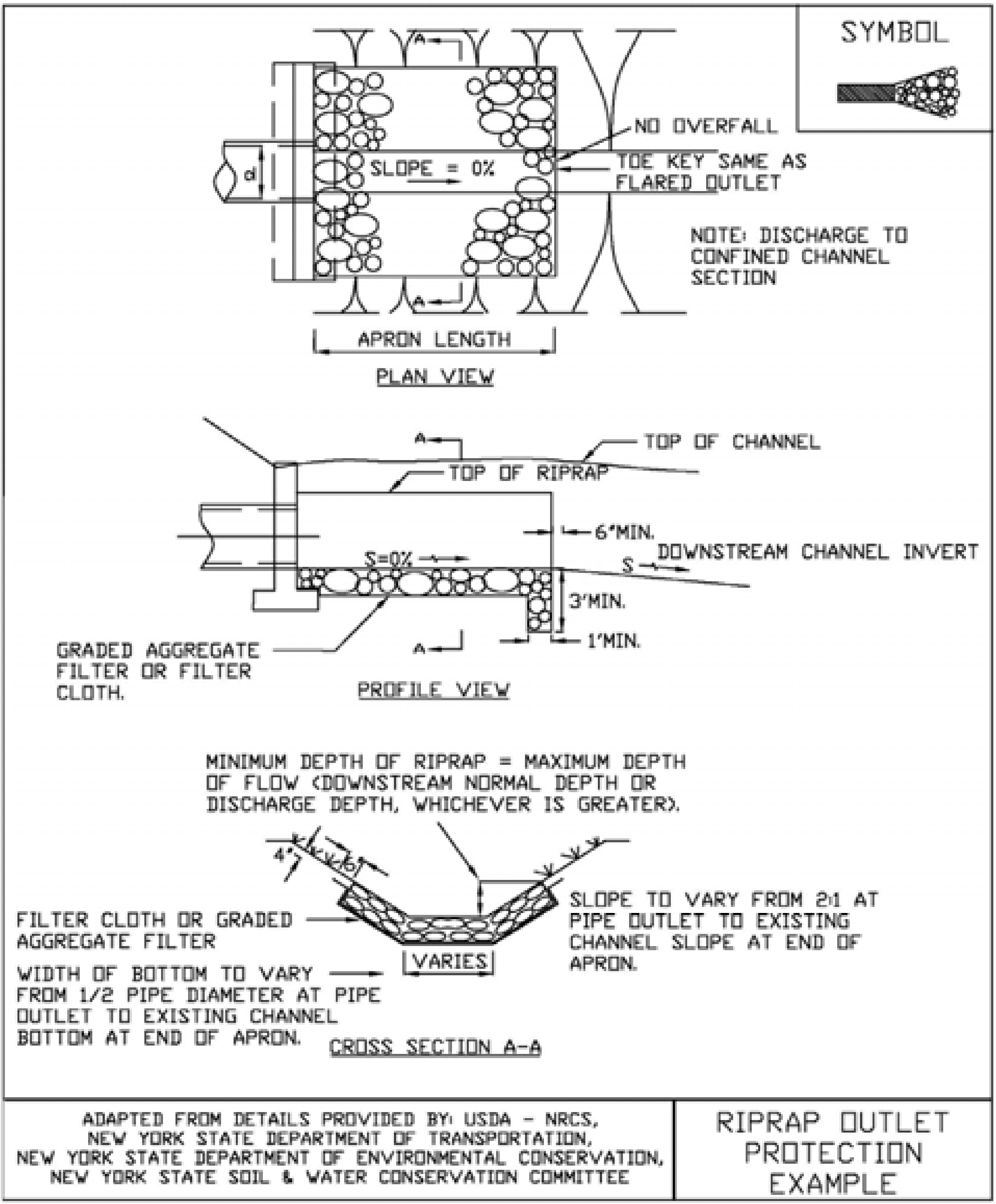
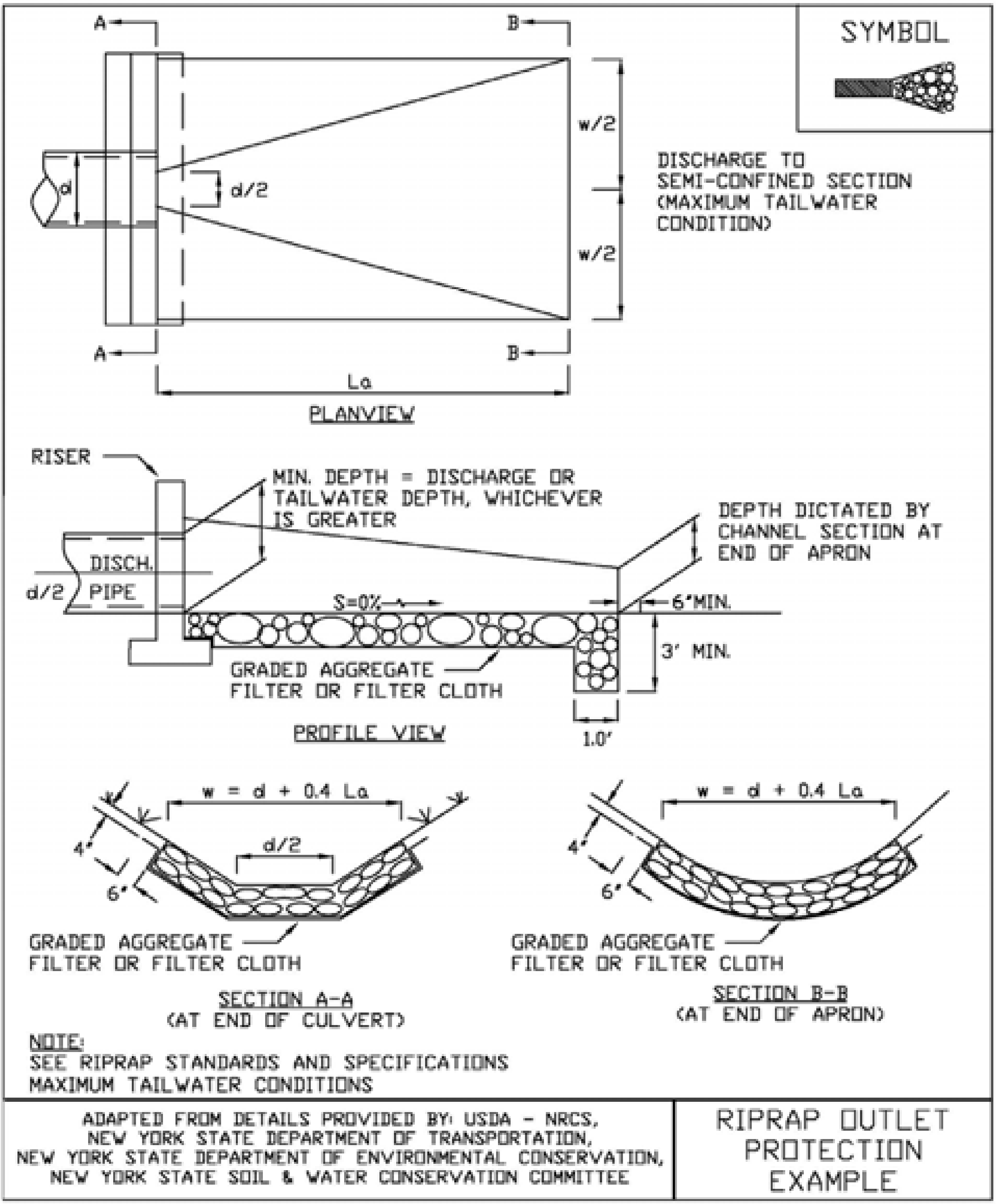


Figure 3.20
Riprap Outlet Protection Detail (3)



STANDARD AND SPECIFICATIONS FOR SUBSURFACE DRAIN

Definition & Scope

A **permanent** conduit, such as tile, pipe, or tubing, installed beneath the ground surface, which intercepts, collects, and/or conveys drainage water to serve one or more of the following purposes:

1. Improve the environment for vegetative growth by regulating the water table and groundwater flow.
2. Intercept and prevent water movement into a wet area.
3. Relieve artesian pressures.
4. Remove surface runoff.
5. Provide internal drainage of slopes to improve their stability and reduce erosion.
6. Provide internal drainage behind bulkheads, retaining walls, etc.
7. Replace existing subsurface drains that are interrupted or destroyed by construction operations.
8. Provide subsurface drainage for dry storm water management structures.
9. Improve dewatering of sediment in sediment basins. (See Standard and Specification for Sediment Basins in Section 5).

Conditions Where Practice Applies

Subsurface drains are used in areas having a high water table or where subsurface drainage is required. The soil shall have enough depth and permeability to permit installation of an effective system. This standard does not apply to storm drainage systems or foundation drains. Regulatory restrictions may apply if wetlands are present.

An outlet for the drainage system shall be available, either by gravity flow or by pumping. The outlet shall be adequate for the quantity of water to be discharged without causing damage above or below the point of discharge and shall comply with all state and local laws.

Design Criteria

The design and installation shall be based on adequate surveys and on-site soils investigations.

Required Capacity of Drains

The required capacity shall be determined by one or more of the following:

1. Where sub-surface drainage is to be uniform over an area through a systematic pattern of drains, a drainage coefficient of 1 inch to be removed in 24 hours shall be used; see Drain Chart, Figure 3.21 on page 3.51.

2. Where sub-surface drainage is to be by a random interceptor system, a minimum inflow rate of 0.5 cfs per 1,000 feet of line shall be used to determine the required capacity. If actual field tests and measurements of flow amounts are available, they may be used for determining capacity.

   For interceptor subsurface drains on sloping land, increase the inflow rate as follows:

Land Slope	Increase Inflow Rate By
2-5 percent	10 percent
5-12 percent	20 percent
Over 12 percent	30 percent

3. Additional design capacity must be provided if surface water is allowed to enter the system.

Size of Subsurface Drain

The size of subsurface drains shall be determined from the drain chart found on Figures 3.21 on page 3.51. All subsurface drains shall have a nominal diameter, which equals or exceeds four (4) inches.

Depth and Spacing

The minimum depth of cover of subsurface drains shall be 24 inches where possible. The minimum depth of cover may be reduced to 15 inches where it is not possible to attain the 24 inch depth and where the drain is not subject to equipment loading or frost action. Roots from some types of vegetation can plug drains, as the drains get closer to the surface.

The spacing of drain laterals will be dependent on the permeability of the soil, the depth of installation of the drains and degree of drainage required. Generally, drains installed 36 inches deep and spaced 50 feet center-to-center will be adequate. For more specific information, see the New York Drainage Guide (USDA-NRCS).

Minimum Velocity and Grade

The minimum grade for subsurface drains shall be 0.10 percent. Where surface water enters the system a velocity of not less than 2 feet per second shall be used to establish the minimum grades. Provisions shall be made for preventing debris or sediment from entering the system by means of filters or collection and periodic removal of sediment from installed traps.

Materials for Subsurface Drains

Acceptable subsurface drain materials include perforated, continuous closed joint conduits of polyethylene plastic, concrete, corrugated metal, polyvinyl chloride, and clay tile.

The conduit shall meet strength and durability requirements of the site.

Loading

The allowable loads on subsurface drain conduits shall be based on the trench and bedding conditions specified for the job. A factor of safety of not less than 1.5 shall be used in computing the maximum allowable depth of cover for a particular type of conduit.

Envelopes and Envelope Materials

Envelopes shall be used around subsurface drains for proper bedding and to provide better flow into the conduit. Not less than three inches of envelope material shall be used for sand/gravel envelopes. Where necessary to improve the characteristics of flow of groundwater into the conduit, more envelope material may be required.

Where county regulations do not allow sand/gravel envelopes, but require a special type and size of envelope material, they shall be followed.
Envelope material shall be placed to the height of the uppermost seepage strata. Behind bulkheads and retaining walls, it shall go to within twelve inches of the top of the structure. This standard does not cover the design of filter materials where needed.

Materials used for envelopes shall not contain materials which will cause an accumulation of sediment in the conduit or render the envelope unsuitable for bedding of the conduit. Envelope materials shall consist of either filter cloth or sand/gravel material, which shall pass a 1 ½ inch sieve, 90 to 100 percent shall pass a ¾ inch sieve, and not more than 10 percent shall pass a No. 60 sieve.

Filter cloth envelope can be either woven or non-woven monofilament yarns and shall have a sieve opening ranging from 40 to 80. The envelope shall be placed in such a manner that once the conduit is installed, it shall completely encase the conduit.

The conduit shall be placed and bedded in a sand/gravel envelope. A minimum of three inches depth of envelope materials shall be placed on the bottom of a conventional trench. The conduit shall be placed on this and the trench completely filled with envelope material to minimum depth of 3 inches above the conduit.

Soft or yielding soils under the drain shall be stabilized where required and lines protected from settlement by adding gravel or other suitable material to the trench, by placing the conduit on plank or other rigid support, or by using long sections of perforated or watertight pipe with adequate strength to ensure satisfactory subsurface drain performance.

Use of Heavy Duty Corrugated Plastic Drainage Tubing

Heavy duty corrugated drainage tubing shall be specified where rocky or gravelly soils are expected to be encountered during installation operations. The quality of tubing will also be specified when cover over this tubing is expected to exceed 24 inches for 4, 5, 6, or 8 inch tubing. Larger size tubing designs will be handled on an individual job basis.

Auxiliary Structure and Subsurface Drain Protection

The outlet shall be protected against erosion and undermining of the conduit, against damaging periods of submergence, and against entry of rodents or other animals into the subsurface drain. An animal guard shall be installed on the outlet end of the pipe. A swinging animal guard shall be used if surface water enters the pipe.

A continuous 10-foot section of corrugated metal, cast iron, polyvinyl chloride, or steel pipe without perforations shall be used at the outlet end of the line and shall outlet 1.0 foot above the normal elevation of low flow in the outlet ditch or above mean high tide in tidal areas. No envelope material shall be used around the 10-foot section of pipe. Two-thirds of the pipe shall be buried in the ditch bank and the cantilevered section shall extend to a point above the toe of the ditch side slope. If not possible, the side slope shall be protected from erosion.

Conduits under roadways and embankments shall be water-tight and designed to exclude debris and prevent sediment from entering the conduit. Lines flowing under pressure shall be designed to withstand the resulting pressures and velocity of flow. Surface waterways shall be used where feasible.

The upper end of each subsurface drain line shall be capped with a tight fitting cap of the same material as the conduit or other durable material unless connected to a structure.

Construction Specifications

1. Deformed, warped, or otherwise damaged pipe or tubing shall not be used.

2. All subsurface drains shall be laid to a uniform line and covered with envelope material. The pipe or tubing shall be laid with the perforations down and oriented symmetrically about the vertical centerline. Connections will be made with manufactured appurtenances comparable in strength with the specified pipe or tubing unless otherwise specified. The method of placement and bedding shall be as specified on the drawing.

3. Envelope material shall consist of filter cloth or a sand/gravel (which shall pass the 1 ½ inch sieve, 90 to 100 percent shall pass ¾ inch sieve, and not more than 10 percent shall pass the No. 60 sieve).

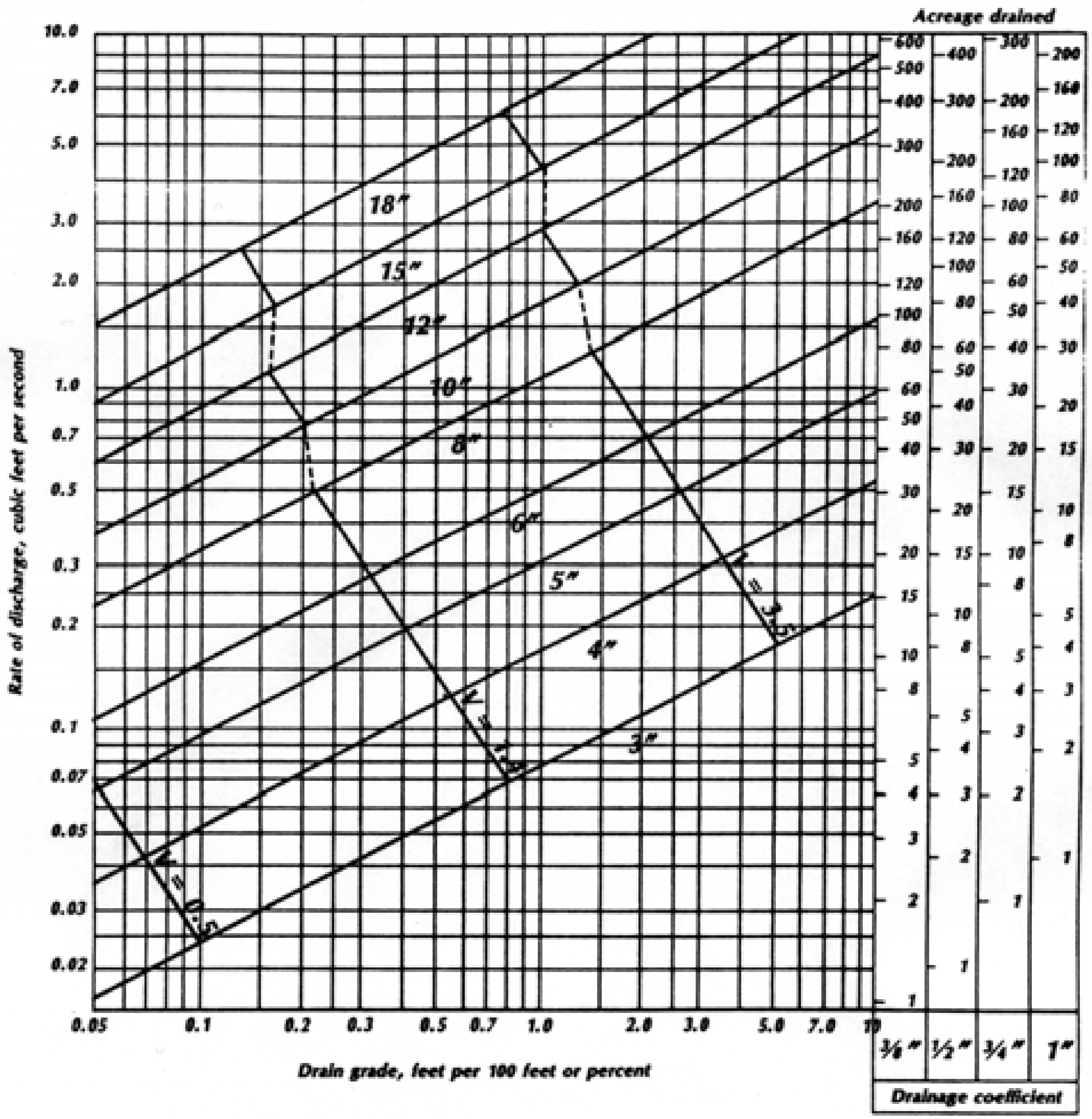
4. The upper end of each subsurface drain line shall be capped with a tight fittings cap of the same material as the conduit or other durable material unless connected to a structure.

5. A continuous 10-foot section of corrugated metal, cast iron, polyvinyl chloride, or steel pipe without perforations shall be used at the outlet end of the line. No envelope material shall be used around the 10-foot section of the pipe. An animal guard shall be installed on the outlet end of the pipe.

6. Earth backfill material shall be placed in the trench in such a manner that displacement of the drain will not occur.

7. Where surface water is entering the system, the pipe outlet section of the system shall contain a swing type trash and animal guard.

Figure 3.21
Drain Chart - Corrugated Plastic Drain Tubing (USDA-NRCS)



STANDARD AND SPECIFICATIONS FOR ANCHORED STABILIZATION MATTING

Definition and Scope

A **temporary** or **permanent** protective covering placed on a prepared, seeded planting area that is anchored in place by staples or other means to aid in controlling erosion by absorbing rain splash energy and withstand overland flow as well as provide a microclimate to protect and promote seed establishment.

Conditions Where Practice Applies

Anchored stabilization mats are required for seeded earthen slopes steeper than 3 horizontal to 1 vertical; in vegetated channels where the velocity of the design flow exceeds the allowable velocity for vegetation alone (usually greater than 5 feet per second); on streambanks and shorelines where moving water is likely to erode newly seeded or planted areas; and in areas where wind prevents standard mulching with straw. This standard does not apply to slopes stabilized with sod, rock riprap or hard armor material.

Design Criteria

Slope Applications - Anchored stabilization mats for use on slopes are primarily used as mulch blankets where the mesh material is within the blanket or as a netting over previously placed mulch. These stabilization mats are NOT effective in preventing slope failures.

1. Required on all slopes steeper than 3:1
2. Matting will be designed for proper longevity need and strength based on intended use.
3. All installation details and directions will be included on the site erosion and sediment control plan and will follow manufactures specifications.

Channel Applications - Anchored stabilization mats, for use in supporting vegetation in flow channels, are generally a non-degradable, three dimensional plastic structure which can be filled with soil prior to planting. This structure provides a medium for root growth where the matting and roots become intertwined forming a continuous anchor for the vegetated lining.

1. Channel stabilization shall be based on the tractive force method.
2. For maximum design shear stresses less than 2 pounds per square foot, a temporary or bio-degradable mat may be used.
3. The design of the final matting shall be based on the mats ability to resist the tractive shear stress at bank full flow.
4. The installation details and procedures shall be included on the site erosion and sediment control plan and will follow manufacturers specifications.

Construction Specifications

1. Prepare soil before installing matting by smoothing the surface, removing debris and large stone, and applying lime, fertilizer and seed. Refer to manufacturers installation details.
2. Begin at the top of the slope by anchoring the mat in a 6” deep x 6” wide trench. Backfill and compact the trench after stapling.
3. In channels or swales, begin at the downslope end, anchoring the mat at the bottom and top ends of the blanket. When another roll is needed, the upslope roll

should overlay the lower layer, shingle style, so that channel flows do not peel back the material.

4. Roll the mats down a slope with a minimum 4” overlap. Roll center mat in a channel in direction of water flow on bottom of the channel. Do not stretch blankets. Blankets shall have good continuous contact with the underlying soil throughout its entire length.

5. Place mats end over end (shingle style) with a 6” overlap, use a double row of staggered staples 4” apart to secure mats.

6. Full length edge of mats at top of side slopes must be anchored in 6” deep x 6” wide trench; backfill and compact the trench after stapling.

7. Mats on side slopes of a channel must be overlapped 4” over the center mat and stapled.

8. In high flow channel applications, a staple check slot is recommended at 30 to 40 foot intervals. Use a row of staples 4” apart over entire width of the channel. Place a second row 4” below the first row in a staggered pattern.

9. The terminal end of the mats must be anchored in a 6”x6” wide trench. Backfill and compact the trench after stapling.

10. Stapling and anchoring of blanket shall be done in accordance with the manufactures recommendations.

Maintenance

Blanketed areas shall be inspected weekly and after each runoff event until perennial vegetation is established to a minimum uniform 80% coverage throughout the blanketed area. Damaged or displaced blankets shall be restored or replaced within 2 calendar days.

STANDARD AND SPECIFICATIONS FOR ARMORED SLOPE AND CHANNEL STABILIZATION

Definition & Scope

A **permanent** layer of stone designed to protect and stabilize areas subject to erosion by protecting the soil surface from rain splash, sheet flow, rill and gully erosion and channel erosion. It can also be used to improve the stability of soil slopes that are subject to seepage or have poor soil structure.

Conditions Where Practice Applies

Riprap is used for cut and fill slopes subject to seepage, erosion, or weathering, particularly where conditions prohibit the establishment of vegetation. Riprap is also used for channel side slopes and bottoms, temporary dewatering diversion channels where the flow velocities exceed 6 feet/second, grade sills, on shorelines subject to erosion, and at inlets and outlets to culverts, bridges, slope drains, grade stabilization structures, and storm drains.

Slope Stabilization Design Criteria

Gradation – Riprap shall be a well-graded mixture with 50% by weight larger than the specified design size. The diameter of the largest stone size in such a mixture should be 1.5 times the d_{50} size with smaller sizes grading down to 1 inch. The designer should select the size or sizes that equal or exceed that minimum size based on riprap gradations commercially available in the area.

Thickness – The minimum layer thickness shall be 1.5 times the maximum stone diameter, but in no case less than 6 inches.

Quality – Stone for riprap shall be hard, durable field or quarry materials. They shall be angular and not subject to breaking down when exposed to water or weathering. The specific gravity shall be at least 2.5.

Size – The sizes of stones used for riprap protection are determined by purpose and specific site conditions:

1. Slope Stabilization – Riprap stone for slope stabilization not subject to flowing water or wave action shall be sized for the proposed grade. The gradient of the slope to be stabilized shall be less than the natural angle of repose of the stone selected. Angles of repose of riprap stones may be estimated from Figure 4.1.

   Riprap used for surface stabilization of slopes does not add significant resistance to sliding or slope failure and should not be considered a retaining wall. Slopes approaching 1.5:1 may require special stability analysis. The inherent stability of the soil must be satisfactory before riprap is used for surface stabilization.

2. Channel Stabilization - Design criteria for sizing stone for stability of channel side slopes are presented under Channel Stabilization Design Criteria on page 4.10.

2. Outlet Protection – Design criteria for sizing stone and determining dimensions of riprap aprons are presented in Standards and Specifications for Rock Outlet Protection on page 3.39.

Filter Blanket – A filter blanket is a layer of material placed between the riprap and the underlying soil to prevent soil movement into or through the riprap. A suitable filter may consist of a well-graded gravel or sand-gravel layer or a synthetic filter fabric manufactured for this purpose. The design of a gravel filter blanket is based on the ratio of particle size in the overlying filter material to that of the base material in accordance with the criteria below. Multiple layers may be designed to affect a proper filter if necessary.

A gravel filter blanket should have the following relationship for a stable design:

$$\frac{d_{15}\text{ filter}}{d_{85}\text{ base}} \leq 5$$

$$5 < \frac{d_{15}\text{ filter}}{d_{50}\text{ base}} \leq 40$$

and

$$\frac{d_{50}\text{ filter}}{d_{50}\text{ base}} \leq 40$$

Filter refers to the overlying material while base refers to the underlying material. These relationships must hold between the base and filter and the filter and riprap to prevent migration of material. In some cases, more than one filter may be needed. Each filter layer should be a minimum of 6 inches thick, unless an acceptable filter fabric is used.

A synthetic filter fabric may be used with or in place of gravel filters. The following particle size relationships should exist:

1. Filter fabric covering a base containing 50% or less by weight of fine particles (#200 sieve size):

   A. $$\frac{d_{85}\text{ base (mm)}}{\text{EOS} \times \text{filter fabric (mm)}} > 1$$

   B. total open area of filter fabric should not exceed 36%

2. Filter fabric covering other soils:

   A. EOS is no larger than 0.21 mm (#70 sieve size)

   B. total open area of filter fabric should not exceed 10%

*EOS – Equivalent opening size compared to a U.S. standard sieve size.

No filter fabric should have less than 4% open area or an EOS less than U.S. Standard Sieve #100 (0.15 mm). The permeability of the fabric must be greater than that of the soil. The fabric may be made of woven or nonwoven monofilament yarns and should meet the following minimum requirements:

Thickness 20-60 mils

grab strength 90-120 lbs.

conform to ASTM D-1682 or ASTM D-177

Filter blankets should always be provided where seepage is significant or where flow velocity and duration of flow or turbulence may cause underlying soil particles to move though the riprap.

Construction Specifications

Subgrade Preparation – Prepare the subgrade for riprap and filter to the required lines and grades shown on the plans. Compact any fill required in the subgrade to a density approximating that of the undisturbed material or overfill depressions with riprap. Remove brush, trees, stumps, and other objectionable material. Cut the subgrade sufficiently deep so that the finished grade of the riprap will be at the elevation of the surrounding area. Channels shall be excavated sufficiently to allow placement of the riprap in a manner such that the finished inside dimensions and grade of the riprap meet design specifications.

Sand and gravel filter blanket – Place the filter blanket immediately after the ground foundation is prepared. For gravel, spread filter stone in a uniform layer to the specified depth. Where more than one layer of filter material is used, spread the layers with minimal mixing.

Synthetic filter fabric – Place the cloth directly on the prepared foundation. Overlap the edges by at least 2 feet, and space the anchor pins every 3 feet along the overlap. Bury the upper and lower ends of the cloth a minimum of 12 inches below ground. Take precautions not to damage the cloth by dropping the riprap. If damage occurs, remove the riprap and repair the sheet by adding another layer of filter fabric with a minimum overlap of 12 inches around the damaged area. Where large stones are to be placed, a 4-inch layer of fine sand or gravel is recommended to protect the filter cloth. Filter fabric is not recommended as a filter on slopes steeper than 2 horizontal to 1 vertical.

Stone placement – Placement of the riprap shall follow immediately after placement of the filter. Place riprap so that it forms dense, well-graded mass of stone with a minimum of voids. The desired distribution of stones throughout the mass may be obtained by selective loading at the quarry and controlled dumping during final placement. Place riprap to its full thickness in one operation. Do not place riprap by dumping through chutes or other methods that cause segregation of stone sizes. Be careful not to dislodge the underlying base or filter when placing the stones.

The toe of the riprap shall be keyed into a stable foundation at its base as shown in Figure 4.2 - Typical Riprap Slope Protection Detail. The toe should be excavated to a depth of 2.0 feet. The design thickness of the riprap shall extend a minimum of 3 feet horizontally from the slope. The finished slope should be free of pockets of small stone or clusters of large stones. Hand placing may be necessary to achieve proper distribution of stone sizes to produce a relatively smooth, uniform surface. The finished grade of the riprap should blend with the surrounding area.

Maintenance

Riprap shall be inspected periodically for scour or dislodged stones. Control weed and brush growth as needed.

Figure 4.1
Angles of Repose of Riprap Stones (FHWA)

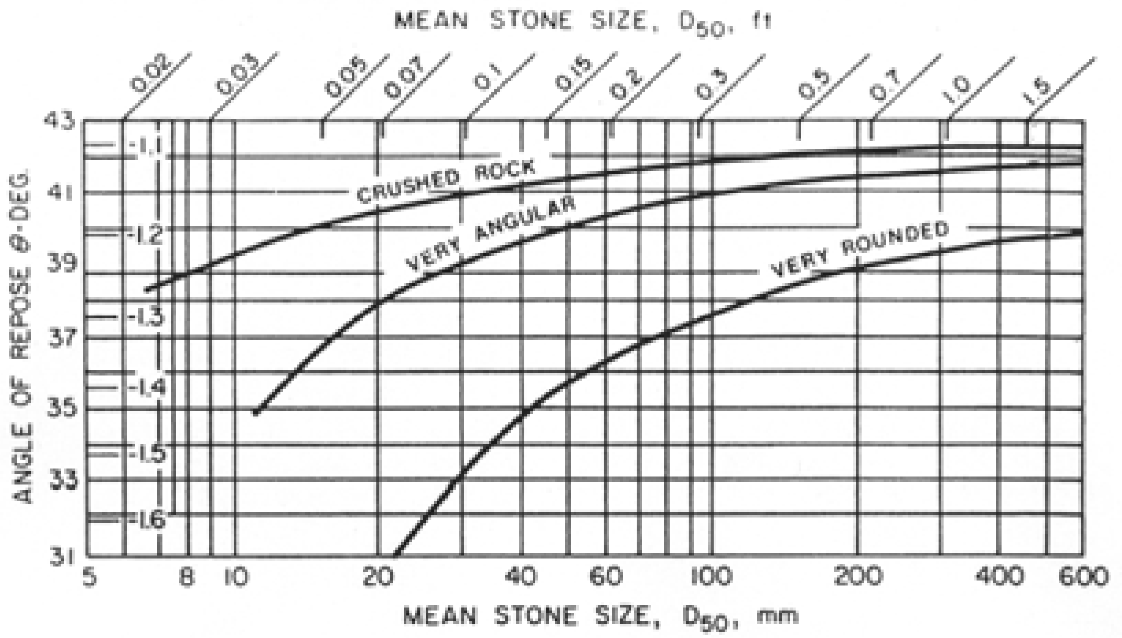
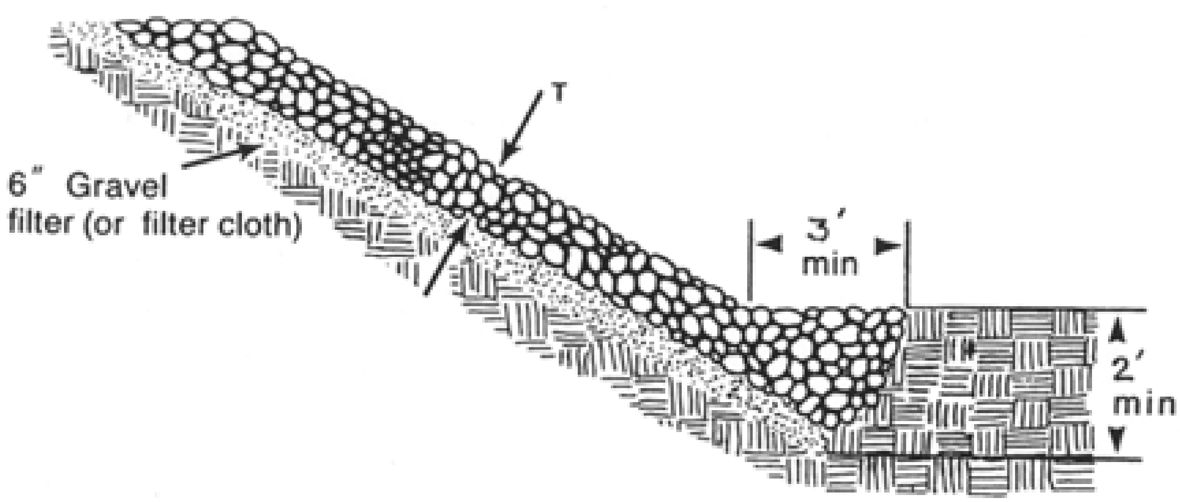


Figure 4.2
Typical Riprap Slope Protection Detail



Channel Stabilization Design Criteria

1. Since each channel is unique, measures for structural channel stabilization should be installed according to a design based on specific site conditions.

2. The plan and profile of the design reach should approximate a naturally stable channel from the project area, based on a stable "reference reach" for the subject channel type.

3. Develop designs according to the following principles:

   - Make protective measures compatible with other channel modifications planned or being carried out in the channel reaches.
   - Whenever excavation and re-shaping work is proposed within channels, the design should provide functional channel dimensions and geometry at each section. Work proposed within a stream channel may require permits from the NYS DEC and US Army Corps of Engineers.
   - Use the design velocity of the peak discharge of the 10-year storm or bankfull discharge, whichever is less. Structural measures should be capable of withstanding greater flows without serious damage.
   - Ensure that the channel bottom is stable or stabilized by structural means before installing any permanent slope protection.
   - Channel stabilization should begin at a stable location and end at a stable point along the bank.
   - Changes in alignment should not be done without a complete analysis of the environmental and stability effects on the entire system.
   - Provisions should be made to maintain and improve fish and wildlife habitat. For example, restoring lost vegetation will provide valuable shade, food, and/or cover.
   - Ensure that all requirements of state law and all permit requirements of local, state, and federal agencies are met.

Construction Specifications

Riprap – Riprap is the most commonly used material to structurally stabilize a channel. While riprap will provide the structural stabilization necessary, the side slope can be enhanced with vegetative material to slow the velocity of water, filter debris, and enhance habitat. See Principles of Biotechnical Practices on page 4.1, for more information.

1. Side slope – slopes shall be graded to 2:1 or flatter prior to placing bedding, filter fabric, or riprap.

2. Filter – filters should be placed between the base material and the riprap and meet the requirements of criteria listed pages 4.7 and 4.8.

3. Gradation – The gradation of the riprap is dependent on the velocity expected against the bank for the design conditions. See Table 4.1 on page 4.12. Once the velocity is known, gradation can be selected from the table for the appropriate class of rock. Note, this table was developed for a 2:1 slope; if the slope steepens to 1.5:1 the gradations should be increased 20%. The riprap should extend 2 feet below the channel bottom and be keyed into the side slope both at the upstream end and downstream end of the proposed work or reach.

See Figure 4.3 on page 4.13 for details.

Reinforced Concrete - Is often used to armor eroding sections of flow channel by constructing walls, bulk heads, or stabilize bank linings in urban areas for redevelopment work. Provide positive drainage behind these structures to relieve uplift pressures.

Grid Pavers – Modular concrete units with or without void areas can be used to stabilize flow channel. Units with void areas can allow the establishment of vegetation. These structures may be obtained in a variety of shapes (Figure 4.4) or they may be formed and poured in place. Maintain design and installation in accordance with manufacturer's instructions.

Revetment – Structural support or armoring to protect an embankment from erosion. Riprap and gabions are commonly used. Also used is a hollow fabric mattress with cells that receive a concrete mixture. Any revetment should be installed to a depth below the anticipated channel degradation and into the channel bed as necessary to provide stability.

Modular Pre-Cast Units – Interlocking modular precast units of different sizes, shapes, heights, and depths, have been developed for a wide variety of applications. They provide vertical support in tight areas as well as durability. Many types are available with textured surfaces. They also act as gravity retaining walls. They should be designed and installed in accordance with the manufacturer's recommendations (Figure 4.4). All areas disturbed by construction should be stabilized as soon as the structural measures are complete.

Maintenance

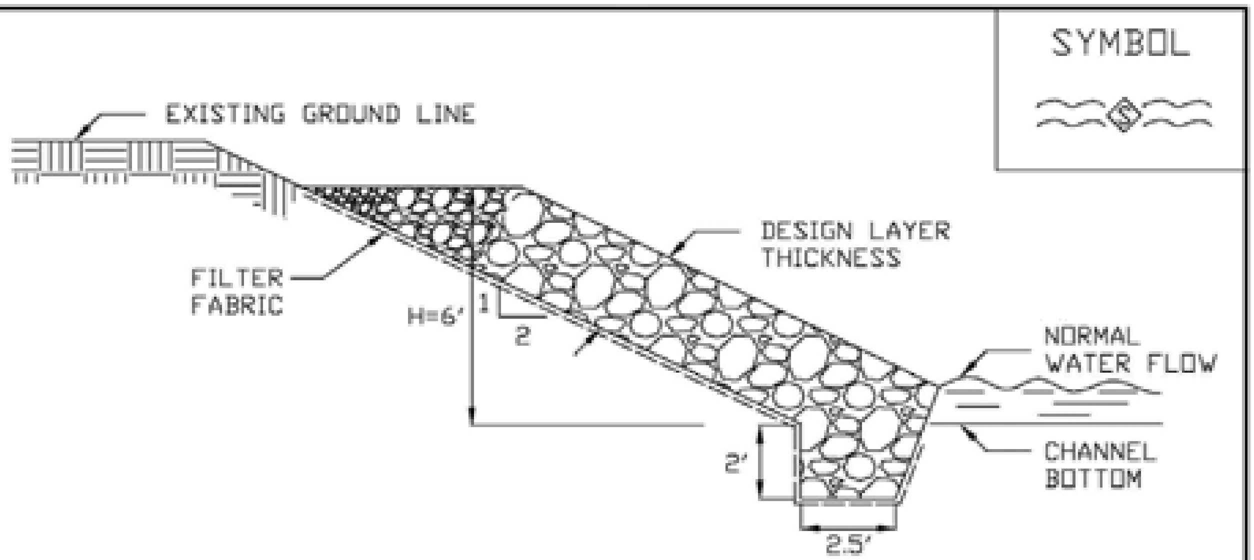
Check stabilized flow channel sections after every high-water event, and make any needed repairs immediately to prevent any further damage or unraveling of the existing work.

Table 4.1 - Riprap Gradations for Channel Stabilization

Class	Layer Thickness (in.)	Max. Velocity (ft/s)	Wave Height (ft.)		PERCENT FINER BY WEIGHT											
					D_{10}			D_{50}			D_{85}			D_{100}		
					Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)
I	18	8.5	-		5	5	4	50	10	8	100	13	10	150	15	12
II	18	10	-		17	7	6	170	15	12	340	19	15	500	22	18
III	24	12	2		46	10	8	460	21	17	920	26	21	1400	30	24
IV	36	14	3		150	15	12	1500	30	25	3000	39	32	4500	47	36
V	48	17	4.8		370	20	16	3700	42	34	7400	53	43	11,000	60	49

d_o = gravel material   d□ = angular rock riprap
Wt = weight in pounds

Figure 4.3
Riprap Channel Stabilization



RIPRAP DESIGN TABLE

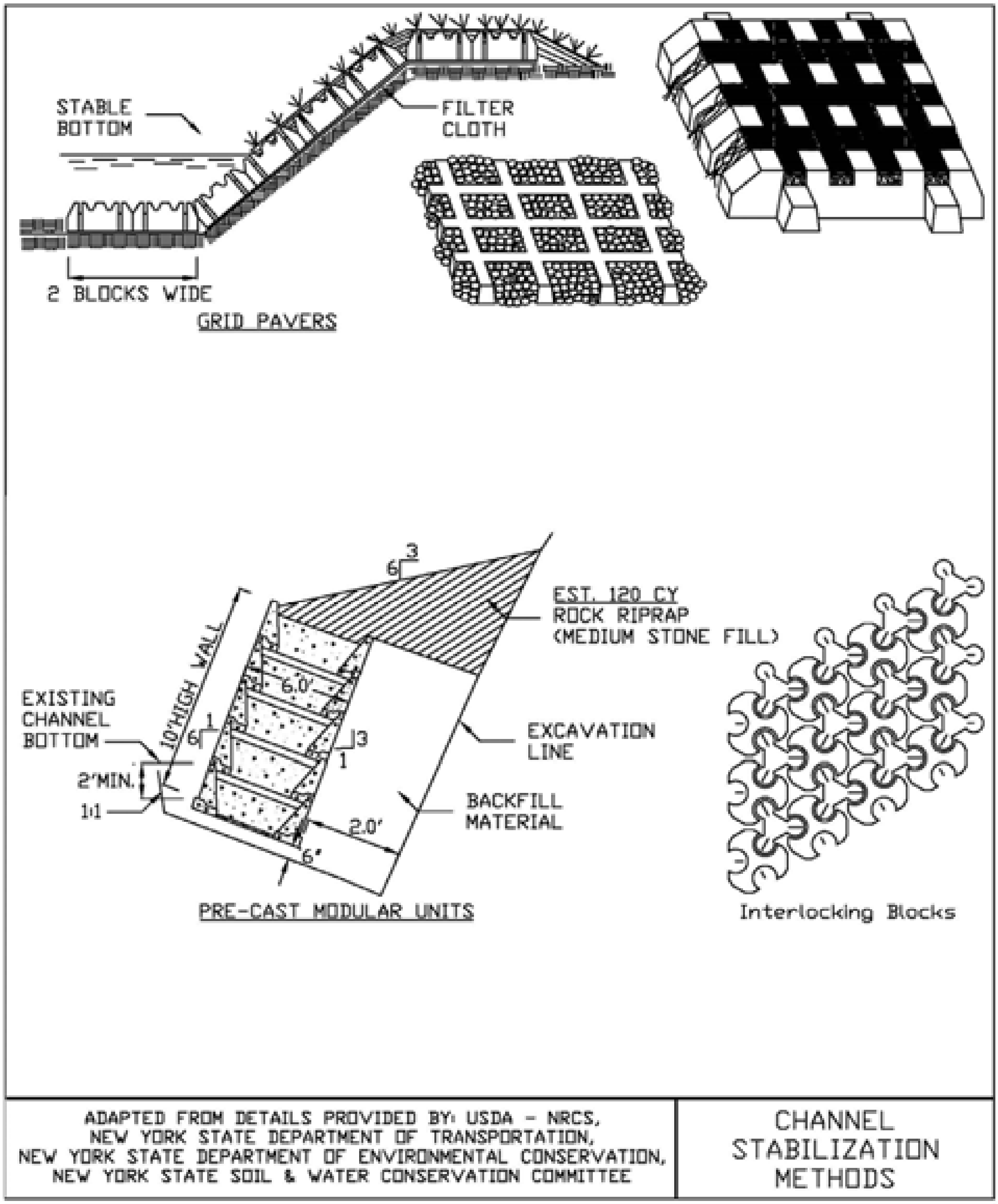
REACH	CLASS	THICKNESS	LAYER	HEIGHT	D10	D50	D85	D100	FILTER

CONSTRUCTION SPECIFICATIONS

1. SLOPE SHALL BE GRADED TO 2:1 OR FLATTER PRIOR TO PLACING FILTER, FILTER FABRIC, OR RIPRAP.
2. RIPRAP SHALL BE PLACED TO MAINTAIN A UNIFORM GRADATION. LARGER STONE SHALL BE PLACED AT THE TOE.
3. ENDS OF THE RIPRAP SHALL BE KEYED INTO A STABLE BANK. WHEN TYING INTO OTHER STRUCTURES, LARGER RIPRAP CAN BE LAID IN STEPS OR STACKED AS NEEDED TO FIT. STONES LARGER THAN THOSE DESIGNED FOR FLOW SHALL BE USED FOR THIS PURPOSE.
4. REMAINING DISTURBED AREAS SHALL BE GRADED AND PERMANENTLY SEEDED AND MULCHED.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	RIPRAP CHANNEL STABILIZATION

Figure 4.4
Channel Stabilization Methods



STANDARD AND SPECIFICATIONS FOR LANDGRADING

Definition & Scope

Permanent reshaping of the existing land surface by grading in accordance with an engineering topographic plan and specification to provide for erosion control and vegetative establishment on disturbed, reshaped areas.

Design Criteria

The grading plan should be based upon the incorporation of building designs and street layouts that fit and utilize existing topography and desirable natural surrounding to avoid extreme grade modifications. Information submitted must provide sufficient topographic surveys and soil investigations to determine limitations that must be imposed on the grading operation related to slope stability, effect on adjacent properties and drainage patterns, measures for drainage and water removal, and vegetative treatment, etc.

Many municipalities and counties have regulations and design procedures already established for land grading and cut and fill slopes. Where these requirements exist, they shall be followed.

The plan must show existing and proposed contours of the area(s) to be graded. The plan shall also include practices for erosion control, slope stabilization, safe disposal of runoff water and drainage, such as waterways, lined ditches, reverse slope benches (include grade and cross section), grade stabilization structures, retaining walls, and surface and subsurface drains. The plan shall also include phasing of these practices. The following shall be incorporated into the plan:

1. Provisions shall be made to safely convey surface runoff to storm drains, protected outlets, or to stable water courses to ensure that surface runoff will not damage slopes or other graded areas; see standards and specifications for Grassed Waterway, Diversion, or Grade Stabilization Structure.

2. Cut and fill slopes that are to be stabilized with grasses shall not be steeper than 2:1. When slopes exceed 2:1, special design and stabilization consideration are required and shall be adequately shown on the plans. (Note: Where the slope is to be mowed, the slope should be no steeper than 3:1, although 4:1 is preferred because of safety factors related to mowing steep slopes.)

3. Reverse slope benches or diversion shall be provided whenever the vertical interval (height) of any 2:1 slope exceeds 20 feet; for 3:1 slope it shall be increased to 30 feet and for 4:1 to 40 feet. Benches shall be located to divide the slope face as equally as possible and shall convey the water to a stable outlet. Soils, seeps, rock outcrops, etc., shall also be taken into consideration when designing benches.

   A. Benches shall be a minimum of six feet wide to provide for ease of maintenance.

   B. Benches shall be designed with a reverse slope of 6:1 or flatter to the toe of the upper slope and with a minimum of one foot in depth. Bench gradient to the outlet shall be between 2 percent and 3 percent, unless accompanied by appropriate design and computations.

   C. The flow length within a bench shall not exceed 800 feet unless accompanied by appropriate design and computations; see Standard and Specifications for Diversion on page 3.9

4. Surface water shall be diverted from the face of all cut and/or fill slopes by the use of diversions, ditches and swales or conveyed downslope by the use of a designed structure, except where:

   A. The face of the slope is or shall be stabilized and the face of all graded slopes shall be protected from surface runoff until they are stabilized.

   B. The face of the slope shall not be subject to any concentrated flows of surface water such as from natural drainage ways, graded ditches, downspouts, etc.

   C. The face of the slope will be protected by anchored stabilization matting, sod, gravel, riprap, or other stabilization method.

5. Cut slopes occurring in ripable rock shall be serrated as shown in Figure 4.9 on page 4.26. The serrations shall be made with conventional equipment as the excavation is made. Each step or serration shall be constructed on the contour and will have steps cut at nominal two-foot intervals with nominal three-foot horizontal shelves. These steps will vary depending on the slope ratio or the cut slope. The nominal slope line is 1 ½: 1. These steps will weather and act to hold moisture, lime, fertilizer, and seed thus producing a much quicker and longer-lived vegetative cover and better slope stabilization. Overland flow shall be diverted from the top of all serrated cut slopes and carried to a suitable outlet.

6. Subsurface drainage shall be provided where necessary to intercept seepage that would otherwise adversely affect slope stability or create excessively wet site conditions.

7. Slopes shall not be created so close to property lines as to endanger adjoining properties without adequately protecting such properties against sedimentation, erosion, slippage, settlement, subsidence, or other related damages.

8. Fill material shall be free of brush, rubbish, rocks, logs, stumps, building debris, and other objectionable material. It should be free of stones over two (2) inches in diameter where compacted by hand or mechanical tampers or over eight (8) inches in diameter where compacted by rollers or other equipment. Frozen material shall not be placed in the fill nor shall the fill material be placed on a frozen foundation.

9. Stockpiles, borrow areas, and spoil shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

10. All disturbed areas shall be stabilized structurally or vegetatively in compliance with the Permanent Construction Area Planting Standard on page 4.42.

Construction Specifications

See Figures 4.9 and 4.10 for details.

1. All graded or disturbed areas, including slopes, shall be protected during clearing and construction in accordance with the erosion and sediment control plan until they are adequately stabilized.

2. All erosion and sediment control practices and measures shall be constructed, applied and maintained in accordance with the erosion and sediment control plan and these standards.

3. Topsoil required for the establishment of vegetation shall be stockpiled in amount necessary to complete finished grading of all exposed areas.

4. Areas to be filled shall be cleared, grubbed, and stripped of topsoil to remove trees, vegetation, roots, or other objectionable material.

5. Areas that are to be topsoiled shall be scarified to a minimum depth of four inches prior to placement of topsoil.

6. All fills shall be compacted as required to reduce erosion, slippage, settlement, subsidence, or other related problems. Fill intended to support buildings, structures, and conduits, etc., shall be compacted in accordance with local requirements or codes.

7. All fill shall be placed and compacted in layers not to exceed 9 inches in thickness.

8. Except for approved landfills or nonstructural fills, fill material shall be free of frozen particles, brush, roots, sod, or other foreign objectionable materials that would interfere with, or prevent, construction of satisfactory fills.

9. Frozen material or soft, mucky or highly compressible materials shall not be incorporated into fill slopes or structural fills.

10. Fill shall not be placed on saturated or frozen surfaces.

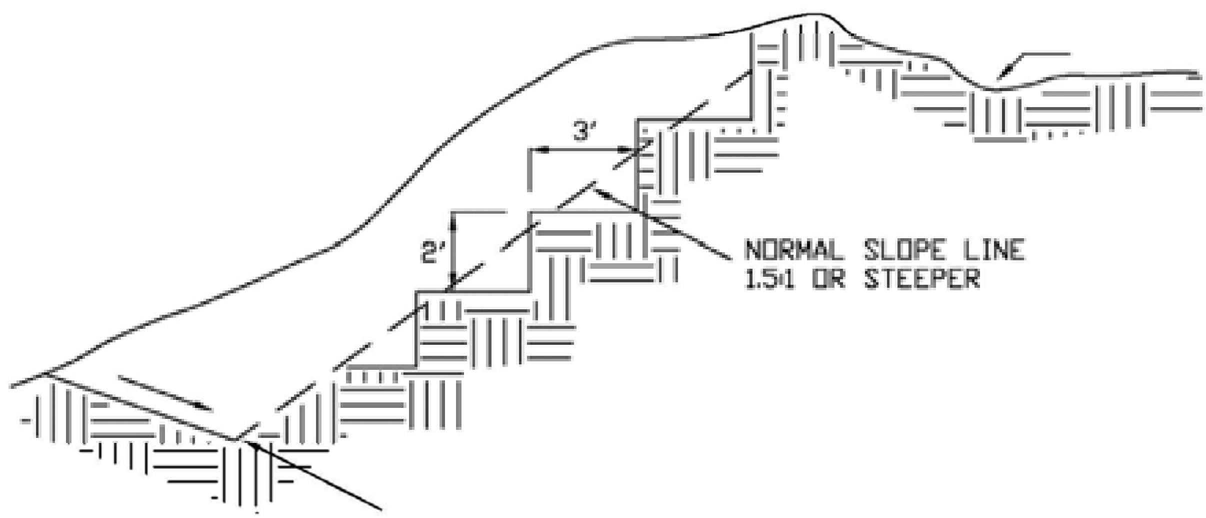
11. All benches shall be kept free of sediment during all phases of development.

12. Seeps or springs encountered during construction shall be handled in accordance with the Standard and Specification for Subsurface Drain on page 3.48 or other approved methods.

13. All graded areas shall be permanently stabilized immediately following finished grading.

14. Stockpiles, borrow areas, and spoil areas shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

Figure 4.9
Typical Section of Serrated Cut Slope



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NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

TYPICAL SECTION OF SERRATED CUT SLOPE

Figure 4.10
Landgrading

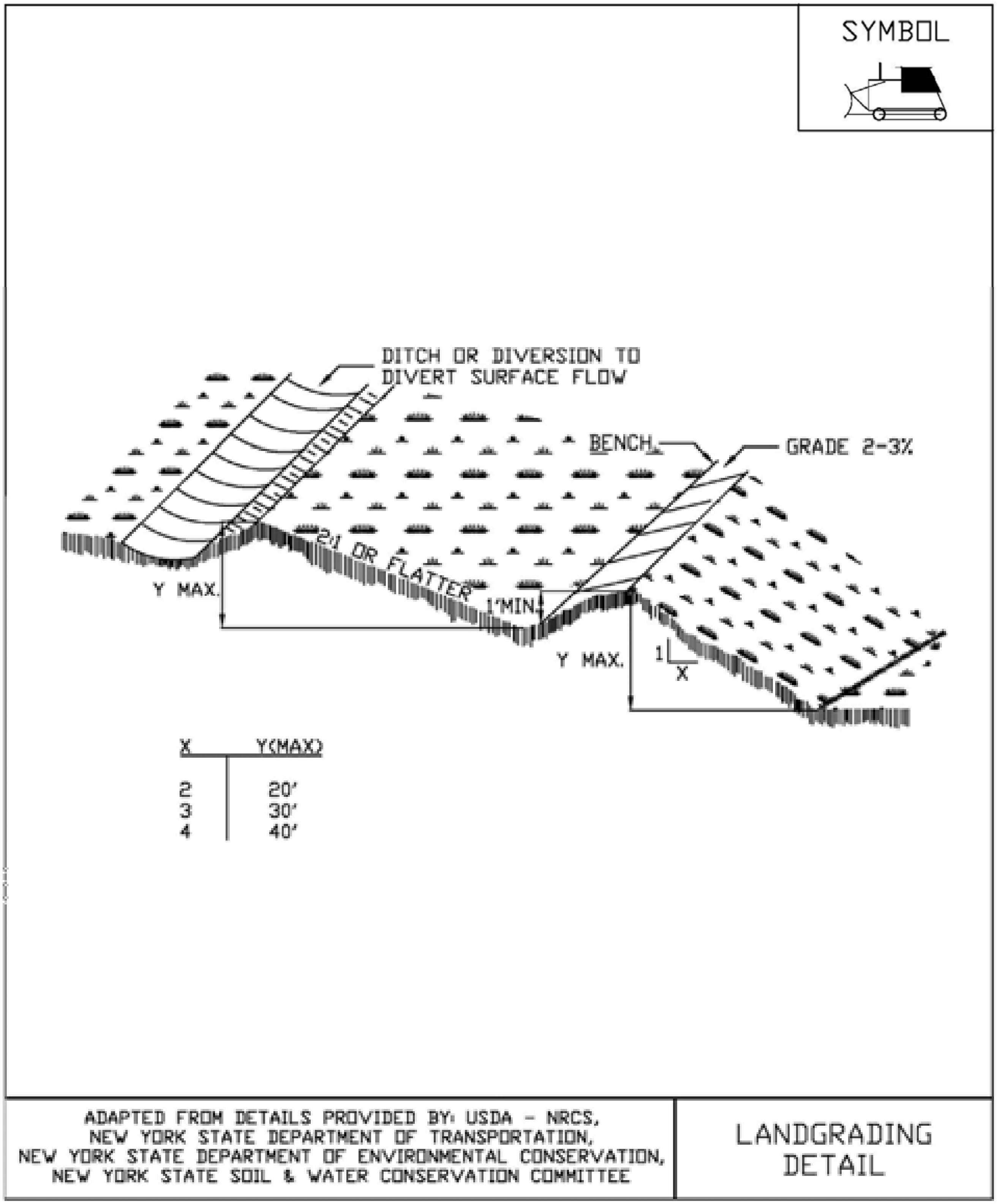


Figure 4.11
Landgrading - Construction Specifications

CONSTRUCTION SPECIFICATIONS

1. ALL GRADED OR DISTURBED AREAS INCLUDING SLOPES SHALL BE PROTECTED DURING CLEARING AND CONSTRUCTION IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN UNTIL THEY ARE PERMANENTLY STABILIZED.
2. ALL SEDIMENT CONTROL PRACTICES AND MEASURES SHALL BE CONSTRUCTED, APPLIED AND MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN.
3. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED IN AMOUNT NECESSARY TO COMPLETE FINISHED GRADING OF ALL EXPOSED AREAS.
4. AREAS TO BE FILLED SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS OR OTHER OBJECTIONABLE MATERIAL.
5. AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF FOUR INCHES PRIOR TO PLACEMENT OF TOPSOIL.
6. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.
7. ALL FILL SHALL BE PLACED AND COMPACTED IN LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.
8. EXCEPT FOR APPROVED LANDFILLS, FILL MATERIAL SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OTHER OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.
9. FROZEN MATERIALS OR SOFT, MUCKY OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED IN FILLS.
10. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES.
11. ALL BENCHES SHALL BE KEPT FREE OF SEDIMENT DURING ALL PHASES OF DEVELOPMENT.
12. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.
13. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY FOLLOWING FINISHED GRADING.
14. STOCKPILES, BORROW AREAS AND SPOIL AREAS SHALL BE SHOWN ON THE PLANS AND SHALL BE SUBJECT TO THE PROVISIONS OF THIS STANDARD AND SPECIFICATION.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	LANDGRADING SPECIFICATIONS

STANDARD AND SPECIFICATIONS FOR LOOSE STABILIZATION BLANKETS

Definition and Scope

Blankets of various materials placed pneumatically, hydraulically, or other means on a prepared planting area or a critical area where existing vegetation can remain to reduce rain splash and sheet erosion and promote vegetative stabilization.

Conditions Where Practice Applies

Loose blankets are an appropriate stabilization practice for any soil surface that is rocky, frozen, flat, or steep. They can be used on streambanks, road cuts and embankments, and construction site areas where stormwater runoff occurs as sheet flow. They should not be used in areas of concentrated flow.

Design Criteria

Compost Blanket

Material: The compost infill shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table. **Note: All biosolids composts produced in New York State (or approved for importation) must meet NYS DEC's 6 NYCRR Part 360 (Soild Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metal content. When using compost blankets adjacent to surface waters, the compost should have a low nutrient value.**

Placement: The method of application and depth of compost depend upon site conditions. Vegetation of the compost blanket is generally archived by incorporating seed into the compost before it is applied. However, seeding may occur after the application if needed.

The compost application rate will be in accordance with the following table. Compost is not recommended for slopes steeper than 2H:1V. Slopes with problem soils and more runoff will require greater application rates.

Compost Application Rates		
Slope Length (ft)	<3H:1V Slopes	3H:1V to 2H:1V Slopes
20 or less	270 cy/acre (2" Layer)	540 cy/acre (4" Layer)
20 to 60	405 cy/acre (3" Layer)	675 cy/acre (5" Layer)
60 to 100	540 cy/acre (4" Layer)	810 cy/acre (6" Layer)*
* For slopes between 2H:1V and 1H:1V use this rate with a max. slope length of 40 ft.		

Construction Specifications

1. Compost shall be placed evenly and must provide 100% soil coverage (no soil visible). On highly unstable soils, use compost in conjunction with appropriate structural measures.
2. Spread the compost uniformly to the design thickness by hand or mechanically (e.g. with a manure spreader, front end loader, dozer, pneumatic blower, etc.) and then track (compact) the compost layer using a bulldozer or other appropriate equipment.
3. When using a pneumatic (blower) unit, shoot the compost directly at soil, to provide a tighter interface between the soil and compost and prevent water from moving between the two layers.
4. Apply compost layer approximately 3 feet beyond the top of the slope or overlap it into existing vegetation.
5. Follow by seeding or ornamental planting as specified.
6. When planting immediate grass, wildflower, or legume seeding or ornamental planting, use only a well composted product that contains no substances toxic to plants.

7. Very coarse composts should be avoided if the slope is to be landscaped or seeded, as it will make planting and crop establishment more difficult. Composts containing fibrous particles that range in size produce a more stable mat.

Hydraulically Applied Blankets

These blankets are formed by mixing different types of materials with water and are then applied using standard hydroseeding equipment. These blankets should not be used in areas of concentrated flow such as ditches and channels.

A. Bonded Fiber Matrix (BFM) - This method makes use of a cross-linked hydrocolloid tackifier to bond thermally processed wood fibers. Application rates vary according to site conditions. For slopes up to 3H:1V the BFM should be applied at a rate of 3,000 lb/acre. Steeper slopes may need as much as 4,000 lb/acre in accordance with the manufacturer's recommendations.

   BFMs should only be used when no rain is forecast for at least 48 hours following the application. This is to allow the tackifier sufficient time to cure properly. Once properly applied, a BFM is very effective in preventing accelerated erosion. **Bonded Fiber Matrix should not be applied between September 30 and April 1 to allow for proper curing of the polymer.**

B. Flexible Growth Medium (FGM) - This method has the added component of 1/2 inch long, crimped manmade fibers which add a mechanical bond to the chemical bond provided by BFMs. This increases the blanket's resistance to both raindrop impact and erosion due to runoff. Unlike BFMs, a flexible growth medium typically does not require a curing time to be effective. Properly applied, an FGM is also very effective.

   There is no need to smooth the slope prior to application. In fact some roughening of the surface (either natural or mechanically induced) is preferable. However, large rocks (≥ 9 inches) and existing rills should be removed prior to application. Mixing and application rates should follow manufacturer's recommendations.

C. Polymer Stabilized Fiber Matrix (PSFM) - PSFMs make use of a linear soil stabilization tackifier that works directly on soil to maintain soil structure, maintain pore space capacity and flocculate dislodged sediment that will significantly reduce runoff turbidity. PSFMs can be used in re-vegetation applications and for site winterization and/or dormant seeding - fall planting for spring germination - applications. Application rates vary according to site conditions and should be in accordance with manufacturers recommendations.

Construction Specifications

BFMs, FGMs and PSFMs are typically applied in two stages. Unless specifically recommended to be applied in one application by the manufacturer, the seed mixture and soil amendments should be applied first. If the seed is applied at the same time as the hydraulically applied blankets, the bonded fibers may keep the seed from making sufficient contact with the soil to germinate. After the seed mixture is applied, the hydraulically applied blankets should be sprayed over the area at the required application rate, according to the manufactures recommendations.

STANDARD AND SPECIFICATIONS FOR MULCHING

Definition and Scope

Applying coarse plant residue or chips, or other suitable materials, to cover the soil surface to provide initial erosion control while a seeding or shrub planting is establishing. Mulch will conserve moisture and modify the surface soil temperature and reduce fluctuation of both. Mulch will prevent soil surface crusting and aid in weed control. Mulch can also be used alone for temporary stabilization in non-growing months. Use of stone as a mulch could be more permanent and should not be limited to non-growing months.

Conditions Where Practice Applies

On soils subject to erosion and on new seedings and shrub plantings. Mulch is useful on soils with low infiltration rates by retarding runoff.

Criteria

Site preparation prior to mulching requires the installation of necessary erosion control or water management practices and drainage systems.

Slope, grade and smooth the site to fit needs of selected mulch products.

Remove all undesirable stones and other debris to meet the needs of the anticipated land use and maintenance required.

Apply mulch after soil amendments and planting is accomplished or simultaneously if hydroseeding is used.

Select appropriate mulch material and application rate or material needs. Hay mulch shall not be used in wetlands or in areas of permanent seeding. Clean straw mulch is preferred alternative in wetland application. Determine local availability.

Select appropriate mulch anchoring material.

NOTE: The best combination for grass/legume establishment is straw (cereal grain) mulch applied at 2 ton/acre (90 lbs./1000sq.ft.) and anchored with wood fiber mulch (hydromulch) at 500 – 750 lbs./acre (11 – 17 lbs./1000 sq. ft.). The wood fiber mulch must be applied through a hydroseeder immediately after mulching.

Table 4.2
Guide to Mulch Materials, Rates, and Uses

Mulch Material	Quality Standards	per 1000 Sq. Ft.	per Acre	Depth of Application	Remarks
Wood chips or shavings	Air-dried. Free of objectionable coarse material	500-900 lbs.	10-20 tons	2-7”	Used primarily around shrub and tree plantings and recreation trails to inhibit weed competition. Resistant to wind blowing. Decomposes slowly.
Wood fiber cellulose (partly digested wood fibers)	Made from natural wood usually with green dye and dispersing agent	50 lbs.	2,000 lbs.	—	Apply with hydromulcher. No tie down required. Less erosion control provided than 2 tons of hay or straw.
Gravel, Crushed Stone or Slag	Washed; Size 2B or 3A—1 1/2”	9 cu. yds.	405 cu. yds.	3”	Excellent mulch for short slopes and around plants and ornamentals. Use 2B where subject to traffic. (Approximately 2,000 lbs./cu. yd.). Frequently used over filter fabric for better weed control.
Hay or Straw	Air-dried; free of undesirable seeds & coarse materials	90-100 lbs. 2-3 bales	2 tons (100-120 bales)	cover about 90% surface	Use small grain straw where mulch is maintained for more than three months. Subject to wind blowing unless anchored. Most commonly used mulching material. Provides the best micro-environment for germinating seeds.
Jute twisted yarn	Undyed, unbleached plain weave. Warp 78 ends/yd., Weft 41 ends/yd. 60-90 lbs./roll	48” x 50 yds. or 48” x 75 yds.	—	—	Use without additional mulch. Tie down as per manufacturers specifications. Good for center line of concentrated water flow.
Excelsior wood fiber mats	Interlocking web of excelsior fibers with photodegradable plastic netting	4’ x 112.5’ or 8’ x 112.5’.	—	—	Use without additional mulch. Excellent for seeding establishment. Anchor as per manufacturers specifications. Approximately 72 lbs./roll for excelsior with plastic on both sides. Use two sided plastic for centerline of waterways.
Straw or coconut fiber, or combination	Photodegradable plastic net on one or two sides	Most are 6.5 ft. x 3.5 ft.	81 rolls	—	Designed to tolerate higher velocity water flow, centerlines of waterways, 60 sq. yds. per roll.

Table 4.3
Mulch Anchoring Guide

Anchoring Method or Material	Kind of Mulch to be Anchored	How to Apply
1. Peg and Twine	Hay or straw	After mulching, divide areas into blocks approximately 1 sq. yd. in size. Drive 4-6 pegs per block to within 2" to 3" of soil surface. Secure mulch to surface by stretching twine between pegs in criss-cross pattern on each block. Secure twine around each peg with 2 or more tight turns. Drive pegs flush with soil. Driving stakes into ground tightens the twine.
2. Mulch netting	Hay or straw	Staple the light-weight paper, jute, wood fiber, or plastic nettings to soil surface according to manufacturer's recommendations. Should be biodegradable. Most products are not suitable for foot traffic.
3. Wood cellulose fiber	Hay or straw	Apply with hydroseeder immediately after mulching. Use 500 lbs. wood fiber per acre. Some products contain an adhesive material ("tackifier"), possibly advantageous.
4. Mulch anchoring tool	Hay or straw	Apply mulch and pull a mulch anchoring tool (blunt, straight discs) over mulch as near to the contour as possible. Mulch material should be "tucked" into soil surface about 3".
5. Tackifier	Hay or straw	Mix and apply polymeric and gum tackifiers according to manufacturer's instructions. Avoid application during rain. A 24-hour curing period and a soil temperature higher than 45^0 Fahrenheit are required.

STANDARD AND SPECIFICATIONS FOR PERMANENT CONSTRUCTION AREA PLANTING

Definition & Scope

Establishing **permanent** grasses with other forbs and/or shrubs to provide a minimum 80% perennial vegetative cover on areas disturbed by construction and critical areas to reduce erosion and sediment transport. Critical areas may include but are not limited to steep excavated cut or fill slopes as well as eroding or denuded natural slopes and areas subject to erosion.

Conditions Where Practice Applies

This practice applies to all disturbed areas void of, or having insufficient, cover to prevent erosion and sediment transport. See additional standards for special situations such as sand dunes and sand and gravel pits.

Criteria

All water control measures will be installed as needed prior to final grading and seedbed preparation. Any severely compacted sections will require chiseling or disking to provide an adequate rooting zone, to a minimum depth of 12", see Soil Restoration Standard. The seedbed must be prepared to allow good soil to seed contact, with the soil not too soft and not too compact. Adequate soil moisture must be present to accomplish this. If surface is powder dry or sticky wet, postpone operations until moisture changes to a favorable condition. If seeding is accomplished within 24 hours of final grading, additional scarification is generally not needed, especially on ditch or stream banks. Remove all stones and other debris from the surface that are greater than 4 inches, or that will interfere with future mowing or maintenance.

Soil amendments should be incorporated into the upper 2 inches of soil when feasible. **The soil should be tested to determine the amounts of amendments needed.** Apply ground agricultural limestone to attain a pH of 6.0 in the upper 2 inches of soil. If soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply commercial fertilizer at 600 lbs. per acre of 5-5-10 or equivalent. If manure is used, apply a quantity to meet the nutrients of the above fertilizer. This requires an appropriate manure analysis prior to applying to the site. Do not use manure on sites to be planted with birdsfoot trefoil or in the path of concentrated water flow.

Seed mixtures may vary depending on location within the state and time of seeding. Generally, warm season grasses should only be seeded during early spring, April to May. These grasses are primarily used for vegetating excessively drained sands and gravels. See Standard and Specification for Sand and Gravel Mine Reclamation. Other grasses may be seeded any time of the year when the soil is not frozen and is workable. When legumes such as birdsfoot trefoil are included, spring seeding is preferred. See Table 4.4, "Permanent Construction Area Planting Mixture Recommendations" for additional seed mixtures.

General Seed Mix:	**Variety**	**lbs./ acre**	**lbs/1000 sq. ft.**
Red Clover[1] OR	Acclaim, Rally, Red Head II, Renegade	8[2]	0.20
Common white clover[1]	Common	8	0.20
PLUS			
Creeping Red Fescue	Common	20	0.45
PLUS			
Smooth Bromegrass OR	Common	2	0.05
Ryegrass (perennial)	Pennfine/Linn	5	0.10

[1] add inoculant immediately prior to seeding
[2] Mix 4 lbs each of Empire and Pardee OR 4 lbs of Birdsfoot and 4 lbs white clover per acre. All seeding rates are given for Pure Live Seed (PLS)

Pure Live Seed, or (PLS) refers to the amount of live seed in a lot of bulk seed. Information on the seed bag label includes the type of seed, supplier, test date, source of seed, purity, and germination. Purity is the percentage of pure seed. Germination is the percentage of pure seed that will produce normal plants when planted under favorable conditions.

To compute Pure Live Seed multiply the "germination percent" times the "purity" and divide that by 100 to get Pure Live Seed.

$$\text{Pure Live Seed (PLS)} = \frac{\%\text{ Germination} \times \%\text{ Purity}}{100}$$

For example, the PLS for a lot of Kentucky Blue grass with 75% purity and 96% germination would be calculated as follows:

$$\frac{(96) \times (75)}{100} = 72\%\text{ Pure Live Seed}$$

For 10lbs of PLS from this lot =

$$\frac{10}{0.72} = 13.9\text{ lbs}$$

Therefore, 13.9 lbs of seed is the actual weight needed to meet 10lbs PSL from this specific seed lot.

Time of Seeding: The optimum timing for the general seed mixture is early spring. Permanent seedings may be made any time of year if properly mulched and adequate moisture is provided. Late June through early August is not a good time to seed, but may facilitate covering the land without additional disturbance if construction is completed. Portions of the seeding may fail due to drought and heat. These areas may need reseeding in late summer/fall or the following spring.

Method of seeding: Broadcasting, drilling, cultipack type seeding, or hydroseeding are acceptable methods. Proper soil to seed contact is key to successful seedings.

Mulching: Mulching is essential to obtain a uniform stand of seeded plants. Optimum benefits of mulching new seedings are obtained with the use of small grain straw applied at a rate of 2 tons per acre, and anchored with a netting or tackifier. See the Standard and Specifications for Mulching for choices and requirements.

Irrigation: Watering may be essential to establish a new seeding when a drought condition occurs shortly after a new seeding emerges. Irrigation is a specialized practice and care must be taken not to exceed the application rate for the soil or subsoil. When disconnecting irrigation pipe, be sure pipes are drained in a safe manor, not creating an erosion concern.

80% Perennial Vegetative Cover

50% Perennial Vegetative Cover

Table 4.4
Permanent Construction Area Planting Mixture Recommendations

Seed Mixture	Variety	Rate in lbs./acre (PLS)	Rate in lbs./ 1, 000 ft^2
Mix #1			
Creeping red fescue	Ensylva, Pennlawn, Boreal	10	.25
Perennial ryegrass	Pennfine, Linn	10	.25
*This mix is used extensively for shaded areas.			
Mix #2			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	20	.50
*This rate is in pure live seed, this would be an excellent choice along the upland edge of a wetland to filter runoff and provide wildlife benefits. In areas where erosion may be a problem, a companion seeding of sand lovegrass should be added to provide quick cover at a rate of 2 lbs. per acre (0.05 lbs. per 1000 sq. ft.).			
Mix #3			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	4	.10
Big bluestem	Niagara	4	.10
Little bluestem	Aldous or Camper	2	.05
Indiangrass	Rumsey	4	.10
Coastal panicgrass	Atlantic	2	.05
Sideoats grama	El Reno or Trailway	2	.05
Wildflower mix		.50	.01
*This mix has been successful on sand and gravel plantings. It is very difficult to seed without a warm season grass seeder such as a Truax seed drill. Broadcasting this seed is very difficult due to the fluffy nature of some of the seed, such as bluestems and indiangrass.			
Mix #4			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	10	.25
Coastal panicgrass	Atlantic	10	.25
*This mix is salt tolerant, a good choice along the upland edge of tidal areas and roadsides.			
Mix #5			
Saltmeadow cordgrass (Spartina patens)—This grass is used for tidal shoreline protection and tidal marsh restoration. It is planted by vegetative stem divisions. 'Cape' American beachgrass can be planted for sand dune stabilization above the saltmeadow cordgrass zone.			
Mix #6			
Creeping red fescue	Ensylva, Pennlawn, Boreal	20	.45
Chewings Fescue	Common	20	.45
Perennial ryegrass	Pennfine, Linn	5	.10
Red Clover	Common	10	.45
*General purpose erosion control mix. Not to be used for a turf planting or play grounds.			

STANDARD AND SPECIFICATIONS FOR SOIL RESTORATION

Definition & Scope

The decompaction of areas of a development site or construction project where soils have been disturbed to recover the original properties and porosity of the soil; thus providing a sustainable growth medium for vegetation, reduction of runoff and filtering of pollutants from stormwater runoff.

Conditions Where Practice Applies

Soil restoration is to be applied to areas whose heavy construction traffic is done and final stabilization is to begin. This is generally applied in the cleanup, site restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate ground cover to maintain the soil structure. Soil restoration measures should be applied over and adjacent to any runoff reduction practices to achieve design performance.

Design Criteria

1. Soil restoration areas will be designated on the plan views of areas to be disturbed.
2. Soil restoration will be completed in accordance with Table 4.6 on page 4.53.

Specification for Full Soil Restoration

During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

1. Apply 3 inches of compost over subsoil. The compost shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table, except for "Particle Size" 100% will pass the 1/2" sieve. **Note: All biosolids compost produced in New York State (or approved for importation) must meet NYS DEC's 6 NYCRR Part 360 (Solid Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metals content.**

2. Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor mounted disc, or tiller, to mix and circulate air and compost into the subsoil.
3. Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.
4. Apply topsoil to a depth of 6 inches.
5. Vegetate as required by the seeding plan. Use appropriate ground cover with deep roots to maintain the soil structure.
6. Topsoil may be manufactured as a mixture or a mineral component and organic material such as compost.

At the end of the project an inspector should be able to push a 3/8” metal bar 12 inches into the soil just with body weight. This should not be performed within the drip line of any existing trees or over utility installations that are within 24 inches of the surface.

Maintenance

Keep the site free of vehicular and foot traffic or other weight loads. Consider pedestrian footpaths.

Table 4.6
Soil Restoration Requirements

<table>
<tr><th>Type of Soil Disturbance</th><th colspan="2">Soil Restoration Requirement</th><th>Comments/Examples</th></tr>
<tr><td>No soil disturbance</td><td colspan="2">Restoration not permitted</td><td>Preservation of Natural Features</td></tr>
<tr><td>Minimal soil disturbance</td><td colspan="2">Restoration not required</td><td>Clearing and grubbing</td></tr>
<tr><td rowspan="2">Areas where topsoil is stripped only - no change in grade</td><td>HSG A&B</td><td>HSG C&D</td><td rowspan="2">Protect area from any ongoing construction activities.</td></tr>
<tr><td>Apply 6 inches of topsoil</td><td>Aerate* and apply 6 inches of topsoil</td></tr>
<tr><td rowspan="2">Areas of cut or fill</td><td>HSG A&B</td><td>HSG C&D</td><td rowspan="2"></td></tr>
<tr><td>Aerate* and apply 6 inches of topsoil</td><td>Apply full Soil Restoration**</td></tr>
<tr><td>Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)</td><td colspan="2">Apply full Soil Restoration (decompaction and compost enhancement)</td><td></td></tr>
<tr><td>Areas where Runoff Reduction and/or Infiltration practices are applied</td><td colspan="2">Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.</td><td>Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area</td></tr>
<tr><td>Redevelopment projects</td><td colspan="2">Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.</td><td></td></tr>
<tr><td colspan="4">* Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.
** Per “Deep Ripping and De-compaction, DEC 2008”.</td></tr>
</table>

STANDARD AND SPECIFICATIONS FOR TEMPORARY CONSTRUCTION AREA SEEDING

Definition & Scope

Providing temporary erosion control protection to disturbed areas and/or localized critical areas for an interim period by covering all bare ground that exists as a result of construction activities or a natural event. Critical areas may include but are not limited to steep excavated cut or fill slopes and any disturbed, denuded natural slopes subject to erosion.

Conditions Where Practice Applies

Temporary seedings may be necessary on construction sites to protect an area, or section, where final grading is complete, when preparing for winter work shutdown, or to provide cover when permanent seedings are likely to fail due to mid-summer heat and drought. The intent is to provide temporary protective cover during temporary shutdown of construction and/or while waiting for optimal planting time.

Criteria

Water management practices must be installed as appropriate for site conditions. The area must be rough graded and slopes physically stable. Large debris and rocks are usually removed. Seedbed must be seeded within 24 hours of disturbance or scarification of the soil surface will be necessary prior to seeding.

Fertilizer or lime are not typically used for temporary seedings.

IF: Spring or summer or early fall, then seed the area with ryegrass (annual or perennial) at 30 lbs. per acre (Approximately 0.7 lb./1000 sq. ft. or use 1 lb./1000 sq. ft.).

IF: Late fall or early winter, then seed Certified 'Aroostook' winter rye (cereal rye) at 100 lbs. per acre (2.5 lbs./1000 sq. ft.).

Any seeding method may be used that will provide uniform application of seed to the area and result in relatively good soil to seed contact.

Mulch the area with hay or straw at 2 tons/acre (approx. 90 lbs./1000 sq. ft. or 2 bales). Quality of hay or straw mulch allowable will be determined based on long term use and visual concerns. Mulch anchoring will be required where wind or areas of concentrated water are of concern. Wood fiber hydromulch or other sprayable products approved for erosion control (nylon web or mesh) may be used if applied according to manufacturers' specification. Caution is advised when using nylon or other synthetic products. They may be difficult to remove prior to final seeding and can be a hazard to young wildlife species.

STANDARD AND SPECIFICATIONS FOR TOPSOILING

Definition & Scope

Spreading a specified quality and quantity of topsoil materials on graded or constructed subsoil areas to provide acceptable plant cover growing conditions, thereby reducing erosion; to reduce irrigation water needs; and to reduce the need for nitrogen fertilizer application.

Conditions Where Practice Applies

Topsoil is applied to subsoils that are droughty (low available moisture for plants), stony, slowly permeable, salty or extremely acid. It is also used to backfill around shrub and tree transplants. This standard does not apply to wetland soils.

Design Criteria

1. Preserve existing topsoil in place where possible, thereby reducing the need for added topsoil.
2. Conserve by stockpiling topsoil and friable fine textured subsoils that must be stripped from the excavated site and applied after final grading where vegetation will be established. Topsoil stockpiles must be stabilized. Stockpile surfaces can be stabilized by vegetation, geotextile or plastic covers. This can be aided by orientating the stockpile lengthwise into prevailing winds.
3. Refer to USDA Natural Resource Conservation Service soil surveys or soil interpretation record sheets for further soil texture information for selecting appropriate design topsoil depths.

Site Preparation

1. As needed, install erosion and sediment control practices such as diversions, channels, sediment traps, and stabilizing measures, or maintain if already installed.
2. Complete rough grading and final grade, allowing for depth of topsoil to be added.
3. Scarify all compact, slowly permeable, medium and fine textured subsoil areas. Scarify at approximately right angles to the slope direction in soil areas that are steeper than 5 percent. Areas that have been overly compacted shall be decompacted in accordance with the Soil Restoration Standard.
4. Remove refuse, woody plant parts, stones over 3 inches in diameter, and other litter.

Topsoil Materials

1. Topsoil shall have at least 6 percent by weight of fine textured stable organic material, and no greater than 20 percent. Muck soil shall not be considered topsoil.
2. Topsoil shall have not less than 20 percent fine textured material (passing the NO. 200 sieve) and not more than 15 percent clay.
3. Topsoil treated with soil sterilants or herbicides shall be so identified to the purchaser.
4. Topsoil shall be relatively free of stones over 1 1/2 inches in diameter, trash, noxious weeds such as nut sedge and quackgrass, and will have less than 10 percent gravel.
5. Topsoil containing soluble salts greater than 500 parts per million shall not be used.
6. Topsoil may be manufactured as a mixture of a mineral component and organic material such as compost.

Application and Grading

1. Topsoil shall be distributed to a uniform depth over the area. It shall not be placed when it is partly frozen, muddy, or on frozen slopes or over ice, snow, or standing water puddles.
2. Topsoil placed and graded on slopes steeper than 5 percent shall be promptly fertilized, seeded, mulched, and stabilized by “tracking” with suitable equipment.
3. Apply topsoil in the amounts shown in Table 4.7 below:

Table 4.7 - Topsoil Application Depth		
Site Conditions	**Intended Use**	**Minimum Topsoil Depth**
1. Deep sand or loamy sand	Mowed lawn	6 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	1 in.
2. Deep sandy loam	Mowed lawn	5 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	none
3. Six inches or more: silt loam, clay loam, loam, or silt	Mowed lawn	4 in.
	Tall legumes, unmowed	1 in.
	Tall grass, unmowed	1 in.

STANDARD AND SPECIFICATIONS FOR COFFERDAM STRUCTURES

Definition & Scope

A **temporary** barrier placed at a worksite to prevent water from flooding the work area so that construction can take place without discharging sediment into the water resource.

Condition Where Practice Applies

Temporary coffer dams are used to separate streams, rivers, lakes, and other sources of surface water from adjacent locations where soil disturbances are undertaken to complete construction. These barriers can be constructed of manufactured components such as geotextile/plastic tubes filled with water, portable dams formed by metal framing with a geo-membrane, or conventionally constructed earth and stone dike systems.

Design Criteria

The maximum height for this application is 10 feet. No construction activity shall commence in the area of the cofferdam until it is completed and stabilized.

Water Filled Structures

1. These structures shall be sized and installed according to the manufacturers recommendations.
2. Adequate freeboard must be provided to prevent flotation during high water events and periods of below freezing temperatures.
3. The foundation shall be prepared to provide full bottom contact prior to filling.
4. An interior dewatering system shall be designed within the work area to manage seepage.
5. The ends of the water structures shall be anchored on the stream banks or shorelines at an elevation at least above the top of the structure.

Structural Component Dams

1. These structures shall be sized and installed in accordance with the manufacturers recommendations.
2. The foundation area for the placement of the structural steel framing and the impervious fabric membrane shall be as directed by the manufacturer or by qualified personnel.
3. Dewatering the interior of the coffer dam will be done in a manner that does not disturb the foundation area of the structural frame.
4. A minimum of 2 feet of freeboard shall be provided above the expected high water elevation.

Earthen Coffer Dams

1. The earthen coffer dam shall be constructed of fill material that will preclude the transmission of water through the dam, or contain an impermeable core.
2. The minimum top width shall be 8 feet with 2:1 side slopes, and compacted in 9 inch lifts with a minimum of 4 passes of construction equipment.
3. The outside slope shall be covered with a 1 foot layer of rock riprap over a graded stone bedding or geotextile to prevent erosion of soil material into water. An alternative method is to cover the outside slope with an anchored plastic cover with a minimum thickness of 20 mil.
4. Interior work will be conducted in a manner that will not disturb or undermine the earthen coffer dam or its foundation.

Inspection and Maintenance

1. All cofferdams will be inspected daily to assure proper performance and stability as vibration from construction equipment can cause disturbance of the structures.
2. Particular attention should be given to the foundation support system at perimeter of structural component dams. Any undermined or settled areas shall be restored immediately.

3. Any holes, leaks, or torn areas in the geo-membranes or fabric shall be repaired immediately.

4. Any shifting, movement, or settling of the coffer dam shall be addressed immediately to protect workers in the construction area.

5. Inspect the interior dewatering system and ensure that the system is discharging clean water, or is being pumped to appropriate sediment control facility prior to returning to the water resource.

6. Repair or replace any loss of rock riprap or fill that may occur and assure the top of the coffer dam is level without any low spots due to settling.

7. Upon completion of the construction work, remove all excess material, accumulated sediment and debris from the work area, and remove the cofferdam in accordance with the site stabilization plan.

STANDARD AND SPECIFICATIONS FOR COMPOST FILTER SOCK

Definition & Scope

A **temporary** sediment control practice composed of a degradable geotextile mesh tube filled with compost filter media to filter sediment and other pollutants associated with construction activity to prevent their migration offsite.

Condition Where Practice Applies

Compost filter socks can be used in many construction site applications where erosion will occur in the form of sheet erosion and there is no concentration of water flowing to the sock. In areas with steep slopes and/or rocky terrain, soil conditions must be such that good continuous contact between the sock and the soil is maintained throughout its length. For use on impervious surfaces such as road pavement or parking areas, proper anchorage must be provided to prevent shifting of the sock or separation of the contact between the sock and the pavement. Compost filter socks are utilized both at the site perimeter as well as within the construction areas. These socks may be filled after placement by blowing compost into the tube pneumatically, or filled at a staging location and moved into its designed location.

Design Criteria

1. Compost filter socks will be placed on the contour with both terminal ends of the sock extended 8 feet upslope at a 45 degree angle to prevent bypass flow.

2. Diameters designed for use shall be 12” – 32” except that 8” diameter socks may be used for residential lots to control areas less than 0.25 acres.

3. The flat dimension of the sock shall be at least 1.5 times the nominal diameter.

4. The **Maximum Slope Length** (in feet) above a compost filter sock shall not exceed the following limits:

Dia. (in.)	Slope %						
	2	5	10	20	25	33	50
8	225*	200	100	50	20	—	—
12	250	225	125	65	50	40	25
18	275	250	150	70	55	45	30
24	350	275	200	130	100	60	35
32	450	325	275	150	120	75	50
* Length in feet							

5. The compost infill shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table. **Note: All biosolids compost produced in New York State (or approved for importation) must meet NYS DEC’s 6 NYCRR Part 360 (Solid Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metals content. When using compost filter socks adjacent to surface water, the compost should have a low nutrient value.**

6. The compost filter sock fabric material shall meet the

7. Compost filter socks shall be anchored in earth with 2" x 2" wooden stakes driven 12" into the soil on 10 foot centers on the centerline of the sock. On uneven terrain, effective ground contact can be enhanced by the placement of a fillet of filter media on the disturbed area side of the compost sock.

8. All specific construction details and material specifications shall appear on the erosion and sediment control constructions drawings when compost filter socks are included in the plan.

Maintenance

1. Traffic shall not be permitted to cross filter socks.

2. Accumulated sediment shall be removed when it reaches half the above ground height of the sock and disposed of in accordance with the plan.

3. Socks shall be inspected weekly and after each runoff event. Damaged socks shall be repaired in the manner required by the manufacturer or replaced within 24 hours of inspection notification.

4. Biodegradable filter socks shall be replaced after 6 months; photodegradable filter socks after 1 year. Polypropylene socks shall be replaced according to the manufacturer's recommendations.

5. Upon stabilization of the area contributory to the sock, stakes shall be removed. The sock may be left in place and vegetated or removed in accordance with the stabilization plan. For removal the mesh can be cut and the compost spread as an additional mulch to act as a soil supplement.

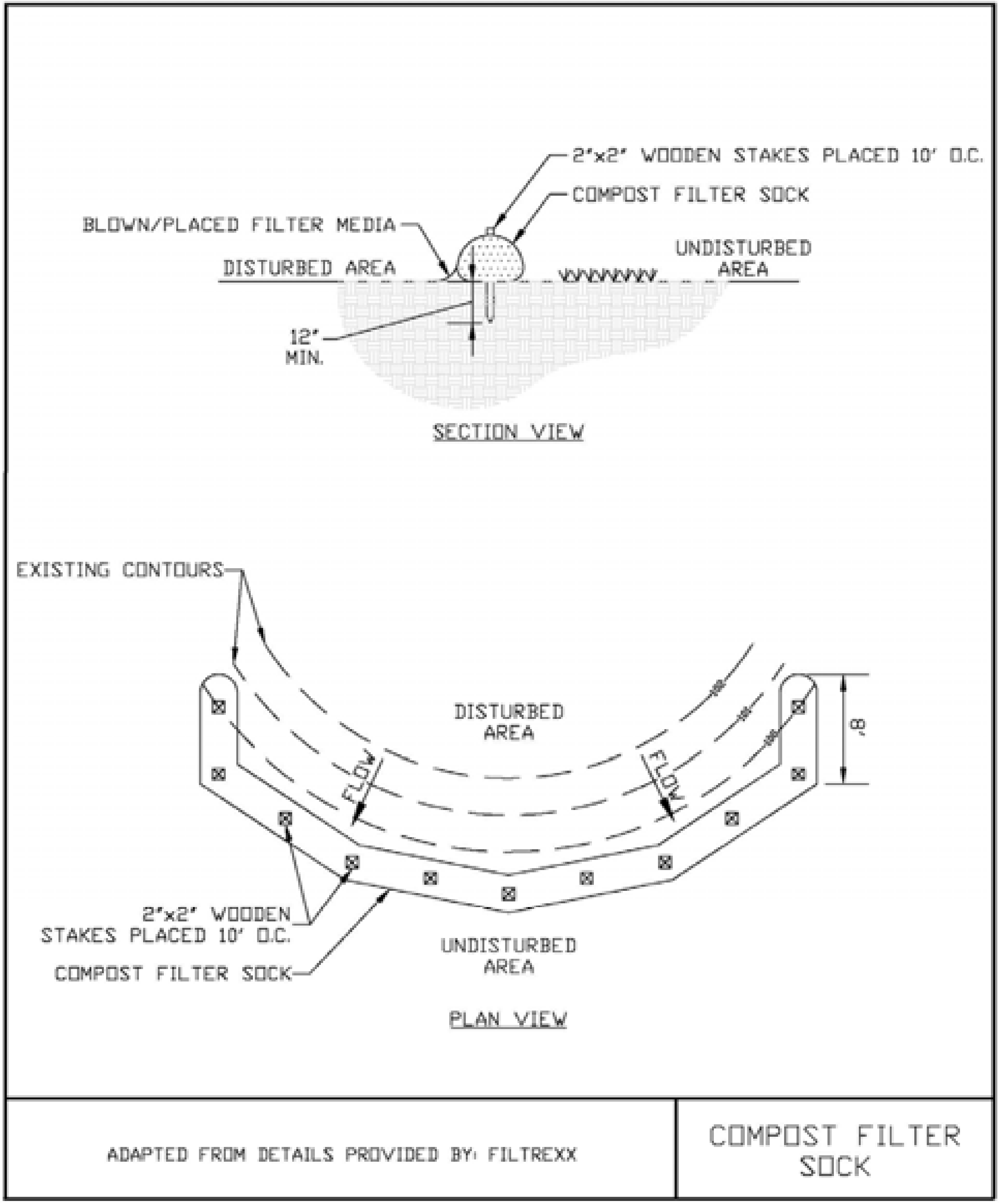
Table 5.1 - Compost Sock Fabric Minimum Specifications Table

Material Type	3 mil HDPE	5 mil HDPE	5 mil HDPE	Multi-Filament Polypropylene (MFPP)	Heavy Duty Multi-Filament Polypropylene (HDMFPP)
Material Characteristics	Photodegradable	Photodegradable	Biodegradable	Photodegradable	Photodegradable
Sock Diameters	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
Mesh Opening	3/8"	3/8"	3/8"	3/8"	1/8"
Tensile Strength		26 psi	26 psi	44 psi	202 psi
Ultraviolet Stability % Original Strength (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
Minimum Functional Longevity	6 months	9 months	6 months	1 year	2 years

Table 5.2 - Compost Standards Table

Organic matter content	25% - 100% (dry weight)
Organic portion	Fibrous and elongated
pH	6.0 – 8.0
Moisture content	30% - 60%
Particle size	100% passing a 1" screen and 10 - 50% passing a 3/8" screen
Soluble salt concentration	5.0 dS/m (mmhos/cm) maximum

Figure 5.2
Compost Filter Sock



STANDARD AND SPECIFICATIONS FOR GEOTEXTILE FILTER BAG

Definition & Scope

A **temporary** portable device through which sediment laden water is pumped to trap and retain sediment prior to its discharge to drainageways or off-site.

Condition Where Practice Applies

On sites where space is limited such as urban construction or linear projects (e.g. roads and utility work) where rights-of-way are limited and larger de-silting practices are impractical.

Design Criteria

1. Location - The portable filter bag should be located to minimize interference with construction activities and pedestrian traffic. It should also be placed in a location that is vegetated, relatively level, and provides for ease of access by heavy equipment, cleanout, disposal of trapped sediment, and proper release of filtered water.

   The filter bag shall also be placed at least 50 feet from all wetlands, streams or other surface waters.

2. Size - Geotextile filter bag shall be sized in accordance with the manufacturers recommendations based on the pump discharge rate.

Materials and Installation

1. The geotextile material will have the following attributes:

Minimum Grab Tensile Strength	200 lbs.
Minimum Grab Tensile Elongation	50 %
Minimum Trapezoid Tear Strength	80 lbs.
Mullen Burst Strength	380 psi
Minimum Puncture Strength	130 lbs
Apparent Opening Size	40 - 80 US sieve
Minimum UV Resistance	70%
Minimum Flow Thru Rate	70 gpm/sq ft

2. The bag shall be sewn with a double needle machine using high strength thread, double stitched “Joe” type capable of minimum roll strength of 100 lbs/inch (ASTM D4884).

3. The geotextile filter bag shall have an opening large enough to accommodate a 4 inch diameter discharge hose with an attached strap to tie off the bag to the hose to prevent back flow.

4. The geotextile shall be placed on a gravel bed 2 inches thick, a straw mat 4 inches thick, or a vegetated filter strip to allow water to flow out of the bag in all directions.

Maintenance

1. The geotextile filter bag is considered full when remaining bag flow area has been reduced by 75%. At this point, it should be replaced with a new bag.

2. Disposal may be accomplished by removing the bag to an appropriate designated upland area, cut open, remove the geotextile for disposal, and spread sediment contents and seeded and mulched according to the vegetative plan.

STANDARD AND SPECIFICATIONS FOR SILT FENCE

Definition & Scope

A **temporary** barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil by temporarily ponding the sediment laden runoff allowing settling to occur. The maximum period of use is limited by the ultraviolet stability of the fabric (approximately one year).

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope length and fence length will not exceed the limits shown in the Design Criteria for the specific type of silt fence used ; and

2. Maximum ponding depth of 1.5 feet behind the fence; and

3. Erosion would occur in the form of sheet erosion; and

4. There is no concentration of water flowing to the barrier; and

5. Soil conditions allow for proper keying of fabric, or other anchorage, to prevent blowouts.

Design Criteria

1. Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff.

2. All silt fences shall be placed as close to the disturbed area as possible, but at least 10 feet from the toe of a slope steeper than 3H:1V, to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized.

3. The type of silt fence specified for each location on the plan shall not exceed the maximum slope length and maximum fence length requirements shown in the following table:

		Slope Length/Fence Length (ft.)		
Slope	Steepness	Standard	Reinforced	Super
<2%	< 50:1	300/1500	N/A	N/A
2-10%	50:1 to 10:1	125/1000	250/2000	300/2500
10-20%	10:1 to 5:1	100/750	150/1000	200/1000
20-33%	5:1 to 3:1	60/500	80/750	100/1000
33-50%	3:1 to 2:1	40/250	70/350	100/500
>50%	> 2:1	20/125	30/175	50/250

Standard Silt Fence (SF) is fabric rolls stapled to wooden stakes driven 16 inches in the ground.
Reinforced Silt Fence (RSF) is fabric placed against welded wire fabric with anchored steel posts driven 16 inches in the ground.
Super Silt Fence (SSF) is fabric placed against chain link fence as support backing with posts driven 3 feet in the ground.

4. Silt fence shall be removed as soon as the disturbed area has achieved final stabilization.

The silt fence shall be installed in accordance with the appropriate details. Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. Butt joints are not acceptable. A detail of the silt fence shall be shown on the plan. See Figure 5.30 on page 5.56 for Reinforced Silt Fence as an example of details to be provided.

Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	110	ASTM D 4632
Elongation at Failure (%)	20	ASTM D 4632
Mullen Burst Strength (PSI)	300	ASTM D 3786
Puncture Strength (lbs)	60	ASTM D 4833
Minimum Trapezoidal Tear Strength (lbs)	50	ASTM D 4533
Flow Through Rate (gal/min/sf)	25	ASTM D 4491
Equivalent Opening Size	40-80	US Std Sieve ASTM D 4751
Minimum UV Residual (%)	70	ASTM D 4355

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.5 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot. Posts for super silt fence shall be standard chain link fence posts.

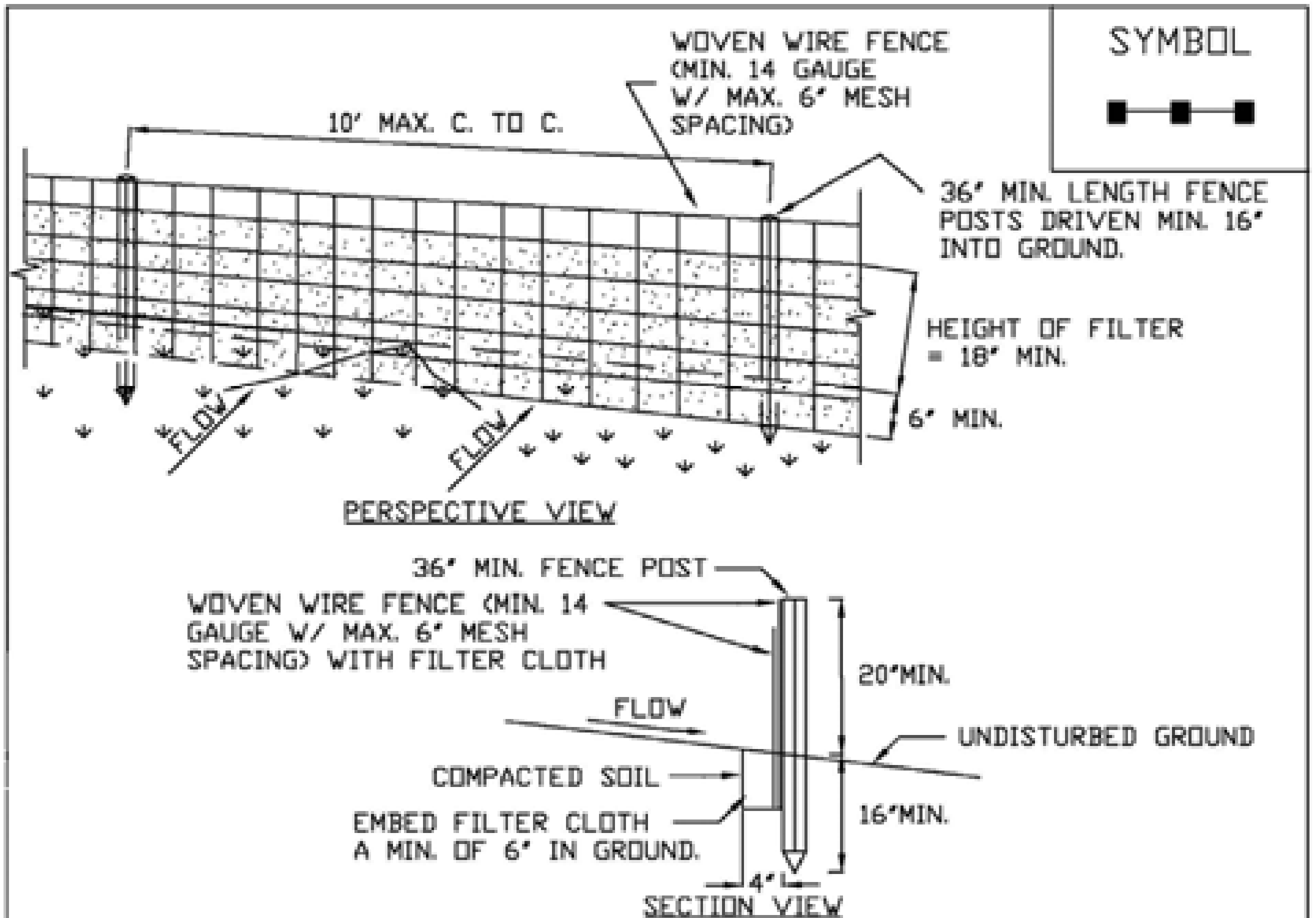
3. Wire Fence for reinforced silt fence: Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

4. Prefabricated silt fence is acceptable as long as all material specifications are met.

Reinforced Silt Fence

Super Silt Fence

Figure 5.30
Reinforced Silt Fence



CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL MEET THE MINIMUM REQUIREMENTS SHOWN.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	REINFORCED SILT FENCE

STANDARD AND SPECIFICATIONS FOR STRAW BALE DIKE

Definition & Scope

A **temporary** barrier of straw, or similar material, used to intercept sediment laden runoff from small drainage areas of disturbed soil to reduce runoff velocity and effect deposition of the transported sediment load. Straw bale dikes have an estimated design life of three (3) months.

Condition Where Practice Applies

The straw bale dike is used where:

1. No other practice is feasible.

2. There is no concentration of water in a channel or other drainageway above the barrier.

3. Erosion would occur in the form of sheet erosion.

4. Length of slope above the straw bale dike does not exceed the following limits with the bale placed 10 feet from the toe of the slope:

Constructed Slope	Percent Slope	Slope Length (ft.)
2:1	50	25
3:1	33	50
4:1	25	75

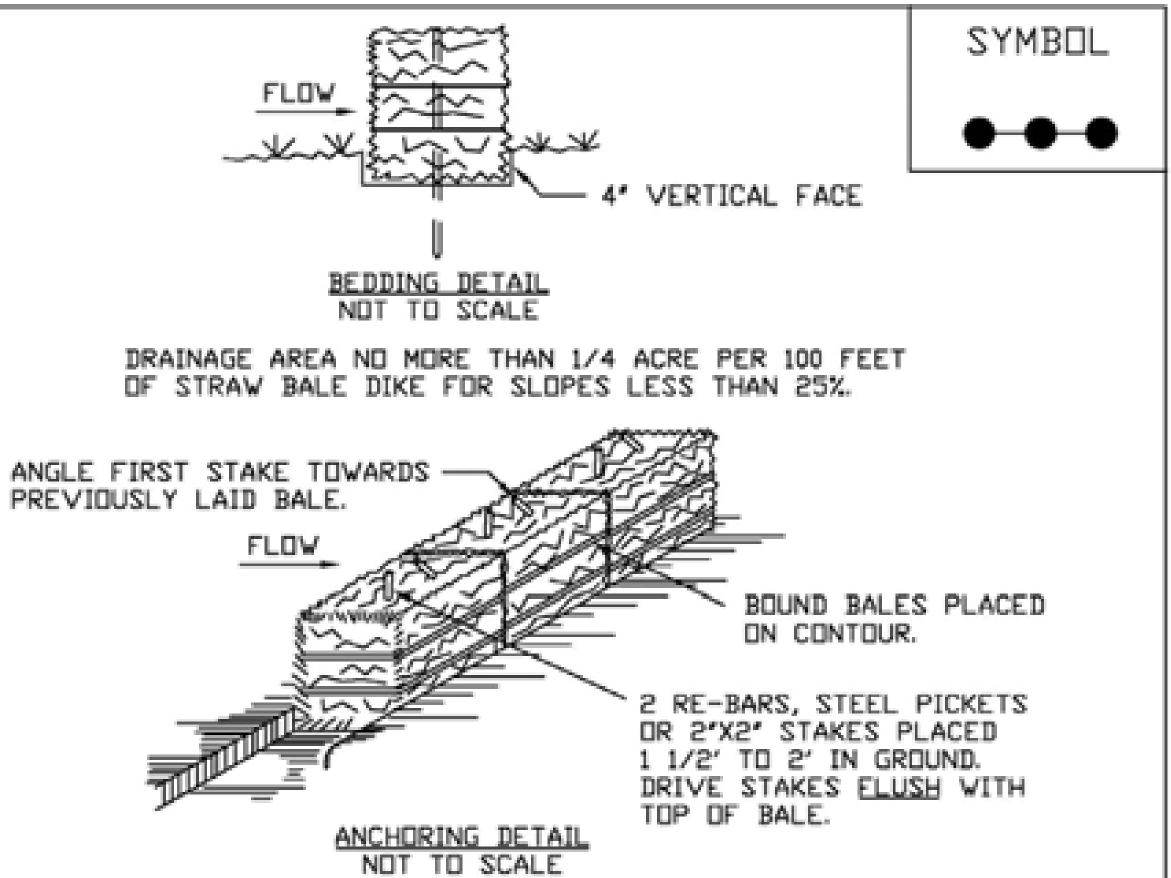
Where slope gradient changes through the drainage area, steepness refers to the steepest slope section contributing to the straw bale dike.

The practice may also be used for a single family lot if the slope is less than 15 percent. The contributing drainage areas in this instance shall be less than one quarter of an acre per 100 feet of dike and the length of slope above the dike shall be less than 100 feet.

Design Criteria

The above table is adequate, in general, for a one-inch rainfall event. Larger storms could cause failure of this practice. Use of this practice in sensitive areas for longer than one month should be specifically designed to store expected runoff. All bales shall be placed on the contour with cut edge of bale adhering to the ground. See Figure 5.34 on page 5.64 for details.

Figure 5.34
Straw Bale Dike



CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED AT THE TOE OF A SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF (4) INCHES, AND PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULLNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STRAW BALE DIKE

Appendix H – Spill Cleanup and Reporting Guidance

-NYSDEC Technical Field Guidance: Spill Reporting and Initial Notification Requirements -

- NYSDEC CP-51: Soil Cleanup Guidance -

Appendix H – NYSDEC Technical Field Guidance: Spill Reporting and Initial Notification Requirements

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATION REQUIREMENTS

NOTES

Spill Reporting and Initial Notification Requirements

GUIDANCE SUMMARY AT-A-GLANCE

- Reporting spills is a crucial first step in the response process.
- You should understand the spill reporting requirements to be able to inform the spillers of their responsibilities.
- Several different state, local, and federal laws and regulations require spillers to report petroleum and hazardous materials spills.
- The state and federal reporting requirements are summarized in Exhibit 1.1-1.
- Petroleum spills must be reported to DEC unless they meet all of the following criteria:
  - The spill is known to be less than 5 gallons; and
  - The spill is contained and under the control of the spiller; and
  - The spill has not and will not reach the State's water or any land; and
  - The spill is cleaned up within 2 hours of discovery.

  All reportable petroleum spills and most hazardous materials spills must be reported to DEC hotline (1-800-457-7362) within New York State; and (1-518 457-7362) from outside New York State. For spills not deemed reportable, it is strongly recommended that the facts concerning the incident be documented by the spiller and a record maintained for one year.
- Inform the spiller to report the spill to other federal or local authorities, if required.
- Report yourself those spills for which you are unable to locate the responsible spiller.
- Make note of other agencies' emergency response telephone numbers in case you require their on-scene assistance, or if the response is their responsibility and not BSPR's.

NOTES

1.1.1 Notification Requirements for Oil Spills and Hazardous Material Spills

Spillers are required under state law and under certain local and federal laws to report spills. These various requirements, summarized in Exhibit 1.1-1, often overlap; that is, a particular spill might be required to be reported under several laws or regulations and to several authorities. Under state law, all petroleum and most hazardous material spills must be reported to DEC Hotline (1-800-457-7362), within New York State, and to 1-518-457-7362 from outside New York State. Prompt reporting by spillers allows for a quick response, which may reduce the likelihood of any adverse impact to human health and the environment. Yo will often have to inform spillers of there responsibilities.

Although the spiller is responsible for reporting spills, other persons with knowledge of a spill, leak, or discharge is required to report the incident (see Appendices A and B). You will often have to inform spillers of their responsibilities. You may also have to report spills yourself in situations where the spiller is not known or cannot be located. However, it is the legal responsibility of the spiller to report spills to both state and other authorities.

BSPR personnel also are responsible for notifying other response agencies when the expertise or assistance of other agencies is needed. For example, the local fire department should be notified of spills that pose a potential explosion and/or fire hazard. If such a hazard is detected and the fire department has not been notified, call for their assistance immediately. Fire departments are trained and equipped to respond to these situations; you should not proceed with your response until the fire/safety hazard is eliminated. For more information on interagency coordination in emergency situations see Part 1, Section 3, Emergency Response.

Another important responsibility is notifying health department officials when a drinking water supply is found to be contaminated as a result of a spill. It will be the health department's responsibility to advise you on the health risk associated with any contamination.

Exhibits 1.1-1 and 1.1-2 list the state and federal requirements to report petroleum and hazardous substance spills, respectively. The charts describe the type of material covered, the applicable act or regulation, the agency that must be notified, what must be reported, and the person responsible for reporting. New York state also has a emergency notification network for spill situations (e.g., major chemical releases) that escalate beyond the capabilities of local and regional response agencies/authorities to provide adequate response. The New York State Emergency Management Office (SEMO) coordinates emergency response activities among local, state, and federal government organizations in these cases.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Petroleum from any source	Navigation Law Article 12; 17 NYCRR 32.3 and 32.4	DEC Hotline 1-800-457-7362	The notification of a discharge must be immediate, but in no case later than two hours after discharge. 1. Name of person making report and his relationship to any person which might be responsible for causing the discharge. 2. Time and date of discharge. 3. Probable source of discharge. 4. The location of the discharge, both geographic and with respect to bodies of water. 5. Type of petroleum discharges. 6. Possible health or fire hazards resulting from the discharge. 7. Amount of petroleum discharged. 8. All actions that are being taken to clean up and remove the discharge. 9. The personnel presently on the scene. 10. Other government agencies that have been or will be notified.	Any person causing discharge of petroleum. Owner or person in actual or constructive control must notify DEC unless that person has adequate assurance that such notice has already been given.
All aboveground petroleum and underground storage facilities with a combined storage capacity of over 1100 gallons.	ECL §17-1007; 6 NYCRR §613.8	DEC Hotline 1-800-457-7362	1. Report spill incident within two hours of discovery. 2. Also when results of any inventory, record, test, or inspection shows a facility is leaking, that fact must be reported within two hours of discovery.	Any person with knowledge of a spill, leak, or discharge.
Petroleum contaminated with PCB.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of PCB oil.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Any liquid (petroleum included) that if released would be likely to pollute lands or waters of the state.	ECL §17-1743	DEC Hotline 1-800-457-7362	Immediate notification that a spill, release, or discharge of any amount has occurred. Owner or person in actual or constructive possession or control of more than 1,100 gallons of the liquid.	
Petroleum Discharge in violation of §311(b)(3) of the Clean Water Act	40 CFR §110.10 (Clean Water Act)	1. National Response Center (NRC) 1-800-424-8802. 2. If not possible to notify NRC, notify Coast Guard or predesignated on-scene coordinator. 3. If not possible to notify either 1 or 2, reports may be made immediately to nearest Coast Guard units, provided NRC notified as soon as possible.	Immediate notification as soon as there is knowledge of an oil discharge that violates water quality standards or causes sheen on navigable waters. Procedures for notice are set forth in 33 CFR Part 153, Subpart B, and in the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, Subpart E.	Person in charge of vessel or on-shore or off-shore facility.
Petroleum, petroleum by-products or other dangerous liquid commodities that may create a hazardous or toxic condition spilled into navigable waters.	33 CFR 126.29 (Ports and Waters Safety Act)	Captain of the Port or District Commander	As soon as discharge occurs, owner or master of vessel must immediately report that a discharge has occurred.	Owner or master of vessel or owner or operator of the facility at which the discharge occurred.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Petroleum or hazardous substance from a vessel, on-shore or off-shore facility in violation of §311(b)(3) of the Clean Water Act.	33 CFR 153.203 (Clean Water Act)	1. NRC U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; 1-800-424-8802. 2. Where direct reporting not practicable, reports may be made to the Coast Guard (District Offices), the 3rd and 9th district of the EPA regional office at 26 Federal Plaza, NY, NY 10278; 1-201-548-8730. 3. Where none of the above is possible, may contact nearest Coast Guard unit, provided NRC notified as soon as possible.	Any discharger shall immediately notify the NRC of such discharge.	Person in charge of vessel or facility.

Exhibit 1.1-2

State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Any hazardous substance pursuant to Article 37. Does not include petroleum.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597; ECL 40-0113(d)	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of a hazardous substance.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.
Hazardous materials or substances as defined in 49 CFR §171.8 that are transported. (See federal reporting requirements.)	Transportation Law 14(f); 17 NYCRR 507.4(b)	Local fire department or police department or local municipality	Immediate notification must be given of incident in which any of the following occurs as a direct result of a spill of hazardous materials: 1. Person is killed. 2. Person receives injuries requiring hospitalization. 3. Estimated damage to carrier or other property exceeds $50,000. 4. Fire, breakage, spillage, or suspected contamination due to radioactive materials. 5. Fire, breakage, spillage, or suspected contamination involving etiologic agents. 6. Situation is such that, in the judgment of the carrier, a continuing danger to life or property exists at the scene of the incident.	All persons and carriers engaged in the transportation of hazardous materials.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous materials (wastes included) that are transported, whose carrier is involved in an accident.	Department of Transportation Regulations 49 CFR 171.15; 17 NYCRR Part 924; 17 NYCRR Part 507	1. U.S. Department of Transportation 1-800-424-8802 2. DEC Hotline 1-800-457-7362 3. Rail Carrier On-Duty 518-457-1046 Off-Duty 518-457-6164 4. Notify local police or fire department.	Notice should be given by telephone at the earliest practicable moment and should include: 1. Name of reporter. 2. Name and address of carrier represented by reporter. 3. Phone number where reporter can be contacted. 4. Date, time, and location of incident. 5. The extent of injuries, if any. 6. Classification, name and quantity of hazardous materials involved, if available. 7. Type of incident and nature of hazardous material involved and whether a continuing danger to life exists at scene. 8. Each carrier making this report must also make the report required by §171.16.	Each carrier that transports hazardous materials involves in an accident that causes any of the following as a direct result: 1. A person is killed 2. A person receives injuries requiring hospitalization 3. Estimated damage to carrier or other property exceeds $50,000 4. Fire, breakage, spillage, suspected or otherwise involving radioactive material. 5. Fire, breakage, spillage, suspected contamination involving etiologic agents. 6. Situation is such that carrier thinks it should be reported in accordance with paragraph b.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Reportable quantity of a hazardous substance into navigable waters or adjoining shorelines. Substances are listed in 40 CFR 302.4.	Department of Transportation Regulations 49 CFR §171.16 as authorized by the Hazardous Materials Transportation Act	U.S. Coast Guard National Response Center (NRC), 1-800-424-8802 or 1-202-267-2675	As soon as person in charge becomes aware of a spill incident, he must notify NRC and provide the following information: 1. The information required by 49 CFR §171.15 (see above). 2. Name of shipper of hazardous substance. 3. Quantity of hazardous substance discharged, if known. 4. If person in charge is incapacitated, carrier shall make the notification. 5. Estimate of quantity of hazardous substance removed from the scene and the manner of disposition of any unremoved hazardous substance shall be entered in Part (H) of the report required by 49 CFR 171.16 (see above).	Person in charge of aircraft, vessel, transport vehicle, or facility. Must inform NRC directly, or indirectly through carrier.
Reportable quantity of a hazardous substance from vessel, on-shore or off-shore facility. Substances and requirements specified in 40 CFR §117.3.	40 CFR §117.21 as authorized under the FWPCA	NRC 1-800-424-8802. If not practicable report may be made to the Coast Guard (3rd or 9th Districts) District Offices or to EPA, designated On-Scene Coordinator, Region II, 26 Federal Plaza, NY, NY 10278; 1-201-548-8730	Immediate notification is required.	Person in charge of vessel, or on-shore or off-shore facility

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Facilities where a hazardous chemical is produced, used, or stored, and there is a reportable quantity of any extremely hazardous substance as set out in Appendix A to 40 CFR 355 or a CERCLA hazardous substance as specified in 40 CFR 302.4. (This section does not apply to a release that does not go beyond the facility, that emanates from a facility that is federally permitted, is continuous as defined under §103(f) of CERCLA or to any release exempt from CERCLA §103(a) reporting under §101(22) of CERCLA.)	40 CFR 355.40 (SARA) Releases of CERCLA Hazardous Substances are subject to release reporting requirements of CERCLA §103, codified at 40 CFR Part 302, in addition to being subject to the requirements of this Part.	Community emergency coordinator for the local emergency planning committee of any area likely to be affected and the State Emergency Response Commission of any state likely to be affected by the release. If there is no local emergency planning commission notification shall be made to relevant local emergency response personnel.	Immediately notify agencies at left and provide the following information when available: 1. Chemical name or identity of any substance involved in the release. 2. Indication of whether the substance is an extremely hazardous substance. 3. An estimate of the quantity released. 4. Time and duration of release. 5. Medium or media into which the release occurred. 6. Known health risks associated with emergency and where appropriate advice regarding medical attention for those exposed. 7. Proper precautions/actions that should be taken, including evacuation. 8. Names and telephone numbers of person to be contacted for further information. As soon as practicable after release, followup notification by providing the following information: 1. Actions taken to respond to and contain the release. 2. Health risks. 3. Advice on medical attention for exposed individuals.	Owner or operator of facility

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous liquids transported in pipelines, a release of which results in any circumstances as set out in 195.50(a) through (f). Also any incident that results in circumstances listed in 195.52(g).	49 CFR 195.50, 195.52 and 195.54 (Hazardous Liquid Pipeline Safety Act).	NRC, 1-800-424-8802	Notice must be given at the earliest practicable moment and the following information provided: 1. Name and address of the operator. 2. Name and telephone number of the reporter. 3. Location of the failure. 4. The time of the failure. 5. The fatalities and personal injuries, if any. 6. All other significant facts known by the operator that are relevant to the cause of the failure or extent of the damages.	Operator of system.
Hazardous wastes in transport	40 CFR §263.30(a) (RCRA)	1. Local authorities 2. If required by 49 CFR 171.15, notify the NRC at 1-800-424-8802 or 1-202-426-2675 3. Report in writing to Director of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation, Washington, DC 20590	Notification must be immediate. For discharge of hazardous waste by air, rail, highway, or water, the transporter must: 1. Give notice as in 49 CFR 161.15 (if applicable). 2. Report in writing as in 49 CFR 171.16. Wastes transporter (bulk shipment) must give same notice as required by 33 CFR 153.20.	Transporter by air, rail, highway, or water.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Vinyl Chloride from any manual vent valve, or polyvinyl chloride plants	Clean Air Act 40 CFR 61.64	Administrator of EPA	Within 10 days of any discharge from any manual vent valve, report must be made, in writing, and the following information provided: 1. Source, nature and cause of the discharge 2. Date and time of the discharge 3. Approximate total vinyl chloride loss during discharge 4. Method used for determining loss 5. Action taken to prevent the discharge 6. Measures adopted to prevent future discharges.	Owner or operator of plant.
Radioactive Materials	6 NYCRR §380.7	Commissioner of DEC	1. Notify immediately by telephone when concentration, averaged over a 24-hour period, exceeds or threatens to exceed 5000 times the limits set forth in Schedule 2 of 380.9 (in uncontrolled areas). 2. Notify within 24 hours by telephone when concentration, averaged over 24- hour period, exceeds or threatens to exceed 500 times the limits set forth in Schedule 2 above (in uncontrolled areas). 3. Report within 30 days the concentration and quantity of radioactive material involved, the cause of the discharge, and corrective steps taken or planned to ensure no recurrence of the discharge.	Operator of the radiation installation.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Low Level radioactive wastes in transport. Any suspected or actual uncontrolled releases.	6 NYCRR 381.16 ECL §27-0305 Waste Transporter Permits	DEC and Department of Health	Immediate notification.	Transporter

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATION ENFORCEMENT OF SPILLER RESPONSIBILITY

Spill Reporting and Initial Notification -
Enforcement of Spiller Responsibility

GUIDANCE SUMMARY-AT-A-GLANCE

Use the "Notification Procedures Checklist" (Exhibit 1.1-3) to document conversations with the responsible party or potentially responsible party (PRP/RP) concerning his or her clean-up responsibilities.

The steps to follow when you inform the PRP/RP of his or her legal responsibility are:

-- Give your name and identify yourself as a DEC employee;

-- Inform them that they have been identified as the party responsible for the spill;

-- Inform PRP/Rps of their liability for all clean-up and removal costs. (If necessary, cite Section 181 of the Navigation Law);

-- Ask PRP/Rps "point blank" if they will accept responsibility for the cleanup; and

-- If the PRP/RP does not accept responsibility, or does not admit to being the PRP/RP, inform him or her that DEC will conduct the cleanup and send the bill to whoever is the PRP/RP. Also inform them that a DEC-conducted cleanup could be more costly than a PRP/RP-conducted cleanup, and that the PRP/RP could face interest charges and penalties for refusing to clean up the spill.

If the PRP/RP accepts responsibility for the cleanup:

(1) Send the PRP/RP a "Spiller Responsibility Letter" (Exhibit 1.1-5) and an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) and

(2) Send the PRP/RP an "Option Letter," which should outline the options available to the PRP/RP to clean up the spill. See Exhibit 1.1-4 for a summary of how and when to use these forms and what they may include.

NOTES

1.1.2 Spill Reporting and Initial Notification - Enforcement of Spiller Responsibility

This section provides guidance on those steps you take to inform responsible parties or potentially responsible parties (PRP/Rps) or spillers of their responsibility under state law for cleaning up spills. This guidance applies to all contacts (by phone, by mail, or in person) you have with Rps throughout the response process concerning their fulfillment of this legal responsibility. The possible consequences of an RP's refusal or inability to conduct the spill response are also discussed.

1. State Law and Policy

Under Article 12 of the Navigation Law and Article 71 of the Environmental Conservation law (ECL), those parties responsible for a petroleum release are liable for all costs associated with cleaning up the spill as well as third party damages (see Introduction-A for more information). Section 181 of the Navigation Law states:

> *Any person who has discharged petroleum shall be strictly liable, without regard to fault, for all cleanup and removal costs and all direct damages, no matter by whom sustained as defined in this section.*

There are two ways by which PRP/RPs can pay for the costs associated with cleanups. First, the PRP/RP can reimburse the state for site investigation, clean-up, and remediation costs incurred by the State Oil Spill Fund or federal Leaking Underground Storage Tank (LUST) Trust Fund. Second, the PRP/RP can assume full responsibility for the cleanup from the beginning and bear all costs throughout the clean-up process. It is DEC's policy to make every effort to have PRP/RPs pay for cleanups from the outset.[1]

To achieve PRP/RP-directed and PRP/RP-financed cleanups, your responsibilities are to: (1) identify the PRP/RP(s), (2) inform them of their legal responsibilities for the spill, and (3) ensure that they carry out these responsibilities. All investigations of spills and PRP/RPs should be pursued vigorously and without prejudice. Use to your advantage the argument that having the PRP/RP assume responsibility for clean-up costs benefits both DEC and the spiller. It saves DEC the expense of cost-recovery procedures. It also allows the PRP/RP to be more involved in clean-up decisions (e.g., choosing their clean-up contractors) and, more significantly, it usually results in lower clean-up costs. Because the PRP/RP is responsible for all indirect costs incurred if DEC conducts the cleanup, the spiller will pay for the DEC contractor's clean-up work, as well as the supervision costs incurred by DEC, any third-party claims associated with the spill, and any punitive fines levied.

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[1] Spillers are not only responsible for assuming the costs of a cleanup, but also can be subject to a $25,000 per day fine for not paying the clean-up costs (among other violations). The Navigation Law provides for these penalties in Section 192, which states:

> Any person who knowingly gives or causes to be given any false information as a part of, or in response to, any claim made pursuant to this article for cleanup and removal costs, direct or indirect damages resulting from a discharge, or who otherwise violates any of the provisions of this article or any rule promulgated thereunder or who fails to comply with any duty created by this article shall be liable to a penalty of not more than twenty-five thousand dollars for each offense in court of competent jurisdiction. If the violation is of a continuing nature each day during which it continues shall constitute an additional, separate, and distinct offense. (emphasis added)

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2. Notification Process

Part 1, Section 4, of this manual discusses the process of identifying the PRP/RP as part of the spill investigation for a particular site. Once you identify the PRP/RP, follow the guidance provided below for informing the PRP/RP of his or her responsibilities for spill cleanup. If you are uncertain about who the PRP/RP is, apply the procedures outlined below with all suspected RPs until the responsible party or parties are identified.

a. Informing RPs of Their Responsibility at the Spill Scene

It is important to inform PRP/RPs of their legal responsibility to clean up a spill as soon as possible. When you arrive at a spill site, you should immediately inform the representative of any PRP/RP of their liability under the Navigation Law and the Environmental Conservation Law. In doing so, follow the steps covered in the "Notification Procedures Checklist" (Exhibit 1.1-3).

Document completion of the notification steps, and identify your contact(s).

> Although you should be firm and direct in informing the PRP/RP of their responsibility, you should make every attempt to avoid an adversarial relationship with the RP. The full cooperation of the PRP/RP will result in a more efficient and effective cleanup.

b. Informing Spillers of Their Responsibility in Writing

You should send three different letters to the PRP/RP to inform them of their responsibility (see Exhibit 1.1-4, "Notification Forms Summary"). If a site response was initiated and you are able to confirm the spill visually, the "Spiller Responsibility Letter" (Exhibit 1.1-5) along with an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) should be sent as soon as possible. In addition, an "Option Letter" that informs the PRP/RP of their possible options for addressing a spill should be sent. These letters should be kept as part of the Corrective Action Plan (CAP) (see Part 1, Section 5, "Corrective Action Plans.")

Exhibit 1.1-3
Notification Procedures Checklist

Completed	Step	Date	Contact(s)
________	1. Give your name and identify yourself as a DEC employee.		
________	2. Inform the PRP/RP that he/she has been identified as the party responsible for the spill.		
________	3. Inform PRP/RPs of their responsibility to pay for all clean-up costs. (As necessary, cite Section 181 of the Navigation Law or Article 71 of the ECL.)		
________	4. Ask PRP/RPs "point blank" if they will accept responsibility for the cleanup. Response: ______________________________		
________	5. If the PRP/RP does not accept responsibility, or does not admit to being the spiller, inform him/her that DEC will conduct the cleanup and send the bill to whoever is the spiller.		
________	6. If the PRP/RP does not accept responsibility also inform him or her that a DEC-conducted cleanup could be more costly than a spiller-conducted cleanup, and that the spiller could face interest charges and a fine for refusing to pay for the billed clean-up costs.		

Exhibit 1-A-4

Notification Forms Summary
(Send Forms by Certified Mail)

Notification Form	When and How to Use	Information to be Included
Spiller Responsibility Letter	Send by certified mail to PRP/RP for confirmed spill.	# Spill location; # Spiller's responsibility under the Navigation Law; # Penalties that can be levied if the spiller does not cooperate; and # Deadline for spiller to begin containment and removal of the spill.
Acceptance of Spiller Responsibility Form	Send by certified mail to PRP/RP for confirmed spill.	# Request for spiller's signature acknowledging his or her acceptance of responsibility for the spill cleanup.
Option Letter	Send by certified mail to PRP/RP for confirmed or suspected release (e.g., failed tightness test).	# Spill number; # Date spill was discovered or reported; # Exact location of the spill; # Authority of Article 12 of the Navigation Act; and # Penalties for noncompliance.

Exhibit 1.1-5

Spiller Responsibility Letter

[Date]

[Addressee]
[Address]

Dear [   ]:

This is to inform you that as a result of investigation by our Department, we consider you responsible for Petroleum Spill Number __________, dated _______, at ___________________________. Under Article 12 of the Navigation Law, Section 192, any person who discharges petroleum without a permit and fails to promptly clean up such prohibited discharge may be subject to a penalty of up to $25,000 a day.

Containment and removal of this spill must be initiated within _____ hours.

Your failure to initiate timely spill cleanup and removal, in addition to the penalty stated above, will result in your being billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law. These costs include cleanup and removal, all direct and indirect damages, including damages incurred by third parties.

Sincerely,

Regional Spill Engineer
Region

Exhibit 1.1-6
Acceptance of Spiller Responsibility Letter

[Date]

SPILL #_________

ACCEPTANCE OF FINANCIAL RESPONSIBILITY

___________________________, hereby assumes responsibility for containment and
(Name of Company and Person)

cleanup of _______________ discharged from_______________________
(Substance) (Source)

on _______, and recognizes that the determination of the adequacy and propriety of
(Date)

the containment and cleanup operation continues to rest with the New York State

Department of Environmental Conservation On-Scene Coordinator.

____
(Authorized Signature and Title)

____
(Name and Title Printed)

____
(Address of Company)

____
(Date and Time)

____
(Witness)

NOTES

The "Spiller Responsibility Letter" informs spillers of their responsibility under the Navigation Law and explains the penalties that can be levied if the spiller does not cooperate. It should be sent to the spiller or suspected spiller as soon as a petroleum spill has been confirmed. The letter notifies the spiller that he or she is required to initiate containment and removal of the spill within a period of time you specify.

There are at least three factors you should consider when specifying a deadline in this letter:

The size and nature of the spill;

The proximity of the spill to, or its possible effects on, water supplies (surface or ground water), nearby homes and other structures, and/or sensitive environmental areas; and The possible environmental, safety, and/or human health effects of delaying containment and removal.

The "Acceptance of Spiller Responsibility Form" requires the spiller's signature acknowledging his or her responsibility for containment and cleanup of the spill. This form and the "Spiller Responsibility Letter" should be sent by certified mail.

The "Option Letter" outlines the possible options available to the PRP/RP for cleanup of the spill. The contents of this letter can vary somewhat depending on how the release was discovered (e.g., through a complaint or a failed tightness test), the extent and type of spill, and the policies and procedures of your regional office. There is, however, some information that should appear in every "Option Letter." All "Option Letters" should contain the following: spill number, date the spill was discovered, and exact location of the spill. In addition, the letter should cite the response authority provided DEC by Article 12 of the Navigation Act and describe the penalties for noncompliance.

Each "Option Letter" should outline clearly the options open to the PRP/RP to address the spill and the information you wish submitted, and may also specify certain deadlines for taking action. However, it is up to you to determine the particular options, information requirements, and dates you include in the letter. Depending on the circumstances, you may list in your letter one or several options from which the PRP/RP can choose. For example, when an UST fails an initial tank test the following options could be included:

Conduct separate integrity tests on the piping and the tanks in order to verify the release source within the tank system.

Remove the "non-tight" tank and either remove and dispose of all contaminated soils, or install monitoring wells.

NOTES

- # Install monitoring wells and abandon the "non-tight" tank in-place.

- # Remove the tank within 30 days, according to the requirements for tank removal (outline these requirements in the letter).

The "Option Letter" should always be sent by certified mail. In addition, you should have the PRP/RP inform you as soon as possible about the option(s) he or she has chosen.

Several examples of possible "Option Letters" are included as Exhibits 1.1-7 through 1.1-12. These are provided as examples only; you should use "Option Letters" developed by your own office, or develop your own.

Exhibit 1.1-7 is a sample option letter to an PRP/RP for removal of contaminated soil from an UST release. Note that this option letter includes: (a) specific requirements for removal of the contaminated soil; (b) dates for when the removal must be completed, and (c) requirements for the PRP/RP to forward to DEC copies of the landfill disposal receipt and ample test results. The additional sample option letters apply to the following situations: when an UST has failed an initial tightness test (Exhibit 1.1-8), when an UST fails an isolation tank test (Exhibit 1.1-9), when an UST fails a Petro-tite Systems Test (Exhibit 1.1-10), and ground-water contamination cleanup (Exhibit 1.1-11).

3. Dealing with Uncooperative Spillers

There are generally two ways in which an PRP/RP may fail to fulfill his or her legal responsibilities for spill cleanup: (1) a PRP/RP may refuse from the beginning to accept responsibility, or (2) an PRP/RP may fail to conduct a cleanup in the manner, or in as timely a fashion, as agreed upon with the DEC. If a PRP/RP refuses to cooperate from the outset, try again to change the RP's mind. Send additional notices of spiller responsibility (Exhibit 1.1-12) and/or initiate phone conversations with PRP/RPs to inform them again of the consequences of not cooperating (i.e., higher clean-up costs and possible penalties). If a party claims not to be the PRP/RP, you should inform them of your reasons for believing they are the PRP/RP under the Navigation Law.

If a PRP/RP agrees to conduct and pay for the cleanup and then does not proceed in the manner agreed upon or as quickly as agreed upon, you should inform the PRP/RP immediately that you are dissatisfied with the progress of the cleanup and that DEC is considering taking it over. There are no hard-and-fast rules for deciding when you should take over a cleanup. If possible, you should always work toward having the PRP/RP continue the cleanup in the agreed-upon manner. Attempt to determine why the cleanup is not proceeding as planned and consider means of helping the PRP/RP-directed cleanup get back on track.

Exhibit 1.1-7

Sample Option Letter:
Soil Cleanup Spill

[Date]

[Addressee]
[Address]

Dear [ ]:

This letter is to confirm your - (site meeting) (telephone conversation) with ______________ of this Department on ______________________________,
(Name) (day) (date) (year)
in regards to the above-mentioned spill site. This site involves ______________________________
(explanation)

The following items were discussed and agreed upon:

1. All contaminated material must be removed and stored on site until it can be properly disposed of at a properly permitted landfill.

2. All contaminated material must be sampled for ____
____. The results must be
(analyses)
negative for the material to be considered non-hazardous oily debris. You must contact your selected sanitary landfill to verify the sample analyses that they require for disposal.

3. A hauler with a Part 364 permit must be used to haul the contaminated soil to your selected landfill.

4. Please notify this Department after the work is completed but prior to any backfilling of the spill area so that an inspection of the excavation may be made.

5. Please forward to us a copy of the landfill disposal receipt and the sample results.

A schedule for this work is required by ________________________________.
(day) (date) (year)
Cleanup must be performed by no later than ________________________________.
(day) (date) (year)

If you have any questions, please feel free to contact ______________________________________
(Name)
at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

Exhibit 1.1-8

Sample Option Letter:
Initial Tank Failure

[Date]

[Addressee]
[Address]

Dear [ ]:

This Department received notification on ______________________that (a)
(day) (date) (year)
_______________________tank(s) failed its (their) tank test performed by
(gallons) (product stored)
_____________. On _________, Mr._____________of this Department
(contractor) (date) (name)
discussed with __________ that one of the following options must be done concerning this tank.
(person)

OPTION 1:

1. The tank is to be immediately isolated from the piping and is to be retested. If the tank tests tight, it may remain in service.
2. The lines are to be repaired, if necessary, and retested by a state-approved method. Exposed piping may be air tested.
3. A copy of any test results are to be sent to this office.

OPTION 2: If the tank fails the retest, or if you decide not to retest, the following must now be done:

1. All product must be immediately removed from the tank.
2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form must be submitted to this Department prior to tank removal.
3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.
4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.
5. Once the tank has been cleaned out, it may be disposed as scrap.

Mr.________must be notified when you have a firm date for retesting or removal. Please note, we must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

If you have any questions, please contact________ at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-9

Sample Option Letter:
Retest Failure, Tank Removal

[Date]

[Addressee]
[Address]

Dear [ ]:

On____________________, a ______gallon _______________, underground store storage tank at the
(day) (date) (year) (#) (material)
above-mentioned address failed a system tank test. On____________________, this tank failed an isolation tank test.
(day) (date) (year)
Since the tank failed the retest, the following must now be done:

1. All product must be immediately removed from the tank.

2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form (enclosed) must be submitted to this Department prior to tank removal.

3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.

4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.

5. Once the tank has been cleaned out, it may be disposed as scrap.

____________________of this Department must be notified when you have a firm
(Name)
date for removal. We must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

For your use, enclosed is a list of contractors that are known by this Department to do this type of work. This list is by no means complete. Any contractor may be used by you for this work.

If you have any questions, please feel free to call ________________________at 847-4590.
(Name)
Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-10

Sample Option Letter:
Failed Tank Test

[Date]

CERTIFIED - RETURN RECEIPT REQUESTED

[Addressee]
[Address]

RE: Spill No.

Gentlemen:

This office has been informed by ______(Name)___ that __(tank)__ failed a Petrotite systems test. In accordance with Article 12 of the New York State Navigation Law, I must determine if there has been any harm to the lands or the groundwater of the State. In order for me to make this determination, you have three options:

1. Prove that it was not a leaking tank by removing all the piping from the tank and separately Petrotite test the tank. If the tank passes the Petrotite test, it is a piping leak. The tank may then be abandoned or the piping can be repaired, attached to the tank, and the system Petrotite tested.

2. Excavate and remove the tank in the presence of a representative from this office so that an inspection of the tank and the soil can be made. If the tank is sound, and there is no evidence of product loss, nothing further need be done. If there is a problem, proceed as in 3 below.

3. Abandon the tank in-place and install several four (4) inch diameter PVC site wells extending five (5) feet into the groundwater with a screen length of ten (10) feet, with slot size of .020 inches. The exact location and number of wells will be determined by a representative from this office. These wells will be checked for a period of twelve months by New York State, and if there is no evidence of product for that period, the spill will be removed from our listing. If free or dissolved product appears, cleanup must begin immediately.

If cleanup does not begin by __(Date)__ by the responsible party, the State will begin the cleanup and bill the responsible party.

Sincerely,

[ ]

Exhibit 1.1-11

Sample Option Letter:
Ground-water Cleanup

[Date]

[Addressee]
[Address]

Dear [ ]:

This letter is to confirm your (site meeting) (telephone conversation) with (Name) of this Department on (day) (date) (year). Groundwater at this spill site is contaminated with (free floating oil) (dissolved oil components). The following items were discussed and agreed upon:

1. (#) additional four-inch monitoring wells will be installed at the agreed upon locations. A sketch of a typical monitoring well is enclosed for your use.

2. One recovery well will be installed to recover oil product. Groundwater must be pumped to depress the groundwater table. The groundwater must be pumped to an oil-water separator tank. Accumulated oil may be recovered from the well by bailing or by a second pump. A second type of recovery well pumps both oil and water to a separator tank. Oil from the tank is then recovered. You should check with your contractor to determine the best method for the recovery well. Groundwater must be pumped to depress the groundwater table.

3. The discharge water must be sampled for (Contaminates) . Dependent upon the sampling results, it may be discharged with a SPDES permit to (Name) . The water must at all times be sheenless. An air stripper or a carbon filter may be necessary for the discharge water.

4. All collected oil must be properly disposed. Copies of receipts indicating the disposal site must be forwarded to this office.

It was also agreed that these actions be completed by (Date) . Should you have any questions, please do not hesitate to contact (Name) at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-12

Sample Option Letter:
Soil Disposal, Soil Still On Site

[Date]

[Addressee]
[Address]

Dear [ ]:

A recent inspection by___(Name)_______of this office indicated that the contaminated soil at your facility still remains on site. We are requesting this oil be removed by__(day)__(date)__(year)_to an acceptable landfill. Please send a copy of the disposal receipt to this office.

If you cannot remove the soil by that date, please contact this office immediately. If you do not contact this office and the soil still remains on site past___(Date)_, DEC will have the soil removed from your site. You will then be billed for the costs of removal and disposal as well any relevant penalties.

If you have any questions, please feel free to contact__(Name)________at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

NOTES

If all efforts to encourage a PRP/RP to continue the cleanup fail, send a certified letter (Exhibit 1.1-13) notifying them that their actions have been unsatisfactory and that DEC will assume responsibility for the cleanup. This letter again informs the PRP/RP of his or her liability for all costs incurred by DEC during its cleanup.

Exhibit 1.1-13

Unsatisfactory Cleanup Notice Letter

[Date]

CERTIFIED MAIL SPILL #

[Addressee]
[Address]

Dear Sir:

My letter of (Date) notified you of New York State's interest in a pollution incident for which you are presently considered responsible.

You are hereby given notice that your actions to remove the pollutant and mitigate its effects have been evaluated as unsatisfactory. Effective (Date) , the New York State Department of Environmental Conservation will conduct all cleanup activities under the authority of Article 12 of the Navigation Law. Removal will be effected in accordance with the regulations of the Department of Environmental Conservation. You will be billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law, as well as interest and penalties.

Should you require further information concerning this matter, contact: (Name) .

Sincerely,

[ ]

Received and Acknowledged

______________________	____________ Time	___________ Date

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATIONS - ACCESS AND RIGHT-OF-ENTRY

NOTES

**Spill Reporting and Initial Notifications -
Access and Right-of-Entry**

GUIDANCE SUMMARY AT-A-GLANCE

Section 178 of the Navigation Law gives you the authority to enter private property to investigate or clean up a suspected spill.

In general, you should inform the property owner of your right to enter onto private property and obtain consent from the owner. This consent can be either written or verbal.

Detailed information and procedures for access and right-of-entry is considered confidential for spill responders. This information is contained in Appendix L, and is marked confidential.

NOTES

1.1.3 Access and Right-of-Entry

This section addresses the right of NYSDEC personnel to enter private property on which a spill has occurred or is suspected, for the purpose of investigating, containing, and/or cleaning up the spill. Detailed information and procedures of access and right-of-entry are considered confidential. Therefore, this information can be found in Appendix L, including your legal rights to enter property and the procedures to follow to ensure that no charges of trespassing are brought against the Department.

1. State Law and Policy

You have the authority, under the Navigation Law, to enter property to investigate or clean up a real or suspected spill. Specifically, Section 178 of the Navigation Law states:

> *The department is hereby authorized to enter and inspect any property or premises for the purpose of inspecting facilities and investigating either actual or suspected sources of discharges or violation of this article or any rule or regulations promulgated pursuant to this article. The department is further authorized to enter on property or premises in order to assist in the cleanup or removal of the discharge. Any information relating to secret processes or methods of manufacture shall be kept confidential.*

In any emergency or non-emergency, you must possess information supporting a reasonable belief to suspect that a spill has occurred or is occurring, or that the spill is impacting the premises for which access is sought. A reasonable belief may be based on a report of a spill or visual observation. For example, if a gasoline station operator reports an unexpected loss of product from his underground storage tanks that are located near private household wells, you might want to investigate those wells and check the water.

Although you have the authority to enter the premises, *it is always advisable to obtain the consent of the property owner or his or her agent before entering the property.* This consent can be either written or verbal. Obtaining this consent may help avoid civil or criminal charges for trespass being logged. In cases where the owner/agent is not available or not ascertainable, entry should be made.

Appendix H – NYSDEC CP-51: Soil Cleanup Guidance

CP-51 / Soil Cleanup Guidance

New York State Department of Environmental Conservation

DEC Policy

Issuing Authority: Alexander B. Grannis, Commissioner	
Date Issued: October 21, 2010	**Latest Date Revised:**

I. Summary

This policy provides the framework and procedures for the selection of soil cleanup levels appropriate for each of the remedial programs in the New York State Department of Environmental Conservation (DEC) Division of Environmental Remediation (DER). This policy applies to the Inactive Hazardous Waste Disposal Site Remedial Program, known as the State Superfund Program (SSF); Brownfield Cleanup Program (BCP); Voluntary Cleanup Program (VCP); Environmental Restoration Program (ERP); Spill Response Program - Navigation Law (NL) section 176 (SRP); and the Resource Conservation and Recovery Act (RCRA) Corrective Action Program. It replaces *Technical and Administrative Guidance Memorandum (TAGM) 4046: Determination of Soil Cleanup Objectives and Cleanup Levels* (January 24, 1994); the *Petroleum Site Inactivation and Closure Memorandum* (February 23, 1998); and Sections III and IV of *Spill Technology and Remediation Series (STARS) #1* (August 1992).

This document is used in conjunction with the applicable statutes, regulations and guidance. Site-specific soil cleanup levels, determined in accordance with this guidance, are only applied after:

- the site, or area of concern, is fully investigated to determine the nature and extent of contamination;
- all sources of contamination are addressed consistent with the hierarchy provided in 6 NYCRR 375-1.8(c) or consistent with the RCRA Corrective Action Program (as appropriate);
- groundwater, if contaminated, has been evaluated for appropriate remedial actions consistent with 6 NYCRR 375-1.8(d) or consistent with the RCRA Corrective Action Program (as appropriate); and
- impacts on adjacent residential properties, surface water, aquatic ecological resources are evaluated, as well as indoor air, soil vapor, vapor intrusion and other appropriate media.

II. Policy

It is DEC’s policy, consistent with applicable statutes and regulations, that all remedies will be protective of public health and the environment. DEC's preference is that remedial programs, including the selection of soil cleanup levels, be designed such that the performance standard results in the implementation of a permanent remedy resulting in no future land use restrictions. However, some of

DEC's remedial programs are predicated on future site use. Further, it is not always feasible to return to a condition where no restrictions are required.

The procedures set forth herein are intended for the use and guidance of both DEC and remedial parties to provide a uniform and consistent process for the determination of soil cleanup levels. This guidance is not intended to create any substantive or procedural rights, enforceable by any party in administrative or judicial litigation with DEC. DEC reserves the right to act at variance with these procedures to address site-specific circumstances and to change the procedures in this guidance at any time.

Please note that this guidance focuses only on soil cleanup levels. All remedies must be fully protective of public health and the environment and must prevent further off-site migration to the extent feasible, with special emphasis on preventing or minimizing migration onto adjacent residential properties. A remedial party is required to evaluate and investigate, if necessary, all environmental media including soil, groundwater, surface water, sediments, soil vapor, ambient air, and biota. [See 6 NYCRR 375-1.8(a)(6) or RCRA Corrective Action Program (as appropriate)]. This investigation will determine if any of the referenced media are, or may be, impacted by site contamination. Applicable guidance should be consulted for media other than soil.

Nothing contained in this guidance, in itself, forms the basis for changes to previously selected remedies. However, a change in the site remedy may be considered consistent with *DER-2: Making Changes to Selected Remedies* (April 1, 2008). [See Section VI, Related References.] To the extent that a change to a selected remedy at a site in one of DER's remedial programs is necessary as provided in DER-2, as applicable, the Soil Cleanup Objectives (SCOs) may be considered in the evaluation of appropriate changes to the selected remedy. For sites in other programs, applicable regulations and guidance must be used.

III. Purpose and Background

DEC has a number of different remedial programs that were developed over time based on separate and distinct authorities. These programs use different procedures to determine the extent of soil cleanup necessary to satisfy the remedial program goals. The purpose of this document is to set forth how soil cleanup levels are selected for the different programs.

Legislation establishing New York State's Brownfield Cleanup Program (Article 27, Title 14 of the Environmental Conservation Law [ECL]) required DEC, in consultation with the New York State Department of Health (NYSDOH), to develop an approach for the remediation of contamination at brownfield sites. The resulting regulation includes seven sets of SCOs. Four sets provide for the protection of public health for different land uses (residential, restricted residential, commercial, and industrial); two sets provide for the protection of other resources (groundwater and ecological resources); and one set includes SCOs for protection of public health and the environment for all uses (unrestricted use).

With the promulgation of the SCOs, it is necessary to discuss how the SCOs, and soil cleanup levels generally, are arrived at for a specific site. Some key definitions in understanding how cleanup levels for soil are arrived at follow.

Feasible, which means suitable to site conditions, capable of being successfully carried out with available technology, implementable and cost effective [see 6 NYCRR 375-1.2(s)].

Presumptive remedy, which means a technology or technique where experience has shown the remedy to be a proven solution for specific types of sites and/or contaminant classes [See *DER-15: Presumptive/Proven Remedial Technologies* February 27, 2007. Refer to Section VI, Related References.]

Soil cleanup level, which means the concentration of a given contaminant for a specific site that must be achieved under a remedial program for soil. Depending on the regulatory program, a soil cleanup level may be based on the regulation [6 NYCRR 375-6.8(a) or (b)], modified from the regulatory value based on site-specific differences, or based on other information, including background levels or feasibility. Soil cleanup levels may include:

- SCOs promulgated at 6 NYCRR 375-6;
- Supplemental Soil Cleanup Objectives (SSCOs);
- a "totals" approach for a family of contaminants known as Polycyclic Aromatic Hydrocarbons (PAHs);
- Presumptive remedy for Polychlorinated Biphenyls (PCBs); and
- Nuisance Condition.

Soil Cleanup Objective (SCO), which means the chemical concentrations for soil cleanup of individual chemicals contained in 6 NYCRR 375-6.8(a) or (b). The SCOs were developed using the process outlined in the Technical Support Document (TSD). The SCOs and the SSCOs defined below are applicable statewide and do not account for many site-specific considerations which could potentially result in higher levels. Soil concentrations that are higher than the SCOs and SSCOs are not necessarily a health or environmental concern. When an SCO (or SSCO) is exceeded, the degree of public health or environmental concern depends on several factors, including the magnitude of the exceedance, the accuracy of the exposure estimates, other sources of exposure to the contaminant, and the strength and quality of the available toxicological information on the contaminant.

Supplemental Soil Cleanup Objective (SSCO), which means a) an existing soil cleanup level for a contaminant which had been included in former TAGM 4046 and was not included in 6 NYCRR 375-6; b) has been developed using the same process used for development of the SCOs; and c) new cleanup levels for soil developed by the remedial party following the approach detailed in Appendix E of the TSD. The TSD provides information relative to the development of cleanup objectives for soil that are not set forth in 6 NYCRR 375-6. Cleanup objectives that have been established at the direction of DEC or the election of remedial parties are included in Table 1.

Technical Support Document (TSD), which refers to the document dated December 2006 detailing the development of the SCOs that were promulgated in 6 NYCRR 375-6. It provides the technical background and provides a detailed discussion of the considerations for development of the SCOs for the different land uses and exposure pathways. The TSD is available on DEC's website [see Section VI, Related References].

The purpose of this guidance is NOT to focus on media other than soil. Accordingly, the remedial program may require remedial activities to address media other than soil (e.g., groundwater, surface water, sediment, and vapor). Applicable guidance should be consulted for media other than soil. This guidance is to be used in conjunction with the applicable statutes, regulations and guidance. Site-specific soil cleanup levels, determined in accordance with this guidance, are only applied after:

- the site, or area of concern, is fully investigated to determine the nature and extent of contamination;
- all sources of contamination are addressed consistent with the hierarchy provided in 6 NYCRR 375-1.8(c) or consistent with the RCRA Corrective Action Program (as appropriate);
- groundwater, if contaminated, has been evaluated for appropriate remedial actions consistent with 6 NYCRR 375-1.8(d) or consistent with the RCRA Corrective Action Program (as appropriate); and
- an evaluation of impacts on adjacent residential properties, surface water, aquatic ecological resources, as well as indoor air, soil vapor, vapor intrusion and other appropriate media.

IV. Responsibility

The responsibility for maintaining and updating this policy lies with DER. DEC staff are responsible for implementing this policy, with input (as applicable) from NYSDOH.

V. Procedures

A. General Approaches to the Selection of Soil Cleanup Levels

The determination of soil cleanup levels for a site is dependent on:

1. The regulatory program pursuant to which the site is being addressed;
2. Whether the groundwater beneath or down gradient of the site is, or may become contaminated with site-related contaminants;
3. Whether ecological resources constitute an important component of the environment at or adjacent to a site, and which are, or may be, impacted by site-related contaminants; and
4. Other impacted environmental media such as surface water, sediment, and soil vapor.

After fully evaluating the nature and extent of soil contamination associated with a site, the soil cleanup levels will be based on one, or a combination of, the following four approaches.

Approach 1: **Utilize the Unrestricted Use Soil Cleanup Objectives** [see 6 NYCRR Table 375-6.8(a)]. Under this approach, the soil cleanup levels will be established consistent with the SCOs set forth in 6 NYCRR Table 375-6.8(a). For contaminants of concern which are not included in the rule, DEC may direct development of a soil cleanup level which is protective of public health and the environment without restrictions following the procedure outlined in Appendix E of the TSD. Under this approach, the unrestricted SCOs are applied throughout the soil matrix to the top of bedrock (including the saturated zone).

Approach 2: **Utilize the Restricted Use Soil Cleanup Objectives** [see 6 NYCRR Table 375-6.8(b)]. Under this approach, soil cleanup levels will be established consistent with the SCOs set forth in 6 NYCRR Table 375-6.8(b) selecting the lowest SCO in the categories described in A through C below. Generally, after source removal, the soil cleanup levels do not need to be achieved to more than 15 feet below ground surface or to the top of bedrock, whichever is shallower.

A. Select the applicable land use category for the protection of public health (residential, restricted residential, commercial or industrial);

B. Determine if the SCOs for the protection of groundwater are applicable (see Section V.D); and

C. Determine if the SCOs for the protection of ecological resources are applicable (see Section V.C).

Approach 3: **Limited Site-Specific Modifications to Soil Cleanup Objectives.** This approach allows for consideration of site-specific information to modify the SCOs promulgated in 6 NYCRR Tables 375-6.8 (a) and (b) following the approach detailed in Appendix E of the TSD. The equations and basic methodology specified for calculating the 6 NYCRR 375-6.8 (a) and (b) values may not be modified under this approach. However, in instances where site-specific parameters were used in the calculation of the SCOs, site data different from the assumptions used to calculate the SCOs may be used to modify the soil cleanup levels for a specific site. These instances are very limited and occur only in certain pathways that are listed below.

- Protection of groundwater pathway
- Particulate inhalation pathway
- Volatile inhalation pathway
- Protection of ecological resources pathway

It should be noted that even if site-specific data modifies these pathways, it may not result in modifying the SCOs because the lowest value from all applicable pathways is used to determine each SCO. The inhalation pathway is very seldom the controlling pathway in the determination of the protection of public health. The specific parameters that can be modified are identified in Appendix E of the TSD (e.g., inhalation dispersion terms, fraction of organic carbon in soil, etc.).

The remedial party should consider the cost of collecting the data necessary to support a request to modify the SCOs with the potential for deriving a higher SCO that provides an appropriate level of protection. The remedial party may be required to submit additional data to support the use of modified SCOs. Once DEC approves one or more modified SCOs, they are applied in the manner described under Approach 2.

Approach 4: **Site-Specific Soil Cleanup Objectives.** Under this approach, the remedial party may propose site-specific cleanup levels or approaches for soil which are protective of public health and the environment based on other information. This approach sets forth a flexible framework to develop soil cleanup levels by allowing the remedial party to conduct a more detailed evaluation of site information in an effort to calculate protective soil cleanup levels or approaches unique to a site. Under this approach, the remedial party may propose a remedy that does not include specific soil cleanup levels (e.g., excavate the top 6 feet in an area extending 75 feet in all directions from boring B12); modify the input parameters used in the SCO calculations; use site data to improve or confirm predictions of exposures to receptors to contaminants of concern; analyze site-specific risks using risk assessments; use toxicological information available from alternate sources; or consider site background and historic fill. Data supporting these site-specific adjustments or use of alternate methodologies must also be provided to DEC for review and approval to ensure that the resulting soil cleanup levels are protective.

The Approach 4 framework leaves DEC with discretion to determine whether a different approach is appropriate for the site and, if a different approach is to be used, the proper method of implementation. The remedial party should consider the cost of collecting the data necessary to develop site-specific soil cleanup levels (or approaches) with the potential for deriving a soil cleanup level which is higher than a particular SCO and which provides an appropriate level of protection. The remedial party may also be required to submit additional data to support the use of methodologies in the calculation of site-specific soil cleanup levels or to support the proposed approach.

B. Application of Soil Cleanup Levels for the Specific Remedial Programs: Soil cleanup levels are determined on a site-specific basis depending on the program under which the site is being remediated. In some cases (e.g., BCP Track 1 or Track 2), the soil cleanup levels are the SCOs taken directly from 6 NYCRR 375-6. In other cases, soil cleanup levels may be derived from the Part 375 SCOs but modified based on other information. In yet other cases, the soil cleanup levels may have no relationship or connection to the SCOs, but rather be developed in accordance with DEC-approved methodologies or approaches.

1. Inactive Hazardous Waste Disposal Site Remedial Program (State Superfund Program): The goal of the remedial program for a specific site is to restore that site to pre-disposal conditions, to the extent feasible. The unrestricted use SCOs are considered to be representative of pre-disposal conditions unless an impact to ecological resources has been identified (see 6 NYCRR 375-2.8(b)(2)). However, it must be recognized that achievement of this goal may not be feasible in every case. At a minimum, all remedies must be protective of public health and the environment. The following procedure is used to determine the most feasible remedy.

(a) The remedial party shall evaluate, and if feasible, implement a cleanup utilizing Approach 1 (application of unrestricted SCOs).

(b) Where DEC determines that achieving unrestricted SCOs is not feasible as documented in a feasibility study, the remedial party may evaluate alternatives to remediate the site to the greatest extent feasible (see *DER-10: Technical Guidance for Site Investigation and Remediation*, Chapter 4.3). [See Section VI, Related References.] In this event, the remedial party may propose soil cleanup levels in accordance with any of the general approaches. However, when considering restricted use soil cleanup levels, the remedial party should apply the least restrictive use category feasible. For purposes of this discussion, residential use is the least restrictive use and industrial use is the most restrictive category. This process starts with consideration of residential use, followed by restricted residential use, commercial use, and then industrial use. The evaluation proceeds through the different land uses until a feasible remedy is found. This evaluation is not bound to the SCOs in regulation or SSCOs set forth in this guidance but may result in a site-specific soil cleanup level that is between the SCOs or soil cleanup level for two different land uses (e.g., above the restricted residential SCO and below the commercial SCO).

2. Brownfield Cleanup Program The remedy shall be fully protective of public health and the environment, including, but not limited to, groundwater according to its classification pursuant to ECL 17-0301, drinking water, surface water, air (including indoor air), sensitive populations (including children), and ecological resources (including fish and wildlife). Soil cleanup levels corresponding to the cleanup track under which the site is being remediated are required to be met. The four cleanup tracks are:

Track 1: Cleanups pursuant to this track must achieve unrestricted use of the site. This track requires that the remedial party implement a cleanup utilizing Approach 1. Institutional and engineering controls are allowed only for periods of less than five years (defined as short-term controls) except in the limited instance where a volunteer has conducted remedial activities resulting in a bulk reduction in groundwater contamination to asymptotic levels.

Track 2 : Cleanups pursuant to this track may consider the current, intended, or reasonably anticipated future use in determining the appropriate cleanup levels for soil. This track requires that the remedial party implement a cleanup that achieves the SCOs in the tables in 6 NYCRR 375-6.7(b) for the top 15 feet of soil (or bedrock if less than 15 feet). This track follows approach 2. Institutional and engineering controls are allowed for soil (for the top 15 feet of soil or bedrock if less than 15 feet) for less than five years (defined as short-term controls). Institutional and engineering controls which limit site use and the use of onsite groundwater can be used without regard to duration. Track 2 cleanups at restricted residential, commercial or industrial use sites require site management plans to ensure that material removed from the site (post remedial action) is managed appropriately and to ensure that any buffer zone protecting adjacent residential use sites or ecological resources is maintained.

Track 3: Cleanups pursuant to this track may consider the current, intended, or reasonably anticipated use in determining the appropriate cleanup levels for soil. This track requires that the remedial party implement a cleanup utilizing Approach 3 for those SCOs which the remedial party seeks to modify an established SCO. Institutional and engineering controls are allowed for soil (for the top 15 feet of soil or bedrock if less than 15 feet) for less than 5 years (defined as short-term controls). Institutional and engineering controls which limit site use and the use of on-site groundwater can be used without regard to duration. Track 3 cleanups at restricted residential, commercial or industrial use sites require site management plans to ensure that material removed from the site (post remedial action)is managed appropriately and to ensure that any buffer zone protecting adjacent residential use sites or ecological resources is maintained.

Track 4: Cleanups pursuant to this track may consider the current, intended, or reasonably anticipated use in determining the appropriate cleanup levels for soil. This track allows for the development of site-specific soil cleanup levels below the cover system in accordance with Approach 4. Track 4 remedies must address all sources as a component of the remedy. Short- and long-term institutional and engineering controls are allowed to achieve protection of public health and the environment. The remedy under Track 4 must provide a cover system over exposed residual soil contamination. Soils which are not otherwise covered by structures such as buildings, sidewalks or pavement (i.e., exposed surface soils) must be covered with soil that complies with the use-based SCOs in 6 NYCRR Table 375-6.8(b) levels for the top one foot (non-residential uses) or top two feet (restricted residential use).

3. <u>Environmental Restoration Program</u>: The goal of the program for a specific site is to select a remedy that is protective of public health and the environment, including, but not limited to, groundwater according to its classification pursuant to ECL 17-0301, drinking water, surface water and air (including indoor air), sensitive populations (including children) and ecological resources (including fish and wildlife). At a minimum, the remedy selected shall eliminate or mitigate all significant threats to public health and to the environment presented by contaminants disposed at the site through the proper application of scientific and engineering principles. Soil cleanup levels may be developed in accordance with Approaches 1 – 4 without restriction.

4. <u>Voluntary Cleanup Program</u>: The goal of the program for a specific site is to select a remedy that is protective of public health and the environment for the contemplated use. The soil cleanup levels may be developed in accordance with Approaches 1 – 4 without restriction.

5. <u>Petroleum Spill Response Program</u>: The goal of the Petroleum Spill Response Program is to achieve pre-spill conditions [6 NYCRR 611.6(a)(4)]. Remedial activities under this program shall be undertaken relative to the petroleum contamination that was released along with any co-mingled contamination from other sources. The remedial party shall achieve, to the extent feasible, the unrestricted SCOs for petroleum-related contaminants listed in 6 NYCRR Table 375-6.8(a). For petroleum contaminants not included in 6 NYCRR Table 375-6.8(a) (discussed in Section E below), the remedial party shall apply, to the extent feasible, the soil cleanup levels provided in Table 1. For ease of implementation, two lists of petroleum contaminants (Gasoline and Fuel Oil, Tables 2 and 3) are attached. The tables combine the applicable petroleum-related SCOs from 6 NYCRR 375-6.8(a) and the applicable petroleum related SSCOs from Table 1. Where DEC determines that it is not feasible to achieve the soil cleanup levels as set forth in this paragraph, the remedial party may propose soil cleanup levels in accordance with any of the general approaches. However, when considering restricted use soil cleanup levels, the remedial party should apply the least restrictive use category feasible.

For purposes of this discussion, residential use is the least restrictive use, and industrial use is the most restrictive category. This process starts with consideration of residential use, followed by restricted residential use, commercial use, and then industrial use. The evaluation proceeds through the different land uses until a feasible remedy is found. If the protection of groundwater or ecological SCOs apply, the lower of the applicable protection of the public health SCO or the applicable protection of groundwater or ecological SCO should be achieved to the extent feasible. This evaluation is not bound to the SCOs in regulation or the SSCOs set forth in this guidance but may result in a site-specific soil cleanup level that is between the SCOs or soil cleanup level for two different land uses (e.g., above the restricted residential SCO and below the commercial SCO).

6. <u>RCRA Corrective Action Program</u>: The RCRA program was promulgated to regulate facilities that actively manage hazardous waste. DER administers the RCRA Corrective Action Program, with a goal of achieving soil cleanup levels at Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) that eliminate risks to public health and the environment (i.e., clean the site to unrestricted use) or control said risks (i.e., clean the site or unit(s) to the lowest possible soil cleanup objective, regardless of site use), to the extent feasible. This goal takes into account that certain units at the facility may be permitted to manage hazardous waste under New York State's Hazardous Waste Management (HWM) regulations (6 NYCRR Part 373). The requirements of active HWM facilities, as well as the site's history, will be considered when soil cleanup levels are determined. Selected remedies must be protective of public health and the environment. Soil cleanup levels will be selected using the following procedure.

(a) The remedial party shall evaluate, and if feasible, implement a cleanup utilizing Approach 1. Under this approach, the unrestricted SCOs apply to the entire soil matrix to the top of bedrock. For contaminants not listed in 6 NYCRR 375-6, a new or existing SSCO may be used.

(b) If DEC determines that achieving unrestricted SCOs is not feasible, the remedial party may evaluate other alternatives to remediate the site. In this event, the remedial party may propose soil cleanup levels in accordance with any of the general approaches. However, when considering restricted use soil cleanup levels, the remedial party shall apply the use category which is both feasible and least restricted. For purposes of this discussion, residential use is the least restricted category and industrial use is the most restricted category. A soil cleanup level between two different land uses (e.g., residential and restricted residential) may be determined to be feasible, and if selected, must be achieved.

Any soil cleanup levels specified in regulation (i.e., 6 NYCRR 373-2.6(b)-(k) for "regulated units" as defined in 6 NYCRR 373-2.6 (a)(1)(ii)) or in a DEC enforceable document (Part 373 permits, Consent Orders, etc.) shall take precedence over the soil cleanup levels which could be established through use of this document.

C. Determination of Whether Ecological Resources SCOs Apply to a Site: SCOs developed to protect ecological resources (ESCOs) are incorporated in the Unrestricted Use SCO in 6 NYCRR Table 375-6.8(a) and are included as a separate category in 6 NYCRR Table 375-6.8(b). For contaminants of concern which do not have a calculated ESCO in regulation, DEC may direct the remedial party to develop a soil cleanup level which is protective of ecological resources where appropriate, based on the process outlined in Appendix E of the TSD.

The presence of ecological resources and any impact to those resources will be assessed during the remedial investigation. For sites where there is the potential for an ecological resource impact to be present, or where it is likely to be present, an assessment of fish and wildlife resource impacts will be performed. For sites in DER's SSF, BCP, VCP and ERP, the assessment will be performed in accordance with DEC's guidance, *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites*, October, 1994, as described in DER-10, Section 3.10. For sites in the RCRA Corrective Action Program, the assessment will be performed using the above referenced fish and wildlife impact analysis document as guidance, and by consulting with appropriate personnel in DEC's Division of Fish, Wildlife and Marine Resources.

Soil cleanup levels which are protective of ecological resources must be considered and applied, as appropriate, for the upland soils (not sediment) at sites where DEC determines, based on the foregoing analysis, that:

- ecological resources are present, or will be present, under the reasonably anticipated future use of the site, and such resources constitute an important component of the environment at, or adjacent to, the site;
- an impact or threat of impact to the ecological resource has been identified; and
- contaminant concentrations in soil exceed the ESCOs as set forth in 6 NYCRR 375-6.8(b) or the Protection of Ecological Resources SSCOs contained in this document.

Sites or portions thereof that will be covered by buildings, structures or pavement are not subject to the ESCOs. Further, ecological resources do not include pets, livestock, agricultural or horticultural crops, or landscaping in developed areas. (See 6 NYCRR 375-6.6 for more detail.)

D. Determination of Whether Protection of Groundwater SCOs Apply: SCOs developed to protect groundwater are incorporated in the Unrestricted Use SCOs in 6 NYCRR Table 375-6.8(a) and are included as a separate category in 6 NYCRR Table 375-6.8(b). For contaminants of concern which do not have a protection of groundwater SCO, DEC may direct the remedial party to develop a soil cleanup level which is protective of groundwater using the process in Appendix E of the TSD.

1. Except as provided for in (2) below, the protection of groundwater SCOs will be applicable where:

   (i) contamination has been identified in on-site soil by the remedial investigation; and
   (ii) groundwater standards are, or are threatened to be, contravened by the presence of soil contamination at concentrations above the protection of groundwater SCOs.

2. DEC may provide an exception to the applicability of the protection of groundwater SCOs, as set forth in 6 NYCRR 375-6.5(a)(1), when (i), (ii), and (iii) exist and either (iv) or (v) also apply, as described below.

   (i) The groundwater standard contravention is the result of an on-site source which is addressed by the remedial program.
   (ii) An environmental easement or other institutional control will be put in place which provides for a groundwater use restriction.
   (iii) DEC determines that contaminated groundwater at the site:
      (a) is not migrating, nor is likely to migrate, off-site; or
      (b) is migrating, or is likely to migrate, off-site; however, the remedy includes active groundwater management to address off-site migration.
   (iv) DEC determines the groundwater quality will improve over time.
   (v) The groundwater contamination migrating from the site is the result of an off-site source of contamination, and site contaminants are not contributing consequential amounts to the groundwater contamination.

3. In determining whether to provide the exemption set forth in subparagraph 2 above, DEC will consider:

   (i) all of the remedy selection criteria at 6 NYCRR 375-1.8(h) or in the RCRA Corrective Action program;
   (ii) the amount of time that the groundwater will need to be actively managed for the protection of public health and the environment; and
   (iii) the potential impact that groundwater contamination may have on media not specifically addressed by the SCOs (e.g., vapor intrusion, protection of surface water, and protection of aquatic ecological resources).

E. Supplemental Soil Cleanup Objectives: SSCOs are either existing cleanup levels in Table 1 or are new soil cleanup levels developed by the remedial party as part of its remedial program. These SSCOs are in addition to the SCOs that are included in Part 375.

Existing SSCOs: The Table 1 list of SSCOs includes contaminants from former TAGM 4046 that were not included in 6 NYCRR 375-6.8 and soil cleanup levels developed using the process detailed in Appendix E of the TSD but not promulgated. For those contaminants which were part of the former TAGM 4046, soil cleanup levels exist for the protection of public health (based on ingestion) and for the protection of groundwater. In some cases, to be determined on a site-by-site basis, evaluation of other factors is likely needed for the protection of public health, especially when the use of a site includes residential use.

These other factors include other exposure pathways (e.g., homegrown vegetable ingestion, inhalation and dermal contact), potential non-site exposures to the contaminant and current toxicological data on the contaminant. In these instances, DEC (in consultation with NYSDOH) will determine if the additional factors have been adequately addressed. The SSCOs identified in Table 1 (subject to the limitation described above) may be used as if they were included in Part 375. A remedial party is not required to use the SSCOs set forth in Table 1. In lieu of applying an SSCO, the remedial party may elect to develop a soil cleanup level (using the process described in Appendix E of the TSD and discussed below.) Table 1 also includes SSCOs that were developed for some pathways using the same process detailed in the TSD. A remedial party may elect to use those SSCOs directly or confirm that the calculated value for that pathway is correct.

New SSCOs: The remedial party may elect to, or DEC may direct a remedial party to, develop a contaminant-specific SCO for any contaminant not included in 6 NYCRR Tables 375-6.8(a) or (b). Generally, DEC will request that an SCO be developed only where the contaminant is a predominant contaminant of concern (COC) at the site and is not otherwise being addressed to DEC's satisfaction as part of the proposed remedy. This could happen, for example, when a remedial party is seeking a Track 1 cleanup and non-SCO/SSCO contaminants are present and may not be satisfactorily addressed by the remedial activities addressing the SCOs or SSCOs. Guidance on the process for developing new SCOs is provided in Appendix E of the TSD. DEC will include all newly developed soil cleanup levels, developed and approved pursuant to this paragraph in a revised Table 1. The developed SSCO must:

1. be developed utilizing the same methodologies that were used by DEC to develop SCOs that are set forth in Part 375; and

2. apply the maximum acceptable soil concentrations (caps), as set forth in section 9.3 of the TSD.

F. Use of SCOs and SSCOs as a Screening Tool: The SCOs and SSCOs may be used to identify areas of soil contamination and to determine the extent of soil contamination. As noted in Section V.K, consideration of other media is required to determine if remedial action is needed.

1. At sites or areas of concern where contaminant concentrations are equal to or below the unrestricted SCOs in 6 NYCRR Table 375-6.8(a), no action or study is warranted because of soil contamination.

2. The exceedance of one or more applicable SCOs or SSCOs, (which is the lower of protection of public health, protection of groundwater, or protection of ecological resources soil cleanup objectives as described in Section III below), alone does not trigger the need for remedial action, define “unacceptable” levels of contaminants in soil, or indicates that a site qualifies for any DEC remedial program (e.g., BCP, SSF). As noted in the definition of SCO above, SCOs and SSCOs are applicable statewide and do not account for many site-specific considerations which could potentially result in higher levels. Therefore, soil concentrations that are higher than the applicable SCOs or SSCOs are not necessarily health or environmental concerns.

3. When an applicable SCO or SSCO is exceeded, the degree of public health or environmental concern depends on several factors, including:

   - magnitude of the exceedance;
   - accuracy of the exposure estimates;
   - other sources of exposure to the contaminant; and
   - strength and quality of the available toxicological information on the contaminant.

G. Soil Cleanup Levels for Nuisance Conditions: Experience has shown that contaminants in soil that meets the DEC-approved soil cleanup levels can exhibit a distinct odor or other type of nuisance (e.g., staining). This is true even though the contaminants will not leach from the soil (e.g., certain soils with more insoluble substances at higher concentrations). When DEC determines that soil remaining after the remedial action will result in the continuation of a nuisance (e.g., odors, staining, etc), DEC will require that additional remedial measures be evaluated, and may require additional remedial actions be taken to address the nuisance condition.

H. Subsurface Soil Cleanup for Total Polycyclic Aromatic Hydrocarbons: For non-residential use sites (i.e., commercial or industrial use sites) where the ESCOs are not applicable, DEC may approve a remedial program which achieves a soil cleanup level of 500 parts per million (ppm) for total PAHs for all subsurface soil. The 500 ppm soil cleanup level is in lieu of achieving all of the PAH-specific SCOs in 6 NYCRR 375-6. For purposes of this provision, subsurface soil shall mean the soil beneath permanent structures, pavement, or similar cover systems; or at least one foot of soil cover (which must meet the applicable SCOs). Institutional controls (e.g., an environmental easement) along with a site management plan will be required when this soil cleanup level is employed at a site. This cleanup level is determined to be feasible and protective based on DEC’s experience in its various remedial programs. This approach has existed in TAGM 4046 since it was first issued in 1992.

I. Soil Cleanup for PCBs: DEC may approve a remedial program which achieves a soil cleanup level for PCBs as set forth herein:

1. **For Non-BCP sites:** An acceptable presumptive remedy for soil where neither the unrestricted SCOs nor the ESCOs are applied in the remedial program may include a soil cleanup level for PCBs of 1 ppm in the surface soils and 10 ppm in subsurface soils.

2. **For BCP sites:** An acceptable presumptive remedy for soil may include a soil cleanup level for PCBs of 1 ppm (the applicable SCO) in the surface soils and 10 ppm in subsurface in limited circumstances as follows:

- cleanup track is Track 4;
- site use will be restricted residential, commercial or industrial; and
- ESCOs do not apply.

3. **At industrial use sites,** a level of 25 ppm for PCBs provided that access is limited and individual occupancy is restricted to less than an average of 6.7 hours per week.

For purposes of this provision, subsurface soil shall mean:

- soil beneath permanent structures, pavement, or similar cover systems;
- soil beneath 1 foot of soil cover for commercial and industrial uses; or
- soil beneath 2 feet of soil cover for residential and restricted residential uses.

Institutional controls (i.e., an environmental easement), along with a site management plan, will be required when this soil cleanup level is employed at a site. As with all presumptive remedies, just because a remedy is presumptive does not mean that it will work at every site. For example, this presumptive remedy for PCBs in soil is not applicable at most landfills. This cleanup level is determined to be feasible and protective based on DEC's experience in its various remedial programs. Further, this approach has existed in TAGM 4046 since it was first issued in 1992.

J. Sampling and Compliance with Soil Cleanup Levels: The number of samples to determine if the SCOs have been achieved should be sufficient to be representative of the area being sampled. See attached Table 4 for suggested sampling frequency and subdivision 5.4(e) of DER-10 for details. This frequency can be used for confirmatory samples or for backfill. It is DEC's goal that all confirmatory samples demonstrate that the remedy has achieved the DEC-approved soil cleanup levels. However, recognizing the heterogeneity of contaminated sites and the uncertainty of sampling and analysis, DEC project manager has limited discretion to determine that remediation is complete where some discrete samples do not meet the soil cleanup levels established for a site. See DER-10 for more information regarding the determination that remediation is complete.

K. Other Considerations: All remedies must be fully protective of public health and the environment and prevent off-site migration to the extent feasible with special emphasis for the prevention or minimization of migration onto adjacent residential properties or into ecological resources. A remedial party is required to investigate all environmental media including soil, groundwater, surface water, sediments, soil vapor, indoor air, and biota. (See 6 NYCRR 375-1.8(a)(6) or RCRA Corrective Action Program). This investigation will determine if any of the referenced media are, or may be, impacted by site contamination. However, the SCOs do not directly address these other media. DEC may require remedial actions to address such media and impacts, including but not limited to the application of lower soil cleanup levels or buffer zones where it determines, based on the investigation, that any of these media are, or may be, impacted by site contamination.

VI. Related References:

- Environmental Conservation Law, Article 27 Titles 3, 5, 9, 13 and 14.

- Article 12 of the Navigation Law, Section 178.

- 6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

- 6 NYCRR Subparts 373-1, 373-2 and 373-3, Requirements for Hazardous Waste Management Facilities. September 6, 2006.

- 6 NYCRR Part 611, Environmental Priorities and Procedures in Petroleum Cleanup and Removal. November 5, 1984 (amended).

- Development of Soil Cleanup Objectives: Technical Support Document. New York State Department of Environmental Conservation. December 14, 2006.

- Supplemental Guidance to RAGS: Calculating the Concentration Term. United States Environmental Protection Agency. Publication 9285.7-081. May 1992.

- New York State Guidelines for Urban Erosion and Sediment Control. 1997.

- Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites. New York State Department of Environmental Conservation. October 1994.

- Program Policy DER-2, *Making Changes to Selected Remedies*. New York State Department of Environmental Conservation. April 1, 2008.

- Program Policy DER-10, *Technical Guidance for Site Investigation and Remediation*. New York State Department of Environmental Conservation. May 3, 2010.

- Program Policy DER-15, *Presumptive/Proven Remedial Technologies*. New York State Department of Environmental Conservation. February 27, 2007.

TABLES

1 - Supplemental Soil Cleanup Objectives
2 - Soil Cleanup Levels for Gasoline Contaminated Soils
3 - Soil Cleanup Levels for Fuel Oil Contaminated Soils
4 - Recommended Number of Soil Samples for Soil Imported to or Exported From a Site

Table 1

Supplemental Soil Cleanup Objectives
(ppm)

Contaminant	CAS Number	Residential	Restricted Residential	Commercial	Industrial	Protection of Ecological Resources	Protection of Ground-water
METALS							
Aluminum	7429-90-5					10,000 [a,b]	
Antimony	7440–36-0					12[c]	
Boron	7440-42-8					0.5	
Calcium	7440-70-2					10,000 [a,b]	
Cobalt	7440-48-4	30				20	
Iron	7439-89-6	2,000					
Lithium	7439-93-2					2	
Molybdenum	7439-98-7					2	
Technetium	7440-26-8					0.2	
Thallium	7440-28-0					5 [c]	
Tin	7440-31-5					50	
Uranium	7440-61-1					5	
Vanadium	7440-62-2	100 [a]				39[b]	
PESTICIDES							
Biphenyl	92-52-4					60	
Chlordecone (Kepone)	143-50-0					0.06	
Dibenzofuran	132-64-9						6.2
2,4-D (2,4-Dichloro-phenoxyacetic acid)	94-75-7	100 [a]					0.5
Furan	110-00-9					600	
Gamma Chlordane	5103-74-2	0.54					14
Heptachlor Epoxide	1024-57-3	0.077					0.02
Methoxychlor	72-43-5	100 [a]				1.2	900

Contaminant	CAS Number	Residential	Restricted Residential	Commercial	Industrial	Protection of Ecological Resources	Protection of Ground-water
Parathion	56-38-2	100 [a]					1.2
2,4,5-T	93-76-5	100 [a]					1.9
2,3,7,8-TCDD	1746-01-6					0.000001	
2,3,7,8-TCDF	51207-31-9					0.000001	
SEMIVOLATILE ORGANIC COMPOUNDS							
Aniline	62-53-3	48	100[a]	500[a]	1000[a]		0.33[b]
Bis(2-ethylhexyl) phthalate	117-81-7	50				239	435
Benzoic Acid	65-85-0	100[a]					2.7
Butylbenzyl-phthalate	85-68-7	100 [a]					122
4-Chloroaniline	106-47-8	100 [a]					0.22
Chloroethane	75-00-3						1.9
2-Chlorophenol	95-57-8	100 [a]				0.8	
3-Chloroaniline	108-42-9					20	
3-Chlorophenol	108-43-0					7	
Di-n-butyl-phthalate	84-74-2	100 [a]				0.014	8.1
2,4-Dichlorophenol	120-83-2	100 [a]				20	0.40
3,4-Dichlorophenol	95-77-2					20	
Diethylphthalate	84-66-2	100 [a]				100	7.1
Di-*n*-hexyl-phthalate	84-75-3					0.91	
2,4-Dinitrophenol	51-28-5	100 [a]				20	0.2
Dimethylphthlate	131-11-3	100 [a]				200	27
Di-n-octylphthlate	117-84-0	100 [a]					120
1,2,3,6,7,8-HCDF	57117-44-9					0.00021	
Hexachloro-benzene	118-74-1	0.41					1.4
2,6-Dinitrotoluene	606-20-2	1.03					1.0
Isophorone	78-59-1	100 [a]					4.4

Contaminant	CAS Number	Residential	Restricted Residential	Commercial	Industrial	Protection of Ecological Resources	Protection of Ground-water
4-methyl-2-pentanone	108-10-1						1.0
2-methyl-naphthalene	91-57-6	0.41					36.4
2-Nitroaniline	88-74-4						0.4
3-Nitroaniline	99-09-2						0.5
Nitrobenzene	98-95-3	3.7	15	69	140	40	0.17[b]
2-Nitrophenol	88-75-5					7	0.3
4-Nitrophenol	100-02-7					7	0.1
Pentachloroaniline	527-20-8					100	
2,3,5,6-Tetrachloroaniline	3481-20-7					20	
2,3,4,5-Tetrachlorophenol	4901-51-3					20	
2,4,5-Trichloroaniline	636-30-6					20	
2,4,5-Trichlorophenol	95-95-4	100 [a]				4	0.1
2,4,6-Trichlorophenol	88-06-2					10	
VOLATILE ORGANIC COMPOUNDS							
2-Butanone	78-93-3	100 [a]					0.3
Carbon Disulfide	75-15-0	100 [a]					2.7
Chloroacetamide	79-07-2					2	
Dibromochloro-methane	124-48-1					10	
2,4-Dichloro aniline	554-00-7					100	
3,4-Dichloroaniline	95-76-1					20	
1,2-Dichloropropane	78-87-5					700	
1,3-Dichloropropane	142-28-9						0.3
2,6-Dinitrotoluene	606-20-2	1.03					0.17[b]
Ethylacetate	141-78-6					48	

Contaminant	CAS Number	Residential	Restricted Residential	Commercial	Industrial	Protection of Ecological Resources	Protection of Ground-water
4-methyl-2-pentanone	108-10-1						1.0
113 Freon (1,1,2- TFE)	76-13-1	100 [a]					6
isopropylbenzene	98-82-8	100 [a]					2.3
p-isopropyltoluene	99-87-6						10
Hexachlorocyclo-pentadiene	77-47-4					10	
Methanol	67-56-1					6.5	
N-nitrosodiphenyl-amine	86-30-6					20	
Pentachloro-benzene	608-93-5					20	
Pentachloronitro-benzene	82-68-8					10	
Styrene	100-42-5					300	
1,2,3,4-Tetrachlorobenzene	634-66-2					10	
1,1,2,2-Tetrachloroethane	79-34-5	35					0.6
1,1,2,2-Tetrachloroethylene	127-18-4					2	
1,2,3-Trichlorobenzene	87-61-6					20	
1,2,4-Trichlorobenzene	120-82-1					20	3.4
1,2,3-Trichloropropane	96-18-4	80					0.34

[a] SCOs for organic contaminants (volatile organic compounds, semivolatile organic compounds, and pesticides) are capped at 100 ppm for residential use, 500 ppm for commercial use, 1000 ppm for industrial use. SCOs for metals are capped at 10,000 ppm.

[b] Based on rural background study

[c] SCO limited by contract required quantitation limit.

Table 2

Soil Cleanup Levels for Gasoline Contaminated Soils

Contaminant	CAS Registry Number	Soil Cleanup Level (ppm)
Benzene	71-43-2	0.06
n-Butylbenzene	104-51-8	12.0
sec-Butylbenzene	135-98-8	11.0
Ethylbenzene	100-41-4	1.0
Isopropylbenzene	98-82-8	2.3
p-Isopropyltoluene	99-87-6	10.0
Methyl-Tert-Butyl-Ether	1634-04-4	0.93
Naphthalene	91-20-3	12.0
n-Propylbenzene	103-65-1	3.9
Tert-Butylbenzene	98-06-6	5.9
Toluene	108-88-3	0.7
1,2,4-Trimethylbenzene	95-63-6	3.6
1,3,5-Trimethylbenzene	108-67-8	8.4
Xylene (Mixed)	1330-20-7	0.26

Table 3

Soil Cleanup Levels for Fuel Oil Contaminated Soil

Contaminant	CAS Registry Number	Soil Cleanup Level (ppm)
Acenaphthene	83-32-9	20
Acenaphthylene	208-96-8	100
Anthracene	120-12-7	100
Benz(a)Anthracene	56-55-3	1.0
Dibenzo(a,h)Anthracene	53-70-3	0.33
Benzene	71-43-2	0.06
n-Butylbenzene	104-51-8	12.0
sec-Butylbenzene	135-98-8	11.0
Tert-Butylbenzene	98-06-6	5.9
Chrysene	218-01-9	1.0
Ethylbenzene	100-41-4	1.0
Fluoranthene	206-44-0	100
Benzo(b)Fluoranthene	205-99-2	1.0
Benzo(k)Fluoranthene	207-08-9	0.8
Fluorene	86-73-7	30
Isopropylbenzene	98-82-8	2.3
p-Isopropyltoluene	99-87-6	10.0
Naphthalene	91-20-3	12.0
n-Propylbenzene	103-65-1	3.9
Benzo(g,h,i)Perylene	191-24-2	100
Phenanthrene	85-01-8	100
Pyrene	129-00-0	100
Benzo(a)Pyrene	50-32-8	1.0
Indeno(1,2,3-cd)Pyrene	193-39-5	0.5
1,2,4-Trimethylbenzene	95-63-6	3.6
1,3,5-Trimethylbenzene	108-67-8	8.4
Toluene	108-88-3	0.7
Xylene (Mixed)	1330-20-7	0.26

Table 4

Recommended Number of Soil Samples for Soil Imported To or Exported From a Site

<table>
<tr><th>Contaminant</th><th>VOCs[a]</th><th colspan="2">SVOCs, Inorganics & PCBs/Pesticides</th></tr>
<tr><th>Soil Quantity (cubic yards)</th><th>Discrete Samples</th><th>Composite</th><th>Discrete Samples/Composite</th></tr>
<tr><td>0-50</td><td>1</td><td>1</td><td rowspan="8">Each composite sample for analysis is created from 3-5 discrete samples from representative locations in the fill.</td></tr>
<tr><td>50-100</td><td>2</td><td>1</td></tr>
<tr><td>100-200</td><td>3</td><td>1</td></tr>
<tr><td>200-300</td><td>4</td><td>1</td></tr>
<tr><td>300-400</td><td>4</td><td>2</td></tr>
<tr><td>400-500</td><td>5</td><td>2</td></tr>
<tr><td>500-800</td><td>6</td><td>2</td></tr>
<tr><td>800-1000</td><td>7</td><td>2</td></tr>
<tr><td>➢ 1000</td><td colspan="3">Add an additional 2 VOC and 1 composite for each additional 1000 Cubic yards or consult with DER.[b]</td></tr>
</table>

[a] VOC samples cannot be composited. Discrete samples must be taken to maximize the representativeness of the results.

[b] For example, a 3,000 cubic yard soil pile to be sampled and analyzed for VOCs would require 11 discrete representative samples. The same pile to be sampled for SVOCs would require 4 composite samples with each composite sample consisting of 3-5 discrete samples.

<u>Appendix I – Post-Construction Operation and Maintenance (O&M) Manual</u>

Post-Construction Operation and Maintenance (O&M) Manual for Stormwater Management Facilities

for

BR BENSON MINES SOLAR PROJECT

TOWN OF CLIFTON
ST. LAWRENCE COUNTY, NEW YORK
SPDES Permit #: _____________

Prepared for:
New York State Energy Research and Development Authority (NYSERDA)
17 Columbia Circle
Albany, NY 12203-1091

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

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December 2021

Table of Contents:

Appendices:

1.0 Introduction

The stormwater management system for the Benson Mines Solar Project consists of vegetated swales, vegetated buffer filter strips, infiltration basins and riprap outlet protection. The following O&M Manual outlines the minimum requirements for maintaining the stormwater management facilities, as required in Section 3.5 of the New York State Stormwater Management Design Manual (SMDM).

1.1 Purpose of the Manual

This manual is intended to outline the requirements for proper maintenance and operation of the stormwater management facilities associated with the Benson Mines Solar Project. Proper maintenance ensures the following:

- Stormwater facilities operate as they were designed;
- Stormwater facilities remain free of sediment, debris, and potential pollutants; and
- Stormwater facilities do not result in adverse downstream impacts to environmentally sensitive areas.

The Benson Mines Solar Project will be solely-owned, operated, and maintained by NYSERDA (the Owner). The Owner is responsible for ensuring that the stormwater management facilities installed on the Project Site are properly maintained and that they function as designed. In some cases, the maintenance responsibility may be assigned to others through special maintenance agreements. Stormwater management practice schematics for the Project Site are provided in Appendix A. Maintenance agreements associated with this Project shall be included in Appendix D of this Manual.

This Manual details the various stormwater facility components and the general operation and maintenance activities required for each component. Additional operation and maintenance information may be found in the SMDM) and the New York State Standards and Specifications for Erosion and Sediment Control.

2.0 Inspection and Maintenance Schedule

The stormwater management systems shall be inspected and maintained regularly to ensure proper site function. Inspection frequency may depend on the stormwater management systems and facilities present at the Project Site.

A Maintenance Inspection Form shall be completed during each inspection to document the Site conditions and required maintenance activities. Maintenance activities may include, but are not limited to, removal of sediment, trash, or debris; vegetation management; erosion repair; and revegetation of exposed soils. A blank sample Maintenance Inspection Form has been included in Appendix B. Completed Maintenance Inspection Forms shall be incorporated into Appendix C.

3.0 First Year Maintenance

The following maintenance activities are required during the first year following Project completion:

- Water vegetation once every three days for the first month, then provide a half inch of water per week during the first year.
- Fertilization may be needed in the fall after the first growing season to increase plant vigor. Fertilizer application and use should be in accordance with local, state, and federal laws and regulations.
- Keep the site free of vehicular and foot traffic and other weight loads.

4.0 General Site Maintenance

Site cover and associated structures should be inspected periodically for the first few months following construction and then on a bi-annual basis. Site inspections should also be performed following major weather events such as, but not limited to, major storm events, thunderstorms, and significant snow melt.

Items to inspect for include, but are not limited to:

- Differential settlement of embankments, cracking, or erosion.
- Lack of vegetative cover density.
- Sediment accumulation on the ground surface or within stormwater management practices or conveyance systems.
- Accumulation of debris, litter, or pollutants such as oil or grease on the ground surface or within stormwater management practices or conveyance systems.
- Damage to or weakness of stormwater management practices or conveyance systems.

4.1 Site Restoration

Areas within a Project Site that have undergone site restoration should be inspected periodically for the first six months and once after each storm event greater than a half-inch.

Items to inspect for include, but are not limited to:

- Checking embankments for subsidence, erosion, cracking, undesirable tree and shrub growth, and the presence of burrowing animals.
- Health and vigor of vegetation such as trees, shrubs, grass, and flowers.
- Accumulation of sediment or vegetative debris such as leaves and branches.

5.0 Winter Maintenance

To prevent impacts to stormwater management facilities, the following winter maintenance limitations, restrictions, and/or requirements are recommended:

- Remove snow and ice from catch basins, inlet and outlet structures, and away from culvert end sections.
- Snow plowed or removed should not be piled at inlets/outlets of stormwater management practices or structures.

- De-icing materials should be limited to sand and “environmentally friendly” chemical products.
    - The use of salt mixtures should be kept to a minimum.
    - Sand used for de-icing should be clean, coarse material free of fines, silt and clay.
- De-icing materials should be removed during the early spring by sweeping and/or vacuuming.

6.0 Operation and Maintenance Procedures: Stormwater Management Facilities

6.1 Vegetated Swales

Vegetated swales use grass or other dense vegetation to filter sediment out of stormwater.

General Inspection Requirements

Vegetated swales shall be visually inspected annually and after major storm events for damage, debris and/or excessive sedimentation. Damage within the swale may include erosion, channeling flows, rills, ponding water, or exposed soils.

Sedimentation

Sediment build-up within the bottom of the swale shall be removed when 25% of the original swale volume has been exceeded. Leaf litter and vegetative debris shall be removed as necessary to prevent stormwater blockage through the swale.

Trash and Debris

If debris or trash is observed, it shall be removed and disposed of properly.

Vegetation Management

Adequate vegetative cover shall be maintained within the swale. Exposed soils shall be seeded and mulched to re-establish vegetation. The vegetation within vegetated wet swales shall be maintained at a height of eight inches. Vegetation within vegetated dry swales shall be mowed during the growing season to maintain a height of four to six inches.

6.2 Riparian Buffers and Filter Strips

Vegetated filter strips or undisturbed natural areas such as riparian buffers are utilized to treat and control stormwater runoff from areas of development. Vegetated filter strips are vegetated surfaces designed to treat sheet flow from adjacent areas and removed pollutants through filtration and infiltration.

General Inspection Requirements

The riparian buffers and/or filter strips shall be inspected annually for damage and debris. Damage may include, but is not limited to, exposed soils, erosion or channelization, and reduction in the buffer length. The buffer length shall be maintained at the design length to ensure effectiveness of the practice.

Erosion and Sedimentation

If sedimentation occurs, the sediment shall be removed with a hand shovel when greater than two inches of sediment is present. If erosion or channelization is experienced, upstream maintenance may be required to repair an underlying problem contributing to the damages.

Vegetation Management

Vegetation within filter strips shall be mowed to a minimum height of four inches with a minimum of four cuttings per year. Exposed soils within filter strips shall be reseeded and mulch, as needed.

Riparian buffers shall remain as undisturbed natural areas to ensure effectiveness of the practice.

6.3 Infiltration Facilities

Infiltration facilities dispose of stormwater by detaining the water and allowing it to infiltrate into the ground. Infiltration facilities may be designed to handle all or a portion of the runoff from a Project Site, or they may overflow and bypass larger storms to alternate systems.

General Inspection Requirements

Stormwater infiltration systems shall be inspected annually and after major storm events. The facility should be inspected following a storm event to ensure the system is functioning properly and maintaining the capacity to infiltrate the stormwater. A monitoring well may be utilized to inspect the functionality of the system. The system shall be inspected for sedimentation, debris/trash, and damage.

Access and Vegetation Management

Direct access to the infiltration facility shall be available at all times. Vegetation shall be managed to sustain the facility and allow for access. Seed and mulch bare soils are needed to maintain adequate soil cover.

Trash and Debris

Trash and debris shall be removed as needed.

Erosion and Sedimentation

Sediment shall be removed from the system when it accumulates to two inches, or when the system is not draining properly. The sediment shall be removed with a hand shovel and disposed of at an approved solid waste disposal facility. The infiltration facility shall be inspected annually for sediment deposition.

Inspect the system for displacement of aggregate material. Remove the displaced aggregate and repair the infiltration facility as needed to meet the design specifications.

System Functionality and Dewatering

The infiltration system shall fully dewater within 48 hours of a storm event. Damage to the infiltration system shall be repaired immediately following identification. The overflow from the infiltration system shall be inspected for damage and to ensure the system is operating correctly.

7.0 Operation and Maintenance Procedures: Stormwater Structures and Features

7.1 Storm Culverts and Drainage Pipes

Storm culverts and drainage pipes convey stormwater throughout the Project Site. The storm culverts and drainage pipes shall be inspected annually and after major storm events to assess for damage and obstructions. Storm culverts and drainage pipes may experience damage such as cracking, warping due to compaction, or corrosion. The culverts and piping shall be repaired or replaced when 25% or more of the structure has been compromised.

Sediment build-up and debris/trash shall be removed and disposed of at an approved soil waste disposal facility. Improper removal of sediment and debris/trash may result in flooding and adverse impacts to upstream areas. Use of a hand shovel is recommended for sediment removal.

Riprap outlet protection and stone aprons at the outlets of storm culverts and drainage pipes shall be inspected as detailed in Section 8.1 of this Manual. The inlets and outlets shall be assessed for erosive conditions. Repair to erosion shall be completed as needed.

Vegetation shall be maintained to prevent excess vegetative growth at the inlets and outlets of the culverts and piping.

8.0 Operation and Maintenance Procedures: Miscellaneous Items

8.1 End Sections

End sections are found at the end of pipes and typically include rock outlet protection such as riprap stone aprons. The purpose of riprap aprons placed at the end of pipes is to reduce the velocity, depth, and energy of stormwater, such that the flow will not erode downstream areas.

The end section(s) of pipes, including stone aprons, should be visually inspected for trash and sediment annually and after major storm events. If trash is observed, it should be removed and disposed of properly. If excess sediment deposition is observed on the stone apron, measures should be taken to remove the sediment. Excessive sedimentation occurs when the stones on the bottom of the apron are no longer visible due to sediment deposition. It is recommended that accumulated sediments be removed with a hand shovel and disposed of off-site at an approved or otherwise authorized solid waste disposal facility.

8.2 Fences, Gates, and Signage

Fences have been installed around the perimeter of stormwater facilities in order to restrict entry to the facility, and to protecting the public and wildlife. Gates have been installed at various locations along the perimeter fencing to allow for maintenance access. Gates are to be secured shut with a lock except when maintenance operations are actively occurring.

Inspect the fences, gates, and signage annually for areas needing repair or replacement. Repair or replace damaged or compromised components of the fences, gates, or signage as needed. Maintain the ground underneath the fences and gates as needed to allow safe entry and exit to the stormwater management facility and prevent further erosion impacts. Replace the signage if any information is missing or has been sun-bleached.

8.3 Access Roads, Gravel Parking Areas and Substation Yards

Access roads shall be maintained to allow for safe access to and from the Project Site. The access roads shall be inspected annually and after major storm events to assess for trash/debris, erosion, rilling, sedimentation, or gravel migration. Trash/debris shall be removed as needed and disposed of at an approved solid waste facility. Erosion, sedimentation, rilling, or gravel migration shall be repaired. Vegetation along the access roads shall be maintained as needed to allow for safe access to the Project Site.

9.0 Operation and Maintenance Procedures: Repair/Replacement Activities

Damage to on-site stormwater facilities and infrastructure may occur and repair or replacement may be necessary to ensure proper function. Components of the stormwater management practices, conveyance systems, or on-site structures which require repair or replacement should be addressed immediately following identification of deficiencies.

Repair of stormwater management facilities shall be completed as outlined in this Manual. Replacement of stormwater facilities or components of a facility may require assessment and design by a licensed engineer. The Owner/Operator shall read local, state, and federal regulations prior to replacement activities to ensure compliance.

10.0 Contact Information

Questions about the stormwater management systems and operation and maintenance procedures should be directed to NYSERDA's Project representative at the following:

- Phone: ____-____-______
- Email: ______________________________________

Appendix A - Stormwater Management Practice Schematics

Post-Construction O&M Manual: Stormwater Management Practice Schematics

Project Name:	
Owner/Operator:	

1		**2**	

3		**4**	

5		6	

7		8	

9		10	

11		12	

Appendix B – Blank Maintenance Inspection Form

Post-Construction Operation and Maintenance Manual: Maintenance Inspection Form

Project Name:	
Inspection Date:	
Inspection Time:	
Inspector's Name:	

Inspection Item	Inspection Frequency	Maintenance Required?	Comments
Swale(s)			
Free of trash, debris, and pollutants?	Annually		
Erosion and/or sedimentation observed?	Annually		
Spillway is stable and is free of erosion or sedimentation?	Annually		
Channel dewaters between storm events?	Annually		
Blockage of flow present in the swale, culverts or underdrains?	Annually		
Vegetation is healthy and sufficient ground cover is observed?	Annually		
Vegetation is mowed to a minimum height of 4 to 6 inches?	Quarterly		
Riparian Buffers and Filter Strips			
Free of trash, debris, and pollutants?	Annually		
Erosion and/or sedimentation observed?	Annually		
Vegetation is healthy and sufficient ground cover is observed?	Annually		
Vegetation is mowed to a minimum height of 4 inches (minimum of 4 cuttings per year)?	Quarterly		
Buffer length has not been reduced?	Annually		
Infiltration Facilities			
Facility is functioning properly?	Annually		
Free of trash, debris, and pollutants?	Annually		
System is draining properly?	Quarterly		
Sediment accumulation has reached 2 inches or greater?	Annually		
Vegetation is healthy and sufficient ground cover is observed?	Annually		
Vegetation is mowed to a minimum height of 8 inches?	Quarterly		
Overflow area is in good condition?	Annually		
Storm Culverts and Drainage Pipes			
Free of trash, debris, and pollutants?	Annually		
Culvert/pipe is free of obstructions and functioning properly?	Annually		

Inspection Item	Inspection Frequency	Maintenance Required?	Comments
Vegetation at the inlet and outlet is properly maintained?	Annually		
Culvert/pipe is not damaged (cracked, warped, corroded, etc.)?	Annually		
25% or more of the culvert/pipe structure has been compromised?	Annually		
End Sections			
Free of trash, debris, and pollutants?	Annually		
Erosion and/or sedimentation is observed?	Annually		
Rocks at the outlet have not been displaced or are insufficient?	Annually		
Vegetation is impeding the flow of stormwater from the structure?	Annually		
Fences, Gates, and Signage			
Fencing and gates are in working order and are not damaged?	Annually		
Signage is legible and displayed clearly?	Annually		
Vegetation is maintained to not impede gated access or block signage?	Annually		
Access Roads			
Road surface is free of riling?	Annually		
Geo-web/grid is not exposed?	Annually		
Gravel cover is sufficient, and the road has maintained the proper grade?	Annually		
Erosion and/or sedimentation observed?	Annually		
Free of trash, debris, and pollutants?	Annually		
Vegetation adjacent to road is healthy and sufficient ground cover is observed?	Annually		
Vegetation adjacent to road is mowed to a minimum height of 4 inches?	Quarterly		

Appendix C – Completed Maintenance Inspection Forms

Appendix D – Maintenance Agreements

Appendix J – Pre-Development Modeling

- Pre-Development Subcatchment Map -

- Pre-Development HydroCAD Model -

Appendix J – Pre-Development Subcatchment Map

PRELIMINARY
NOT FOR CONSTRUCTION

LEGEND

SUBCATCHMENT BOUNDARY		APA WETLAND	
SOIL GROUP BOUNDARY		WETLAND	
Tc FLOW PATH		FLOODPLAIN	
LIMITS OF DISTURBANCE			
EXISTING CULVERT			
EXISTING SURFACE FLOW DIRECTION			

300 0 300 600 FT
SCALE: 1" = 300'

UNDER NEW YORK STATE EDUCATION LAW ARTICLE 145 (ENGINEERING), SECTION 7209 (2), IT IS A VIOLATION OF THE LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

TRC
10 MAXWELL DRIVE
CLIFTON PARK, NY 12065

PROJECT NO: 444154

REV	DESCRIPTION	DATE	DES	CHK	APP
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
A	ISSUED FOR PERMITTING	1/2022	NAM	NAM	NAM

BWH DESIGNED
BWH DRAWN
JWH CHECKED
NAM APPROVED
- REVIEW 1
- REVIEW 2
7/21 DATE
AS NOTED SCALE

EXISTING HYDROLOGY PLAN

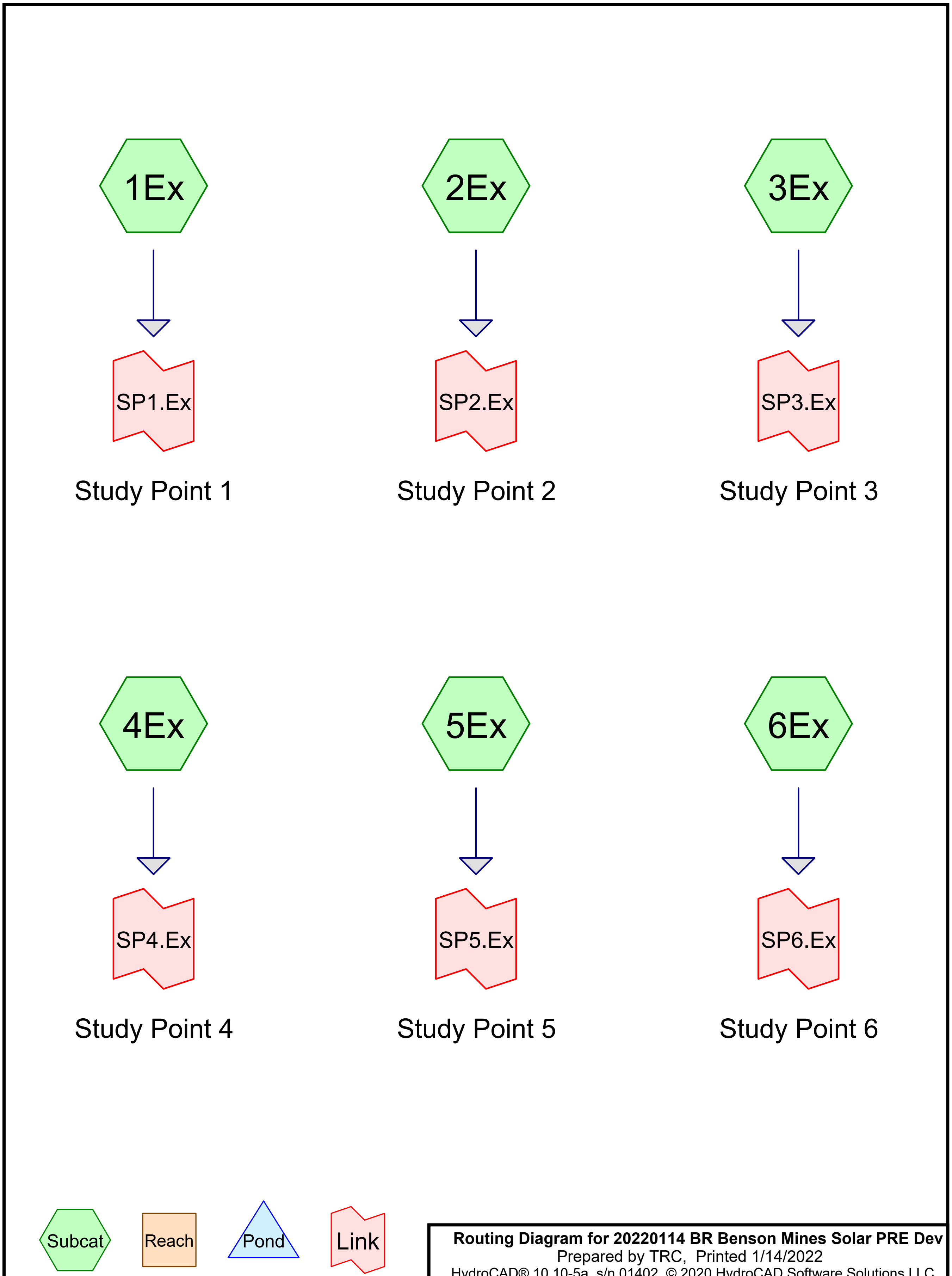
BR BENSON MINES SOLAR PROJECT
NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY
CLIFTON, ST LAWRENCE COUNTY, NEW YORK

TRC

C-101

REV. -

Appendix J – Pre-Development HydroCAD Model



Routing Diagram for 20220114 BR Benson Mines Solar PRE Dev
Prepared by TRC, Printed 1/14/2022
HydroCAD® 10.10-5a s/n 01402 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Yr Storm	Type II 24-hr		Default	24.00	1	1.98	2
2	10-Yr Storm	Type II 24-hr		Default	24.00	1	3.28	2
3	100-Yr Storm	Type II 24-hr		Default	24.00	1	5.43	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.721	61	>75% Grass cover, Good, HSG B (3Ex, 4Ex, 6Ex)
0.979	74	>75% Grass cover, Good, HSG C (2Ex, 3Ex)
5.213	96	Gravel surface (1Ex, 2Ex, 3Ex, 4Ex, 5Ex, 6Ex)
4.928	30	Meadow, non-grazed, HSG A (1Ex)
3.988	58	Meadow, non-grazed, HSG B (1Ex, 4Ex, 6Ex)
255.446	71	Meadow, non-grazed, HSG C (1Ex, 2Ex, 3Ex, 4Ex, 5Ex, 6Ex)
2.432	78	Meadow, non-grazed, HSG D (1Ex)
3.071	98	Paved Roads & Rooftops (3Ex, 4Ex, 6Ex)
10.043	30	Woods, Good, HSG A (1Ex)
88.588	55	Woods, Good, HSG B (1Ex, 3Ex, 4Ex, 6Ex)
81.625	70	Woods, Good, HSG C (1Ex, 2Ex, 3Ex, 4Ex, 5Ex, 6Ex)
461.034	**67**	**TOTAL AREA**

Summary for Subcatchment 1Ex:

Runoff = 8.68 cfs @ 15.41 hrs, Volume= 5.304 af, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	2.141	96	Gravel surface
	4.928	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	225.364	71	Meadow, non-grazed, HSG C
	2.432	78	Meadow, non-grazed, HSG D
	10.043	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	60.589	70	Woods, Good, HSG C
	338.817	68	Weighted Average
	338.817		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	199	0.0226	1.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
204.1	6,781	Total			

Summary for Subcatchment 2Ex:

Runoff = 3.92 cfs @ 12.10 hrs, Volume= 0.314 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	1.417	96	Gravel surface
	0.573	74	>75% Grass cover, Good, HSG C
	6.306	71	Meadow, non-grazed, HSG C
	2.763	70	Woods, Good, HSG C
	11.059	74	Weighted Average
	11.059		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0617	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
7.1	1,620	0.0560	3.81		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	166	0.1474	23.24	2,984.65	**Channel Flow,** Area= 128.4 sf Perim= 75.4' r= 1.70' n= 0.035 Earth, dense weeds
14.5	1,886	Total			

Summary for Subcatchment 3Ex:

Runoff = 1.33 cfs @ 12.09 hrs, Volume= 0.192 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.004	98	Paved Roads & Rooftops
*	0.225	96	Gravel surface
	2.011	61	>75% Grass cover, Good, HSG B
	0.406	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.000	58	Meadow, non-grazed, HSG B
	5.360	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	4.276	70	Woods, Good, HSG C
	15.624	66	Weighted Average
	15.620		99.97% Pervious Area
	0.004		0.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	52	0.0937	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.0	886	Total			

Summary for Subcatchment 4Ex:

Runoff = 0.32 cfs @ 15.31 hrs, Volume= 0.249 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	1.617	98	Paved Roads & Rooftops
*	0.492	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	2.634	58	Meadow, non-grazed, HSG B
	6.914	71	Meadow, non-grazed, HSG C
	48.226	55	Woods, Good, HSG B
	4.669	70	Woods, Good, HSG C
	64.717	59	Weighted Average
	63.100		97.50% Pervious Area
	1.617		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.5	703	0.0144	0.60		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.4	746	0.0104	8.97	932.76	**Channel Flow,** Area= 104.0 sf Perim= 70.0' r= 1.49' n= 0.022 Earth, clean & straight
46.7	2,427	Total			

Summary for Subcatchment 5Ex:

Runoff = 2.01 cfs @ 12.07 hrs, Volume= 0.152 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.458	96	Gravel surface
	4.303	71	Meadow, non-grazed, HSG C
	1.090	70	Woods, Good, HSG C
	5.851	73	Weighted Average
	5.851		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0671	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
4.8	1,034	0.0506	3.62		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	46	0.1988	3.12		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.1	1,180	Total			

Summary for Subcatchment 6Ex:

Runoff = 1.53 cfs @ 12.83 hrs, Volume= 0.437 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
*	0.480	96	Gravel surface
	2.545	61	>75% Grass cover, Good, HSG B
	0.788	58	Meadow, non-grazed, HSG B
	7.199	71	Meadow, non-grazed, HSG C
	4.266	55	Woods, Good, HSG B
	8.238	70	Woods, Good, HSG C
	24.966	69	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Summary for Link SP1.Ex: Study Point 1

Inflow Area = 338.817 ac, 0.00% Impervious, Inflow Depth = 0.19" for 1-Yr Storm event
Inflow = 8.68 cfs @ 15.41 hrs, Volume= 5.304 af
Primary = 8.68 cfs @ 15.41 hrs, Volume= 5.304 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP2.Ex: Study Point 2

Inflow Area = 11.059 ac, 0.00% Impervious, Inflow Depth = 0.34" for 1-Yr Storm event
Inflow = 3.92 cfs @ 12.10 hrs, Volume= 0.314 af
Primary = 3.92 cfs @ 12.10 hrs, Volume= 0.314 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP3.Ex: Study Point 3

Inflow Area = 15.624 ac, 0.03% Impervious, Inflow Depth = 0.15" for 1-Yr Storm event
Inflow = 1.33 cfs @ 12.09 hrs, Volume= 0.192 af
Primary = 1.33 cfs @ 12.09 hrs, Volume= 0.192 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP4.Ex: Study Point 4

Inflow Area = 64.717 ac, 2.50% Impervious, Inflow Depth = 0.05" for 1-Yr Storm event
Inflow = 0.32 cfs @ 15.31 hrs, Volume= 0.249 af
Primary = 0.32 cfs @ 15.31 hrs, Volume= 0.249 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP5.Ex: Study Point 5

Inflow Area = 5.851 ac, 0.00% Impervious, Inflow Depth = 0.31" for 1-Yr Storm event
Inflow = 2.01 cfs @ 12.07 hrs, Volume= 0.152 af
Primary = 2.01 cfs @ 12.07 hrs, Volume= 0.152 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP6.Ex: Study Point 6

Inflow Area = 24.966 ac, 5.81% Impervious, Inflow Depth = 0.21" for 1-Yr Storm event
Inflow = 1.53 cfs @ 12.83 hrs, Volume= 0.437 af
Primary = 1.53 cfs @ 12.83 hrs, Volume= 0.437 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 1Ex:

Runoff = 47.47 cfs @ 14.74 hrs, Volume= 21.924 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	2.141	96	Gravel surface
	4.928	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	225.364	71	Meadow, non-grazed, HSG C
	2.432	78	Meadow, non-grazed, HSG D
	10.043	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	60.589	70	Woods, Good, HSG C
	338.817	68	Weighted Average
	338.817		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	199	0.0226	1.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
204.1	6,781	Total			

Summary for Subcatchment 2Ex:

Runoff = 15.38 cfs @ 12.07 hrs, Volume= 1.005 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	1.417	96	Gravel surface
	0.573	74	>75% Grass cover, Good, HSG C
	6.306	71	Meadow, non-grazed, HSG C
	2.763	70	Woods, Good, HSG C
	11.059	74	Weighted Average
	11.059		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0617	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
7.1	1,620	0.0560	3.81		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	166	0.1474	23.24	2,984.65	**Channel Flow,** Area= 128.4 sf Perim= 75.4' r= 1.70' n= 0.035 Earth, dense weeds
14.5	1,886	Total			

Summary for Subcatchment 3Ex:

Runoff = 14.04 cfs @ 12.04 hrs, Volume= 0.890 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.004	98	Paved Roads & Rooftops
*	0.225	96	Gravel surface
	2.011	61	>75% Grass cover, Good, HSG B
	0.406	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.000	58	Meadow, non-grazed, HSG B
	5.360	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	4.276	70	Woods, Good, HSG C
	15.624	66	Weighted Average
	15.620		99.97% Pervious Area
	0.004		0.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	52	0.0937	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.0	886	Total			

Summary for Subcatchment 4Ex:

Runoff = 9.86 cfs @ 12.61 hrs, Volume= 2.180 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	1.617	98	Paved Roads & Rooftops
*	0.492	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	2.634	58	Meadow, non-grazed, HSG B
	6.914	71	Meadow, non-grazed, HSG C
	48.226	55	Woods, Good, HSG B
	4.669	70	Woods, Good, HSG C
	64.717	59	Weighted Average
	63.100		97.50% Pervious Area
	1.617		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.5	703	0.0144	0.60		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.4	746	0.0104	8.97	932.76	**Channel Flow,** Area= 104.0 sf Perim= 70.0' r= 1.49' n= 0.022 Earth, clean & straight
46.7	2,427	Total			

Summary for Subcatchment 5Ex:

Runoff = 8.36 cfs @ 12.05 hrs, Volume= 0.504 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.458	96	Gravel surface
	4.303	71	Meadow, non-grazed, HSG C
	1.090	70	Woods, Good, HSG C
	5.851	73	Weighted Average
	5.851		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0671	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
4.8	1,034	0.0506	3.62		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	46	0.1988	3.12		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.1	1,180	Total			

Summary for Subcatchment 6Ex:

Runoff = 9.29 cfs @ 12.69 hrs, Volume= 1.716 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
*	0.480	96	Gravel surface
	2.545	61	>75% Grass cover, Good, HSG B
	0.788	58	Meadow, non-grazed, HSG B
	7.199	71	Meadow, non-grazed, HSG C
	4.266	55	Woods, Good, HSG B
	8.238	70	Woods, Good, HSG C
	24.966	69	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Summary for Link SP1.Ex: Study Point 1

Inflow Area = 338.817 ac, 0.00% Impervious, Inflow Depth = 0.78" for 10-Yr Storm event
Inflow = 47.47 cfs @ 14.74 hrs, Volume= 21.924 af
Primary = 47.47 cfs @ 14.74 hrs, Volume= 21.924 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP2.Ex: Study Point 2

Inflow Area = 11.059 ac, 0.00% Impervious, Inflow Depth = 1.09" for 10-Yr Storm event
Inflow = 15.38 cfs @ 12.07 hrs, Volume= 1.005 af
Primary = 15.38 cfs @ 12.07 hrs, Volume= 1.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP3.Ex: Study Point 3

Inflow Area =	15.624 ac,	0.03% Impervious, Inflow Depth = 0.68"	for 10-Yr Storm event	
Inflow =	14.04 cfs @	12.04 hrs, Volume=	0.890 af	
Primary =	14.04 cfs @	12.04 hrs, Volume=	0.890 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP4.Ex: Study Point 4

Inflow Area =	64.717 ac,	2.50% Impervious, Inflow Depth = 0.40"	for 10-Yr Storm event	
Inflow =	9.86 cfs @	12.61 hrs, Volume=	2.180 af	
Primary =	9.86 cfs @	12.61 hrs, Volume=	2.180 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP5.Ex: Study Point 5

Inflow Area =	5.851 ac,	0.00% Impervious, Inflow Depth = 1.03"	for 10-Yr Storm event	
Inflow =	8.36 cfs @	12.05 hrs, Volume=	0.504 af	
Primary =	8.36 cfs @	12.05 hrs, Volume=	0.504 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP6.Ex: Study Point 6

Inflow Area =	24.966 ac,	5.81% Impervious, Inflow Depth = 0.83"	for 10-Yr Storm event	
Inflow =	9.29 cfs @	12.69 hrs, Volume=	1.716 af	
Primary =	9.29 cfs @	12.69 hrs, Volume=	1.716 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 1Ex:

Runoff = 149.99 cfs @ 14.74 hrs, Volume= 61.874 af, Depth= 2.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	2.141	96	Gravel surface
	4.928	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	225.364	71	Meadow, non-grazed, HSG C
	2.432	78	Meadow, non-grazed, HSG D
	10.043	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	60.589	70	Woods, Good, HSG C
	338.817	68	Weighted Average
	338.817		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.2	199	0.0226	1.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
204.1	6,781	Total			

Summary for Subcatchment 2Ex:

Runoff = 39.56 cfs @ 12.07 hrs, Volume= 2.499 af, Depth= 2.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	1.417	96	Gravel surface
	0.573	74	>75% Grass cover, Good, HSG C
	6.306	71	Meadow, non-grazed, HSG C
	2.763	70	Woods, Good, HSG C
	11.059	74	Weighted Average
	11.059		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0617	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
7.1	1,620	0.0560	3.81		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	166	0.1474	23.24	2,984.65	**Channel Flow,** Area= 128.4 sf Perim= 75.4' r= 1.70' n= 0.035 Earth, dense weeds
14.5	1,886	Total			

Summary for Subcatchment 3Ex:

Runoff = 46.60 cfs @ 12.04 hrs, Volume= 2.639 af, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.004	98	Paved Roads & Rooftops
*	0.225	96	Gravel surface
	2.011	61	>75% Grass cover, Good, HSG B
	0.406	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.000	58	Meadow, non-grazed, HSG B
	5.360	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	4.276	70	Woods, Good, HSG C
	15.624	66	Weighted Average
	15.620		99.97% Pervious Area
	0.004		0.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	52	0.0937	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.0	886	Total			

Summary for Subcatchment 4Ex:

Runoff = 53.97 cfs @ 12.50 hrs, Volume= 8.011 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	1.617	98	Paved Roads & Rooftops
*	0.492	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	2.634	58	Meadow, non-grazed, HSG B
	6.914	71	Meadow, non-grazed, HSG C
	48.226	55	Woods, Good, HSG B
	4.669	70	Woods, Good, HSG C
	64.717	59	Weighted Average
	63.100		97.50% Pervious Area
	1.617		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.5	703	0.0144	0.60		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.4	746	0.0104	8.97	932.76	**Channel Flow,** Area= 104.0 sf Perim= 70.0' r= 1.49' n= 0.022 Earth, clean & straight
46.7	2,427	Total			

Summary for Subcatchment 5Ex:

Runoff = 21.94 cfs @ 12.04 hrs, Volume= 1.279 af, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.458	96	Gravel surface
	4.303	71	Meadow, non-grazed, HSG C
	1.090	70	Woods, Good, HSG C
	5.851	73	Weighted Average
	5.851		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0671	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
4.8	1,034	0.0506	3.62		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	46	0.1988	3.12		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.1	1,180	Total			

Summary for Subcatchment 6Ex:

Runoff = 29.33 cfs @ 12.62 hrs, Volume= 4.734 af, Depth= 2.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
*	0.480	96	Gravel surface
	2.545	61	>75% Grass cover, Good, HSG B
	0.788	58	Meadow, non-grazed, HSG B
	7.199	71	Meadow, non-grazed, HSG C
	4.266	55	Woods, Good, HSG B
	8.238	70	Woods, Good, HSG C
	24.966	69	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Summary for Link SP1.Ex: Study Point 1

Inflow Area = 338.817 ac, 0.00% Impervious, Inflow Depth = 2.19" for 100-Yr Storm event
Inflow = 149.99 cfs @ 14.74 hrs, Volume= 61.874 af
Primary = 149.99 cfs @ 14.74 hrs, Volume= 61.874 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP2.Ex: Study Point 2

Inflow Area = 11.059 ac, 0.00% Impervious, Inflow Depth = 2.71" for 100-Yr Storm event
Inflow = 39.56 cfs @ 12.07 hrs, Volume= 2.499 af
Primary = 39.56 cfs @ 12.07 hrs, Volume= 2.499 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP3.Ex: Study Point 3

Inflow Area = 15.624 ac, 0.03% Impervious, Inflow Depth = 2.03" for 100-Yr Storm event
Inflow = 46.60 cfs @ 12.04 hrs, Volume= 2.639 af
Primary = 46.60 cfs @ 12.04 hrs, Volume= 2.639 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP4.Ex: Study Point 4

Inflow Area = 64.717 ac, 2.50% Impervious, Inflow Depth = 1.49" for 100-Yr Storm event
Inflow = 53.97 cfs @ 12.50 hrs, Volume= 8.011 af
Primary = 53.97 cfs @ 12.50 hrs, Volume= 8.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP5.Ex: Study Point 5

Inflow Area = 5.851 ac, 0.00% Impervious, Inflow Depth = 2.62" for 100-Yr Storm event
Inflow = 21.94 cfs @ 12.04 hrs, Volume= 1.279 af
Primary = 21.94 cfs @ 12.04 hrs, Volume= 1.279 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP6.Ex: Study Point 6

Inflow Area = 24.966 ac, 5.81% Impervious, Inflow Depth = 2.28" for 100-Yr Storm event
Inflow = 29.33 cfs @ 12.62 hrs, Volume= 4.734 af
Primary = 29.33 cfs @ 12.62 hrs, Volume= 4.734 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Appendix K – Post-Development Modeling

- Post-Development Subcatchment Map -

- Post-Development HydroCAD Model -

Appendix K – Post-Development Subcatchment Map

PRELIMINARY
NOT FOR CONSTRUCTION

LEGEND

SUBCATCHMENT BOUNDARY	APA WETLAND
SUBCATCHMENT SUBANALYSIS	WETLAND
SOIL GROUP BOUNDARY	FLOODPLAIN
Tc FLOW PATH	
LIMITS OF DISTURBANCE (LOD)	
EXISTING CULVERT	
SURFACE FLOW DIRECTION	
INFILTRATION TEST PITS	

300 0 300 600 FT
SCALE: 1" = 300'

UNDER NEW YORK STATE EDUCATION LAW ARTICLE 145 (ENGINEERING), SECTION 7209 (2), IT IS A VIOLATION OF THE LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

TRC
10 MAXWELL DRIVE
CLIFTON PARK, NY 12065

PROJECT NO: 444154

REV	DESCRIPTION	DATE	DES	CHK	APP
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
A	ISSUED FOR PERMITTING	1/2022	NAM	NAM	NAM

BWH DESIGNED
BWH DRAWN
JWH CHECKED
NAM APPROVED

PROPOSED HYDROLOGY PLAN

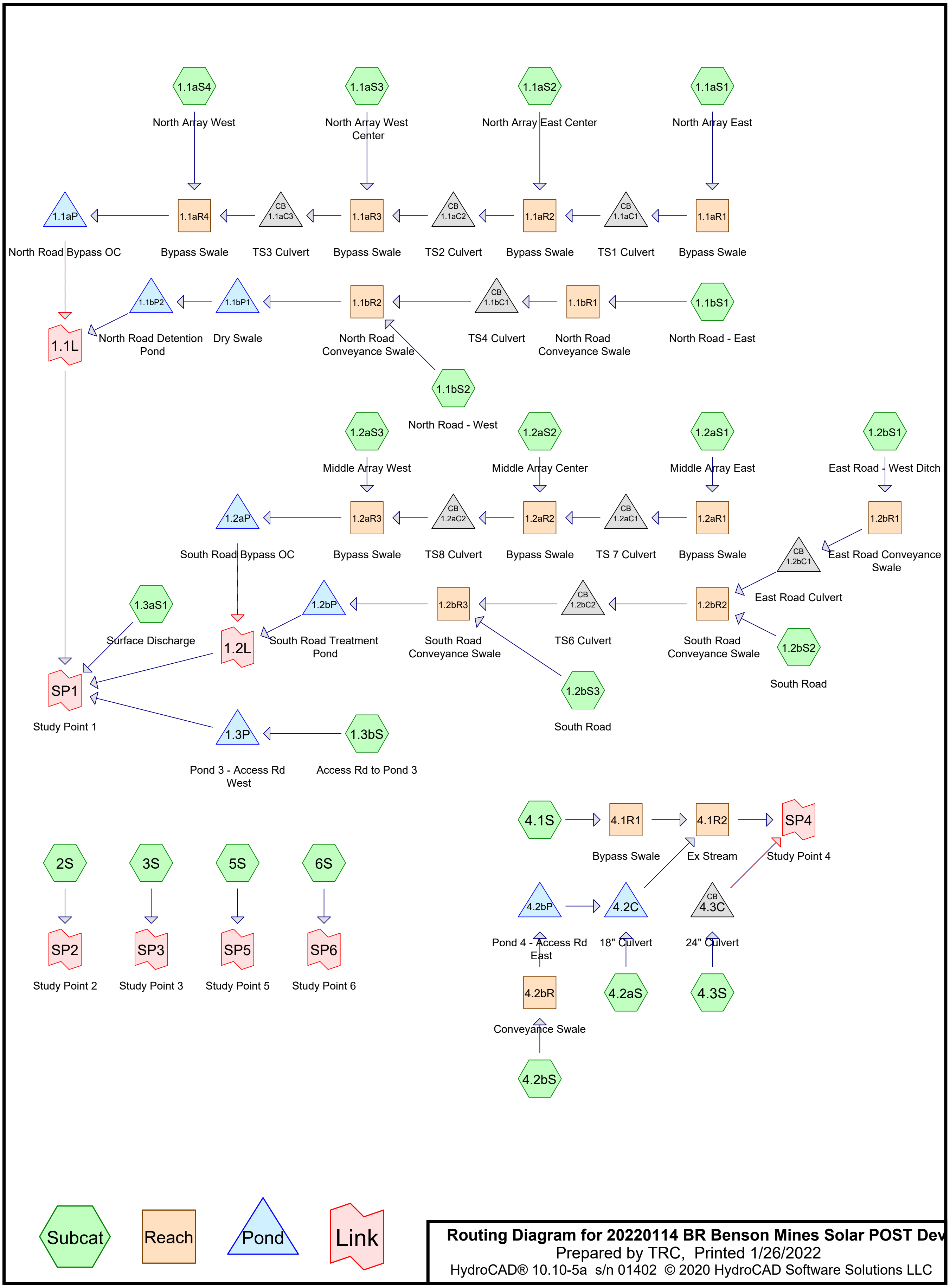
BR BENSON MINES SOLAR PROJECT
NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY
CLIFTON, ST LAWRENCE COUNTY, NEW YORK

7/21 DATE
AS NOTED SCALE

C-102

REV. -

Appendix K – Post-Development HydroCAD Model



Routing Diagram for 20220114 BR Benson Mines Solar POST Dev
Prepared by TRC, Printed 1/26/2022
HydroCAD® 10.10-5a s/n 01402 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Yr Storm	Type II 24-hr		Default	24.00	1	1.98	2
2	10-Yr Storm	Type II 24-hr		Default	24.00	1	3.28	2
3	100-Yr Storm	Type II 24-hr		Default	24.00	1	5.43	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.722	61	>75% Grass cover, Good, HSG B (3S, 4.1S, 6S)
0.980	74	>75% Grass cover, Good, HSG C (2S, 3S)
4.226	96	Gravel surface (1.2bS2, 1.3aS1, 2S, 3S, 4.1S, 4.2aS, 4.2bS, 6S)
2.150	96	Gravel surface, HSG C (1.1bS1, 1.1bS2, 1.2bS1, 1.2bS3, 1.3bS)
0.063	96	Gravel surface, HSG C, Redev (1.3bS)
4.928	30	Meadow, non-grazed, HSG A (1.3aS1)
4.081	58	Meadow, non-grazed, HSG B (1.3aS1, 4.1S, 4.2aS, 4.3S, 6S)
258.057	71	Meadow, non-grazed, HSG C (1.1aS1, 1.1aS2, 1.1aS3, 1.1aS4, 1.1bS1, 1.1bS2, 1.2aS1, 1.2aS2, 1.2aS3, 1.2bS1, 1.2bS2, 1.2bS3, 1.3aS1, 1.3bS, 2S, 3S, 4.1S, 4.2aS, 4.2bS, 5S, 6S)
2.432	78	Meadow, non-grazed, HSG D (1.3aS1)
3.074	98	Paved Roads & Rooftops (3S, 4.1S, 4.3S, 6S)
0.015	98	Roofs (1.2bS2, 1.2bS3)
0.015	98	Roofs, HSG C (1.1bS1, 1.1bS2)
10.043	30	Woods, Good, HSG A (1.3aS1)
88.272	55	Woods, Good, HSG B (1.3aS1, 3S, 4.1S, 4.2aS, 4.3S, 6S)
73.373	70	Woods, Good, HSG C (1.3aS1, 2S, 3S, 5S, 6S)
3.605	70	Woods, Good, HSG D (4.1S)
0.977	70	Woods, Poor, HSG C (4.2aS)
461.013	**67**	**TOTAL AREA**

Summary for Subcatchment 1.1aS1: North Array East

Runoff = 1.11 cfs @ 12.16 hrs, Volume= 0.126 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (sf)	CN	Description
255,877	71	Meadow, non-grazed, HSG C
255,877		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0499	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.1	688	0.0526	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.8	788	Total			

Summary for Subcatchment 1.1aS2: North Array East Center

Runoff = 1.47 cfs @ 12.20 hrs, Volume= 0.182 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (sf)	CN	Description
368,824	71	Meadow, non-grazed, HSG C
368,824		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0476	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.2	831	0.0463	1.51		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.1	931	Total			

Summary for Subcatchment 1.1aS3: North Array West Center

Runoff = 1.06 cfs @ 12.18 hrs, Volume= 0.124 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (sf)	CN	Description
252,317	71	Meadow, non-grazed, HSG C
252,317		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0618	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.0	931	0.0601	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	1,031	Total			

Summary for Subcatchment 1.1aS4: North Array West

Runoff = 1.93 cfs @ 12.27 hrs, Volume= 0.276 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
12.848	71	Meadow, non-grazed, HSG C
12.848		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0560	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
15.0	1,462	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.1	1,562	Total			

Summary for Subcatchment 1.1bS1: North Road - East

Runoff = 1.99 cfs @ 11.98 hrs, Volume= 0.093 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (sf)	CN	Description
22,104	71	Meadow, non-grazed, HSG C
35,655	96	Gravel surface, HSG C
320	98	Roofs, HSG C
58,079	86	Weighted Average
57,759		99.45% Pervious Area
320		0.55% Impervious Area

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

Summary for Subcatchment 1.1bS2: North Road - West

Runoff = 0.91 cfs @ 11.98 hrs, Volume= 0.042 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (sf)	CN	Description
12,139	71	Meadow, non-grazed, HSG C
15,891	96	Gravel surface, HSG C
320	98	Roofs, HSG C
28,350	85	Weighted Average
28,030		98.87% Pervious Area
320		1.13% Impervious Area

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

Summary for Subcatchment 1.2aS1: Middle Array East

Runoff = 1.47 cfs @ 12.16 hrs, Volume= 0.169 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (sf)	CN	Description
343,088	71	Meadow, non-grazed, HSG C
343,088		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0628	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.5	765	0.0459	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.1	865	Total			

Summary for Subcatchment 1.2aS2: Middle Array Center

Runoff = 1.73 cfs @ 12.16 hrs, Volume= 0.191 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (sf)	CN	Description
388,184	71	Meadow, non-grazed, HSG C
388,184		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0607	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.3	725	0.0559	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.1	825	Total			

Summary for Subcatchment 1.2aS3: Middle Array West

Runoff = 1.05 cfs @ 12.15 hrs, Volume= 0.118 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (sf)	CN	Description
239,564	71	Meadow, non-grazed, HSG C
239,564		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.0660	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.1	782	0.0529	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.5	882	Total			

Summary for Subcatchment 1.2bS1: East Road - West Ditch

Runoff = 0.82 cfs @ 11.98 hrs, Volume= 0.039 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
0.410	71	Meadow, non-grazed, HSG C
0.317	96	Gravel surface, HSG C
0.727	82	Weighted Average
0.727		100.00% Pervious Area

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

Summary for Subcatchment 1.2bS2: South Road

Runoff = 0.65 cfs @ 12.07 hrs, Volume= 0.042 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
	0.498	71	Meadow, non-grazed, HSG C
*	0.352	96	Gravel surface
*	0.004	98	Roofs
	0.854	81	Weighted Average
	0.850		99.53% Pervious Area
	0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0516	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
0.4	25	0.0310	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
5.9	40	0.0429	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.4	208	0.0442	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	308	Total			

Summary for Subcatchment 1.2bS3: South Road

Runoff = 1.22 cfs @ 11.98 hrs, Volume= 0.057 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
	0.313	71	Meadow, non-grazed, HSG C
	0.491	96	Gravel surface, HSG C
*	0.011	98	Roofs
	0.815	86	Weighted Average
	0.804		98.65% Pervious Area
	0.011		1.35% Impervious Area

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

Summary for Subcatchment 1.3aS1: Surface Discharge

Runoff = 6.05 cfs @ 15.25 hrs, Volume= 3.892 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.999	96	Gravel surface
	4.928	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	169.799	71	Meadow, non-grazed, HSG C
	2.432	78	Meadow, non-grazed, HSG D
	10.043	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	57.790	70	Woods, Good, HSG C
	279.311	67	Weighted Average
	279.311		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	189	0.0157	3.84	76.82	**Channel Flow, Rerouted Stream** Area= 20.0 sf Perim= 32.6' r= 0.61' n= 0.035 Earth, dense weeds
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
201.7	6,771	Total			

Summary for Subcatchment 1.3bS: Access Rd to Pond 3

Runoff = 0.61 cfs @ 11.98 hrs, Volume= 0.030 af, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
	0.473	71	Meadow, non-grazed, HSG C
*	0.063	96	Gravel surface, HSG C, Redev
	0.159	96	Gravel surface, HSG C
	0.695	79	Weighted Average
	0.695		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	12	0.1209	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
0.4	28	0.0283	1.04		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
0.7	222	0.0426	5.00	48.51	**Channel Flow,** Area= 9.7 sf Perim= 22.5' r= 0.43' n= 0.035
2.1	262	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2S:

Runoff = 2.08 cfs @ 12.40 hrs, Volume= 0.314 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	1.417	96	Gravel surface
	0.574	74	>75% Grass cover, Good, HSG C
	6.531	71	Meadow, non-grazed, HSG C
	2.536	70	Woods, Good, HSG C
	11.058	74	Weighted Average
	11.058		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0624	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.7	614	0.0535	3.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	1,184	0.0543	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	115	0.0407	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	68	0.1443	1.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	261	0.0118	0.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.0	2,342	Total			

Summary for Subcatchment 3S:

Runoff = 1.21 cfs @ 12.11 hrs, Volume= 0.193 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.004	98	Paved Roads & Rooftops
*	0.084	96	Gravel surface
	2.012	61	>75% Grass cover, Good, HSG B
	0.406	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.000	58	Meadow, non-grazed, HSG B
	5.525	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	4.276	70	Woods, Good, HSG C
	15.649	66	Weighted Average
	15.645		99.97% Pervious Area
	0.004		0.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	52	0.0937	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.7	886	Total			

Summary for Subcatchment 4.1S:

Runoff = 0.78 cfs @ 12.16 hrs, Volume= 0.144 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.327	98	Paved Roads & Rooftops
*	0.375	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.560	58	Meadow, non-grazed, HSG B
	2.543	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
*	4.087	55	Woods, Good, HSG B
*	3.605	70	Woods, Good, HSG D
	11.662	66	Weighted Average
	11.335		97.20% Pervious Area
	0.327		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0430	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
2.6	360	0.1077	2.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	385	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.8	845	Total			

Summary for Subcatchment 4.2aS:

Runoff = 0.10 cfs @ 15.60 hrs, Volume= 0.082 af, Depth= 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.000	98	Paved Roads & Rooftops
*	0.237	96	Gravel surface
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.384	58	Meadow, non-grazed, HSG B
	4.086	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	21.433	55	Woods, Good, HSG B
*	0.977	70	Woods, Poor, HSG C
	27.117	58	Weighted Average
	27.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	662	0.0144	0.84		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	1,640	Total			

Summary for Subcatchment 4.2bS:

Runoff = 0.75 cfs @ 11.98 hrs, Volume= 0.035 af, Depth= 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.296	96	Gravel surface
	0.174	71	Meadow, non-grazed, HSG C
	0.470	87	Weighted Average
	0.470		100.00% Pervious Area

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

Summary for Subcatchment 4.3S:

Runoff = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	1.293	98	Paved Roads & Rooftops
*	0.000	96	Gravel surface
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	1.783	58	Meadow, non-grazed, HSG B
	0.000	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	22.390	55	Woods, Good, HSG B
*	0.000	70	Woods, Poor, HSG C
	25.466	57	Weighted Average
	24.173		94.92% Pervious Area
	1.293		5.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0634	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
17.8	1,368	0.0656	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	38	0.3960	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	774	0.0281	4.70	109.09	**Channel Flow,** Area= 23.2 sf Perim= 43.2' r= 0.54' n= 0.035
36.5	2,280	Total			

Summary for Subcatchment 5S:

Runoff = 0.99 cfs @ 12.15 hrs, Volume= 0.107 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
4.139	71	Meadow, non-grazed, HSG C
0.831	70	Woods, Good, HSG C
4.970	71	Weighted Average
4.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0675	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
8.5	801	0.0508	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	217	0.1515	2.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	62	0.0697	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,180	Total			

Summary for Subcatchment 6S:

Runoff = 1.53 cfs @ 12.83 hrs, Volume= 0.437 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
*	0.466	96	Gravel surface
	2.545	61	>75% Grass cover, Good, HSG B
	0.788	58	Meadow, non-grazed, HSG B
	7.511	71	Meadow, non-grazed, HSG C
	4.266	55	Woods, Good, HSG B
	7.940	70	Woods, Good, HSG C
	24.966	69	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Summary for Reach 1.1aR1: Bypass Swale

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 1.11 cfs @ 12.16 hrs, Volume= 0.126 af
Outflow = 0.95 cfs @ 12.25 hrs, Volume= 0.126 af, Atten= 14%, Lag= 4.9 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.52 fps, Min. Travel Time= 6.4 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 15.7 min

Peak Storage= 364 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.25' , Surface Width= 3.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.37 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.0' Slope= 0.0108 '/'
Inlet Invert= 1,493.84', Outlet Invert= 1,487.56'

Summary for Reach 1.1aR2: Bypass Swale

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 2.39 cfs @ 12.22 hrs, Volume= 0.308 af
Outflow = 2.30 cfs @ 12.26 hrs, Volume= 0.308 af, Atten= 4%, Lag= 2.7 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.78 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 1.13 fps, Avg. Travel Time= 8.2 min

Peak Storage= 461 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 3.26'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 91.27 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.4' Slope= 0.0284 '/'
Inlet Invert= 1,486.80', Outlet Invert= 1,470.98'

Summary for Reach 1.1aR3: Bypass Swale

Inflow Area = 20.134 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 3.24 cfs @ 12.24 hrs, Volume= 0.433 af
Outflow = 3.16 cfs @ 12.28 hrs, Volume= 0.433 af, Atten= 3%, Lag= 2.3 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.30 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 6.9 min

Peak Storage= 533 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.35' , Surface Width= 3.41'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.68 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.5' Slope= 0.0352 '/'
Inlet Invert= 1,469.57', Outlet Invert= 1,449.93'

Summary for Reach 1.1aR4: Bypass Swale

Inflow Area = 32.982 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 5.08 cfs @ 12.27 hrs, Volume= 0.709 af
Outflow = 4.99 cfs @ 12.31 hrs, Volume= 0.709 af, Atten= 2%, Lag= 2.2 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.82 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 1.56 fps, Avg. Travel Time= 6.2 min

Peak Storage= 758 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.45' , Surface Width= 3.80'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 103.04 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.5' Slope= 0.0362 '/'
Inlet Invert= 1,447.64', Outlet Invert= 1,426.64'

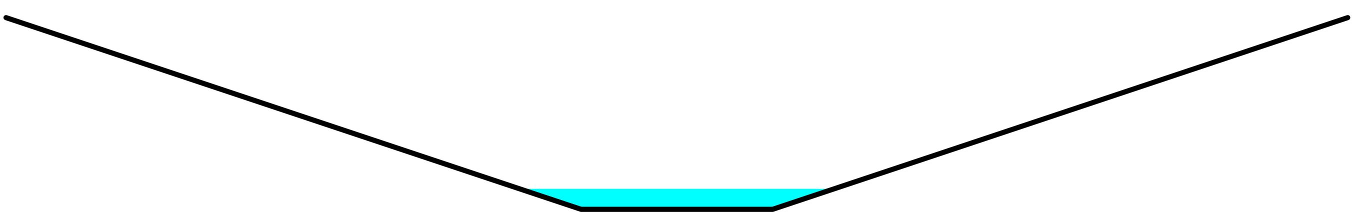
Summary for Reach 1.1bR1: North Road Conveyance Swale

Inflow Area =	1.333 ac,	0.55% Impervious, Inflow Depth = 0.83"		for 1-Yr Storm event
Inflow =	1.99 cfs @	11.98 hrs, Volume=	0.093 af	
Outflow =	1.13 cfs @	12.05 hrs, Volume=	0.093 af,	Atten= 43%, Lag= 4.7 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.01 fps, Min. Travel Time= 14.4 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 46.1 min

Peak Storage= 977 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 3.28'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 111.65 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,733.0' Slope= 0.0240 '/'
Inlet Invert= 1,491.12', Outlet Invert= 1,449.50'



Summary for Reach 1.1bR2: North Road Conveyance Swale

Inflow Area =	1.984 ac,	0.74% Impervious, Inflow Depth = 0.82"		for 1-Yr Storm event
Inflow =	1.85 cfs @	12.01 hrs, Volume=	0.135 af	
Outflow =	1.70 cfs @	12.05 hrs, Volume=	0.135 af,	Atten= 8%, Lag= 2.4 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.66 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 12.0 min

Peak Storage= 378 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 3.41'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 140.36 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 593.3' Slope= 0.0380 '/'
Inlet Invert= 1,447.27', Outlet Invert= 1,424.75'

Summary for Reach 1.2aR1: Bypass Swale

Inflow Area =	7.876 ac,	0.00% Impervious, Inflow Depth =	0.26"	for 1-Yr Storm event
Inflow =	1.47 cfs @	12.16 hrs, Volume=	0.169 af	
Outflow =	1.36 cfs @	12.23 hrs, Volume=	0.169 af, Atten= 7%, Lag= 3.7 min	

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.05 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 10.4 min

Peak Storage= 348 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.26' , Surface Width= 3.05'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 74.30 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 524.2' Slope= 0.0188 '/'
Inlet Invert= 1,454.08', Outlet Invert= 1,444.22'

Summary for Reach 1.2aR2: Bypass Swale

Inflow Area = 16.788 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 2.98 cfs @ 12.19 hrs, Volume= 0.361 af
Outflow = 2.84 cfs @ 12.24 hrs, Volume= 0.361 af, Atten= 5%, Lag= 2.8 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.64 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 1.08 fps, Avg. Travel Time= 8.6 min

Peak Storage= 596 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.39' , Surface Width= 3.55'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 77.47 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 556.0' Slope= 0.0204 '/'
Inlet Invert= 1,443.21', Outlet Invert= 1,431.84'

Summary for Reach 1.2aR3: Bypass Swale

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 3.78 cfs @ 12.22 hrs, Volume= 0.479 af
Outflow = 3.74 cfs @ 12.24 hrs, Volume= 0.479 af, Atten= 1%, Lag= 1.3 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.45 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.95 fps, Avg. Travel Time= 4.3 min

Peak Storage= 380 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.40' , Surface Width= 4.61'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 81.84 cfs

3.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 11.00'
Length= 249.0' Slope= 0.0153 '/'
Inlet Invert= 1,431.11', Outlet Invert= 1,427.29'

Summary for Reach 1.2bR1: East Road Conveyance Swale

Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.64" for 1-Yr Storm event
Inflow = 0.82 cfs @ 11.98 hrs, Volume= 0.039 af
Outflow = 0.66 cfs @ 12.03 hrs, Volume= 0.039 af, Atten= 20%, Lag= 2.8 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.09 fps, Min. Travel Time= 5.8 min
Avg. Velocity = 0.64 fps, Avg. Travel Time= 18.9 min

Peak Storage= 230 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 2.79'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 79.22 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 731.4' Slope= 0.0456 '/'
Inlet Invert= 1,489.53', Outlet Invert= 1,456.20'

‡

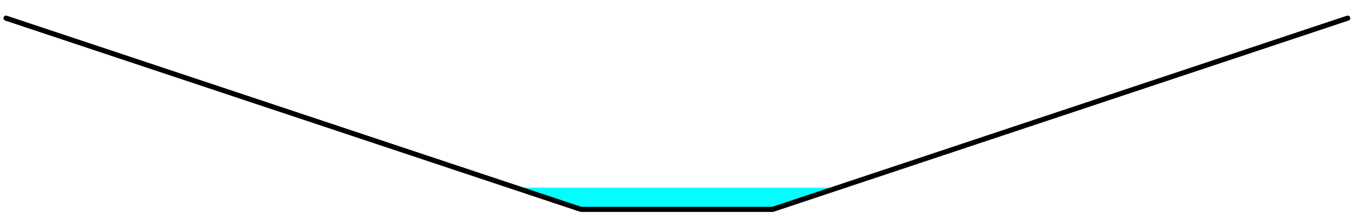
Summary for Reach 1.2bR2: South Road Conveyance Swale

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.61" for 1-Yr Storm event
Inflow = 1.28 cfs @ 12.04 hrs, Volume= 0.081 af
Outflow = 1.09 cfs @ 12.11 hrs, Volume= 0.081 af, Atten= 15%, Lag= 3.7 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.78 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 17.3 min

Peak Storage= 368 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.23' , Surface Width= 3.36'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 95.76 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 604.5' Slope= 0.0177 '/'
Inlet Invert= 1,454.47', Outlet Invert= 1,443.79'



Summary for Reach 1.2bR3: South Road Conveyance Swale

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.69" for 1-Yr Storm event
Inflow = 1.81 cfs @ 12.01 hrs, Volume= 0.137 af
Outflow = 1.53 cfs @ 12.08 hrs, Volume= 0.137 af, Atten= 16%, Lag= 4.5 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.02 fps, Min. Travel Time= 6.2 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 19.0 min

Peak Storage= 572 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 3.62'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 98.64 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 755.9' Slope= 0.0187 '/'
Inlet Invert= 1,442.84', Outlet Invert= 1,428.67'

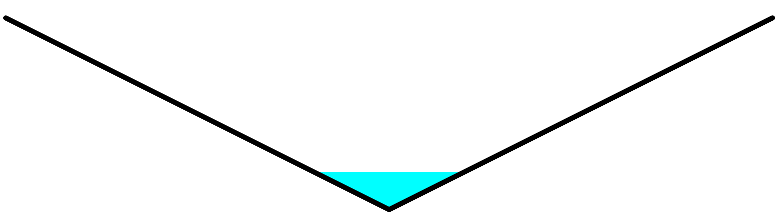
Summary for Reach 4.1R1: Bypass Swale

Inflow Area = 11.662 ac, 2.80% Impervious, Inflow Depth = 0.15" for 1-Yr Storm event
Inflow = 0.78 cfs @ 12.16 hrs, Volume= 0.144 af
Outflow = 0.71 cfs @ 12.22 hrs, Volume= 0.144 af, Atten= 9%, Lag= 3.6 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.32 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 7.1 min

Peak Storage= 175 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.39' , Surface Width= 1.57'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 54.88 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 570.0' Slope= 0.0303 '/'
Inlet Invert= 1,448.24', Outlet Invert= 1,430.97'



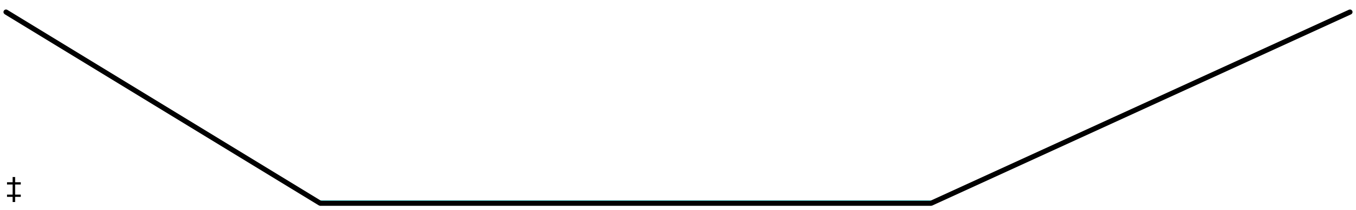
Summary for Reach 4.1R2: Ex Stream

Inflow Area = 39.249 ac, 0.83% Impervious, Inflow Depth = 0.07" for 1-Yr Storm event
Inflow = 0.71 cfs @ 12.22 hrs, Volume= 0.225 af
Outflow = 0.42 cfs @ 12.59 hrs, Volume= 0.225 af, Atten= 41%, Lag= 22.0 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.55 fps, Min. Travel Time= 22.4 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 29.6 min

Peak Storage= 566 cf @ 12.59 hrs
Average Depth at Peak Storage= 0.04' , Surface Width= 17.80'
Bank-Full Depth= 3.00' Flow Area= 84.0 sf, Capacity= 588.81 cfs

17.50' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 4.0 '/' Top Width= 38.50'
Length= 740.0' Slope= 0.0099 '/'
Inlet Invert= 1,430.98', Outlet Invert= 1,423.64'



Summary for Reach 4.2bR: Conveyance Swale

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.89" for 1-Yr Storm event
Inflow = 0.75 cfs @ 11.98 hrs, Volume= 0.035 af
Outflow = 0.65 cfs @ 12.01 hrs, Volume= 0.035 af, Atten= 13%, Lag= 2.3 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.05 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 15.5 min

Peak Storage= 179 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 2.79'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 77.09 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 565.0' Slope= 0.0432 '/'
Inlet Invert= 1,472.38', Outlet Invert= 1,448.00'

Summary for Pond 1.1aC1: TS1 Culvert

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 0.95 cfs @ 12.25 hrs, Volume= 0.126 af
Outflow = 0.95 cfs @ 12.25 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min
Primary = 0.95 cfs @ 12.25 hrs, Volume= 0.126 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,487.86' @ 12.25 hrs
Flood Elev= 1,489.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,487.56'	**36.3" W x 22.5" H, R=18.8"/51.0" Pipe Arch RCP_Arch 37x23** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,487.56' / 1,486.80' S= 0.0162 '/' Cc= 0.900 n= 0.012, Flow Area= 4.43 sf

Primary OutFlow Max=0.95 cfs @ 12.25 hrs HW=1,487.86' (Free Discharge)
└─**1=RCP_Arch 37x23** (Inlet Controls 0.95 cfs @ 1.58 fps)

Summary for Pond 1.1aC2: TS2 Culvert

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 2.30 cfs @ 12.26 hrs, Volume= 0.308 af
Outflow = 2.30 cfs @ 12.26 hrs, Volume= 0.308 af, Atten= 0%, Lag= 0.0 min
Primary = 2.30 cfs @ 12.26 hrs, Volume= 0.308 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,471.12' @ 12.26 hrs
Flood Elev= 1,473.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,470.80'	**48.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,470.80' / 1,469.57' S= 0.0262 '/' Cc= 0.900 n= 0.012, Flow Area= 8.00 sf

Primary OutFlow Max=2.30 cfs @ 12.26 hrs HW=1,471.12' (Free Discharge)
└─**1=Culvert** (Inlet Controls 2.30 cfs @ 1.81 fps)

Summary for Pond 1.1aC3: TS3 Culvert

Inflow Area = 20.134 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 3.16 cfs @ 12.28 hrs, Volume= 0.433 af
Outflow = 3.16 cfs @ 12.28 hrs, Volume= 0.433 af, Atten= 0%, Lag= 0.0 min
Primary = 3.16 cfs @ 12.28 hrs, Volume= 0.433 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.89' @ 12.28 hrs
Flood Elev= 1,452.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.55'	**60.0" W x 24.0" H Box Culvert** L= 47.2' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.55' / 1,447.64' S= 0.0405 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=3.16 cfs @ 12.28 hrs HW=1,449.89' (Free Discharge)
└─**1=Culvert** (Inlet Controls 3.16 cfs @ 1.87 fps)

Summary for Pond 1.1aP: North Road Bypass OC

Inflow Area = 32.982 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 4.99 cfs @ 12.31 hrs, Volume= 0.709 af
Outflow = 4.97 cfs @ 12.32 hrs, Volume= 0.701 af, Atten= 0%, Lag= 0.8 min
Discarded = 0.01 cfs @ 12.32 hrs, Volume= 0.033 af
Primary = 4.96 cfs @ 12.32 hrs, Volume= 0.668 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,428.84' @ 12.32 hrs Surf.Area= 0.023 ac Storage= 0.036 af

Plug-Flow detention time= 62.2 min calculated for 0.701 af (99% of inflow)
Center-of-Mass det. time= 56.1 min (1,001.6 - 945.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,426.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,426.00'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,428.50'	**10.0' 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

Discarded OutFlow Max=0.01 cfs @ 12.32 hrs HW=1,428.84' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=4.96 cfs @ 12.32 hrs HW=1,428.84' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 4.96 cfs @ 1.47 fps)

Summary for Pond 1.1bC1: TS4 Culvert

Inflow Area = 1.333 ac, 0.55% Impervious, Inflow Depth = 0.83" for 1-Yr Storm event
Inflow = 1.13 cfs @ 12.05 hrs, Volume= 0.093 af
Outflow = 1.13 cfs @ 12.05 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min
Primary = 1.13 cfs @ 12.05 hrs, Volume= 0.093 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.98' @ 12.05 hrs
Flood Elev= 1,451.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.50'	**18.0" Round Culvert**

L= 45.9' CPP, end-section conforming to fill, Ke= 0.500
Inlet / Outlet Invert= 1,449.50' / 1,447.27' S= 0.0486 '/' Cc= 0.900
n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=1.13 cfs @ 12.05 hrs HW=1,449.98' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.13 cfs @ 2.35 fps)

Summary for Pond 1.1bP1: Dry Swale

Inflow Area = 1.984 ac, 0.74% Impervious, Inflow Depth = 0.82" for 1-Yr Storm event
Inflow = 1.70 cfs @ 12.05 hrs, Volume= 0.135 af
Outflow = 1.68 cfs @ 12.07 hrs, Volume= 0.135 af, Atten= 1%, Lag= 1.1 min
Discarded = 0.00 cfs @ 12.07 hrs, Volume= 0.004 af
Primary = 1.67 cfs @ 12.07 hrs, Volume= 0.131 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.16' @ 12.07 hrs Surf.Area= 336 sf Storage= 177 cf

Plug-Flow detention time= 16.0 min calculated for 0.135 af (100% of inflow)
Center-of-Mass det. time= 16.2 min (888.3 - 872.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.75'	428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,424.75	0	0.0	0	0	0
1,425.00	25	22.9	2	2	42
1,426.00	273	98.0	127	129	767
1,426.70	603	161.7	299	428	2,086

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.75'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,425.69'	**2.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.00 cfs @ 12.07 hrs HW=1,426.16' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=1.67 cfs @ 12.07 hrs HW=1,426.16' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 1.67 cfs @ 1.79 fps)

Summary for Pond 1.1bP2: North Road Detention Pond

Inflow Area = 1.984 ac, 0.74% Impervious, Inflow Depth = 0.79" for 1-Yr Storm event
Inflow = 1.67 cfs @ 12.07 hrs, Volume= 0.131 af
Outflow = 0.56 cfs @ 12.47 hrs, Volume= 0.117 af, Atten= 66%, Lag= 24.3 min
Discarded = 0.02 cfs @ 12.47 hrs, Volume= 0.053 af
Primary = 0.54 cfs @ 12.47 hrs, Volume= 0.064 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.05' @ 12.47 hrs Surf.Area= 0.032 ac Storage= 0.050 af

Plug-Flow detention time= 592.1 min calculated for 0.117 af (89% of inflow)
Center-of-Mass det. time= 536.6 min (1,406.5 - 869.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,421.50'	0.166 af	**10.00'W x 40.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,421.50'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,424.00'	**20.0' 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

Discarded OutFlow Max=0.02 cfs @ 12.47 hrs HW=1,424.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.54 cfs @ 12.47 hrs HW=1,424.05' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.54 cfs @ 0.55 fps)

Summary for Pond 1.2aC1: TS 7 Culvert

Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 1.36 cfs @ 12.23 hrs, Volume= 0.169 af
Outflow = 1.36 cfs @ 12.23 hrs, Volume= 0.169 af, Atten= 0%, Lag= 0.0 min
Primary = 1.36 cfs @ 12.23 hrs, Volume= 0.169 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.49' @ 12.23 hrs
Flood Elev= 1,446.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,444.22'	**36.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,444.22' / 1,443.21' S= 0.0215 '/' Cc= 0.900 n= 0.012, Flow Area= 6.00 sf

Primary OutFlow Max=1.36 cfs @ 12.23 hrs HW=1,444.49' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.36 cfs @ 1.67 fps)

Summary for Pond 1.2aC2: TS8 Culvert

Inflow Area =	16.788 ac,	0.00% Impervious, Inflow Depth = 0.26"	for 1-Yr Storm event
Inflow =	2.84 cfs @	12.24 hrs, Volume=	0.361 af
Outflow =	2.84 cfs @	12.24 hrs, Volume=	0.361 af, Atten= 0%, Lag= 0.0 min
Primary =	2.84 cfs @	12.24 hrs, Volume=	0.361 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.96' @ 12.24 hrs
Flood Elev= 1,433.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.65'	**60.0" W x 24.0" H Box Culvert** L= 47.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,431.65' / 1,431.11' S= 0.0114 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=2.83 cfs @ 12.24 hrs HW=1,431.96' (Free Discharge)
└─**1=Culvert** (Inlet Controls 2.83 cfs @ 1.80 fps)

Summary for Pond 1.2aP: South Road Bypass OC

Inflow Area =	22.287 ac,	0.00% Impervious, Inflow Depth = 0.26"	for 1-Yr Storm event
Inflow =	3.74 cfs @	12.24 hrs, Volume=	0.479 af
Outflow =	3.66 cfs @	12.27 hrs, Volume=	0.479 af, Atten= 2%, Lag= 2.0 min
Discarded =	0.27 cfs @	12.27 hrs, Volume=	0.268 af
Secondary =	3.39 cfs @	12.27 hrs, Volume=	0.211 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.76' @ 12.27 hrs Surf.Area= 0.022 ac Storage= 0.034 af

Plug-Flow detention time= 45.7 min calculated for 0.479 af (100% of inflow)
Center-of-Mass det. time= 45.7 min (986.2 - 940.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area**
#2	Secondary	1,426.50'	**10.0' 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

Discarded OutFlow Max=0.27 cfs @ 12.27 hrs HW=1,426.76' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.27 cfs)

Secondary OutFlow Max=3.39 cfs @ 12.27 hrs HW=1,426.76' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 3.39 cfs @ 1.29 fps)

Summary for Pond 1.2bC1: East Road Culvert

Inflow Area =	0.727 ac,	0.00% Impervious, Inflow Depth = 0.64"	for 1-Yr Storm event	
Inflow =	0.66 cfs @	12.03 hrs, Volume=	0.039 af	
Outflow =	0.66 cfs @	12.03 hrs, Volume=	0.039 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.66 cfs @	12.03 hrs, Volume=	0.039 af	

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,454.77' @ 12.03 hrs
Flood Elev= 1,457.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,454.39'	**15.0" Round Culvert** L= 41.6' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,454.39' / 1,453.67' S= 0.0173 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.66 cfs @ 12.03 hrs HW=1,454.77' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.66 cfs @ 2.09 fps)

Summary for Pond 1.2bC2: TS6 Culvert

Inflow Area =	1.581 ac,	0.25% Impervious, Inflow Depth = 0.61"	for 1-Yr Storm event	
Inflow =	1.09 cfs @	12.11 hrs, Volume=	0.081 af	
Outflow =	1.09 cfs @	12.11 hrs, Volume=	0.081 af,	Atten= 0%, Lag= 0.0 min
Primary =	1.09 cfs @	12.11 hrs, Volume=	0.081 af	

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,443.98' @ 12.11 hrs
Flood Elev= 1,445.09'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,443.51'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,443.51' / 1,442.84' S= 0.0151 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=1.08 cfs @ 12.11 hrs HW=1,443.98' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.08 cfs @ 2.32 fps)

Summary for Pond 1.2bP: South Road Treatment Pond

Inflow Area =	2.396 ac,	0.63% Impervious, Inflow Depth = 0.69"	for 1-Yr Storm event	
Inflow =	1.53 cfs @	12.08 hrs, Volume=	0.137 af	
Outflow =	0.90 cfs @	12.33 hrs, Volume=	0.137 af,	Atten= 41%, Lag= 14.6 min
Discarded =	0.30 cfs @	12.33 hrs, Volume=	0.125 af	
Primary =	0.61 cfs @	12.33 hrs, Volume=	0.012 af	

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Peak Elev= 1,426.10' @ 12.33 hrs Surf.Area= 0.024 ac Storage= 0.034 af

Plug-Flow detention time= 41.6 min calculated for 0.137 af (100% of inflow)
Center-of-Mass det. time= 41.6 min (920.9 - 879.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.149 af	**20.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,426.05'	**20.0' 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

Discarded OutFlow Max=0.30 cfs @ 12.33 hrs HW=1,426.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=0.60 cfs @ 12.33 hrs HW=1,426.10' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.60 cfs @ 0.57 fps)

Summary for Pond 1.3P: Pond 3 - Access Rd West

Inflow Area =	0.695 ac,	0.00% Impervious,	Inflow Depth = 0.51"	for 1-Yr Storm event
Inflow =	0.61 cfs @	11.98 hrs, Volume=	0.030 af	
Outflow =	0.13 cfs @	12.16 hrs, Volume=	0.030 af,	Atten= 79%, Lag= 10.4 min
Discarded =	0.13 cfs @	12.16 hrs, Volume=	0.030 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,456.36' @ 12.16 hrs Surf.Area= 925 sf Storage= 306 cf

Plug-Flow detention time= 15.6 min calculated for 0.030 af (100% of inflow)
Center-of-Mass det. time= 15.6 min (888.4 - 872.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,456.00'	8,743 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,456.00	784	123.0	0	0	784
1,458.00	1,720	194.0	2,443	2,443	2,603
1,459.00	2,884	279.0	2,277	4,721	5,811
1,460.00	5,280	421.0	4,022	8,743	13,729

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,456.00'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,459.99'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.13 cfs @ 12.16 hrs HW=1,456.36' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond 4.2bP: Pond 4 - Access Rd East

Inflow Area =	0.470 ac,	0.00% Impervious,	Inflow Depth = 0.89"	for 1-Yr Storm event
Inflow =	0.65 cfs @	12.01 hrs, Volume=	0.035 af	
Outflow =	0.08 cfs @	12.54 hrs, Volume=	0.035 af,	Atten= 88%, Lag= 31.6 min
Discarded =	0.08 cfs @	12.54 hrs, Volume=	0.035 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,447.05' @ 12.54 hrs Surf.Area= 565 sf Storage= 571 cf

Plug-Flow detention time= 70.0 min calculated for 0.035 af (100% of inflow)
Center-of-Mass det. time= 70.0 min (918.6 - 848.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,445.50'	2,317 cf	**10.00'W x 20.00'L x 3.50'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,445.50'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,448.25'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.08 cfs @ 12.54 hrs HW=1,447.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,445.50' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond 4.2C: 18" Culvert

Inflow Area =	27.587 ac,	0.00% Impervious,	Inflow Depth = 0.04"	for 1-Yr Storm event
Inflow =	0.10 cfs @	15.60 hrs, Volume=	0.082 af	
Outflow =	0.10 cfs @	15.80 hrs, Volume=	0.081 af,	Atten= 0%, Lag= 11.7 min
Primary =	0.10 cfs @	15.80 hrs, Volume=	0.081 af	

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.97' @ 15.80 hrs Surf.Area= 1,036 sf Storage= 161 cf
Flood Elev= 1,434.64' Surf.Area= 27,666 sf Storage= 28,656 cf

Plug-Flow detention time= 29.9 min calculated for 0.081 af (98% of inflow)
Center-of-Mass det. time= 23.9 min (1,146.8 - 1,122.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,431.50'	39,033 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,431.50	0	0.0	0	0	0
1,432.00	1,190	146.0	198	198	1,697
1,432.50	3,534	368.0	1,129	1,327	10,778
1,433.00	5,795	497.0	2,309	3,637	19,660
1,433.50	10,362	837.0	3,984	7,621	55,755
1,434.00	16,931	975.0	6,756	14,377	75,659
1,434.60	27,412	1,352.0	13,177	27,555	145,474
1,435.00	30,000	1,500.0	11,479	39,033	179,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.83'	**18.0" Round Culvert** L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.83' / 1,431.18' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.10 cfs @ 15.80 hrs HW=1,431.97' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.10 cfs @ 1.26 fps)

Summary for Pond 4.3C: 24" Culvert

Inflow Area = 25.466 ac, 5.08% Impervious, Inflow Depth = 0.03" for 1-Yr Storm event
Inflow = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af
Outflow = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min
Primary = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.75' @ 17.89 hrs
Flood Elev= 1,434.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.64'	**24.0" Round Culvert** L= 83.7' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.64' / 1,429.73' S= 0.0228 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	1,434.80'	**20.0' 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

Primary OutFlow Max=0.07 cfs @ 17.89 hrs HW=1,431.75' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.07 cfs @ 1.11 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.64' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link 1.1L:

Inflow Area =	34.966 ac,	0.04% Impervious,	Inflow Depth = 0.25"	for 1-Yr Storm event
Inflow =	4.96 cfs @	12.32 hrs, Volume=	0.732 af	
Primary =	4.96 cfs @	12.32 hrs, Volume=	0.732 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link 1.2L:

Inflow Area =	24.683 ac,	0.06% Impervious,	Inflow Depth = 0.11"	for 1-Yr Storm event
Inflow =	3.82 cfs @	12.30 hrs, Volume=	0.223 af	
Primary =	3.82 cfs @	12.30 hrs, Volume=	0.223 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP1: Study Point 1

Inflow Area =	339.655 ac,	0.01% Impervious,	Inflow Depth = 0.17"	for 1-Yr Storm event
Inflow =	8.82 cfs @	12.31 hrs, Volume=	4.846 af	
Primary =	8.82 cfs @	12.31 hrs, Volume=	4.846 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP2: Study Point 2

Inflow Area =	11.058 ac,	0.00% Impervious,	Inflow Depth = 0.34"	for 1-Yr Storm event
Inflow =	2.08 cfs @	12.40 hrs, Volume=	0.314 af	
Primary =	2.08 cfs @	12.40 hrs, Volume=	0.314 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP3: Study Point 3

Inflow Area =	15.649 ac,	0.03% Impervious,	Inflow Depth = 0.15"	for 1-Yr Storm event
Inflow =	1.21 cfs @	12.11 hrs, Volume=	0.193 af	
Primary =	1.21 cfs @	12.11 hrs, Volume=	0.193 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP4: Study Point 4

Inflow Area =	64.715 ac,	2.50% Impervious,	Inflow Depth = 0.05"	for 1-Yr Storm event
Inflow =	0.42 cfs @	12.59 hrs, Volume=	0.283 af	
Primary =	0.42 cfs @	12.59 hrs, Volume=	0.283 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP5: Study Point 5

Inflow Area = 4.970 ac, 0.00% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 0.99 cfs @ 12.15 hrs, Volume= 0.107 af
Primary = 0.99 cfs @ 12.15 hrs, Volume= 0.107 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP6: Study Point 6

Inflow Area = 24.966 ac, 5.81% Impervious, Inflow Depth = 0.21" for 1-Yr Storm event
Inflow = 1.53 cfs @ 12.83 hrs, Volume= 0.437 af
Primary = 1.53 cfs @ 12.83 hrs, Volume= 0.437 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 1.1aS1: North Array East

Runoff = 5.79 cfs @ 12.13 hrs, Volume= 0.454 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (sf)	CN	Description
255,877	71	Meadow, non-grazed, HSG C
255,877		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0499	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.1	688	0.0526	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.8	788	Total			

Summary for Subcatchment 1.1aS2: North Array East Center

Runoff = 7.75 cfs @ 12.16 hrs, Volume= 0.654 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (sf)	CN	Description
368,824	71	Meadow, non-grazed, HSG C
368,824		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0476	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.2	831	0.0463	1.51		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.1	931	Total			

Summary for Subcatchment 1.1aS3: North Array West Center

Runoff = 5.54 cfs @ 12.14 hrs, Volume= 0.447 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (sf)	CN	Description
252,317	71	Meadow, non-grazed, HSG C
252,317		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0618	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.0	931	0.0601	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	1,031	Total			

Summary for Subcatchment 1.1aS4: North Array West

Runoff = 10.22 cfs @ 12.21 hrs, Volume= 0.992 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
12.848	71	Meadow, non-grazed, HSG C
12.848		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0560	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
15.0	1,462	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.1	1,562	Total			

Summary for Subcatchment 1.1bS1: North Road - East

Runoff = 4.48 cfs @ 11.97 hrs, Volume= 0.212 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (sf)	CN	Description
22,104	71	Meadow, non-grazed, HSG C
35,655	96	Gravel surface, HSG C
320	98	Roofs, HSG C
58,079	86	Weighted Average
57,759		99.45% Pervious Area
320		0.55% Impervious Area

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

Summary for Subcatchment 1.1bS2: North Road - West

Runoff = 2.11 cfs @ 11.97 hrs, Volume= 0.099 af, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (sf)	CN	Description
12,139	71	Meadow, non-grazed, HSG C
15,891	96	Gravel surface, HSG C
320	98	Roofs, HSG C
28,350	85	Weighted Average
28,030		98.87% Pervious Area
320		1.13% Impervious Area

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

Summary for Subcatchment 1.2aS1: Middle Array East

Runoff = 7.67 cfs @ 12.13 hrs, Volume= 0.608 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (sf)	CN	Description
343,088	71	Meadow, non-grazed, HSG C
343,088		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0628	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.5	765	0.0459	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.1	865	Total			

Summary for Subcatchment 1.2aS2: Middle Array Center

Runoff = 8.99 cfs @ 12.12 hrs, Volume= 0.688 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (sf)	CN	Description
388,184	71	Meadow, non-grazed, HSG C
388,184		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0607	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.3	725	0.0559	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.1	825	Total			

Summary for Subcatchment 1.2aS3: Middle Array West

Runoff = 5.47 cfs @ 12.13 hrs, Volume= 0.425 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (sf)	CN	Description
239,564	71	Meadow, non-grazed, HSG C
239,564		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.0660	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.1	782	0.0529	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.5	882	Total			

Summary for Subcatchment 1.2bS1: East Road - West Ditch

Runoff = 2.08 cfs @ 11.97 hrs, Volume= 0.097 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
0.410	71	Meadow, non-grazed, HSG C
0.317	96	Gravel surface, HSG C
0.727	82	Weighted Average
0.727		100.00% Pervious Area

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

Summary for Subcatchment 1.2bS2: South Road

Runoff = 1.77 cfs @ 12.06 hrs, Volume= 0.109 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
	0.498	71	Meadow, non-grazed, HSG C
*	0.352	96	Gravel surface
*	0.004	98	Roofs
	0.854	81	Weighted Average
	0.850		99.53% Pervious Area
	0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0516	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
0.4	25	0.0310	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
5.9	40	0.0429	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.4	208	0.0442	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	308	Total			

Summary for Subcatchment 1.2bS3: South Road

Runoff = 2.74 cfs @ 11.97 hrs, Volume= 0.129 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
	0.313	71	Meadow, non-grazed, HSG C
	0.491	96	Gravel surface, HSG C
*	0.011	98	Roofs
	0.815	86	Weighted Average
	0.804		98.65% Pervious Area
	0.011		1.35% Impervious Area

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

Summary for Subcatchment 1.3aS1: Surface Discharge

Runoff = 36.00 cfs @ 14.79 hrs, Volume= 16.978 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.999	96	Gravel surface
	4.928	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	169.799	71	Meadow, non-grazed, HSG C
	2.432	78	Meadow, non-grazed, HSG D
	10.043	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	57.790	70	Woods, Good, HSG C
	279.311	67	Weighted Average
	279.311		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	189	0.0157	3.84	76.82	**Channel Flow, Rerouted Stream** Area= 20.0 sf Perim= 32.6' r= 0.61' n= 0.035 Earth, dense weeds
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
201.7	6,771	Total			

Summary for Subcatchment 1.3bS: Access Rd to Pond 3

Runoff = 1.74 cfs @ 11.98 hrs, Volume= 0.081 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
	0.473	71	Meadow, non-grazed, HSG C
*	0.063	96	Gravel surface, HSG C, Redev
	0.159	96	Gravel surface, HSG C
	0.695	79	Weighted Average
	0.695		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	12	0.1209	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
0.4	28	0.0283	1.04		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
0.7	222	0.0426	5.00	48.51	**Channel Flow,** Area= 9.7 sf Perim= 22.5' r= 0.43' n= 0.035
2.1	262	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2S:

Runoff = 8.63 cfs @ 12.36 hrs, Volume= 1.005 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	1.417	96	Gravel surface
	0.574	74	>75% Grass cover, Good, HSG C
	6.531	71	Meadow, non-grazed, HSG C
	2.536	70	Woods, Good, HSG C
	11.058	74	Weighted Average
	11.058		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0624	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.7	614	0.0535	3.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	1,184	0.0543	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	115	0.0407	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	68	0.1443	1.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	261	0.0118	0.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.0	2,342	Total			

Summary for Subcatchment 3S:

Runoff = 13.05 cfs @ 12.07 hrs, Volume= 0.892 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.004	98	Paved Roads & Rooftops
*	0.084	96	Gravel surface
	2.012	61	>75% Grass cover, Good, HSG B
	0.406	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.000	58	Meadow, non-grazed, HSG B
	5.525	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	4.276	70	Woods, Good, HSG C
	15.649	66	Weighted Average
	15.645		99.97% Pervious Area
	0.004		0.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	52	0.0937	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.7	886	Total			

Summary for Subcatchment 4.1S:

Runoff = 8.57 cfs @ 12.10 hrs, Volume= 0.665 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.327	98	Paved Roads & Rooftops
*	0.375	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.560	58	Meadow, non-grazed, HSG B
	2.543	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
*	4.087	55	Woods, Good, HSG B
*	3.605	70	Woods, Good, HSG D
	11.662	66	Weighted Average
	11.335		97.20% Pervious Area
	0.327		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0430	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
2.6	360	0.1077	2.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	385	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.8	845	Total			

Summary for Subcatchment 4.2aS:

Runoff = 4.00 cfs @ 12.49 hrs, Volume= 0.836 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.000	98	Paved Roads & Rooftops
*	0.237	96	Gravel surface
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.384	58	Meadow, non-grazed, HSG B
	4.086	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	21.433	55	Woods, Good, HSG B
*	0.977	70	Woods, Poor, HSG C
	27.117	58	Weighted Average
	27.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	662	0.0144	0.84		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	1,640	Total			

Summary for Subcatchment 4.2bS:

Runoff = 1.64 cfs @ 11.97 hrs, Volume= 0.078 af, Depth= 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.296	96	Gravel surface
	0.174	71	Meadow, non-grazed, HSG C
	0.470	87	Weighted Average
	0.470		100.00% Pervious Area

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

Summary for Subcatchment 4.3S:

Runoff = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	1.293	98	Paved Roads & Rooftops
*	0.000	96	Gravel surface
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	1.783	58	Meadow, non-grazed, HSG B
	0.000	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	22.390	55	Woods, Good, HSG B
*	0.000	70	Woods, Poor, HSG C
	25.466	57	Weighted Average
	24.173		94.92% Pervious Area
	1.293		5.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0634	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
17.8	1,368	0.0656	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	38	0.3960	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	774	0.0281	4.70	109.09	**Channel Flow,** Area= 23.2 sf Perim= 43.2' r= 0.54' n= 0.035
36.5	2,280	Total			

Summary for Subcatchment 5S:

Runoff = 5.12 cfs @ 12.11 hrs, Volume= 0.384 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
4.139	71	Meadow, non-grazed, HSG C
0.831	70	Woods, Good, HSG C
4.970	71	Weighted Average
4.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0675	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
8.5	801	0.0508	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	217	0.1515	2.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	62	0.0697	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,180	Total			

Summary for Subcatchment 6S:

Runoff = 9.29 cfs @ 12.69 hrs, Volume= 1.716 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
*	0.466	96	Gravel surface
	2.545	61	>75% Grass cover, Good, HSG B
	0.788	58	Meadow, non-grazed, HSG B
	7.511	71	Meadow, non-grazed, HSG C
	4.266	55	Woods, Good, HSG B
	7.940	70	Woods, Good, HSG C
	24.966	69	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Summary for Reach 1.1aR1: Bypass Swale

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 5.79 cfs @ 12.13 hrs, Volume= 0.454 af
Outflow = 5.46 cfs @ 12.18 hrs, Volume= 0.454 af, Atten= 6%, Lag= 2.7 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.55 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 11.3 min

Peak Storage= 1,245 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.65' , Surface Width= 4.60'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.37 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.0' Slope= 0.0108 '/'
Inlet Invert= 1,493.84', Outlet Invert= 1,487.56'

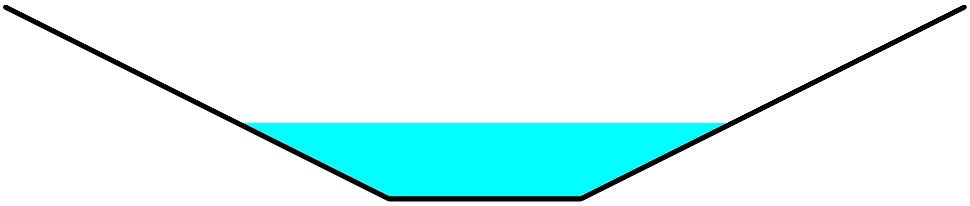
Summary for Reach 1.1aR2: Bypass Swale

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 13.20 cfs @ 12.17 hrs, Volume= 1.107 af
Outflow = 12.99 cfs @ 12.19 hrs, Volume= 1.107 af, Atten= 2%, Lag= 1.5 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.58 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.57 fps, Avg. Travel Time= 5.9 min

Peak Storage= 1,581 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.79' , Surface Width= 5.17'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 91.27 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.4' Slope= 0.0284 '/'
Inlet Invert= 1,486.80', Outlet Invert= 1,470.98'



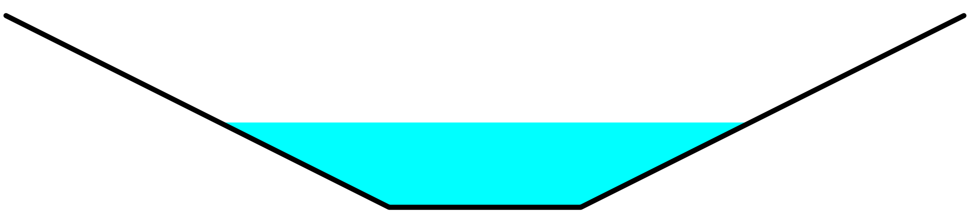
Summary for Reach 1.1aR3: Bypass Swale

Inflow Area = 20.134 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 18.28 cfs @ 12.18 hrs, Volume= 1.555 af
Outflow = 18.09 cfs @ 12.20 hrs, Volume= 1.555 af, Atten= 1%, Lag= 1.3 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.42 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.85 fps, Avg. Travel Time= 5.0 min

Peak Storage= 1,862 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.89' , Surface Width= 5.54'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.68 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.5' Slope= 0.0352 '/'
Inlet Invert= 1,469.57', Outlet Invert= 1,449.93'



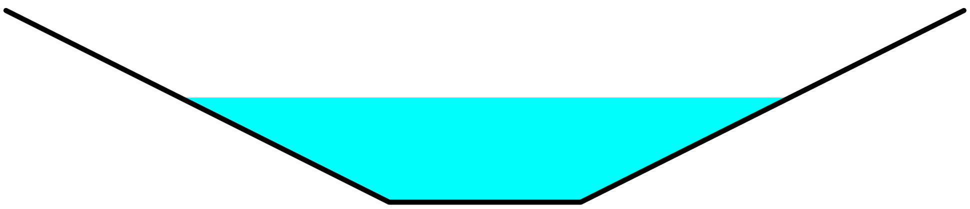
Summary for Reach 1.1aR4: Bypass Swale

Inflow Area = 32.982 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 28.27 cfs @ 12.21 hrs, Volume= 2.547 af
Outflow = 28.02 cfs @ 12.23 hrs, Volume= 2.547 af, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.14 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 2.14 fps, Avg. Travel Time= 4.5 min

Peak Storage= 2,648 cf @ 12.23 hrs
Average Depth at Peak Storage= 1.09' , Surface Width= 6.36'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 103.04 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.5' Slope= 0.0362 '/'
Inlet Invert= 1,447.64', Outlet Invert= 1,426.64'



Summary for Reach 1.1bR1: North Road Conveyance Swale

Inflow Area =	1.333 ac,	0.55% Impervious, Inflow Depth = 1.90"	for 10-Yr Storm event	
Inflow =	4.48 cfs @	11.97 hrs, Volume=	0.212 af	
Outflow =	3.02 cfs @	12.04 hrs, Volume=	0.212 af,	Atten= 33%, Lag= 3.9 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.69 fps, Min. Travel Time= 10.7 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 39.1 min

Peak Storage= 1,946 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.36' , Surface Width= 4.18'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 111.65 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,733.0' Slope= 0.0240 '/'
Inlet Invert= 1,491.12', Outlet Invert= 1,449.50'

Summary for Reach 1.1bR2: North Road Conveyance Swale

Inflow Area =	1.984 ac,	0.74% Impervious, Inflow Depth = 1.88"	for 10-Yr Storm event	
Inflow =	4.79 cfs @	12.00 hrs, Volume=	0.311 af	
Outflow =	4.54 cfs @	12.03 hrs, Volume=	0.311 af,	Atten= 5%, Lag= 1.9 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.56 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 10.2 min

Peak Storage= 757 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.40' , Surface Width= 4.39'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 140.36 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 593.3' Slope= 0.0380 '/'
Inlet Invert= 1,447.27', Outlet Invert= 1,424.75'

Summary for Reach 1.2aR1: Bypass Swale

Inflow Area =	7.876 ac,	0.00% Impervious, Inflow Depth = 0.93"	for 10-Yr Storm event
Inflow =	7.67 cfs @	12.13 hrs, Volume=	0.608 af
Outflow =	7.47 cfs @	12.17 hrs, Volume=	0.608 af, Atten= 3%, Lag= 2.0 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.39 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.18 fps, Avg. Travel Time= 7.4 min

Peak Storage= 1,156 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.66' , Surface Width= 4.65'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 74.30 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 524.2' Slope= 0.0188 '/'
Inlet Invert= 1,454.08', Outlet Invert= 1,444.22'

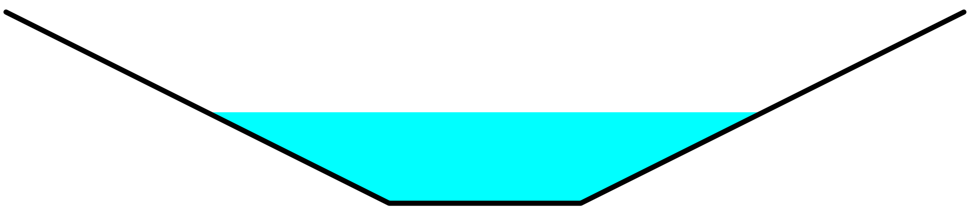
Summary for Reach 1.2aR2: Bypass Swale

Inflow Area = 16.788 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 16.22 cfs @ 12.14 hrs, Volume= 1.296 af
Outflow = 15.91 cfs @ 12.17 hrs, Volume= 1.296 af, Atten= 2%, Lag= 1.8 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.29 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 6.2 min

Peak Storage= 2,063 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.95' , Surface Width= 5.80'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 77.47 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 556.0' Slope= 0.0204 '/'
Inlet Invert= 1,443.21', Outlet Invert= 1,431.84'



Summary for Reach 1.2aR3: Bypass Swale

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 21.17 cfs @ 12.16 hrs, Volume= 1.721 af
Outflow = 21.09 cfs @ 12.17 hrs, Volume= 1.721 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.08 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 3.1 min

Peak Storage= 1,288 cf @ 12.17 hrs
Average Depth at Peak Storage= 1.02' , Surface Width= 7.10'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 81.84 cfs

3.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 11.00'
Length= 249.0' Slope= 0.0153 '/'
Inlet Invert= 1,431.11', Outlet Invert= 1,427.29'

Summary for Reach 1.2bR1: East Road Conveyance Swale

Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 1.60" for 10-Yr Storm event
Inflow = 2.08 cfs @ 11.97 hrs, Volume= 0.097 af
Outflow = 1.84 cfs @ 12.01 hrs, Volume= 0.097 af, Atten= 12%, Lag= 2.2 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.91 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 15.5 min

Peak Storage= 462 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.23' , Surface Width= 3.40'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 79.22 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 731.4' Slope= 0.0456 '/'
Inlet Invert= 1,489.53', Outlet Invert= 1,456.20'

‡

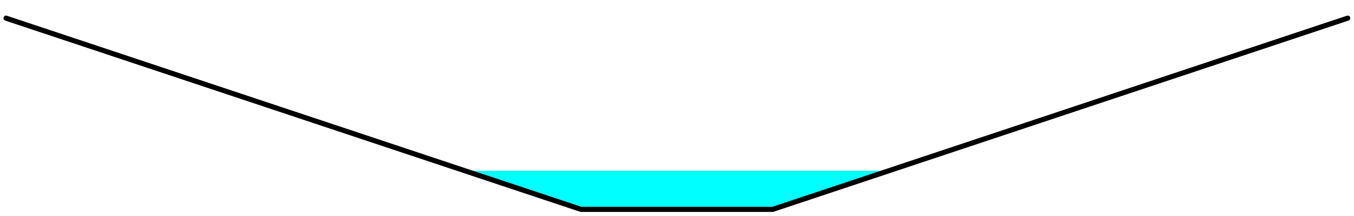
Summary for Reach 1.2bR2: South Road Conveyance Swale

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 1.56" for 10-Yr Storm event
Inflow = 3.49 cfs @ 12.03 hrs, Volume= 0.206 af
Outflow = 3.18 cfs @ 12.07 hrs, Volume= 0.206 af, Atten= 9%, Lag= 2.7 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.45 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 14.1 min

Peak Storage= 786 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.40' , Surface Width= 4.43'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 95.76 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 604.5' Slope= 0.0177 '/'
Inlet Invert= 1,454.47', Outlet Invert= 1,443.79'



Summary for Reach 1.2bR3: South Road Conveyance Swale

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 1.68" for 10-Yr Storm event
Inflow = 5.07 cfs @ 12.01 hrs, Volume= 0.336 af
Outflow = 4.57 cfs @ 12.06 hrs, Volume= 0.336 af, Atten= 10%, Lag= 3.1 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.76 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 15.8 min

Peak Storage= 1,249 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 4.88'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 98.64 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 755.9' Slope= 0.0187 '/'
Inlet Invert= 1,442.84', Outlet Invert= 1,428.67'

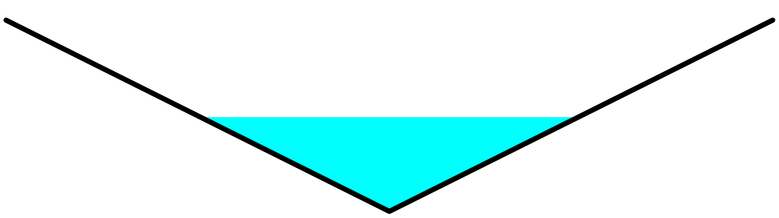
Summary for Reach 4.1R1: Bypass Swale

Inflow Area = 11.662 ac, 2.80% Impervious, Inflow Depth = 0.68" for 10-Yr Storm event
Inflow = 8.57 cfs @ 12.10 hrs, Volume= 0.665 af
Outflow = 8.30 cfs @ 12.13 hrs, Volume= 0.665 af, Atten= 3%, Lag= 1.8 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.28 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.81 fps, Avg. Travel Time= 5.2 min

Peak Storage= 1,106 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.98' , Surface Width= 3.94'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 54.88 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 570.0' Slope= 0.0303 '/'
Inlet Invert= 1,448.24', Outlet Invert= 1,430.97'



Summary for Reach 4.1R2: Ex Stream

Inflow Area = 39.249 ac, 0.83% Impervious, Inflow Depth = 0.46" for 10-Yr Storm event
Inflow = 8.55 cfs @ 12.14 hrs, Volume= 1.499 af
Outflow = 7.08 cfs @ 12.24 hrs, Volume= 1.499 af, Atten= 17%, Lag= 6.0 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.59 fps, Min. Travel Time= 7.7 min
Avg. Velocity = 0.64 fps, Avg. Travel Time= 19.2 min

Peak Storage= 3,290 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 19.20'
Bank-Full Depth= 3.00' Flow Area= 84.0 sf, Capacity= 588.81 cfs

17.50' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 4.0 '/' Top Width= 38.50'
Length= 740.0' Slope= 0.0099 '/'
Inlet Invert= 1,430.98', Outlet Invert= 1,423.64'

‡ 

Summary for Reach 4.2bR: Conveyance Swale

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 1.99" for 10-Yr Storm event
Inflow = 1.64 cfs @ 11.97 hrs, Volume= 0.078 af
Outflow = 1.50 cfs @ 12.00 hrs, Volume= 0.078 af, Atten= 9%, Lag= 1.9 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.68 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 13.6 min

Peak Storage= 316 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 3.27'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 77.09 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 565.0' Slope= 0.0432 '/'
Inlet Invert= 1,472.38', Outlet Invert= 1,448.00'

‡ 

Summary for Pond 1.1aC1: TS1 Culvert

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 5.46 cfs @ 12.18 hrs, Volume= 0.454 af
Outflow = 5.46 cfs @ 12.18 hrs, Volume= 0.454 af, Atten= 0%, Lag= 0.0 min
Primary = 5.46 cfs @ 12.18 hrs, Volume= 0.454 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,488.34' @ 12.18 hrs
Flood Elev= 1,489.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,487.56'	**36.3" W x 22.5" H, R=18.8"/51.0" Pipe Arch RCP_Arch 37x23** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,487.56' / 1,486.80' S= 0.0162 '/' Cc= 0.900 n= 0.012, Flow Area= 4.43 sf

Primary OutFlow Max=5.46 cfs @ 12.18 hrs HW=1,488.34' (Free Discharge)
└─**1=RCP_Arch 37x23** (Inlet Controls 5.46 cfs @ 2.67 fps)

Summary for Pond 1.1aC2: TS2 Culvert

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 12.99 cfs @ 12.19 hrs, Volume= 1.107 af
Outflow = 12.99 cfs @ 12.19 hrs, Volume= 1.107 af, Atten= 0%, Lag= 0.0 min
Primary = 12.99 cfs @ 12.19 hrs, Volume= 1.107 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,471.81' @ 12.19 hrs
Flood Elev= 1,473.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,470.80'	**48.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,470.80' / 1,469.57' S= 0.0262 '/' Cc= 0.900 n= 0.012, Flow Area= 8.00 sf

Primary OutFlow Max=12.98 cfs @ 12.19 hrs HW=1,471.81' (Free Discharge)
└─**1=Culvert** (Inlet Controls 12.98 cfs @ 3.22 fps)

Summary for Pond 1.1aC3: TS3 Culvert

Inflow Area = 20.134 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 18.09 cfs @ 12.20 hrs, Volume= 1.555 af
Outflow = 18.09 cfs @ 12.20 hrs, Volume= 1.555 af, Atten= 0%, Lag= 0.0 min
Primary = 18.09 cfs @ 12.20 hrs, Volume= 1.555 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,450.63' @ 12.20 hrs
Flood Elev= 1,452.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.55'	**60.0" W x 24.0" H Box Culvert** L= 47.2' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.55' / 1,447.64' S= 0.0405 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=18.08 cfs @ 12.20 hrs HW=1,450.63' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 18.08 cfs @ 3.34 fps)

Summary for Pond 1.1aP: North Road Bypass OC

Inflow Area = 32.982 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 28.02 cfs @ 12.23 hrs, Volume= 2.547 af
Outflow = 27.98 cfs @ 12.23 hrs, Volume= 2.539 af, Atten= 0%, Lag= 0.5 min
Discarded = 0.01 cfs @ 12.23 hrs, Volume= 0.034 af
Primary = 27.96 cfs @ 12.23 hrs, Volume= 2.505 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,429.53' @ 12.23 hrs Surf.Area= 0.029 ac Storage= 0.054 af

Plug-Flow detention time= 18.1 min calculated for 2.539 af (100% of inflow)
Center-of-Mass det. time= 16.2 min (906.3 - 890.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,426.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,426.00'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,428.50'	**10.0' 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

Discarded OutFlow Max=0.01 cfs @ 12.23 hrs HW=1,429.53' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=27.95 cfs @ 12.23 hrs HW=1,429.53' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 27.95 cfs @ 2.72 fps)

Summary for Pond 1.1bC1: TS4 Culvert

Inflow Area = 1.333 ac, 0.55% Impervious, Inflow Depth = 1.90" for 10-Yr Storm event
Inflow = 3.02 cfs @ 12.04 hrs, Volume= 0.212 af
Outflow = 3.02 cfs @ 12.04 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.0 min
Primary = 3.02 cfs @ 12.04 hrs, Volume= 0.212 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,450.32' @ 12.04 hrs
Flood Elev= 1,451.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.50'	**18.0" Round Culvert**

L= 45.9' CPP, end-section conforming to fill, Ke= 0.500
Inlet / Outlet Invert= 1,449.50' / 1,447.27' S= 0.0486 '/' Cc= 0.900
n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.02 cfs @ 12.04 hrs HW=1,450.32' (Free Discharge)
└─**1=Culvert** (Inlet Controls 3.02 cfs @ 3.07 fps)

Summary for Pond 1.1bP1: Dry Swale

Inflow Area =	1.984 ac,	0.74% Impervious, Inflow Depth = 1.88"	for 10-Yr Storm event	
Inflow =	4.54 cfs @	12.03 hrs, Volume=	0.311 af	
Outflow =	4.46 cfs @	12.05 hrs, Volume=	0.311 af,	Atten= 2%, Lag= 1.1 min
Discarded =	0.01 cfs @	12.05 hrs, Volume=	0.005 af	
Primary =	4.46 cfs @	12.05 hrs, Volume=	0.306 af	

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.59' @ 12.05 hrs Surf.Area= 540 sf Storage= 363 cf

Plug-Flow detention time= 8.3 min calculated for 0.311 af (100% of inflow)
Center-of-Mass det. time= 8.5 min (849.7 - 841.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.75'	428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,424.75	0	0.0	0	0	0
1,425.00	25	22.9	2	2	42
1,426.00	273	98.0	127	129	767
1,426.70	603	161.7	299	428	2,086

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.75'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,425.69'	**2.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.01 cfs @ 12.05 hrs HW=1,426.59' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=4.46 cfs @ 12.05 hrs HW=1,426.59' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 4.46 cfs @ 2.49 fps)

Summary for Pond 1.1bP2: North Road Detention Pond

Inflow Area = 1.984 ac, 0.74% Impervious, Inflow Depth = 1.85" for 10-Yr Storm event
Inflow = 4.46 cfs @ 12.05 hrs, Volume= 0.306 af
Outflow = 4.42 cfs @ 12.07 hrs, Volume= 0.292 af, Atten= 1%, Lag= 0.9 min
Discarded = 0.02 cfs @ 12.07 hrs, Volume= 0.054 af
Primary = 4.40 cfs @ 12.07 hrs, Volume= 0.237 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.20' @ 12.07 hrs Surf.Area= 0.034 ac Storage= 0.055 af

Plug-Flow detention time= 246.6 min calculated for 0.292 af (95% of inflow)
Center-of-Mass det. time= 219.3 min (1,060.6 - 841.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,421.50'	0.166 af	**10.00'W x 40.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,421.50'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,424.00'	**20.0' 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

Discarded OutFlow Max=0.02 cfs @ 12.07 hrs HW=1,424.20' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=4.39 cfs @ 12.07 hrs HW=1,424.20' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 4.39 cfs @ 1.11 fps)

Summary for Pond 1.2aC1: TS 7 Culvert

Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 7.47 cfs @ 12.17 hrs, Volume= 0.608 af
Outflow = 7.47 cfs @ 12.17 hrs, Volume= 0.608 af, Atten= 0%, Lag= 0.0 min
Primary = 7.47 cfs @ 12.17 hrs, Volume= 0.608 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,445.06' @ 12.17 hrs
Flood Elev= 1,446.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,444.22'	**36.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,444.22' / 1,443.21' S= 0.0215 '/' Cc= 0.900 n= 0.012, Flow Area= 6.00 sf

Primary OutFlow Max=7.47 cfs @ 12.17 hrs HW=1,445.06' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 7.47 cfs @ 2.95 fps)

Summary for Pond 1.2aC2: TS8 Culvert

Inflow Area = 16.788 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 15.91 cfs @ 12.17 hrs, Volume= 1.296 af
Outflow = 15.91 cfs @ 12.17 hrs, Volume= 1.296 af, Atten= 0%, Lag= 0.0 min
Primary = 15.91 cfs @ 12.17 hrs, Volume= 1.296 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,432.64' @ 12.17 hrs
Flood Elev= 1,433.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.65'	**60.0" W x 24.0" H Box Culvert** L= 47.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,431.65' / 1,431.11' S= 0.0114 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=15.91 cfs @ 12.17 hrs HW=1,432.64' (Free Discharge)
└─**1=Culvert** (Inlet Controls 15.91 cfs @ 3.20 fps)

Summary for Pond 1.2aP: South Road Bypass OC

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 21.09 cfs @ 12.17 hrs, Volume= 1.721 af
Outflow = 21.04 cfs @ 12.18 hrs, Volume= 1.721 af, Atten= 0%, Lag= 0.6 min
Discarded = 0.33 cfs @ 12.18 hrs, Volume= 0.300 af
Secondary = 20.71 cfs @ 12.18 hrs, Volume= 1.421 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,427.34' @ 12.18 hrs Surf.Area= 0.028 ac Storage= 0.049 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.8 min (900.5 - 885.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area**
#2	Secondary	1,426.50'	**10.0' 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

Discarded OutFlow Max=0.33 cfs @ 12.18 hrs HW=1,427.34' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.33 cfs)

Secondary OutFlow Max=20.70 cfs @ 12.18 hrs HW=1,427.34' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 20.70 cfs @ 2.46 fps)

Summary for Pond 1.2bC1: East Road Culvert

Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 1.60" for 10-Yr Storm event
Inflow = 1.84 cfs @ 12.01 hrs, Volume= 0.097 af
Outflow = 1.84 cfs @ 12.01 hrs, Volume= 0.097 af, Atten= 0%, Lag= 0.0 min
Primary = 1.84 cfs @ 12.01 hrs, Volume= 0.097 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,455.05' @ 12.01 hrs
Flood Elev= 1,457.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,454.39'	**15.0" Round Culvert** L= 41.6' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,454.39' / 1,453.67' S= 0.0173 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=1.83 cfs @ 12.01 hrs HW=1,455.05' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.83 cfs @ 2.77 fps)

Summary for Pond 1.2bC2: TS6 Culvert

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 1.56" for 10-Yr Storm event
Inflow = 3.18 cfs @ 12.07 hrs, Volume= 0.206 af
Outflow = 3.18 cfs @ 12.07 hrs, Volume= 0.206 af, Atten= 0%, Lag= 0.0 min
Primary = 3.18 cfs @ 12.07 hrs, Volume= 0.206 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.35' @ 12.07 hrs
Flood Elev= 1,445.09'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,443.51'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,443.51' / 1,442.84' S= 0.0151 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.18 cfs @ 12.07 hrs HW=1,444.35' (Free Discharge)
└─**1=Culvert** (Inlet Controls 3.18 cfs @ 3.12 fps)

Summary for Pond 1.2bP: South Road Treatment Pond

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 1.68" for 10-Yr Storm event
Inflow = 4.57 cfs @ 12.06 hrs, Volume= 0.336 af
Outflow = 4.55 cfs @ 12.07 hrs, Volume= 0.336 af, Atten= 0%, Lag= 0.6 min
Discarded = 0.31 cfs @ 12.07 hrs, Volume= 0.204 af
Primary = 4.24 cfs @ 12.07 hrs, Volume= 0.132 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Peak Elev= 1,426.24' @ 12.07 hrs Surf.Area= 0.026 ac Storage= 0.038 af

Plug-Flow detention time= 31.7 min calculated for 0.336 af (100% of inflow)
Center-of-Mass det. time= 31.7 min (879.4 - 847.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.149 af	**20.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,426.05'	**20.0' 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

Discarded OutFlow Max=0.31 cfs @ 12.07 hrs HW=1,426.24' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=4.23 cfs @ 12.07 hrs HW=1,426.24' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 4.23 cfs @ 1.09 fps)

Summary for Pond 1.3P: Pond 3 - Access Rd West

Inflow Area = 0.695 ac, 0.00% Impervious, Inflow Depth = 1.40" for 10-Yr Storm event
Inflow = 1.74 cfs @ 11.98 hrs, Volume= 0.081 af
Outflow = 0.18 cfs @ 12.43 hrs, Volume= 0.081 af, Atten= 89%, Lag= 27.3 min
Discarded = 0.18 cfs @ 12.43 hrs, Volume= 0.081 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,457.25' @ 12.43 hrs Surf.Area= 1,326 sf Storage= 1,302 cf

Plug-Flow detention time= 60.7 min calculated for 0.081 af (100% of inflow)
Center-of-Mass det. time= 60.7 min (902.1 - 841.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,456.00'	8,743 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,456.00	784	123.0	0	0	784
1,458.00	1,720	194.0	2,443	2,443	2,603
1,459.00	2,884	279.0	2,277	4,721	5,811
1,460.00	5,280	421.0	4,022	8,743	13,729

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,456.00'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,459.99'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.18 cfs @ 12.43 hrs HW=1,457.25' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 4.2bP: Pond 4 - Access Rd East

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 1.99" for 10-Yr Storm event
Inflow = 1.50 cfs @ 12.00 hrs, Volume= 0.078 af
Outflow = 0.15 cfs @ 12.55 hrs, Volume= 0.078 af, Atten= 90%, Lag= 32.8 min
Discarded = 0.13 cfs @ 12.55 hrs, Volume= 0.078 af
Primary = 0.01 cfs @ 12.55 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,448.25' @ 12.55 hrs Surf.Area= 969 sf Storage= 1,485 cf

Plug-Flow detention time= 120.7 min calculated for 0.078 af (100% of inflow)
Center-of-Mass det. time= 120.7 min (944.2 - 823.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,445.50'	2,317 cf	**10.00'W x 20.00'L x 3.50'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,445.50'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,448.25'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.13 cfs @ 12.55 hrs HW=1,448.25' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.01 cfs @ 12.55 hrs HW=1,448.25' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.16 fps)

Summary for Pond 4.2C: 18" Culvert

Inflow Area = 27.587 ac, 0.00% Impervious, Inflow Depth = 0.36" for 10-Yr Storm event
Inflow = 4.00 cfs @ 12.49 hrs, Volume= 0.836 af
Outflow = 3.49 cfs @ 12.66 hrs, Volume= 0.834 af, Atten= 13%, Lag= 10.1 min
Primary = 3.49 cfs @ 12.66 hrs, Volume= 0.834 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,432.72' @ 12.66 hrs Surf.Area= 4,450 sf Storage= 2,195 cf
Flood Elev= 1,434.64' Surf.Area= 27,666 sf Storage= 28,656 cf

Plug-Flow detention time= 12.2 min calculated for 0.834 af (100% of inflow)
Center-of-Mass det. time= 11.2 min (970.0 - 958.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,431.50'	39,033 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,431.50	0	0.0	0	0	0
1,432.00	1,190	146.0	198	198	1,697
1,432.50	3,534	368.0	1,129	1,327	10,778
1,433.00	5,795	497.0	2,309	3,637	19,660
1,433.50	10,362	837.0	3,984	7,621	55,755
1,434.00	16,931	975.0	6,756	14,377	75,659
1,434.60	27,412	1,352.0	13,177	27,555	145,474
1,435.00	30,000	1,500.0	11,479	39,033	179,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.83'	**18.0" Round Culvert** L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.83' / 1,431.18' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.49 cfs @ 12.66 hrs HW=1,432.72' (Free Discharge)
└─**1=Culvert** (Inlet Controls 3.49 cfs @ 3.21 fps)

Summary for Pond 4.3C: 24" Culvert

Inflow Area = 25.466 ac, 5.08% Impervious, Inflow Depth = 0.34" for 10-Yr Storm event
Inflow = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af
Outflow = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af, Atten= 0%, Lag= 0.0 min
Primary = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,432.41' @ 12.45 hrs
Flood Elev= 1,434.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.64'	**24.0" Round Culvert** L= 83.7' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.64' / 1,429.73' S= 0.0228 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	1,434.80'	**20.0' 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

Primary OutFlow Max=3.30 cfs @ 12.45 hrs HW=1,432.41' (Free Discharge)
└─**1=Culvert** (Inlet Controls 3.30 cfs @ 2.98 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.64' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link 1.1L:

Inflow Area =	34.966 ac,	0.04% Impervious,	Inflow Depth = 0.94"	for 10-Yr Storm event
Inflow =	30.43 cfs @	12.23 hrs, Volume=	2.742 af	
Primary =	30.43 cfs @	12.23 hrs, Volume=	2.742 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link 1.2L:

Inflow Area =	24.683 ac,	0.06% Impervious,	Inflow Depth = 0.75"	for 10-Yr Storm event
Inflow =	24.05 cfs @	12.17 hrs, Volume=	1.553 af	
Primary =	24.05 cfs @	12.17 hrs, Volume=	1.553 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP1: Study Point 1

Inflow Area =	339.655 ac,	0.01% Impervious,	Inflow Depth = 0.75"	for 10-Yr Storm event
Inflow =	53.92 cfs @	12.20 hrs, Volume=	21.273 af	
Primary =	53.92 cfs @	12.20 hrs, Volume=	21.273 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP2: Study Point 2

Inflow Area =	11.058 ac,	0.00% Impervious,	Inflow Depth = 1.09"	for 10-Yr Storm event
Inflow =	8.63 cfs @	12.36 hrs, Volume=	1.005 af	
Primary =	8.63 cfs @	12.36 hrs, Volume=	1.005 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP3: Study Point 3

Inflow Area =	15.649 ac,	0.03% Impervious,	Inflow Depth = 0.68"	for 10-Yr Storm event
Inflow =	13.05 cfs @	12.07 hrs, Volume=	0.892 af	
Primary =	13.05 cfs @	12.07 hrs, Volume=	0.892 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP4: Study Point 4

Inflow Area =	64.715 ac,	2.50% Impervious,	Inflow Depth = 0.41"	for 10-Yr Storm event
Inflow =	9.50 cfs @	12.30 hrs, Volume=	2.214 af	
Primary =	9.50 cfs @	12.30 hrs, Volume=	2.214 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP5: Study Point 5

Inflow Area =	4.970 ac,	0.00% Impervious,	Inflow Depth =	0.93"	for 10-Yr Storm event
Inflow =	5.12 cfs @	12.11 hrs,	Volume=	0.384 af	
Primary =	5.12 cfs @	12.11 hrs,	Volume=	0.384 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP6: Study Point 6

Inflow Area =	24.966 ac,	5.81% Impervious,	Inflow Depth =	0.83"	for 10-Yr Storm event
Inflow =	9.29 cfs @	12.69 hrs,	Volume=	1.716 af	
Primary =	9.29 cfs @	12.69 hrs,	Volume=	1.716 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 1.1aS1: North Array East

Runoff = 16.43 cfs @ 12.12 hrs, Volume= 1.198 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (sf)	CN	Description
255,877	71	Meadow, non-grazed, HSG C
255,877		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0499	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.1	688	0.0526	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.8	788	Total			

Summary for Subcatchment 1.1aS2: North Array East Center

Runoff = 22.12 cfs @ 12.14 hrs, Volume= 1.726 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (sf)	CN	Description
368,824	71	Meadow, non-grazed, HSG C
368,824		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0476	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.2	831	0.0463	1.51		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.1	931	Total			

Summary for Subcatchment 1.1aS3: North Array West Center

Runoff = 15.77 cfs @ 12.13 hrs, Volume= 1.181 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (sf)	CN	Description
252,317	71	Meadow, non-grazed, HSG C
252,317		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0618	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.0	931	0.0601	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	1,031	Total			

Summary for Subcatchment 1.1aS4: North Array West

Runoff = 29.48 cfs @ 12.21 hrs, Volume= 2.620 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
12.848	71	Meadow, non-grazed, HSG C
12.848		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0560	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
15.0	1,462	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.1	1,562	Total			

Summary for Subcatchment 1.1bS1: North Road - East

Runoff = 8.80 cfs @ 11.97 hrs, Volume= 0.430 af, Depth= 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (sf)	CN	Description
22,104	71	Meadow, non-grazed, HSG C
35,655	96	Gravel surface, HSG C
320	98	Roofs, HSG C
58,079	86	Weighted Average
57,759		99.45% Pervious Area
320		0.55% Impervious Area

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

Summary for Subcatchment 1.1bS2: North Road - West

Runoff = 4.21 cfs @ 11.97 hrs, Volume= 0.204 af, Depth= 3.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (sf)	CN	Description
12,139	71	Meadow, non-grazed, HSG C
15,891	96	Gravel surface, HSG C
320	98	Roofs, HSG C
28,350	85	Weighted Average
28,030		98.87% Pervious Area
320		1.13% Impervious Area

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

Summary for Subcatchment 1.2aS1: Middle Array East

Runoff = 21.87 cfs @ 12.12 hrs, Volume= 1.606 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (sf)	CN	Description
343,088	71	Meadow, non-grazed, HSG C
343,088		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0628	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.5	765	0.0459	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.1	865	Total			

Summary for Subcatchment 1.2aS2: Middle Array Center

Runoff = 25.47 cfs @ 12.11 hrs, Volume= 1.817 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (sf)	CN	Description
388,184	71	Meadow, non-grazed, HSG C
388,184		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0607	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.3	725	0.0559	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.1	825	Total			

Summary for Subcatchment 1.2aS3: Middle Array West

Runoff = 15.55 cfs @ 12.11 hrs, Volume= 1.121 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (sf)	CN	Description
239,564	71	Meadow, non-grazed, HSG C
239,564		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.0660	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.1	782	0.0529	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.5	882	Total			

Summary for Subcatchment 1.2bS1: East Road - West Ditch

Runoff = 4.39 cfs @ 11.97 hrs, Volume= 0.210 af, Depth= 3.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
0.410	71	Meadow, non-grazed, HSG C
0.317	96	Gravel surface, HSG C
0.727	82	Weighted Average
0.727		100.00% Pervious Area

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

Summary for Subcatchment 1.2bS2: South Road

Runoff = 3.86 cfs @ 12.05 hrs, Volume= 0.240 af, Depth= 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
	0.498	71	Meadow, non-grazed, HSG C
*	0.352	96	Gravel surface
*	0.004	98	Roofs
	0.854	81	Weighted Average
	0.850		99.53% Pervious Area
	0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0516	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
0.4	25	0.0310	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
5.9	40	0.0429	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.4	208	0.0442	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	308	Total			

Summary for Subcatchment 1.2bS3: South Road

Runoff = 5.38 cfs @ 11.97 hrs, Volume= 0.263 af, Depth= 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
	0.313	71	Meadow, non-grazed, HSG C
	0.491	96	Gravel surface, HSG C
*	0.011	98	Roofs
	0.815	86	Weighted Average
	0.804		98.65% Pervious Area
	0.011		1.35% Impervious Area

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

Summary for Subcatchment 1.3aS1: Surface Discharge

Runoff = 119.17 cfs @ 14.57 hrs, Volume= 49.077 af, Depth= 2.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.999	96	Gravel surface
	4.928	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	169.799	71	Meadow, non-grazed, HSG C
	2.432	78	Meadow, non-grazed, HSG D
	10.043	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	57.790	70	Woods, Good, HSG C
	279.311	67	Weighted Average
	279.311		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	189	0.0157	3.84	76.82	**Channel Flow, Rerouted Stream** Area= 20.0 sf Perim= 32.6' r= 0.61' n= 0.035 Earth, dense weeds
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
201.7	6,771	Total			

Summary for Subcatchment 1.3bS: Access Rd to Pond 3

Runoff = 3.89 cfs @ 11.97 hrs, Volume= 0.184 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
	0.473	71	Meadow, non-grazed, HSG C
*	0.063	96	Gravel surface, HSG C, Redev
	0.159	96	Gravel surface, HSG C
	0.695	79	Weighted Average
	0.695		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	12	0.1209	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
0.4	28	0.0283	1.04		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
0.7	222	0.0426	5.00	48.51	**Channel Flow,** Area= 9.7 sf Perim= 22.5' r= 0.43' n= 0.035
2.1	262	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2S:

Runoff = 22.85 cfs @ 12.32 hrs, Volume= 2.499 af, Depth= 2.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	1.417	96	Gravel surface
	0.574	74	>75% Grass cover, Good, HSG C
	6.531	71	Meadow, non-grazed, HSG C
	2.536	70	Woods, Good, HSG C
	11.058	74	Weighted Average
	11.058		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0624	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.7	614	0.0535	3.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	1,184	0.0543	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	115	0.0407	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	68	0.1443	1.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	261	0.0118	0.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.0	2,342	Total			

Summary for Subcatchment 3S:

Runoff = 43.75 cfs @ 12.05 hrs, Volume= 2.643 af, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.004	98	Paved Roads & Rooftops
*	0.084	96	Gravel surface
	2.012	61	>75% Grass cover, Good, HSG B
	0.406	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.000	58	Meadow, non-grazed, HSG B
	5.525	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	4.276	70	Woods, Good, HSG C
	15.649	66	Weighted Average
	15.645		99.97% Pervious Area
	0.004		0.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	52	0.0937	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.7	886	Total			

Summary for Subcatchment 4.1S:

Runoff = 29.22 cfs @ 12.09 hrs, Volume= 1.970 af, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.327	98	Paved Roads & Rooftops
*	0.375	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.560	58	Meadow, non-grazed, HSG B
	2.543	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
*	4.087	55	Woods, Good, HSG B
*	3.605	70	Woods, Good, HSG D
	11.662	66	Weighted Average
	11.335		97.20% Pervious Area
	0.327		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0430	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
2.6	360	0.1077	2.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	385	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.8	845	Total			

Summary for Subcatchment 4.2aS:

Runoff = 24.16 cfs @ 12.40 hrs, Volume= 3.192 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.000	98	Paved Roads & Rooftops
*	0.237	96	Gravel surface
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	0.384	58	Meadow, non-grazed, HSG B
	4.086	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	21.433	55	Woods, Good, HSG B
*	0.977	70	Woods, Poor, HSG C
	27.117	58	Weighted Average
	27.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	662	0.0144	0.84		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	1,640	Total			

Summary for Subcatchment 4.2bS:

Runoff = 3.16 cfs @ 11.97 hrs, Volume= 0.156 af, Depth= 3.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.296	96	Gravel surface
	0.174	71	Meadow, non-grazed, HSG C
	0.470	87	Weighted Average
	0.470		100.00% Pervious Area

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

Summary for Subcatchment 4.3S:

Runoff = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	1.293	98	Paved Roads & Rooftops
*	0.000	96	Gravel surface
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	30	Meadow, non-grazed, HSG A
	1.783	58	Meadow, non-grazed, HSG B
	0.000	71	Meadow, non-grazed, HSG C
	0.000	78	Meadow, non-grazed, HSG D
	0.000	30	Woods, Good, HSG A
	22.390	55	Woods, Good, HSG B
*	0.000	70	Woods, Poor, HSG C
	25.466	57	Weighted Average
	24.173		94.92% Pervious Area
	1.293		5.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0634	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
17.8	1,368	0.0656	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	38	0.3960	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	774	0.0281	4.70	109.09	**Channel Flow,** Area= 23.2 sf Perim= 43.2' r= 0.54' n= 0.035
36.5	2,280	Total			

Summary for Subcatchment 5S:

Runoff = 14.48 cfs @ 12.11 hrs, Volume= 1.013 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
4.139	71	Meadow, non-grazed, HSG C
0.831	70	Woods, Good, HSG C
4.970	71	Weighted Average
4.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0675	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
8.5	801	0.0508	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	217	0.1515	2.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	62	0.0697	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,180	Total			

Summary for Subcatchment 6S:

Runoff = 29.33 cfs @ 12.62 hrs, Volume= 4.734 af, Depth= 2.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
*	0.466	96	Gravel surface
	2.545	61	>75% Grass cover, Good, HSG B
	0.788	58	Meadow, non-grazed, HSG B
	7.511	71	Meadow, non-grazed, HSG C
	4.266	55	Woods, Good, HSG B
	7.940	70	Woods, Good, HSG C
	24.966	69	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

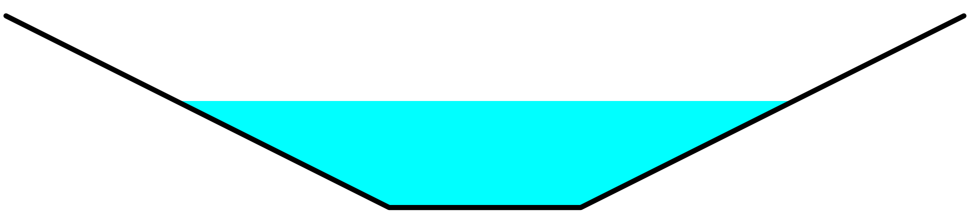
Summary for Reach 1.1aR1: Bypass Swale

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 16.43 cfs @ 12.12 hrs, Volume= 1.198 af
Outflow = 15.92 cfs @ 12.15 hrs, Volume= 1.198 af, Atten= 3%, Lag= 2.0 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.39 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 9.0 min

Peak Storage= 2,721 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.11' , Surface Width= 6.44'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.37 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.0' Slope= 0.0108 '/'
Inlet Invert= 1,493.84', Outlet Invert= 1,487.56'



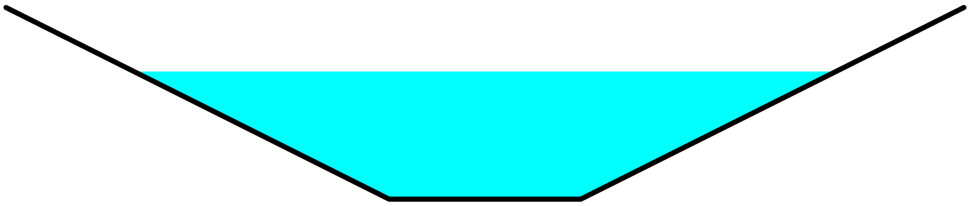
Summary for Reach 1.1aR2: Bypass Swale

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 38.03 cfs @ 12.15 hrs, Volume= 2.924 af
Outflow = 37.72 cfs @ 12.17 hrs, Volume= 2.924 af, Atten= 1%, Lag= 1.2 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.07 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.96 fps, Avg. Travel Time= 4.8 min

Peak Storage= 3,466 cf @ 12.17 hrs
Average Depth at Peak Storage= 1.33' , Surface Width= 7.33'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 91.27 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.4' Slope= 0.0284 '/'
Inlet Invert= 1,486.80', Outlet Invert= 1,470.98'



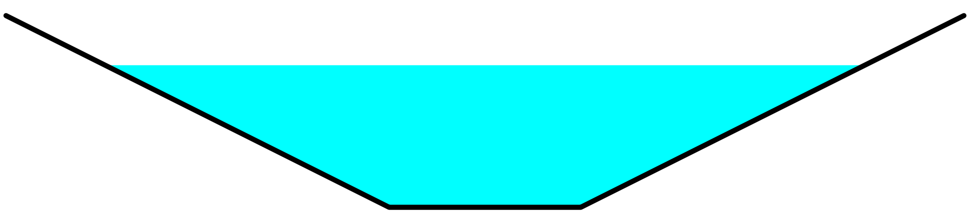
Summary for Reach 1.1aR3: Bypass Swale

Inflow Area = 20.134 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 53.09 cfs @ 12.15 hrs, Volume= 4.105 af
Outflow = 52.75 cfs @ 12.17 hrs, Volume= 4.105 af, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.17 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 2.31 fps, Avg. Travel Time= 4.0 min

Peak Storage= 4,103 cf @ 12.17 hrs
Average Depth at Peak Storage= 1.48' , Surface Width= 7.93'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.68 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.5' Slope= 0.0352 '/'
Inlet Invert= 1,469.57', Outlet Invert= 1,449.93'



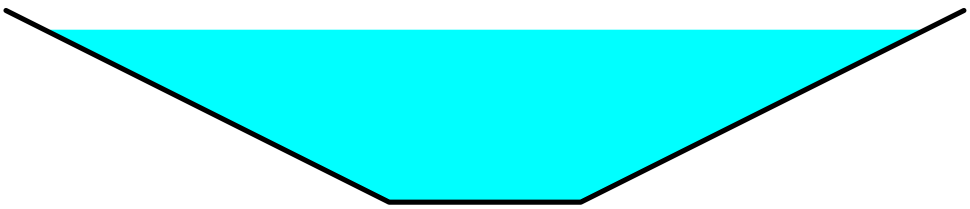
Summary for Reach 1.1aR4: Bypass Swale

Inflow Area = 32.982 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 81.84 cfs @ 12.18 hrs, Volume= 6.725 af
Outflow = 81.46 cfs @ 12.20 hrs, Volume= 6.725 af, Atten= 0%, Lag= 0.9 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.09 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 2.65 fps, Avg. Travel Time= 3.6 min

Peak Storage= 5,846 cf @ 12.20 hrs
Average Depth at Peak Storage= 1.80' , Surface Width= 9.20'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 103.04 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.5' Slope= 0.0362 '/'
Inlet Invert= 1,447.64', Outlet Invert= 1,426.64'



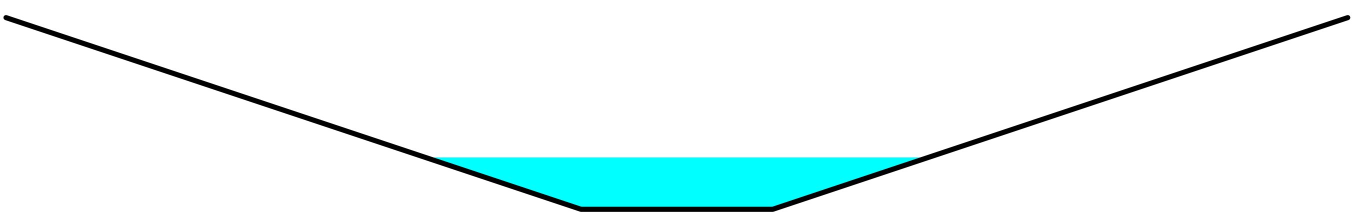
Summary for Reach 1.1bR1: North Road Conveyance Swale

Inflow Area =	1.333 ac,	0.55% Impervious, Inflow Depth =	3.87"	for 100-Yr Storm event	
Inflow =	8.80 cfs @	11.97 hrs, Volume=	0.430 af		
Outflow =	6.52 cfs @	12.03 hrs, Volume=	0.430 af,	Atten= 26%,	Lag= 3.5 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.33 fps, Min. Travel Time= 8.7 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 33.3 min

Peak Storage= 3,386 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.54' , Surface Width= 5.24'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 111.65 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,733.0' Slope= 0.0240 '/'
Inlet Invert= 1,491.12', Outlet Invert= 1,449.50'



Summary for Reach 1.1bR2: North Road Conveyance Swale

Inflow Area =	1.984 ac,	0.74% Impervious, Inflow Depth =	3.84"	for 100-Yr Storm event	
Inflow =	10.16 cfs @	12.00 hrs, Volume=	0.634 af		
Outflow =	9.79 cfs @	12.02 hrs, Volume=	0.634 af,	Atten= 4%,	Lag= 1.5 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.40 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.14 fps, Avg. Travel Time= 8.7 min

Peak Storage= 1,320 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.59' , Surface Width= 5.54'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 140.36 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 593.3' Slope= 0.0380 '/'
Inlet Invert= 1,447.27', Outlet Invert= 1,424.75'

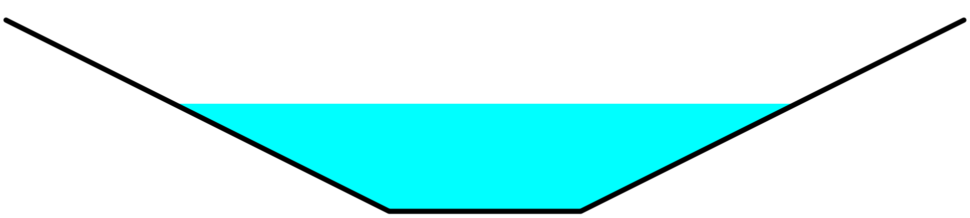
Summary for Reach 1.2aR1: Bypass Swale

Inflow Area =	7.876 ac,	0.00% Impervious, Inflow Depth = 2.45"	for 100-Yr Storm event	
Inflow =	21.87 cfs @	12.12 hrs, Volume=	1.606 af	
Outflow =	21.50 cfs @	12.14 hrs, Volume=	1.606 af,	Atten= 2%, Lag= 1.5 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.50 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.48 fps, Avg. Travel Time= 5.9 min

Peak Storage= 2,504 cf @ 12.14 hrs
Average Depth at Peak Storage= 1.12' , Surface Width= 6.50'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 74.30 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 524.2' Slope= 0.0188 '/'
Inlet Invert= 1,454.08', Outlet Invert= 1,444.22'



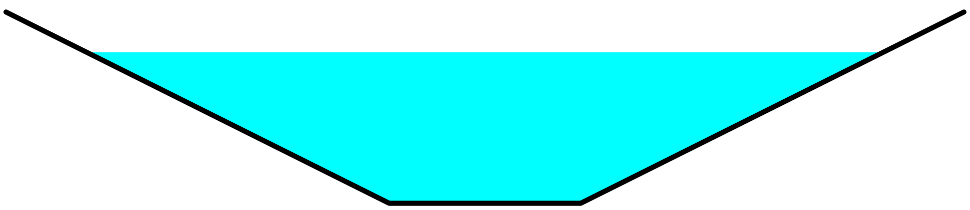
Summary for Reach 1.2aR2: Bypass Swale

Inflow Area = 16.788 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 46.62 cfs @ 12.13 hrs, Volume= 3.423 af
Outflow = 46.06 cfs @ 12.15 hrs, Volume= 3.423 af, Atten= 1%, Lag= 1.2 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.65 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.86 fps, Avg. Travel Time= 5.0 min

Peak Storage= 4,529 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.58' , Surface Width= 8.32'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 77.47 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 556.0' Slope= 0.0204 '/'
Inlet Invert= 1,443.21', Outlet Invert= 1,431.84'



Summary for Reach 1.2aR3: Bypass Swale

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 61.27 cfs @ 12.14 hrs, Volume= 4.544 af
Outflow = 61.13 cfs @ 12.15 hrs, Volume= 4.544 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.42 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.69 fps, Avg. Travel Time= 2.5 min

Peak Storage= 2,809 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.74' , Surface Width= 9.96'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 81.84 cfs

3.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 11.00'
Length= 249.0' Slope= 0.0153 '/'
Inlet Invert= 1,431.11', Outlet Invert= 1,427.29'

Summary for Reach 1.2bR1: East Road Conveyance Swale

Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 3.47" for 100-Yr Storm event
Inflow = 4.39 cfs @ 11.97 hrs, Volume= 0.210 af
Outflow = 4.03 cfs @ 12.00 hrs, Volume= 0.210 af, Atten= 8%, Lag= 1.8 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.67 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.94 fps, Avg. Travel Time= 13.0 min

Peak Storage= 803 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.36' , Surface Width= 4.14'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 79.22 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 731.4' Slope= 0.0456 '/'
Inlet Invert= 1,489.53', Outlet Invert= 1,456.20'

‡

Summary for Reach 1.2bR2: South Road Conveyance Swale

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 3.41" for 100-Yr Storm event
Inflow = 7.62 cfs @ 12.02 hrs, Volume= 0.450 af
Outflow = 7.14 cfs @ 12.06 hrs, Volume= 0.450 af, Atten= 6%, Lag= 2.2 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.06 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 11.7 min

Peak Storage= 1,412 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.61' , Surface Width= 5.66'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 95.76 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 604.5' Slope= 0.0177 '/'
Inlet Invert= 1,454.47', Outlet Invert= 1,443.79'

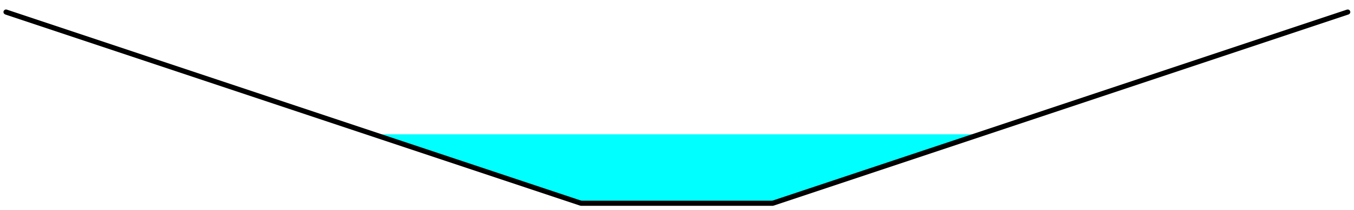
Summary for Reach 1.2bR3: South Road Conveyance Swale

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 3.57" for 100-Yr Storm event
Inflow = 11.17 cfs @ 12.00 hrs, Volume= 0.713 af
Outflow = 10.38 cfs @ 12.04 hrs, Volume= 0.713 af, Atten= 7%, Lag= 2.5 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.45 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.95 fps, Avg. Travel Time= 13.2 min

Peak Storage= 2,271 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.72' , Surface Width= 6.33'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 98.64 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 755.9' Slope= 0.0187 '/'
Inlet Invert= 1,442.84', Outlet Invert= 1,428.67'



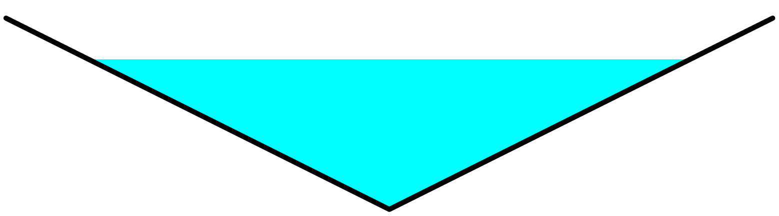
Summary for Reach 4.1R1: Bypass Swale

Inflow Area = 11.662 ac, 2.80% Impervious, Inflow Depth = 2.03" for 100-Yr Storm event
Inflow = 29.22 cfs @ 12.09 hrs, Volume= 1.970 af
Outflow = 28.79 cfs @ 12.11 hrs, Volume= 1.970 af, Atten= 1%, Lag= 1.2 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.84 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 2.22 fps, Avg. Travel Time= 4.3 min

Peak Storage= 2,810 cf @ 12.11 hrs
Average Depth at Peak Storage= 1.57' , Surface Width= 6.28'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 54.88 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 570.0' Slope= 0.0303 '/'
Inlet Invert= 1,448.24', Outlet Invert= 1,430.97'



Summary for Reach 4.1R2: Ex Stream

Inflow Area = 39.249 ac, 0.83% Impervious, Inflow Depth = 1.59" for 100-Yr Storm event
Inflow = 34.08 cfs @ 12.12 hrs, Volume= 5.208 af
Outflow = 31.95 cfs @ 12.18 hrs, Volume= 5.208 af, Atten= 6%, Lag= 3.1 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.77 fps, Min. Travel Time= 4.5 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 14.0 min

Peak Storage= 8,541 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.59' , Surface Width= 21.63'
Bank-Full Depth= 3.00' Flow Area= 84.0 sf, Capacity= 588.81 cfs

17.50' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 4.0 '/' Top Width= 38.50'
Length= 740.0' Slope= 0.0099 '/'
Inlet Invert= 1,430.98', Outlet Invert= 1,423.64'

‡

Summary for Reach 4.2bR: Conveyance Swale

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 3.97" for 100-Yr Storm event
Inflow = 3.16 cfs @ 11.97 hrs, Volume= 0.156 af
Outflow = 2.96 cfs @ 12.00 hrs, Volume= 0.156 af, Atten= 6%, Lag= 1.6 min

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.29 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 11.4 min

Peak Storage= 509 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 3.85'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 77.09 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 565.0' Slope= 0.0432 '/'
Inlet Invert= 1,472.38', Outlet Invert= 1,448.00'

‡

Summary for Pond 1.1aC1: TS1 Culvert

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 15.92 cfs @ 12.15 hrs, Volume= 1.198 af
Outflow = 15.92 cfs @ 12.15 hrs, Volume= 1.198 af, Atten= 0%, Lag= 0.0 min
Primary = 15.92 cfs @ 12.15 hrs, Volume= 1.198 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,489.10' @ 12.15 hrs
Flood Elev= 1,489.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,487.56'	**36.3" W x 22.5" H, R=18.8"/51.0" Pipe Arch RCP_Arch 37x23** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,487.56' / 1,486.80' S= 0.0162 '/' Cc= 0.900 n= 0.012, Flow Area= 4.43 sf

Primary OutFlow Max=15.91 cfs @ 12.15 hrs HW=1,489.10' (Free Discharge)
└─**1=RCP_Arch 37x23** (Inlet Controls 15.91 cfs @ 3.99 fps)

Summary for Pond 1.1aC2: TS2 Culvert

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 37.72 cfs @ 12.17 hrs, Volume= 2.924 af
Outflow = 37.72 cfs @ 12.17 hrs, Volume= 2.924 af, Atten= 0%, Lag= 0.0 min
Primary = 37.72 cfs @ 12.17 hrs, Volume= 2.924 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,472.86' @ 12.17 hrs
Flood Elev= 1,473.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,470.80'	**48.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,470.80' / 1,469.57' S= 0.0262 '/' Cc= 0.900 n= 0.012, Flow Area= 8.00 sf

Primary OutFlow Max=37.71 cfs @ 12.17 hrs HW=1,472.86' (Free Discharge)
└─**1=Culvert** (Inlet Controls 37.71 cfs @ 4.71 fps)

Summary for Pond 1.1aC3: TS3 Culvert

Inflow Area = 20.134 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 52.75 cfs @ 12.17 hrs, Volume= 4.105 af
Outflow = 52.75 cfs @ 12.17 hrs, Volume= 4.105 af, Atten= 0%, Lag= 0.0 min
Primary = 52.75 cfs @ 12.17 hrs, Volume= 4.105 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,451.82' @ 12.17 hrs
Flood Elev= 1,452.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.55'	**60.0" W x 24.0" H Box Culvert** L= 47.2' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.55' / 1,447.64' S= 0.0405 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=52.73 cfs @ 12.17 hrs HW=1,451.82' (Free Discharge)
└─**1=Culvert** (Inlet Controls 52.73 cfs @ 5.27 fps)

Summary for Pond 1.1aP: North Road Bypass OC

Inflow Area = 32.982 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 81.46 cfs @ 12.20 hrs, Volume= 6.725 af
Outflow = 81.62 cfs @ 12.19 hrs, Volume= 6.717 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.02 cfs @ 12.06 hrs, Volume= 0.036 af
Primary = 81.60 cfs @ 12.19 hrs, Volume= 6.681 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,430.62' @ 12.19 hrs Surf.Area= 0.034 ac Storage= 0.069 af

Plug-Flow detention time= 7.6 min calculated for 6.717 af (100% of inflow)
Center-of-Mass det. time= 6.9 min (865.4 - 858.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,426.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,426.00'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,428.50'	**10.0' 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

Discarded OutFlow Max=0.02 cfs @ 12.06 hrs HW=1,430.09' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=81.51 cfs @ 12.19 hrs HW=1,430.62' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 81.51 cfs @ 3.84 fps)

Summary for Pond 1.1bC1: TS4 Culvert

Inflow Area = 1.333 ac, 0.55% Impervious, Inflow Depth = 3.87" for 100-Yr Storm event
Inflow = 6.52 cfs @ 12.03 hrs, Volume= 0.430 af
Outflow = 6.52 cfs @ 12.03 hrs, Volume= 0.430 af, Atten= 0%, Lag= 0.0 min
Primary = 6.52 cfs @ 12.03 hrs, Volume= 0.430 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,450.83' @ 12.03 hrs
Flood Elev= 1,451.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.50'	**18.0" Round Culvert**

L= 45.9' CPP, end-section conforming to fill, Ke= 0.500
Inlet / Outlet Invert= 1,449.50' / 1,447.27' S= 0.0486 '/' Cc= 0.900
n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=6.51 cfs @ 12.03 hrs HW=1,450.83' (Free Discharge)
↑**1=Culvert** (Inlet Controls 6.51 cfs @ 3.93 fps)

Summary for Pond 1.1bP1: Dry Swale

Inflow Area =	1.984 ac,	0.74% Impervious, Inflow Depth = 3.84"	for 100-Yr Storm event	
Inflow =	9.79 cfs @	12.02 hrs, Volume=	0.634 af	
Outflow =	10.50 cfs @	12.03 hrs, Volume=	0.634 af,	Atten= 0%, Lag= 0.4 min
Discarded =	0.01 cfs @	11.92 hrs, Volume=	0.006 af	
Primary =	10.49 cfs @	12.03 hrs, Volume=	0.629 af	

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,427.20' @ 12.03 hrs Surf.Area= 603 sf Storage= 428 cf

Plug-Flow detention time= 4.9 min calculated for 0.634 af (100% of inflow)
Center-of-Mass det. time= 5.1 min (821.8 - 816.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.75'	428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,424.75	0	0.0	0	0	0
1,425.00	25	22.9	2	2	42
1,426.00	273	98.0	127	129	767
1,426.70	603	161.7	299	428	2,086

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.75'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,425.69'	**2.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.01 cfs @ 11.92 hrs HW=1,426.70' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=10.46 cfs @ 12.03 hrs HW=1,427.19' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 10.46 cfs @ 3.47 fps)

Summary for Pond 1.1bP2: North Road Detention Pond

Inflow Area = 1.984 ac, 0.74% Impervious, Inflow Depth = 3.80" for 100-Yr Storm event
Inflow = 10.49 cfs @ 12.03 hrs, Volume= 0.629 af
Outflow = 9.74 cfs @ 12.03 hrs, Volume= 0.614 af, Atten= 7%, Lag= 0.2 min
Discarded = 0.02 cfs @ 12.03 hrs, Volume= 0.057 af
Primary = 9.72 cfs @ 12.03 hrs, Volume= 0.557 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.33' @ 12.03 hrs Surf.Area= 0.035 ac Storage= 0.060 af

Plug-Flow detention time= 125.7 min calculated for 0.614 af (98% of inflow)
Center-of-Mass det. time= 111.2 min (928.9 - 817.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,421.50'	0.166 af	**10.00'W x 40.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,421.50'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,424.00'	**20.0' 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

Discarded OutFlow Max=0.02 cfs @ 12.03 hrs HW=1,424.33' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=9.69 cfs @ 12.03 hrs HW=1,424.33' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 9.69 cfs @ 1.46 fps)

Summary for Pond 1.2aC1: TS 7 Culvert

Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 21.50 cfs @ 12.14 hrs, Volume= 1.606 af
Outflow = 21.50 cfs @ 12.14 hrs, Volume= 1.606 af, Atten= 0%, Lag= 0.0 min
Primary = 21.50 cfs @ 12.14 hrs, Volume= 1.606 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,445.93' @ 12.14 hrs
Flood Elev= 1,446.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,444.22'	**36.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,444.22' / 1,443.21' S= 0.0215 '/' Cc= 0.900 n= 0.012, Flow Area= 6.00 sf

Primary OutFlow Max=21.49 cfs @ 12.14 hrs HW=1,445.93' (Free Discharge)
└─**1=Culvert** (Inlet Controls 21.49 cfs @ 4.19 fps)

Summary for Pond 1.2aC2: TS8 Culvert

Inflow Area = 16.788 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 46.06 cfs @ 12.15 hrs, Volume= 3.423 af
Outflow = 46.06 cfs @ 12.15 hrs, Volume= 3.423 af, Atten= 0%, Lag= 0.0 min
Primary = 46.06 cfs @ 12.15 hrs, Volume= 3.423 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,433.67' @ 12.15 hrs
Flood Elev= 1,433.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.65'	**60.0" W x 24.0" H Box Culvert** L= 47.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,431.65' / 1,431.11' S= 0.0114 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=46.03 cfs @ 12.15 hrs HW=1,433.67' (Free Discharge)
└─**1=Culvert** (Inlet Controls 46.03 cfs @ 4.60 fps)

Summary for Pond 1.2aP: South Road Bypass OC

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 61.13 cfs @ 12.15 hrs, Volume= 4.544 af
Outflow = 62.88 cfs @ 12.14 hrs, Volume= 4.544 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.42 cfs @ 12.07 hrs, Volume= 0.345 af
Secondary = 62.47 cfs @ 12.14 hrs, Volume= 4.199 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,428.28' @ 12.14 hrs Surf.Area= 0.034 ac Storage= 0.069 af

Plug-Flow detention time= 6.6 min calculated for 4.543 af (100% of inflow)
Center-of-Mass det. time= 6.6 min (860.8 - 854.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area**
#2	Secondary	1,426.50'	**10.0' 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

Discarded OutFlow Max=0.42 cfs @ 12.07 hrs HW=1,428.01' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.42 cfs)

Secondary OutFlow Max=62.34 cfs @ 12.14 hrs HW=1,428.27' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 62.34 cfs @ 3.52 fps)

Summary for Pond 1.2bC1: East Road Culvert

Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 3.47" for 100-Yr Storm event
Inflow = 4.03 cfs @ 12.00 hrs, Volume= 0.210 af
Outflow = 4.03 cfs @ 12.00 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min
Primary = 4.03 cfs @ 12.00 hrs, Volume= 0.210 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,455.48' @ 12.00 hrs
Flood Elev= 1,457.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,454.39'	**15.0" Round Culvert** L= 41.6' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,454.39' / 1,453.67' S= 0.0173 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=4.03 cfs @ 12.00 hrs HW=1,455.48' (Free Discharge)
└─**1=Culvert** (Inlet Controls 4.03 cfs @ 3.55 fps)

Summary for Pond 1.2bC2: TS6 Culvert

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 3.41" for 100-Yr Storm event
Inflow = 7.14 cfs @ 12.06 hrs, Volume= 0.450 af
Outflow = 7.14 cfs @ 12.06 hrs, Volume= 0.450 af, Atten= 0%, Lag= 0.0 min
Primary = 7.14 cfs @ 12.06 hrs, Volume= 0.450 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.95' @ 12.06 hrs
Flood Elev= 1,445.09'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,443.51'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,443.51' / 1,442.84' S= 0.0151 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=7.14 cfs @ 12.06 hrs HW=1,444.95' (Free Discharge)
└─**1=Culvert** (Inlet Controls 7.14 cfs @ 4.09 fps)

Summary for Pond 1.2bP: South Road Treatment Pond

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 3.57" for 100-Yr Storm event
Inflow = 10.38 cfs @ 12.04 hrs, Volume= 0.713 af
Outflow = 10.35 cfs @ 12.05 hrs, Volume= 0.713 af, Atten= 0%, Lag= 0.5 min
Discarded = 0.33 cfs @ 12.05 hrs, Volume= 0.309 af
Primary = 10.03 cfs @ 12.05 hrs, Volume= 0.404 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Peak Elev= 1,426.39' @ 12.05 hrs Surf.Area= 0.027 ac Storage= 0.041 af

Plug-Flow detention time= 27.5 min calculated for 0.712 af (100% of inflow)
Center-of-Mass det. time= 27.5 min (850.6 - 823.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.149 af	**20.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,426.05'	**20.0' 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

Discarded OutFlow Max=0.33 cfs @ 12.05 hrs HW=1,426.39' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.33 cfs)

Primary OutFlow Max=10.00 cfs @ 12.05 hrs HW=1,426.39' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 10.00 cfs @ 1.48 fps)

Summary for Pond 1.3P: Pond 3 - Access Rd West

Inflow Area =	0.695 ac,	0.00% Impervious,	Inflow Depth =	3.18"	for 100-Yr Storm event
Inflow =	3.89 cfs @	11.97 hrs,	Volume=	0.184 af	
Outflow =	0.32 cfs @	12.52 hrs,	Volume=	0.184 af,	Atten= 92%, Lag= 33.0 min
Discarded =	0.32 cfs @	12.52 hrs,	Volume=	0.184 af	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,458.52' @ 12.52 hrs Surf.Area= 2,284 sf Storage= 3,474 cf

Plug-Flow detention time= 119.1 min calculated for 0.184 af (100% of inflow)
Center-of-Mass det. time= 119.1 min (936.9 - 817.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,456.00'	8,743 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,456.00	784	123.0	0	0	784
1,458.00	1,720	194.0	2,443	2,443	2,603
1,459.00	2,884	279.0	2,277	4,721	5,811
1,460.00	5,280	421.0	4,022	8,743	13,729

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,456.00'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,459.99'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.32 cfs @ 12.52 hrs HW=1,458.52' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.32 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 4.2bP: Pond 4 - Access Rd East

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 3.97" for 100-Yr Storm event
Inflow = 2.96 cfs @ 12.00 hrs, Volume= 0.156 af
Outflow = 2.85 cfs @ 12.02 hrs, Volume= 0.156 af, Atten= 4%, Lag= 1.4 min
Discarded = 0.15 cfs @ 12.02 hrs, Volume= 0.108 af
Primary = 2.71 cfs @ 12.02 hrs, Volume= 0.047 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,448.48' @ 12.02 hrs Surf.Area= 1,057 sf Storage= 1,716 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 90.3 min (892.4 - 802.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,445.50'	2,317 cf	**10.00'W x 20.00'L x 3.50'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,445.50'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,448.25'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.15 cfs @ 12.02 hrs HW=1,448.48' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=2.70 cfs @ 12.02 hrs HW=1,448.48' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 2.70 cfs @ 1.16 fps)

Summary for Pond 4.2C: 18" Culvert

Inflow Area = 27.587 ac, 0.00% Impervious, Inflow Depth = 1.41" for 100-Yr Storm event
Inflow = 24.39 cfs @ 12.40 hrs, Volume= 3.239 af
Outflow = 12.00 cfs @ 12.85 hrs, Volume= 3.238 af, Atten= 51%, Lag= 27.0 min
Primary = 12.00 cfs @ 12.85 hrs, Volume= 3.238 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,434.57' @ 12.85 hrs Surf.Area= 26,824 sf Storage= 26,734 cf
Flood Elev= 1,434.64' Surf.Area= 27,666 sf Storage= 28,656 cf

Plug-Flow detention time= 20.3 min calculated for 3.238 af (100% of inflow)
Center-of-Mass det. time= 19.9 min (920.2 - 900.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,431.50'	39,033 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,431.50	0	0.0	0	0	0
1,432.00	1,190	146.0	198	198	1,697
1,432.50	3,534	368.0	1,129	1,327	10,778
1,433.00	5,795	497.0	2,309	3,637	19,660
1,433.50	10,362	837.0	3,984	7,621	55,755
1,434.00	16,931	975.0	6,756	14,377	75,659
1,434.60	27,412	1,352.0	13,177	27,555	145,474
1,435.00	30,000	1,500.0	11,479	39,033	179,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.83'	**18.0" Round Culvert** L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.83' / 1,431.18' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=12.00 cfs @ 12.85 hrs HW=1,434.57' (Free Discharge)
└─**1=Culvert** (Inlet Controls 12.00 cfs @ 6.79 fps)

Summary for Pond 4.3C: 24" Culvert

Inflow Area = 25.466 ac, 5.08% Impervious, Inflow Depth = 1.34" for 100-Yr Storm event
Inflow = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af
Outflow = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af, Atten= 0%, Lag= 0.0 min
Primary = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,434.79' @ 12.37 hrs
Flood Elev= 1,434.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.64'	**24.0" Round Culvert** L= 83.7' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.64' / 1,429.73' S= 0.0228 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	1,434.80'	**20.0' 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

Primary OutFlow Max=22.15 cfs @ 12.37 hrs HW=1,434.78' (Free Discharge)
└─**1=Culvert** (Inlet Controls 22.15 cfs @ 7.05 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.64' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link 1.1L:

Inflow Area = 34.966 ac, 0.04% Impervious, Inflow Depth = 2.48" for 100-Yr Storm event
Inflow = 86.81 cfs @ 12.19 hrs, Volume= 7.238 af
Primary = 86.81 cfs @ 12.19 hrs, Volume= 7.238 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link 1.2L:

Inflow Area = 24.683 ac, 0.06% Impervious, Inflow Depth = 2.24" for 100-Yr Storm event
Inflow = 70.59 cfs @ 12.14 hrs, Volume= 4.603 af
Primary = 70.59 cfs @ 12.14 hrs, Volume= 4.603 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP1: Study Point 1

Inflow Area = 339.655 ac, 0.01% Impervious, Inflow Depth = 2.15" for 100-Yr Storm event
Inflow = 157.65 cfs @ 12.16 hrs, Volume= 60.919 af
Primary = 157.65 cfs @ 12.16 hrs, Volume= 60.919 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP2: Study Point 2

Inflow Area = 11.058 ac, 0.00% Impervious, Inflow Depth = 2.71" for 100-Yr Storm event
Inflow = 22.85 cfs @ 12.32 hrs, Volume= 2.499 af
Primary = 22.85 cfs @ 12.32 hrs, Volume= 2.499 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP3: Study Point 3

Inflow Area = 15.649 ac, 0.03% Impervious, Inflow Depth = 2.03" for 100-Yr Storm event
Inflow = 43.75 cfs @ 12.05 hrs, Volume= 2.643 af
Primary = 43.75 cfs @ 12.05 hrs, Volume= 2.643 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP4: Study Point 4

Inflow Area = 64.715 ac, 2.50% Impervious, Inflow Depth = 1.49" for 100-Yr Storm event
Inflow = 48.49 cfs @ 12.23 hrs, Volume= 8.054 af
Primary = 48.49 cfs @ 12.23 hrs, Volume= 8.054 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP5: Study Point 5

Inflow Area = 4.970 ac, 0.00% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 14.48 cfs @ 12.11 hrs, Volume= 1.013 af
Primary = 14.48 cfs @ 12.11 hrs, Volume= 1.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Link SP6: Study Point 6

Inflow Area = 24.966 ac, 5.81% Impervious, Inflow Depth = 2.28" for 100-Yr Storm event
Inflow = 29.33 cfs @ 12.62 hrs, Volume= 4.734 af
Primary = 29.33 cfs @ 12.62 hrs, Volume= 4.734 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Appendix L – Stormwater Design Calculations

Summary:

Study Area	WQ Rqd		WQ Prov		RRV Min		RRV	
	ft^3	Ac-Ft	ft^3	Ac-Ft	ft^3	Ac-Ft	ft^3	Ac-Ft
1	9,339	0.214	9,339	0.214	2,782	0.064	9,339	0.214
4	2,206	0.051	1,052	0.024	1,101	0.025	1300	0.030
	11,545	0.265	10,391	0.239	3,883	0.089	10,639	0.244

Water Quality Volume, WQv - Study Area 1

WQv

New Roof/Pavement	1,280	sq-ft
New Gravel	109,644	sq-ft
Redeveloped Gravel*	6,197	sq-ft
Pervious	104,315	sq-ft
Total Area, A	216,788	sq-ft
Percent Impervious Cover, I	51.9	%
90% Rainfall depth, P:	1.00	in

*25% included in calcs for redeveloped impervious

Calculate Volumetric Runoff Coefficient, Rv

Rv = 0.05 + (0.009 * I) = 0.517 **Rv = 0.517**

Min. Rv = 0.2

Calculate Water Quality Volume, WQv (ft^3)

WQv = (P * Rv * A)/12 **WQv = 9,339 ft^3**

Minimum RRv - Study Area 1

HSG	Area	S	
A	0	0.55	
B	0.000	0.4	
C	5.083	0.3	
D	0	0.2	
Total	5.083	0.3	Weighted S

Impervious =	2.689	*acre*
Precipitation	1	*in*
Rv	0.95	
Minimum RRv	**2,782**	***ft3***
	0.06	af

$$RRv_{min} = \frac{P * \bar{R}_v * Aic * S}{12}$$

Where:

RRv_{min}= Minimum runoff reduction volume required from impervious area (acre-feet)

$\bar{R}_v$= 0.05+0.009(I) where I is 100% impervious

Aic= Total area of new impervious cover

S = Hydrologic Soil Group (HSG) Specific Reduction Factor (*S*)

Water Quality Volume, WQv - Study Area 1

WQv

New Roof/Pavement	737	sq-ft
New Gravel	21,619	sq-ft
Redeveloped Gravel*	17,367	sq-ft
Pervious	22,300	sq-ft
Total Area, A	48,998	sq-ft
Percent Impervious Cover, I	54.5	%
90% Rainfall depth, P:	1.00	in

*25% included in calcs for redeveloped impervious

Calculate Volumetric Runoff Coefficient, Rv

Rv = 0.05 + (0.009 * I) = 0.540 **Rv = 0.540**

Min. Rv = 0.2

Calculate Water Quality Volume, WQv (ft^3)

WQv = (P * Rv * A)/12 **WQv = 2,206 ft^3**

Minimum RRv - Study Area 1

HSG	Area	S	
A	0	0.55	
B	0.680	0.4	
C	0.744	0.3	
D	0	0.2	
Total	1.424	0.35	Weighted S

Impervious =	0.912	*acre*
Precipitation	1	*in*
Rv	0.95	
Minimum RRv	**1,101**	***ft3***
	0.03	af

$$RRv_{min} = \frac{P * \bar{R}_v * Aic * S}{12}$$

Where:

RRv_{min}= Minimum runoff reduction volume required from impervious area (acre-feet)

$\bar{R}_v$= 0.05+0.009(I) where I is 100% impervious

Aic= Total area of new impervious cover

S = Hydrologic Soil Group (HSG) Specific Reduction Factor (S)

Vegetated Swale Data Sheet

Design Point:	4.1b

Enter Site Data For Drainage Area to be Treated by Practice

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Precipitation *(in)*	Rv	WQv *(ft^3)*
1	0.350	0.235	67%	1.00	0.65	831

Enter Soil Infiltration Rate

Soil Infiltration Rate	*1.00*	*in/hour*	*Okay*

Calculate Peak WQv

Q	Q^2	1.25QP	(Q^2+1.25QP)^0.5	10*(Q^2+1.25QP)^0.
0.654285714	0.428	0.818	1.116	11.162

Modified CN	96	*Note: Value is modified curve number using Appendix B.2 - Water Quality Peak Flow Calculation of the New York State Stormwater Management Design Manual*	
Ia	0.076		
Ia/P	0.076		
Tc (hours)	0.10	*Note: Tc is a direct entry using the flow path for the catchment draining to the*	
qu	1000	*Note: qu value is taken from TR-55 (either Exhibit 4-II (Type II Rainfall Distribution) or*	
Qp	0.36	*cfs*	
Q10	1.09	*cfs*	*From TR-55*

Enter Swale Dimensions

Bottom Width	2	*ft*	*Minimum of 2 ft but no greater than 6 ft*
Side Slopes	3	*:1*	*Okay*
Channel Height	1.5	*ft*	
Flow Depth	0.07	*ft*	*Okay*
Longitudinal Slope	1.6%		*Between .5% and 4% (1.5-2.5% Preferred)*
Swale Length	208.00	*ft*	
Mannings Coef.	0.15		*Use variable n values corresponding to flow depths*

Calculated Swale Dimensions

Top Width	2.42		Q	0.0	
Area	0.15	*ft^2*	Velocity	0.20	*fps*
Wetted Perimeter	2.44	*ft*	Detention Time	17.20	*minutes*

Determine Required Length Of Channel

Required Length	208.00	*ft*
Length Provided	208.00	*ft*
Q10 Velocity	0.58	*fps*
Q10 flow depth	5.40	*inches*
Q10 freeboard	12.60	*inches*

Determine Runoff Reduction

Soil Group	B	Percent Reduction	0.20	
Is the Vegetated Swale contributing flow to another practice?		No	Select Practice	
Runoff Reduction		**166**	***ft3***	

Vegetated Swale Data Sheet

Design Point:	**4.2b**					
Enter Site Data For Drainage Area to be Treated by Practice						
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Precipitation** *(in)*	**Rv**	**WQv** *(ft^3)*
1	0.470	0.296	63%	1.00	0.62	1,052
Enter Soil Infiltration Rate						
Soil Infiltration Rate		*6.00*	*in/hour*	*Okay*		
Calculate Peak WQv						
Q	Q^2	1.25QP	(Q^2+1.25QP)^0.5		10*(Q^2+1.25QP)^0.	
0.616808511	0.380	0.771	1.073		10.731	
Modified CN	96	*Note: Value is modified curve number using Appendix B.2 - Water Quality Peak Flow*				
Ia	0.087					
Ia/P	0.087					
Tc (hours)	0.10	*Note: Tc is a direct entry using the flow path for the catchment draining to the*				
qu	1000	*Note: qu value is taken from TR-55 (either Exhibit 4-II (Type II Rainfall Distribution) or*				
Qp	0.45	*cfs*				
Q10	1.64	*cfs*	*From TR-55*			
Enter Swale Dimensions						
Bottom Width		2	*ft*	*Minimum of 2 ft but no greater than 6 ft*		
Side Slopes		3	*:1*	*Okay*		
Channel Height		1.5	*ft*			
Flow Depth		0.07	*ft*	*Okay*		
Longitudinal Slope		4.3%		*Between .5% and 4% (1.5-2.5% Preferred)*		
Swale Length		565.00	*ft*			
Mannings Coef.		0.15		*Use variable n values corresponding to flow depths*		
Calculated Swale Dimensions						
Top Width	2.42		Q	0.1		
Area	0.15	*ft^2*	Velocity	0.33	*fps*	
Wetted Perimeter	2.44	*ft*	Detention Time	28.71	*minutes*	
Determine Required Length Of Channel						
Required Length		565.00	*ft*			
Length Provided		565.00	*ft*			
Q10 Velocity		0.24	*fps*			
Q10 flow depth		4.68	*inches*			
Q10 freeboard		13.32	*inches*			
Determine Runoff Reduction						
Soil Group	C	Percent Reduction		0.10		
Is the Vegetated Swale contributing flow to			Yes	Select Practice		Infiltration Basin
Runoff Reduction			**105**	***ft3***		

Vegetated Swale Data Sheet

Design Point:	4.2c

Enter Site Data For Drainage Area to be Treated by Practice						
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Precipitation** *(in)*	**Rv**	**WQv** *(ft^3)*
1	0.354	0.238	67%	1.00	0.66	842
Enter Soil Infiltration Rate						
Soil Infiltration Rate		*6.00*	*in/hour*	*Okay*		
Calculate Peak WQv						
Q	Q^2	1.25QP	(Q^2+1.25QP)^0.5		10*(Q^2+1.25QP)^0.	
0.655084746	0.429	0.819	1.117		11.171	
Modified CN	96	*Note: Value is modified curve number using Appendix B.2 - Water Quality Peak Flow*				
Ia	0.076					
Ia/P	0.076					
Tc (hours)	0.10	*Note: Tc is a direct entry using the flow path for the catchment draining to the*				
qu	1000	*Note: qu value is taken from TR-55 (either Exhibit 4-II (Type II Rainfall Distribution) or*				
Qp	0.36	*cfs*				
Q10	1.24	*cfs*	*From TR-55*			
Enter Swale Dimensions						
Bottom Width		2	*ft*	*Minimum of 2 ft but no greater than 6 ft*		
Side Slopes		3	*:1*	*Okay*		
Channel Height		1.5	*ft*			
Flow Depth		0.08	*ft*	*Okay*		
Longitudinal Slope		2.9%		*Between .5% and 4% (1.5-2.5% Preferred)*		
Swale Length		381.00	*ft*			
Mannings Coef.		0.15		*Use variable n values corresponding to flow depths*		
Calculated Swale Dimensions						
Top Width	2.48		Q		0.1	
Area	0.18	*ft^2*	Velocity		0.29	*fps*
Wetted Perimeter	2.51	*ft*	Detention Time		21.86	*minutes*
Determine Required Length Of Channel						
Required Length		381.00	*ft*			
Length Provided		381.00	*ft*			
Q10 Velocity		0.19	*fps*			
Q10 flow depth		4.56	*inches*			
Q10 freeboard		13.44	*inches*			
Determine Runoff Reduction						
Soil Group	C	Percent Reduction		0.10		
Is the Vegetated Swale contributing flow to			No	Select Practice		
Runoff Reduction			**84**	***ft3***		

Appendix M – Inadvertent Return Plan

Inadvertent Return Plan

for

BR BENSON MINES SOLAR PROJECT

TOWN OF CLIFTON
ST. LAWRENCE COUNTY, NEW YORK

Prepared for:
New York State Energy Research and
Development Authority (NYSERDA)
17 Columbia Circle
Albany, NY 12203-1091

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Appendices:

1.0 Introduction

The Benson Mines Solar Project (the Project) is proposing to utilize trenchless excavation techniques, otherwise known as horizontal directional drilling (HDD), to route collection circuits from the Project Site under State Route 3 in the Town of Clifton, St. Lawrence County, New York to the collection substation. The location of the proposed HDD crossing is shown on the Construction Drawings.

The HDD process involves the use of water and drilling fluids as a coolant and lubricant for the advancing drill head. The drilling fluid also aid in stabilizing the bore removing the drill cuttings from the bore location. Biodegradable drilling fluids shall be used for HDD operations to minimize potential harm to aquatic species in the event of a drilling frac-out. Safety Data Sheets (SDS) for all drilling solutions shall be included in Appendix A of this Inadvertent Return Plan (the Plan).

This Plan has been developed to outline the operational procedures and responsibilities for the prevention, containment, and cleanup of inadvertent releases associated with the HDD process. The objective of this Plan is to:

1. Minimize the potential for an inadvertent release of drilling fluids associated with HDD activities;
2. Provide for the timely detection of inadvertent returns;
3. Protect environmentally sensitive areas (e.g., streams, wetlands) while responding to an inadvertent release;
4. Ensure an organized, timely and "minimum-impact" response in the event of an inadvertent return and release of drilling fluids; and,
5. Ensure that all appropriate notifications are made immediately.

2.0 Project Personnel Responsibilities

2.1 HDD Contractor

The HDD Contractor will be responsible for execution of HDD operations, including detecting and controlling inadvertent releases of drilling fluids. The Contractor is also responsible for understanding the contents of this Plan and ensuring construction personnel and subcontractors are familiar with its contents and procedures.

The HDD Contractor must immediately notify the Site Supervisor in the event of an inadvertent release and shall work with the Supervisor to document the release. Refer to Section 5.0 below for additional information regarding documentation requirements.

2.2 Site Supervisor

The Site Supervisor will have overall responsibility of implementing this Plan and shall be familiar with all aspects of the drilling activity, containment, and response procedures. The Site Supervisor will ensure that a copy of this Plan is available on-site and accessible to all construction personnel at locations where HDD activities are occurring.

The Site Supervisor has the authority to stop work, evaluate the situation, and determine the appropriate measures necessary to address an inadvertent release. The Site Supervisor is responsible for notifying the appropriate agencies of the spill and documenting the release and cleanup activities.

2.3 SWPPP Inspector

The SWPPP Inspector will closely supervise the progress and actions of the HDD Contractor while conducting routine SWPPP inspections. The SWPPP inspector will not be on site full-time during drilling operations. If the SWPPP inspector identifies an inadvertent return occur during a SWPPP inspection, the inspector will notify the Site Supervisor immediately. The SWPPP inspector will have the authority to stop work, evaluate the situation, and determine the appropriate measures necessary to address an inadvertent release.

2.4 Training

Prior to the commencement of construction, the Site Supervisor and HDD Contractor will ensure that the construction personnel receive and understand the following:

- Provisions of this Plan;
- Site-specific permit and monitoring requirements;
- Locations of sensitive environmental resources at and/or adjacent to the HDD site;
- Procedures for inadvertent release prevention;
- Location and proper use of containment equipment and materials;
- Contractor/crew member obligation to immediately suspend drilling operations upon evidence of an inadvertent release;
- Requirement to immediately report any inadvertent releases to the Site Construction Manager and EM;
- Contractor/crew member responsibilities in the event of an inadvertent release;
- Protocols for reporting observed releases and communication with appropriate regulatory agencies.

3.0 Equipment

The Site Supervisor will ensure that:

- All equipment and vehicles are checked and maintained daily to prevent leaks of hazardous materials;
- Spill kits and spill containment materials are available on-site at all times and that the equipment is in good working order;
- Equipment required to contain and clean up an inadvertent release will either be available at the work site or readily available at an off-site location within 10 minutes of the drill site; and,
- If equipment is required to be operated near a streambed, absorbent pads and plastic sheeting for placement beneath motorized equipment will be used to protect the streambed from engine fluids.

This Plan and the necessary response equipment shall be maintained on-site for the duration of drilling operations. At a minimum, the following equipment shall be available at each HDD crossing location during the time of the drill in the event of an accidental release of drilling fluids:

- Spill kit;
- Silt fence;
- Plastic sheeting;
- Turbidity barriers;
- Sand bags;
- Shovels;
- Buckets;
- Push brooms;
- Squeegees;
- Pumps and suction hose;
- Discharge hose;
- Storage tanks; and,
- Vacuum truck on 24-hour call.

4.0 Drilling Procedures

The following procedures shall be followed each day, prior to the start of work:

- The Inadvertent Return Plan shall be available on-site during all construction.
- The Site Supervisor shall be on site at any time that the drilling is occurring or is planned to occur.
- The Site Supervisor shall ensure that a job briefing meeting is held at the start of each day of drilling to review the appropriate procedures to be followed in case of an inadvertent return. Questions shall be answered, and clarification given on any point over which the drilling crew or other project staff has concerns.

The following procedures shall be followed each day during drilling operations:

- Drilling pressures shall be closely monitored so they do not exceed those needed to penetrate the formation. Pressure levels shall be monitored randomly by the operator. Pressure levels shall be set at a minimum to prevent inadvertent returns.
- During the pilot bore, maintain the drilled annulus. Cutters and reamers will be pulled back into previously-drilled sections after each new joint of pipe is added.
- Exit and entry pits shall be enclosed by silt fences and straw.
- A spill kit shall be on-site and used if an inadvertent return occurs.
- A vacuum truck shall be readily available on-site prior to and during all drilling operations.
- Containment materials (Straw, silt fencing, sand bags, inadvertent return spill kits, etc.) shall be staged on-site at location where they are readily available and easily mobilized for immediate use in the event of an accidental release of drilling mud (inadvertent return). If necessary, barriers (straw bales or sedimentation fences) between the bore site and the edge of the water source shall be constructed, prior to drilling, to prevent released bentonite material from reaching the water.
- Stop work whenever the pressure in the drill rig drops, or there is a lack of returns in the entrance pit.
  - The Site Supervisor shall be informed of the potential inadvertent return.
  - The Site Supervisor and the drill rig operator(s) shall work to coordinate the likely location of the inadvertent return. The location of the inadvertent return shall be recorded, and notes made on the location and measures taken to address the concern. The following subsections shall be adhered to when addressing an inadvertent return situation.
- Water containing mud, silt, bentonite, or other pollutants from equipment washing or other activities, shall not be allowed to enter a lake, flowing stream or any other water source. The drilling solution shall be either disposed of at an approved disposal facility or recycled in an approved manner.
- Other construction materials and waste shall be recycled, or disposed of, as appropriate.

4.1 Measures to Prevent Inadvertent Releases

Inadvertent return releases typically occur as a result of seeps which can form when pressure in the drill hole exceeds the capability of the overburden to contain it, or when fluids find a pre-existing fault in the overburden. The probability of a release occurring can be minimized by taking into consideration the soil type and bedrock composition at the Project Site. Bore depth will be determined based on the following site-specific factors:

- Increased pressures in the drill hole can be the result of excessively tight turns. Increasing the radius of the bend of the drill will reduced the potential for increased pressure.

- A loss of drilling pressure is the most evident indication of a seep. The drilling pressure shall be monitored continuously during drilling operations.
- Erosion and sediment controls shall be used at HDD entry and exit points to prevent drilling fluid from escaping the drill site and entering a stream, wetland, or other sensitive features. The erosion and sediment controls shall be maintained in good condition.
- HDD entry and exit points shall be located a minimum of 50 feet from the edge of the stream or wetland, when and where practical, consistent with the Project Construction Drawings.

The Site Supervisor will ensure a corridor centered on the drill path will be continuously monitored for any signs of inadvertent release. In addition, if crossing a stream, the downstream area will be continuously monitored for signs of an inadvertent release.

Water containing mud, silt, drilling fluids or other pollutants from equipment washing or other activities, will not be allowed to enter a wetland or waterbody. The drilling fluids used in the drilling process will either be recycled or disposed of at an approved facility.

4.2 Response to Inadvertent Releases

The Site Supervisor will be on-site during any HDD activities. The Site Supervisor will have a job briefing meeting at the beginning of each day of drilling to review appropriate procedures in the case of an inadvertent return. During the briefing, drilling crew or other Project personnel questions and concerns will be addressed.

Drilling fluid circulation shall be maintained to the extent practical. Once the drill rig is in place and HDD begins, the drill operator will immediately stop work whenever the pressure in the drill rig drops, there is a lack of returns in the entrance pit, or other evidence of an inadvertent release occurs. Upon evidence of an inadvertent release, the drill operator will immediately pull back the drill head to relieve pressure on the system.

If an inadvertent release is suspected, the Site Supervisor will be notified immediately to ensure appropriate response actions are taken and notifications are made. The Site Supervisor will conduct an evaluation of the situation and will document the conditions. Drilling operations shall be suspended if the surface returns may result in a violation of water quality standards or poses a threat to environmentally sensitive resources or public health and safety.

If no inadvertent release is detected, the drill operator will attempt to re-establish returns through standard HDD practice and continue HDD activity.

If an inadvertent release is detected, the Site Supervisor will:

1. Cease all drilling activities.
2. Make appropriate initial notifications – see “Notifications” below. Notification of DPS and Region 4 of the NYSDEC respective staffs if off Project Area access is needed to clean up an inadvertent release.
3. Implement containment measures to minimize the affected area.
    a. In upland or relatively dry wetland areas, containment techniques may include installation of earthen dams/ditches, or placement of sand bags or silt fence barriers to stem flow. If inadvertent returns occur in upland areas, the fluids shall be immediately contained and collected.
    b. In a flowing stream, several techniques may be implemented including turbidity curtains, sand bags placed on the bottom of the stream to slow flow, bypass

pumping water from above the inadvertent release to below the inadvertent release, or others which minimize or stop materials from flowing further downstream.

    c. In wetlands, the Site Supervisor will direct containment of material consistent with the methods described above. In some cases, however, equipment and personnel activities associated with containment of the surface return may be deemed likely to cause more damage to the ecosystem. Under such circumstances, mitigation efforts may be suspended at the Site Supervisor's discretion.
    d. Any drilling fluid inadvertently discharged shall be removed from agricultural areas.

4. If inadvertent drilling fluids surface returns occur in an environmentally sensitive area (i.e. wetlands and water bodies) the returns shall be monitored and documented.
5. If the volume of a release is too small to be practically collected, the affected area will be diluted with freshwater and allowed to dry and dissipate naturally.
6. If the volume of a release is small and it is practical to do so, it can be collected by hand with shovels and soft bristled brooms. The area should be scraped down to bare soil without unnecessarily disturbing exiting vegetation.
7. If the amount of surface return exceeds that which can be collected using small pumps, drilling operations shall be suspended until surface volumes can be brought under control.
8. If the volume of a release is large, a vacuum truck or diaphragm mud pump shall be utilized.
9. Drilling fluids, whether collected by hand or mechanical means, shall be directed into buckets, tanks, a vacuum truck, or other containment device and stored outside of sensitive environmental areas and recycled or disposed of in an approved manner.
10. Removal of released fluids from environmentally sensitive areas will take place only if the removal does not cause additional adverse impacts to the resource. Prior to the removal of fluids from environmentally sensitive areas, NYSDEC staff will be notified and consulted.
11. If inadvertent drilling fluid surface returns occur in an environmentally sensitive area, NYSDEC Staff shall be notified immediately and a monitoring report summarizing the location of surface returns, estimated quantity of fluid and summary of cleanup efforts shall be submitted within 24 hours of the occurrence.

If no inadvertent release is detected, the drill operator will attempt to re-establish returns through standard HDD practice and continue HDD activity.

5.0 Reporting Requirement

In the event that an Inadvertent Return occurs, and it reaches a water source, the Contractor shall immediately notify the Site Supervisor. The Site Supervisor must notify all appropriate agencies within two hours if possible. The Site Supervisor shall contact the agencies listed in the table below.

Agency	Contact	Address and Telephone Number
New York State Department of Environmental Conservation (NYSDEC)	Region 6 Spill Prevention and Response	317 Washington Street Watertown, NY 13601-3787 **Watertown: (315) 785-2513** **Utica: (315) 793-2554**
	NYS Spills Hotline	625 Broadway, 11th Floor Albany, New York 12233 **(1-800-457-7362)**

The Site Supervisor, in consultation with the Contractor, shall document the inadvertent return occurrence. Documentation shall include the following information:

- Date and time of loss of return;
- Time of discovery of any drilling material to the surface of the ground;
- Person who made the first discovery and their contact information;
- Physical location of release including if the release occurred in an upland area, stream, and/or wetland;
- Type of construction activities occurring at the time of the release;
- Approximate volume of material released;
- Identification of sensitive areas adjacent to the release;
- Measures employed for containment; and,
- Cleanup activities and methods.

A written report shall be provided to the agency representatives within 24 hours of the release.

6.0 Cleanup Procedures

6.1 Restarting Construction

The Site Supervisor, HDD Contractor, and SWPPP inspector (as applicable) will develop and implement corrective actions to resume HDD operations as practical. Options may include the industry standard practice of lower pressure/flow, changing viscosity of the slurry, using additives consistent with the geology, “pushing through” if the volume of inadvertent release is manageable and not impacting a stream or wetland, abandonment and relocation of the entry, or changing the drill path.

For small releases not requiring external notification, drilling may continue, if 100 percent containment is achieved through the use of a leak stopping compound or redirection of the bore and the clean-up crew remains at the inadvertent return location throughout the construction period. For release requiring external notification and/or other agencies, construction activities will not start without prior approval from the safety department. Abandonment of the bore will only be required when all efforts to control the inadvertent return within the existing directional bore have failed

6.2 Documentation

Record of inadvertent release shall be included in the Site Supervisor's daily log. The log shall include the following information regarding the release:

- Name and contact information of the person reporting the release;
- Approximate location and time of the release;
- An estimate of the amount of drilling fluid released;
- Size of the area impacted;
- Notifications made;
- Summary of the response; and,
- Description of cleanup action.

Appendix A – Safety Data Sheets (SDS)

Appendix N – SWPPP Amendments

The Owner/Operator shall have a Qualified Professional amend the SWPPP when one or more of the following occur:

- There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
- The SWPPP proves to be ineffective in:
  - Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
  - Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and

Additionally, the SWPPP shall be amended to identify any new Contractor or Subcontractor that will implement any measure of the SWPPP.

The following information should be documented in this section:

- Dates when major grading activities occur;
- Dates when construction activities temporarily or permanently cease on a portion of the Project Site; and
- Dates when stabilization measures (temporary and permanent) are initiated.

AMENDMENTS TO STORMWATER POLLUTION PREVENTION PLAN

Date	Person Amending SWPPP (Name and Title)	Page(s), Figure(s), or Plan(s) Where Amendments Made	Details of Amendment

Date	Person Amending SWPPP (Name and Title)	Page(s), Figure(s), or Plan(s) Where Amendments Made	Details of Amendment

Appendix O – SWPPP Inspection Reports

- Blank SWPPP Inspection Form -

- Completed SWPPP Inspection Reports -

Appendix O – Blank SWPPP Inspection Form

General Project Information

Project Name:				
SPDES Permit Number:			**Type of Construction Activities Being Completed:**	
Date of Inspection:				
Inspector's Name:				
Time On Site:			**Inspection Type:**	
Time Off Site:				
General Project Notes:				
SWPPP Amendment Required:	☐ Yes	☐ No	**If yes, describe:**	

Weather Information		
Has there been a storm event since the last inspection?	☒ Yes	☐ No
If yes, what was the approx. amount of precipitation (inches) since the last inspection:		
Weather conditions at the time of inspection?	Temperature: °F	
☐ Clear ☐ Cloudy ☐ Rain ☐ Sleet ☐ Snow ☐ Fog ☐ High Winds		
Does the Project Site discharge to natural surface waterbodies located within or immediately adjacent to the Project area?	☐ Yes	☐ No
If yes, describe:		
Were there any discharges observed at the time of inspection?	☐ Yes	☐ No
If yes, were sediment laden discharges observed?	☐ Yes	☐ No
Describe:		
If yes, was erosion or sedimentation observed at the discharge location?	☐ Yes	☐ No
Describe:		
Soil Condition:		
Were areas of soil disturbance observed at the time of inspection?	☐ Yes	☐ No
If yes, describe:		

Maintaining Water Quality

Water Quality Observations	**Yes**	**No**	**N/A**
Is there an increase in turbidity causing a substantial visual contrast to natural conditions?	☐	☐	☐
Is there residue from oil and floating substances, visible oil film, or grease or globules?	☐	☐	☐
Are all disturbances within the approved limits, as outlined on the plans?	☐	☐	☐
Have receiving waterbodies and/or wetland been impacted by the Project?	☐	☐	☐
Are the concrete washout facilities located a minimum of 100 feet from sensitive areas and properly maintained?	☐	☐	☐
Comments:			

General Housekeeping

Site Conditions	**Yes**	**No**	**N/A**
Is construction site litter and debris appropriately managed?	☐	☐	☐
Are facilities and equipment necessary for implementation of erosion and sediment controls in working and/or properly maintained?	☐	☐	☐
Is construction impacting adjacent properties?	☐	☐	☐
Is dust adequately controlled?	☐	☐	☐
Comments:			

Runoff Control Practices

Temporary Stream Crossings	Yes	No	N/A
Are the maximum necessary diameter pipes installed to span stream without dredging?	☐	☐	☐
Is non-woven geotextile fabric installed beneath the approaches?	☐	☐	☐
Is fill composed of aggregate (no earthen or soil material)?	☐	☐	☐
Is the rock on approaches clean enough to remove mud/sediment from vehicles and prevent sediment from entering the stream during high flows?	☐	☐	☐
Comments:			

Excavation Dewatering	Yes	No	N/A
Are upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per the Construction Drawings?	☐	☐	☐
Is clean water from the upstream pool being pumped to the downstream pool?	☐	☐	☐
Is sediment laden water from the work area being discharged to a sediment trapping device?	☐	☐	☐
Is the water discharging from the sediment trapping device clear and free of sediment?	☐	☐	☐
Does the constructed upstream berm have a minimum of one-foot freeboard?	☐	☐	☐
Comments:			

Flow Spreader(s)	Yes	No	N/A
Is the flow spreader installed per the Construction Drawings?	☐	☐	☐
Was the flow spreader constructed on undisturbed soil, not on fill?	☐	☐	☐
Does the flow spreader receive only clear, non-sediment laden flows?	☐	☐	☐
Does the discharge from the flow spreader sheet flow out of the spreader without erosion downstream?	☐	☐	☐
Comments:			

Interceptor Dikes and Swales	Yes	No	N/A
Is the dike/swale installed per the Construction Drawings?	☐	☐	☐
Has the dike/swale been stabilized by geotextile fabric, seed, and/or mulch?	☐	☐	☐
Was erosion observed within the dike/swale?	☐	☐	☐
Is sediment-laden runoff directed to a sediment trapping device?	☐	☐	☐
Comments:			

Stone Check Dam(s)	Yes	No	N/A
Are the check dams in good condition (rocks in place and no ponding behind the dams)?	☐	☐	☐
Has geotextile fabric been placed beneath the rock fill?	☐	☐	☐
Was sediment accumulation greater than 50% of the design capacity?	☐	☐	☐
Was erosion observed within the channel?	☐	☐	☐
Comments:			

Rock Outlet Protection	Yes	No	N/A
Is the rock outlet protection installed per approved plans?	☐	☐	☐
Was the outlet protection installed concurrently with pipe installation?	☐	☐	☐
Have the rocks been displaced?	☐	☐	☐
Is the sediment accumulation 0% of the design capacity?	☐	☐	☐
Comments:			

Soil Stabilization

Topsoil and Spoil Stockpiles	Yes	No	N/A
Are stockpiles properly stabilized and contained?	☐	☐	☐
Are sediment control installed at the toe of the slope?	☐	☐	☐
Are idle soil stockpiles are stabilized with vegetation and/or mulch?	☐	☐	☐
Comments:			

Revegetation	Yes	No	N/A
Has temporary seed and mulch been applied to idle areas?	☐	☐	☐
Has a minimum of 4 inches of topsoil been applied under permanent seeding areas?	☐	☐	☐
Comments:			

Sediment Control Practices

Stabilized Construction Entrance(s)	Yes	No	N/A
Is the entrance installed per the Construction Drawings?	☐	☐	☐
Is the stone clean enough to effectively remove mud/sediment from vehicle tires?	☐	☐	☐
Does all traffic enter and exit the site at the stabilized construction entrance(s)?	☐	☐	☐
Is adequate drainage provided to prevent ponding at the entrance(s)?	☐	☐	☐
Comments:			

Linear Sediment Control Barriers	Yes	No	N/A
Are the sediment controls installed along the contour, 10 feet from toe of slope and not within conveyance channels?	☐	☐	☐
Are silt fence joints constructed by wrapping the two ends together for continuous support?	☐	☐	☐
Is the silt fence fabric is buried a minimum of 6 inches?	☐	☐	☐
Are the posts stable and the fabric is tight and without rips/frayed areas?	☐	☐	☐
Does the compost filter sock have good contact with the soil?	☐	☐	☐
Is the sediment accumulation 0% of the design capacity?	☐	☐	☐
Comments:			

Storm Drain Inlet Protection	Yes	No	N/A
Is the inlet protection installed in accordance with the Construction Drawings?	☐	☐	☐
Is the inlet protection structurally sound?	☐	☐	☐
Are the posts stable and the fabric is tight and without rips/frayed areas?	☐	☐	☐
Is the sediment accumulation greater than 50% of the design capacity?	☐	☐	☐
Comments:			

Temporary Sediment Basin	Yes	No	N/A
Is the basin and outlet structure constructed per the Construction Drawings?	☐	☐	☐
Are the basin side slopes stabilized?	☐	☐	☐
Was the drainage structure flushed and basin surface restored upon removal of the sediment basin facility?	☐	☐	☐
Is the sediment basin dewatering at an appropriate rate?	☐	☐	☐
Is the sediment accumulation greater than 50% of the design capacity?	☐	☐	☐
Comments:			

Temporary Sediment Trap	Yes	No	N/A
Is the outlet structure constructed per the Construction Drawings?	☐	☐	☐
Has geotextile fabric been placed beneath the rock fill?	☐	☐	☐
Are the sediment trap slopes and disturbed areas are stabilized?	☐	☐	☐
Is the sediment accumulation greater than 50% of the design capacity?	☐	☐	☐
Comments:			

Note: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design. All practices shall be maintained in accordance with their respective standards.

Qualified Inspector

Qualified Inspector Signature

Qualified Professional

Qualified Professional Signature

The above signed acknowledges that, to the best of his/her knowledge, all information provided in this report is accurate and complete. If there are any questions, comments, or concerns regarding the contents of this report, feel free to contact Inspector's Name at XXX-XXX-XXXX or email address.

Sketch Map

Legend:		
	Area of Active Soil Disturbance	Area has Achieved Temporary Stabilization
	Area of Inactive Soil Disturbance	Area has Achieved Final Stabilization

Inspection Photographs

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Appendix O – Completed SWPPP Inspection Reports

Appendix P – Alternative Stormwater Design

- Alternative Stormwater Management Design Re-Evaluation Memo -

- NYSDEC Consultation Email -

- Pre-Development Subcatchment Map -

- Pre-Development HydroCAD Model -

- Post-Development Subcatchment Map -

- Post-Development HydroCAD Model -

Appendix P – Alternative Stormwater Management Design Re-Evaluation Memo

July 12, 2022

BR Benson Mines Solar Project

Stormwater Management Design Re-evaluation

The current stormwater runoff analysis for this Project is based on Natural Resources Conservation Service (NRCS) Hydrologic Soil Group (HSG) classifications. These are summarized in the following table.

NRCS Soil Classifications:

Symbol	Name	Slope	HSG
021	Dawson-Fluvaquents-Loxley Complex, Frequently Flooded	-	A/D
365	Naumberg-Croghan Complex	-	A/D
346C	Colton-Duxbury-Adams Complex	3-15%	A
634C	Bershire Loam, Very Bouldery	3-15%	B
741C	Potsdam-Tunbridge-Crary Complex, Very Bouldery	3-15%	C
807	Udorthents, Mine Waste	-	C
831D	Tunbridge-Lyman Complex, Very Rocky, Very Bouldery	15-35%	B

During the design process, infiltration testing was conducted at various areas across the site to determine soil infiltration rates where infiltration is proposed as a Water Quality treatment Stormwater Management Practice (SMP). The results of the testing demonstrated that the infiltration rate of soil type 807 – "Udorthents, Mine Waste" soil is significantly higher than would be expected from typical HSG C soil. The Applicant provided the infiltration testing results to the New York State Department of Environmental Conservation (NYSDEC) and requested permission to use HSG A for the mine waste soil type 807. This request was approved in an email received from NYSDEC dated June 27, 2022.

Both the pre- and post-development runoff models were re-evaluated using HSG A to determine the runoff curve number (CN) for the mine waste soil for all land cover types. The soil group for 741C – "Potsdam-Tunbridge-Crary Complex, Very Bouldery", also an HSG C soil, was not changed. Preliminary results from the revised pre- and post-development models are summarized below. As expected, the use of HSG A and corresponding CN for the mine waste soil reduces the peak rate and volume of runoff at all Study Points effected by the change, as detailed in the table below.

Study Point	Storm Event	Peak Rate of Runoff (cfs)			Runoff Volume (ac-ft)		
		Pre	Post	Change	Pre	Post	Change
SP1	WQ	0.00	0.00	0.00	0.000	0.000	0.000
	1-Year	0.00	0.00	0.00	0.000	0.000	0.000
	10-Year	0.00	0.56	0.56	0.000	0.110	0.110
	100-Year	9.09	10.61	1.52	7.713	7.384	-0.330
SP2	WQ	0.00	0.00	0.00	0.000	0.000	0.000
	1-Year	0.00	0.00	0.00	0.000	0.000	0.000
	10-Year	0.01	0.01	0.00	0.001	0.001	0.000
	100-Year	0.88	0.66	-0.22	0.272	0.272	0.000
SP3	WQ	0.00	0.00	0.00	0.000	0.000	0.000
	1-Year	0.00	0.00	0.00	0.000	0.000	0.000
	10-Year	0.03	0.02	-0.01	0.014	0.007	-0.007
	100-Year	3.17	2.04	-1.13	0.500	0.442	-0.058
SP4	WQ	0.00	0.00	0.00	0.000	0.000	0.000
	1-Year	0.04	0.07	0.03	0.010	0.059	0.049
	10-Year	2.53	3.36	0.83	1.040	1.146	0.106
	100-Year	30.77	31.02	0.25	5.405	5.546	0.141
SP5	WQ	0.00	0.00	0.00	0.000	0.000	0.000
	1-Year	0.00	0.00	0.00	0.000	0.000	0.000
	10-Year	0.00	0.00	0.00	0.000	0.000	0.000
	100-Year	0.10	0.02	-0.08	0.071	0.010	-0.061
SP6	WQ	0.00	0.00	0.00	0.000	0.000	0.000
	1-Year	0.00	0.00	0.00	0.000	0.000	0.000
	10-Year	0.11	0.08	-0.03	0.083	0.059	-0.024
	100-Year	3.69	3.11	-0.58	1.109	1.002	-0.107

Conclusion

The current stormwater runoff analysis has not been revised. The HSG A curve number has not been used to model runoff from the "807 – Udorthents, Mine Waste" soil type. The design is still based on the curve number for the HSG C soil group, as provided by NRCS, which provides a more conservative design. However, the Contractor/Owner that ultimately builds the Project will have the option to revise the design based on the use of an HSG A soil group for the soil type 807 soils.

Appendix P – NYSDEC Consultation Email

Kniffen, Chelsey

From:	Darougar, Tracy L (NYSERDA) <Tracy.Darougar@nyserda.ny.gov>
Sent:	Tuesday, July 5, 2022 10:13 AM
To:	Brown, Joshua S.
Cc:	Bergquist, Erin; Lefebvre, Laura; Wagner, Shirley
Subject:	[EXTERNAL] Fwd: NYSERDA Build-Ready Benson Mines Solar Project

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From: Boyer, Brian C (DEC) <brian.boyer@dec.ny.gov>
Sent: Monday, June 27, 2022 2:16 PM
To: Darougar, Tracy L (NYSERDA) <Tracy.Darougar@nyserda.ny.gov>
Cc: Wagner, Shirley <SJWagner@trccompanies.com>; Purzycki, Alicia J (APA) <Alicia.Purzycki@apa.ny.gov>; Gasper, David J (DEC) <david.gasper@dec.ny.gov>; Duffany, Matthew W (DEC) <matthew.duffany@dec.ny.gov>
Subject: NYSERDA Build-Ready Benson Mines Solar Project

Tracy,

The following (in blue) are comments on the two requested points of clarification following my 6/14 site visit to the NYSERDA Build-Ready Benson Mines Solar Project Site.

1. Whether the attached geotechnical investigation results and infiltration (percolation) test results, coupled with your field observations today, will allow us to apply a Hydrologic Soil Group (HSG) A classification to the site as opposed to the HSG C classification derived from the USDA NRCS Web Soil Survey. (Note that these attachments are included as an excerpt from the Draft SWPPP NYSERDA submitted to the APA in March of 2022 – we can send the full draft SWPPP if you'd like via Sharepoint).

   The geotechnical investigation and infiltration tests provided within the January 2022 SWPPP are sufficient to allow the application of a HSG A classification to the project site.

2. Whether vegetative stabilization will be required throughout the entire mine tailings pile given the lack of top soil and lack of well-established vegetation (due to low-to-no nutrients in the soil and the soil's inability to retain moisture), the low probability of erosion, and the need to augment the soil at great cost ($2.5m estimate) via many truck trips of top soil to then create a potential erosion issue and increase the maintenance cost of the solar array (increased vegetative management obligations).

   Achieving Final Stabilization on a project site is a central tenet of the SPDES General Permit for Stormwater Discharges for Stormwater Discharges From Construction Activity, GP-0-20-001. Leaving a bare unstabilized surface presents the potential for erosion from both wind and precipitation that could impact nearby surface waters and/or wetlands. The Landscaping Plan included in the January 2022 SWPPP called for seeding the site with either of two pollinator seed mixes. If NYSERDA/TRC proposes to not vegetatively stabilize the entire project site as currently proposed in the January 2022 SWPPP then in order for the NYSDEC and other agencies

(APA) to provide appropriate feedback, please provide an alternative proposal that at minimum addresses the following:

- Potential for erosion from wind and precipitation
- Potential impacts to Water Quality and wetlands from erosion on site
- Demonstrate equivalency to the permit requirements
- Elimination of the existing berms through proposed site grading

Note that any changes made to the January 2022 SWPPP may require further review and approval by other agencies (APA) and have impacts on other aspects of the proposal that will require further review, such as an updated visual analysis.

Would NYSERDA/TRC be able to develop an alternate proposal(s) to address the comments above by next week or should we postpone the planned call until a complete proposal can be developed?

Brian Boyer
Environmental Program Specialist, Division of Water

New York State Department of Environmental Conservation
317 Washington Street, Watertown, NY 13601
P: (315) 785-2513 | F: (315) 785-2422 | brian.boyer@dec.ny.gov
www.dec.ny.gov | |

Appendix P – Pre-Development Subcatchment Map

PRELIMINARY
NOT FOR CONSTRUCTION

Call811 before you dig

LEGEND

- SUBCATCHMENT BOUNDARY
- SOIL GROUP BOUNDARY
- Tc FLOW PATH
- LOD — LIMITS OF DISTURBANCE
- EXISTING CULVERT
- EXISTING SURFACE FLOW DIRECTION
- APA WETLAND
- WETLAND
- FLOODPLAIN

300 0 300 600 FT
SCALE: 1" = 300'

UNDER NEW YORK STATE EDUCATION LAW ARTICLE 145 (ENGINEERING), SECTION 7209 (2), IT IS A VIOLATION OF THE LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

TRC
10 MAXWELL DRIVE
CLIFTON PARK, NY 12065

PROJECT NO: 444154

REV	DESCRIPTION	DATE	DES	CHK	APP
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
A	ISSUED FOR PERMITTING	1/2022	NAM	NAM	NAM

BWH DESIGNED
BWH DRAWN
JWH CHECKED
NAM APPROVED
- REVIEW 1
- REVIEW 2
7/21 DATE
AS NOTED SCALE

EXISTING HYDROLOGY PLAN

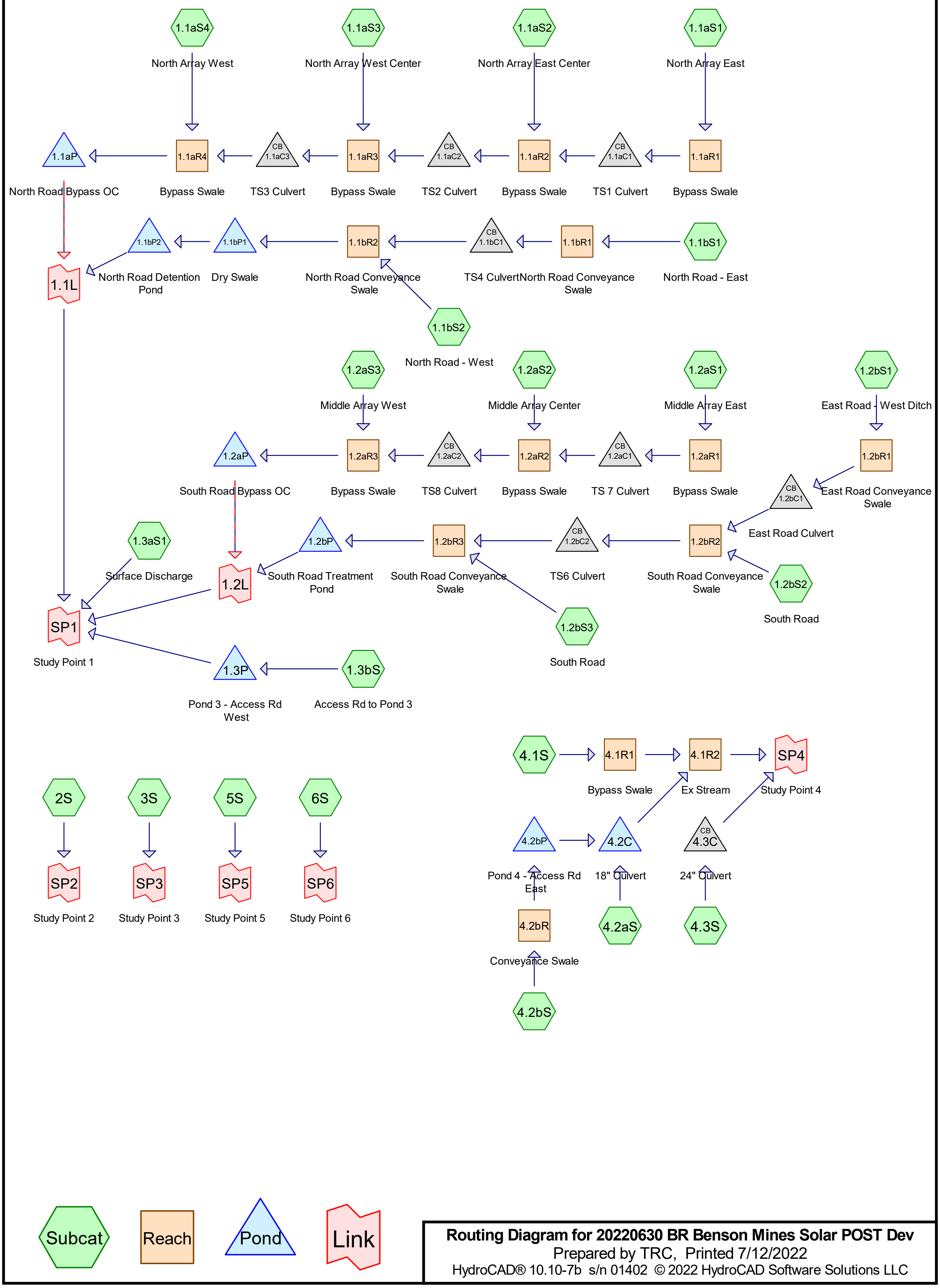
BR BENSON MINES SOLAR PROJECT
NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY
CLIFTON, ST LAWRENCE COUNTY, NEW YORK

TRC

C-101

REV. -

Appendix P – Pre-Development HydroCAD Model



Routing Diagram for 20220630 BR Benson Mines Solar POST Dev
Prepared by TRC, Printed 7/12/2022
HydroCAD® 10.10-7b s/n 01402 © 2022 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	WQv	Type II 24-hr		Default	24.00	1	1.00	2
2	1-Yr Storm	Type II 24-hr		Default	24.00	1	1.98	2
3	10-Yr Storm	Type II 24-hr		Default	24.00	1	3.28	2
4	100-Yr Storm	Type II 24-hr		Default	24.00	1	5.43	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.979	39	>75% Grass cover, Good, HSG A (2S, 3S)
4.721	61	>75% Grass cover, Good, HSG B (3S, 4.1S, 6S)
1.719	96	Gravel surface (1.2bS2, 1.3aS1, 4.1S, 4.2aS)
4.423	96	Gravel surface, HSG A (1.1bS1, 1.1bS2, 1.2bS1, 1.2bS3, 1.3bS, 2S, 4.2bS, 6S)
0.063	96	Gravel surface, HSG A, Redev (1.3bS)
232.790	30	Meadow, non-grazed, HSG A (1.1aS1, 1.1aS2, 1.1aS3, 1.1aS4, 1.1bS1, 1.1bS2, 1.2aS1, 1.2aS2, 1.2aS3, 1.2bS1, 1.2bS2, 1.2bS3, 1.3aS1, 1.3bS, 2S, 3S, 4.1S, 4.2aS, 4.2bS, 5S, 6S)
4.081	58	Meadow, non-grazed, HSG B (1.3aS1, 4.1S, 4.2aS, 4.3S, 6S)
25.274	71	Meadow, non-grazed, HSG C (1.3aS1)
3.158	98	Paved Roads & Rooftops (3S, 4.1S, 4.3S, 6S)
0.015	98	Roofs (1.2bS2, 1.2bS3)
0.014	98	Roofs, HSG A (1.1bS1, 1.1bS2)
81.857	30	Woods, Good, HSG A (1.3aS1, 2S, 3S, 4.1S, 4.2aS, 5S, 6S)
88.271	55	Woods, Good, HSG B (1.3aS1, 3S, 4.1S, 4.2aS, 4.3S, 6S)
13.623	70	Woods, Good, HSG C (1.3aS1)
460.988	**40**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
320.126	HSG A	1.1aS1, 1.1aS2, 1.1aS3, 1.1aS4, 1.1bS1, 1.1bS2, 1.2aS1, 1.2aS2, 1.2aS3, 1.2bS1, 1.2bS2, 1.2bS3, 1.3aS1, 1.3bS, 2S, 3S, 4.1S, 4.2aS, 4.2bS, 5S, 6S
97.073	HSG B	1.3aS1, 3S, 4.1S, 4.2aS, 4.3S, 6S
38.897	HSG C	1.3aS1
0.000	HSG D	
4.892	Other	1.2bS2, 1.2bS3, 1.3aS1, 3S, 4.1S, 4.2aS, 4.3S, 6S
460.988		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.979	4.721	0.000	0.000	0.000	5.700	>75% Grass cover, Good	2S, 3S, 4.1S, 6S
4.486	0.000	0.000	0.000	1.719	6.205	Gravel surface	1.1bS1, 1.1bS2, 1.2bS1, 1.2bS2, 1.2bS3, 1.3aS1, 1.3bS, 2S, 4.1S, 4.2aS, 4.2bS, 6S
232.790	4.081	25.274	0.000	0.000	262.145	Meadow, non-grazed	1.1aS1, 1.1aS2, 1.1aS3, 1.1aS4, 1.1bS1, 1.1bS2, 1.2aS1, 1.2aS2, 1.2aS3, 1.2bS1, 1.2bS2, 1.2bS3, 1.3aS1, 1.3bS, 2S, 3S, 4.1S, 4.2aS, 4.2bS, 4.3S, 5S, 6S
0.000	0.000	0.000	0.000	3.158	3.158	Paved Roads & Rooftops	3S, 4.1S, 4.3S, 6S
0.014	0.000	0.000	0.000	0.015	0.029	Roofs	1.1bS1, 1.1bS2, 1.2bS2, 1.2bS3
81.857	88.271	13.623	0.000	0.000	183.751	Woods, Good	1.3aS1, 2S, 3S, 4.1S, 4.2aS, 4.3S, 5S, 6S
320.126	**97.073**	**38.897**	**0.000**	**4.892**	**460.988**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1.1aC1	1,487.56	1,486.80	47.0	0.0162	0.012	36.3	22.5	0.0
2	1.1aC2	1,470.80	1,469.57	47.0	0.0262	0.012	48.0	24.0	0.0
3	1.1aC3	1,449.55	1,447.64	47.2	0.0405	0.012	60.0	24.0	0.0
4	1.1bC1	1,449.50	1,447.27	45.9	0.0486	0.012	0.0	18.0	0.0
5	1.2aC1	1,444.22	1,443.21	47.0	0.0215	0.012	36.0	24.0	0.0
6	1.2aC2	1,431.65	1,431.11	47.5	0.0114	0.012	60.0	24.0	0.0
7	1.2bC1	1,454.39	1,453.67	41.6	0.0173	0.012	0.0	15.0	0.0
8	1.2bC2	1,443.51	1,442.84	44.3	0.0151	0.012	0.0	18.0	0.0
9	4.2C	1,431.83	1,431.18	44.0	0.0148	0.012	0.0	18.0	0.0
10	4.3C	1,431.35	1,429.87	55.8	0.0265	0.012	0.0	24.0	0.0

Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1.1aS1: North Array East Runoff Area=5.874 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=788' Tc=18.8 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS2: North Array East Runoff Area=8.467 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=931' Tc=21.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS3: North Array West Runoff Area=5.792 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,031' Tc=19.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS4: North Array West Runoff Area=12.825 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,562' Tc=26.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1bS1: North Road - East Runoff Area=1.333 ac 0.53% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=71 Runoff=0.00 cfs 0.001 af

Subcatchment 1.1bS2: North Road - West Runoff Area=0.651 ac 1.08% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=68 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS1: Middle Array East Runoff Area=7.876 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=865' Tc=19.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS2: Middle Array Center Runoff Area=8.911 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=825' Tc=18.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS3: Middle Array West Runoff Area=5.500 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=18.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2bS1: East Road - West Runoff Area=0.727 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=67 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2bS2: South Road Runoff Area=0.854 ac 0.47% Impervious Runoff Depth=0.00"
Flow Length=308' Tc=13.7 min CN=58 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2bS3: South Road Runoff Area=0.815 ac 1.35% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=71 Runoff=0.00 cfs 0.001 af

Subcatchment 1.3aS1: Surface Discharge Runoff Area=279.312 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=6,771' Tc=201.7 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 1.3bS: Access Rd to Pond 3 Runoff Area=0.695 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=51 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Runoff Area=11.056 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=2,342' Tc=36.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 3S: Runoff Area=15.648 ac 0.56% Impervious Runoff Depth=0.00"
Flow Length=886' Tc=12.7 min CN=40 Runoff=0.00 cfs 0.000 af

Subcatchment 4.1S: Runoff Area=11.663 ac 2.80% Impervious Runoff Depth=0.00"
Flow Length=845' Tc=15.8 min CN=45 Runoff=0.00 cfs 0.000 af

Subcatchment 4.2aS: Runoff Area=27.117 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,640' Tc=38.9 min CN=51 Runoff=0.00 cfs 0.000 af

Subcatchment 4.2bS: Runoff Area=0.470 ac 0.00% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=72 Runoff=0.00 cfs 0.000 af

Subcatchment 4.3S: Runoff Area=25.466 ac 5.08% Impervious Runoff Depth=0.00"
Flow Length=2,280' Tc=36.5 min CN=57 Runoff=0.00 cfs 0.000 af

Subcatchment 5S: Runoff Area=4.970 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,180' Tc=17.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 6S: Runoff Area=24.966 ac 5.81% Impervious Runoff Depth=0.00"
Flow Length=1,961' Tc=60.1 min CN=43 Runoff=0.00 cfs 0.000 af

Reach 1.1aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.0' S=0.0108 '/' Capacity=56.37 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.4' S=0.0284 '/' Capacity=91.27 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.5' S=0.0352 '/' Capacity=101.68 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR4: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.5' S=0.0362 '/' Capacity=103.04 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1bR1: North Road Conveyance Avg. Flow Depth=0.00' Max Vel=0.47 fps Inflow=0.00 cfs 0.001 af
n=0.035 L=1,733.0' S=0.0240 '/' Capacity=111.65 cfs Outflow=0.00 cfs 0.001 af

Reach 1.1bR2: North Road Conveyance Avg. Flow Depth=0.00' Max Vel=0.60 fps Inflow=0.00 cfs 0.001 af
n=0.035 L=593.3' S=0.0380 '/' Capacity=140.36 cfs Outflow=0.00 cfs 0.001 af

Reach 1.2aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=524.2' S=0.0188 '/' Capacity=74.30 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=556.0' S=0.0204 '/' Capacity=77.47 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=249.0' S=0.0153 '/' Capacity=81.84 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2bR1: East Road Conveyance Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=731.4' S=0.0456 '/' Capacity=79.22 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2bR2: South Road Conveyance Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=604.5' S=0.0177 '/' Capacity=95.76 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2bR3: South Road Conveyance Avg. Flow Depth=0.00' Max Vel=0.42 fps Inflow=0.00 cfs 0.001 af
n=0.035 L=755.9' S=0.0187 '/' Capacity=98.64 cfs Outflow=0.00 cfs 0.001 af

Reach 4.1R1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=570.0' S=0.0303 '/' Capacity=54.88 cfs Outflow=0.00 cfs 0.000 af

Reach 4.1R2: Ex Stream Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=740.0' S=0.0099 '/' Capacity=588.81 cfs Outflow=0.00 cfs 0.000 af

Reach 4.2bR: Conveyance Swale Avg. Flow Depth=0.00' Max Vel=0.53 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=565.0' S=0.0432 '/' Capacity=77.09 cfs Outflow=0.00 cfs 0.000 af

Pond 1.1aC1: TS1 Culvert Peak Elev=1,487.56' Inflow=0.00 cfs 0.000 af
36.3" x 22.5", R=18.8"/51.0" Pipe Arch Culvert n=0.012 L=47.0' S=0.0162 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC2: TS2 Culvert Peak Elev=1,470.80' Inflow=0.00 cfs 0.000 af
48.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0262 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC3: TS3 Culvert Peak Elev=1,449.55' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.2' S=0.0405 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aP: North Road Bypass OC Peak Elev=1,426.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.1bC1: TS4 Culvert Peak Elev=1,449.51' Inflow=0.00 cfs 0.001 af
18.0" Round Culvert n=0.012 L=45.9' S=0.0486 '/' Outflow=0.00 cfs 0.001 af

Pond 1.1bP1: Dry Swale Peak Elev=1,425.32' Storage=17 cf Inflow=0.00 cfs 0.001 af
Discarded=0.00 cfs 0.001 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.001 af

Pond 1.1bP2: North Road Detention Pond Peak Elev=1,421.50' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.2aC1: TS 7 Culvert Peak Elev=1,444.22' Inflow=0.00 cfs 0.000 af
36.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0215 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aC2: TS8 Culvert Peak Elev=1,431.65' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.5' S=0.0114 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aP: South Road Bypass OC Peak Elev=1,424.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.2bC1: East Road Culvert Peak Elev=1,454.39' Inflow=0.00 cfs 0.000 af
15.0" Round Culvert n=0.012 L=41.6' S=0.0173 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2bC2: TS6 Culvert Peak Elev=1,443.51' Inflow=0.00 cfs 0.000 af
18.0" Round Culvert n=0.012 L=44.3' S=0.0151 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2bP: South Road Treatment Pond Peak Elev=1,424.00' Storage=0.000 af Inflow=0.00 cfs 0.001 af
Discarded=0.00 cfs 0.001 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.001 af

Pond 1.3P: Pond 3 - Access Rd West Peak Elev=1,456.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 4.2bP: Pond 4 - Access Rd East Peak Elev=1,445.50' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 4.2C: 18" Culvert Peak Elev=1,431.50' Storage=0 cf Inflow=0.00 cfs 0.000 af
18.0" Round Culvert n=0.012 L=44.0' S=0.0148 '/' Outflow=0.00 cfs 0.000 af

Pond 4.3C: 24" Culvert Peak Elev=1,431.35' Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Link 1.1L:
Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 1.2L:
Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP1: Study Point 1
Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP2: Study Point 2
Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP3: Study Point 3
Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP4: Study Point 4
Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP5: Study Point 5
Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP6: Study Point 6
Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 460.988 ac Runoff Volume = 0.002 af Average Runoff Depth = 0.00"
99.31% Pervious = 457.801 ac 0.69% Impervious = 3.187 ac

Summary for Subcatchment 1.1aS1: North Array East

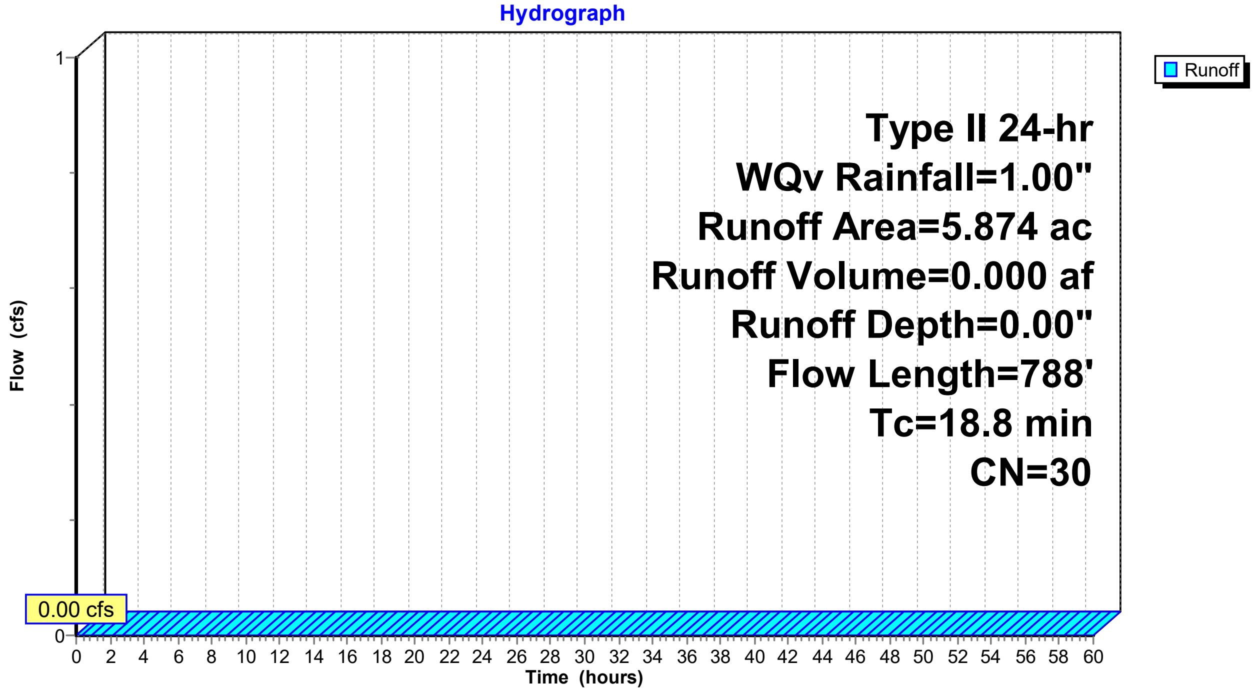
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
5.874	30	Meadow, non-grazed, HSG A
5.874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0499	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.1	688	0.0526	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.8	788	Total			

Subcatchment 1.1aS1: North Array East



Summary for Subcatchment 1.1aS2: North Array East Center

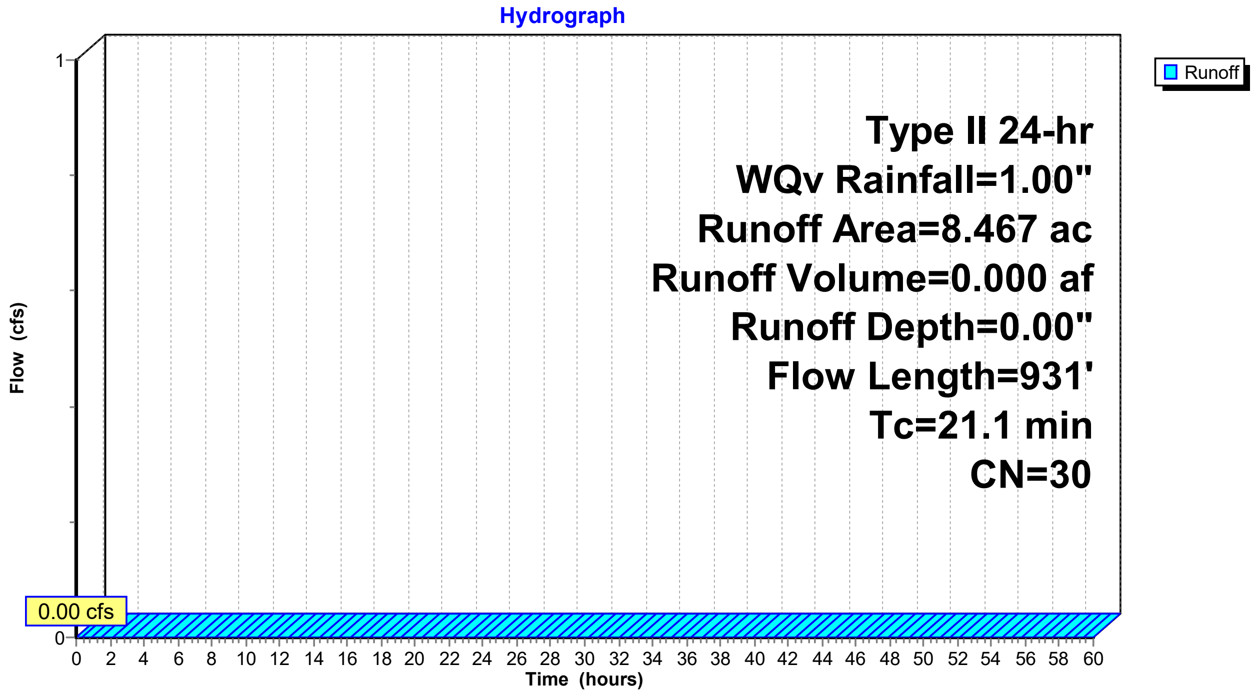
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
8.467	30	Meadow, non-grazed, HSG A
8.467		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0476	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.2	831	0.0463	1.51		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.1	931	Total			

Subcatchment 1.1aS2: North Array East Center



Summary for Subcatchment 1.1aS3: North Array West Center

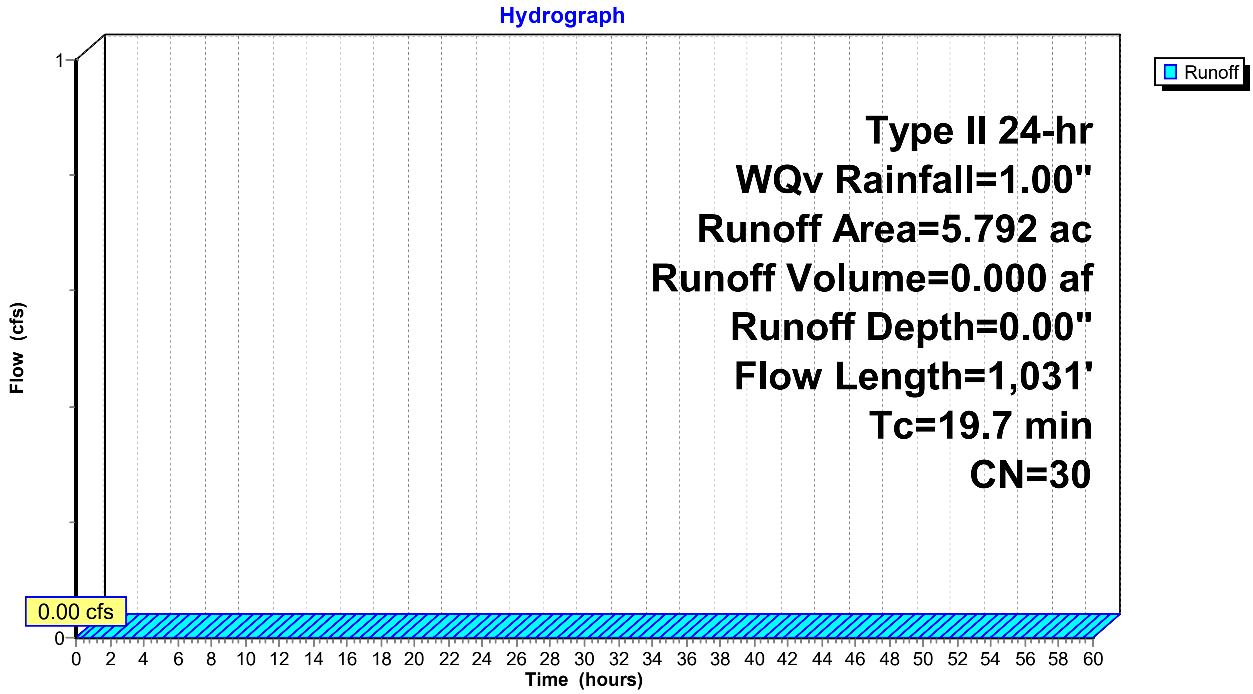
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
5.792	30	Meadow, non-grazed, HSG A
5.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0618	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.0	931	0.0601	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	1,031	Total			

Subcatchment 1.1aS3: North Array West Center



Summary for Subcatchment 1.1aS4: North Array West

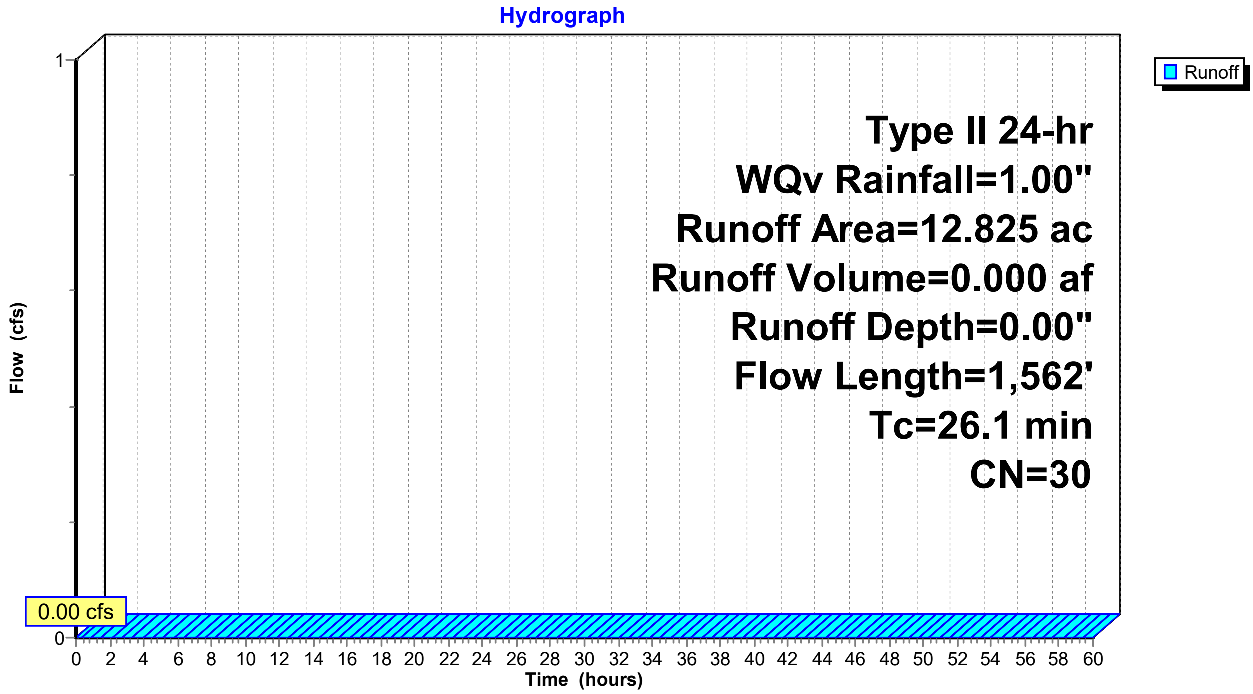
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR4 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
12.825	30	Meadow, non-grazed, HSG A
12.825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0560	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
15.0	1,462	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.1	1,562	Total			

Subcatchment 1.1aS4: North Array West



Summary for Subcatchment 1.1bS1: North Road - East

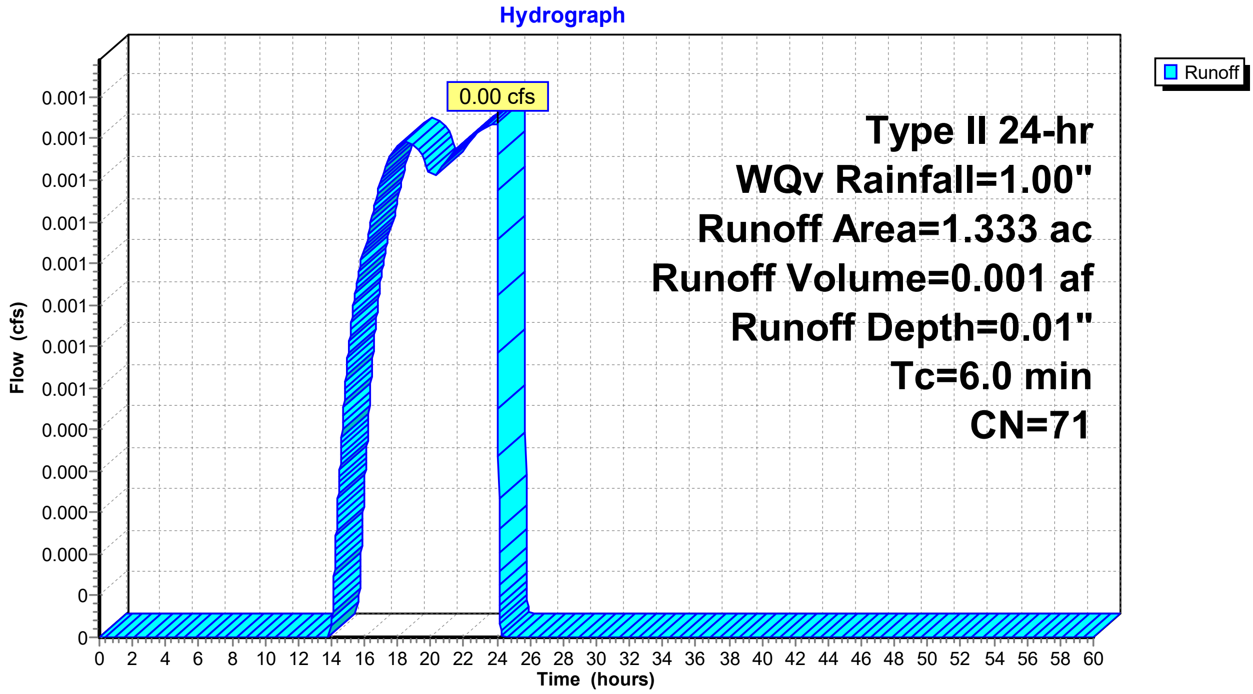
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af, Depth= 0.01"
Routed to Reach 1.1bR1 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
0.507	30	Meadow, non-grazed, HSG A
0.819	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
1.333	71	Weighted Average
1.326		99.47% Pervious Area
0.007		0.53% Impervious Area

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

Subcatchment 1.1bS1: North Road - East



Summary for Subcatchment 1.1bS2: North Road - West

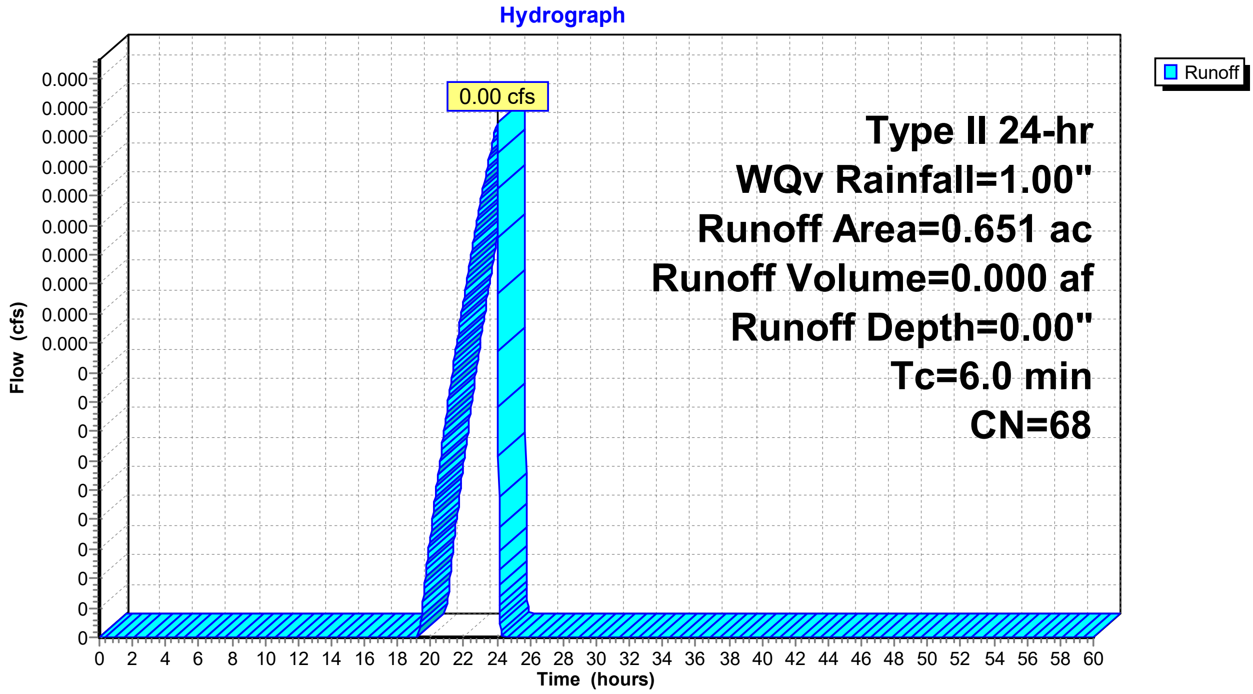
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
0.279	30	Meadow, non-grazed, HSG A
0.365	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
0.651	68	Weighted Average
0.644		98.92% Pervious Area
0.007		1.08% Impervious Area

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

Subcatchment 1.1bS2: North Road - West



Summary for Subcatchment 1.2aS1: Middle Array East

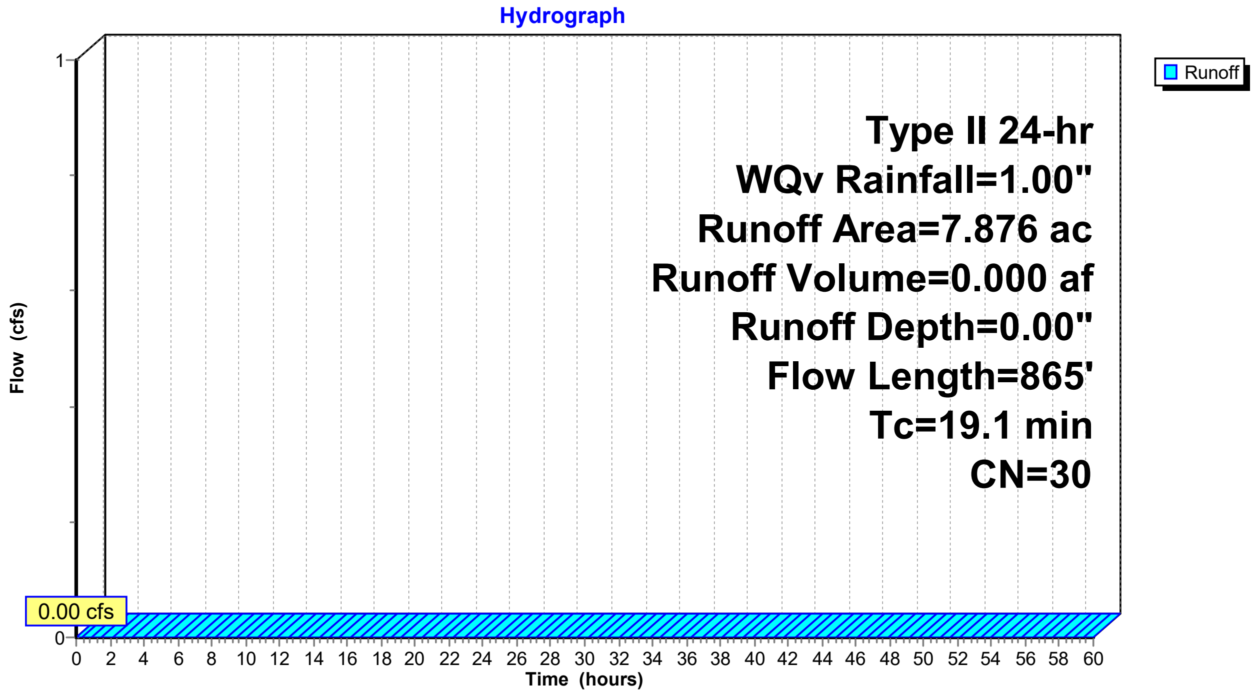
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
7.876	30	Meadow, non-grazed, HSG A
7.876		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0628	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.5	765	0.0459	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.1	865	Total			

Subcatchment 1.2aS1: Middle Array East



Summary for Subcatchment 1.2aS2: Middle Array Center

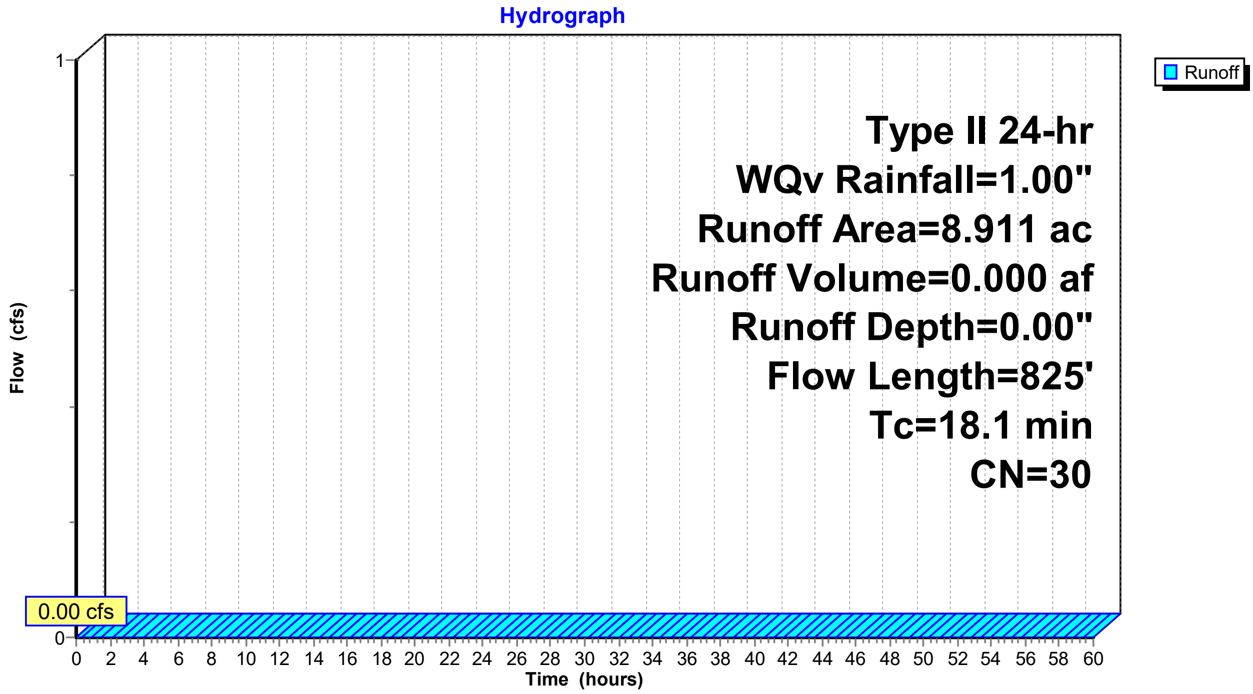
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
8.911	30	Meadow, non-grazed, HSG A
8.911		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0607	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.3	725	0.0559	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.1	825	Total			

Subcatchment 1.2aS2: Middle Array Center



Summary for Subcatchment 1.2aS3: Middle Array West

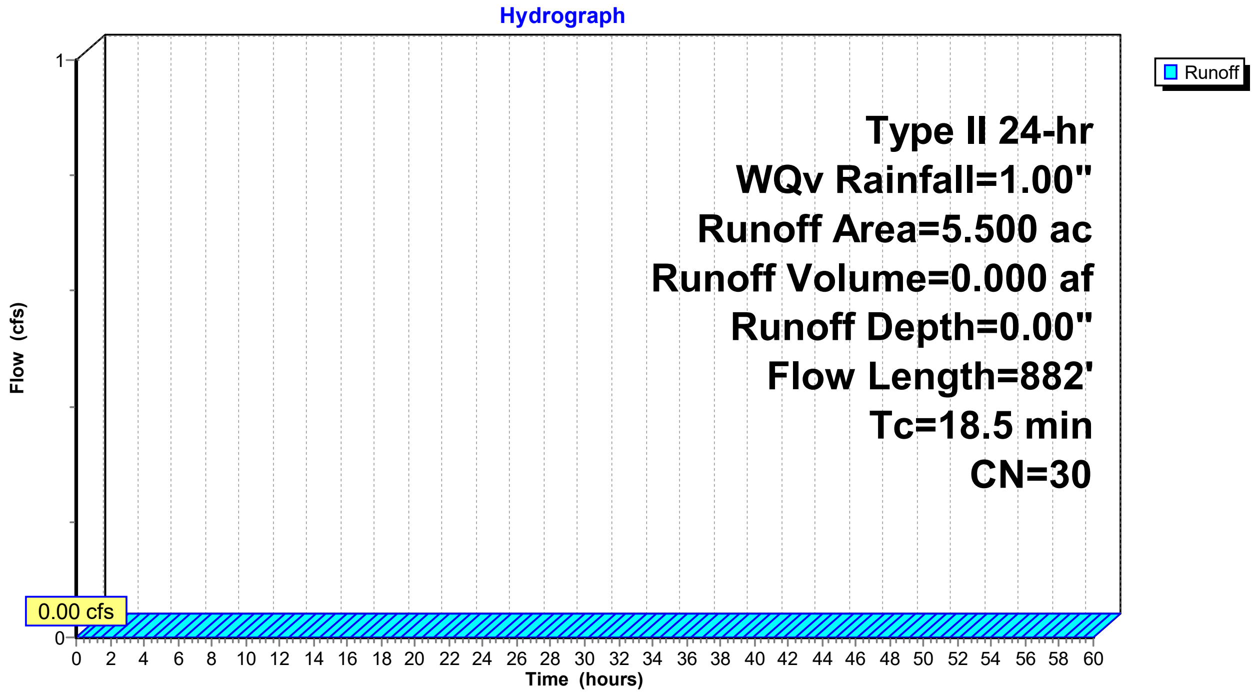
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
5.500	30	Meadow, non-grazed, HSG A
5.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.0660	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.1	782	0.0529	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.5	882	Total			

Subcatchment 1.2aS3: Middle Array West



Summary for Subcatchment 1.2bS1: East Road - West Ditch

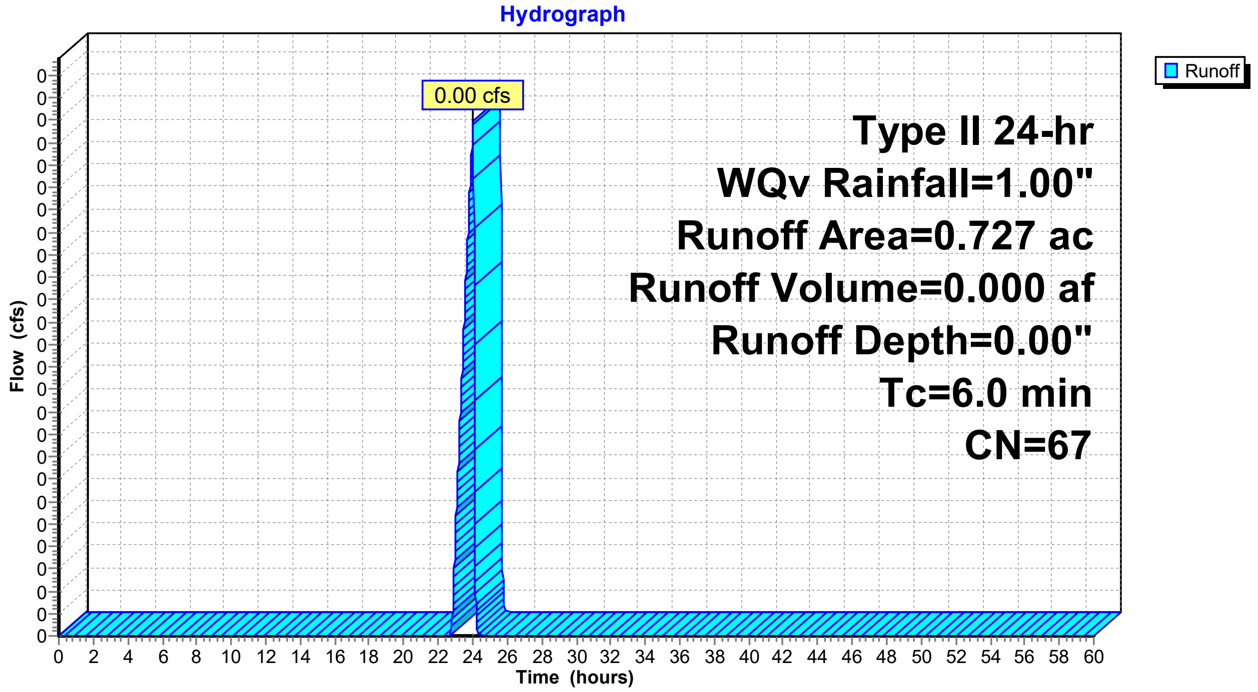
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2bR1 : East Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
0.410	96	Gravel surface, HSG A
0.317	30	Meadow, non-grazed, HSG A
0.727	67	Weighted Average
0.727		100.00% Pervious Area

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

Subcatchment 1.2bS1: East Road - West Ditch



Summary for Subcatchment 1.2bS2: South Road

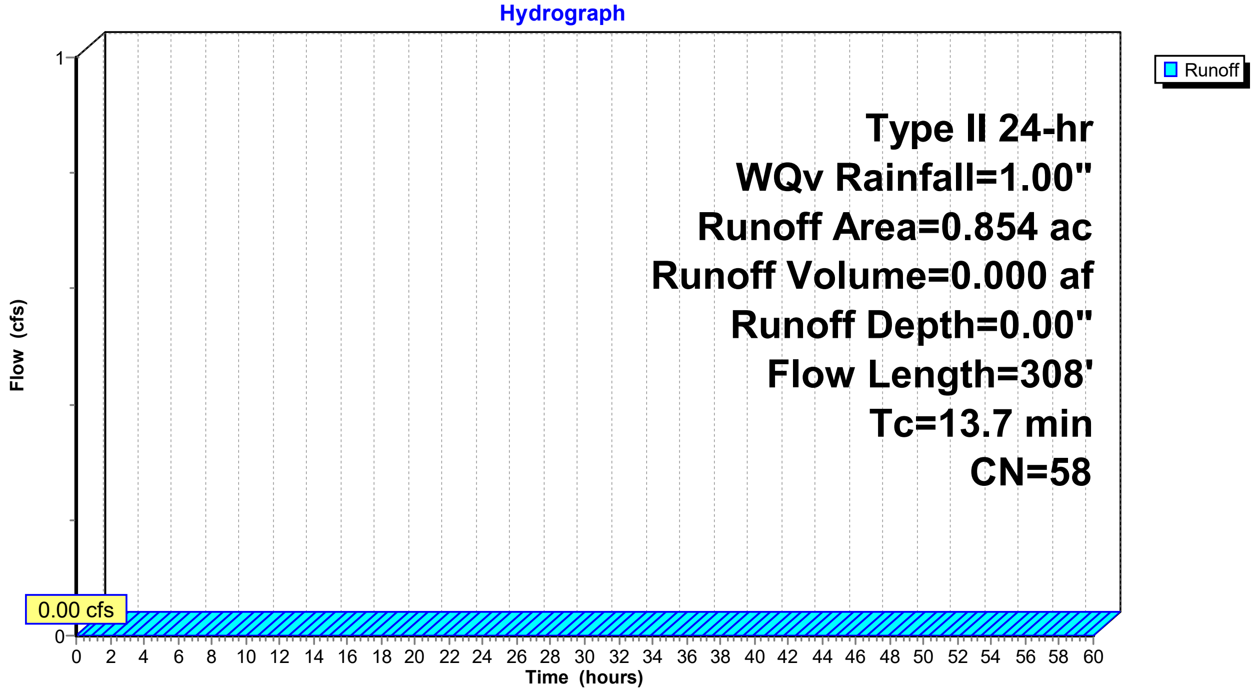
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
	0.498	30	Meadow, non-grazed, HSG A
*	0.352	96	Gravel surface
*	0.004	98	Roofs
	0.854	58	Weighted Average
	0.850		99.53% Pervious Area
	0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0516	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
0.4	25	0.0310	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
5.9	40	0.0429	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.4	208	0.0442	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	308	Total			

Subcatchment 1.2bS2: South Road



Summary for Subcatchment 1.2bS3: South Road

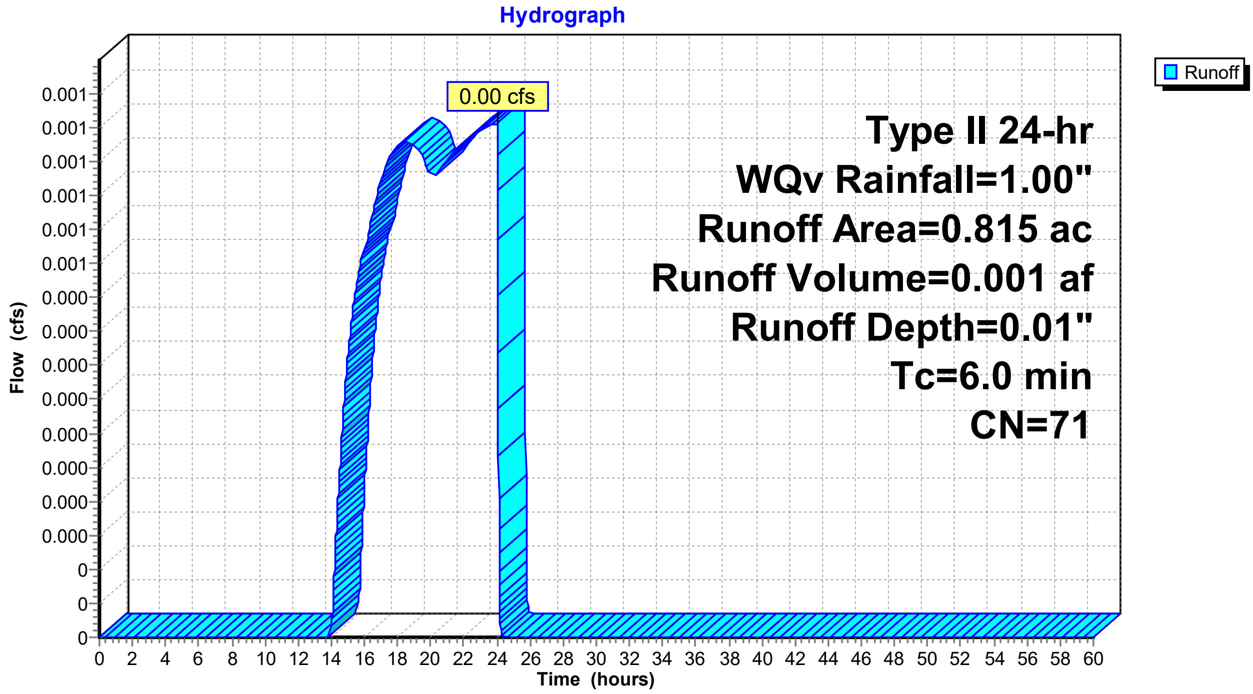
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af, Depth= 0.01"
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
	0.313	30	Meadow, non-grazed, HSG A
	0.491	96	Gravel surface, HSG A
*	0.011	98	Roofs
	0.815	71	Weighted Average
	0.804		98.65% Pervious Area
	0.011		1.35% Impervious Area

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

Subcatchment 1.2bS3: South Road



Summary for Subcatchment 1.3aS1: Surface Discharge

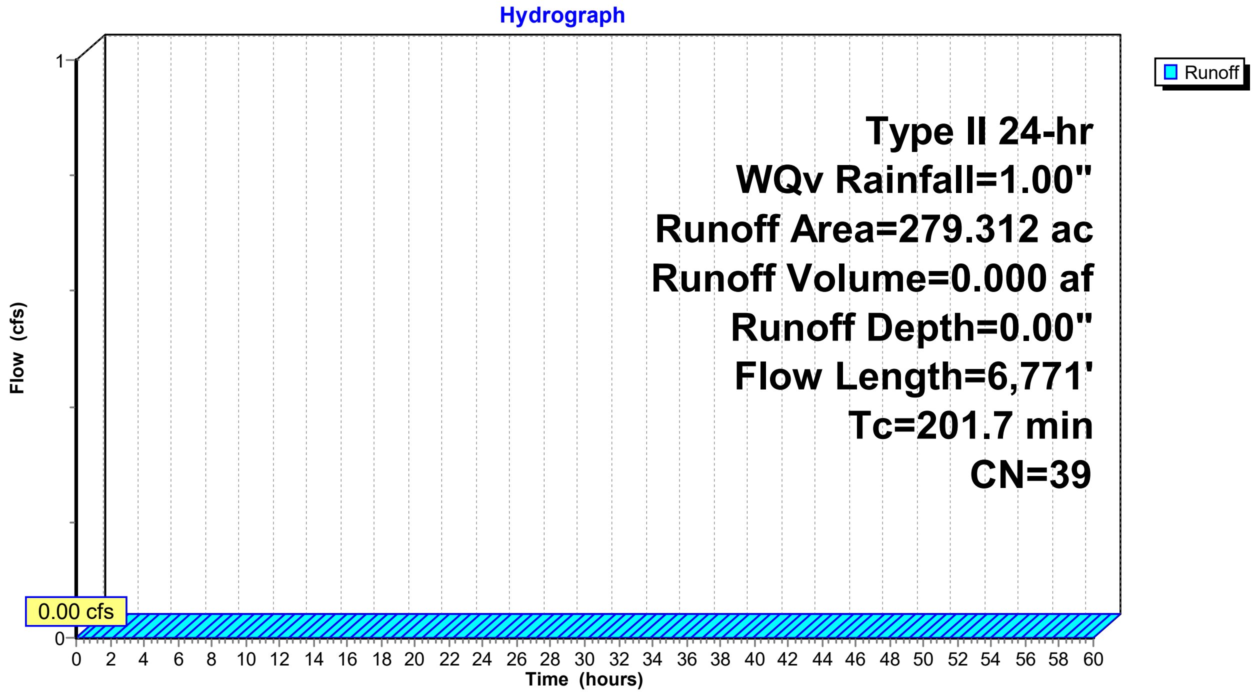
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	0.754	96	Gravel surface
	144.649	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	25.274	71	Meadow, non-grazed, HSG C
	61.692	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	13.623	70	Woods, Good, HSG C
	279.312	39	Weighted Average
	279.312		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	189	0.0157	3.84	76.82	**Channel Flow, Rerouted Stream** Area= 20.0 sf Perim= 32.6' r= 0.61' n= 0.035 Earth, dense weeds
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
201.7	6,771	Total			

Subcatchment 1.3aS1: Surface Discharge



Summary for Subcatchment 1.3bS: Access Rd to Pond 3

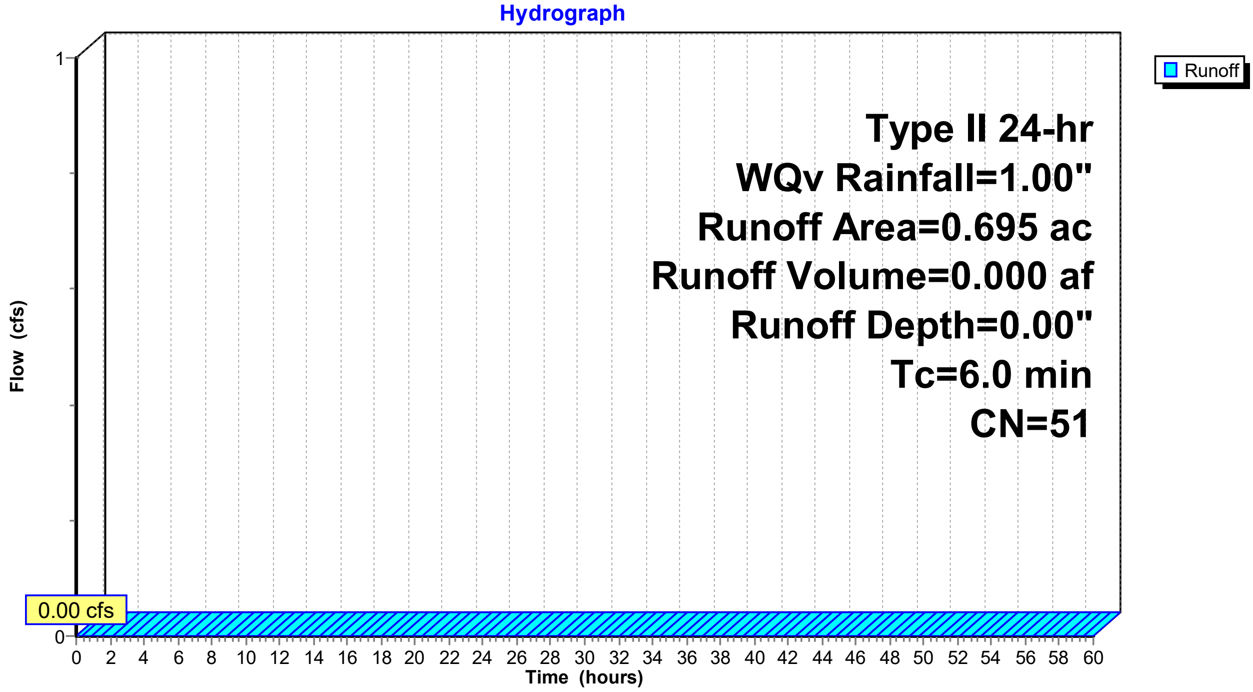
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond 1.3P : Pond 3 - Access Rd West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
	0.473	30	Meadow, non-grazed, HSG A
*	0.063	96	Gravel surface, HSG A, Redev
*	0.159	96	Gravel surface, HSG A
	0.695	51	Weighted Average
	0.695		100.00% Pervious Area

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

Subcatchment 1.3bS: Access Rd to Pond 3



Summary for Subcatchment 2S:

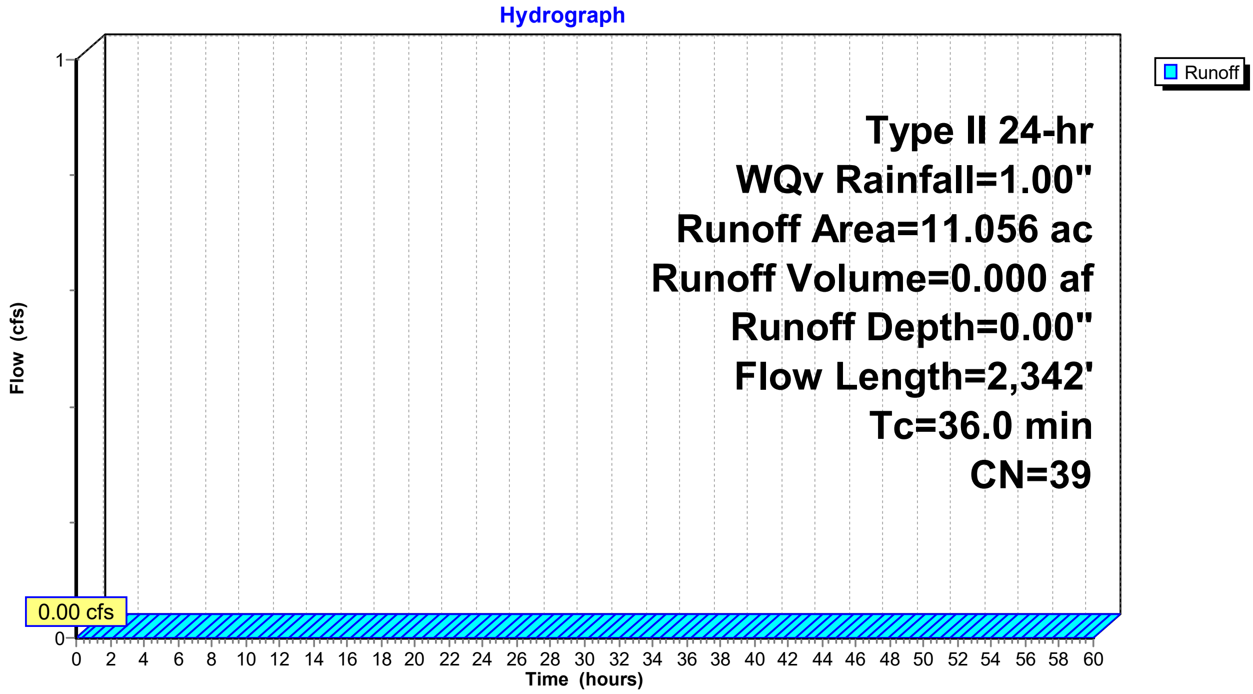
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
1.417	96	Gravel surface, HSG A
0.573	39	>75% Grass cover, Good, HSG A
6.530	30	Meadow, non-grazed, HSG A
2.536	30	Woods, Good, HSG A
11.056	39	Weighted Average
11.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0624	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.7	614	0.0535	3.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	1,184	0.0543	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	115	0.0407	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	68	0.1443	1.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	261	0.0118	0.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.0	2,342	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

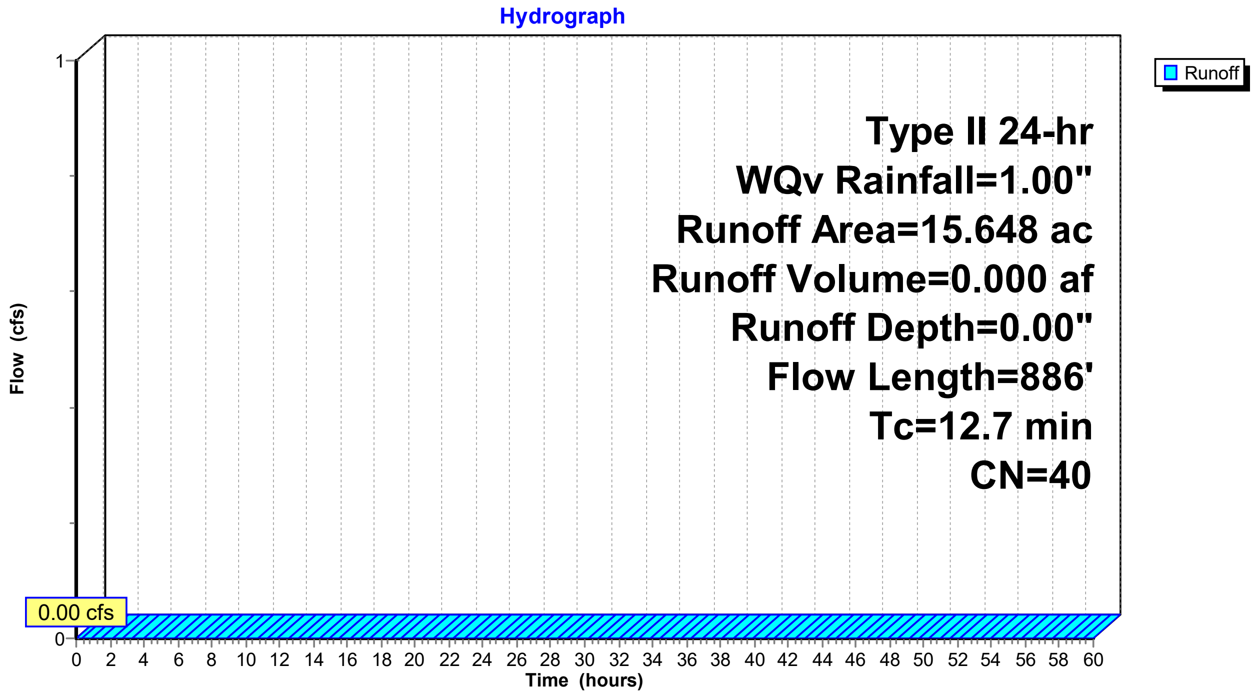
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	0.088	98	Paved Roads & Rooftops
	0.406	39	>75% Grass cover, Good, HSG A
	2.011	61	>75% Grass cover, Good, HSG B
	5.525	30	Meadow, non-grazed, HSG A
	4.276	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	15.648	40	Weighted Average
	15.560		99.44% Pervious Area
	0.088		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	52	0.0937	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.7	886	Total			

Subcatchment 3S:



Summary for Subcatchment 4.1S:

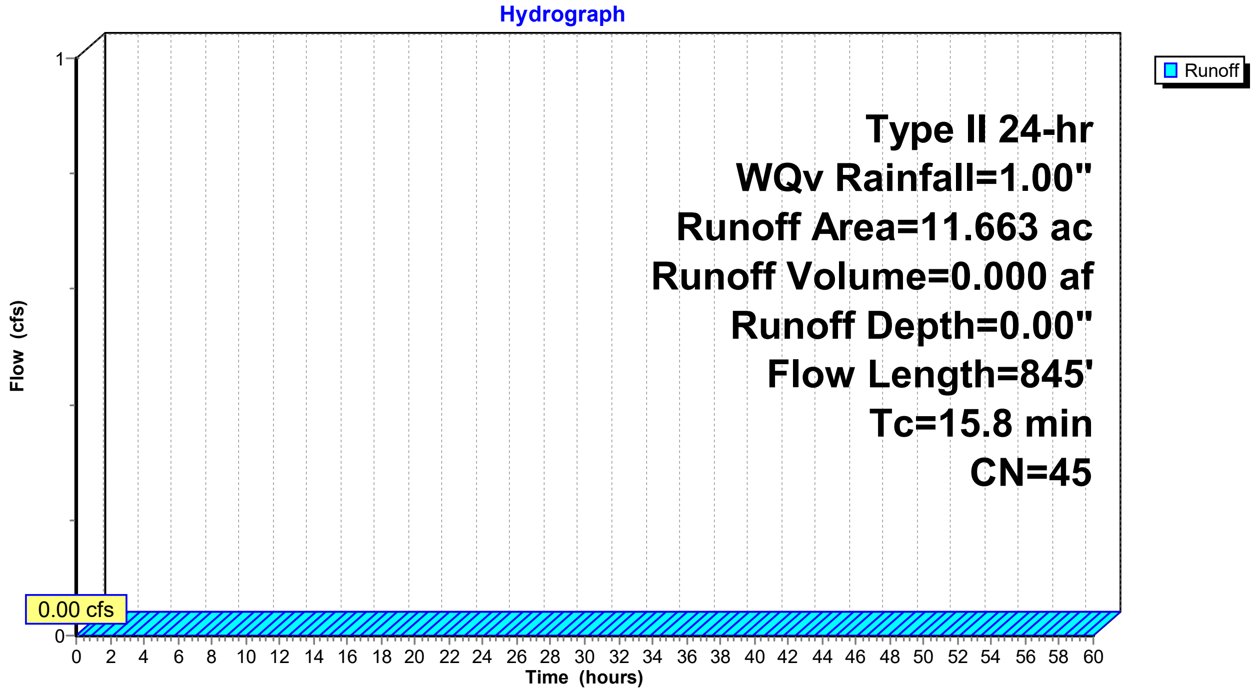
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 4.1R1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	0.327	98	Paved Roads & Rooftops
*	0.375	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	2.544	30	Meadow, non-grazed, HSG A
	0.560	58	Meadow, non-grazed, HSG B
	3.605	30	Woods, Good, HSG A
*	4.087	55	Woods, Good, HSG B
	11.663	45	Weighted Average
	11.336		97.20% Pervious Area
	0.327		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0430	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
2.6	360	0.1077	2.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	385	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.8	845	Total			

Subcatchment 4.1S:



Summary for Subcatchment 4.2aS:

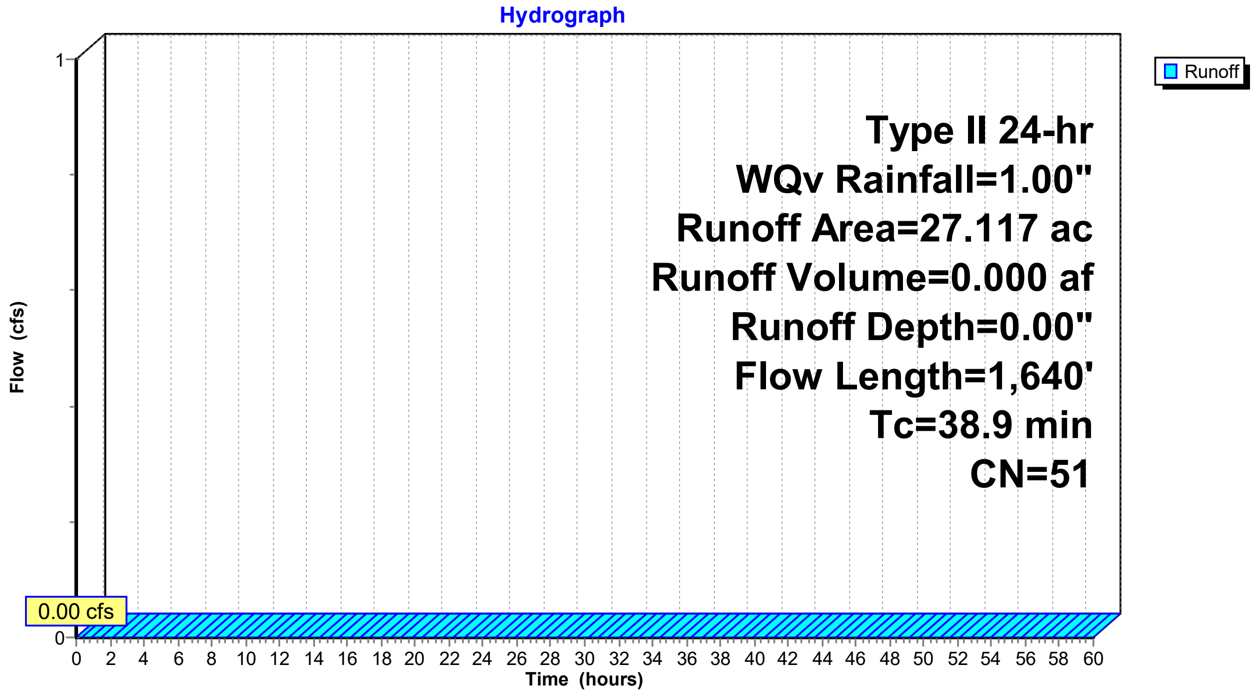
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond 4.2C : 18" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	0.238	96	Gravel surface
	4.086	30	Meadow, non-grazed, HSG A
	0.384	58	Meadow, non-grazed, HSG B
	0.977	30	Woods, Good, HSG A
	21.432	55	Woods, Good, HSG B
	27.117	51	Weighted Average
	27.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	662	0.0144	0.84		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	1,640	Total			

Subcatchment 4.2aS:



Summary for Subcatchment 4.2bS:

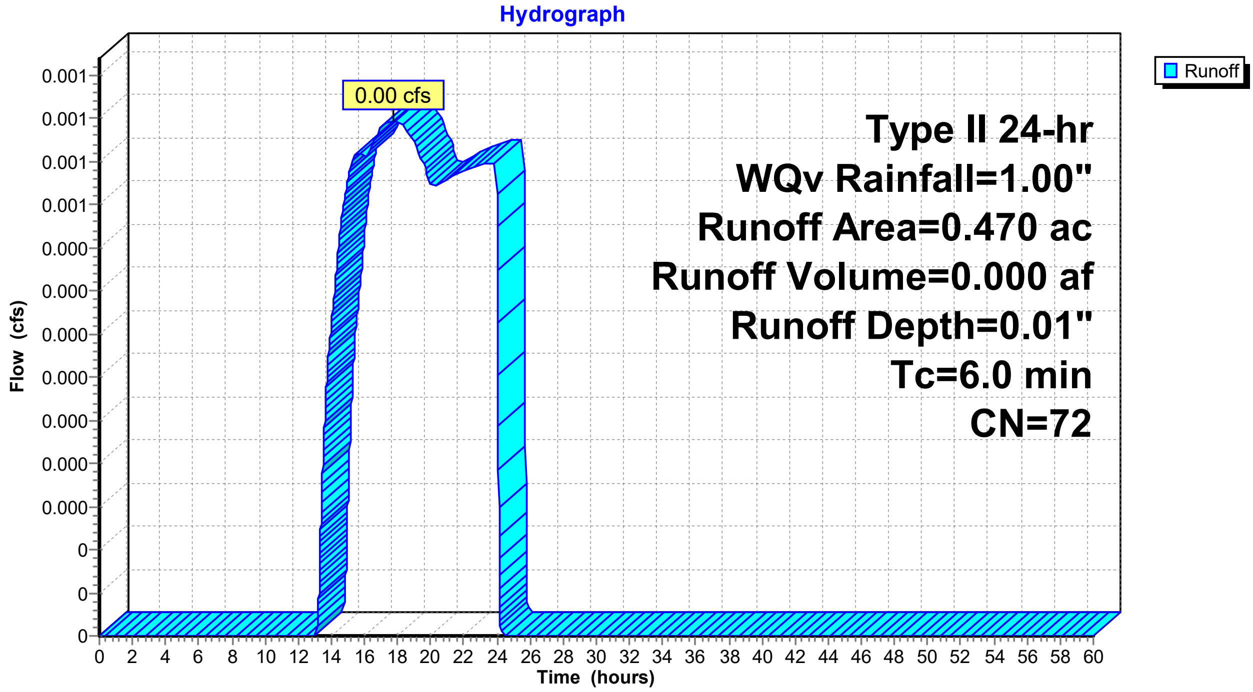
Runoff = 0.00 cfs @ 17.70 hrs, Volume= 0.000 af, Depth= 0.01"
Routed to Reach 4.2bR : Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
0.296	96	Gravel surface, HSG A
0.174	30	Meadow, non-grazed, HSG A
0.470	72	Weighted Average
0.470		100.00% Pervious Area

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

Subcatchment 4.2bS:



Summary for Subcatchment 4.3S:

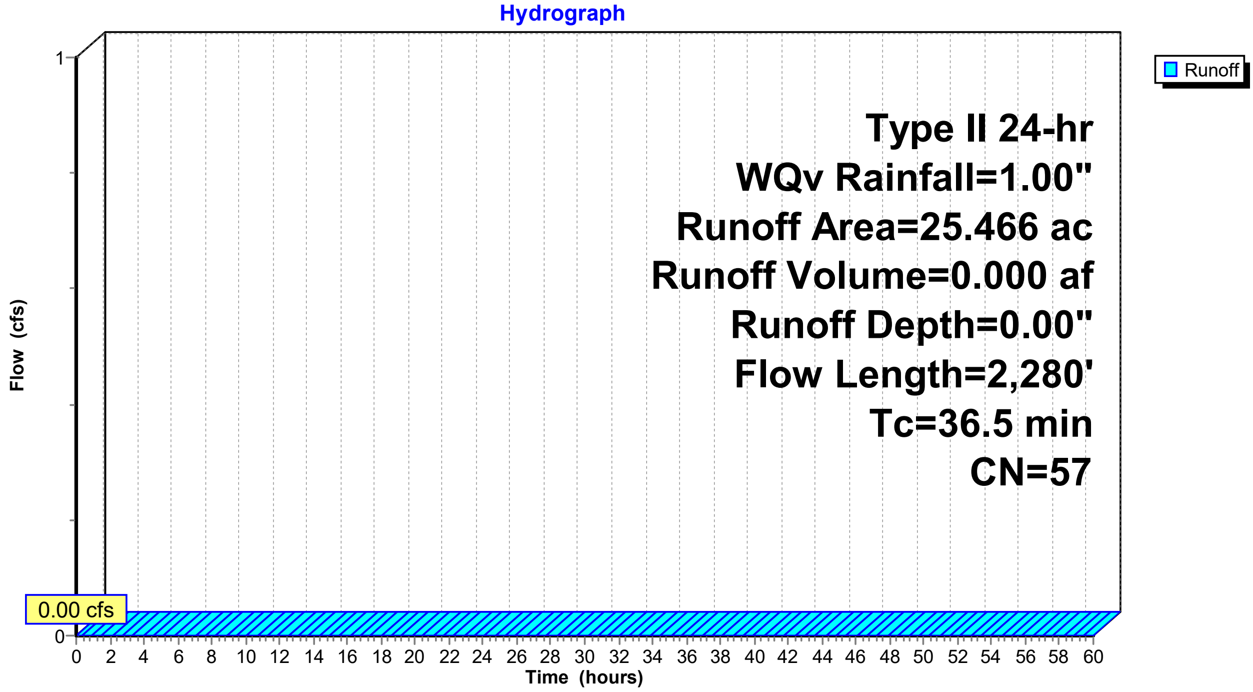
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond 4.3C : 24" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	1.293	98	Paved Roads & Rooftops
	1.783	58	Meadow, non-grazed, HSG B
	22.390	55	Woods, Good, HSG B
	25.466	57	Weighted Average
	24.173		94.92% Pervious Area
	1.293		5.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0634	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
17.8	1,368	0.0656	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	38	0.3960	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	774	0.0281	4.70	109.09	**Channel Flow,** Area= 23.2 sf Perim= 43.2' r= 0.54' n= 0.035
36.5	2,280	Total			

Subcatchment 4.3S:



Summary for Subcatchment 5S:

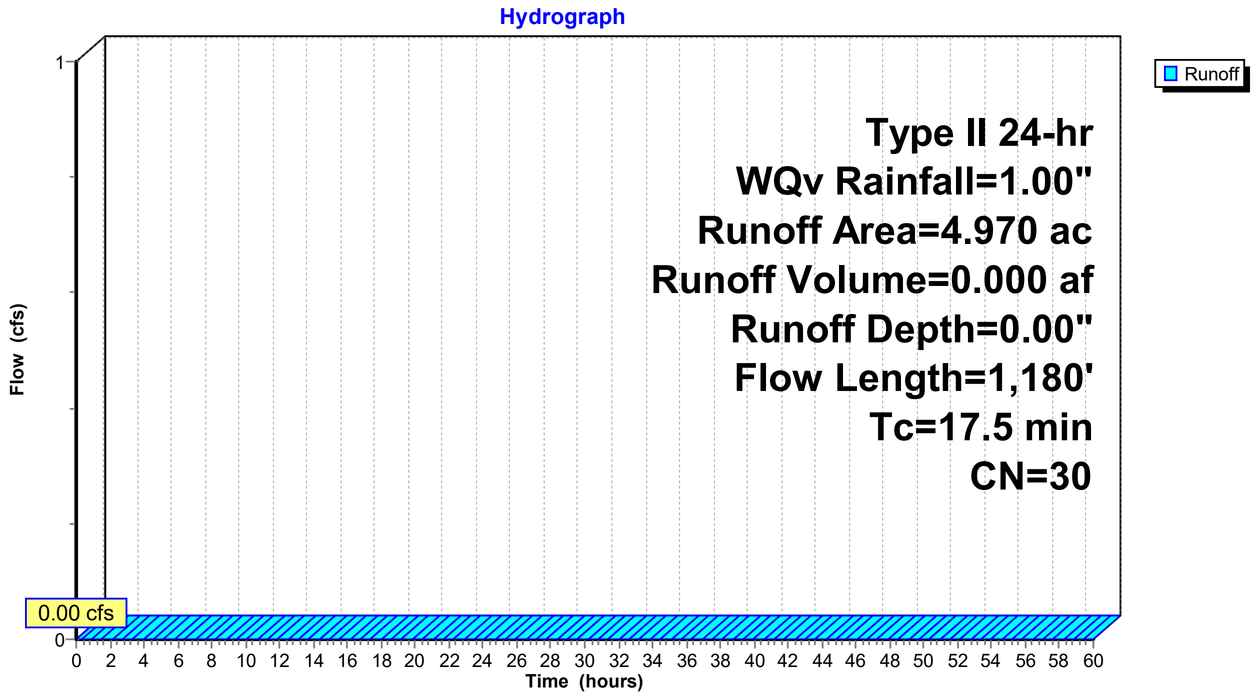
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
4.139	30	Meadow, non-grazed, HSG A
0.831	30	Woods, Good, HSG A
4.970	30	Weighted Average
4.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0675	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
8.5	801	0.0508	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	217	0.1515	2.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	62	0.0697	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,180	Total			

Subcatchment 5S:



Summary for Subcatchment 6S:

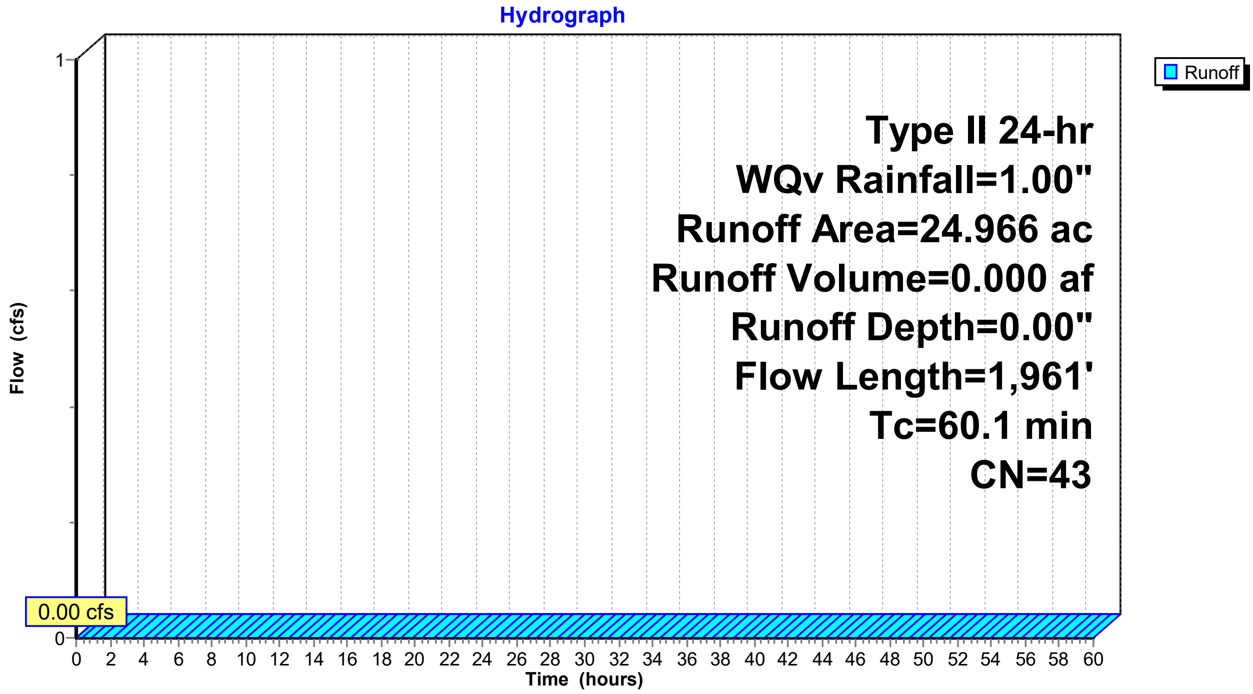
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP6 : Study Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
	0.466	96	Gravel surface, HSG A
	2.545	61	>75% Grass cover, Good, HSG B
	7.511	30	Meadow, non-grazed, HSG A
	0.788	58	Meadow, non-grazed, HSG B
	7.940	30	Woods, Good, HSG A
	4.266	55	Woods, Good, HSG B
	24.966	43	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Subcatchment 6S:



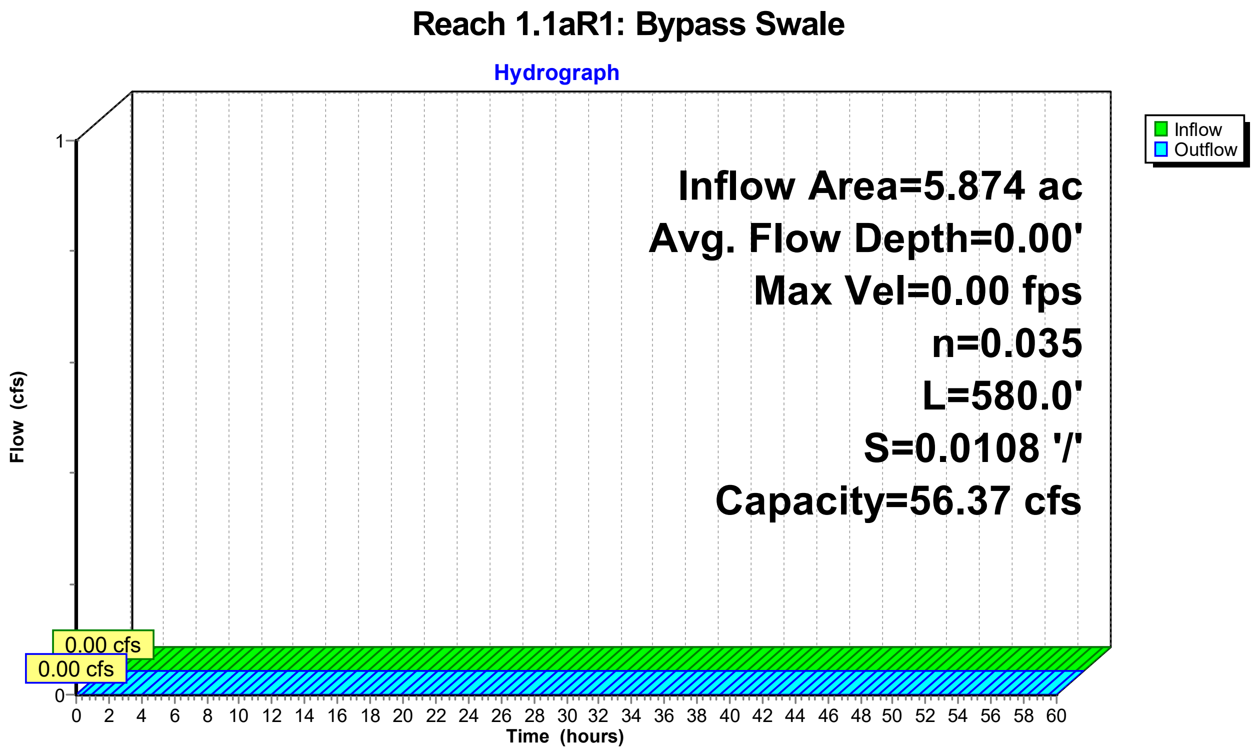
Summary for Reach 1.1aR1: Bypass Swale

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC1 : TS1 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.37 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.0' Slope= 0.0108 '/'
Inlet Invert= 1,493.84', Outlet Invert= 1,487.56'



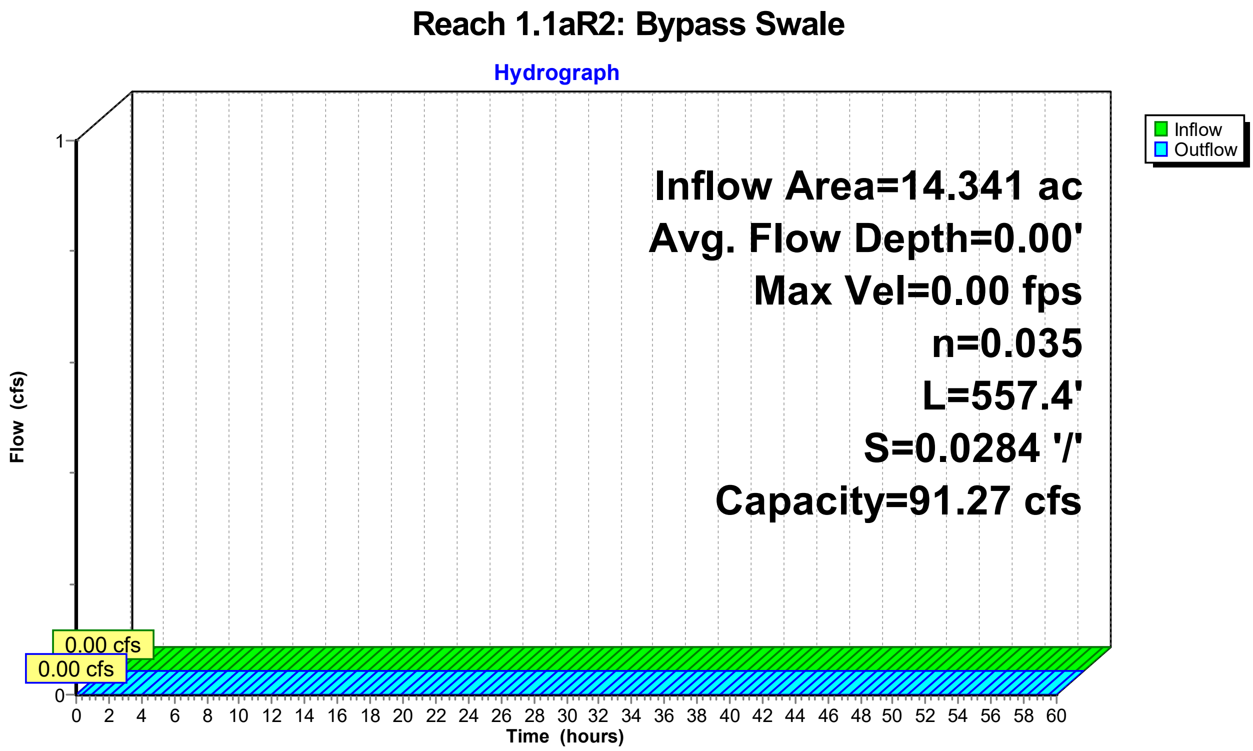
Summary for Reach 1.1aR2: Bypass Swale

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC2 : TS2 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 91.27 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.4' Slope= 0.0284 '/'
Inlet Invert= 1,486.80', Outlet Invert= 1,470.98'



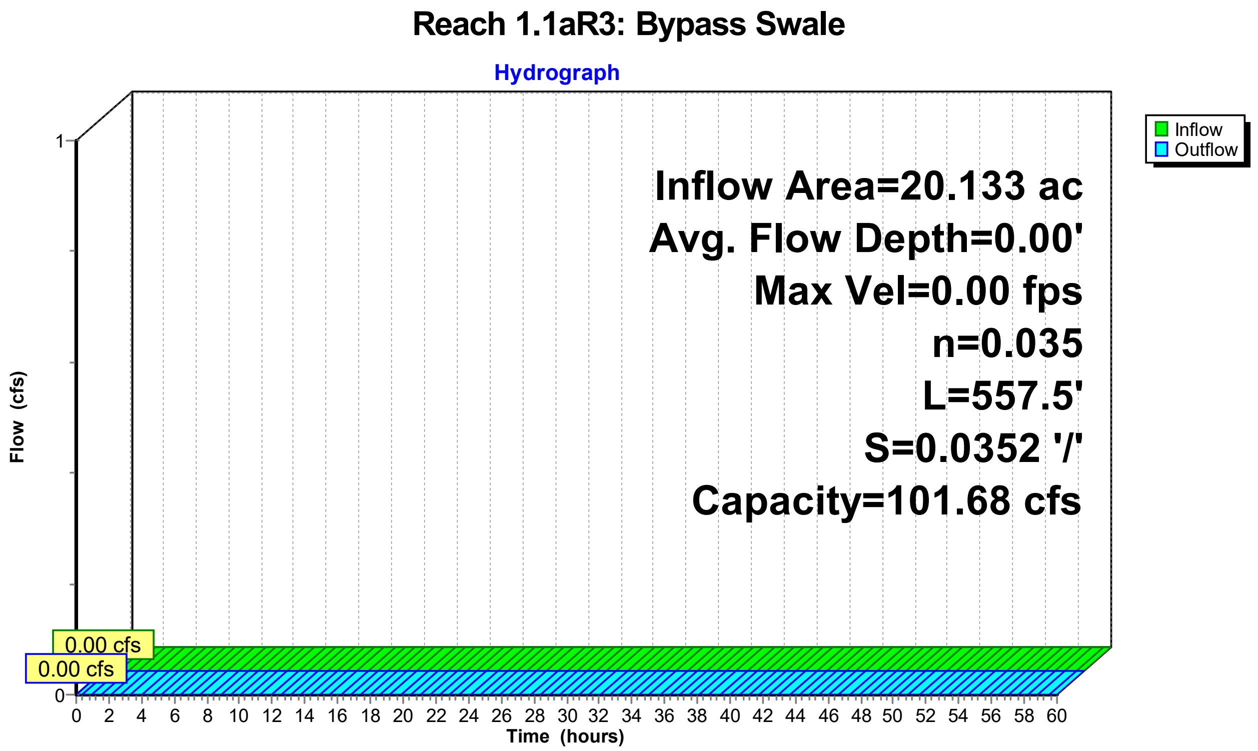
Summary for Reach 1.1aR3: Bypass Swale

Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC3 : TS3 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.68 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.5' Slope= 0.0352 '/'
Inlet Invert= 1,469.57', Outlet Invert= 1,449.93'



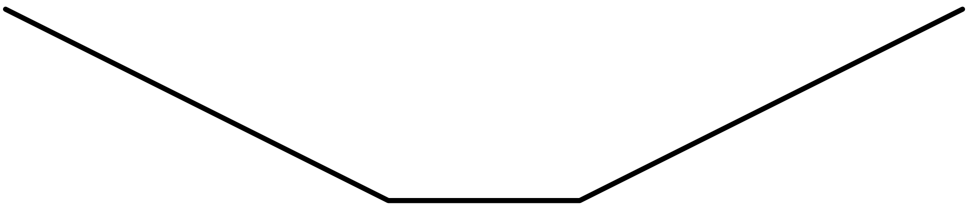
Summary for Reach 1.1aR4: Bypass Swale

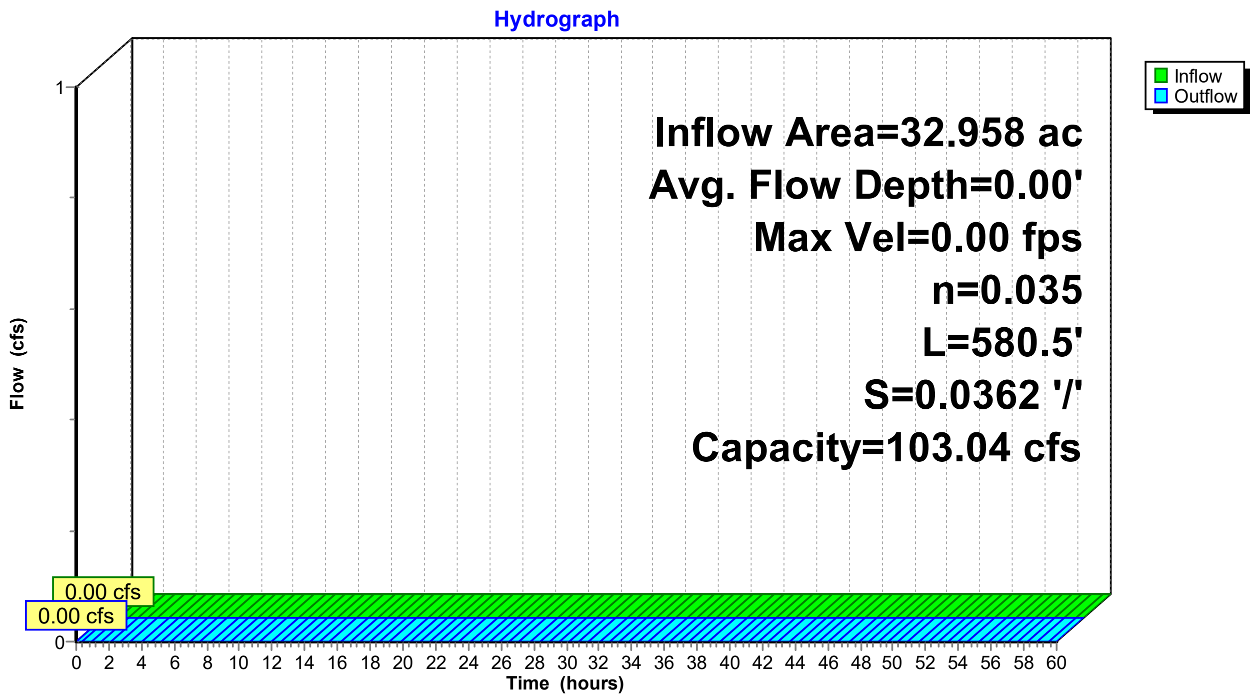
Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aP : North Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 103.04 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.5' Slope= 0.0362 '/'
Inlet Invert= 1,447.64', Outlet Invert= 1,426.64'





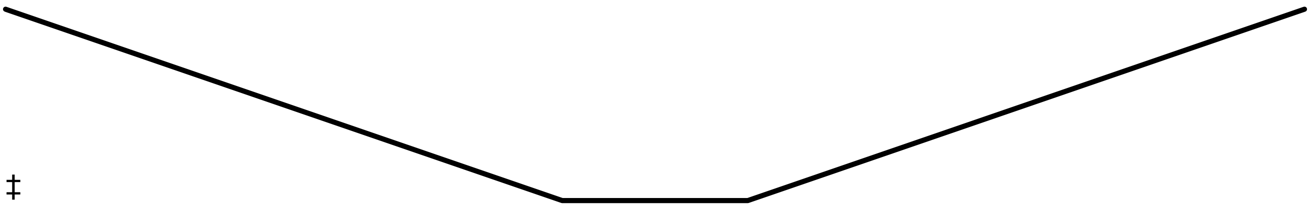
Summary for Reach 1.1bR1: North Road Conveyance Swale

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af, Atten= 2%, Lag= 1.0 min
Routed to Pond 1.1bC1 : TS4 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.47 fps, Min. Travel Time= 60.9 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 60.9 min

Peak Storage= 4 cf @ 24.03 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.01'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 111.65 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,733.0' Slope= 0.0240 '/'
Inlet Invert= 1,491.12', Outlet Invert= 1,449.50'



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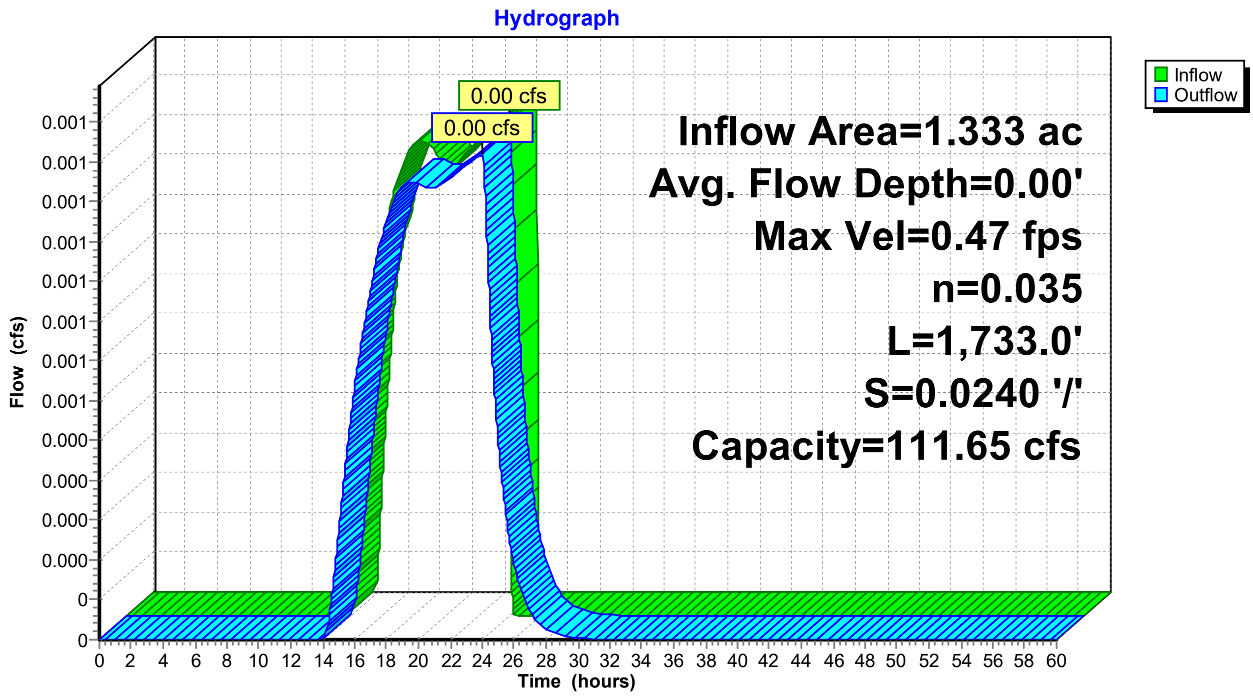
Reach 1.1bR1: North Road Conveyance Swale



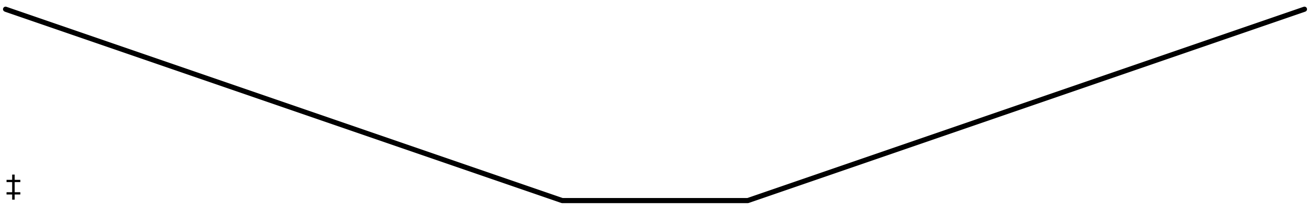
Summary for Reach 1.1bR2: North Road Conveyance Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.04 hrs, Volume= 0.001 af, Atten= 1%, Lag= 1.9 min
Routed to Pond 1.1bP1 : Dry Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.60 fps, Min. Travel Time= 16.6 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 16.6 min

Peak Storage= 1 cf @ 24.04 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.01'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 140.36 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 593.3' Slope= 0.0380 '/'
Inlet Invert= 1,447.27', Outlet Invert= 1,424.75'



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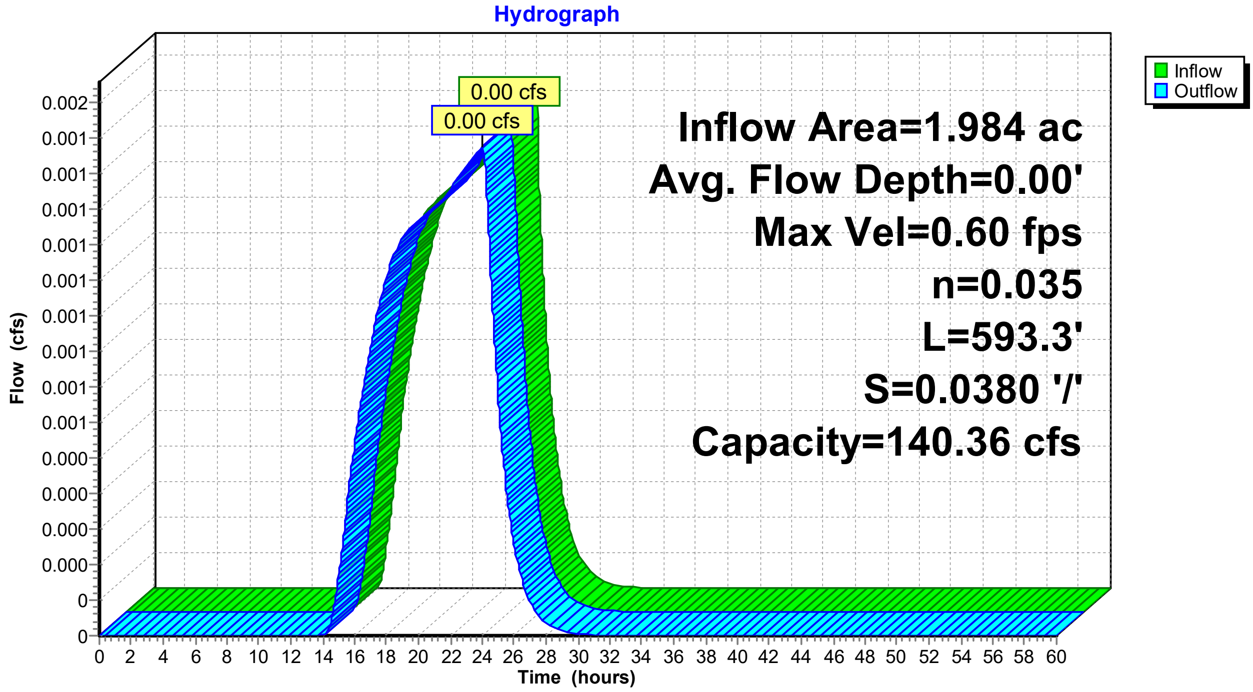
Reach 1.1bR2: North Road Conveyance Swale



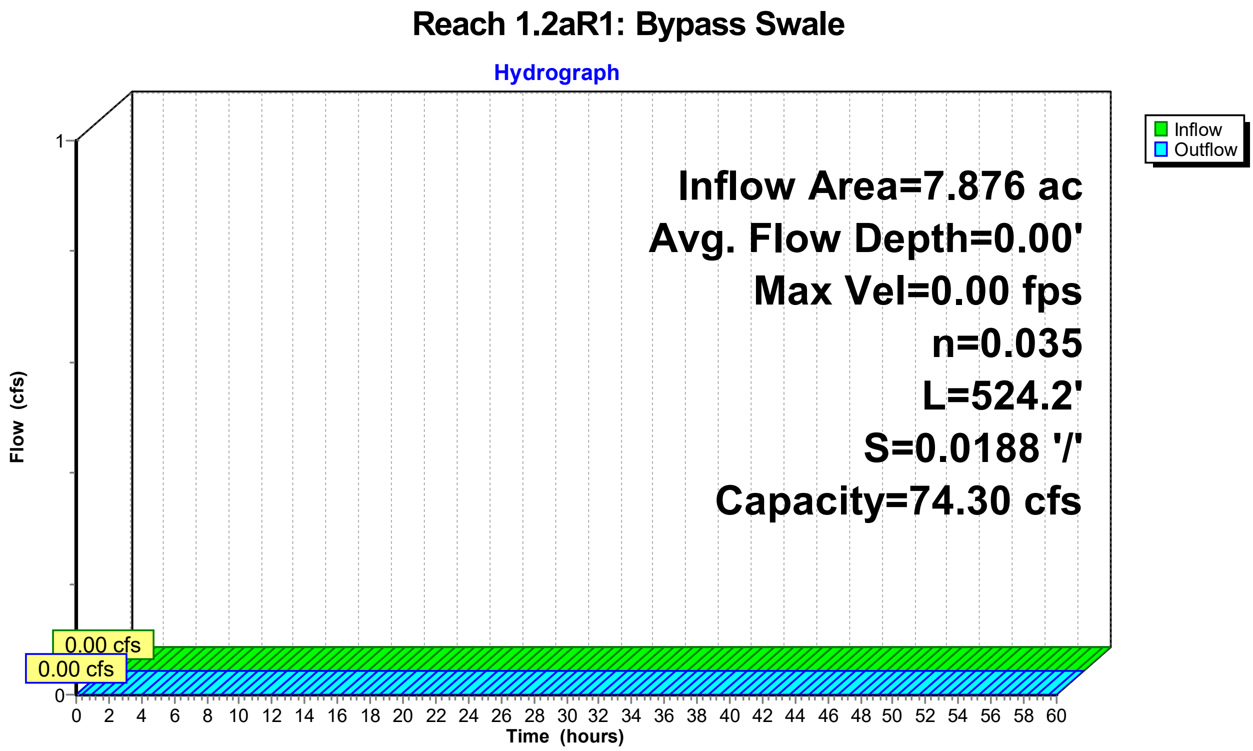
Summary for Reach 1.2aR1: Bypass Swale

Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC1 : TS 7 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 74.30 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 524.2' Slope= 0.0188 '/'
Inlet Invert= 1,454.08', Outlet Invert= 1,444.22'



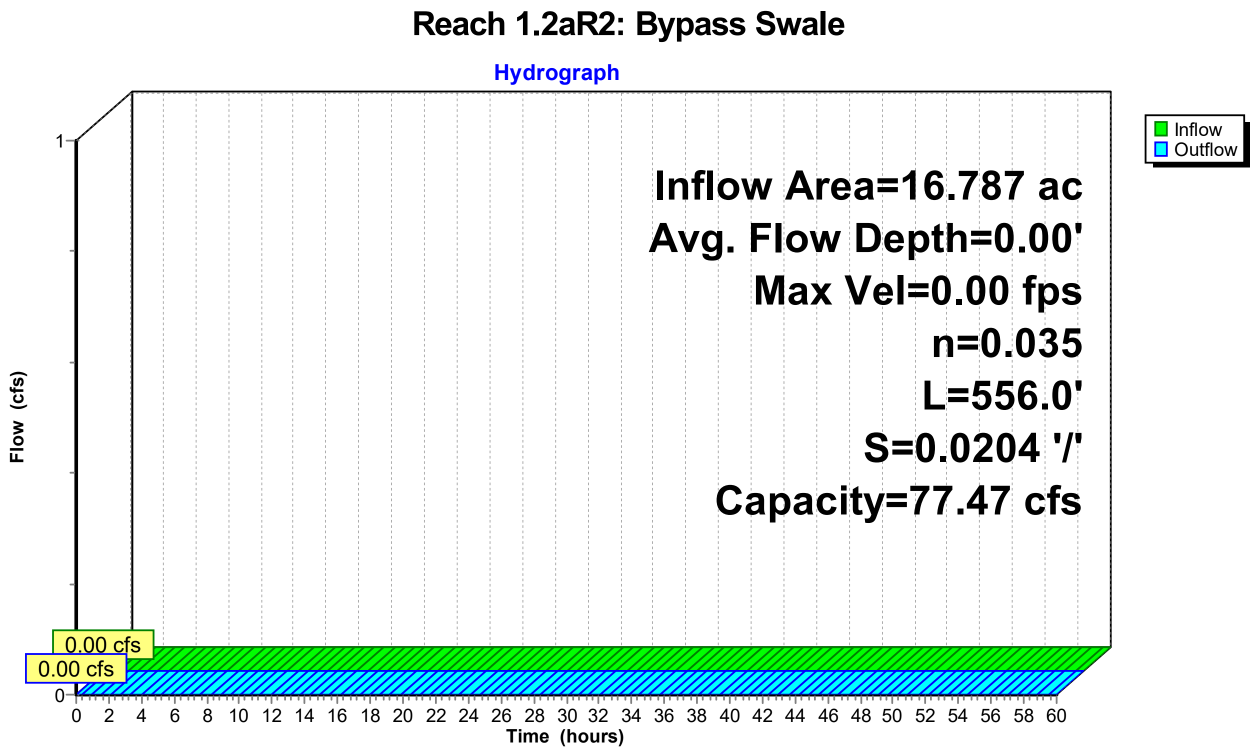
Summary for Reach 1.2aR2: Bypass Swale

Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC2 : TS8 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 77.47 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 556.0' Slope= 0.0204 '/'
Inlet Invert= 1,443.21', Outlet Invert= 1,431.84'



Summary for Reach 1.2aR3: Bypass Swale

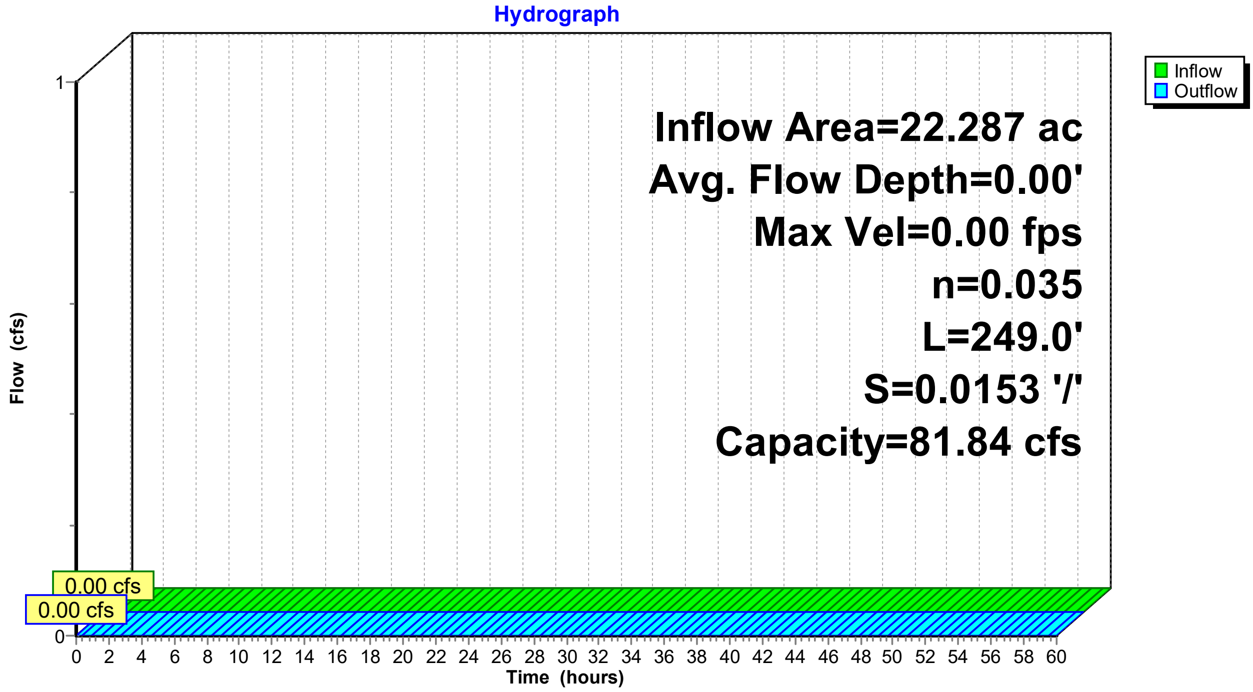
Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aP : South Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 81.84 cfs

3.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 11.00'
Length= 249.0' Slope= 0.0153 '/'
Inlet Invert= 1,431.11', Outlet Invert= 1,427.29'

Reach 1.2aR3: Bypass Swale



Summary for Reach 1.2bR1: East Road Conveyance Swale

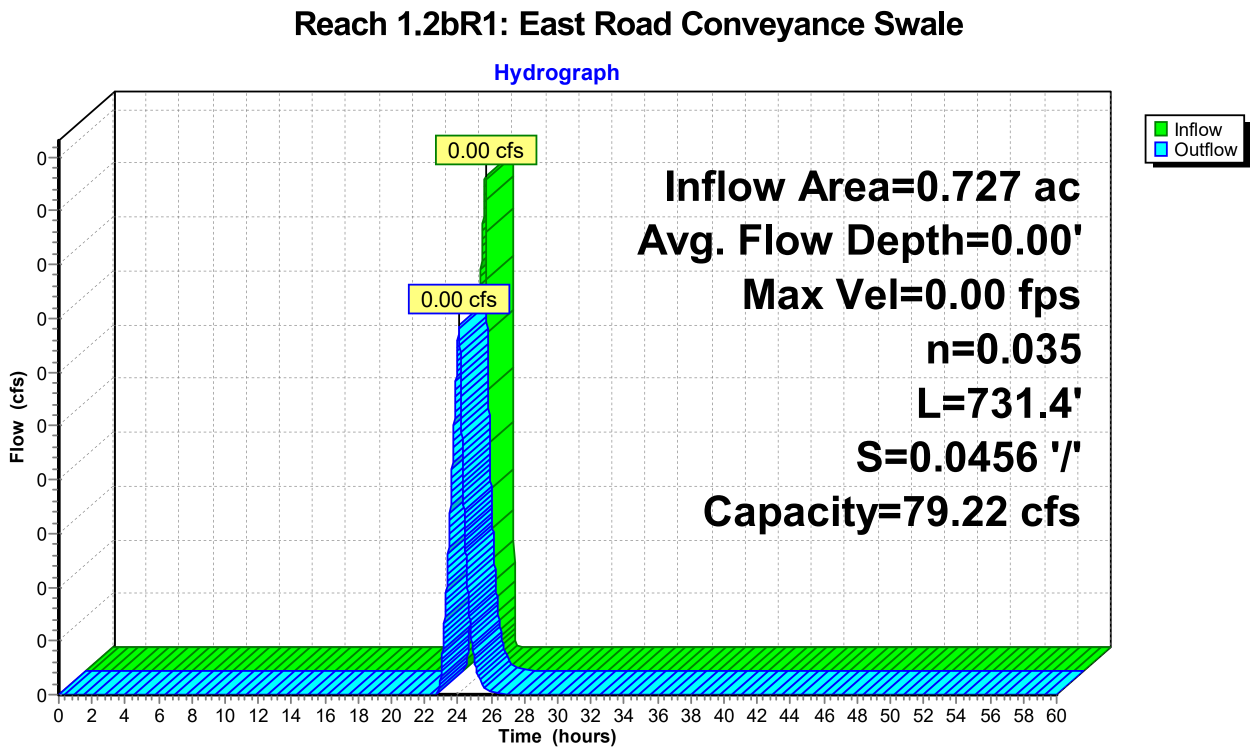
Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Atten= 25%, Lag= 2.9 min
Routed to Pond 1.2bC1 : East Road Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 24.06 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.00'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 79.22 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 731.4' Slope= 0.0456 '/'
Inlet Invert= 1,489.53', Outlet Invert= 1,456.20'

‡



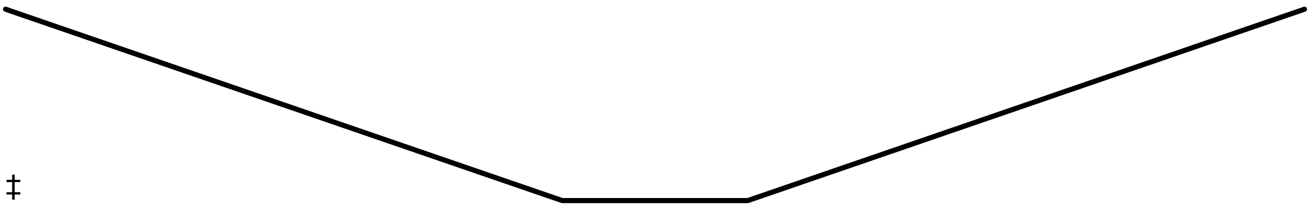
Summary for Reach 1.2bR2: South Road Conveyance Swale

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.23 hrs, Volume= 0.000 af, Atten= 28%, Lag= 10.2 min
Routed to Pond 1.2bC2 : TS6 Culvert

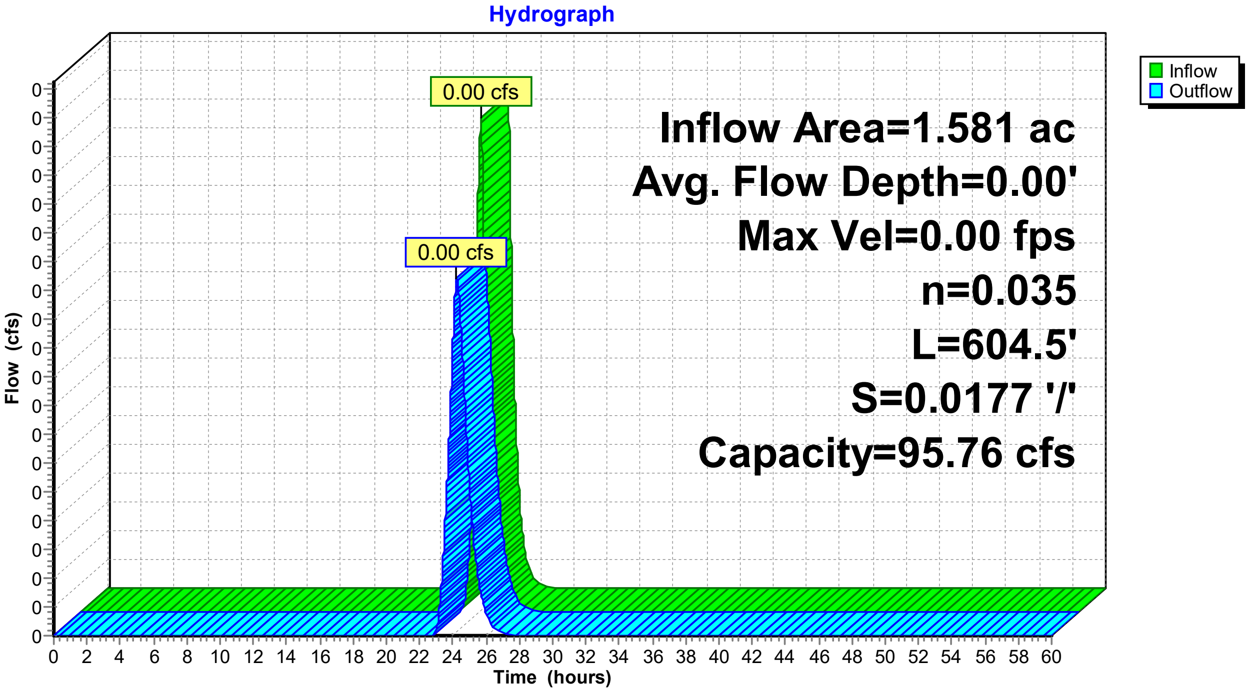
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 24.23 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.00'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 95.76 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 604.5' Slope= 0.0177 '/'
Inlet Invert= 1,454.47', Outlet Invert= 1,443.79'



Reach 1.2bR2: South Road Conveyance Swale



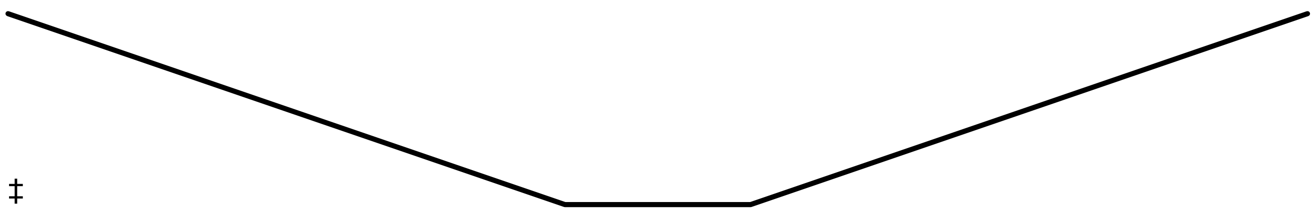
Summary for Reach 1.2bR3: South Road Conveyance Swale

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af, Atten= 2%, Lag= 1.0 min
Routed to Pond 1.2bP : South Road Treatment Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.42 fps, Min. Travel Time= 30.0 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 30.0 min

Peak Storage= 1 cf @ 24.03 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.01'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 98.64 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 755.9' Slope= 0.0187 '/'
Inlet Invert= 1,442.84', Outlet Invert= 1,428.67'



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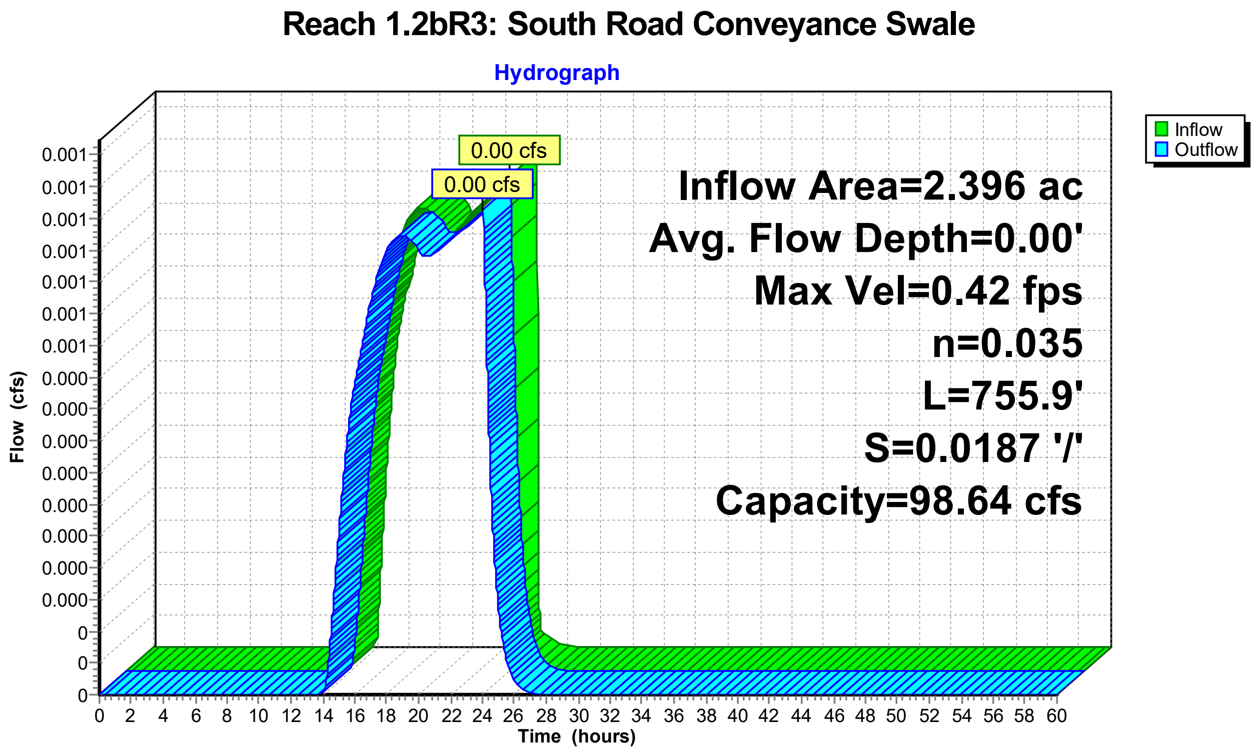


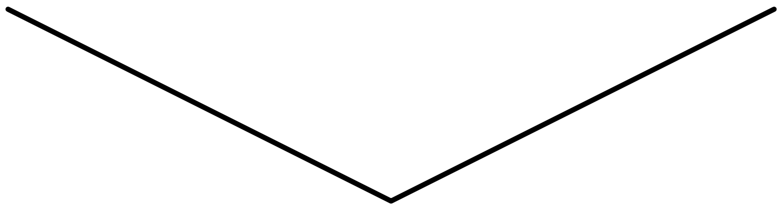
Summary for Reach 4.1R1: Bypass Swale

Inflow Area = 11.663 ac, 2.80% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 4.1R2 : Ex Stream

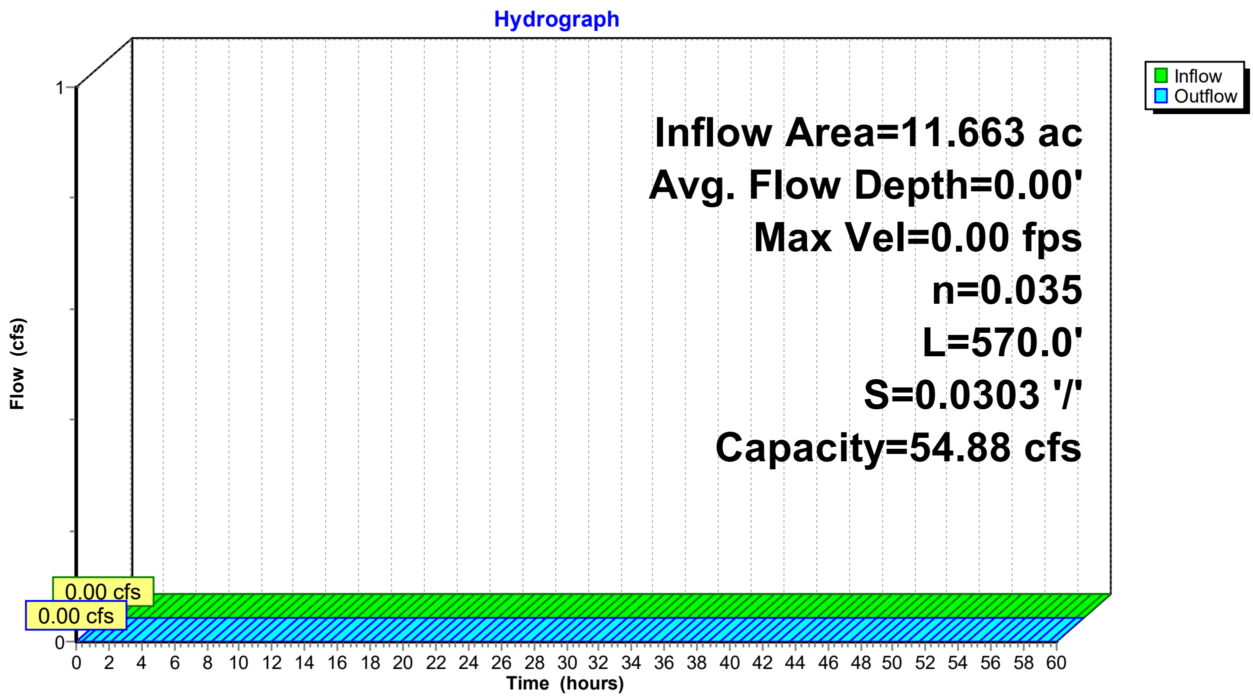
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 54.88 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 570.0' Slope= 0.0303 '/'
Inlet Invert= 1,448.24', Outlet Invert= 1,430.97'



Reach 4.1R1: Bypass Swale



Summary for Reach 4.1R2: Ex Stream

Inflow Area = 39.250 ac, 0.83% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP4 : Study Point 4

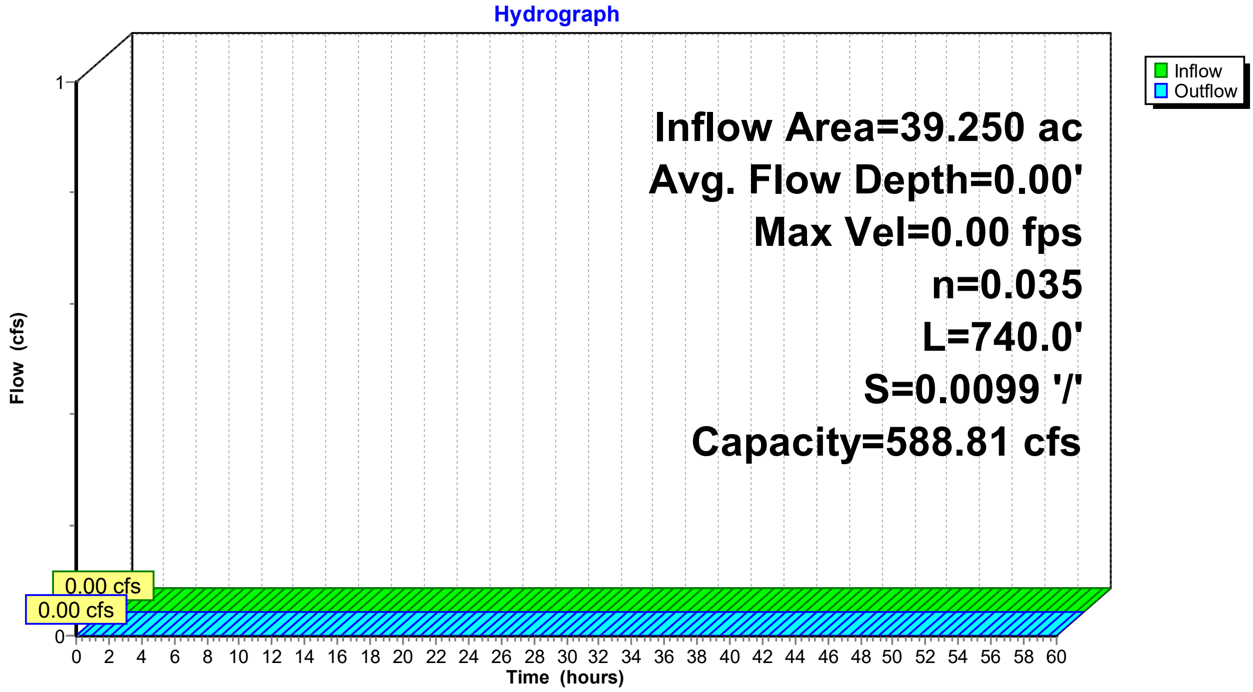
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 3.00' Flow Area= 84.0 sf, Capacity= 588.81 cfs

17.50' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 4.0 '/' Top Width= 38.50'
Length= 740.0' Slope= 0.0099 '/'
Inlet Invert= 1,430.98', Outlet Invert= 1,423.64'

‡

Reach 4.1R2: Ex Stream



Summary for Reach 4.2bR: Conveyance Swale

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 17.70 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 18.02 hrs, Volume= 0.000 af, Atten= 0%, Lag= 19.4 min
Routed to Pond 4.2bP : Pond 4 - Access Rd East

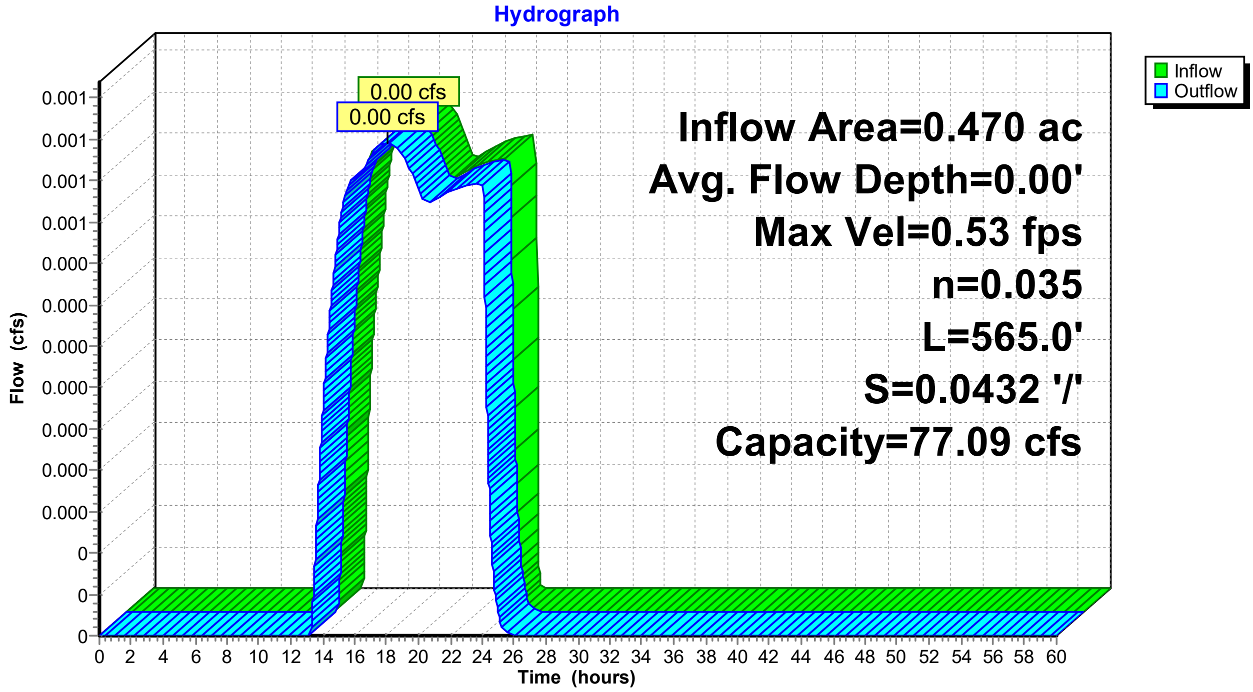
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.53 fps, Min. Travel Time= 17.8 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 17.8 min

Peak Storage= 1 cf @ 18.02 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.00'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 77.09 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 565.0' Slope= 0.0432 '/'
Inlet Invert= 1,472.38', Outlet Invert= 1,448.00'

‡

Reach 4.2bR: Conveyance Swale



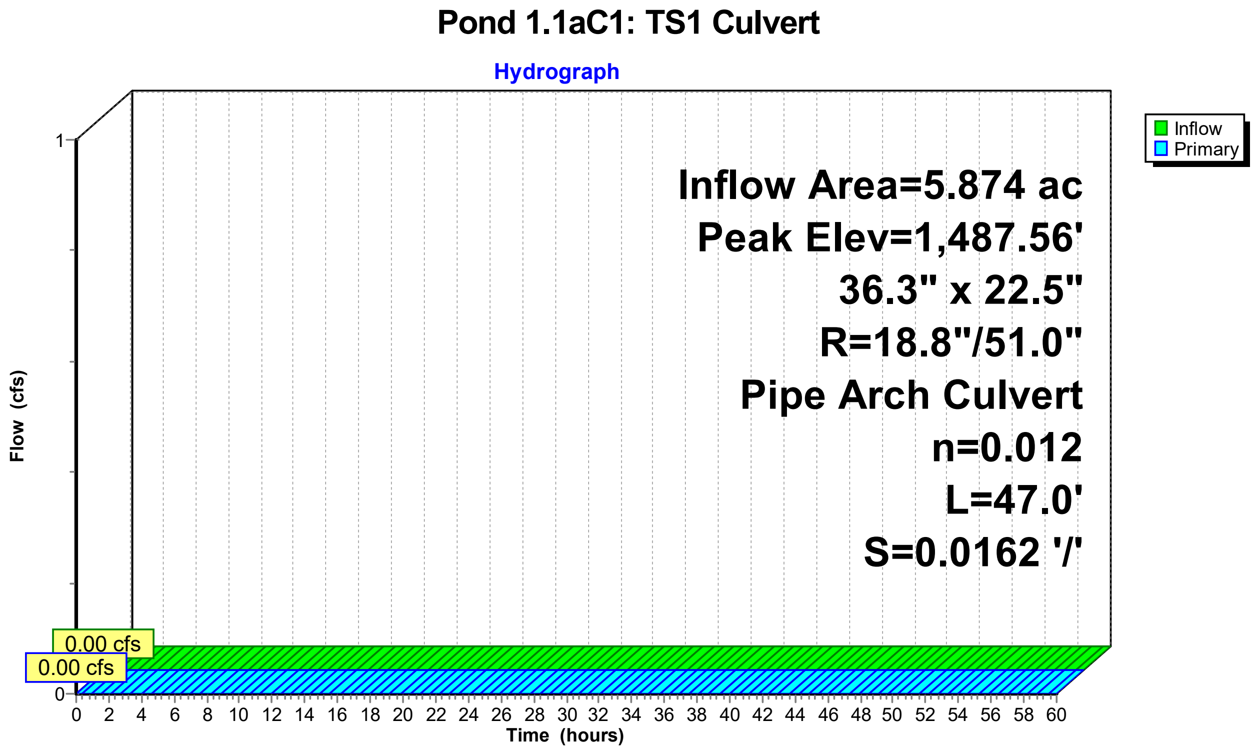
Summary for Pond 1.1aC1: TS1 Culvert

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,487.56' @ 0.00 hrs
Flood Elev= 1,489.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,487.56'	**36.3" W x 22.5" H, R=18.8"/51.0" Pipe Arch RCP_Arch 37x23** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,487.56' / 1,486.80' S= 0.0162 '/' Cc= 0.900 n= 0.012, Flow Area= 4.43 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,487.56' (Free Discharge)
↑**1=RCP_Arch 37x23** (Controls 0.00 cfs)



Summary for Pond 1.1aC2: TS2 Culvert

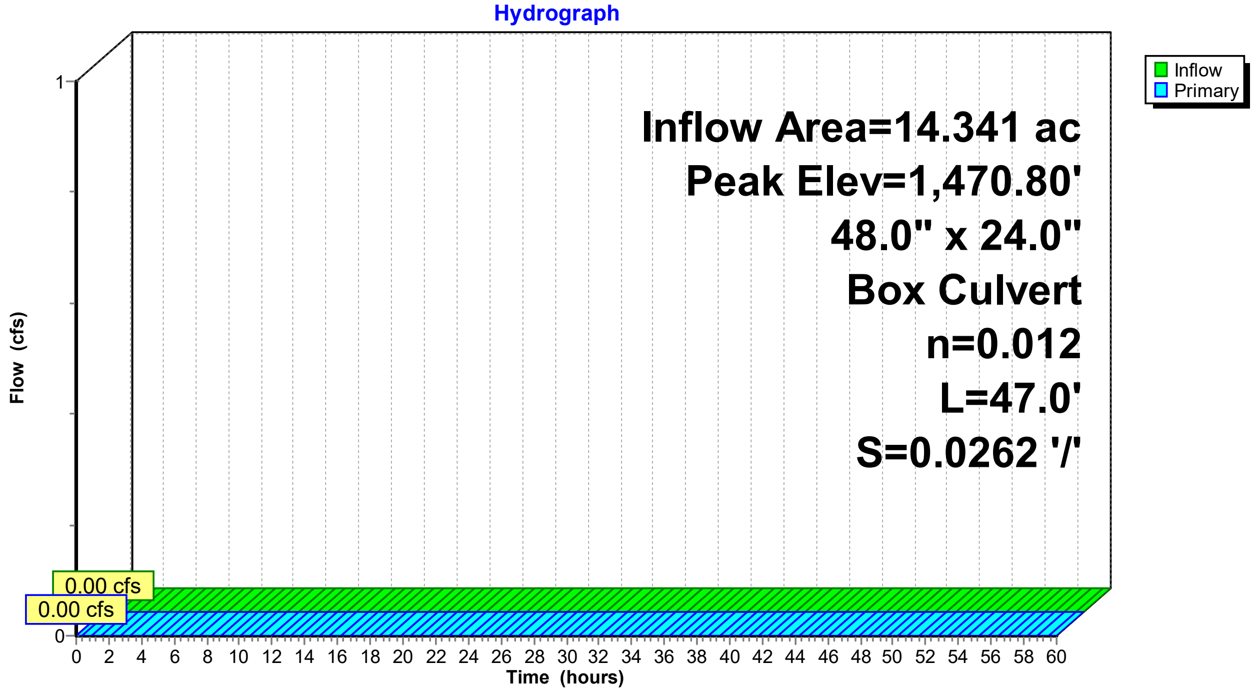
Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,470.80' @ 0.00 hrs
Flood Elev= 1,473.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,470.80'	**48.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,470.80' / 1,469.57' S= 0.0262 '/' Cc= 0.900 n= 0.012, Flow Area= 8.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,470.80' (Free Discharge)
1=Culvert (Controls 0.00 cfs)

Pond 1.1aC2: TS2 Culvert



Summary for Pond 1.1aC3: TS3 Culvert

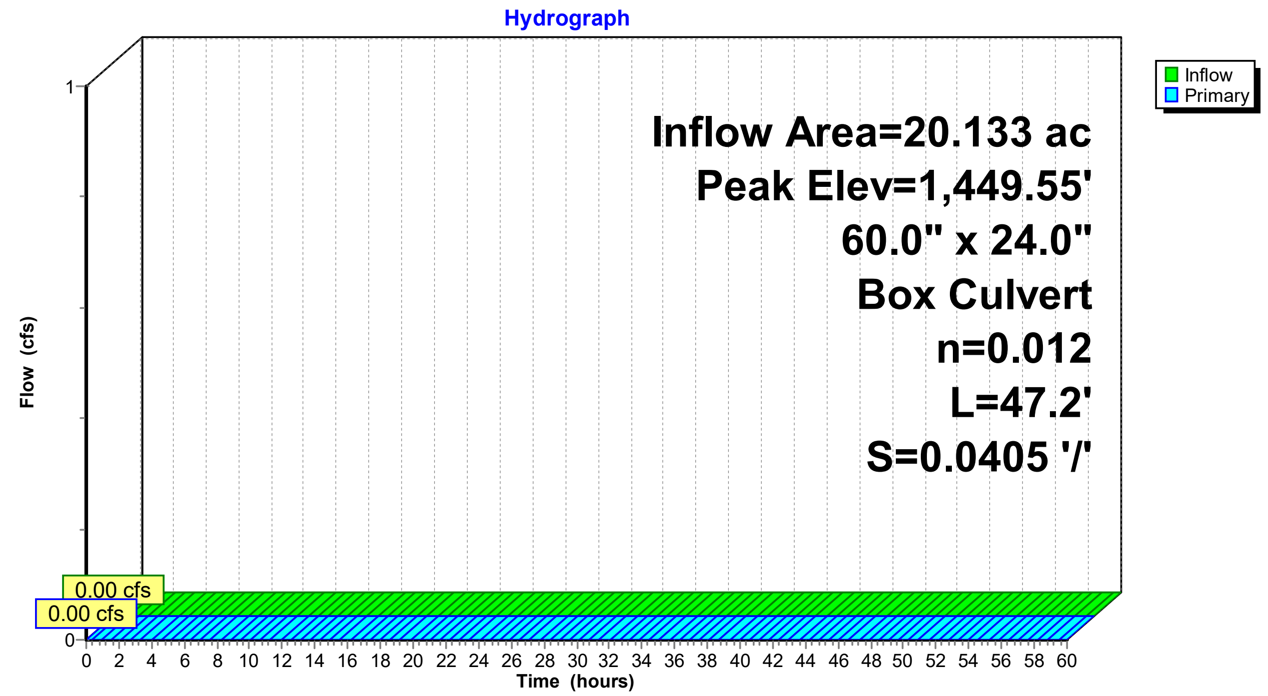
Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR4 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.55' @ 0.00 hrs
Flood Elev= 1,452.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.55'	**60.0" W x 24.0" H Box Culvert** L= 47.2' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.55' / 1,447.64' S= 0.0405 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,449.55' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)

Pond 1.1aC3: TS3 Culvert



Summary for Pond 1.1aP: North Road Bypass OC

Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

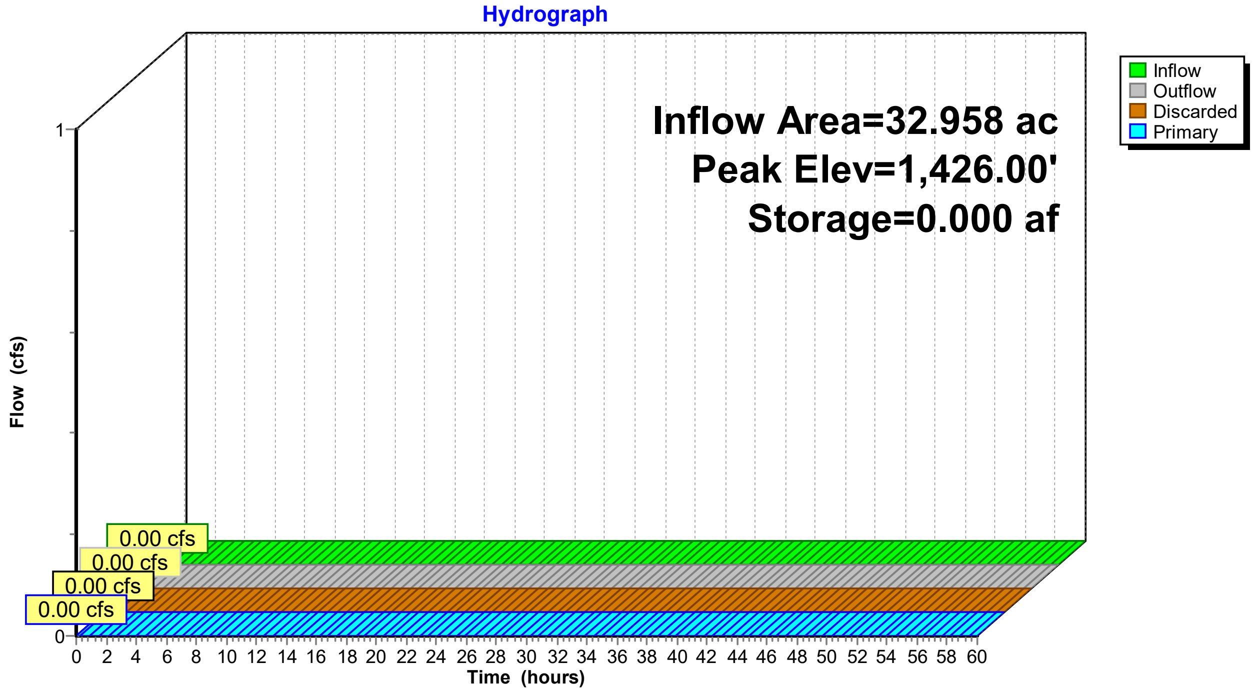
Volume	Invert	Avail.Storage	Storage Description
#1	1,426.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,426.00'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,428.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.1aP: North Road Bypass OC



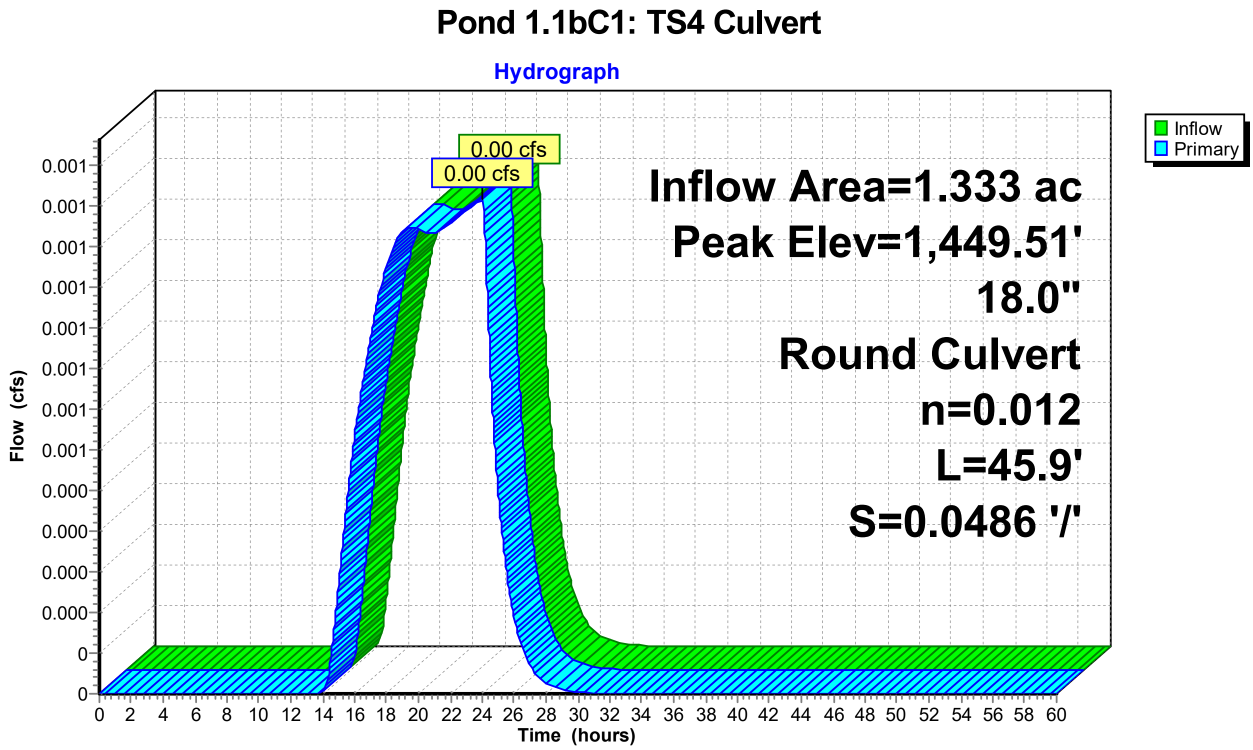
Summary for Pond 1.1bC1: TS4 Culvert

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.51' @ 24.03 hrs
Flood Elev= 1,451.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.50'	**18.0" Round Culvert** L= 45.9' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.50' / 1,447.27' S= 0.0486 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 24.03 hrs HW=1,449.51' (Free Discharge)
1=Culvert (Inlet Controls 0.00 cfs @ 0.39 fps)



Summary for Pond 1.1bP1: Dry Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 24.04 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.72 hrs, Volume= 0.001 af, Atten= 37%, Lag= 40.6 min
Discarded = 0.00 cfs @ 24.72 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1.1bP2 : North Road Detention Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,425.32' @ 24.72 hrs Surf.Area= 76 sf Storage= 17 cf

Plug-Flow detention time= 255.0 min calculated for 0.001 af (100% of inflow)
Center-of-Mass det. time= 255.0 min (1,512.3 - 1,257.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.75'	428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

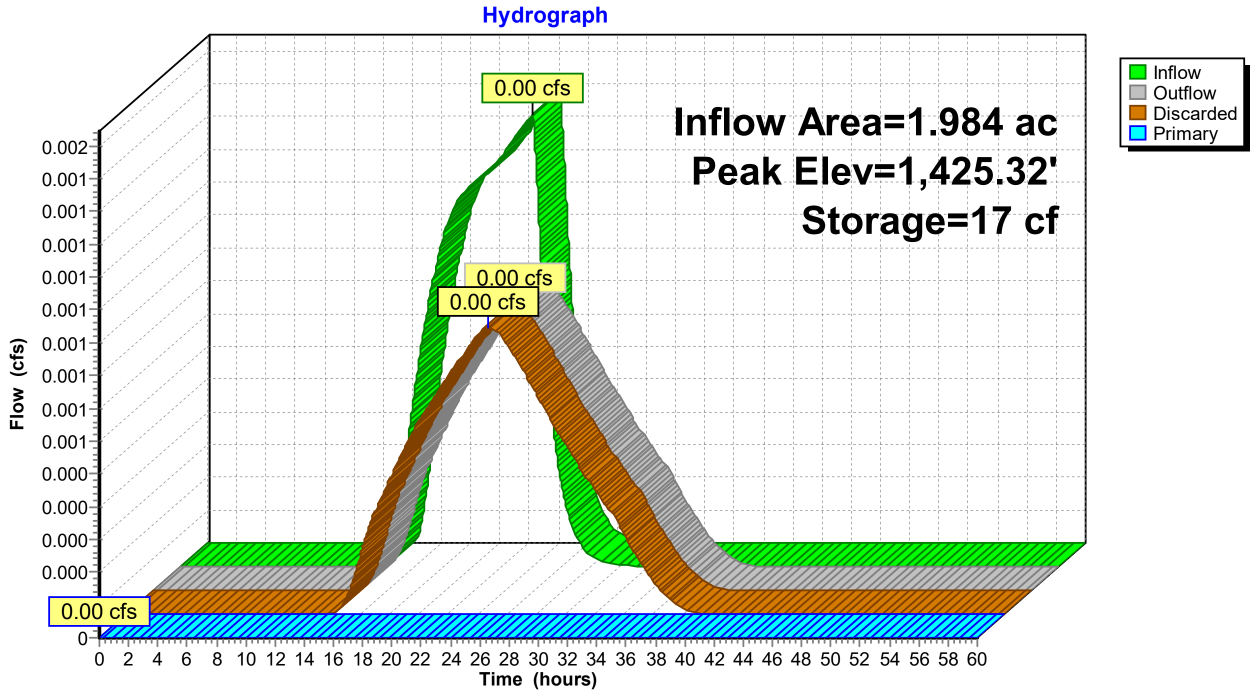
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,424.75	0	0.0	0	0	0
1,425.00	25	22.9	2	2	42
1,426.00	273	98.0	127	129	767
1,426.70	603	161.7	299	428	2,086

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.75'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,425.69'	**2.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.00 cfs @ 24.72 hrs HW=1,425.32' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.75' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1.1bP1: Dry Swale



Summary for Pond 1.1bP2: North Road Detention Pond

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,421.50' @ 0.00 hrs Surf.Area= 0.009 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

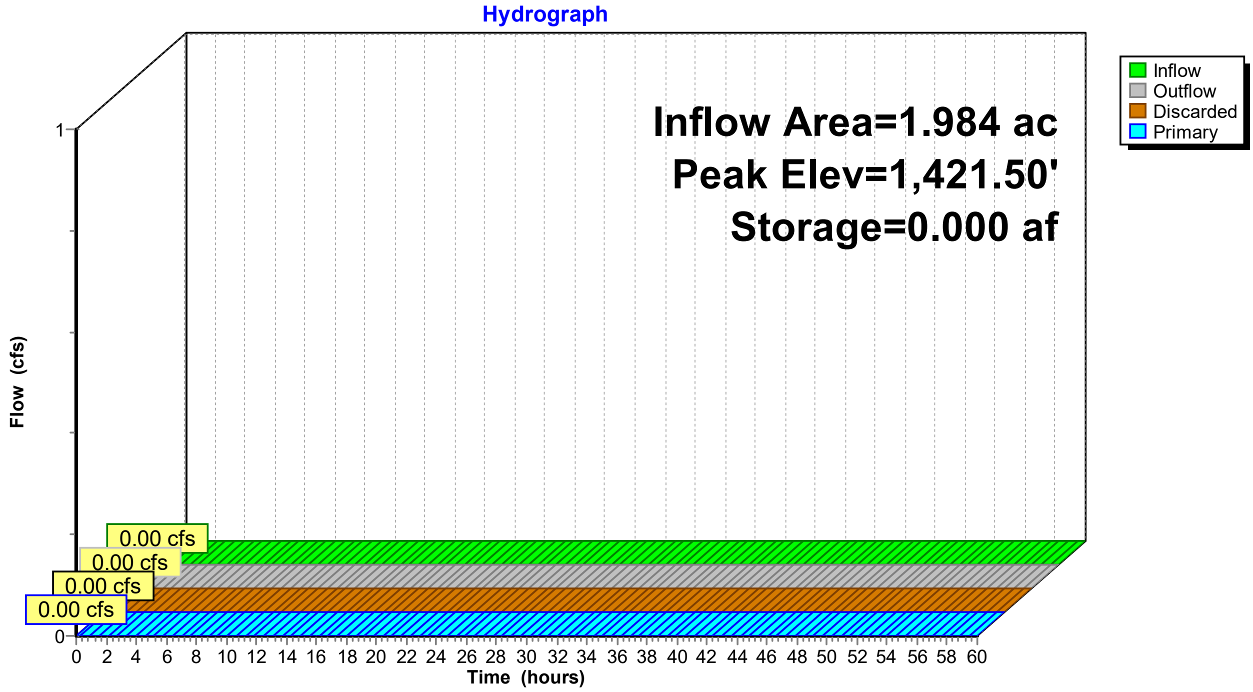
Volume	Invert	Avail.Storage	Storage Description
#1	1,421.50'	0.166 af	**10.00'W x 40.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,421.50'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,424.00'	**20.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,421.50' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,421.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.1bP2: North Road Detention Pond



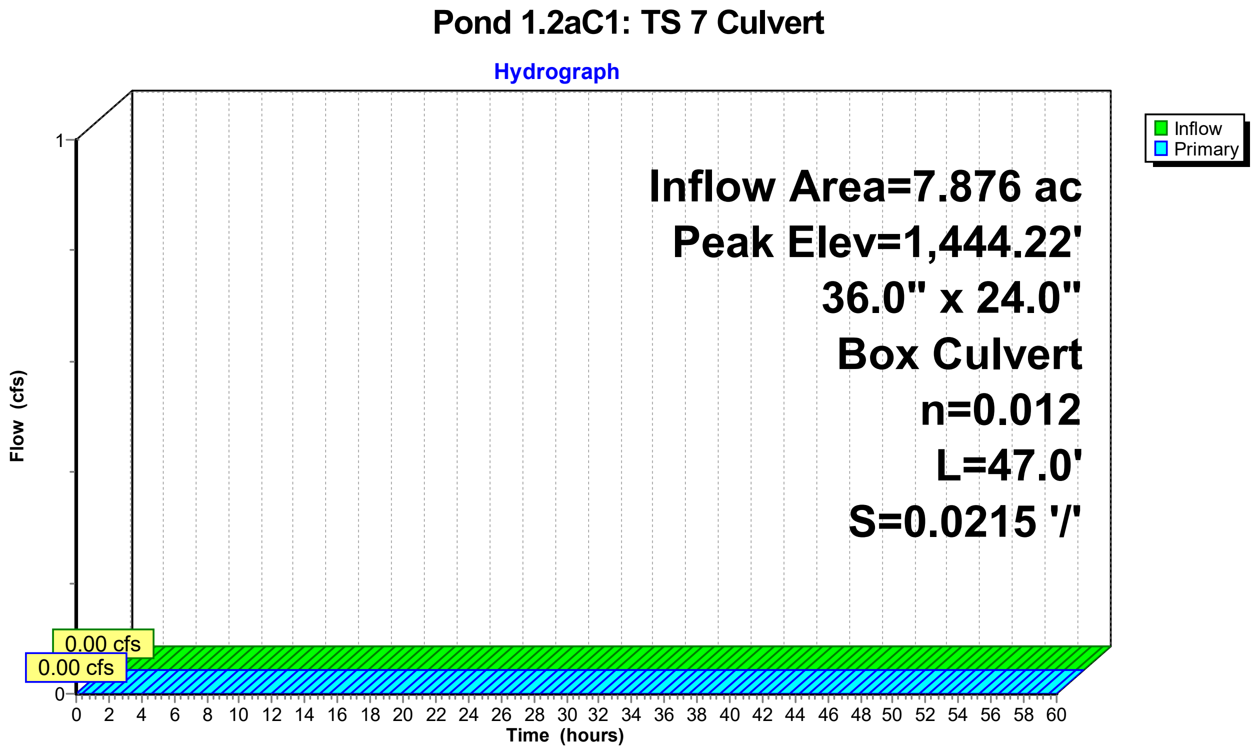
Summary for Pond 1.2aC1: TS 7 Culvert

Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.2aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.22' @ 0.00 hrs
Flood Elev= 1,446.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,444.22'	**36.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,444.22' / 1,443.21' S= 0.0215 '/' Cc= 0.900 n= 0.012, Flow Area= 6.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,444.22' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)



Summary for Pond 1.2aC2: TS8 Culvert

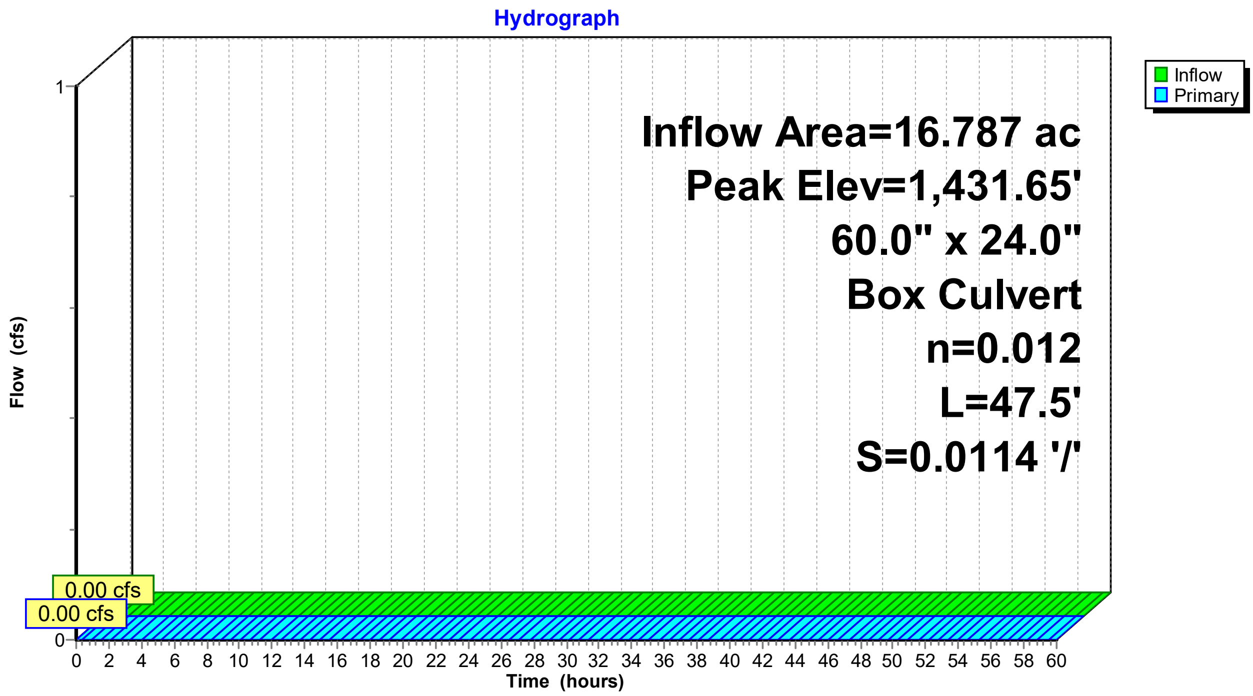
Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.2aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.65' @ 0.00 hrs
Flood Elev= 1,433.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.65'	**60.0" W x 24.0" H Box Culvert** L= 47.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,431.65' / 1,431.11' S= 0.0114 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.65' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)

Pond 1.2aC2: TS8 Culvert



Summary for Pond 1.2aP: South Road Bypass OC

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

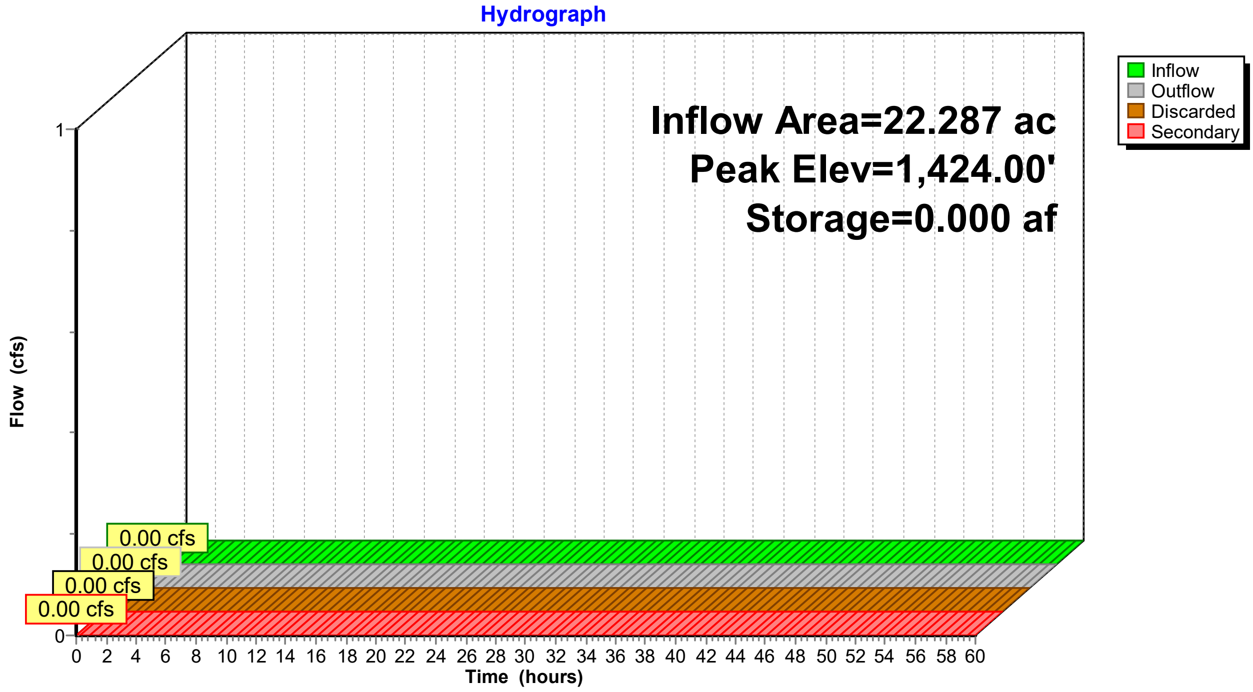
Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area**
#2	Secondary	1,426.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
└**1=Exfiltration** (Passes 0.00 cfs of 0.06 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.2aP: South Road Bypass OC



Summary for Pond 1.2bC1: East Road Culvert

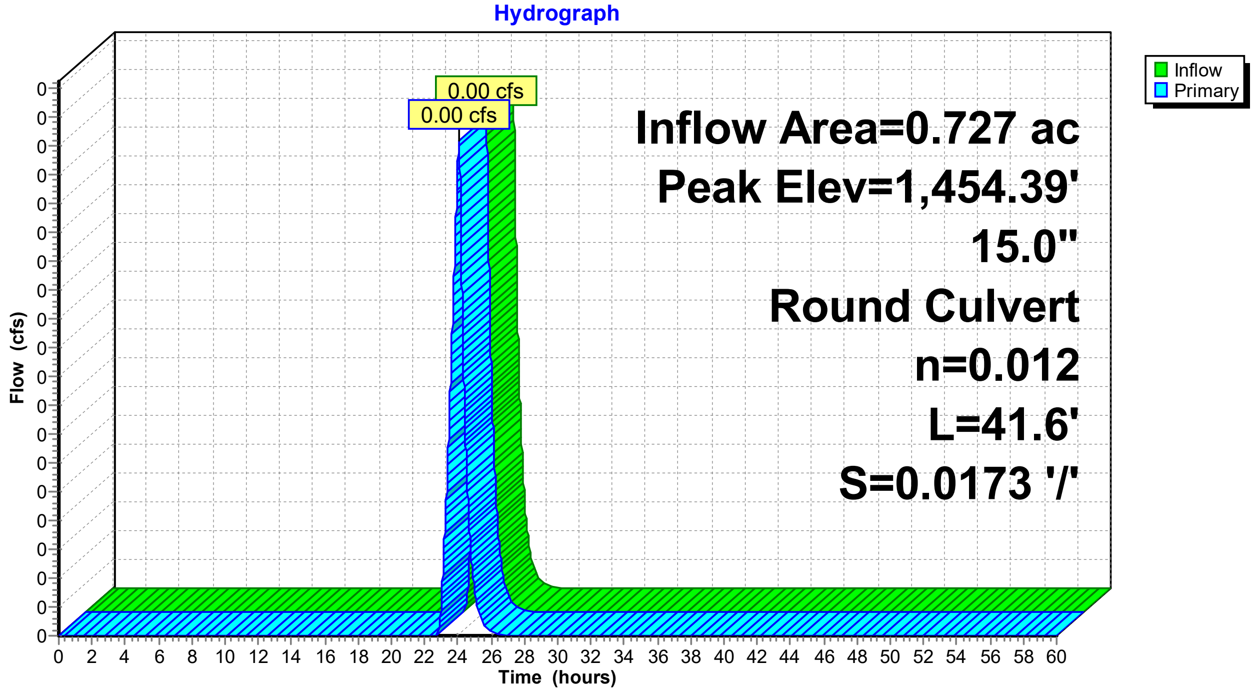
Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,454.39' @ 24.06 hrs
Flood Elev= 1,457.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,454.39'	**15.0" Round Culvert** L= 41.6' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,454.39' / 1,453.67' S= 0.0173 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 24.06 hrs HW=1,454.39' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.00 cfs @ 0.04 fps)

Pond 1.2bC1: East Road Culvert



Summary for Pond 1.2bC2: TS6 Culvert

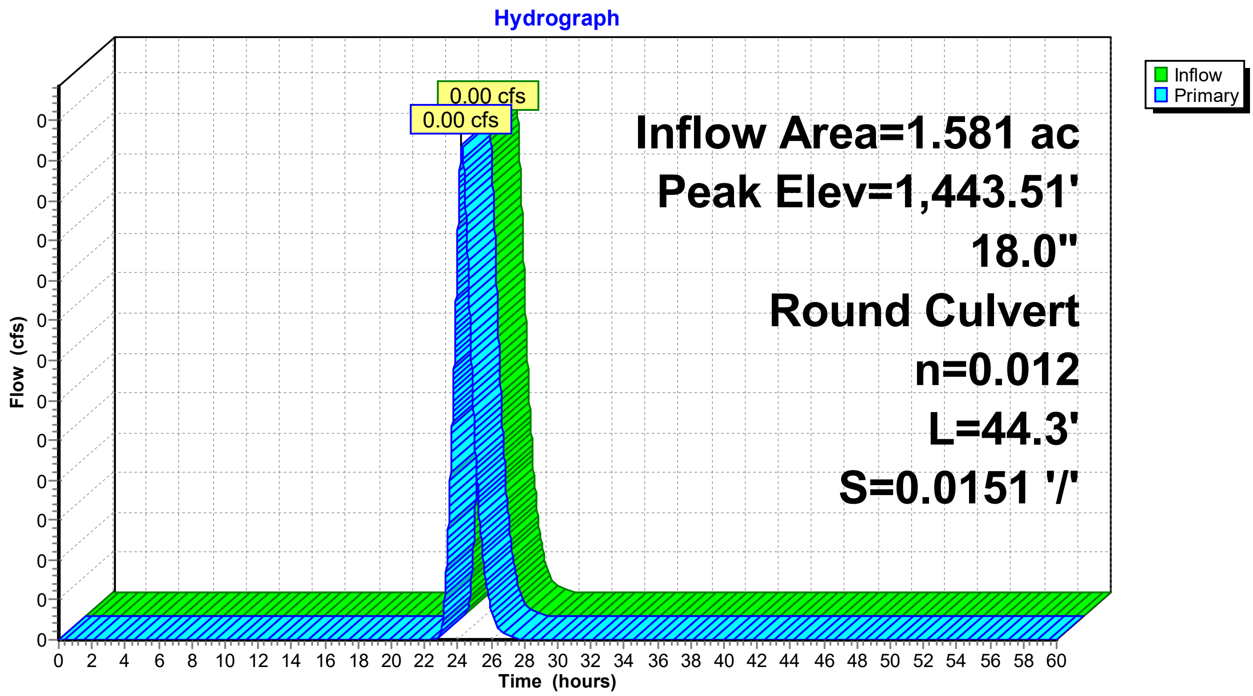
Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.23 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.23 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 24.23 hrs, Volume= 0.000 af
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,443.51' @ 24.23 hrs
Flood Elev= 1,445.09'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,443.51'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,443.51' / 1,442.84' S= 0.0151 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 24.23 hrs HW=1,443.51' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.00 cfs @ 0.04 fps)

Pond 1.2bC2: TS6 Culvert



Summary for Pond 1.2bP: South Road Treatment Pond

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.05 hrs, Volume= 0.001 af, Atten= 0%, Lag= 1.1 min
Discarded = 0.00 cfs @ 24.05 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.00' @ 24.05 hrs Surf.Area= 0.009 ac Storage= 0.000 af

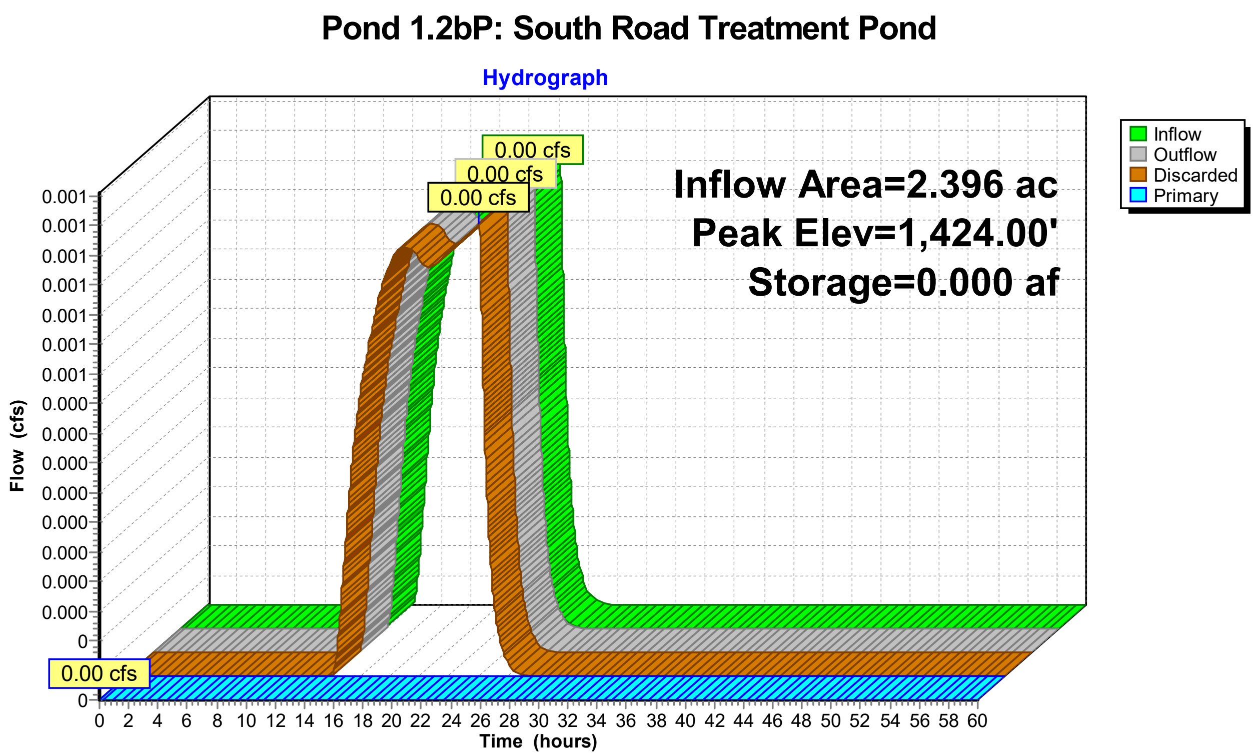
Plug-Flow detention time= 3.0 min calculated for 0.001 af (100% of inflow)
Center-of-Mass det. time= 3.0 min (1,209.7 - 1,206.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.149 af	**20.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,426.05'	**20.0' 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

Discarded OutFlow Max=0.00 cfs @ 24.05 hrs HW=1,424.00' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)



Summary for Pond 1.3P: Pond 3 - Access Rd West

Inflow Area = 0.695 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link SP1 : Study Point 1

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,456.00' @ 0.00 hrs Surf.Area= 784 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,456.00'	8,743 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

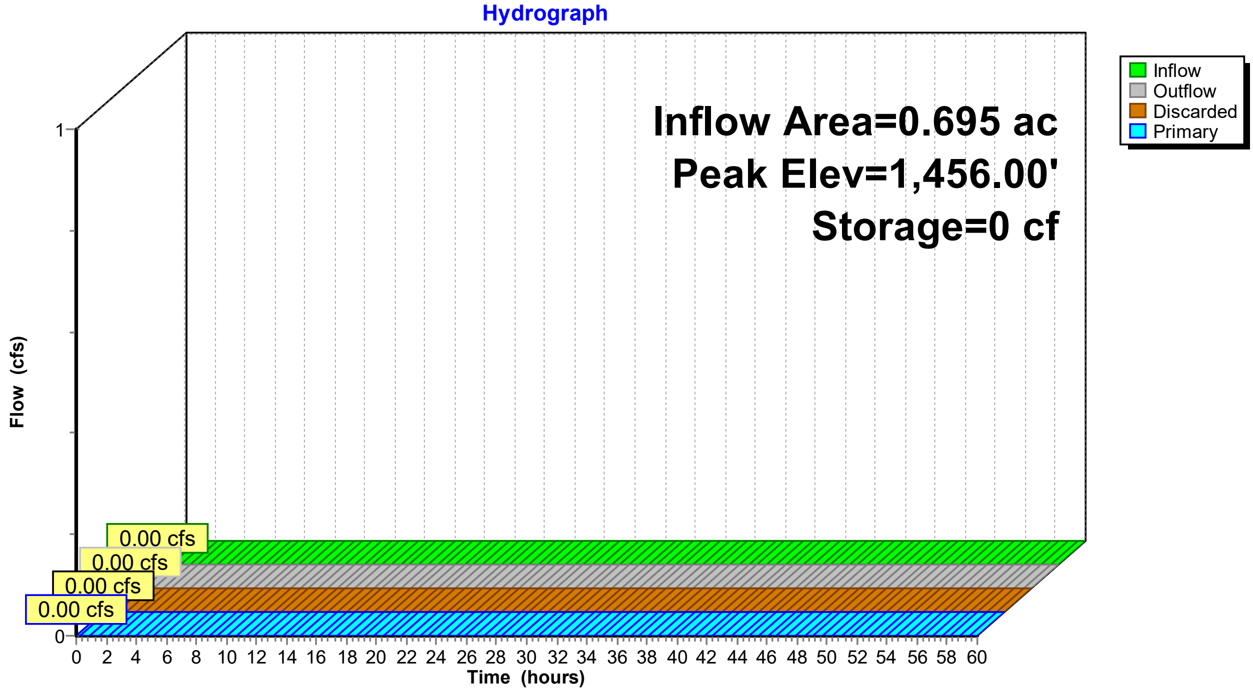
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,456.00	784	123.0	0	0	784
1,458.00	1,720	194.0	2,443	2,443	2,603
1,459.00	2,884	279.0	2,277	4,721	5,811
1,460.00	5,280	421.0	4,022	8,743	13,729

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,456.00'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,459.99'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.3P: Pond 3 - Access Rd West



Summary for Pond 4.2bP: Pond 4 - Access Rd East

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 18.02 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 18.09 hrs, Volume= 0.000 af, Atten= 0%, Lag= 3.7 min
Discarded = 0.00 cfs @ 18.09 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4.2C : 18" Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,445.50' @ 18.09 hrs Surf.Area= 200 sf Storage= 0 cf

Plug-Flow detention time= 4.1 min calculated for 0.000 af (100% of inflow)
Center-of-Mass det. time= 4.1 min (1,156.5 - 1,152.4)

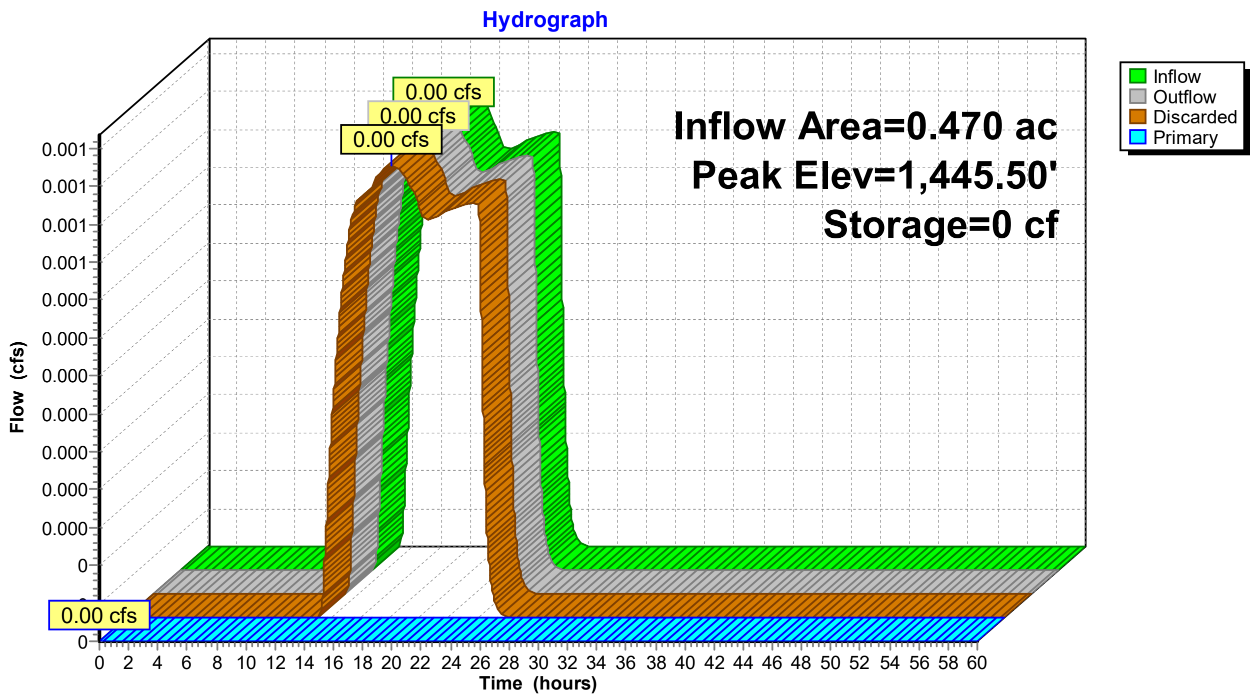
Volume	Invert	Avail.Storage	Storage Description
#1	1,445.50'	2,317 cf	**10.00'W x 20.00'L x 3.50'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,445.50'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,448.25'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.00 cfs @ 18.09 hrs HW=1,445.50' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,445.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4.2bP: Pond 4 - Access Rd East



Summary for Pond 4.2C: 18" Culvert

Inflow Area = 27.587 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.50' @ 0.00 hrs Storage= 0 cf
Flood Elev= 1,434.64' Surf.Area= 27,666 sf Storage= 28,656 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

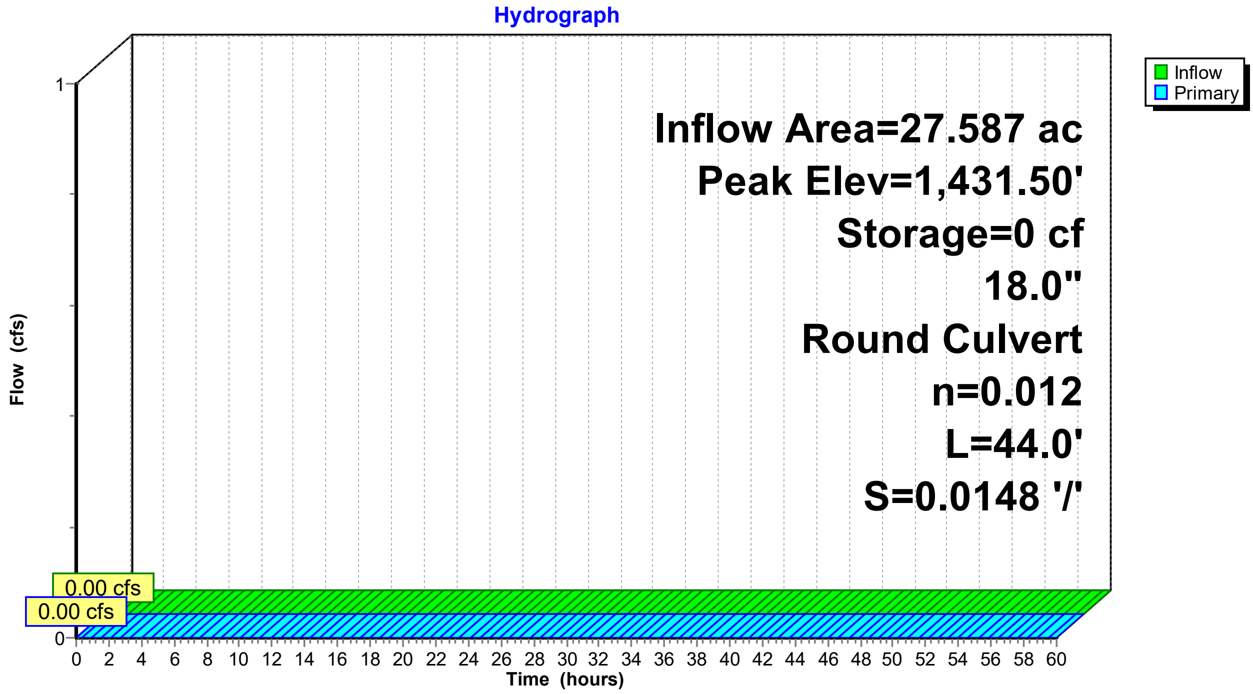
Volume	Invert	Avail.Storage	Storage Description
#1	1,431.50'	39,033 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,431.50	0	0.0	0	0	0
1,432.00	1,190	146.0	198	198	1,697
1,432.50	3,534	368.0	1,129	1,327	10,778
1,433.00	5,795	497.0	2,309	3,637	19,660
1,433.50	10,362	837.0	3,984	7,621	55,755
1,434.00	16,931	975.0	6,756	14,377	75,659
1,434.60	27,412	1,352.0	13,177	27,555	145,474
1,435.00	30,000	1,500.0	11,479	39,033	179,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.83'	**18.0" Round Culvert** L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.83' / 1,431.18' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.50' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)

Pond 4.2C: 18" Culvert



Summary for Pond 4.3C: 24" Culvert

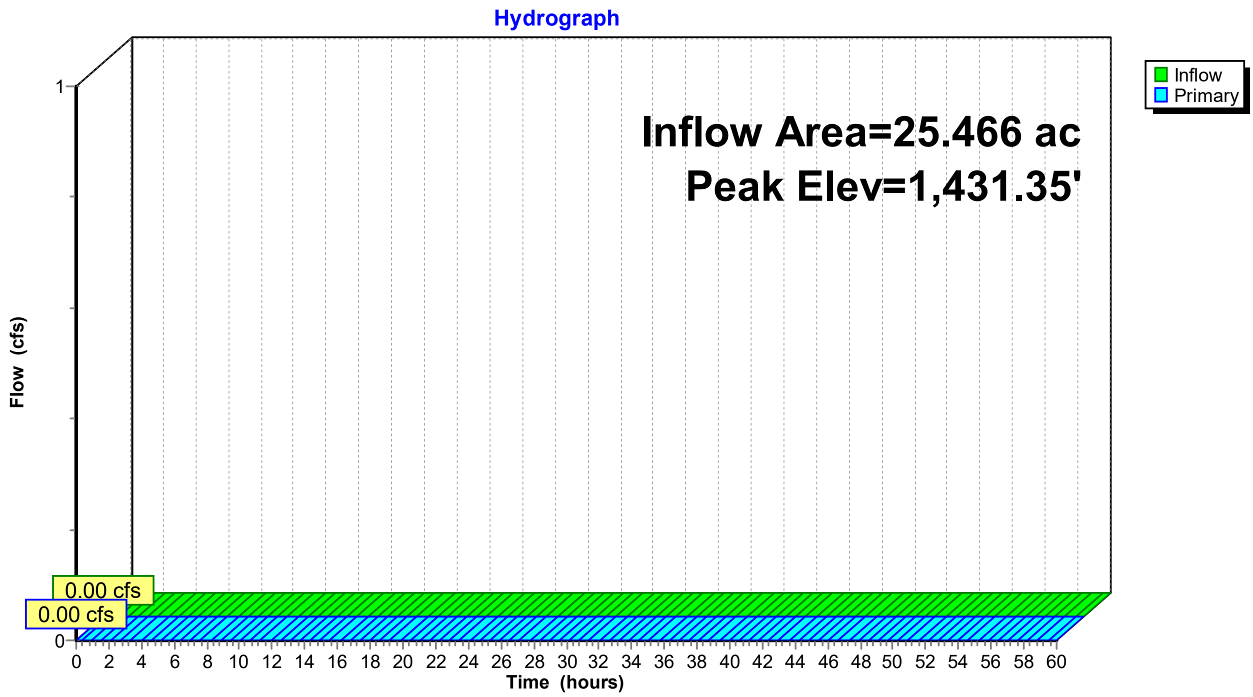
Inflow Area = 25.466 ac, 5.08% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.35' @ 0.00 hrs
Flood Elev= 1,434.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.35'	**24.0" Round Culvert** L= 55.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.35' / 1,429.87' S= 0.0265 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Primary	1,434.81'	**20.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.35' (Free Discharge)
1=Culvert (Controls 0.00 cfs)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 4.3C: 24" Culvert

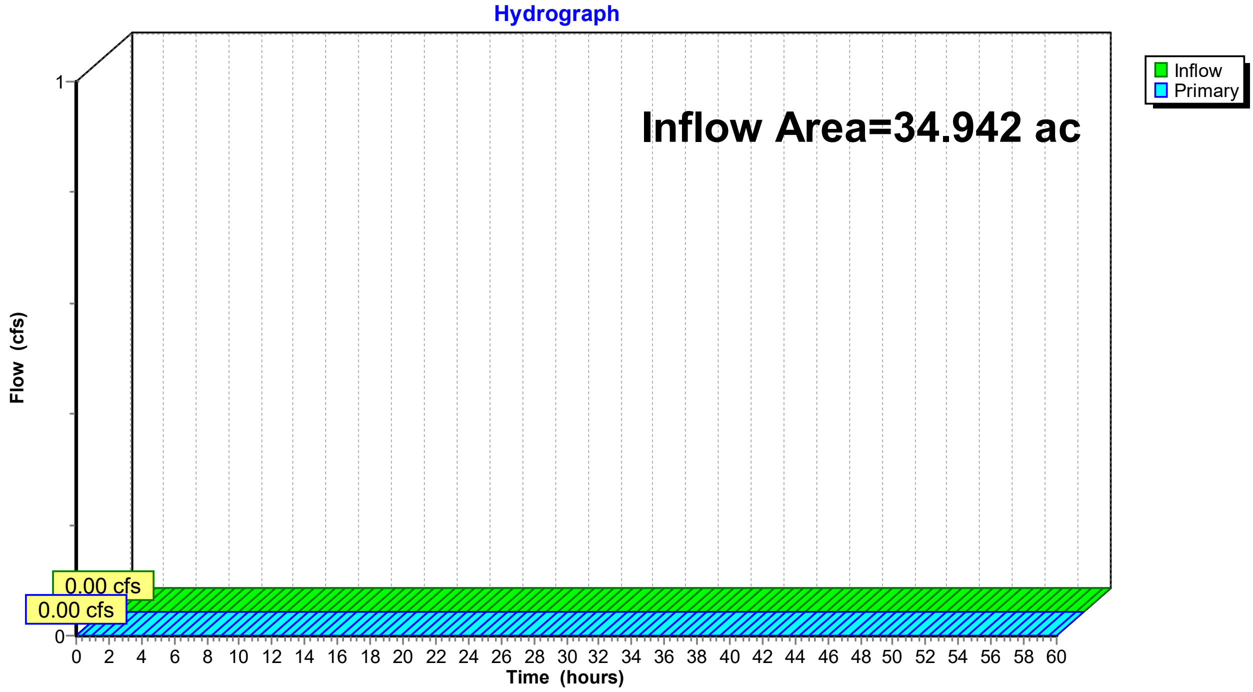


Summary for Link 1.1L:

Inflow Area = 34.942 ac, 0.04% Impervious, Inflow Depth = 0.00" for WQv 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
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link 1.1L:

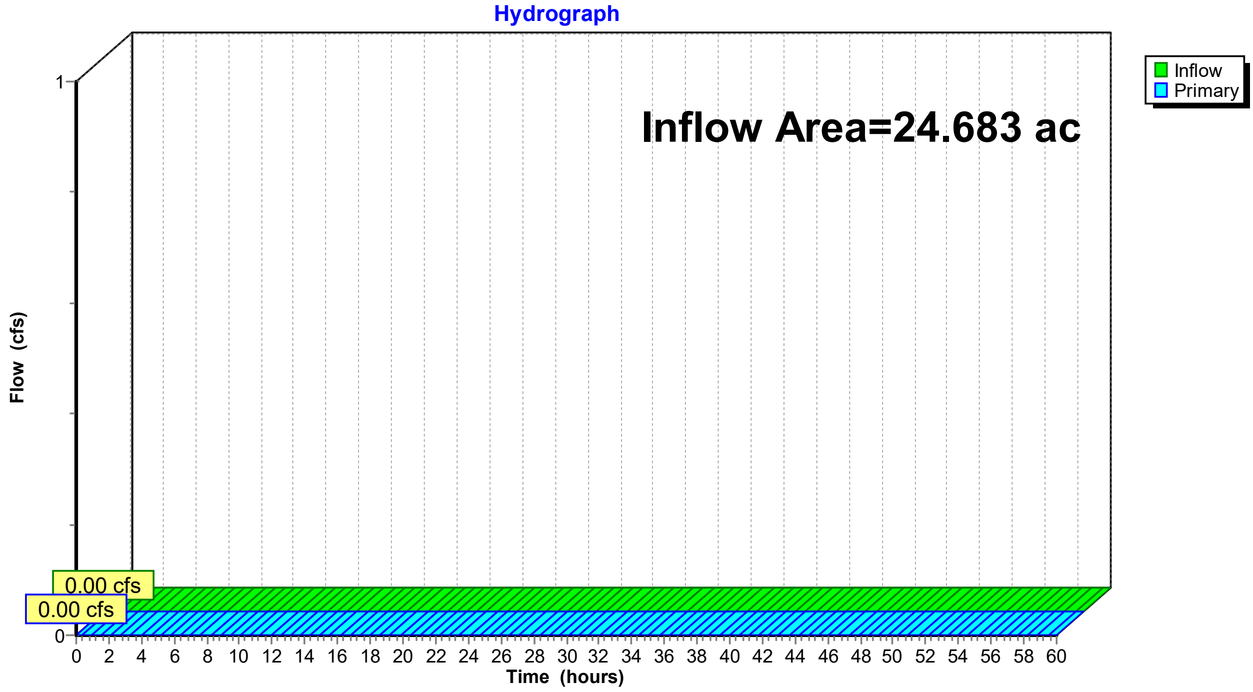


Summary for Link 1.2L:

Inflow Area = 24.683 ac, 0.06% Impervious, Inflow Depth = 0.00" for WQv 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
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link 1.2L:

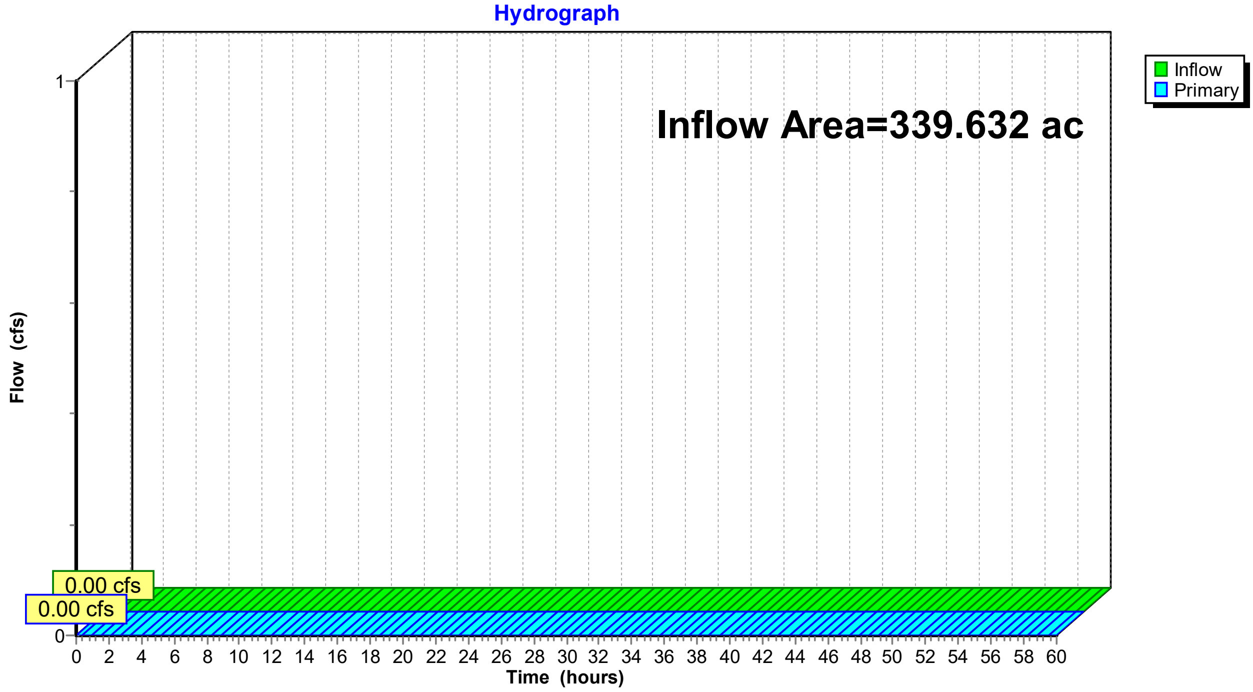


Summary for Link SP1: Study Point 1

Inflow Area = 339.632 ac, 0.01% Impervious, Inflow Depth = 0.00" for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP1: Study Point 1

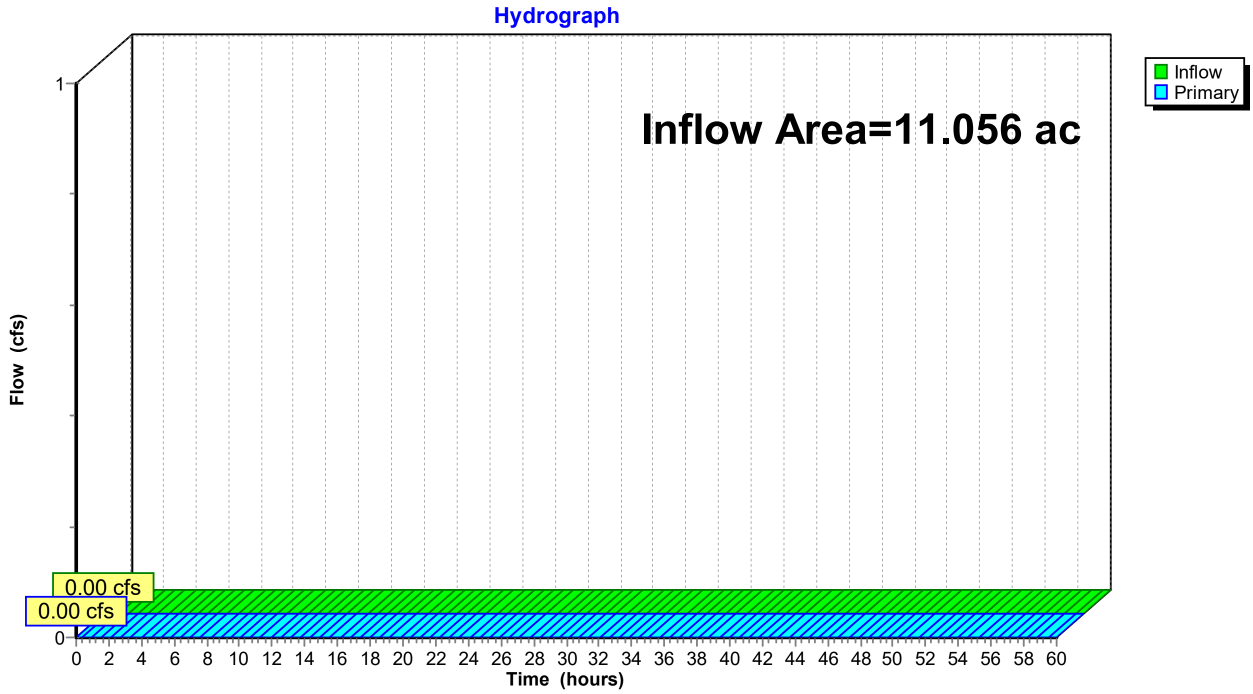


Summary for Link SP2: Study Point 2

Inflow Area =	11.056 ac,	0.00% Impervious,	Inflow Depth = 0.00"	for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP2: Study Point 2

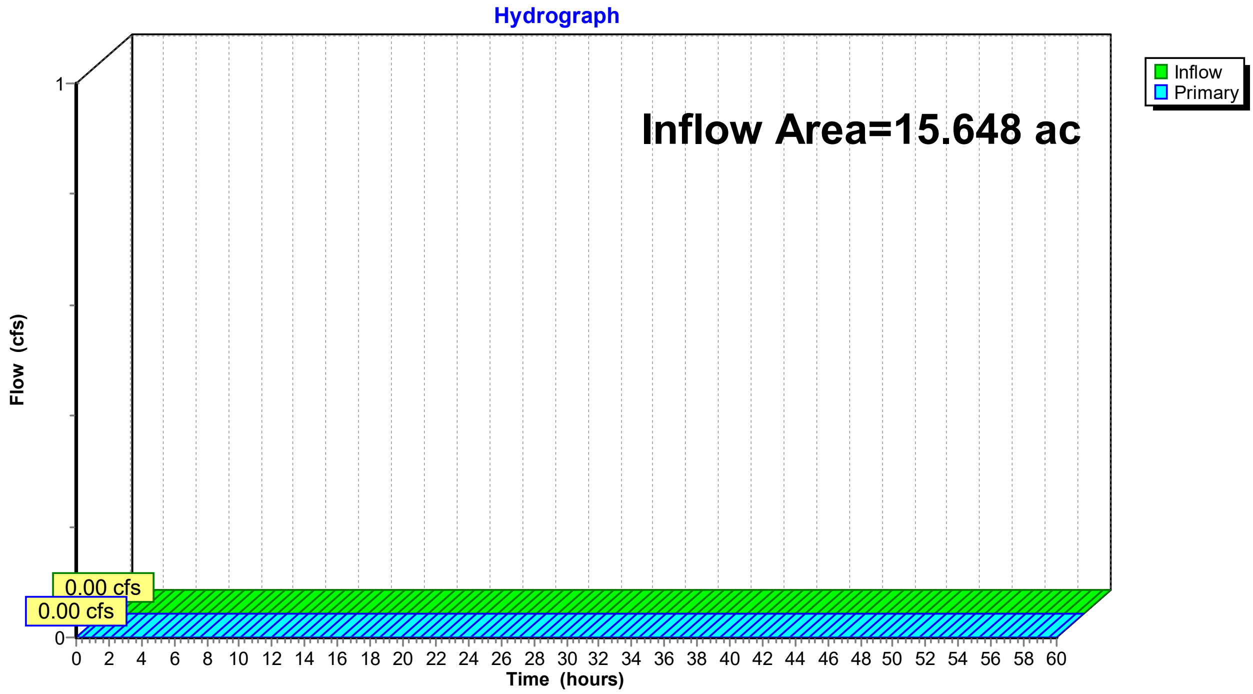


Summary for Link SP3: Study Point 3

Inflow Area =	15.648 ac,	0.56% Impervious, Inflow Depth = 0.00"	for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP3: Study Point 3

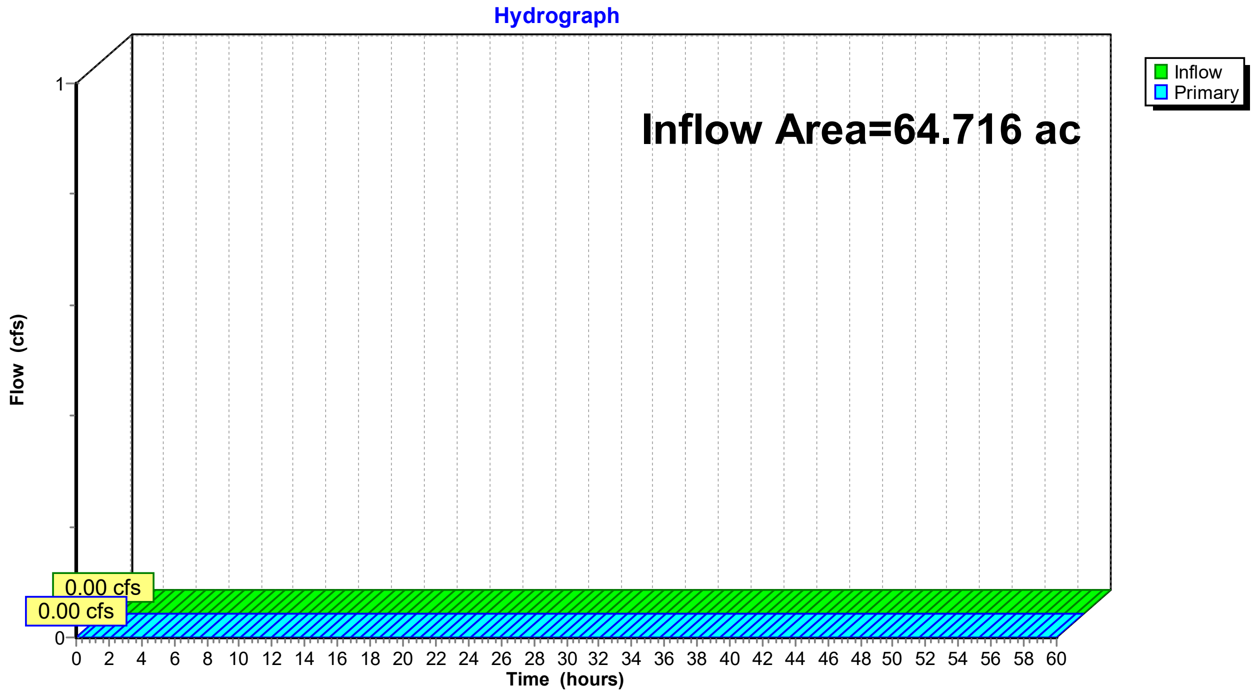


Summary for Link SP4: Study Point 4

Inflow Area =	64.716 ac,	2.50% Impervious, Inflow Depth = 0.00"	for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP4: Study Point 4

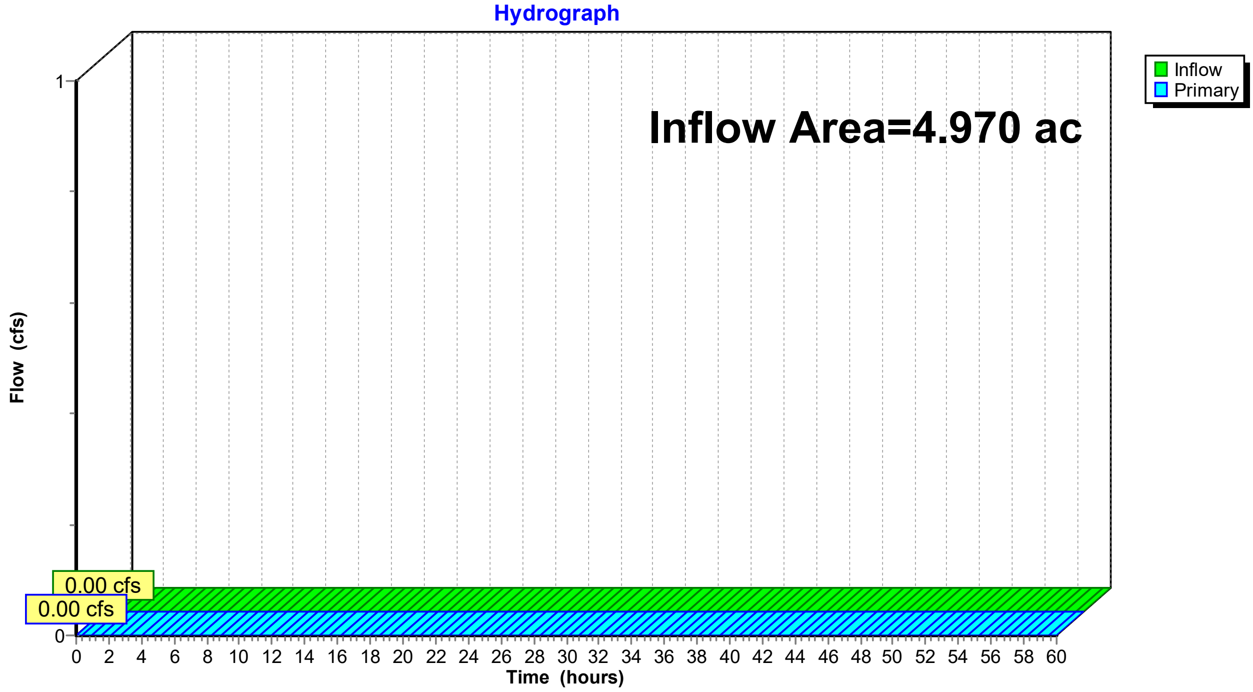


Summary for Link SP5: Study Point 5

Inflow Area =	4.970 ac,	0.00% Impervious, Inflow Depth = 0.00"	for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP5: Study Point 5

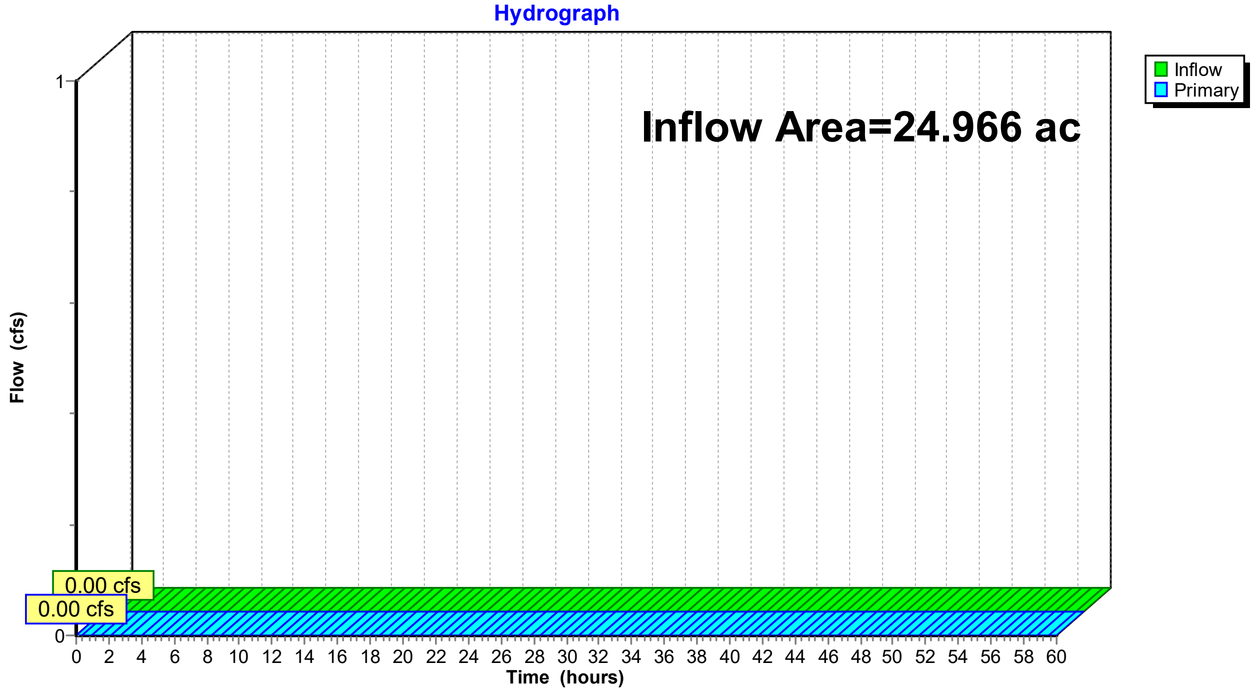


Summary for Link SP6: Study Point 6

Inflow Area =	24.966 ac,	5.81% Impervious, Inflow Depth = 0.00"	for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP6: Study Point 6



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1.1aS1: North Array East Runoff Area=5.874 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=788' Tc=18.8 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS2: North Array East Runoff Area=8.467 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=931' Tc=21.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS3: North Array West Runoff Area=5.792 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,031' Tc=19.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS4: North Array West Runoff Area=12.825 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,562' Tc=26.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1bS1: North Road - East Runoff Area=1.333 ac 0.53% Impervious Runoff Depth=0.26"
Tc=6.0 min CN=71 Runoff=0.47 cfs 0.029 af

Subcatchment 1.1bS2: North Road - West Runoff Area=0.651 ac 1.08% Impervious Runoff Depth=0.19"
Tc=6.0 min CN=68 Runoff=0.13 cfs 0.010 af

Subcatchment 1.2aS1: Middle Array East Runoff Area=7.876 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=865' Tc=19.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS2: Middle Array Center Runoff Area=8.911 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=825' Tc=18.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS3: Middle Array West Runoff Area=5.500 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=18.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2bS1: East Road - West Runoff Area=0.727 ac 0.00% Impervious Runoff Depth=0.17"
Tc=6.0 min CN=67 Runoff=0.12 cfs 0.010 af

Subcatchment 1.2bS2: South Road Runoff Area=0.854 ac 0.47% Impervious Runoff Depth=0.04"
Flow Length=308' Tc=13.7 min CN=58 Runoff=0.00 cfs 0.003 af

Subcatchment 1.2bS3: South Road Runoff Area=0.815 ac 1.35% Impervious Runoff Depth=0.26"
Tc=6.0 min CN=71 Runoff=0.29 cfs 0.018 af

Subcatchment 1.3aS1: Surface Discharge Runoff Area=279.312 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=6,771' Tc=201.7 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 1.3bS: Access Rd to Pond 3 Runoff Area=0.695 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=51 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Runoff Area=11.056 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=2,342' Tc=36.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 3S: Runoff Area=15.648 ac 0.56% Impervious Runoff Depth=0.00"
Flow Length=886' Tc=12.7 min CN=40 Runoff=0.00 cfs 0.000 af

Subcatchment 4.1S: Runoff Area=11.663 ac 2.80% Impervious Runoff Depth=0.00"
Flow Length=845' Tc=15.8 min CN=45 Runoff=0.00 cfs 0.000 af

Subcatchment 4.2aS: Runoff Area=27.117 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,640' Tc=38.9 min CN=51 Runoff=0.01 cfs 0.001 af

Subcatchment 4.2bS: Runoff Area=0.470 ac 0.00% Impervious Runoff Depth=0.28"
Tc=6.0 min CN=72 Runoff=0.19 cfs 0.011 af

Subcatchment 4.3S: Runoff Area=25.466 ac 5.08% Impervious Runoff Depth=0.03"
Flow Length=2,280' Tc=36.5 min CN=57 Runoff=0.07 cfs 0.059 af

Subcatchment 5S: Runoff Area=4.970 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,180' Tc=17.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 6S: Runoff Area=24.966 ac 5.81% Impervious Runoff Depth=0.00"
Flow Length=1,961' Tc=60.1 min CN=43 Runoff=0.00 cfs 0.000 af

Reach 1.1aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.0' S=0.0108 '/' Capacity=56.37 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.4' S=0.0284 '/' Capacity=91.27 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.5' S=0.0352 '/' Capacity=101.68 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR4: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.5' S=0.0362 '/' Capacity=103.04 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1bR1: North Road Conveyance Avg. Flow Depth=0.06' Max Vel=0.94 fps Inflow=0.47 cfs 0.029 af
n=0.035 L=1,733.0' S=0.0240 '/' Capacity=111.65 cfs Outflow=0.12 cfs 0.029 af

Reach 1.1bR2: North Road Conveyance Avg. Flow Depth=0.06' Max Vel=1.18 fps Inflow=0.20 cfs 0.039 af
n=0.035 L=593.3' S=0.0380 '/' Capacity=140.36 cfs Outflow=0.15 cfs 0.039 af

Reach 1.2aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=524.2' S=0.0188 '/' Capacity=74.30 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=556.0' S=0.0204 '/' Capacity=77.47 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=249.0' S=0.0153 '/' Capacity=81.84 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2bR1: East Road Conveyance Avg. Flow Depth=0.03' Max Vel=0.80 fps Inflow=0.12 cfs 0.010 af
n=0.035 L=731.4' S=0.0456 '/' Capacity=79.22 cfs Outflow=0.04 cfs 0.010 af

Reach 1.2bR2: South Road Conveyance Avg. Flow Depth=0.03' Max Vel=0.53 fps Inflow=0.04 cfs 0.013 af
n=0.035 L=604.5' S=0.0177 '/' Capacity=95.76 cfs Outflow=0.03 cfs 0.013 af

Reach 1.2bR3: South Road Conveyance Avg. Flow Depth=0.06' Max Vel=0.89 fps Inflow=0.29 cfs 0.030 af
n=0.035 L=755.9' S=0.0187 '/' Capacity=98.64 cfs Outflow=0.13 cfs 0.030 af

Reach 4.1R1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=570.0' S=0.0303 '/' Capacity=54.88 cfs Outflow=0.00 cfs 0.000 af

Reach 4.1R2: Ex Stream Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=740.0' S=0.0099 '/' Capacity=588.81 cfs Outflow=0.00 cfs 0.000 af

Reach 4.2bR: Conveyance Swale Avg. Flow Depth=0.05' Max Vel=1.13 fps Inflow=0.19 cfs 0.011 af
n=0.035 L=565.0' S=0.0432 '/' Capacity=77.09 cfs Outflow=0.12 cfs 0.011 af

Pond 1.1aC1: TS1 Culvert Peak Elev=1,487.56' Inflow=0.00 cfs 0.000 af
36.3" x 22.5", R=18.8"/51.0" Pipe Arch Culvert n=0.012 L=47.0' S=0.0162 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC2: TS2 Culvert Peak Elev=1,470.80' Inflow=0.00 cfs 0.000 af
48.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0262 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC3: TS3 Culvert Peak Elev=1,449.55' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.2' S=0.0405 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aP: North Road Bypass OC Peak Elev=1,426.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.1bC1: TS4 Culvert Peak Elev=1,449.65' Inflow=0.12 cfs 0.029 af
18.0" Round Culvert n=0.012 L=45.9' S=0.0486 '/' Outflow=0.12 cfs 0.029 af

Pond 1.1bP1: Dry Swale Peak Elev=1,425.78' Storage=78 cf Inflow=0.15 cfs 0.039 af
Discarded=0.00 cfs 0.004 af Primary=0.15 cfs 0.035 af Outflow=0.15 cfs 0.039 af

Pond 1.1bP2: North Road Detention Pond Peak Elev=1,423.08' Storage=0.024 af Inflow=0.15 cfs 0.035 af
Discarded=0.01 cfs 0.034 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.034 af

Pond 1.2aC1: TS 7 Culvert Peak Elev=1,444.22' Inflow=0.00 cfs 0.000 af
36.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0215 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aC2: TS8 Culvert Peak Elev=1,431.65' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.5' S=0.0114 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aP: South Road Bypass OC Peak Elev=1,424.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.2bC1: East Road Culvert Peak Elev=1,454.48' Inflow=0.04 cfs 0.010 af
15.0" Round Culvert n=0.012 L=41.6' S=0.0173 '/' Outflow=0.04 cfs 0.010 af

Pond 1.2bC2: TS6 Culvert Peak Elev=1,443.58' Inflow=0.03 cfs 0.013 af
18.0" Round Culvert n=0.012 L=44.3' S=0.0151 '/' Outflow=0.03 cfs 0.013 af

Pond 1.2bP: South Road Treatment Pond Peak Elev=1,424.05' Storage=0.000 af Inflow=0.13 cfs 0.030 af
Discarded=0.11 cfs 0.030 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.030 af

Pond 1.3P: Pond 3 - Access Rd West Peak Elev=1,456.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 4.2bP: Pond 4 - Access Rd East Peak Elev=1,445.81' Storage=70 cf Inflow=0.12 cfs 0.011 af
Discarded=0.04 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.011 af

Pond 4.2C: 18" Culvert Peak Elev=1,431.78' Storage=35 cf Inflow=0.01 cfs 0.001 af
18.0" Round Culvert n=0.012 L=44.0' S=0.0148 '/' Outflow=0.00 cfs 0.000 af

Pond 4.3C: 24" Culvert Peak Elev=1,431.46' Inflow=0.07 cfs 0.059 af
Outflow=0.07 cfs 0.059 af

Link 1.1L:	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link 1.2L:	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP1: Study Point 1	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP2: Study Point 2	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP3: Study Point 3	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP4: Study Point 4	Inflow=0.07 cfs 0.059 af Primary=0.07 cfs 0.059 af
Link SP5: Study Point 5	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP6: Study Point 6	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af

Total Runoff Area = 460.988 ac Runoff Volume = 0.140 af Average Runoff Depth = 0.00"
99.31% Pervious = 457.801 ac 0.69% Impervious = 3.187 ac

Summary for Subcatchment 1.1aS1: North Array East

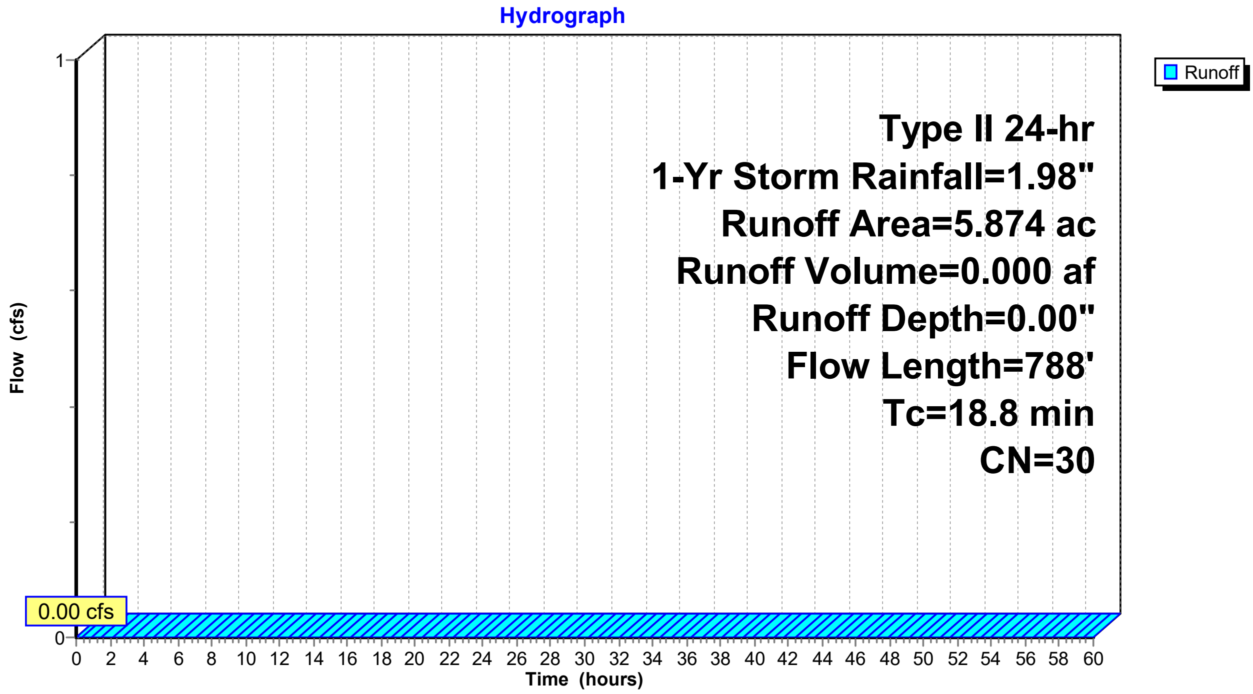
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
5.874	30	Meadow, non-grazed, HSG A
5.874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0499	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.1	688	0.0526	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.8	788	Total			

Subcatchment 1.1aS1: North Array East



Summary for Subcatchment 1.1aS2: North Array East Center

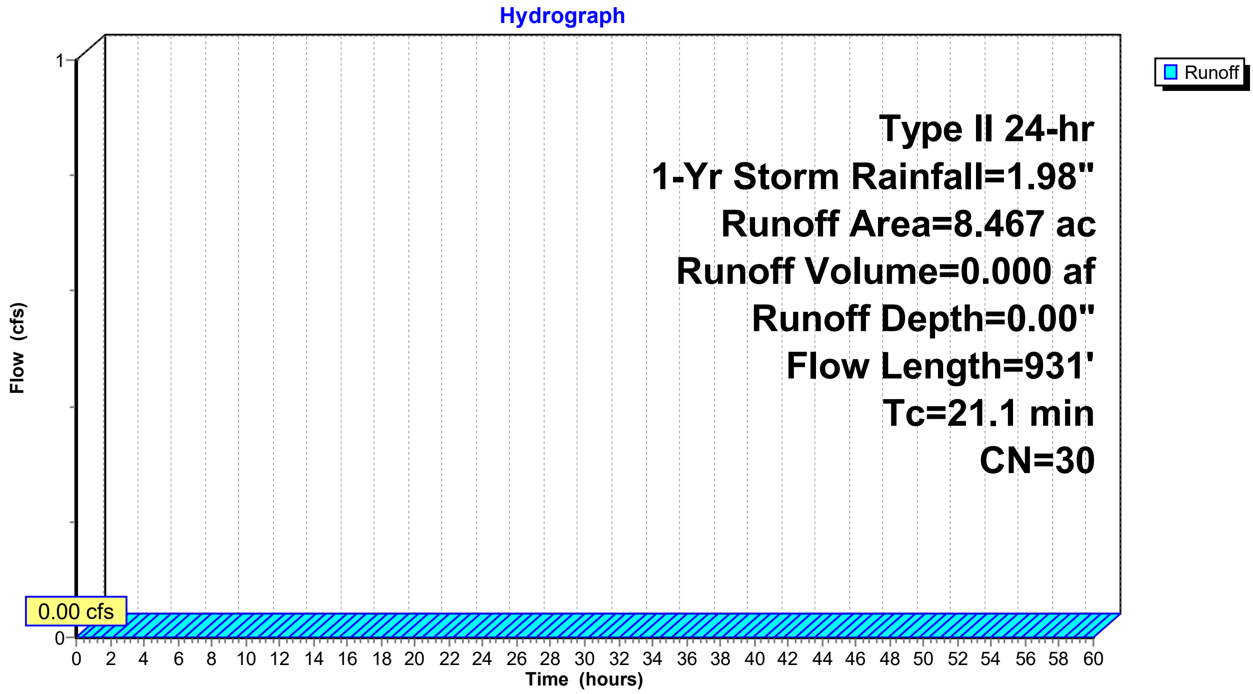
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
8.467	30	Meadow, non-grazed, HSG A
8.467		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0476	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.2	831	0.0463	1.51		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.1	931	Total			

Subcatchment 1.1aS2: North Array East Center



Summary for Subcatchment 1.1aS3: North Array West Center

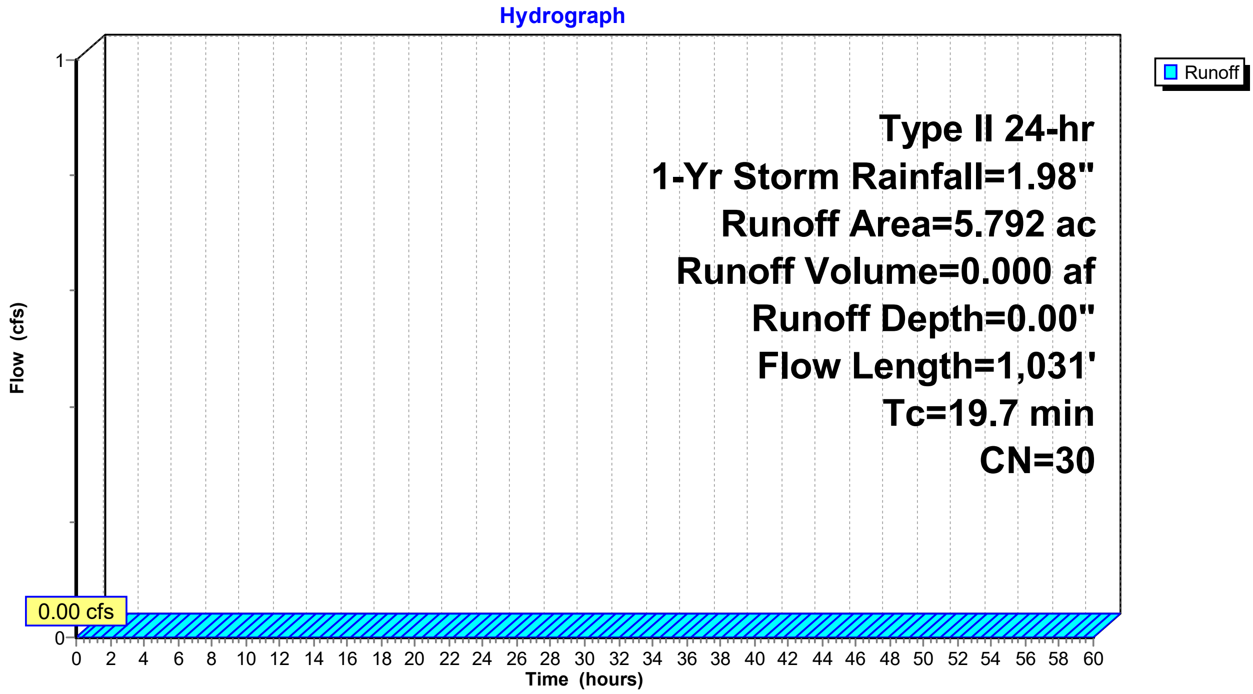
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
5.792	30	Meadow, non-grazed, HSG A
5.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0618	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.0	931	0.0601	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	1,031	Total			

Subcatchment 1.1aS3: North Array West Center



Summary for Subcatchment 1.1aS4: North Array West

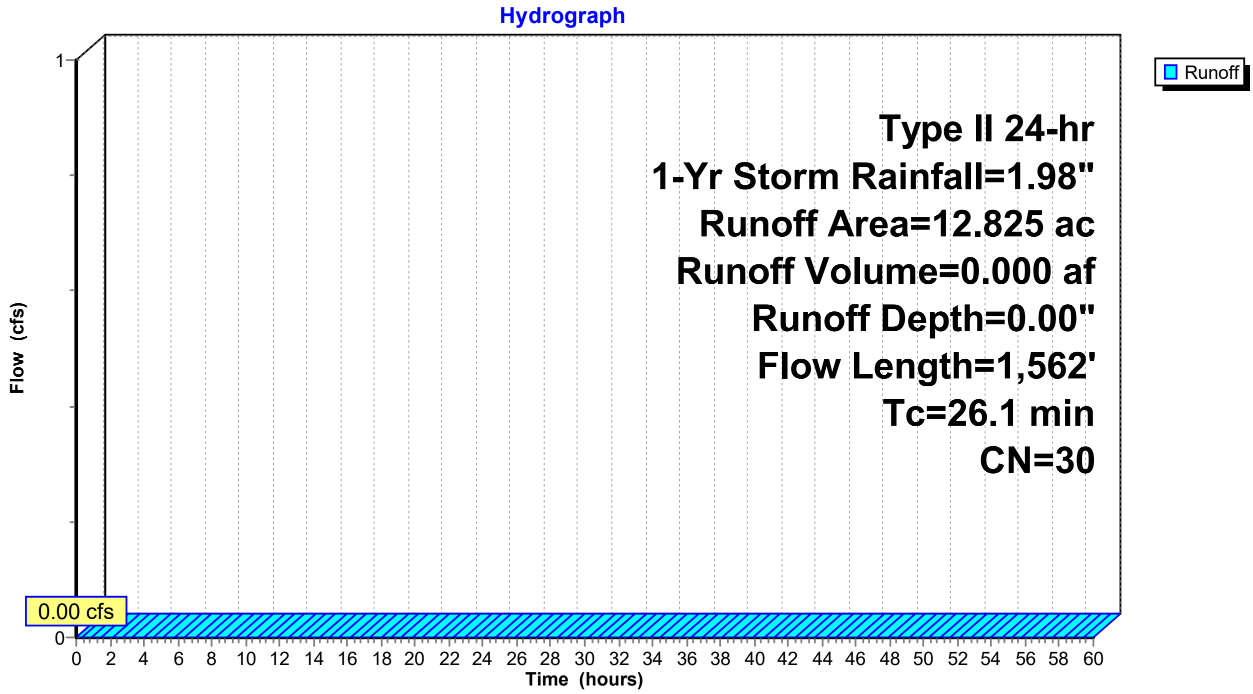
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR4 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
12.825	30	Meadow, non-grazed, HSG A
12.825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0560	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
15.0	1,462	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.1	1,562	Total			

Subcatchment 1.1aS4: North Array West



Summary for Subcatchment 1.1bS1: North Road - East

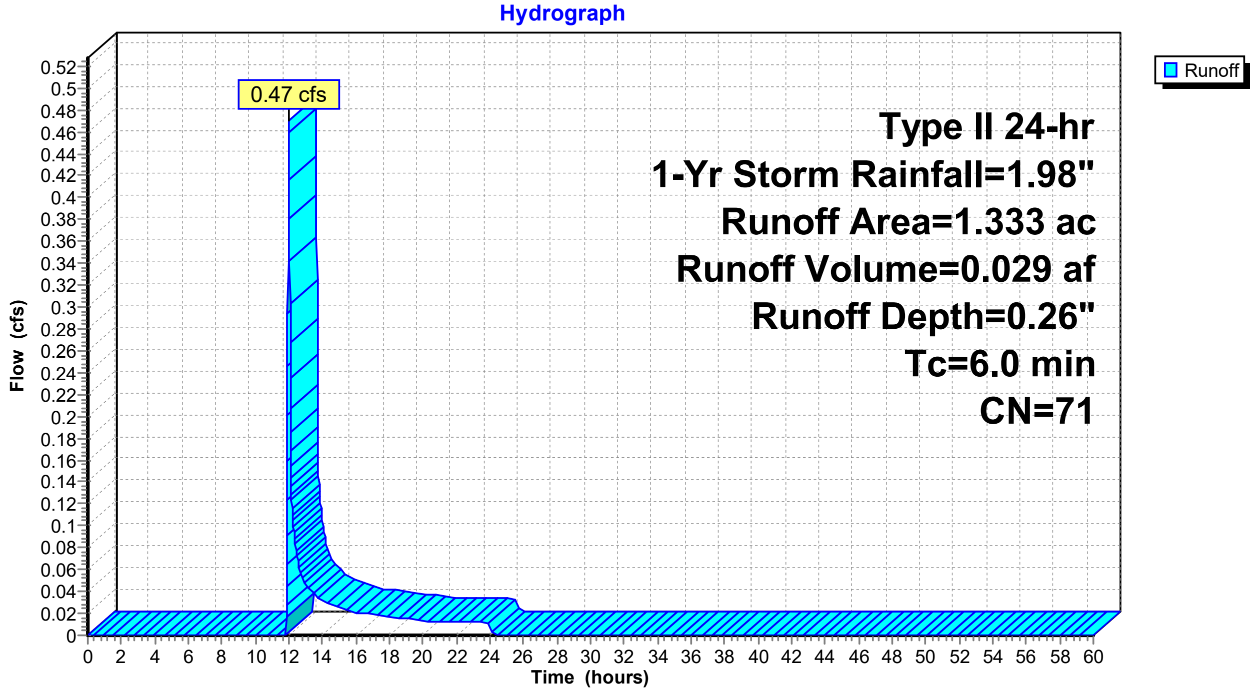
Runoff = 0.47 cfs @ 12.00 hrs, Volume= 0.029 af, Depth= 0.26"
Routed to Reach 1.1bR1 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
0.507	30	Meadow, non-grazed, HSG A
0.819	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
1.333	71	Weighted Average
1.326		99.47% Pervious Area
0.007		0.53% Impervious Area

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

Subcatchment 1.1bS1: North Road - East



Summary for Subcatchment 1.1bS2: North Road - West

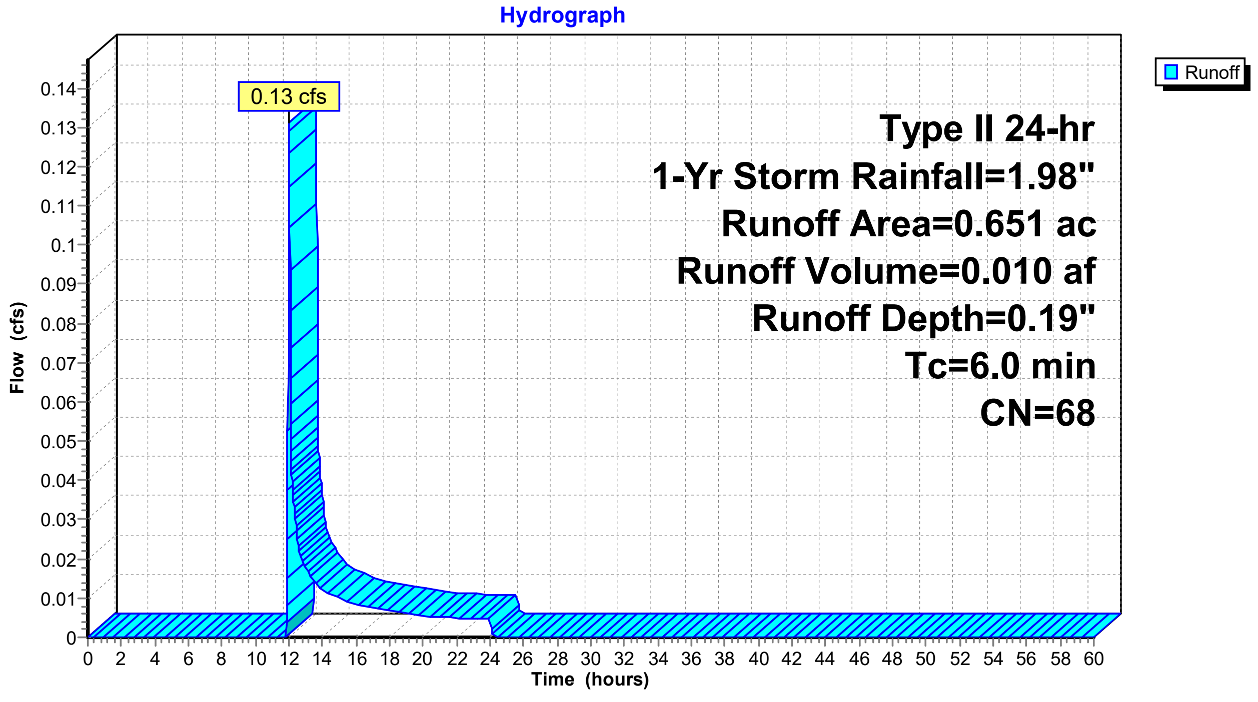
Runoff = 0.13 cfs @ 12.01 hrs, Volume= 0.010 af, Depth= 0.19"
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
0.279	30	Meadow, non-grazed, HSG A
0.365	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
0.651	68	Weighted Average
0.644		98.92% Pervious Area
0.007		1.08% Impervious Area

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

Subcatchment 1.1bS2: North Road - West



Summary for Subcatchment 1.2aS1: Middle Array East

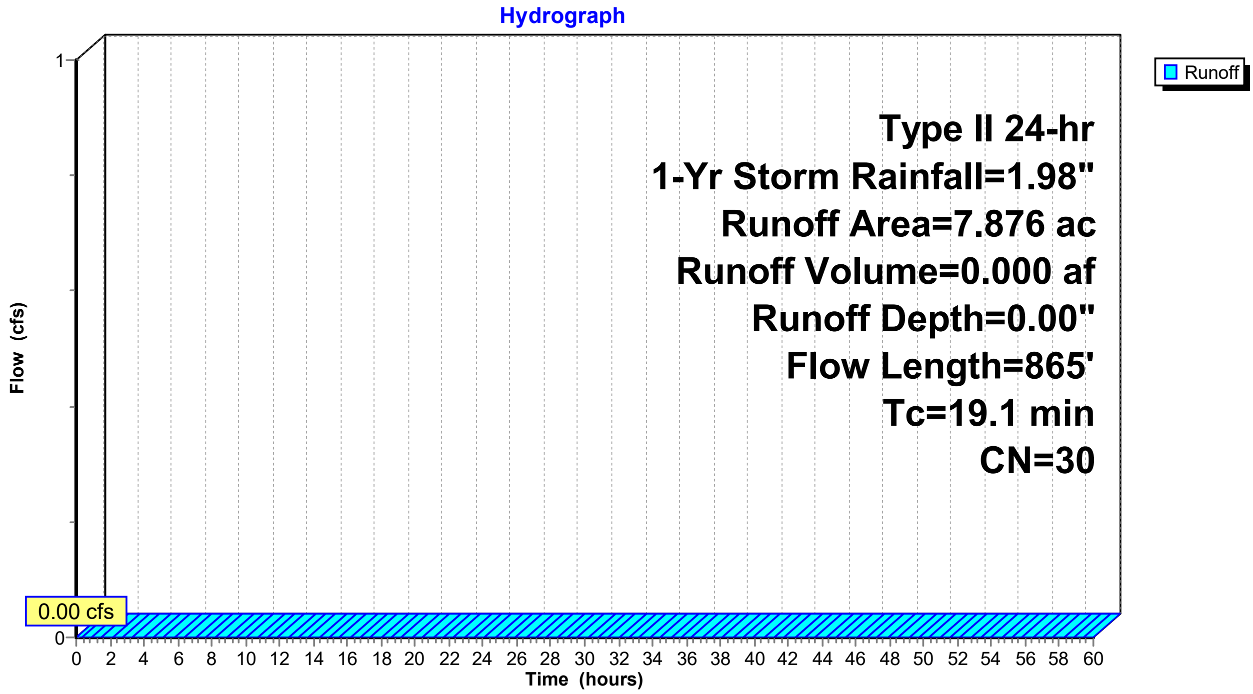
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
7.876	30	Meadow, non-grazed, HSG A
7.876		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0628	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.5	765	0.0459	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.1	865	Total			

Subcatchment 1.2aS1: Middle Array East



Summary for Subcatchment 1.2aS2: Middle Array Center

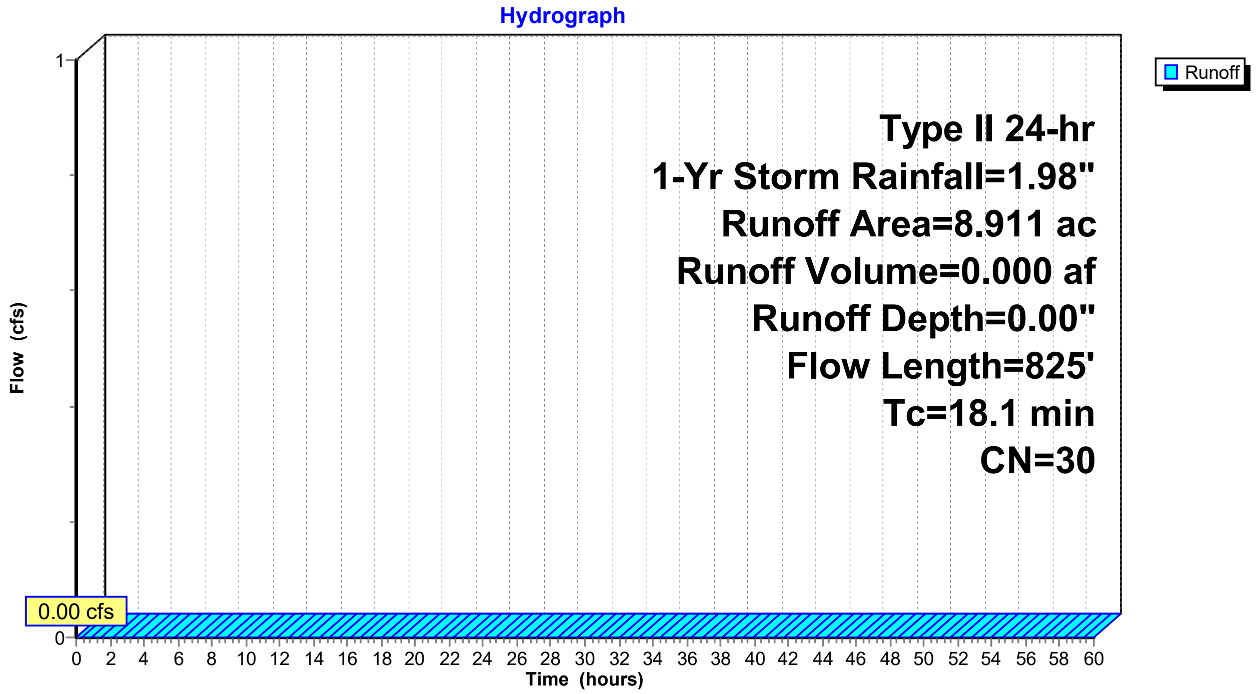
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
8.911	30	Meadow, non-grazed, HSG A
8.911		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0607	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.3	725	0.0559	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.1	825	Total			

Subcatchment 1.2aS2: Middle Array Center



Summary for Subcatchment 1.2aS3: Middle Array West

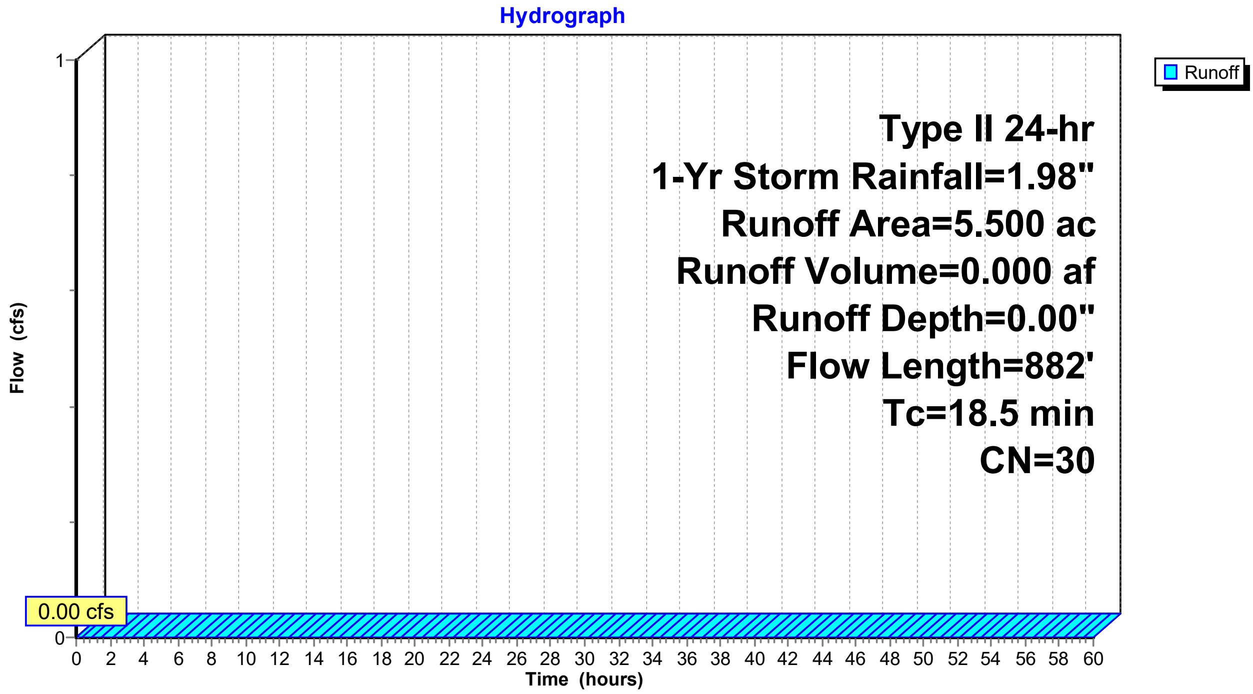
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
5.500	30	Meadow, non-grazed, HSG A
5.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.0660	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.1	782	0.0529	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.5	882	Total			

Subcatchment 1.2aS3: Middle Array West



Summary for Subcatchment 1.2bS1: East Road - West Ditch

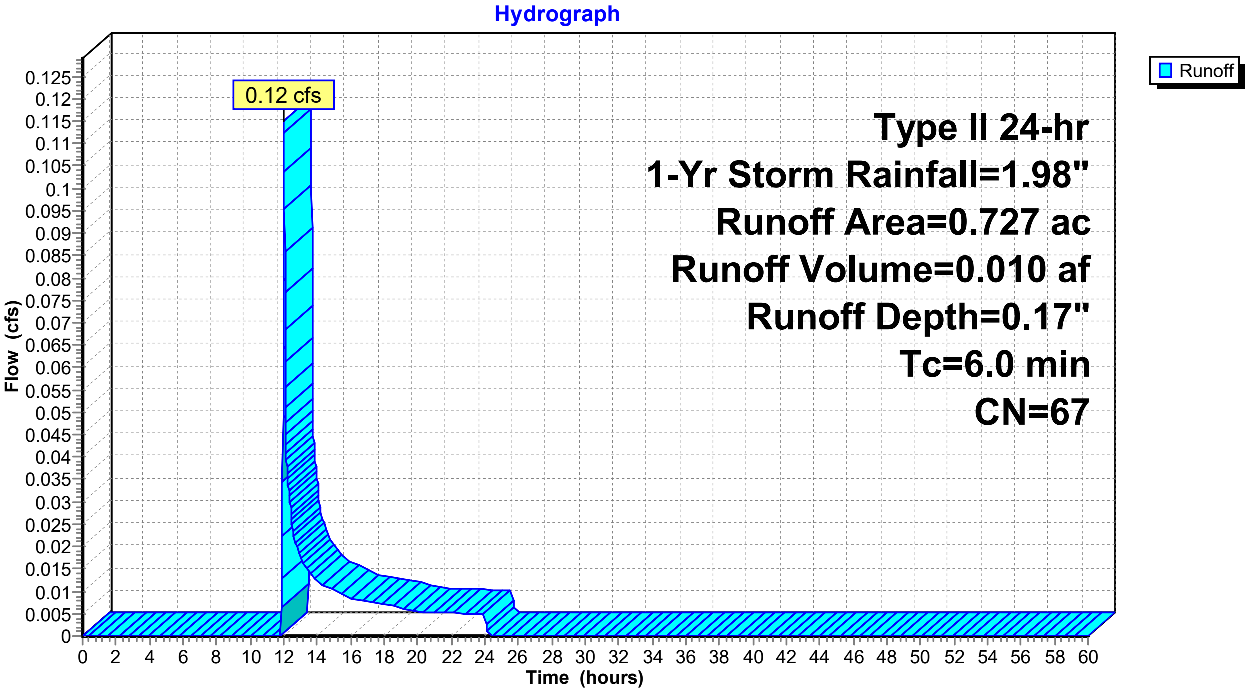
Runoff = 0.12 cfs @ 12.01 hrs, Volume= 0.010 af, Depth= 0.17"
Routed to Reach 1.2bR1 : East Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
0.410	96	Gravel surface, HSG A
0.317	30	Meadow, non-grazed, HSG A
0.727	67	Weighted Average
0.727		100.00% Pervious Area

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

Subcatchment 1.2bS1: East Road - West Ditch



Summary for Subcatchment 1.2bS2: South Road

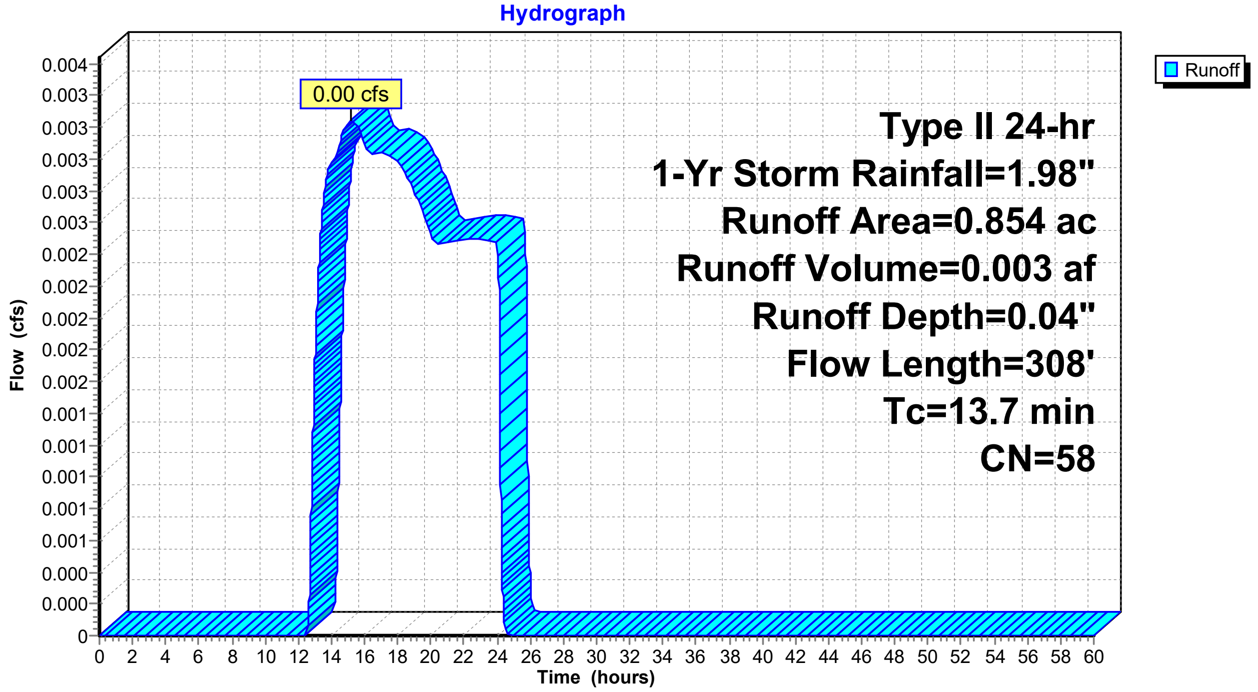
Runoff = 0.00 cfs @ 15.21 hrs, Volume= 0.003 af, Depth= 0.04"
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
	0.498	30	Meadow, non-grazed, HSG A
*	0.352	96	Gravel surface
*	0.004	98	Roofs
	0.854	58	Weighted Average
	0.850		99.53% Pervious Area
	0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0516	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
0.4	25	0.0310	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
5.9	40	0.0429	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.4	208	0.0442	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	308	Total			

Subcatchment 1.2bS2: South Road



Summary for Subcatchment 1.2bS3: South Road

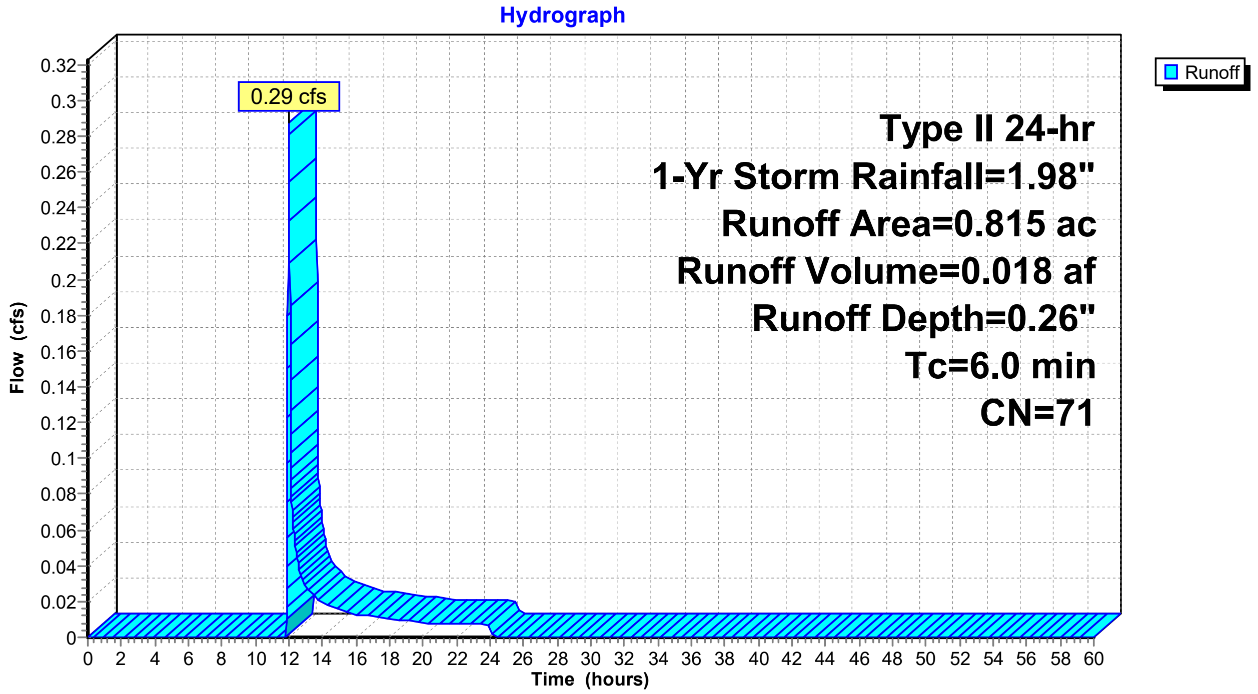
Runoff = 0.29 cfs @ 12.00 hrs, Volume= 0.018 af, Depth= 0.26"
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
	0.313	30	Meadow, non-grazed, HSG A
	0.491	96	Gravel surface, HSG A
*	0.011	98	Roofs
	0.815	71	Weighted Average
	0.804		98.65% Pervious Area
	0.011		1.35% Impervious Area

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

Subcatchment 1.2bS3: South Road



Summary for Subcatchment 1.3aS1: Surface Discharge

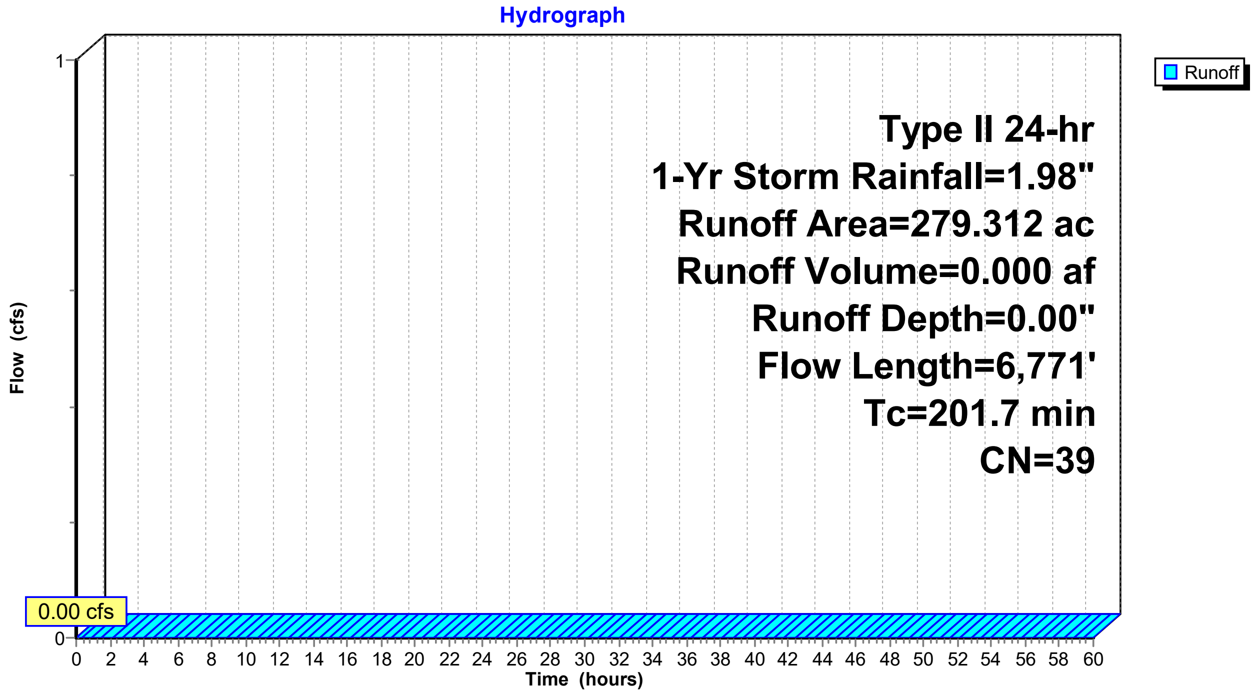
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.754	96	Gravel surface
	144.649	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	25.274	71	Meadow, non-grazed, HSG C
	61.692	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	13.623	70	Woods, Good, HSG C
	279.312	39	Weighted Average
	279.312		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	189	0.0157	3.84	76.82	**Channel Flow, Rerouted Stream** Area= 20.0 sf Perim= 32.6' r= 0.61' n= 0.035 Earth, dense weeds
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
201.7	6,771	Total			

Subcatchment 1.3aS1: Surface Discharge



Summary for Subcatchment 1.3bS: Access Rd to Pond 3

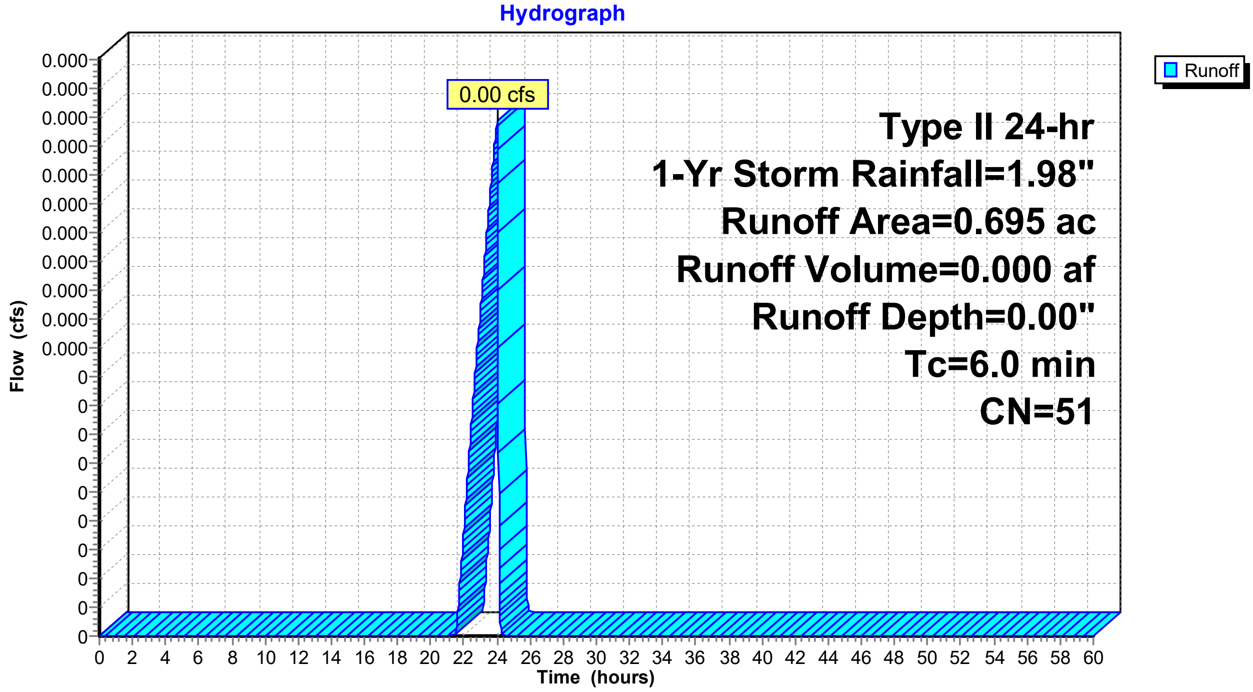
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond 1.3P : Pond 3 - Access Rd West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
	0.473	30	Meadow, non-grazed, HSG A
*	0.063	96	Gravel surface, HSG A, Redev
*	0.159	96	Gravel surface, HSG A
	0.695	51	Weighted Average
	0.695		100.00% Pervious Area

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

Subcatchment 1.3bS: Access Rd to Pond 3



Summary for Subcatchment 2S:

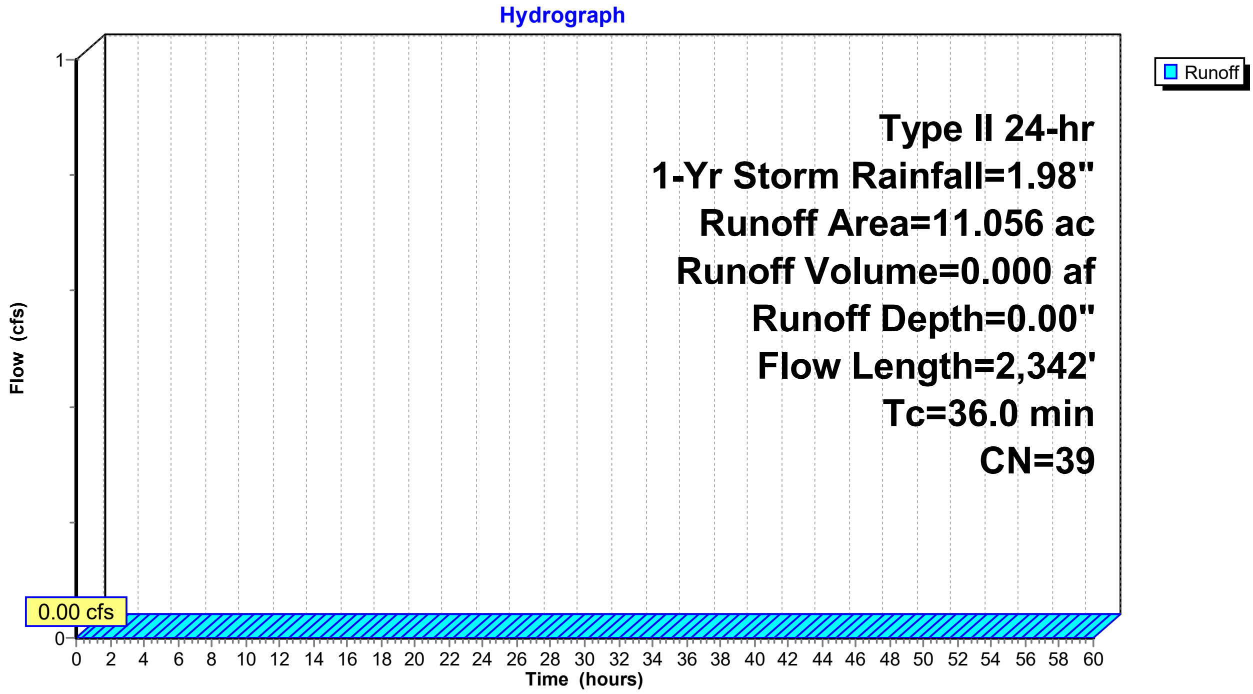
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
1.417	96	Gravel surface, HSG A
0.573	39	>75% Grass cover, Good, HSG A
6.530	30	Meadow, non-grazed, HSG A
2.536	30	Woods, Good, HSG A
11.056	39	Weighted Average
11.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0624	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.7	614	0.0535	3.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	1,184	0.0543	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	115	0.0407	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	68	0.1443	1.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	261	0.0118	0.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.0	2,342	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

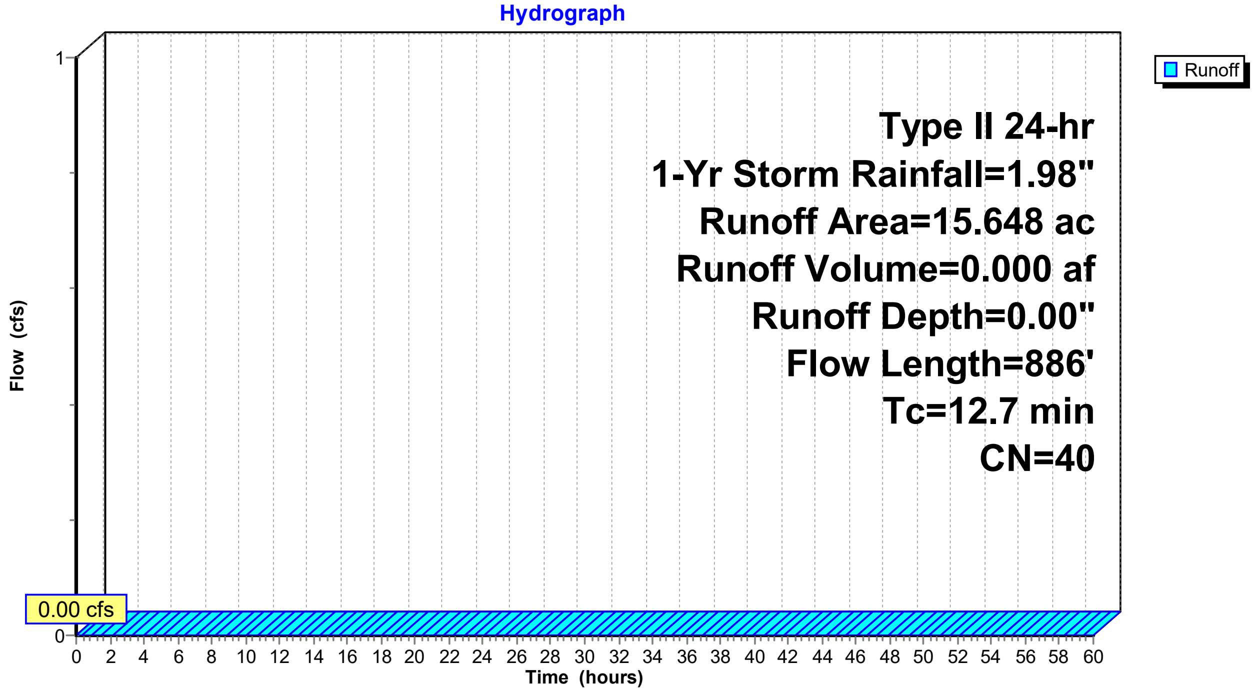
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.088	98	Paved Roads & Rooftops
	0.406	39	>75% Grass cover, Good, HSG A
	2.011	61	>75% Grass cover, Good, HSG B
	5.525	30	Meadow, non-grazed, HSG A
	4.276	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	15.648	40	Weighted Average
	15.560		99.44% Pervious Area
	0.088		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	52	0.0937	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.7	886	Total			

Subcatchment 3S:



Summary for Subcatchment 4.1S:

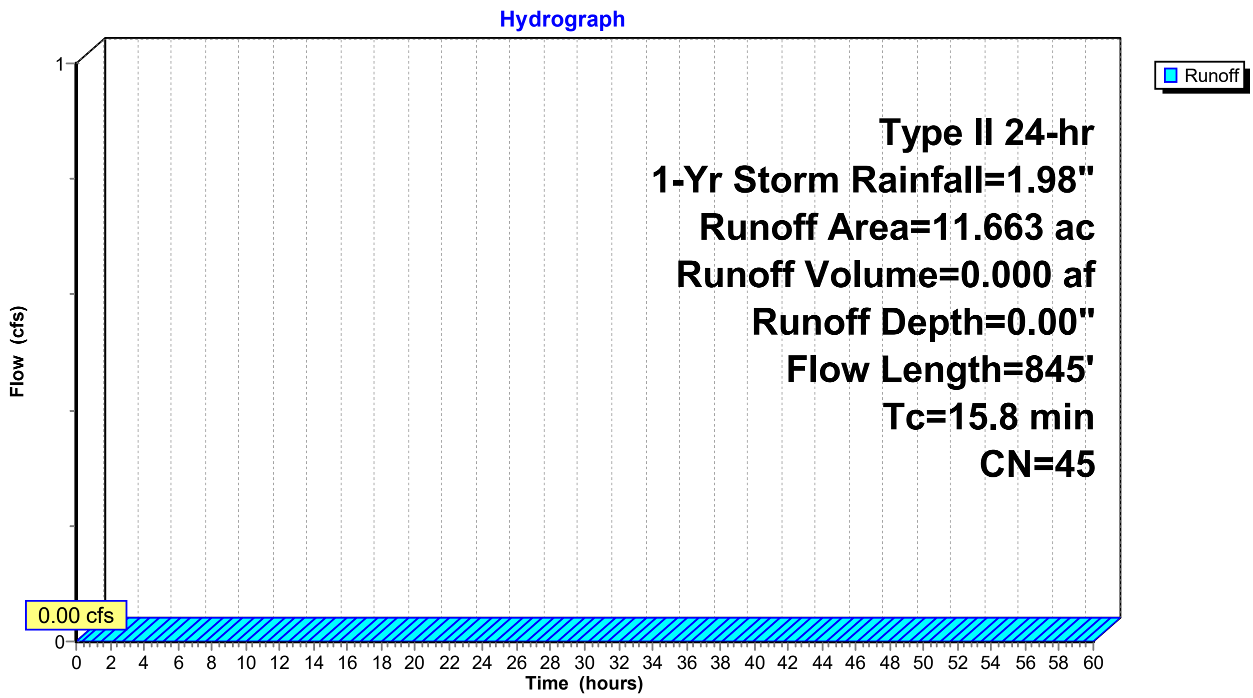
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 4.1R1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.327	98	Paved Roads & Rooftops
*	0.375	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	2.544	30	Meadow, non-grazed, HSG A
	0.560	58	Meadow, non-grazed, HSG B
	3.605	30	Woods, Good, HSG A
*	4.087	55	Woods, Good, HSG B
	11.663	45	Weighted Average
	11.336		97.20% Pervious Area
	0.327		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0430	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
2.6	360	0.1077	2.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	385	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.8	845	Total			

Subcatchment 4.1S:



Summary for Subcatchment 4.2aS:

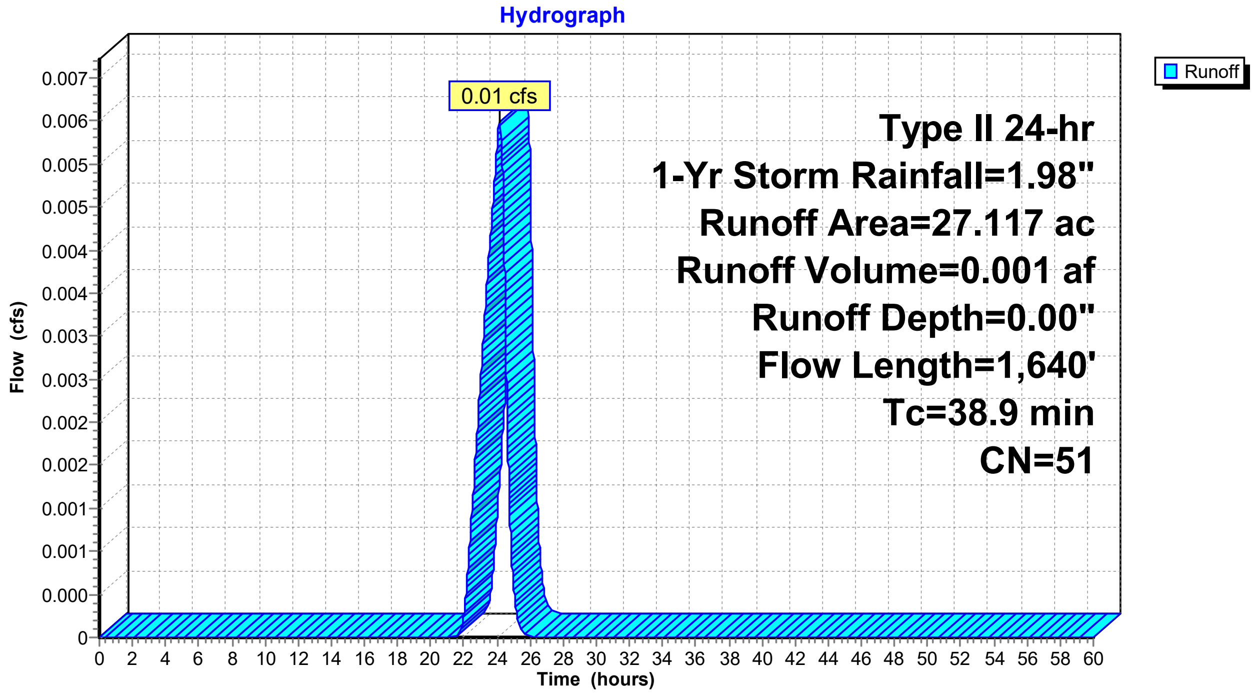
Runoff = 0.01 cfs @ 24.16 hrs, Volume= 0.001 af, Depth= 0.00"
Routed to Pond 4.2C : 18" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.238	96	Gravel surface
	4.086	30	Meadow, non-grazed, HSG A
	0.384	58	Meadow, non-grazed, HSG B
	0.977	30	Woods, Good, HSG A
	21.432	55	Woods, Good, HSG B
	27.117	51	Weighted Average
	27.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	662	0.0144	0.84		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	1,640	Total			

Subcatchment 4.2aS:



Summary for Subcatchment 4.2bS:

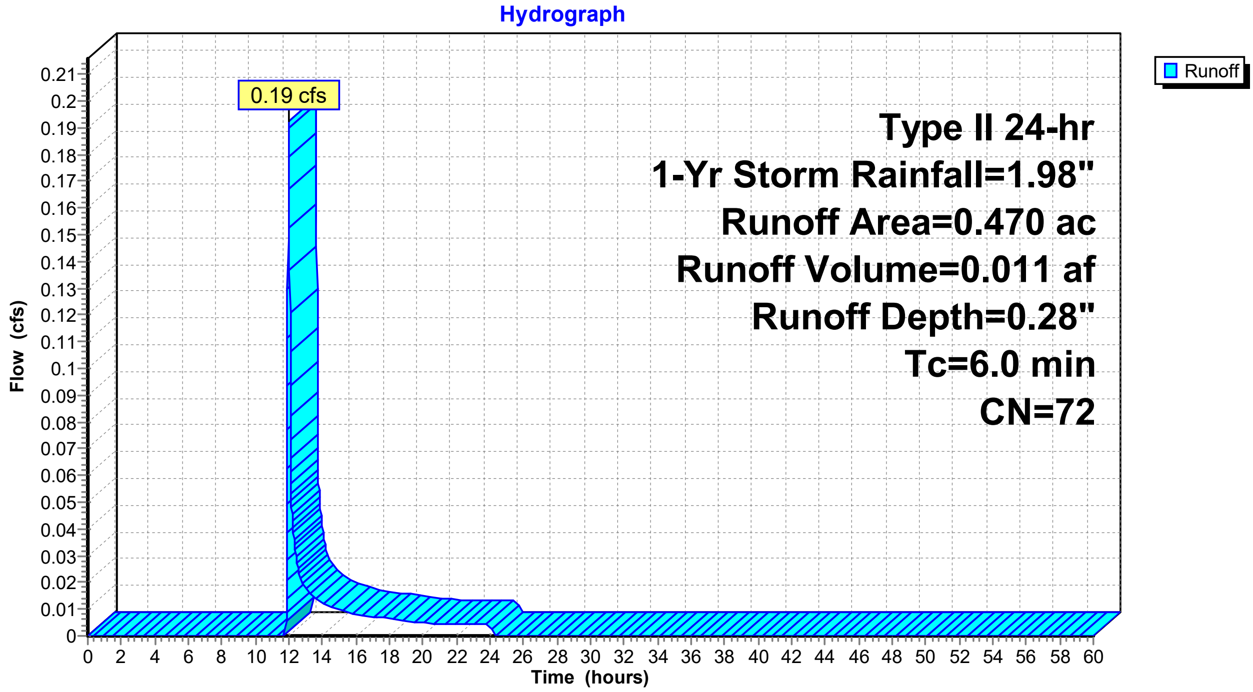
Runoff = 0.19 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 0.28"
Routed to Reach 4.2bR : Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
0.296	96	Gravel surface, HSG A
0.174	30	Meadow, non-grazed, HSG A
0.470	72	Weighted Average
0.470		100.00% Pervious Area

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

Subcatchment 4.2bS:



Summary for Subcatchment 4.3S:

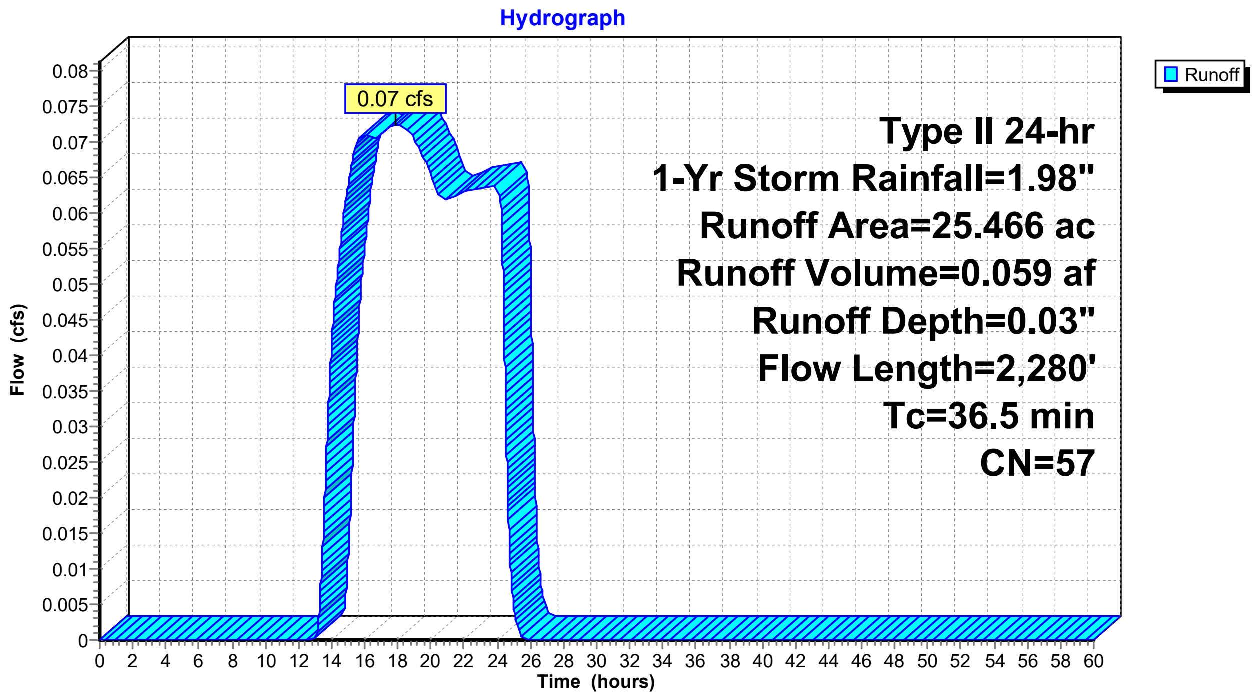
Runoff = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af, Depth= 0.03"
Routed to Pond 4.3C : 24" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	1.293	98	Paved Roads & Rooftops
	1.783	58	Meadow, non-grazed, HSG B
	22.390	55	Woods, Good, HSG B
	25.466	57	Weighted Average
	24.173		94.92% Pervious Area
	1.293		5.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0634	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
17.8	1,368	0.0656	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	38	0.3960	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	774	0.0281	4.70	109.09	**Channel Flow,** Area= 23.2 sf Perim= 43.2' r= 0.54' n= 0.035
36.5	2,280	Total			

Subcatchment 4.3S:



Summary for Subcatchment 5S:

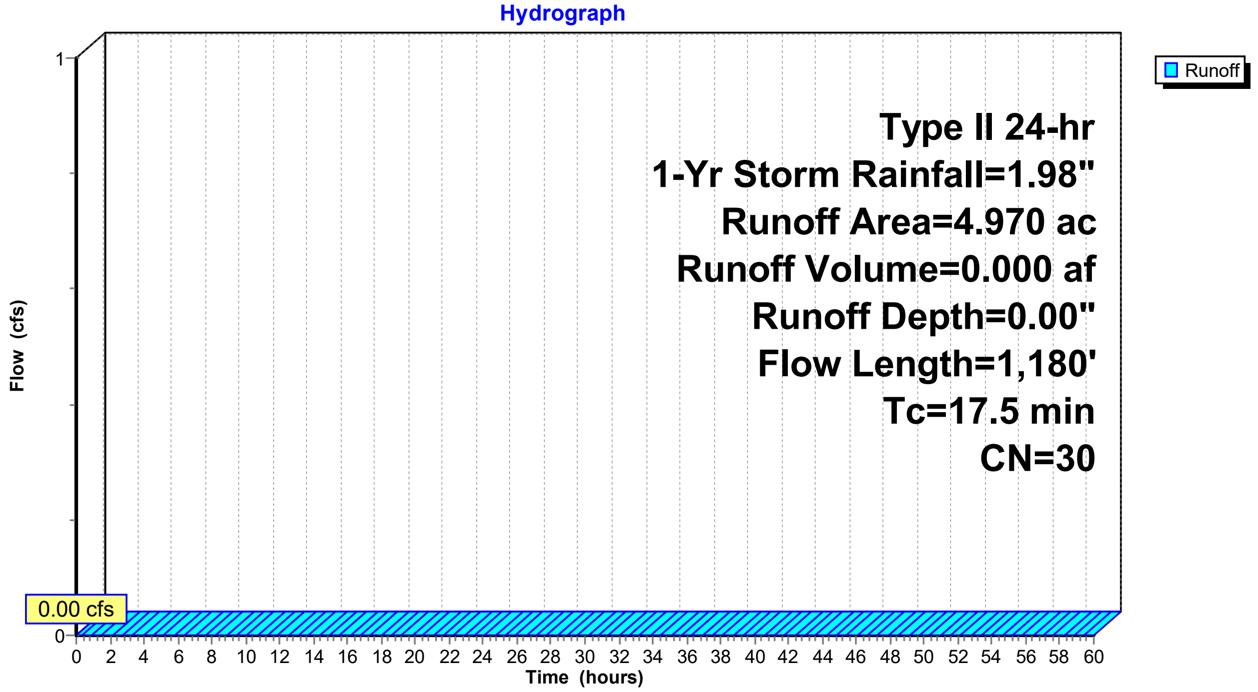
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
4.139	30	Meadow, non-grazed, HSG A
0.831	30	Woods, Good, HSG A
4.970	30	Weighted Average
4.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0675	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
8.5	801	0.0508	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	217	0.1515	2.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	62	0.0697	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,180	Total			

Subcatchment 5S:



Summary for Subcatchment 6S:

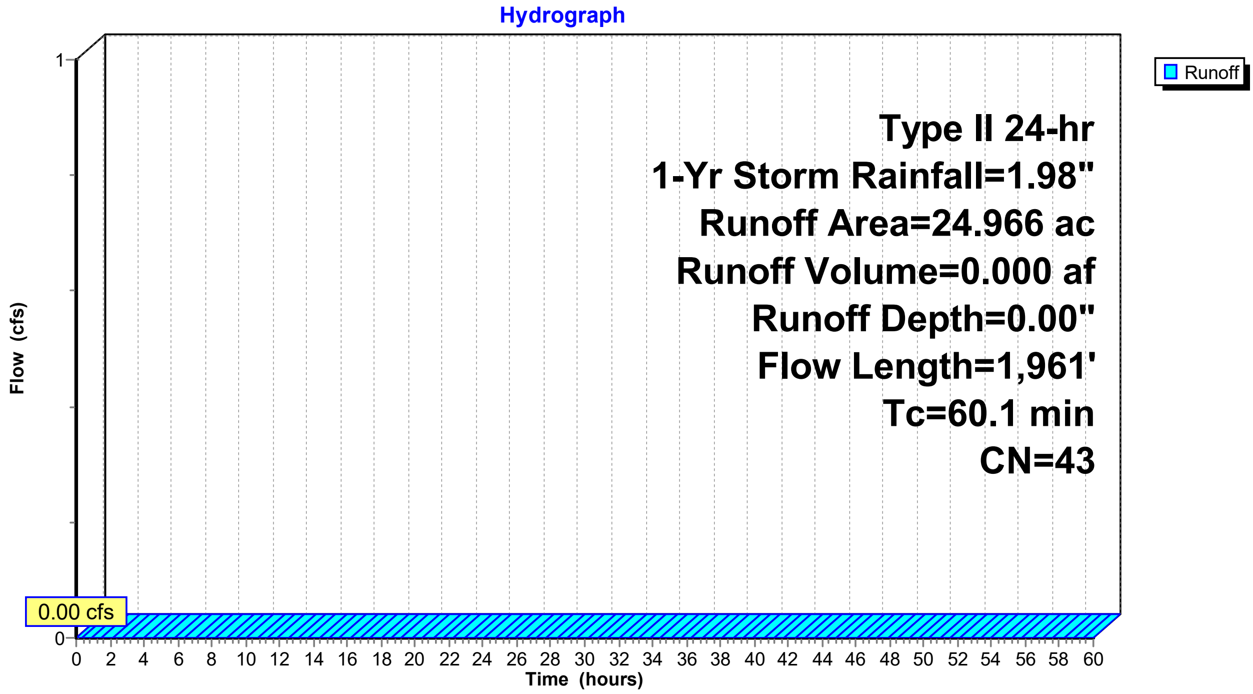
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP6 : Study Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
	0.466	96	Gravel surface, HSG A
	2.545	61	>75% Grass cover, Good, HSG B
	7.511	30	Meadow, non-grazed, HSG A
	0.788	58	Meadow, non-grazed, HSG B
	7.940	30	Woods, Good, HSG A
	4.266	55	Woods, Good, HSG B
	24.966	43	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Subcatchment 6S:



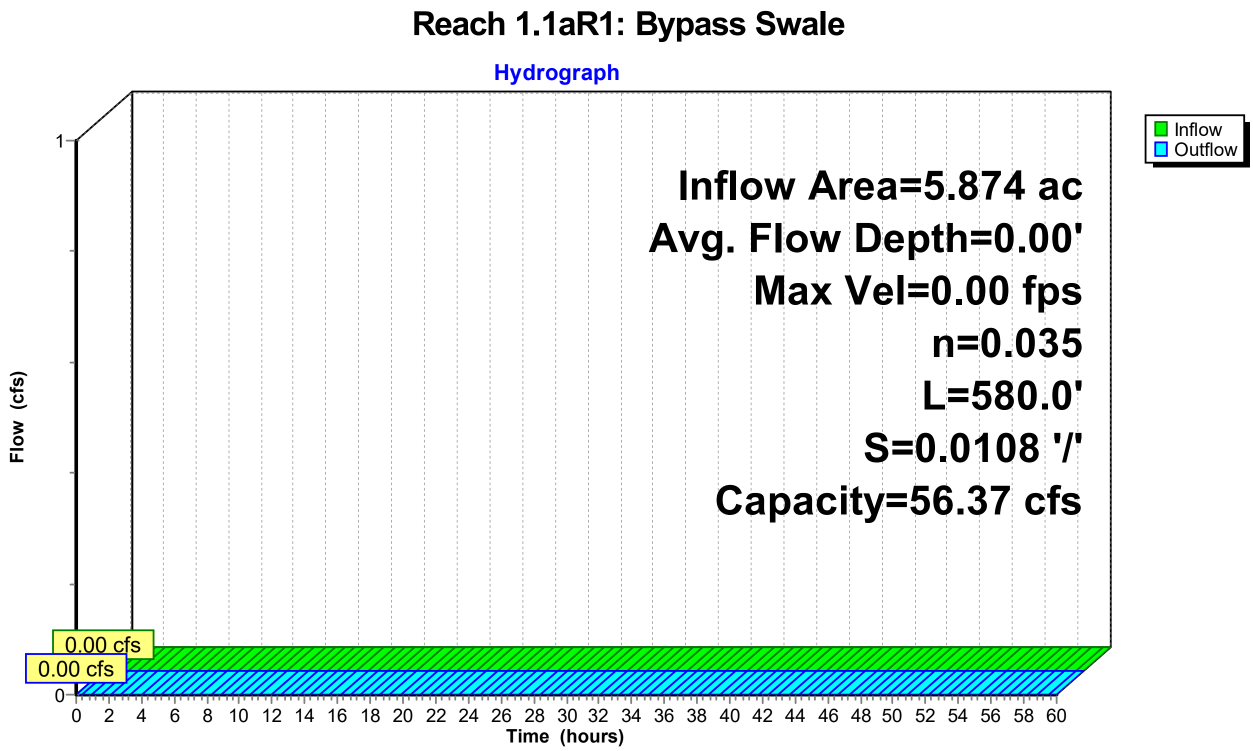
Summary for Reach 1.1aR1: Bypass Swale

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC1 : TS1 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.37 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.0' Slope= 0.0108 '/'
Inlet Invert= 1,493.84', Outlet Invert= 1,487.56'



Summary for Reach 1.1aR2: Bypass Swale

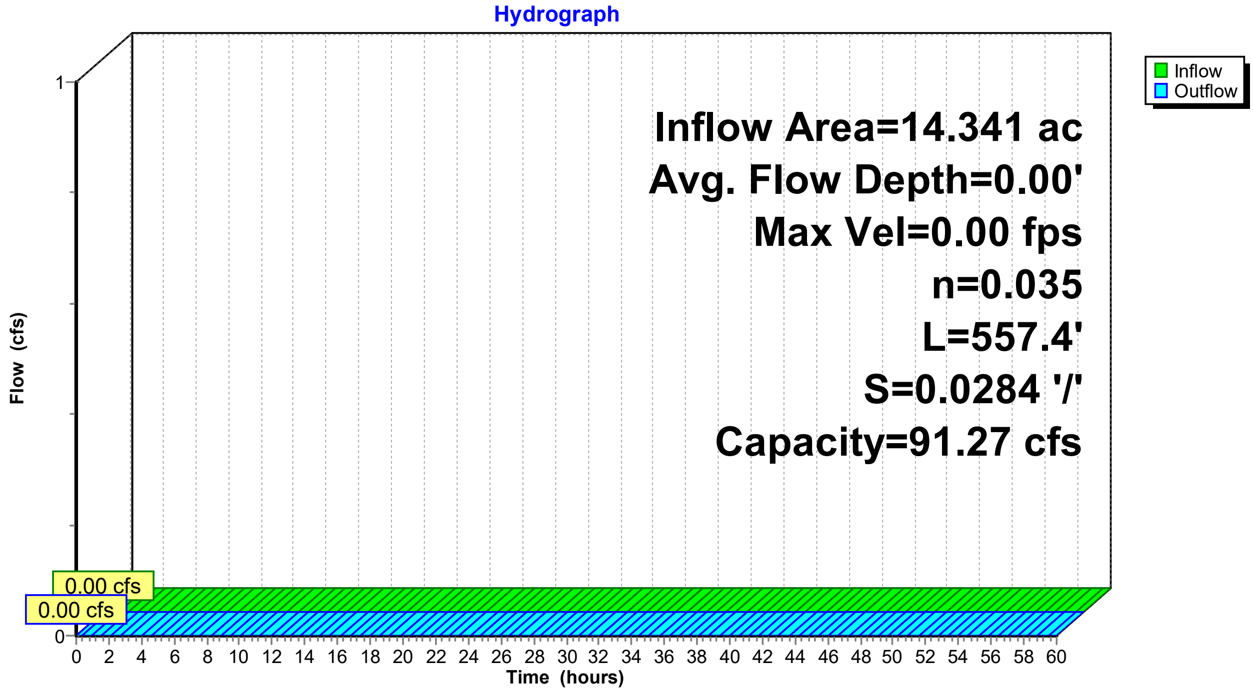
Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC2 : TS2 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 91.27 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.4' Slope= 0.0284 '/'
Inlet Invert= 1,486.80', Outlet Invert= 1,470.98'

Reach 1.1aR2: Bypass Swale



Summary for Reach 1.1aR3: Bypass Swale

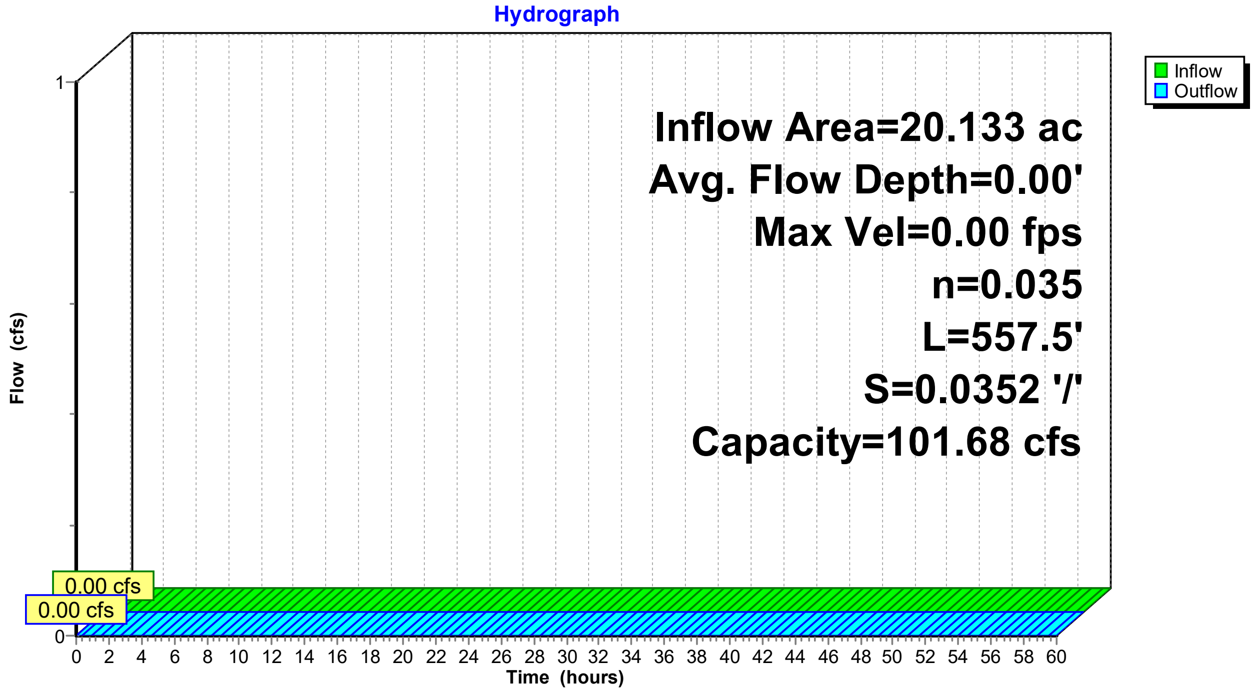
Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC3 : TS3 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.68 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.5' Slope= 0.0352 '/'
Inlet Invert= 1,469.57', Outlet Invert= 1,449.93'

Reach 1.1aR3: Bypass Swale



Summary for Reach 1.1aR4: Bypass Swale

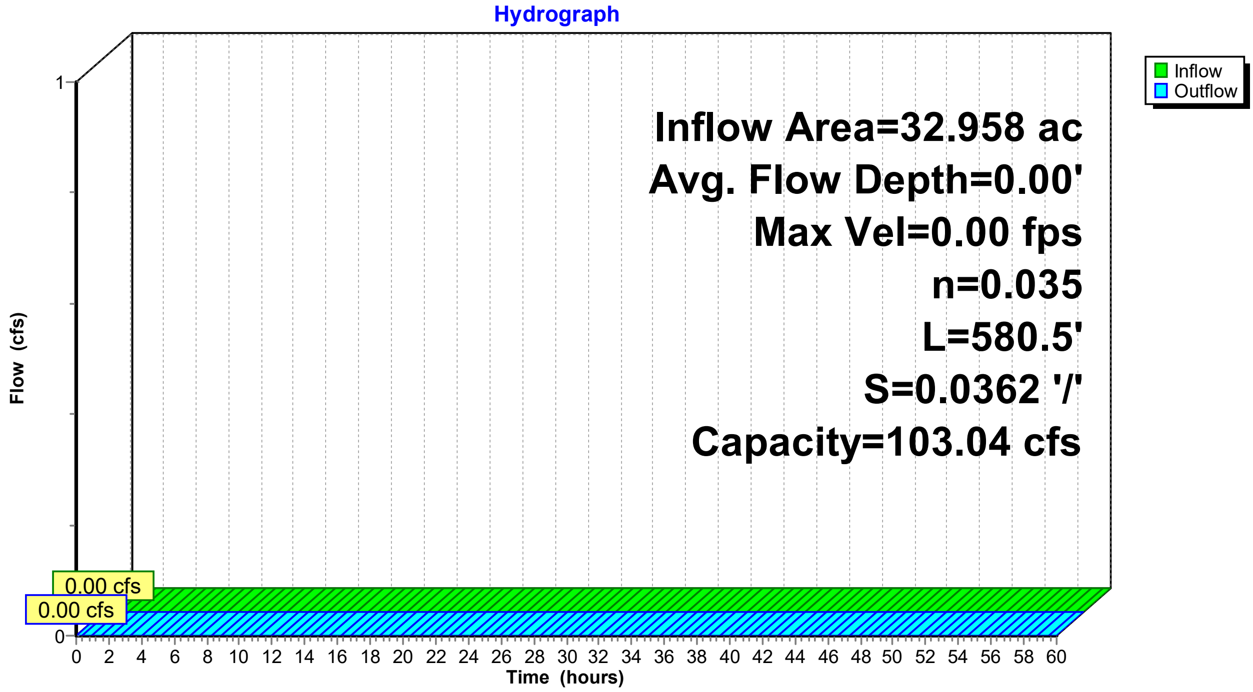
Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aP : North Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 103.04 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.5' Slope= 0.0362 '/'
Inlet Invert= 1,447.64', Outlet Invert= 1,426.64'

Reach 1.1aR4: Bypass Swale



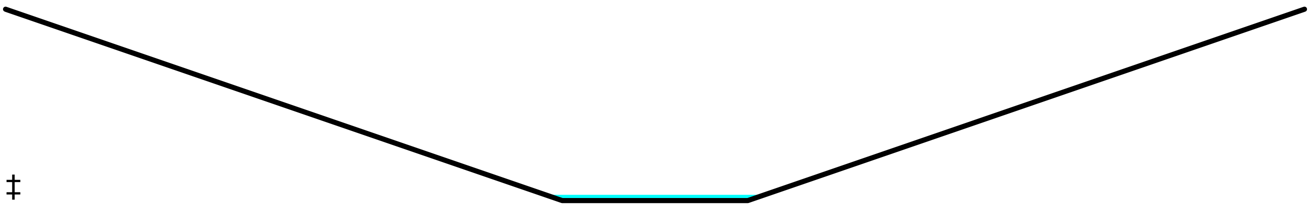
Summary for Reach 1.1bR1: North Road Conveyance Swale

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 0.47 cfs @ 12.00 hrs, Volume= 0.029 af
Outflow = 0.12 cfs @ 12.17 hrs, Volume= 0.029 af, Atten= 75%, Lag= 10.3 min
Routed to Pond 1.1bC1 : TS4 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.94 fps, Min. Travel Time= 30.8 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 55.4 min

Peak Storage= 219 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 2.35'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 111.65 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,733.0' Slope= 0.0240 '/'
Inlet Invert= 1,491.12', Outlet Invert= 1,449.50'



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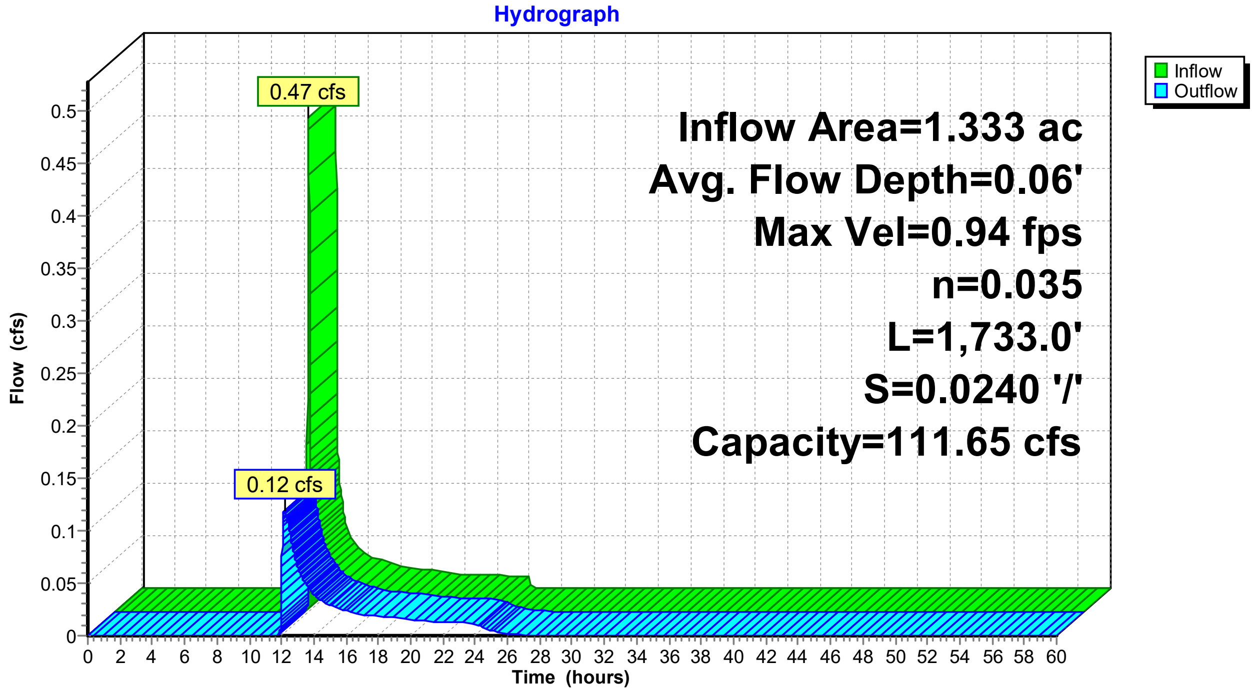
Reach 1.1bR1: North Road Conveyance Swale



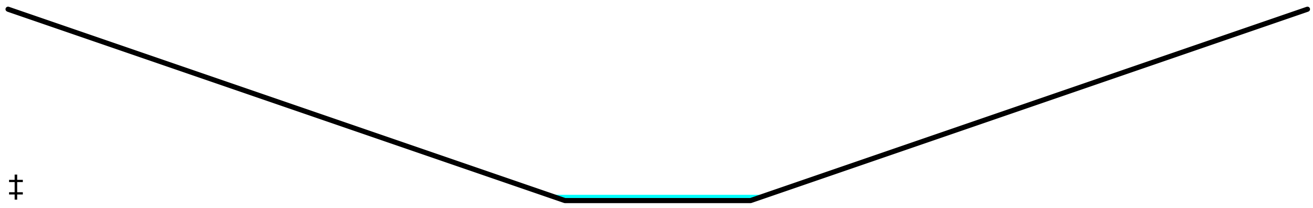
Summary for Reach 1.1bR2: North Road Conveyance Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.23" for 1-Yr Storm event
Inflow = 0.20 cfs @ 12.04 hrs, Volume= 0.039 af
Outflow = 0.15 cfs @ 12.26 hrs, Volume= 0.039 af, Atten= 25%, Lag= 13.6 min
Routed to Pond 1.1bP1 : Dry Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.18 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 14.9 min

Peak Storage= 75 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 2.35'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 140.36 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 593.3' Slope= 0.0380 '/'
Inlet Invert= 1,447.27', Outlet Invert= 1,424.75'



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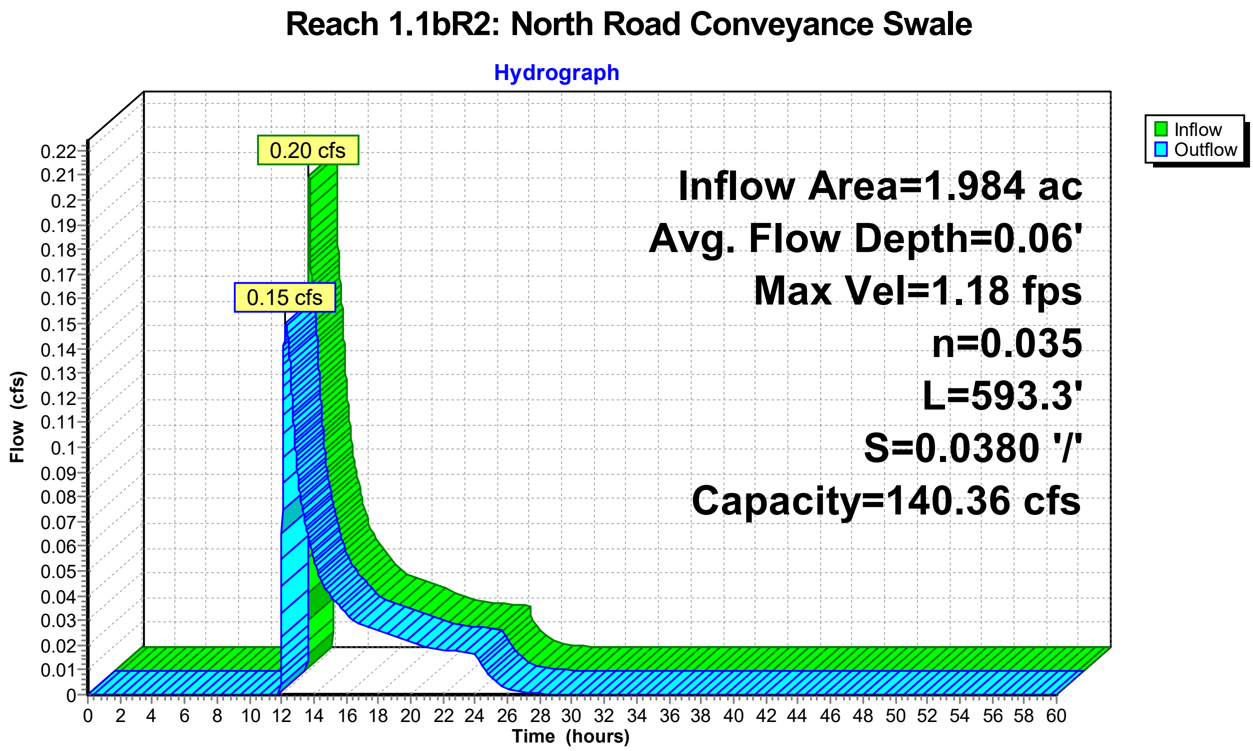


Summary for Reach 1.2aR1: Bypass Swale

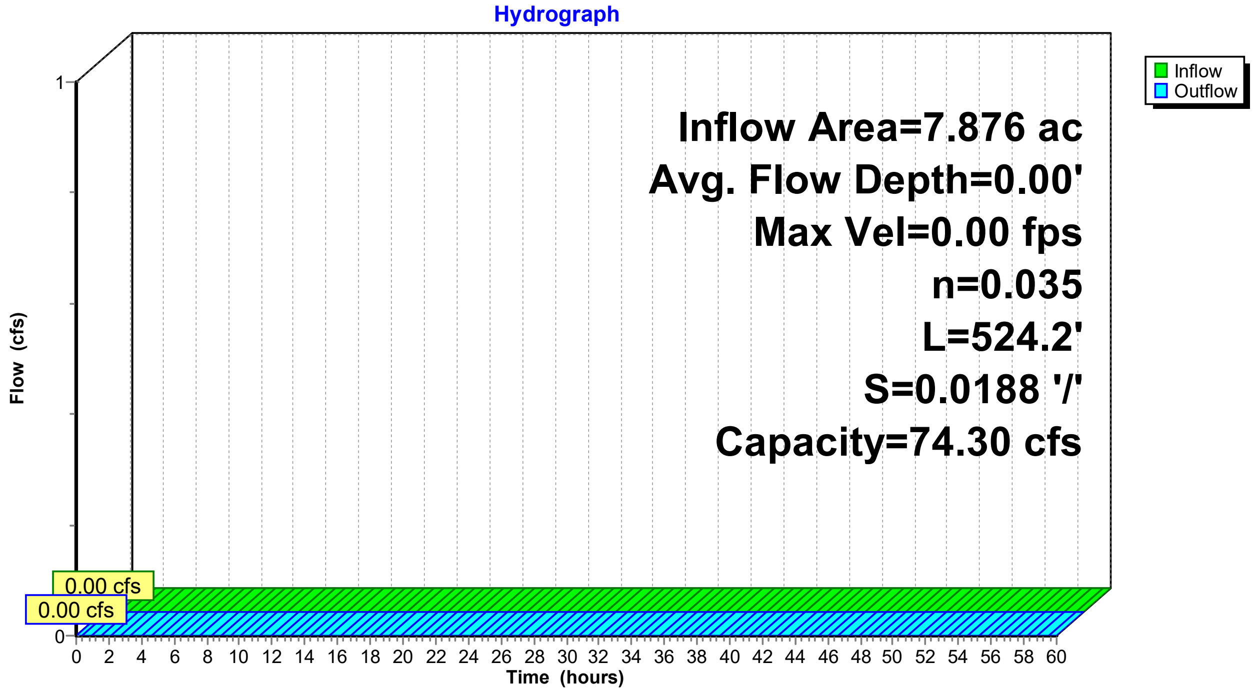
Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC1 : TS 7 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 74.30 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 524.2' Slope= 0.0188 '/'
Inlet Invert= 1,454.08', Outlet Invert= 1,444.22'

Reach 1.2aR1: Bypass Swale



Summary for Reach 1.2aR2: Bypass Swale

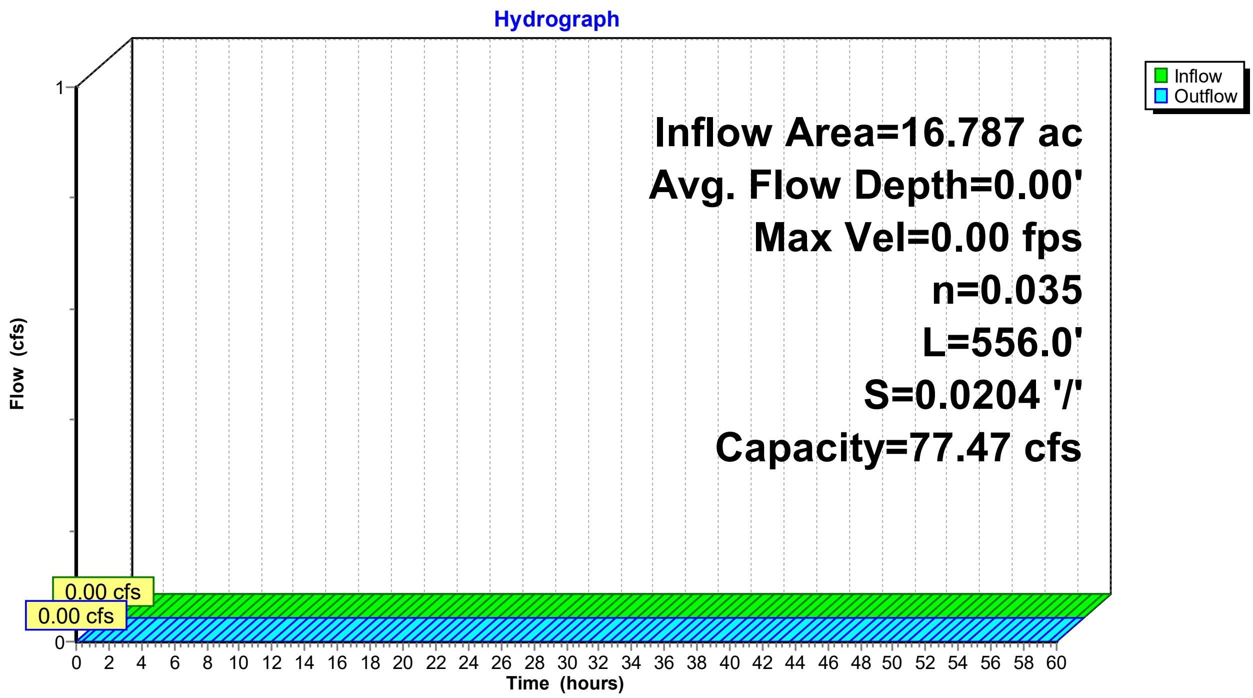
Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC2 : TS8 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 77.47 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 556.0' Slope= 0.0204 '/'
Inlet Invert= 1,443.21', Outlet Invert= 1,431.84'

Reach 1.2aR2: Bypass Swale



Summary for Reach 1.2aR3: Bypass Swale

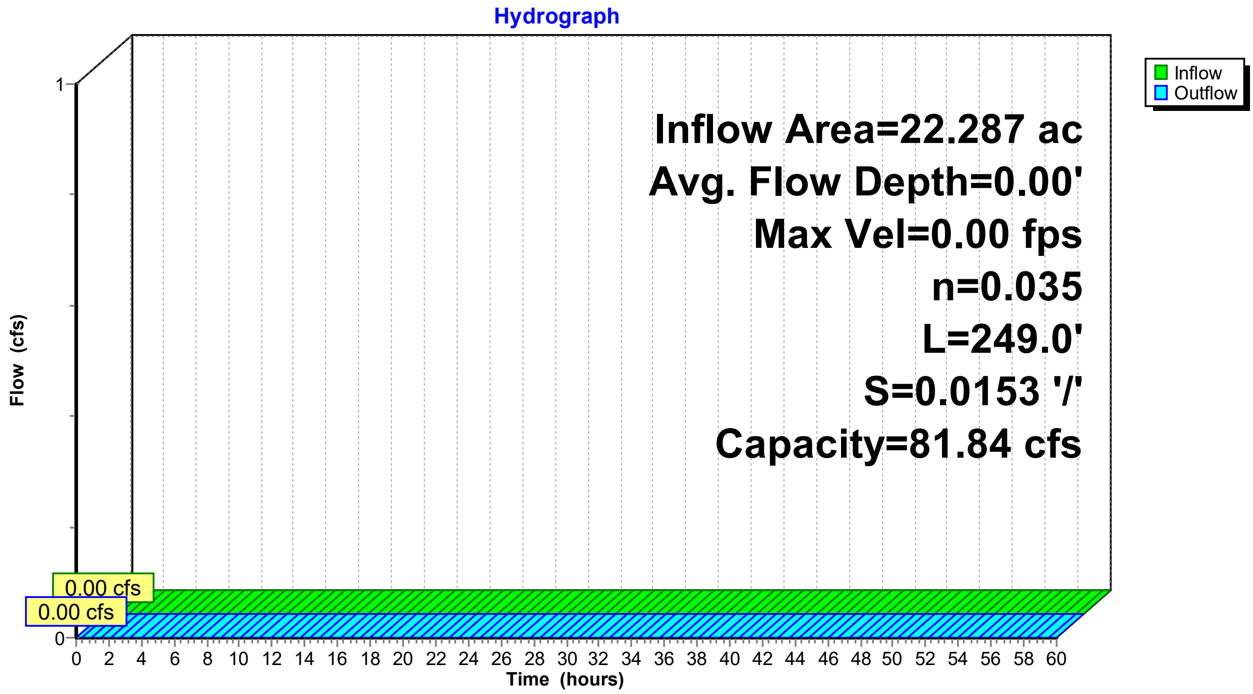
Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aP : South Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 81.84 cfs

3.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 11.00'
Length= 249.0' Slope= 0.0153 '/'
Inlet Invert= 1,431.11', Outlet Invert= 1,427.29'

Reach 1.2aR3: Bypass Swale



Summary for Reach 1.2bR1: East Road Conveyance Swale

Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.17" for 1-Yr Storm event
Inflow = 0.12 cfs @ 12.01 hrs, Volume= 0.010 af
Outflow = 0.04 cfs @ 12.13 hrs, Volume= 0.010 af, Atten= 62%, Lag= 7.2 min
Routed to Pond 1.2bC1 : East Road Culvert

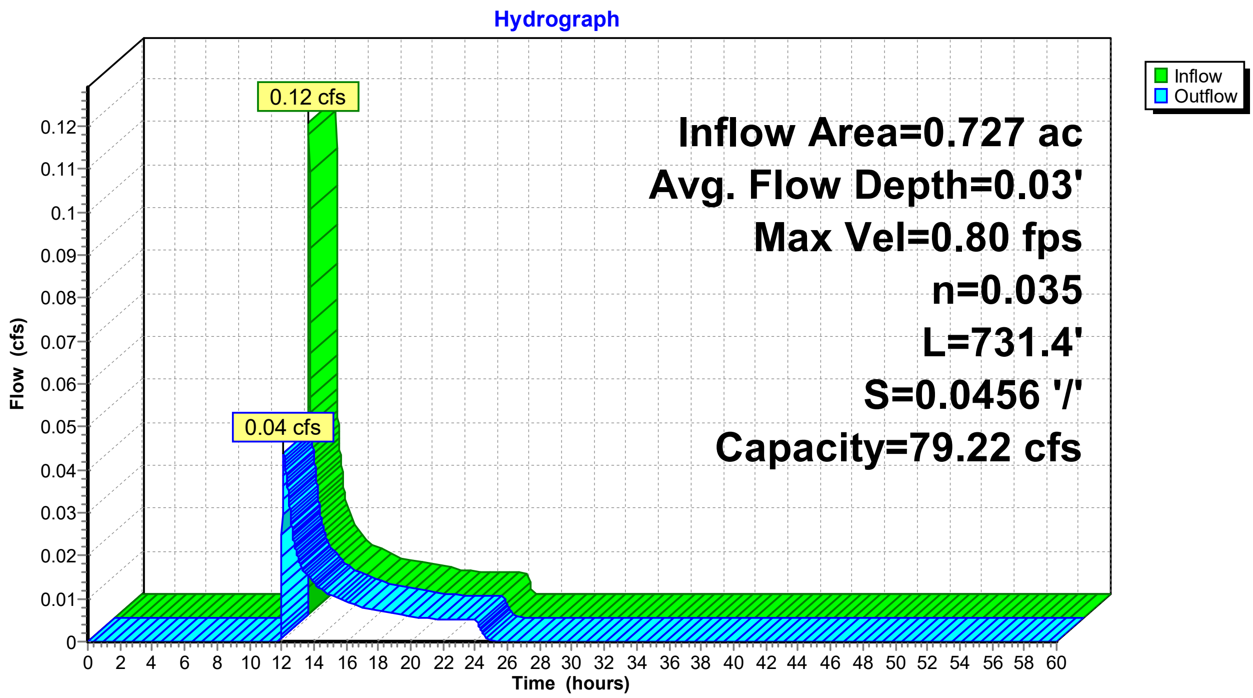
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.80 fps, Min. Travel Time= 15.1 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 22.0 min

Peak Storage= 40 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 2.16'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 79.22 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 731.4' Slope= 0.0456 '/'
Inlet Invert= 1,489.53', Outlet Invert= 1,456.20'

‡

Reach 1.2bR1: East Road Conveyance Swale



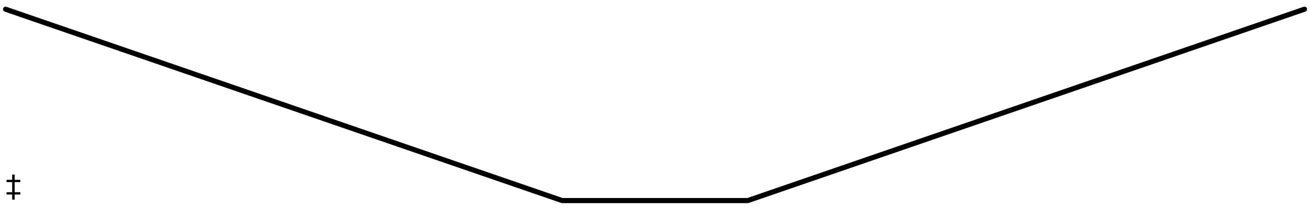
Summary for Reach 1.2bR2: South Road Conveyance Swale

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.10" for 1-Yr Storm event
Inflow = 0.04 cfs @ 12.13 hrs, Volume= 0.013 af
Outflow = 0.03 cfs @ 12.52 hrs, Volume= 0.013 af, Atten= 30%, Lag= 23.3 min
Routed to Pond 1.2bC2 : TS6 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.53 fps, Min. Travel Time= 18.9 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 24.3 min

Peak Storage= 35 cf @ 12.52 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 2.17'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 95.76 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 604.5' Slope= 0.0177 '/'
Inlet Invert= 1,454.47', Outlet Invert= 1,443.79'



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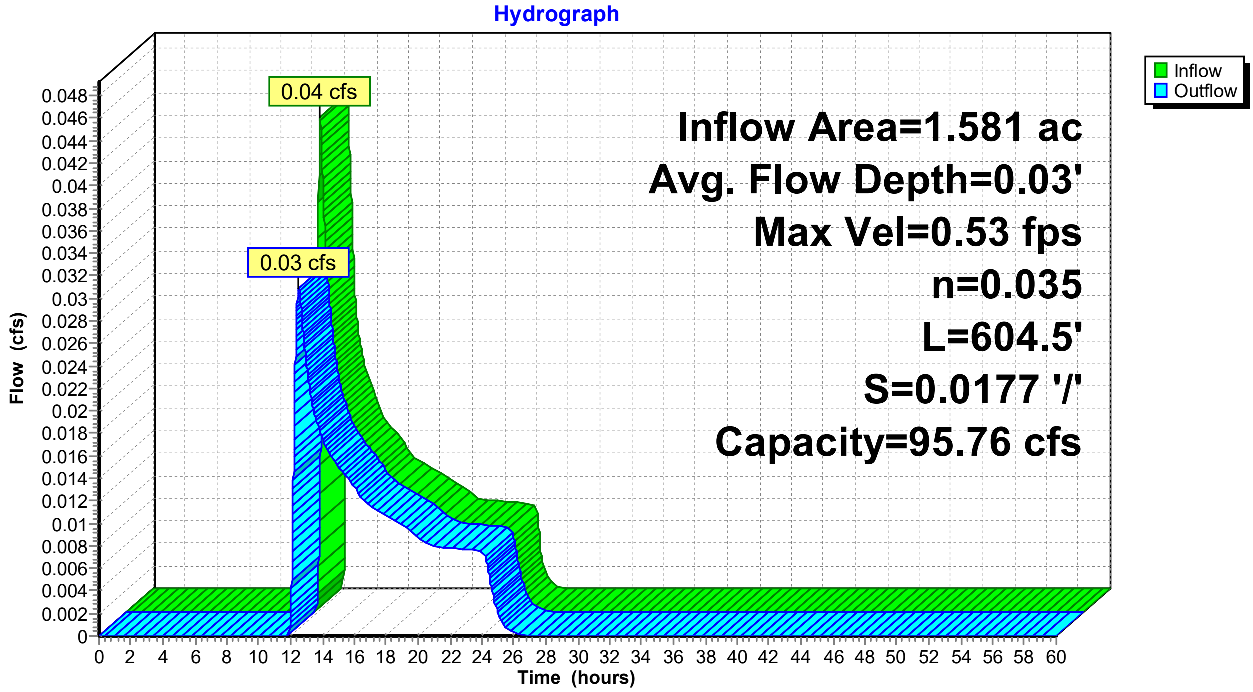
Reach 1.2bR2: South Road Conveyance Swale



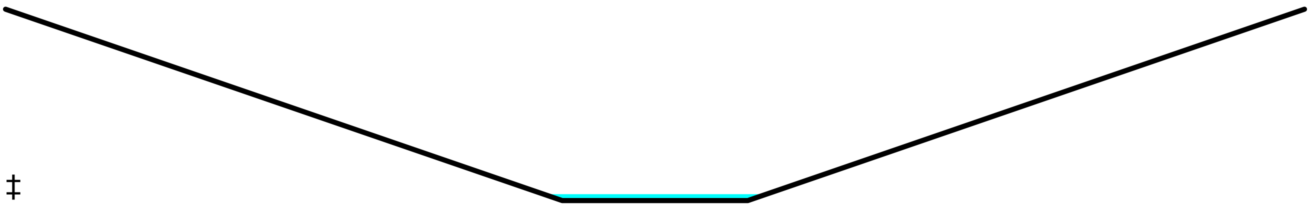
Summary for Reach 1.2bR3: South Road Conveyance Swale

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.15" for 1-Yr Storm event
Inflow = 0.29 cfs @ 12.00 hrs, Volume= 0.030 af
Outflow = 0.13 cfs @ 12.10 hrs, Volume= 0.030 af, Atten= 56%, Lag= 5.8 min
Routed to Pond 1.2bP : South Road Treatment Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.89 fps, Min. Travel Time= 14.2 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 26.1 min

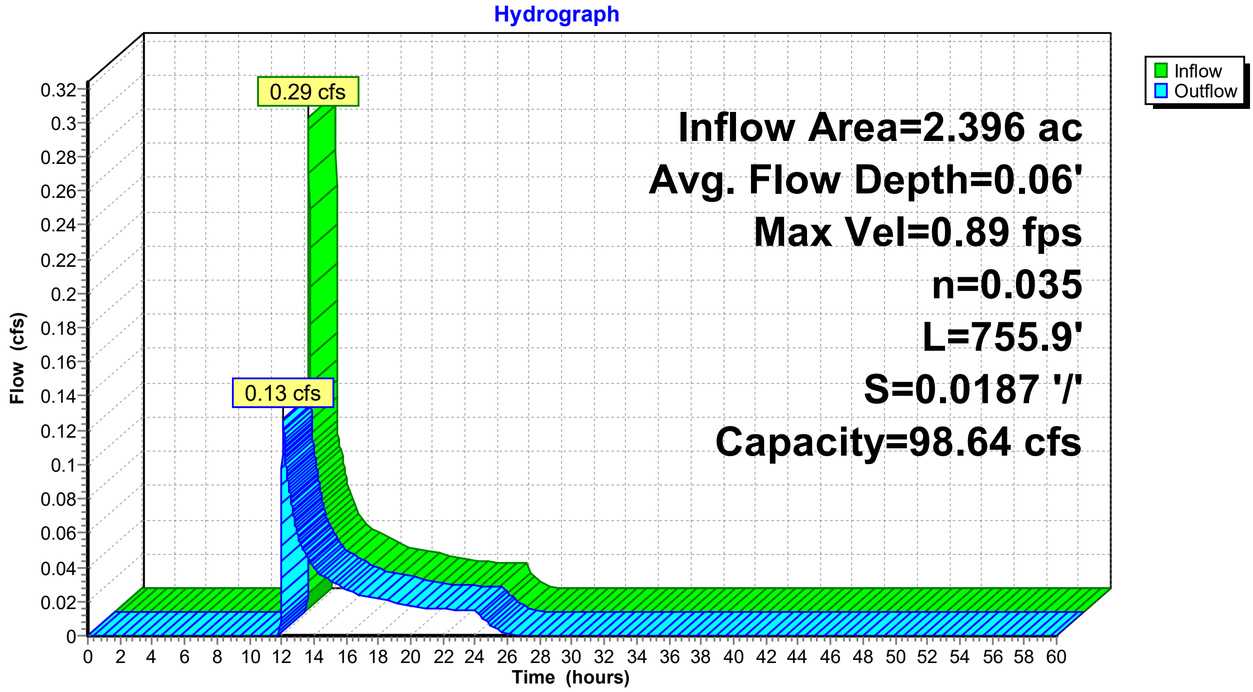
Peak Storage= 108 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 2.39'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 98.64 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 755.9' Slope= 0.0187 '/'
Inlet Invert= 1,442.84', Outlet Invert= 1,428.67'



‡

Reach 1.2bR3: South Road Conveyance Swale



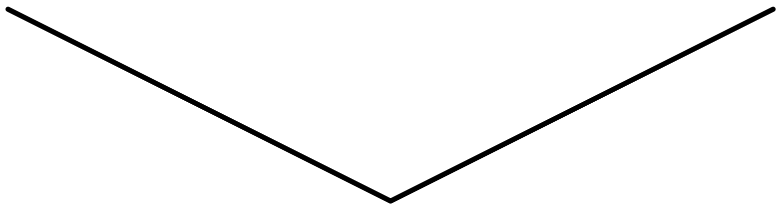
Summary for Reach 4.1R1: Bypass Swale

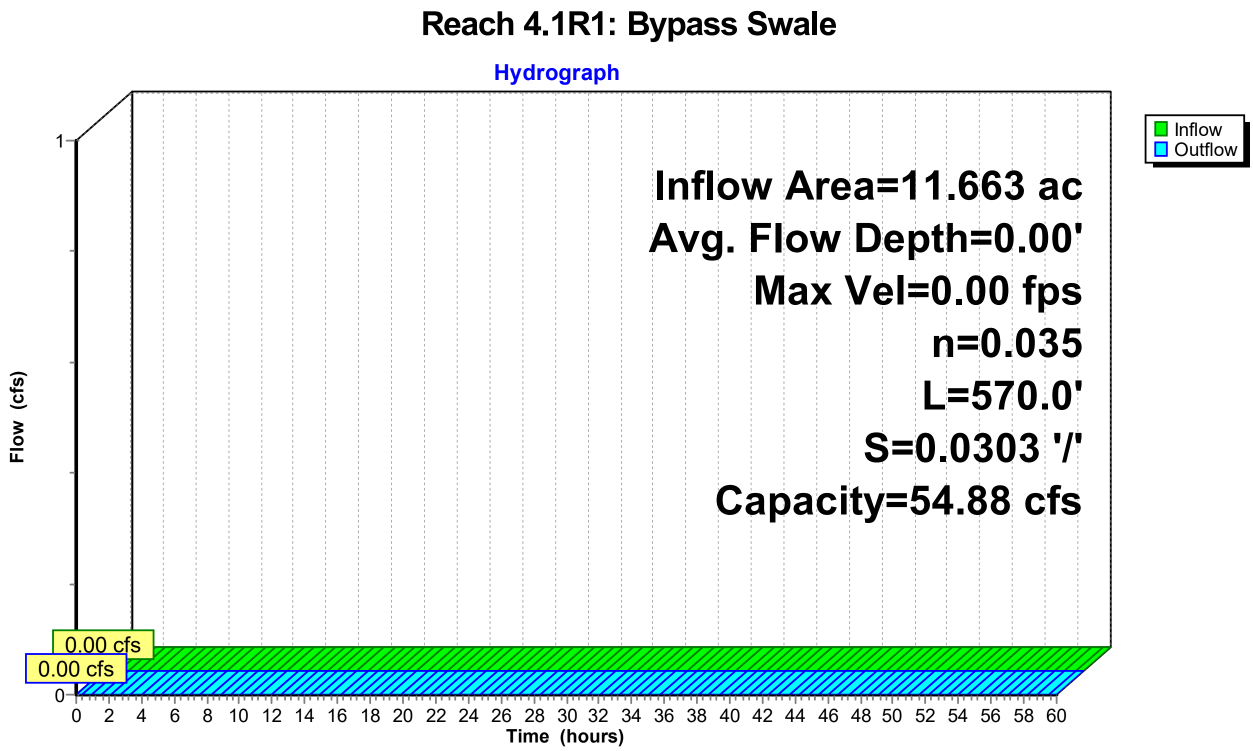
Inflow Area = 11.663 ac, 2.80% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 54.88 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 570.0' Slope= 0.0303 '/'
Inlet Invert= 1,448.24', Outlet Invert= 1,430.97'





Summary for Reach 4.1R2: Ex Stream

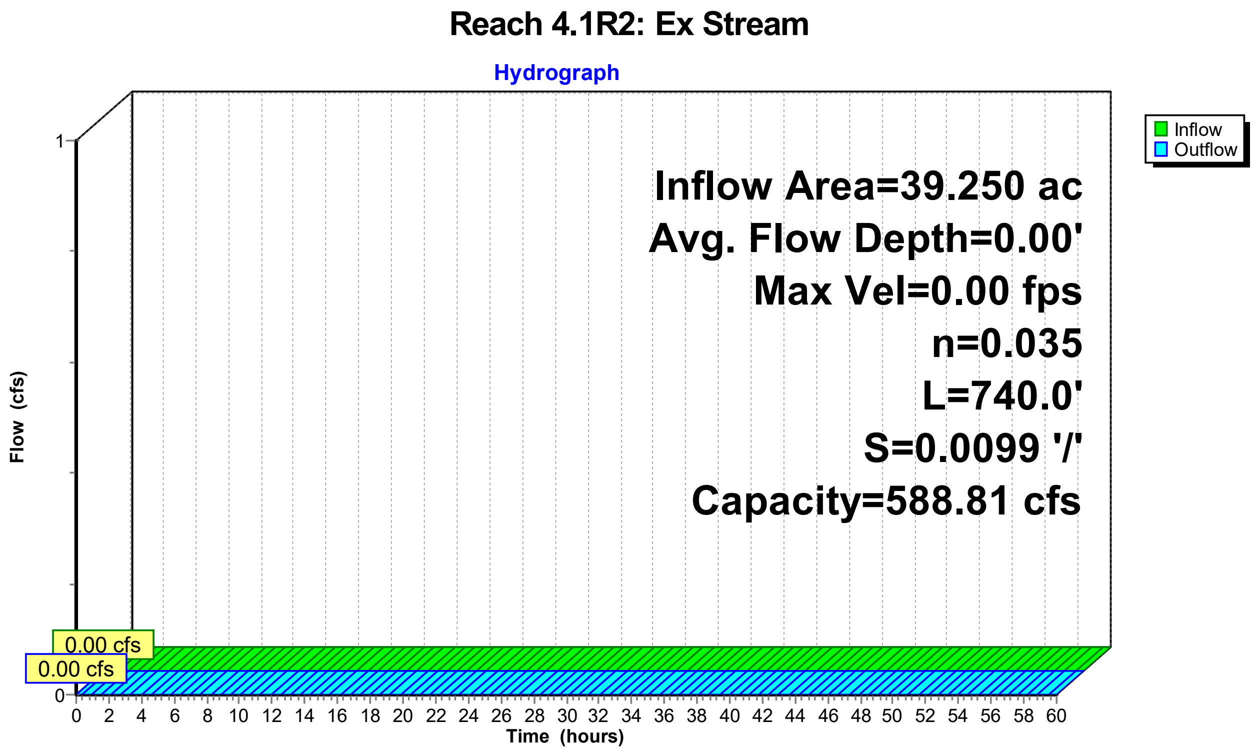
Inflow Area = 39.250 ac, 0.83% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 3.00' Flow Area= 84.0 sf, Capacity= 588.81 cfs

17.50' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 4.0 '/' Top Width= 38.50'
Length= 740.0' Slope= 0.0099 '/'
Inlet Invert= 1,430.98', Outlet Invert= 1,423.64'

‡



Summary for Reach 4.2bR: Conveyance Swale

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.28" for 1-Yr Storm event
Inflow = 0.19 cfs @ 12.00 hrs, Volume= 0.011 af
Outflow = 0.12 cfs @ 12.06 hrs, Volume= 0.011 af, Atten= 39%, Lag= 4.1 min
Routed to Pond 4.2bP : Pond 4 - Access Rd East

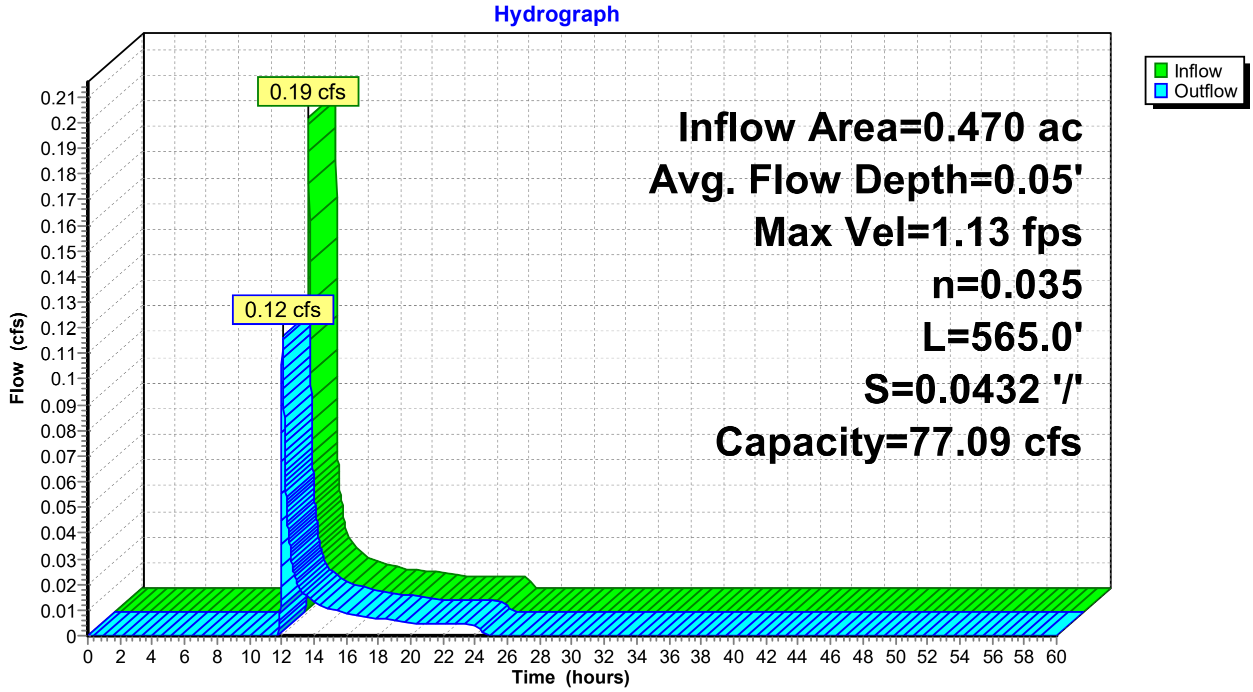
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.13 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 17.2 min

Peak Storage= 59 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.05' , Surface Width= 2.29'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 77.09 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 565.0' Slope= 0.0432 '/'
Inlet Invert= 1,472.38', Outlet Invert= 1,448.00'

‡

Reach 4.2bR: Conveyance Swale



Summary for Pond 1.1aC1: TS1 Culvert

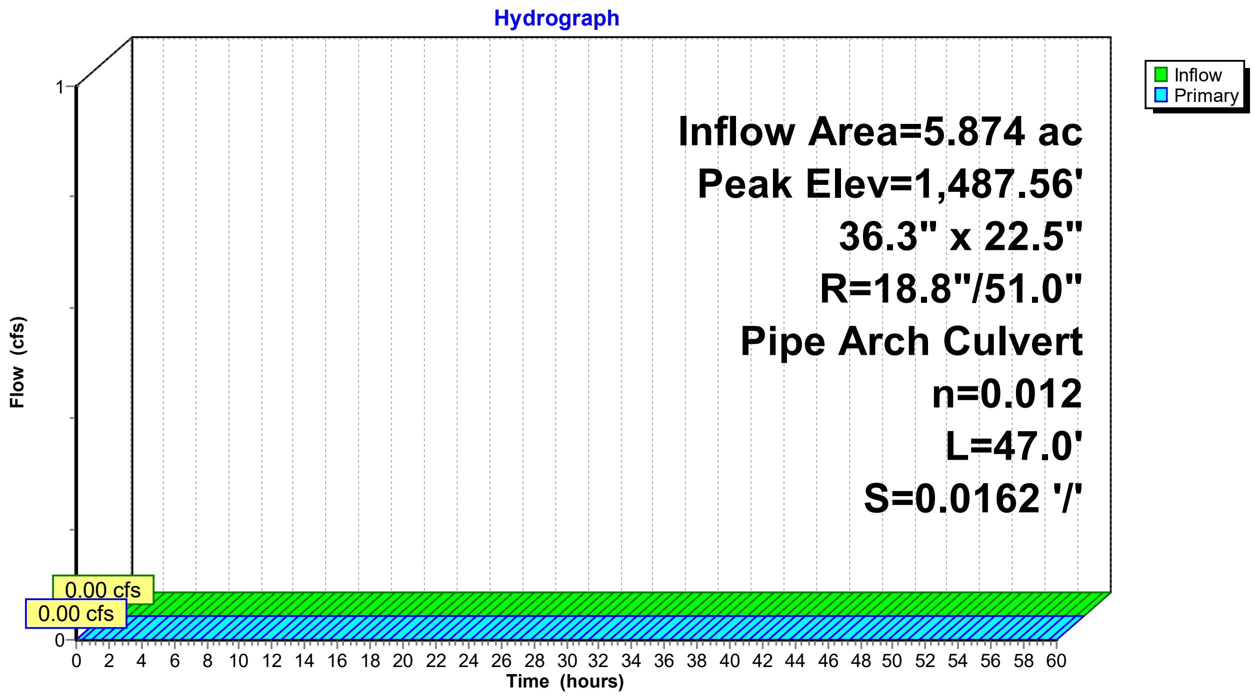
Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,487.56' @ 0.00 hrs
Flood Elev= 1,489.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,487.56'	**36.3" W x 22.5" H, R=18.8"/51.0" Pipe Arch RCP_Arch 37x23** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,487.56' / 1,486.80' S= 0.0162 '/' Cc= 0.900 n= 0.012, Flow Area= 4.43 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,487.56' (Free Discharge)
└─**1=RCP_Arch 37x23** (Controls 0.00 cfs)

Pond 1.1aC1: TS1 Culvert



Summary for Pond 1.1aC2: TS2 Culvert

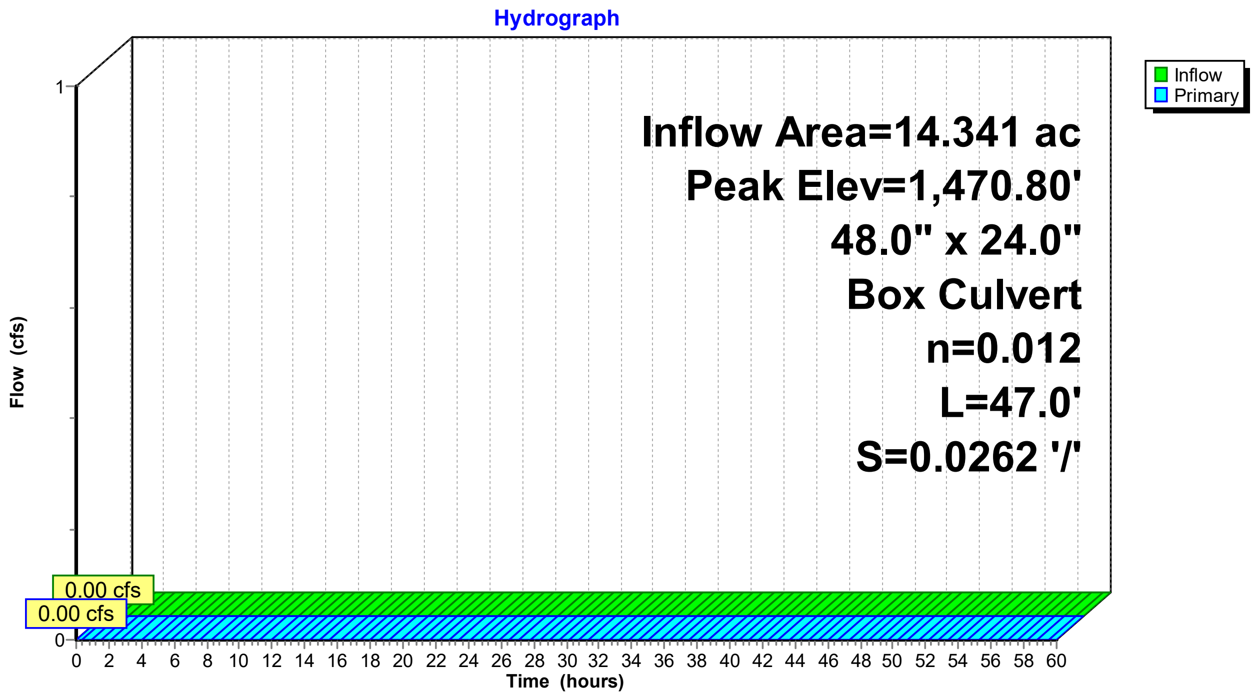
Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,470.80' @ 0.00 hrs
Flood Elev= 1,473.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,470.80'	**48.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,470.80' / 1,469.57' S= 0.0262 '/' Cc= 0.900 n= 0.012, Flow Area= 8.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,470.80' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)

Pond 1.1aC2: TS2 Culvert



Summary for Pond 1.1aC3: TS3 Culvert

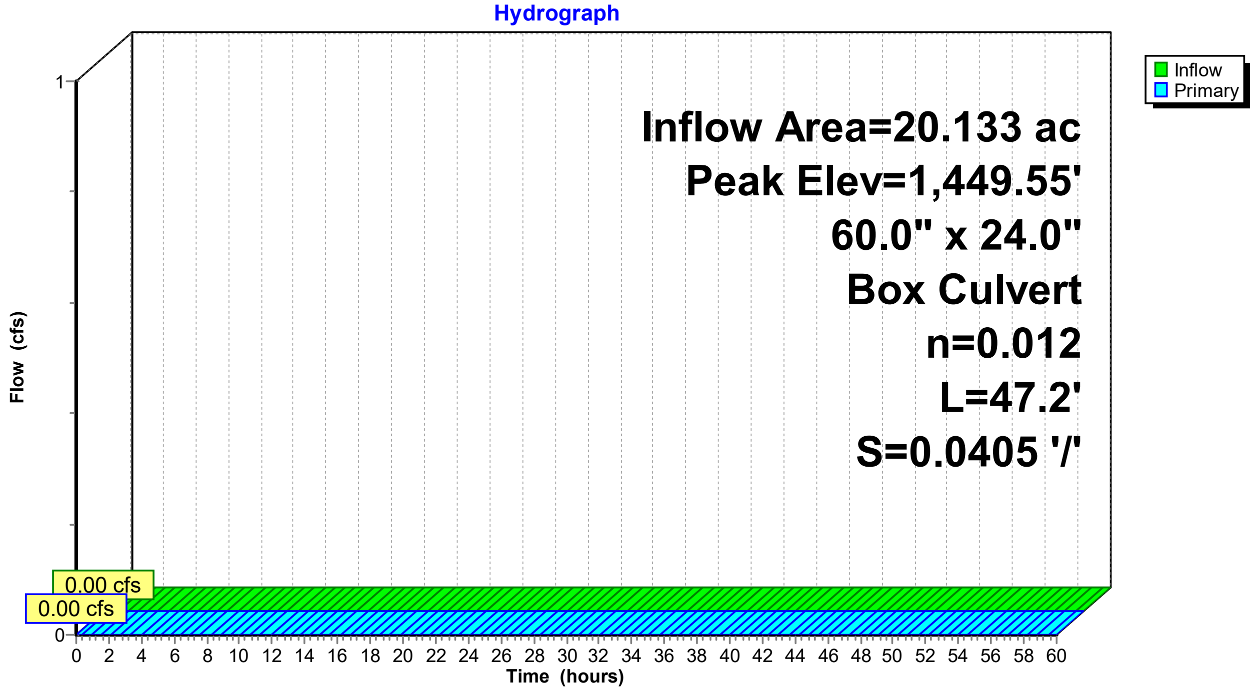
Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR4 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.55' @ 0.00 hrs
Flood Elev= 1,452.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.55'	**60.0" W x 24.0" H Box Culvert** L= 47.2' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.55' / 1,447.64' S= 0.0405 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,449.55' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)

Pond 1.1aC3: TS3 Culvert



Summary for Pond 1.1aP: North Road Bypass OC

Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

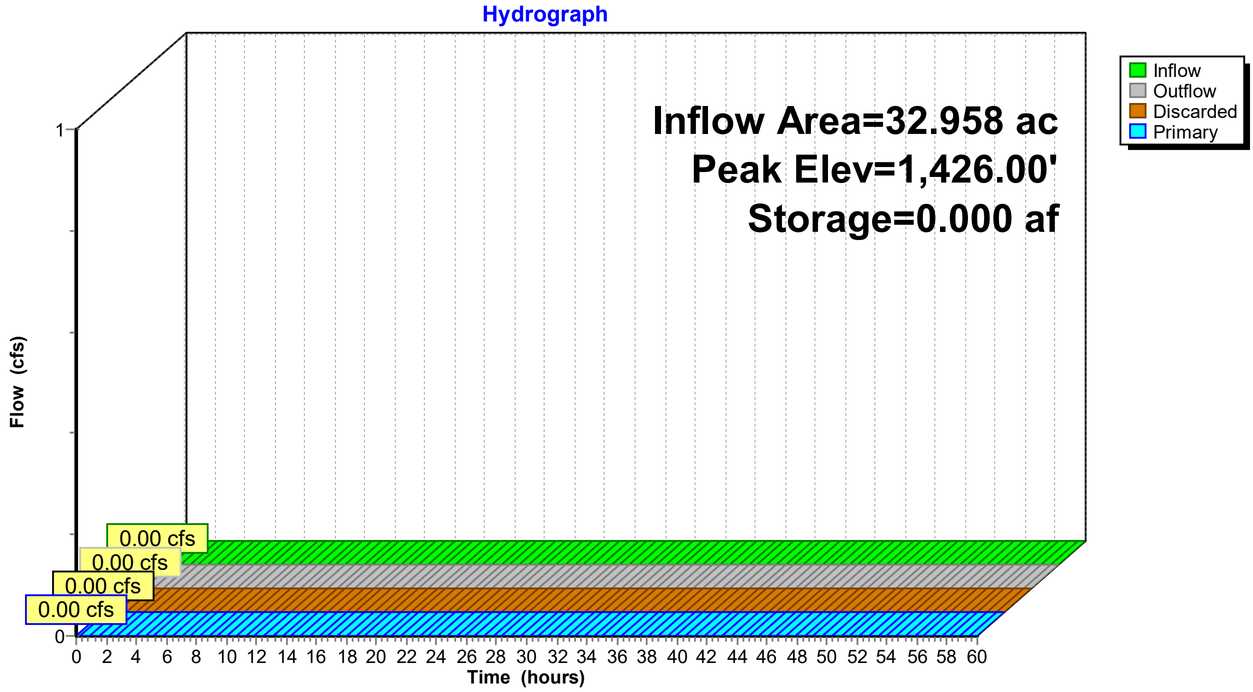
Volume	Invert	Avail.Storage	Storage Description
#1	1,426.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,426.00'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,428.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
1=Exfiltration (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1.1aP: North Road Bypass OC



Summary for Pond 1.1bC1: TS4 Culvert

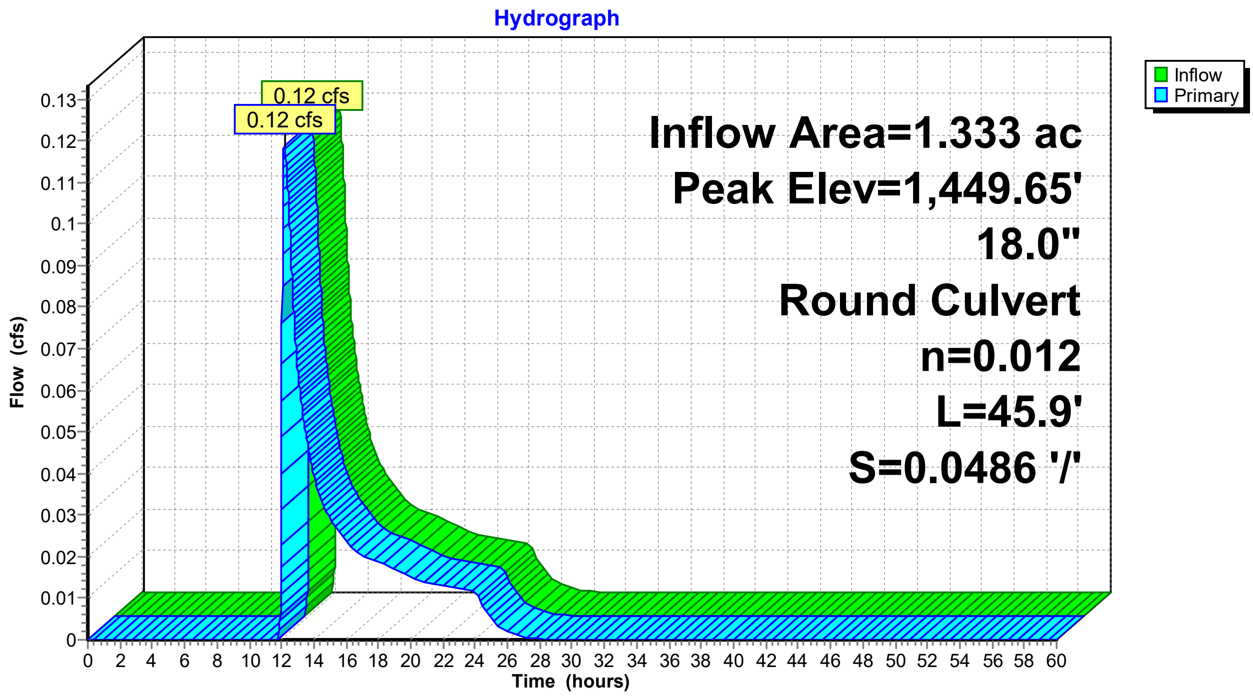
Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 0.12 cfs @ 12.17 hrs, Volume= 0.029 af
Outflow = 0.12 cfs @ 12.17 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.17 hrs, Volume= 0.029 af
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.65' @ 12.17 hrs
Flood Elev= 1,451.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.50'	**18.0" Round Culvert** L= 45.9' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.50' / 1,447.27' S= 0.0486 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.12 cfs @ 12.17 hrs HW=1,449.65' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.12 cfs @ 1.31 fps)

Pond 1.1bC1: TS4 Culvert



Summary for Pond 1.1bP1: Dry Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.23" for 1-Yr Storm event
Inflow = 0.15 cfs @ 12.26 hrs, Volume= 0.039 af
Outflow = 0.15 cfs @ 12.31 hrs, Volume= 0.039 af, Atten= 1%, Lag= 2.8 min
Discarded = 0.00 cfs @ 12.31 hrs, Volume= 0.004 af
Primary = 0.15 cfs @ 12.31 hrs, Volume= 0.035 af
Routed to Pond 1.1bP2 : North Road Detention Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,425.78' @ 12.31 hrs Surf.Area= 197 sf Storage= 78 cf

Plug-Flow detention time= 49.3 min calculated for 0.039 af (100% of inflow)
Center-of-Mass det. time= 49.5 min (1,022.2 - 972.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.75'	428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

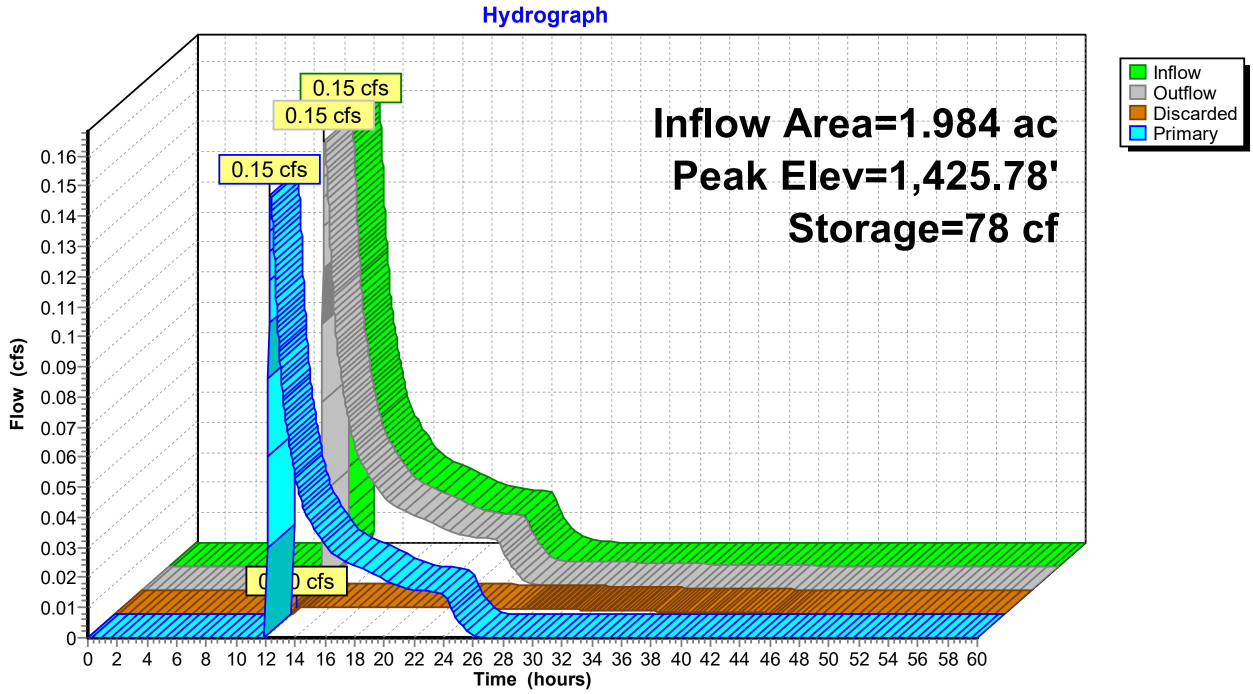
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,424.75	0	0.0	0	0	0
1,425.00	25	22.9	2	2	42
1,426.00	273	98.0	127	129	767
1,426.70	603	161.7	299	428	2,086

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.75'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,425.69'	**2.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.00 cfs @ 12.31 hrs HW=1,425.78' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.15 cfs @ 12.31 hrs HW=1,425.78' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.15 cfs @ 0.78 fps)

Pond 1.1bP1: Dry Swale



Summary for Pond 1.1bP2: North Road Detention Pond

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.21" for 1-Yr Storm event
Inflow = 0.15 cfs @ 12.31 hrs, Volume= 0.035 af
Outflow = 0.01 cfs @ 24.37 hrs, Volume= 0.034 af, Atten= 92%, Lag= 723.7 min
Discarded = 0.01 cfs @ 24.37 hrs, Volume= 0.034 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,423.08' @ 24.37 hrs Surf.Area= 0.022 ac Storage= 0.024 af

Plug-Flow detention time= 1,064.8 min calculated for 0.034 af (96% of inflow)
Center-of-Mass det. time= 1,046.6 min (2,017.3 - 970.8)

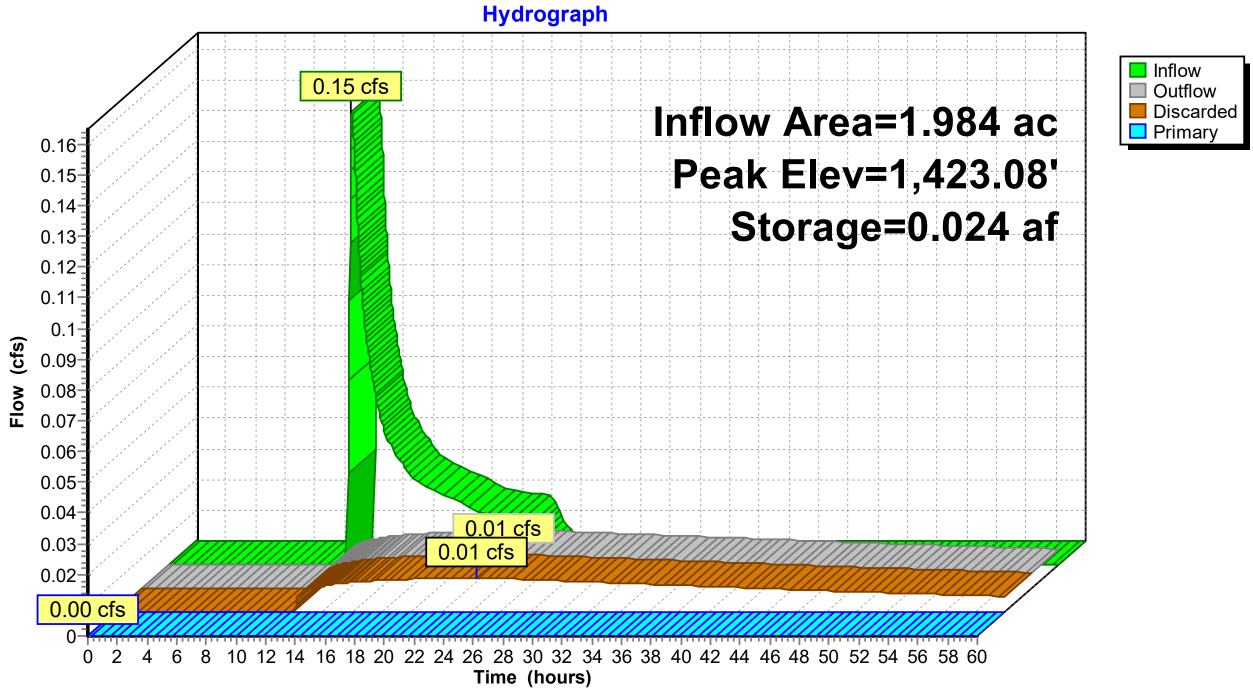
Volume	Invert	Avail.Storage	Storage Description
#1	1,421.50'	0.166 af	**10.00'W x 40.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,421.50'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,424.00'	**20.0' 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

Discarded OutFlow Max=0.01 cfs @ 24.37 hrs HW=1,423.08' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,421.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.1bP2: North Road Detention Pond



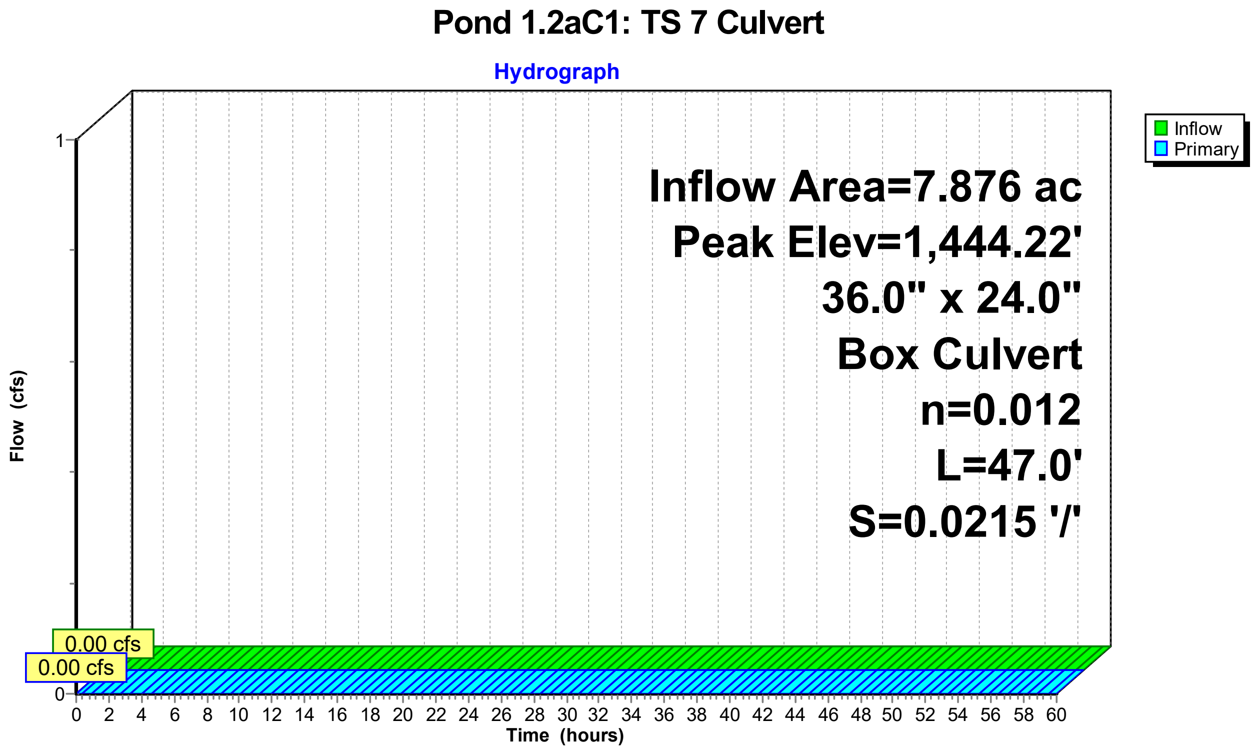
Summary for Pond 1.2aC1: TS 7 Culvert

Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.2aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.22' @ 0.00 hrs
Flood Elev= 1,446.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,444.22'	**36.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,444.22' / 1,443.21' S= 0.0215 '/' Cc= 0.900 n= 0.012, Flow Area= 6.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,444.22' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)



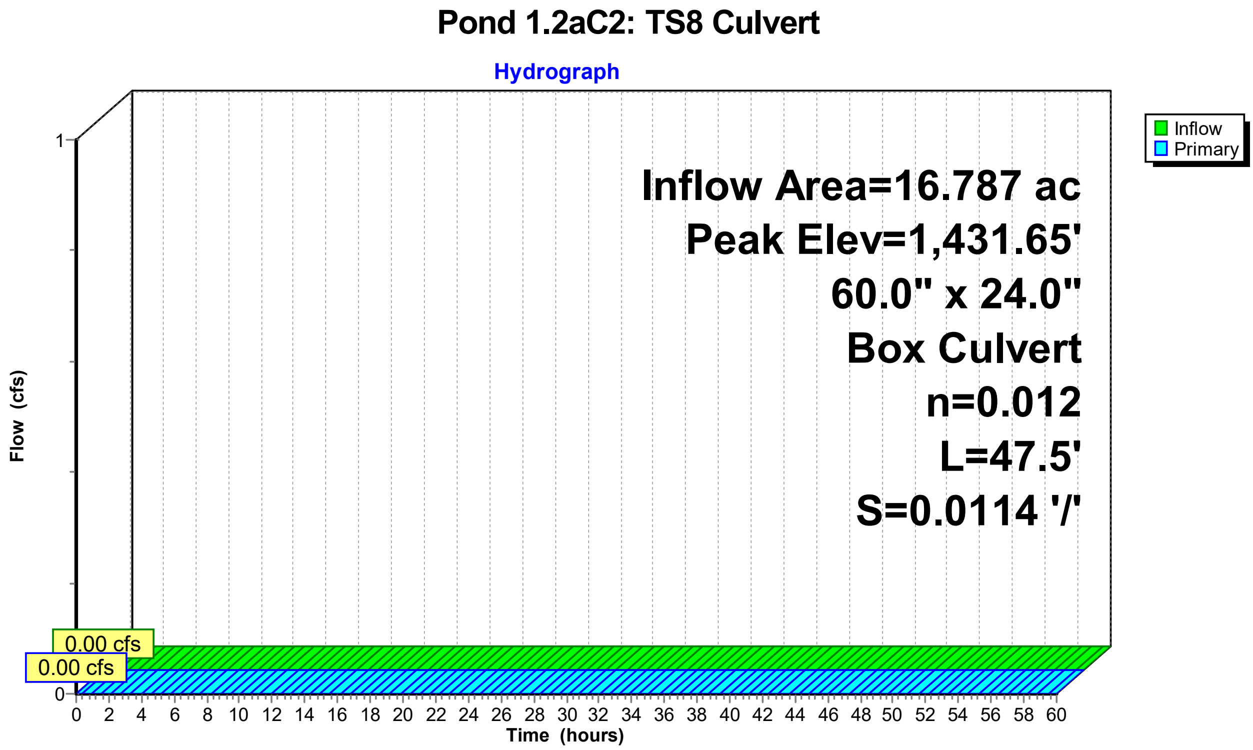
Summary for Pond 1.2aC2: TS8 Culvert

Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.2aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.65' @ 0.00 hrs
Flood Elev= 1,433.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.65'	**60.0" W x 24.0" H Box Culvert** L= 47.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,431.65' / 1,431.11' S= 0.0114 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.65' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)



Summary for Pond 1.2aP: South Road Bypass OC

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

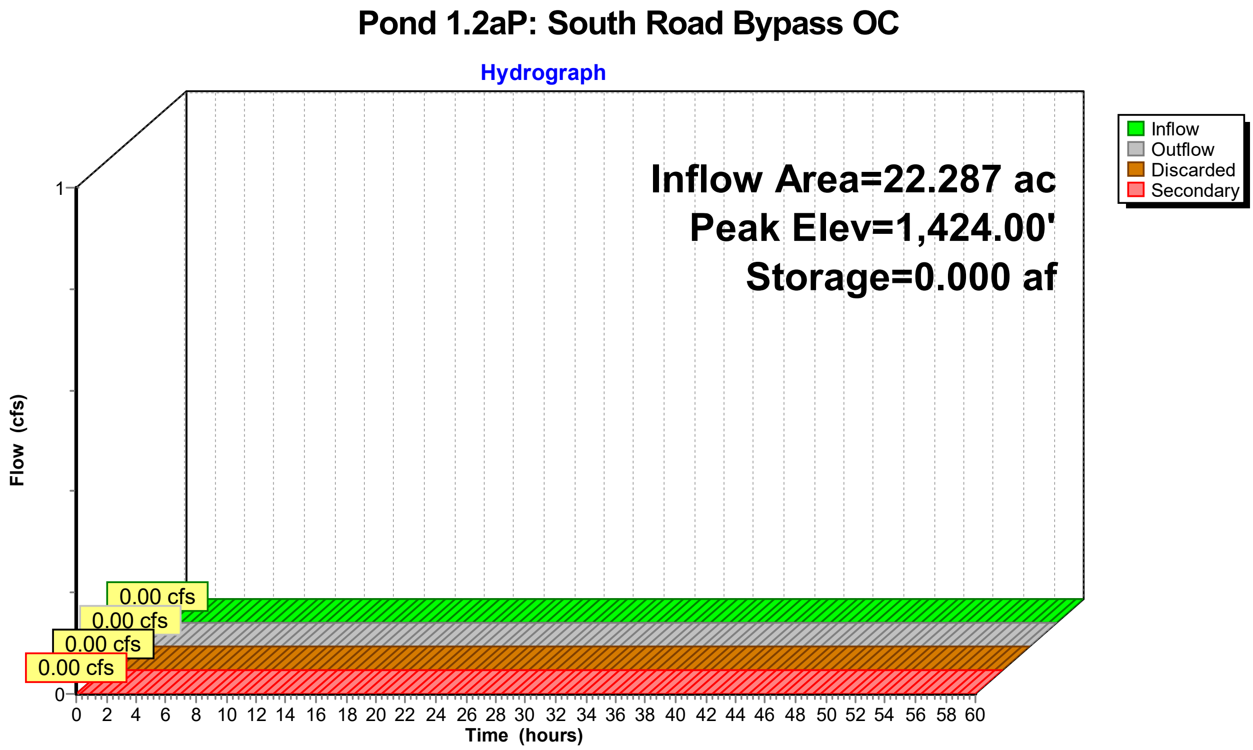
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area**
#2	Secondary	1,426.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
└**1=Exfiltration** (Passes 0.00 cfs of 0.06 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Summary for Pond 1.2bC1: East Road Culvert

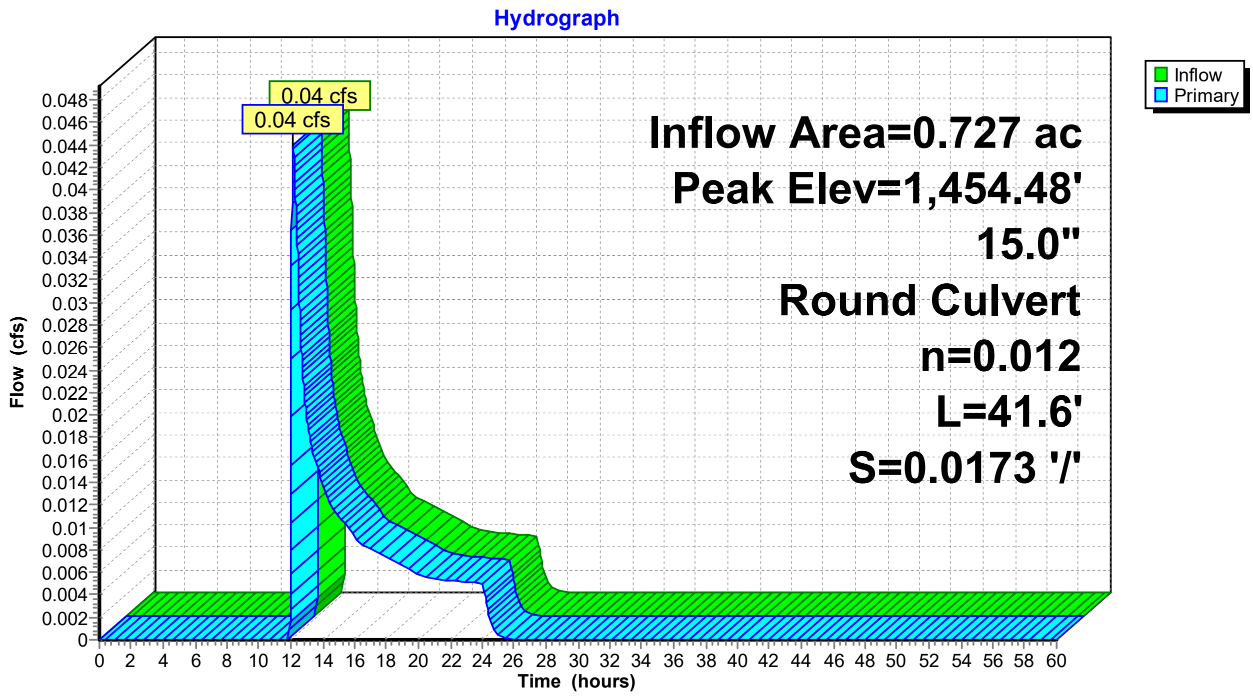
Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.17" for 1-Yr Storm event
Inflow = 0.04 cfs @ 12.13 hrs, Volume= 0.010 af
Outflow = 0.04 cfs @ 12.13 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 12.13 hrs, Volume= 0.010 af
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,454.48' @ 12.13 hrs
Flood Elev= 1,457.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,454.39'	**15.0" Round Culvert** L= 41.6' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,454.39' / 1,453.67' S= 0.0173 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.04 cfs @ 12.13 hrs HW=1,454.48' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.04 cfs @ 1.04 fps)

Pond 1.2bC1: East Road Culvert



Summary for Pond 1.2bC2: TS6 Culvert

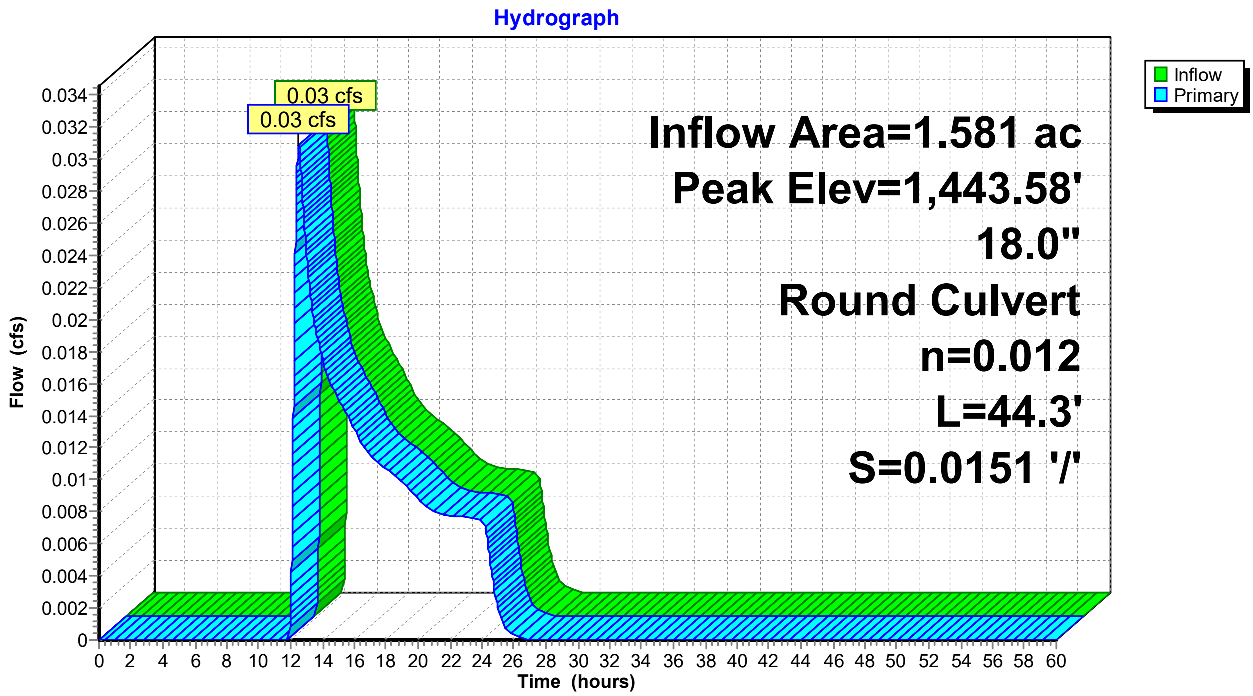
Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.10" for 1-Yr Storm event
Inflow = 0.03 cfs @ 12.52 hrs, Volume= 0.013 af
Outflow = 0.03 cfs @ 12.52 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min
Primary = 0.03 cfs @ 12.52 hrs, Volume= 0.013 af
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,443.58' @ 12.52 hrs
Flood Elev= 1,445.09'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,443.51'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,443.51' / 1,442.84' S= 0.0151 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.03 cfs @ 12.52 hrs HW=1,443.58' (Free Discharge)
1=Culvert (Inlet Controls 0.03 cfs @ 0.93 fps)

Pond 1.2bC2: TS6 Culvert



Summary for Pond 1.2bP: South Road Treatment Pond

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.15" for 1-Yr Storm event
Inflow = 0.13 cfs @ 12.10 hrs, Volume= 0.030 af
Outflow = 0.11 cfs @ 12.17 hrs, Volume= 0.030 af, Atten= 9%, Lag= 4.6 min
Discarded = 0.11 cfs @ 12.17 hrs, Volume= 0.030 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.05' @ 12.17 hrs Surf.Area= 0.009 ac Storage= 0.000 af

Plug-Flow detention time= 3.0 min calculated for 0.030 af (100% of inflow)
Center-of-Mass det. time= 3.0 min (987.7 - 984.7)

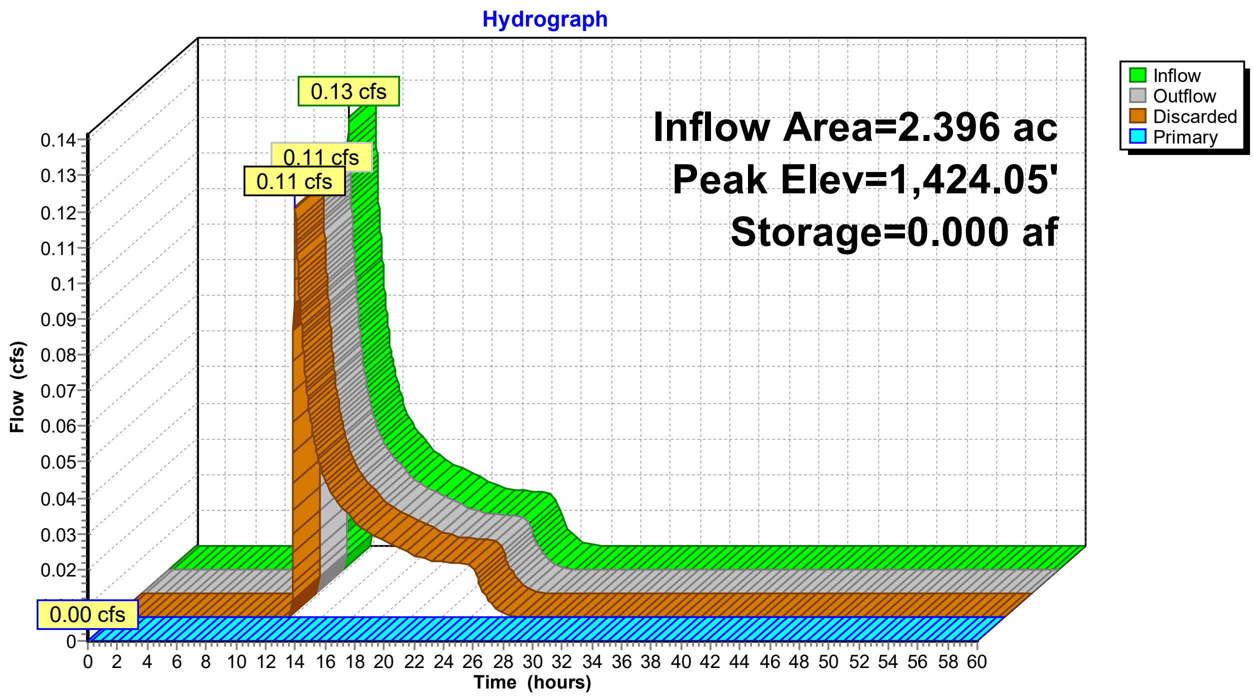
Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.149 af	**20.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,426.05'	**20.0' 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

Discarded OutFlow Max=0.11 cfs @ 12.17 hrs HW=1,424.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.2bP: South Road Treatment Pond



Summary for Pond 1.3P: Pond 3 - Access Rd West

Inflow Area = 0.695 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af, Atten= 2%, Lag= 1.1 min
Discarded = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link SP1 : Study Point 1

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,456.00' @ 24.03 hrs Surf.Area= 784 sf Storage= 0 cf

Plug-Flow detention time= 4.8 min calculated for 0.000 af (100% of inflow)
Center-of-Mass det. time= 4.8 min (1,398.1 - 1,393.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,456.00'	8,743 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

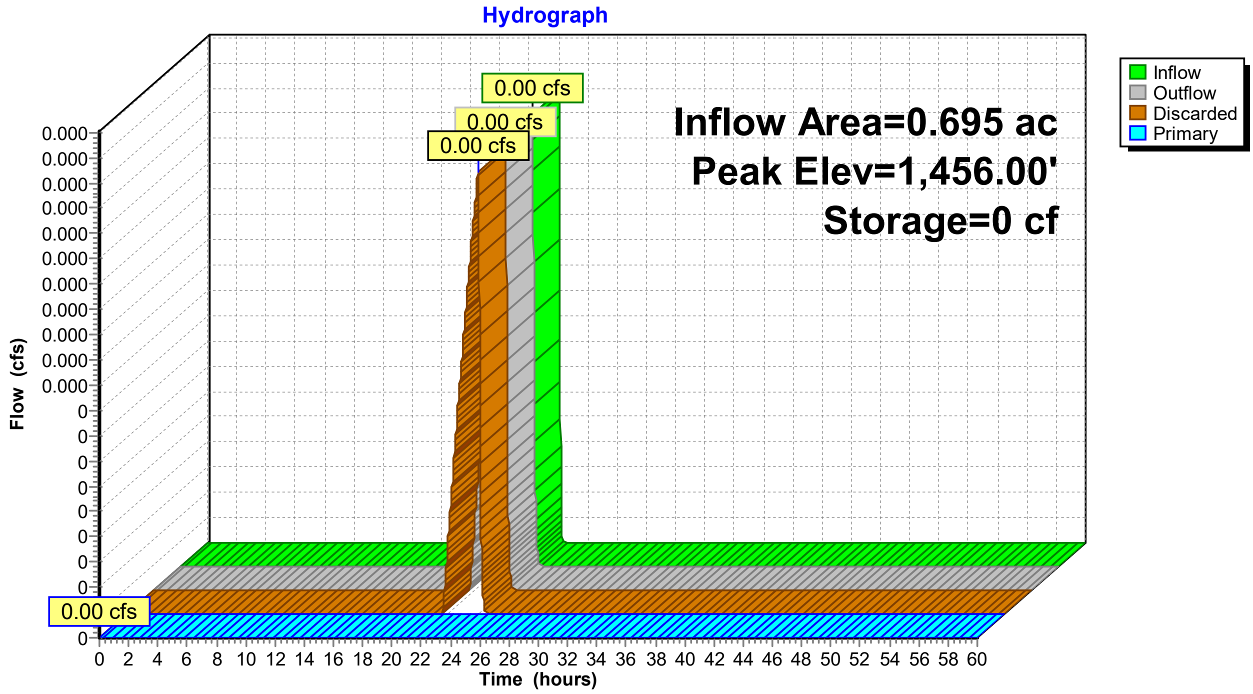
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,456.00	784	123.0	0	0	784
1,458.00	1,720	194.0	2,443	2,443	2,603
1,459.00	2,884	279.0	2,277	4,721	5,811
1,460.00	5,280	421.0	4,022	8,743	13,729

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,456.00'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,459.99'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.00 cfs @ 24.03 hrs HW=1,456.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.3P: Pond 3 - Access Rd West



Summary for Pond 4.2bP: Pond 4 - Access Rd East

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.28" for 1-Yr Storm event
Inflow = 0.12 cfs @ 12.06 hrs, Volume= 0.011 af
Outflow = 0.04 cfs @ 12.50 hrs, Volume= 0.011 af, Atten= 69%, Lag= 26.2 min
Discarded = 0.04 cfs @ 12.50 hrs, Volume= 0.011 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4.2C : 18" Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,445.81' @ 12.50 hrs Surf.Area= 259 sf Storage= 70 cf

Plug-Flow detention time= 12.7 min calculated for 0.011 af (100% of inflow)
Center-of-Mass det. time= 12.7 min (939.1 - 926.4)

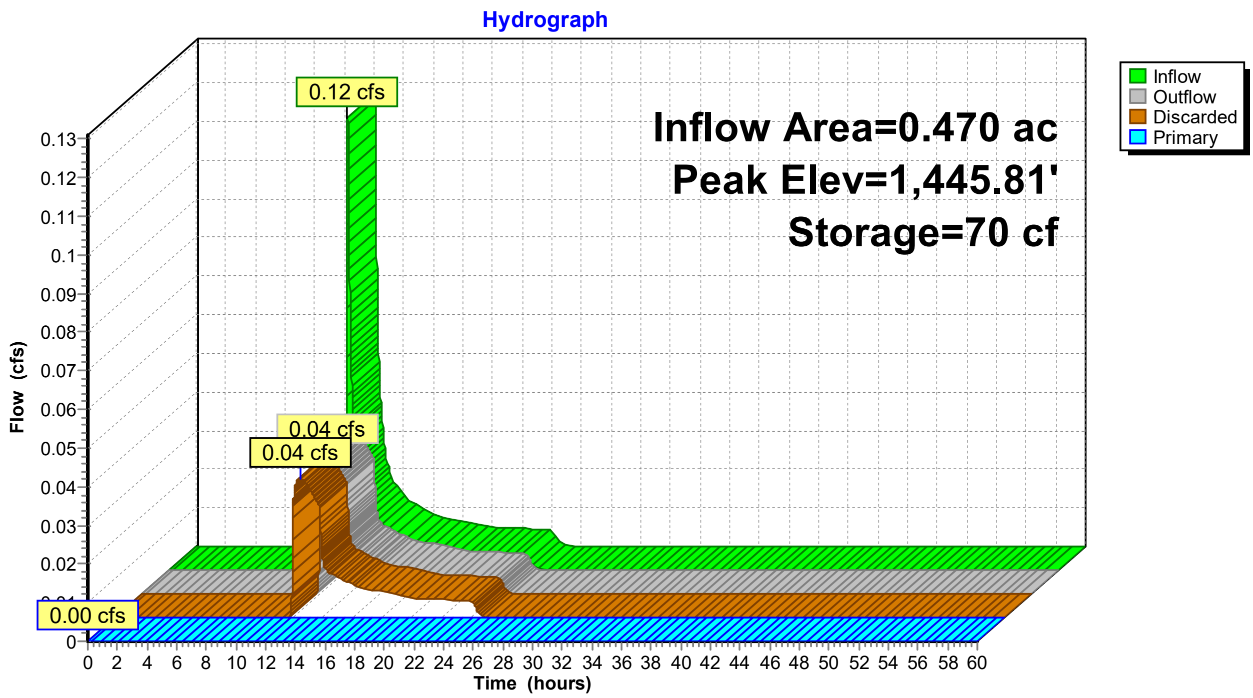
Volume	Invert	Avail.Storage	Storage Description
#1	1,445.50'	2,317 cf	**10.00'W x 20.00'L x 3.50'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,445.50'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,448.25'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.04 cfs @ 12.50 hrs HW=1,445.81' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,445.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4.2bP: Pond 4 - Access Rd East



Summary for Pond 4.2C: 18" Culvert

Inflow Area = 27.587 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.01 cfs @ 24.16 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.78' @ 26.20 hrs Surf.Area= 373 sf Storage= 35 cf
Flood Elev= 1,434.64' Surf.Area= 27,666 sf Storage= 28,656 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

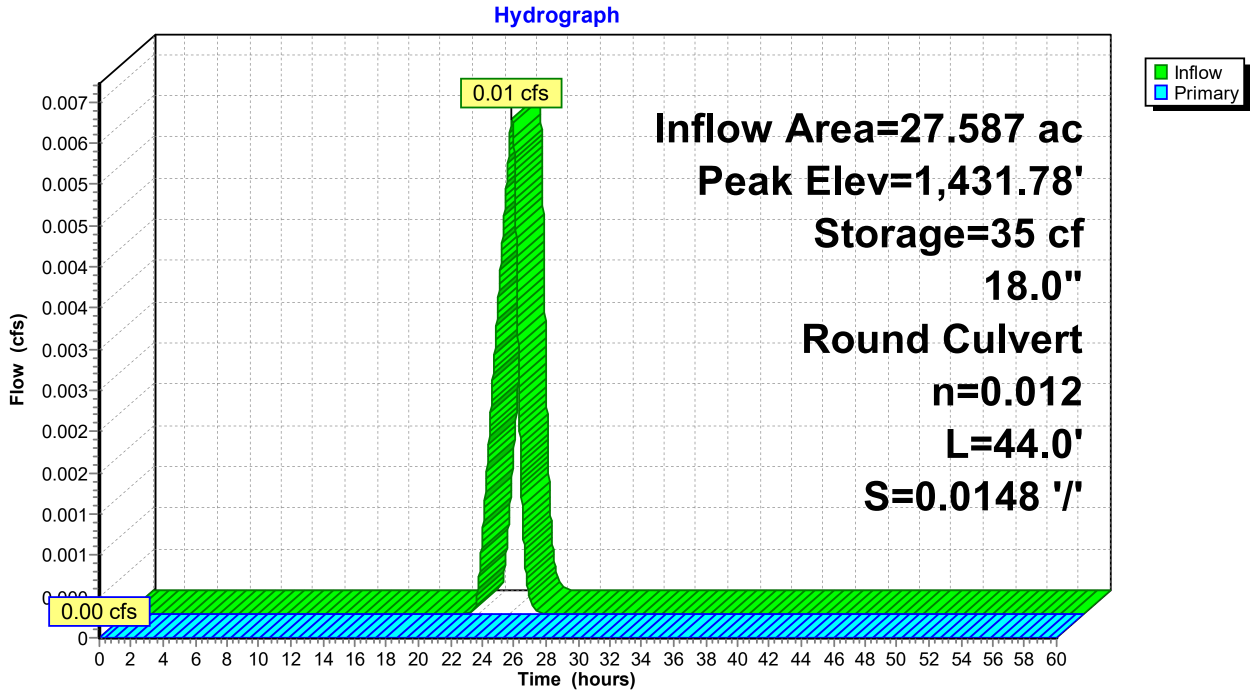
Volume	Invert	Avail.Storage	Storage Description
#1	1,431.50'	39,033 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,431.50	0	0.0	0	0	0
1,432.00	1,190	146.0	198	198	1,697
1,432.50	3,534	368.0	1,129	1,327	10,778
1,433.00	5,795	497.0	2,309	3,637	19,660
1,433.50	10,362	837.0	3,984	7,621	55,755
1,434.00	16,931	975.0	6,756	14,377	75,659
1,434.60	27,412	1,352.0	13,177	27,555	145,474
1,435.00	30,000	1,500.0	11,479	39,033	179,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.83'	**18.0" Round Culvert** L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.83' / 1,431.18' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.50' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)

Pond 4.2C: 18" Culvert



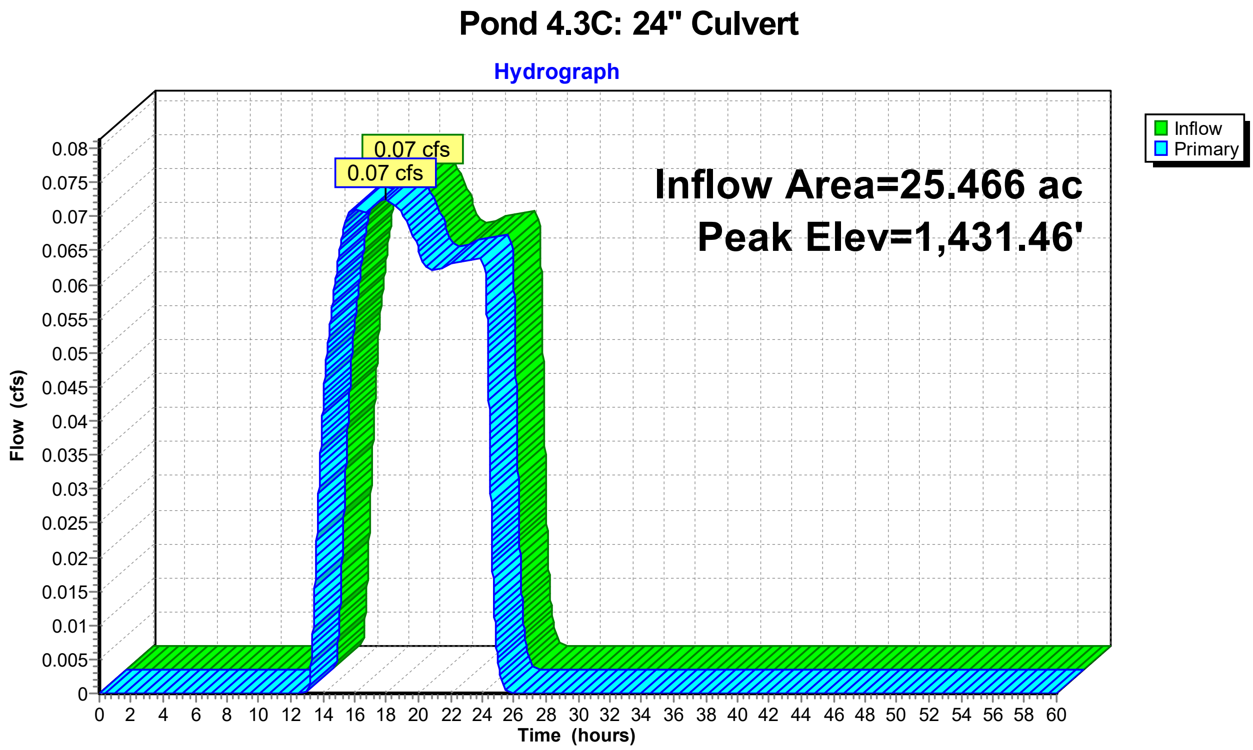
Summary for Pond 4.3C: 24" Culvert

Inflow Area = 25.466 ac, 5.08% Impervious, Inflow Depth = 0.03" for 1-Yr Storm event
Inflow = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af
Outflow = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min
Primary = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.46' @ 17.89 hrs
Flood Elev= 1,434.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.35'	**24.0" Round Culvert** L= 55.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.35' / 1,429.87' S= 0.0265 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Primary	1,434.81'	**20.0' 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

Primary OutFlow Max=0.07 cfs @ 17.89 hrs HW=1,431.46' (Free Discharge)
1=Culvert (Inlet Controls 0.07 cfs @ 1.11 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

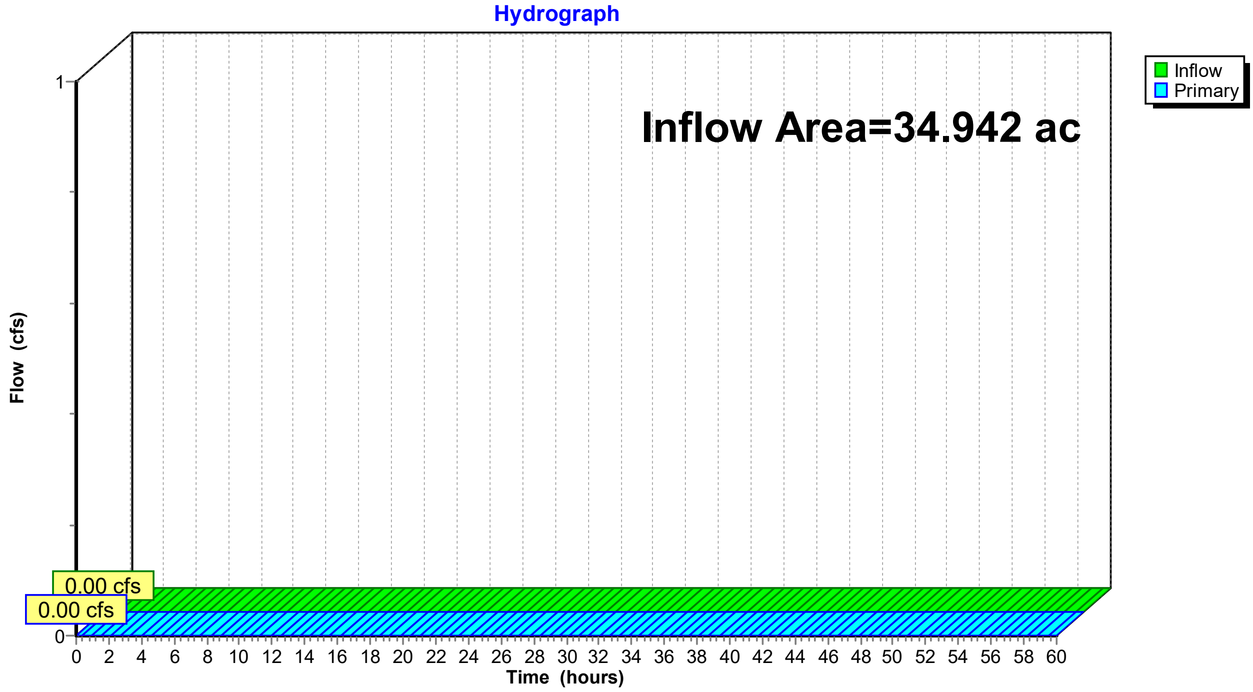


Summary for Link 1.1L:

Inflow Area = 34.942 ac, 0.04% Impervious, Inflow Depth = 0.00" for 1-Yr Storm 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
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link 1.1L:

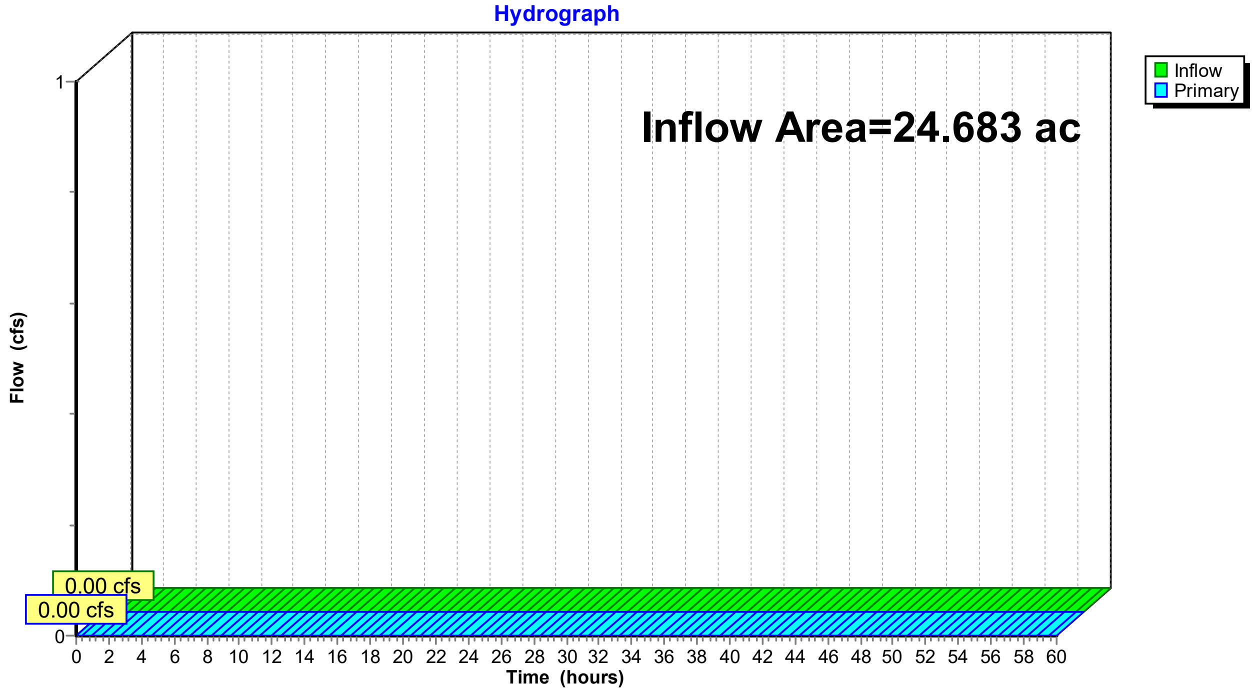


Summary for Link 1.2L:

Inflow Area = 24.683 ac, 0.06% Impervious, Inflow Depth = 0.00" for 1-Yr Storm 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
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link 1.2L:

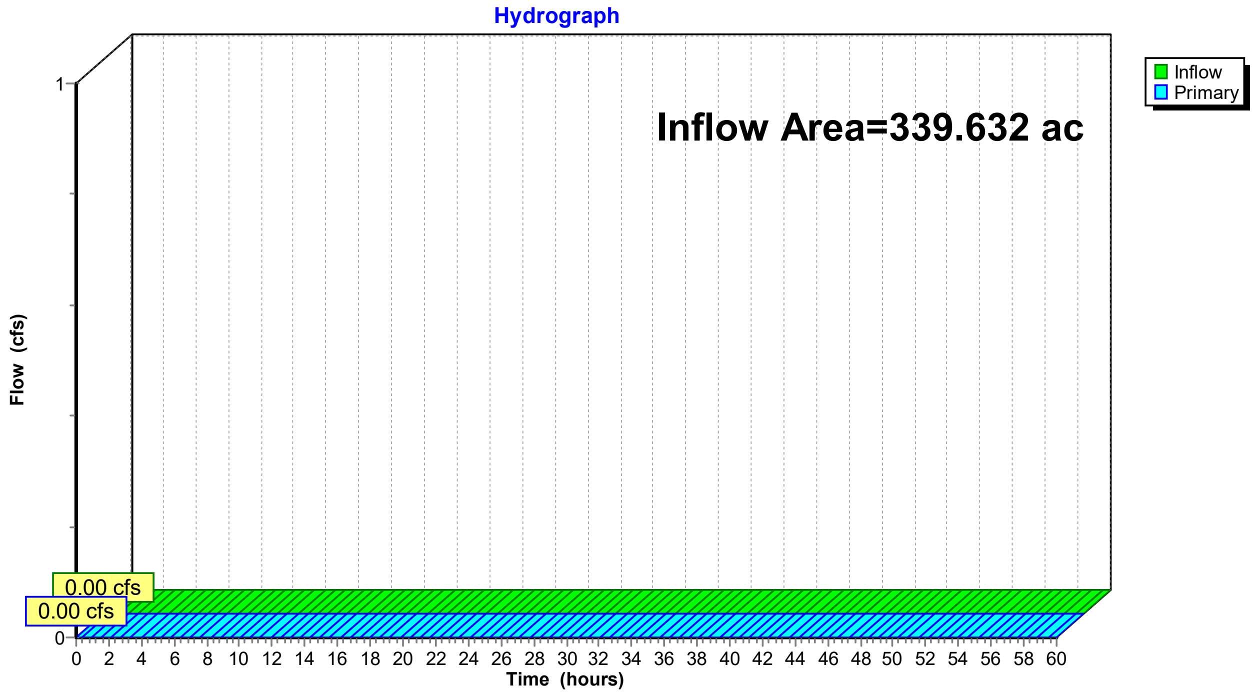


Summary for Link SP1: Study Point 1

Inflow Area =	339.632 ac,	0.01% Impervious, Inflow Depth = 0.00"	for 1-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP1: Study Point 1

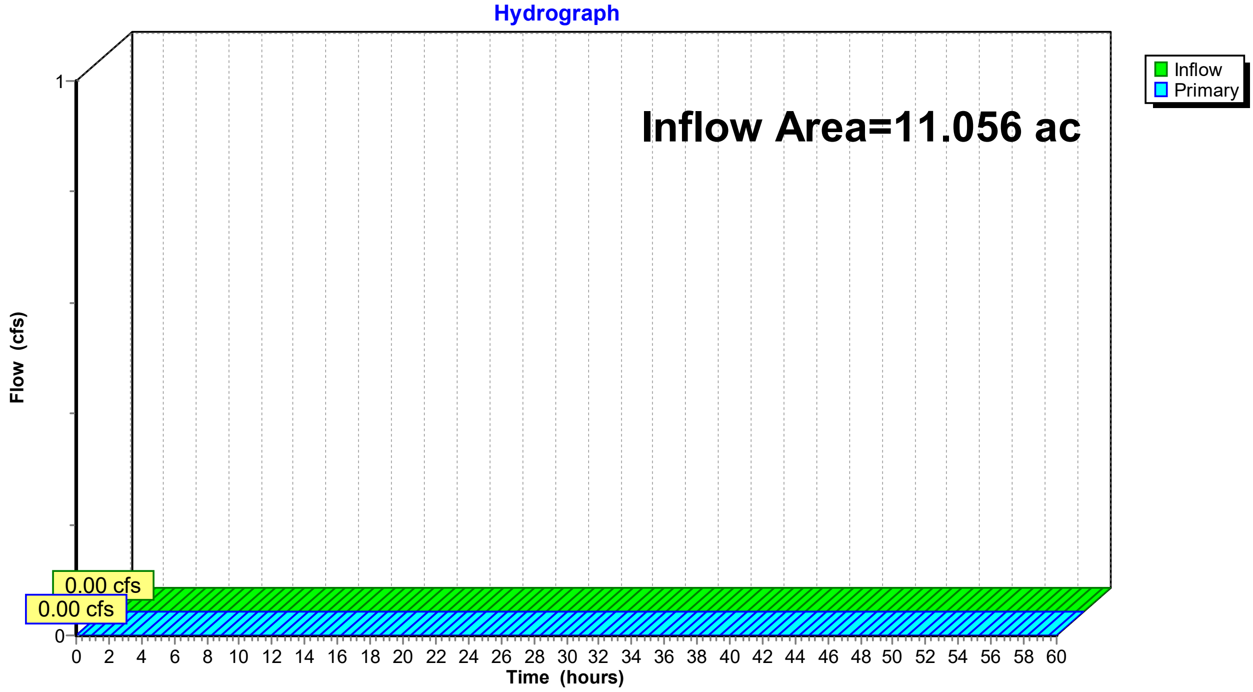


Summary for Link SP2: Study Point 2

Inflow Area = 11.056 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP2: Study Point 2

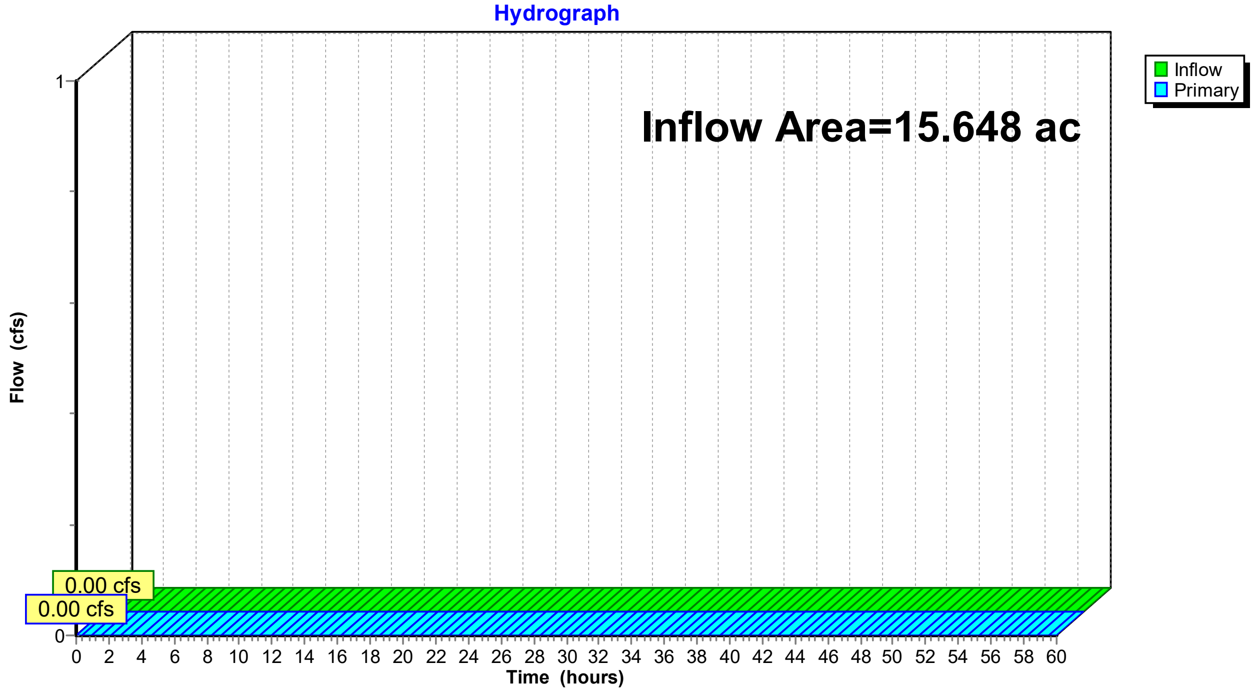


Summary for Link SP3: Study Point 3

Inflow Area =	15.648 ac,	0.56% Impervious, Inflow Depth = 0.00"	for 1-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP3: Study Point 3

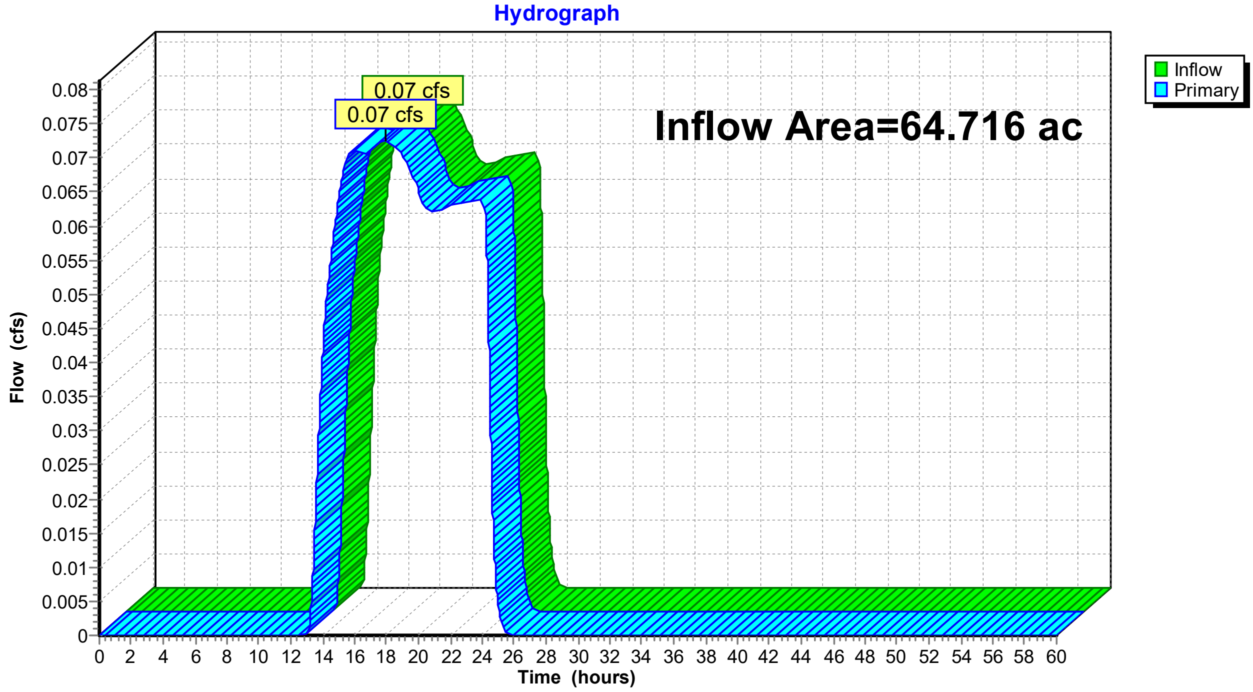


Summary for Link SP4: Study Point 4

Inflow Area = 64.716 ac, 2.50% Impervious, Inflow Depth = 0.01" for 1-Yr Storm event
Inflow = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af
Primary = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP4: Study Point 4

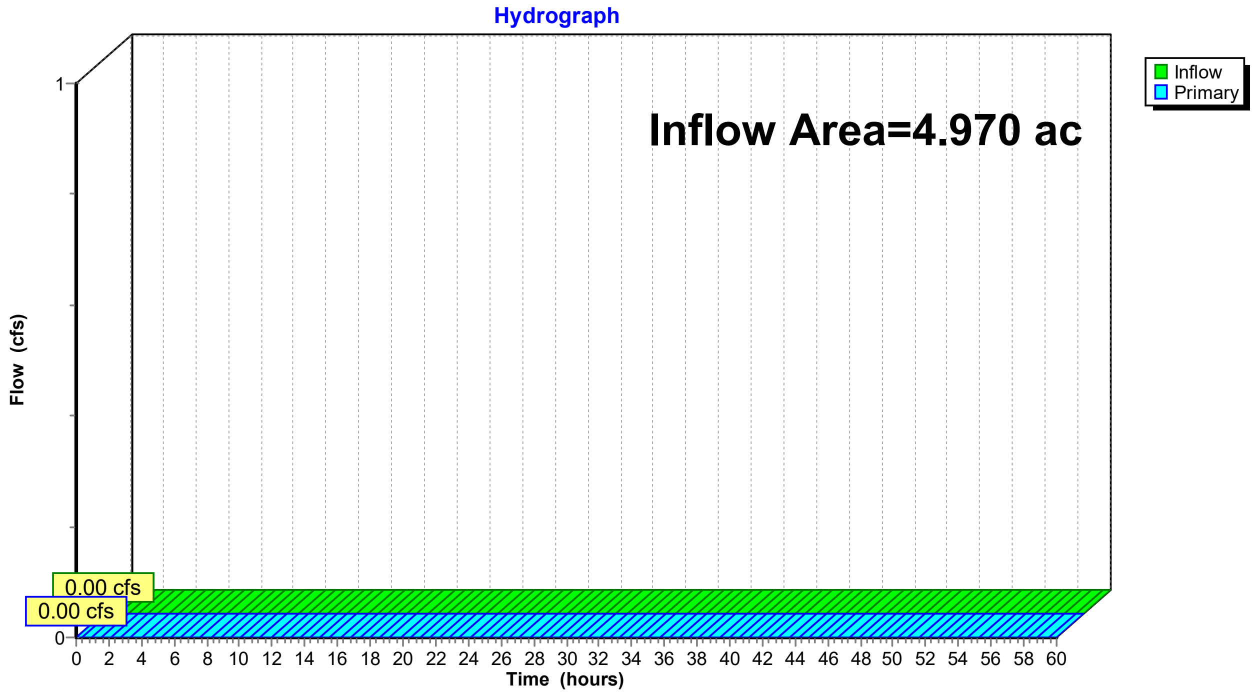


Summary for Link SP5: Study Point 5

Inflow Area =	4.970 ac,	0.00% Impervious, Inflow Depth = 0.00"	for 1-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP5: Study Point 5

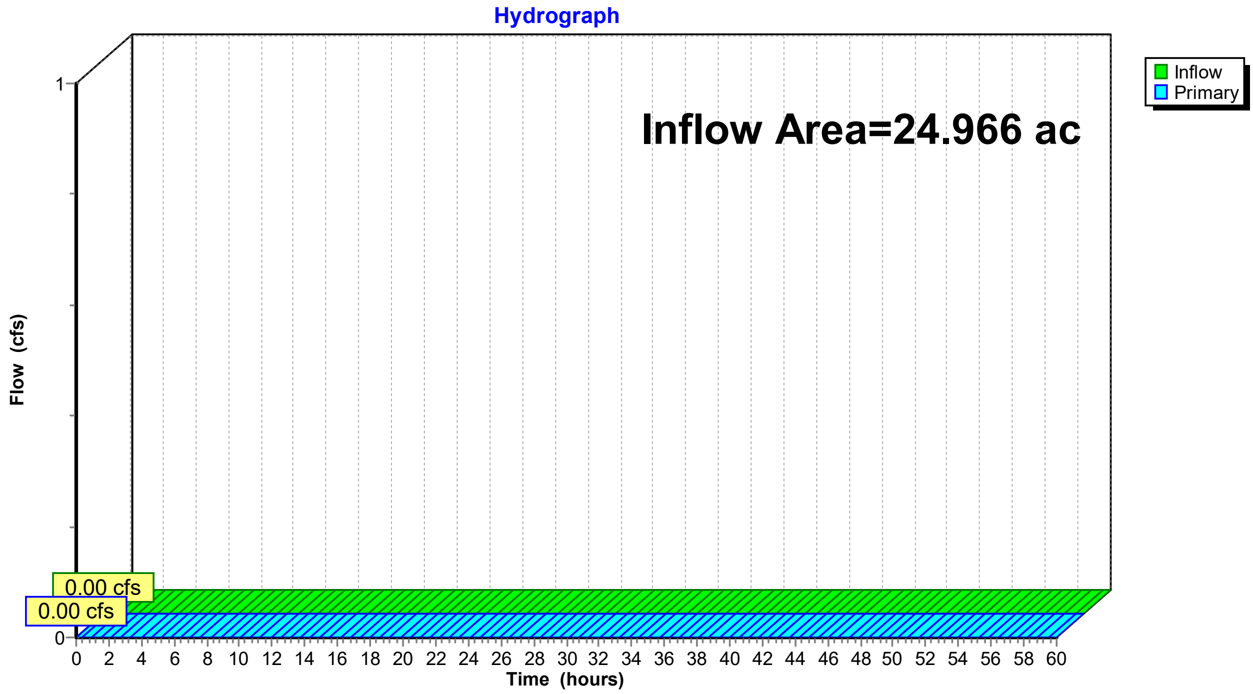


Summary for Link SP6: Study Point 6

Inflow Area =	24.966 ac,	5.81% Impervious, Inflow Depth = 0.00"	for 1-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP6: Study Point 6



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1.1aS1: North Array East Runoff Area=5.874 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=788' Tc=18.8 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS2: North Array East Runoff Area=8.467 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=931' Tc=21.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS3: North Array West Runoff Area=5.792 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,031' Tc=19.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS4: North Array West Runoff Area=12.825 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,562' Tc=26.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1bS1: North Road - East Runoff Area=1.333 ac 0.53% Impervious Runoff Depth=0.93"
Tc=6.0 min CN=71 Runoff=2.16 cfs 0.103 af

Subcatchment 1.1bS2: North Road - West Runoff Area=0.651 ac 1.08% Impervious Runoff Depth=0.78"
Tc=6.0 min CN=68 Runoff=0.86 cfs 0.042 af

Subcatchment 1.2aS1: Middle Array East Runoff Area=7.876 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=865' Tc=19.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS2: Middle Array Center Runoff Area=8.911 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=825' Tc=18.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS3: Middle Array West Runoff Area=5.500 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=18.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2bS1: East Road - West Runoff Area=0.727 ac 0.00% Impervious Runoff Depth=0.73"
Tc=6.0 min CN=67 Runoff=0.89 cfs 0.044 af

Subcatchment 1.2bS2: South Road Runoff Area=0.854 ac 0.47% Impervious Runoff Depth=0.37"
Flow Length=308' Tc=13.7 min CN=58 Runoff=0.26 cfs 0.026 af

Subcatchment 1.2bS3: South Road Runoff Area=0.815 ac 1.35% Impervious Runoff Depth=0.93"
Tc=6.0 min CN=71 Runoff=1.32 cfs 0.063 af

Subcatchment 1.3aS1: Surface Discharge Runoff Area=279.312 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=6,771' Tc=201.7 min CN=39 Runoff=0.11 cfs 0.034 af

Subcatchment 1.3bS: Access Rd to Pond 3 Runoff Area=0.695 ac 0.00% Impervious Runoff Depth=0.17"
Tc=6.0 min CN=51 Runoff=0.04 cfs 0.010 af

Subcatchment 2S: Runoff Area=11.056 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=2,342' Tc=36.0 min CN=39 Runoff=0.01 cfs 0.001 af

Subcatchment 3S: Runoff Area=15.648 ac 0.56% Impervious Runoff Depth=0.01"
Flow Length=886' Tc=12.7 min CN=40 Runoff=0.02 cfs 0.007 af

Subcatchment 4.1S: Runoff Area=11.663 ac 2.80% Impervious Runoff Depth=0.05"
Flow Length=845' Tc=15.8 min CN=45 Runoff=0.06 cfs 0.052 af

Subcatchment 4.2aS: Runoff Area=27.117 ac 0.00% Impervious Runoff Depth=0.17"
Flow Length=1,640' Tc=38.9 min CN=51 Runoff=0.85 cfs 0.380 af

Subcatchment 4.2bS: Runoff Area=0.470 ac 0.00% Impervious Runoff Depth=0.98"
Tc=6.0 min CN=72 Runoff=0.81 cfs 0.038 af

Subcatchment 4.3S: Runoff Area=25.466 ac 5.08% Impervious Runoff Depth=0.34"
Flow Length=2,280' Tc=36.5 min CN=57 Runoff=3.30 cfs 0.715 af

Subcatchment 5S: Runoff Area=4.970 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,180' Tc=17.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 6S: Runoff Area=24.966 ac 5.81% Impervious Runoff Depth=0.03"
Flow Length=1,961' Tc=60.1 min CN=43 Runoff=0.08 cfs 0.059 af

Reach 1.1aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.0' S=0.0108 '/' Capacity=56.37 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.4' S=0.0284 '/' Capacity=91.27 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.5' S=0.0352 '/' Capacity=101.68 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR4: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.5' S=0.0362 '/' Capacity=103.04 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1bR1: North Road Conveyance Avg. Flow Depth=0.21' Max Vel=2.01 fps Inflow=2.16 cfs 0.103 af
n=0.035 L=1,733.0' S=0.0240 '/' Capacity=111.65 cfs Outflow=1.13 cfs 0.103 af

Reach 1.1bR2: North Road Conveyance Avg. Flow Depth=0.23' Max Vel=2.62 fps Inflow=1.78 cfs 0.145 af
n=0.035 L=593.3' S=0.0380 '/' Capacity=140.36 cfs Outflow=1.61 cfs 0.145 af

Reach 1.2aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=524.2' S=0.0188 '/' Capacity=74.30 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=556.0' S=0.0204 '/' Capacity=77.47 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=249.0' S=0.0153 '/' Capacity=81.84 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2bR1: East Road Conveyance Avg. Flow Depth=0.13' Max Vel=2.13 fps Inflow=0.89 cfs 0.044 af
n=0.035 L=731.4' S=0.0456 '/' Capacity=79.22 cfs Outflow=0.69 cfs 0.044 af

Reach 1.2bR2: South Road Conveyance Avg. Flow Depth=0.18' Max Vel=1.55 fps Inflow=0.89 cfs 0.071 af
n=0.035 L=604.5' S=0.0177 '/' Capacity=95.76 cfs Outflow=0.70 cfs 0.071 af

Reach 1.2bR3: South Road Conveyance Avg. Flow Depth=0.24' Max Vel=1.89 fps Inflow=1.54 cfs 0.133 af
n=0.035 L=755.9' S=0.0187 '/' Capacity=98.64 cfs Outflow=1.22 cfs 0.133 af

Reach 4.1R1: Bypass Swale Avg. Flow Depth=0.16' Max Vel=1.27 fps Inflow=0.06 cfs 0.052 af
n=0.035 L=570.0' S=0.0303 '/' Capacity=54.88 cfs Outflow=0.06 cfs 0.052 af

Reach 4.1R2: Ex Stream Avg. Flow Depth=0.06' Max Vel=0.68 fps Inflow=0.82 cfs 0.431 af
n=0.035 L=740.0' S=0.0099 '/' Capacity=588.81 cfs Outflow=0.77 cfs 0.431 af

Reach 4.2bR: Conveyance Swale Avg. Flow Depth=0.14' Max Vel=2.09 fps Inflow=0.81 cfs 0.038 af
n=0.035 L=565.0' S=0.0432 '/' Capacity=77.09 cfs Outflow=0.69 cfs 0.038 af

Pond 1.1aC1: TS1 Culvert Peak Elev=1,487.56' Inflow=0.00 cfs 0.000 af
36.3" x 22.5", R=18.8"/51.0" Pipe Arch Culvert n=0.012 L=47.0' S=0.0162 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC2: TS2 Culvert Peak Elev=1,470.80' Inflow=0.00 cfs 0.000 af
48.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0262 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC3: TS3 Culvert Peak Elev=1,449.55' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.2' S=0.0405 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aP: North Road Bypass OC Peak Elev=1,426.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.1bC1: TS4 Culvert Peak Elev=1,449.98' Inflow=1.13 cfs 0.103 af
18.0" Round Culvert n=0.012 L=45.9' S=0.0486 '/' Outflow=1.13 cfs 0.103 af

Pond 1.1bP1: Dry Swale Peak Elev=1,426.14' Storage=171 cf Inflow=1.61 cfs 0.145 af
Discarded=0.00 cfs 0.004 af Primary=1.58 cfs 0.141 af Outflow=1.59 cfs 0.145 af

Pond 1.1bP2: North Road Detention Pond Peak Elev=1,424.04' Storage=0.050 af Inflow=1.58 cfs 0.141 af
Discarded=0.02 cfs 0.052 af Primary=0.45 cfs 0.074 af Outflow=0.46 cfs 0.127 af

Pond 1.2aC1: TS 7 Culvert Peak Elev=1,444.22' Inflow=0.00 cfs 0.000 af
36.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0215 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aC2: TS8 Culvert Peak Elev=1,431.65' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.5' S=0.0114 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aP: South Road Bypass OC Peak Elev=1,424.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.2bC1: East Road Culvert Peak Elev=1,454.78' Inflow=0.69 cfs 0.044 af
15.0" Round Culvert n=0.012 L=41.6' S=0.0173 '/' Outflow=0.69 cfs 0.044 af

Pond 1.2bC2: TS6 Culvert Peak Elev=1,443.88' Inflow=0.70 cfs 0.071 af
18.0" Round Culvert n=0.012 L=44.3' S=0.0151 '/' Outflow=0.70 cfs 0.071 af

Pond 1.2bP: South Road Treatment Pond Peak Elev=1,426.06' Storage=0.033 af Inflow=1.22 cfs 0.133 af
Discarded=0.29 cfs 0.132 af Primary=0.12 cfs 0.002 af Outflow=0.41 cfs 0.133 af

Pond 1.3P: Pond 3 - Access Rd West Peak Elev=1,456.01' Storage=8 cf Inflow=0.04 cfs 0.010 af
Discarded=0.03 cfs 0.010 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.010 af

Pond 4.2bP: Pond 4 - Access Rd East Peak Elev=1,447.07' Storage=581 cf Inflow=0.69 cfs 0.038 af
Discarded=0.08 cfs 0.038 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.038 af

Pond 4.2C: 18" Culvert Peak Elev=1,432.23' Storage=572 cf Inflow=0.85 cfs 0.380 af
18.0" Round Culvert n=0.012 L=44.0' S=0.0148 '/' Outflow=0.81 cfs 0.379 af

Pond 4.3C: 24" Culvert Peak Elev=1,432.12' Inflow=3.30 cfs 0.715 af
Outflow=3.30 cfs 0.715 af

Link 1.1L:	Inflow=0.45 cfs 0.074 af Primary=0.45 cfs 0.074 af
Link 1.2L:	Inflow=0.12 cfs 0.002 af Primary=0.12 cfs 0.002 af
Link SP1: Study Point 1	Inflow=0.56 cfs 0.110 af Primary=0.56 cfs 0.110 af
Link SP2: Study Point 2	Inflow=0.01 cfs 0.001 af Primary=0.01 cfs 0.001 af
Link SP3: Study Point 3	Inflow=0.02 cfs 0.007 af Primary=0.02 cfs 0.007 af
Link SP4: Study Point 4	Inflow=3.36 cfs 1.146 af Primary=3.36 cfs 1.146 af
Link SP5: Study Point 5	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP6: Study Point 6	Inflow=0.08 cfs 0.059 af Primary=0.08 cfs 0.059 af

Total Runoff Area = 460.988 ac Runoff Volume = 1.575 af Average Runoff Depth = 0.04"
99.31% Pervious = 457.801 ac 0.69% Impervious = 3.187 ac

Summary for Subcatchment 1.1aS1: North Array East

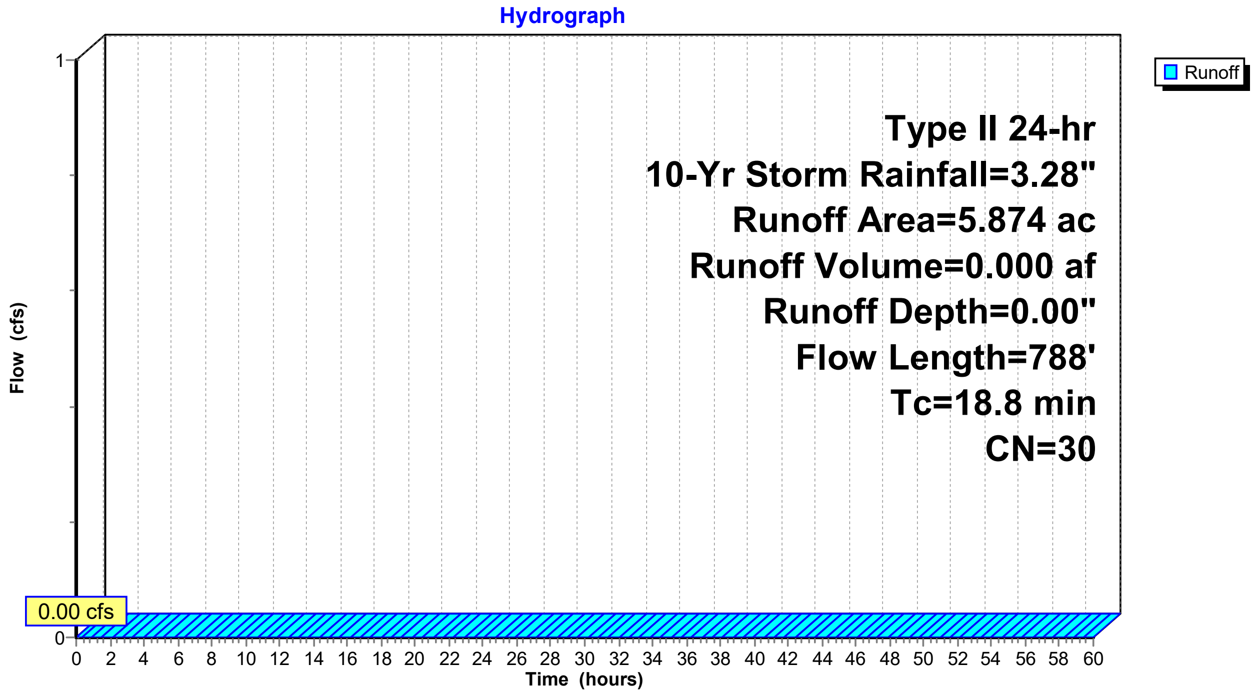
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
5.874	30	Meadow, non-grazed, HSG A
5.874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0499	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.1	688	0.0526	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.8	788	Total			

Subcatchment 1.1aS1: North Array East



Summary for Subcatchment 1.1aS2: North Array East Center

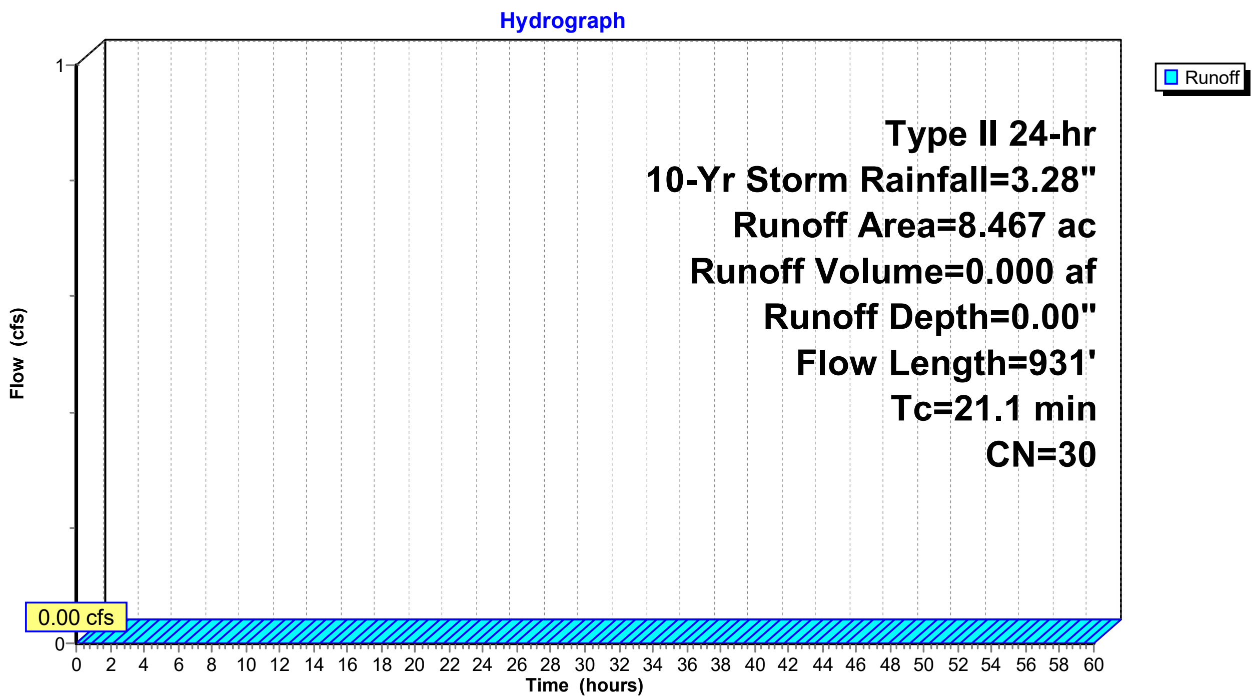
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
8.467	30	Meadow, non-grazed, HSG A
8.467		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0476	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.2	831	0.0463	1.51		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.1	931	Total			

Subcatchment 1.1aS2: North Array East Center



Summary for Subcatchment 1.1aS3: North Array West Center

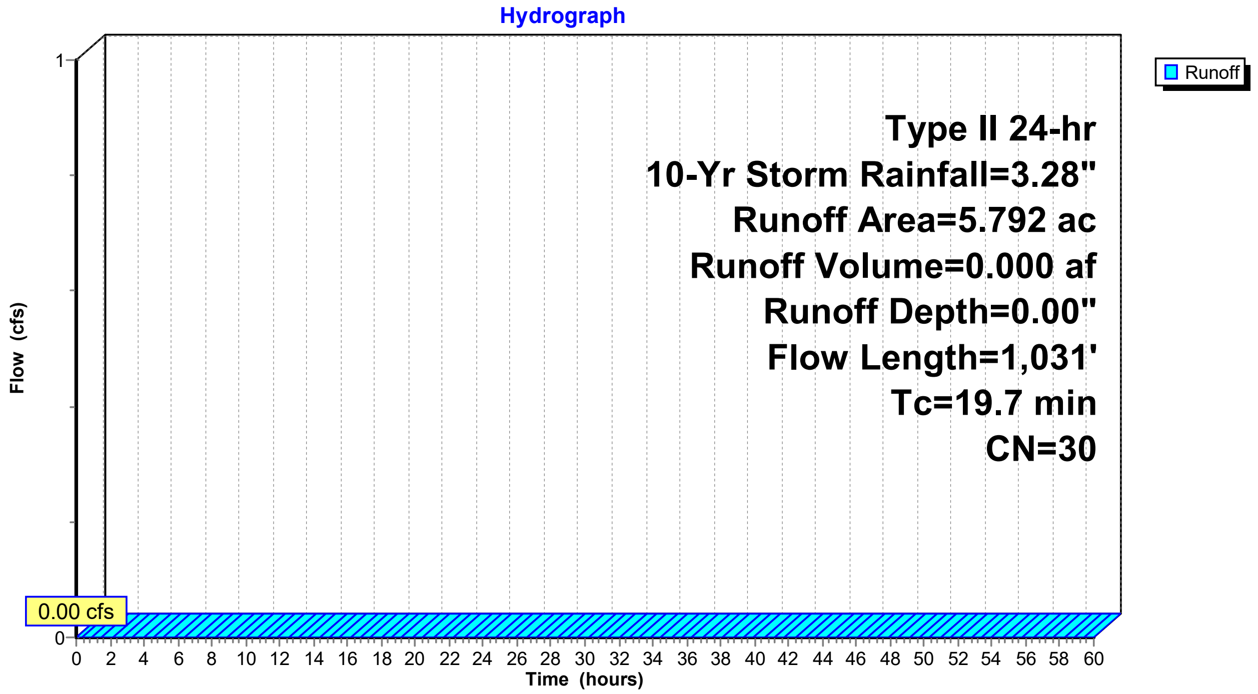
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
5.792	30	Meadow, non-grazed, HSG A
5.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0618	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.0	931	0.0601	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	1,031	Total			

Subcatchment 1.1aS3: North Array West Center



Summary for Subcatchment 1.1aS4: North Array West

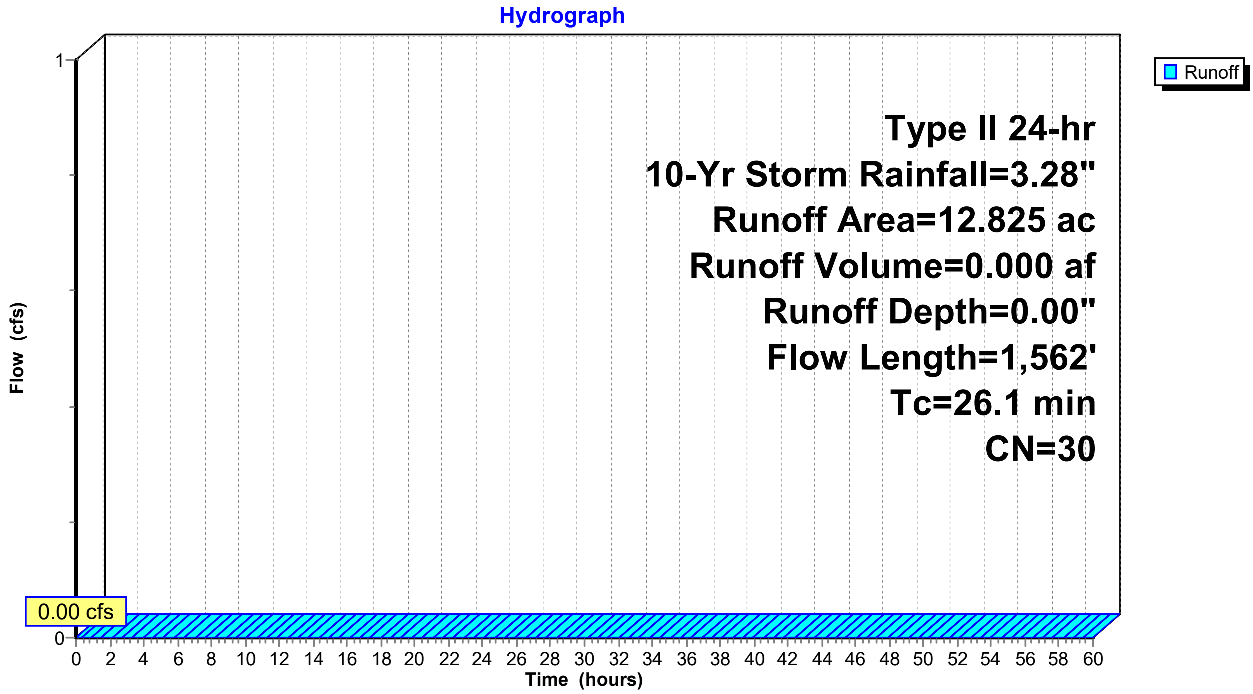
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR4 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
12.825	30	Meadow, non-grazed, HSG A
12.825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0560	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
15.0	1,462	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.1	1,562	Total			

Subcatchment 1.1aS4: North Array West



Summary for Subcatchment 1.1bS1: North Road - East

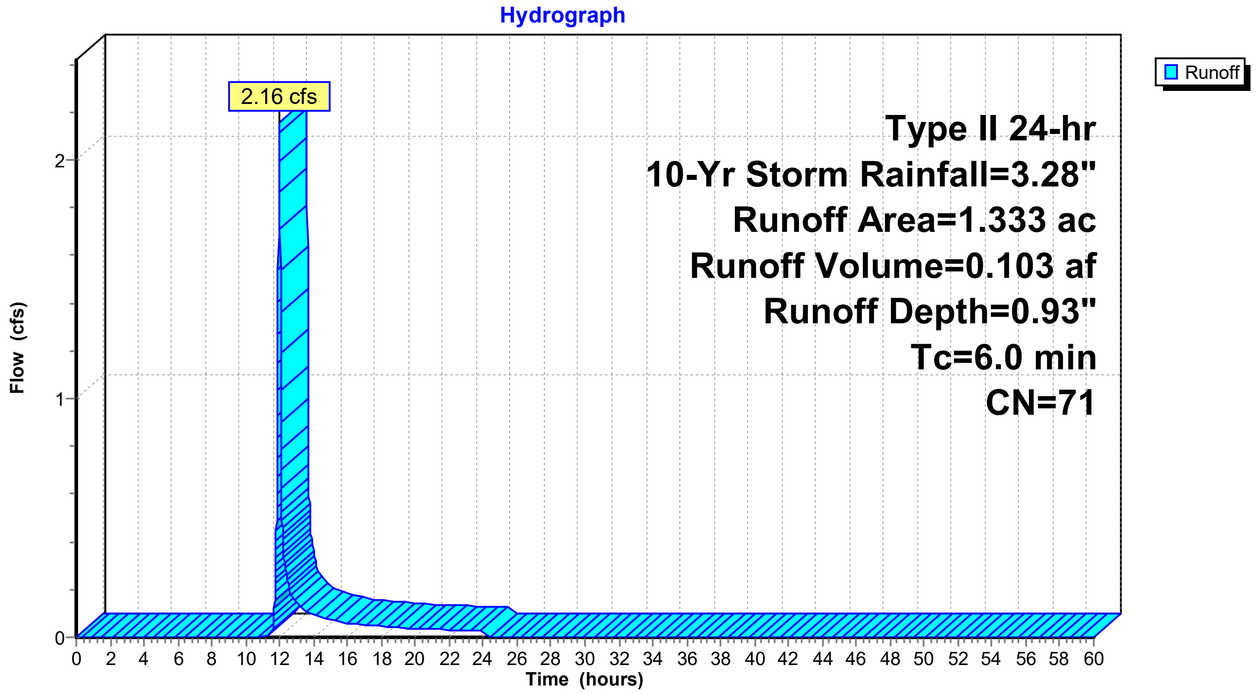
Runoff = 2.16 cfs @ 11.98 hrs, Volume= 0.103 af, Depth= 0.93"
Routed to Reach 1.1bR1 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
0.507	30	Meadow, non-grazed, HSG A
0.819	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
1.333	71	Weighted Average
1.326		99.47% Pervious Area
0.007		0.53% Impervious Area

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

Subcatchment 1.1bS1: North Road - East



Summary for Subcatchment 1.1bS2: North Road - West

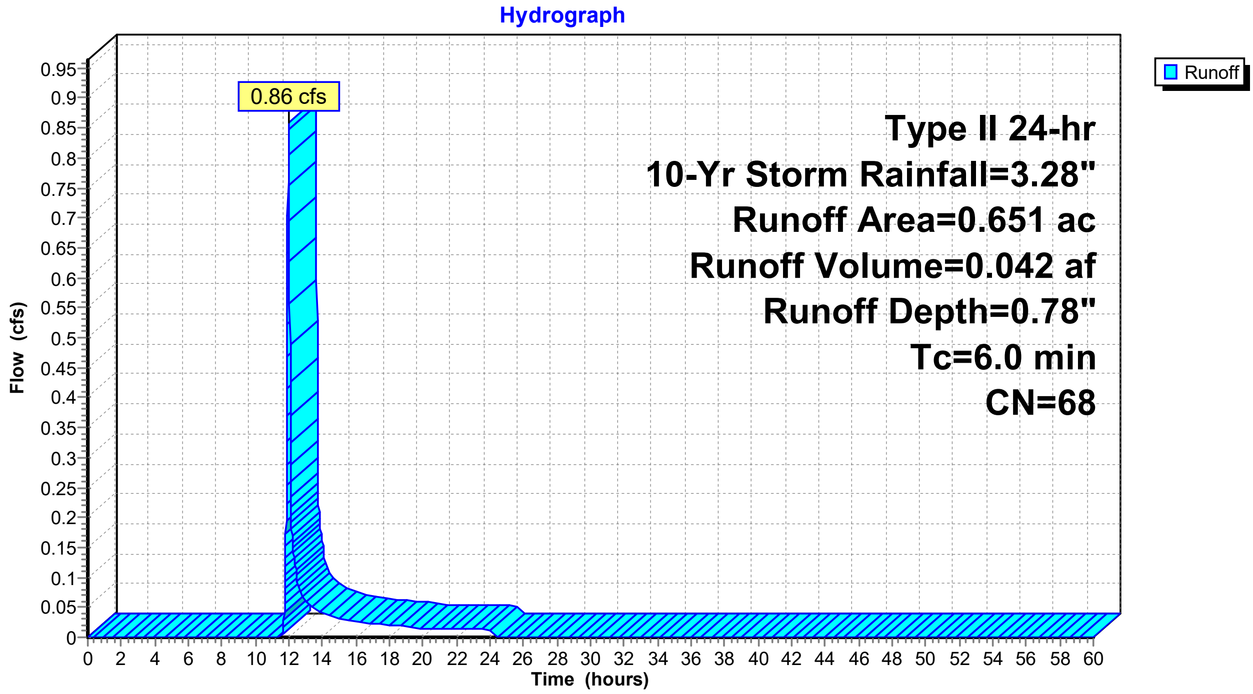
Runoff = 0.86 cfs @ 11.98 hrs, Volume= 0.042 af, Depth= 0.78"
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
0.279	30	Meadow, non-grazed, HSG A
0.365	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
0.651	68	Weighted Average
0.644		98.92% Pervious Area
0.007		1.08% Impervious Area

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

Subcatchment 1.1bS2: North Road - West



Summary for Subcatchment 1.2aS1: Middle Array East

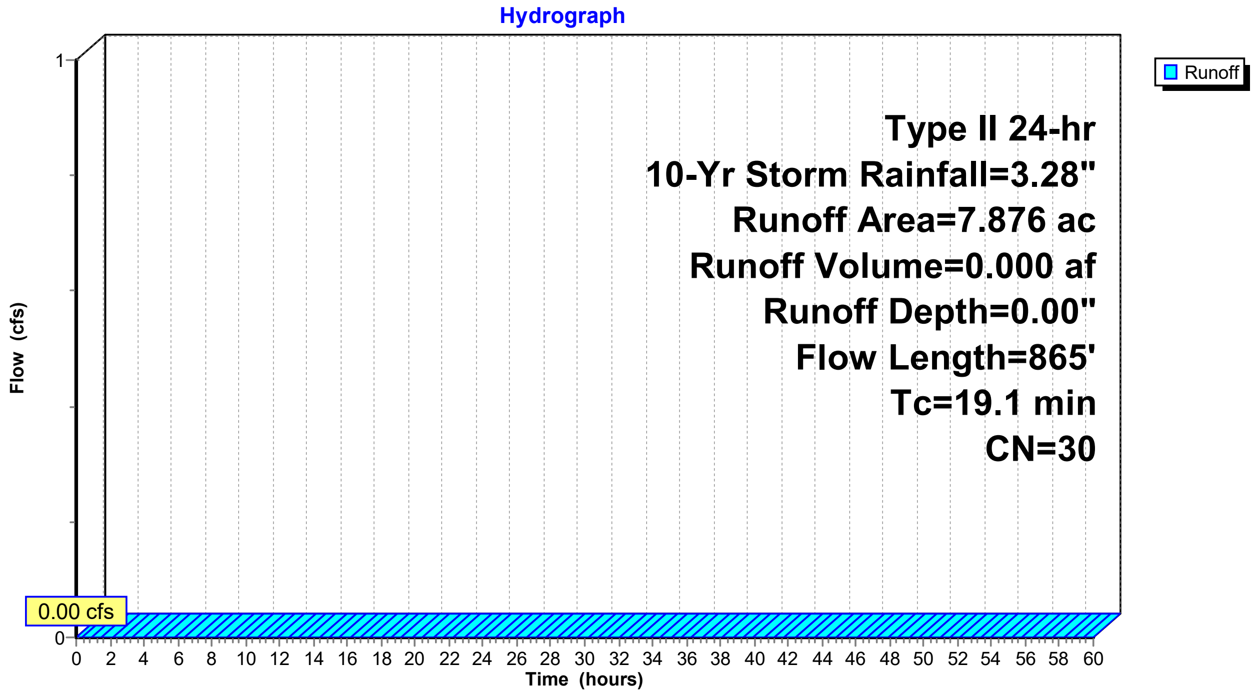
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
7.876	30	Meadow, non-grazed, HSG A
7.876		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0628	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.5	765	0.0459	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.1	865	Total			

Subcatchment 1.2aS1: Middle Array East



Summary for Subcatchment 1.2aS2: Middle Array Center

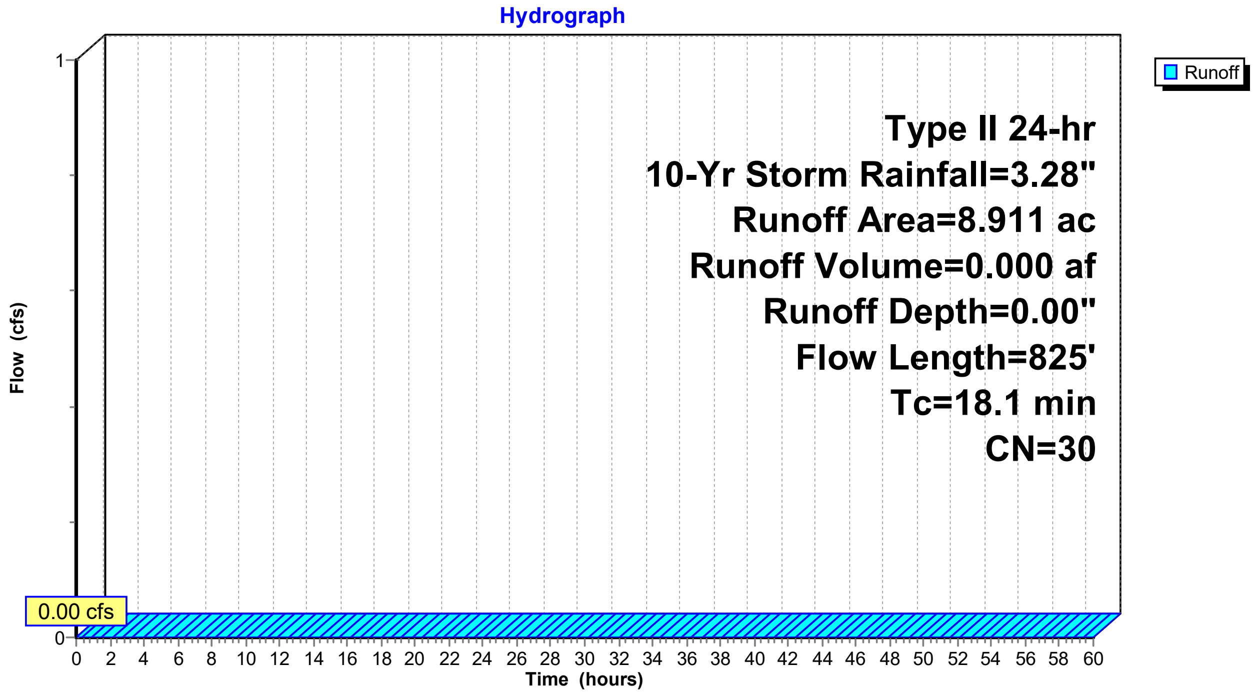
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
8.911	30	Meadow, non-grazed, HSG A
8.911		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0607	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.3	725	0.0559	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.1	825	Total			

Subcatchment 1.2aS2: Middle Array Center



Summary for Subcatchment 1.2aS3: Middle Array West

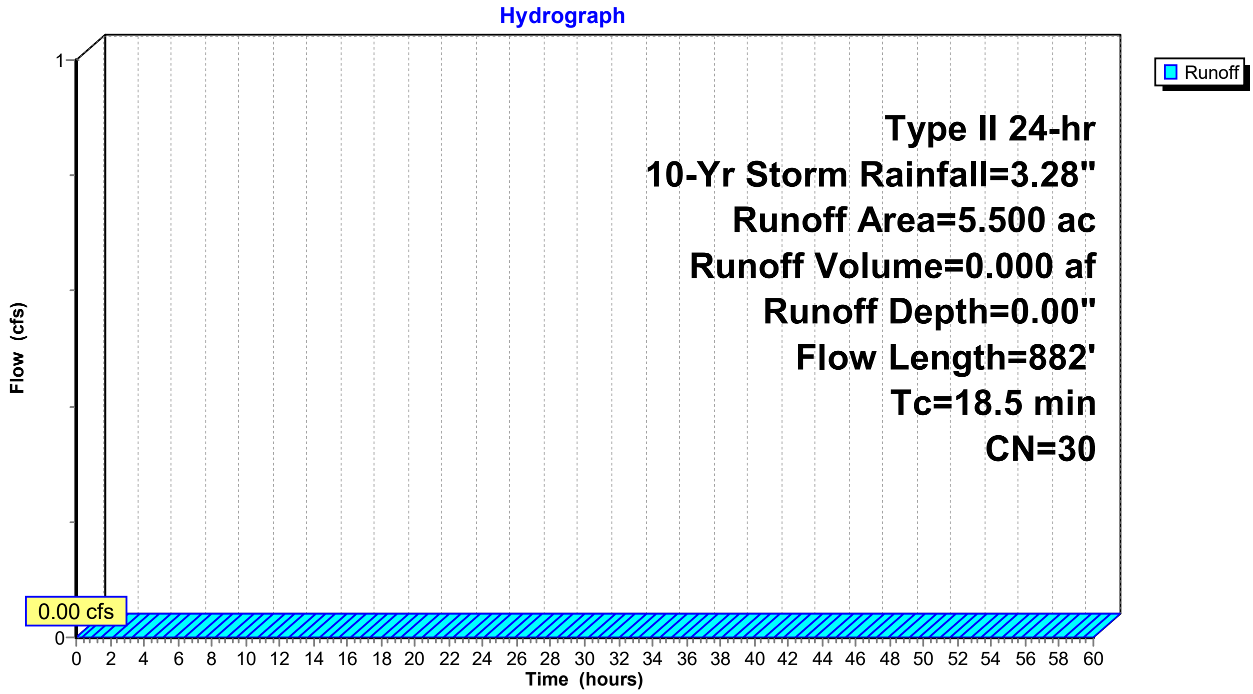
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
5.500	30	Meadow, non-grazed, HSG A
5.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.0660	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.1	782	0.0529	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.5	882	Total			

Subcatchment 1.2aS3: Middle Array West



Summary for Subcatchment 1.2bS1: East Road - West Ditch

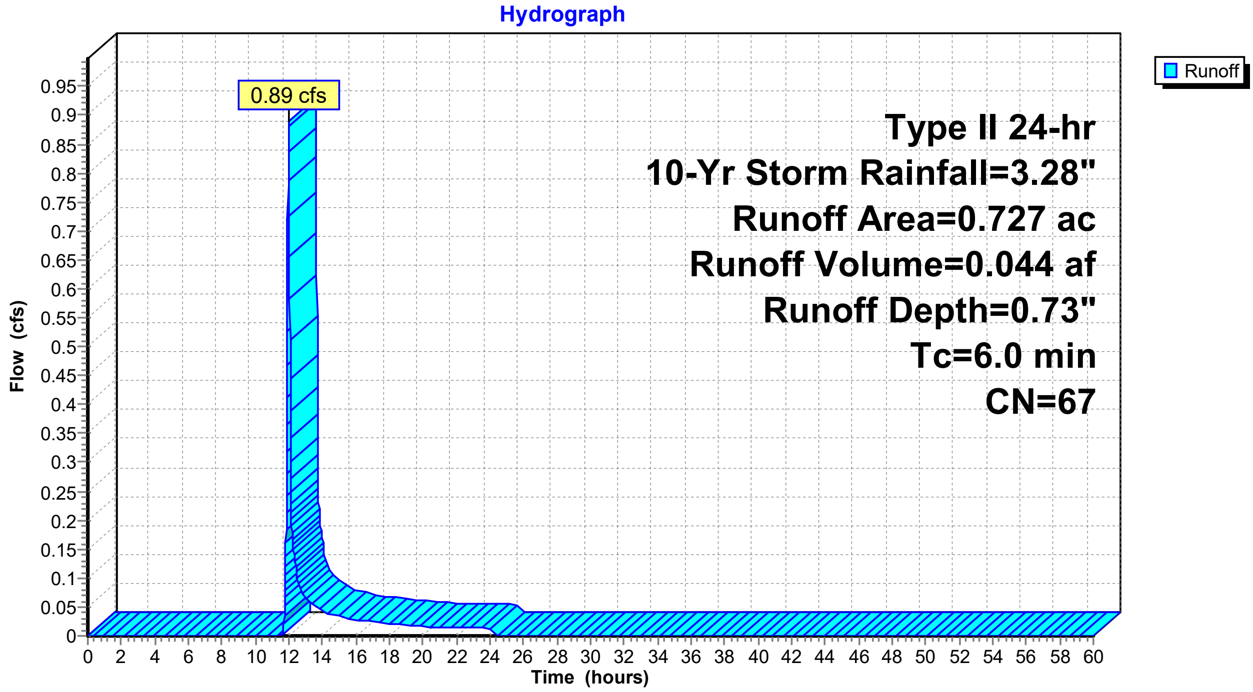
Runoff = 0.89 cfs @ 11.99 hrs, Volume= 0.044 af, Depth= 0.73"
Routed to Reach 1.2bR1 : East Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
0.410	96	Gravel surface, HSG A
0.317	30	Meadow, non-grazed, HSG A
0.727	67	Weighted Average
0.727		100.00% Pervious Area

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

Subcatchment 1.2bS1: East Road - West Ditch



Summary for Subcatchment 1.2bS2: South Road

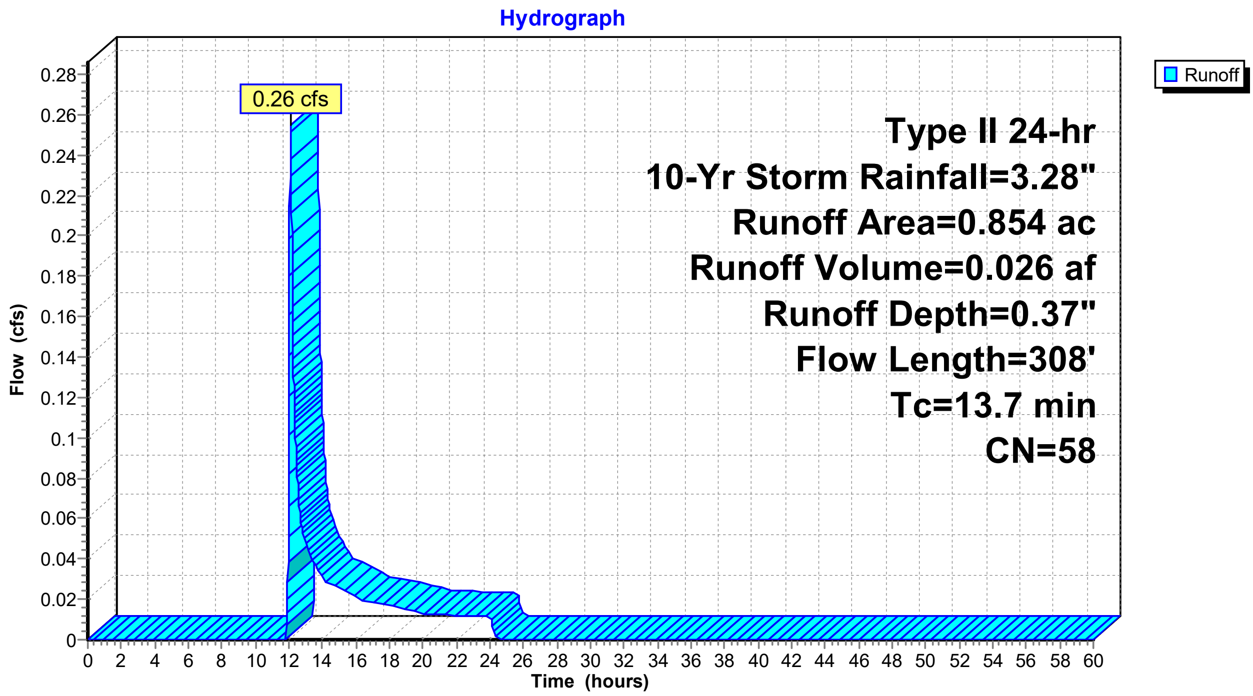
Runoff = 0.26 cfs @ 12.10 hrs, Volume= 0.026 af, Depth= 0.37"
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
	0.498	30	Meadow, non-grazed, HSG A
*	0.352	96	Gravel surface
*	0.004	98	Roofs
	0.854	58	Weighted Average
	0.850		99.53% Pervious Area
	0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0516	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
0.4	25	0.0310	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
5.9	40	0.0429	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.4	208	0.0442	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	308	Total			

Subcatchment 1.2bS2: South Road



Summary for Subcatchment 1.2bS3: South Road

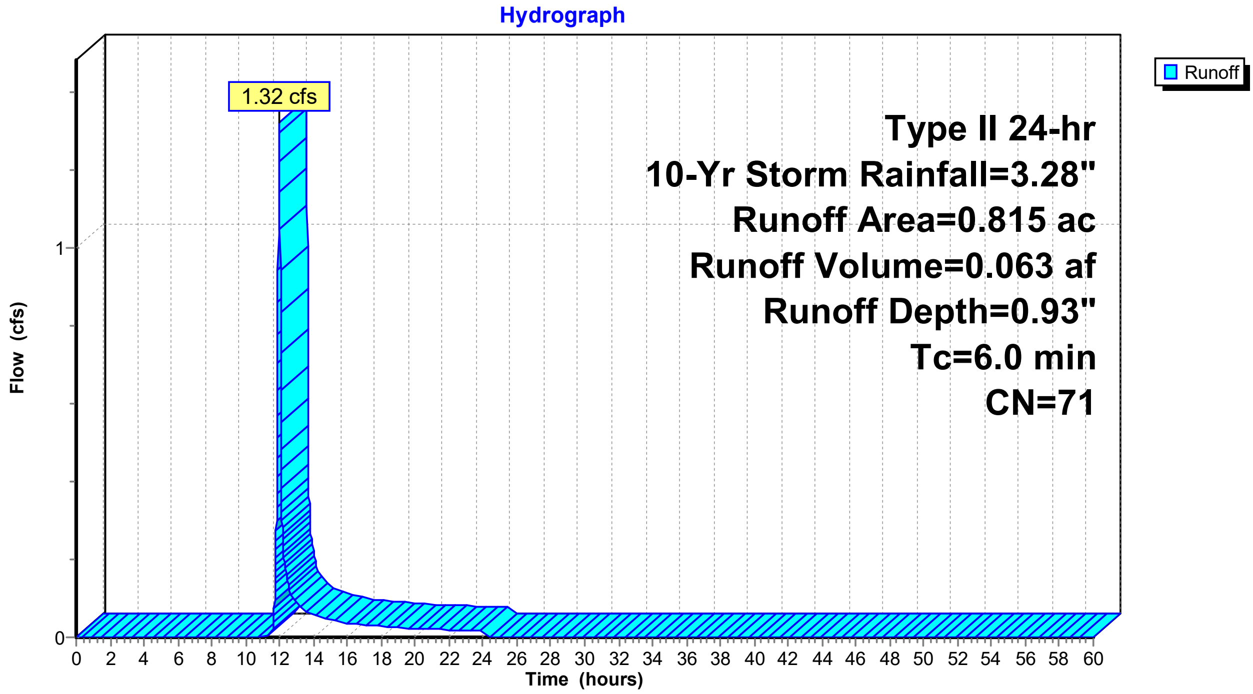
Runoff = 1.32 cfs @ 11.98 hrs, Volume= 0.063 af, Depth= 0.93"
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
	0.313	30	Meadow, non-grazed, HSG A
	0.491	96	Gravel surface, HSG A
*	0.011	98	Roofs
	0.815	71	Weighted Average
	0.804		98.65% Pervious Area
	0.011		1.35% Impervious Area

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

Subcatchment 1.2bS3: South Road



Summary for Subcatchment 1.3aS1: Surface Discharge

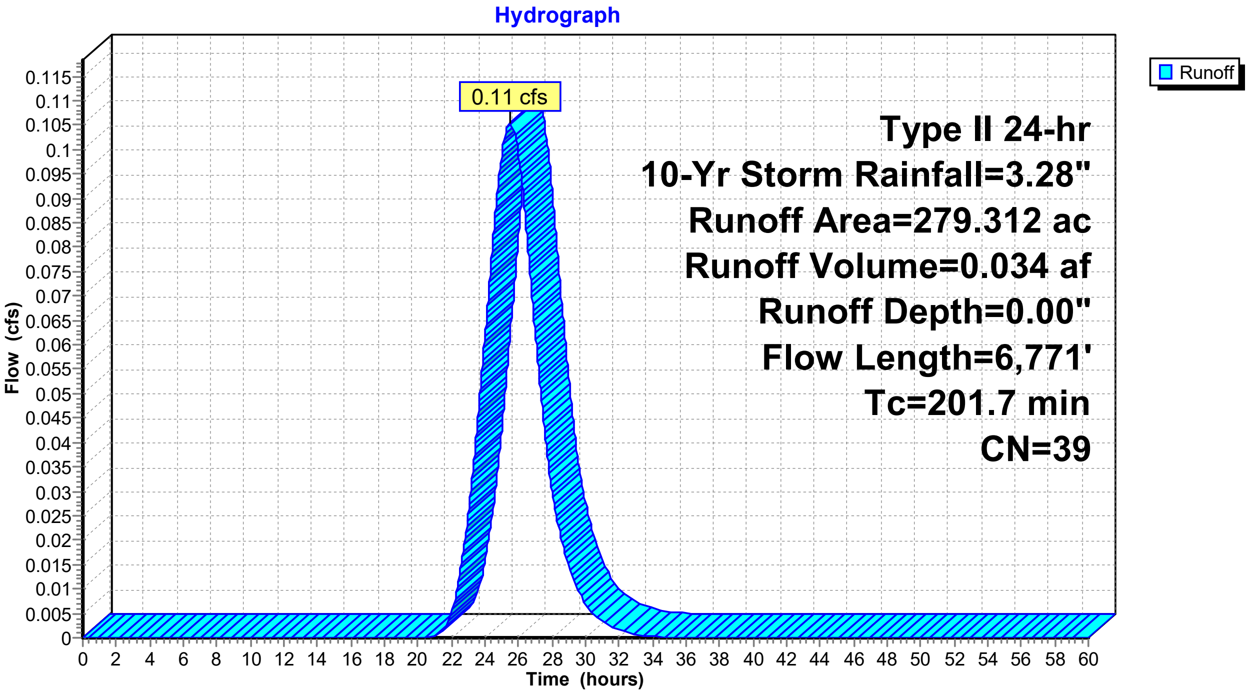
Runoff = 0.11 cfs @ 25.55 hrs, Volume= 0.034 af, Depth= 0.00"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.754	96	Gravel surface
	144.649	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	25.274	71	Meadow, non-grazed, HSG C
	61.692	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	13.623	70	Woods, Good, HSG C
	279.312	39	Weighted Average
	279.312		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	189	0.0157	3.84	76.82	**Channel Flow, Rerouted Stream** Area= 20.0 sf Perim= 32.6' r= 0.61' n= 0.035 Earth, dense weeds
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
201.7	6,771	Total			

Subcatchment 1.3aS1: Surface Discharge



Summary for Subcatchment 1.3bS: Access Rd to Pond 3

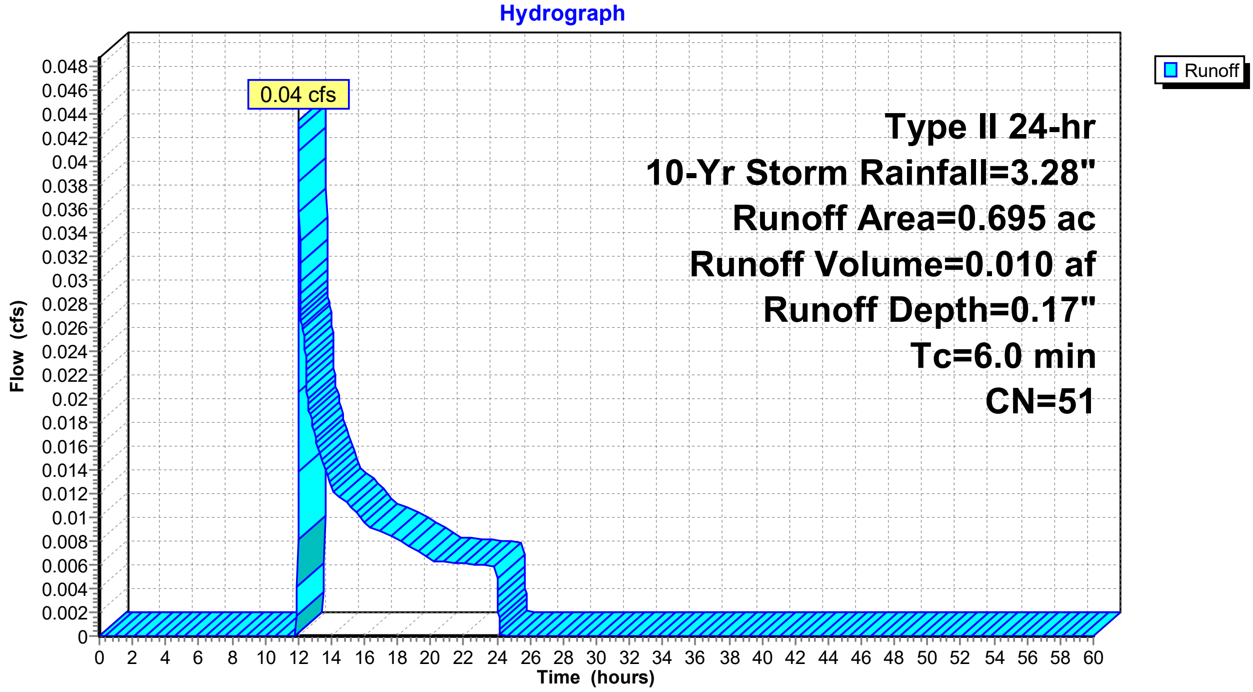
Runoff = 0.04 cfs @ 12.04 hrs, Volume= 0.010 af, Depth= 0.17"
Routed to Pond 1.3P : Pond 3 - Access Rd West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
	0.473	30	Meadow, non-grazed, HSG A
*	0.063	96	Gravel surface, HSG A, Redev
*	0.159	96	Gravel surface, HSG A
	0.695	51	Weighted Average
	0.695		100.00% Pervious Area

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

Subcatchment 1.3bS: Access Rd to Pond 3



Summary for Subcatchment 2S:

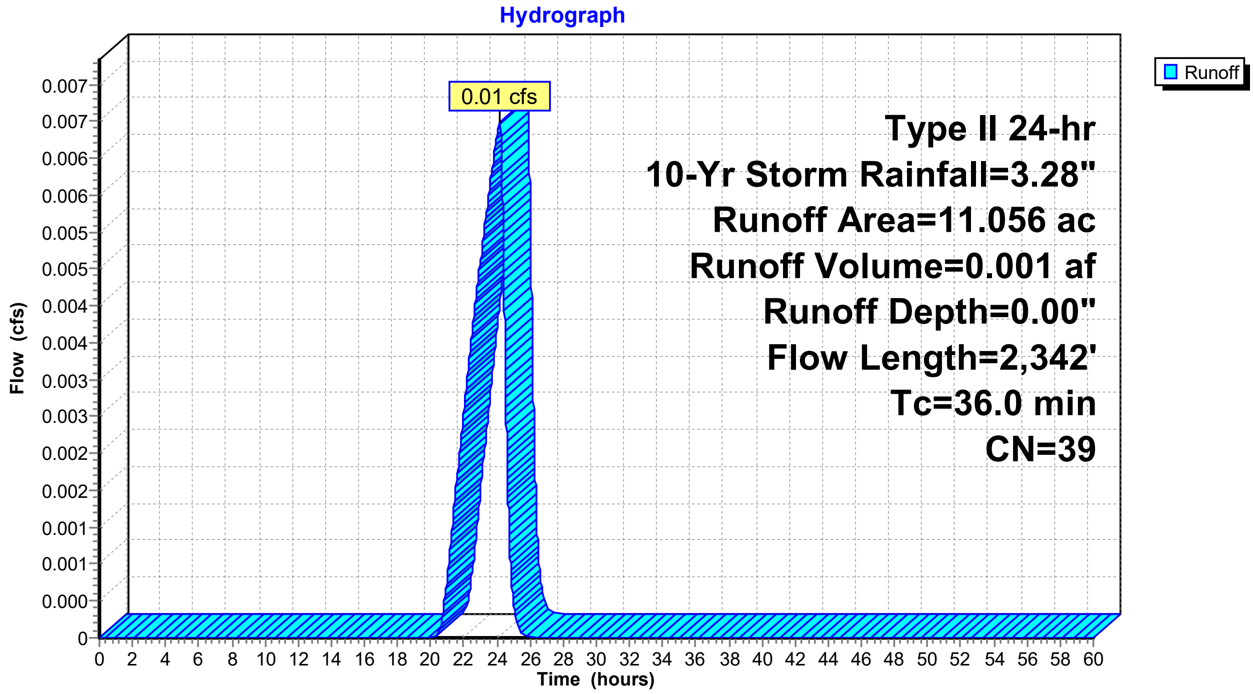
Runoff = 0.01 cfs @ 24.12 hrs, Volume= 0.001 af, Depth= 0.00"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
1.417	96	Gravel surface, HSG A
0.573	39	>75% Grass cover, Good, HSG A
6.530	30	Meadow, non-grazed, HSG A
2.536	30	Woods, Good, HSG A
11.056	39	Weighted Average
11.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0624	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.7	614	0.0535	3.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	1,184	0.0543	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	115	0.0407	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	68	0.1443	1.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	261	0.0118	0.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.0	2,342	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

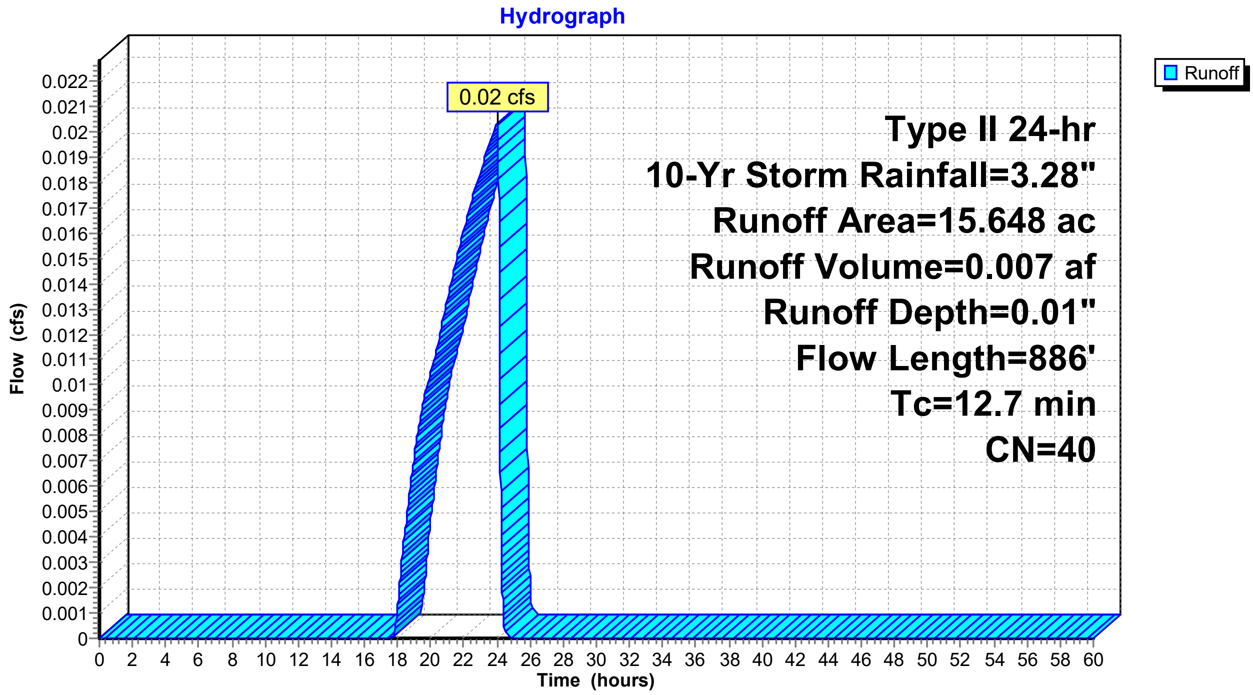
Runoff = 0.02 cfs @ 24.01 hrs, Volume= 0.007 af, Depth= 0.01"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.088	98	Paved Roads & Rooftops
	0.406	39	>75% Grass cover, Good, HSG A
	2.011	61	>75% Grass cover, Good, HSG B
	5.525	30	Meadow, non-grazed, HSG A
	4.276	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	15.648	40	Weighted Average
	15.560		99.44% Pervious Area
	0.088		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	52	0.0937	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.7	886	Total			

Subcatchment 3S:



Summary for Subcatchment 4.1S:

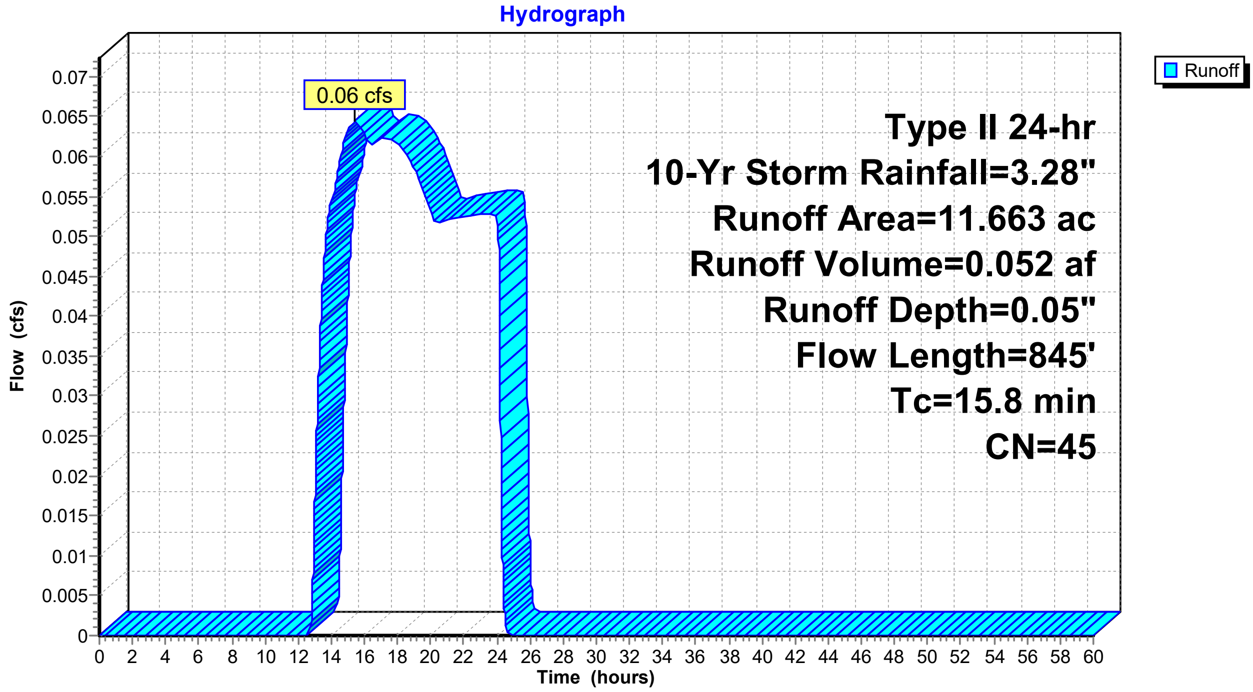
Runoff = 0.06 cfs @ 15.43 hrs, Volume= 0.052 af, Depth= 0.05"
Routed to Reach 4.1R1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.327	98	Paved Roads & Rooftops
*	0.375	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	2.544	30	Meadow, non-grazed, HSG A
	0.560	58	Meadow, non-grazed, HSG B
	3.605	30	Woods, Good, HSG A
*	4.087	55	Woods, Good, HSG B
	11.663	45	Weighted Average
	11.336		97.20% Pervious Area
	0.327		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0430	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
2.6	360	0.1077	2.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	385	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.8	845	Total			

Subcatchment 4.1S:



Summary for Subcatchment 4.2aS:

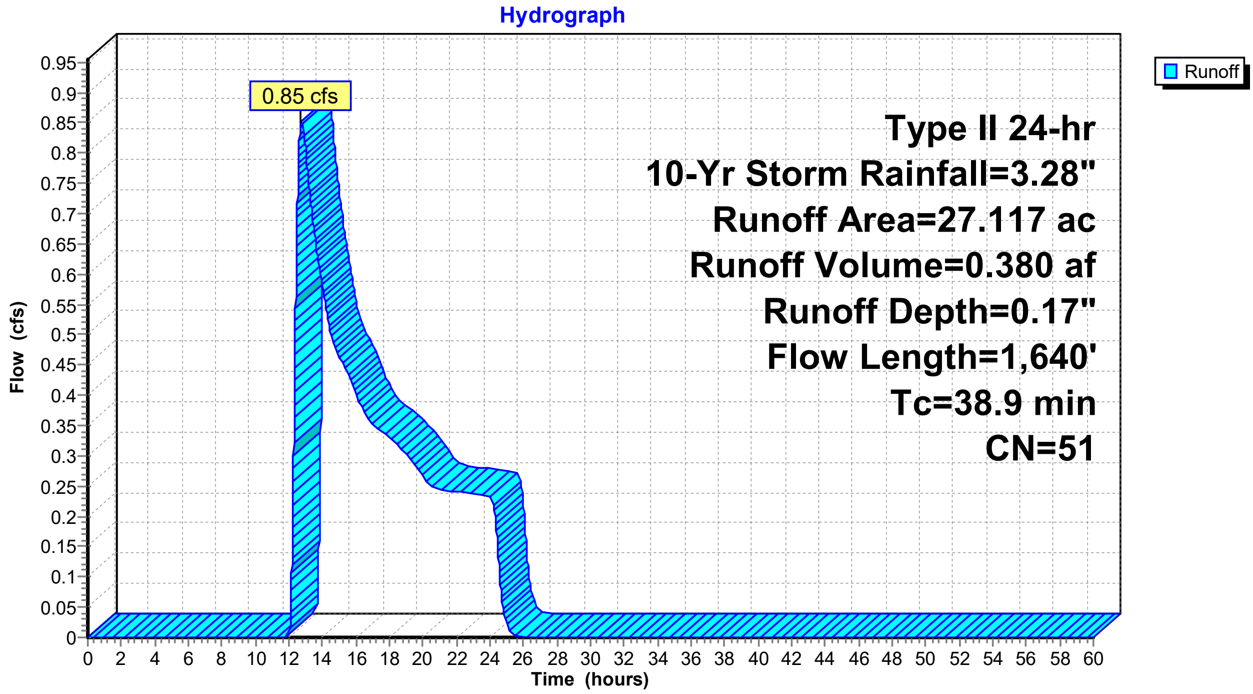
Runoff = 0.85 cfs @ 12.75 hrs, Volume= 0.380 af, Depth= 0.17"
Routed to Pond 4.2C : 18" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.238	96	Gravel surface
	4.086	30	Meadow, non-grazed, HSG A
	0.384	58	Meadow, non-grazed, HSG B
	0.977	30	Woods, Good, HSG A
	21.432	55	Woods, Good, HSG B
	27.117	51	Weighted Average
	27.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	662	0.0144	0.84		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	1,640	Total			

Subcatchment 4.2aS:



Summary for Subcatchment 4.2bS:

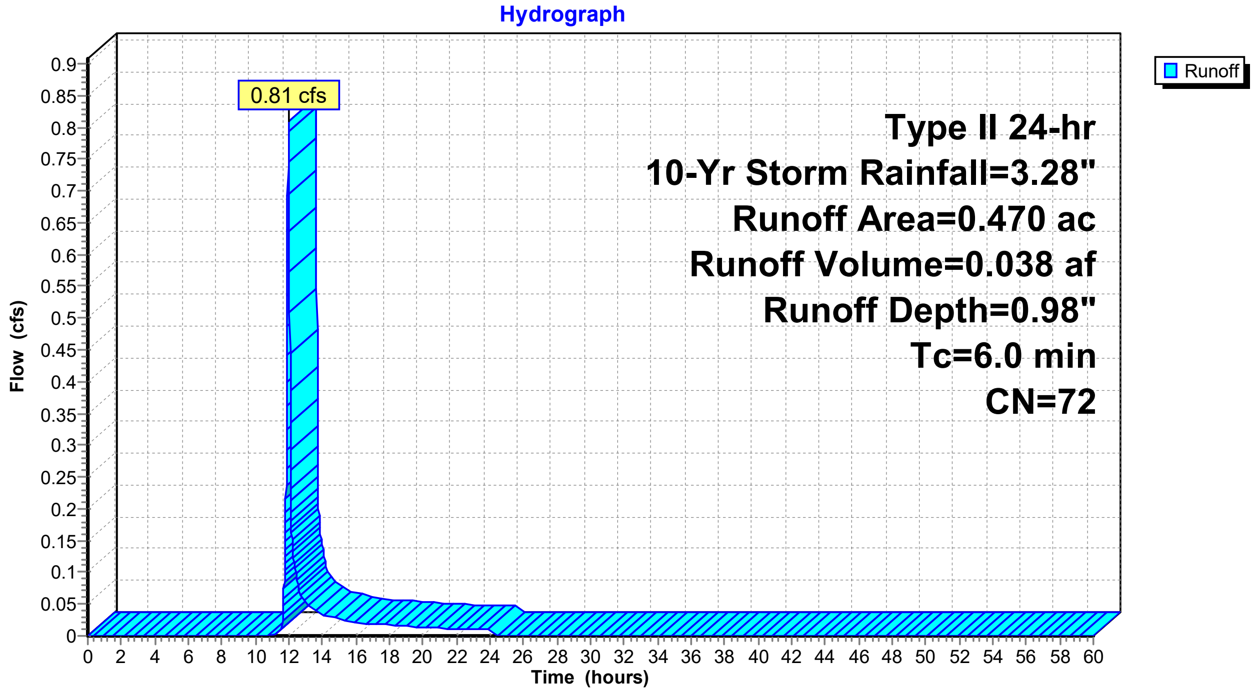
Runoff = 0.81 cfs @ 11.98 hrs, Volume= 0.038 af, Depth= 0.98"
Routed to Reach 4.2bR : Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
0.296	96	Gravel surface, HSG A
0.174	30	Meadow, non-grazed, HSG A
0.470	72	Weighted Average
0.470		100.00% Pervious Area

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

Subcatchment 4.2bS:



Summary for Subcatchment 4.3S:

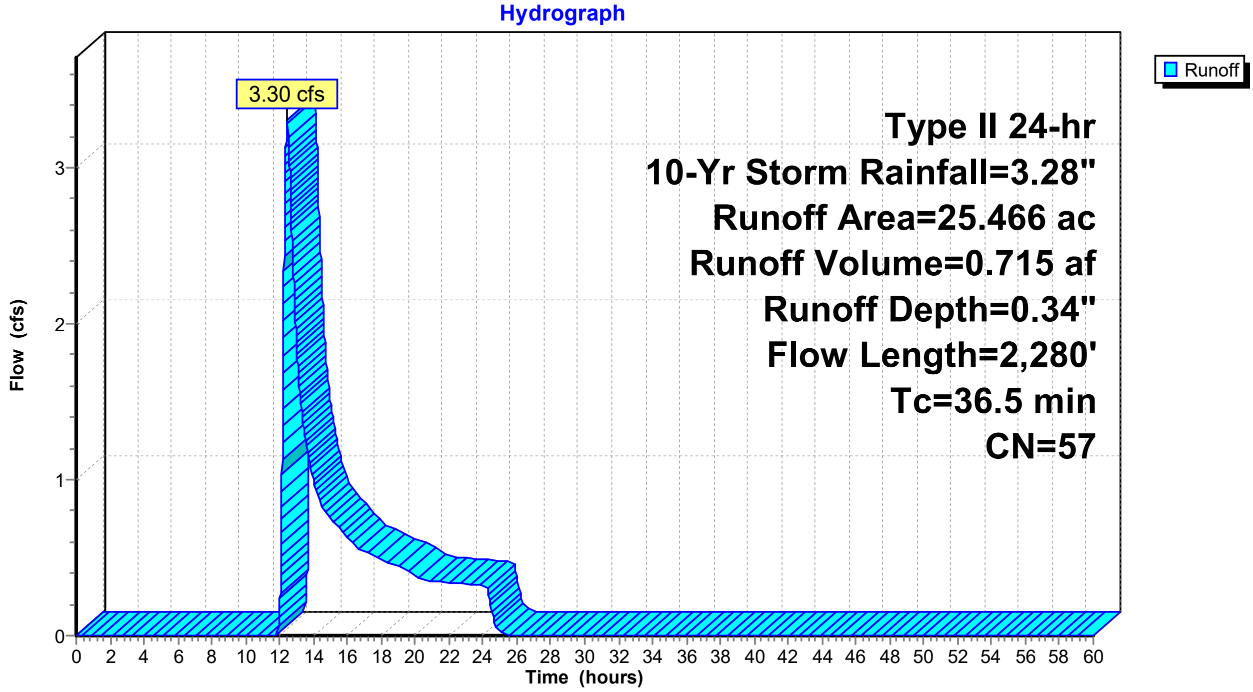
Runoff = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af, Depth= 0.34"
Routed to Pond 4.3C : 24" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	1.293	98	Paved Roads & Rooftops
	1.783	58	Meadow, non-grazed, HSG B
	22.390	55	Woods, Good, HSG B
	25.466	57	Weighted Average
	24.173		94.92% Pervious Area
	1.293		5.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0634	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
17.8	1,368	0.0656	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	38	0.3960	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	774	0.0281	4.70	109.09	**Channel Flow,** Area= 23.2 sf Perim= 43.2' r= 0.54' n= 0.035
36.5	2,280	Total			

Subcatchment 4.3S:



Summary for Subcatchment 5S:

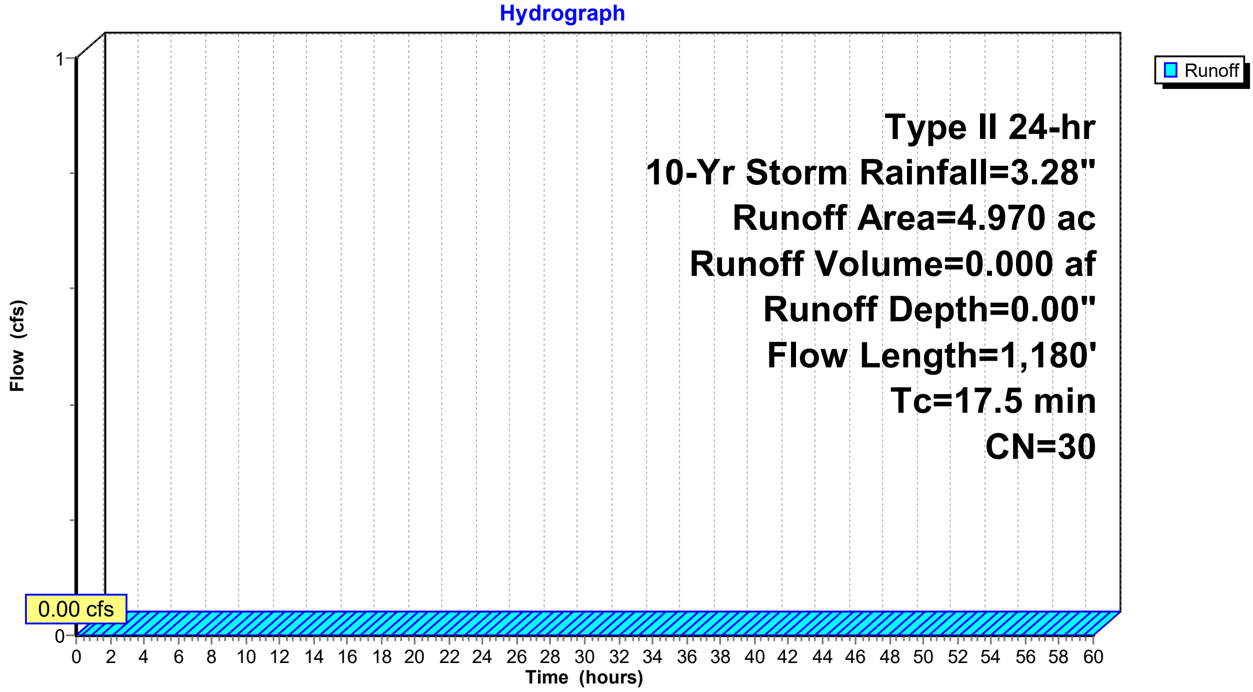
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
4.139	30	Meadow, non-grazed, HSG A
0.831	30	Woods, Good, HSG A
4.970	30	Weighted Average
4.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0675	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
8.5	801	0.0508	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	217	0.1515	2.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	62	0.0697	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,180	Total			

Subcatchment 5S:



Summary for Subcatchment 6S:

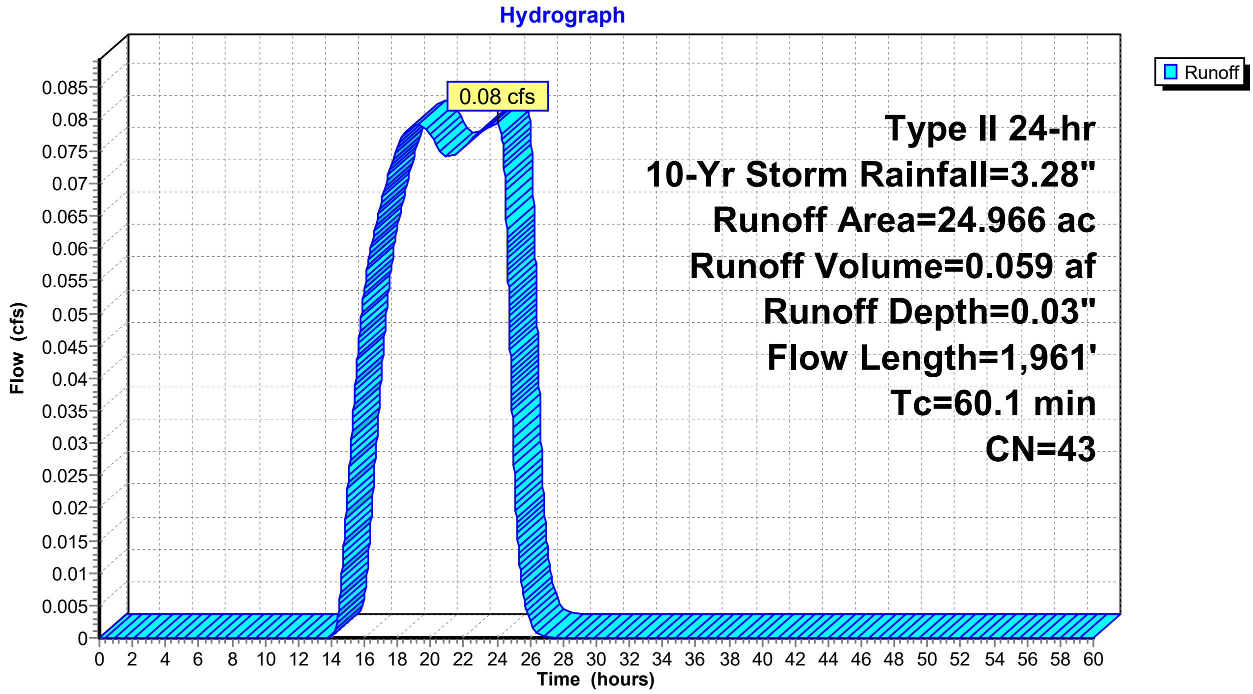
Runoff = 0.08 cfs @ 24.10 hrs, Volume= 0.059 af, Depth= 0.03"
Routed to Link SP6 : Study Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
	0.466	96	Gravel surface, HSG A
	2.545	61	>75% Grass cover, Good, HSG B
	7.511	30	Meadow, non-grazed, HSG A
	0.788	58	Meadow, non-grazed, HSG B
	7.940	30	Woods, Good, HSG A
	4.266	55	Woods, Good, HSG B
	24.966	43	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Subcatchment 6S:



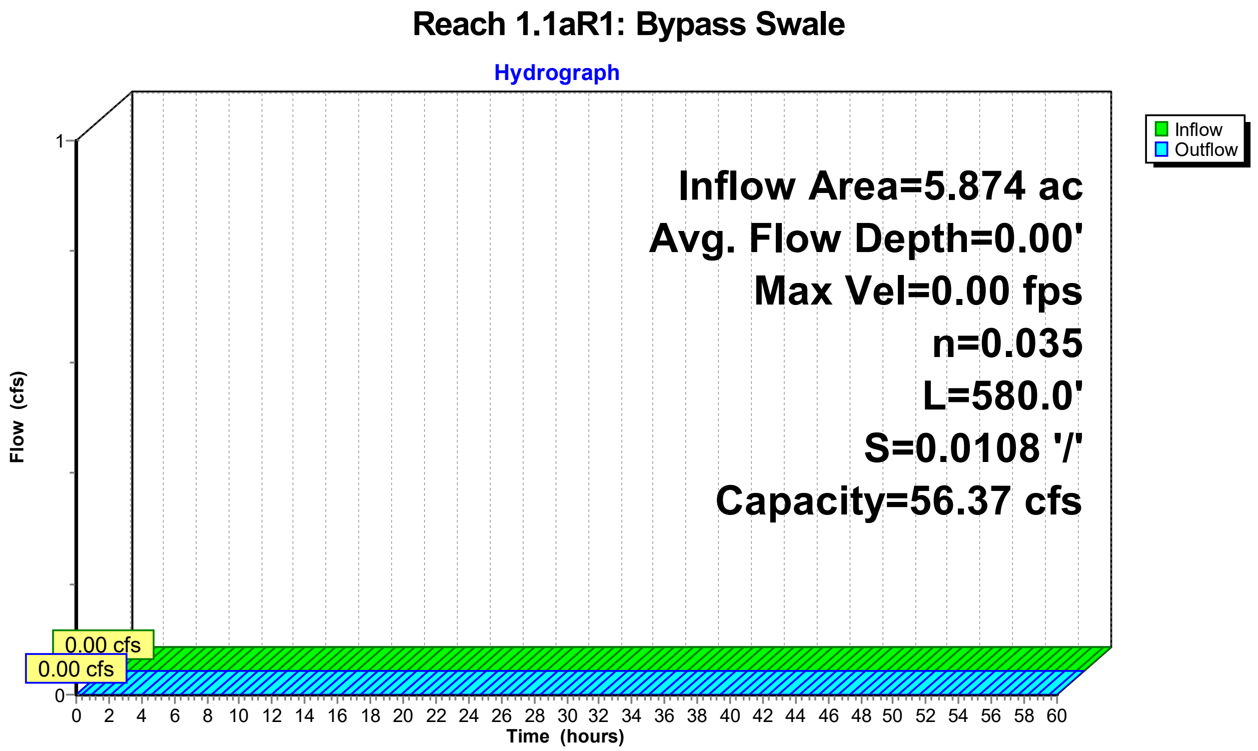
Summary for Reach 1.1aR1: Bypass Swale

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC1 : TS1 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.37 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.0' Slope= 0.0108 '/'
Inlet Invert= 1,493.84', Outlet Invert= 1,487.56'



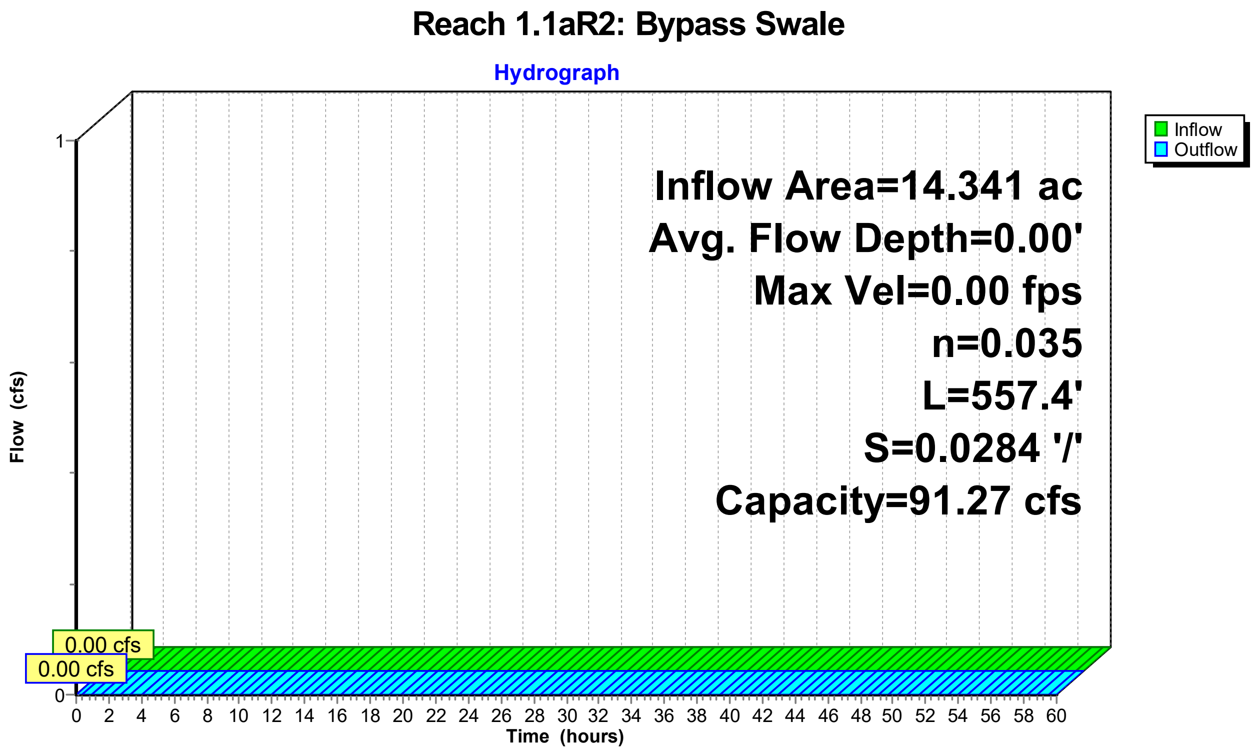
Summary for Reach 1.1aR2: Bypass Swale

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC2 : TS2 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 91.27 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.4' Slope= 0.0284 '/'
Inlet Invert= 1,486.80', Outlet Invert= 1,470.98'



Summary for Reach 1.1aR3: Bypass Swale

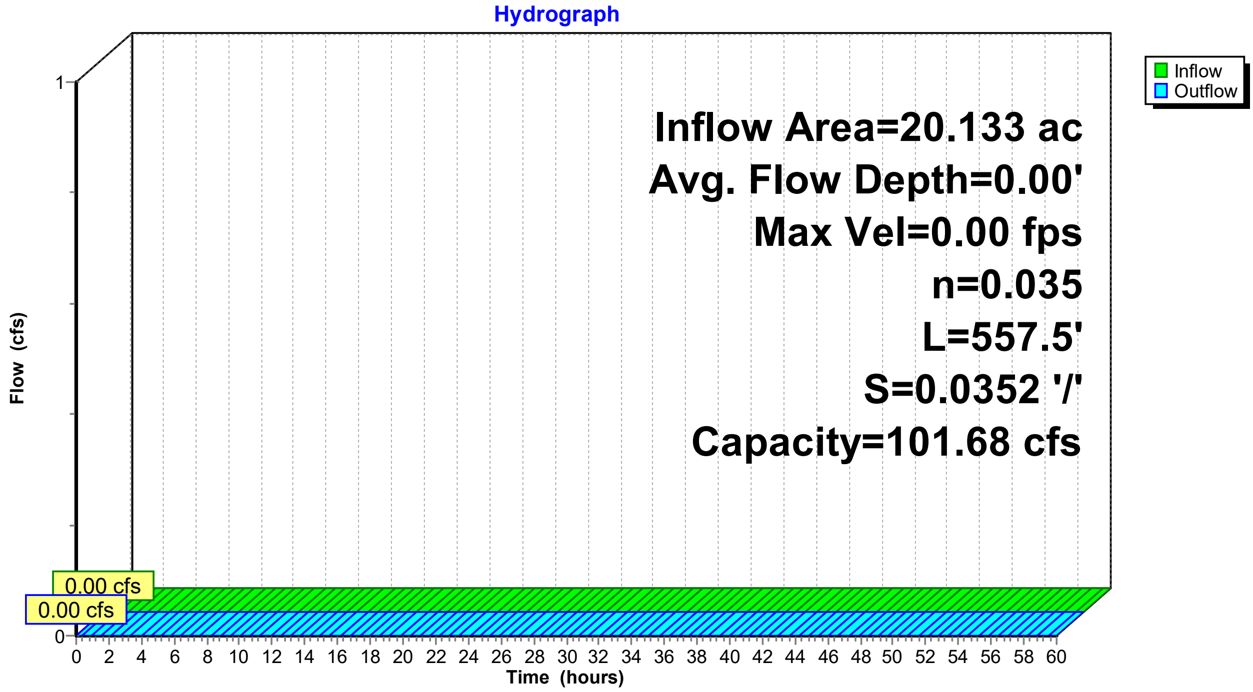
Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC3 : TS3 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.68 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.5' Slope= 0.0352 '/'
Inlet Invert= 1,469.57', Outlet Invert= 1,449.93'

Reach 1.1aR3: Bypass Swale



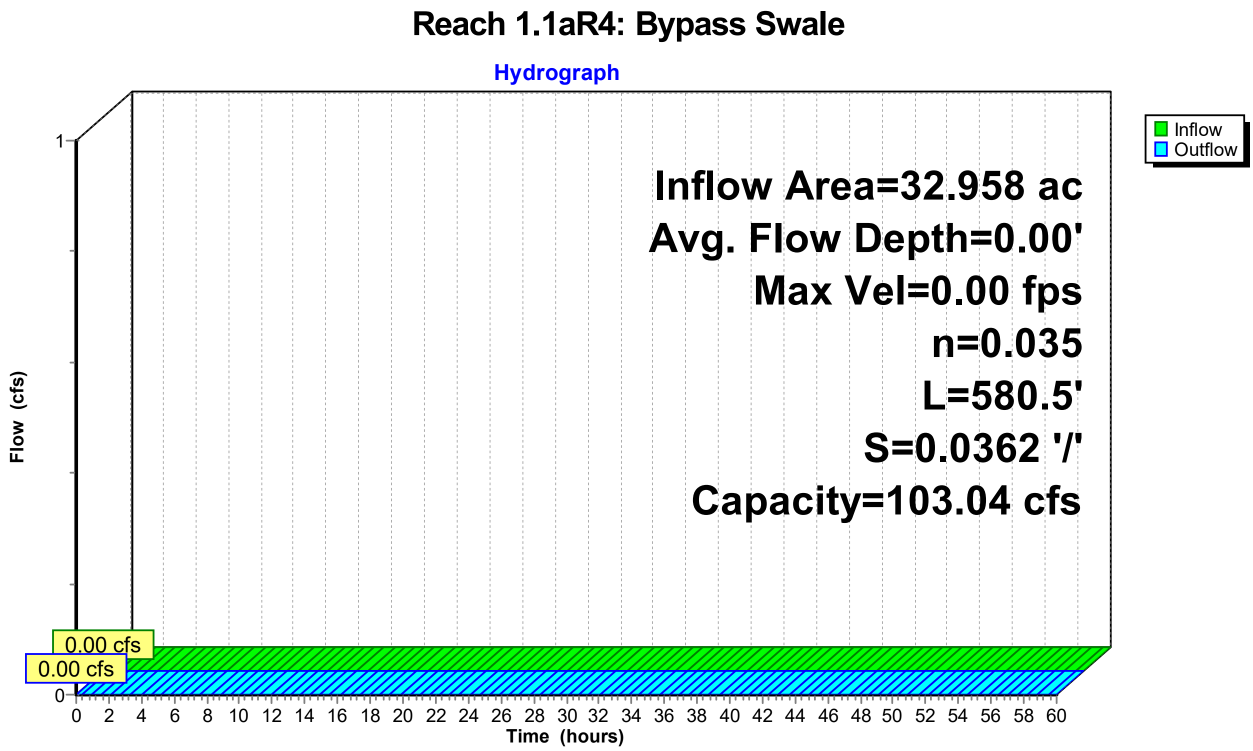
Summary for Reach 1.1aR4: Bypass Swale

Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aP : North Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 103.04 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.5' Slope= 0.0362 '/'
Inlet Invert= 1,447.64', Outlet Invert= 1,426.64'



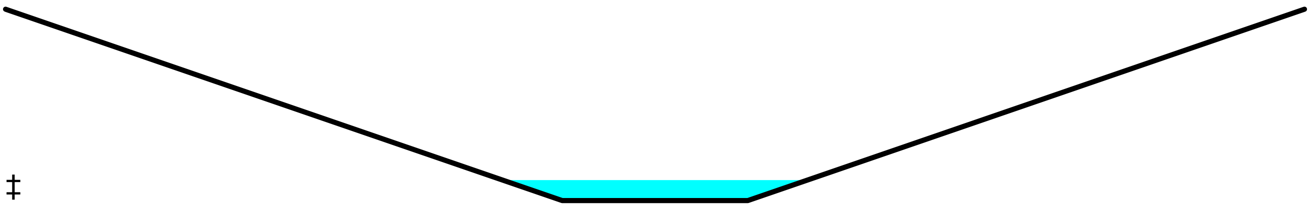
Summary for Reach 1.1bR1: North Road Conveyance Swale

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 2.16 cfs @ 11.98 hrs, Volume= 0.103 af
Outflow = 1.13 cfs @ 12.06 hrs, Volume= 0.103 af, Atten= 48%, Lag= 4.9 min
Routed to Pond 1.1bC1 : TS4 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.01 fps, Min. Travel Time= 14.4 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 42.9 min

Peak Storage= 977 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 3.28'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 111.65 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,733.0' Slope= 0.0240 '/'
Inlet Invert= 1,491.12', Outlet Invert= 1,449.50'



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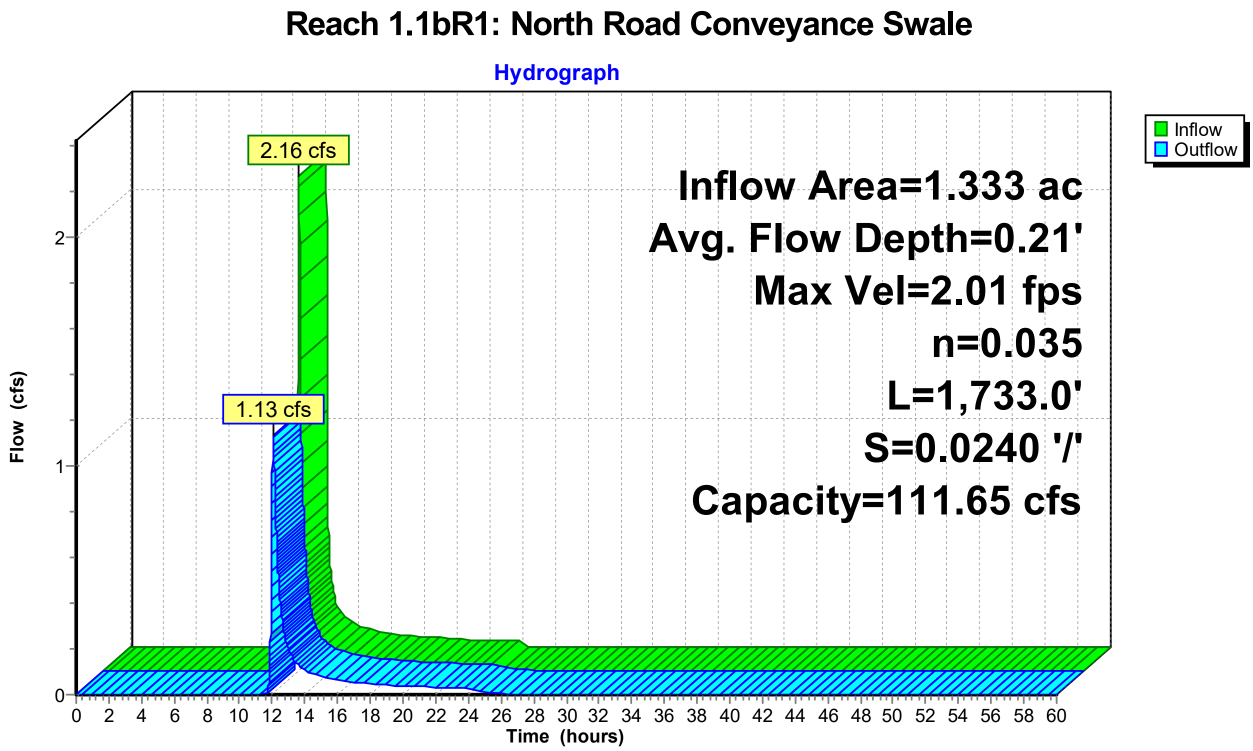


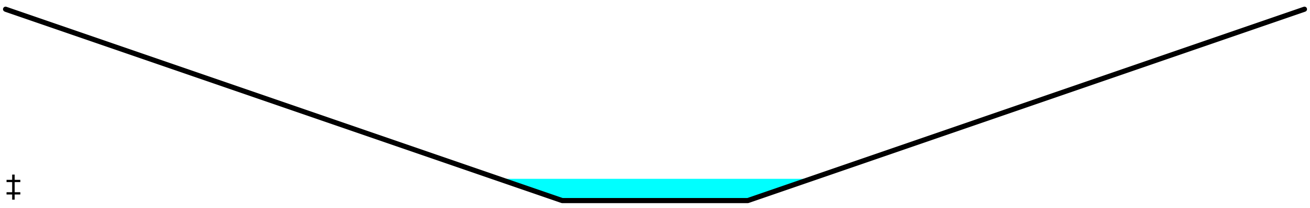
Summary for Reach 1.1bR2: North Road Conveyance Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.88" for 10-Yr Storm event
Inflow = 1.78 cfs @ 12.02 hrs, Volume= 0.145 af
Outflow = 1.61 cfs @ 12.06 hrs, Volume= 0.145 af, Atten= 10%, Lag= 2.7 min
Routed to Pond 1.1bP1 : Dry Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.62 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 11.3 min

Peak Storage= 364 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.23' , Surface Width= 3.37'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 140.36 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 593.3' Slope= 0.0380 '/'
Inlet Invert= 1,447.27', Outlet Invert= 1,424.75'



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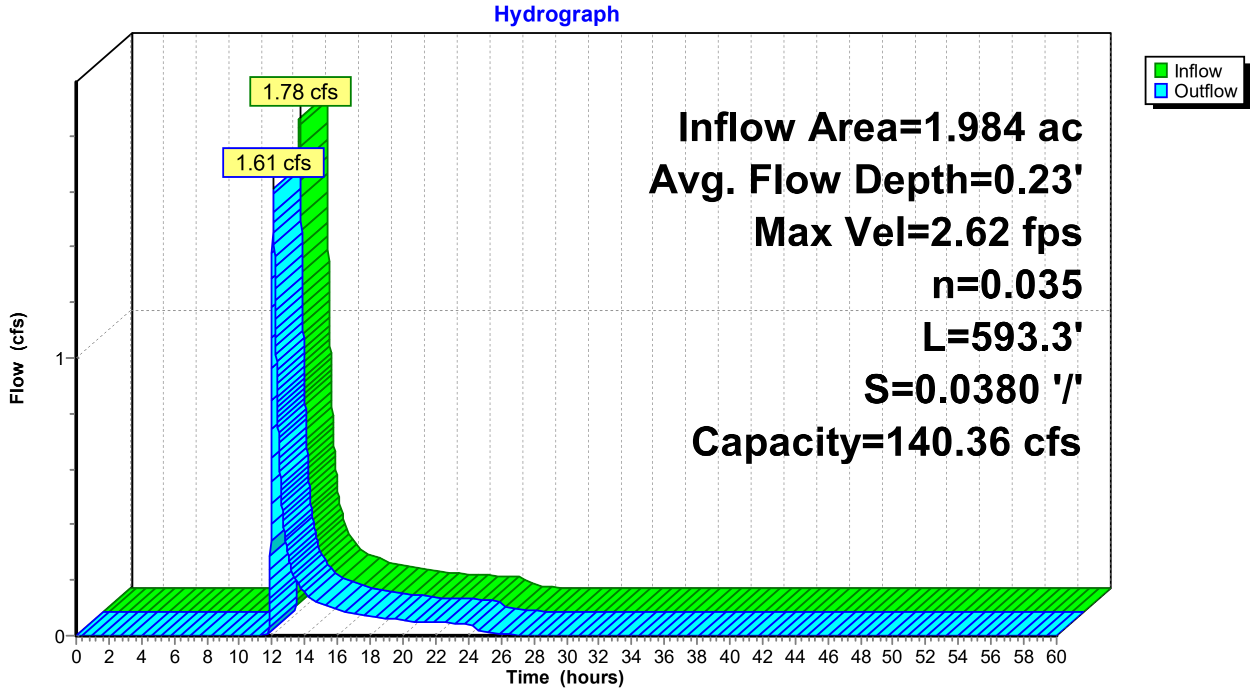
Reach 1.1bR2: North Road Conveyance Swale



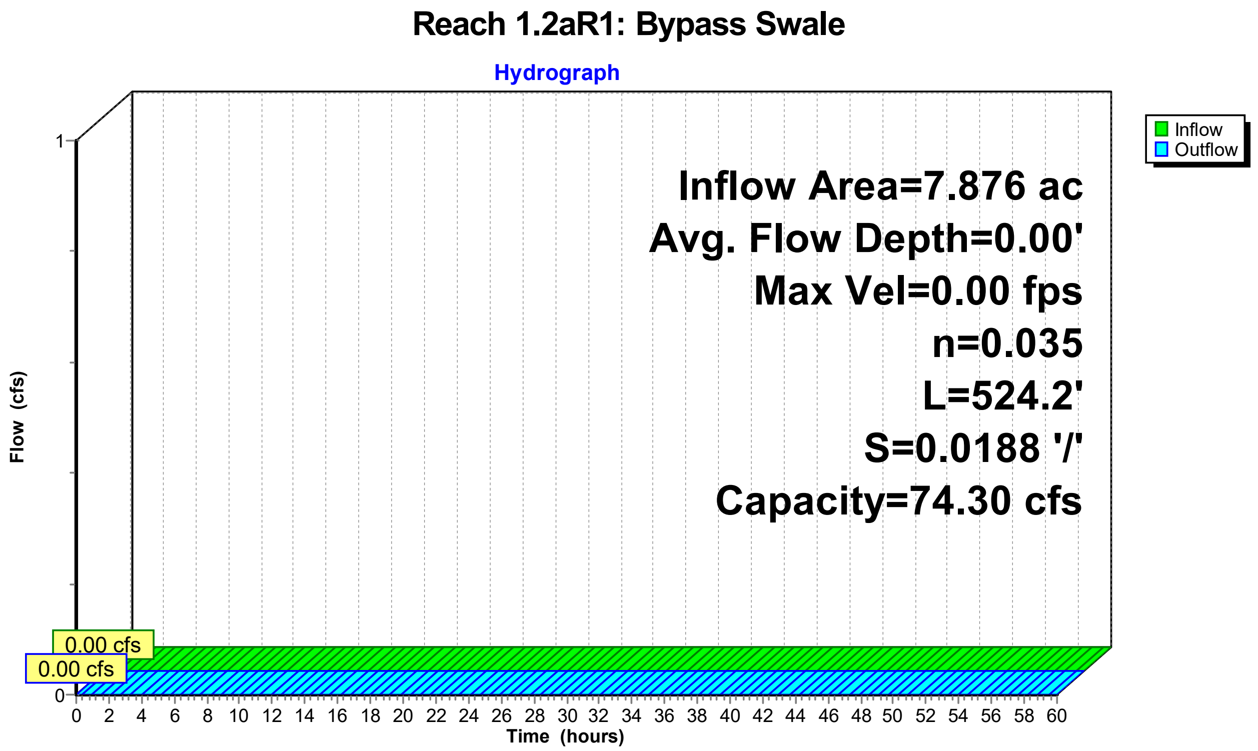
Summary for Reach 1.2aR1: Bypass Swale

Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC1 : TS 7 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 74.30 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 524.2' Slope= 0.0188 '/'
Inlet Invert= 1,454.08', Outlet Invert= 1,444.22'



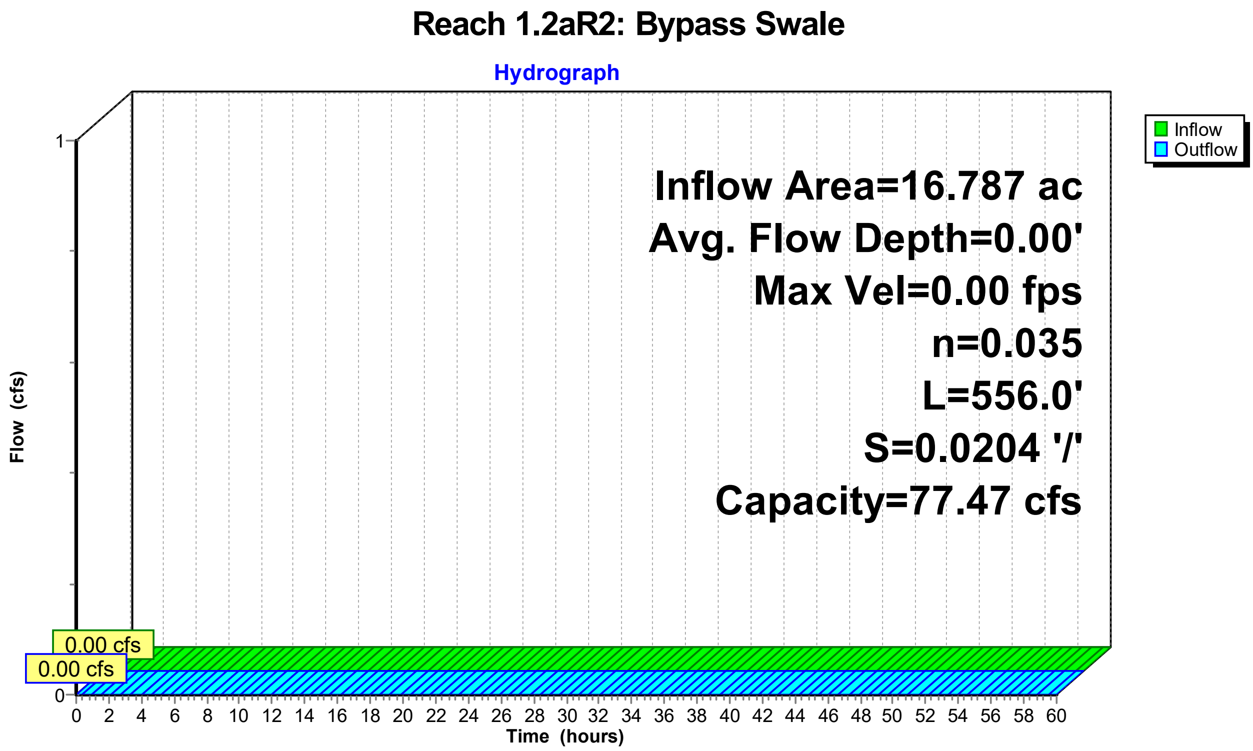
Summary for Reach 1.2aR2: Bypass Swale

Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC2 : TS8 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 77.47 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 556.0' Slope= 0.0204 '/'
Inlet Invert= 1,443.21', Outlet Invert= 1,431.84'



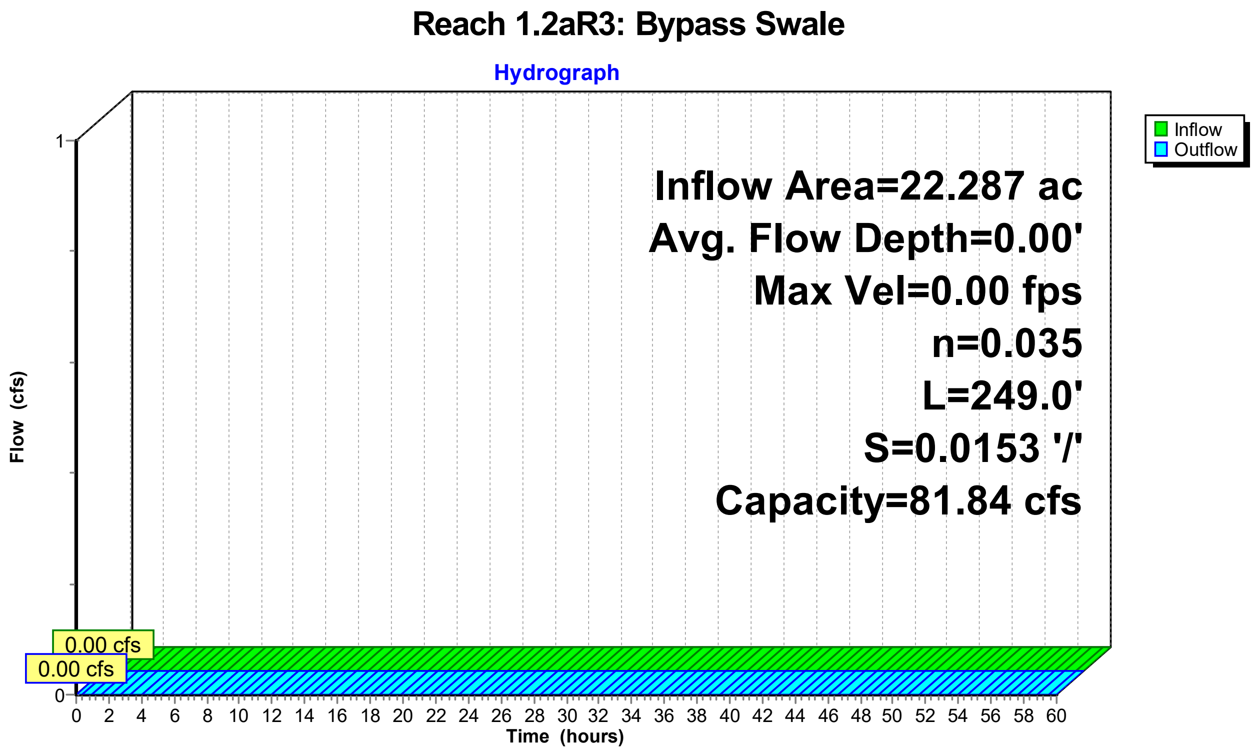
Summary for Reach 1.2aR3: Bypass Swale

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aP : South Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 81.84 cfs

3.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 11.00'
Length= 249.0' Slope= 0.0153 '/'
Inlet Invert= 1,431.11', Outlet Invert= 1,427.29'



Summary for Reach 1.2bR1: East Road Conveyance Swale

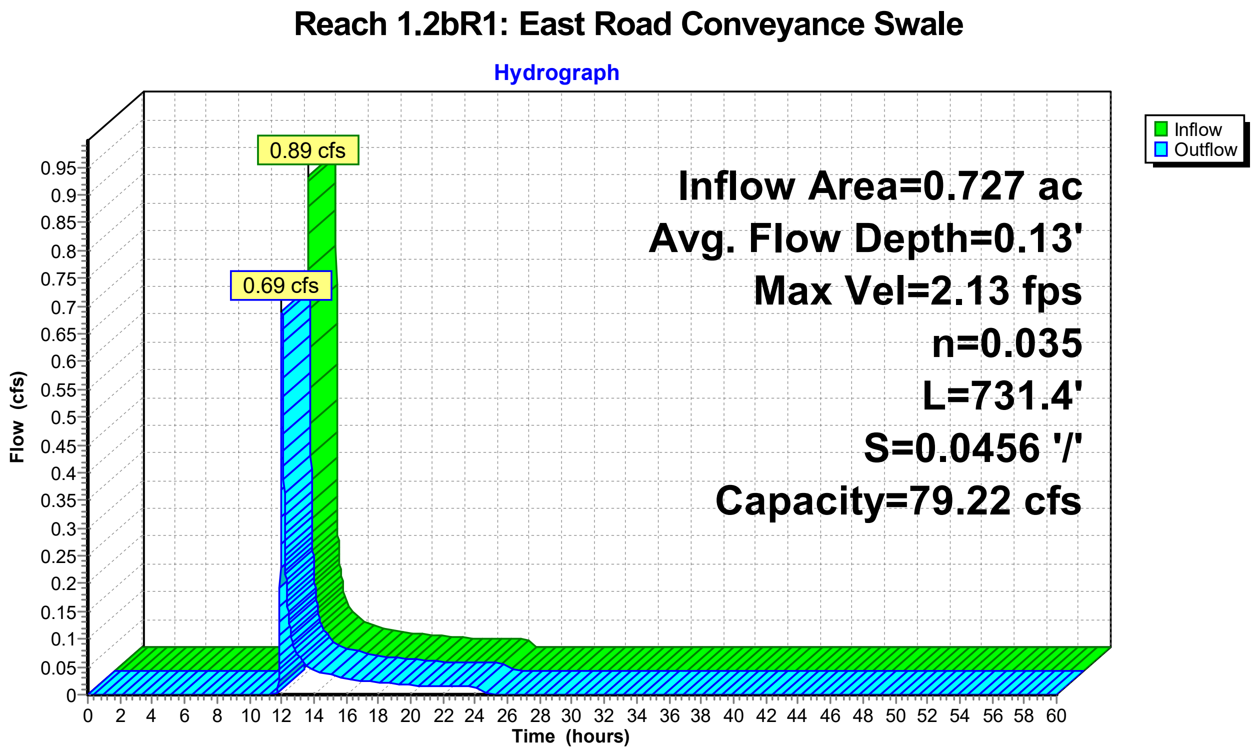
Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.73" for 10-Yr Storm event
Inflow = 0.89 cfs @ 11.99 hrs, Volume= 0.044 af
Outflow = 0.69 cfs @ 12.04 hrs, Volume= 0.044 af, Atten= 23%, Lag= 3.0 min
Routed to Pond 1.2bC1 : East Road Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.13 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 18.0 min

Peak Storage= 237 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 2.81'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 79.22 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 731.4' Slope= 0.0456 '/'
Inlet Invert= 1,489.53', Outlet Invert= 1,456.20'

‡



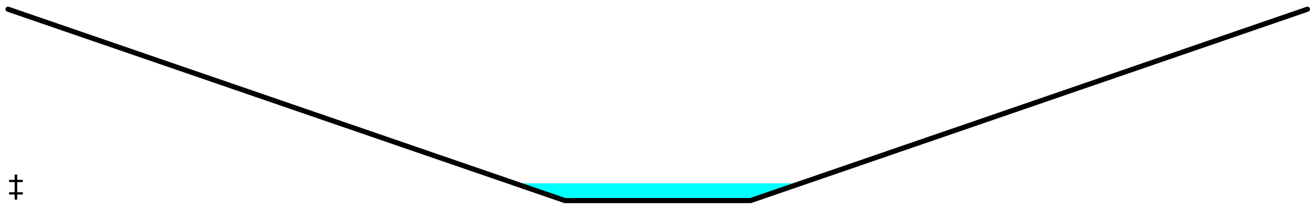
Summary for Reach 1.2bR2: South Road Conveyance Swale

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.54" for 10-Yr Storm event
Inflow = 0.89 cfs @ 12.05 hrs, Volume= 0.071 af
Outflow = 0.70 cfs @ 12.13 hrs, Volume= 0.071 af, Atten= 22%, Lag= 4.6 min
Routed to Pond 1.2bC2 : TS6 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.55 fps, Min. Travel Time= 6.5 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 17.1 min

Peak Storage= 272 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 3.06'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 95.76 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 604.5' Slope= 0.0177 '/'
Inlet Invert= 1,454.47', Outlet Invert= 1,443.79'



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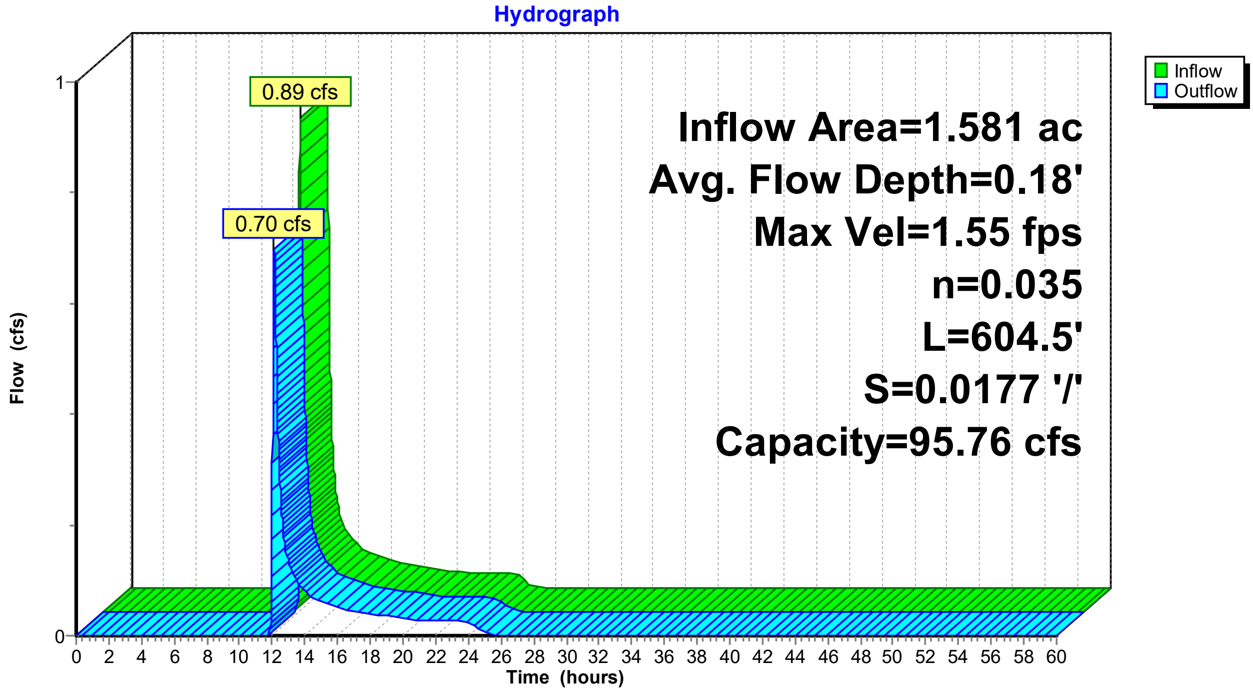
Reach 1.2bR2: South Road Conveyance Swale



Summary for Reach 1.2bR3: South Road Conveyance Swale

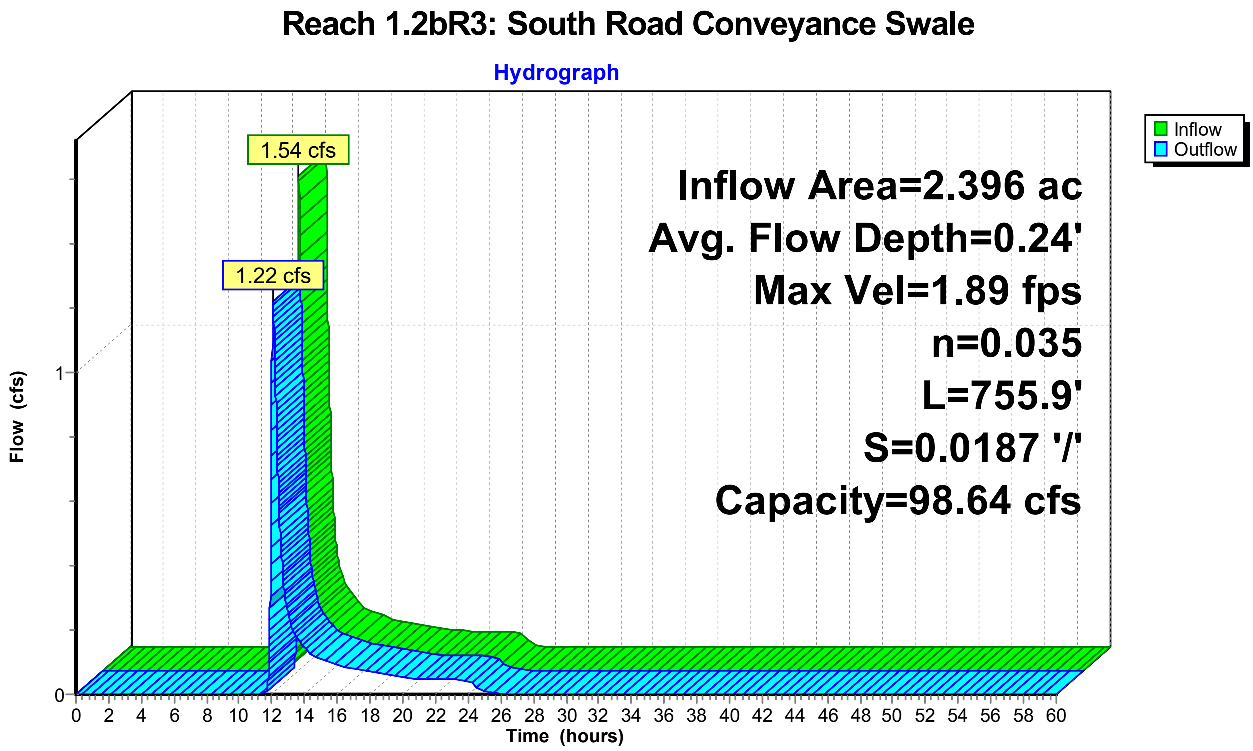
Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.67" for 10-Yr Storm event
Inflow = 1.54 cfs @ 12.00 hrs, Volume= 0.133 af
Outflow = 1.22 cfs @ 12.07 hrs, Volume= 0.133 af, Atten= 21%, Lag= 4.3 min
Routed to Pond 1.2bP : South Road Treatment Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.89 fps, Min. Travel Time= 6.7 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 18.1 min

Peak Storage= 490 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 3.43'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 98.64 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 755.9' Slope= 0.0187 '/'
Inlet Invert= 1,442.84', Outlet Invert= 1,428.67'

‡



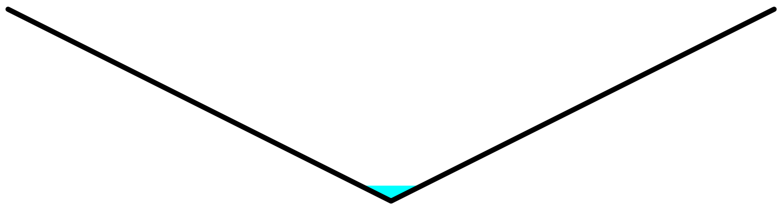
Summary for Reach 4.1R1: Bypass Swale

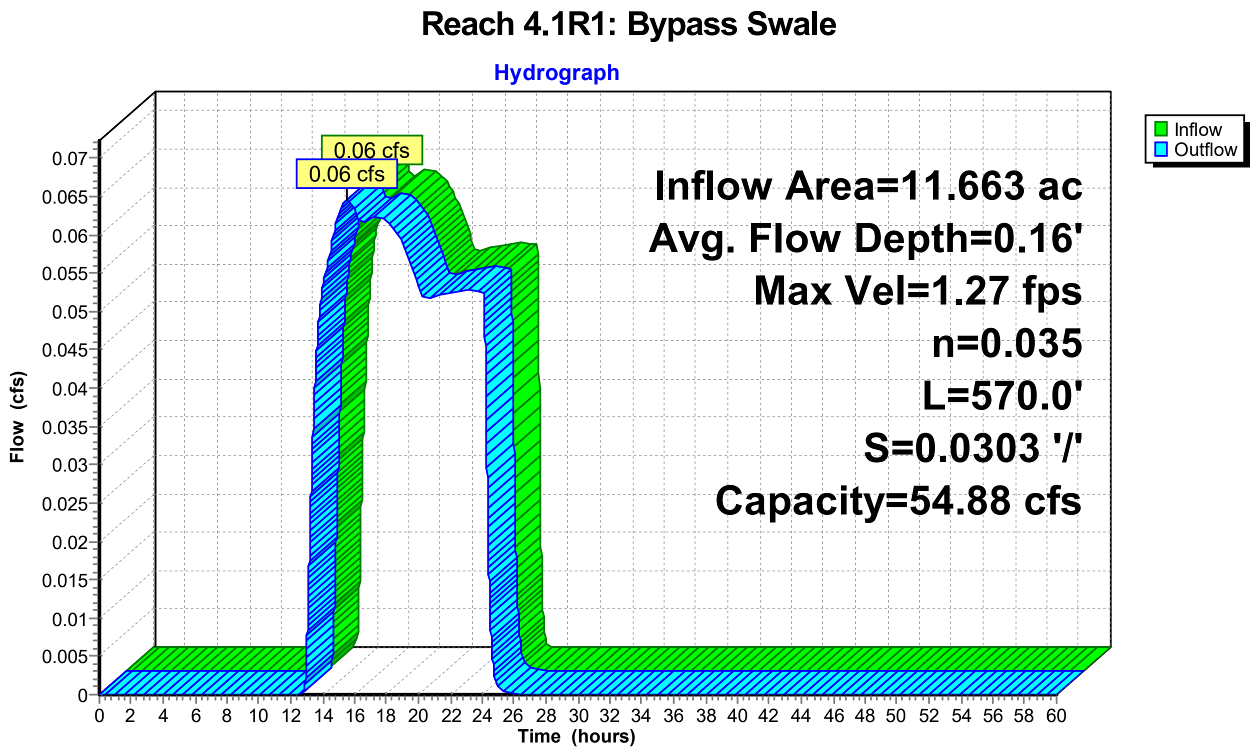
Inflow Area = 11.663 ac, 2.80% Impervious, Inflow Depth = 0.05" for 10-Yr Storm event
Inflow = 0.06 cfs @ 15.43 hrs, Volume= 0.052 af
Outflow = 0.06 cfs @ 15.51 hrs, Volume= 0.052 af, Atten= 0%, Lag= 4.8 min
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.27 fps, Min. Travel Time= 7.5 min
Avg. Velocity = 1.09 fps, Avg. Travel Time= 8.7 min

Peak Storage= 29 cf @ 15.51 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.64'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 54.88 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 570.0' Slope= 0.0303 '/'
Inlet Invert= 1,448.24', Outlet Invert= 1,430.97'





Summary for Reach 4.1R2: Ex Stream

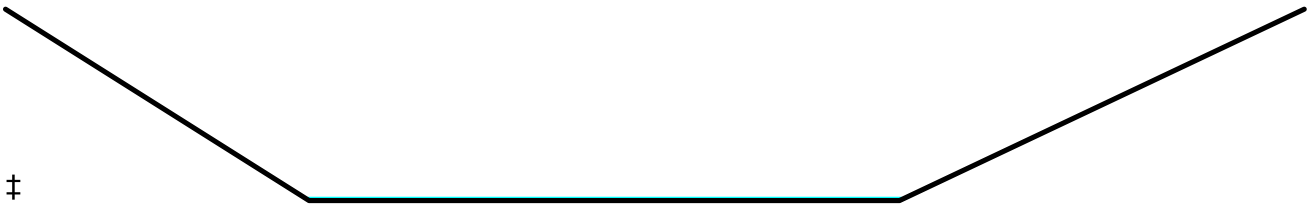
Inflow Area = 39.250 ac, 0.83% Impervious, Inflow Depth = 0.13" for 10-Yr Storm event
Inflow = 0.82 cfs @ 13.01 hrs, Volume= 0.431 af
Outflow = 0.77 cfs @ 13.36 hrs, Volume= 0.431 af, Atten= 5%, Lag= 21.0 min
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.68 fps, Min. Travel Time= 18.1 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 25.5 min

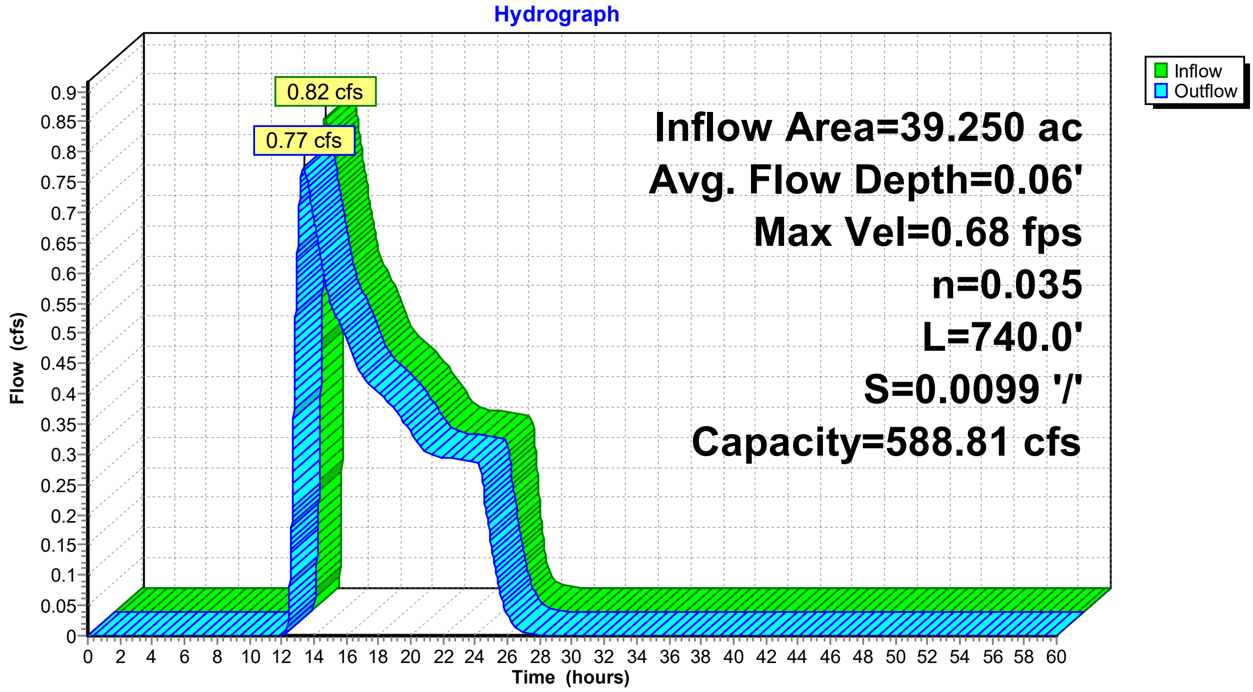
Peak Storage= 842 cf @ 13.36 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 17.95'
Bank-Full Depth= 3.00' Flow Area= 84.0 sf, Capacity= 588.81 cfs

17.50' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 4.0 '/' Top Width= 38.50'
Length= 740.0' Slope= 0.0099 '/'
Inlet Invert= 1,430.98', Outlet Invert= 1,423.64'

‡



Reach 4.1R2: Ex Stream



Summary for Reach 4.2bR: Conveyance Swale

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.98" for 10-Yr Storm event
Inflow = 0.81 cfs @ 11.98 hrs, Volume= 0.038 af
Outflow = 0.69 cfs @ 12.02 hrs, Volume= 0.038 af, Atten= 15%, Lag= 2.4 min
Routed to Pond 4.2bP : Pond 4 - Access Rd East

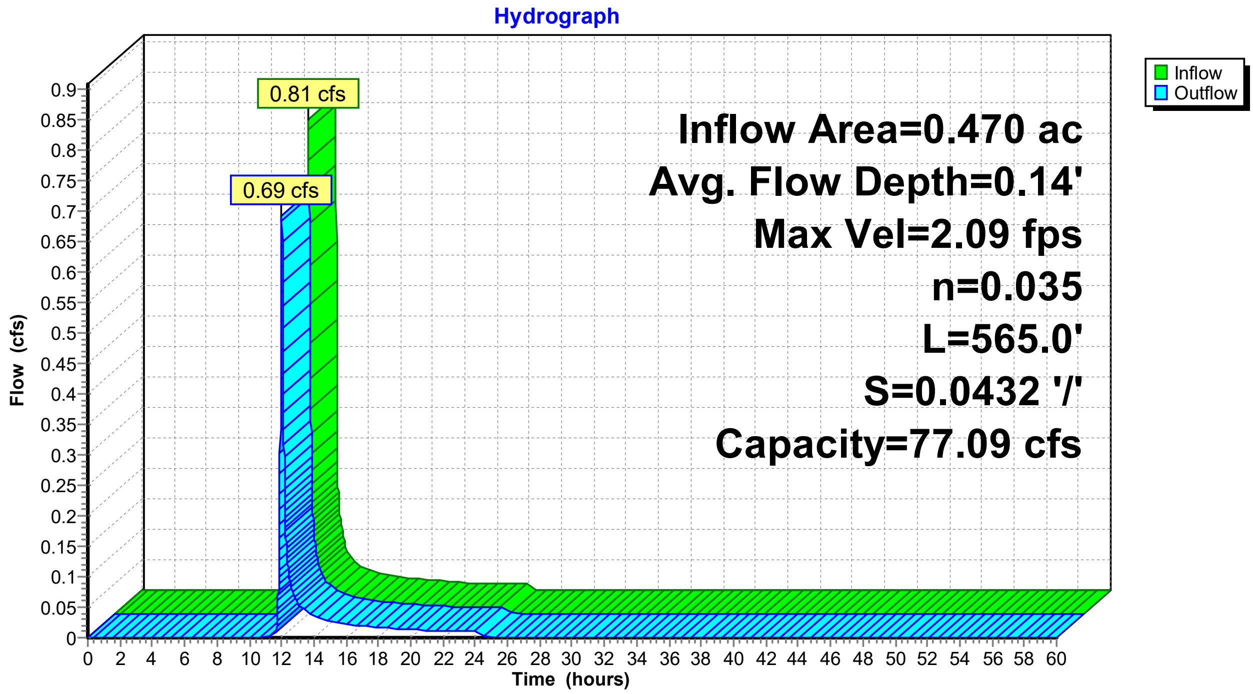
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.09 fps, Min. Travel Time= 4.5 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 14.8 min

Peak Storage= 187 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 2.82'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 77.09 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 565.0' Slope= 0.0432 '/'
Inlet Invert= 1,472.38', Outlet Invert= 1,448.00'

‡

Reach 4.2bR: Conveyance Swale



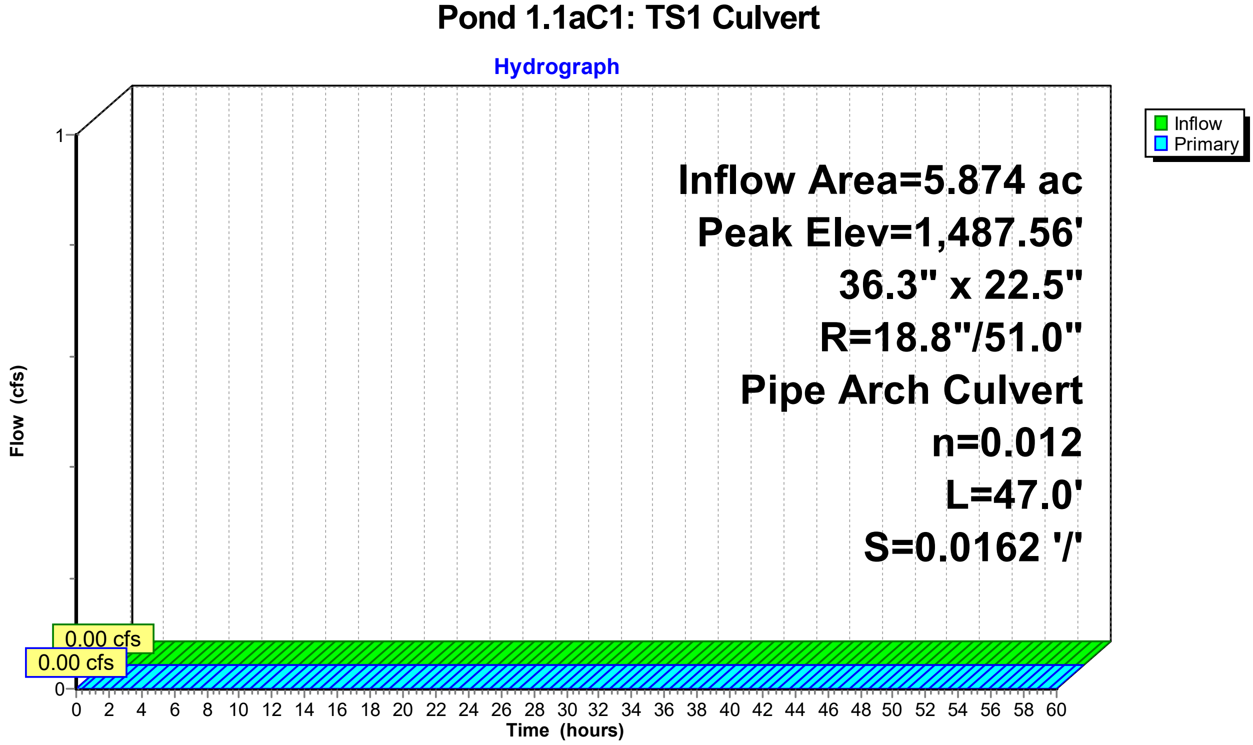
Summary for Pond 1.1aC1: TS1 Culvert

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,487.56' @ 0.00 hrs
Flood Elev= 1,489.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,487.56'	**36.3" W x 22.5" H, R=18.8"/51.0" Pipe Arch RCP_Arch 37x23** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,487.56' / 1,486.80' S= 0.0162 '/' Cc= 0.900 n= 0.012, Flow Area= 4.43 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,487.56' (Free Discharge)
1=RCP_Arch 37x23 (Controls 0.00 cfs)



Summary for Pond 1.1aC2: TS2 Culvert

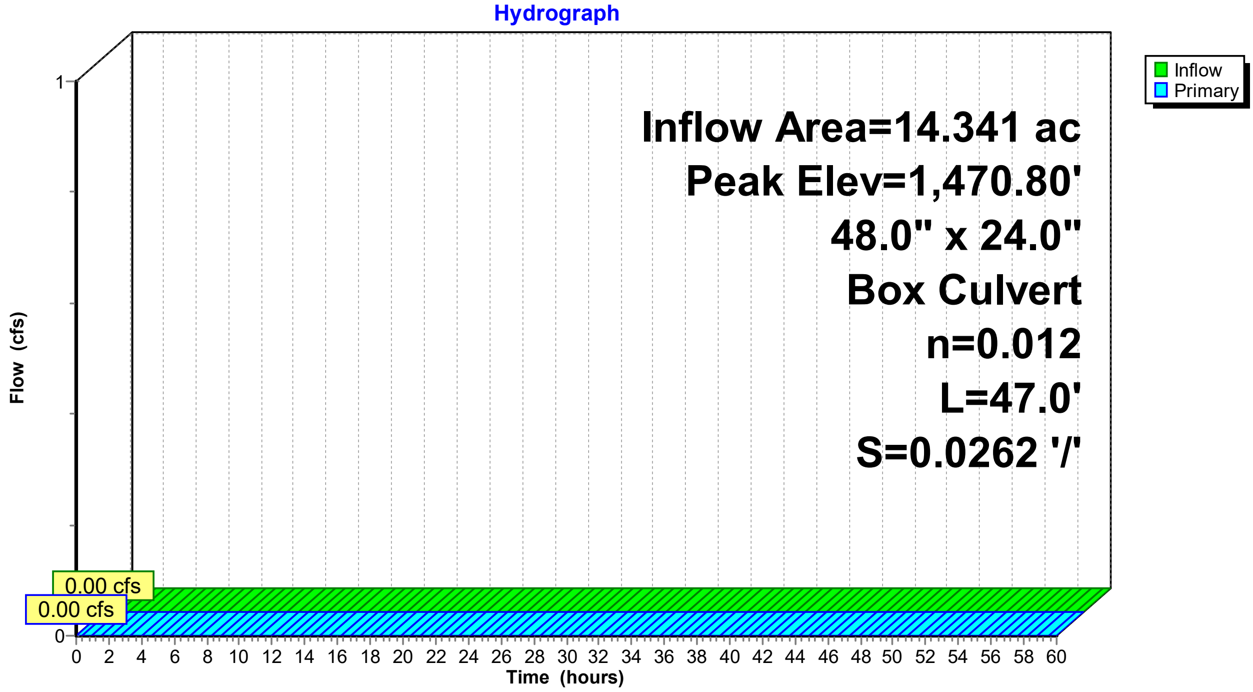
Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,470.80' @ 0.00 hrs
Flood Elev= 1,473.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,470.80'	**48.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,470.80' / 1,469.57' S= 0.0262 '/' Cc= 0.900 n= 0.012, Flow Area= 8.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,470.80' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)

Pond 1.1aC2: TS2 Culvert



Summary for Pond 1.1aC3: TS3 Culvert

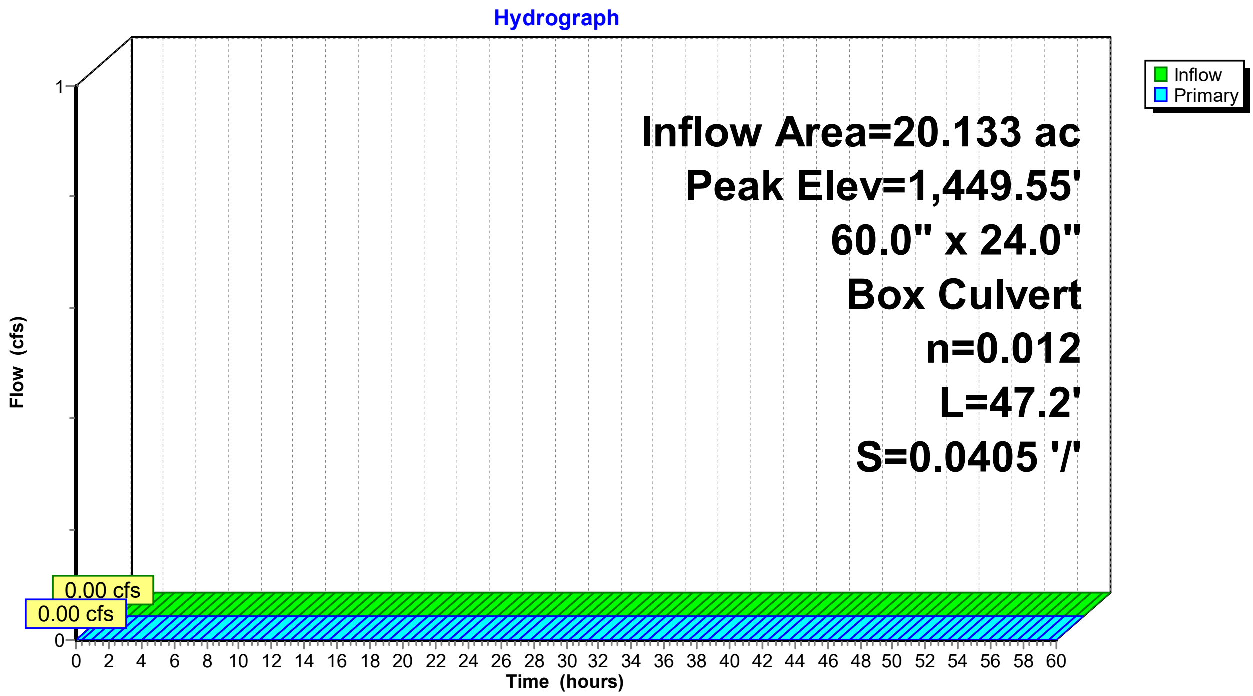
Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR4 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.55' @ 0.00 hrs
Flood Elev= 1,452.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.55'	**60.0" W x 24.0" H Box Culvert** L= 47.2' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.55' / 1,447.64' S= 0.0405 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,449.55' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)

Pond 1.1aC3: TS3 Culvert



Summary for Pond 1.1aP: North Road Bypass OC

Inflow Area =	32.958 ac,	0.00% Impervious,	Inflow Depth = 0.00"	for 10-Yr Storm event
Inflow =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Outflow =	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min	
Discarded =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

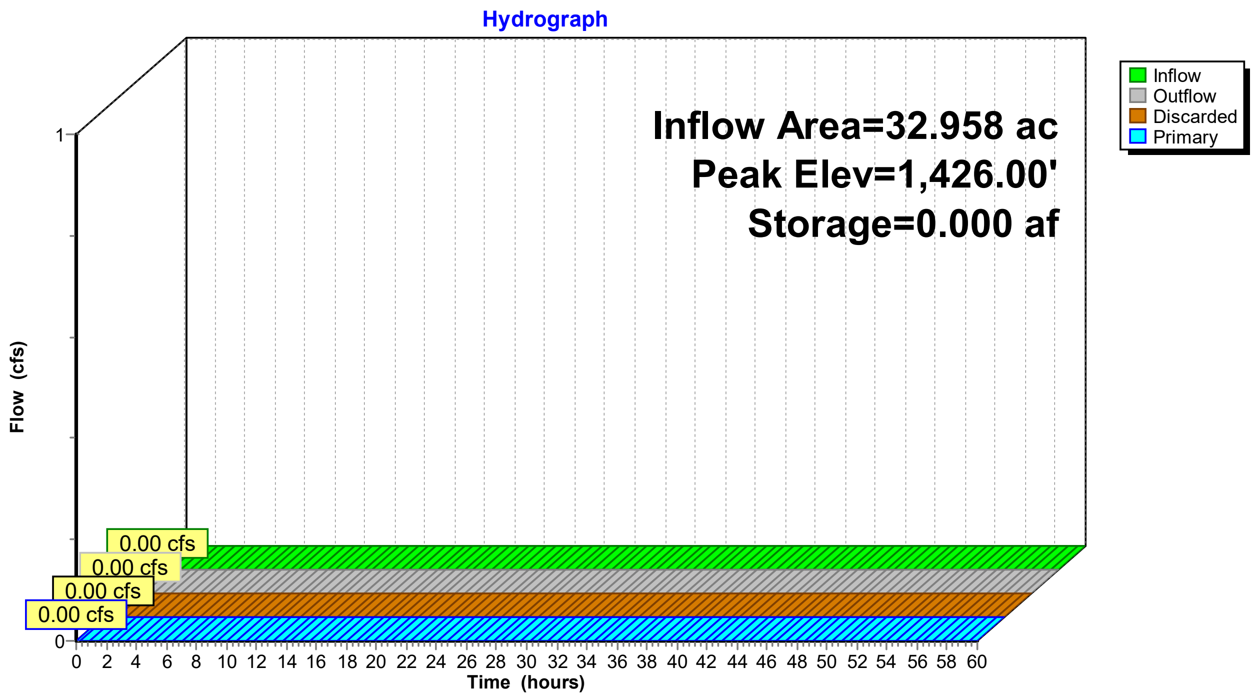
Volume	Invert	Avail.Storage	Storage Description
#1	1,426.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,426.00'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,428.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.1aP: North Road Bypass OC



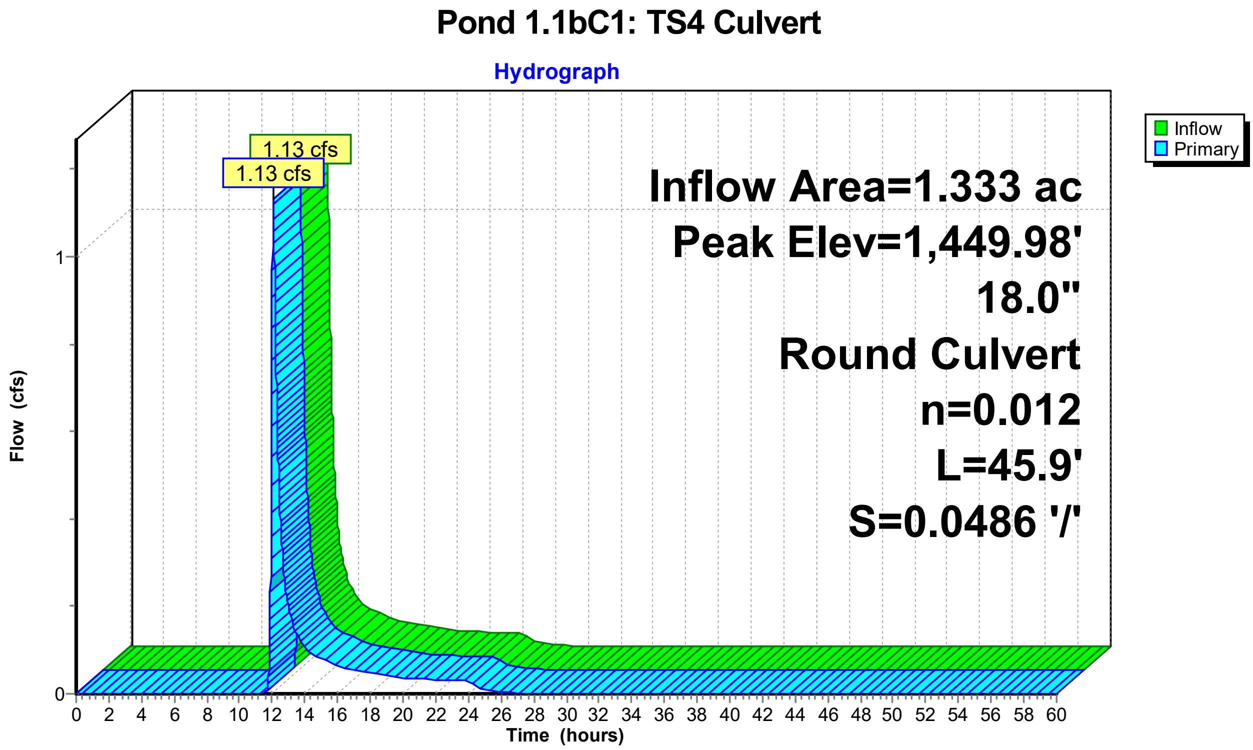
Summary for Pond 1.1bC1: TS4 Culvert

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 1.13 cfs @ 12.06 hrs, Volume= 0.103 af
Outflow = 1.13 cfs @ 12.06 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min
Primary = 1.13 cfs @ 12.06 hrs, Volume= 0.103 af
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.98' @ 12.06 hrs
Flood Elev= 1,451.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.50'	**18.0" Round Culvert** L= 45.9' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.50' / 1,447.27' S= 0.0486 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=1.13 cfs @ 12.06 hrs HW=1,449.98' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.13 cfs @ 2.35 fps)



Summary for Pond 1.1bP1: Dry Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.88" for 10-Yr Storm event
Inflow = 1.61 cfs @ 12.06 hrs, Volume= 0.145 af
Outflow = 1.59 cfs @ 12.08 hrs, Volume= 0.145 af, Atten= 1%, Lag= 1.1 min
Discarded = 0.00 cfs @ 12.08 hrs, Volume= 0.004 af
Primary = 1.58 cfs @ 12.08 hrs, Volume= 0.141 af
Routed to Pond 1.1bP2 : North Road Detention Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.14' @ 12.08 hrs Surf.Area= 329 sf Storage= 171 cf

Plug-Flow detention time= 14.8 min calculated for 0.145 af (100% of inflow)
Center-of-Mass det. time= 14.9 min (914.0 - 899.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.75'	428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

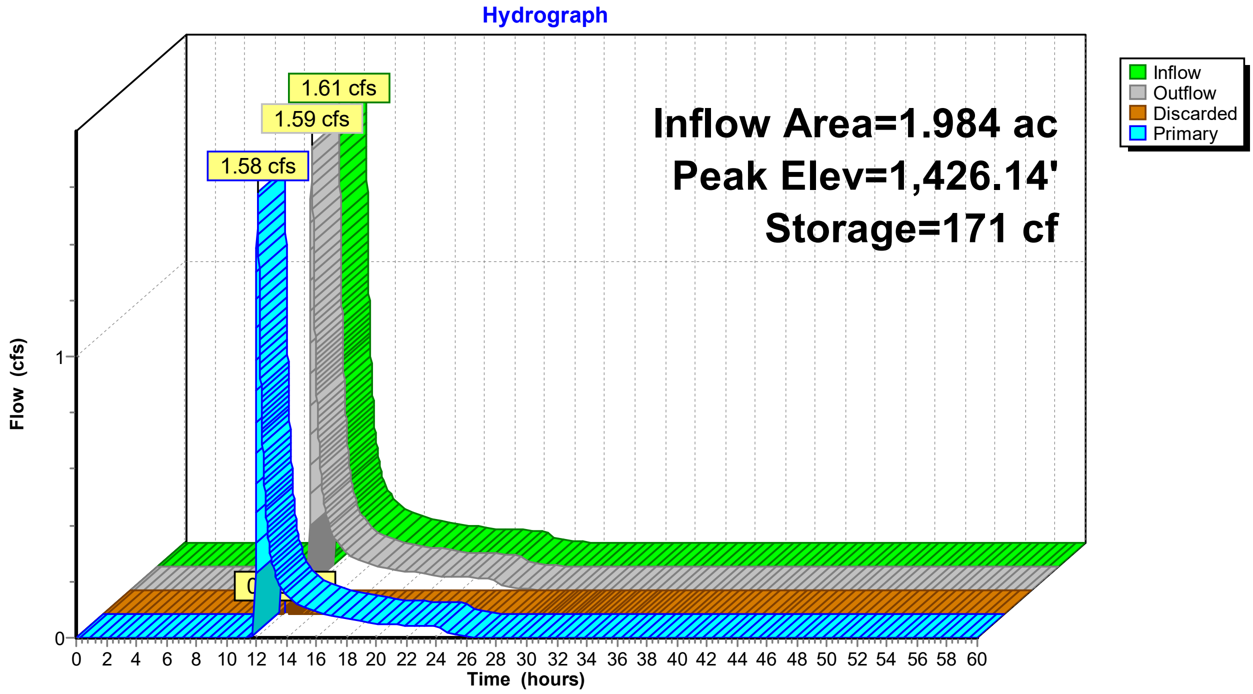
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,424.75	0	0.0	0	0	0
1,425.00	25	22.9	2	2	42
1,426.00	273	98.0	127	129	767
1,426.70	603	161.7	299	428	2,086

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.75'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,425.69'	**2.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.00 cfs @ 12.08 hrs HW=1,426.14' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=1.58 cfs @ 12.08 hrs HW=1,426.14' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 1.58 cfs @ 1.75 fps)

Pond 1.1bP1: Dry Swale



Summary for Pond 1.1bP2: North Road Detention Pond

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.85" for 10-Yr Storm event
Inflow = 1.58 cfs @ 12.08 hrs, Volume= 0.141 af
Outflow = 0.46 cfs @ 12.62 hrs, Volume= 0.127 af, Atten= 71%, Lag= 32.3 min
Discarded = 0.02 cfs @ 12.62 hrs, Volume= 0.052 af
Primary = 0.45 cfs @ 12.62 hrs, Volume= 0.074 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.04' @ 12.62 hrs Surf.Area= 0.032 ac Storage= 0.050 af

Plug-Flow detention time= 547.6 min calculated for 0.127 af (90% of inflow)
Center-of-Mass det. time= 495.3 min (1,392.5 - 897.2)

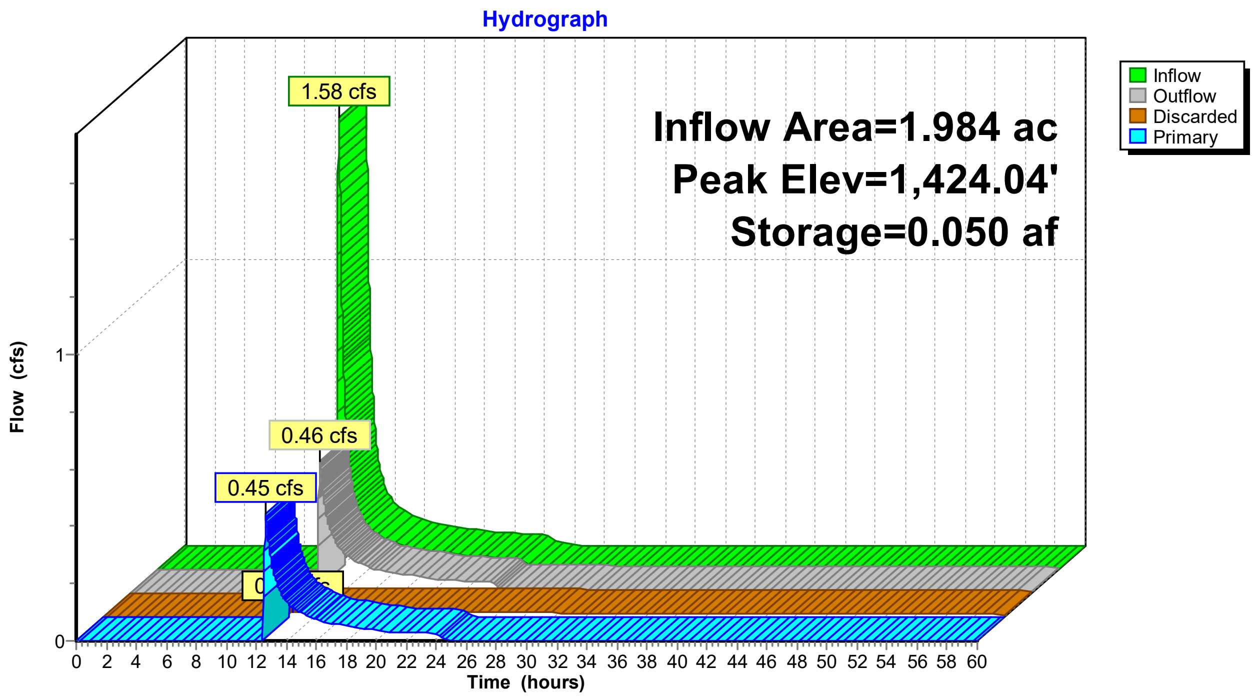
Volume	Invert	Avail.Storage	Storage Description
#1	1,421.50'	0.166 af	**10.00'W x 40.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,421.50'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,424.00'	**20.0' 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

Discarded OutFlow Max=0.02 cfs @ 12.62 hrs HW=1,424.04' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.40 cfs @ 12.62 hrs HW=1,424.04' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.40 cfs @ 0.50 fps)

Pond 1.1bP2: North Road Detention Pond



Summary for Pond 1.2aC1: TS 7 Culvert

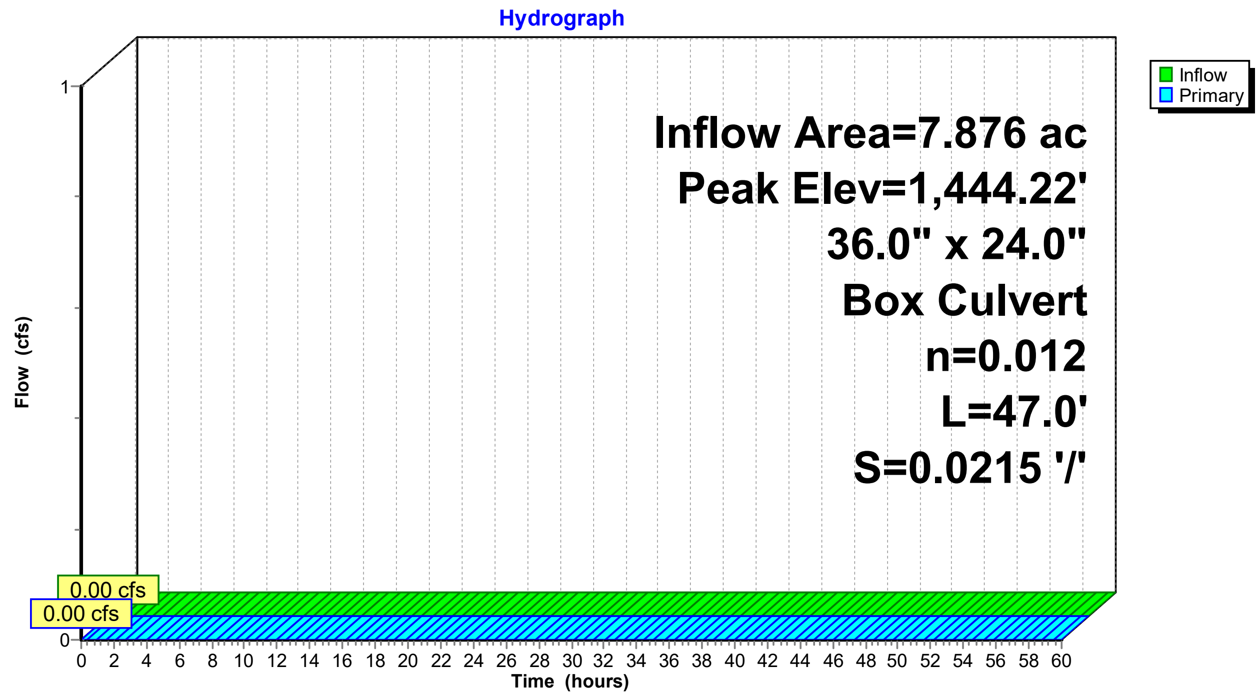
Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.2aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.22' @ 0.00 hrs
Flood Elev= 1,446.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,444.22'	**36.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,444.22' / 1,443.21' S= 0.0215 '/' Cc= 0.900 n= 0.012, Flow Area= 6.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,444.22' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)

Pond 1.2aC1: TS 7 Culvert



Summary for Pond 1.2aC2: TS8 Culvert

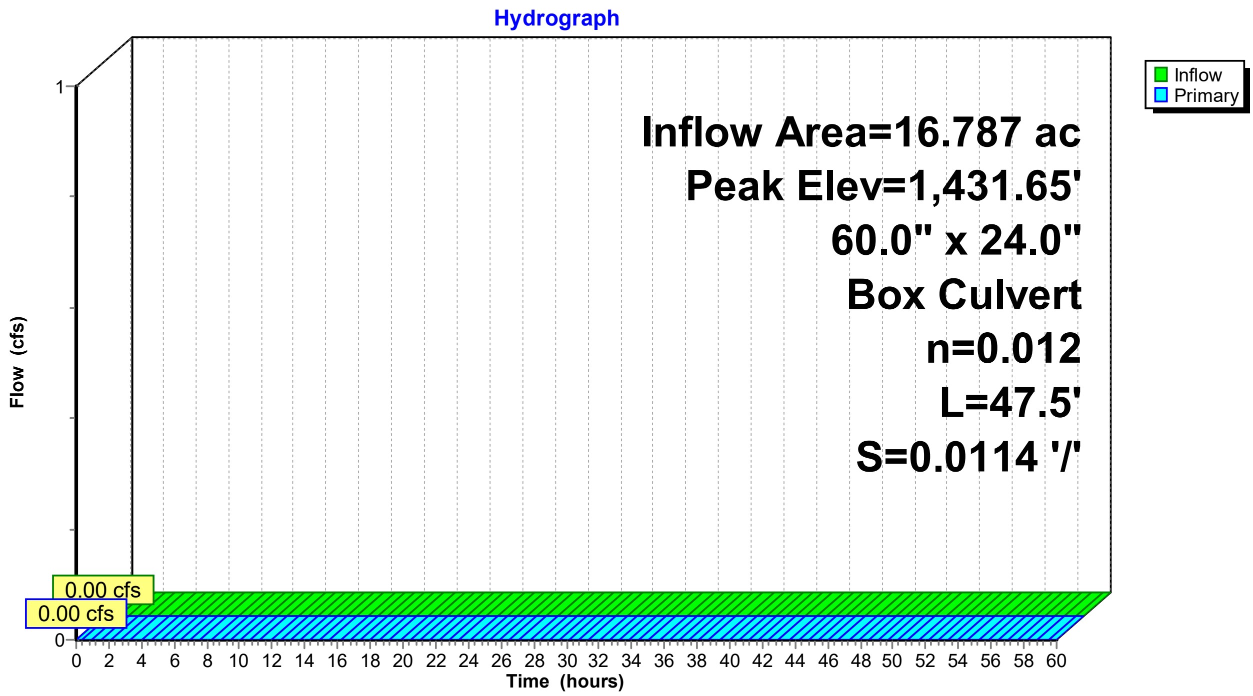
Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.2aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.65' @ 0.00 hrs
Flood Elev= 1,433.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.65'	**60.0" W x 24.0" H Box Culvert** L= 47.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,431.65' / 1,431.11' S= 0.0114 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.65' (Free Discharge)
1=Culvert (Controls 0.00 cfs)

Pond 1.2aC2: TS8 Culvert



Summary for Pond 1.2aP: South Road Bypass OC

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

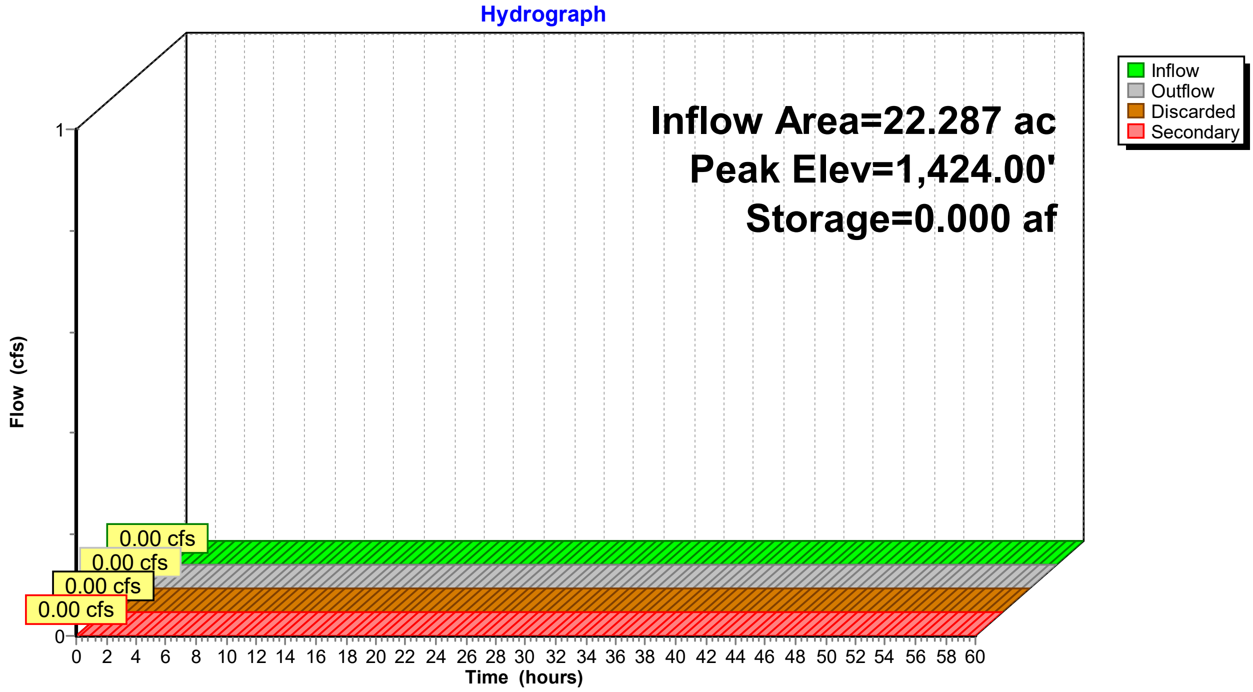
Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area**
#2	Secondary	1,426.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
1=Exfiltration (Passes 0.00 cfs of 0.06 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1.2aP: South Road Bypass OC



Summary for Pond 1.2bC1: East Road Culvert

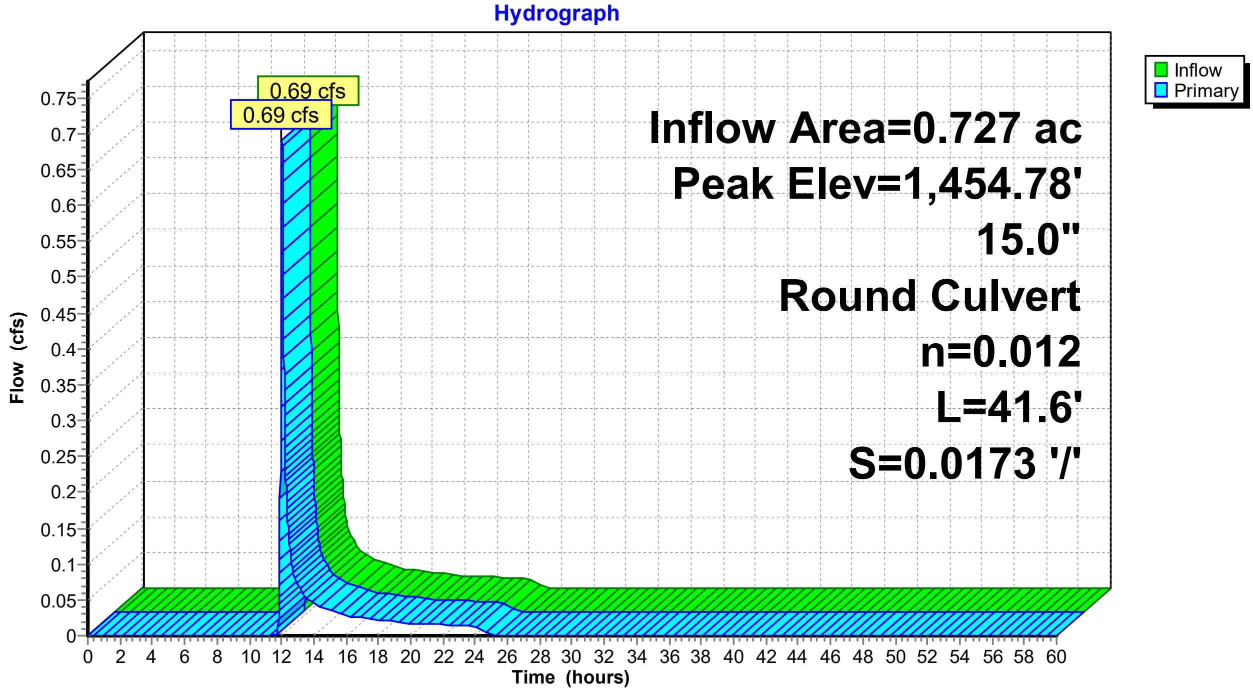
Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.73" for 10-Yr Storm event
Inflow = 0.69 cfs @ 12.04 hrs, Volume= 0.044 af
Outflow = 0.69 cfs @ 12.04 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min
Primary = 0.69 cfs @ 12.04 hrs, Volume= 0.044 af
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,454.78' @ 12.04 hrs
Flood Elev= 1,457.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,454.39'	**15.0" Round Culvert** L= 41.6' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,454.39' / 1,453.67' S= 0.0173 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.69 cfs @ 12.04 hrs HW=1,454.78' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.69 cfs @ 2.12 fps)

Pond 1.2bC1: East Road Culvert



Summary for Pond 1.2bC2: TS6 Culvert

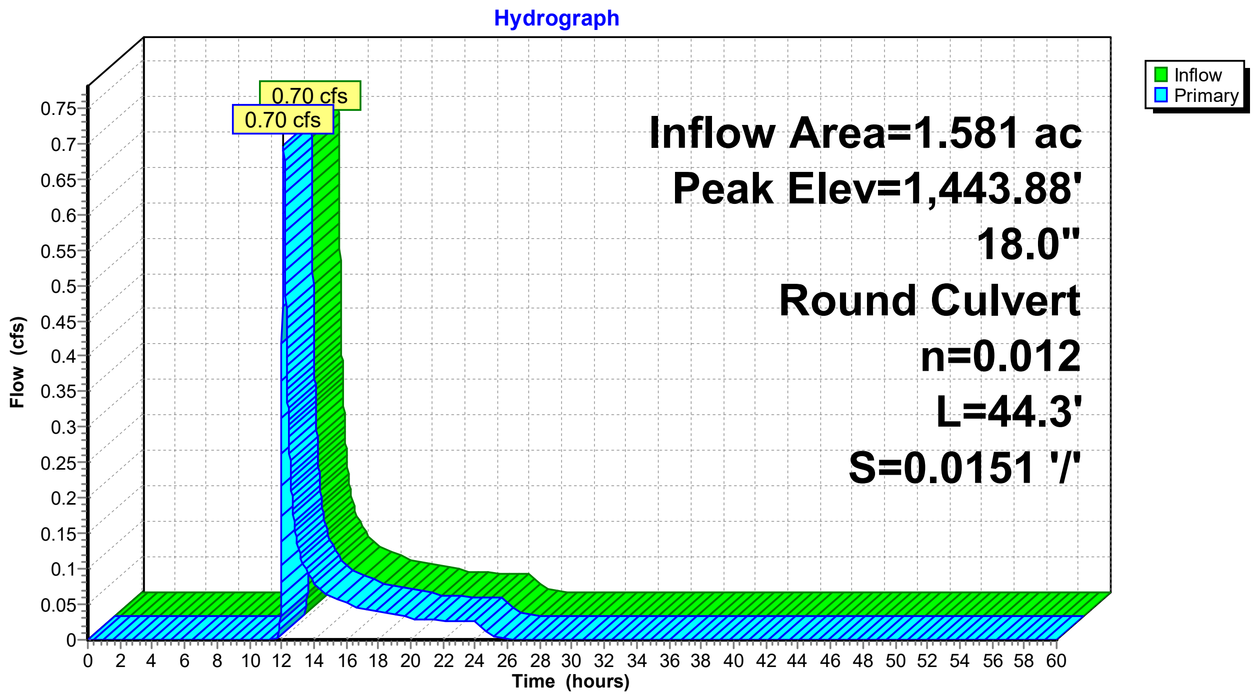
Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.54" for 10-Yr Storm event
Inflow = 0.70 cfs @ 12.13 hrs, Volume= 0.071 af
Outflow = 0.70 cfs @ 12.13 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min
Primary = 0.70 cfs @ 12.13 hrs, Volume= 0.071 af
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,443.88' @ 12.13 hrs
Flood Elev= 1,445.09'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,443.51'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,443.51' / 1,442.84' S= 0.0151 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.70 cfs @ 12.13 hrs HW=1,443.88' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.70 cfs @ 2.07 fps)

Pond 1.2bC2: TS6 Culvert



Summary for Pond 1.2bP: South Road Treatment Pond

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.67" for 10-Yr Storm event
Inflow = 1.22 cfs @ 12.07 hrs, Volume= 0.133 af
Outflow = 0.41 cfs @ 12.61 hrs, Volume= 0.133 af, Atten= 67%, Lag= 32.1 min
Discarded = 0.29 cfs @ 12.61 hrs, Volume= 0.132 af
Primary = 0.12 cfs @ 12.61 hrs, Volume= 0.002 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.06' @ 12.61 hrs Surf.Area= 0.024 ac Storage= 0.033 af

Plug-Flow detention time= 44.3 min calculated for 0.133 af (100% of inflow)
Center-of-Mass det. time= 44.3 min (954.4 - 910.1)

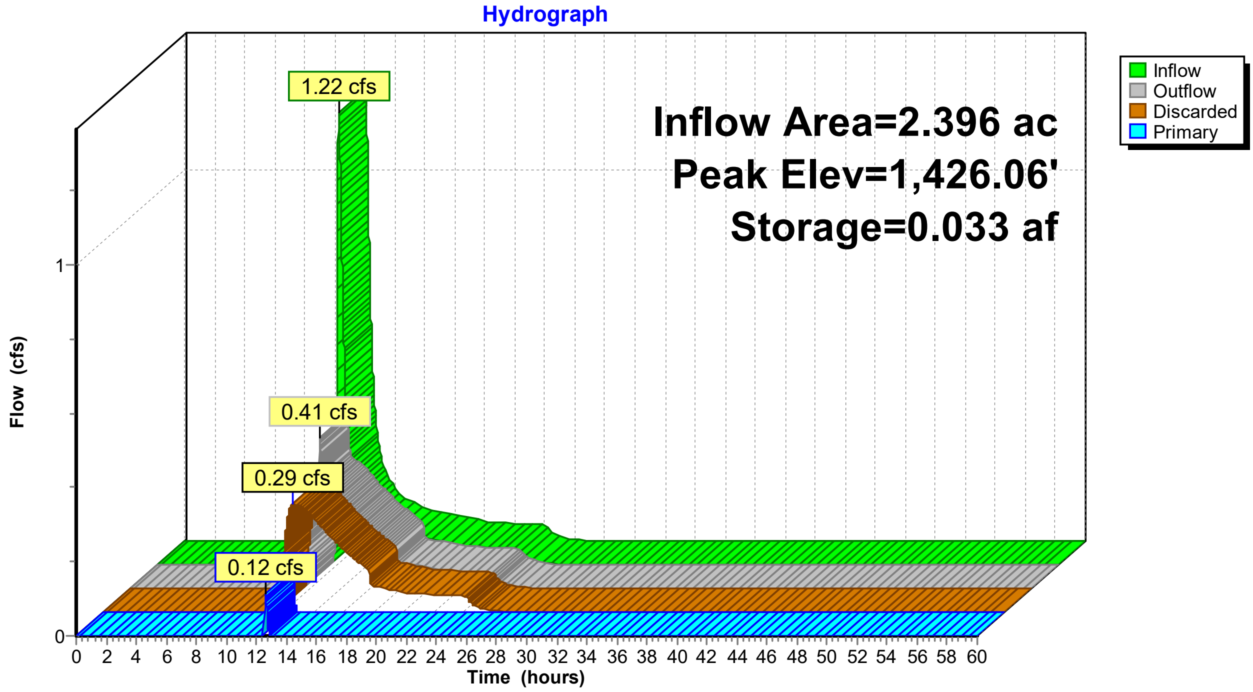
Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.149 af	**20.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,426.05'	**20.0' 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

Discarded OutFlow Max=0.29 cfs @ 12.61 hrs HW=1,426.06' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.05 cfs @ 12.61 hrs HW=1,426.06' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.25 fps)

Pond 1.2bP: South Road Treatment Pond



Summary for Pond 1.3P: Pond 3 - Access Rd West

Inflow Area = 0.695 ac, 0.00% Impervious, Inflow Depth = 0.17" for 10-Yr Storm event
Inflow = 0.04 cfs @ 12.04 hrs, Volume= 0.010 af
Outflow = 0.03 cfs @ 12.12 hrs, Volume= 0.010 af, Atten= 33%, Lag= 4.7 min
Discarded = 0.03 cfs @ 12.12 hrs, Volume= 0.010 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link SP1 : Study Point 1

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,456.01' @ 12.12 hrs Surf.Area= 788 sf Storage= 8 cf

Plug-Flow detention time= 4.8 min calculated for 0.010 af (100% of inflow)
Center-of-Mass det. time= 4.8 min (997.7 - 992.9)

Volume	Invert	Avail.Storage	Storage Description
#1	1,456.00'	8,743 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

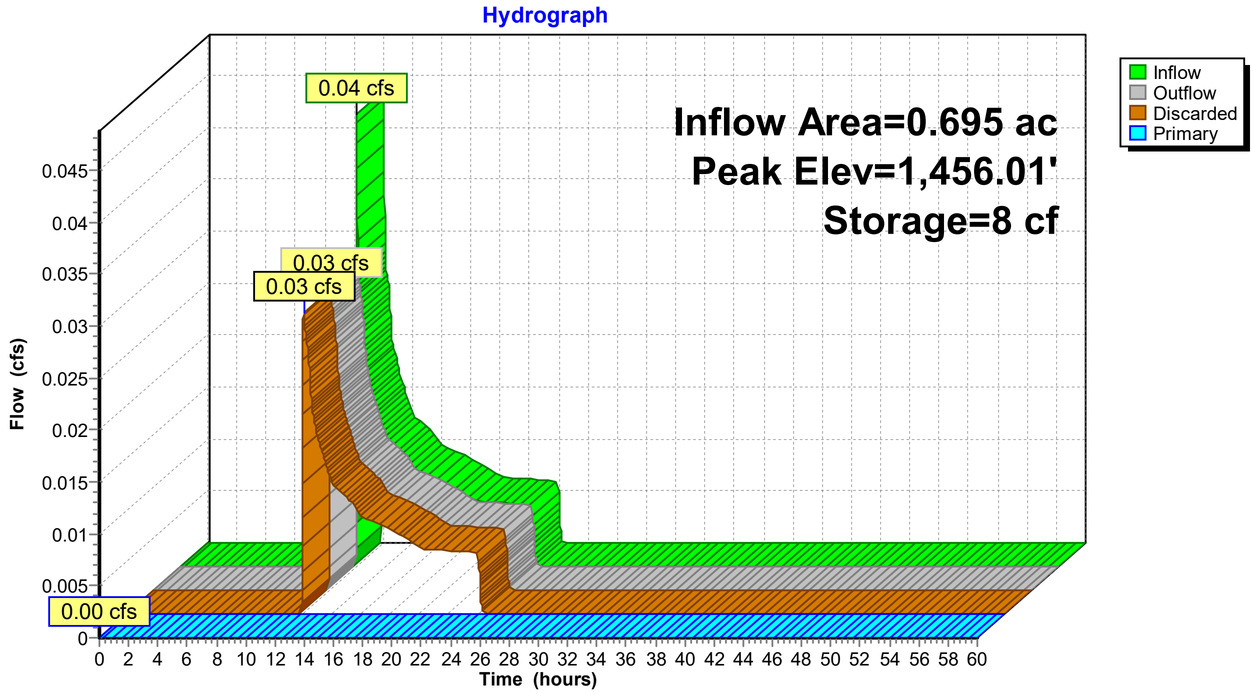
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,456.00	784	123.0	0	0	784
1,458.00	1,720	194.0	2,443	2,443	2,603
1,459.00	2,884	279.0	2,277	4,721	5,811
1,460.00	5,280	421.0	4,022	8,743	13,729

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,456.00'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,459.99'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.11 cfs @ 12.12 hrs HW=1,456.01' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.3P: Pond 3 - Access Rd West



Summary for Pond 4.2bP: Pond 4 - Access Rd East

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.98" for 10-Yr Storm event
Inflow = 0.69 cfs @ 12.02 hrs, Volume= 0.038 af
Outflow = 0.08 cfs @ 12.64 hrs, Volume= 0.038 af, Atten= 89%, Lag= 37.2 min
Discarded = 0.08 cfs @ 12.64 hrs, Volume= 0.038 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4.2C : 18" Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,447.07' @ 12.64 hrs Surf.Area= 571 sf Storage= 581 cf

Plug-Flow detention time= 73.6 min calculated for 0.038 af (100% of inflow)
Center-of-Mass det. time= 73.5 min (948.1 - 874.6)

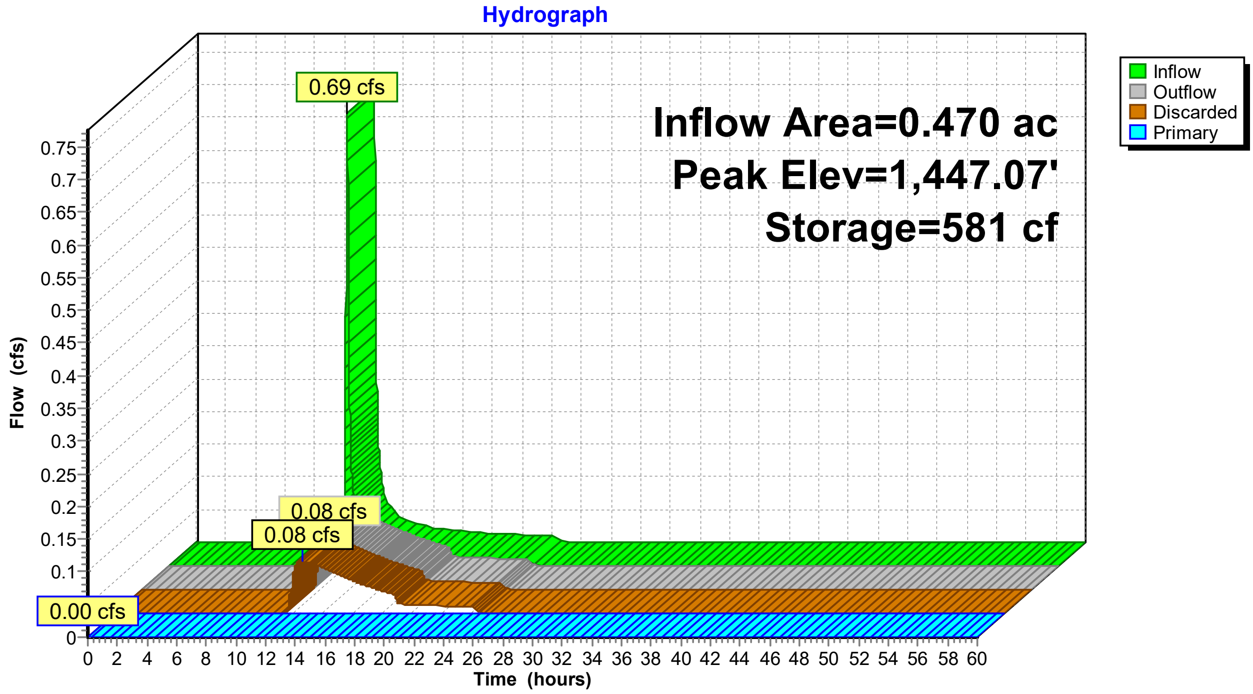
Volume	Invert	Avail.Storage	Storage Description
#1	1,445.50'	2,317 cf	**10.00'W x 20.00'L x 3.50'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,445.50'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,448.25'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.08 cfs @ 12.64 hrs HW=1,447.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,445.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4.2bP: Pond 4 - Access Rd East



Summary for Pond 4.2C: 18" Culvert

Inflow Area = 27.587 ac, 0.00% Impervious, Inflow Depth = 0.17" for 10-Yr Storm event
Inflow = 0.85 cfs @ 12.75 hrs, Volume= 0.380 af
Outflow = 0.81 cfs @ 12.97 hrs, Volume= 0.379 af, Atten= 5%, Lag= 13.4 min
Primary = 0.81 cfs @ 12.97 hrs, Volume= 0.379 af
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,432.23' @ 12.97 hrs Surf.Area= 2,110 sf Storage= 572 cf
Flood Elev= 1,434.64' Surf.Area= 27,666 sf Storage= 28,656 cf

Plug-Flow detention time= 14.9 min calculated for 0.379 af (100% of inflow)
Center-of-Mass det. time= 13.3 min (1,036.8 - 1,023.5)

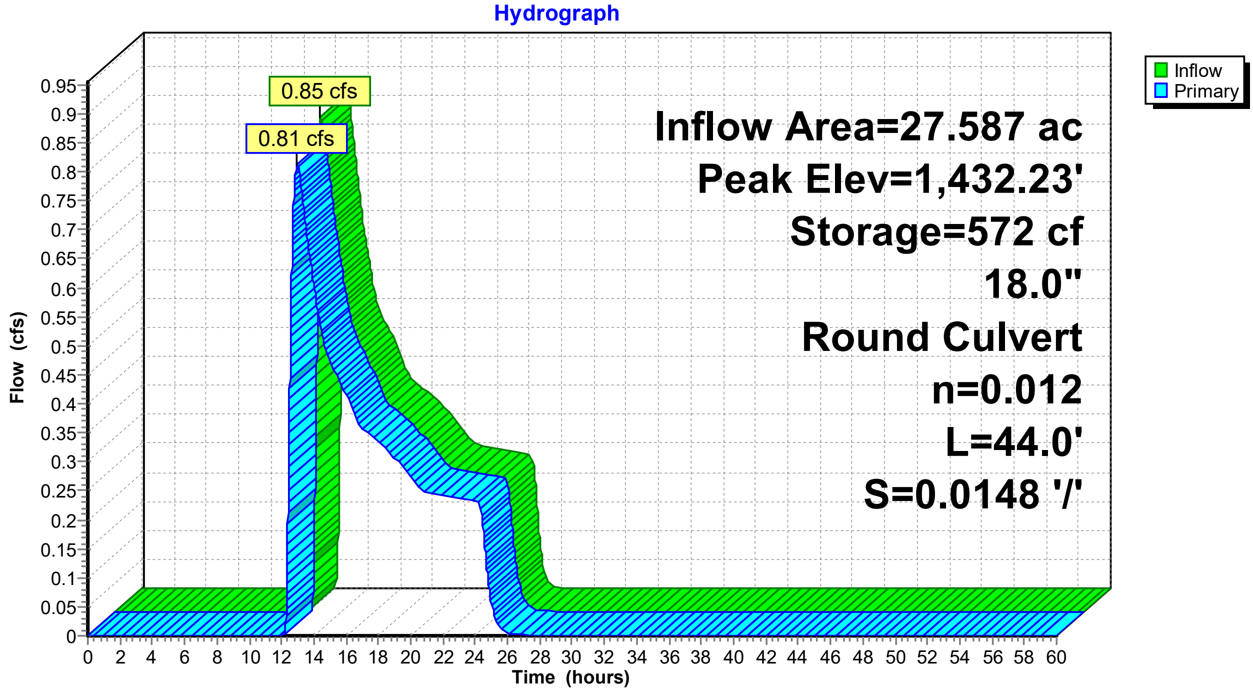
Volume	Invert	Avail.Storage	Storage Description
#1	1,431.50'	39,033 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,431.50	0	0.0	0	0	0
1,432.00	1,190	146.0	198	198	1,697
1,432.50	3,534	368.0	1,129	1,327	10,778
1,433.00	5,795	497.0	2,309	3,637	19,660
1,433.50	10,362	837.0	3,984	7,621	55,755
1,434.00	16,931	975.0	6,756	14,377	75,659
1,434.60	27,412	1,352.0	13,177	27,555	145,474
1,435.00	30,000	1,500.0	11,479	39,033	179,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.83'	**18.0" Round Culvert** L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.83' / 1,431.18' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.81 cfs @ 12.97 hrs HW=1,432.23' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.81 cfs @ 2.15 fps)

Pond 4.2C: 18" Culvert



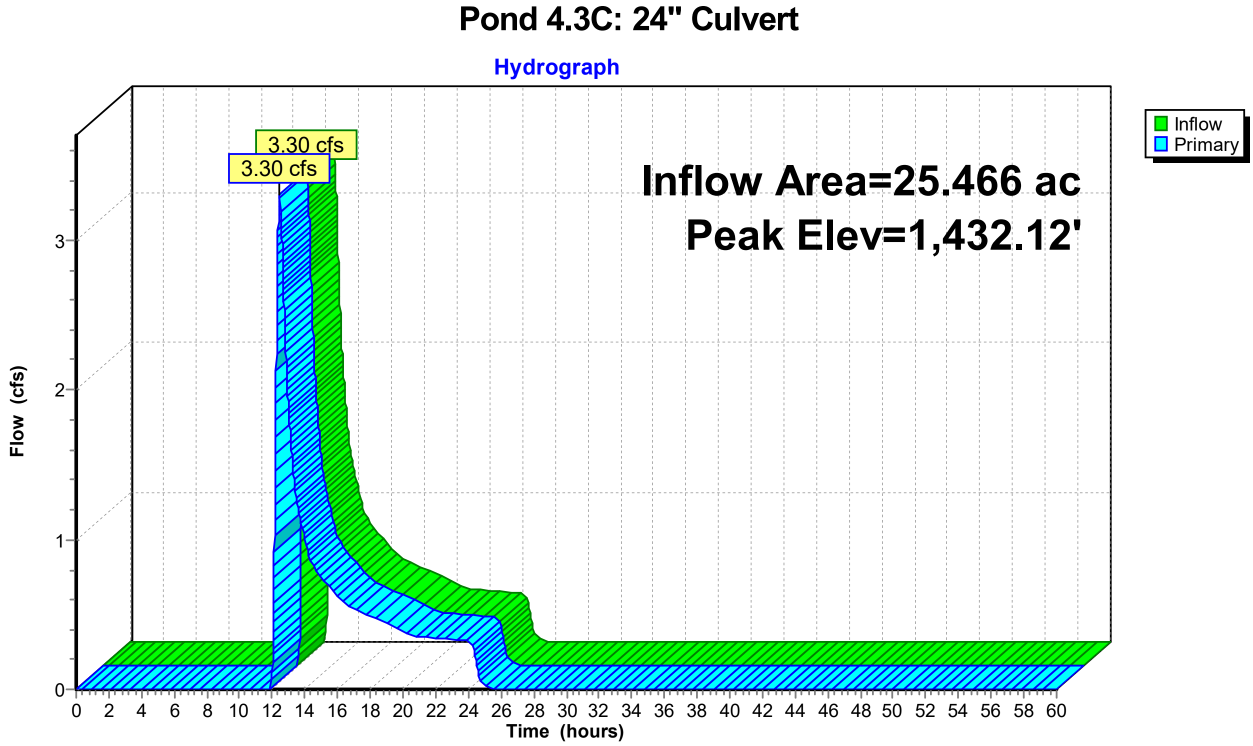
Summary for Pond 4.3C: 24" Culvert

Inflow Area = 25.466 ac, 5.08% Impervious, Inflow Depth = 0.34" for 10-Yr Storm event
Inflow = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af
Outflow = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af, Atten= 0%, Lag= 0.0 min
Primary = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,432.12' @ 12.45 hrs
Flood Elev= 1,434.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.35'	**24.0" Round Culvert** L= 55.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.35' / 1,429.87' S= 0.0265 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Primary	1,434.81'	**20.0' 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

Primary OutFlow Max=3.30 cfs @ 12.45 hrs HW=1,432.12' (Free Discharge)
1=Culvert (Inlet Controls 3.30 cfs @ 2.98 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

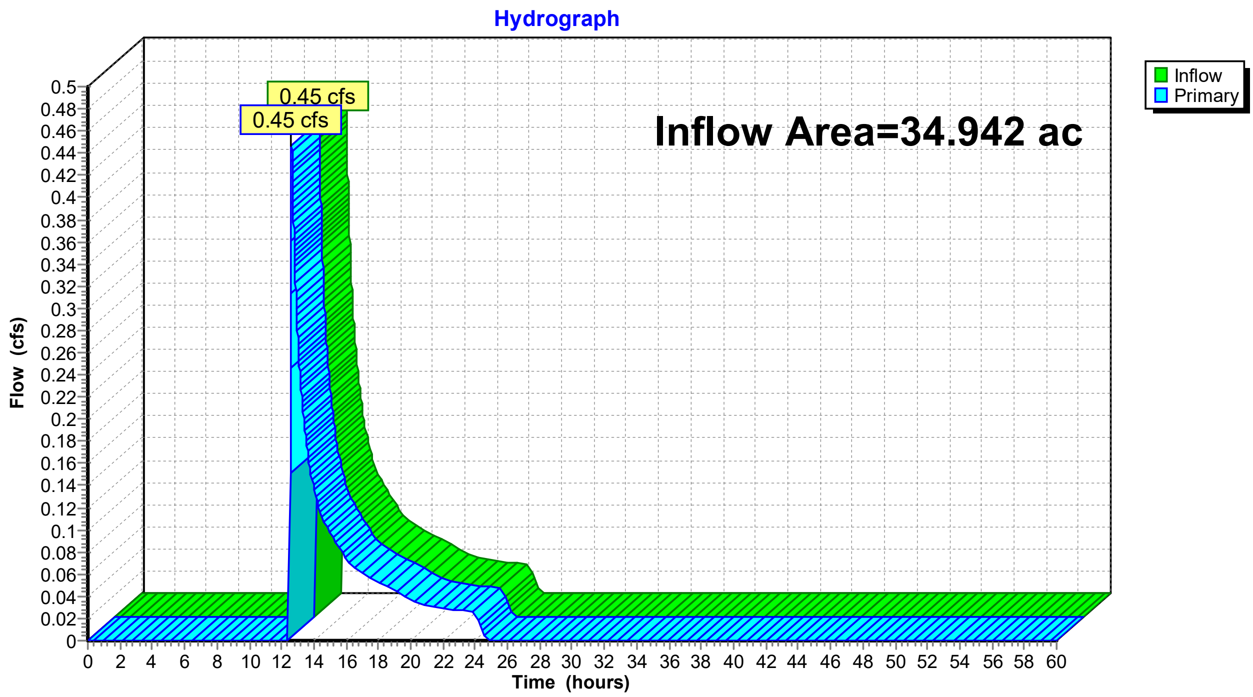


Summary for Link 1.1L:

Inflow Area = 34.942 ac, 0.04% Impervious, Inflow Depth = 0.03" for 10-Yr Storm event
Inflow = 0.45 cfs @ 12.62 hrs, Volume= 0.074 af
Primary = 0.45 cfs @ 12.62 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

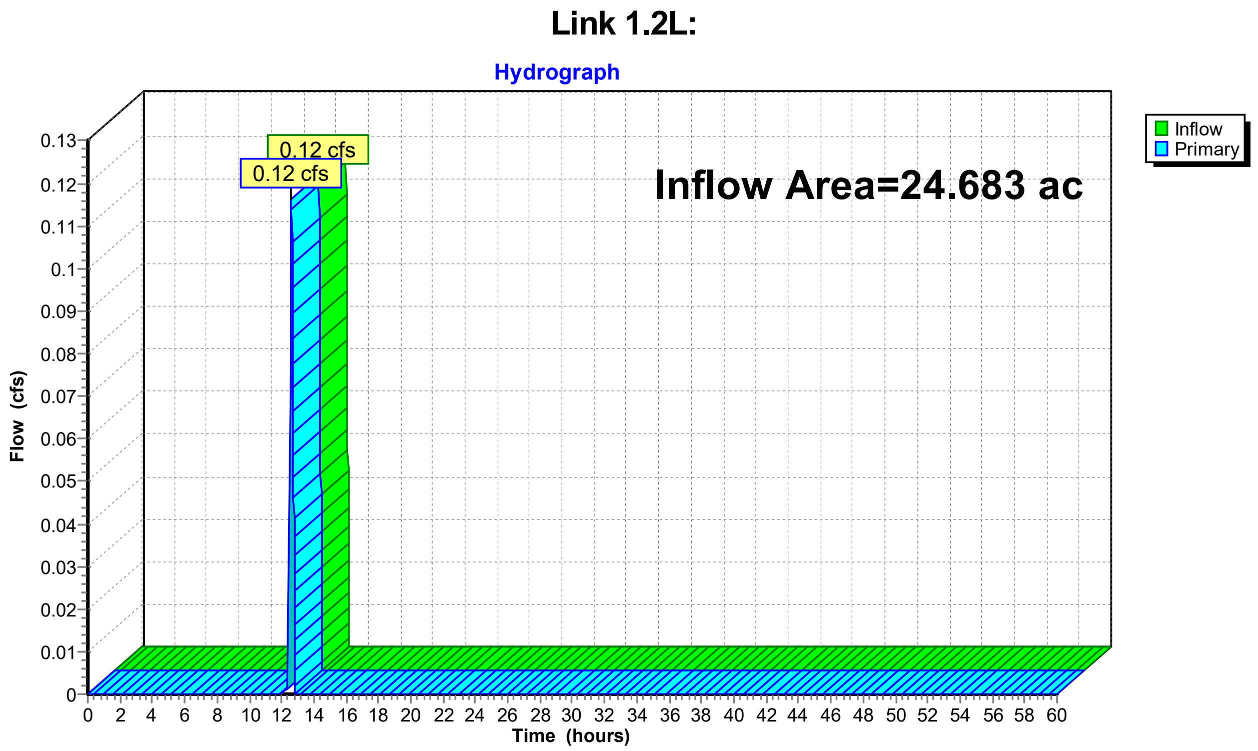
Link 1.1L:



Summary for Link 1.2L:

Inflow Area = 24.683 ac, 0.06% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.12 cfs @ 12.61 hrs, Volume= 0.002 af
Primary = 0.12 cfs @ 12.61 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

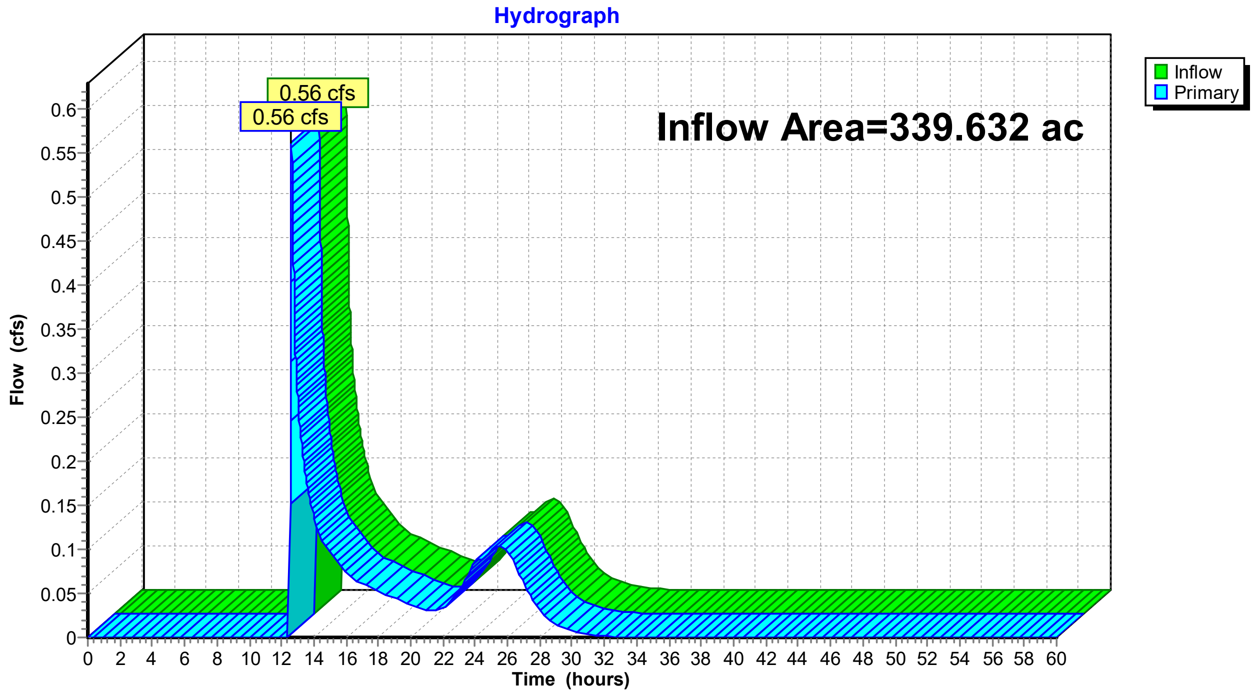


Summary for Link SP1: Study Point 1

Inflow Area = 339.632 ac, 0.01% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.56 cfs @ 12.61 hrs, Volume= 0.110 af
Primary = 0.56 cfs @ 12.61 hrs, Volume= 0.110 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP1: Study Point 1

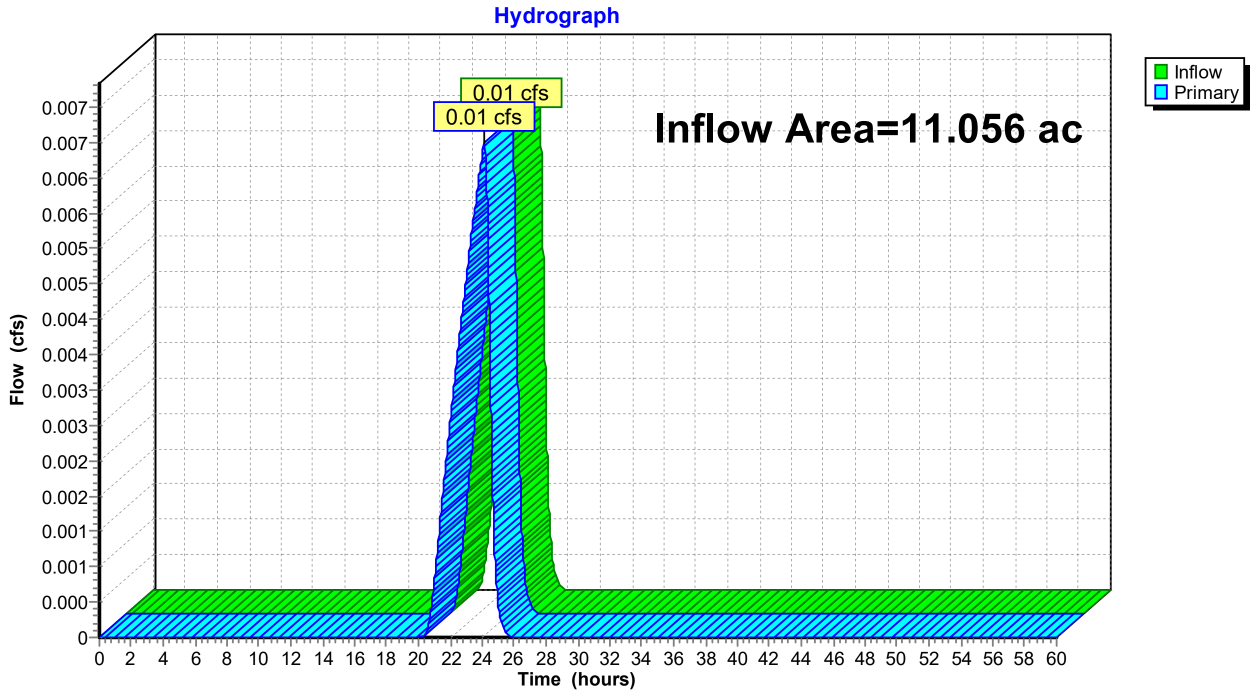


Summary for Link SP2: Study Point 2

Inflow Area = 11.056 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.01 cfs @ 24.12 hrs, Volume= 0.001 af
Primary = 0.01 cfs @ 24.12 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP2: Study Point 2

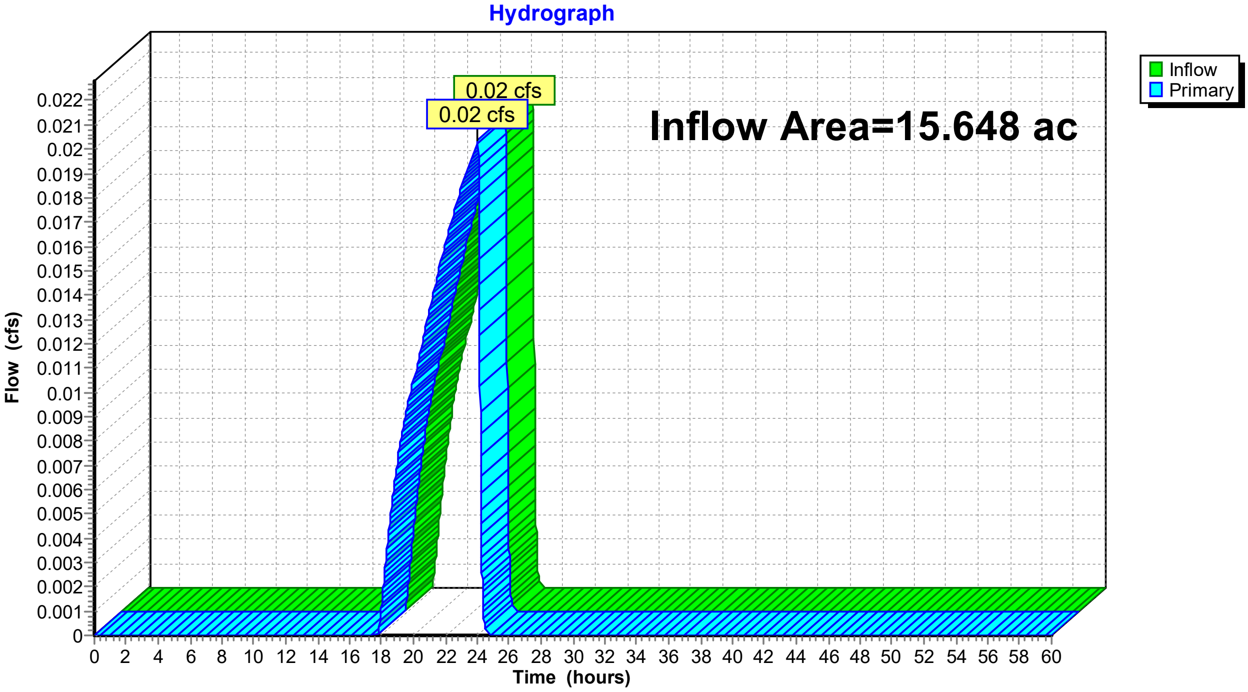


Summary for Link SP3: Study Point 3

Inflow Area =	15.648 ac,	0.56% Impervious,	Inflow Depth = 0.01"	for 10-Yr Storm event	
Inflow =	0.02 cfs @	24.01 hrs,	Volume=	0.007 af	
Primary =	0.02 cfs @	24.01 hrs,	Volume=	0.007 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP3: Study Point 3

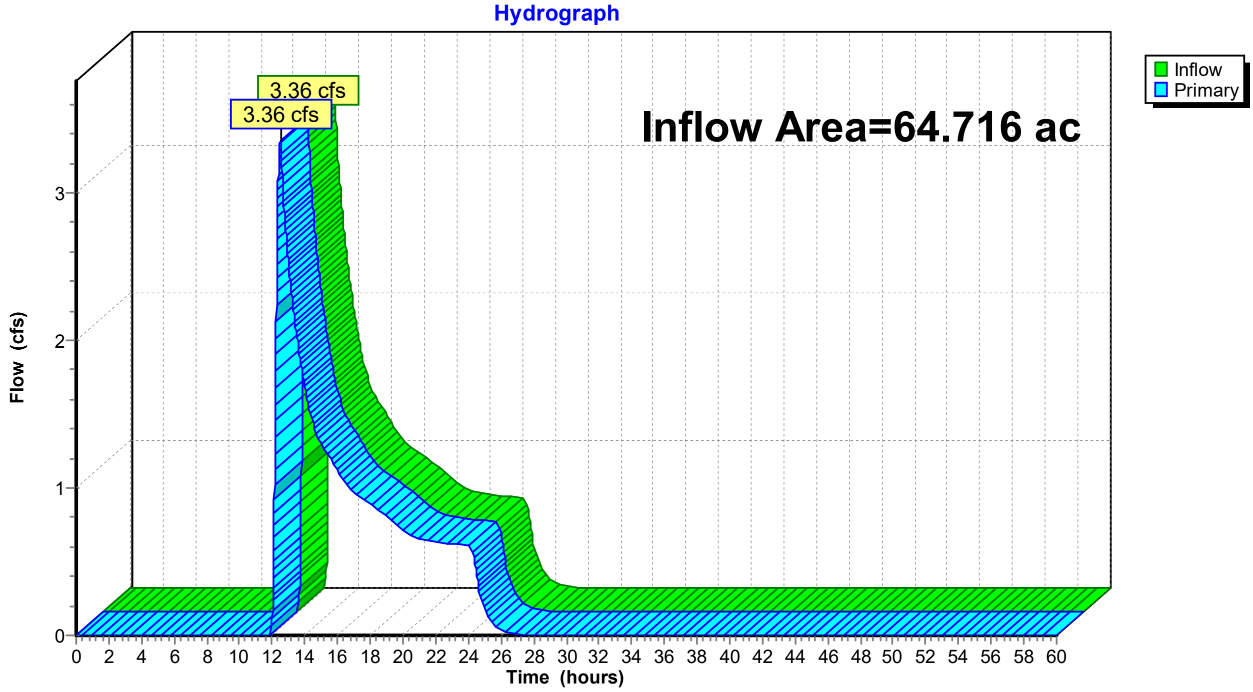


Summary for Link SP4: Study Point 4

Inflow Area = 64.716 ac, 2.50% Impervious, Inflow Depth = 0.21" for 10-Yr Storm event
Inflow = 3.36 cfs @ 12.49 hrs, Volume= 1.146 af
Primary = 3.36 cfs @ 12.49 hrs, Volume= 1.146 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP4: Study Point 4

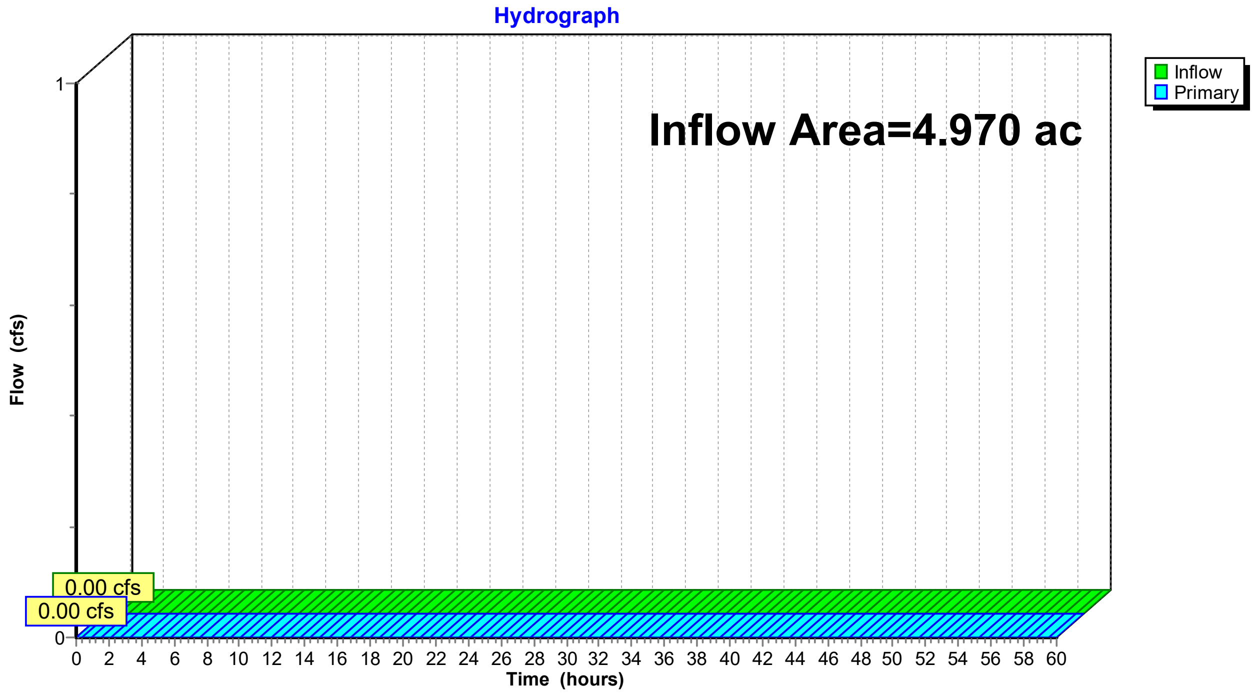


Summary for Link SP5: Study Point 5

Inflow Area = 4.970 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

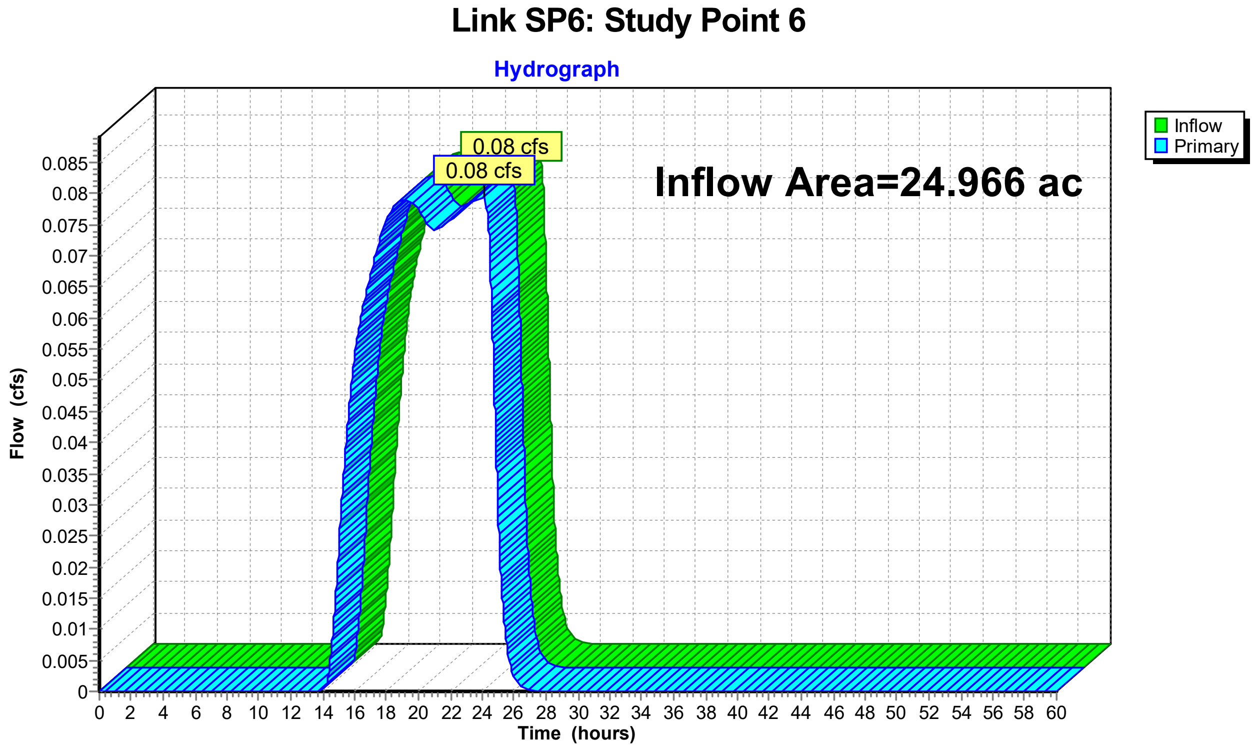
Link SP5: Study Point 5



Summary for Link SP6: Study Point 6

Inflow Area =	24.966 ac,	5.81% Impervious,	Inflow Depth = 0.03"	for 10-Yr Storm event	
Inflow =	0.08 cfs @	24.10 hrs,	Volume=	0.059 af	
Primary =	0.08 cfs @	24.10 hrs,	Volume=	0.059 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1.1aS1: North Array East Runoff Area=5.874 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=788' Tc=18.8 min CN=30 Runoff=0.02 cfs 0.012 af

Subcatchment 1.1aS2: North Array East Runoff Area=8.467 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=931' Tc=21.1 min CN=30 Runoff=0.03 cfs 0.017 af

Subcatchment 1.1aS3: North Array West Runoff Area=5.792 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=1,031' Tc=19.7 min CN=30 Runoff=0.02 cfs 0.012 af

Subcatchment 1.1aS4: North Array West Runoff Area=12.825 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=1,562' Tc=26.1 min CN=30 Runoff=0.05 cfs 0.026 af

Subcatchment 1.1bS1: North Road - East Runoff Area=1.333 ac 0.53% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=71 Runoff=5.85 cfs 0.272 af

Subcatchment 1.1bS2: North Road - West Runoff Area=0.651 ac 1.08% Impervious Runoff Depth=2.19"
Tc=6.0 min CN=68 Runoff=2.56 cfs 0.119 af

Subcatchment 1.2aS1: Middle Array East Runoff Area=7.876 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=865' Tc=19.1 min CN=30 Runoff=0.03 cfs 0.016 af

Subcatchment 1.2aS2: Middle Array Center Runoff Area=8.911 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=825' Tc=18.1 min CN=30 Runoff=0.03 cfs 0.018 af

Subcatchment 1.2aS3: Middle Array West Runoff Area=5.500 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=882' Tc=18.5 min CN=30 Runoff=0.02 cfs 0.011 af

Subcatchment 1.2bS1: East Road - West Runoff Area=0.727 ac 0.00% Impervious Runoff Depth=2.11"
Tc=6.0 min CN=67 Runoff=2.75 cfs 0.128 af

Subcatchment 1.2bS2: South Road Runoff Area=0.854 ac 0.47% Impervious Runoff Depth=1.41"
Flow Length=308' Tc=13.7 min CN=58 Runoff=1.51 cfs 0.101 af

Subcatchment 1.2bS3: South Road Runoff Area=0.815 ac 1.35% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=71 Runoff=3.57 cfs 0.166 af

Subcatchment 1.3aS1: Surface Discharge Runoff Area=279.312 ac 0.00% Impervious Runoff Depth=0.30"
Flow Length=6,771' Tc=201.7 min CN=39 Runoff=9.14 cfs 6.873 af

Subcatchment 1.3bS: Access Rd to Pond 3 Runoff Area=0.695 ac 0.00% Impervious Runoff Depth=0.94"
Tc=6.0 min CN=51 Runoff=1.02 cfs 0.054 af

Subcatchment 2S: Runoff Area=11.056 ac 0.00% Impervious Runoff Depth=0.30"
Flow Length=2,342' Tc=36.0 min CN=39 Runoff=0.66 cfs 0.272 af

Subcatchment 3S: Runoff Area=15.648 ac 0.56% Impervious Runoff Depth=0.34"
Flow Length=886' Tc=12.7 min CN=40 Runoff=2.04 cfs 0.442 af

Subcatchment 4.1S: Runoff Area=11.663 ac 2.80% Impervious Runoff Depth=0.59"
Flow Length=845' Tc=15.8 min CN=45 Runoff=4.82 cfs 0.570 af

Subcatchment 4.2aS: Runoff Area=27.117 ac 0.00% Impervious Runoff Depth=0.94"
Flow Length=1,640' Tc=38.9 min CN=51 Runoff=13.31 cfs 2.121 af

Subcatchment 4.2bS: Runoff Area=0.470 ac 0.00% Impervious Runoff Depth=2.53"
Tc=6.0 min CN=72 Runoff=2.13 cfs 0.099 af

Subcatchment 4.3S: Runoff Area=25.466 ac 5.08% Impervious Runoff Depth=1.34"
Flow Length=2,280' Tc=36.5 min CN=57 Runoff=22.16 cfs 2.846 af

Subcatchment 5S: Runoff Area=4.970 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=1,180' Tc=17.5 min CN=30 Runoff=0.02 cfs 0.010 af

Subcatchment 6S: Runoff Area=24.966 ac 5.81% Impervious Runoff Depth=0.48"
Flow Length=1,961' Tc=60.1 min CN=43 Runoff=3.11 cfs 1.002 af

Reach 1.1aR1: Bypass Swale Avg. Flow Depth=0.03' Max Vel=0.41 fps Inflow=0.02 cfs 0.012 af
n=0.035 L=580.0' S=0.0108 '/' Capacity=56.37 cfs Outflow=0.02 cfs 0.012 af

Reach 1.1aR2: Bypass Swale Avg. Flow Depth=0.03' Max Vel=0.76 fps Inflow=0.05 cfs 0.029 af
n=0.035 L=557.4' S=0.0284 '/' Capacity=91.27 cfs Outflow=0.05 cfs 0.029 af

Reach 1.1aR3: Bypass Swale Avg. Flow Depth=0.04' Max Vel=0.90 fps Inflow=0.07 cfs 0.041 af
n=0.035 L=557.5' S=0.0352 '/' Capacity=101.68 cfs Outflow=0.07 cfs 0.041 af

Reach 1.1aR4: Bypass Swale Avg. Flow Depth=0.05' Max Vel=1.10 fps Inflow=0.12 cfs 0.066 af
n=0.035 L=580.5' S=0.0362 '/' Capacity=103.04 cfs Outflow=0.12 cfs 0.066 af

Reach 1.1bR1: North Road Conveyance Avg. Flow Depth=0.42' Max Vel=2.90 fps Inflow=5.85 cfs 0.272 af
n=0.035 L=1,733.0' S=0.0240 '/' Capacity=111.65 cfs Outflow=3.95 cfs 0.272 af

Reach 1.1bR2: North Road Conveyance Avg. Flow Depth=0.45' Max Vel=3.81 fps Inflow=6.08 cfs 0.391 af
n=0.035 L=593.3' S=0.0380 '/' Capacity=140.36 cfs Outflow=5.77 cfs 0.391 af

Reach 1.2aR1: Bypass Swale Avg. Flow Depth=0.03' Max Vel=0.54 fps Inflow=0.03 cfs 0.016 af
n=0.035 L=524.2' S=0.0188 '/' Capacity=74.30 cfs Outflow=0.03 cfs 0.016 af

Reach 1.2aR2: Bypass Swale Avg. Flow Depth=0.04' Max Vel=0.71 fps Inflow=0.06 cfs 0.034 af
n=0.035 L=556.0' S=0.0204 '/' Capacity=77.47 cfs Outflow=0.06 cfs 0.034 af

Reach 1.2aR3: Bypass Swale Avg. Flow Depth=0.04' Max Vel=0.63 fps Inflow=0.08 cfs 0.045 af
n=0.035 L=249.0' S=0.0153 '/' Capacity=81.84 cfs Outflow=0.08 cfs 0.045 af

Reach 1.2bR1: East Road Conveyance Avg. Flow Depth=0.27' Max Vel=3.17 fps Inflow=2.75 cfs 0.128 af
n=0.035 L=731.4' S=0.0456 '/' Capacity=79.22 cfs Outflow=2.43 cfs 0.128 af

Reach 1.2bR2: South Road Conveyance Avg. Flow Depth=0.42' Max Vel=2.49 fps Inflow=3.77 cfs 0.228 af
n=0.035 L=604.5' S=0.0177 '/' Capacity=95.76 cfs Outflow=3.39 cfs 0.228 af

Reach 1.2bR3: South Road Conveyance Avg. Flow Depth=0.52' Max Vel=2.88 fps Inflow=5.95 cfs 0.394 af
n=0.035 L=755.9' S=0.0187 '/' Capacity=98.64 cfs Outflow=5.31 cfs 0.394 af

Reach 4.1R1: Bypass Swale Avg. Flow Depth=0.79' Max Vel=3.69 fps Inflow=4.82 cfs 0.570 af
n=0.035 L=570.0' S=0.0303 '/' Capacity=54.88 cfs Outflow=4.59 cfs 0.570 af

Reach 4.1R2: Ex Stream Avg. Flow Depth=0.31' Max Vel=1.85 fps Inflow=10.59 cfs 2.700 af
n=0.035 L=740.0' S=0.0099 '/' Capacity=588.81 cfs Outflow=10.53 cfs 2.700 af

Reach 4.2bR: Conveyance Swale Avg. Flow Depth=0.25' Max Vel=2.91 fps Inflow=2.13 cfs 0.099 af
n=0.035 L=565.0' S=0.0432 '/' Capacity=77.09 cfs Outflow=1.95 cfs 0.099 af

Pond 1.1aC1: TS1 Culvert Peak Elev=1,487.60' Inflow=0.02 cfs 0.012 af
36.3" x 22.5", R=18.8"/51.0" Pipe Arch Culvert n=0.012 L=47.0' S=0.0162 '/' Outflow=0.02 cfs 0.012 af

Pond 1.1aC2: TS2 Culvert Peak Elev=1,470.83' Inflow=0.05 cfs 0.029 af
48.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0262 '/' Outflow=0.05 cfs 0.029 af

Pond 1.1aC3: TS3 Culvert Peak Elev=1,449.58' Inflow=0.07 cfs 0.041 af
60.0" x 24.0" Box Culvert n=0.012 L=47.2' S=0.0405 '/' Outflow=0.07 cfs 0.041 af

Pond 1.1aP: North Road Bypass OC Peak Elev=1,428.53' Storage=0.029 af Inflow=0.12 cfs 0.066 af
Discarded=0.01 cfs 0.028 af Primary=0.11 cfs 0.031 af Outflow=0.12 cfs 0.059 af

Pond 1.1bC1: TS4 Culvert Peak Elev=1,450.46' Inflow=3.95 cfs 0.272 af
18.0" Round Culvert n=0.012 L=45.9' S=0.0486 '/' Outflow=3.95 cfs 0.272 af

Pond 1.1bP1: Dry Swale Peak Elev=1,426.74' Storage=428 cf Inflow=5.77 cfs 0.391 af
Discarded=0.01 cfs 0.005 af Primary=5.77 cfs 0.386 af Outflow=5.77 cfs 0.391 af

Pond 1.1bP2: North Road Detention Pond Peak Elev=1,424.23' Storage=0.056 af Inflow=5.77 cfs 0.386 af
Discarded=0.02 cfs 0.053 af Primary=5.63 cfs 0.318 af Outflow=5.65 cfs 0.372 af

Pond 1.2aC1: TS 7 Culvert Peak Elev=1,444.24' Inflow=0.03 cfs 0.016 af
36.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0215 '/' Outflow=0.03 cfs 0.016 af

Pond 1.2aC2: TS8 Culvert Peak Elev=1,431.67' Inflow=0.06 cfs 0.034 af
60.0" x 24.0" Box Culvert n=0.012 L=47.5' S=0.0114 '/' Outflow=0.06 cfs 0.034 af

Pond 1.2aP: South Road Bypass OC Peak Elev=1,424.42' Storage=0.002 af Inflow=0.08 cfs 0.045 af
Discarded=0.08 cfs 0.045 af Secondary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.045 af

Pond 1.2bC1: East Road Culvert Peak Elev=1,455.17' Inflow=2.43 cfs 0.128 af
15.0" Round Culvert n=0.012 L=41.6' S=0.0173 '/' Outflow=2.43 cfs 0.128 af

Pond 1.2bC2: TS6 Culvert Peak Elev=1,444.38' Inflow=3.39 cfs 0.228 af
18.0" Round Culvert n=0.012 L=44.3' S=0.0151 '/' Outflow=3.39 cfs 0.228 af

Pond 1.2bP: South Road Treatment Pond Peak Elev=1,426.26' Storage=0.038 af Inflow=5.31 cfs 0.394 af
Discarded=0.31 cfs 0.232 af Primary=4.98 cfs 0.162 af Outflow=5.30 cfs 0.394 af

Pond 1.3P: Pond 3 - Access Rd West Peak Elev=1,456.62' Storage=566 cf Inflow=1.02 cfs 0.054 af
Discarded=0.14 cfs 0.054 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.054 af

Pond 4.2bP: Pond 4 - Access Rd East Peak Elev=1,448.33' Storage=1,559 cf Inflow=1.95 cfs 0.099 af
Discarded=0.14 cfs 0.089 af Primary=0.55 cfs 0.011 af Outflow=0.69 cfs 0.099 af

Pond 4.2C: 18" Culvert Peak Elev=1,433.72' Storage=10,213 cf Inflow=13.46 cfs 2.131 af
18.0" Round Culvert n=0.012 L=44.0' S=0.0148 '/' Outflow=9.09 cfs 2.130 af

Pond 4.3C: 24" Culvert Peak Elev=1,434.50' Inflow=22.16 cfs 2.846 af
Outflow=22.16 cfs 2.846 af

Link 1.1L:	Inflow=5.63 cfs 0.349 af Primary=5.63 cfs 0.349 af
Link 1.2L:	Inflow=4.98 cfs 0.162 af Primary=4.98 cfs 0.162 af
Link SP1: Study Point 1	Inflow=10.61 cfs 7.384 af Primary=10.61 cfs 7.384 af
Link SP2: Study Point 2	Inflow=0.66 cfs 0.272 af Primary=0.66 cfs 0.272 af
Link SP3: Study Point 3	Inflow=2.04 cfs 0.442 af Primary=2.04 cfs 0.442 af
Link SP4: Study Point 4	Inflow=31.02 cfs 5.546 af Primary=31.02 cfs 5.546 af
Link SP5: Study Point 5	Inflow=0.02 cfs 0.010 af Primary=0.02 cfs 0.010 af
Link SP6: Study Point 6	Inflow=3.11 cfs 1.002 af Primary=3.11 cfs 1.002 af

Total Runoff Area = 460.988 ac Runoff Volume = 15.185 af Average Runoff Depth = 0.40"
99.31% Pervious = 457.801 ac 0.69% Impervious = 3.187 ac

Summary for Subcatchment 1.1aS1: North Array East

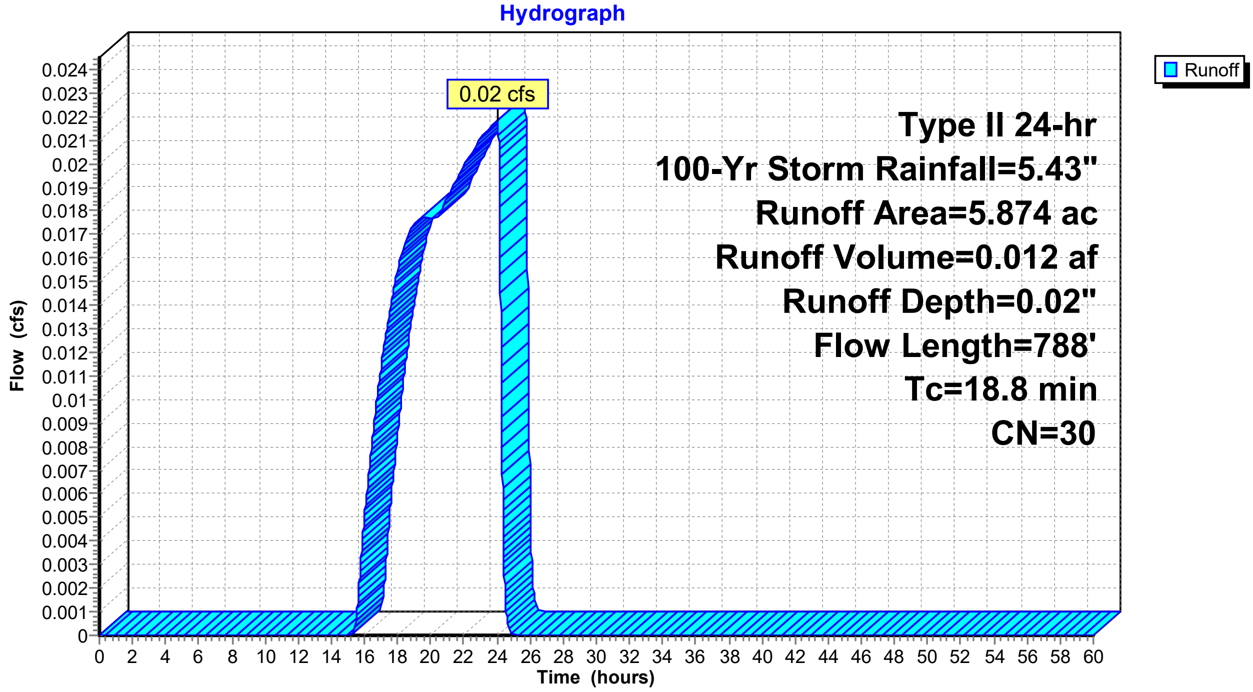
Runoff = 0.02 cfs @ 24.00 hrs, Volume= 0.012 af, Depth= 0.02"
Routed to Reach 1.1aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
5.874	30	Meadow, non-grazed, HSG A
5.874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0499	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.1	688	0.0526	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.8	788	Total			

Subcatchment 1.1aS1: North Array East



Summary for Subcatchment 1.1aS2: North Array East Center

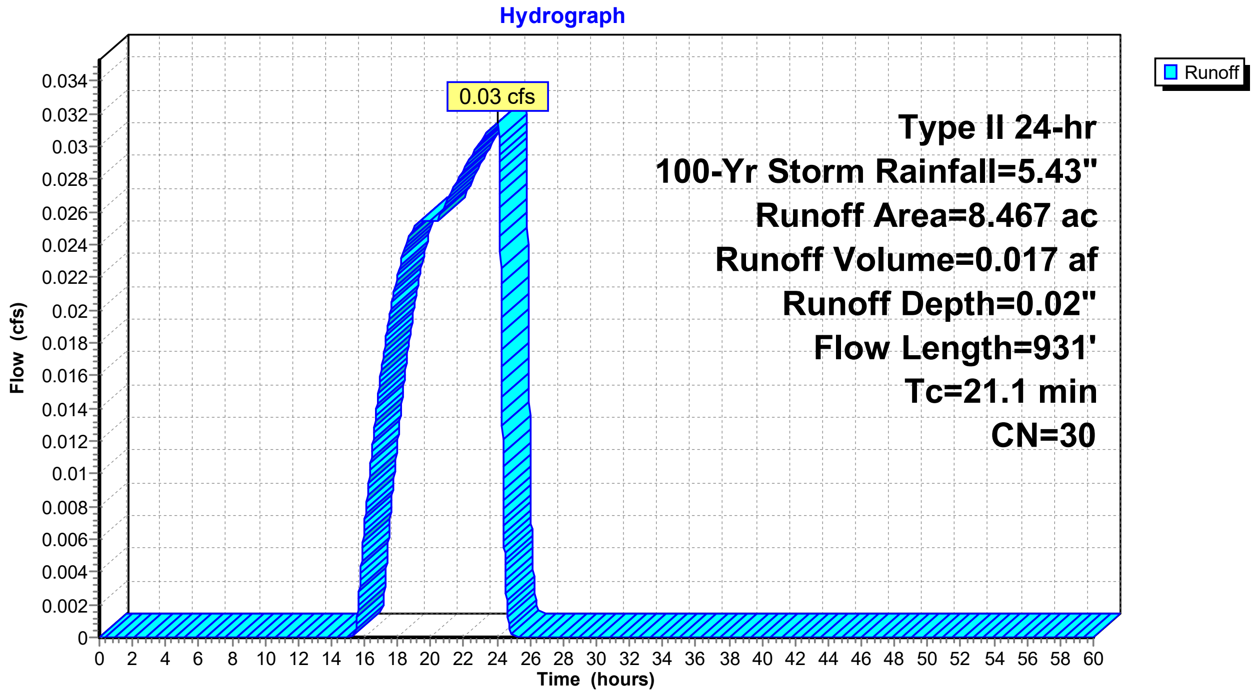
Runoff = 0.03 cfs @ 24.03 hrs, Volume= 0.017 af, Depth= 0.02"
Routed to Reach 1.1aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
8.467	30	Meadow, non-grazed, HSG A
8.467		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0476	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.2	831	0.0463	1.51		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.1	931	Total			

Subcatchment 1.1aS2: North Array East Center



Summary for Subcatchment 1.1aS3: North Array West Center

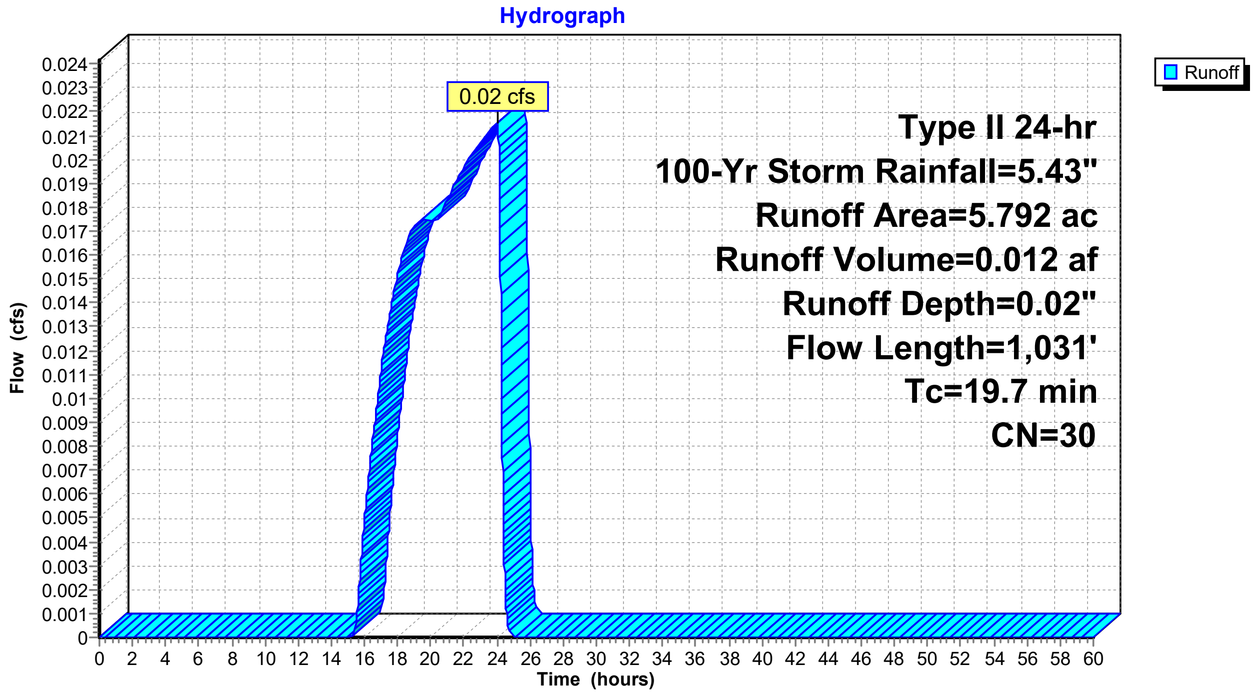
Runoff = 0.02 cfs @ 24.01 hrs, Volume= 0.012 af, Depth= 0.02"
Routed to Reach 1.1aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
5.792	30	Meadow, non-grazed, HSG A
5.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0618	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.0	931	0.0601	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	1,031	Total			

Subcatchment 1.1aS3: North Array West Center



Summary for Subcatchment 1.1aS4: North Array West

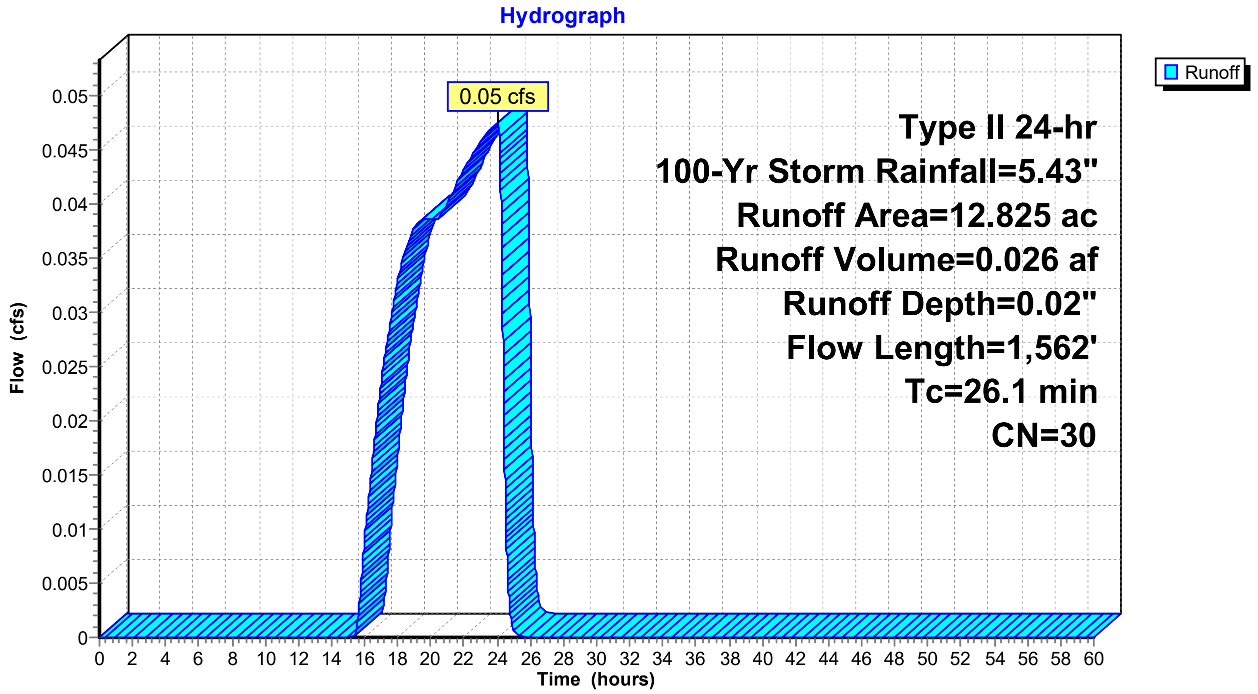
Runoff = 0.05 cfs @ 24.04 hrs, Volume= 0.026 af, Depth= 0.02"
Routed to Reach 1.1aR4 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
12.825	30	Meadow, non-grazed, HSG A
12.825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0560	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
15.0	1,462	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.1	1,562	Total			

Subcatchment 1.1aS4: North Array West



Summary for Subcatchment 1.1bS1: North Road - East

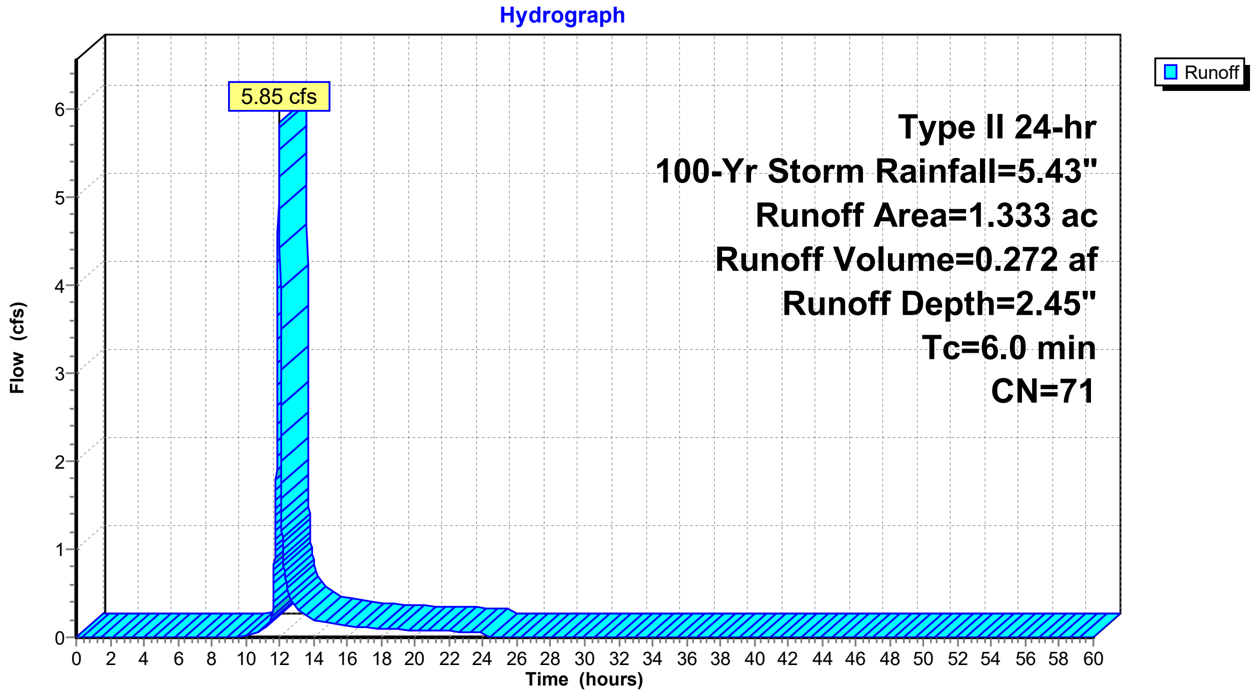
Runoff = 5.85 cfs @ 11.98 hrs, Volume= 0.272 af, Depth= 2.45"
Routed to Reach 1.1bR1 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
0.507	30	Meadow, non-grazed, HSG A
0.819	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
1.333	71	Weighted Average
1.326		99.47% Pervious Area
0.007		0.53% Impervious Area

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

Subcatchment 1.1bS1: North Road - East



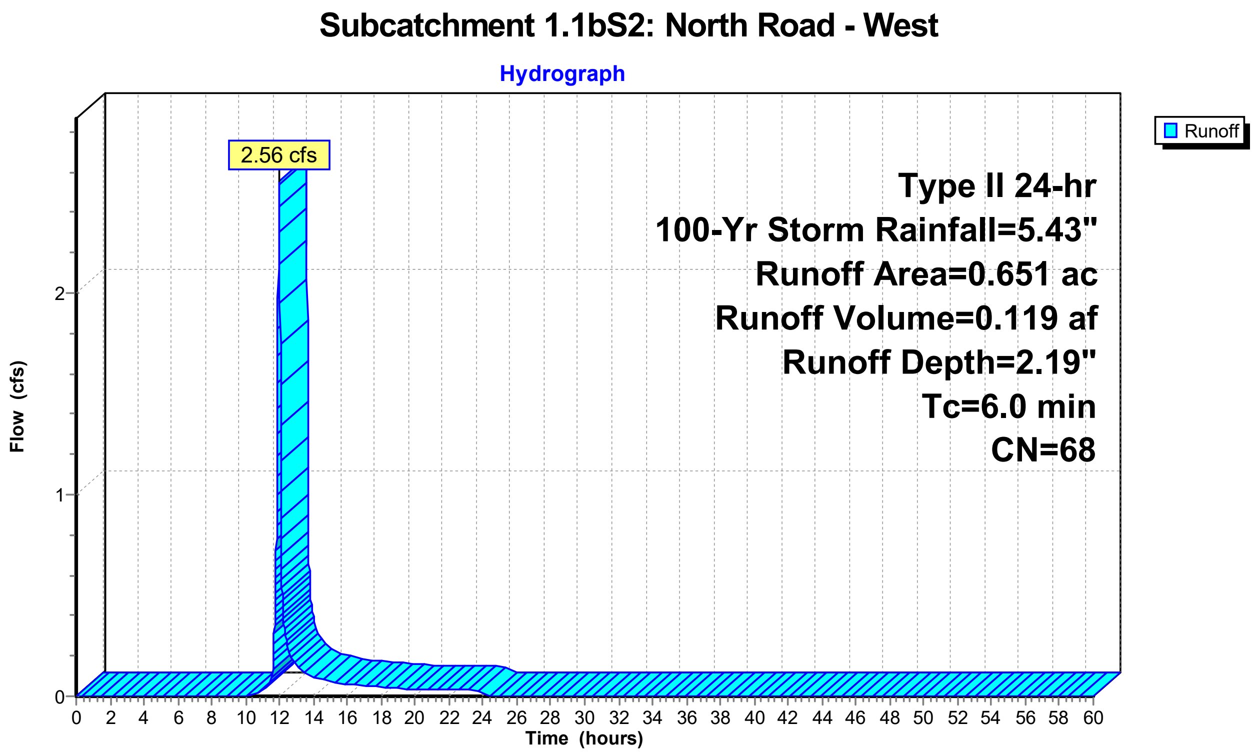
Summary for Subcatchment 1.1bS2: North Road - West

Runoff = 2.56 cfs @ 11.98 hrs, Volume= 0.119 af, Depth= 2.19"
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
0.279	30	Meadow, non-grazed, HSG A
0.365	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
0.651	68	Weighted Average
0.644		98.92% Pervious Area
0.007		1.08% Impervious Area

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



Summary for Subcatchment 1.2aS1: Middle Array East

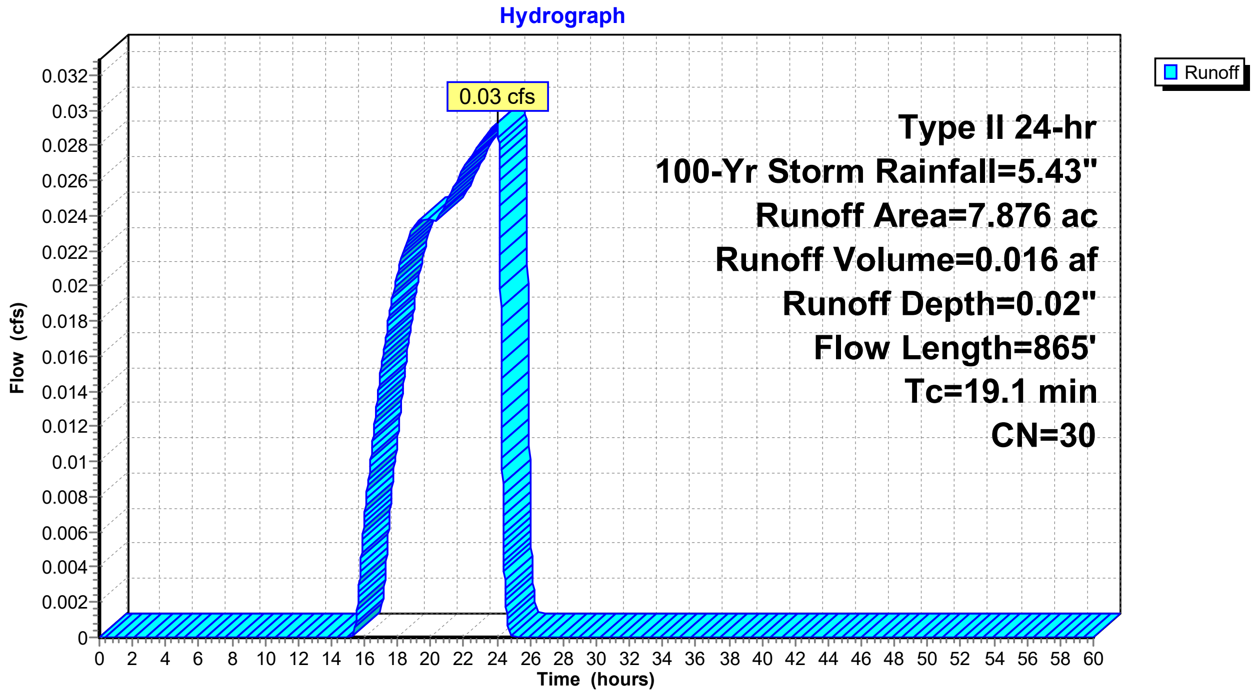
Runoff = 0.03 cfs @ 24.00 hrs, Volume= 0.016 af, Depth= 0.02"
Routed to Reach 1.2aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
7.876	30	Meadow, non-grazed, HSG A
7.876		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0628	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.5	765	0.0459	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.1	865	Total			

Subcatchment 1.2aS1: Middle Array East



Summary for Subcatchment 1.2aS2: Middle Array Center

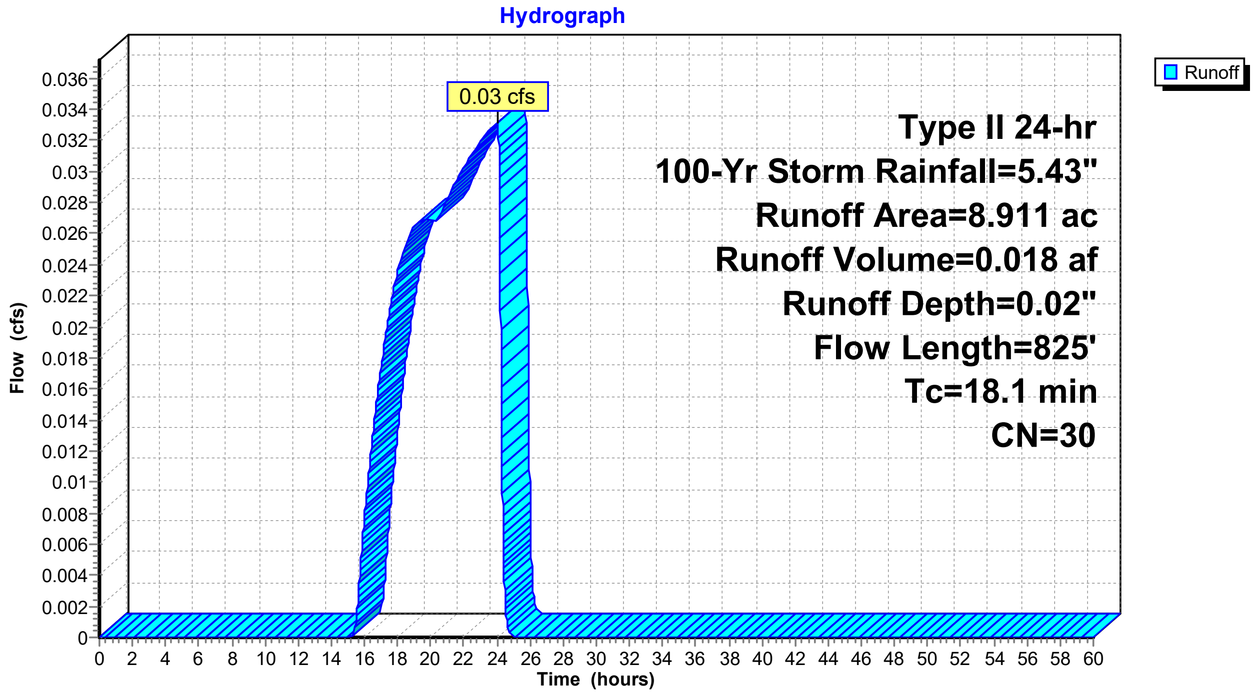
Runoff = 0.03 cfs @ 24.03 hrs, Volume= 0.018 af, Depth= 0.02"
Routed to Reach 1.2aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
8.911	30	Meadow, non-grazed, HSG A
8.911		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0607	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.3	725	0.0559	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.1	825	Total			

Subcatchment 1.2aS2: Middle Array Center



Summary for Subcatchment 1.2aS3: Middle Array West

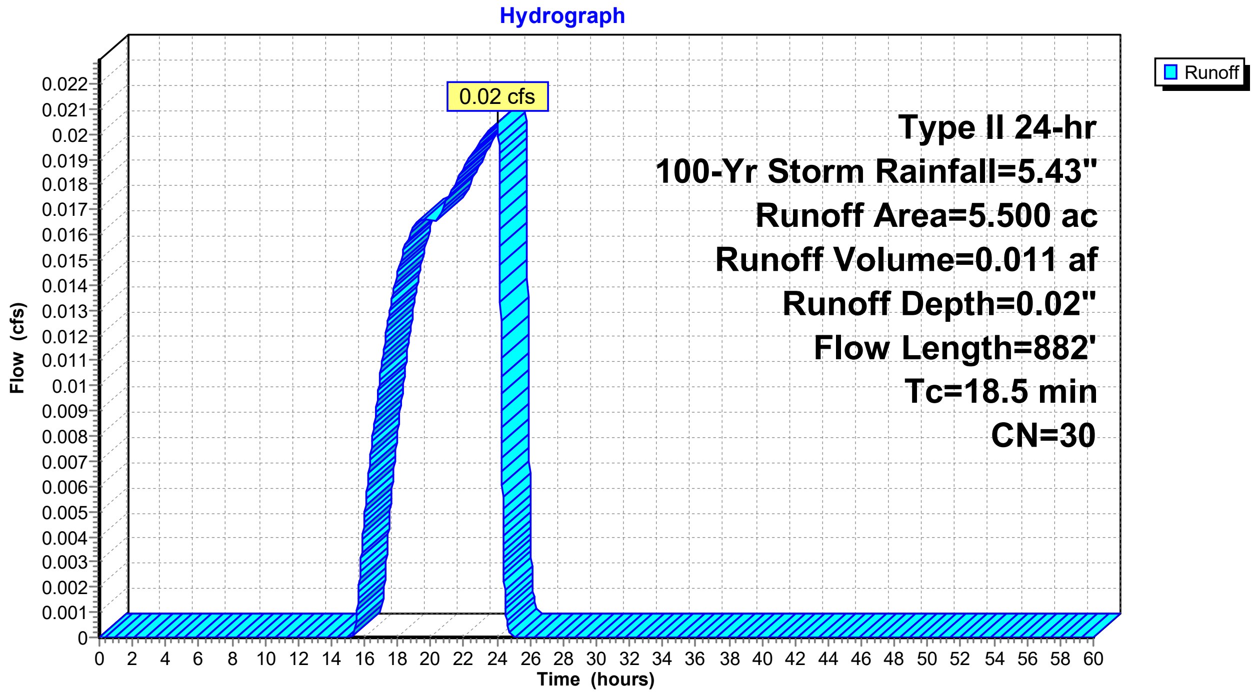
Runoff = 0.02 cfs @ 24.03 hrs, Volume= 0.011 af, Depth= 0.02"
Routed to Reach 1.2aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
5.500	30	Meadow, non-grazed, HSG A
5.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.0660	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.1	782	0.0529	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.5	882	Total			

Subcatchment 1.2aS3: Middle Array West



Summary for Subcatchment 1.2bS1: East Road - West Ditch

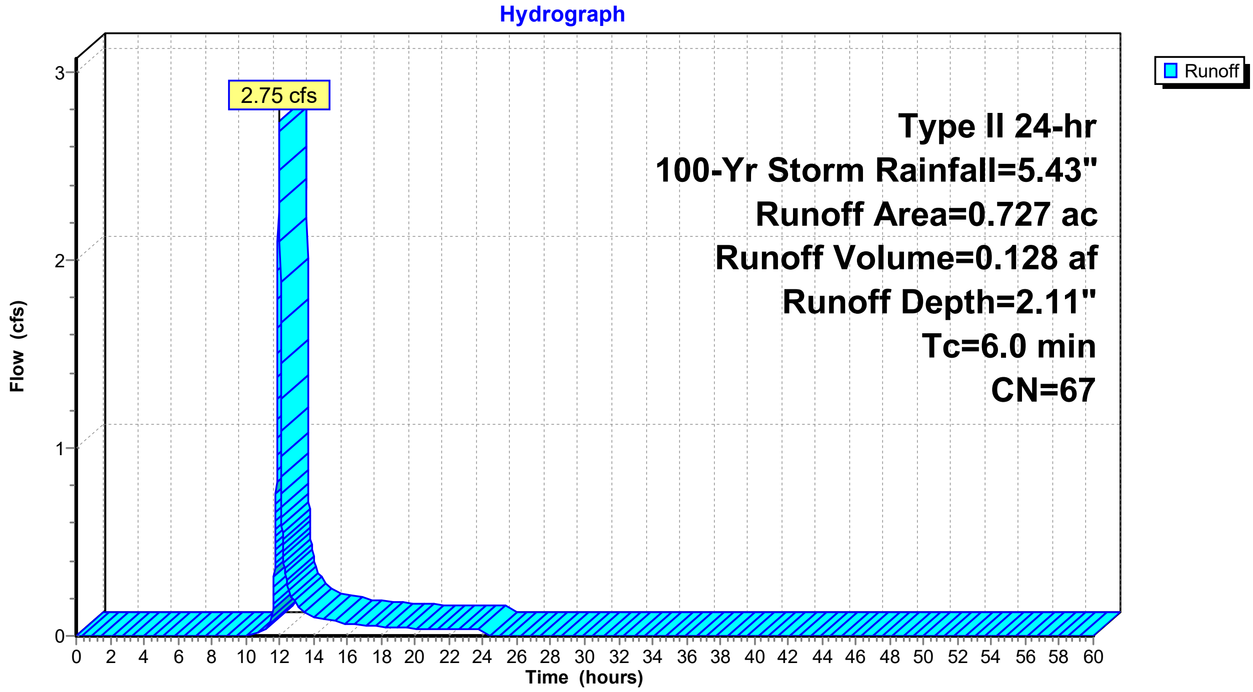
Runoff = 2.75 cfs @ 11.98 hrs, Volume= 0.128 af, Depth= 2.11"
Routed to Reach 1.2bR1 : East Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
0.410	96	Gravel surface, HSG A
0.317	30	Meadow, non-grazed, HSG A
0.727	67	Weighted Average
0.727		100.00% Pervious Area

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

Subcatchment 1.2bS1: East Road - West Ditch



Summary for Subcatchment 1.2bS2: South Road

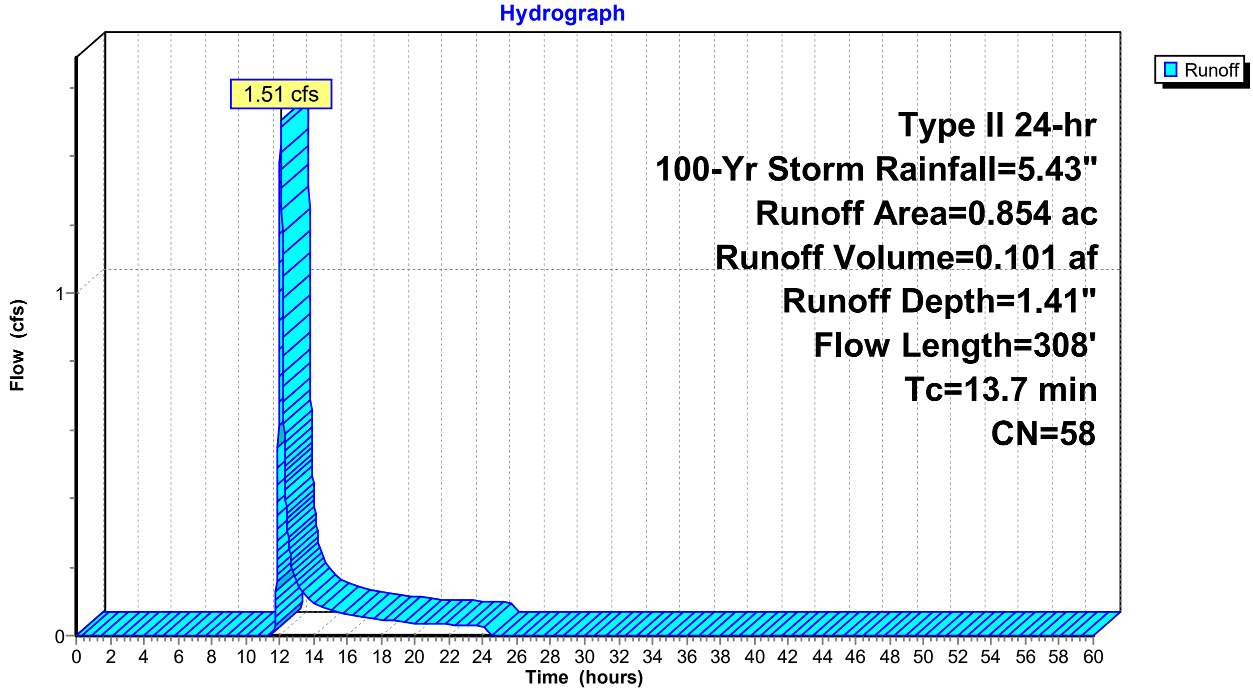
Runoff = 1.51 cfs @ 12.07 hrs, Volume= 0.101 af, Depth= 1.41"
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
	0.498	30	Meadow, non-grazed, HSG A
*	0.352	96	Gravel surface
*	0.004	98	Roofs
	0.854	58	Weighted Average
	0.850		99.53% Pervious Area
	0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0516	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
0.4	25	0.0310	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
5.9	40	0.0429	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.4	208	0.0442	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	308	Total			

Subcatchment 1.2bS2: South Road



Summary for Subcatchment 1.2bS3: South Road

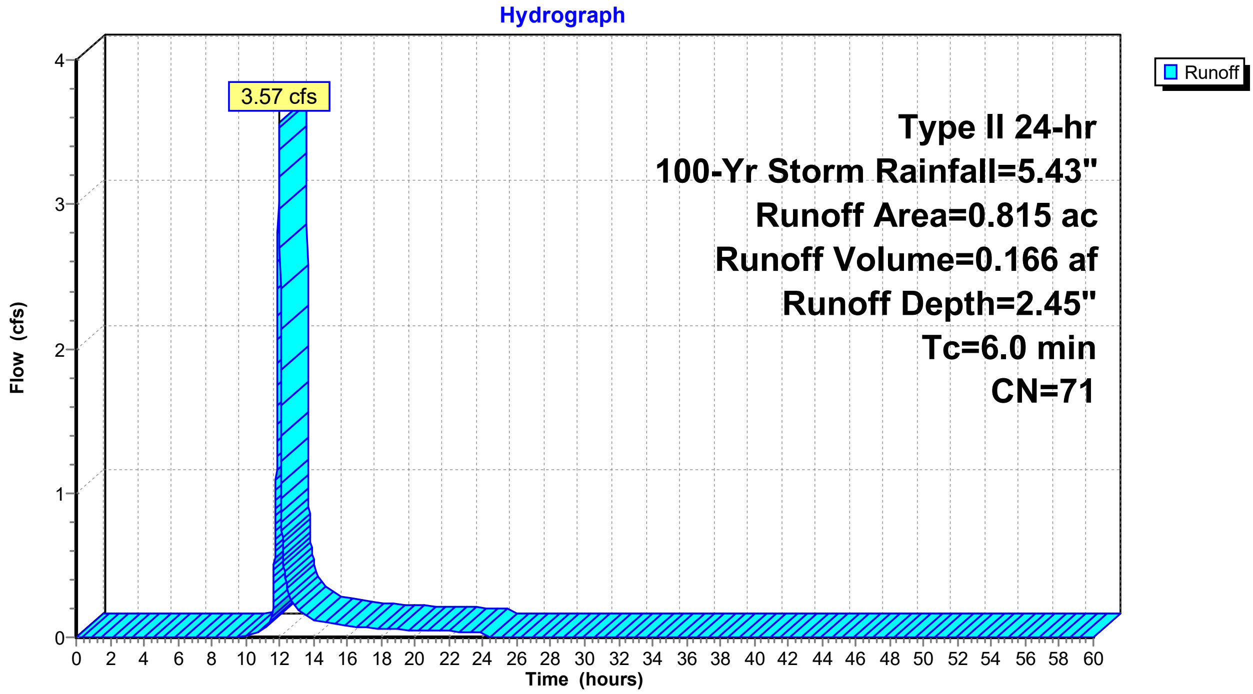
Runoff = 3.57 cfs @ 11.98 hrs, Volume= 0.166 af, Depth= 2.45"
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
	0.313	30	Meadow, non-grazed, HSG A
	0.491	96	Gravel surface, HSG A
*	0.011	98	Roofs
	0.815	71	Weighted Average
	0.804		98.65% Pervious Area
	0.011		1.35% Impervious Area

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

Subcatchment 1.2bS3: South Road



Summary for Subcatchment 1.3aS1: Surface Discharge

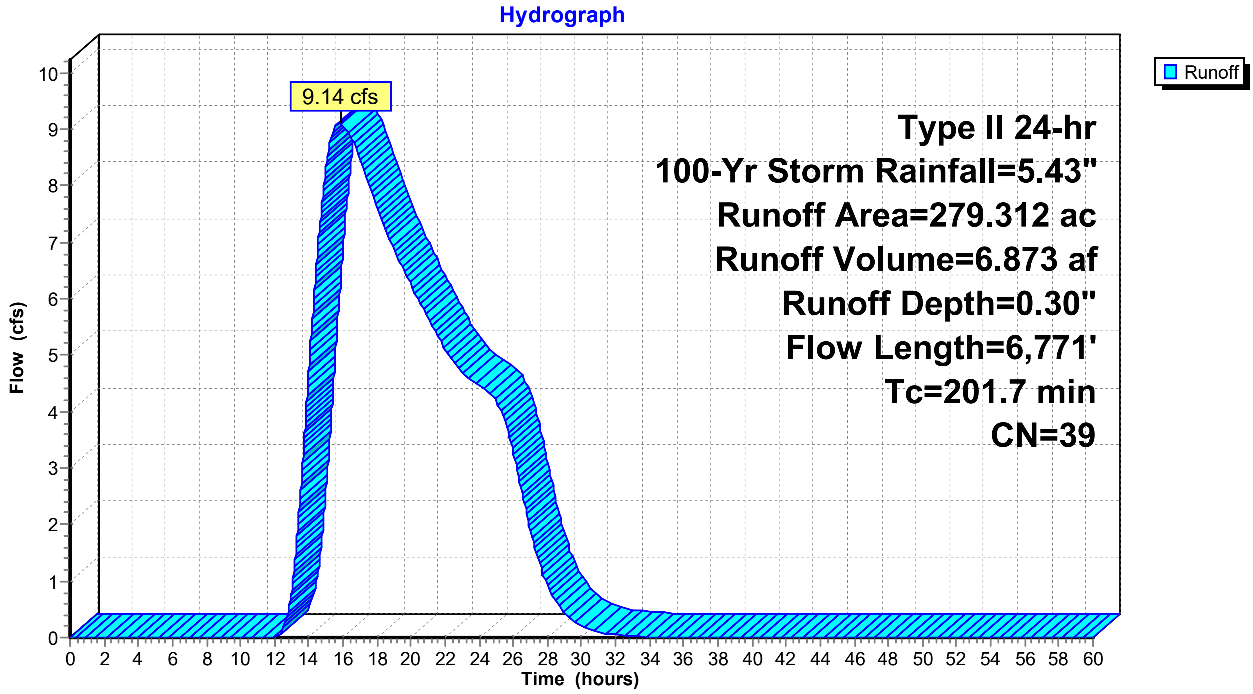
Runoff = 9.14 cfs @ 15.91 hrs, Volume= 6.873 af, Depth= 0.30"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.754	96	Gravel surface
	144.649	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	25.274	71	Meadow, non-grazed, HSG C
	61.692	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	13.623	70	Woods, Good, HSG C
	279.312	39	Weighted Average
	279.312		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	189	0.0157	3.84	76.82	**Channel Flow, Rerouted Stream** Area= 20.0 sf Perim= 32.6' r= 0.61' n= 0.035 Earth, dense weeds
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
201.7	6,771	Total			

Subcatchment 1.3aS1: Surface Discharge



Summary for Subcatchment 1.3bS: Access Rd to Pond 3

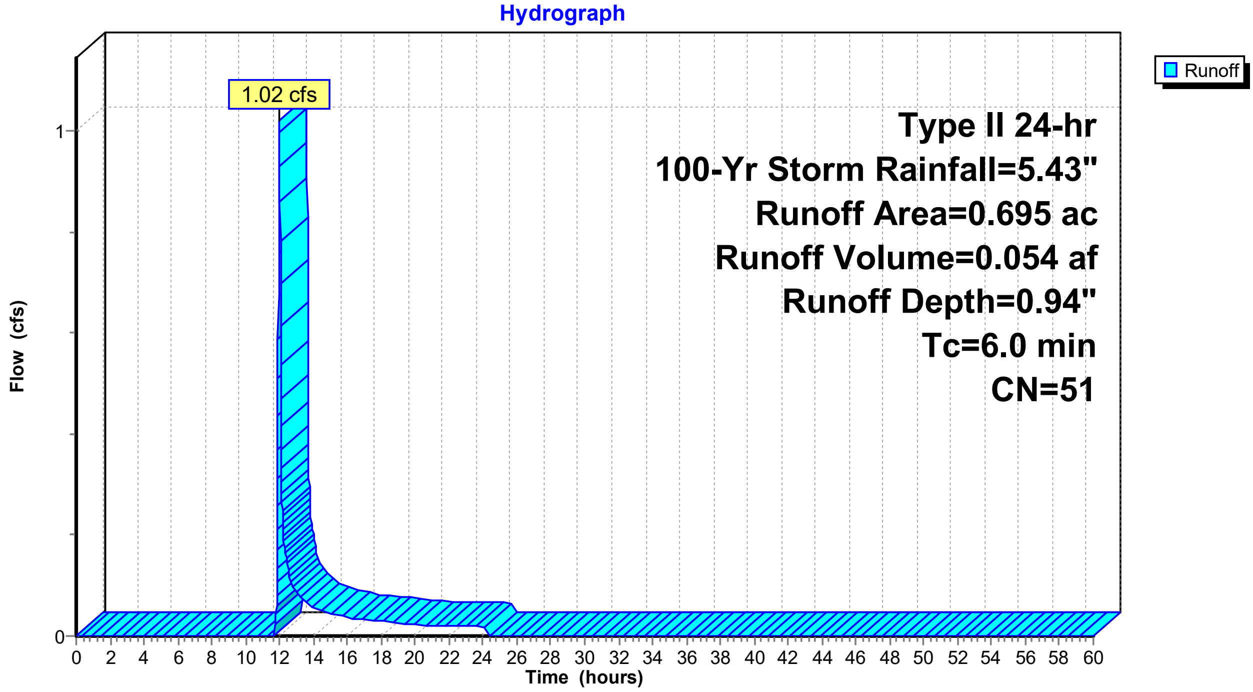
Runoff = 1.02 cfs @ 11.99 hrs, Volume= 0.054 af, Depth= 0.94"
Routed to Pond 1.3P : Pond 3 - Access Rd West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
	0.473	30	Meadow, non-grazed, HSG A
*	0.063	96	Gravel surface, HSG A, Redev
*	0.159	96	Gravel surface, HSG A
	0.695	51	Weighted Average
	0.695		100.00% Pervious Area

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

Subcatchment 1.3bS: Access Rd to Pond 3



Summary for Subcatchment 2S:

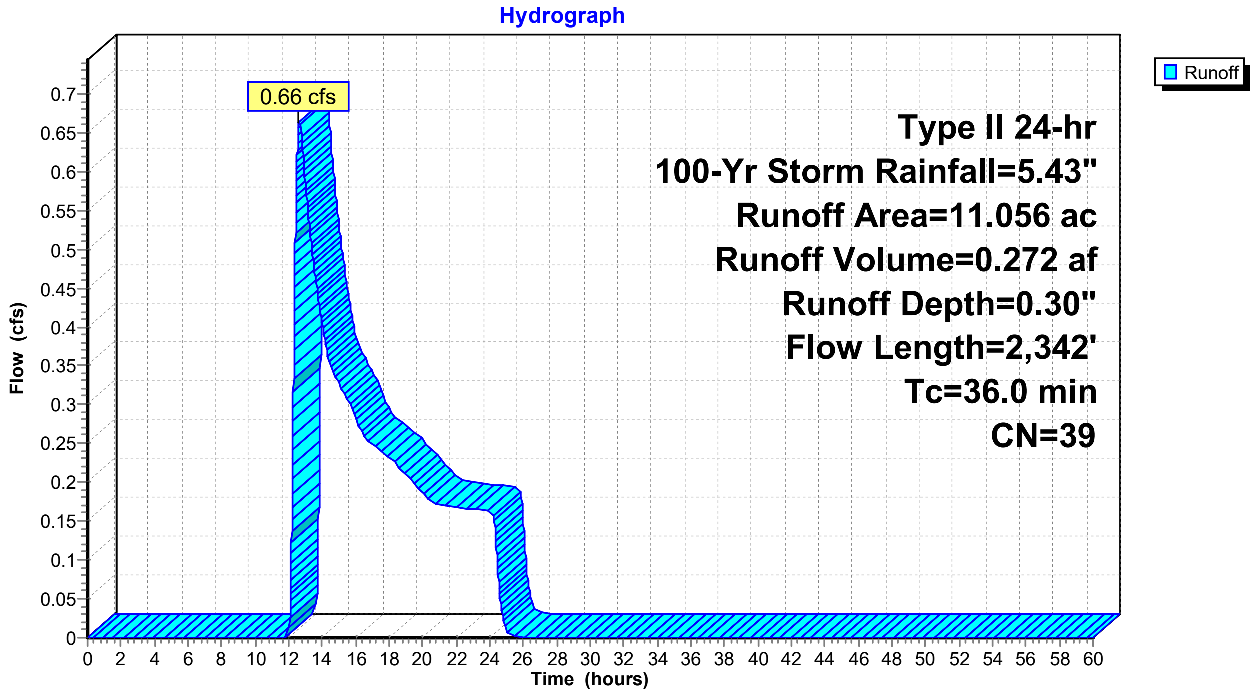
Runoff = 0.66 cfs @ 12.61 hrs, Volume= 0.272 af, Depth= 0.30"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
1.417	96	Gravel surface, HSG A
0.573	39	>75% Grass cover, Good, HSG A
6.530	30	Meadow, non-grazed, HSG A
2.536	30	Woods, Good, HSG A
11.056	39	Weighted Average
11.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0624	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.7	614	0.0535	3.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	1,184	0.0543	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	115	0.0407	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	68	0.1443	1.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	261	0.0118	0.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.0	2,342	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

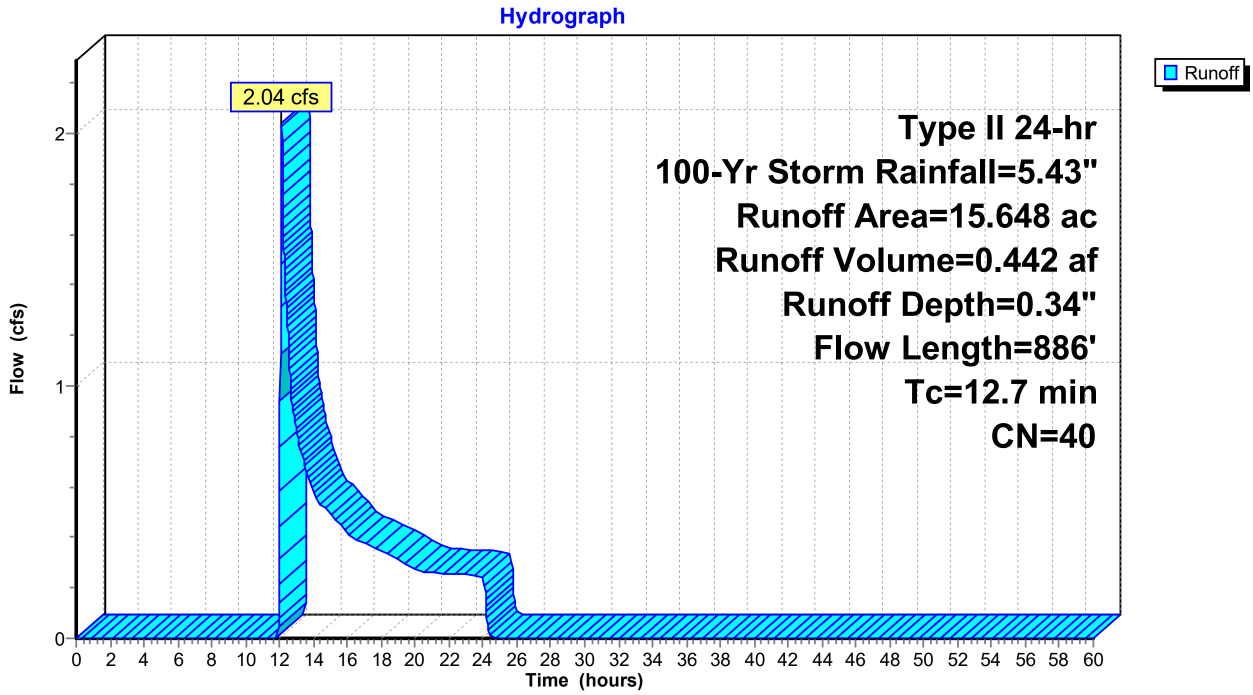
Runoff = 2.04 cfs @ 12.13 hrs, Volume= 0.442 af, Depth= 0.34"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.088	98	Paved Roads & Rooftops
	0.406	39	>75% Grass cover, Good, HSG A
	2.011	61	>75% Grass cover, Good, HSG B
	5.525	30	Meadow, non-grazed, HSG A
	4.276	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	15.648	40	Weighted Average
	15.560		99.44% Pervious Area
	0.088		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	52	0.0937	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.7	886	Total			

Subcatchment 3S:



Summary for Subcatchment 4.1S:

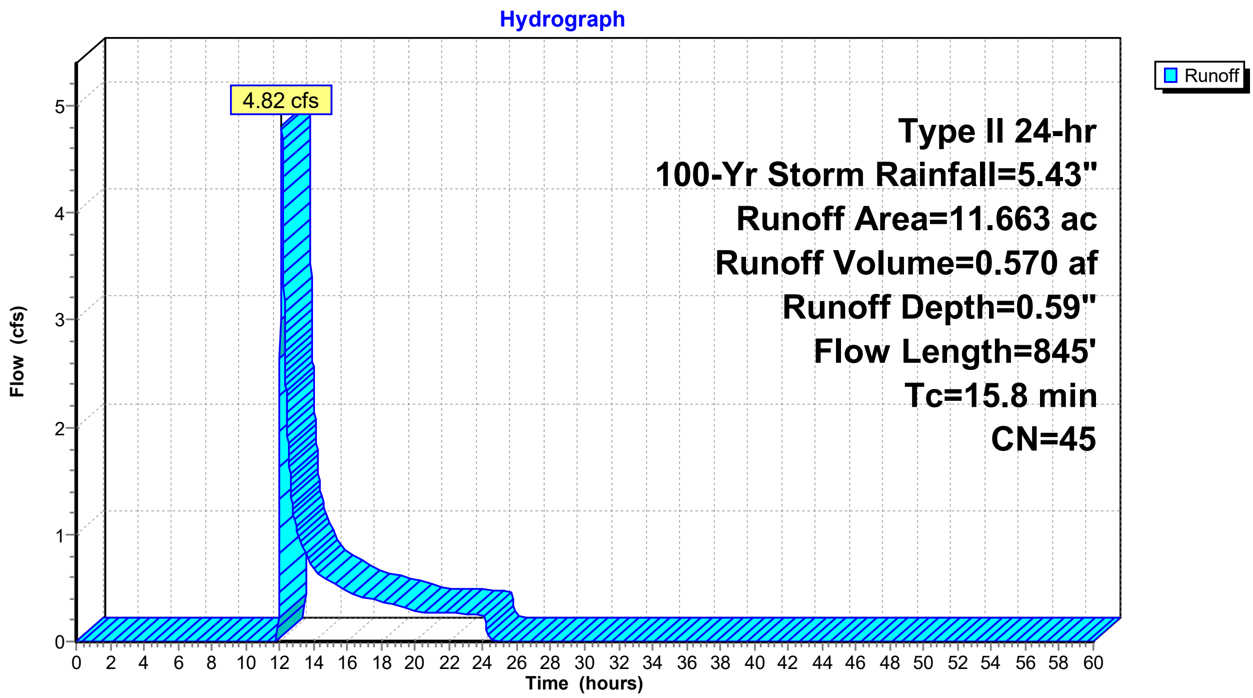
Runoff = 4.82 cfs @ 12.13 hrs, Volume= 0.570 af, Depth= 0.59"
Routed to Reach 4.1R1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.327	98	Paved Roads & Rooftops
*	0.375	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	2.544	30	Meadow, non-grazed, HSG A
	0.560	58	Meadow, non-grazed, HSG B
	3.605	30	Woods, Good, HSG A
*	4.087	55	Woods, Good, HSG B
	11.663	45	Weighted Average
	11.336		97.20% Pervious Area
	0.327		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0430	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
2.6	360	0.1077	2.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	385	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.8	845	Total			

Subcatchment 4.1S:



Summary for Subcatchment 4.2aS:

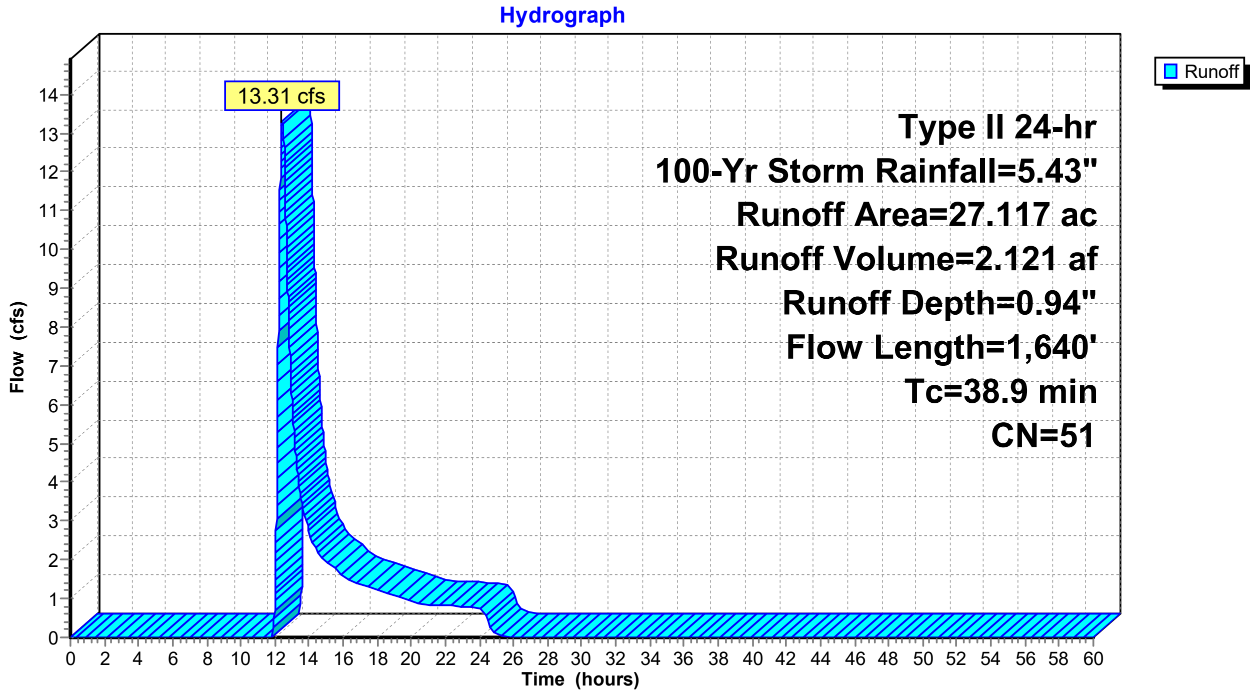
Runoff = 13.31 cfs @ 12.41 hrs, Volume= 2.121 af, Depth= 0.94"
Routed to Pond 4.2C : 18" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.238	96	Gravel surface
	4.086	30	Meadow, non-grazed, HSG A
	0.384	58	Meadow, non-grazed, HSG B
	0.977	30	Woods, Good, HSG A
	21.432	55	Woods, Good, HSG B
	27.117	51	Weighted Average
	27.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	662	0.0144	0.84		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	1,640	Total			

Subcatchment 4.2aS:



Summary for Subcatchment 4.2bS:

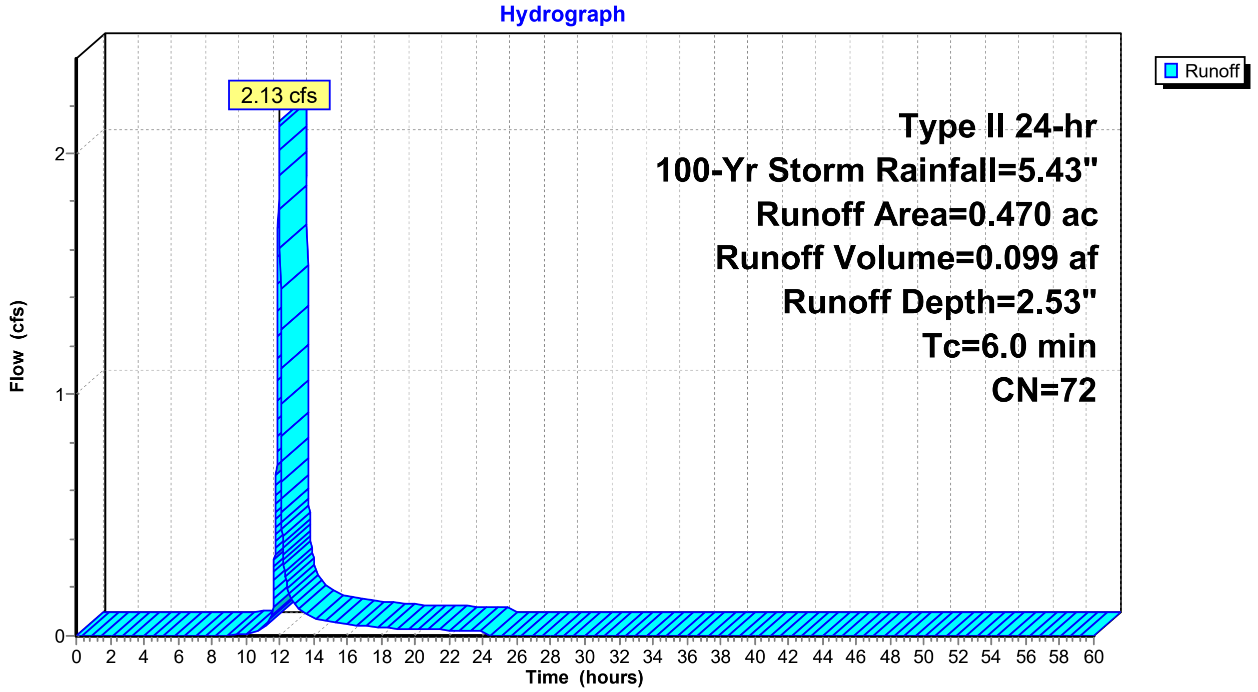
Runoff = 2.13 cfs @ 11.98 hrs, Volume= 0.099 af, Depth= 2.53"
Routed to Reach 4.2bR : Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
0.296	96	Gravel surface, HSG A
0.174	30	Meadow, non-grazed, HSG A
0.470	72	Weighted Average
0.470		100.00% Pervious Area

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

Subcatchment 4.2bS:



Summary for Subcatchment 4.3S:

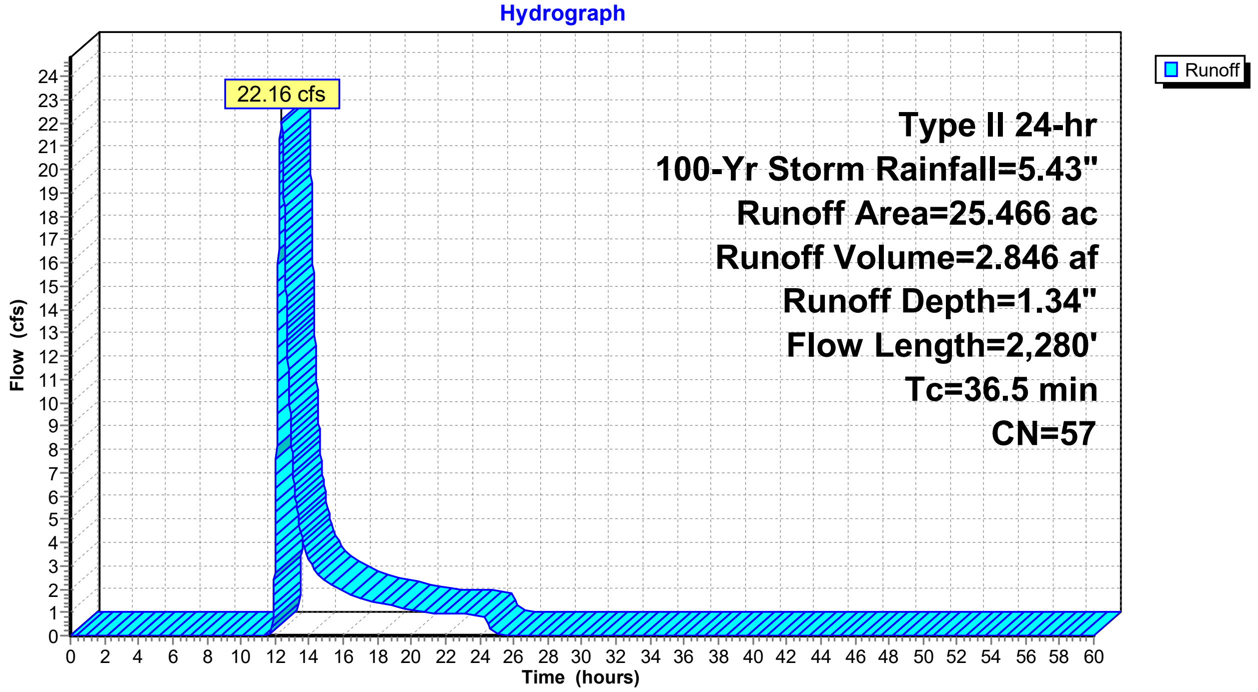
Runoff = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af, Depth= 1.34"
Routed to Pond 4.3C : 24" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	1.293	98	Paved Roads & Rooftops
	1.783	58	Meadow, non-grazed, HSG B
	22.390	55	Woods, Good, HSG B
	25.466	57	Weighted Average
	24.173		94.92% Pervious Area
	1.293		5.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0634	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
17.8	1,368	0.0656	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	38	0.3960	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	774	0.0281	4.70	109.09	**Channel Flow,** Area= 23.2 sf Perim= 43.2' r= 0.54' n= 0.035
36.5	2,280	Total			

Subcatchment 4.3S:



Summary for Subcatchment 5S:

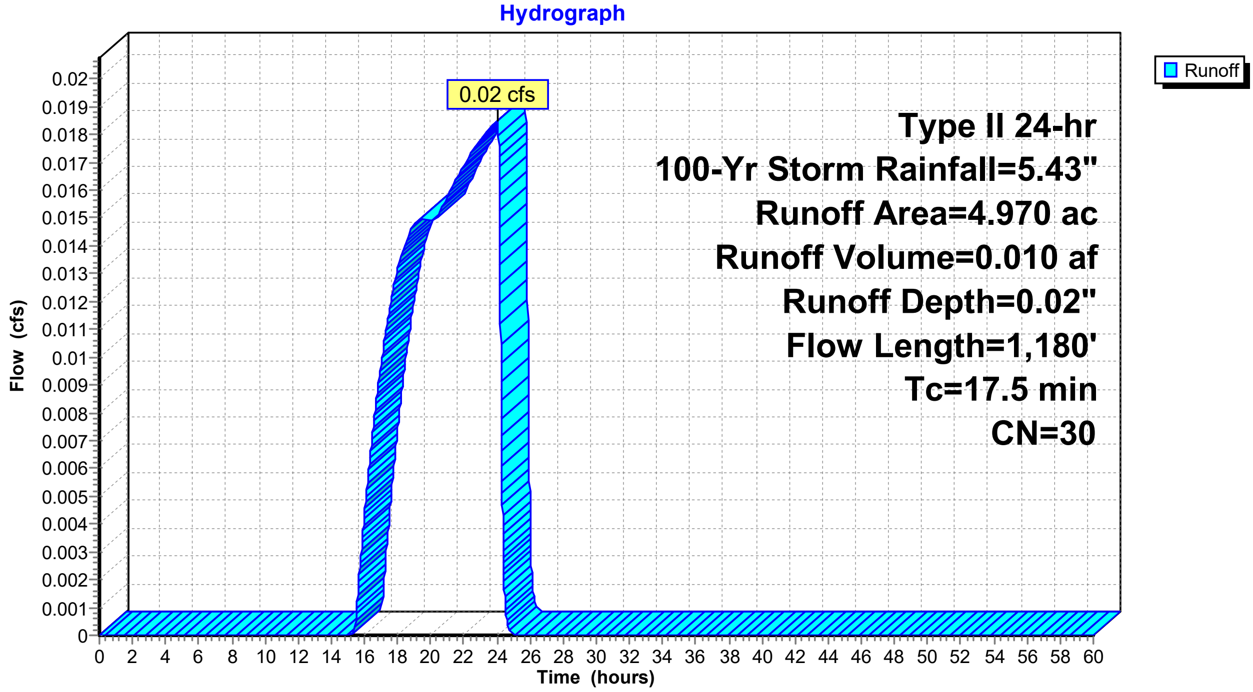
Runoff = 0.02 cfs @ 24.02 hrs, Volume= 0.010 af, Depth= 0.02"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
4.139	30	Meadow, non-grazed, HSG A
0.831	30	Woods, Good, HSG A
4.970	30	Weighted Average
4.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0675	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
8.5	801	0.0508	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	217	0.1515	2.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	62	0.0697	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,180	Total			

Subcatchment 5S:



Summary for Subcatchment 6S:

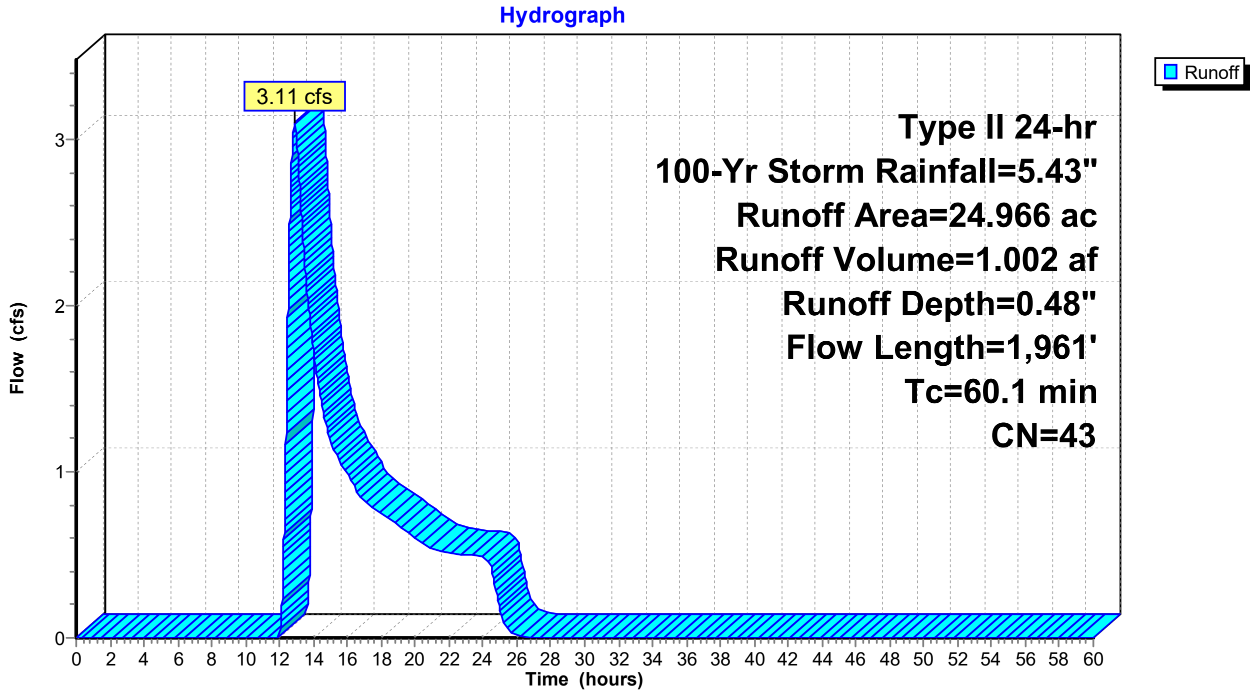
Runoff = 3.11 cfs @ 12.89 hrs, Volume= 1.002 af, Depth= 0.48"
Routed to Link SP6 : Study Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
	0.466	96	Gravel surface, HSG A
	2.545	61	>75% Grass cover, Good, HSG B
	7.511	30	Meadow, non-grazed, HSG A
	0.788	58	Meadow, non-grazed, HSG B
	7.940	30	Woods, Good, HSG A
	4.266	55	Woods, Good, HSG B
	24.966	43	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Subcatchment 6S:



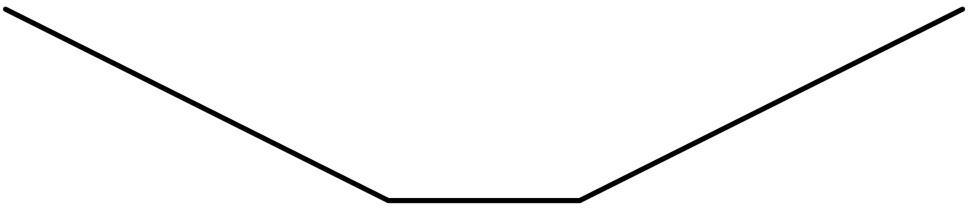
Summary for Reach 1.1aR1: Bypass Swale

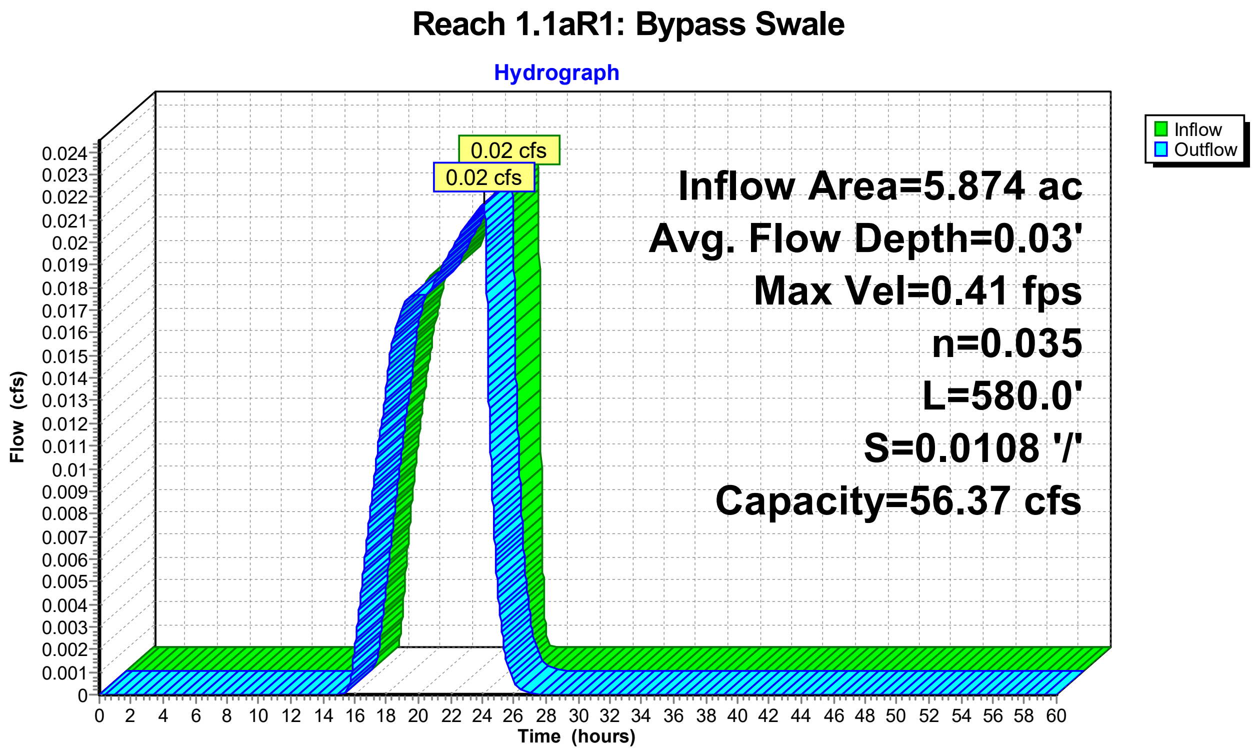
Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.02 cfs @ 24.00 hrs, Volume= 0.012 af
Outflow = 0.02 cfs @ 24.06 hrs, Volume= 0.012 af, Atten= 1%, Lag= 3.5 min
Routed to Pond 1.1aC1 : TS1 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.41 fps, Min. Travel Time= 23.9 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 27.5 min

Peak Storage= 31 cf @ 24.06 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 2.10'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.37 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.0' Slope= 0.0108 '/'
Inlet Invert= 1,493.84', Outlet Invert= 1,487.56'





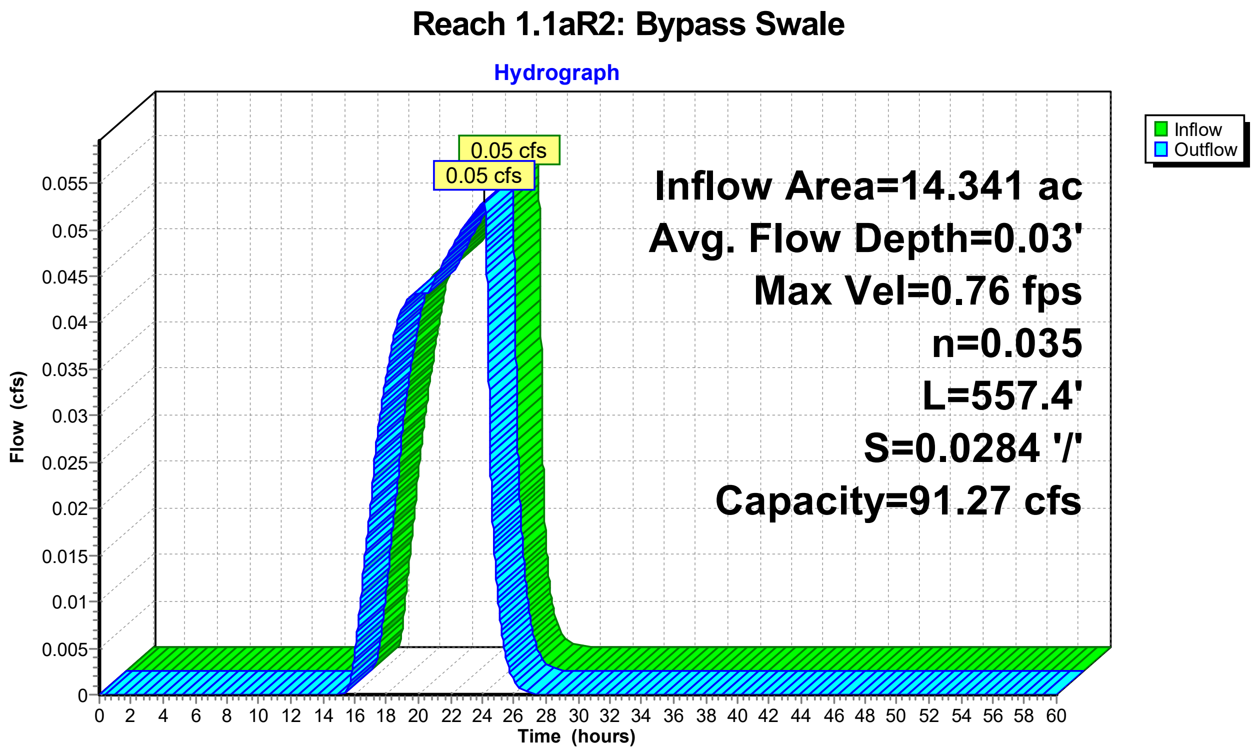
Summary for Reach 1.1aR2: Bypass Swale

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.05 cfs @ 24.03 hrs, Volume= 0.029 af
Outflow = 0.05 cfs @ 24.08 hrs, Volume= 0.029 af, Atten= 0%, Lag= 2.7 min
Routed to Pond 1.1aC2 : TS2 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.76 fps, Min. Travel Time= 12.3 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 14.7 min

Peak Storage= 39 cf @ 24.08 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 2.13'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 91.27 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.4' Slope= 0.0284 '/'
Inlet Invert= 1,486.80', Outlet Invert= 1,470.98'



Summary for Reach 1.1aR3: Bypass Swale

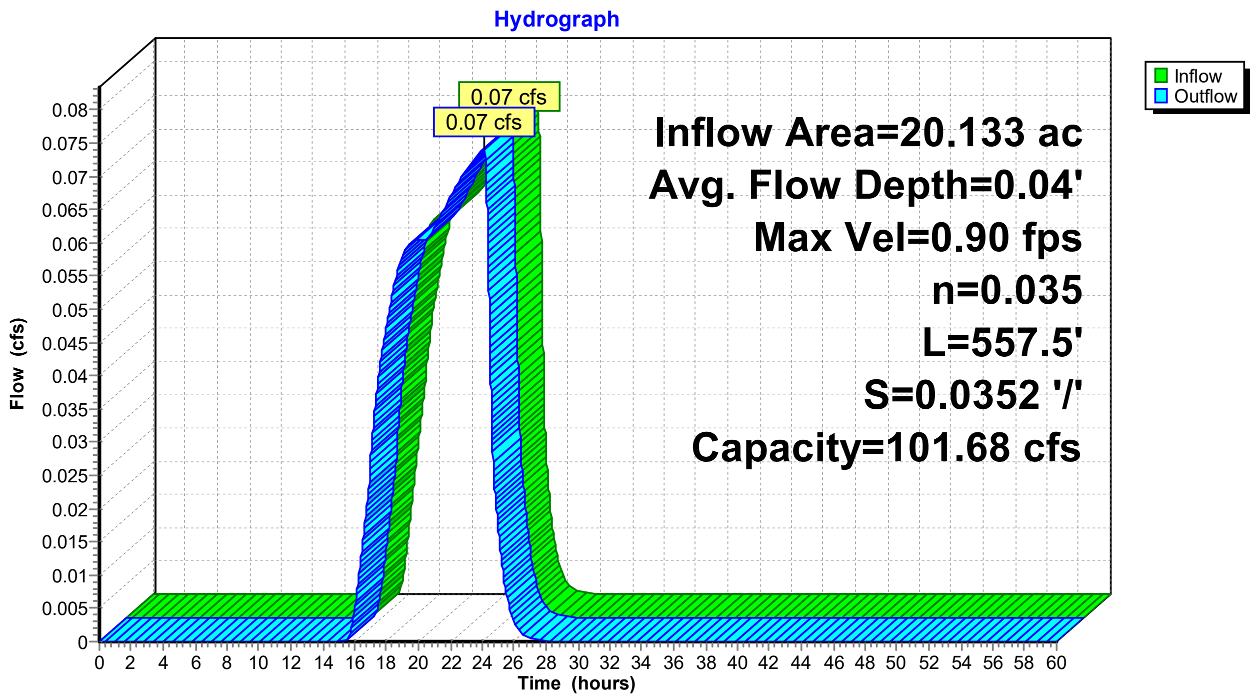
Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.07 cfs @ 24.05 hrs, Volume= 0.041 af
Outflow = 0.07 cfs @ 24.08 hrs, Volume= 0.041 af, Atten= 0%, Lag= 2.2 min
Routed to Pond 1.1aC3 : TS3 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 10.3 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 12.6 min

Peak Storage= 46 cf @ 24.08 hrs
Average Depth at Peak Storage= 0.04' , Surface Width= 2.16'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.68 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.5' Slope= 0.0352 '/'
Inlet Invert= 1,469.57', Outlet Invert= 1,449.93'

Reach 1.1aR3: Bypass Swale



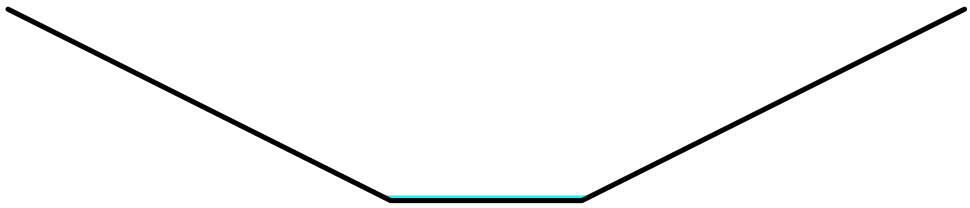
Summary for Reach 1.1aR4: Bypass Swale

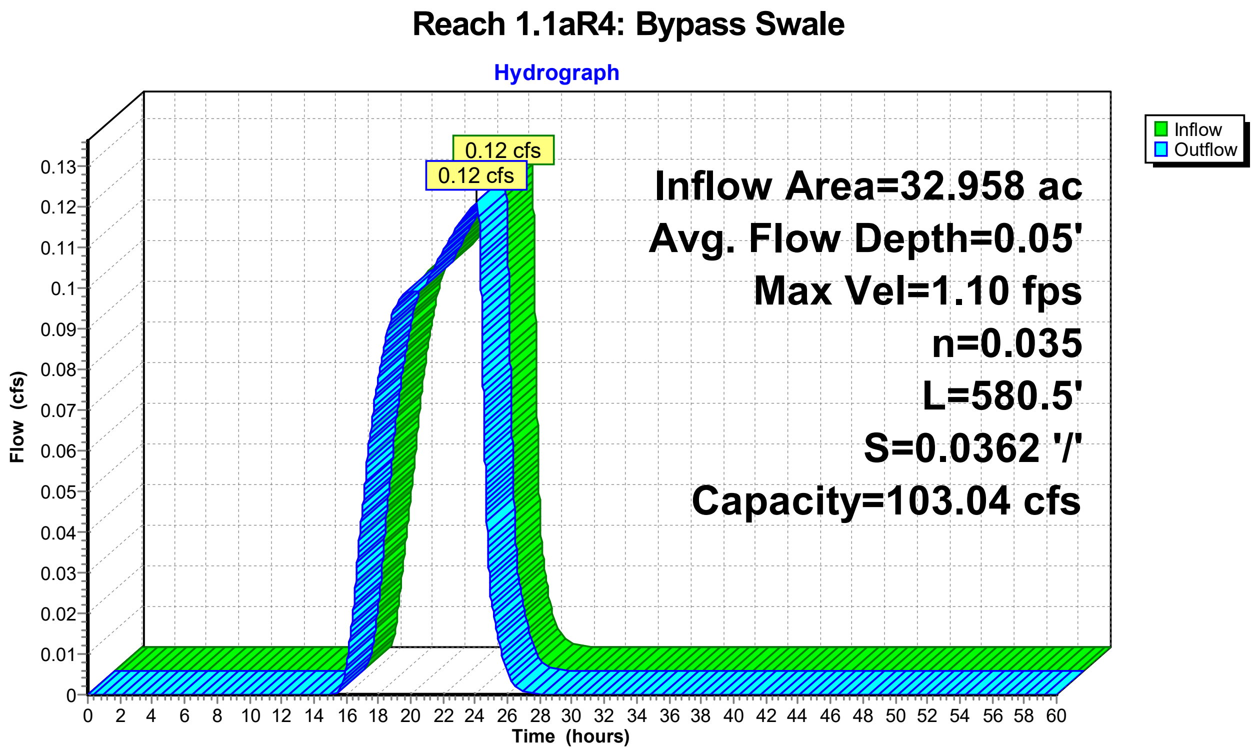
Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.12 cfs @ 24.04 hrs, Volume= 0.066 af
Outflow = 0.12 cfs @ 24.09 hrs, Volume= 0.066 af, Atten= 0%, Lag= 3.1 min
Routed to Pond 1.1aP : North Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.10 fps, Min. Travel Time= 8.8 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 11.4 min

Peak Storage= 64 cf @ 24.09 hrs
Average Depth at Peak Storage= 0.05' , Surface Width= 2.21'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 103.04 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.5' Slope= 0.0362 '/'
Inlet Invert= 1,447.64', Outlet Invert= 1,426.64'





Summary for Reach 1.1bR1: North Road Conveyance Swale

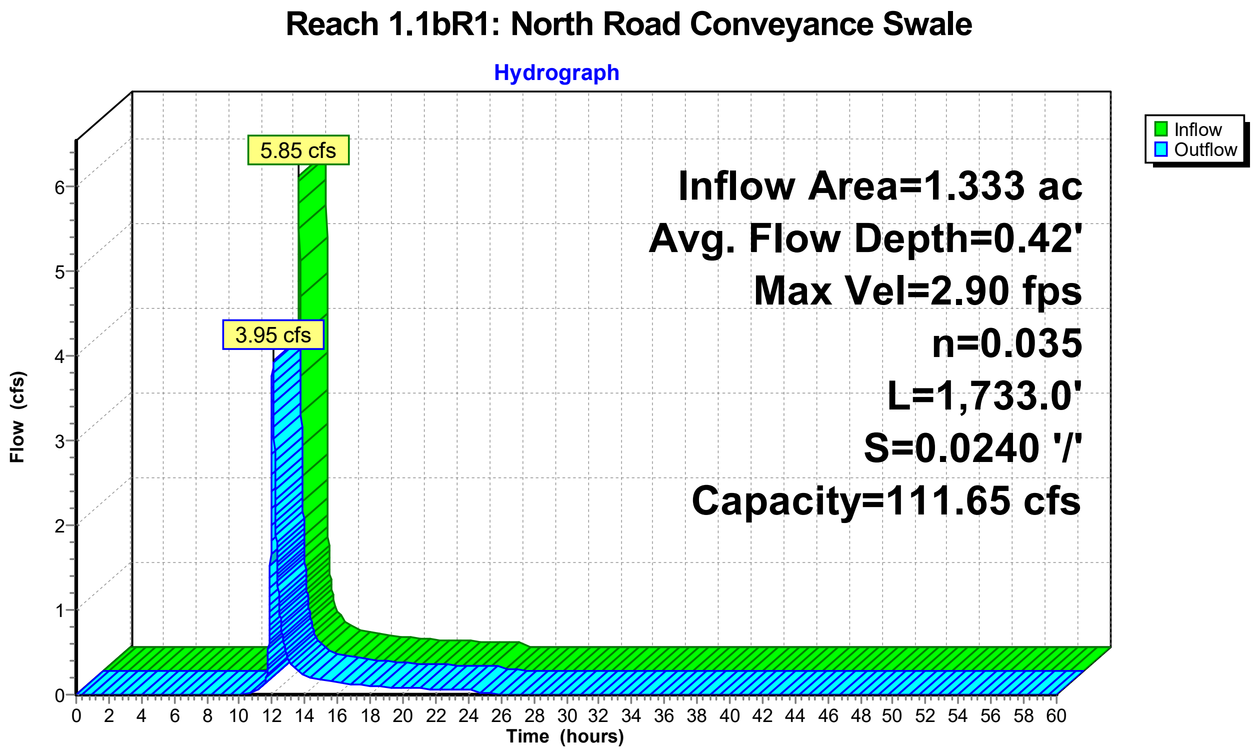
Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 5.85 cfs @ 11.98 hrs, Volume= 0.272 af
Outflow = 3.95 cfs @ 12.04 hrs, Volume= 0.272 af, Atten= 32%, Lag= 3.9 min
Routed to Pond 1.1bC1 : TS4 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.90 fps, Min. Travel Time= 9.9 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 35.4 min

Peak Storage= 2,359 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.42' , Surface Width= 4.51'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 111.65 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,733.0' Slope= 0.0240 '/'
Inlet Invert= 1,491.12', Outlet Invert= 1,449.50'

‡



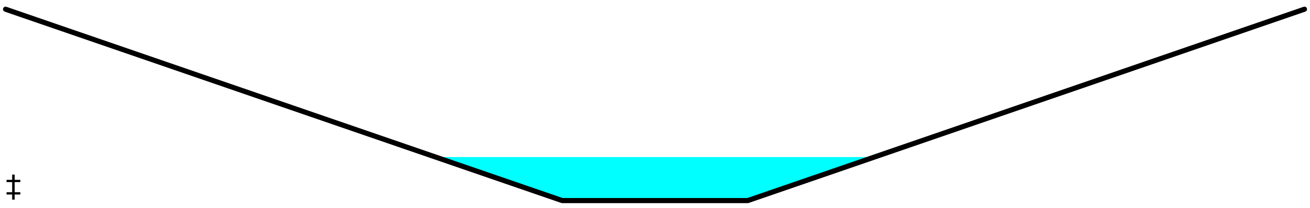
Summary for Reach 1.1bR2: North Road Conveyance Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 2.36" for 100-Yr Storm event
Inflow = 6.08 cfs @ 12.01 hrs, Volume= 0.391 af
Outflow = 5.77 cfs @ 12.04 hrs, Volume= 0.391 af, Atten= 5%, Lag= 1.8 min
Routed to Pond 1.1bP1 : Dry Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.81 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 9.3 min

Peak Storage= 900 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.45' , Surface Width= 4.71'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 140.36 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 593.3' Slope= 0.0380 '/'
Inlet Invert= 1,447.27', Outlet Invert= 1,424.75'



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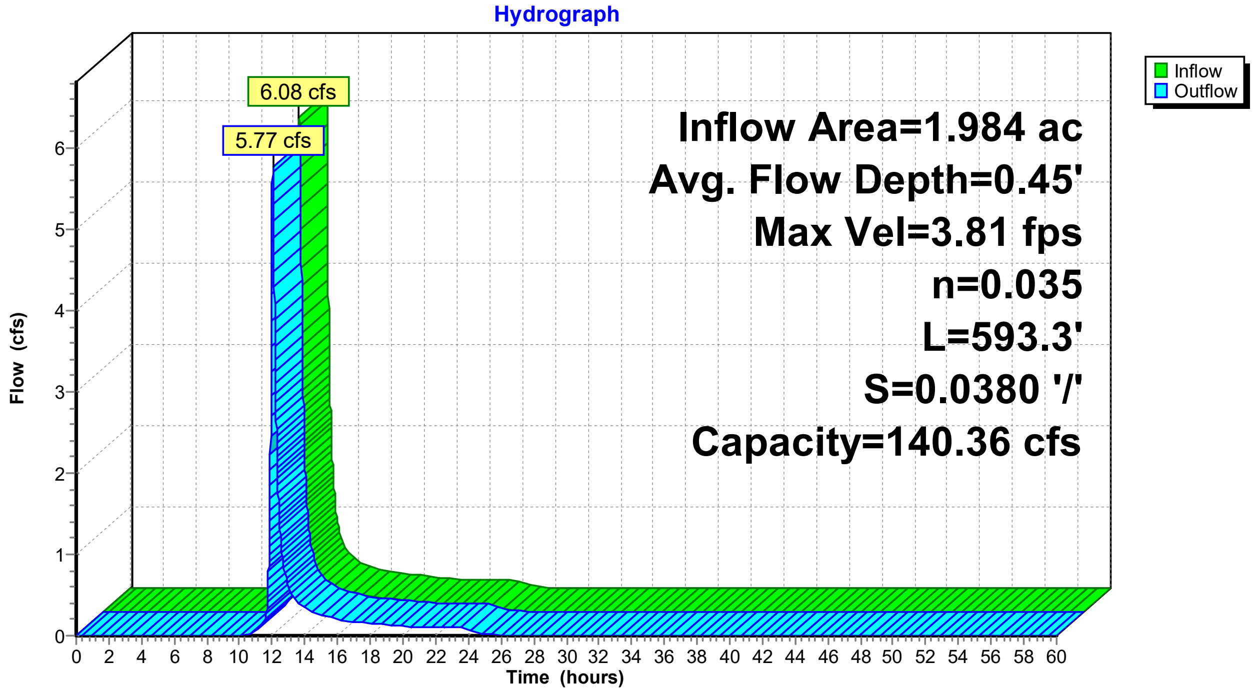
Reach 1.1bR2: North Road Conveyance Swale



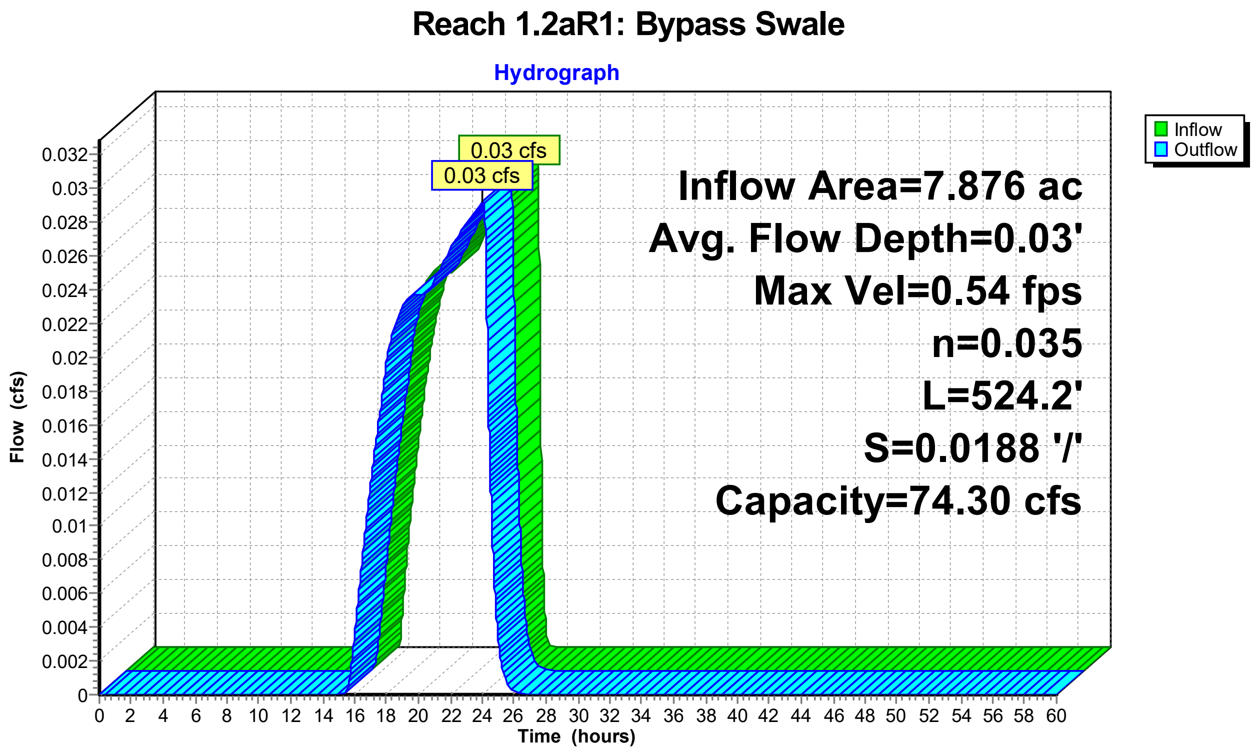
Summary for Reach 1.2aR1: Bypass Swale

Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.03 cfs @ 24.00 hrs, Volume= 0.016 af
Outflow = 0.03 cfs @ 24.06 hrs, Volume= 0.016 af, Atten= 0%, Lag= 3.1 min
Routed to Pond 1.2aC1 : TS 7 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.54 fps, Min. Travel Time= 16.2 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 18.6 min

Peak Storage= 28 cf @ 24.06 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 2.11'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 74.30 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 524.2' Slope= 0.0188 '/'
Inlet Invert= 1,454.08', Outlet Invert= 1,444.22'



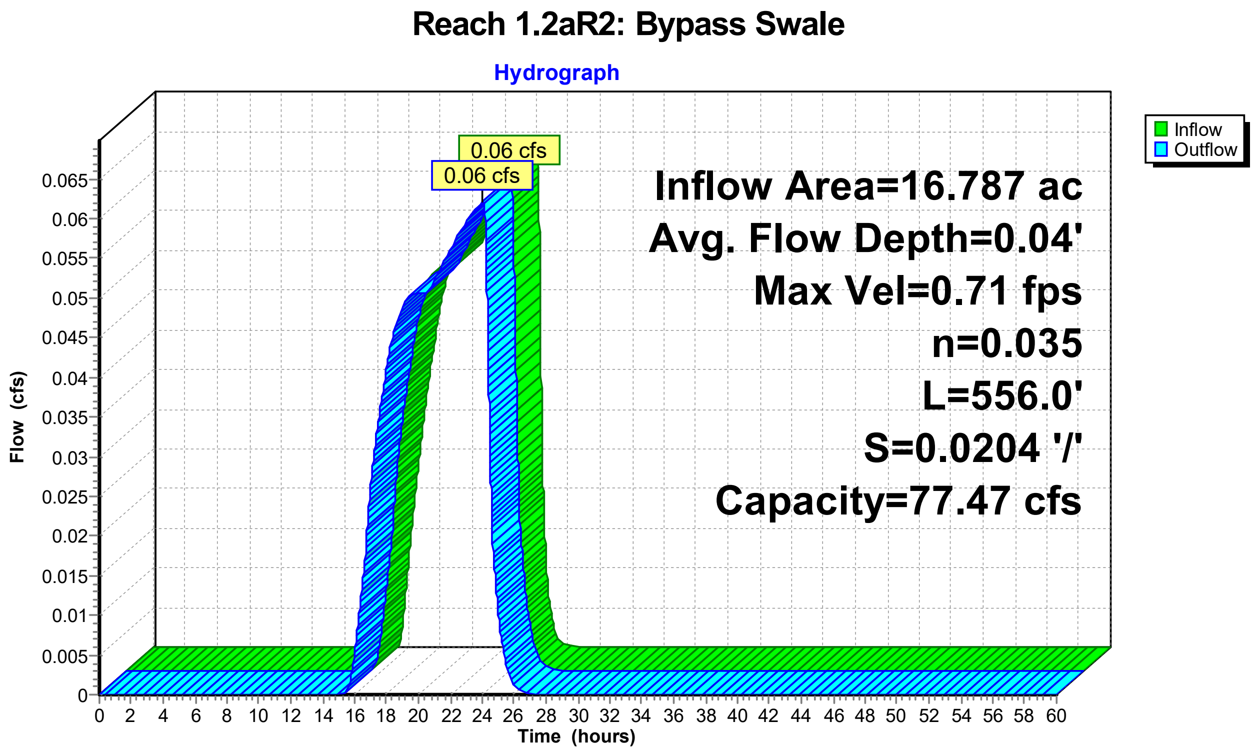
Summary for Reach 1.2aR2: Bypass Swale

Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.06 cfs @ 24.03 hrs, Volume= 0.034 af
Outflow = 0.06 cfs @ 24.06 hrs, Volume= 0.034 af, Atten= 0%, Lag= 1.9 min
Routed to Pond 1.2aC2 : TS8 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.71 fps, Min. Travel Time= 13.0 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 15.9 min

Peak Storage= 48 cf @ 24.06 hrs
Average Depth at Peak Storage= 0.04' , Surface Width= 2.17'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 77.47 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 556.0' Slope= 0.0204 '/'
Inlet Invert= 1,443.21', Outlet Invert= 1,431.84'



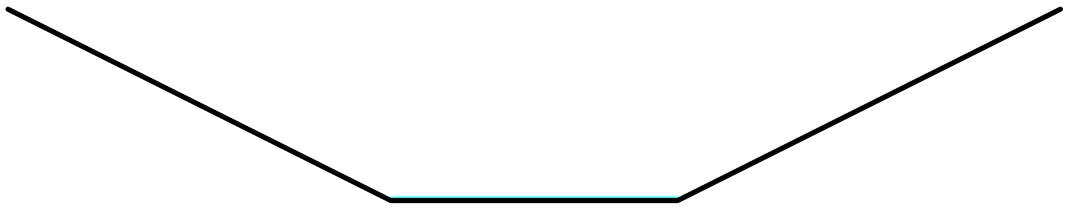
Summary for Reach 1.2aR3: Bypass Swale

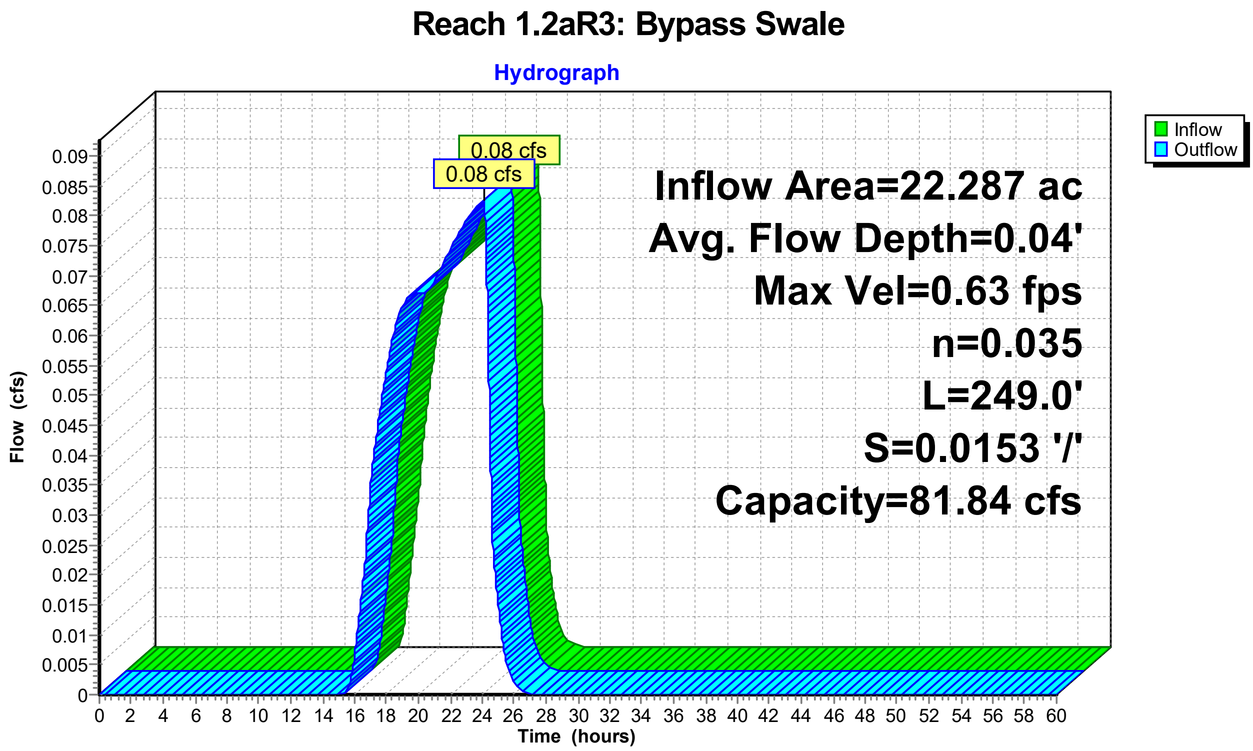
Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.08 cfs @ 24.03 hrs, Volume= 0.045 af
Outflow = 0.08 cfs @ 24.07 hrs, Volume= 0.045 af, Atten= 0%, Lag= 2.0 min
Routed to Pond 1.2aP : South Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.63 fps, Min. Travel Time= 6.6 min
Avg. Velocity = 0.51 fps, Avg. Travel Time= 8.2 min

Peak Storage= 33 cf @ 24.07 hrs
Average Depth at Peak Storage= 0.04' , Surface Width= 3.17'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 81.84 cfs

3.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 11.00'
Length= 249.0' Slope= 0.0153 '/'
Inlet Invert= 1,431.11', Outlet Invert= 1,427.29'





Summary for Reach 1.2bR1: East Road Conveyance Swale

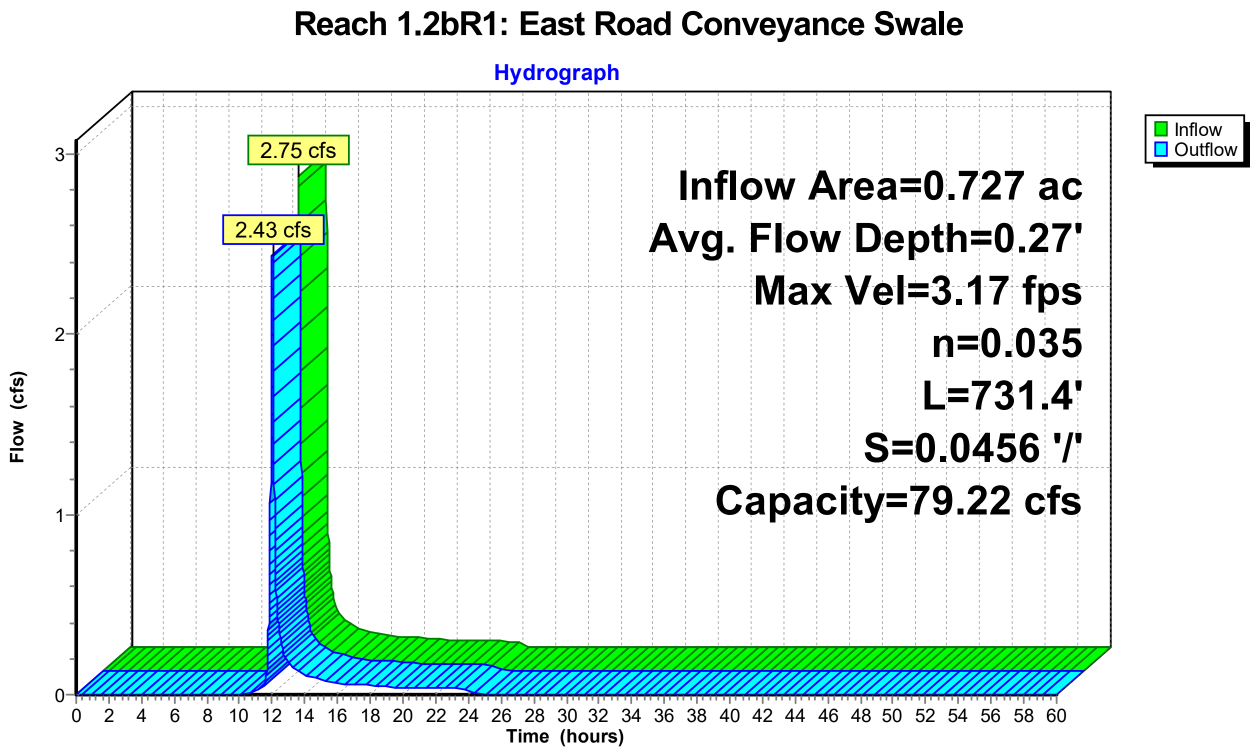
Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 2.11" for 100-Yr Storm event
Inflow = 2.75 cfs @ 11.98 hrs, Volume= 0.128 af
Outflow = 2.43 cfs @ 12.01 hrs, Volume= 0.128 af, Atten= 11%, Lag= 2.1 min
Routed to Pond 1.2bC1 : East Road Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.17 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 13.7 min

Peak Storage= 562 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 3.64'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 79.22 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 731.4' Slope= 0.0456 '/'
Inlet Invert= 1,489.53', Outlet Invert= 1,456.20'

‡



Summary for Reach 1.2bR2: South Road Conveyance Swale

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 1.73" for 100-Yr Storm event
Inflow = 3.77 cfs @ 12.03 hrs, Volume= 0.228 af
Outflow = 3.39 cfs @ 12.07 hrs, Volume= 0.228 af, Atten= 10%, Lag= 2.7 min
Routed to Pond 1.2bC2 : TS6 Culvert

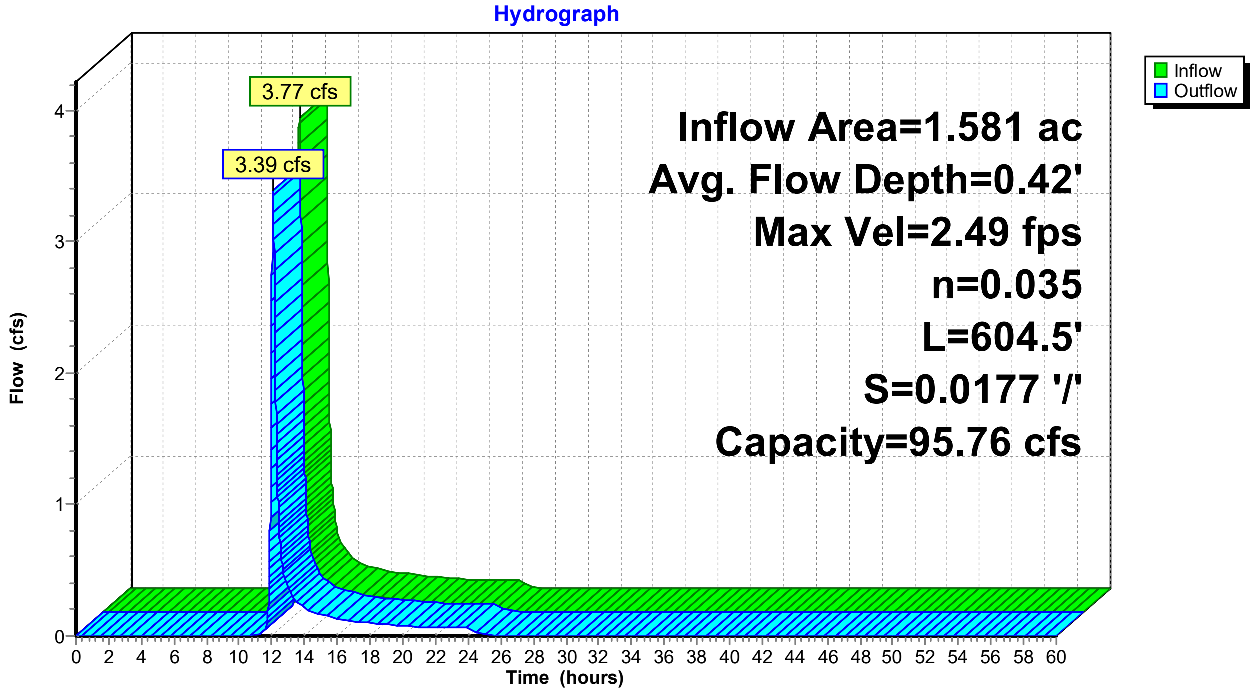
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.49 fps, Min. Travel Time= 4.0 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 13.0 min

Peak Storage= 822 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.42' , Surface Width= 4.51'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 95.76 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 604.5' Slope= 0.0177 '/'
Inlet Invert= 1,454.47', Outlet Invert= 1,443.79'

‡

Reach 1.2bR2: South Road Conveyance Swale



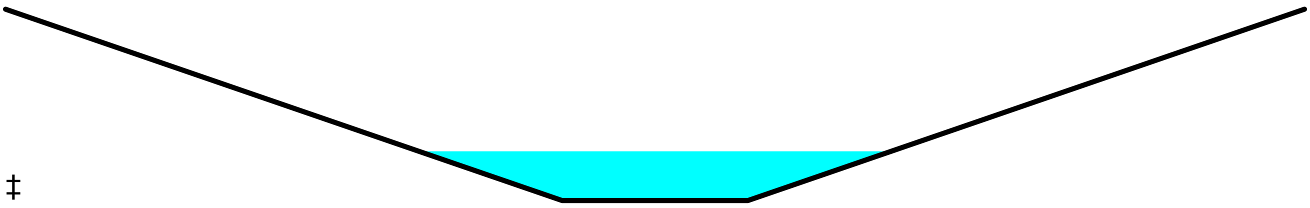
Summary for Reach 1.2bR3: South Road Conveyance Swale

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 1.98" for 100-Yr Storm event
Inflow = 5.95 cfs @ 12.01 hrs, Volume= 0.394 af
Outflow = 5.31 cfs @ 12.06 hrs, Volume= 0.394 af, Atten= 11%, Lag= 3.0 min
Routed to Pond 1.2bP : South Road Treatment Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.88 fps, Min. Travel Time= 4.4 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 14.3 min

Peak Storage= 1,393 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.52' , Surface Width= 5.11'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 98.64 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 755.9' Slope= 0.0187 '/'
Inlet Invert= 1,442.84', Outlet Invert= 1,428.67'



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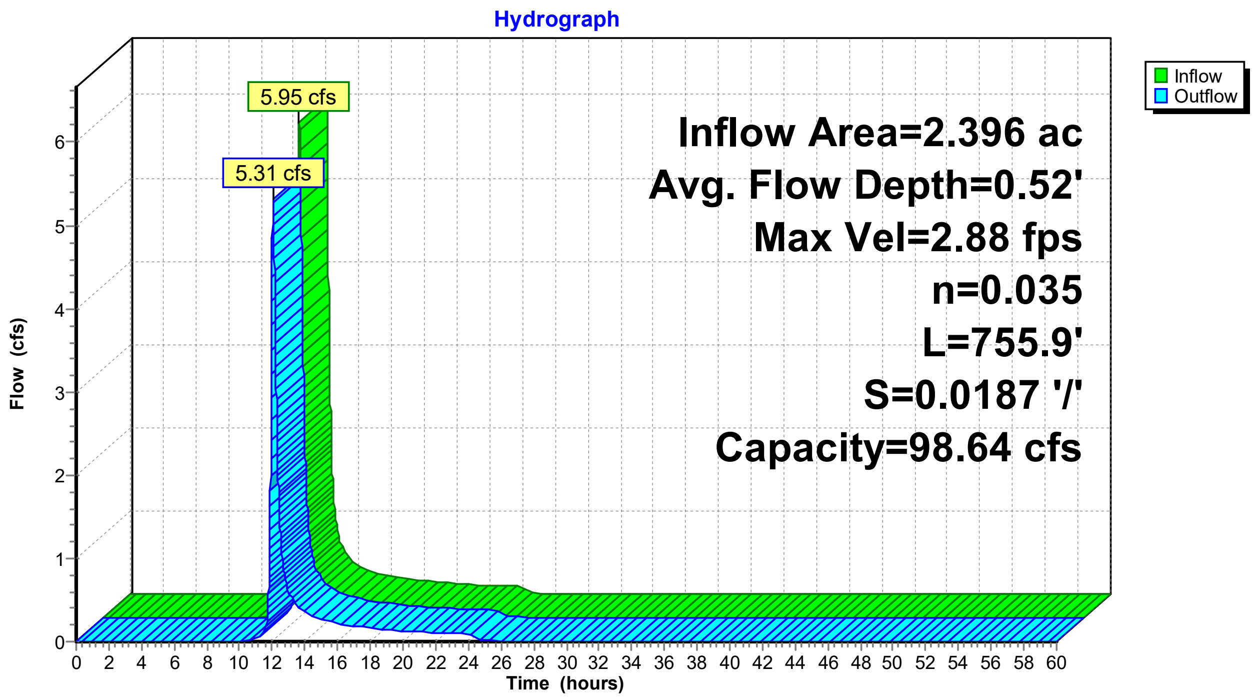
Reach 1.2bR3: South Road Conveyance Swale



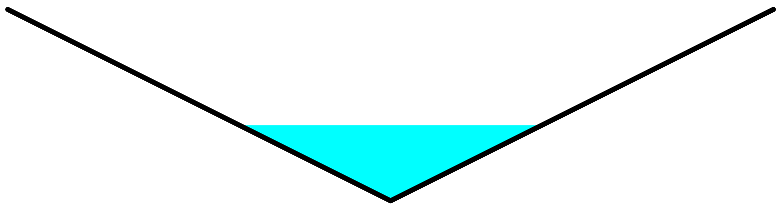
Summary for Reach 4.1R1: Bypass Swale

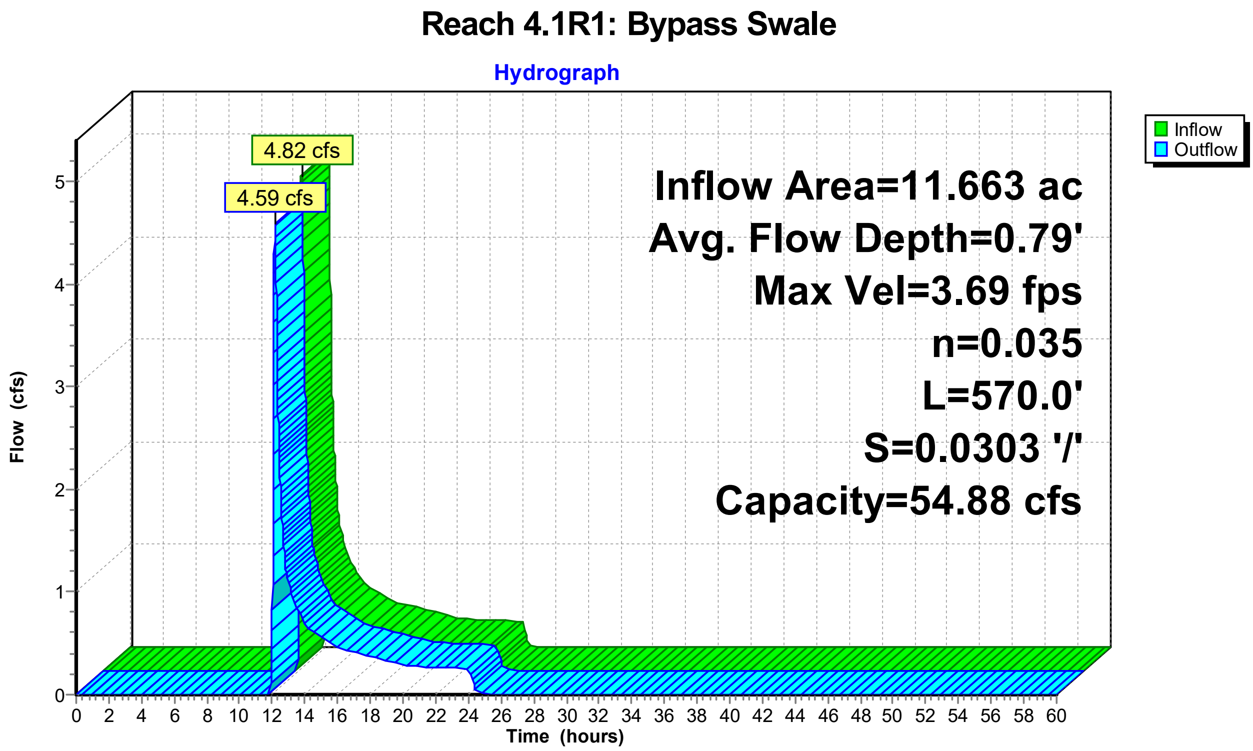
Inflow Area = 11.663 ac, 2.80% Impervious, Inflow Depth = 0.59" for 100-Yr Storm event
Inflow = 4.82 cfs @ 12.13 hrs, Volume= 0.570 af
Outflow = 4.59 cfs @ 12.17 hrs, Volume= 0.570 af, Atten= 5%, Lag= 2.3 min
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.69 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.82 fps, Avg. Travel Time= 5.2 min

Peak Storage= 709 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.79' , Surface Width= 3.16'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 54.88 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 570.0' Slope= 0.0303 '/'
Inlet Invert= 1,448.24', Outlet Invert= 1,430.97'





Summary for Reach 4.1R2: Ex Stream

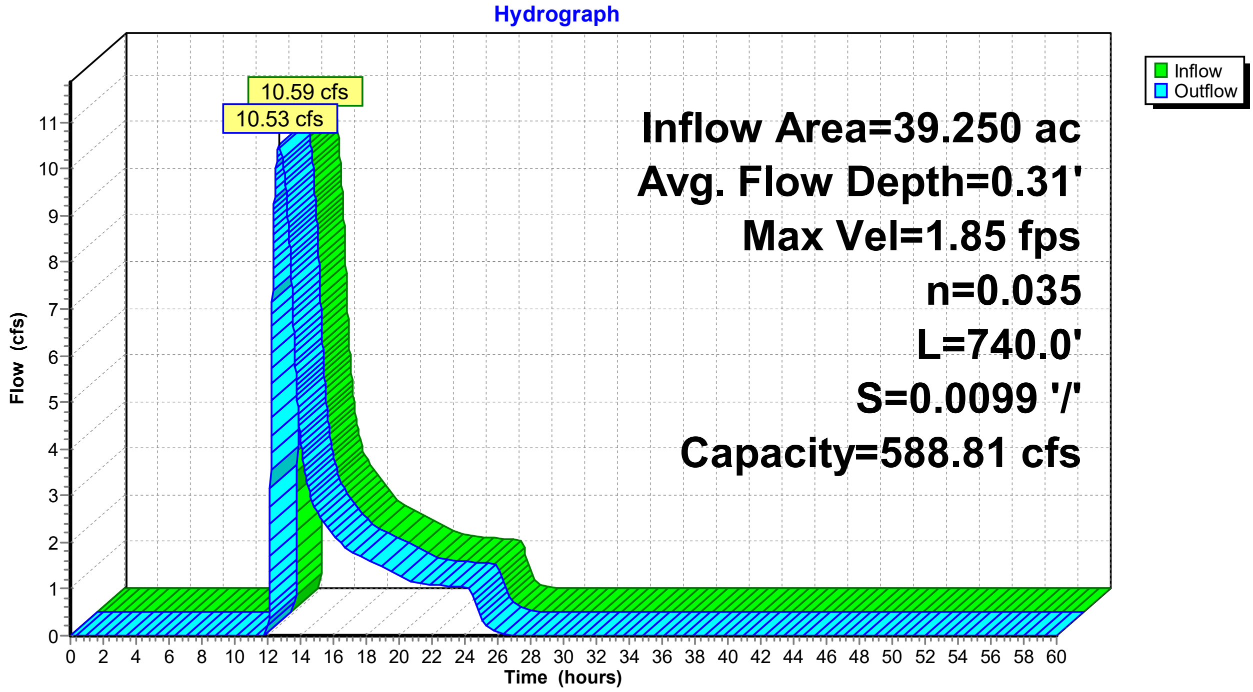
Inflow Area = 39.250 ac, 0.83% Impervious, Inflow Depth = 0.83" for 100-Yr Storm event
Inflow = 10.59 cfs @ 12.62 hrs, Volume= 2.700 af
Outflow = 10.53 cfs @ 12.70 hrs, Volume= 2.700 af, Atten= 1%, Lag= 4.9 min
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.85 fps, Min. Travel Time= 6.7 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 16.2 min

Peak Storage= 4,215 cf @ 12.70 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 19.65'
Bank-Full Depth= 3.00' Flow Area= 84.0 sf, Capacity= 588.81 cfs

17.50' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 4.0 '/' Top Width= 38.50'
Length= 740.0' Slope= 0.0099 '/'
Inlet Invert= 1,430.98', Outlet Invert= 1,423.64'

Reach 4.1R2: Ex Stream



Summary for Reach 4.2bR: Conveyance Swale

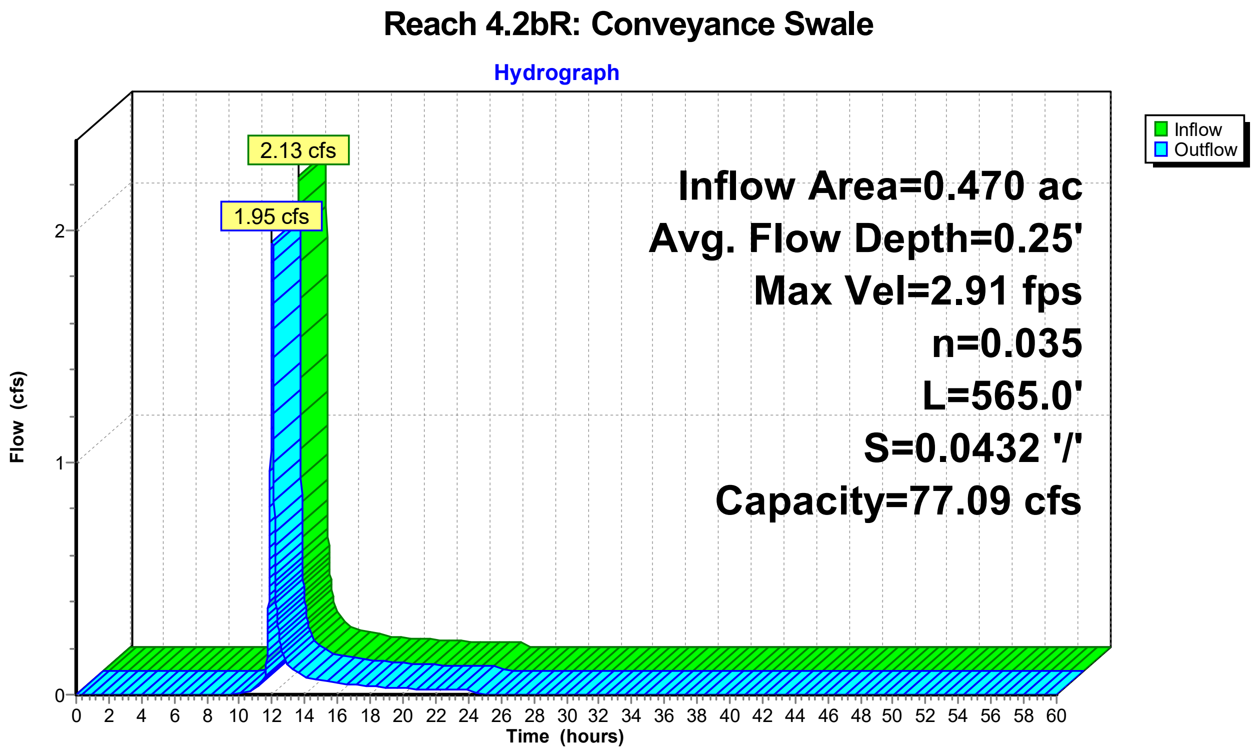
Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 2.53" for 100-Yr Storm event
Inflow = 2.13 cfs @ 11.98 hrs, Volume= 0.099 af
Outflow = 1.95 cfs @ 12.01 hrs, Volume= 0.099 af, Atten= 8%, Lag= 1.8 min
Routed to Pond 4.2bP : Pond 4 - Access Rd East

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.91 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 11.9 min

Peak Storage= 380 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.25' , Surface Width= 3.47'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 77.09 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 565.0' Slope= 0.0432 '/'
Inlet Invert= 1,472.38', Outlet Invert= 1,448.00'

‡



Summary for Pond 1.1aC1: TS1 Culvert

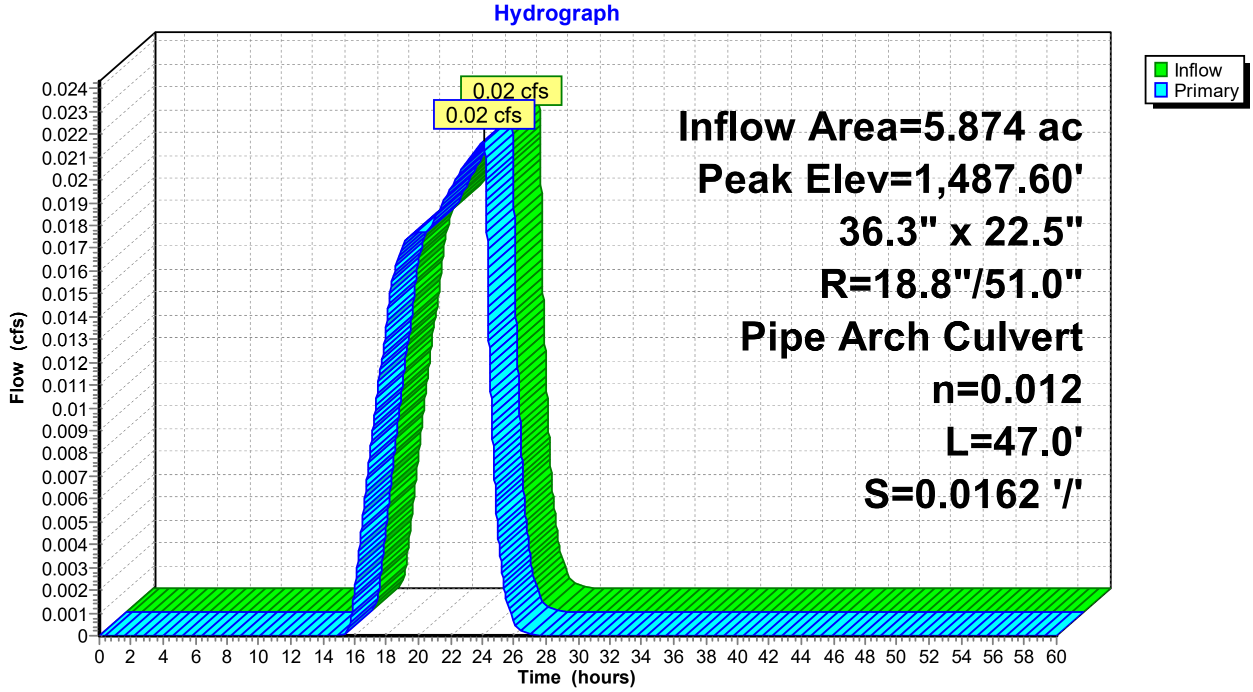
Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.02 cfs @ 24.06 hrs, Volume= 0.012 af
Outflow = 0.02 cfs @ 24.06 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min
Primary = 0.02 cfs @ 24.06 hrs, Volume= 0.012 af
Routed to Reach 1.1aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,487.60' @ 24.06 hrs
Flood Elev= 1,489.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,487.56'	**36.3" W x 22.5" H, R=18.8"/51.0" Pipe Arch RCP_Arch 37x23** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,487.56' / 1,486.80' S= 0.0162 '/' Cc= 0.900 n= 0.012, Flow Area= 4.43 sf

Primary OutFlow Max=0.02 cfs @ 24.06 hrs HW=1,487.60' (Free Discharge)
↑—**1=RCP_Arch 37x23** (Inlet Controls 0.02 cfs @ 0.61 fps)

Pond 1.1aC1: TS1 Culvert



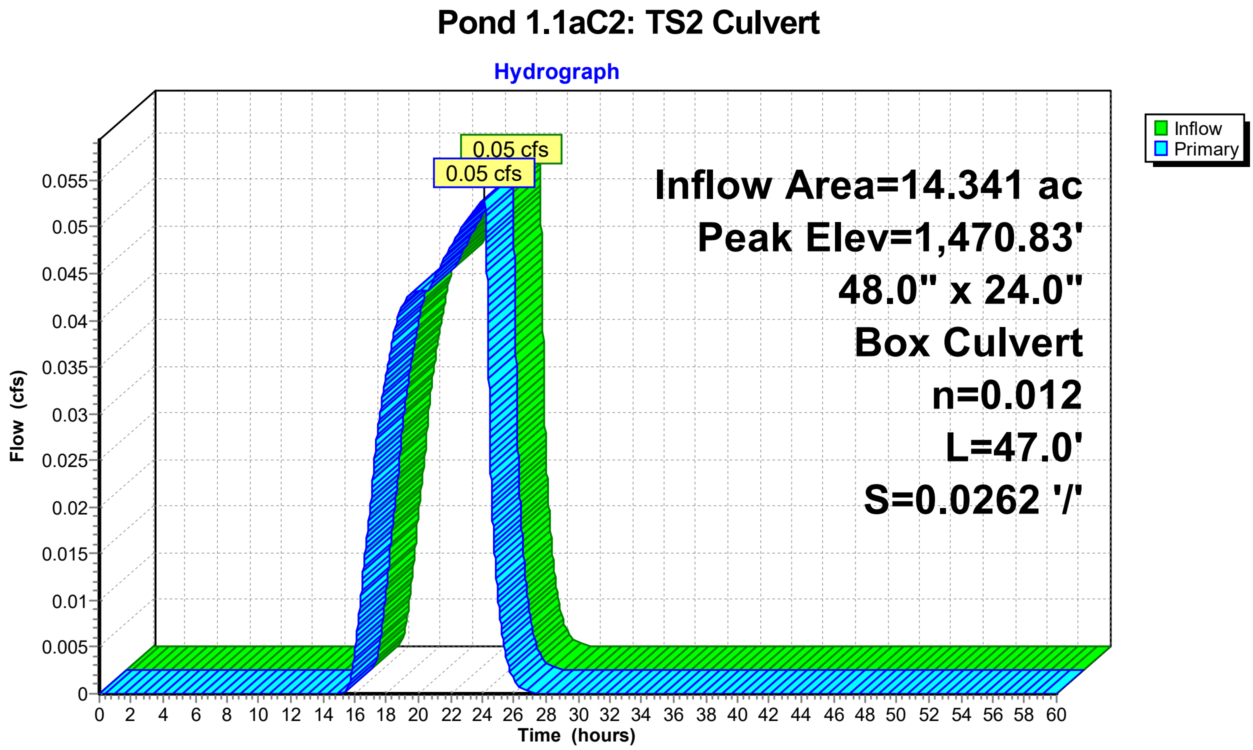
Summary for Pond 1.1aC2: TS2 Culvert

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.05 cfs @ 24.08 hrs, Volume= 0.029 af
Outflow = 0.05 cfs @ 24.08 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min
Primary = 0.05 cfs @ 24.08 hrs, Volume= 0.029 af
Routed to Reach 1.1aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,470.83' @ 24.08 hrs
Flood Elev= 1,473.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,470.80'	**48.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,470.80' / 1,469.57' S= 0.0262 '/' Cc= 0.900 n= 0.012, Flow Area= 8.00 sf

Primary OutFlow Max=0.05 cfs @ 24.08 hrs HW=1,470.83' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.05 cfs @ 0.51 fps)



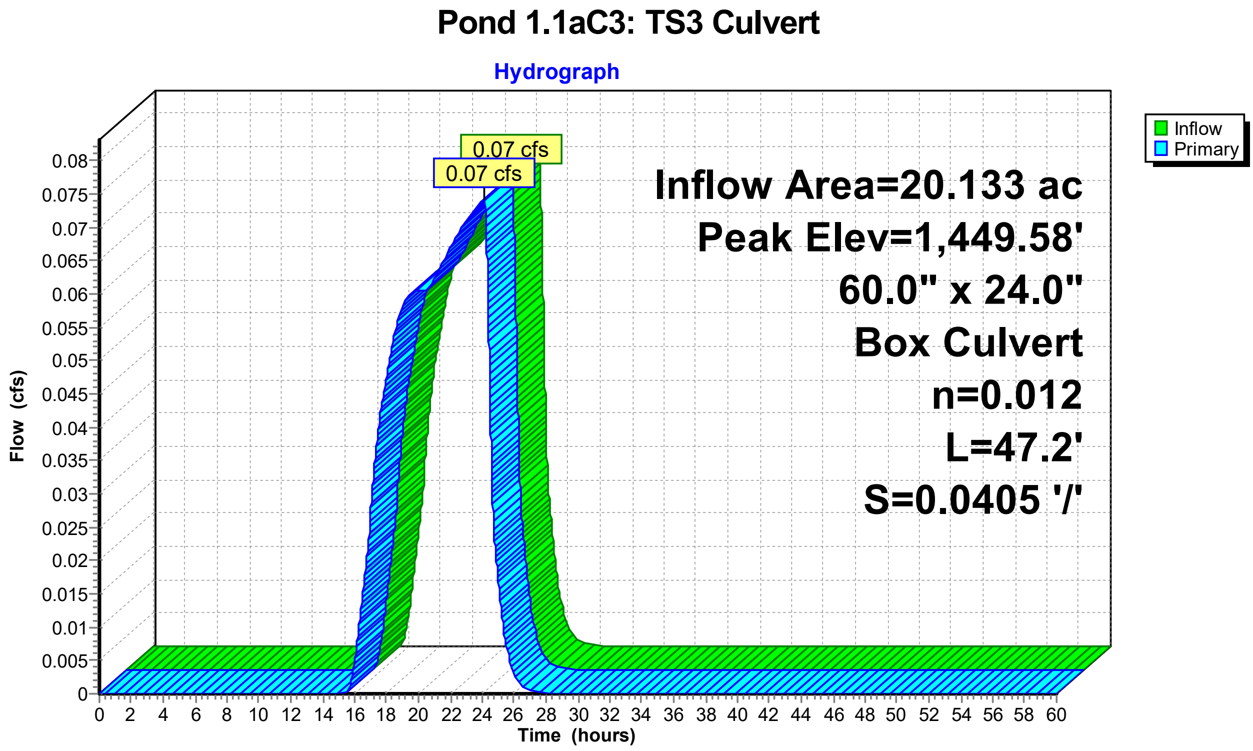
Summary for Pond 1.1aC3: TS3 Culvert

Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.07 cfs @ 24.08 hrs, Volume= 0.041 af
Outflow = 0.07 cfs @ 24.08 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
Primary = 0.07 cfs @ 24.08 hrs, Volume= 0.041 af
Routed to Reach 1.1aR4 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.58' @ 24.08 hrs
Flood Elev= 1,452.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.55'	**60.0" W x 24.0" H Box Culvert** L= 47.2' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.55' / 1,447.64' S= 0.0405 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.07 cfs @ 24.08 hrs HW=1,449.58' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.07 cfs @ 0.53 fps)



Summary for Pond 1.1aP: North Road Bypass OC

Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.12 cfs @ 24.09 hrs, Volume= 0.066 af
Outflow = 0.12 cfs @ 24.12 hrs, Volume= 0.059 af, Atten= 0%, Lag= 1.3 min
Discarded = 0.01 cfs @ 24.12 hrs, Volume= 0.028 af
Primary = 0.11 cfs @ 24.12 hrs, Volume= 0.031 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,428.53' @ 24.12 hrs Surf.Area= 0.020 ac Storage= 0.029 af

Plug-Flow detention time= 520.4 min calculated for 0.059 af (88% of inflow)
Center-of-Mass det. time= 493.0 min (1,761.0 - 1,268.0)

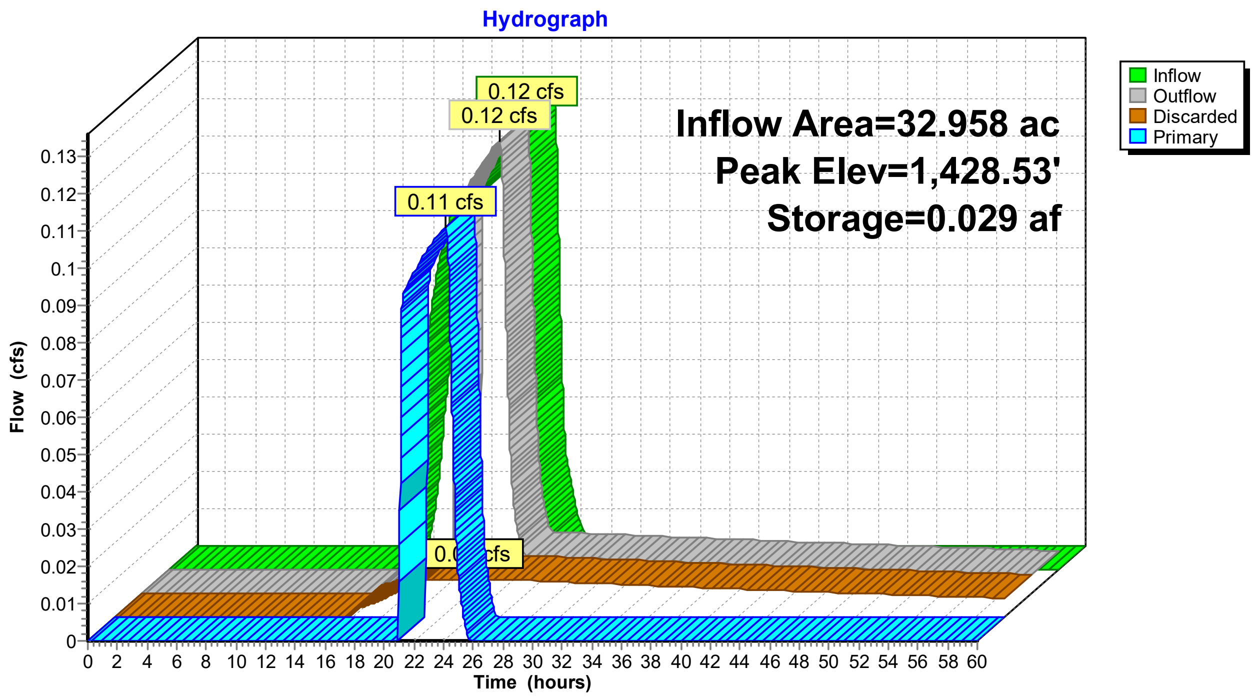
Volume	Invert	Avail.Storage	Storage Description
#1	1,426.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,426.00'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,428.50'	**10.0' 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

Discarded OutFlow Max=0.01 cfs @ 24.12 hrs HW=1,428.53' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.10 cfs @ 24.12 hrs HW=1,428.53' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.10 cfs @ 0.40 fps)

Pond 1.1aP: North Road Bypass OC



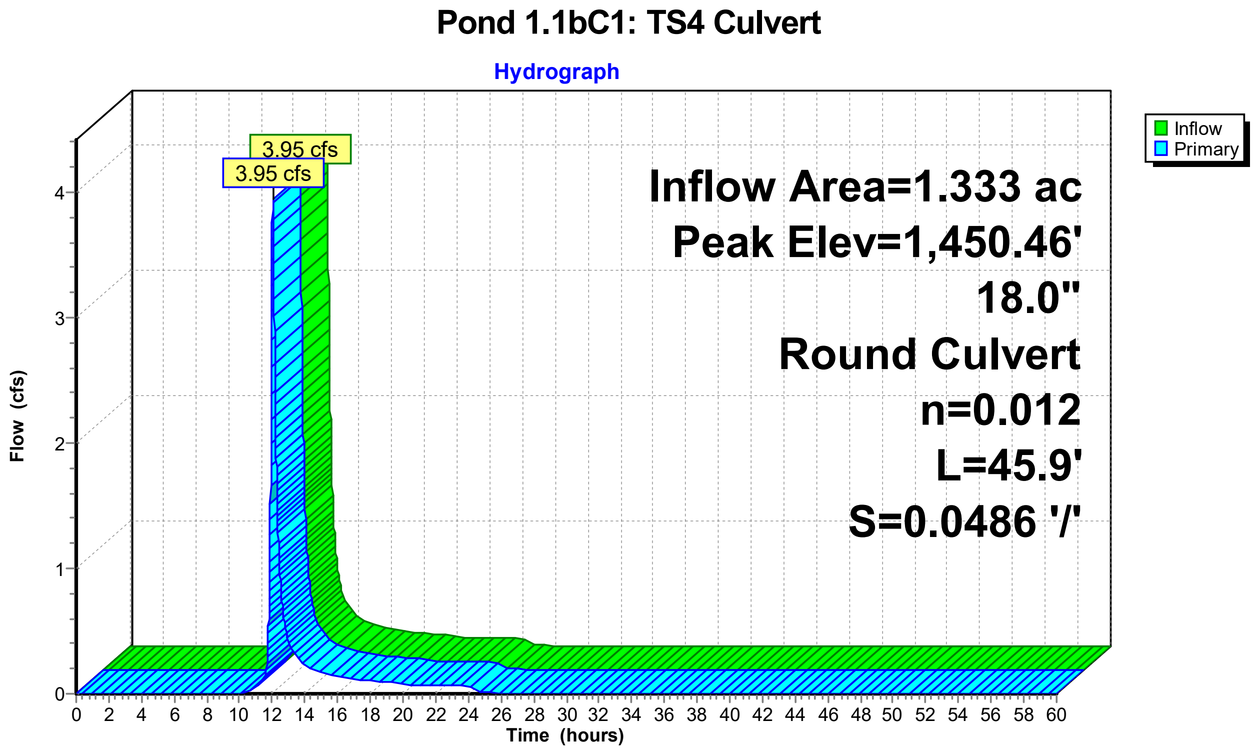
Summary for Pond 1.1bC1: TS4 Culvert

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 3.95 cfs @ 12.04 hrs, Volume= 0.272 af
Outflow = 3.95 cfs @ 12.04 hrs, Volume= 0.272 af, Atten= 0%, Lag= 0.0 min
Primary = 3.95 cfs @ 12.04 hrs, Volume= 0.272 af
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,450.46' @ 12.04 hrs
Flood Elev= 1,451.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.50'	**18.0" Round Culvert** L= 45.9' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.50' / 1,447.27' S= 0.0486 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.95 cfs @ 12.04 hrs HW=1,450.46' (Free Discharge)
1=Culvert (Inlet Controls 3.95 cfs @ 3.33 fps)



Summary for Pond 1.1bP1: Dry Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 2.36" for 100-Yr Storm event
Inflow = 5.77 cfs @ 12.04 hrs, Volume= 0.391 af
Outflow = 5.77 cfs @ 12.04 hrs, Volume= 0.391 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.03 hrs, Volume= 0.005 af
Primary = 5.77 cfs @ 12.04 hrs, Volume= 0.386 af
Routed to Pond 1.1bP2 : North Road Detention Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.74' @ 12.04 hrs Surf.Area= 603 sf Storage= 428 cf

Plug-Flow detention time= 6.5 min calculated for 0.391 af (100% of inflow)
Center-of-Mass det. time= 6.7 min (866.5 - 859.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.75'	428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

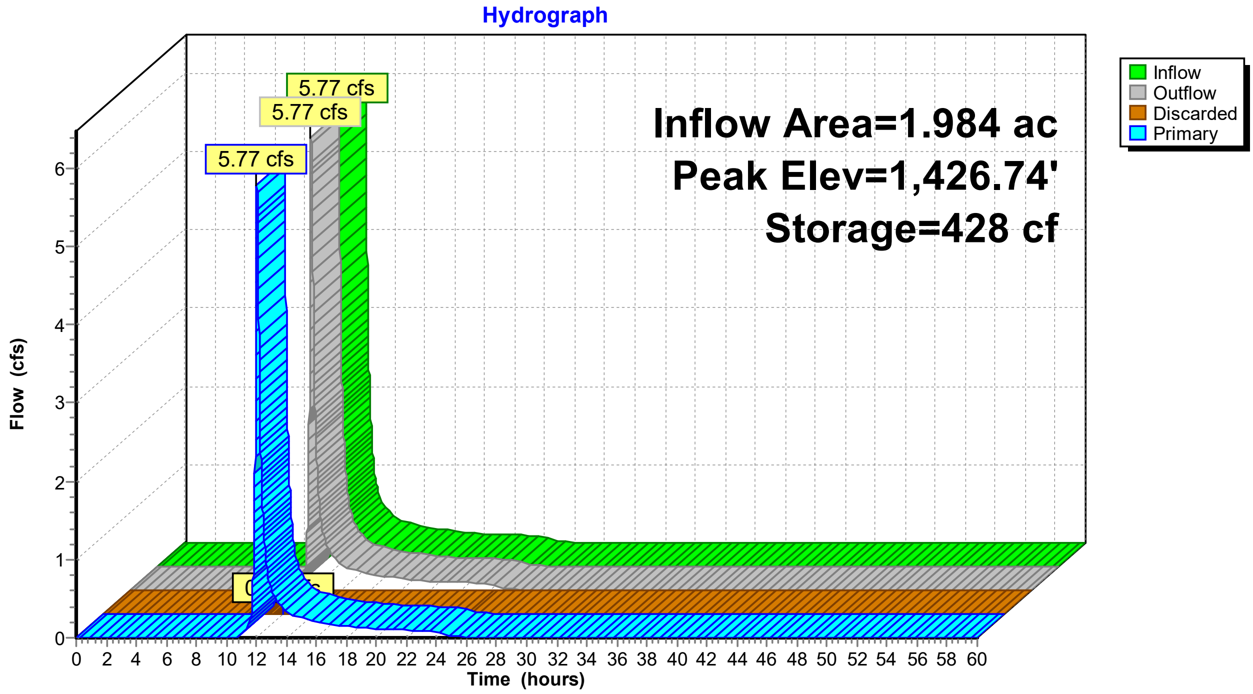
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,424.75	0	0.0	0	0	0
1,425.00	25	22.9	2	2	42
1,426.00	273	98.0	127	129	767
1,426.70	603	161.7	299	428	2,086

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.75'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,425.69'	**2.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.01 cfs @ 12.03 hrs HW=1,426.74' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=5.76 cfs @ 12.04 hrs HW=1,426.74' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 5.76 cfs @ 2.74 fps)

Pond 1.1bP1: Dry Swale



Summary for Pond 1.1bP2: North Road Detention Pond

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 2.33" for 100-Yr Storm event
Inflow = 5.77 cfs @ 12.04 hrs, Volume= 0.386 af
Outflow = 5.65 cfs @ 12.06 hrs, Volume= 0.372 af, Atten= 2%, Lag= 1.3 min
Discarded = 0.02 cfs @ 12.06 hrs, Volume= 0.053 af
Primary = 5.63 cfs @ 12.06 hrs, Volume= 0.318 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.23' @ 12.06 hrs Surf.Area= 0.034 ac Storage= 0.056 af

Plug-Flow detention time= 193.0 min calculated for 0.371 af (96% of inflow)
Center-of-Mass det. time= 171.5 min (1,031.2 - 859.7)

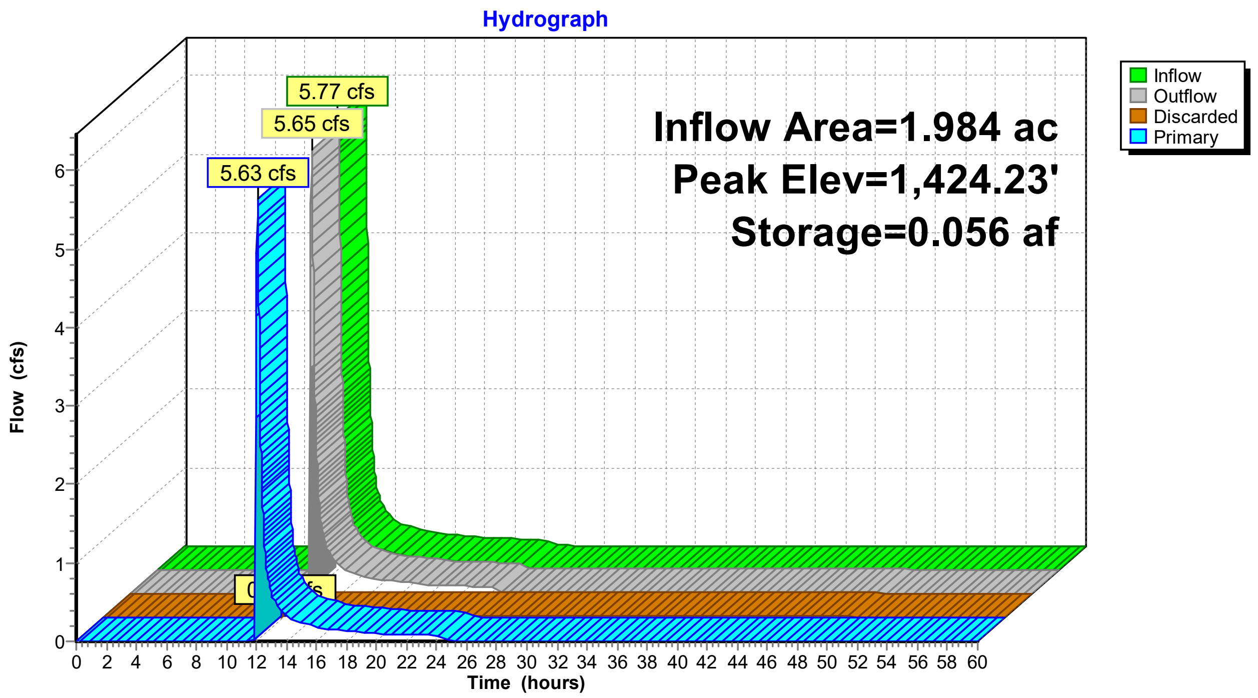
Volume	Invert	Avail.Storage	Storage Description
#1	1,421.50'	0.166 af	**10.00'W x 40.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,421.50'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,424.00'	**20.0' 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

Discarded OutFlow Max=0.02 cfs @ 12.06 hrs HW=1,424.23' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=5.60 cfs @ 12.06 hrs HW=1,424.23' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 5.60 cfs @ 1.21 fps)

Pond 1.1bP2: North Road Detention Pond



Summary for Pond 1.2aC1: TS 7 Culvert

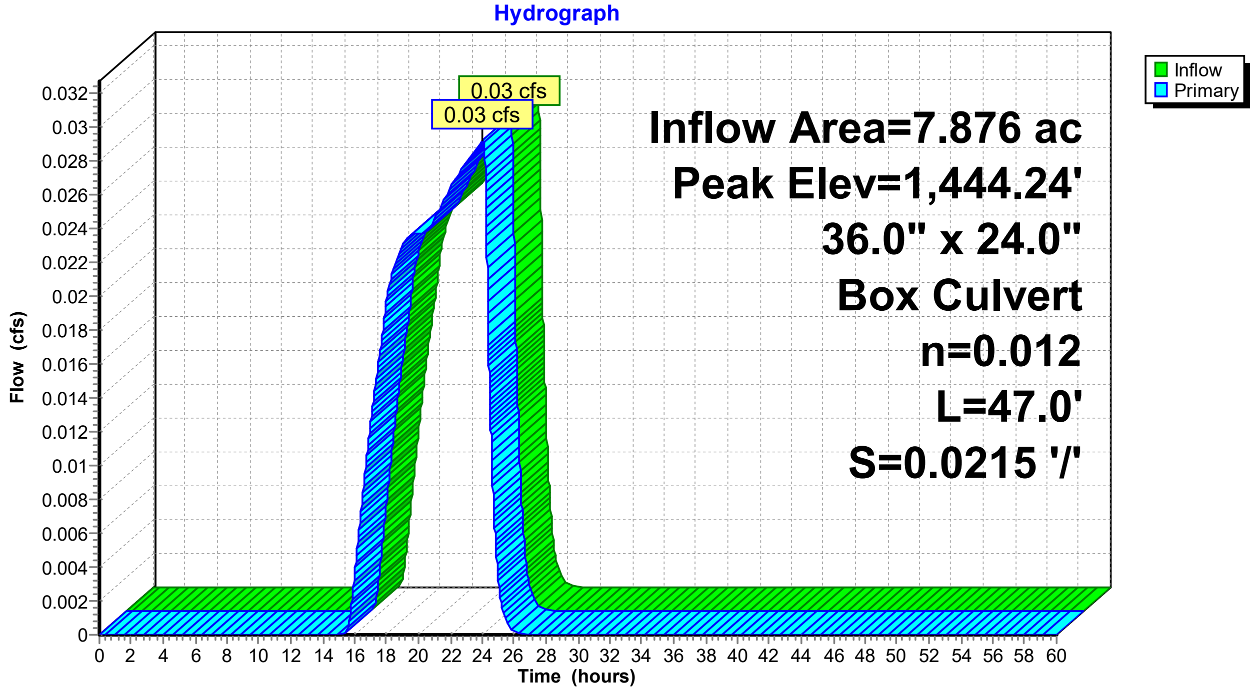
Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.03 cfs @ 24.06 hrs, Volume= 0.016 af
Outflow = 0.03 cfs @ 24.06 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min
Primary = 0.03 cfs @ 24.06 hrs, Volume= 0.016 af
Routed to Reach 1.2aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.24' @ 24.06 hrs
Flood Elev= 1,446.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,444.22'	**36.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,444.22' / 1,443.21' S= 0.0215 '/' Cc= 0.900 n= 0.012, Flow Area= 6.00 sf

Primary OutFlow Max=0.03 cfs @ 24.06 hrs HW=1,444.24' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.03 cfs @ 0.46 fps)

Pond 1.2aC1: TS 7 Culvert



Summary for Pond 1.2aC2: TS8 Culvert

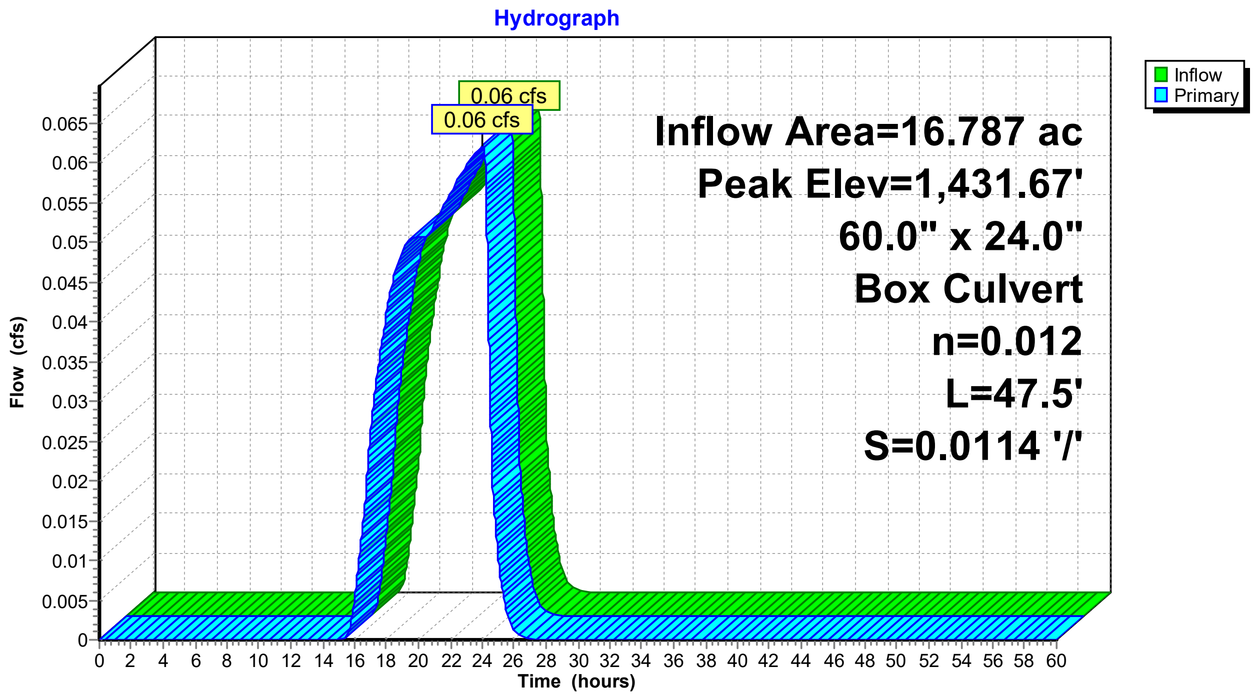
Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.06 cfs @ 24.06 hrs, Volume= 0.034 af
Outflow = 0.06 cfs @ 24.06 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min
Primary = 0.06 cfs @ 24.06 hrs, Volume= 0.034 af
Routed to Reach 1.2aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.67' @ 24.06 hrs
Flood Elev= 1,433.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.65'	**60.0" W x 24.0" H Box Culvert** L= 47.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,431.65' / 1,431.11' S= 0.0114 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.06 cfs @ 24.06 hrs HW=1,431.67' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.06 cfs @ 0.50 fps)

Pond 1.2aC2: TS8 Culvert



Summary for Pond 1.2aP: South Road Bypass OC

Inflow Area =	22.287 ac,	0.00% Impervious, Inflow Depth = 0.02"	for 100-Yr Storm event
Inflow =	0.08 cfs @	24.07 hrs, Volume=	0.045 af
Outflow =	0.08 cfs @	24.20 hrs, Volume=	0.045 af, Atten= 5%, Lag= 8.4 min
Discarded =	0.08 cfs @	24.20 hrs, Volume=	0.045 af
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af

Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.42' @ 24.20 hrs Surf.Area= 0.006 ac Storage= 0.002 af

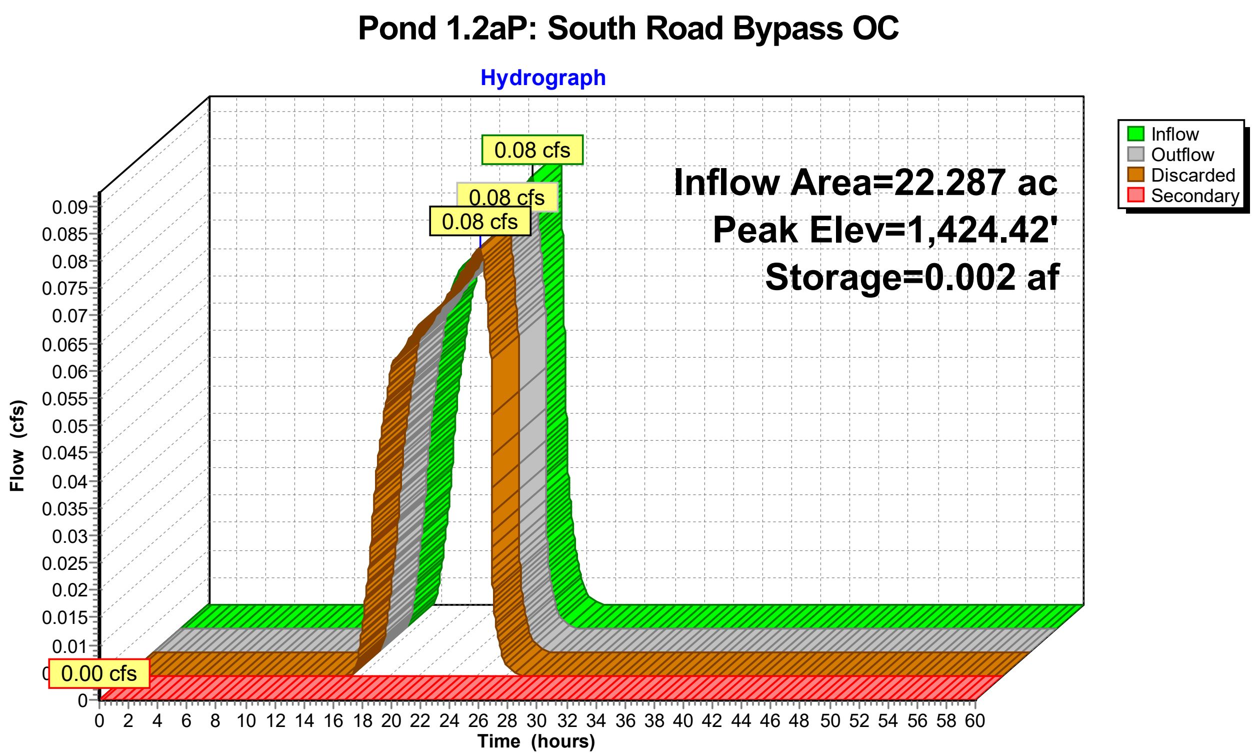
Plug-Flow detention time= 11.1 min calculated for 0.045 af (100% of inflow)
Center-of-Mass det. time= 11.1 min (1,272.7 - 1,261.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area**
#2	Secondary	1,426.50'	**10.0' 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

Discarded OutFlow Max=0.08 cfs @ 24.20 hrs HW=1,424.42' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Summary for Pond 1.2bC1: East Road Culvert

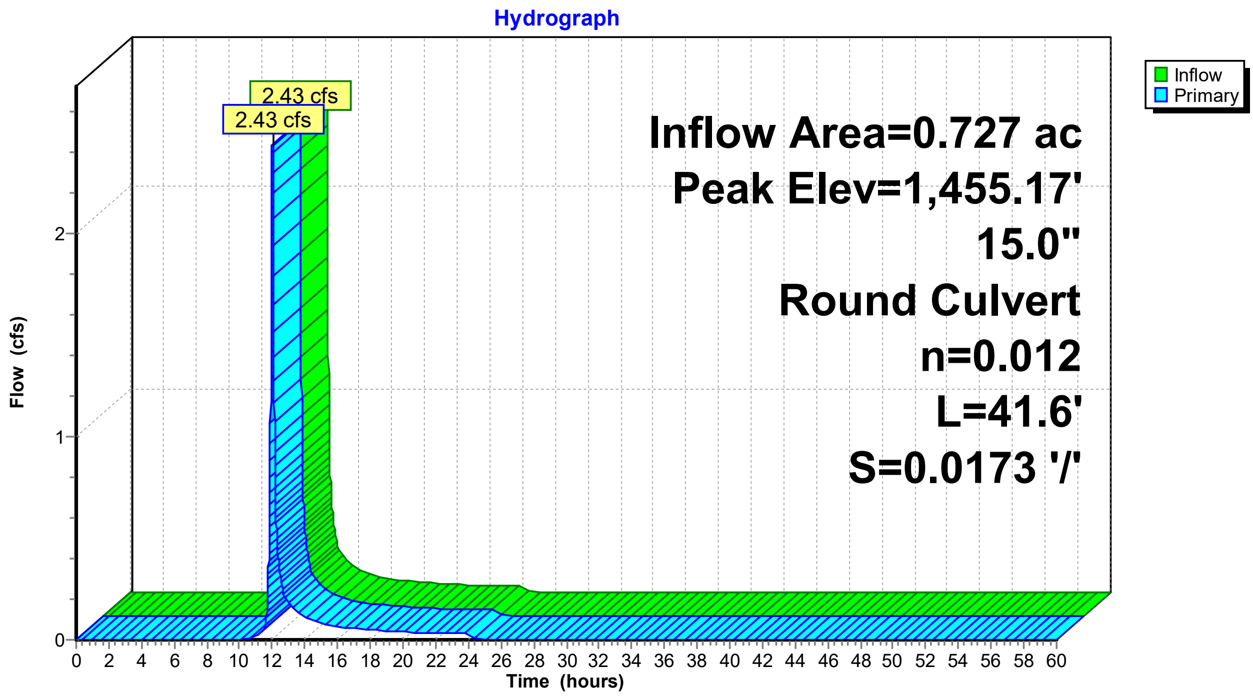
Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 2.11" for 100-Yr Storm event
Inflow = 2.43 cfs @ 12.01 hrs, Volume= 0.128 af
Outflow = 2.43 cfs @ 12.01 hrs, Volume= 0.128 af, Atten= 0%, Lag= 0.0 min
Primary = 2.43 cfs @ 12.01 hrs, Volume= 0.128 af
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,455.17' @ 12.01 hrs
Flood Elev= 1,457.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,454.39'	**15.0" Round Culvert** L= 41.6' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,454.39' / 1,453.67' S= 0.0173 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=2.43 cfs @ 12.01 hrs HW=1,455.17' (Free Discharge)
↑**1=Culvert** (Inlet Controls 2.43 cfs @ 3.01 fps)

Pond 1.2bC1: East Road Culvert



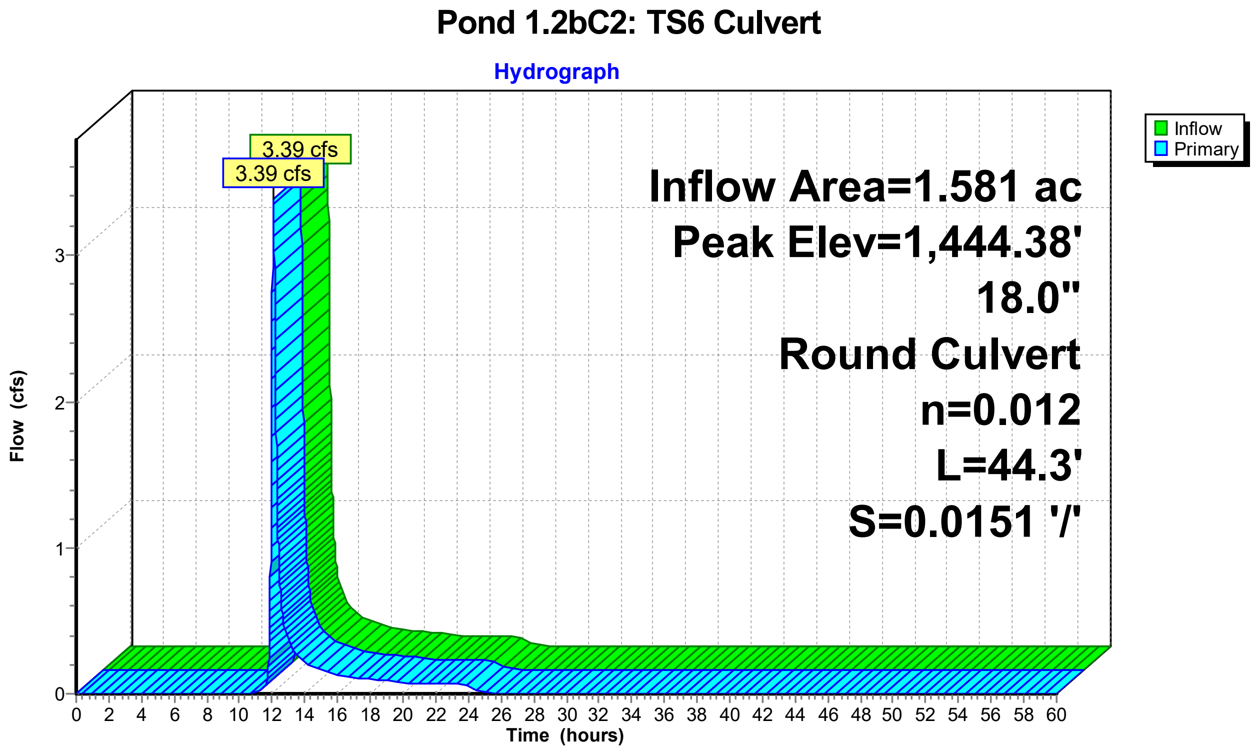
Summary for Pond 1.2bC2: TS6 Culvert

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 1.73" for 100-Yr Storm event
Inflow = 3.39 cfs @ 12.07 hrs, Volume= 0.228 af
Outflow = 3.39 cfs @ 12.07 hrs, Volume= 0.228 af, Atten= 0%, Lag= 0.0 min
Primary = 3.39 cfs @ 12.07 hrs, Volume= 0.228 af
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.38' @ 12.07 hrs
Flood Elev= 1,445.09'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,443.51'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,443.51' / 1,442.84' S= 0.0151 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.38 cfs @ 12.07 hrs HW=1,444.38' (Free Discharge)
1=Culvert (Inlet Controls 3.38 cfs @ 3.18 fps)



Summary for Pond 1.2bP: South Road Treatment Pond

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 1.98" for 100-Yr Storm event
Inflow = 5.31 cfs @ 12.06 hrs, Volume= 0.394 af
Outflow = 5.30 cfs @ 12.06 hrs, Volume= 0.394 af, Atten= 0%, Lag= 0.6 min
Discarded = 0.31 cfs @ 12.06 hrs, Volume= 0.232 af
Primary = 4.98 cfs @ 12.06 hrs, Volume= 0.162 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.26' @ 12.06 hrs Surf.Area= 0.026 ac Storage= 0.038 af

Plug-Flow detention time= 34.9 min calculated for 0.394 af (100% of inflow)
Center-of-Mass det. time= 34.9 min (902.9 - 868.1)

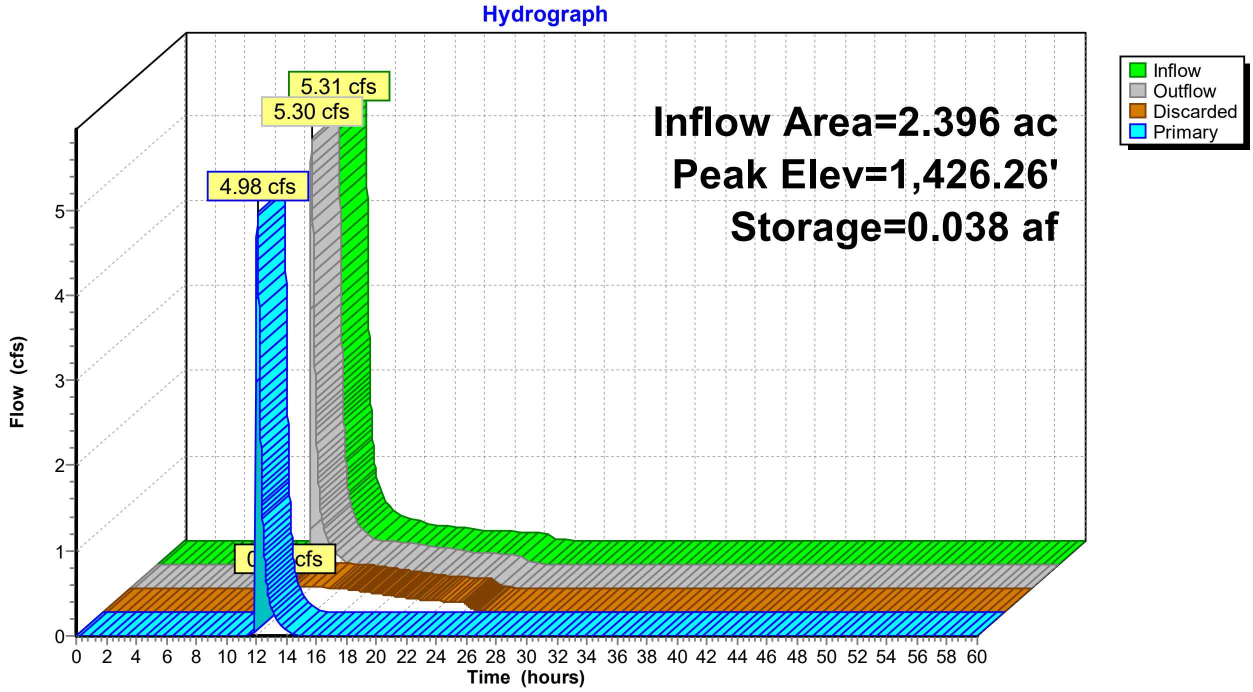
Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.149 af	**20.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,426.05'	**20.0' 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

Discarded OutFlow Max=0.31 cfs @ 12.06 hrs HW=1,426.26' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=4.95 cfs @ 12.06 hrs HW=1,426.26' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 4.95 cfs @ 1.16 fps)

Pond 1.2bP: South Road Treatment Pond



Summary for Pond 1.3P: Pond 3 - Access Rd West

Inflow Area = 0.695 ac, 0.00% Impervious, Inflow Depth = 0.94" for 100-Yr Storm event
Inflow = 1.02 cfs @ 11.99 hrs, Volume= 0.054 af
Outflow = 0.14 cfs @ 12.44 hrs, Volume= 0.054 af, Atten= 86%, Lag= 27.2 min
Discarded = 0.14 cfs @ 12.44 hrs, Volume= 0.054 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link SP1 : Study Point 1

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,456.62' @ 12.44 hrs Surf.Area= 1,037 sf Storage= 566 cf

Plug-Flow detention time= 28.7 min calculated for 0.054 af (100% of inflow)
Center-of-Mass det. time= 28.7 min (927.0 - 898.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,456.00'	8,743 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

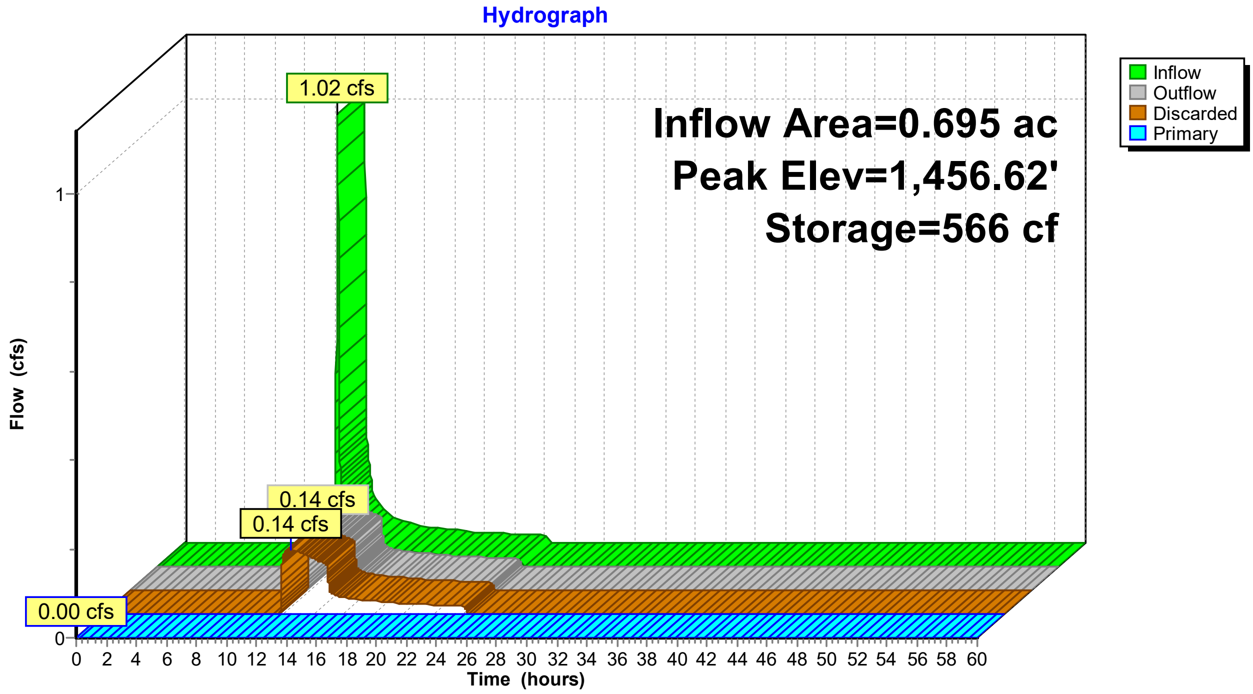
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,456.00	784	123.0	0	0	784
1,458.00	1,720	194.0	2,443	2,443	2,603
1,459.00	2,884	279.0	2,277	4,721	5,811
1,460.00	5,280	421.0	4,022	8,743	13,729

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,456.00'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,459.99'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.14 cfs @ 12.44 hrs HW=1,456.62' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.3P: Pond 3 - Access Rd West



Summary for Pond 4.2bP: Pond 4 - Access Rd East

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 2.53" for 100-Yr Storm event
Inflow = 1.95 cfs @ 12.01 hrs, Volume= 0.099 af
Outflow = 0.69 cfs @ 12.15 hrs, Volume= 0.099 af, Atten= 65%, Lag= 8.9 min
Discarded = 0.14 cfs @ 12.15 hrs, Volume= 0.089 af
Primary = 0.55 cfs @ 12.15 hrs, Volume= 0.011 af
Routed to Pond 4.2C : 18" Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,448.33' @ 12.15 hrs Surf.Area= 998 sf Storage= 1,559 cf

Plug-Flow detention time= 117.3 min calculated for 0.099 af (100% of inflow)
Center-of-Mass det. time= 117.3 min (960.2 - 842.9)

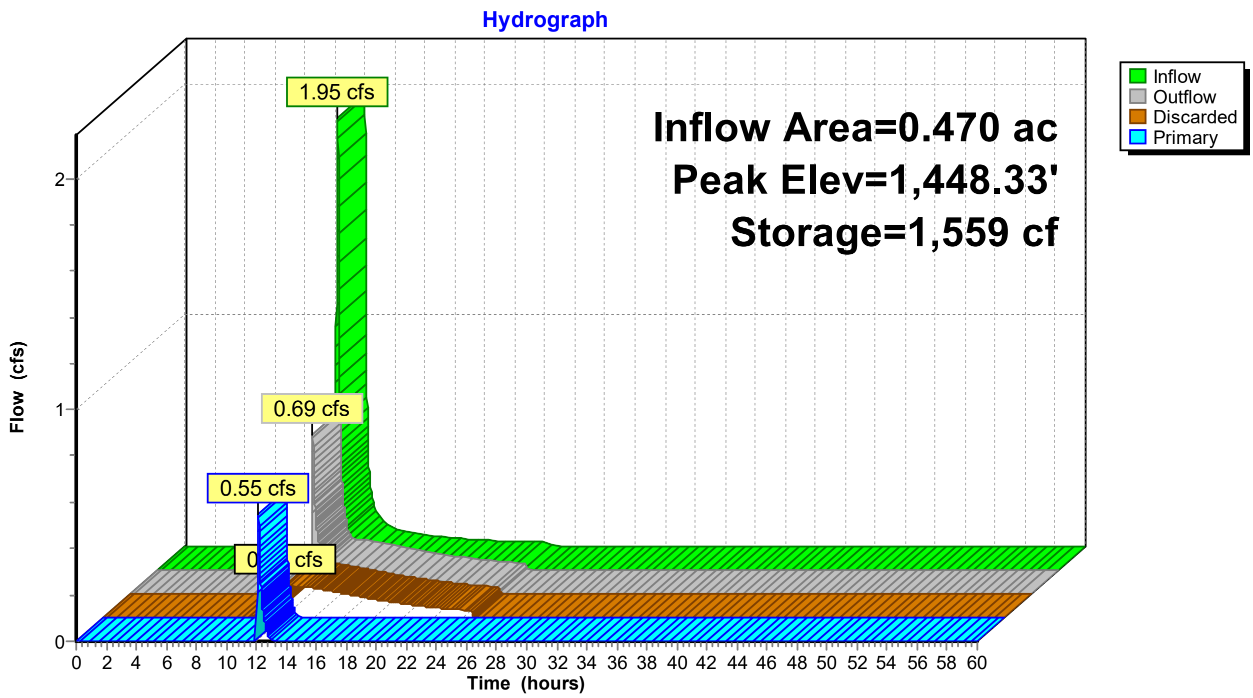
Volume	Invert	Avail.Storage	Storage Description
#1	1,445.50'	2,317 cf	**10.00'W x 20.00'L x 3.50'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,445.50'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,448.25'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.14 cfs @ 12.15 hrs HW=1,448.33' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.54 cfs @ 12.15 hrs HW=1,448.33' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.54 cfs @ 0.67 fps)

Pond 4.2bP: Pond 4 - Access Rd East



Summary for Pond 4.2C: 18" Culvert

Inflow Area = 27.587 ac, 0.00% Impervious, Inflow Depth = 0.93" for 100-Yr Storm event
Inflow = 13.46 cfs @ 12.41 hrs, Volume= 2.131 af
Outflow = 9.09 cfs @ 12.74 hrs, Volume= 2.130 af, Atten= 32%, Lag= 19.7 min
Primary = 9.09 cfs @ 12.74 hrs, Volume= 2.130 af
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,433.72' @ 12.74 hrs Surf.Area= 13,077 sf Storage= 10,213 cf
Flood Elev= 1,434.64' Surf.Area= 27,666 sf Storage= 28,656 cf

Plug-Flow detention time= 13.0 min calculated for 2.130 af (100% of inflow)
Center-of-Mass det. time= 12.5 min (940.4 - 927.9)

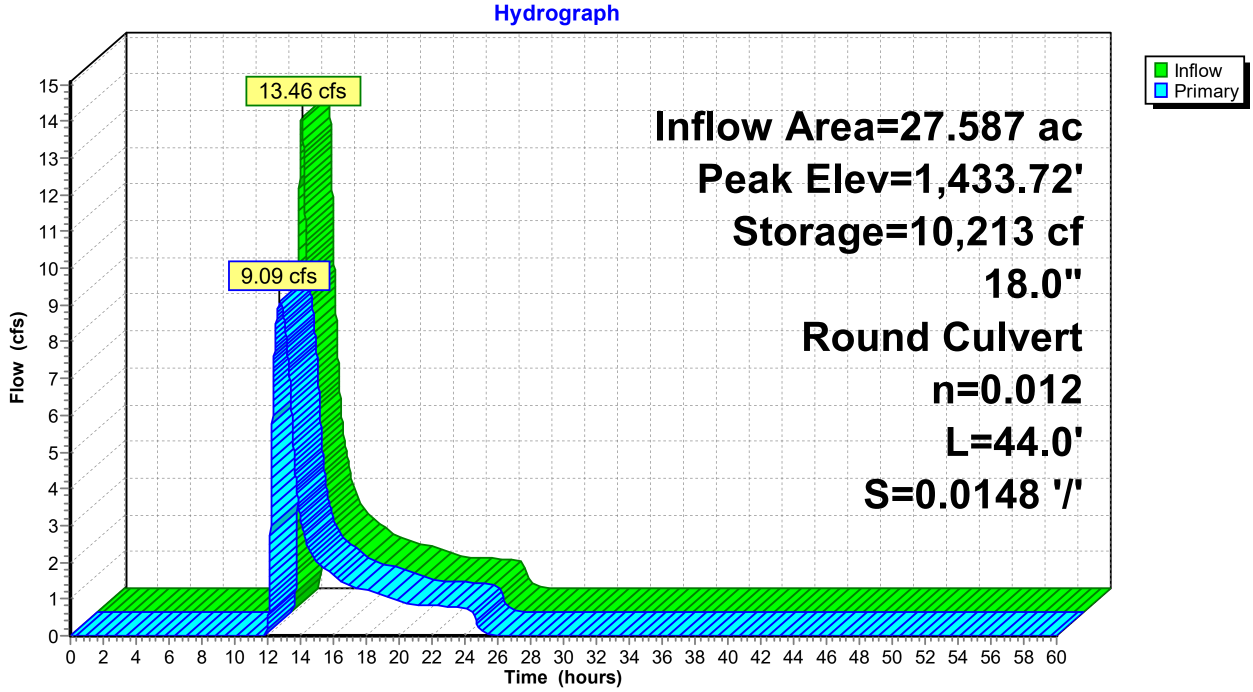
Volume	Invert	Avail.Storage	Storage Description
#1	1,431.50'	39,033 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,431.50	0	0.0	0	0	0
1,432.00	1,190	146.0	198	198	1,697
1,432.50	3,534	368.0	1,129	1,327	10,778
1,433.00	5,795	497.0	2,309	3,637	19,660
1,433.50	10,362	837.0	3,984	7,621	55,755
1,434.00	16,931	975.0	6,756	14,377	75,659
1,434.60	27,412	1,352.0	13,177	27,555	145,474
1,435.00	30,000	1,500.0	11,479	39,033	179,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.83'	**18.0" Round Culvert** L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.83' / 1,431.18' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=9.09 cfs @ 12.74 hrs HW=1,433.72' (Free Discharge)
└—**1=Culvert** (Inlet Controls 9.09 cfs @ 5.14 fps)

Pond 4.2C: 18" Culvert



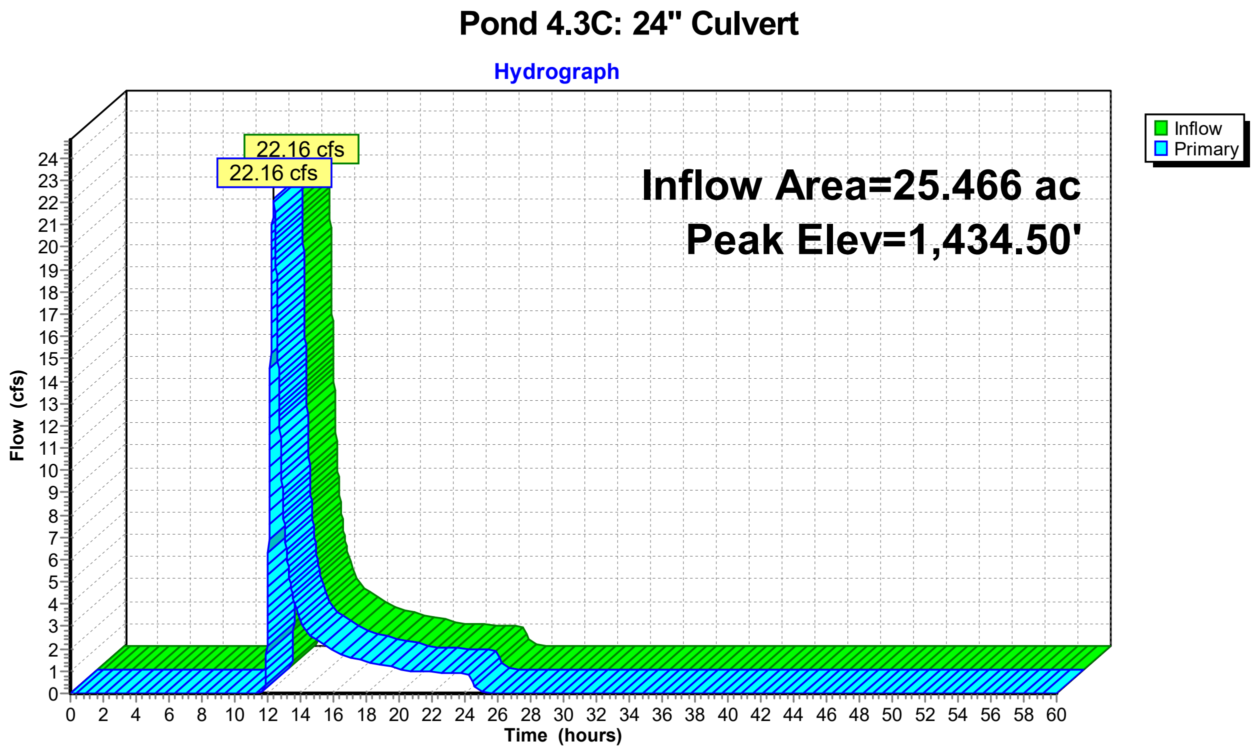
Summary for Pond 4.3C: 24" Culvert

Inflow Area = 25.466 ac, 5.08% Impervious, Inflow Depth = 1.34" for 100-Yr Storm event
Inflow = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af
Outflow = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af, Atten= 0%, Lag= 0.0 min
Primary = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,434.50' @ 12.37 hrs
Flood Elev= 1,434.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.35'	**24.0" Round Culvert** L= 55.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.35' / 1,429.87' S= 0.0265 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Primary	1,434.81'	**20.0' 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

Primary OutFlow Max=22.15 cfs @ 12.37 hrs HW=1,434.49' (Free Discharge)
1=Culvert (Inlet Controls 22.15 cfs @ 7.05 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

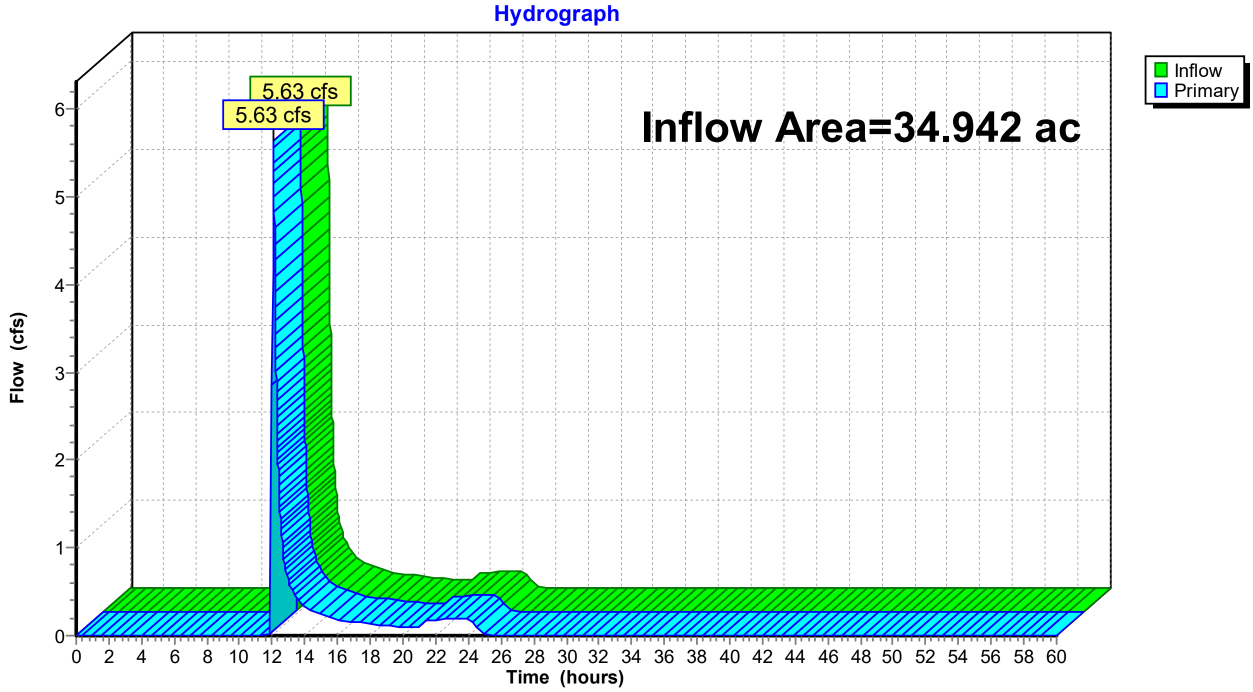


Summary for Link 1.1L:

Inflow Area = 34.942 ac, 0.04% Impervious, Inflow Depth = 0.12" for 100-Yr Storm event
Inflow = 5.63 cfs @ 12.06 hrs, Volume= 0.349 af
Primary = 5.63 cfs @ 12.06 hrs, Volume= 0.349 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link 1.1L:

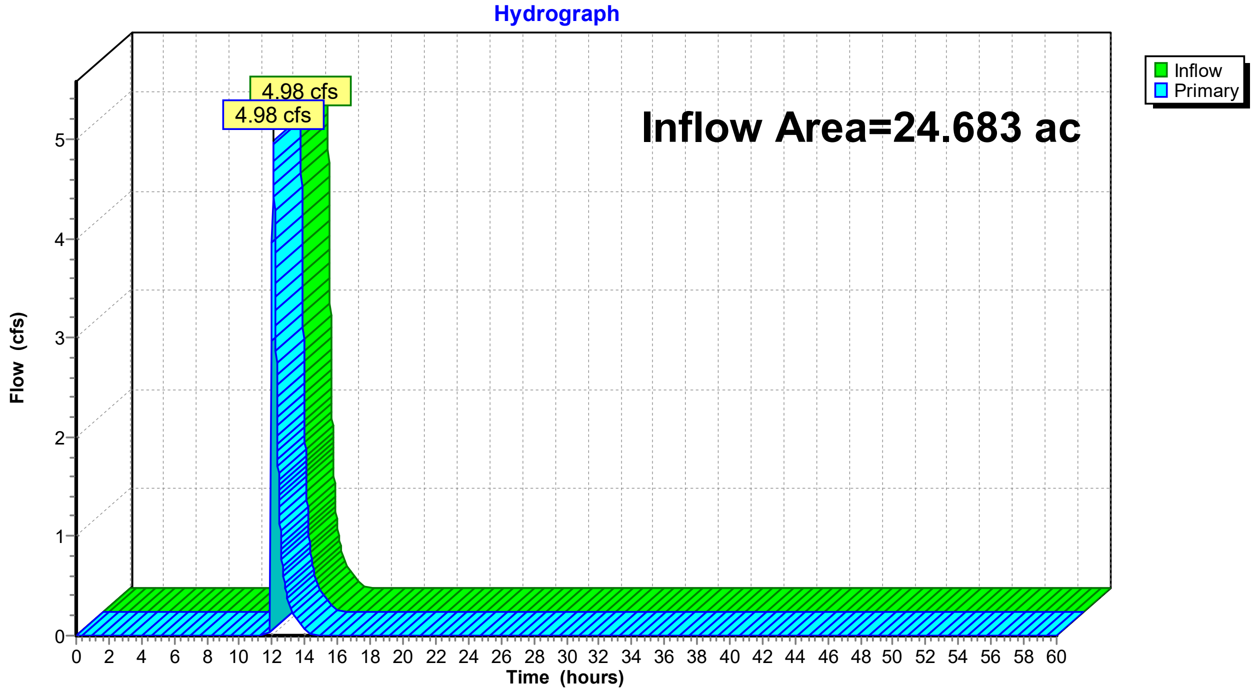


Summary for Link 1.2L:

Inflow Area = 24.683 ac, 0.06% Impervious, Inflow Depth = 0.08" for 100-Yr Storm event
Inflow = 4.98 cfs @ 12.06 hrs, Volume= 0.162 af
Primary = 4.98 cfs @ 12.06 hrs, Volume= 0.162 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

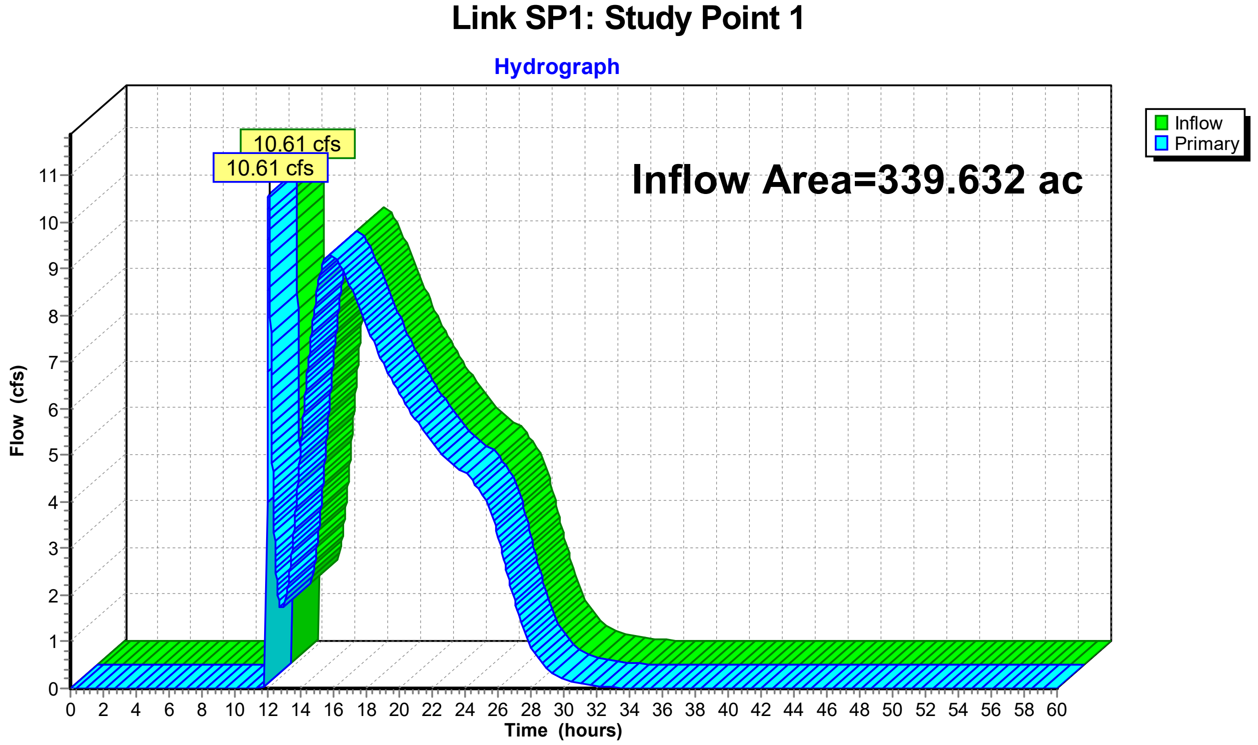
Link 1.2L:



Summary for Link SP1: Study Point 1

Inflow Area = 339.632 ac, 0.01% Impervious, Inflow Depth = 0.26" for 100-Yr Storm event
Inflow = 10.61 cfs @ 12.06 hrs, Volume= 7.384 af
Primary = 10.61 cfs @ 12.06 hrs, Volume= 7.384 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

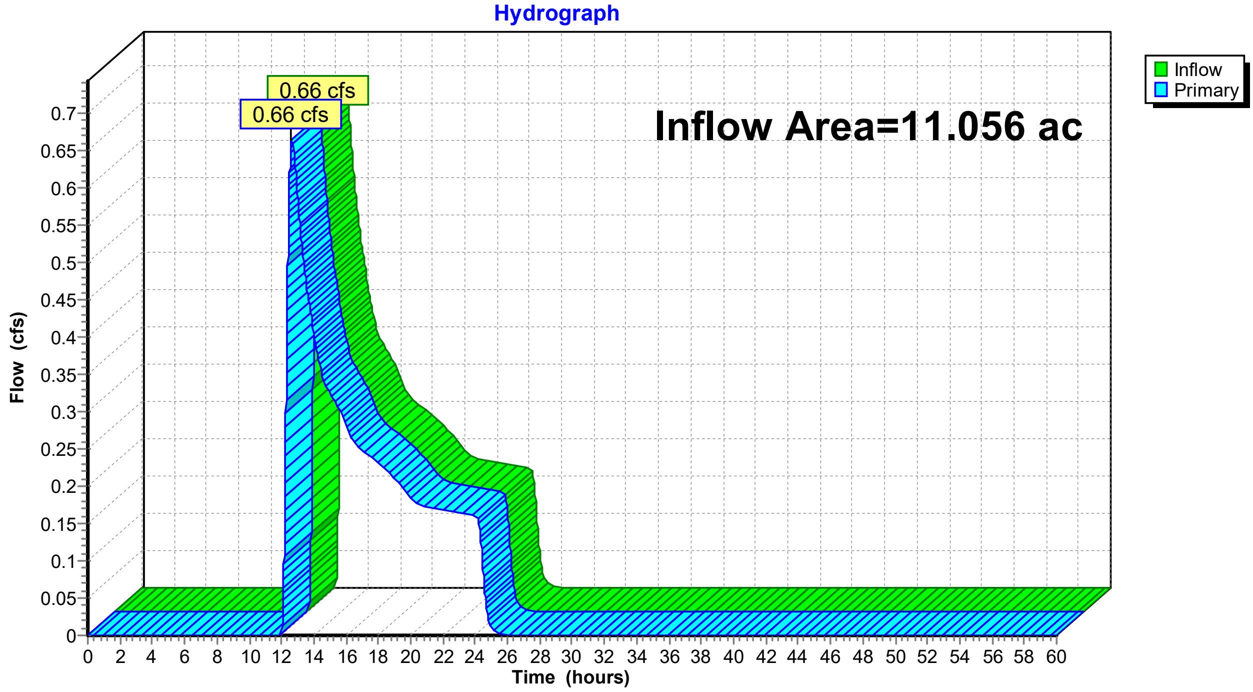


Summary for Link SP2: Study Point 2

Inflow Area =	11.056 ac,	0.00% Impervious, Inflow Depth = 0.30"	for 100-Yr Storm event	
Inflow =	0.66 cfs @	12.61 hrs, Volume=	0.272 af	
Primary =	0.66 cfs @	12.61 hrs, Volume=	0.272 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP2: Study Point 2

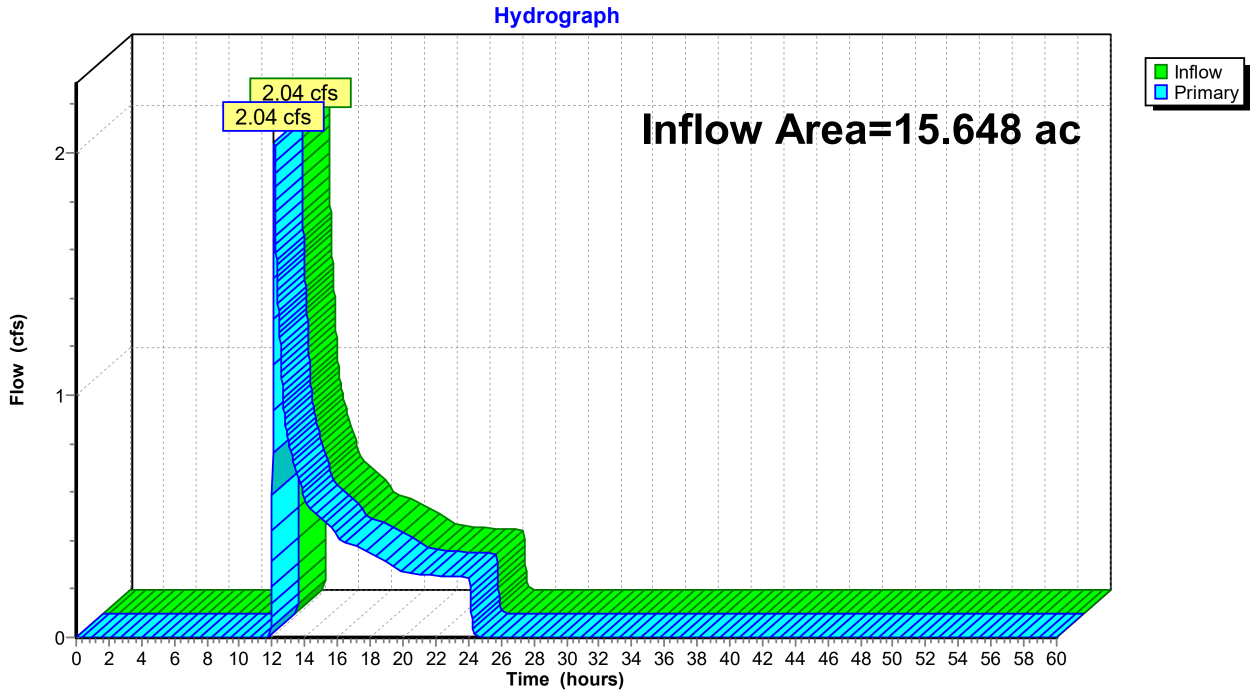


Summary for Link SP3: Study Point 3

Inflow Area = 15.648 ac, 0.56% Impervious, Inflow Depth = 0.34" for 100-Yr Storm event
Inflow = 2.04 cfs @ 12.13 hrs, Volume= 0.442 af
Primary = 2.04 cfs @ 12.13 hrs, Volume= 0.442 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP3: Study Point 3

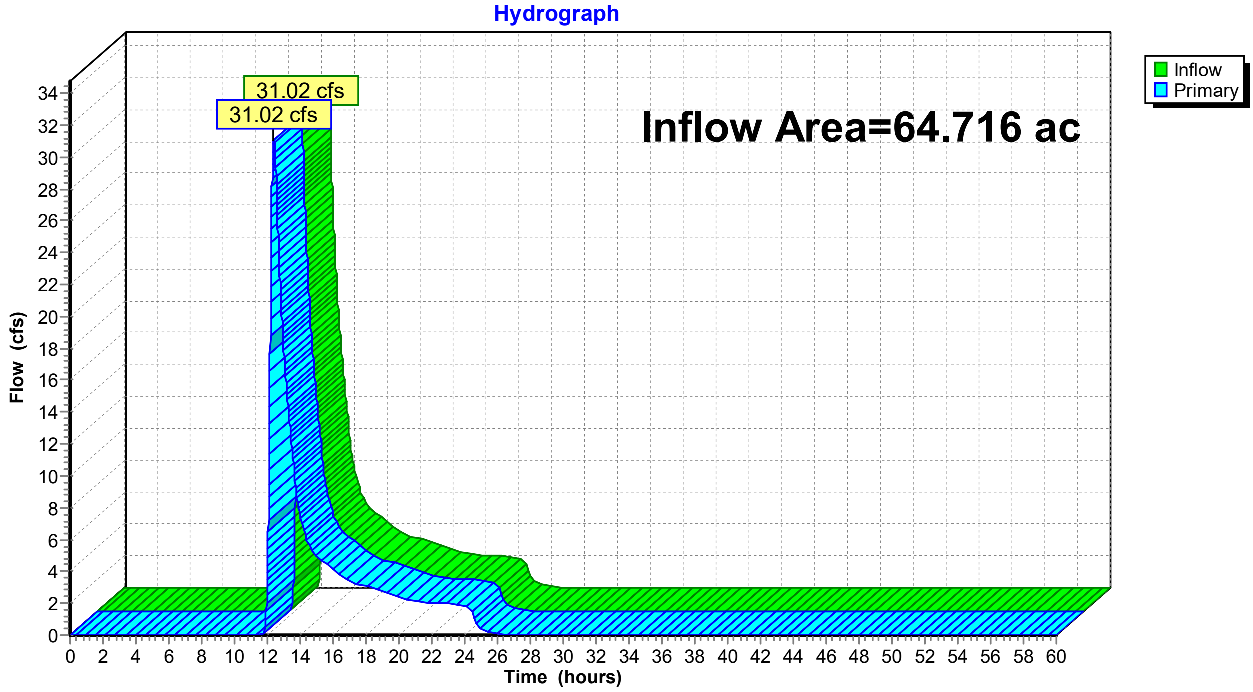


Summary for Link SP4: Study Point 4

Inflow Area =	64.716 ac,	2.50% Impervious, Inflow Depth =	1.03"	for 100-Yr Storm event
Inflow =	31.02 cfs @	12.41 hrs, Volume=	5.546 af	
Primary =	31.02 cfs @	12.41 hrs, Volume=	5.546 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP4: Study Point 4

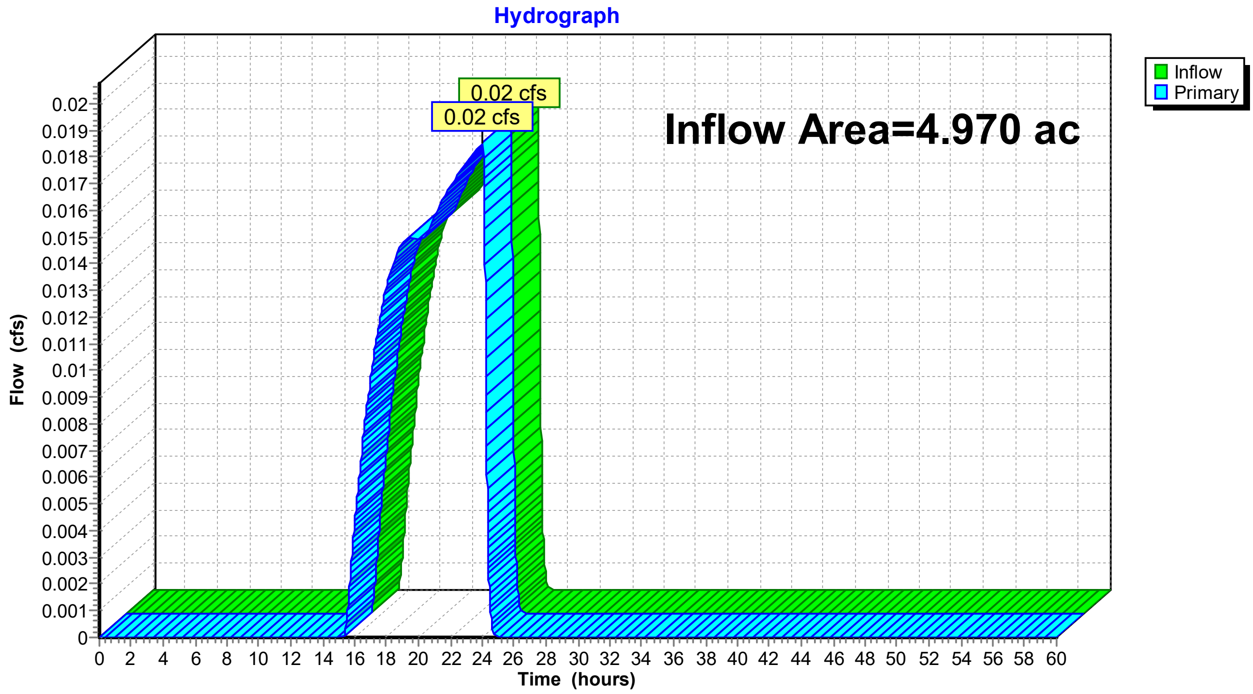


Summary for Link SP5: Study Point 5

Inflow Area =	4.970 ac,	0.00% Impervious, Inflow Depth = 0.02"	for 100-Yr Storm event	
Inflow =	0.02 cfs @	24.02 hrs, Volume=	0.010 af	
Primary =	0.02 cfs @	24.02 hrs, Volume=	0.010 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP5: Study Point 5

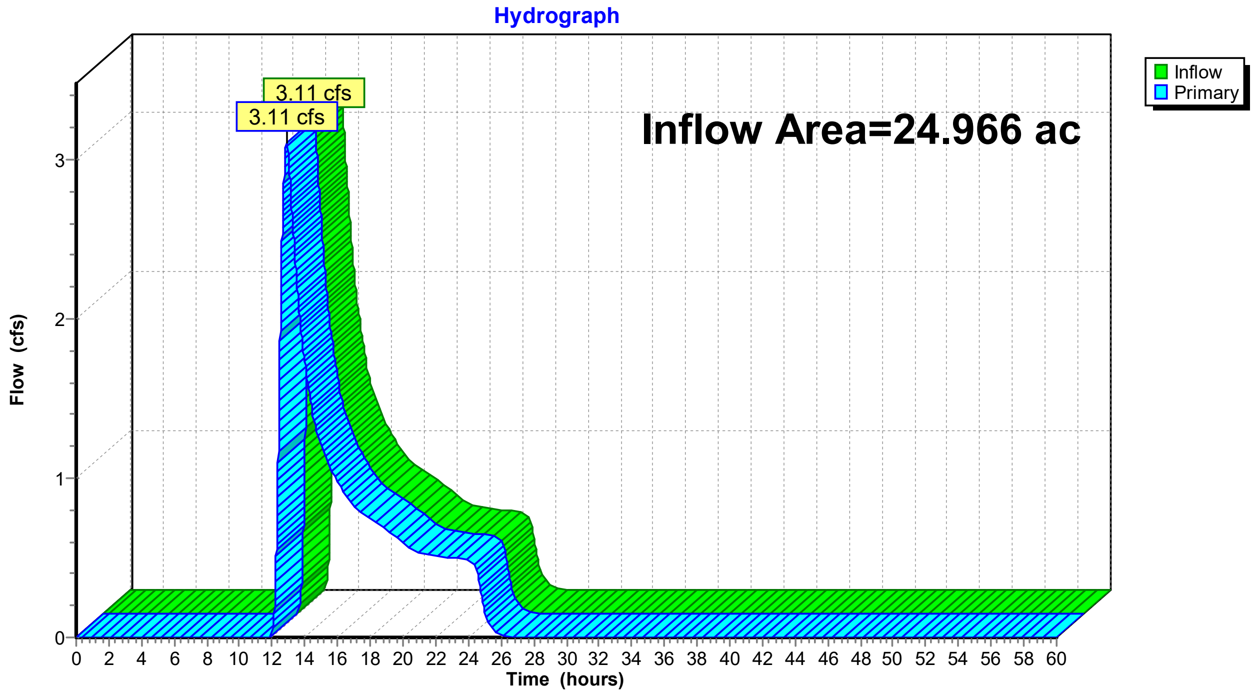


Summary for Link SP6: Study Point 6

Inflow Area = 24.966 ac, 5.81% Impervious, Inflow Depth = 0.48" for 100-Yr Storm event
Inflow = 3.11 cfs @ 12.89 hrs, Volume= 1.002 af
Primary = 3.11 cfs @ 12.89 hrs, Volume= 1.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP6: Study Point 6



Appendix P – Post-Development Subcatchment Map

LEGEND

	SUBCATCHMENT BOUNDARY
	SUBCATCHMENT SUBANALYSIS
	SOIL GROUP BOUNDARY
	Tc FLOW PATH
LOD	LIMITS OF DISTURBANCE
	EXISTING CULVERT
	SURFACE FLOW DIRECTION
	INFILTRATION TEST PITS
	APA WETLAND
	WETLAND
	FLOODPLAIN

300 0 300 600 FT

SCALE: 1" = 300'

UNDER NEW YORK STATE EDUCATION LAW ARTICLE 145 (ENGINEERING), SECTION 7209 (2), IT IS A VIOLATION OF THE LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

TRC
10 MAXWELL DRIVE
CLIFTON PARK, NY 12065

PROJECT NO: 444154

REV	DESCRIPTION	DATE	DES	CHK	APP
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
A	ISSUED FOR PERMITTING	1/2022	NAM	NAM	NAM

BWH DESIGNED
BWH DRAWN
JWH CHECKED
NAM APPROVED

PROPOSED HYDROLOGY PLAN

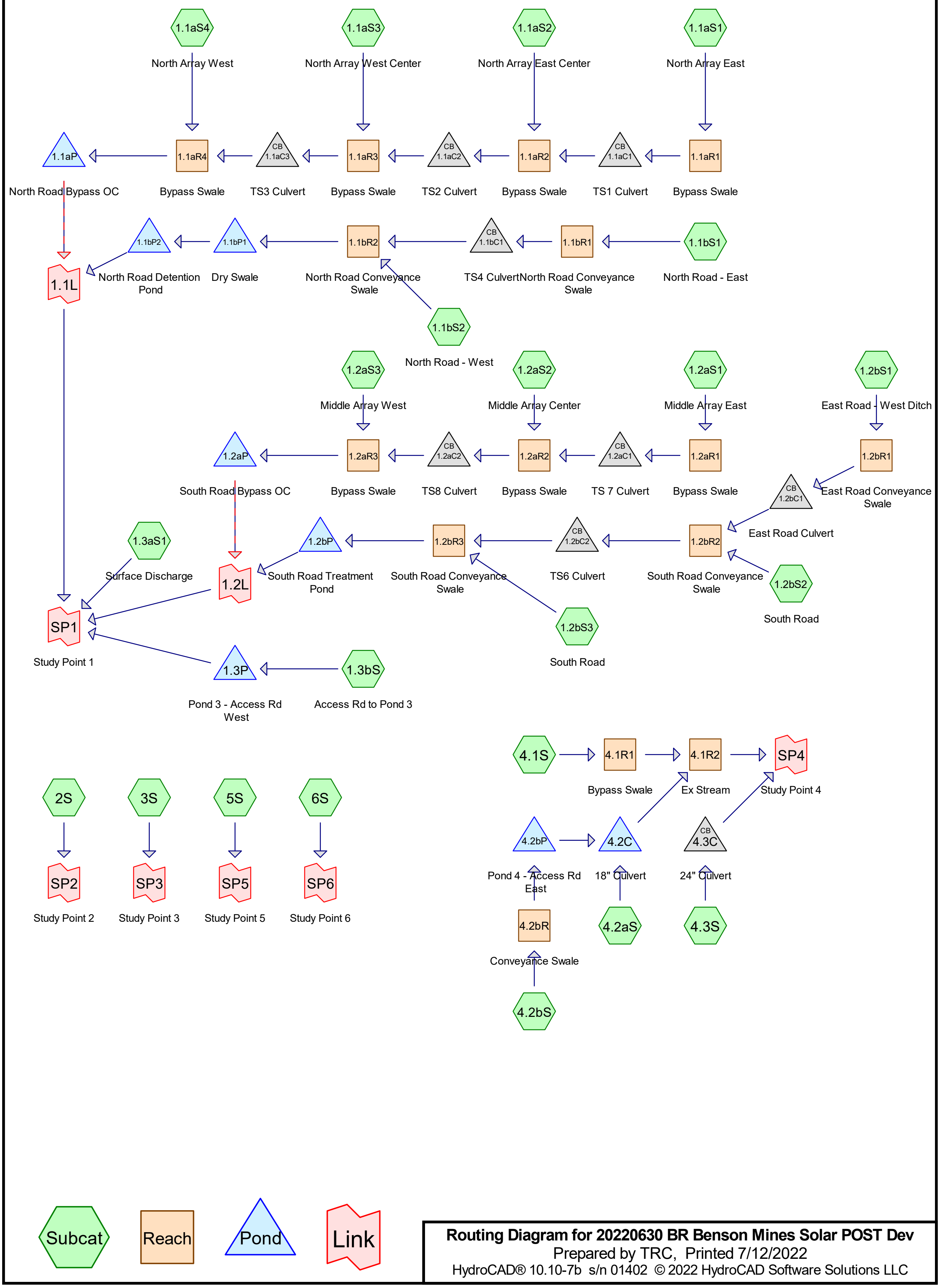
BR BENSON MINES SOLAR PROJECT
NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY
CLIFTON, ST LAWRENCE COUNTY, NEW YORK

7/21 DATE
AS NOTED SCALE

C-102

REV. -

Appendix P – Post-Development HydroCAD Model



Routing Diagram for 20220630 BR Benson Mines Solar POST Dev
Prepared by TRC, Printed 7/12/2022
HydroCAD® 10.10-7b s/n 01402 © 2022 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	WQv	Type II 24-hr		Default	24.00	1	1.00	2
2	1-Yr Storm	Type II 24-hr		Default	24.00	1	1.98	2
3	10-Yr Storm	Type II 24-hr		Default	24.00	1	3.28	2
4	100-Yr Storm	Type II 24-hr		Default	24.00	1	5.43	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.979	39	>75% Grass cover, Good, HSG A (2S, 3S)
4.721	61	>75% Grass cover, Good, HSG B (3S, 4.1S, 6S)
1.719	96	Gravel surface (1.2bS2, 1.3aS1, 4.1S, 4.2aS)
4.423	96	Gravel surface, HSG A (1.1bS1, 1.1bS2, 1.2bS1, 1.2bS3, 1.3bS, 2S, 4.2bS, 6S)
0.063	96	Gravel surface, HSG A, Redev (1.3bS)
232.790	30	Meadow, non-grazed, HSG A (1.1aS1, 1.1aS2, 1.1aS3, 1.1aS4, 1.1bS1, 1.1bS2, 1.2aS1, 1.2aS2, 1.2aS3, 1.2bS1, 1.2bS2, 1.2bS3, 1.3aS1, 1.3bS, 2S, 3S, 4.1S, 4.2aS, 4.2bS, 5S, 6S)
4.081	58	Meadow, non-grazed, HSG B (1.3aS1, 4.1S, 4.2aS, 4.3S, 6S)
25.274	71	Meadow, non-grazed, HSG C (1.3aS1)
3.158	98	Paved Roads & Rooftops (3S, 4.1S, 4.3S, 6S)
0.015	98	Roofs (1.2bS2, 1.2bS3)
0.014	98	Roofs, HSG A (1.1bS1, 1.1bS2)
81.857	30	Woods, Good, HSG A (1.3aS1, 2S, 3S, 4.1S, 4.2aS, 5S, 6S)
88.271	55	Woods, Good, HSG B (1.3aS1, 3S, 4.1S, 4.2aS, 4.3S, 6S)
13.623	70	Woods, Good, HSG C (1.3aS1)
460.988	**40**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
320.126	HSG A	1.1aS1, 1.1aS2, 1.1aS3, 1.1aS4, 1.1bS1, 1.1bS2, 1.2aS1, 1.2aS2, 1.2aS3, 1.2bS1, 1.2bS2, 1.2bS3, 1.3aS1, 1.3bS, 2S, 3S, 4.1S, 4.2aS, 4.2bS, 5S, 6S
97.073	HSG B	1.3aS1, 3S, 4.1S, 4.2aS, 4.3S, 6S
38.897	HSG C	1.3aS1
0.000	HSG D	
4.892	Other	1.2bS2, 1.2bS3, 1.3aS1, 3S, 4.1S, 4.2aS, 4.3S, 6S
460.988		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.979	4.721	0.000	0.000	0.000	5.700	>75% Grass cover, Good	2S, 3S, 4.1S, 6S
4.486	0.000	0.000	0.000	1.719	6.205	Gravel surface	1.1bS1, 1.1bS2, 1.2bS1, 1.2bS2, 1.2bS3, 1.3aS1, 1.3bS, 2S, 4.1S, 4.2aS, 4.2bS, 6S
232.790	4.081	25.274	0.000	0.000	262.145	Meadow, non-grazed	1.1aS1, 1.1aS2, 1.1aS3, 1.1aS4, 1.1bS1, 1.1bS2, 1.2aS1, 1.2aS2, 1.2aS3, 1.2bS1, 1.2bS2, 1.2bS3, 1.3aS1, 1.3bS, 2S, 3S, 4.1S, 4.2aS, 4.2bS, 4.3S, 5S, 6S
0.000	0.000	0.000	0.000	3.158	3.158	Paved Roads & Rooftops	3S, 4.1S, 4.3S, 6S
0.014	0.000	0.000	0.000	0.015	0.029	Roofs	1.1bS1, 1.1bS2, 1.2bS2, 1.2bS3
81.857	88.271	13.623	0.000	0.000	183.751	Woods, Good	1.3aS1, 2S, 3S, 4.1S, 4.2aS, 4.3S, 5S, 6S
320.126	**97.073**	**38.897**	**0.000**	**4.892**	**460.988**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1.1aC1	1,487.56	1,486.80	47.0	0.0162	0.012	36.3	22.5	0.0
2	1.1aC2	1,470.80	1,469.57	47.0	0.0262	0.012	48.0	24.0	0.0
3	1.1aC3	1,449.55	1,447.64	47.2	0.0405	0.012	60.0	24.0	0.0
4	1.1bC1	1,449.50	1,447.27	45.9	0.0486	0.012	0.0	18.0	0.0
5	1.2aC1	1,444.22	1,443.21	47.0	0.0215	0.012	36.0	24.0	0.0
6	1.2aC2	1,431.65	1,431.11	47.5	0.0114	0.012	60.0	24.0	0.0
7	1.2bC1	1,454.39	1,453.67	41.6	0.0173	0.012	0.0	15.0	0.0
8	1.2bC2	1,443.51	1,442.84	44.3	0.0151	0.012	0.0	18.0	0.0
9	4.2C	1,431.83	1,431.18	44.0	0.0148	0.012	0.0	18.0	0.0
10	4.3C	1,431.35	1,429.87	55.8	0.0265	0.012	0.0	24.0	0.0

Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1.1aS1: North Array East Runoff Area=5.874 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=788' Tc=18.8 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS2: North Array East Runoff Area=8.467 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=931' Tc=21.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS3: North Array West Runoff Area=5.792 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,031' Tc=19.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS4: North Array West Runoff Area=12.825 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,562' Tc=26.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1bS1: North Road - East Runoff Area=1.333 ac 0.53% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=71 Runoff=0.00 cfs 0.001 af

Subcatchment 1.1bS2: North Road - West Runoff Area=0.651 ac 1.08% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=68 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS1: Middle Array East Runoff Area=7.876 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=865' Tc=19.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS2: Middle Array Center Runoff Area=8.911 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=825' Tc=18.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS3: Middle Array West Runoff Area=5.500 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=18.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2bS1: East Road - West Runoff Area=0.727 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=67 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2bS2: South Road Runoff Area=0.854 ac 0.47% Impervious Runoff Depth=0.00"
Flow Length=308' Tc=13.7 min CN=58 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2bS3: South Road Runoff Area=0.815 ac 1.35% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=71 Runoff=0.00 cfs 0.001 af

Subcatchment 1.3aS1: Surface Discharge Runoff Area=279.312 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=6,771' Tc=201.7 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 1.3bS: Access Rd to Pond 3 Runoff Area=0.695 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=51 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Runoff Area=11.056 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=2,342' Tc=36.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 3S: Runoff Area=15.648 ac 0.56% Impervious Runoff Depth=0.00"
Flow Length=886' Tc=12.7 min CN=40 Runoff=0.00 cfs 0.000 af

Subcatchment 4.1S: Runoff Area=11.663 ac 2.80% Impervious Runoff Depth=0.00"
Flow Length=845' Tc=15.8 min CN=45 Runoff=0.00 cfs 0.000 af

Subcatchment 4.2aS: Runoff Area=27.117 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,640' Tc=38.9 min CN=51 Runoff=0.00 cfs 0.000 af

Subcatchment 4.2bS: Runoff Area=0.470 ac 0.00% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=72 Runoff=0.00 cfs 0.000 af

Subcatchment 4.3S: Runoff Area=25.466 ac 5.08% Impervious Runoff Depth=0.00"
Flow Length=2,280' Tc=36.5 min CN=57 Runoff=0.00 cfs 0.000 af

Subcatchment 5S: Runoff Area=4.970 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,180' Tc=17.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 6S: Runoff Area=24.966 ac 5.81% Impervious Runoff Depth=0.00"
Flow Length=1,961' Tc=60.1 min CN=43 Runoff=0.00 cfs 0.000 af

Reach 1.1aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.0' S=0.0108 '/' Capacity=56.37 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.4' S=0.0284 '/' Capacity=91.27 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.5' S=0.0352 '/' Capacity=101.68 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR4: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.5' S=0.0362 '/' Capacity=103.04 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1bR1: North Road Conveyance Avg. Flow Depth=0.00' Max Vel=0.47 fps Inflow=0.00 cfs 0.001 af
n=0.035 L=1,733.0' S=0.0240 '/' Capacity=111.65 cfs Outflow=0.00 cfs 0.001 af

Reach 1.1bR2: North Road Conveyance Avg. Flow Depth=0.00' Max Vel=0.60 fps Inflow=0.00 cfs 0.001 af
n=0.035 L=593.3' S=0.0380 '/' Capacity=140.36 cfs Outflow=0.00 cfs 0.001 af

Reach 1.2aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=524.2' S=0.0188 '/' Capacity=74.30 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=556.0' S=0.0204 '/' Capacity=77.47 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=249.0' S=0.0153 '/' Capacity=81.84 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2bR1: East Road Conveyance Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=731.4' S=0.0456 '/' Capacity=79.22 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2bR2: South Road Conveyance Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=604.5' S=0.0177 '/' Capacity=95.76 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2bR3: South Road Conveyance Avg. Flow Depth=0.00' Max Vel=0.42 fps Inflow=0.00 cfs 0.001 af
n=0.035 L=755.9' S=0.0187 '/' Capacity=98.64 cfs Outflow=0.00 cfs 0.001 af

Reach 4.1R1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=570.0' S=0.0303 '/' Capacity=54.88 cfs Outflow=0.00 cfs 0.000 af

Reach 4.1R2: Ex Stream Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=740.0' S=0.0099 '/' Capacity=588.81 cfs Outflow=0.00 cfs 0.000 af

Reach 4.2bR: Conveyance Swale Avg. Flow Depth=0.00' Max Vel=0.53 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=565.0' S=0.0432 '/' Capacity=77.09 cfs Outflow=0.00 cfs 0.000 af

Pond 1.1aC1: TS1 Culvert Peak Elev=1,487.56' Inflow=0.00 cfs 0.000 af
36.3" x 22.5", R=18.8"/51.0" Pipe Arch Culvert n=0.012 L=47.0' S=0.0162 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC2: TS2 Culvert Peak Elev=1,470.80' Inflow=0.00 cfs 0.000 af
48.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0262 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC3: TS3 Culvert Peak Elev=1,449.55' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.2' S=0.0405 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aP: North Road Bypass OC Peak Elev=1,426.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.1bC1: TS4 Culvert Peak Elev=1,449.51' Inflow=0.00 cfs 0.001 af
18.0" Round Culvert n=0.012 L=45.9' S=0.0486 '/' Outflow=0.00 cfs 0.001 af

Pond 1.1bP1: Dry Swale Peak Elev=1,425.32' Storage=17 cf Inflow=0.00 cfs 0.001 af
Discarded=0.00 cfs 0.001 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.001 af

Pond 1.1bP2: North Road Detention Pond Peak Elev=1,421.50' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.2aC1: TS 7 Culvert Peak Elev=1,444.22' Inflow=0.00 cfs 0.000 af
36.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0215 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aC2: TS8 Culvert Peak Elev=1,431.65' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.5' S=0.0114 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aP: South Road Bypass OC Peak Elev=1,424.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.2bC1: East Road Culvert Peak Elev=1,454.39' Inflow=0.00 cfs 0.000 af
15.0" Round Culvert n=0.012 L=41.6' S=0.0173 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2bC2: TS6 Culvert Peak Elev=1,443.51' Inflow=0.00 cfs 0.000 af
18.0" Round Culvert n=0.012 L=44.3' S=0.0151 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2bP: South Road Treatment Pond Peak Elev=1,424.00' Storage=0.000 af Inflow=0.00 cfs 0.001 af
Discarded=0.00 cfs 0.001 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.001 af

Pond 1.3P: Pond 3 - Access Rd West Peak Elev=1,456.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 4.2bP: Pond 4 - Access Rd East Peak Elev=1,445.50' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 4.2C: 18" Culvert Peak Elev=1,431.50' Storage=0 cf Inflow=0.00 cfs 0.000 af
18.0" Round Culvert n=0.012 L=44.0' S=0.0148 '/' Outflow=0.00 cfs 0.000 af

Pond 4.3C: 24" Culvert Peak Elev=1,431.35' Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Link 1.1L: Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link 1.2L: Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP1: Study Point 1 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP2: Study Point 2 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP3: Study Point 3 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP4: Study Point 4 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP5: Study Point 5 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link SP6: Study Point 6 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 460.988 ac Runoff Volume = 0.002 af Average Runoff Depth = 0.00"
99.31% Pervious = 457.801 ac 0.69% Impervious = 3.187 ac

Summary for Subcatchment 1.1aS1: North Array East

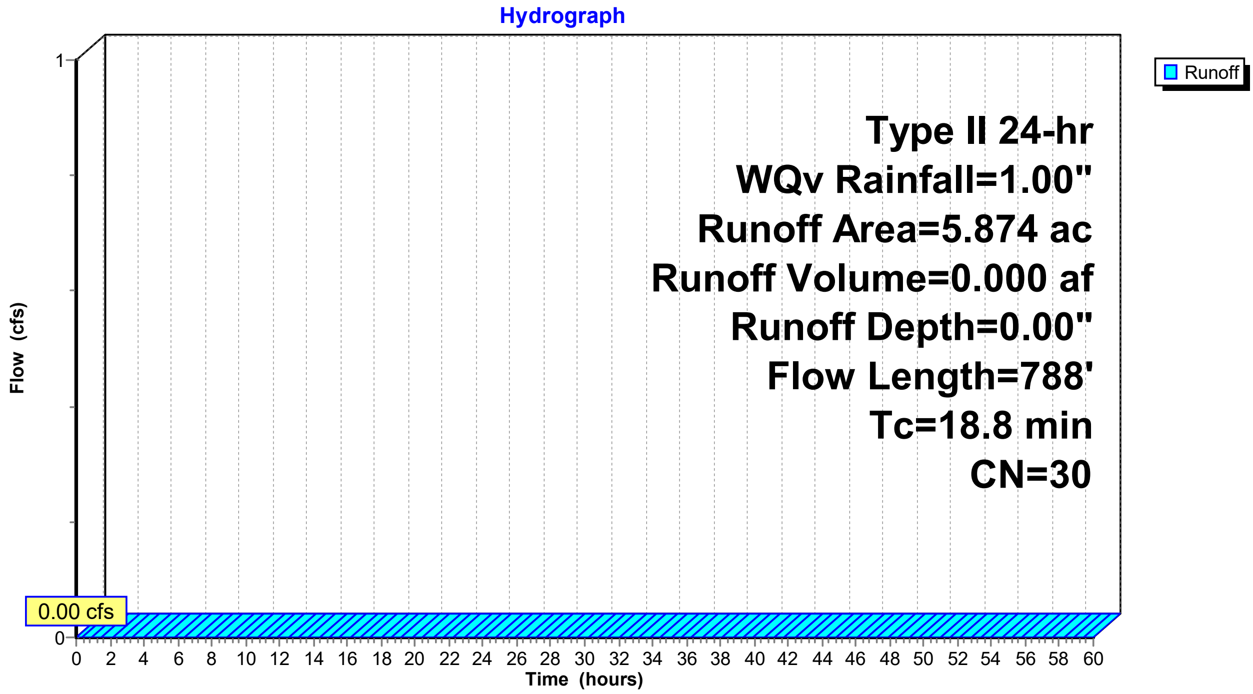
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
5.874	30	Meadow, non-grazed, HSG A
5.874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0499	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.1	688	0.0526	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.8	788	Total			

Subcatchment 1.1aS1: North Array East



Summary for Subcatchment 1.1aS2: North Array East Center

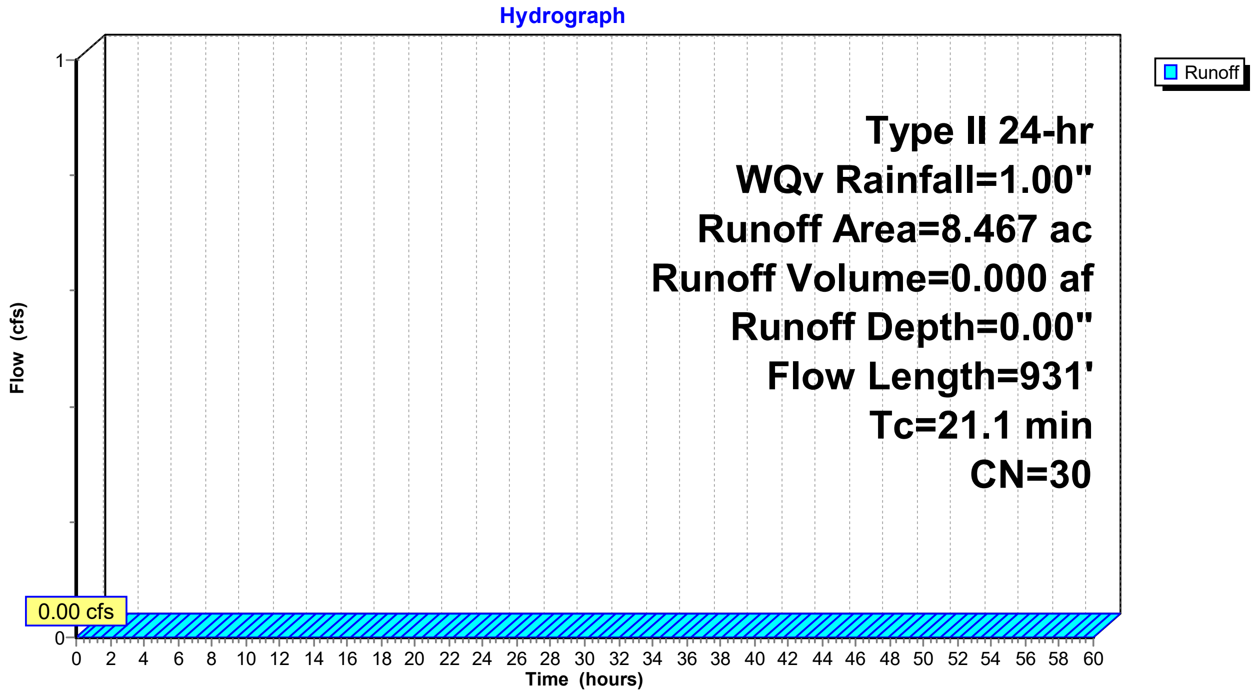
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
8.467	30	Meadow, non-grazed, HSG A
8.467		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0476	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.2	831	0.0463	1.51		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.1	931	Total			

Subcatchment 1.1aS2: North Array East Center



Summary for Subcatchment 1.1aS3: North Array West Center

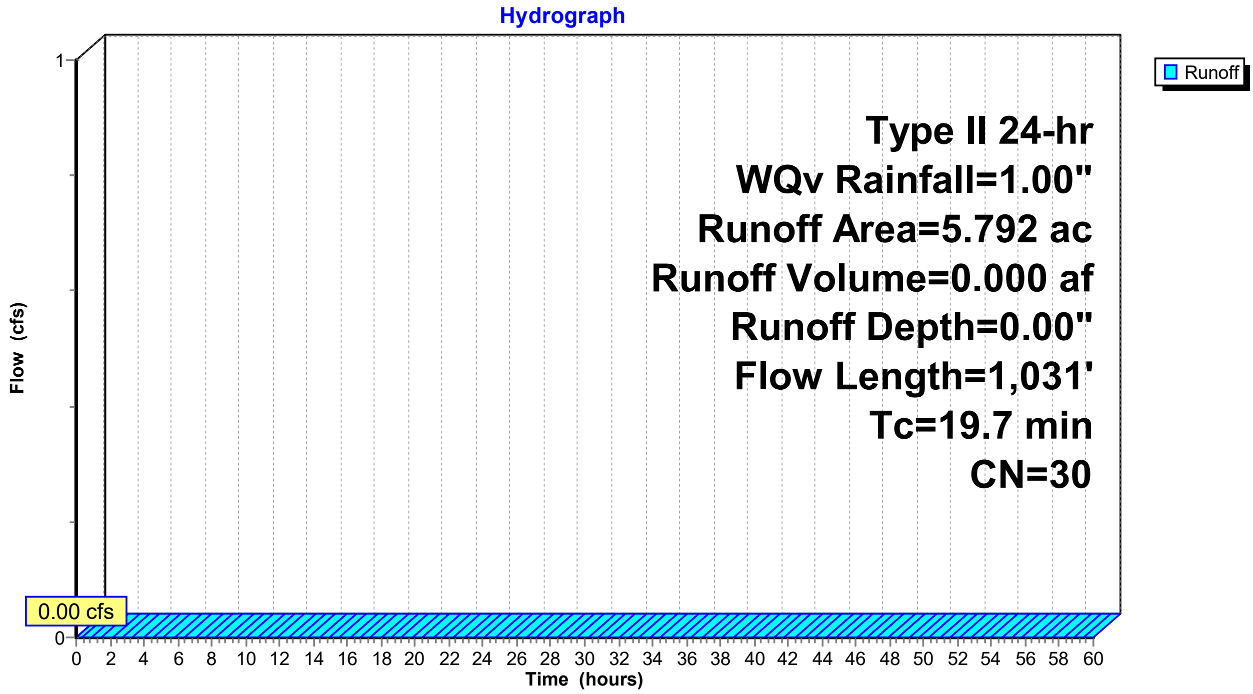
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
5.792	30	Meadow, non-grazed, HSG A
5.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0618	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.0	931	0.0601	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	1,031	Total			

Subcatchment 1.1aS3: North Array West Center



Summary for Subcatchment 1.1aS4: North Array West

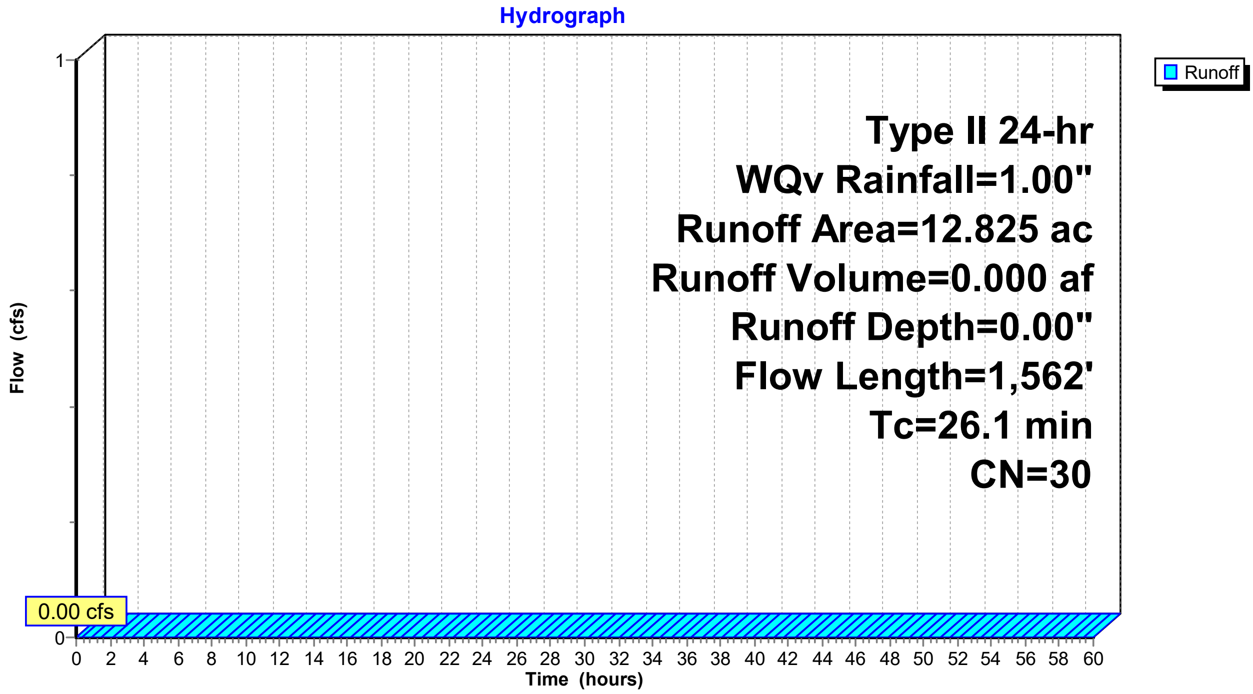
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR4 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
12.825	30	Meadow, non-grazed, HSG A
12.825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0560	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
15.0	1,462	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.1	1,562	Total			

Subcatchment 1.1aS4: North Array West



Summary for Subcatchment 1.1bS1: North Road - East

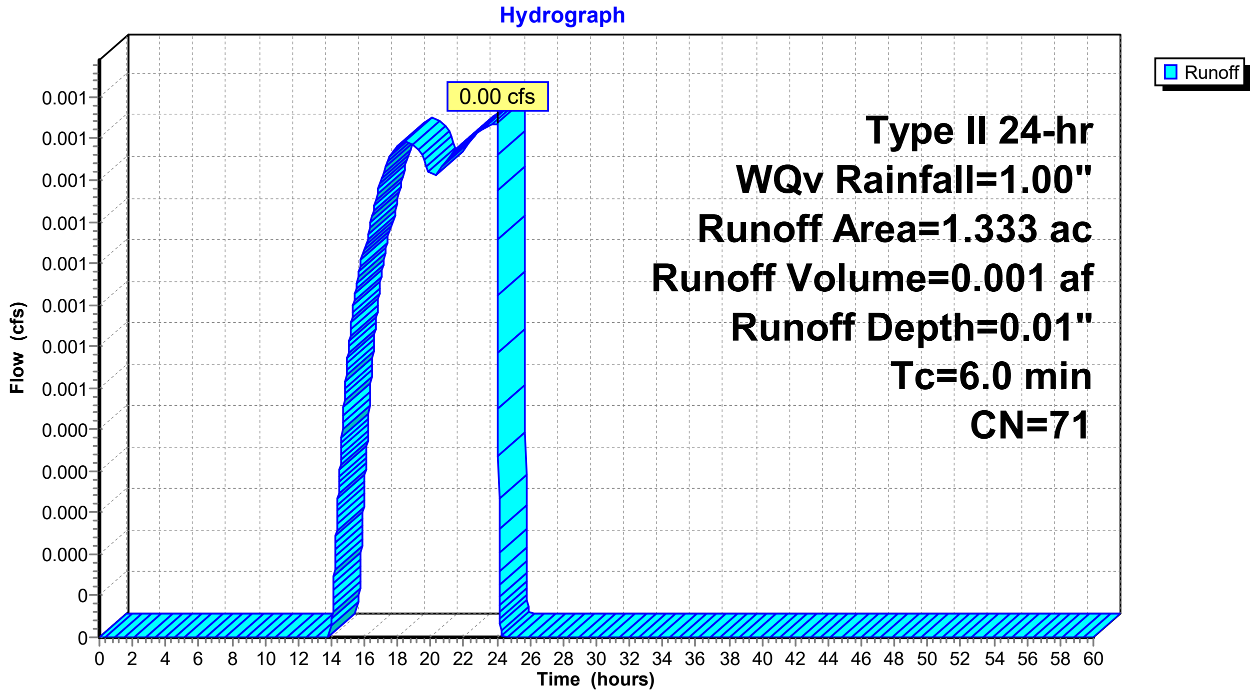
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af, Depth= 0.01"
Routed to Reach 1.1bR1 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
0.507	30	Meadow, non-grazed, HSG A
0.819	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
1.333	71	Weighted Average
1.326		99.47% Pervious Area
0.007		0.53% Impervious Area

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

Subcatchment 1.1bS1: North Road - East



Summary for Subcatchment 1.1bS2: North Road - West

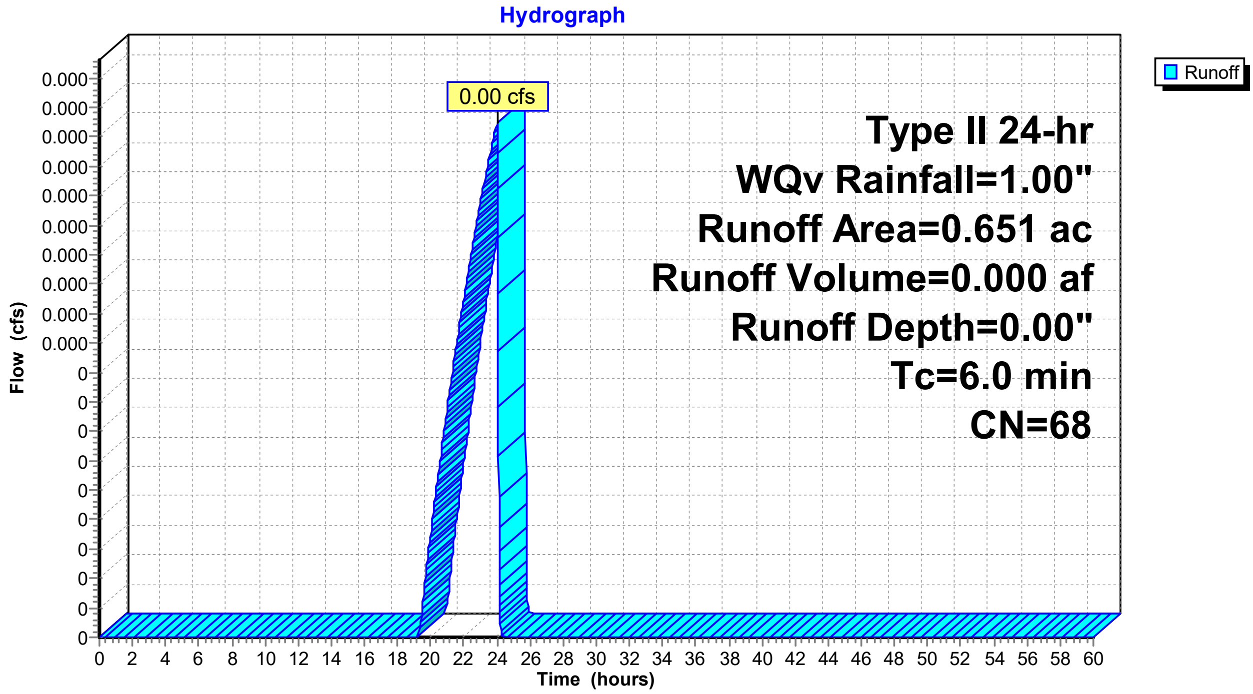
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
0.279	30	Meadow, non-grazed, HSG A
0.365	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
0.651	68	Weighted Average
0.644		98.92% Pervious Area
0.007		1.08% Impervious Area

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

Subcatchment 1.1bS2: North Road - West



Summary for Subcatchment 1.2aS1: Middle Array East

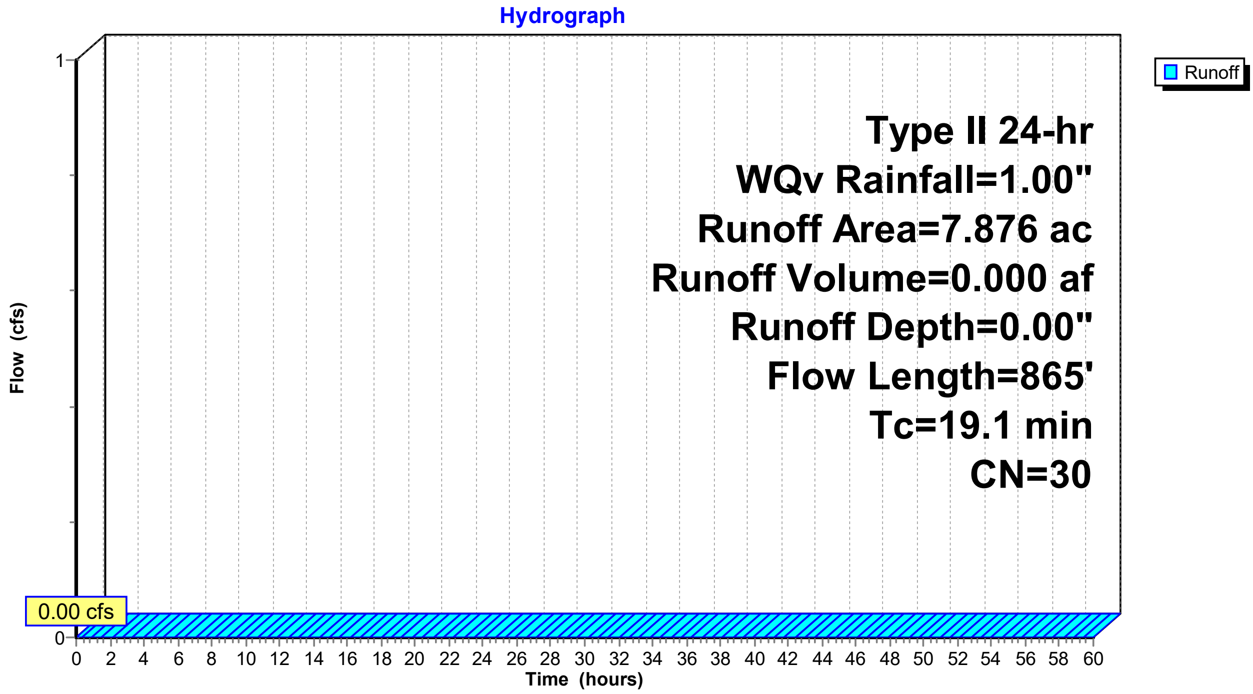
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
7.876	30	Meadow, non-grazed, HSG A
7.876		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0628	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.5	765	0.0459	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.1	865	Total			

Subcatchment 1.2aS1: Middle Array East



Summary for Subcatchment 1.2aS2: Middle Array Center

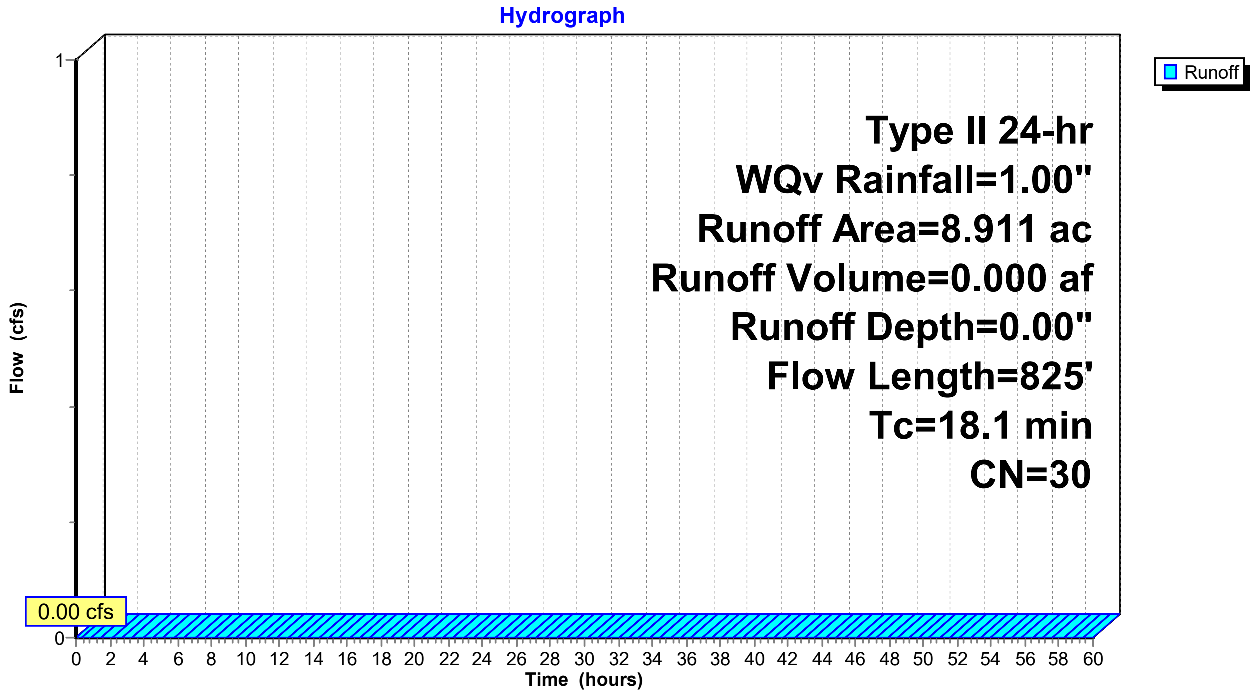
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
8.911	30	Meadow, non-grazed, HSG A
8.911		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0607	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.3	725	0.0559	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.1	825	Total			

Subcatchment 1.2aS2: Middle Array Center



Summary for Subcatchment 1.2aS3: Middle Array West

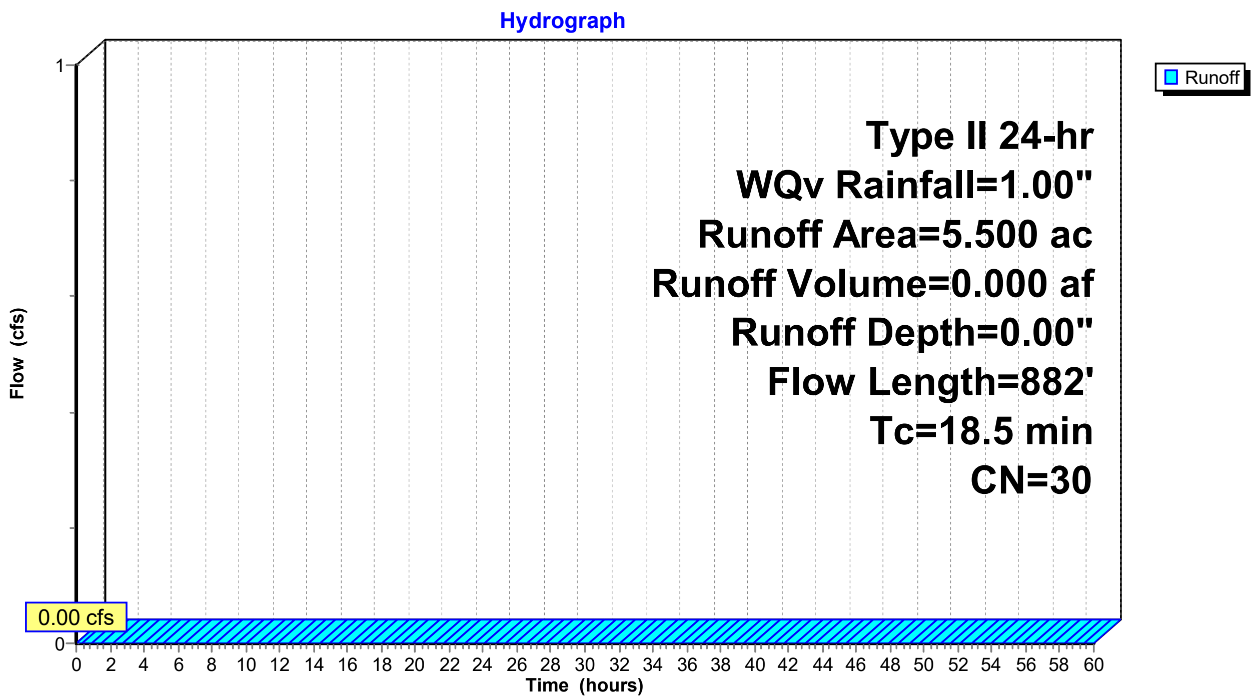
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
5.500	30	Meadow, non-grazed, HSG A
5.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.0660	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.1	782	0.0529	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.5	882	Total			

Subcatchment 1.2aS3: Middle Array West



Summary for Subcatchment 1.2bS1: East Road - West Ditch

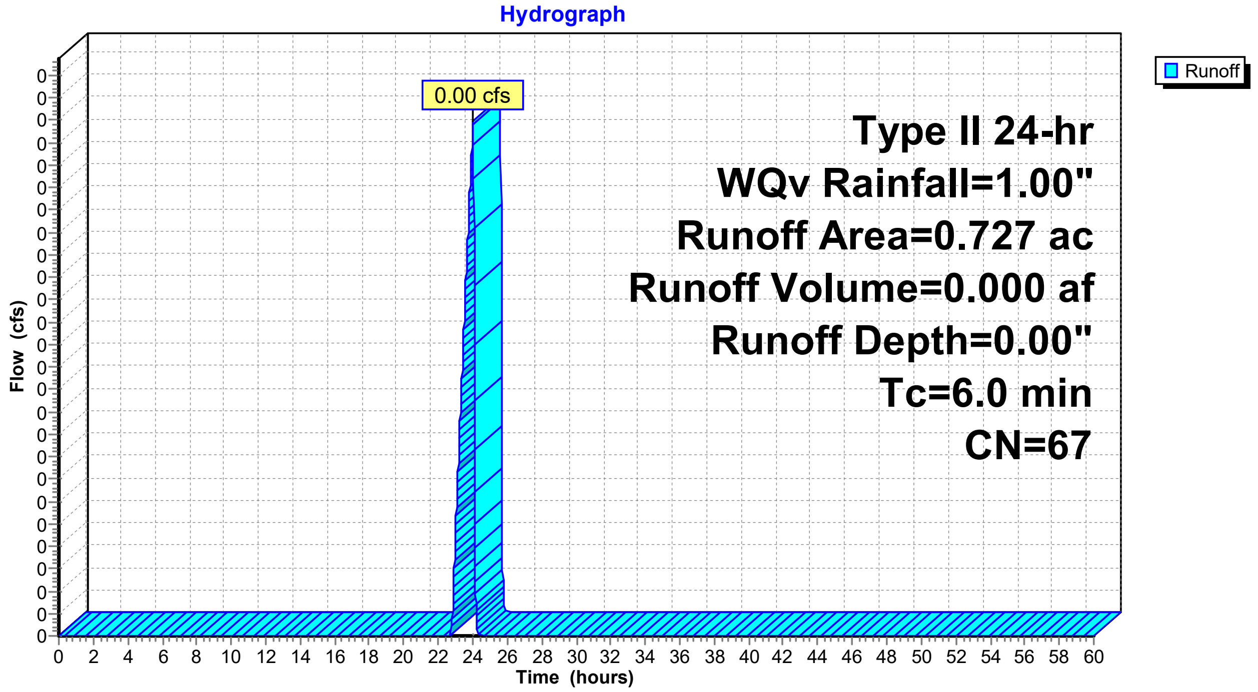
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2bR1 : East Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
0.410	96	Gravel surface, HSG A
0.317	30	Meadow, non-grazed, HSG A
0.727	67	Weighted Average
0.727		100.00% Pervious Area

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

Subcatchment 1.2bS1: East Road - West Ditch



Summary for Subcatchment 1.2bS2: South Road

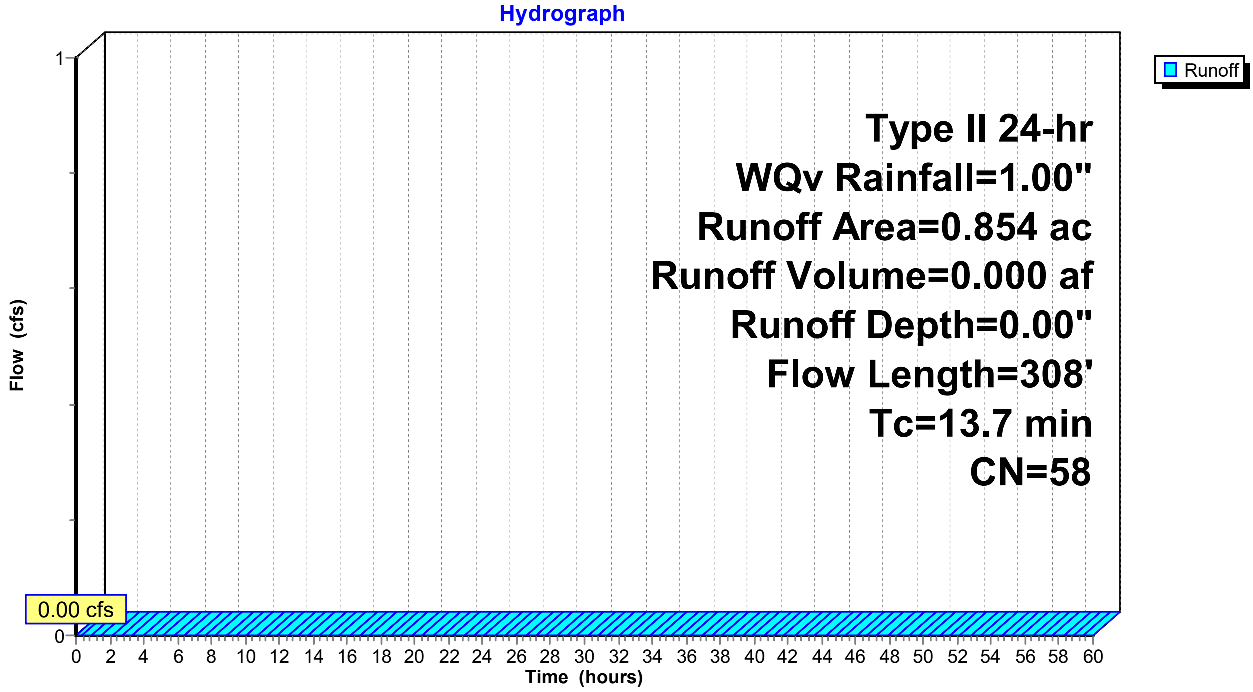
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
	0.498	30	Meadow, non-grazed, HSG A
*	0.352	96	Gravel surface
*	0.004	98	Roofs
	0.854	58	Weighted Average
	0.850		99.53% Pervious Area
	0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0516	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
0.4	25	0.0310	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
5.9	40	0.0429	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.4	208	0.0442	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	308	Total			

Subcatchment 1.2bS2: South Road



Summary for Subcatchment 1.2bS3: South Road

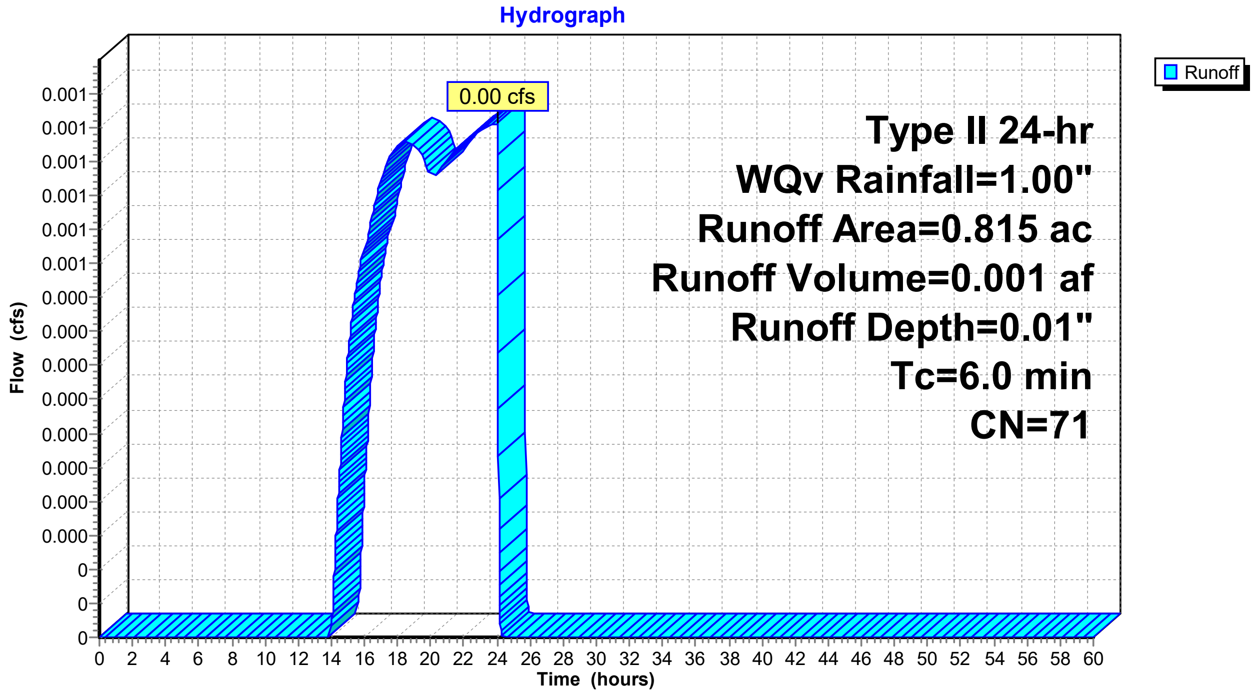
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af, Depth= 0.01"
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
	0.313	30	Meadow, non-grazed, HSG A
	0.491	96	Gravel surface, HSG A
*	0.011	98	Roofs
	0.815	71	Weighted Average
	0.804		98.65% Pervious Area
	0.011		1.35% Impervious Area

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

Subcatchment 1.2bS3: South Road



Summary for Subcatchment 1.3aS1: Surface Discharge

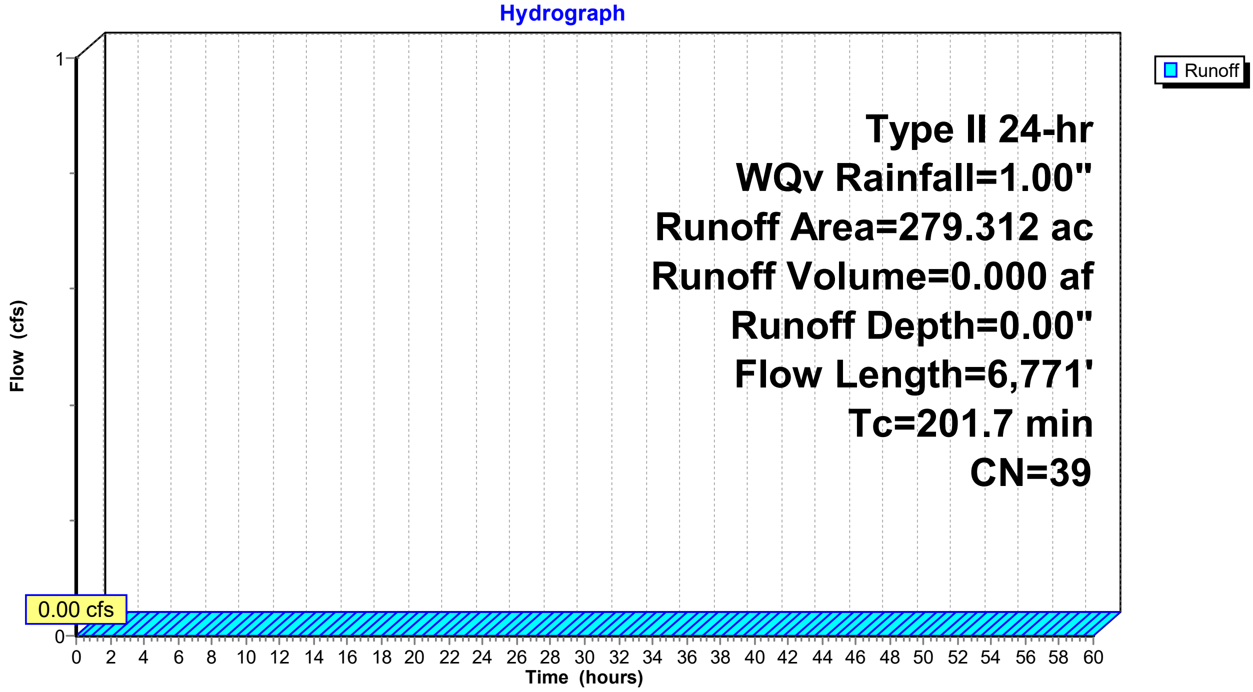
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	0.754	96	Gravel surface
	144.649	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	25.274	71	Meadow, non-grazed, HSG C
	61.692	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	13.623	70	Woods, Good, HSG C
	279.312	39	Weighted Average
	279.312		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	189	0.0157	3.84	76.82	**Channel Flow, Rerouted Stream** Area= 20.0 sf Perim= 32.6' r= 0.61' n= 0.035 Earth, dense weeds
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
201.7	6,771	Total			

Subcatchment 1.3aS1: Surface Discharge



Summary for Subcatchment 1.3bS: Access Rd to Pond 3

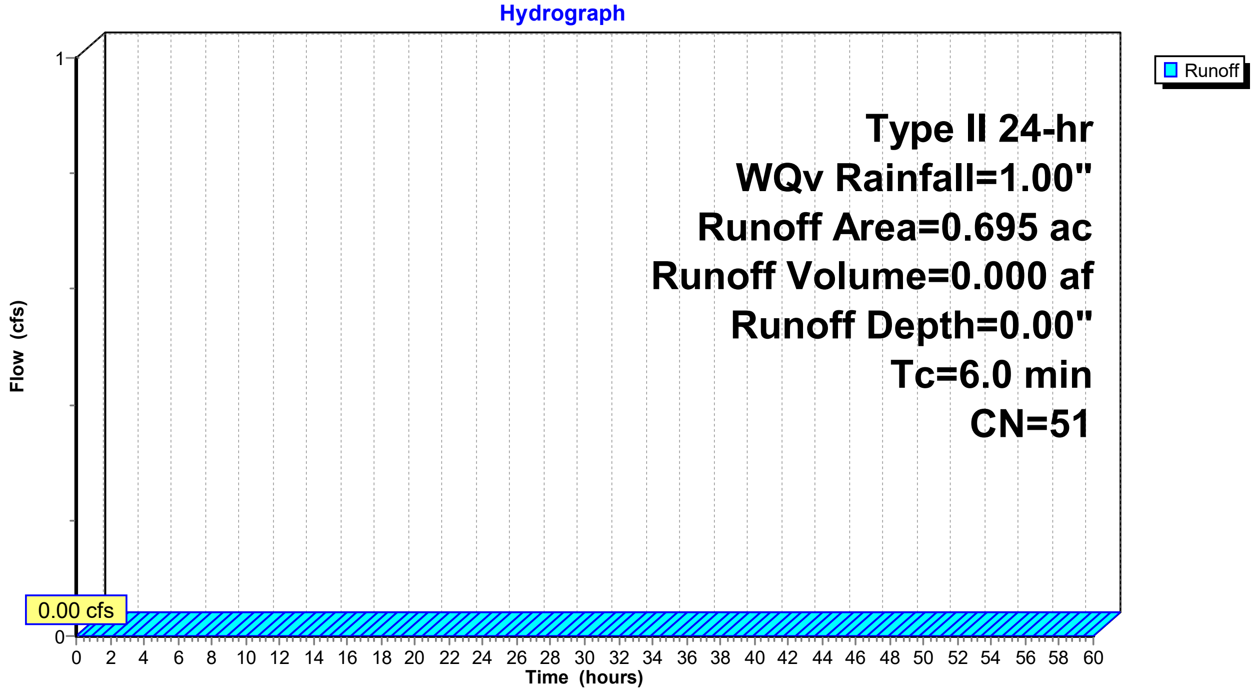
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond 1.3P : Pond 3 - Access Rd West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
	0.473	30	Meadow, non-grazed, HSG A
*	0.063	96	Gravel surface, HSG A, Redev
*	0.159	96	Gravel surface, HSG A
	0.695	51	Weighted Average
	0.695		100.00% Pervious Area

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

Subcatchment 1.3bS: Access Rd to Pond 3



Summary for Subcatchment 2S:

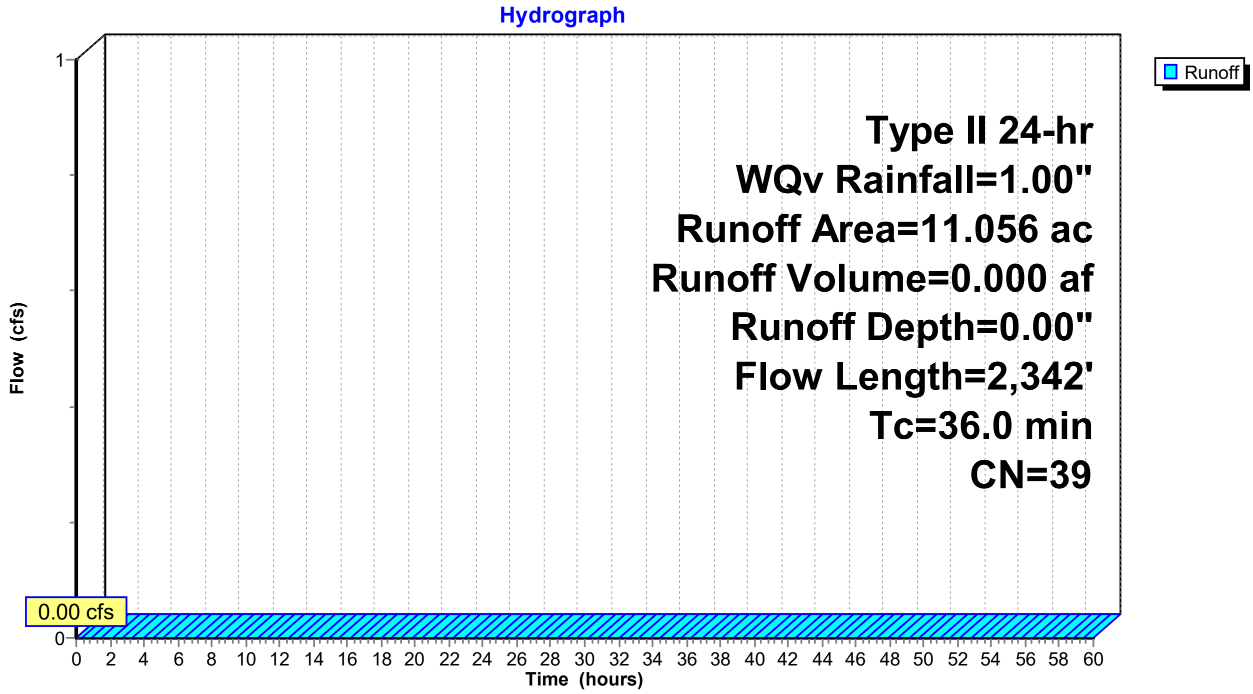
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
1.417	96	Gravel surface, HSG A
0.573	39	>75% Grass cover, Good, HSG A
6.530	30	Meadow, non-grazed, HSG A
2.536	30	Woods, Good, HSG A
11.056	39	Weighted Average
11.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0624	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.7	614	0.0535	3.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	1,184	0.0543	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	115	0.0407	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	68	0.1443	1.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	261	0.0118	0.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.0	2,342	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

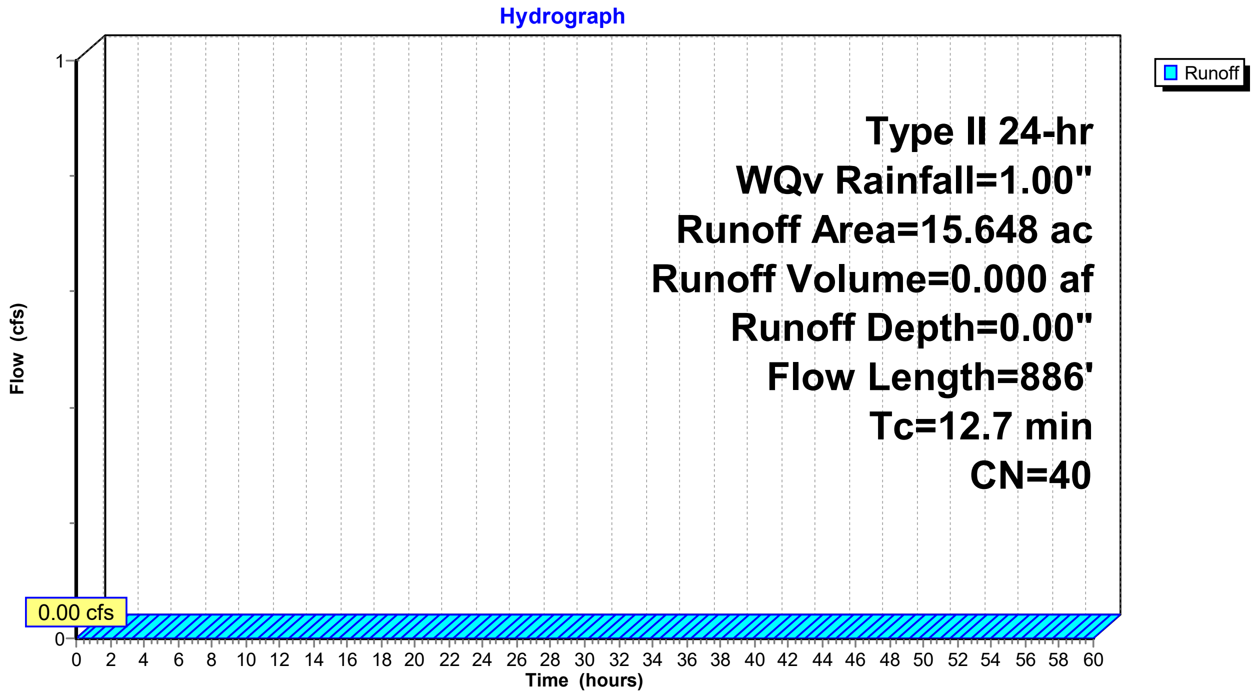
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	0.088	98	Paved Roads & Rooftops
	0.406	39	>75% Grass cover, Good, HSG A
	2.011	61	>75% Grass cover, Good, HSG B
	5.525	30	Meadow, non-grazed, HSG A
	4.276	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	15.648	40	Weighted Average
	15.560		99.44% Pervious Area
	0.088		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	52	0.0937	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.7	886	Total			

Subcatchment 3S:



Summary for Subcatchment 4.1S:

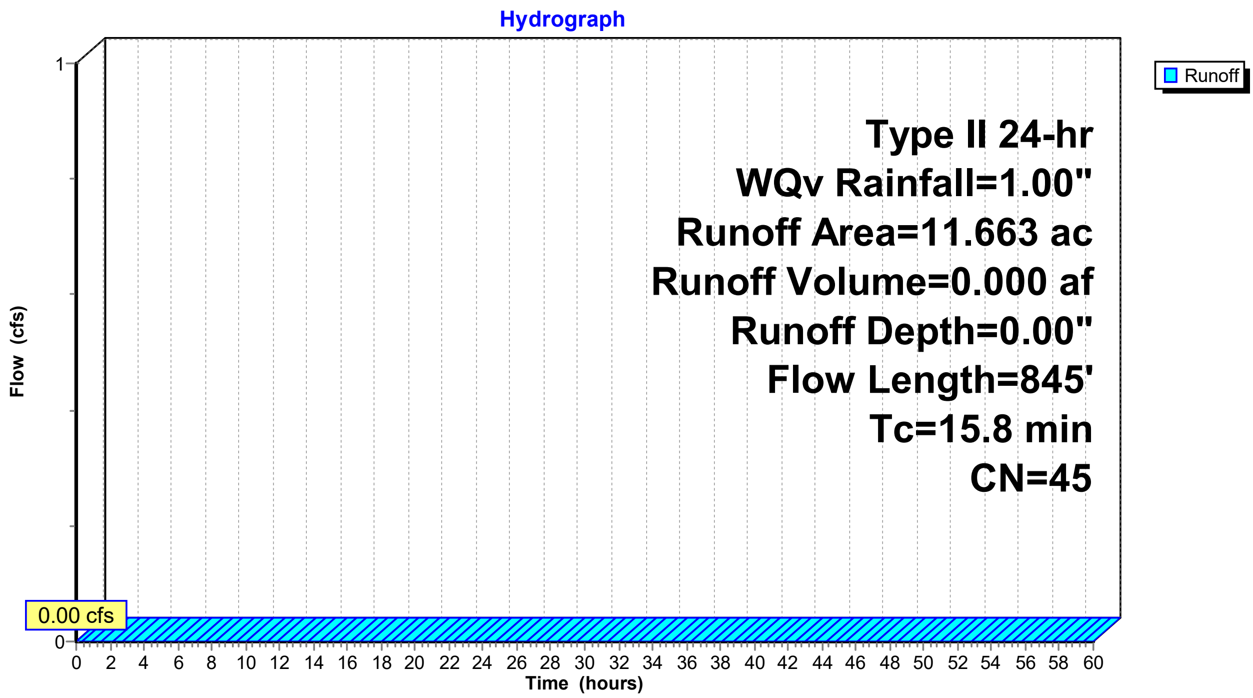
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 4.1R1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	0.327	98	Paved Roads & Rooftops
*	0.375	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	2.544	30	Meadow, non-grazed, HSG A
	0.560	58	Meadow, non-grazed, HSG B
	3.605	30	Woods, Good, HSG A
*	4.087	55	Woods, Good, HSG B
	11.663	45	Weighted Average
	11.336		97.20% Pervious Area
	0.327		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0430	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
2.6	360	0.1077	2.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	385	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.8	845	Total			

Subcatchment 4.1S:



Summary for Subcatchment 4.2aS:

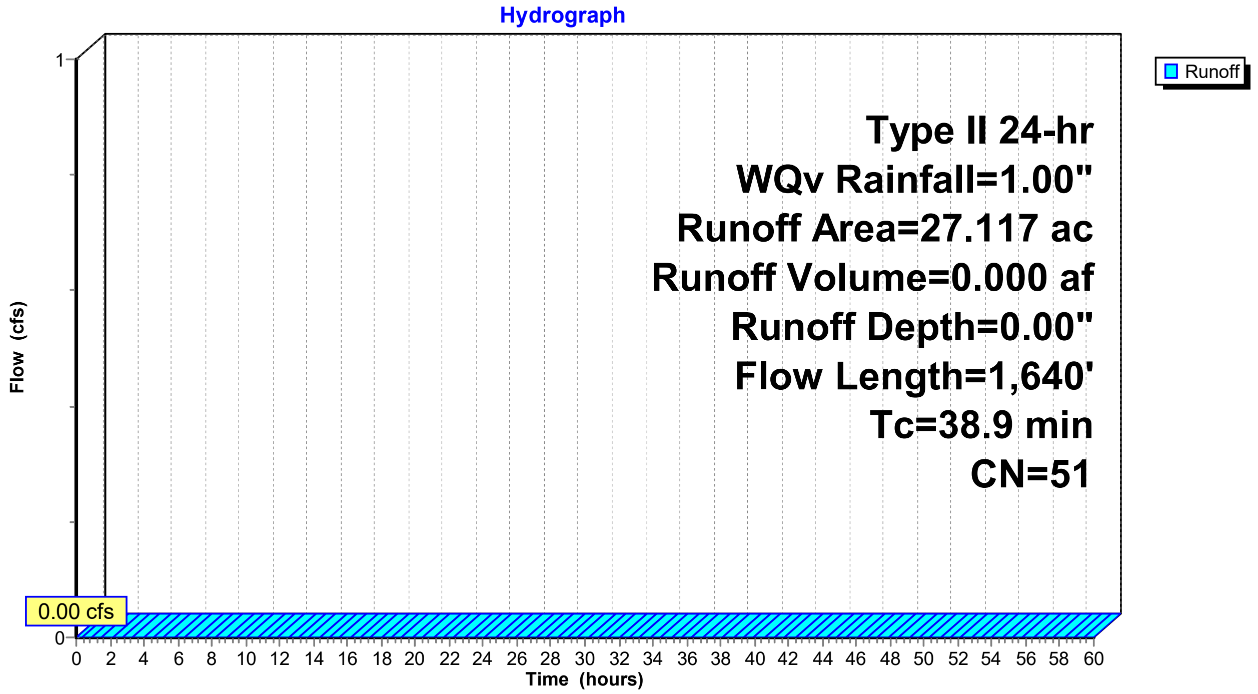
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond 4.2C : 18" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	0.238	96	Gravel surface
	4.086	30	Meadow, non-grazed, HSG A
	0.384	58	Meadow, non-grazed, HSG B
	0.977	30	Woods, Good, HSG A
	21.432	55	Woods, Good, HSG B
	27.117	51	Weighted Average
	27.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	662	0.0144	0.84		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	1,640	Total			

Subcatchment 4.2aS:



Summary for Subcatchment 4.2bS:

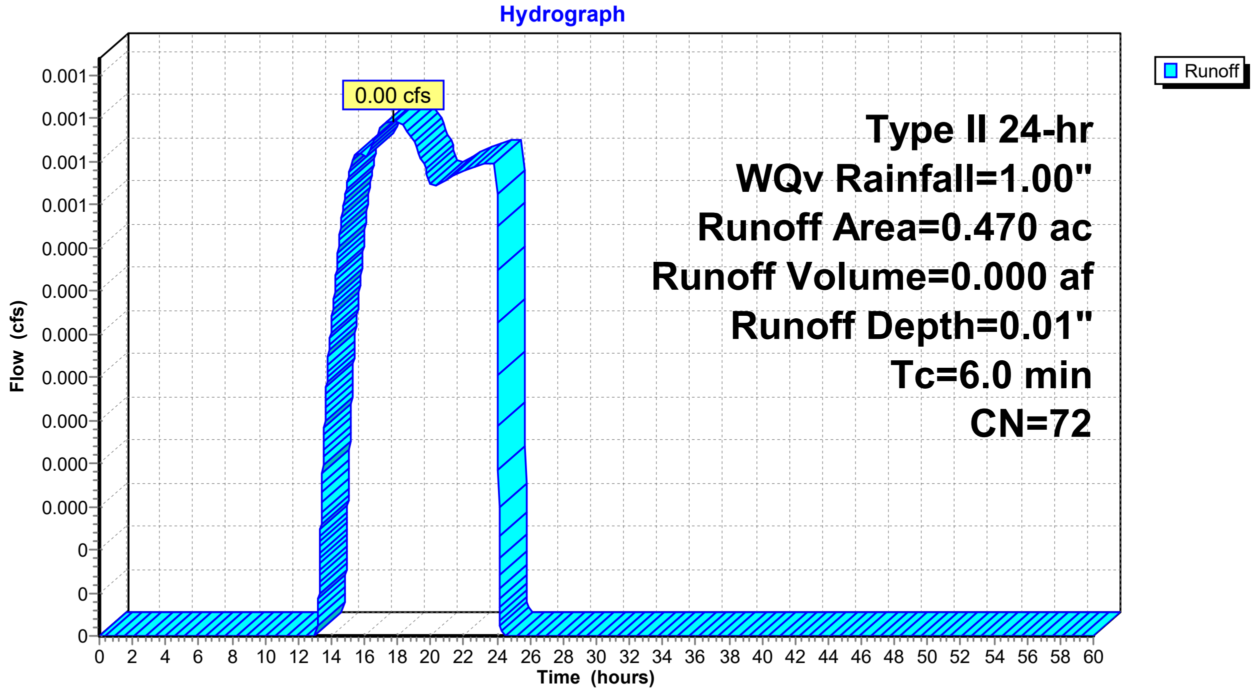
Runoff = 0.00 cfs @ 17.70 hrs, Volume= 0.000 af, Depth= 0.01"
Routed to Reach 4.2bR : Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
0.296	96	Gravel surface, HSG A
0.174	30	Meadow, non-grazed, HSG A
0.470	72	Weighted Average
0.470		100.00% Pervious Area

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

Subcatchment 4.2bS:



Summary for Subcatchment 4.3S:

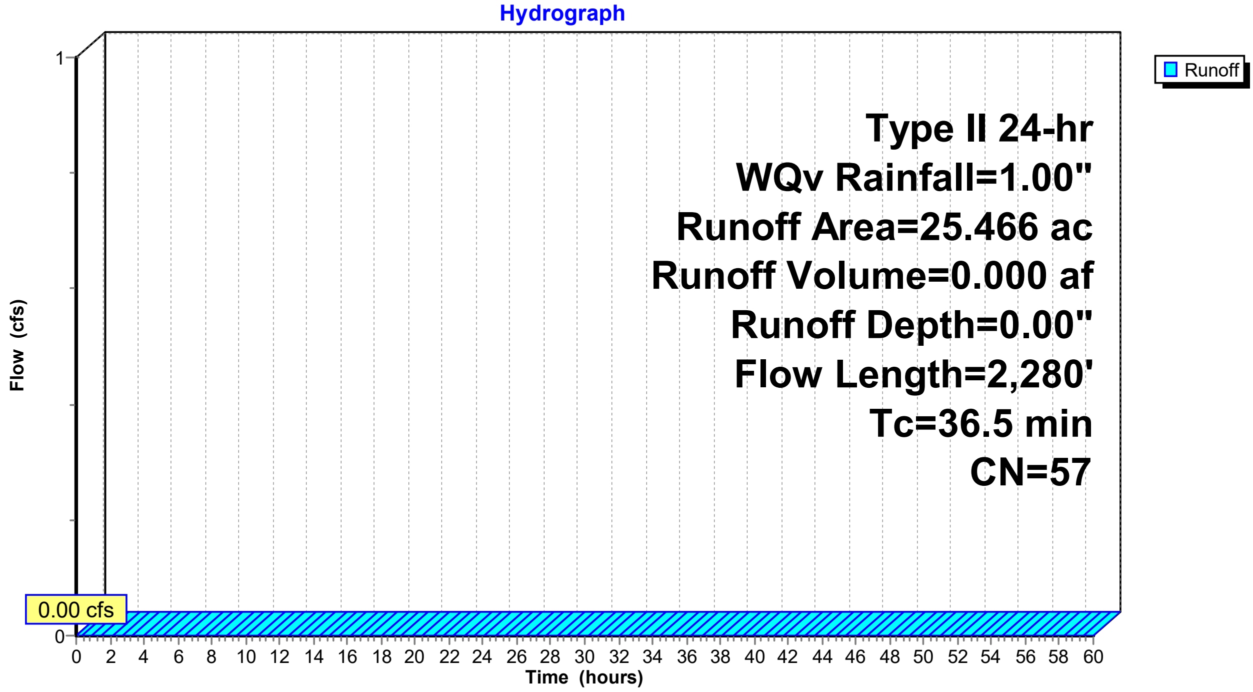
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond 4.3C : 24" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	1.293	98	Paved Roads & Rooftops
	1.783	58	Meadow, non-grazed, HSG B
	22.390	55	Woods, Good, HSG B
	25.466	57	Weighted Average
	24.173		94.92% Pervious Area
	1.293		5.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0634	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
17.8	1,368	0.0656	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	38	0.3960	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	774	0.0281	4.70	109.09	**Channel Flow,** Area= 23.2 sf Perim= 43.2' r= 0.54' n= 0.035
36.5	2,280	Total			

Subcatchment 4.3S:



Summary for Subcatchment 5S:

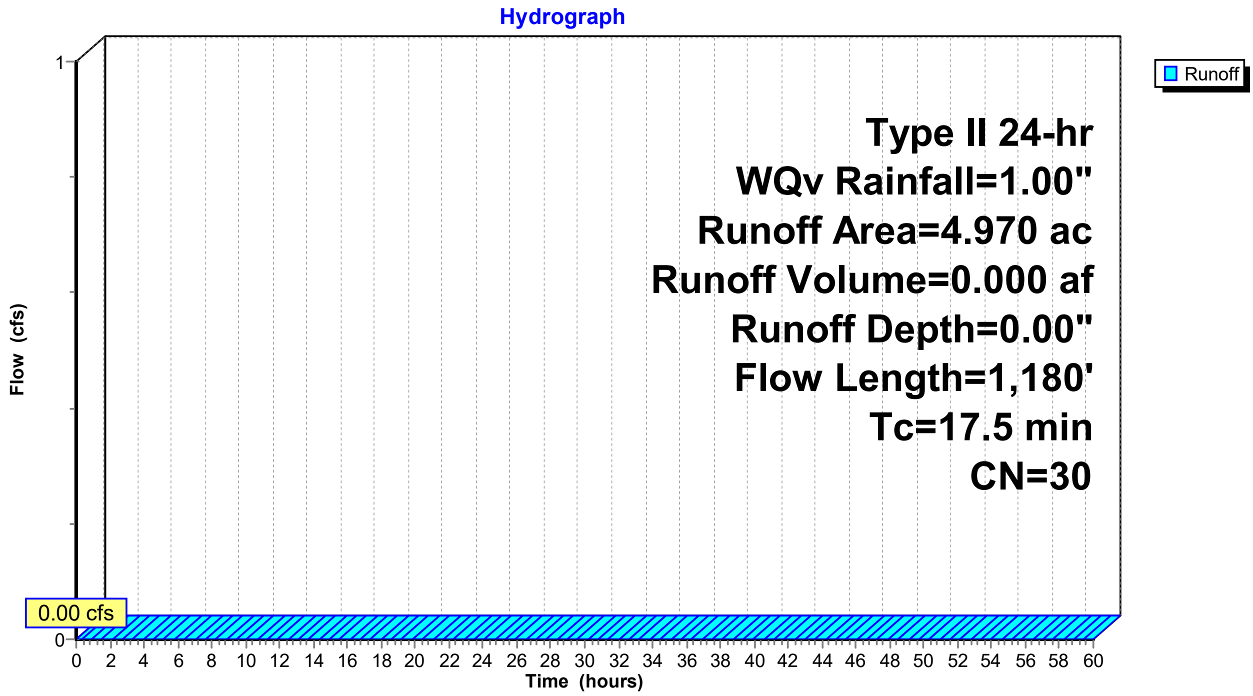
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

Area (ac)	CN	Description
4.139	30	Meadow, non-grazed, HSG A
0.831	30	Woods, Good, HSG A
4.970	30	Weighted Average
4.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0675	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
8.5	801	0.0508	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	217	0.1515	2.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	62	0.0697	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,180	Total			

Subcatchment 5S:



Summary for Subcatchment 6S:

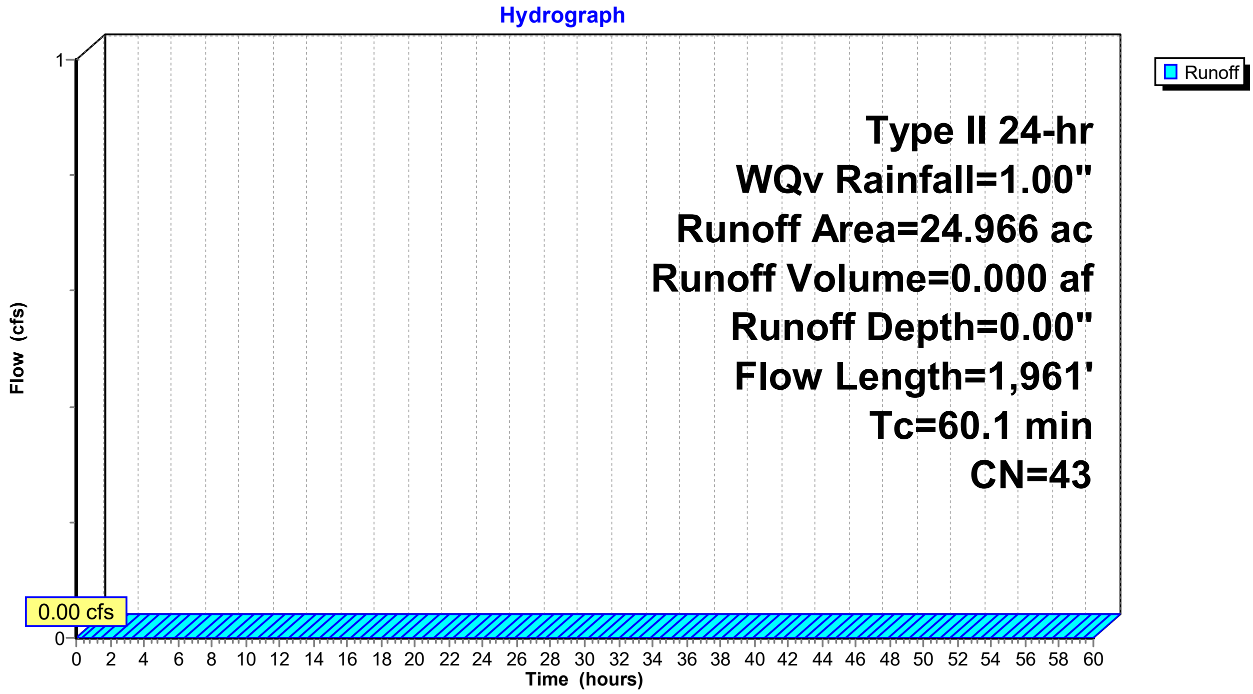
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP6 : Study Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=1.00"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
	0.466	96	Gravel surface, HSG A
	2.545	61	>75% Grass cover, Good, HSG B
	7.511	30	Meadow, non-grazed, HSG A
	0.788	58	Meadow, non-grazed, HSG B
	7.940	30	Woods, Good, HSG A
	4.266	55	Woods, Good, HSG B
	24.966	43	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Subcatchment 6S:



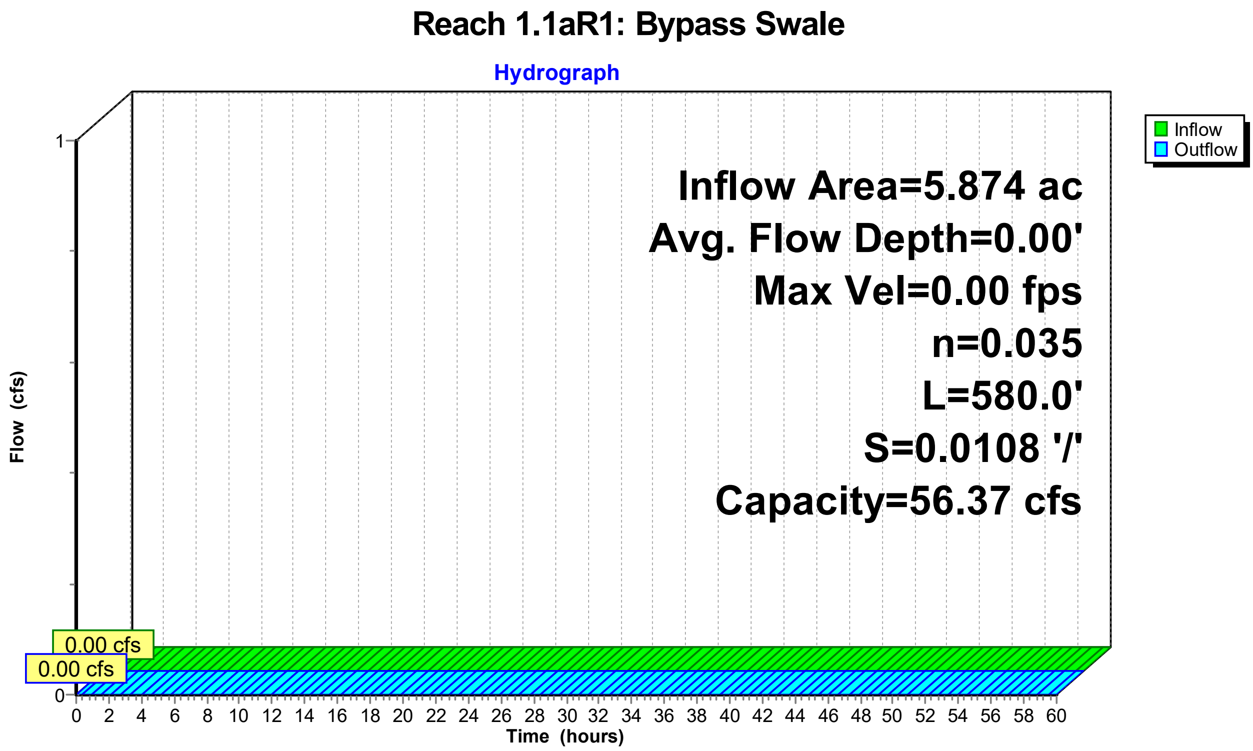
Summary for Reach 1.1aR1: Bypass Swale

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC1 : TS1 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.37 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.0' Slope= 0.0108 '/'
Inlet Invert= 1,493.84', Outlet Invert= 1,487.56'



Summary for Reach 1.1aR2: Bypass Swale

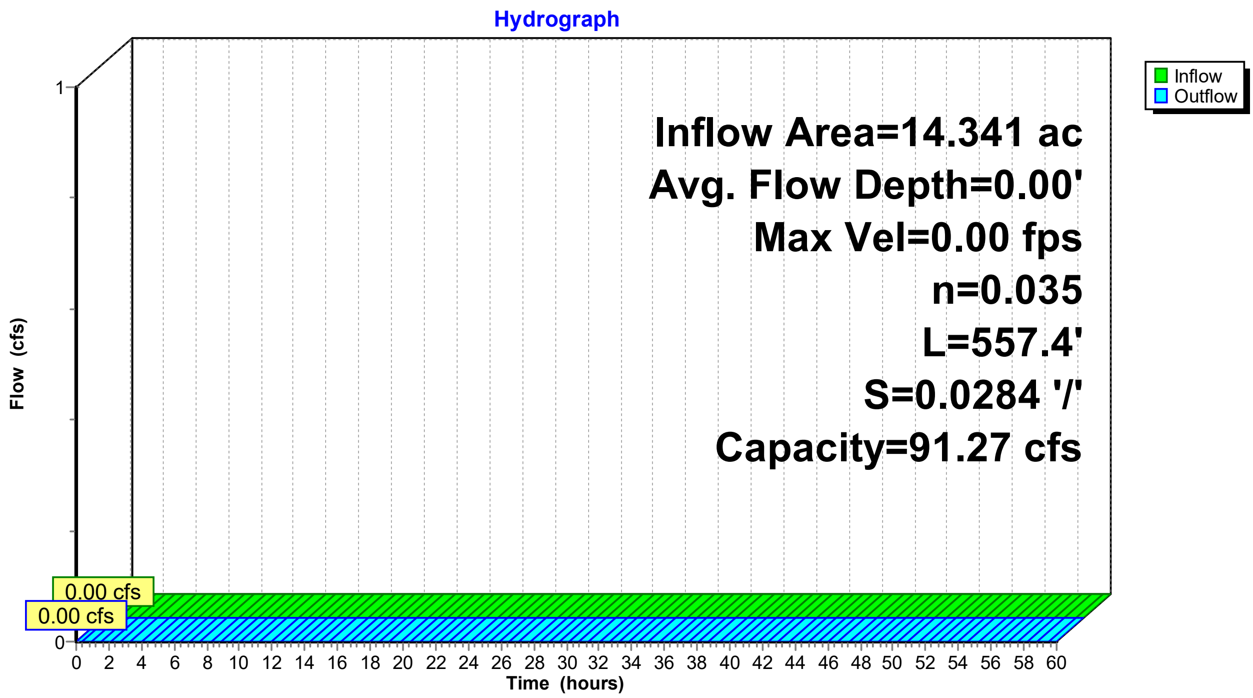
Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC2 : TS2 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 91.27 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.4' Slope= 0.0284 '/'
Inlet Invert= 1,486.80', Outlet Invert= 1,470.98'

Reach 1.1aR2: Bypass Swale



Summary for Reach 1.1aR3: Bypass Swale

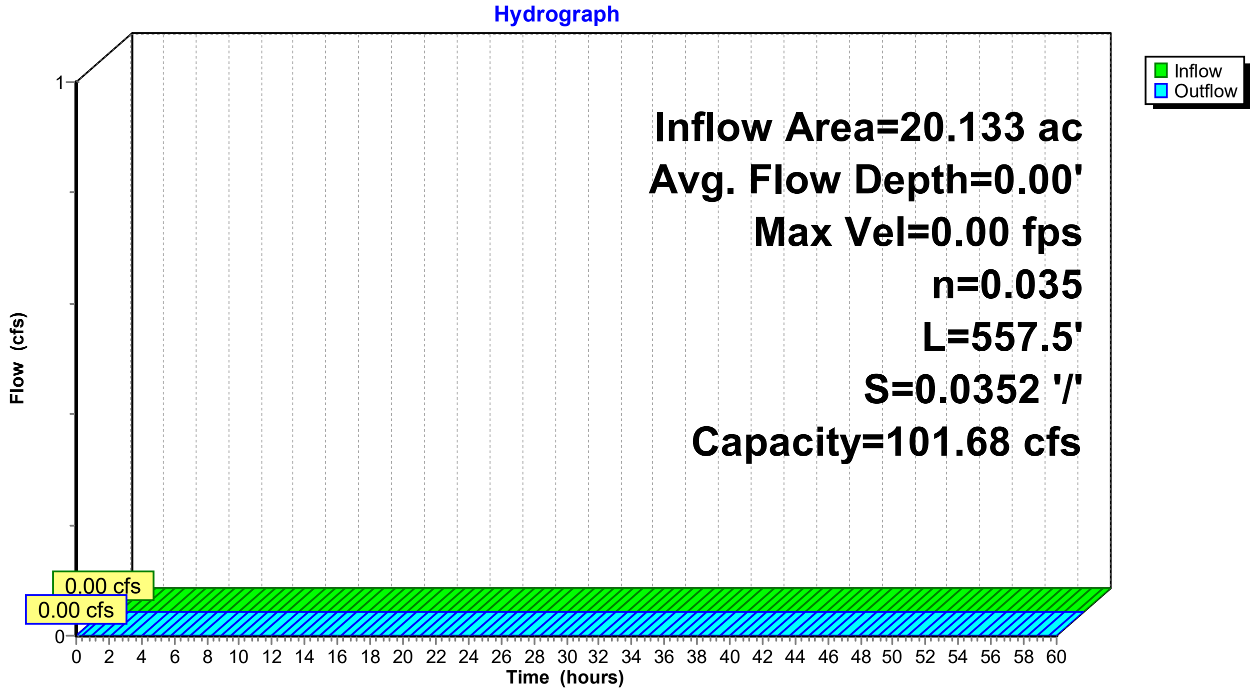
Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC3 : TS3 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.68 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.5' Slope= 0.0352 '/'
Inlet Invert= 1,469.57', Outlet Invert= 1,449.93'

Reach 1.1aR3: Bypass Swale



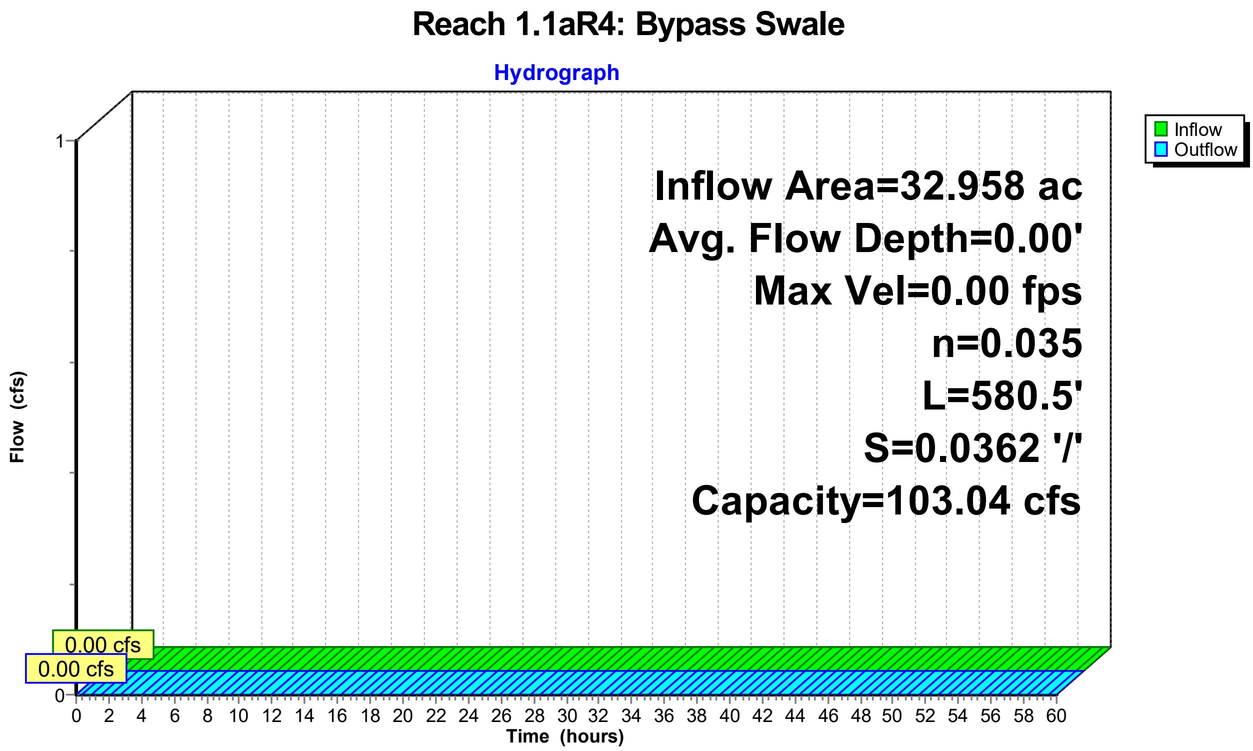
Summary for Reach 1.1aR4: Bypass Swale

Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aP : North Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 103.04 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.5' Slope= 0.0362 '/'
Inlet Invert= 1,447.64', Outlet Invert= 1,426.64'



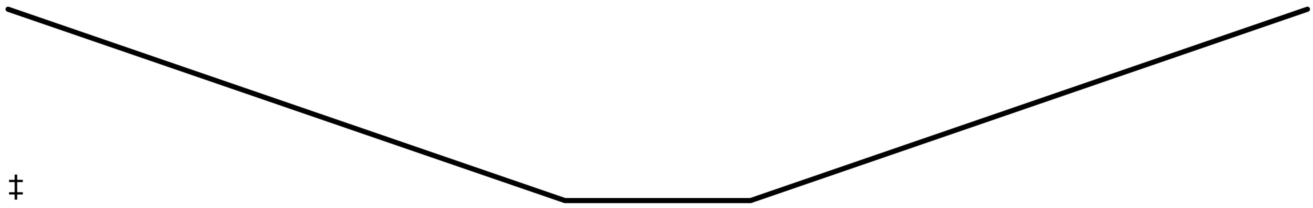
Summary for Reach 1.1bR1: North Road Conveyance Swale

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af, Atten= 2%, Lag= 1.0 min
Routed to Pond 1.1bC1 : TS4 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.47 fps, Min. Travel Time= 60.9 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 60.9 min

Peak Storage= 4 cf @ 24.03 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.01'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 111.65 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,733.0' Slope= 0.0240 '/'
Inlet Invert= 1,491.12', Outlet Invert= 1,449.50'



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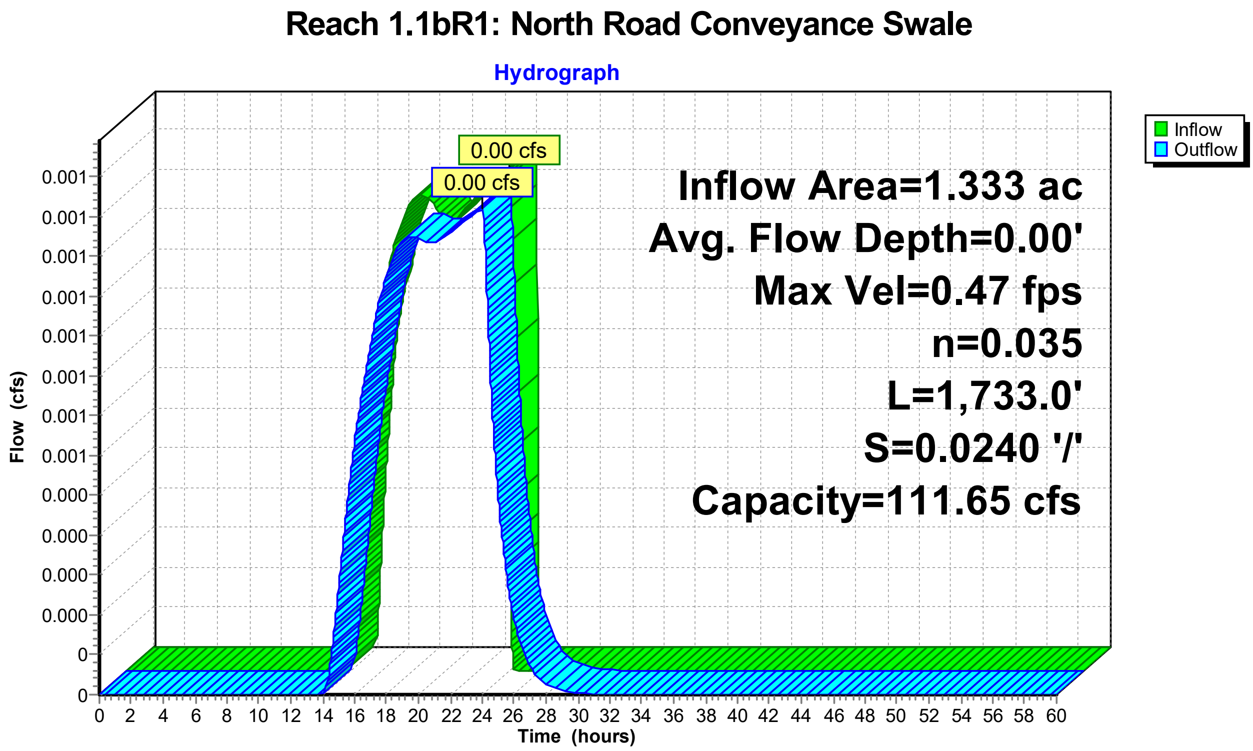


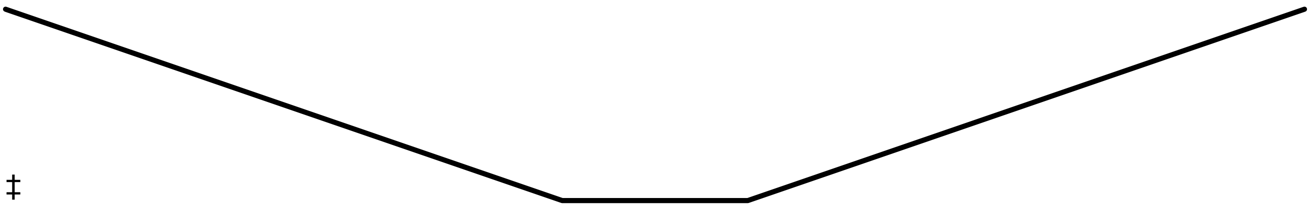
Summary for Reach 1.1bR2: North Road Conveyance Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.04 hrs, Volume= 0.001 af, Atten= 1%, Lag= 1.9 min
Routed to Pond 1.1bP1 : Dry Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.60 fps, Min. Travel Time= 16.6 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 16.6 min

Peak Storage= 1 cf @ 24.04 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.01'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 140.36 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 593.3' Slope= 0.0380 '/'
Inlet Invert= 1,447.27', Outlet Invert= 1,424.75'



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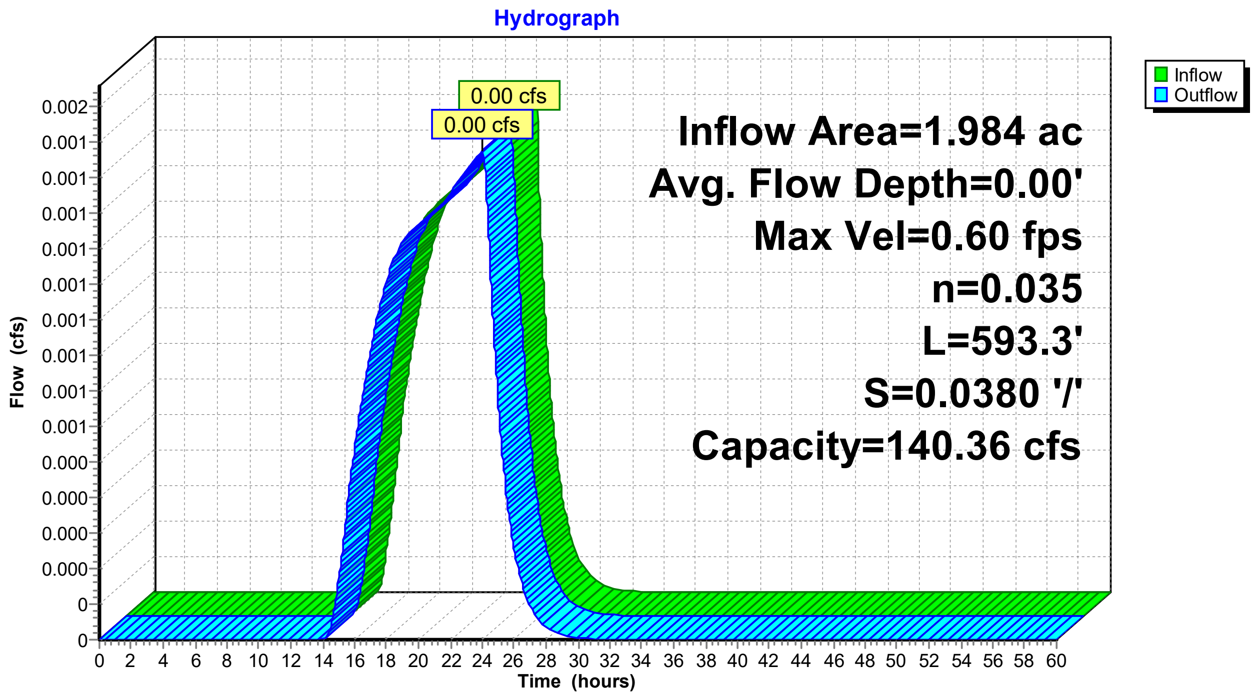
Reach 1.1bR2: North Road Conveyance Swale



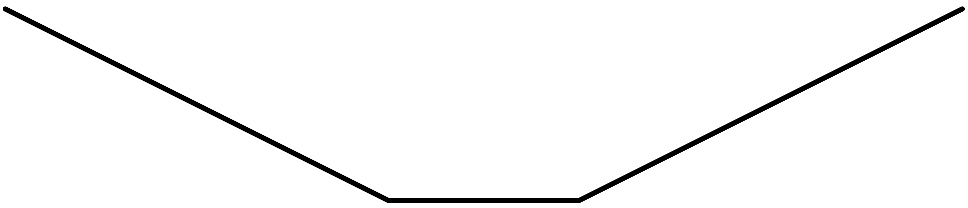
Summary for Reach 1.2aR1: Bypass Swale

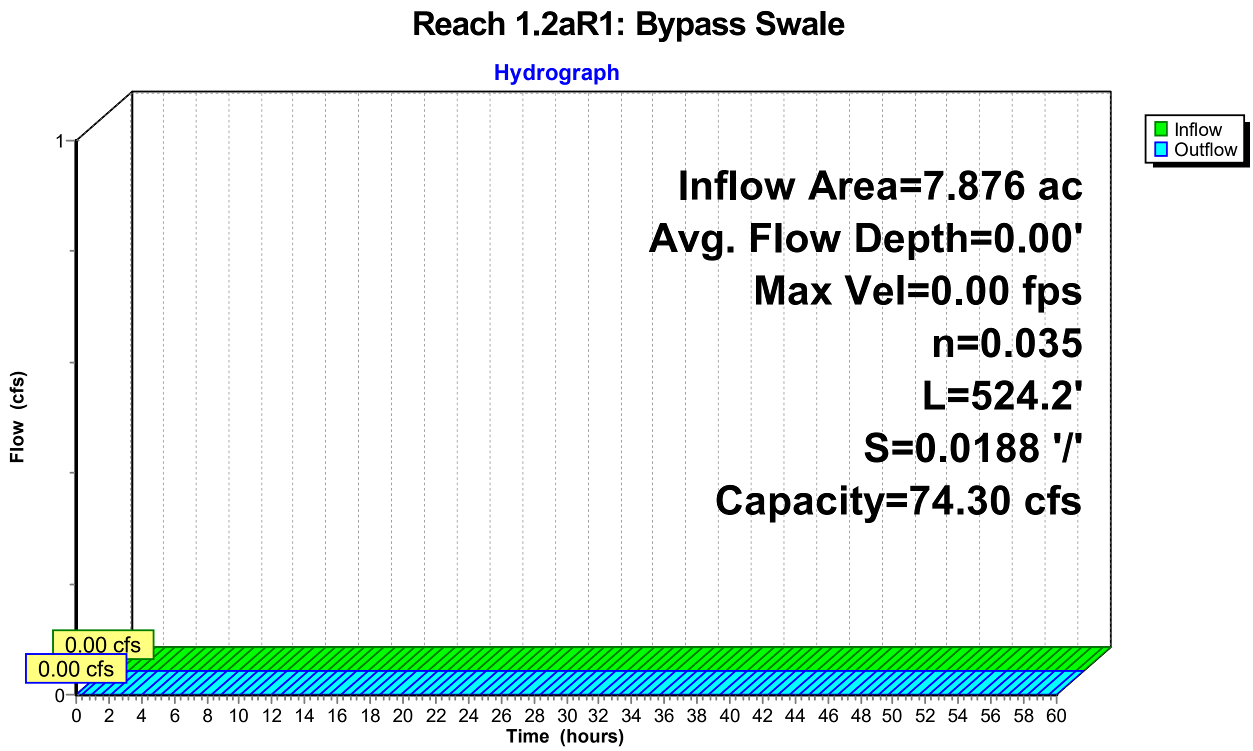
Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC1 : TS 7 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 74.30 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 524.2' Slope= 0.0188 '/'
Inlet Invert= 1,454.08', Outlet Invert= 1,444.22'





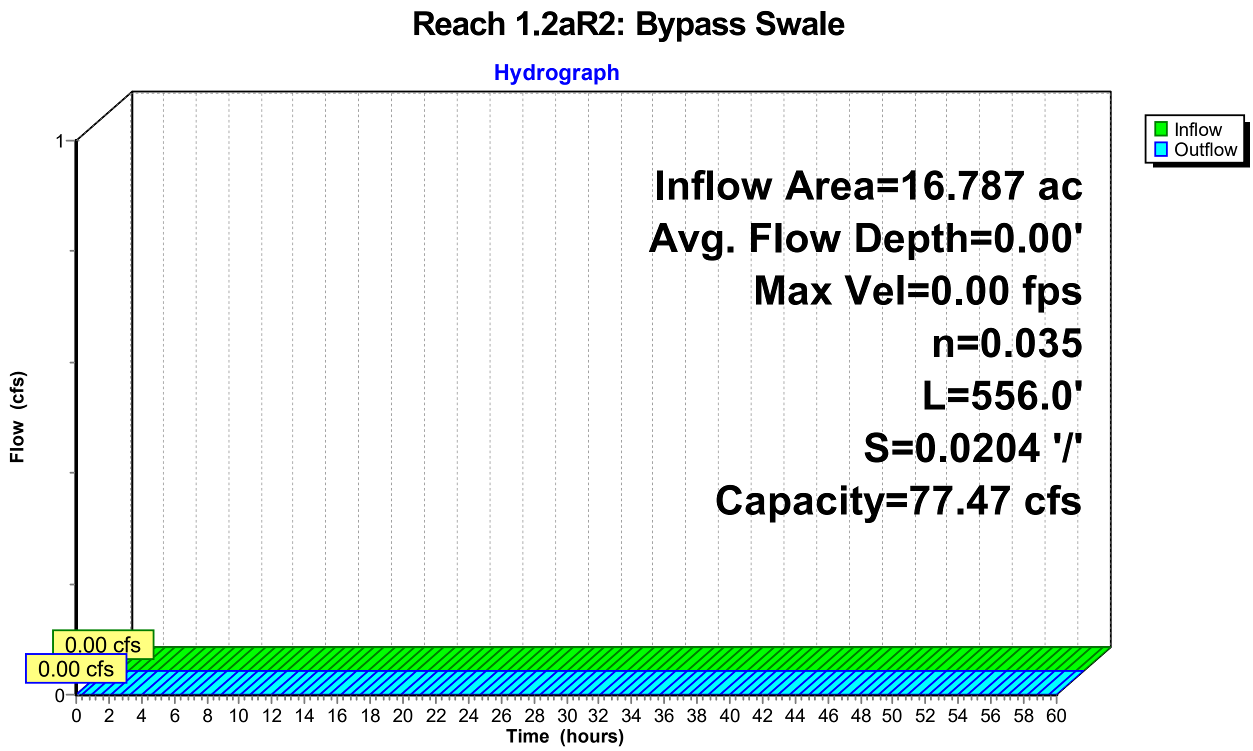
Summary for Reach 1.2aR2: Bypass Swale

Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC2 : TS8 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 77.47 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 556.0' Slope= 0.0204 '/'
Inlet Invert= 1,443.21', Outlet Invert= 1,431.84'



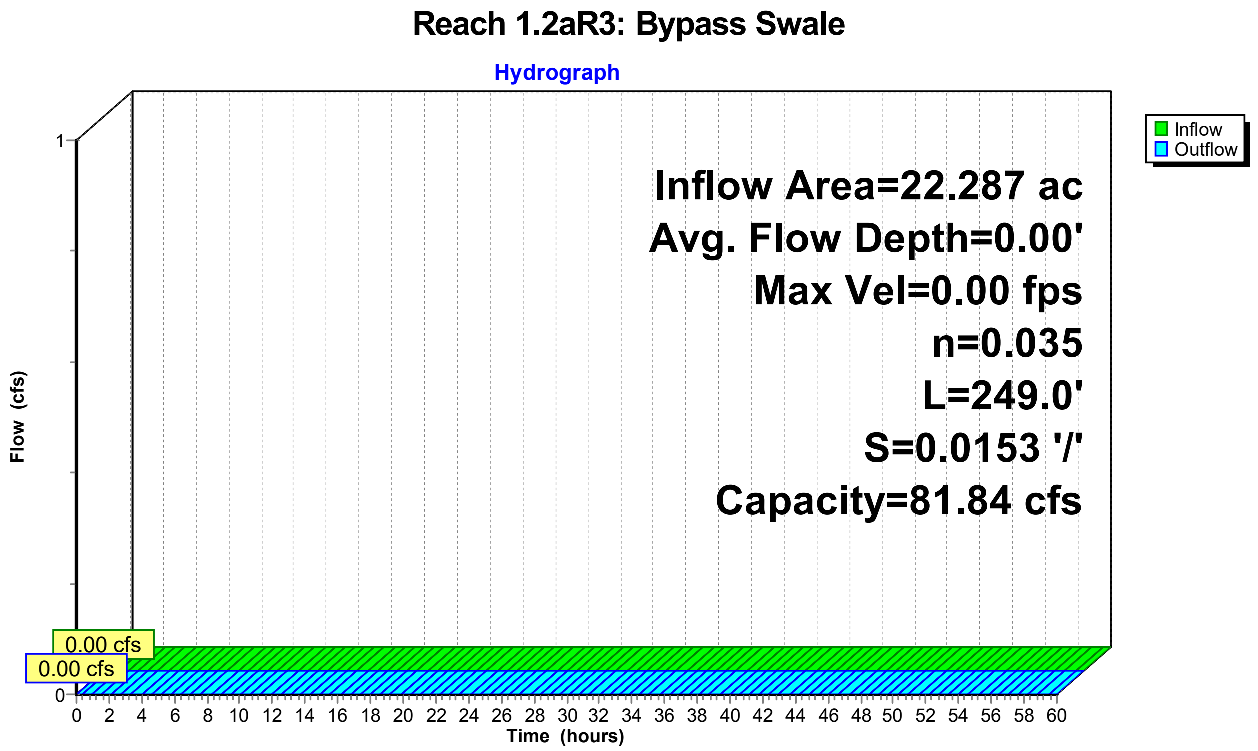
Summary for Reach 1.2aR3: Bypass Swale

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aP : South Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 81.84 cfs

3.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 11.00'
Length= 249.0' Slope= 0.0153 '/'
Inlet Invert= 1,431.11', Outlet Invert= 1,427.29'



Summary for Reach 1.2bR1: East Road Conveyance Swale

Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Atten= 25%, Lag= 2.9 min
Routed to Pond 1.2bC1 : East Road Culvert

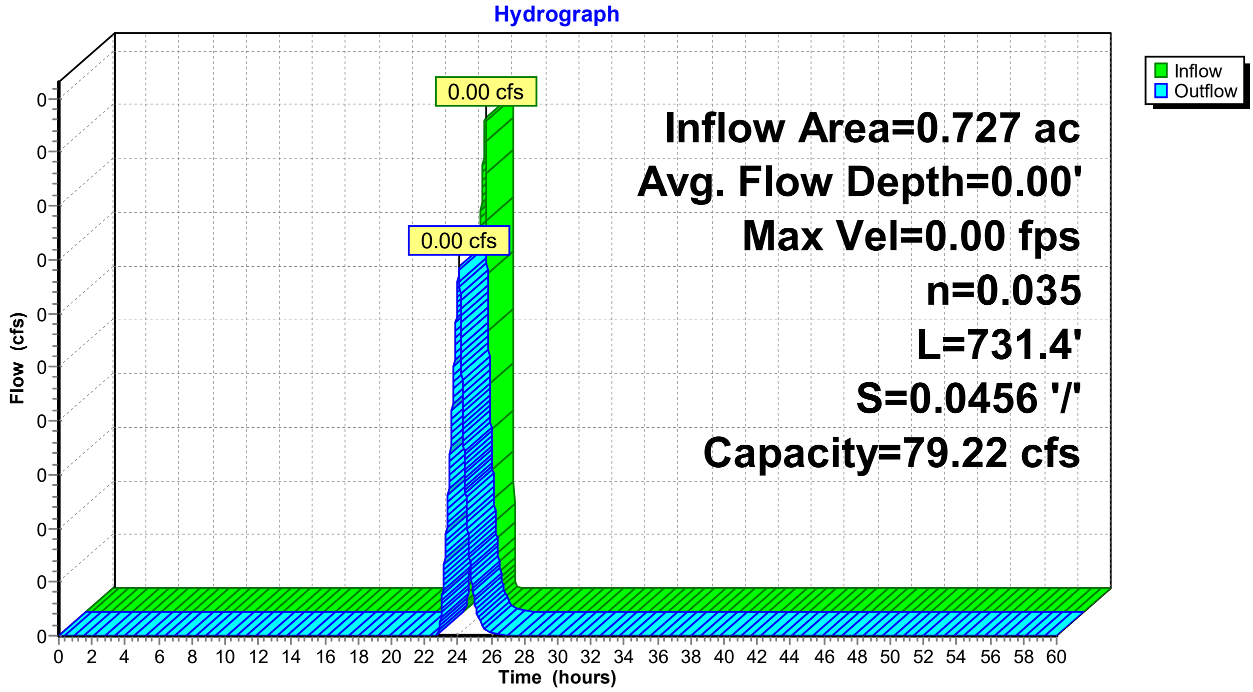
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 24.06 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.00'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 79.22 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 731.4' Slope= 0.0456 '/'
Inlet Invert= 1,489.53', Outlet Invert= 1,456.20'

‡

Reach 1.2bR1: East Road Conveyance Swale



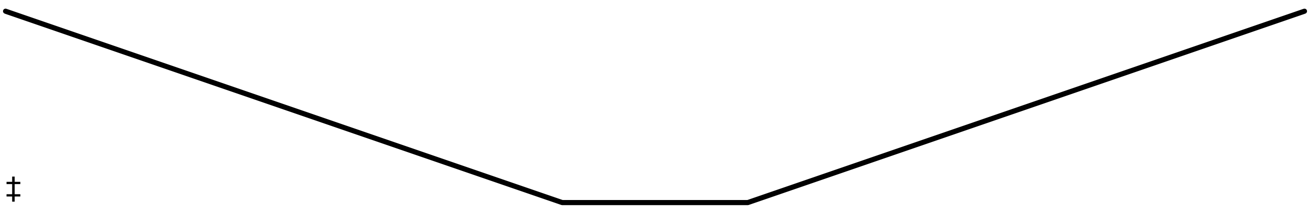
Summary for Reach 1.2bR2: South Road Conveyance Swale

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.23 hrs, Volume= 0.000 af, Atten= 28%, Lag= 10.2 min
Routed to Pond 1.2bC2 : TS6 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 24.23 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.00'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 95.76 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 604.5' Slope= 0.0177 '/'
Inlet Invert= 1,454.47', Outlet Invert= 1,443.79'



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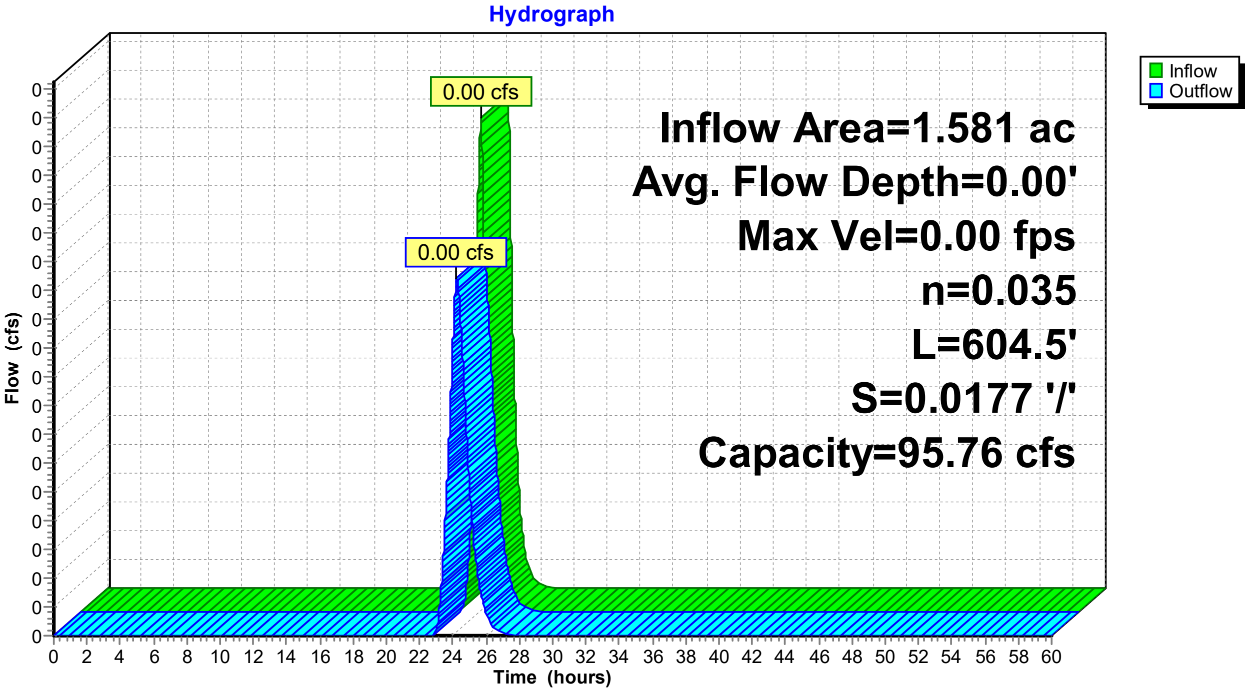
Reach 1.2bR2: South Road Conveyance Swale



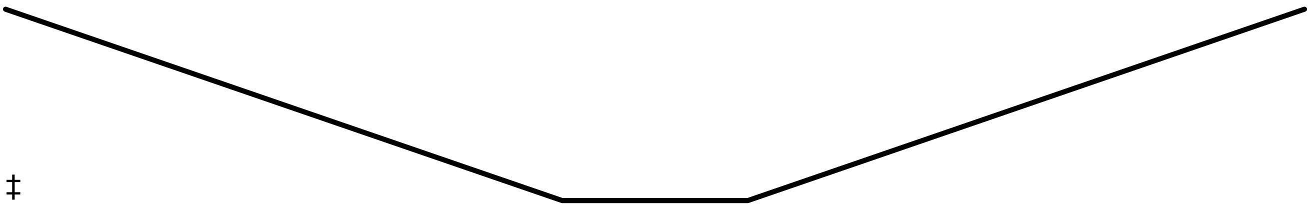
Summary for Reach 1.2bR3: South Road Conveyance Swale

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af, Atten= 2%, Lag= 1.0 min
Routed to Pond 1.2bP : South Road Treatment Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.42 fps, Min. Travel Time= 30.0 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 30.0 min

Peak Storage= 1 cf @ 24.03 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.01'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 98.64 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 755.9' Slope= 0.0187 '/'
Inlet Invert= 1,442.84', Outlet Invert= 1,428.67'



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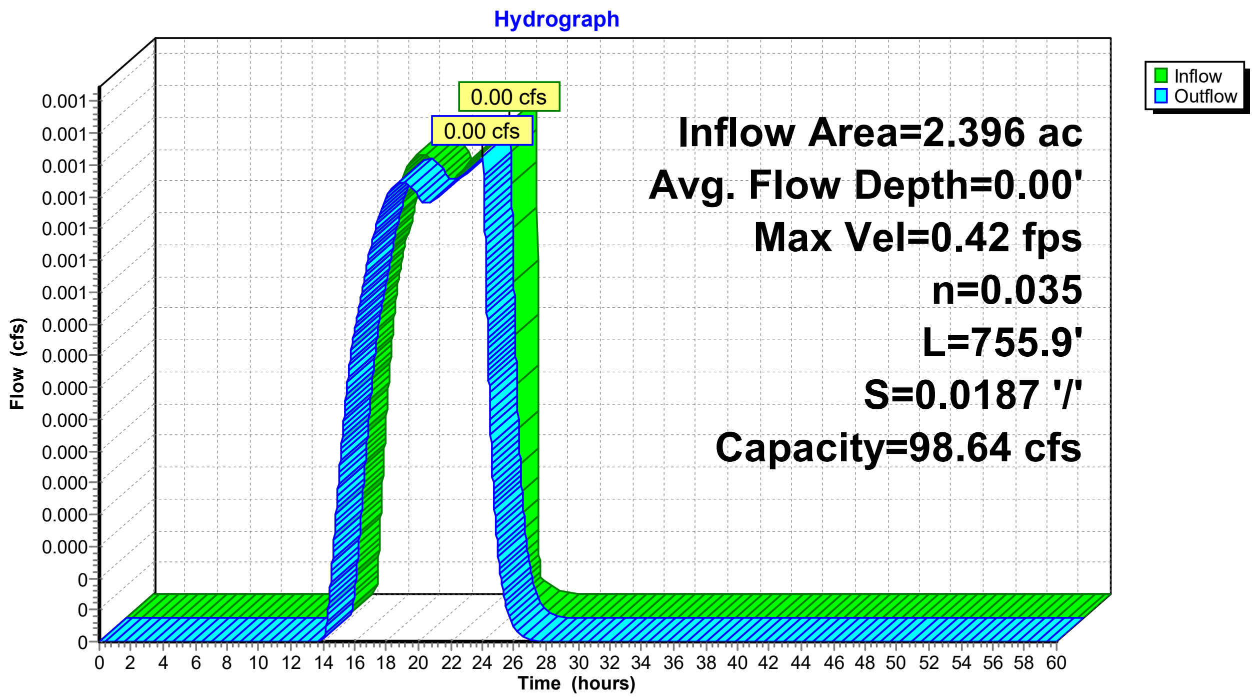


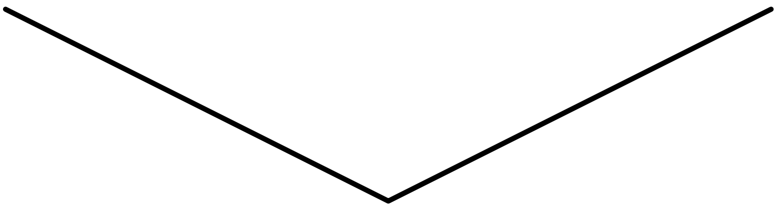
Summary for Reach 4.1R1: Bypass Swale

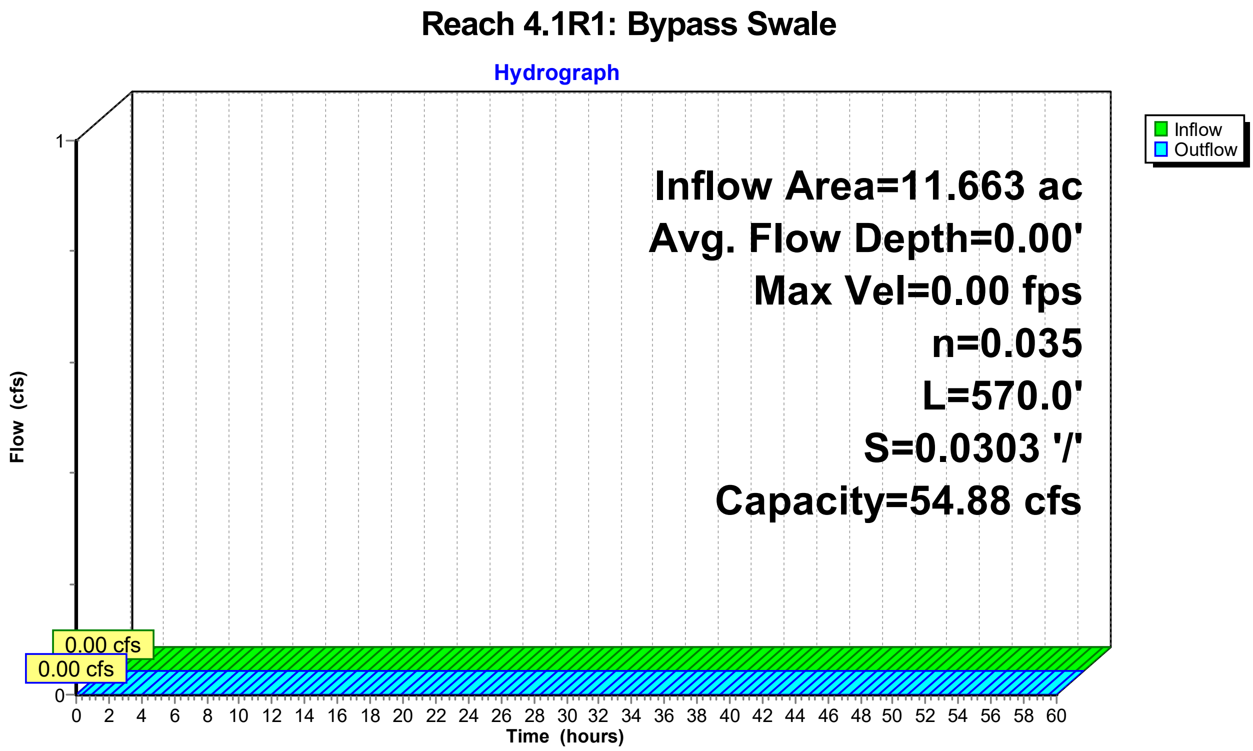
Inflow Area = 11.663 ac, 2.80% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 54.88 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 570.0' Slope= 0.0303 '/'
Inlet Invert= 1,448.24', Outlet Invert= 1,430.97'





Summary for Reach 4.1R2: Ex Stream

Inflow Area = 39.250 ac, 0.83% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP4 : Study Point 4

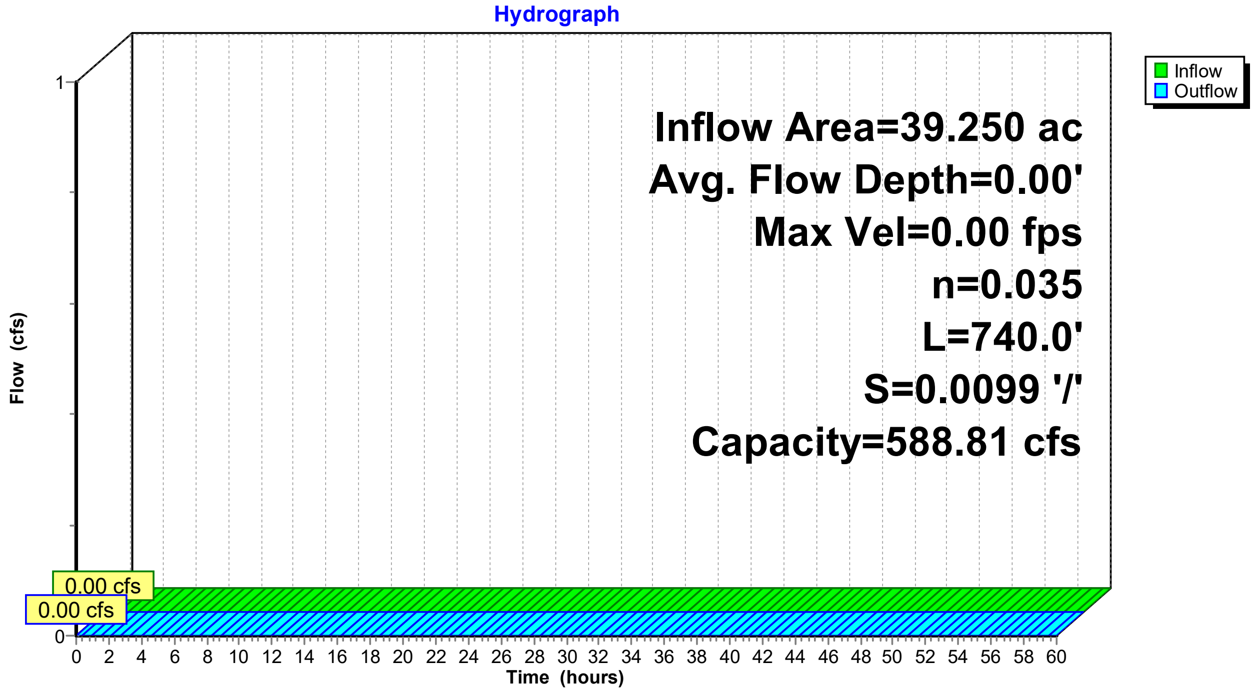
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 3.00' Flow Area= 84.0 sf, Capacity= 588.81 cfs

17.50' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 4.0 '/' Top Width= 38.50'
Length= 740.0' Slope= 0.0099 '/'
Inlet Invert= 1,430.98', Outlet Invert= 1,423.64'

‡

Reach 4.1R2: Ex Stream



Summary for Reach 4.2bR: Conveyance Swale

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 17.70 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 18.02 hrs, Volume= 0.000 af, Atten= 0%, Lag= 19.4 min
Routed to Pond 4.2bP : Pond 4 - Access Rd East

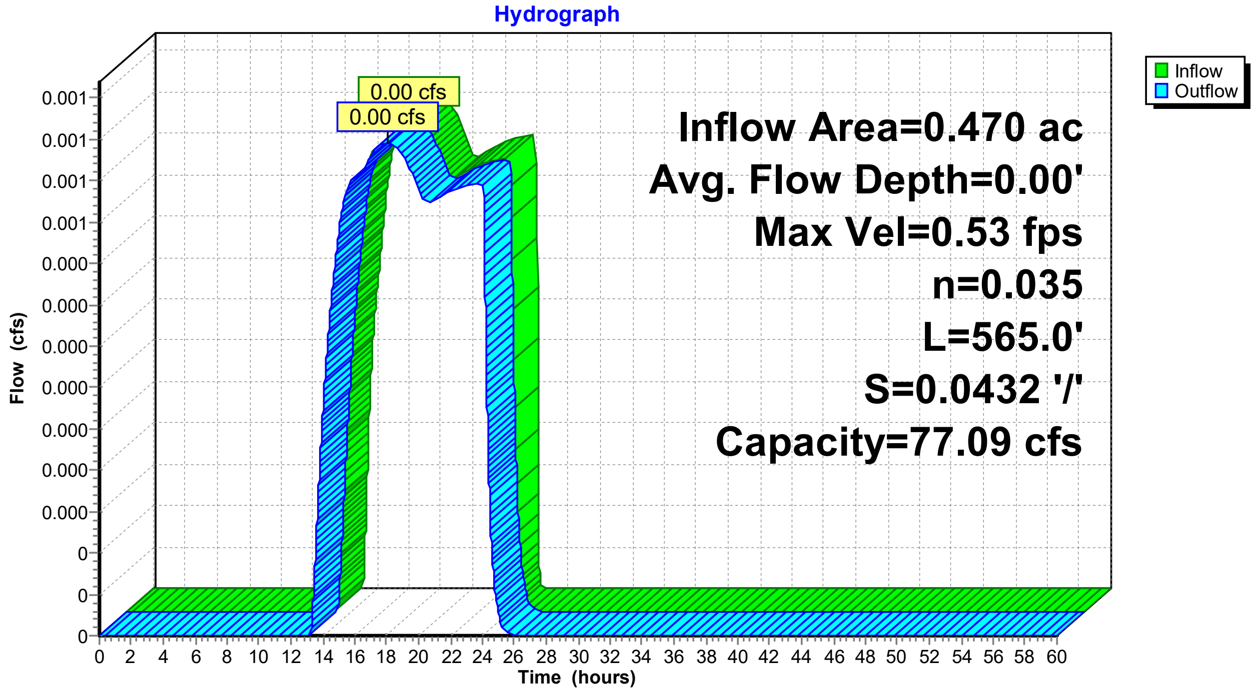
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.53 fps, Min. Travel Time= 17.8 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 17.8 min

Peak Storage= 1 cf @ 18.02 hrs
Average Depth at Peak Storage= 0.00' , Surface Width= 2.00'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 77.09 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 565.0' Slope= 0.0432 '/'
Inlet Invert= 1,472.38', Outlet Invert= 1,448.00'

‡

Reach 4.2bR: Conveyance Swale



Summary for Pond 1.1aC1: TS1 Culvert

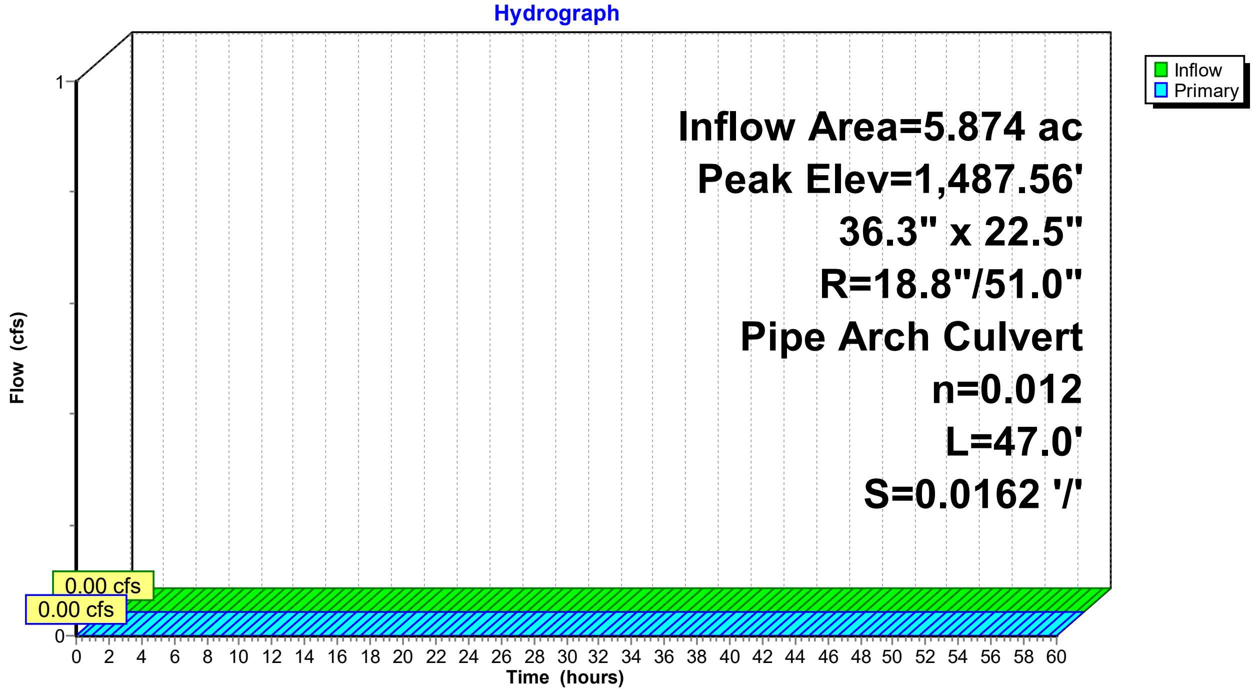
Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,487.56' @ 0.00 hrs
Flood Elev= 1,489.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,487.56'	**36.3" W x 22.5" H, R=18.8"/51.0" Pipe Arch RCP_Arch 37x23** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,487.56' / 1,486.80' S= 0.0162 '/' Cc= 0.900 n= 0.012, Flow Area= 4.43 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,487.56' (Free Discharge)
└—**1=RCP_Arch 37x23** (Controls 0.00 cfs)

Pond 1.1aC1: TS1 Culvert



Summary for Pond 1.1aC2: TS2 Culvert

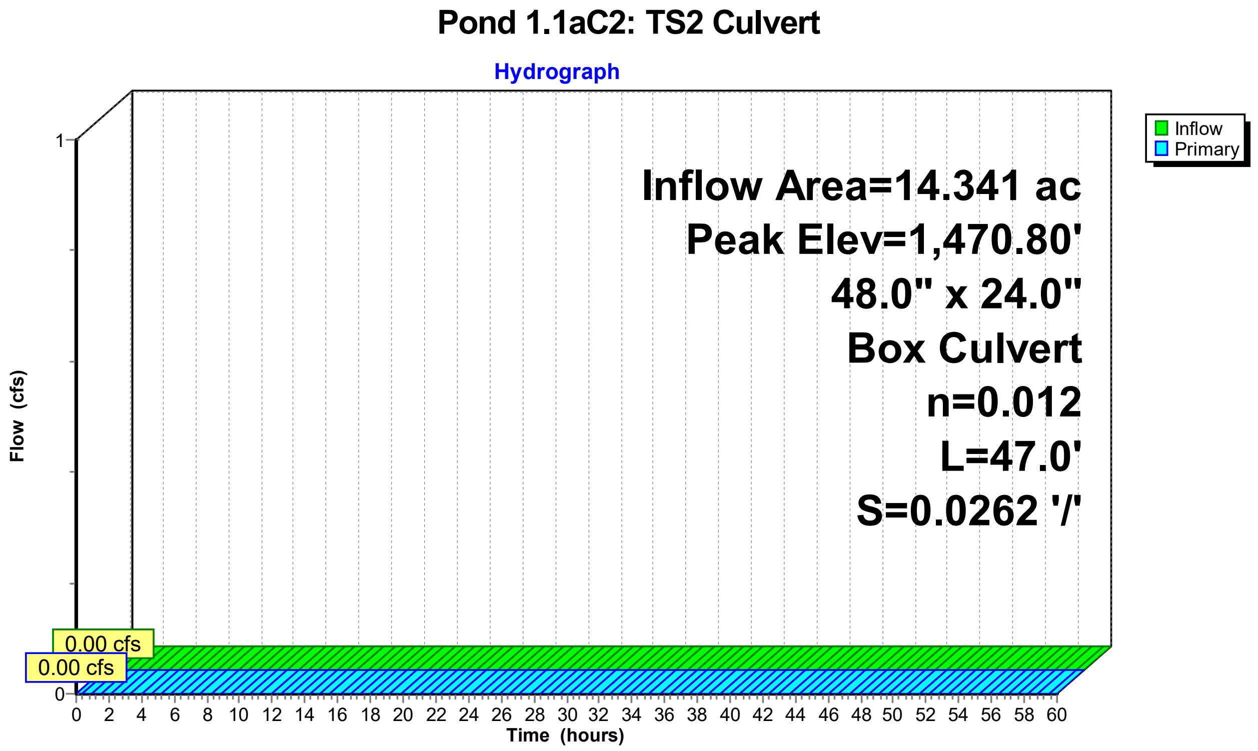
Inflow Area =	14.341 ac,	0.00% Impervious,	Inflow Depth = 0.00"	for WQv event	
Inflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	
Outflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routed to Reach 1.1aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,470.80' @ 0.00 hrs
Flood Elev= 1,473.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,470.80'	**48.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,470.80' / 1,469.57' S= 0.0262 '/' Cc= 0.900 n= 0.012, Flow Area= 8.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,470.80' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)



Summary for Pond 1.1aC3: TS3 Culvert

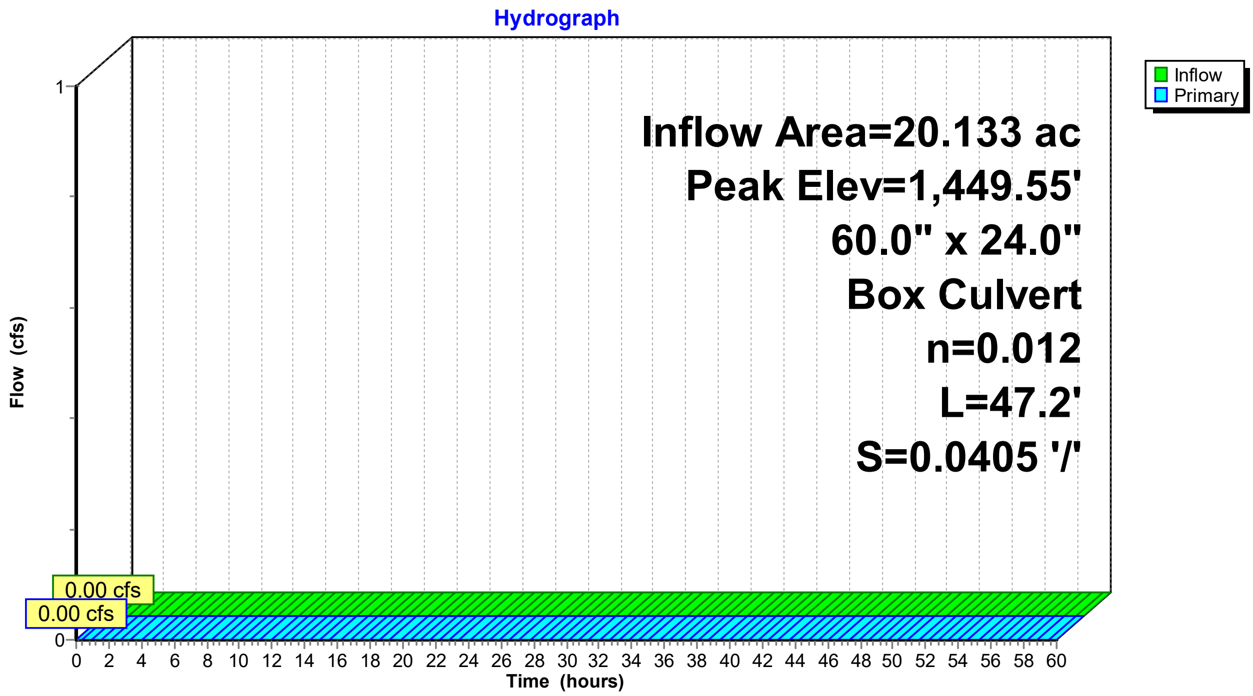
Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR4 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.55' @ 0.00 hrs
Flood Elev= 1,452.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.55'	**60.0" W x 24.0" H Box Culvert** L= 47.2' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.55' / 1,447.64' S= 0.0405 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,449.55' (Free Discharge)
1=Culvert (Controls 0.00 cfs)

Pond 1.1aC3: TS3 Culvert



Summary for Pond 1.1aP: North Road Bypass OC

Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

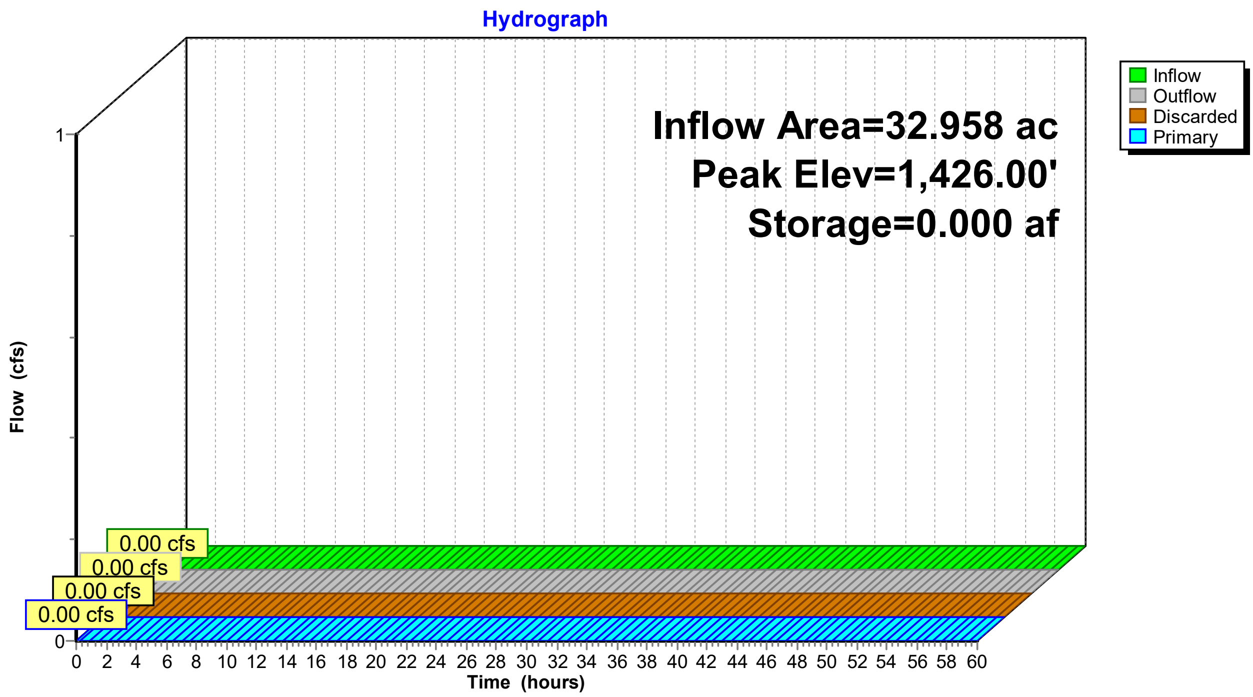
Volume	Invert	Avail.Storage	Storage Description
#1	1,426.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,426.00'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,428.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.1aP: North Road Bypass OC



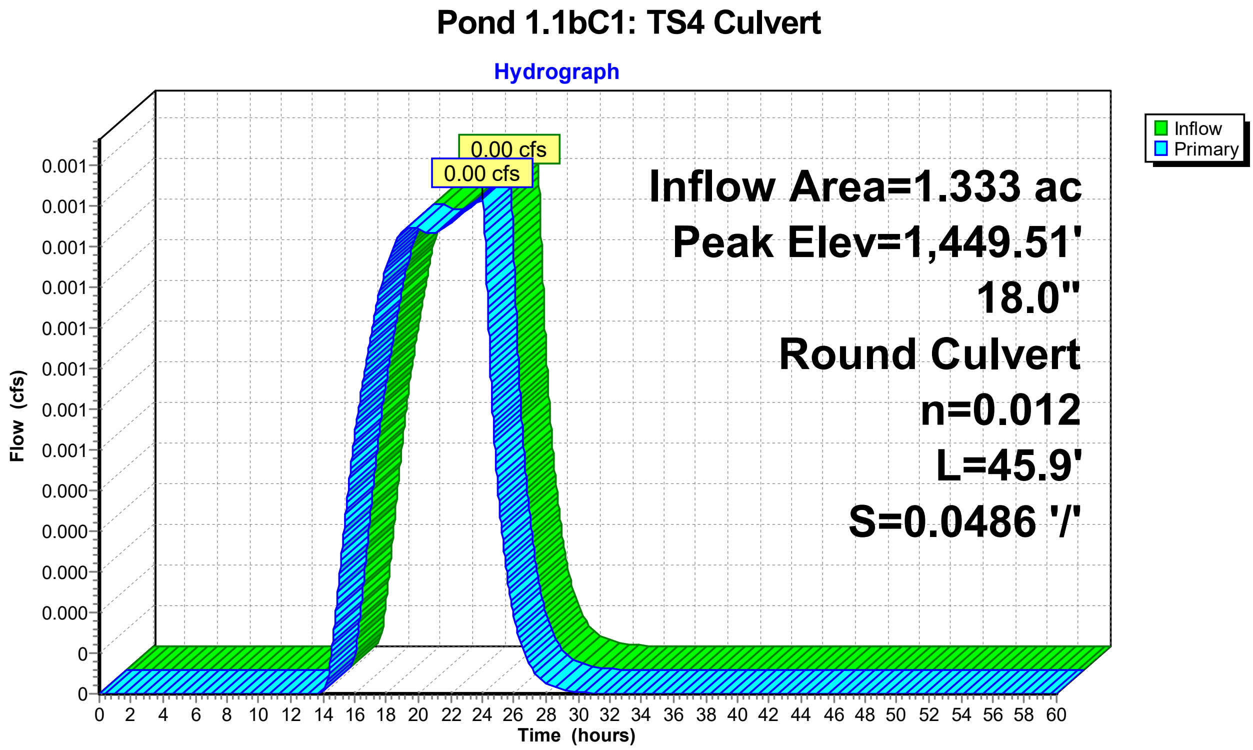
Summary for Pond 1.1bC1: TS4 Culvert

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.51' @ 24.03 hrs
Flood Elev= 1,451.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.50'	**18.0" Round Culvert** L= 45.9' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.50' / 1,447.27' S= 0.0486 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 24.03 hrs HW=1,449.51' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.00 cfs @ 0.39 fps)



Summary for Pond 1.1bP1: Dry Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 24.04 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.72 hrs, Volume= 0.001 af, Atten= 37%, Lag= 40.6 min
Discarded = 0.00 cfs @ 24.72 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1.1bP2 : North Road Detention Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,425.32' @ 24.72 hrs Surf.Area= 76 sf Storage= 17 cf

Plug-Flow detention time= 255.0 min calculated for 0.001 af (100% of inflow)
Center-of-Mass det. time= 255.0 min (1,512.3 - 1,257.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.75'	428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

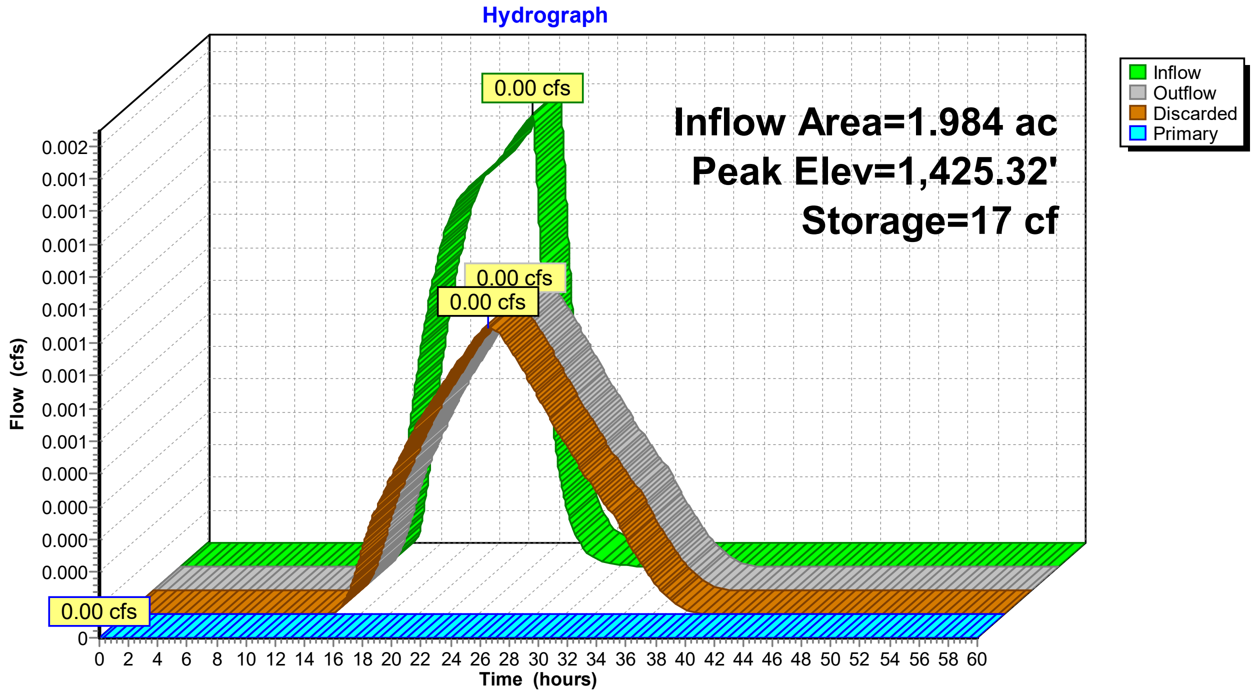
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,424.75	0	0.0	0	0	0
1,425.00	25	22.9	2	2	42
1,426.00	273	98.0	127	129	767
1,426.70	603	161.7	299	428	2,086

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.75'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,425.69'	**2.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.00 cfs @ 24.72 hrs HW=1,425.32' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.75' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.1bP1: Dry Swale



Summary for Pond 1.1bP2: North Road Detention Pond

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,421.50' @ 0.00 hrs Surf.Area= 0.009 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

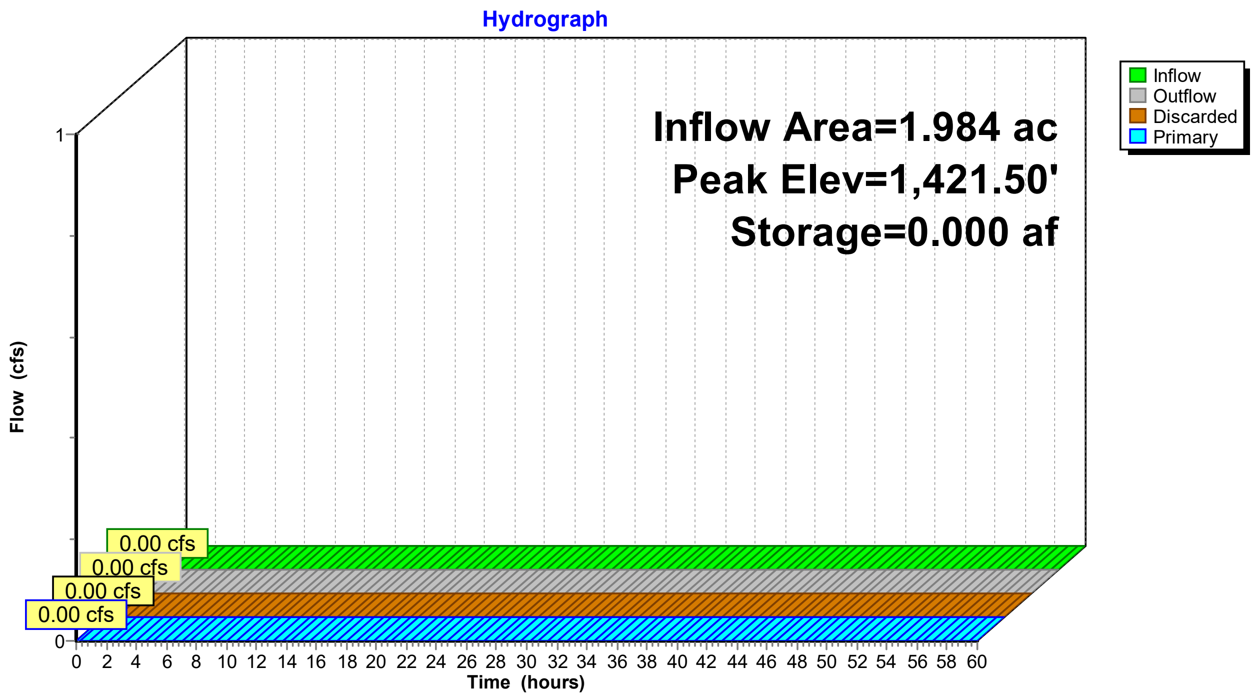
Volume	Invert	Avail.Storage	Storage Description
#1	1,421.50'	0.166 af	**10.00'W x 40.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,421.50'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,424.00'	**20.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,421.50' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,421.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.1bP2: North Road Detention Pond



Summary for Pond 1.2aC1: TS 7 Culvert

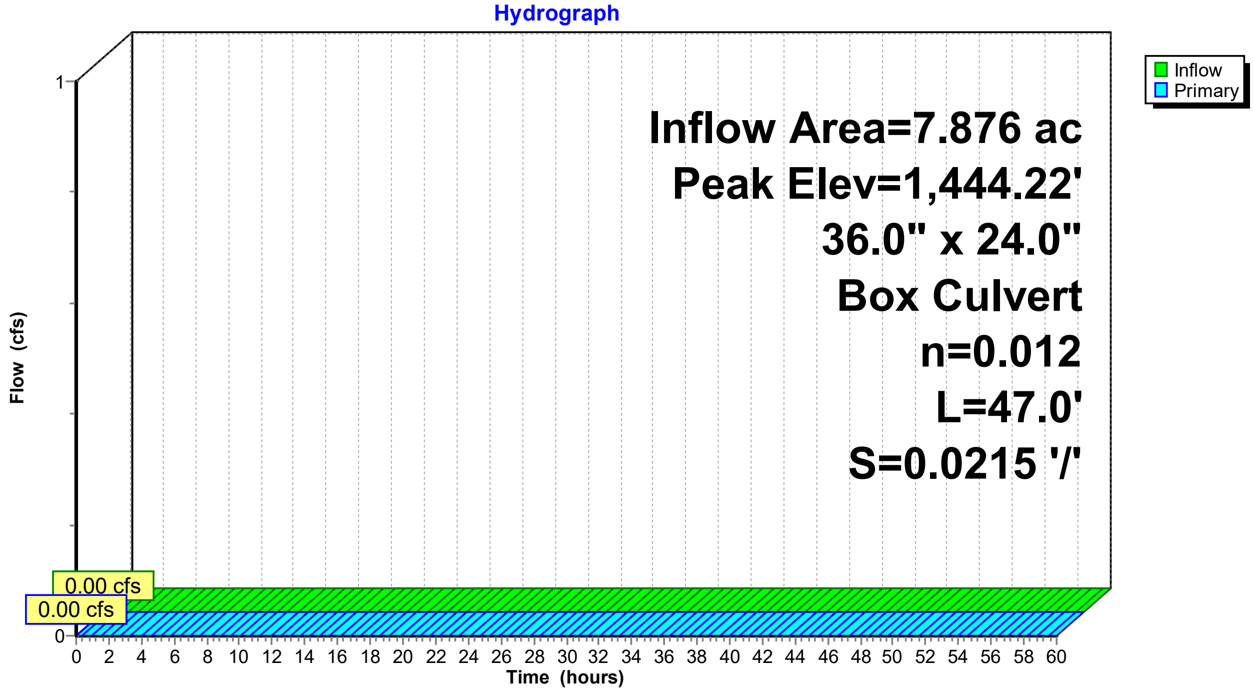
Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.2aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.22' @ 0.00 hrs
Flood Elev= 1,446.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,444.22'	**36.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,444.22' / 1,443.21' S= 0.0215 '/' Cc= 0.900 n= 0.012, Flow Area= 6.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,444.22' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)

Pond 1.2aC1: TS 7 Culvert



Summary for Pond 1.2aC2: TS8 Culvert

Inflow Area =	16.787 ac,	0.00% Impervious,	Inflow Depth = 0.00"	for WQv event	
Inflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	
Outflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

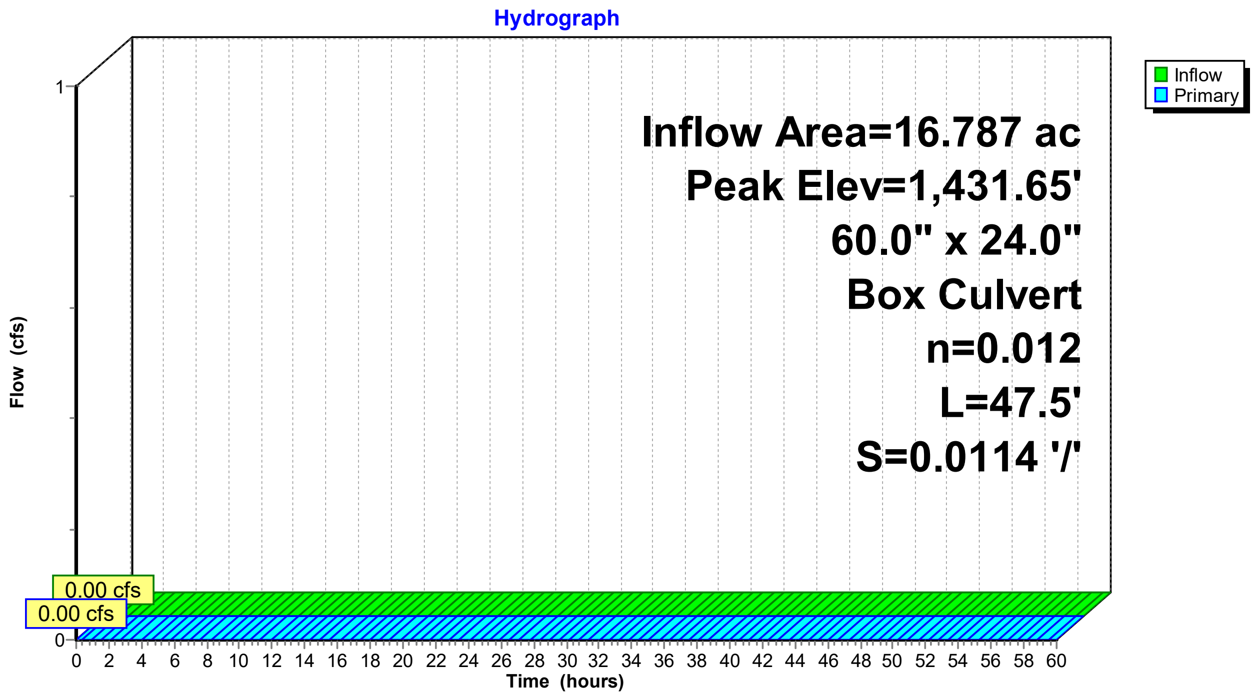
Routed to Reach 1.2aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.65' @ 0.00 hrs
Flood Elev= 1,433.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.65'	**60.0" W x 24.0" H Box Culvert** L= 47.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,431.65' / 1,431.11' S= 0.0114 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.65' (Free Discharge)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond 1.2aC2: TS8 Culvert



Summary for Pond 1.2aP: South Road Bypass OC

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

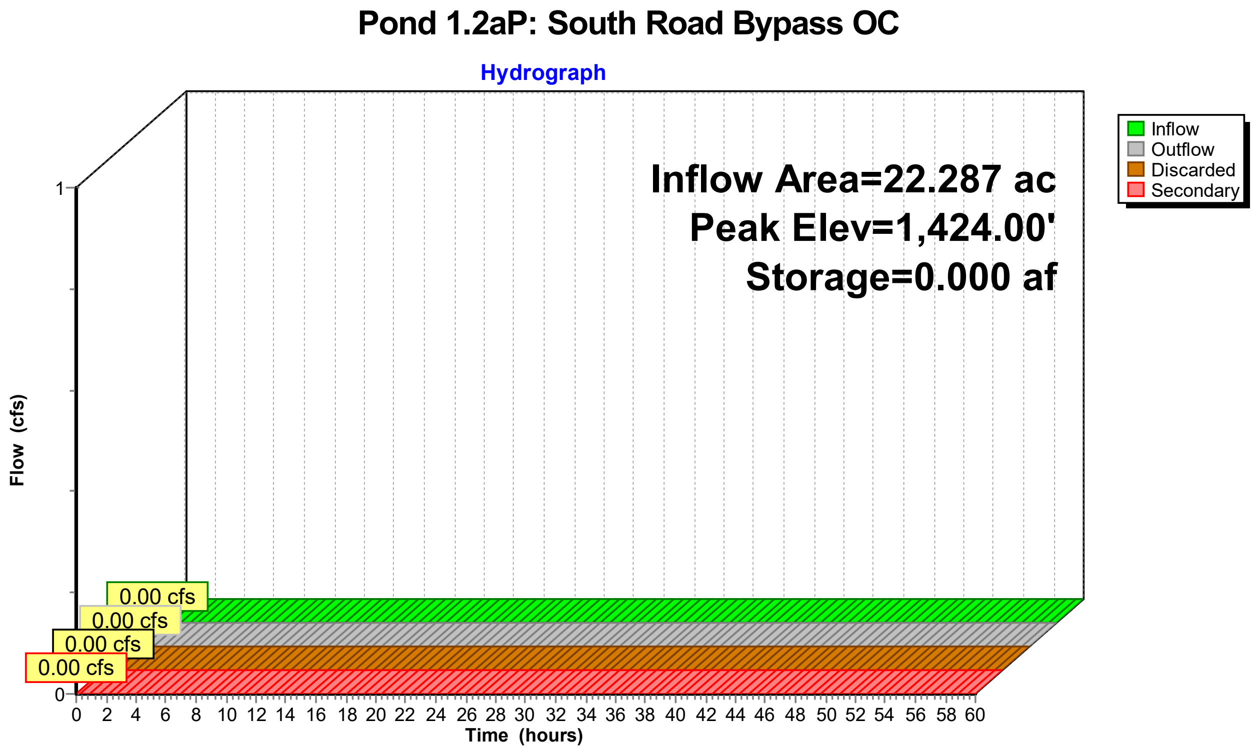
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area**
#2	Secondary	1,426.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.06 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Summary for Pond 1.2bC1: East Road Culvert

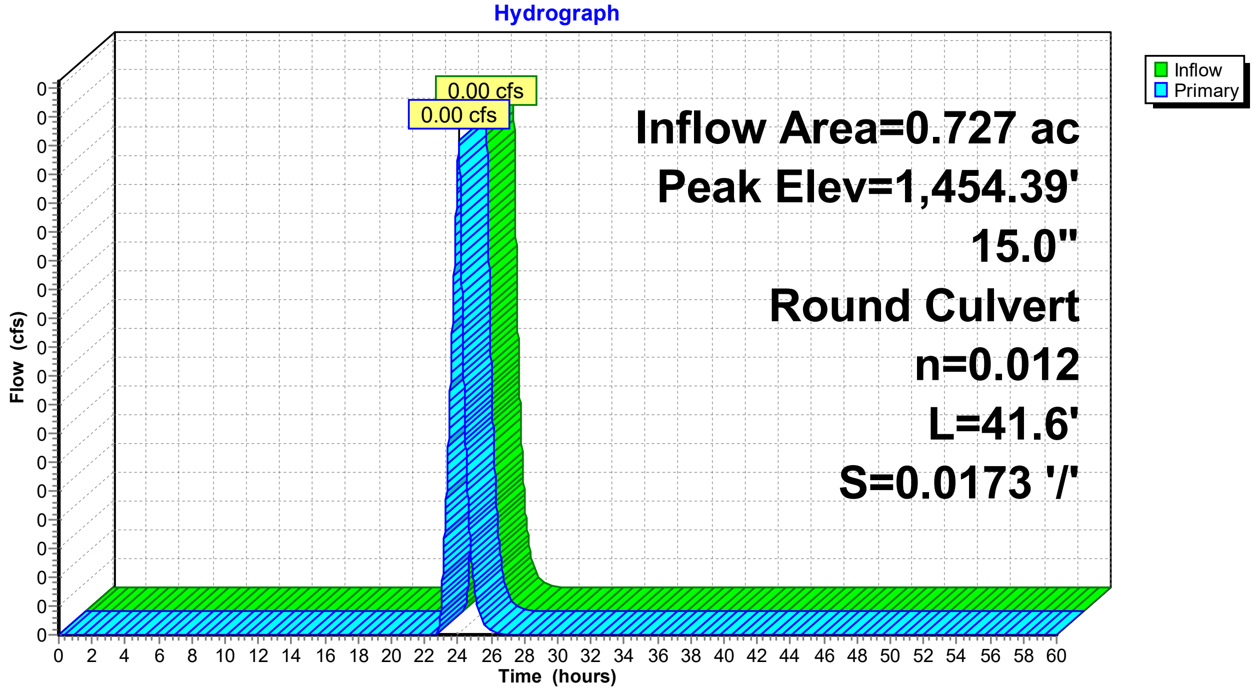
Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,454.39' @ 24.06 hrs
Flood Elev= 1,457.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,454.39'	**15.0" Round Culvert** L= 41.6' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,454.39' / 1,453.67' S= 0.0173 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 24.06 hrs HW=1,454.39' (Free Discharge)
1=Culvert (Barrel Controls 0.00 cfs @ 0.04 fps)

Pond 1.2bC1: East Road Culvert



Summary for Pond 1.2bC2: TS6 Culvert

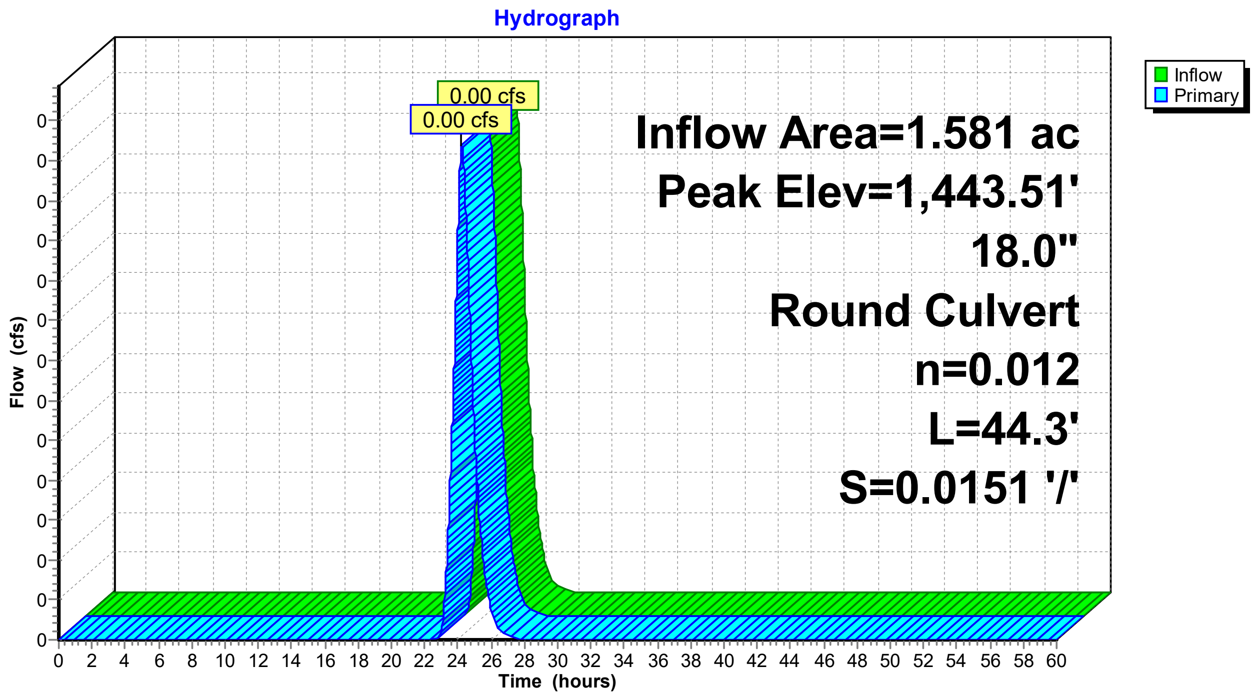
Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.23 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.23 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 24.23 hrs, Volume= 0.000 af
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,443.51' @ 24.23 hrs
Flood Elev= 1,445.09'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,443.51'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,443.51' / 1,442.84' S= 0.0151 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 24.23 hrs HW=1,443.51' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.00 cfs @ 0.04 fps)

Pond 1.2bC2: TS6 Culvert



Summary for Pond 1.2bP: South Road Treatment Pond

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 24.03 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.05 hrs, Volume= 0.001 af, Atten= 0%, Lag= 1.1 min
Discarded = 0.00 cfs @ 24.05 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.00' @ 24.05 hrs Surf.Area= 0.009 ac Storage= 0.000 af

Plug-Flow detention time= 3.0 min calculated for 0.001 af (100% of inflow)
Center-of-Mass det. time= 3.0 min (1,209.7 - 1,206.7)

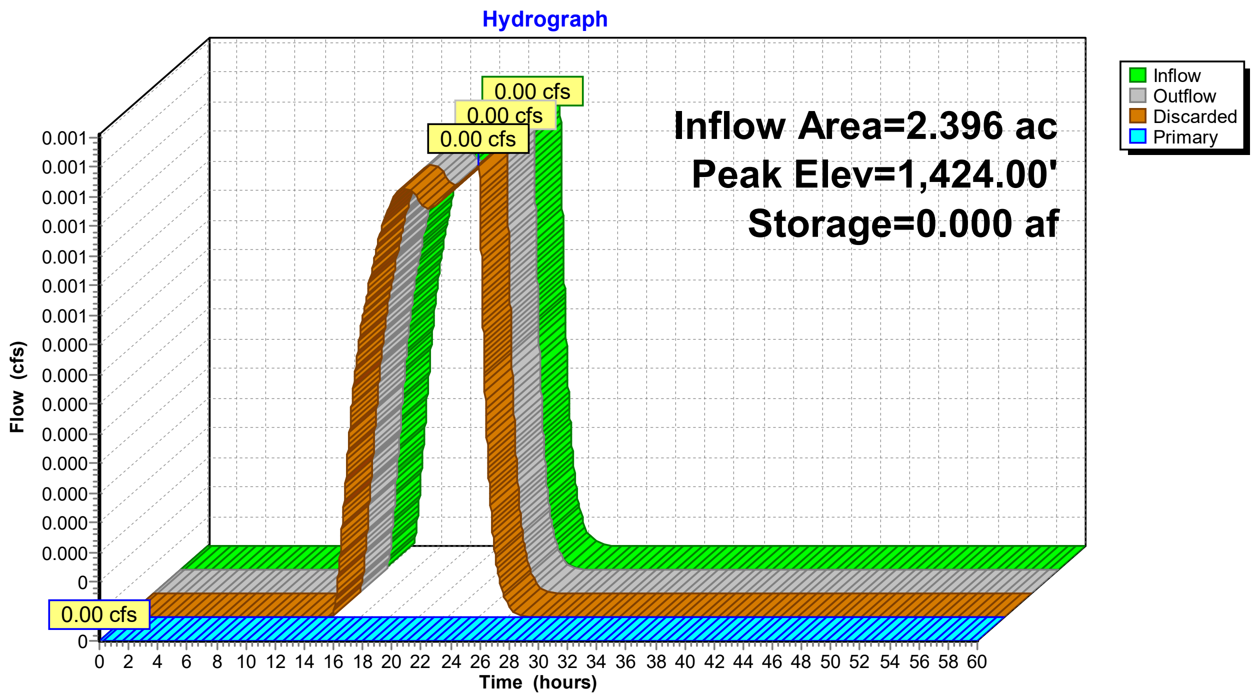
Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.149 af	**20.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,426.05'	**20.0' 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

Discarded OutFlow Max=0.00 cfs @ 24.05 hrs HW=1,424.00' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.2bP: South Road Treatment Pond



Summary for Pond 1.3P: Pond 3 - Access Rd West

Inflow Area = 0.695 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link SP1 : Study Point 1

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,456.00' @ 0.00 hrs Surf.Area= 784 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,456.00'	8,743 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

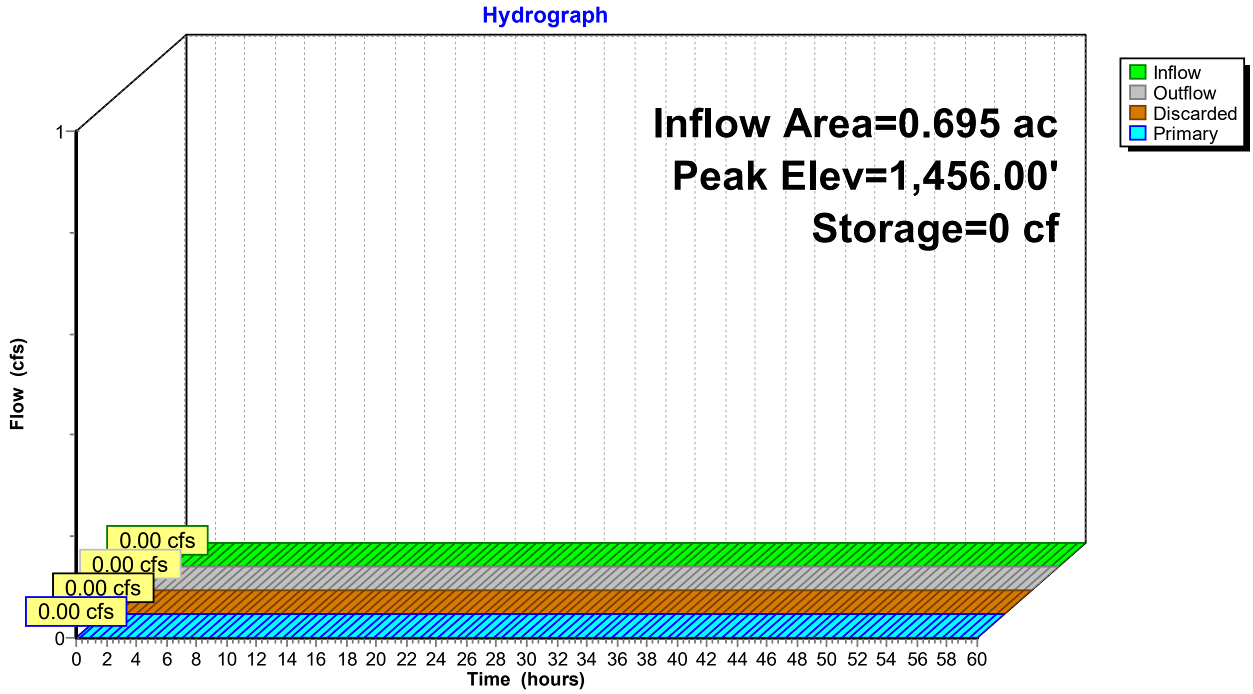
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,456.00	784	123.0	0	0	784
1,458.00	1,720	194.0	2,443	2,443	2,603
1,459.00	2,884	279.0	2,277	4,721	5,811
1,460.00	5,280	421.0	4,022	8,743	13,729

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,456.00'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,459.99'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
1=Exfiltration (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1.3P: Pond 3 - Access Rd West



Summary for Pond 4.2bP: Pond 4 - Access Rd East

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.01" for WQv event
Inflow = 0.00 cfs @ 18.02 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 18.09 hrs, Volume= 0.000 af, Atten= 0%, Lag= 3.7 min
Discarded = 0.00 cfs @ 18.09 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4.2C : 18" Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,445.50' @ 18.09 hrs Surf.Area= 200 sf Storage= 0 cf

Plug-Flow detention time= 4.1 min calculated for 0.000 af (100% of inflow)
Center-of-Mass det. time= 4.1 min (1,156.5 - 1,152.4)

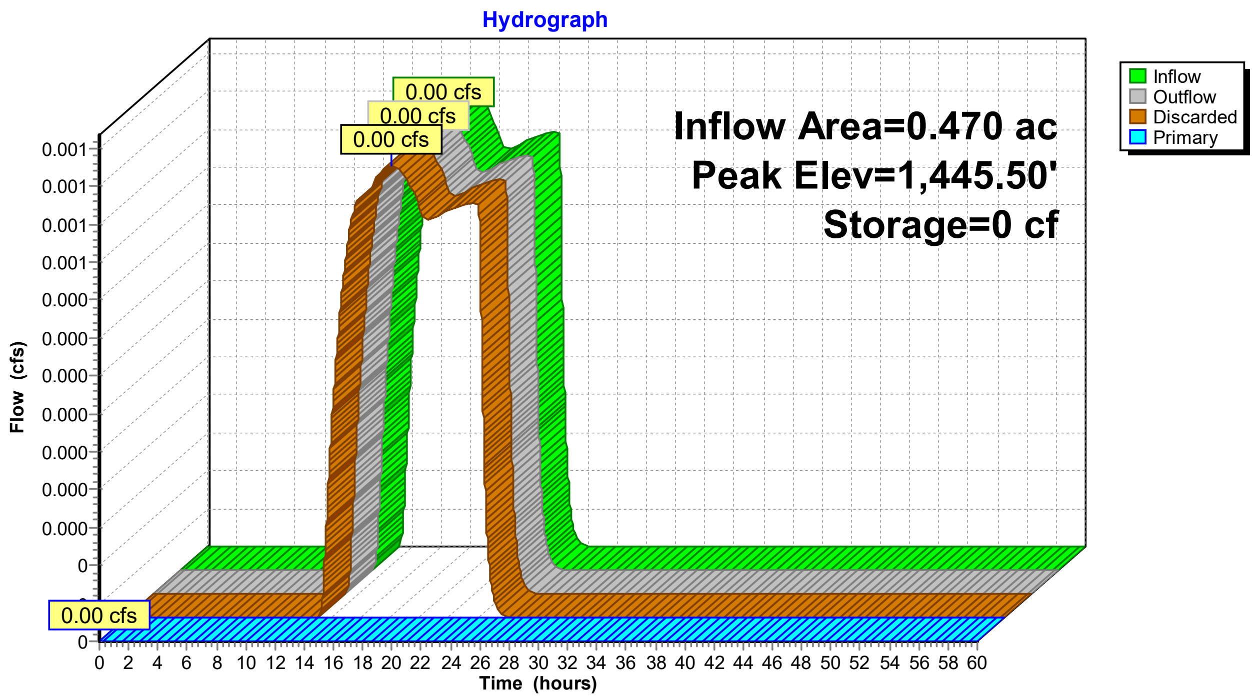
Volume	Invert	Avail.Storage	Storage Description
#1	1,445.50'	2,317 cf	**10.00'W x 20.00'L x 3.50'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,445.50'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,448.25'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.00 cfs @ 18.09 hrs HW=1,445.50' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,445.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4.2bP: Pond 4 - Access Rd East



Summary for Pond 4.2C: 18" Culvert

Inflow Area = 27.587 ac, 0.00% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.50' @ 0.00 hrs Storage= 0 cf
Flood Elev= 1,434.64' Surf.Area= 27,666 sf Storage= 28,656 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

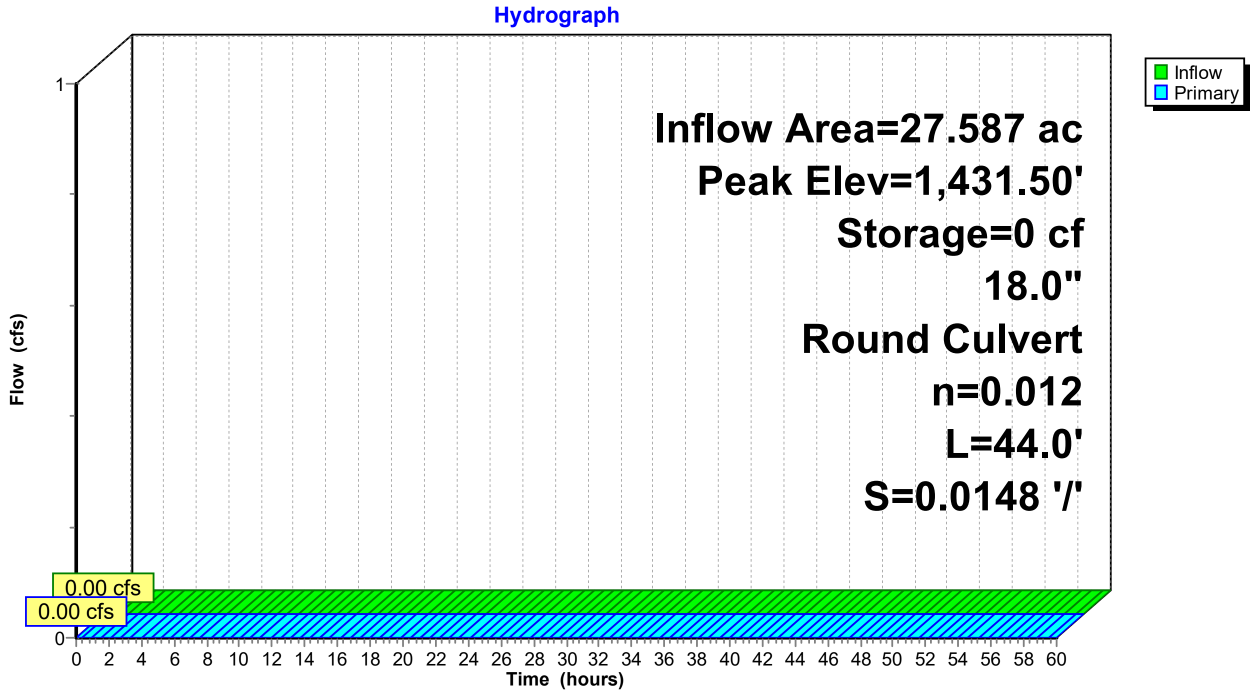
Volume	Invert	Avail.Storage	Storage Description
#1	1,431.50'	39,033 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,431.50	0	0.0	0	0	0
1,432.00	1,190	146.0	198	198	1,697
1,432.50	3,534	368.0	1,129	1,327	10,778
1,433.00	5,795	497.0	2,309	3,637	19,660
1,433.50	10,362	837.0	3,984	7,621	55,755
1,434.00	16,931	975.0	6,756	14,377	75,659
1,434.60	27,412	1,352.0	13,177	27,555	145,474
1,435.00	30,000	1,500.0	11,479	39,033	179,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.83'	**18.0" Round Culvert** L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.83' / 1,431.18' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.50' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)

Pond 4.2C: 18" Culvert



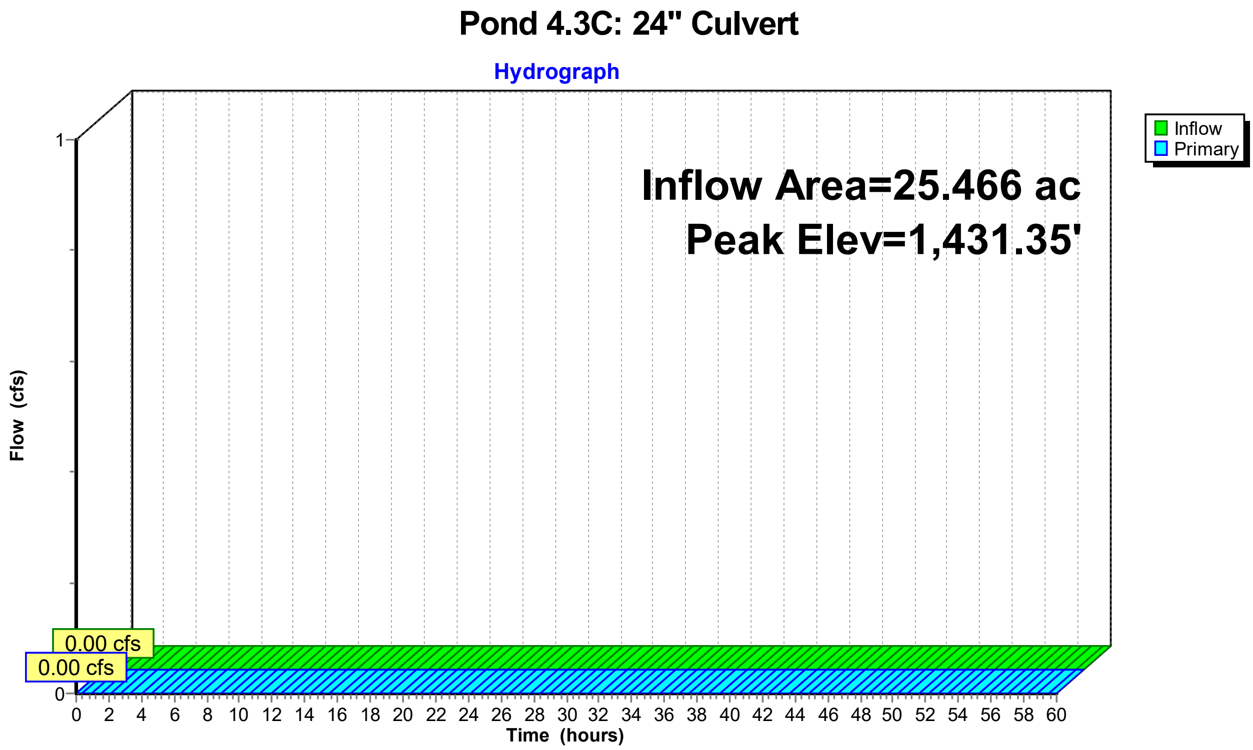
Summary for Pond 4.3C: 24" Culvert

Inflow Area = 25.466 ac, 5.08% Impervious, Inflow Depth = 0.00" for WQv event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.35' @ 0.00 hrs
Flood Elev= 1,434.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.35'	**24.0" Round Culvert** L= 55.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.35' / 1,429.87' S= 0.0265 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Primary	1,434.81'	**20.0' 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

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.35' (Free Discharge)
1=Culvert (Controls 0.00 cfs)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

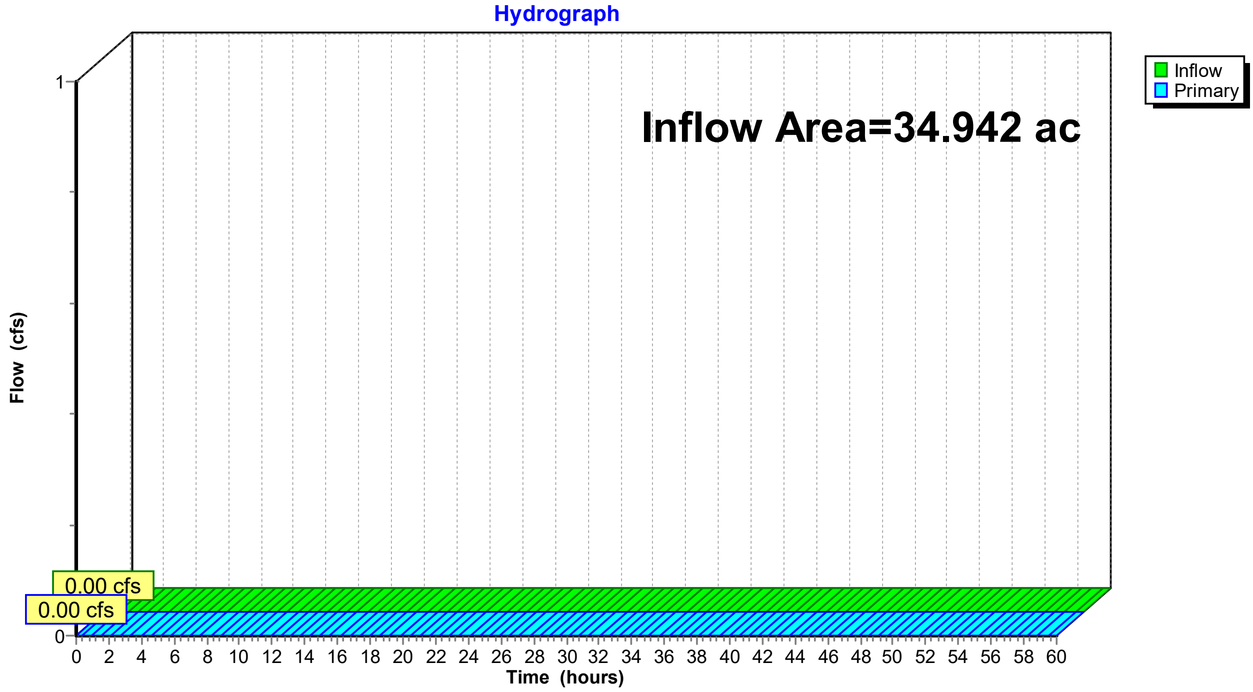


Summary for Link 1.1L:

Inflow Area = 34.942 ac, 0.04% Impervious, Inflow Depth = 0.00" for WQv 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
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

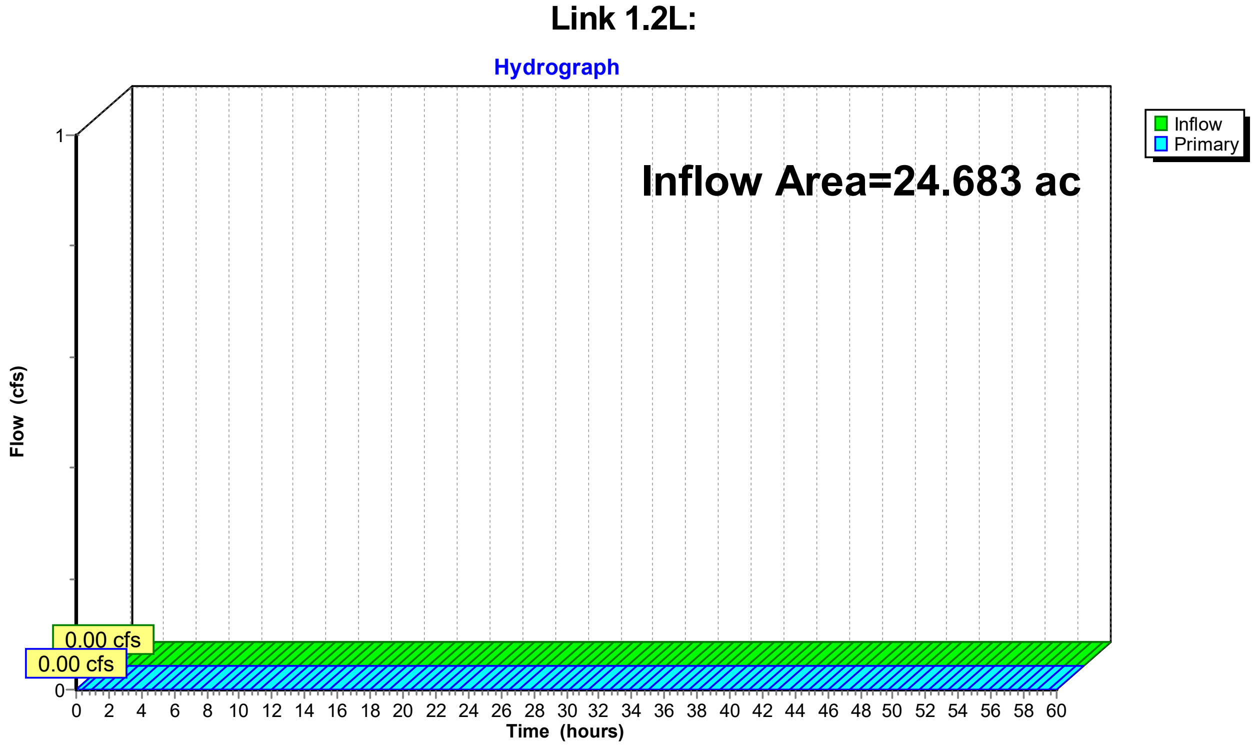
Link 1.1L:



Summary for Link 1.2L:

Inflow Area = 24.683 ac, 0.06% Impervious, Inflow Depth = 0.00" for WQv 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
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

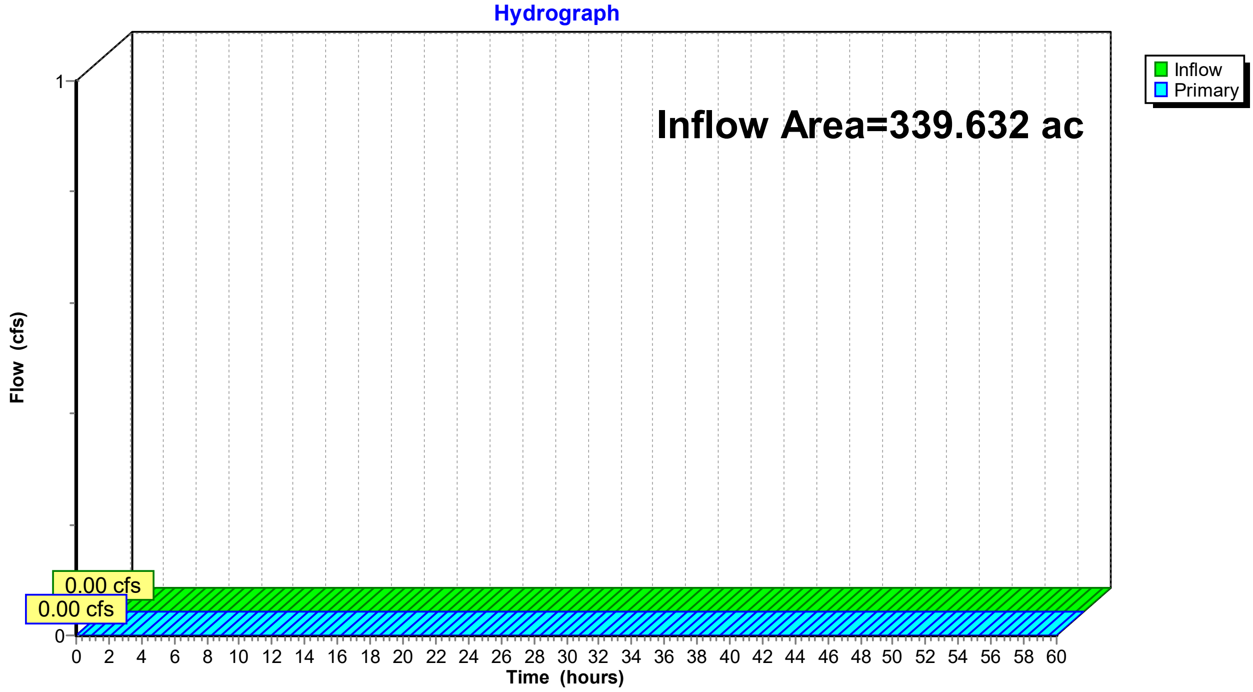


Summary for Link SP1: Study Point 1

Inflow Area =	339.632 ac,	0.01% Impervious, Inflow Depth = 0.00"	for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP1: Study Point 1

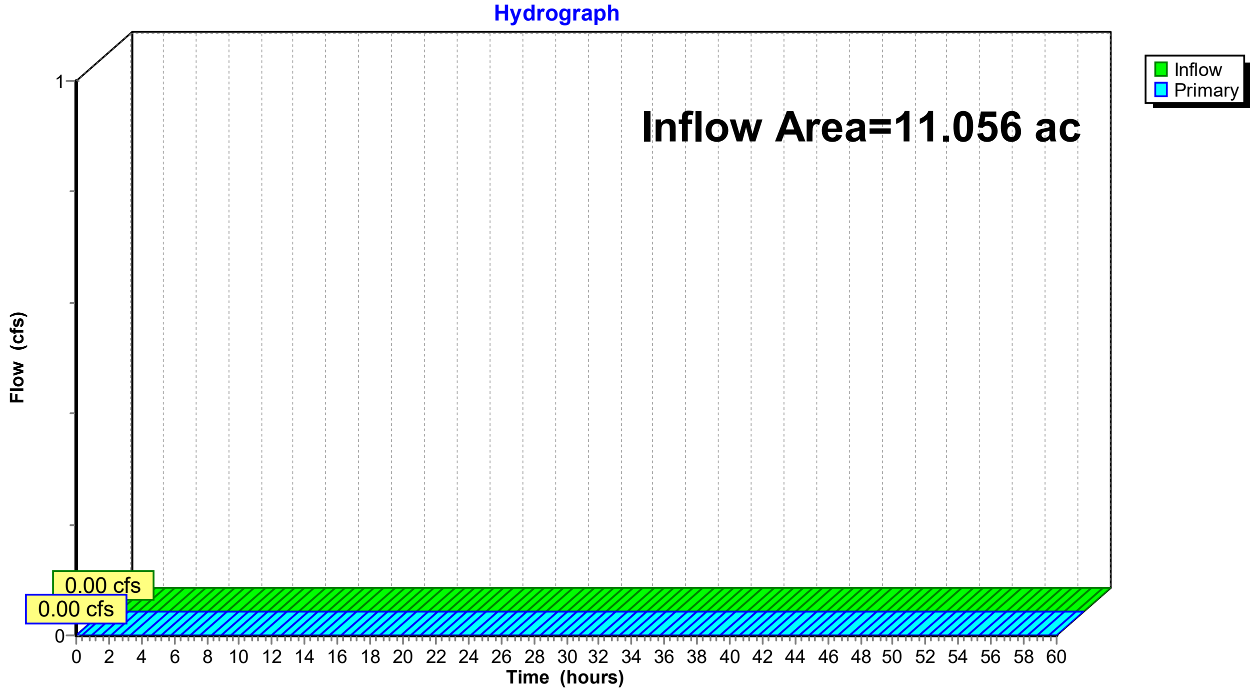


Summary for Link SP2: Study Point 2

Inflow Area =	11.056 ac,	0.00% Impervious, Inflow Depth = 0.00"	for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP2: Study Point 2

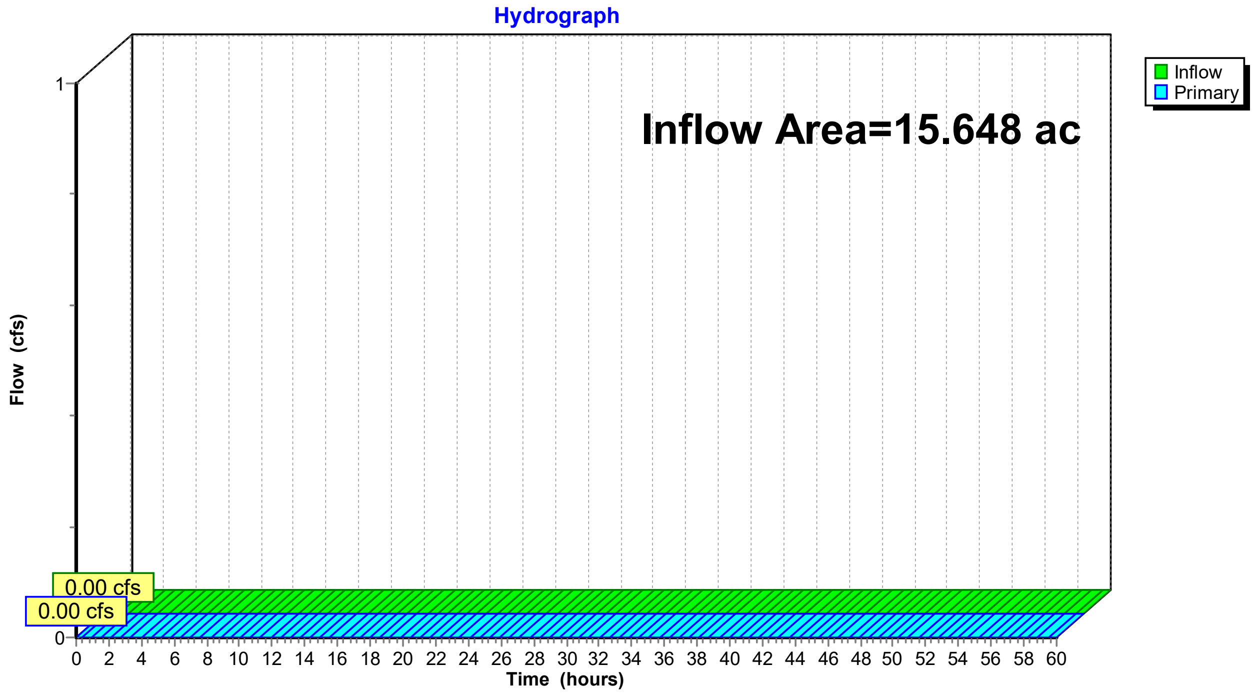


Summary for Link SP3: Study Point 3

Inflow Area =	15.648 ac,	0.56% Impervious, Inflow Depth = 0.00"	for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP3: Study Point 3

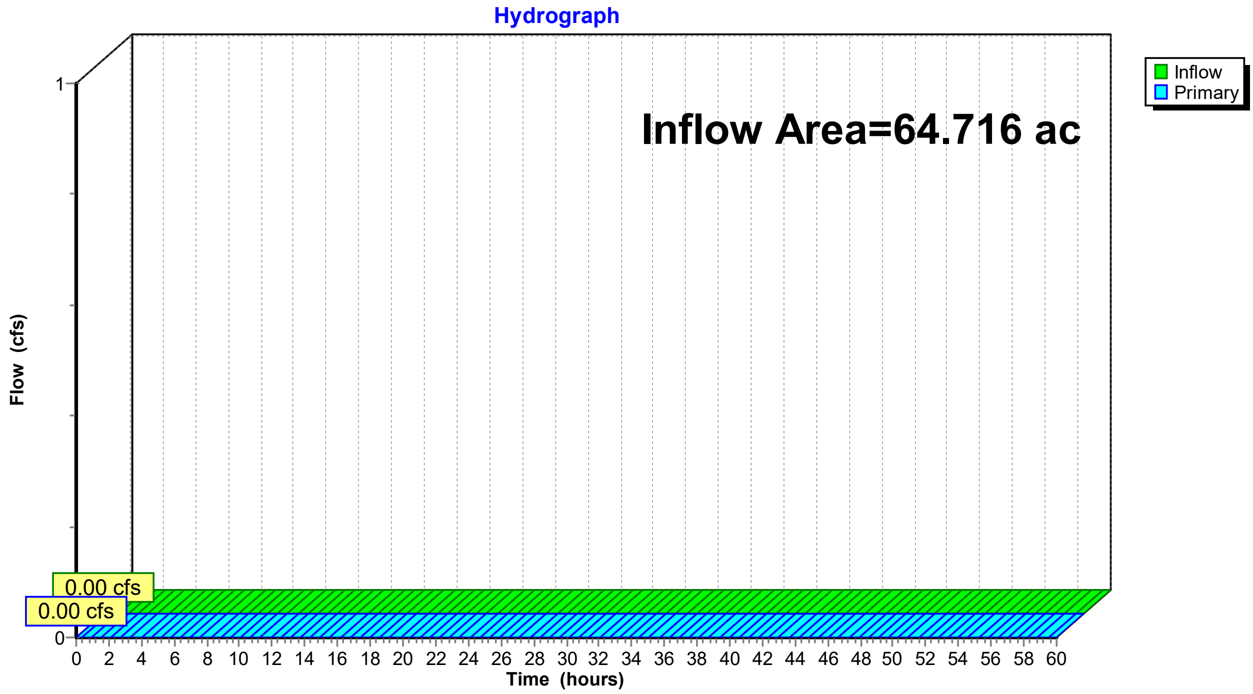


Summary for Link SP4: Study Point 4

Inflow Area =	64.716 ac,	2.50% Impervious,	Inflow Depth = 0.00"	for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP4: Study Point 4

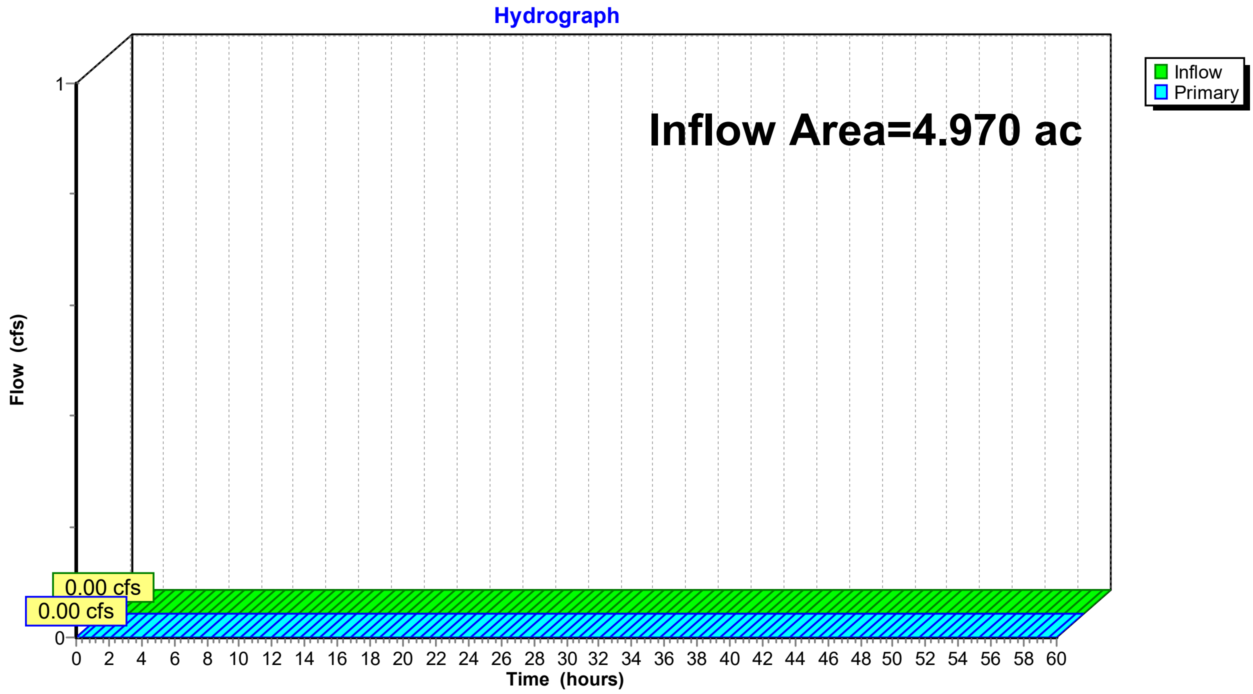


Summary for Link SP5: Study Point 5

Inflow Area =	4.970 ac,	0.00% Impervious, Inflow Depth = 0.00"	for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP5: Study Point 5

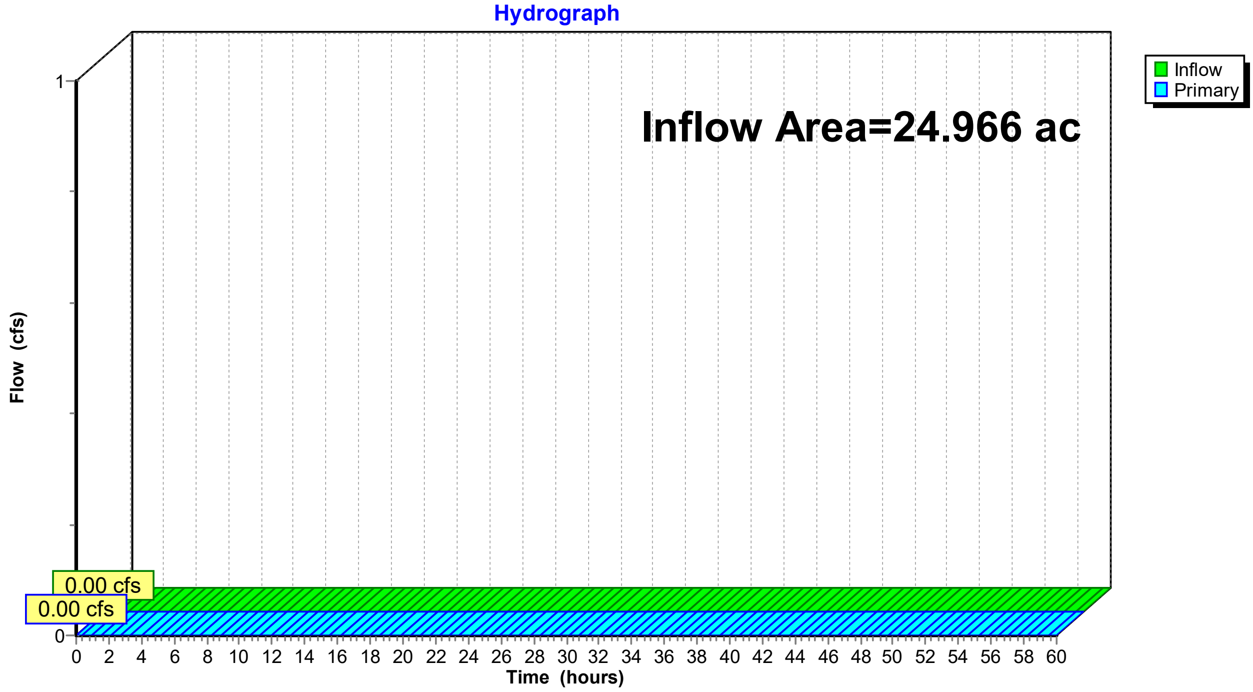


Summary for Link SP6: Study Point 6

Inflow Area =	24.966 ac,	5.81% Impervious, Inflow Depth = 0.00"	for WQv 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP6: Study Point 6



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1.1aS1: North Array East Runoff Area=5.874 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=788' Tc=18.8 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS2: North Array East Runoff Area=8.467 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=931' Tc=21.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS3: North Array West Runoff Area=5.792 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,031' Tc=19.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS4: North Array West Runoff Area=12.825 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,562' Tc=26.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1bS1: North Road - East Runoff Area=1.333 ac 0.53% Impervious Runoff Depth=0.26"
Tc=6.0 min CN=71 Runoff=0.47 cfs 0.029 af

Subcatchment 1.1bS2: North Road - West Runoff Area=0.651 ac 1.08% Impervious Runoff Depth=0.19"
Tc=6.0 min CN=68 Runoff=0.13 cfs 0.010 af

Subcatchment 1.2aS1: Middle Array East Runoff Area=7.876 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=865' Tc=19.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS2: Middle Array Center Runoff Area=8.911 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=825' Tc=18.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS3: Middle Array West Runoff Area=5.500 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=18.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2bS1: East Road - West Runoff Area=0.727 ac 0.00% Impervious Runoff Depth=0.17"
Tc=6.0 min CN=67 Runoff=0.12 cfs 0.010 af

Subcatchment 1.2bS2: South Road Runoff Area=0.854 ac 0.47% Impervious Runoff Depth=0.04"
Flow Length=308' Tc=13.7 min CN=58 Runoff=0.00 cfs 0.003 af

Subcatchment 1.2bS3: South Road Runoff Area=0.815 ac 1.35% Impervious Runoff Depth=0.26"
Tc=6.0 min CN=71 Runoff=0.29 cfs 0.018 af

Subcatchment 1.3aS1: Surface Discharge Runoff Area=279.312 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=6,771' Tc=201.7 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 1.3bS: Access Rd to Pond 3 Runoff Area=0.695 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=51 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Runoff Area=11.056 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=2,342' Tc=36.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 3S: Runoff Area=15.648 ac 0.56% Impervious Runoff Depth=0.00"
Flow Length=886' Tc=12.7 min CN=40 Runoff=0.00 cfs 0.000 af

Subcatchment 4.1S: Runoff Area=11.663 ac 2.80% Impervious Runoff Depth=0.00"
Flow Length=845' Tc=15.8 min CN=45 Runoff=0.00 cfs 0.000 af

Subcatchment 4.2aS: Runoff Area=27.117 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,640' Tc=38.9 min CN=51 Runoff=0.01 cfs 0.001 af

Subcatchment 4.2bS: Runoff Area=0.470 ac 0.00% Impervious Runoff Depth=0.28"
Tc=6.0 min CN=72 Runoff=0.19 cfs 0.011 af

Subcatchment 4.3S: Runoff Area=25.466 ac 5.08% Impervious Runoff Depth=0.03"
Flow Length=2,280' Tc=36.5 min CN=57 Runoff=0.07 cfs 0.059 af

Subcatchment 5S: Runoff Area=4.970 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,180' Tc=17.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 6S: Runoff Area=24.966 ac 5.81% Impervious Runoff Depth=0.00"
Flow Length=1,961' Tc=60.1 min CN=43 Runoff=0.00 cfs 0.000 af

Reach 1.1aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.0' S=0.0108 '/' Capacity=56.37 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.4' S=0.0284 '/' Capacity=91.27 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.5' S=0.0352 '/' Capacity=101.68 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR4: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.5' S=0.0362 '/' Capacity=103.04 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1bR1: North Road Conveyance Avg. Flow Depth=0.06' Max Vel=0.94 fps Inflow=0.47 cfs 0.029 af
n=0.035 L=1,733.0' S=0.0240 '/' Capacity=111.65 cfs Outflow=0.12 cfs 0.029 af

Reach 1.1bR2: North Road Conveyance Avg. Flow Depth=0.06' Max Vel=1.18 fps Inflow=0.20 cfs 0.039 af
n=0.035 L=593.3' S=0.0380 '/' Capacity=140.36 cfs Outflow=0.15 cfs 0.039 af

Reach 1.2aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=524.2' S=0.0188 '/' Capacity=74.30 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=556.0' S=0.0204 '/' Capacity=77.47 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=249.0' S=0.0153 '/' Capacity=81.84 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2bR1: East Road Conveyance Avg. Flow Depth=0.03' Max Vel=0.80 fps Inflow=0.12 cfs 0.010 af
n=0.035 L=731.4' S=0.0456 '/' Capacity=79.22 cfs Outflow=0.04 cfs 0.010 af

Reach 1.2bR2: South Road Conveyance Avg. Flow Depth=0.03' Max Vel=0.53 fps Inflow=0.04 cfs 0.013 af
n=0.035 L=604.5' S=0.0177 '/' Capacity=95.76 cfs Outflow=0.03 cfs 0.013 af

Reach 1.2bR3: South Road Conveyance Avg. Flow Depth=0.06' Max Vel=0.89 fps Inflow=0.29 cfs 0.030 af
n=0.035 L=755.9' S=0.0187 '/' Capacity=98.64 cfs Outflow=0.13 cfs 0.030 af

Reach 4.1R1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=570.0' S=0.0303 '/' Capacity=54.88 cfs Outflow=0.00 cfs 0.000 af

Reach 4.1R2: Ex Stream Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=740.0' S=0.0099 '/' Capacity=588.81 cfs Outflow=0.00 cfs 0.000 af

Reach 4.2bR: Conveyance Swale Avg. Flow Depth=0.05' Max Vel=1.13 fps Inflow=0.19 cfs 0.011 af
n=0.035 L=565.0' S=0.0432 '/' Capacity=77.09 cfs Outflow=0.12 cfs 0.011 af

Pond 1.1aC1: TS1 Culvert Peak Elev=1,487.56' Inflow=0.00 cfs 0.000 af
36.3" x 22.5", R=18.8"/51.0" Pipe Arch Culvert n=0.012 L=47.0' S=0.0162 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC2: TS2 Culvert Peak Elev=1,470.80' Inflow=0.00 cfs 0.000 af
48.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0262 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC3: TS3 Culvert Peak Elev=1,449.55' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.2' S=0.0405 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aP: North Road Bypass OC Peak Elev=1,426.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.1bC1: TS4 Culvert Peak Elev=1,449.65' Inflow=0.12 cfs 0.029 af
18.0" Round Culvert n=0.012 L=45.9' S=0.0486 '/' Outflow=0.12 cfs 0.029 af

Pond 1.1bP1: Dry Swale Peak Elev=1,425.78' Storage=78 cf Inflow=0.15 cfs 0.039 af
Discarded=0.00 cfs 0.004 af Primary=0.15 cfs 0.035 af Outflow=0.15 cfs 0.039 af

Pond 1.1bP2: North Road Detention Pond Peak Elev=1,423.08' Storage=0.024 af Inflow=0.15 cfs 0.035 af
Discarded=0.01 cfs 0.034 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.034 af

Pond 1.2aC1: TS 7 Culvert Peak Elev=1,444.22' Inflow=0.00 cfs 0.000 af
36.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0215 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aC2: TS8 Culvert Peak Elev=1,431.65' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.5' S=0.0114 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aP: South Road Bypass OC Peak Elev=1,424.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.2bC1: East Road Culvert Peak Elev=1,454.48' Inflow=0.04 cfs 0.010 af
15.0" Round Culvert n=0.012 L=41.6' S=0.0173 '/' Outflow=0.04 cfs 0.010 af

Pond 1.2bC2: TS6 Culvert Peak Elev=1,443.58' Inflow=0.03 cfs 0.013 af
18.0" Round Culvert n=0.012 L=44.3' S=0.0151 '/' Outflow=0.03 cfs 0.013 af

Pond 1.2bP: South Road Treatment Pond Peak Elev=1,424.05' Storage=0.000 af Inflow=0.13 cfs 0.030 af
Discarded=0.11 cfs 0.030 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.030 af

Pond 1.3P: Pond 3 - Access Rd West Peak Elev=1,456.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 4.2bP: Pond 4 - Access Rd East Peak Elev=1,445.81' Storage=70 cf Inflow=0.12 cfs 0.011 af
Discarded=0.04 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.011 af

Pond 4.2C: 18" Culvert Peak Elev=1,431.78' Storage=35 cf Inflow=0.01 cfs 0.001 af
18.0" Round Culvert n=0.012 L=44.0' S=0.0148 '/' Outflow=0.00 cfs 0.000 af

Pond 4.3C: 24" Culvert Peak Elev=1,431.46' Inflow=0.07 cfs 0.059 af
Outflow=0.07 cfs 0.059 af

Link 1.1L:	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link 1.2L:	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP1: Study Point 1	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP2: Study Point 2	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP3: Study Point 3	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP4: Study Point 4	Inflow=0.07 cfs 0.059 af Primary=0.07 cfs 0.059 af
Link SP5: Study Point 5	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP6: Study Point 6	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af

Total Runoff Area = 460.988 ac Runoff Volume = 0.140 af Average Runoff Depth = 0.00"
99.31% Pervious = 457.801 ac 0.69% Impervious = 3.187 ac

Summary for Subcatchment 1.1aS1: North Array East

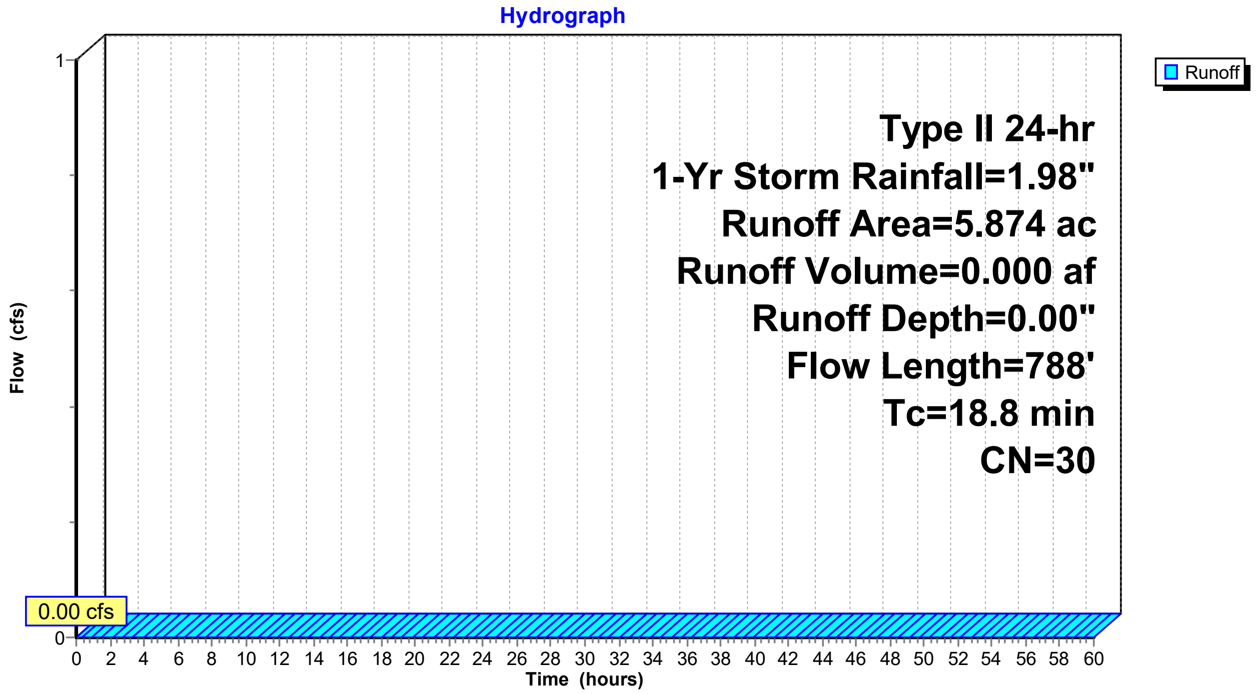
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
5.874	30	Meadow, non-grazed, HSG A
5.874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0499	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.1	688	0.0526	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.8	788	Total			

Subcatchment 1.1aS1: North Array East



Summary for Subcatchment 1.1aS2: North Array East Center

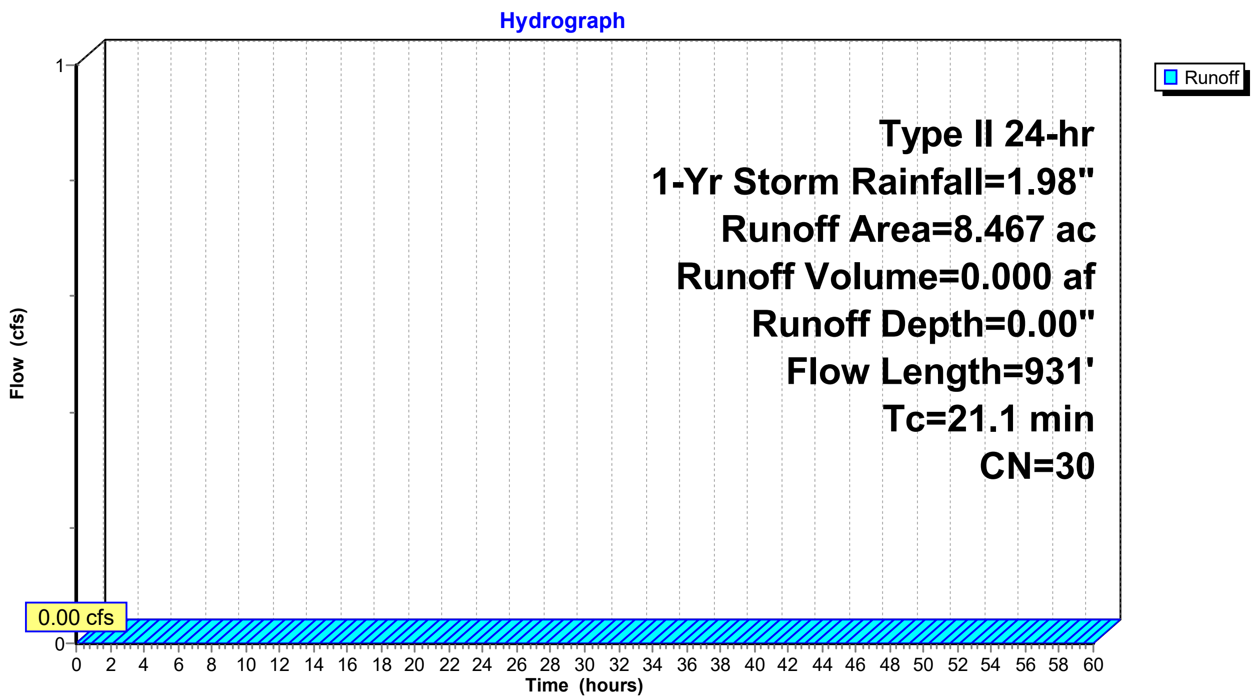
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
8.467	30	Meadow, non-grazed, HSG A
8.467		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0476	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.2	831	0.0463	1.51		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.1	931	Total			

Subcatchment 1.1aS2: North Array East Center



Summary for Subcatchment 1.1aS3: North Array West Center

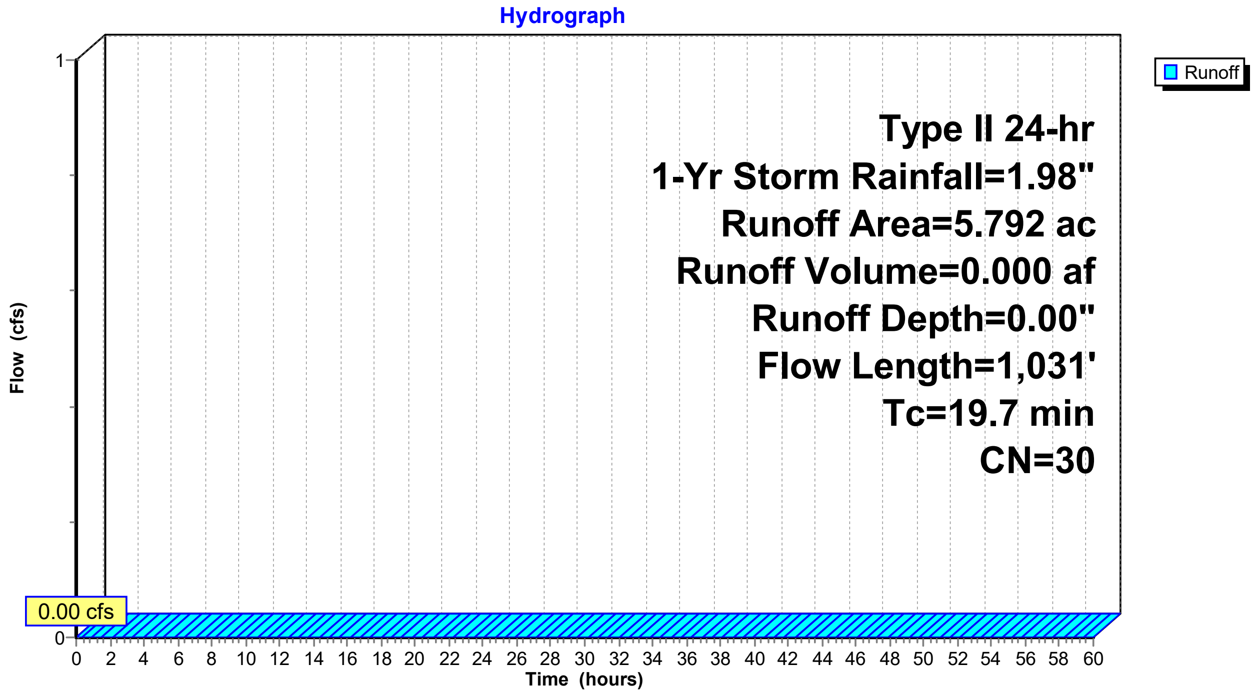
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
5.792	30	Meadow, non-grazed, HSG A
5.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0618	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.0	931	0.0601	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	1,031	Total			

Subcatchment 1.1aS3: North Array West Center



Summary for Subcatchment 1.1aS4: North Array West

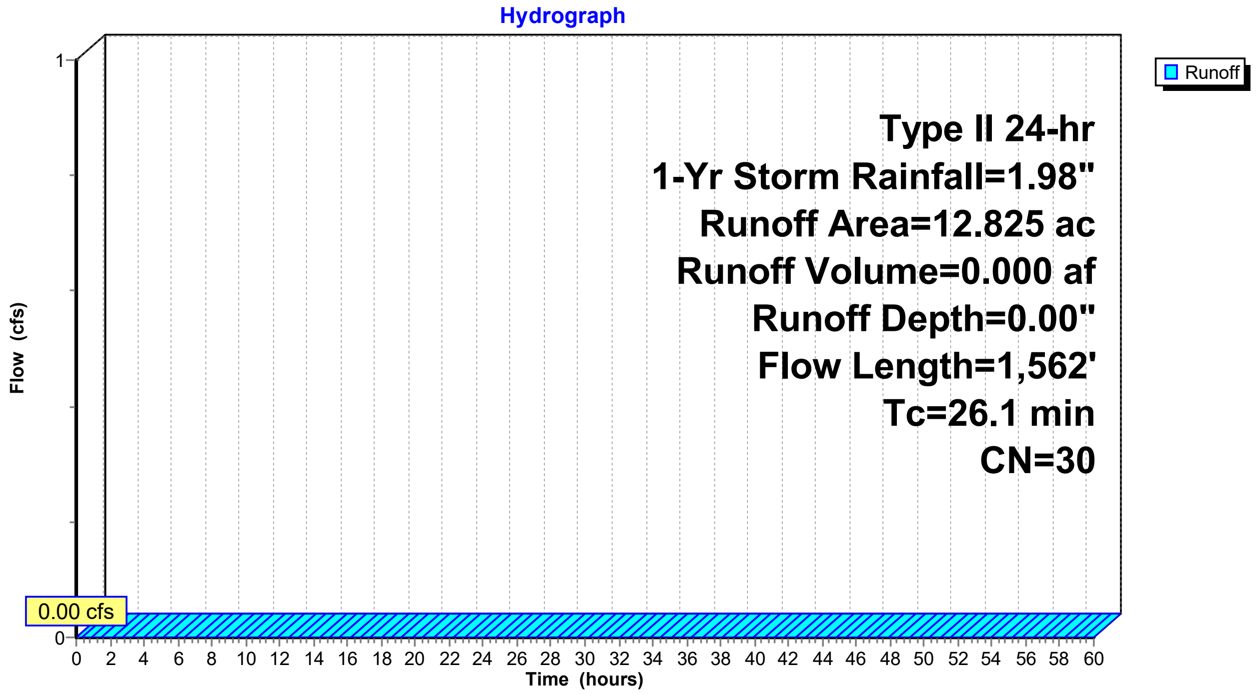
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR4 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
12.825	30	Meadow, non-grazed, HSG A
12.825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0560	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
15.0	1,462	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.1	1,562	Total			

Subcatchment 1.1aS4: North Array West



Summary for Subcatchment 1.1bS1: North Road - East

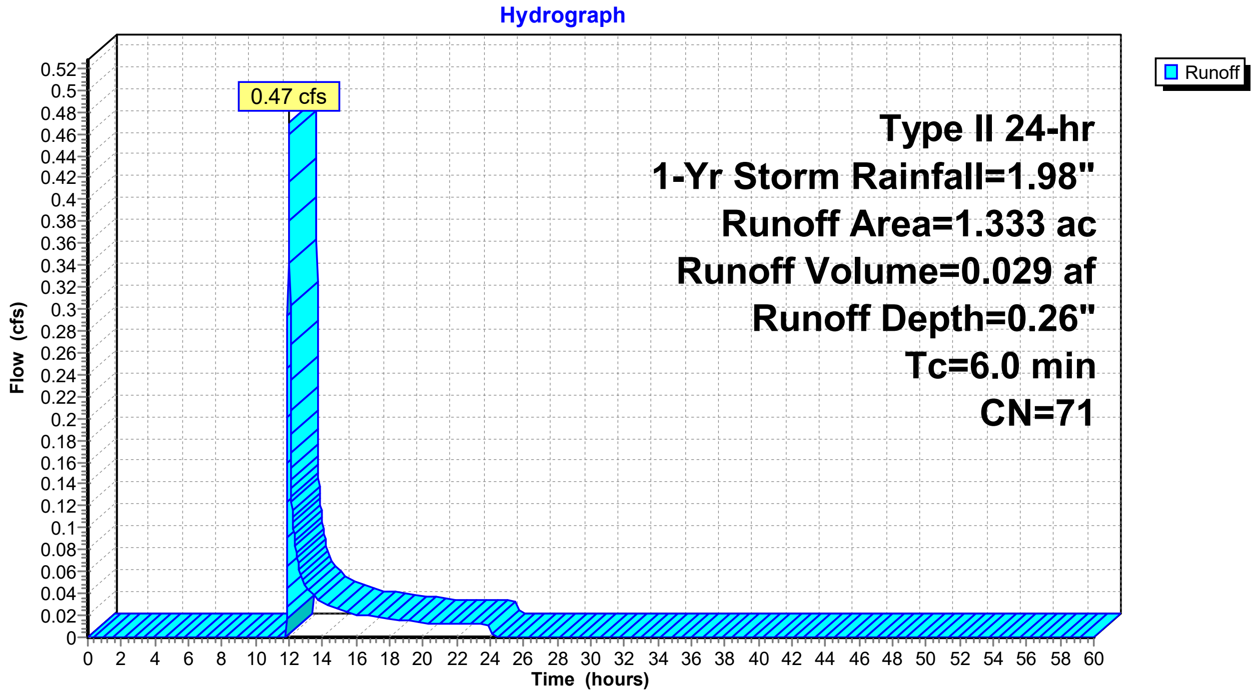
Runoff = 0.47 cfs @ 12.00 hrs, Volume= 0.029 af, Depth= 0.26"
Routed to Reach 1.1bR1 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
0.507	30	Meadow, non-grazed, HSG A
0.819	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
1.333	71	Weighted Average
1.326		99.47% Pervious Area
0.007		0.53% Impervious Area

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

Subcatchment 1.1bS1: North Road - East



Summary for Subcatchment 1.1bS2: North Road - West

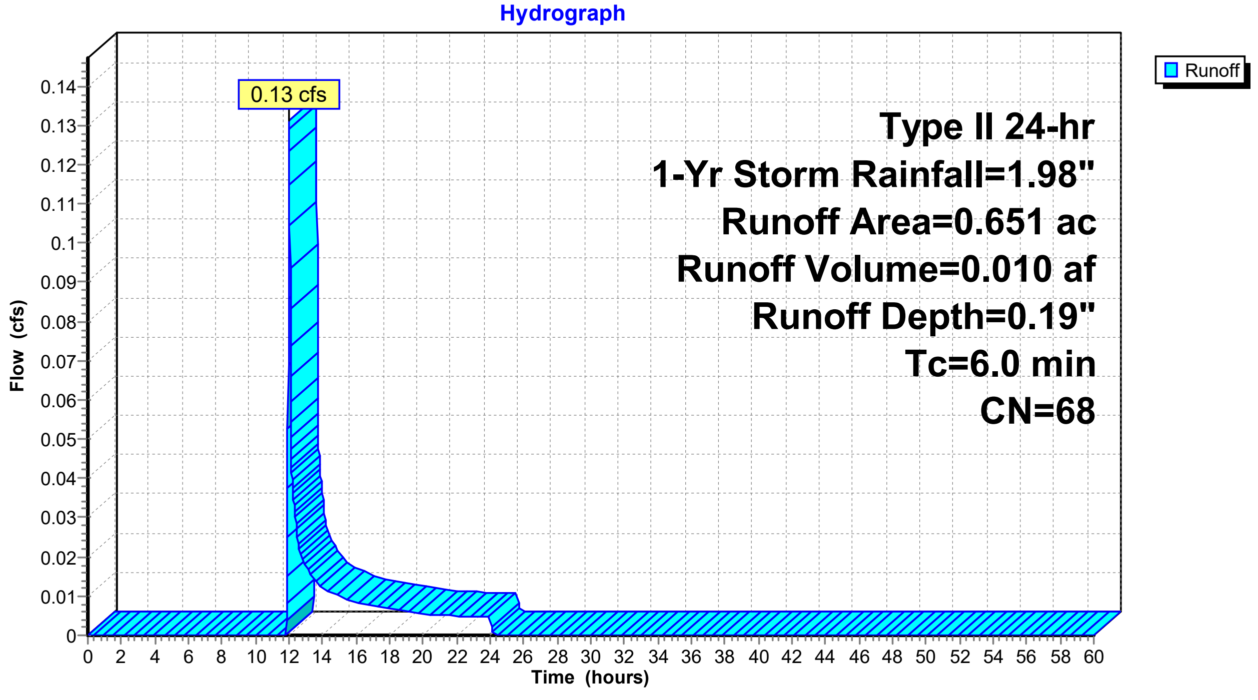
Runoff = 0.13 cfs @ 12.01 hrs, Volume= 0.010 af, Depth= 0.19"
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
0.279	30	Meadow, non-grazed, HSG A
0.365	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
0.651	68	Weighted Average
0.644		98.92% Pervious Area
0.007		1.08% Impervious Area

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

Subcatchment 1.1bS2: North Road - West



Summary for Subcatchment 1.2aS1: Middle Array East

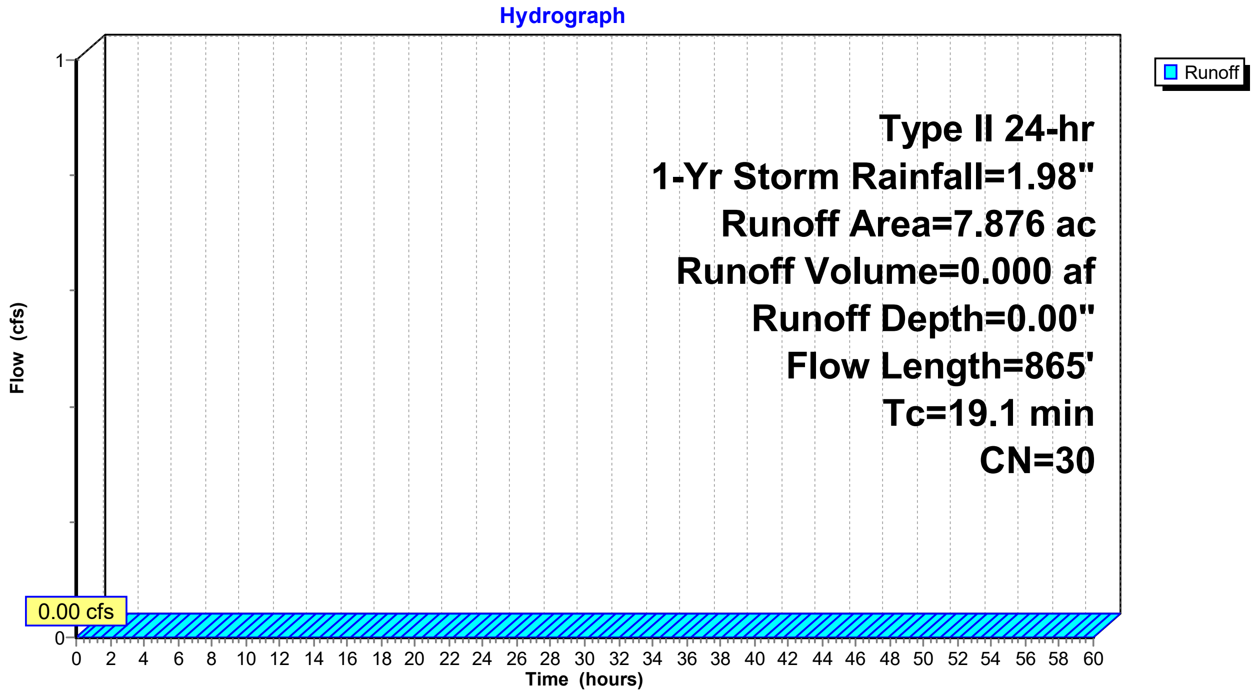
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
7.876	30	Meadow, non-grazed, HSG A
7.876		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0628	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.5	765	0.0459	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.1	865	Total			

Subcatchment 1.2aS1: Middle Array East



Summary for Subcatchment 1.2aS2: Middle Array Center

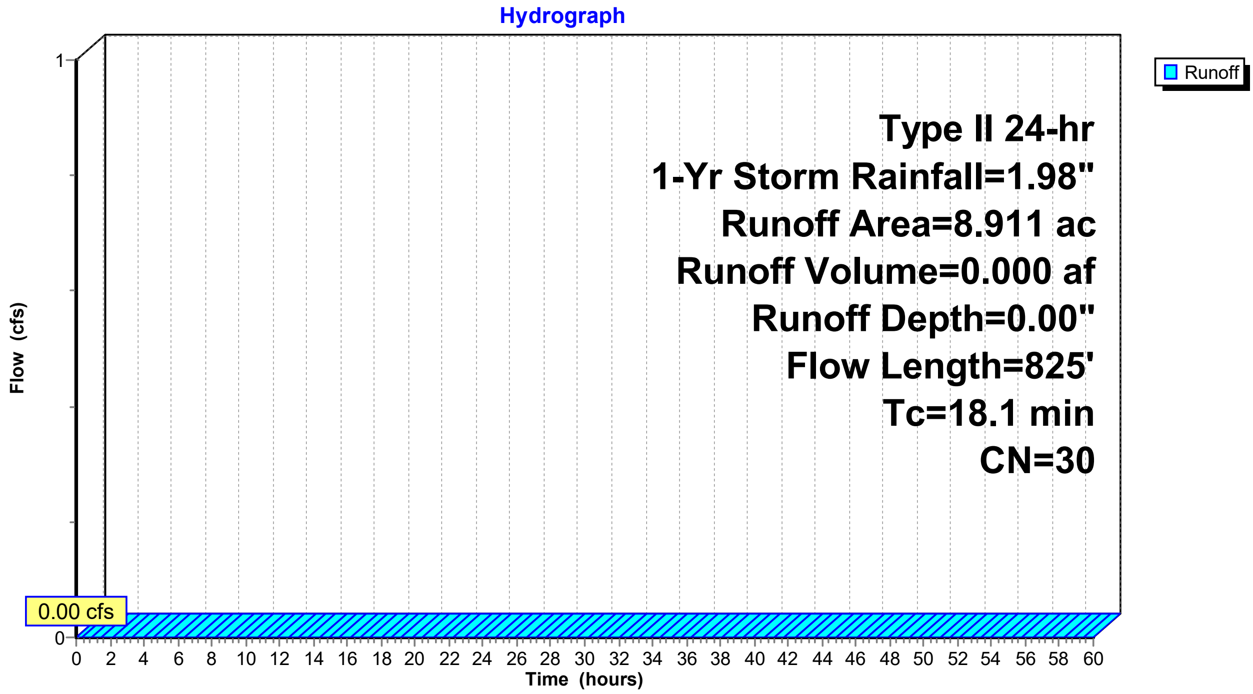
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
8.911	30	Meadow, non-grazed, HSG A
8.911		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0607	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.3	725	0.0559	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.1	825	Total			

Subcatchment 1.2aS2: Middle Array Center



Summary for Subcatchment 1.2aS3: Middle Array West

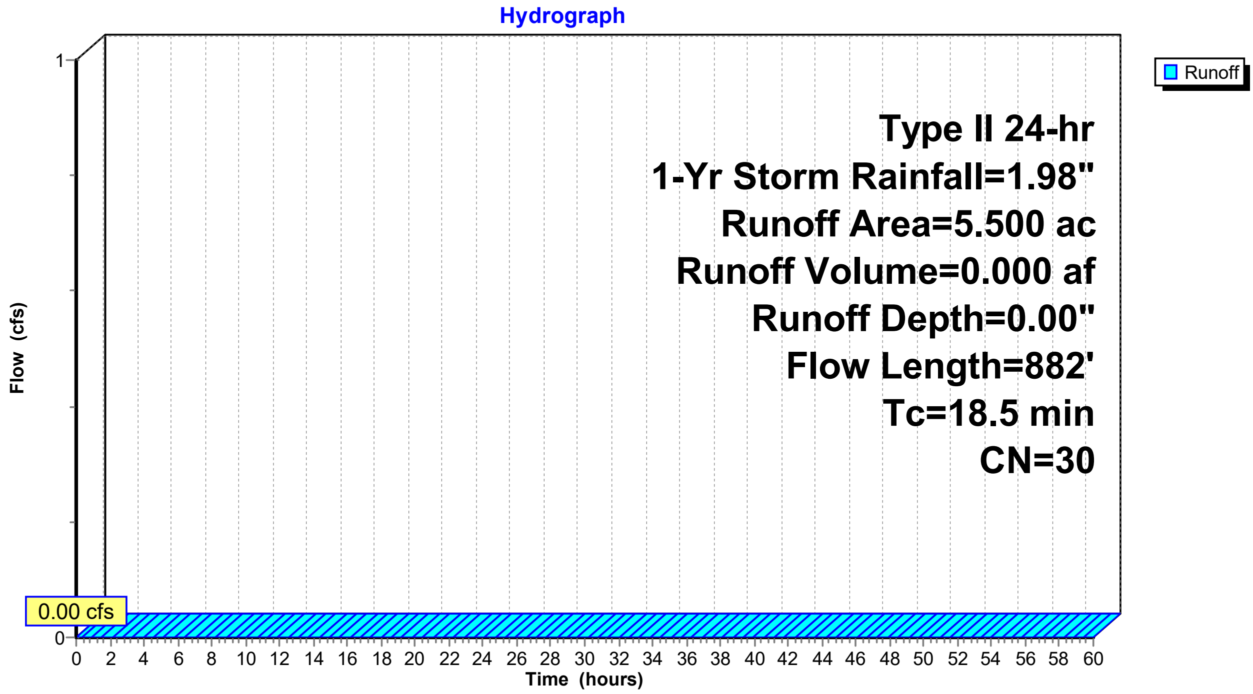
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
5.500	30	Meadow, non-grazed, HSG A
5.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.0660	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.1	782	0.0529	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.5	882	Total			

Subcatchment 1.2aS3: Middle Array West



Summary for Subcatchment 1.2bS1: East Road - West Ditch

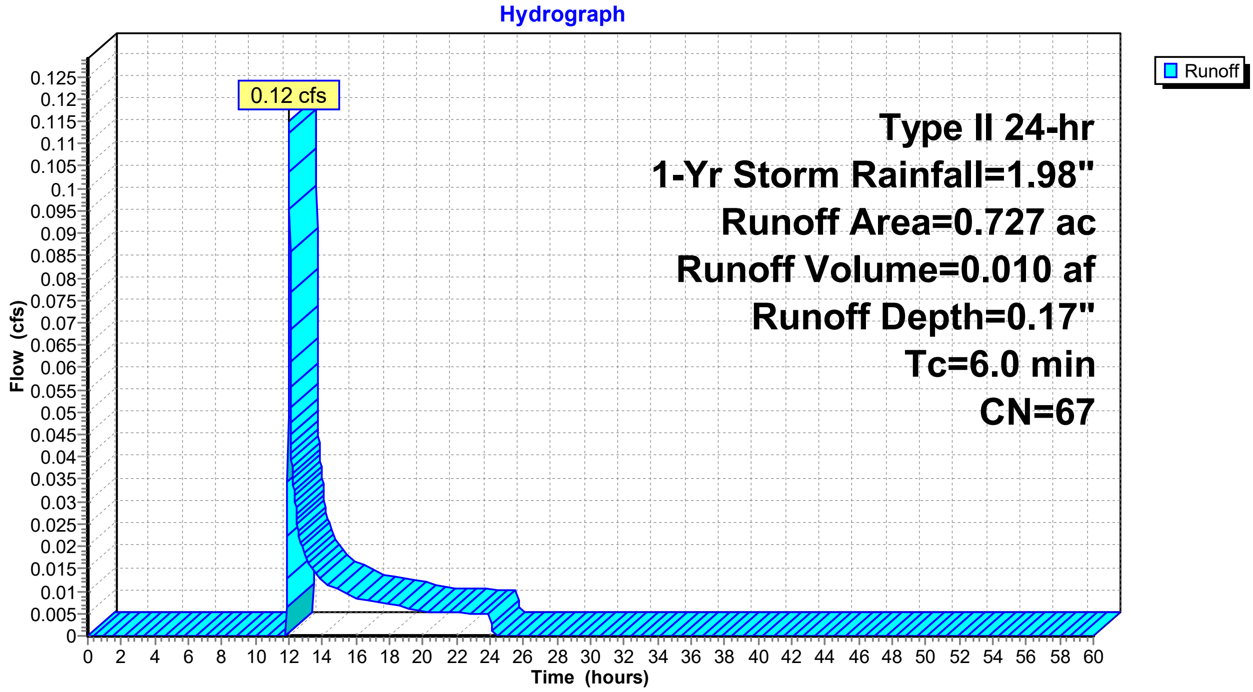
Runoff = 0.12 cfs @ 12.01 hrs, Volume= 0.010 af, Depth= 0.17"
Routed to Reach 1.2bR1 : East Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
0.410	96	Gravel surface, HSG A
0.317	30	Meadow, non-grazed, HSG A
0.727	67	Weighted Average
0.727		100.00% Pervious Area

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

Subcatchment 1.2bS1: East Road - West Ditch



Summary for Subcatchment 1.2bS2: South Road

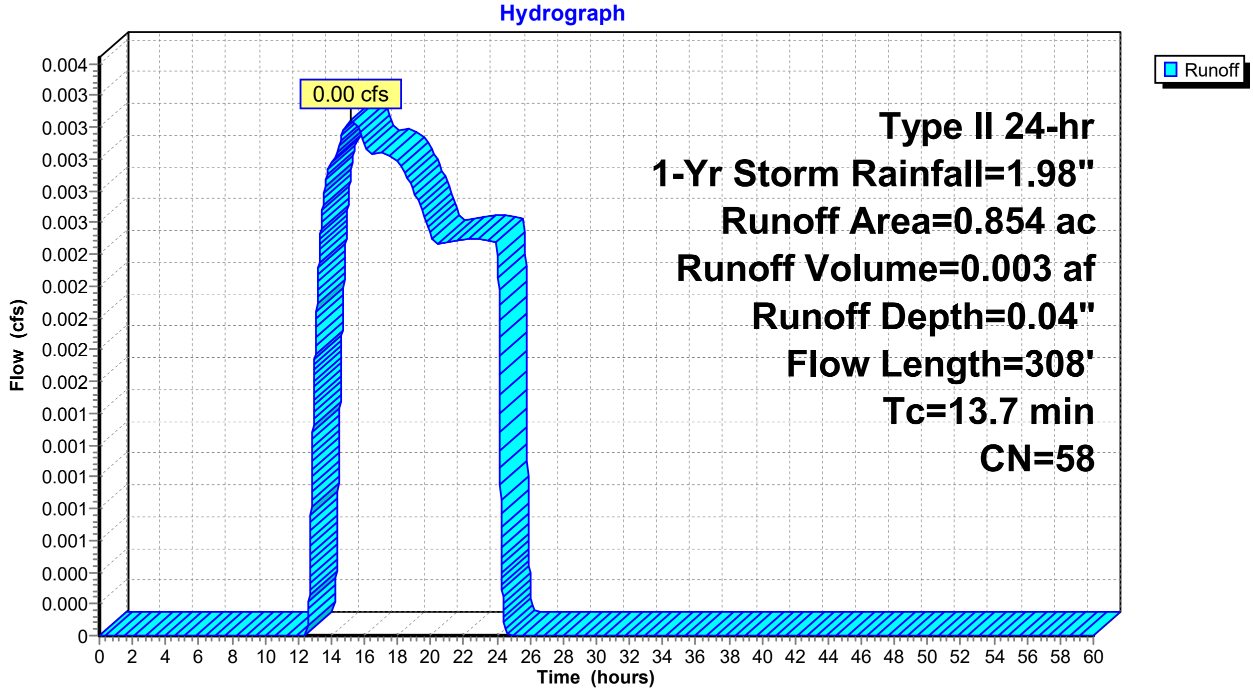
Runoff = 0.00 cfs @ 15.21 hrs, Volume= 0.003 af, Depth= 0.04"
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
	0.498	30	Meadow, non-grazed, HSG A
*	0.352	96	Gravel surface
*	0.004	98	Roofs
	0.854	58	Weighted Average
	0.850		99.53% Pervious Area
	0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0516	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
0.4	25	0.0310	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
5.9	40	0.0429	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.4	208	0.0442	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	308	Total			

Subcatchment 1.2bS2: South Road



Summary for Subcatchment 1.2bS3: South Road

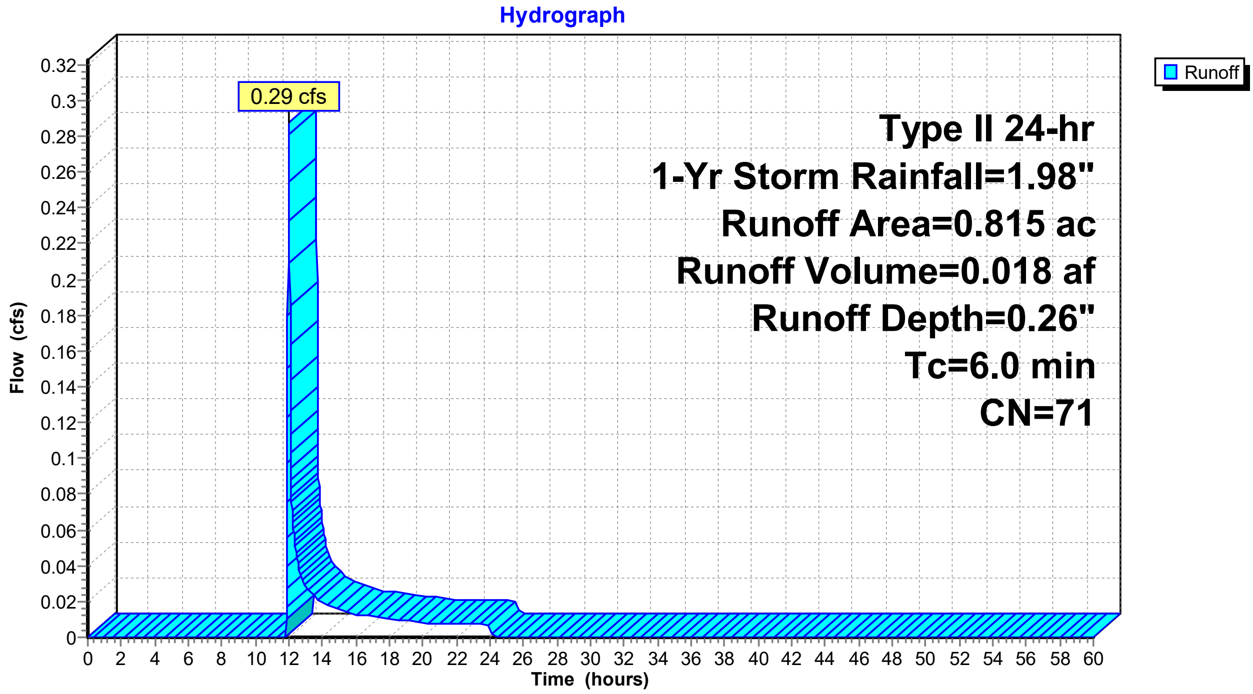
Runoff = 0.29 cfs @ 12.00 hrs, Volume= 0.018 af, Depth= 0.26"
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
	0.313	30	Meadow, non-grazed, HSG A
	0.491	96	Gravel surface, HSG A
*	0.011	98	Roofs
	0.815	71	Weighted Average
	0.804		98.65% Pervious Area
	0.011		1.35% Impervious Area

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

Subcatchment 1.2bS3: South Road



Summary for Subcatchment 1.3aS1: Surface Discharge

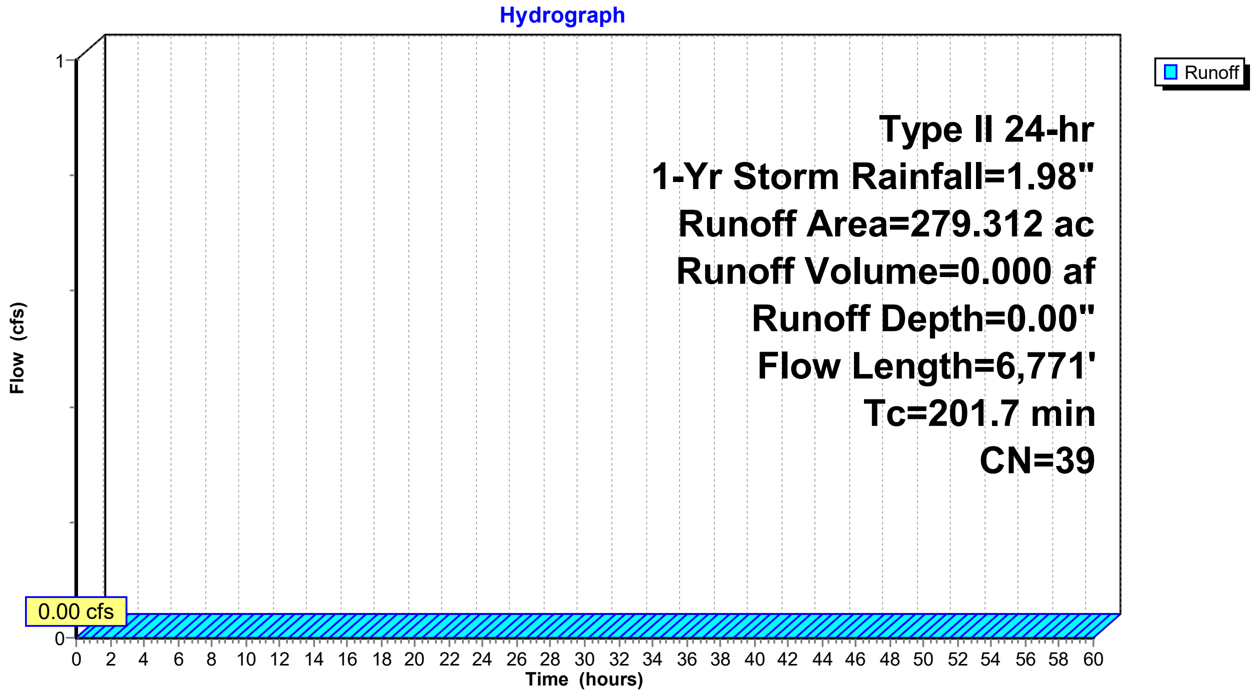
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.754	96	Gravel surface
	144.649	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	25.274	71	Meadow, non-grazed, HSG C
	61.692	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	13.623	70	Woods, Good, HSG C
	279.312	39	Weighted Average
	279.312		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	189	0.0157	3.84	76.82	**Channel Flow, Rerouted Stream** Area= 20.0 sf Perim= 32.6' r= 0.61' n= 0.035 Earth, dense weeds
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
201.7	6,771	Total			

Subcatchment 1.3aS1: Surface Discharge



Summary for Subcatchment 1.3bS: Access Rd to Pond 3

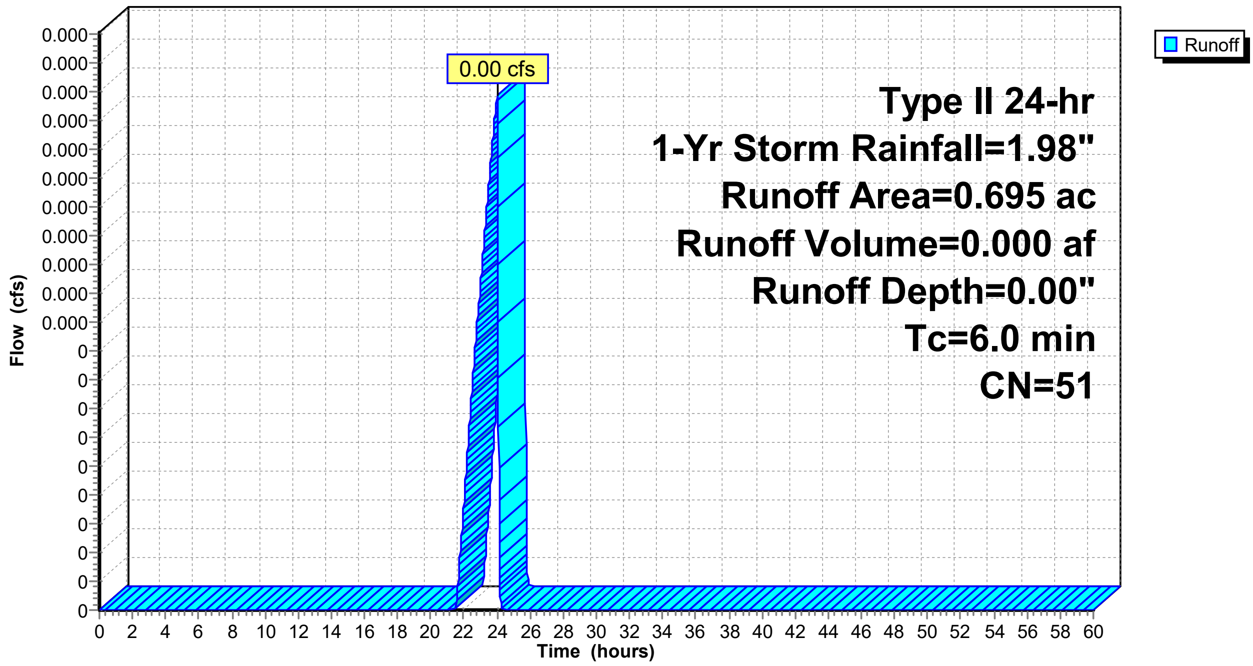
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Pond 1.3P : Pond 3 - Access Rd West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
	0.473	30	Meadow, non-grazed, HSG A
*	0.063	96	Gravel surface, HSG A, Redev
*	0.159	96	Gravel surface, HSG A
	0.695	51	Weighted Average
	0.695		100.00% Pervious Area

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

Subcatchment 1.3bS: Access Rd to Pond 3



Summary for Subcatchment 2S:

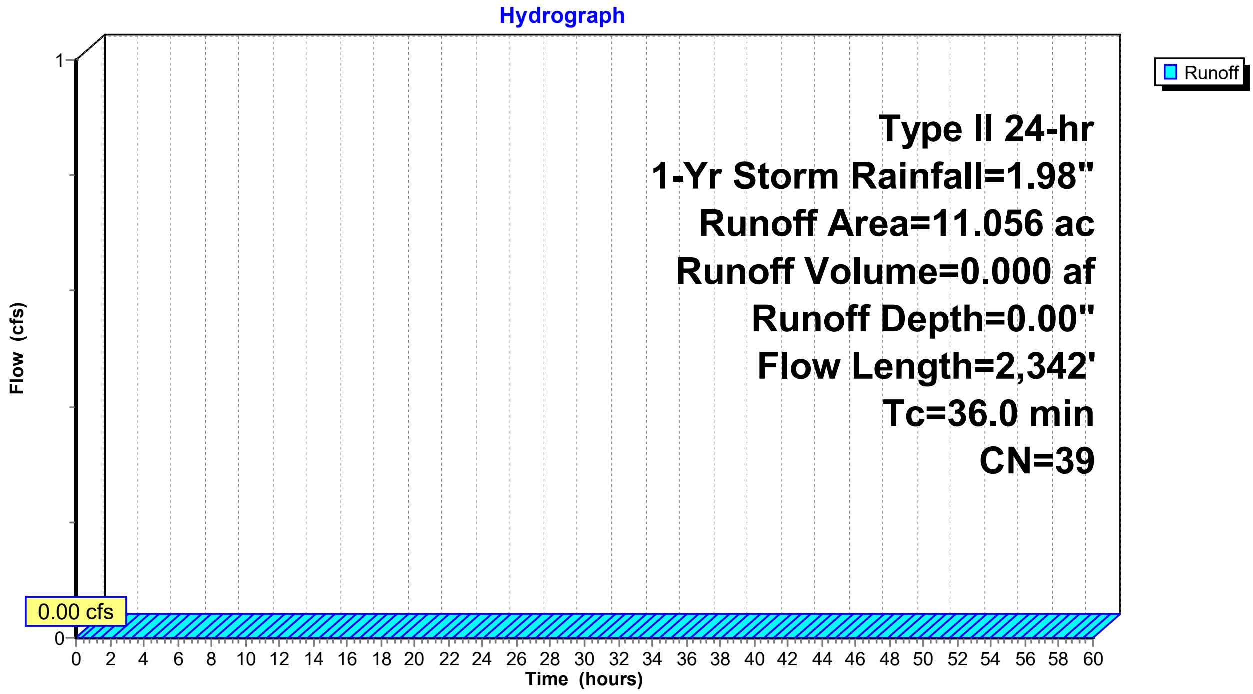
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
1.417	96	Gravel surface, HSG A
0.573	39	>75% Grass cover, Good, HSG A
6.530	30	Meadow, non-grazed, HSG A
2.536	30	Woods, Good, HSG A
11.056	39	Weighted Average
11.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0624	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.7	614	0.0535	3.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	1,184	0.0543	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	115	0.0407	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	68	0.1443	1.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	261	0.0118	0.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.0	2,342	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

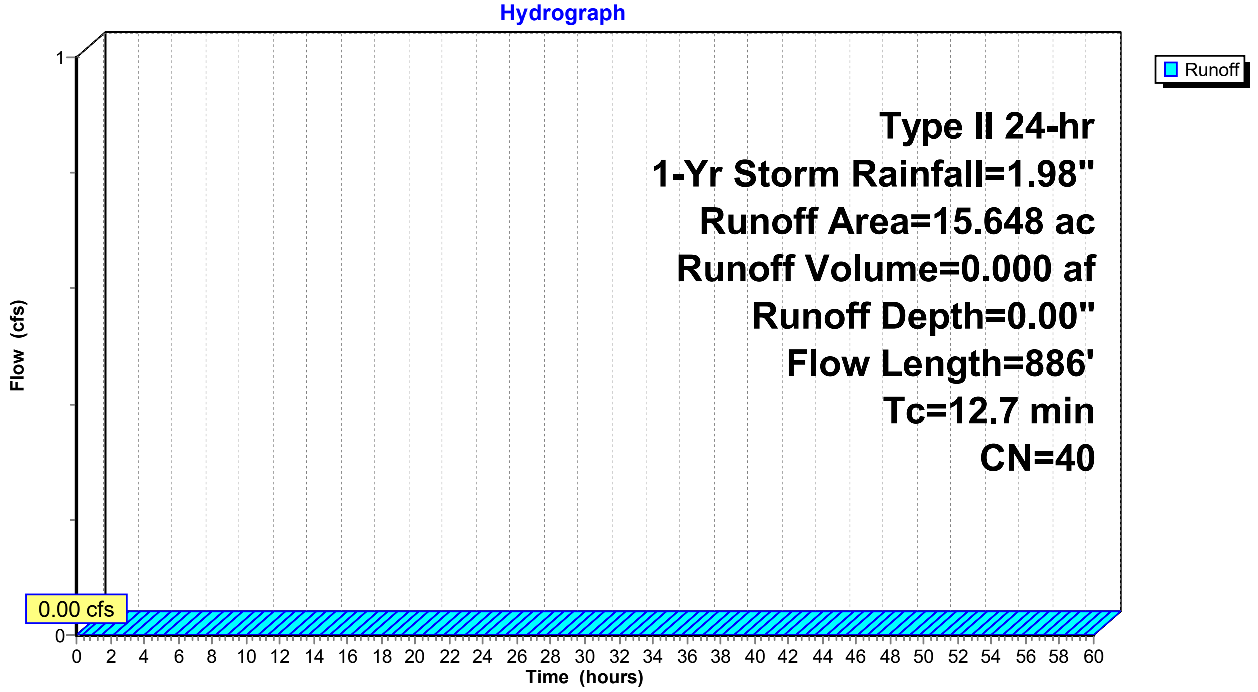
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.088	98	Paved Roads & Rooftops
	0.406	39	>75% Grass cover, Good, HSG A
	2.011	61	>75% Grass cover, Good, HSG B
	5.525	30	Meadow, non-grazed, HSG A
	4.276	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	15.648	40	Weighted Average
	15.560		99.44% Pervious Area
	0.088		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	52	0.0937	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.7	886	Total			

Subcatchment 3S:



Summary for Subcatchment 4.1S:

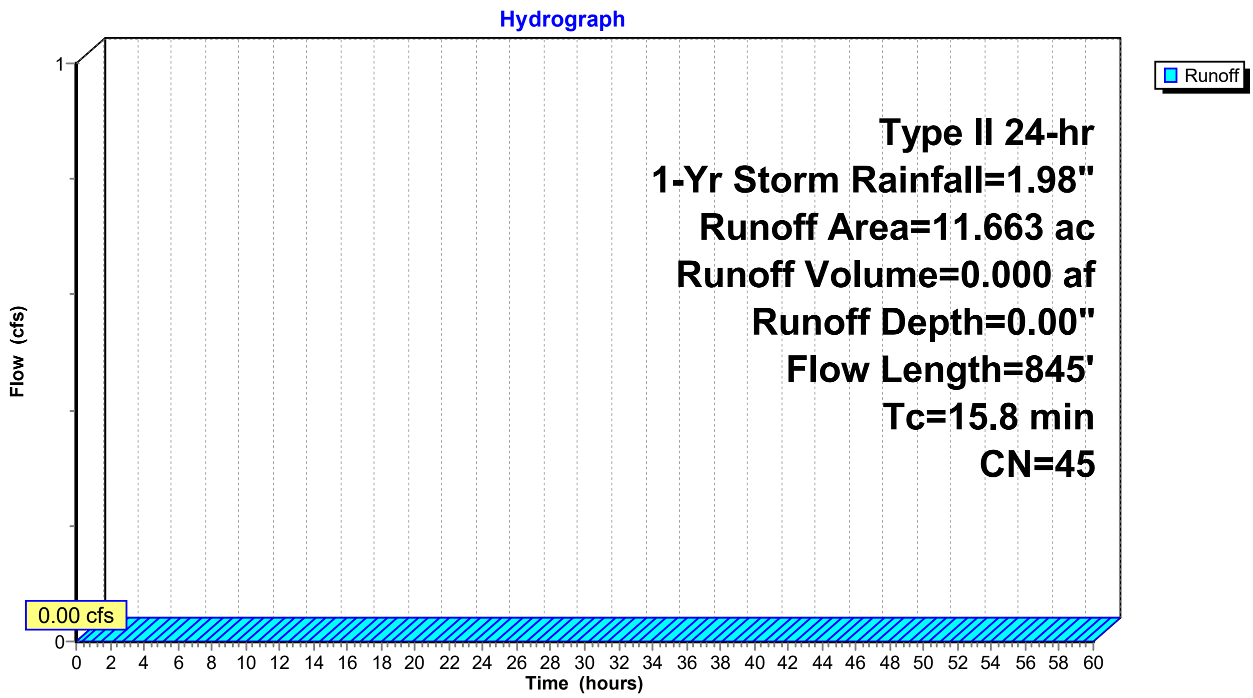
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 4.1R1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.327	98	Paved Roads & Rooftops
*	0.375	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	2.544	30	Meadow, non-grazed, HSG A
	0.560	58	Meadow, non-grazed, HSG B
	3.605	30	Woods, Good, HSG A
*	4.087	55	Woods, Good, HSG B
	11.663	45	Weighted Average
	11.336		97.20% Pervious Area
	0.327		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0430	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
2.6	360	0.1077	2.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	385	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.8	845	Total			

Subcatchment 4.1S:



Summary for Subcatchment 4.2aS:

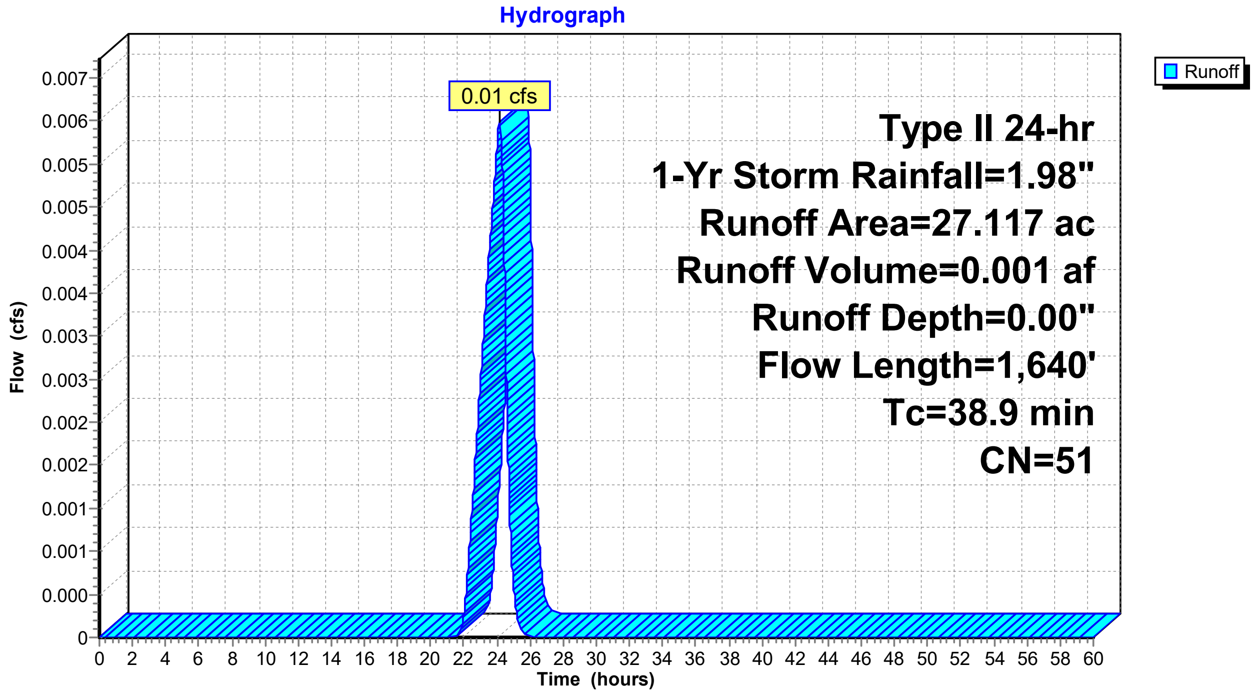
Runoff = 0.01 cfs @ 24.16 hrs, Volume= 0.001 af, Depth= 0.00"
Routed to Pond 4.2C : 18" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	0.238	96	Gravel surface
	4.086	30	Meadow, non-grazed, HSG A
	0.384	58	Meadow, non-grazed, HSG B
	0.977	30	Woods, Good, HSG A
	21.432	55	Woods, Good, HSG B
	27.117	51	Weighted Average
	27.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	662	0.0144	0.84		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	1,640	Total			

Subcatchment 4.2aS:



Summary for Subcatchment 4.2bS:

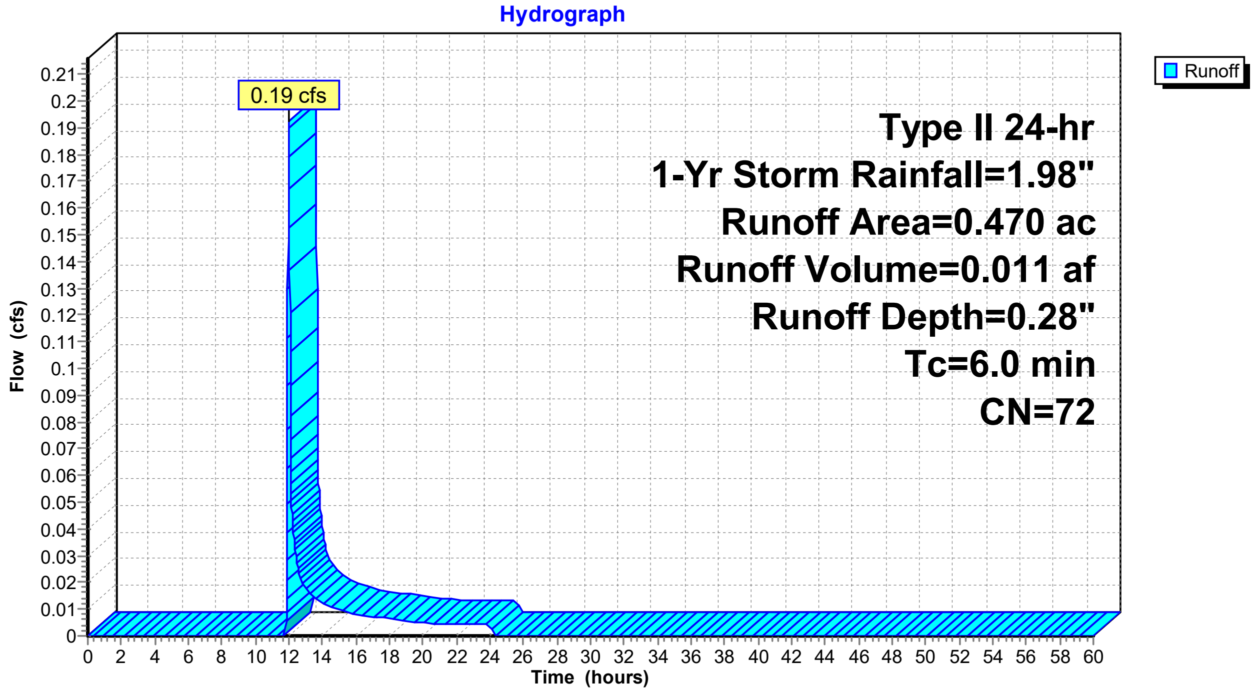
Runoff = 0.19 cfs @ 12.00 hrs, Volume= 0.011 af, Depth= 0.28"
Routed to Reach 4.2bR : Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
0.296	96	Gravel surface, HSG A
0.174	30	Meadow, non-grazed, HSG A
0.470	72	Weighted Average
0.470		100.00% Pervious Area

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

Subcatchment 4.2bS:



Summary for Subcatchment 4.3S:

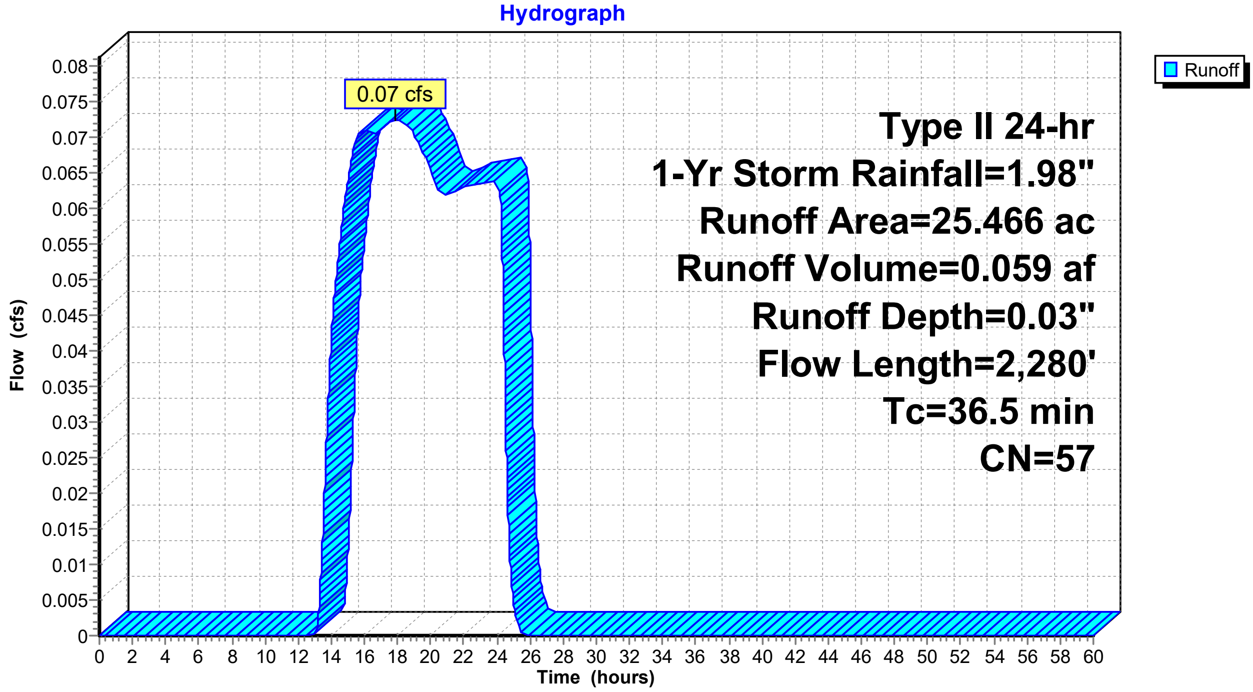
Runoff = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af, Depth= 0.03"
Routed to Pond 4.3C : 24" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	1.293	98	Paved Roads & Rooftops
	1.783	58	Meadow, non-grazed, HSG B
	22.390	55	Woods, Good, HSG B
	25.466	57	Weighted Average
	24.173		94.92% Pervious Area
	1.293		5.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0634	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
17.8	1,368	0.0656	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	38	0.3960	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	774	0.0281	4.70	109.09	**Channel Flow,** Area= 23.2 sf Perim= 43.2' r= 0.54' n= 0.035
36.5	2,280	Total			

Subcatchment 4.3S:



Summary for Subcatchment 5S:

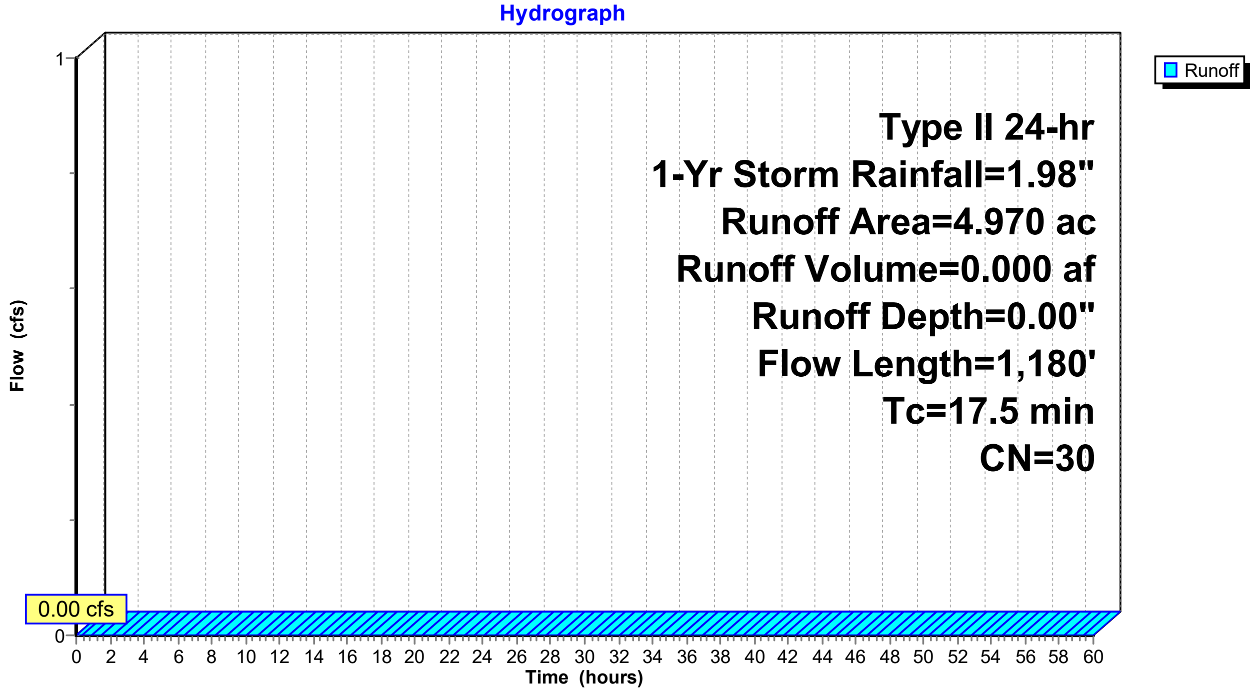
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

Area (ac)	CN	Description
4.139	30	Meadow, non-grazed, HSG A
0.831	30	Woods, Good, HSG A
4.970	30	Weighted Average
4.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0675	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
8.5	801	0.0508	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	217	0.1515	2.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	62	0.0697	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,180	Total			

Subcatchment 5S:



Summary for Subcatchment 6S:

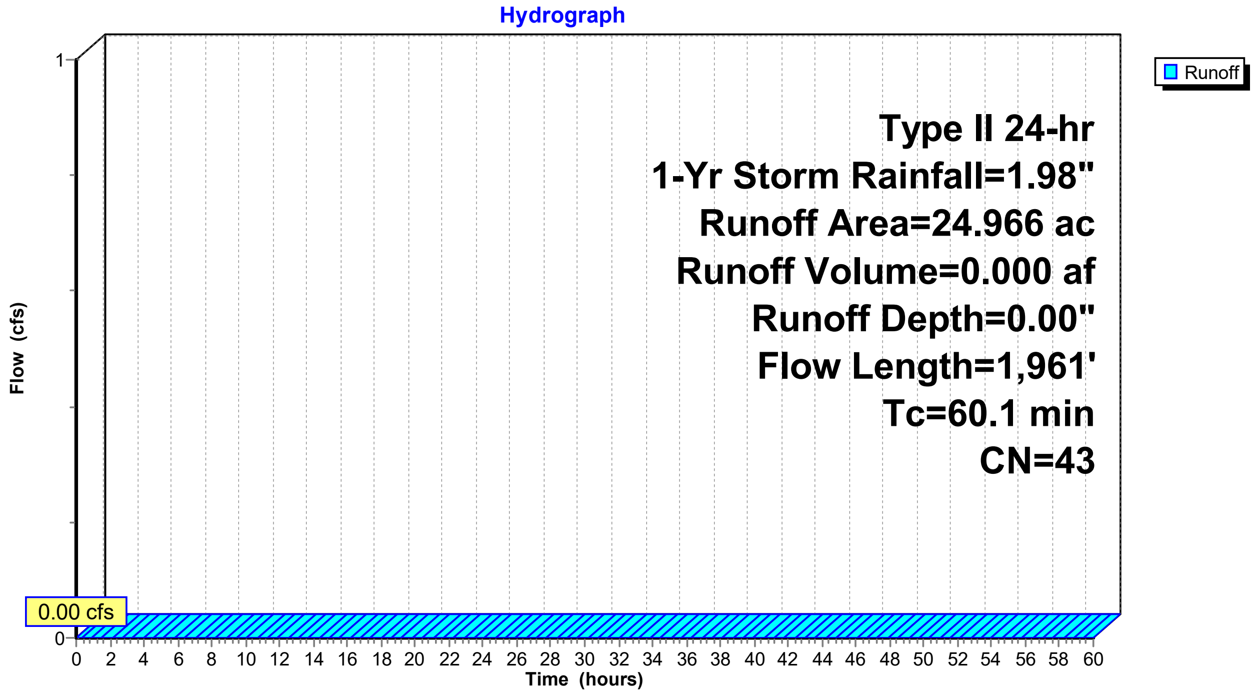
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP6 : Study Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Storm Rainfall=1.98"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
	0.466	96	Gravel surface, HSG A
	2.545	61	>75% Grass cover, Good, HSG B
	7.511	30	Meadow, non-grazed, HSG A
	0.788	58	Meadow, non-grazed, HSG B
	7.940	30	Woods, Good, HSG A
	4.266	55	Woods, Good, HSG B
	24.966	43	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Subcatchment 6S:



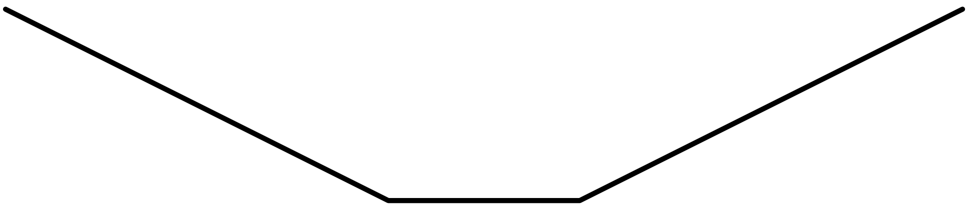
Summary for Reach 1.1aR1: Bypass Swale

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC1 : TS1 Culvert

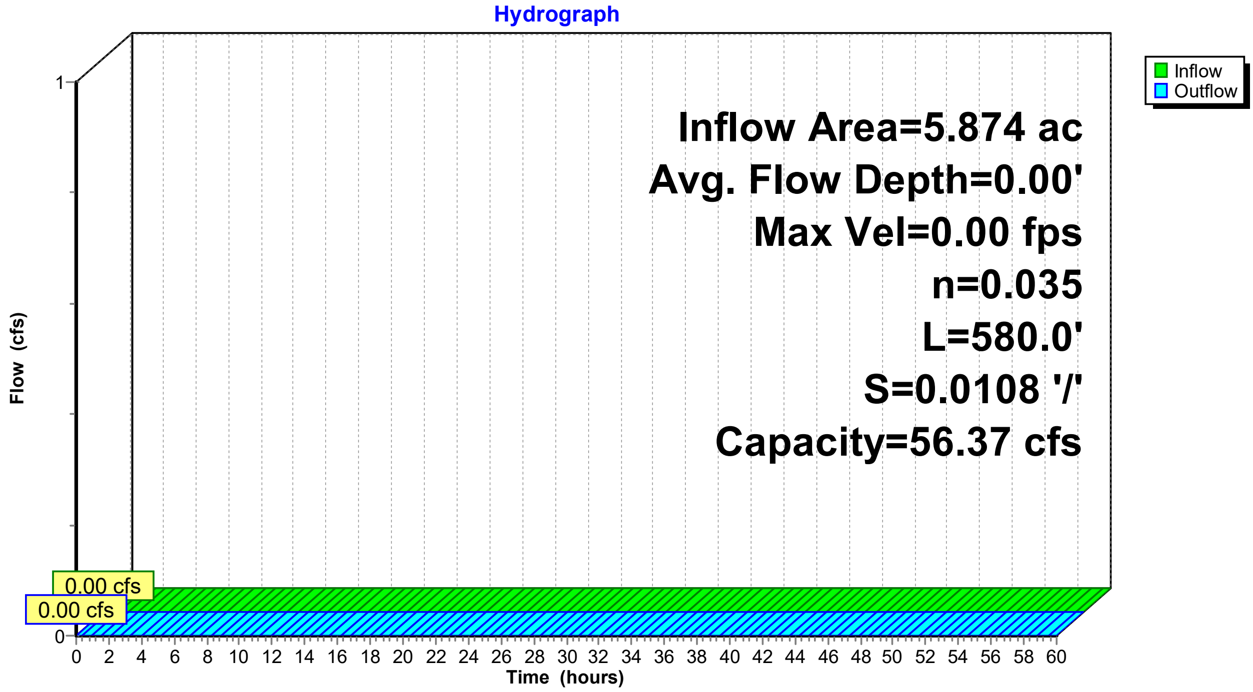
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.37 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.0' Slope= 0.0108 '/'
Inlet Invert= 1,493.84', Outlet Invert= 1,487.56'



Reach 1.1aR1: Bypass Swale



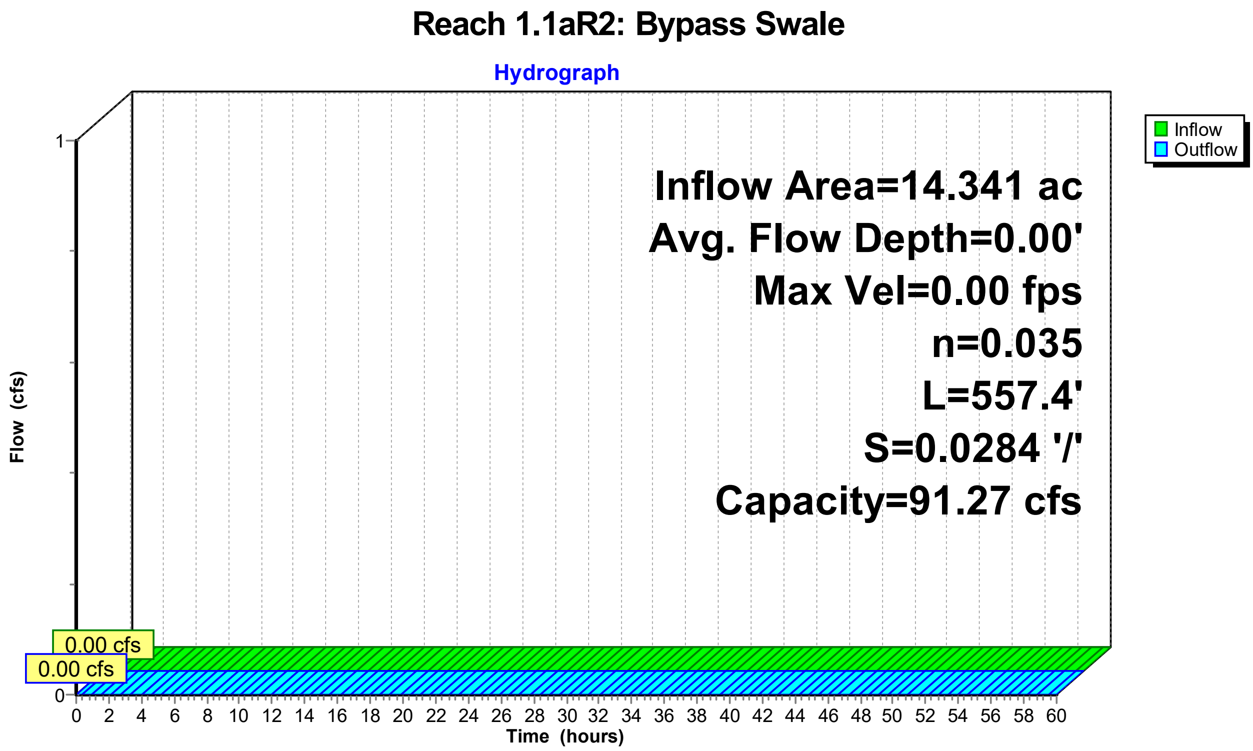
Summary for Reach 1.1aR2: Bypass Swale

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC2 : TS2 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 91.27 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.4' Slope= 0.0284 '/'
Inlet Invert= 1,486.80', Outlet Invert= 1,470.98'



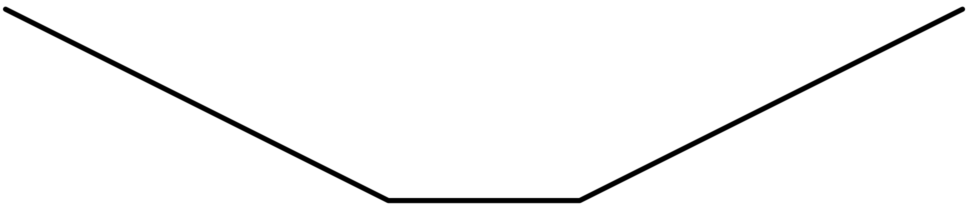
Summary for Reach 1.1aR3: Bypass Swale

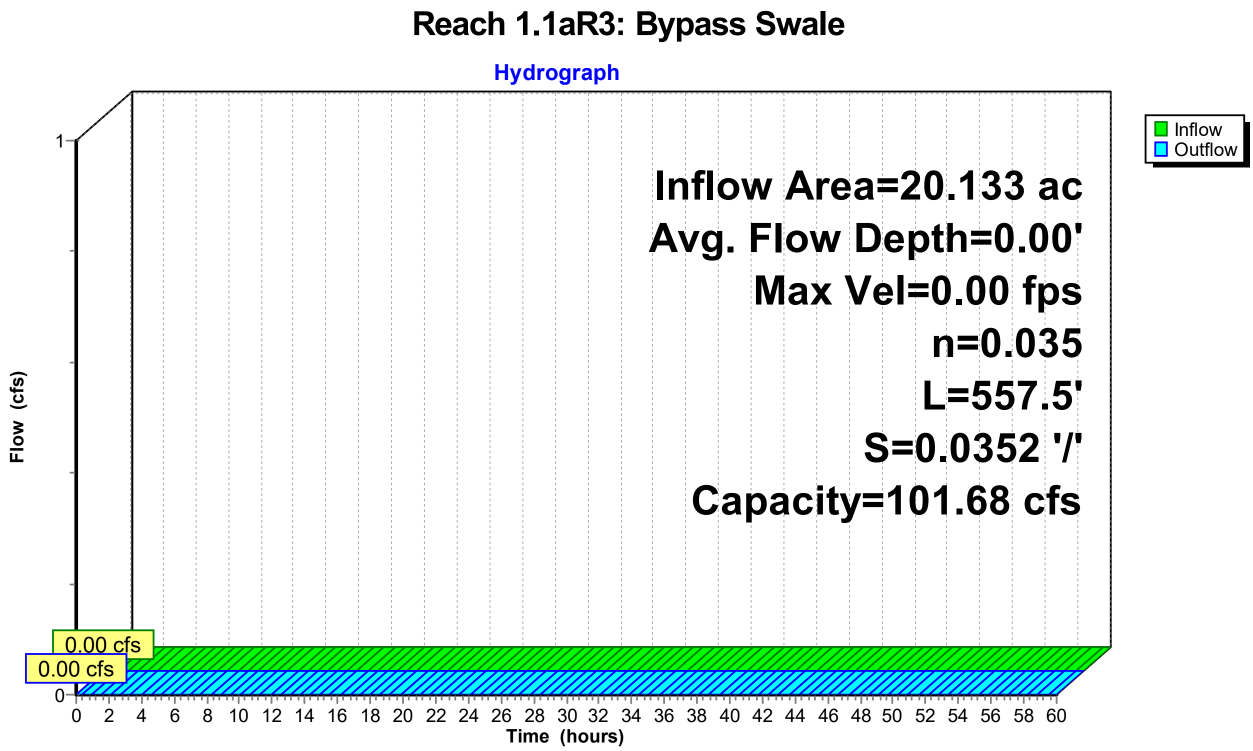
Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC3 : TS3 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.68 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.5' Slope= 0.0352 '/'
Inlet Invert= 1,469.57', Outlet Invert= 1,449.93'





Summary for Reach 1.1aR4: Bypass Swale

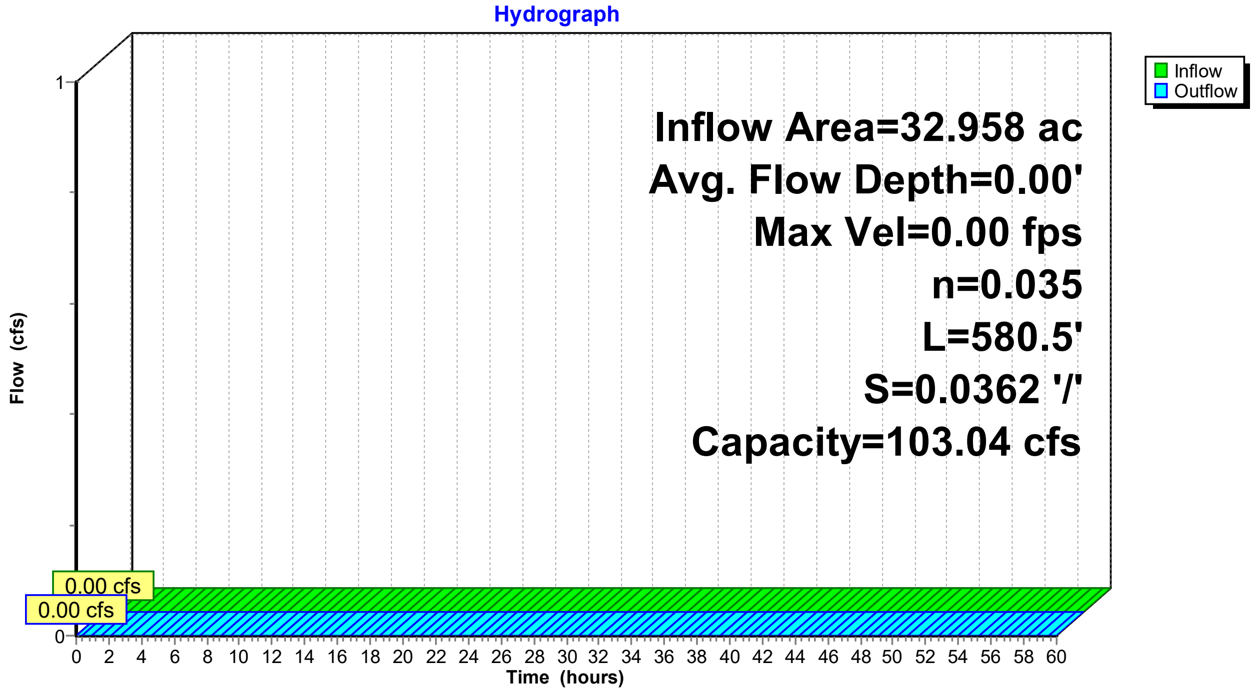
Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aP : North Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 103.04 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.5' Slope= 0.0362 '/'
Inlet Invert= 1,447.64', Outlet Invert= 1,426.64'

Reach 1.1aR4: Bypass Swale



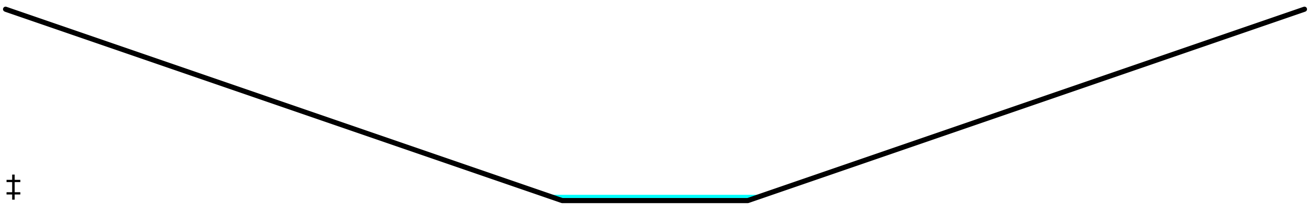
Summary for Reach 1.1bR1: North Road Conveyance Swale

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 0.47 cfs @ 12.00 hrs, Volume= 0.029 af
Outflow = 0.12 cfs @ 12.17 hrs, Volume= 0.029 af, Atten= 75%, Lag= 10.3 min
Routed to Pond 1.1bC1 : TS4 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.94 fps, Min. Travel Time= 30.8 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 55.4 min

Peak Storage= 219 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 2.35'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 111.65 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,733.0' Slope= 0.0240 '/'
Inlet Invert= 1,491.12', Outlet Invert= 1,449.50'



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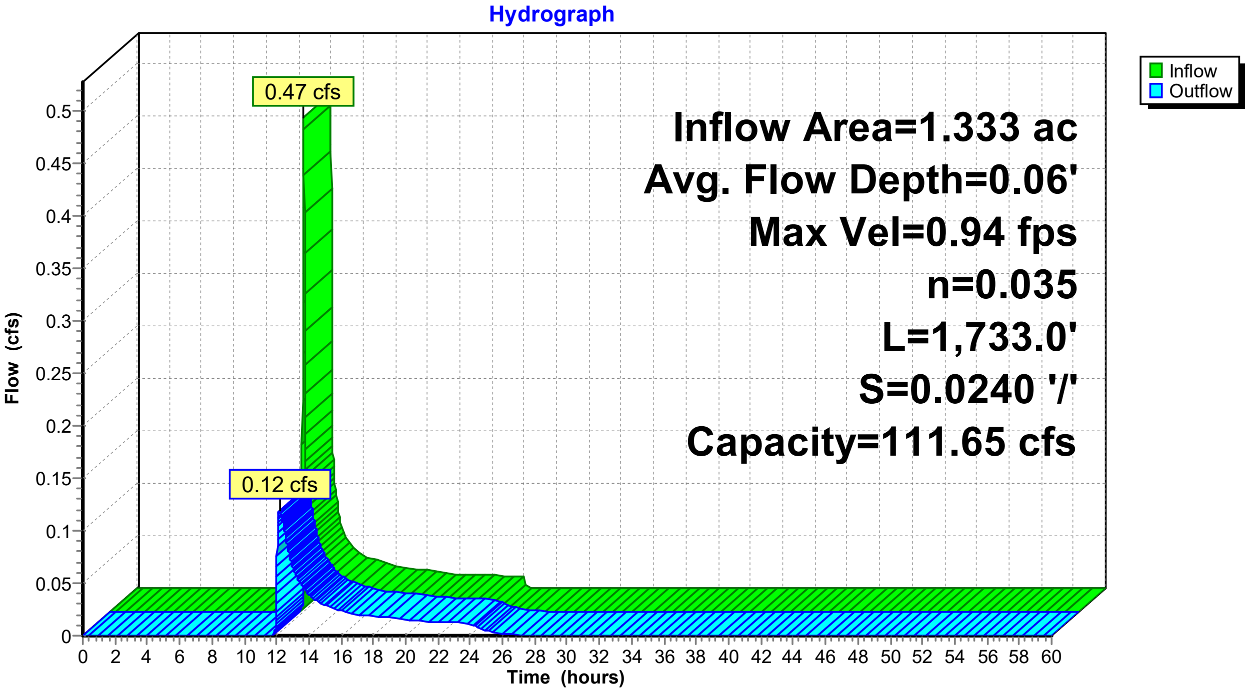
Reach 1.1bR1: North Road Conveyance Swale



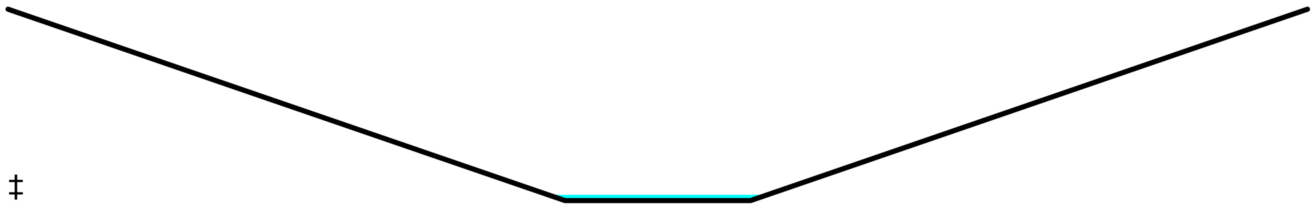
Summary for Reach 1.1bR2: North Road Conveyance Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.23" for 1-Yr Storm event
Inflow = 0.20 cfs @ 12.04 hrs, Volume= 0.039 af
Outflow = 0.15 cfs @ 12.26 hrs, Volume= 0.039 af, Atten= 25%, Lag= 13.6 min
Routed to Pond 1.1bP1 : Dry Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.18 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 14.9 min

Peak Storage= 75 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 2.35'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 140.36 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 593.3' Slope= 0.0380 '/'
Inlet Invert= 1,447.27', Outlet Invert= 1,424.75'



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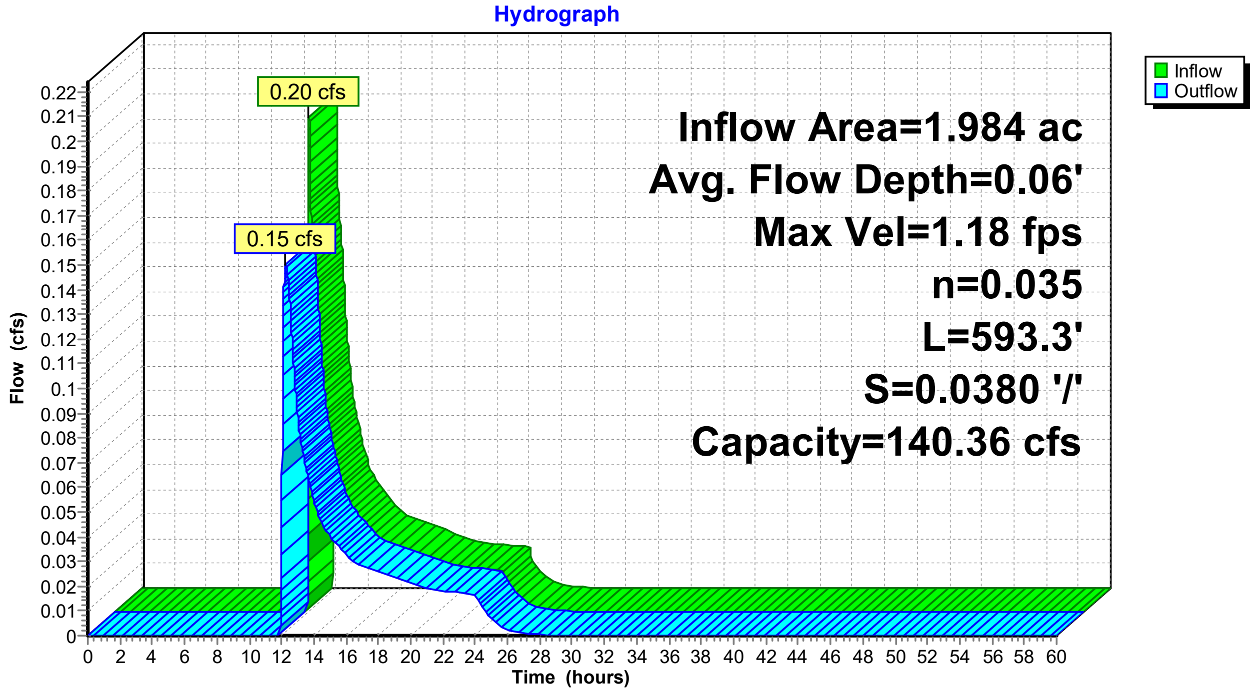
Reach 1.1bR2: North Road Conveyance Swale



Summary for Reach 1.2aR1: Bypass Swale

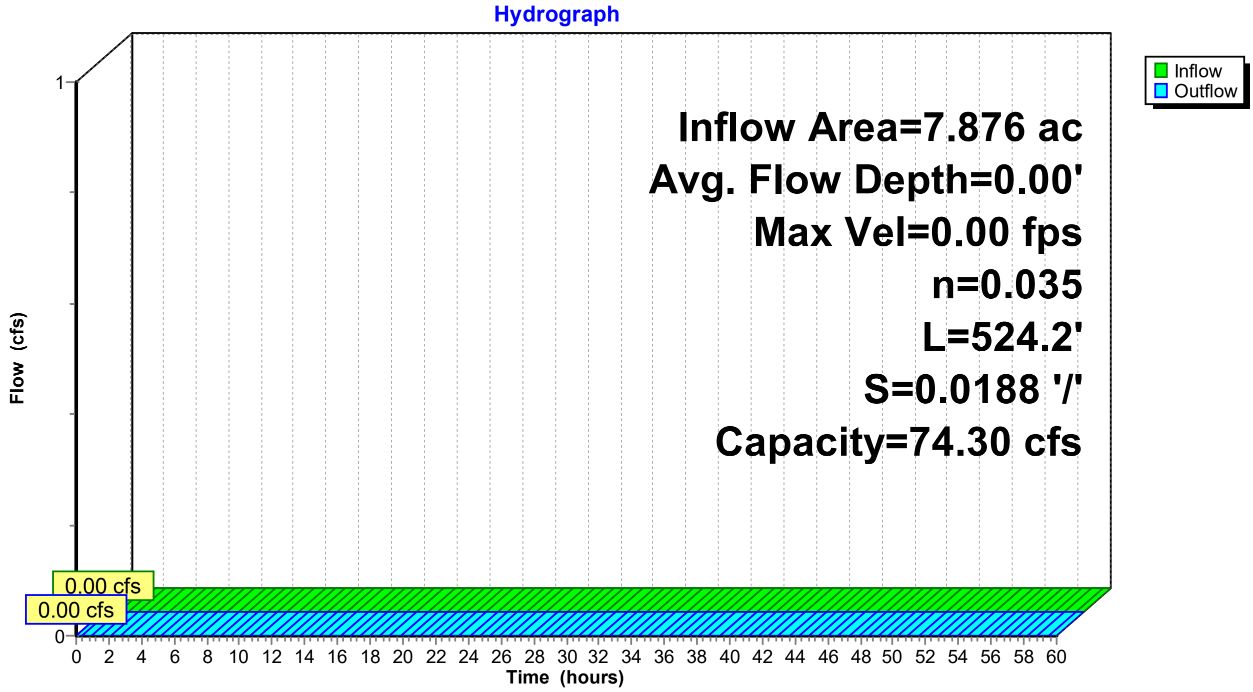
Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC1 : TS 7 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 74.30 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 524.2' Slope= 0.0188 '/'
Inlet Invert= 1,454.08', Outlet Invert= 1,444.22'

Reach 1.2aR1: Bypass Swale



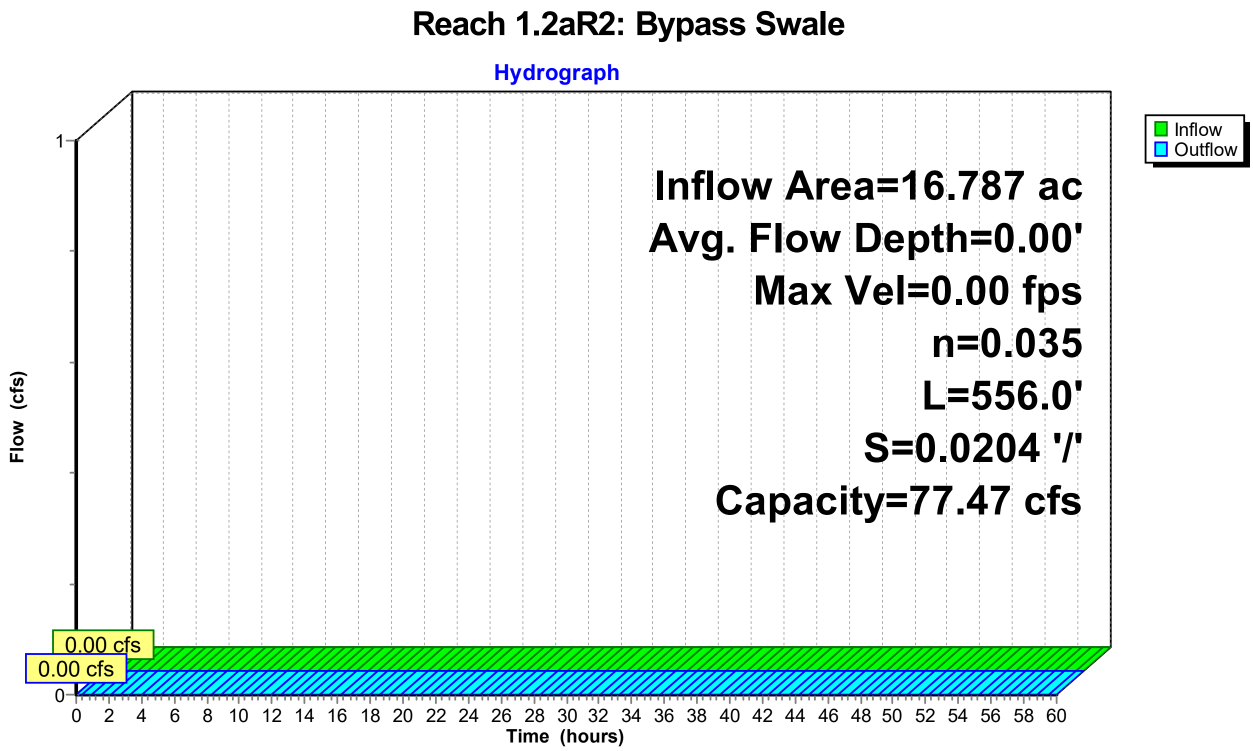
Summary for Reach 1.2aR2: Bypass Swale

Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC2 : TS8 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 77.47 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 556.0' Slope= 0.0204 '/'
Inlet Invert= 1,443.21', Outlet Invert= 1,431.84'



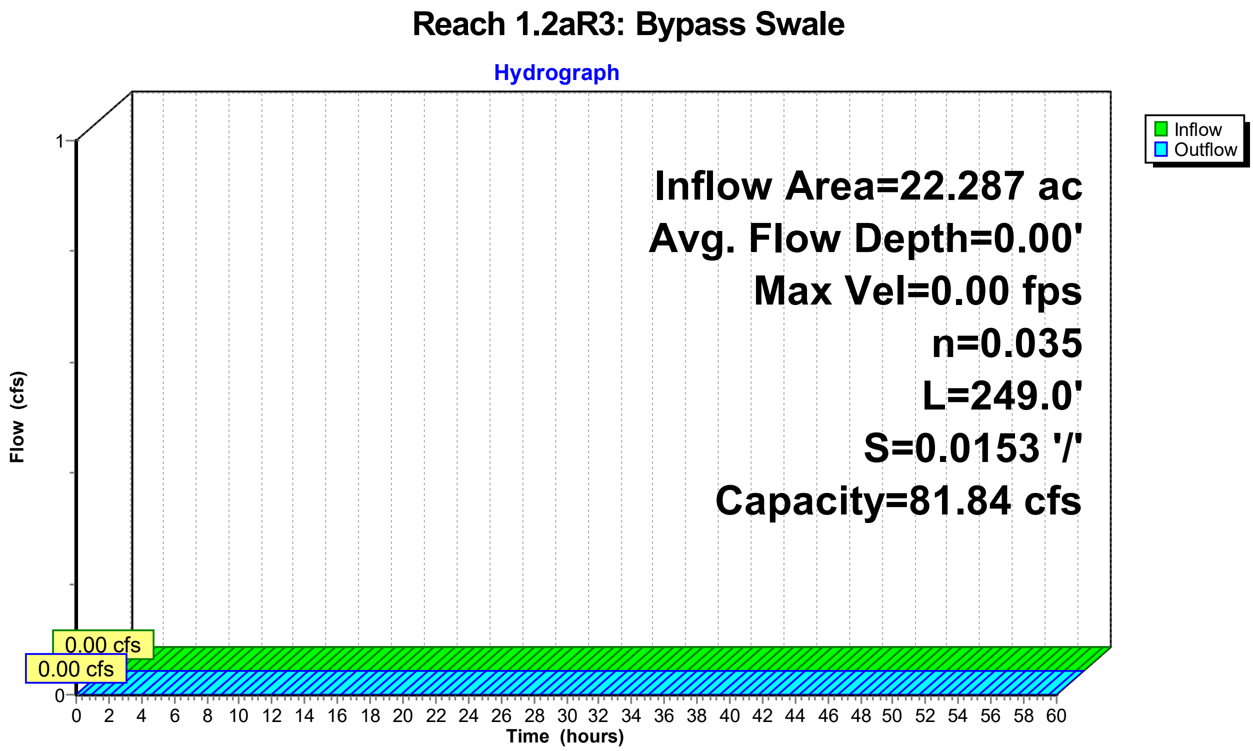
Summary for Reach 1.2aR3: Bypass Swale

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aP : South Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 81.84 cfs

3.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 11.00'
Length= 249.0' Slope= 0.0153 '/'
Inlet Invert= 1,431.11', Outlet Invert= 1,427.29'



Summary for Reach 1.2bR1: East Road Conveyance Swale

Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.17" for 1-Yr Storm event
Inflow = 0.12 cfs @ 12.01 hrs, Volume= 0.010 af
Outflow = 0.04 cfs @ 12.13 hrs, Volume= 0.010 af, Atten= 62%, Lag= 7.2 min
Routed to Pond 1.2bC1 : East Road Culvert

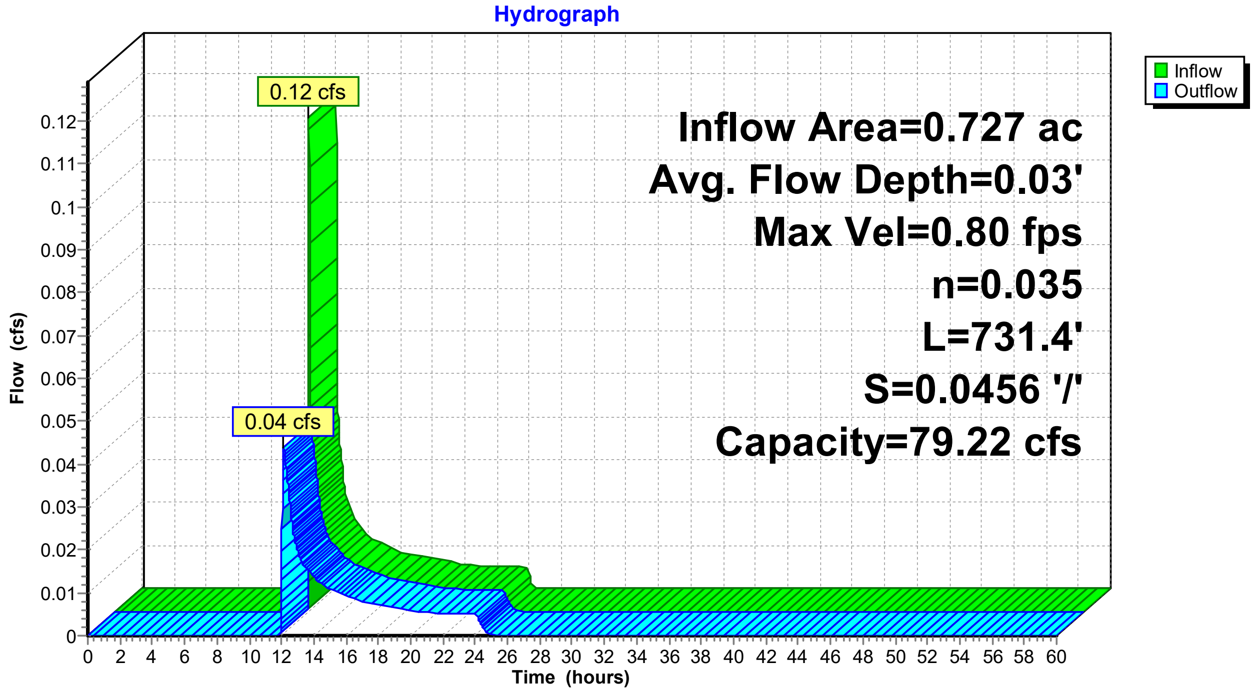
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.80 fps, Min. Travel Time= 15.1 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 22.0 min

Peak Storage= 40 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 2.16'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 79.22 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 731.4' Slope= 0.0456 '/'
Inlet Invert= 1,489.53', Outlet Invert= 1,456.20'

‡

Reach 1.2bR1: East Road Conveyance Swale



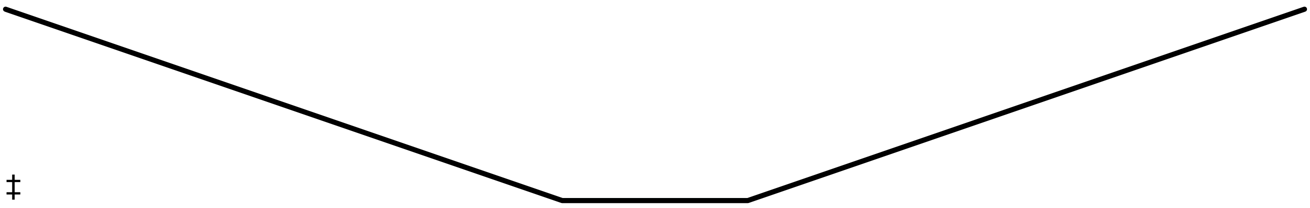
Summary for Reach 1.2bR2: South Road Conveyance Swale

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.10" for 1-Yr Storm event
Inflow = 0.04 cfs @ 12.13 hrs, Volume= 0.013 af
Outflow = 0.03 cfs @ 12.52 hrs, Volume= 0.013 af, Atten= 30%, Lag= 23.3 min
Routed to Pond 1.2bC2 : TS6 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.53 fps, Min. Travel Time= 18.9 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 24.3 min

Peak Storage= 35 cf @ 12.52 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 2.17'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 95.76 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 604.5' Slope= 0.0177 '/'
Inlet Invert= 1,454.47', Outlet Invert= 1,443.79'



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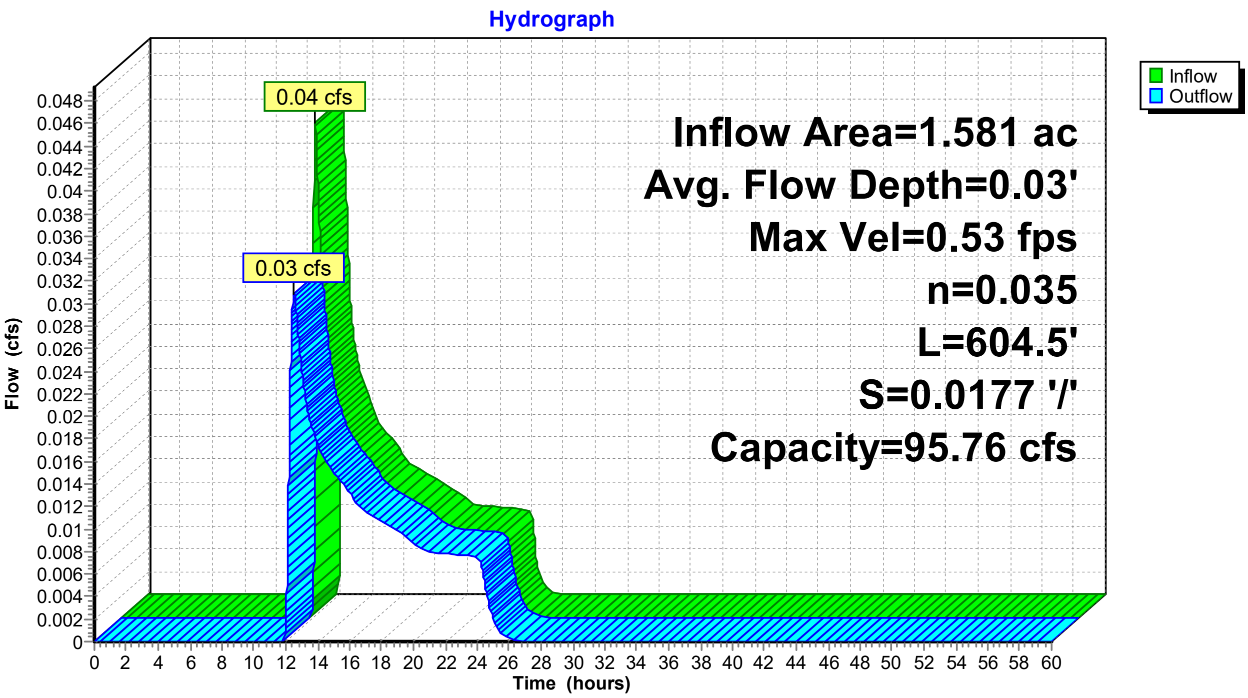
Reach 1.2bR2: South Road Conveyance Swale



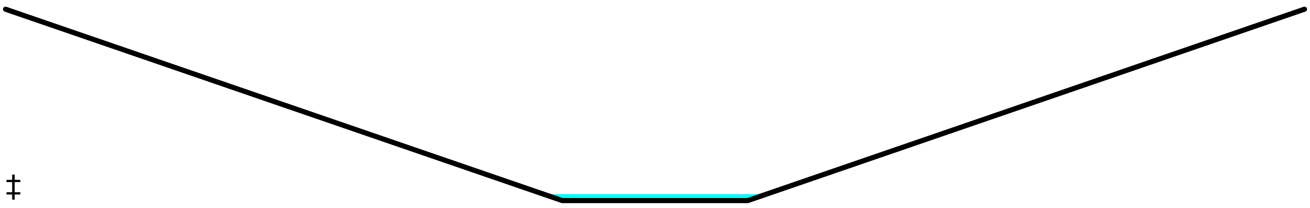
Summary for Reach 1.2bR3: South Road Conveyance Swale

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.15" for 1-Yr Storm event
Inflow = 0.29 cfs @ 12.00 hrs, Volume= 0.030 af
Outflow = 0.13 cfs @ 12.10 hrs, Volume= 0.030 af, Atten= 56%, Lag= 5.8 min
Routed to Pond 1.2bP : South Road Treatment Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.89 fps, Min. Travel Time= 14.2 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 26.1 min

Peak Storage= 108 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 2.39'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 98.64 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 755.9' Slope= 0.0187 '/'
Inlet Invert= 1,442.84', Outlet Invert= 1,428.67'



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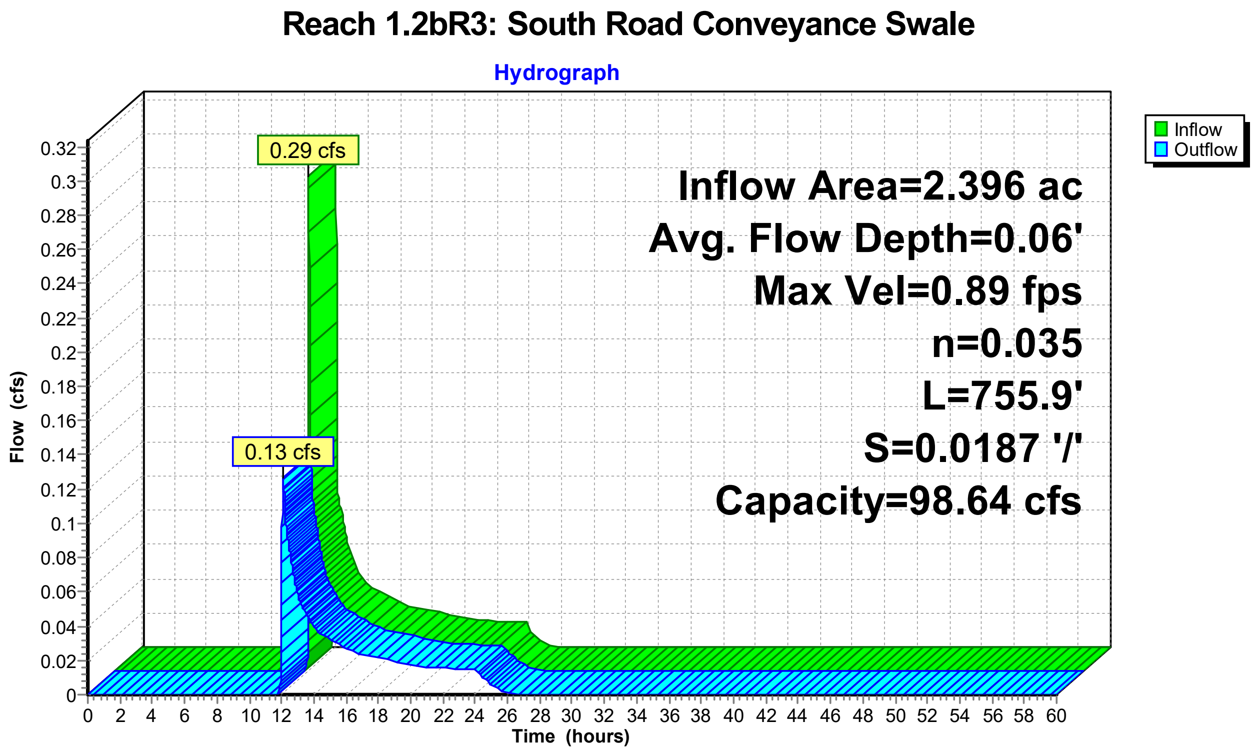


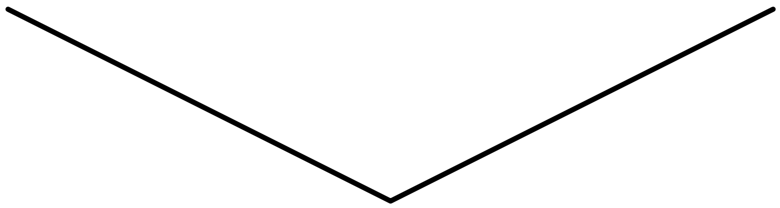
Summary for Reach 4.1R1: Bypass Swale

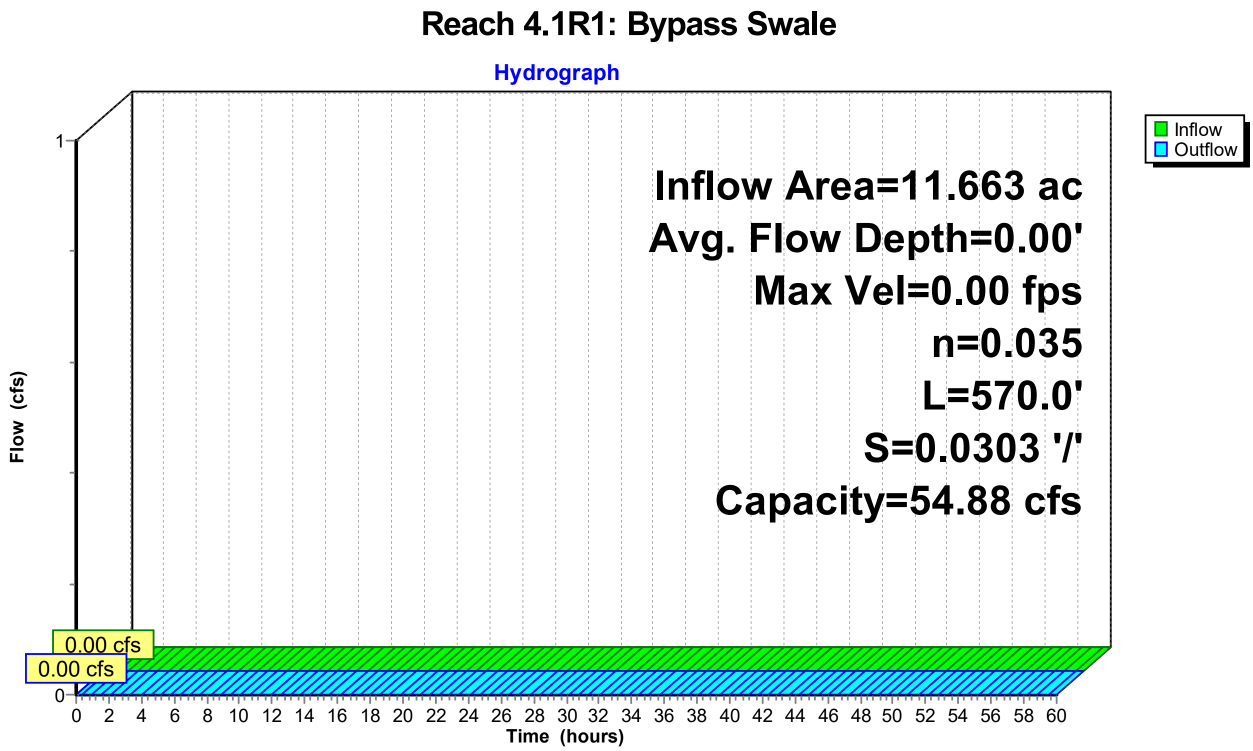
Inflow Area = 11.663 ac, 2.80% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 54.88 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 570.0' Slope= 0.0303 '/'
Inlet Invert= 1,448.24', Outlet Invert= 1,430.97'





Summary for Reach 4.1R2: Ex Stream

Inflow Area = 39.250 ac, 0.83% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP4 : Study Point 4

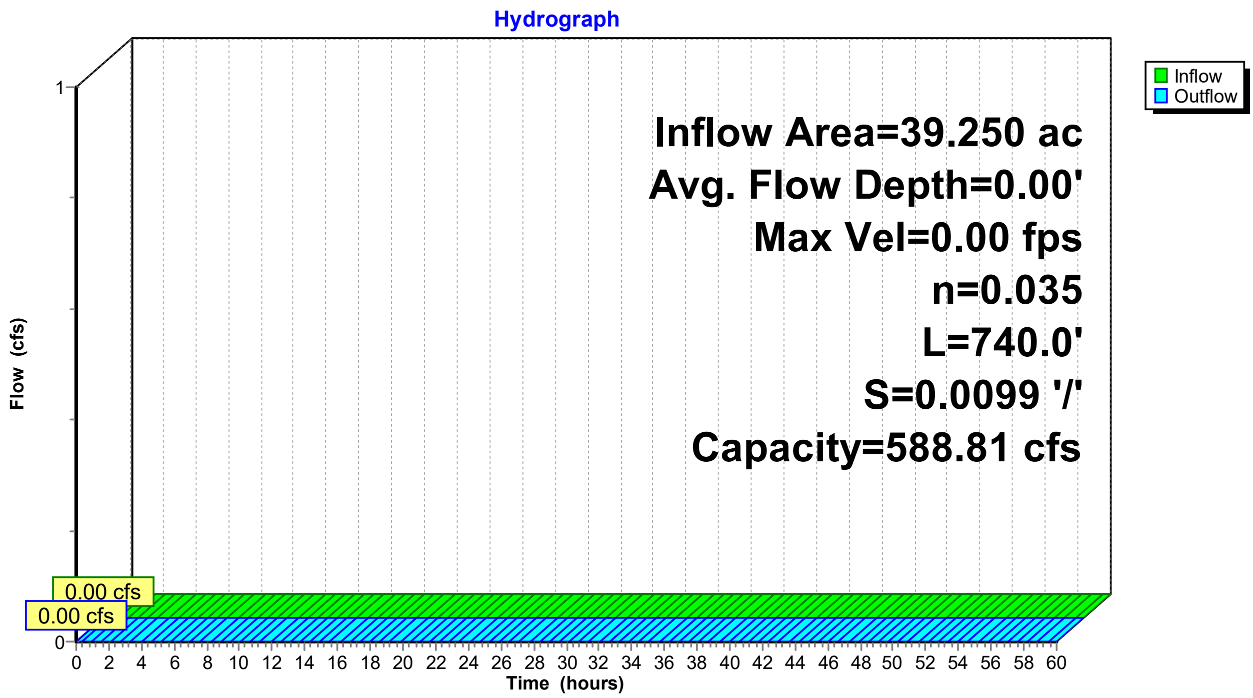
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 3.00' Flow Area= 84.0 sf, Capacity= 588.81 cfs

17.50' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 4.0 '/' Top Width= 38.50'
Length= 740.0' Slope= 0.0099 '/'
Inlet Invert= 1,430.98', Outlet Invert= 1,423.64'

‡

Reach 4.1R2: Ex Stream



Summary for Reach 4.2bR: Conveyance Swale

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.28" for 1-Yr Storm event
Inflow = 0.19 cfs @ 12.00 hrs, Volume= 0.011 af
Outflow = 0.12 cfs @ 12.06 hrs, Volume= 0.011 af, Atten= 39%, Lag= 4.1 min
Routed to Pond 4.2bP : Pond 4 - Access Rd East

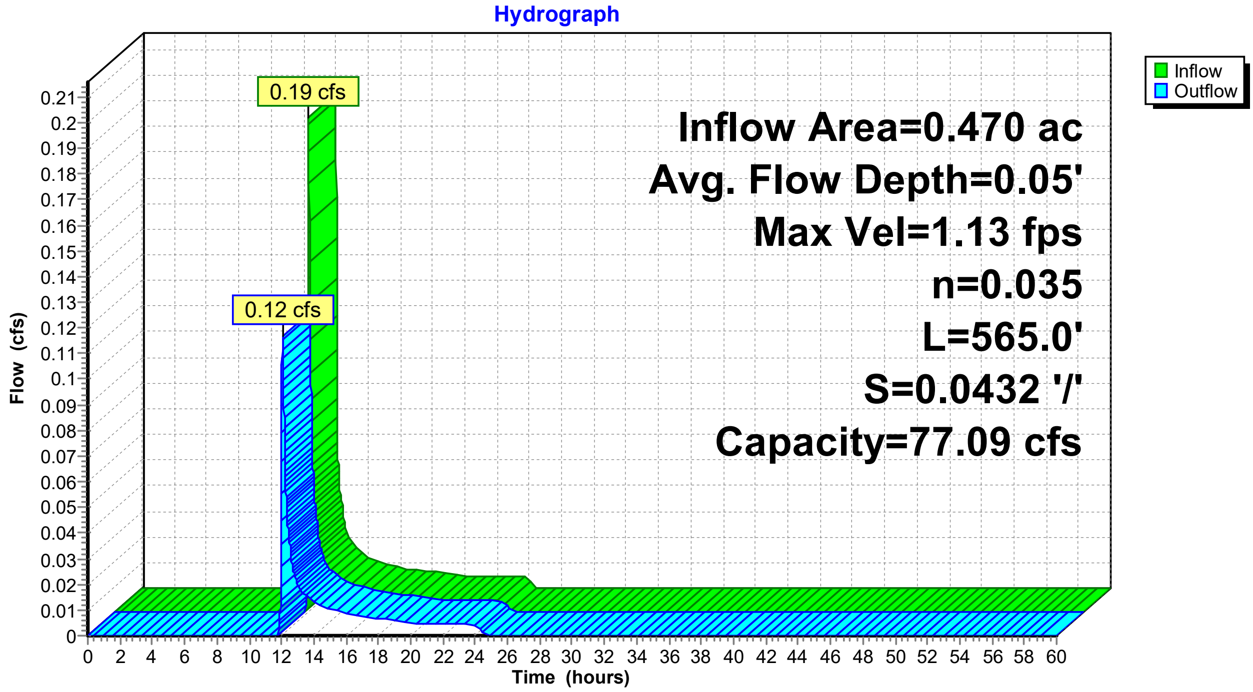
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.13 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 17.2 min

Peak Storage= 59 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.05' , Surface Width= 2.29'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 77.09 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 565.0' Slope= 0.0432 '/'
Inlet Invert= 1,472.38', Outlet Invert= 1,448.00'

‡

Reach 4.2bR: Conveyance Swale



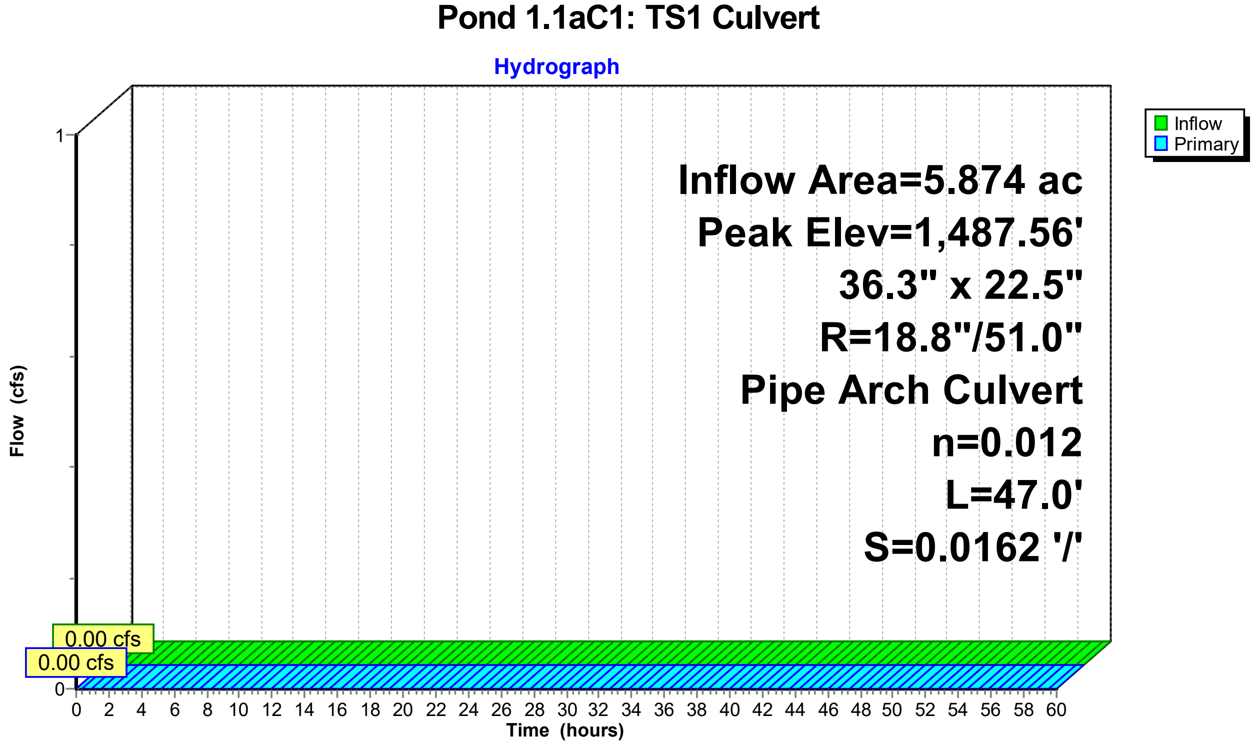
Summary for Pond 1.1aC1: TS1 Culvert

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,487.56' @ 0.00 hrs
Flood Elev= 1,489.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,487.56'	**36.3" W x 22.5" H, R=18.8"/51.0" Pipe Arch RCP_Arch 37x23** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,487.56' / 1,486.80' S= 0.0162 '/' Cc= 0.900 n= 0.012, Flow Area= 4.43 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,487.56' (Free Discharge)
↑**1=RCP_Arch 37x23** (Controls 0.00 cfs)



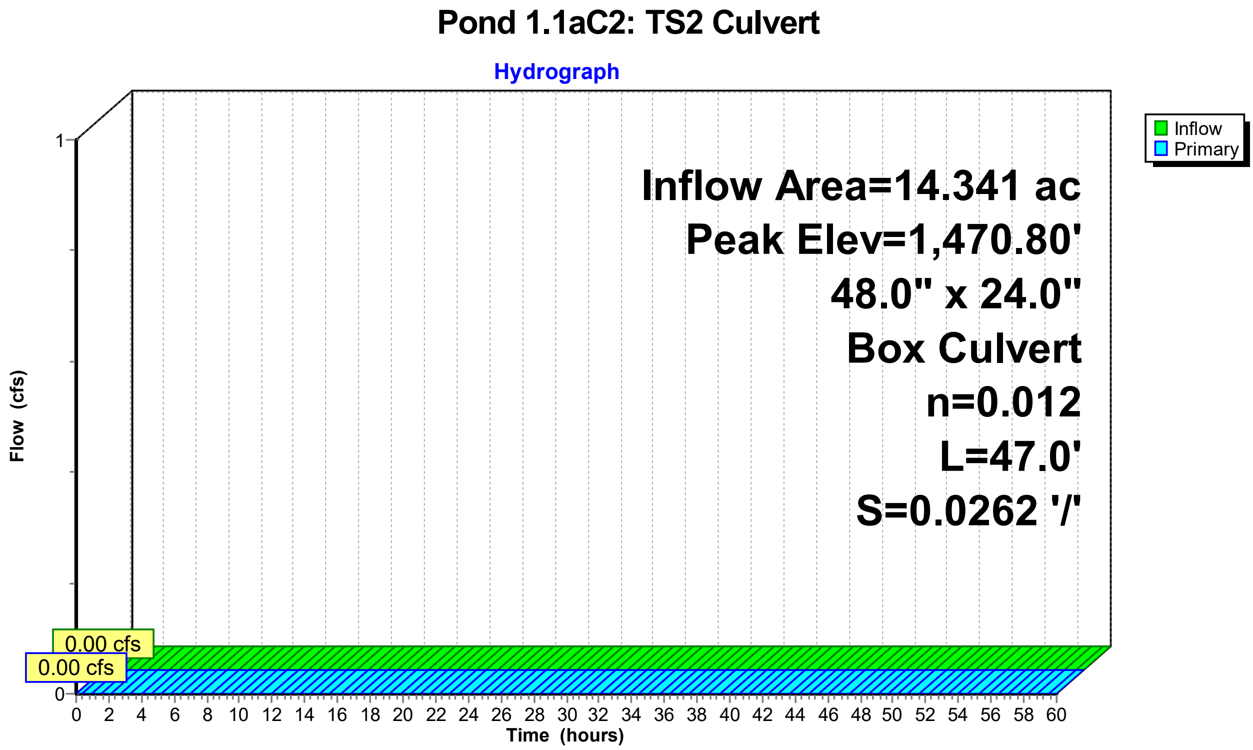
Summary for Pond 1.1aC2: TS2 Culvert

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,470.80' @ 0.00 hrs
Flood Elev= 1,473.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,470.80'	**48.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,470.80' / 1,469.57' S= 0.0262 '/' Cc= 0.900 n= 0.012, Flow Area= 8.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,470.80' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)



Summary for Pond 1.1aC3: TS3 Culvert

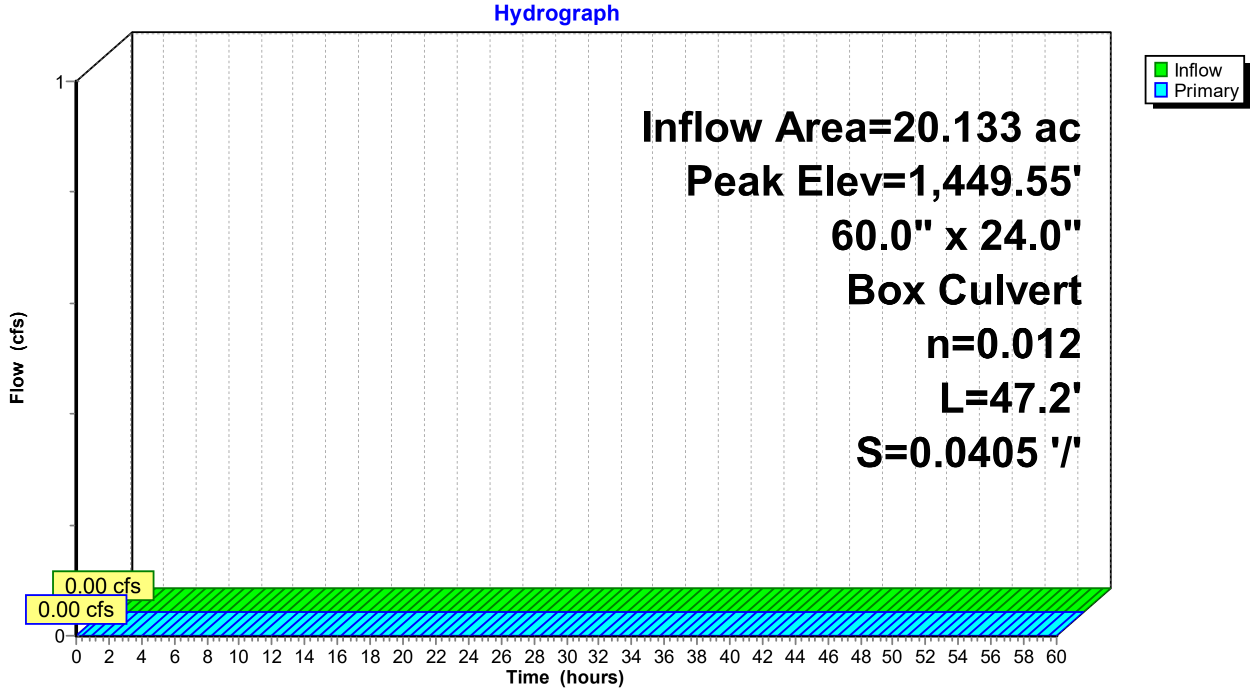
Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR4 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.55' @ 0.00 hrs
Flood Elev= 1,452.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.55'	**60.0" W x 24.0" H Box Culvert** L= 47.2' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.55' / 1,447.64' S= 0.0405 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,449.55' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)

Pond 1.1aC3: TS3 Culvert



Summary for Pond 1.1aP: North Road Bypass OC

Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

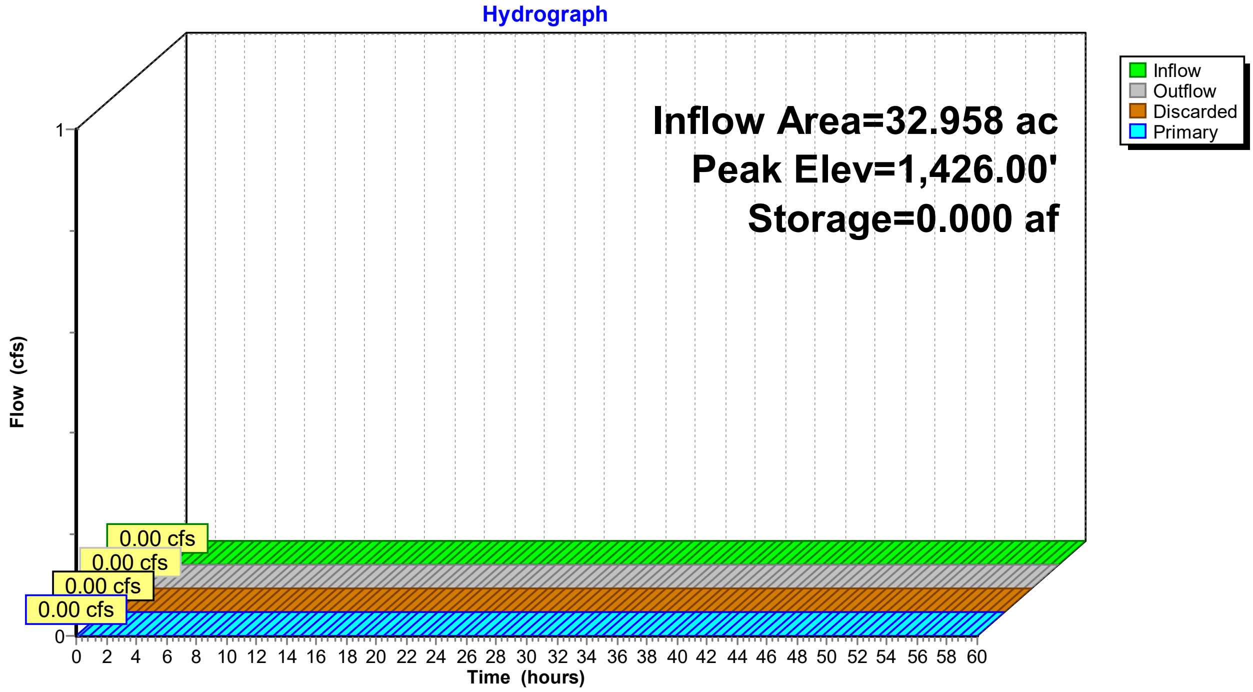
Volume	Invert	Avail.Storage	Storage Description
#1	1,426.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,426.00'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,428.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.1aP: North Road Bypass OC



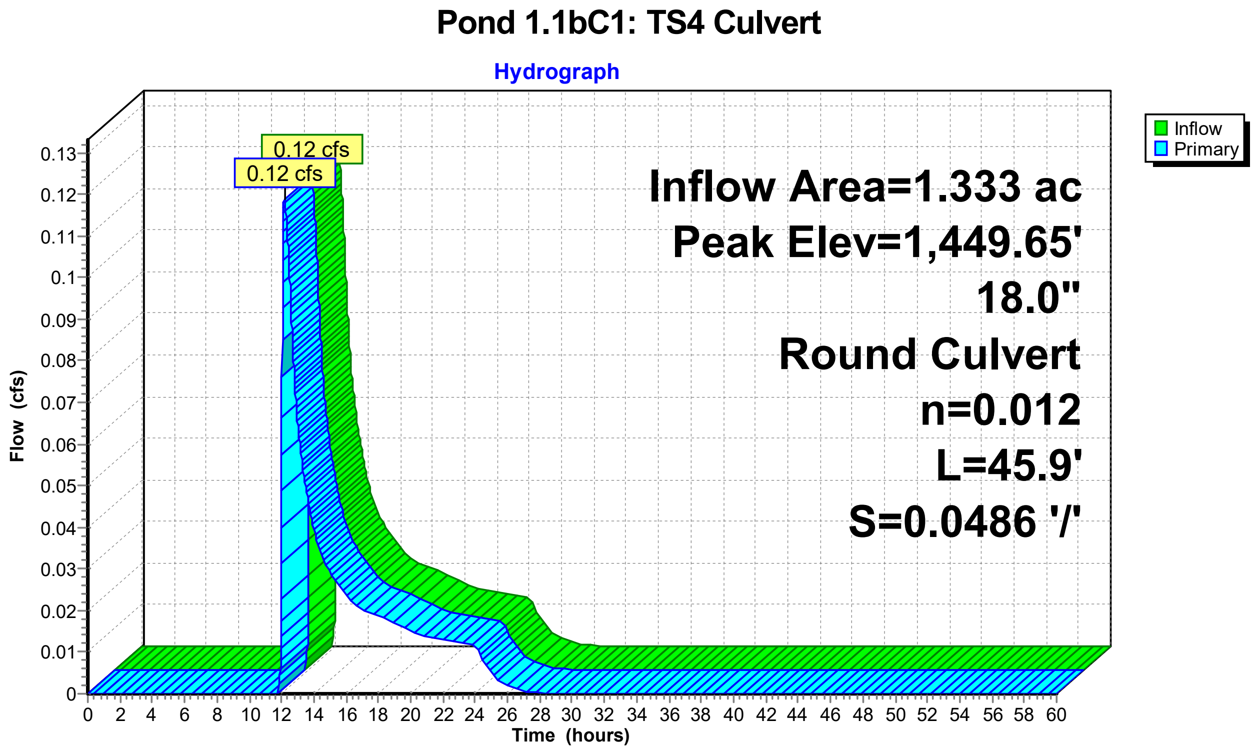
Summary for Pond 1.1bC1: TS4 Culvert

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.26" for 1-Yr Storm event
Inflow = 0.12 cfs @ 12.17 hrs, Volume= 0.029 af
Outflow = 0.12 cfs @ 12.17 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.17 hrs, Volume= 0.029 af
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.65' @ 12.17 hrs
Flood Elev= 1,451.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.50'	**18.0" Round Culvert** L= 45.9' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.50' / 1,447.27' S= 0.0486 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.12 cfs @ 12.17 hrs HW=1,449.65' (Free Discharge)
1=Culvert (Inlet Controls 0.12 cfs @ 1.31 fps)



Summary for Pond 1.1bP1: Dry Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.23" for 1-Yr Storm event
Inflow = 0.15 cfs @ 12.26 hrs, Volume= 0.039 af
Outflow = 0.15 cfs @ 12.31 hrs, Volume= 0.039 af, Atten= 1%, Lag= 2.8 min
Discarded = 0.00 cfs @ 12.31 hrs, Volume= 0.004 af
Primary = 0.15 cfs @ 12.31 hrs, Volume= 0.035 af
Routed to Pond 1.1bP2 : North Road Detention Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,425.78' @ 12.31 hrs Surf.Area= 197 sf Storage= 78 cf

Plug-Flow detention time= 49.3 min calculated for 0.039 af (100% of inflow)
Center-of-Mass det. time= 49.5 min (1,022.2 - 972.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.75'	428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

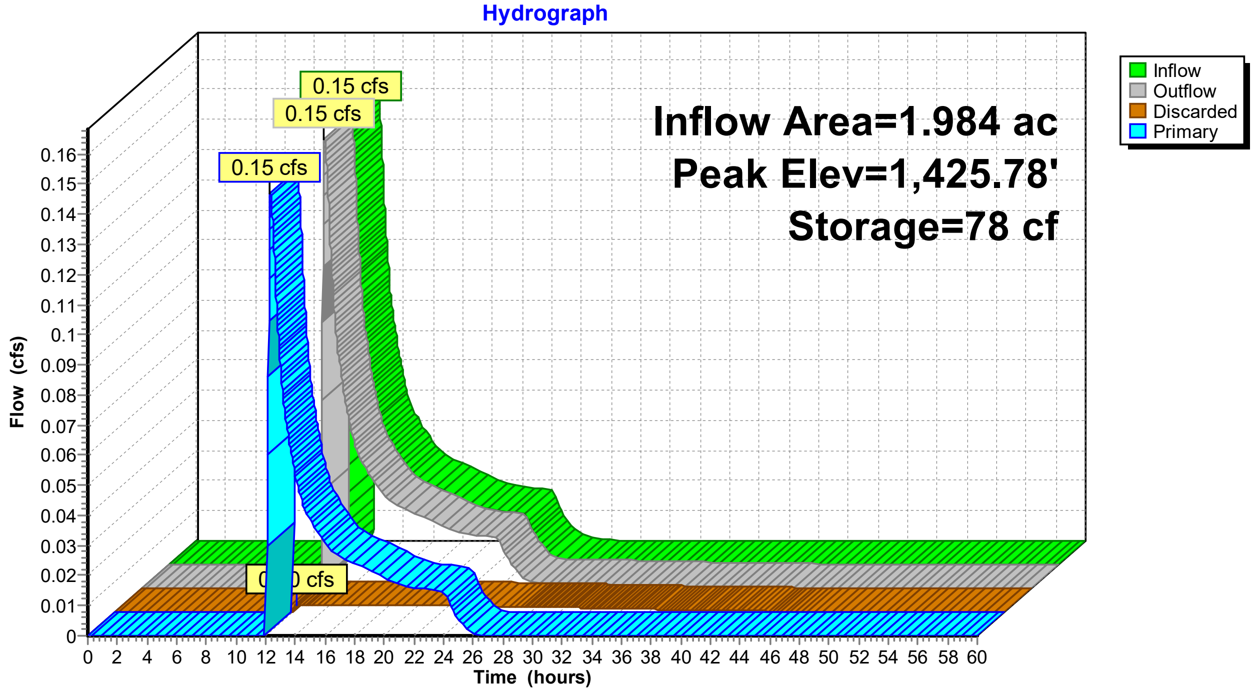
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,424.75	0	0.0	0	0	0
1,425.00	25	22.9	2	2	42
1,426.00	273	98.0	127	129	767
1,426.70	603	161.7	299	428	2,086

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.75'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,425.69'	**2.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.00 cfs @ 12.31 hrs HW=1,425.78' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.15 cfs @ 12.31 hrs HW=1,425.78' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.15 cfs @ 0.78 fps)

Pond 1.1bP1: Dry Swale



Summary for Pond 1.1bP2: North Road Detention Pond

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.21" for 1-Yr Storm event
Inflow = 0.15 cfs @ 12.31 hrs, Volume= 0.035 af
Outflow = 0.01 cfs @ 24.37 hrs, Volume= 0.034 af, Atten= 92%, Lag= 723.7 min
Discarded = 0.01 cfs @ 24.37 hrs, Volume= 0.034 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,423.08' @ 24.37 hrs Surf.Area= 0.022 ac Storage= 0.024 af

Plug-Flow detention time= 1,064.8 min calculated for 0.034 af (96% of inflow)
Center-of-Mass det. time= 1,046.6 min (2,017.3 - 970.8)

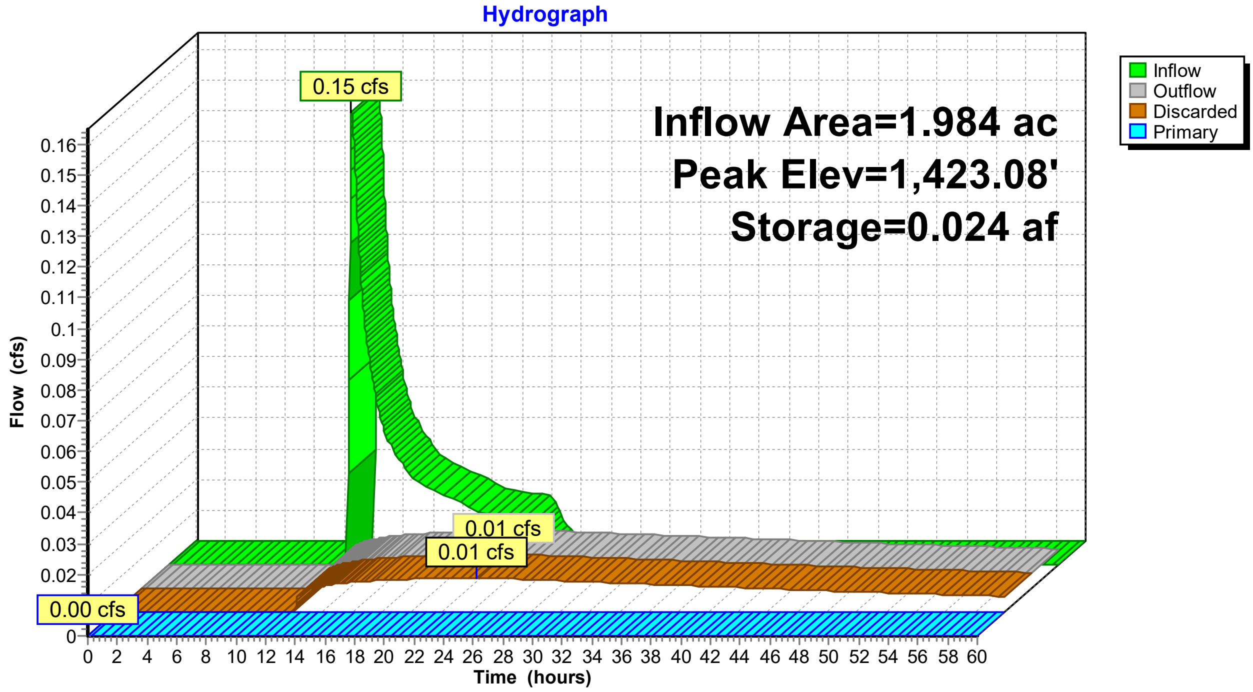
Volume	Invert	Avail.Storage	Storage Description
#1	1,421.50'	0.166 af	**10.00'W x 40.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,421.50'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,424.00'	**20.0' 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

Discarded OutFlow Max=0.01 cfs @ 24.37 hrs HW=1,423.08' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,421.50' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.1bP2: North Road Detention Pond



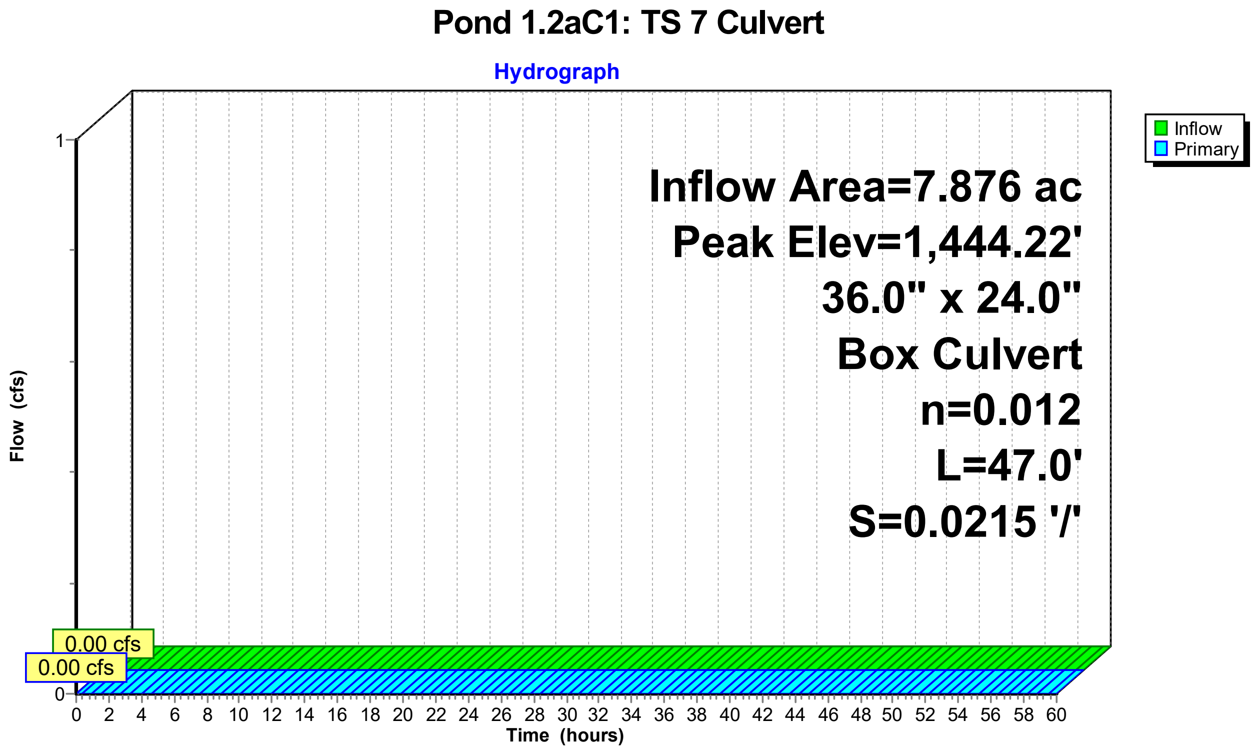
Summary for Pond 1.2aC1: TS 7 Culvert

Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.2aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.22' @ 0.00 hrs
Flood Elev= 1,446.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,444.22'	**36.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,444.22' / 1,443.21' S= 0.0215 '/' Cc= 0.900 n= 0.012, Flow Area= 6.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,444.22' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)



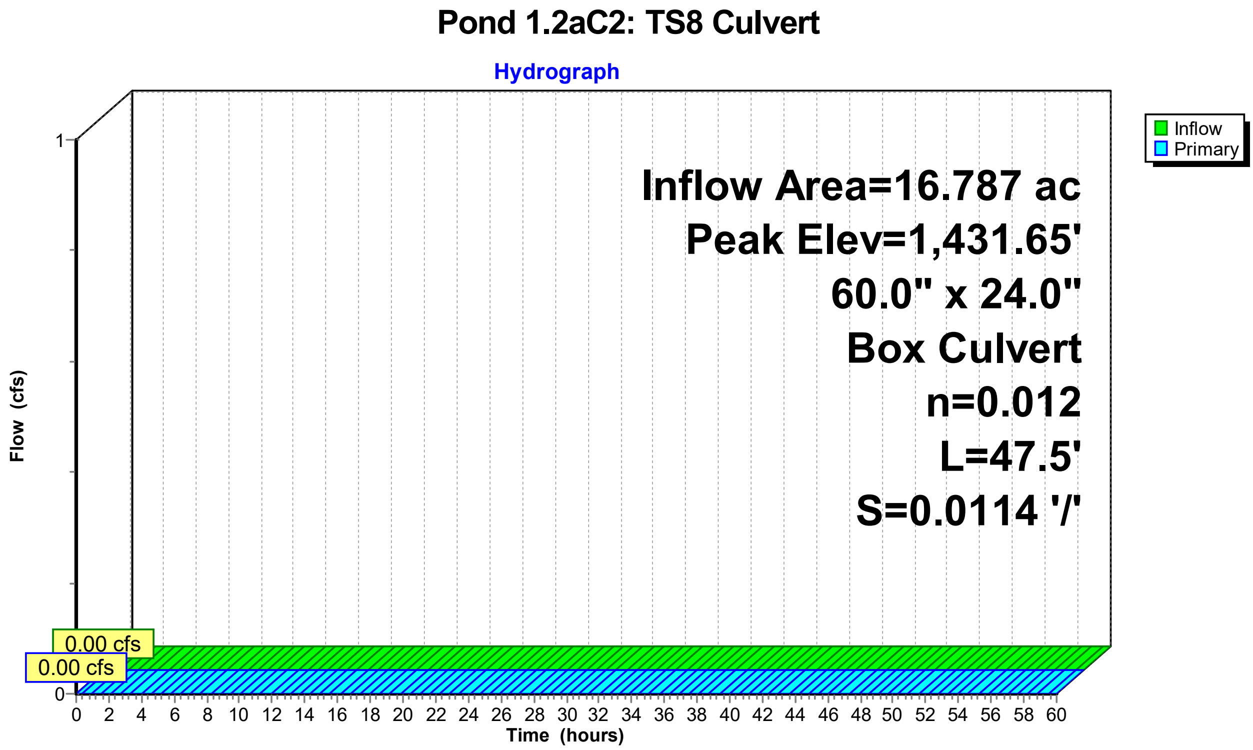
Summary for Pond 1.2aC2: TS8 Culvert

Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.2aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.65' @ 0.00 hrs
Flood Elev= 1,433.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.65'	**60.0" W x 24.0" H Box Culvert** L= 47.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,431.65' / 1,431.11' S= 0.0114 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.65' (Free Discharge)
1=Culvert (Controls 0.00 cfs)



Summary for Pond 1.2aP: South Road Bypass OC

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

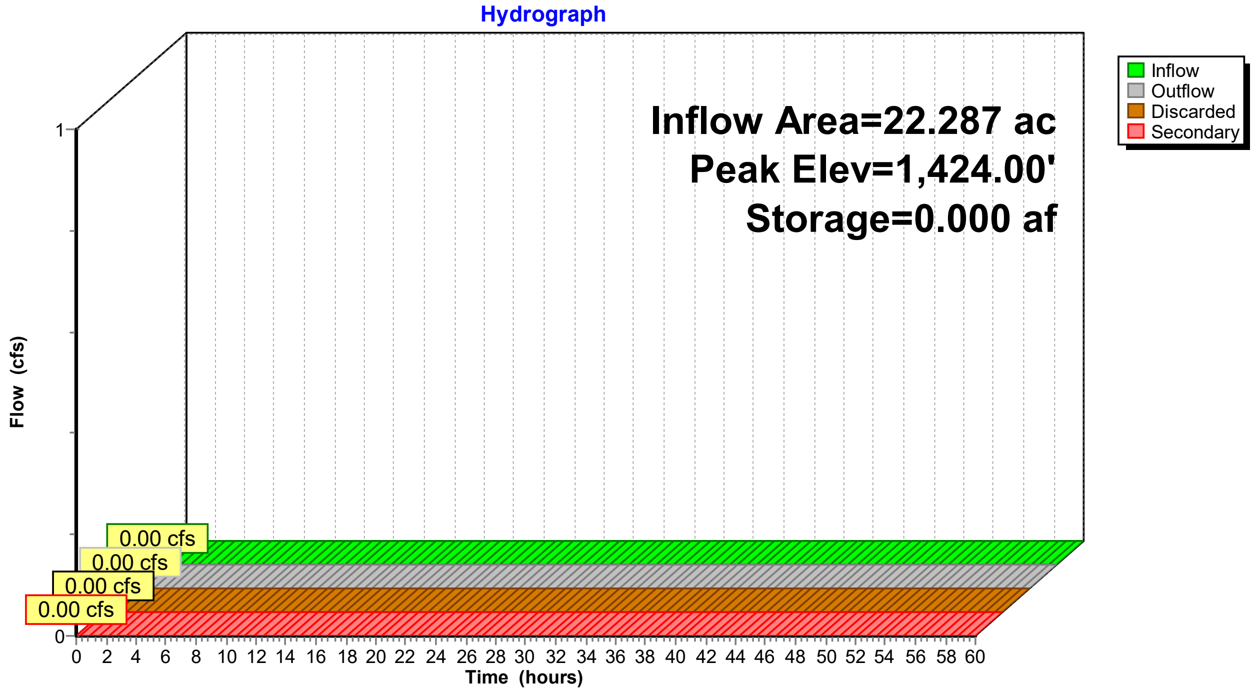
Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area**
#2	Secondary	1,426.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.06 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.2aP: South Road Bypass OC



Summary for Pond 1.2bC1: East Road Culvert

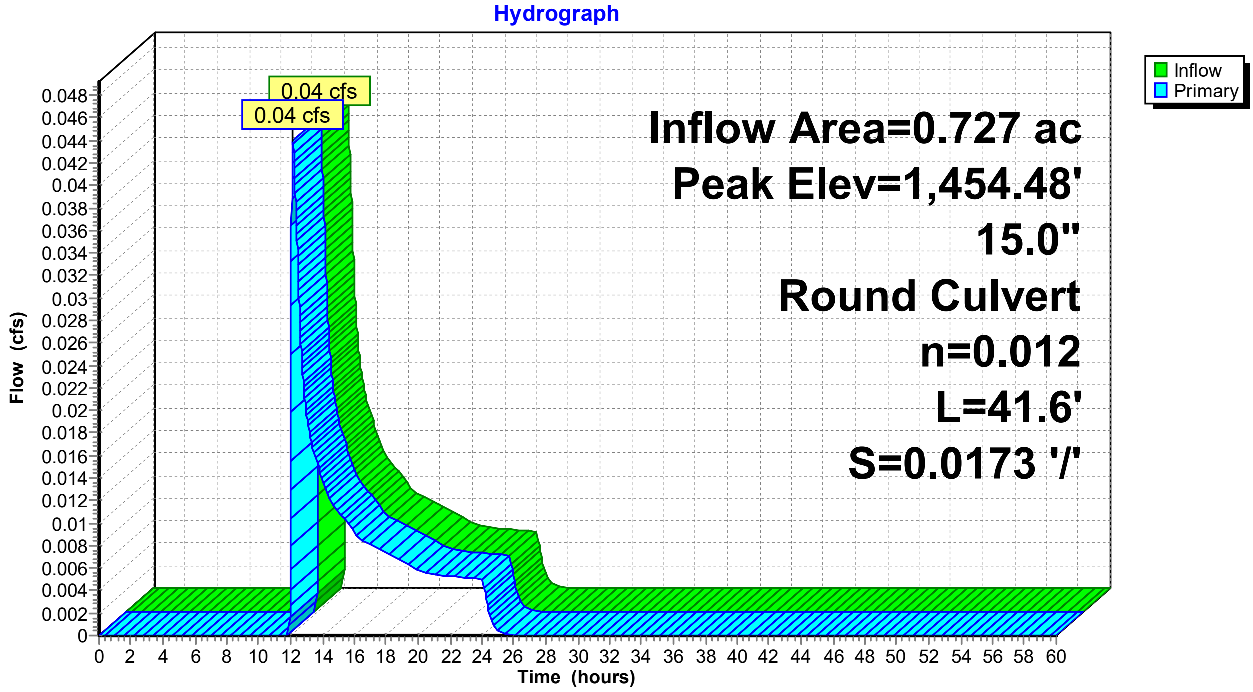
Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.17" for 1-Yr Storm event
Inflow = 0.04 cfs @ 12.13 hrs, Volume= 0.010 af
Outflow = 0.04 cfs @ 12.13 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 12.13 hrs, Volume= 0.010 af
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,454.48' @ 12.13 hrs
Flood Elev= 1,457.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,454.39'	**15.0" Round Culvert** L= 41.6' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,454.39' / 1,453.67' S= 0.0173 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.04 cfs @ 12.13 hrs HW=1,454.48' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.04 cfs @ 1.04 fps)

Pond 1.2bC1: East Road Culvert



Summary for Pond 1.2bC2: TS6 Culvert

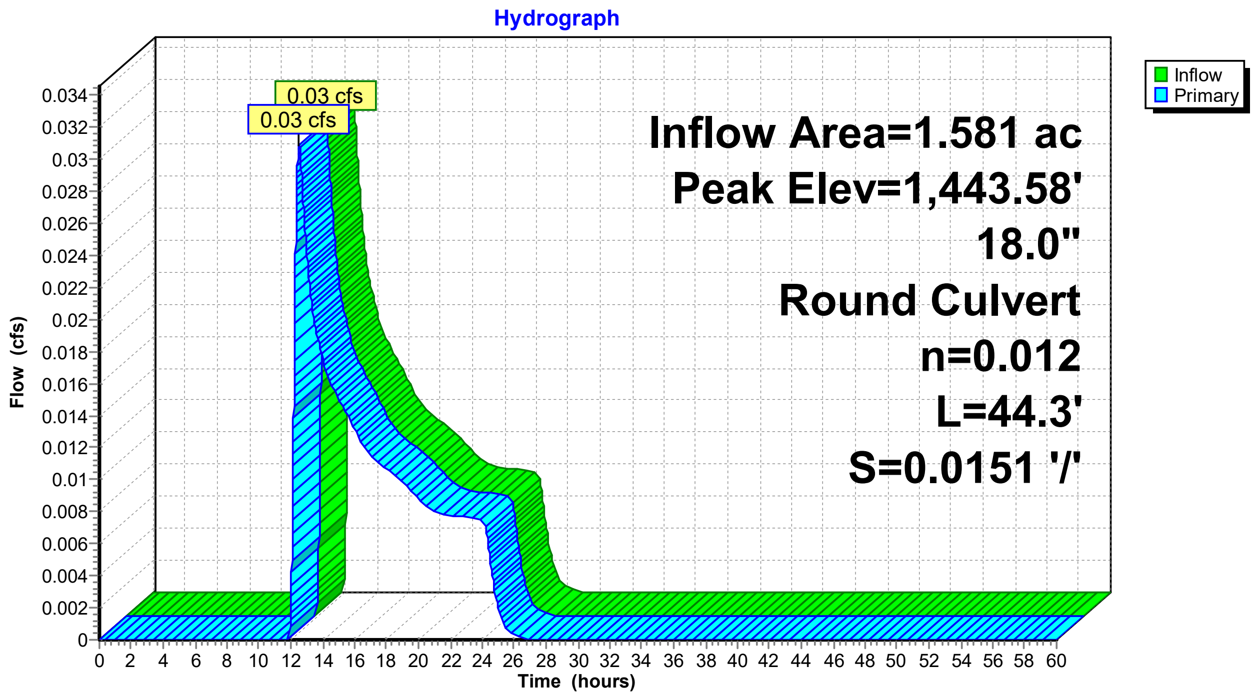
Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.10" for 1-Yr Storm event
Inflow = 0.03 cfs @ 12.52 hrs, Volume= 0.013 af
Outflow = 0.03 cfs @ 12.52 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min
Primary = 0.03 cfs @ 12.52 hrs, Volume= 0.013 af
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,443.58' @ 12.52 hrs
Flood Elev= 1,445.09'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,443.51'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,443.51' / 1,442.84' S= 0.0151 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.03 cfs @ 12.52 hrs HW=1,443.58' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.03 cfs @ 0.93 fps)

Pond 1.2bC2: TS6 Culvert



Summary for Pond 1.2bP: South Road Treatment Pond

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.15" for 1-Yr Storm event
Inflow = 0.13 cfs @ 12.10 hrs, Volume= 0.030 af
Outflow = 0.11 cfs @ 12.17 hrs, Volume= 0.030 af, Atten= 9%, Lag= 4.6 min
Discarded = 0.11 cfs @ 12.17 hrs, Volume= 0.030 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.05' @ 12.17 hrs Surf.Area= 0.009 ac Storage= 0.000 af

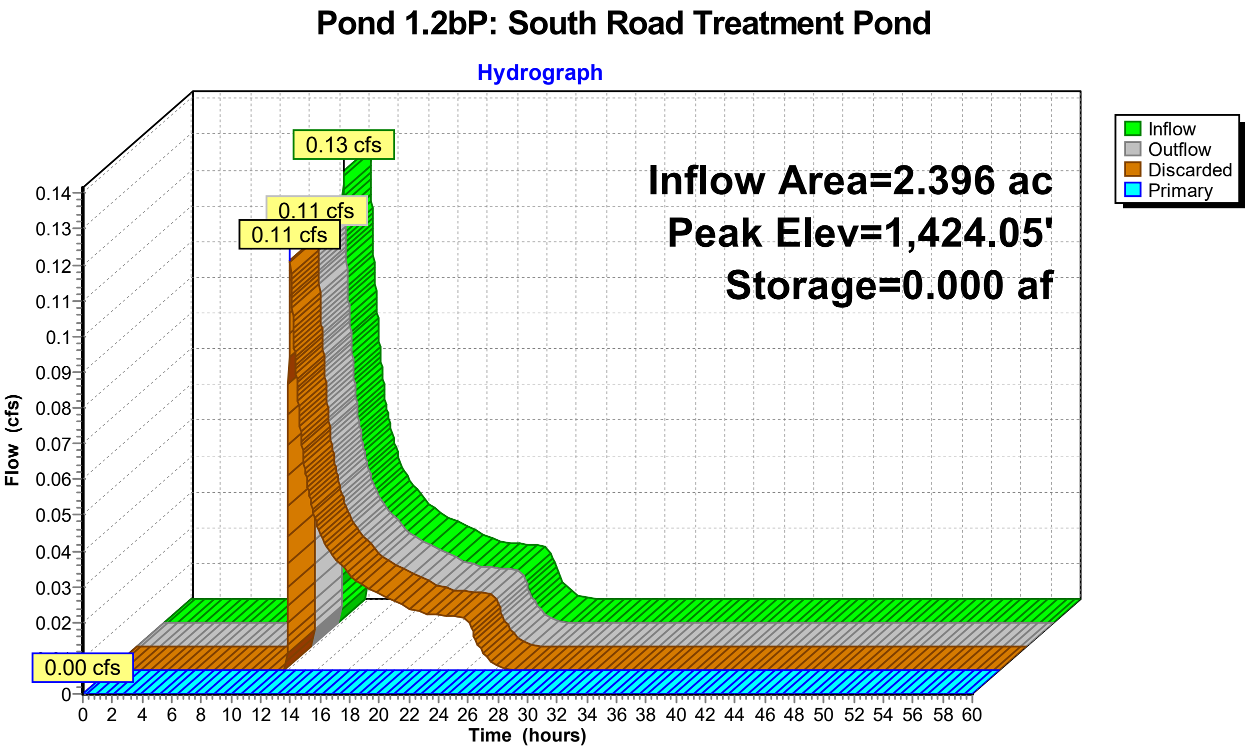
Plug-Flow detention time= 3.0 min calculated for 0.030 af (100% of inflow)
Center-of-Mass det. time= 3.0 min (987.7 - 984.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.149 af	**20.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,426.05'	**20.0' 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

Discarded OutFlow Max=0.11 cfs @ 12.17 hrs HW=1,424.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Summary for Pond 1.3P: Pond 3 - Access Rd West

Inflow Area = 0.695 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af, Atten= 2%, Lag= 1.1 min
Discarded = 0.00 cfs @ 24.03 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link SP1 : Study Point 1

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,456.00' @ 24.03 hrs Surf.Area= 784 sf Storage= 0 cf

Plug-Flow detention time= 4.8 min calculated for 0.000 af (100% of inflow)
Center-of-Mass det. time= 4.8 min (1,398.1 - 1,393.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,456.00'	8,743 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

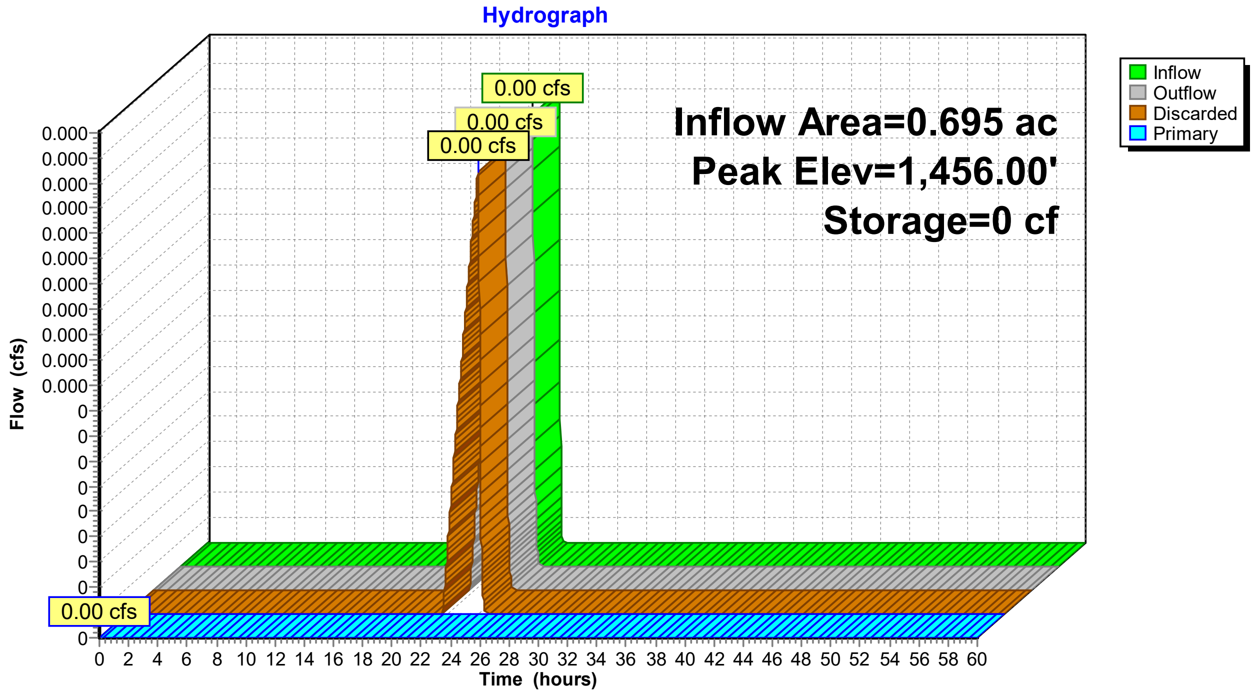
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,456.00	784	123.0	0	0	784
1,458.00	1,720	194.0	2,443	2,443	2,603
1,459.00	2,884	279.0	2,277	4,721	5,811
1,460.00	5,280	421.0	4,022	8,743	13,729

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,456.00'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,459.99'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.00 cfs @ 24.03 hrs HW=1,456.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.3P: Pond 3 - Access Rd West



Summary for Pond 4.2bP: Pond 4 - Access Rd East

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.28" for 1-Yr Storm event
Inflow = 0.12 cfs @ 12.06 hrs, Volume= 0.011 af
Outflow = 0.04 cfs @ 12.50 hrs, Volume= 0.011 af, Atten= 69%, Lag= 26.2 min
Discarded = 0.04 cfs @ 12.50 hrs, Volume= 0.011 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4.2C : 18" Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,445.81' @ 12.50 hrs Surf.Area= 259 sf Storage= 70 cf

Plug-Flow detention time= 12.7 min calculated for 0.011 af (100% of inflow)
Center-of-Mass det. time= 12.7 min (939.1 - 926.4)

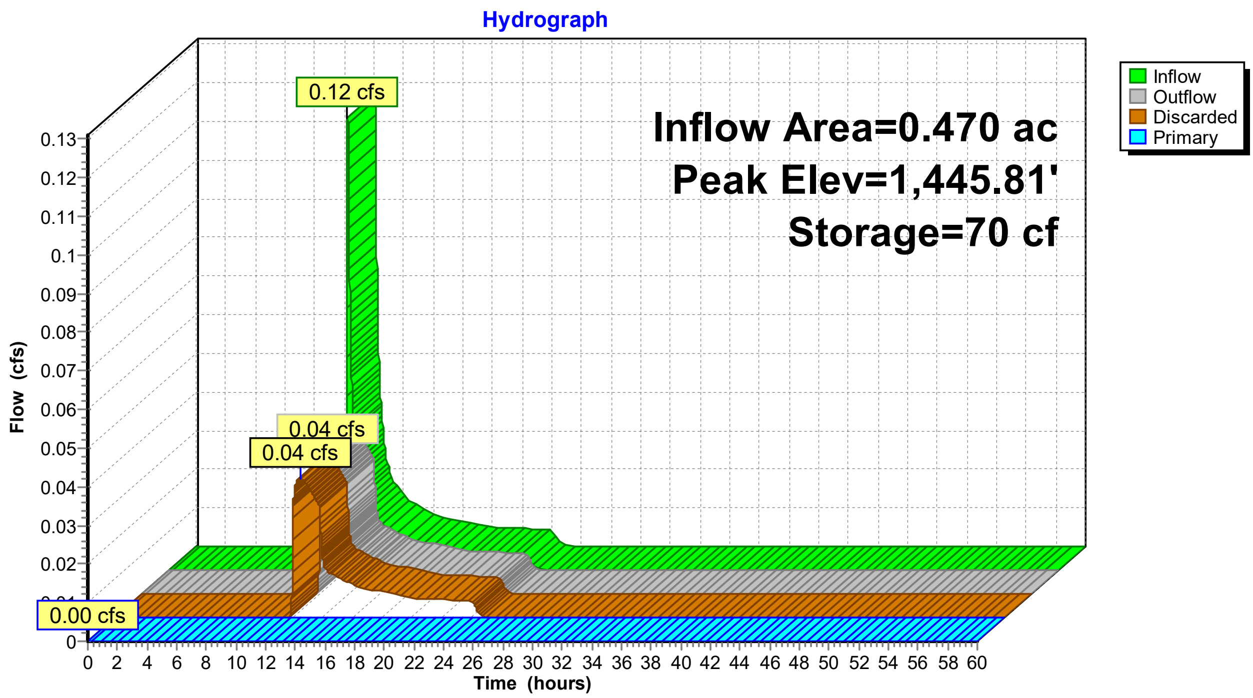
Volume	Invert	Avail.Storage	Storage Description
#1	1,445.50'	2,317 cf	**10.00'W x 20.00'L x 3.50'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,445.50'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,448.25'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.04 cfs @ 12.50 hrs HW=1,445.81' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,445.50' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4.2bP: Pond 4 - Access Rd East



Summary for Pond 4.2C: 18" Culvert

Inflow Area = 27.587 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm event
Inflow = 0.01 cfs @ 24.16 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.78' @ 26.20 hrs Surf.Area= 373 sf Storage= 35 cf
Flood Elev= 1,434.64' Surf.Area= 27,666 sf Storage= 28,656 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

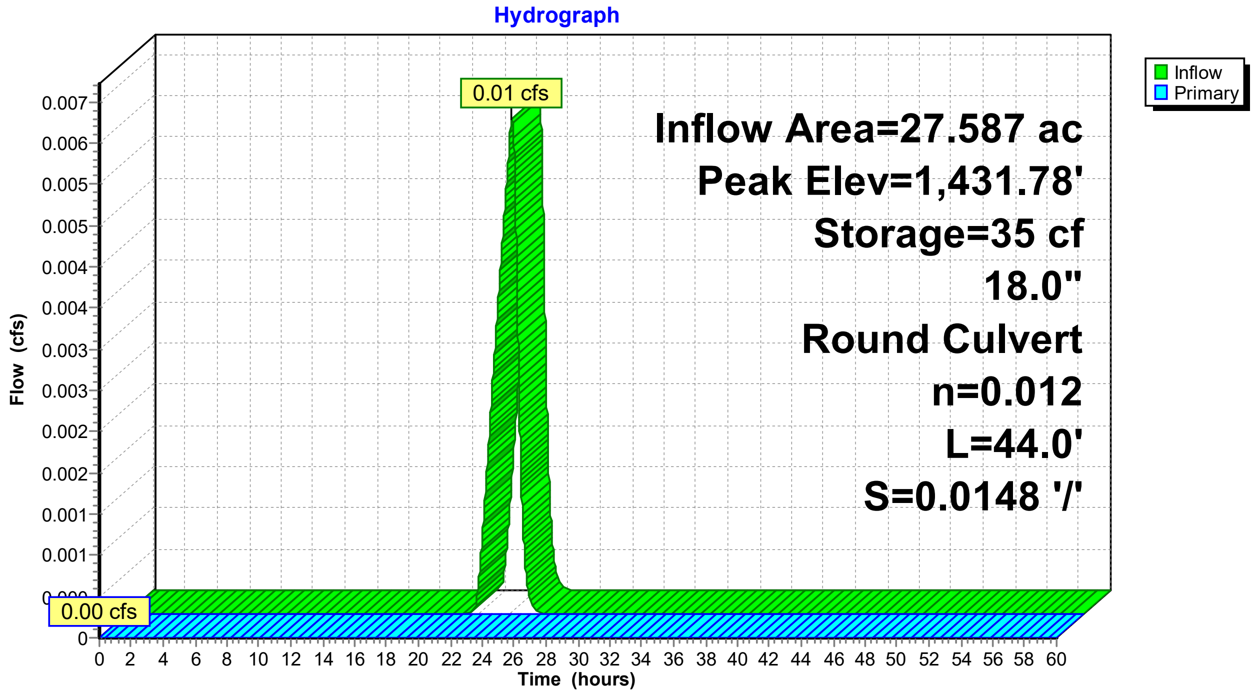
Volume	Invert	Avail.Storage	Storage Description
#1	1,431.50'	39,033 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,431.50	0	0.0	0	0	0
1,432.00	1,190	146.0	198	198	1,697
1,432.50	3,534	368.0	1,129	1,327	10,778
1,433.00	5,795	497.0	2,309	3,637	19,660
1,433.50	10,362	837.0	3,984	7,621	55,755
1,434.00	16,931	975.0	6,756	14,377	75,659
1,434.60	27,412	1,352.0	13,177	27,555	145,474
1,435.00	30,000	1,500.0	11,479	39,033	179,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.83'	**18.0" Round Culvert** L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.83' / 1,431.18' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.50' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)

Pond 4.2C: 18" Culvert



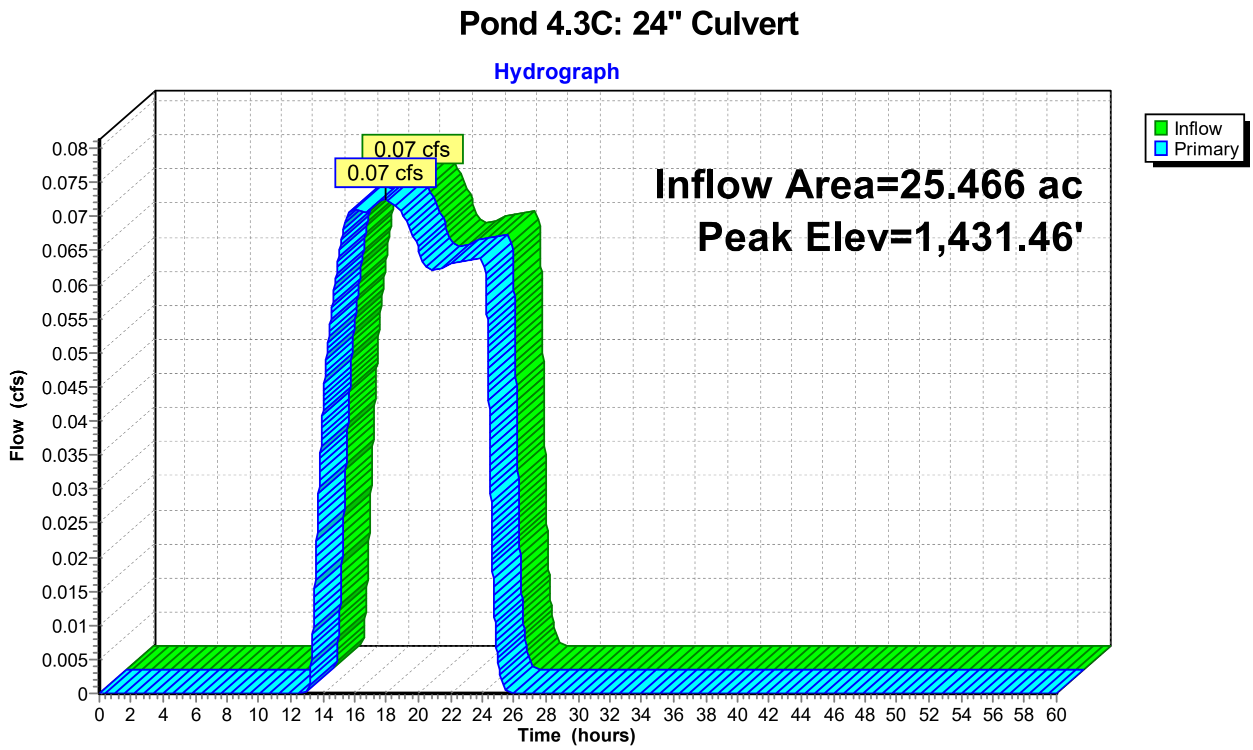
Summary for Pond 4.3C: 24" Culvert

Inflow Area = 25.466 ac, 5.08% Impervious, Inflow Depth = 0.03" for 1-Yr Storm event
Inflow = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af
Outflow = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min
Primary = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.46' @ 17.89 hrs
Flood Elev= 1,434.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.35'	**24.0" Round Culvert** L= 55.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.35' / 1,429.87' S= 0.0265 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Primary	1,434.81'	**20.0' 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

Primary OutFlow Max=0.07 cfs @ 17.89 hrs HW=1,431.46' (Free Discharge)
1=Culvert (Inlet Controls 0.07 cfs @ 1.11 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

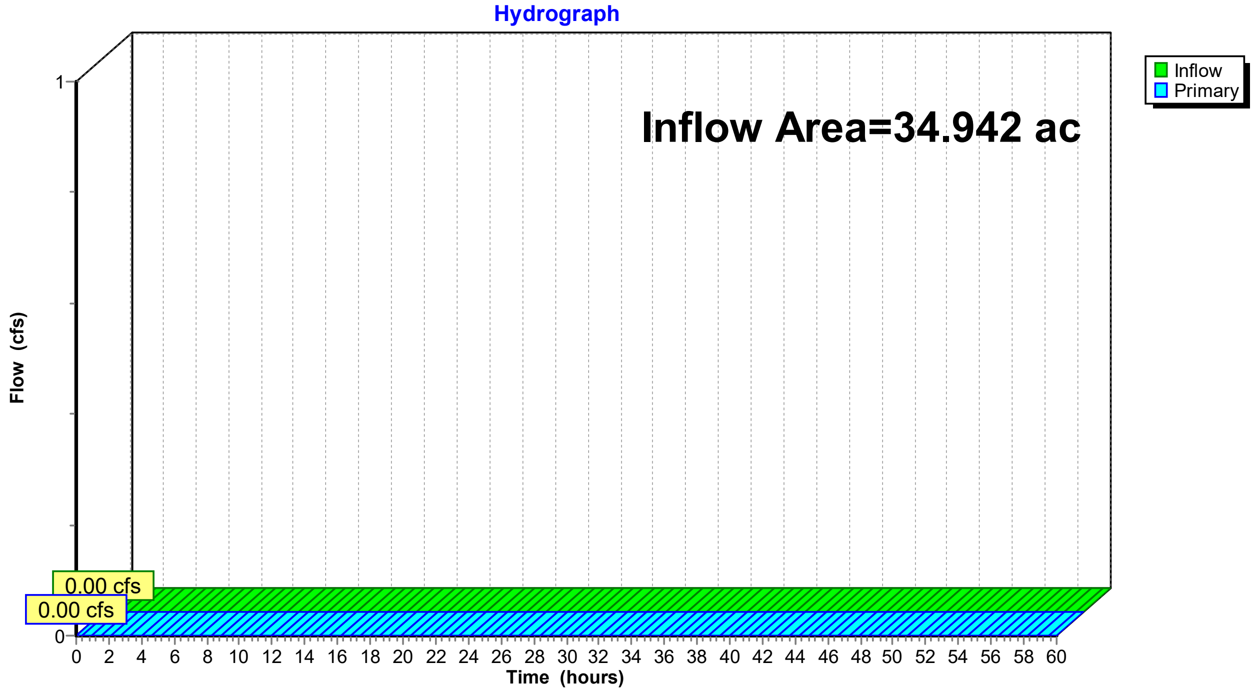


Summary for Link 1.1L:

Inflow Area = 34.942 ac, 0.04% Impervious, Inflow Depth = 0.00" for 1-Yr Storm 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
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link 1.1L:

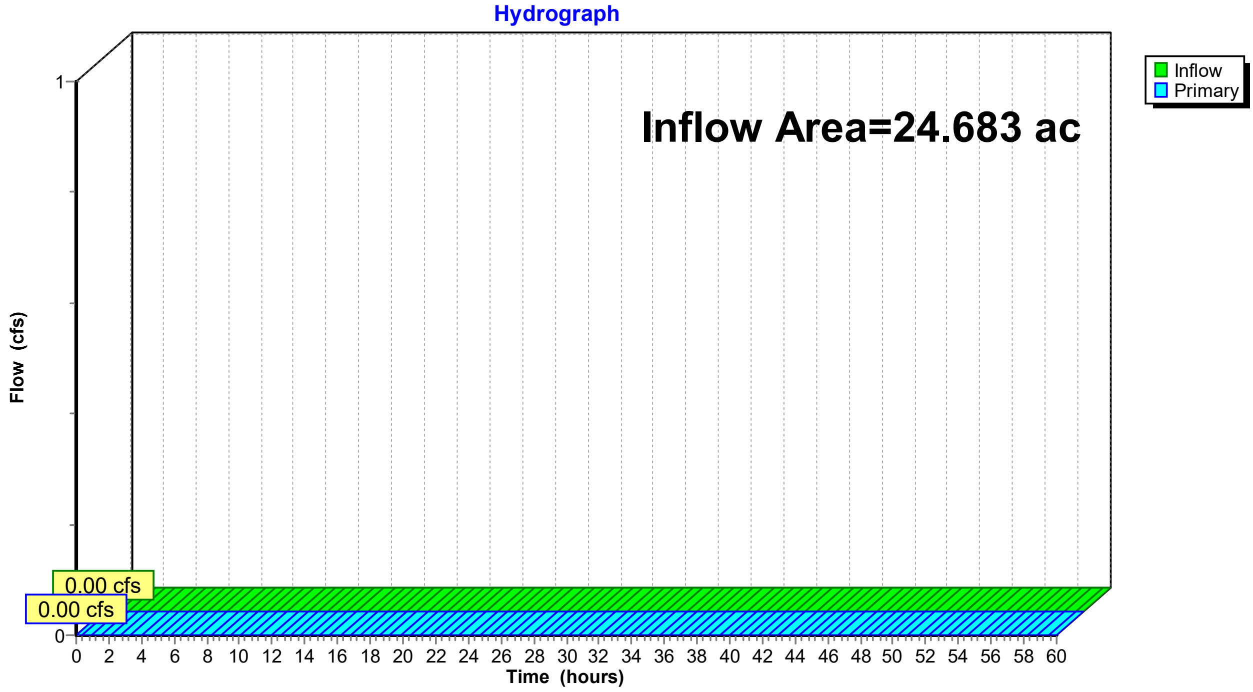


Summary for Link 1.2L:

Inflow Area = 24.683 ac, 0.06% Impervious, Inflow Depth = 0.00" for 1-Yr Storm 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
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link 1.2L:

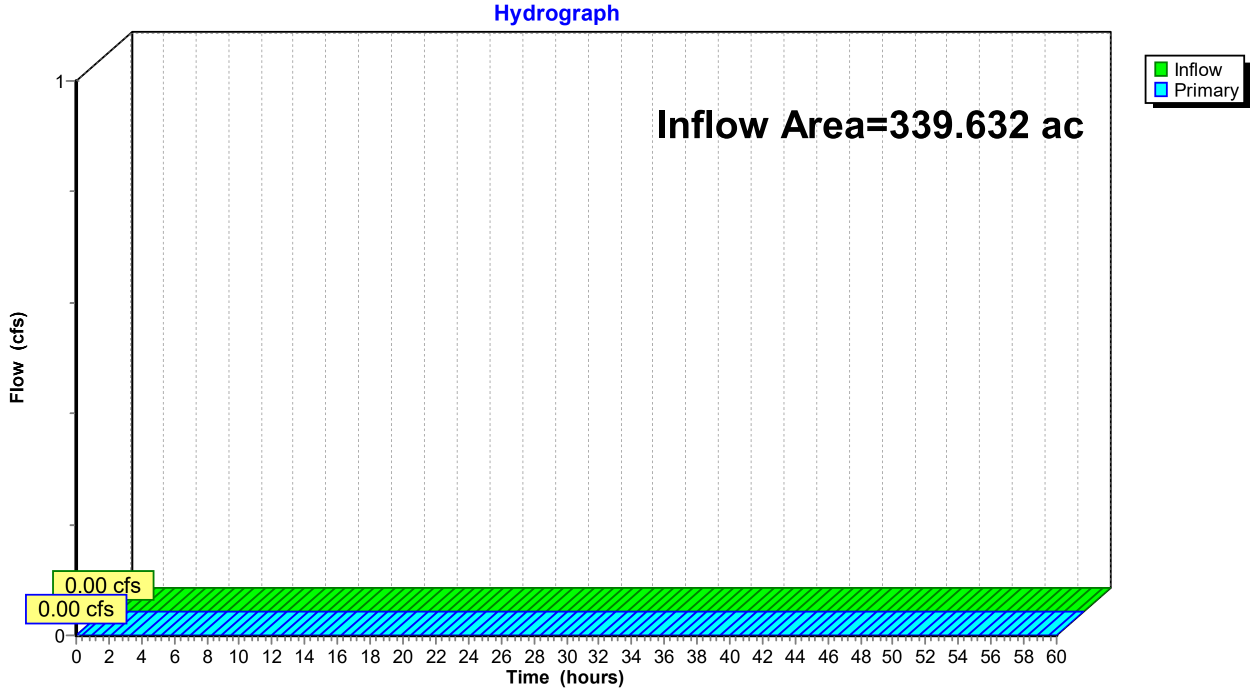


Summary for Link SP1: Study Point 1

Inflow Area = 339.632 ac, 0.01% Impervious, Inflow Depth = 0.00" for 1-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

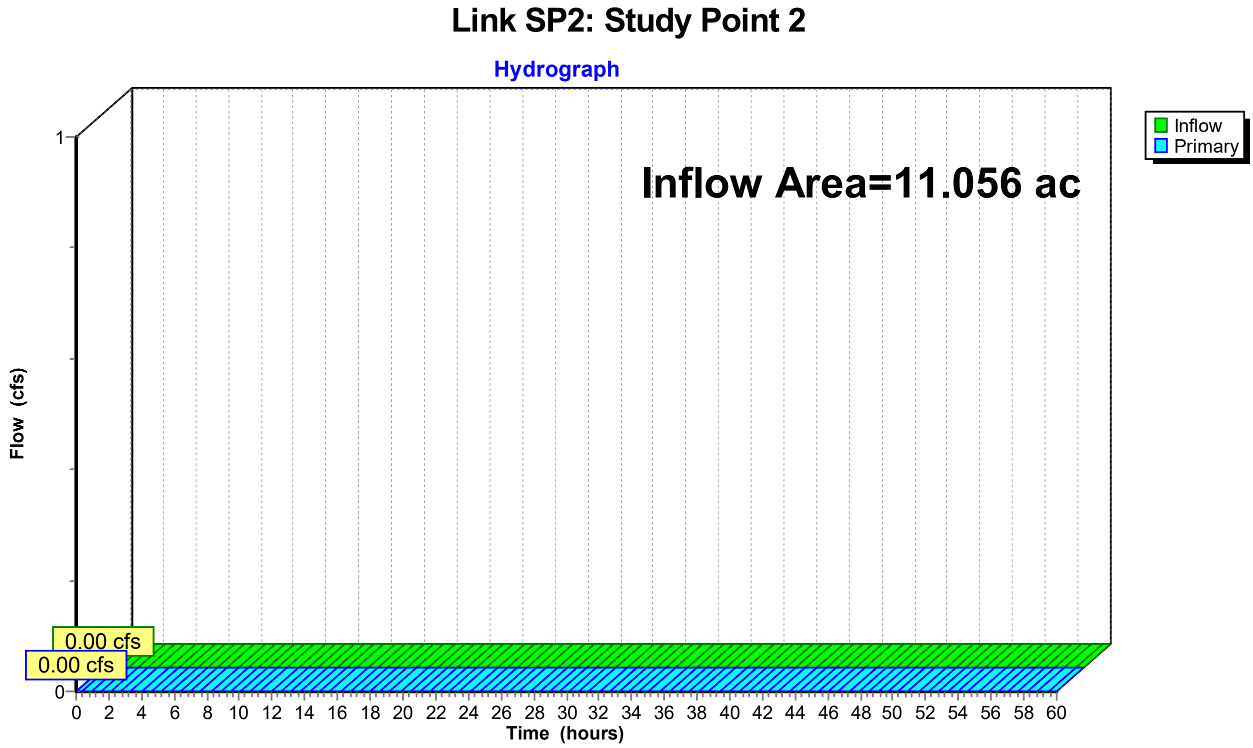
Link SP1: Study Point 1



Summary for Link SP2: Study Point 2

Inflow Area =	11.056 ac,	0.00% Impervious,	Inflow Depth = 0.00"	for 1-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

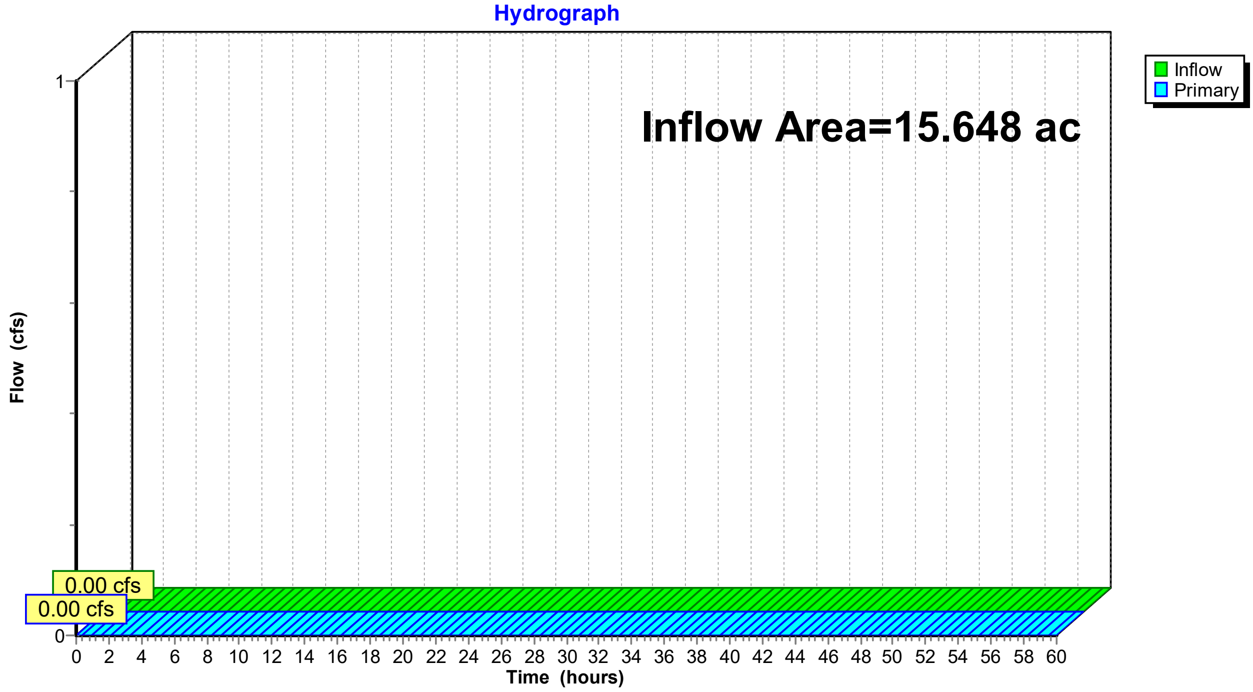


Summary for Link SP3: Study Point 3

Inflow Area =	15.648 ac,	0.56% Impervious,	Inflow Depth = 0.00"	for 1-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP3: Study Point 3

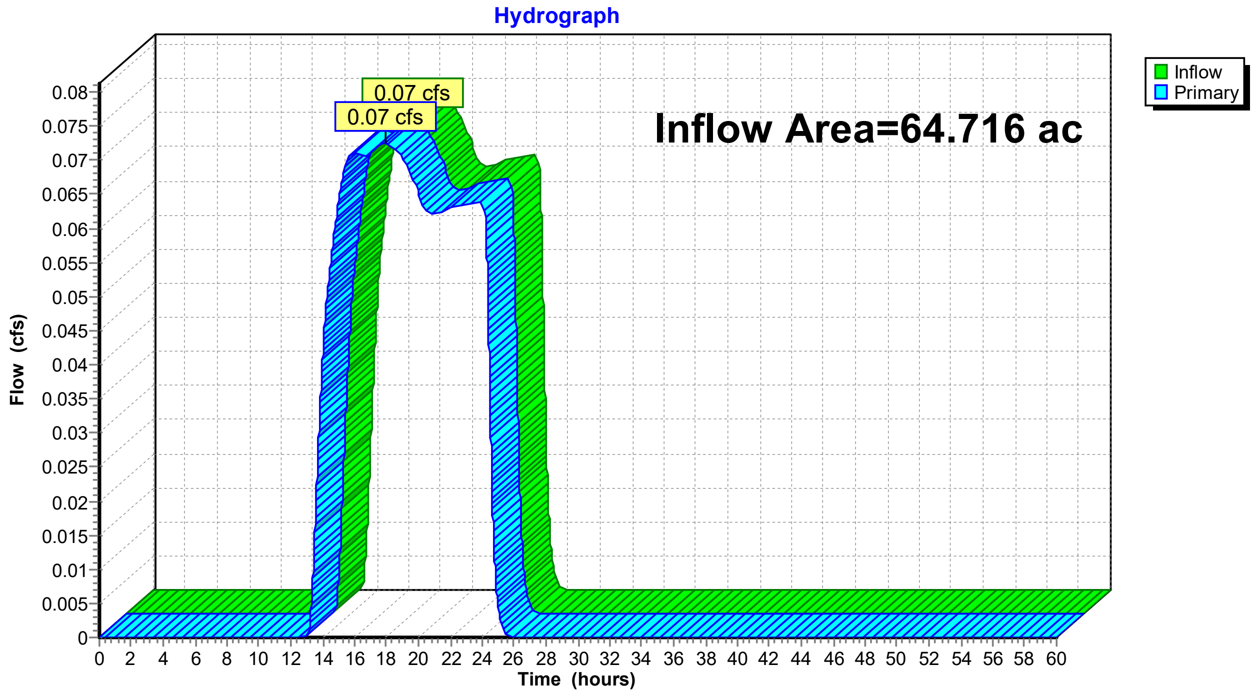


Summary for Link SP4: Study Point 4

Inflow Area = 64.716 ac, 2.50% Impervious, Inflow Depth = 0.01" for 1-Yr Storm event
Inflow = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af
Primary = 0.07 cfs @ 17.89 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP4: Study Point 4

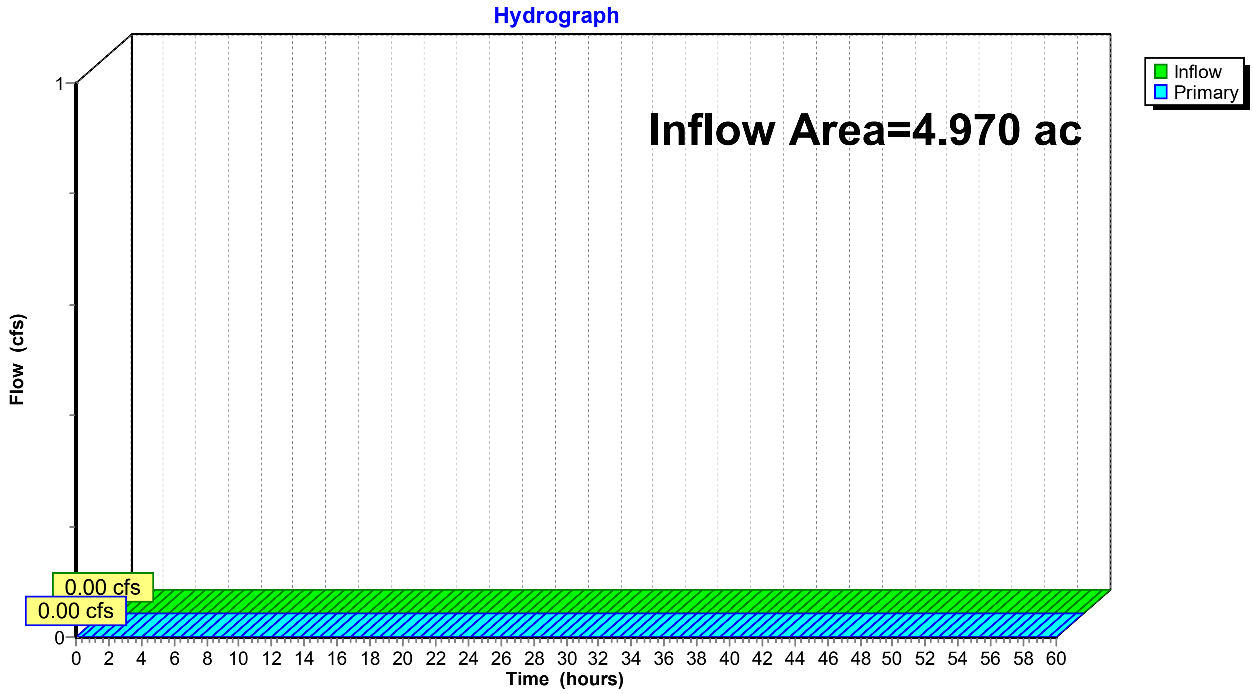


Summary for Link SP5: Study Point 5

Inflow Area = 4.970 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP5: Study Point 5

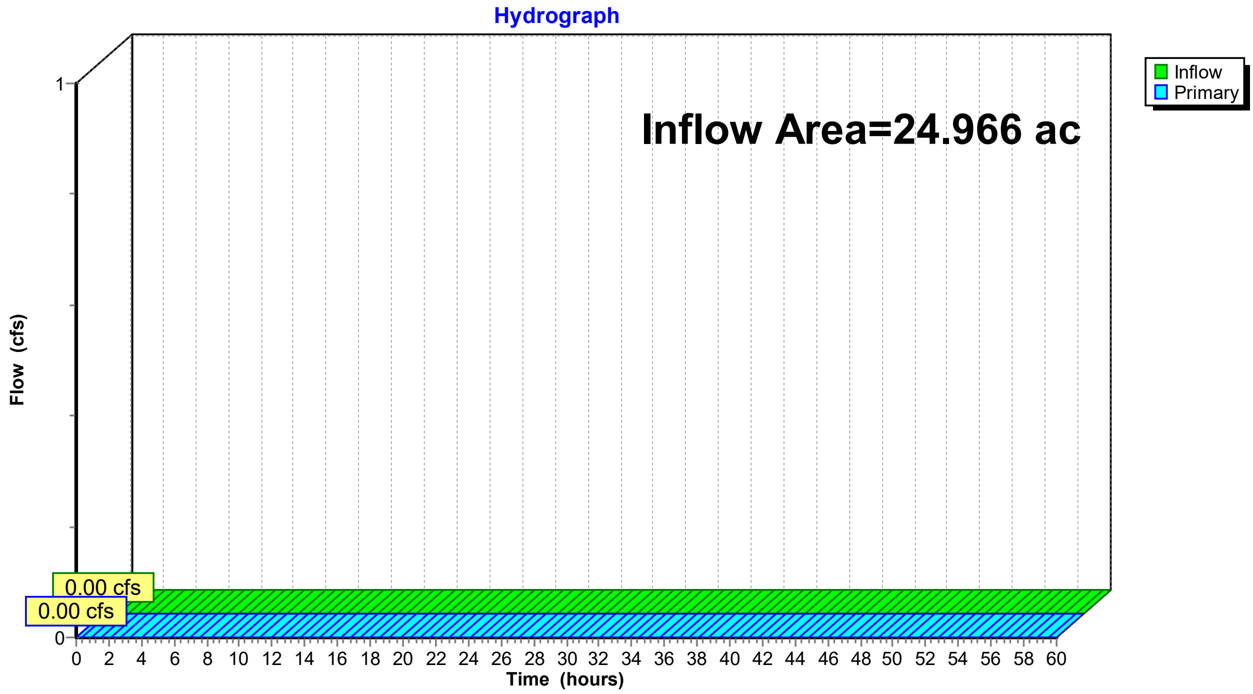


Summary for Link SP6: Study Point 6

Inflow Area =	24.966 ac,	5.81% Impervious, Inflow Depth = 0.00"	for 1-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP6: Study Point 6



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1.1aS1: North Array East Runoff Area=5.874 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=788' Tc=18.8 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS2: North Array East Runoff Area=8.467 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=931' Tc=21.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS3: North Array West Runoff Area=5.792 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,031' Tc=19.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1aS4: North Array West Runoff Area=12.825 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,562' Tc=26.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.1bS1: North Road - East Runoff Area=1.333 ac 0.53% Impervious Runoff Depth=0.93"
Tc=6.0 min CN=71 Runoff=2.16 cfs 0.103 af

Subcatchment 1.1bS2: North Road - West Runoff Area=0.651 ac 1.08% Impervious Runoff Depth=0.78"
Tc=6.0 min CN=68 Runoff=0.86 cfs 0.042 af

Subcatchment 1.2aS1: Middle Array East Runoff Area=7.876 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=865' Tc=19.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS2: Middle Array Center Runoff Area=8.911 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=825' Tc=18.1 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2aS3: Middle Array West Runoff Area=5.500 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=882' Tc=18.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 1.2bS1: East Road - West Runoff Area=0.727 ac 0.00% Impervious Runoff Depth=0.73"
Tc=6.0 min CN=67 Runoff=0.89 cfs 0.044 af

Subcatchment 1.2bS2: South Road Runoff Area=0.854 ac 0.47% Impervious Runoff Depth=0.37"
Flow Length=308' Tc=13.7 min CN=58 Runoff=0.26 cfs 0.026 af

Subcatchment 1.2bS3: South Road Runoff Area=0.815 ac 1.35% Impervious Runoff Depth=0.93"
Tc=6.0 min CN=71 Runoff=1.32 cfs 0.063 af

Subcatchment 1.3aS1: Surface Discharge Runoff Area=279.312 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=6,771' Tc=201.7 min CN=39 Runoff=0.11 cfs 0.034 af

Subcatchment 1.3bS: Access Rd to Pond 3 Runoff Area=0.695 ac 0.00% Impervious Runoff Depth=0.17"
Tc=6.0 min CN=51 Runoff=0.04 cfs 0.010 af

Subcatchment 2S: Runoff Area=11.056 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=2,342' Tc=36.0 min CN=39 Runoff=0.01 cfs 0.001 af

Subcatchment 3S: Runoff Area=15.648 ac 0.56% Impervious Runoff Depth=0.01"
Flow Length=886' Tc=12.7 min CN=40 Runoff=0.02 cfs 0.007 af

Subcatchment 4.1S: Runoff Area=11.663 ac 2.80% Impervious Runoff Depth=0.05"
Flow Length=845' Tc=15.8 min CN=45 Runoff=0.06 cfs 0.052 af

Subcatchment 4.2aS: Runoff Area=27.117 ac 0.00% Impervious Runoff Depth=0.17"
Flow Length=1,640' Tc=38.9 min CN=51 Runoff=0.85 cfs 0.380 af

Subcatchment 4.2bS: Runoff Area=0.470 ac 0.00% Impervious Runoff Depth=0.98"
Tc=6.0 min CN=72 Runoff=0.81 cfs 0.038 af

Subcatchment 4.3S: Runoff Area=25.466 ac 5.08% Impervious Runoff Depth=0.34"
Flow Length=2,280' Tc=36.5 min CN=57 Runoff=3.30 cfs 0.715 af

Subcatchment 5S: Runoff Area=4.970 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,180' Tc=17.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 6S: Runoff Area=24.966 ac 5.81% Impervious Runoff Depth=0.03"
Flow Length=1,961' Tc=60.1 min CN=43 Runoff=0.08 cfs 0.059 af

Reach 1.1aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.0' S=0.0108 '/' Capacity=56.37 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.4' S=0.0284 '/' Capacity=91.27 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=557.5' S=0.0352 '/' Capacity=101.68 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1aR4: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=580.5' S=0.0362 '/' Capacity=103.04 cfs Outflow=0.00 cfs 0.000 af

Reach 1.1bR1: North Road Conveyance Avg. Flow Depth=0.21' Max Vel=2.01 fps Inflow=2.16 cfs 0.103 af
n=0.035 L=1,733.0' S=0.0240 '/' Capacity=111.65 cfs Outflow=1.13 cfs 0.103 af

Reach 1.1bR2: North Road Conveyance Avg. Flow Depth=0.23' Max Vel=2.62 fps Inflow=1.78 cfs 0.145 af
n=0.035 L=593.3' S=0.0380 '/' Capacity=140.36 cfs Outflow=1.61 cfs 0.145 af

Reach 1.2aR1: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=524.2' S=0.0188 '/' Capacity=74.30 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR2: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=556.0' S=0.0204 '/' Capacity=77.47 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2aR3: Bypass Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=249.0' S=0.0153 '/' Capacity=81.84 cfs Outflow=0.00 cfs 0.000 af

Reach 1.2bR1: East Road Conveyance Avg. Flow Depth=0.13' Max Vel=2.13 fps Inflow=0.89 cfs 0.044 af
n=0.035 L=731.4' S=0.0456 '/' Capacity=79.22 cfs Outflow=0.69 cfs 0.044 af

Reach 1.2bR2: South Road Conveyance Avg. Flow Depth=0.18' Max Vel=1.55 fps Inflow=0.89 cfs 0.071 af
n=0.035 L=604.5' S=0.0177 '/' Capacity=95.76 cfs Outflow=0.70 cfs 0.071 af

Reach 1.2bR3: South Road Conveyance Avg. Flow Depth=0.24' Max Vel=1.89 fps Inflow=1.54 cfs 0.133 af
n=0.035 L=755.9' S=0.0187 '/' Capacity=98.64 cfs Outflow=1.22 cfs 0.133 af

Reach 4.1R1: Bypass Swale Avg. Flow Depth=0.16' Max Vel=1.27 fps Inflow=0.06 cfs 0.052 af
n=0.035 L=570.0' S=0.0303 '/' Capacity=54.88 cfs Outflow=0.06 cfs 0.052 af

Reach 4.1R2: Ex Stream Avg. Flow Depth=0.06' Max Vel=0.68 fps Inflow=0.82 cfs 0.431 af
n=0.035 L=740.0' S=0.0099 '/' Capacity=588.81 cfs Outflow=0.77 cfs 0.431 af

Reach 4.2bR: Conveyance Swale Avg. Flow Depth=0.14' Max Vel=2.09 fps Inflow=0.81 cfs 0.038 af
n=0.035 L=565.0' S=0.0432 '/' Capacity=77.09 cfs Outflow=0.69 cfs 0.038 af

Pond 1.1aC1: TS1 Culvert Peak Elev=1,487.56' Inflow=0.00 cfs 0.000 af
36.3" x 22.5", R=18.8"/51.0" Pipe Arch Culvert n=0.012 L=47.0' S=0.0162 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC2: TS2 Culvert Peak Elev=1,470.80' Inflow=0.00 cfs 0.000 af
48.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0262 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aC3: TS3 Culvert Peak Elev=1,449.55' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.2' S=0.0405 '/' Outflow=0.00 cfs 0.000 af

Pond 1.1aP: North Road Bypass OC Peak Elev=1,426.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.1bC1: TS4 Culvert Peak Elev=1,449.98' Inflow=1.13 cfs 0.103 af
18.0" Round Culvert n=0.012 L=45.9' S=0.0486 '/' Outflow=1.13 cfs 0.103 af

Pond 1.1bP1: Dry Swale Peak Elev=1,426.14' Storage=171 cf Inflow=1.61 cfs 0.145 af
Discarded=0.00 cfs 0.004 af Primary=1.58 cfs 0.141 af Outflow=1.59 cfs 0.145 af

Pond 1.1bP2: North Road Detention Pond Peak Elev=1,424.04' Storage=0.050 af Inflow=1.58 cfs 0.141 af
Discarded=0.02 cfs 0.052 af Primary=0.45 cfs 0.074 af Outflow=0.46 cfs 0.127 af

Pond 1.2aC1: TS 7 Culvert Peak Elev=1,444.22' Inflow=0.00 cfs 0.000 af
36.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0215 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aC2: TS8 Culvert Peak Elev=1,431.65' Inflow=0.00 cfs 0.000 af
60.0" x 24.0" Box Culvert n=0.012 L=47.5' S=0.0114 '/' Outflow=0.00 cfs 0.000 af

Pond 1.2aP: South Road Bypass OC Peak Elev=1,424.00' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 1.2bC1: East Road Culvert Peak Elev=1,454.78' Inflow=0.69 cfs 0.044 af
15.0" Round Culvert n=0.012 L=41.6' S=0.0173 '/' Outflow=0.69 cfs 0.044 af

Pond 1.2bC2: TS6 Culvert Peak Elev=1,443.88' Inflow=0.70 cfs 0.071 af
18.0" Round Culvert n=0.012 L=44.3' S=0.0151 '/' Outflow=0.70 cfs 0.071 af

Pond 1.2bP: South Road Treatment Pond Peak Elev=1,426.06' Storage=0.033 af Inflow=1.22 cfs 0.133 af
Discarded=0.29 cfs 0.132 af Primary=0.12 cfs 0.002 af Outflow=0.41 cfs 0.133 af

Pond 1.3P: Pond 3 - Access Rd West Peak Elev=1,456.01' Storage=8 cf Inflow=0.04 cfs 0.010 af
Discarded=0.03 cfs 0.010 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.010 af

Pond 4.2bP: Pond 4 - Access Rd East Peak Elev=1,447.07' Storage=581 cf Inflow=0.69 cfs 0.038 af
Discarded=0.08 cfs 0.038 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.038 af

Pond 4.2C: 18" Culvert Peak Elev=1,432.23' Storage=572 cf Inflow=0.85 cfs 0.380 af
18.0" Round Culvert n=0.012 L=44.0' S=0.0148 '/' Outflow=0.81 cfs 0.379 af

Pond 4.3C: 24" Culvert Peak Elev=1,432.12' Inflow=3.30 cfs 0.715 af
Outflow=3.30 cfs 0.715 af

Link 1.1L:	Inflow=0.45 cfs 0.074 af Primary=0.45 cfs 0.074 af
Link 1.2L:	Inflow=0.12 cfs 0.002 af Primary=0.12 cfs 0.002 af
Link SP1: Study Point 1	Inflow=0.56 cfs 0.110 af Primary=0.56 cfs 0.110 af
Link SP2: Study Point 2	Inflow=0.01 cfs 0.001 af Primary=0.01 cfs 0.001 af
Link SP3: Study Point 3	Inflow=0.02 cfs 0.007 af Primary=0.02 cfs 0.007 af
Link SP4: Study Point 4	Inflow=3.36 cfs 1.146 af Primary=3.36 cfs 1.146 af
Link SP5: Study Point 5	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af
Link SP6: Study Point 6	Inflow=0.08 cfs 0.059 af Primary=0.08 cfs 0.059 af

Total Runoff Area = 460.988 ac Runoff Volume = 1.575 af Average Runoff Depth = 0.04"
99.31% Pervious = 457.801 ac 0.69% Impervious = 3.187 ac

Summary for Subcatchment 1.1aS1: North Array East

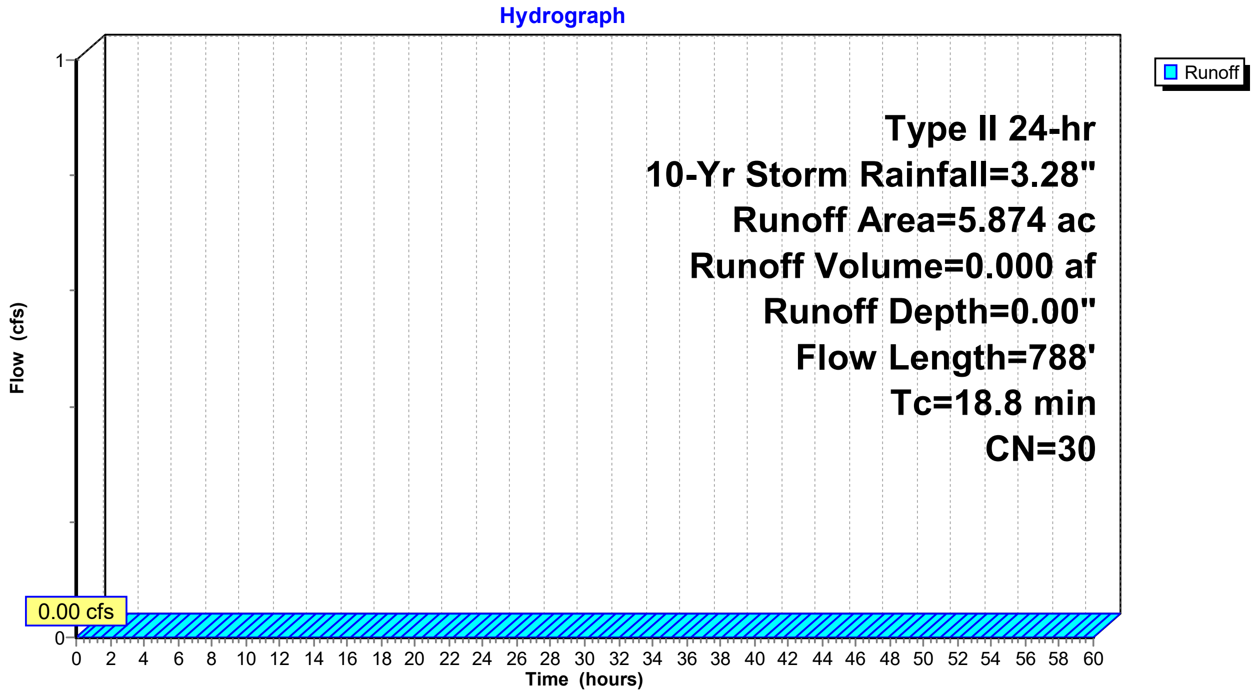
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
5.874	30	Meadow, non-grazed, HSG A
5.874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0499	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.1	688	0.0526	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.8	788	Total			

Subcatchment 1.1aS1: North Array East



Summary for Subcatchment 1.1aS2: North Array East Center

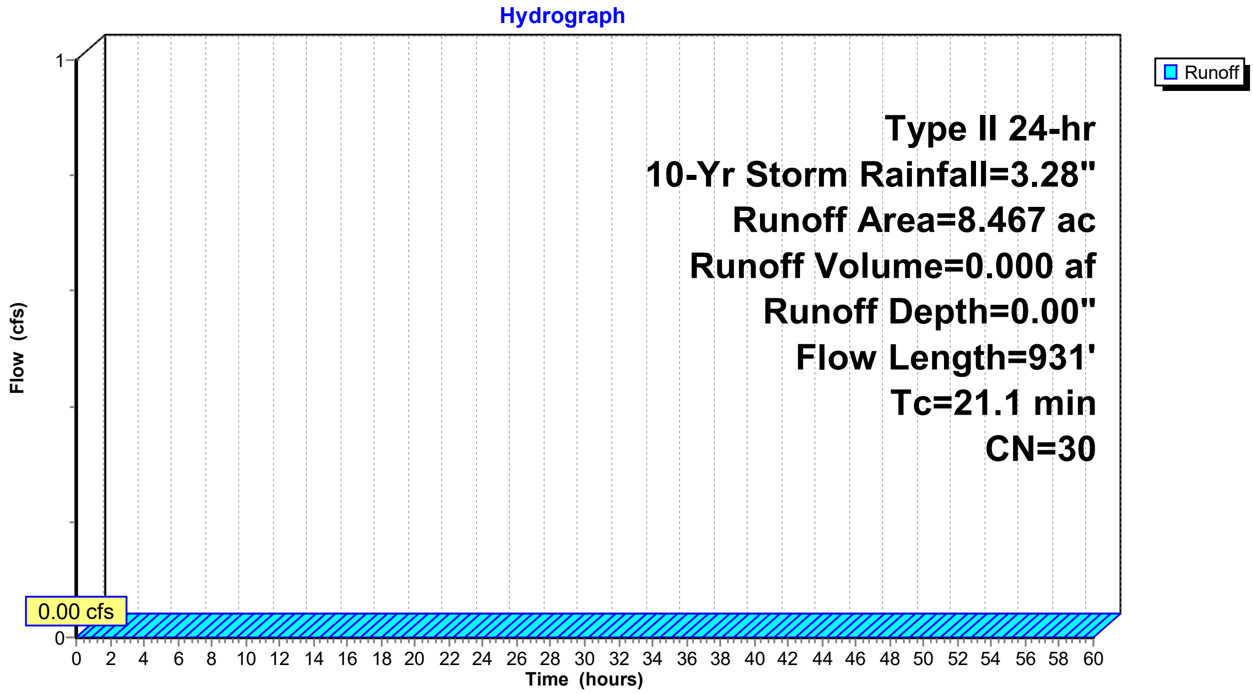
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
8.467	30	Meadow, non-grazed, HSG A
8.467		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0476	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.2	831	0.0463	1.51		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.1	931	Total			

Subcatchment 1.1aS2: North Array East Center



Summary for Subcatchment 1.1aS3: North Array West Center

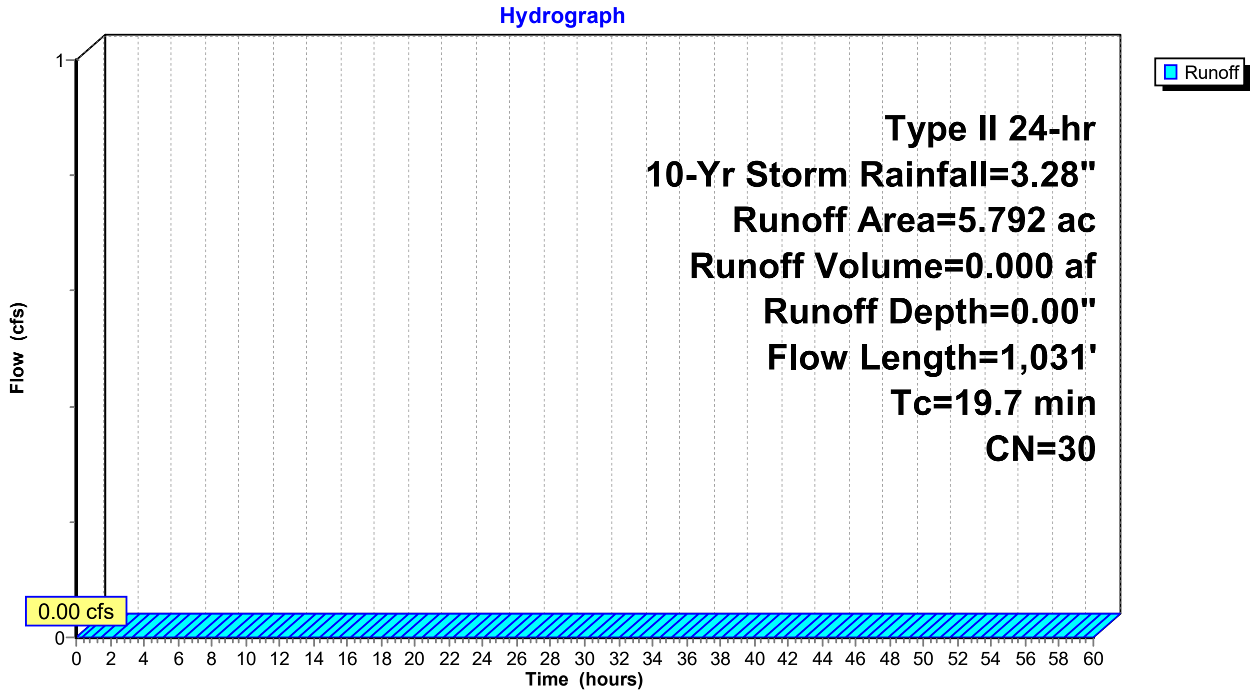
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
5.792	30	Meadow, non-grazed, HSG A
5.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0618	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.0	931	0.0601	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	1,031	Total			

Subcatchment 1.1aS3: North Array West Center



Summary for Subcatchment 1.1aS4: North Array West

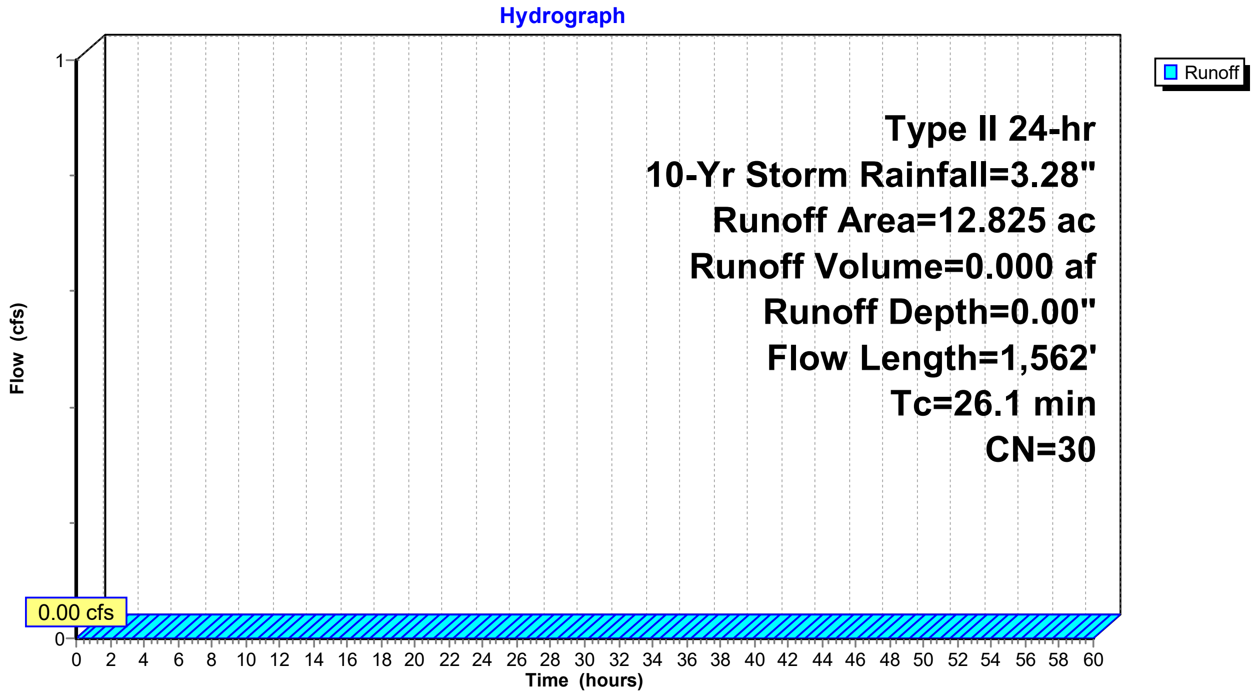
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.1aR4 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
12.825	30	Meadow, non-grazed, HSG A
12.825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0560	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
15.0	1,462	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.1	1,562	Total			

Subcatchment 1.1aS4: North Array West



Summary for Subcatchment 1.1bS1: North Road - East

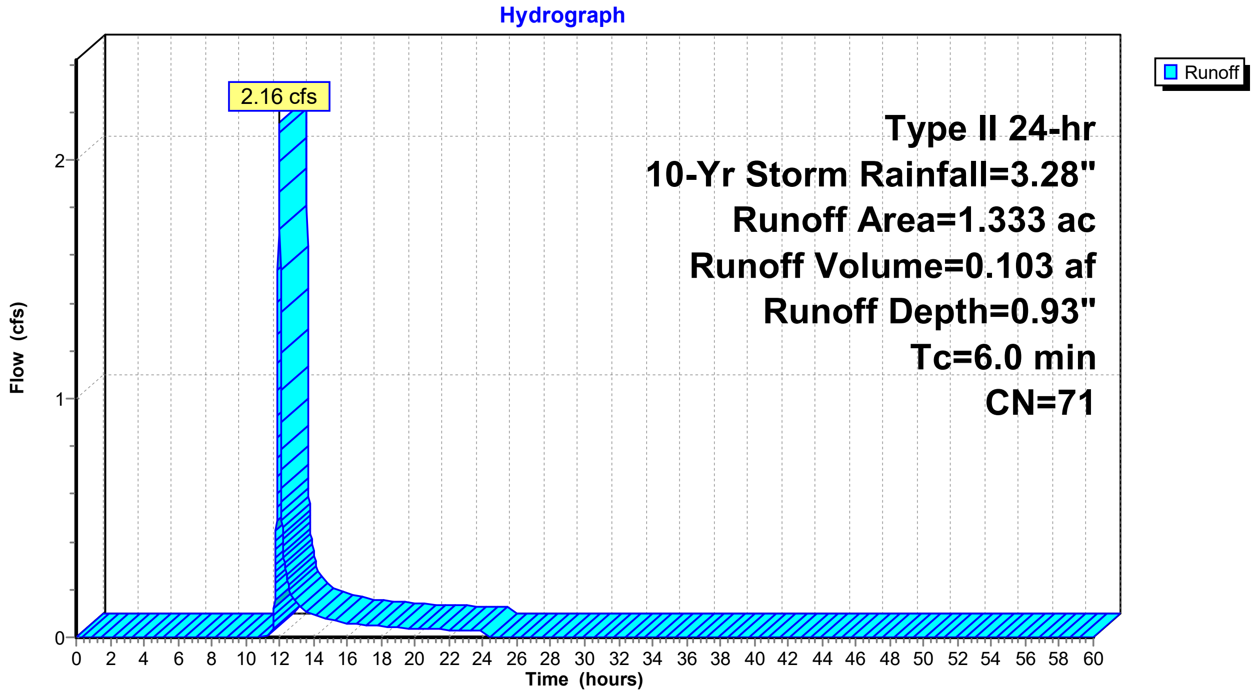
Runoff = 2.16 cfs @ 11.98 hrs, Volume= 0.103 af, Depth= 0.93"
Routed to Reach 1.1bR1 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
0.507	30	Meadow, non-grazed, HSG A
0.819	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
1.333	71	Weighted Average
1.326		99.47% Pervious Area
0.007		0.53% Impervious Area

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

Subcatchment 1.1bS1: North Road - East



Summary for Subcatchment 1.1bS2: North Road - West

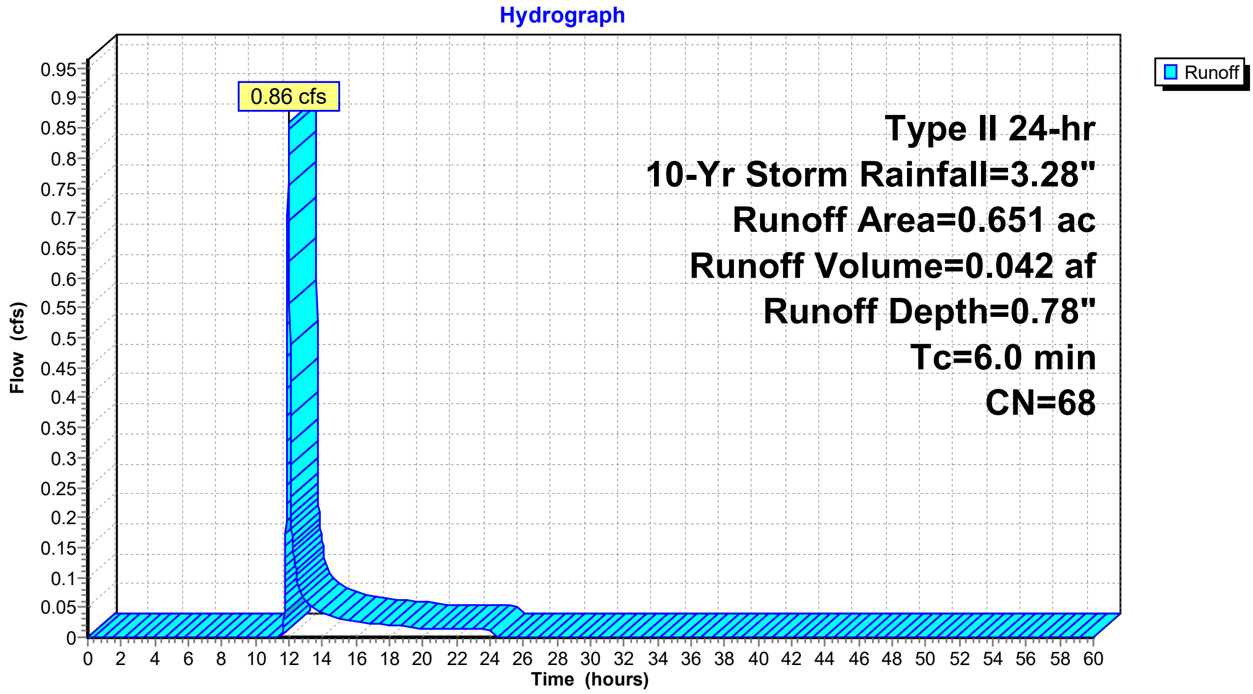
Runoff = 0.86 cfs @ 11.98 hrs, Volume= 0.042 af, Depth= 0.78"
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
0.279	30	Meadow, non-grazed, HSG A
0.365	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
0.651	68	Weighted Average
0.644		98.92% Pervious Area
0.007		1.08% Impervious Area

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

Subcatchment 1.1bS2: North Road - West



Summary for Subcatchment 1.2aS1: Middle Array East

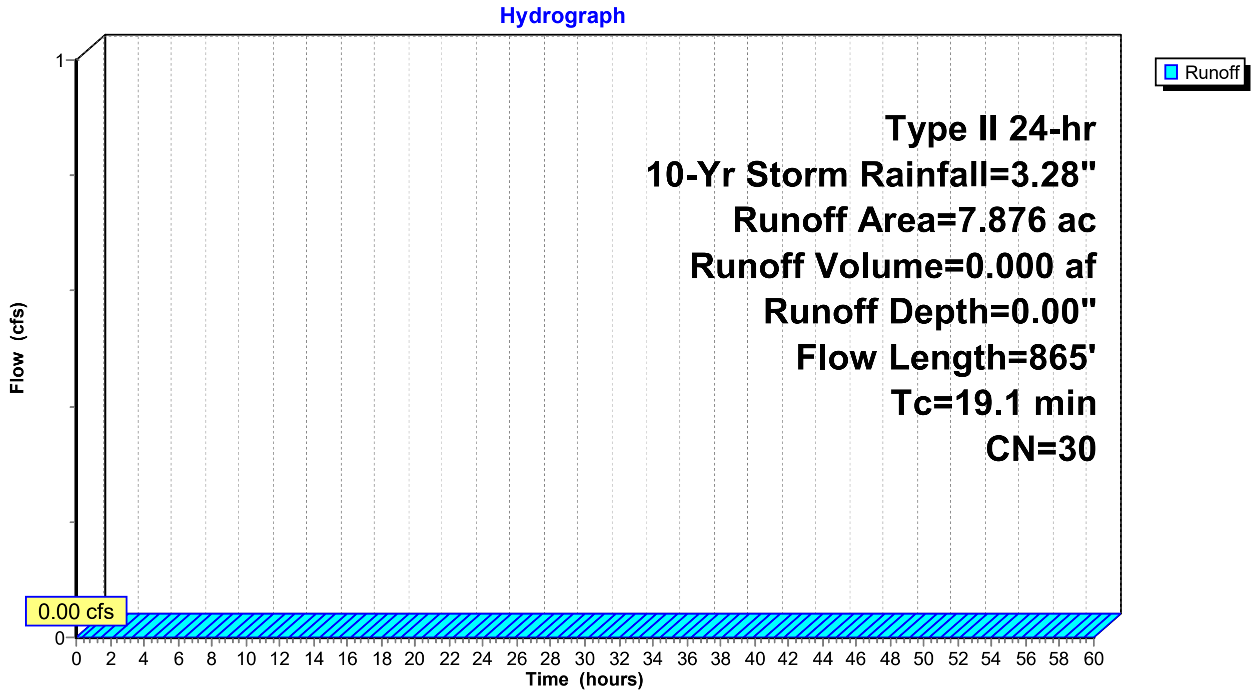
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
7.876	30	Meadow, non-grazed, HSG A
7.876		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0628	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.5	765	0.0459	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.1	865	Total			

Subcatchment 1.2aS1: Middle Array East



Summary for Subcatchment 1.2aS2: Middle Array Center

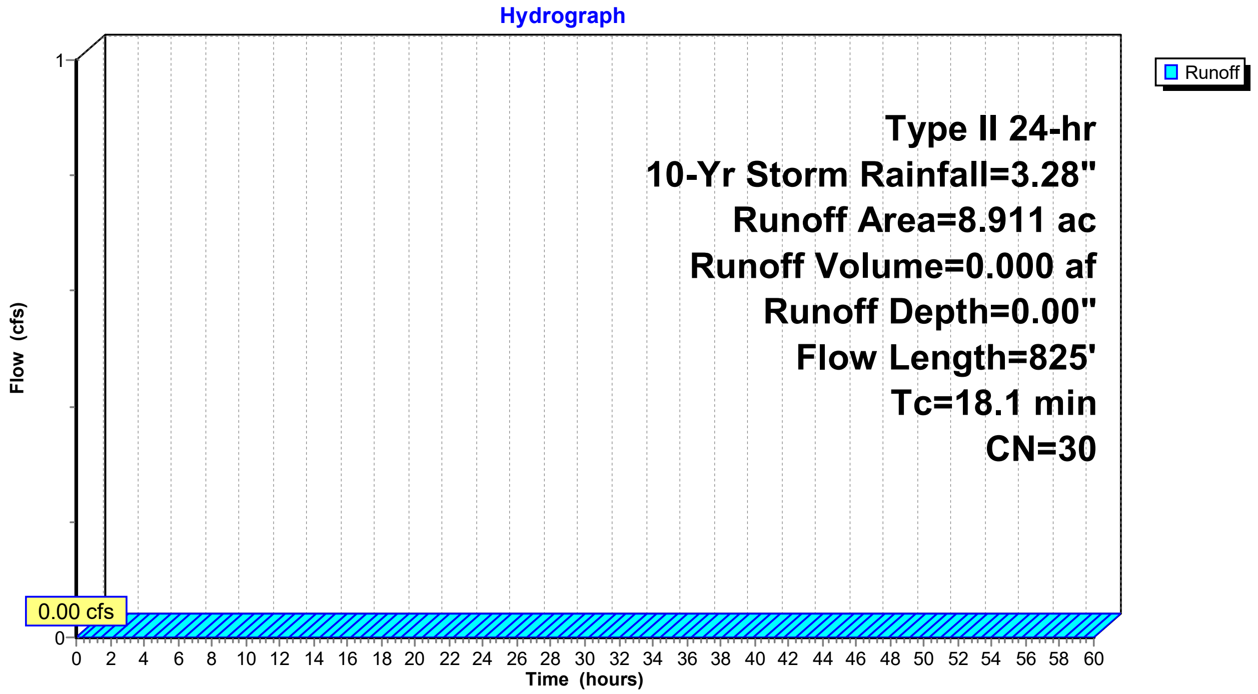
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
8.911	30	Meadow, non-grazed, HSG A
8.911		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0607	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.3	725	0.0559	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.1	825	Total			

Subcatchment 1.2aS2: Middle Array Center



Summary for Subcatchment 1.2aS3: Middle Array West

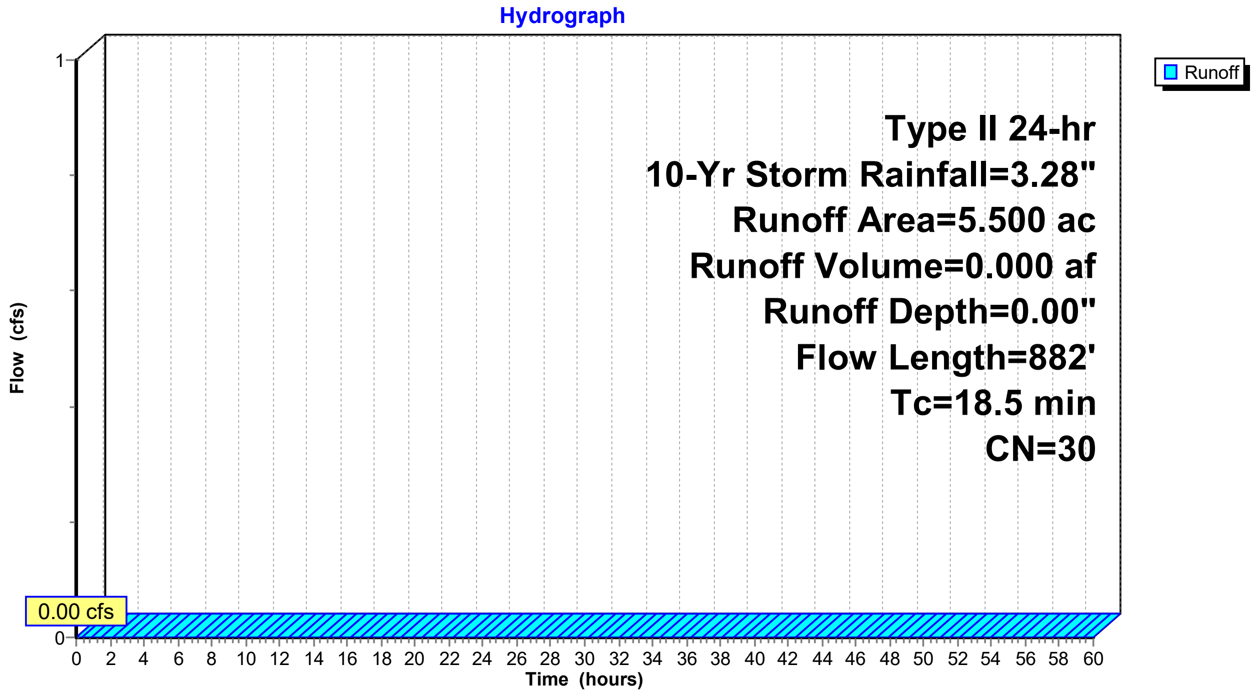
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1.2aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
5.500	30	Meadow, non-grazed, HSG A
5.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.0660	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.1	782	0.0529	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.5	882	Total			

Subcatchment 1.2aS3: Middle Array West



Summary for Subcatchment 1.2bS1: East Road - West Ditch

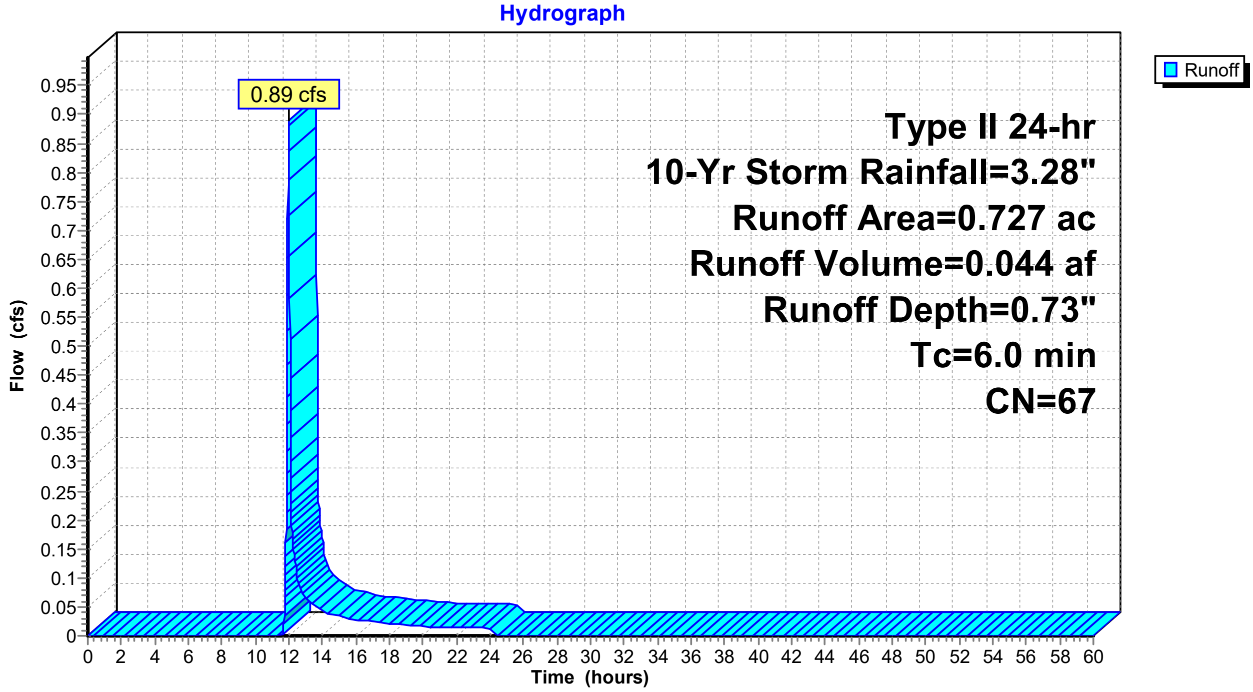
Runoff = 0.89 cfs @ 11.99 hrs, Volume= 0.044 af, Depth= 0.73"
Routed to Reach 1.2bR1 : East Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
0.410	96	Gravel surface, HSG A
0.317	30	Meadow, non-grazed, HSG A
0.727	67	Weighted Average
0.727		100.00% Pervious Area

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

Subcatchment 1.2bS1: East Road - West Ditch



Summary for Subcatchment 1.2bS2: South Road

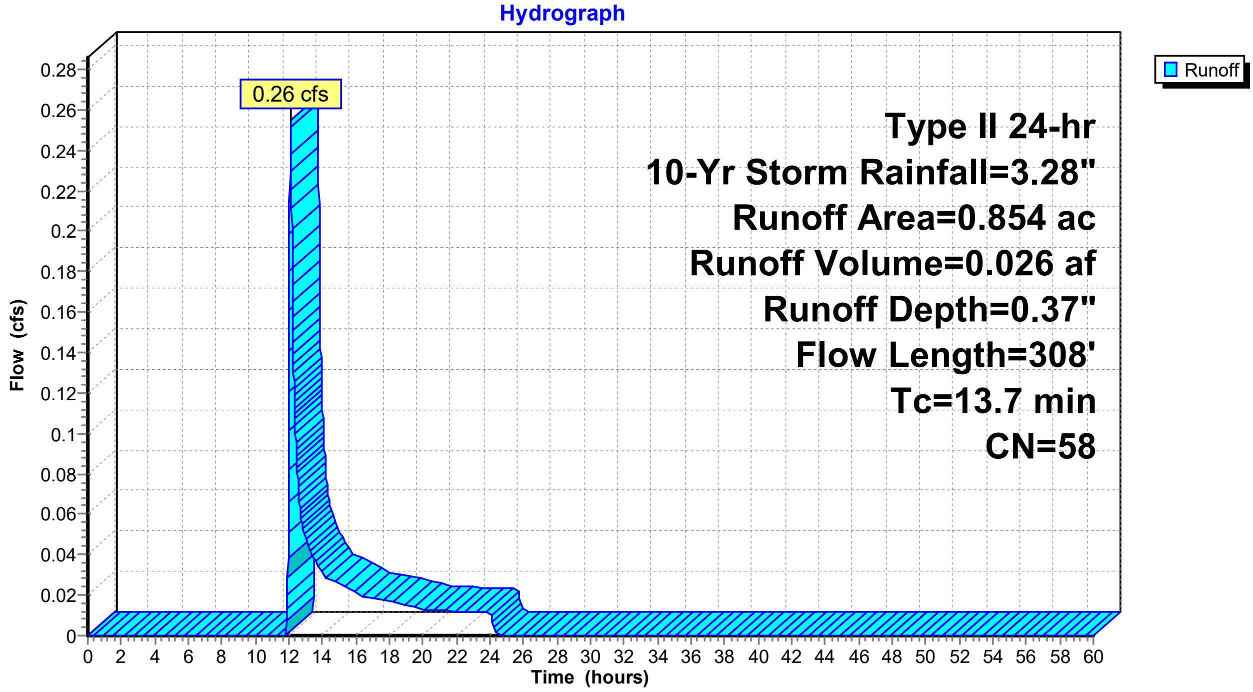
Runoff = 0.26 cfs @ 12.10 hrs, Volume= 0.026 af, Depth= 0.37"
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
	0.498	30	Meadow, non-grazed, HSG A
*	0.352	96	Gravel surface
*	0.004	98	Roofs
	0.854	58	Weighted Average
	0.850		99.53% Pervious Area
	0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0516	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
0.4	25	0.0310	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
5.9	40	0.0429	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.4	208	0.0442	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	308	Total			

Subcatchment 1.2bS2: South Road



Summary for Subcatchment 1.2bS3: South Road

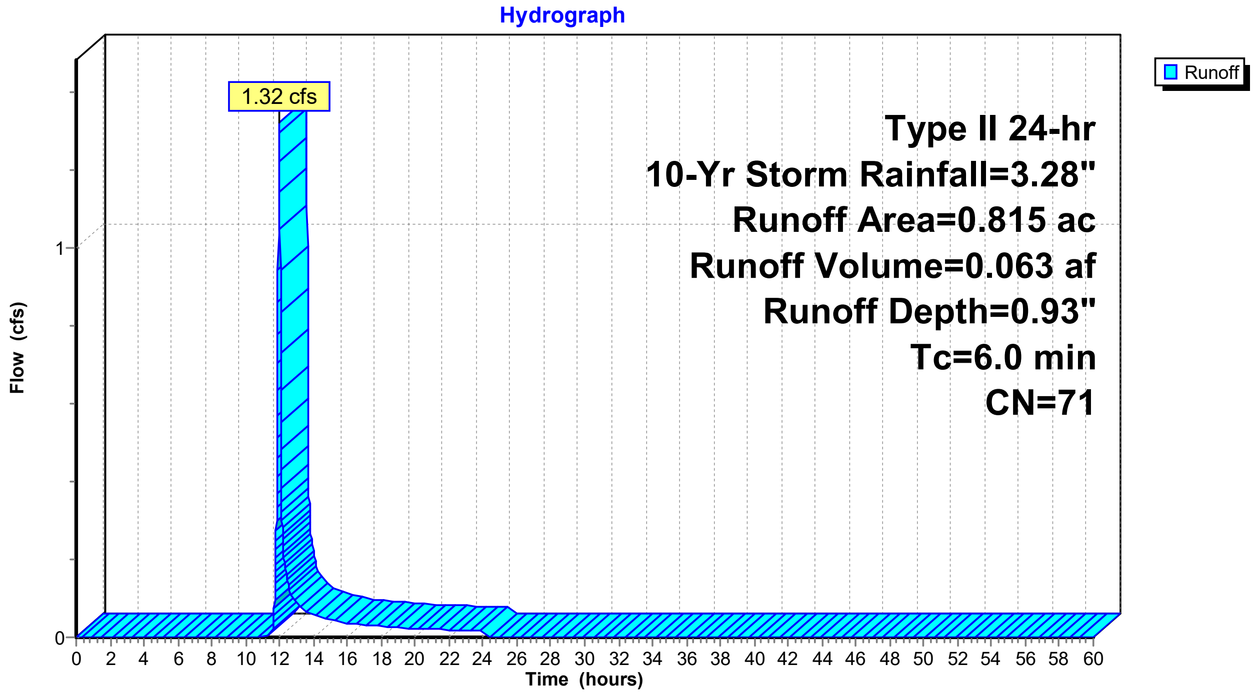
Runoff = 1.32 cfs @ 11.98 hrs, Volume= 0.063 af, Depth= 0.93"
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
	0.313	30	Meadow, non-grazed, HSG A
	0.491	96	Gravel surface, HSG A
*	0.011	98	Roofs
	0.815	71	Weighted Average
	0.804		98.65% Pervious Area
	0.011		1.35% Impervious Area

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

Subcatchment 1.2bS3: South Road



Summary for Subcatchment 1.3aS1: Surface Discharge

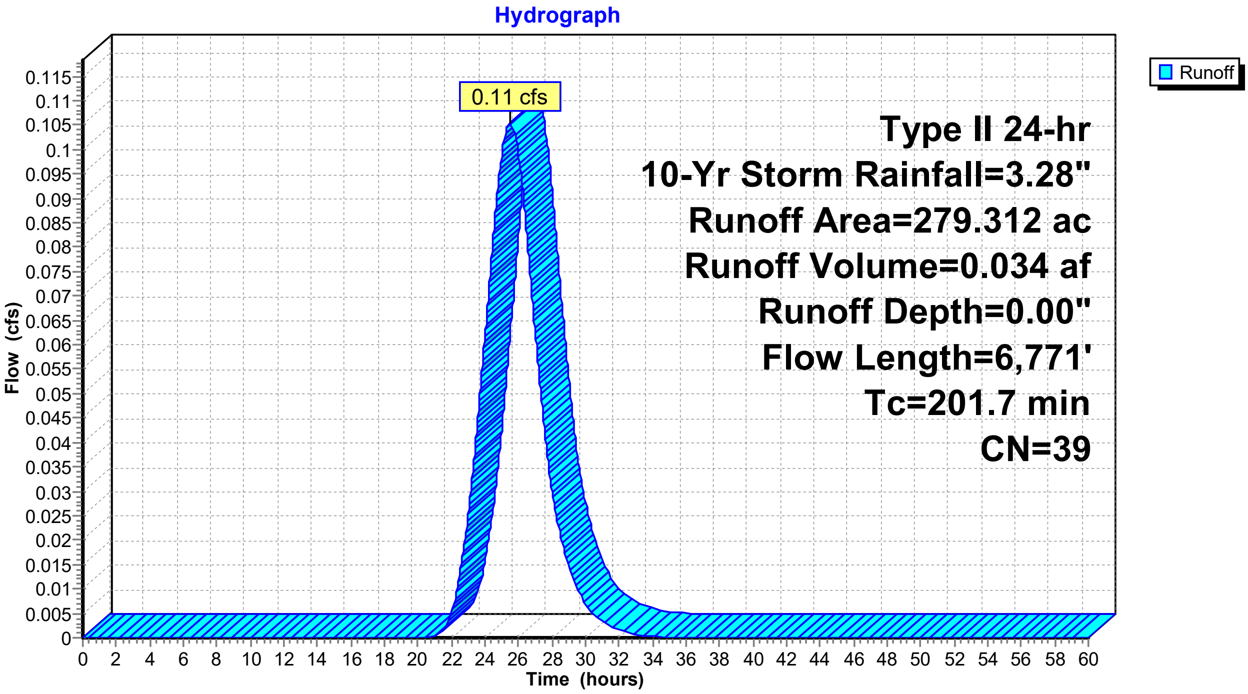
Runoff = 0.11 cfs @ 25.55 hrs, Volume= 0.034 af, Depth= 0.00"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.754	96	Gravel surface
	144.649	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	25.274	71	Meadow, non-grazed, HSG C
	61.692	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	13.623	70	Woods, Good, HSG C
	279.312	39	Weighted Average
	279.312		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	189	0.0157	3.84	76.82	**Channel Flow, Rerouted Stream** Area= 20.0 sf Perim= 32.6' r= 0.61' n= 0.035 Earth, dense weeds
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
201.7	6,771	Total			

Subcatchment 1.3aS1: Surface Discharge



Summary for Subcatchment 1.3bS: Access Rd to Pond 3

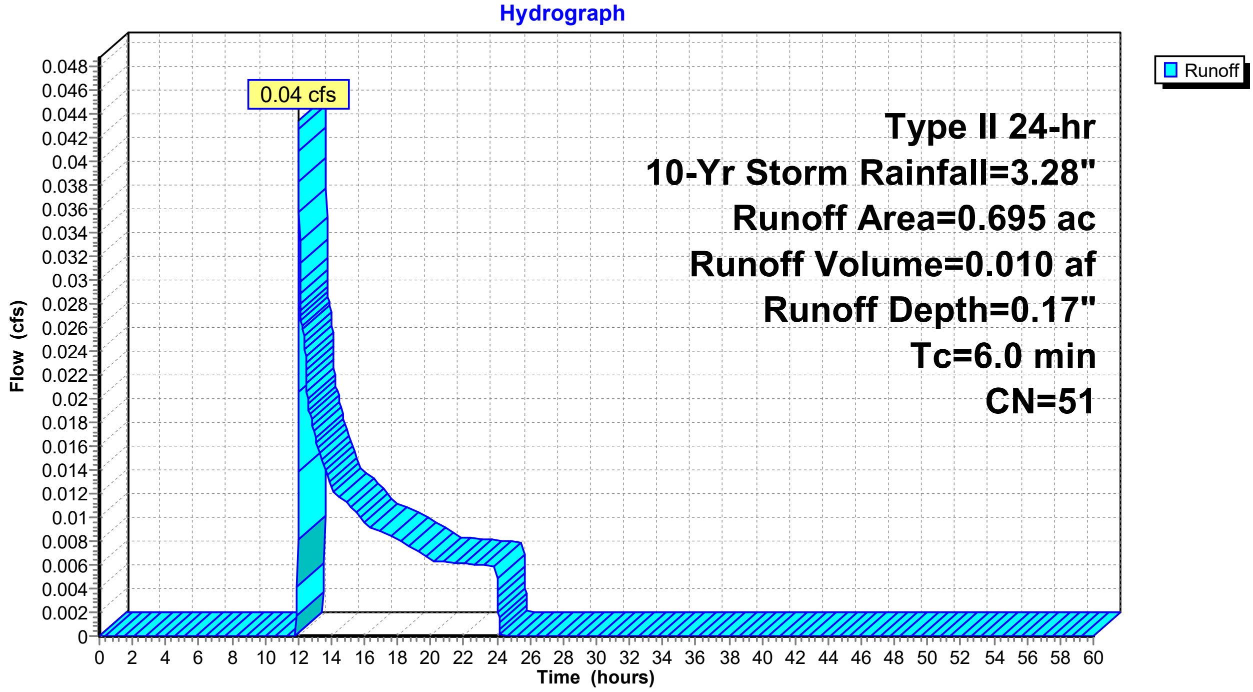
Runoff = 0.04 cfs @ 12.04 hrs, Volume= 0.010 af, Depth= 0.17"
Routed to Pond 1.3P : Pond 3 - Access Rd West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
	0.473	30	Meadow, non-grazed, HSG A
*	0.063	96	Gravel surface, HSG A, Redev
*	0.159	96	Gravel surface, HSG A
	0.695	51	Weighted Average
	0.695		100.00% Pervious Area

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

Subcatchment 1.3bS: Access Rd to Pond 3



Summary for Subcatchment 2S:

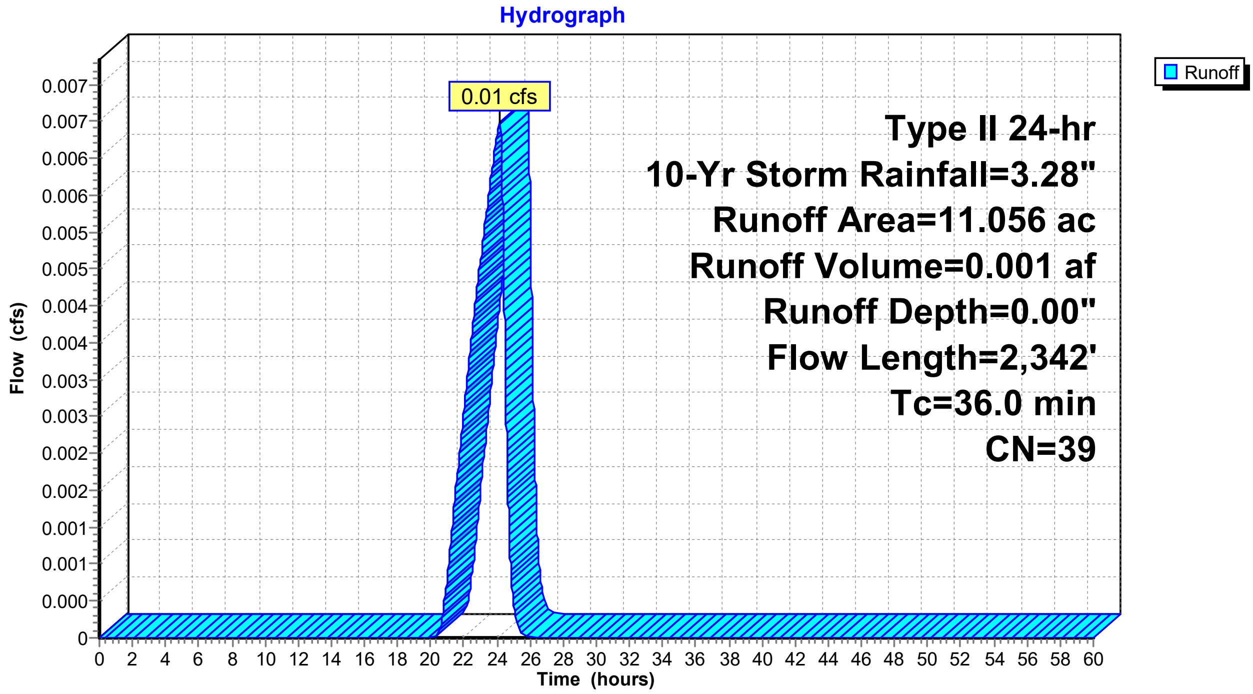
Runoff = 0.01 cfs @ 24.12 hrs, Volume= 0.001 af, Depth= 0.00"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
1.417	96	Gravel surface, HSG A
0.573	39	>75% Grass cover, Good, HSG A
6.530	30	Meadow, non-grazed, HSG A
2.536	30	Woods, Good, HSG A
11.056	39	Weighted Average
11.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0624	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.7	614	0.0535	3.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	1,184	0.0543	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	115	0.0407	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	68	0.1443	1.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	261	0.0118	0.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.0	2,342	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

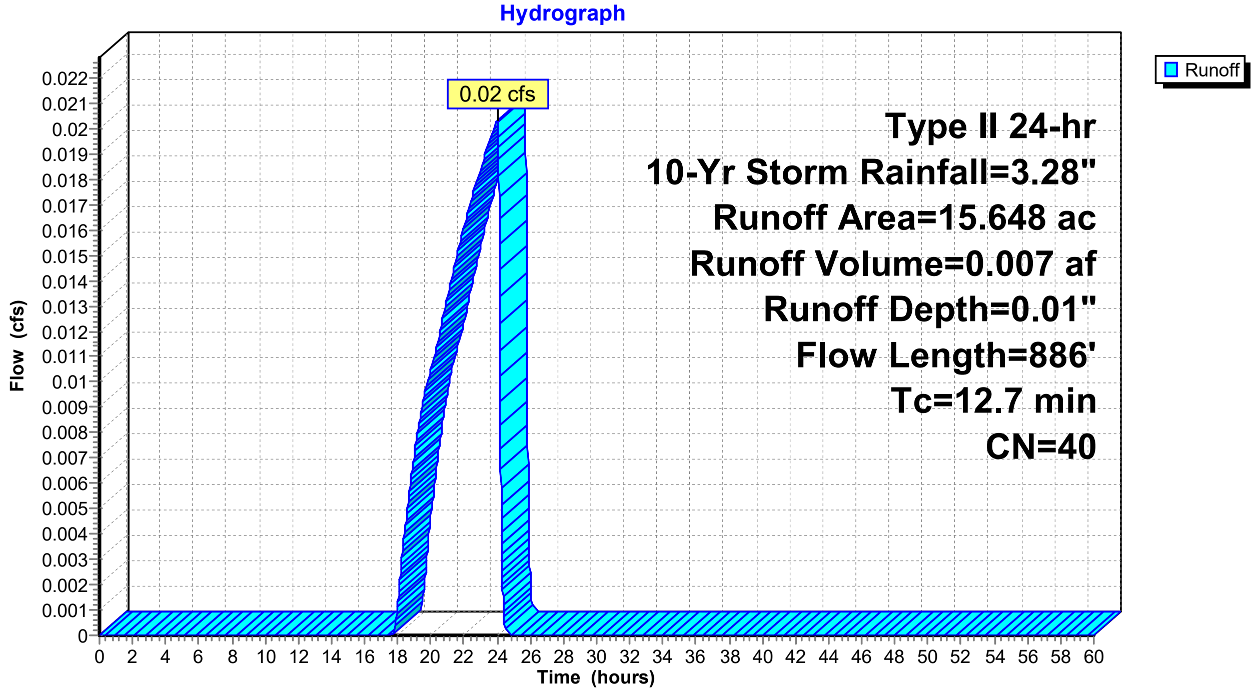
Runoff = 0.02 cfs @ 24.01 hrs, Volume= 0.007 af, Depth= 0.01"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.088	98	Paved Roads & Rooftops
	0.406	39	>75% Grass cover, Good, HSG A
	2.011	61	>75% Grass cover, Good, HSG B
	5.525	30	Meadow, non-grazed, HSG A
	4.276	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	15.648	40	Weighted Average
	15.560		99.44% Pervious Area
	0.088		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	52	0.0937	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.7	886	Total			

Subcatchment 3S:



Summary for Subcatchment 4.1S:

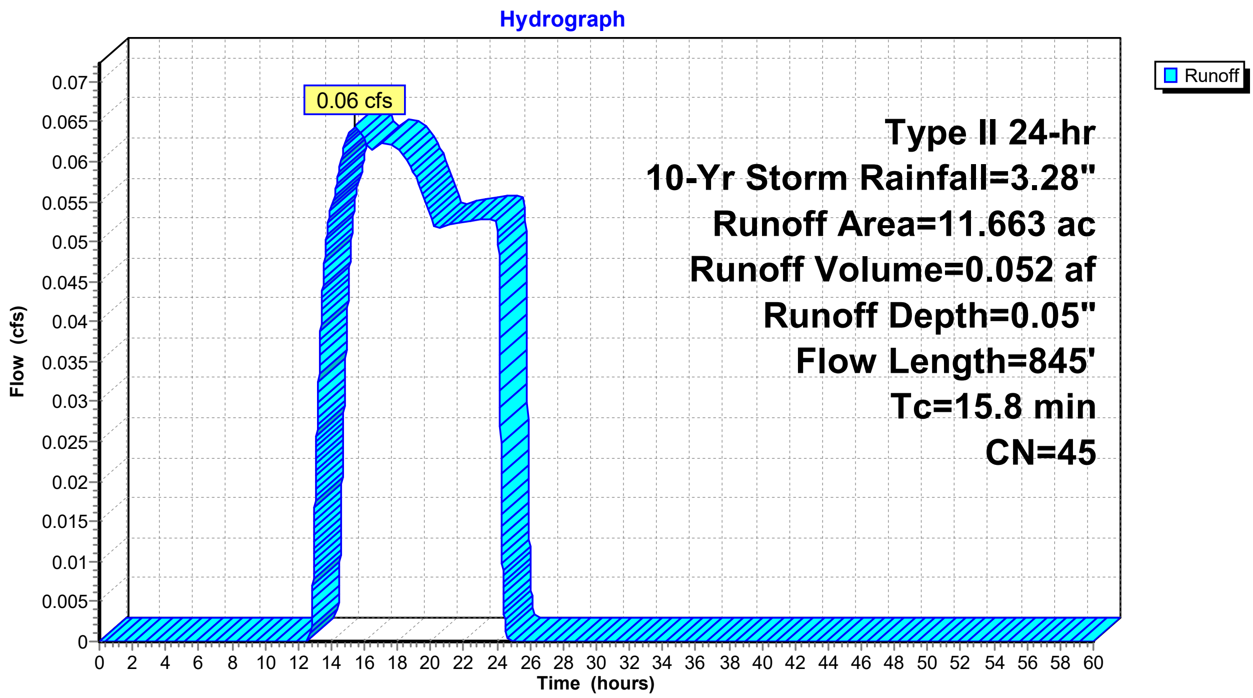
Runoff = 0.06 cfs @ 15.43 hrs, Volume= 0.052 af, Depth= 0.05"
Routed to Reach 4.1R1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.327	98	Paved Roads & Rooftops
*	0.375	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	2.544	30	Meadow, non-grazed, HSG A
	0.560	58	Meadow, non-grazed, HSG B
	3.605	30	Woods, Good, HSG A
*	4.087	55	Woods, Good, HSG B
	11.663	45	Weighted Average
	11.336		97.20% Pervious Area
	0.327		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0430	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
2.6	360	0.1077	2.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	385	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.8	845	Total			

Subcatchment 4.1S:



Summary for Subcatchment 4.2aS:

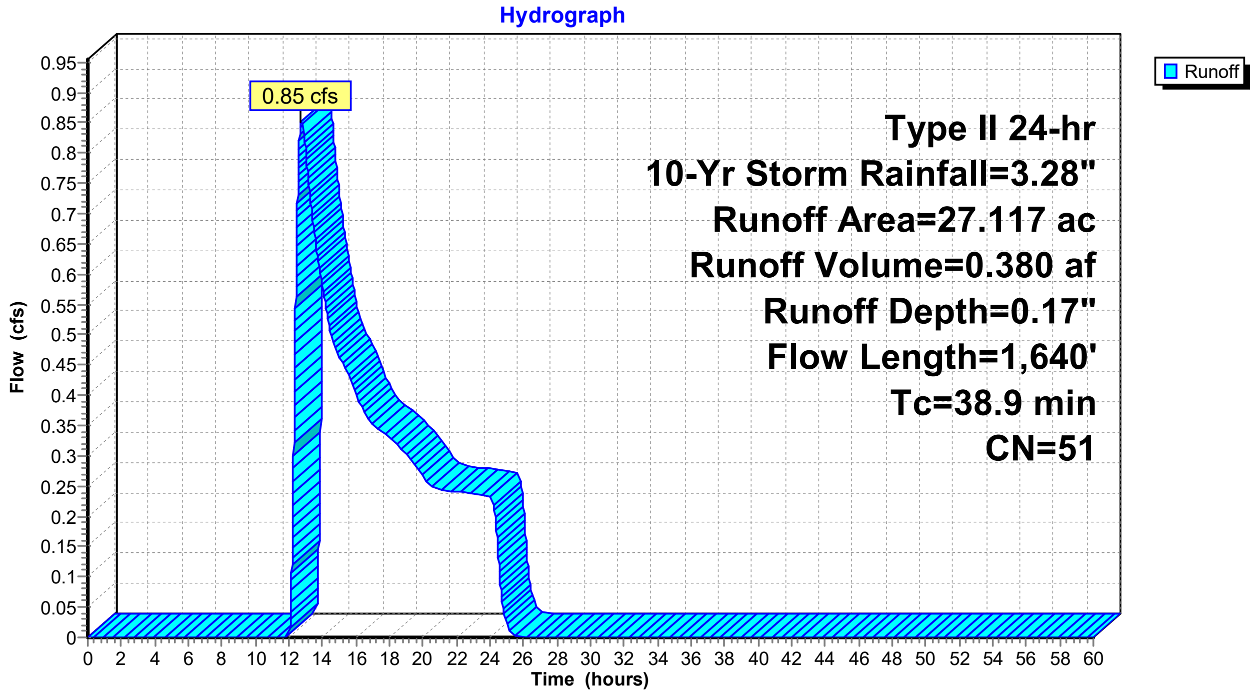
Runoff = 0.85 cfs @ 12.75 hrs, Volume= 0.380 af, Depth= 0.17"
Routed to Pond 4.2C : 18" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	0.238	96	Gravel surface
	4.086	30	Meadow, non-grazed, HSG A
	0.384	58	Meadow, non-grazed, HSG B
	0.977	30	Woods, Good, HSG A
	21.432	55	Woods, Good, HSG B
	27.117	51	Weighted Average
	27.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	662	0.0144	0.84		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	1,640	Total			

Subcatchment 4.2aS:



Summary for Subcatchment 4.2bS:

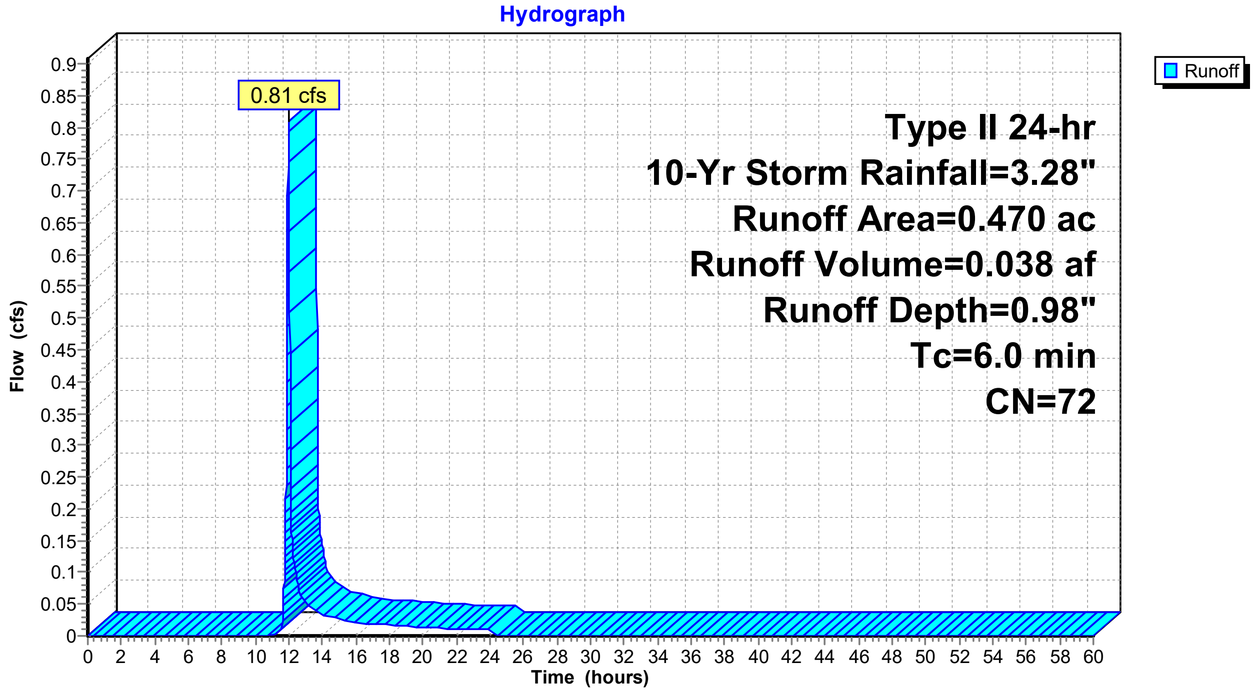
Runoff = 0.81 cfs @ 11.98 hrs, Volume= 0.038 af, Depth= 0.98"
Routed to Reach 4.2bR : Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
0.296	96	Gravel surface, HSG A
0.174	30	Meadow, non-grazed, HSG A
0.470	72	Weighted Average
0.470		100.00% Pervious Area

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

Subcatchment 4.2bS:



Summary for Subcatchment 4.3S:

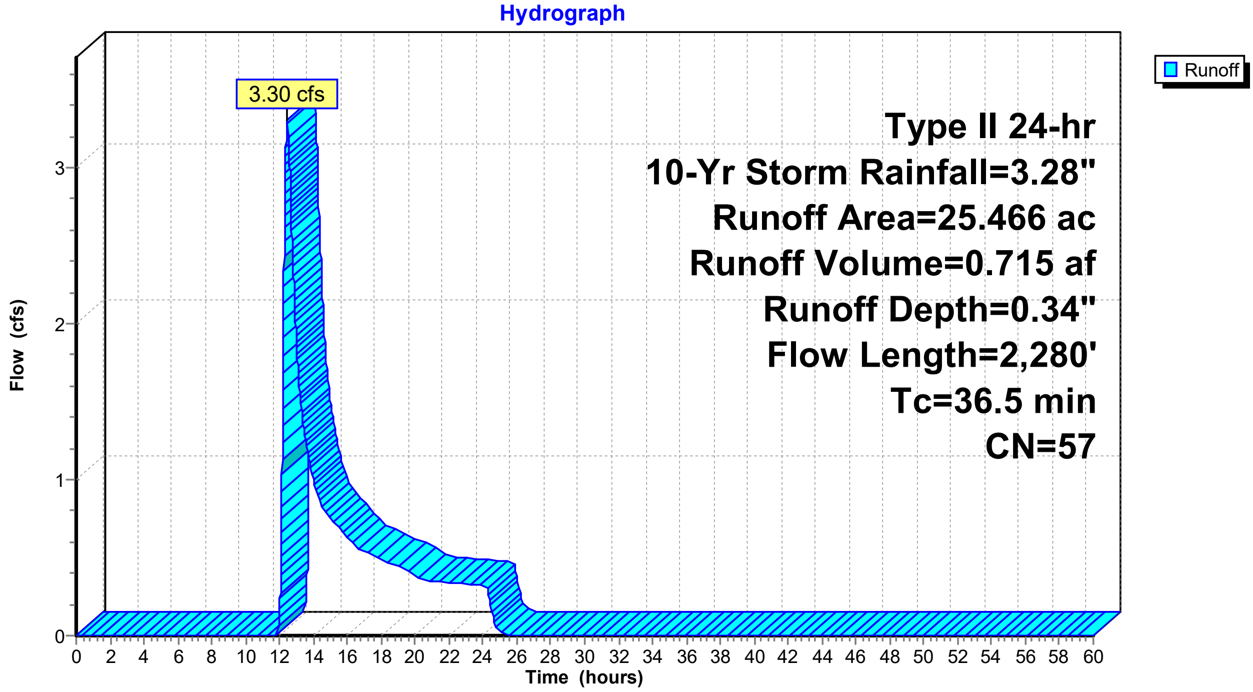
Runoff = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af, Depth= 0.34"
Routed to Pond 4.3C : 24" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	1.293	98	Paved Roads & Rooftops
	1.783	58	Meadow, non-grazed, HSG B
	22.390	55	Woods, Good, HSG B
	25.466	57	Weighted Average
	24.173		94.92% Pervious Area
	1.293		5.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0634	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
17.8	1,368	0.0656	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	38	0.3960	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	774	0.0281	4.70	109.09	**Channel Flow,** Area= 23.2 sf Perim= 43.2' r= 0.54' n= 0.035
36.5	2,280	Total			

Subcatchment 4.3S:



Summary for Subcatchment 5S:

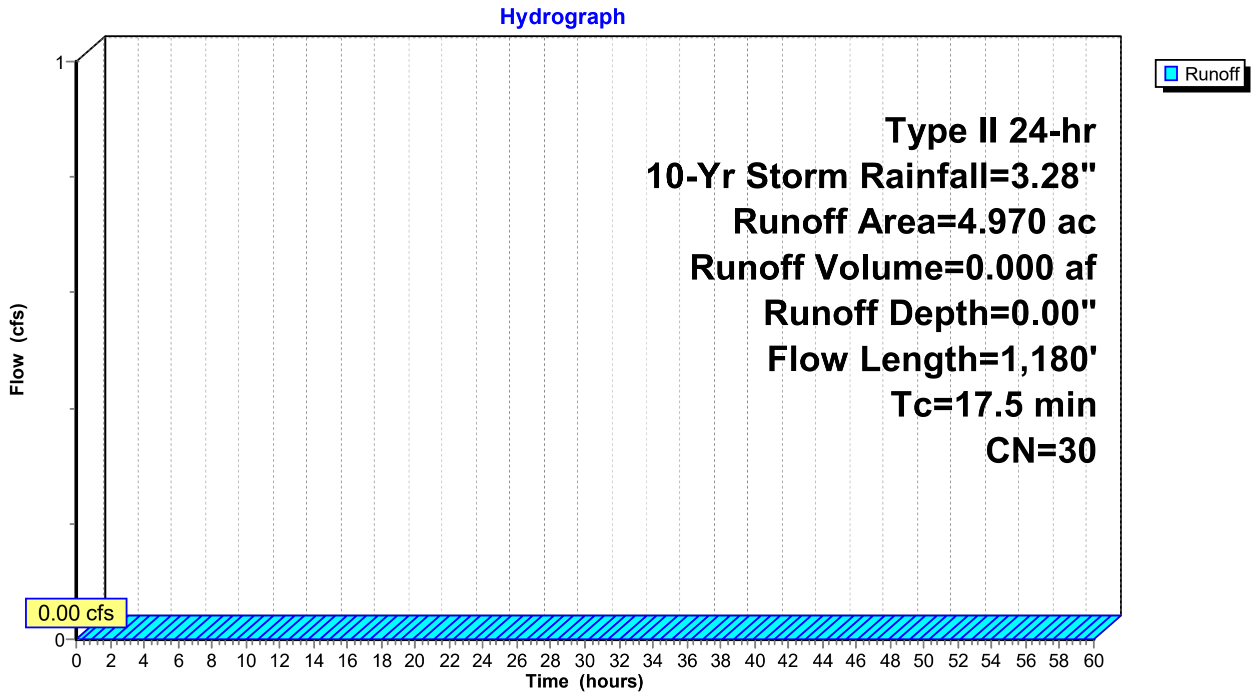
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

Area (ac)	CN	Description
4.139	30	Meadow, non-grazed, HSG A
0.831	30	Woods, Good, HSG A
4.970	30	Weighted Average
4.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0675	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
8.5	801	0.0508	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	217	0.1515	2.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	62	0.0697	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,180	Total			

Subcatchment 5S:



Summary for Subcatchment 6S:

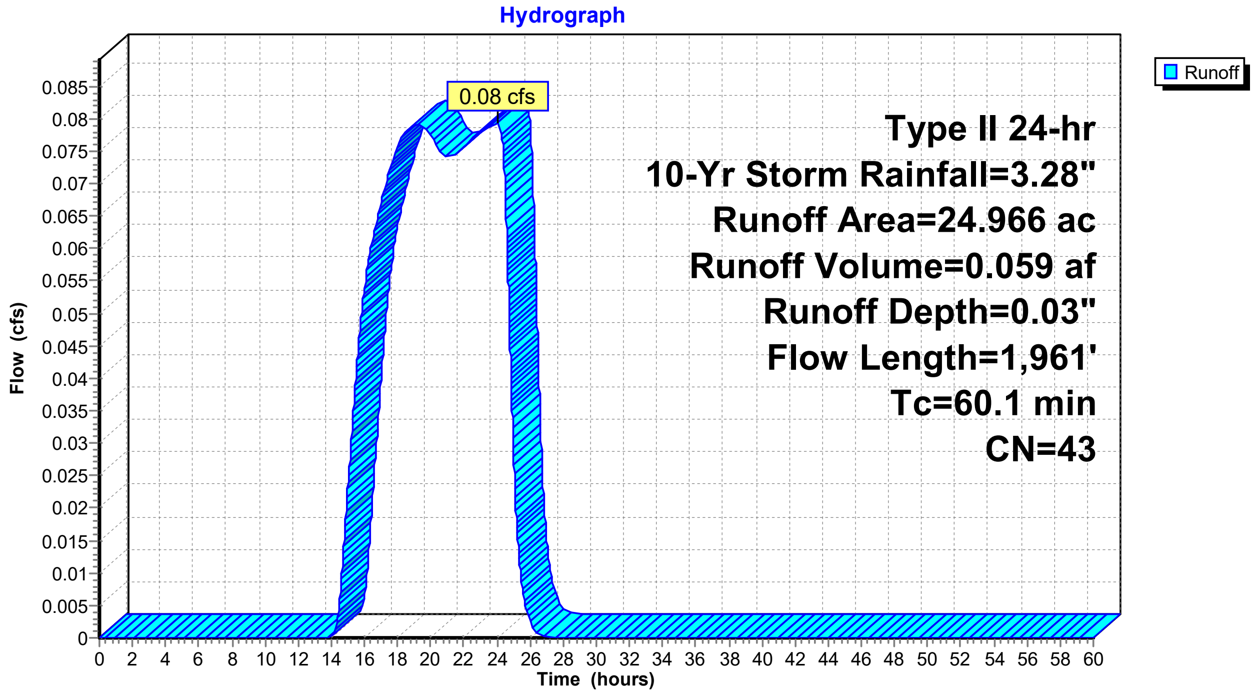
Runoff = 0.08 cfs @ 24.10 hrs, Volume= 0.059 af, Depth= 0.03"
Routed to Link SP6 : Study Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Storm Rainfall=3.28"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
	0.466	96	Gravel surface, HSG A
	2.545	61	>75% Grass cover, Good, HSG B
	7.511	30	Meadow, non-grazed, HSG A
	0.788	58	Meadow, non-grazed, HSG B
	7.940	30	Woods, Good, HSG A
	4.266	55	Woods, Good, HSG B
	24.966	43	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Subcatchment 6S:



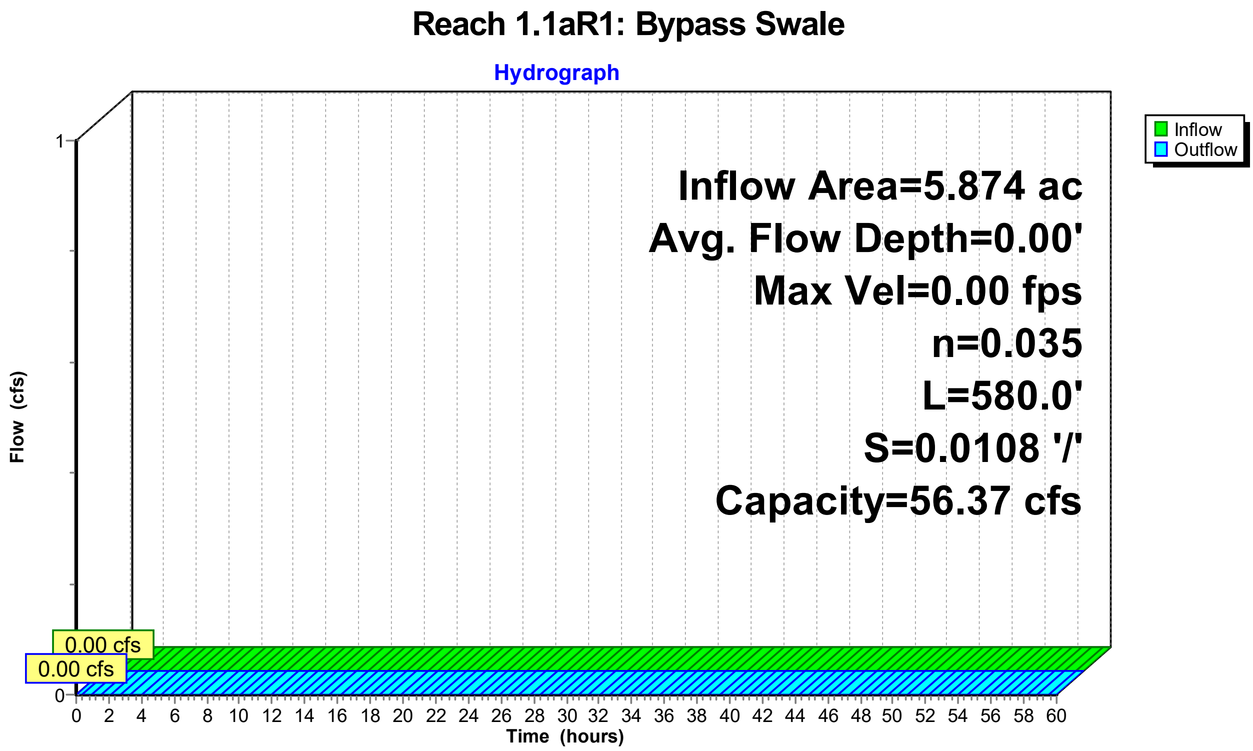
Summary for Reach 1.1aR1: Bypass Swale

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC1 : TS1 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.37 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.0' Slope= 0.0108 '/'
Inlet Invert= 1,493.84', Outlet Invert= 1,487.56'



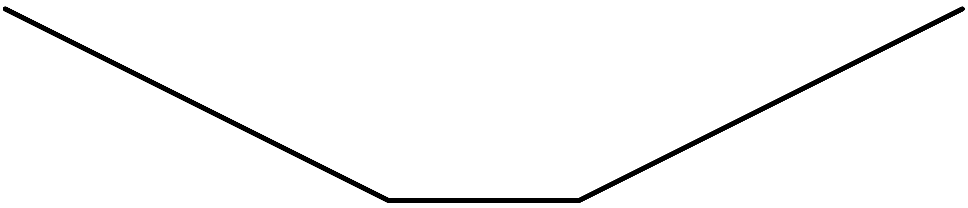
Summary for Reach 1.1aR2: Bypass Swale

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC2 : TS2 Culvert

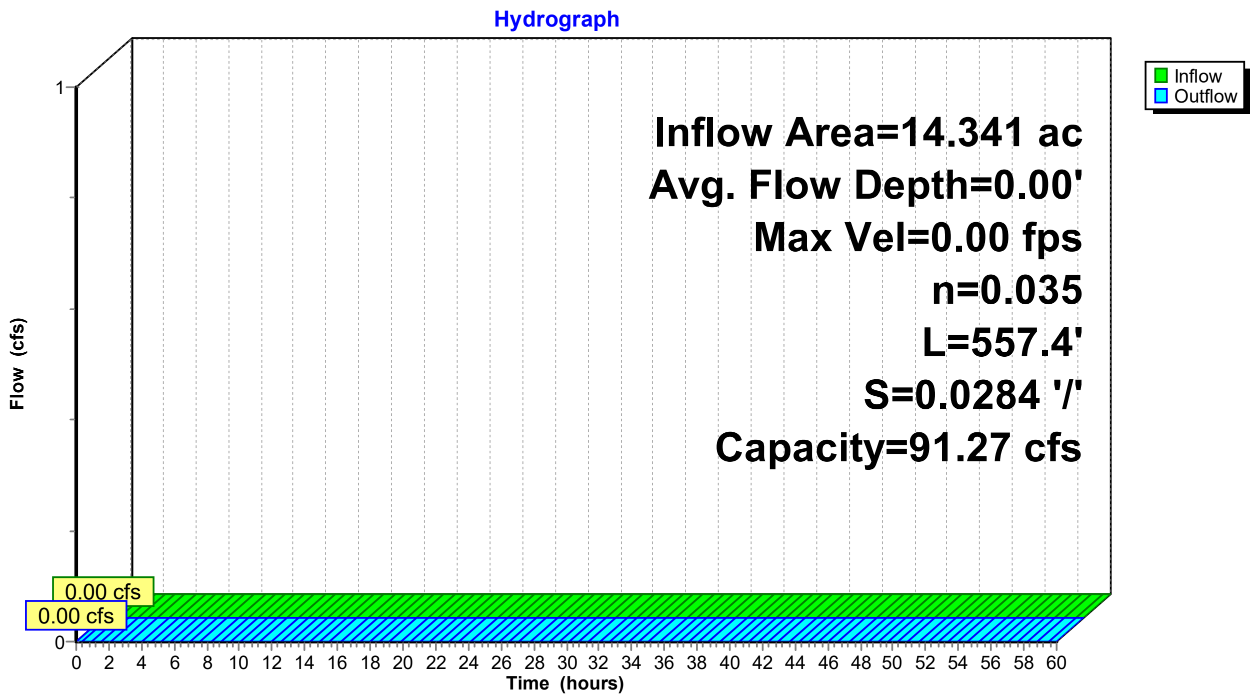
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 91.27 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.4' Slope= 0.0284 '/'
Inlet Invert= 1,486.80', Outlet Invert= 1,470.98'



Reach 1.1aR2: Bypass Swale



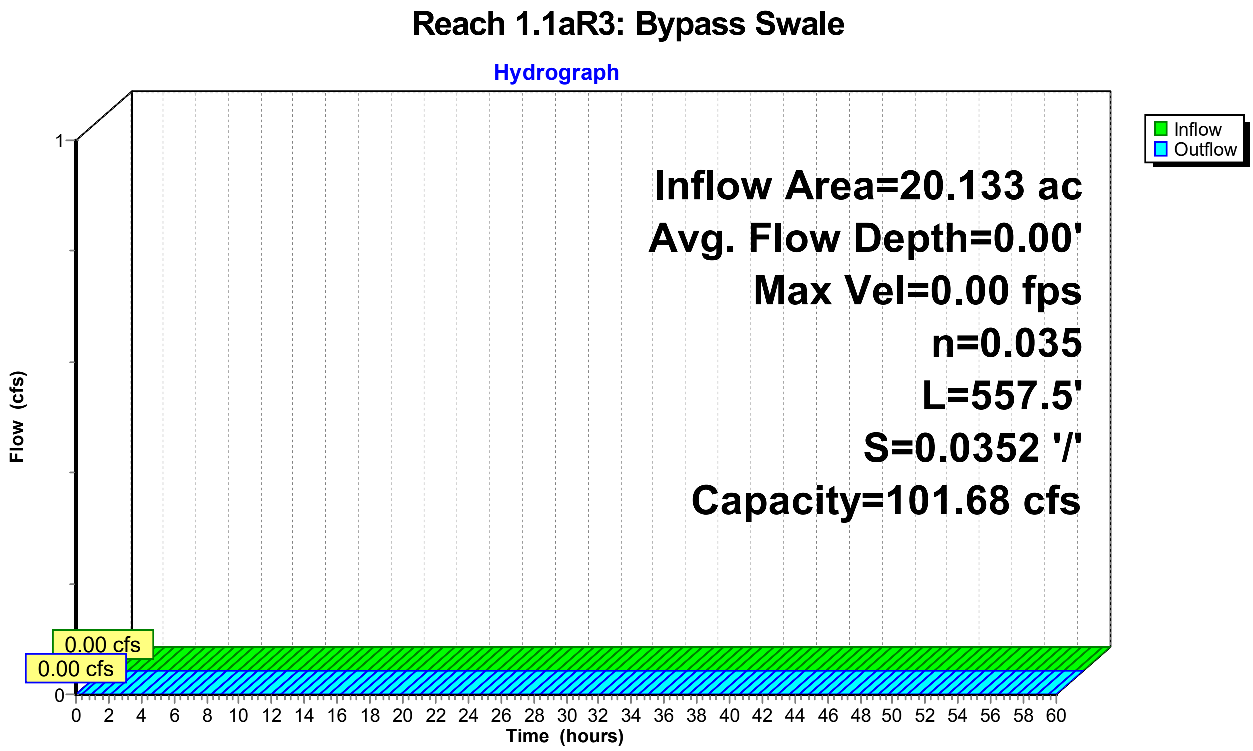
Summary for Reach 1.1aR3: Bypass Swale

Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aC3 : TS3 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.68 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.5' Slope= 0.0352 '/'
Inlet Invert= 1,469.57', Outlet Invert= 1,449.93'



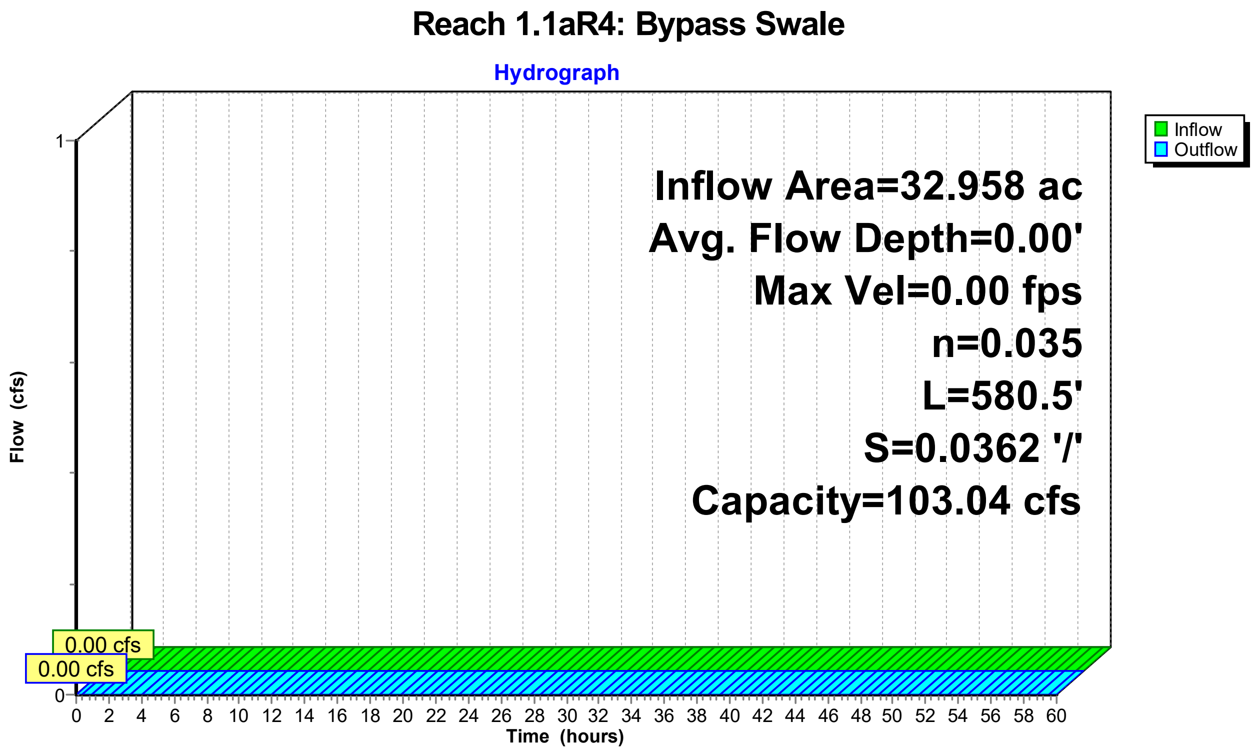
Summary for Reach 1.1aR4: Bypass Swale

Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.1aP : North Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 103.04 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.5' Slope= 0.0362 '/'
Inlet Invert= 1,447.64', Outlet Invert= 1,426.64'



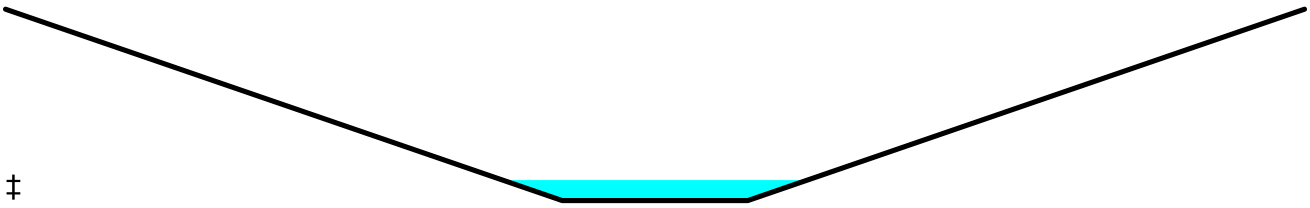
Summary for Reach 1.1bR1: North Road Conveyance Swale

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 2.16 cfs @ 11.98 hrs, Volume= 0.103 af
Outflow = 1.13 cfs @ 12.06 hrs, Volume= 0.103 af, Atten= 48%, Lag= 4.9 min
Routed to Pond 1.1bC1 : TS4 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.01 fps, Min. Travel Time= 14.4 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 42.9 min

Peak Storage= 977 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 3.28'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 111.65 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,733.0' Slope= 0.0240 '/'
Inlet Invert= 1,491.12', Outlet Invert= 1,449.50'



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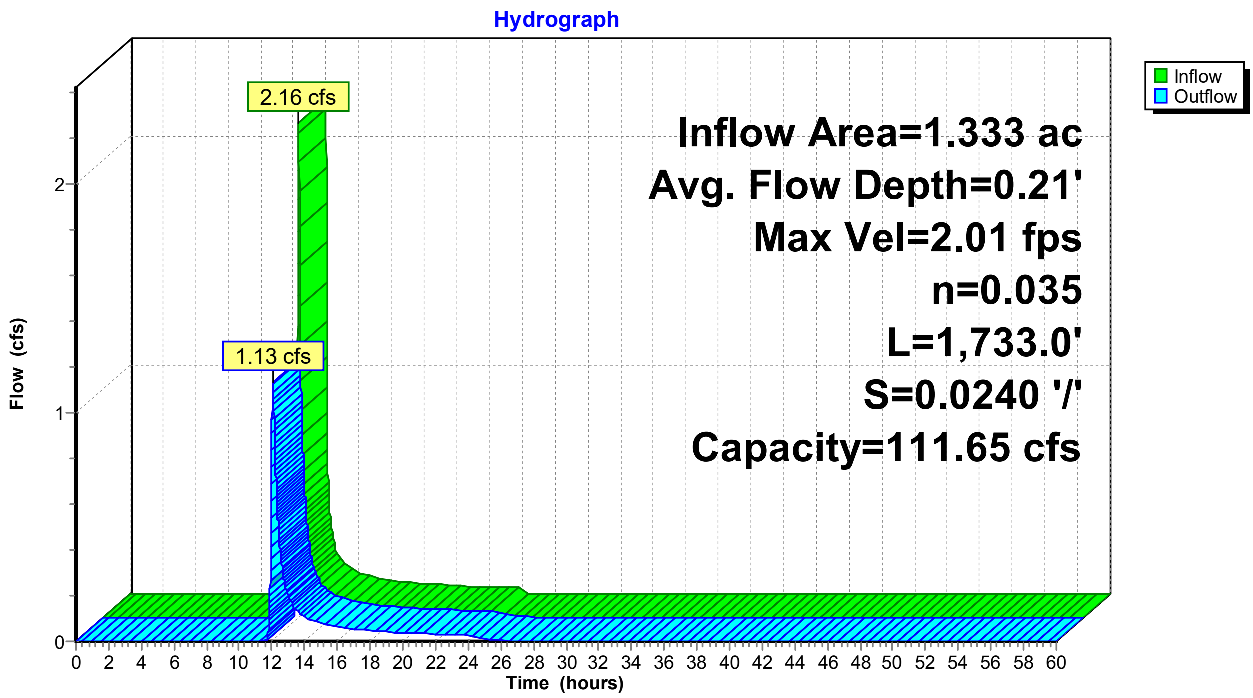


Summary for Reach 1.1bR2: North Road Conveyance Swale

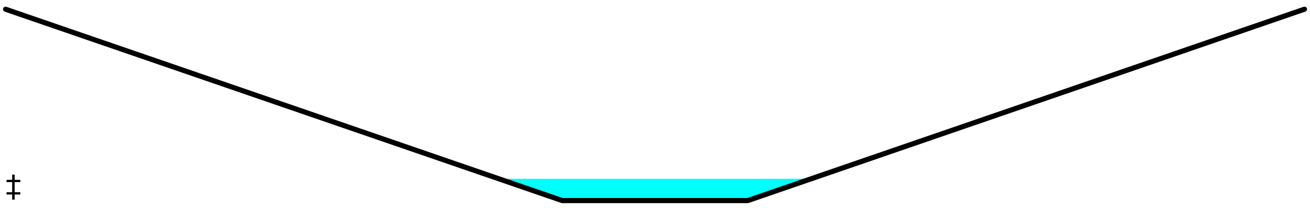
Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.88" for 10-Yr Storm event
Inflow = 1.78 cfs @ 12.02 hrs, Volume= 0.145 af
Outflow = 1.61 cfs @ 12.06 hrs, Volume= 0.145 af, Atten= 10%, Lag= 2.7 min
Routed to Pond 1.1bP1 : Dry Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.62 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 11.3 min

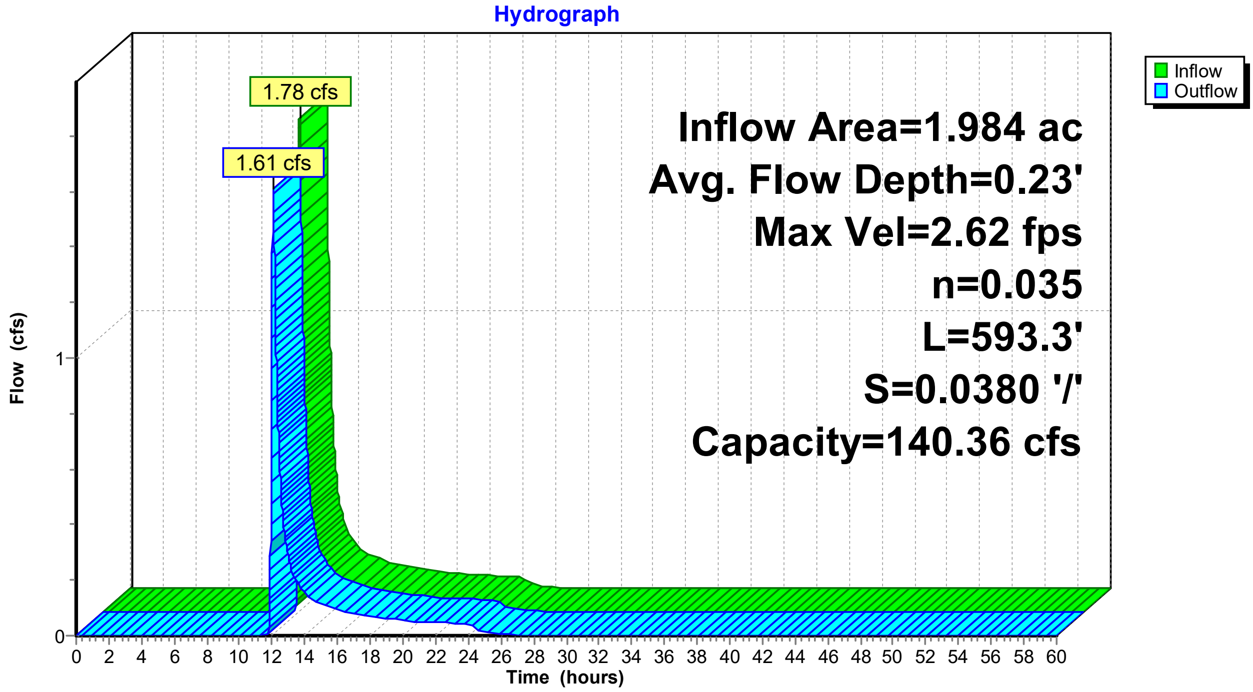
Peak Storage= 364 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.23' , Surface Width= 3.37'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 140.36 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 593.3' Slope= 0.0380 '/'
Inlet Invert= 1,447.27', Outlet Invert= 1,424.75'

‡



Reach 1.1bR2: North Road Conveyance Swale



Summary for Reach 1.2aR1: Bypass Swale

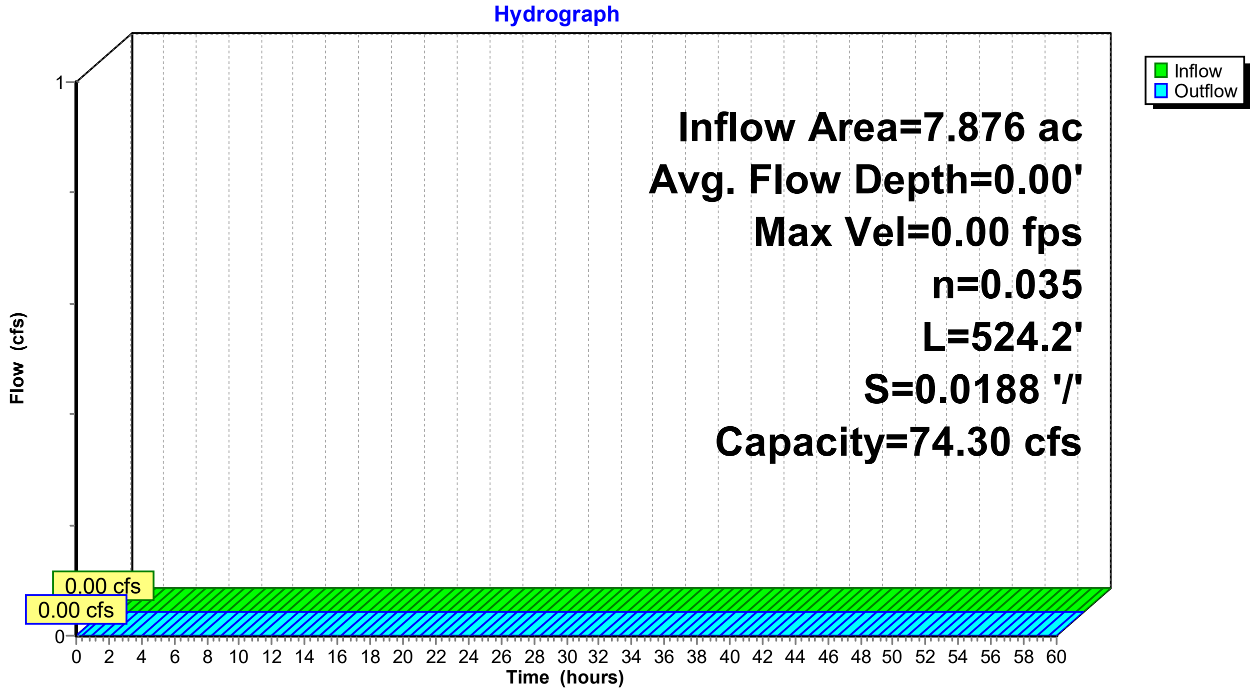
Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC1 : TS 7 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 74.30 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 524.2' Slope= 0.0188 '/'
Inlet Invert= 1,454.08', Outlet Invert= 1,444.22'

Reach 1.2aR1: Bypass Swale



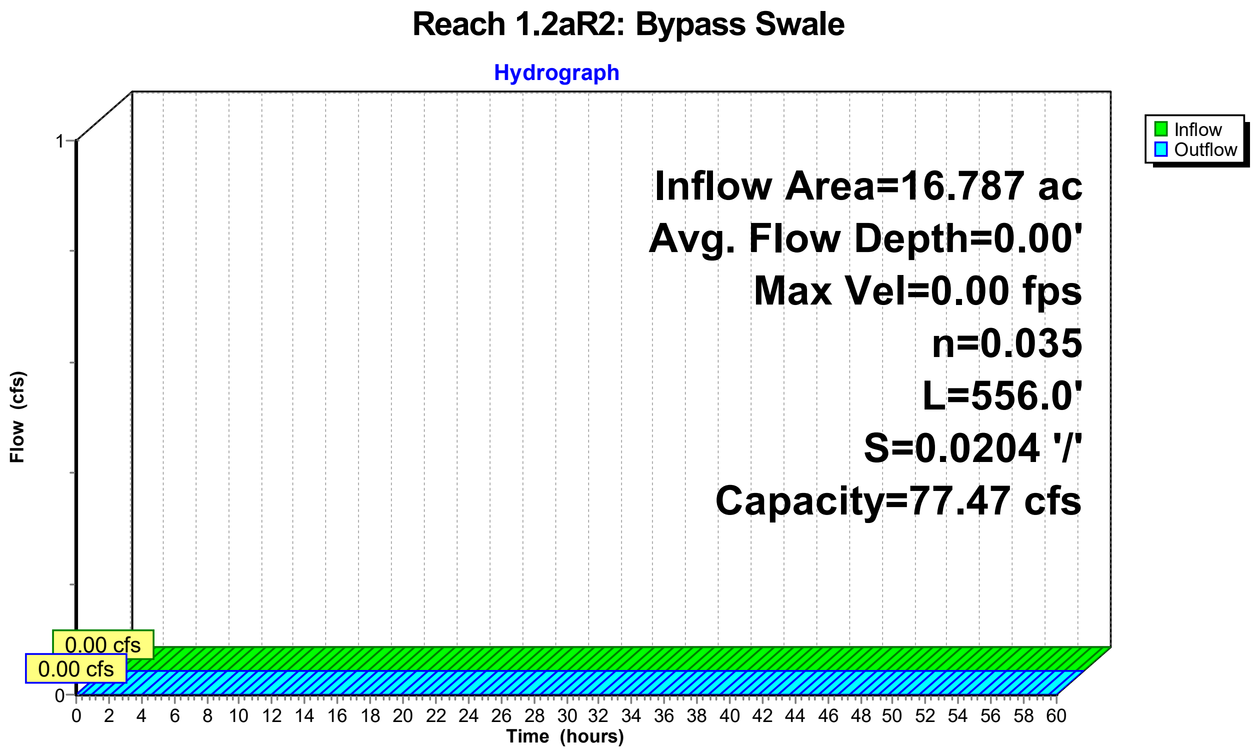
Summary for Reach 1.2aR2: Bypass Swale

Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aC2 : TS8 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 77.47 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 556.0' Slope= 0.0204 '/'
Inlet Invert= 1,443.21', Outlet Invert= 1,431.84'



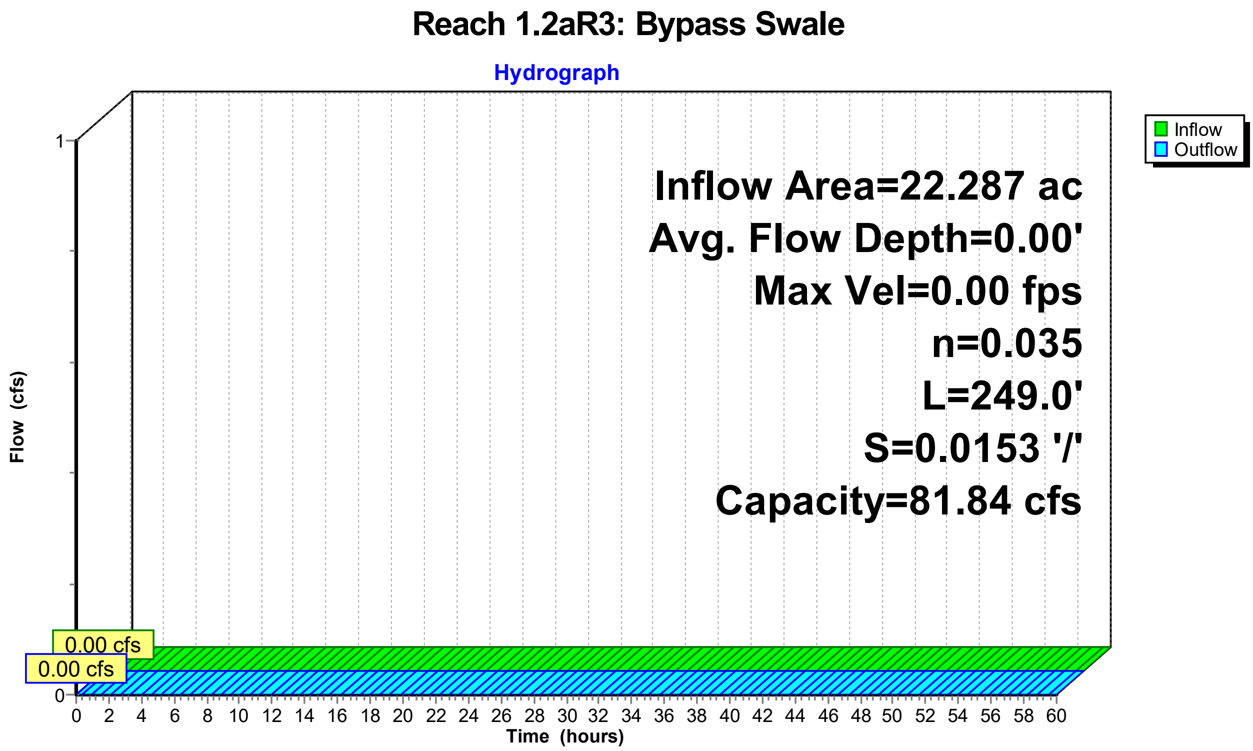
Summary for Reach 1.2aR3: Bypass Swale

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 1.2aP : South Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 81.84 cfs

3.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 11.00'
Length= 249.0' Slope= 0.0153 '/'
Inlet Invert= 1,431.11', Outlet Invert= 1,427.29'



Summary for Reach 1.2bR1: East Road Conveyance Swale

Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.73" for 10-Yr Storm event
Inflow = 0.89 cfs @ 11.99 hrs, Volume= 0.044 af
Outflow = 0.69 cfs @ 12.04 hrs, Volume= 0.044 af, Atten= 23%, Lag= 3.0 min
Routed to Pond 1.2bC1 : East Road Culvert

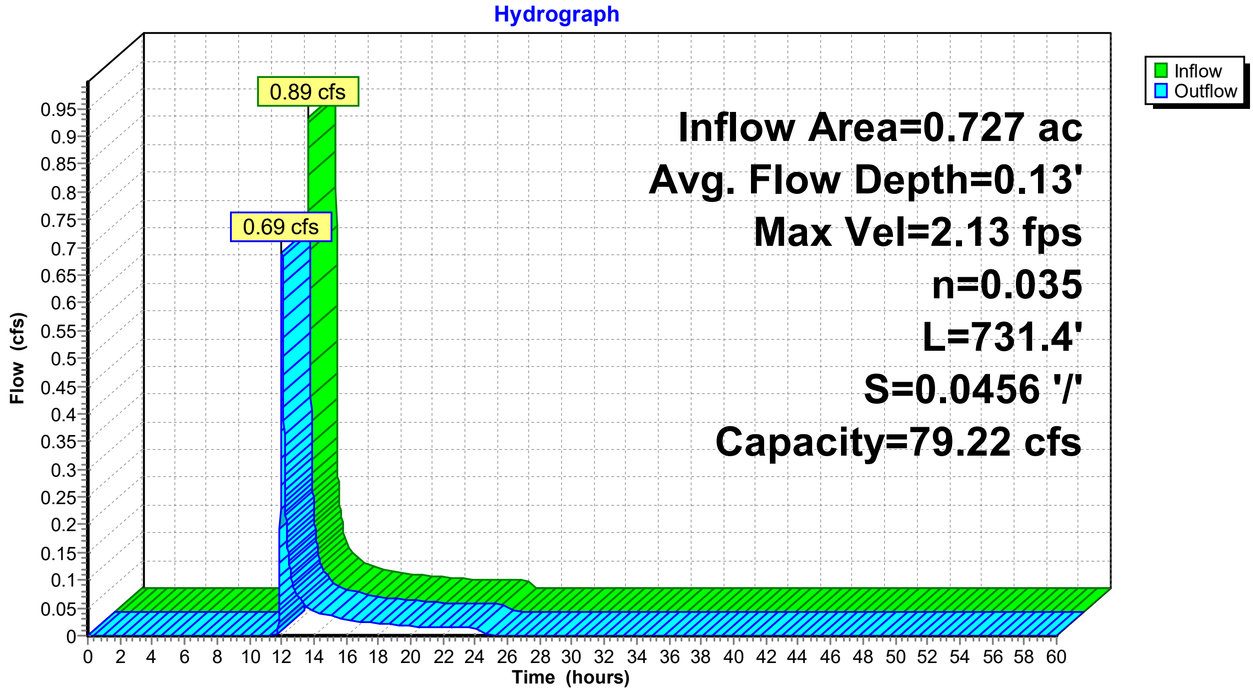
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.13 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 18.0 min

Peak Storage= 237 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 2.81'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 79.22 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 731.4' Slope= 0.0456 '/'
Inlet Invert= 1,489.53', Outlet Invert= 1,456.20'

‡

Reach 1.2bR1: East Road Conveyance Swale



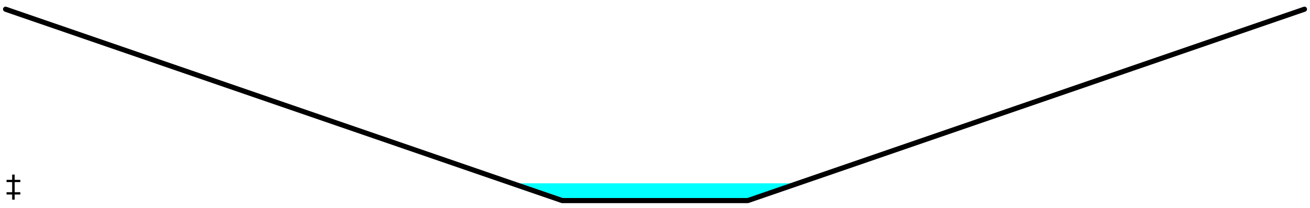
Summary for Reach 1.2bR2: South Road Conveyance Swale

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.54" for 10-Yr Storm event
Inflow = 0.89 cfs @ 12.05 hrs, Volume= 0.071 af
Outflow = 0.70 cfs @ 12.13 hrs, Volume= 0.071 af, Atten= 22%, Lag= 4.6 min
Routed to Pond 1.2bC2 : TS6 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.55 fps, Min. Travel Time= 6.5 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 17.1 min

Peak Storage= 272 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 3.06'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 95.76 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 604.5' Slope= 0.0177 '/'
Inlet Invert= 1,454.47', Outlet Invert= 1,443.79'



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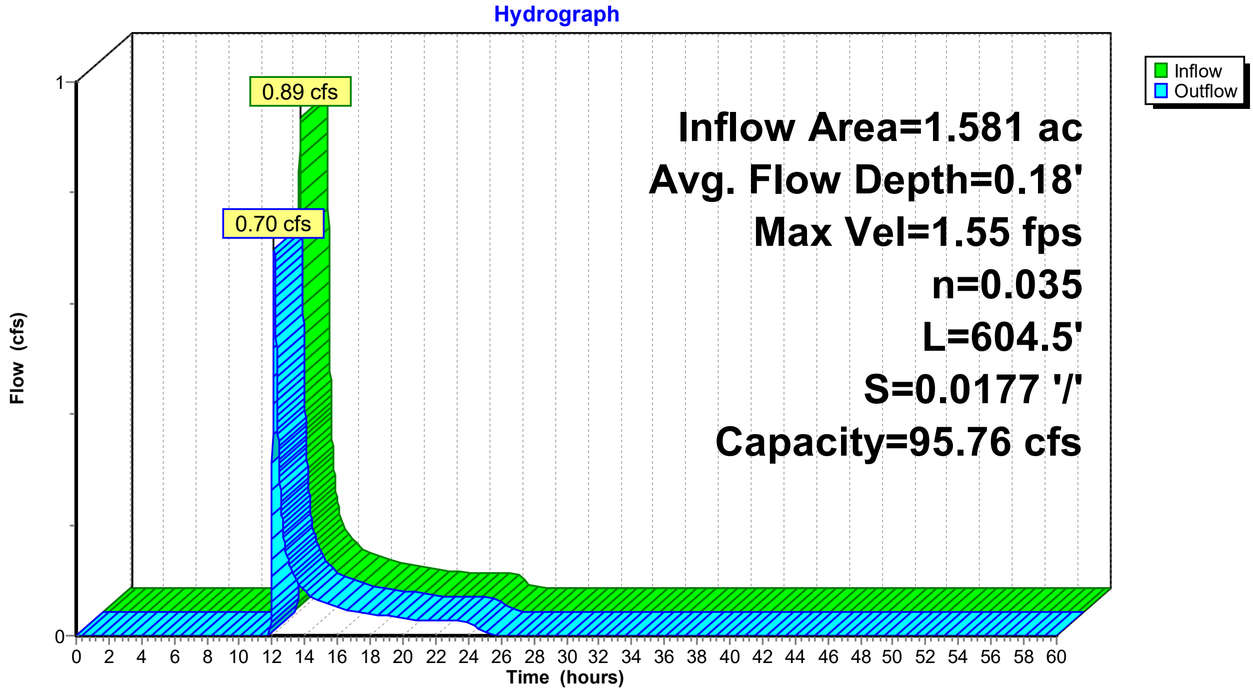
Reach 1.2bR2: South Road Conveyance Swale



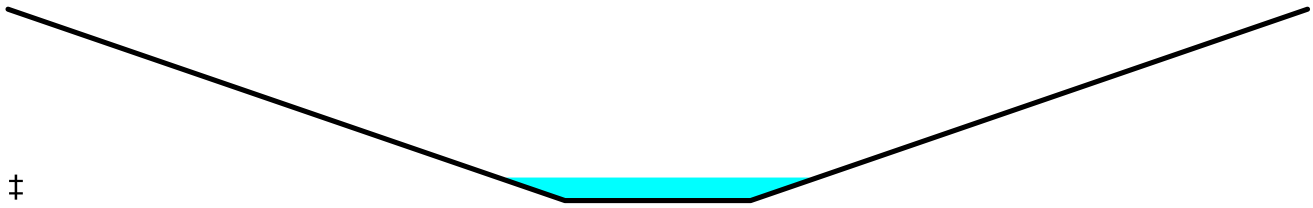
Summary for Reach 1.2bR3: South Road Conveyance Swale

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 0.67" for 10-Yr Storm event
Inflow = 1.54 cfs @ 12.00 hrs, Volume= 0.133 af
Outflow = 1.22 cfs @ 12.07 hrs, Volume= 0.133 af, Atten= 21%, Lag= 4.3 min
Routed to Pond 1.2bP : South Road Treatment Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.89 fps, Min. Travel Time= 6.7 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 18.1 min

Peak Storage= 490 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 3.43'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 98.64 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 755.9' Slope= 0.0187 '/'
Inlet Invert= 1,442.84', Outlet Invert= 1,428.67'



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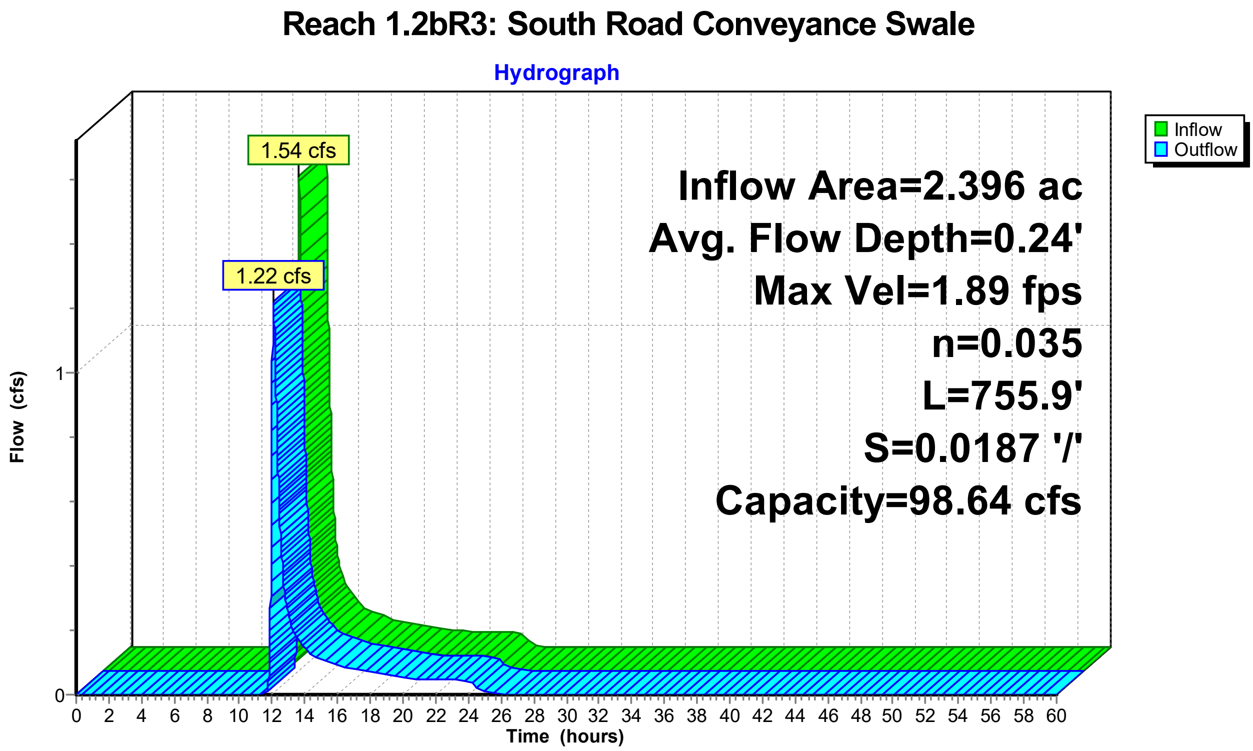


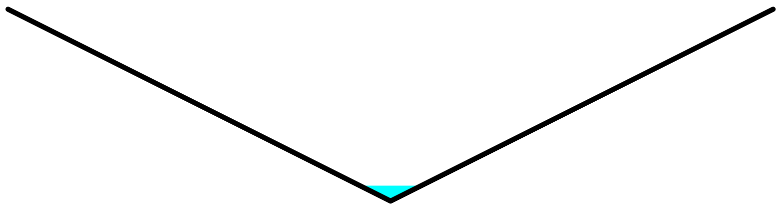
Summary for Reach 4.1R1: Bypass Swale

Inflow Area = 11.663 ac, 2.80% Impervious, Inflow Depth = 0.05" for 10-Yr Storm event
Inflow = 0.06 cfs @ 15.43 hrs, Volume= 0.052 af
Outflow = 0.06 cfs @ 15.51 hrs, Volume= 0.052 af, Atten= 0%, Lag= 4.8 min
Routed to Reach 4.1R2 : Ex Stream

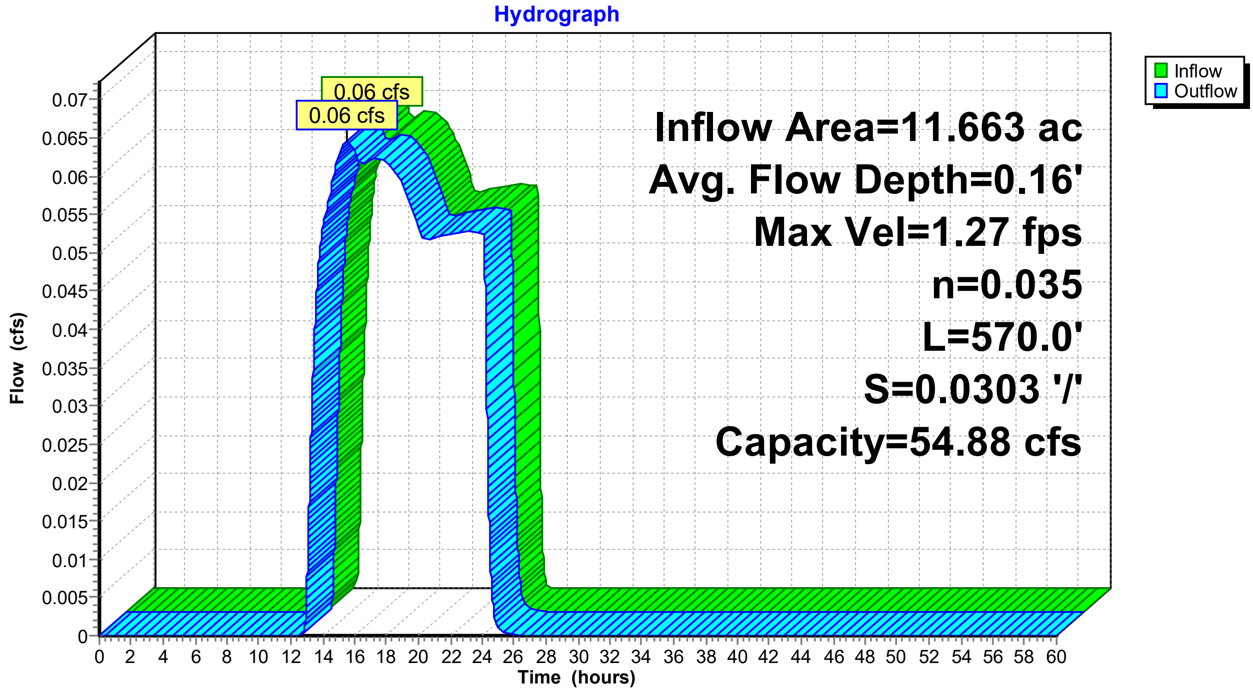
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.27 fps, Min. Travel Time= 7.5 min
Avg. Velocity = 1.09 fps, Avg. Travel Time= 8.7 min

Peak Storage= 29 cf @ 15.51 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.64'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 54.88 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 570.0' Slope= 0.0303 '/'
Inlet Invert= 1,448.24', Outlet Invert= 1,430.97'



Reach 4.1R1: Bypass Swale



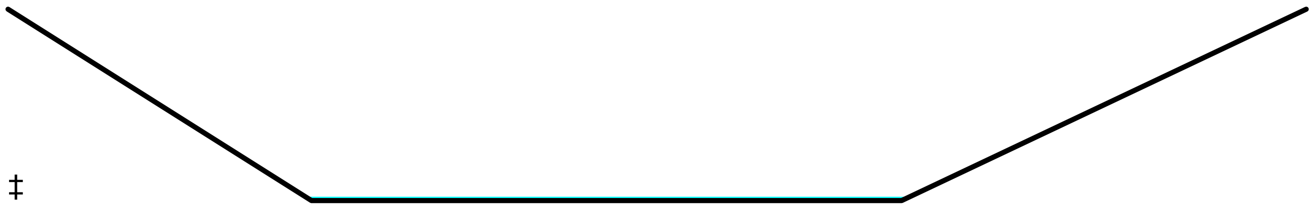
Summary for Reach 4.1R2: Ex Stream

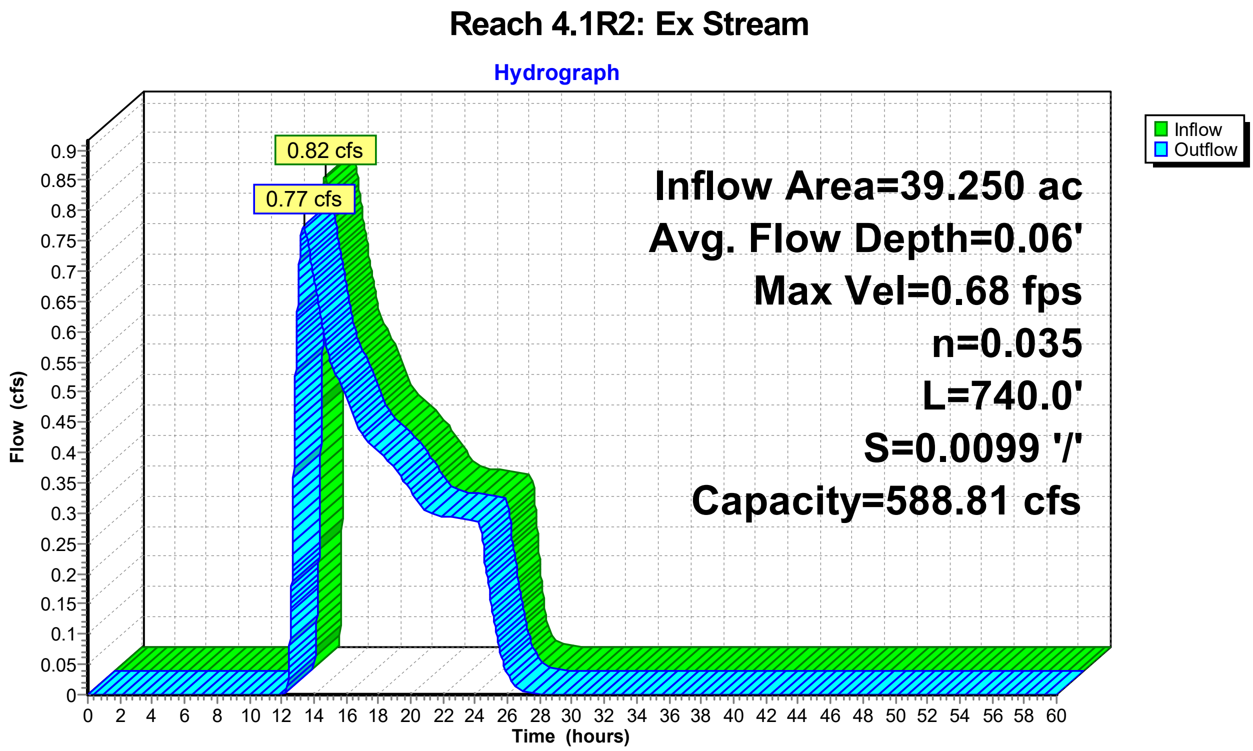
Inflow Area = 39.250 ac, 0.83% Impervious, Inflow Depth = 0.13" for 10-Yr Storm event
Inflow = 0.82 cfs @ 13.01 hrs, Volume= 0.431 af
Outflow = 0.77 cfs @ 13.36 hrs, Volume= 0.431 af, Atten= 5%, Lag= 21.0 min
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.68 fps, Min. Travel Time= 18.1 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 25.5 min

Peak Storage= 842 cf @ 13.36 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 17.95'
Bank-Full Depth= 3.00' Flow Area= 84.0 sf, Capacity= 588.81 cfs

17.50' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 4.0 '/' Top Width= 38.50'
Length= 740.0' Slope= 0.0099 '/'
Inlet Invert= 1,430.98', Outlet Invert= 1,423.64'





Summary for Reach 4.2bR: Conveyance Swale

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.98" for 10-Yr Storm event
Inflow = 0.81 cfs @ 11.98 hrs, Volume= 0.038 af
Outflow = 0.69 cfs @ 12.02 hrs, Volume= 0.038 af, Atten= 15%, Lag= 2.4 min
Routed to Pond 4.2bP : Pond 4 - Access Rd East

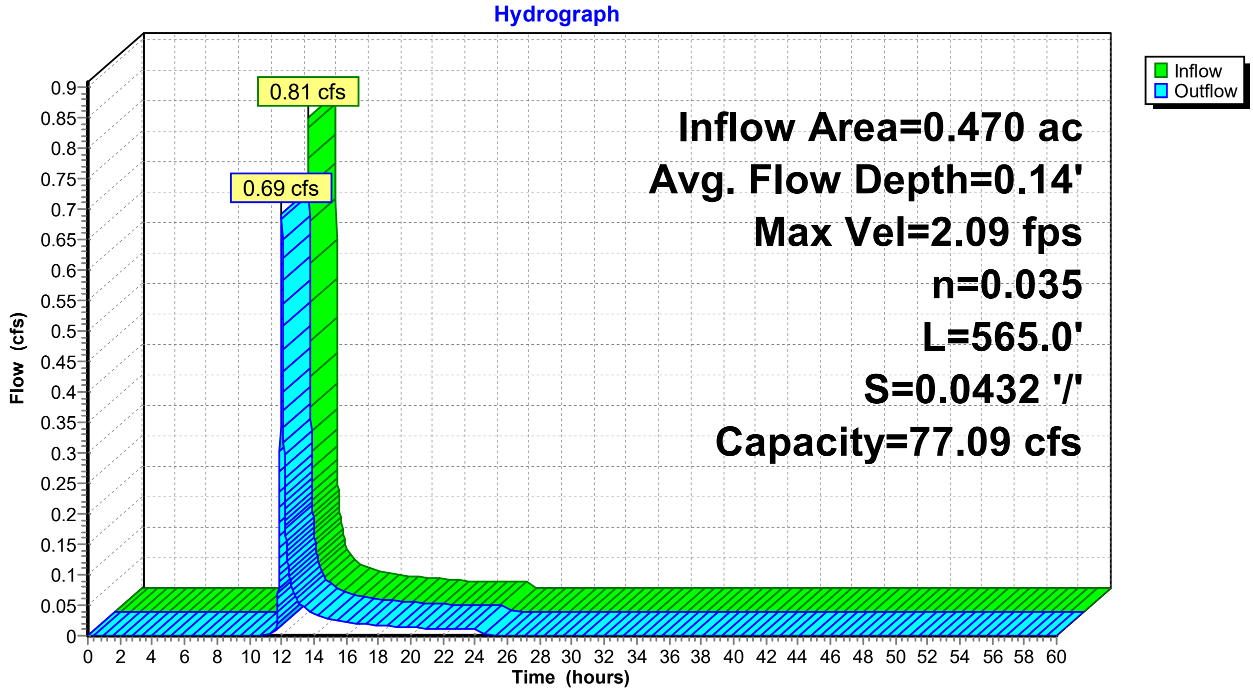
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.09 fps, Min. Travel Time= 4.5 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 14.8 min

Peak Storage= 187 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 2.82'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 77.09 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 565.0' Slope= 0.0432 '/'
Inlet Invert= 1,472.38', Outlet Invert= 1,448.00'

‡

Reach 4.2bR: Conveyance Swale



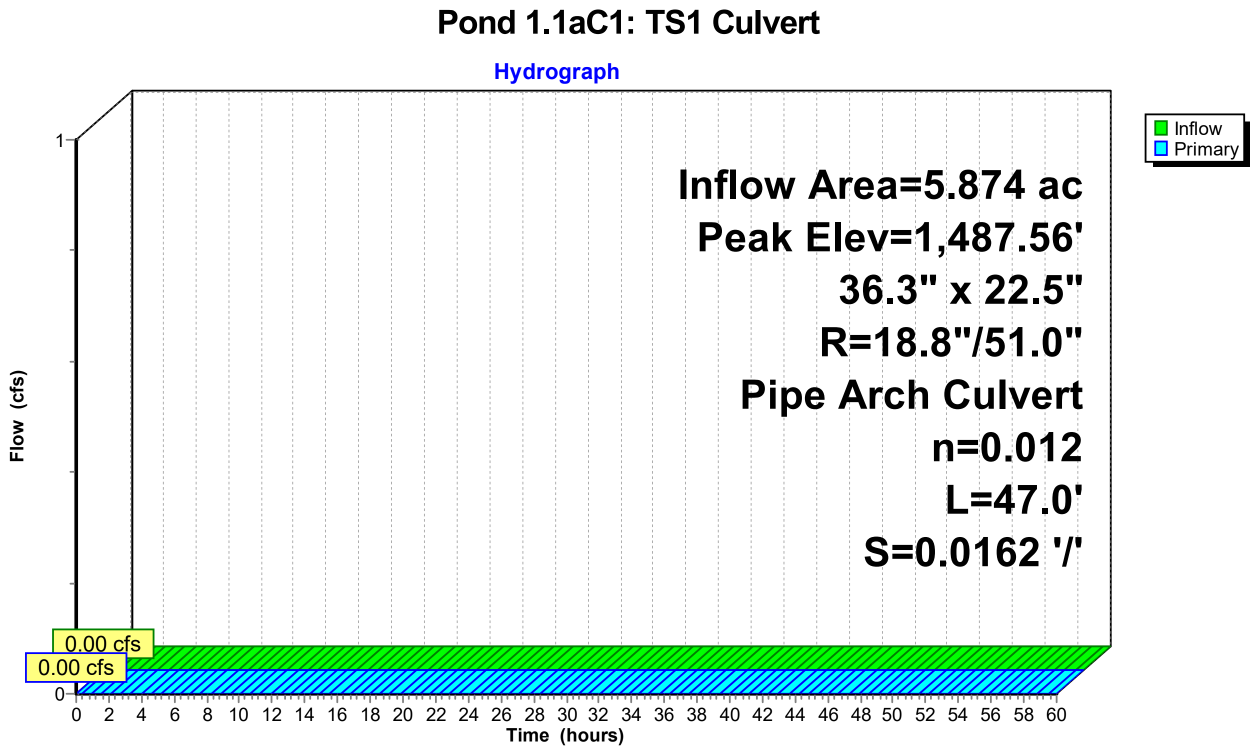
Summary for Pond 1.1aC1: TS1 Culvert

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,487.56' @ 0.00 hrs
Flood Elev= 1,489.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,487.56'	**36.3" W x 22.5" H, R=18.8"/51.0" Pipe Arch RCP_Arch 37x23** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,487.56' / 1,486.80' S= 0.0162 '/' Cc= 0.900 n= 0.012, Flow Area= 4.43 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,487.56' (Free Discharge)
└─**1=RCP_Arch 37x23** (Controls 0.00 cfs)



Summary for Pond 1.1aC2: TS2 Culvert

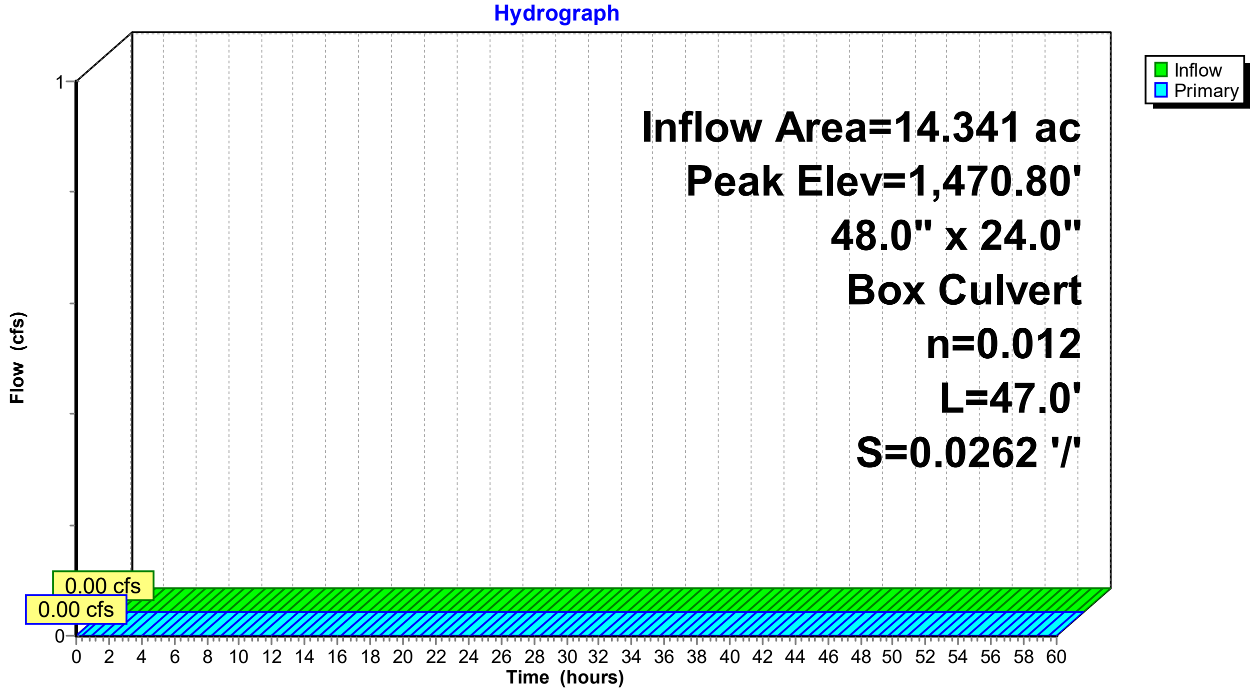
Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,470.80' @ 0.00 hrs
Flood Elev= 1,473.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,470.80'	**48.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,470.80' / 1,469.57' S= 0.0262 '/' Cc= 0.900 n= 0.012, Flow Area= 8.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,470.80' (Free Discharge)
↑**1=Culvert** (Controls 0.00 cfs)

Pond 1.1aC2: TS2 Culvert



Summary for Pond 1.1aC3: TS3 Culvert

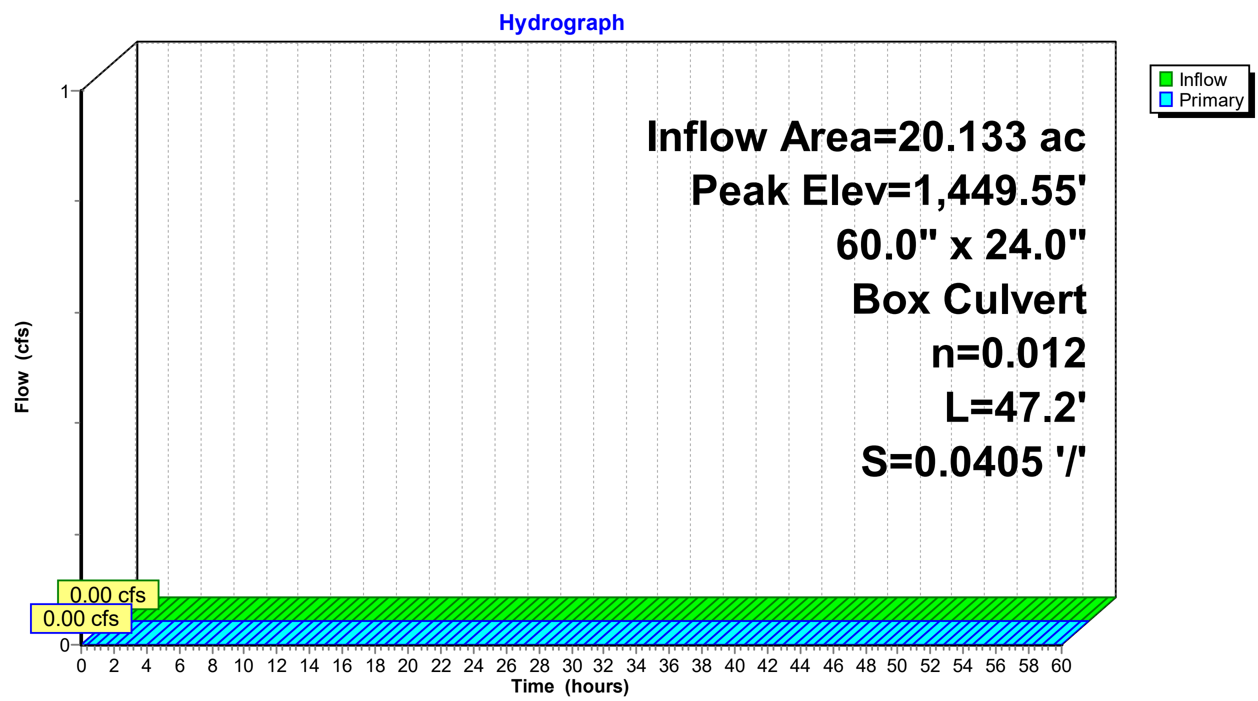
Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.1aR4 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.55' @ 0.00 hrs
Flood Elev= 1,452.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.55'	**60.0" W x 24.0" H Box Culvert** L= 47.2' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.55' / 1,447.64' S= 0.0405 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,449.55' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)

Pond 1.1aC3: TS3 Culvert



Summary for Pond 1.1aP: North Road Bypass OC

Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

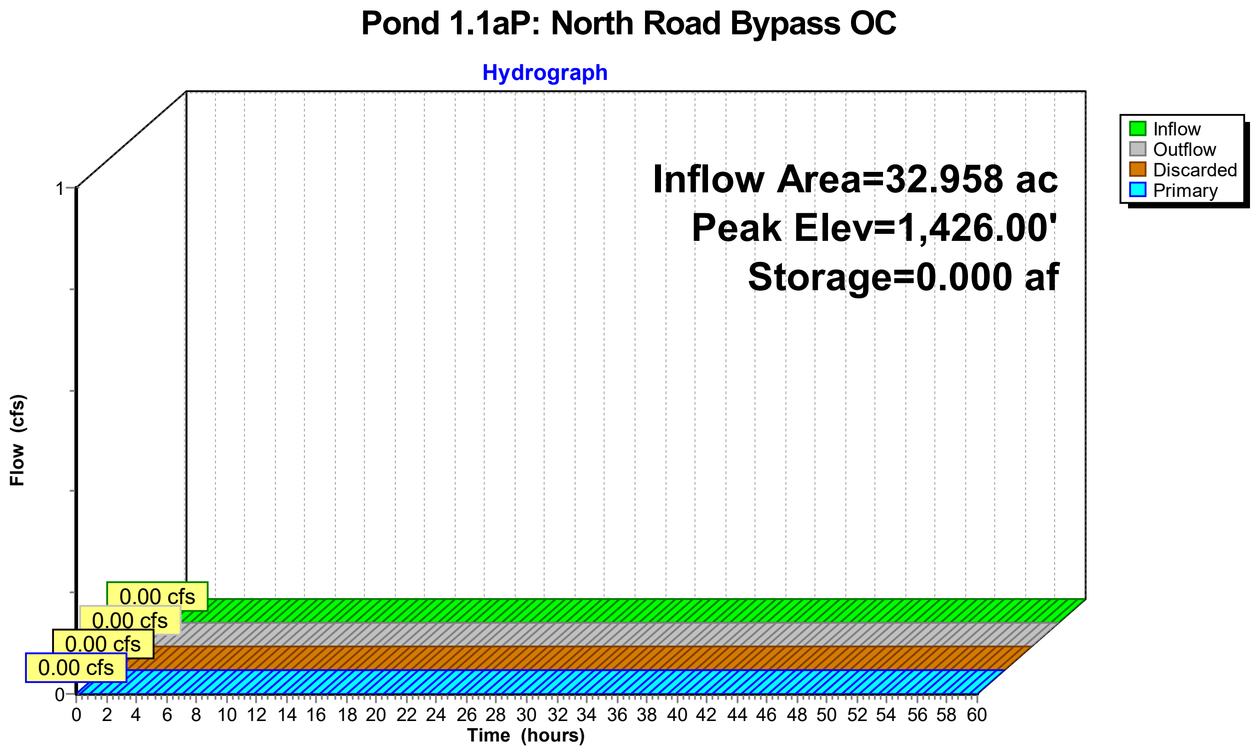
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,426.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,426.00'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,428.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,426.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Summary for Pond 1.1bC1: TS4 Culvert

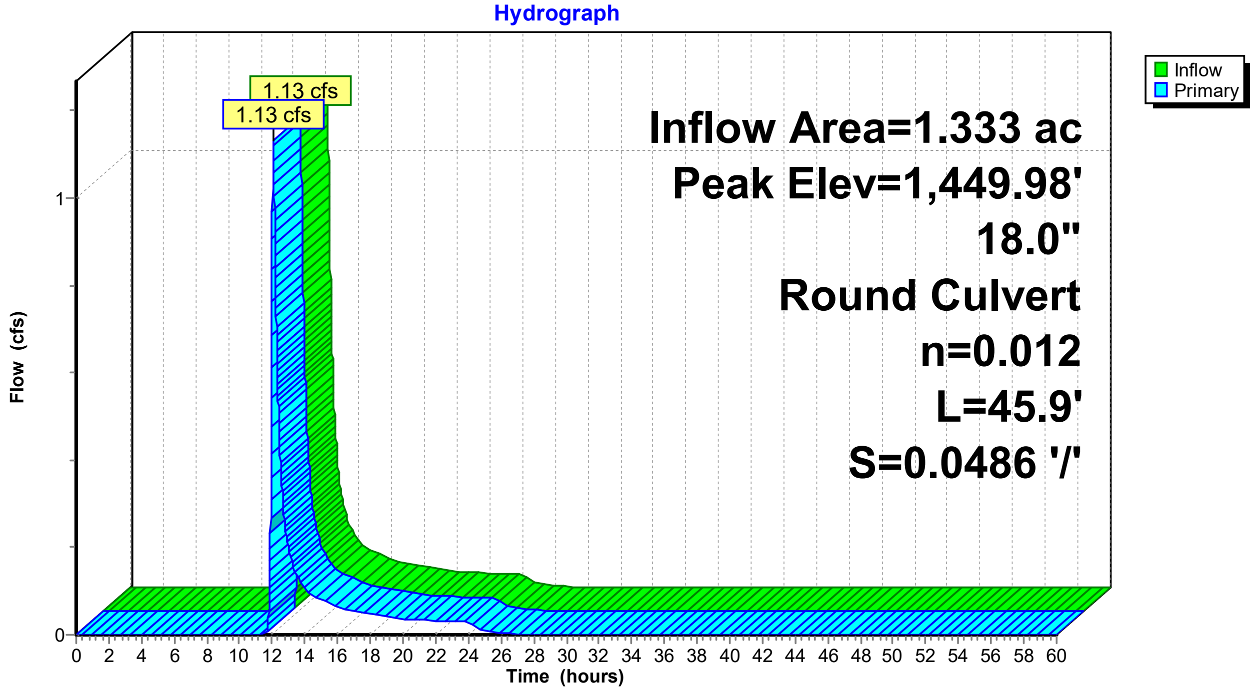
Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 0.93" for 10-Yr Storm event
Inflow = 1.13 cfs @ 12.06 hrs, Volume= 0.103 af
Outflow = 1.13 cfs @ 12.06 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min
Primary = 1.13 cfs @ 12.06 hrs, Volume= 0.103 af
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.98' @ 12.06 hrs
Flood Elev= 1,451.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.50'	**18.0" Round Culvert** L= 45.9' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.50' / 1,447.27' S= 0.0486 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=1.13 cfs @ 12.06 hrs HW=1,449.98' (Free Discharge)
1=Culvert (Inlet Controls 1.13 cfs @ 2.35 fps)

Pond 1.1bC1: TS4 Culvert



Summary for Pond 1.1bP1: Dry Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.88" for 10-Yr Storm event
Inflow = 1.61 cfs @ 12.06 hrs, Volume= 0.145 af
Outflow = 1.59 cfs @ 12.08 hrs, Volume= 0.145 af, Atten= 1%, Lag= 1.1 min
Discarded = 0.00 cfs @ 12.08 hrs, Volume= 0.004 af
Primary = 1.58 cfs @ 12.08 hrs, Volume= 0.141 af
Routed to Pond 1.1bP2 : North Road Detention Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.14' @ 12.08 hrs Surf.Area= 329 sf Storage= 171 cf

Plug-Flow detention time= 14.8 min calculated for 0.145 af (100% of inflow)
Center-of-Mass det. time= 14.9 min (914.0 - 899.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.75'	428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

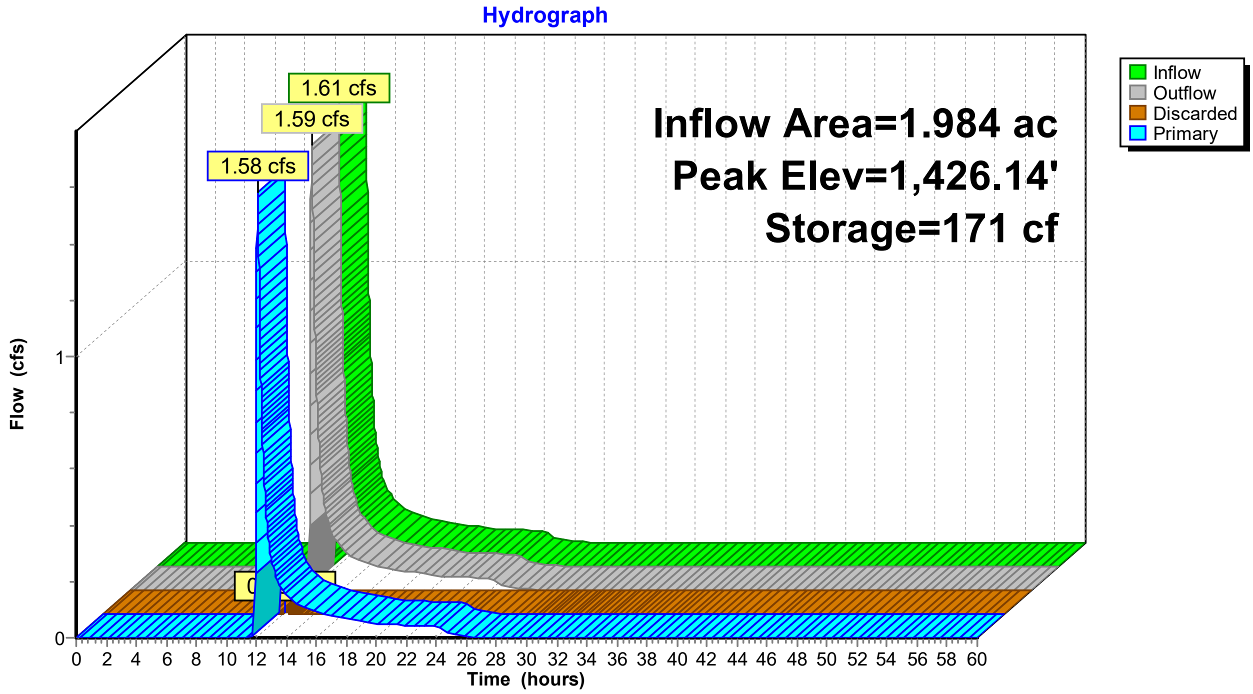
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,424.75	0	0.0	0	0	0
1,425.00	25	22.9	2	2	42
1,426.00	273	98.0	127	129	767
1,426.70	603	161.7	299	428	2,086

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.75'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,425.69'	**2.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.00 cfs @ 12.08 hrs HW=1,426.14' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=1.58 cfs @ 12.08 hrs HW=1,426.14' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.58 cfs @ 1.75 fps)

Pond 1.1bP1: Dry Swale



Summary for Pond 1.1bP2: North Road Detention Pond

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 0.85" for 10-Yr Storm event
Inflow = 1.58 cfs @ 12.08 hrs, Volume= 0.141 af
Outflow = 0.46 cfs @ 12.62 hrs, Volume= 0.127 af, Atten= 71%, Lag= 32.3 min
Discarded = 0.02 cfs @ 12.62 hrs, Volume= 0.052 af
Primary = 0.45 cfs @ 12.62 hrs, Volume= 0.074 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.04' @ 12.62 hrs Surf.Area= 0.032 ac Storage= 0.050 af

Plug-Flow detention time= 547.6 min calculated for 0.127 af (90% of inflow)
Center-of-Mass det. time= 495.3 min (1,392.5 - 897.2)

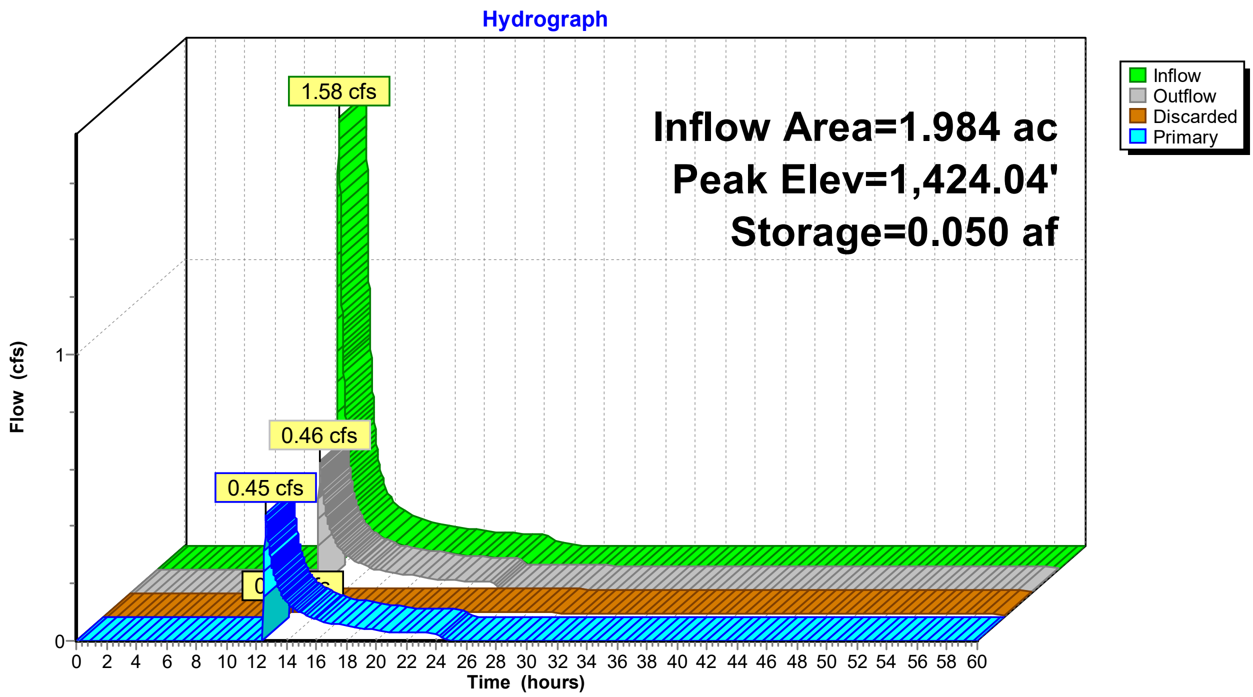
Volume	Invert	Avail.Storage	Storage Description
#1	1,421.50'	0.166 af	**10.00'W x 40.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,421.50'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,424.00'	**20.0' 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

Discarded OutFlow Max=0.02 cfs @ 12.62 hrs HW=1,424.04' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.40 cfs @ 12.62 hrs HW=1,424.04' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.40 cfs @ 0.50 fps)

Pond 1.1bP2: North Road Detention Pond



Summary for Pond 1.2aC1: TS 7 Culvert

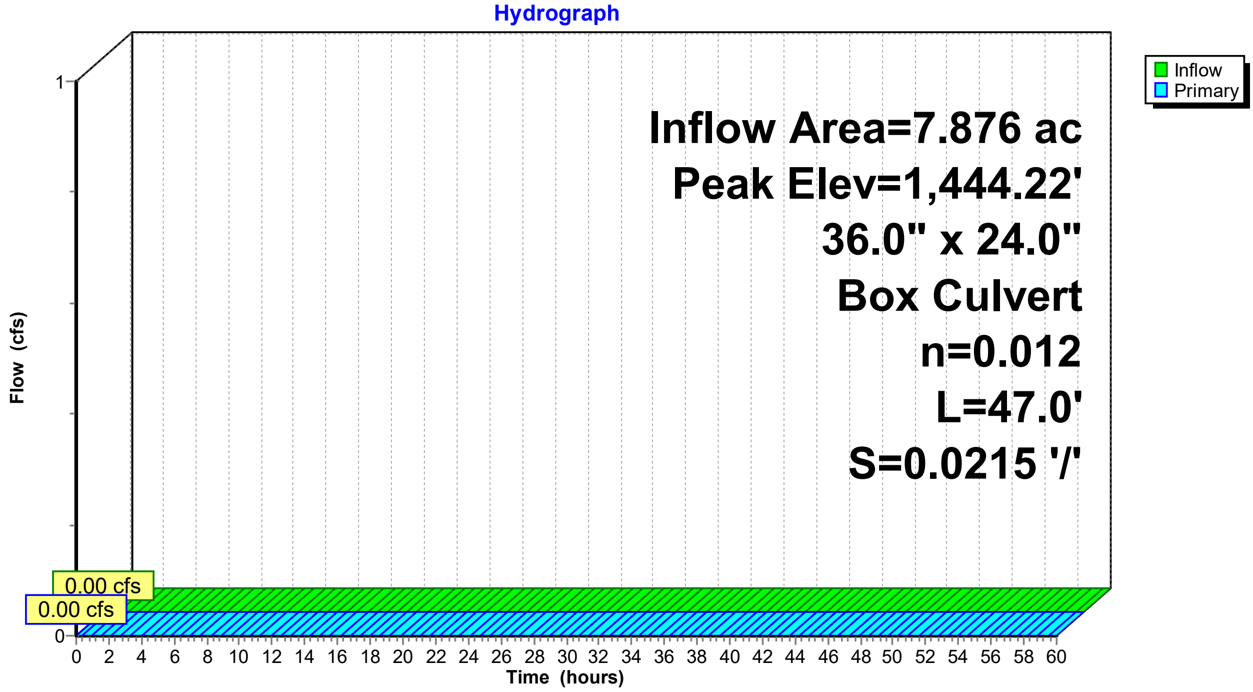
Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.2aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.22' @ 0.00 hrs
Flood Elev= 1,446.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,444.22'	**36.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,444.22' / 1,443.21' S= 0.0215 '/' Cc= 0.900 n= 0.012, Flow Area= 6.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,444.22' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)

Pond 1.2aC1: TS 7 Culvert



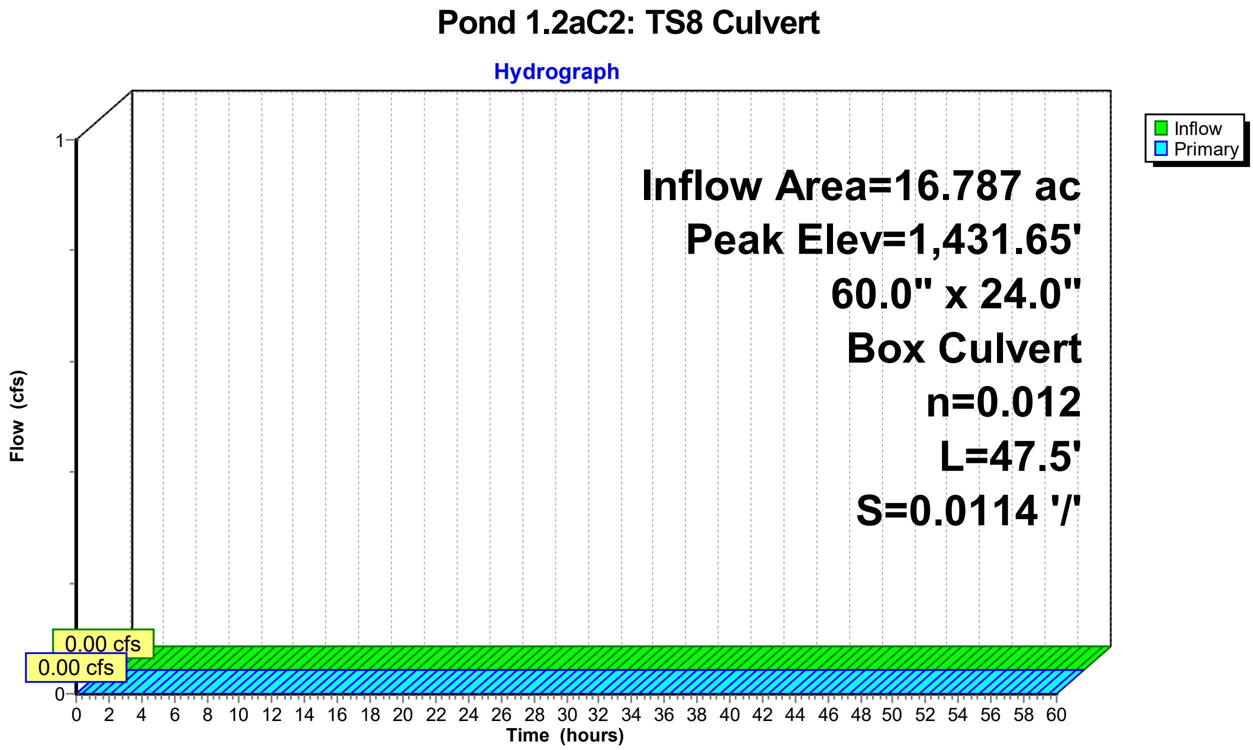
Summary for Pond 1.2aC2: TS8 Culvert

Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1.2aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.65' @ 0.00 hrs
Flood Elev= 1,433.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.65'	**60.0" W x 24.0" H Box Culvert** L= 47.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,431.65' / 1,431.11' S= 0.0114 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,431.65' (Free Discharge)
1=Culvert (Controls 0.00 cfs)



Summary for Pond 1.2aP: South Road Bypass OC

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.00' @ 0.00 hrs Surf.Area= 0.005 ac Storage= 0.000 af

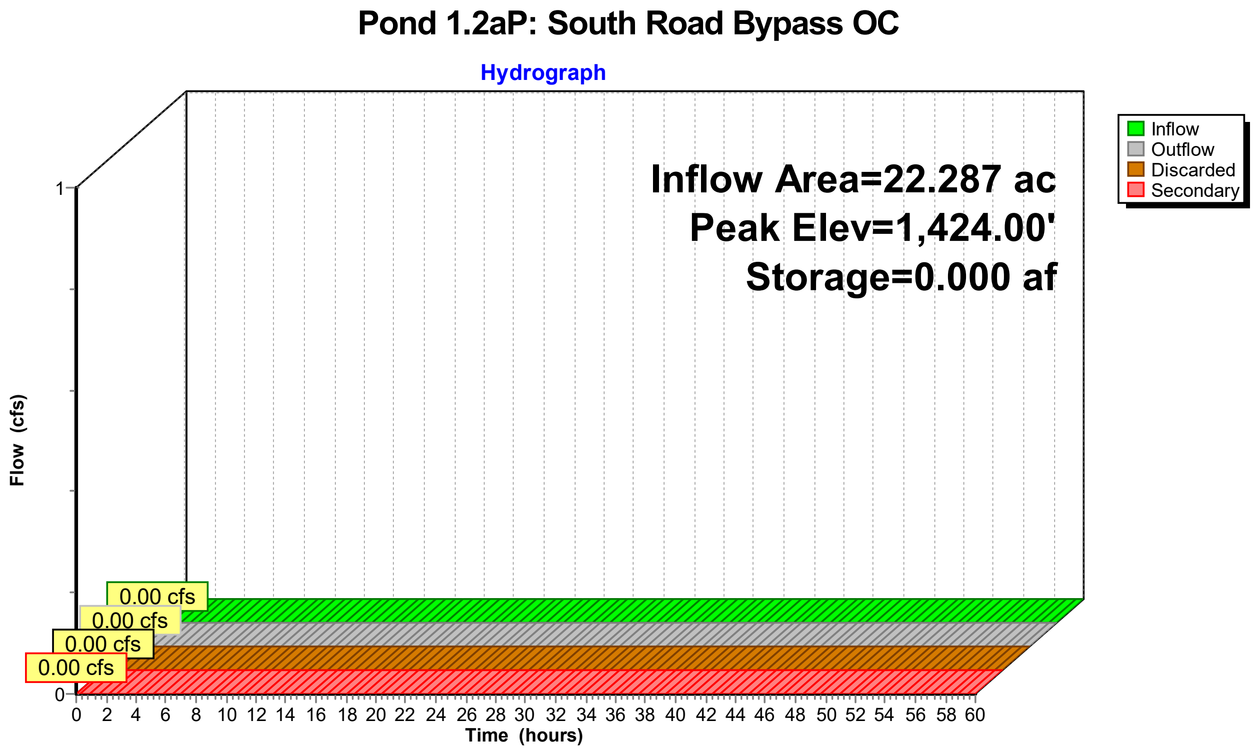
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area**
#2	Secondary	1,426.50'	**10.0' 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

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
└**1=Exfiltration** (Passes 0.00 cfs of 0.06 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Summary for Pond 1.2bC1: East Road Culvert

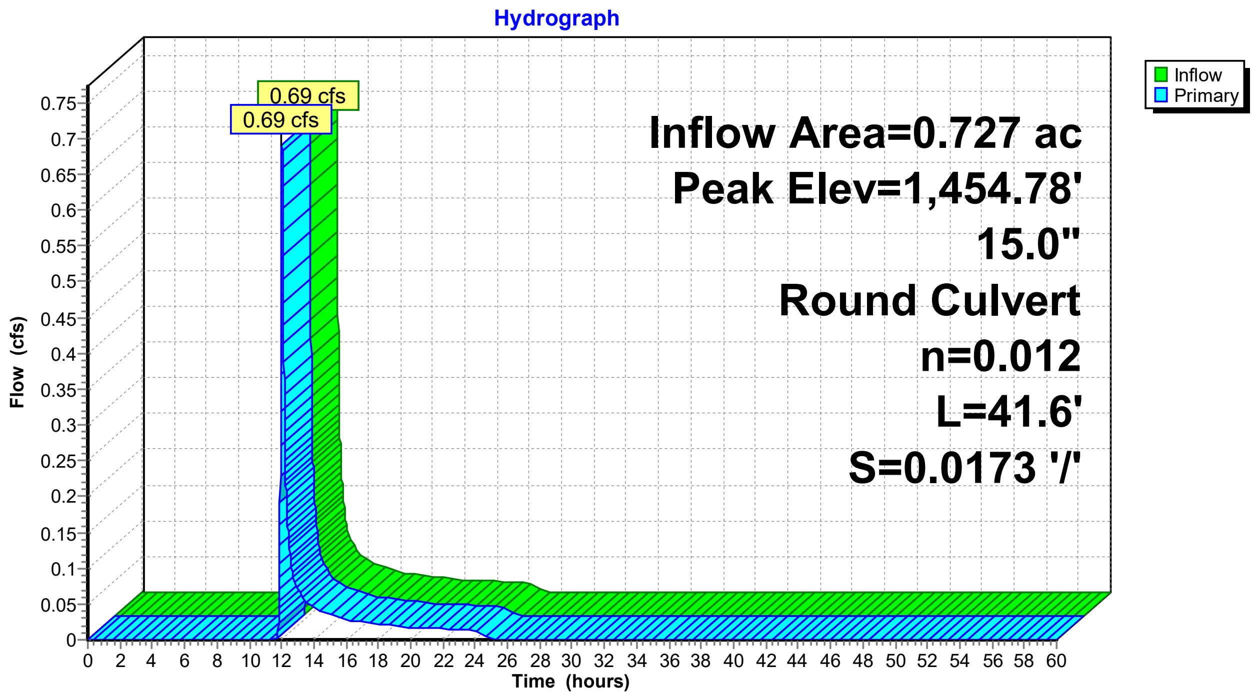
Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 0.73" for 10-Yr Storm event
Inflow = 0.69 cfs @ 12.04 hrs, Volume= 0.044 af
Outflow = 0.69 cfs @ 12.04 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min
Primary = 0.69 cfs @ 12.04 hrs, Volume= 0.044 af
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,454.78' @ 12.04 hrs
Flood Elev= 1,457.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,454.39'	**15.0" Round Culvert** L= 41.6' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,454.39' / 1,453.67' S= 0.0173 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=0.69 cfs @ 12.04 hrs HW=1,454.78' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.69 cfs @ 2.12 fps)

Pond 1.2bC1: East Road Culvert



Summary for Pond 1.2bC2: TS6 Culvert

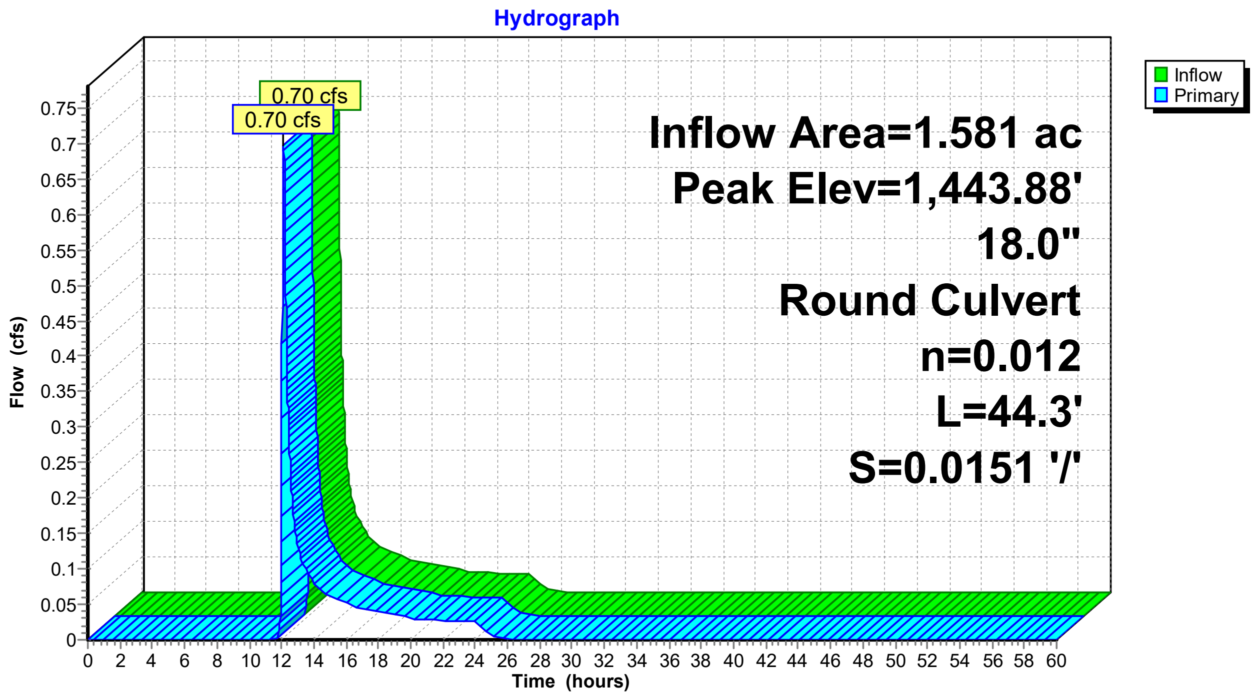
Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 0.54" for 10-Yr Storm event
Inflow = 0.70 cfs @ 12.13 hrs, Volume= 0.071 af
Outflow = 0.70 cfs @ 12.13 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min
Primary = 0.70 cfs @ 12.13 hrs, Volume= 0.071 af
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,443.88' @ 12.13 hrs
Flood Elev= 1,445.09'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,443.51'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,443.51' / 1,442.84' S= 0.0151 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.70 cfs @ 12.13 hrs HW=1,443.88' (Free Discharge)
1=Culvert (Inlet Controls 0.70 cfs @ 2.07 fps)

Pond 1.2bC2: TS6 Culvert



Summary for Pond 1.2bP: South Road Treatment Pond

Inflow Area =	2.396 ac,	0.63% Impervious, Inflow Depth = 0.67"	for 10-Yr Storm event	
Inflow =	1.22 cfs @	12.07 hrs, Volume=	0.133 af	
Outflow =	0.41 cfs @	12.61 hrs, Volume=	0.133 af,	Atten= 67%, Lag= 32.1 min
Discarded =	0.29 cfs @	12.61 hrs, Volume=	0.132 af	
Primary =	0.12 cfs @	12.61 hrs, Volume=	0.002 af	

Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.06' @ 12.61 hrs Surf.Area= 0.024 ac Storage= 0.033 af

Plug-Flow detention time= 44.3 min calculated for 0.133 af (100% of inflow)
Center-of-Mass det. time= 44.3 min (954.4 - 910.1)

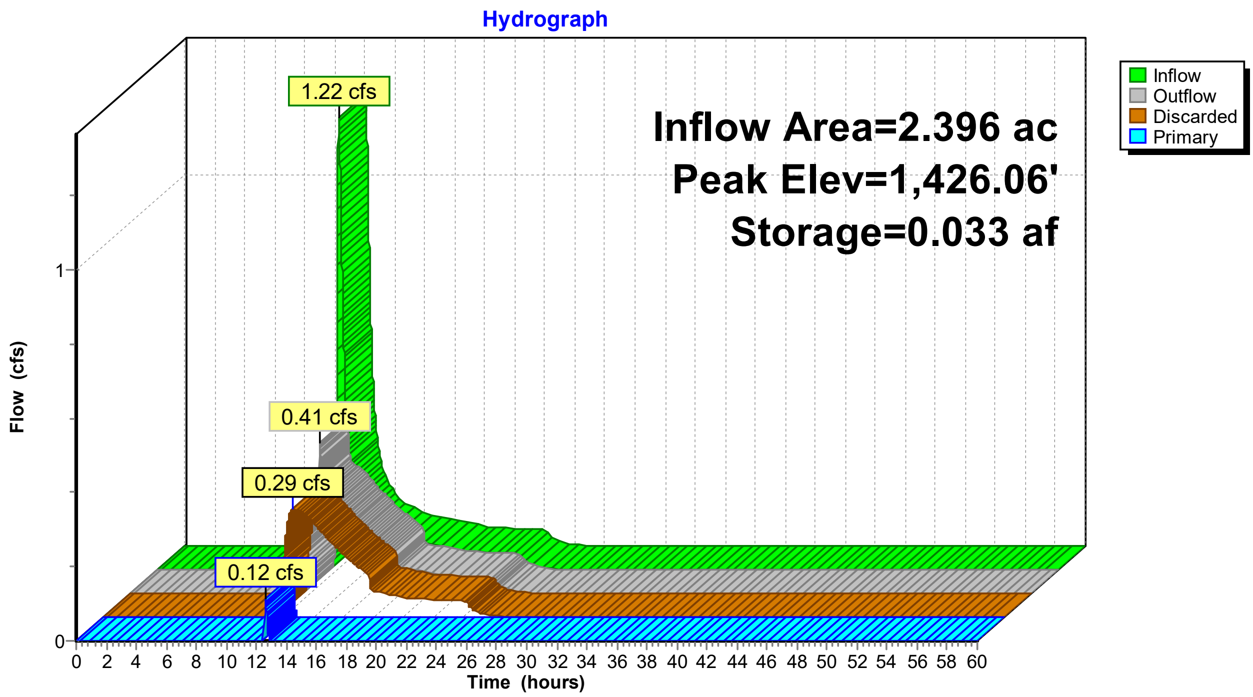
Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.149 af	**20.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,426.05'	**20.0' 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

Discarded OutFlow Max=0.29 cfs @ 12.61 hrs HW=1,426.06' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.05 cfs @ 12.61 hrs HW=1,426.06' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.25 fps)

Pond 1.2bP: South Road Treatment Pond



Summary for Pond 1.3P: Pond 3 - Access Rd West

Inflow Area = 0.695 ac, 0.00% Impervious, Inflow Depth = 0.17" for 10-Yr Storm event
Inflow = 0.04 cfs @ 12.04 hrs, Volume= 0.010 af
Outflow = 0.03 cfs @ 12.12 hrs, Volume= 0.010 af, Atten= 33%, Lag= 4.7 min
Discarded = 0.03 cfs @ 12.12 hrs, Volume= 0.010 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link SP1 : Study Point 1

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,456.01' @ 12.12 hrs Surf.Area= 788 sf Storage= 8 cf

Plug-Flow detention time= 4.8 min calculated for 0.010 af (100% of inflow)
Center-of-Mass det. time= 4.8 min (997.7 - 992.9)

Volume	Invert	Avail.Storage	Storage Description
#1	1,456.00'	8,743 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

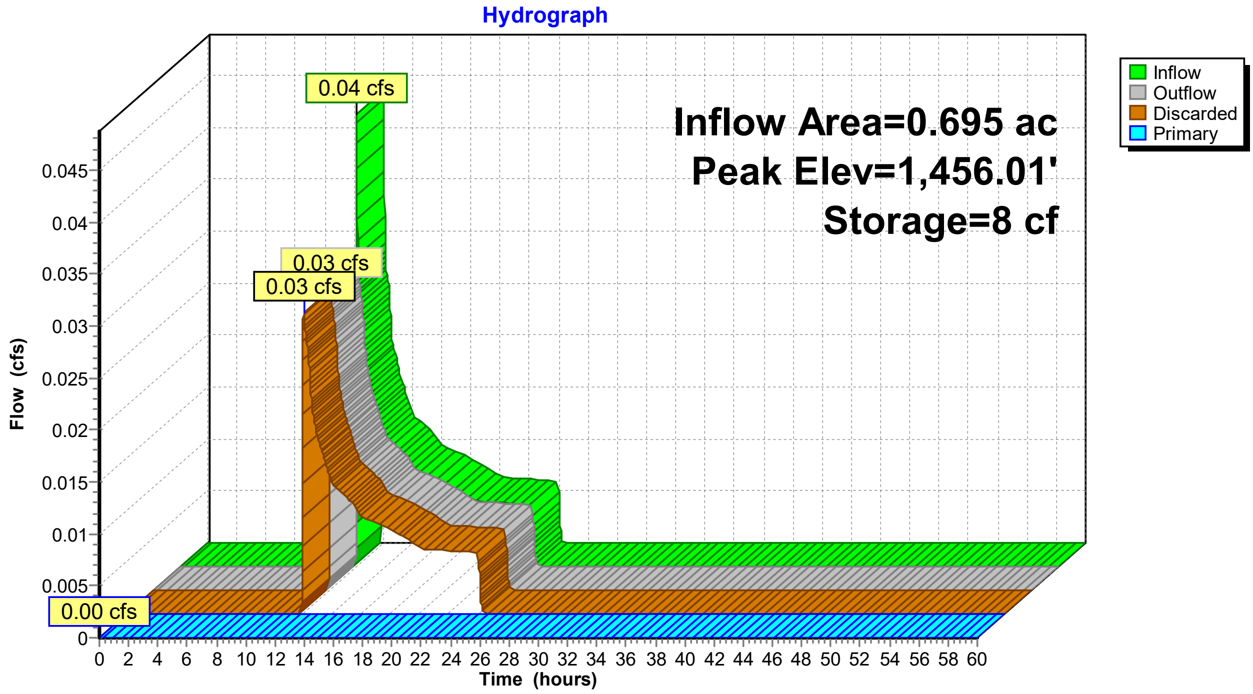
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,456.00	784	123.0	0	0	784
1,458.00	1,720	194.0	2,443	2,443	2,603
1,459.00	2,884	279.0	2,277	4,721	5,811
1,460.00	5,280	421.0	4,022	8,743	13,729

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,456.00'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,459.99'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.11 cfs @ 12.12 hrs HW=1,456.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.3P: Pond 3 - Access Rd West



Summary for Pond 4.2bP: Pond 4 - Access Rd East

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 0.98" for 10-Yr Storm event
Inflow = 0.69 cfs @ 12.02 hrs, Volume= 0.038 af
Outflow = 0.08 cfs @ 12.64 hrs, Volume= 0.038 af, Atten= 89%, Lag= 37.2 min
Discarded = 0.08 cfs @ 12.64 hrs, Volume= 0.038 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4.2C : 18" Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,447.07' @ 12.64 hrs Surf.Area= 571 sf Storage= 581 cf

Plug-Flow detention time= 73.6 min calculated for 0.038 af (100% of inflow)
Center-of-Mass det. time= 73.5 min (948.1 - 874.6)

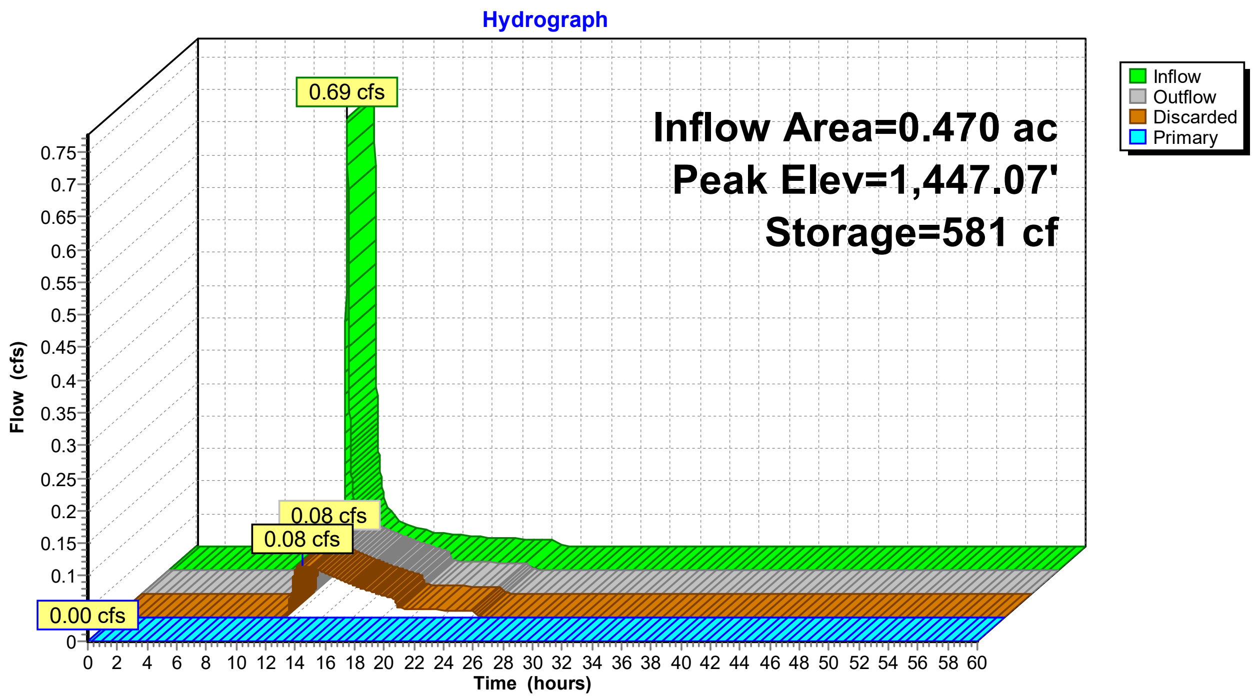
Volume	Invert	Avail.Storage	Storage Description
#1	1,445.50'	2,317 cf	**10.00'W x 20.00'L x 3.50'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,445.50'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,448.25'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.08 cfs @ 12.64 hrs HW=1,447.07' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,445.50' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4.2bP: Pond 4 - Access Rd East



Summary for Pond 4.2C: 18" Culvert

Inflow Area = 27.587 ac, 0.00% Impervious, Inflow Depth = 0.17" for 10-Yr Storm event
Inflow = 0.85 cfs @ 12.75 hrs, Volume= 0.380 af
Outflow = 0.81 cfs @ 12.97 hrs, Volume= 0.379 af, Atten= 5%, Lag= 13.4 min
Primary = 0.81 cfs @ 12.97 hrs, Volume= 0.379 af
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,432.23' @ 12.97 hrs Surf.Area= 2,110 sf Storage= 572 cf
Flood Elev= 1,434.64' Surf.Area= 27,666 sf Storage= 28,656 cf

Plug-Flow detention time= 14.9 min calculated for 0.379 af (100% of inflow)
Center-of-Mass det. time= 13.3 min (1,036.8 - 1,023.5)

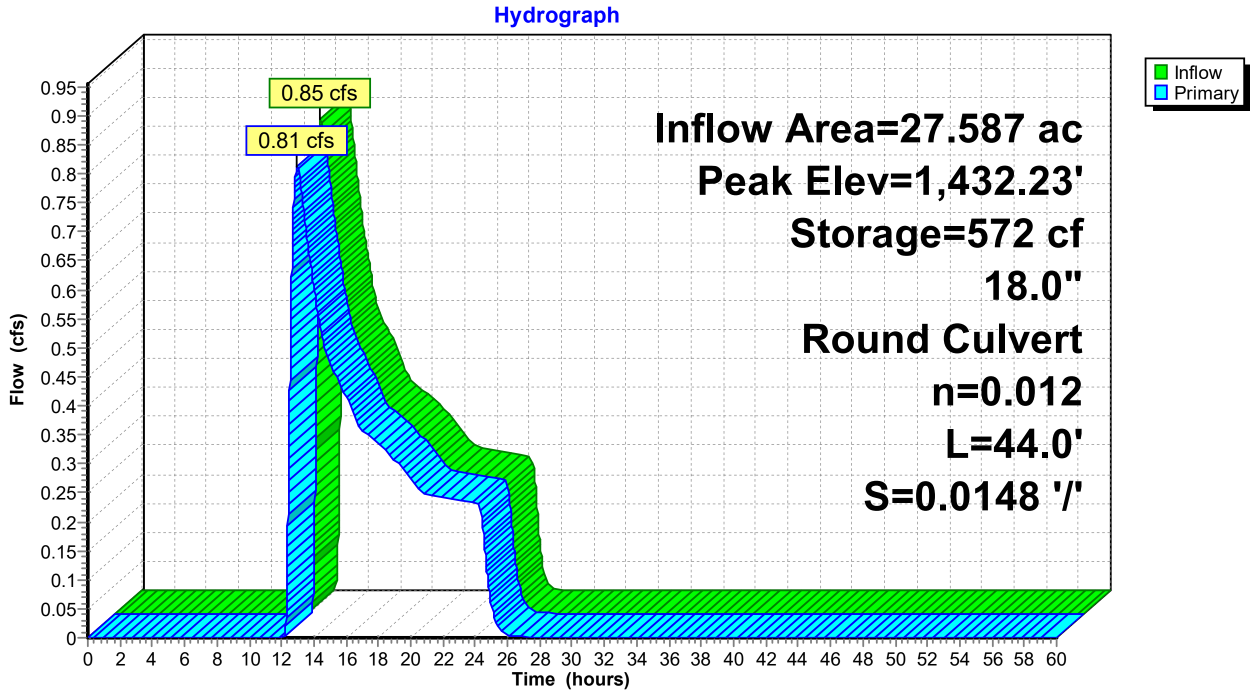
Volume	Invert	Avail.Storage	Storage Description
#1	1,431.50'	39,033 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,431.50	0	0.0	0	0	0
1,432.00	1,190	146.0	198	198	1,697
1,432.50	3,534	368.0	1,129	1,327	10,778
1,433.00	5,795	497.0	2,309	3,637	19,660
1,433.50	10,362	837.0	3,984	7,621	55,755
1,434.00	16,931	975.0	6,756	14,377	75,659
1,434.60	27,412	1,352.0	13,177	27,555	145,474
1,435.00	30,000	1,500.0	11,479	39,033	179,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.83'	**18.0" Round Culvert** L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.83' / 1,431.18' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.81 cfs @ 12.97 hrs HW=1,432.23' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.81 cfs @ 2.15 fps)

Pond 4.2C: 18" Culvert



Summary for Pond 4.3C: 24" Culvert

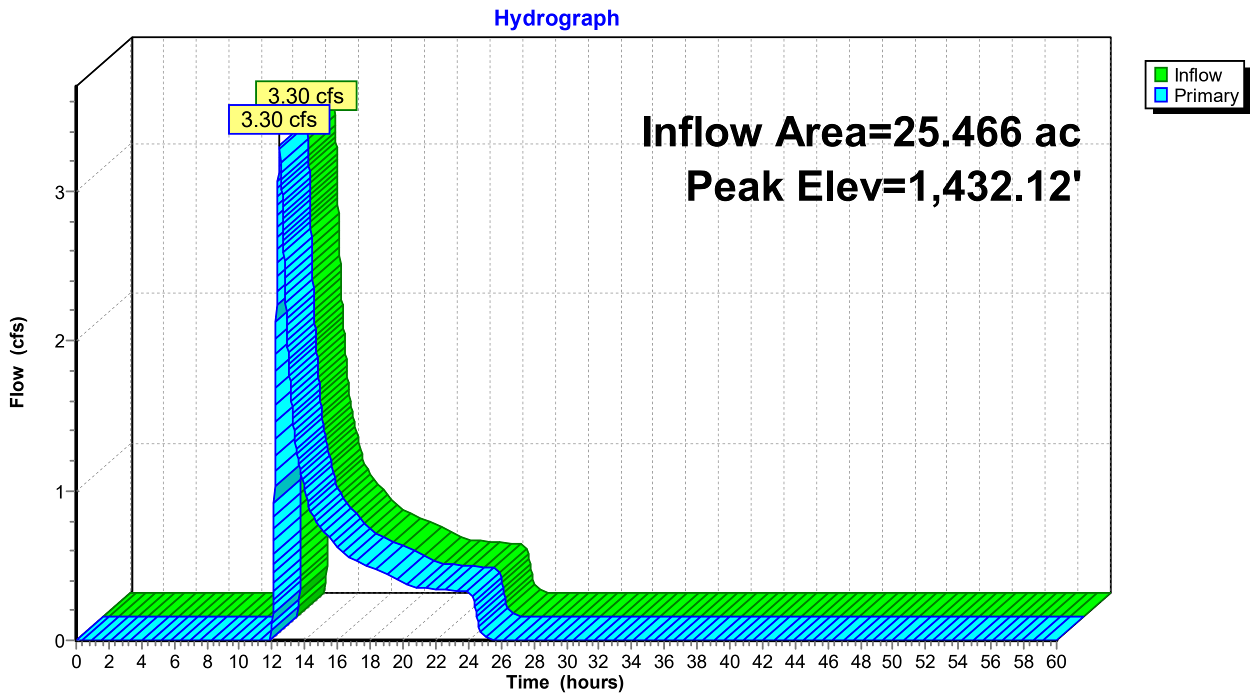
Inflow Area = 25.466 ac, 5.08% Impervious, Inflow Depth = 0.34" for 10-Yr Storm event
Inflow = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af
Outflow = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af, Atten= 0%, Lag= 0.0 min
Primary = 3.30 cfs @ 12.45 hrs, Volume= 0.715 af
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,432.12' @ 12.45 hrs
Flood Elev= 1,434.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.35'	**24.0" Round Culvert** L= 55.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.35' / 1,429.87' S= 0.0265 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Primary	1,434.81'	**20.0' 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

Primary OutFlow Max=3.30 cfs @ 12.45 hrs HW=1,432.12' (Free Discharge)
1=Culvert (Inlet Controls 3.30 cfs @ 2.98 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 4.3C: 24" Culvert

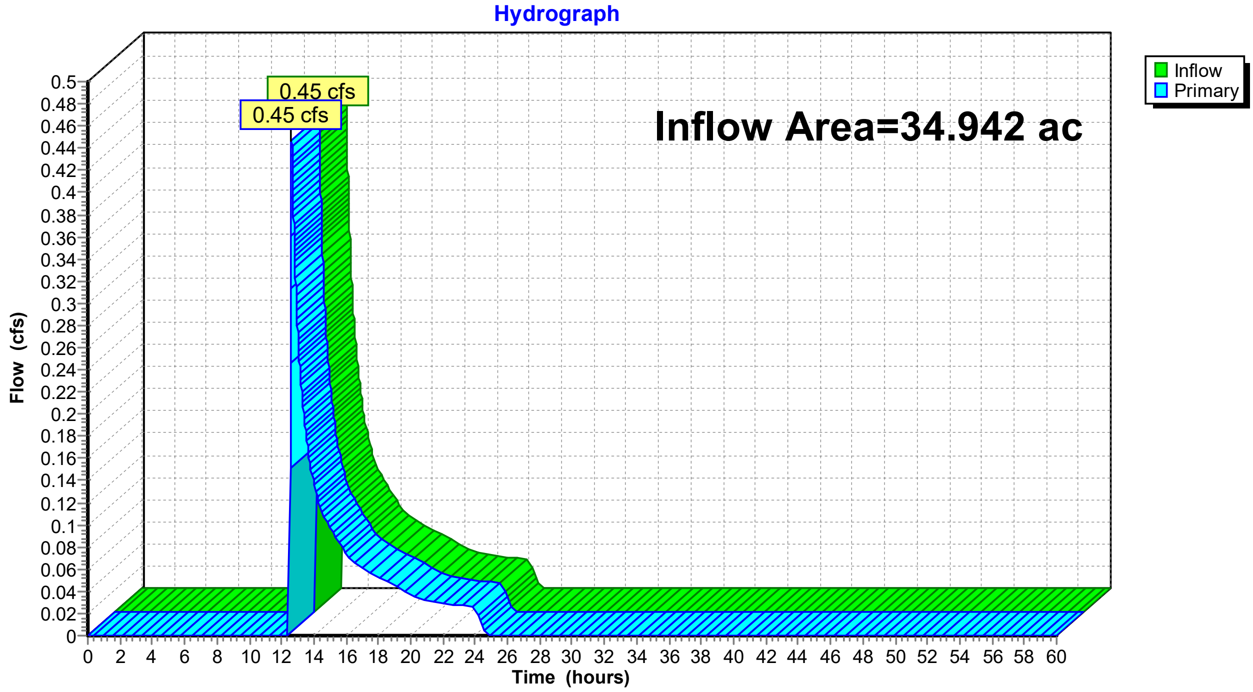


Summary for Link 1.1L:

Inflow Area = 34.942 ac, 0.04% Impervious, Inflow Depth = 0.03" for 10-Yr Storm event
Inflow = 0.45 cfs @ 12.62 hrs, Volume= 0.074 af
Primary = 0.45 cfs @ 12.62 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link 1.1L:

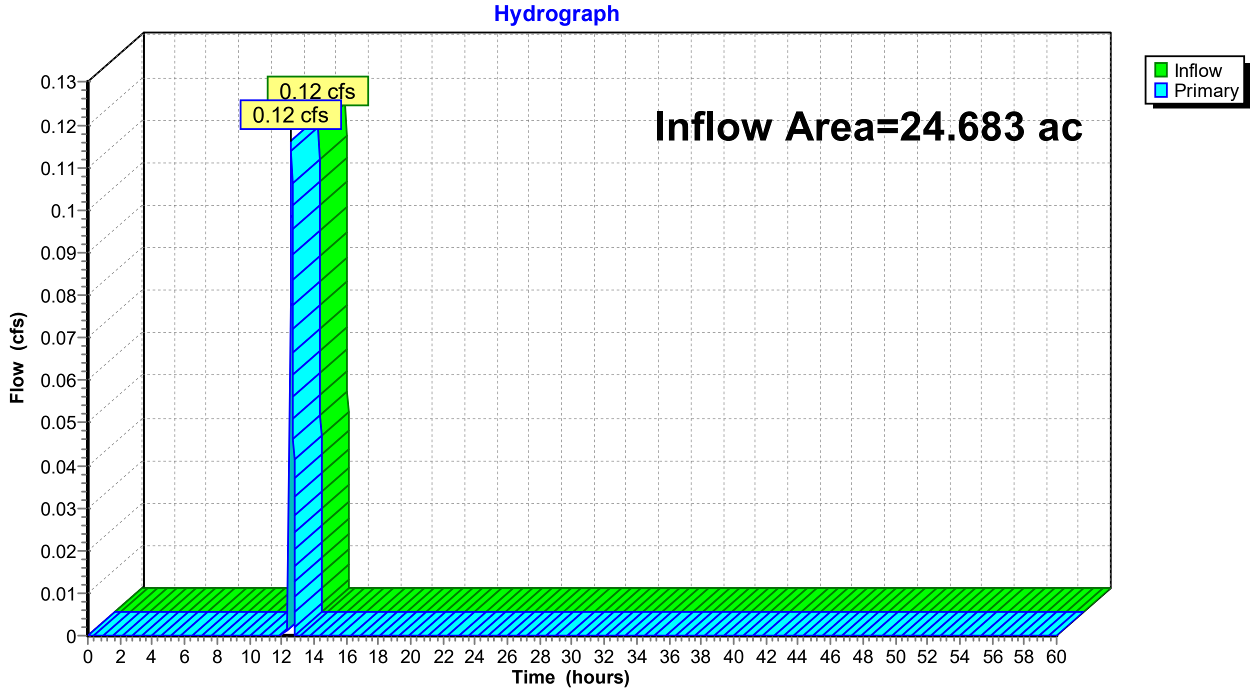


Summary for Link 1.2L:

Inflow Area = 24.683 ac, 0.06% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.12 cfs @ 12.61 hrs, Volume= 0.002 af
Primary = 0.12 cfs @ 12.61 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link 1.2L:

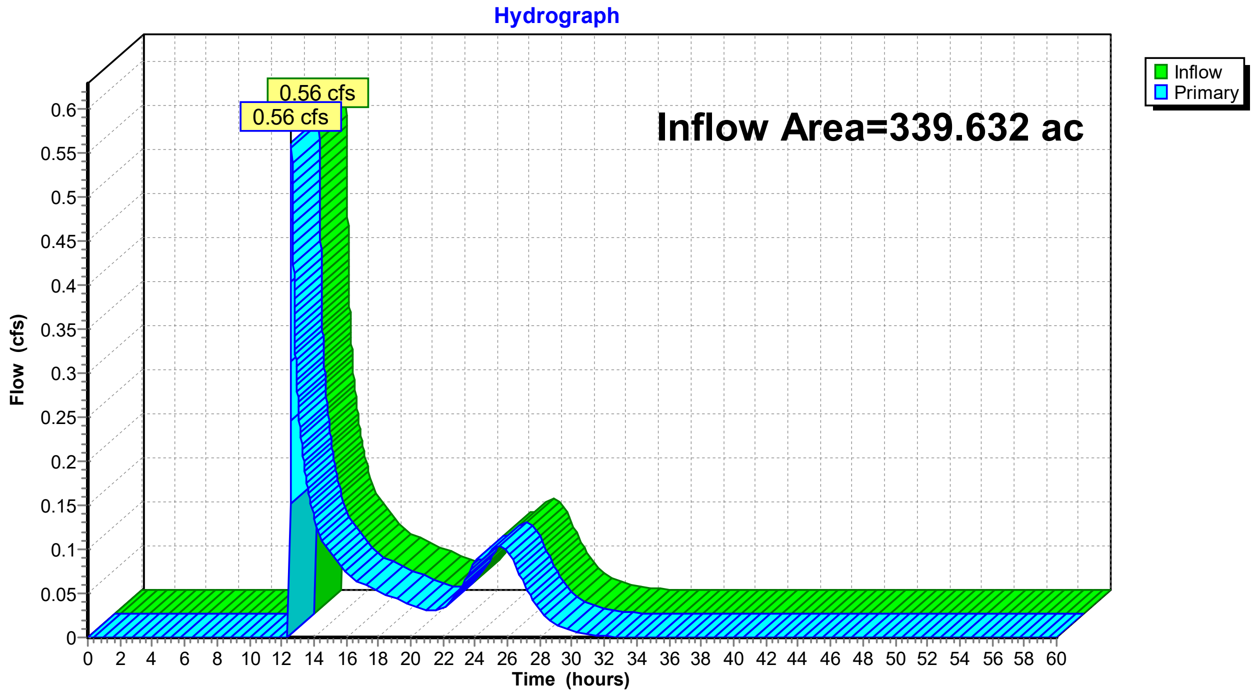


Summary for Link SP1: Study Point 1

Inflow Area = 339.632 ac, 0.01% Impervious, Inflow Depth = 0.00" for 10-Yr Storm event
Inflow = 0.56 cfs @ 12.61 hrs, Volume= 0.110 af
Primary = 0.56 cfs @ 12.61 hrs, Volume= 0.110 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP1: Study Point 1

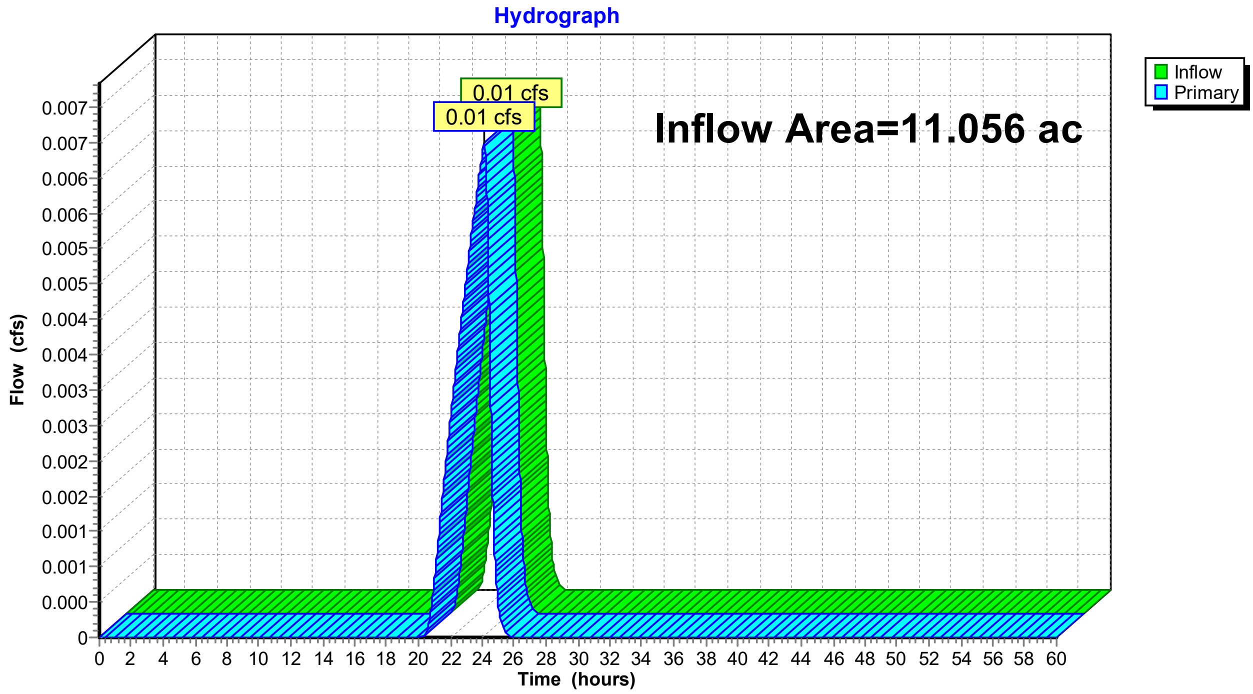


Summary for Link SP2: Study Point 2

Inflow Area =	11.056 ac,	0.00% Impervious, Inflow Depth = 0.00"	for 10-Yr Storm event	
Inflow =	0.01 cfs @	24.12 hrs, Volume=	0.001 af	
Primary =	0.01 cfs @	24.12 hrs, Volume=	0.001 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP2: Study Point 2

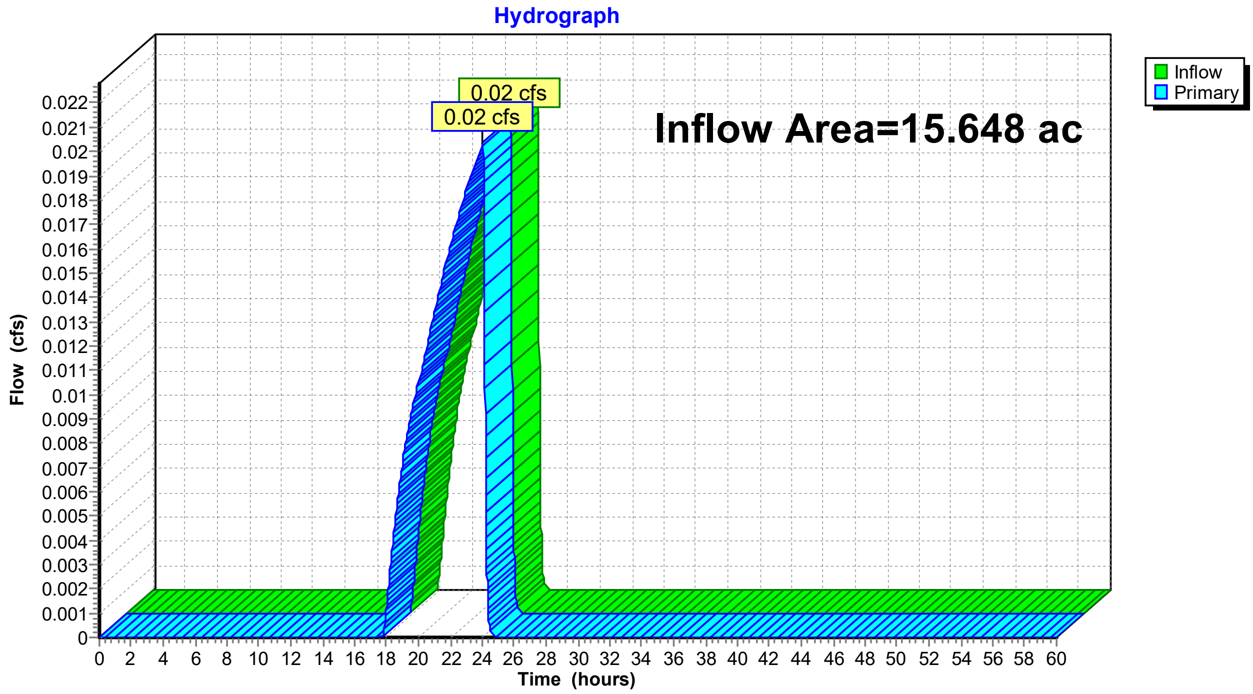


Summary for Link SP3: Study Point 3

Inflow Area = 15.648 ac, 0.56% Impervious, Inflow Depth = 0.01" for 10-Yr Storm event
Inflow = 0.02 cfs @ 24.01 hrs, Volume= 0.007 af
Primary = 0.02 cfs @ 24.01 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP3: Study Point 3

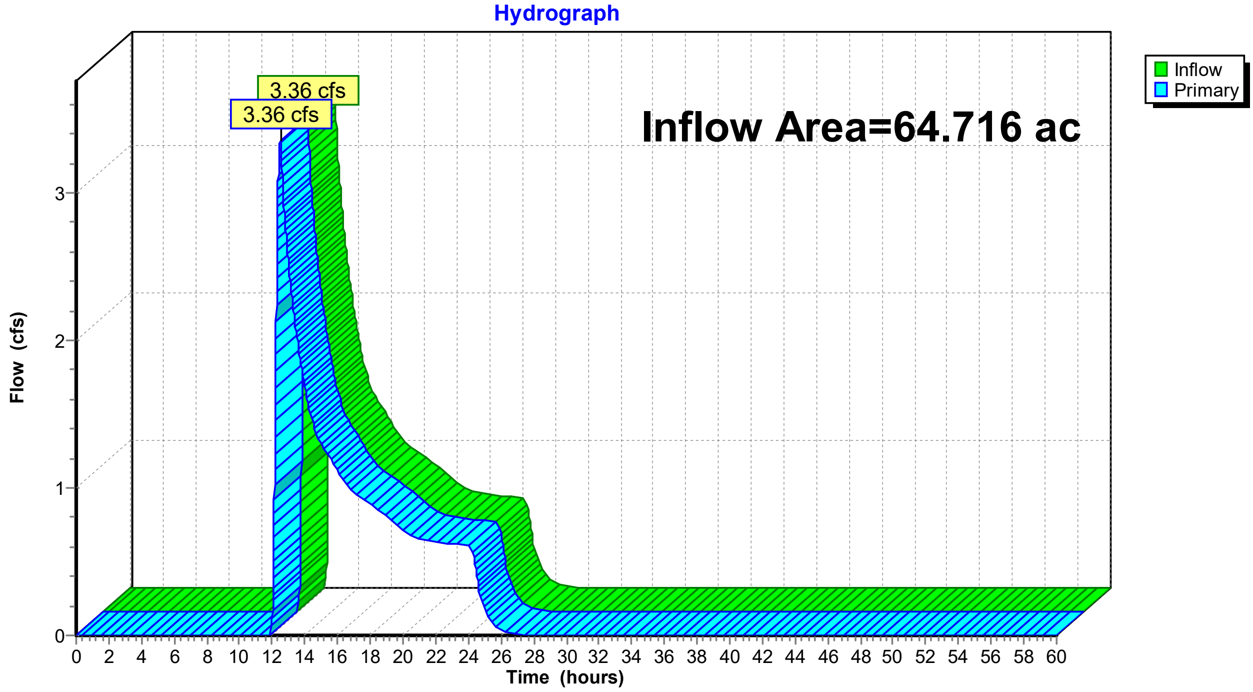


Summary for Link SP4: Study Point 4

Inflow Area =	64.716 ac,	2.50% Impervious, Inflow Depth = 0.21"	for 10-Yr Storm event	
Inflow =	3.36 cfs @	12.49 hrs, Volume=	1.146 af	
Primary =	3.36 cfs @	12.49 hrs, Volume=	1.146 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP4: Study Point 4

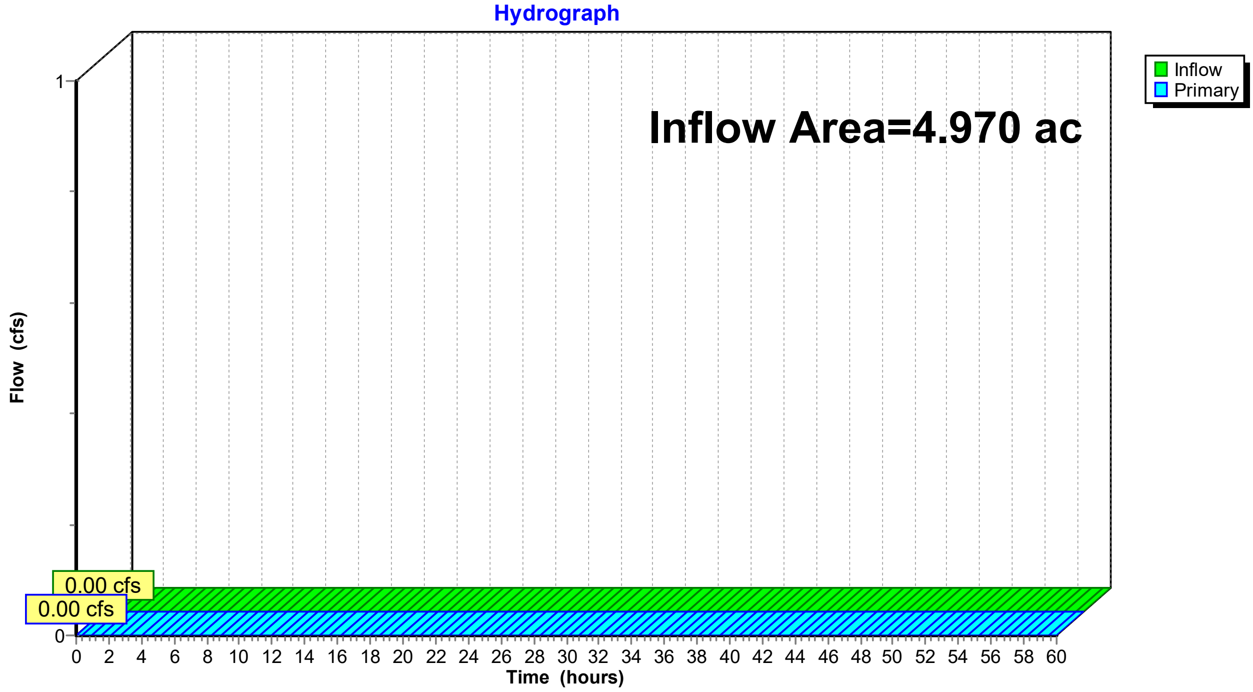


Summary for Link SP5: Study Point 5

Inflow Area =	4.970 ac,	0.00% Impervious,	Inflow Depth = 0.00"	for 10-Yr Storm 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= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP5: Study Point 5

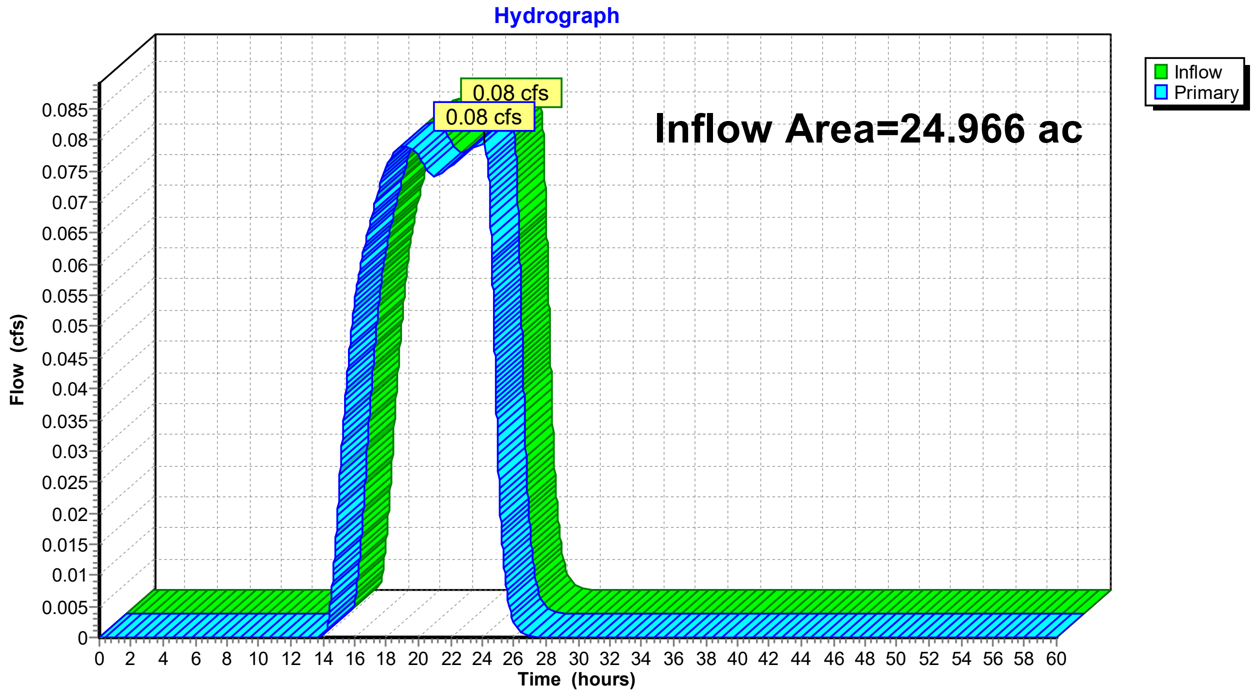


Summary for Link SP6: Study Point 6

Inflow Area =	24.966 ac,	5.81% Impervious, Inflow Depth = 0.03"	for 10-Yr Storm event	
Inflow =	0.08 cfs @	24.10 hrs, Volume=	0.059 af	
Primary =	0.08 cfs @	24.10 hrs, Volume=	0.059 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP6: Study Point 6



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1.1aS1: North Array East Runoff Area=5.874 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=788' Tc=18.8 min CN=30 Runoff=0.02 cfs 0.012 af

Subcatchment 1.1aS2: North Array East Runoff Area=8.467 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=931' Tc=21.1 min CN=30 Runoff=0.03 cfs 0.017 af

Subcatchment 1.1aS3: North Array West Runoff Area=5.792 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=1,031' Tc=19.7 min CN=30 Runoff=0.02 cfs 0.012 af

Subcatchment 1.1aS4: North Array West Runoff Area=12.825 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=1,562' Tc=26.1 min CN=30 Runoff=0.05 cfs 0.026 af

Subcatchment 1.1bS1: North Road - East Runoff Area=1.333 ac 0.53% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=71 Runoff=5.85 cfs 0.272 af

Subcatchment 1.1bS2: North Road - West Runoff Area=0.651 ac 1.08% Impervious Runoff Depth=2.19"
Tc=6.0 min CN=68 Runoff=2.56 cfs 0.119 af

Subcatchment 1.2aS1: Middle Array East Runoff Area=7.876 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=865' Tc=19.1 min CN=30 Runoff=0.03 cfs 0.016 af

Subcatchment 1.2aS2: Middle Array Center Runoff Area=8.911 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=825' Tc=18.1 min CN=30 Runoff=0.03 cfs 0.018 af

Subcatchment 1.2aS3: Middle Array West Runoff Area=5.500 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=882' Tc=18.5 min CN=30 Runoff=0.02 cfs 0.011 af

Subcatchment 1.2bS1: East Road - West Runoff Area=0.727 ac 0.00% Impervious Runoff Depth=2.11"
Tc=6.0 min CN=67 Runoff=2.75 cfs 0.128 af

Subcatchment 1.2bS2: South Road Runoff Area=0.854 ac 0.47% Impervious Runoff Depth=1.41"
Flow Length=308' Tc=13.7 min CN=58 Runoff=1.51 cfs 0.101 af

Subcatchment 1.2bS3: South Road Runoff Area=0.815 ac 1.35% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=71 Runoff=3.57 cfs 0.166 af

Subcatchment 1.3aS1: Surface Discharge Runoff Area=279.312 ac 0.00% Impervious Runoff Depth=0.30"
Flow Length=6,771' Tc=201.7 min CN=39 Runoff=9.14 cfs 6.873 af

Subcatchment 1.3bS: Access Rd to Pond 3 Runoff Area=0.695 ac 0.00% Impervious Runoff Depth=0.94"
Tc=6.0 min CN=51 Runoff=1.02 cfs 0.054 af

Subcatchment 2S: Runoff Area=11.056 ac 0.00% Impervious Runoff Depth=0.30"
Flow Length=2,342' Tc=36.0 min CN=39 Runoff=0.66 cfs 0.272 af

Subcatchment 3S: Runoff Area=15.648 ac 0.56% Impervious Runoff Depth=0.34"
Flow Length=886' Tc=12.7 min CN=40 Runoff=2.04 cfs 0.442 af

Subcatchment 4.1S: Runoff Area=11.663 ac 2.80% Impervious Runoff Depth=0.59"
Flow Length=845' Tc=15.8 min CN=45 Runoff=4.82 cfs 0.570 af

Subcatchment 4.2aS: Runoff Area=27.117 ac 0.00% Impervious Runoff Depth=0.94"
Flow Length=1,640' Tc=38.9 min CN=51 Runoff=13.31 cfs 2.121 af

Subcatchment 4.2bS: Runoff Area=0.470 ac 0.00% Impervious Runoff Depth=2.53"
Tc=6.0 min CN=72 Runoff=2.13 cfs 0.099 af

Subcatchment 4.3S: Runoff Area=25.466 ac 5.08% Impervious Runoff Depth=1.34"
Flow Length=2,280' Tc=36.5 min CN=57 Runoff=22.16 cfs 2.846 af

Subcatchment 5S: Runoff Area=4.970 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=1,180' Tc=17.5 min CN=30 Runoff=0.02 cfs 0.010 af

Subcatchment 6S: Runoff Area=24.966 ac 5.81% Impervious Runoff Depth=0.48"
Flow Length=1,961' Tc=60.1 min CN=43 Runoff=3.11 cfs 1.002 af

Reach 1.1aR1: Bypass Swale Avg. Flow Depth=0.03' Max Vel=0.41 fps Inflow=0.02 cfs 0.012 af
n=0.035 L=580.0' S=0.0108 '/' Capacity=56.37 cfs Outflow=0.02 cfs 0.012 af

Reach 1.1aR2: Bypass Swale Avg. Flow Depth=0.03' Max Vel=0.76 fps Inflow=0.05 cfs 0.029 af
n=0.035 L=557.4' S=0.0284 '/' Capacity=91.27 cfs Outflow=0.05 cfs 0.029 af

Reach 1.1aR3: Bypass Swale Avg. Flow Depth=0.04' Max Vel=0.90 fps Inflow=0.07 cfs 0.041 af
n=0.035 L=557.5' S=0.0352 '/' Capacity=101.68 cfs Outflow=0.07 cfs 0.041 af

Reach 1.1aR4: Bypass Swale Avg. Flow Depth=0.05' Max Vel=1.10 fps Inflow=0.12 cfs 0.066 af
n=0.035 L=580.5' S=0.0362 '/' Capacity=103.04 cfs Outflow=0.12 cfs 0.066 af

Reach 1.1bR1: North Road Conveyance Avg. Flow Depth=0.42' Max Vel=2.90 fps Inflow=5.85 cfs 0.272 af
n=0.035 L=1,733.0' S=0.0240 '/' Capacity=111.65 cfs Outflow=3.95 cfs 0.272 af

Reach 1.1bR2: North Road Conveyance Avg. Flow Depth=0.45' Max Vel=3.81 fps Inflow=6.08 cfs 0.391 af
n=0.035 L=593.3' S=0.0380 '/' Capacity=140.36 cfs Outflow=5.77 cfs 0.391 af

Reach 1.2aR1: Bypass Swale Avg. Flow Depth=0.03' Max Vel=0.54 fps Inflow=0.03 cfs 0.016 af
n=0.035 L=524.2' S=0.0188 '/' Capacity=74.30 cfs Outflow=0.03 cfs 0.016 af

Reach 1.2aR2: Bypass Swale Avg. Flow Depth=0.04' Max Vel=0.71 fps Inflow=0.06 cfs 0.034 af
n=0.035 L=556.0' S=0.0204 '/' Capacity=77.47 cfs Outflow=0.06 cfs 0.034 af

Reach 1.2aR3: Bypass Swale Avg. Flow Depth=0.04' Max Vel=0.63 fps Inflow=0.08 cfs 0.045 af
n=0.035 L=249.0' S=0.0153 '/' Capacity=81.84 cfs Outflow=0.08 cfs 0.045 af

Reach 1.2bR1: East Road Conveyance Avg. Flow Depth=0.27' Max Vel=3.17 fps Inflow=2.75 cfs 0.128 af
n=0.035 L=731.4' S=0.0456 '/' Capacity=79.22 cfs Outflow=2.43 cfs 0.128 af

Reach 1.2bR2: South Road Conveyance Avg. Flow Depth=0.42' Max Vel=2.49 fps Inflow=3.77 cfs 0.228 af
n=0.035 L=604.5' S=0.0177 '/' Capacity=95.76 cfs Outflow=3.39 cfs 0.228 af

Reach 1.2bR3: South Road Conveyance Avg. Flow Depth=0.52' Max Vel=2.88 fps Inflow=5.95 cfs 0.394 af
n=0.035 L=755.9' S=0.0187 '/' Capacity=98.64 cfs Outflow=5.31 cfs 0.394 af

Reach 4.1R1: Bypass Swale Avg. Flow Depth=0.79' Max Vel=3.69 fps Inflow=4.82 cfs 0.570 af
n=0.035 L=570.0' S=0.0303 '/' Capacity=54.88 cfs Outflow=4.59 cfs 0.570 af

Reach 4.1R2: Ex Stream Avg. Flow Depth=0.31' Max Vel=1.85 fps Inflow=10.59 cfs 2.700 af
n=0.035 L=740.0' S=0.0099 '/' Capacity=588.81 cfs Outflow=10.53 cfs 2.700 af

Reach 4.2bR: Conveyance Swale Avg. Flow Depth=0.25' Max Vel=2.91 fps Inflow=2.13 cfs 0.099 af
n=0.035 L=565.0' S=0.0432 '/' Capacity=77.09 cfs Outflow=1.95 cfs 0.099 af

Pond 1.1aC1: TS1 Culvert Peak Elev=1,487.60' Inflow=0.02 cfs 0.012 af
36.3" x 22.5", R=18.8"/51.0" Pipe Arch Culvert n=0.012 L=47.0' S=0.0162 '/' Outflow=0.02 cfs 0.012 af

Pond 1.1aC2: TS2 Culvert Peak Elev=1,470.83' Inflow=0.05 cfs 0.029 af
48.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0262 '/' Outflow=0.05 cfs 0.029 af

Pond 1.1aC3: TS3 Culvert Peak Elev=1,449.58' Inflow=0.07 cfs 0.041 af
60.0" x 24.0" Box Culvert n=0.012 L=47.2' S=0.0405 '/' Outflow=0.07 cfs 0.041 af

Pond 1.1aP: North Road Bypass OC Peak Elev=1,428.53' Storage=0.029 af Inflow=0.12 cfs 0.066 af
Discarded=0.01 cfs 0.028 af Primary=0.11 cfs 0.031 af Outflow=0.12 cfs 0.059 af

Pond 1.1bC1: TS4 Culvert Peak Elev=1,450.46' Inflow=3.95 cfs 0.272 af
18.0" Round Culvert n=0.012 L=45.9' S=0.0486 '/' Outflow=3.95 cfs 0.272 af

Pond 1.1bP1: Dry Swale Peak Elev=1,426.74' Storage=428 cf Inflow=5.77 cfs 0.391 af
Discarded=0.01 cfs 0.005 af Primary=5.77 cfs 0.386 af Outflow=5.77 cfs 0.391 af

Pond 1.1bP2: North Road Detention Pond Peak Elev=1,424.23' Storage=0.056 af Inflow=5.77 cfs 0.386 af
Discarded=0.02 cfs 0.053 af Primary=5.63 cfs 0.318 af Outflow=5.65 cfs 0.372 af

Pond 1.2aC1: TS 7 Culvert Peak Elev=1,444.24' Inflow=0.03 cfs 0.016 af
36.0" x 24.0" Box Culvert n=0.012 L=47.0' S=0.0215 '/' Outflow=0.03 cfs 0.016 af

Pond 1.2aC2: TS8 Culvert Peak Elev=1,431.67' Inflow=0.06 cfs 0.034 af
60.0" x 24.0" Box Culvert n=0.012 L=47.5' S=0.0114 '/' Outflow=0.06 cfs 0.034 af

Pond 1.2aP: South Road Bypass OC Peak Elev=1,424.42' Storage=0.002 af Inflow=0.08 cfs 0.045 af
Discarded=0.08 cfs 0.045 af Secondary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.045 af

Pond 1.2bC1: East Road Culvert Peak Elev=1,455.17' Inflow=2.43 cfs 0.128 af
15.0" Round Culvert n=0.012 L=41.6' S=0.0173 '/' Outflow=2.43 cfs 0.128 af

Pond 1.2bC2: TS6 Culvert Peak Elev=1,444.38' Inflow=3.39 cfs 0.228 af
18.0" Round Culvert n=0.012 L=44.3' S=0.0151 '/' Outflow=3.39 cfs 0.228 af

Pond 1.2bP: South Road Treatment Pond Peak Elev=1,426.26' Storage=0.038 af Inflow=5.31 cfs 0.394 af
Discarded=0.31 cfs 0.232 af Primary=4.98 cfs 0.162 af Outflow=5.30 cfs 0.394 af

Pond 1.3P: Pond 3 - Access Rd West Peak Elev=1,456.62' Storage=566 cf Inflow=1.02 cfs 0.054 af
Discarded=0.14 cfs 0.054 af Primary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.054 af

Pond 4.2bP: Pond 4 - Access Rd East Peak Elev=1,448.33' Storage=1,559 cf Inflow=1.95 cfs 0.099 af
Discarded=0.14 cfs 0.089 af Primary=0.55 cfs 0.011 af Outflow=0.69 cfs 0.099 af

Pond 4.2C: 18" Culvert Peak Elev=1,433.72' Storage=10,213 cf Inflow=13.46 cfs 2.131 af
18.0" Round Culvert n=0.012 L=44.0' S=0.0148 '/' Outflow=9.09 cfs 2.130 af

Pond 4.3C: 24" Culvert Peak Elev=1,434.50' Inflow=22.16 cfs 2.846 af
Outflow=22.16 cfs 2.846 af

Link 1.1L:	Inflow=5.63 cfs 0.349 af Primary=5.63 cfs 0.349 af
Link 1.2L:	Inflow=4.98 cfs 0.162 af Primary=4.98 cfs 0.162 af
Link SP1: Study Point 1	Inflow=10.61 cfs 7.384 af Primary=10.61 cfs 7.384 af
Link SP2: Study Point 2	Inflow=0.66 cfs 0.272 af Primary=0.66 cfs 0.272 af
Link SP3: Study Point 3	Inflow=2.04 cfs 0.442 af Primary=2.04 cfs 0.442 af
Link SP4: Study Point 4	Inflow=31.02 cfs 5.546 af Primary=31.02 cfs 5.546 af
Link SP5: Study Point 5	Inflow=0.02 cfs 0.010 af Primary=0.02 cfs 0.010 af
Link SP6: Study Point 6	Inflow=3.11 cfs 1.002 af Primary=3.11 cfs 1.002 af

Total Runoff Area = 460.988 ac Runoff Volume = 15.185 af Average Runoff Depth = 0.40"
99.31% Pervious = 457.801 ac 0.69% Impervious = 3.187 ac

Summary for Subcatchment 1.1aS1: North Array East

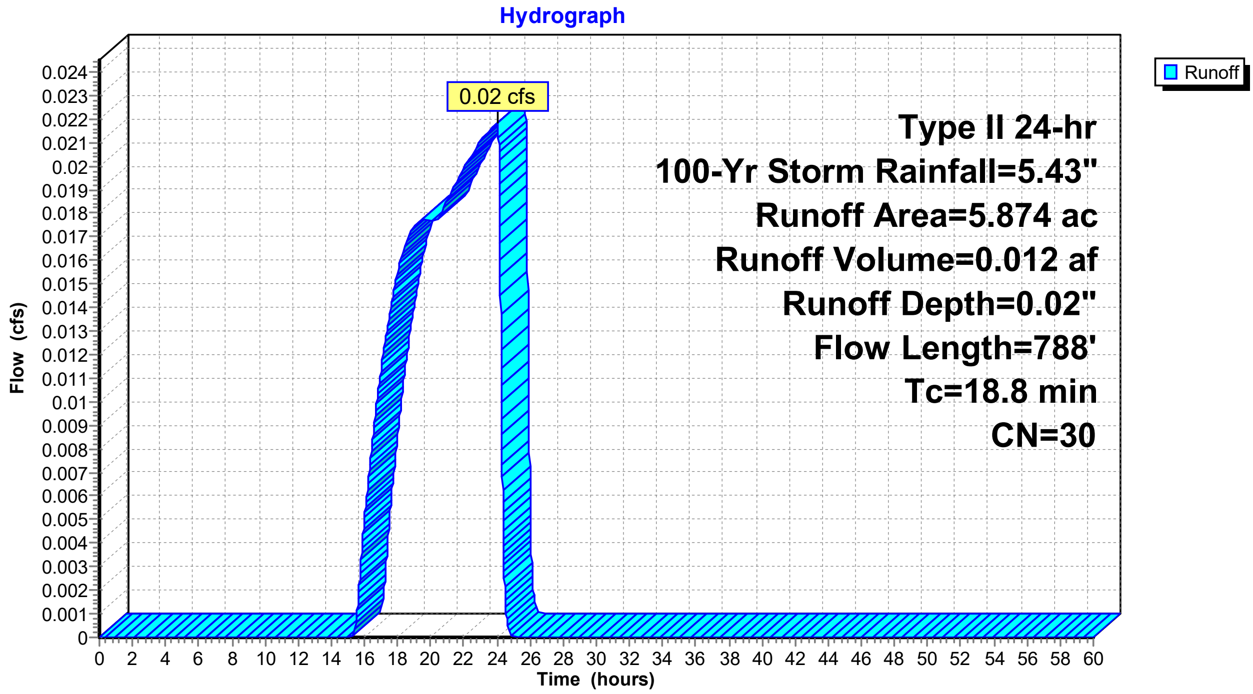
Runoff = 0.02 cfs @ 24.00 hrs, Volume= 0.012 af, Depth= 0.02"
Routed to Reach 1.1aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
5.874	30	Meadow, non-grazed, HSG A
5.874		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0499	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.1	688	0.0526	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.8	788	Total			

Subcatchment 1.1aS1: North Array East



Summary for Subcatchment 1.1aS2: North Array East Center

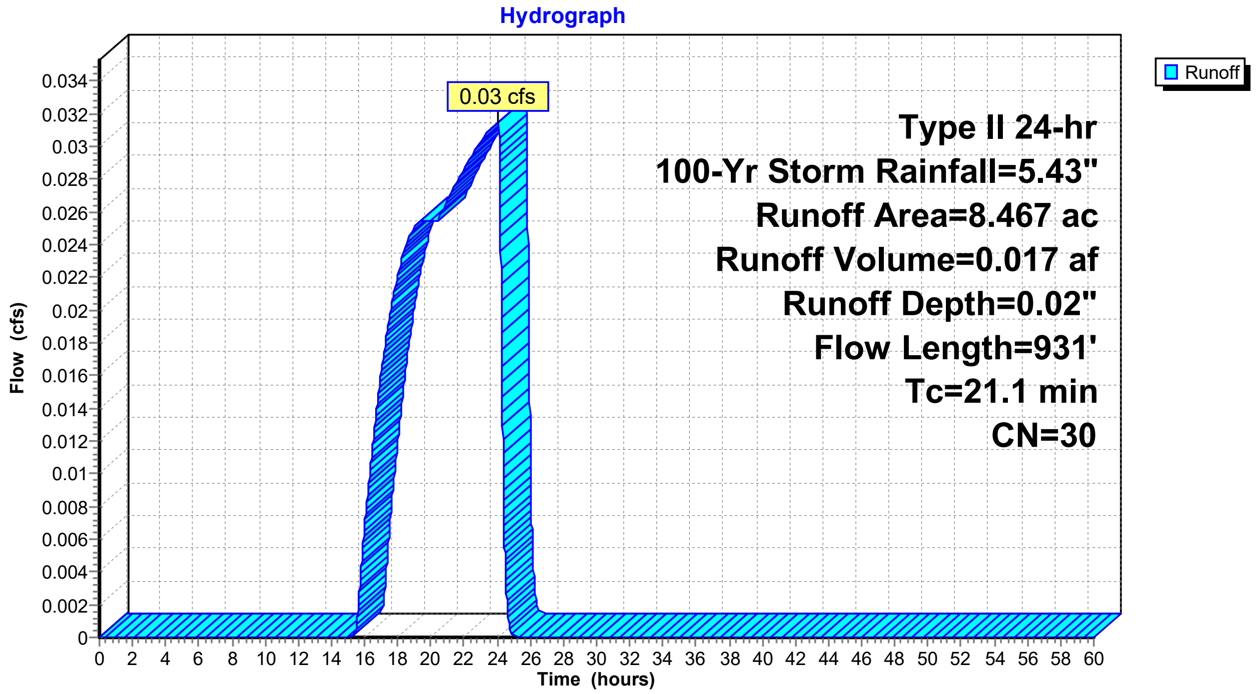
Runoff = 0.03 cfs @ 24.03 hrs, Volume= 0.017 af, Depth= 0.02"
Routed to Reach 1.1aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
8.467	30	Meadow, non-grazed, HSG A
8.467		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0476	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.2	831	0.0463	1.51		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.1	931	Total			

Subcatchment 1.1aS2: North Array East Center



Summary for Subcatchment 1.1aS3: North Array West Center

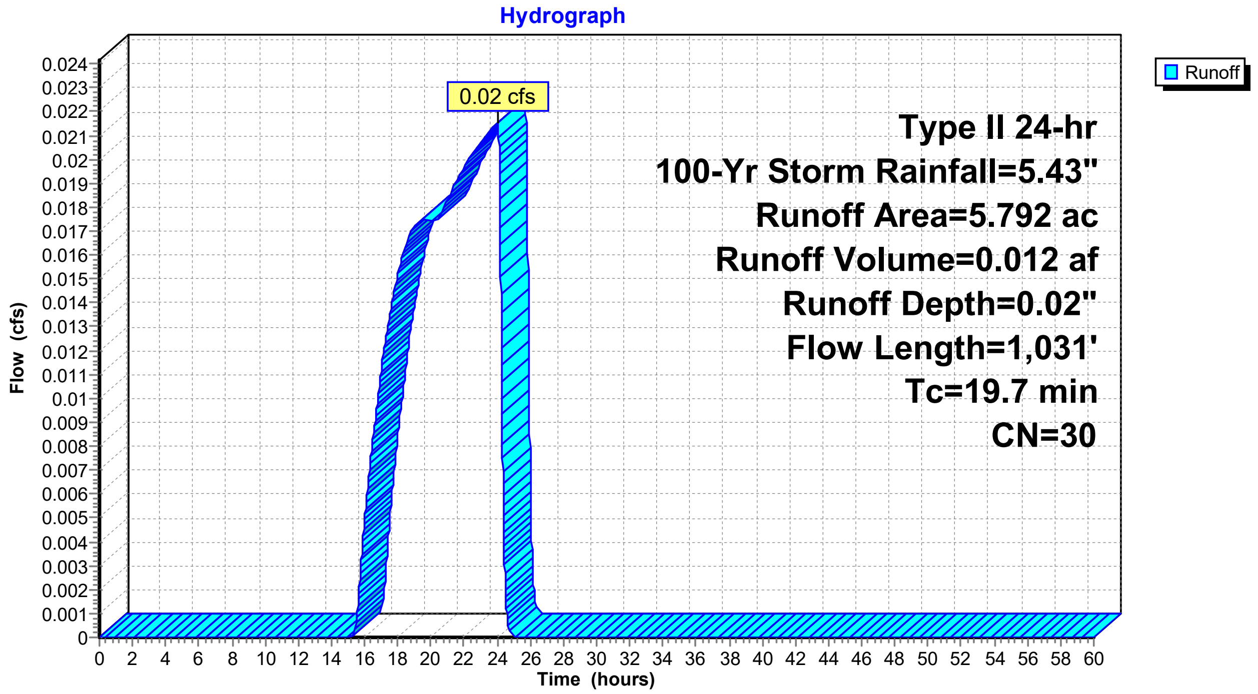
Runoff = 0.02 cfs @ 24.01 hrs, Volume= 0.012 af, Depth= 0.02"
Routed to Reach 1.1aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
5.792	30	Meadow, non-grazed, HSG A
5.792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0618	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
9.0	931	0.0601	1.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.7	1,031	Total			

Subcatchment 1.1aS3: North Array West Center



Summary for Subcatchment 1.1aS4: North Array West

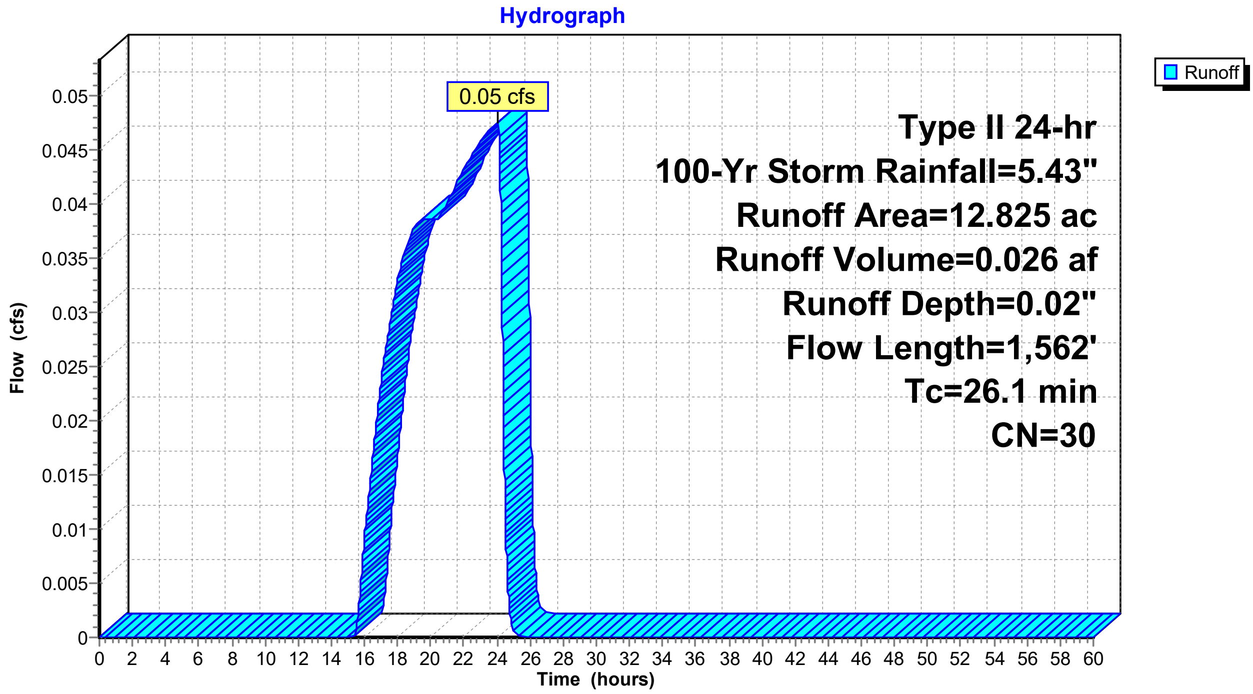
Runoff = 0.05 cfs @ 24.04 hrs, Volume= 0.026 af, Depth= 0.02"
Routed to Reach 1.1aR4 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
12.825	30	Meadow, non-grazed, HSG A
12.825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.1	100	0.0560	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
15.0	1,462	0.0540	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.1	1,562	Total			

Subcatchment 1.1aS4: North Array West



Summary for Subcatchment 1.1bS1: North Road - East

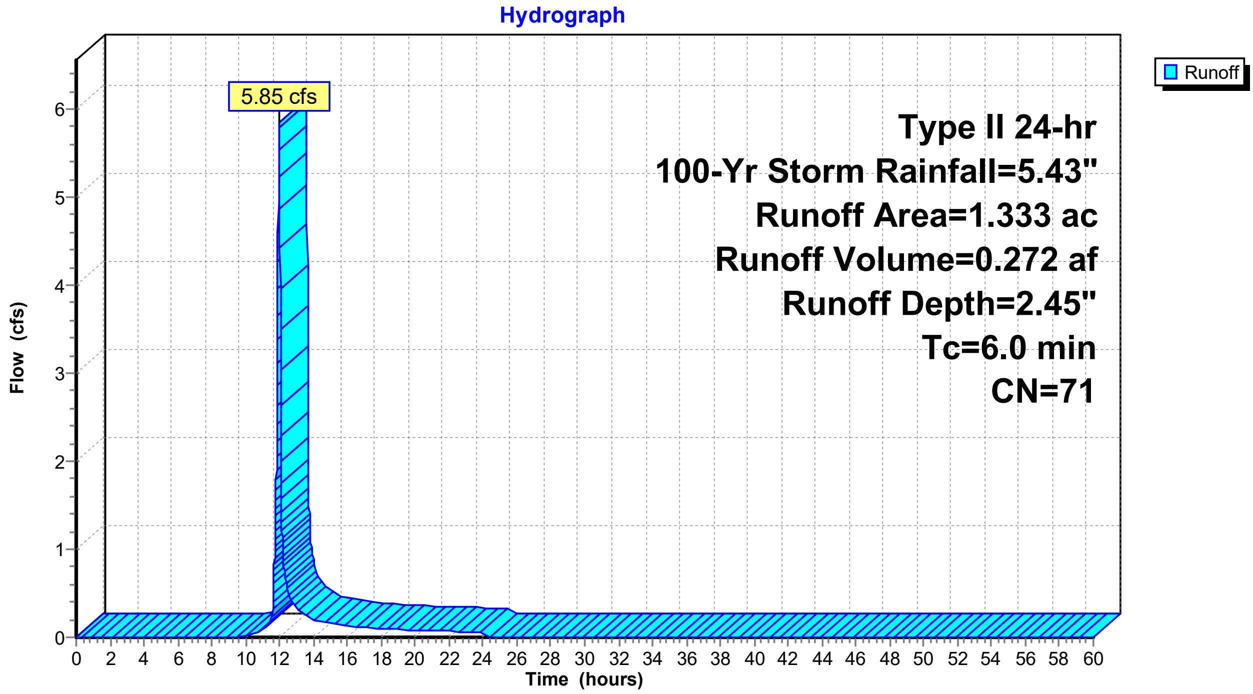
Runoff = 5.85 cfs @ 11.98 hrs, Volume= 0.272 af, Depth= 2.45"
Routed to Reach 1.1bR1 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
0.507	30	Meadow, non-grazed, HSG A
0.819	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
1.333	71	Weighted Average
1.326		99.47% Pervious Area
0.007		0.53% Impervious Area

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

Subcatchment 1.1bS1: North Road - East



Summary for Subcatchment 1.1bS2: North Road - West

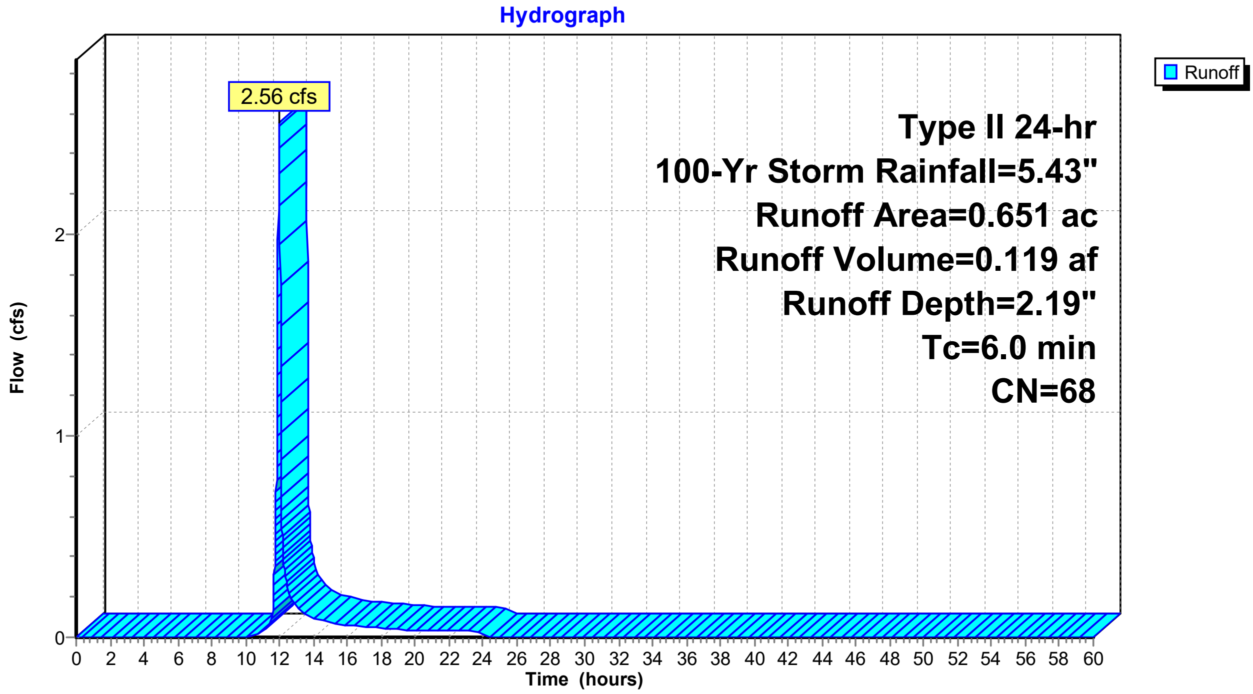
Runoff = 2.56 cfs @ 11.98 hrs, Volume= 0.119 af, Depth= 2.19"
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
0.279	30	Meadow, non-grazed, HSG A
0.365	96	Gravel surface, HSG A
0.007	98	Roofs, HSG A
0.651	68	Weighted Average
0.644		98.92% Pervious Area
0.007		1.08% Impervious Area

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

Subcatchment 1.1bS2: North Road - West



Summary for Subcatchment 1.2aS1: Middle Array East

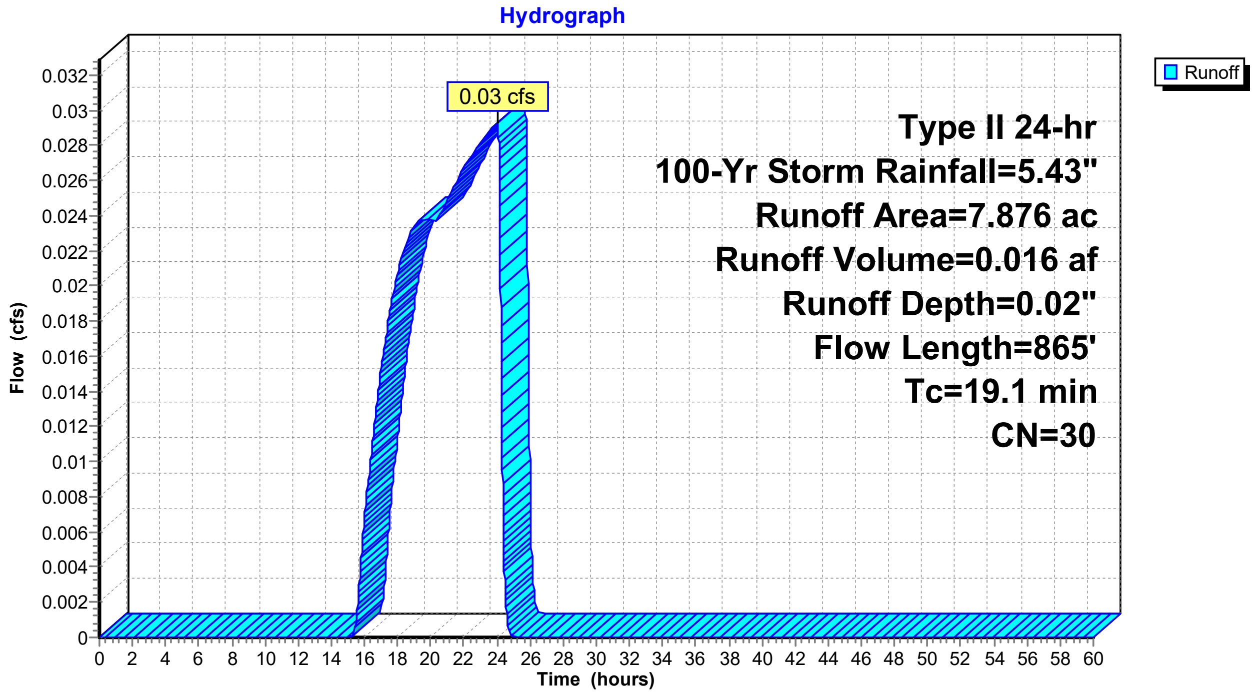
Runoff = 0.03 cfs @ 24.00 hrs, Volume= 0.016 af, Depth= 0.02"
Routed to Reach 1.2aR1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
7.876	30	Meadow, non-grazed, HSG A
7.876		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0628	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.5	765	0.0459	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.1	865	Total			

Subcatchment 1.2aS1: Middle Array East



Summary for Subcatchment 1.2aS2: Middle Array Center

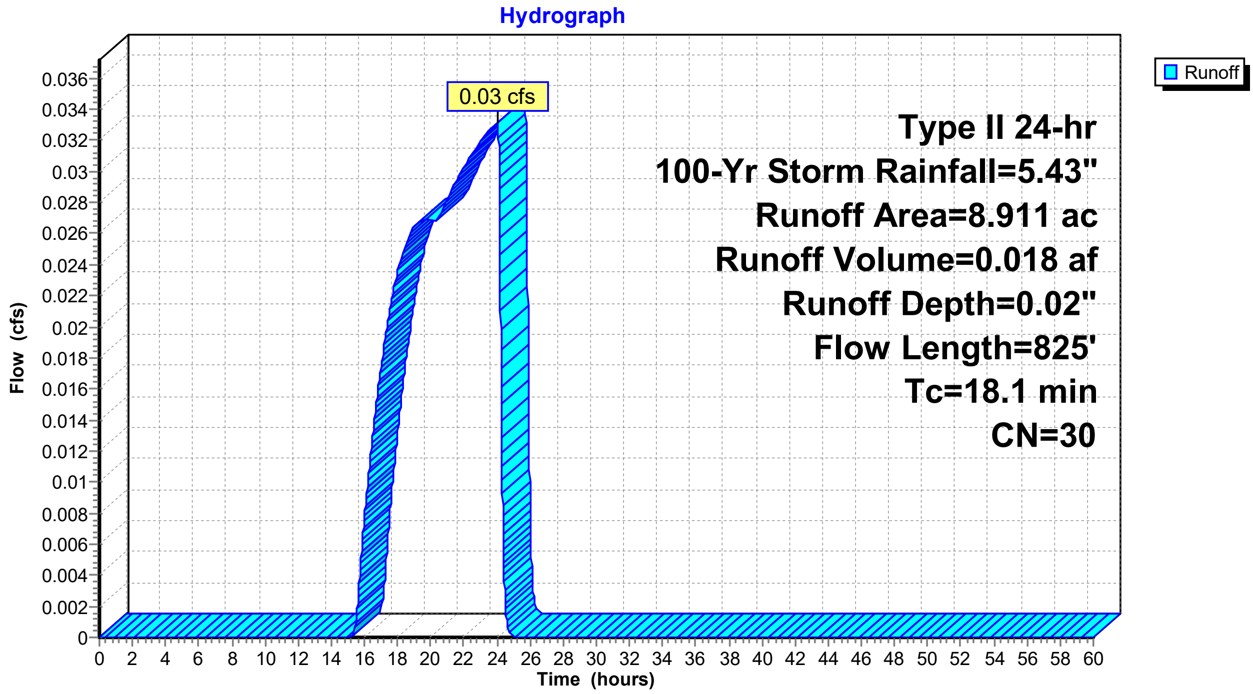
Runoff = 0.03 cfs @ 24.03 hrs, Volume= 0.018 af, Depth= 0.02"
Routed to Reach 1.2aR2 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
8.911	30	Meadow, non-grazed, HSG A
8.911		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0607	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
7.3	725	0.0559	1.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.1	825	Total			

Subcatchment 1.2aS2: Middle Array Center



Summary for Subcatchment 1.2aS3: Middle Array West

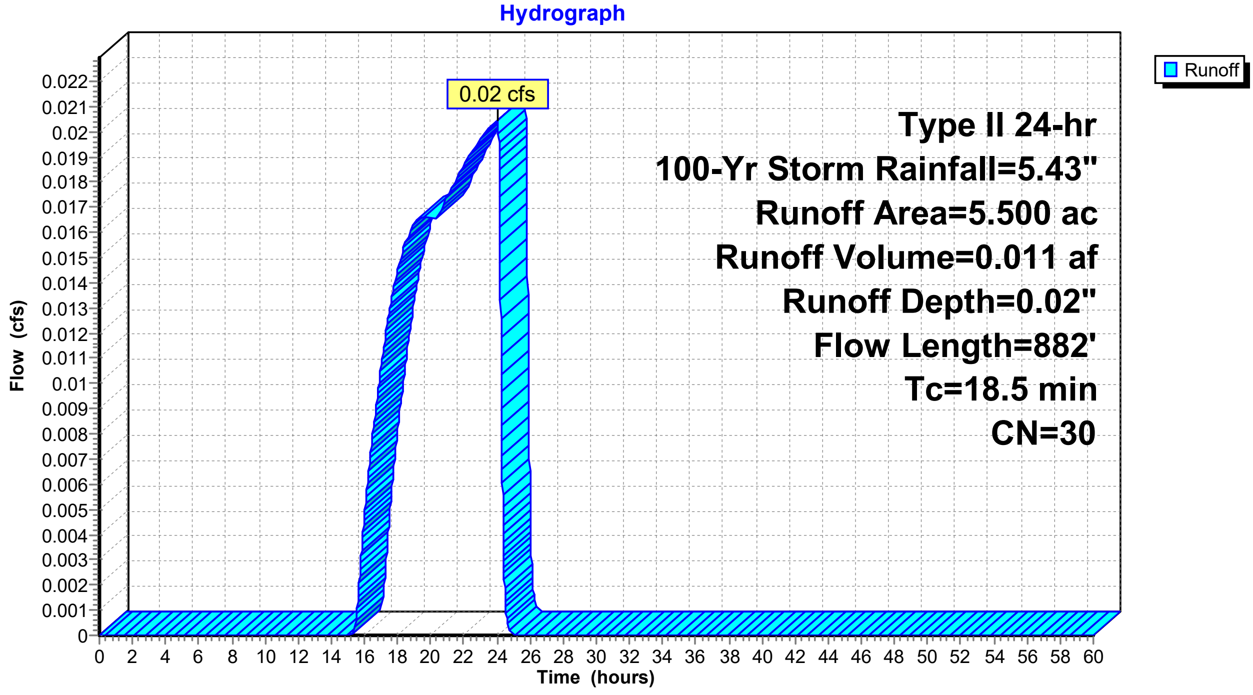
Runoff = 0.02 cfs @ 24.03 hrs, Volume= 0.011 af, Depth= 0.02"
Routed to Reach 1.2aR3 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
5.500	30	Meadow, non-grazed, HSG A
5.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.0660	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
8.1	782	0.0529	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
18.5	882	Total			

Subcatchment 1.2aS3: Middle Array West



Summary for Subcatchment 1.2bS1: East Road - West Ditch

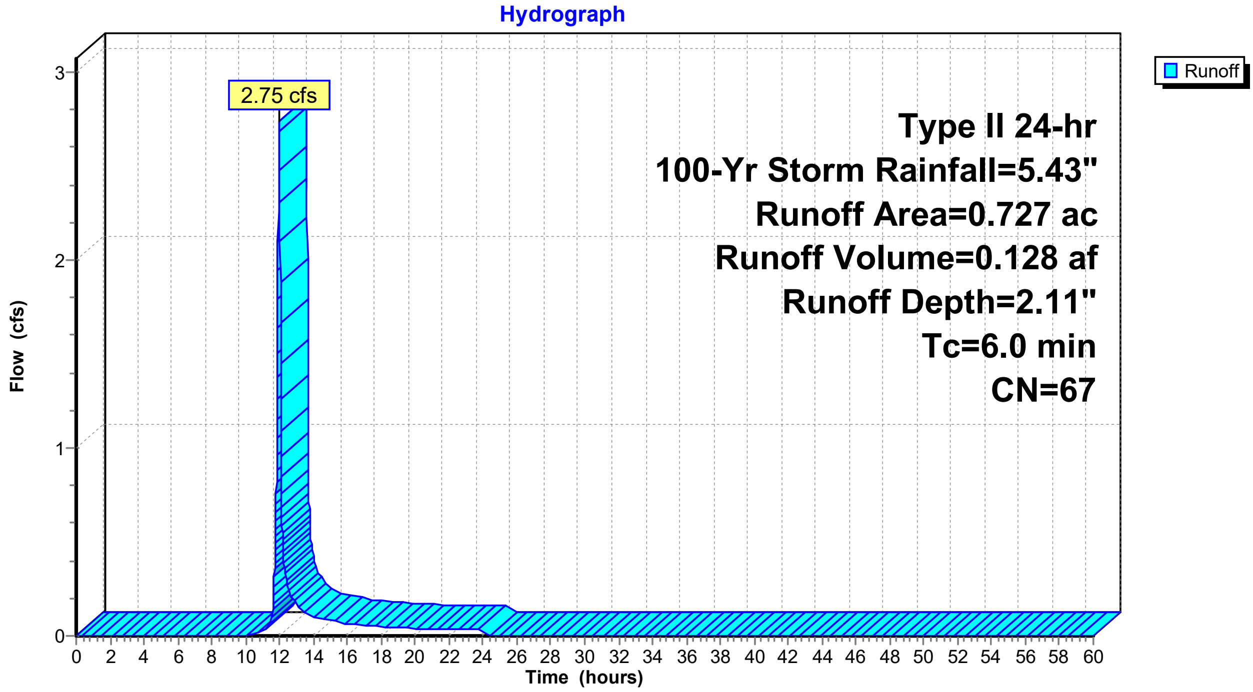
Runoff = 2.75 cfs @ 11.98 hrs, Volume= 0.128 af, Depth= 2.11"
Routed to Reach 1.2bR1 : East Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
0.410	96	Gravel surface, HSG A
0.317	30	Meadow, non-grazed, HSG A
0.727	67	Weighted Average
0.727		100.00% Pervious Area

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

Subcatchment 1.2bS1: East Road - West Ditch



Summary for Subcatchment 1.2bS2: South Road

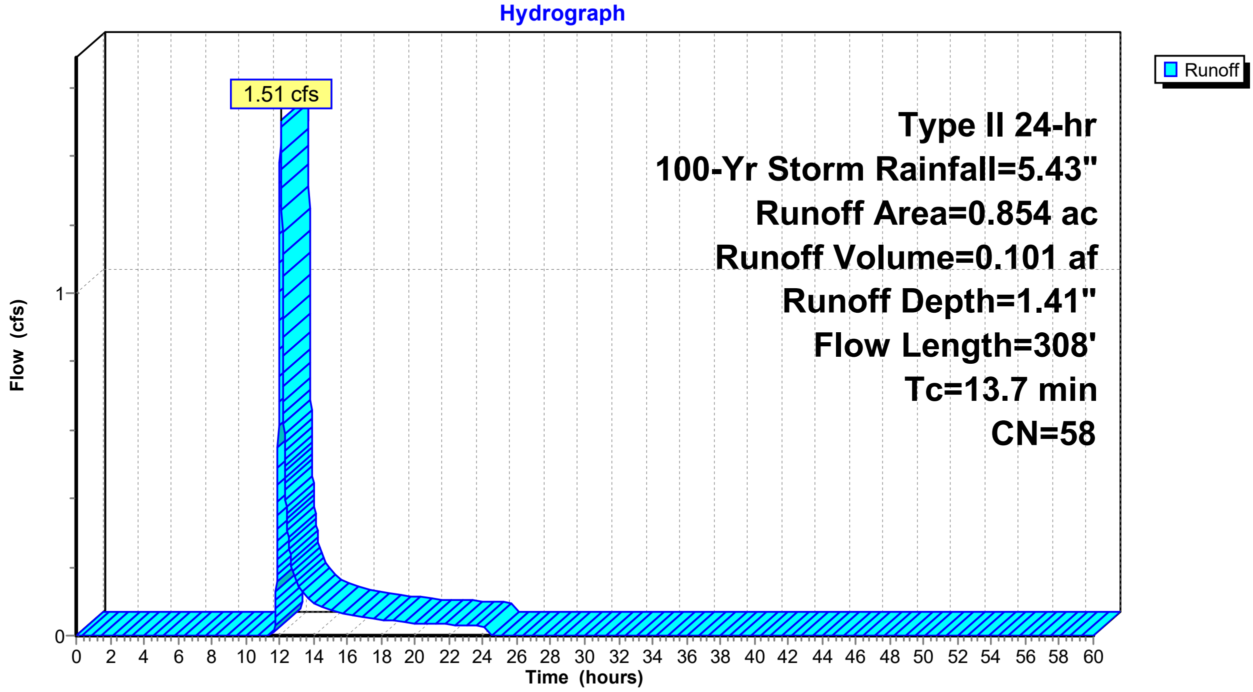
Runoff = 1.51 cfs @ 12.07 hrs, Volume= 0.101 af, Depth= 1.41"
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
	0.498	30	Meadow, non-grazed, HSG A
*	0.352	96	Gravel surface
*	0.004	98	Roofs
	0.854	58	Weighted Average
	0.850		99.53% Pervious Area
	0.004		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0516	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
0.4	25	0.0310	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.31"
5.9	40	0.0429	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.4	208	0.0442	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.7	308	Total			

Subcatchment 1.2bS2: South Road



Summary for Subcatchment 1.2bS3: South Road

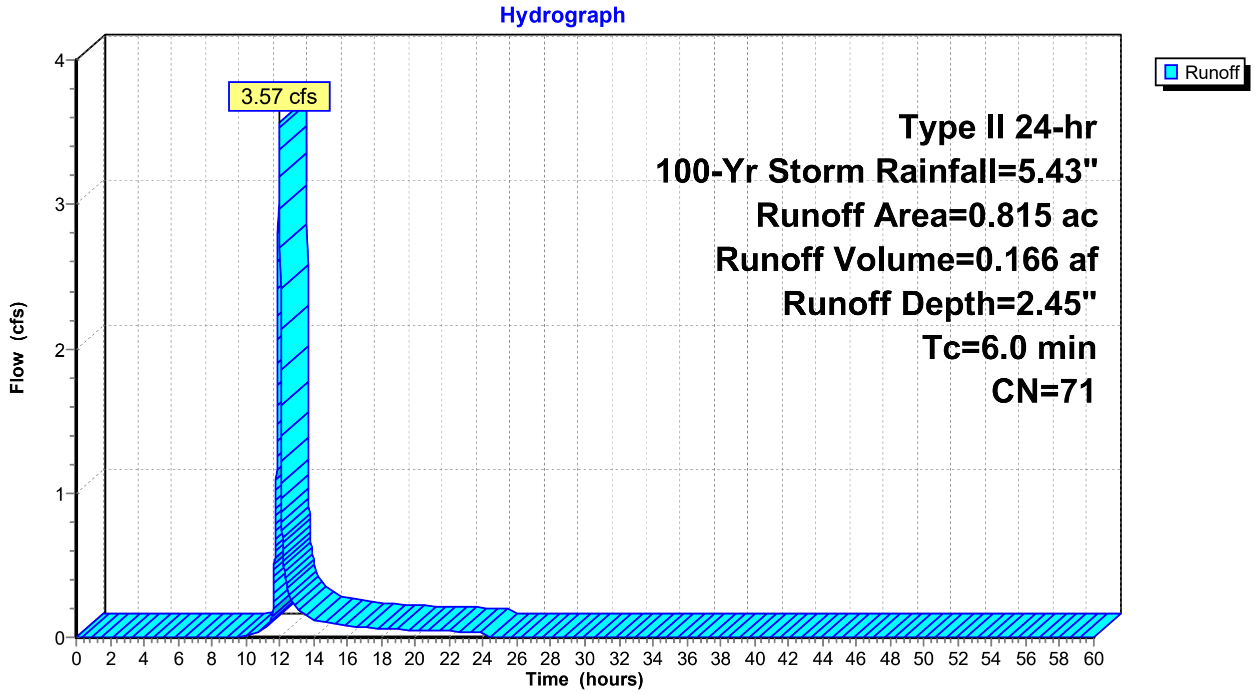
Runoff = 3.57 cfs @ 11.98 hrs, Volume= 0.166 af, Depth= 2.45"
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
	0.313	30	Meadow, non-grazed, HSG A
	0.491	96	Gravel surface, HSG A
*	0.011	98	Roofs
	0.815	71	Weighted Average
	0.804		98.65% Pervious Area
	0.011		1.35% Impervious Area

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

Subcatchment 1.2bS3: South Road



Summary for Subcatchment 1.3aS1: Surface Discharge

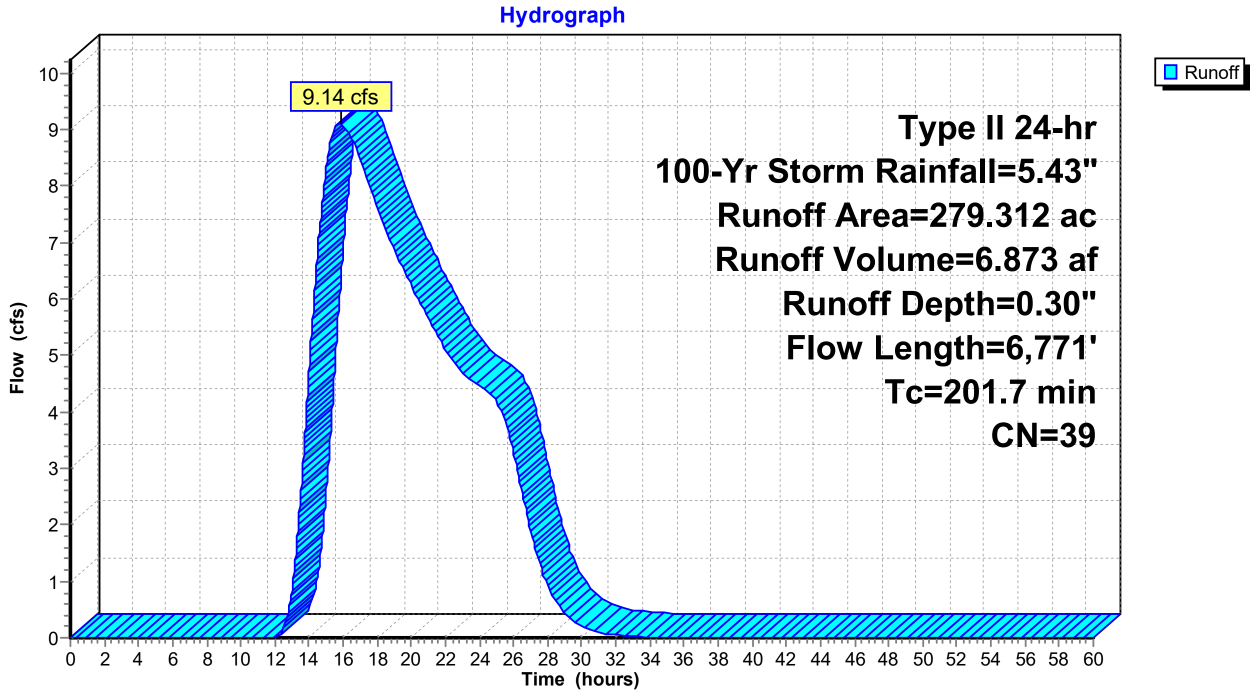
Runoff = 9.14 cfs @ 15.91 hrs, Volume= 6.873 af, Depth= 0.30"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.754	96	Gravel surface
	144.649	30	Meadow, non-grazed, HSG A
	0.566	58	Meadow, non-grazed, HSG B
	25.274	71	Meadow, non-grazed, HSG C
	61.692	30	Woods, Good, HSG A
	32.754	55	Woods, Good, HSG B
	13.623	70	Woods, Good, HSG C
	279.312	39	Weighted Average
	279.312		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	100	0.0764	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
4.7	581	0.1683	2.05		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.7	1,199	0.0241	0.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	189	0.0157	3.84	76.82	**Channel Flow, Rerouted Stream** Area= 20.0 sf Perim= 32.6' r= 0.61' n= 0.035 Earth, dense weeds
154.9	4,646	0.0051	0.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	56	0.0566	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
201.7	6,771	Total			

Subcatchment 1.3aS1: Surface Discharge



Summary for Subcatchment 1.3bS: Access Rd to Pond 3

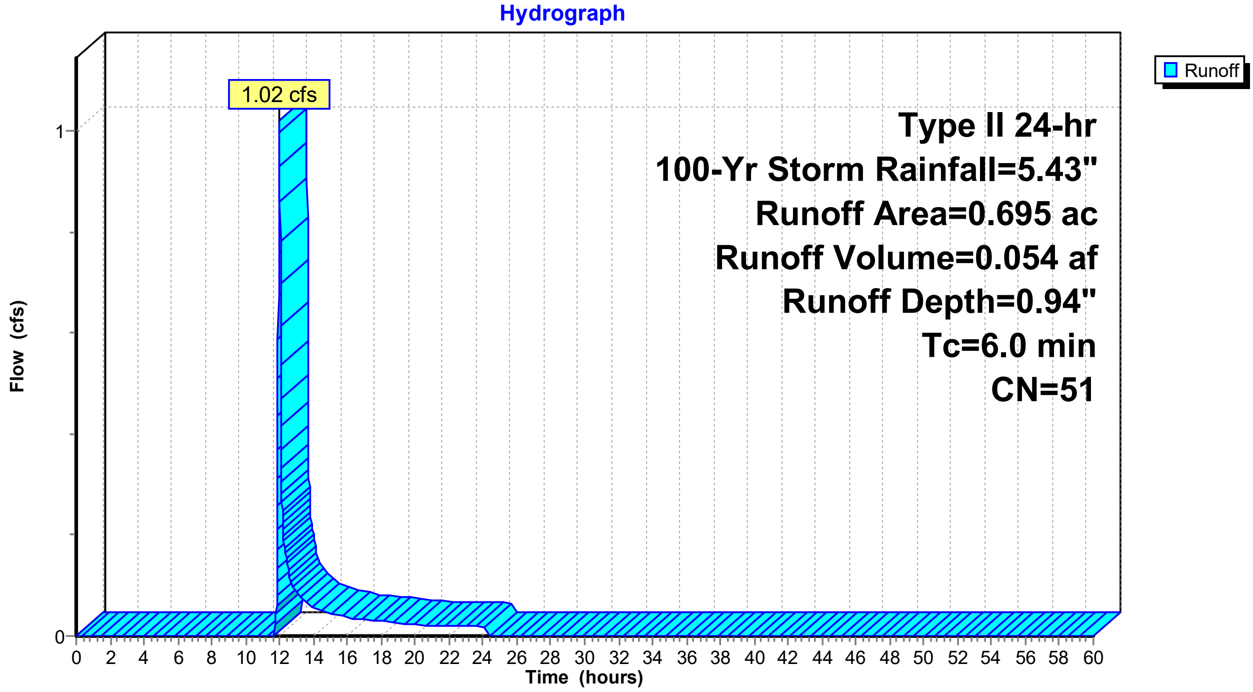
Runoff = 1.02 cfs @ 11.99 hrs, Volume= 0.054 af, Depth= 0.94"
Routed to Pond 1.3P : Pond 3 - Access Rd West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
	0.473	30	Meadow, non-grazed, HSG A
*	0.063	96	Gravel surface, HSG A, Redev
*	0.159	96	Gravel surface, HSG A
	0.695	51	Weighted Average
	0.695		100.00% Pervious Area

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

Subcatchment 1.3bS: Access Rd to Pond 3



Summary for Subcatchment 2S:

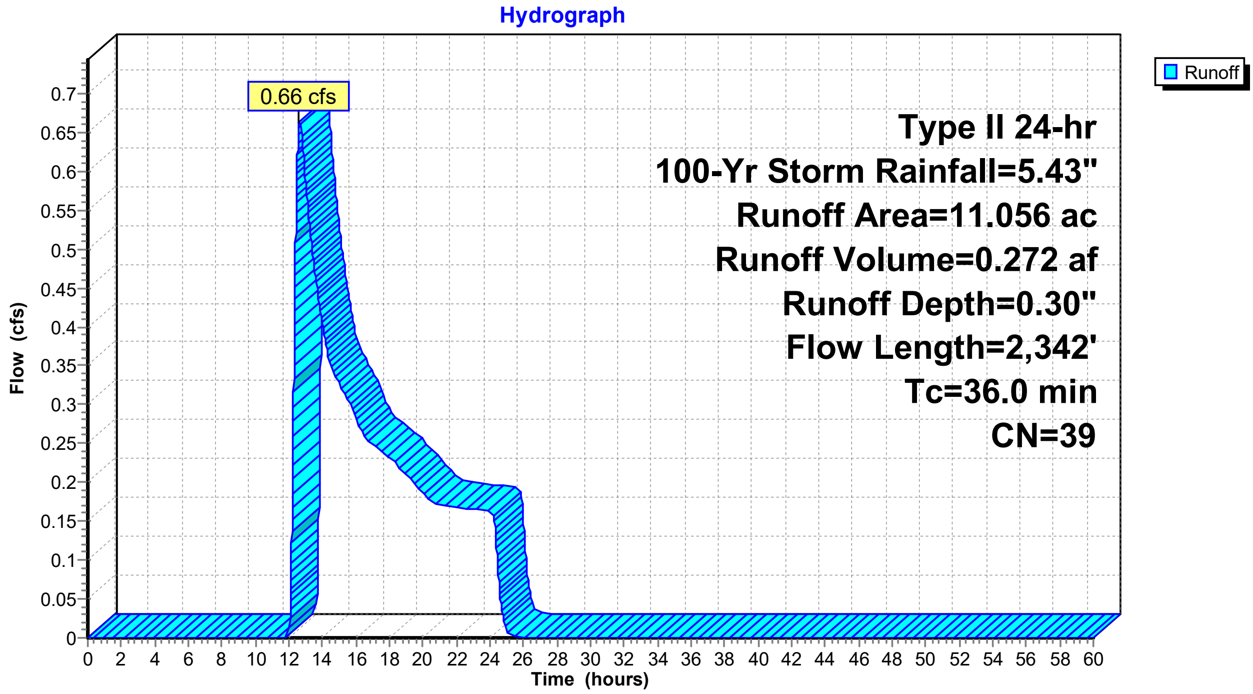
Runoff = 0.66 cfs @ 12.61 hrs, Volume= 0.272 af, Depth= 0.30"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
1.417	96	Gravel surface, HSG A
0.573	39	>75% Grass cover, Good, HSG A
6.530	30	Meadow, non-grazed, HSG A
2.536	30	Woods, Good, HSG A
11.056	39	Weighted Average
11.056		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	100	0.0624	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
2.7	614	0.0535	3.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.1	1,184	0.0543	1.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	115	0.0407	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	68	0.1443	1.90		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	261	0.0118	0.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
36.0	2,342	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

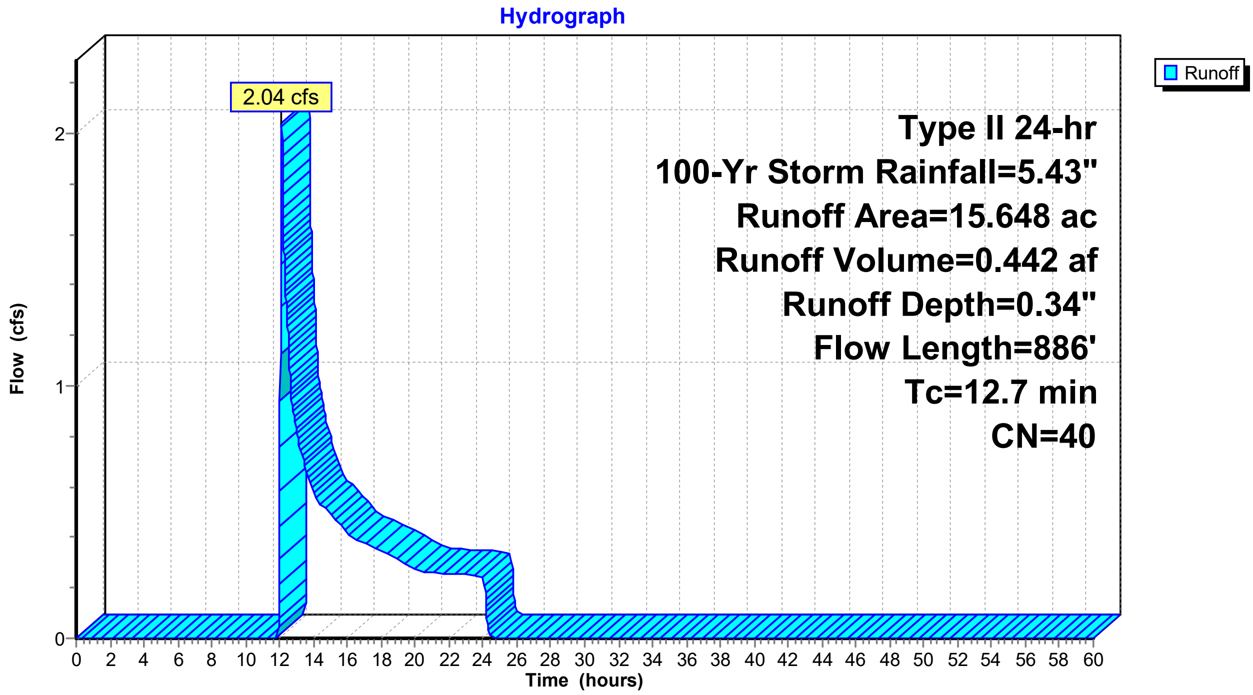
Runoff = 2.04 cfs @ 12.13 hrs, Volume= 0.442 af, Depth= 0.34"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.088	98	Paved Roads & Rooftops
	0.406	39	>75% Grass cover, Good, HSG A
	2.011	61	>75% Grass cover, Good, HSG B
	5.525	30	Meadow, non-grazed, HSG A
	4.276	30	Woods, Good, HSG A
	3.342	55	Woods, Good, HSG B
	15.648	40	Weighted Average
	15.560		99.44% Pervious Area
	0.088		0.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	52	0.0937	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.31"
3.7	625	0.1637	2.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	209	0.0384	0.98		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.7	886	Total			

Subcatchment 3S:



Summary for Subcatchment 4.1S:

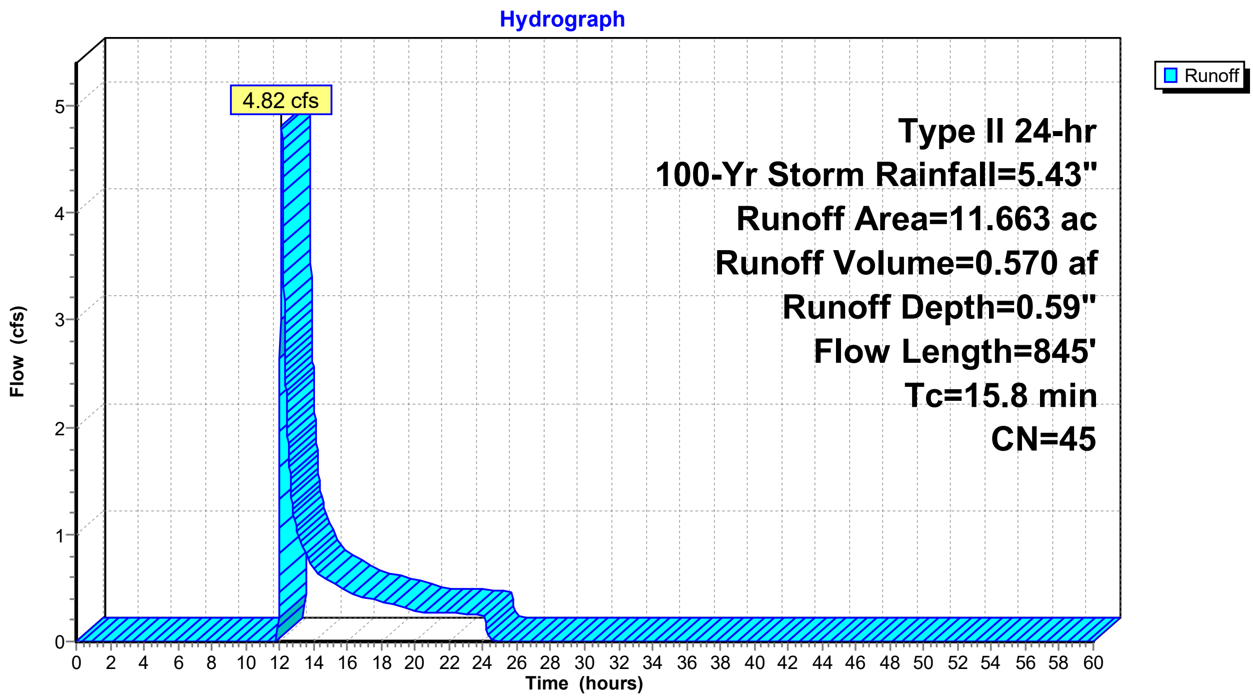
Runoff = 4.82 cfs @ 12.13 hrs, Volume= 0.570 af, Depth= 0.59"
Routed to Reach 4.1R1 : Bypass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.327	98	Paved Roads & Rooftops
*	0.375	96	Gravel surface
	0.165	61	>75% Grass cover, Good, HSG B
	2.544	30	Meadow, non-grazed, HSG A
	0.560	58	Meadow, non-grazed, HSG B
	3.605	30	Woods, Good, HSG A
*	4.087	55	Woods, Good, HSG B
	11.663	45	Weighted Average
	11.336		97.20% Pervious Area
	0.327		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0430	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
2.6	360	0.1077	2.30		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	385	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.8	845	Total			

Subcatchment 4.1S:



Summary for Subcatchment 4.2aS:

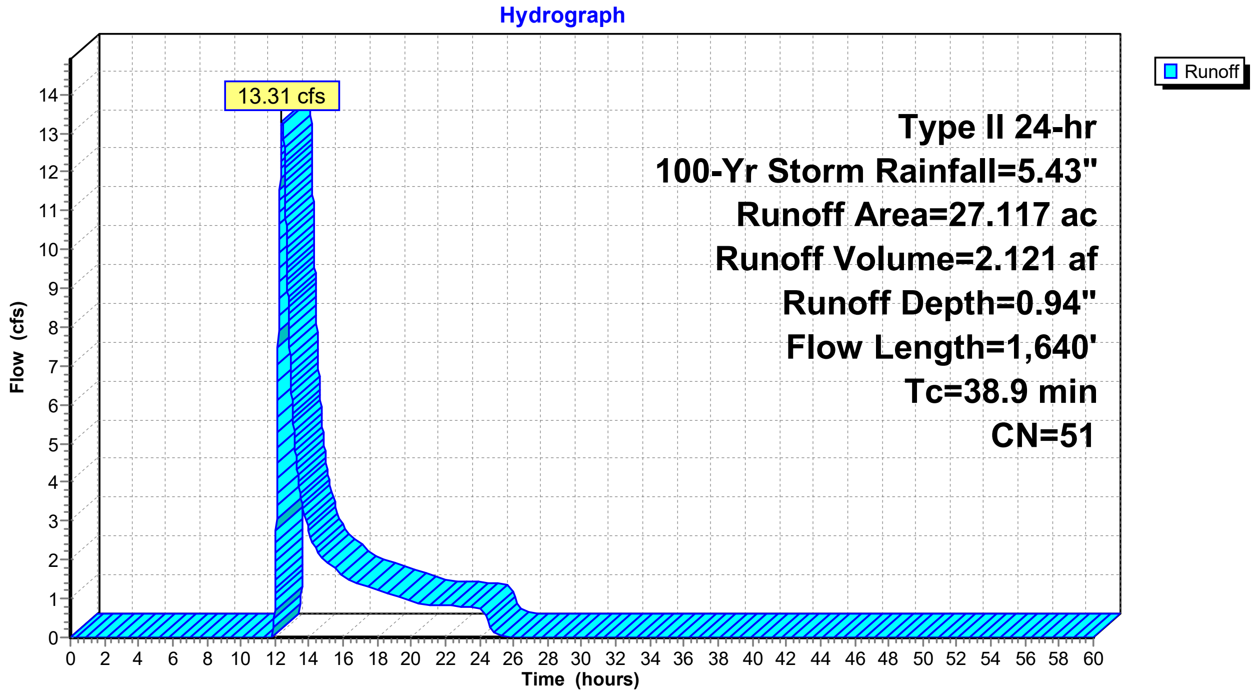
Runoff = 13.31 cfs @ 12.41 hrs, Volume= 2.121 af, Depth= 0.94"
Routed to Pond 4.2C : 18" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	0.238	96	Gravel surface
	4.086	30	Meadow, non-grazed, HSG A
	0.384	58	Meadow, non-grazed, HSG B
	0.977	30	Woods, Good, HSG A
	21.432	55	Woods, Good, HSG B
	27.117	51	Weighted Average
	27.117		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
8.0	878	0.1354	1.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.1	662	0.0144	0.84		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.9	1,640	Total			

Subcatchment 4.2aS:



Summary for Subcatchment 4.2bS:

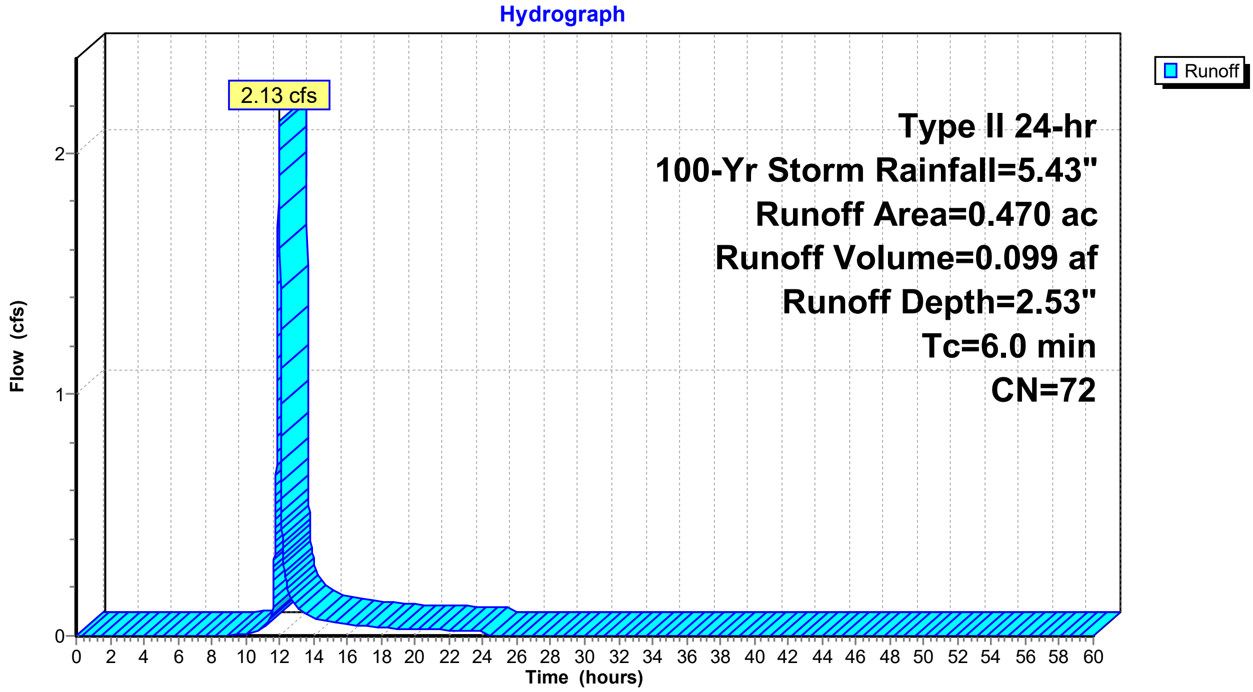
Runoff = 2.13 cfs @ 11.98 hrs, Volume= 0.099 af, Depth= 2.53"
Routed to Reach 4.2bR : Conveyance Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
0.296	96	Gravel surface, HSG A
0.174	30	Meadow, non-grazed, HSG A
0.470	72	Weighted Average
0.470		100.00% Pervious Area

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

Subcatchment 4.2bS:



Summary for Subcatchment 4.3S:

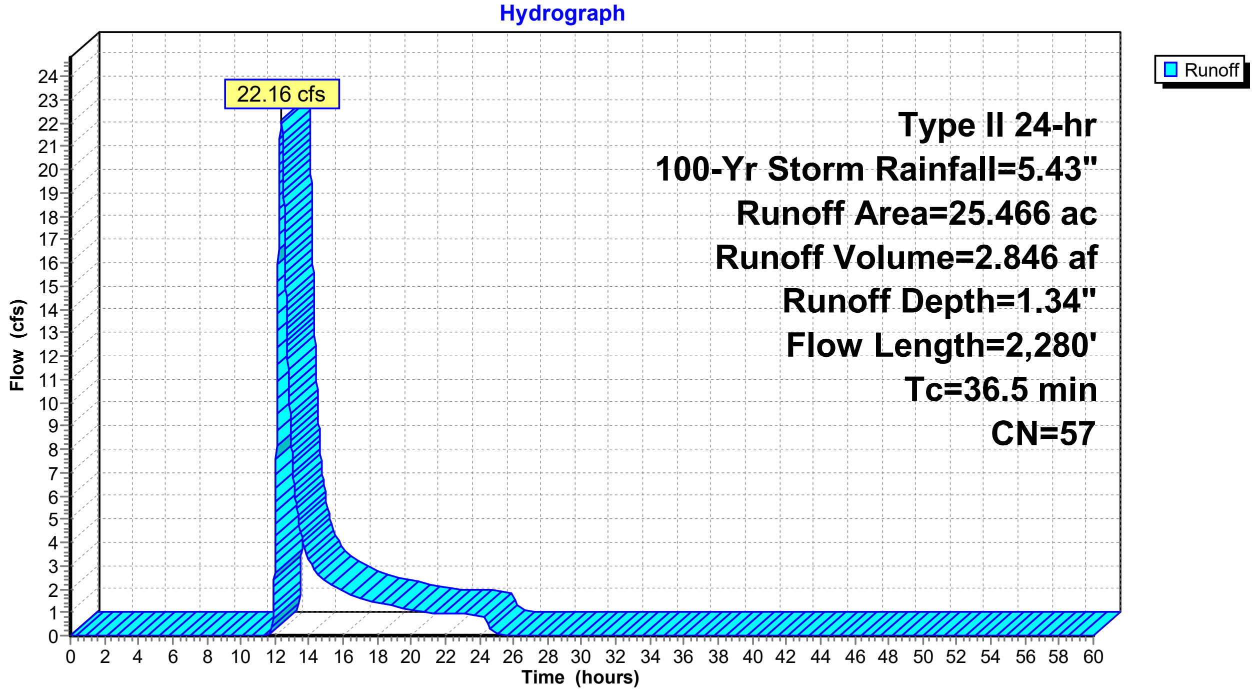
Runoff = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af, Depth= 1.34"
Routed to Pond 4.3C : 24" Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	1.293	98	Paved Roads & Rooftops
	1.783	58	Meadow, non-grazed, HSG B
	22.390	55	Woods, Good, HSG B
	25.466	57	Weighted Average
	24.173		94.92% Pervious Area
	1.293		5.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0634	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.31"
17.8	1,368	0.0656	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	38	0.3960	4.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	774	0.0281	4.70	109.09	**Channel Flow,** Area= 23.2 sf Perim= 43.2' r= 0.54' n= 0.035
36.5	2,280	Total			

Subcatchment 4.3S:



Summary for Subcatchment 5S:

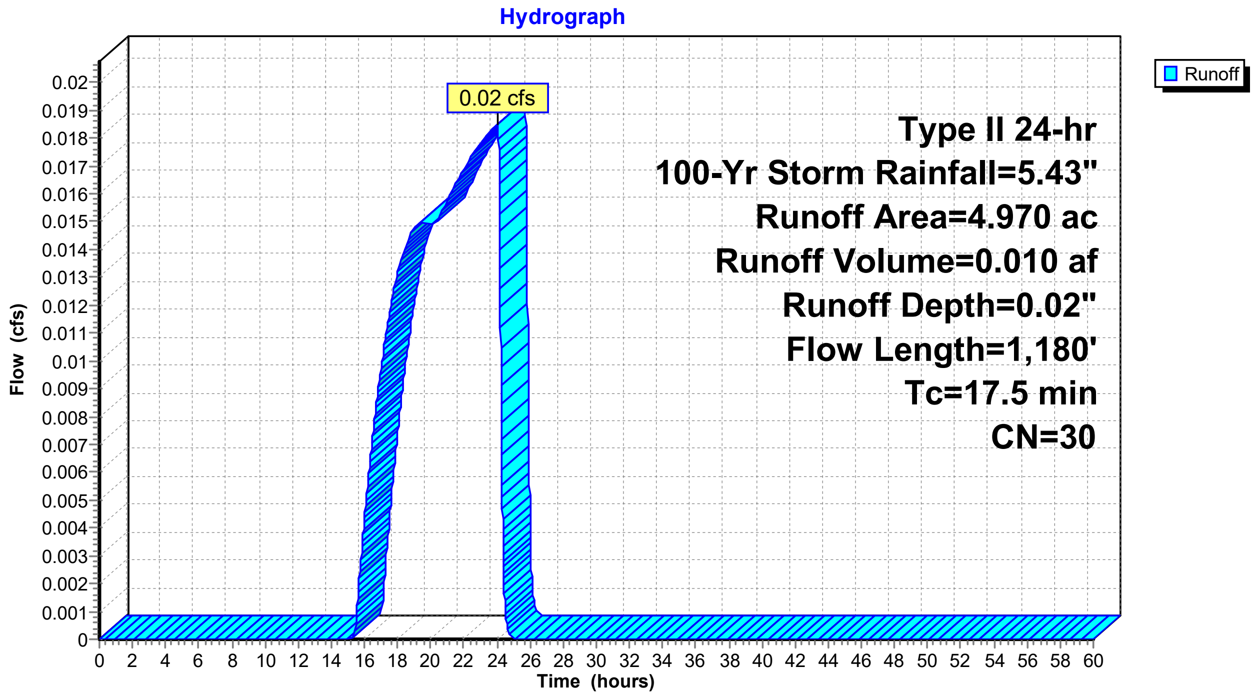
Runoff = 0.02 cfs @ 24.02 hrs, Volume= 0.010 af, Depth= 0.02"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

Area (ac)	CN	Description
4.139	30	Meadow, non-grazed, HSG A
0.831	30	Woods, Good, HSG A
4.970	30	Weighted Average
4.970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0675	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
8.5	801	0.0508	1.58		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	217	0.1515	2.72		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	62	0.0697	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	1,180	Total			

Subcatchment 5S:



Summary for Subcatchment 6S:

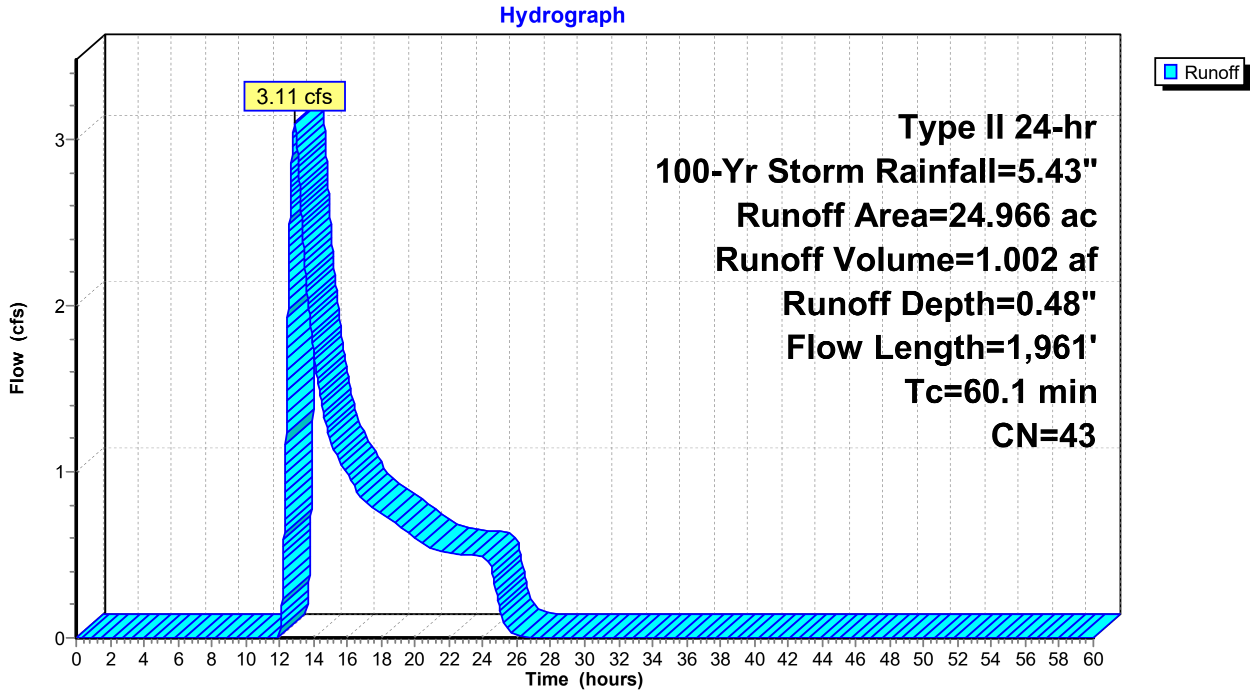
Runoff = 3.11 cfs @ 12.89 hrs, Volume= 1.002 af, Depth= 0.48"
Routed to Link SP6 : Study Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Storm Rainfall=5.43"

	Area (ac)	CN	Description
*	1.450	98	Paved Roads & Rooftops
	0.466	96	Gravel surface, HSG A
	2.545	61	>75% Grass cover, Good, HSG B
	7.511	30	Meadow, non-grazed, HSG A
	0.788	58	Meadow, non-grazed, HSG B
	7.940	30	Woods, Good, HSG A
	4.266	55	Woods, Good, HSG B
	24.966	43	Weighted Average
	23.516		94.19% Pervious Area
	1.450		5.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0278	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.31"
3.2	313	0.0528	1.61		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	486	0.1742	2.09		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
42.9	1,062	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
60.1	1,961	Total			

Subcatchment 6S:



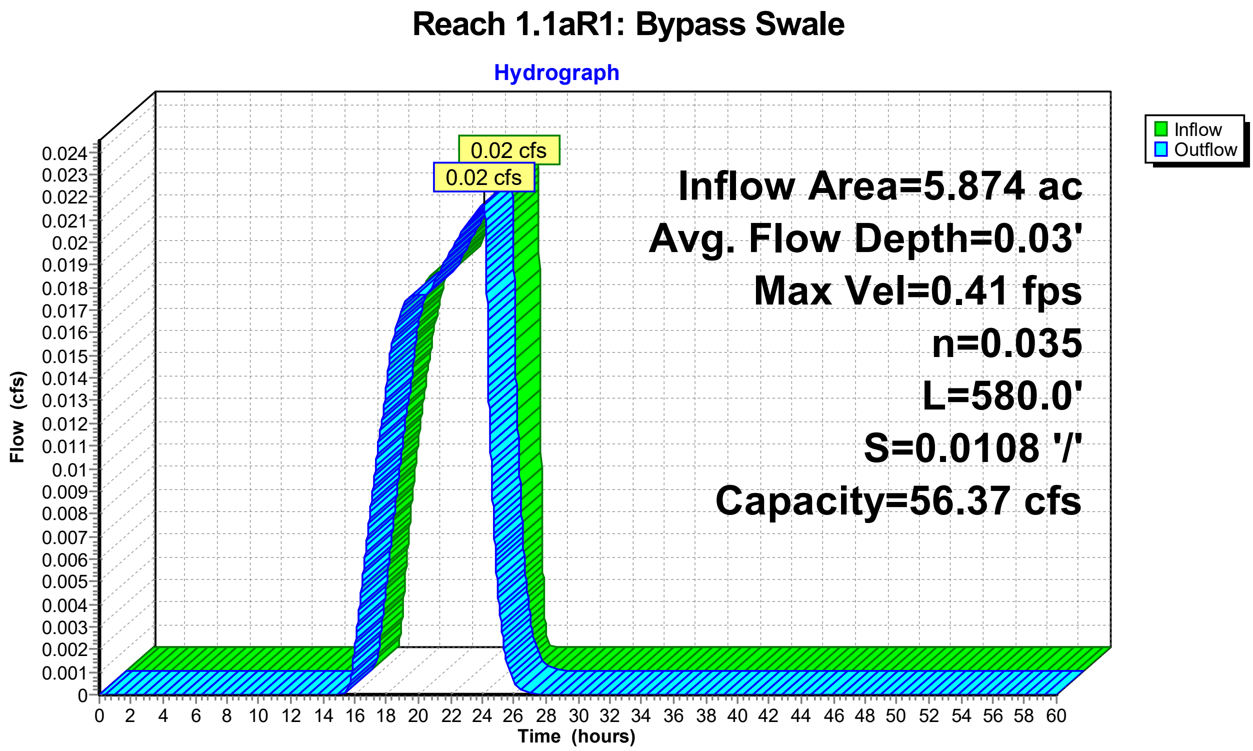
Summary for Reach 1.1aR1: Bypass Swale

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.02 cfs @ 24.00 hrs, Volume= 0.012 af
Outflow = 0.02 cfs @ 24.06 hrs, Volume= 0.012 af, Atten= 1%, Lag= 3.5 min
Routed to Pond 1.1aC1 : TS1 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.41 fps, Min. Travel Time= 23.9 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 27.5 min

Peak Storage= 31 cf @ 24.06 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 2.10'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.37 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.0' Slope= 0.0108 '/'
Inlet Invert= 1,493.84', Outlet Invert= 1,487.56'



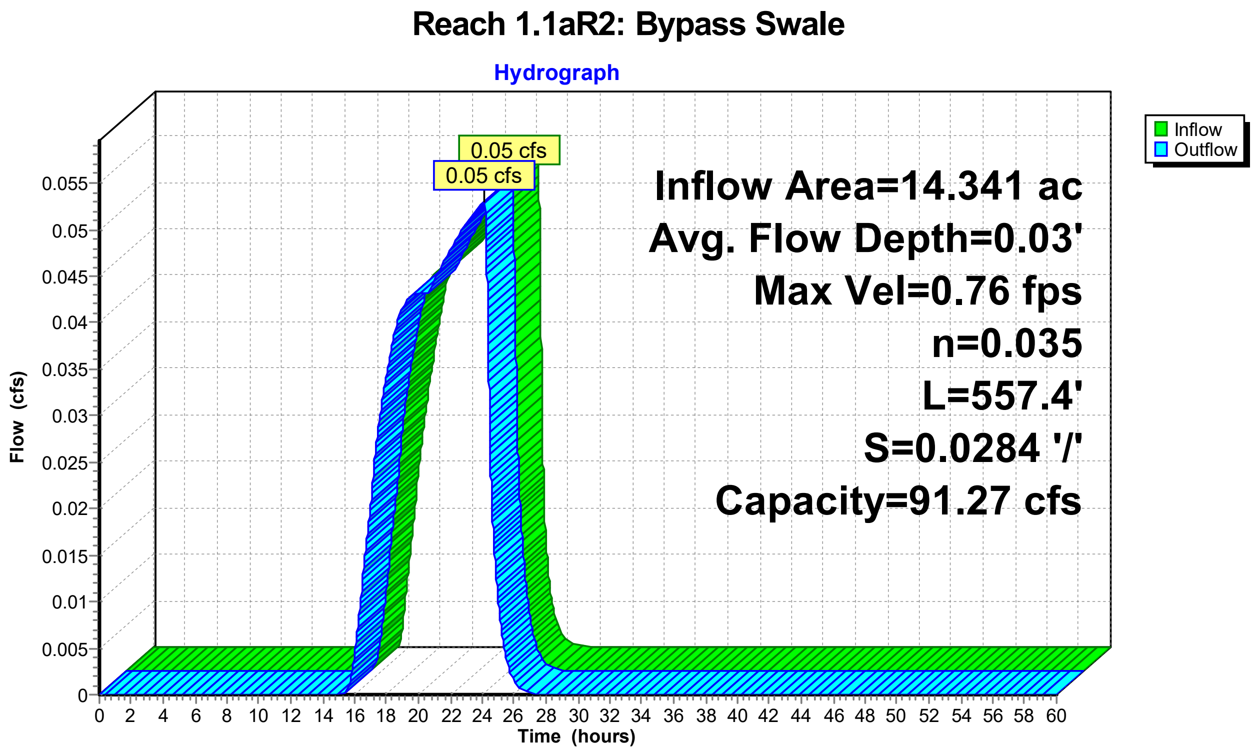
Summary for Reach 1.1aR2: Bypass Swale

Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.05 cfs @ 24.03 hrs, Volume= 0.029 af
Outflow = 0.05 cfs @ 24.08 hrs, Volume= 0.029 af, Atten= 0%, Lag= 2.7 min
Routed to Pond 1.1aC2 : TS2 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.76 fps, Min. Travel Time= 12.3 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 14.7 min

Peak Storage= 39 cf @ 24.08 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 2.13'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 91.27 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.4' Slope= 0.0284 '/'
Inlet Invert= 1,486.80', Outlet Invert= 1,470.98'



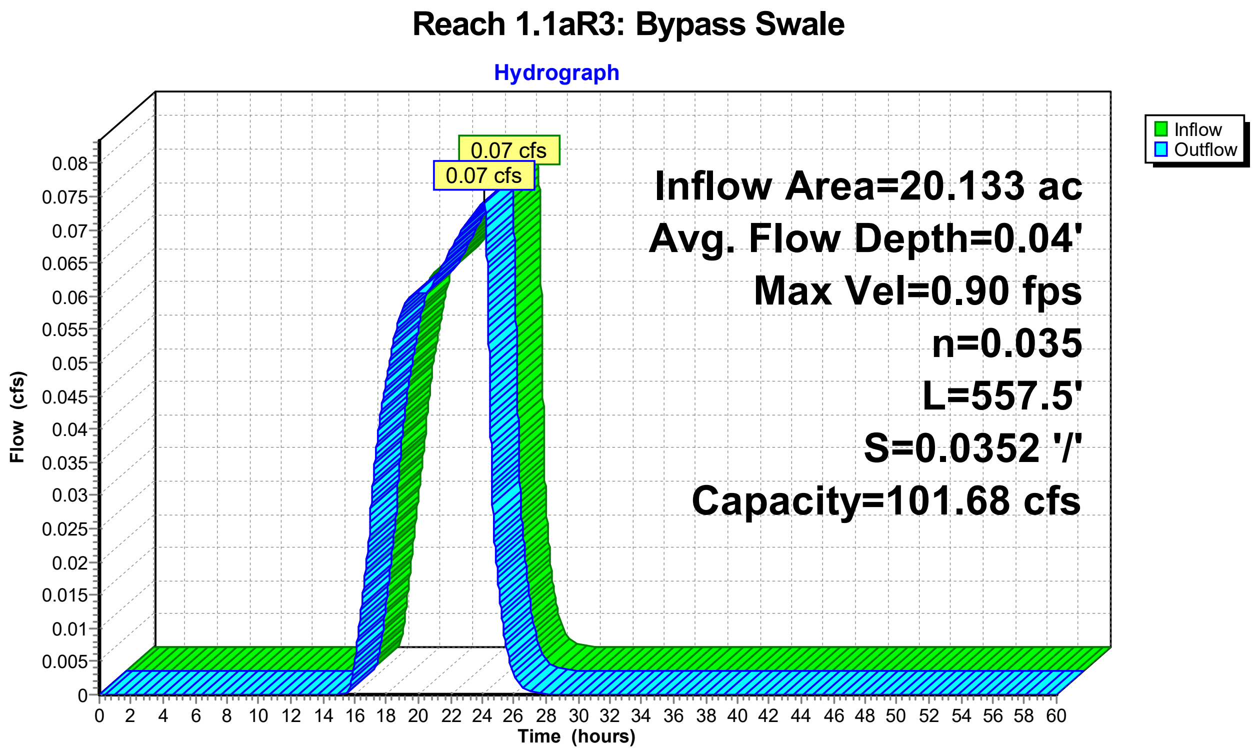
Summary for Reach 1.1aR3: Bypass Swale

Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.07 cfs @ 24.05 hrs, Volume= 0.041 af
Outflow = 0.07 cfs @ 24.08 hrs, Volume= 0.041 af, Atten= 0%, Lag= 2.2 min
Routed to Pond 1.1aC3 : TS3 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 10.3 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 12.6 min

Peak Storage= 46 cf @ 24.08 hrs
Average Depth at Peak Storage= 0.04' , Surface Width= 2.16'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.68 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 557.5' Slope= 0.0352 '/'
Inlet Invert= 1,469.57', Outlet Invert= 1,449.93'



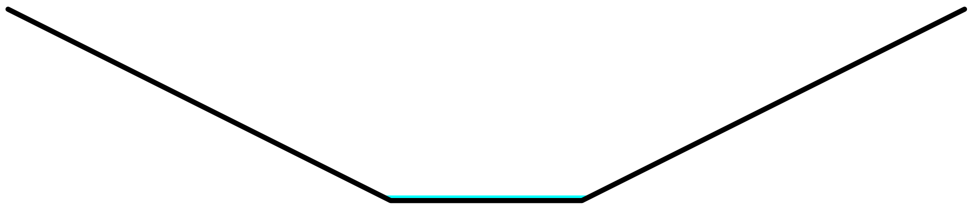
Summary for Reach 1.1aR4: Bypass Swale

Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.12 cfs @ 24.04 hrs, Volume= 0.066 af
Outflow = 0.12 cfs @ 24.09 hrs, Volume= 0.066 af, Atten= 0%, Lag= 3.1 min
Routed to Pond 1.1aP : North Road Bypass OC

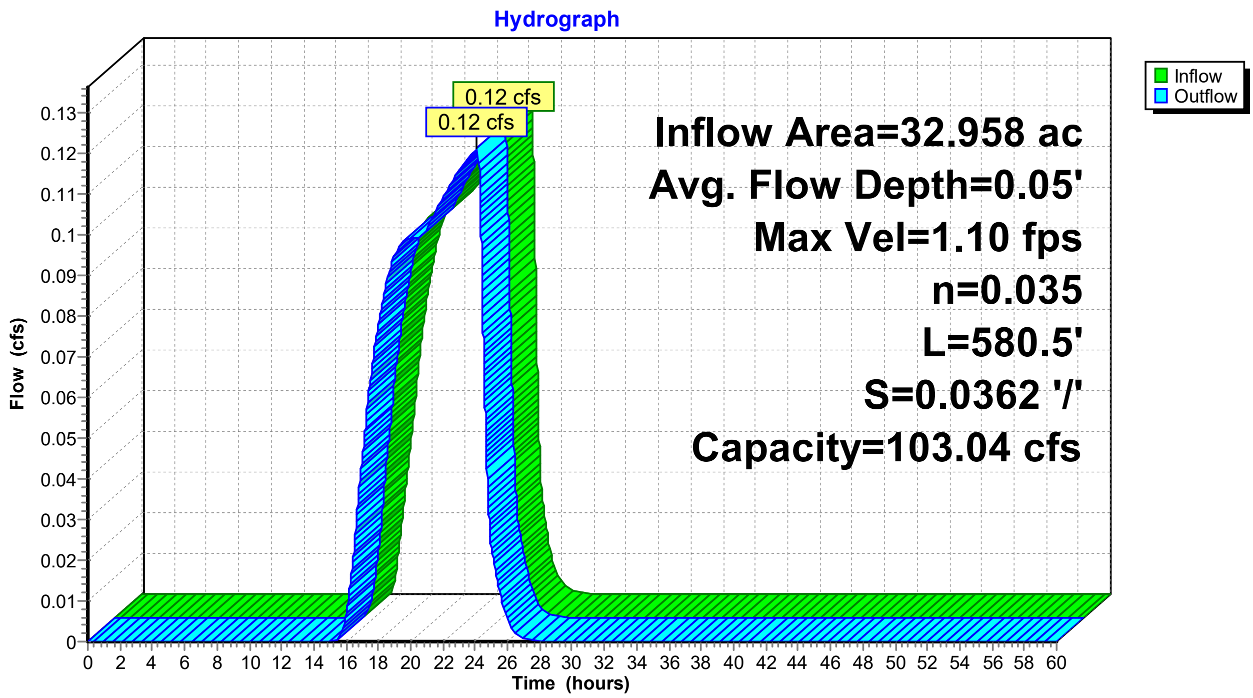
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.10 fps, Min. Travel Time= 8.8 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 11.4 min

Peak Storage= 64 cf @ 24.09 hrs
Average Depth at Peak Storage= 0.05' , Surface Width= 2.21'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 103.04 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 580.5' Slope= 0.0362 '/'
Inlet Invert= 1,447.64', Outlet Invert= 1,426.64'



Reach 1.1aR4: Bypass Swale



Summary for Reach 1.1bR1: North Road Conveyance Swale

Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 5.85 cfs @ 11.98 hrs, Volume= 0.272 af
Outflow = 3.95 cfs @ 12.04 hrs, Volume= 0.272 af, Atten= 32%, Lag= 3.9 min
Routed to Pond 1.1bC1 : TS4 Culvert

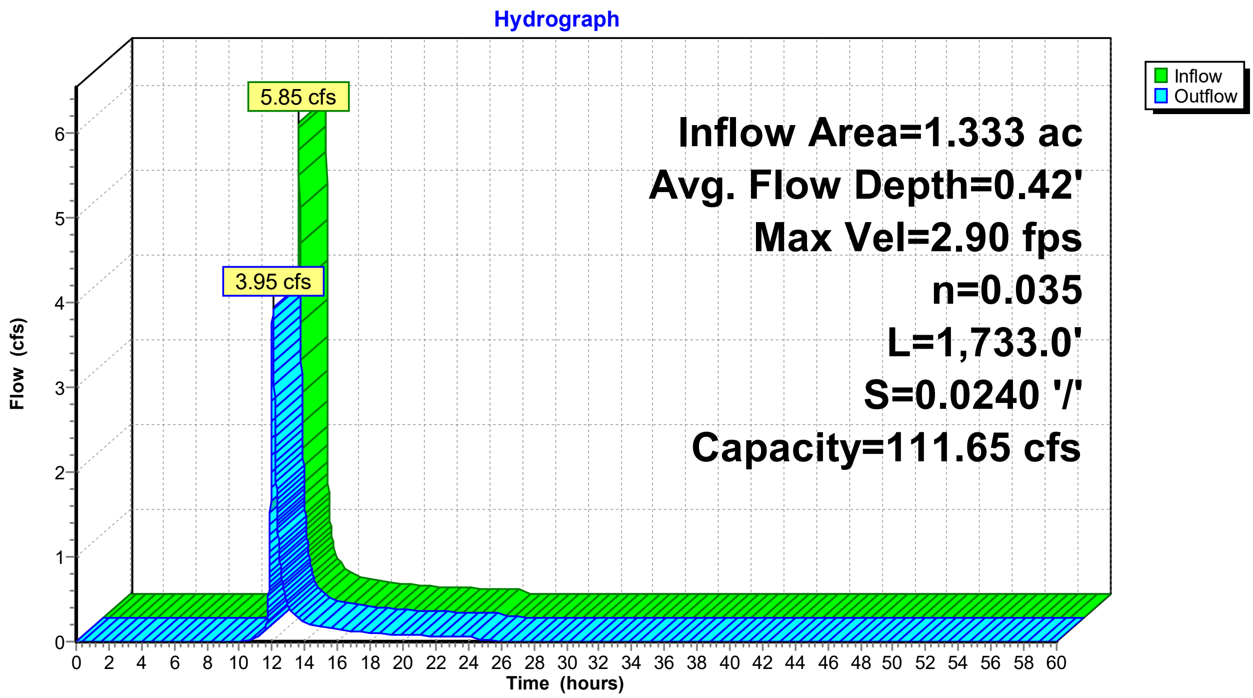
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.90 fps, Min. Travel Time= 9.9 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 35.4 min

Peak Storage= 2,359 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.42' , Surface Width= 4.51'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 111.65 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,733.0' Slope= 0.0240 '/'
Inlet Invert= 1,491.12', Outlet Invert= 1,449.50'

‡

Reach 1.1bR1: North Road Conveyance Swale



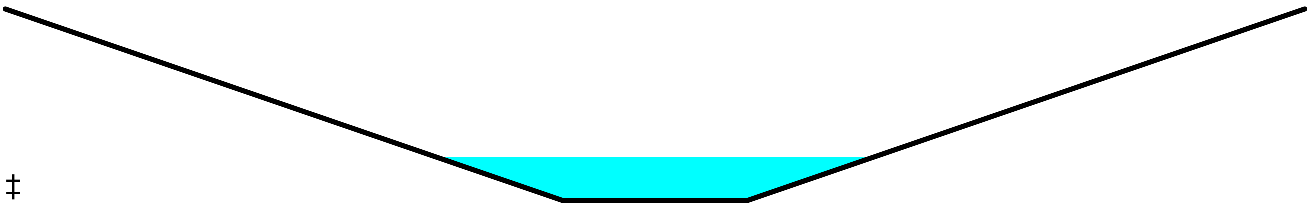
Summary for Reach 1.1bR2: North Road Conveyance Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 2.36" for 100-Yr Storm event
Inflow = 6.08 cfs @ 12.01 hrs, Volume= 0.391 af
Outflow = 5.77 cfs @ 12.04 hrs, Volume= 0.391 af, Atten= 5%, Lag= 1.8 min
Routed to Pond 1.1bP1 : Dry Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.81 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 9.3 min

Peak Storage= 900 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.45' , Surface Width= 4.71'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 140.36 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 593.3' Slope= 0.0380 '/'
Inlet Invert= 1,447.27', Outlet Invert= 1,424.75'



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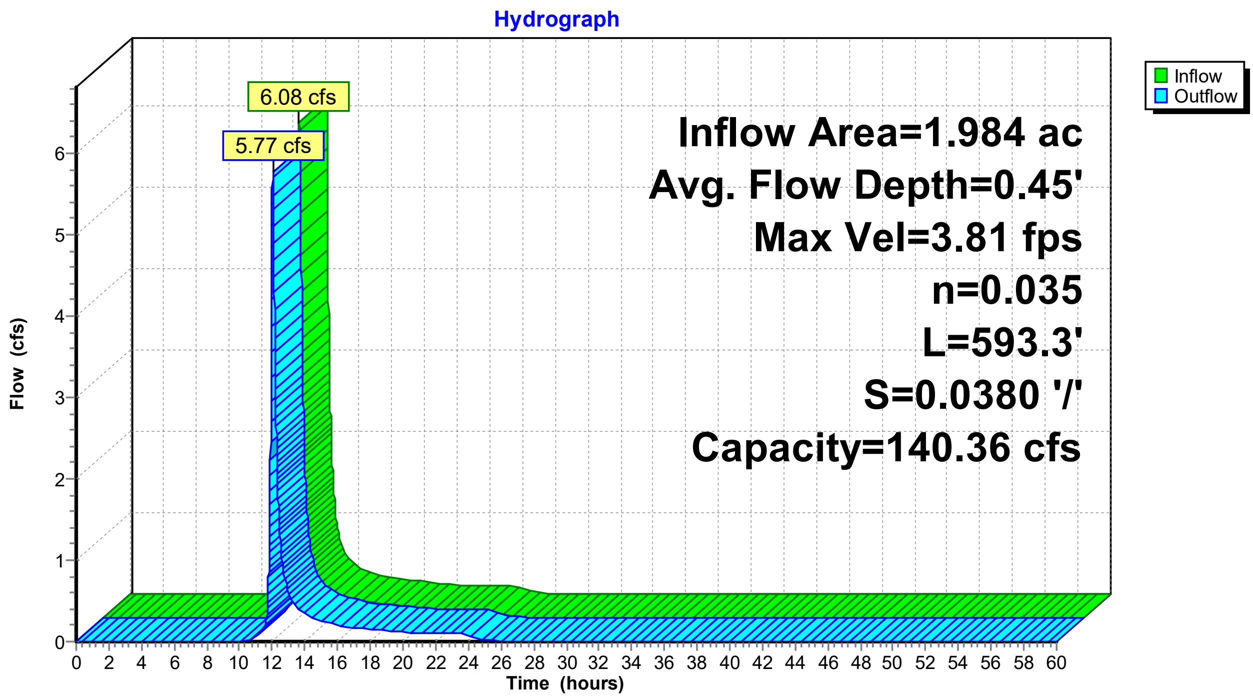
Reach 1.1bR2: North Road Conveyance Swale



Summary for Reach 1.2aR1: Bypass Swale

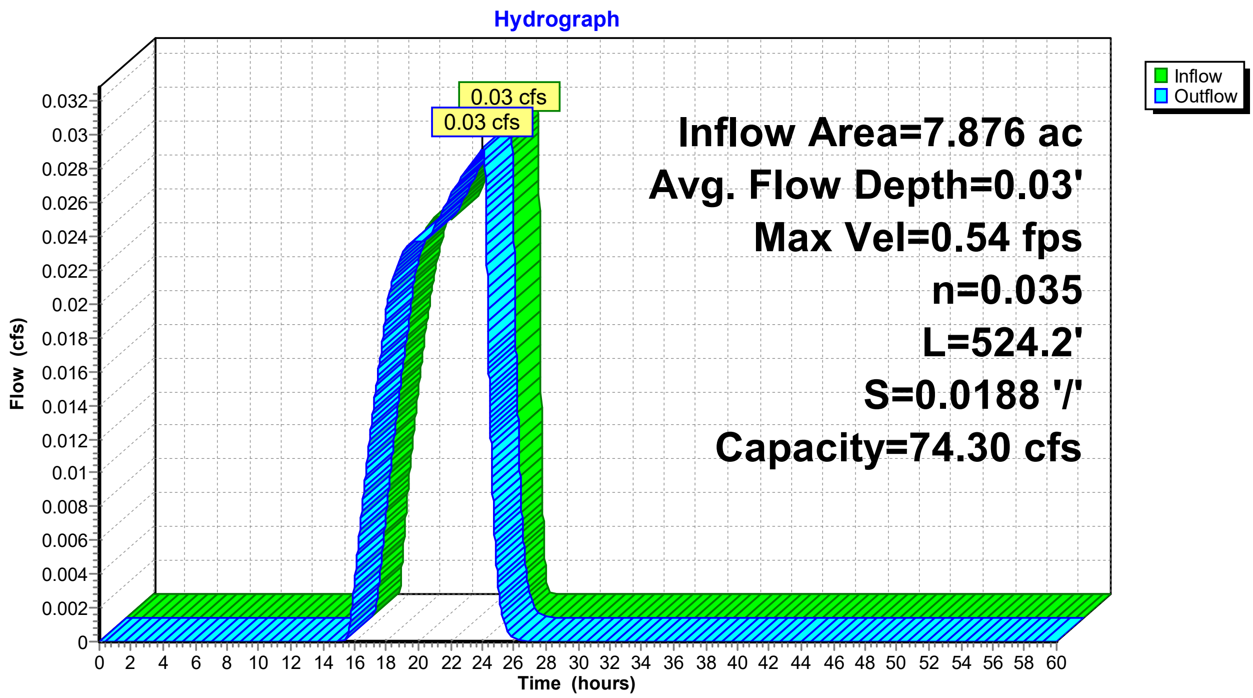
Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.03 cfs @ 24.00 hrs, Volume= 0.016 af
Outflow = 0.03 cfs @ 24.06 hrs, Volume= 0.016 af, Atten= 0%, Lag= 3.1 min
Routed to Pond 1.2aC1 : TS 7 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.54 fps, Min. Travel Time= 16.2 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 18.6 min

Peak Storage= 28 cf @ 24.06 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 2.11'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 74.30 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 524.2' Slope= 0.0188 '/'
Inlet Invert= 1,454.08', Outlet Invert= 1,444.22'

Reach 1.2aR1: Bypass Swale



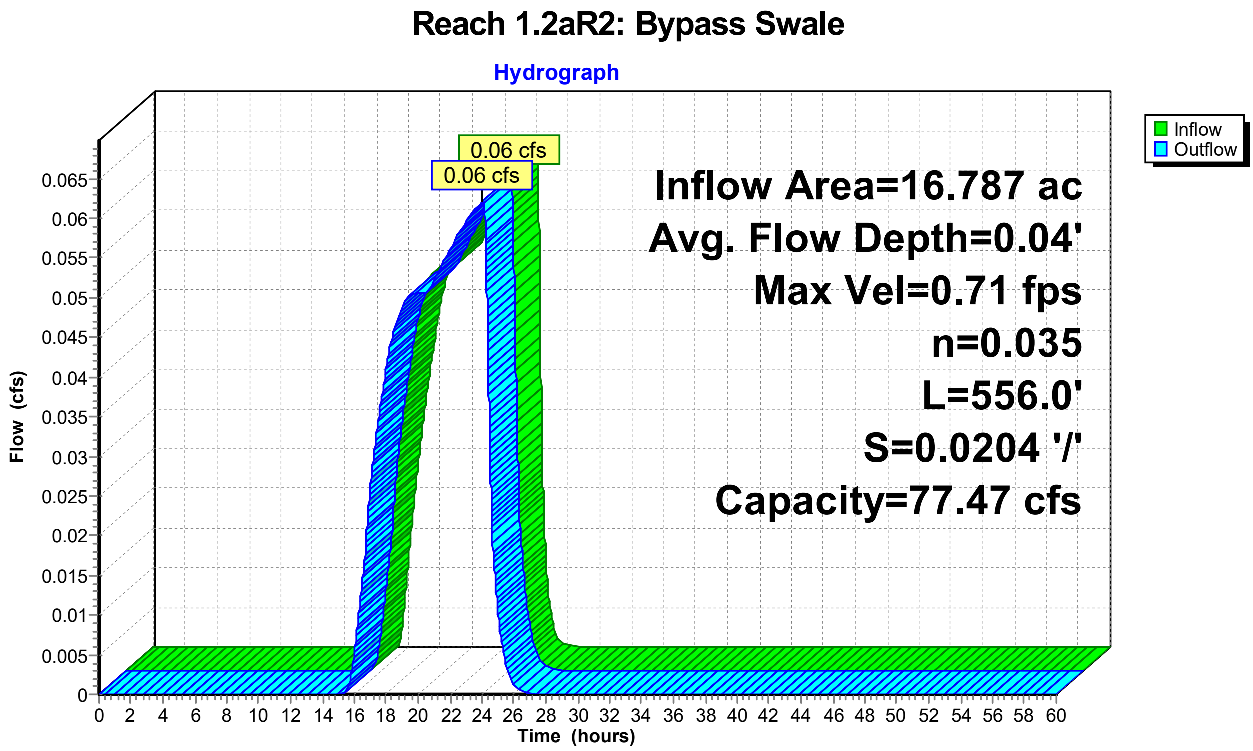
Summary for Reach 1.2aR2: Bypass Swale

Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.06 cfs @ 24.03 hrs, Volume= 0.034 af
Outflow = 0.06 cfs @ 24.06 hrs, Volume= 0.034 af, Atten= 0%, Lag= 1.9 min
Routed to Pond 1.2aC2 : TS8 Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.71 fps, Min. Travel Time= 13.0 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 15.9 min

Peak Storage= 48 cf @ 24.06 hrs
Average Depth at Peak Storage= 0.04' , Surface Width= 2.17'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 77.47 cfs

2.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 556.0' Slope= 0.0204 '/'
Inlet Invert= 1,443.21', Outlet Invert= 1,431.84'



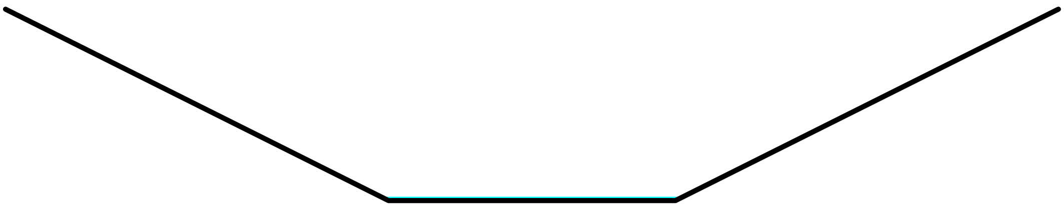
Summary for Reach 1.2aR3: Bypass Swale

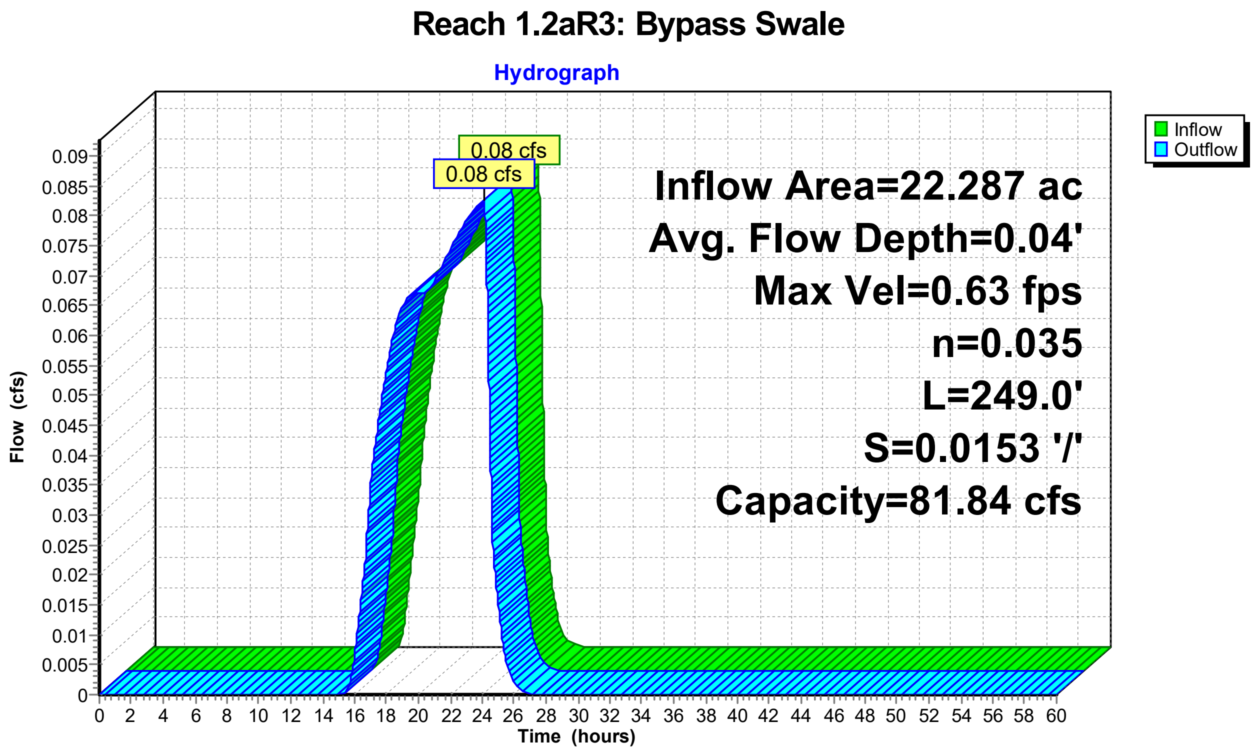
Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.08 cfs @ 24.03 hrs, Volume= 0.045 af
Outflow = 0.08 cfs @ 24.07 hrs, Volume= 0.045 af, Atten= 0%, Lag= 2.0 min
Routed to Pond 1.2aP : South Road Bypass OC

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.63 fps, Min. Travel Time= 6.6 min
Avg. Velocity = 0.51 fps, Avg. Travel Time= 8.2 min

Peak Storage= 33 cf @ 24.07 hrs
Average Depth at Peak Storage= 0.04' , Surface Width= 3.17'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 81.84 cfs

3.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 11.00'
Length= 249.0' Slope= 0.0153 '/'
Inlet Invert= 1,431.11', Outlet Invert= 1,427.29'





Summary for Reach 1.2bR1: East Road Conveyance Swale

Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 2.11" for 100-Yr Storm event
Inflow = 2.75 cfs @ 11.98 hrs, Volume= 0.128 af
Outflow = 2.43 cfs @ 12.01 hrs, Volume= 0.128 af, Atten= 11%, Lag= 2.1 min
Routed to Pond 1.2bC1 : East Road Culvert

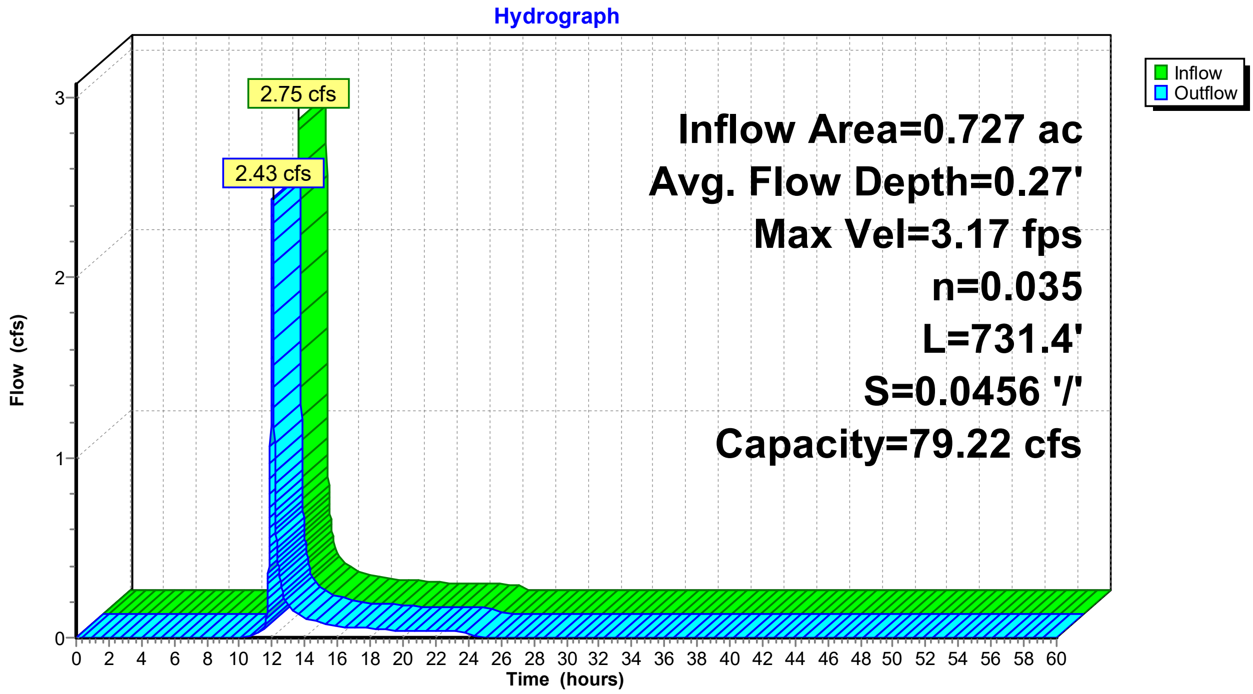
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.17 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 13.7 min

Peak Storage= 562 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 3.64'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 79.22 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 731.4' Slope= 0.0456 '/'
Inlet Invert= 1,489.53', Outlet Invert= 1,456.20'

‡

Reach 1.2bR1: East Road Conveyance Swale



Summary for Reach 1.2bR2: South Road Conveyance Swale

Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 1.73" for 100-Yr Storm event
Inflow = 3.77 cfs @ 12.03 hrs, Volume= 0.228 af
Outflow = 3.39 cfs @ 12.07 hrs, Volume= 0.228 af, Atten= 10%, Lag= 2.7 min
Routed to Pond 1.2bC2 : TS6 Culvert

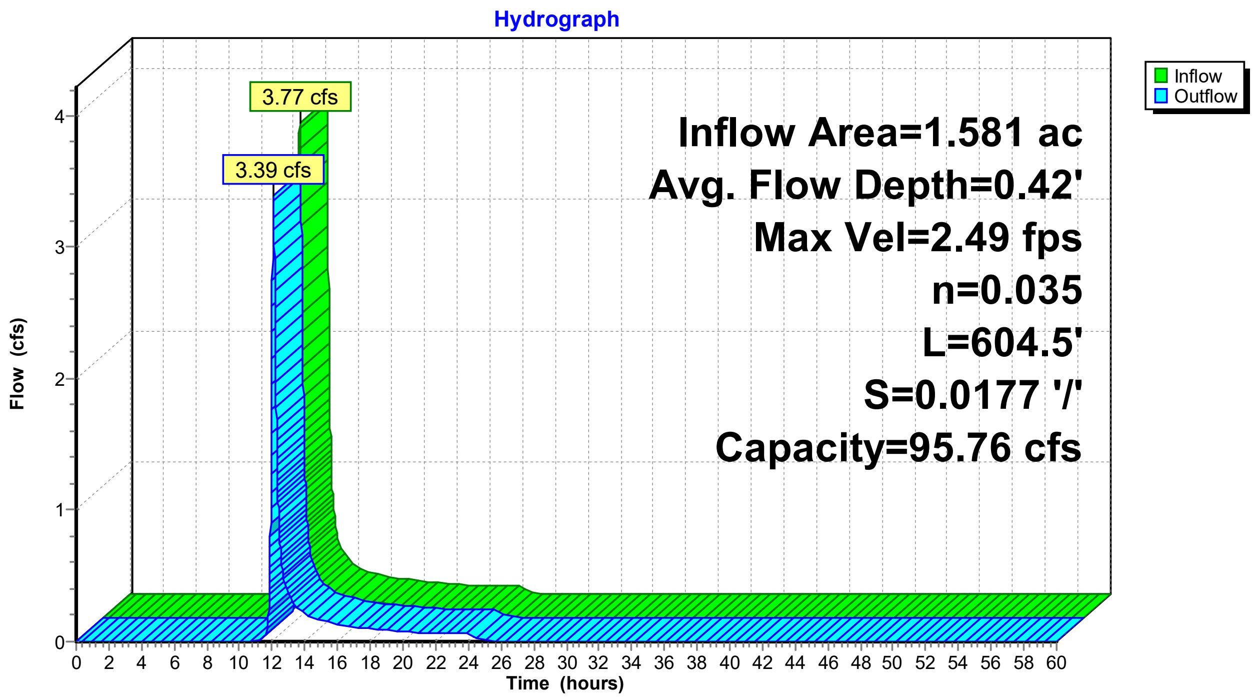
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.49 fps, Min. Travel Time= 4.0 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 13.0 min

Peak Storage= 822 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.42' , Surface Width= 4.51'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 95.76 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 604.5' Slope= 0.0177 '/'
Inlet Invert= 1,454.47', Outlet Invert= 1,443.79'

‡

Reach 1.2bR2: South Road Conveyance Swale



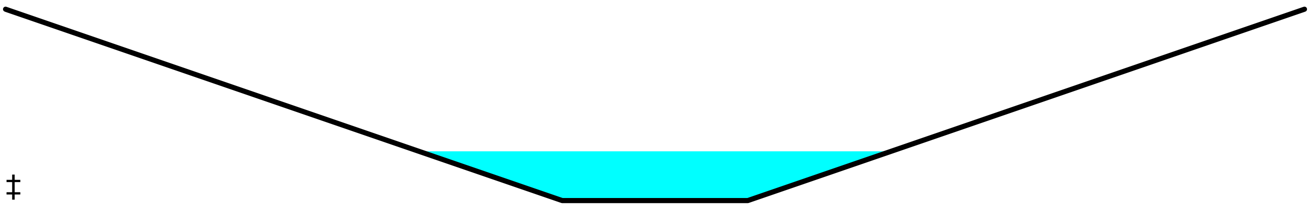
Summary for Reach 1.2bR3: South Road Conveyance Swale

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 1.98" for 100-Yr Storm event
Inflow = 5.95 cfs @ 12.01 hrs, Volume= 0.394 af
Outflow = 5.31 cfs @ 12.06 hrs, Volume= 0.394 af, Atten= 11%, Lag= 3.0 min
Routed to Pond 1.2bP : South Road Treatment Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.88 fps, Min. Travel Time= 4.4 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 14.3 min

Peak Storage= 1,393 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.52' , Surface Width= 5.11'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 98.64 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 755.9' Slope= 0.0187 '/'
Inlet Invert= 1,442.84', Outlet Invert= 1,428.67'



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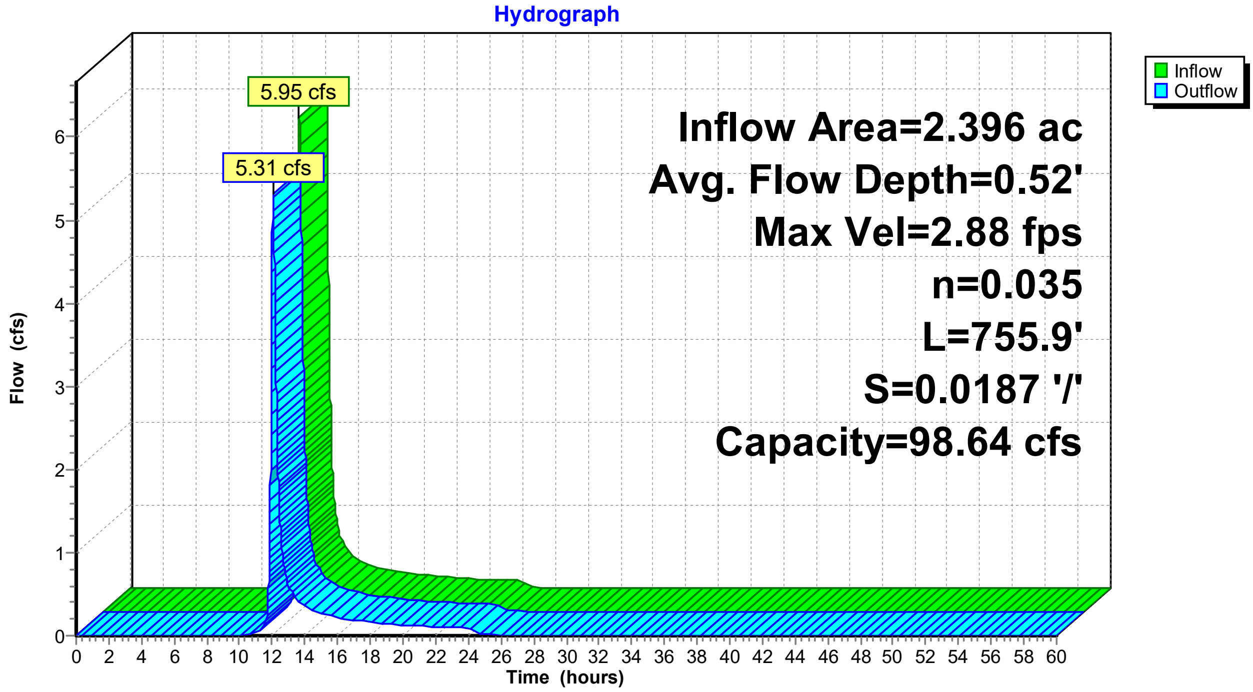
Reach 1.2bR3: South Road Conveyance Swale



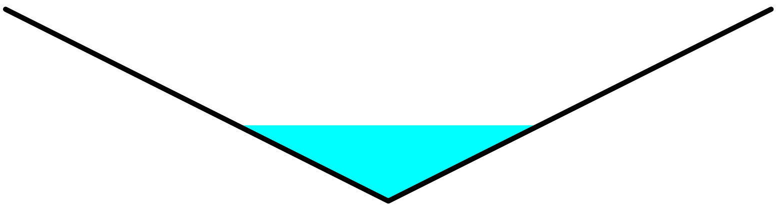
Summary for Reach 4.1R1: Bypass Swale

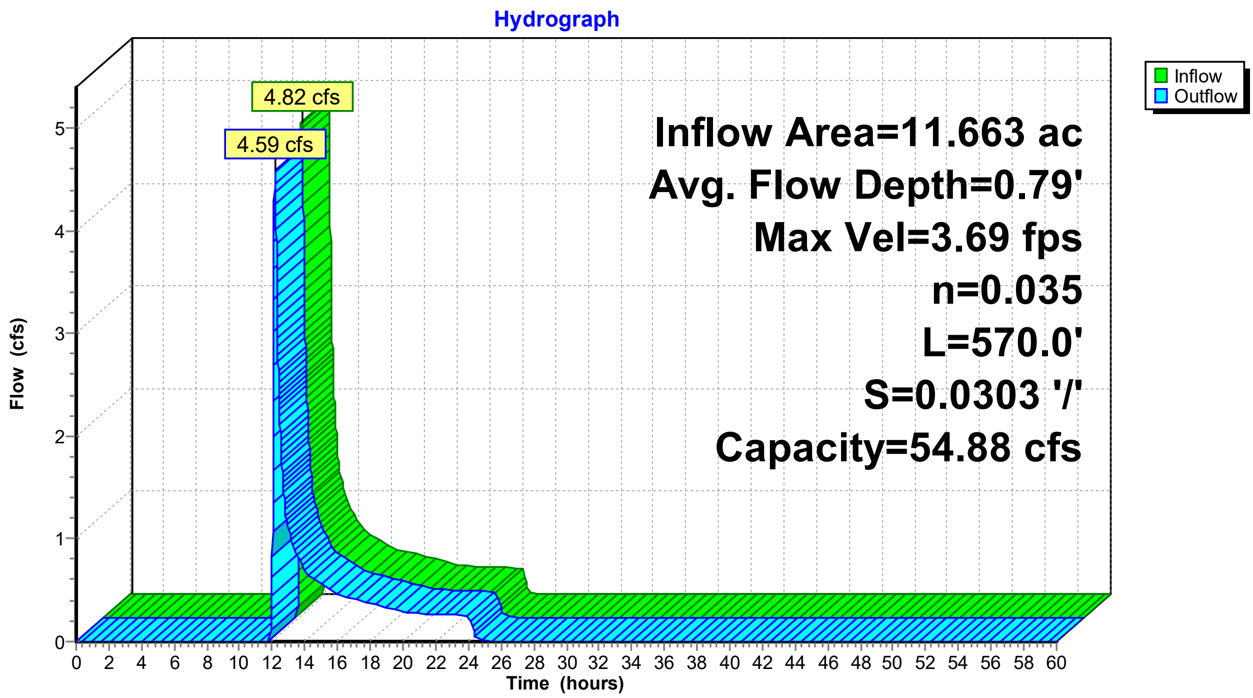
Inflow Area = 11.663 ac, 2.80% Impervious, Inflow Depth = 0.59" for 100-Yr Storm event
Inflow = 4.82 cfs @ 12.13 hrs, Volume= 0.570 af
Outflow = 4.59 cfs @ 12.17 hrs, Volume= 0.570 af, Atten= 5%, Lag= 2.3 min
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.69 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.82 fps, Avg. Travel Time= 5.2 min

Peak Storage= 709 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.79' , Surface Width= 3.16'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 54.88 cfs

0.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 570.0' Slope= 0.0303 '/'
Inlet Invert= 1,448.24', Outlet Invert= 1,430.97'





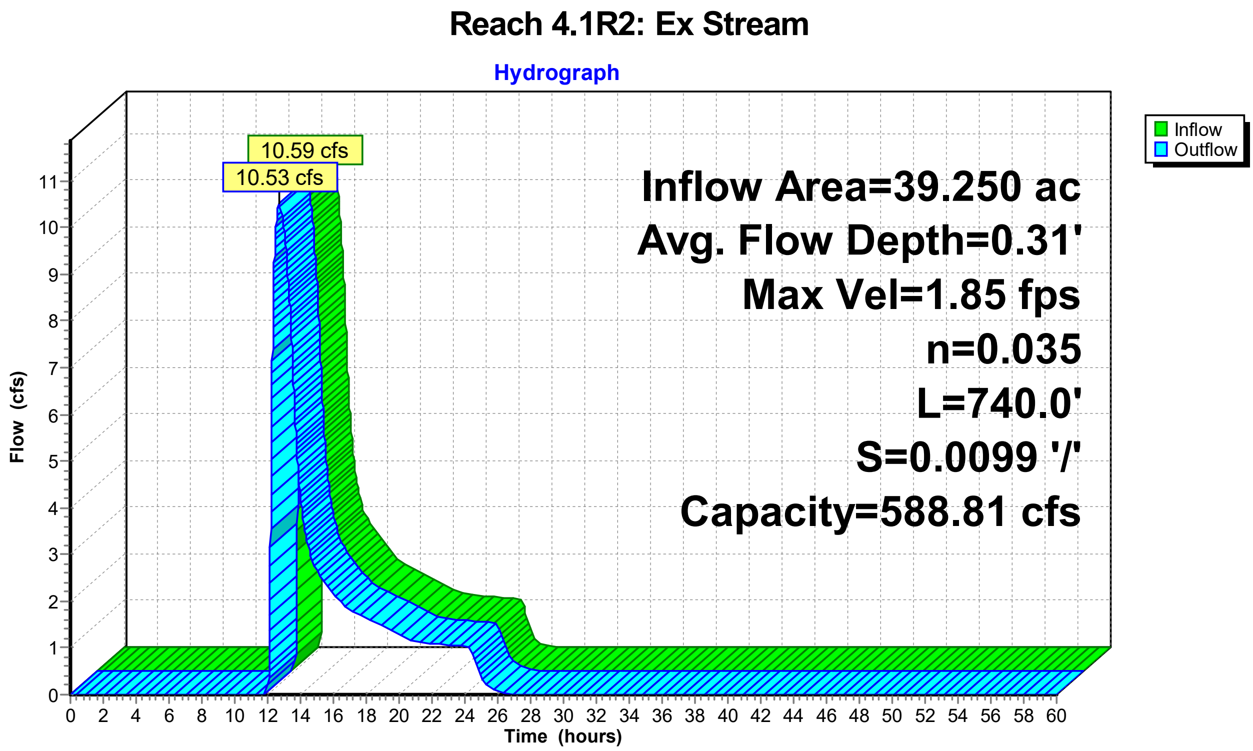
Summary for Reach 4.1R2: Ex Stream

Inflow Area = 39.250 ac, 0.83% Impervious, Inflow Depth = 0.83" for 100-Yr Storm event
Inflow = 10.59 cfs @ 12.62 hrs, Volume= 2.700 af
Outflow = 10.53 cfs @ 12.70 hrs, Volume= 2.700 af, Atten= 1%, Lag= 4.9 min
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.85 fps, Min. Travel Time= 6.7 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 16.2 min

Peak Storage= 4,215 cf @ 12.70 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 19.65'
Bank-Full Depth= 3.00' Flow Area= 84.0 sf, Capacity= 588.81 cfs

17.50' x 3.00' deep channel, n= 0.035
Side Slope Z-value= 3.0 4.0 '/' Top Width= 38.50'
Length= 740.0' Slope= 0.0099 '/'
Inlet Invert= 1,430.98', Outlet Invert= 1,423.64'



Summary for Reach 4.2bR: Conveyance Swale

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 2.53" for 100-Yr Storm event
Inflow = 2.13 cfs @ 11.98 hrs, Volume= 0.099 af
Outflow = 1.95 cfs @ 12.01 hrs, Volume= 0.099 af, Atten= 8%, Lag= 1.8 min
Routed to Pond 4.2bP : Pond 4 - Access Rd East

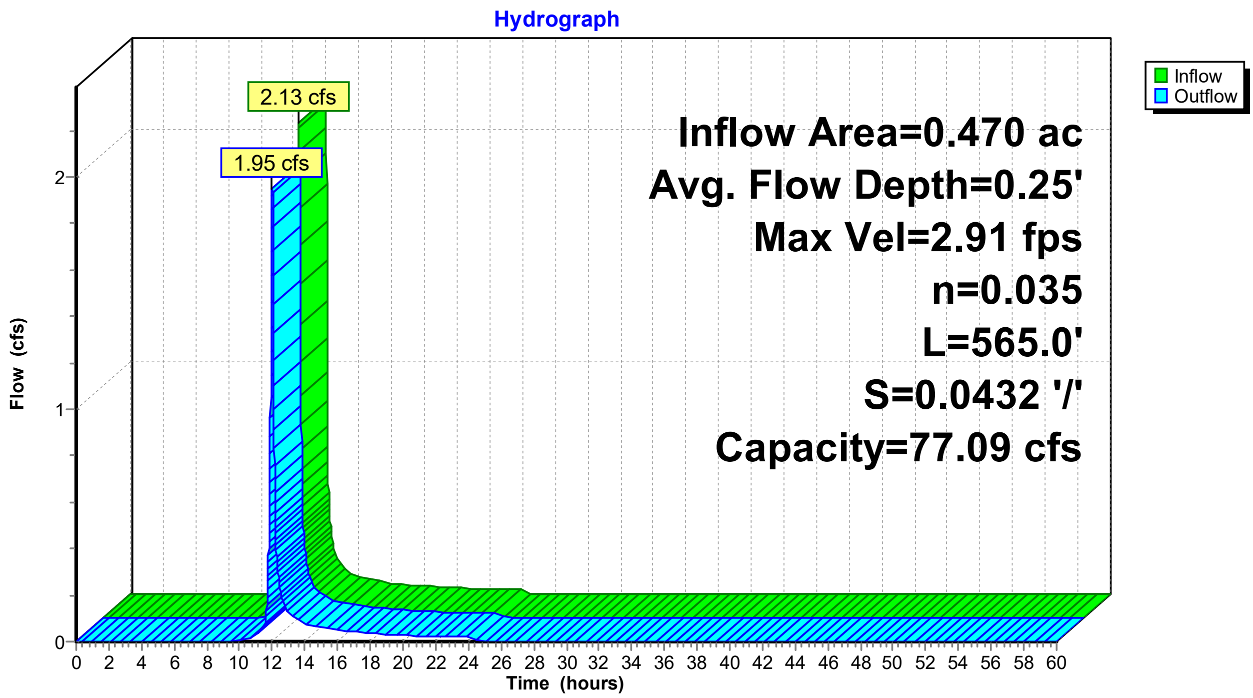
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.91 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 11.9 min

Peak Storage= 380 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.25' , Surface Width= 3.47'
Bank-Full Depth= 1.50' Flow Area= 9.8 sf, Capacity= 77.09 cfs

2.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 11.00'
Length= 565.0' Slope= 0.0432 '/'
Inlet Invert= 1,472.38', Outlet Invert= 1,448.00'

‡

Reach 4.2bR: Conveyance Swale



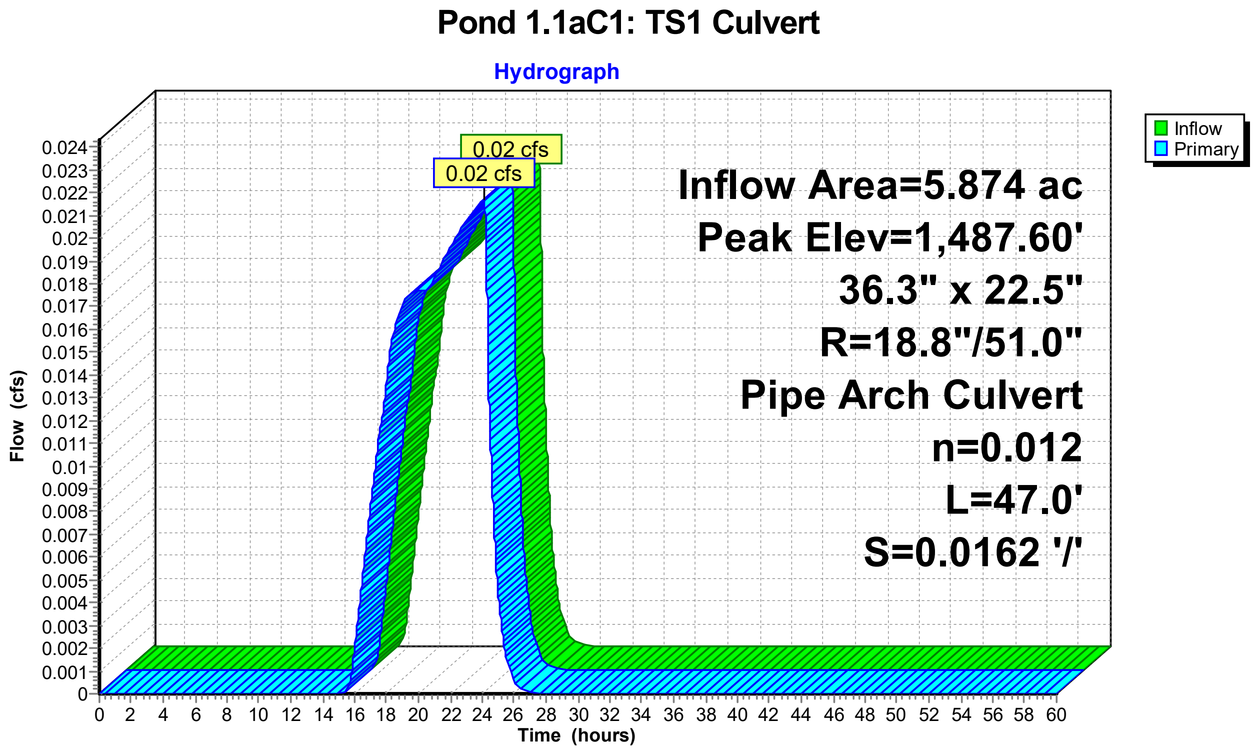
Summary for Pond 1.1aC1: TS1 Culvert

Inflow Area = 5.874 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.02 cfs @ 24.06 hrs, Volume= 0.012 af
Outflow = 0.02 cfs @ 24.06 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min
Primary = 0.02 cfs @ 24.06 hrs, Volume= 0.012 af
Routed to Reach 1.1aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,487.60' @ 24.06 hrs
Flood Elev= 1,489.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,487.56'	**36.3" W x 22.5" H, R=18.8"/51.0" Pipe Arch RCP_Arch 37x23** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,487.56' / 1,486.80' S= 0.0162 '/' Cc= 0.900 n= 0.012, Flow Area= 4.43 sf

Primary OutFlow Max=0.02 cfs @ 24.06 hrs HW=1,487.60' (Free Discharge)
↑**1=RCP_Arch 37x23** (Inlet Controls 0.02 cfs @ 0.61 fps)



Summary for Pond 1.1aC2: TS2 Culvert

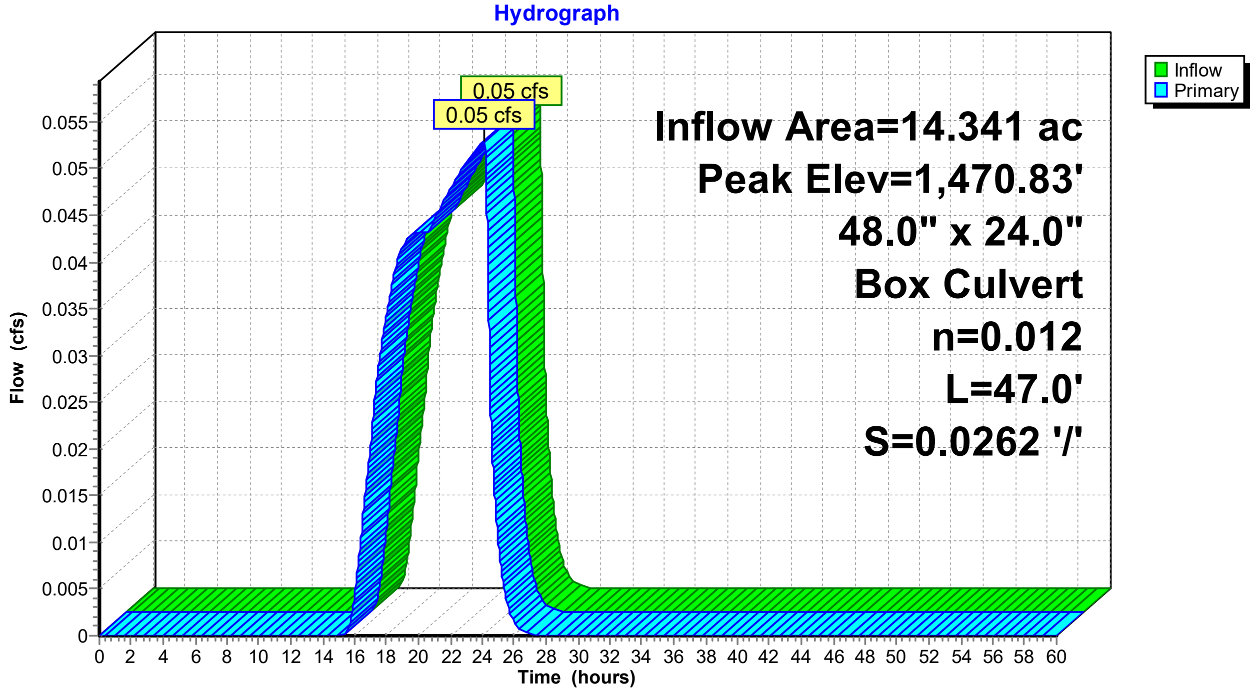
Inflow Area = 14.341 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.05 cfs @ 24.08 hrs, Volume= 0.029 af
Outflow = 0.05 cfs @ 24.08 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min
Primary = 0.05 cfs @ 24.08 hrs, Volume= 0.029 af
Routed to Reach 1.1aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,470.83' @ 24.08 hrs
Flood Elev= 1,473.07'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,470.80'	**48.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,470.80' / 1,469.57' S= 0.0262 '/' Cc= 0.900 n= 0.012, Flow Area= 8.00 sf

Primary OutFlow Max=0.05 cfs @ 24.08 hrs HW=1,470.83' (Free Discharge)
1=Culvert (Inlet Controls 0.05 cfs @ 0.51 fps)

Pond 1.1aC2: TS2 Culvert



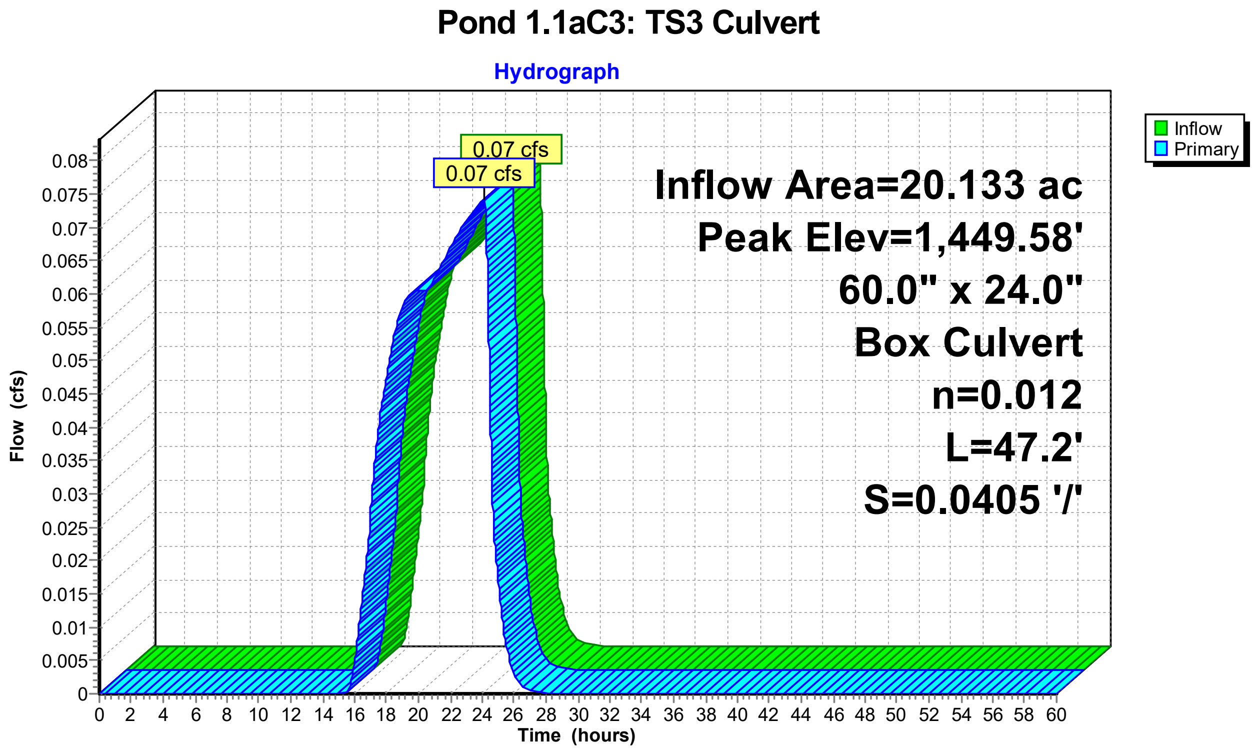
Summary for Pond 1.1aC3: TS3 Culvert

Inflow Area = 20.133 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.07 cfs @ 24.08 hrs, Volume= 0.041 af
Outflow = 0.07 cfs @ 24.08 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
Primary = 0.07 cfs @ 24.08 hrs, Volume= 0.041 af
Routed to Reach 1.1aR4 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,449.58' @ 24.08 hrs
Flood Elev= 1,452.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.55'	**60.0" W x 24.0" H Box Culvert** L= 47.2' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.55' / 1,447.64' S= 0.0405 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.07 cfs @ 24.08 hrs HW=1,449.58' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.07 cfs @ 0.53 fps)



Summary for Pond 1.1aP: North Road Bypass OC

Inflow Area = 32.958 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.12 cfs @ 24.09 hrs, Volume= 0.066 af
Outflow = 0.12 cfs @ 24.12 hrs, Volume= 0.059 af, Atten= 0%, Lag= 1.3 min
Discarded = 0.01 cfs @ 24.12 hrs, Volume= 0.028 af
Primary = 0.11 cfs @ 24.12 hrs, Volume= 0.031 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,428.53' @ 24.12 hrs Surf.Area= 0.020 ac Storage= 0.029 af

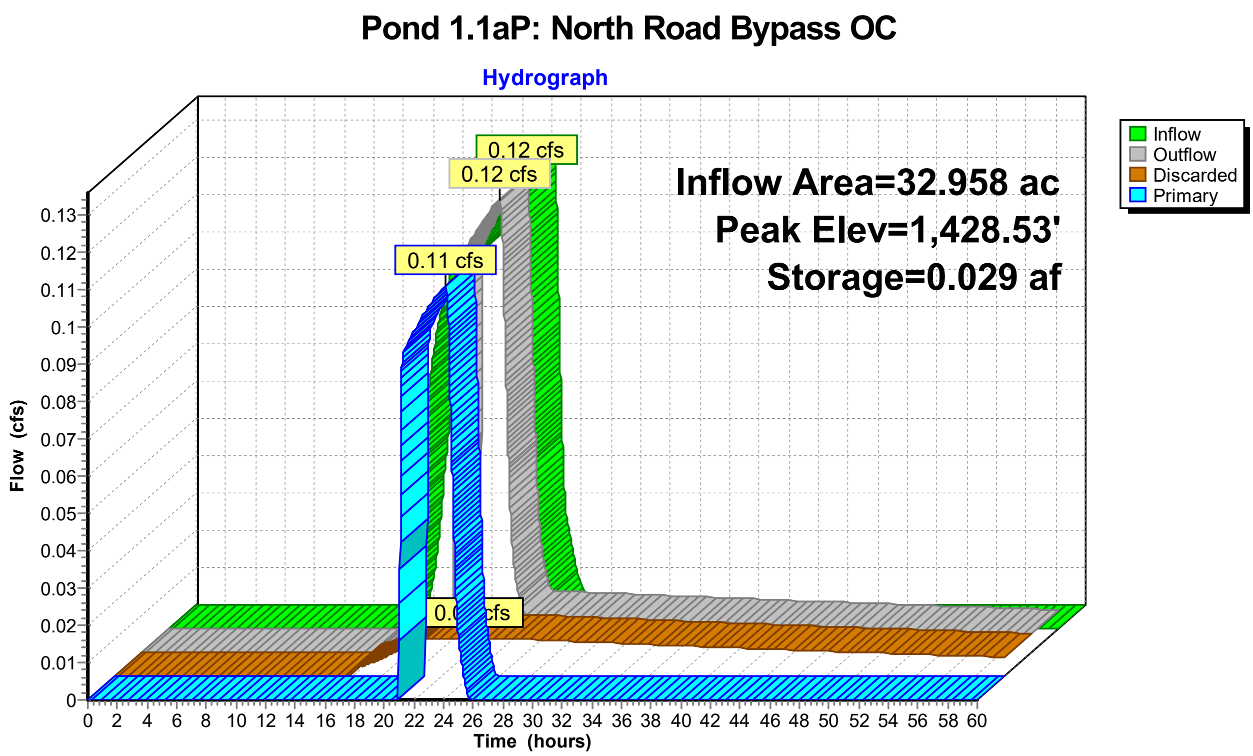
Plug-Flow detention time= 520.4 min calculated for 0.059 af (88% of inflow)
Center-of-Mass det. time= 493.0 min (1,761.0 - 1,268.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1,426.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,426.00'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,428.50'	**10.0' 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

Discarded OutFlow Max=0.01 cfs @ 24.12 hrs HW=1,428.53' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.10 cfs @ 24.12 hrs HW=1,428.53' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.10 cfs @ 0.40 fps)



Summary for Pond 1.1bC1: TS4 Culvert

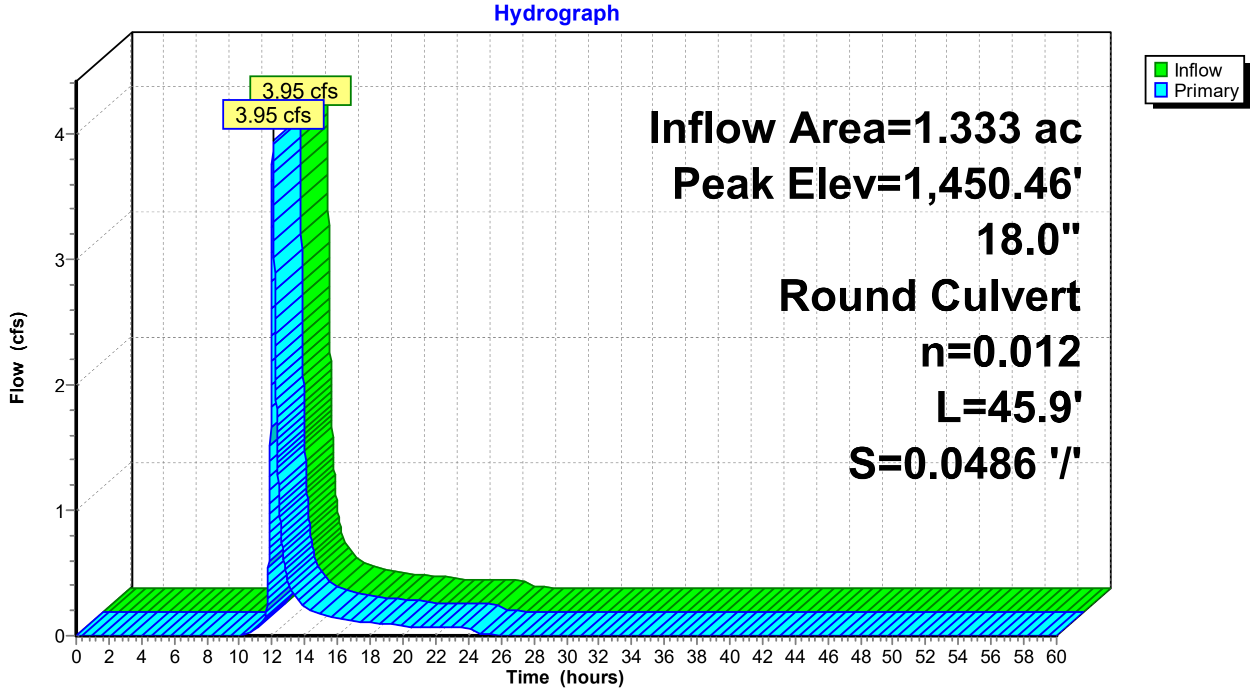
Inflow Area = 1.333 ac, 0.53% Impervious, Inflow Depth = 2.45" for 100-Yr Storm event
Inflow = 3.95 cfs @ 12.04 hrs, Volume= 0.272 af
Outflow = 3.95 cfs @ 12.04 hrs, Volume= 0.272 af, Atten= 0%, Lag= 0.0 min
Primary = 3.95 cfs @ 12.04 hrs, Volume= 0.272 af
Routed to Reach 1.1bR2 : North Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,450.46' @ 12.04 hrs
Flood Elev= 1,451.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,449.50'	**18.0" Round Culvert** L= 45.9' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,449.50' / 1,447.27' S= 0.0486 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.95 cfs @ 12.04 hrs HW=1,450.46' (Free Discharge)
1=Culvert (Inlet Controls 3.95 cfs @ 3.33 fps)

Pond 1.1bC1: TS4 Culvert



Summary for Pond 1.1bP1: Dry Swale

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 2.36" for 100-Yr Storm event
Inflow = 5.77 cfs @ 12.04 hrs, Volume= 0.391 af
Outflow = 5.77 cfs @ 12.04 hrs, Volume= 0.391 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.03 hrs, Volume= 0.005 af
Primary = 5.77 cfs @ 12.04 hrs, Volume= 0.386 af
Routed to Pond 1.1bP2 : North Road Detention Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.74' @ 12.04 hrs Surf.Area= 603 sf Storage= 428 cf

Plug-Flow detention time= 6.5 min calculated for 0.391 af (100% of inflow)
Center-of-Mass det. time= 6.7 min (866.5 - 859.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.75'	428 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

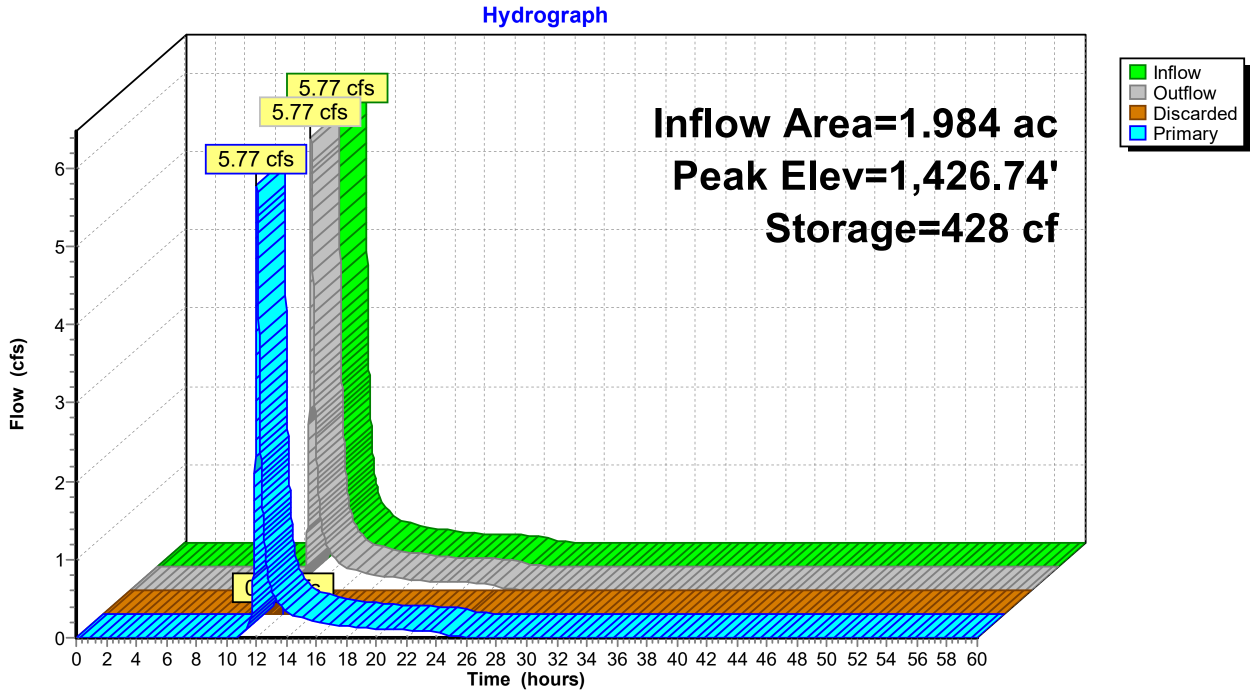
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,424.75	0	0.0	0	0	0
1,425.00	25	22.9	2	2	42
1,426.00	273	98.0	127	129	767
1,426.70	603	161.7	299	428	2,086

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.75'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,425.69'	**2.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.01 cfs @ 12.03 hrs HW=1,426.74' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=5.76 cfs @ 12.04 hrs HW=1,426.74' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 5.76 cfs @ 2.74 fps)

Pond 1.1bP1: Dry Swale



Summary for Pond 1.1bP2: North Road Detention Pond

Inflow Area = 1.984 ac, 0.71% Impervious, Inflow Depth = 2.33" for 100-Yr Storm event
Inflow = 5.77 cfs @ 12.04 hrs, Volume= 0.386 af
Outflow = 5.65 cfs @ 12.06 hrs, Volume= 0.372 af, Atten= 2%, Lag= 1.3 min
Discarded = 0.02 cfs @ 12.06 hrs, Volume= 0.053 af
Primary = 5.63 cfs @ 12.06 hrs, Volume= 0.318 af
Routed to Link 1.1L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.23' @ 12.06 hrs Surf.Area= 0.034 ac Storage= 0.056 af

Plug-Flow detention time= 193.0 min calculated for 0.371 af (96% of inflow)
Center-of-Mass det. time= 171.5 min (1,031.2 - 859.7)

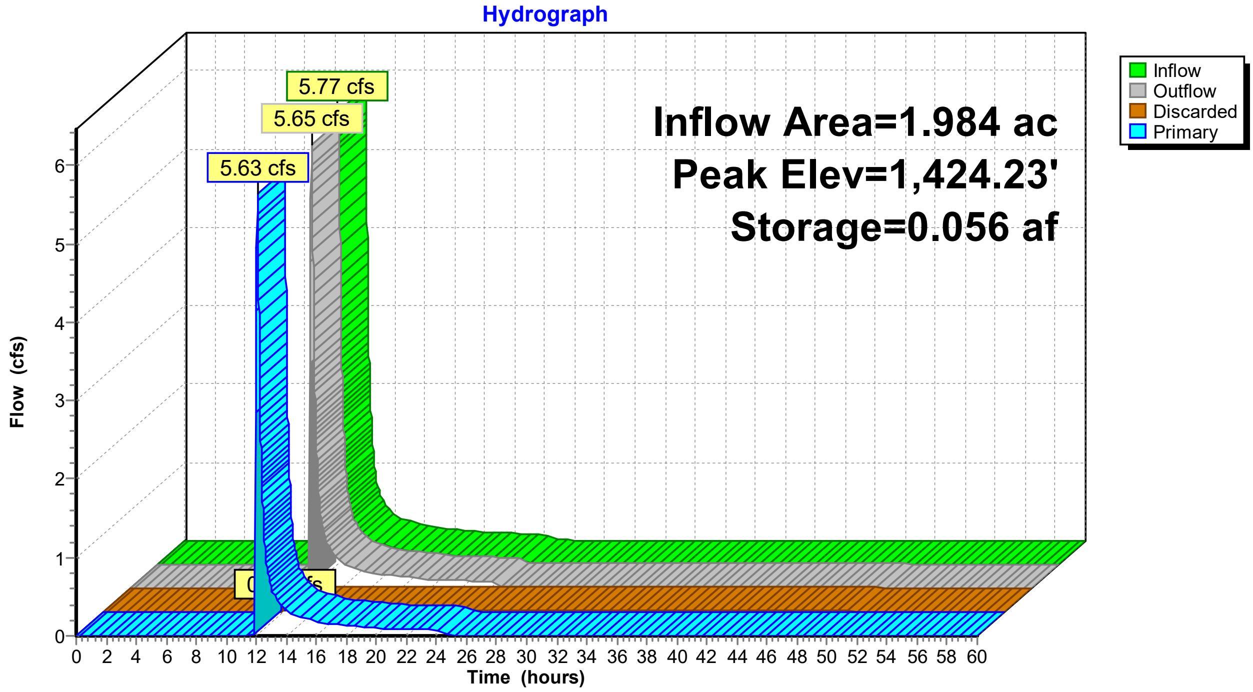
Volume	Invert	Avail.Storage	Storage Description
#1	1,421.50'	0.166 af	**10.00'W x 40.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,421.50'	**0.500 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,424.00'	**20.0' 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

Discarded OutFlow Max=0.02 cfs @ 12.06 hrs HW=1,424.23' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=5.60 cfs @ 12.06 hrs HW=1,424.23' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 5.60 cfs @ 1.21 fps)

Pond 1.1bP2: North Road Detention Pond



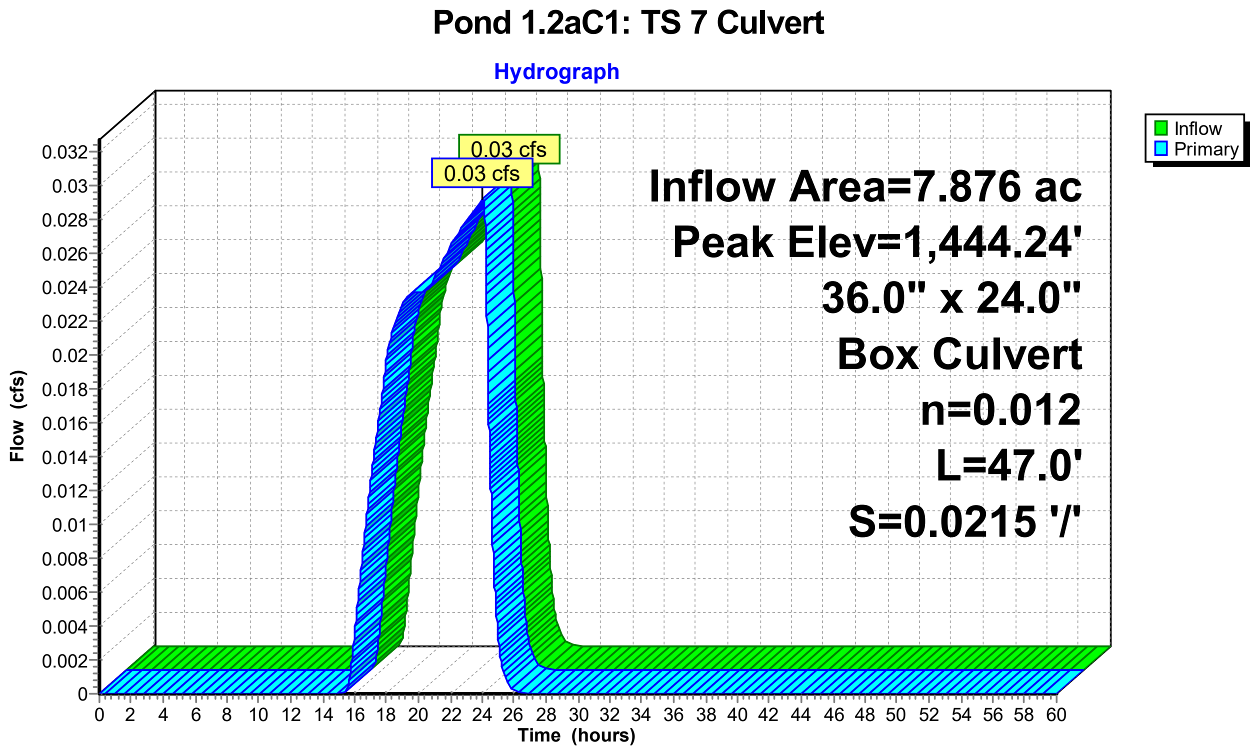
Summary for Pond 1.2aC1: TS 7 Culvert

Inflow Area = 7.876 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.03 cfs @ 24.06 hrs, Volume= 0.016 af
Outflow = 0.03 cfs @ 24.06 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min
Primary = 0.03 cfs @ 24.06 hrs, Volume= 0.016 af
Routed to Reach 1.2aR2 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.24' @ 24.06 hrs
Flood Elev= 1,446.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,444.22'	**36.0" W x 24.0" H Box Culvert** L= 47.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,444.22' / 1,443.21' S= 0.0215 '/' Cc= 0.900 n= 0.012, Flow Area= 6.00 sf

Primary OutFlow Max=0.03 cfs @ 24.06 hrs HW=1,444.24' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.03 cfs @ 0.46 fps)



Summary for Pond 1.2aC2: TS8 Culvert

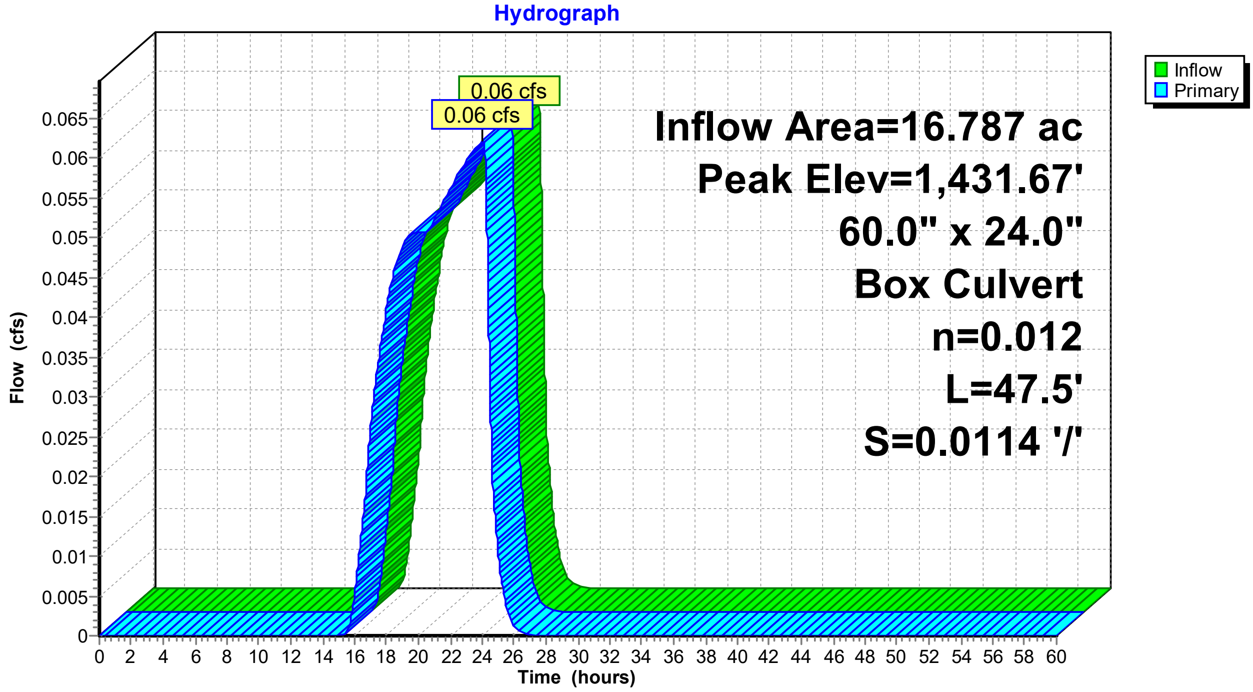
Inflow Area = 16.787 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.06 cfs @ 24.06 hrs, Volume= 0.034 af
Outflow = 0.06 cfs @ 24.06 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min
Primary = 0.06 cfs @ 24.06 hrs, Volume= 0.034 af
Routed to Reach 1.2aR3 : Bypass Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,431.67' @ 24.06 hrs
Flood Elev= 1,433.87'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.65'	**60.0" W x 24.0" H Box Culvert** L= 47.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,431.65' / 1,431.11' S= 0.0114 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 10.00 sf

Primary OutFlow Max=0.06 cfs @ 24.06 hrs HW=1,431.67' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.06 cfs @ 0.50 fps)

Pond 1.2aC2: TS8 Culvert



Summary for Pond 1.2aP: South Road Bypass OC

Inflow Area = 22.287 ac, 0.00% Impervious, Inflow Depth = 0.02" for 100-Yr Storm event
Inflow = 0.08 cfs @ 24.07 hrs, Volume= 0.045 af
Outflow = 0.08 cfs @ 24.20 hrs, Volume= 0.045 af, Atten= 5%, Lag= 8.4 min
Discarded = 0.08 cfs @ 24.20 hrs, Volume= 0.045 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,424.42' @ 24.20 hrs Surf.Area= 0.006 ac Storage= 0.002 af

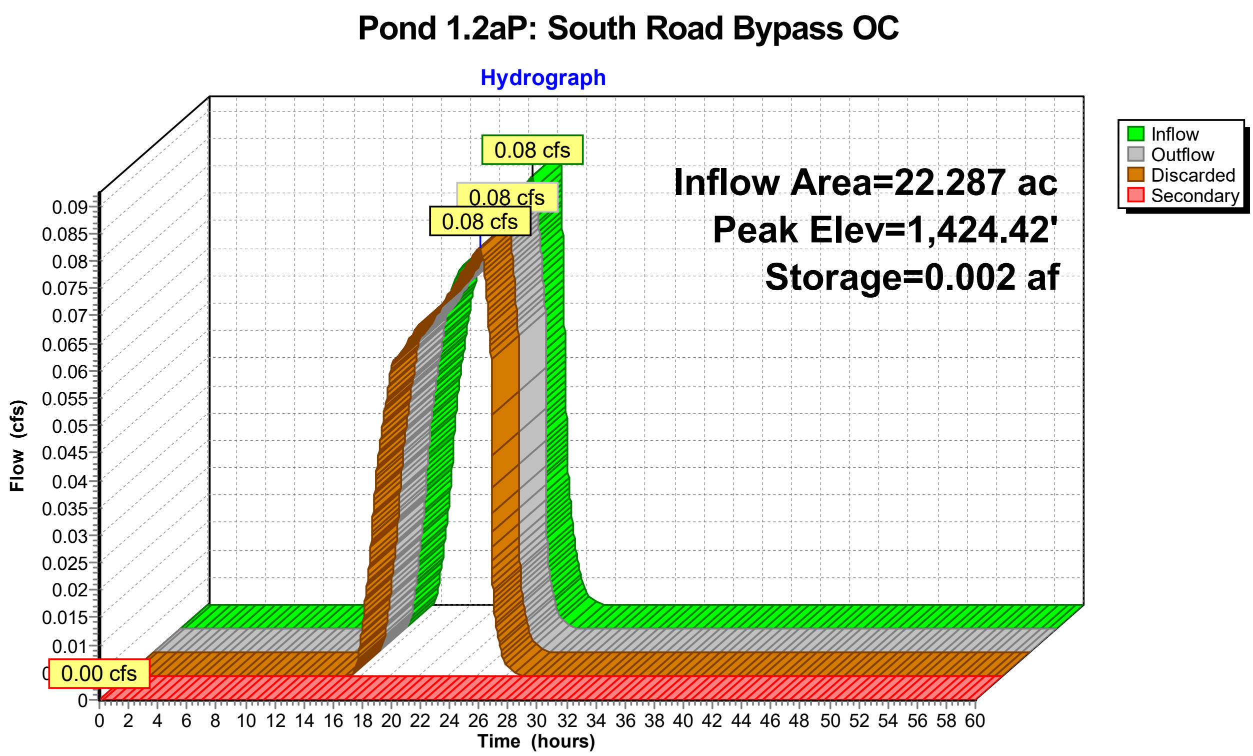
Plug-Flow detention time= 11.1 min calculated for 0.045 af (100% of inflow)
Center-of-Mass det. time= 11.1 min (1,272.7 - 1,261.5)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.069 af	**10.00'W x 20.00'L x 4.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area**
#2	Secondary	1,426.50'	**10.0' 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

Discarded OutFlow Max=0.08 cfs @ 24.20 hrs HW=1,424.42' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,424.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Summary for Pond 1.2bC1: East Road Culvert

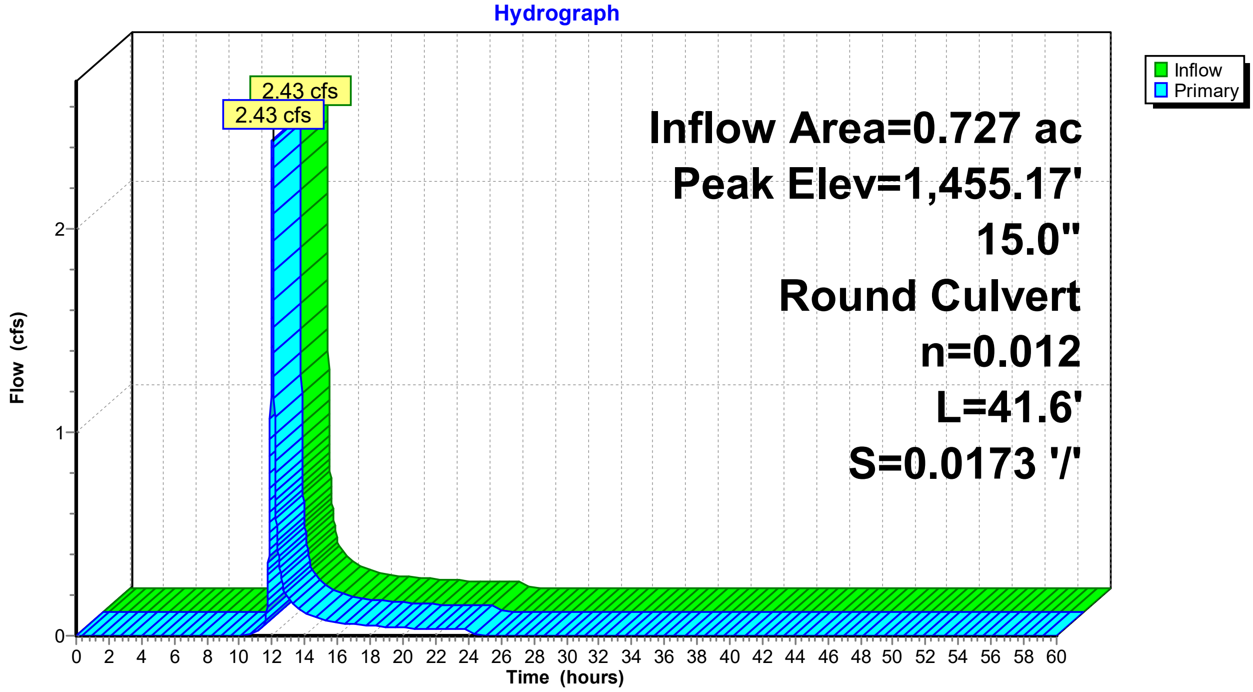
Inflow Area = 0.727 ac, 0.00% Impervious, Inflow Depth = 2.11" for 100-Yr Storm event
Inflow = 2.43 cfs @ 12.01 hrs, Volume= 0.128 af
Outflow = 2.43 cfs @ 12.01 hrs, Volume= 0.128 af, Atten= 0%, Lag= 0.0 min
Primary = 2.43 cfs @ 12.01 hrs, Volume= 0.128 af
Routed to Reach 1.2bR2 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,455.17' @ 12.01 hrs
Flood Elev= 1,457.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,454.39'	**15.0" Round Culvert** L= 41.6' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,454.39' / 1,453.67' S= 0.0173 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=2.43 cfs @ 12.01 hrs HW=1,455.17' (Free Discharge)
1=Culvert (Inlet Controls 2.43 cfs @ 3.01 fps)

Pond 1.2bC1: East Road Culvert



Summary for Pond 1.2bC2: TS6 Culvert

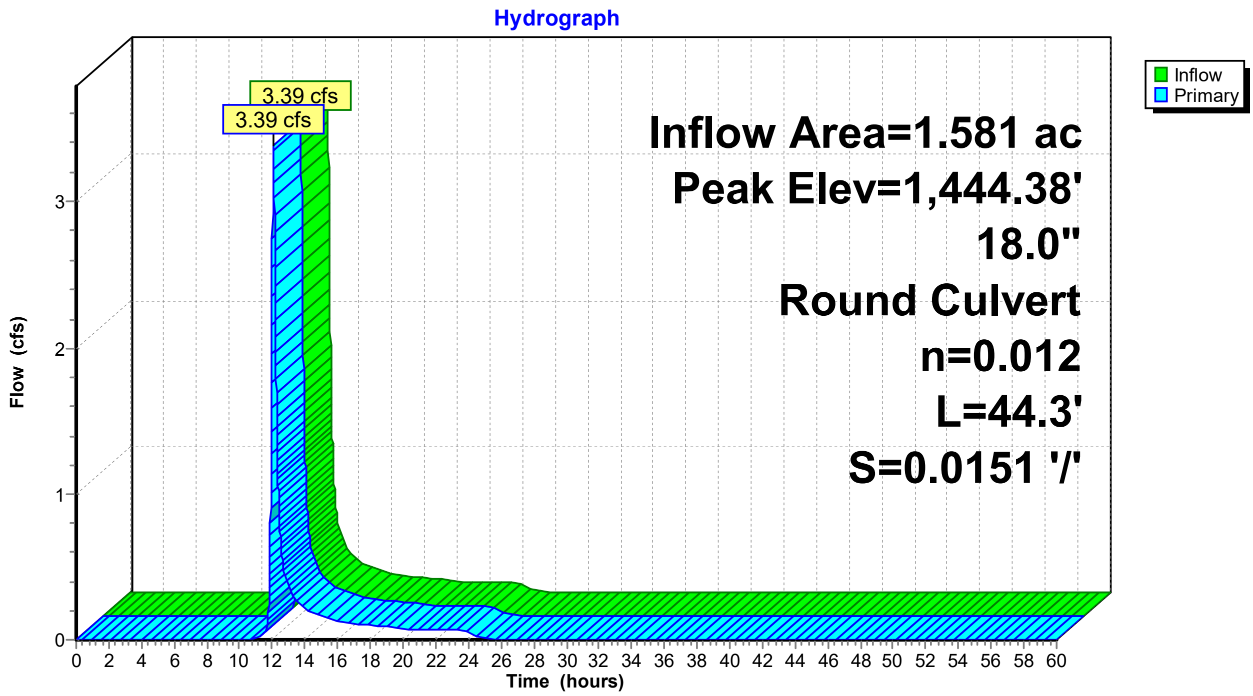
Inflow Area = 1.581 ac, 0.25% Impervious, Inflow Depth = 1.73" for 100-Yr Storm event
Inflow = 3.39 cfs @ 12.07 hrs, Volume= 0.228 af
Outflow = 3.39 cfs @ 12.07 hrs, Volume= 0.228 af, Atten= 0%, Lag= 0.0 min
Primary = 3.39 cfs @ 12.07 hrs, Volume= 0.228 af
Routed to Reach 1.2bR3 : South Road Conveyance Swale

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,444.38' @ 12.07 hrs
Flood Elev= 1,445.09'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,443.51'	**18.0" Round Culvert** L= 44.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,443.51' / 1,442.84' S= 0.0151 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.38 cfs @ 12.07 hrs HW=1,444.38' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 3.38 cfs @ 3.18 fps)

Pond 1.2bC2: TS6 Culvert



Summary for Pond 1.2bP: South Road Treatment Pond

Inflow Area = 2.396 ac, 0.63% Impervious, Inflow Depth = 1.98" for 100-Yr Storm event
Inflow = 5.31 cfs @ 12.06 hrs, Volume= 0.394 af
Outflow = 5.30 cfs @ 12.06 hrs, Volume= 0.394 af, Atten= 0%, Lag= 0.6 min
Discarded = 0.31 cfs @ 12.06 hrs, Volume= 0.232 af
Primary = 4.98 cfs @ 12.06 hrs, Volume= 0.162 af
Routed to Link 1.2L :

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,426.26' @ 12.06 hrs Surf.Area= 0.026 ac Storage= 0.038 af

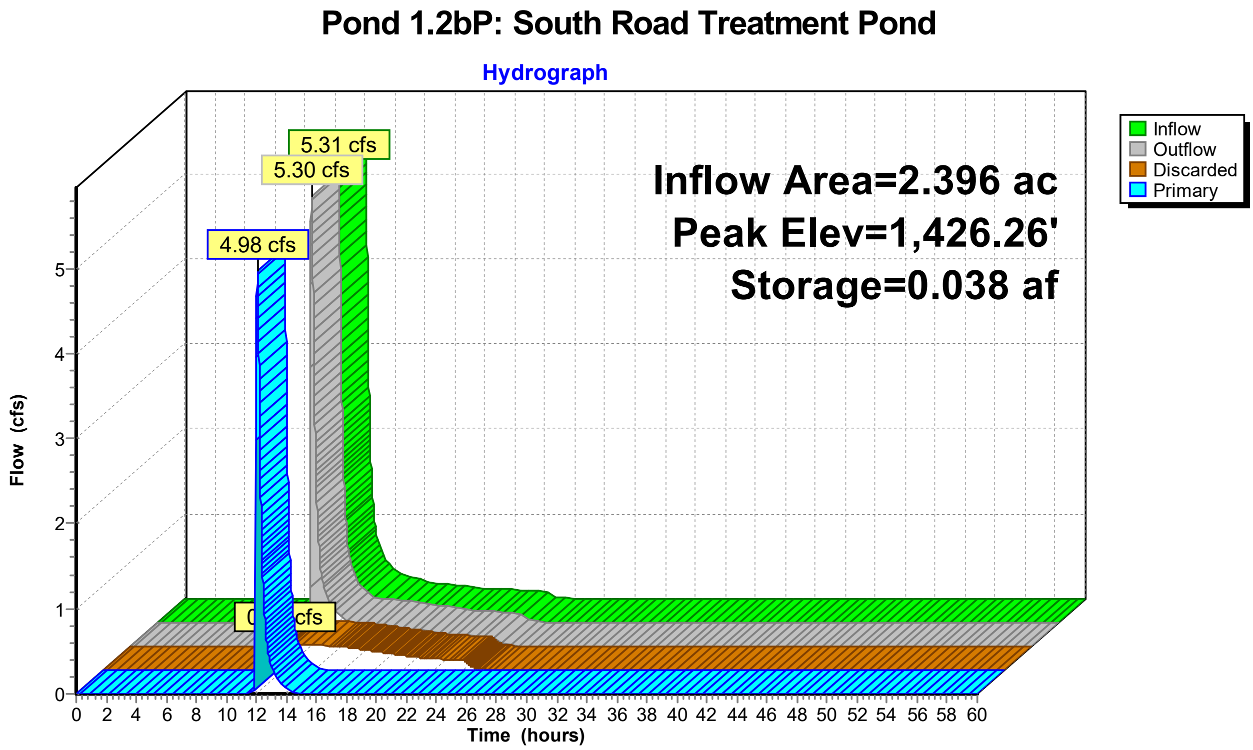
Plug-Flow detention time= 34.9 min calculated for 0.394 af (100% of inflow)
Center-of-Mass det. time= 34.9 min (902.9 - 868.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,424.00'	0.149 af	**20.00'W x 20.00'L x 5.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,424.00'	**12.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,426.05'	**20.0' 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

Discarded OutFlow Max=0.31 cfs @ 12.06 hrs HW=1,426.26' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=4.95 cfs @ 12.06 hrs HW=1,426.26' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 4.95 cfs @ 1.16 fps)



Summary for Pond 1.3P: Pond 3 - Access Rd West

Inflow Area = 0.695 ac, 0.00% Impervious, Inflow Depth = 0.94" for 100-Yr Storm event
Inflow = 1.02 cfs @ 11.99 hrs, Volume= 0.054 af
Outflow = 0.14 cfs @ 12.44 hrs, Volume= 0.054 af, Atten= 86%, Lag= 27.2 min
Discarded = 0.14 cfs @ 12.44 hrs, Volume= 0.054 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link SP1 : Study Point 1

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,456.62' @ 12.44 hrs Surf.Area= 1,037 sf Storage= 566 cf

Plug-Flow detention time= 28.7 min calculated for 0.054 af (100% of inflow)
Center-of-Mass det. time= 28.7 min (927.0 - 898.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,456.00'	8,743 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

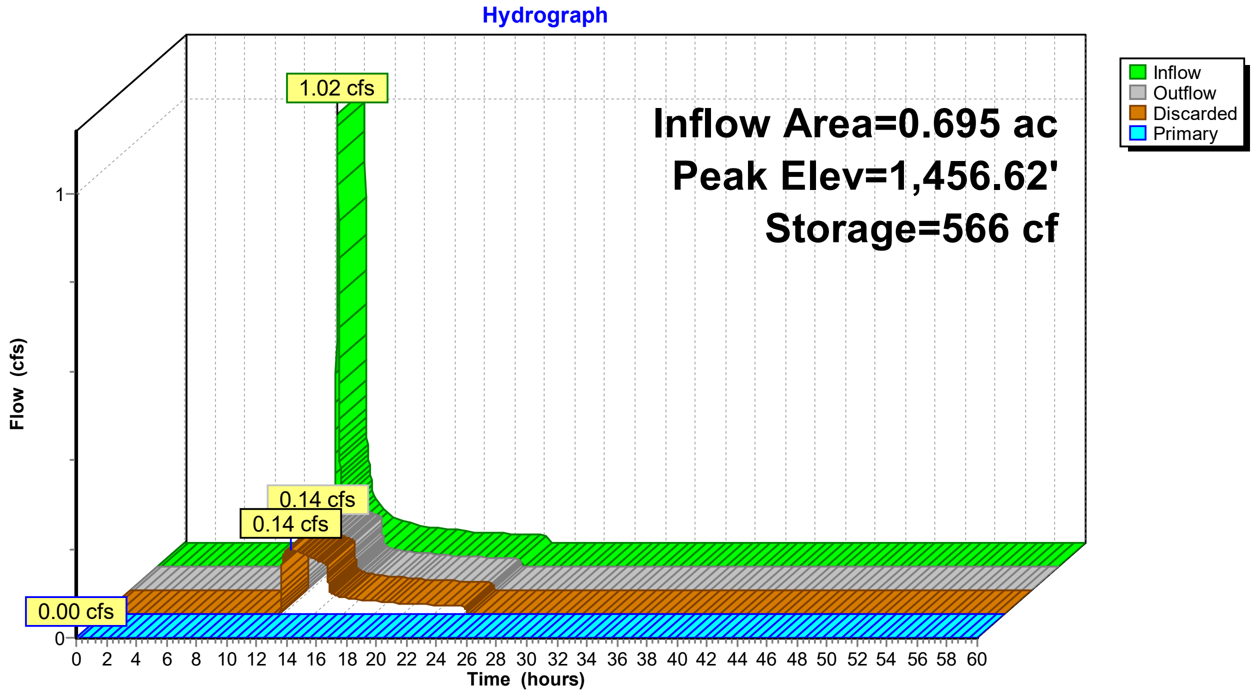
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,456.00	784	123.0	0	0	784
1,458.00	1,720	194.0	2,443	2,443	2,603
1,459.00	2,884	279.0	2,277	4,721	5,811
1,460.00	5,280	421.0	4,022	8,743	13,729

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,456.00'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,459.99'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.14 cfs @ 12.44 hrs HW=1,456.62' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,456.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1.3P: Pond 3 - Access Rd West



Summary for Pond 4.2bP: Pond 4 - Access Rd East

Inflow Area = 0.470 ac, 0.00% Impervious, Inflow Depth = 2.53" for 100-Yr Storm event
Inflow = 1.95 cfs @ 12.01 hrs, Volume= 0.099 af
Outflow = 0.69 cfs @ 12.15 hrs, Volume= 0.099 af, Atten= 65%, Lag= 8.9 min
Discarded = 0.14 cfs @ 12.15 hrs, Volume= 0.089 af
Primary = 0.55 cfs @ 12.15 hrs, Volume= 0.011 af
Routed to Pond 4.2C : 18" Culvert

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,448.33' @ 12.15 hrs Surf.Area= 998 sf Storage= 1,559 cf

Plug-Flow detention time= 117.3 min calculated for 0.099 af (100% of inflow)
Center-of-Mass det. time= 117.3 min (960.2 - 842.9)

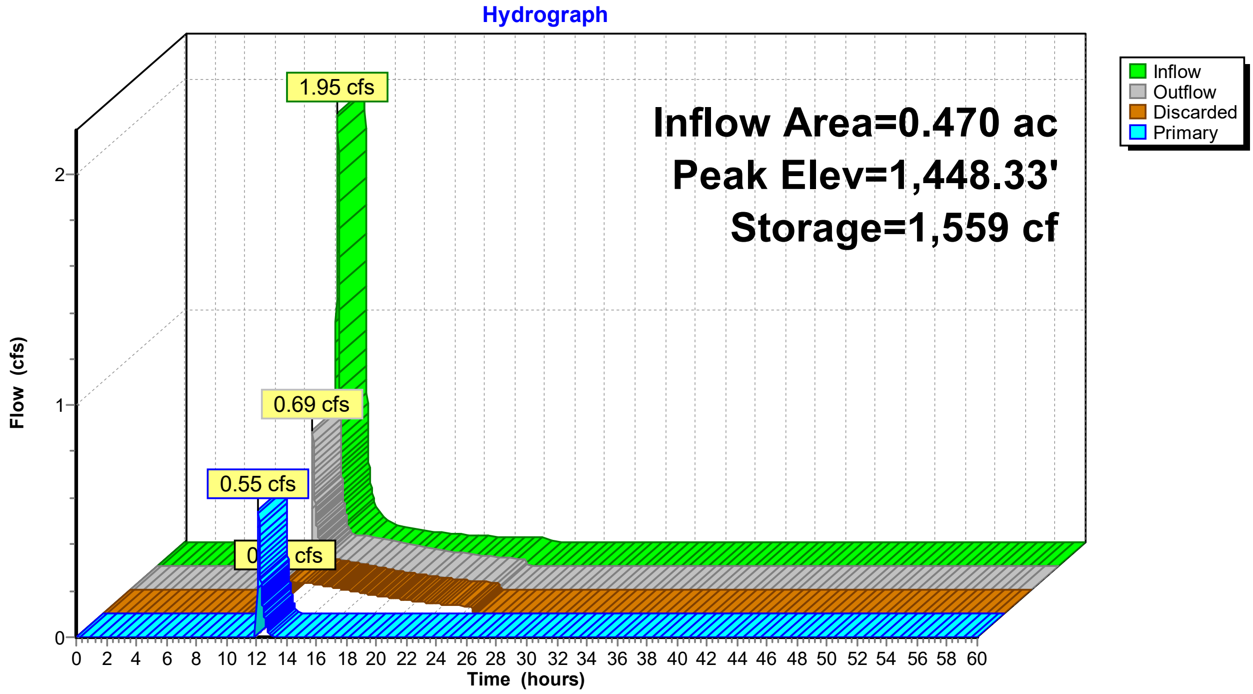
Volume	Invert	Avail.Storage	Storage Description
#1	1,445.50'	2,317 cf	**10.00'W x 20.00'L x 3.50'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Discarded	1,445.50'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	1,448.25'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.14 cfs @ 12.15 hrs HW=1,448.33' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.54 cfs @ 12.15 hrs HW=1,448.33' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.54 cfs @ 0.67 fps)

Pond 4.2bP: Pond 4 - Access Rd East



Summary for Pond 4.2C: 18" Culvert

Inflow Area = 27.587 ac, 0.00% Impervious, Inflow Depth = 0.93" for 100-Yr Storm event
Inflow = 13.46 cfs @ 12.41 hrs, Volume= 2.131 af
Outflow = 9.09 cfs @ 12.74 hrs, Volume= 2.130 af, Atten= 32%, Lag= 19.7 min
Primary = 9.09 cfs @ 12.74 hrs, Volume= 2.130 af
Routed to Reach 4.1R2 : Ex Stream

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,433.72' @ 12.74 hrs Surf.Area= 13,077 sf Storage= 10,213 cf
Flood Elev= 1,434.64' Surf.Area= 27,666 sf Storage= 28,656 cf

Plug-Flow detention time= 13.0 min calculated for 2.130 af (100% of inflow)
Center-of-Mass det. time= 12.5 min (940.4 - 927.9)

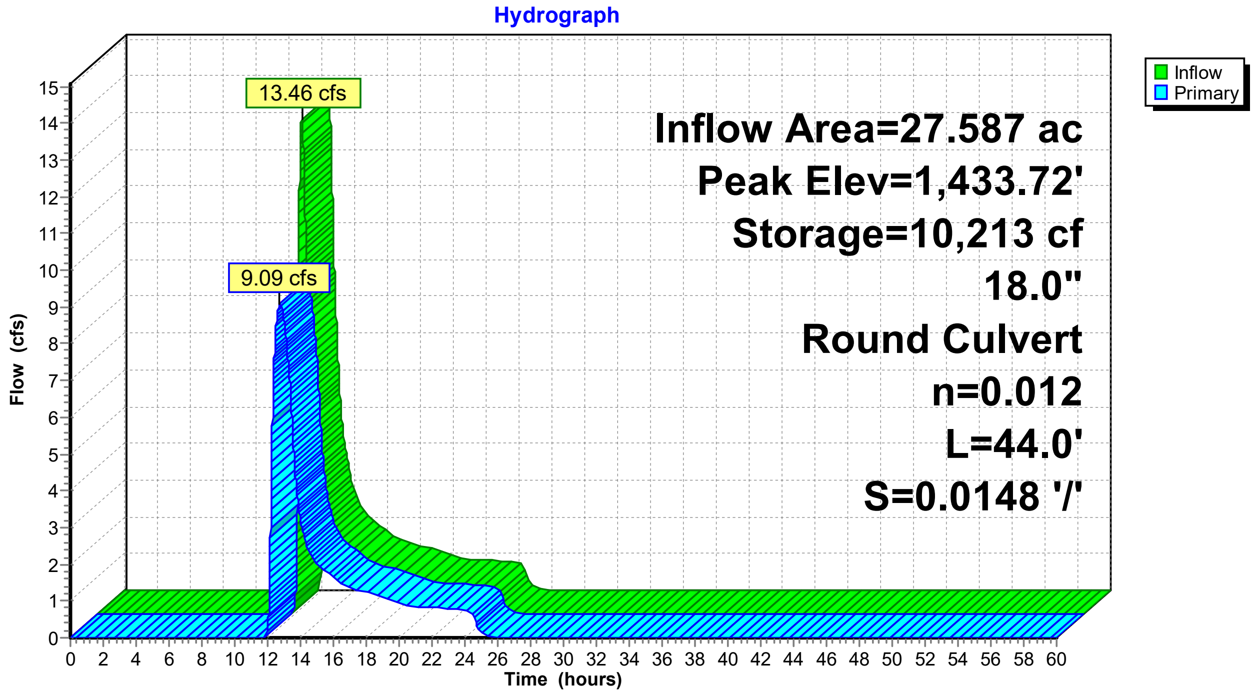
Volume	Invert	Avail.Storage	Storage Description
#1	1,431.50'	39,033 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,431.50	0	0.0	0	0	0
1,432.00	1,190	146.0	198	198	1,697
1,432.50	3,534	368.0	1,129	1,327	10,778
1,433.00	5,795	497.0	2,309	3,637	19,660
1,433.50	10,362	837.0	3,984	7,621	55,755
1,434.00	16,931	975.0	6,756	14,377	75,659
1,434.60	27,412	1,352.0	13,177	27,555	145,474
1,435.00	30,000	1,500.0	11,479	39,033	179,068

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.83'	**18.0" Round Culvert** L= 44.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.83' / 1,431.18' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=9.09 cfs @ 12.74 hrs HW=1,433.72' (Free Discharge)
└─**1=Culvert** (Inlet Controls 9.09 cfs @ 5.14 fps)

Pond 4.2C: 18" Culvert



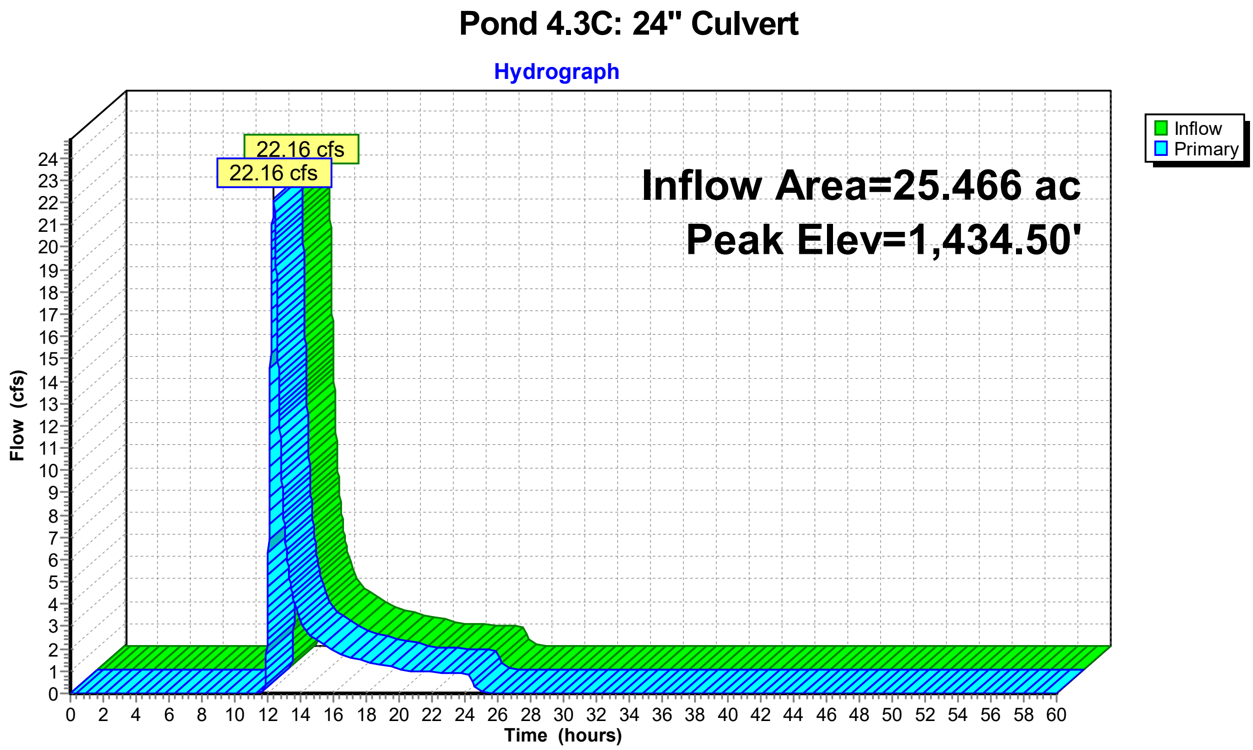
Summary for Pond 4.3C: 24" Culvert

Inflow Area = 25.466 ac, 5.08% Impervious, Inflow Depth = 1.34" for 100-Yr Storm event
Inflow = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af
Outflow = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af, Atten= 0%, Lag= 0.0 min
Primary = 22.16 cfs @ 12.37 hrs, Volume= 2.846 af
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 1,434.50' @ 12.37 hrs
Flood Elev= 1,434.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,431.35'	**24.0" Round Culvert** L= 55.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,431.35' / 1,429.87' S= 0.0265 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Primary	1,434.81'	**20.0' 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

Primary OutFlow Max=22.15 cfs @ 12.37 hrs HW=1,434.49' (Free Discharge)
1=Culvert (Inlet Controls 22.15 cfs @ 7.05 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

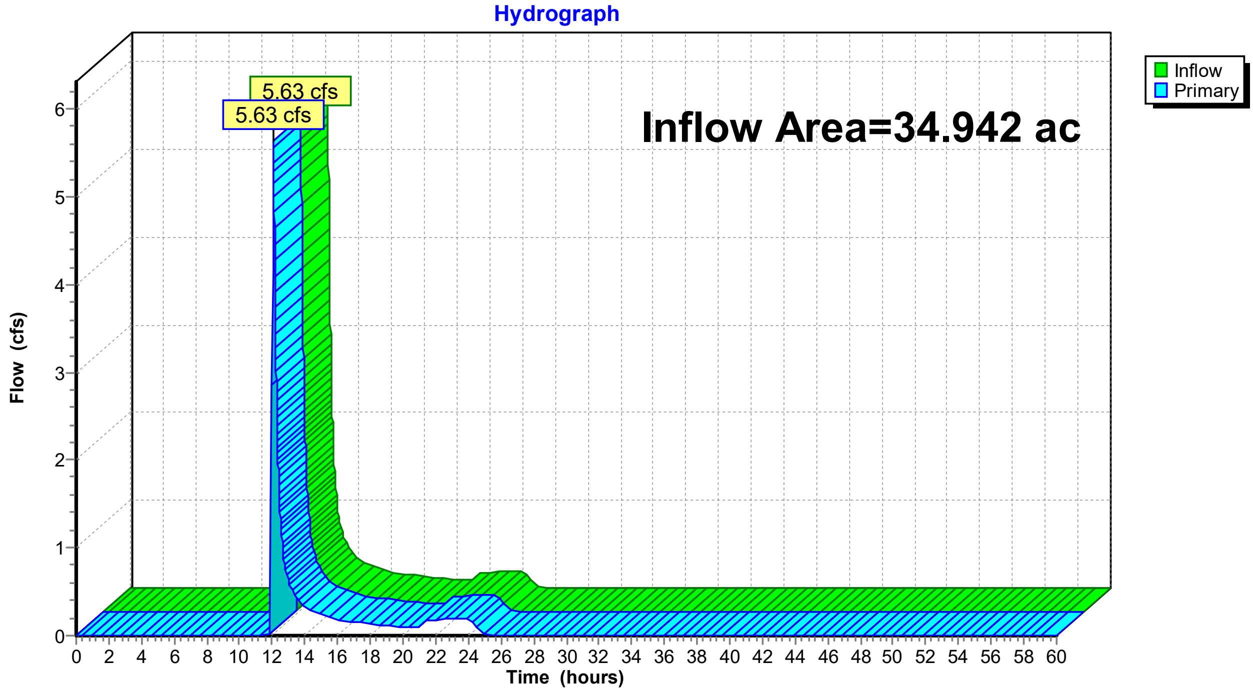


Summary for Link 1.1L:

Inflow Area = 34.942 ac, 0.04% Impervious, Inflow Depth = 0.12" for 100-Yr Storm event
Inflow = 5.63 cfs @ 12.06 hrs, Volume= 0.349 af
Primary = 5.63 cfs @ 12.06 hrs, Volume= 0.349 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link 1.1L:

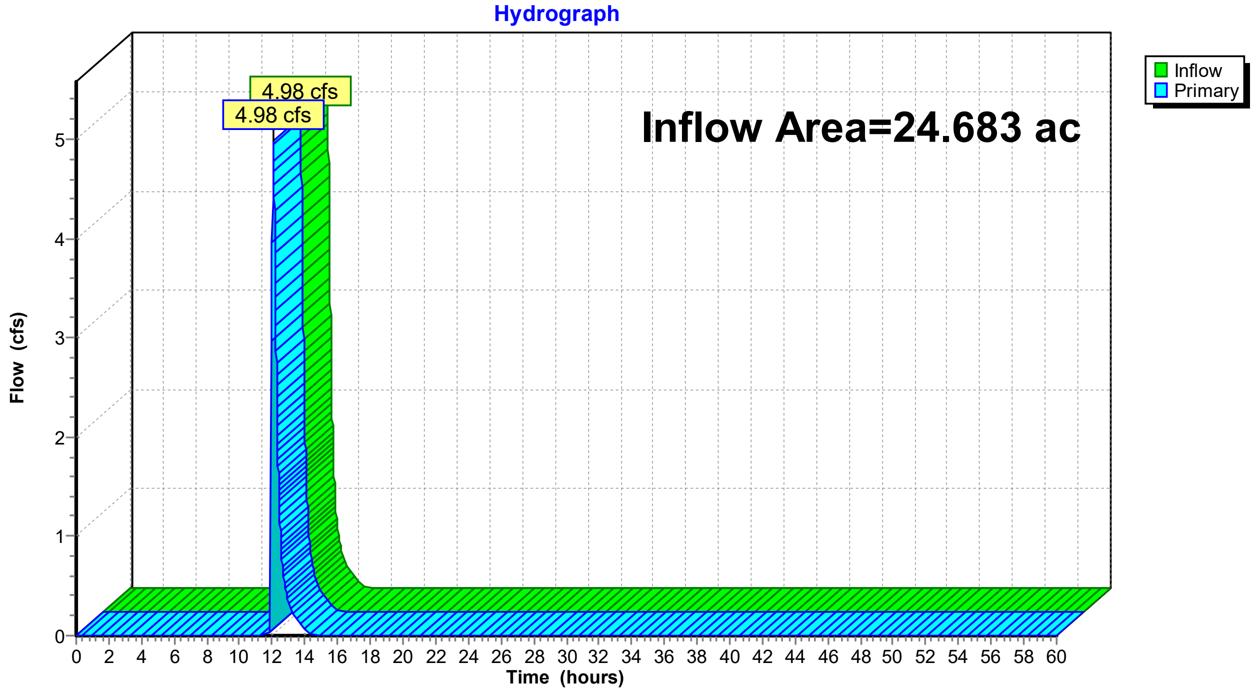


Summary for Link 1.2L:

Inflow Area = 24.683 ac, 0.06% Impervious, Inflow Depth = 0.08" for 100-Yr Storm event
Inflow = 4.98 cfs @ 12.06 hrs, Volume= 0.162 af
Primary = 4.98 cfs @ 12.06 hrs, Volume= 0.162 af, Atten= 0%, Lag= 0.0 min
Routed to Link SP1 : Study Point 1

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link 1.2L:

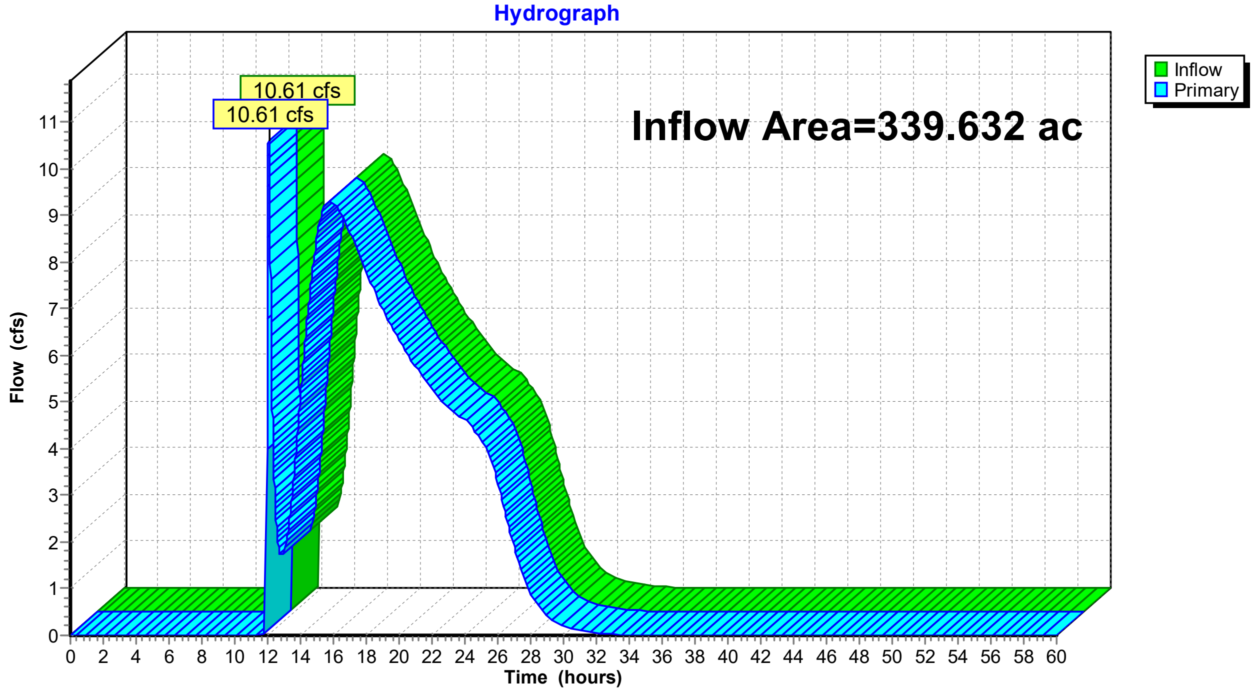


Summary for Link SP1: Study Point 1

Inflow Area = 339.632 ac, 0.01% Impervious, Inflow Depth = 0.26" for 100-Yr Storm event
Inflow = 10.61 cfs @ 12.06 hrs, Volume= 7.384 af
Primary = 10.61 cfs @ 12.06 hrs, Volume= 7.384 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP1: Study Point 1

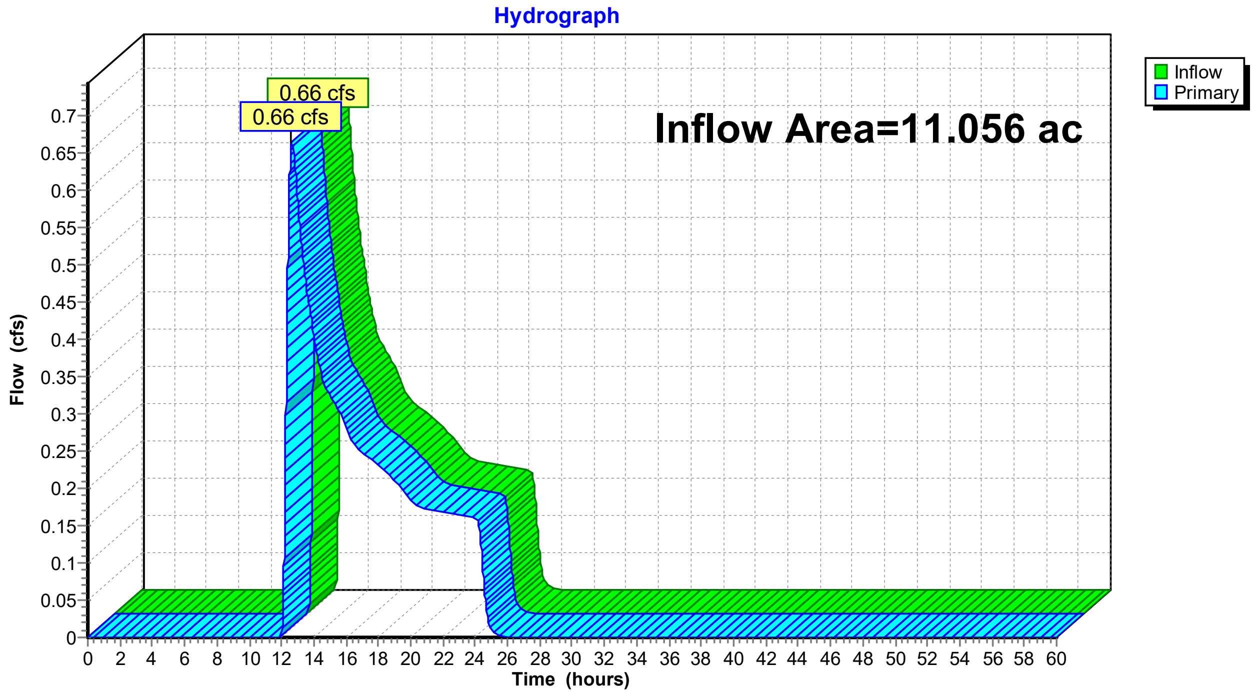


Summary for Link SP2: Study Point 2

Inflow Area =	11.056 ac,	0.00% Impervious, Inflow Depth = 0.30"	for 100-Yr Storm event	
Inflow =	0.66 cfs @	12.61 hrs, Volume=	0.272 af	
Primary =	0.66 cfs @	12.61 hrs, Volume=	0.272 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP2: Study Point 2

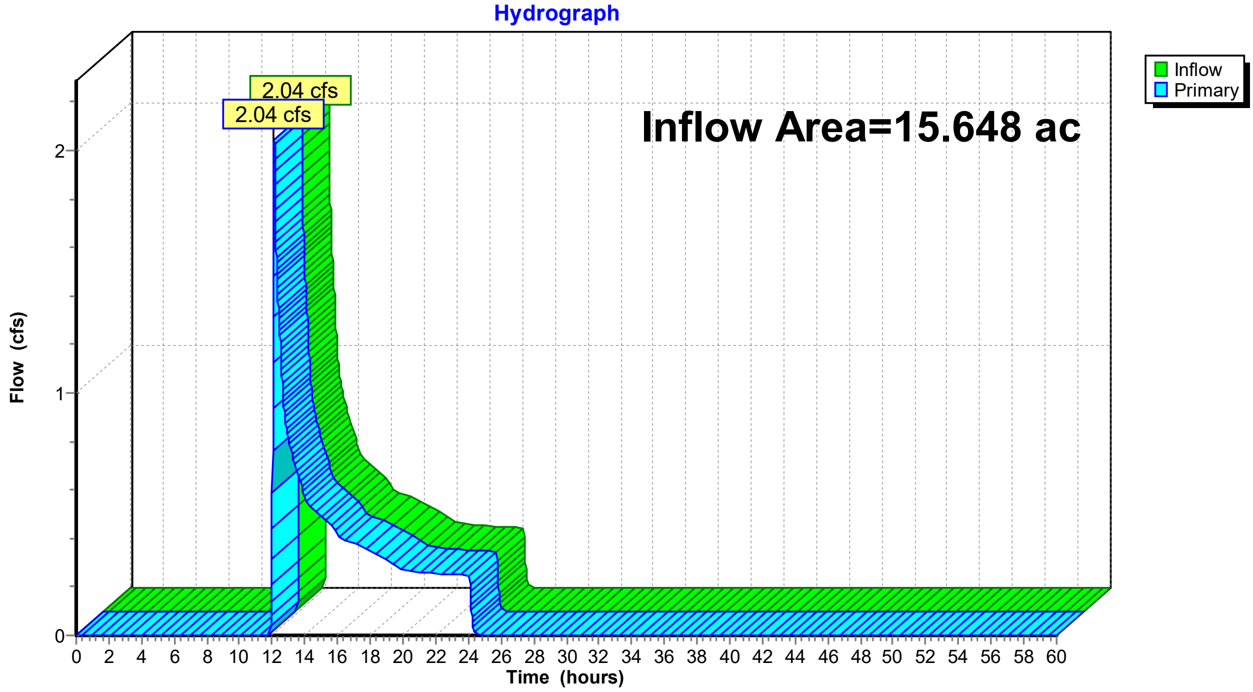


Summary for Link SP3: Study Point 3

Inflow Area =	15.648 ac,	0.56% Impervious,	Inflow Depth = 0.34"	for 100-Yr Storm event	
Inflow =	2.04 cfs @	12.13 hrs,	Volume=	0.442 af	
Primary =	2.04 cfs @	12.13 hrs,	Volume=	0.442 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP3: Study Point 3

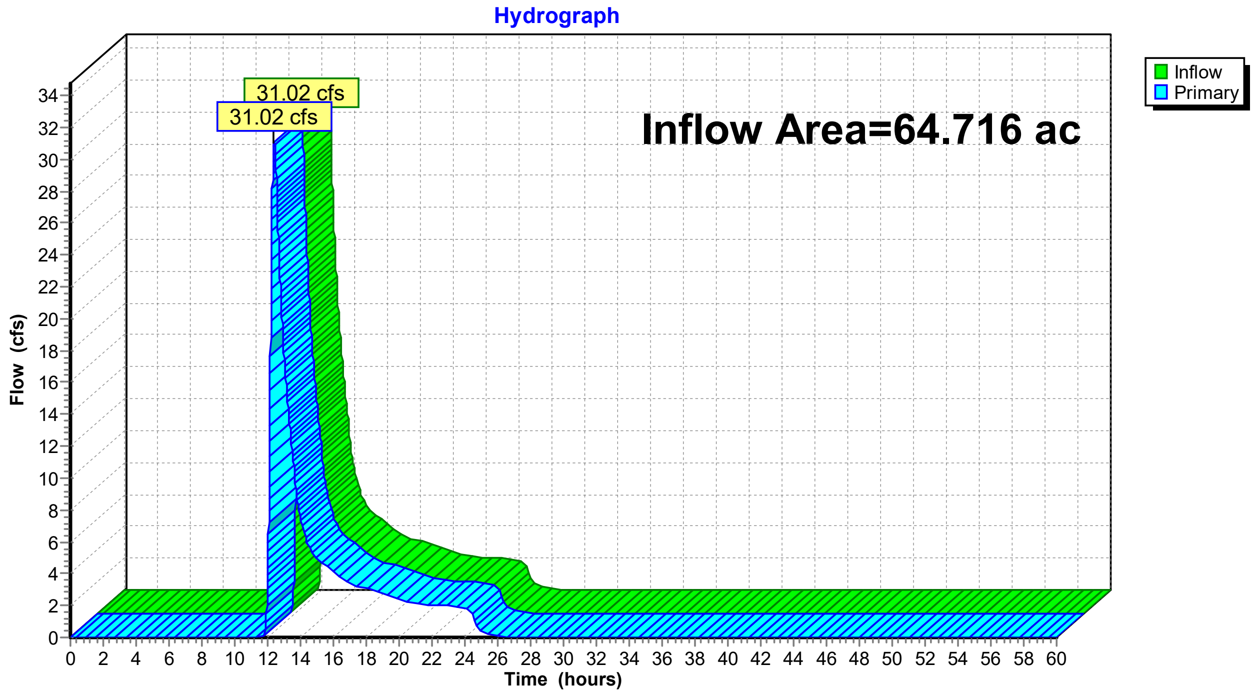


Summary for Link SP4: Study Point 4

Inflow Area =	64.716 ac,	2.50% Impervious, Inflow Depth = 1.03"	for 100-Yr Storm event	
Inflow =	31.02 cfs @	12.41 hrs, Volume=	5.546 af	
Primary =	31.02 cfs @	12.41 hrs, Volume=	5.546 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP4: Study Point 4

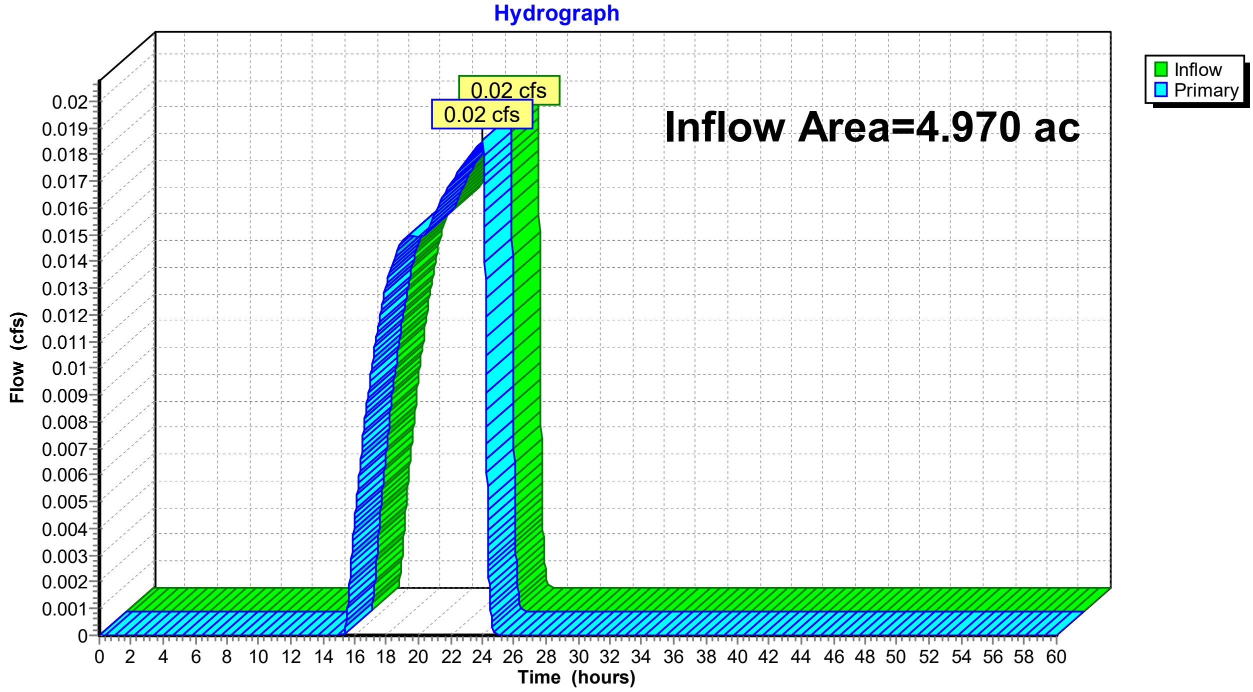


Summary for Link SP5: Study Point 5

Inflow Area =	4.970 ac,	0.00% Impervious, Inflow Depth = 0.02"	for 100-Yr Storm event	
Inflow =	0.02 cfs @	24.02 hrs, Volume=	0.010 af	
Primary =	0.02 cfs @	24.02 hrs, Volume=	0.010 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP5: Study Point 5



Summary for Link SP6: Study Point 6

Inflow Area =	24.966 ac,	5.81% Impervious, Inflow Depth = 0.48"	for 100-Yr Storm event	
Inflow =	3.11 cfs @	12.89 hrs, Volume=	1.002 af	
Primary =	3.11 cfs @	12.89 hrs, Volume=	1.002 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Link SP6: Study Point 6