ROYAL ENERGY PROPERTIES, LLC

STORMWATER POLLUTION PREVENTION PLAN

183 Main Street
New Paltz, NY 12561
T 845.255.0210
www.willinghamengineering.com

Project Location:
1666 US Route 9W
Town of Marlborough
Ulster County, New York

Owner:
Royal Energy Properties, LLC
1666 Route 9W
Milton, New York 12547

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APPENDICES

1.0 INTRODUCTION

1.1 Overview

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared for the Applicant and Owner, Royal Energy Properties, LLC. The property is approximately 4.9 acres in size and is located at 1666 Route 9W in the Town of Marlborough. The existing use of the parcel is cold storage, with several buildings located on site which will be demolished to allow for the proposed building at the site. Additional site improvements include parking lot expansion and resurfacing, gravel emergency vehicle access road, landscaping, subsurface wastewater disposal system, and water supply well. The property is bordered to the south and east by an active farm, to the north by a single family home and to the west by Route 9W.

The Applicant is proposing to expand the existing cold storage facility on the site. All proposed land disturbance is in relation to the development of the storage facility and its associated improvements.

This Stormwater Pollution Prevention Plan (SWPPP) has been developed in accordance with New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-15-002, dated January 12, 2015 which authorizes stormwater discharges to surface waters of the State from the following construction activities identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. Construction activities involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a larger common plan of development or sale that will ultimately disturb one or more acres of land; excluding routine maintenance activity that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;
2. Construction activities involving soil disturbances of less than one (1) acre where the Department has determined that a SPDES permit is required for stormwater discharges based on the potential for contribution to a violation of a water quality standard or for significant contribution of pollutants to surface waters of the State.
3. Construction activities located in the New York City, East of Hudson watershed, that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

This project qualifies for SPDES coverage under provision 1 as stated above.

The objectives of this SWPPP are as follows:

- To develop a sediment and erosion control plan in accordance with the most current version of the technical standard, New York State Standards and Specifications for Erosion

and Sediment Control, which implements best management practices to stabilize disturbed areas, protect off site areas and sensitive areas and minimize the transport of sediment.

- To develop the permanent stormwater management system for the site which will control the rate of stormwater discharge from the site after construction, reduce the overall volume of runoff being discharged from the site and treat the stormwater for runoff pollutants. The stormwater management system has been designed in accordance with the most current version of the technical standard, New York State Department of Environmental Conservation Stormwater Management Design Manual (the Design Manual).

Construction activities are not permitted to begin until such time that authorization is obtained under the General Permit. This project is located within a designated Municipal Separate Storm Sewer System (MS4) area and thus must be reviewed by the Municipalities designated Stormwater Officer. Authorization to commence construction activities may commence five (5) days following receipt of the Notice of Intent (NOI) accompanied by the MS4 Acceptance Form.

A copy of the General Permit, SWPPP, NOI, NOI acknowledgment letter, MS4 SWPPP acceptance form, inspection reports and accompanying plans shall be maintained on-site from the date of initiation of construction activities until final stabilization of all disturbed areas has been achieved and the Notice of Termination (NOT) has been submitted.

1.2 Land Disturbance

Per the General Permit, no more than five (5) acres of land disturbance may occur at any one time without written approval from the NYSDEC.

Disturbance of more than five (5) acres at any one time is not anticipated for this project, as the total disturbance is approximately 3.7 acres. For areas where construction activity temporarily or permanently ceases, stabilization measures must be initiated by the end of the next business day and be completed within fourteen (14) days of the date that the soil disturbance activity ceased in accordance with the SPDES permit.

2.0 EXISTING CONDITIONS

2.1 Site Soils and Ground Cover Description

The 4.9-acre parcel proposed for development is primarily developed with buildings. The parcel also contains grass areas and wooded areas with the majority of development occurring in previously developed areas. The soils encountered on the portion of the site proposed for development consist of Bath and Nassau soils. On-site soil classifications and their approximate

boundaries have been taken from the *Ulster County Soil Survey*. The soil locations are shown on the attached Erosion & Sediment Control Plan. Site soils include the following soil types:

Table 2.1 Soil Types

Soil Name	Soil Symbol	Hydrologic Soil Group
Bath Nassau complex	BNC	C
Bath-Nassau-Rock Outcrop Complex	BOD	C

2.2 Hydrologic Soil Group Information

Type A-Soils- These soils have low runoff potential when thoroughly wet. Soils are excessively drained and are typically comprised of less than 10 percent clay and more than 90 percent sand or gravel.

Type B-Soils- These soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately course textures.

Type C-Soils- These soils have a moderately high runoff potential when thoroughly wet. These soils are poorly drained and typically contain between 20 and 40 percent clay and less than 50 percent sand or gravel.

Type D-Soils- These soils have high runoff potential, with low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, high water table, and shallow soils over impervious material.

Additional soils data can be found in the Appendices.

2.3 Name of Receiving Waters

All drainage flows from the property into an existing unnamed stream on the north side of the property. The stream flows to the north then east and then outlets into the Hudson River, approximately ½ a mile northeast of the project site.

2.4 Environmentally Sensitive Areas

There are no environmentally sensitive areas located on the project site.

3.0 STORMWATER OBJECTIVES

Development of the site will result in several impacts to the existing drainage patterns at the site, both during and after construction. During construction, there is potential for erosion as disturbed areas are not yet vegetated. This lack of vegetation during construction creates the potential for significant amounts of sediment to enter the existing wetlands and watercourses. Excess sediment can be damaging to existing habitats both on-site and downstream.

Temporary and permanent erosion control measures shall be implemented to reduce sediment discharge from the site into wetlands and watercourses located on adjacent properties. Best Management Practices will be incorporated for all erosion and sediment control practices and may include the use of silt fence, temporary silt basins, silt barriers, diversion swales, sediment forebays, check dams, stone construction entrances, rip rap, and vegetative means both during and after construction. Permanent erosion and sediment control measures to be implemented may include, but are not limited to, establishment of a stabilizing ground cover in all areas, storm sewers, catch basins and water quality treatment units. Specific measures will be implemented to ensure the protection of the site's undisturbed areas, to limit soil transport and to provide for increased monitoring of stormwater management and erosion control facilities throughout the construction process.

This SWPPP will describe provisions for the treatment of the Water Quality Volume (WQv) and Runoff Reduction Volume (RRv) and for the attenuation of the Overbank Flood Flow (Qp – "10 year storm") and Extreme Flood Flow (Qf – "100 year storm") as defined by the NYSDEC Manual.

The stormwater management system has been designed to meet the Channel Protection (CPv) requirement set forth in the Design Manual. According to the NYSDEC Manual CPv is not required at sites where the resulting diameter of the ED orifice is too small to prevent clogging, which it was in this case. Therefore, meeting the full CPv requirement is considered inappropriate for this site. The outlet orifices within the pond outlet control structure, which are designed to outlet runoff from the 1-year storm event, have been sized as small as possible to prevent frequent clogging, which is discussed in Section 4.4 of the Design Manual. A 4" diameter outlet with a trash rack is proposed on the outlet control structure. The maximum flow rate exiting the pond during the 1-year storm is 0.91 cfs, a flow that will not be erosive to downstream channels.

As noted above, the stormwater management system will meet all conditions set forth in the Design Manual with regards to Water Quality Volume (WQv). All of the stormwater runoff from disturbed / improved areas will be directed to either one of the bioretention areas, and/or the stormwater pond where the runoff will be treated and discharged into the existing stormwater conveyance system located east of the site, at rates no greater than existing runoff rates.

Runoff Reduction Volume (RRv) will also be achieved at the site to replicate pre-development hydrology, in accordance with conditions set forth in the Design Manual. The RRv requirement will be satisfied by the bioretention areas, which are considered to be standard stormwater management practices with RRv capacity. In accordance with the Design Manual, the Specific Reduction Factor may be applied to the total calculated RRv. This factor accounts for the absorptive capacity of on-site hydrologic soil groups in order to determine the RRv which is considered feasible for a specific site. As noted in the redevelopment section, RRv is not required for areas of the site proposed as redevelopment.

4.0 STORMWATER MANAGEMENT PLAN

4.1 Narrative

A Drainage Analysis was completed to assess the pre-and post-development runoff rates for the 1-year, 10-year and the 100-year storm events. This Drainage Analysis provides a calculation model for the operation of the stormwater management system and structures being proposed. The following summarizes the findings from this drainage analysis.

4.2 Calculation Methodology

The design storms analyzed in this study are the 1-year, 10-year and the 100-year, 24-hr. duration storm events. The Soil Conservation Service (SCS) TR 55 method for establishing runoff curve numbers and times of concentration was used along with the Soil Conservation Service TR 20 method to analyze peak runoff rates, and to develop hydrographs, routing, storage requirements and structure design. Applied Microcomputer Systems HydroCAD (v10.00) computer modeling software was utilized.

The time of concentration was computed to determine the time for an entire watershed to contribute runoff to a specific location. The method incorporates watershed characteristics such as slope, length, and runoff curve number. Flow paths used in this analysis of each watershed are shown on the attached Drainage Maps. Runoff curve numbers were calculated by takeoff of coverage areas using AutoCAD software.

Rainfall events and types were obtained from the Northeast Regional Climate Center, which provides local, specific rainfall events for a particular location. Rainfall information from the NRCC is included in the Appendix.

The quantitative analysis has been conducted to determine the optimal sizing and volumetric capacities of the proposed stormwater system components in order to prevent any increase in runoff rates at the Stormwater Discharge Points (SDP) as a result of the proposed site development. The analysis proves that there will not be an increased rate of runoff as a result of site development at either SDP during the 1 year, 10 year and 100 year rain events. The stormwater management system has been designed to meet the conditions for Qp, and Qf as per the NYSDEC Design Manual. Pre and Post development drainage calculations and maps are included in the Appendix.

4.3 Qualitative Analysis

Stormwater run-off is recognized as a major contributor of pollution that can adversely affect the quality of receiving water bodies. Water quality contaminants are transported from land, particularly impervious surface, during the initial stages of storm events. The initial stormwater volume created as part of the storm event is referred to as the Water Quality Volume (WQv).

This is the target volume to be treated with the proposed stormwater measures as per the Design Manual.

The Water Quality Volume (WQv) can be determined using the following equation from Section 4 of the New York State Stormwater Design Manual:

$WQv = (P) * (R_V) * (A) / 12$

Where:

WQv = Water quality volume (in acre-feet)

P = 90% Rainfall Event Number

$R_V = .05 + 0.009 * (I)$, where I is percent impervious

A = Site area in acres

Two bioretention areas, and a stormwater pond were incorporated into the stormwater management system to capture and treat the WQv identified for the site. Each practice has been designed in accordance with the Design Manual, latest edition. Calculations for WQv are included as an Appendix.

In addition to the WQv treatment required, the Runoff Reduction Volume (RRv) must be satisfied / reduced by Green Infrastructure Practices (GIP's) or by standard stormwater management practices (SMP's) with RRv capacity as detailed in the Design Manual. Runoff Reduction of 100% of the post-development WQv must be achieved through stormwater infiltration, groundwater recharge, reuse, recycle, evaporation / evapotranspiration in order to replicate pre-development hydrology by maintaining pre-construction infiltration, peak runoff flow, discharge volume, as well as minimizing concentrated flow by using runoff control techniques to provide treatment in a distributed manner before runoff reaches the collections system. As mentioned above, this requirement can be accomplished by the application of GIP's and/or standard SMP's with RRv capacity.

Projects that cannot meet 100% of the runoff reduction requirement due to site limitations that prevent or limit the use of infiltration techniques shall identify the specific site limitations. As previously mentioned, the Specific Reduction Factor may be used to provide a reduction to the required RRv at a specific site if deemed appropriate.

The minimum RRv can be determined using the following equation from Section 4 of the Design Manual:

RRv = (P) * (Rv) * (Ai) / 12

Where:

RRv = Runoff Reduction Volume (in acre-feet)

Ai = (S) * (Aic)

Ai = Impervious cover targeted for runoff reduction

Aic = Total area of new impervious cover

P = 90% Rainfall Event Number

Rv = .05 + 0.009 * (I), where I is percent impervious

S = Hydrologic Soil Group (HSG) Specific Reduction Factor (HSG A = 0.55, HSG B = 0.40, HSG C = 0.30, HSB D = 0.20)

Two bioretention areas with underdrains are proposed to provide the required minimum runoff reduction volume for the site. The practices were sized in accordance with the Design Manual and provided as an Appendix.

4.4 Redevelopment Activity

Redevelopment of previously developed sites is encouraged from a watershed protection standpoint because it often provides an opportunity to conserve natural resources in less impacted areas by targeting development to areas with existing services and infrastructures. At the same time, redevelopment provides an opportunity to correct existing problems and reduce pollutant discharges from older developed areas that were constructed without effective stormwater pollution controls.

In accordance with the Design Manual, redevelopment activity is considered when a project includes disturbance and reconstruction of existing impervious surfaces. As described above, the site currently contains several buildings and paved / gravel driveways which are proposed to be demolished. The existing conditions and demolition plans show the impervious surfaces (interior gravel driveway areas and buildings) which will be removed as part of the proposed development. These impervious surfaces proposed to be removed on the site are considered redevelopment areas.

The Design Manual provides alternative sizing criteria for stormwater management practices proposed as part of redevelopment activities. Implementation of the alternative sizing criteria will result in pollution reductions over existing conditions with no or substandard practices in place.

The alternative sizing criteria to be utilized for water quality volume at this site is described in option 2 of Chapter 9 of the manual. Option 2 states that a minimum of 25% of the WQv from the disturbed impervious area is captured and treated by the implementation of standard stormwater management practices or reduced by application of green infrastructure techniques. RRv is not required for redevelopment areas. The stormwater management practices proposed to treat impervious surfaces not considered redevelopment activity are required to satisfy the full WQv and RRv.

4.5 Site Design

As required by the SPDES permit, the majority of runoff from impervious surfaces at the site is directed to either an RR technique or standard SMP with RRv capacity. This runoff enters either

one of the bioretention facilities or the stormwater pond, where the RRv requirement is satisfied and the WQv is treated. The runoff from the site outlets to the existing stream north of the site. The "treatment train", as required by the Design Manual provides a high level of water quality treatment, efficiently removing pollutants before discharging to the downstream wetland and watercourse system.

Pretreatment is provided for all stormwater management practices as needed. Pretreatment for the bioretention facilities is provided by a mulch layer over the bioretention planting bed and by grass channels. All runoff from impervious surfaces entering the bioretention area comes from roof runoff so there will not be the significant levels of sediments and pollutants found in surface runoff. Pretreatment for the pond from parking lot runoff will be provided by a sediment forebay which will collect sediments and pollutants. Roof runoff is not required to be pretreated as sediments and pollutants will not be present as they are in surface runoff.

Please see below for a summary table of the WQv and RRv. For additional information please see the Appendices.

Parameter	Required	Provided	Practice / Information
WQv	6,265 cf	7,329 cf	Bioretention Facility 1 – 4,349 cf
			Bioretention Facility 2 – 936 cf
			Pond Permanent Pool – 2,044 cf
RRv	1,333 cf	1,919 cf	Bioretention Facility 1 – 1,545 cf
			Bioretention Facility 2 – 374 cf

4.6 Pre Development Conditions

The existing watershed area that will be impacted as a result of the proposed development is shown on the Pre Development Drainage Map, which is included as an Appendix. Pertinent information relating to this watershed is summarized in the table below.

Table 4.2 Pre-Development Conditions

Sub catch	Area (acre)	Cover Condition	Curve Number	Soil Group	Time of Conc. (min)
EX-1	4.944	Paved Parking, Buildings, Concrete, Gravel, Woods, Grass	87	C	24.3

For a more detailed description of the watershed, refer to the pre-development drainage calculations included in the Appendix.

4.7 Post Development Conditions

The post-development watershed area is shown on the Post-Development Drainage Map, which is included in the Appendix. Pertinent information relating to the watershed is summarized in the table below.

Table 4.3 Post-Development Conditions

Sub catch	Area (acre)	Cover Condition	Curve Number	Soil Group	Time of Conc. (min)
PR-B-1	0.317	Buildings	98	C	6.0
PR-B-2	0.490	Grass, Buildings	90	C	10.8
PR-EX	1.569	Pavement, Buildings, Concrete, Woods, Gravel, Grass	89	C	20.0
PR-P-1	2.443	Buildings, Gravel, Pavement, Grass	93	C	15.5
OFFSITE	0.740	Pavement, Grass	83	C	17.9

For a more detailed description of the watersheds, refer to the HydroCAD drainage calculations included as an Appendix.

4.8 Pre-and Post-Development Flow Comparison

The quantitative analysis focuses on pre-development verses post-development flow rates at the Stormwater Discharge Point (SDP). The analysis proves that no impact will result at any of the SDPs with respect to stormwater quantity for the 1, 10 or 100 year storm events.

The pre-and post-development watershed areas have been analyzed to determine stormwater runoff flow rates at each SDP. Table 4.4 compares pre-and post-development peak runoff rates during all storm events analyzed for the watershed area.

Table 4.4 Pre vs. Post Runoff Rates at SDPs

Design Point	1-Year Storm Event (cfs)		10-Year Storm Event (cfs)		100-Year Storm Event (cfs)	
	Pre	Post	Pre	Post	Pre	Post
SDP-1	5.04	3.03	11.54	11.43	22.81	22.01

As shown on Table 4.4, there is a decrease in runoff rates from pre-development to post-development conditions for each design storm. The HydroCAD drainage analysis which was used to calculate these values can be found in the Appendix.

4.9 Water Quality Treatment

The qualitative analysis focuses on the methods proposed to provide treatment of the Water Quality Volume (WQv) in order to prevent pollutants from being discharged into existing wetlands and watercourses, post-development and satisfaction of the Runoff Reduction Volume (RRv) in order to replicate pre-development hydrologic conditions. The WQv and RRv calculations have been provided in the Appendices. The following is a brief description of the water quality practices, which were designed in accordance with the Design Manual.

The bioretention areas have been designed to capture and treat the required Water Quality Volume (WQv) and Runoff Reduction Volume (RRv). Runoff from the building and paved surface adjacent to the bioretention areas will be directed into the bioretention areas, which have been sized according to the WQv and the required RRv for this portion of the site. The remaining WQv will be satisfied by the permanent pool in the pond which collects the stormwater runoff from the remainder of the developed site. The bioretention areas, and pond meet the requirements set forth in the NYSDEC Design Manual, including but not limited to pretreatment, landscaping and maintenance access.

4.10 Green Infrastructure Practices

Green Infrastructure Planning Practices were utilized in order to preserve sensitive areas, reduce impervious cover and promote reduction of the total runoff volume discharging from the site.

- Development is located in areas previously developed to preserve undisturbed areas and locate development in less sensitive areas.
- Pavement areas, buildings and associated development were located at the less steep portion of the property to best fit site terrain.
- Post construction, all soil in disturbed areas will be restored to their original properties by way of deep tilling and compost amendment. After soil restoration has occurred, these areas will then be vegetated in order to maintain the restored soil structure which will help to absorb rainwater, prevent flooding and erosion and filter out pollutants.

5.0 CONSTRUCTION SEQUENCING SCHEDULE

Construction activities shall be scheduled in such a manner as to minimize the impacts that stormwater will have during construction on receiving waters both on and off-site. The total area of disturbance for the proposed project is approximately 3.7 acres.

5.1 Construction Sequence

The project will be constructed in controlled phases to minimize overall disturbance. Erosion Controls must be installed prior to the start of construction and must be maintained throughout the construction process. Each phase of the project will have a specific construction sequencing schedule to ensure proper temporary and permanent erosion controls are in place. The Contractor will be responsible for implementing the sequencing schedule.

A typical sequencing schedule will be provided on the "Erosion and Sediment Control Plan". The schedule will address the following items.

- Pre-Construction Activities
- Installation of erosion and sediment control (ESC) measures
- Approval of ESC measures
- Land clearing and grading activities
- Maintenance of ESC measures and installation of additional ESC measures
- Installation of utilities
- Surface stabilization
- Building construction
- Landscaping and final stabilization
- Final inspection

6.0 EROSION AND SEDIMENT CONTROL MEASURES

6.1 General

The most sensitive stage of the development cycle is the period when vegetation is cleared and a site is graded. The potential impacts to on-site and off-site receiving waters and adjoining properties are particularly high at this stage. For example, trees and topsoil are removed, soils are exposed to erosion, and natural topography and drainage patterns are altered. Control of erosion and sediment during these periods is an essential function of this SWPPP and accompanying plans.

Effective and practical measures employed to minimize the erosion potential and prevent sediment from leaving the construction site and reaching streams or other water bodies have been recommended in accordance with:

- New York State Standards and Specifications for Erosion and Sediment Control, Latest Edition

In order to ensure the effectiveness of the measures recommended herein, routine inspections and documentation, along with procedures for monitoring the findings, maintenance, and corrective actions resulting from each inspection are outlined within this section of the SWPPP.

6.2 Timing of Control Measures

As indicated above in the Construction Sequence Schedule, all erosion and sediment control measures shall be installed prior to commencing any clearing or grading of the site. Structural controls (i.e. check dams) shall be installed concurrently with the applicable activity. Areas where construction activity temporarily or permanently cease shall have stabilization initiated by the end of the next business day and be completed within fourteen (14) days of the last disturbance in accordance with the SPDES permit. Once construction activity ceases permanently in an area, silt fences and hay bale barriers and any earth/dikes shall be removed once permanent vegetation/stabilization is established.

The exposed areas or soil stockpile shall have stabilization initiated by the end of the next business day and be completed within the 14-day period. Stabilization measures to be used include temporary seeding, permanent seeding, mulching and stone riprap.

During construction, runoff shall be diverted around the site with earth dikes, piping, or stabilized channels where possible. Sheet runoff from the site shall be filtered through silt fences. All storm drain inlets shall be provided with barrier filters. Stone riprap shall be provided at the outlets of drainage pipes where erosive velocities are encountered.

After major site construction has been completed, soil restoration is required across areas of the developed site where soils have been disturbed and will be vegetated in order to recover the original properties and porosity of the soil. This practice is applied in the cleanup, restoration and landscaping phase of construction followed by the permanent establishment of an appropriate, deep-rooted groundcover to help maintain the restored soil structure. Soil restoration includes mechanical decompaction, compost amendment, or both. Refer to section 5.1.6 of the NYSDEC Stormwater Management Design Manual for additional information.

6.3 Planned Erosion and Sediment Control Practices

6.3.1 *Stabilized Construction Entrance*

A stabilized construction entrance consists of a pad of aggregate overlaying a geotextile fabric located at a point where construction vehicles enter or exit a site to reduce or eliminate the tracking of sediment onto public right of ways, street, alleys or parking areas, thereby preventing the transportation of sediment into local stormwater collection systems. Efficiency is greatly increased when a washing area is included as part of a stabilized construction entrance.

Stabilized construction entrances shall be a minimum of fifty (50) feet long and twelve (12) feet wide, but not less than the full width of points where vehicles enter and exit the site. Where there is only one access point to the site, the stabilized construction entrance shall be a minimum of twenty-four (24) feet wide. Stabilized construction entrances shall be a minimum of six (6) inches in depth consisting of one (1) to four (4) inch stone or reclaimed or recycled equivalent.

6.3.2 *Silt Fencing*

A silt fence is a temporary sediment barrier consisting of a filter fabric stretched across and attached to supporting posts, entrenched, and supported with woven wire fence. Silt fences are

installed on the contours across a slope and used to trap sediment by intercepting and detaining sediment laden runoff from disturbed areas in order to promote sedimentation on the uphill side of the fence.

Silt fences are suitable for perimeter and interior control, placed below areas where runoff may occur in the form of sheet flow. It should not be placed in channels or areas where flow is concentrated. In addition to interior and perimeter control a silt fence can be applied in the following applications:

- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels banks.
- Around temporary spoil area and stockpiles.

6.3.3 *Dust Control*

Dust control measures reduce the surface and air transport of dust, thereby preventing pollutants from mixing into stormwater. Dust control measures for the construction activities associated within this project consist of windbreaks, minimization of soil disturbance (preserving buffer areas of vegetation where practical), mulching, temporary and permanent vegetation cover, barriers (i.e. geotextile on driving surfaces) and water spraying.

Construction activities shall be scheduled to minimize the amount of area disturbed at any one time.

6.3.4 *Straw Bales*

Straw bales will be placed around catch basins. Straw bales will be placed in a row with ends tightly abutting the adjacent bales. Each bale will be embedded in the soil a minimum of four inches. Bales will be securely anchored in place by stakes or re-bars driven through the bales. The first stake in each bale will be angled toward the previously laid bale to force the bales together.

6.3.5 *Temporary Sediment Basin*

Various types of sediment containment facilities, consisting of rip-rap outlet traps and pipe outlet traps may be proposed as part of the erosion and sediment control plan. These facilities purpose is to intercept sediment-laden surface runoff and enable sediment settlement prior to discharge from the site. The outlet for these traps will be properly stabilized to avoid erosion at the discharge point. Sediment traps shall be located and installed in all drainage ways, storm drain inlets, pipe outlets, grass outlets, stone outlets, riprap outlets and at other points of collection from the disturbed area. Sediment traps shall be located and installed prior to grading or filling the drainage area they are to protect.

6.3.6 *Stone Check Dam*

Check dams shall be placed in channels to reduce scour and erosion by reducing flow velocity and promoting sediment settlement. Check dams shall be spaced in the channel so that the crest of the downstream dam is at the elevation of the toe of the upstream dam. Check dams, consisting of a well-graded stone two (2) – nine (9) inches in size (NYSDOT – Light Stone) shall maintain a height of two (2) feet with side slopes of 2:1 extending beyond the bank of the channel by a

minimum of one and a half (1.5) feet. Check dams shall be anchored in the channel by a cutoff trench of one and a half (1.5) feet in width by a half (0.5) foot in depth.

6.3.7 *Temporary Diversion Swales*

Temporary diversions swales will be constructed and installed to direct runoff away from disturbed areas, as required. Swales will be installed with stone check dams to prevent downstream siltation. Diverted runoff from disturbed areas will be directed into the temporary sediment basins. Temporary diversion swales will be stabilized and operational before land disturbing activities begin.

6.3.8 *Tree Preservation and Protection*

Fencing shall be used wherever trees are to be protected adjacent to areas of disturbance. Trees to be detained within 40 feet of any proposed structure or excavation shall be protected by fencing as specified on the Erosion and Sediment Control Plan. Fences may also be used to prevent compaction or disturbance of sensitive soils.

6.3.9 *Temporary Soil Stockpiles*

Material, such as topsoil, will be temporarily stockpiled (if necessary) on the site throughout the construction. Stockpiles will be located in areas away from the path of stormwater and will be protected from erosion by a surrounding silt fence barrier. Soil and topsoil stockpiles will be seeded or stabilized by the end of the next business day they are created and completed within 14 days.

6.3.10 *Limit of Disturbance*

Construction fence: a standard, 40" high construction fence shall be used. Construction fences shall be secured at all clearing limits, using standard steel fence posts set six feet apart. If plastic mesh "mirafi" fence is used, post spacing shall be as per manufacturer's specifications.

6.3.11 *Land Grading*

A waiver to disturb an area greater than five acres at any one time will not be required prior to construction as the total land disturbance associated with this project is less than 5 acres.

- Topsoil shall be distributed to form a uniform depth over the area. It shall not be placed when it is partly frozen, muddy, or on frozen slopes or over ice, snow, or standing water.
- Topsoil placed and graded on slopes steeper than 5% shall be promptly fertilized, seeded, mulched and stabilized by "tracking" with suitable equipment.
- Apply topsoil in the following amounts for intended use:
- Mowed lawn: four to six inches
- Area not to be maintained: one to two inches
- Complete rough grading and final grade, allowing for depth of topsoil to be added.
- Scarify all compact, slowly permeable, medium and fine textured subsoil areas. Scarify at approximately right angles to the slope direction in soil areas that are steeper than 5%.

- Remove refuse, woody plant parts, stones over three inches in diameter, and other litter.
- The furnishing of new topsoil shall be of a better or equal to quality of the existing adjacent topsoil. It shall meet the following criteria:
- Topsoil shall have at least 2% by weight of fine textured stable organic material, and no greater than 6%.
- Topsoil shall have not less than 20% fine texture material (passing the no. 200 sieve) and not more than 15% clay.
- Topsoil shall be relatively free of stones over 1½" diameter, thrash, noxious weeds, and shall have less than 10% gravel by volume.

6.3.12 *Temporary Vegetative Cover (during construction)*

Temporary seeding may be used in disturbed areas to minimize erosion and sediment loss. Any disturbed area that will not be redisturbed for 7 days or more will be stabilized by the 7th day after the last disturbance. After grass has appeared, those areas which fail to show a uniform stand of grass shall be reseeded. This process will be repeated until all areas are covered with satisfactory growth.

- Site Preparation: same as permanent vegetative cover
- Seed Mixtures:
- Rapidly germinating annual ryegrass (30 lbs. per acre)
- Perennial ryegrass (100 lbs. per acre)
- Cereal rye (30 lbs. per acre)
- Seeding: same as permanent vegetative cover

6.3.13 *Permanent Vegetative Cover (after construction)*

1. Site Preparation:

- Bring area to be seeded to required grade. A minimum of four inches of topsoil is required.
- Prepare seedbed-loosening soil to a depth of four to six inches.
- Remove all stones over one inch in diameter, sticks and foreign matter from the surface.
- Lime to pH of 6.5.
- Where the soil has been compacted by construction operations, loosen soil to a depth of two (2) inches before applying fertilizer, lime and seed.
- Apply fertilizer at the rate of 600 pounds per acre of 5-10-10. Apply limestone (equivalent to 50 percent calcium plus magnesium oxide) at a rate of three tons per acre.
- Incorporate lime and fertilizer in the top two to four inches of topsoil.

- Smooth and firm the seedbed.

2. Seeding:

- Apply seed uniformly by hand, cyclone seeder, or hydro-seeder (slurry including seed and fertilizer). Hydro-seeding, which includes mulch, may be left on soil surface. Seeding rates must be increased 10% when hydro-seeding.
- Mulch seeded areas with hay or straw mulch (2000 lbs./acre).
- Irrigate to fully saturate soil layer, but not to dislodge planting soil.
- Seed between April 1st and May 15th or August 15th and October 15th. Seeding may occur between May 15th and August 15th if adequate irrigation is provided.

6.3.14 *Water Barriers*

Water barriers will be used to prevent water from concentrating on unprotected road surfaces. The water barriers will be designed to divert runoff into a temporary sediment trap or stabilized drainage channel thereby protecting the road surface from gully erosion.

6.3.15 *Dewatering*

Dewatering will be used to intercept sediment-laden stormwater or pumped groundwater and allow it to settle out of the pumped discharge prior to being released from the site. Water resulting from dewatering operations shall be direct to temporary sediment traps or dewatering devices. Temporary sediment traps and dewatering bags will be provided, installed and maintained at down-gradient locations to control sediment deposits offsite. Water from dewatering operations shall be treated to eliminate the discharge of sediment and other pollutants.

6.3.16 *Outlet Stabilization Structures*

Rip Rap outlet protection will be placed at all pipe discharge locations, in order to reduce depth, velocity, and energy of the discharge flow and to minimize downstream erosion. A filter layer will be placed between the rip-rap and underlying soil surface to prevent soil movement into and through the rip-rap. Rock outlet protection will be designed in accordance with the New York State Guidelines for Urban Erosion and Sediment Control.

6.3.17 *Concrete Washout Area*

Best management practice objectives for concrete washout are to collect and retain all the concrete washout water and solids in leak proof containers, preventing caustic material from reaching the soil surface and migrating to surface waters or into ground waters. 100 percent of collected concrete washout water and solids should be recycled. Several different types of EPA approved washout containers are available, all of which are capable of containing all concrete washout materials. Washout containers should not be placed within 50 feet of storm drains, open ditches and water bodies. Washout facilities should be inspected daily during use and after heavy rains to check for leaks. When the contains has reached 75% capacity, the washwater should be vacuumed off or allowed to evaporate to avoid overflows. The hardened materials should be removed and recycled.

6.4 General Inspection and Maintenance Practice

6.4.1 *Pre-Construction Inspection and Maintenance*

Prior to the commencement of construction, a qualified professional shall conduct an assessment of the site and certify that the appropriate erosion and sediment control structures have been adequately installed and implemented.

6.4.2 *Construction Inspection and Maintenance*

Owner or Operator Maintenance Inspection Requirements:

The owner or operator shall inspect, in accordance with the requirements in the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, the erosion and sediment controls identified in the SWPPP to ensure that they are being maintained in effective operating condition at all times.

Qualified Inspector Inspection Requirements:

The owner or operator shall have a qualified inspector conduct site inspection. In order to perform these inspections, the qualified inspector has to be a:

- Licensed Professional Engineer
- Certified Professional in Erosion and Sediment Control
- Registered Landscape Architect, or
- Someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity.

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

For construction sites where soil disturbance activities are on-going and the owner or operator has received authorization in accordance with Part II.C.3 of GP-0-15-002 to disturb greater than five acres of soil at any one time, the qualified inspector shall conduct at least two site inspections every seven calendar days. The two inspections shall be separated by a minimum of two full calendar days.

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

1. Date and time of inspection
2. Name and title of person performing inspection
3. A description of the weather and soil conditions at the time of inspection

4. A description of the condition of the runoff at all points of discharge from the construction site. This shall include identification of any discharges of sediment from the construction site. Include discharges from conveyance systems and overland flow.
5. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any discharges of sediment to the surface waterbody
6. Identification of all erosion and sediment control practices that need repair or maintenance
7. 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
8. 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
9. 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
10. Corrective actions 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
11. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The qualified inspector shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven calendar days of the date of the inspection. The qualified inspector shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The qualified inspector shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven calendar days of that inspection.

Within one business day of the completion of an inspection, the qualified inspector shall notify the owner or operator and appropriate contractor or subcontractor identified in Part III.A.6 of GP-0-15-002 of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

All inspection reports shall be signed by the qualified inspector. The inspection reports shall be maintained on site with the SWPPP.

The contractor is responsible for the installation and maintenance of all erosion and sediment control measures throughout the course of construction.

The contractor is responsible for controlling dust by sprinkling exposed soil areas periodically with water as required. The contractor is to supply all equipment and water.

6.5 Reporting

6.5.1 *Inspection / Maintenance Reports*

Inspection/maintenance reports will be prepared prior to and during construction in accordance with the schedule outlined above, by the qualified professional. All inspection reports shall be signed by the qualified inspector. Pursuant to Part II.C.2, the inspection reports shall be maintained on site with the SWPPP.

6.5.2 *Site Log Book*

During construction, the contractor shall maintain a record of all erosion and sediment control inspection reports at the site in a log book. The site log book shall be maintained on-site and made available to the permitting authority.

6.5.3 *Post Construction*

The owner or operator shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five years from the date that the site achieves final stabilization. This period may be extended by the Department, in its sole discretion, at any time upon written notification.

With the exception of the NOI, NOT and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.A.1), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate Department Regional Office listed in Appendix F of GP-0-15-002.

The operator shall also prepare a written summary of its status with respect to compliance with this general permit at a minimum frequency of every three months during which coverage under this permit exists. The summary should address the status of achieving the overall goal of the SWPPP. This summary shall be handled in the same manner as prescribed for SWPPP's under Part III, subsection B of the NYSDEC SPDES General Permit GP-0-15-002.

7.0 STORMWATER MEASURES

The following section describes the design of each stormwater measure and the maintenance requirements. All maintenance activities are the responsibility of the property owner. Construction specifications for each stormwater measure are identified on the approved plans.

7.1 Bioretention Area

7.1.1 *Bioretention - Design*

Stormwater runoff from the building and portions of the driveway will be directed toward the bioretention areas. This Stormwater Management practice will be integrated into the site to provide WQv treatment and to satisfy the RRv requirements.

The bioretention areas have been sized to treat the WQv and satisfy the RRv for site runoff directed to the practices in accordance with the Design Manual. Runoff in excess capacity of bioretention area 1 will rise to the invert / rim elevation of an engineered outlet control structure and be conveyed to the stormwater management pond. Runoff in excess capacity of bioretention area 2 will rise to the invert / rim elevation of an engineered outlet control structure and be conveyed to the stormwater discharge point.

Elements of the systems include grass filter strip, mulch, bioretention soil, filter fabric, gravel, 6" diameter perforated collection pipes, a 12” diameter outlet pipe and an outlet control structure.

The bioretention areas will be covered with two to three inches of mulch with grasses and various absorbent plantings, on top of a layer of engineered permeable soil 2.5 feet in depth. Captured runoff will infiltrate downward through the underlying soils, where it is filtered of pollutants. This filtered runoff will be collected by underground perforated pipes and then be directed to either the pond or the stormwater discharge point.

Pretreatment for the bioretention will be provided by a grass filter strip and mulch layer in accordance with the Design Manual. Additional pretreatment is not required as runoff primarily comes from the new building roof which will be mostly free of sediments and contaminants typically found in surface runoff.

The bioretention area will be incorporated to provide both water quality treatment and to reduce the runoff reduction volume of impervious surfaces as required.

7.1.2 *Maintenance and Inspection*

Silt / sediment shall be removed from the filter bed when the accumulation exceeds one inch. When the filtering capacity of the bioretention soil diminishes substantially (i.e. when water ponds on the surface of the filter bed for more than 48 hours), the top few inches of discolored material shall be removed and replaced with fresh material. The removed sediments shall be disposed of in an acceptable manner. Areas devoid of mulch shall be re-mulched on an annual basis. Dead or diseased plant material shall be replaced.

7.2 Stormwater Ponds

7.2.1 *Design*

The pond has been designed primarily to reduce peak flow rates discharging from the site. Additionally, the pond will have a permanent pool which will capture and treat the remaining Water Quality Volume (WQv). The lowest outlet elevation has been set above the WQv elevation to ensure the full treatment volume. The pond will have 3H:1V side slopes. The pond meets the requirements set forth in the NYSDEC Design Manual, including but not limited to pretreatment, landscaping and maintenance access. Preatreatment for surface runoff conveyed to the pond is provided by the sediment forebay. Pretreatment is not required for the runoff that comes from the building roof as the roof will be free of contaminants and sediments typically found in surface runoff.

7.2.2 *Maintenance and Inspection*

The pond shall be inspected by the owner annually and maintained as necessary. The pond berm and banks must be mowed a minimum of 2 times per year. Sediment removal should occur after 50% of total permanent pool capacity has been lost.

8.0 GOOD HOUSEKEEPING AND MATERIAL MANAGEMENT PRACTICES

8.1 General

The following good housekeeping and material management practices shall be followed to reduce the risk of spills or exposure of materials to stormwater runoff.

8.2 Chemical

Chemicals used on-site shall be kept in small quantities and stored in closed water tight containers undercover in a neat and orderly manner and kept out of direct contact with stormwater. Chemical products shall not be mixed with one another unless recommended by manufacturer.

All on-site personnel shall have access to material safety data sheets (MSDS) and National Institute for Occupational Safety and Health (NIOSH) Guide to Chemical Hazards (latest edition) for all chemicals stored and used on-site.

Manufacturer's and/or Federal, State, County and Local guidelines for proper use and disposal shall be followed. Any spills or contamination of runoff with chemicals shall be contained, collected, cleaned up immediately and disposed of in accordance with Federal, State, County and Local regulations.

8.3 Fuels and Oil

All on-site vehicles, tools, and construction equipment shall be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. On-site vehicle and equipment refueling shall be conducted at a location away from access to surface waters and runoff. Any on-site storage tanks shall have a means of secondary containment. Oil products shall be kept in their original containers with original manufacturer's label. In the event of a spill, it shall be contained, cleaned up immediately and the material, including any contaminated soil, shall be disposed of in accordance with Federal, State, County and Local regulations.

Fuel and oil spills in excess of reportable quantities shall be reported to the NYSDEC as soon as the discharge is discovered.

8.4 Fertilizers

Fertilizers used on-site shall be stored in closed water tight containers undercover in a neat orderly manner and kept out of direct contact with stormwater. Manufacturer's and/or Federal, State, County and Local guidelines for proper use and disposal shall be followed. Any spills or

contamination of runoff with fertilizers shall be contained, collected, cleaned up immediately, and disposed of in accordance with Federal, State, County and Local regulations.

8.5 Sanitary Waste Facilities

Should portable units be located on-site, they shall be placed in upland areas away from direct contact with surface waters. They shall be serviced and cleaned on a weekly basis by a licensed portable toilet and septic disposal service. Any spills occurring during service shall be cleaned up immediately and disposed of in accordance with Federal, State, County, and Local regulations.

8.6 Concrete and Asphalt Trucks

Concrete and asphalt trucks shall not be allowed to wash out or discharge surplus material on-site unless within an approved washout facility.

9.0 CERTIFICATIONS

9.1 Preparer of the SWPPP

The following certification will be signed by the preparer of the final SWPPP to accompany the site plan and subdivision set.

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

Name	Andrew Willingham, PE
*Title	Principal
Firm/Business Name	Willingham Engineering, PLLC
Address	10 Main Street – Suite 321
Telephone Number	(845) 255-0210

Signature _____

Date _____

* Person providing signature shall meet the requirements of Part V.H. of General Permit GP-0-15-002

9.2 Site Contractor and Sub-Contractors

The general contractor, and all subcontractor's involved with construction activity that disturbs site soil or who implement erosion and sediment control measures identified in this preliminary SWPPP, and subsequent SWPPP's for the project are responsible for complying with the requirements set forth in the NYSDEC SPDES Permit GP-0-15-002 and therefore must provide the following certification.

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

Name _____

*Title _____

Firm/Business Name_____

Address_____

Telephone Number_____

Signature_____

Date_____

Person providing signature shall meet the requirements of Part V.H. of General Permit GP-0-15-002

APPENDICES

APPENDIX A: SOILS DATA

APPENDIX B: EROSION AND SEDIMENT CONTROL PLANS

APPENDIX C: NOTICE OF INTENT (NOI)

APPENDIX D: GP-0-15-002

APPENDIX E: WEEKLY INSPECTION FORM

APPENDIX F: MS4 ACCEPTANCE FORM

APPENDIX G: HYDROCAD ANALYSIS

APPENDIX H: DRAINAGE MAPS

APPENDIX I: STORMWATER CALCULATIONS

APPENDIX J: CONSTRUCTION INSPECTION AND MAINTENANCE CHECKLISTS

APPENDIX K: NRCC MEAN PRECIPITATION FREQUENCY ESTIMATES

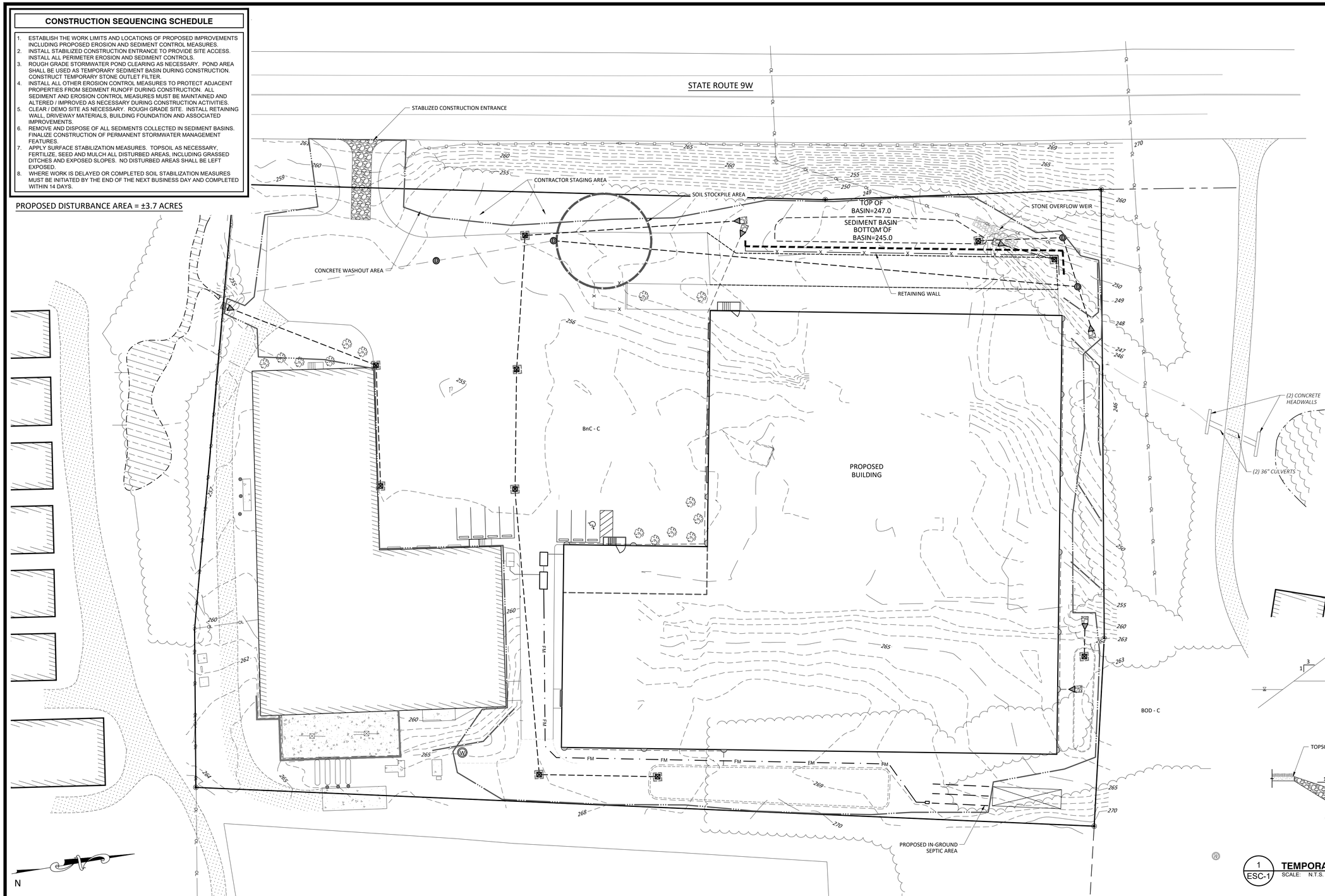
APPENDIX B

EROSION & SEDIMENT CONTROL PLANS

CONSTRUCTION SEQUENCING SCHEDULE

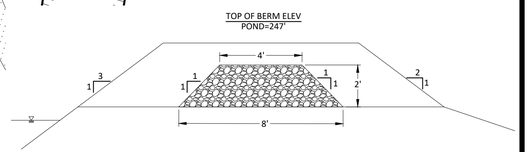
1. ESTABLISH THE WORK LIMITS AND LOCATIONS OF PROPOSED IMPROVEMENTS INCLUDING PROPOSED EROSION AND SEDIMENT CONTROL MEASURES.
2. INSTALL STABILIZED CONSTRUCTION ENTRANCE TO PROVIDE SITE ACCESS. INSTALL ALL PERIMETER EROSION AND SEDIMENT CONTROLS.
3. ROUGH GRADE STORMWATER POND CLEARING AS NECESSARY. POND AREA SHALL BE USED AS TEMPORARY SEDIMENT BASIN DURING CONSTRUCTION. CONSTRUCT TEMPORARY STONE OUTLET FILTER.
4. INSTALL ALL OTHER EROSION CONTROL MEASURES TO PROTECT ADJACENT PROPERTIES FROM SEDIMENT RUNOFF DURING CONSTRUCTION. ALL SEDIMENT AND EROSION CONTROL MEASURES MUST BE MAINTAINED AND ALTERED / IMPROVED AS NECESSARY DURING CONSTRUCTION ACTIVITIES.
5. CLEAR / DEMO SITE AS NECESSARY. ROUGH GRADE SITE. INSTALL RETAINING WALL, DRIVEWAY MATERIALS, BUILDING FOUNDATION AND ASSOCIATED IMPROVEMENTS.
6. REMOVE AND DISPOSE OF ALL SEDIMENTS COLLECTED IN SEDIMENT BASINS. FINALIZE CONSTRUCTION OF PERMANENT STORMWATER MANAGEMENT FEATURES.
7. APPLY SURFACE STABILIZATION MEASURES. TOPSOIL AS NECESSARY, FERTILIZE, SEED AND MULCH ALL DISTURBED AREAS, INCLUDING GRASSED DITCHES AND EXPOSED SLOPES. NO DISTURBED AREAS SHALL BE LEFT EXPOSED.
8. WHERE WORK IS DELAYED OR COMPLETED SOIL STABILIZATION MEASURES MUST BE INITIATED BY THE END OF THE NEXT BUSINESS DAY AND COMPLETED WITHIN 14 DAYS.

PROPOSED DISTURBANCE AREA = ±3.7 ACRES

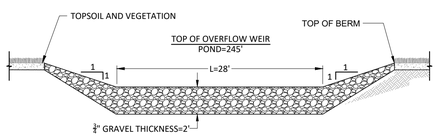


LEGEND

- EXISTING PROPERTY LINE
- ADJACENT PROPERTY LINE
- BUILDING SETBACK
- PROPERTY BOUNDARY CORNER
- EXISTING MONUMENT
- EXISTING REBAR
- EXISTING IRON PIPE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING EDGE OF PAVEMENT
- EXISTING EDGE OF GRAVEL
- EXISTING TREE LINE
- EXISTING PINE TREE
- EXISTING TREE
- EXISTING GUIDE RAIL
- EXISTING WOOD FENCE
- EXISTING DITCH
- EXISTING DRAINAGE CULVERT
- EXISTING DRAINAGE CATCH BASIN
- UTILITY POLE & OVERHEAD LINE
- PROPOSED SILT FENCE
- PROPOSED OVERFLOW WEIR
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED INLET PROTECTION
- PROPOSED RETAINING WALL
- PROPOSED DRAINAGE CULVERT
- PROPOSED CATCH BASIN
- PROPOSED DRAINAGE MANHOLE
- PROPOSED END SECTION WITH RIP-RAP OUTLET PROTECTION
- PROPOSED EDGE OF PAVEMENT



SECTION A-A



SECTION B-B

1 ESC-1 **TEMPORARY STONE OVERFLOW WEIR**
SCALE: N.T.S.

0 1 2 3
SIZE IN INCHES (FULL SIZE - 22"x34" SHEET)
0 1
SIZE IN INCHES (HALF SIZE - 11"x17" SHEET)

STATE OF NEW YORK · ANDREW W. WILLINGHAM · 083984 · LICENSED PROFESSIONAL ENGINEER

willingham engineering
183 Main Street
New Paltz, New York 12561
T 845.255.0210 F 845.256.8110
www.willinghamengineering.com

REV	DATE	DESCRIPTION
1	10/25/19	REVISIONS PER PLANNING BOARD

EROSION AND SEDIMENT CONTROL PLAN

ROYAL ENERGY PROPERTIES, LLC

1666 ROUTE 9W

TOWN OF MARLBOROUGH, ULSTER COUNTY, NEW YORK

DRAWN BY	CHECKED BY
MLT	AVW
DATE	SCALE
09/20/19	1"=30'
PROJECT NO.	
19032	
SHEET NO.	
ESC-1	

EROSION AND SEDIMENT CONTROL NOTES - GENERAL

ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN ACCORDANCE WITH THE STANDARDS AND PRINCIPLES AS OUTLINED IN THE "NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL" AND THE LOCAL MUNICIPALITY'S EROSION AND SEDIMENT CONTROL STANDARDS AND PRACTICES, IF SUCH A DOCUMENT EXISTS. THE INTENT OF THE OUTLINED MEASURES IS TO MINIMIZE EROSION AND SEDIMENTATION DURING CONSTRUCTION, STABILIZE AND PROTECT THE SITE FROM EROSION AFTER CONSTRUCTION IS COMPLETE AND MITIGATE ANY ADVERSE IMPACTS TO STORMWATER QUALITY RESULTING FROM SEDIMENT RUNOFF CAUSED BY DEVELOPMENT ACTIVITIES.

NO SOIL STOCKPILE OR GRADED AREA SHALL REMAIN EXPOSED FOR MORE THAN 14 DAYS. THE EXPOSED AREAS OR SOIL STOCKPILE SHALL BE STABILIZED WITHIN THE 14 DAY PERIOD. STABILIZATION MEASURES TO BE USED INCLUDE TEMPORARY SEEDING, PERMANENT SEEDING, MULCHING AND STONE RIP RAP. DURING CONSTRUCTION, RUNOFF SHALL BE DIVERTED AROUND THE SITE WITH EARTH DIKES, PIPING, OR STABILIZED CHANNELS WHERE POSSIBLE. SHEET RUNOFF FROM THE SITE SHALL BE PROVIDED WITH BARRIER FILTERS. STONE RIP RAP SHALL BE PROVIDED AT THE OUTLETS OF DRAINAGE PIPES WHERE EROSIVE VELOCITIES ARE ENCOUNTERED.

TIMING OF CONTROL MEASURES

AS INDICATED ABOVE IN THE CONSTRUCTION SEQUENCE SCHEDULE, ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED PRIOR TO COMMENCING ANY CLEARING OR GRADING OF THE SITE. STRUCTURAL CONTROLS SHALL BE INSTALLED CONCURRENTLY WITH THE APPLICABLE ACTIVITY, AREAS WHERE CONSTRUCTION ACTIVITY TEMPORARILY CEASES FOR MORE THAN TWENTY ONE (21) DAYS WILL BE STABILIZED WITH A TEMPORARY SEED AND MULCH WITHIN FOURTEEN (14) DAYS OF THE LAST DISTURBANCE. ONCE CONSTRUCTION ACTIVITY CEASES PERMANENTLY IN AN AREA, SILT FENCES AND HAY BALE BARRIERS AND ANY EARTH DIKES WILL BE REMOVED ONCE PERMANENT MEASURES AND STABILIZATION ARE ESTABLISHED.

GENERAL INSPECTION AND MAINTENANCE PRACTICE

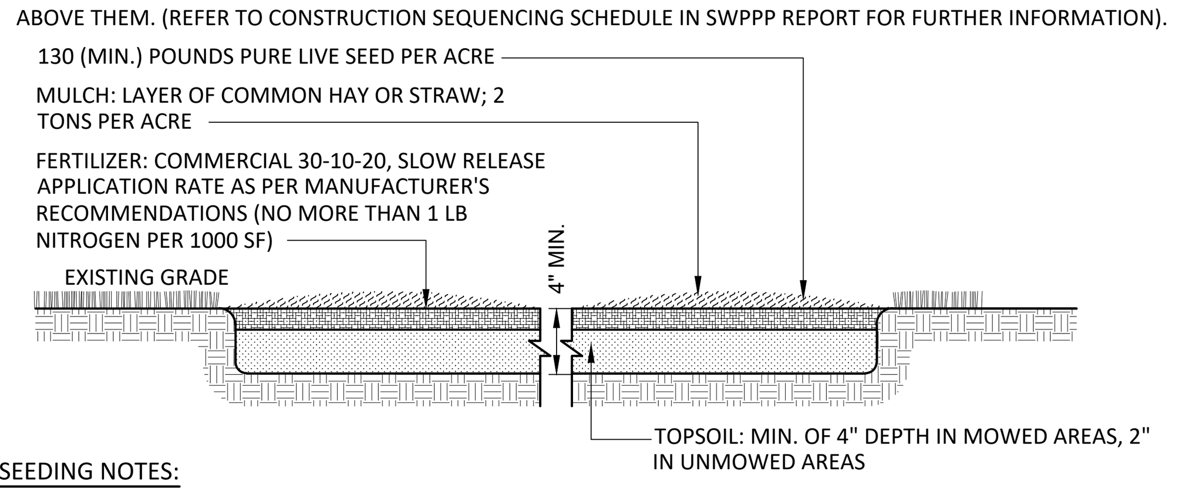
THESE ARE THE GENERAL INSPECTION AND MAINTENANCE PRACTICES THAT WILL BE USED TO IMPLEMENT THE PLAN DURING CONSTRUCTION.

1. THE SMALLEST PRACTICAL PORTION OF THE SITE WILL BE DISTURBED AT ONE TIME.
2. ALL CONTROL MEASURES WILL BE INSPECTED AT LEAST ONCE EACH WEEK.
3. ALL MEASURES WILL BE MAINTAINED IN GOOD WORKING ORDER. IF A REPAIR IS NECESSARY IT WILL BE INITIATED WITHIN 24 HOURS OF REPORT.
4. A MAINTENANCE INSPECTION REPORT WILL BE MADE AFTER EACH INSPECTION.
5. THE CONTRACTOR IS RESPONSIBLE FOR THE INSTALLATION AND MAINTENANCE OF ALL EROSION AND SEDIMENT CONTROL MEASURES THROUGHOUT THE COURSE OF CONSTRUCTION.

INSTALLATION NOTES

1. TEMPORARY SEEDING SHOULD BE MADE WITHIN 24 HOURS OF CONSTRUCTION OR DISTURBANCE. IF NOT, THE SOIL MUST BE SCARIFIED PRIOR TO SEEDING.
2. IN ORDER FOR MULCH TO BE EFFECTIVE IT MUST BE PLACED PRIOR TO MAJOR STORM EVENTS. IT WILL BE NECESSARY TO CLOSELY MONITOR WEATHER PREDICTIONS TO HAVE ADEQUATE WARNING OF SIGNIFICANT STORMS.
3. THE TIME PERIOD TO MULCH CAN RANGE FROM 14 TO 21 DAYS OF INACTIVITY ON AN AREA, THE LENGTH OF TIME VARYING WITH SITE CONDITIONS. PROFESSIONAL JUDGMENT SHALL BE USED TO EVALUATE THE INTERACTION OF SITE CONDITIONS (SOIL ERODABILITY, SEASON OF YEAR, EXTENT OF DISTURBANCE, PROXIMITY TO SENSITIVE RESOURCES, ETC.) AND THE POTENTIAL IMPACT OF EROSION ON ADJACENT AREAS IN ORDER TO CHOOSE AN APPROPRIATE TIME RESTRICTION.
4. WHEN MULCH IS APPLIED TO PROVIDE PROTECTION OVER WINTER (PAST THE GROWING SEASON) IT SHALL BE AT THE RATE OF 6,000 LBS OF HAY OR STRAW PER ACRE. A TACKIFIER MAY BE ADDED TO THE MULCH.

SEDIMENT BARRIERS SHALL BE INSTALLED PRIOR TO ANY SOIL DISTURBANCE OF THE CONTRIBUTING DRAINAGE AREA ABOVE THEM. (REFER TO CONSTRUCTION SEQUENCING SCHEDULE IN SWPPP REPORT FOR FURTHER INFORMATION).



SEEDING NOTES:

1. PROVIDE FRESH, CLEAN, NEW SEED COMPLYING WITH ESTABLISHED TOLERANCES FOR GERMINATION AND PURITY IN ACCORDANCE WITH THE U.S. DEPARTMENT OF AGRICULTURE RULES AND REGULATIONS UNDER THE LATEST EDITION OF THE FEDERAL SEED ACT. SEED SHALL BE MIXED BY THE DEALER AND SHALL BE DELIVERED TO THE SITE IN SEALED CONTAINERS WHICH SHALL BEAR THE DEALER'S GUARANTEE ANALYSIS.
2. SEED MIXTURES:
   FOR TEMPORARY SEEDING - OR - AREAS THAT WILL NOT BE MAINTAINED:
   RAPIDLY GERMINATING ANNUAL RYEGRASS: 30 LBS PER ACRE PERENNIAL
   RYEGRASS: 100 LBS PER ACRE
   CEREAL RYE: 30 LBS PER ACRE
   FOR USE ON LAWN AREAS (AREAS TO BE MAINTAINED)
   ALTERNATE A (SUNNY SITE)
   65% KENTUCKY BLUE GRASS BLEND: 85-114 LBS PER ACRE
   20% PERENNIAL RYEGRASS: 26-35 LBS PER ACRE
   15% FINE FESCUE: 19-26 LBS PER ACRE
   TOTAL: 130-175 LBS PER ACRE
   ALTERNATE B (SHADY SITE)
   80% KENTUCKY BLUE GRASS BLEND*: 105-138 LBS PER ACRE
   20% PERENNIAL RYEGRASS: 25-37 LBS PER ACRE
   TOTAL: 130-175 LBS PER ACRE
   * SHADE TOLERANT
3. APPLY SEED UNIFORMLY BY HAND, CYCLONE SEEDER, OR HYDRO SEEDER (SLURRY INCLUDING SEED AND FERTILIZER). HYDRO-SEEDINGS, WHICH INCLUDE MULCH, MAY BE LEFT ON SOIL SURFACE. SEEDING RATES MUST BE INCREASED 10% WHEN HYDRO-SEEDING.
4. MULCH SEEDED AREAS WITH STRAW MULCH (2000 LBS PER ACRE).
5. IRRIGATE TO FULLY SATURATE SOIL LAYER, BUT NOT TO DISLODGE PLANTING SOIL.
6. SEED BETWEEN APRIL 1ST AND MAY 15TH OR AUGUST 15TH AND OCTOBER 15TH. SEEDING MAY OCCUR BETWEEN MAY 15TH AND AUGUST 15TH IF ADEQUATE IRRIGATION IS PROVIDED.

TOPSOIL APPLICATION NOTES:

1. TOPSOIL SHALL BE DISTURBED TO A UNIFORM DEPTH OVER THE AREA. IT SHALL NOT BE PLACED WHEN IT IS PARTIALLY FROZEN, MUDDY OR ON FROZEN SLOPES OVER ICE, SNOW OR STANDING WATER.
2. TOPSOIL PLACED AND GRADED ON SLOPES STEEPER THAN 5% SHALL BE PROMPTLY FERTILIZED, SEEDED AND STABILIZED BY "TRACKING" WITH SUITABLE EQUIPMENT.
3. APPLY TOPSOIL IN THE FOLLOWING AMOUNTS FOR INTENDED USE:
   MOWED LAWN: 4-8 INCHES
   UNMOWED AREA: 2-4 INCHES
4. COMPLETE ROUGH GRADING AND FINAL GRADE, ALLOWING FOR DEPTH OF TOPSOIL TO BE ADDED. SCARIFY ALL COMPACT, SLOWLY PERMEABLE, MEDIUM AND FINE TEXTURED SUBSOIL AREAS. SCARIFY AT APPROXIMATELY RIGHT ANGLES TO THE SLOPE DIRECTION IN SOIL AREAS THAT ARE STEEPER THAN 5%.
5. REMOVE REFUSE, WOODY PLANT PARTS, STONES OVER 3 INCHES IN DIAMETER, AND OTHER LITTER.

TOPSOIL MATERIAL NOTES:

THE FURNISHINGS OF NEW TOPSOIL SHALL BE OF A BETTER OR EQUAL QUALITY OF THE EXISTING ADJACENT TOPSOIL AND SHALL MEET THE FOLLOWING CRITERIA;

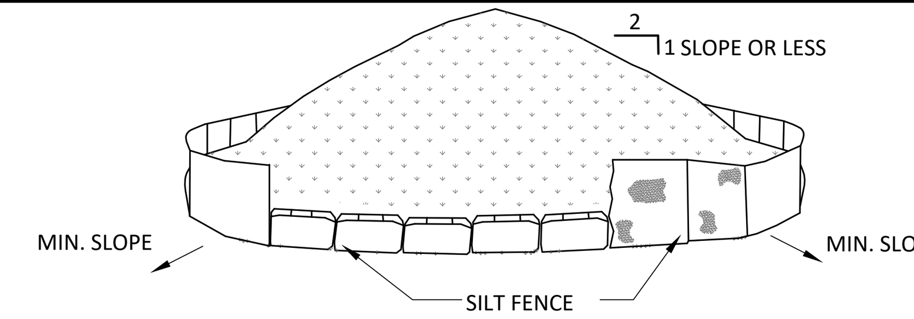
- TOPSOIL SHALL HAVE AT LEAST 2%, BUT NOT MORE THAN 6% BY WEIGHT OF FINE TEXTURED STABLE ORGANIC MATERIAL.
- TOPSOIL SHALL HAVE NOT LESS THAN 20% FINE TEXTURED MATERIAL (PASSING THE NO. 200 SIEVE) AND NOT MORE THAN 15% CLAY.
- TOPSOIL SHALL BE RELATIVELY FREE OF STONES OVER 1" DIAMETER, THRASH, NOXIOUS WEEDS, AND WILL HAVE LESS THAN 10% GRAVEL BY VOLUME.

INSPECTION & MAINTENANCE NOTES:

1. TEMPORARY SEEDING AND PLANTING WILL BE INSPECTED FOR BARE SPOTS, WASHOUTS, AND UNHEALTHY GROWTH.
2. TEMPORARY SEEDINGS SHALL BE PERIODICALLY INSPECTED. AT A MINIMUM 95% OF THE SOIL SURFACE SHOULD BE COVERED BY VEGETATION. IF ANY EVIDENCE OF EROSION OR SEDIMENTATION IS APPARENT, REPAIRS SHALL BE MADE AND OTHER TEMPORARY MEASURES USED IN THE INTERIM. (MULCH, FILTER BARRIERS, CHECK DAMS, ETC.)
3. ALL MULCHES MUST BE INSPECTED PERIODICALLY, IN PARTICULAR AFTER RAINSTORMS, TO CHECK FOR RILL EROSION. IF LESS THAN 90% OF THE SOIL SURFACE IS COVERED BY MULCH, ADDITIONAL MULCH SHALL BE APPLIED IMMEDIATELY.
4. AERATE COMPACTED OR HEAVY USED AREAS, ANNUALLY AS SOON AS THE SOIL MOISTURE CONDITIONS PERMIT. AERATE AREA 6 TO 8 TIMES USING A SPOON HOLLOW TINE TYPE AERATION. DO NOT USE SPIKE EQUIPMENT.
5. RESEED BARE AND THIN AREAS ANNUALLY WITH ORIGINAL SPECIES.
6. SOIL SHALL MAINTAIN A pH OF 6.0-7.0.

TOPSOIL, SEED AND MULCH DETAIL

SCALE: NTS



SPECIFICATION AND INSTALLATION NOTES:

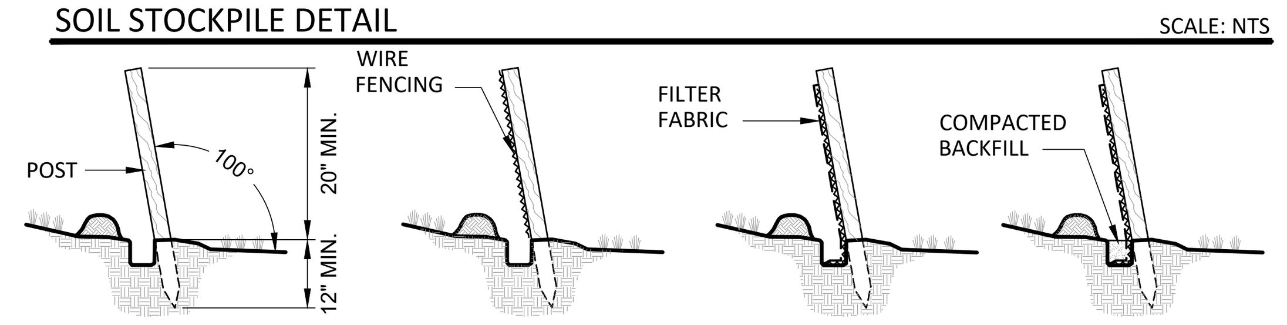
1. AREA CHOSEN FOR STOCKPILING OPERATIONS SHALL BE DRY AND STABLE.
2. MAXIMUM SLOPE OF STOCKPILE SHALL BE 1:2.
3. UPON COMPLETION OF SOIL STOCKPILING, EACH PILE SHALL BE SURROUNDED WITH EITHER SILT FENCING OR HAY BALES AND STABILIZED WITH VEGETATION OR COVERED.
4. SEE SPECIFICATIONS ON INSTALLATION OF SILT FENCE.

INSPECTION & MAINTENANCE NOTES:

1. SOIL AND TOPSOIL STOCKPILE SHOULD BE SEEDED IF THEY ARE TO REMAIN DORMANT FOR 30 DAYS.
2. SEE SILT FENCE DETAIL FOR MAINTENANCE AND INSPECTIONS.

SOIL STOCKPILE DETAIL

SCALE: NTS



STEP 1
SET POSTS AND EXCAVATE A 6"x6" TRENCH, SET POST DOWNSLOPE.
ANGLE POST 10° UPSLOPE FOR STABILITY AND SELF CLEANING.

STEP 2
STAPLE WIRE MESH FENCING TO FENCE POSTS.

STEP 3
ATTACH FILTER FABRIC TO THE WIRE FENCING AND EXTEND IT INTO THE TRENCH.

STEP 4
BACKFILL THE TRENCH AND COMPACT THE EXCAVATED SOIL.

MATERIAL NOTES:

1. SYNTHETIC FILTER FABRIC SHALL CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABILIZERS TO PROVIDE A MINIMUM OF 6 MONTHS OF EXPECTED USABLE CONSTRUCTION LIFE AT A TEMPERATURE RANGE OF 0 DEGREES TO 120 DEGREE F. SYNTHETIC FILTER FABRIC SHALL BE CERTIFIED BY THE MANUFACTURER OR SUPPLIERS AS CONFORMING TO THE FOLLOWING REQUIREMENTS:

FABRIC PROPERTIES	MIN. ACCEPTED VALUE	TEST METHOD
GRAB TENSILE STRENGTH (lbs)	90	ASTM D1682
ELONGATION FAILURE AT (%)	50	ASTM D1682
MULLEN BURST STRENGTH (PSI)	190	ASTM D3786
PUNCTURE STRENGTH (lbs)	40	ASTM D751 (MODIFIED)
SLURRY FLOW RATE (gal/min/sf)	0.3	
EQUIVALENT OPENING SIZE	40-80	US STD SIEVE CW-02215
ULTRAVIOLET RADIATION STABILITY (%)	90	ASTM G-26

2. THE HEIGHT OF THE SILT FENCE SHALL NOT EXCEED 36 INCHES.
3. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID THE USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT SUPPORT POSTS, WITH A 6 INCH OVERLAP MINIMUM AND SHALL BE SECURELY SEALED.

INSTALLATION NOTES:

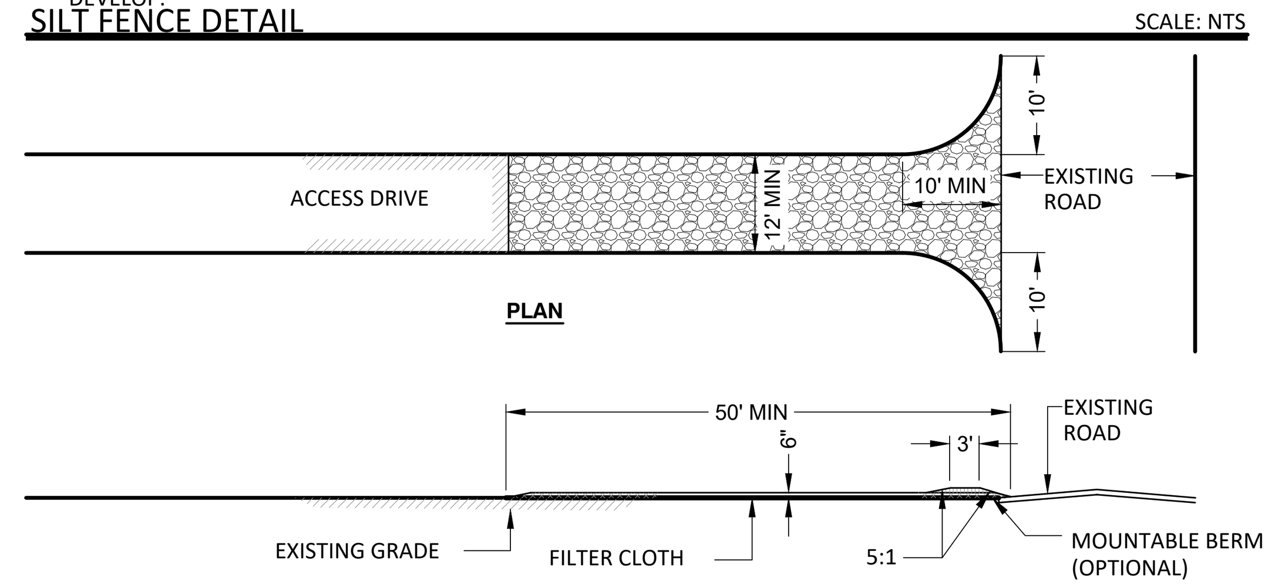
1. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY WIRE STAPLES AT LEAST ONE (1) INCH LONG, TIE WIRES, OR HOG RINGS. THE WIRE SHALL EXTEND NO MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACES.
2. THE "STANDARD STRENGTH" FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND EIGHT (8) INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
3. WHEN EXTRA STRENGTH FILTER FABRIC AND CLOSER POST SPACING ARE USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POSTS WITH ALL OTHER PROVISIONS APPLYING.
4. SILT FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
5. POSTS SHALL BE SPACED A MAXIMUM OF 10 FEET APART AND DRIVEN SECURELY INTO THE GROUND .

INSPECTION AND MAINTENANCE NOTES:

1. STRAW BALE BARRIER AND SILT FENCE BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. THEY SHALL BE REPAIRED IF THERE ARE ANY SIGNS OF EROSION OR SEDIMENTATION BELOW THEM. ANY REQUIRED REPAIRS SHALL BE MADE WITHIN 24 HOURS OF CONTRACTOR NOTIFICATION. IF THERE ARE SIGNS OF UNDERCUTTING AT THE CENTER OR THE EDGES, OR IMPOUNDING OF LARGE VOLUMES OF WATER BEHIND THEM, SEDIMENT BARRIERS SHALL BE REPLACED WITH A TEMPORARY CHECK DAM.
2. SHOULD THE FABRIC ON A SILT FENCE OR FILTER BARRIER DECOMPOSE OR BECOME INEFFECTIVE PRIOR TO THE END OF THE EXPECTED USABLE LIFE AND THE BARRIER IS STILL NECESSARY, THE FABRIC SHALL BE REPLACED PROMPTLY.
3. SEDIMENT DEPOSITS SHOULD BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE THIRD (1/3) THE HEIGHT OF THE BARRIER.
4. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SILT FENCE OR FILTER BARRIER IS NO LONGER REQUIRED SHOULD BE DRESSED TO CONFORM TO THE EXISTING GRADE, PREPARED, AND SEEDED.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" IN THE SILT FENCES DEVELOP.

SILT FENCE DETAIL

SCALE: NTS



SPECIFICATIONS AND INSTALLATION NOTES:

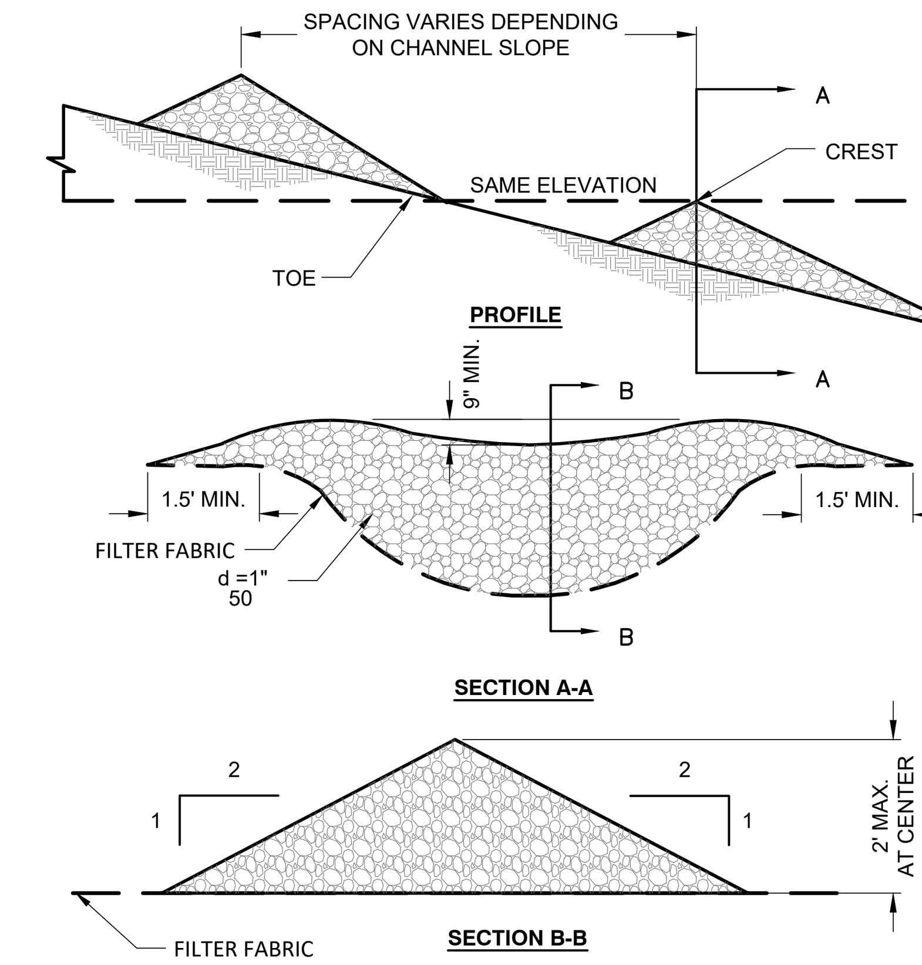
1. PRIOR TO INITIATION OF CONSTRUCTION ACTIVITIES AT THE PROJECT SITE, STABILIZED CONSTRUCTION ENTRANCED SHALL BE CONSTRUCTED AT ALL POINTS OF CONSTRUCTION INGRESS AND EGRESS.
2. STONE SIZE - USE 2" STONE OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
3. THICKNESS - NOT LESS THAN 6 INCHES.
4. WIDTH - 12 FEET MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
5. LENGTH - AS REQUIRED, BUT NOT LESS THAN 50 FEET.
6. FILTER CLOTH - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE. THE FILTER CLOTH SHALL BE WOVEN .
7. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.

INSPECTION & MAINTENANCE NOTES:

1. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAINFALL.
2. THE STABILIZED CONSTRUCTION ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OF SEDIMENT ON TO PUBLIC RIGHT-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH AGGREGATE, WHICH DRAINS INTO AN APPROVED SEDIMENT-TRAPPING DEVICE. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING STORM DRAINS, DITCHES OR WATERWAYS.

STABILIZED CONSTRUCTION ENTRANCE DETAIL

SCALE: NTS



SPECIFICATIONS AND INSTALLATION NOTES:

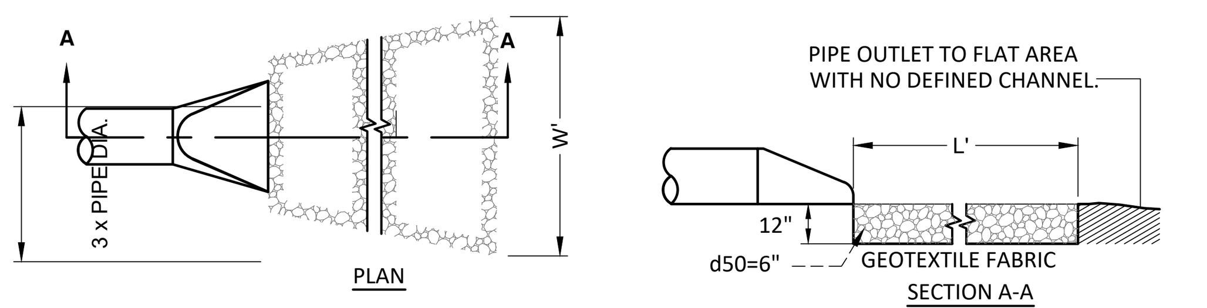
1. STONE SHALL BE PLACED ON A FILTER FABRIC FOUNDATION.
2. SET SPACING OF CHECK DAMS SUCH THAT THE ELEVATION OF THE CREST OF THE DOWNSTREAM DAM IS THE SAME AS THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCE SUCH AS CULVERT ENTRANCED BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONES.

INSTALLATION AND MAINTENANCE NOTES:

1. THE CHECK DAMS SHALL BE INSPECTED PERIODICALLY. CONTRACTOR SHALL CORRECT THE DAMAGE WITHIN 24 HOURS OF NOTIFICATION.
2. REMOVE SEDIMENT ACCUMULATED BEHIND DAM AS NEEDED TO ALLOW CHANNEL TO DRAIN THROUGH THE STONE CHECK DAM.
3. REPLACE STONE AS NEEDED TO MAINTAIN THE DESIGN CROSS SECTION OF THE STRUCTURES.

STONE CHECK DAM DETAIL

SCALE: NTS



SPECIFICATIONS AND INSTALLATION NOTES:

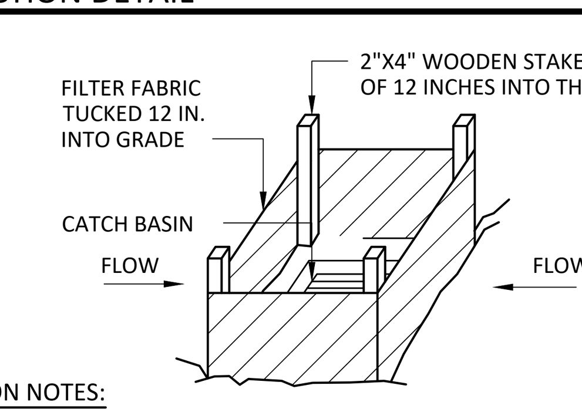
1. ANY FILL REQUIRED IN THE SUBGRADE SHALL BE SUITABLY COMPACTED.
2. THE ROCK OR GRAVEL SHALL CONFORM TO THE SPECIFIED GRADING LIMITS.
3. FILTERING CLOTH SHALL BE PROTECTED FROM PUNCHING, CUTTING, OR TEARING. ANY DAMAGE OTHER THAN THE OCCASIONAL SMALL HOLE SHALL BE REPAIRED BY PLACING ANOTHER PIECE OF CLOTH OVER THE DAMAGED PART OR BY COMPLETELY REPLACING THE CLOTH. ALL OVERLAPS WHETHER FOR REPAIRS OR FOR JOINING TWO PIECES OF CLOTH SHALL BE A MINIMUM OF 1 FOOT.
4. STONE FOR RIP RAP MAY BE PLACED BY EQUIPMENT. IT SHALL BE CONSTRUCTED TO THE FULL COURSE THICKNESS IN ONE OPERATION AND IN SUCH A MANNER AS TO AVOID DISPLACEMENT OF UNDERLYING MATERIALS. THE STONE RIP RAP SHALL BE PLACED IN A MANNER THAT WILL INSURE THAT THE RIP RAP IS REASONABLY HOMOGENEOUS WITH THE SMALLER STONES FILLING THE VOIDS BETWEEN THE LARGER STONES. RIP RAP SHALL BE PLACED IN A MANNER TO PREVENT DAMAGE TO THE FILTER CLOTH.

INSPECTION & MAINTENANCE NOTES:

1. INSPECT THE STRUCTURE PERIODICALLY AND AFTER MAJOR STORM EVENTS.
2. REPAIR OR REPLACE FAILING STRUCTURES IMMEDIATELY.
3. CHECK CHANNEL FOR SCOUR OR DEBRIS AND LOSS OF ROCK FROM APRONS.

RIPRAP OUTLET PROTECTION DETAIL

SCALE: NTS



SPECIFICATIONS AND INSTALLATION NOTES:

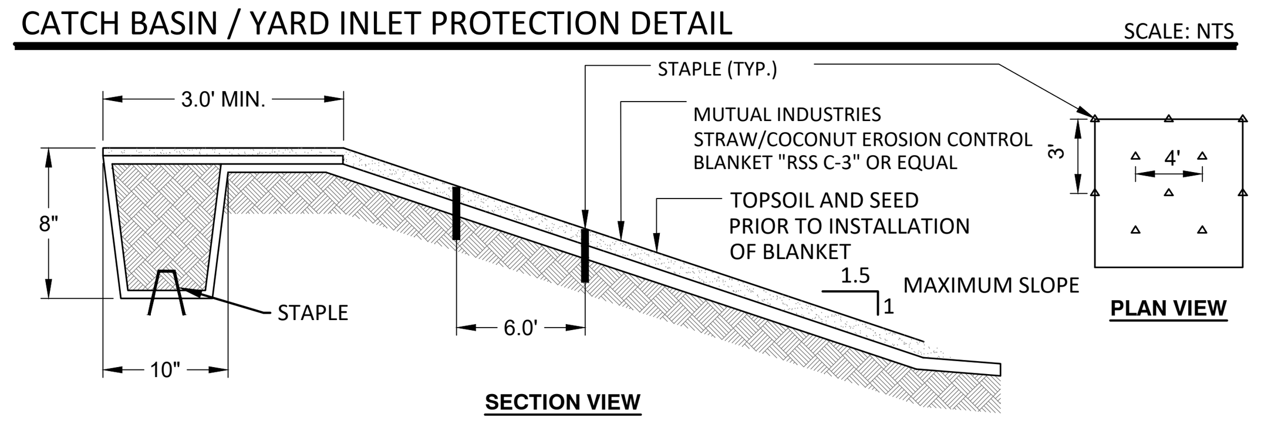
1. INLET PROTECTION SHALL BE INSTALLED IMMEDIATELY AFTER INSTALLATION OF CATCH BASIN OR YARD DRAIN AND BE MAINTAINED UNTIL UNTIL DRAINAGE AREA IS STABILIZED.
2. REFER TO SILT FENCE DETAIL. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NEEDED THEY WILL BE OVERLAPPED TO THE NEXT STAKE.
3. STAKE MATERIALS WILL BE STANDARD 2X4 WOOD WITH A MINIMUM LENGTH OF 3 FEET.
4. SPACE STAKES EVENLY AROUND INLET, 3 FEET APART AND DRIVE INTO THE GROUND A MINIMUM OF 18 INCHES. SPANS GREATER THAN 3 FEET MAY BE BRIDGED WITH THE USE OF WIRE MESH BEHIND THE FILTER FABRIC FOR SUPPORT.
5. FABRIC SHALL BE EMBEDDED 1 FOOT MINIMUM BELOW GRADE AND BACKFILLED. IT SHALL BE SECURELY FASTENED TO THE STAKES AND FRAME.

INSPECTION & MAINTENANCE NOTES:

1. SEDIMENT DEPOSITS SHALL BE REMOVED AFTER REACHING $\frac{1}{3}$ OF THE HEIGHT OF THE FABRIC, OR MORE OFTEN IF THE FABRIC BECOMES CLOGGED.
2. THE INLET PROTECTION SHALL BE INSPECTED WITHIN 24 HOURS AFTER EACH RAINFALL, OR DAILY DURING EXTENDED PERIODS OF PRECIPITATION.
3. REPAIRS SHALL BE MADE IMMEDIATELY, AS NECESSARY, TO PREVENT PARTICLES FROM REACHING THE DRAINAGE SYSTEM AND/ OR CAUSING SURFACE FLOODING.
4. SHOULD THE FABRIC ON A SILT FENCE OR FILTER BARRIER DECOMPOSE OR BECOME INEFFECTIVE PRIOR TO THE END OF THE EXPECTED USABLE LIFE AND THE BARRIER IS STILL NECESSARY, THE FABRIC SHALL BE REPLACED WITHIN 24 HOURS OF CONTRACTOR NOTIFICATION.

CATCH BASIN / YARD INLET PROTECTION DETAIL

SCALE: NTS

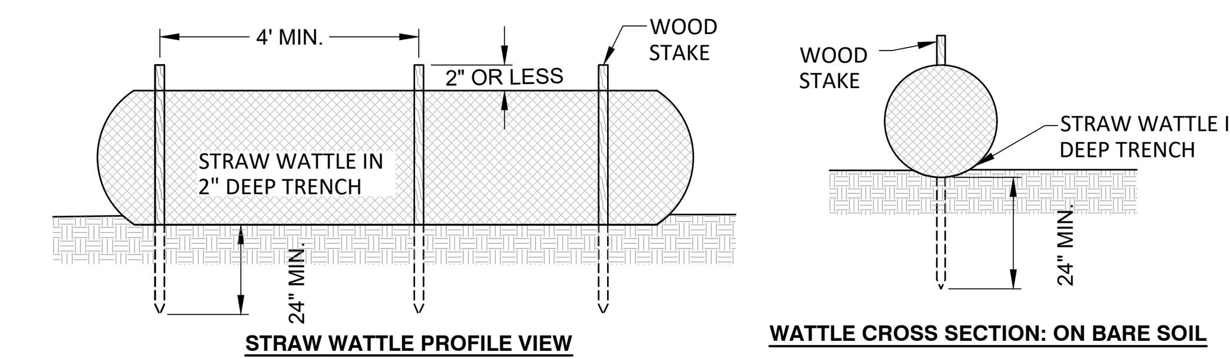


NOTES:

1. GRADE AND COMPACT AREA OF INSTALLATION, REMOVING ALL ROCKS, VEGETATION, ETC.
2. INSTALL TOPSOIL, SEED AND MULCH PER DETAIL.
3. EXTEND BLANKET 2'-0" OVER CREST OF SLOPE AND EXCAVATE A 12"X6" TERMINAL ANCHOR TRENCH.
4. ANCHOR BLANKET IN TRENCH WITH STAPLES @ SPACING PER MANUFACTURER , BACKFILL AND COMPACT SOIL.
5. UNROLL BLANKET DOWN SLOPE.
6. OVERLAP ADJACENT ROLLS AT LEAST 3" AND ANCHOR PER MANUFACTURER.
7. LAY BLANKET LOOSE TO MAINTAIN DIRECT CONTACT WITH SOIL (DO NOT PULL TAUGHT).
8. SECURE BLANKET TO GROUND SURFACE STAPLES WITH PATTERN PER MANUFACTURER..
9. TRIM TO BE STAPLED PARALLEL TO CONTOUR.
10. EROSION CONTROL BLANKET SHALL BE CURLEX DOUBLE NET (CURLEX II).
11. EROSION CONTROL BLANKET SHALL BE COMPOSED OF BIODEGRADABLE MATERIALS.

EROSION CONTROL BLANKET DETAIL

SCALE: NTS



MATERIAL NOTES:

1. WATTLES SHALL BE AMERICAN EXCELSIOR COMPANY'S PREMIER STRAW WATTLES OR APPROVED EQUAL.
2. ORGANIC, AGRICULTURAL STRAW FIBERS MUST BE WEED FREE ENCASED IN POLYPROPYLENE OR FIBERNET.
3. 75% OF FIBERS MUST BE A MINIMUM OF 4" LONG.
4. NET OPENINGS MUST BE APPROXIMATELY 0.5" WIDE BY 1.0" LONG.
5. ALL COMPONENTS MUST BE BIODEGRADABLE.

INSTALLATION NOTES:

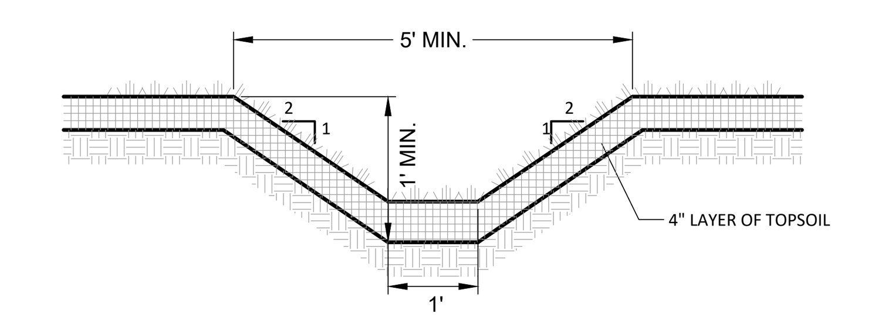
1. INSTALL WATTLE IN A 2" DEEP TRENCH CONSTRUCTED ALONG THE CONTOUR, PERPENDICULAR TO THE SLOPE OR DIRECTION OF FLOW.
2. ENDS OF WATTLES SHALL BE TURNED UP THE SLOPE SO AS TO RETAIN WATER AND PREVENT ITS RELEASE FROM THE END OF THE WATTLE.
3. WATTLES SHALL BE SECURED TO THE SUBGRADE BY WOODEN STAKES SPACED EVERY FOUR LINEAL FEET ACROSS THE LENGTH OF THE WATTLE. STAKES SHALL BE DRIVEN THROUGH THE CENTER OF THE WATTLE AND INTO THE GROUND A MINIMUM OF 24" WITH LESS THAN TWO INCHES PROJECTING ABOVE THE TOP OF THE WATTLE. A STAKE SHALL BE PLACED WITHIN 2 FEET OF THE END OF THE WATTLE.
4. IF WATTLES ARE JOINED TOGETHER BY ABUTTING THE ENDS, TIE THE ENDS TOGETHER USING HEAVY TWINE OR PLASTIC LOCKING TIES.
5. WHEN INSTALLING IN A CHANNEL BOTTOM, WATTLE INSTALLATION SHALL CONTINUE THREE FEET ABOVE THE ANTICIPATED HIGH WATER MARK.
6. WATTLE SHALL REMAIN IN PLACE UNTIL FULLY ESTABLISHED VEGETATION AND ROOT SYSTEMS ARE PRESENT AND CAN SURVIVE ON THEIR OWN. WATTLES ARE NOT REMOVED AND WILL DEGRADE IN PLACE.

INSPECTION AND MAINTENANCE NOTES:

1. STRAW WATTLES SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. THEY SHALL BE REPAIRED IF THERE ARE ANY SIGNS OF EROSION OR SEDIMENTATION BELOW THEM. ANY REQUIRED REPAIRS SHALL BE MADE WITHIN 24 HOURS OF CONTRACTOR NOTIFICATION. IF THERE ARE SIGNS OF UNDERCUTTING AT THE CENTER OR THE EDGES, OR IMPOUNDING OF LARGE VOLUMES OF WATER BEHIND THEM, SEDIMENT BARRIERS SHALL BE REPLACED WITH A TEMPORARY CHECK DAM.
2. SHOULD THE STRAW WATTLE DECOMPOSE OR BECOME INEFFECTIVE PRIOR TO THE END OF THE EXPECTED USABLE LIFE AND THE BARRIER IS STILL NECESSARY, IT SHALL BE REPLACED.
3. SEDIMENT DEPOSITS SHOULD BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE HALF (1/2) THE HEIGHT OF THE BARRIER.
4. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE WATTLE IS NO LONGER REQUIRED SHOULD BE DRESSED TO CONFORM TO THE EXISTING GRADE, PREPARED, AND SEEDED. WHEN THE WATTLE IS NO LONGER NEEDED, STAKES SHALL BE REMOVED.

STRAW WATTLE DETAIL

SCALE: NTS



SECTION

NOTES:

1. STABILIZATION OF THE SWALE SHALL BE COMPLETED WITHIN 10 DAYS OF INSTALLATION.
2. ALL TEMPORARY SWALES SHALL HAVE UNINTERRUPTED POSITIVE GRADE TO OUTLET.
3. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
4. ALL TREES, BRUSH , STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE FUNCTIONING OF THE SWALE.
5. THE SWALE SHALL BE EXCAVATED OR SHAPED AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
6. SWALE SHALL BE SEEDED AND MULCHED IN ACCORDANCE WITH TOPSOIL, SEED AND MULCH DETAIL.
7. CONTRACTOR IS RESPONSIBLE FOR PERIODIC INSPECTION AND REQUIRED MAINTENANCE.
8. ALL DRAINAGE SWALES SHALL BE KEPT FREE OF DEBRIS AND THE VEGETATION SHALL BE MAINTAINED TO ALLOW FLOW OF STORMWATER.

GRASS LINED DIVERSION SWALE DETAIL

SCALE: NTS

CONDITIONS WHERE PRACTICE APPLIES:

WASHOUT FACILITIES SHALL BE PROVIDED FOR EVERY PROJECT WHERE CONCRETE WILL BE POURED OR OTHERWISE FORMED ON THE SITE. THIS FACILITY WILL RECEIVE HIGHLY ALKALINE WASH WATER FROM THE CLEANING OF CHUTES, MIXERS, HOPPERS, VIBRATORS, PLACING EQUIPMENT, TROWELS, AND SCREEDS. UNDER NO CIRCUMSTANCES WILL WASH WATER FROM THESE OPERATIONS BE ALLOWED TO INFILTRATE INTO THE SOIL OR ENTER SURFACE WATERS.

DESIGN CAPACITY:

THE WASHOUT FACILITY SHOULD BE SIZED TO CONTAIN SOLIDS, WASH WATER, AND RAINFALL AND SIZED TO ALLOW FOR THE EVAPORATION OF THE WASH WATER AND RAINFALL. WASH WATER SHALL BE ESTIMATED AT 7 GALLONS PER CHUTE AND 50 GALLONS PER HOPPER OF THE CONCRETE PUMP TRUCK AND/OR DISCHARGING DRUM. THE MINIMUM SIZE SHALL BE 8 FEET BY 8 FEET AT THE BOTTOM AND 2 FEET IF EXCAVATED, THE SIDE SLOPES SHALL BE 2 HORIZONTAL TO 1 VERTICAL.

LOCATION:

LOCATE THE FACILITY A MINIMUM OF 100 FEET FROM DRAINAGE SWALES, STORM DRAIN INLETS, WETLANDS, STREAMS AND OTHER SURFACE WATERS. PREVENT SURFACE WATER FROM ENTERING THE STRUCTURE EXCEPT FOR THE ACCESS ROAD. PROVIDE APPROPRIATE ACCESS WITH A GRAVEL ACCESS ROAD SLOPED DOWN TO THE STRUCTURE. SIGNS SHALL BE PLACED TO DIRECT DRIVERS TO THE FACILITY AFTER THEIR LOAD IS DISCHARGED.

LINER:

ALL WASHOUT FACILITIES WILL BE LINED TO PREVENT LEACHING OF LIQUIDS INTO THE GROUND. THE LINER SHALL BE PLASTIC SHEETING WITH A MINIMUM THICKNESS OF 10 MILS WITH NO HOLES OR TEARS, AND ANCHORED BEYOND THE TOP OF THE PIT WITH AN EARTHEN BERM, SAND BAGS, STONE, OR OTHER STRUCTURAL APPURTENANCE EXCEPT AT THE ACCESS POINT. IF PRE-FABRICATED WASHOUTS ARE USED THEY MUST ENSURE THE CAPTURE AND CONTAINMENT OF THE CONCRETE WASH AND BE SIZED BASED ON THE EXPECTED FREQUENCY OF CONCRETE POURS. THEY SHALL BE SITED AS NOTED IN THE LOCATION CRITERIA.

MAINTENANCE:

1. ALL CONCRETE WASHOUT FACILITIES SHALL BE INSPECTED DAILY. DAMAGED OR LEAKING FACILITIES SHALL BE DEACTIVATED AND REPAIRED OR REPLACED IMMEDIATELY. EXCESS RAINWATER THAT HAS ACCUMULATED OVER HARDENED CONCRETE SHOULD BE PUMPED TO A STABILIZED AREA, SUCH AS A GRASS FILTER STRIP.
2. ACCUMULATED HARDENED MATERIAL SHALL BE REMOVED WHEN 75% OF THE STORAGE CAPACITY OF THE STRUCTURE IS FILLED. ANY EXCESS WASH WATER SHALL BE PUMPED INTO A CONTAINMENT VESSEL AND PROPERLY DISPOSED OF OFF SITE.
3. DISPOSE OF THE HARDENED MATERIAL OFF-SITE IN A CONSTRUCTION/DEMOLITION LANDFILL. ON-SITE DISPOSAL MAY BE ALLOWED IF THIS HAS BEEN APPROVED AND ACCEPTED AS PART OF THE PROJECTS SWPPP. IN THAT CASE, THE MATERIAL SHOULD BE RECYCLED AS SPECIFIED, OR BURIED AND COVERED WITH A MINIMUM OF 2 FEET OF CLEAN COMPACTED EARTHFILL THAT IS PERMANENTLY STABILIZED TO PREVENT EROSION.
4. THE PLASTIC LINER SHALL BE REPLACED WITH EACH CLEANING OF THE WASHOUT FACILITY.
5. INSPECT THE PROJECT SITE FREQUENTLY TO ENSURE THAT NO CONCRETE DISCHARGES ARE TAKING PLACE IN NON-DESIGNATED AREAS.

CONCRETE WASHOUT FACILITY

SCALE: NTS

CONDITIONS WHERE PRACTICE APPLIES:

ON CONSTRUCTION ROADS, ACCESS POINTS, AND OTHER DISTURBED AREAS SUBJECT TO SURFACE DUST MOVEMENT AND DUST BLOWING WHERE OFF-SITE DAMAGE MAY OCCUR IF DUST IS NOT CONTROLLED.

DESIGN CRITERIA:

CONSTRUCTION OPERATIONS SHOULD BE SCHEDULED TO MINIMIZE THE AMOUNT OF AREA DISTURBED AT ONE TIME. BUFFER AREAS OF VEGETATION SHOULD BE LEFT WHERE PRACTICAL. TEMPORARY OR PERMANENT STABILIZATION MEASURES SHALL BE INSTALLED. NO SPECIFIC DESIGN CRITERIA IS GIVEN; SEE CONSTRUCTION SPECIFICATIONS BELOW FOR COMMON METHODS OF DUST CONTROL.

WATER QUALITY MUST BE CONSIDERED WHEN MATERIALS ARE SELECTED FOR DUST CONTROL. WHERE THERE IS A POTENTIAL FOR THE MATERIAL TO WASH OFF TO A STREAM, INGREDIENT INFORMATION MUST BE PROVIDED TO THE NYSDEC.

NO POLYMER APPLICATION SHALL TAKE PLACE WITHOUT WRITTEN APPROVAL FROM THE NYSDEC.

DESIGN CRITERIA:

A. NON-DRIVING AREAS – THESE AREAS USE PRODUCTS AND MATERIALS APPLIED OR PLACED ON SOIL SURFACES TO PREVENT AIRBORNE MIGRATION OF SOIL PARTICLES.

VEGETATIVE COVER – FOR DISTURBED AREAS NOT SUBJECT TO TRAFFIC, VEGETATION PROVIDES THE MOST PRACTICAL METHOD OF DUST CONTROL.

MULCH (INCLUDING GRAVEL MULCH) – MULCH OFFERS A FAST EFFECTIVE MEANS OF CONTROLLING DUST. THIS CAN ALSO INCLUDE ROLLED EROSION CONTROL BLANKETS.

SPRAY ADHESIVES – THESE ARE PRODUCTS GENERALLY COMPOSED OF POLYMERS IN A LIQUID OR SOLID FORM THAT ARE MIXED WITH WATER TO FORM AN EMULSION THAT IS SPRAYED ON THE SOIL SURFACE WITH TYPICAL HYDROSEEDING EQUIPMENT. THE MIXING RATIOS AND APPLICATION RATES WILL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR THE SPECIFIC SOILS ON THE SITE. IN NO CASE SHOULD THE APPLICATION OF THESE ADHESIVES BE MADE ON WET SOILS OR IF THERE IS A PROBABILITY OF PRECIPITATION WITHIN 48 HOURS OF ITS PROPOSED USE. MATERIAL SAFETY DATA SHEETS WILL BE PROVIDED TO ALL APPLICATORS AND OTHERS WORKING WITH THE MATERIAL.

B. DRIVING AREAS – THESE AREAS UTILIZE WATER, POLYMER EMULSIONS, AND BARRIERS TO PREVENT DUST MOVEMENT FROM THE TRAFFIC SURFACE INTO THE AIR.

SPRINKLING – THE SITE MAY BE SPRAYED WITH WATER UNTIL THE SURFACE IS WET. THIS IS ESPECIALLY EFFECTIVE ON HAUL ROADS AND ACCESS ROUTE TO PROVIDE SHORT TERM LIMITED DUST CONTROL.

POLYMER ADDITIVES – THESE POLYMERS ARE MIXED WITH WATER AND APPLIED TO THE DRIVING SURFACE BY A WATER TRUCK WITH A GRAVITY FEED DRIP BAR, SPRAY BAR OR AUTOMATED DISTRIBUTOR TRUCK. THE MIXING RATIOS AND APPLICATION RATES WILL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. INCORPORATION OF THE EMULSION INTO THE SOIL WILL BE DONE TO THE APPROPRIATE DEPTH BASED ON EXPECTED TRAFFIC. COMPACTION AFTER INCORPORATION WILL BE BY VIBRATORY ROLLER TO A MINIMUM OF 95%. THE PREPARED SURFACE SHALL BE MOIST AND NO APPLICATION OF THE POLYMER WILL BE MADE IF THERE IS A PROBABILITY OF PRECIPITATION WITHIN 48 HOURS OF ITS PROPOSED USE. MATERIAL SAFETY DATA SHEETS WILL BE PROVIDED TO ALL APPLICATORS WORKING WITH THE MATERIAL.

BARRIERS – WOVEN GEO-TEXTILES CAN BE PLACED ON THE DRIVING SURFACE TO EFFECTIVELY REDUCE DUST THROW AND PARTICLE MIGRATION ON HAUL ROADS. STONE CAN ALSO BE USED FOR CONSTRUCTION ROADS FOR EFFECTIVE DUST CONTROL.

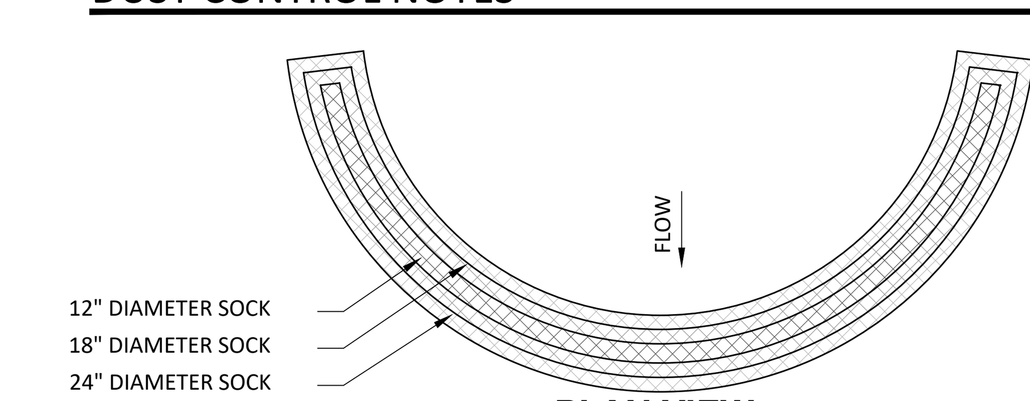
WINDBREAK – A SILT FENCE OR SIMILAR BARRIER CAN CONTROL AIR CURRENTS AT INTERVALS EQUAL TO TEN TIMES THE BARRIER HEIGHT. PRESERVE EXISTING WIND BARRIER VEGETATION AS MUCH AS PRACTICAL.

MAINTENANCE:

MAINTAIN DUST CONTROL MEASURES THROUGH DRY WEATHER PERIODS UNTIL ALL DISTURBED AREAS ARE STABILIZED.

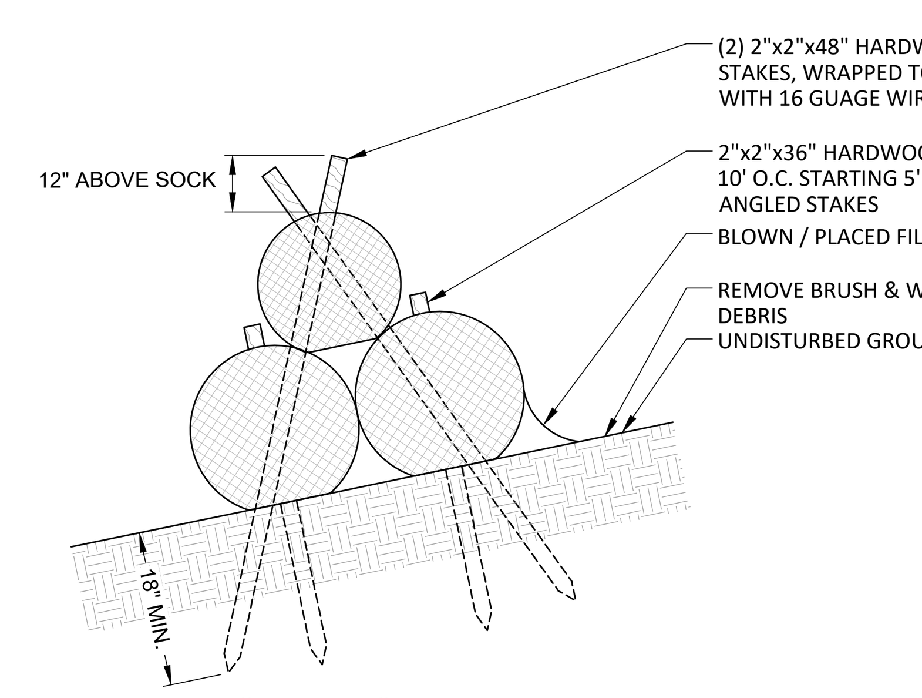
DUST CONTROL NOTES

SCALE: NTS



PLAN VIEW

1. COMPOST SOCK SEDIMENT TRAP SHALL BE SIZED TO PROVIDE 3,600 CUBIC FEET OF STORAGE CAPACITY FOR ACRE TRIBUTARY TO THE TRAP.
2. MINIMUM BASE WIDTH IS EQUIVALENT TO THE HEIGHT.
3. SEDIMENT ACCUMULATION SHALL NOT EXCEED $\frac{1}{3}$ THE TOTAL HEIGHT OF THE TRAP.
4. SOCKS SHALL BE OF LARGER DIAMETER AT THE BASE OF THE TRAP AND DECREASE IN DIAMETER FOR SUCCESSIVE LAYERS AS INDICATED TO THE LEFT.
5. ENDS OF THE TRAP SHALL BE A MINIMUM OF 1 FOOT HIGHER IN ELEVATION THAT THE MID-SECTION, WHICH SHALL BE LOCATED AT THE POINT OF DISCHARGE.



STAKING DETAIL

SPECIFICATIONS:

1. SOCK INFILL AND FILTER MEDIA MATERIAL SHALL MEET THE STANDARDS OF THE NYS STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL.
2. COMPOST SOCK SEDIMENT TRAPS SHALL NOT EXCEED THREE SOCKS IN HEIGHT AND SHALL BE STACKED IN PYRAMIDAL FORM AS SHOWN ABOVE. MINIMUM TRAP HEIGHT IS ONE 24 INCH DIAMETER SOCK. ADDITIONAL STORAGE MAY BE PROVIDED BY MEANS OF AN EXCAVATED SUMP 12 INCHES DEEP EXTENDING 1 TO 3 FEET UPSLOPE OF THE SOCKS ALONG THE LOWER SIDE OF THE TRAP.
3. COMPOST SOCK SEDIMENT TRAPS SHALL PROVIDE 3,600 CUBIC FEET STORAGE CAPACITY WITH 12 INCHES OF FREEBOARD FOR EACH TRIBUTARY DRAINAGE ACRE.
4. THE MAXIMUM TRIBUTARY DRAINAGE AREA IS 5.0 ACRES. SINCE COMPOST SOCKS ARE "FLOW-THROUGH", NO SPILLWAY IS REQUIRED.
5. COMPOST SOCK SEDIMENT TRAPS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. SEDIMENT SHALL BE REMOVED WHEN IT REACHES $\frac{1}{3}$ THE HEIGHT OF THE SOCKS.
6. PHOTODEGRADABLE AND BIODEGRADABLE SOCKS SHALL NOT BE USED FOR MORE THAN 1 YEAR.

COMPOST FILTER SOCK SEDIMENT TRAP

SCALE: NTS

0 1 2 3
SIZE IN INCHES (FULL SIZE - 22"x34" SHEET)

0 1
SIZE IN INCHES (HALF SIZE - 11"x17" SHEET)

STATE OF NEW YORK
ANDREW V. WILLINGHAM
083984
PROFESSIONAL ENGINEER

willingham engineering
183 Main Street
New Paltz, New York 12561
T 845.255.0210 F 845.256.8110
www.willinghamengineering.com

REV	DATE	DESCRIPTION

EROSION AND SEDIMENT CONTROL DETAILS

ROYAL ENERGY PROPERTIES, LLC

1666 ROUTE 9W

TOWN OF MARLBOROUGH, ULSTER COUNTY, NEW YORK

DRAWN BY	CHECKED BY
MLT	
DATE	SCALE
09/06/19	NTS
PROJECT NO.	
19032	
SHEET NO.	
ESC-2	

APPENDIX C

NOTICE OF INTENT (NOI)

0644089821

NOTICE OF INTENT

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

NYR _____
(for DEC use only)

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

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

-IMPORTANT-
RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)
Royal Energy Properties, LLC

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

Owner/Operator Contact Person First Name
David

Owner/Operator Mailing Address
1666 Route 9W

City
Milton

State
NY

Zip
12547-

Phone (Owner/Operator)
9142637423

Fax (Owner/Operator)
- -

Email (Owner/Operator)
grapeseedsny@gmail.com

FED TAX ID
475631455 (not required for individuals)

Project Site Information

Project/Site Name
Royal Energy Properties, LLC

Street Address (NOT P.O. BOX)
1666 Route 9W

Side of Street
○ **North** ○ **South** ● **East** ○ **West**

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

State: NY
Zip: 12547-
County: Ulster
DEC Region: 3

Name of Nearest Cross Street
Chestnut Lane

Distance to Nearest Cross Street (Feet)
260

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

Tax Map Numbers
Section-Block-Parcel
103.3-3-68

Tax Map Numbers
103.3-3-68

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

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

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

X Coordinates (Easting): 739612

Y Coordinates (Northing): 4611633991100

2. What is the nature of this construction project?

○ **New Construction**

● **Redevelopment with increase in impervious area**

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

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

Pre-Development Existing Land Use

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

Post-Development Future Land Use

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

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

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

Total Site Area	Total Area To Be Disturbed	Existing Impervious Area To Be Disturbed	Future Impervious Area Within Disturbed Area
4.94.9	3.73.7	1.51.5	3.83.8

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

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

A	B	C	D
%	%	100%	%

7. Is this a phased project? ○ **Yes** ● **No**

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

Start Date 11/01/2019 - **End Date** 05/01/2020

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

Name

Unnamed Stream

9a. Type of waterbody identified in Question 9?

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

9b. How was the wetland identified?

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

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

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

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

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

.

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

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

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

Town of Marlborough

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

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

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

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

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

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

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

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

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

SWPPP Preparer
Willingham Engineering

Contact Name (Last, Space, First)
Willingham Andrew

Mailing Address
183 Main Street

City
New Paltz

State Zip
NY 12561-

Phone
8452562010

Fax
- -

Email
awillinghamwillinghamengineering.com

SWPPP Preparer Certification

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

First Name
Andrew

MI
V

Last Name
Willingham

Signature

Date
10/25/2019

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

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

Temporary Structural

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

Biotechnical

- ○ Brush Matting
- ○ Wattling

Vegetative Measures

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

Permanent Structural

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

Other

Post-construction Stormwater Management Practice (SMP) Requirements

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

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

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

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

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

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

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

Total WQv Required

0.104144 **acre-feet**

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

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

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

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

	Total Contributing Area (acres)		Total Contributing Impervious Area(acres)
RR Techniques (Area Reduction)			
○ Conservation of Natural Areas (RR-1)		and/or	
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)		and/or	
○ Tree Planting/Tree Pit (RR-3)		and/or	
○ Disconnection of Rooftop Runoff (RR-4)		and/or	
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			
○ Rain Garden (RR-6)			
○ Stormwater Planter (RR-7)			
○ Rain Barrel/Cistern (RR-8)			
○ Porous Pavement (RR-9)			
○ Green Roof (RR-10)			
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			
○ Infiltration Basin (I-2)			
○ Dry Well (I-3)			
○ Underground Infiltration System (I-4)			
● Bioretention (F-5)	0.306464		0.306464
○ Dry Swale (O-1)			
Standard SMPs			
○ Micropool Extended Detention (P-1)			
● Wet Pond (P-2)	1.914444		1.914444
○ Wet Extended Detention (P-3)			
○ Multiple Pond System (P-4)			
○ Pocket Pond (P-5)			
○ Surface Sand Filter (F-1)			
○ Underground Sand Filter (F-2)			
○ Perimeter Sand Filter (F-3)			
○ Organic Filter (F-4)			
○ Shallow Wetland (W-1)			
○ Extended Detention Wetland (W-2)			
○ Pond/Wetland System (W-3)			
○ Pocket Wetland (W-4)			
○ Wet Swale (O-2)			

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

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

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

Name

Manufacturer

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

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

Total RRv provided

0.00444 **acre-feet**

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

○ **Yes** ● **No**

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

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

Minimum RRv Required

0.00331 **acre-feet**

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

● **Yes** ○ **No**

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

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

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

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

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

WQv Provided

0.106168 **acre-feet**

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

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

0.201212

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

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

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

CPv Required

0.607670 **acre-feet**

CPv Provided

0.607670 **acre-feet**

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

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

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

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

Total Overbank Flood Control Criteria (Qp)

Pre-Development

11.1544 **CFS**

Post-development

11.1443 **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development

22.2811 **CFS**

Post-development

22.2011 **CFS**

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

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

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ● **Yes** ○ **No**

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

Site Owner

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

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

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

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

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

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

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

Owner/Operator Certification

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

Print First Name: David

MI:

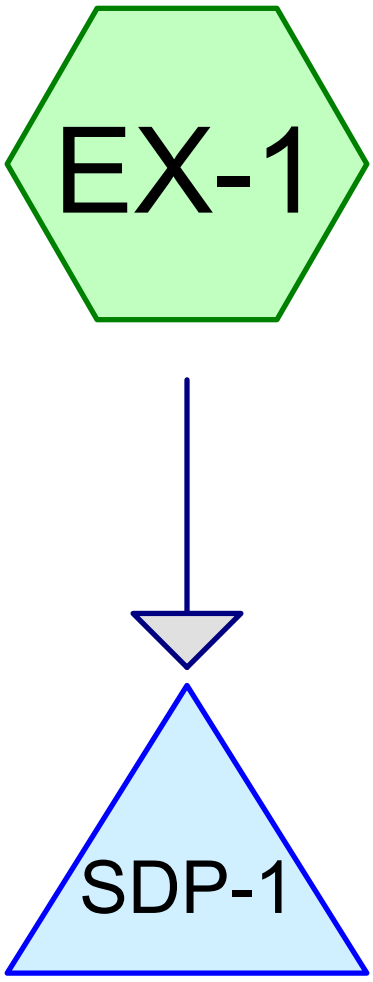
Print Last Name: Schwartz

Owner/Operator Signature:

Date: / /

APPENDIX G

HYDROCAD ANALYSIS



Subcat Reach Pond Link

Routing Diagram for PRE

Prepared by {enter your company name here}, Printed 9/19/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.867	74	>75% Grass cover, Good, HSG C (EX-1)
0.118	98	Concrete, HSG C (EX-1)
0.087	96	Gravel surface, HSG C (EX-1)
1.105	98	Paved parking, HSG C (EX-1)
1.360	98	Roofs, HSG C (EX-1)
0.407	70	Woods, Good, HSG C (EX-1)
4.944	**87**	**TOTAL AREA**

Summary for Subcatchment EX-1:

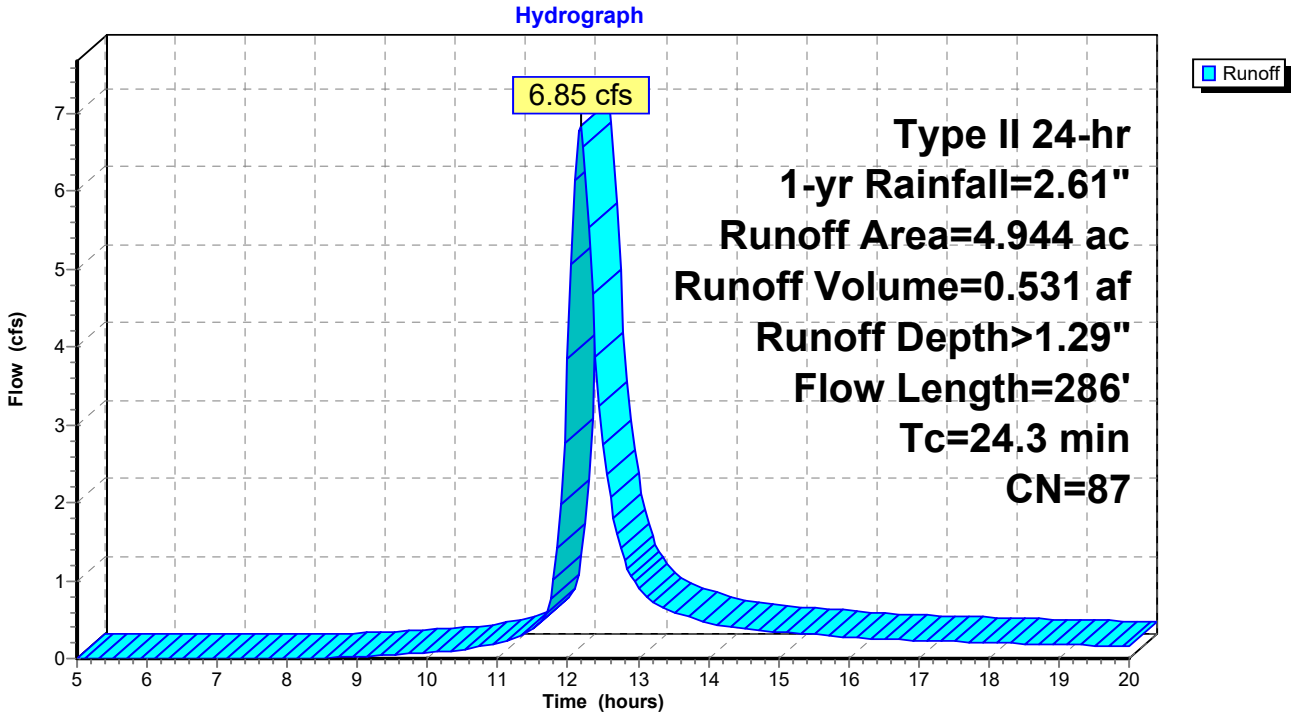
Runoff = 6.85 cfs @ 12.18 hrs, Volume= 0.531 af, Depth> 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
	1.105	98	Paved parking, HSG C
	1.360	98	Roofs, HSG C
*	0.118	98	Concrete, HSG C
	0.407	70	Woods, Good, HSG C
	0.087	96	Gravel surface, HSG C
	1.867	74	>75% Grass cover, Good, HSG C
	4.944	87	Weighted Average
	2.361		47.75% Pervious Area
	2.583		52.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.7	150	0.0400	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.15"
0.5	35	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	45	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	56	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.3	286	Total			

Subcatchment EX-1:

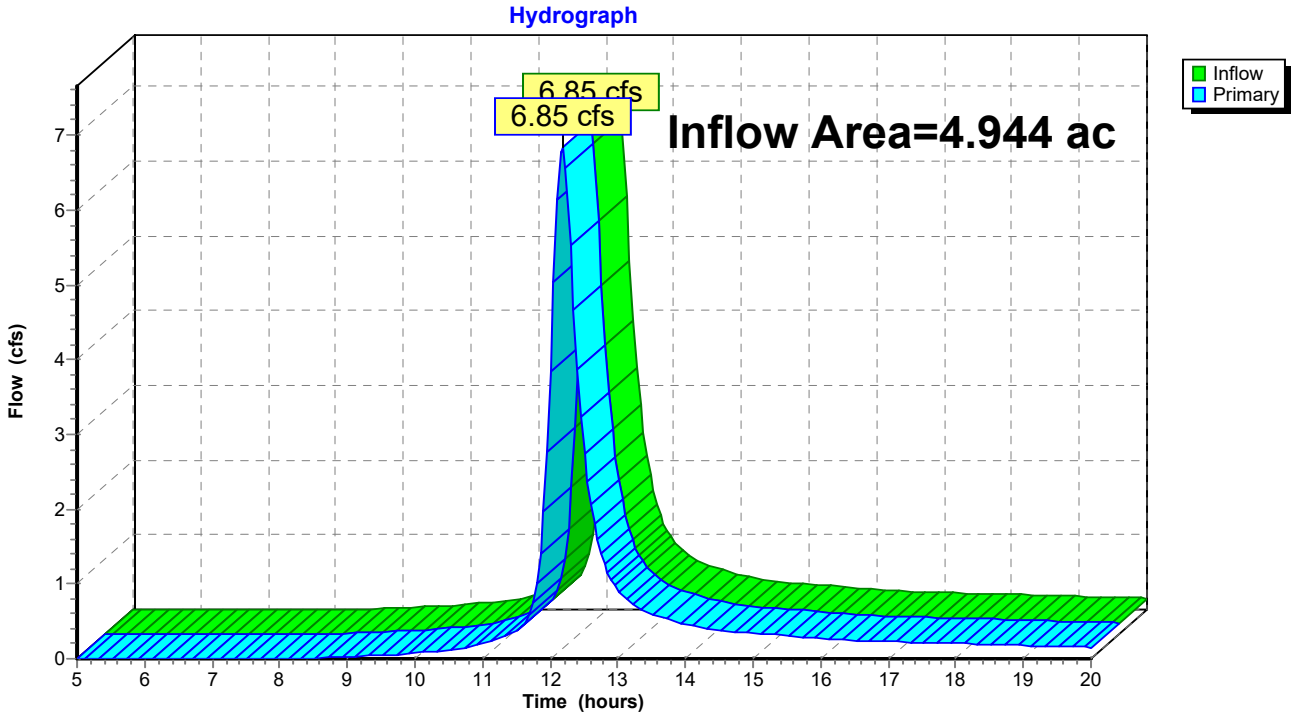


Summary for Pond SDP-1:

Inflow Area = 4.944 ac, 52.25% Impervious, Inflow Depth > 1.29" for 1-yr event
Inflow = 6.85 cfs @ 12.18 hrs, Volume= 0.531 af
Primary = 6.85 cfs @ 12.18 hrs, Volume= 0.531 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond SDP-1:



Summary for Subcatchment EX-1:

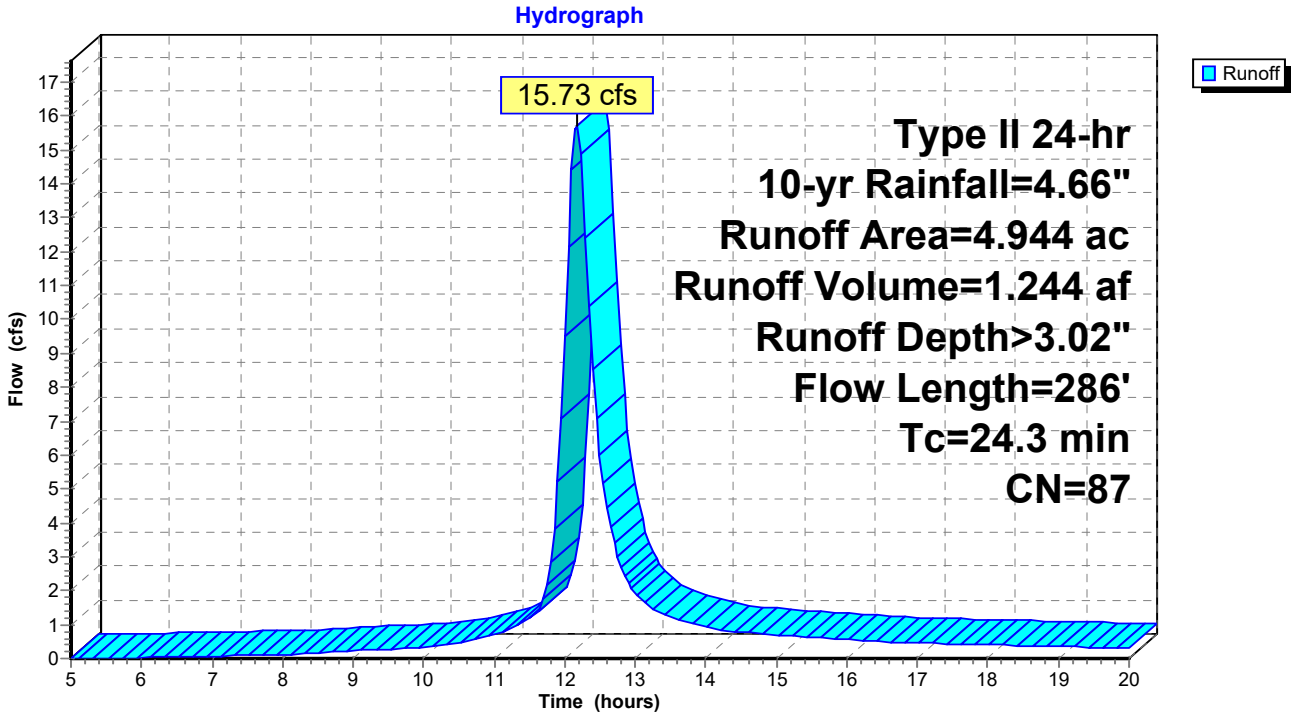
Runoff = 15.73 cfs @ 12.17 hrs, Volume= 1.244 af, Depth> 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=4.66"

	Area (ac)	CN	Description
	1.105	98	Paved parking, HSG C
	1.360	98	Roofs, HSG C
*	0.118	98	Concrete, HSG C
	0.407	70	Woods, Good, HSG C
	0.087	96	Gravel surface, HSG C
	1.867	74	>75% Grass cover, Good, HSG C
	4.944	87	Weighted Average
	2.361		47.75% Pervious Area
	2.583		52.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.7	150	0.0400	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.15"
0.5	35	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	45	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	56	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.3	286	Total			

Subcatchment EX-1:

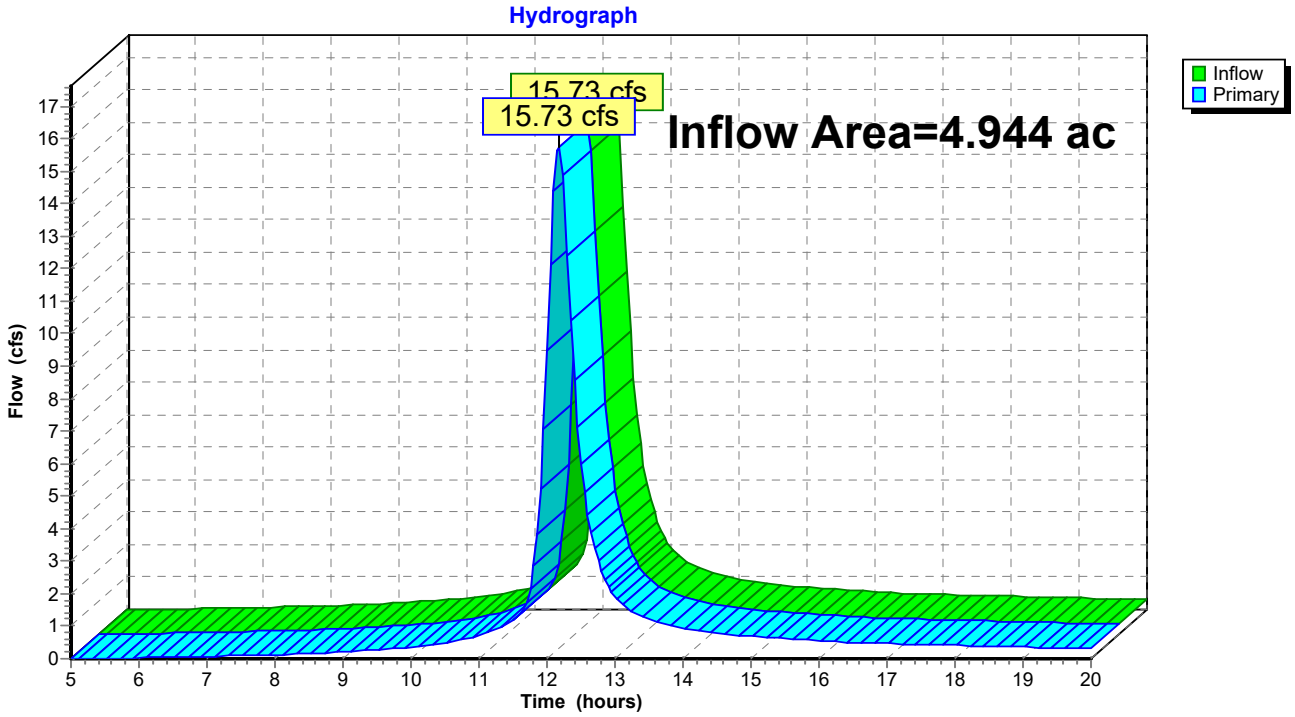


Summary for Pond SDP-1:

Inflow Area = 4.944 ac, 52.25% Impervious, Inflow Depth > 3.02" for 10-yr event
Inflow = 15.73 cfs @ 12.17 hrs, Volume= 1.244 af
Primary = 15.73 cfs @ 12.17 hrs, Volume= 1.244 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond SDP-1:



Summary for Subcatchment EX-1:

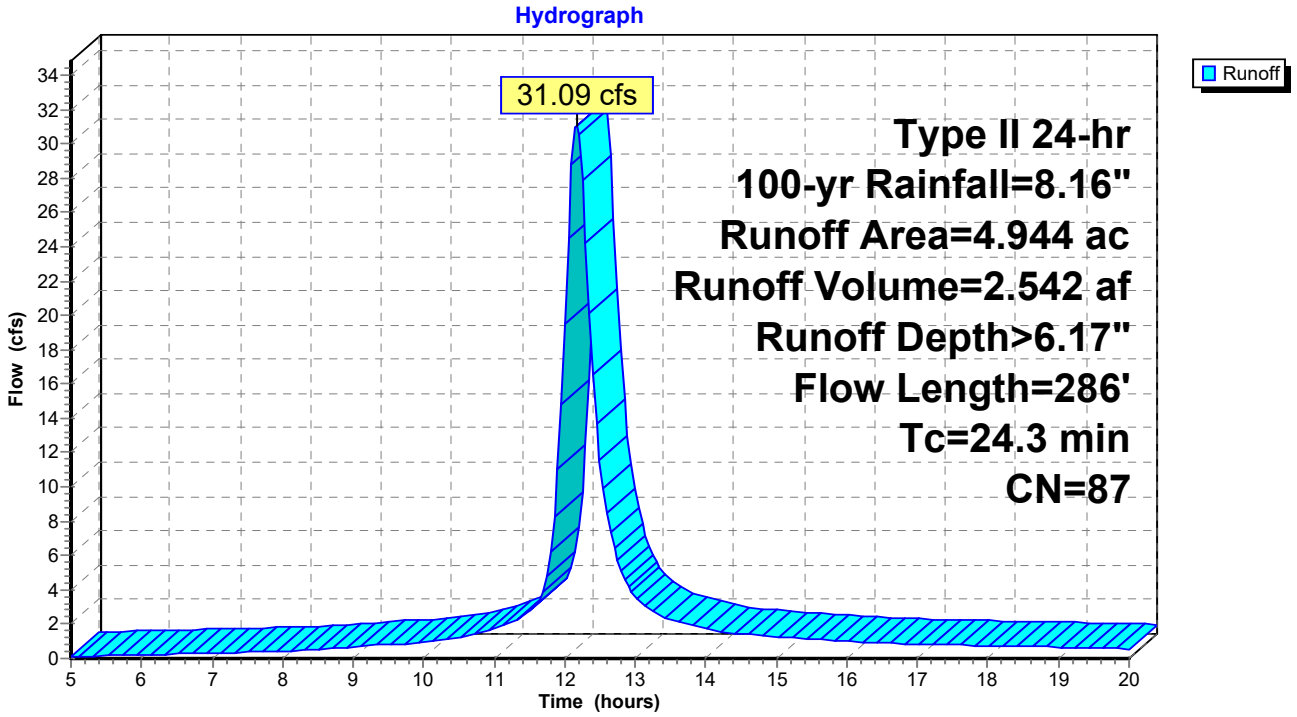
Runoff = 31.09 cfs @ 12.17 hrs, Volume= 2.542 af, Depth> 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=8.16"

	Area (ac)	CN	Description
	1.105	98	Paved parking, HSG C
	1.360	98	Roofs, HSG C
*	0.118	98	Concrete, HSG C
	0.407	70	Woods, Good, HSG C
	0.087	96	Gravel surface, HSG C
	1.867	74	>75% Grass cover, Good, HSG C
	4.944	87	Weighted Average
	2.361		47.75% Pervious Area
	2.583		52.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.7	150	0.0400	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.15"
0.5	35	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	45	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	56	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.3	286	Total			

Subcatchment EX-1:

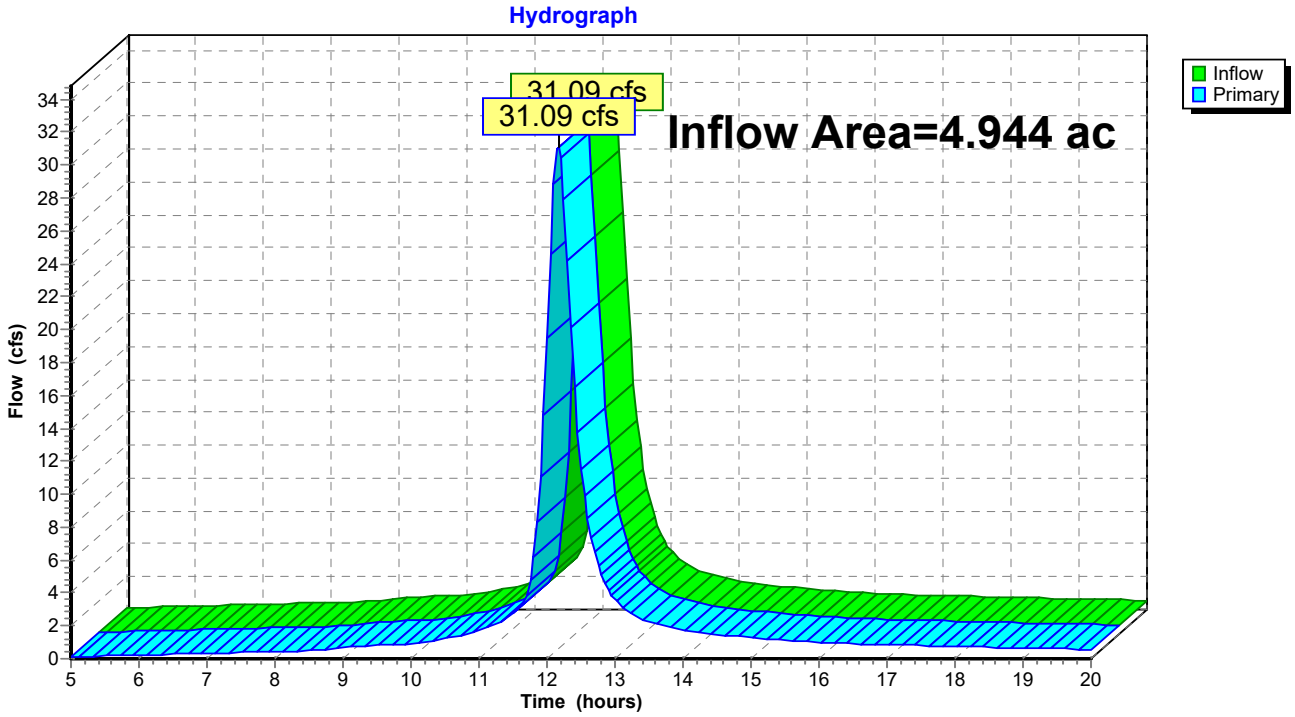


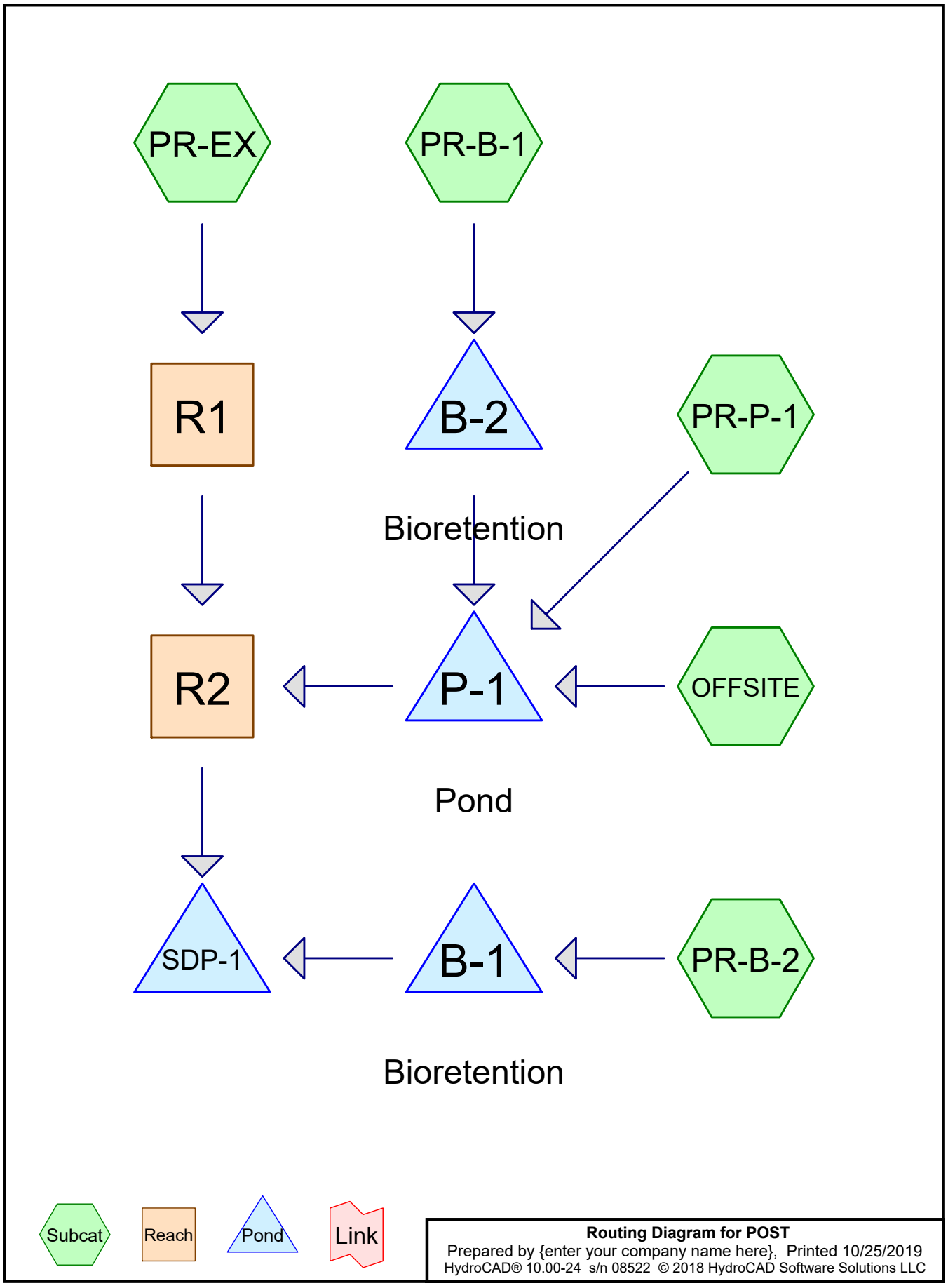
Summary for Pond SDP-1:

Inflow Area = 4.944 ac, 52.25% Impervious, Inflow Depth > 6.17" for 100-yr event
Inflow = 31.09 cfs @ 12.17 hrs, Volume= 2.542 af
Primary = 31.09 cfs @ 12.17 hrs, Volume= 2.542 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond SDP-1:





Routing Diagram for POST

Prepared by {enter your company name here}, Printed 10/25/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.626	74	>75% Grass cover, Good, HSG C (OFFSITE, PR-B-2, PR-EX, PR-P-1)
0.071	98	Concrete, HSG C (PR-EX)
0.236	96	Gravel surface, HSG C (PR-EX, PR-P-1)
1.331	98	Paved parking, HSG C (OFFSITE, PR-EX, PR-P-1)
2.211	98	Roofs, HSG C (PR-B-1, PR-B-2, PR-EX, PR-P-1)
0.084	70	Woods, Good, HSG C (PR-EX)
5.559	**90**	**TOTAL AREA**

Summary for Subcatchment OFFSITE:

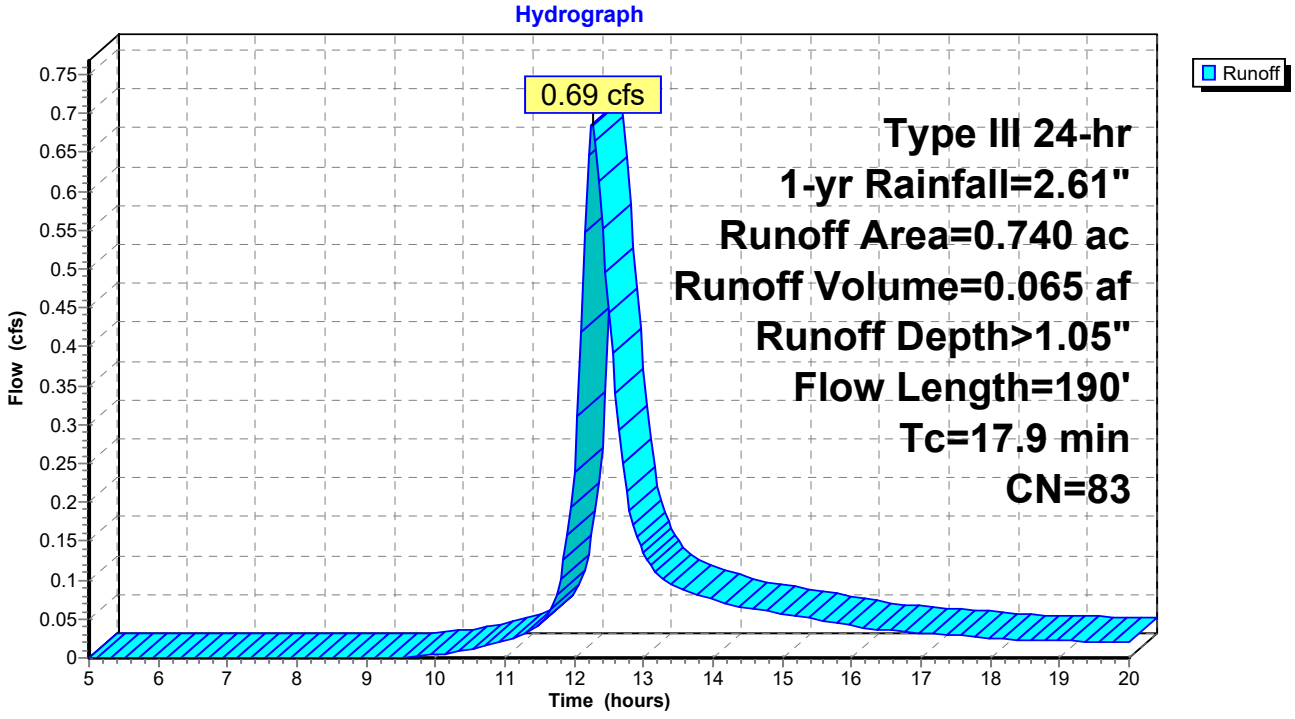
Runoff = 0.69 cfs @ 12.26 hrs, Volume= 0.065 af, Depth> 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.281	98	Paved parking, HSG C
0.459	74	>75% Grass cover, Good, HSG C
0.740	83	Weighted Average
0.459		62.03% Pervious Area
0.281		37.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	150	0.0300	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"
1.0	40	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.9	190	Total			

Subcatchment OFFSITE:



Summary for Subcatchment PR-B-1:

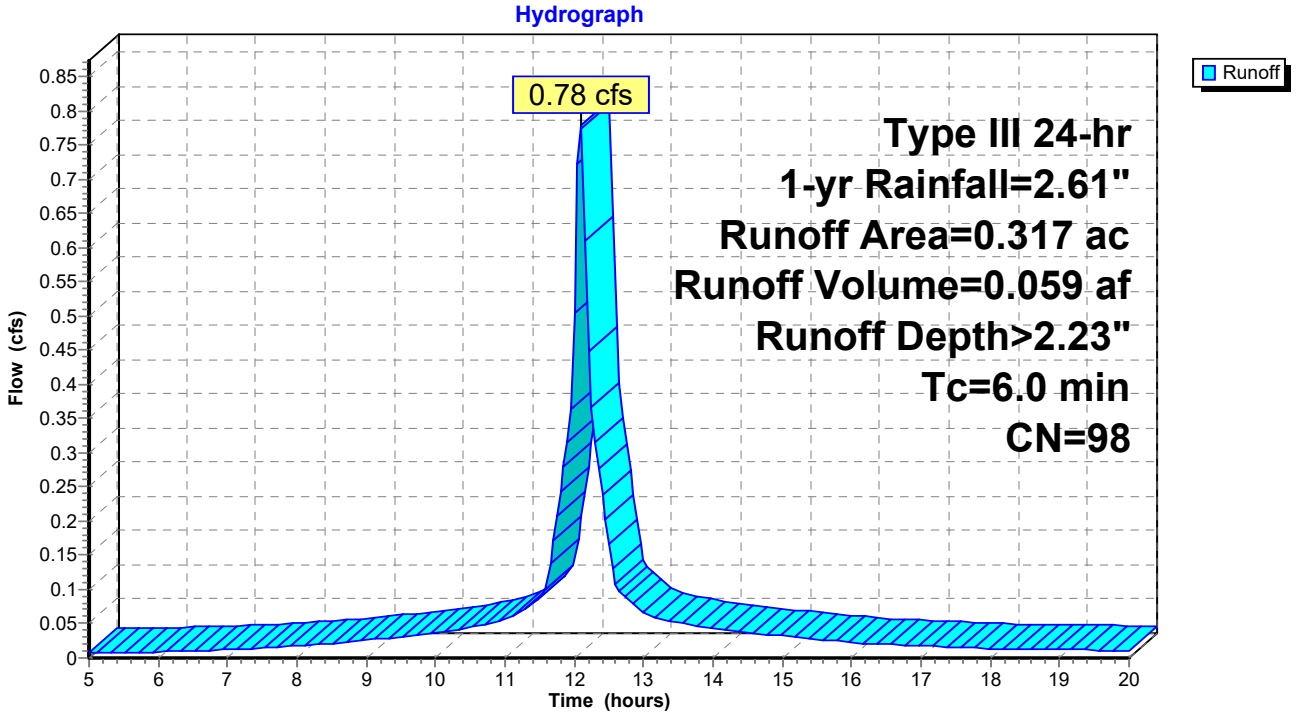
Runoff = 0.78 cfs @ 12.09 hrs, Volume= 0.059 af, Depth> 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.317	98	Roofs, HSG C
0.317		100.00% Impervious Area

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

Subcatchment PR-B-1:



Summary for Subcatchment PR-B-2:

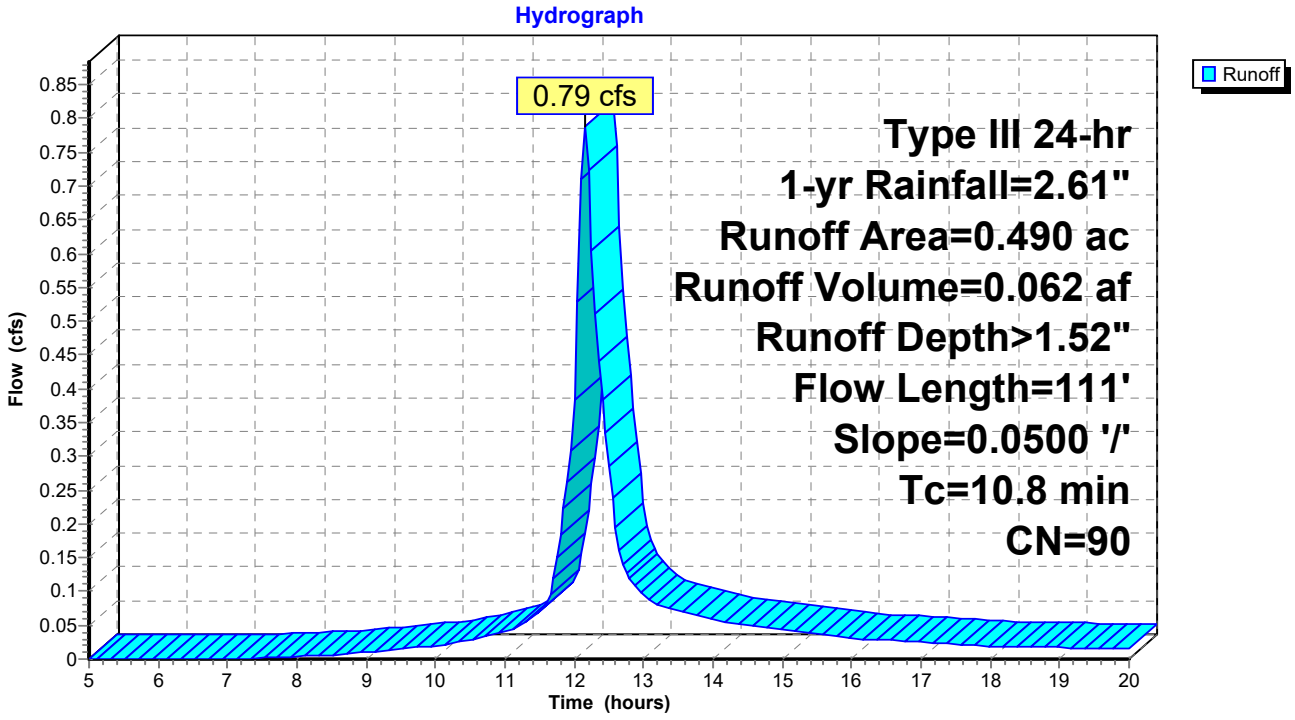
Runoff = 0.79 cfs @ 12.15 hrs, Volume= 0.062 af, Depth> 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.158	74	>75% Grass cover, Good, HSG C
0.332	98	Roofs, HSG C
0.490	90	Weighted Average
0.158		32.24% Pervious Area
0.332		67.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	111	0.0500	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"

Subcatchment PR-B-2:



Summary for Subcatchment PR-EX:

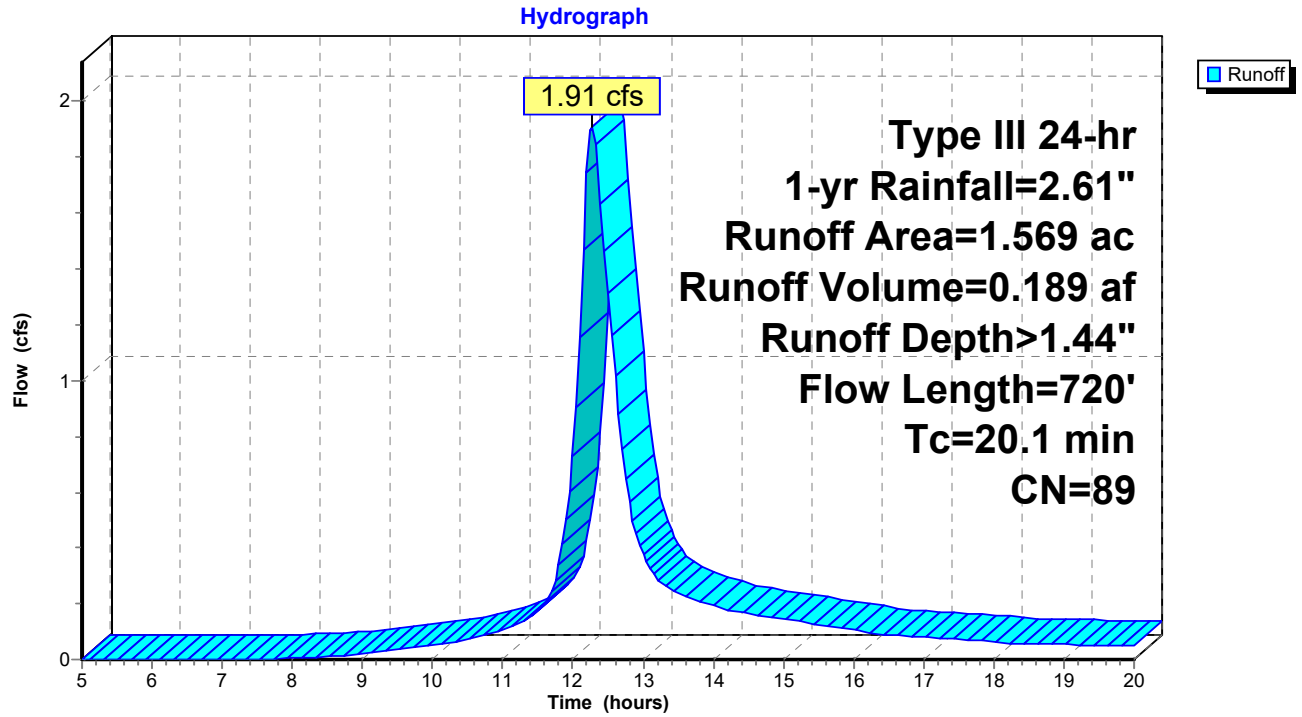
Runoff = 1.91 cfs @ 12.28 hrs, Volume= 0.189 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
	0.261	98	Paved parking, HSG C
	0.557	98	Roofs, HSG C
*	0.071	98	Concrete, HSG C
	0.084	70	Woods, Good, HSG C
	0.087	96	Gravel surface, HSG C
	0.509	74	>75% Grass cover, Good, HSG C
	1.569	89	Weighted Average
	0.680		43.34% Pervious Area
	0.889		56.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	150	0.0240	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"
1.6	570	0.0066	5.85	18.38	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
20.1	720	Total			

Subcatchment PR-EX:



Summary for Subcatchment PR-P-1:

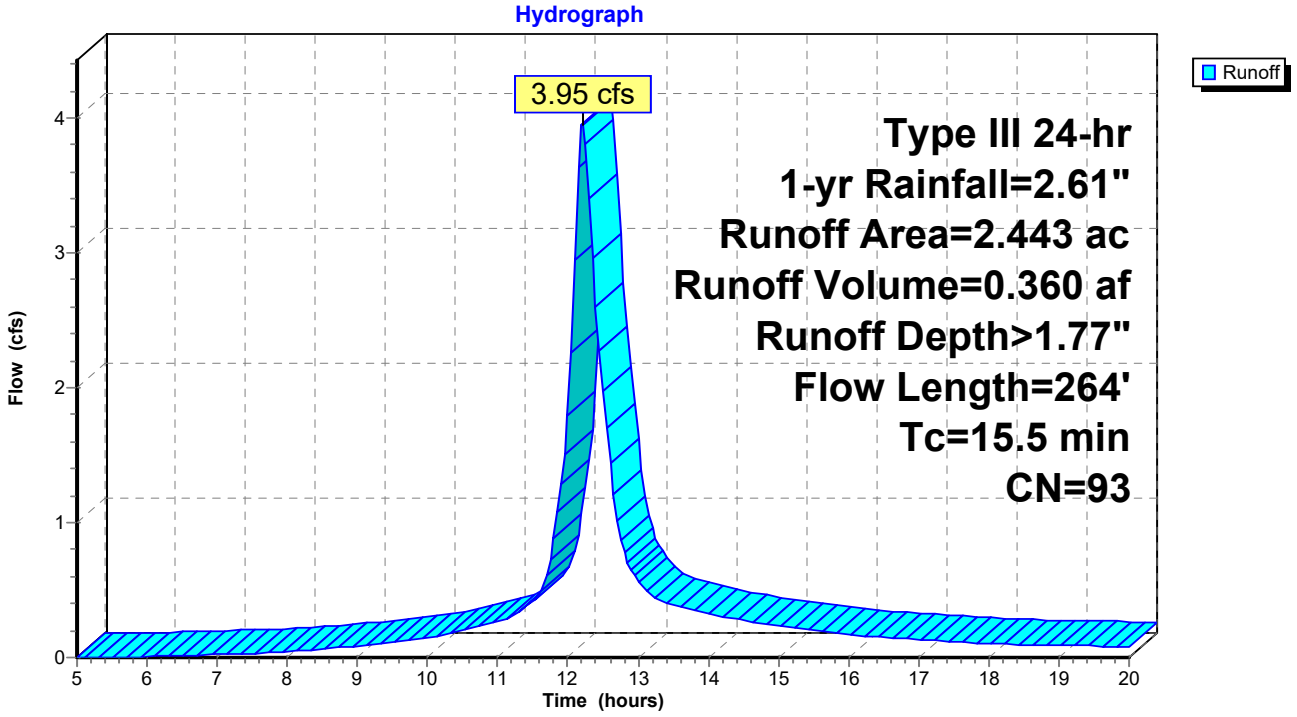
Runoff = 3.95 cfs @ 12.21 hrs, Volume= 0.360 af, Depth> 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-yr Rainfall=2.61"

Area (ac)	CN	Description
1.005	98	Roofs, HSG C
0.149	96	Gravel surface, HSG C
0.789	98	Paved parking, HSG C
0.500	74	>75% Grass cover, Good, HSG C
2.443	93	Weighted Average
0.649		26.57% Pervious Area
1.794		73.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0200	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"
0.9	126	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	38	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
15.5	264	Total			

Subcatchment PR-P-1:



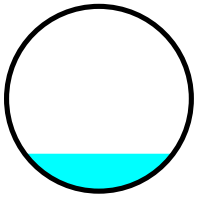
Summary for Reach R1:

Inflow Area = 1.569 ac, 56.66% Impervious, Inflow Depth > 1.44" for 1-yr event
Inflow = 1.91 cfs @ 12.28 hrs, Volume= 0.189 af
Outflow = 1.90 cfs @ 12.31 hrs, Volume= 0.189 af, Atten= 1%, Lag= 1.9 min

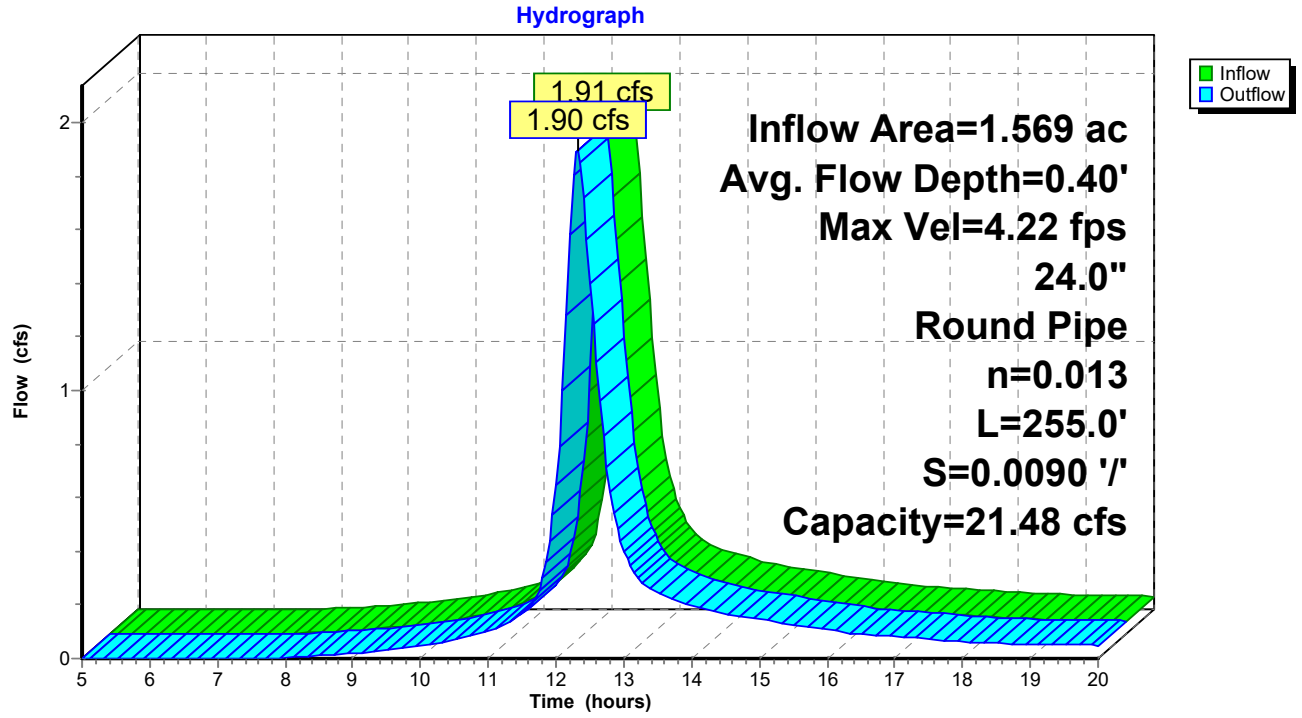
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.22 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.76 fps, Avg. Travel Time= 2.4 min

Peak Storage= 115 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 21.48 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 255.0' Slope= 0.0090 '/'
Inlet Invert= 248.40', Outlet Invert= 246.10'



Reach R1:



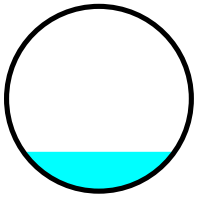
Summary for Reach R2:

Inflow Area = 5.069 ac, 64.73% Impervious, Inflow Depth > 1.45" for 1-yr event
Inflow = 2.50 cfs @ 12.32 hrs, Volume= 0.613 af
Outflow = 2.50 cfs @ 12.32 hrs, Volume= 0.612 af, Atten= 0%, Lag= 0.2 min

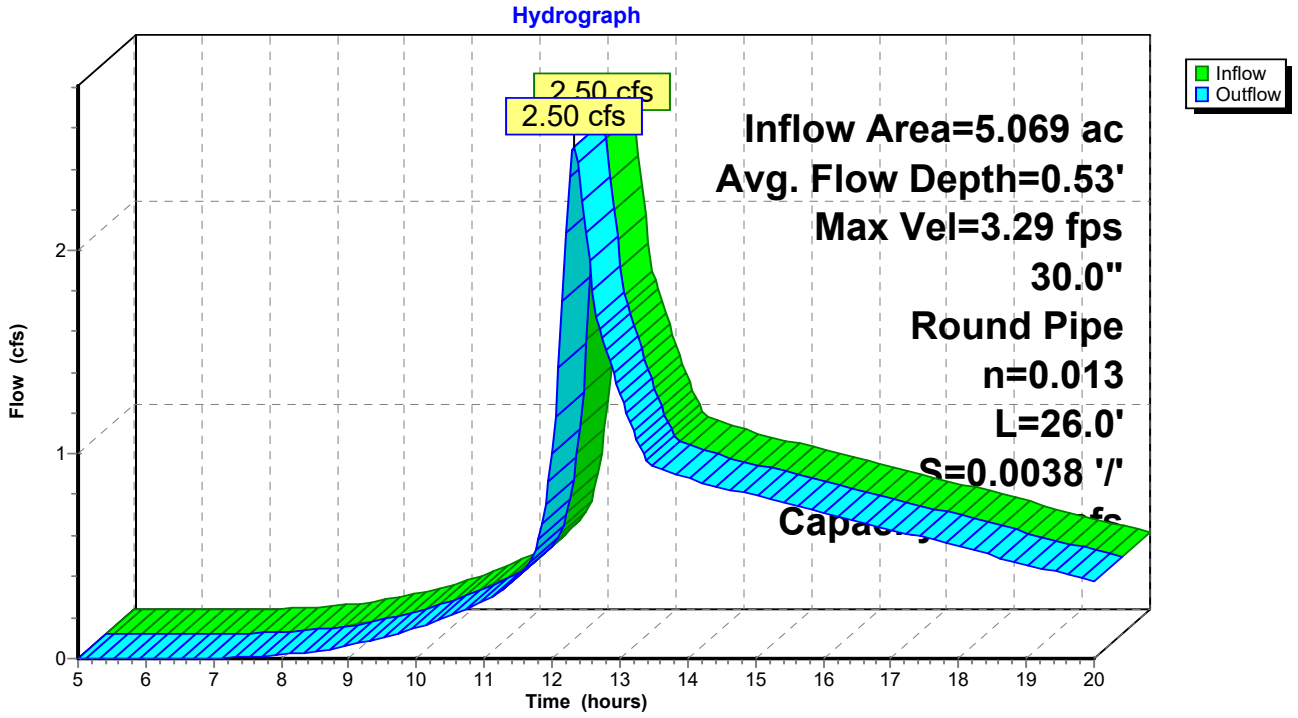
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.29 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.77 fps, Avg. Travel Time= 0.2 min

Peak Storage= 20 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 25.44 cfs

30.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 26.0' Slope= 0.0038 '/'
Inlet Invert= 246.10', Outlet Invert= 246.00'



Reach R2:



Summary for Pond B-1: Bioretention

Inflow Area = 0.490 ac, 67.76% Impervious, Inflow Depth > 1.52" for 1-yr event
Inflow = 0.79 cfs @ 12.15 hrs, Volume= 0.062 af
Outflow = 0.78 cfs @ 12.17 hrs, Volume= 0.054 af, Atten= 1%, Lag= 1.0 min
Primary = 0.78 cfs @ 12.17 hrs, Volume= 0.054 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 263.10' @ 12.17 hrs Surf.Area= 744 sf Storage= 417 cf

Plug-Flow detention time= 61.9 min calculated for 0.054 af (87% of inflow)
Center-of-Mass det. time= 23.7 min (808.9 - 785.2)

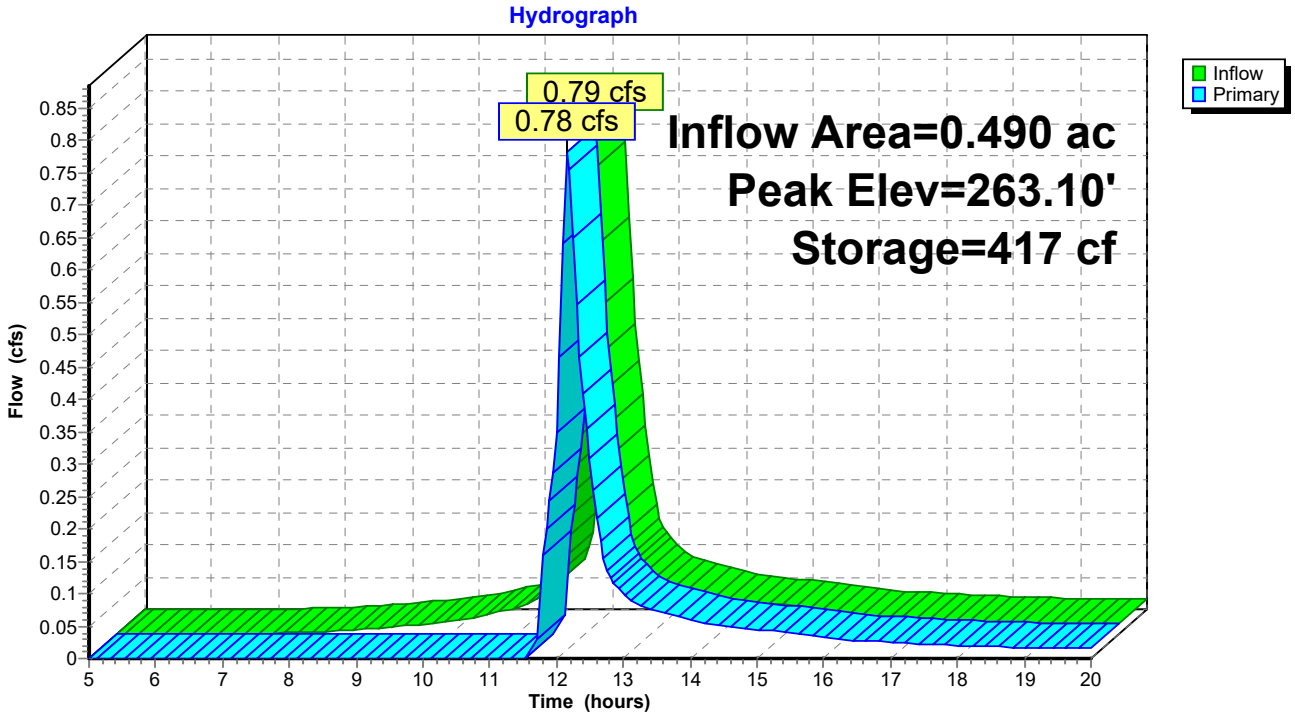
Volume	Invert	Avail.Storage	Storage Description
#1	262.50'	1,160 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.50	659	0	0
263.00	727	347	347
264.00	900	814	1,160

Device	Routing	Invert	Outlet Devices
#1	Primary	258.50'	**12.0" Round Culvert** L= 16.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 258.50' / 258.30' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	263.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	263.50'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.76 cfs @ 12.17 hrs HW=263.09' (Free Discharge)
- **1=Culvert** (Passes 0.76 cfs of 7.65 cfs potential flow)
  - **2=Orifice/Grate** (Weir Controls 0.76 cfs @ 1.01 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-1: Bioretention



Summary for Pond B-2: Bioretention

Inflow Area = 0.317 ac,100.00% Impervious, Inflow Depth > 2.23" for 1-yr event
Inflow = 0.78 cfs @ 12.09 hrs, Volume= 0.059 af
Outflow = 0.59 cfs @ 12.16 hrs, Volume= 0.038 af, Atten= 25%, Lag= 4.7 min
Primary = 0.59 cfs @ 12.16 hrs, Volume= 0.038 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 268.38' @ 12.16 hrs Surf.Area= 3,155 sf Storage= 1,152 cf

Plug-Flow detention time= 150.4 min calculated for 0.038 af (64% of inflow)
Center-of-Mass det. time= 77.1 min (817.8 - 740.8)

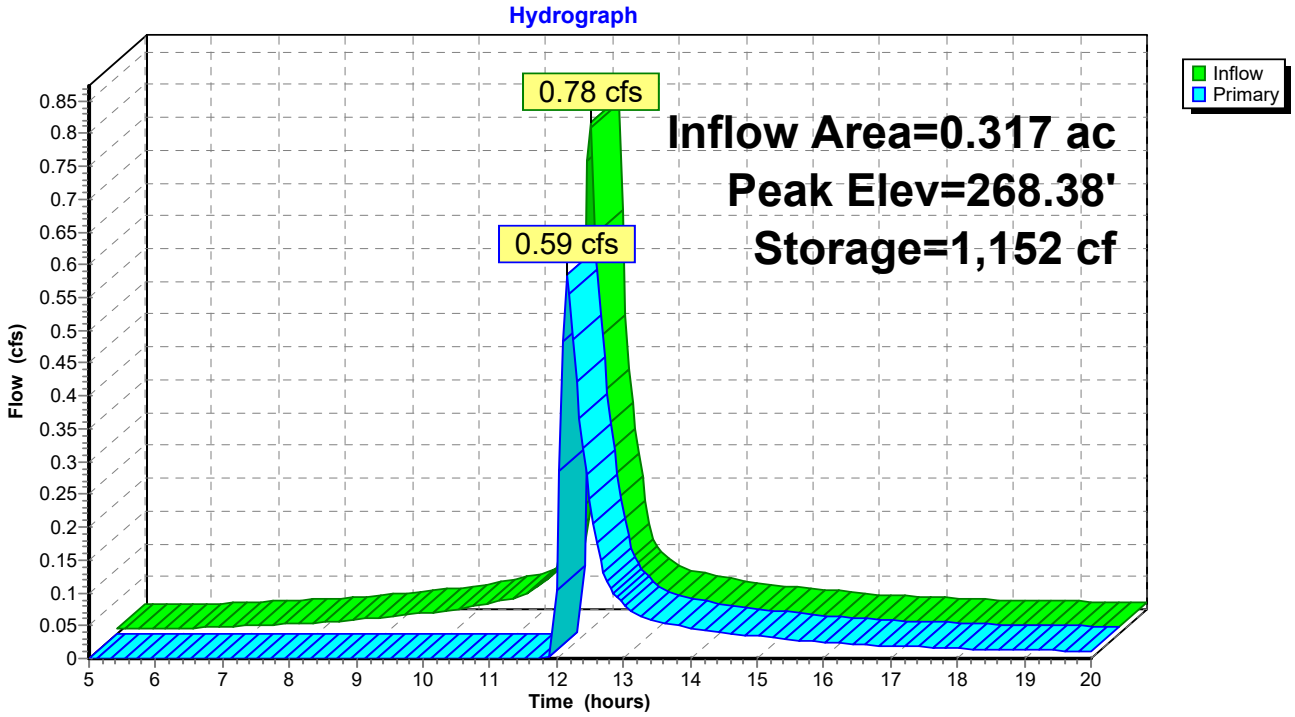
Volume	Invert	Avail.Storage	Storage Description
#1	268.00'	3,220 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
268.00	2,919	0	0
268.50	3,230	1,537	1,537
269.00	3,500	1,683	3,220

Device	Routing	Invert	Outlet Devices
#1	Primary	264.00'	**15.0" Round Culvert** L= 250.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 264.00' / 252.40' S= 0.0464 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	268.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.57 cfs @ 12.16 hrs HW=268.38' (Free Discharge)
↑—**1=Culvert** (Passes 0.57 cfs of 11.45 cfs potential flow)
↑—**2=Orifice/Grate** (Weir Controls 0.57 cfs @ 0.91 fps)

Pond B-2: Bioretention



Summary for Pond P-1: Pond

Inflow Area = 3.500 ac, 68.34% Impervious, Inflow Depth > 1.59" for 1-yr event
Inflow = 5.16 cfs @ 12.21 hrs, Volume= 0.463 af
Outflow = 0.91 cfs @ 12.90 hrs, Volume= 0.424 af, Atten= 82%, Lag= 41.2 min
Primary = 0.91 cfs @ 12.90 hrs, Volume= 0.424 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Starting Elev= 246.50' Surf.Area= 1,909 sf Storage= 2,044 cf
Peak Elev= 249.47' @ 12.90 hrs Surf.Area= 4,342 sf Storage= 11,336 cf (9,291 cf above start)
Flood Elev= 252.00' Surf.Area= 7,067 sf Storage= 25,423 cf (23,378 cf above start)

Plug-Flow detention time= 202.3 min calculated for 0.377 af (81% of inflow)
Center-of-Mass det. time= 120.7 min (905.5 - 784.8)

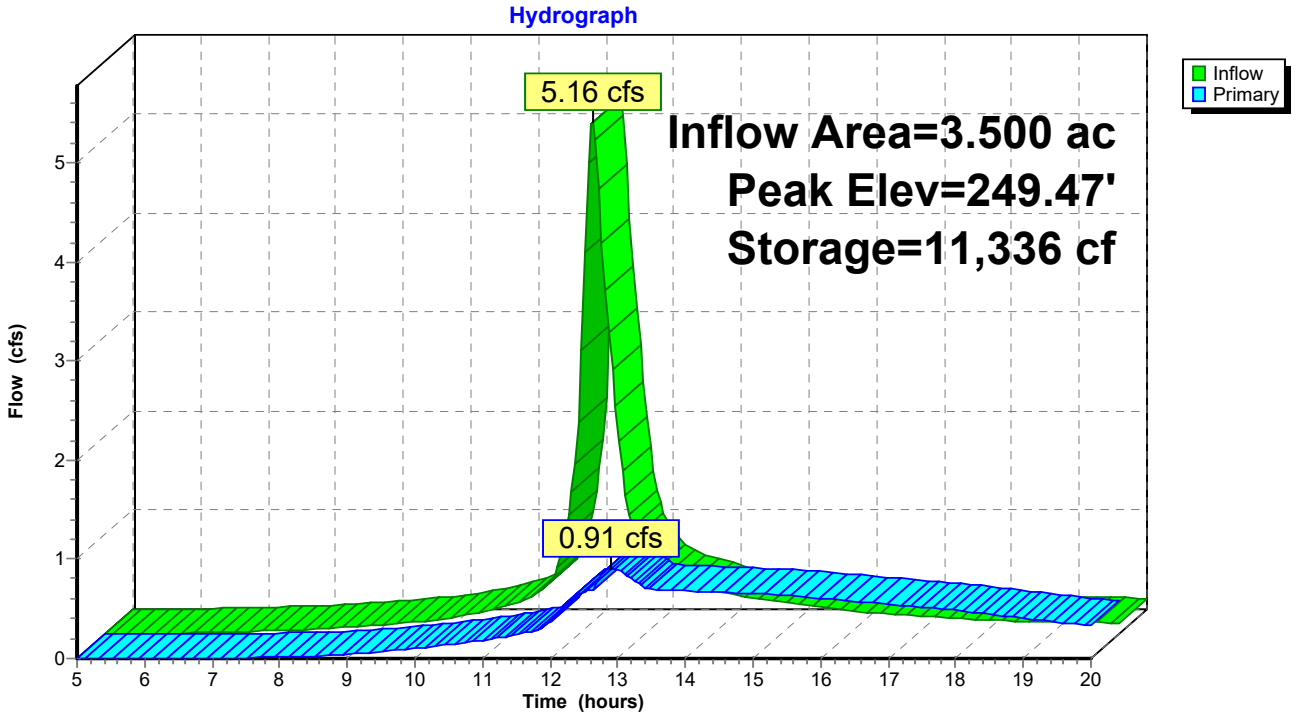
Volume	Invert	Avail.Storage	Storage Description
#1	245.00'	25,423 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
245.00	708	0	0
246.00	1,472	1,090	1,090
247.00	2,345	1,909	2,999
248.00	3,175	2,760	5,759
249.00	3,876	3,526	9,284
250.00	4,870	4,373	13,657
251.00	5,797	5,334	18,991
252.00	7,067	6,432	25,423

Device	Routing	Invert	Outlet Devices
#1	Primary	246.50'	**18.0" Round Culvert** L= 78.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 246.50' / 246.10' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	246.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	251.80'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#4	Device 1	251.60'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	249.40'	**20.0" W x 5.0" H Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=0.90 cfs @ 12.90 hrs HW=249.47' (Free Discharge)
- **1=Culvert** (Passes 0.90 cfs of 11.33 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.70 cfs @ 8.06 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
  - **5=Orifice/Grate** (Orifice Controls 0.19 cfs @ 0.84 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P-1: Pond

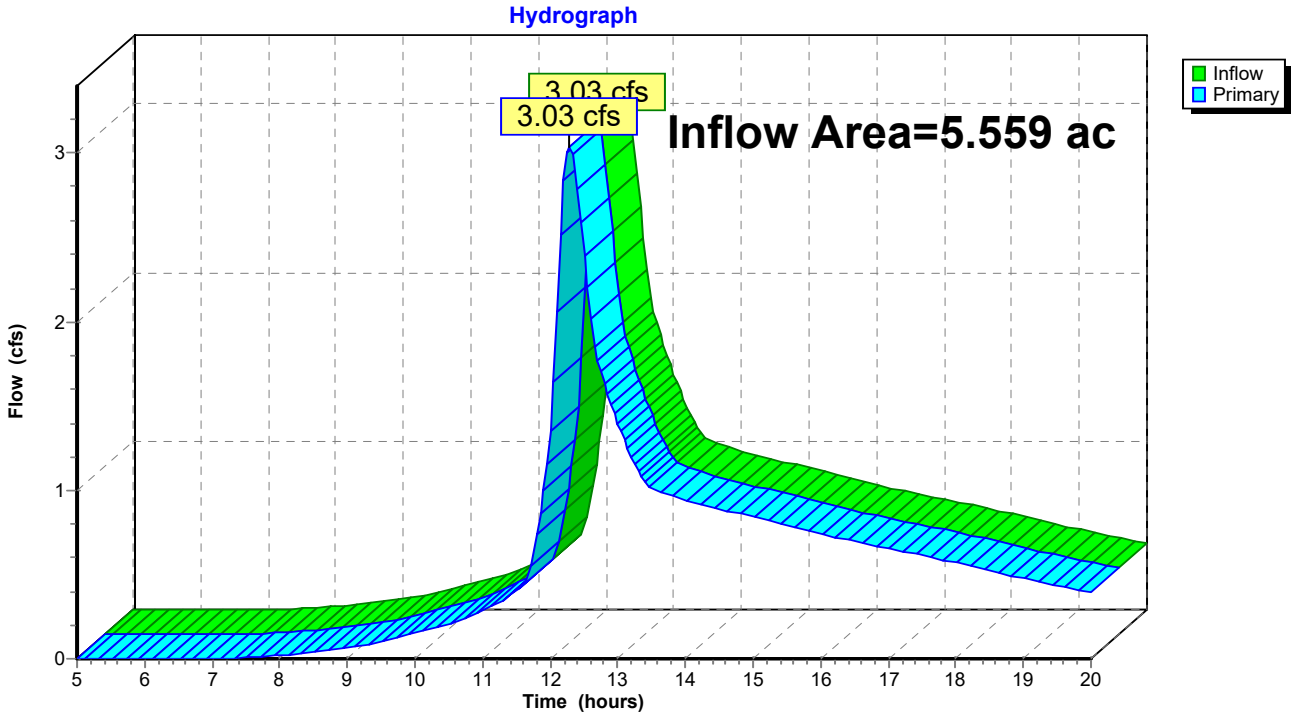

Hydrograph
5.16 cfs
0.91 cfs
Inflow Area=3.500 ac
Peak Elev=249.47'
Storage=11,336 cf
Inflow
Primary
Flow (cfs)
0
1
2
3
4
5
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Time (hours)

Summary for Pond SDP-1:

Inflow Area = 5.559 ac, 64.99% Impervious, Inflow Depth > 1.44" for 1-yr event
Inflow = 3.03 cfs @ 12.29 hrs, Volume= 0.667 af
Primary = 3.03 cfs @ 12.29 hrs, Volume= 0.667 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond SDP-1:



Summary for Subcatchment OFFSITE:

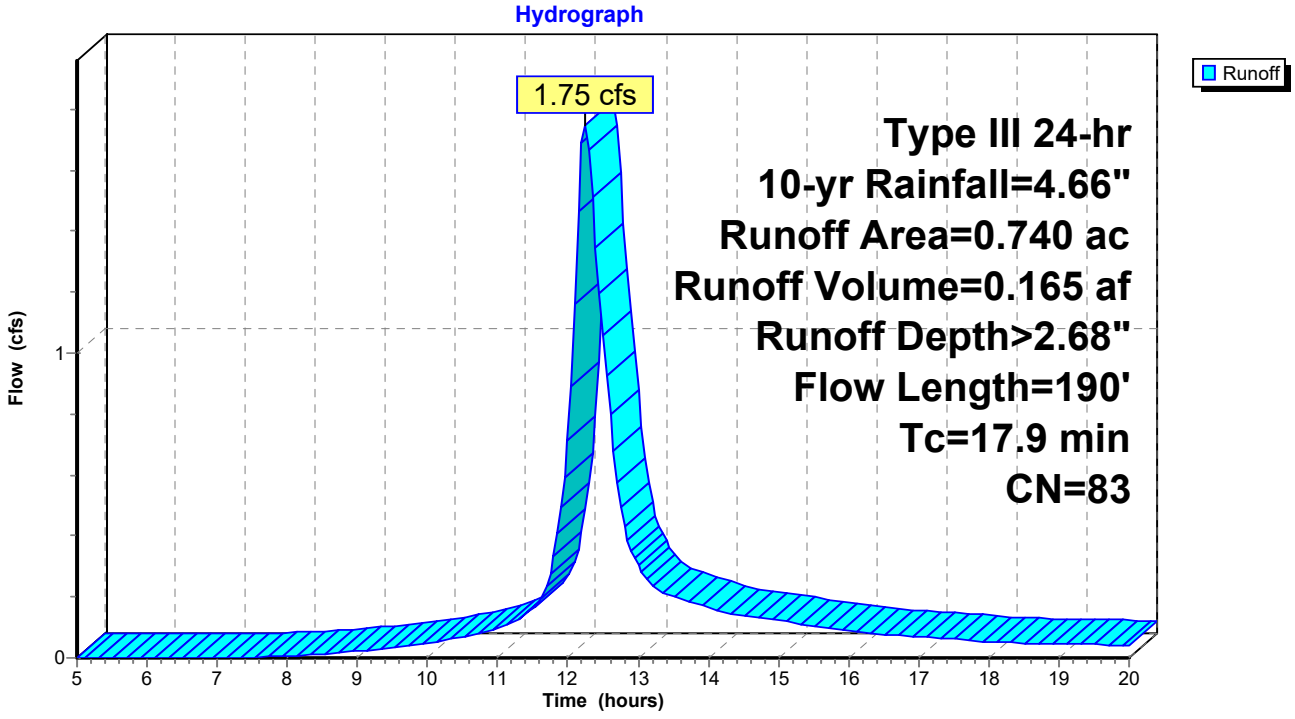
Runoff = 1.75 cfs @ 12.25 hrs, Volume= 0.165 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.66"

Area (ac)	CN	Description
0.281	98	Paved parking, HSG C
0.459	74	>75% Grass cover, Good, HSG C
0.740	83	Weighted Average
0.459		62.03% Pervious Area
0.281		37.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	150	0.0300	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"
1.0	40	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.9	190	Total			

Subcatchment OFFSITE:



Summary for Subcatchment PR-B-1:

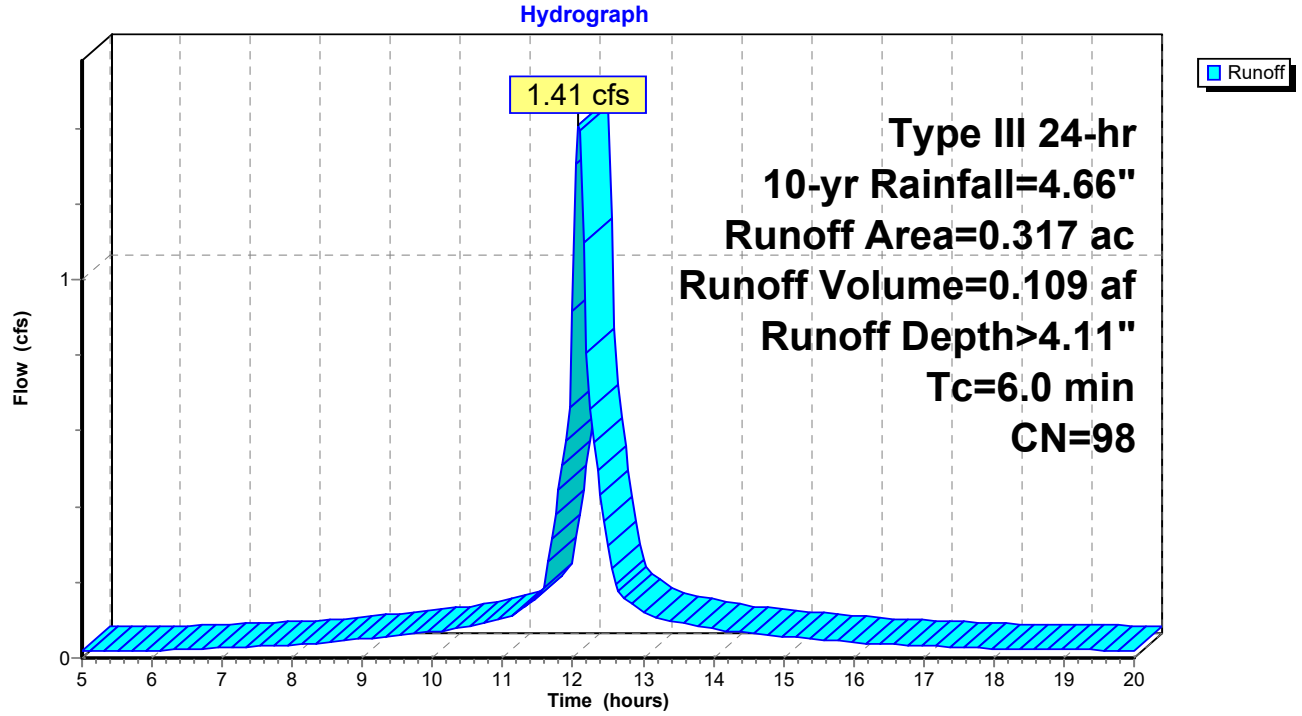
Runoff = 1.41 cfs @ 12.09 hrs, Volume= 0.109 af, Depth> 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.66"

Area (ac)	CN	Description
0.317	98	Roofs, HSG C
0.317		100.00% Impervious Area

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

Subcatchment PR-B-1:



Summary for Subcatchment PR-B-2:

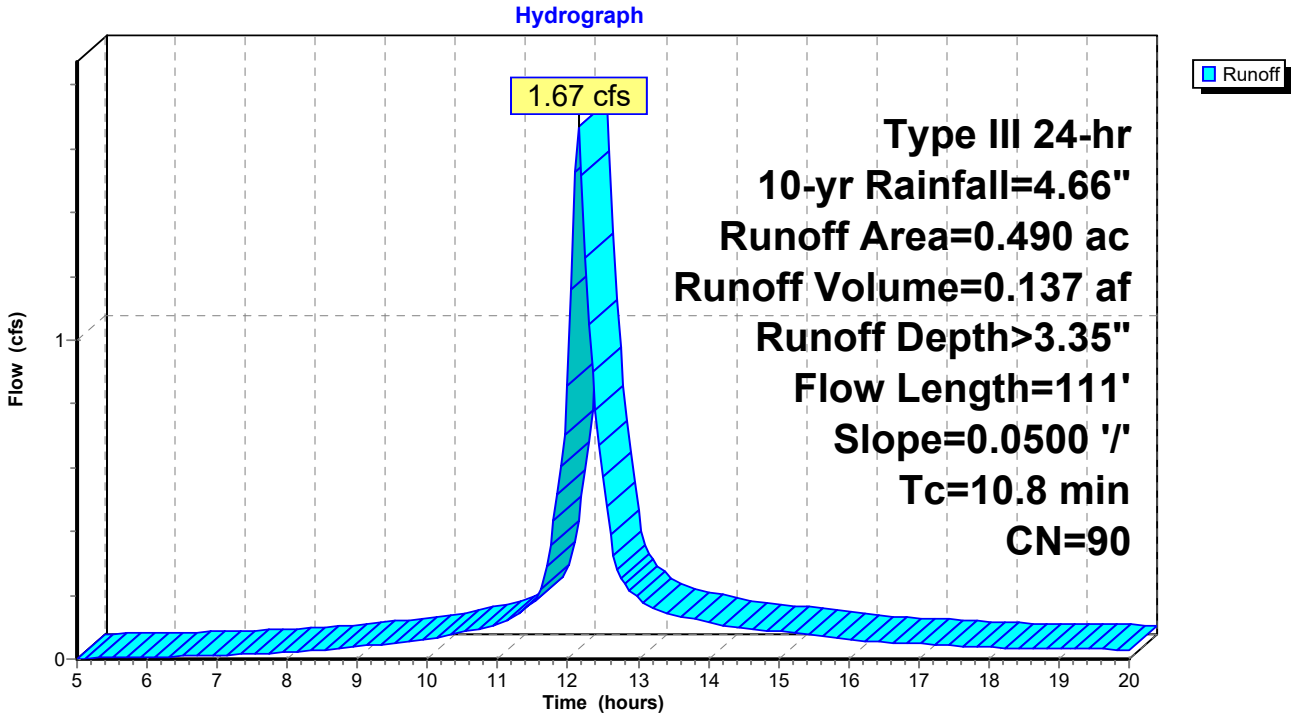
Runoff = 1.67 cfs @ 12.15 hrs, Volume= 0.137 af, Depth> 3.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.66"

Area (ac)	CN	Description
0.158	74	>75% Grass cover, Good, HSG C
0.332	98	Roofs, HSG C
0.490	90	Weighted Average
0.158		32.24% Pervious Area
0.332		67.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	111	0.0500	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"

Subcatchment PR-B-2:



Summary for Subcatchment PR-EX:

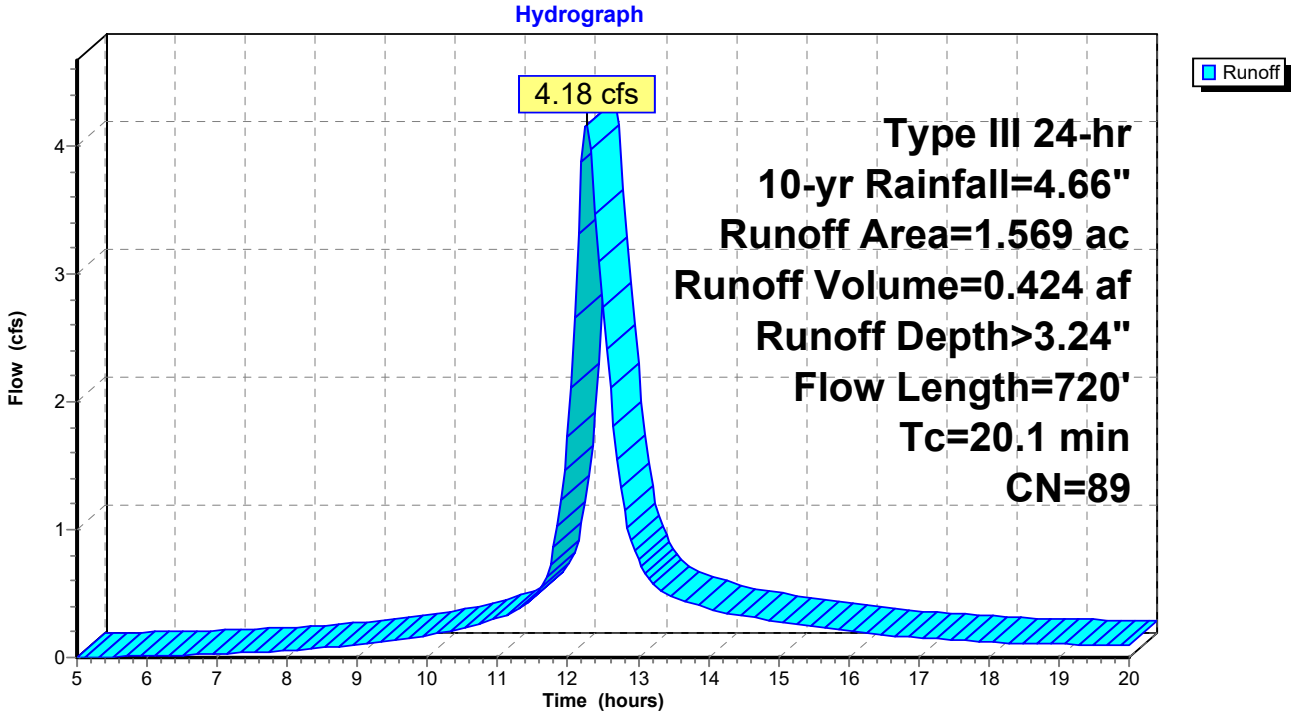
Runoff = 4.18 cfs @ 12.27 hrs, Volume= 0.424 af, Depth> 3.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.66"

	Area (ac)	CN	Description
	0.261	98	Paved parking, HSG C
	0.557	98	Roofs, HSG C
*	0.071	98	Concrete, HSG C
	0.084	70	Woods, Good, HSG C
	0.087	96	Gravel surface, HSG C
	0.509	74	>75% Grass cover, Good, HSG C
	1.569	89	Weighted Average
	0.680		43.34% Pervious Area
	0.889		56.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	150	0.0240	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"
1.6	570	0.0066	5.85	18.38	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
20.1	720	Total			

Subcatchment PR-EX:



Summary for Subcatchment PR-P-1:

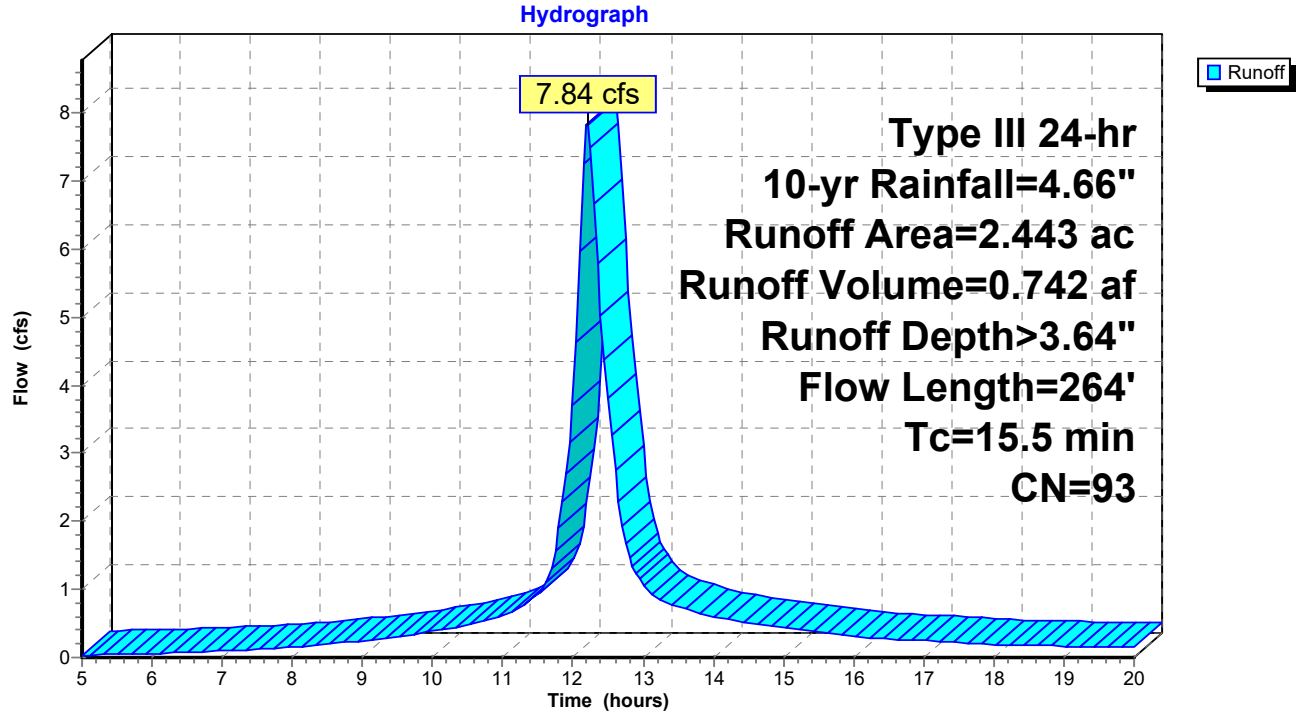
Runoff = 7.84 cfs @ 12.21 hrs, Volume= 0.742 af, Depth> 3.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.66"

Area (ac)	CN	Description
1.005	98	Roofs, HSG C
0.149	96	Gravel surface, HSG C
0.789	98	Paved parking, HSG C
0.500	74	>75% Grass cover, Good, HSG C
2.443	93	Weighted Average
0.649		26.57% Pervious Area
1.794		73.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0200	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"
0.9	126	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	38	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
15.5	264	Total			

Subcatchment PR-P-1:



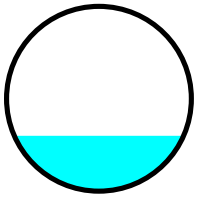
Summary for Reach R1:

Inflow Area = 1.569 ac, 56.66% Impervious, Inflow Depth > 3.24" for 10-yr event
Inflow = 4.18 cfs @ 12.27 hrs, Volume= 0.424 af
Outflow = 4.14 cfs @ 12.30 hrs, Volume= 0.423 af, Atten= 1%, Lag= 1.6 min

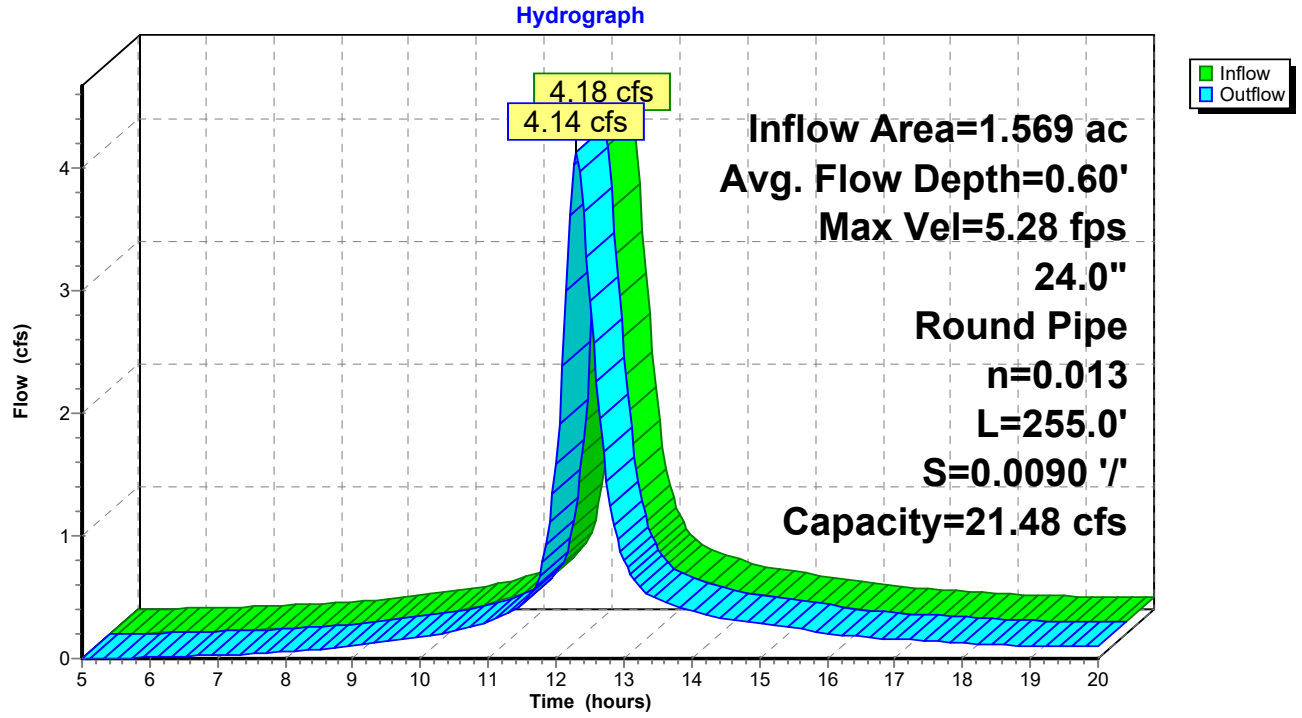
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.28 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 2.09 fps, Avg. Travel Time= 2.0 min

Peak Storage= 201 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 21.48 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 255.0' Slope= 0.0090 '/'
Inlet Invert= 248.40', Outlet Invert= 246.10'



Reach R1:



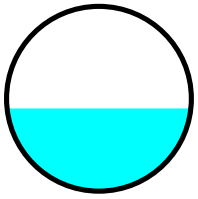
Summary for Reach R2:

Inflow Area = 5.069 ac, 64.73% Impervious, Inflow Depth > 3.14" for 10-yr event
Inflow = 10.45 cfs @ 12.35 hrs, Volume= 1.325 af
Outflow = 10.45 cfs @ 12.35 hrs, Volume= 1.324 af, Atten= 0%, Lag= 0.2 min

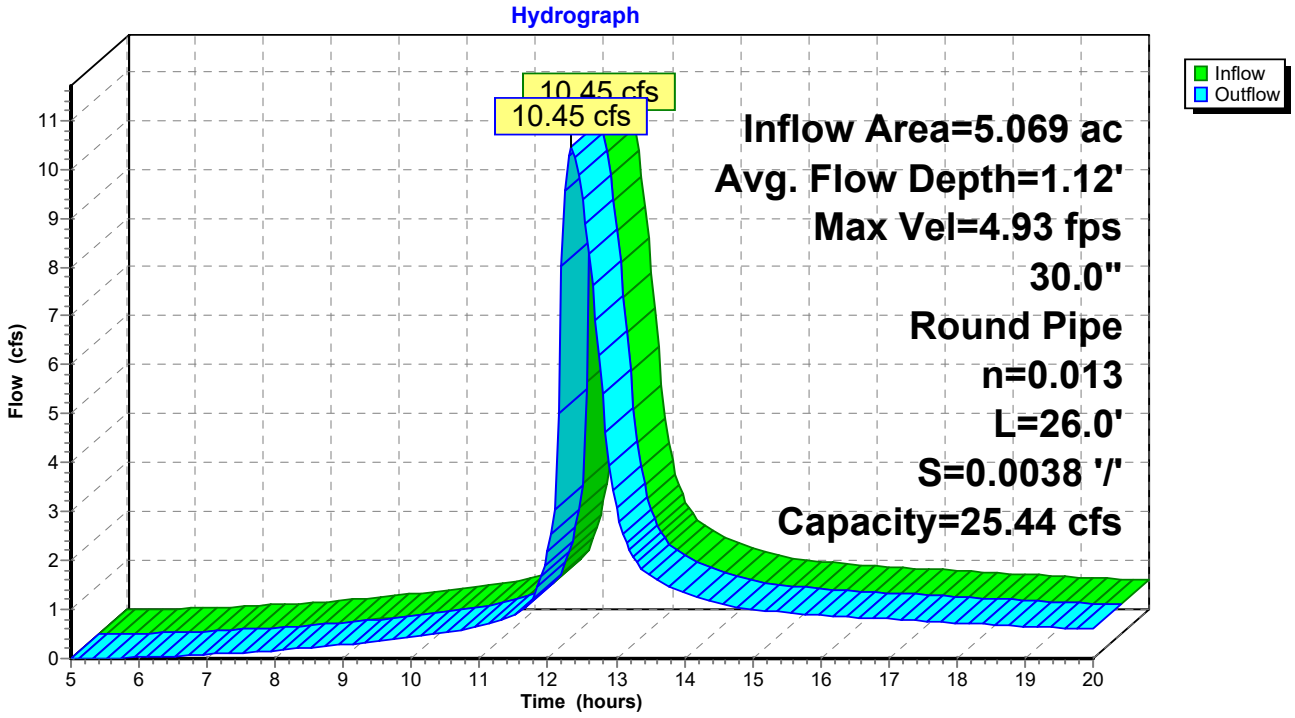
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.93 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.17 fps, Avg. Travel Time= 0.2 min

Peak Storage= 55 cf @ 12.35 hrs
Average Depth at Peak Storage= 1.12'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 25.44 cfs

30.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 26.0' Slope= 0.0038 '/'
Inlet Invert= 246.10', Outlet Invert= 246.00'



Reach R2:



Summary for Pond B-1: Bioretention

Inflow Area = 0.490 ac, 67.76% Impervious, Inflow Depth > 3.35" for 10-yr event
Inflow = 1.67 cfs @ 12.15 hrs, Volume= 0.137 af
Outflow = 1.66 cfs @ 12.16 hrs, Volume= 0.129 af, Atten= 1%, Lag= 0.8 min
Primary = 1.66 cfs @ 12.16 hrs, Volume= 0.129 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 263.16' @ 12.16 hrs Surf.Area= 755 sf Storage= 465 cf

Plug-Flow detention time= 39.2 min calculated for 0.128 af (94% of inflow)
Center-of-Mass det. time= 17.8 min (784.4 - 766.6)

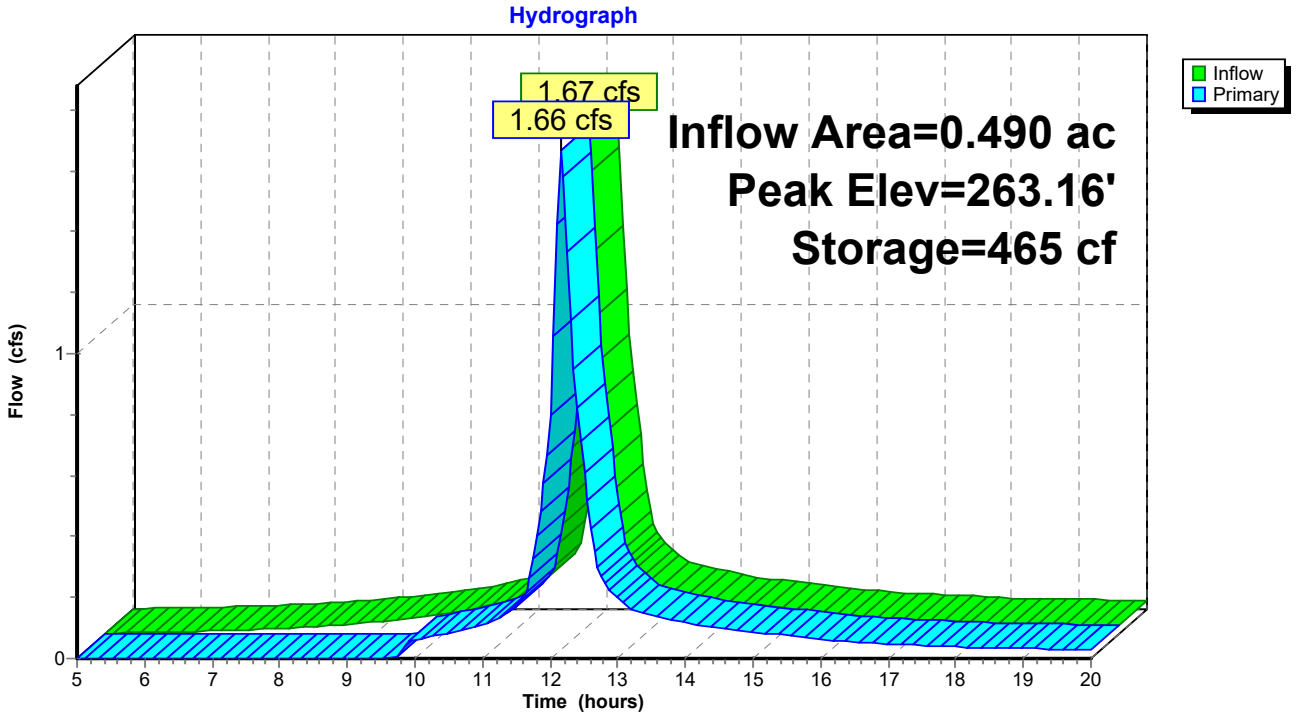
Volume	Invert	Avail.Storage	Storage Description
#1	262.50'	1,160 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.50	659	0	0
263.00	727	347	347
264.00	900	814	1,160

Device	Routing	Invert	Outlet Devices
#1	Primary	258.50'	**12.0" Round Culvert** L= 16.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 258.50' / 258.30' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	263.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	263.50'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=1.63 cfs @ 12.16 hrs HW=263.16' (Free Discharge)
- **1=Culvert** (Passes 1.63 cfs of 7.71 cfs potential flow)
  - **2=Orifice/Grate** (Weir Controls 1.63 cfs @ 1.30 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-1: Bioretention



Summary for Pond B-2: Bioretention

Inflow Area = 0.317 ac,100.00% Impervious, Inflow Depth > 4.11" for 10-yr event
Inflow = 1.41 cfs @ 12.09 hrs, Volume= 0.109 af
Outflow = 1.21 cfs @ 12.14 hrs, Volume= 0.087 af, Atten= 15%, Lag= 3.2 min
Primary = 1.21 cfs @ 12.14 hrs, Volume= 0.087 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 268.43' @ 12.14 hrs Surf.Area= 3,186 sf Storage= 1,308 cf

Plug-Flow detention time= 109.2 min calculated for 0.087 af (80% of inflow)
Center-of-Mass det. time= 56.0 min (791.5 - 735.5)

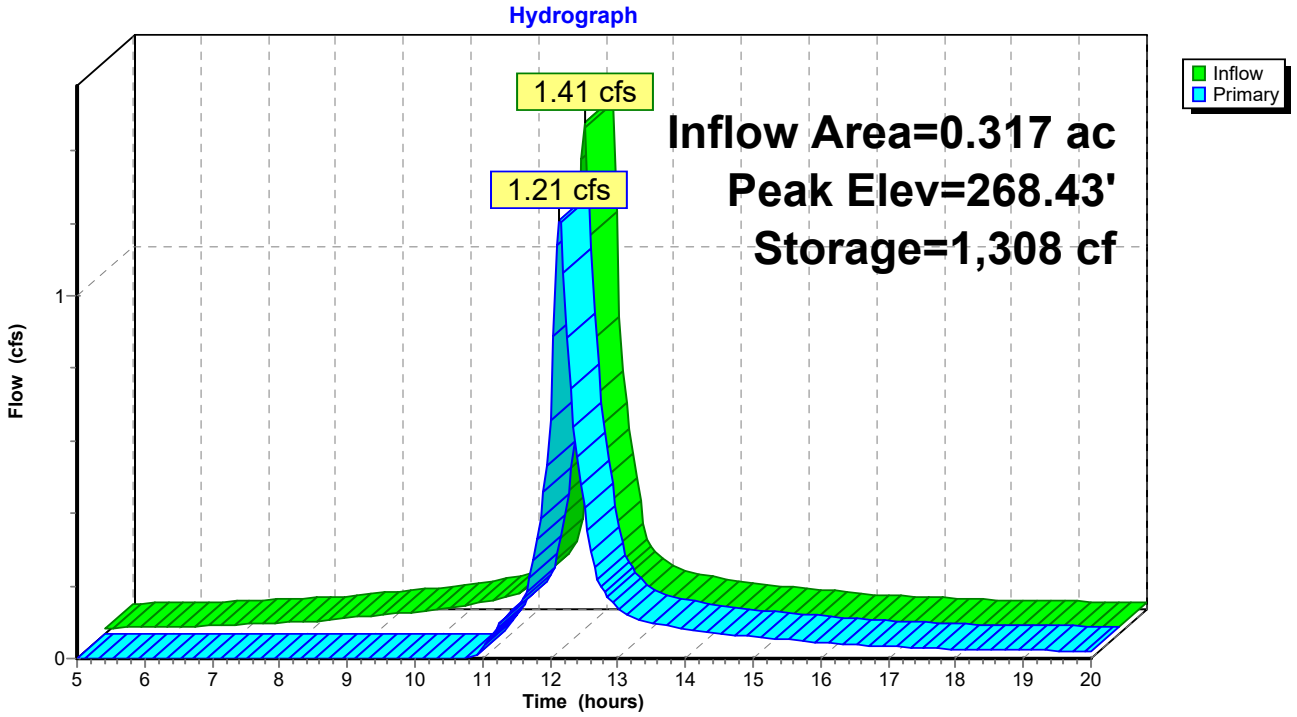
Volume	Invert	Avail.Storage	Storage Description
#1	268.00'	3,220 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
268.00	2,919	0	0
268.50	3,230	1,537	1,537
269.00	3,500	1,683	3,220

Device	Routing	Invert	Outlet Devices
#1	Primary	264.00'	**15.0" Round Culvert** L= 250.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 264.00' / 252.40' S= 0.0464 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	268.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.19 cfs @ 12.14 hrs HW=268.43' (Free Discharge)
↑—**1=Culvert** (Passes 1.19 cfs of 11.52 cfs potential flow)
↑—**2=Orifice/Grate** (Weir Controls 1.19 cfs @ 1.17 fps)

Pond B-2: Bioretention



Summary for Pond P-1: Pond

Inflow Area = 3.500 ac, 68.34% Impervious, Inflow Depth > 3.41" for 10-yr event
Inflow = 10.58 cfs @ 12.20 hrs, Volume= 0.994 af
Outflow = 6.60 cfs @ 12.42 hrs, Volume= 0.901 af, Atten= 38%, Lag= 12.9 min
Primary = 6.60 cfs @ 12.42 hrs, Volume= 0.901 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Starting Elev= 246.50' Surf.Area= 1,909 sf Storage= 2,044 cf
Peak Elev= 250.36' @ 12.42 hrs Surf.Area= 5,208 sf Storage= 15,602 cf (13,558 cf above start)
Flood Elev= 252.00' Surf.Area= 7,067 sf Storage= 25,423 cf (23,378 cf above start)

Plug-Flow detention time= 123.4 min calculated for 0.854 af (86% of inflow)
Center-of-Mass det. time= 64.8 min (833.2 - 768.4)

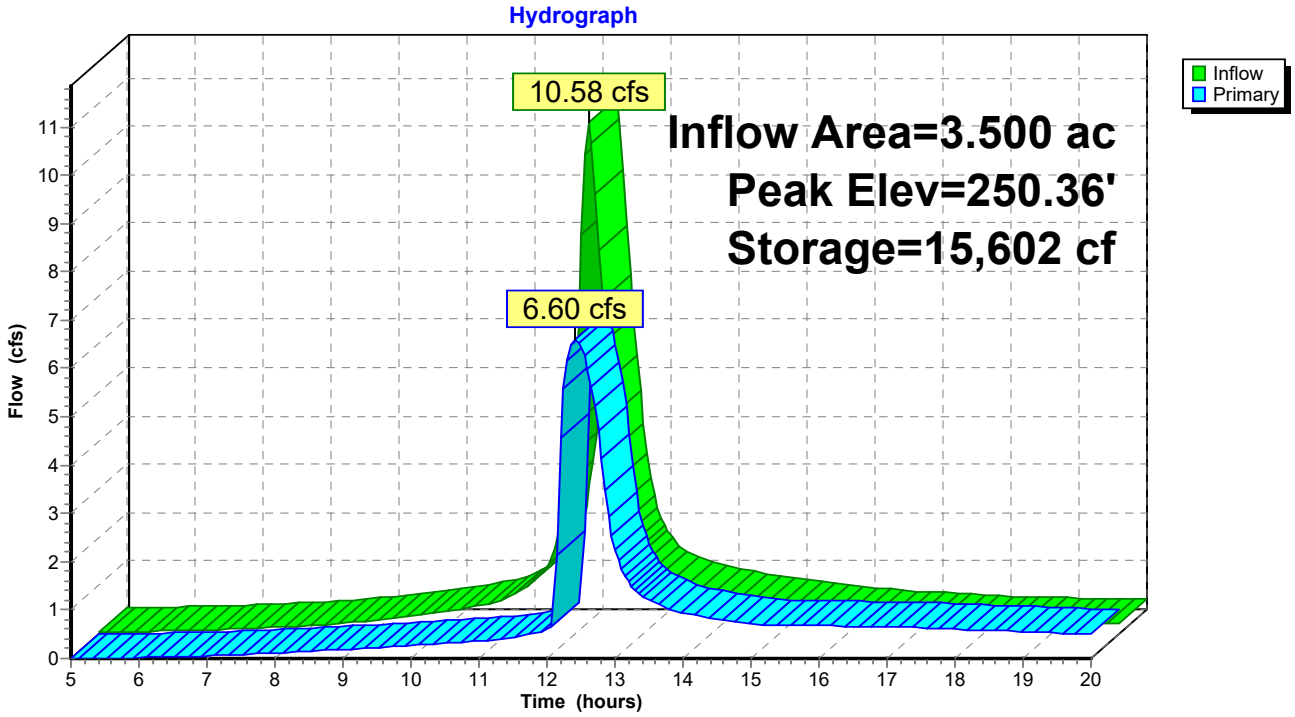
Volume	Invert	Avail.Storage	Storage Description
#1	245.00'	25,423 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
245.00	708	0	0
246.00	1,472	1,090	1,090
247.00	2,345	1,909	2,999
248.00	3,175	2,760	5,759
249.00	3,876	3,526	9,284
250.00	4,870	4,373	13,657
251.00	5,797	5,334	18,991
252.00	7,067	6,432	25,423

Device	Routing	Invert	Outlet Devices
#1	Primary	246.50'	**18.0" Round Culvert** L= 78.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 246.50' / 246.10' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	246.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	251.80'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#4	Device 1	251.60'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	249.40'	**20.0" W x 5.0" H Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=6.59 cfs @ 12.42 hrs HW=250.36' (Free Discharge)
- **1=Culvert** (Passes 6.59 cfs of 13.77 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.81 cfs @ 9.25 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
  - **5=Orifice/Grate** (Orifice Controls 5.78 cfs @ 4.16 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P-1: Pond

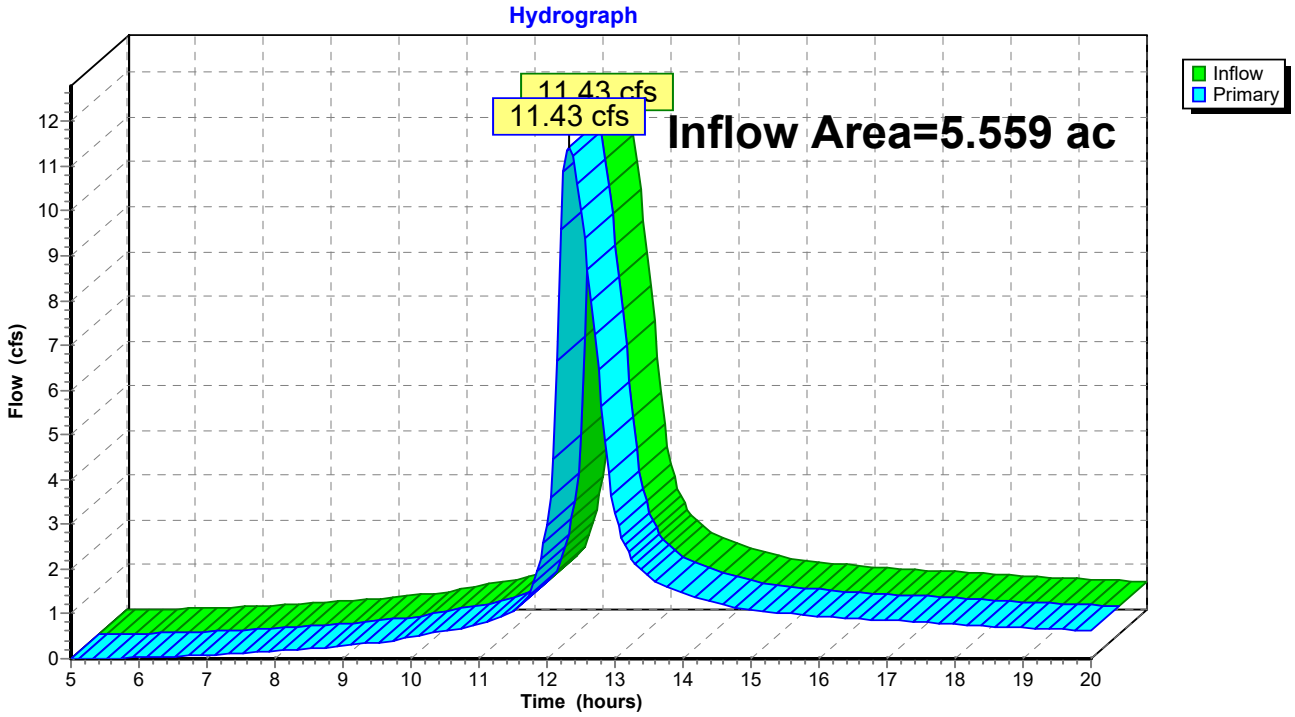

Hydrograph
10.58 cfs
6.60 cfs
Inflow Area=3.500 ac
Peak Elev=250.36'
Storage=15,602 cf
Inflow
Primary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond SDP-1:

Inflow Area = 5.559 ac, 64.99% Impervious, Inflow Depth > 3.14" for 10-yr event
Inflow = 11.43 cfs @ 12.33 hrs, Volume= 1.453 af
Primary = 11.43 cfs @ 12.33 hrs, Volume= 1.453 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond SDP-1:



Summary for Subcatchment OFFSITE:

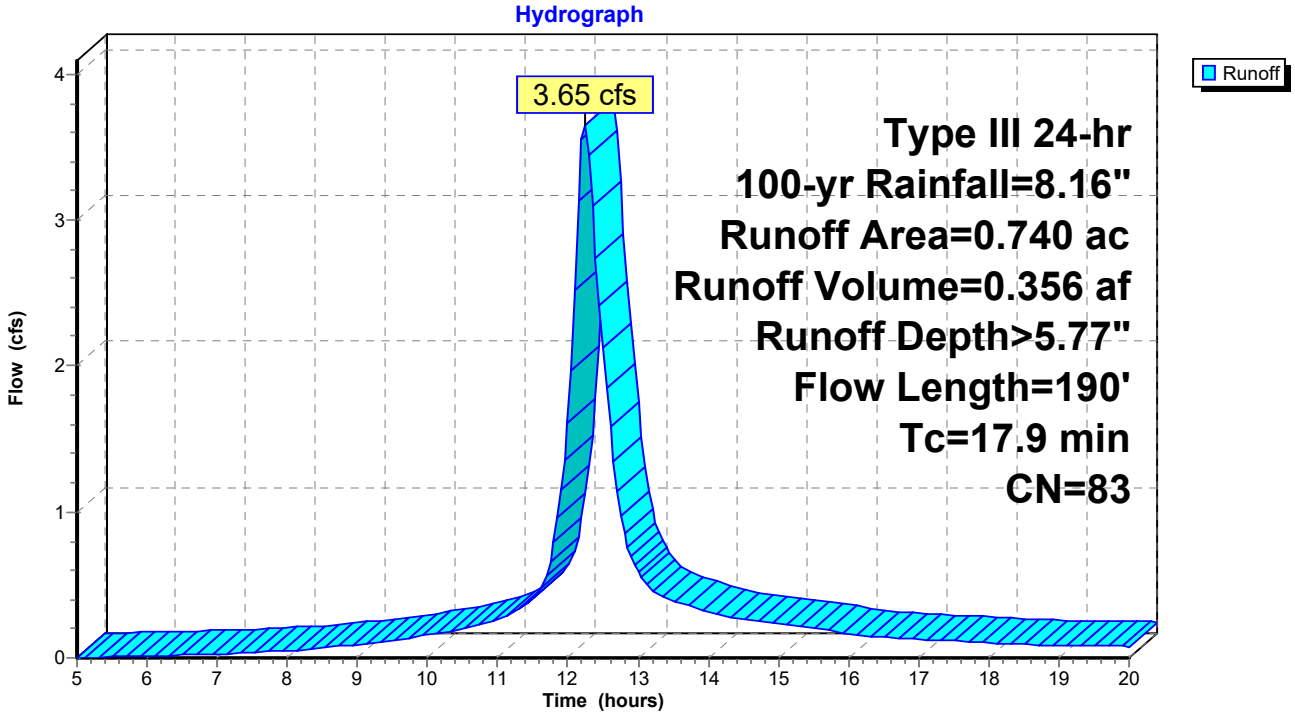
Runoff = 3.65 cfs @ 12.24 hrs, Volume= 0.356 af, Depth> 5.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.16"

Area (ac)	CN	Description
0.281	98	Paved parking, HSG C
0.459	74	>75% Grass cover, Good, HSG C
0.740	83	Weighted Average
0.459		62.03% Pervious Area
0.281		37.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	150	0.0300	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"
1.0	40	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.9	190	Total			

Subcatchment OFFSITE:



Summary for Subcatchment PR-B-1:

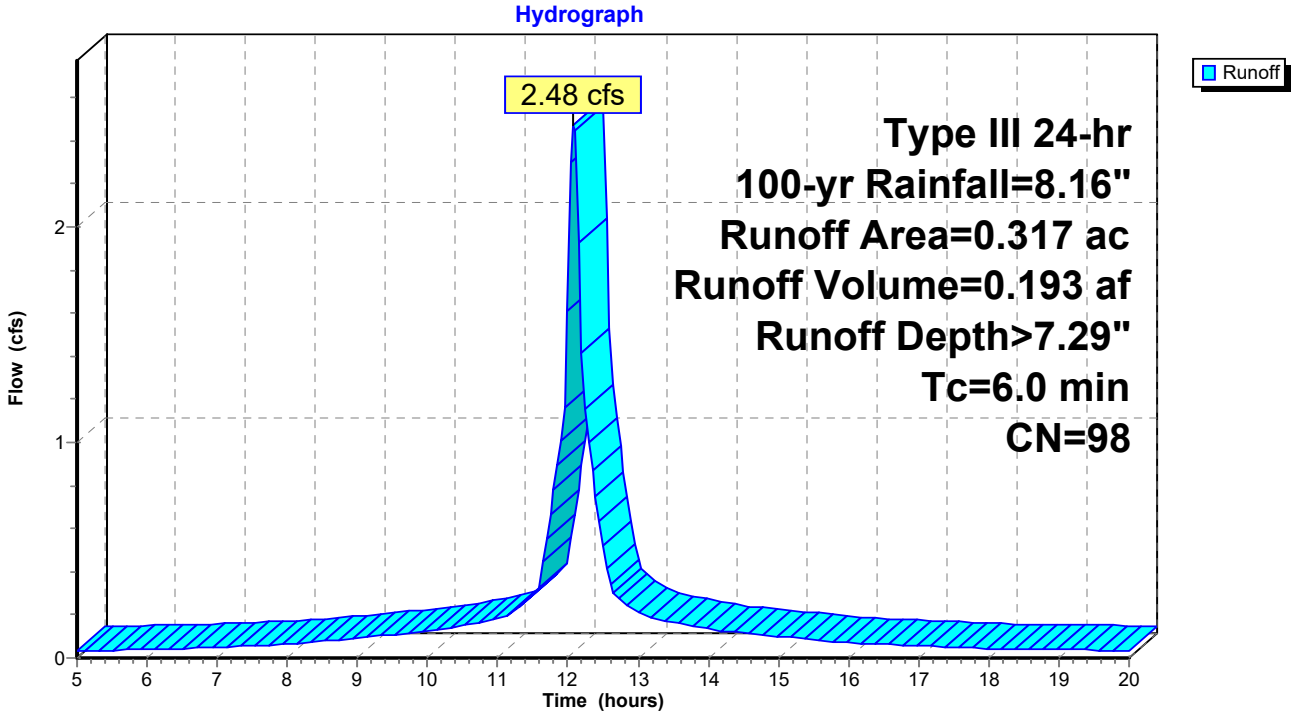
Runoff = 2.48 cfs @ 12.09 hrs, Volume= 0.193 af, Depth> 7.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.16"

Area (ac)	CN	Description
0.317	98	Roofs, HSG C
0.317		100.00% Impervious Area

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

Subcatchment PR-B-1:



Summary for Subcatchment PR-B-2:

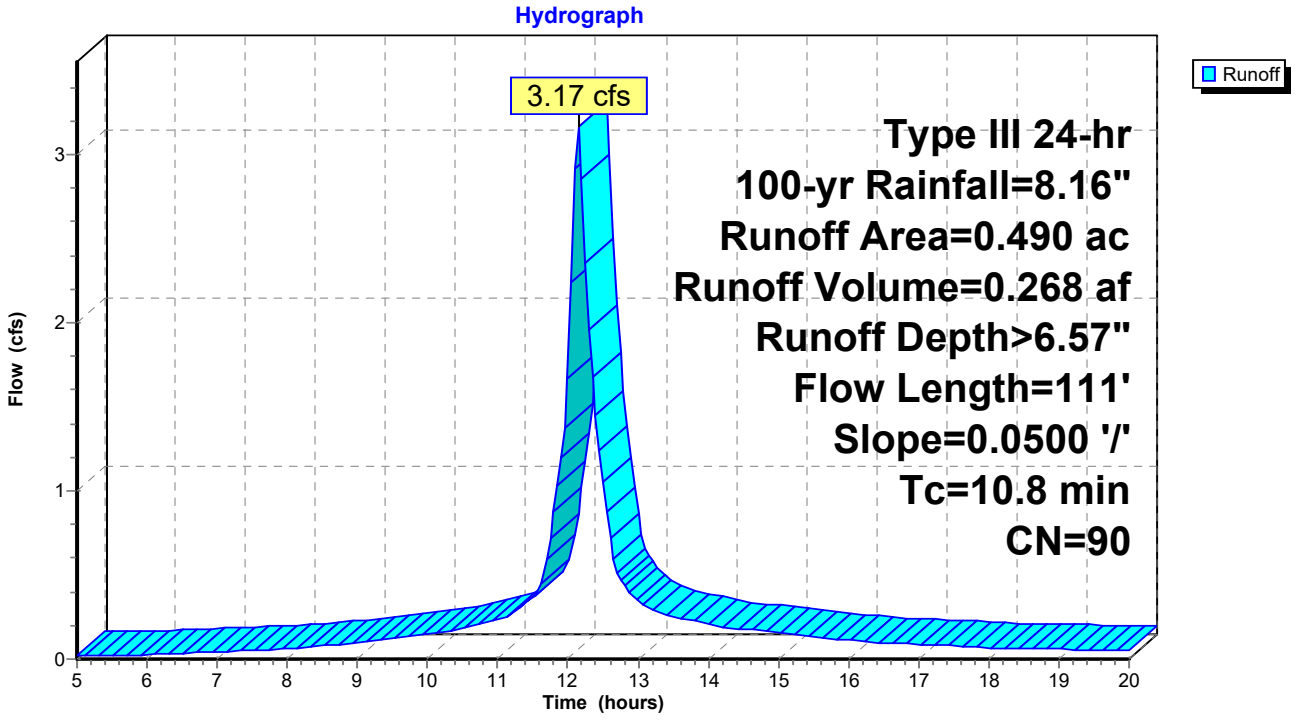
Runoff = 3.17 cfs @ 12.15 hrs, Volume= 0.268 af, Depth> 6.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.16"

Area (ac)	CN	Description
0.158	74	>75% Grass cover, Good, HSG C
0.332	98	Roofs, HSG C
0.490	90	Weighted Average
0.158		32.24% Pervious Area
0.332		67.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	111	0.0500	0.17		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"

Subcatchment PR-B-2:



Summary for Subcatchment PR-EX:

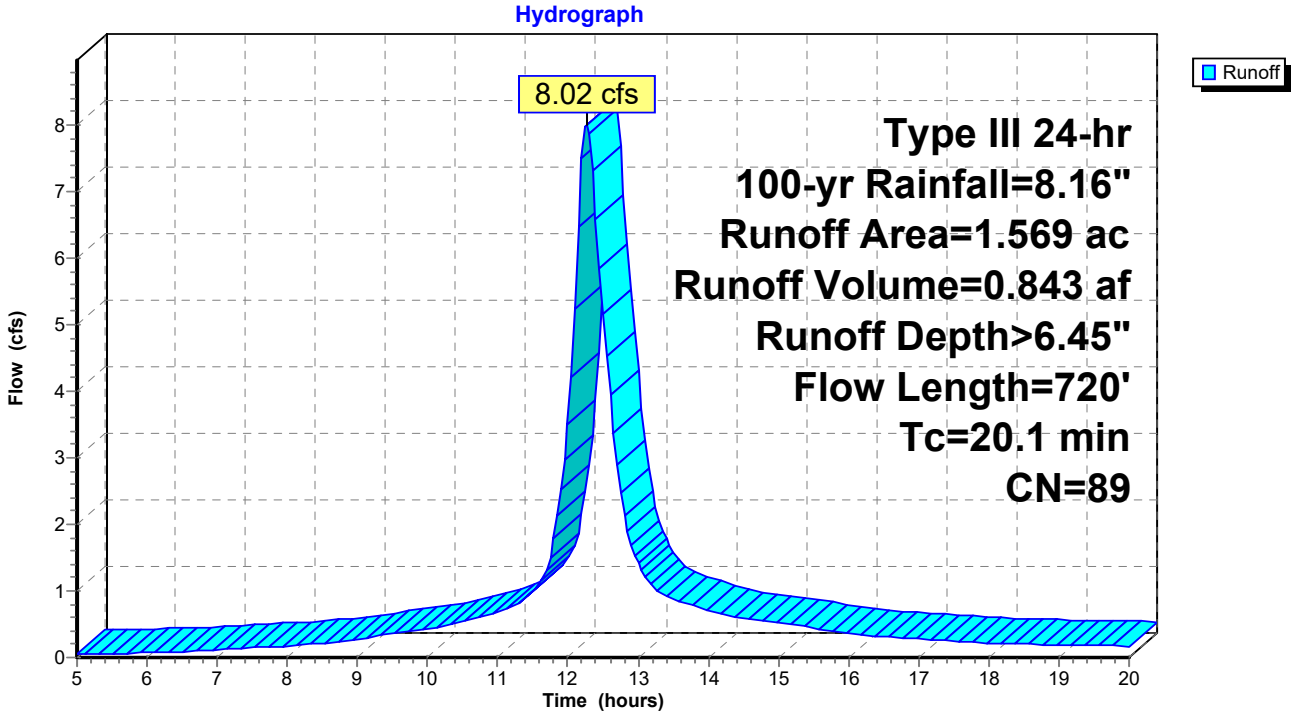
Runoff = 8.02 cfs @ 12.27 hrs, Volume= 0.843 af, Depth> 6.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.16"

	Area (ac)	CN	Description
	0.261	98	Paved parking, HSG C
	0.557	98	Roofs, HSG C
*	0.071	98	Concrete, HSG C
	0.084	70	Woods, Good, HSG C
	0.087	96	Gravel surface, HSG C
	0.509	74	>75% Grass cover, Good, HSG C
	1.569	89	Weighted Average
	0.680		43.34% Pervious Area
	0.889		56.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	150	0.0240	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"
1.6	570	0.0066	5.85	18.38	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
20.1	720	Total			

Subcatchment PR-EX:



Summary for Subcatchment PR-P-1:

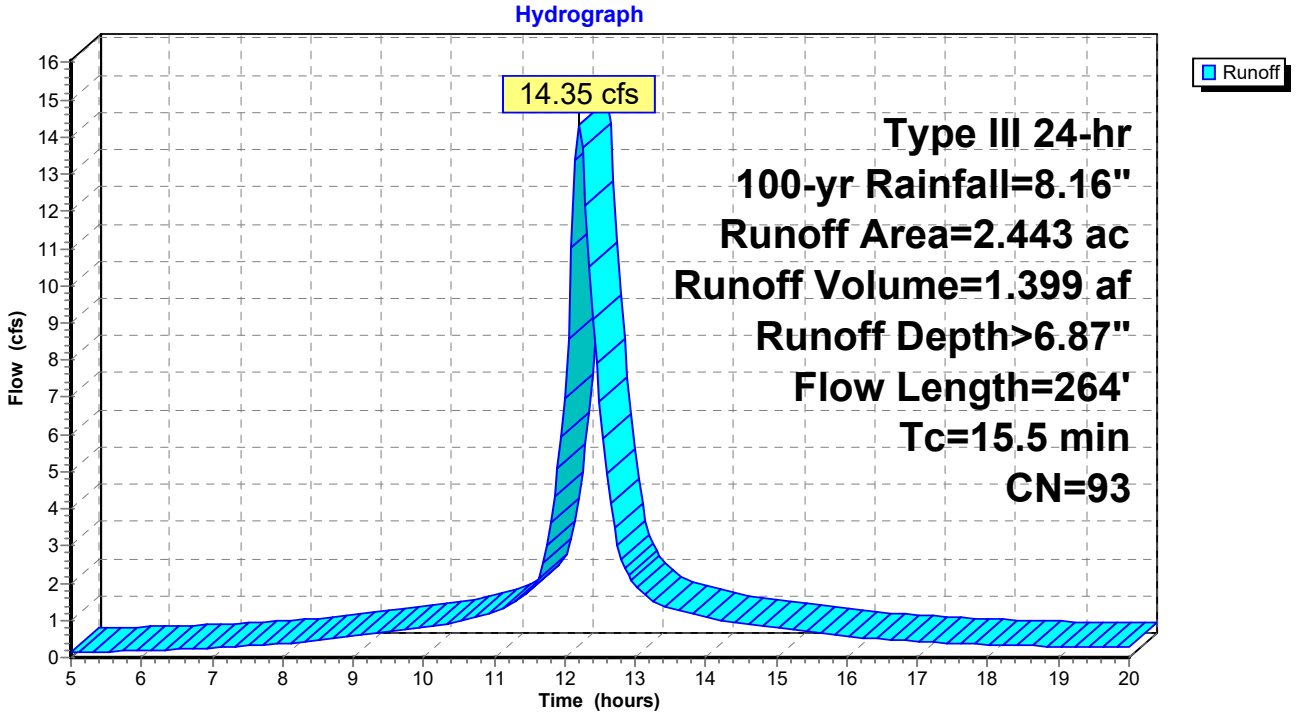
Runoff = 14.35 cfs @ 12.21 hrs, Volume= 1.399 af, Depth> 6.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.16"

Area (ac)	CN	Description
1.005	98	Roofs, HSG C
0.149	96	Gravel surface, HSG C
0.789	98	Paved parking, HSG C
0.500	74	>75% Grass cover, Good, HSG C
2.443	93	Weighted Average
0.649		26.57% Pervious Area
1.794		73.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	100	0.0200	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.15"
0.9	126	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	38	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
15.5	264	Total			

Subcatchment PR-P-1:



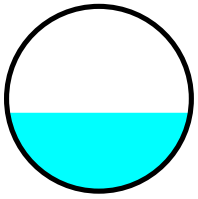
Summary for Reach R1:

Inflow Area = 1.569 ac, 56.66% Impervious, Inflow Depth > 6.45" for 100-yr event
Inflow = 8.02 cfs @ 12.27 hrs, Volume= 0.843 af
Outflow = 7.95 cfs @ 12.29 hrs, Volume= 0.842 af, Atten= 1%, Lag= 1.3 min

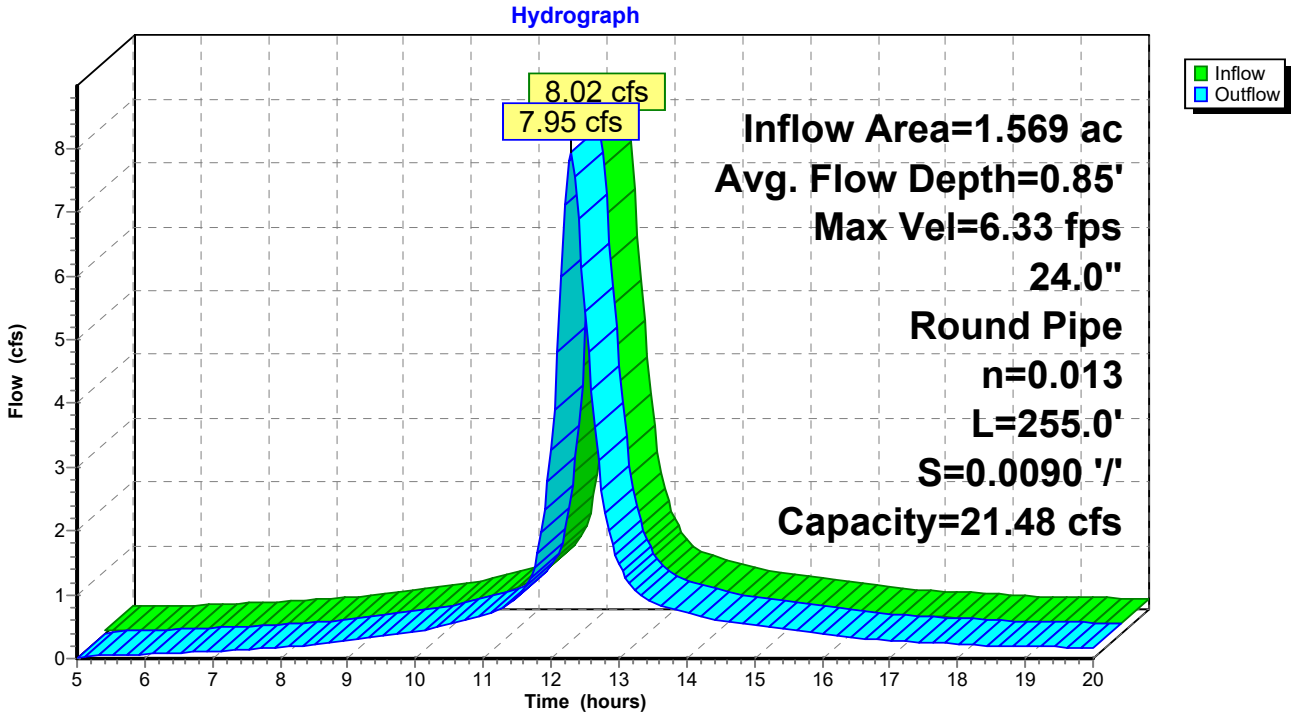
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.33 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.66 fps, Avg. Travel Time= 1.6 min

Peak Storage= 322 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 21.48 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 255.0' Slope= 0.0090 '/'
Inlet Invert= 248.40', Outlet Invert= 246.10'



Reach R1:



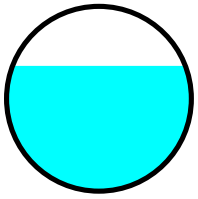
Summary for Reach R2:

Inflow Area = 5.069 ac, 64.73% Impervious, Inflow Depth > 6.18" for 100-yr event
Inflow = 20.39 cfs @ 12.37 hrs, Volume= 2.611 af
Outflow = 20.35 cfs @ 12.37 hrs, Volume= 2.611 af, Atten= 0%, Lag= 0.2 min

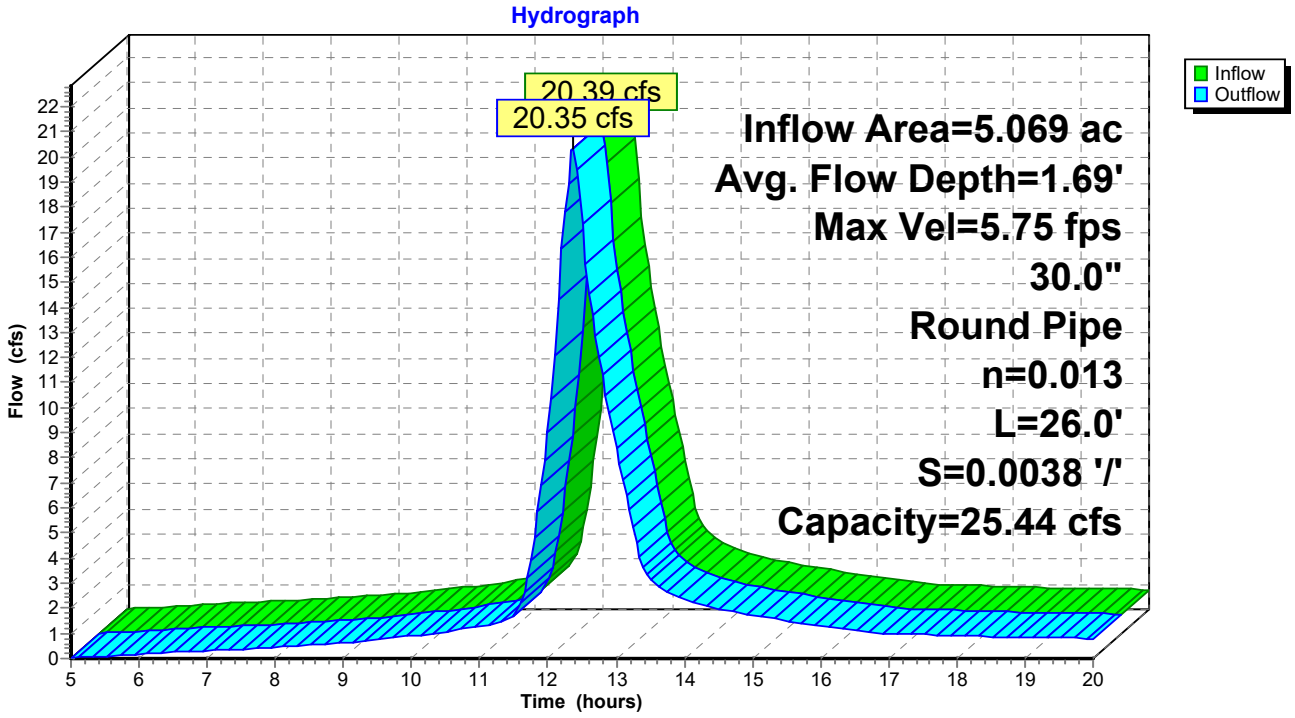
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.75 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.65 fps, Avg. Travel Time= 0.2 min

Peak Storage= 92 cf @ 12.37 hrs
Average Depth at Peak Storage= 1.69'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 25.44 cfs

30.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 26.0' Slope= 0.0038 '/'
Inlet Invert= 246.10', Outlet Invert= 246.00'



Reach R2:



Summary for Pond B-1: Bioretention

Inflow Area = 0.490 ac, 67.76% Impervious, Inflow Depth > 6.57" for 100-yr event
Inflow = 3.17 cfs @ 12.15 hrs, Volume= 0.268 af
Outflow = 3.16 cfs @ 12.16 hrs, Volume= 0.260 af, Atten= 0%, Lag= 0.7 min
Primary = 3.16 cfs @ 12.16 hrs, Volume= 0.260 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 263.24' @ 12.16 hrs Surf.Area= 769 sf Storage= 529 cf

Plug-Flow detention time= 24.8 min calculated for 0.260 af (97% of inflow)
Center-of-Mass det. time= 12.2 min (765.4 - 753.2)

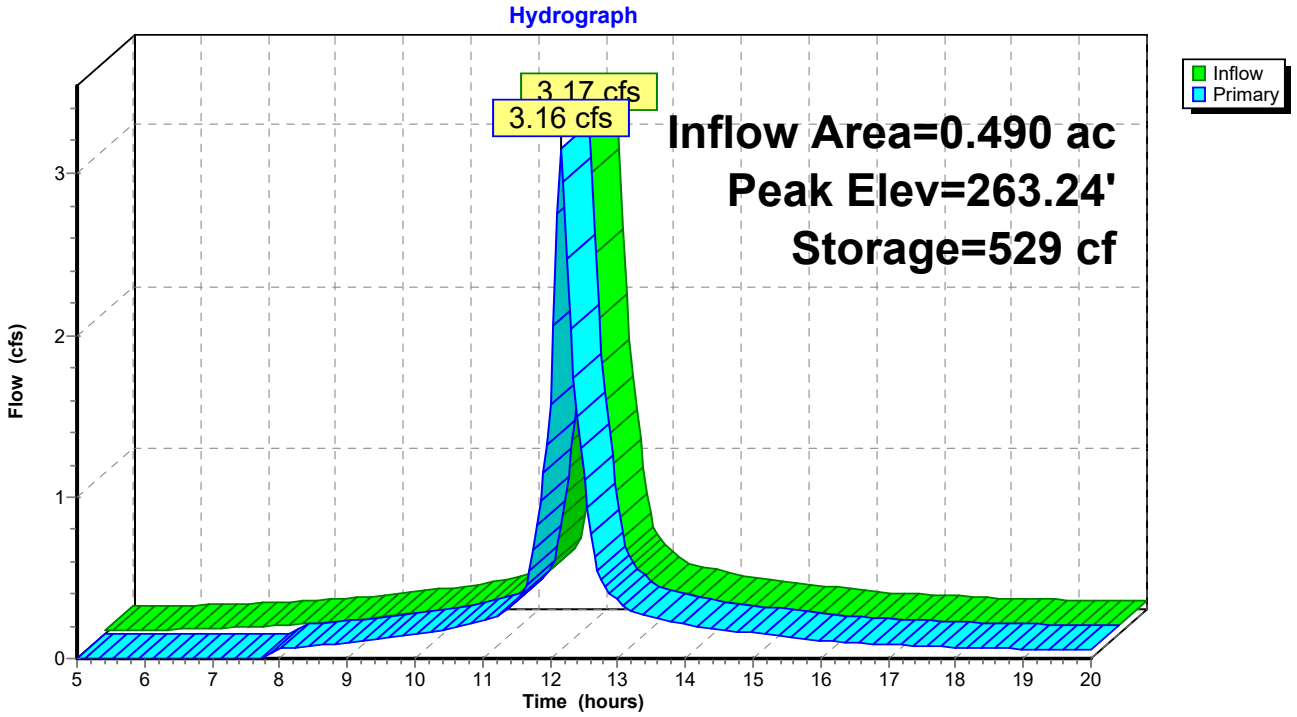
Volume	Invert	Avail.Storage	Storage Description
#1	262.50'	1,160 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.50	659	0	0
263.00	727	347	347
264.00	900	814	1,160

Device	Routing	Invert	Outlet Devices
#1	Primary	258.50'	**12.0" Round Culvert** L= 16.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 258.50' / 258.30' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	263.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	263.50'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=3.11 cfs @ 12.16 hrs HW=263.24' (Free Discharge)
- **1=Culvert** (Passes 3.11 cfs of 7.79 cfs potential flow)
  - **2=Orifice/Grate** (Weir Controls 3.11 cfs @ 1.61 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-1: Bioretention



Summary for Pond B-2: Bioretention

Inflow Area = 0.317 ac,100.00% Impervious, Inflow Depth > 7.29" for 100-yr event
Inflow = 2.48 cfs @ 12.09 hrs, Volume= 0.193 af
Outflow = 2.18 cfs @ 12.13 hrs, Volume= 0.171 af, Atten= 12%, Lag= 2.8 min
Primary = 2.18 cfs @ 12.13 hrs, Volume= 0.171 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 268.49' @ 12.13 hrs Surf.Area= 3,224 sf Storage= 1,508 cf

Plug-Flow detention time= 76.9 min calculated for 0.170 af (88% of inflow)
Center-of-Mass det. time= 40.1 min (773.1 - 733.0)

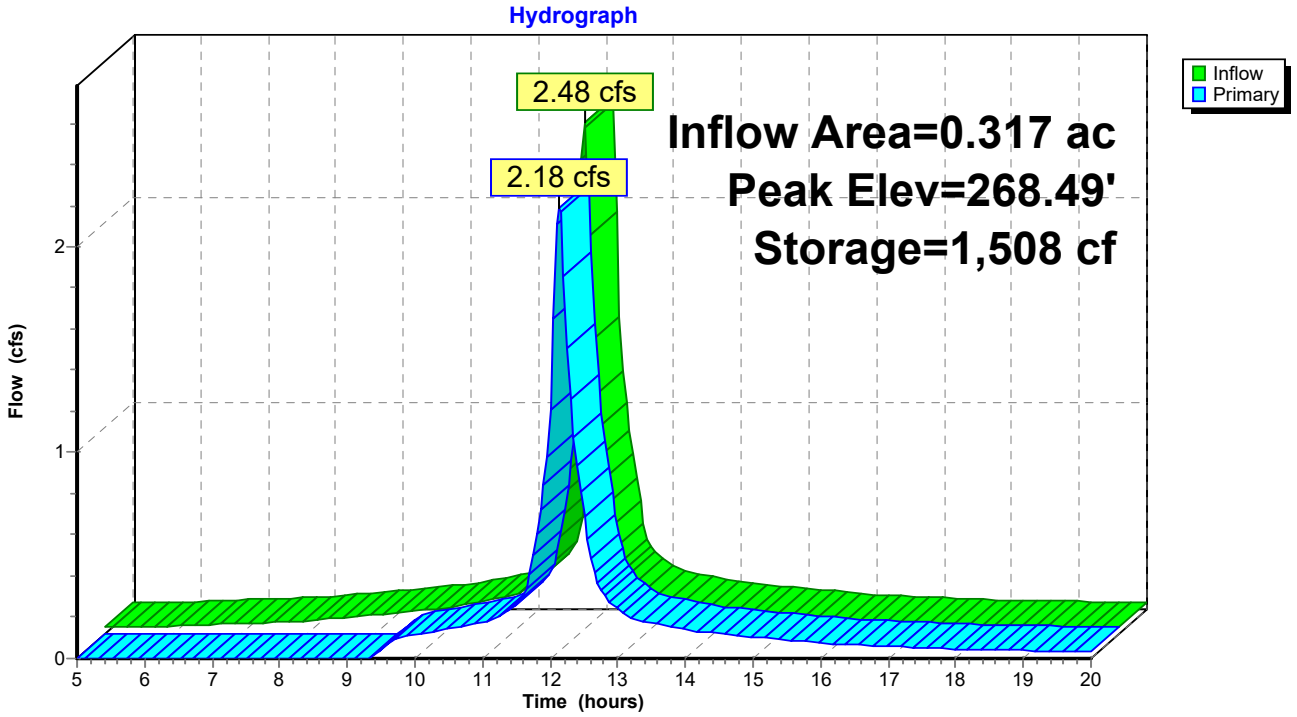
Volume	Invert	Avail.Storage	Storage Description
#1	268.00'	3,220 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
268.00	2,919	0	0
268.50	3,230	1,537	1,537
269.00	3,500	1,683	3,220

Device	Routing	Invert	Outlet Devices
#1	Primary	264.00'	**15.0" Round Culvert** L= 250.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 264.00' / 252.40' S= 0.0464 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	268.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.14 cfs @ 12.13 hrs HW=268.49' (Free Discharge)
↑—**1=Culvert** (Passes 2.14 cfs of 11.61 cfs potential flow)
↑—**2=Orifice/Grate** (Weir Controls 2.14 cfs @ 1.42 fps)

Pond B-2: Bioretention



Summary for Pond P-1: Pond

Inflow Area = 3.500 ac, 68.34% Impervious, Inflow Depth > 6.60" for 100-yr event
Inflow = 19.75 cfs @ 12.20 hrs, Volume= 1.926 af
Outflow = 13.15 cfs @ 12.40 hrs, Volume= 1.769 af, Atten= 33%, Lag= 11.7 min
Primary = 13.15 cfs @ 12.40 hrs, Volume= 1.769 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Starting Elev= 246.50' Surf.Area= 1,909 sf Storage= 2,044 cf
Peak Elev= 251.80' @ 12.40 hrs Surf.Area= 6,810 sf Storage= 24,123 cf (22,079 cf above start)
Flood Elev= 252.00' Surf.Area= 7,067 sf Storage= 25,423 cf (23,378 cf above start)

Plug-Flow detention time= 83.5 min calculated for 1.716 af (89% of inflow)
Center-of-Mass det. time= 39.6 min (796.2 - 756.6)

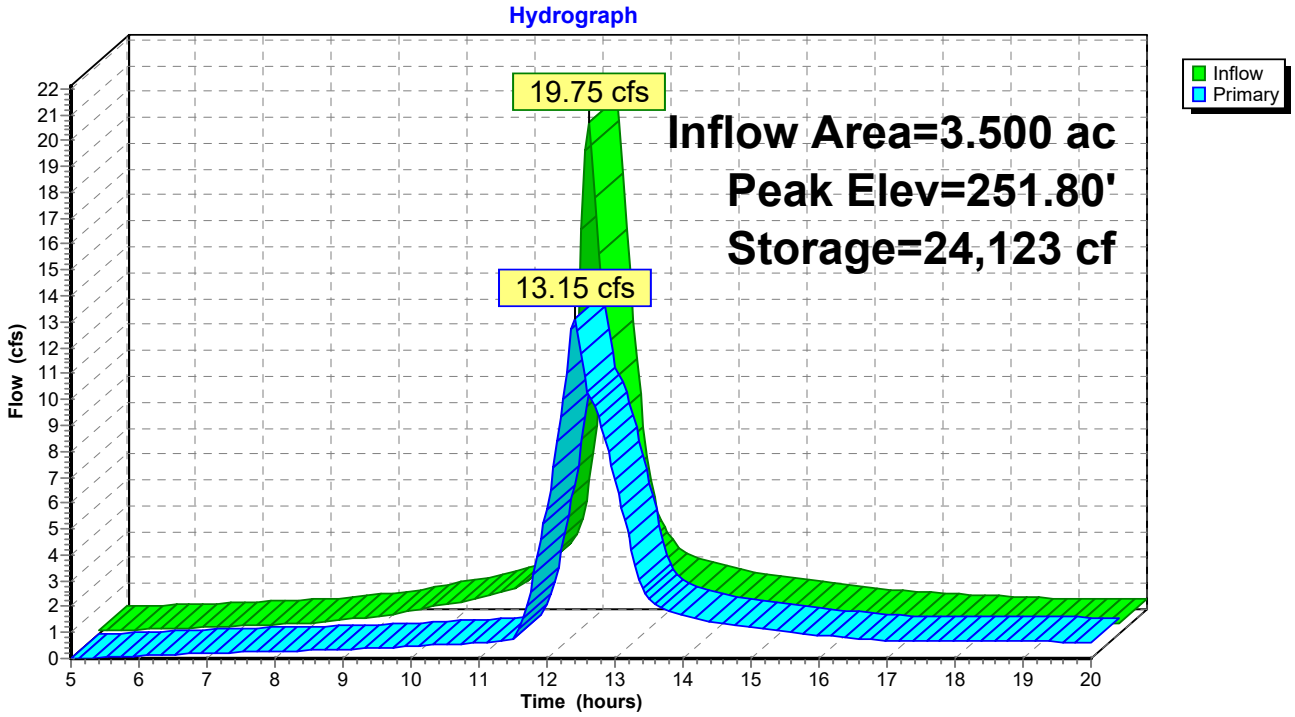
Volume	Invert	Avail.Storage	Storage Description
#1	245.00'	25,423 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
245.00	708	0	0
246.00	1,472	1,090	1,090
247.00	2,345	1,909	2,999
248.00	3,175	2,760	5,759
249.00	3,876	3,526	9,284
250.00	4,870	4,373	13,657
251.00	5,797	5,334	18,991
252.00	7,067	6,432	25,423

Device	Routing	Invert	Outlet Devices
#1	Primary	246.50'	**18.0" Round Culvert** L= 78.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 246.50' / 246.10' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	246.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	251.80'	**20.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#4	Device 1	251.60'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	249.40'	**20.0" W x 5.0" H Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=13.13 cfs @ 12.40 hrs HW=251.80' (Free Discharge)
- **1=Culvert** (Passes 13.13 cfs of 16.98 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.95 cfs @ 10.91 fps)
  - **4=Orifice/Grate** (Weir Controls 2.29 cfs @ 1.45 fps)
  - **5=Orifice/Grate** (Orifice Controls 9.89 cfs @ 7.12 fps)
- **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P-1: Pond

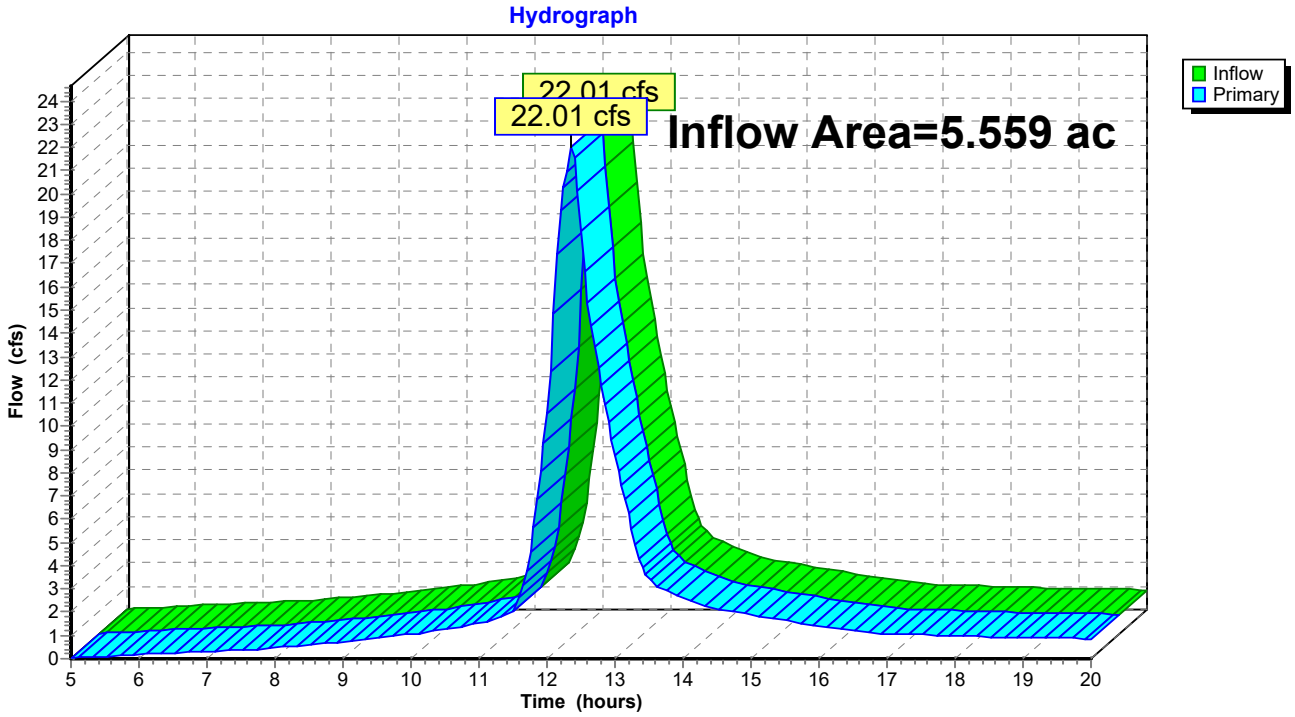

Hydrograph
19.75 cfs
13.15 cfs
Inflow Area=3.500 ac
Peak Elev=251.80'
Storage=24,123 cf
Inflow
Primary
Flow (cfs)
Time (hours)

Summary for Pond SDP-1:

Inflow Area = 5.559 ac, 64.99% Impervious, Inflow Depth > 6.20" for 100-yr event
Inflow = 22.01 cfs @ 12.36 hrs, Volume= 2.871 af
Primary = 22.01 cfs @ 12.36 hrs, Volume= 2.871 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond SDP-1:



APPENDIX H

DRAINAGE MAPS

STATE ROUTE 9W

EX-1

255.6 EG

1

(2) CONCRETE HEADWALLS

(2) 36" CULVERTS

BOD - C

EX-1

SDP-1

HYDROCAD ROUTING DIAGRAM

N

LEGEND

- EXISTING PROPERTY LINE
- ADJACENT PROPERTY LINE
- EXISTING IRON PIPE
- EXISTING BOLLARD
- EXISTING DRAINAGE CATCH BASIN
- EXISTING EDGE OF PAVEMENT
- UTILITY POLE & OVERHEAD LINE
- UTILITY POLE WITH GUY WIRE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING TREE LINE
- EXISTING TREE
- EXISTING CONIFEROUS TREE
- EXISTING STREAM/DITCH
- EXISTING SITE FEATURE
- EXISTING GUIDE RAIL
- EXISTING BUILDING
- EXISTING PAVEMENT
- EXISTING GRAVEL
- EXISTING RETAINING WALL
- EXISTING WATER
- ACOE WETLAND AREA
- EXISTING PAVEMENT TO BE REMOVED
- MgB-C — SOIL TYPE DESIGNATION WITH HSG
- SOIL TYPE BOUNDARY
- SUBCATCHMENT BOUNDARY
- TIME OF CONCENTRATION/ REACH SEGMENT
- EX-1 — SUBCATCHMENT
- 1 — STORMWATER DISCHARGE POINT - SDP

SUBCATCHMENT AREA SUMMARY

Subcatchment EX-1	Soil Type	Cn	Area (Ac)
PAVED PARKING	C	98	1.105
ROOFS	C	98	1.360
CONCRETE	C	98	0.118
WOODS, GOOD	C	70	0.407
GRAVEL SURFACE	C	96	0.098
75% GRASS COVER, GOOD	C	74	1.856

Total= 4.944

0 1 2 3
SIZE IN INCHES (FULL SIZE - 22"x34" SHEET)
0 1
SIZE IN INCHES (HALF SIZE - 11"x17" SHEET)

STATE OF NEW YORK
ANDREW V. WILLINGHAM
083984
LICENSED PROFESSIONAL ENGINEER

willingham engineering
183 Main Street
New Paltz, New York 12561
T 845.255.0210 F 845.256.8110
www.willinghamengineering.com

REV	DATE	DESCRIPTION

PRE DEVELOPMENT DRAINAGE PLAN

ROYAL ENERGY PROPERTIES, LLC

1666 ROUTE 9W

TOWN OF MARLBOROUGH, ULSTER COUNTY, NEW YORK

DRAWN BY	CHECKED BY
MLT	AVW
DATE	SCALE
09/20/19	1"=30'
PROJECT NO.	
19032	
SHEET NO.	
PRE	

STATE ROUTE 9W

OFFSITE

INV OUT=249.8

256.7 HP

256.7 FG

255.4 EG

255.5 EG

255.6 EG

BnC - C

BOD - C

EXISTING COMMERCIAL
BUILDING
FFE=260.7

PROPOSED COMMERCIAL
BUILDING
72,000 SF FOOTPRINT
FFE=260.7

BIORETENTION AREA 2=268

PROPOSED IN-GROUND ABSORPTION
BED SYSTEM (PRIMARY AREA)

PR-EX

PR-P-1

PR-B-1

PR-B-2

P-1

R-1

R-2

B-1

B-2

N

PR-EX
PR-B-1
R1
B-1
PR-P-1
Bioretention
R2
P-1
OFFSITE
Pond
SDP-1
B-2
PR-B-2
Bioretention

HYDROCAD ROUTING DIAGRAM

(2) CONCRETE HEADWALLS

(2) 36" CULVERTS

LEGEND

- EXISTING PROPERTY LINE
- ADJACENT PROPERTY LINE
- EXISTING IRON PIPE
- EXISTING BOLLARD
- EXISTING DRAINAGE CATCH BASIN
- EXISTING EDGE OF PAVEMENT
- EXISTING EDGE OF PAVEMENT WITH 6" CONCRETE CURB
- UTILITY POLE & OVERHEAD LINE
- UTILITY POLE WITH GUY WIRE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING TREE LINE
- EXISTING STREAM/DITCH
- EXISTING STONE WALL
- EXISTING SITE FEATURE
- EXISTING GUIDE RAIL
- EXISTING BUILDING
- EXISTING PAVEMENT
- EXISTING GRAVEL
- EXISTING RETAINING WALL
- EXISTING WATER
- ACOE WETLAND AREA
- PROPOSED BUILDING
- PROPOSED GRAVEL AREA
- PROPOSED ASPHALT PAVEMENT
- PROPOSED CONCRETE WALK
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED WELL
- PROPOSED BIORETENTION AREA / RAIN GARDEN
- PROPOSED END SECTION WITH RIP-RAP OUTLET PROTECTION
- PROPOSED CATCH BASIN
- PROPOSED DRAINAGE MANHOLE
- PROPOSED DRAINAGE CULVERT
- PROPOSED DRAINAGE DITCH
- PROPOSED ROOF LEADER WITH SDR 35 DOWNSPOUT
- PROPOSED PRIMARY SANITARY DISPOSAL SYSTEM
- PROPOSED RESERVE SANITARY DISPOSAL SYSTEM
- PROPOSED LANDSCAPED AREA
- PROPOSED RETAINING WALL
- MgB-C — SOIL TYPE DESIGNATION WITH HSG
- SOIL TYPE BOUNDARY
- SUBCATCHMENT BOUNDARY
- TIME OF CONCENTRATION/ REACH SEGMENT
- EX-1 — SUBCATCHMENT
- 1 — STORMWATER DISCHARGE POINT - SDP
- R-1 — STORMWATER REACH
- B-3 — STORMWATER MANAGEMENT PRACTICE

SUBCATCHMENT AREA SUMMARY

Subcatchment PR-B-1	Soil Type	Cn	Area (Ac)
ROOFS	C	98	0.317
		Total=	0.317

Subcatchment PR-EX	Soil Type	Cn	Area (Ac)
PAVED PARKING	C	98	0.261
ROOFS	C	98	0.557
GRAVEL SURFACE	C	96	0.071
75% GRASS COVER, GOOD	C	74	0.509
WOODS, GOOD	C	70	0.084
CONCRETE	C	96	0.071
		Total=	1.569

Subcatchment PR-P-1	Soil Type	Cn	Area (Ac)
PAVED PARKING	C	98	0.789
ROOFS	C	98	1.005
GRAVEL SURFACE	C	96	0.149
75% GRASS COVER, GOOD	C	74	0.500
		Total=	2.443

Subcatchment PR-B-2	Soil Type	Cn	Area (Ac)
ROOFS	C	98	0.332
75% GRASS COVER, GOOD	C	74	0.158
		Total=	0.490

Subcatchment OFFSITE	Soil Type	Cn	Area (Ac)
PAVEMENT	C	98	0.281
75% GRASS COVER, GOOD	C	74	0.459
		Total=	0.740

SIZE IN INCHES (FULL SIZE - 22"x34" SHEET)

SIZE IN INCHES (HALF SIZE - 11"x17" SHEET)

STATE OF NEW YORK
ANDREW V. WILLINGHAM
083984
PROFESSIONAL ENGINEER

willingham engineering
183 Main Street
New Paltz, New York 12561
T 845.255.0210 F 845.256.8110
www.willinghamengineering.com

REV	DATE	DESCRIPTION
1	10/25/19	REVISIONS PER PLANNING BOARD

POST DEVELOPMENT DRAINAGE PLAN

ROYAL ENERGY PROPERTIES, LLC

1666 ROUTE 9W

TOWN OF MARLBOROUGH, ULSTER COUNTY, NEW YORK

DRAWN BY	CHECKED BY
MLT	AVW
DATE	SCALE
09/20/19	1"=30'
PROJECT NO.	
19032	
SHEET NO.	
POST	

APPENDIX I

STORMWATER CALCULATIONS

WQv and RRv Summary Sheet

Total WQv Required =			6,265	cf
WQv Provided by:	Bioretention 1 -		4,349	cf
	Bioretention 2 -		936	cf
	Pond Permanent Pool-		2,044	cf
Total WQv Provided=			7,329	cf
Total Minimum RRv Required using specific reduction factor=			1,333	cf
RRv Provided by:	Bioretention 1 (40% of WQv) -		1,545	cf
	Bioretention 2 (40% of WQv) -		374	cf
Total RRv Provided =			1,919	cf

Redevelopment Calculations

Existing Impervious to be removed and redeveloped

Total 1.51 Ac

Redeveloped impervious surface requiring
25% WQv treatment (no RRv requirement for redevelopment)

1.51 ac

P= 1.4
Rv= 0.05 + 0.009 (I)
Rv= 0.95
I= Impervious Cover (percent)
I= 100%
A= 1.51

WQv={[(P)(Rv)(A)]/12} * 25% reduction for redevelopment
WQv= 1,823 cf for portion of site to be redeveloped

Total WQv required for redevelopment portion of site
Total WQv = 1,823 cf

Note - RRv is not required for areas of redevelopment

New Impervious Surfaces

Total 0.92 Ac

P= 1.4
Rv= 0.05 + 0.009 (I)
Rv= 0.95
I= Impervious Cover (percent)
I= 100%
A= 0.92
S= 0.3

WQv={[(P)(Rv)(A)]/12}
WQv= 4,442 cf for new impervious surfaces

RRv={[(P)(Rv)(A)(S)]/12}
RRv= 1,333 cf with specific reduction factor
*Note - RRv not requried for Redeveloped Impervious Surfaces

Total WQv= 6,265 cf New and Redevelopment impervious surfaces