STORMWATER POLLUTION PREVENTION PLAN

Central Hudson Gas & Electric Corporation (Training Academy, Training Annex, PCC, Outdoor Pole Yard and Gas Village)

Town of Ulster

Ulster County, New York

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1.0 SUMMARY OF REQUIREMENTS

This Storm Water Pollution Prevention Plan (SWPPP) has been prepared in conjunction with the design for the proposed Central Hudson Gas and Electric Corporation Training Center and Primary Control Center (PCC). The project site is currently a vacant lot located on N.Y.S. Route 9W in the Town of Ulster, Ulster County, New York. The project site will be accessed from the existing Hudson Gas & Electric Kingston Facility located along the southerly property line on the adjacent parcel. The secondary emergency access to the site will be provided from the Eastern Parkway located along the northerly property line.

The proposed improvements will include construction of a Training Facility Building, PCC Building, Training Annex Building, Outdoor Pole Yard, Gas Village and associated driveways and parking areas.

The proposed improvements will result in approximately 28.7 acres of disturbance, and therefore will exceed the threshold which requires preparation of a stormwater pollution prevention plan (SWPPP) in conformance with the New York State Department of Environmental Conservation (NYSEC) general permit for stormwater discharges from construction activities (GP-0-15-002). The proposed design meets all of the permit requirements for water quality treatment and runoff quantity control in conformance to the current Stormwater Design Manual.

This SWPPP includes the applicable General Permit, in addition to all necessary elements in order to comply with the National General Permit for Construction Activities administered by the New York State Department of Environmental Conservation (NYSDEC) via the State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from construction activity. This SWPPP shall be implemented upon the start of construction activities. In order for the project to obtain coverage under this SPDES General Permit, the SWPPP must contain the following requirements:

1. Certifications for the Owner, Operator, and Subcontractors must be included in the SWPPP. The Owner is defined as the permittee with operational control over construction plans and specifications. The Operator is defined as the permittee with day-to-day operational control over activities necessary to ensure compliance with the SWPPP. The Subcontractor is defined as anyone employed by the Operator to carry out construction activities. Certifications are provided in Appendix III of the SWPPP.

2. A Notice if Intent (NOI) must be submitted to the NYSDEC prior to the initiation of construction activity covered by the General Permit. Construction activities may begin five (5) days after receipt of the complete NOI by the NYSDEC. The Notice of Intent is provided in Appendix II.

3. Stormwater pollution prevention controls for construction activities must be implemented and must conform to the “New York Standards and Specifications for Erosion and Sediment Control”. The stormwater pollution prevention controls proposed for this project are presented in Section 3.0.

4. An inspection and maintenance plan must be developed and implemented. This inspection and maintenance plan is presented in Section 5.0.

5. The SWPPP must identify any authorized non-stormwater discharges that are combined with stormwater discharges and implement a system of controls to provide appropriate pollution prevention measures to these components of the discharges. Non-stormwater discharges and appropriate controls are discussed in Section 4.0.

6. Construction activity records must be completed and maintained.

7. After final stabilization of the construction site, a Notice of Termination (NOT) shall be submitted to the NYSDEC. The NOT is provided in Appendix V.

8. The SWPPP and all construction records must be retained for a period of at least 5 years following final stabilization and the filing of the NOT. A copy of the SWPPP and all pertinent records shall be maintained at the construction site during the duration of construction activity.

Additional requirements under the General Permit that are not included as part of this SWPPP include the following:

1. The owner or operator shall maintain a copy of the General Permit (GP-0-15-002), NOI, NOI Acknowledgement Letter, SWPPP, MS4 SWPPP Acceptance Form and inspection reports at the construction site until all areas have achieved final stabilization and the Notice of Termination 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; that is accessible during normal working hours to an individual performing a compliance inspection.

2. The Owner and Operator must allow access to the construction site by the NYSDEC.

2.0 SITE DESCRIPTION

2.1 Site Characteristics

2.1.1 Physical Properties

The Site construction drawings prepared in conjunction with this project are also part of the SWPPP. See plans for Central Hudson Gas and Electric Training Center, dated July 30, 2019.

Appropriate measures need to be taken to eliminate the potential for any pollutants to be transported by stormwater. The major construction activities involved are site grading, paving, the installation of utilities and storm drainage system, site lighting and landscaping in order to facilitate construction of the buildings and parking areas for the proposed Central Hudson Gas and Electric Training Center.

Project location – 2229 – 2271 Route 9W, Town of Ulster, Ulster County, New York. The UTM coordinates for this site are X=283829 and Y=4650181. The receiving waters are the Esopus Creek.

The project site is currently a vacant wooded site with irregular topography.

Site Soils –

Map Unit Symbol	**Map Unit name**	**Soil Description**	**Hydrologic Soil Group**
Cc	Canandaigua Silt Loam	Poorly and very poorly drained	"D"
FAE	Farmington-Rock outcrop complex, steep	Well Drained, Somewhat Excessively Drained	"C"
PlB	Plainfield loamy sand, 0 to 8 percent slopes	Excessively Drained	"A"
PrC	Plainfield-Rock outcrop complex, rolling	Excessively Drained	"A"
Ra	Raynham silt loam	Poorly drained	"C"
RhA	Rhinebeck silt loam, 0 to 3 percent slope	Somewhat poorly drained	"D"
RvA	Riverhead fine sandy loam, 0 to 3 percent slope	Well drained	"B"
STD	Stockbridge-Farmington-rock outcrop complex, hilly	Well drained	"B" and "C"
WsA	Williamson silt loam, 0 to 3 percent slopes	Moderately well drained	"C"
WsB	Williamson silt loam, 3 to 8 percent slopes	Moderately well drained	"C"

Rainfall information – The average annual rainfall for the area is 50.73" per information included in Urban Hydrology for Small Watersheds. The reported highest monthly rainfall amounts from locations in the vicinity of the project have occurred during the during the month of September.

The entire project contains 56.51 acres and the total area of disturbance is approximately 27.9 acres. The initial runoff coefficients for existing conditions on site range from CN=70 to CN=72. The post construction runoff coefficients will range from CN = 71 to CN = 90.

2.1.2 Wildlife

According to the New York State Department of Environmental Conservation (NYSDEC) Environmental Resource Mapper the project site contains the Northern Long-eared Bat.

2.1.3 Historical and Cultural Resources

Based on the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) web site information, there is no evidence of any historic period structures within the project area.

2.2 Description of Receiving Waters

There is a Federal Wetland located on the project site. The receiving waters have been identified as the Esopus Creek. The Esopus Creek in the vicinity of the project is not a TMDL or 303D listed waterway. Stormwater runoff generated within the project site is directed through inlets and culverts into proposed detention basins on site. These basins are designed to mitigate increases in post-development rates of runoff. Proposed Bioretention Practices on site will provide the required water quality treatment.

2.3 Construction activities

Construction activities will involve site preparation necessary for construction of the foundations for the on-site structures, building of the access driveways and parking areas, installation of the necessary underground utilities and construction of the stormwater management features. These activities primarily include: clearing and stripping of vegetation, excavating, hauling within site and stockpiling of top and subsoils, and trenching and rough grading.

Soil erosion and sediment control measures will be installed prior to commencement of any significant soil disturbing activities and will remain in place until final site stabilization is complete. Topsoil which must be excavated for site development will be separated from the remaining soil and stockpiled on-site for use during site landscaping. These are discussed in the following section. Stockpiled soil will be surrounded by silt fence and seeded to prevent the mobilization of sediment.

2.4 Storm Water Discharges

The proposed stormwater management has been designed to conform to the guidelines established in the New York State Stormwater Design Manual, January 2015 in order to achieve conformance with NYSDEC regulations.

2.4.1 Stormwater Quantity Control

Proposed Detention Basins will provide stream channel protection by providing 24-hour extended detention of the one-year, 24-hour storm event and will attenuate the post-development 10-year and 100-year peak discharge rates to predevelopment rates.

2.4.2 Stormwater Quality Treatment

Proposed Bioretention Practices, which are identified as a standard SMPs with runoff reduction capacity (RRv), will provide the required water quality treatment from the newly constructed impervious areas. Proposed Bioretention Practices will capture and temporarily store the required water quality volume (WQv).

2.5 Project schedule: Sequence of Major Activities

Construction is scheduled to begin in January of 2020 and extend for approximately three (3) years. In accordance with New York Guidelines for Urban Erosion and Sediment control, there shall be no more than five (5) acres of disturbed soil at any one time without prior written approval from the MS4.

Construction activities are to be scheduled as follows:

- Construction activities may begin 5 days after receipt of completed NOI and MS4 SWPPP acceptance form posted by the NYSDEC.

- Conduct preconstruction conference at the project location with the operator and the project engineer to review the requirements of GP-0-15-002, including posting of the required documentation and location where the SWPPP will be maintained on site.

- Construct temporary construction exit points at locations shown on the plans, for construction traffic, by installing stone per the construction access detail.

- Dust onsite shall be minimized by spraying water on dry areas of the site. If the majority of mud or dirt is not removed from existing traffic, hose bibs shall be provided at construction traffic points and vehicle tires shall be washed before exiting on public roads. Silt from this washing operation shall be intercepted and trapped before wash water is allowed to be discharged offsite. The use of oils and other petroleum based or toxic liquids for dust suppression is prohibited.

- Install silt fence along the downhill perimeter of planned land disturbance in the locations indicated on the grading and erosion control plan.

- Rough grade the proposed roadway to the lines and grades on the grading plan. Stabilize hardscape areas by installing item 4 base course. Vegetate disturbed soil areas not to be subject to additional disturbance within 14 days.

- Silt fence should be installed around any temporary soil stockpiles. If these stockpiles are not to be used within 14 days they should be temporarily seeded and mulched.

- Provide rough grading for the proposed Bioretention Areas. These areas to be used as temporary sediment traps during the construction. These areas to be initially excavated only to the proposed finished top grade of these facilities. Excavation to the basin bottoms and installation of the planting material and underground collection systems should be deferred until all contributing areas have been stabilized.

- Construct proposed Detention Basins. Install overflow catch basins, discharge culverts and rip rap outlet protection.

- Rough grade the site to the lines and grades indicated on the grading plan. Stabilize hardscape areas by installing item 4 base course. Vegetate disturbed soil areas not to be subject to additional disturbance within 14 days.

- Construct proposed stormwater collection system that discharges to proposed Bioretention Practices and Detention Basins including rip rap outlet protection. Inlet protection as indicated in the detail is to be installed around catch basins. Top of grate elevations shall initially be set at top of binder elevation in order that inlets will function during construction. Grates area to be subsequently raised to match top course elevation at completion of paving.

- Install building footings/foundations and install gas, water and sewer below paved areas to buildings. Install footing drains.

- Upon completion of the building footings/foundation and site utilities, construct curbing necessary to direct runoff into catch basins or stormwater management practices. Install asphalt binder to within 20 feet of proposed building and stabilize all areas not subject to construction within 14 days.

- Commence building exterior construction.

- Upon completion of building exterior, install balance of asphalt binder, risers shall be installed to raise frame and grate of catch basins to finished grade. Install final pavement as shown on the plans.

- All disturbed areas which are to be landscaped shall be immediately stabilized by seeding and mulching using permanent seeding procedure. Slopes equal to or steeper than 3h:1v shall be stabilized with north american green "C125" double net erosion control blanket (install per manufacturer's recommendations).

- Remove all silt fences and clean the stormwater collection system.

- Records retention for 5 years after filing NOT.

3.0 STORM WATER POLLUTION PREVENTION CONTROLS

The Construction General Permit (CGP) requires that the SWPPP provide a description of appropriate controls and measures that will be implemented during construction as well as controls and measures that will operate after construction is complete. The permit also requires that plan to clearly describe for each major construction activity: the appropriate control measures to be used, the timing as to how the plan shall be incorporated into the construction process and the Permittee responsible for implementation.

There are several principles of erosion and sediment control outlined in EPA guidelines and the "The New York Standards and Specifications for Erosion and Sediment Control." It is the Sub-Contractor's responsibility to incorporate the specifics of this plan into practice and to apply the principles of erosion and sediment control to prevent stormwater pollution and a discharge of sediment from the construction site. The principles of erosion and sediment control are:

- Fit the activity to the topography and soils;
- Minimize the disturbed area and duration of exposure;
- Stabilize disturbed areas immediately;
- Retain or accommodate runoff;
- Retain sediment; and
- Do not encroach upon water resources.

The principal pollutant source expected to be generated from the Project is sediment. The Erosion and Sediment Controls described in this plan are designed to minimize the impacts from this pollutant.

The following section describes the erosion and sediment controls that will be used during the construction process, the permanent stormwater management practices, which will be employed at the site during construction, and other control practices which will be used to minimize stormwater pollution. Project Plans are provided in Appendix IX.

3.1 Timing of Controls and Construction Activities

The sequence of construction activities and the timing of the installation of Erosion and Sediment Controls are described in Section 2.5 and on the Project Plans prepared for this project.

3.2 Erosion and Sediment Controls

This section presents the Erosion and Sediment Controls to be utilized during construction, which are designed to keep sediment on site. Erosion and Sediment Controls can be further subdivided into two categories:
Stabilization controls and structural controls.

3.2.1 Stabilization Controls

A fundamental principal for preventing erosion and controlling sedimentation is to minimize the extent of land disturbance. For areas where disturbances cannot be avoided, rapid stabilization of the surface is the most effective method of controlling erosion. Areas that are disturbed during construction activity must be stabilized as soon as practicable. A land surface that is stabilized resists the erosive action of stormwater runoff.

The Construction General Permit requires that stabilization measures be initiated as soon as practicable in portions of the site where construction activities have permanently or temporarily ceased, but in no case more than 14 days after the construction activity in that portion of the site has stopped. There is one exception to this requirement. When snow cover precludes the initiation of stabilization within 14 days, then such measures shall be undertaken as soon as practicable.

Because of the requirement that stabilization activities be initiated on disturbed surfaces within 14 days of the cessation construction activities, the General Permit also requires that records be retained as part of the SWPPP. The records should include the dates of major grading activities, cessation and initiation of construction activities, and initiation of stabilization measures.

Stabilization measures will include the following:

- Temporary seeding;
- Permanent seeding;
- Permanent plantings;
- Mulching;
- Geotextiles;
- Protection of Trees and Mature Vegetation

Below are descriptions of stabilization measures that will be used during project construction:

- Temporary Seeding – Within 14 days after construction activity ceases on any particular area, all disturbed ground where there will not be construction for longer than 14 days must be seeded with fast-germinating temporary seed and protected with mulch.

- Permanent Seeding – All areas at final grade must be seeded within 14 days after completion of the major construction activity. Except for small level spots, seeded areas should generally be protected with mulch.

- Permanent Plantings – At the completion of the Project, the contractor shall install and adequately establish all planting as required.

- Mulching – Mulching refers to the placement of material, including but not limited to grass, wood chips, straw, and gravel, on the soil surface to cover and hold in place disturbed soils. This practice is often complementary to seeding practices.

- Geotextiles – Geotextiles are porous fabrics known in the construction industry as filter fabrics, road rugs, synthetic fabrics, construction fabrics, or simply fabrics.

Geotextiles can be manufactured from synthetic or natural materials. Geotextiles are used for filtration, reinforcement, material separation, mattings, drainage applications, and erosion control. For sediment and erosion control applications, they are most commonly used as mattings to stabilize flow in channels and swales and on recently planted slopes, and as separators to prevent the migration of sediments into other layers such as could occur from soil into adjacent rip rap.

- Protection of Trees and Mature Vegetation – Natural vegetation shall be preserved whenever possible, but especially on steep slopes, near perennial and intermittent watercourses or swales, and on sites in wooded areas. Preserving natural and mature vegetation can save money, beautifies areas, provides buffer and habitat and reduces soil erosion. Erosion and Sediment Control Barriers shall be sued to prevent equipment from damaging areas designated for preservation. Special care should be taken with mature trees. Barriers should be offset from trees to protect roots.

3.2.2 Structural Controls

Structural controls are used to divert stormwater runoff flows away from disturbed areas, or otherwise limit the discharge of pollutants from exposed areas of the site to the degree attainable. Proposed controls include the following:

- Erosion Control Barrier;
- Temporary Sediment Trap;
- Construction Entrance/Exit;
- Rip Rap;

Descriptions of structural control measures that will be used at the site area follows:

- Sediment Trap – Temporary sediment trap is depression constructed downslope of construction activity and located such that storm water runoff from upland areas of less than 5 acres are diverted though the trap. Sediment trap shall be constructed as indicated by the Storm Water Pollution Prevention Plan and shall be constructed as part of the initial best management practices whenever practical. An outlet pipe and riser are incorporated at the outlet to discharge flow from the trap. Sediment traps shall be phased with the earthwork activity where practical.

- Silt Fence – Silt fence is a synthetic permeable mesh fabric typically incorporating wooden support stakes at intervals sufficient to support the fence and water and sediment retained by the fence. Silt fence is also available with a wire mesh backing. The fence is designed to retain sediment-laden water to allow settlement of suspended soils before filtering through the mesh fabric for discharge downstream. Silt fence shall be located to capture overland, low-velocity sheet flows as follows. Install silt fence at a fairly level grade (along the contour) to provide sufficient upstream storage volume for the anticipated runoff.

- All access points from the public street into the construction site shall include a construction exit composed of course stone to the dimensions shown on the Construction Drawings. The rough texture of the stone helps to remove clumps of soil adhering to

construction vehicle tires through the action of vibration and jarring over the rough surface and the friction of the stone matrix against soils attached to vehicle tires.

- Rip Rap is a section of rock protection placed at the outlet end of the culverts. The purpose of the rock outlet protection is to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach.

Final site stabilization is achieved when turf grass cover provides permanent stabilization for at least 80 percent of the disturbed soil surface, exclusive of areas that have been paved.

3.3 Stormwater Management Measures

During the construction phase of the project, the Contractor will install stormwater management measures to control pollutants in storm water discharges that will occur after the construction operations have been completed. The stormwater management measures will consist of the following:

- Bioretention Practices (F-5);
- Detention Basins;
- Outflow Velocity Dissipation Device (i.e. Rip rap).

Water Quality Treatment will be achieved by the use of Bioretention Practices (F-5), identify as Standard SMP's with Runoff Reduction Capacity in the New York State Stormwater Design Manual. The storm water management measures are designed to attenuate flows to be less than pre-construction conditions. The system is designed to reduce the runoff generated from a 100-year, 24-hour storm to mitigate any impacts to downstream water resources.

3.4 Other Controls

In addition to the erosion and sediment controls and the stormwater management measures discussed above, additional controls/practices shall be undertaken to comply with the General Permit and to reduce pollution in stormwater runoff. Such controls, some of which are depicted, on the Erosion and Sediment Control Plan in Appendix IX, include the following:

- Practices to control off-site mud tracking from the construction site;
- Dust suppression practices;
- Proper material stockpiling practices;
- Proper sanitary wastes disposal;
- Earthwork procedures timed and conducted in manners aimed to minimize erosion and sedimentation;
- Waste materials;
- Concrete waste from concrete trucks;
- Contaminated soils;
- Hazardous substances & hazardous waste;
- Preparation of a snow removal plan; and
- Spill prevention and control measures.

Practices to control off-site construction vehicle mud tracking – The construction site-roads will be maintained in good construction condition to minimize off-site vehicle tracking of sediments. A construction entrance tire mud cleaning structure and laydown area shall be constructed of crushed stone to remove mud from the tires of construction vehicles. The rock will be replaced as necessary to assure its effectiveness. Additionally, dump trucks hauling material to or from the construction site will be covered in accordance with state and local regulations, the paved streets adjacent to the site will be inspected daily and swept as necessary.

Dust suppression – Fine water sprays shall be used to control dust during extended dry periods. Chemical dust suppressants shall not be used.

Proper material stockpiling practices - Construction materials shall be stored in a manner that will minimize exposure to precipitation and runoff or otherwise to prevent the contamination of stormwater. For pollutant materials that must be kept dry (fertilizers, plaster, dry ingredients, etc.), indoor storage, shelters, storage trailers, tarpaulins, and other means shall be employed to keep pollutant materials from being exposed to stormwater. Building component materials shall not be exposed to conveyances or otherwise stored in a manner that will concentrate runoff. Stockpiles of earthen materials shall be stored out of stormwater conveyance areas and in a manner that prevents erosion and the transport of sediments. Silt fences shall be employed when required, as described in this plan.

Sanitary wastes – All sanitary waste will be collected from the portable units by a licensed sanitary waste management contractor, at least 3 times per week as required by local regulations.

Earthwork - Earthwork procedures shall be timed, and shall progress, in a manner that will minimize the exposure of disturbed surfaces to stormwater runoff. Excavation and filling sequences shall typically proceed down slope while maintaining an earth dike at the toe of the slope. Tree felling, stumping, grubbing, stripping and other construction activities shall be performed so as to minimize disturbances and to not concentrate runoff (i.e., up or down slope, not cross slope) into flows capable of soil erosion. Stabilization procedures shall be undertaken in accordance with this plan and the requirement s of the General Permit. Grubbing during wet seasons should be avoided.

Waste materials – All waste materials will be collected and stored in a securely lidded metal dumpster rented from a local waste management company which must be a solid waste management company licensed to do business by the state and the village. The dumpster will comply with all local and state solid waste management regulations.

Concrete waste from concrete trucks – Emptying of excess concrete and/or washout from concrete delivery trucks shall be avoided on the job site. If concrete washout must occur it shall be performed in conformance with standards provided in the New York State Standards and Specifications for Erosion and Sediment Control, and with the details on the project plans. If such excess concrete and/or washout residue is found on the job site, it will be cleaned up immediately and not allowed to come in contact with stormwater discharges.

Hazardous waste – All hazardous waste materials will be disposed of in the manner specified by local, state and /or federal regulations and by the manufacturer of such products. Site personnel will be instructed in these practices by the job site superintendent, who will also be responsible for seeing that these practices are followed.

Any spills of hazardous materials which are in quantities in excess of Reportable Quantities as defined by EPA regulations shall be immediately reported to the EPA National Response Center 1-800-424-8802.

The job site superintendent will be responsible for seeing that these procedures are followed.

Snow Removal Plan – Snow removal practices will consist of several management techniques to minimize major runoff and pollutant loading impacts. No de-icing chemicals should be used in the parking lot. All the snow removed should be placed in pervious areas where it can slowly infiltrate.

4.0 NON-STORM WATER DISCHARGES

Non-storm water discharges anticipated for the project that are authorized by the General Permit include the following:

- Discharges from the fire fighting activities;
- Water to which cleansers or other components have not been added to wash vehicles or control dust in accordance with the SWPPP.
- Routine external building wash down that does not use detergents;
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
- Air conditioning condensate;
- Springs;
- Foundation or footing drains where flows are not contaminated with process materials such as solvents.

Discharges of the above non-storm water flows are permitted under the General Permit providing such flows (except flows from fire fighting activities) are identified in the SWPPP and appropriate pollution prevention measures are described and implemented for such flows.

5.0 INSPECTION AND MAINTENANCE PLAN

The contractor will obtain copies of any and all local and state regulations, which are applicable to stormwater management and pollution minimization at this job site and will comply fully with such regulations. The contractor will submit written evidence of such compliance if requested by the Owner or any agent of a regulatory body. The contractor will comply will all conditions of the SPDES General Permit for Construction Activities, including the conditions related to maintaining the SWPPP and evidence of compliance with the SWPPP at the job site and allowing regulatory personnel access to the job site and to records in order to determine compliance.

5.1 Inspection Requirements

The inspection reports will either certify compliance with this SWPPP and the General Permit, or identify any incidents of non-compliance. For incidents of non-compliance, the inspection report will also describe the modifications to the project, site or control measures required and implemented to prevent further incidents of non-compliance. The inspection reports will be signed by an authorized individual and retained for a period of 5 years following the date the site is finally stabilized and the NOT is filed.

5.2 Maintenance Requirements

The following maintenance procedures are to be performed as noted.

- Litter, construction debris, and chemicals shall be prevented from exposure to stormwater and from becoming a pollutant source. A daily walkover of the Project site to identify exposure of potential pollutants to stormwater shall be performed.

- All control measures will be inspected at least once every 7 calendar days.

- All measures will be maintained in good working order; if repairs are found to be necessary, they will be initiated within 24 hours of report.

- Built-up sediment shall be removed from silt fences when it has reached 1/3 of the above ground height of the silt fence.

- Silt fences will be inspected for depth of sediment, tears or sags in the fabric, and to see if the fabric is securely attached to the posts. Posts will also be inspected to ensure that they are firmly set in the ground.

- Temporary and permanent seeding shall be inspected weekly during its period of establishment for bare spots and areas of insufficient germination or growth. Remedial action shall be taken to establish a stabilized surface in these areas once identified.

- Deteriorated silt fences shall be replaced as soon as the condition is discovered.

- Conveyance structures shall be maintained so as to operate in the design condition. Foreign debris, including leaves and lawn cuttings shall not be allowed to accumulate in infiltration basin.

- Fertilizer applications shall be applied strictly in accordance with all applicable laws, rules and regulations pertaining to application of fertilizer.

- Sediment trap shall be maintained in working order and free of foreign debris throughout the construction period. Sediment trap will be inspected for depth of sediment, and built up sediment will be removed when it reaches 50 percent of the design capacity or at the end of the job.

- Accumulations of sediment that escape to off-site areas must be removed at intervals to minimize offsite impacts. Sediment accumulations in public streets shall be removed as soon as possible and before any anticipated rain event. Vehicle tire mud cleaning devices shall be maintained to ensure their proper operation.

- Spare Erosion and Sediment Control Barrier material shall be stocked on site.

- A maintenance inspection report will be made after each inspection. A copy of the report form to be completed by the inspector is attached.

- Personnel selected for the inspection and maintenance responsibilities will receive training from the job site superintendent. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls that are used onsite in good working order.

5.3 Facility Inspections:

Central Hudson Gas & Electric Corporation, as the operator, shall follow the guidelines set forth in Part IV of the GP-0-15-002. Central Hudson Gas & Electric Corporation shall designate an operator, responsible for the construction phase of the project and the implementation of the pollution prevention measures shown on the Erosion and Sediment Control plan and in the Stormwater Pollution Prevention Plan Report. The contractor shall be responsible for providing a ***trained contractor*** to perform daily erosion and sediment control inspection. Each contractor who will be involved in the land development activity must provide proof that trained individual has obtained training and/or certification in proper erosion and sedimentation control practices. A ***trained contractor*** shall inspect the erosion and sediment controls identified in SWPPP to ensure that they are being maintained in effective operating condition at all time. The owner/operator shall be responsible for insuring that the facility is inspected by a ***qualified inspector*** as per the checklist every seven-(7) calendar days. Central Hudson Gas & Electric Corporation shall designate a representative for the post development inspection and monitoring meeting qualifications set forth in the General Permit GP-0-15-002. The designated individual shall have a complete understanding of all components of the stormwater management system and shall be familiar with OSHA requirements for entering confined spaces. A visual inspection of all structures shall take place monthly. The operator shall follow criteria set forth in the inspection checklists included in this report. Enclosed is inspection checklist for the Bioretention Practices (F-5). The inspector shall follow the format of the checklists and any recommendations such as cleaning, repair or replacement of deficient devices, etc., shall be initiated immediately. Inspections shall take place immediately following the completion of any repairs. Copies of the inspections, recommendations and mitigation measures shall be kept on file by Central Hudson Gas & Electric Corporation and supplied to the Town of Ulster at their request. The following is a schedule of inspections responsibilities:

Operation and Maintenance:

The following is a summary of the operations and maintenance to occur at this facility for the lifetime of the establishment. The operator is to follow the guidelines set for herein, the Bioretention Practice (F-5) Maintenance and Inspection checklist.

Operations and Maintenance of this facility is the responsibility of Central Hudson Gas & Electric Corporation. A designated representative shall conduct monthly inspections and keep a log of results and mitigation measures taken. This log shall be made available to the Town of Ulster at their request. Maintenance shall depend mainly on inspection observations. Any deficiencies in the facility shall be corrected immediately upon discovery. Sediment removal shall occur on an as needed basis. A qualified hauler, familiar in the proper disposal of waste, shall dispose of sediment. Cleaning of structures shall include the removal, and proper disposal, of all sand and debris from the sumps. All paved parking lots shall be swept two (2) times per year, between the dates of October 1 and June 1 of each year.

Monthly inspection:

- Drainage structures clear of debris;
- Bioretention and contributing areas clear of debris;
- Pant height not less than design water depth in Bioretention Areas;
- Grass height not greater than 6 inches in Bioretention Areas;
- Bioretention Areas dewaters between the storms, and no evidence of standing water;
- No evidence of erosion;
- Inflow pipes clear of debris;
- Inlet area clear of debris;
- No signs of erosion or slope failure throughout the site.

Quarterly inspection:

- Refer to monthly inspections above.

Annual inspections:

- Drainage structure and pretreatment inspections for signs of damage and/or failure;
- More detailed inspection of all monthly inspection items listed above;
- Inspect all components of drainage system for signs of structure failure, erosion and sedimentation build-up;
- No evidence of sediment buildup in Bioretention Areas;
- Outlet/Overflow Spillway in good condition, no need to repair;
- Inspect rip-rap areas to insure aggregate surface is clean, top layer of stone does not need replacement and erosion has not occurred.

6.0 ***RECORD KEEPING AND REPORTING***

6.1 Record Keeping

It is recognized that stormwater pollution prevention efforts can be enhanced by retaining records in an orderly manner at one location for reference. Provisions of the Construction General Permit also require the retention of certain records. Therefore, records regarding stormwater pollution prevention activities shall be maintained at the construction site. The records shall be retained and maintained by for a period of 5 years after the filing of the NOT for General Permit coverage. Records to be retained shall include:

- The SWPPP and all revisions.
- All NOI's to discharge to waters of the United States under authorization of The General Permit as well as all data used to determine Permit eligibility.
- Certifications required by the SWPPP (Appendix III).
- All inspection reports (Appendix IV).
- Construction activity records indicating dates of construction milestones and storm water management and pollution prevention controls installations.
- All spill reports/notifications.
- All NOT's (Appendix V).

6.2 Reporting

In the event of a discharge of oil or another hazardous material, rapid notification of responsible facility personnel, oil spill and/or hazardous material removal organizations and federal, state, and local Regulatory agencies can be essential to protecting the environment in the immediate vicinity.

As required by the conditions of the General Permit, all spills shall be recorded and documented within the SWPPP. Detailed reports including the date and time of the incident, location, volume and contents of the spill, weather conditions, response procedures, parties notified, recommended revisions to the proposed stormwater pollution prevention controls, operating procedures, and /or equipment needed to prevent recurrence shall be maintained. Reports on Reportable Quantity (RQ) spills are to be maintained as part of this SWPPP.

Because construction activities may handle many hazardous substances over the course of construction, spills of these substances in amounts that equal or exceed RQ levels are a possibility. Any discharge of a substance above an RQ shall be reported to the Construction Manager.

6.3 Revisions of the SWPPP

The SWPPP must be amended whenever:

1. There is a change in design, construction, operation or maintenance, which will have a significant effect on the potential for the discharge of pollutants to the Water of the U.S.;

2. The SWPPP proves to be ineffective in eliminating or significantly minimizing pollutants from sources; and,

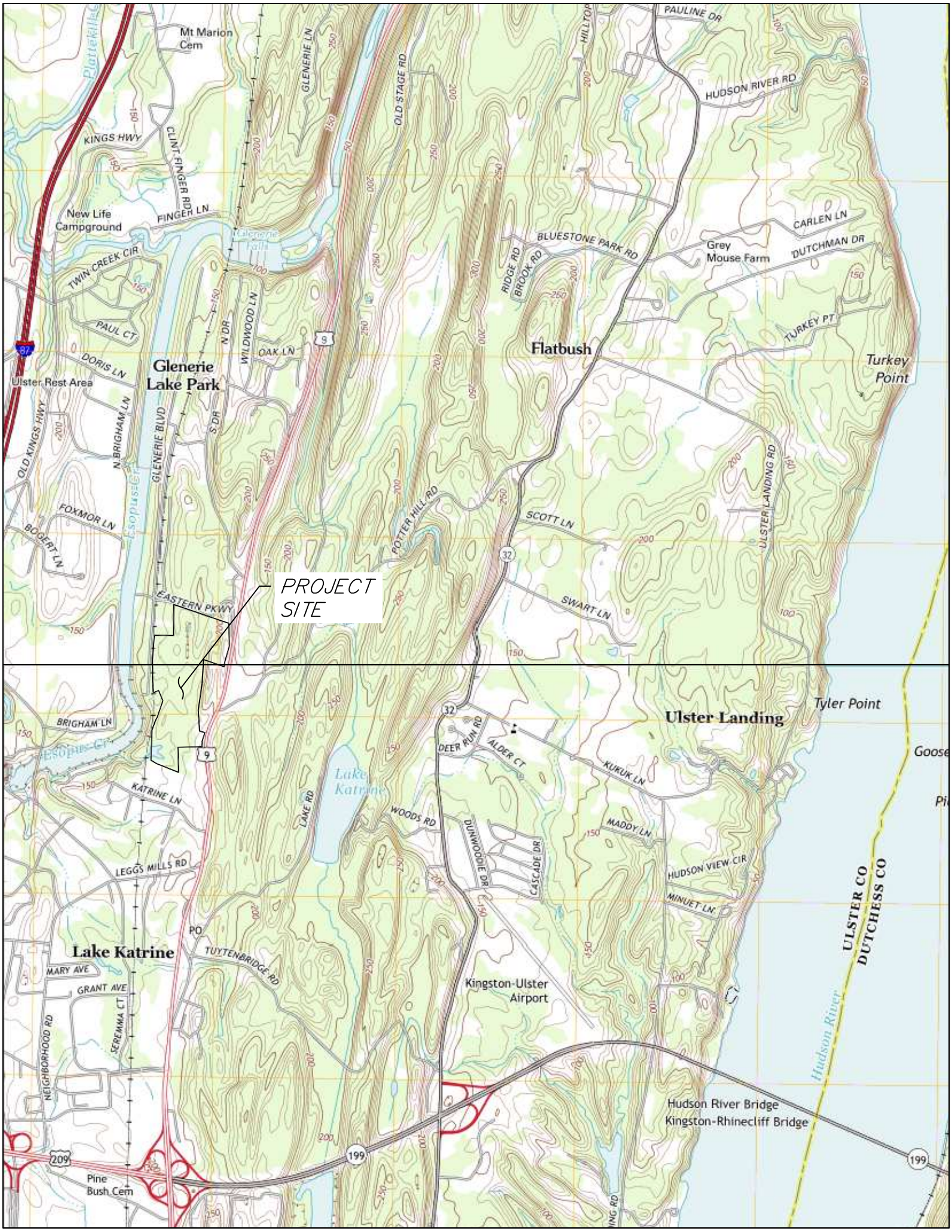
3. It is proven to be ineffective in achieving the general objectives of controlling pollutants from the construction site's stormwater discharges. Plan certifications shall also be made whenever Permittees change for the described Project.

APPENDICES

Appendix I	Site Location Map
Appendix II	Notice of Intent (NOI)
Appendix III	Contractor/Owner Certification Forms
Appendix IV	Inspection Reports/General Contractor's Designated Inspector Form
Appendix V	Notice of Termination
Appendix VI	MS4 SWPPP Acceptance Form
Appendix VII	Bioretention Practice Maintenance, and Management Inspection Checklist.
Appendix VIII	Drainage Report
Appendix IX	General Permit (GP-0-15-002) – Not Included
Appendix X	Project Plans

Appendix I

Site location Map


PROJECT SITE
Mt Marion Cem
KINGS HWY
CLINT FINGER RD
FINGER LN
New Life Campground
GLENERIE LN
OLD STAGE RD
HILLTOP
PAULINE DR
HUDSON RIVER RD
BLUESTONE PARK RD
RIDGE RD
BROOK RD
Grey Mouse Farm
CARLEN LN
DUTCHMAN DR
TURKEY PT
Turkey Point
Flatbush
TWIN CREEK CIR
PAUL CT
DORIS LN
Ulster Rest Area
Glenerie Lake Park
N DR
WILDWOOD LN
OAK LN
S DR
GLENERIE BLVD
N BRIGHAM LN
OLD KINGS HWY
FOXMOR LN
BOGERT LN
EASTERN PKWY
POTTER HILL RD
SCOTT LN
ULSTER LANDING RD
SWART LN
BRIGHAM LN
DEER RUN RD
ALDER CT
KUKUK LN
Ulster Landing
Tyler Point
KATRINE LN
LAKE RD
Lake Katrine
WOODS RD
DUNWOODIE DR
CASCADE DR
MADDY LN
HUDSON VIEW CIR
MINUET LN
LEGGS MILLS RD
PO
TUYTENBRIDGE RD
Lake Katrine
MARY AVE
GRANT AVE
JEREMMA CT
NEIGHBORHOOD RD
Kingston-Ulster Airport
ULSTER CO
DUTCHESS CO
Hudson River
Hudson River Bridge
Kingston-Rhinecliff Bridge
Pine Bush Cem

Appendix II

Notice of Intent (NOI)

NOI for coverage under Stormwater General Permit for Construction Activity

version 1.18

(Submission #: 3BW-E1AC-81W8, version 1)

PRINTED ON 7/29/2019

Summary

Submission #:	3BW-E1AC-81W8	**Date Submitted:**	Not Submitted
Form:	NOI for coverage under Stormwater General Permit for Construction Activity	**Status:**	Draft
Applicant:	Lawrence Paggi	**Active Steps:**	Form Submitted
Reference #:			
Description:	NOI for coverage under Stormwater General Permit for Construction Activity		

Notes
There are currently no Submission Notes.

Details

Owner/Operator Information

Owner/Operator Name (Company/Private Owner/Municipality/Agency/Institution, etc.)
Central Hudson Gas & Electric Corporation

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
Caserto

Owner/Operator Contact Person First Name
Jessica

Owner/Operator Mailing Address
284 South Avenue

City
Poughkeepsie

State
New York

Zip
12601

Phone
845-486-5485

Email
JCaserto@cenhud.com

Federal Tax ID
14-0555980

Project Location

Project/Site Name
Central Hudson gas & Electric Corporation Training Center

Street Address (Not P.O. Box)
2229-2271 Route 9W

Side of Street
West

City/Town/Village (THAT ISSUES BUILDING PERMIT)
Town of Ulster

State
New York

Zip
12449

County
ULSTER

DEC Region
3

Name of Nearest Cross Street
Eastern Parkway

Distance to Nearest Cross Street (Feet)
0

Project In Relation to Cross Street
South

Tax Map Numbers Section-Block-Parcel
39.15-4-11

Tax Map Numbers
NONE PROVIDED

1. Coordinates

Provide the Geographic Coordinates for the project site. The two methods are: - Navigate to the project location on the map (below) and click to place a marker and obtain the XY coordinates. - The "Find Me" button will provide the lat/long for the person filling out this form. Then pan the map to the correct location and click the map to place a marker and obtain the XY coordinates.

Navigate to your location and click on the map to get the X,Y coordinates
42.000292688474055,-73.98810193854206

Project Details

2. What is the nature of this project?
New Construction

3. Select the predominant land use for both pre and post development conditions.

Pre-Development Existing Landuse
Forest

Post-Development Future Land Use
Commercial

3a. If Single Family Subdivision was selected in question 3, enter the number of subdivision lots.
NONE PROVIDED

---

4. In accordance with the larger common plan of development or sale, enter the total project site acreage, the acreage to be disturbed and the future impervious area (acreage)within the disturbed area. *** ROUND TO THE NEAREST TENTH OF AN ACRE. ***

Total Site Area (acres)
56.51

Total Area to be Disturbed (acres)
28.7

Existing Impervious Area to be Disturbed (acres)
0

Future Impervious Area Within Disturbed Area (acres)
11.22

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

---

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

A (%)
5

B (%)
8

C (%)
75

D (%)
12

7. Is this a phased project?
No

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

Start Date
01/01/2020

End Date
01/01/2023

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

9a. Type of waterbody identified in question 9?
Wetland/Federal Jurisdiction On Site (Answer 9b)

Other Waterbody Type Off Site Description
NONE PROVIDED

9b. If "wetland" was selected in 9A, how was the wetland identified?
Delineated by Consultant

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

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

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters?
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?

If Yes, what is the acreage to be disturbed?
NONE PROVIDED

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

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)?

No

16. What is the name of the municipality/entity that owns the separate storm sewer system?
None

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

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

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

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

Required SWPPP Components

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

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

If you answered No in question 22, skip question 23 and the Post-construction Criteria and Post-construction SMP Identification sections.

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

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:
Professional Engineer (P.E.)

SWPPP Preparer
LAWRENCE J. PAGGI, P.E., P.C.

Contact Name (Last, Space, First)
PAGGI LAWRENCE

Mailing Address
43 BROAD STREET

City
FISHKILL

State
NEW YORK

Zip
12524

Phone
845-897-2375

Email

LJPAGGI@OPTONLINE.NET

Download SWPPP Preparer Certification Form

Please take the following steps to prepare and upload your preparer certification form: 1) Click on the link below to download a blank certification form 2) The certified SWPPP preparer should sign this form 3) Scan the signed form 4) Upload the scanned document

Download SWPPP Preparer Certification Form

Please upload the SWPPP Preparer Certification - Attachment

SWPPP Preparer Certification Form (GP-0-15-002).pdf

Comment: NONE PROVIDED

Erosion & Sediment Control Criteria

25. Has a construction sequence schedule for the planned management practices been prepared?

Yes

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

Temporary Structural

Dust Control
Sediment Traps
Silt Fence
Stabilized Construction Entrance
Storm Drain Inlet Protection

Biotechnical

None

Vegetative Measures

Mulching
Seeding
Topsoiling

Permanent Structural

Diversion
Rock Outlet Protection

Other

NONE PROVIDED

Post-Construction Criteria

* 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.

Reduction of Clearing and Grading
Roadway 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).

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

1.4

29. Post-construction SMP Identification

Use the Post-construction SMP Identification section to identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity that were used to reduce the Total WQv Required (#28). Identify the SMPs to be used by providing 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 the Post-Construction SMP Identification section 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.

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

0.61

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

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)] (acre-feet)

0.41

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

Yes

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; therefore, NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. SMPs

Use the Post-construction SMP Identification section to identify the Standard SMPs and, if applicable, the Alternative SMPs to be used to treat the remaining total WQv (=Total WQv Required in #28 - Total RRv Provided in #30). Also, provide the total impervious area that contributes runoff to each practice selected. NOTE: Use the Post-construction SMP Identification section 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. (acre-feet)

0.79

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 - 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).

1.4

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

If Yes, go to question 36. If No, sizing criteria has not been met; therefore, 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)

2.31

CPv Provided (acre-feet)
2.49

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

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

Overbank Flood Control Criteria (Qp)

Pre-Development (CFS)
108.79

Post-Development (CFS)
82.17

Total Extreme Flood Control Criteria (Qf)

Pre-Development (CFS)
275.76

Post-Development (CFS)
236.63

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

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

If Yes, Identify the entity responsible for the long term Operation and Maintenance
NONE PROVIDED

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.
DUE TO SITE LIMITATIONS, WHICH INCLUDE SEASONAL HIGH GROUNDWATER AND SHALLOW DEPTH TO BEDROCK, THE TOTAL WQv WAS NOT REDUCED BY APPLICATION OF RR TECHNIQUES AND STANDARD SMP's WITH RRv CAPACITY.

Post-Construction SMP Identification

Runoff Reduction (RR) Techniques, Standard Stormwater Management Practices (SMPs) and Alternative SMPs

Identify the Post-construction SMPs to be used by providing 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.

RR Techniques (Area Reduction)

Round to the nearest tenth

Total Contributing Acres for Conservation of Natural Area (RR-1)
NONE PROVIDED

Total Contributing Impervious Acres for Conservation of Natural Area (RR-1)
NONE PROVIDED

Total Contributing Acres for Sheetflow to Riparian Buffers/Filter Strips (RR-2)

NONE PROVIDED

Total Contributing Impervious Acres for Sheetflow to Riparian Buffers/Filter Strips (RR-2)
NONE PROVIDED

Total Contributing Acres for Tree Planting/Tree Pit (RR-3)
NONE PROVIDED

Total Contributing Impervious Acres for Tree Planting/Tree Pit (RR-3)
NONE PROVIDED

Total Contributing Acres for Disconnection of Rooftop Runoff (RR-4)
NONE PROVIDED

RR Techniques (Volume Reduction)

Total Contributing Impervious Acres for Disconnection of Rooftop Runoff (RR-4)
NONE PROVIDED

Total Contributing Impervious Acres for Vegetated Swale (RR-5)
NONE PROVIDED

Total Contributing Impervious Acres for Rain Garden (RR-6)
NONE PROVIDED

Total Contributing Impervious Acres for Stormwater Planter (RR-7)
NONE PROVIDED

Total Contributing Impervious Acres for Rain Barrel/Cistern (RR-8)
NONE PROVIDED

Total Contributing Impervious Acres for Porous Pavement (RR-9)
NONE PROVIDED

Total Contributing Impervious Acres for Green Roof (RR-10)
NONE PROVIDED

Standard SMPs with RRv Capacity

Total Contributing Impervious Acres for Infiltration Trench (I-1)
NONE PROVIDED

Total Contributing Impervious Acres for Infiltration Basin (I-2)
NONE PROVIDED

Total Contributing Impervious Acres for Dry Well (I-3)
NONE PROVIDED

Total Contributing Impervious Acres for Underground Infiltration System (I-4)
NONE PROVIDED

Total Contributing Impervious Acres for Bioretention (F-5)
21.53

Total Contributing Impervious Acres for Dry Swale (O-1)
NONE PROVIDED

Standard SMPs

Total Contributing Impervious Acres for Micropool Extended Detention (P-1)
NONE PROVIDED

Total Contributing Impervious Acres for Wet Pond (P-2)
NONE PROVIDED

Total Contributing Impervious Acres for Wet Extended Detention (P-3)
NONE PROVIDED

Total Contributing Impervious Acres for Multiple Pond System (P-4)
NONE PROVIDED

Total Contributing Impervious Acres for Pocket Pond (P-5)
NONE PROVIDED

Total Contributing Impervious Acres for Surface Sand Filter (F-1)
NONE PROVIDED

Total Contributing Impervious Acres for Underground Sand Filter (F-2)
NONE PROVIDED

Total Contributing Impervious Acres for Perimeter Sand Filter (F-3)
NONE PROVIDED

Total Contributing Impervious Acres for Organic Filter (F-4)
NONE PROVIDED

Total Contributing Impervious Acres for Shallow Wetland (W-1)
NONE PROVIDED

Total Contributing Impervious Acres for Extended Detention Wetland (W-2)
NONE PROVIDED

Total Contributing Impervious Acres for Pond/Wetland System (W-3)
NONE PROVIDED

Total Contributing Impervious Acres for Pocket Wetland (W-4)
NONE PROVIDED

Total Contributing Impervious Acres for Wet Swale (O-2)
NONE PROVIDED

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

Total Contributing Impervious Area for Hydrodynamic
NONE PROVIDED

Total Contributing Impervious Area for Wet Vault
NONE PROVIDED

Total Contributing Impervious Area for Media Filter
NONE PROVIDED

"Other" Alternative SMP?
NONE PROVIDED

Total Contributing Impervious Area for "Other"
NONE PROVIDED

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

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.

Manufacturer of Alternative SMP
NONE PROVIDED

Name of Alternative SMP
NONE PROVIDED

Other Permits

40. Identify other DEC permits, existing and new, that are required for this project/facility.
None

If SPDES Multi-Sector GP, then give permit ID
NONE PROVIDED

If Other, then identify
NONE PROVIDED

41. Does this project require a US Army Corps of Engineers Wetland Permit?
Yes

If "Yes," then indicate Size of Impact, in acres, to the nearest tenth
0.2

42. 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.
NONE PROVIDED

MS4 SWPPP Acceptance

43. Is this project subject to the requirements of a regulated, traditional land use control MS4?
Yes - Please attach the MS4 Acceptance form below

If No, skip question 44

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

MS4 SWPPP Acceptance Form Download

Download form from the link below. Complete, sign, and upload.

MS4 SWPPP Acceptance Form

MS4 Acceptance Form Upload - Attachment
MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form.pdf
Comment: NONE PROVIDED

Owner/Operator Certification

Owner/Operator Certification Form Download

Download the certification form by clicking the link below. Complete, sign, scan, and upload the form.

Owner/Operator Certification Form (PDF, 45KB)

Upload Owner/Operator Certification Form * - Attachment

SWPPP Owner Certification Form.pdf

Comment: NONE PROVIDED

Attachments

Date	Attachment Name	Context	
07/11/2019 02:34 PM	SWPPP Preparer Certification Form (GP-0-15-002).pdf	v1 - Required SWPPP Components	
07/11/2019 02:35 PM	SWPPP Owner Certification Form.pdf	v1 - Owner/Operator Certification	
07/11/2019 02:35 PM	MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form.pdf	v1 - MS4 SWPPP Acceptance	

Status History

Date	User	Processing Status
None		

Processing Steps

Step Name	Assigned To/Completed By	Date Completed
Form Submitted		
Deemed Complete	Toni Cioffi	

Appendix III

Contractor/Owner Certification Forms

Central Hudson Gas & Electric Corporation - Contractors' and Subcontractors' Certification: *(to be signed and submitted by all Contractors and Subcontractors that will implement the erosion and sediment control measures before they commence any construction activity)*

I hereby certify 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 New York State Pollutant Discharge Elimination System (SPDES) general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I 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.

Each contractor who will be involved in the land development activity must provide proof that he/she has obtained training and/or certification* in proper erosion and sedimentation control practices and this proof shall become part of the SWPPP for the land development activity.

*Trained Contractor – means an employee from a contracting (construction) firm that has received four (4) hours of training, which has been endorsed by the Department, from a Soil and Water Conservation District, CPESC, Inc. or other Department endorsed entity, in proper erosion and sediment control principles no later than two (2) years from the date this general permit is issued. After receiving the initial training, the trained individual shall receive four (4) hours of training every three (3) years. This individual will be responsible for implementation of the SWPPP.

Elements of the SWPPP for which the contractor/subcontractor is responsible:

_____
_____
_____
_____
_____

_____
Signature Date

_____
Name Title

_____
Name of Contracting Firm

_____
Address of Contracting Firm

_____
Telephone Number of Contracting Firm

Appendix IV

Inspection Reports/General Contractor's Designated Inspector Form

Central Hudson Gas & Electric Corporation – SWPPP INSPECTION LOG

Date: **Time:**

_____

Name **Title**

Description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection:

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.

Description of the condition of the Receiving Waters at all points of discharge from the construction site.

Identification of all erosion and sediment control practices that need repair or maintenance (including identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and need to be reinstalled or replaced) :

Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection:

Describe the 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:

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

Appendix V

Notice of Termination

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: Central Hudson Gas & Electric Corporation

2. Street Address: 284 South Avenue

3. City/State/Zip: Poughkeepsie, NY 12601

4. Contact Person: Jessica D. Caserto | 4a.Telephone: 845-486-5485

4b. Contact Person E-Mail: JCaserto@cenhud.com

II. Project Site Information

5. Project/Site Name: CHG&E Corporation Training Center

6. Street Address: 2229-2271 Route 9W

7. City/Zip: Town of Ulster, NY 12449

8. County: Ulster

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 VI

MS4 SWPPP Acceptance Form

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

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit

*(NOTE: Attach Completed Form to Notice Of Intent and Submit to Address Above)

I. Project Owner/Operator Information	
1. Owner/Operator Name:	CHG&E Corporation
2. Contact Person:	Jessica D. Caserto
3. Street Address:	284 South Avenue
4. City/State/Zip:	Poughkeepsie, NY 12601
II. Project Site Information	
5. Project/Site Name:	CHG&E Corporation Training Center
6. Street Address:	2229-2271 Route 9W
7. City/State/Zip:	Town of Ulster, NY 12449
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information	
8. SWPPP Reviewed by:	
9. Title/Position:	
10. Date Final SWPPP Reviewed and Accepted:	
IV. Regulated MS4 Information	
11. Name of MS4:	
12. MS4 SPDES Permit Identification Number: NYR20A	
13. Contact Person:	
14. Street Address:	
15. City/State/Zip:	
16. Telephone Number:	

MS4 SWPPP Acceptance Form - continued

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name:

Title/Position:

Signature:

Date:

VI. Additional Information

(NYS DEC - MS4 SWPPP Acceptance Form - January 2015)

Appendix VII

Bioretention Practice Operation, Maintenance, and Management Inspection Checklist

Bioretention Operation, Maintenance and Management Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Monthly)		
Bioretention and contributing areas clean of debris		
No dumping of yard wastes into practice		
Litter (branches, etc.) have been removed		
2. Vegetation (Monthly)		
Plant height not less than design water depth		
Fertilized per specifications		
Plant composition according to approved plans		
No placement of inappropriate plants		
Grass height not greater than 6 inches		
No evidence of erosion		
3. Check Dams/Energy Dissipaters/Sumps (Annual, After Major Storms)		
No evidence of sediment buildup		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
Sumps should not be more than 50% full of sediment		
No evidence of erosion at downstream toe of drop structure		
4. Dewatering (Monthly)		
Dewaters between storms		
No evidence of standing water		
5. Sediment Deposition (Annual)		
Swale clean of sediments		
Sediments should not be > 20% of swale design depth		
6. Outlet/Overflow Spillway (Annual, After Major Storms)		
Good condition, no need for repair		
No evidence of erosion		
No evidence of any blockages		
7. Integrity of Filter Bed (Annual)		
Filter bed has not been blocked or filled inappropriately		

Appendix VIII

Drainage Report

HYDROLOGICAL ANALYSIS

Prepared For

Central Hudson Gas & Electric Corporation (Training Academy, Training Annex, PCC, Outdoor Pole Yard and Gas Village)

Town of Ulster

Ulster County, New York

July 2019

Prepared By

LAWRENCE J. PAGGI,PE,PC

43 Broad Street

Fishkill, New York 12524

Introduction:

This report provides an analysis of existing and proposed drainage conditions for the Central Hudson Gas & Electric Corporation. The project site is currently a vacant lot located on N.Y.S. Route 9W in the Town of Ulster, Ulster County, New York. The project site will be accessed from the existing Hudson Gas & Electric Kingston Facility located along the southerly property line on the adjacent parcel. The secondary emergency access to the site will be provided from the Eastern Parkway located along the northerly property line.

The proposed improvements will include construction of a Training Facility Building, Primary Control Center (PCC) Building, Training Annex Building, Outdoor Pole Yard, Gas Village and associated driveways and parking areas. The area of the new development currently includes wooded area. There are unregulated streams and area of Federal Wetland located in the southwest corner of the parcel.

The entire project contains 56.51 acres and the total area of disturbance is approximately 28.7 acres. No more than five (5) acres of soil shall be disturbed at any time without prior written approval from the MS4. This report demonstrates that runoff from the project area will be controlled to predevelopment values to mitigate impact to downstream conditions. The area of disturbance exceeds the threshold of 1 acre, which requires preparation of a stormwater pollution prevention plan (SWPPP) in conformance with the New York State Department of Environmental Conservation (NYSEC) general permit for stormwater discharges from construction activities (GP-0-15-002). The proposed design meets all of the permit requirements for water quality treatment and runoff quantity control in conformance to the current Stormwater Design Manual.

The computer program HydroCAD 10.0, was employed to generate hydrographs for the 1, 2, 10, 25 and 100-year design storms with a duration of 24 hours. Precipitation distribution data was generated from the USDA NRCS Win TR20 software. The following rainfall amounts for each frequency have been used in the analysis: 1-year – 2.68”, 2-year – 3.24”, 10-year – 4.76”, 25-year – 5.93”, 100-year – 8.30”.

Soils:

According to the soil survey map of the USDA Natural Resources Conservation Service, there are ten soil mapping unit types mapped within the Project Area. The soils information is summarized below:

Map Unit Symbol	**Map Unit name**	**Soil Description**	**Hydrologic Soil Group**
Cc	Canandaigua Silt Loam	Poorly and very poorly drained	“D”
FAE	Farmington-Rock outcrop complex, steep	Well Drained, Somewhat Excessively Drained	“C”
PlB	Plainfield loamy sand, 0 to 8 percent slopes	Excessively Drained	“A”
PrC	Plainfield-Rock outcrop complex, rolling	Excessively Drained	“A”
Ra	Raynham silt loam	Poorly drained	“C”
RhA	Rhinebeck silt loam, 0 to 3 percent slope	Somewhat poorly drained	“D”
RvA	Riverhead fine sandy loam,	Well drained	“B”

	0 to 3 percent slope		
STD	Stockbridge-Farmington-rock outcrop complex, hilly	Well drained	"B" and "C"
WsA	Williamson silt loam, 0 to 3 percent slopes	Moderately well drained	"C"
WsB	Williamson silt loam, 3 to 8 percent slopes	Moderately well drained	"C"

Stockbridge-Farmington-rock outcrop complex was modeled as 30% of soil group "B", 50% of soil group "C" and 20% of rock outcrop.

A soils map is included in *Appendix A* for reference.

Predevelopment Drainage Analysis:

The area of the project site that is being modified to the extent that will affect existing drainage conditions has been evaluated in this drainage analysis. The existing drainage condition for the project area has been modeled as two sub-areas, A and B based upon ultimate point of discharge from the project site. These basins are described below, along with a summary of their hydrologic conditions:

Drainage Area A (Design Point 1) includes the northerly portion of the project site and offsite contributing drainage area. This drainage basin discharges overland in a westerly direction toward the existing lower area located approximately midway along the westerly boundary of the site.

Approximately 7.2 acres of this basin includes offsite contributing area. The offsite contributing area has been modeled as impervious cover with the balance modeled as woods in good condition. The area within the project site has been modeled as woods in good condition.

Drainage Area B (Design Point 2) includes the southerly part of the project site. The drainage basin discharges overland in a westerly direction toward the existing wetland, which includes a pond at the southwest corner of the site, and ultimately discharges into the Esopus Creek.

Approximately 5.41 acres of this basin includes offsite contributing drainage area, known as the Bread Alone Bakery site. The offsite contributing area has been modeled as impervious cover and woods and lawn in good condition. The area within the project site has been modeled as water surface with the balance modeled as woods in good and fair conditions.

The existing Central Hudson site adjacent to the south end of the project also discharges to the existing pond in the southwest corner of the site. This discharge occurs downstream of any proposed development and will not impact the evaluation of the hydrology to the design point since this area remains unchanged. Therefore, the existing Central Hudson site has not been included in the evaluation.

Predevelopment Peak Flow Values

Peak flow discharge values were determined for the 1, 2, 10 (Qp), 25 and 100 (Qf) design storm events.

	Peak Flow Discharge (cfs)				
Drainage Area	**1yr**	**2yr**	**10yr**	**25yr**	**100yr**
Design point 1	20.50	33.66	75.79	112.49	190.75

Design Point 2	8.53	14.36	33.47	49.93	85.55

Existing condition hydrographs can be found in *Appendix B* of this report.

Postdevelopment Drainage Analysis:

The proposed stormwater management has been designed to conform to the guidelines established in the New York State Stormwater Design Manual, January 2015.

Step 1: Site Planning

A. Conserve Natural Areas – Natural drainage design points will be maintained; retention of forest cover and undisturbed soils will be maintained where possible; the minimum required clearing and grading to accomplish the project goals is proposed.

B. Reduce Impervious Cover – proposing minimum sizes, allowed by the Town of Ulster Code, for parking and roadway width will reduce impact of development.

Step 2: Determine Water Quality Volume (WQv)

The calculations of water quality storage volume, using NYSDEC Green Infrastructure Spreadsheets for WQv calculations, are provided in *Appendix C* of this report.

Step 3: Runoff Reduction by Applying Green Infrastructure Techniques and Standard SMP's with RRv Capacity

Proposed Bioretention Practices, which are identified as a standard SMPs with runoff reduction capacity (RRv), will provide the minimum runoff reduction (RRv) from the newly constructed impervious areas. Due to site limitations, which include seasonal high groundwater and shallow depth to bedrock, infiltration practices are not viable and the total WQv cannot be reduced by the proposed Bioretention Practices. The calculations of RRv provided by the Bioretention Practices, using NYSDEC Green Infrastructure Spreadsheets, are provided in *Appendix C* of this report.

Step 4: Determine the required RRv

The calculations of the required RRv are provided in *Appendix C* of this report.

Step 5: Apply SMP's to address remaining WQv

Proposed Bioretention Practices will provide the minimum runoff reduction (RRv) and treatment of the remaining WQv from the newly constructed impervious areas. The calculations of RRv and treated volume provided by the Bioretention Practices are provided in *Appendix C* of this report.

Step 6: Apply volume and peak rate control practices:

Proposed Detention Basins will provide stream channel protection by providing 24-hour extended detention of the one-year, 24-hour storm event and will attenuate the post-development 10-year and 100-year peak discharge rates to predevelopment rates (refer to hydrograph routings for 10-year and 100-year storm).

In the postdevelopment drainage condition the drainage area has been divided into four sub-areas based on ultimate point of discharge. These sub-areas are described below, along with a summary of their hydrologic conditions.

Drainage Area A (Design Point 1) - the proposed development will result in an increase in impervious cover inside this drainage area. *Detention Basin 1* located inside this basin will provide channel protection and will control the ten- and one hundred-year design storms. Storm water runoff from this sub-area will be collected by a series of catch basins and an underground pipe system that will convey runoff to the above mentioned Detention Basin. A proposed outlet control structure and discharge pipe will convey runoff from the Detention Basin toward the existing lower area located along the westerly boundary of the site.

Proposed Bioretention Practices located inside this basin will provide the minimum runoff reduction (RRv) and treatment of the remaining WQv from the newly constructed impervious areas.

The offsite contributing area has been modeled as impervious cover with the balance modeled as woods in good condition. The area within the project site has been modeled as impervious surface with the balance modeled as lawn in good condition (grass cover >75%) and woods in good condition

Drainage Area A1 (Design Point 1) - includes a portion of predevelopment drainage area A. This area will remain relatively unchanged in the postdevelopment condition. This drainage area continues to discharge overland in westerly direction toward the existing lower area located along the westerly boundary of the site.

The area has been modeled as woods in good condition.

Drainage Area B (Design Point 2) - includes the proposed southerly parking area and a portion of the driveway. The proposed development will result in an increase in impervious cover inside this drainage area. *Detention Basin 2* located inside this basin will provide channel protection and will control the ten- and one hundred-year design storms. Storm water runoff from this sub-area will discharge overland or will be collected by a series of the catch basins and underground pipe system that will convey runoff to the above-mentioned Detention Basin. The proposed outlet control structure and discharge pipe will convey runoff from the Detention Basin toward the existing wetland on site.

A proposed Bioretention Practice located inside this basin will provide the minimum runoff reduction (RRv) and treatment of the remaining WQv from the newly constructed impervious areas.

The area has been modeled as impervious surface with the balance modeled as a lawn in good condition (grass cover >75%).

Drainage Area B1 (Design Point 2) - includes a portion of predevelopment drainage area B. This area will remain relatively unchanged in the postdevelopment condition. This drainage area continues to discharge overland in a westerly direction toward the existing wetland on site. This area includes 578 linear feet (approximately 17,354 square feet) of the proposed entrance drive to the project site. Additional storage for WQv treatment from the entrance drive within this basin was included in the *Bioretention Area 5* design.

The offsite contributing area has been modeled as impervious cover with the balance modeled as woods and lawn in good condition. The area within the project site has been modeled as water surface, impervious surface with the balance modeled as woods in good and fair conditions.

Postdevelopment Peak Flow Values

Peak flow discharge values were determined for the 1, 2, 10 (Qp), 25 and 100 (Qf) design storm events.

	Peak Flow Discharge (cfs)				
Drainage Area	**1yr**	**2yr**	**10yr**	**25yr**	**100yr**
Design point 1	2.49	8.21	53.18	93.82	159.78
Design Point 2	8.5	13.38	31.15	48.56	80.93

Proposed condition hydrographs can be found in *Appendix B* of this report.

Pre-Post Development Peak Flow Values Comparison

	Peak Flow Discharge (cfs)				
Design Point	**1yr**	**2yr**	**10yr**	**25yr**	**100yr**
Design point 1	-18.01	-25.45	-22.61	-18.67	-30.97
Design Point 2	-0.03	-0.98	-2.32	-1.37	-4.62

Diversion Swales Design:

Swale 1 – the runoff from the northeasterly portion of the post-development *Area A* discharges overland toward proposed *Diversion Swale 1.* The resulting peak rate of flow toward the swale during the 100-year design storm is 68.89 cfs. Pproposed *Diversion Swale A1* will convey the peak discharge at a maximum velocity of 4.48 fps, at an average depth of 1.26', providing at least 6" freeboard. Proposed swale depth is 2.0'.

Swale 2 – the runoff from the southeasterly portion of the post-development *Area A* discharges overland toward proposed *Diversion Swale 2.* The resulting peak rate of flow toward the swale during the 100-year design storm is 24.06 cfs. Proposed *Diversion Swale A1* will convey the peak discharge at a maximum velocity of 3.97 fps, at an average depth of 0.6', providing at least 6" freeboard. Proposed swale depth is 1.5'.

Swale 3 – the runoff from portion of the post-development *Area B* discharges overland toward the proposed *Diversion Swale 3.* The resulting peak rate of flow toward the swale during the 100-year design storm is 4.12 cfs. Proposed *Diversion Swale 3* will convey the peak discharge at a maximum velocity of 1.62 fps, at an average depth of 0.25', providing at least 6" freeboard. Proposed swale depth is 1.0'.

Swale 4 – the runoff from the portion of the post-development *Area B* discharges overland toward proposed *Diversion Swale 4.* The resulting peak rate of flow toward the swale during the 100-year design storm is 29.36 cfs. Proposed *Diversion Swale 4* will convey the peak discharge at a maximum velocity of 4.25 fps, at an average depth of 0.68', providing at least 6" freeboard. Proposed swale depth is 1.5'.

Swale 5 – the runoff from the portion of the post-development *Area A* discharges overland toward proposed *Diversion Swale 5* that runs along the roadway in the Gas Village portion of the development. The resulting peak rate of flow toward the swale during the 100-year design storm is 6.66 cfs. Proposed *Diversion Swale 5* will convey the peak discharge at a maximum velocity of 2.82 fps, at an average depth of 0.43', providing at least 6" freeboard. Proposed swale depth is 1.0'.

Channel Protection Volume (CPv):

Drainage Area A – discharges toward *Detention Pond 1*. *Detention Pond 1* will provide Stream Channel Protection Volume (CPv). The required CPv calculations are provided in *Appendix C* of this report. The required CPv for *Drainage Area A* is 87,948 cf and storage provided in *Detention Pond* 1 from elevation 158.0 to elevation 160.1 is 89,918 cf.

Drainage Area B – discharges toward *Detention Pond 2*. *Detention Pond 2* will provide Stream Channel Protection Volume (CPv). The required CPv calculations are provided in *Appendix C* of this report. The required CPv for *Drainage Area B* is 12,850 cf and storage provided in *Detention Pond 2* from elevation 164.0 to elevation 165.0 is 18,764 cf.

Conclusion:

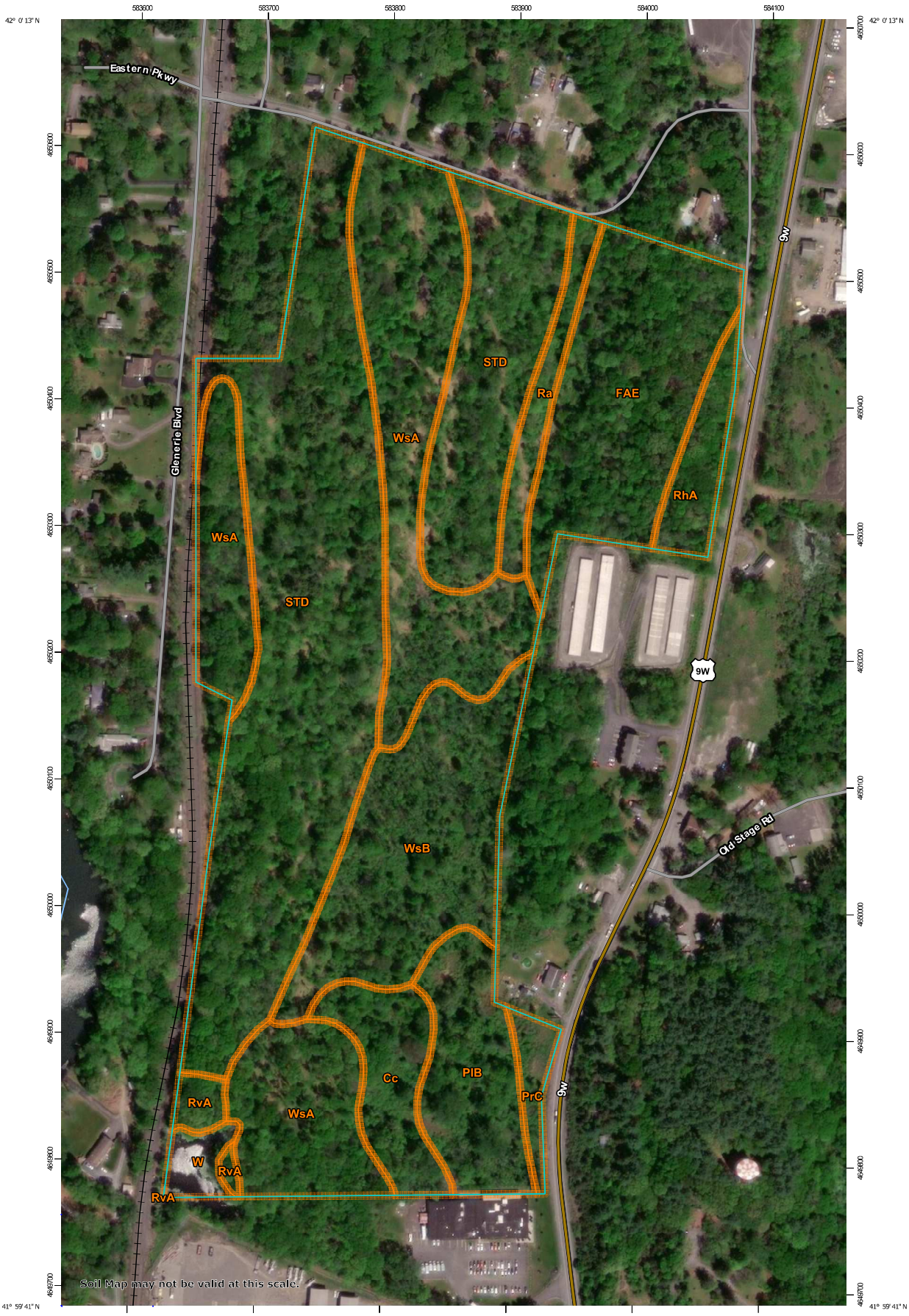
The stormwater management plan demonstrates that the proposed development will result in post-construction hydrologic conditions with equal or lower runoff discharge rates and similar patterns of drainage conveyance as those that currently exist in predevelopment conditions, along with an improved quality of discharge.

APPENDICES

Appendix A	Soil Map
Appendix B	Hydrographs
Appendix C	Green Infrastructure Spreadsheets for WQv and CPv calculations
Appendix D	Pre- and Post-Development Watershed Delineation Maps

Appendix A

Soil Map



Map Scale: 1:2,840 if printed on B portrait (11" x 17") sheet.

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

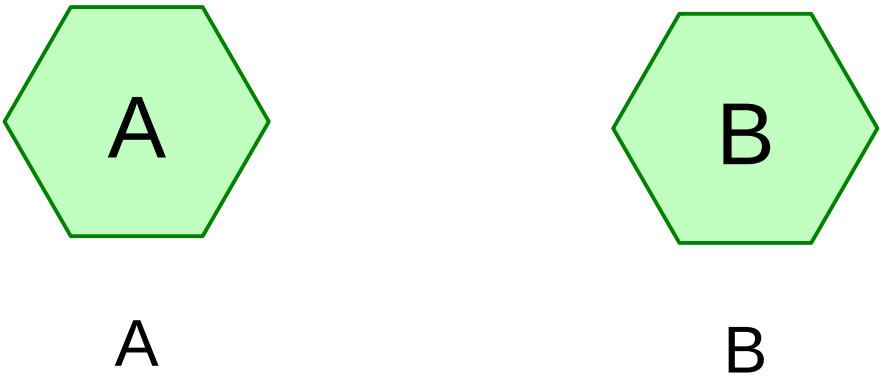
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Cc	Canandaigua silt loam	2.4	4.0%
FAE	Farmington-Rock outcrop complex, steep	6.9	11.5%
PlB	Plainfield loamy sand, 0 to 8 percent slopes	3.4	5.8%
PrC	Plainfield-Rock outcrop complex, rolling	0.7	1.1%
Ra	Raynham silt loam	1.4	2.4%
RhA	Rhinebeck silt loam, 0 to 3 percent slopes	1.4	2.4%
RvA	Riverhead fine sandy loam, 0 to 3 percent slopes	0.5	0.9%
STD	Stockbridge-Farmington-Rock outcrop complex, hilly	21.6	36.4%
W	Water	0.6	1.1%
WsA	Williamson silt loam, 0 to 3 percent slopes	13.6	22.9%
WsB	Williamson silt loam, 3 to 8 percent slopes	6.9	11.6%
Totals for Area of Interest		**59.5**	**100.0%**

Appendix B

Hydrographs



Subcat Reach Pond Link

Routing Diagram for 07.26.19 CHG&E Training Predevelopment
Prepared by Lawrence J. Paggi, P.E., P.C., Printed 7/26/2019

Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=1,938,974 sf 12.62% Impervious Runoff Depth=0.62"
Flow Length=2,087' Tc=15.9 min CN=72 Runoff=20.50 cfs 2.318 af

Subcatchment B: B Runoff Area=871,065 sf 23.22% Impervious Runoff Depth=0.58"
Flow Length=1,028' Tc=15.0 min CN=71 Runoff=8.53 cfs 0.973 af

Total Runoff Area = 64.510 ac Runoff Volume = 3.290 af Average Runoff Depth = 0.61"
84.09% Pervious = 54.249 ac 15.91% Impervious = 10.261 ac

Summary for Subcatchment A: A

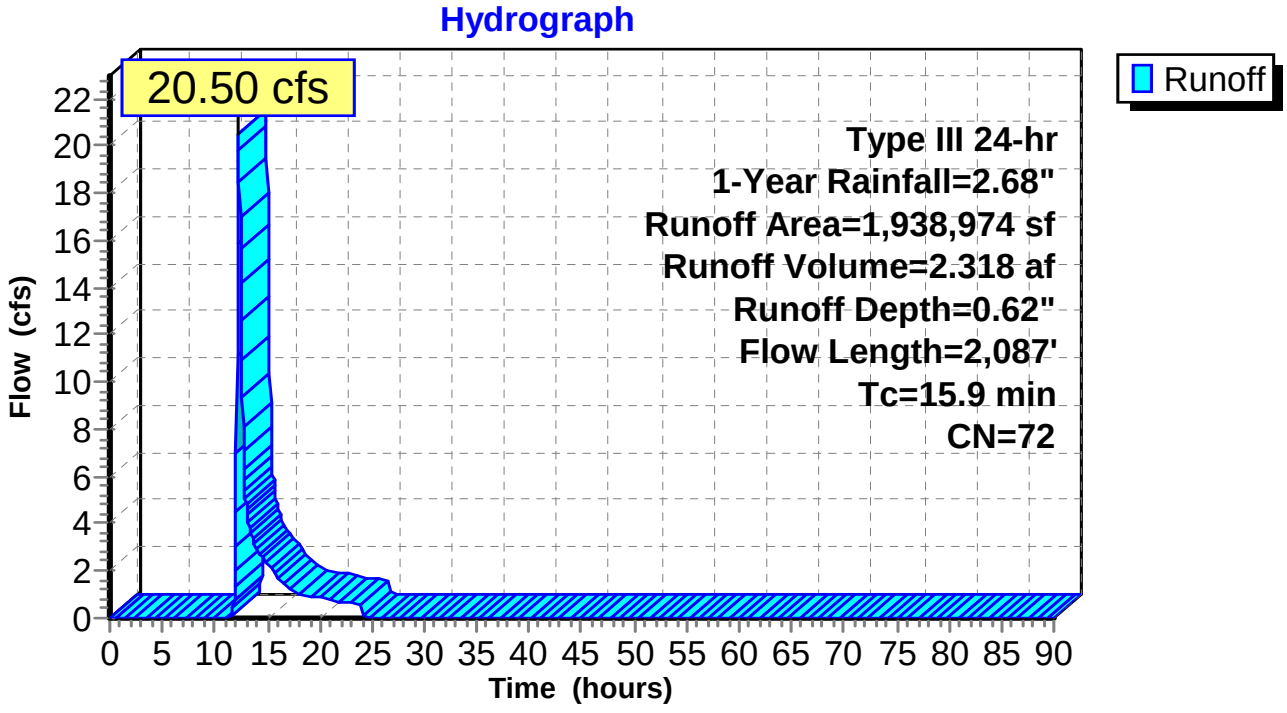
Runoff = 20.50 cfs @ 12.26 hrs, Volume= 2.318 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.68"

	Area (sf)	CN	Description
*	123,997	98	Paved parking, roofs
*	120,704	98	Rock outcrop
	181,055	55	Woods, Good, HSG B
	1,513,218	70	Woods, Good, HSG C
	1,938,974	72	Weighted Average
	1,694,273		87.38% Pervious Area
	244,701		12.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	100	0.6000	0.32		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	200	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.9	1,787	0.0150	3.01	69.16	**Channel Flow,** Area= 23.0 sf Perim= 52.3' r= 0.44' n= 0.035
15.9	2,087	Total			

Subcatchment A: A



Summary for Subcatchment B: B

Runoff = 8.53 cfs @ 12.25 hrs, Volume= 0.973 af, Depth= 0.58"

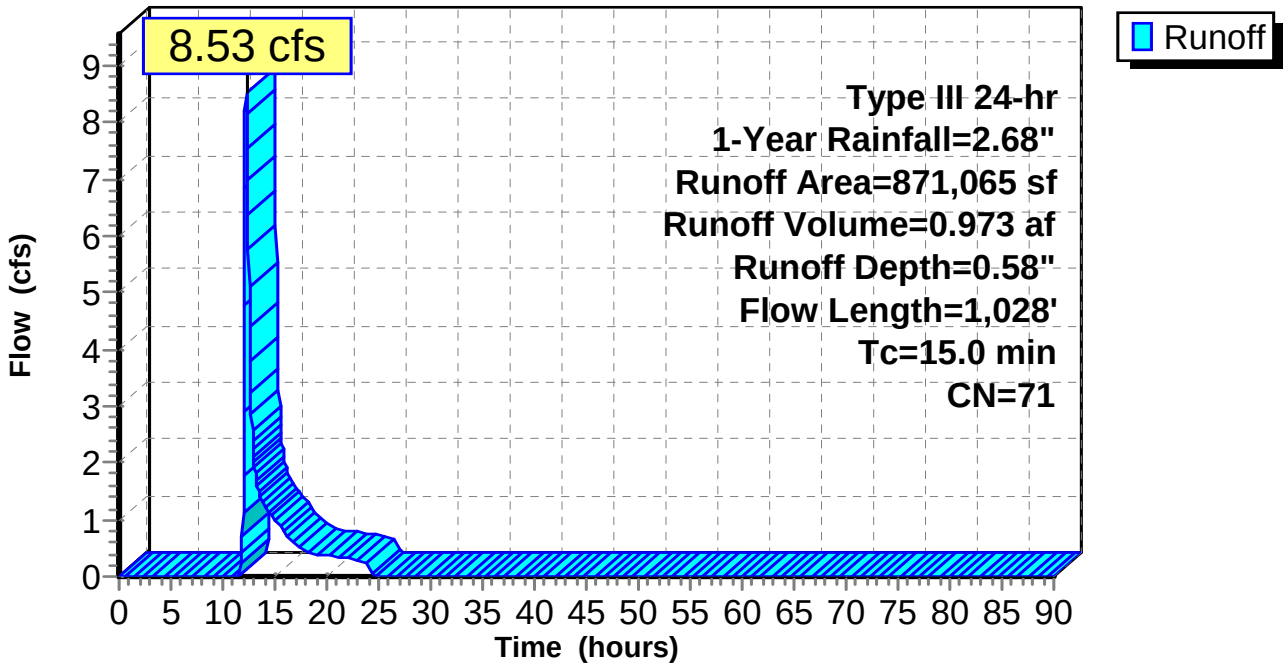
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.68"

	Area (sf)	CN	Description
	108,929	98	Water Surface, HSG C
	118,364	36	Woods, Fair, HSG A
	24,231	60	Woods, Fair, HSG B
	264,758	73	Woods, Fair, HSG C
	67,830	79	Woods, Fair, HSG D
*	16,153	98	Rock Outcrop
*	77,187	98	Paved parking, roof
	47,429	30	Woods, Good, HSG A
	5,630	70	Woods, Good, HSG C
	49,149	77	Woods, Good, HSG D
	38,852	39	>75% Grass cover, Good, HSG A
	45,985	80	>75% Grass cover, Good, HSG D
	6,568	74	>75% Grass cover, Good, HSG C
	871,065	71	Weighted Average
	668,796		76.78% Pervious Area
	202,269		23.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
4.4	682	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	246	0.0330	6.55	209.56	**Channel Flow,** Area= 32.0 sf Perim= 40.9' r= 0.78' n= 0.035
15.0	1,028	Total			

Subcatchment B: B

Hydrograph



Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=1,938,974 sf 12.62% Impervious Runoff Depth=0.95"
Flow Length=2,087' Tc=15.9 min CN=72 Runoff=33.66 cfs 3.541 af

Subcatchment B: B Runoff Area=871,065 sf 23.22% Impervious Runoff Depth=0.90"
Flow Length=1,028' Tc=15.0 min CN=71 Runoff=14.36 cfs 1.503 af

Total Runoff Area = 64.510 ac Runoff Volume = 5.044 af Average Runoff Depth = 0.94"
84.09% Pervious = 54.249 ac 15.91% Impervious = 10.261 ac

Summary for Subcatchment A: A

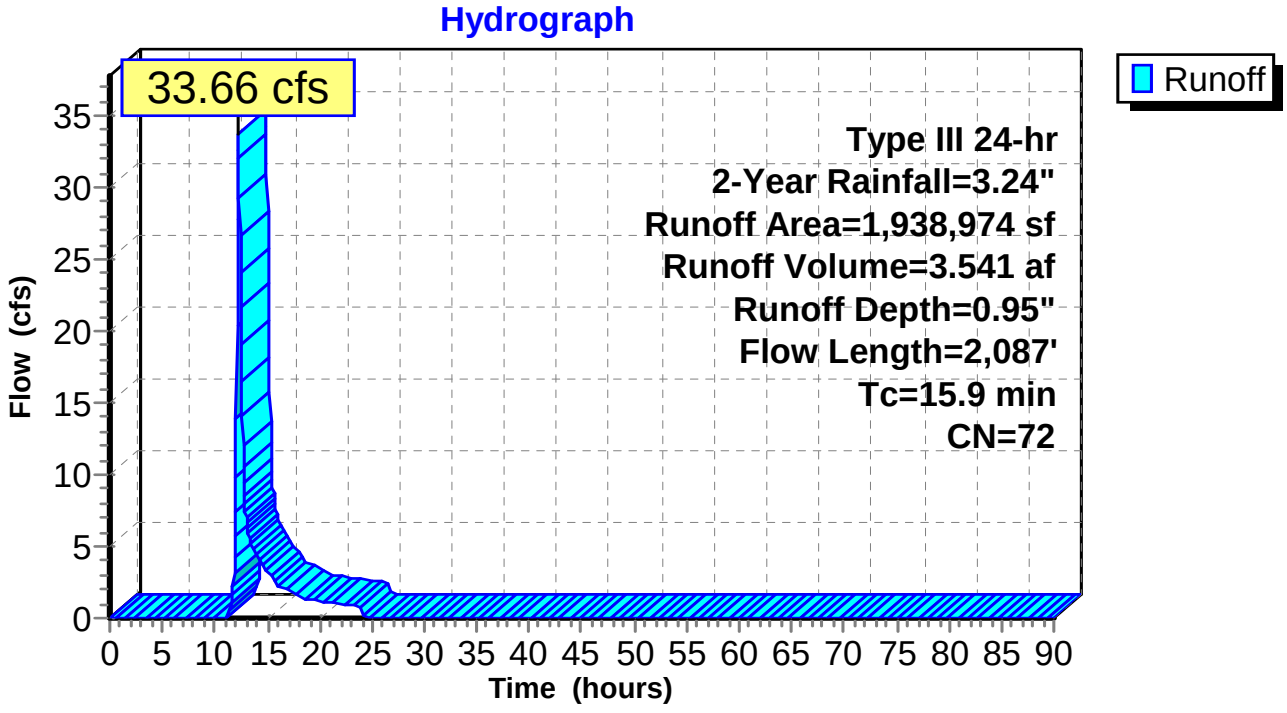
Runoff = 33.66 cfs @ 12.24 hrs, Volume= 3.541 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	123,997	98	Paved parking, roofs
*	120,704	98	Rock outcrop
	181,055	55	Woods, Good, HSG B
	1,513,218	70	Woods, Good, HSG C
	1,938,974	72	Weighted Average
	1,694,273		87.38% Pervious Area
	244,701		12.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	100	0.6000	0.32		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	200	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.9	1,787	0.0150	3.01	69.16	**Channel Flow,** Area= 23.0 sf Perim= 52.3' r= 0.44' n= 0.035
15.9	2,087	Total			

Subcatchment A: A



Summary for Subcatchment B: B

Runoff = 14.36 cfs @ 12.23 hrs, Volume= 1.503 af, Depth= 0.90"

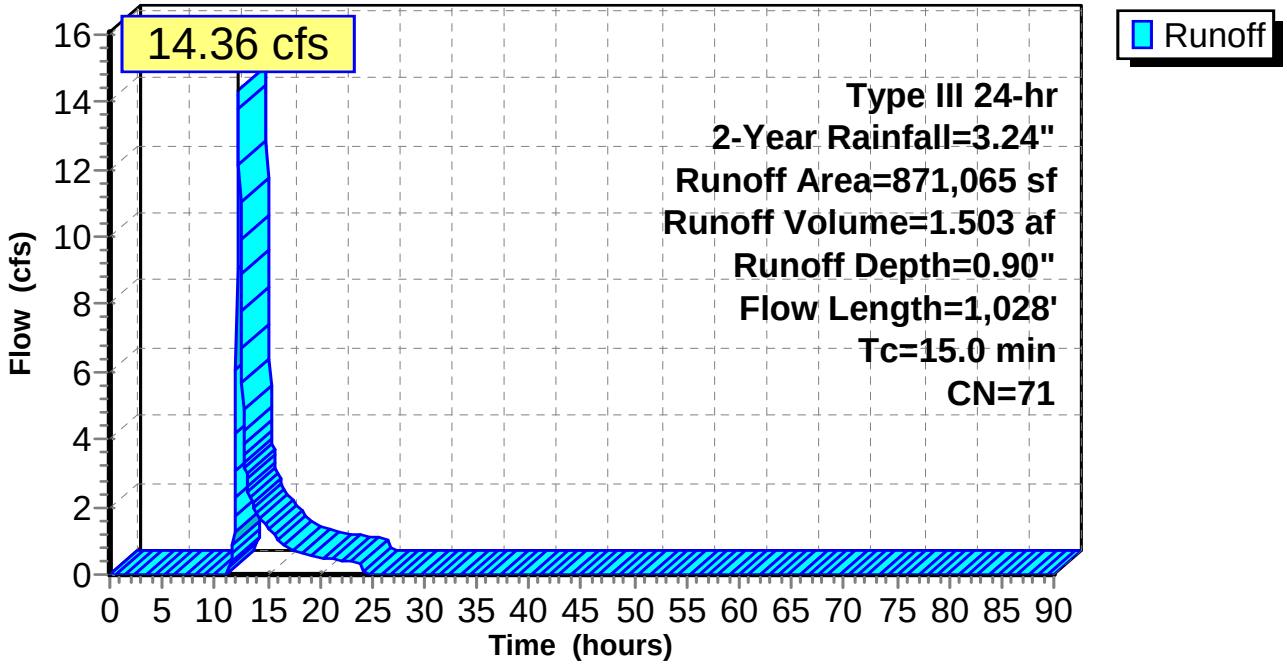
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
	108,929	98	Water Surface, HSG C
	118,364	36	Woods, Fair, HSG A
	24,231	60	Woods, Fair, HSG B
	264,758	73	Woods, Fair, HSG C
	67,830	79	Woods, Fair, HSG D
*	16,153	98	Rock Outcrop
*	77,187	98	Paved parking, roof
	47,429	30	Woods, Good, HSG A
	5,630	70	Woods, Good, HSG C
	49,149	77	Woods, Good, HSG D
	38,852	39	>75% Grass cover, Good, HSG A
	45,985	80	>75% Grass cover, Good, HSG D
	6,568	74	>75% Grass cover, Good, HSG C
	871,065	71	Weighted Average
	668,796		76.78% Pervious Area
	202,269		23.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
4.4	682	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	246	0.0330	6.55	209.56	**Channel Flow,** Area= 32.0 sf Perim= 40.9' r= 0.78' n= 0.035
15.0	1,028	Total			

Subcatchment B: B

Hydrograph



Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=1,938,974 sf 12.62% Impervious Runoff Depth=2.01"
Flow Length=2,087' Tc=15.9 min CN=72 Runoff=75.79 cfs 7.473 af

Subcatchment B: B Runoff Area=871,065 sf 23.22% Impervious Runoff Depth=1.94"
Flow Length=1,028' Tc=15.0 min CN=71 Runoff=33.47 cfs 3.228 af

Total Runoff Area = 64.510 ac Runoff Volume = 10.701 af Average Runoff Depth = 1.99"
84.09% Pervious = 54.249 ac 15.91% Impervious = 10.261 ac

Summary for Subcatchment A: A

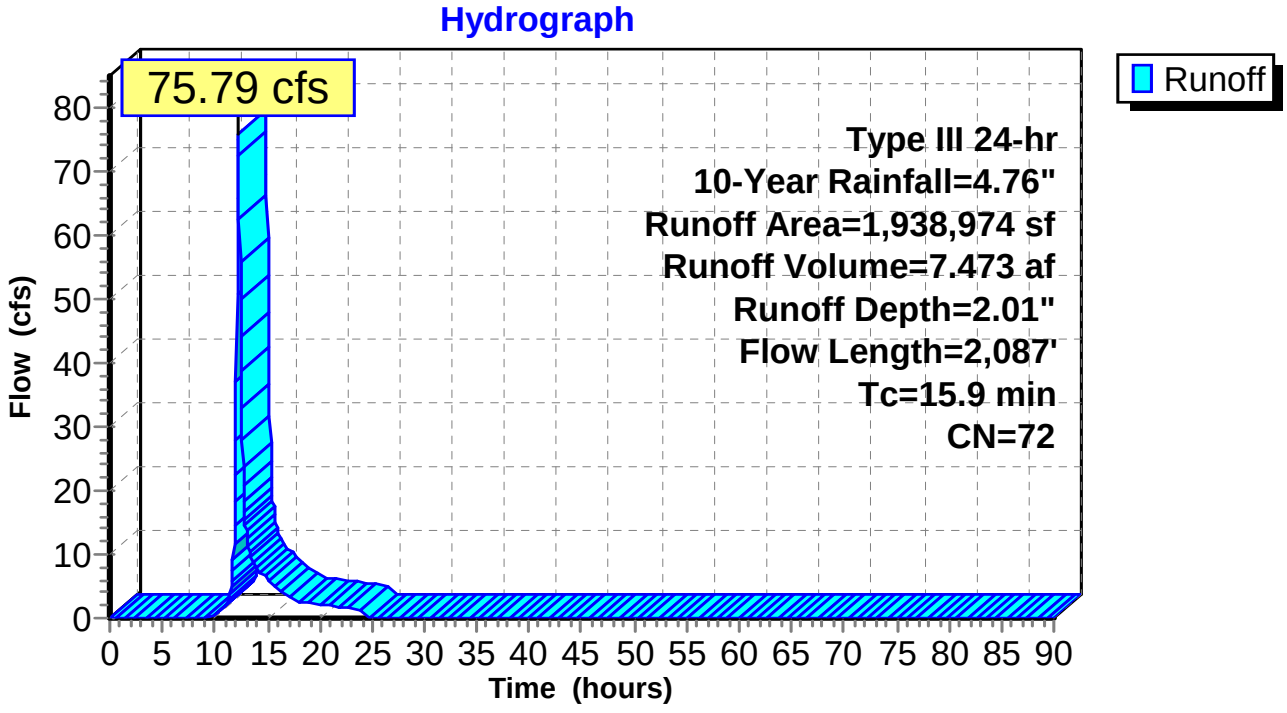
Runoff = 75.79 cfs @ 12.23 hrs, Volume= 7.473 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.76"

	Area (sf)	CN	Description
*	123,997	98	Paved parking, roofs
*	120,704	98	Rock outcrop
	181,055	55	Woods, Good, HSG B
	1,513,218	70	Woods, Good, HSG C
	1,938,974	72	Weighted Average
	1,694,273		87.38% Pervious Area
	244,701		12.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	100	0.6000	0.32		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	200	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.9	1,787	0.0150	3.01	69.16	**Channel Flow,** Area= 23.0 sf Perim= 52.3' r= 0.44' n= 0.035
15.9	2,087	Total			

Subcatchment A: A



Summary for Subcatchment B: B

Runoff = 33.47 cfs @ 12.22 hrs, Volume= 3.228 af, Depth= 1.94"

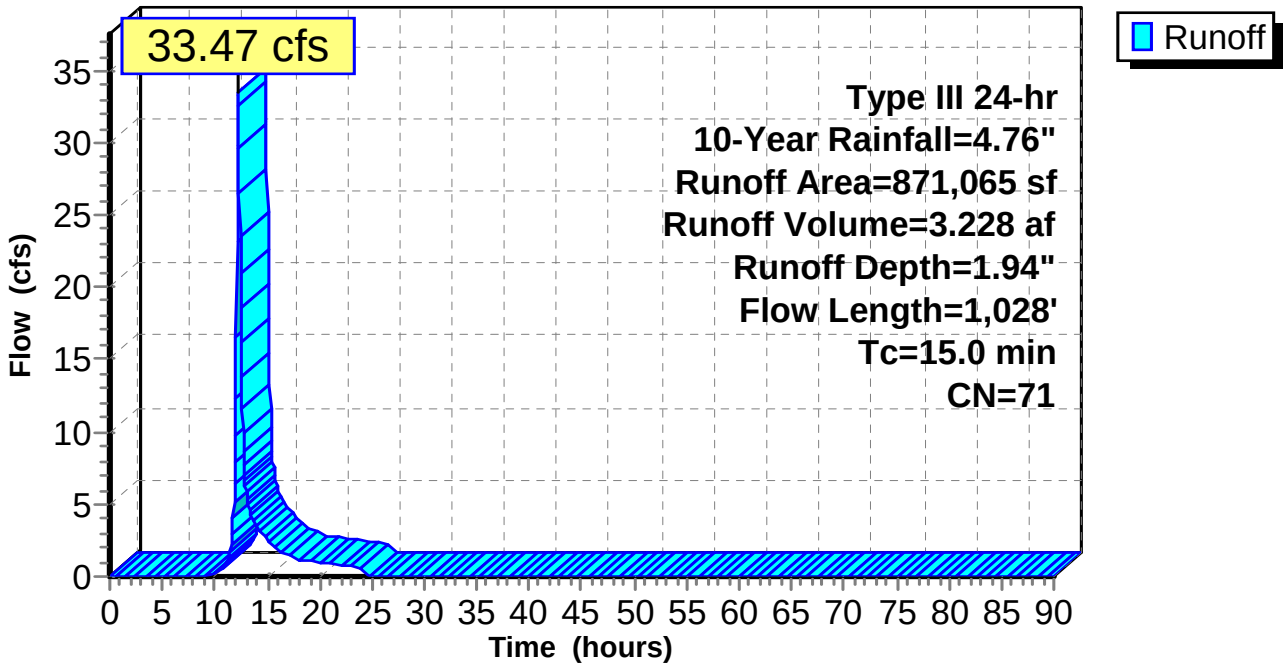
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.76"

	Area (sf)	CN	Description
	108,929	98	Water Surface, HSG C
	118,364	36	Woods, Fair, HSG A
	24,231	60	Woods, Fair, HSG B
	264,758	73	Woods, Fair, HSG C
	67,830	79	Woods, Fair, HSG D
*	16,153	98	Rock Outcrop
*	77,187	98	Paved parking, roof
	47,429	30	Woods, Good, HSG A
	5,630	70	Woods, Good, HSG C
	49,149	77	Woods, Good, HSG D
	38,852	39	>75% Grass cover, Good, HSG A
	45,985	80	>75% Grass cover, Good, HSG D
	6,568	74	>75% Grass cover, Good, HSG C
	871,065	71	Weighted Average
	668,796		76.78% Pervious Area
	202,269		23.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
4.4	682	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	246	0.0330	6.55	209.56	**Channel Flow,** Area= 32.0 sf Perim= 40.9' r= 0.78' n= 0.035
15.0	1,028	Total			

Subcatchment B: B

Hydrograph



Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=1,938,974 sf 12.62% Impervious Runoff Depth=2.94"
Flow Length=2,087' Tc=15.9 min CN=72 Runoff=112.49 cfs 10.891 af

Subcatchment B: B Runoff Area=871,065 sf 23.22% Impervious Runoff Depth=2.84"
Flow Length=1,028' Tc=15.0 min CN=71 Runoff=49.93 cfs 4.737 af

Total Runoff Area = 64.510 ac Runoff Volume = 15.628 af Average Runoff Depth = 2.91"
84.09% Pervious = 54.249 ac 15.91% Impervious = 10.261 ac

Summary for Subcatchment A: A

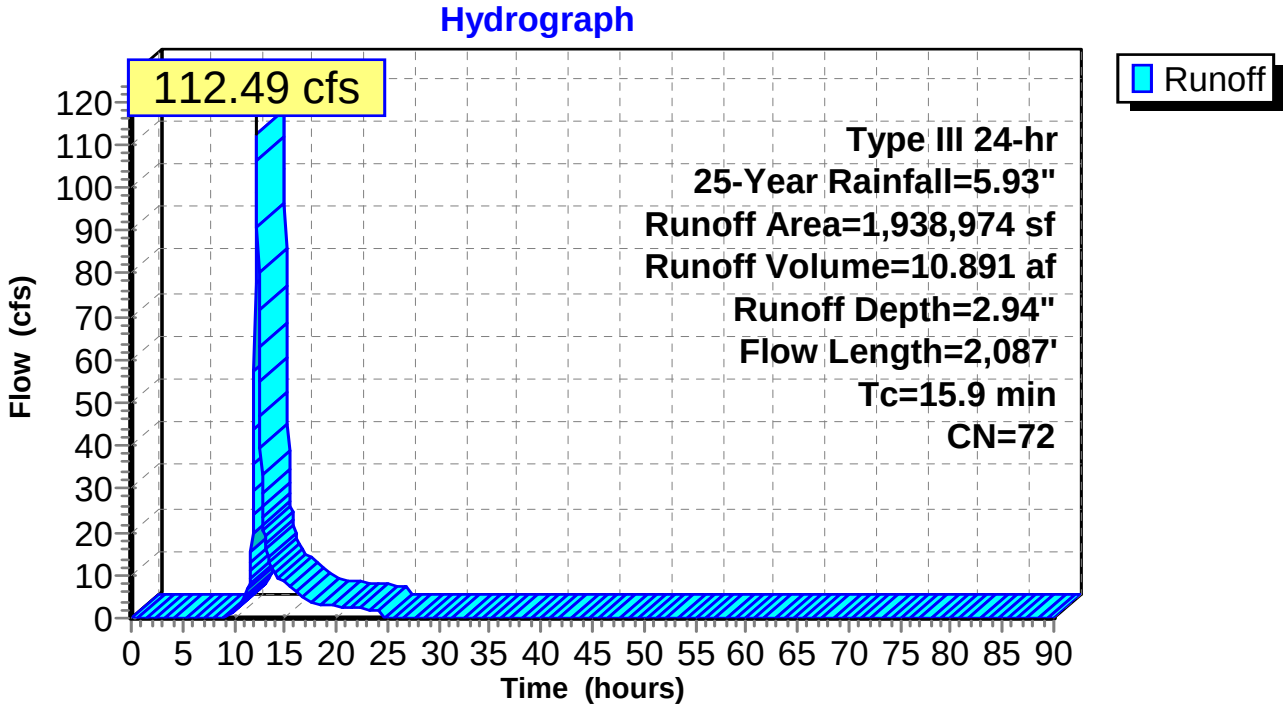
Runoff = 112.49 cfs @ 12.22 hrs, Volume= 10.891 af, Depth= 2.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.93"

	Area (sf)	CN	Description
*	123,997	98	Paved parking, roofs
*	120,704	98	Rock outcrop
	181,055	55	Woods, Good, HSG B
	1,513,218	70	Woods, Good, HSG C
	1,938,974	72	Weighted Average
	1,694,273		87.38% Pervious Area
	244,701		12.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	100	0.6000	0.32		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	200	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.9	1,787	0.0150	3.01	69.16	**Channel Flow,** Area= 23.0 sf Perim= 52.3' r= 0.44' n= 0.035
15.9	2,087	Total			

Subcatchment A: A



Summary for Subcatchment B: B

Runoff = 49.93 cfs @ 12.21 hrs, Volume= 4.737 af, Depth= 2.84"

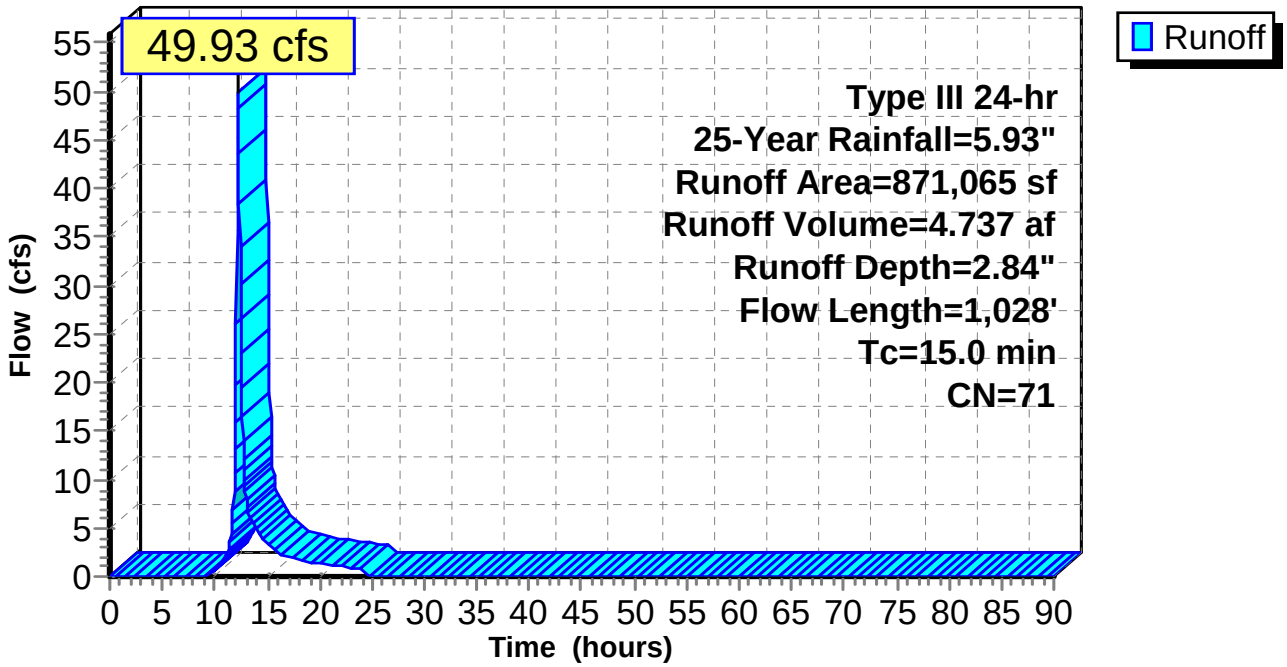
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.93"

	Area (sf)	CN	Description
	108,929	98	Water Surface, HSG C
	118,364	36	Woods, Fair, HSG A
	24,231	60	Woods, Fair, HSG B
	264,758	73	Woods, Fair, HSG C
	67,830	79	Woods, Fair, HSG D
*	16,153	98	Rock Outcrop
*	77,187	98	Paved parking, roof
	47,429	30	Woods, Good, HSG A
	5,630	70	Woods, Good, HSG C
	49,149	77	Woods, Good, HSG D
	38,852	39	>75% Grass cover, Good, HSG A
	45,985	80	>75% Grass cover, Good, HSG D
	6,568	74	>75% Grass cover, Good, HSG C
	871,065	71	Weighted Average
	668,796		76.78% Pervious Area
	202,269		23.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
4.4	682	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	246	0.0330	6.55	209.56	**Channel Flow,** Area= 32.0 sf Perim= 40.9' r= 0.78' n= 0.035
15.0	1,028	Total			

Subcatchment B: B

Hydrograph



Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=1,938,974 sf 12.62% Impervious Runoff Depth=4.96"
Flow Length=2,087' Tc=15.9 min CN=72 Runoff=190.75 cfs 18.394 af

Subcatchment B: B Runoff Area=871,065 sf 23.22% Impervious Runoff Depth=4.84"
Flow Length=1,028' Tc=15.0 min CN=71 Runoff=85.55 cfs 8.067 af

Total Runoff Area = 64.510 ac Runoff Volume = 26.460 af Average Runoff Depth = 4.92"
84.09% Pervious = 54.249 ac 15.91% Impervious = 10.261 ac

Summary for Subcatchment A: A

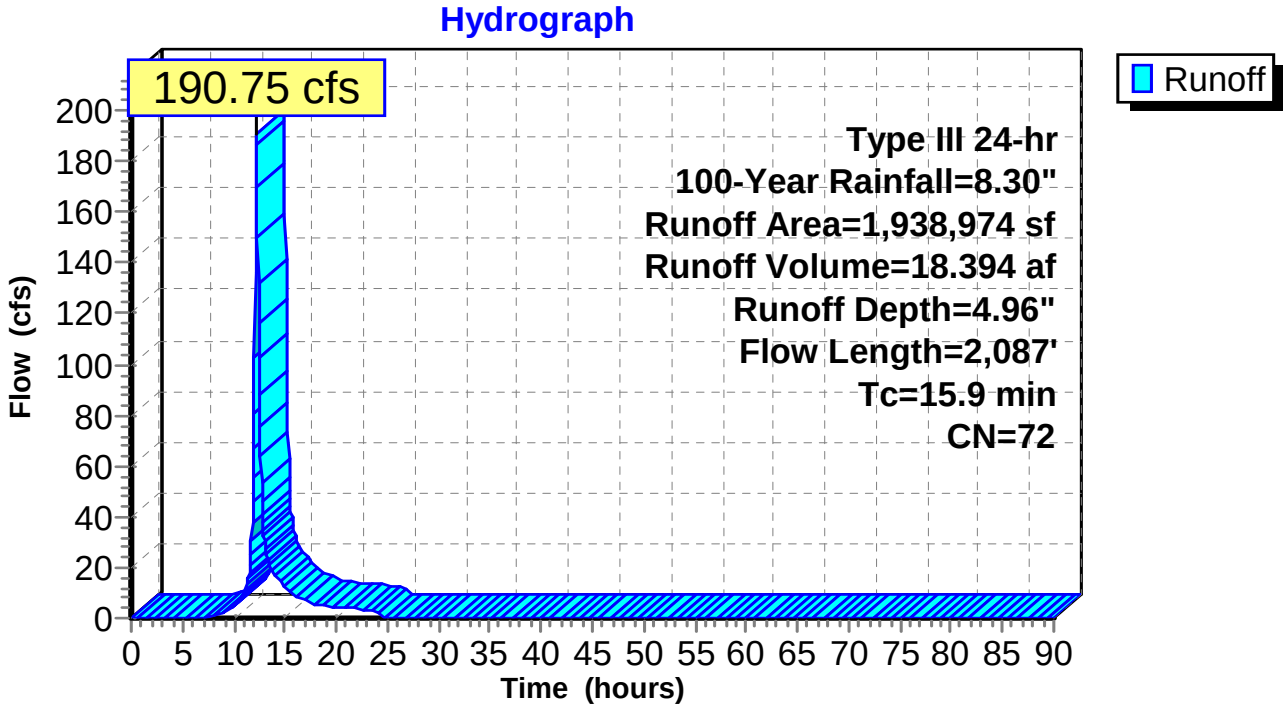
Runoff = 190.75 cfs @ 12.22 hrs, Volume= 18.394 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

	Area (sf)	CN	Description
*	123,997	98	Paved parking, roofs
*	120,704	98	Rock outcrop
	181,055	55	Woods, Good, HSG B
	1,513,218	70	Woods, Good, HSG C
	1,938,974	72	Weighted Average
	1,694,273		87.38% Pervious Area
	244,701		12.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	100	0.6000	0.32		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	200	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.9	1,787	0.0150	3.01	69.16	**Channel Flow,** Area= 23.0 sf Perim= 52.3' r= 0.44' n= 0.035
15.9	2,087	Total			

Subcatchment A: A



Summary for Subcatchment B: B

Runoff = 85.55 cfs @ 12.21 hrs, Volume= 8.067 af, Depth= 4.84"

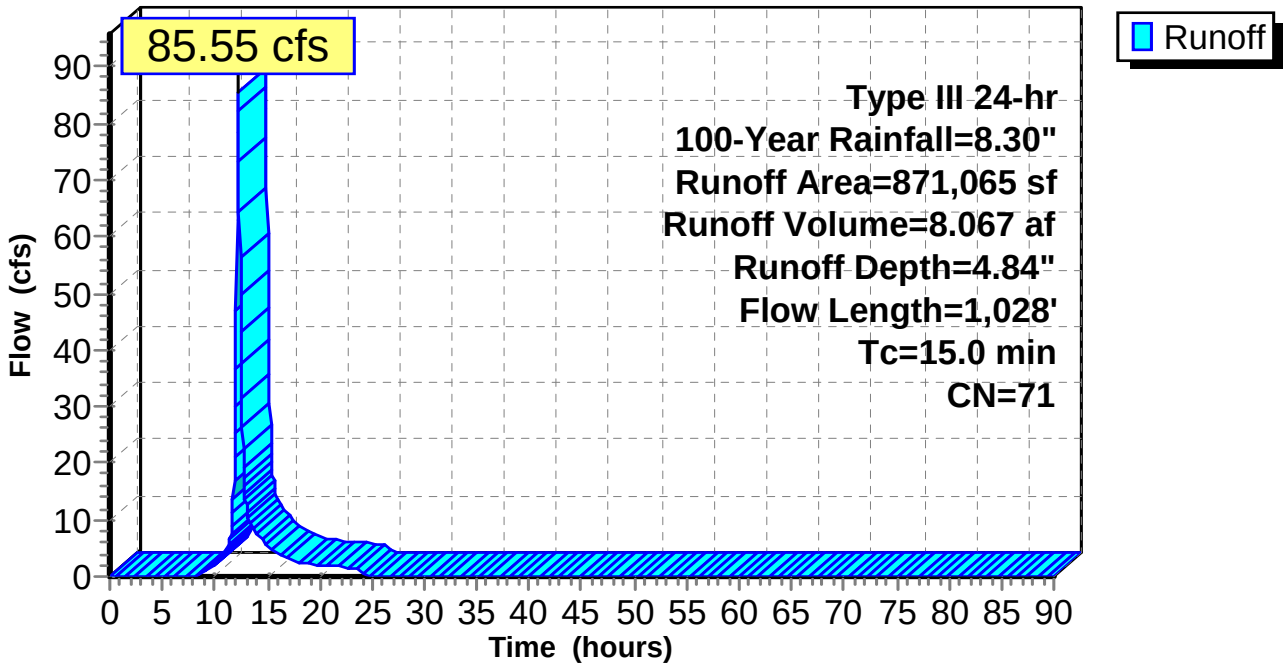
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

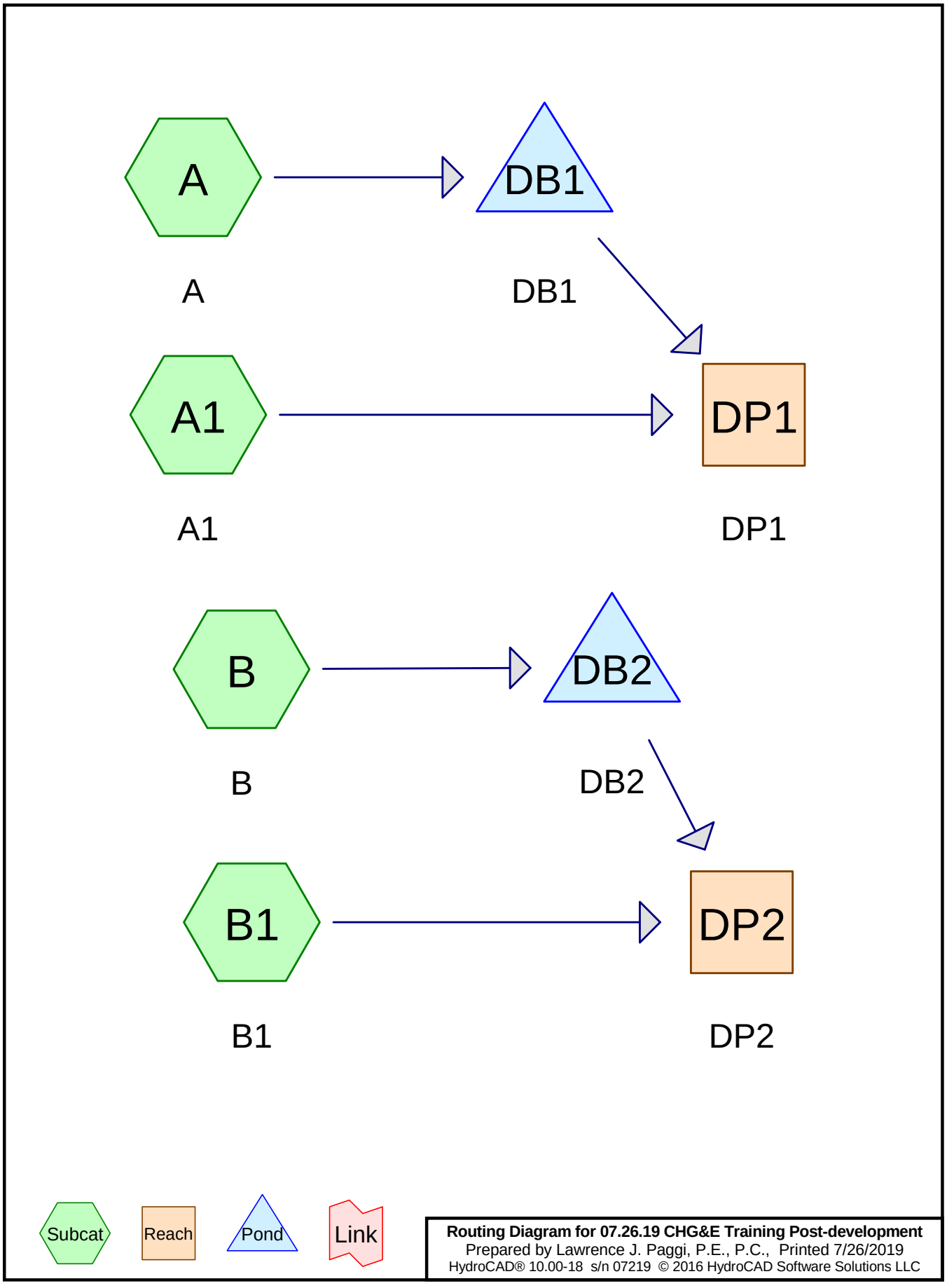
	Area (sf)	CN	Description
	108,929	98	Water Surface, HSG C
	118,364	36	Woods, Fair, HSG A
	24,231	60	Woods, Fair, HSG B
	264,758	73	Woods, Fair, HSG C
	67,830	79	Woods, Fair, HSG D
*	16,153	98	Rock Outcrop
*	77,187	98	Paved parking, roof
	47,429	30	Woods, Good, HSG A
	5,630	70	Woods, Good, HSG C
	49,149	77	Woods, Good, HSG D
	38,852	39	>75% Grass cover, Good, HSG A
	45,985	80	>75% Grass cover, Good, HSG D
	6,568	74	>75% Grass cover, Good, HSG C
	871,065	71	Weighted Average
	668,796		76.78% Pervious Area
	202,269		23.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
4.4	682	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	246	0.0330	6.55	209.56	**Channel Flow,** Area= 32.0 sf Perim= 40.9' r= 0.78' n= 0.035
15.0	1,028	Total			

Subcatchment B: B

Hydrograph





Routing Diagram for 07.26.19 CHG&E Training Post-development
Prepared by Lawrence J. Paggi, P.E., P.C., Printed 7/26/2019

Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=1,812,362 sf 30.45% Impervious Runoff Depth=0.96"
Flow Length=1,815' Tc=12.6 min CN=79 Runoff=35.91 cfs 3.329 af

Subcatchment A1: A1 Runoff Area=160,052 sf 9.69% Impervious Runoff Depth=0.58"
Flow Length=712' Tc=38.5 min CN=71 Runoff=1.07 cfs 0.179 af

Subcatchment B: B Runoff Area=174,108 sf 77.38% Impervious Runoff Depth=1.69"
Tc=6.0 min CN=90 Runoff=7.73 cfs 0.564 af

Subcatchment B1: B1 Runoff Area=663,518 sf 32.85% Impervious Runoff Depth=0.71"
Flow Length=673' Tc=15.3 min CN=74 Runoff=8.46 cfs 0.904 af

Reach DP1: DP1 Inflow=2.49 cfs 3.454 af
Outflow=2.49 cfs 3.454 af

Reach DP2: DP2 Inflow=8.50 cfs 1.285 af
Outflow=8.50 cfs 1.285 af

Pond DB1: DB1 Peak Elev=160.11' Storage=90,433 cf Inflow=35.91 cfs 3.329 af
Outflow=1.78 cfs 3.276 af

Pond DB2: DB2 Peak Elev=165.05' Storage=19,697 cf Inflow=7.73 cfs 0.564 af
Outflow=0.19 cfs 0.381 af

Total Runoff Area = 64.510 ac Runoff Volume = 4.976 af Average Runoff Depth = 0.93"
67.26% Pervious = 43.386 ac 32.74% Impervious = 21.123 ac

Summary for Subcatchment A: A

Runoff = 35.91 cfs @ 12.19 hrs, Volume= 3.329 af, Depth= 0.96"

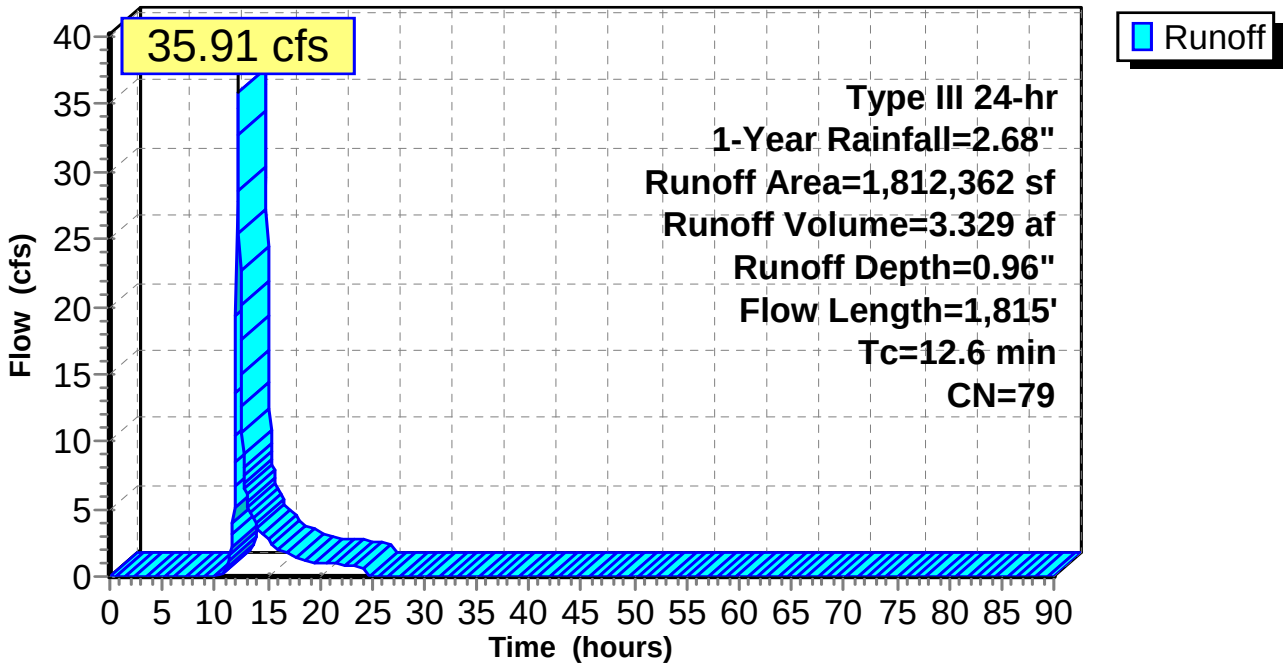
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.68"

	Area (sf)	CN	Description
*	396,369	98	Roofs, pavement on site
*	123,997	98	Roofs, driveways off site
*	31,558	98	Rock outcrop
	45,533	39	>75% Grass cover, Good, HSG A
	535,763	74	>75% Grass cover, Good, HSG C
	47,337	55	Woods, Good, HSG B
	631,805	70	Woods, Good, HSG C
	1,812,362	79	Weighted Average
	1,260,438		69.55% Pervious Area
	551,924		30.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	100	0.4400	0.28		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	200	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	472	0.0170	3.20	73.63	**Channel Flow,** Area= 23.0 sf Perim= 52.3' r= 0.44' n= 0.035
2.8	654	0.0120	3.93	86.51	**Channel Flow,** Area= 22.0 sf Perim= 28.3' r= 0.78' n= 0.035
0.6	389	0.0050	10.30	227.15	**Pipe Channel, CMP_Arch_1/2 77x52** 77.0" x 52.0", R=39.4"/121.3" Pipe Arch Area= 22.0 sf Perim= 17.3' n= 0.012
12.6	1,815	Total			

Subcatchment A: A

Hydrograph



Summary for Subcatchment A1: A1

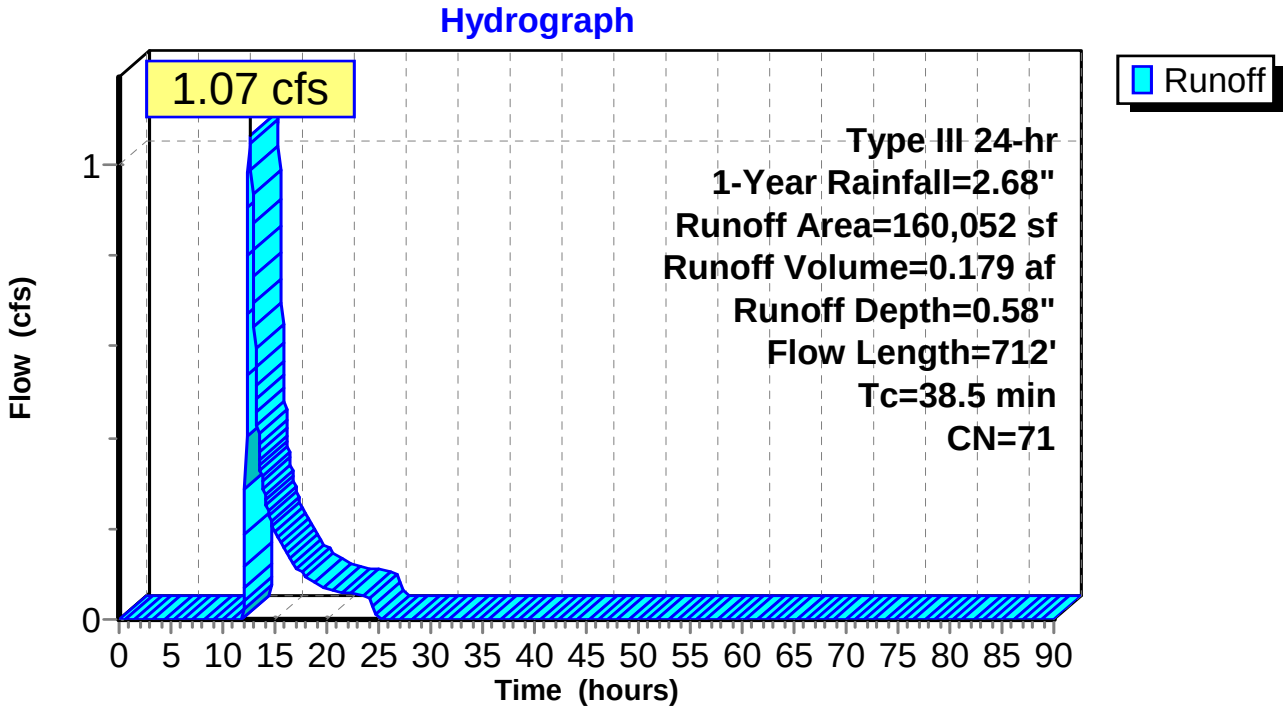
Runoff = 1.07 cfs @ 12.62 hrs, Volume= 0.179 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.68"

	Area (sf)	CN	Description
*	15,516	98	Rock outcrop
	23,274	55	Woods, Good, HSG B
	121,262	70	Woods, Good, HSG C
	160,052	71	Weighted Average
	144,536		90.31% Pervious Area
	15,516		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.7	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
2.8	612	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38.5	712	Total			

Subcatchment A1: A1



Summary for Subcatchment B: B

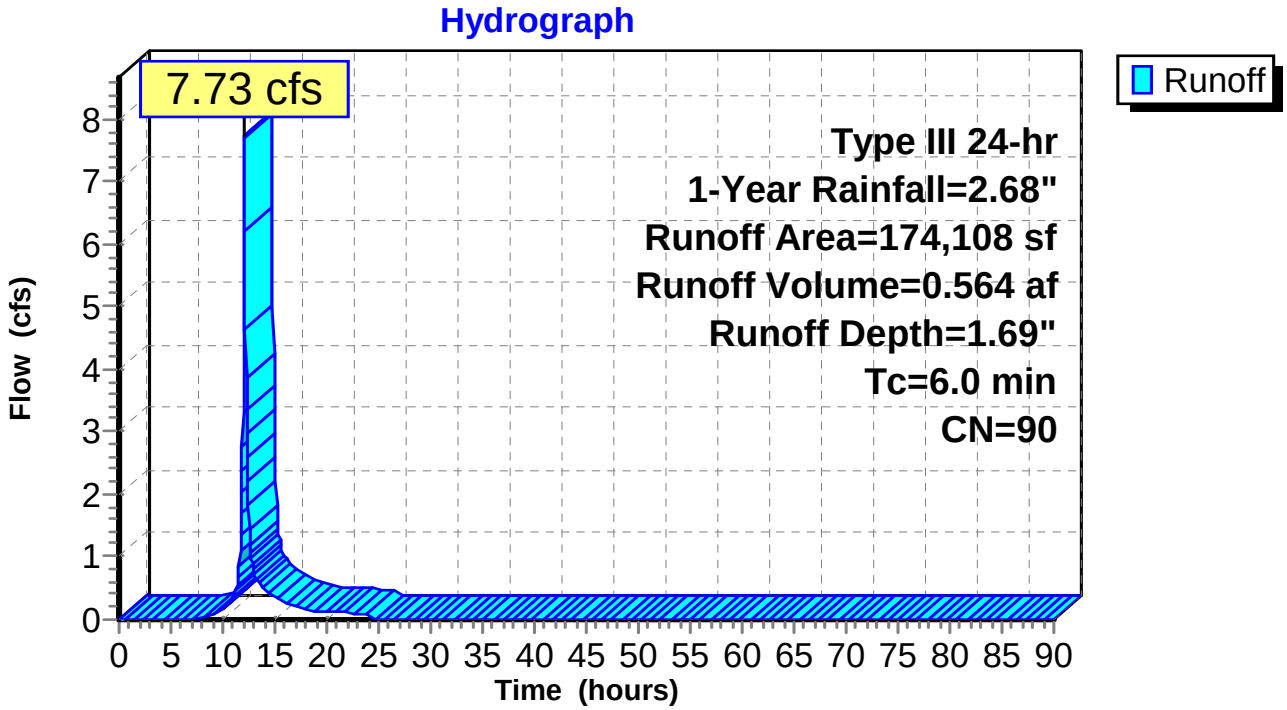
Runoff = 7.73 cfs @ 12.09 hrs, Volume= 0.564 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.68"

	Area (sf)	CN	Description
*	134,723	98	Paved parking
	11,134	39	>75% Grass cover, Good, HSG A
	28,251	74	>75% Grass cover, Good, HSG C
	174,108	90	Weighted Average
	39,385		22.62% Pervious Area
	134,723		77.38% Impervious Area

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

Subcatchment B: B



Summary for Subcatchment B1: B1

Runoff = 8.46 cfs @ 12.24 hrs, Volume= 0.904 af, Depth= 0.71"

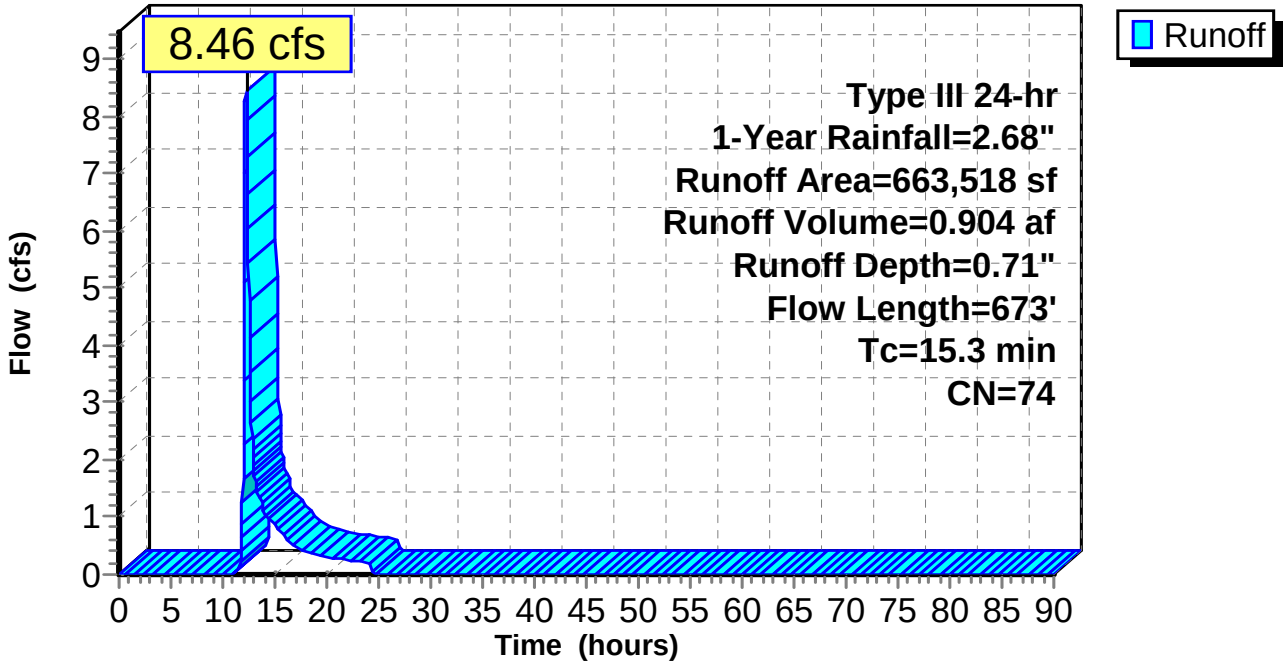
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.68"

	Area (sf)	CN	Description
	108,929	98	Water Surface, HSG C
*	17,354	98	Paved driveway
	9,827	36	Woods, Fair, HSG A
	21,742	60	Woods, Fair, HSG B
	181,381	73	Woods, Fair, HSG C
*	14,494	98	Rock Outcrop
	77,187	98	Paved parking, HSG C
	47,429	30	Woods, Good, HSG A
	5,630	70	Woods, Good, HSG C
	49,149	77	Woods, Good, HSG D
	38,852	39	>75% Grass cover, Good, HSG A
	45,985	80	>75% Grass cover, Good, HSG D
	26,494	30	Woods, Good, HSG A
	12,497	39	>75% Grass cover, Good, HSG A
	6,568	74	>75% Grass cover, Good, HSG C
	663,518	74	Weighted Average
	445,554		67.15% Pervious Area
	217,964		32.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0900	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
3.4	327	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	246	0.0330	6.55	209.56	**Channel Flow,** Area= 32.0 sf Perim= 40.9' r= 0.78' n= 0.035
15.3	673	Total			

Subcatchment B1: B1

Hydrograph

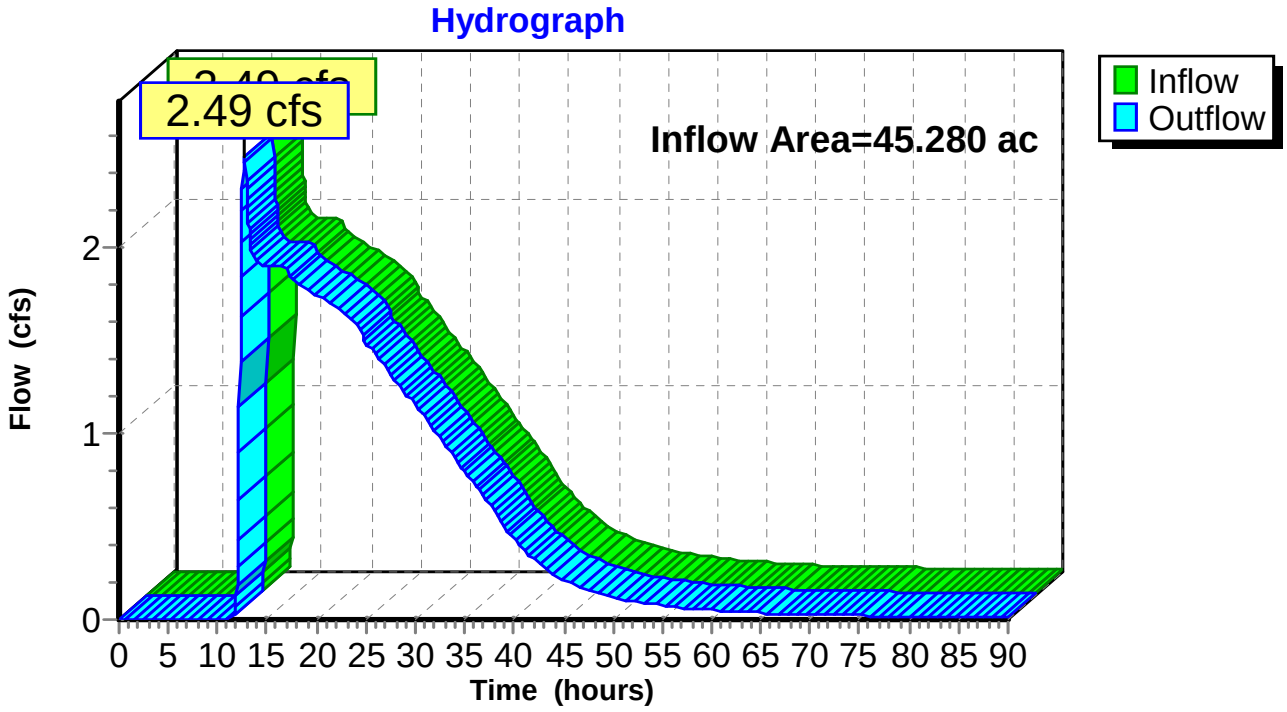


Summary for Reach DP1: DP1

Inflow Area = 45.280 ac, 28.77% Impervious, Inflow Depth > 0.92" for 1-Year event
Inflow = 2.49 cfs @ 12.66 hrs, Volume= 3.454 af
Outflow = 2.49 cfs @ 12.66 hrs, Volume= 3.454 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs

Reach DP1: DP1

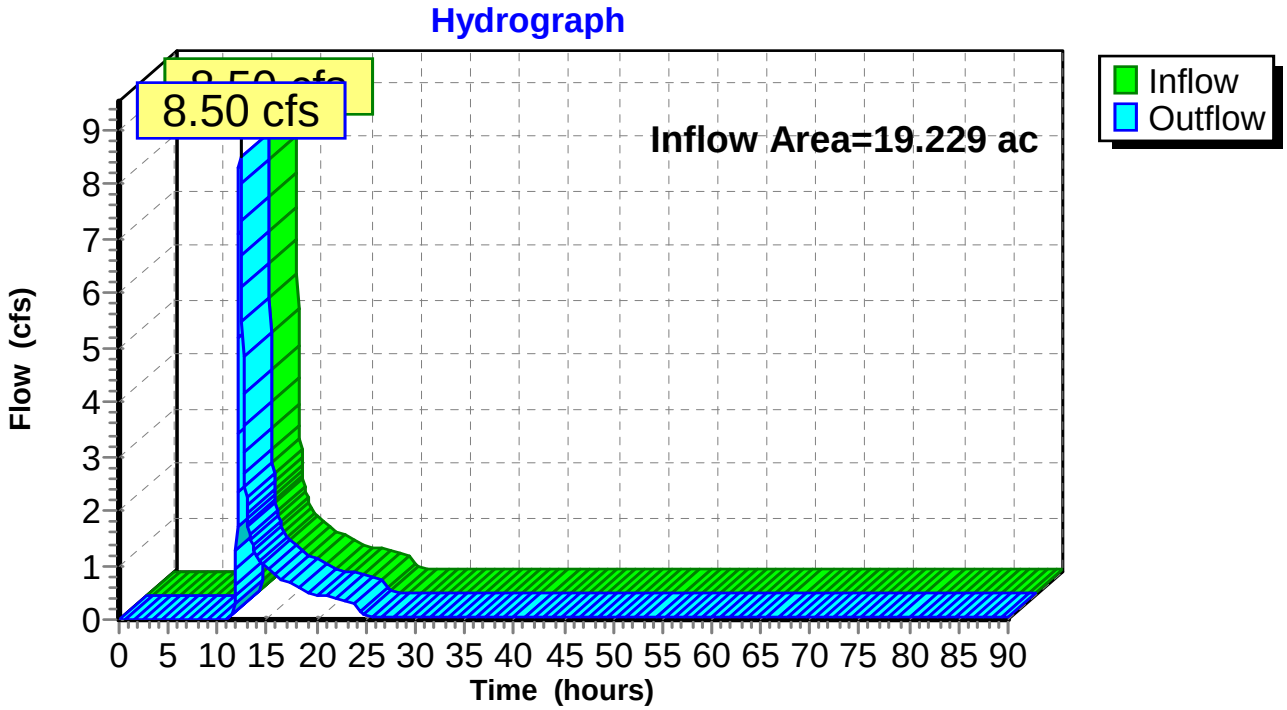


Summary for Reach DP2: DP2

Inflow Area = 19.229 ac, 42.11% Impervious, Inflow Depth > 0.80" for 1-Year event
Inflow = 8.50 cfs @ 12.24 hrs, Volume= 1.285 af
Outflow = 8.50 cfs @ 12.24 hrs, Volume= 1.285 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs

Reach DP2: DP2



Summary for Pond DB1: DB1

Inflow Area = 41.606 ac, 30.45% Impervious, Inflow Depth = 0.96" for 1-Year event
Inflow = 35.91 cfs @ 12.19 hrs, Volume= 3.329 af
Outflow = 1.78 cfs @ 16.56 hrs, Volume= 3.276 af, Atten= 95%, Lag= 262.2 min
Primary = 1.78 cfs @ 16.56 hrs, Volume= 3.276 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 160.11' @ 16.56 hrs Surf.Area= 46,224 sf Storage= 90,433 cf

Plug-Flow detention time= 731.5 min calculated for 3.276 af (98% of inflow)
Center-of-Mass det. time= 722.3 min (1,584.3 - 862.0)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	295,591 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

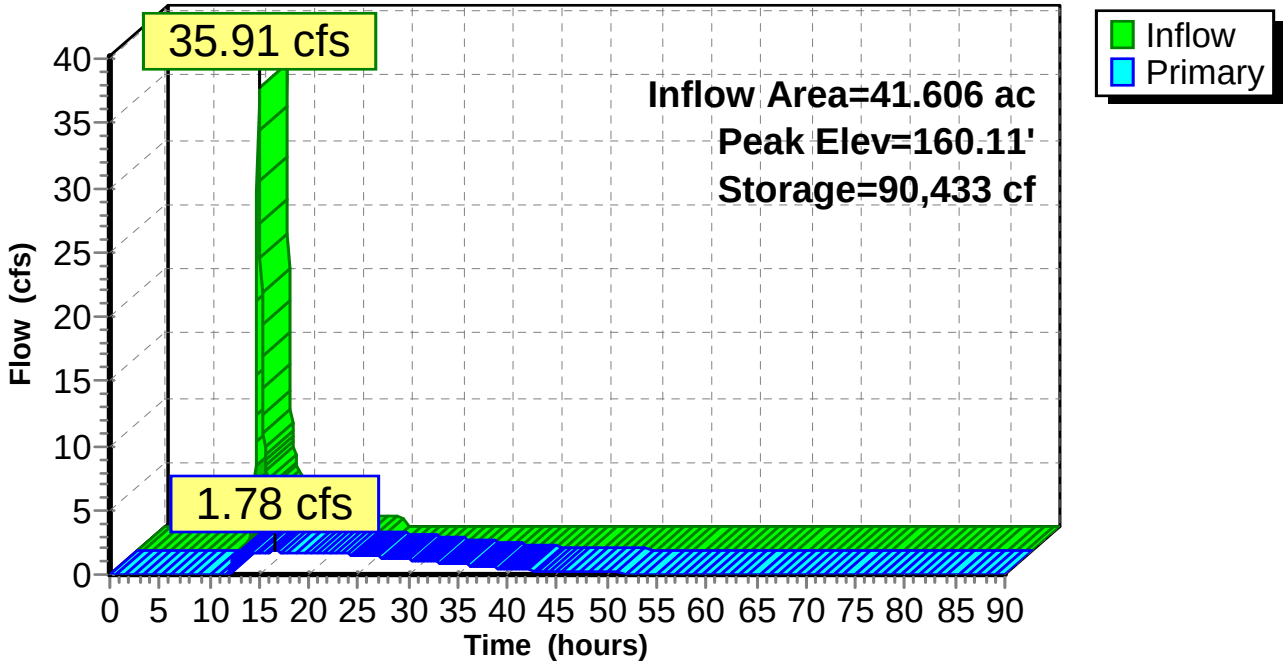
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	39,432	0	0
160.00	45,883	85,315	85,315
160.10	46,187	4,603	89,918
162.00	52,502	93,755	183,673
164.00	59,416	111,918	295,591

Device	Routing	Invert	Outlet Devices
#1	Primary	153.00'	**36.0" Round Culvert X 2.00** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 153.00' / 152.00' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 7.07 sf
#2	Device 1	158.00'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	160.10'	**36.0" W x 24.0" H Vert. Orifice/Grate X 4.00** C= 0.600
#4	Device 1	163.00'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.78 cfs @ 16.56 hrs HW=160.11' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.78 cfs of 161.24 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.74 cfs @ 6.49 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.05 cfs @ 0.34 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond DB1: DB1

Hydrograph



Summary for Pond DB2: DB2

Inflow Area = 3.997 ac, 77.38% Impervious, Inflow Depth = 1.69" for 1-Year event
Inflow = 7.73 cfs @ 12.09 hrs, Volume= 0.564 af
Outflow = 0.19 cfs @ 17.30 hrs, Volume= 0.381 af, Atten= 98%, Lag= 312.6 min
Primary = 0.19 cfs @ 17.30 hrs, Volume= 0.381 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 165.05' @ 17.30 hrs Surf.Area= 19,680 sf Storage= 19,697 cf

Plug-Flow detention time= 1,848.2 min calculated for 0.381 af (68% of inflow)
Center-of-Mass det. time= 1,752.1 min (2,566.0 - 813.9)

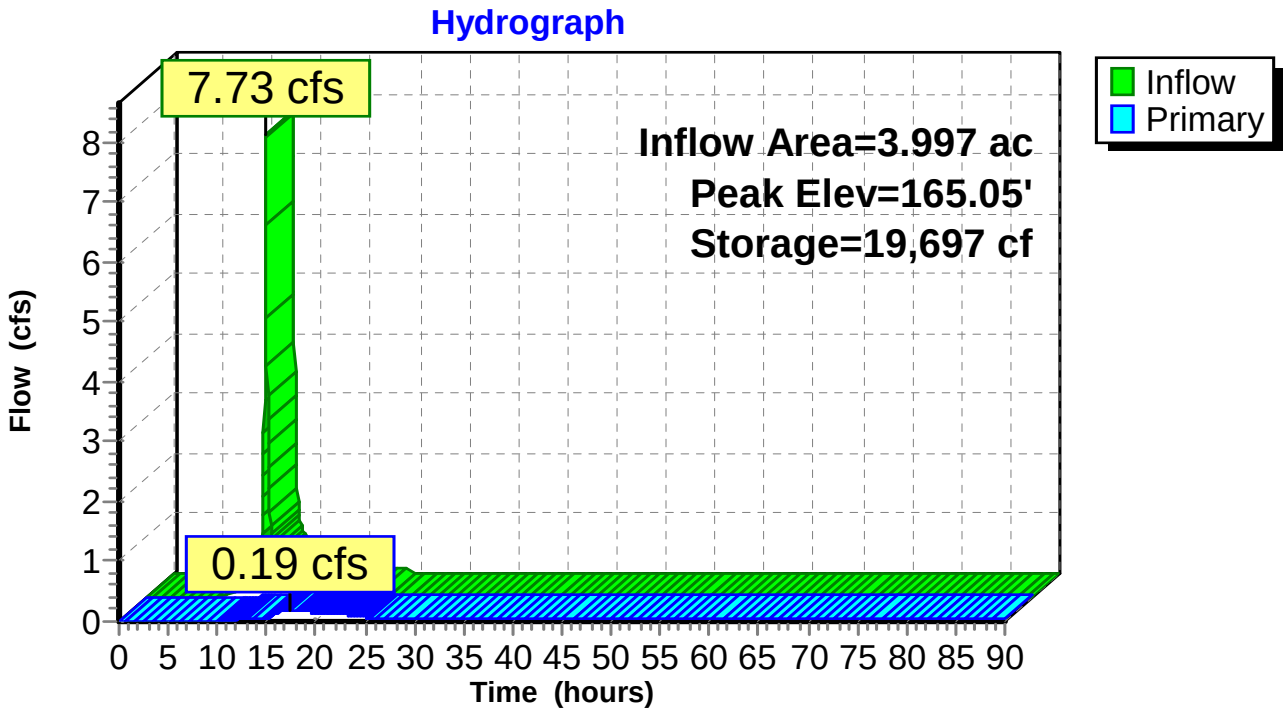
Volume	Invert	Avail.Storage	Storage Description
#1	164.00'	85,850 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
164.00	17,936	0	0
165.00	19,592	18,764	18,764
166.00	21,437	20,515	39,279
167.00	23,237	22,337	61,616
168.00	25,231	24,234	85,850

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**24.0" Round Culvert** L= 40.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 161.50' / 161.00' S= 0.0125 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	164.00'	**1.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	165.00'	**24.0" W x 8.0" H Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	167.00'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.19 cfs @ 17.30 hrs HW=165.05' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.19 cfs of 24.14 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 4.78 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.13 cfs @ 0.70 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond DB2: DB2


Hydrograph
7.73 cfs
0.19 cfs
Inflow Area=3.997 ac
Peak Elev=165.05'
Storage=19,697 cf
Inflow
Primary
Flow (cfs)
0 1 2 3 4 5 6 7 8
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
Time (hours)

Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=1,812,362 sf 30.45% Impervious Runoff Depth=1.37"
Flow Length=1,815' Tc=12.6 min CN=79 Runoff=52.29 cfs 4.739 af

Subcatchment A1: A1 Runoff Area=160,052 sf 9.69% Impervious Runoff Depth=0.90"
Flow Length=712' Tc=38.5 min CN=71 Runoff=1.78 cfs 0.276 af

Subcatchment B: B Runoff Area=174,108 sf 77.38% Impervious Runoff Depth=2.21"
Tc=6.0 min CN=90 Runoff=10.00 cfs 0.735 af

Subcatchment B1: B1 Runoff Area=663,518 sf 32.85% Impervious Runoff Depth=1.06"
Flow Length=673' Tc=15.3 min CN=74 Runoff=13.33 cfs 1.351 af

Reach DP1: DP1 Inflow=8.21 cfs 4.960 af
Outflow=8.21 cfs 4.960 af

Reach DP2: DP2 Inflow=13.38 cfs 1.901 af
Outflow=13.38 cfs 1.901 af

Pond DB1: DB1 Peak Elev=160.37' Storage=102,467 cf Inflow=52.29 cfs 4.739 af
Outflow=7.23 cfs 4.684 af

Pond DB2: DB2 Peak Elev=165.12' Storage=21,159 cf Inflow=10.00 cfs 0.735 af
Outflow=0.61 cfs 0.551 af

Total Runoff Area = 64.510 ac Runoff Volume = 7.101 af Average Runoff Depth = 1.32"
67.26% Pervious = 43.386 ac 32.74% Impervious = 21.123 ac

Summary for Subcatchment A: A

Runoff = 52.29 cfs @ 12.18 hrs, Volume= 4.739 af, Depth= 1.37"

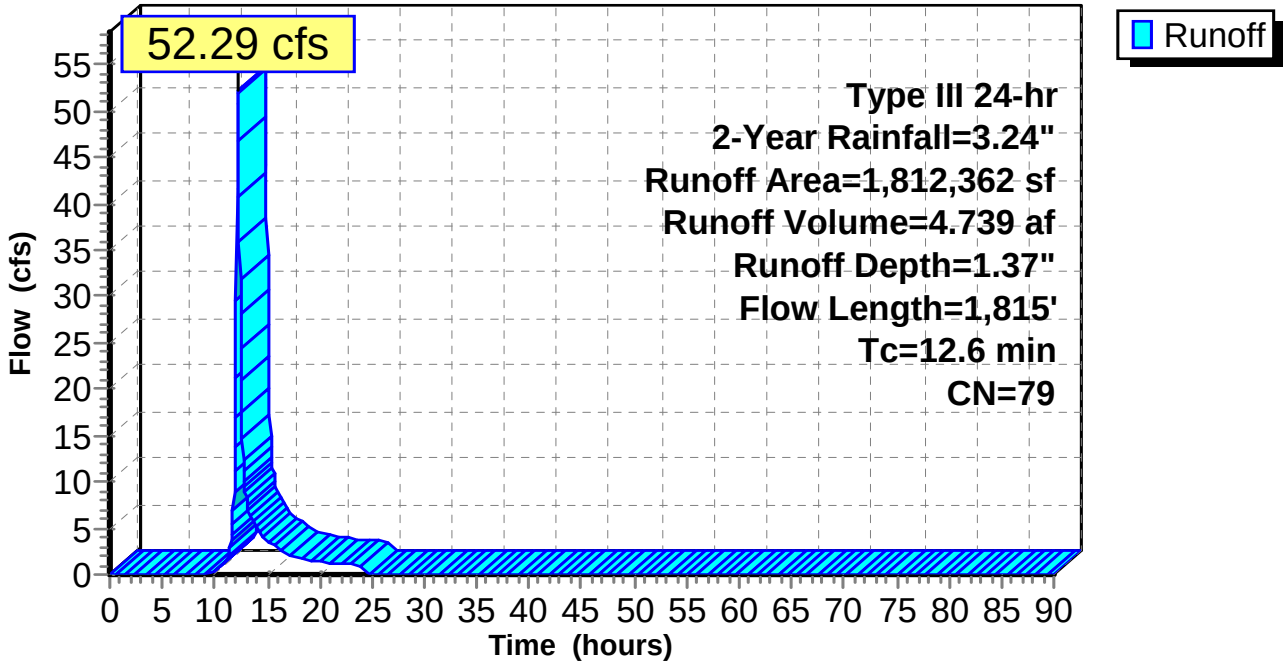
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	396,369	98	Roofs, pavement on site
*	123,997	98	Roofs, driveways off site
*	31,558	98	Rock outcrop
	45,533	39	>75% Grass cover, Good, HSG A
	535,763	74	>75% Grass cover, Good, HSG C
	47,337	55	Woods, Good, HSG B
	631,805	70	Woods, Good, HSG C
	1,812,362	79	Weighted Average
	1,260,438		69.55% Pervious Area
	551,924		30.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	100	0.4400	0.28		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	200	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	472	0.0170	3.20	73.63	**Channel Flow,** Area= 23.0 sf Perim= 52.3' r= 0.44' n= 0.035
2.8	654	0.0120	3.93	86.51	**Channel Flow,** Area= 22.0 sf Perim= 28.3' r= 0.78' n= 0.035
0.6	389	0.0050	10.30	227.15	**Pipe Channel, CMP_Arch_1/2 77x52** 77.0" x 52.0", R=39.4"/121.3" Pipe Arch Area= 22.0 sf Perim= 17.3' n= 0.012
12.6	1,815	Total			

Subcatchment A: A

Hydrograph



Summary for Subcatchment A1: A1

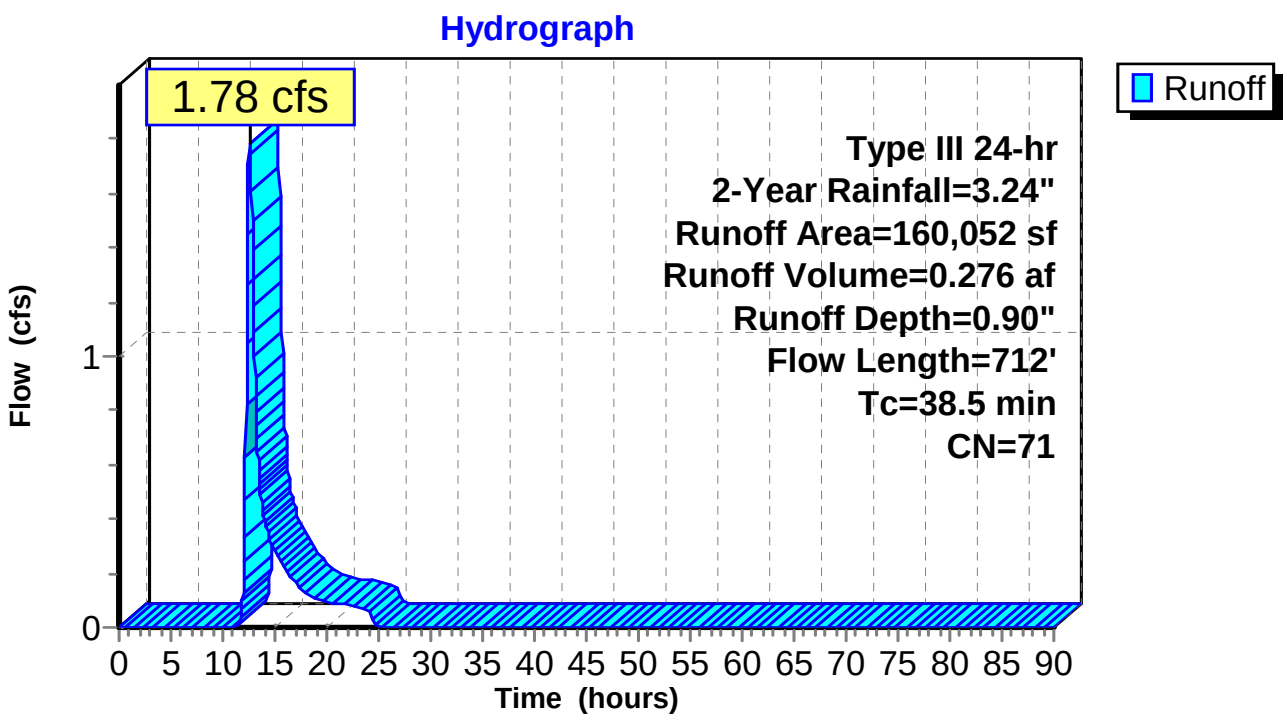
Runoff = 1.78 cfs @ 12.59 hrs, Volume= 0.276 af, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	15,516	98	Rock outcrop
	23,274	55	Woods, Good, HSG B
	121,262	70	Woods, Good, HSG C
	160,052	71	Weighted Average
	144,536		90.31% Pervious Area
	15,516		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.7	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
2.8	612	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38.5	712	Total			

Subcatchment A1: A1



Summary for Subcatchment B: B

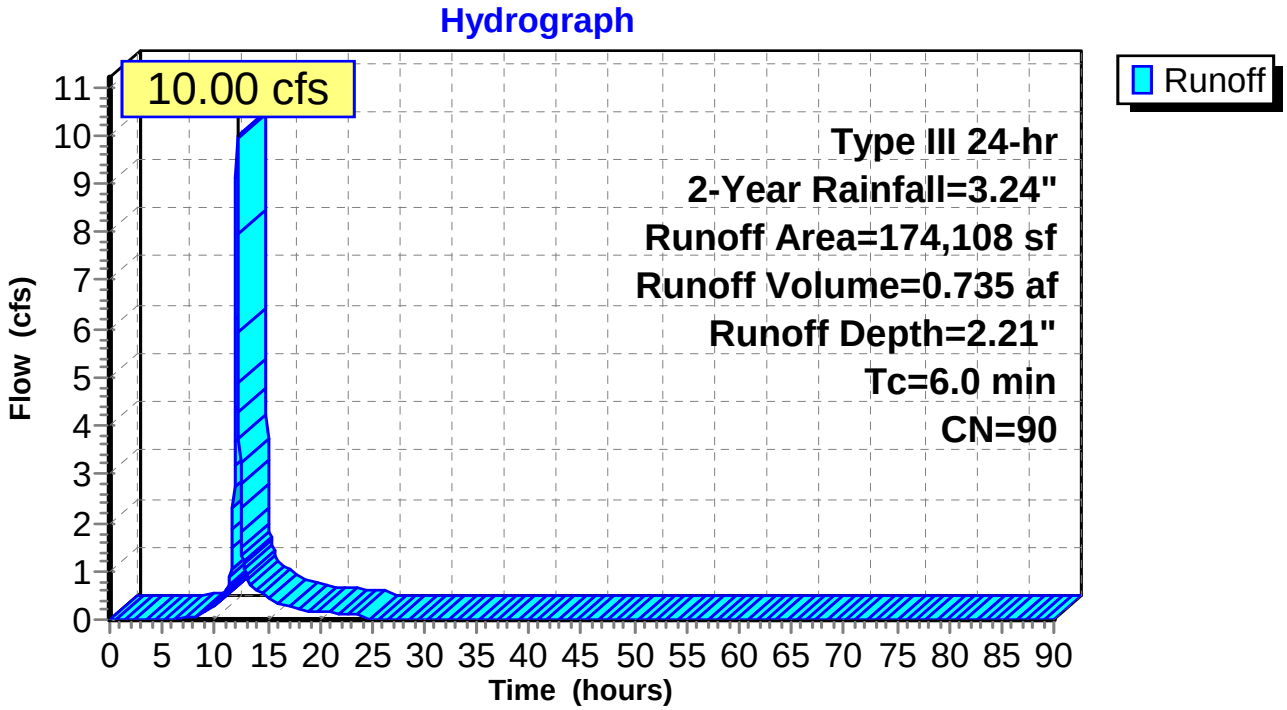
Runoff = 10.00 cfs @ 12.09 hrs, Volume= 0.735 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
*	134,723	98	Paved parking
	11,134	39	>75% Grass cover, Good, HSG A
	28,251	74	>75% Grass cover, Good, HSG C
	174,108	90	Weighted Average
	39,385		22.62% Pervious Area
	134,723		77.38% Impervious Area

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

Subcatchment B: B



Summary for Subcatchment B1: B1

Runoff = 13.33 cfs @ 12.23 hrs, Volume= 1.351 af, Depth= 1.06"

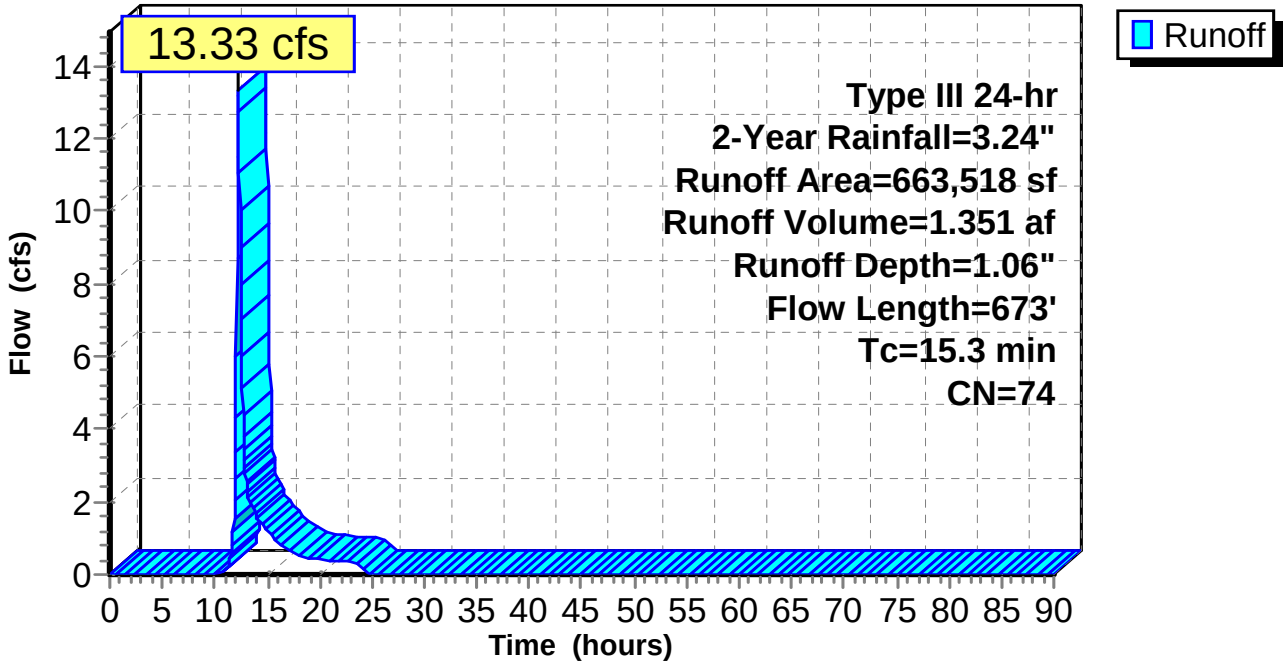
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.24"

	Area (sf)	CN	Description
	108,929	98	Water Surface, HSG C
*	17,354	98	Paved driveway
	9,827	36	Woods, Fair, HSG A
	21,742	60	Woods, Fair, HSG B
	181,381	73	Woods, Fair, HSG C
*	14,494	98	Rock Outcrop
	77,187	98	Paved parking, HSG C
	47,429	30	Woods, Good, HSG A
	5,630	70	Woods, Good, HSG C
	49,149	77	Woods, Good, HSG D
	38,852	39	>75% Grass cover, Good, HSG A
	45,985	80	>75% Grass cover, Good, HSG D
	26,494	30	Woods, Good, HSG A
	12,497	39	>75% Grass cover, Good, HSG A
	6,568	74	>75% Grass cover, Good, HSG C
	663,518	74	Weighted Average
	445,554		67.15% Pervious Area
	217,964		32.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0900	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
3.4	327	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	246	0.0330	6.55	209.56	**Channel Flow,** Area= 32.0 sf Perim= 40.9' r= 0.78' n= 0.035
15.3	673	Total			

Subcatchment B1: B1

Hydrograph

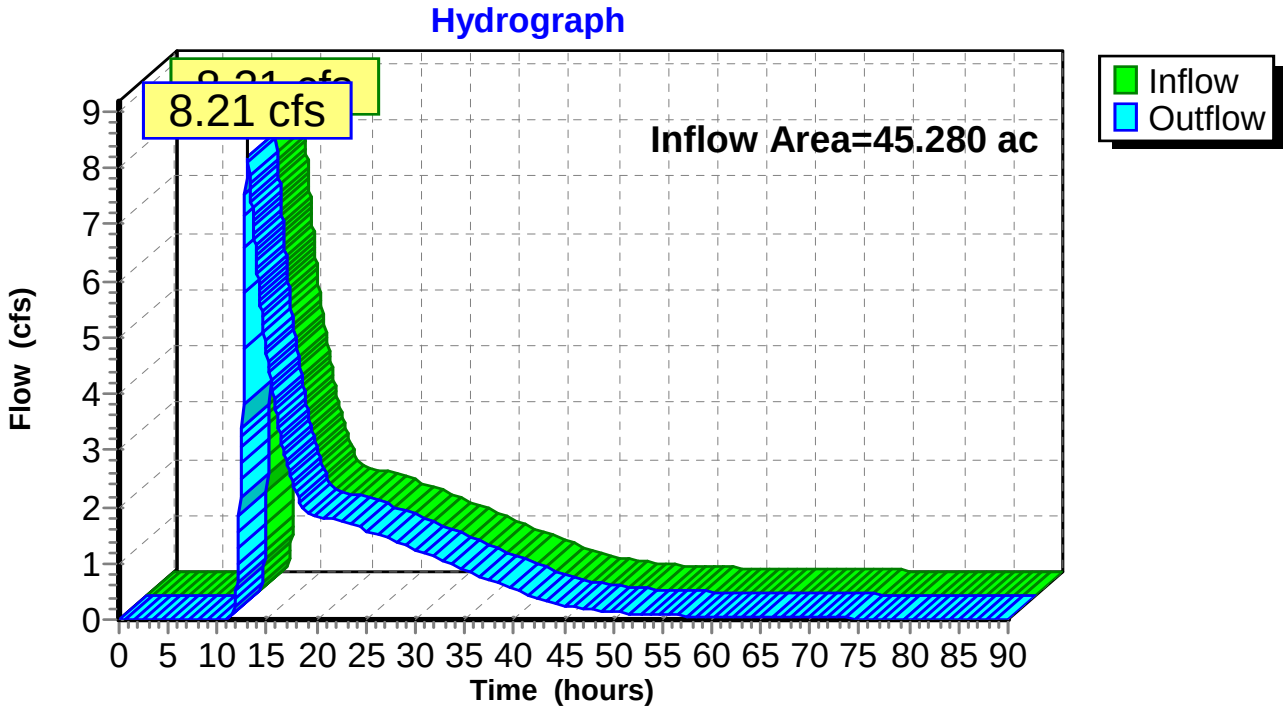


Summary for Reach DP1: DP1

Inflow Area = 45.280 ac, 28.77% Impervious, Inflow Depth > 1.31" for 2-Year event
Inflow = 8.21 cfs @ 13.02 hrs, Volume= 4.960 af
Outflow = 8.21 cfs @ 13.02 hrs, Volume= 4.960 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs

Reach DP1: DP1

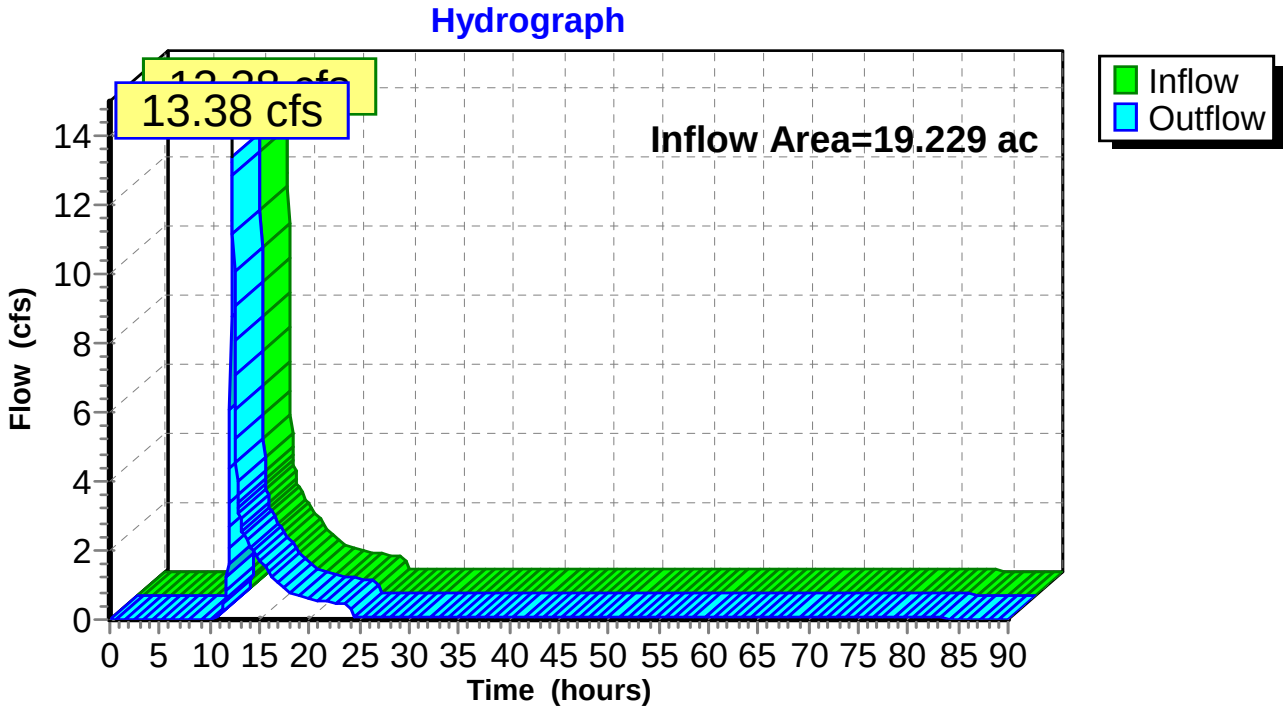


Summary for Reach DP2: DP2

Inflow Area = 19.229 ac, 42.11% Impervious, Inflow Depth > 1.19" for 2-Year event
Inflow = 13.38 cfs @ 12.23 hrs, Volume= 1.901 af
Outflow = 13.38 cfs @ 12.23 hrs, Volume= 1.901 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs

Reach DP2: DP2



Summary for Pond DB1: DB1

Inflow Area = 41.606 ac, 30.45% Impervious, Inflow Depth = 1.37" for 2-Year event
Inflow = 52.29 cfs @ 12.18 hrs, Volume= 4.739 af
Outflow = 7.23 cfs @ 13.11 hrs, Volume= 4.684 af, Atten= 86%, Lag= 55.8 min
Primary = 7.23 cfs @ 13.11 hrs, Volume= 4.684 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 160.37' @ 13.11 hrs Surf.Area= 47,081 sf Storage= 102,467 cf

Plug-Flow detention time= 572.9 min calculated for 4.684 af (99% of inflow)
Center-of-Mass det. time= 566.1 min (1,417.5 - 851.4)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	295,591 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

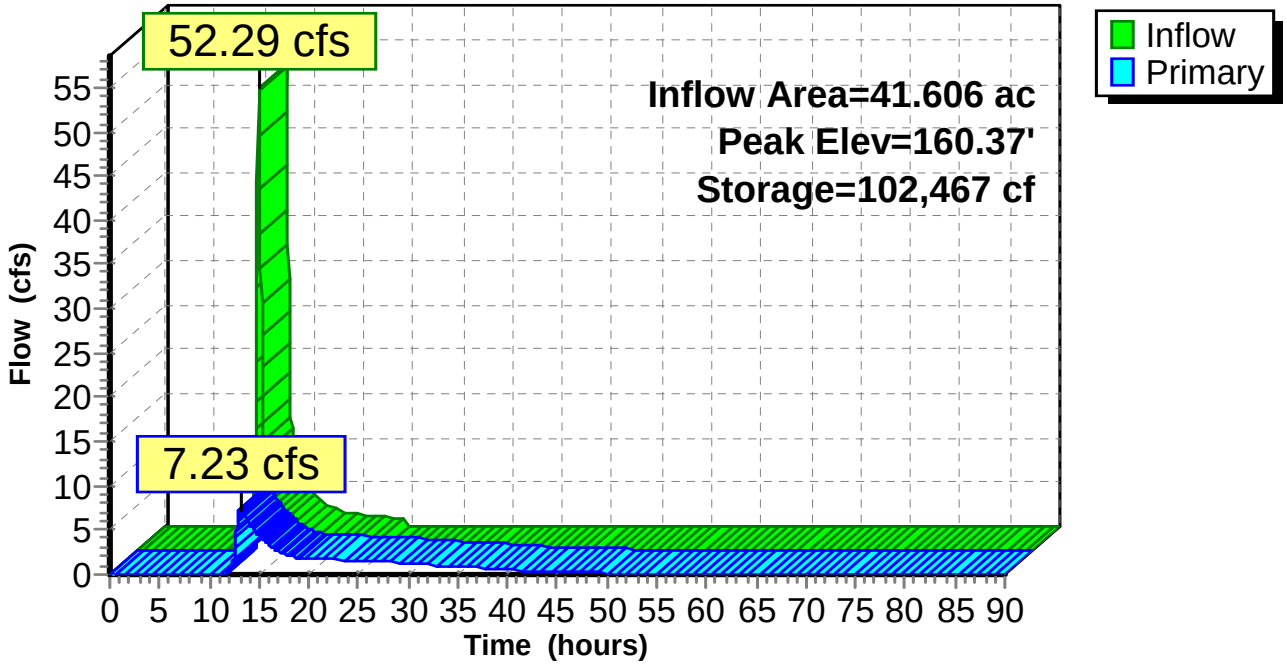
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	39,432	0	0
160.00	45,883	85,315	85,315
160.10	46,187	4,603	89,918
162.00	52,502	93,755	183,673
164.00	59,416	111,918	295,591

Device	Routing	Invert	Outlet Devices
#1	Primary	153.00'	**36.0" Round Culvert X 2.00** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 153.00' / 152.00' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 7.07 sf
#2	Device 1	158.00'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	160.10'	**36.0" W x 24.0" H Vert. Orifice/Grate X 4.00** C= 0.600
#4	Device 1	163.00'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.23 cfs @ 13.11 hrs HW=160.37' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 7.23 cfs of 164.91 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.85 cfs @ 6.94 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 5.37 cfs @ 1.66 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond DB1: DB1

Hydrograph



Summary for Pond DB2: DB2

Inflow Area = 3.997 ac, 77.38% Impervious, Inflow Depth = 2.21" for 2-Year event
Inflow = 10.00 cfs @ 12.09 hrs, Volume= 0.735 af
Outflow = 0.61 cfs @ 13.99 hrs, Volume= 0.551 af, Atten= 94%, Lag= 113.9 min
Primary = 0.61 cfs @ 13.99 hrs, Volume= 0.551 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 165.12' @ 13.99 hrs Surf.Area= 19,816 sf Storage= 21,159 cf

Plug-Flow detention time= 1,341.6 min calculated for 0.551 af (75% of inflow)
Center-of-Mass det. time= 1,257.6 min (2,064.1 - 806.4)

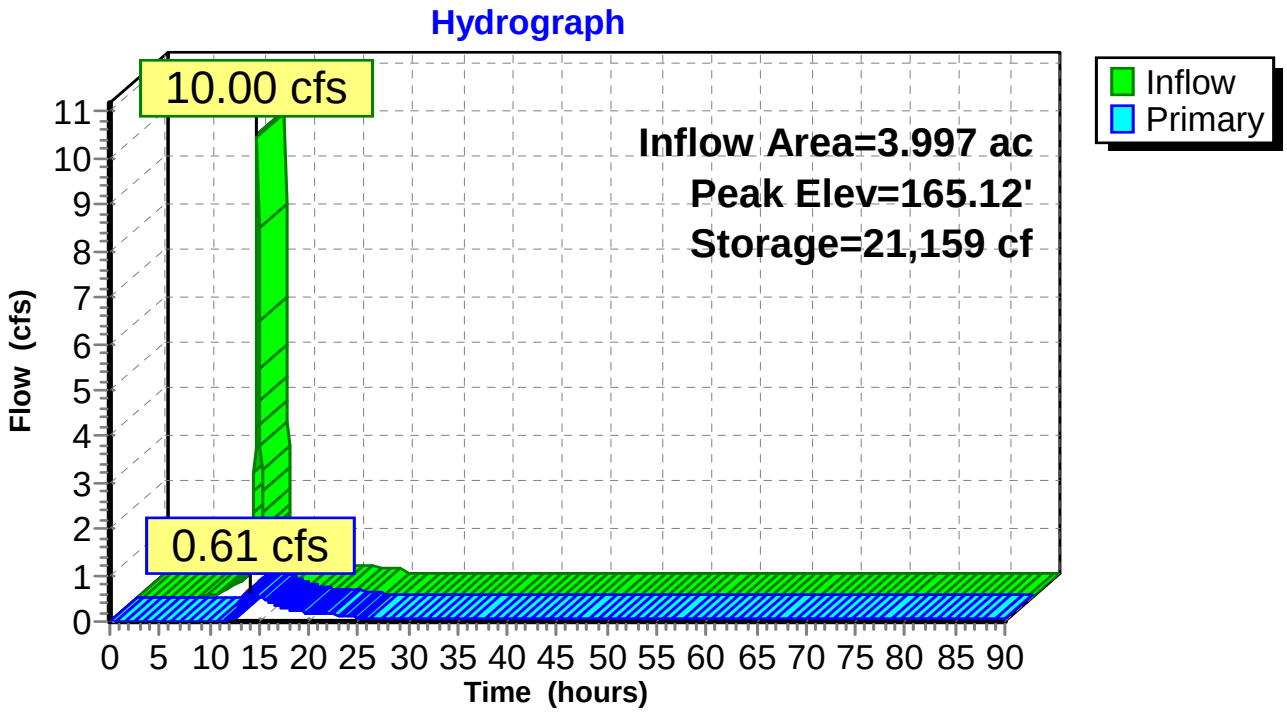
Volume	Invert	Avail.Storage	Storage Description
#1	164.00'	85,850 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
164.00	17,936	0	0
165.00	19,592	18,764	18,764
166.00	21,437	20,515	39,279
167.00	23,237	22,337	61,616
168.00	25,231	24,234	85,850

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**24.0" Round Culvert** L= 40.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 161.50' / 161.00' S= 0.0125 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	164.00'	**1.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	165.00'	**24.0" W x 8.0" H Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	167.00'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.60 cfs @ 13.99 hrs HW=165.12' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.60 cfs of 24.49 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 4.96 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.54 cfs @ 1.12 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond DB2: DB2


Hydrograph
10.00 cfs
0.61 cfs
Inflow Area=3.997 ac
Peak Elev=165.12'
Storage=21,159 cf
Inflow
Primary
Flow (cfs)
0 1 2 3 4 5 6 7 8 9 10 11
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
Time (hours)

Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=1,812,362 sf 30.45% Impervious Runoff Depth=2.60"
Flow Length=1,815' Tc=12.6 min CN=79 Runoff=101.00 cfs 9.001 af

Subcatchment A1: A1 Runoff Area=160,052 sf 9.69% Impervious Runoff Depth=1.94"
Flow Length=712' Tc=38.5 min CN=71 Runoff=4.10 cfs 0.593 af

Subcatchment B: B Runoff Area=174,108 sf 77.38% Impervious Runoff Depth=3.65"
Tc=6.0 min CN=90 Runoff=16.16 cfs 1.214 af

Subcatchment B1: B1 Runoff Area=663,518 sf 32.85% Impervious Runoff Depth=2.17"
Flow Length=673' Tc=15.3 min CN=74 Runoff=28.76 cfs 2.760 af

Reach DP1: DP1 Inflow=53.18 cfs 9.538 af
Outflow=53.18 cfs 9.538 af

Reach DP2: DP2 Inflow=31.15 cfs 3.789 af
Outflow=31.15 cfs 3.789 af

Pond DB1: DB1 Peak Elev=161.24' Storage=144,854 cf Inflow=101.00 cfs 9.001 af
Outflow=49.25 cfs 8.945 af

Pond DB2: DB2 Peak Elev=165.45' Storage=27,750 cf Inflow=16.16 cfs 1.214 af
Outflow=3.93 cfs 1.029 af

Total Runoff Area = 64.510 ac Runoff Volume = 13.569 af Average Runoff Depth = 2.52"
67.26% Pervious = 43.386 ac 32.74% Impervious = 21.123 ac

Summary for Subcatchment A: A

Runoff = 101.00 cfs @ 12.18 hrs, Volume= 9.001 af, Depth= 2.60"

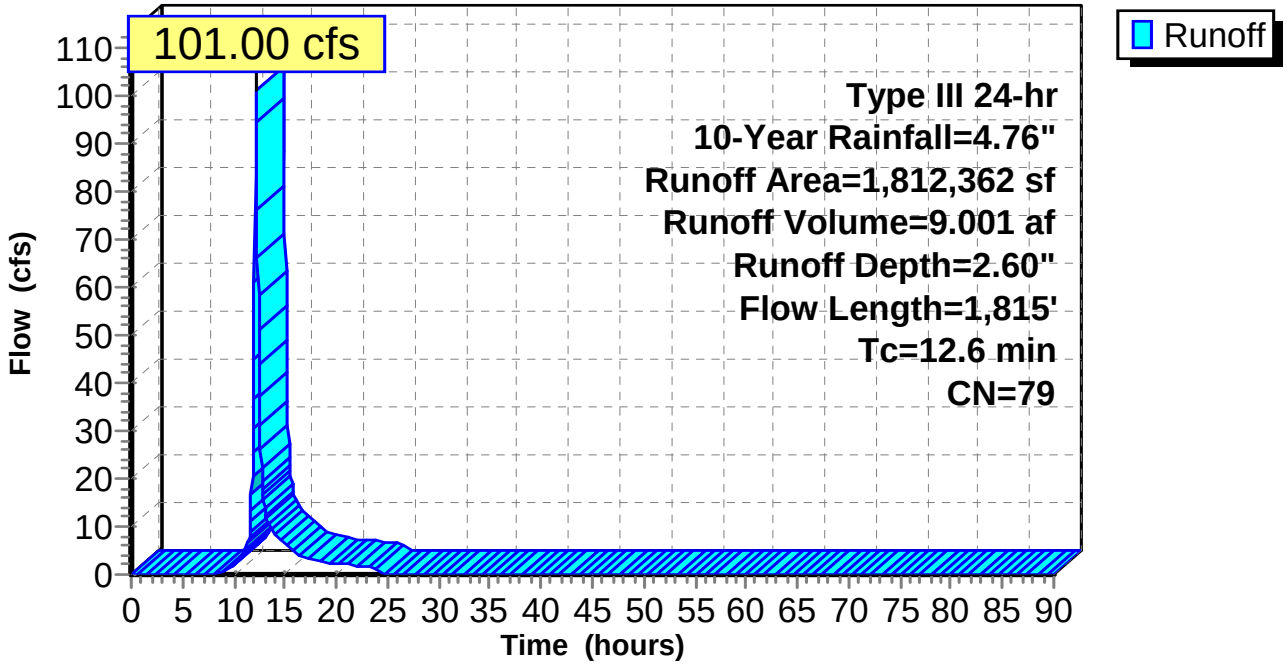
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.76"

	Area (sf)	CN	Description
*	396,369	98	Roofs, pavement on site
*	123,997	98	Roofs, driveways off site
*	31,558	98	Rock outcrop
	45,533	39	>75% Grass cover, Good, HSG A
	535,763	74	>75% Grass cover, Good, HSG C
	47,337	55	Woods, Good, HSG B
	631,805	70	Woods, Good, HSG C
	1,812,362	79	Weighted Average
	1,260,438		69.55% Pervious Area
	551,924		30.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	100	0.4400	0.28		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	200	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	472	0.0170	3.20	73.63	**Channel Flow,** Area= 23.0 sf Perim= 52.3' r= 0.44' n= 0.035
2.8	654	0.0120	3.93	86.51	**Channel Flow,** Area= 22.0 sf Perim= 28.3' r= 0.78' n= 0.035
0.6	389	0.0050	10.30	227.15	**Pipe Channel, CMP_Arch_1/2 77x52** 77.0" x 52.0", R=39.4"/121.3" Pipe Arch Area= 22.0 sf Perim= 17.3' n= 0.012
12.6	1,815	Total			

Subcatchment A: A

Hydrograph



Summary for Subcatchment A1: A1

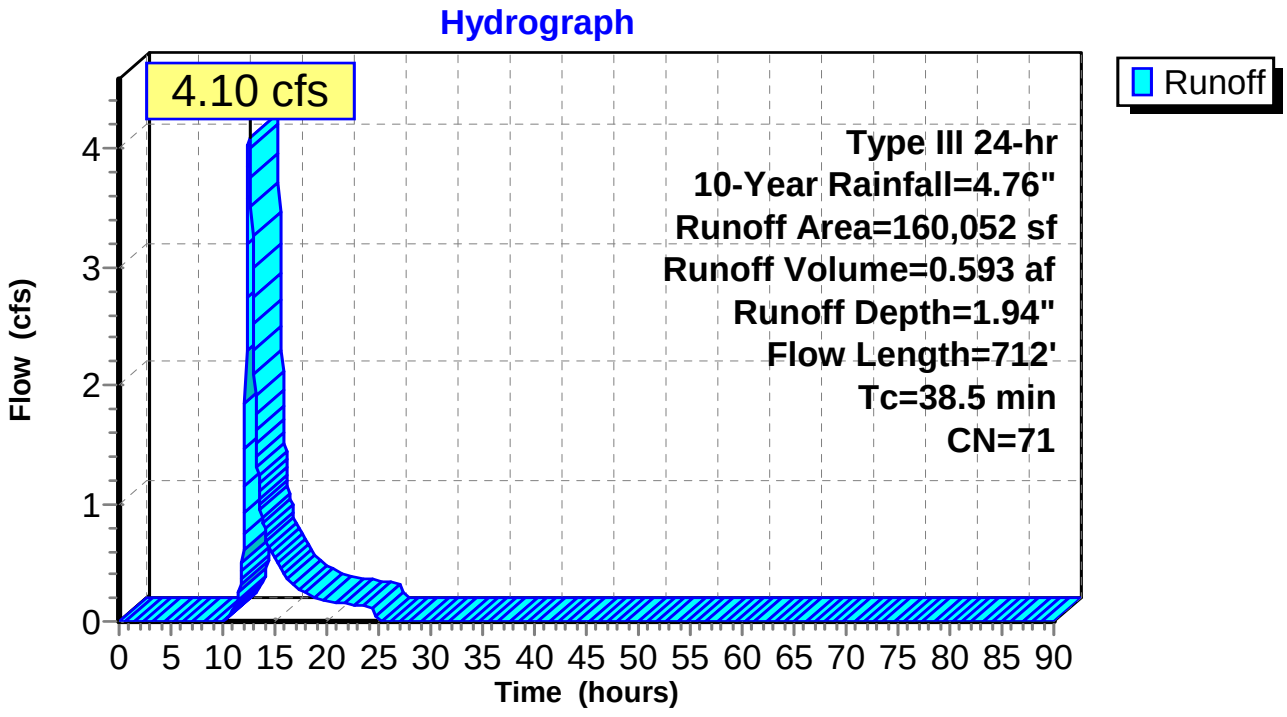
Runoff = 4.10 cfs @ 12.56 hrs, Volume= 0.593 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.76"

	Area (sf)	CN	Description
*	15,516	98	Rock outcrop
	23,274	55	Woods, Good, HSG B
	121,262	70	Woods, Good, HSG C
	160,052	71	Weighted Average
	144,536		90.31% Pervious Area
	15,516		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.7	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
2.8	612	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38.5	712	Total			

Subcatchment A1: A1



Summary for Subcatchment B: B

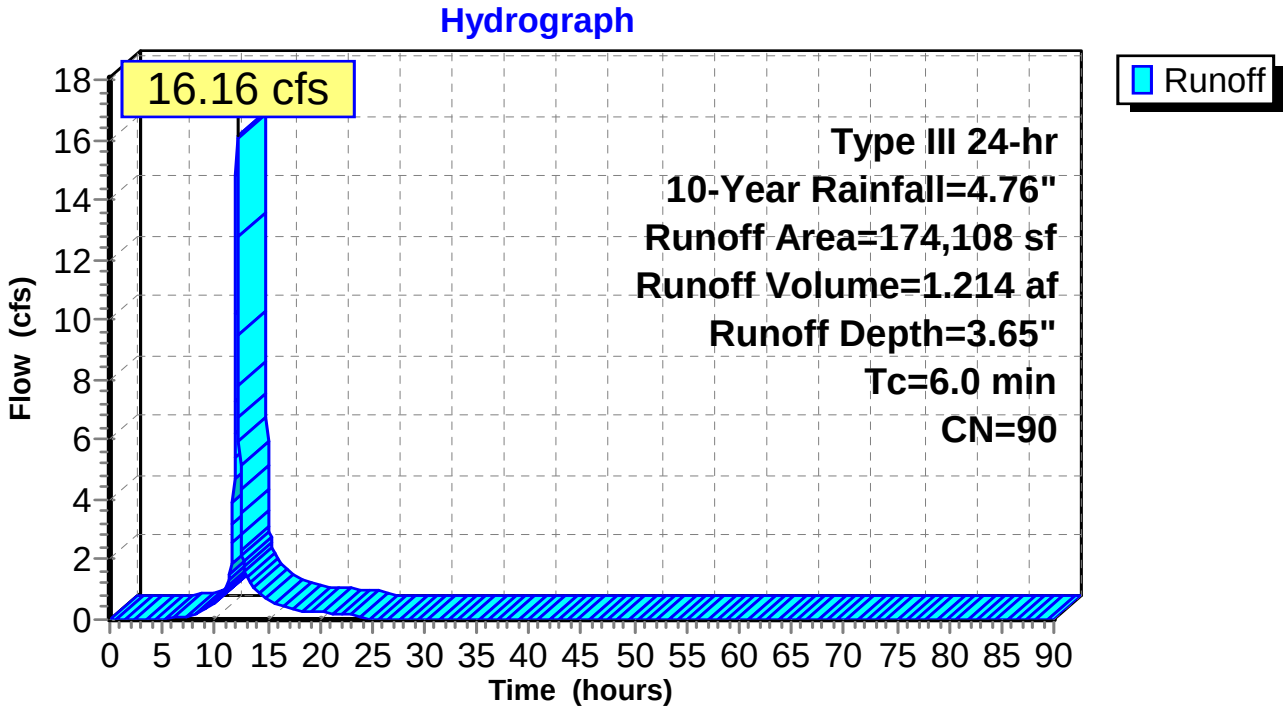
Runoff = 16.16 cfs @ 12.09 hrs, Volume= 1.214 af, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.76"

	Area (sf)	CN	Description
*	134,723	98	Paved parking
	11,134	39	>75% Grass cover, Good, HSG A
	28,251	74	>75% Grass cover, Good, HSG C
	174,108	90	Weighted Average
	39,385		22.62% Pervious Area
	134,723		77.38% Impervious Area

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

Subcatchment B: B



Summary for Subcatchment B1: B1

Runoff = 28.76 cfs @ 12.22 hrs, Volume= 2.760 af, Depth= 2.17"

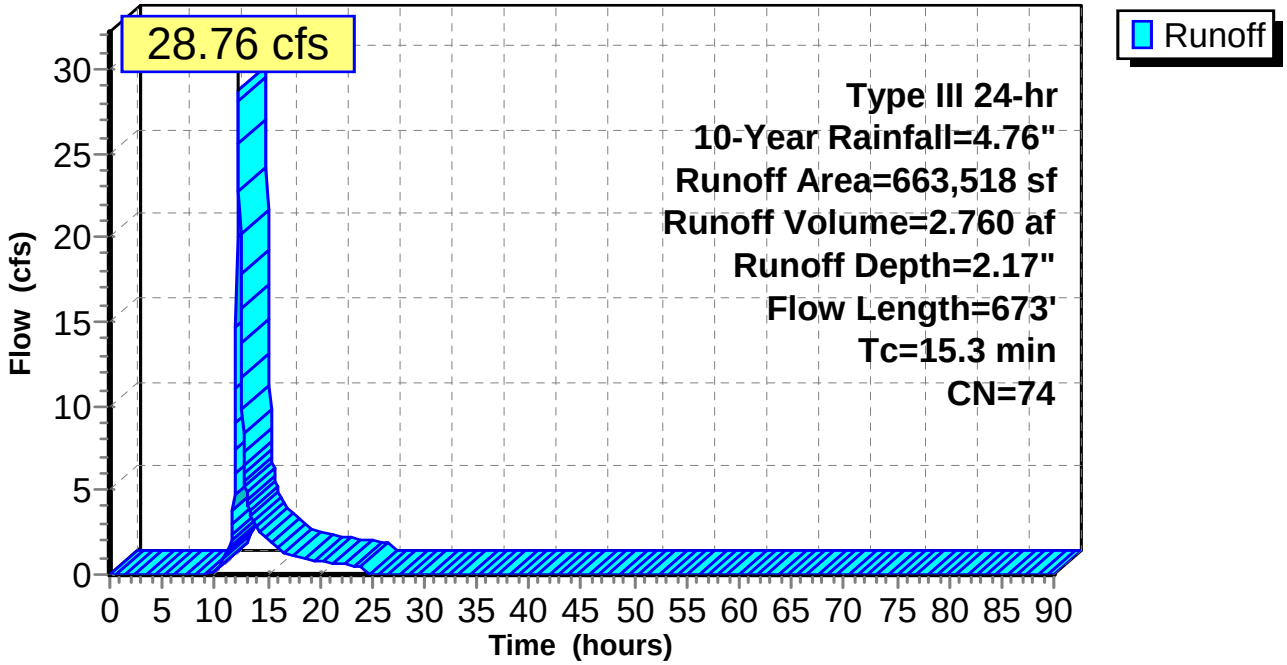
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.76"

	Area (sf)	CN	Description
	108,929	98	Water Surface, HSG C
*	17,354	98	Paved driveway
	9,827	36	Woods, Fair, HSG A
	21,742	60	Woods, Fair, HSG B
	181,381	73	Woods, Fair, HSG C
*	14,494	98	Rock Outcrop
	77,187	98	Paved parking, HSG C
	47,429	30	Woods, Good, HSG A
	5,630	70	Woods, Good, HSG C
	49,149	77	Woods, Good, HSG D
	38,852	39	>75% Grass cover, Good, HSG A
	45,985	80	>75% Grass cover, Good, HSG D
	26,494	30	Woods, Good, HSG A
	12,497	39	>75% Grass cover, Good, HSG A
	6,568	74	>75% Grass cover, Good, HSG C
	663,518	74	Weighted Average
	445,554		67.15% Pervious Area
	217,964		32.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0900	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
3.4	327	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	246	0.0330	6.55	209.56	**Channel Flow,** Area= 32.0 sf Perim= 40.9' r= 0.78' n= 0.035
15.3	673	Total			

Subcatchment B1: B1

Hydrograph

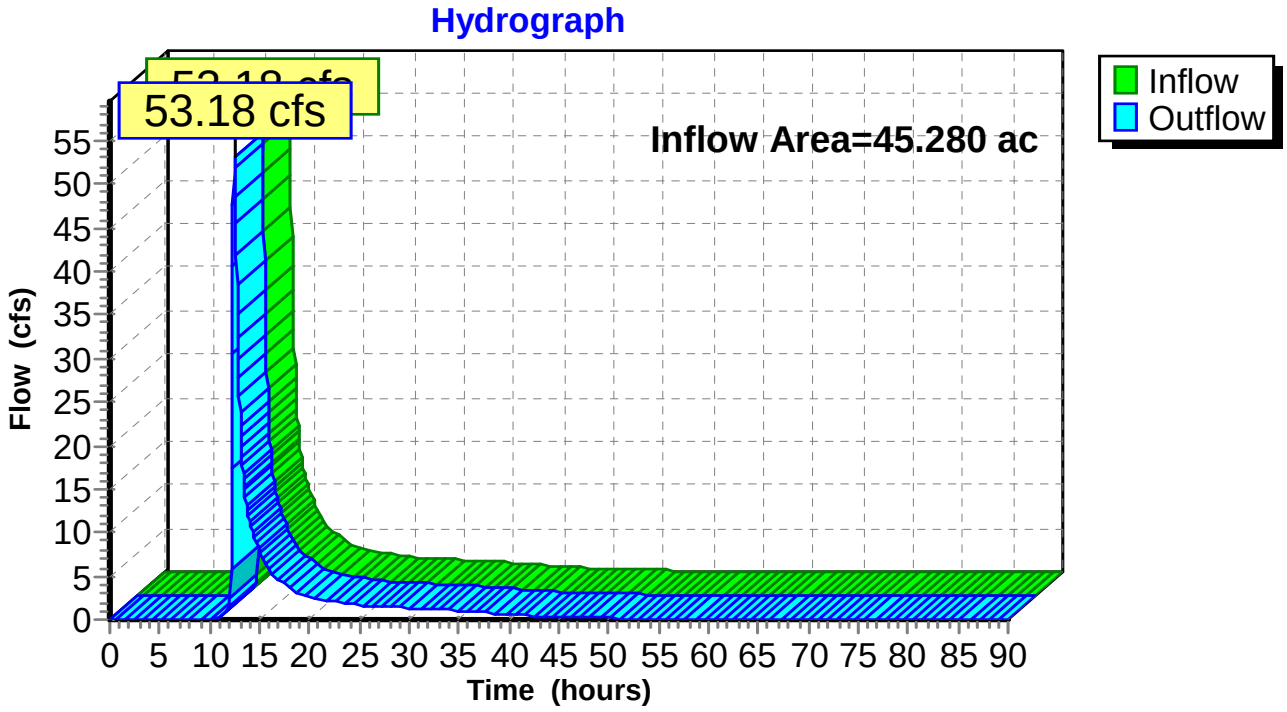


Summary for Reach DP1: DP1

Inflow Area = 45.280 ac, 28.77% Impervious, Inflow Depth > 2.53" for 10-Year event
Inflow = 53.18 cfs @ 12.47 hrs, Volume= 9.538 af
Outflow = 53.18 cfs @ 12.47 hrs, Volume= 9.538 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs

Reach DP1: DP1

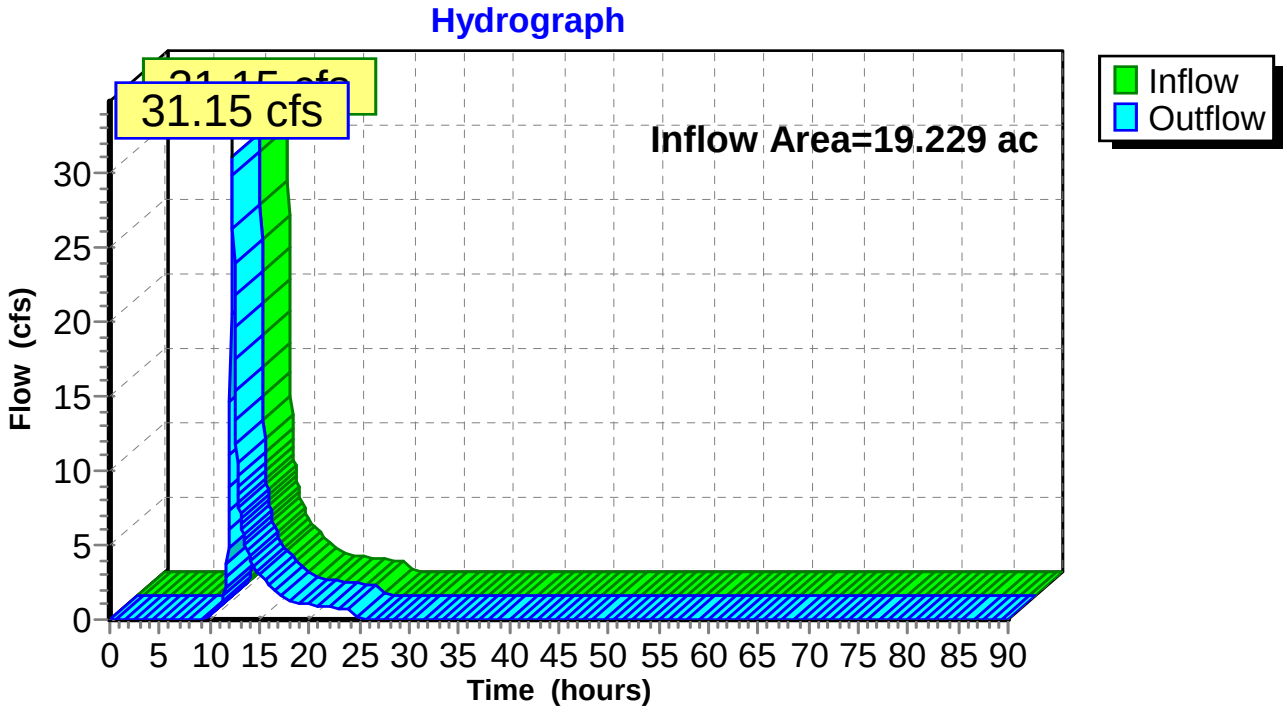


Summary for Reach DP2: DP2

Inflow Area = 19.229 ac, 42.11% Impervious, Inflow Depth > 2.36" for 10-Year event
Inflow = 31.15 cfs @ 12.23 hrs, Volume= 3.789 af
Outflow = 31.15 cfs @ 12.23 hrs, Volume= 3.789 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs

Reach DP2: DP2



Summary for Pond DB1: DB1

Inflow Area = 41.606 ac, 30.45% Impervious, Inflow Depth = 2.60" for 10-Year event
Inflow = 101.00 cfs @ 12.18 hrs, Volume= 9.001 af
Outflow = 49.25 cfs @ 12.46 hrs, Volume= 8.945 af, Atten= 51%, Lag= 17.3 min
Primary = 49.25 cfs @ 12.46 hrs, Volume= 8.945 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 161.24' @ 12.46 hrs Surf.Area= 49,984 sf Storage= 144,854 cf

Plug-Flow detention time= 338.5 min calculated for 8.940 af (99% of inflow)
Center-of-Mass det. time= 336.7 min (1,169.5 - 832.8)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	295,591 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

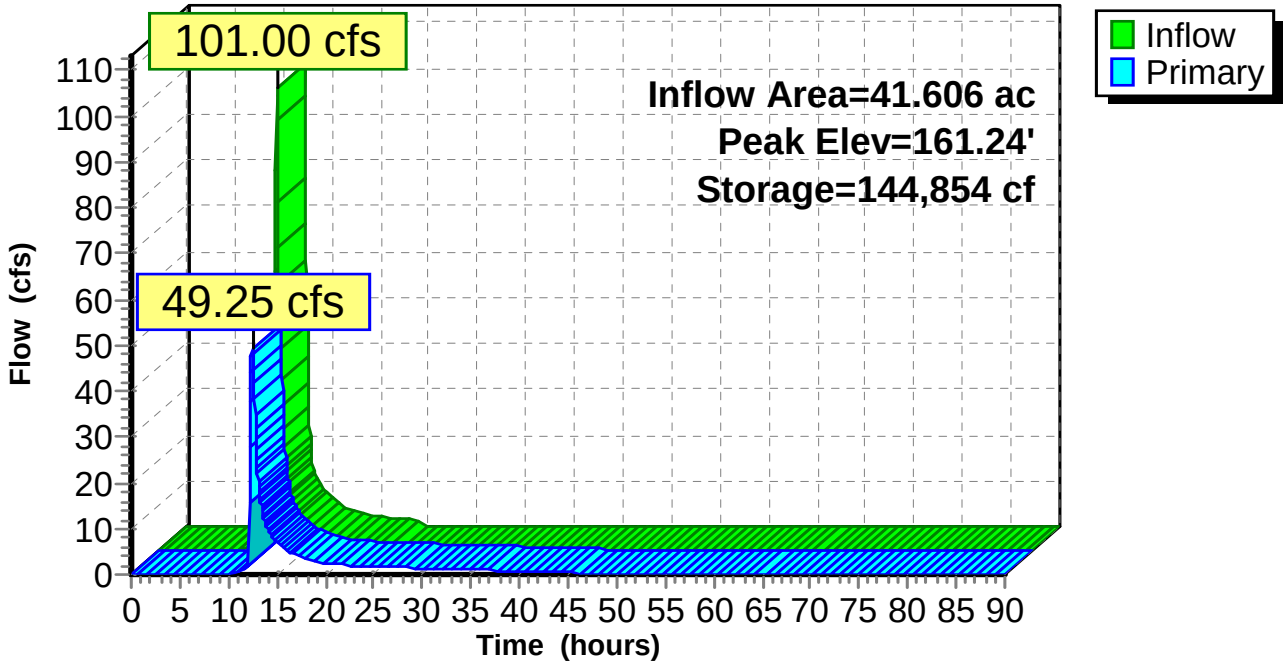
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	39,432	0	0
160.00	45,883	85,315	85,315
160.10	46,187	4,603	89,918
162.00	52,502	93,755	183,673
164.00	59,416	111,918	295,591

Device	Routing	Invert	Outlet Devices
#1	Primary	153.00'	**36.0" Round Culvert X 2.00** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 153.00' / 152.00' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 7.07 sf
#2	Device 1	158.00'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	160.10'	**36.0" W x 24.0" H Vert. Orifice/Grate X 4.00** C= 0.600
#4	Device 1	163.00'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=49.07 cfs @ 12.46 hrs HW=161.24' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 49.07 cfs of 176.72 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.21 cfs @ 8.27 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 46.86 cfs @ 3.43 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond DB1: DB1

Hydrograph



Summary for Pond DB2: DB2

Inflow Area = 3.997 ac, 77.38% Impervious, Inflow Depth = 3.65" for 10-Year event
Inflow = 16.16 cfs @ 12.09 hrs, Volume= 1.214 af
Outflow = 3.93 cfs @ 12.48 hrs, Volume= 1.029 af, Atten= 76%, Lag= 23.3 min
Primary = 3.93 cfs @ 12.48 hrs, Volume= 1.029 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 165.45' @ 12.48 hrs Surf.Area= 20,421 sf Storage= 27,750 cf

Plug-Flow detention time= 774.0 min calculated for 1.029 af (85% of inflow)
Center-of-Mass det. time= 709.5 min (1,501.9 - 792.4)

Volume	Invert	Avail.Storage	Storage Description
#1	164.00'	85,850 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

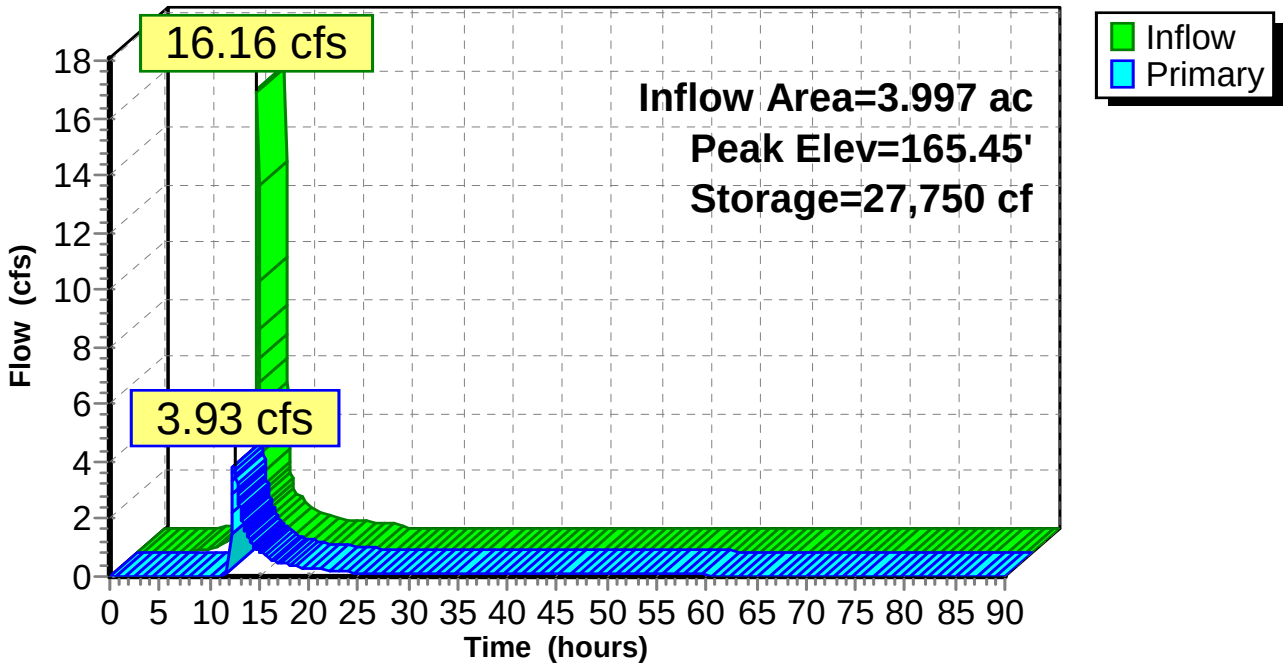
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
164.00	17,936	0	0
165.00	19,592	18,764	18,764
166.00	21,437	20,515	39,279
167.00	23,237	22,337	61,616
168.00	25,231	24,234	85,850

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**24.0" Round Culvert** L= 40.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 161.50' / 161.00' S= 0.0125 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	164.00'	**1.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	165.00'	**24.0" W x 8.0" H Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	167.00'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.92 cfs @ 12.48 hrs HW=165.45' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.92 cfs of 25.97 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.07 cfs @ 5.67 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 3.85 cfs @ 2.15 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond DB2: DB2

Hydrograph



Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=1,812,362 sf 30.45% Impervious Runoff Depth=3.62"
Flow Length=1,815' Tc=12.6 min CN=79 Runoff=141.42 cfs 12.541 af

Subcatchment A1: A1 Runoff Area=160,052 sf 9.69% Impervious Runoff Depth=2.84"
Flow Length=712' Tc=38.5 min CN=71 Runoff=6.11 cfs 0.870 af

Subcatchment B: B Runoff Area=174,108 sf 77.38% Impervious Runoff Depth=4.78"
Tc=6.0 min CN=90 Runoff=20.87 cfs 1.591 af

Subcatchment B1: B1 Runoff Area=663,518 sf 32.85% Impervious Runoff Depth=3.13"
Flow Length=673' Tc=15.3 min CN=74 Runoff=41.72 cfs 3.968 af

Reach DP1: DP1 Inflow=93.82 cfs 13.355 af
Outflow=93.82 cfs 13.355 af

Reach DP2: DP2 Inflow=48.56 cfs 5.373 af
Outflow=48.56 cfs 5.373 af

Pond DB1: DB1 Peak Elev=161.81' Storage=173,871 cf Inflow=141.42 cfs 12.541 af
Outflow=88.71 cfs 12.485 af

Pond DB2: DB2 Peak Elev=165.70' Storage=32,841 cf Inflow=20.87 cfs 1.591 af
Outflow=7.46 cfs 1.405 af

Total Runoff Area = 64.510 ac Runoff Volume = 18.971 af Average Runoff Depth = 3.53"
67.26% Pervious = 43.386 ac 32.74% Impervious = 21.123 ac

Summary for Subcatchment A: A

Runoff = 141.42 cfs @ 12.17 hrs, Volume= 12.541 af, Depth= 3.62"

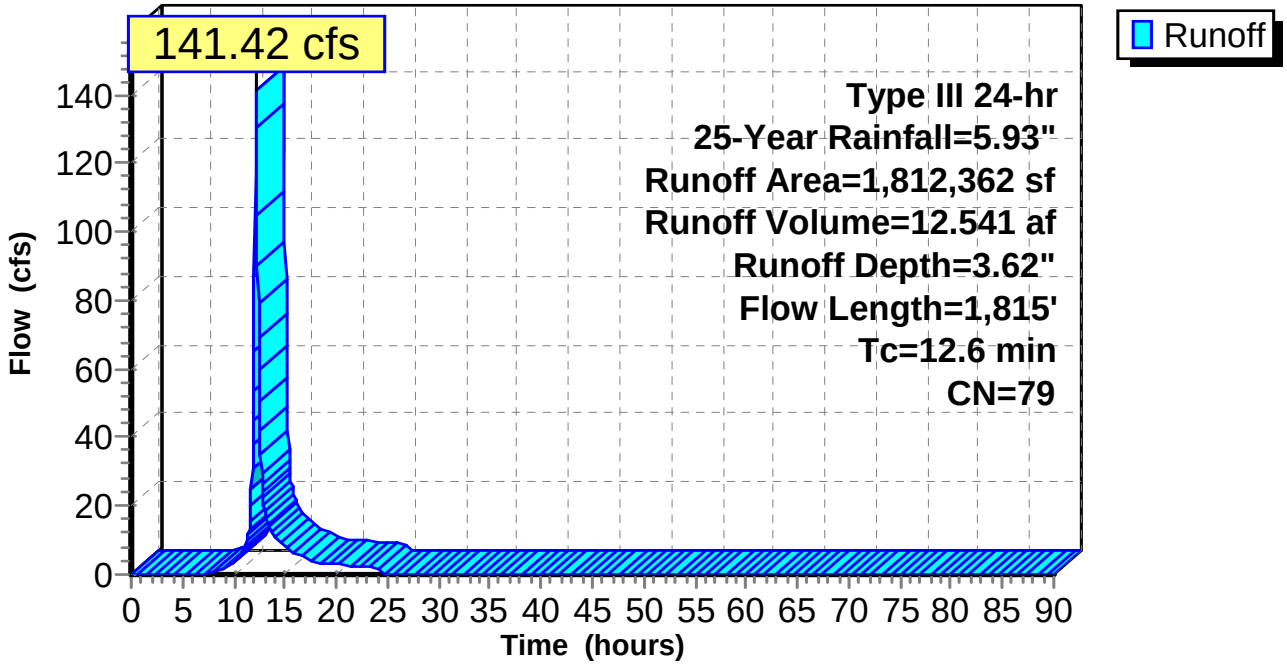
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.93"

	Area (sf)	CN	Description
*	396,369	98	Roofs, pavement on site
*	123,997	98	Roofs, driveways off site
*	31,558	98	Rock outcrop
	45,533	39	>75% Grass cover, Good, HSG A
	535,763	74	>75% Grass cover, Good, HSG C
	47,337	55	Woods, Good, HSG B
	631,805	70	Woods, Good, HSG C
	1,812,362	79	Weighted Average
	1,260,438		69.55% Pervious Area
	551,924		30.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	100	0.4400	0.28		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	200	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	472	0.0170	3.20	73.63	**Channel Flow,** Area= 23.0 sf Perim= 52.3' r= 0.44' n= 0.035
2.8	654	0.0120	3.93	86.51	**Channel Flow,** Area= 22.0 sf Perim= 28.3' r= 0.78' n= 0.035
0.6	389	0.0050	10.30	227.15	**Pipe Channel, CMP_Arch_1/2 77x52** 77.0" x 52.0", R=39.4"/121.3" Pipe Arch Area= 22.0 sf Perim= 17.3' n= 0.012
12.6	1,815	Total			

Subcatchment A: A

Hydrograph



Summary for Subcatchment A1: A1

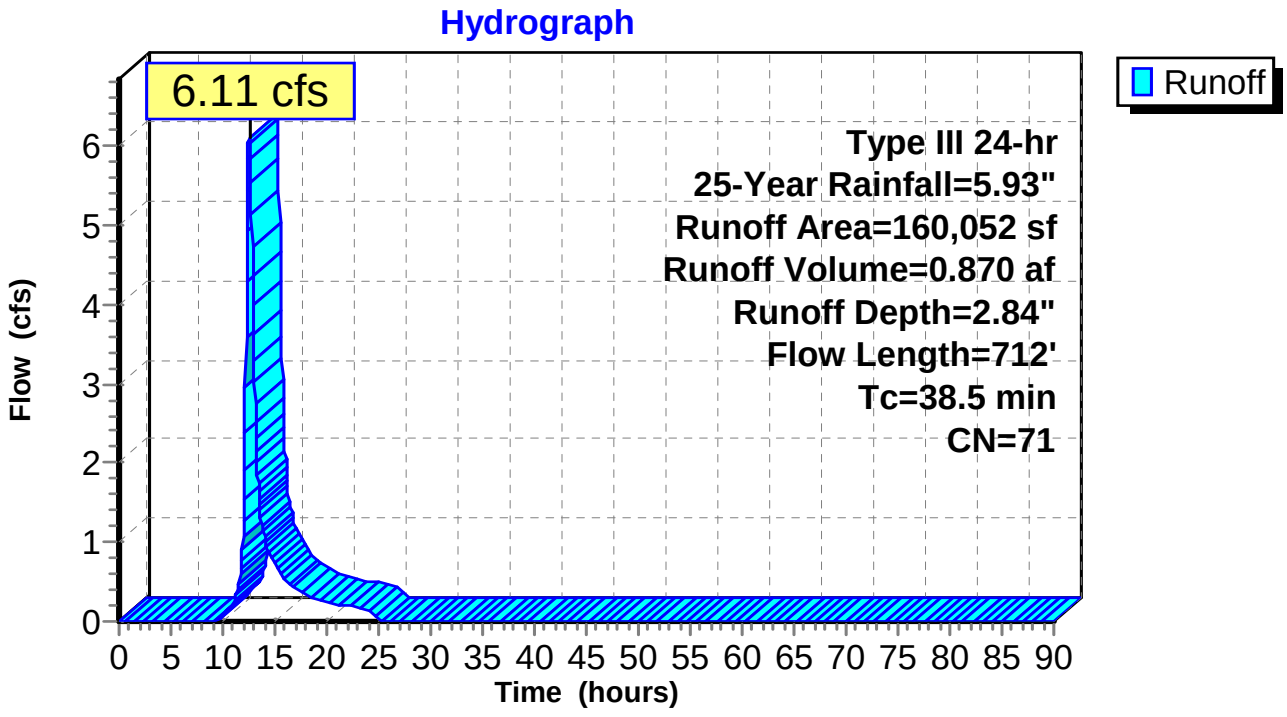
Runoff = 6.11 cfs @ 12.55 hrs, Volume= 0.870 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.93"

	Area (sf)	CN	Description
*	15,516	98	Rock outcrop
	23,274	55	Woods, Good, HSG B
	121,262	70	Woods, Good, HSG C
	160,052	71	Weighted Average
	144,536		90.31% Pervious Area
	15,516		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.7	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
2.8	612	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38.5	712	Total			

Subcatchment A1: A1



Summary for Subcatchment B: B

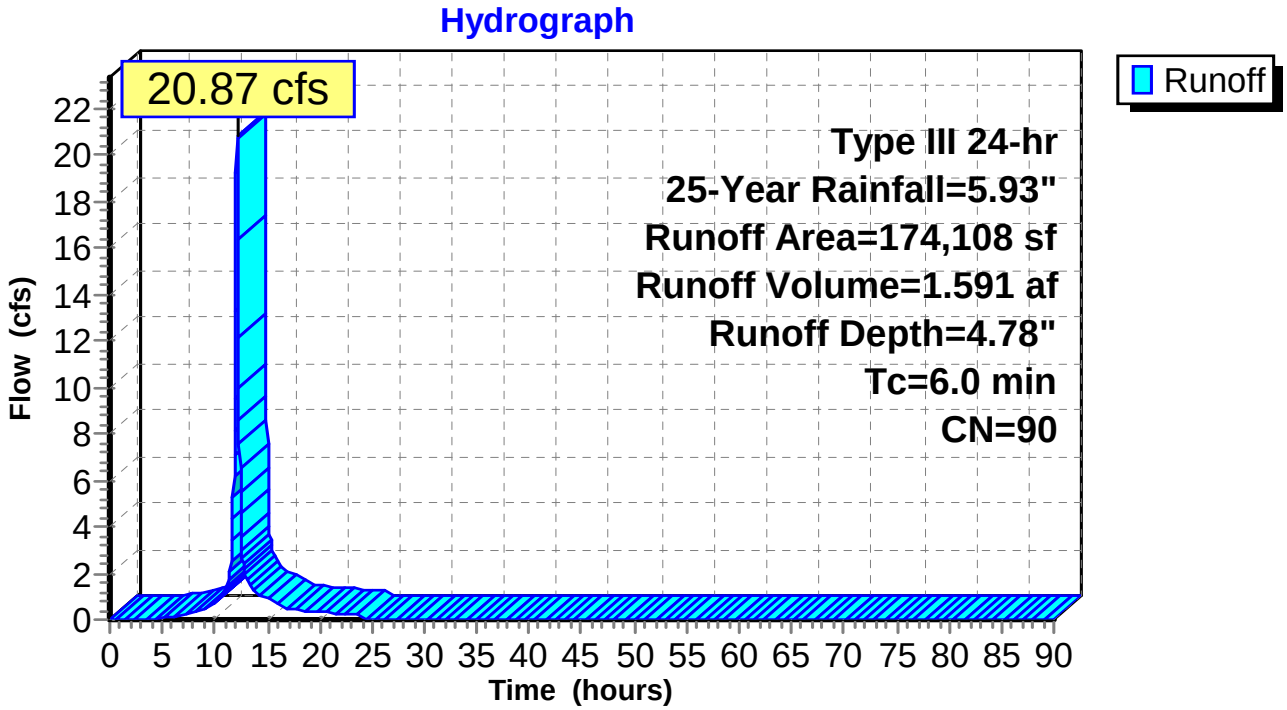
Runoff = 20.87 cfs @ 12.09 hrs, Volume= 1.591 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.93"

	Area (sf)	CN	Description
*	134,723	98	Paved parking
	11,134	39	>75% Grass cover, Good, HSG A
	28,251	74	>75% Grass cover, Good, HSG C
	174,108	90	Weighted Average
	39,385		22.62% Pervious Area
	134,723		77.38% Impervious Area

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

Subcatchment B: B



Summary for Subcatchment B1: B1

Runoff = 41.72 cfs @ 12.21 hrs, Volume= 3.968 af, Depth= 3.13"

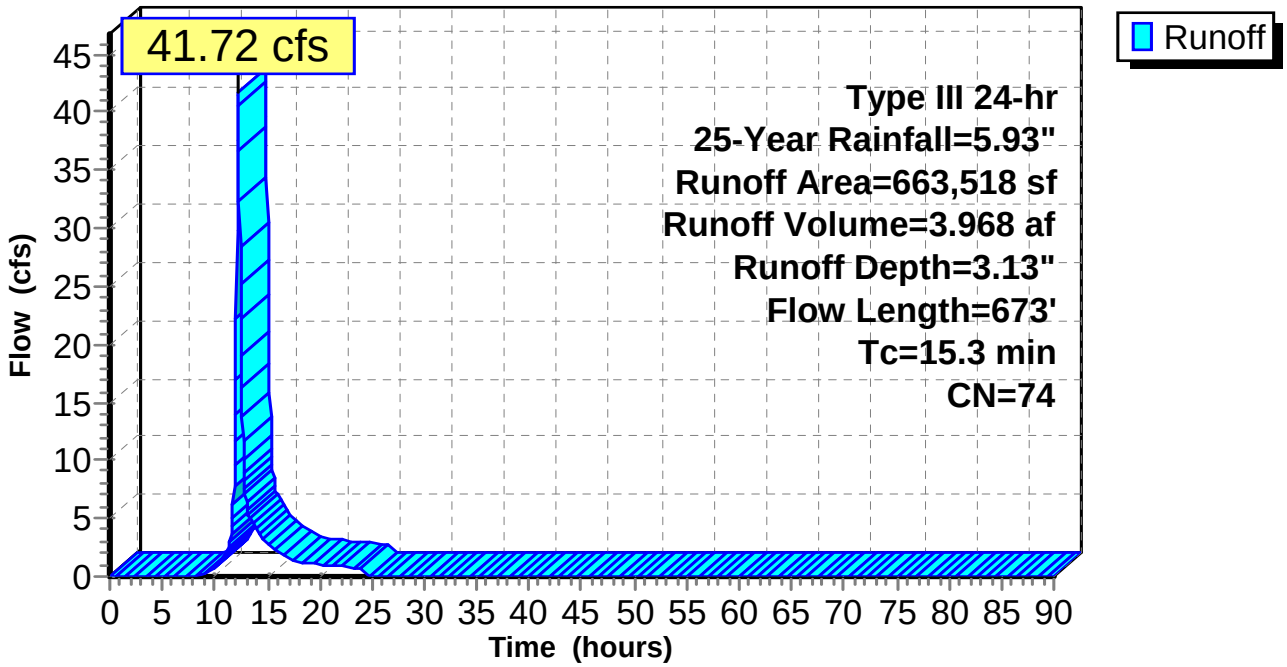
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.93"

	Area (sf)	CN	Description
	108,929	98	Water Surface, HSG C
*	17,354	98	Paved driveway
	9,827	36	Woods, Fair, HSG A
	21,742	60	Woods, Fair, HSG B
	181,381	73	Woods, Fair, HSG C
*	14,494	98	Rock Outcrop
	77,187	98	Paved parking, HSG C
	47,429	30	Woods, Good, HSG A
	5,630	70	Woods, Good, HSG C
	49,149	77	Woods, Good, HSG D
	38,852	39	>75% Grass cover, Good, HSG A
	45,985	80	>75% Grass cover, Good, HSG D
	26,494	30	Woods, Good, HSG A
	12,497	39	>75% Grass cover, Good, HSG A
	6,568	74	>75% Grass cover, Good, HSG C
	663,518	74	Weighted Average
	445,554		67.15% Pervious Area
	217,964		32.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0900	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
3.4	327	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	246	0.0330	6.55	209.56	**Channel Flow,** Area= 32.0 sf Perim= 40.9' r= 0.78' n= 0.035
15.3	673	Total			

Subcatchment B1: B1

Hydrograph

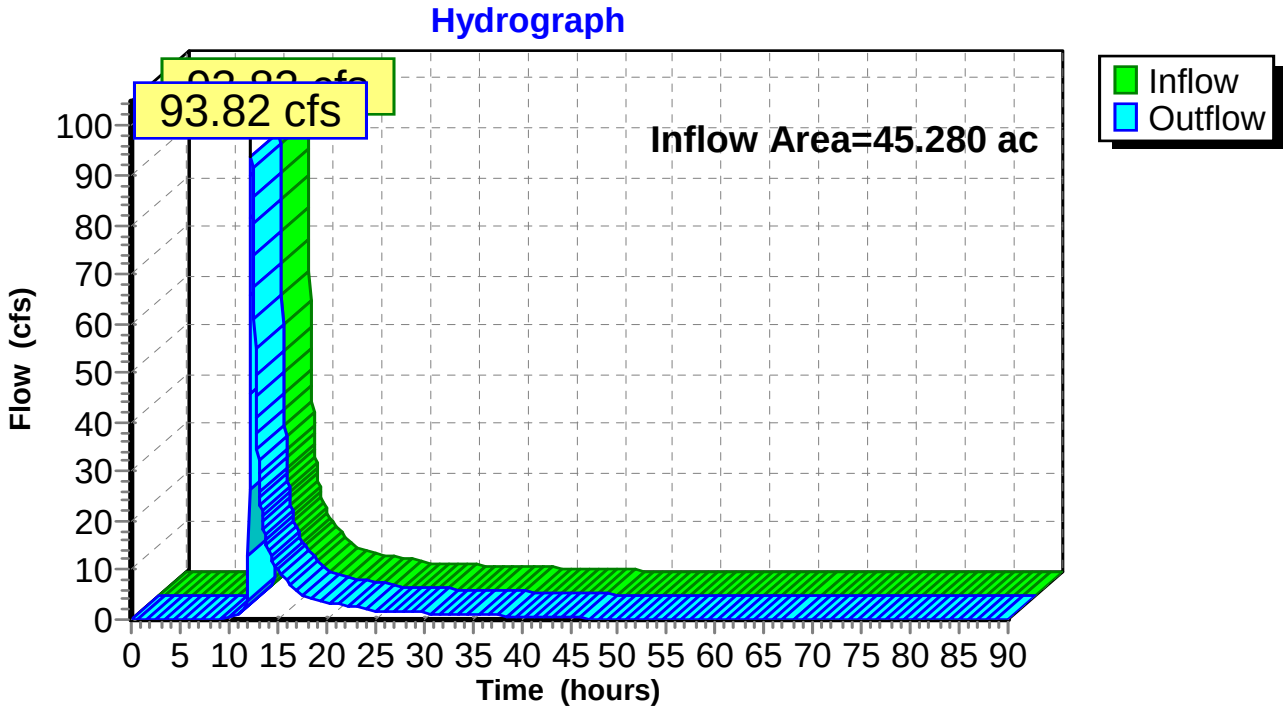


Summary for Reach DP1: DP1

Inflow Area = 45.280 ac, 28.77% Impervious, Inflow Depth > 3.54" for 25-Year event
Inflow = 93.82 cfs @ 12.37 hrs, Volume= 13.355 af
Outflow = 93.82 cfs @ 12.37 hrs, Volume= 13.355 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs

Reach DP1: DP1

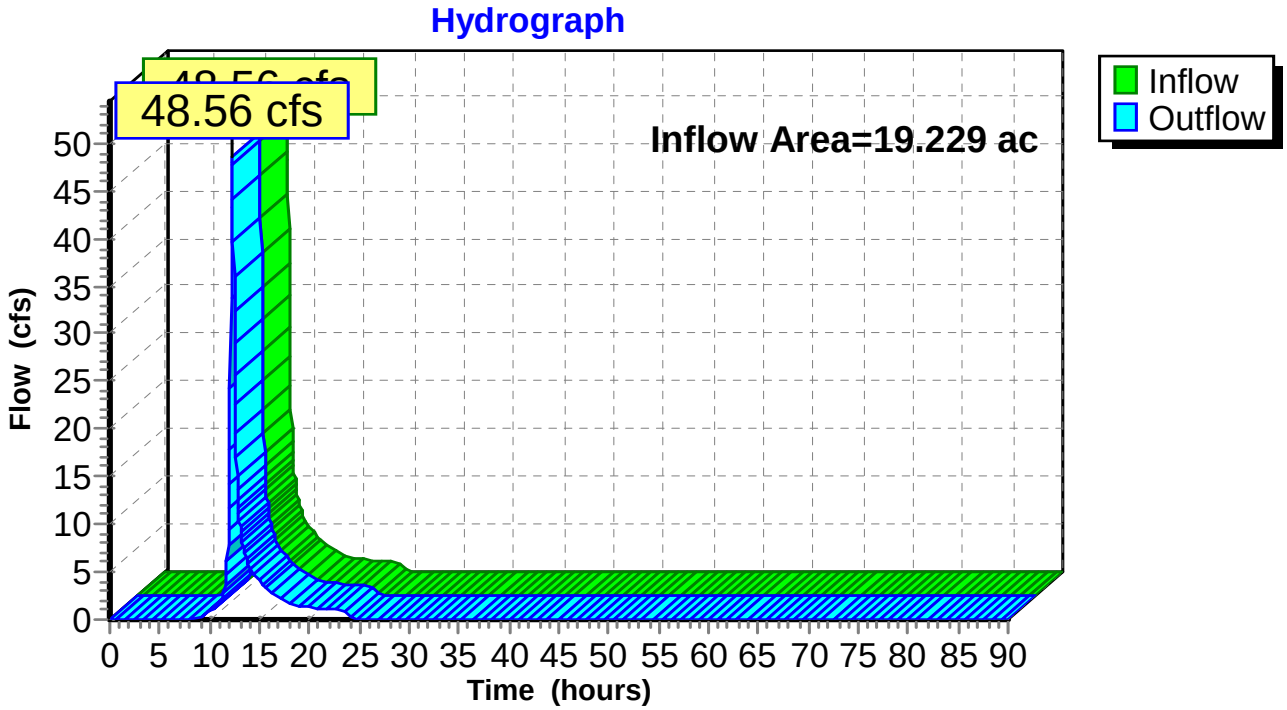


Summary for Reach DP2: DP2

Inflow Area = 19.229 ac, 42.11% Impervious, Inflow Depth > 3.35" for 25-Year event
Inflow = 48.56 cfs @ 12.22 hrs, Volume= 5.373 af
Outflow = 48.56 cfs @ 12.22 hrs, Volume= 5.373 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs

Reach DP2: DP2



Summary for Pond DB1: DB1

Inflow Area = 41.606 ac, 30.45% Impervious, Inflow Depth = 3.62" for 25-Year event
Inflow = 141.42 cfs @ 12.17 hrs, Volume= 12.541 af
Outflow = 88.71 cfs @ 12.36 hrs, Volume= 12.485 af, Atten= 37%, Lag= 11.3 min
Primary = 88.71 cfs @ 12.36 hrs, Volume= 12.485 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 161.81' @ 12.36 hrs Surf.Area= 51,878 sf Storage= 173,871 cf

Plug-Flow detention time= 255.0 min calculated for 12.478 af (99% of inflow)
Center-of-Mass det. time= 254.1 min (1,077.4 - 823.3)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	295,591 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

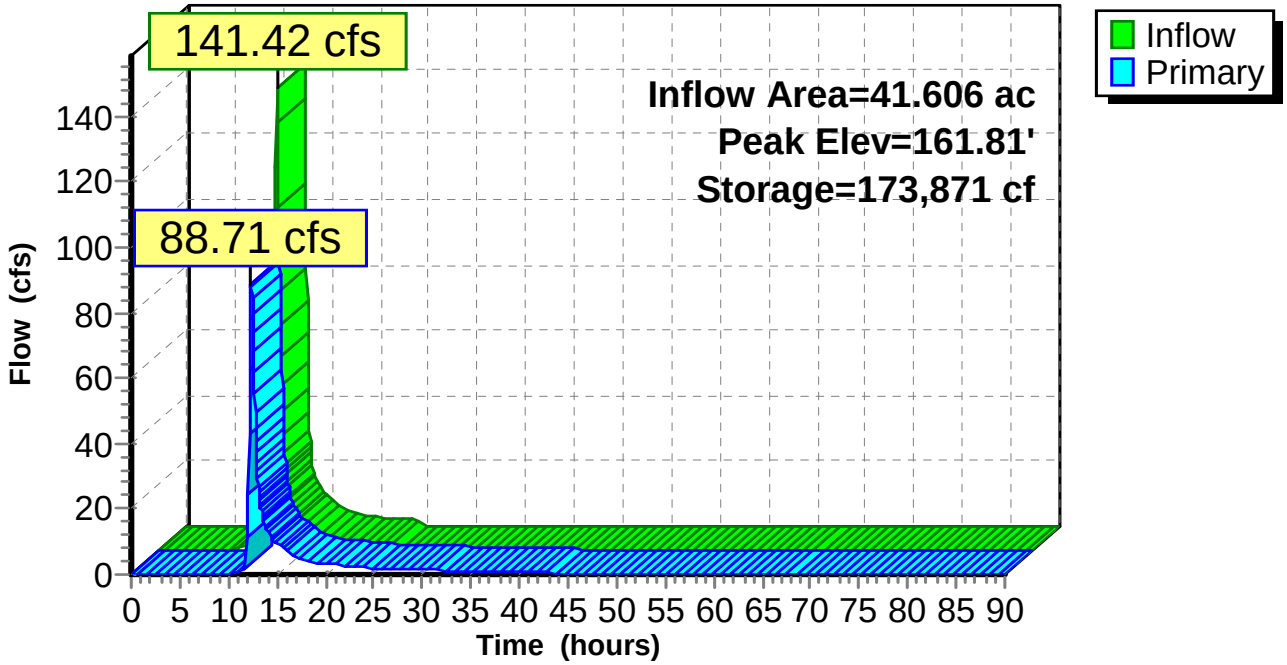
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	39,432	0	0
160.00	45,883	85,315	85,315
160.10	46,187	4,603	89,918
162.00	52,502	93,755	183,673
164.00	59,416	111,918	295,591

Device	Routing	Invert	Outlet Devices
#1	Primary	153.00'	**36.0" Round Culvert X 2.00** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 153.00' / 152.00' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 7.07 sf
#2	Device 1	158.00'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	160.10'	**36.0" W x 24.0" H Vert. Orifice/Grate X 4.00** C= 0.600
#4	Device 1	163.00'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=88.38 cfs @ 12.36 hrs HW=161.81' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 88.38 cfs of 184.01 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.41 cfs @ 9.03 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 85.96 cfs @ 4.19 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond DB1: DB1

Hydrograph



Summary for Pond DB2: DB2

Inflow Area = 3.997 ac, 77.38% Impervious, Inflow Depth = 4.78" for 25-Year event
Inflow = 20.87 cfs @ 12.09 hrs, Volume= 1.591 af
Outflow = 7.46 cfs @ 12.36 hrs, Volume= 1.405 af, Atten= 64%, Lag= 16.1 min
Primary = 7.46 cfs @ 12.36 hrs, Volume= 1.405 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 165.70' @ 12.36 hrs Surf.Area= 20,876 sf Storage= 32,841 cf

Plug-Flow detention time= 592.1 min calculated for 1.405 af (88% of inflow)
Center-of-Mass det. time= 537.8 min (1,322.9 - 785.1)

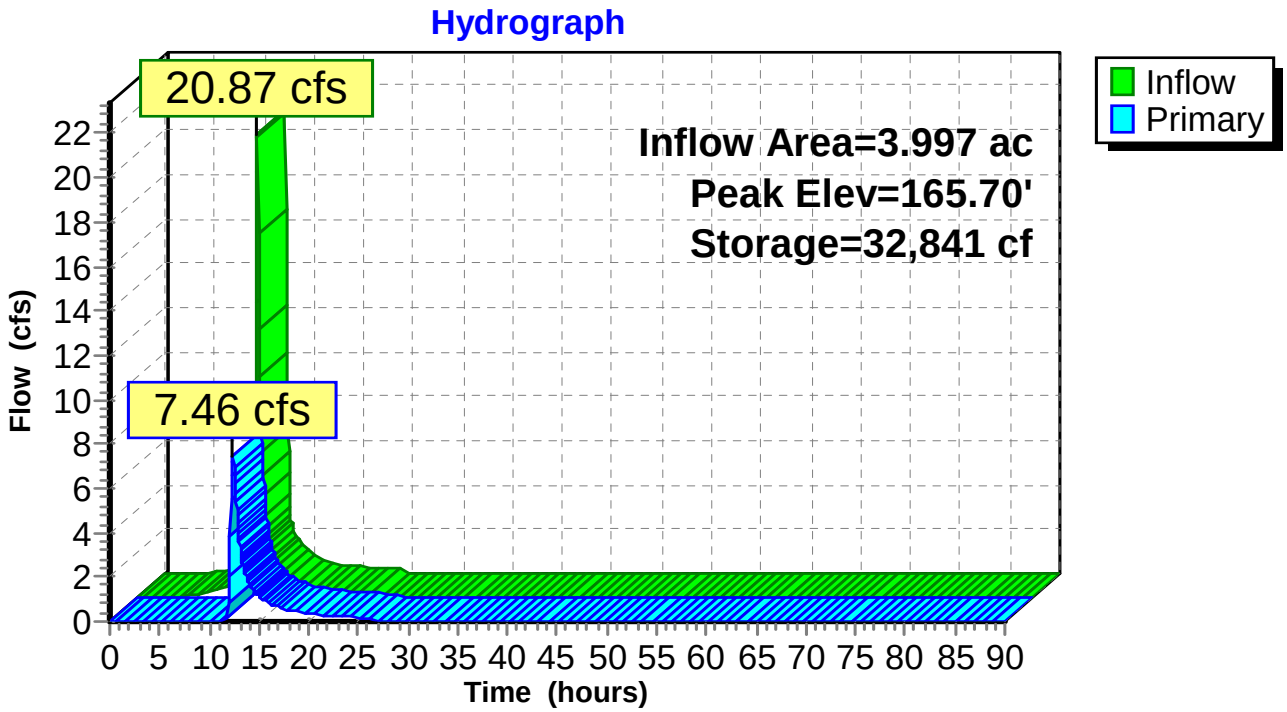
Volume	Invert	Avail.Storage	Storage Description
#1	164.00'	85,850 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
164.00	17,936	0	0
165.00	19,592	18,764	18,764
166.00	21,437	20,515	39,279
167.00	23,237	22,337	61,616
168.00	25,231	24,234	85,850

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**24.0" Round Culvert** L= 40.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 161.50' / 161.00' S= 0.0125 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	164.00'	**1.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	165.00'	**24.0" W x 8.0" H Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	167.00'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.46 cfs @ 12.36 hrs HW=165.70' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 7.46 cfs of 27.04 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.08 cfs @ 6.15 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 7.38 cfs @ 2.77 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond DB2: DB2


Hydrograph
20.87 cfs
7.46 cfs
Inflow Area=3.997 ac
Peak Elev=165.70'
Storage=32,841 cf
Inflow
Primary
Flow (cfs)
0 2 4 6 8 10 12 14 16 18 20 22
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
Time (hours)

Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A: A Runoff Area=1,812,362 sf 30.45% Impervious Runoff Depth=5.79"
Flow Length=1,815' Tc=12.6 min CN=79 Runoff=223.88 cfs 20.067 af

Subcatchment A1: A1 Runoff Area=160,052 sf 9.69% Impervious Runoff Depth=4.84"
Flow Length=712' Tc=38.5 min CN=71 Runoff=10.46 cfs 1.482 af

Subcatchment B: B Runoff Area=174,108 sf 77.38% Impervious Runoff Depth=7.10"
Tc=6.0 min CN=90 Runoff=30.32 cfs 2.365 af

Subcatchment B1: B1 Runoff Area=663,518 sf 32.85% Impervious Runoff Depth=5.19"
Flow Length=673' Tc=15.3 min CN=74 Runoff=69.26 cfs 6.594 af

Reach DP1: DP1 Inflow=159.78 cfs 21.493 af
Outflow=159.78 cfs 21.493 af

Reach DP2: DP2 Inflow=80.93 cfs 8.772 af
Outflow=80.93 cfs 8.772 af

Pond DB1: DB1 Peak Elev=162.81' Storage=227,142 cf Inflow=223.88 cfs 20.067 af
Outflow=151.38 cfs 20.010 af

Pond DB2: DB2 Peak Elev=166.19' Storage=43,483 cf Inflow=30.32 cfs 2.365 af
Outflow=11.93 cfs 2.178 af

Total Runoff Area = 64.510 ac Runoff Volume = 30.509 af Average Runoff Depth = 5.68"
67.26% Pervious = 43.386 ac 32.74% Impervious = 21.123 ac

Summary for Subcatchment A: A

Runoff = 223.88 cfs @ 12.17 hrs, Volume= 20.067 af, Depth= 5.79"

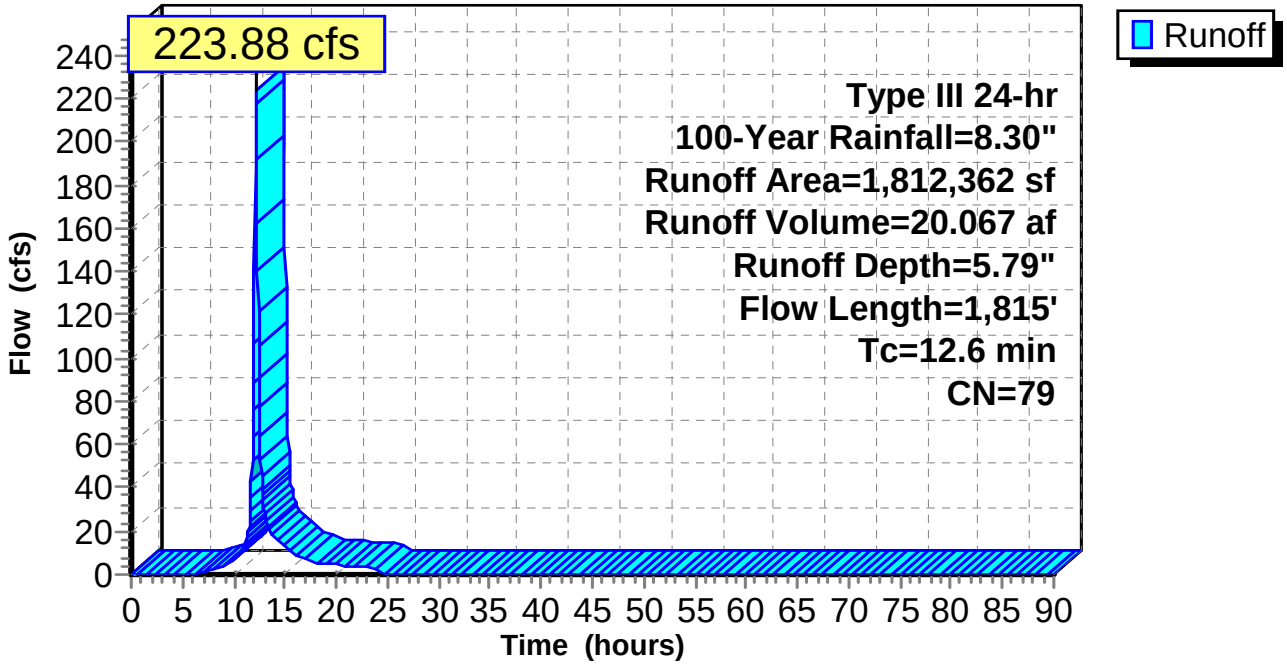
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

	Area (sf)	CN	Description
*	396,369	98	Roofs, pavement on site
*	123,997	98	Roofs, driveways off site
*	31,558	98	Rock outcrop
	45,533	39	>75% Grass cover, Good, HSG A
	535,763	74	>75% Grass cover, Good, HSG C
	47,337	55	Woods, Good, HSG B
	631,805	70	Woods, Good, HSG C
	1,812,362	79	Weighted Average
	1,260,438		69.55% Pervious Area
	551,924		30.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	100	0.4400	0.28		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	200	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	472	0.0170	3.20	73.63	**Channel Flow,** Area= 23.0 sf Perim= 52.3' r= 0.44' n= 0.035
2.8	654	0.0120	3.93	86.51	**Channel Flow,** Area= 22.0 sf Perim= 28.3' r= 0.78' n= 0.035
0.6	389	0.0050	10.30	227.15	**Pipe Channel, CMP_Arch_1/2 77x52** 77.0" x 52.0", R=39.4"/121.3" Pipe Arch Area= 22.0 sf Perim= 17.3' n= 0.012
12.6	1,815	Total			

Subcatchment A: A

Hydrograph



Summary for Subcatchment A1: A1

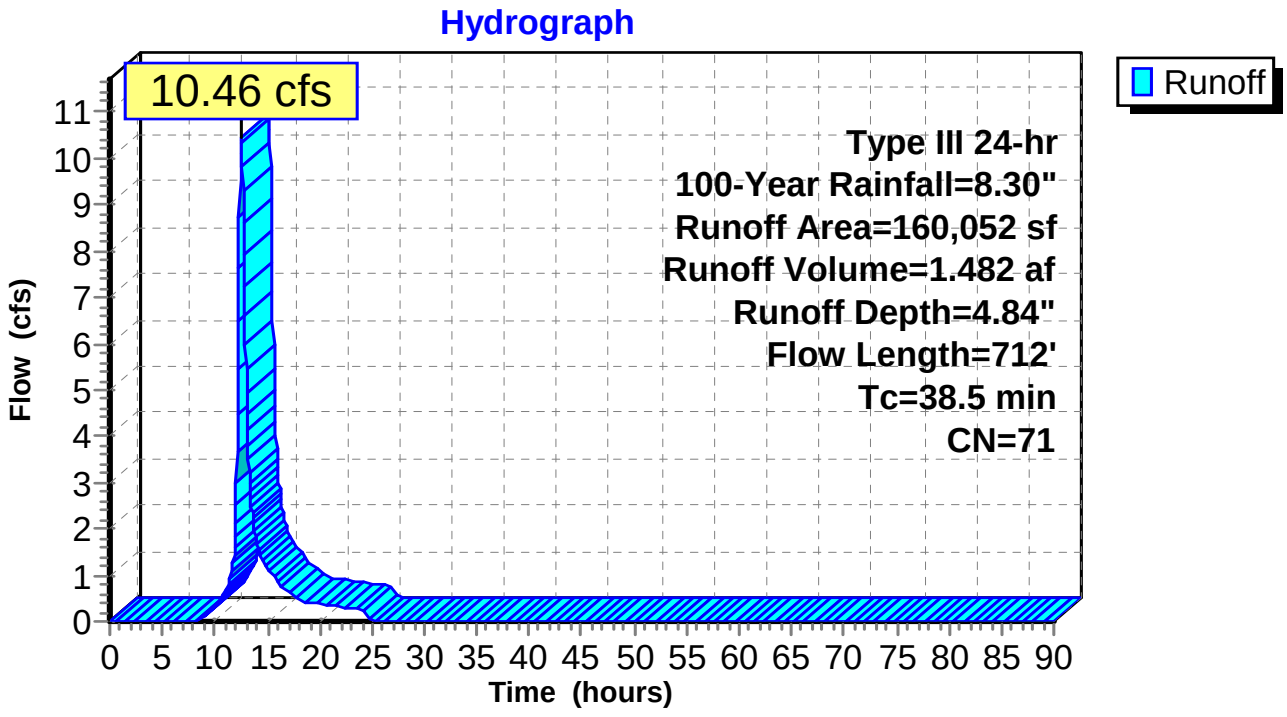
Runoff = 10.46 cfs @ 12.53 hrs, Volume= 1.482 af, Depth= 4.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

	Area (sf)	CN	Description
*	15,516	98	Rock outcrop
	23,274	55	Woods, Good, HSG B
	121,262	70	Woods, Good, HSG C
	160,052	71	Weighted Average
	144,536		90.31% Pervious Area
	15,516		9.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.7	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
2.8	612	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
38.5	712	Total			

Subcatchment A1: A1



Summary for Subcatchment B: B

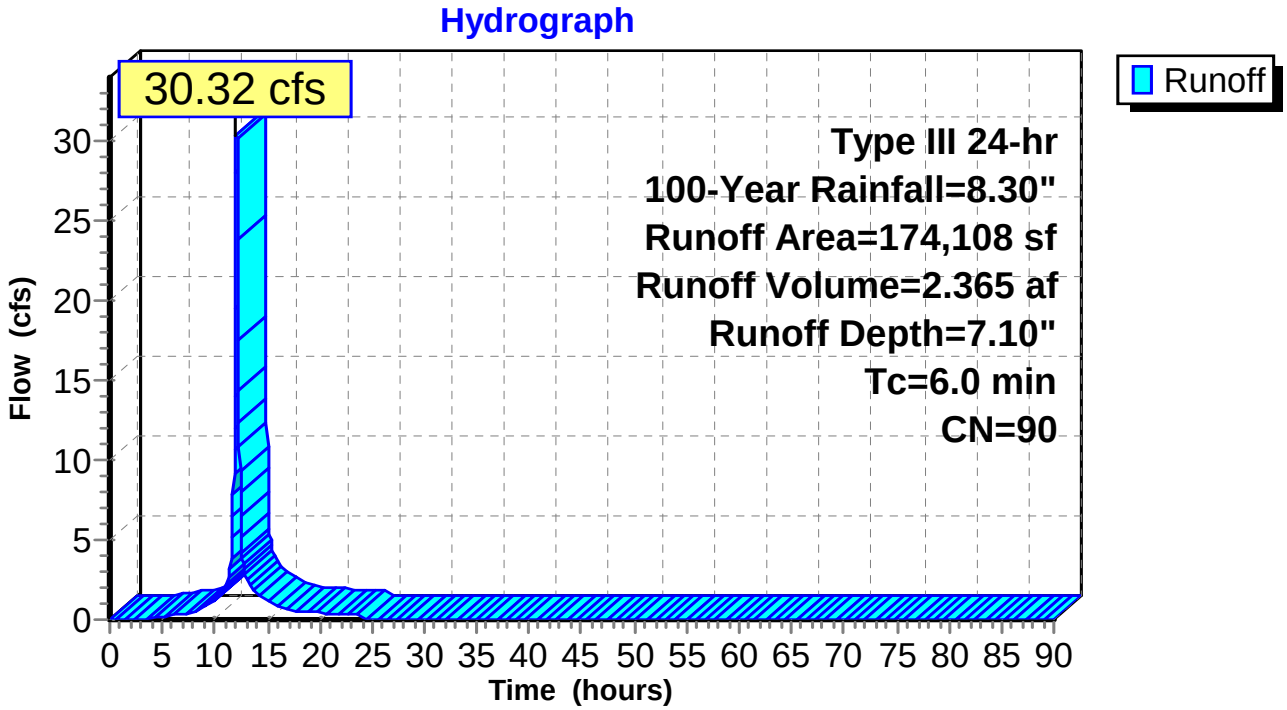
Runoff = 30.32 cfs @ 12.09 hrs, Volume= 2.365 af, Depth= 7.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

	Area (sf)	CN	Description
*	134,723	98	Paved parking
	11,134	39	>75% Grass cover, Good, HSG A
	28,251	74	>75% Grass cover, Good, HSG C
	174,108	90	Weighted Average
	39,385		22.62% Pervious Area
	134,723		77.38% Impervious Area

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

Subcatchment B: B



Summary for Subcatchment B1: B1

Runoff = 69.26 cfs @ 12.21 hrs, Volume= 6.594 af, Depth= 5.19"

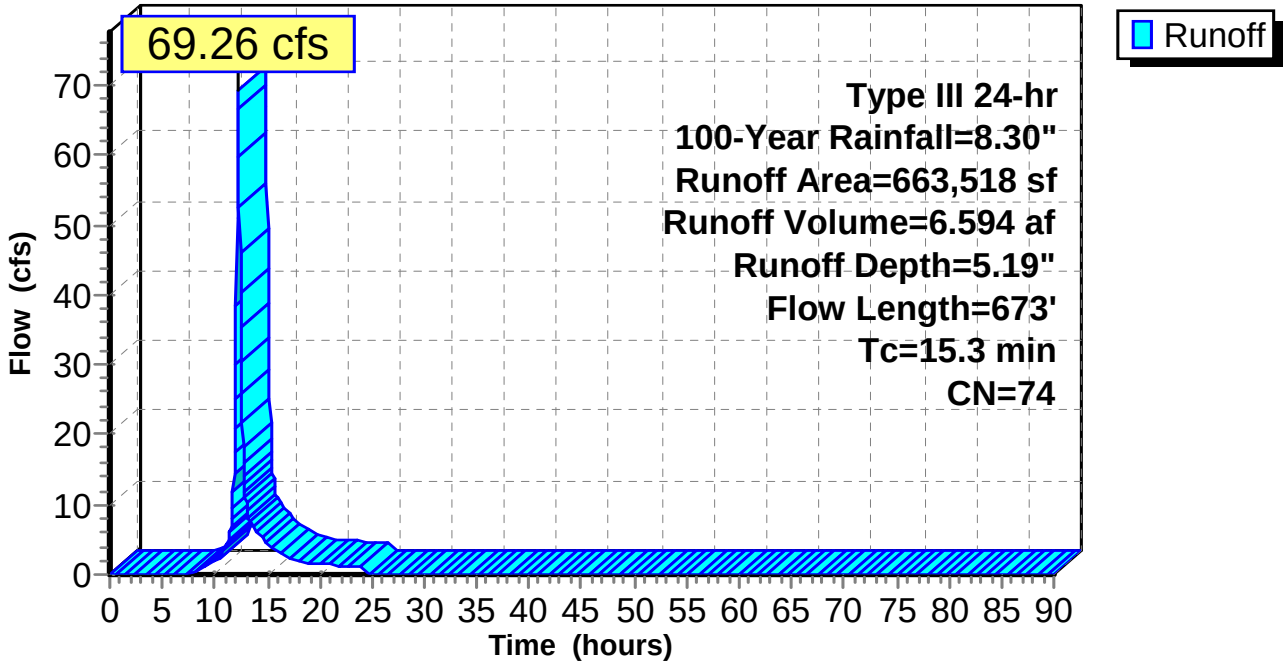
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

	Area (sf)	CN	Description
	108,929	98	Water Surface, HSG C
*	17,354	98	Paved driveway
	9,827	36	Woods, Fair, HSG A
	21,742	60	Woods, Fair, HSG B
	181,381	73	Woods, Fair, HSG C
*	14,494	98	Rock Outcrop
	77,187	98	Paved parking, HSG C
	47,429	30	Woods, Good, HSG A
	5,630	70	Woods, Good, HSG C
	49,149	77	Woods, Good, HSG D
	38,852	39	>75% Grass cover, Good, HSG A
	45,985	80	>75% Grass cover, Good, HSG D
	26,494	30	Woods, Good, HSG A
	12,497	39	>75% Grass cover, Good, HSG A
	6,568	74	>75% Grass cover, Good, HSG C
	663,518	74	Weighted Average
	445,554		67.15% Pervious Area
	217,964		32.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	100	0.0900	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
3.4	327	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	246	0.0330	6.55	209.56	**Channel Flow,** Area= 32.0 sf Perim= 40.9' r= 0.78' n= 0.035
15.3	673	Total			

Subcatchment B1: B1

Hydrograph

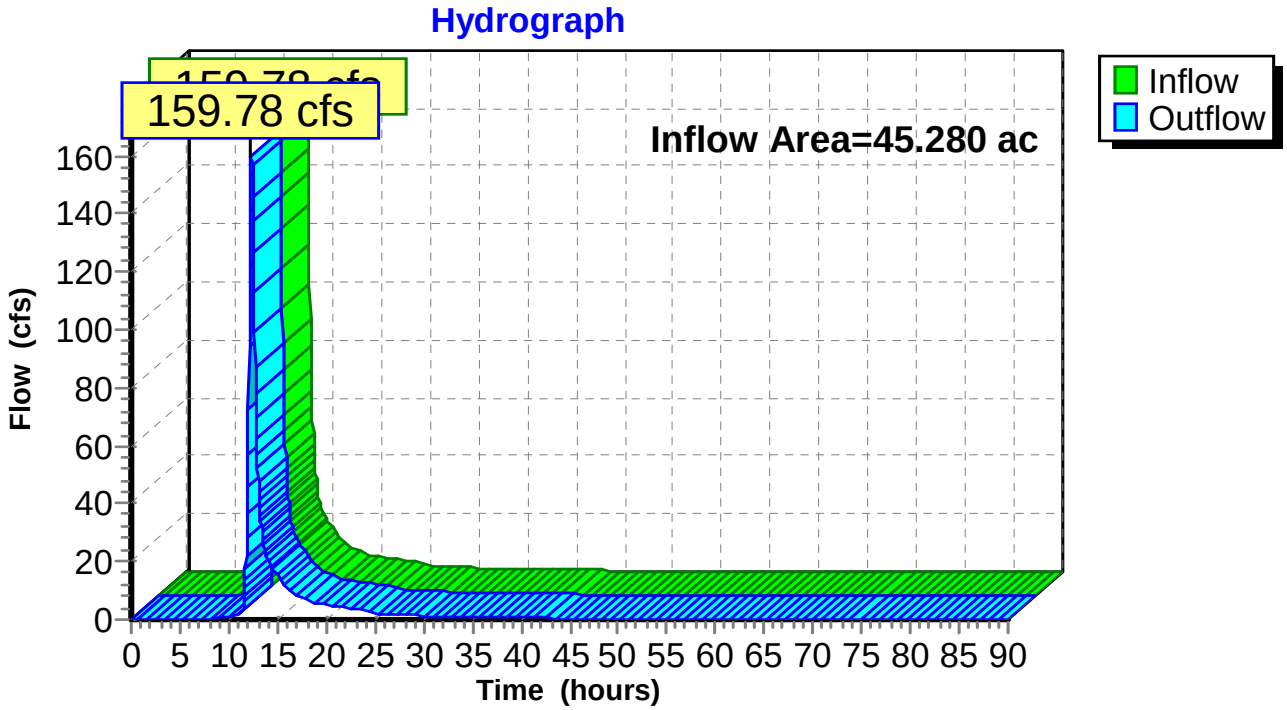


Summary for Reach DP1: DP1

Inflow Area = 45.280 ac, 28.77% Impervious, Inflow Depth = 5.70" for 100-Year event
Inflow = 159.78 cfs @ 12.34 hrs, Volume= 21.493 af
Outflow = 159.78 cfs @ 12.34 hrs, Volume= 21.493 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs

Reach DP1: DP1

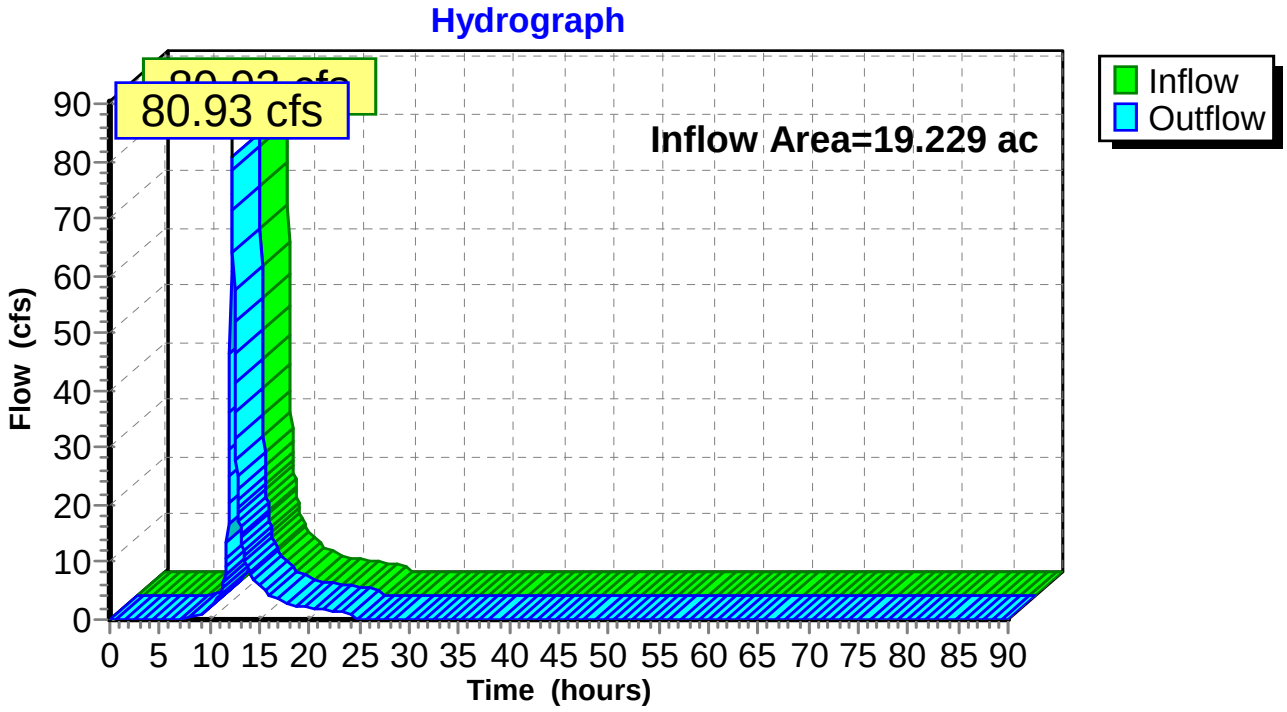


Summary for Reach DP2: DP2

Inflow Area = 19.229 ac, 42.11% Impervious, Inflow Depth > 5.47" for 100-Year event
Inflow = 80.93 cfs @ 12.21 hrs, Volume= 8.772 af
Outflow = 80.93 cfs @ 12.21 hrs, Volume= 8.772 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs

Reach DP2: DP2



Summary for Pond DB1: DB1

Inflow Area = 41.606 ac, 30.45% Impervious, Inflow Depth = 5.79" for 100-Year event
Inflow = 223.88 cfs @ 12.17 hrs, Volume= 20.067 af
Outflow = 151.38 cfs @ 12.33 hrs, Volume= 20.010 af, Atten= 32%, Lag= 9.3 min
Primary = 151.38 cfs @ 12.33 hrs, Volume= 20.010 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 162.81' @ 12.33 hrs Surf.Area= 55,290 sf Storage= 227,142 cf

Plug-Flow detention time= 175.3 min calculated for 20.010 af (100% of inflow)
Center-of-Mass det. time= 173.5 min (983.5 - 809.9)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	295,591 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

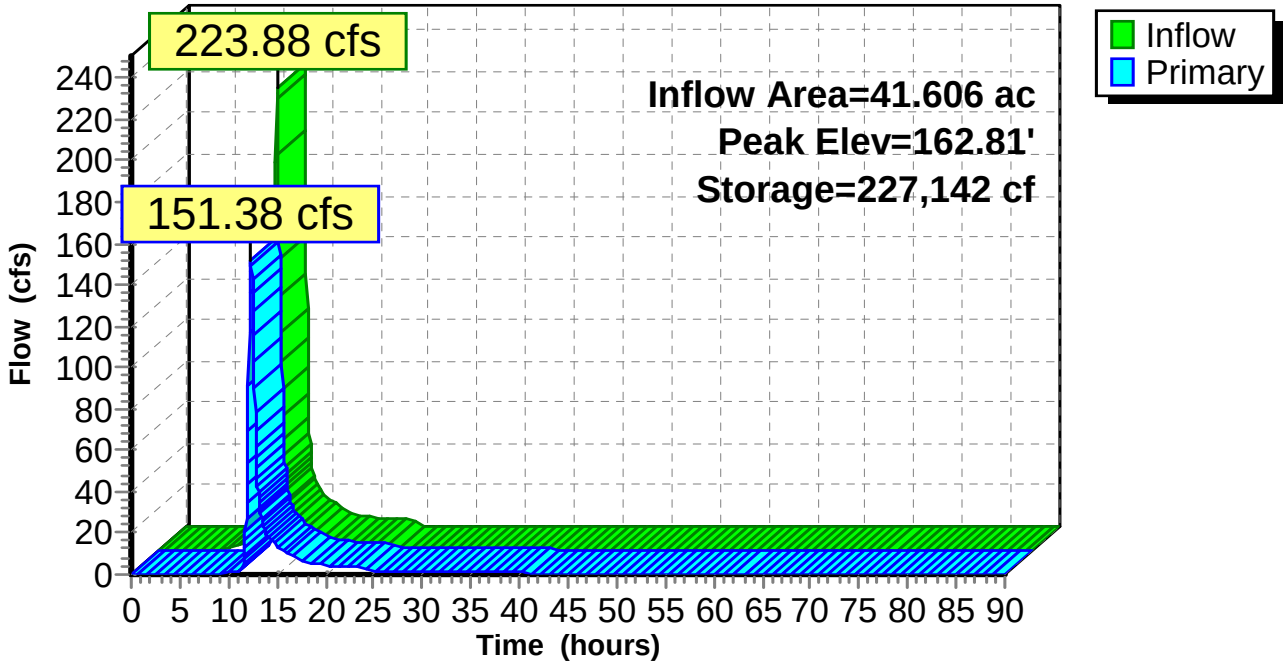
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	39,432	0	0
160.00	45,883	85,315	85,315
160.10	46,187	4,603	89,918
162.00	52,502	93,755	183,673
164.00	59,416	111,918	295,591

Device	Routing	Invert	Outlet Devices
#1	Primary	153.00'	**36.0" Round Culvert X 2.00** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 153.00' / 152.00' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 7.07 sf
#2	Device 1	158.00'	**7.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	160.10'	**36.0" W x 24.0" H Vert. Orifice/Grate X 4.00** C= 0.600
#4	Device 1	163.00'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=151.01 cfs @ 12.33 hrs HW=162.80' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 151.01 cfs of 196.09 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.73 cfs @ 10.22 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 148.28 cfs @ 6.18 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond DB1: DB1

Hydrograph



Summary for Pond DB2: DB2

Inflow Area = 3.997 ac, 77.38% Impervious, Inflow Depth = 7.10" for 100-Year event
Inflow = 30.32 cfs @ 12.09 hrs, Volume= 2.365 af
Outflow = 11.93 cfs @ 12.32 hrs, Volume= 2.178 af, Atten= 61%, Lag= 13.8 min
Primary = 11.93 cfs @ 12.32 hrs, Volume= 2.178 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 166.19' @ 12.32 hrs Surf.Area= 21,787 sf Storage= 43,483 cf

Plug-Flow detention time= 413.5 min calculated for 2.178 af (92% of inflow)
Center-of-Mass det. time= 372.3 min (1,147.2 - 774.8)

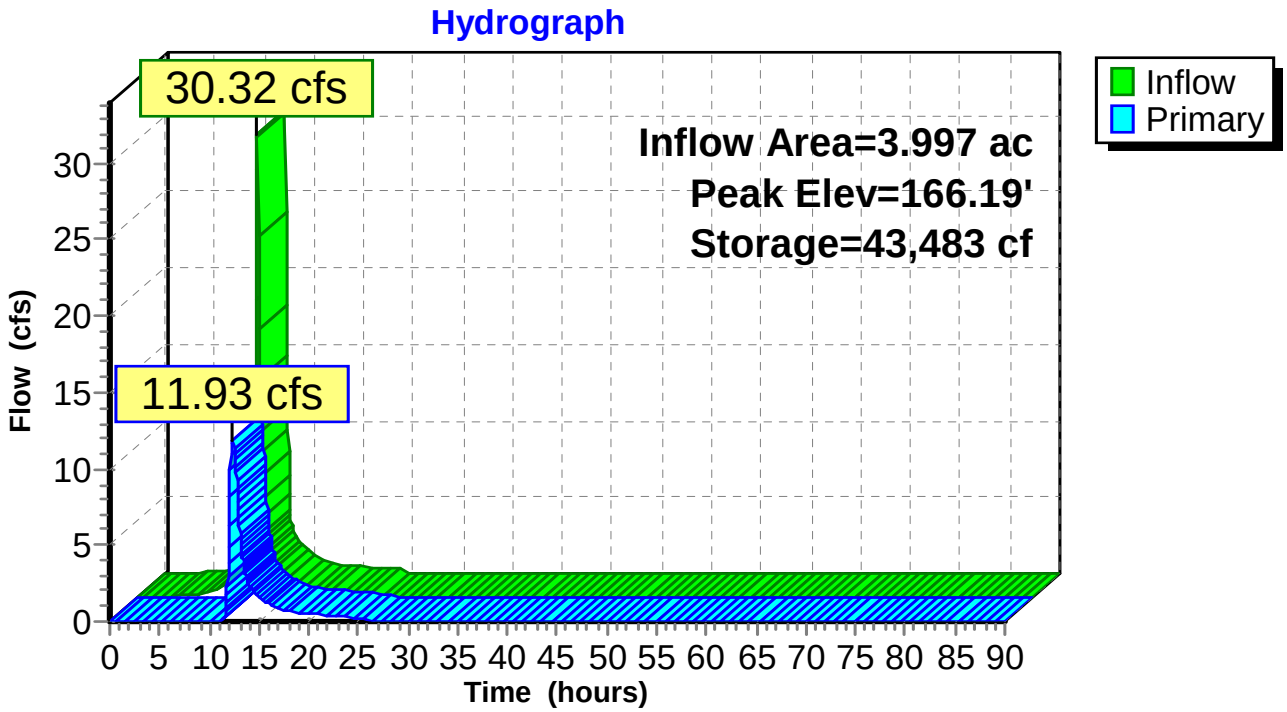
Volume	Invert	Avail.Storage	Storage Description
#1	164.00'	85,850 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

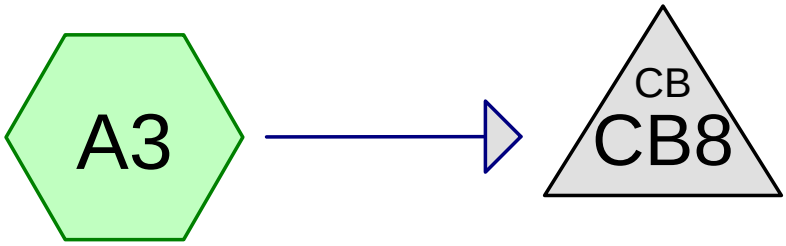
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
164.00	17,936	0	0
165.00	19,592	18,764	18,764
166.00	21,437	20,515	39,279
167.00	23,237	22,337	61,616
168.00	25,231	24,234	85,850

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**24.0" Round Culvert** L= 40.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 161.50' / 161.00' S= 0.0125 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	164.00'	**1.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	165.00'	**24.0" W x 8.0" H Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	167.00'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

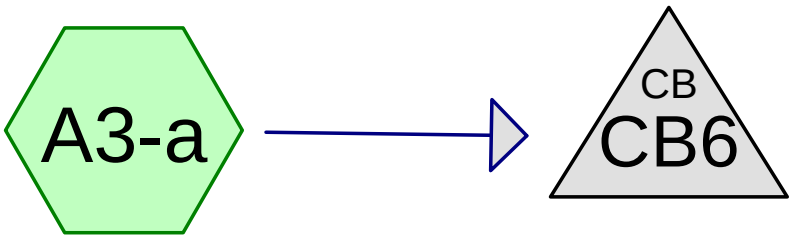
Primary OutFlow Max=11.91 cfs @ 12.32 hrs HW=166.19' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 11.91 cfs of 29.07 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.09 cfs @ 7.03 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 11.83 cfs @ 4.44 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond DB2: DB2

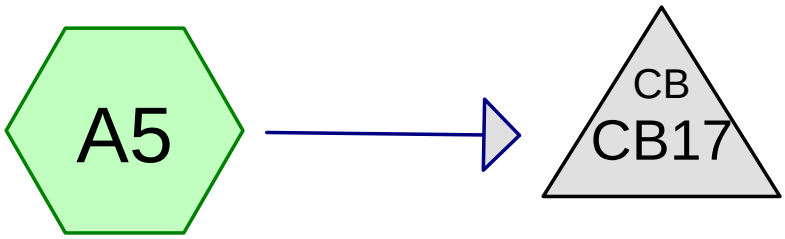

Hydrograph
30.32 cfs
11.93 cfs
Inflow Area=3.997 ac
Peak Elev=166.19'
Storage=43,483 cf
Inflow
Primary
Flow (cfs)
0
5
10
15
20
25
30
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
Time (hours)



A3 CB8



A3-a CB6



A5 CB17

Subcat Reach Pond Link

Routing Diagram for 07.01.19 CHG&E Training Storm Sewer
Prepared by Lawrence J. Paggi, P.E., P.C., Printed 7/10/2019

Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A3: A3 Runoff Area=76,656 sf 63.54% Impervious Runoff Depth=6.98"
Tc=6.0 min CN=89 Runoff=13.22 cfs 1.024 af

Subcatchment A3-a: A3-a Runoff Area=30,098 sf 32.07% Impervious Runoff Depth=6.15"
Tc=6.0 min CN=82 Runoff=4.75 cfs 0.354 af

Subcatchment A5: A5 Runoff Area=84,183 sf 69.01% Impervious Runoff Depth=7.22"
Tc=6.0 min CN=91 Runoff=14.79 cfs 1.163 af

Pond CB17: CB17 Peak Elev=169.86' Inflow=14.79 cfs 1.163 af
28.0" x 20.0", R=14.4"/42.3" Pipe Arch Culvert n=0.012 L=90.0' S=0.0056 '/' Outflow=14.79 cfs 1.163 af

Pond CB6: CB6 Peak Elev=169.65' Inflow=4.75 cfs 0.354 af
18.0" Round Culvert n=0.012 L=295.0' S=0.0051 '/' Outflow=4.75 cfs 0.354 af

Pond CB8: CB8 Peak Elev=169.64' Inflow=13.22 cfs 1.024 af
18.0" Round Culvert x 2.00 n=0.012 L=225.0' S=0.0053 '/' Outflow=13.22 cfs 1.024 af

Total Runoff Area = 4.383 ac Runoff Volume = 2.541 af Average Runoff Depth = 6.96"
39.01% Pervious = 1.710 ac 60.99% Impervious = 2.673 ac

Summary for Subcatchment A3: A3

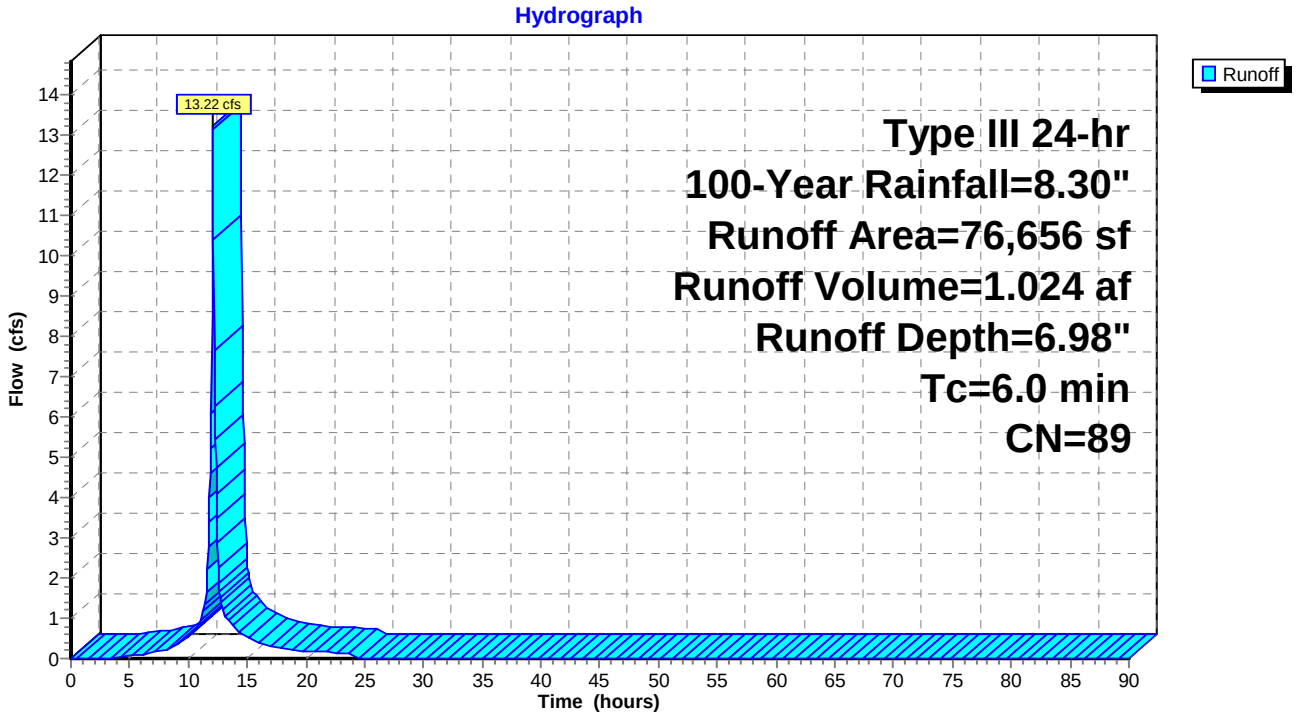
Runoff = 13.22 cfs @ 12.09 hrs, Volume= 1.024 af, Depth= 6.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
48,708	98	Paved parking, HSG C
27,948	74	>75% Grass cover, Good, HSG C
76,656	89	Weighted Average
27,948		36.46% Pervious Area
48,708		63.54% Impervious Area

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

Subcatchment A3: A3



Summary for Subcatchment A3-a: A3-a

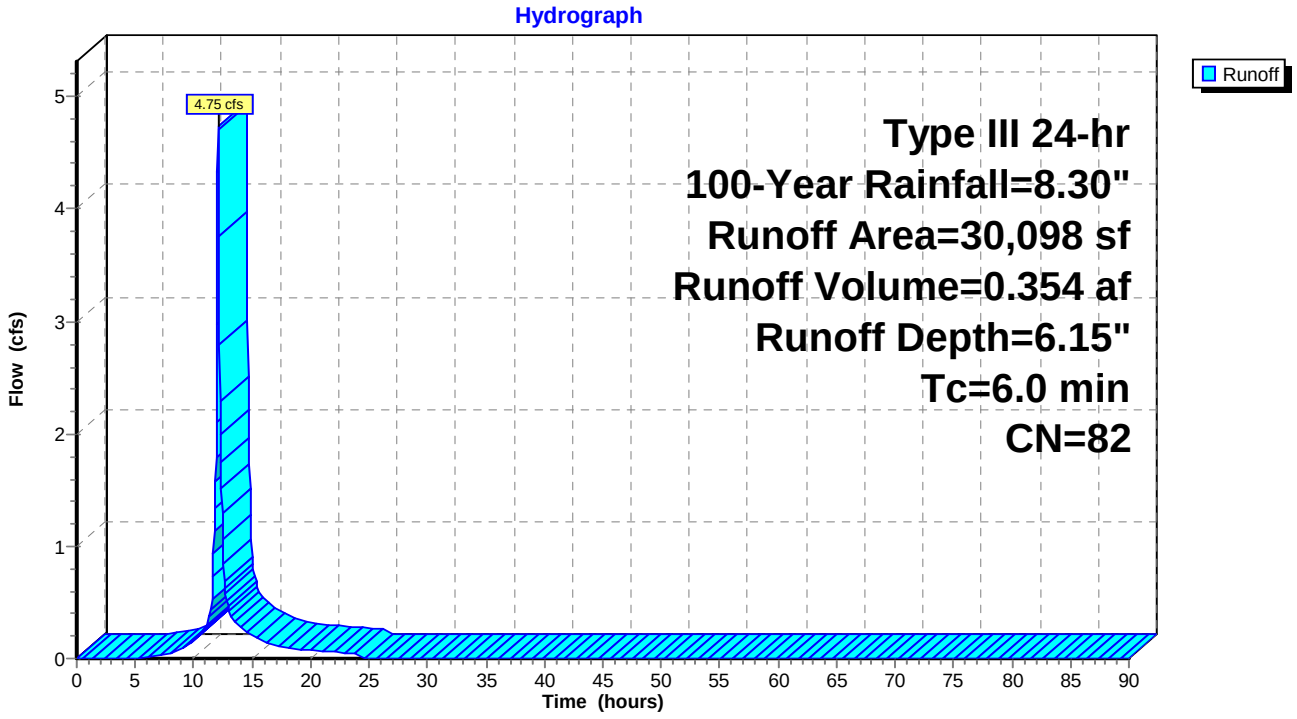
Runoff = 4.75 cfs @ 12.09 hrs, Volume= 0.354 af, Depth= 6.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
9,651	98	Paved parking, HSG C
20,447	74	>75% Grass cover, Good, HSG C
30,098	82	Weighted Average
20,447		67.93% Pervious Area
9,651		32.07% Impervious Area

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

Subcatchment A3-a: A3-a



Summary for Subcatchment A5: A5

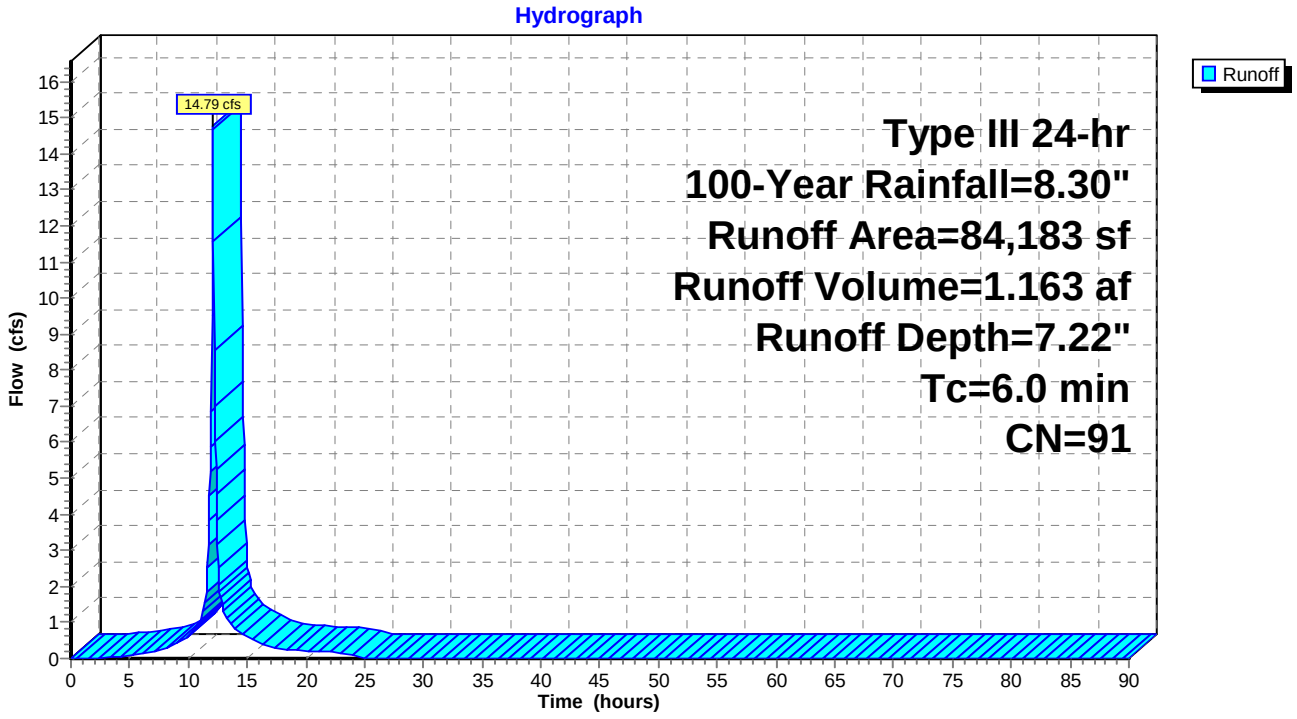
Runoff = 14.79 cfs @ 12.09 hrs, Volume= 1.163 af, Depth= 7.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

	Area (sf)	CN	Description
*	58,094	98	Paved parking
	26,089	74	>75% Grass cover, Good, HSG C
	84,183	91	Weighted Average
	26,089		30.99% Pervious Area
	58,094		69.01% Impervious Area

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

Subcatchment A5: A5



Summary for Pond CB17: CB17

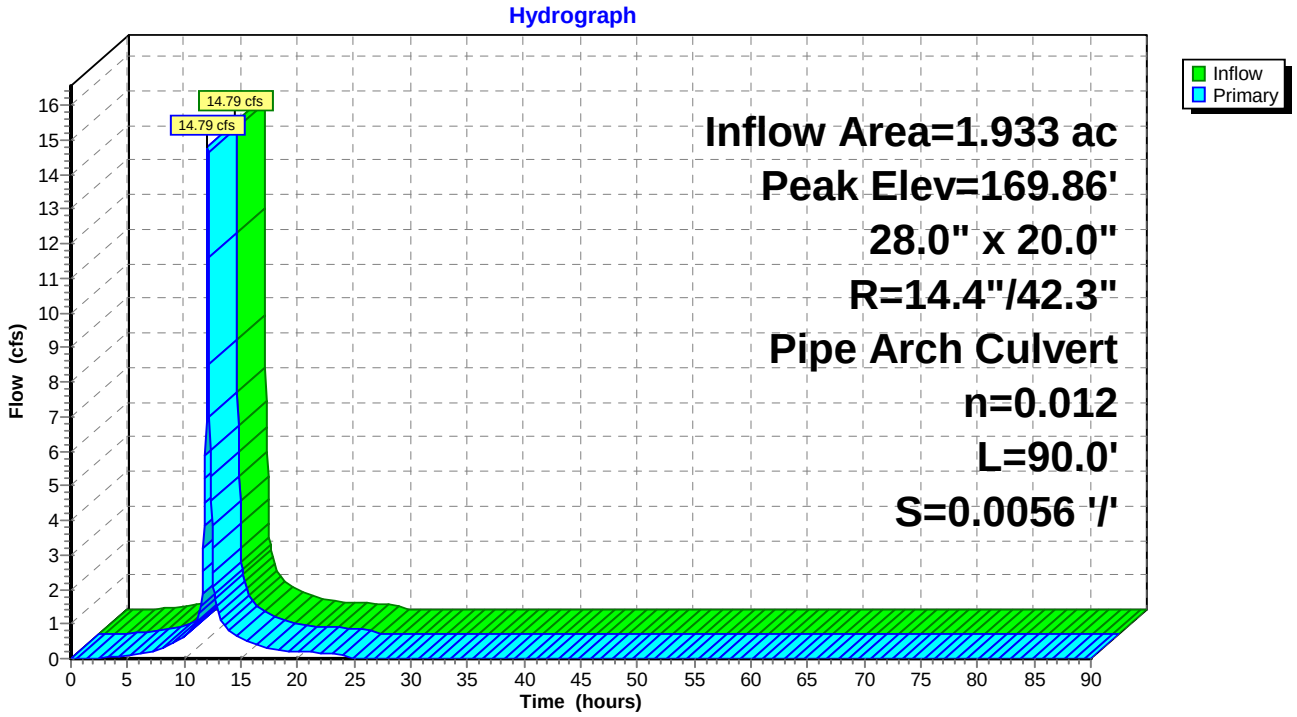
Inflow Area = 1.933 ac, 69.01% Impervious, Inflow Depth = 7.22" for 100-Year event
Inflow = 14.79 cfs @ 12.09 hrs, Volume= 1.163 af
Outflow = 14.79 cfs @ 12.09 hrs, Volume= 1.163 af, Atten= 0%, Lag= 0.0 min
Primary = 14.79 cfs @ 12.09 hrs, Volume= 1.163 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 169.86' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	168.00'	**28.0" W x 20.0" H, R=14.4"/42.3" Pipe Arch CMP_Arch_1/2 28x20** L= 90.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 168.00' / 167.50' S= 0.0056 '/' Cc= 0.900 n= 0.012, Flow Area= 3.10 sf

Primary OutFlow Max=14.41 cfs @ 12.09 hrs HW=169.82' (Free Discharge)
└**1=CMP_Arch_1/2 28x20** (Barrel Controls 14.41 cfs @ 5.21 fps)

Pond CB17: CB17



Summary for Pond CB6: CB6

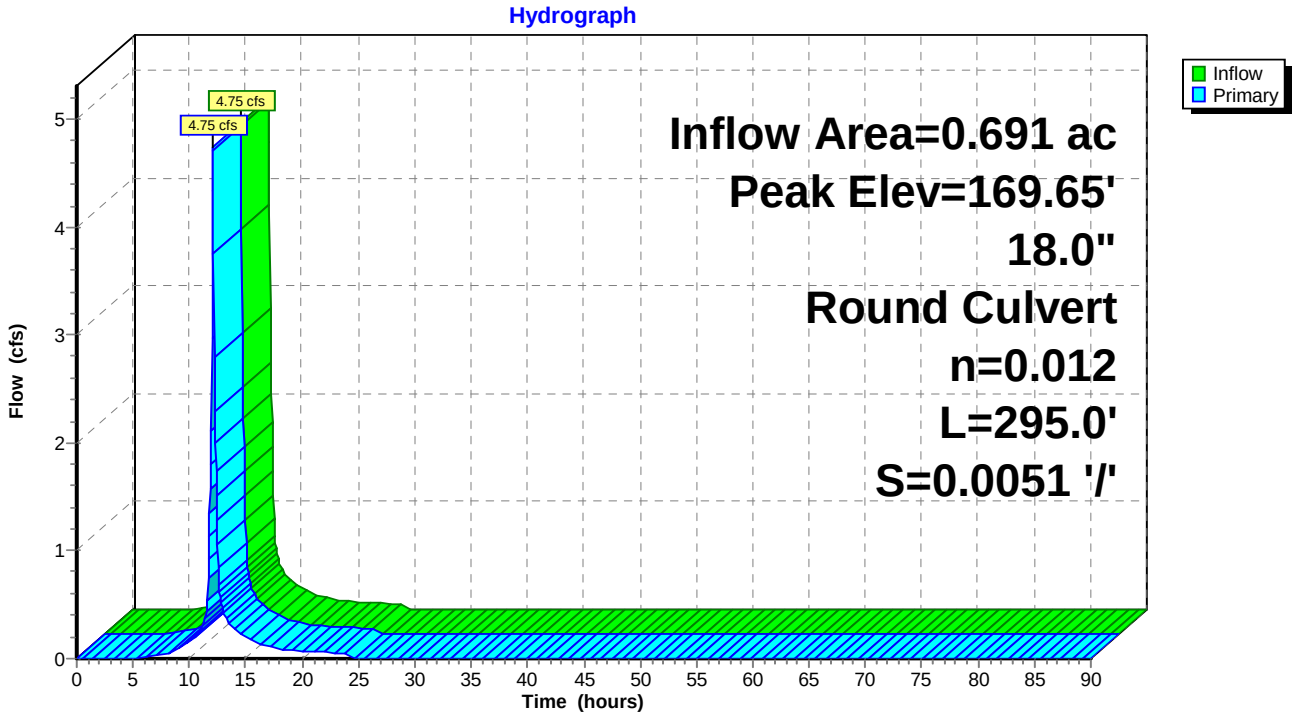
Inflow Area = 0.691 ac, 32.07% Impervious, Inflow Depth = 6.15" for 100-Year event
Inflow = 4.75 cfs @ 12.09 hrs, Volume= 0.354 af
Outflow = 4.75 cfs @ 12.09 hrs, Volume= 0.354 af, Atten= 0%, Lag= 0.0 min
Primary = 4.75 cfs @ 12.09 hrs, Volume= 0.354 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 169.65' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	168.50'	**18.0" Round Culvert** L= 295.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 168.50' / 167.00' S= 0.0051 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=4.63 cfs @ 12.09 hrs HW=169.63' (Free Discharge)
1=Culvert (Barrel Controls 4.63 cfs @ 4.50 fps)

Pond CB6: CB6



Summary for Pond CB8: CB8

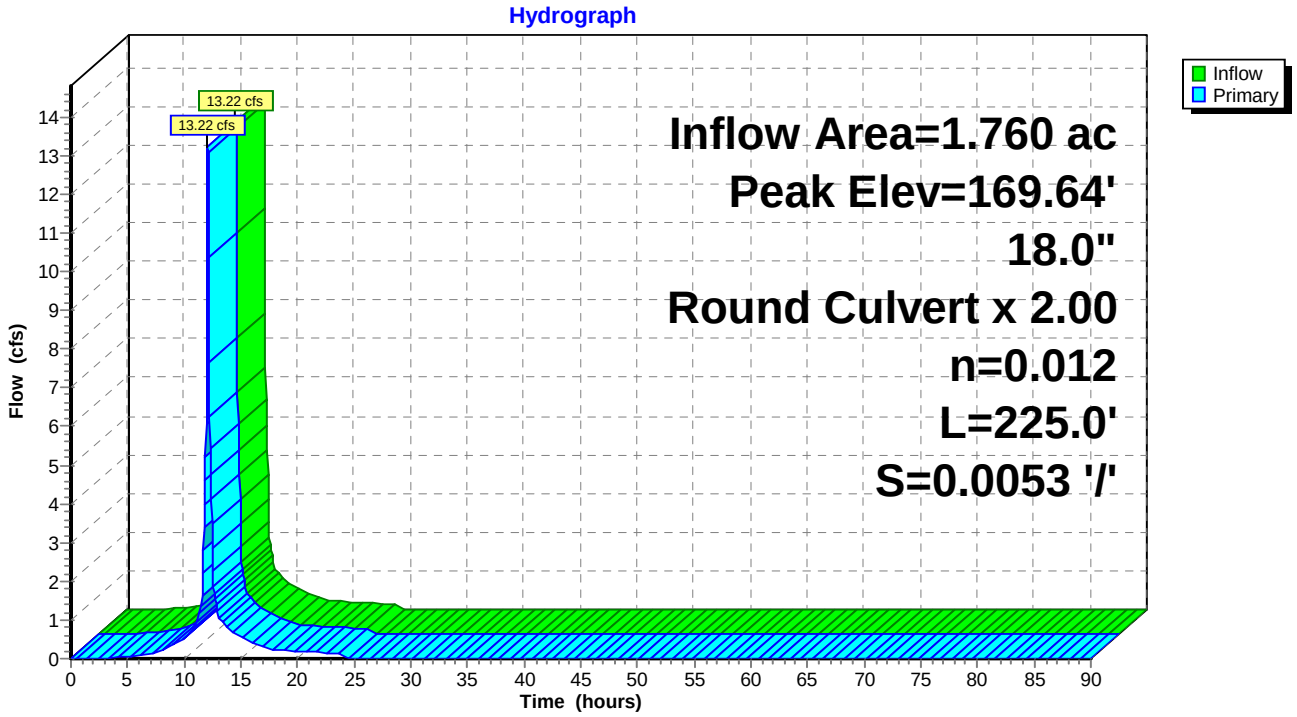
Inflow Area = 1.760 ac, 63.54% Impervious, Inflow Depth = 6.98" for 100-Year event
Inflow = 13.22 cfs @ 12.09 hrs, Volume= 1.024 af
Outflow = 13.22 cfs @ 12.09 hrs, Volume= 1.024 af, Atten= 0%, Lag= 0.0 min
Primary = 13.22 cfs @ 12.09 hrs, Volume= 1.024 af

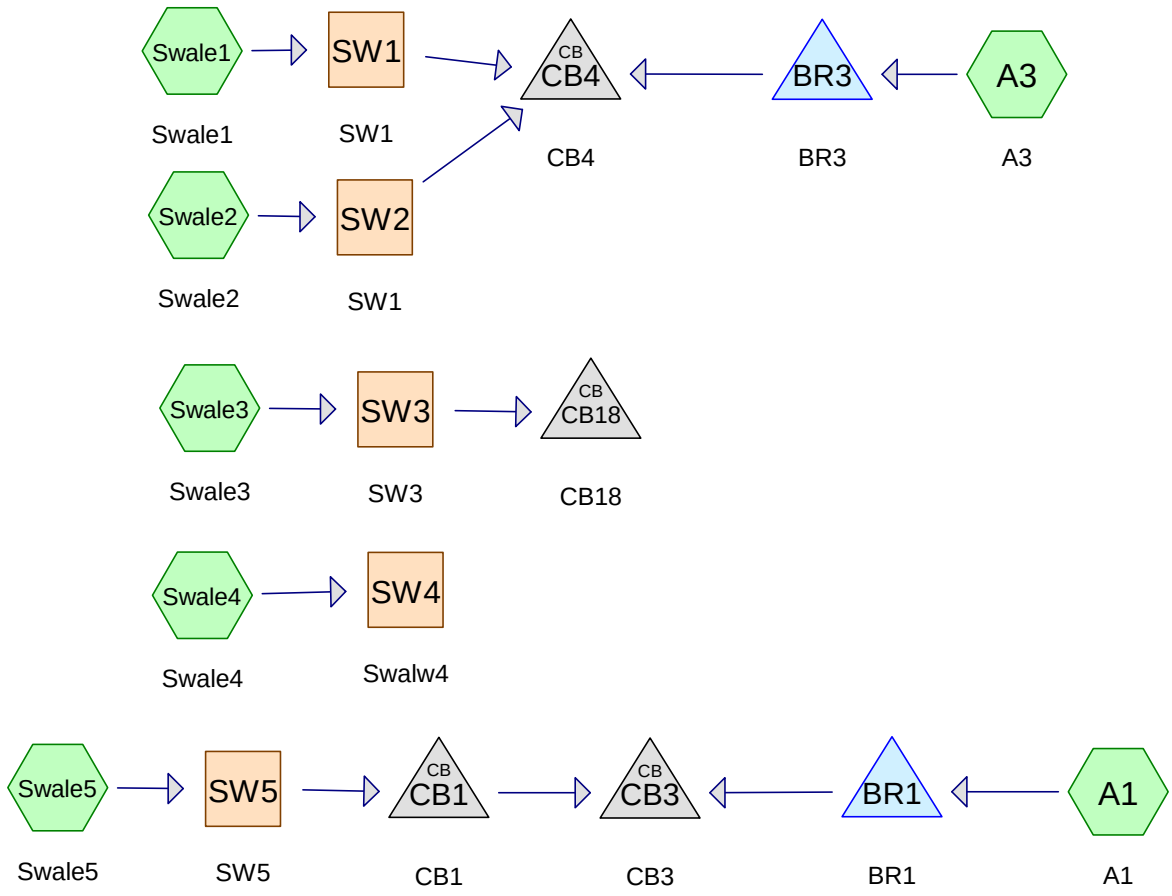
Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 169.64' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	168.20'	**18.0" Round Culvert X 2.00** L= 225.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 168.20' / 167.00' S= 0.0053 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=12.88 cfs @ 12.09 hrs HW=169.61' (Free Discharge)
└**1=Culvert** (Barrel Controls 12.88 cfs @ 4.83 fps)

Pond CB8: CB8





Subcat Reach Pond Link

Routing Diagram for 07.01.19 CHG&E Training Swales
Prepared by Lawrence J. Paggi, P.E., P.C., Printed 7/10/2019

Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: A1 Runoff Area=6.440 ac 38.66% Impervious Runoff Depth=6.15"
Tc=6.0 min CN=82 Runoff=44.24 cfs 3.298 af

Subcatchment A3: A3 Runoff Area=3.060 ac 49.02% Impervious Runoff Depth=6.38"
Tc=6.0 min CN=84 Runoff=21.64 cfs 1.628 af

Subcatchment Swale1: Swale1 Runoff Area=592,231 sf 16.58% Impervious Runoff Depth=5.31"
Flow Length=1,426' Tc=12.0 min CN=75 Runoff=68.89 cfs 6.020 af

Subcatchment Swale2: Swale2 Runoff Area=248,405 sf 8.75% Impervious Runoff Depth=4.96"
Flow Length=840' Tc=16.4 min CN=72 Runoff=24.06 cfs 2.356 af

Subcatchment Swale3: Swale3 Runoff Area=38,991 sf 0.00% Impervious Runoff Depth=4.72"
Flow Length=398' Tc=11.4 min CN=70 Runoff=4.12 cfs 0.352 af

Subcatchment Swale4: Swale4 Runoff Area=237,961 sf 32.44% Impervious Runoff Depth=4.72"
Flow Length=354' Tc=6.4 min CN=70 Runoff=29.36 cfs 2.150 af

Subcatchment Swale5: Swale5 Runoff Area=63,167 sf 0.00% Impervious Runoff Depth=5.19"
Flow Length=787' Tc=14.9 min CN=74 Runoff=6.66 cfs 0.628 af

Reach SW1: SW1 Avg. Flow Depth=1.26' Max Vel=4.48 fps Inflow=68.89 cfs 6.020 af
n=0.035 L=654.0' S=0.0122 '/' Capacity=161.08 cfs Outflow=66.88 cfs 6.020 af

Reach SW2: SW1 Avg. Flow Depth=0.60' Max Vel=3.97 fps Inflow=24.06 cfs 2.356 af
n=0.035 L=895.0' S=0.0223 '/' Capacity=124.67 cfs Outflow=23.30 cfs 2.356 af

Reach SW3: SW3 Avg. Flow Depth=0.25' Max Vel=1.62 fps Inflow=4.12 cfs 0.352 af
n=0.035 L=670.0' S=0.0104 '/' Capacity=40.03 cfs Outflow=3.58 cfs 0.352 af

Reach SW4: Swalw4 Avg. Flow Depth=0.68' Max Vel=4.25 fps Inflow=29.36 cfs 2.150 af
n=0.035 L=272.0' S=0.0221 '/' Capacity=123.86 cfs Outflow=29.08 cfs 2.150 af

Reach SW5: SW5 Avg. Flow Depth=0.43' Max Vel=2.82 fps Inflow=6.66 cfs 0.628 af
n=0.035 L=687.0' S=0.0189 '/' Capacity=31.55 cfs Outflow=6.34 cfs 0.628 af

Pond BR1: BR1 Peak Elev=167.30' Storage=19,316 cf Inflow=44.24 cfs 3.298 af
Outflow=37.15 cfs 3.144 af

Pond BR3: BR3 Peak Elev=168.06' Storage=9,019 cf Inflow=21.64 cfs 1.628 af
Outflow=17.84 cfs 1.534 af

Pond CB1: CB1 Peak Elev=168.80' Inflow=6.34 cfs 0.628 af
18.0" Round Culvert n=0.012 L=270.0' S=0.0126 '/' Outflow=6.34 cfs 0.628 af

Pond CB18: CB18 Peak Elev=175.90' Inflow=3.58 cfs 0.352 af
18.0" Round Culvert n=0.012 L=285.0' S=0.0316 '/' Outflow=3.58 cfs 0.352 af

Pond CB3: CB3 Peak Elev=165.07' Inflow=42.14 cfs 3.771 af
36.0" Round Culvert n=0.012 L=210.0' S=0.0050 '/' Outflow=42.14 cfs 3.771 af

Pond CB4: CB4 Peak Elev=164.63' Inflow=104.14 cfs 9.910 af
77.0" x 52.0", R=39.4"/121.3" Pipe Arch Culvert n=0.012 L=280.0' S=0.0050 '/' Outflow=104.14 cfs 9.910 af

Summary for Subcatchment A1: A1

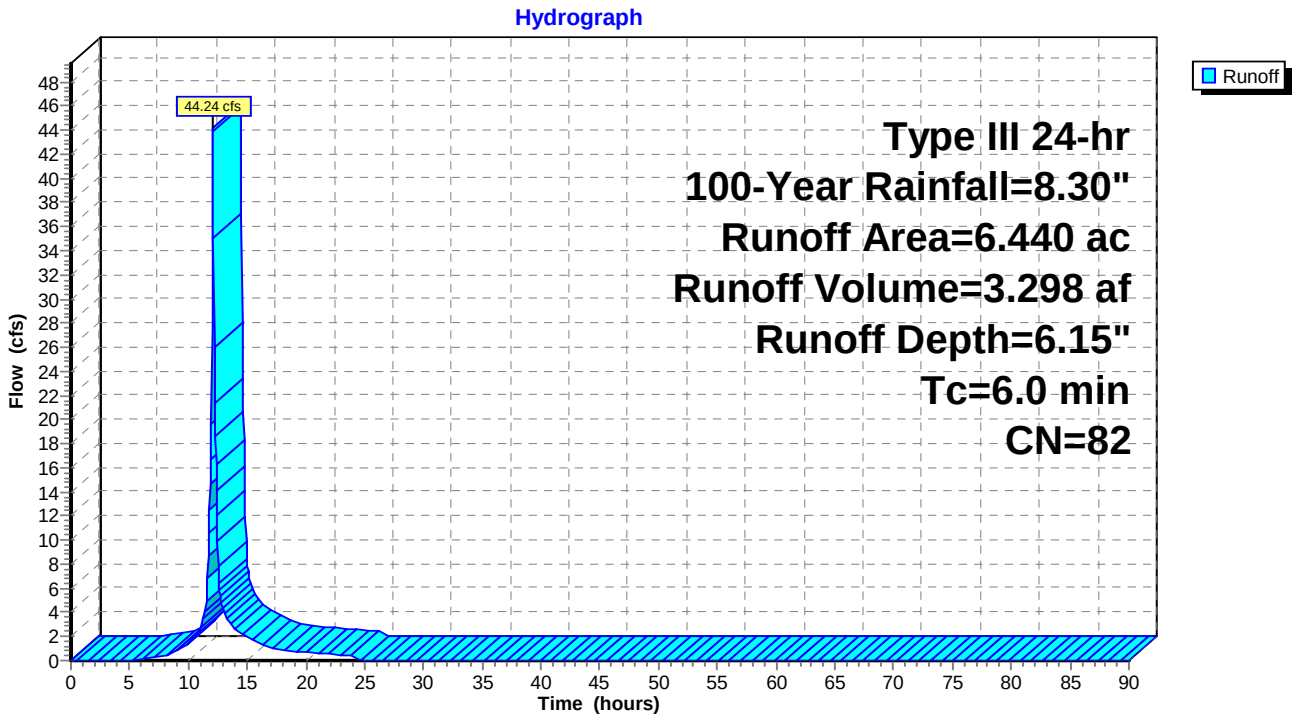
Runoff = 44.24 cfs @ 12.09 hrs, Volume= 3.298 af, Depth= 6.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (ac)	CN	Description
2.490	98	Unconnected pavement, HSG C
3.660	74	>75% Grass cover, Good, HSG C
0.290	39	>75% Grass cover, Good, HSG A
6.440	82	Weighted Average
3.950		61.34% Pervious Area
2.490		38.66% Impervious Area
2.490		100.00% Unconnected

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

Subcatchment A1: A1



Summary for Subcatchment A3: A3

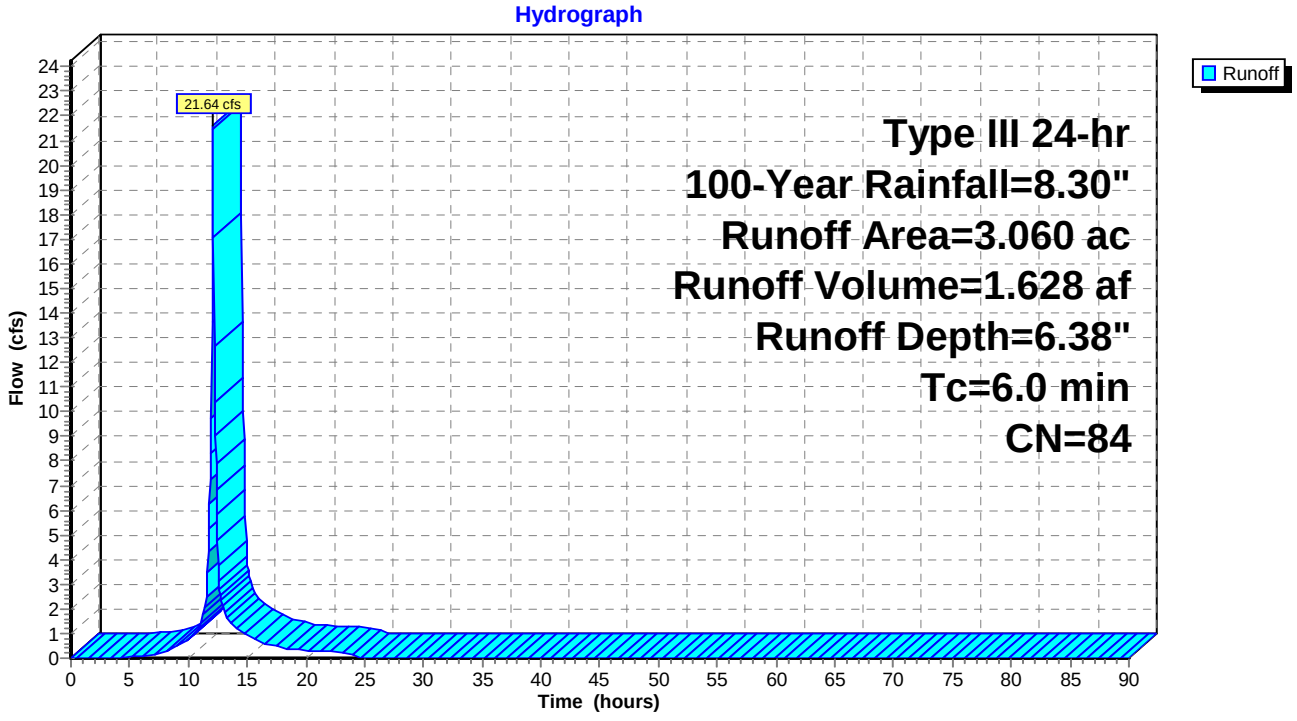
Runoff = 21.64 cfs @ 12.09 hrs, Volume= 1.628 af, Depth= 6.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (ac)	CN	Description
1.500	98	Paved parking, HSG C
1.380	74	>75% Grass cover, Good, HSG C
0.180	39	>75% Grass cover, Good, HSG A
3.060	84	Weighted Average
1.560		50.98% Pervious Area
1.500		49.02% Impervious Area

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

Subcatchment A3: A3



Summary for Subcatchment Swale1: Swale1

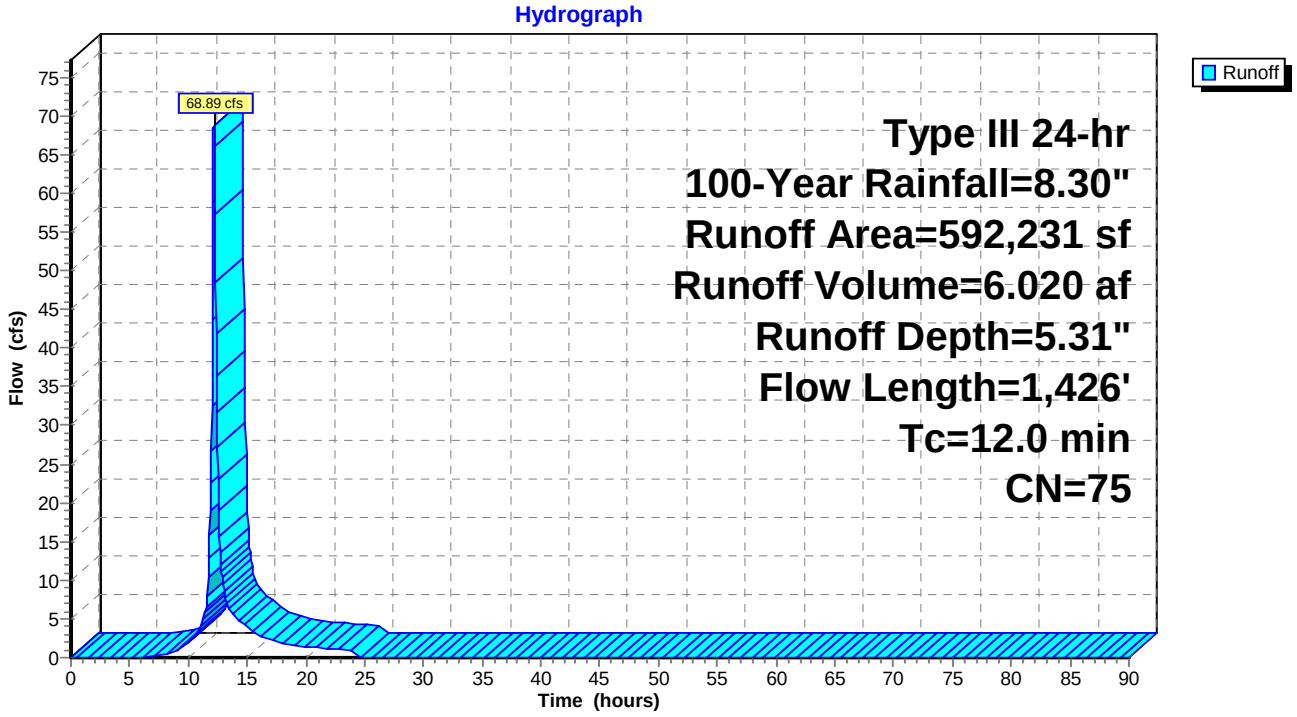
Runoff = 68.89 cfs @ 12.17 hrs, Volume= 6.020 af, Depth= 5.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

	Area (sf)	CN	Description
*	98,169	98	Roofs, driveways off site
	494,062	70	Woods, Good, HSG C
	592,231	75	Weighted Average
	494,062		83.42% Pervious Area
	98,169		16.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	100	0.4400	0.28		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	200	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	472	0.0170	3.20	73.63	**Channel Flow,** Area= 23.0 sf Perim= 52.3' r= 0.44' n= 0.035
2.8	654	0.0120	3.93	86.51	**Channel Flow,** Area= 22.0 sf Perim= 28.3' r= 0.78' n= 0.035
12.0	1,426	Total			

Subcatchment Swale1: Swale1



Summary for Subcatchment Swale2: Swale2

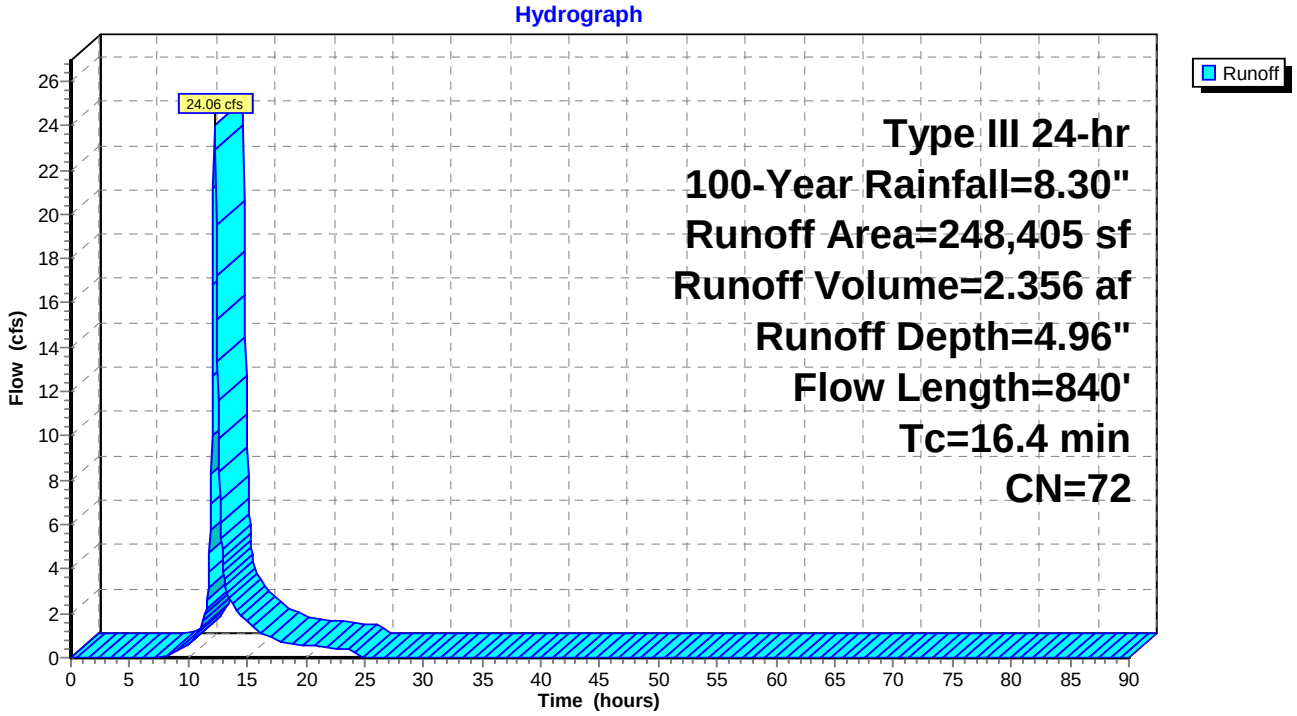
Runoff = 24.06 cfs @ 12.23 hrs, Volume= 2.356 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

	Area (sf)	CN	Description
*	21,738	98	Roofs, driveways off site
	226,667	70	Woods, Good, HSG C
	248,405	72	Weighted Average
	226,667		91.25% Pervious Area
	21,738		8.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.4	110	0.0700	4.26		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.8	630	0.0270	5.90	129.76	**Channel Flow,** Area= 22.0 sf Perim= 28.3' r= 0.78' n= 0.035
16.4	840	Total			

Subcatchment Swale2: Swale2



Summary for Subcatchment Swale3: Swale3

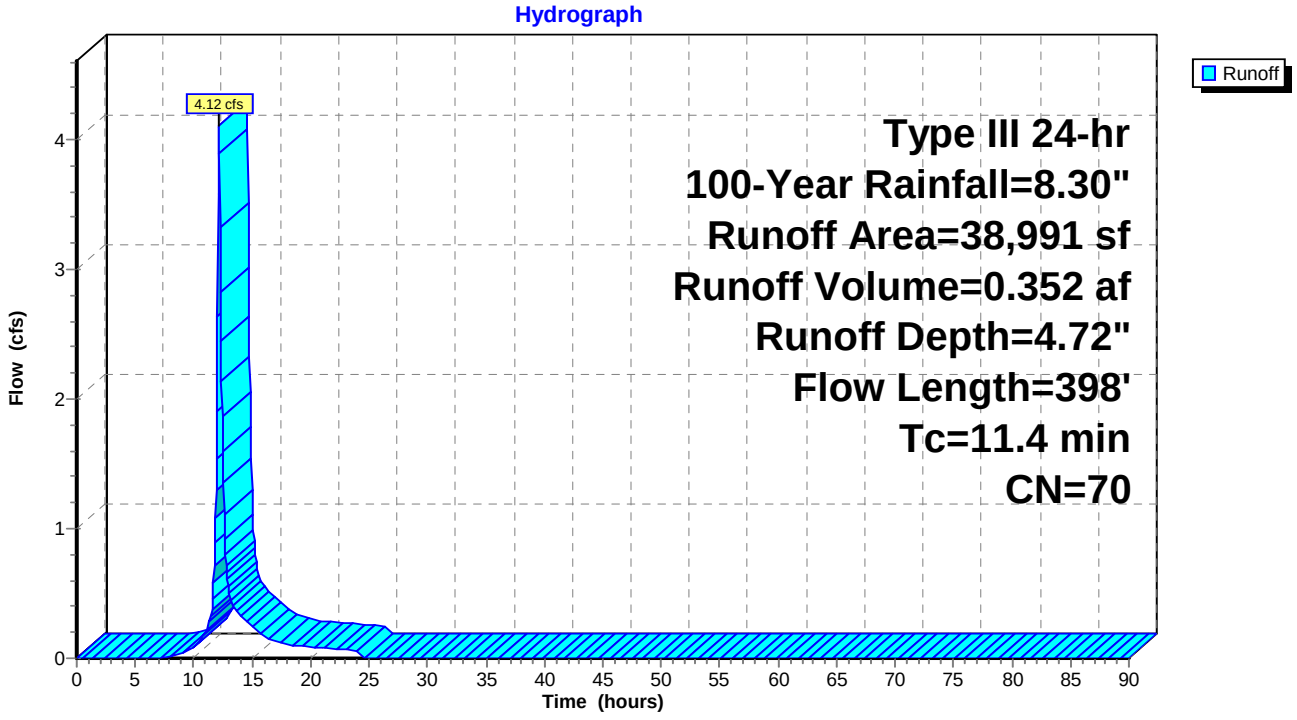
Runoff = 4.12 cfs @ 12.16 hrs, Volume= 0.352 af, Depth= 4.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
38,991	70	Woods, Good, HSG C
38,991		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.1100	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.2	74	0.0950	4.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	224	0.0180	4.82	105.95	**Channel Flow,** Area= 22.0 sf Perim= 28.3' r= 0.78' n= 0.035
11.4	398	Total			

Subcatchment Swale3: Swale3



Summary for Subcatchment Swale4: Swale4

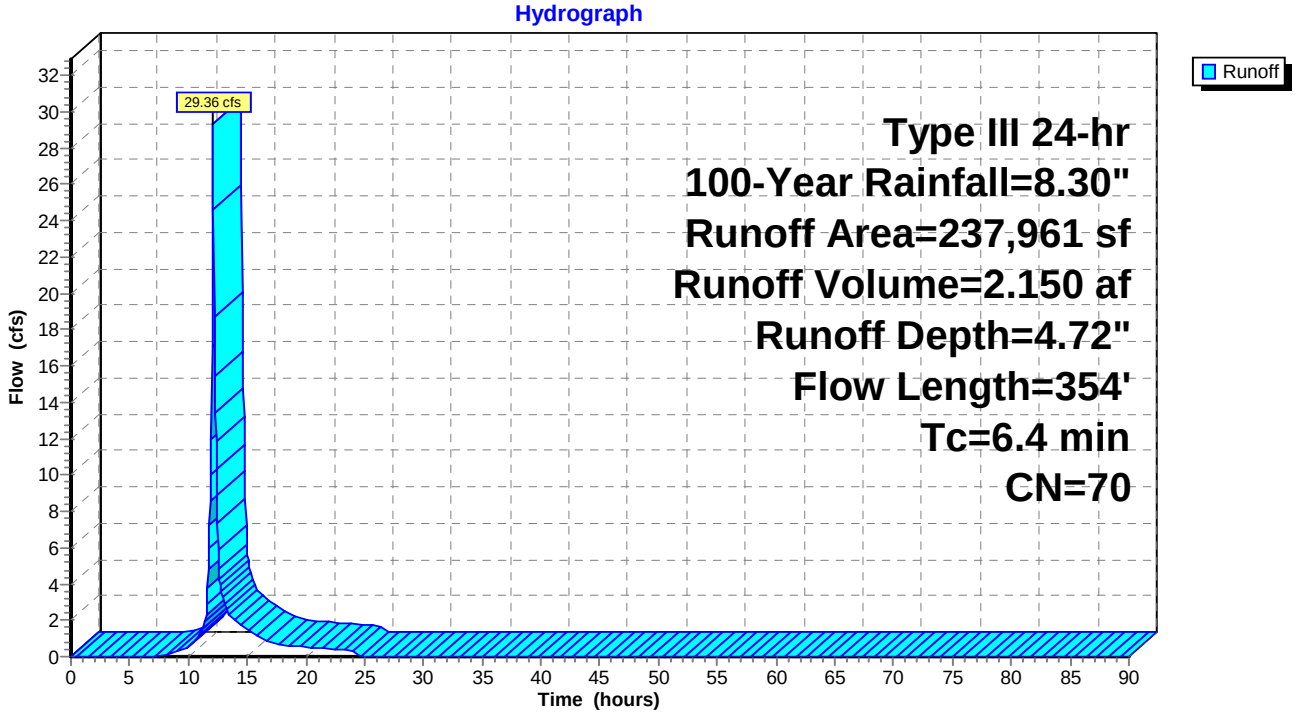
Runoff = 29.36 cfs @ 12.10 hrs, Volume= 2.150 af, Depth= 4.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
77,187	98	Roofs, HSG C
47,429	30	Woods, Good, HSG A
5,630	70	Woods, Good, HSG C
49,149	77	Woods, Good, HSG D
29,566	39	>75% Grass cover, Good, HSG A
29,000	80	>75% Grass cover, Good, HSG D
237,961	70	Weighted Average
160,774		67.56% Pervious Area
77,187		32.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	82	0.1300	0.25		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.50"
0.9	272	0.0220	5.32	117.13	**Channel Flow,** Area= 22.0 sf Perim= 28.3' r= 0.78' n= 0.035
6.4	354	Total			

Subcatchment Swale4: Swale4



Summary for Subcatchment Swale5: Swale5

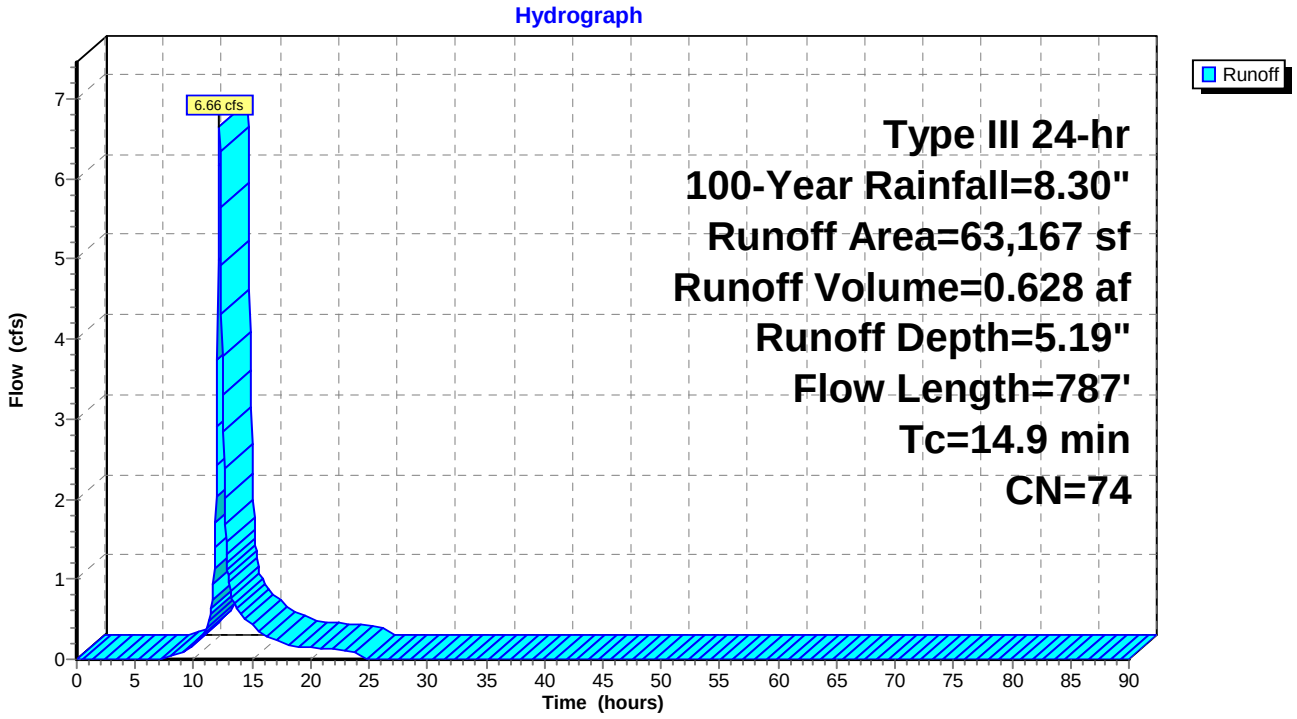
Runoff = 6.66 cfs @ 12.21 hrs, Volume= 0.628 af, Depth= 5.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (sf)	CN	Description
63,167	74	>75% Grass cover, Good, HSG C
63,167		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	100	0.0700	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
2.5	687	0.0190	4.57	63.96	**Channel Flow,** Area= 14.0 sf Perim= 20.3' r= 0.69' n= 0.035
14.9	787	Total			

Subcatchment Swale5: Swale5



Summary for Reach SW1: SW1

Inflow Area = 13.596 ac, 16.58% Impervious, Inflow Depth = 5.31" for 100-Year event
Inflow = 68.89 cfs @ 12.17 hrs, Volume= 6.020 af
Outflow = 66.88 cfs @ 12.20 hrs, Volume= 6.020 af, Atten= 3%, Lag= 2.0 min

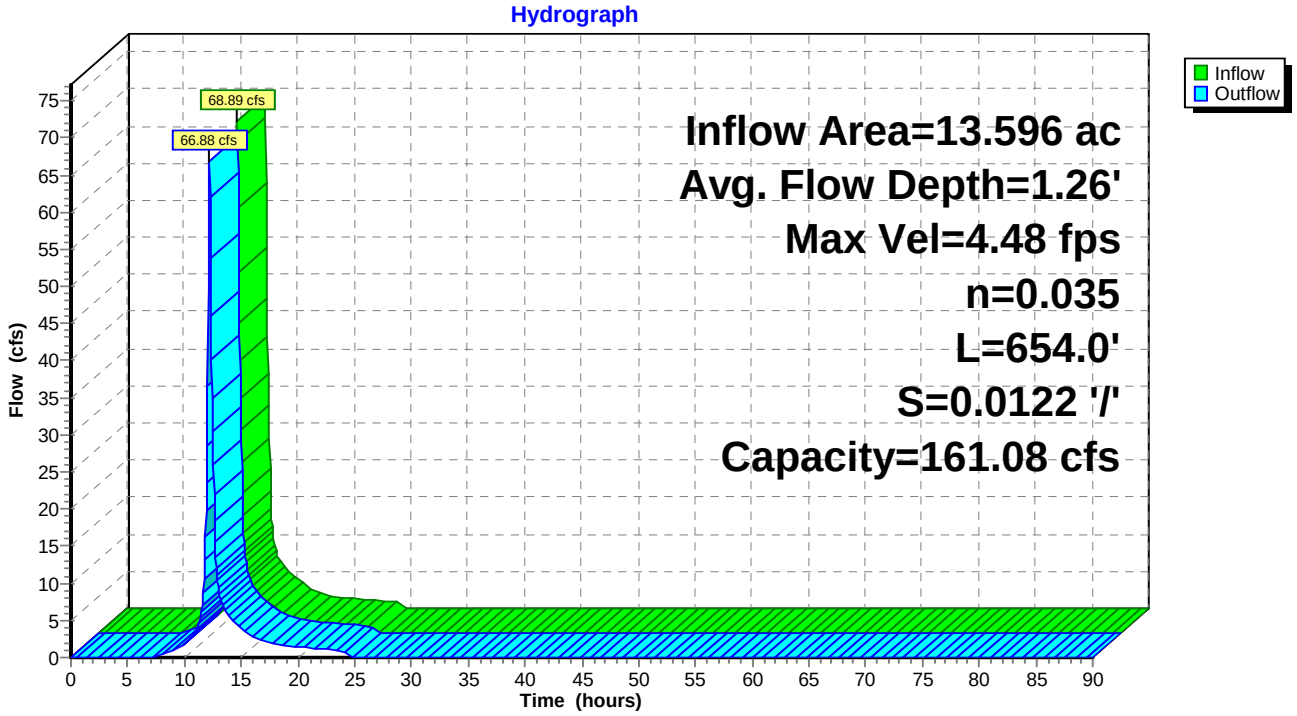
Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.48 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 1.24 fps, Avg. Travel Time= 8.8 min

Peak Storage= 9,758 cf @ 12.20 hrs
Average Depth at Peak Storage= 1.26'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 161.08 cfs

8.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 654.0' Slope= 0.0122 '/'
Inlet Invert= 170.00', Outlet Invert= 162.00'

‡

Reach SW1: SW1



Summary for Reach SW2: SW1

Inflow Area = 5.703 ac, 8.75% Impervious, Inflow Depth = 4.96" for 100-Year event
Inflow = 24.06 cfs @ 12.23 hrs, Volume= 2.356 af
Outflow = 23.30 cfs @ 12.27 hrs, Volume= 2.356 af, Atten= 3%, Lag= 2.8 min

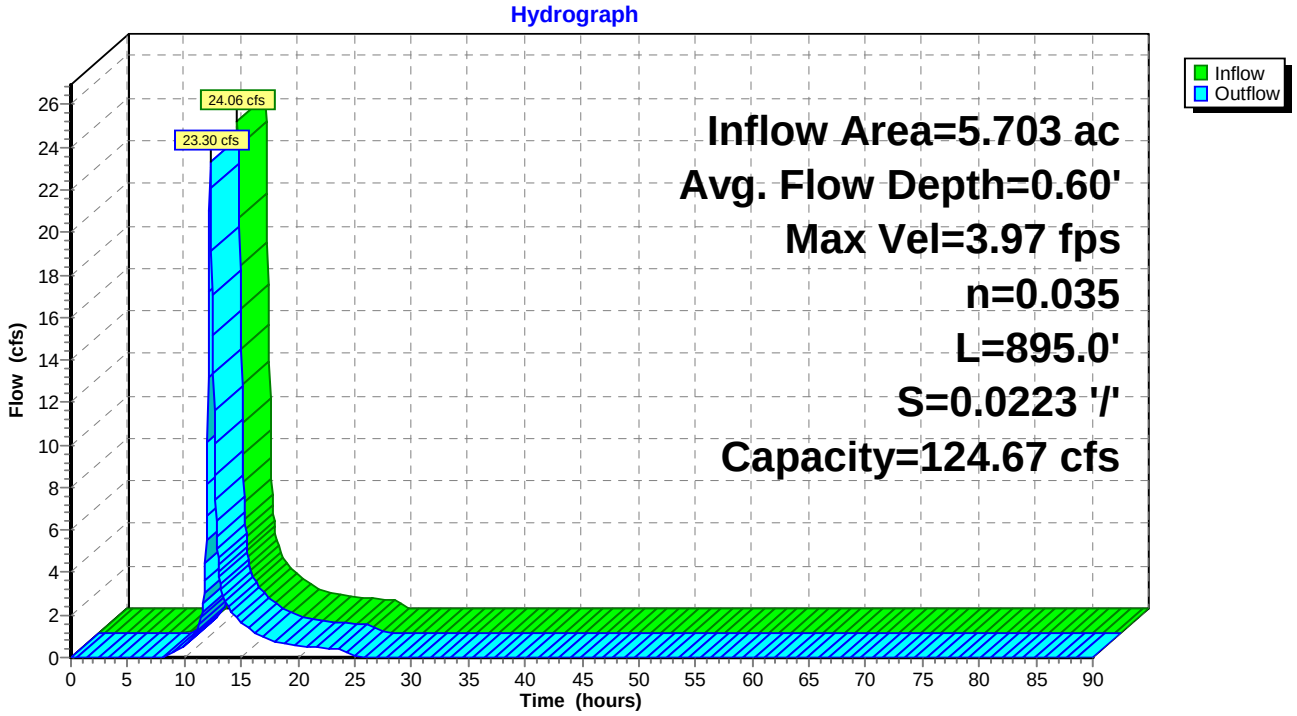
Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.97 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 13.9 min

Peak Storage= 5,238 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 1.50' Flow Area= 18.8 sf, Capacity= 124.67 cfs

8.00' x 1.50' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 895.0' Slope= 0.0223 '/'
Inlet Invert= 182.00', Outlet Invert= 162.00'

‡

Reach SW2: SW1



Summary for Reach SW3: SW3

Inflow Area = 0.895 ac, 0.00% Impervious, Inflow Depth = 4.72" for 100-Year event
Inflow = 4.12 cfs @ 12.16 hrs, Volume= 0.352 af
Outflow = 3.58 cfs @ 12.23 hrs, Volume= 0.352 af, Atten= 13%, Lag= 4.4 min

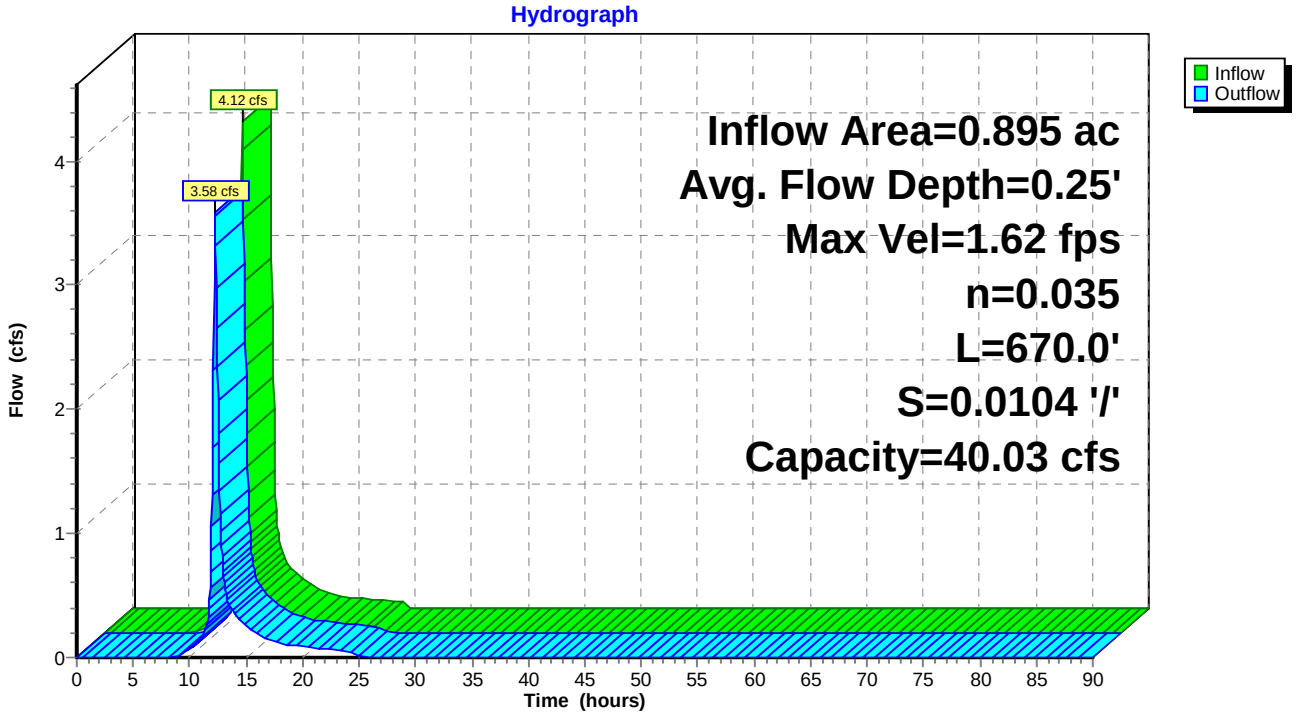
Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.62 fps, Min. Travel Time= 6.9 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 27.1 min

Peak Storage= 1,474 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.00' Flow Area= 11.0 sf, Capacity= 40.03 cfs

8.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 670.0' Slope= 0.0104 '/'
Inlet Invert= 180.00', Outlet Invert= 173.00'

‡

Reach SW3: SW3



Summary for Reach SW4: Swalw4

Inflow Area = 5.463 ac, 32.44% Impervious, Inflow Depth = 4.72" for 100-Year event
Inflow = 29.36 cfs @ 12.10 hrs, Volume= 2.150 af
Outflow = 29.08 cfs @ 12.11 hrs, Volume= 2.150 af, Atten= 1%, Lag= 0.7 min

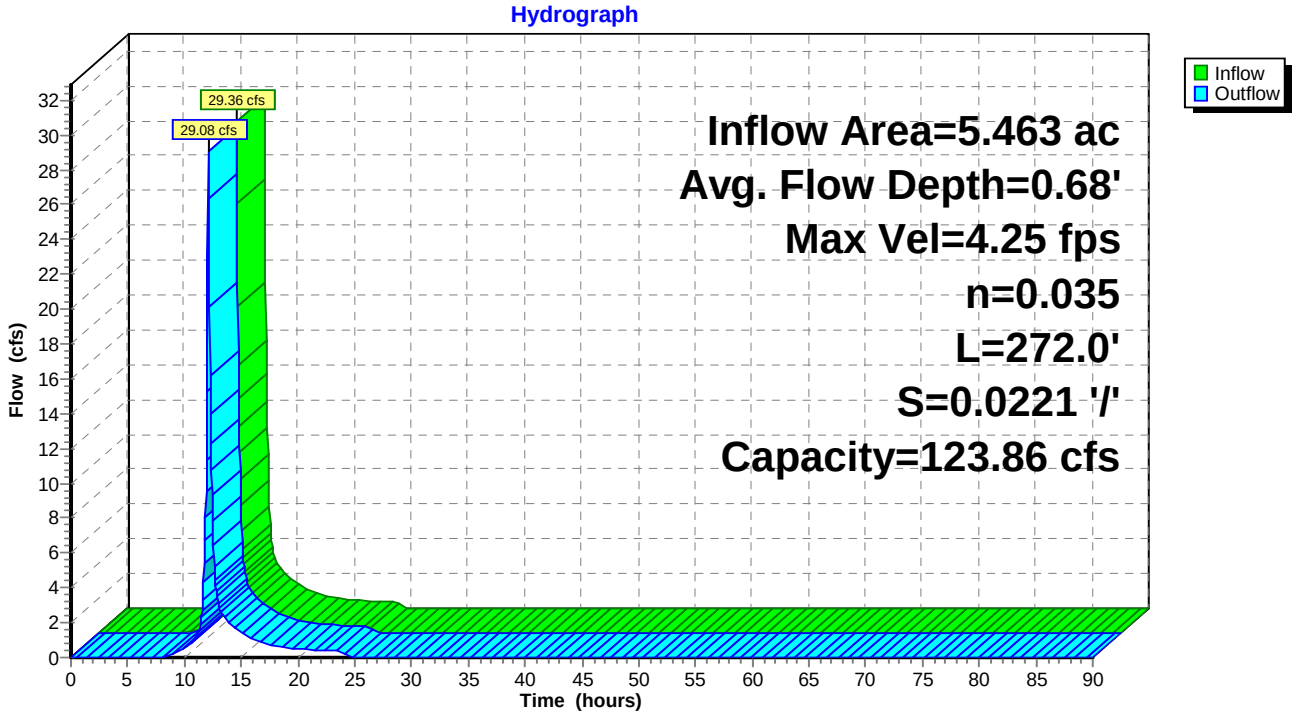
Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.25 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.17 fps, Avg. Travel Time= 3.9 min

Peak Storage= 1,858 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 1.50' Flow Area= 18.8 sf, Capacity= 123.86 cfs

8.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 272.0' Slope= 0.0221 '/'
Inlet Invert= 176.00', Outlet Invert= 170.00'

‡

Reach SW4: Swalw4



Summary for Reach SW5: SW5

Inflow Area = 1.450 ac, 0.00% Impervious, Inflow Depth = 5.19" for 100-Year event
Inflow = 6.66 cfs @ 12.21 hrs, Volume= 0.628 af
Outflow = 6.34 cfs @ 12.26 hrs, Volume= 0.628 af, Atten= 5%, Lag= 3.0 min

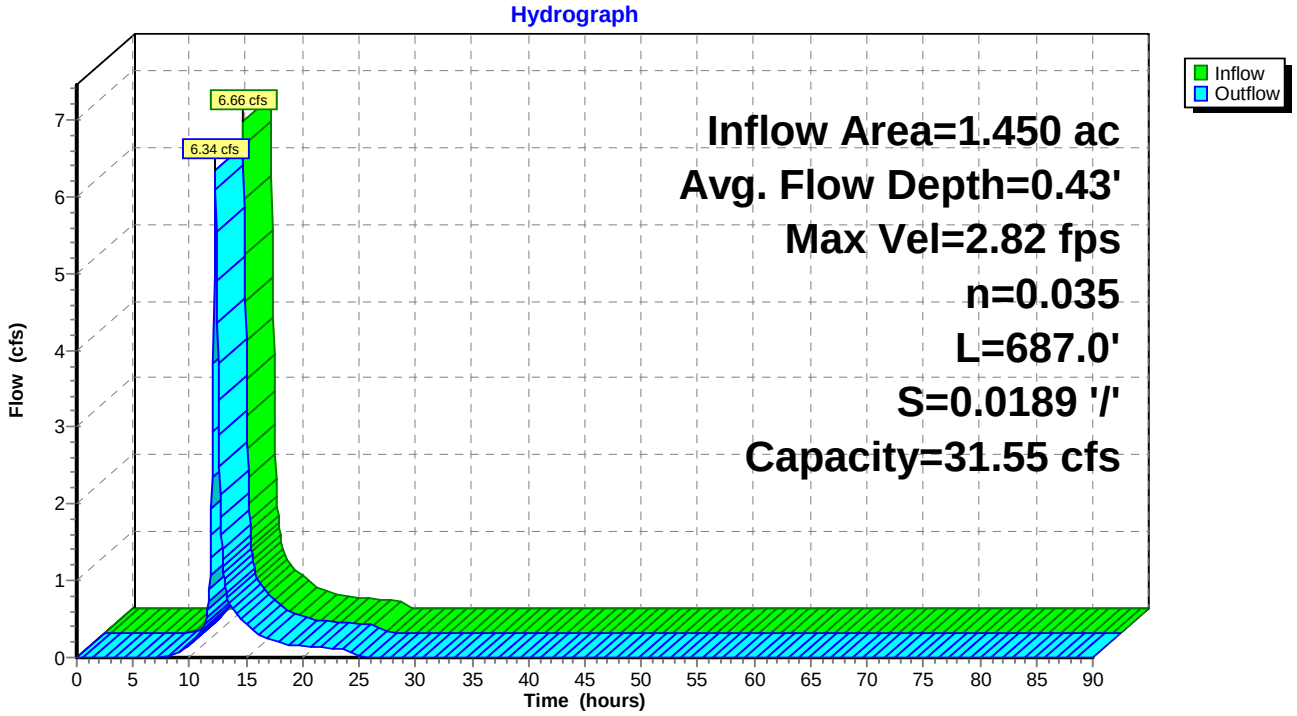
Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.82 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 14.8 min

Peak Storage= 1,543 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.00' Flow Area= 7.0 sf, Capacity= 31.55 cfs

4.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 10.00'
Length= 687.0' Slope= 0.0189 '/'
Inlet Invert= 184.00', Outlet Invert= 171.00'

‡

Reach SW5: SW5



Summary for Pond BR1: BR1

Inflow Area = 6.440 ac, 38.66% Impervious, Inflow Depth = 6.15" for 100-Year event
Inflow = 44.24 cfs @ 12.09 hrs, Volume= 3.298 af
Outflow = 37.15 cfs @ 12.15 hrs, Volume= 3.144 af, Atten= 16%, Lag= 3.4 min
Primary = 37.15 cfs @ 12.15 hrs, Volume= 3.144 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 167.30' @ 12.15 hrs Surf.Area= 17,557 sf Storage= 19,316 cf

Plug-Flow detention time= 52.3 min calculated for 3.144 af (95% of inflow)
Center-of-Mass det. time= 25.2 min (822.0 - 796.8)

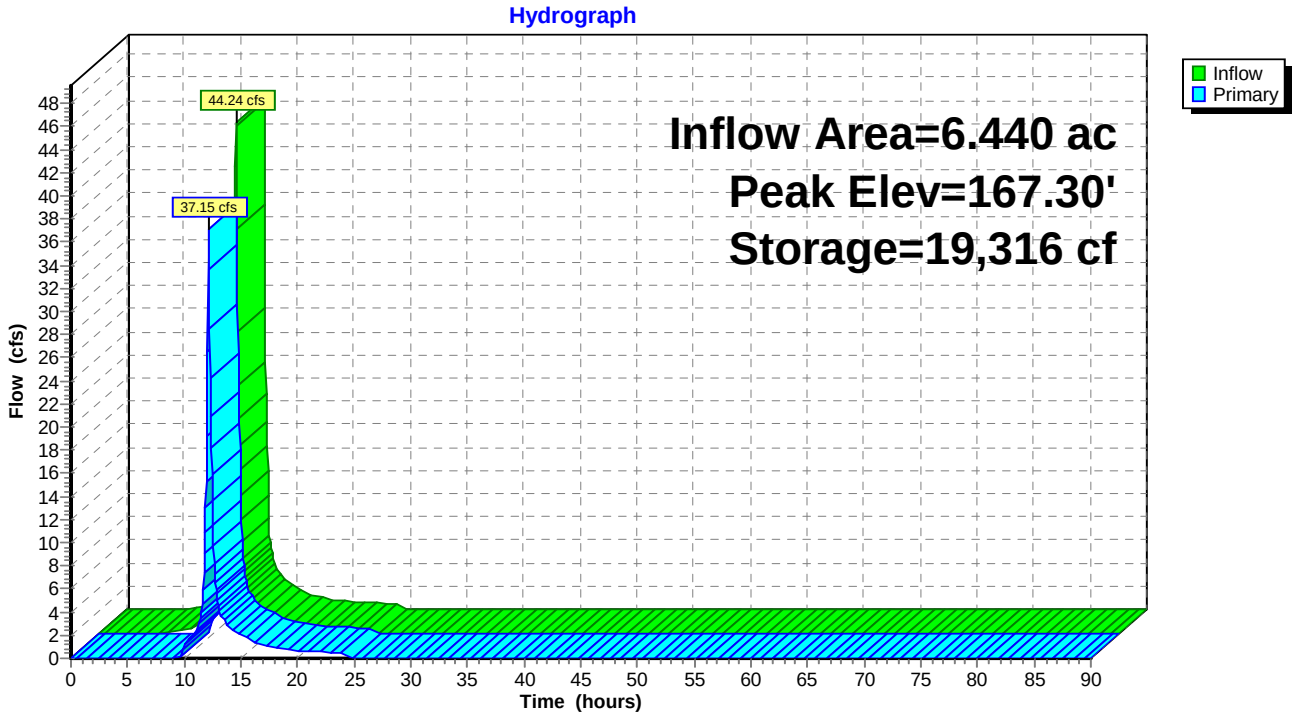
Volume	Invert	Avail.Storage	Storage Description
#1	166.00'	32,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
166.00	12,785	0	0
166.50	14,093	6,720	6,720
168.00	20,620	26,035	32,754

Device	Routing	Invert	Outlet Devices
#1	Primary	162.00'	**36.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 162.00' / 161.85' S= 0.0060 '/' Cc= 0.900 n= 0.012, Flow Area= 7.07 sf
#2	Device 1	166.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=36.95 cfs @ 12.15 hrs HW=167.29' TW=165.05' (Dynamic Tailwater)
↑**1=Culvert** (Passes 36.95 cfs of 50.97 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 36.95 cfs @ 2.91 fps)

Pond BR1: BR1


Hydrograph
Inflow
Primary
44.24 cfs
37.15 cfs
Inflow Area=6.440 ac
Peak Elev=167.30'
Storage=19,316 cf
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90

Summary for Pond BR3: BR3

Inflow Area = 3.060 ac, 49.02% Impervious, Inflow Depth = 6.38" for 100-Year event
Inflow = 21.64 cfs @ 12.09 hrs, Volume= 1.628 af
Outflow = 17.84 cfs @ 12.11 hrs, Volume= 1.534 af, Atten= 18%, Lag= 1.6 min
Primary = 17.84 cfs @ 12.11 hrs, Volume= 1.534 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 168.06' @ 12.15 hrs Surf.Area= 9,238 sf Storage= 9,019 cf

Plug-Flow detention time= 57.4 min calculated for 1.533 af (94% of inflow)
Center-of-Mass det. time= 26.0 min (817.8 - 791.8)

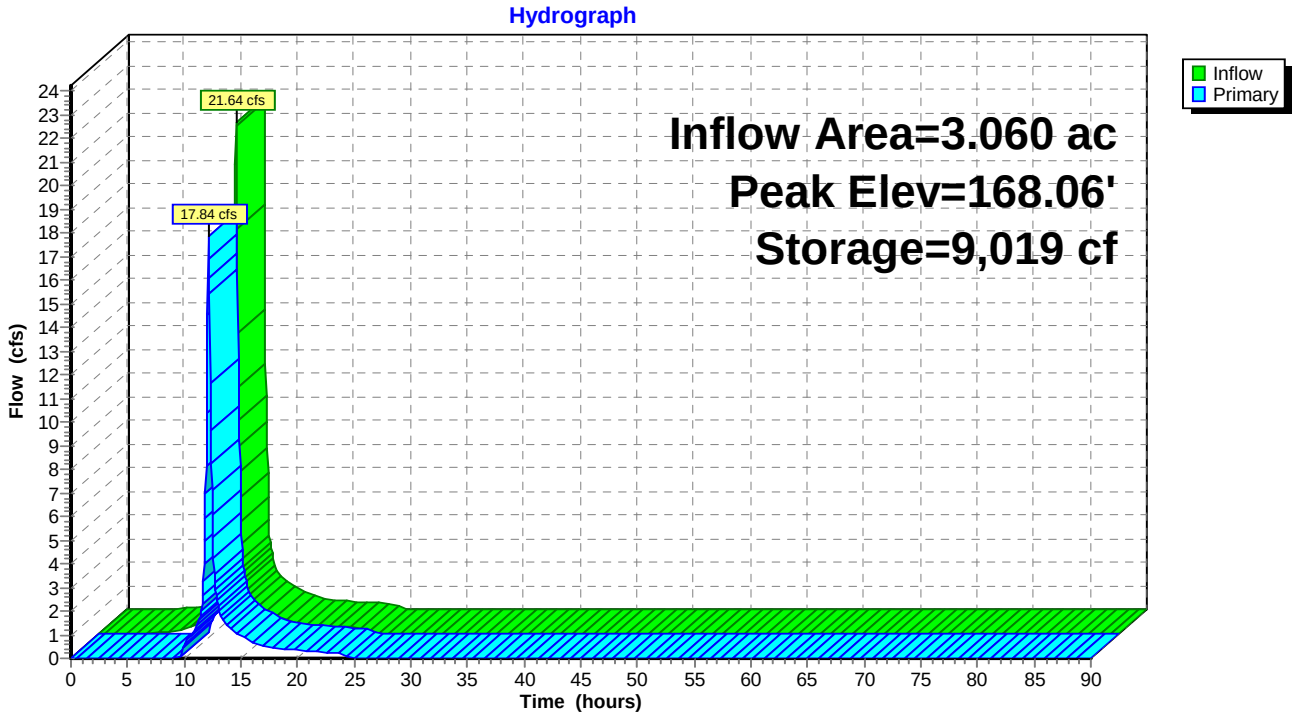
Volume	Invert	Avail.Storage	Storage Description
#1	167.00'	18,337 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
167.00	7,868	0	0
167.50	8,502	4,093	4,093
169.00	10,490	14,244	18,337

Device	Routing	Invert	Outlet Devices
#1	Primary	161.80'	**18.0" Round RCP_Round 18"** L= 45.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 161.80' / 161.57' S= 0.0051 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	167.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=16.59 cfs @ 12.11 hrs HW=168.03' TW=164.23' (Dynamic Tailwater)
↑**1=RCP_Round 18"** (Inlet Controls 16.59 cfs @ 9.39 fps)
↑**2=Orifice/Grate** (Passes 16.59 cfs of 20.04 cfs potential flow)

Pond BR3: BR3


Hydrograph
Inflow
Primary
21.64 cfs
17.84 cfs
Inflow Area=3.060 ac
Peak Elev=168.06'
Storage=9,019 cf
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90

Summary for Pond CB1: CB1

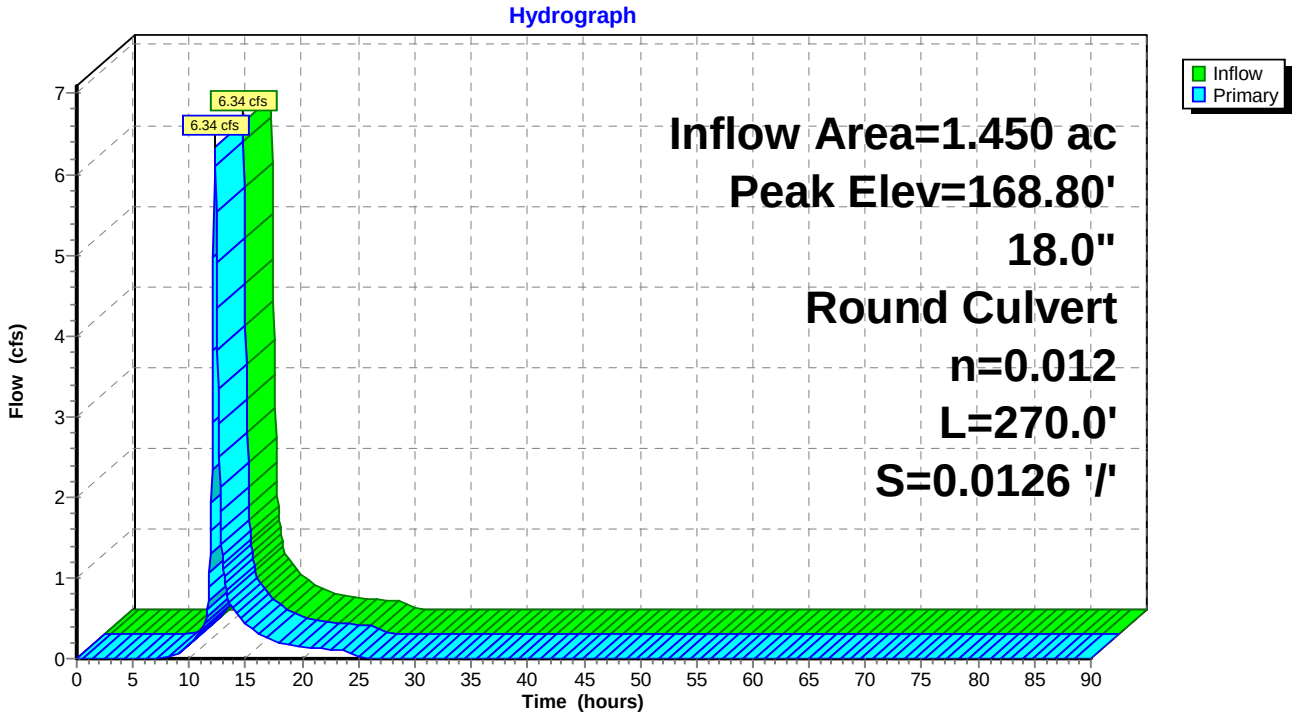
Inflow Area = 1.450 ac, 0.00% Impervious, Inflow Depth = 5.19" for 100-Year event
Inflow = 6.34 cfs @ 12.26 hrs, Volume= 0.628 af
Outflow = 6.34 cfs @ 12.26 hrs, Volume= 0.628 af, Atten= 0%, Lag= 0.0 min
Primary = 6.34 cfs @ 12.26 hrs, Volume= 0.628 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 168.80' @ 12.26 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	167.50'	**18.0" Round Culvert** L= 270.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 167.50' / 164.10' S= 0.0126 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=6.30 cfs @ 12.26 hrs HW=168.80' TW=164.60' (Dynamic Tailwater)
1=Culvert (Inlet Controls 6.30 cfs @ 3.88 fps)

Pond CB1: CB1



Summary for Pond CB18: CB18

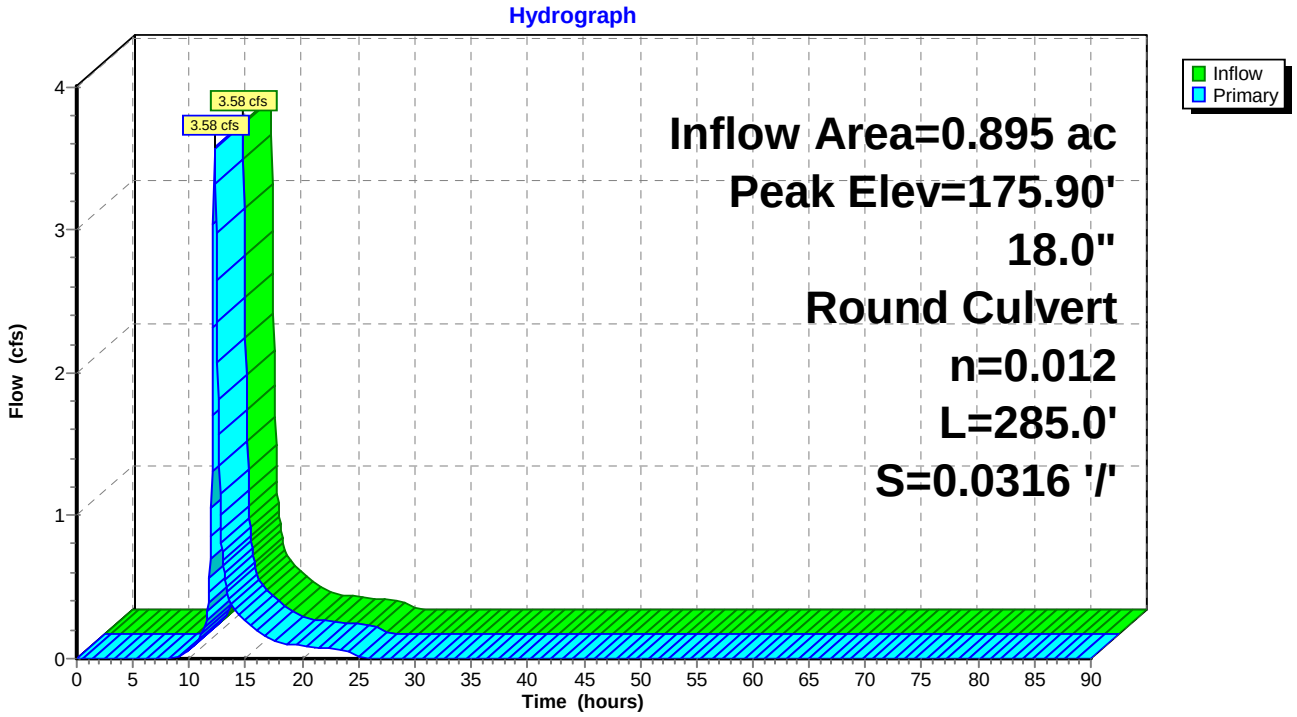
Inflow Area = 0.895 ac, 0.00% Impervious, Inflow Depth = 4.72" for 100-Year event
Inflow = 3.58 cfs @ 12.23 hrs, Volume= 0.352 af
Outflow = 3.58 cfs @ 12.23 hrs, Volume= 0.352 af, Atten= 0%, Lag= 0.0 min
Primary = 3.58 cfs @ 12.23 hrs, Volume= 0.352 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 175.90' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	175.00'	**18.0" Round Culvert** L= 285.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 175.00' / 166.00' S= 0.0316 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.55 cfs @ 12.23 hrs HW=175.90' (Free Discharge)
1=Culvert (Inlet Controls 3.55 cfs @ 3.22 fps)

Pond CB18: CB18



Summary for Pond CB3: CB3

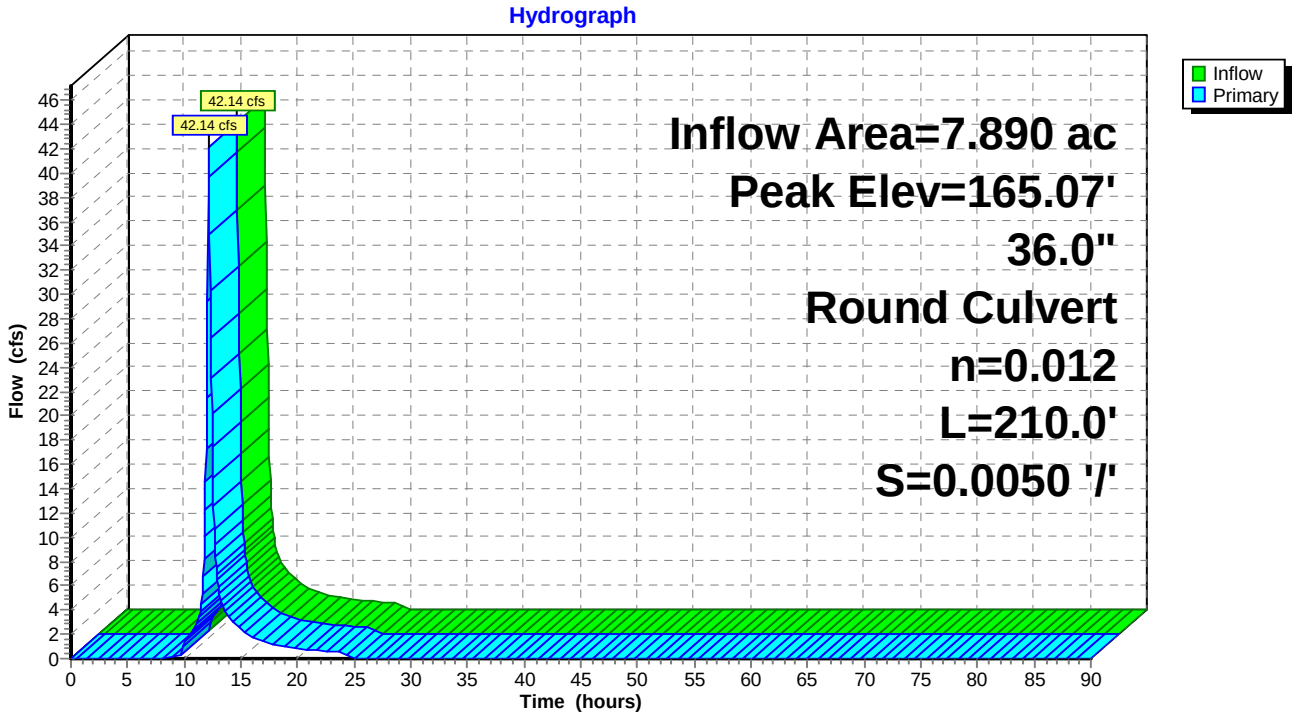
Inflow Area = 7.890 ac, 31.56% Impervious, Inflow Depth = 5.74" for 100-Year event
Inflow = 42.14 cfs @ 12.16 hrs, Volume= 3.771 af
Outflow = 42.14 cfs @ 12.16 hrs, Volume= 3.771 af, Atten= 0%, Lag= 0.0 min
Primary = 42.14 cfs @ 12.16 hrs, Volume= 3.771 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 165.07' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.85'	**36.0" Round Culvert** L= 210.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 161.85' / 160.80' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 7.07 sf

Primary OutFlow Max=41.86 cfs @ 12.16 hrs HW=165.05' (Free Discharge)
1=Culvert (Barrel Controls 41.86 cfs @ 6.90 fps)

Pond CB3: CB3



Summary for Pond CB4: CB4

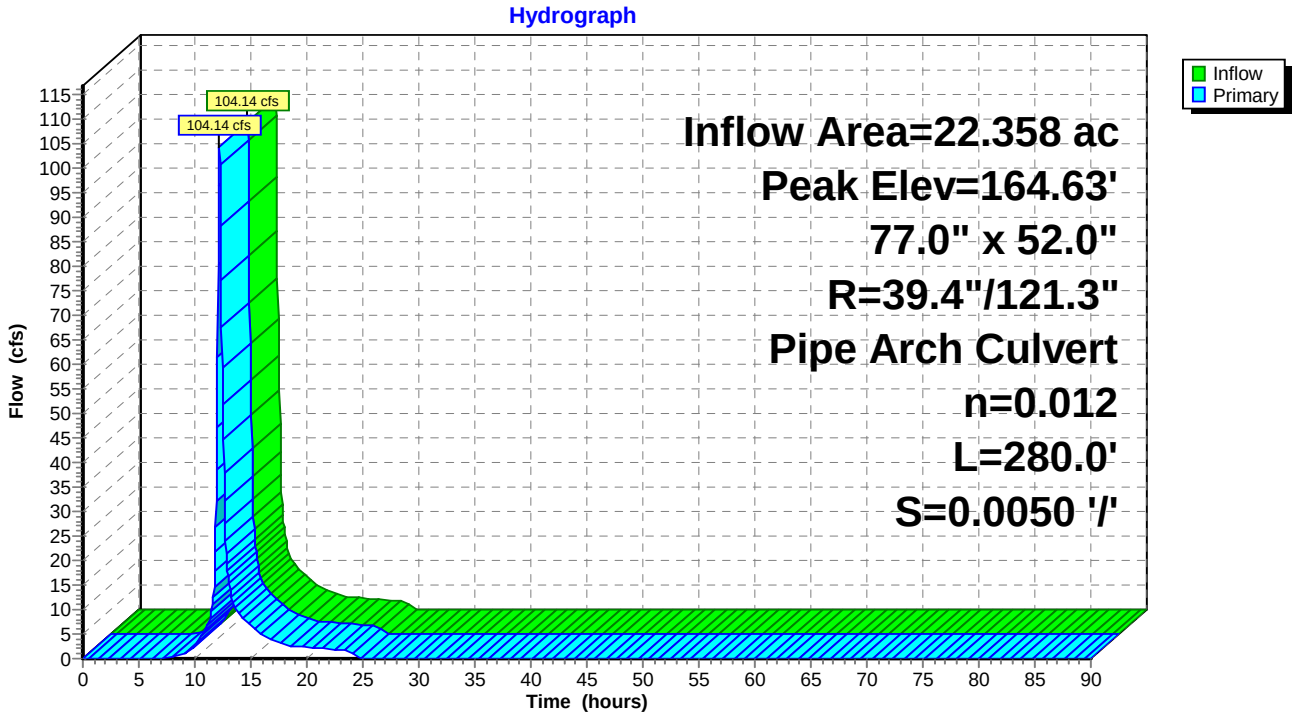
Inflow Area = 22.358 ac, 19.02% Impervious, Inflow Depth = 5.32" for 100-Year event
Inflow = 104.14 cfs @ 12.21 hrs, Volume= 9.910 af
Outflow = 104.14 cfs @ 12.21 hrs, Volume= 9.910 af, Atten= 0%, Lag= 0.0 min
Primary = 104.14 cfs @ 12.21 hrs, Volume= 9.910 af

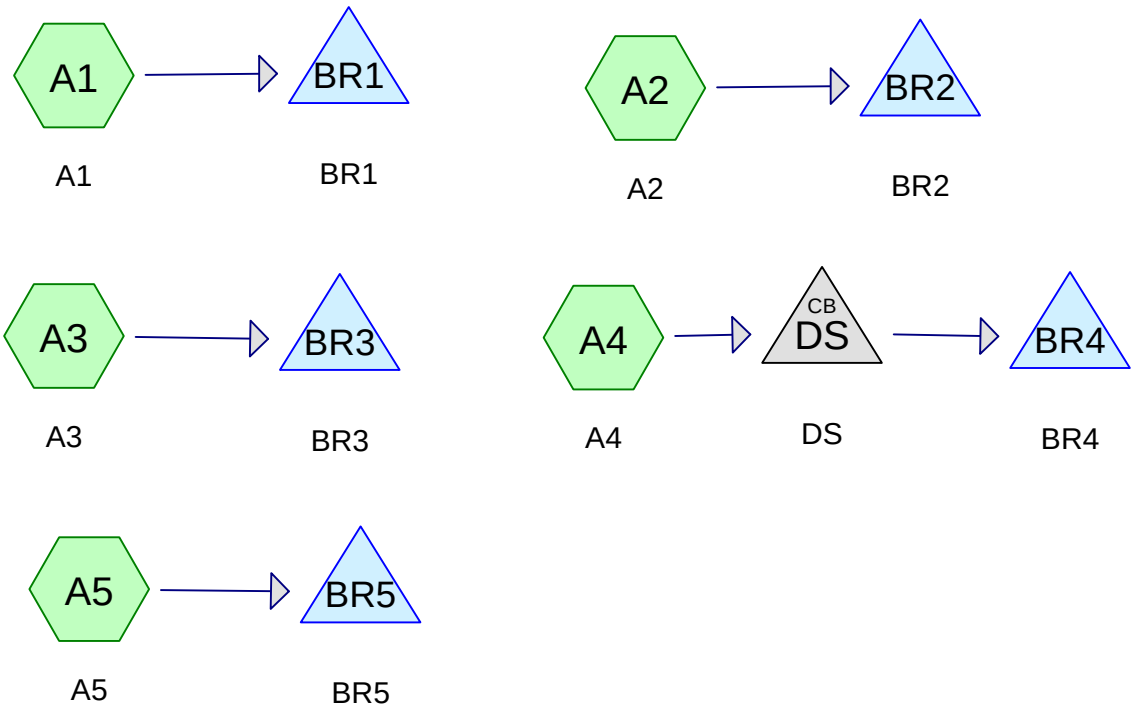
Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 164.63' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	161.40'	**77.0" W x 52.0" H, R=39.4"/121.3" Pipe Arch CMP_Arch_1/2 77x52** L= 280.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 161.40' / 160.00' S= 0.0050 '/' Cc= 0.900 n= 0.012, Flow Area= 22.05 sf

Primary OutFlow Max=103.30 cfs @ 12.21 hrs HW=164.61' (Free Discharge)
└**1=CMP_Arch_1/2 77x52** (Inlet Controls 103.30 cfs @ 5.68 fps)

Pond CB4: CB4





Subcat Reach Pond Link

Routing Diagram for 07.01.19 CHG&E Training BR

Prepared by Lawrence J. Paggi, P.E., P.C., Printed 7/10/2019

Time span=0.00-90.00 hrs, dt=0.05 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: A1 Runoff Area=6.440 ac 38.66% Impervious Runoff Depth=6.15"
Tc=6.0 min CN=82 Runoff=44.24 cfs 3.298 af

Subcatchment A2: A2 Runoff Area=4.080 ac 53.68% Impervious Runoff Depth=6.50"
Tc=6.0 min CN=85 Runoff=29.25 cfs 2.211 af

Subcatchment A3: A3 Runoff Area=3.060 ac 49.02% Impervious Runoff Depth=6.38"
Tc=6.0 min CN=84 Runoff=21.64 cfs 1.628 af

Subcatchment A4: A4 Runoff Area=4.460 ac 65.47% Impervious Runoff Depth=6.74"
Tc=6.0 min CN=87 Runoff=32.77 cfs 2.506 af

Subcatchment A5: A5 Runoff Area=3.800 ac 48.68% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=83 Runoff=26.50 cfs 1.984 af

Pond BR1: BR1 Peak Elev=167.69' Storage=26,588 cf Inflow=44.24 cfs 3.298 af
Outflow=26.69 cfs 3.144 af

Pond BR2: BR2 Peak Elev=164.86' Storage=10,921 cf Inflow=29.25 cfs 2.211 af
Outflow=27.35 cfs 2.071 af

Pond BR3: BR3 Peak Elev=168.25' Storage=10,841 cf Inflow=21.64 cfs 1.628 af
Outflow=17.03 cfs 1.534 af

Pond BR4: BR4 Peak Elev=164.88' Storage=12,642 cf Inflow=12.77 cfs 2.154 af
Outflow=12.09 cfs 1.995 af

Pond BR5: BR5 Peak Elev=168.34' Storage=10,159 cf Inflow=26.50 cfs 1.984 af
Outflow=24.84 cfs 1.849 af

Pond DS: DS Peak Elev=167.50' Inflow=32.77 cfs 2.506 af
Primary=12.77 cfs 2.154 af Secondary=20.00 cfs 0.351 af Outflow=32.77 cfs 2.506 af

Total Runoff Area = 21.840 ac Runoff Volume = 11.626 af Average Runoff Depth = 6.39"
49.86% Pervious = 10.890 ac 50.14% Impervious = 10.950 ac

Summary for Subcatchment A1: A1

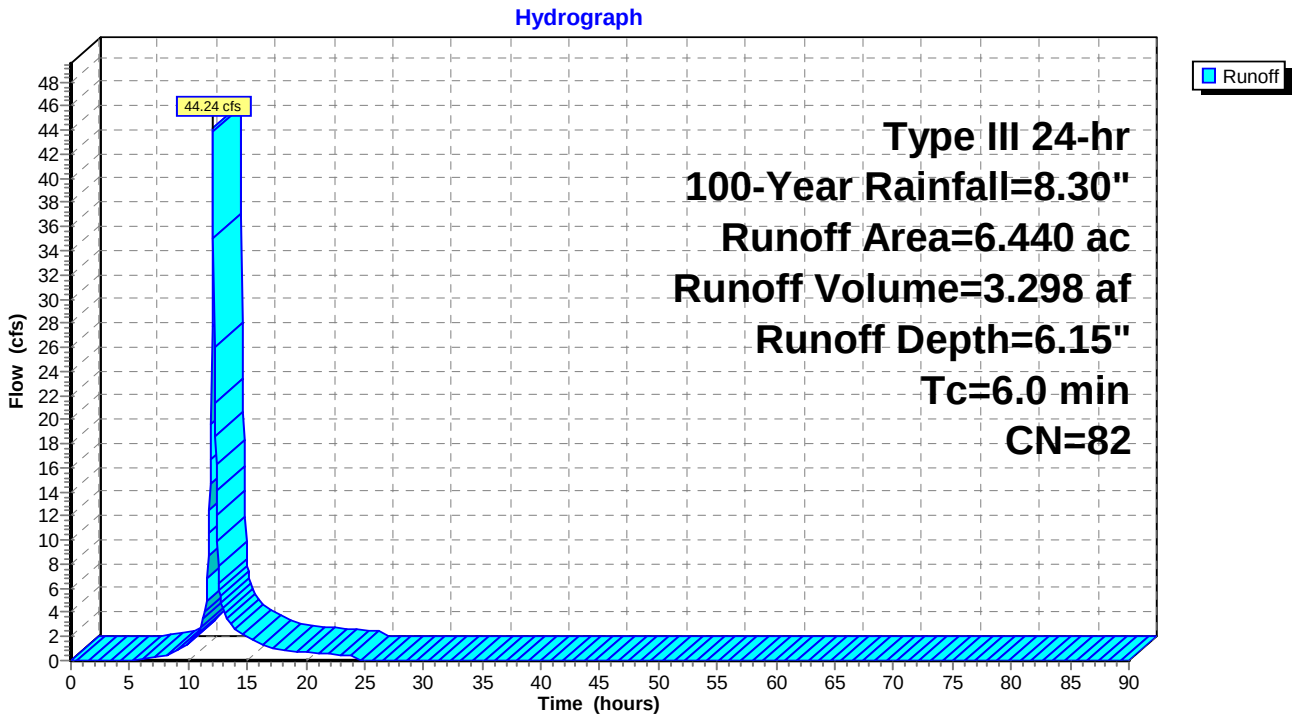
Runoff = 44.24 cfs @ 12.09 hrs, Volume= 3.298 af, Depth= 6.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (ac)	CN	Description
2.490	98	Unconnected pavement, HSG C
3.660	74	>75% Grass cover, Good, HSG C
0.290	39	>75% Grass cover, Good, HSG A
6.440	82	Weighted Average
3.950		61.34% Pervious Area
2.490		38.66% Impervious Area
2.490		100.00% Unconnected

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

Subcatchment A1: A1



Summary for Subcatchment A2: A2

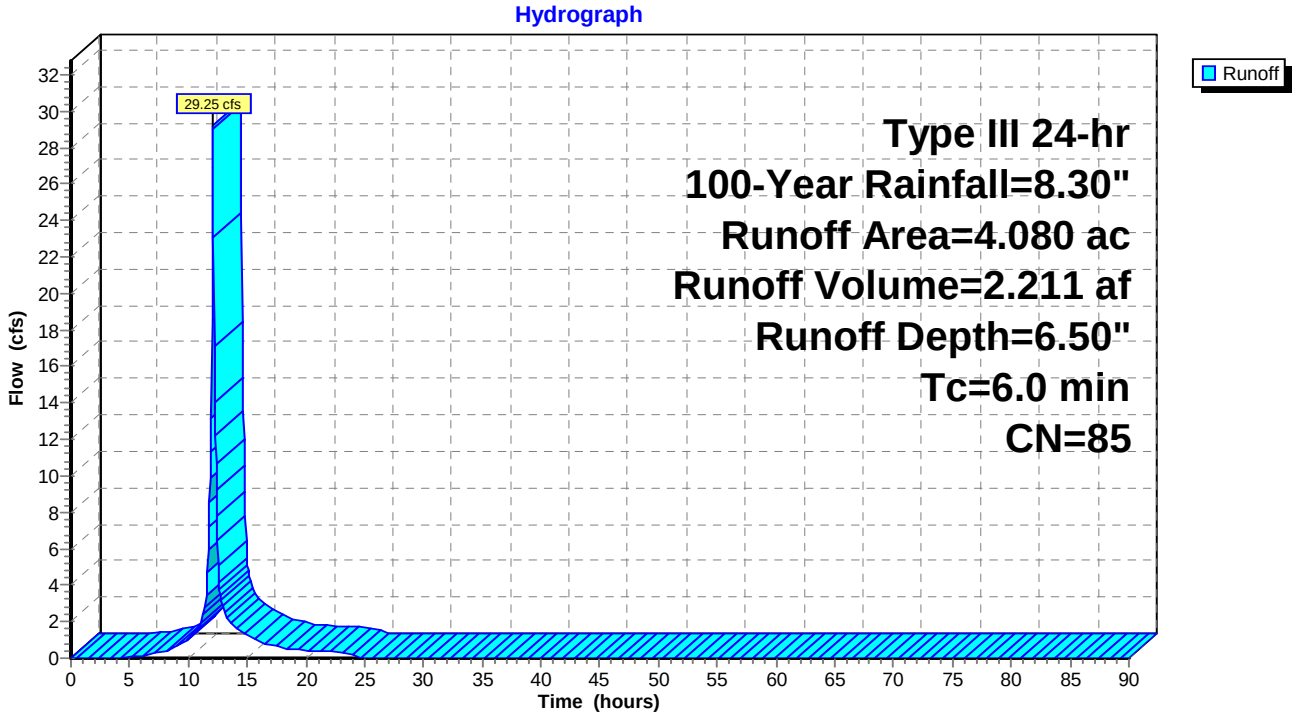
Runoff = 29.25 cfs @ 12.09 hrs, Volume= 2.211 af, Depth= 6.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

	Area (ac)	CN	Description
*	2.190	98	Roofs, driveways off site
	1.630	74	>75% Grass cover, Good, HSG C
	0.260	39	>75% Grass cover, Good, HSG A
	4.080	85	Weighted Average
	1.890		46.32% Pervious Area
	2.190		53.68% Impervious Area

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

Subcatchment A2: A2



Summary for Subcatchment A3: A3

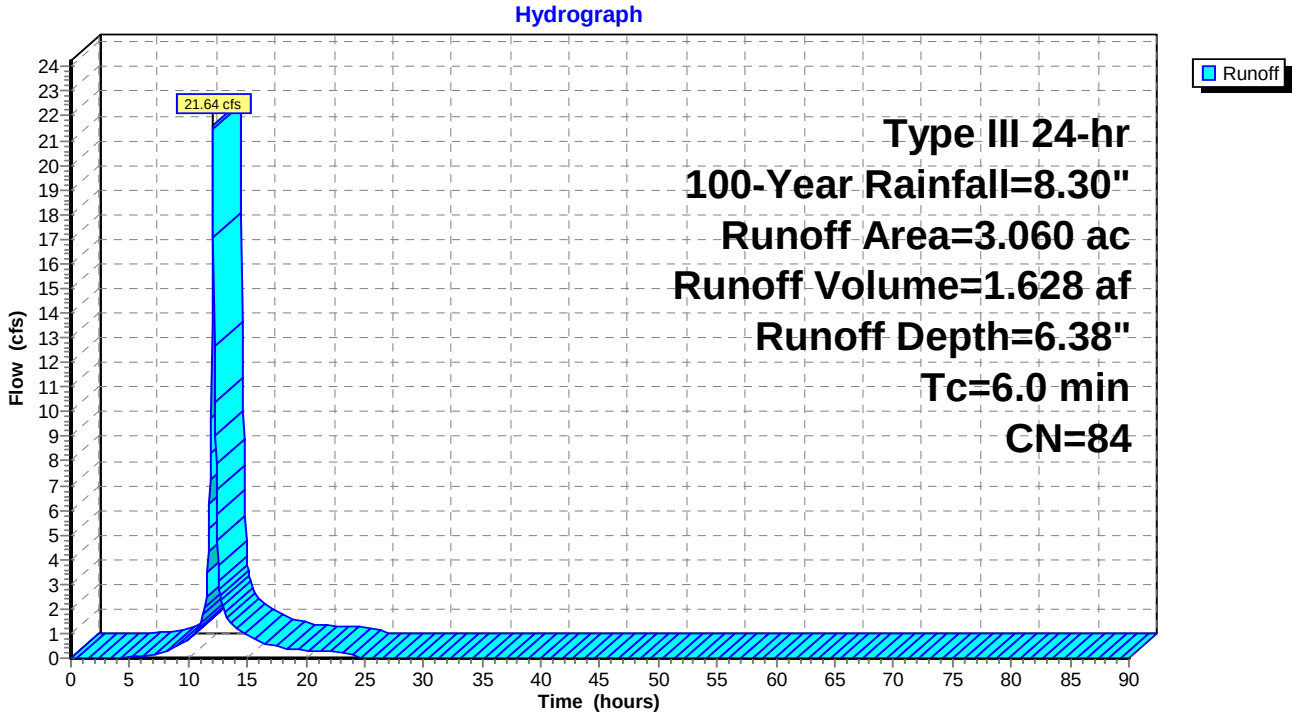
Runoff = 21.64 cfs @ 12.09 hrs, Volume= 1.628 af, Depth= 6.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

Area (ac)	CN	Description
1.500	98	Paved parking, HSG C
1.380	74	>75% Grass cover, Good, HSG C
0.180	39	>75% Grass cover, Good, HSG A
3.060	84	Weighted Average
1.560		50.98% Pervious Area
1.500		49.02% Impervious Area

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

Subcatchment A3: A3



Summary for Subcatchment A4: A4

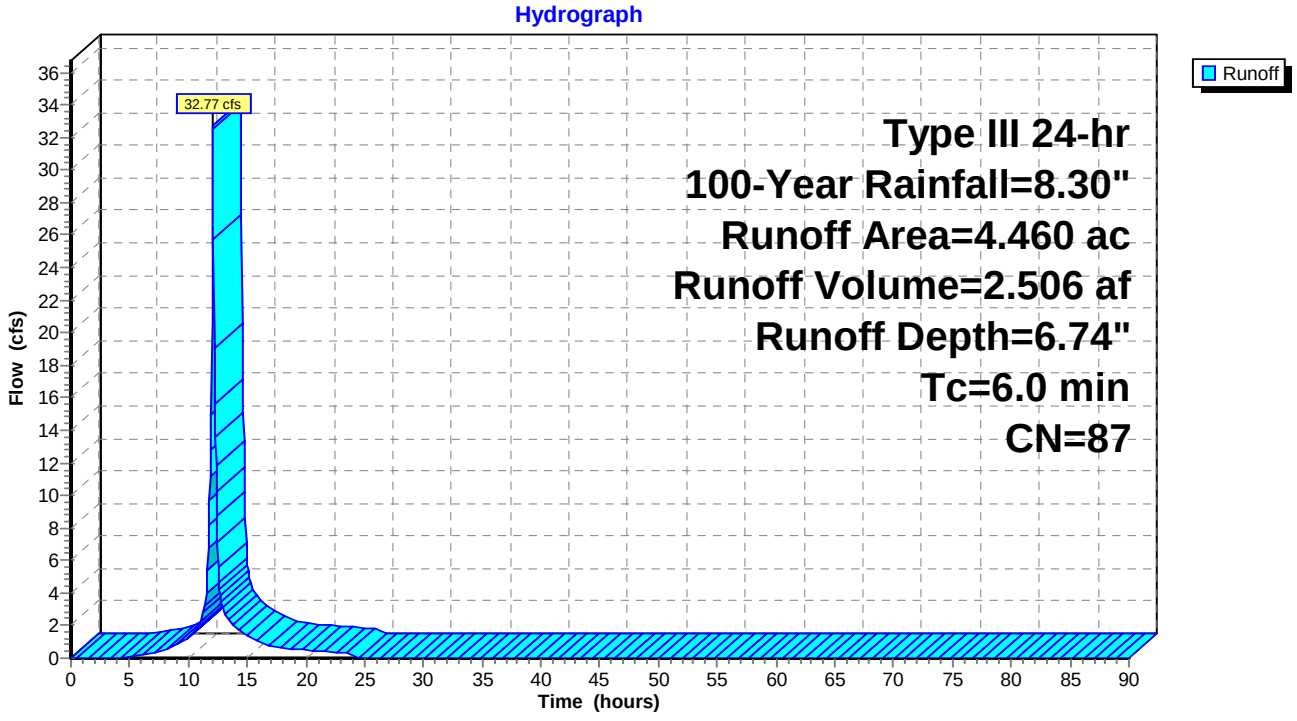
Runoff = 32.77 cfs @ 12.09 hrs, Volume= 2.506 af, Depth= 6.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

	Area (ac)	CN	Description
*	2.920	98	Roofs, Driveway off site
	1.230	74	>75% Grass cover, Good, HSG C
	0.310	39	>75% Grass cover, Good, HSG A
	4.460	87	Weighted Average
	1.540		34.53% Pervious Area
	2.920		65.47% Impervious Area

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

Subcatchment A4: A4



Summary for Subcatchment A5: A5

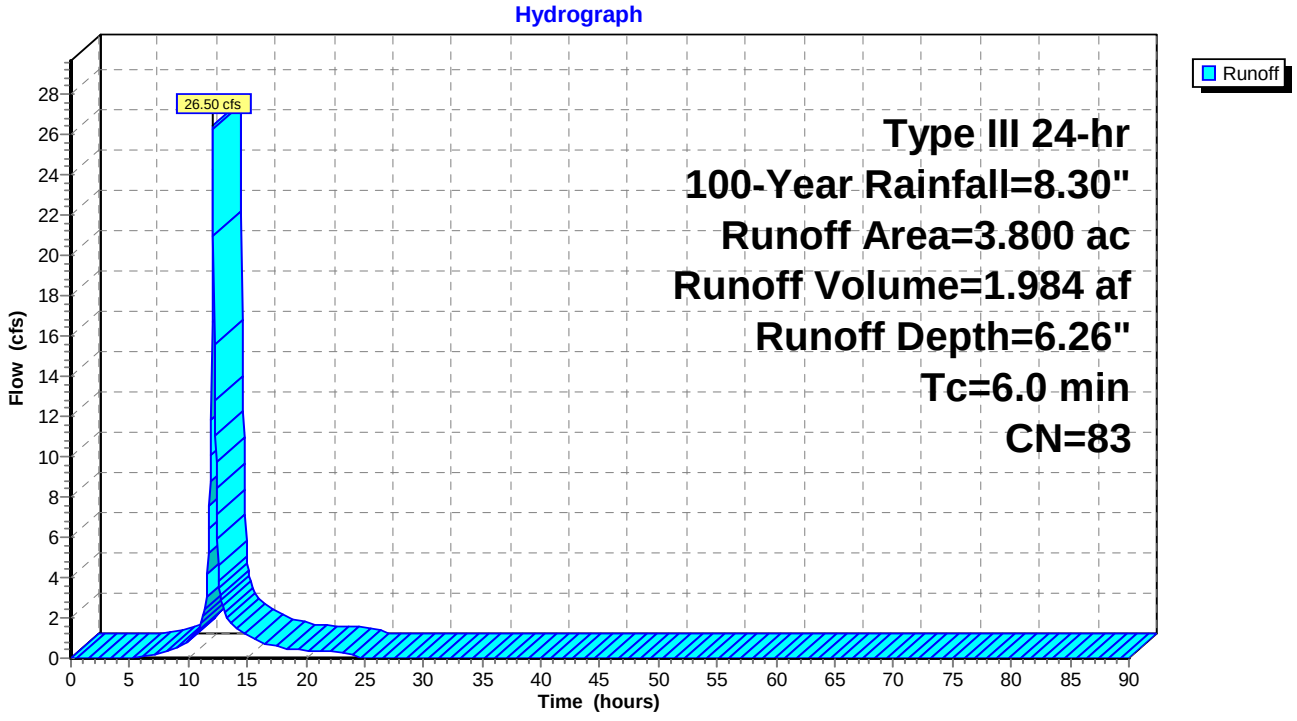
Runoff = 26.50 cfs @ 12.09 hrs, Volume= 1.984 af, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.30"

	Area (ac)	CN	Description
*	1.850	98	Paved parking
	1.700	74	>75% Grass cover, Good, HSG C
	0.250	39	>75% Grass cover, Good, HSG A
	3.800	83	Weighted Average
	1.950		51.32% Pervious Area
	1.850		48.68% Impervious Area

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

Subcatchment A5: A5



Summary for Pond BR1: BR1

Inflow Area = 6.440 ac, 38.66% Impervious, Inflow Depth = 6.15" for 100-Year event
Inflow = 44.24 cfs @ 12.09 hrs, Volume= 3.298 af
Outflow = 26.69 cfs @ 12.20 hrs, Volume= 3.144 af, Atten= 40%, Lag= 6.9 min
Primary = 26.69 cfs @ 12.20 hrs, Volume= 3.144 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 167.69' @ 12.20 hrs Surf.Area= 19,275 sf Storage= 26,588 cf

Plug-Flow detention time= 57.5 min calculated for 3.142 af (95% of inflow)
Center-of-Mass det. time= 31.5 min (828.3 - 796.8)

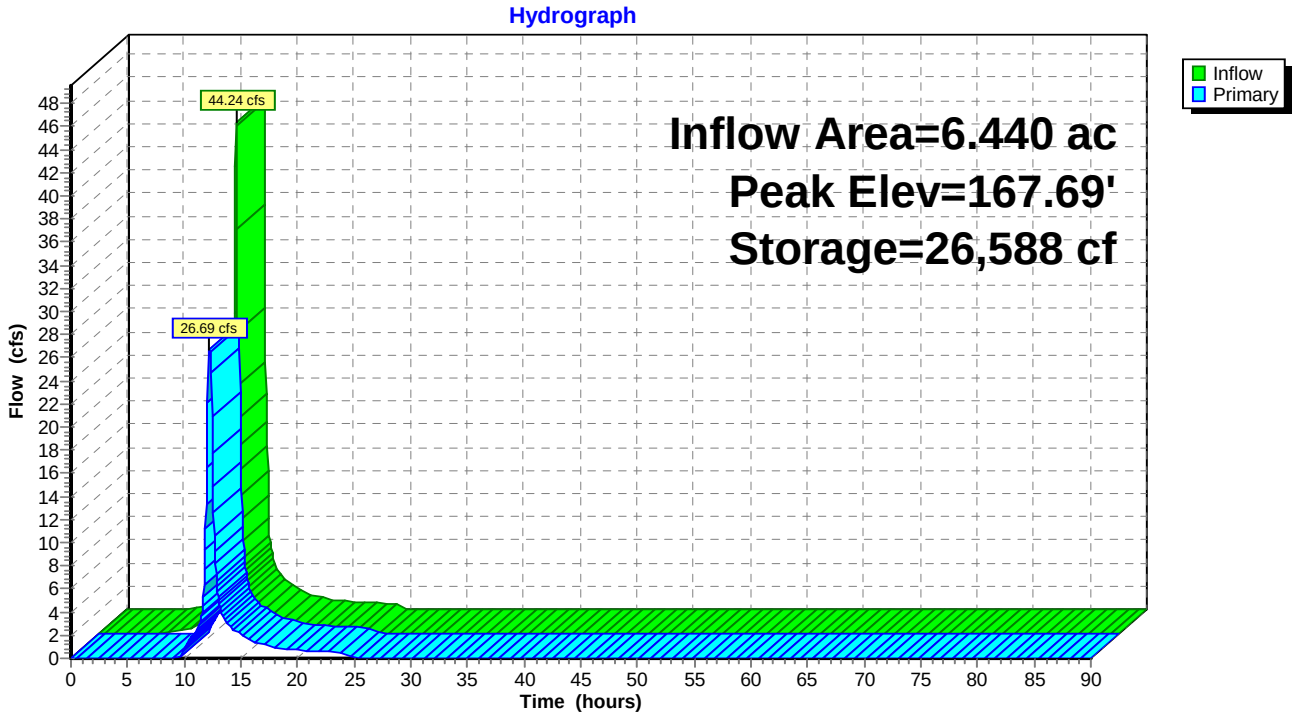
Volume	Invert	Avail.Storage	Storage Description
#1	166.00'	32,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
166.00	12,785	0	0
166.50	14,093	6,720	6,720
168.00	20,620	26,035	32,754

Device	Routing	Invert	Outlet Devices
#1	Primary	162.50'	**24.0" Round Culvert** L= 253.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 162.50' / 161.00' S= 0.0059 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	166.50'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=26.68 cfs @ 12.20 hrs HW=167.69' (Free Discharge)
↑**1=Culvert** (Barrel Controls 26.68 cfs @ 8.49 fps)
↑**2=Orifice/Grate** (Passes 26.68 cfs of 31.18 cfs potential flow)

Pond BR1: BR1


Hydrograph
Inflow
Primary
44.24 cfs
26.69 cfs
Inflow Area=6.440 ac
Peak Elev=167.69'
Storage=26,588 cf
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90

Summary for Pond BR2: BR2

Inflow Area = 4.080 ac, 53.68% Impervious, Inflow Depth = 6.50" for 100-Year event
Inflow = 29.25 cfs @ 12.09 hrs, Volume= 2.211 af
Outflow = 27.35 cfs @ 12.12 hrs, Volume= 2.071 af, Atten= 6%, Lag= 1.9 min
Primary = 27.35 cfs @ 12.12 hrs, Volume= 2.071 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 164.86' @ 12.12 hrs Surf.Area= 13,995 sf Storage= 10,921 cf

Plug-Flow detention time= 60.4 min calculated for 2.071 af (94% of inflow)
Center-of-Mass det. time= 25.9 min (815.1 - 789.2)

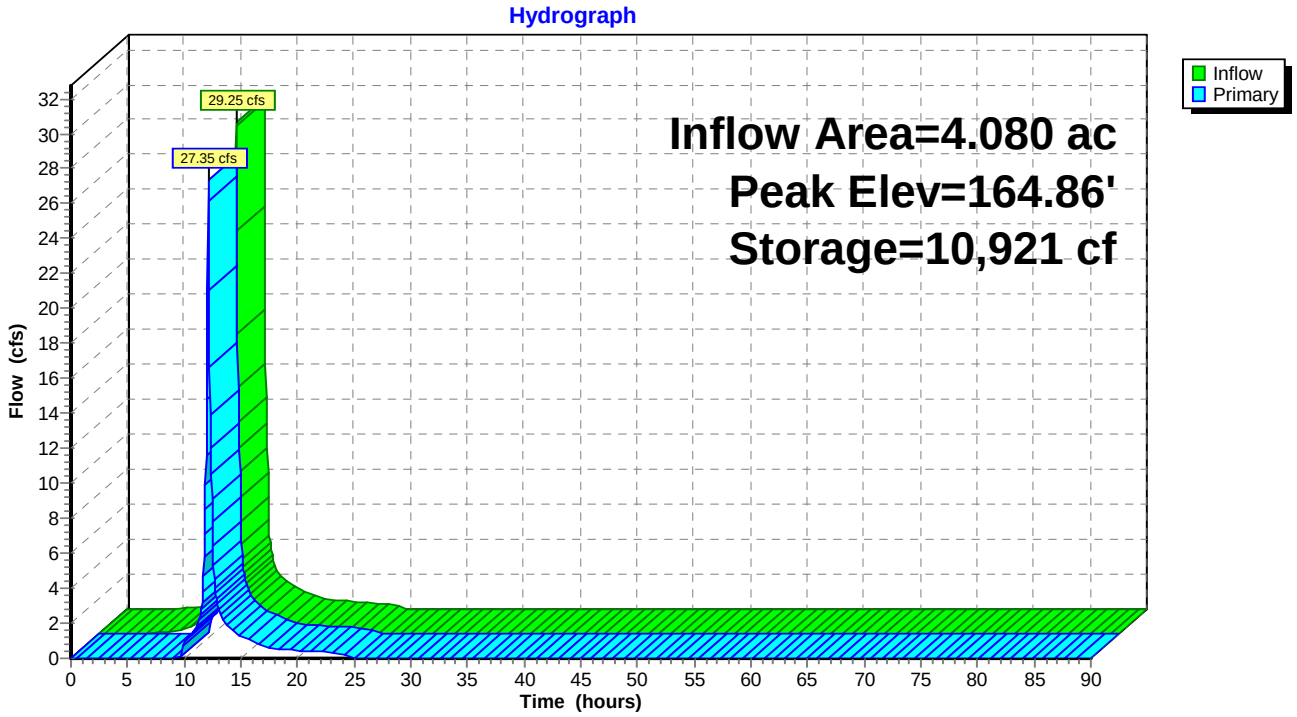
Volume	Invert	Avail.Storage	Storage Description
#1	164.00'	28,865 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
164.00	11,465	0	0
164.50	12,904	6,092	6,092
166.00	17,460	22,773	28,865

Device	Routing	Invert	Outlet Devices
#1	Primary	164.50'	**50.0' 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

Primary OutFlow Max=26.58 cfs @ 12.12 hrs HW=164.85' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 26.58 cfs @ 1.51 fps)

Pond BR2: BR2


Hydrograph
Inflow
Primary
29.25 cfs
27.35 cfs
Inflow Area=4.080 ac
Peak Elev=164.86'
Storage=10,921 cf
Flow (cfs)
Time (hours)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90

Summary for Pond BR3: BR3

Inflow Area = 3.060 ac, 49.02% Impervious, Inflow Depth = 6.38" for 100-Year event
Inflow = 21.64 cfs @ 12.09 hrs, Volume= 1.628 af
Outflow = 17.03 cfs @ 12.16 hrs, Volume= 1.534 af, Atten= 21%, Lag= 4.5 min
Primary = 17.03 cfs @ 12.16 hrs, Volume= 1.534 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 168.25' @ 12.15 hrs Surf.Area= 9,496 sf Storage= 10,841 cf

Plug-Flow detention time= 62.6 min calculated for 1.534 af (94% of inflow)
Center-of-Mass det. time= 30.2 min (822.0 - 791.8)

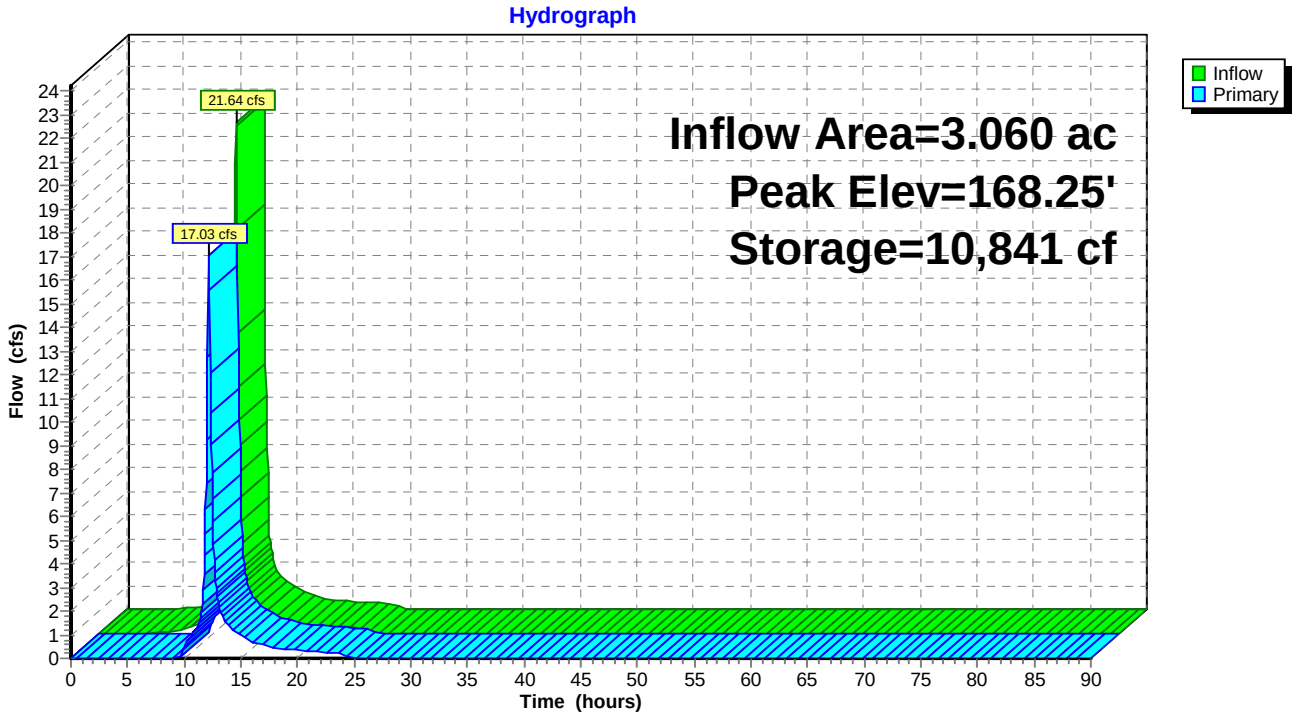
Volume	Invert	Avail.Storage	Storage Description
#1	167.00'	18,337 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
167.00	7,868	0	0
167.50	8,502	4,093	4,093
169.00	10,490	14,244	18,337

Device	Routing	Invert	Outlet Devices
#1	Primary	163.50'	**18.0" Round RCP_Round 18"** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 163.50' / 163.20' S= 0.0060 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	167.50'	**33.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=16.99 cfs @ 12.16 hrs HW=168.24' (Free Discharge)
↑—**1=RCP_Round 18"** (Inlet Controls 16.99 cfs @ 9.62 fps)
↑—**2=Orifice/Grate** (Passes 16.99 cfs of 17.96 cfs potential flow)

Pond BR3: BR3


Hydrograph
Inflow
Primary
21.64 cfs
17.03 cfs
Inflow Area=3.060 ac
Peak Elev=168.25'
Storage=10,841 cf
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90

Summary for Pond BR4: BR4

Inflow Area = 4.460 ac, 65.47% Impervious, Inflow Depth = 5.80" for 100-Year event
Inflow = 12.77 cfs @ 12.09 hrs, Volume= 2.154 af
Outflow = 12.09 cfs @ 12.16 hrs, Volume= 1.995 af, Atten= 5%, Lag= 4.3 min
Primary = 12.09 cfs @ 12.16 hrs, Volume= 1.995 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 164.88' @ 12.16 hrs Surf.Area= 15,264 sf Storage= 12,642 cf

Plug-Flow detention time= 79.8 min calculated for 1.995 af (93% of inflow)
Center-of-Mass det. time= 39.1 min (832.3 - 793.2)

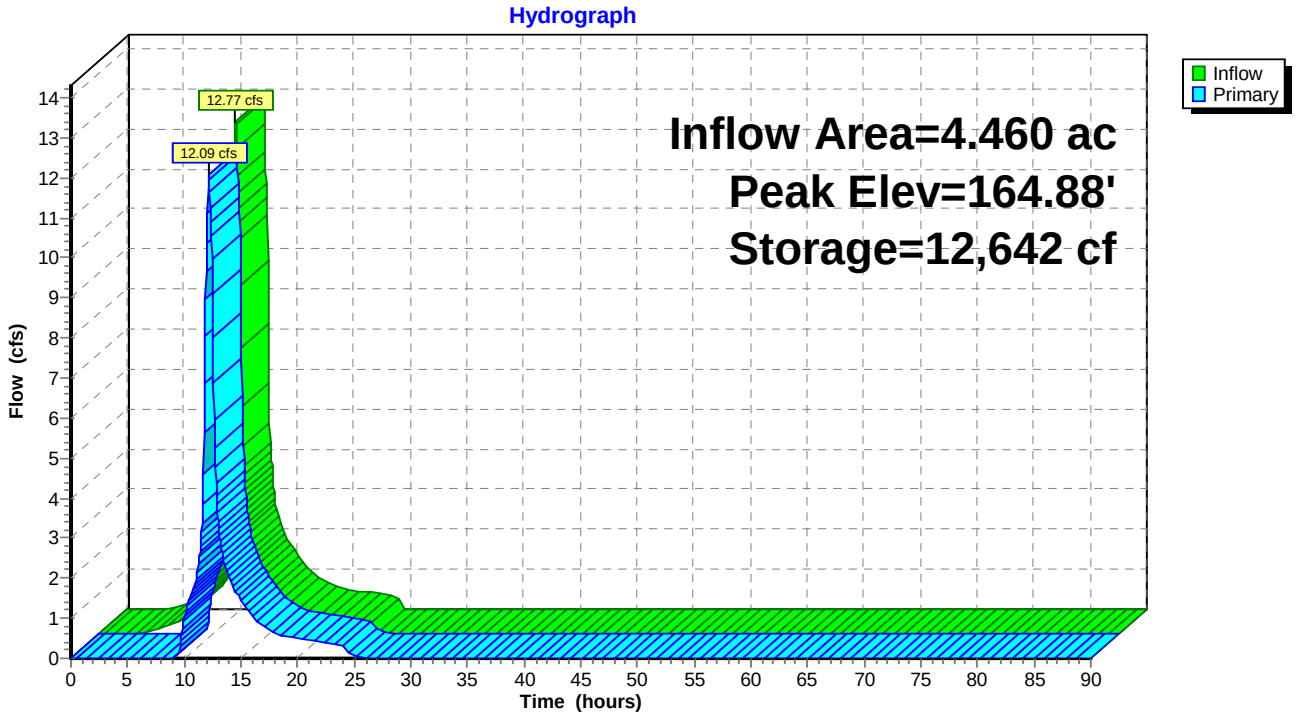
Volume	Invert	Avail.Storage	Storage Description
#1	164.00'	31,057 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
164.00	13,414	0	0
164.50	14,430	6,961	6,961
166.00	17,698	24,096	31,057

Device	Routing	Invert	Outlet Devices
#1	Primary	164.50'	**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

Primary OutFlow Max=12.06 cfs @ 12.16 hrs HW=164.88' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 12.06 cfs @ 1.58 fps)

Pond BR4: BR4


Hydrograph
Inflow
Primary
12.77 cfs
12.09 cfs
Inflow Area=4.460 ac
Peak Elev=164.88'
Storage=12,642 cf
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90

Summary for Pond BR5: BR5

Inflow Area = 3.800 ac, 48.68% Impervious, Inflow Depth = 6.26" for 100-Year event
Inflow = 26.50 cfs @ 12.09 hrs, Volume= 1.984 af
Outflow = 24.84 cfs @ 12.12 hrs, Volume= 1.849 af, Atten= 6%, Lag= 1.8 min
Primary = 24.84 cfs @ 12.12 hrs, Volume= 1.849 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 168.34' @ 12.12 hrs Surf.Area= 13,129 sf Storage= 10,159 cf

Plug-Flow detention time= 62.2 min calculated for 1.849 af (93% of inflow)
Center-of-Mass det. time= 25.8 min (820.1 - 794.3)

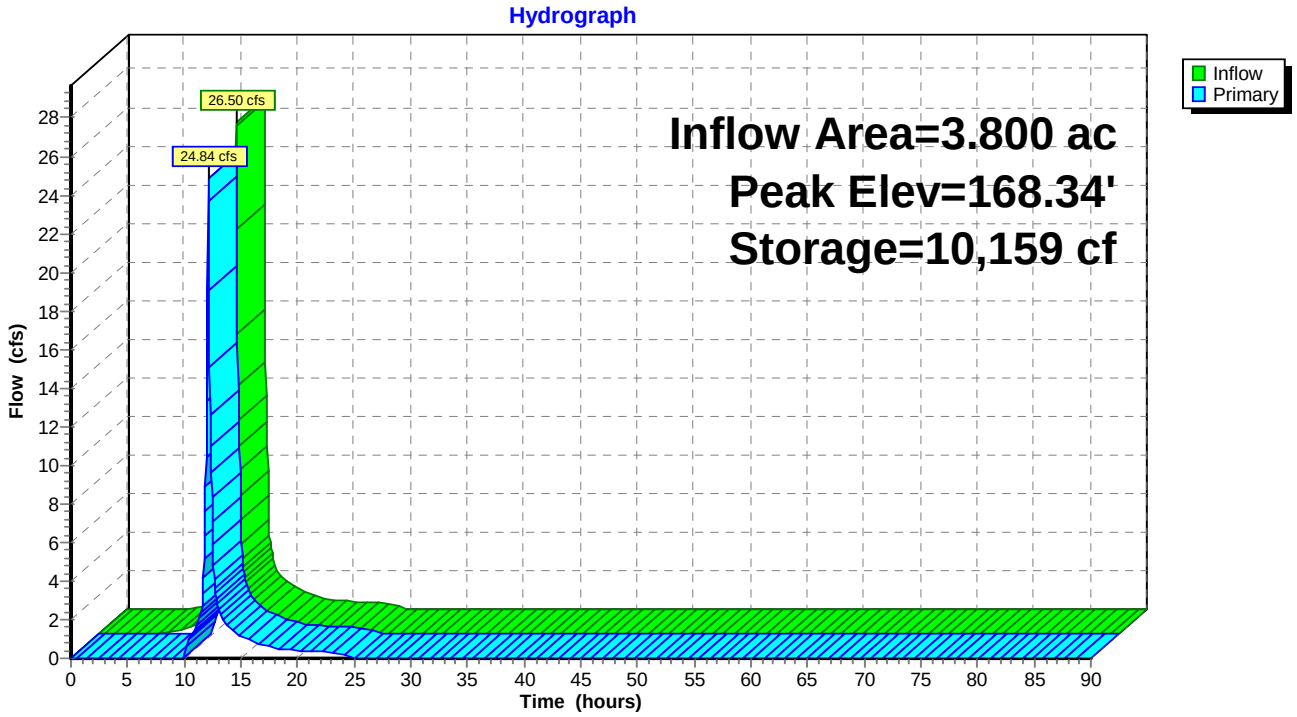
Volume	Invert	Avail.Storage	Storage Description
#1	167.50'	27,034 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
167.50	11,134	0	0
168.00	12,325	5,865	5,865
169.50	15,901	21,170	27,034

Device	Routing	Invert	Outlet Devices
#1	Primary	168.00'	**50.0' 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

Primary OutFlow Max=24.13 cfs @ 12.12 hrs HW=168.33' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 24.13 cfs @ 1.46 fps)

Pond BR5: BR5


Hydrograph
Inflow
Primary
26.50 cfs
24.84 cfs
Inflow Area=3.800 ac
Peak Elev=168.34'
Storage=10,159 cf
Flow (cfs)
Time (hours)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90

Summary for Pond DS: DS

Inflow Area = 4.460 ac, 65.47% Impervious, Inflow Depth = 6.74" for 100-Year event
Inflow = 32.77 cfs @ 12.09 hrs, Volume= 2.506 af
Outflow = 32.77 cfs @ 12.09 hrs, Volume= 2.506 af, Atten= 0%, Lag= 0.0 min
Primary = 12.77 cfs @ 12.09 hrs, Volume= 2.154 af
Secondary = 20.00 cfs @ 12.09 hrs, Volume= 0.351 af

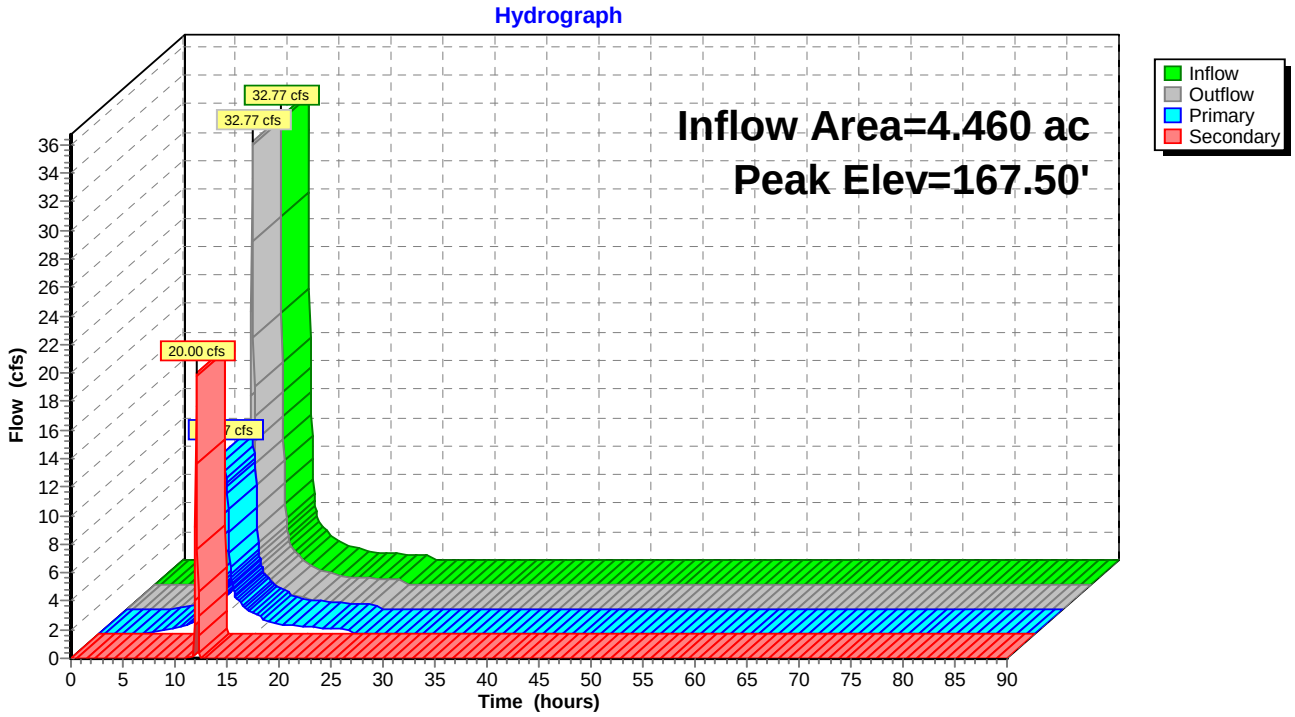
Routing by Dyn-Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.05 hrs
Peak Elev= 167.50' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	164.50'	**18.0" Round Culvert** L= 15.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 164.50' / 164.00' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Secondary	164.00'	**24.0" Round RCP_Round 24"** L= 130.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 164.00' / 162.00' S= 0.0154 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#3	Device 2	166.50'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=12.70 cfs @ 12.09 hrs HW=167.48' TW=164.87' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 12.70 cfs @ 7.19 fps)

Secondary OutFlow Max=19.24 cfs @ 12.09 hrs HW=167.48' (Free Discharge)
└**2=RCP_Round 24"** (Passes 19.24 cfs of 23.81 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 19.24 cfs @ 3.28 fps)

Pond DS: DS


Hydrograph
Inflow Area=4.460 ac
Peak Elev=167.50'
32.77 cfs
32.77 cfs
20.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
0
5
10
15
20
25
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45
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75
80
85
90

Appendix C

Green Infrastructure Spreadsheets for WQv and CPv calculations

Version 1.8
Last Updated: 11/09/2015

Total Water Quality Volume Calculation
WQv(acre-feet) = [(P)(Rv)(A)] /12

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?.....	No

Design Point:	1	
P=	1.50	*inch*

Manually enter P, Total Area and Impervious Cover.

Breakdown of Subcatchments

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft^3)*	Description
1	6.44	2.49	39%	0.40	13,956	Bioretention
2	4.08	2.19	54%	0.53	11,843	Bioretention
3	3.06	1.50	49%	0.49	8,184	Bioretention
4	4.46	2.92	65%	0.64	15,524	Bioretention
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	18.04	9.10	50%	0.50	**49,506**	**Subtotal 1**
Total	18.04	9.10	50%	0.50	**49,506**	**Initial WQv**

Identify Runoff Reduction Techniques By Area

Technique	Total Contributing Area *(Acre)*	Contributing Impervious Area *(Acre)*	Notes
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected impervious area may be subtracted per tree*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques

	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Runoff Coefficient Rv	WQv *(ft^3)*
"<<Initial WQv"	18.04	9.10	50%	0.50	49,506
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	**18.04**	**9.10**	50%	0.50	49,506
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	18.04	9.10	50%	0.50	**49,506**
WQv reduced by Area Reduction techniques					0

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A	0.00	55%
B	0.73	40%
C	15.51	30%
D	**1.80**	20%
Total Area	18.04	
Calculate the Minimum RRv		
S =	**0.29**	
Impervious =	9.10	*acre*
Precipitation	1.5	*in*
Rv	0.95	
Minimum RRv	**13,842**	***ft3***
	0.32	af

NOI QUESTIONS

#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	49506	*1.137*
30	Total RRV Provided	21821	*0.501*
31	Is RRv Provided ≥WQv Required?	No	
32	Minimum RRv	13842	*0.318*
32a	Is RRv Provided ≥ Minimum RRv Required?	Yes	
33a	Total WQv Treated	27685	*0.636*
34	Sum of Volume Reduced & Treated	49506	*1.137*
34	Sum of Volume Reduced and Treated	49506	*1.137*
35	Is Sum RRv Provided and WQv Provided ≥WQv Required?	Yes	

Apply Peak Flow Attenuation			
36	Channel Protection	*Cpv*	
37	Overbank	*Qp*	
37	Extreme Flood Control	*Qf*	
	Are Quantity Control requirements met?		

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k — The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor &

Design Point:	**1**

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
1	6.44	2.49	0.39	0.40	13955.54	1.50	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			39%	0.40	13,956	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	

Soil Information			
Soil Group	C		
Soil Infiltration Rate		*in/hour*	
Using Underdrains?	Yes	*Okay*	

Calculate the Minimum Filter Area				
		Value	Units	Notes
WQv		13,956	*ft^3*	
Enter Depth of Soil Media	*df*	2.5	*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity	*k*	0.5	*ft/day*	
Enter Average Height of Ponding	*hf*	0.5	*ft*	*6 inches max.*
Enter Filter Time	*tf*	2	*days*	
Required Filter Area	***Af***	**11630**	***ft^2***	

Determine Actual Bio-Retention Area			
Filter Width	31	*ft*	
Filter Length	410	*ft*	
Filter Area	12710	*ft^2*	
Actual Volume Provided	15252	*ft^3*	

Determine Runoff Reduction				
Is the Bioretention contributing flow to another practice?			Select Practice	
RRv	6,101			
RRv applied	**6,101**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***	
Volume Treated	7,855	*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*	
Volume Directed	0	*ft^3*	This volume is directed another practice	
Sizing √	OK		*Check to be sure Area provided ≥ Af*	

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k — The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor & Schueler, 1996)

Design Point:	**1**

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
2	4.08	2.19	0.54	0.53	11842.88	1.50	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			54%	0.53	11,843	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	

Soil Information			
Soil Group	C		
Soil Infiltration Rate		*in/hour*	
Using Underdrains?	Yes	*Okay*	

Calculate the Minimum Filter Area				
		Value	Units	Notes
WQv		11,843	*ft^3*	
Enter Depth of Soil Media	*df*	2.5	*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity	*k*	0.5	*ft/day*	
Enter Average Height of Ponding	*hf*	0.5	*ft*	*6 inches max.*
Enter Filter Time	*tf*	2	*days*	
Required Filter Area	***Af***	**9869**	***ft^2***	

Determine Actual Bio-Retention Area			
Filter Width	25	*ft*	
Filter Length	458	*ft*	
Filter Area	11450	*ft^2*	
Actual Volume Provided	13740	*ft^3*	

Determine Runoff Reduction				
Is the Bioretention contributing flow to another practice?			Select Practice	
RRv	5,496			
RRv applied	**5,496**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***	
Volume Treated	6,347	*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*	
Volume Directed	0	*ft^3*	This volume is directed another practice	
Sizing √	OK		*Check to be sure Area provided ≥ Af*	

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k — The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor &

Design Point:	**1**

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
3	3.06	1.50	0.49	0.49	8183.84	1.50	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			49%	0.49	8,184	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	

Soil Information			
Soil Group	C		
Soil Infiltration Rate		*in/hour*	
Using Underdrains?	Yes	*Okay*	

Calculate the Minimum Filter Area				
		Value	Units	Notes
WQv		8,184	*ft^3*	
Enter Depth of Soil Media	*df*	2.5	*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity	*k*	0.5	*ft/day*	
Enter Average Height of Ponding	*hf*	0.5	*ft*	*6 inches max.*
Enter Filter Time	*tf*	2	*days*	
Required Filter Area	***Af***	**6820**	***ft^2***	

Determine Actual Bio-Retention Area			
Filter Width	52	*ft*	
Filter Length	150	*ft*	
Filter Area	7800	*ft^2*	
Actual Volume Provided	9360	*ft^3*	

Determine Runoff Reduction				
Is the Bioretention contributing flow to another practice?			Select Practice	
RRv	3,744			
RRv applied	**3,744**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***	
Volume Treated	4,440	*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*	
Volume Directed	0	*ft^3*	This volume is directed another practice	
Sizing √	OK		*Check to be sure Area provided ≥ Af*	

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k — The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor &

Design Point:	**1**

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
4	4.46	2.92	0.65	0.64	15523.70	1.50	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			65%	0.64	15,524	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	

Soil Information			
Soil Group	C		
Soil Infiltration Rate		*in/hour*	
Using Underdrains?	Yes	*Okay*	

Calculate the Minimum Filter Area				
		Value	Units	Notes
WQv		15,524	*ft^3*	
Enter Depth of Soil Media	*df*	2.5	*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity	*k*	0.5	*ft/day*	
Enter Average Height of Ponding	*hf*	0.5	*ft*	*6 inches max.*
Enter Filter Time	*tf*	2	*days*	
Required Filter Area	***Af***	**12936**	***ft^2***	

Determine Actual Bio-Retention Area			
Filter Width	45	*ft*	
Filter Length	300	*ft*	
Filter Area	13500	*ft^2*	
Actual Volume Provided	16200	*ft^3*	

Determine Runoff Reduction				
Is the Bioretention contributing flow to another practice?			Select Practice	
RRv	6,480			
RRv applied	**6,480**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***	
Volume Treated	9,044	*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*	
Volume Directed	0	*ft^3*	This volume is directed another practice	
Sizing √	OK		*Check to be sure Area provided ≥ Af*	

Version 1.7
Last Updated: 10/02/2015

Total Water Quality Volume Calculation
WQv(acre-feet) = [(P)(Rv)(A)] /12

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?.....	No

Design Point:	2	
P=	1.50	*inch*

Manually enter P, Total Area and Impervious Cover.

Breakdown of Subcatchments

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft^3)*	Description
1	3.49	2.12	61%	0.60	11,339	Bioretention
2						
3						
4						
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	3.49	2.12	61%	0.60	**11,339**	**Subtotal 1**
Total	3.49	2.12	61%	0.60	**11,339**	**Initial WQv**

Identify Runoff Reduction Techniques By Area

Technique	Total Contributing Area *(Acre)*	Contributing Impervious Area *(Acre)*	Notes
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected impervious area may be subtracted per tree*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques

	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Runoff Coefficient Rv	WQv *(ft^3)*
"<<Initial WQv"	3.49	2.12	61%	0.60	11,339
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	**3.49**	**2.12**	61%	0.60	11,339
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	3.49	2.12	61%	0.60	**11,339**
WQv reduced by Area Reduction techniques					0

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A	1.05	55%
B	0.96	40%
C	0.37	30%
D	**1.11**	20%
Total Area	3.49	
Calculate the Minimum RRv		
S =	**0.37**	
Impervious =	2.12	*acre*
Precipitation	1.5	*in*
Rv	0.95	
Minimum RRv	**4,068**	***ft3***
	0.09	af

NOI QUESTIONS

#	NOI Question	Reported Value	
		cf	af
28	Total Water Quality Volume (WQv) Required	11339	*0.260*
30	Total RRV Provided	4565	*0.105*
31	Is RRv Provided ≥WQv Required?	No	
32	Minimum RRv	4068	*0.093*
32a	Is RRv Provided ≥ Minimum RRv Required?	Yes	
33a	Total WQv Treated	6774	*0.156*
34	Sum of Volume Reduced & Treated	11339	*0.260*
34	Sum of Volume Reduced and Treated	11339	*0.260*
35	Is Sum RRv Provided and WQv Provided ≥WQv Required?	Yes	

Apply Peak Flow Attenuation			
36	Channel Protection	*Cpv*	
37	Overbank	*Qp*	
37	Extreme Flood Control	*Qf*	
	Are Quantity Control requirements met?		

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k — The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor &

Design Point:	**2**

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
1	3.49	2.12	0.61	0.60	11339.21	1.50	Bioretention
Enter Impervious Area Reduced by Disconnection of Rooftops			61%	0.60	11,339	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	

Soil Information			
Soil Group	C		
Soil Infiltration Rate		*in/hour*	
Using Underdrains?	Yes	*Okay*	

Calculate the Minimum Filter Area				
		Value	Units	Notes
WQv		11,339	*ft^3*	
Enter Depth of Soil Media	*df*	2.5	*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity	*k*	0.5	*ft/day*	
Enter Average Height of Ponding	*hf*	0.5	*ft*	*6 inches max.*
Enter Filter Time	*tf*	2	*days*	
Required Filter Area	***Af***	**9449**	***ft^2***	

Determine Actual Bio-Retention Area			
Filter Width	30	*ft*	
Filter Length	317	*ft*	
Filter Area	9510	*ft^2*	
Actual Volume Provided	11412	*ft^3*	

Determine Runoff Reduction				
Is the Bioretention contributing flow to another practice?		No	Select Practice	N/A
RRv	4,565			
RRv applied	**4,565**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***	
Volume Treated	6,774	*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*	
Volume Directed	0	*ft^3*	This volume is directed another practice	
Sizing √	OK		*Check to be sure Area provided ≥ Af*	

*.05+(.009*I) where I is*	Rv* =	0.95		
	RRv =	**#DIV/0!**	**acre-feet of storage**	
		#DIV/0!	**cubic feet of storage**	

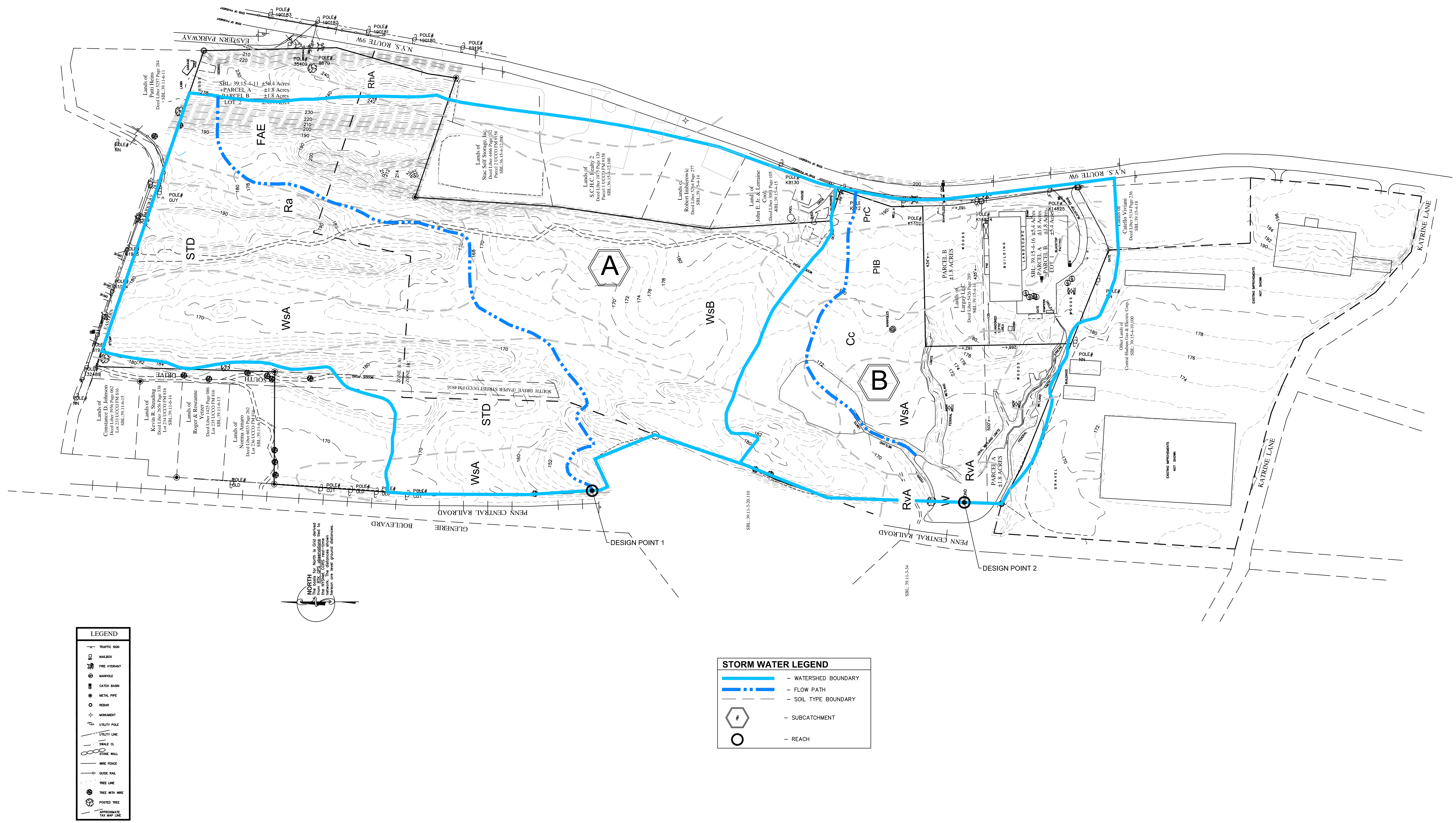
Drainage Area 1:	**Stream Channel Protection Volume, CPv**			
	Variables			
Post-Development Cur	CN =	78		
Initial Abstractions	Ia =	0.564		
1-yr 24-hr RF event	P1-yr	2.68	inches	
	Ia/P1-yr =	0.210		
	Tc =	0.21		
Unit Peak Discharge	q_u =	750	csm/in.	*From TR-55*
Time	T =	24	hrs	
Peak Outflow Discharg	q_0/q_i =	0.025		*From Figure B.1*
Required Storage volu	Vs/Vr =	0.647		
Post-Development run	Qd =	0.91	inches	
	Vs = CPv =	2.019	acre-feet	
		87948	cubic feet	
	Define the Average Release Rate, ARR			
	The Above Volume of		**2.019**	***ac-ft, is to be released over 24 hours per Des***
	ARR =	1.018	cfs	

Drainage Area 2:	**Stream Channel Protection Volume, CPv**			
	Variables			
Post-Development Cur	CN =	82		
Initial Abstractions	Ia =	0.439		
1-yr 24-hr RF event	P1-yr	2.68	inches	
	Ia/P1-yr =	0.164		
	Tc =	0.2		
Unit Peak Discharge	q_u =	750	csm/in.	*From TR-55*
Time	T =	24	hrs	
Peak Outflow Discharg	q_0/q_i =	0.025		*From Figure B.1*
Required Storage volu	Vs/Vr =	0.647		
Post-Development run	Qd =	1.13	inches	
	Vs = CPv =	0.295	acre-feet	
		12850	cubic feet	
	Define the Average Release Rate, ARR			
	The Above Volume of		**0.295**	***ac-ft, is to be released over 24 hours per Des***
	ARR =	0.149	cfs	

Combined Drainage A	**Overbank Flood Protection Volume, Qp_{10}**	
	Variables	

Appendix D

Pre- and Post-Development Delineation Maps



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OWNER:

PROJECT NAME:
CENTRAL HUDSON GAS & ELECTRIC CORPORATION TRAINING CENTER

PROJECT ADDRESS:
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LAKE KATRINE, NEW YORK 12449
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REVISIONS			
NO.	REVISIONS	BY	DATE

DRAWN BY: LJP
CHECKED BY: LJP

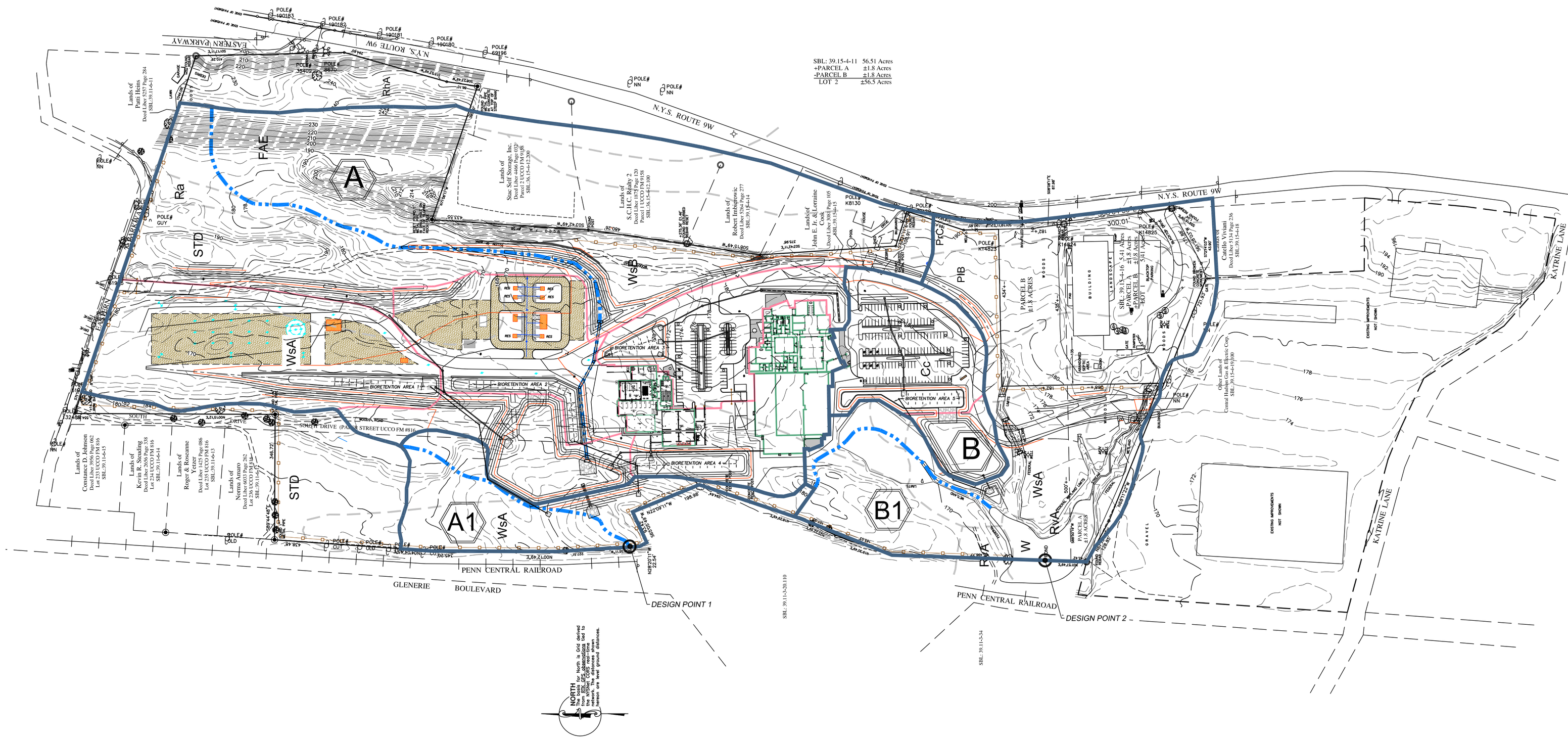
ISSUED FOR:
PLANNING BOARD SUBMISSION

ISSUED DATE: 07/30/2019

SHEET NAME:
PREDEVELOPMENT WATERSHED DELINEATION MAP
NOT TO SCALE

SHEET NO.
Fig. 1

PROJECT NO. 19-04



STORM WATER LEGEND

- WATERSHED BOUNDARY
- BIORETENTION AREA WATERSHED BOUNDARY
- FLOW PATH
- SOIL TYPE BOUNDARY
- SUBCATCHMENT
- REACH

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LAKE KATRINE,
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TOWN OF ULSTER

REVISIONS

NO.	REVISIONS	BY	DATE

DRAWN BY: LJP
CHECKED BY: LJP

ISSUED FOR:

PLANNING BOARD SUBMISSION

ISSUED DATE: 07/30/2019

SHEET NAME:

POST-DEVELOPMENT WATERSHED DELINEATION MAP

NOT TO SCALE

SHEET NO.

Fig. 2

PROJECT NO.

19-04

Appendix IX

General Permit (GP-0-15-002)

Appendix X

Project Plans