INSITE
ENGINEERING, SURVEYING &
LANDSCAPE ARCHITECTURE, P.C.

STORMWATER POLLUTION PREVENTION PLAN

For

Pawling Commons

63-71 E Main Street
Village of Pawling, New York

January 30, 2024

Applicant Information:

KJ-RANT Realty LLC
100 Business Park Drive
Armonk, NY 12564

Note: This report in conjunction with the project plans make up the complete Stormwater Pollution Prevention Plan.

Prepared by:
Insite Engineering, Surveying & Landscape Architecture, P.C.
3 Garrett Place
Carmel, New York 10512

STATE OF NEW YORK JOHN M. WATSON No. 77950 LICENSED PROFESSIONAL ENGINEER

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1.0 INTRODUCTION

1.1 Project Description

The Pawling Commons property is a 4.2± acre parcel on East Main Street in the Village of Pawling. The parcel and its surroundings are delineated on the attached Location Map (Figure 1). The property is designated as Tax Map Number 7056-05-101917 and is located in the B-1 zoning district. The project site is currently developed with two (2) commercial buildings, parking and landscaped areas. It is proposed to redevelop portions of the existing parking lot to provide more parking spaces and a new 3-story multi-family residential building. It is proposed to capture and treat the stormwater runoff associated with the proposed improvements.

A total of 0.5 acres of new impervious surfaces are proposed. New impervious surfaces are being created for the proposed parking lot expansion. A total of 1.1 acres of existing impervious surface are being redeveloped. The redeveloped areas consist of reconstructing portions of the existing asphalt parking lot and converting an area of existing pavement to the proposed residential building. It should be noted that 0.3 acres of existing impervious surface is proposed to be removed and restored as lawn. A net increase of 0.2 acres of impervious is proposed.

1.2 Existing Site Conditions (Pre-Development)

The subject property is located in the Village of Pawling on the west side of East Main Street at the existing Pawling Commons development. The site is currently developed with two (2) commercial buildings, paved parking lot and driveways and landscaped areas. The undeveloped portions of the site consist of woods.

There is a drainage divide the splits the stormwater runoff on the project to the east and west. Stormwater runoff from the east side of the site flows overland to East Main Street while stormwater runoff from the west side of the site flows overland towards the southern and western property lines. The stormwater analysis included in the subject SWPPP utilizes three design lines/points. The design lines/points can be seen on Figure 2 and 3 and are identified as Design Point 1, Design Line 2 and Design Line 3. Design Point 1 is located at the southern property line where the majority of the stormwater runoff from the west side of the site discharges off the subject property. Design Line 2 is located along the eastern property line and Design Line 3 is located along a portion of the western property line. The design lines/points are used to assess the stormwater runoff from the property and any potential impacts from the proposed development to the existing natural resources, stormwater conveyance systems downstream of the project site and neighboring properties. The pre-development contributing areas to the Design Lines/Point are identified as subcatchment PRE 1, PRE 2, and PRE 3.

The hydrologic soils group for the project consists of “C” soils. The designations of the onsite soils located within the proposed limits of disturbance is identified as Galway-Farmington Urban land complex, undulating, rocky (GlB) per the Soil Conservation Service Web Soil Survey.

1.3 Proposed Site Conditions (Post Development)

The project proposes to redevelop the existing Pawling Commons site. The proposed redevelopment includes the construction of 3-story multi-family residential building over existing asphalt pavement, demolition of an existing building and construction of a 4-story mixed use building with smaller footprint in its place, removal of existing asphalt for curbed islands in the existing parking lot, expansion of the parking lot on the north and west side of the site, stormwater management practices, lighting and landscaping. Mitigation for the newly created and redeveloped impervious surfaces will be provided in the form of proposed stormwater management practices (SMP's) discussed further in later sections of this report. The proposed SMP's will be designed to capture and treat runoff from the impervious surfaces associated with the proposed improvements including the buildings, paved driveway and parking areas.

Each subcatchment was identified based on whether there was an existing impervious surface being eliminated, an existing impervious surface being redeveloped with an impervious surface, or a new impervious surface being created. The areas of redevelopment will be treated in accordance with

Chapter 9, Redevelopment, of the New York State Stormwater Management Design Manual (Design Manual).

Treatment of stormwater runoff for all newly created impervious surfaces will meet the sizing requirements of Chapter 4 and 10 of the Design Manual. This will result in new SMP's designed to capture and treat runoff from the impervious surfaces. Stormwater treatment for the new and redeveloped impervious surfaces will be accomplished with several different practices including an I-4 subsurface infiltration system and four hydrodynamic separators sized to capture and treat the Water Quality Volume from the new and redeveloped impervious areas.

It is proposed to maintain the existing drainage patterns on the site to the maximum extent practical in the proposed condition to minimize the impact to the existing downstream stormwater conveyance systems and waterbodies.

As shown in the following sections of this report, the stormwater quality and quantity for the proposed development have been mitigated in accordance with the NYSDEC design standards. Additionally, an erosion and sediment control plan has been prepared in accordance with the New York State Standards and Specifications for Erosion and Sediment Control to protect the existing waterbodies and drainage features during construction activities and in the post development condition.

2.0 STORMWATER MANAGEMENT

The proposed stormwater management system for the Pawling Commons project has been designed to meet the requirements of local, regional, and state stormwater ordinances and guidelines, including but not limited to the Village of Pawling and the NYSDEC. Specifically, the following codes / regulations have been used to design this SWPPP:

- *NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activities, General Permit GP-0-20-001* (GP-0-20-001).
- *Village of Pawling Local Laws, Article XVII – Stormwater Control*.

Since the subject project proposes the disturbance of more than 5,000 square feet, coverage under the New York State Department of Environmental Conservation (NYSDEC) SPDES General Permit for Stormwater Discharges from Construction Activities (GP-0-20-001) is required.

In order to meet the requirements set forth by GP-0-20-001, and the latest edition of the NYSDEC *New York State Stormwater Management Design Manual* (Design Manual), including the requirements listed in Chapter 10: *Enhanced Phosphorus Removal Standards* (Chapter 10) was referenced for the design of the proposed stormwater collection, conveyance and treatment system. The Design Manual specifies five design criteria that are discussed in detail below. They are Runoff Reduction Volume (RR_v), Water Quality Volume (WQ_v), Stream Channel Protection Volume (CP_v), Overbank Flood Control (Q_f), and Extreme Storm Control (Q_p). The first two requirements relate to treating water quality, while the later pertain to stormwater quantity (peak flow) attenuation.

To address stormwater quantity requirements of the NYSDEC, the “HydroCAD” Stormwater Modeling System,” by HydroCAD Software Solutions LLC in Tamworth, New Hampshire, was used to model and assess the peak stormwater flows for the subject project. HydroCAD is a computer aided design program for modeling the hydrology and hydraulics of stormwater runoff. It is based primarily on hydrology techniques developed by the United States Department of Agriculture, Soil Conservation Service (USDA, SCS) TR-20 method combined with standard hydraulic calculations. For details on the input data for the subcatchments and design storms, refer to Appendices C and D and for the supporting data relative to the soils breakdown within the overall contributing area shown in the HydroCAD analysis, see Appendix C and D of this report:

The input requirements for the HydroCAD computer program are as follows:

Subcatchments (contributing watershed/sub-watersheds)

- Design storm rainfall in inches
- CN (runoff curve number) values which are based on soil type and land use/ground cover
- Tc (time of concentration) flow path information

Flow Splitters / Stormwater Management Practices

- Surface area at appropriate elevations
- Flood elevation
- Outlet structure information

The following is a general description of the input data used to calculate the pre- and post-development stormwater runoff values. For detailed information for each subcatchment and stormwater practice, see Appendices C & D. The precipitation values for the 1-Year, 10-Year, 100-Year 24-hour design storm events and rainfall distribution curves utilized for this report were obtained from the information provided by Northeast Regional Climate Center (NRCC) and the Natural Resources Conservation Service (NRCS) which is available online at *www.precip.eas.cornell.edu*. The values provided for all design storms analyzed are listed below.

Design Storm	**24-Hour Rainfall**
1-Year	2.70”
10-Year	4.85”
100-Year	8.61”

The CN (runoff curve number) values utilized in this report were referenced from the USDA, SCS publication *Urban Hydrology for Small Watersheds*.

2.1 Chapter 10: Enhanced Phosphorus Removal Standards

As noted above, the New York City East of Hudson Watershed has been identified in the SPDES General Permit GP-0-20-001 as a watershed requiring compliance with the Enhanced Phosphorus Removal Standards when post-construction stormwater management practices are proposed. Chapter 10 establishes four goals to meet sizing performance standards:

- Goal 1: Reducing Runoff Volumes
- Goal 2: Effective Bypass Treatment
- Goal 3: Achieving Effluent Concentrations for Particulate Phosphorus
- Goal 4: Achieving Effluent Concentrations for Dissolved Phosphorus

In order to achieve the first goal, the site design shall,” assess the feasibility of hydrological source controls and reduce the total water quality volume by source control, implementation of green infrastructure, or standard SMP’s with RR_v capacity, according to the process defined in Chapters 3 and 4 of the Design Manual. Each plan must include a rationale for acceptance and rejection of the various controls.” A discussion on RR_v can be found in section 2.2 below. Based upon the results of onsite soil testing, the soils onsite in select areas are suitable for infiltration. Therefore, the use of an infiltration practice (classified as Standard SMP’s with RRv capacity) has been maximized, specifically a subsurface infiltration system was selected to treat the stormwater runoff from a portion of the proposed impervious surfaces and satisfy RRv minimum requirements. As such, Goal 1 has been achieved in this SWPPP.

Goal 2 cites that proposed stormwater management practices should achieve less than 15% effective treatment bypass of the long-term runoff volume. Chapter 10 further notes this goal is satisfied by capturing and treating the 1-year 24-hour design storm. The NYSDEC stormwater quality treatment practices proposed for this have been designed in accordance with Chapter 10 by utilizing the 1-yr, 24-hour design storm to generate the WQ_v / RR_v. As such, Goal 2 has been achieved in this SWPPP.

Achieving effluent concentrations for particulate phosphorus, Goal 3, is satisfied by achieving an 80% net removal of particulate phosphorus for a median influent concentration of 0.5mg/l. Chapter 10 states that through designing proposed SMP's in accordance with Section 10.4 this goal will be achieved. The proposed I-4 Infiltration System has been designed in accordance with Section 10.4 of Chapter 10 thus satisfying the requirements of this goal.

Goal 4, achieving effluent concentration for dissolved phosphorus, is achieved by obtaining a 60% net removal of dissolved phosphorus given a median influent concentration of 0.15mg/l. As with Goal 3, Goal 4 is achieved by designing the proposed SMP's in accordance with Section 10.4 of Chapter 10. As noted above the proposed I-4 Infiltration System has been designed in accordance with section 10.4 of Chapter 10 thus satisfying the requirements of this goal.

2.2 NYSDEC Runoff Reduction Volume (RR_v)

The Runoff Reduction Volume (RR_v) criterion is intended to replicate pre-development hydrology by maintaining preconstruction infiltration, peak flow runoff, discharge volume, as well as minimizing concentrated stormwater flow. As stated in Chapter 4 of the Design Manual, RR_v may be treated with standard stormwater management practices (SMP's) sized in accordance with the Chapter 4/6 requirements, or with green infrastructure practices (GIP's) sized in accordance with the requirements set forth for each practice in Chapter 5. Runoff reduction is achieved when runoff from a percentage of the impervious area on the site is captured, routed through a SMP or a GIP, infiltrated to the ground, reused, reduced by evapotranspiration, and eventually removed from the stormwater discharge from the site. However, if 100% of the WQ_v cannot be reduced by applying a combination of green infrastructure techniques and standard SMP's with RR_v capacity, "they must, at a minimum, reduce runoff from a percentage of the impervious area constructed as part of the project using the green infrastructure techniques and standard SMPs with RR_v capacity. In addition, the designer must provide justification in the SWPPP that evaluates each of the green infrastructure techniques listed in Table 3.2 and identify the specific site limitations that make application of the technique(s) infeasible."

In accordance with Chapter 5 of the Design Manual, the subject project implemented several green infrastructure planning practices in order to reduce the amount of proposed impervious surfaces onsite. The project implemented the following site planning practices in design of the proposed site plan and layout. By providing multi-level buildings, the overall building footprints were reduced to the maximum extent practical while still achieving the required space for the intended use. Furthermore, the existing building onsite proposed to be razed is proposed to be redeveloped with a building consisting of a smaller footprint resulting in a reduction in impervious surfaces while restoring the parts of the existing impervious from the current building into lawn area. By providing a one-way circulation around the rear of the onsite buildings, the width of the driveways were able to be reduced while still maintaining appropriate distances for the required vehicle maneuvering.

Through the implementation an infiltration system as a SMP with the runoff reduction capacity equal to 100% of the WQ_v, the RRv requirements will be achieved upstream of Design Point 1. For Design Line 2, although there are some areas of new impervious surfaces, the project proposes to remove existing impervious areas tributary to Design Line 2 such that there is no net increase in overall impervious surfaces to Design Line 2. There are no new impervious surfaces tributary to Design Line 3. Therefore, RRv has not been provided for Design Line 2 or 3.

For a calculation of the Initial WQ_v / RR_v, the RR_v minimum, the RR_v / WQ_v required, and the RR_v provided, refer to Appendix A. In calculating the RR_v minimum, onsite soils belongs to the Hydrologic Soil Group C. These soil groups have a specific reduction factor of 0.30. Listed in Table 2.2.1 below is a summary of the NYSDEC compliant practices, and their satisfaction of the NYSDEC RRv requirements. As previously mentioned, only Design Point 1 (specifically subcatchment 1.1S) includes an increase in impervious area, therefore RR_v calculations are not provided for the remaining Design Lines.

Table 2.2.1 Runoff Reduction Volume Summary

	RR_v *Required* = **WQ_v (c.f.)** From Appendix A	**RR_v** *Minimum* **(c.f.)** Calculated in Appendix A	**GIP/SMP ID**	**NYSDEC Practice Designation**	**Allowable % of WQv provided to be applied towards RRv**	**Storage Volume Provided below System Outlet (c.f.)** (From Appendix D)	**RRv** *Provided* **(c.f.)**
1.1	3,365	362	1.1P	I-4 Infiltration System	100%	4,182	4,182

[1] Calculated as noted in Table 2.3.1 below.

As shown in the table above, the $RRv_{provided}$ in 1.1P is greater than the $RRv_{required}$, therefore the RRv requirement has been met for the subject project.

2.3 NYSDEC Water Quality Volume (WQ_v)

The I-4 Infiltration System has been sized to capture and treat the entire water quality volume (WQ_v) from the proposed improvements in accordance with Chapter 4 and 6 of the Design Manual. The subject project is located in the New York City Watershed, which is listed as a phosphorus-limited watershed per the NYSDEC regulations. Therefore, the stormwater management practices have been designed in general accordance with the Enhanced Phosphorus Removal Supplement (Chapter 10) of the Design Manual. As outlined in Chapter 10, the treatment volume for the WQv is the runoff volume produced during the 1-year 24-hour design storm. See table 2.6.1 for a summary of the WQv that would be generated by the proposed improvements during the 1-year, 24-hour storm.

For new impervious surfaces and as required by Chapter 10, the WQv shall be the runoff volume from the 1-year, 24-hour storm event generated by the subcatchment. As permitted by Chapter 9 of the Design Manual the portions of the existing impervious surfaces being redeveloped with impervious surfaces will only require 25% of the WQ_v to be treated. That is provided the redeveloped impervious surfaces are being treated by a standard stormwater management practice.

Subcatchment 1.1S includes redevelopment of existing impervious surfaces and the creation of new impervious surfaces within the same subcatchment. Appendix B has broken subcatchment 1.1S into two nodes. That is so the redeveloped impervious surfaces contained within the subcatchment can be accounted for separately and the 25% reduction allowed by Chapter 9 applied. The calculation for the WQv for the areas of redevelopment are shown in the table below.

Table 2.3.1 - Water Quality Volume Calculation for Redevelopment

Subcatchments	WQ_v[1] New Impervious Surface (a.f.)	Full WQ_v[2] Redeveloped Impervious Surface (a.f.)	25% WQv[3] Redevelopment Calculation (a.f.)	WQv Initial[4] (a.f.)
1.1S	0.054	0.093	0.023	0.077 (3,365 cf)

1 Refer to Appendix B for the stormwater runoff volume from the 1-year, 24-hour storm event for the areas of new impervious surfaces within the subcatchment.

2 Refer to Appendix B for the stormwater runoff volume from the 1-year, 24-hour storm event for the existing impervious areas proposed to be redeveloped within the subcatchment.

3 In accordance with Chapter 9 of the Design Manual, only 25% of the WQv from the existing impervious surfaces to be redeveloped requires treatment. The 25% reduction has been accounted for in the volumes provided.

4 The volumes provided are the sum of the stormwater runoff volume from the new impervious surfaces and 25% of the runoff volume from the existing impervious surfaces to be redeveloped. These volumes are used in the sizing for the proposed SMP's in Appendix A.

The infiltration system has been sized to provide 100% storage of the water quality volume between the bottom of the practice and the overflow pipe from the system. By providing 100% storage of the WQv in the infiltration system, the water quality volume storage requirements set forth in the Design Manual has been met for the proposed practice. By meeting the Water Quality Volume requirements through employment of the infiltration practice, the water quality objectives of the NYSDEC has been met.

Pretreatment for the proposed infiltration system has been provided through the utilization of isolator rows. Based on the stabilized infiltration rate observed during soil testing in the area of the proposed infiltration system, the isolator rows in the system have been sized to provide pretreatment of 25% of the WQv. As such, the infiltration system has been design to provide an overall storage volume of 125% of the calculated WQv in order to provide 25% pretreatment and 100% WQv treatment. As shown in the table below, the infiltration system has been sized to provide storage for 100% of the calculated WQv as well as storage for 25% of the WQv for pretreatment in the isolator rows.

Table 2.2.2 Infiltration System Sizing Summary

Subcatchment	**WQ_v (a.f.)** From Table 2.3.1	**Required Pretreatment**	**Required Pretreatment Volume (a.f.)**	**Total Required Storage Volume in System (a.f.)**	**Storage Volume Provided below System Outlet (a.f.)** (From Appendix D)
1.1S	0.077	25%	0.019	0.096	0.096

The areas of redevelopment upstream of Design Line 2 and remaining redeveloped area upstream of Design Point 1 are proposed to be treated by First Defense hydrodynamic separators as manufactured by Hydro International. In accordance with Chapter 9, redevelopment activities may be treated by flow through practices, including hydrodynamic systems. As a flow through practice is proposed, the separators have been sized for 100% of the peak flow from the 1-year, 24-hour storm event from the tributary area, and the 25% reduction allowed for redevelopment with standard stormwater practices is not applied. As shown in the table below the hydrodynamic separators are sized to provide a treatment capacity greater than the peak flow from the upstream tributary area during the 1-year, 24-hour storm event in order to meet the NYSDEC criteria for water quality. Treatment and bypass capacity for the separators can be verified in Appendix I of this report.

Table 2.3.3 – Hydrodynamic Separator Water Quality Volume Treatment Summary

Subcatchment	SMP	WQv Peak Flow (c.f.s.)	Hydro International Hydrodynamic Separator Model	Treatment Capacity (c.f.s.)	Bypass Capacity (c.f.s.)
1.2S	1.2P	0.79	3-ft First Defense HC	0.85	15.0
2.1S	2.1P	0.36	3-ft First Defense HC	0.85	15.0
2.2S	2.2P	1.02	4-ft First Defense HC	1.50	18.0
2.3S	2.3P	0.26	3-ft First Defense HC	0.85	15.0

2.4 NYSDEC Stream Channel Protection Volume (CP_v)

The Stream Channel Protection (CP_v) criterion is intended to protect stream channels from erosion and is accomplished by the 24-hour extended detention of the center-of-mass of the one-year, 24-hour storm event. As permitted by Chapter 9, Section 9.2 of the Design Manual, for redevelopment activities, the CPv criterion is not required if the peak flow for the project site is the post-development condition is less than the pre-development condition for the 1-year, 24-hour storm event. As shown in Table 2.5.1 below, the project proposes a decrease in the peak flow from the pre to post-development condition. Therefore, the CPv has been met for the project.

2.5 NYSDEC Overbank Flood Control (Q_p), and Extreme Flood Control (Q_f)

The Overbank Flood Control (Q_p) requirement is intended to prevent an increase in the frequency and magnitude of out-of-bank flooding events generated by urban development. Overbank control requires storage to attenuate the post-development 10-year, 24-hour peak discharge to pre-development rates. The Extreme Flood Control (Q_f) requirement is intended to prevent the increased risk of flood damage from large storm events, maintain the boundaries of the pre-development 100-year flood plain, and protect the physical integrity of stormwater management practice. Extreme flood control requires storage to attenuate the post-development 100-year, 24-hour peak discharge to pre-development rates. As shown in Table 2.5.1 attenuation for both the 10-year and 100-year 24-hour storms has been provided thus satisfying the Q_p and Q_f requirements.

Table 2.5.1– Existing and Proposed Conditions Peak Flows

24-HOUR DESIGN STORM PEAK FLOWS (c.f.s.)						
	1-YEAR (Stream Channel Protection)		10-YEAR (Overbank Flood Control)		100-YEAR (Extreme Flood Control)	
	Pre	Post	Pre	Post	Pre	Post
Design Point 1	1.86	0.84	4.25	2.89	8.10	7.82
Design Line 2	4.15	3.94	8.10	7.95	14.33	14.19
Design Line 3	0.09	0.07	0.36	0.32	0.91	0.80

As shown in the above table the peak flows from the contributing areas to the design lines/point in the post development condition has been mitigated to below the existing condition levels, thus meeting the general requirements of the NYSDEC.

3.0 STORMWATER CONVEYANCE SYSTEM

The stormwater conveyance system for the project consists of precast concrete drainage structures and HDPE drainage piping. In the locations of proposed stormwater piping the system will be sized utilizing the Rational Method and is a standard method used by engineers to develop flow rates for sizing collection systems. The Rational Method calculates flows based on a one-hour design storm. The collection system has been sized to convey, at a minimum, the 10-year design storm. Sizing calculations for the stormwater conveyance piping system are provided in Appendix J.

4.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control should be accomplished by four basic principles: diversion of clean water, containment of sediment, treatment of dirty water, and stabilization of disturbed areas. Diversion of clean water should be accomplished with swales. This diverted water should be safely conveyed around the construction area as necessary and discharged downstream of the disturbed areas. Sediment should be contained with the use of silt fence at the toe of disturbed slopes. Disturbed areas should be permanently stabilized within 7 days of final grading to limit the required length of time that the temporary facilities must be utilized. The owner will be responsible for the maintenance of the temporary erosion control facilities. Refer to the Project Drawings for further information implementation of the Erosion Control Plan and Construction Sequence.

4.1 Temporary Erosion and Sediment Control Facilities

Temporary erosion and sediment control facilities should be installed and maintained as required to reduce the impacts to off-site properties. The owner will be required to provide maintenance for the temporary erosion and sediment control facilities. In general, the following temporary methods and materials should be used to control erosion and sedimentation from the project site:

- Stabilized Construction Entrance
- Silt Fence Barriers
- Storm Drain Inlet Protection
- Temporary Soil Stabilization

All temporary erosion control measures shall be maintained in accordance with the Erosion & Sediment Control Maintenance Schedule contained on the Project Drawings, and as discussed below.

A stabilized construction entrance should be installed at the site entrance as shown on the project plans. The design drawings will include details to guide the contractor in the construction of this entrance. The intent of the stabilized construction entrance is to prevent the "tracking" of soil from the site. Dust control should be accomplished with water sprinkling trucks if required. During dry periods, sprinkler trucks should wet all exposed earth surfaces as required to prevent the transport of air-borne particles to adjoining areas.

Siltation barriers constructed of geosynthetic filter cloth should be installed at the toe of all disturbed slopes. The intent of these barriers is to contain silt and sediment at the source and inhibit its transport by stormwater runoff. The siltation barriers will also help reduce the rate of runoff by creating filters through which the stormwater must pass. During construction, the siltation barriers shall be inspected weekly and after a rainfall event and shall be cleaned/replaced when needed.

Storm drain inlet protection in the form of manufactured insert inlet protection will be installed within all proposed and existing inlets around the project area. The manufactured insert inlet protection will serve to filter stormwater runoff before it enters the collection system. Throughout construction the concrete drainage structures, associated piping and inlet protections shall be inspected weekly and after a rainfall event. These items shall be cleaned, repaired and/or replaced when needed.

When land is exposed during development, the exposure shall be kept to the shortest practical period, but in no case more than 7 days. Temporary grass seed and mulch shall be applied to any construction area idle for two weeks. The temporary seeding and mulching shall be performed in accordance with the seeding notes illustrated on the project drawings. Disturbance shall be minimized in the areas required to perform construction. Upon completion of final grading topsoil, permanent seeding and mulch shall be applied in accordance with the project drawings.

The stormwater runoff will be managed by the temporary erosion and sediment control facilities during construction. As discussed in the construction sequences provided the project plans the stabilized construction entrance shall be installed at the site entrance and silt fence shall be installed along the down hill perimeter of where soil disturbing activities will occur containing sediment laden stormwater runoff on-site.

4.2 Permanent Erosion and Sediment Control Facilities

Permanent erosion and sediment control will be accomplished by diverting stormwater runoff from steep slopes, controlling/reducing stormwater runoff velocities and volumes, and vegetative and structural surface stabilization. All of the permanent facilities are relatively maintenance free and only require periodic inspections. The owner will provide maintenance for all the permanent erosion and sediment control facilities.

A flow spreader will be provided at the discharge end of the piped drainage system from the proposed flow splitter and will be sized in accordance with the Blue Book. The purpose of the flow spreader protection is to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach. The flow spreader shall be inspected for evidence of scour beneath the riprap and/or for any dislodged stones. Inspections of the flow spreader shall be performed during the inspections of the post-construction SMP's for the project.

Other than the paved or gravel surfaces, disturbed surfaces will be stabilized with vegetation within 10 days of final grading. Permanent seed mix and mulch shall be applied to idle areas to minimize the amount of exposed soil. Permanent seed mixtures are proposed for the project and illustrated on project drawings. Application rates for the seed and mulch are provided on the project drawings. The vegetation will control stormwater runoff by preventing soil erosion, reducing runoff volume and velocities, and providing a filter medium. Permanent seeding should optimally be undertaken in the spring from March 21st through May 20th and in late summer from August 15th to October 15th.

5.0 IMPLEMENTATION AND MAINTENANCE

5.1 Construction Phase

Details associated with the implementation and maintenance of the proposed stormwater facilities and erosion control measures during construction are shown on the project drawings. Soil disturbance for the subject project is proposed to be less than five acres, and therefore is not proposed to be phased. The erosion control plan will include associated details and notes to aid the contractor in implementing the plan. Construction is anticipated to begin in the Spring of 2024 and anticipated to be completed by the end of the year 2027.

During construction, a Site Log Book, Appendix E, is required to be kept per NYSDEC SPDES General Permit GP-0-20-001. Erosion and sediment control inspections are required to be conducted as necessary under coverage of the permit (minimum twice a week) and an updated logbook and a copy of the SWPPP is required to be kept on site for the duration of the construction activities. The Construction Site Log Book is an appendix taken from the *New York Standards and Specifications for Erosion and Sediment Control* (Blue Book).

In addition to the proposed erosion and sediment control facilities, the following good housekeeping best management practices shall be implemented to mitigate potential pollution during the construction phase of the project. The general contractor overseeing the day-to-day site operation shall be responsible for the good housekeeping best management practices included in the following general categories:

- Material Handling and Waste Management
- Establishment of Building Material Staging Areas
- Establishment of Washout Areas
- Proper Equipment Fueling and Maintenance Practices
- Spill Prevention and Control Plan

All construction waste materials shall be collected and removed from the site regularly by the general contractor. The general contractor shall supply waste barrels for proper disposal of waste materials. All personnel working on the site shall be instructed of the proper procedures for construction waste disposal.

Although it is not anticipated any hazardous waste materials will be utilized during construction, any hazardous waste materials shall be disposed of in accordance with federal, state, and local regulations. No hazardous waste shall be disposed of on-site. Hazardous waste materials shall be stored in appropriate and clearly marked containers and segregated from the other non-waste materials. All hazardous waste shall be stored in a structurally sound and sealed shipping containers located in the staging areas. Material safety data sheets, material inventory, and emergency contact numbers will be maintained in the office trailer. All personnel working on the site shall be instructed of the proper procedures for hazardous waste disposal.

All recyclables, including wood pallets, cardboard boxes, and all other recyclable construction scraps shall be disposed of in a designated recycling barrel provided by the contractor and removed from the site regularly. All personnel working on the site shall be instructed of the proper procedures for construction waste recycling.

All construction equipment and maintenance materials shall be stored in a construction staging area. Silt fence shall be installed down gradient of the construction staging area. Shipping containers shall be utilized to store hand tools, small parts, and other construction materials, not taken off site daily. Construction waste barrels, recycling barrels and if necessary hazardous waste containers shall be located within the limits of the construction staging area.

Throughout the construction of the project, several types of vehicles and equipment will be used on-site. Fueling of the equipment shall occur within the limits of the construction staging area. Fuel will be delivered to the site as needed, by the general contractor, or a party chosen by the general contractor. Only minor vehicle equipment maintenance shall occur on-site, all major maintenance shall be performed off-site. All equipment fluids generated from minor maintenance activities shall be disposed of into designated drums and stored in accordance with the hazardous waste storage as previously discussed.

The designated temporary concrete washout areas shall be constructed in accordance with the detail in the general locations as shown on the project plans. The temporary concrete washout areas shall be lined with plastic sheeting as specified on the detail free of holes or tears. Should the liner rip or tear at any time it shall be replaced immediately. All concrete mixer trucks and chutes shall be washed in the designated concrete wash areas. All personnel working on the site including concrete equipment operators shall be instructed of the locations and proper procedures for concrete washout. When the temporary concrete washout areas are no longer needed the hardened concrete and materials used to construct the washout area shall be broken up and removed from the site and disposed of in a landfill.

Vehicles and equipment shall be inspected on each day of use. Any leak discovered shall be repaired immediately. All leaking equipment unable to be repaired shall be removed from the site. Ample supplies of absorbent, spill-cleanup materials, and spill kits shall be located in the construction staging area. All spills shall be cleaned up immediately upon discovery. Spent absorbent materials and rags shall be hauled off-site immediately after the spill is cleaned for disposal at a local landfill. All personnel working on the site shall be instructed of the proper procedures for spill prevention and control. Any spill large enough to discharge to surface water will be immediately reported to the local fire / police departments, NYCDEP, and the National Response Center 1-800-424-8802.

Vegetation should be inspected every 30 days and after every major storm event until established, after which inspections should take place on a quarterly basis and after every large storm event. Damaged areas should be immediately re-seeded and re-mulched.

5.2 Soil Restoration

Soil Restoration is required to be applied across areas of the development site where soils have been disturbed and will be vegetated. The purpose is to recover the original properties and porosity of the soil compacted during construction activity. Soil Restoration 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 and compost amendment. The table below describes various soil disturbance activities related to land development, soil types and the requirements for soil restoration for each activity as identified in the Design Manual. Restoration is applied across areas of a development site where soils have been compacted and will be vegetated according to the criteria defined in the table below:

Soil Restoration Requirements[1, 2,4] (Onsite soils within the limit of disturbance belong to Hydrologic Soil Groups (HSG) C)			
Type of Soil Disturbance	**Soil Restoration Requirement**		**Comments/Examples**
No soil disturbance	Restoration not permitted		Preservation of Natural Features
Minimal soil disturbance	Restoration not required		Clearing and grubbing
Areas where topsoil is stripped only - no change in grade	~~HSG A & B~~	HSG C&D	Protect area from any ongoing construction activities.
	~~Apply 6 inches of topsoil~~	Aerate[3] and apply 6 inches of topsoil	
Areas of cut or fill	~~HSG A &B~~	HSG C&D	
	~~Aerate[1] and apply 6 inches of topsoil~~	Apply full Soil Restoration [2]	
Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5-foot perimeter around foundation walls)	Apply full Soil Restoration (decompaction and compost Enhancement[6])		
Areas where Runoff Reduction and/or Infiltration practices are applied	Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.		Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area
Redevelopment projects	Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.		

1. Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.
2. Per "Deep Ripping and De-compaction, DEC 2008".
3. Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which functions like a mini-subsoiler.
4. During periods of relatively low to moderate subsoil moisture, the disturbed soils are returned to rough grade and the following Soil Restoration steps applied:
   - 5.1. Apply 3 inches of compost over subsoil.
   - 5.2. Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils.
   - 5.3. Rock-pick until uplifted stone/rock materials of four inches and larger size area cleaned off the site.
   - 5.4. Apply topsoil to a depth of 6 inches.
   - 5.5. Vegetate as required by seeding notes located on the project drawings.
   - 5.6. Tilling should not be performed within the drip line of any existing trees or over any utility installations that are within 24 inches of the surface.
6. Compost shall be aged, from plant derived materials, free of viable weed seeds, have no visible free water or dust produced when handling, pass through a half inch screen and have a pH suitable to grow desired plants.

After soil restoration is completed an inspector should be able to push a 3/8" metal bar twelve inches into the soil with just body weight. Following decompaction/soil restoration activities, the following maintenance is anticipated during the first year:

- Initial inspections for the first six months (once after each storm greater than a half-inch).
- Reseeding to repair bare or eroding areas to assure grass stabilization.

- Water once every three days for first month, and then provide a half inch of water per week during first year. Irrigation plan may be adjusted according to the rain event.
- Fertilization may be needed in the fall after the first growing season to increase plant vigor.

In order to ensure the soil remains decompacted the following ongoing maintenance is recommended:

- Planting the appropriate ground cover with deep roots to maintain the soil structure.
- Keeping the site free of vehicular and foot traffic or other weight loads. Consider pedestrian footpaths (sometimes it may be necessary to de-thatch the turf every few years).

5.3 Long Term Maintenance Plan

The stormwater facilities for the subject project have been designed to minimize the required maintenance. This section discusses the minimum maintenance requirements to insure long-term performance of the stormwater facilities. Initially the stormwater facilities will require an increased maintenance and inspection schedule until all portions of the site are stable. Generally the stormwater facilities consist of either collection and conveyance components or treatment components.

The stormwater collection and conveyance system is composed of HDPE drainage pipe and precast concrete drainage structures. The owner will assume the maintenance responsibilities for the drainage system. Minimal maintenance is typically required for these facilities. All pipes should be checked for debris and blockages and cleaned as required. All drain inlet sumps shall be cleaned to removed deposited sediment. During the cleaning process, the pipes should be inspected for structural integrity and overall condition; repairs and/or replacement should be made as required.

Additionally, the stormwater management practices including the infiltration system and hydrodynamic separators shall be checked for deposited sediment as well. Inspection and maintenance requirements for the proposed stormwater management practices per the Design Manual are provided in Appendix G and I of this report.

APPENDIX A
RR_v Calculations

RRv Calculation Worksheet - Design Point 1

Project: Pawling Commons
Project #: 18135.100
Date: 10/31/2023

INSITE ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.

1. RRv Initial = Water Quality Volume (WQv) *0.077 ac-ft* *= 3,365 c.f.*
(refer to HydroCAD Subcatchments 1.1S for Water Quality Volume)

2. *RRv Minimum =* [(P) (Rv) (S) (Aic)] /12 where…

P = Rainfall (in.)	=	1.40 in.
Rv = 0.05 + 0.009 (100%)	=	0.95
S = Hydrologic Soil Group Specific Reduction Factor [HSG A = 0.55] [HSG B = 0.40] [HSG C = 0.30] [HSG D = 0.20]	=	0.30
Aic = Total area of new impervious cover	=	0.25 Acres
RRv Minimum	=	*362 c.f.*

3. *RRv Required* = RRv Initial - Green Infrastructure Practice (GIP) with Area Reduction

GIP with Area Reduction Applied in Project

5.3.1 Conservation of Natural Area	N/A
5.3.2 Sheet Flow to Riparian Buffers or Filter Strips	N/A
5.3.4 Tree Planting / Tree Box	c.f.
5.3.5 Disconnection of Rooftop Runoff	-
5.3.6 Stream Daylighting	N/A

RRv Required(=WQv-RRV by area)(Refer to HydroCAD output in this Appendix) = 3,365 c.f.

4. *RRv Provided*

GIP with Volume Reduction Applied in Project	WQv Treated (c.f.)	% of WQv Applied to *RRv Provided*	*RRv Provided (c.f.)*
5.3.3 Vegetated Open Swales [HSG A / B = 20%] [HSG C / D = 10%] {Modified HSG C - D = 15% - 12%]		20% 10%	0 0
5.3.7 Rain Garden [No underdrains / Good Soils = 100%] [With underdrains / Poor Soils = 40%]		40%	0
5.3.8 Green Roof [RRv provided equals volume provided in Green Roof]		100%	0
5.3.9 Stormwater Planters [Infiltration Planters = 100%] [Flow Through HSG C = 45%] [Flow Though HSG D = 30%]		45%	0
5.3.10 Rain Tank / Cisterns		100%	0
5.3.11 Porous Pavement		100%	0
Infiltration Practice (Standard SMP)	4182	100%	4,182
Bioretention Practice (Standard SMP) [Without Underdrains HSG A/B = 80%] [With Underdrain HSG C\D = 40%]		40%	0
Dry Swale (Open Channel Practice) (Standard SMP) [HSG A/B = 40%] [HSG C/D = 20%]		20%	0
RRv Provided =			*4,182*

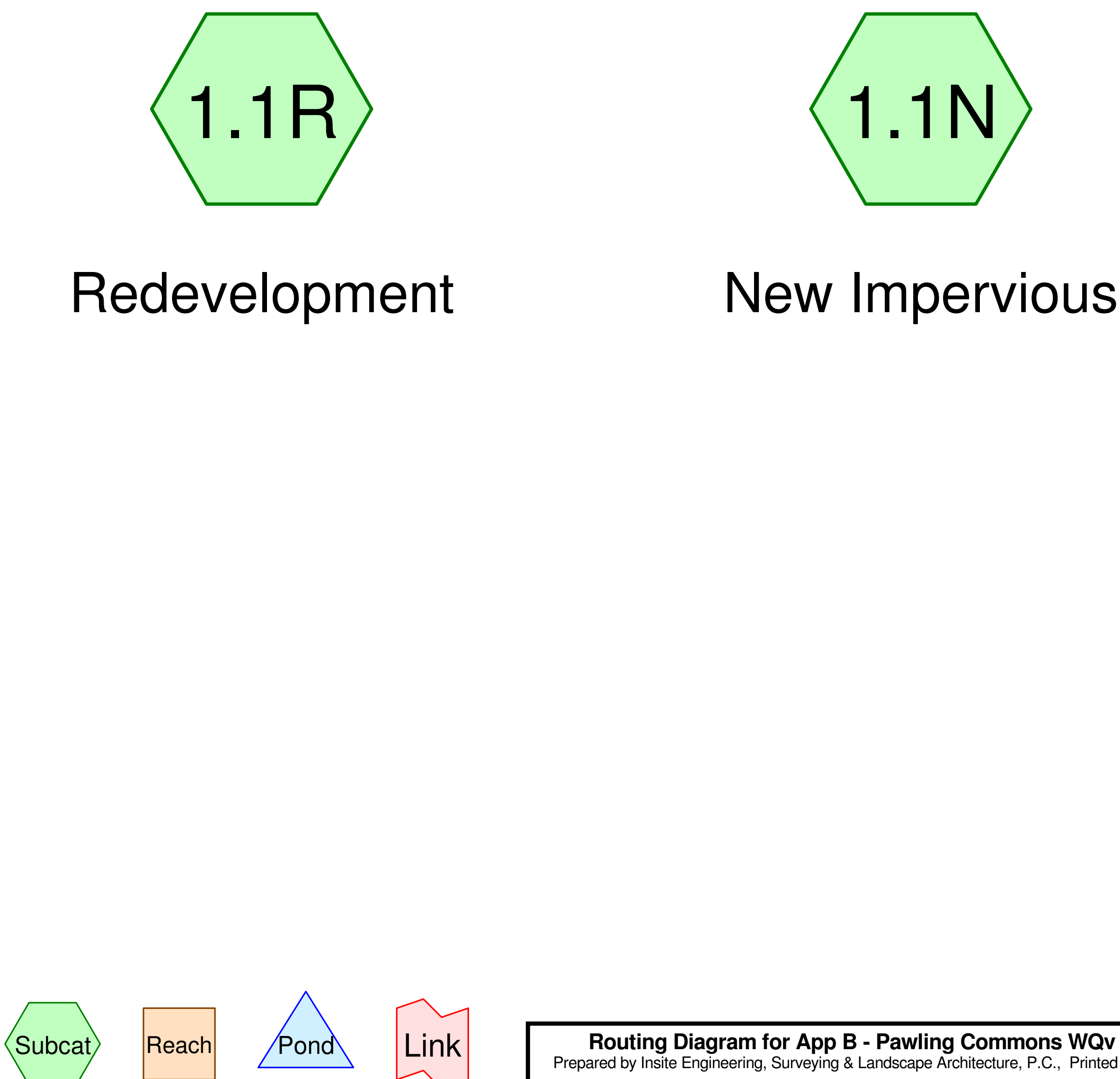
5. Summary

RRv Initial	=	3,365 c.f.	
RRv Required	=	3,365 c.f.	
RRv Minimum	=	362 c.f.	
RRv Provided	=	4,182 c.f.	
WQv Required for Downstream SMP	=	0 c.f.	(= RRv Required - RRv Provided)

Is RRv Provided greater than or equal to RRv Minimum? Yes

APPENDIX B

WQ_v Calculations



Routing Diagram for App B - Pawling Commons WQv Calc
Prepared by Insite Engineering, Surveying & Landscape Architecture, P.C., Printed 10/27/2023

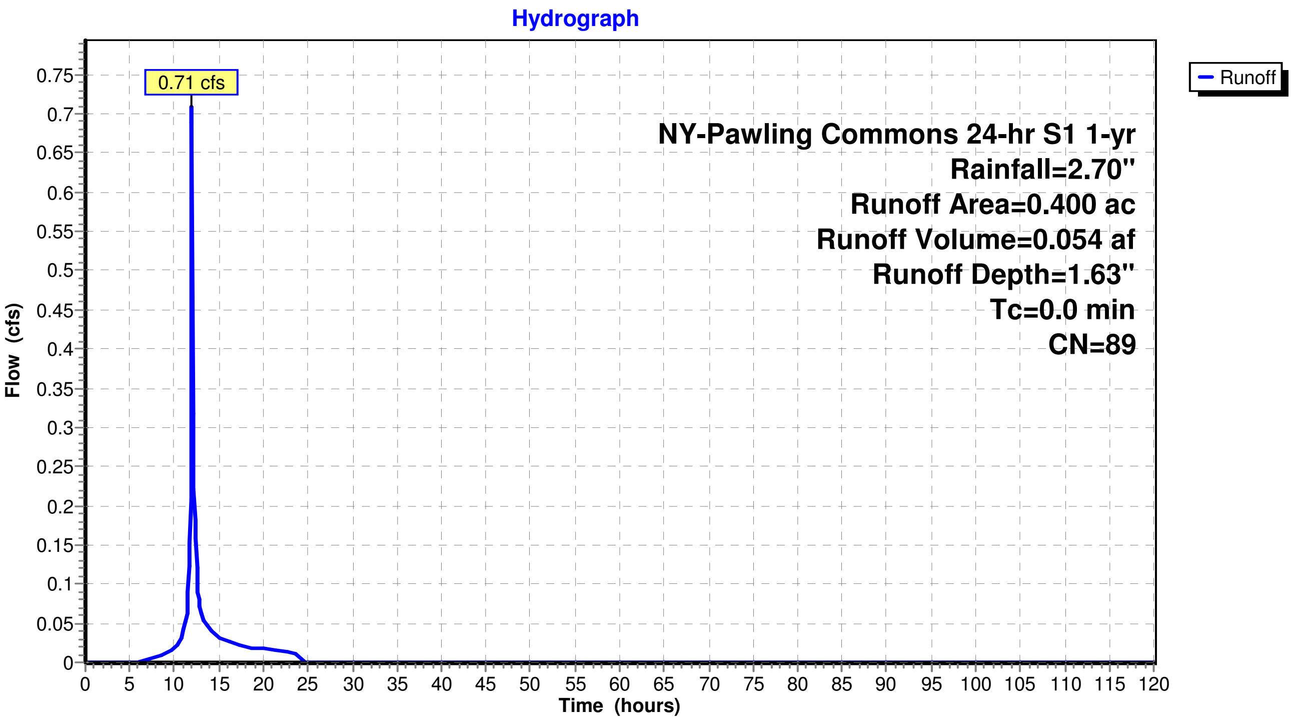
Summary for Subcatchment 1.1N: New Impervious

Runoff = 0.71 cfs @ 11.97 hrs, Volume= 0.054 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.150	74	>75% Grass cover, Good, HSG C
0.400	89	Weighted Average
0.150		37.50% Pervious Area
0.250		62.50% Impervious Area

Subcatchment 1.1N: New Impervious



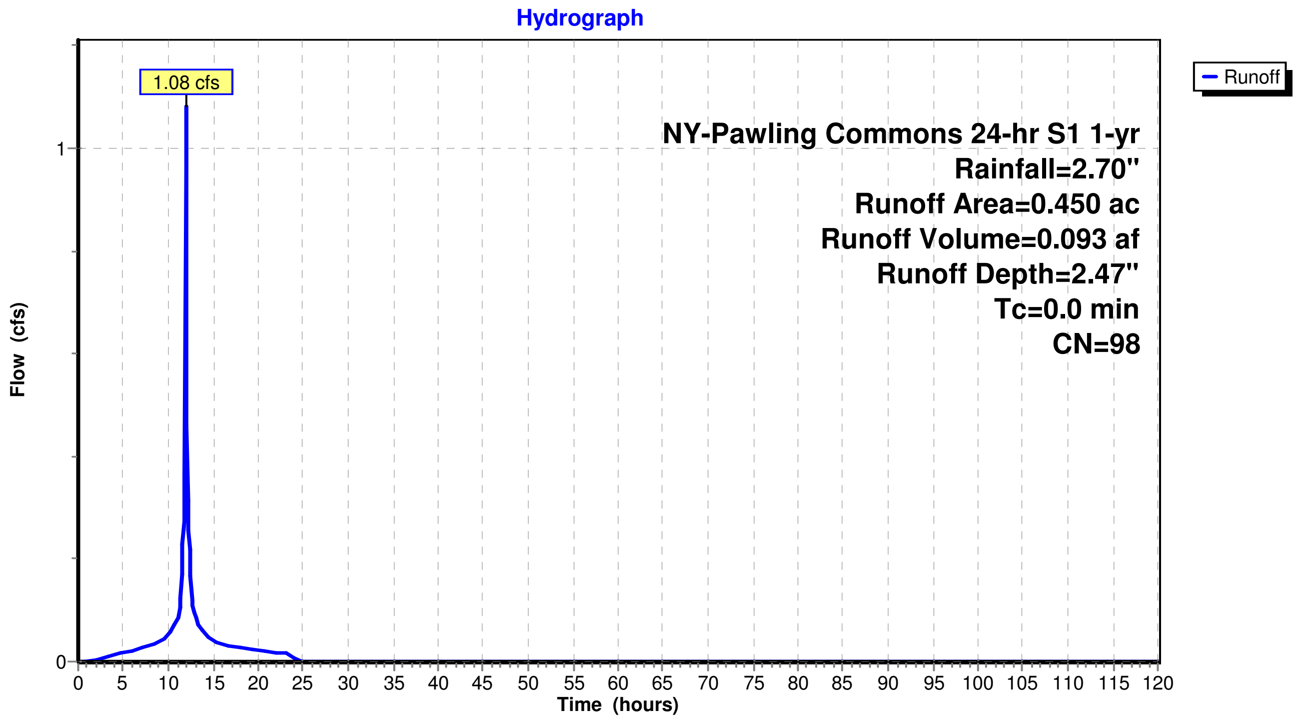
Summary for Subcatchment 1.1R: Redevelopment

Runoff = 1.08 cfs @ 11.96 hrs, Volume= 0.093 af, Depth= 2.47"

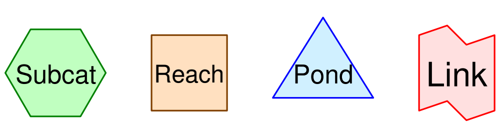
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
0.450	98	Paved parking, HSG C
0.450		100.00% Impervious Area

Subcatchment 1.1R: Redevelopment



APPENDIX C
Pre-Development Computer Data



Routing Diagram for App C - Pawling Commons Pre-Development

Prepared by Insite Engineering, Surveying & Landscape Architecture, P.C., Printed 10/27/2023

Summary for Subcatchment PRE 1:

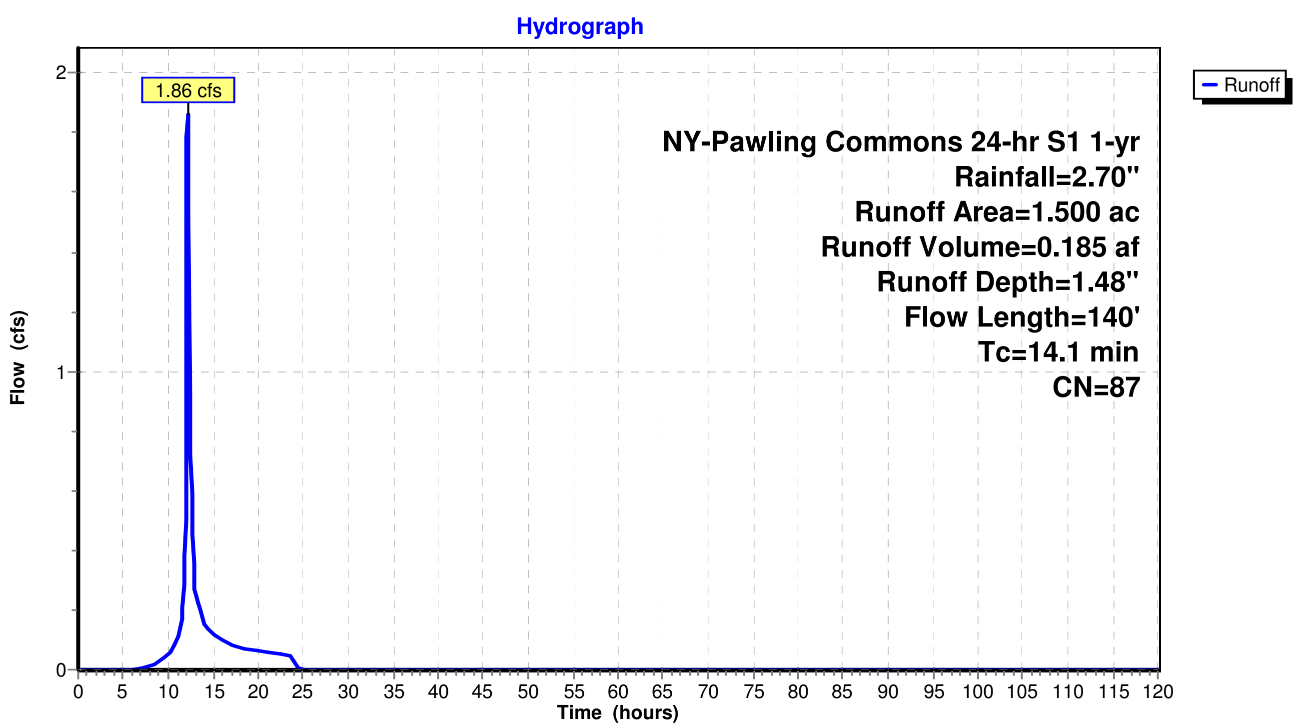
Runoff = 1.86 cfs @ 12.15 hrs, Volume= 0.185 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
0.900	98	Paved parking, HSG C
0.600	70	Woods, Good, HSG C
1.500	87	Weighted Average
0.600		40.00% Pervious Area
0.900		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0600	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
0.4	40	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.1	140	Total			

Subcatchment PRE 1:



Summary for Subcatchment PRE 2:

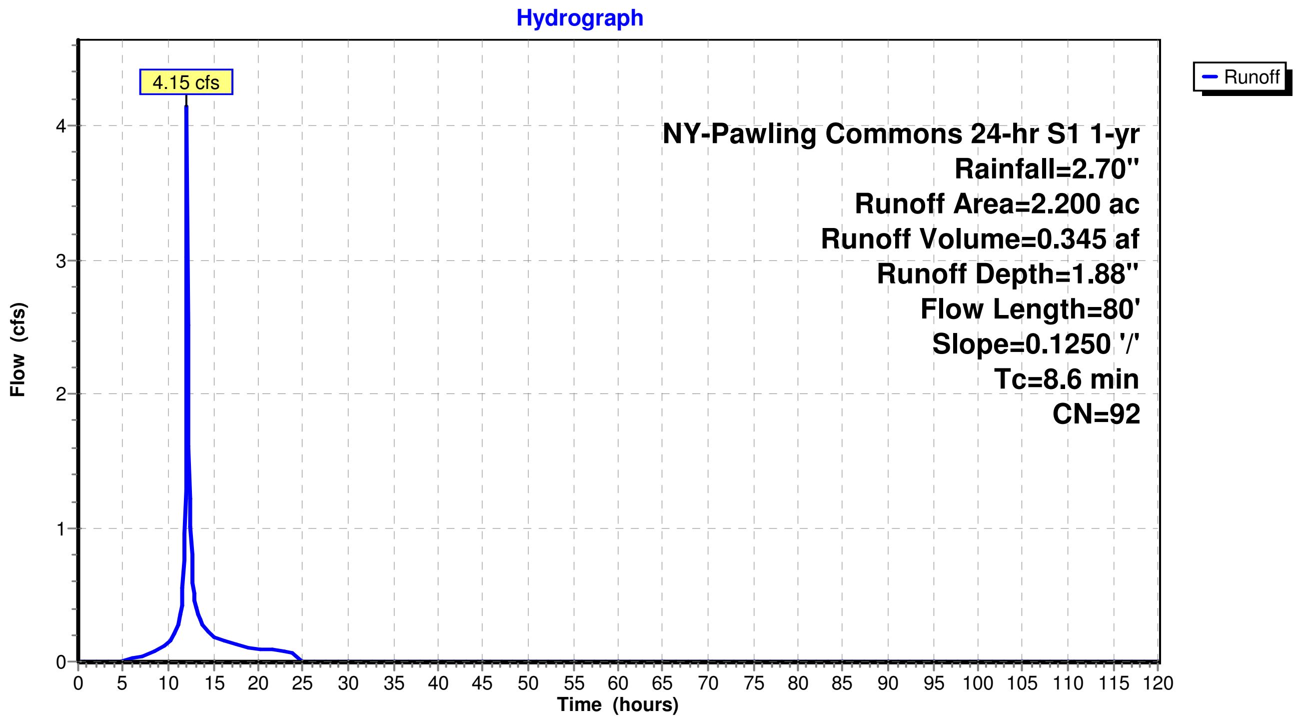
Runoff = 4.15 cfs @ 12.09 hrs, Volume= 0.345 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
1.700	98	Paved parking, HSG C
0.100	74	>75% Grass cover, Good, HSG C
0.400	70	Woods, Good, HSG C
2.200	92	Weighted Average
0.500		22.73% Pervious Area
1.700		77.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	80	0.1250	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"

Subcatchment PRE 2:



Summary for Subcatchment PRE 3:

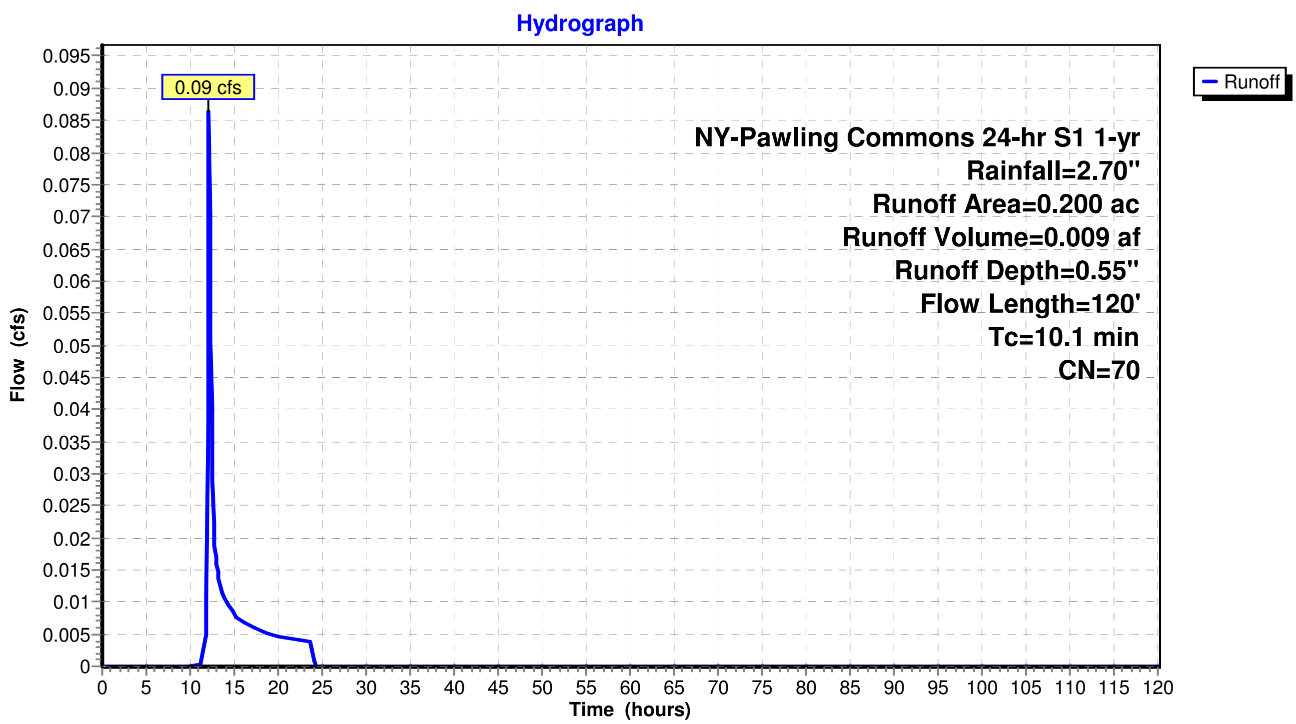
Runoff = 0.09 cfs @ 12.13 hrs, Volume= 0.009 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
0.200	70	Woods, Good, HSG C
0.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
4.0	50	0.3200	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
0.1	20	0.5000	3.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.1	120	Total			

Subcatchment PRE 3:



Summary for Subcatchment PRE 1:

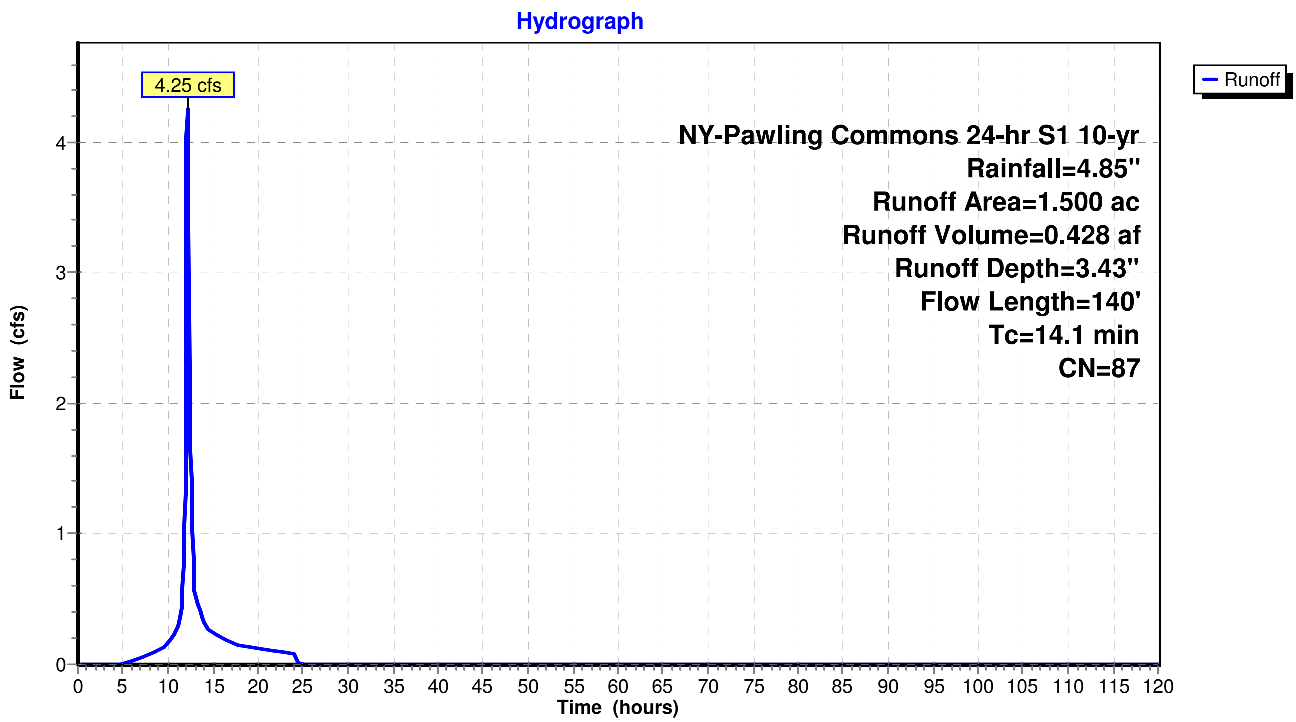
Runoff = 4.25 cfs @ 12.15 hrs, Volume= 0.428 af, Depth= 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 10-yr Rainfall=4.85"

Area (ac)	CN	Description
0.900	98	Paved parking, HSG C
0.600	70	Woods, Good, HSG C
1.500	87	Weighted Average
0.600		40.00% Pervious Area
0.900		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0600	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
0.4	40	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.1	140	Total			

Subcatchment PRE 1:



Summary for Subcatchment PRE 2:

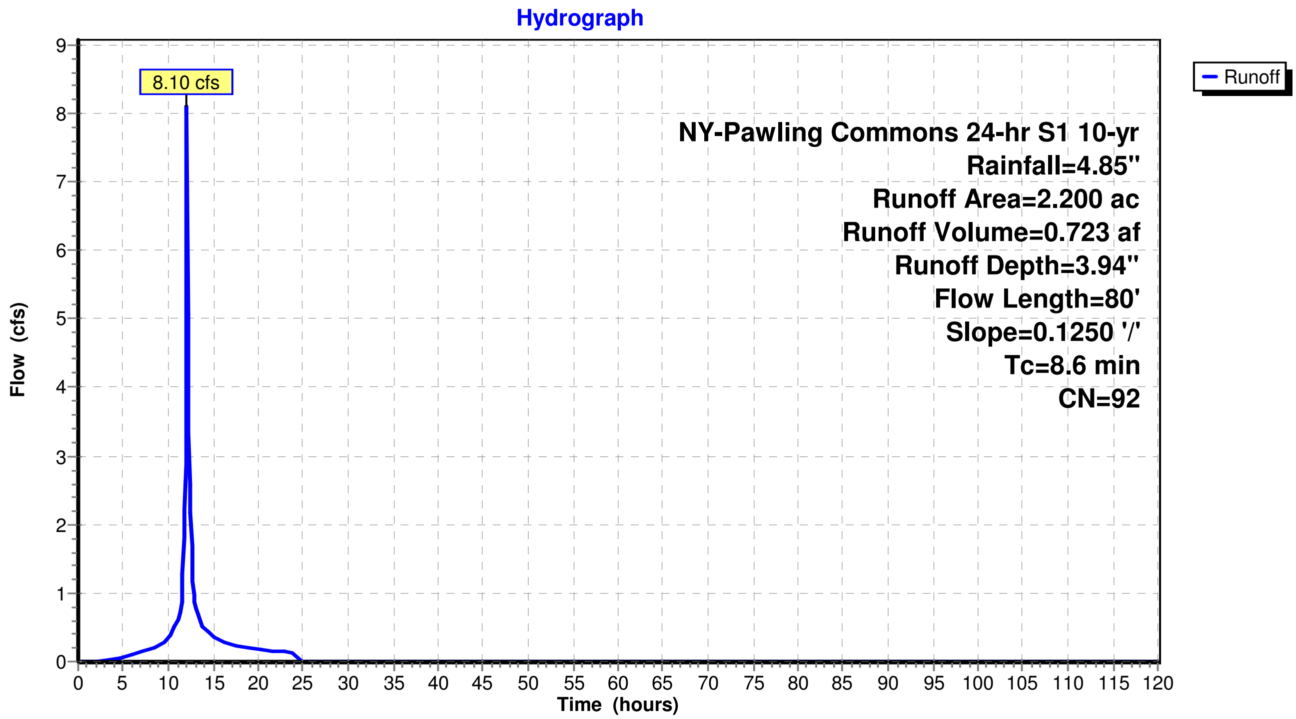
Runoff = 8.10 cfs @ 12.09 hrs, Volume= 0.723 af, Depth= 3.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 10-yr Rainfall=4.85"

Area (ac)	CN	Description
1.700	98	Paved parking, HSG C
0.100	74	>75% Grass cover, Good, HSG C
0.400	70	Woods, Good, HSG C
2.200	92	Weighted Average
0.500		22.73% Pervious Area
1.700		77.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	80	0.1250	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"

Subcatchment PRE 2:



Summary for Subcatchment PRE 3:

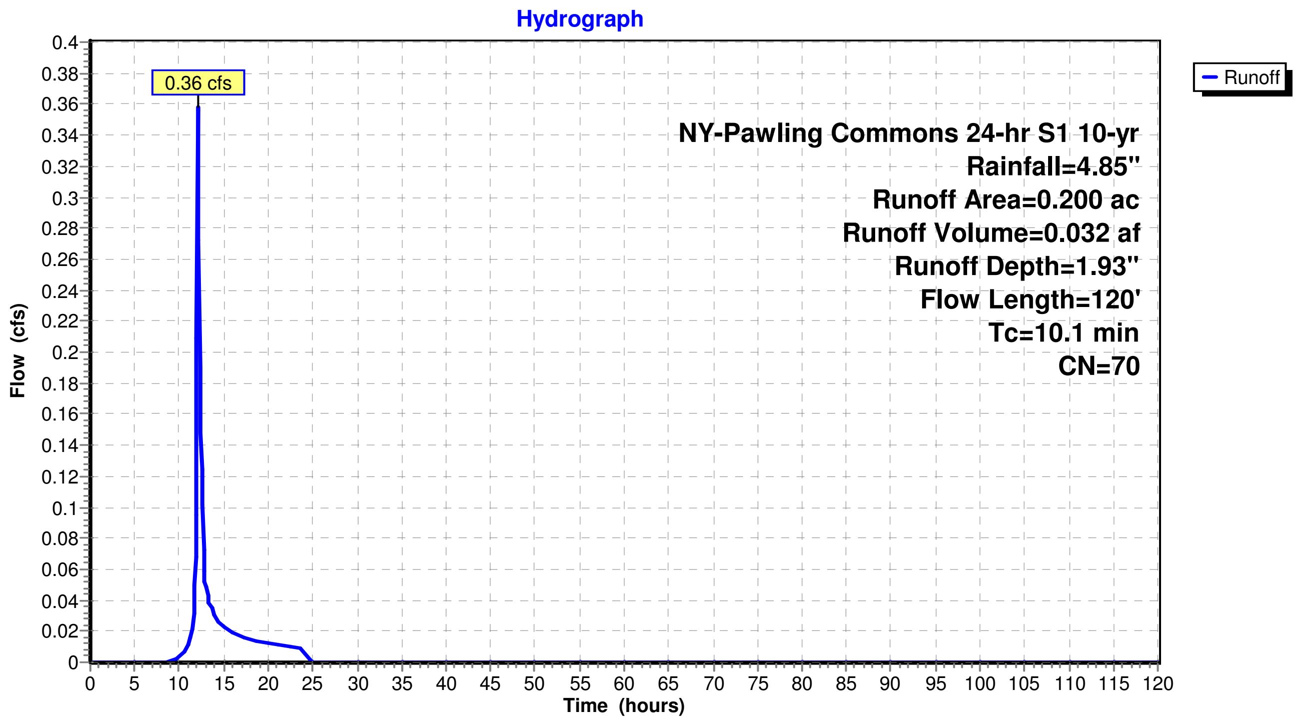
Runoff = 0.36 cfs @ 12.11 hrs, Volume= 0.032 af, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 10-yr Rainfall=4.85"

Area (ac)	CN	Description
0.200	70	Woods, Good, HSG C
0.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
4.0	50	0.3200	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
0.1	20	0.5000	3.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.1	120	Total			

Subcatchment PRE 3:



Summary for Subcatchment PRE 1:

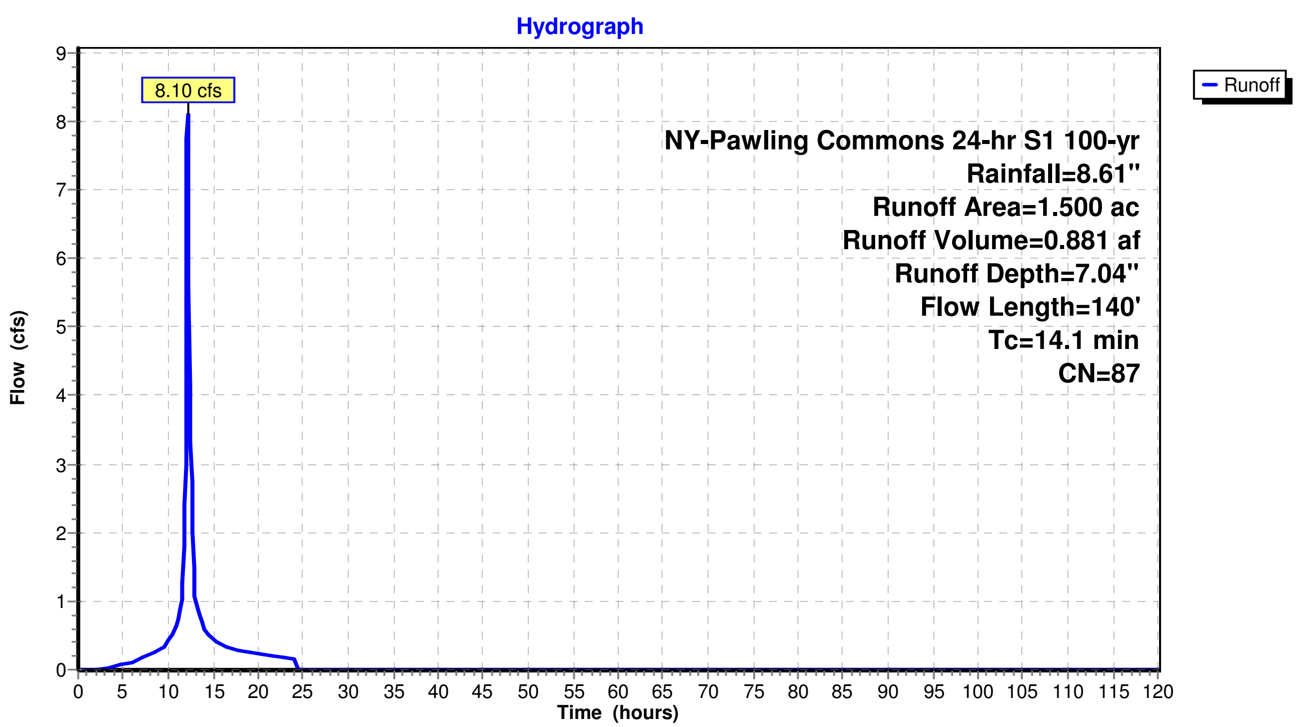
Runoff = 8.10 cfs @ 12.15 hrs, Volume= 0.881 af, Depth= 7.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 100-yr Rainfall=8.61"

Area (ac)	CN	Description
0.900	98	Paved parking, HSG C
0.600	70	Woods, Good, HSG C
1.500	87	Weighted Average
0.600		40.00% Pervious Area
0.900		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0600	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
0.4	40	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.1	140	Total			

Subcatchment PRE 1:



Summary for Subcatchment PRE 2:

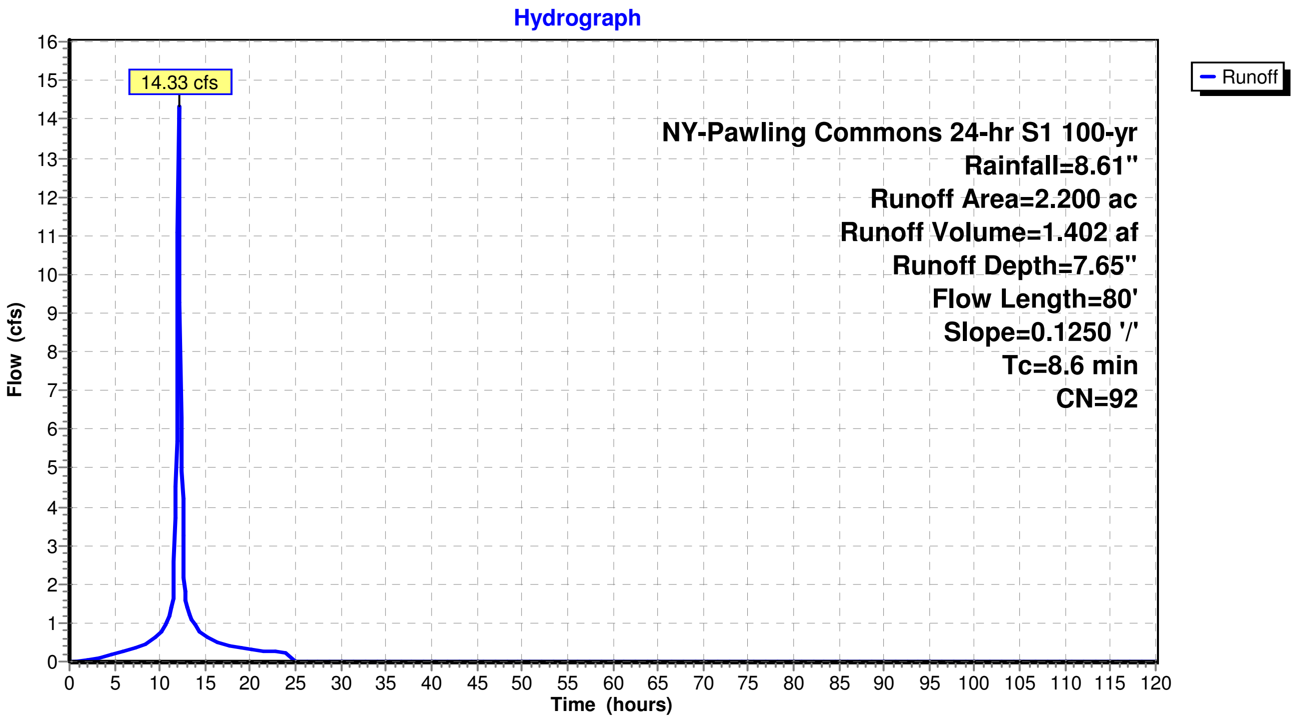
Runoff = 14.33 cfs @ 12.09 hrs, Volume= 1.402 af, Depth= 7.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 100-yr Rainfall=8.61"

Area (ac)	CN	Description
1.700	98	Paved parking, HSG C
0.100	74	>75% Grass cover, Good, HSG C
0.400	70	Woods, Good, HSG C
2.200	92	Weighted Average
0.500		22.73% Pervious Area
1.700		77.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	80	0.1250	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"

Subcatchment PRE 2:



Summary for Subcatchment PRE 3:

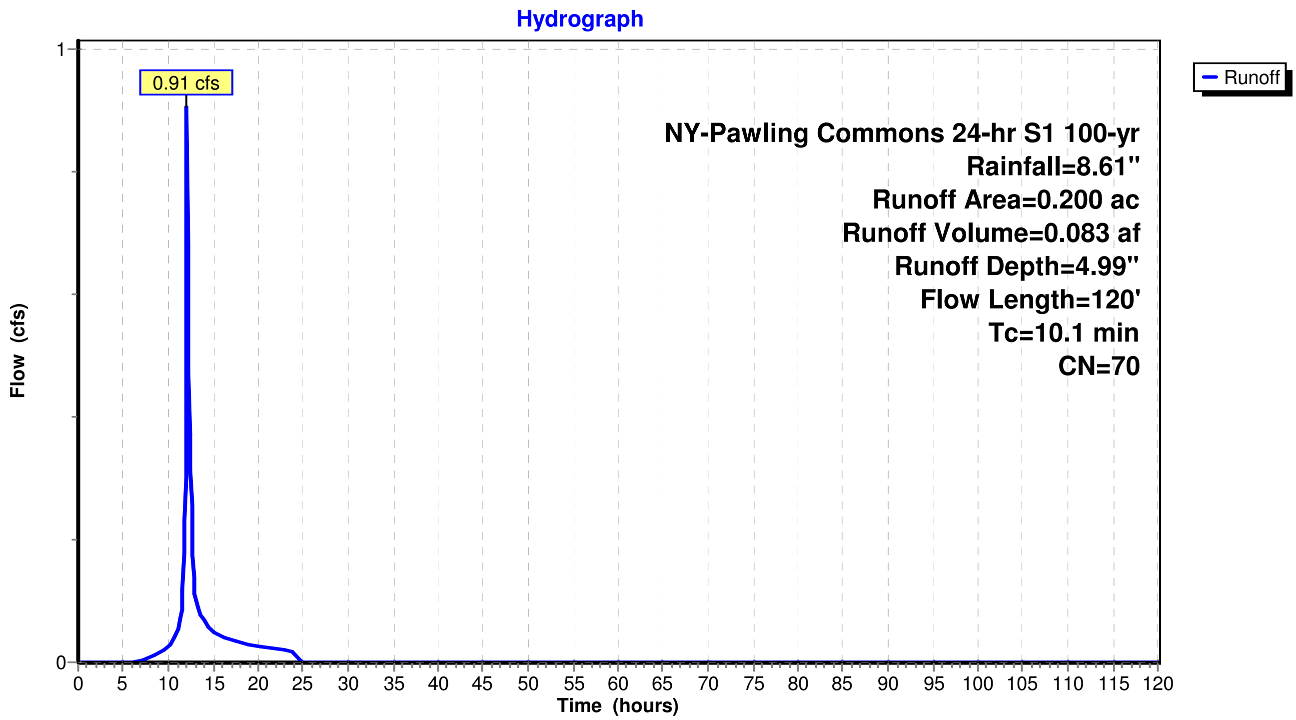
Runoff = 0.91 cfs @ 12.11 hrs, Volume= 0.083 af, Depth= 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 100-yr Rainfall=8.61"

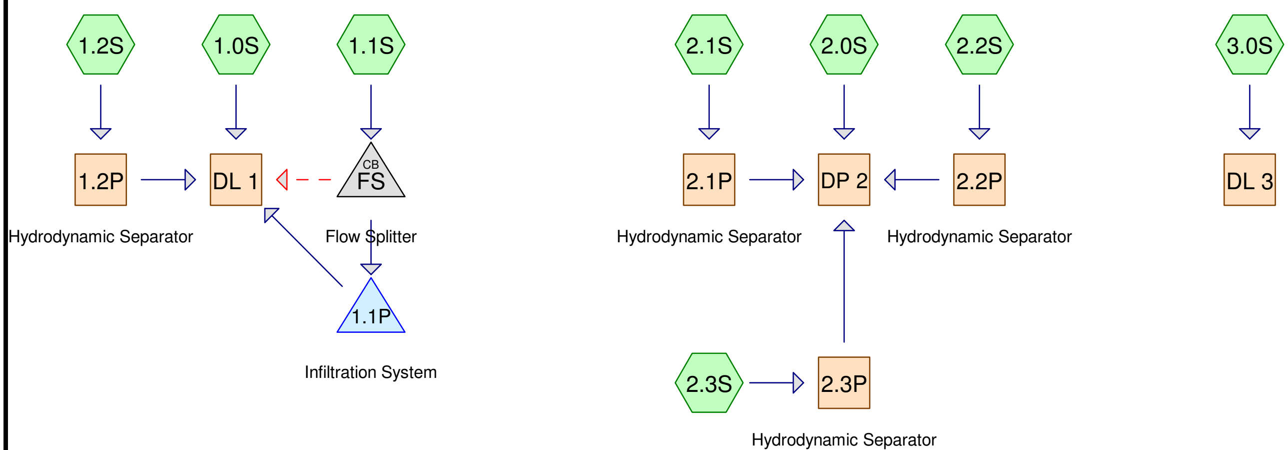
Area (ac)	CN	Description
0.200	70	Woods, Good, HSG C
0.200		100.00% Pervious Area

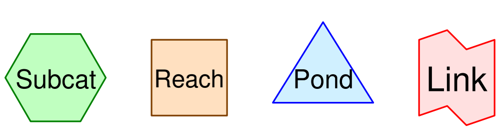
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
4.0	50	0.3200	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
0.1	20	0.5000	3.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.1	120	Total			

Subcatchment PRE 3:



APPENDIX D
Post-Development Computer Data





Routing Diagram for App D - Pawling Commons Post-Development
Prepared by Insite Engineering, Surveying & Landscape Architecture, P.C., Printed 12/28/2023
HydroCAD® 10.00-15 s/n 02171 © 2015 HydroCAD Software Solutions LLC

Summary for Subcatchment 1.0S:

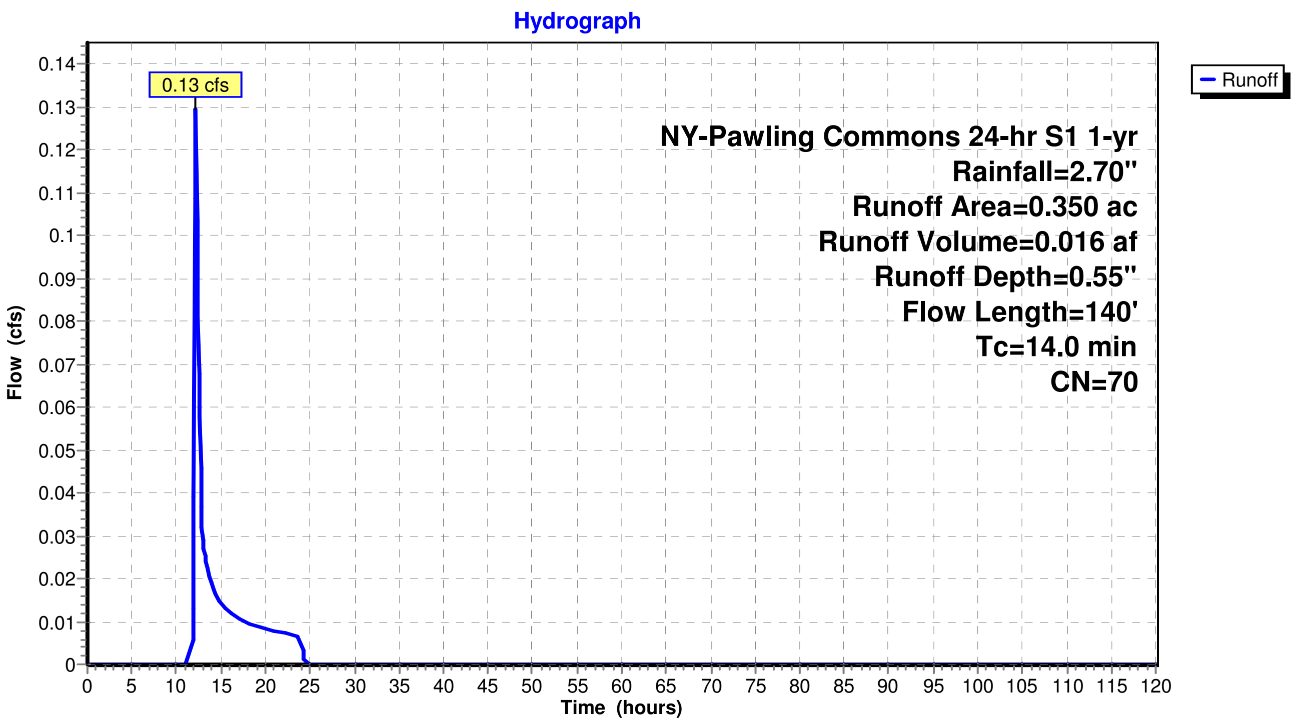
Runoff = 0.13 cfs @ 12.19 hrs, Volume= 0.016 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
0.350	70	Woods, Good, HSG C
0.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0600	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
0.3	40	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.0	140	Total			

Subcatchment 1.0S:



Summary for Subcatchment 1.1S:

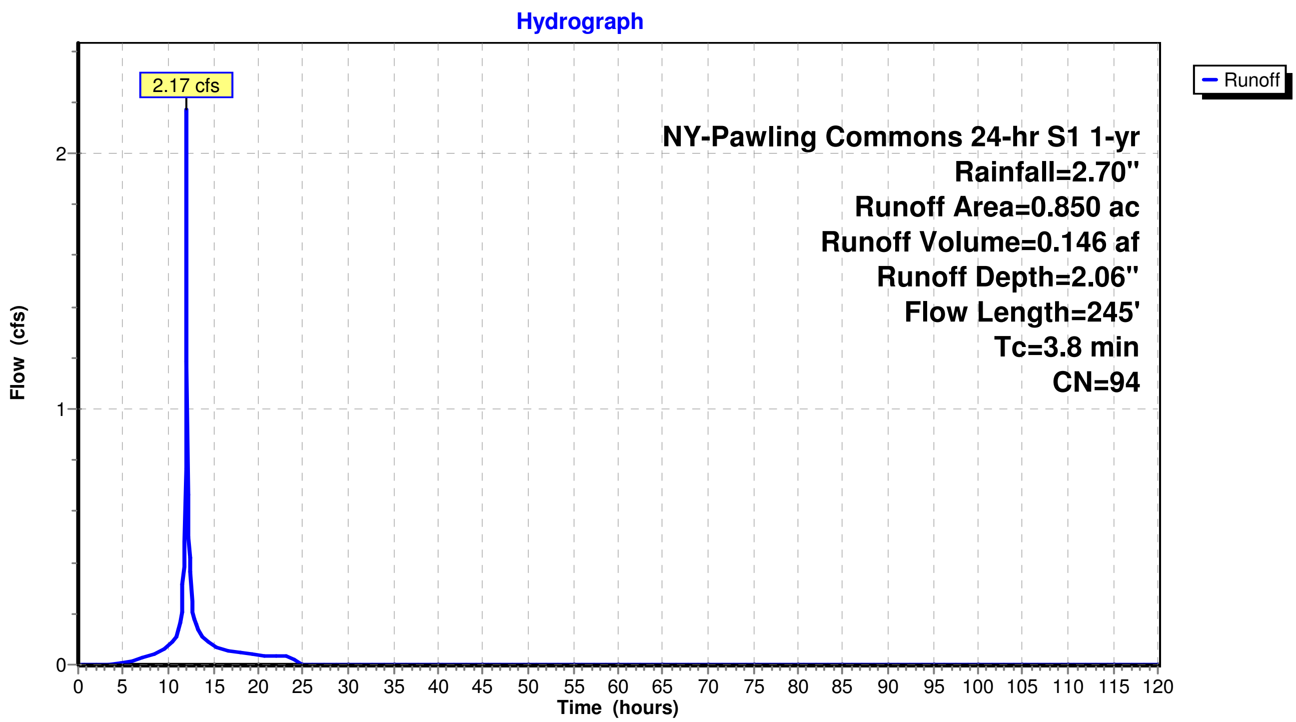
Runoff = 2.17 cfs @ 12.01 hrs, Volume= 0.146 af, Depth= 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
0.700	98	Paved parking, HSG C
0.150	74	>75% Grass cover, Good, HSG C
0.850	94	Weighted Average
0.150		17.65% Pervious Area
0.700		82.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	35	0.5000	0.23		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.26"
1.2	210	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	245	Total			

Subcatchment 1.1S:



Summary for Subcatchment 1.2S:

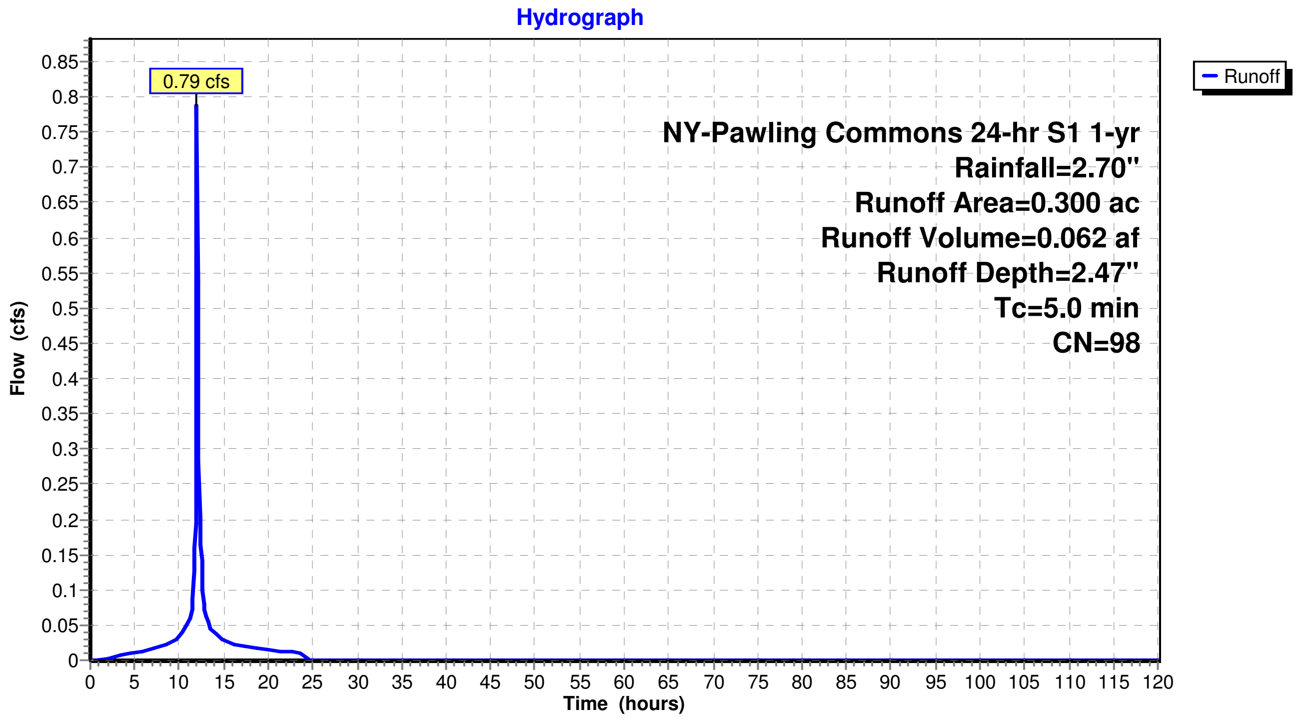
Runoff = 0.79 cfs @ 12.02 hrs, Volume= 0.062 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
0.300	98	Paved parking, HSG C
0.300		100.00% Impervious Area

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

Subcatchment 1.2S:



Summary for Subcatchment 2.0S:

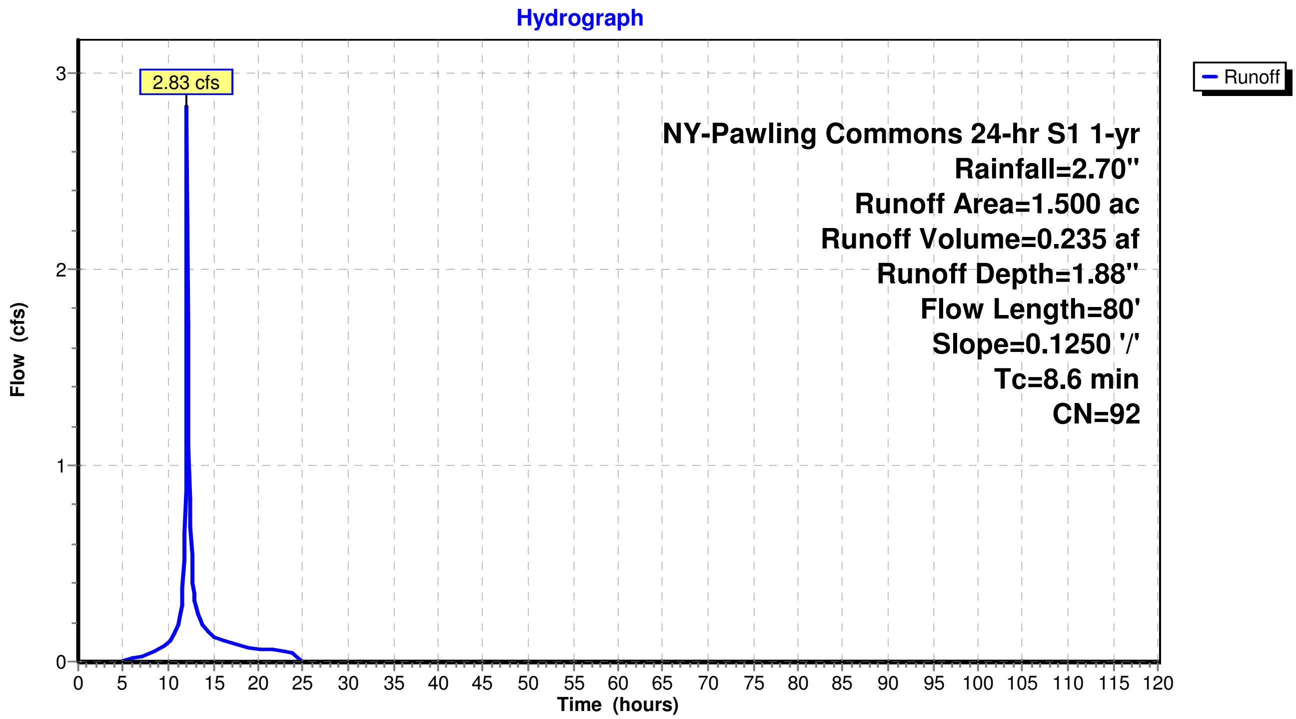
Runoff = 2.83 cfs @ 12.09 hrs, Volume= 0.235 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
1.150	98	Paved parking, HSG C
0.250	74	>75% Grass cover, Good, HSG C
0.100	70	Woods, Good, HSG C
1.500	92	Weighted Average
0.350		23.33% Pervious Area
1.150		76.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	80	0.1250	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"

Subcatchment 2.0S:



Summary for Subcatchment 2.1S:

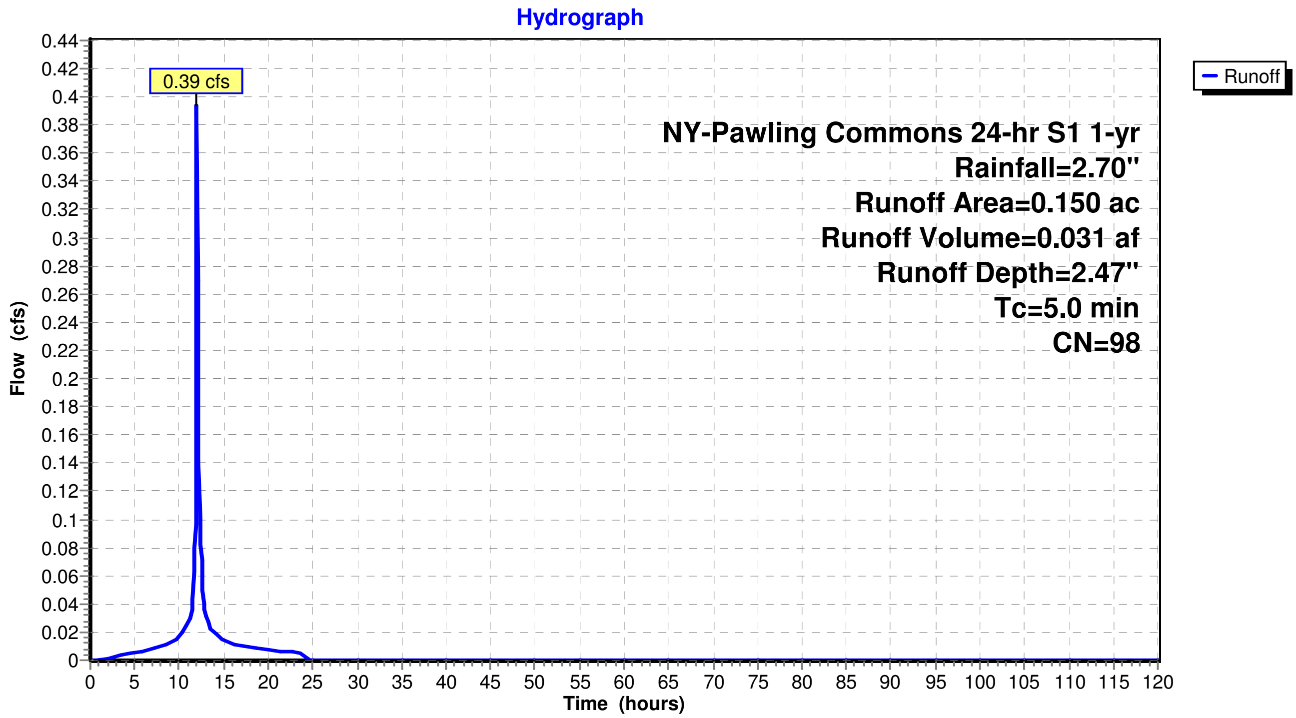
Runoff = 0.39 cfs @ 12.02 hrs, Volume= 0.031 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
0.150	98	Paved parking, HSG C
0.150		100.00% Impervious Area

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

Subcatchment 2.1S:



Summary for Subcatchment 2.2S:

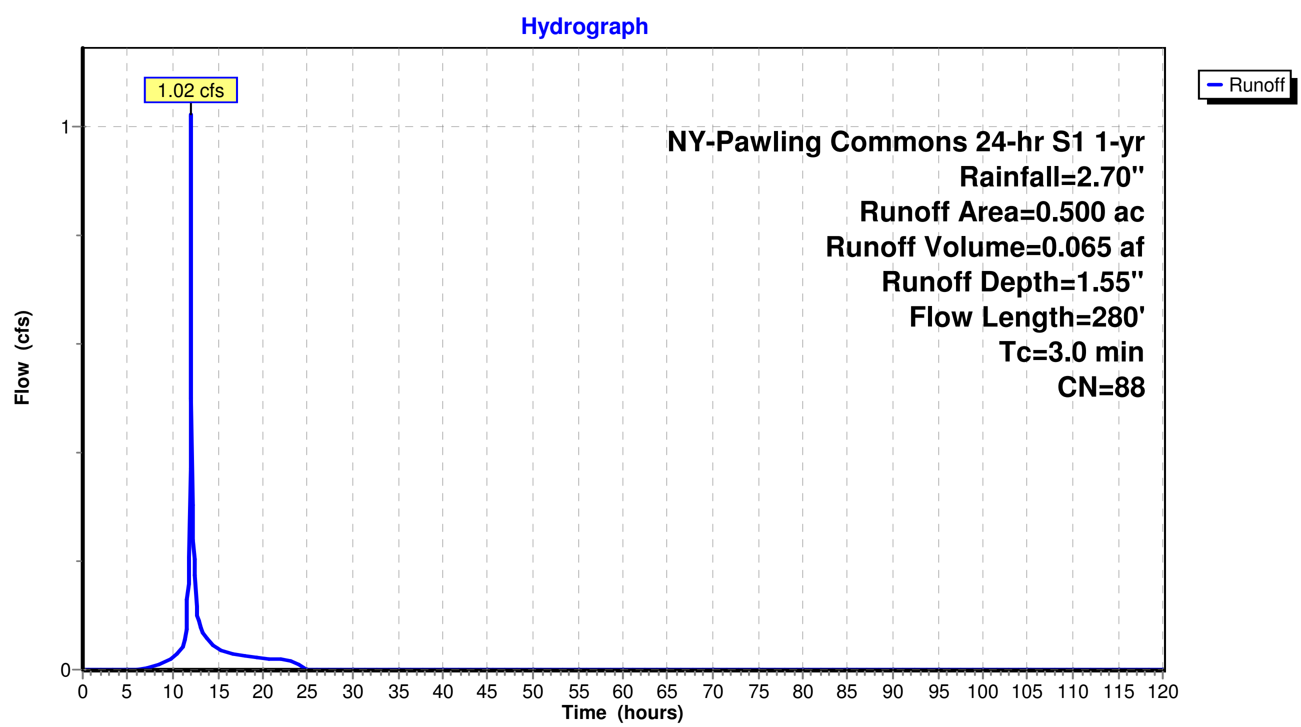
Runoff = 1.02 cfs @ 12.01 hrs, Volume= 0.065 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
0.300	98	Paved parking, HSG C
0.200	74	>75% Grass cover, Good, HSG C
0.500	88	Weighted Average
0.200		40.00% Pervious Area
0.300		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	30	0.5000	0.34		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.26"
1.5	250	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	280	Total			

Subcatchment 2.2S:



Summary for Subcatchment 2.3S:

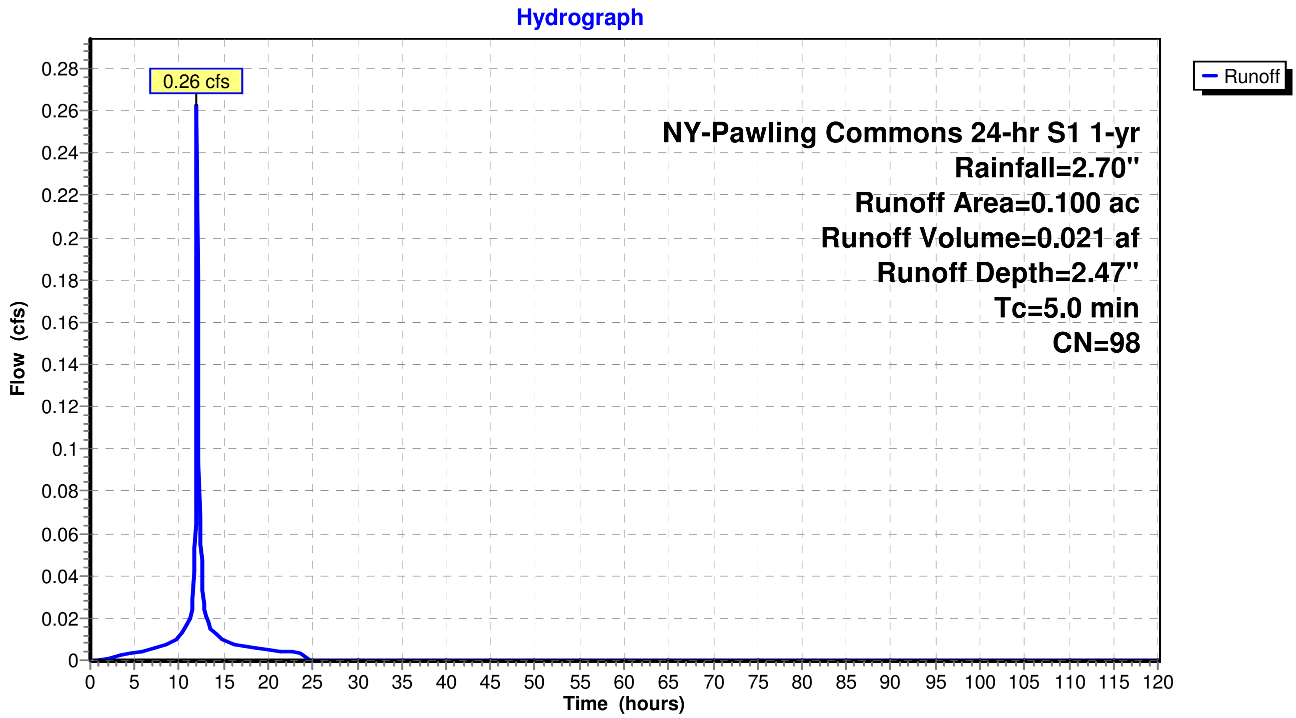
Runoff = 0.26 cfs @ 12.02 hrs, Volume= 0.021 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
0.100	98	Paved parking, HSG C
0.100		100.00% Impervious Area

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

Subcatchment 2.3S:



Summary for Subcatchment 3.0S:

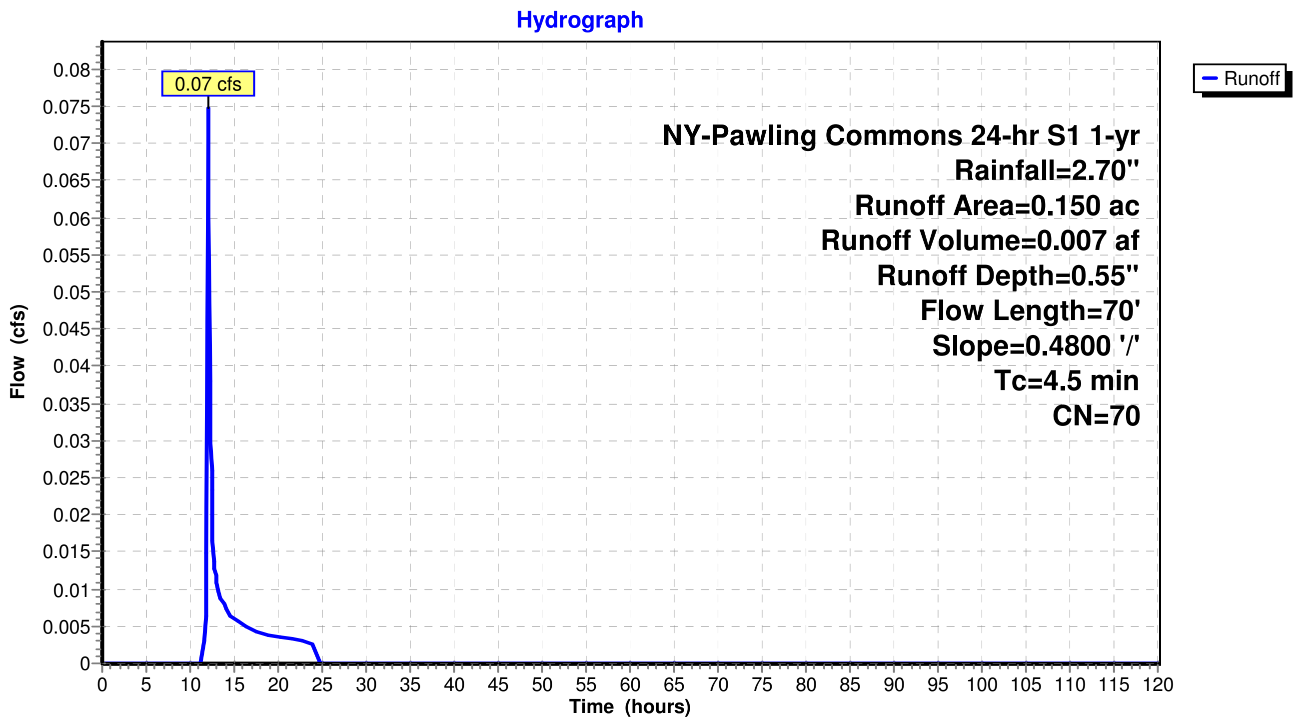
Runoff = 0.07 cfs @ 12.03 hrs, Volume= 0.007 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 1-yr Rainfall=2.70"

Area (ac)	CN	Description
0.150	70	Woods, Good, HSG C
0.150		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	70	0.4800	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"

Subcatchment 3.0S:

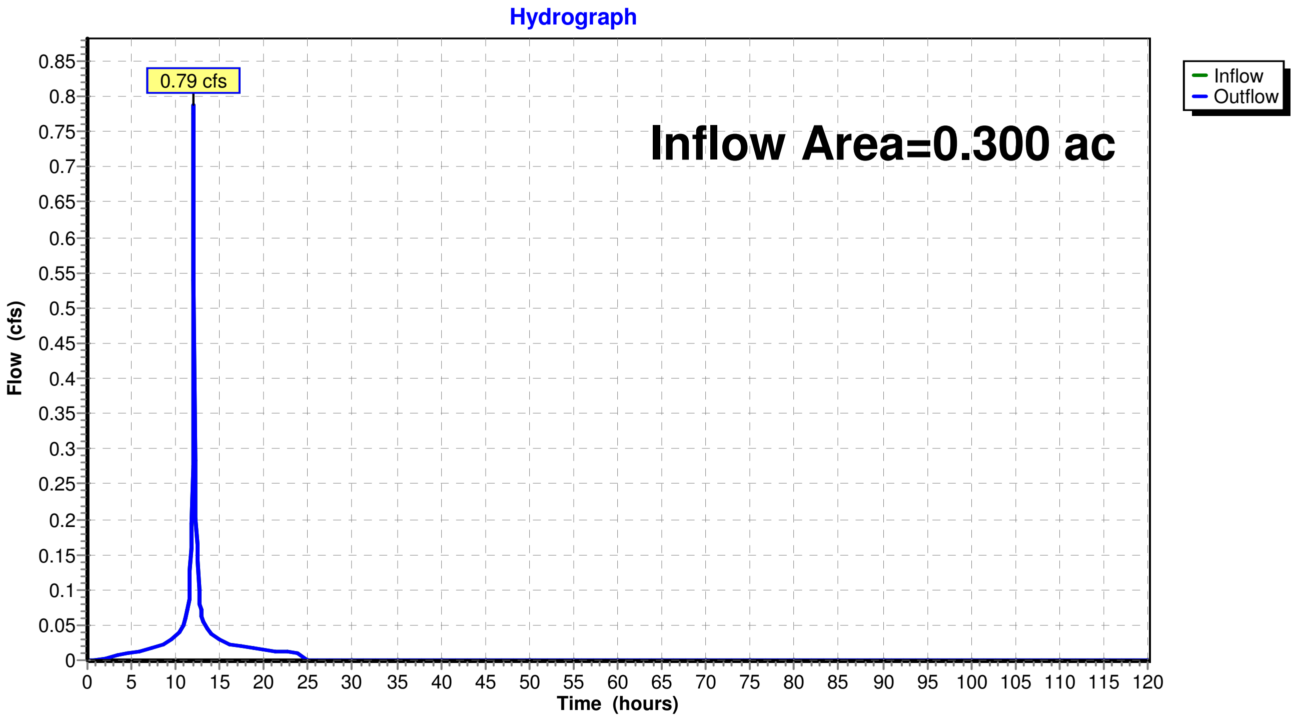


Summary for Reach 1.2P: Hydrodynamic Separator

Inflow Area = 0.300 ac,100.00% Impervious, Inflow Depth = 2.47" for 1-yr event
Inflow = 0.79 cfs @ 12.02 hrs, Volume= 0.062 af
Outflow = 0.79 cfs @ 12.02 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 1.2P: Hydrodynamic Separator

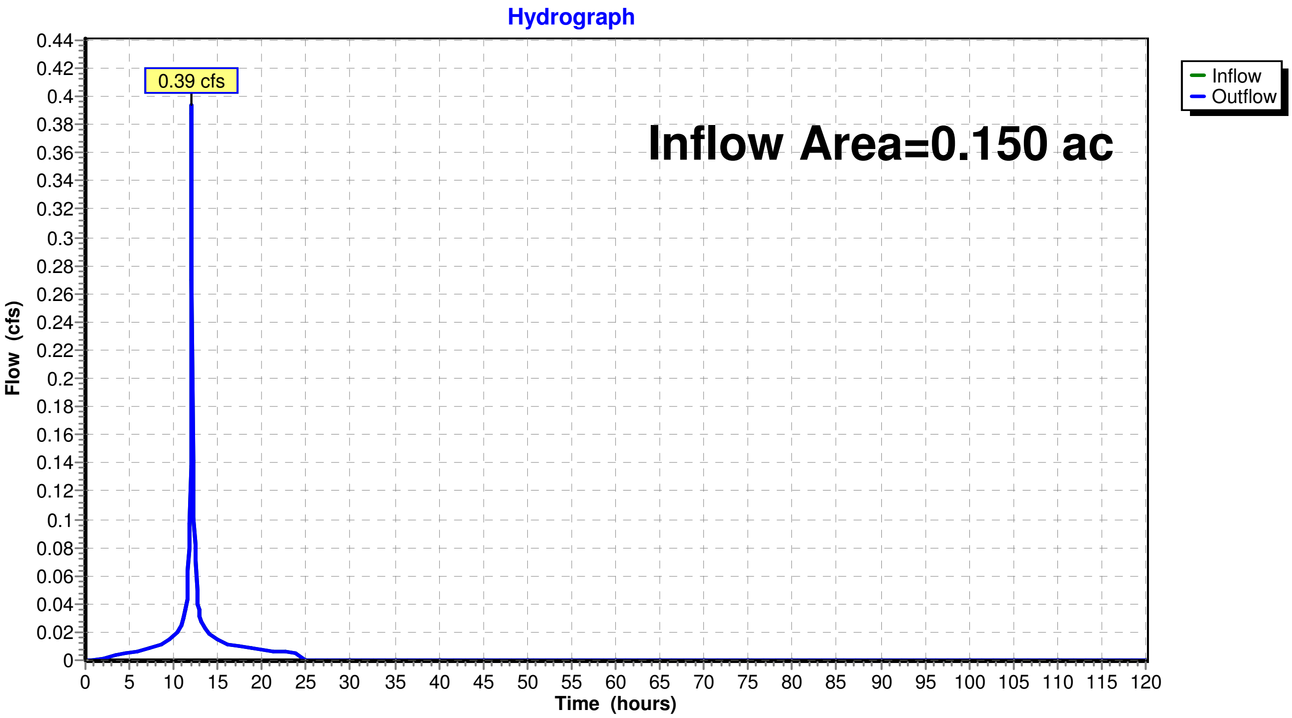


Summary for Reach 2.1P: Hydrodynamic Separator

Inflow Area =	0.150 ac,100.00% Impervious,	Inflow Depth = 2.47"	for 1-yr event	
Inflow =	0.39 cfs @	12.02 hrs, Volume=	0.031 af	
Outflow =	0.39 cfs @	12.02 hrs, Volume=	0.031 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 2.1P: Hydrodynamic Separator

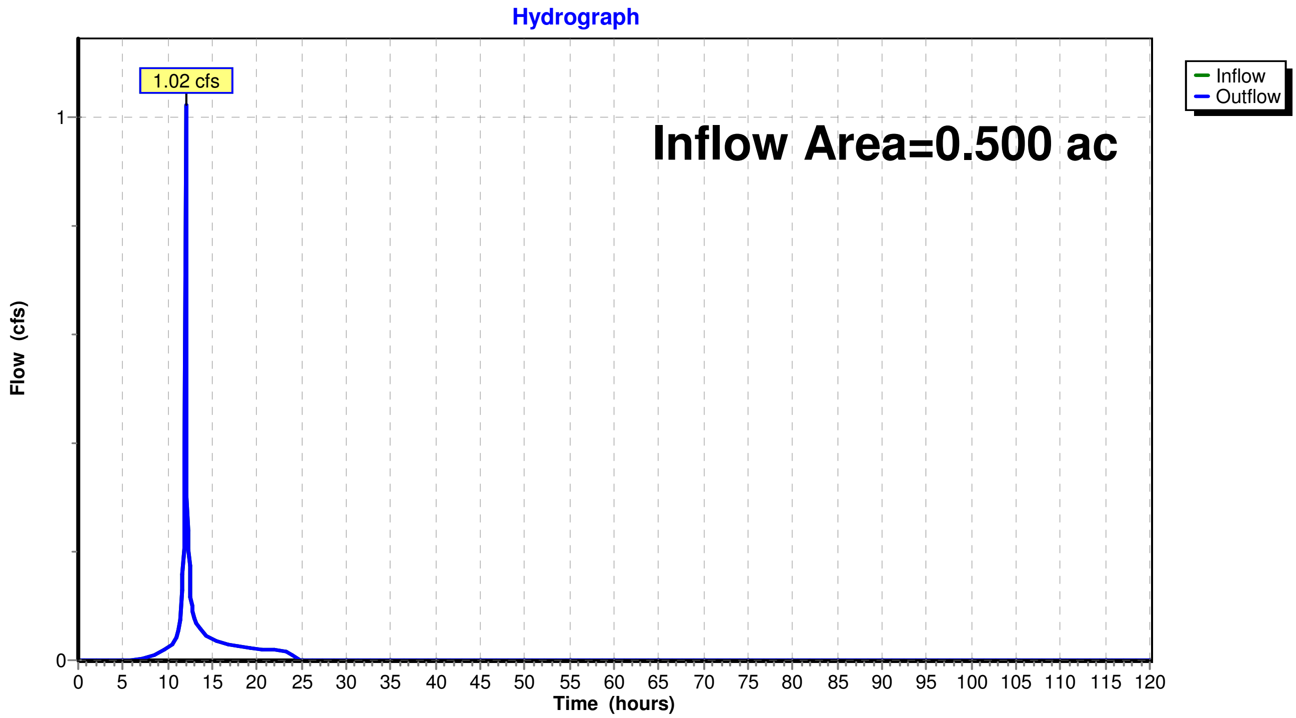


Summary for Reach 2.2P: Hydrodynamic Separator

Inflow Area =	0.500 ac,	60.00% Impervious,	Inflow Depth = 1.55"	for 1-yr event	
Inflow =	1.02 cfs @	12.01 hrs,	Volume=	0.065 af	
Outflow =	1.02 cfs @	12.01 hrs,	Volume=	0.065 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 2.2P: Hydrodynamic Separator

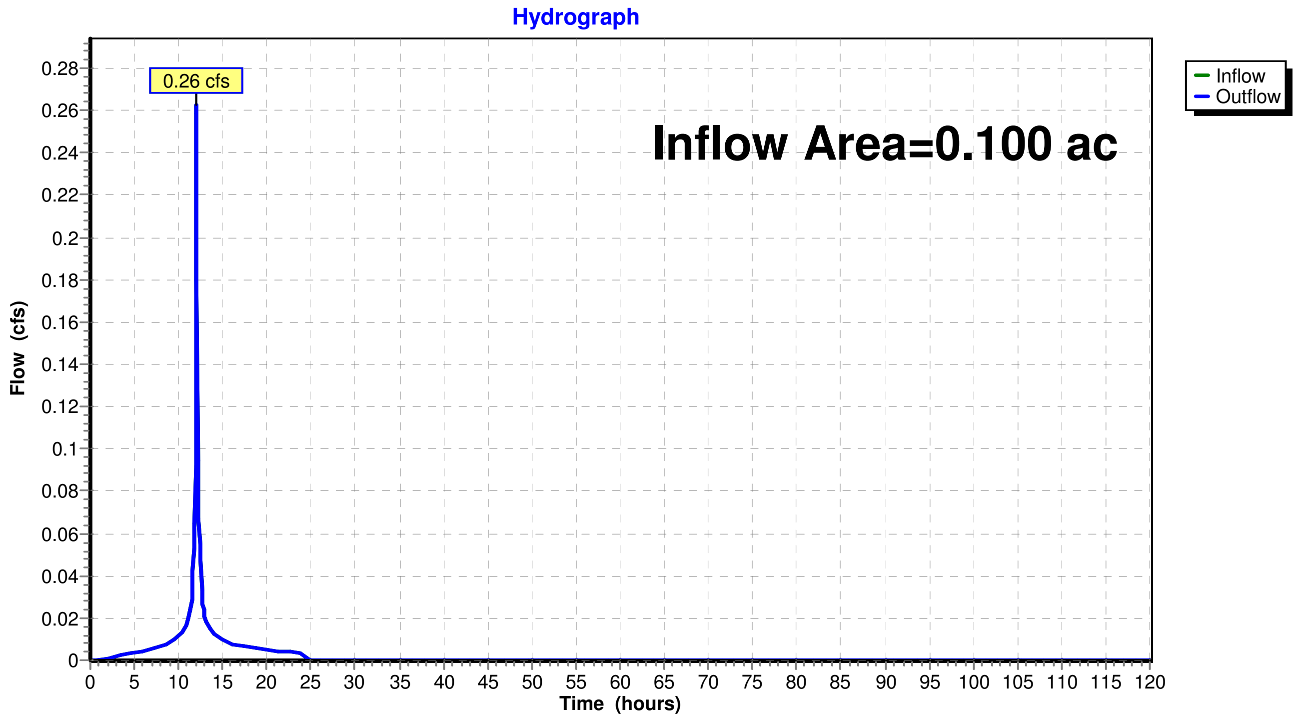


Summary for Reach 2.3P: Hydrodynamic Separator

Inflow Area = 0.100 ac,100.00% Impervious, Inflow Depth = 2.47" for 1-yr event
Inflow = 0.26 cfs @ 12.02 hrs, Volume= 0.021 af
Outflow = 0.26 cfs @ 12.02 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 2.3P: Hydrodynamic Separator

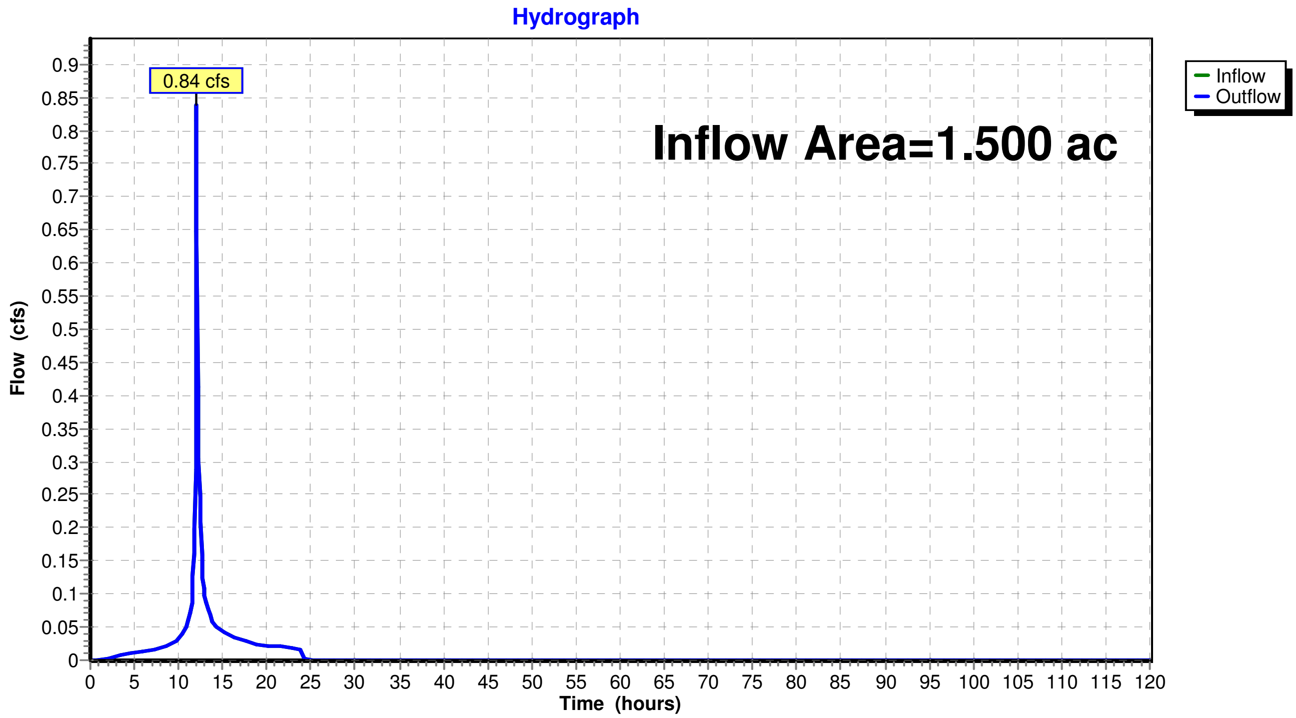


Summary for Reach DL 1:

Inflow Area = 1.500 ac, 66.67% Impervious, Inflow Depth = 0.62" for 1-yr event
Inflow = 0.84 cfs @ 12.03 hrs, Volume= 0.078 af
Outflow = 0.84 cfs @ 12.03 hrs, Volume= 0.078 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach DL 1:

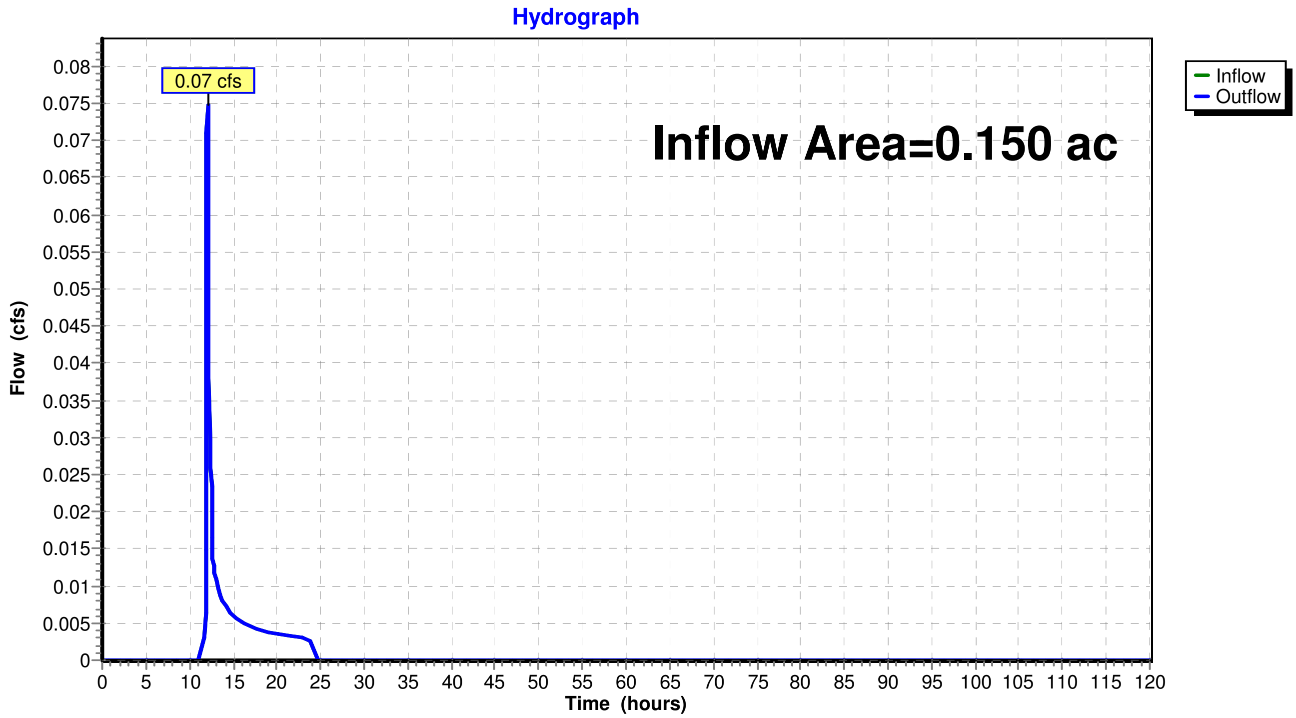


Summary for Reach DL 3:

Inflow Area = 0.150 ac, 0.00% Impervious, Inflow Depth = 0.55" for 1-yr event
Inflow = 0.07 cfs @ 12.03 hrs, Volume= 0.007 af
Outflow = 0.07 cfs @ 12.03 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach DL 3:

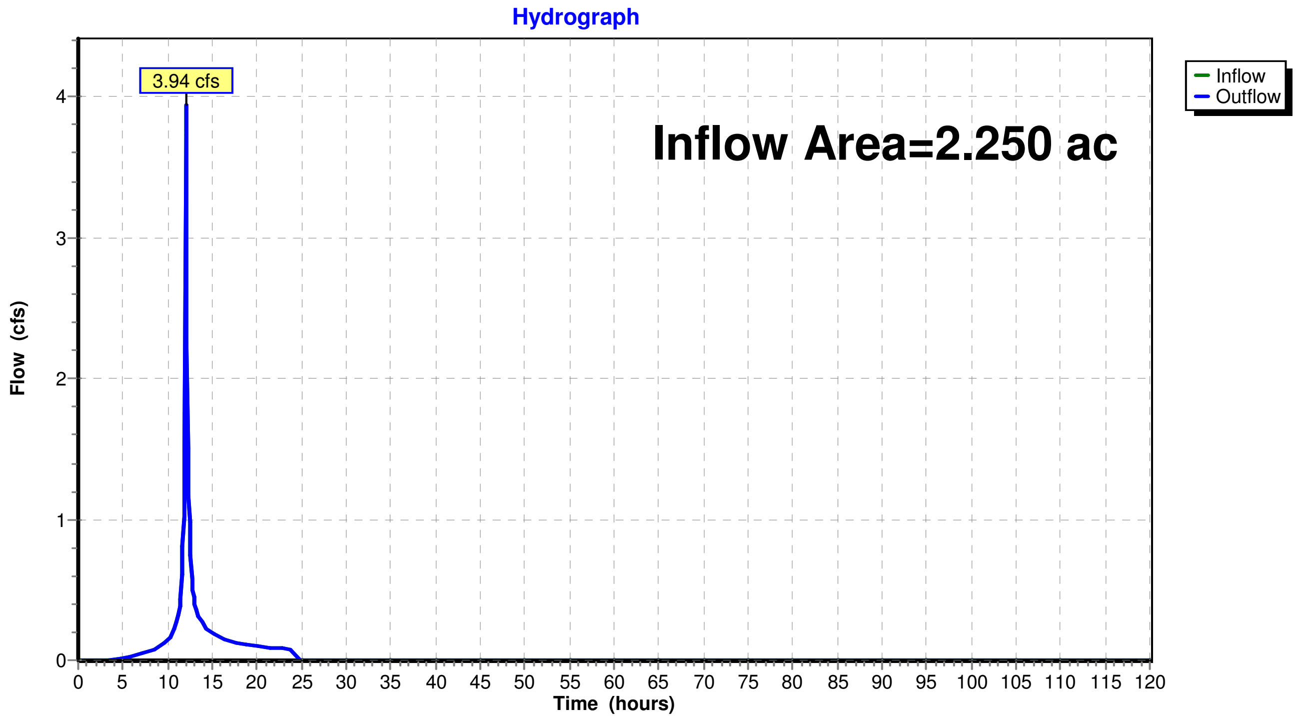


Summary for Reach DP 2:

Inflow Area = 2.250 ac, 75.56% Impervious, Inflow Depth = 1.87" for 1-yr event
Inflow = 3.94 cfs @ 12.05 hrs, Volume= 0.351 af
Outflow = 3.94 cfs @ 12.05 hrs, Volume= 0.351 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach DP 2:



Summary for Pond 1.1P: Infiltration System

Inflow Area = 0.850 ac, 82.35% Impervious, Inflow Depth = 2.06" for 1-yr event
Inflow = 2.17 cfs @ 12.01 hrs, Volume= 0.146 af
Outflow = 0.09 cfs @ 11.10 hrs, Volume= 0.146 af, Atten= 96%, Lag= 0.0 min
Discarded = 0.09 cfs @ 11.10 hrs, Volume= 0.146 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Peak Elev= 489.07' @ 14.38 hrs Surf.Area= 0.059 ac Storage= 0.064 af
Flood Elev= 491.00' Surf.Area= 0.059 ac Storage= 0.131 af

Plug-Flow detention time= 284.7 min calculated for 0.146 af (100% of inflow)
Center-of-Mass det. time= 284.8 min (1,086.0 - 801.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	487.50'	0.050 af	**20.83'W x 122.50'L x 3.54'H Field A**
			0.207 af Overall - 0.082 af Embedded = 0.125 af x 40.0% Voids
#2A	488.00'	0.082 af	**Cultec R-330XLHD** x 68 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		0.132 af	Total Available Storage

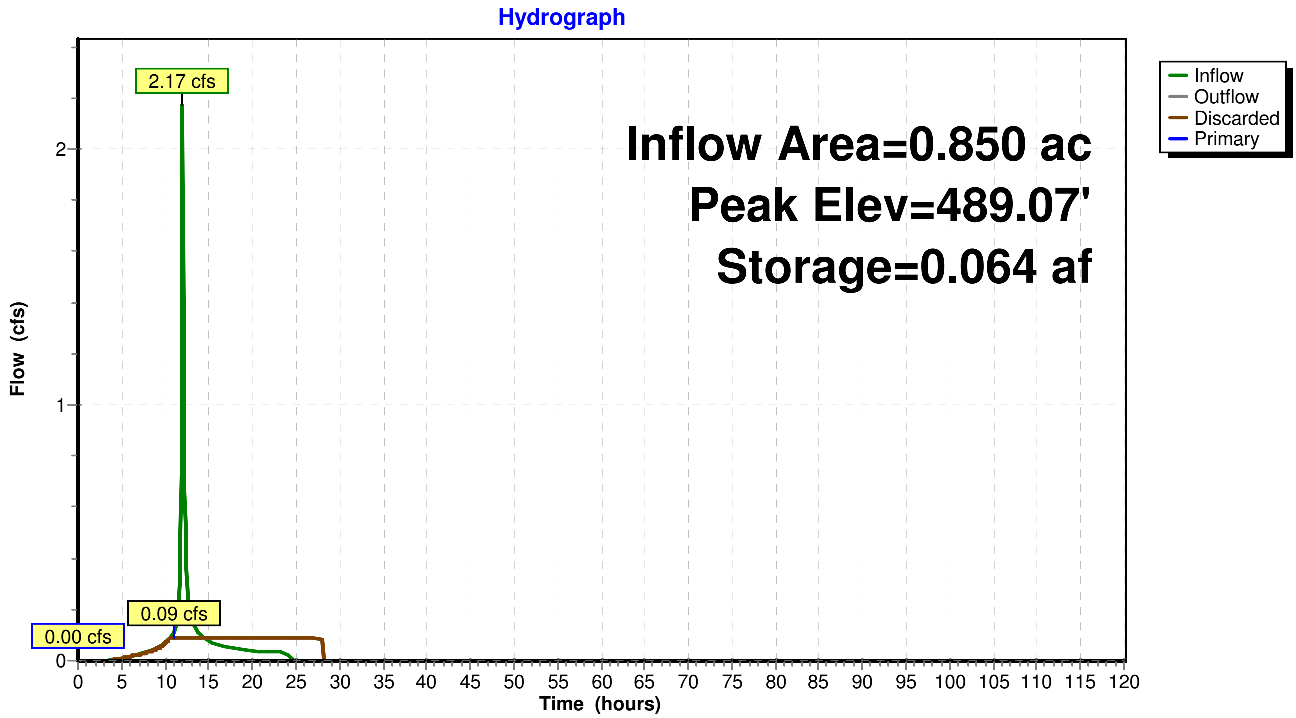
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	487.50'	**1.500 in/hr Exfiltration over Horizontal area** Phase-In= 0.01'
#2	Primary	489.80'	**4.0" Round Culvert**
			L= 10.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 489.80' / 489.70' S= 0.0100 '/' Cc= 0.900
			n= 0.012, Flow Area= 0.09 sf

Discarded OutFlow Max=0.09 cfs @ 11.10 hrs HW=487.55' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=487.50' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.00 cfs)

Pond 1.1P: Infiltration System



Summary for Pond FS: Flow Splitter

Inflow Area = 0.850 ac, 82.35% Impervious, Inflow Depth = 2.06" for 1-yr event
Inflow = 2.17 cfs @ 12.01 hrs, Volume= 0.146 af
Outflow = 2.17 cfs @ 12.01 hrs, Volume= 0.146 af, Atten= 0%, Lag= 0.0 min
Primary = 2.17 cfs @ 12.01 hrs, Volume= 0.146 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

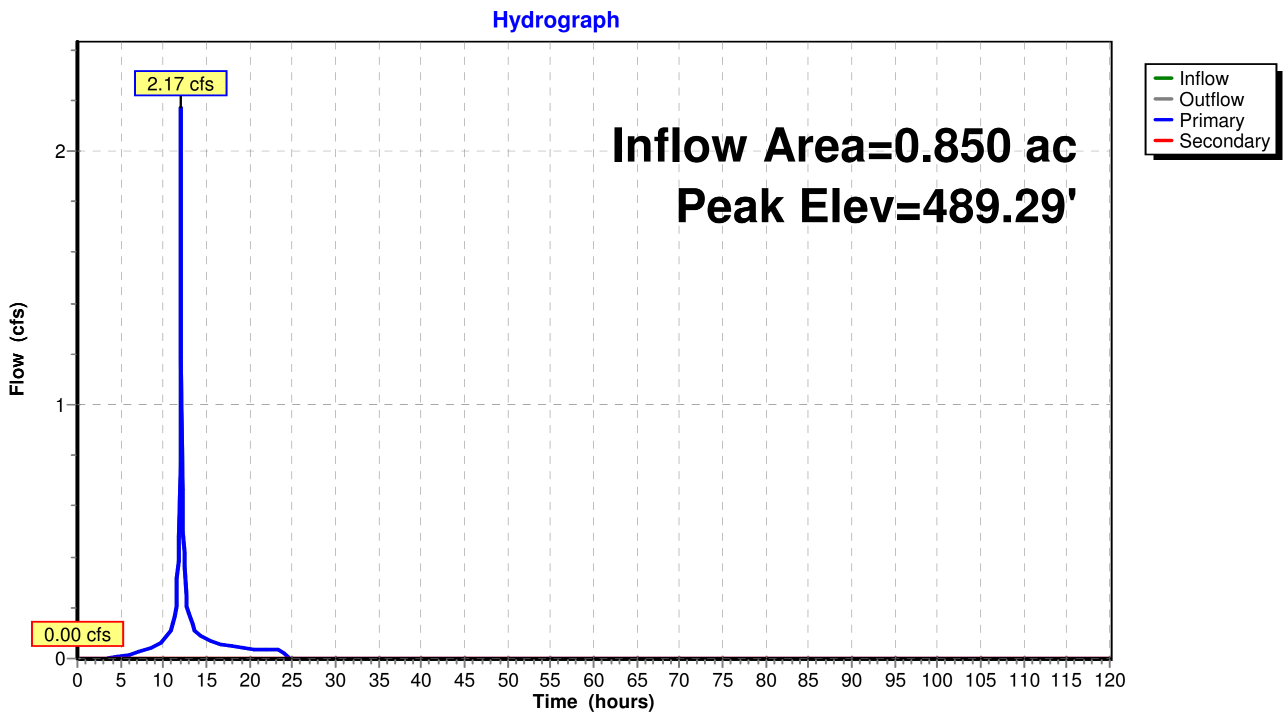
Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Peak Elev= 489.29' @ 12.01 hrs
Flood Elev= 492.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	488.10'	**10.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 488.10' / 488.00' S= 0.0091 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#2	Secondary	489.30'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 489.30' / 488.80' S= 0.0455 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=2.06 cfs @ 12.01 hrs HW=489.25' TW=488.31' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 2.06 cfs @ 3.78 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=488.10' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.00 cfs)

Pond FS: Flow Splitter



Summary for Subcatchment 1.0S:

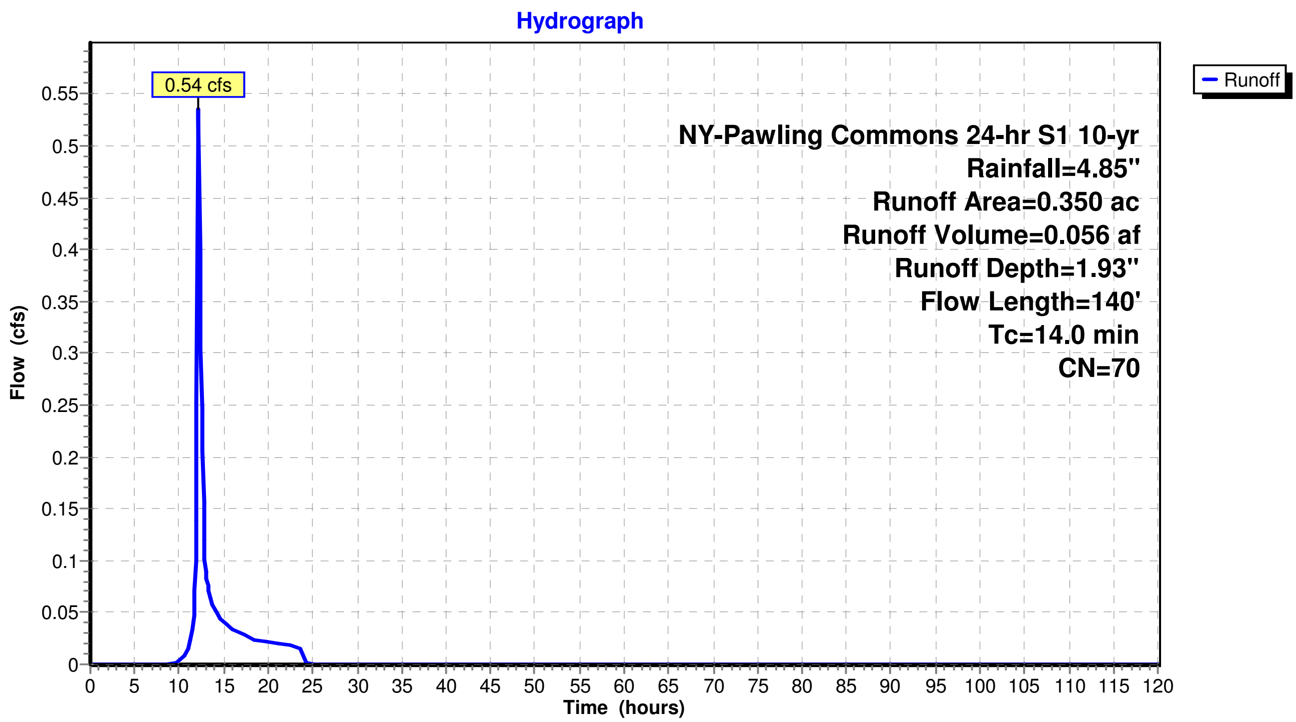
Runoff = 0.54 cfs @ 12.17 hrs, Volume= 0.056 af, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 10-yr Rainfall=4.85"

Area (ac)	CN	Description
0.350	70	Woods, Good, HSG C
0.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0600	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
0.3	40	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.0	140	Total			

Subcatchment 1.0S:



Summary for Subcatchment 1.1S:

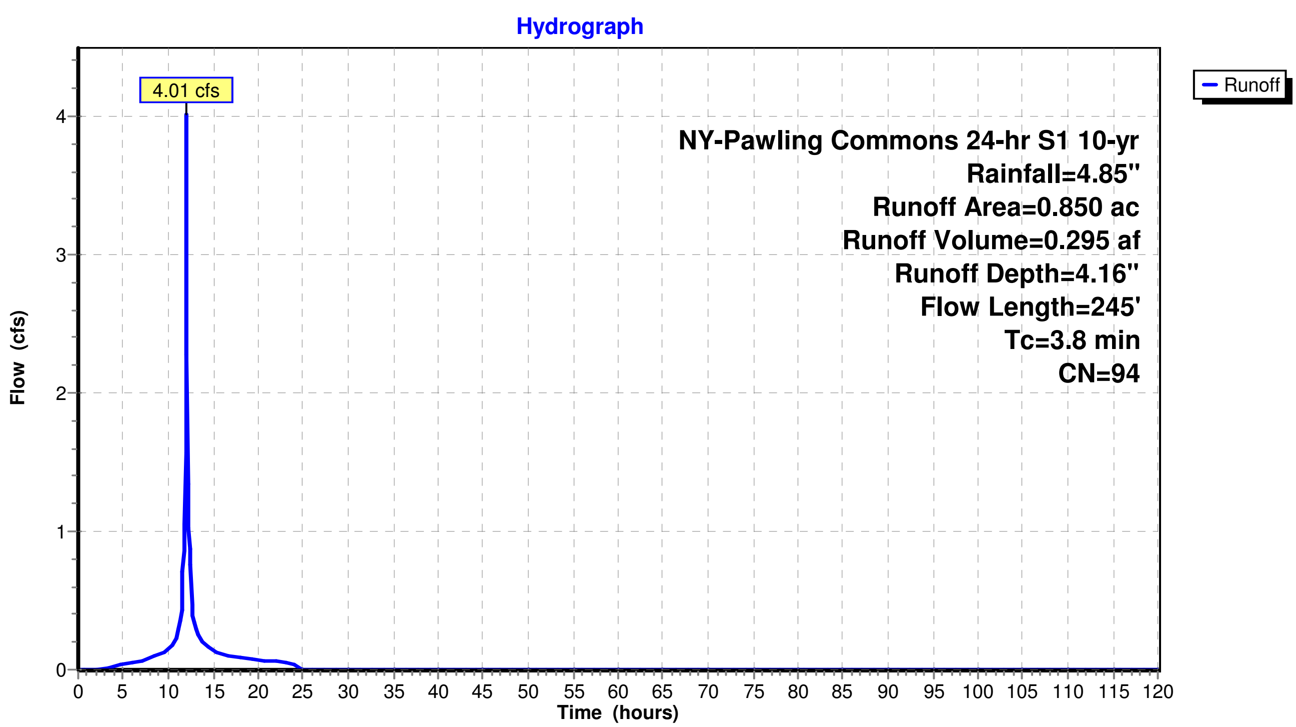
Runoff = 4.01 cfs @ 12.01 hrs, Volume= 0.295 af, Depth= 4.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 10-yr Rainfall=4.85"

Area (ac)	CN	Description
0.700	98	Paved parking, HSG C
0.150	74	>75% Grass cover, Good, HSG C
0.850	94	Weighted Average
0.150		17.65% Pervious Area
0.700		82.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	35	0.5000	0.23		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.26"
1.2	210	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	245	Total			

Subcatchment 1.1S:



Summary for Subcatchment 1.2S:

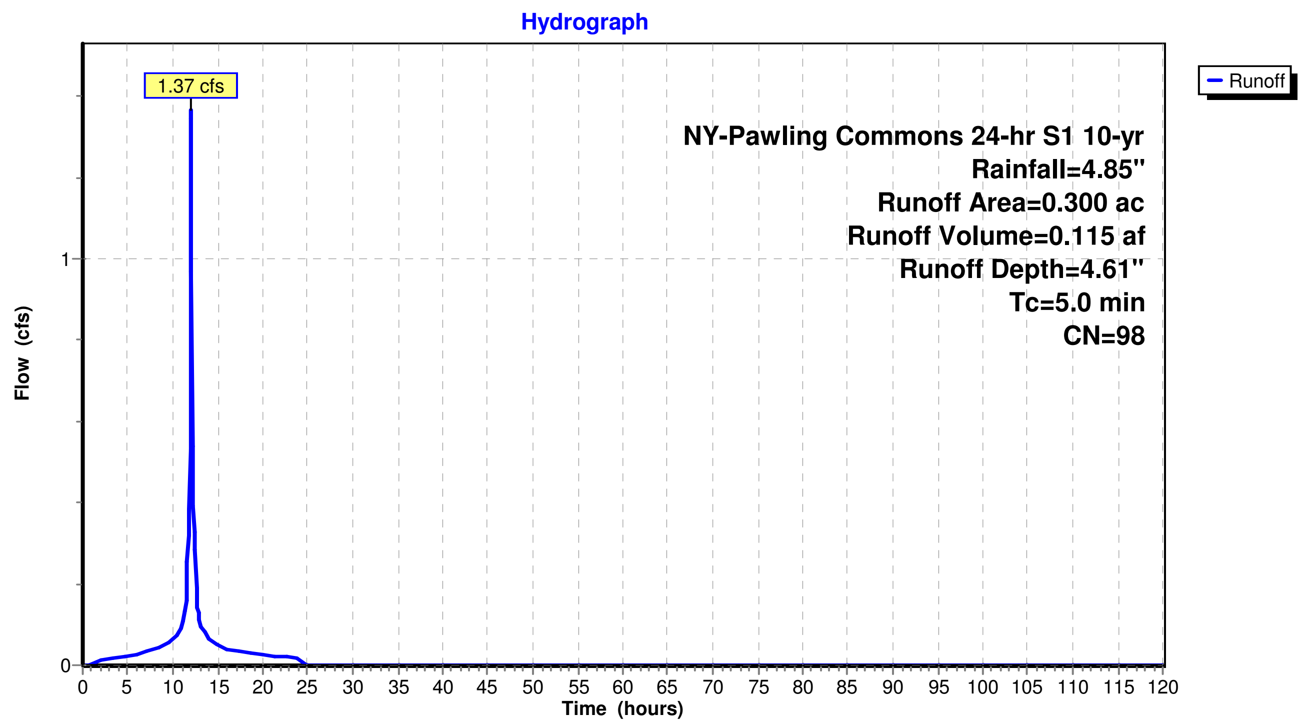
Runoff = 1.37 cfs @ 12.02 hrs, Volume= 0.115 af, Depth= 4.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 10-yr Rainfall=4.85"

Area (ac)	CN	Description
0.300	98	Paved parking, HSG C
0.300		100.00% Impervious Area

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

Subcatchment 1.2S:



Summary for Subcatchment 2.0S:

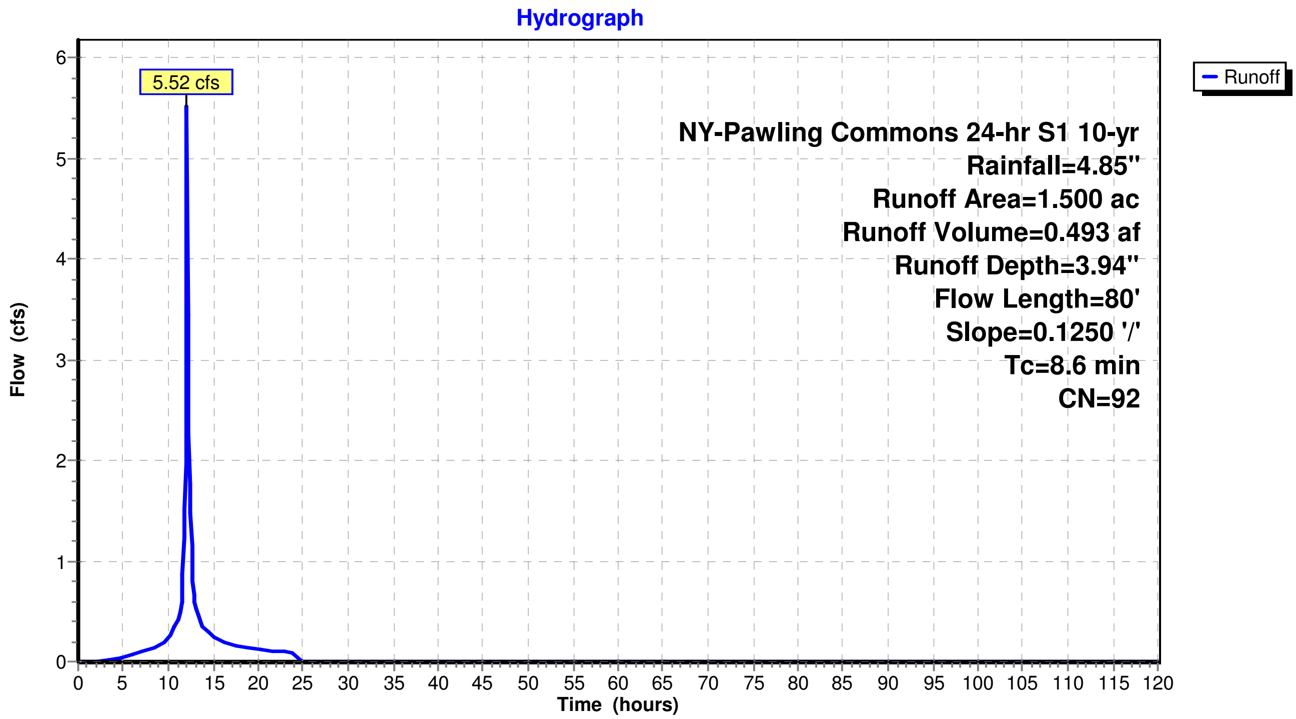
Runoff = 5.52 cfs @ 12.09 hrs, Volume= 0.493 af, Depth= 3.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 10-yr Rainfall=4.85"

Area (ac)	CN	Description
1.150	98	Paved parking, HSG C
0.250	74	>75% Grass cover, Good, HSG C
0.100	70	Woods, Good, HSG C
1.500	92	Weighted Average
0.350		23.33% Pervious Area
1.150		76.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	80	0.1250	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"

Subcatchment 2.0S:



Summary for Subcatchment 2.1S:

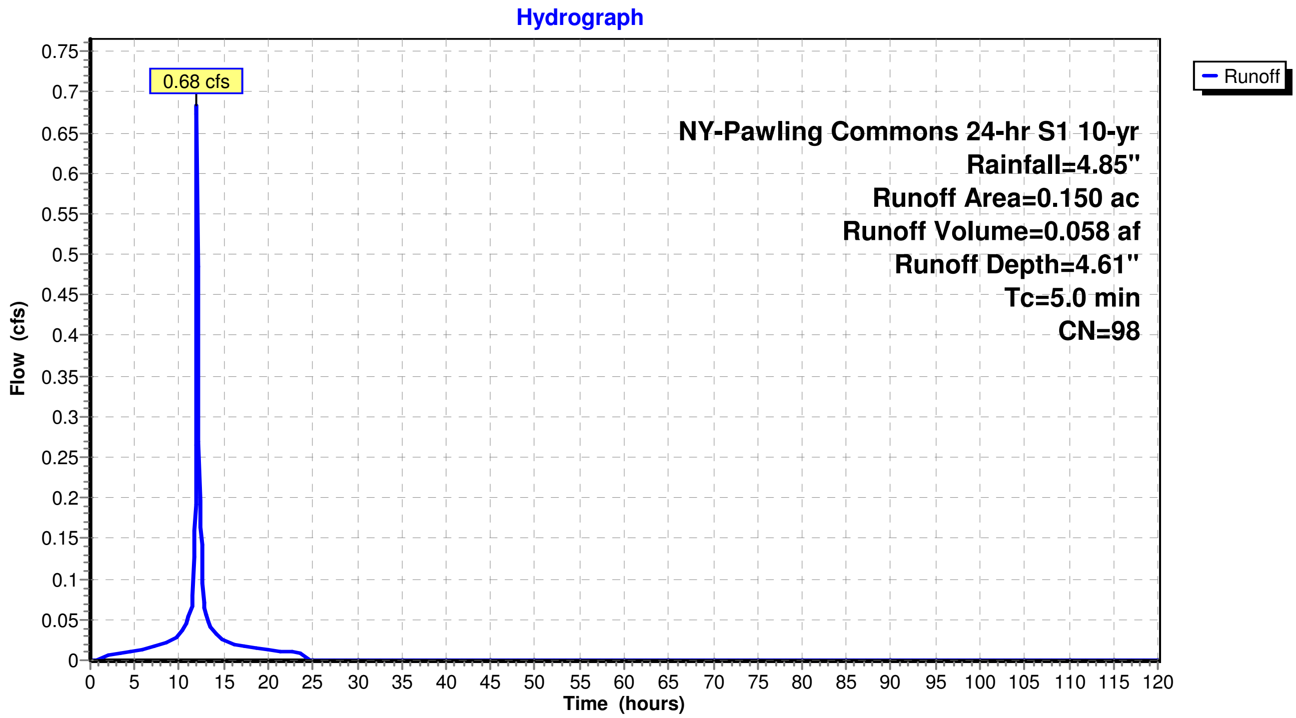
Runoff = 0.68 cfs @ 12.02 hrs, Volume= 0.058 af, Depth= 4.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 10-yr Rainfall=4.85"

Area (ac)	CN	Description
0.150	98	Paved parking, HSG C
0.150		100.00% Impervious Area

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

Subcatchment 2.1S:



Summary for Subcatchment 2.2S:

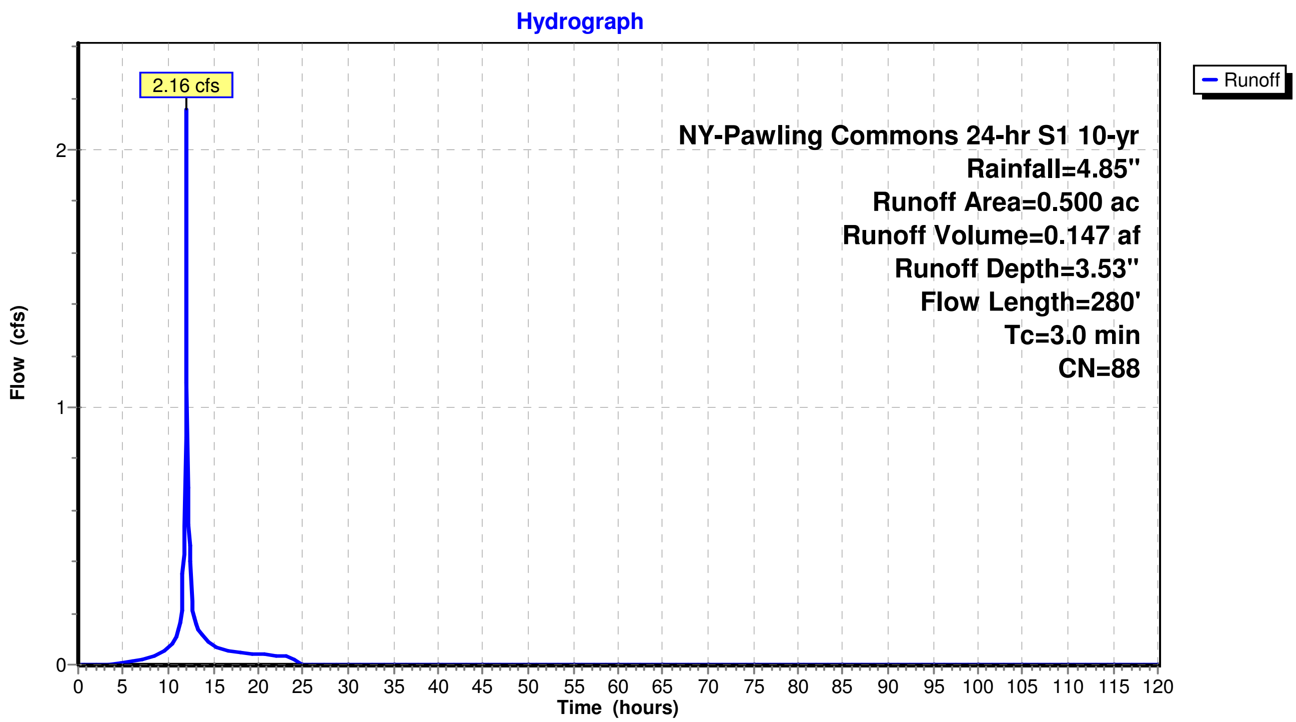
Runoff = 2.16 cfs @ 12.00 hrs, Volume= 0.147 af, Depth= 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 10-yr Rainfall=4.85"

Area (ac)	CN	Description
0.300	98	Paved parking, HSG C
0.200	74	>75% Grass cover, Good, HSG C
0.500	88	Weighted Average
0.200		40.00% Pervious Area
0.300		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	30	0.5000	0.34		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.26"
1.5	250	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	280	Total			

Subcatchment 2.2S:



Summary for Subcatchment 2.3S:

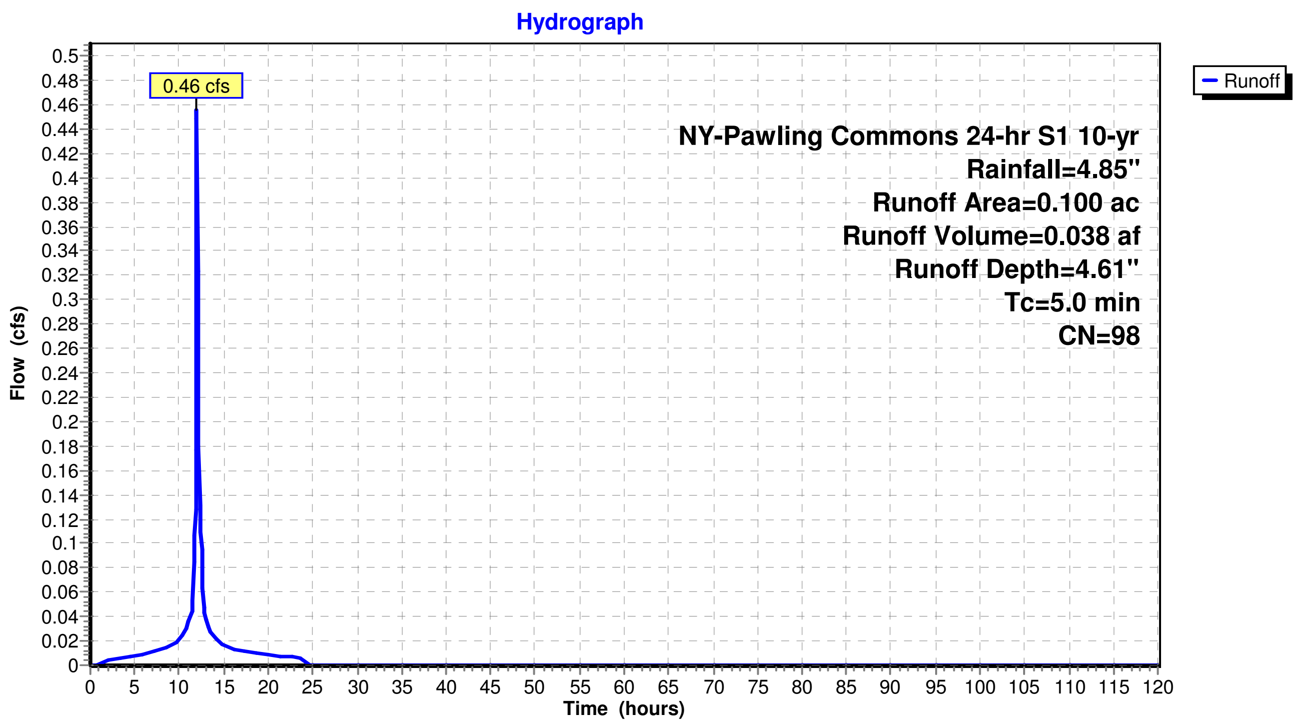
Runoff = 0.46 cfs @ 12.02 hrs, Volume= 0.038 af, Depth= 4.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 10-yr Rainfall=4.85"

Area (ac)	CN	Description
0.100	98	Paved parking, HSG C
0.100		100.00% Impervious Area

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

Subcatchment 2.3S:



Summary for Subcatchment 3.0S:

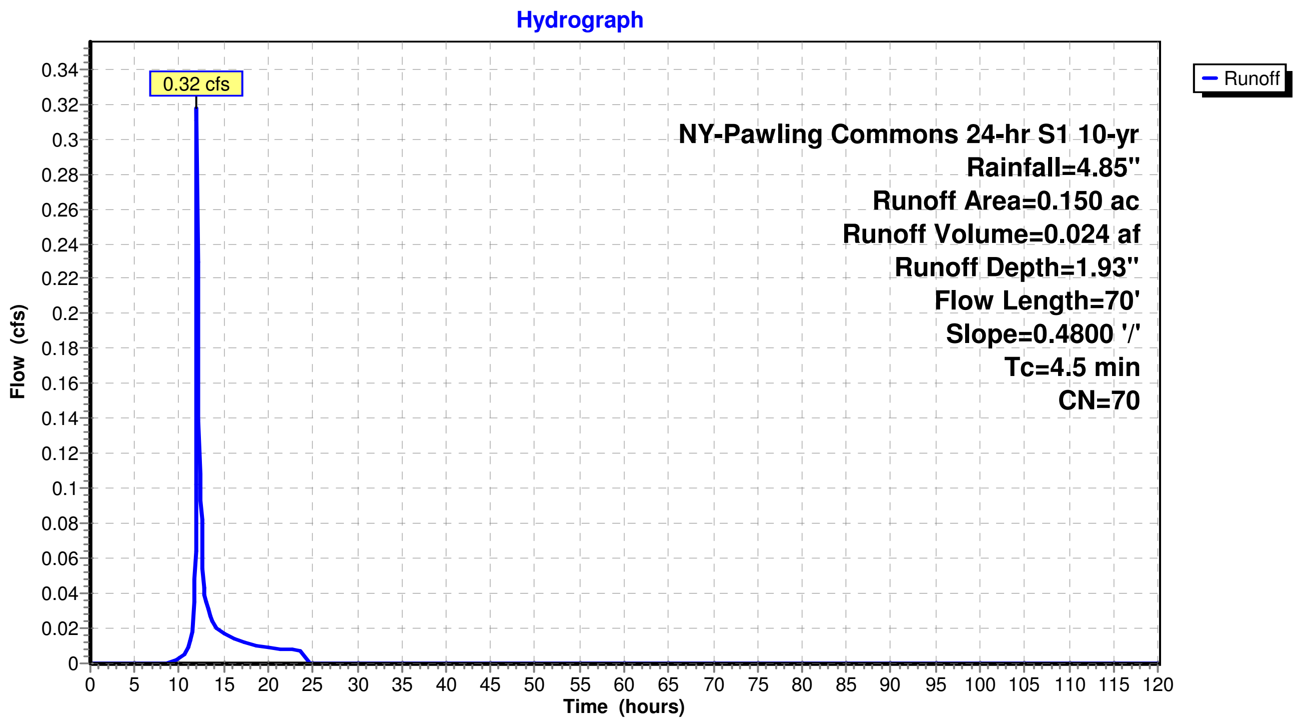
Runoff = 0.32 cfs @ 12.02 hrs, Volume= 0.024 af, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 10-yr Rainfall=4.85"

Area (ac)	CN	Description
0.150	70	Woods, Good, HSG C
0.150		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	70	0.4800	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"

Subcatchment 3.0S:

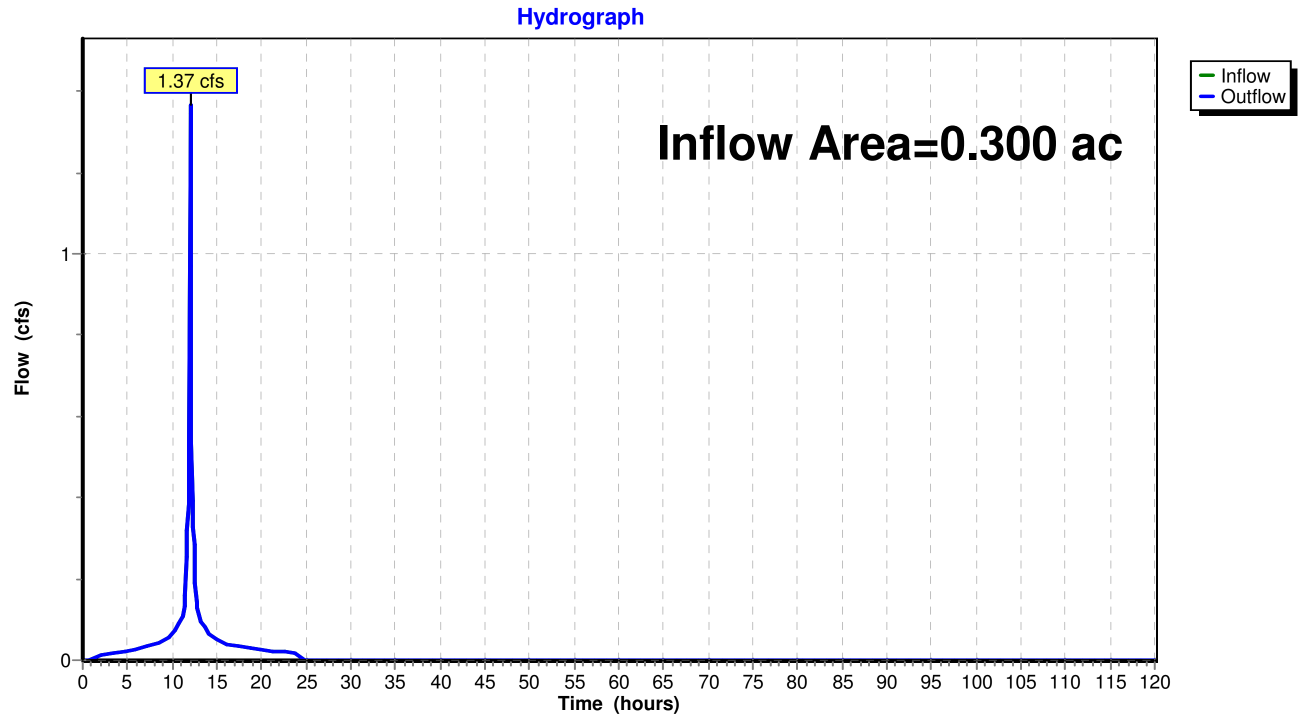


Summary for Reach 1.2P: Hydrodynamic Separator

Inflow Area =	0.300 ac,100.00% Impervious,	Inflow Depth = 4.61"	for 10-yr event		
Inflow =	1.37 cfs @	12.02 hrs, Volume=	0.115 af		
Outflow =	1.37 cfs @	12.02 hrs, Volume=	0.115 af,	Atten= 0%,	Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 1.2P: Hydrodynamic Separator

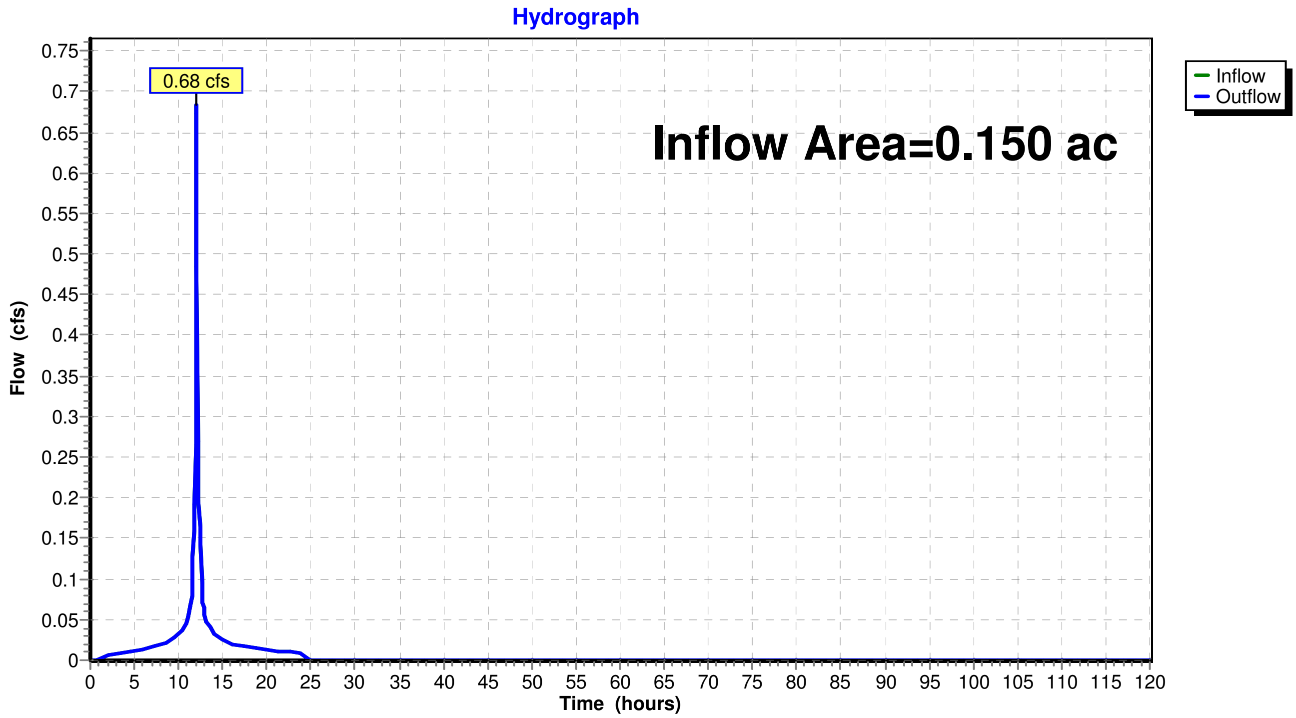


Summary for Reach 2.1P: Hydrodynamic Separator

Inflow Area = 0.150 ac,100.00% Impervious, Inflow Depth = 4.61" for 10-yr event
Inflow = 0.68 cfs @ 12.02 hrs, Volume= 0.058 af
Outflow = 0.68 cfs @ 12.02 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 2.1P: Hydrodynamic Separator

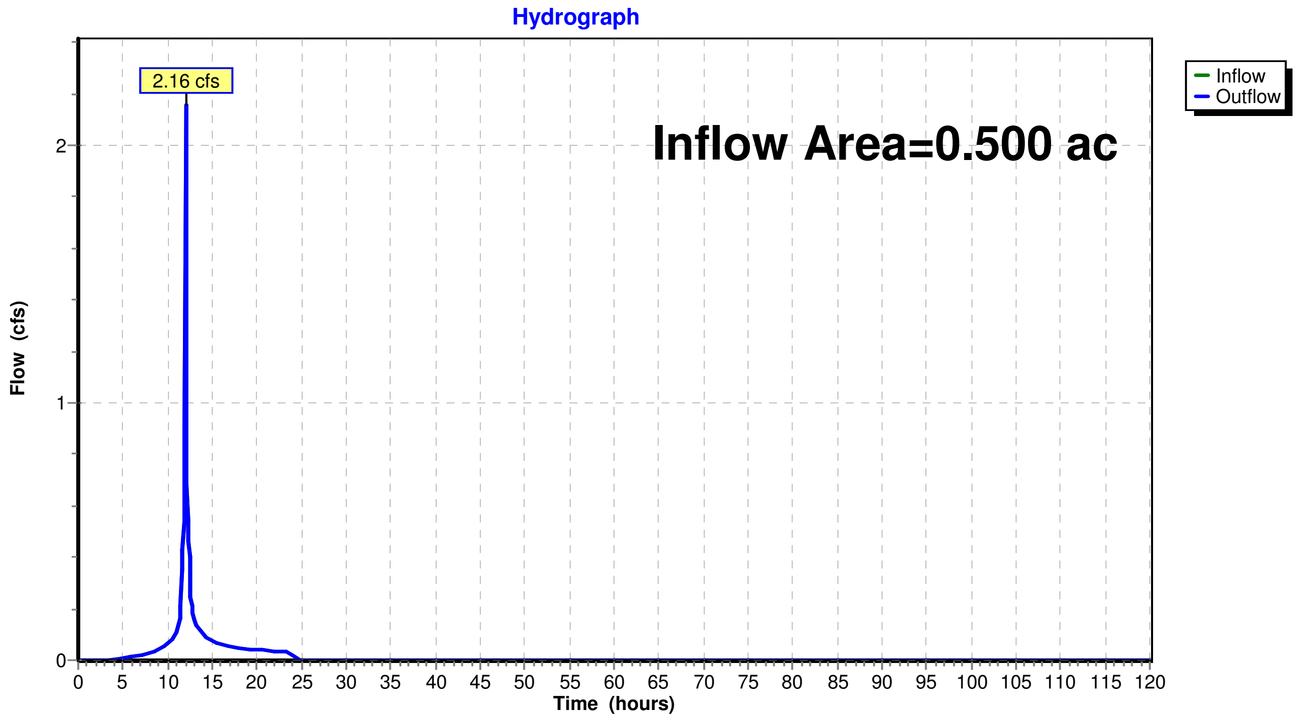


Summary for Reach 2.2P: Hydrodynamic Separator

Inflow Area =	0.500 ac, 60.00% Impervious, Inflow Depth = 3.53"	for 10-yr event	
Inflow =	2.16 cfs @ 12.00 hrs, Volume=	0.147 af	
Outflow =	2.16 cfs @ 12.00 hrs, Volume=	0.147 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 2.2P: Hydrodynamic Separator

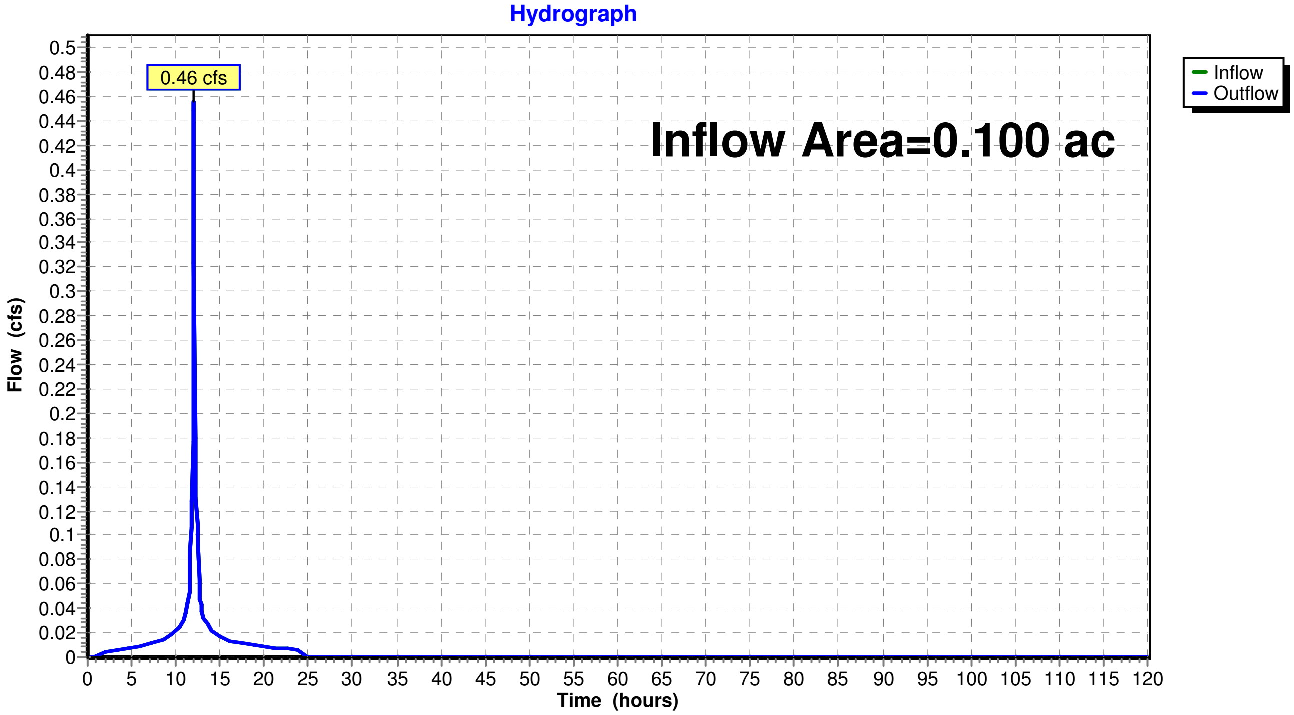


Summary for Reach 2.3P: Hydrodynamic Separator

Inflow Area = 0.100 ac,100.00% Impervious, Inflow Depth = 4.61" for 10-yr event
Inflow = 0.46 cfs @ 12.02 hrs, Volume= 0.038 af
Outflow = 0.46 cfs @ 12.02 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 2.3P: Hydrodynamic Separator

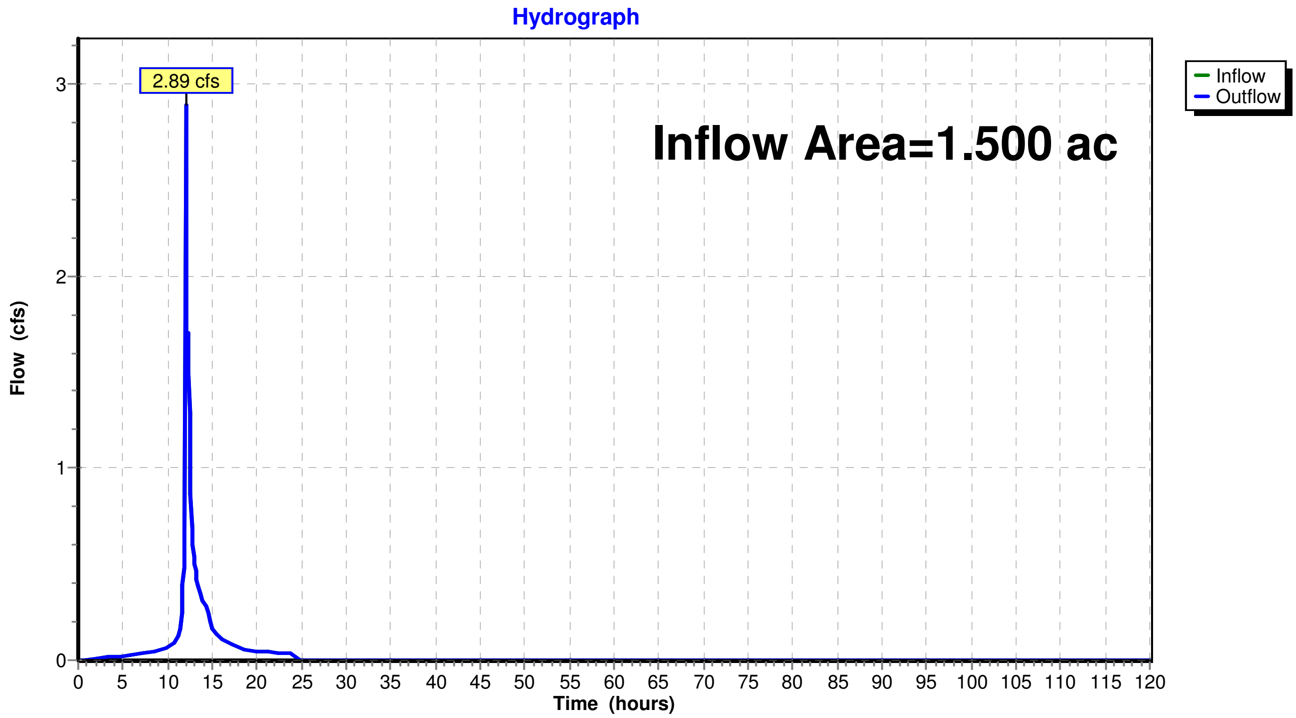


Summary for Reach DL 1:

Inflow Area =	1.500 ac,	66.67% Impervious,	Inflow Depth = 2.12"	for 10-yr event
Inflow =	2.89 cfs @	12.02 hrs, Volume=	0.265 af	
Outflow =	2.89 cfs @	12.02 hrs, Volume=	0.265 af, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach DL 1:

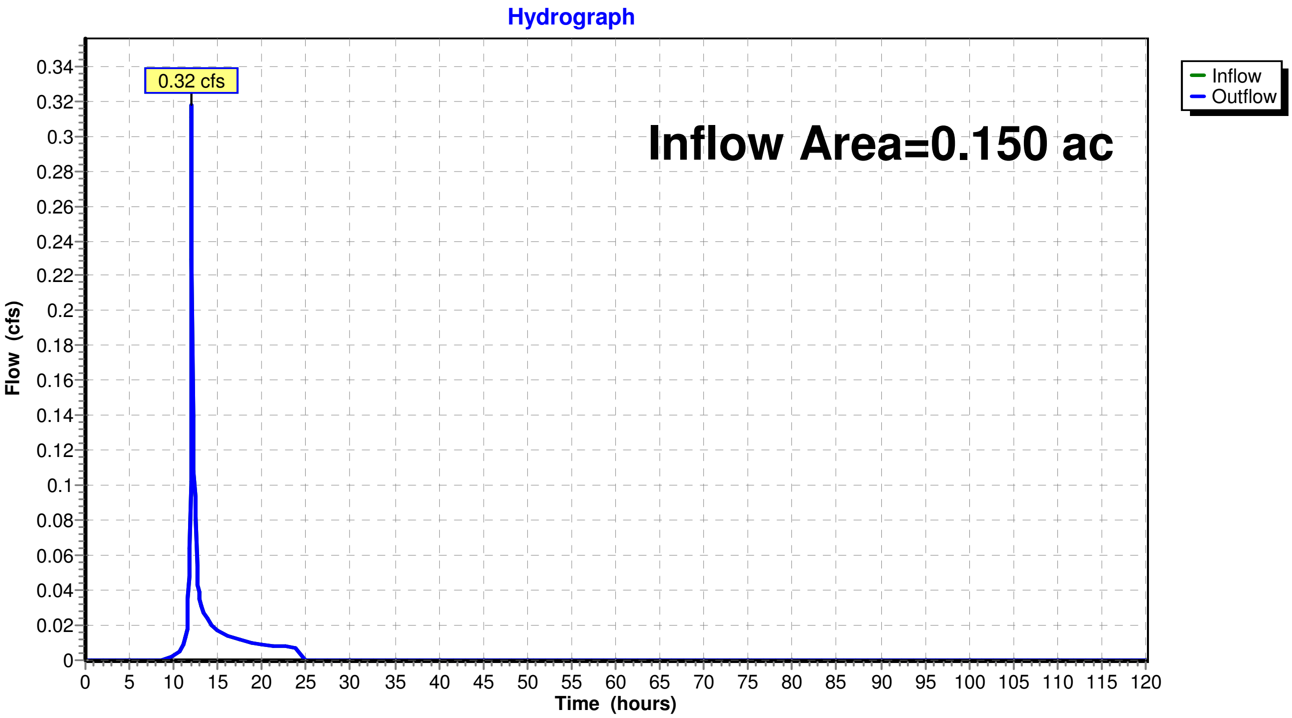


Summary for Reach DL 3:

Inflow Area = 0.150 ac, 0.00% Impervious, Inflow Depth = 1.93" for 10-yr event
Inflow = 0.32 cfs @ 12.02 hrs, Volume= 0.024 af
Outflow = 0.32 cfs @ 12.02 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach DL 3:

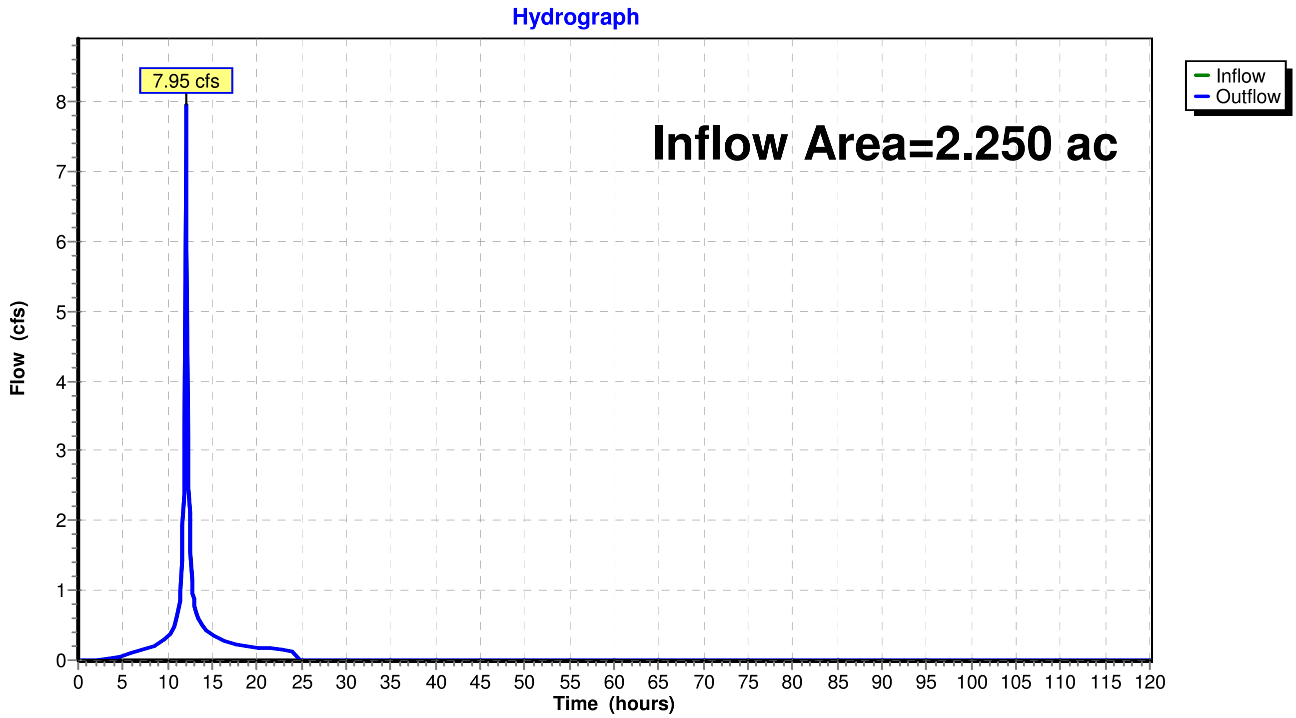


Summary for Reach DP 2:

Inflow Area =	2.250 ac,	75.56% Impervious,	Inflow Depth = 3.92"	for 10-yr event
Inflow =	7.95 cfs @	12.05 hrs, Volume=	0.736 af	
Outflow =	7.95 cfs @	12.05 hrs, Volume=	0.736 af, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach DP 2:



Summary for Pond 1.1P: Infiltration System

Inflow Area = 0.850 ac, 82.35% Impervious, Inflow Depth = 2.85" for 10-yr event
Inflow = 2.77 cfs @ 12.01 hrs, Volume= 0.202 af
Outflow = 0.10 cfs @ 12.33 hrs, Volume= 0.202 af, Atten= 96%, Lag= 19.6 min
Discarded = 0.09 cfs @ 9.10 hrs, Volume= 0.202 af
Primary = 0.01 cfs @ 12.33 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Peak Elev= 489.87' @ 12.34 hrs Surf.Area= 0.059 ac Storage= 0.099 af
Flood Elev= 491.00' Surf.Area= 0.059 ac Storage= 0.131 af

Plug-Flow detention time= 376.1 min calculated for 0.202 af (100% of inflow)
Center-of-Mass det. time= 376.6 min (1,146.4 - 769.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	487.50'	0.050 af	**20.83'W x 122.50'L x 3.54'H Field A** 0.207 af Overall - 0.082 af Embedded = 0.125 af x 40.0% Voids
#2A	488.00'	0.082 af	**Cultec R-330XLHD** x 68 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		0.132 af	Total Available Storage

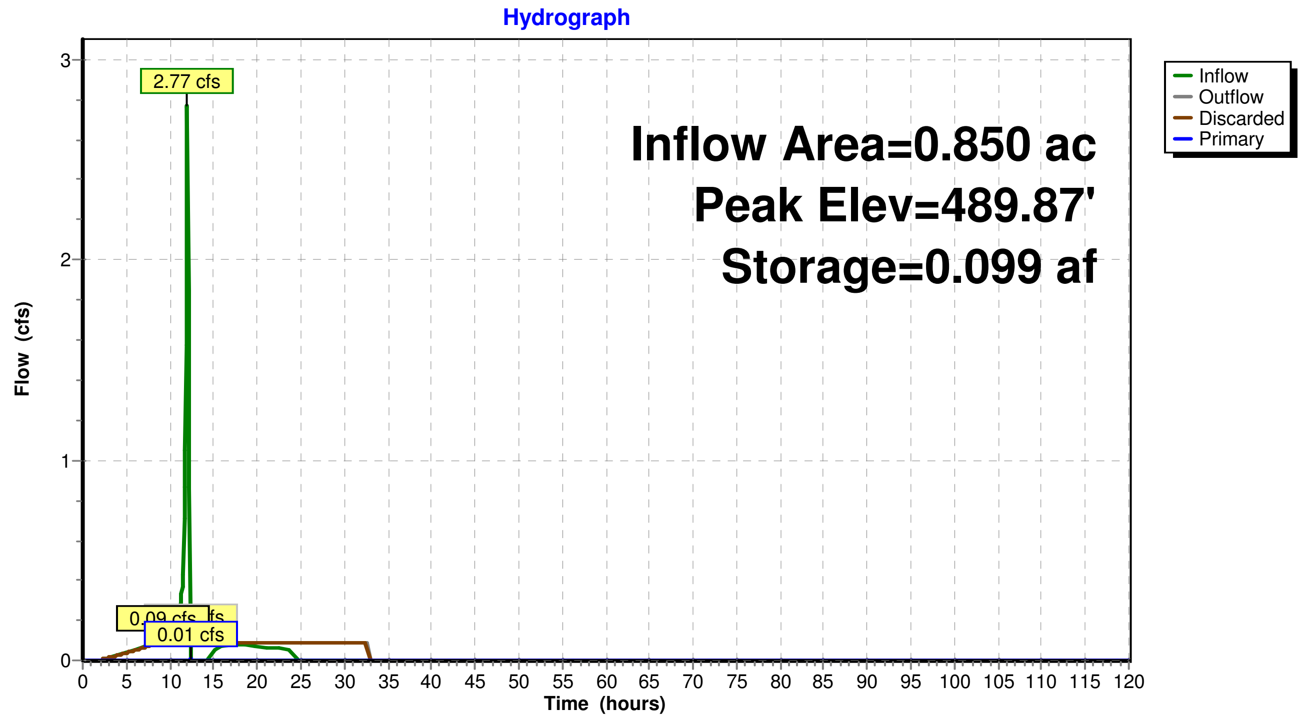
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	487.50'	**1.500 in/hr Exfiltration over Horizontal area** Phase-In= 0.01'
#2	Primary	489.80'	**4.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 489.80' / 489.70' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.09 sf

Discarded OutFlow Max=0.09 cfs @ 9.10 hrs HW=487.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.01 cfs @ 12.33 hrs HW=489.86' TW=0.00' (Dynamic Tailwater)
↑**2=Culvert** (Barrel Controls 0.01 cfs @ 1.11 fps)

Pond 1.1P: Infiltration System



Summary for Pond FS: Flow Splitter

Inflow Area = 0.850 ac, 82.35% Impervious, Inflow Depth = 4.16" for 10-yr event
Inflow = 4.01 cfs @ 12.01 hrs, Volume= 0.295 af
Outflow = 4.01 cfs @ 12.01 hrs, Volume= 0.295 af, Atten= 0%, Lag= 0.0 min
Primary = 2.77 cfs @ 12.01 hrs, Volume= 0.202 af
Secondary = 1.25 cfs @ 12.01 hrs, Volume= 0.093 af

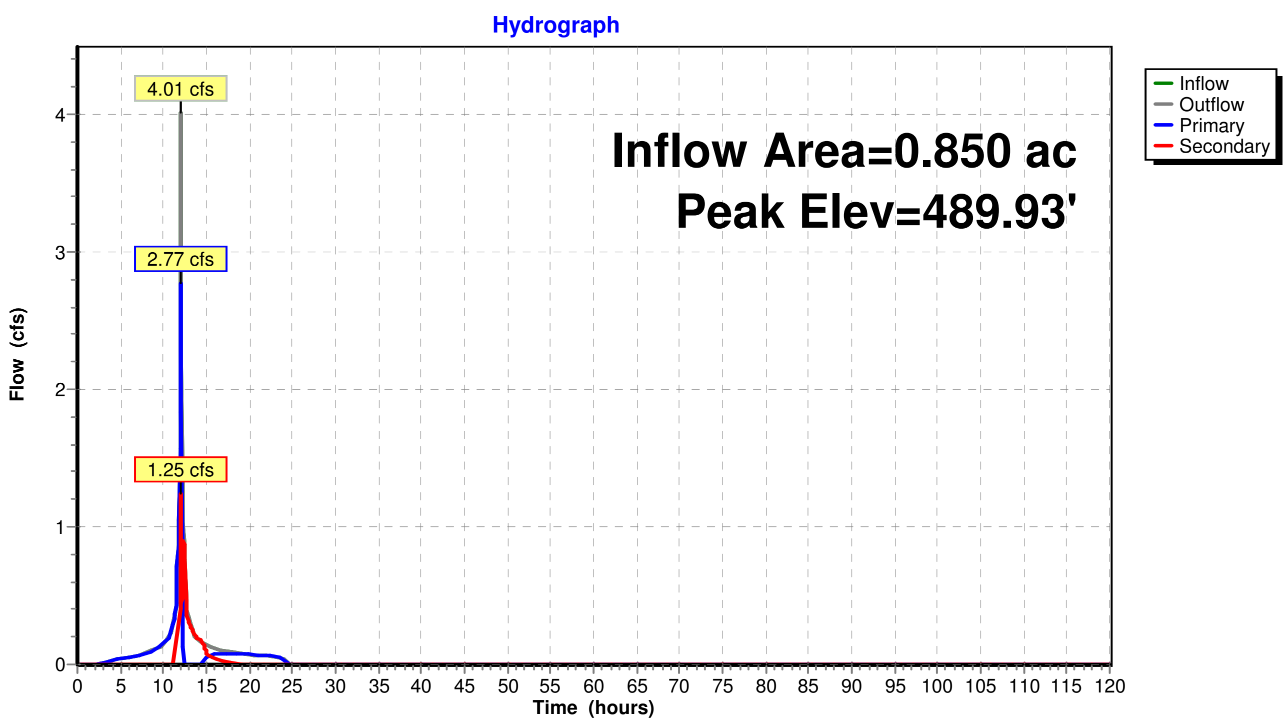
Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Peak Elev= 489.93' @ 12.03 hrs
Flood Elev= 492.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	488.10'	**10.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 488.10' / 488.00' S= 0.0091 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#2	Secondary	489.30'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 489.30' / 488.80' S= 0.0455 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=2.20 cfs @ 12.01 hrs HW=489.87' TW=489.16' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.20 cfs @ 4.04 fps)

Secondary OutFlow Max=1.14 cfs @ 12.01 hrs HW=489.86' TW=0.00' (Dynamic Tailwater)
2=Culvert (Inlet Controls 1.14 cfs @ 2.54 fps)

Pond FS: Flow Splitter



Summary for Subcatchment 1.0S:

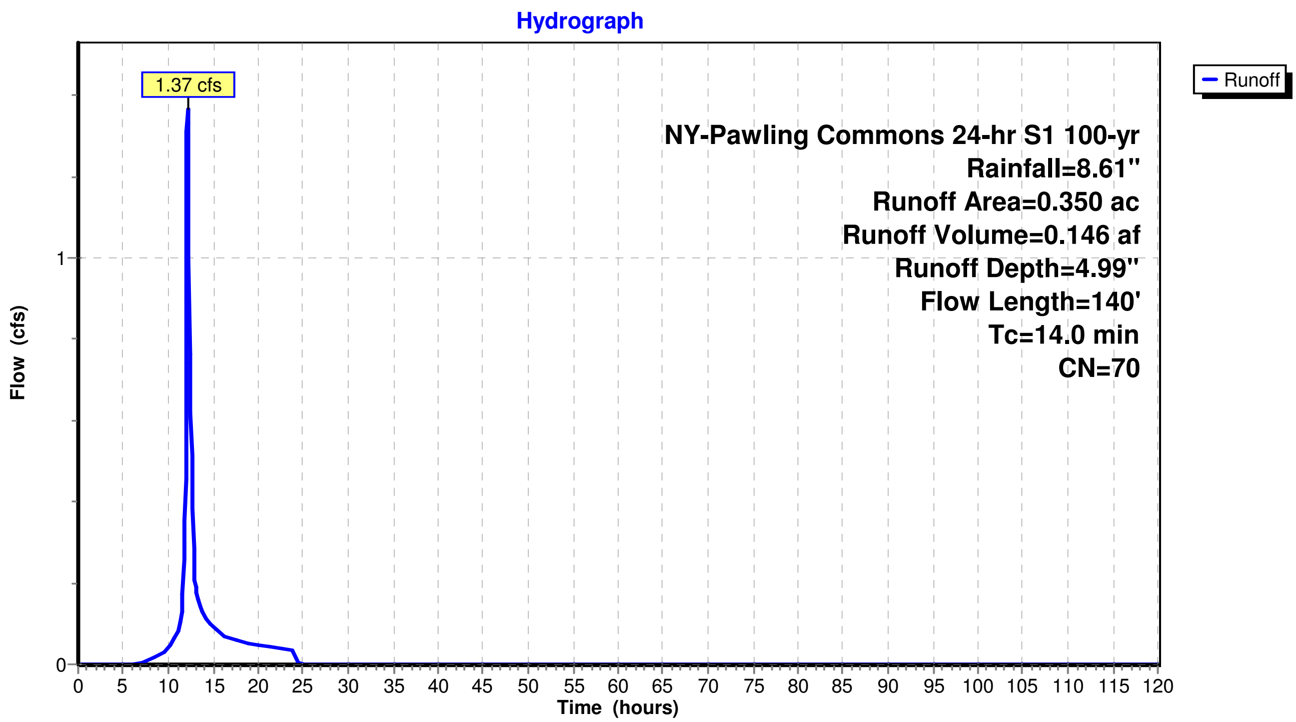
Runoff = 1.37 cfs @ 12.16 hrs, Volume= 0.146 af, Depth= 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 100-yr Rainfall=8.61"

Area (ac)	CN	Description
0.350	70	Woods, Good, HSG C
0.350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	100	0.0600	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"
0.3	40	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.0	140	Total			

Subcatchment 1.0S:



Summary for Subcatchment 1.1S:

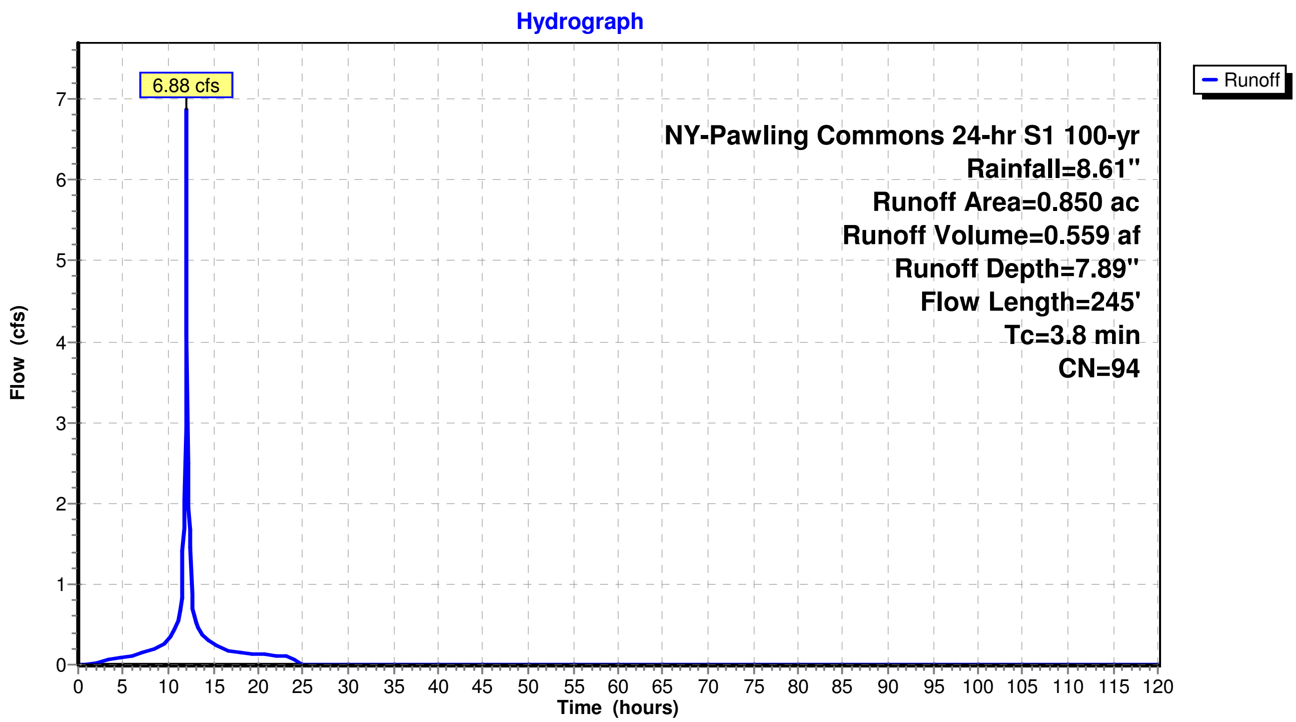
Runoff = 6.88 cfs @ 12.01 hrs, Volume= 0.559 af, Depth= 7.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 100-yr Rainfall=8.61"

Area (ac)	CN	Description
0.700	98	Paved parking, HSG C
0.150	74	>75% Grass cover, Good, HSG C
0.850	94	Weighted Average
0.150		17.65% Pervious Area
0.700		82.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	35	0.5000	0.23		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.26"
1.2	210	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	245	Total			

Subcatchment 1.1S:



Summary for Subcatchment 1.2S:

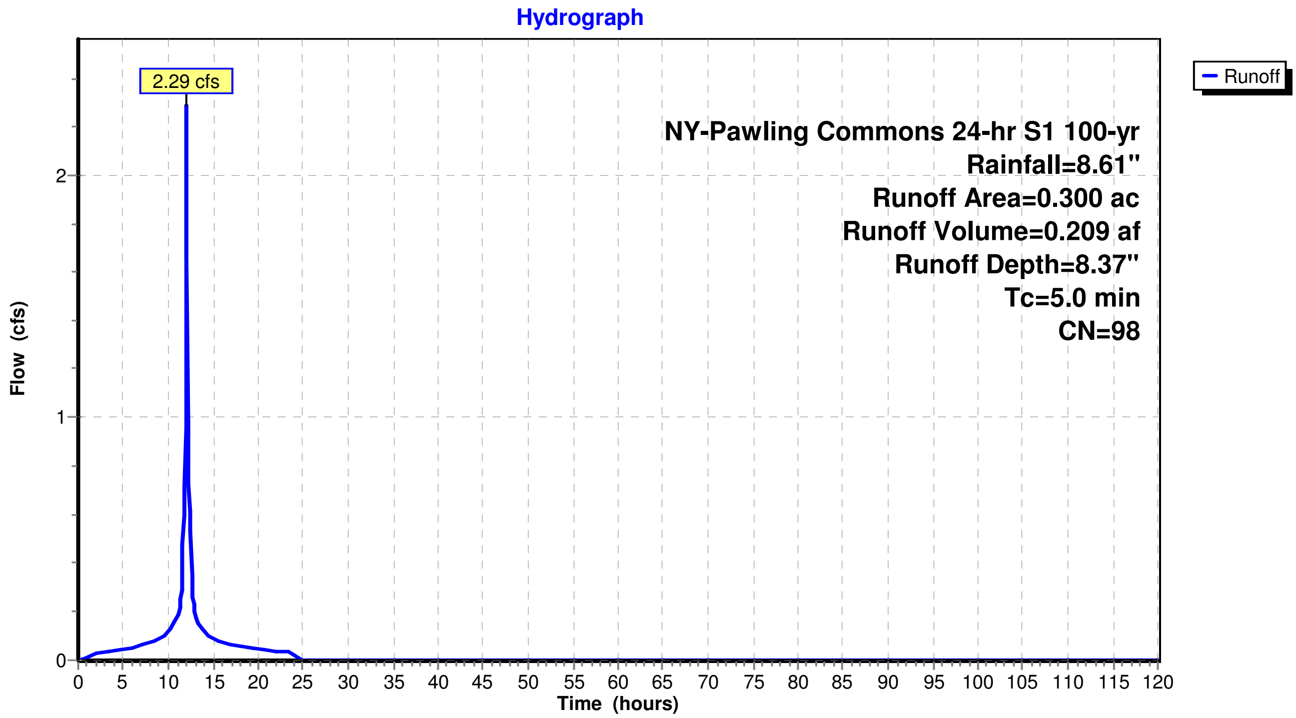
Runoff = 2.29 cfs @ 12.02 hrs, Volume= 0.209 af, Depth= 8.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 100-yr Rainfall=8.61"

Area (ac)	CN	Description
0.300	98	Paved parking, HSG C
0.300		100.00% Impervious Area

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

Subcatchment 1.2S:



Summary for Subcatchment 2.0S:

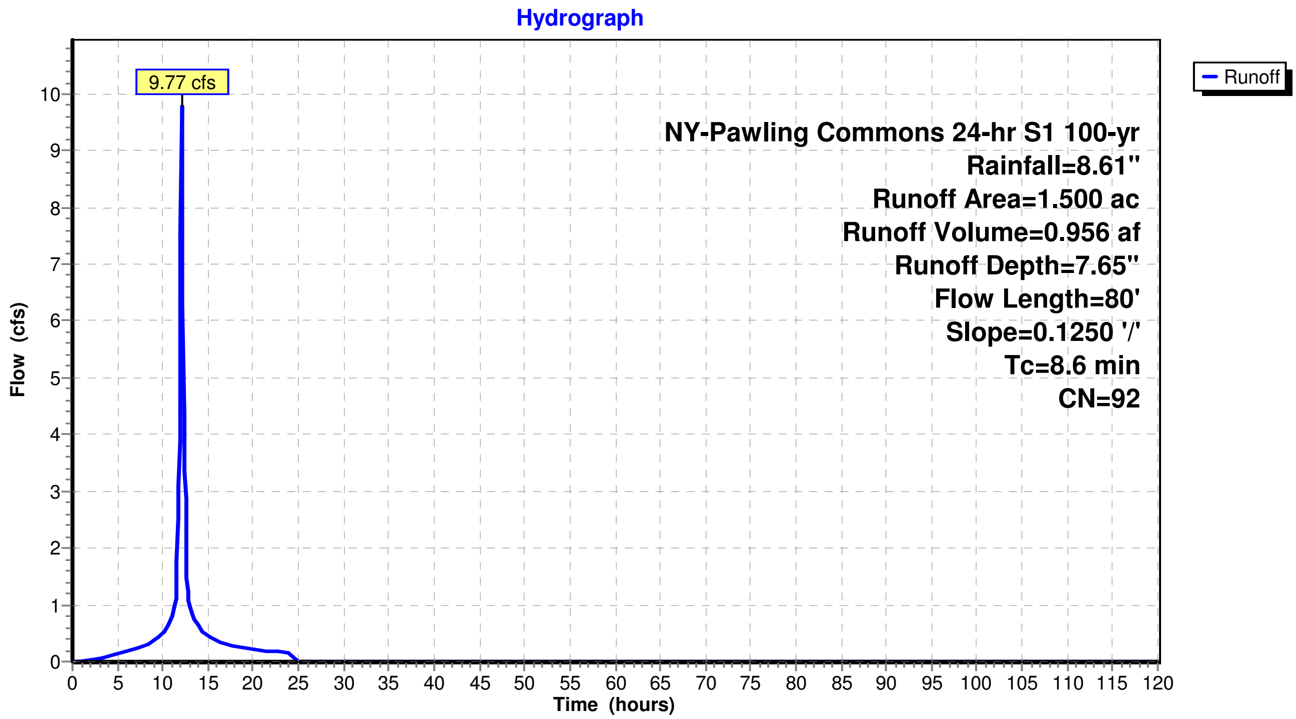
Runoff = 9.77 cfs @ 12.09 hrs, Volume= 0.956 af, Depth= 7.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 100-yr Rainfall=8.61"

Area (ac)	CN	Description
1.150	98	Paved parking, HSG C
0.250	74	>75% Grass cover, Good, HSG C
0.100	70	Woods, Good, HSG C
1.500	92	Weighted Average
0.350		23.33% Pervious Area
1.150		76.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	80	0.1250	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"

Subcatchment 2.0S:



Summary for Subcatchment 2.1S:

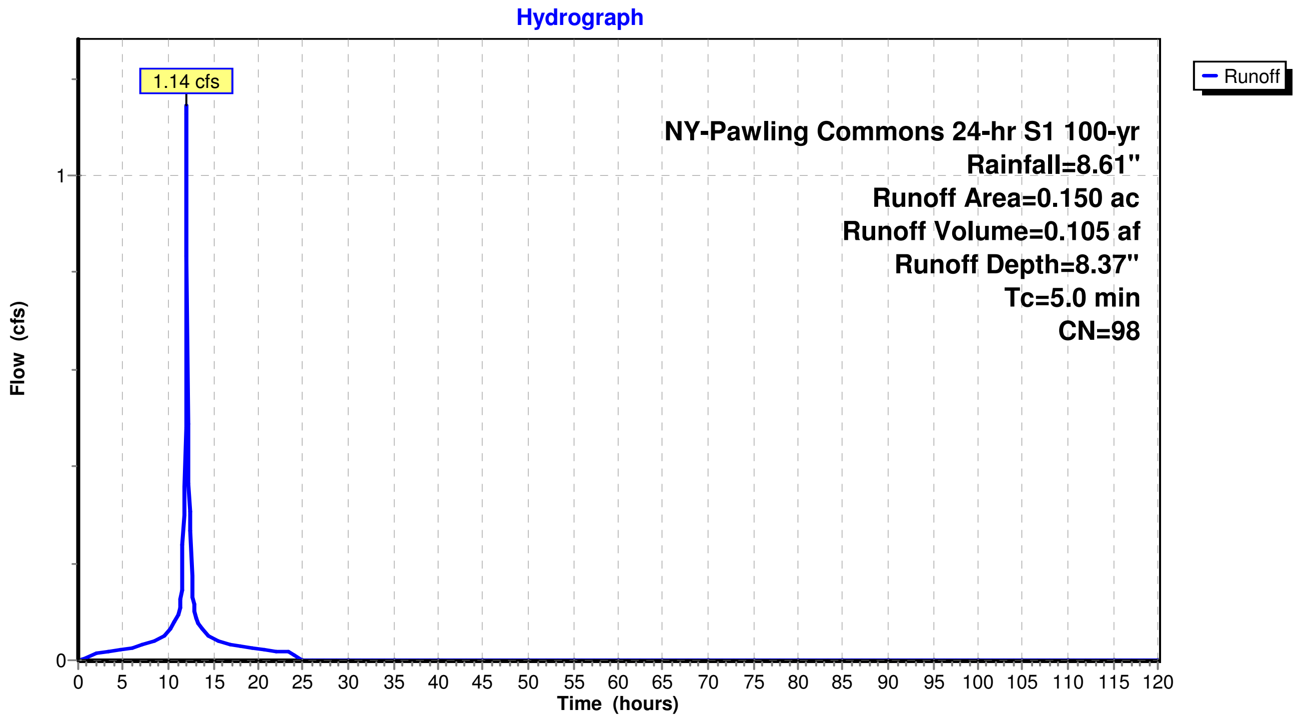
Runoff = 1.14 cfs @ 12.02 hrs, Volume= 0.105 af, Depth= 8.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 100-yr Rainfall=8.61"

Area (ac)	CN	Description
0.150	98	Paved parking, HSG C
0.150		100.00% Impervious Area

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

Subcatchment 2.1S:



Summary for Subcatchment 2.2S:

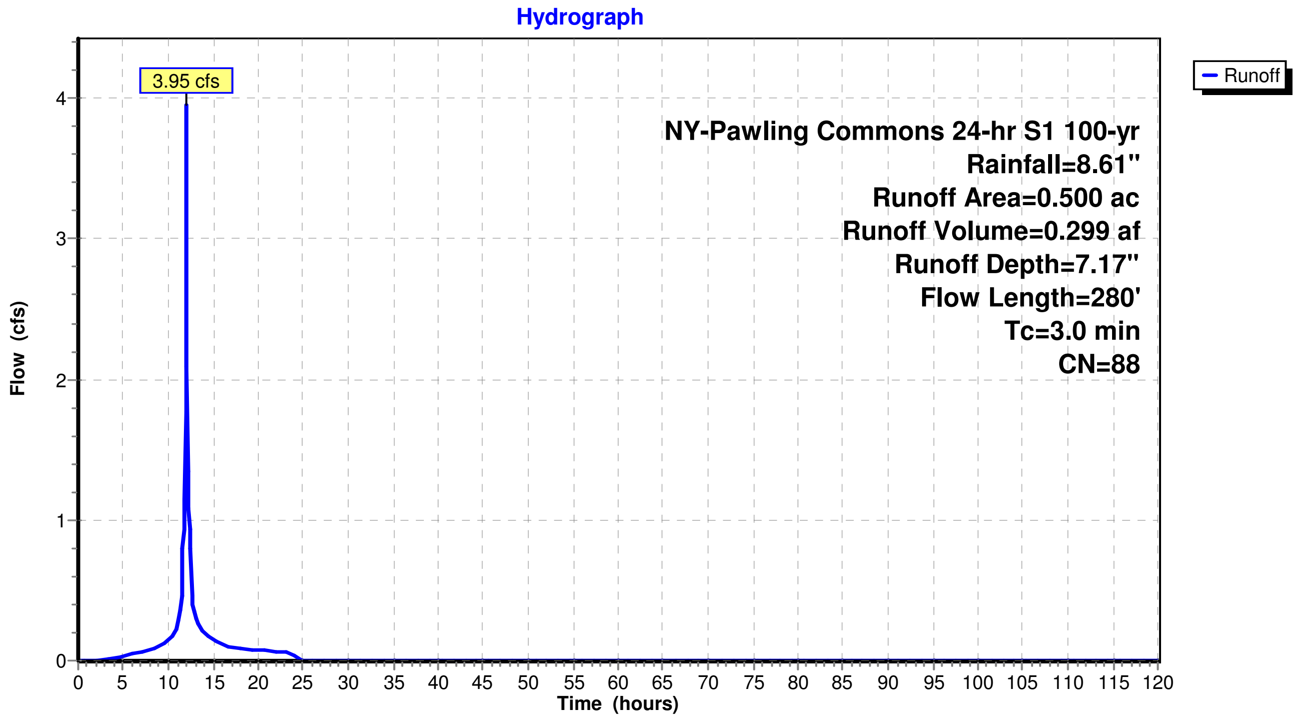
Runoff = 3.95 cfs @ 12.00 hrs, Volume= 0.299 af, Depth= 7.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 100-yr Rainfall=8.61"

Area (ac)	CN	Description
0.300	98	Paved parking, HSG C
0.200	74	>75% Grass cover, Good, HSG C
0.500	88	Weighted Average
0.200		40.00% Pervious Area
0.300		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	30	0.5000	0.34		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.26"
1.5	250	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.0	280	Total			

Subcatchment 2.2S:



Summary for Subcatchment 2.3S:

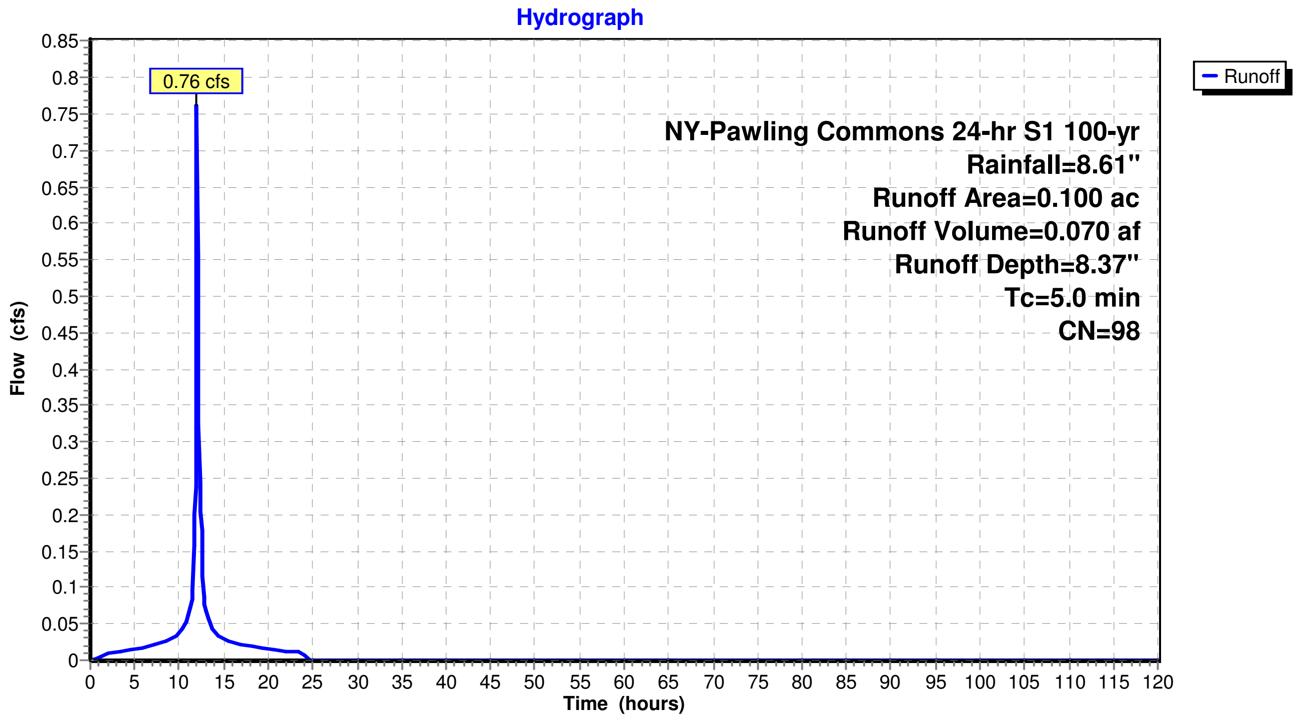
Runoff = 0.76 cfs @ 12.02 hrs, Volume= 0.070 af, Depth= 8.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 100-yr Rainfall=8.61"

Area (ac)	CN	Description
0.100	98	Paved parking, HSG C
0.100		100.00% Impervious Area

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

Subcatchment 2.3S:



Summary for Subcatchment 3.0S:

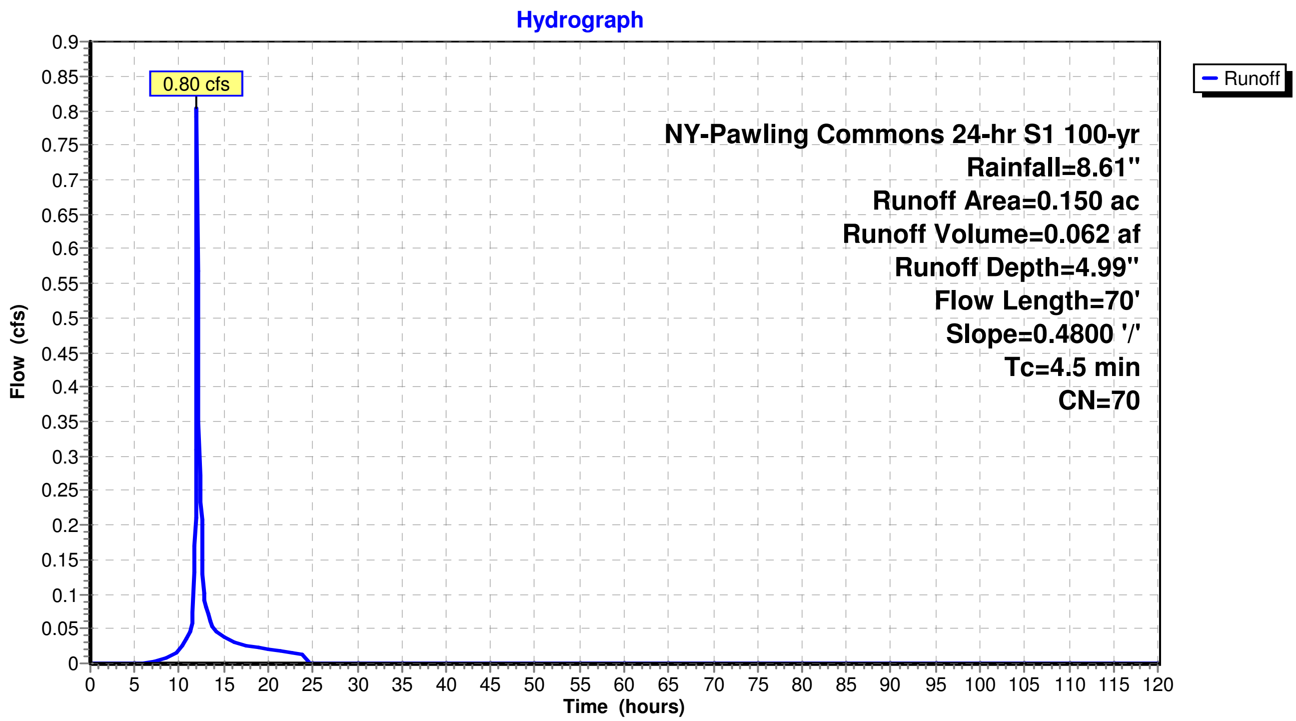
Runoff = 0.80 cfs @ 12.02 hrs, Volume= 0.062 af, Depth= 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
NY-Pawling Commons 24-hr S1 100-yr Rainfall=8.61"

Area (ac)	CN	Description
0.150	70	Woods, Good, HSG C
0.150		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	70	0.4800	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.26"

Subcatchment 3.0S:

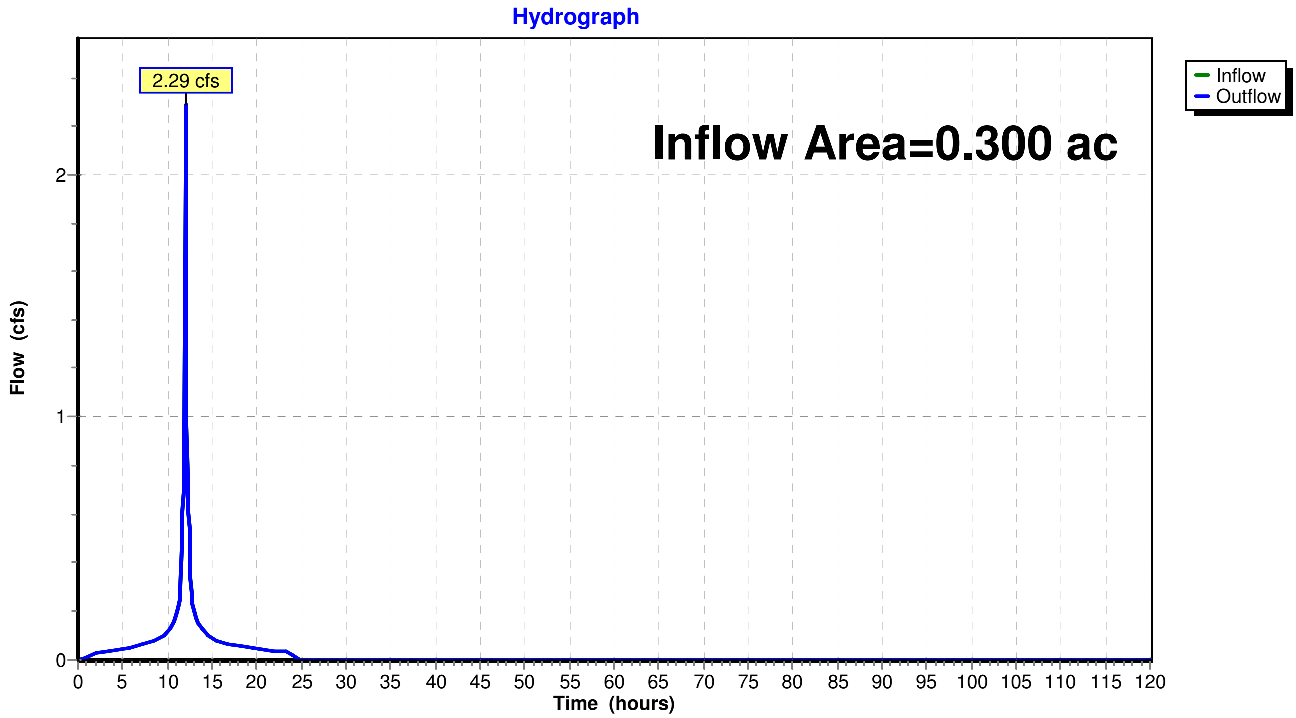


Summary for Reach 1.2P: Hydrodynamic Separator

Inflow Area = 0.300 ac,100.00% Impervious, Inflow Depth = 8.37" for 100-yr event
Inflow = 2.29 cfs @ 12.02 hrs, Volume= 0.209 af
Outflow = 2.29 cfs @ 12.02 hrs, Volume= 0.209 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 1.2P: Hydrodynamic Separator

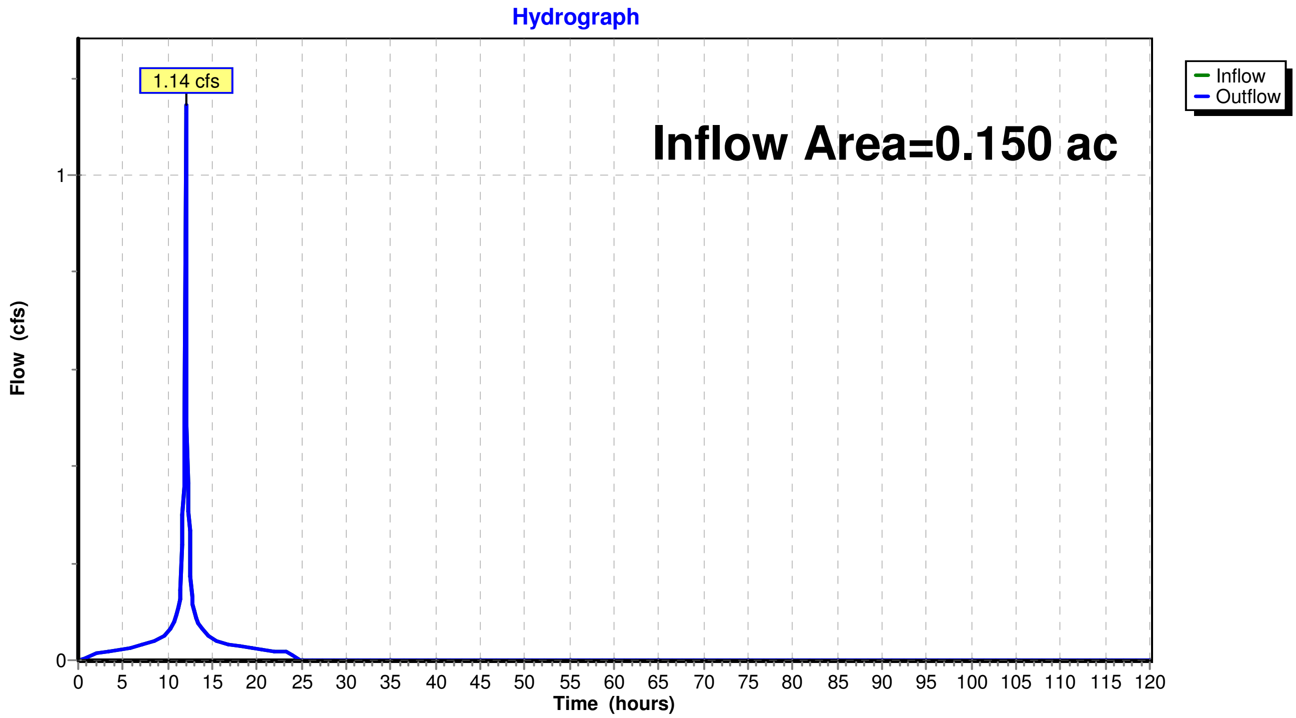


Summary for Reach 2.1P: Hydrodynamic Separator

Inflow Area = 0.150 ac,100.00% Impervious, Inflow Depth = 8.37" for 100-yr event
Inflow = 1.14 cfs @ 12.02 hrs, Volume= 0.105 af
Outflow = 1.14 cfs @ 12.02 hrs, Volume= 0.105 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 2.1P: Hydrodynamic Separator

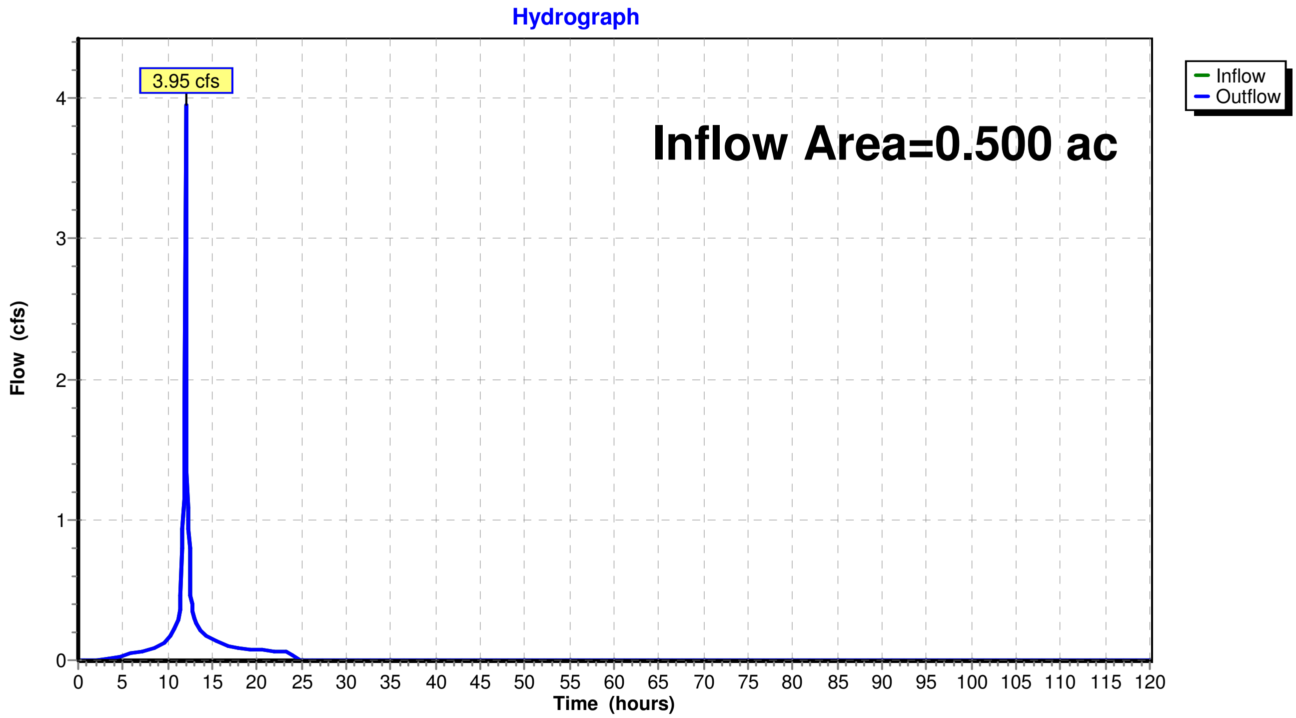


Summary for Reach 2.2P: Hydrodynamic Separator

Inflow Area = 0.500 ac, 60.00% Impervious, Inflow Depth = 7.17" for 100-yr event
Inflow = 3.95 cfs @ 12.00 hrs, Volume= 0.299 af
Outflow = 3.95 cfs @ 12.00 hrs, Volume= 0.299 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 2.2P: Hydrodynamic Separator

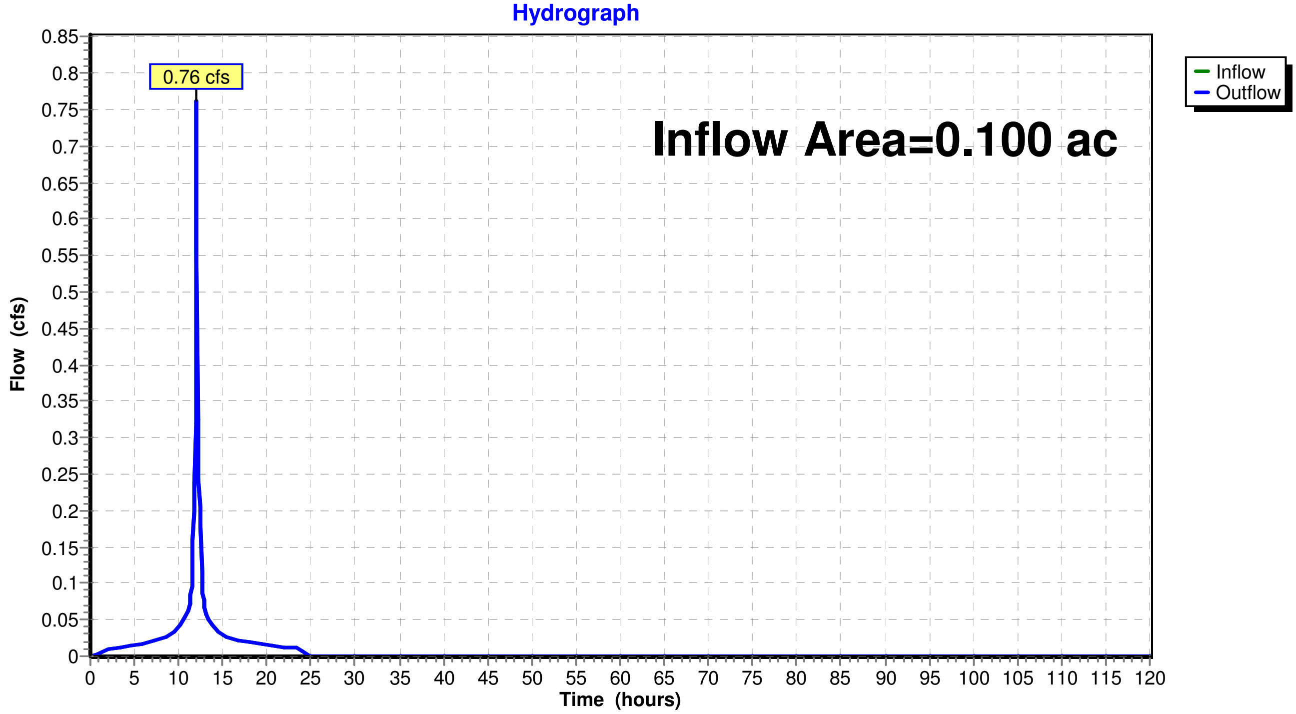


Summary for Reach 2.3P: Hydrodynamic Separator

Inflow Area = 0.100 ac,100.00% Impervious, Inflow Depth = 8.37" for 100-yr event
Inflow = 0.76 cfs @ 12.02 hrs, Volume= 0.070 af
Outflow = 0.76 cfs @ 12.02 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach 2.3P: Hydrodynamic Separator

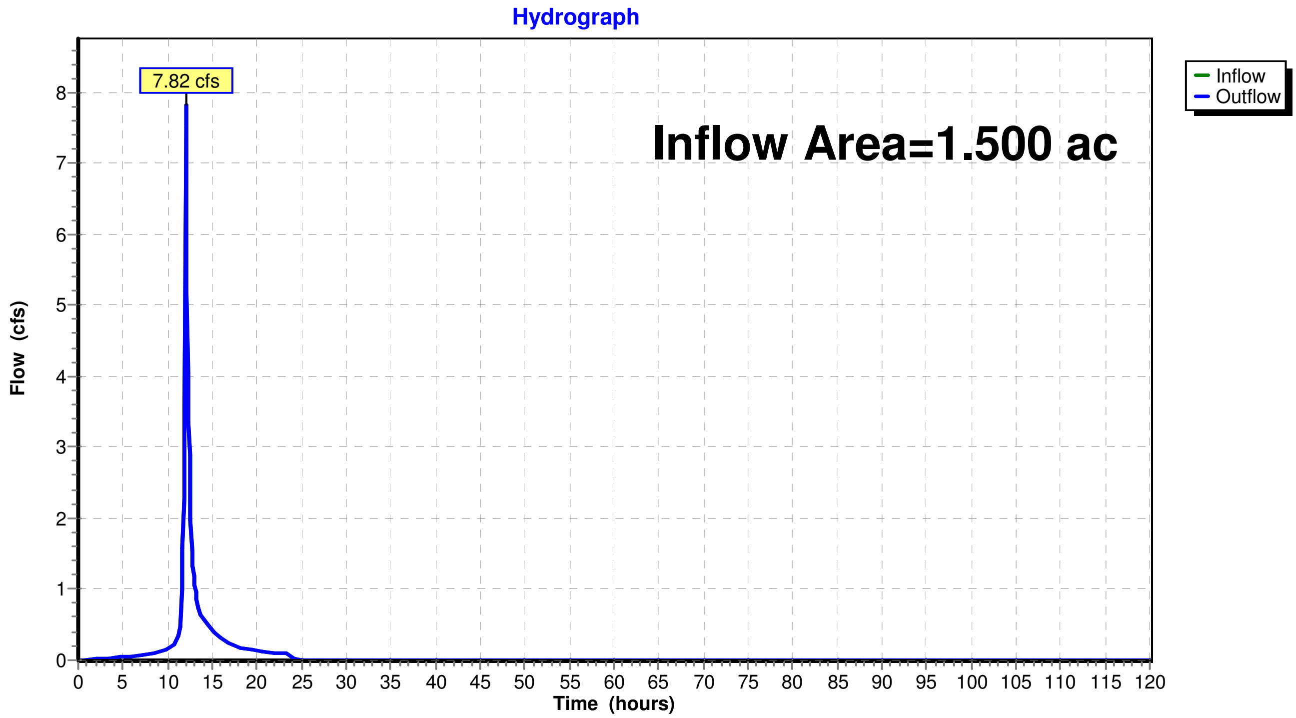


Summary for Reach DL 1:

Inflow Area = 1.500 ac, 66.67% Impervious, Inflow Depth = 5.44" for 100-yr event
Inflow = 7.82 cfs @ 12.03 hrs, Volume= 0.681 af
Outflow = 7.82 cfs @ 12.03 hrs, Volume= 0.681 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach DL 1:

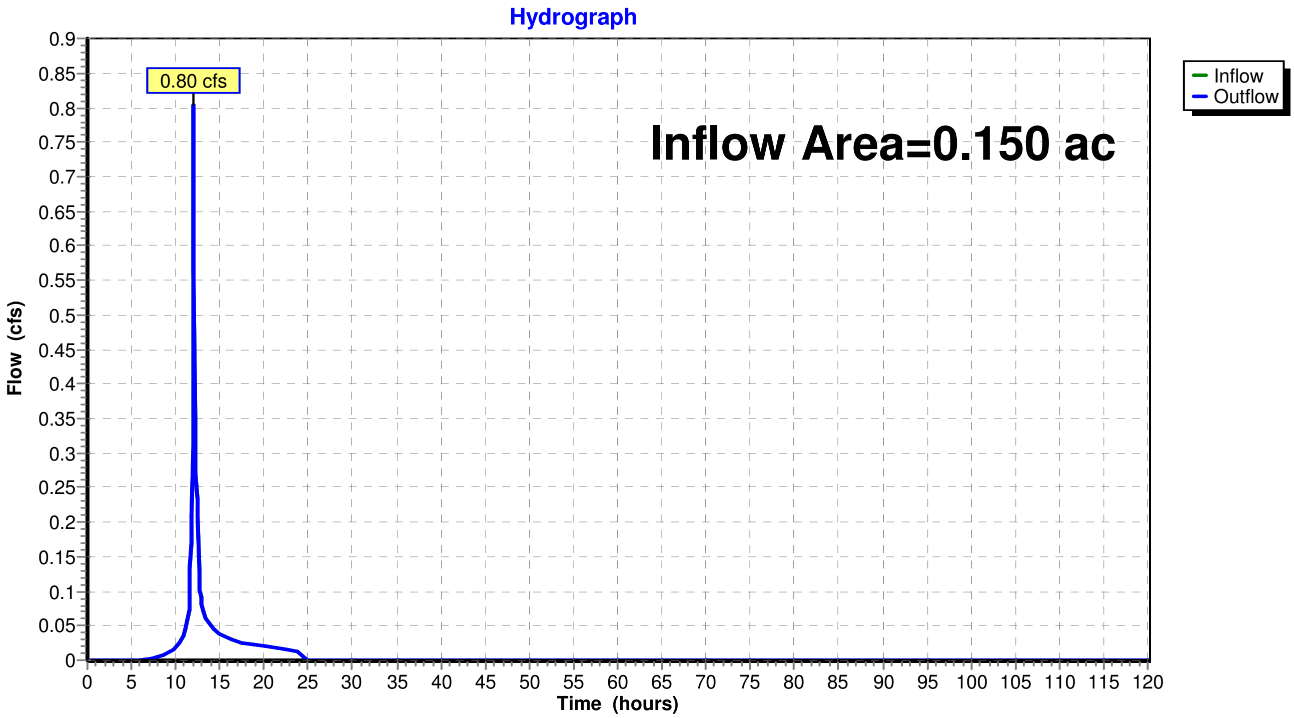


Summary for Reach DL 3:

Inflow Area = 0.150 ac, 0.00% Impervious, Inflow Depth = 4.99" for 100-yr event
Inflow = 0.80 cfs @ 12.02 hrs, Volume= 0.062 af
Outflow = 0.80 cfs @ 12.02 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach DL 3:

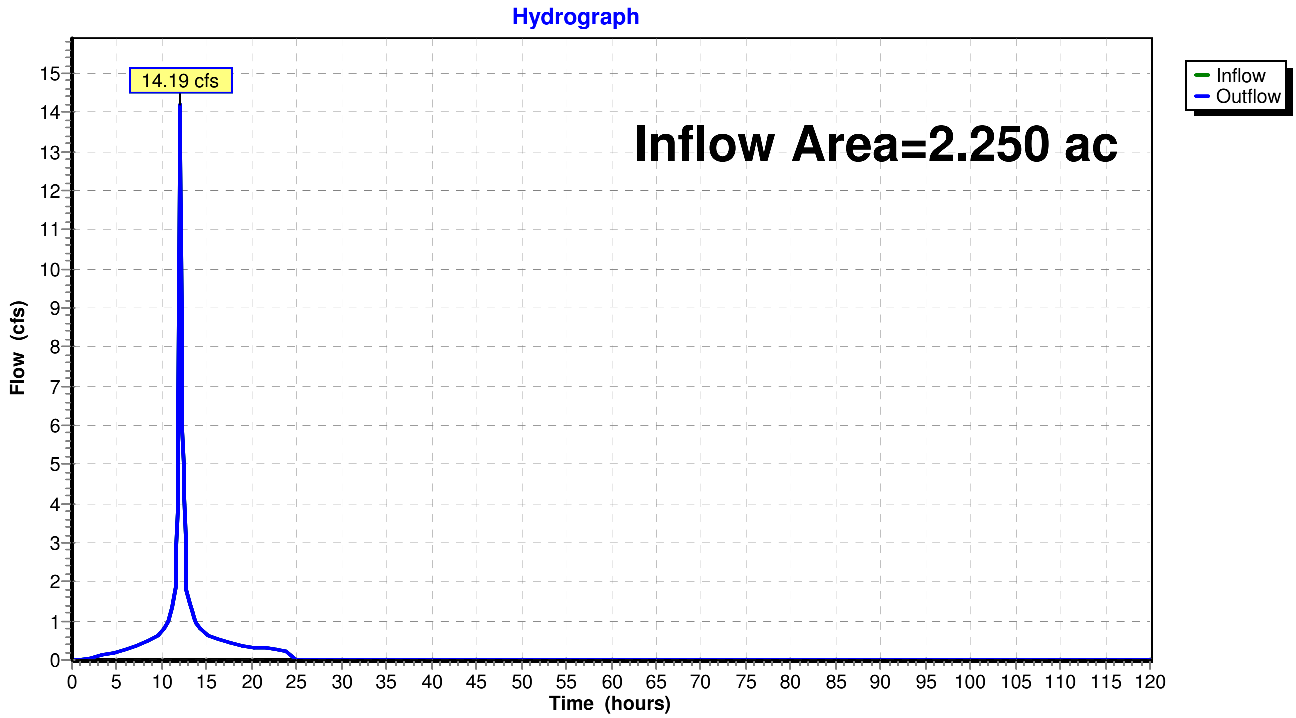


Summary for Reach DP 2:

Inflow Area = 2.250 ac, 75.56% Impervious, Inflow Depth = 7.62" for 100-yr event
Inflow = 14.19 cfs @ 12.05 hrs, Volume= 1.429 af
Outflow = 14.19 cfs @ 12.05 hrs, Volume= 1.429 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs

Reach DP 2:



Summary for Pond 1.1P: Infiltration System

Inflow Area = 0.850 ac, 82.35% Impervious, Inflow Depth = 3.69" for 100-yr event
Inflow = 2.59 cfs @ 12.00 hrs, Volume= 0.261 af
Outflow = 0.51 cfs @ 12.14 hrs, Volume= 0.261 af, Atten= 80%, Lag= 8.7 min
Discarded = 0.09 cfs @ 5.40 hrs, Volume= 0.233 af
Primary = 0.42 cfs @ 12.14 hrs, Volume= 0.028 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Peak Elev= 490.98' @ 12.14 hrs Surf.Area= 0.059 ac Storage= 0.131 af
Flood Elev= 491.00' Surf.Area= 0.059 ac Storage= 0.131 af

Plug-Flow detention time= 372.5 min calculated for 0.261 af (100% of inflow)
Center-of-Mass det. time= 373.1 min (1,077.0 - 703.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	487.50'	0.050 af	**20.83'W x 122.50'L x 3.54'H Field A** 0.207 af Overall - 0.082 af Embedded = 0.125 af x 40.0% Voids
#2A	488.00'	0.082 af	**Cultec R-330XLHD** x 68 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		0.132 af	Total Available Storage

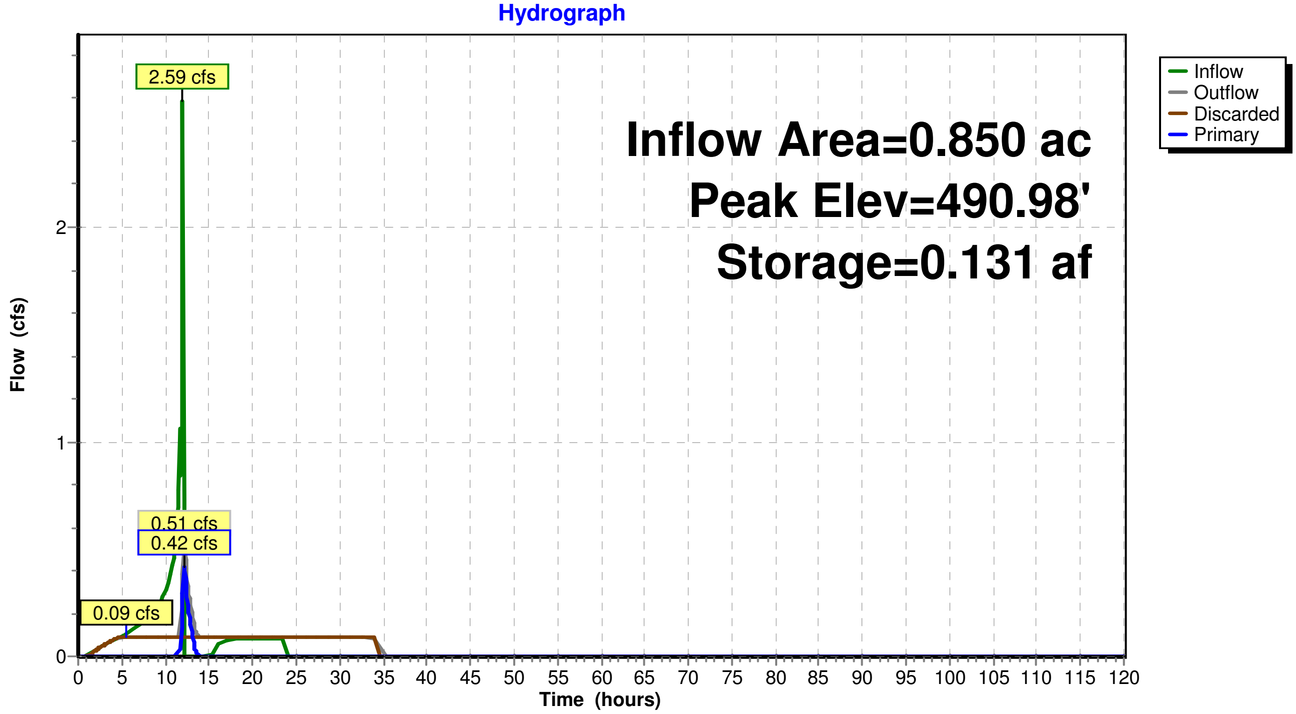
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	487.50'	**1.500 in/hr Exfiltration over Horizontal area** Phase-In= 0.01'
#2	Primary	489.80'	**4.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 489.80' / 489.70' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.09 sf

Discarded OutFlow Max=0.09 cfs @ 5.40 hrs HW=487.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.40 cfs @ 12.14 hrs HW=490.92' TW=0.00' (Dynamic Tailwater)
↑**2=Culvert** (Barrel Controls 0.40 cfs @ 4.63 fps)

Pond 1.1P: Infiltration System



Summary for Pond FS: Flow Splitter

Inflow Area = 0.850 ac, 82.35% Impervious, Inflow Depth = 7.89" for 100-yr event
Inflow = 6.88 cfs @ 12.01 hrs, Volume= 0.559 af
Outflow = 6.88 cfs @ 12.01 hrs, Volume= 0.559 af, Atten= 0%, Lag= 0.0 min
Primary = 2.59 cfs @ 12.00 hrs, Volume= 0.261 af
Secondary = 4.34 cfs @ 12.02 hrs, Volume= 0.298 af

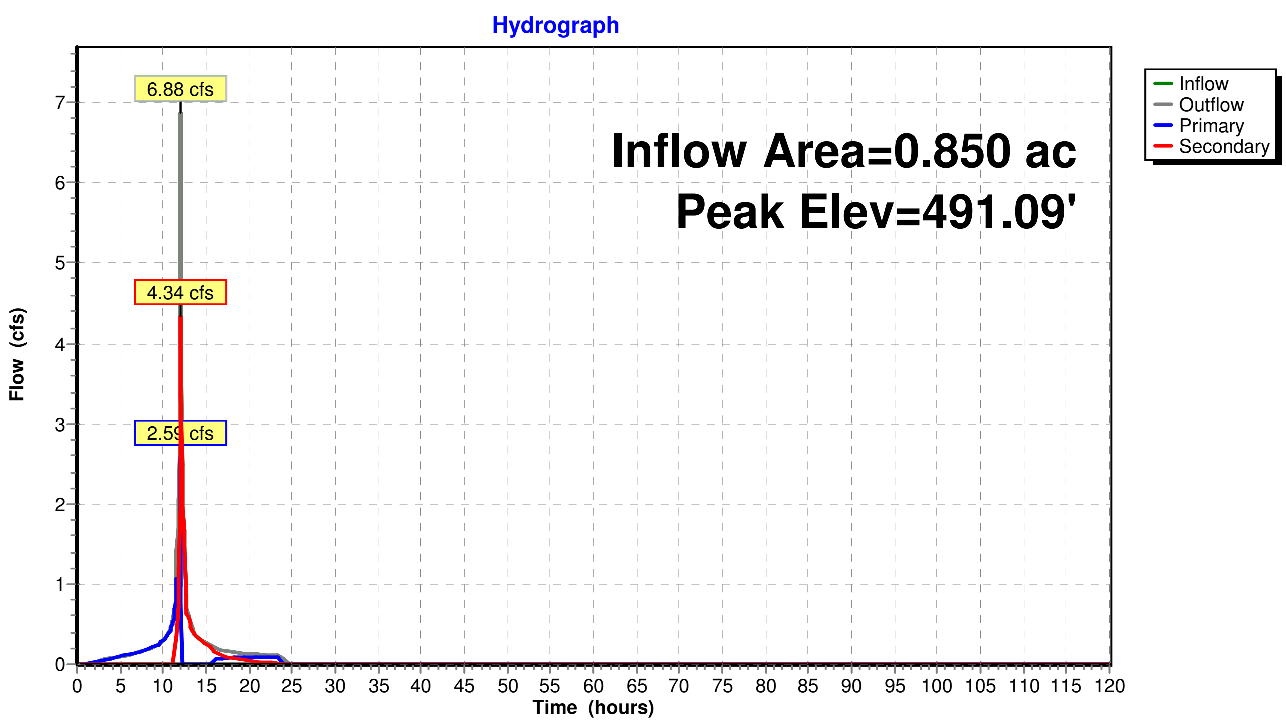
Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.10 hrs
Peak Elev= 491.09' @ 12.02 hrs
Flood Elev= 492.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	488.10'	**10.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 488.10' / 488.00' S= 0.0091 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf
#2	Secondary	489.30'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 489.30' / 488.80' S= 0.0455 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.93 cfs @ 12.00 hrs HW=491.03' TW=490.49' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.93 cfs @ 3.54 fps)

Secondary OutFlow Max=4.08 cfs @ 12.02 hrs HW=490.96' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 4.08 cfs @ 5.20 fps)

Pond FS: Flow Splitter



APPENDIX E

NYSDEC SPDES for Construction Activities Construction Site Log Book

APPENDIX F
CONSTRUCTION SITE INSPECTION AND MAINTENANCE LOG BOOK

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

SAMPLE CONSTRUCTION SITE LOG BOOK

Table of Contents

I. PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name ____

Permit No. ____________________________________ **Date of Authorization** _______________

Name of Operator ____

Prime Contractor ____

a. Preamble to Site Assessment and Inspections

The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified inspector[1] conduct an assessment of the site prior to the commencement of construction[2] and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements. A preconstruction meeting should be held to review all of the SWPPP requirements with construction personnel.

When construction starts, site inspections shall be conducted by the qualified inspector at least every 7 calendar days. The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request.

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified inspector perform a final site inspection. The qualified inspector shall certify that the site has undergone final stabilization[3] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1 Refer to "Qualified Inspector" inspection requirements in the current SPDES General Permit for Stormwater Discharges from Construction Activity for complete list of inspection requirements.
2 "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.
3 "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

b. Pre-construction Site Assessment Checklist
(NOTE: Provide comments below as necessary)

1. Notice of Intent, SWPPP, and Contractors Certification:

Yes No NA

[ ] [ ] [ ] Has a Notice of Intent been filed with the NYS Department of Conservation?
[ ] [ ] [ ] Is the SWPPP on-site? Where?_______________________________
[ ] [ ] [ ] Is the Plan current? What is the latest revision date?______________
[ ] [ ] [ ] Is a copy of the NOI (with brief description) onsite? Where?______________
[ ] [ ] [ ] Have all contractors involved with stormwater related activities signed a contractor's certification?

2. Resource Protection

Yes No NA

[ ] [ ] [ ] Are construction limits clearly flagged or fenced?
[ ] [ ] [ ] Important trees and associated rooting zones, on-site septic system absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, have been flagged for protection.
[ ] [ ] [ ] Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

3. Surface Water Protection

Yes No NA

[ ] [ ] [ ] Clean stormwater runoff has been diverted from areas to be disturbed.
[ ] [ ] [ ] Bodies of water located either on site or in the vicinity of the site have been identified and protected.
[ ] [ ] [ ] Appropriate practices to protect on-site or downstream surface water are installed.
[ ] [ ] [ ] Are clearing and grading operations divided into areas <5 acres?

4. Stabilized Construction Access

Yes No NA

[ ] [ ] [ ] A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
[ ] [ ] [ ] Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
[ ] [ ] [ ] Sediment tracked onto public streets is removed or cleaned on a regular basis.

5. Sediment Controls

Yes No NA

[ ] [ ] [ ] Silt fence material and installation comply with the standard drawing and specifications.
[ ] [ ] [ ] Silt fences are installed at appropriate spacing intervals
[ ] [ ] [ ] Sediment/detention basin was installed as first land disturbing activity.
[ ] [ ] [ ] Sediment traps and barriers are installed.

6. Pollution Prevention for Waste and Hazardous Materials

Yes No NA

[ ] [ ] [ ] The Operator or designated representative has been assigned to implement the spill prevention avoidance and response plan.
[ ] [ ] [ ] The plan is contained in the SWPPP on page ______
[ ] [ ] [ ] Appropriate materials to control spills are onsite. Where? ___________________

II. CONSTRUCTION DURATION INSPECTIONS

a. Directions:

Inspection Forms will be filled out during the entire construction phase of the project.

Required Elements:

1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

4) Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and

6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

SITE PLAN/SKETCH

____ ____
Inspector (print name) **Date of Inspection**

____ ____
Qualified Inspector (print name) **Qualified Inspector Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA
[ ] [ ] [ ] Is there an increase in turbidity causing a substantial visible contrast to natural conditions at the outfalls?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease at the outfalls?
[ ] [ ] [ ] All disturbance is within the limits of the approved plans.
[ ] [ ] [ ] Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions

Yes No NA
[ ] [ ] [ ] Is construction site litter, debris and spoils appropriately managed?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

2. Temporary Stream Crossing

Yes No NA
[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] Is fill composed of aggregate (no earth or soil)?
[ ] [ ] [ ] Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

3. Stabilized Construction Access

Yes No NA
[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

Runoff Control Practices

1. Excavation Dewatering

Yes No NA
[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

Runoff Control Practices (continued)

2. Flow Spreader

Yes No NA
[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales

Yes No NA
[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

4. Stone Check Dam

Yes No NA
[ ] [ ] [ ] Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ] [ ] [ ] Has accumulated sediment been removed?.

5. Rock Outlet Protection

Yes No NA
[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes No NA
[ ] [ ] [ ] Stockpiles are stabilized with vegetation and/or mulch.
[ ] [ ] [ ] Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA
[ ] [ ] [ ] Temporary seedings and mulch have been applied to idle areas.
[ ] [ ] [ ] 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Silt Fence and Linear Barriers

Yes No NA
[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation is ___% of design capacity.

Sediment Control Practices (continued)

2. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated; Filter Sock or Manufactured practices)

Yes No NA
[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2” x 4” frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
[ ] [ ] [ ] Manufactured insert fabric is free of tears and punctures.
[ ] [ ] [ ] Filter Sock is not torn or flattened and fill material is contained within the mesh sock.
Sediment accumulation ___% of design capacity.

3. Temporary Sediment Trap

Yes No NA
[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.
[ ] [ ] [ ] Sediment trap slopes and disturbed areas are stabilized.
Sediment accumulation is ___% of design capacity.

4. Temporary Sediment Basin

Yes No NA
[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.
[ ] [ ] [ ] Sediment basin dewatering pool is dewatering at appropriate rate.
Sediment accumulation is ___% of design capacity.

<u>Note</u>: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design. All practices shall be maintained in accordance with their respective standards.

Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

CONSTRUCTION DURATION INSPECTIONS

b. Modifications to the SWPPP (To be completed as described below)

The Operator shall amend the SWPPP whenever:

1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and
3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason:

APPENDIX F

Project and Owner Information

Site Data:

63-71 E Main Street
Village of Pawling, New York 12564
Tax Map No.: 7056-05-101917
Area: 4.2 acres ±

Owner/Operator Information:

KJ-RANT Realty, LLC
100 Business Park Drive
Armonk, New York 10504
718-655-5450
rob@jantile.com

Parties Responsible for Implementation of the Short and Long Term Maintenance Plan:

KJ-Rant Realty, LLC
100 Business Park Drive
Armonk, New York 10504
718-655-5450
rob@jantile.com

and or the current owner(s) of the subject property.

Qualified Professional Responsible for Inspection of the Stormwater Pollution Prevention Plan:

Insite Engineering, Surveying & Landscape Architecture, P.C.
3 Garrett Place
Carmel, New York 10512
845-225-9690

APPENDIX G

NYSDEC Stormwater Management Practice Construction and Maintenance Checklists

Infiltration Trench Construction Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
1. Pre-Construction		
Pre-construction meeting		
Runoff diverted		
Soil permeability tested		
Groundwater / bedrock sufficient at depth		
2. Excavation		
Size and location		
Side slopes stable		
Excavation does not compact subsoils		
3. Filter Fabric Placement		
Fabric specifications		
Placed on bottom, sides, and top		

CONSTRUCTION SEQUENCE	SATISFACTORY / UNSATISFACTORY	COMMENTS
4. Aggregate Material		
Size as specified		
Clean / washed material		
Placed properly		
5. Observation Well		
Pipe size		
Removable cap / footplate		
Initial depth =______feet		
6. Final Inspection		
Pretreatment facility in place		
Contributing watershed stabilized prior to flow diversion		
Outlet		

Comments:

Actions to be Taken:

Infiltration Trench Operation, Maintenance, and Management Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Monthly)		
Trench surface clear of debris		
Inflow pipes clear of debris		
Overflow spillway clear of debris		
Inlet area clear of debris		
2. Sediment Traps or Forebays (Annual)		
Obviously trapping sediment		
Greater than 50% of storage volume remaining		
3. Dewatering (Monthly)		
Trench dewaters between storms		
4. Sediment Cleanout of Trench (Annual)		
No evidence of sedimentation in trench		
Sediment accumulation doesn’t yet require cleanout		
5. Inlets (Annual)		

Maintenance Item	Satisfactory / Unsatisfactory	Comments
Good condition		
No evidence of erosion		
6. Outlet/Overflow Spillway (Annual)		
Good condition, no need for repair		
No evidence of erosion		
7. Aggregate Repairs (Annual)		
Surface of aggregate clean		
Top layer of stone does not need replacement		
Trench does not need rehabilitation		

Comments:

Actions to be Taken:

APPENDIX H

Draft NYSDEC Notice of Intent and MS4 SWPPP Acceptance Form

0644089821

DRAFT

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-0-20-001

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)
KJ Rant Realty LLC

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

Owner/Operator Contact Person First Name
Robert

Owner/Operator Mailing Address
100 Business Park Drive

City
Armonk

State
NY

Zip
10504 -

Phone (Owner/Operator)
718 - 655 - 5450

Fax (Owner/Operator)
- -

Email (Owner/Operator)
rob@jantile.com

FED TAX ID
82 - 4358958 (not required for individuals)

Project Site Information

Project/Site Name
Pawling Commons

Street Address (NOT P.O. BOX)
63-71 East Main Street

Side of Street
○ North ○ South ○ East ✔ West

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

State: NY
Zip: 12564 -
County: Dutchess
DEC Region: 3

Name of Nearest Cross Street
Spring Street

Distance to Nearest Cross Street (Feet)
300

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

Tax Map Numbers
Section-Block-Parcel
7056-05-101917

Tax Map Numbers

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

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

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

X Coordinates (Easting)	Y Coordinates (Northing)
616875	4601873

2. What is the nature of this construction project?

○ **New Construction**

✔ **Redevelopment with increase in impervious area**

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

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

Pre-Development Existing Land Use

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

Post-Development Future Land Use

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

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

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

Total Site Area	**Total Area To Be Disturbed**	**Existing Impervious Area To Be Disturbed**	**Future Impervious Area Within Disturbed Area**
4.2	1.9	1.1	1.3

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**
0 %	0 %	100 %	0 %

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

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

Start Date 03/01/2024 – **End Date** 12/01/2027

8600089821

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

Name

DP-22

9a. Type of waterbody identified in Question 9?

- [ ] Wetland / State Jurisdiction On Site (Answer 9b)
- [x] 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-0-20-001? ○ **Yes** ● **No**

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-20-001? ✔ **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?

Village of Pawling

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:

- [x] **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
Insite Engineering

Contact Name (Last, Space, First)
Watson, John M.

Mailing Address
3 Garrett Place

City
Carmel

State: NY Zip: 10512 -

Phone: 845 - 225 - 9690

Fax: 845 - 225 - 9717

Email
jwatson@insite-eng.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-0-20-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name: John **MI**: M

Last Name: Watson, PE

Signature

Date / /

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

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

Temporary Structural

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

Biotechnical

- Brush Matting
- Wattling

Vegetative Measures

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

Permanent Structural

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

Other

Post-construction Stormwater Management Practice (SMP) Requirements

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

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

- [ ] **Preservation of Undisturbed Areas**
- [ ] **Preservation of Buffers**
- [ ] **Reduction of Clearing and Grading**
- [ ] **Locating Development in Less Sensitive Areas**
- [ ] **Roadway Reduction**
- [ ] **Sidewalk Reduction**
- [x] **Driveway Reduction**
- [ ] **Cul-de-sac Reduction**
- [x] **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

0.077 **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)			0.7
Bioretention (F-5)			.
Dry Swale (O-1)			.
Standard SMPs			
Micropool Extended Detention (P-1)			.
Wet Pond (P-2)			.
Wet Extended Detention (P-3)			.
Multiple Pond System (P-4)			.
Pocket Pond (P-5)			.
Surface Sand Filter (F-1)			.
Underground Sand Filter (F-2)			.
Perimeter Sand Filter (F-3)			.
Organic Filter (F-4)			.
Shallow Wetland (W-1)			.
Extended Detention Wetland (W-2)			.
Pond/Wetland System (W-3)			.
Pocket Wetland (W-4)			.
Wet Swale (O-2)			.

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

Alternative SMP	Total Contributing Impervious Area (acres)
☑ Hydrodynamic	0.85
○ 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: First Defense HC

Manufacturer: Hydro International

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

.960 **acre-feet**

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

☑ **Yes** ○ **No**

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

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

Minimum RRv Required

. **acre-feet**

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

○ **Yes** ○ **No**

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

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

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

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

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

WQv Provided

___.___ **acre-feet**

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

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

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

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

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

CPv Required	**CPv Provided**
___.___ **acre-feet**	___.___ **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	**Post-development**
12.71 **CFS**	11.16 **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development	**Post-development**
23.34 **CFS**	22.81 **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

KJ Rant Realty LLC

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

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

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

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

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

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

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

Owner/Operator Certification

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

Print First Name: Robert

MI:

Print Last Name: Troccoli

Owner/Operator Signature:

Date: / /

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

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit

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

I. Project Owner/Operator Information
1. Owner/Operator Name: KJ Rant Realty LLC
2. Contact Person: Robert Troccoli
3. Street Address: 100 Business Park Drive
4. City/State/Zip: Armonk, NY 10504
II. Project Site Information
5. Project/Site Name: Pawling Commons
6. Street Address: 63-71 East Main Street
7. City/State/Zip: Pawling, NY 12564
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information
8. SWPPP Reviewed by:
9. Title/Position:
10. Date Final SWPPP Reviewed and Accepted:
IV. Regulated MS4 Information
11. Name of MS4: Village of Pawling
12. MS4 SPDES Permit Identification Number: NYR20A ____
13. Contact Person:
14. Street Address:
15. City/State/Zip:
16. Telephone Number:

MS4 SWPPP Acceptance Form - continued

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

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

Printed Name:

Title/Position:

Signature:

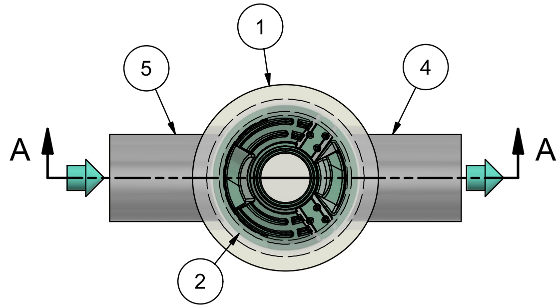
Date:

VI. Additional Information

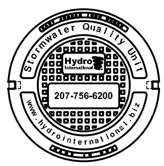
(NYS DEC - MS4 SWPPP Acceptance Form - January 2015)

APPENDIX I

Hydrodynamic Separator Sizing and Maintenance

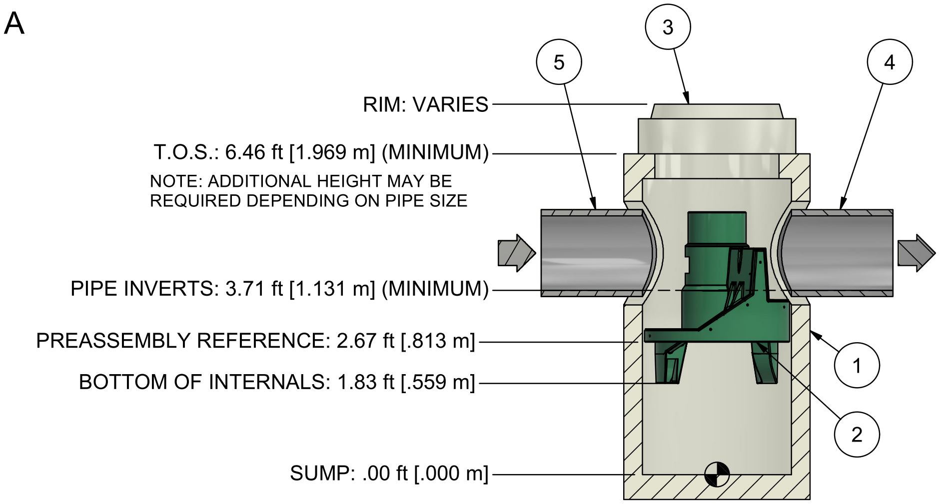


PLAN VIEW



HYDRO FRAME AND COVER (INCLUDED)

GRADE RINGS BY OTHERS AS REQUIRED



SECTION A-A

1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.

2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING FIRST DEFENSE MANHOLE.

3. CONTRACTOR TO CONFIRM RIM, PIPE INVERTS, PIPE DIA. AND PIPE ORIENTATION PRIOR TO RELEASE OF UNIT TO FABRICATION.

PRODUCT SPECIFICATION:

1. Peak Hydraulic Flow: 15.0 cfs (424 l/s)
2. Min Sediment Storage Capacity: 0.4 cu. yd. (0.3 cu. m.)
3. Maximum Inlet/Outlet Pipe Diameters: 18 in. (450 mm)
4. The treatment system shall use an induced vortex to separate pollutants from stormwater runoff.
5. For more product information including regulatory acceptances, please visit https://hydro-int.com/en/products/first-defense

GENERAL NOTES:
1. General Arrangement drawings only. Contact Hydro International for site specific drawings.
2. The diameter of the inlet and outlet pipes may be no more than 18".
3. Multiple inlet pipes possible (refer to project plan).
4. Inlet/outlet pipe angle can vary to align with drainage network (refer to project plans).
5. Peak flow rate and minimum height limited by available cover and pipe diameter.
6. Larger sediment storage capacity may be provided with a deeper sump depth.

PARTS LIST

ITEM	QTY	SIZE (in)	SIZE (mm)	DESCRIPTION
1	1	36	900	I.D. PRECAST MANHOLE
2	1			INTERNAL COMPONENTS (PRE-INSTALLED)
3	1	30	750	FRAME AND COVER (ROUND)
4	1	18 (MAX)	450 (MAX)	OUTLET PIPE (BY OTHERS)
5	1	18 (MAX)	450 (MAX)	INLET PIPE (BY OTHERS)

PROJECTION

IF IN DOUBT ASK

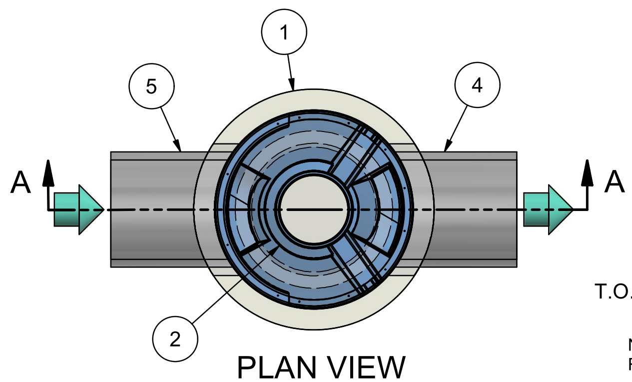
DATE: 11/2/2021	SCALE: 1:30	
DRAWN BY: ER	CHECKED BY: MRJ	APPROVED BY

Title
3-ft DIAMETER
FIRST DEFENSE

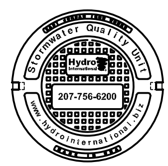
GENERAL ARRANGEMENT

Hydro International
hydro-int.com
HYDRO INTERNATIONAL

WEIGHT:	MATERIAL:	
STOCK NUMBER:		
DRAWING NO.: FD GA-3		
SHEET SIZE: B	SHEET: 1 OF 1	Rev: -

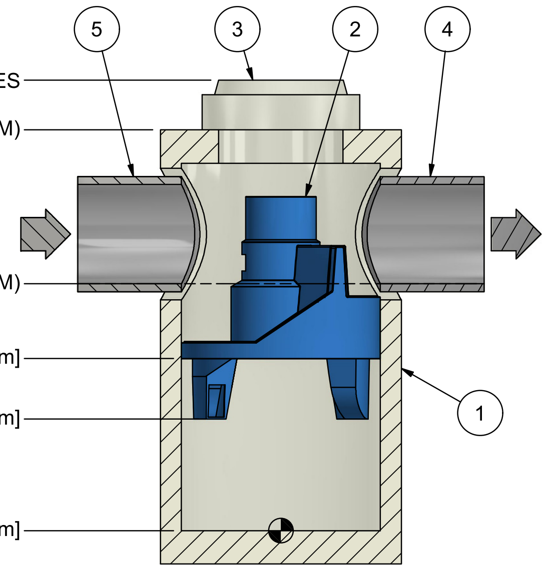


PLAN VIEW



HYDRO FRAME AND COVER (INCLUDED)

GRADE RINGS BY OTHERS
AS REQUIRED



SECTION A-A

1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.

2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING FIRST DEFENSE MANHOLE.

3. CONTRACTOR TO CONFIRM RIM, PIPE INVERTS, PIPE DIA. AND PIPE ORIENTATION PRIOR TO RELEASE OF UNIT TO FABRICATION.

PRODUCT SPECIFICATION:

1. Peak Hydraulic Flow: 18.0 cfs (510 l/s)
2. Min Sediment Storage Capacity: 0.7 cu. yd. (0.5 cu. m.)
3. Maximum Inlet/Outlet Pipe Diameters: 24 in. (600 mm)
4. The Treatment System Shall Use An Induced Vortex To Separate Pollutants From Stormwater Runoff.
5. For More Product Information Including Regulatory Acceptances, Please Visit https://hydro-int.com/en/products/first-defense

GENERAL NOTES:

1. General Arrangement drawings only. Contact Hydro International for site specific drawings.
2. The diameter of the inlet and outlet pipes may be no more than 24".
3. Multiple inlet pipes possible (refer to project plan).
4. Inlet/outlet pipe angle can vary to align with drainage network (refer to project plans).
5. Peak flow rate and minimum height limited by available cover and pipe diameter.
6. Larger sediment storage capacity may be provided with a deeper sump depth.

PARTS LIST

ITEM	QTY	SIZE (in)	SIZE (mm)	DESCRIPTION
1	1	48	1200	I.D. PRECAST MANHOLE
2	1			INTERNAL COMPONENTS (PRE-INSTALLED)
3	1	30	750	FRAME AND COVER (ROUND)
4	1	24 (MAX)	600 (MAX)	OUTLET PIPE (BY OTHERS)
5	1	24 (MAX)	600 (MAX)	INLET PIPE (BY OTHERS)

PROJECTION

IF IN DOUBT ASK

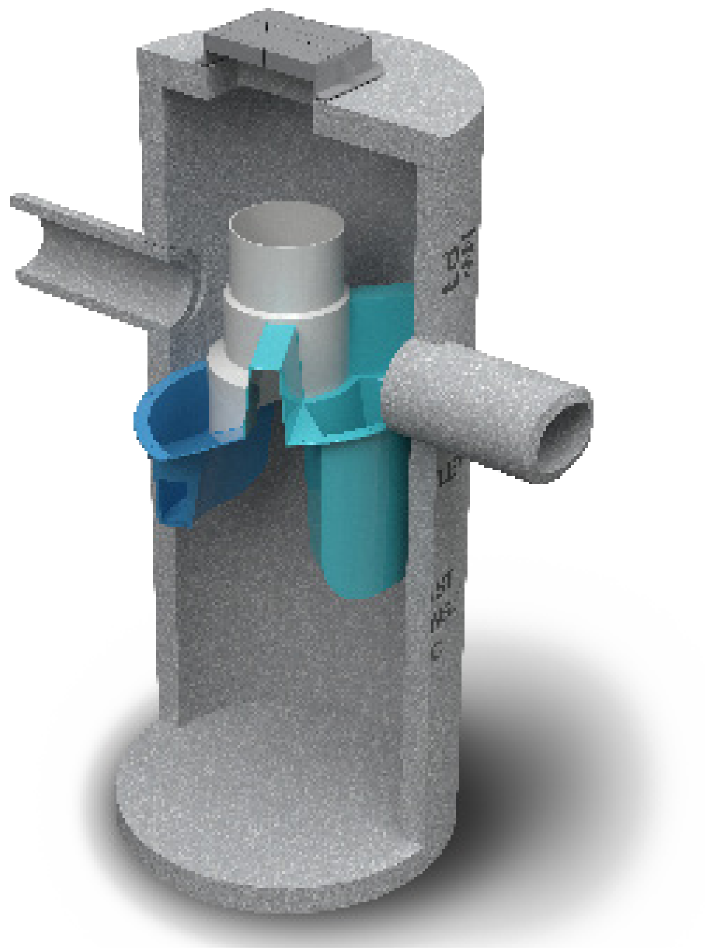
DATE: 11/2/2021	SCALE: 1:30	
DRAWN BY: ER	CHECKED BY: MRJ	APPROVED BY

Title
4-ft DIAMETER
FIRST DEFENSE

GENERAL ARRANGEMENT

Hydro International®
hydro-int.com
HYDRO INTERNATIONAL

WEIGHT:	MATERIAL:	
STOCK NUMBER:		
DRAWING NO.: FD GA-4		
SHEET SIZE: B	SHEET: 1 OF 1	Rev: -



Operation and Maintenance Manual

First Defense® High Capacity and First Defense® Optimum

Vortex Separator for Stormwater Treatment

Table of Contents

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints.

The two product models described in this guide are the First Defense® High Capacity and the First Defense® Optimum; they are inspected and maintained identically.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

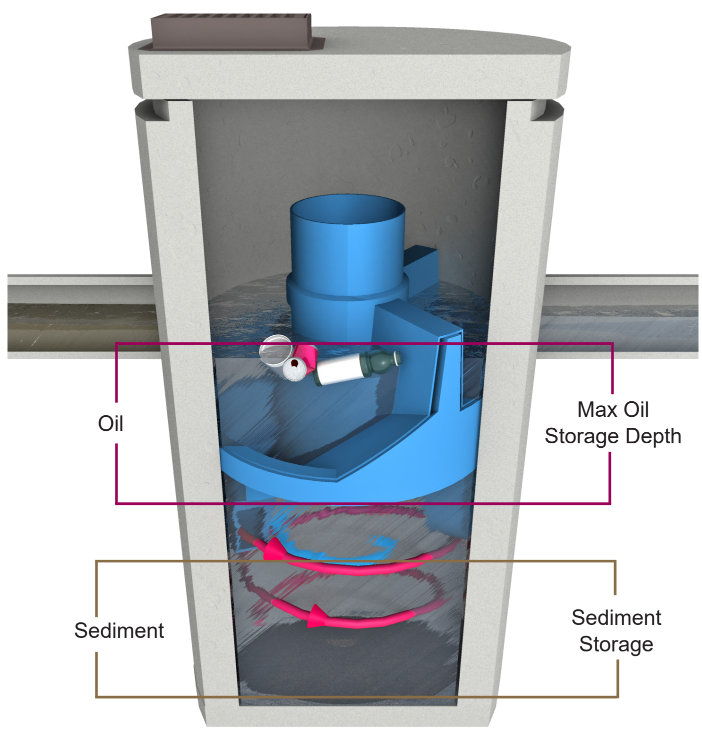


Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components have modified geometries allowing greater design flexibility to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2). First Defense® model sizes (diameter) are shown in Table 1.

III. Maintenance

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**

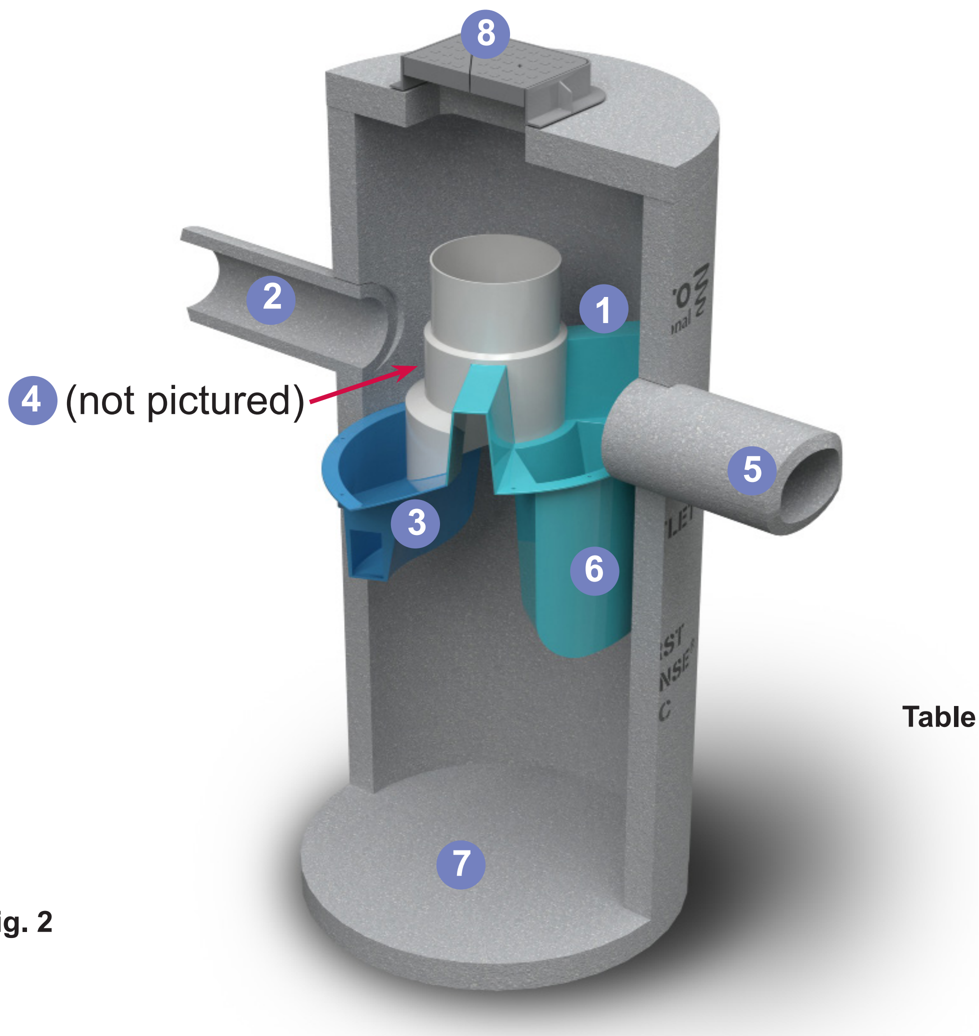


Fig. 2

Table 1

First Defense® Model Sizes
(ft / m) diameter
3 / 0.9
4 / 1.2
5 / 1.5
6 / 1.8
7 / 2.1
8 / 2.4
10 / 3.0

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense® have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

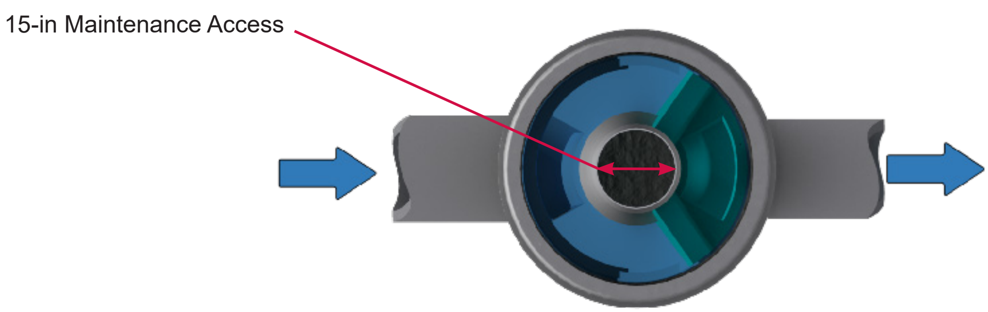


Fig.3 The central opening to the sump of the First Defense®is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Fig.4 Floatables are removed with a vactor hose

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.4).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.

- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

Recommended Equipment

- Safety Equipment (traffic cones, etc)

- Crow bar or other tool to remove grate or lid

- Pole with skimmer or net (if only floatables are being removed)

- Sediment probe (such as a Sludge Judge®)

- Vactor truck (flexible hose recommended)

- First Defense® Maintenance Log

Floatables and Sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose or with the skimmer or net

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): [3-FT] [4-FT] [5-FT] [6-FT] [7-FT] [8-FT] [10-FT]

INLET (CIRCLE ALL THAT APPLY): GRATED INLET (CATCH BASIN) INLET PIPE (FLOW THROUGH)

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com

Turning Water Around...®

NJCAT TECHNOLOGY VERIFICATION

First Defense® HC Stormwater Treatment Device

Hydro International

February 2016

(Revised Tables A-1 and A-2 May 2021)

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1. Description of Technology

The First Defense® HC (FDHC) is a vortex separator designed and supplied by Hydro International. The FDHC is installed as part of typical drainage network systems to capture particulate pollutants that have entered the system from surface runoff. The FDHC has patented flow-modifying internal components that create a swirling flow path within the treatment chamber, which serves to supplement gravitational settling forces with additional vortex forces for enhanced settling performance. The FDHC chamber is a precast concrete manhole. The internal components are rotationally molded high density polyethylene. The internal components include an internal bypass weir to divert peak flows over the treatment chamber to prevent captured particles from being resuspended and washed out (**Figure 1**).

1. Inlet pipe
2. Vortex treatment chamber
3. Sediment storage sump
4. Internal bypass chamber
5. Internal bypass weir
6. Outlet pipe
7. Concrete Manhole

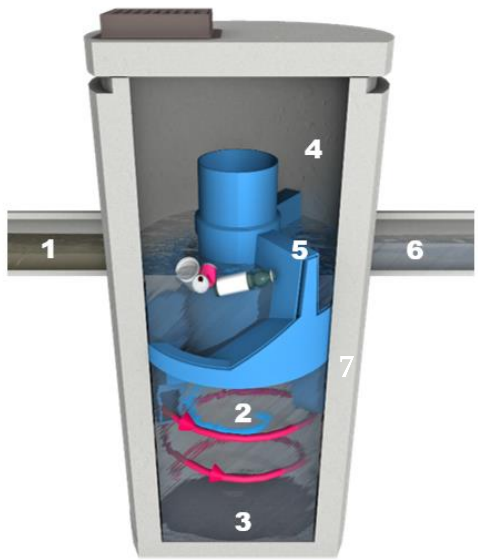

Figure 1 First Defense HC

Stormwater enters the FDHC through an inlet pipe and/or a surface grate. Hydrocarbons and other floatable solids rise to the surface where they are captured on the inlet side of the internal bypass weir. Stormwater is conveyed through a submerged inlet chute designed to initiate a spiraling flow path within the vortex treatment chamber. Suspended solids are captured in the sediment storage sump. Treated water exits the vortex treatment chamber via an outlet chute and exits the FDHC via an outlet pipe.

As many development sites in New Jersey require more than 50% TSS removal, the FDHC can be used as a pretreatment component in a treatment train when higher TSS removals are required and polishing BMPs such as infiltration or bio-infiltration are designed downstream.

2. Laboratory Testing

This testing was conducted to independently verify the FDHC such that it could be certified by the New Jersey Department of Environmental Protection (NJDEP) as a 50% Total Suspended Solids removal device.

The FDHC was tested to the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" (NJDEP 2013). The testing was conducted in Portland, Maine at Hydro International's hydraulics laboratory under the supervision of FB Environmental Associates, Inc., who served as the independent observer. FB Environmental is a Portland, Maine based environmental engineering consultancy with prior experience serving as the independent observer for several hydrodynamic separators previously tested to this protocol.

The particle size distribution of the removal efficiency test sediment samples were analyzed by the independent analytical laboratory GeoTesting Express in Acton, Massachusetts. The particle size distribution samples for the scour testing test sediment were analyzed at the Hydro International laboratory under the supervision of the independent observer. All water quality samples for both the removal efficiency testing and the washout testing were collected, labeled and sealed under the direct supervision of the independent observer from FB Environmental and analyzed by Maine Environmental Laboratory in Yarmouth, Maine.

2.1 Test Unit

The test unit was a 4-ft FDHC comprised of full scale, commercially available 4-ft FDHC internal components installed in a 4-ft round plastic manhole chamber consistent in all key dimensions with the precast chambers used for commercial sales (**Figure 2**). Both the inlet and outlet pipe diameters of the test model were 24 inches, which is the standard pipe size for a 4-ft FDHC.

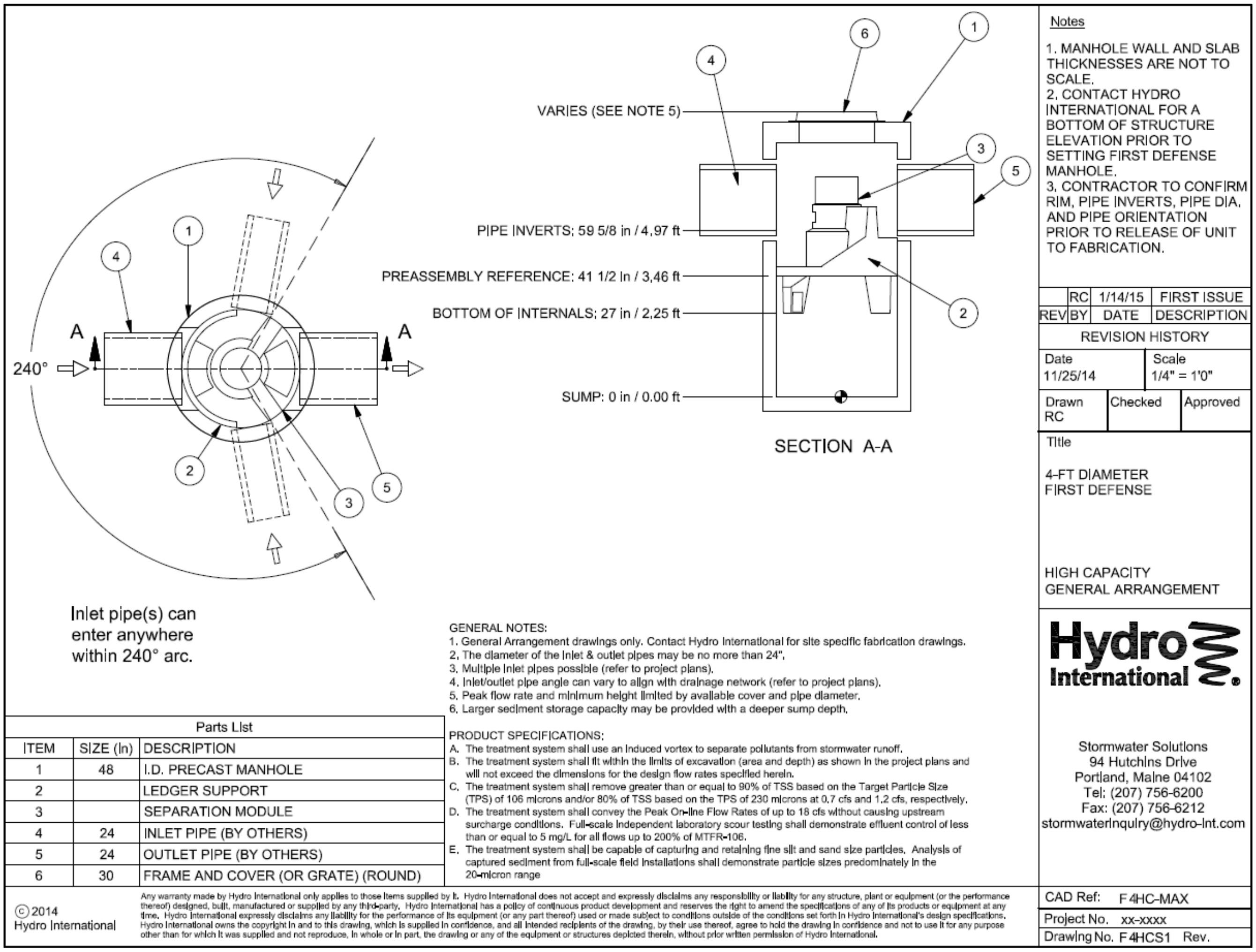

Figure 2 4-ft FDHC

The test vessel, unlike a commercial FDHC, had a rectangular access port located on the sump wall (**Figure 3a-b**). The access port eliminated the need for complete removal of the internal components and confined space entry into the FDHC to clean the unit between test events.

To ensure dimensional consistency with a commercial unit, the inside of the sump access port was fitted with an insert fabricated to be flush with the interior of the cylindrical manhole wall (**Figure 4**). Therefore the access port did not provide any additional sump storage capacity, did not alter the flow path within the vortex treatment chamber and ensured that the test vessel was dimensionally consistent to a standard commercial FDHC.

Prior to the beginning of the testing program, Hydro International laboratory technicians measured and recorded the key dimensions of the test vessel in the presence of the independent observer to ensure that the test unit assembly and test vessel dimensions were consistent with a commercial 4-ft FDHC.

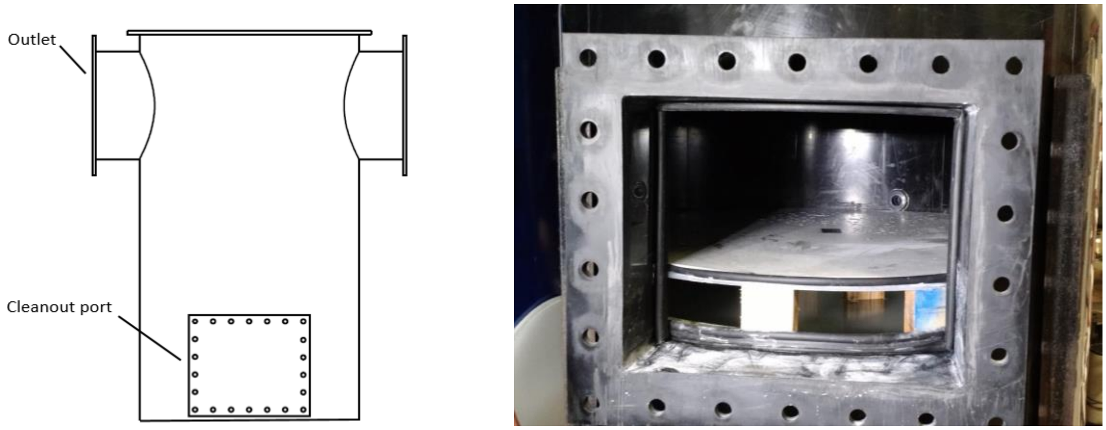

Figure 3 Schematic Drawing and Photo of Sump Access Port

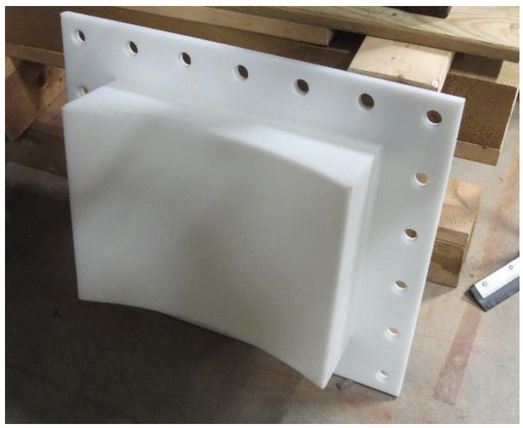

Figure 4 Sump Access Port sits Flush with Interior Manhole Wall

2.2 Test Setup

The laboratory setup consisted of a recirculating closed loop system with an 8-inch submersible Flygt pump that conveyed water from a 23,000 gallon reservoir through a PVC pipe network to the 4-ft FDHC (**Figure 5**). The flow rate of the pump was controlled by a GE Fuji Electric AF-300 P11 Adjustable Frequency Drive and measured by an EMCO Flow Systems 4411e Electromagnetic Flow Transmitter.

The water temperature within the reservoir was regulated by a Hayward 350FD pool heater, which was used to reduce the possibility of volatility in the test data that could potentially be caused by variability in water temperatures between test runs. The night before a test run, the heater was set to 80°F. In the morning, the heater was turned off at least one hour before testing began. The heater then remained off throughout the entire duration of each test run. The Hayward 350FD assembly includes a small recirculation pump that causes a gentle current in the reservoir, which could potentially cause high background concentration readings during testing by carrying sediment discharged during a test run back to the main reservoir feed pump more quickly. Turning the heater off allowed any water movement in the reservoir to stop before the beginning of testing. The test reservoir temperature was recorded at 30 second intervals by a Lascar thermometer and temperature logger over the duration of each test.

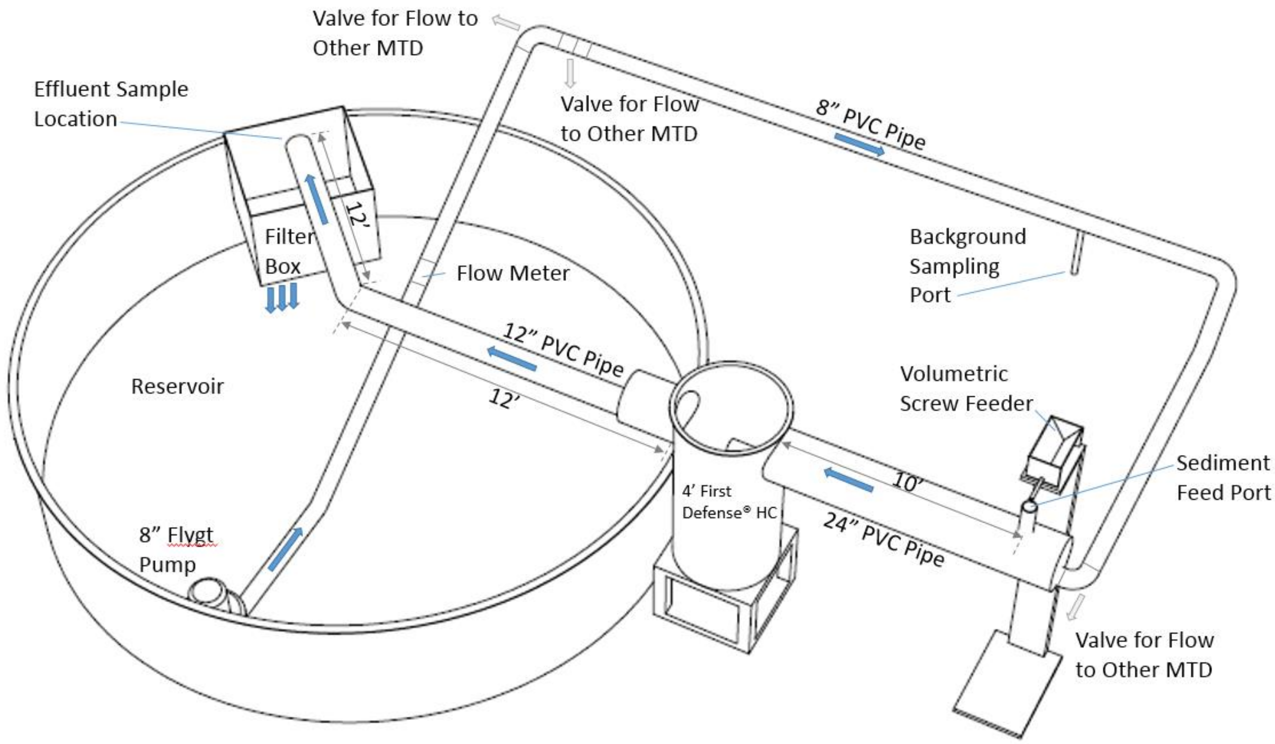

Figure 5 Laboratory Testing Arrangement

Three flow isolation valves were located between the Flygt pump and the FDHC, which would allow flow to bypass the FDHC if fully opened. These valves were installed as part of the piping network to direct flow to three other manufactured stormwater and wastewater treatment systems installed at the test facility along the same piping network, and were fully closed throughout the entire period when the FDHC testing was conducted.

A background sampling port was installed about 27 feet upstream of the FDHC. The FDHC effluent discharged freely from the effluent pipework, where grab samples were taken. The free discharge flowed through a filter box fitted with 1 micron filter socks in order to remove the majority of fine sediment that remained in the flow stream (**Figure 6**). The filter box was located on the opposite side of the reservoir as the submersible pump in order to keep the background concentration from surpassing the maximum allowable limit over the duration of the removal efficiency tests.

Figure 6 Effluent Sampling Location Situated above the Filter Box

Total Suspended Solids Removal Efficiency Laboratory Test Setup

For the removal efficiency test runs, test sediment was introduced into the flow at a consistent, calibrated rate by an Auger Feeder Model VF-2 volumetric screw feeder situated atop a 4-inch port in the 2 foot diameter inlet pipe located 10 feet upstream of the FDHC test unit. The location of the port is shown in **Figure 7**.

Figure 7 Influent Feed Port for TSS Removal Efficiency Testing

The FDHC sump measures 18 inches in height from the bottom of the sump. In line with the protocol requirements, it was fitted with a false bottom positioned 9 inches from the true sump bottom to simulate a 50% full condition (**Figure 8**). It was secured to the chamber and sealed around the edges to prevent any material from collecting below.

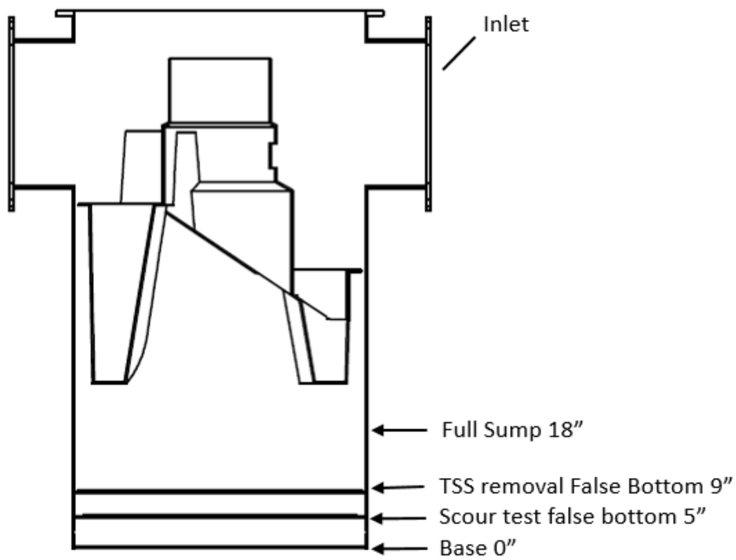

Figure 8 False Bottom Positions used during FDHC Testing

Scour Test Laboratory Setup

To simulate the 50% full condition for the scour test, the false bottom was set 5 inches above the sump floor (**Figure 8**) and 4 inches of the scour test sediment blend was pre-loaded on top of the false bottom, bringing the level of sump contents to 9 inches from the sump bottom.

2.3 Test Sediment

Test Sediment Feed for Suspended Solids Removal Efficiency Testing

The test sediment used for the Suspended Solids Removal Efficiency Testing was an in-house blend of high purity silica (SiO_2 99.8%) supplied by AGSCO Corporation and U.S. Silica, Inc., both commercial silica suppliers. Prior to the start of the removal efficiency testing, a total of five batches of test sediment were blended by Hydro International. Three sediment samples and one spare sample approximately 400 mL in volume were composited from 80 mL subsamples collected from each of the 5 batches under the supervision of the independent observer. The 4 samples were sealed, signed and packaged for independent transport to the outside laboratory under the supervision of the independent observer. After the samples were taken, the 5 batches were sealed and set aside until use. The independent laboratory, GeoTesting Express, analyzed the particle size distribution of each of the 3 samples and the spare sample using ASTM D 422-63. The particle size distributions of each of the 3 samples were averaged and reported as the overall particle size distribution. The particle size distribution of the spare sample was found to meet the protocol specification, however it was not included in the reported average particle size distribution (PSD) because the protocol specifically states that three samples shall be analyzed and averaged.

Scour Test Sediment

The test sediment used for the Scour Testing was high purity (99.8% SiO_2) silica blended by AGSCO Corporation, an independent commercial silica supplier, to meet the specified particle size distribution of the protocol. The scour test sediment was delivered to Hydro International prepackaged, in sealed 50-lb bags. Under observation of the independent observer, three 250 mL subsamples were taken from randomly selected areas of the sump. The subsamples were then sealed and signed under observation of the independent observer and analyzed at the Hydro International laboratory for PSD analysis under the observation of the independent observer at a later date. The reported PSD is the average of the three subsample particle size distributions.

2.4 Removal Efficiency Testing Procedure

Removal efficiency testing was conducted in accordance with Section 5 of the NJDEP Laboratory Protocol for HDS MTDs. A total of five flow rates were tested: the 25%, 50%, 75%, 100% and 125% Maximum Treatment Flow Rate (MTFR). FB Environmental acted as the independent observer for the duration of all testing and water quality sample collection, sealing and packaging for transportation to the independent laboratory. Captured sediment was removed from the sump between each flow rate trial.

The test sediment mass was fed into the flow stream at a known rate using a screw auger with a calibrated funnel. Sediment was introduced at a rate within 10% of the targeted value of 200 mg/L influent concentration throughout the duration of the testing.

Six calibration samples were taken from the injection point. The calibration samples were timed at evenly spaced intervals over the total duration of the test for each tested flow rate and timed such that no collection interval would exceed 1 minute in duration. Each calibration sample was a minimum of 100 mL collected in a clean 1-liter container over an interval timed to the nearest second. These samples were weighed to the nearest milligram. The average influent TSS concentration was calculated using the total mass of the test sediment added during dosing divided by the volume of water that flowed through the MTD during dosing (**Equation 1**). The mass extracted for calibration samples was subtracted from the total mass introduced to the system when removal efficiency was subsequently calculated. The volume of water that flows through the MTD was calculated by multiplying the average flow rate by the time of sediment injection only.

$$\textbf{Average Influent Concentration} = \frac{\text{Total mass added}}{\begin{array}{c}\text{Total volume of water flowing}\\ \text{through the MTD during addition}\\ \text{of test sediment}\end{array}}$$

Equation 1 Calculation for Average Influent Concentration

During each flow rate test, the flow meter data logger recorded flow rate at a minimum of once per minute. The Effluent Grab Sampling Method was used as per Section 5D of the protocol. Once a constant rate of flow and test sediment feed were established, a minimum of three MTD detention times passed before the first effluent sample was collected. All effluent samples were collected in clean half-liter bottles using a sweeping grab sampling motion through the effluent discharge as described in Section 5D of the protocol. Samples were then time stamped and placed into a box for transportation to the analytical laboratory.

The time interval between sequential samples was evenly spaced during the test sediment feed period to obtain 15 samples for each flow rate. The water temperature was recorded at 30 second intervals to ensure that it did not exceed 80 degrees Fahrenheit at any time.

Background samples were taken at the background sample port located upstream of the FDHC test setup. Influent background samples were taken at the same time as odd numbered effluent grab samples (first, third, fifth, etc.). The collection time for each background and effluent sample was recorded. Each collected sample was time stamped, sealed and signed by the independent observer.

At the conclusion of the test all of the collected effluent and background water quality samples were placed into a delivery box, the box was sealed and the seal was signed by the independent observer. All samples were analyzed by Maine Environmental Laboratory in accordance with ASTM D3977-97 (re-approval 2007) "Standard Test Methods for Determining Sediment Concentrations in Water Samples".

The background data were plotted on a curve for use in adjusting the effluent samples for background concentration. The FDHC removal efficiency for each tested flow rate was calculated as per **Equation 2**.

$$\textbf{Removal Efficiency (\%)} = \frac{\left(\begin{array}{c}\text{Average Influent}\\\text{Concentration}\end{array} - \begin{array}{c}\text{Adjusted}\\\text{Average Effluent*}\\\text{Concentration}\end{array}\right)}{\text{Average Influent Concentration}} \times 100$$

* Adjusted for background concentration

Equation 2 Equation for Calculating Removal Efficiency

2.5 Scour Testing Procedure

To simulate a 50% full sump condition, the FDHC sump false bottom was set to a height of 5 inches and then topped with 4 inches of scour test sediment. The sediment was leveled, then the FDHC was filled with clear water at a slow rate as to not disturb the sediment prior to the beginning of testing. In line with the protocol, scour testing was begun less than 96 hours after the sump was pre-loaded with test sediment. All setup measurements, testing and sample collection procedures were observed by the independent observer.

Scour testing began by slowly introducing flow and, in less than 5 minutes, ramping up the flow rate until it reached >200% of the MTFR. The flow rate was recorded at a minimum of once per minute so that the effluent samples could be compared to corresponding flow rates. The flow rate remained constant at the target maximum flow rate for the remainder of the test duration.

Effluent samples were collected and time stamped every 2 minutes after the target flow rate was reached. A minimum of 15 effluent samples were taken over the duration of the test. The effluent samples were collected in half liter bottles using the grab sampling method as described in Section 5D of the protocol. Temperature readings of the test water were recorded every 30 seconds to ensure it did not exceed 80 degrees Fahrenheit at any point during the test.

Eight background samples were collected at evenly spaced intervals throughout the duration of the target maximum flow rate testing. The background samples were drawn from the background sample port located upstream of the FDHC.

At the conclusion of the test all of the collected effluent and background water quality samples were placed into a delivery box, the box was sealed and the seal was signed by the independent observer. All samples were analyzed by Maine Environmental Laboratory in accordance with ASTM D3977-97 (re-approval 2007) “Standard Test Methods for Determining Sediment Concentrations in Water Samples”.

3. Performance Claims

In line with the NJDEP verification procedure, FDHC performance claims are outlined below.

Total Suspended Solids Removal Rate

The TSS removal rate of the FDHC is dependent upon flow rate, particle density and particle size. For the particle size distribution and weighted calculation method required by the NJDEP HDS MTD protocol, the 4-ft FDHC at a MTFR of 1.50 cfs will demonstrate at least 50% TSS removal efficiency.

Maximum Treatment Flow Rate

The MTFR for the 4-ft FDHC was demonstrated to be 673 gpm (1.50 cfs), which corresponds to a surface loading rate of 53.6 gpm/sf.

Sediment Storage Depth and Volume

The maximum sediment storage depth of the FDHC is 18 inches. Available sediment storage volume varies with each FDHC model, as FDHC model dimensions increase in diameter. The available sump volume for a 4-ft FDHC model is 0.70 cubic yards. The maximum sediment storage depth is 9 inches, which corresponds to a 50% full sump capacity (or 0.35 cubic yards) for the standard model. Refer to **Table A-2** in the Verification Appendix for the 50% sump full capacities for other FDHC model sizes.

Effective Treatment Area and Effective Sedimentation Area

The effective treatment and sedimentation area of the FDHC model varies with model size, as it corresponds to the surface area of the FDHC model diameter. The tested 4-ft FDHC model has a treatment surface area of 12.56 square feet.

Detention Time and Volume

The detention time of the FDHC depends on flow rate and model size. The detention time is calculated by dividing the treatment volume by the flow rate. The treatment volume is defined as the volume between the pipe invert and the top of the sediment storage zone. For the tested 4-ft FDHC model at the MTFR of 1.50 cfs, the detention time is 29 seconds.

Online or Offline Installation

Based on the results of the Scour Testing shown in Section 4.4, the FDHC qualifies for online installation.

4. Supporting Documentation

The NJDEP Procedure (NJDEP, 2013a) for obtaining verification of a stormwater manufactured treatment device (MTD) from the New Jersey Corporation for Advanced Technology (NJCAT) requires that "copies of the laboratory test reports, including all collected and measured data; all data from performance evaluation test runs; spreadsheets containing original data from all performance test runs; all pertinent calculations; etc." be included in this section. This was discussed with NJDEP and it was agreed that as long as such documentation could be made available by NJCAT upon request that it would not be prudent or necessary to include all this information in this verification report.

4.1 Test Sediment PSD Analysis – Removal Efficiency Testing

Hydro International purchased two different grades of high purity silica (SiO_2 99.8%) supplied by two different commercial silica suppliers. These silica blends were mixed together at the proportions required to generate a test sediment that complied with the particle size distribution requirements specified in the NJDEP HDS MTD protocol.

Prior to the start of removal efficiency testing trials conducted in November 2015, 5 batches of test sediment were blended by Hydro International. Three composite sediment samples and one spare sample approximately 400 mL in volume were blended using 80 mL of sediment collected from 6 subsamples drawn from each of the 5 batches under the supervision of the independent observer. The samples were also sealed and packaged for independent transport to the outside laboratory under the supervision of the independent observer. The independent laboratory GeoTesting Express analyzed the particle size distribution of each sample using ASTM D 422-63. The test sediment was found to be slightly finer than the protocol specified sediment blend. The results and the comparison to the protocol specification are shown in **Table 1** and **Figure 9.**

Table 1 - Particle Size Distribution Results of Test Sediment Samples

Particle Size	% Finer					Difference from Protocol %
µm	Protocol	Sample 1	Sample 2	Sample 3	Test Sediment Average	
1000	100	100.0	100.0	100.0	100.0	0.0
500	95	96.0	96.0	96.0	96.0	-1.0
250	90	90.0	90.0	90.0	90.0	0.0
150	75	80.0	80.0	80.0	80.0	-5.0
100	60	61.1	61.9	60.4	61.1	-1.1
75	50	54.0	54.0	54.0	54.0	-4.0
50	45	49.5	49.1	49.4	49.3	-4.3
20	35	39.1	37.8	37.9	38.3	-3.3
8	20	23.2	22.8	22.2	22.7	-2.7
5	10	15.3	15.9	15.1	15.4	-5.4
2	5	5.5	6.5	5.5	5.8	-0.8

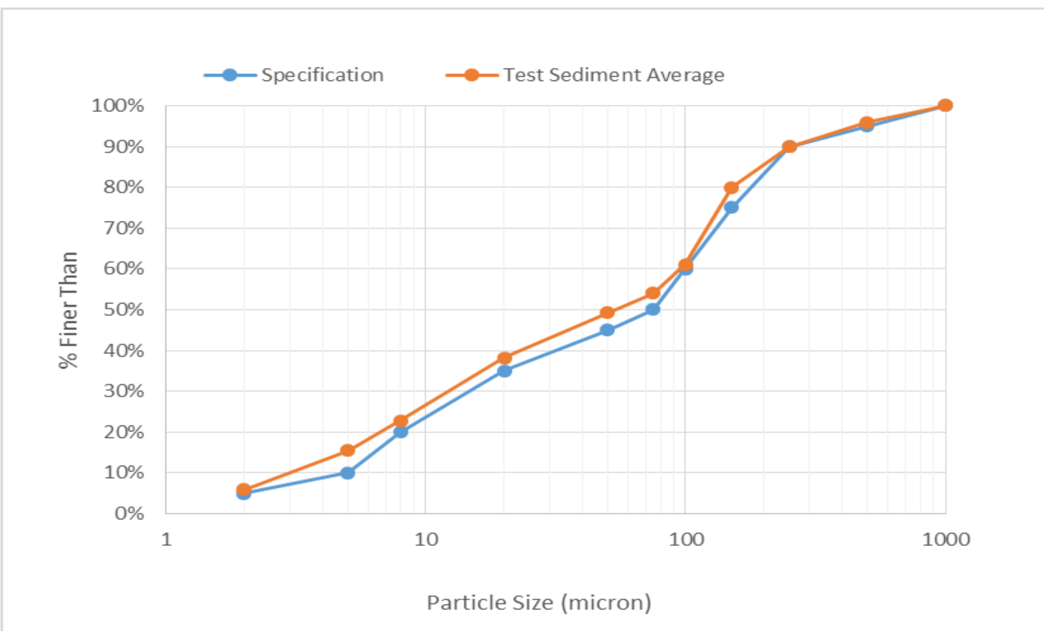

Figure 9 Average Test Sediment PSD vs Protocol Specification

4.2 Removal Efficiency Testing

In accordance with the NJDEP HDS Protocol, removal efficiency testing was executed on the First Defense® HC 4-ft. unit in order to establish the ability of the FDHC to remove the specified test sediment at 25%, 50%, 75%, 100% and 125% of the target MTFR. The target MTFR was 673 gpm (1.50 cfs). This target was chosen based on the ultimate goal of demonstrating greater than 50% annualized weighted solids removal as defined in the Protocol.

All results reported in this section were derived from test runs that fully complied with the terms of the protocol. None of the collection intervals of the calibration samples exceeded one minute in duration for any of the reported tests. The inlet feed concentration coefficient of variance (COV) did not exceed 0.10 for any flow rate trials.

The mean influent concentration was calculated using Equation 1 from *Section 2.4 Removal Efficiency Test Procedure.* The mean effluent concentration was adjusted by subtracting the measured background concentrations. No background TSS concentrations exceeded the 20 mg/L maximum allowed by the protocol. At no point did the water temperature exceed 80 ^{o}F.

25% MTFR Results

The 25% MTFR test was conducted in accordance with the NJDEP HDS Protocol at a target flow rate of 0.38 cfs. A summary of test readings, measurements and calculations are shown in **Table 2**. Feed calibration results are shown in **Table 3**. Background and effluent sampling measurements are shown in **Table 4**.

The 4-ft FDHC removed 61.1% of the test sediment at a flow rate of 0.38 cfs. **Table 5** shows that the QA/QC results for flow rate, feed rate and influent and effluent background concentrations were within the allowable parameters specified by the protocol.

Table 2 - Summary of 4-ft FDHC 25% MTFR Test

Trial Date	Target Flow (cfs)/(gpm)	Detention Time (sec)	Target Sediment Concentration (mg/L)	Target Feed Rate (mg/min)	Test Duration (Min)
11/02/2015	0.38 /168.4	116	200	130,995	44:36
Measured Values					
Mean Flow Rate (cfs)/(gpm)	**Mean Influent Concentration[1] (mg/L)**	**Max. Water Temperature °C / °F**	**Mean Adjusted Effluent Concentration (mg/L)**	**Average Removal Efficiency**	**QA/QC Compliance**
0.38 /169.0	205.0	25.5 / 77.9	79.7	61.1%	YES

[1] The mean influent concentration reported is calculated by dividing the entire mass of test sediment injected into the flow stream over the duration of the test divided by the total flow during the injection of test sediment.

Table 3 - 4-ft FDHC 25% MTFR Test Calibration Results

Target Concentration	200 mg/L	Target Feed Rate		130,995 mg/min	
Sample ID	**Sample Time (min)**	**Sample Mass (g)**	**Sample Duration (sec)**	**Feed Rate (mg/min)**	**Calculated Influent Concentration (mg/L)**
Feed Rate 1	0:00	136.255	60	136,255	213
Feed Rate 2	8:42	128.774	60	128,774	201
Feed Rate 3	17:24	129.323	60	129,323	202
Feed Rate 4	26:06	130.640	60	130,640	204
Feed Rate 5	34:48	129.336	60	129,336	202
Feed Rate 6	43:29	135.498	60	135,498	212
			Mean	131,638	**206**

Table 4 – 4-ft FDHC 25% MTFR Background and Effluent Measurements

Sample ID	Time (min)	Concentration (mg/L)
Background 1	7:42	2
Background 2	8:42	2
Background 3	16:54	2
Background 4	25:06	6
Background 5	26:06	7
Background 6	34:18	8
Background 7	42:29	12
Background 8	43:29	12

Sample ID	Time (min)	Concentration (mg/L)	Associated Background Concentration (mg/L)	Adjusted Concentration (mg/L)
Effluent 1	7:42	81	2	79
Effluent 2	8:12	81	2	79
Effluent 3	8:42	79	2	77
Effluent 4	16:24	80	2	78
Effluent 5	16:54	77	2	75
Effluent 6	17:24	80	4	76
Effluent 7	25:06	83	6	77
Effluent 8	25:36	83	6.5	77
Effluent 9	26:06	86	7	79
Effluent 10	33:48	90	7.5	83
Effluent 11	34:18	90	8	82
Effluent 12	34:48	89	10	79
Effluent 13	42:29	92	12	80
Effluent 14	42:59	98	12	86
Effluent 15	43:29	102	12	90
	Mean	**86.1**	**6.3**	**79.7**

Table 5 – 4-ft FDHC 25% MTFR Trial QA/QC Results

Flow Rate			
Target (cfs / gpm)	Mean (cfs / gpm)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
0.38 / 168.4	0.38 / 169.0	0.019	<0.03
Feed Rate			
Target (mg/min)	Mean (mg/min)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
130,995	131,638	0.025	<0.1
Influent Concentration			
Target (mg/L)	Mean (mg/L)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
200	205	0.025	<0.1
Background Concentration			
Low (mg/L)	High (mg/L)	Mean (mg/L)	Acceptable Threshold (mg/L)
2	12	6.3	<20

50% MTFR Results

The 4-ft FDHC 50% MTFR test was conducted in accordance with the NJDEP HDS protocol at a target flow rate of 0.75 cfs. The 50% MTFR test results are shown in **Table 6**. Calibration results are shown in **Table 7**. Background and effluent results are shown in **Table 8**.

The 4-ft FDHC removed 53.8% of the test sediment at a flow rate of 0.75 cfs. **Table 9** shows that the QA/QC results for flow rate, feed rate and influent and effluent background concentrations were within the allowable parameters specified by the protocol.

Table 6 – Summary of 4-ft FDHC 50% MTFR Test

Trial Date	Target Flow (cfs) / (gpm)	Detention Time (sec)	Target Sediment Concentration (mg/L)	Target Feed Rate (mg/min)	Test Duration (Min)
11/04/2015	0.75 / 336.8	58	200	261,990	24:56
Measured Values					
Mean Flow Rate (cfs) / (gpm)	**Mean Influent Concentration[1] (mg/L)**	**Max. Water Temperature °C / °F**	**Mean Adjusted Effluent Concentration (mg/L)**	**Average Removal Efficiency**	**QA/QC Compliance**
0.75 / 337.5	204.7	25.1 / 77.2	94.6	53.8%	YES

[1] The mean influent concentration reported is calculated by dividing the entire mass of test sediment injected into the flow stream over the duration of the test divided by the total flow during the injection of test sediment.

Table 7 – 4-ft FDHC 50% MTFR Test Calibration Results

Target Concentration	200 mg/L	Target Feed Rate		261,990 mg/min	
Sample ID	**Sample Time (min)**	**Sample Mass (g)**	**Sample Duration (sec)**	**Feed Rate (mg/min)**	**Calculated Influent Concentration (mg/L)**
Feed Rate 1	0:00	132.832	30	265,664	208
Feed Rate 2	4:51	135.837	30	271,674	213
Feed Rate 3	9:42	129.512	30	259,024	203
Feed Rate 4	14:33	134.162	30	268,324	210
Feed Rate 5	19:24	129.638	30	259,276	203
Feed Rate 6	24:15	129.169	30	258,338	202
			Mean	**263,717**	**206**

Table 8 – 4-ft FDHC 50% MTFR Background and Effluent Measurements

Sample ID	Time (min)	Concentration (mg/L)
Background 1	3:51	2
Background 2	4:51	2
Background 3	9:12	2
Background 4	13:33	2
Background 5	14:33	2
Background 6	18:54	5
Background 7	23:15	12
Background 8	24:15	16

Sample ID	Time (min)	Concentration (mg/L)	Associated Background Concentration (mg/L)	Adjusted Concentration (mg/L)
Effluent 1	3:51	90	2	88
Effluent 2	4:21	94	2	92
Effluent 3	4:51	99	2	97
Effluent 4	8:42	98	2	96
Effluent 5	9:12	100	2	98
Effluent 6	9:42	98	2	96
Effluent 7	13:33	95	2	93
Effluent 8	14:03	96	2	94
Effluent 9	14:33	95	2	93
Effluent 10	18:24	98	3.5	95
Effluent 11	18:54	103	5	98
Effluent 12	19:24	102	8.5	94
Effluent 13	23:15	106	12	94
Effluent 14	23:45	113	14	99
Effluent 15	24:15	108	16	92
	Mean	**99.7**	**5.1**	**94.6**

Table 9 – 4-ft FDHC 50% MTFR Trial QA/QC Results

Flow Rate			
Target (cfs / gpm)	Mean (cfs / gpm)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
0.75 / 336.8	0.75 / 337.5	0.008	<0.03
Feed Rate			
Target (mg/min)	Mean (mg/min)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
261,990	263,717	0.021	<0.1
Influent Concentration			
Target (mg/L)	Mean (mg/L)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
200	204.7	0.021	<0.1
Background Concentration			
Low (mg/L)	High (mg/L)	Mean (mg/L)	Acceptable Threshold (mg/L)
2	16	5.4	<20

75% MTFR Results

The 4-ft FDHC 75% MTFR test was conducted in accordance with the NJDEP HDS protocol at a target flow rate of 1.13 cfs (507 gpm). The 75% MTFR test results are shown in **Table 10**. Calibration results are shown in **Table 11**. Background and effluent results are shown in **Table 12.**

The 4-ft FDHC removed 51.3% of the test sediment at a flow rate of 1.13 cfs. **Table 13** shows that the QA/QC results for flow rate, feed rate and influent and effluent background concentrations were within the allowable parameters specified by the protocol.

Table 10 – Summary of 4-ft FDHC 75% MTFR Test

Trial Date	Target Flow (cfs) / (gpm)	Detention Time (sec)	Target Sediment Concentration (mg/L)	Target Feed Rate (mg/min)	Test Duration (Min)
11/06/2015	1.13 / 507.2	39	200	393,600	18:34
Measured Values					
Mean Flow Rate (cfs / gpm)	**Mean Influent Concentration[1] (mg/L)**	**Max. Water Temperature °C / °F**	**Mean Adjusted Effluent Concentration (mg/L)**	**Average Removal Efficiency**	**QA/QC Compliance**
1.13 / 507.5	191.7	24.9 / 76.8	93.3	51.3%	YES

[1] The mean influent concentration reported is calculated by dividing the entire mass of test sediment injected into the flow stream over the duration of the test divided by the total flow during the injection of test sediment.

Table 11 – 4-ft FDHC 75% MTFR Test Calibration Results

Target Concentration	200 mg/L	Target Feed Rate		393,600 mg/min	
Sample ID	**Sample Time (min)**	**Sample Mass (g)**	**Sample Duration (sec)**	**Feed Rate (mg/min)**	**Calculated Influent Concentration (mg/L)**
Feed Rate 1	0:00	132.141	20	396,423	206
Feed Rate 2	3:34	129.181	20	387,543	202
Feed Rate 3	7:08	127.602	20	382,806	199
Feed Rate 4	10:42	121.658	20	364,974	190
Feed Rate 5	14:16	122.327	20	366,981	191
Feed Rate 6	17:50	122.845	20	368,535	192
			Mean	**377,877**	**197**

Table 12 – 4-ft FDHC 75% MTFR Background and Effluent Measurements

Sample ID	Time (min)	Concentration (mg/L)
Background 1	2:34	2
Background 2	3:34	2
Background 3	6:38	2
Background 4	9:42	2
Background 5	10:42	2
Background 6	13:46	14
Background 7	16:50	14
Background 8	17:50	15

Sample ID	Time (min)	Concentration (mg/L)	Associated Background Concentration (mg/L)	Adjusted Concentration (mg/L)
Effluent 1	2:34	87	2	85
Effluent 2	3:04	95	2	93
Effluent 3	3:34	96	2	94
Effluent 4	6:08	96	2	94
Effluent 5	6:38	98	2	96
Effluent 6	7:08	104	2	102
Effluent 7	9:42	99	2	97
Effluent 8	10:12	93	2	91
Effluent 9	10:42	100	2	98
Effluent 10	13:16	103	8	95
Effluent 11	13:46	98	14	84
Effluent 12	14:16	100	14	86
Effluent 13	16:50	102	14	88
Effluent 14	17:20	111	14.5	97
Effluent 15	17:50	115	15	100
	Mean	**99.8**	**6.5**	**93.3**

Table 13 – 4-ft FDHC 75% MTFR Trial QA/QC Results

Flow Rate			
Target (cfs / gpm)	Mean (cfs / gpm)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
1.13 / 507.2	1.13 / 507.5	0.006	<0.03
Feed Rate			
Target (mg/min)	Mean (mg/min)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
393,600	377,877	0.034	<0.1
Influent Concentration			
Target (mg/L)	Mean (mg/L)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
200	191.7	0.034	<0.1
Background Concentration			
Low (mg/L)	High (mg/L)	Mean (mg/L)	Acceptable Threshold (mg/L)
2	15	6.6	<20

100% MTFR Results

The 4-ft FDHC 100% MTFR test was conducted in accordance with the NJDEP HDS protocol at a target flow rate of 1.50 cfs (675 gpm). The 100% MTFR test results are shown in **Table 14**. Calibration results are shown in **Table 15**. Background and effluent results are shown in **Table 16.**

The 4-ft FDHC removed 46.0% of the test sediment at a flow rate of 1.50 cfs. **Table 17** shows that the QA/QC results for flow rate, feed rate and influent and effluent background concentrations were within the allowable parameters specified by the protocol.

Table 14 – Summary of 4-ft FDHC 100% MTFR Test

Trial Date	Target Flow (cfs) / (gpm)	Detention Time (sec)	Target Sediment Concentration (mg/L)	Target Feed Rate (mg/min)	Test Duration (Min)
11/10/2015	1.50 / 675.2	29	200	523,980	15:50
Measured Values					
Mean Flow Rate (cfs / gpm)	**Mean Influent Concentration (mg/L)[1]**	**Max. Water Temperature °C / °F**	**Mean Adjusted Effluent Concentration (mg/L)**	**Average Removal Efficiency**	**QA/QC Compliance**
1.50 / 674.1	204.3	24.8 / 76.6	110.3	46.0%	YES

[1] The mean influent concentration reported is calculated by dividing the entire mass of test sediment injected into the flow stream over the duration of the test divided by the total flow during the injection of test sediment.

Table 15 – 4-ft FDHC 100% MTFR Test Calibration Results

Target Concentration	200 mg/L	Target Feed Rate		523,980 mg/min	
Sample ID	**Sample Time (min)**	**Sample Mass (g)**	**Sample Duration (sec)**	**Feed Rate (mg/min)**	**Calculated Influent Concentration (mg/L)**
Feed Rate 1	0:00	180.656	20	541,968	212
Feed Rate 2	3:00	180.055	20	540,165	212
Feed Rate 3	6:01	178.465	20	535,395	210
Feed Rate 4	9:01	175.592	20	526,776	206
Feed Rate 5	12:02	171.389	20	514,167	201
Feed Rate 6	15:02	167.750	20	503,250	197
			Mean	526,954	**206**

Table 16 – 4-ft FDHC 100% MTFR Background and Effluent Measurements

Sample ID	Time (min)	Concentration (mg/L)
Background 1	2:00	4
Background 2	3:00	2
Background 3	5:31	2
Background 4	8:01	2
Background 5	9:01	2
Background 6	11:32	6
Background 7	14:02	12
Background 8	15:02	15

Sample ID	Time (min)	Concentration (mg/L)	Associated Background Concentration (mg/L)	Adjusted Concentration (mg/L)
Effluent 1	2:00	99	4	95
Effluent 2	2:30	107	3	104
Effluent 3	3:00	112	2	110
Effluent 4	5:01	111	2	109
Effluent 5	5:31	119	2	117
Effluent 6	6:01	116	2	114
Effluent 7	8:01	109	2	107
Effluent 8	8:31	114	2	112
Effluent 9	9:01	115	2	113
Effluent 10	11:02	119	4	115
Effluent 11	11:32	114	6	108
Effluent 12	12:02	123	9	114
Effluent 13	14:02	122	12	110
Effluent 14	14:32	132	13.5	119
Effluent 15	15:02	123	15	108
	Mean	**115.7**	**5.4**	**110.3**

Table 17 – 4-ft FDHC 100% MTFR Trial QA/QC Results

Flow Rate			
Target (cfs / gpm)	Mean (cfs / gpm)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
1.50 / 675.2	1.50 / 674.1	0.007	<0.03
Feed Rate			
Target (mg/min)	Mean (mg/min)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
523,980	526,954	0.03	<0.1
Influent Concentration			
Target (mg/L)	Mean (mg/L)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
200	204.3	0.03	<0.1
Background Concentration			
Low (mg/L)	High (mg/L)	Mean (mg/L)	Acceptable Threshold (mg/L)
2	15	5.6	<20

125% MTFR Results

The 4-ft FDHC 125% MTFR test was conducted in accordance with the NJDEP HDS protocol at a target flow rate of 1.88 cfs (842 gpm). The 125% MTFR test results are shown in **Table 18**. Calibration results are shown in **Table 19**. Background and effluent results are shown in **Table 20.**

The 4-ft FDHC removed 43.5% of the test sediment at a flow rate of 1.88 cfs. **Table 21** shows that the QA/QC results for flow rate, feed rate and influent and effluent background concentrations were within the allowable parameters specified by the protocol.

Table 18 – Summary of 4-ft FDHC 125% MTFR Test

Trial Date	Target Flow (cfs / gpm)	Detention Time (sec)	Target Sediment Concentration (mg/L)	Target Feed Rate (mg/min)	Test Duration (Min)
11/16/2015	1.88 / 842.0	23	200	634,499	13:59
Measured Values					
Mean Flow Rate (cfs / gpm)	**Mean Influent Concentration[1] (mg/L)**	**Max. Water Temperature °C / °F**	**Mean Adjusted Effluent Concentration (mg/L)**	**Average Removal Efficiency**	**QA/QC Compliance**
1.88 / 842.3	201.8	24.8 / 76.7	114.0	43.5%	YES

[1] The mean influent concentration reported is calculated by dividing the entire mass of test sediment injected into the flow stream over the duration of the test divided by the total flow during the injection of test sediment.

Table 19 – 4-ft FDHC 125% MTFR Test Calibration Results

Target Concentration	200 mg/L	Target Feed Rate		634,499 mg/min	
Sample ID	**Sample Time (min)**	**Sample Mass (g)**	**Sample Duration (sec)**	**Feed Rate (mg/min)**	**Calculated Influent Concentration (mg/L)**
Feed Rate 1	0:00	230.390	20	691,170	217
Feed Rate 2	2:40	221.852	20	665,556	209
Feed Rate 3	5:21	224.366	20	673,098	211
Feed Rate 4	8:01	218.425	20	655,275	206
Feed Rate 5	10:42	210.833	20	632,499	198
Feed Rate 6	13:22	204.864	20	614,592	193
			Mean	655,365	**206**

Table 20 – 4-ft FDHC 125% MTFR Background and Effluent Measurements

Sample ID	Time (min)	Concentration (mg/L)
Background 1	1:40	2
Background 2	2:40	2
Background 3	4:51	2
Background 4	7:01	2
Background 5	8:01	2
Background 6	10:12	5
Background 7	12:22	11
Background 8	13:22	11

Sample ID	Time (min)	Concentration (mg/L)	Associated Background Concentration (mg/L)	Adjusted Concentration (mg/L)
Effluent 1	1:40	110	2	108
Effluent 2	2:10	121	2	119
Effluent 3	2:40	108	2	106
Effluent 4	4:21	128	2	126
Effluent 5	4:51	119	2	117
Effluent 6	5:21	119	2	117
Effluent 7	7:01	114	2	112
Effluent 8	7:31	115	2	113
Effluent 9	8:01	115	2	113
Effluent 10	9:42	119	3.5	116
Effluent 11	10:12	119	5	114
Effluent 12	10:42	114	8	106
Effluent 13	12:22	122	11	111
Effluent 14	12:52	124	11	113
Effluent 15	13:22	130	11	119
	Mean	**118.5**	**4.5**	**114.0**

Table 21 – 4-ft FDHC 125% MTFR Trial QA/QC Results

Flow Rate			
Target (cfs / gpm)	Mean (cfs / gpm)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
1.88 / 842.0	1.88 / 842.3	0.005	<0.03
Feed Rate			
Target (mg/min)	Mean (mg/min)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
634,499	655,365	0.04	<0.1
Influent Concentration			
Target (mg/L)	Mean (mg/L)	Coef. Of Variance	Acceptable Parameters Coef. Of Variance
200	201.8	0.04	<0.1
Background Concentration			
Low (mg/L)	High (mg/L)	Mean (mg/L)	Acceptable Threshold (mg/L)
2	11	4.6	<20

Excluded Data/Results

Section 5.D, *Verification Report Requirements: Supporting Documentation* of the NJDEP Process document requires that all data from performance evaluation test runs excluded from the computation of the removal rate or verification analysis be disclosed. No test runs were aborted during the testing process, and no data from tests that did not meet protocol requirements have been excluded from the results presented in the previous section of this report.

One duplicate sample was collected for each effluent water quality sample. These samples were sent to an independent analytical laboratory for particle size distribution analysis. As effluent particle size analysis is not required by the NJDEP protocol, the data are not presented in this report.

The protocol requires that three samples of removal efficiency test sediment be collected and analyzed for particle size distribution, and that the average particle size of the three samples be reported. During the collection of the three sediment samples, a fourth sample was taken in case of spoilage or loss of one of the samples. This fourth sample was analyzed for particle size distribution and met the PSD specified by the protocol. The fourth sample was not included in the reported average particle size distribution, as the protocol specifically states that three samples shall be analyzed for particle size distribution.

Annualized Weighted TSS Removal Efficiency

The NJDEP-specified annual weighted TSS removal efficiency calculation is shown in **Table 22** using the results from the removal efficiency testing.

Testing in accordance with the provisions detailed in the NJDEP HDS Protocol demonstrate that the 4-ft FDHC achieved a 52.93% annualized weighted TSS removal at an MTFR of 1.50 cfs (53.6 gpm/sf). This testing demonstrates that the 4-ft FDHC exceeds the NJDEP requirement that HDS devices demonstrate at least 50% weighted annualized TSS removal efficiency at the MTFR.

Table 22 – Annualized Weighted TSS Removal of the 4-ft FDHC

% MTFR	Mean Flow Rate Tested (cfs)	Actual % MTFR	Measured Removal Efficiency	Annual Weighting Factor	Weighted Removal Efficiency
25	0.38	25.3	61.1%	0.25	15.28%
50	0.75	50.0	53.8%	0.3	16.14%
75	1.13	75.3	51.3%	0.2	10.26%
100	1.50	100.0	46.0%	0.15	6.90%
125	1.88	125.3	43.5%	0.1	4.35%
Weighted Annualized TSS Removal Efficiency					**52.93%**

4.3 Test Sediment PSD Analysis - Scour Testing

The scour test sediment, as described in Section 2.3 *Test Sediment*, was high purity (99.8% SiO_2) silica blended by an independent commercial silica supplier to meet the particle size distribution specified by the NJDEP HDS protocol. Three 250 mL subsamples were taken from the sump and analyzed for particle size analysis at the Hydro International lab under the supervision of the independent observer.

The results showed that the average test sediment was found to meet the particle size distribution specified by the protocol (**Table 23**), with no measured value being greater than two percentage points greater than the target percent finer value. A comparison of the PSD specified by the protocol and average PSD of the test sediment is shown in **Figure 10**.

Table 23 – Scour Test Sediment Particle Size Distribution Comparison

Particle Size (μm)	% Finer					% Difference from Spec
	NJDEP Spec	Sample 1	Sample 2	Sample 3	Average	
1000	100	100.0	100.0	100.0	100.0	0.0
500	90	95.1	95.0	95.2	95.1	-5.1
250	55	64.0	64.6	62.8	63.8	-8.8
150	40	49.8	50.0	47.8	49.2	-9.2
100	25	23.4	23.6	22.0	23.0	2.0
75	10	10.6	11.0	10.0	10.5	-0.5
50	0	1.3	1.6	1.3	1.4	-1.4

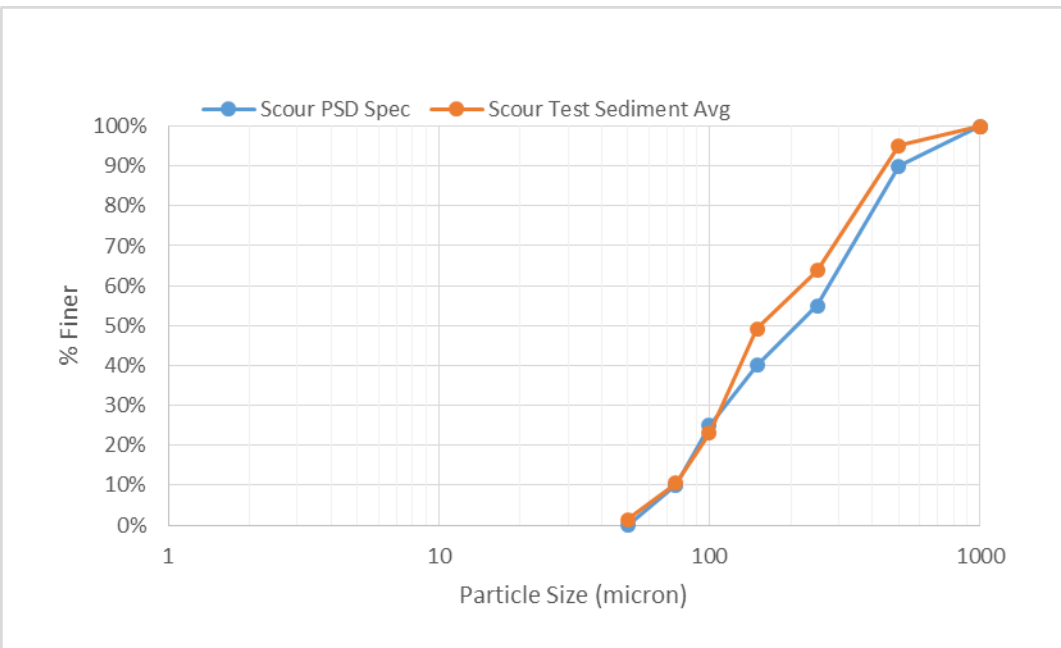

Figure 10 Scour Test Sediment PSD vs Protocol Specification

4.4 Scour Testing for Online Installation

The FDHC underwent scour testing in line with Section 4 of the NJDEP HDS protocol at a flow rate greater than 200% of its MTFR in order to verify its suitability for online use. For the 4-ft FDHC with an MTFR of 1.50 cfs (673 gpm) the average scour test flow rate had to be at least 3.0 cfs (1,344 gpm). The average flow rate for the scour test was 3.24 cfs, which represents 216% of the MTFR. The maximum water temperature during testing was 76.8°F. The flow rate COV was 0.007. Background concentrations measured 2 mg/L for all samples, which complies with the 20 mg/L maximum background concentration specified by the test protocol. Flow and background concentration measurements are shown in **Table 24**.

Table 24 – Flow and Background Concentration Results for 4-ft FDHC Scour Testing

Trial Date		11/18/2015	Average Flow Rate =	3.24cfs
Mean Temperature		**24.5°C / 76.1°F**	**Flow Rate COV**	**0.007**
Sample ID	**Time (min)**	**Concentration (mg/L)**		
Background 1	2:00	2		
Background 2	6:00	2		
Background 3	10:00	2		
Background 4	14:00	2		
Background 5	18:00	2		
Background 6	22:00	2		
Background 7	26:00	2		
Background 8	30:00	2		

Unadjusted effluent concentrations ranged from 2 mg/L to 4 mg/L with a mean of 2.1 mg/L. When adjusted for background concentrations, the effluent concentrations range from 0 to 2 mg/L. The mean adjusted effluent concentration was 0.1 mg/L (**Table 25**).

Table 25 – Effluent Concentration Results for 4-ft FDHC Scour Test at 216% MTFR

Sample ID	Time (min)	Effluent Concentration with Background Concentrations (mg/L)	Background Concentration (mg/L)	Adjusted Effluent Concentration (mg/L)
Effluent 1	2:00	2	2	0
Effluent 2	4:00	2	2	0
Effluent 3	6:00	2	2	0
Effluent 4	8:00	2	2	0
Effluent 5	10:00	2	2	0
Effluent 6	12:00	2	2	0
Effluent 7	14:00	2	2	0
Effluent 8	16:00	2	2	0
Effluent 9	18:00	2	2	0
Effluent 10	20:00	2	2	0
Effluent 11	22:00	2	2	0
Effluent 12	24:00	2	2	0
Effluent 13	26:00	2	2	0
Effluent 14	28:00	4	2	2
Effluent 15	30:00	2	2	0
	Mean	**2.1**	**2**	**0.1**

Excluded Data/Results

The protocol requires the disclosure and discussion of any data collected as a part of the testing process that is excluded from the reported results. No test runs were aborted during the scour testing process, and no data from tests that did not meet protocol requirements have been excluded from the results presented in the scour testing section of this report.

5. Design Limitations

The FDHC is an engineered system for which Hydro International’s engineers work with site designers to generate a detailed engineering submittal package for each installation. As such, design limitations are typically identified and managed during the design process. Design parameters and limitations are discussed in general terms below.

Required Soil Characteristics

The FDHC is a flow-through system contained within a water tight manhole. Therefore the FDHC can be installed and function as intended in all soil types.

Slope of Drainage Pipe

Hydro International recommends contacting our design engineers when the FDHC is going to be installed on a drainage line with a slope greater than 10%. With steeply sloping pipe, site specific parameters such as pipe size, online vs. offline arrangement of the FDHC and the frequency of peak flow are taken into consideration by the Hydro International design team.

Maximum Flow Rate

The maximum treatment flow rate (MTFR) of the FDHC is dependent upon model size. The recommended maximum peak flow rate is dependent on FDHC model size and other design and performance specifications. Hydro International recommends contacting their engineering staff with questions about managing high peak flow rates.

Maintenance Requirements

The FDHC should be inspected and maintained in line with the recommendations and guidelines set forth in the Operation and Maintenance Manual at: https://www.hydro-int.com/en/resources/first-defense-operations-maintenance-manual

The sediment accumulation rate in the FDHC is dependent on site-specific characteristics such as site usage and topography. A more detailed discussion of inspection and maintenance requirements is discussed later in Section 6.

Driving head

Testing conducted according to ASTM Standard Test Methods C1745 / C1745M – 11: Standard Test Method for Measurement of Hydraulic Characteristics of Hydrodynamic Stormwater Separators and Underground Settling Devices showed that the headloss across the FDHC is a function of flow rate and pipe velocities. Generally, the FDHC headloss is estimated using Equation 3.

Equation 3 – Flow dependent headloss of the FDHC

Given H_L = FDHC headloss
H_u = measured pressure head or water elevation in the inlet or upstream pipe
H_d = measured pressure head or water elevation in the outlet or downstream pipe
G = gravitational constant, 32.2 ft/sec^2
V_u, V_d = calculated average flow velocities in the upstream and downstream pipes, respectively

$$H_L = \left(h_u + \frac{V_u^2}{2g}\right) - \left(h_d + \frac{V_d^2}{2g}\right)$$

Installation limitations

Pick weights and installation procedures vary slightly with model size. Hydro International provides contractors with project-specific unit pick weights and installation instructions prior to delivery.

Configurations

The FDHC was designed for online applications in which the inlet and outlet are tied directly into the main drainage line, however the device can also be installed offline using external junction manholes (**Figure 11a-b**). However, the performance of these offline configurations have not been verified.

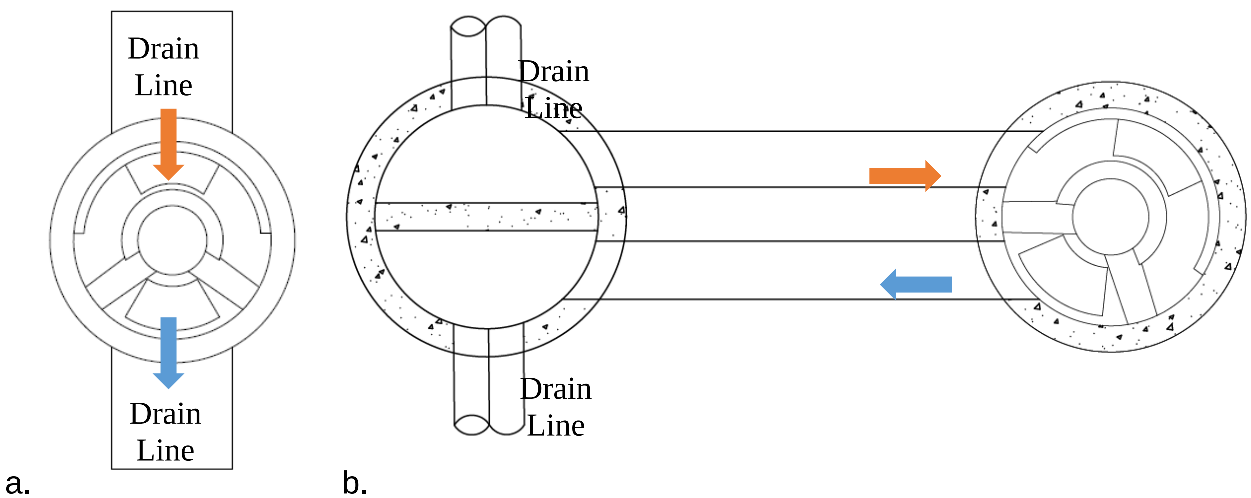

Figure 11 a) FDHC Online Application; b) FDHC Offline Application

In some cases, multiple inlet pipes can be accommodated depending on pipe size and pipe angles as long as at least six inches of concrete remains between inlet pipe knockouts and pipe angles are within 240° of the outlet centerline (**Figure 12**). Various inlet pipe configurations have not been verified. Contact Hydro International for design assistance with multiple inlet pipes.

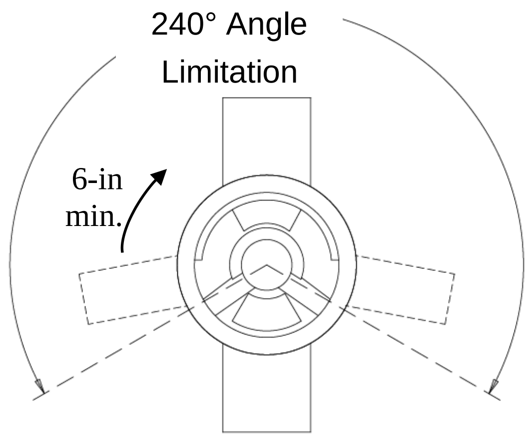

Figure 12 FDHC Design Accommodates Various Inlet Pipe Configurations

Load Limitations

Standard FDHC units are designed for HS-20 loading. Contact Hydro International engineering staff when heavier load ratings are required.

Pretreatment Requirements

The FDHC has no pre-treatment requirements.

Limitations on Tail water

As the FDHC includes an internal bypass, Hydro International recommends working with their engineering team if tail water is present to increase the available driving head to ensure that the full water quality treatment flow rate is treated prior to internal bypass.

Depth to seasonal high water table

Although the functionality of the FDHC is not impacted by high groundwater, Hydro International recommends consulting their engineering staff to determine whether the addition of anti-flotation collars to the base of the FDHC chamber are necessary to counterbalance buoyant forces.

Pipe Size

Each FDHC model has a maximum recommended inlet and outlet pipe size. When the diameter of the main storm drain line exceeds the maximum FDHC pipe size, Hydro International recommends contacting their engineering team. In some circumstances larger pipe sizes can be safely accommodated; otherwise, Hydro International recommends the FDHC be designed in an offline configuration. The maximum recommended inlet and outlet pipe diameter for each FDHC model are shown in **Table A-2** of the Verification Appendix.

6. Maintenance Plans

The FDHC treats stormwater by removing pollutants from stormwater runoff and capturing them in the pollutant storage sump. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the FDHC. When sediment and oil storage capacities are reached, the FDHC's ability to capture and store removed sediment and oil will be compromised.

Inspection and maintenance of the FDHC are simple procedures conducted from the surface. Neither inspection nor maintenance require purchasing spare parts or tools from Hydro International. The FDHC has one centrally located 30-in manhole lid to provide inspection and maintenance access to both the internal bypass chamber and treatment chamber.

Inspection

The required frequency of cleanout depends on site use and other site specific characteristics and should therefore be determined by inspecting the unit after installation. During the first year of operation, the unit should be inspected at least every six months to determine the rate of sediment and floatables accumulation. More frequent inspections are recommended at sites that would generate heavy solids loads, like parking lots with winter sanding or unpaved maintenance lots. A dipstick can be used to measured accumulated oil; a sediment probe can be used to determine the level of accumulated solids stored in the sump.

Hydro International recommends that the units are cleaned when sediment volumes reach 50% sump capacity. The standard sediment storage depth in the FDHC is 18 inches. Because FDHC model sizes vary in diameter, pollutant storage volumes vary with model size as shown in **Table 26**.

Table 26 – Pollutant Storage Capacities of the FDHC

Model	Oil Storage Volume (gal)	Sediment Volume at 50% Sump Capacity (yd^3)	Sediment Depth at 50% Sump Capacity (in)	Sump Volume (yd^3)	Sump Depth (in)
3-ft FDHC	125	0.20	9	0.4	18
4-ft FDHC	191	0.35	9	0.7	18
5-ft FDHC	300	0.55	9	1.1	18
6-ft FDHC	496	0.80	9	1.6	18
7-ft FDHC	720	1.05	9	2.1	18
8-ft FDHC	1,002	1.40	9	2.8	18
10-ft FDHC	1,742	2.20	9	4.4	18

When sediment and oil depths are measured during inspection, they should be recorded on the

Operation & Maintenance manual log and compared to the as-built drawings of the FDHC to assess whether accumulated sediment has reach 9 inches in depth. The O&M Manual is at: https://www.hydro-int.com/en/resources/first-defense-operations-maintenance-manual

Maintenance

The interval of required clean-out should be determined by post-installation inspection of pollutant accumulation rates. If post-installation inspection cannot be conducted for some reason, Hydro International recommends the FDHC be cleaned out at least once per year. There is no need for man entry into the FDHC during maintenance. However, if man entry does occur then proper confined space entry procedures must be followed.

Floatable trash and debris can be removed by lifting the floatable access lid and using a netted skimming pole or a vactor truck to skim trash from the surface of the standing water. Accumulated oil must be vactored from the surface using a vactor truck or sump vac. Accumulated sediment can be removed by lifting the central access lid and dropping a vactor hose down the center shaft to the sump. The entire sump liquid volume does not necessarily need to be removed from the FDHC during maintenance.

When all pollutants have been removed from the FDHC, the manhole lids should be put securely back in place. Removed pollutants should be disposed of in accordance with local regulations and ordinances.

7. Statements

The following signed statements from the manufacturer, third-party observer and NJCAT are required to complete the NJCAT verification process.

In addition, it should be noted that this report has been subjected to public review (e.g., stormwater industry) and all comments and concerns have been satisfactorily addressed.

Stormwater Solutions

Turning Water Around...®

December 21, 2015

Dr. Richard Magee, Sc.D., P.E., BCEE
Technical Director
New Jersey Corporation for Advanced Technology
c/o Center for Environmental Systems
Stevens Institute of Technology
One Castle Point on Hudson
Hoboken, NJ 07030

Re: Verification of First Defense® HC to NJDEP HDS Laboratory Testing Protocol

Dear Dr. Magee:

Hydro International's First Defense® HC (FDHC) vortex separator for stormwater treatment recently underwent verification testing according to the NJDEP HDS Laboratory Testing Protocol. As required by the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology", this letter serves as Hydro International's statement that all procedures and requirements identified in the aforementioned protocol and process document were met or exceeded. The 4-ft FDHC removal efficiency and scour tests conducted at Hydro International's laboratory facility in Portland, Maine were done so under the direct supervision of FB Environmental Associates. All water quality samples were analyzed by the independent analytical lab, Maine Environmental Laboratory. The removal efficiency particle size distribution was analyzed by the independent analytical laboratory, GeoTesting Express. The scour test particle size distribution was analyzed at Hydro International's facility under the supervision of FB Environmental Associates. Additionally, the preparation of the verification report and the documentation contained therein fulfill the submission requirements of the process document and protocol.

If you have any questions or comments regarding the verification of the FDHC, please do not hesitate to contact us.

Sincerely,

Lisa Lemont, CPSWQ
Business Development Manager

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Statement of Third Party Observer

STATEMENT OF THIRD PARTY OBSERVER

To: **Lisa Lemont, Hydro International, Portland, Maine**

From: Forrest Bell, FB Environmental Associates

Subject: **Third Party Review under *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology* (NJDEP, January 25 2013)[1]**

Date: December 31, 2015

cc: Andrew Anastasio, Hydro International; Jeremy Fink, Hydro International
Margaret Burns, FB Environmental Associates

Statement of Third Party Observer

FB Environmental has served as the third-party observer for tests performed by Hydro International in October through December 2015. The tests assessed the First Defense HC Stormwater Treatment Device as a 50% Total Suspended Solids (TSS) removal device under the New Jersey Department of Environmental Protection certification. Tests were performed by Hydro International staff at their laboratory located at 94 Hutchinson Drive in Portland, Maine, to meet the standards described in *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology* (NJDEP, January 25 2013)[1]. On May 10, 2014, we also submitted a statement of qualifications, as required by NJCAT MTD process.

A member of our staff verified compliance with the laboratory test protocol above, and our staff member was physically present to observe the full duration of all laboratory testing. We have also reviewed the data, calculations, and conclusions associated with the removal efficiency testing in the *Verification Testing Report for the First Defense® HC Stormwater Treatment Device* by Hydro International, dated December 29, 2015, and state that they conform to what we saw during our supervision as third-party observer.

Forrest Bell

December 31, 2015

Signed: Date:

[1] Available at http://www.nj.gov/dep/stormwater/treatment.html

1 of 1

Statement of Disclosure

STATEMENT OF DISCLOSURE – THIRD PARTY OBSERVER

To: **Lisa Lemont, Hydro International, Portland, Maine**

From: Forrest Bell, FB Environmental Associates

Subject: **Third Party Observer Statement of Disclosure under *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology* (NJDEP, January 25 2013)[1]**

Date: December 31, 2015

cc: Andrew Anastasio, Hydro International
Margaret Burns, FB Environmental Associates

Statement of Disclosure – Third Party Observer

FB Environmental has no financial conflict of interest regarding the test results of the stormwater device testing outlined in the *Verification Testing Report for the First Defense ® HC Stormwater Treatment Device* by Hydro International, dated December 29, 2015.

Disclosure Record

FB Environmental has provided the service of third party observer for tests performed by Hydro International in October through December of 2015. The tests assessed the First Defense HC Stormwater Treatment Device as a 50% Total Suspended Solids (TSS) removal device under the New Jersey Department of Environmental Protection certification as outlined in the *Verification Testing Report for the First Defense ® HC Stormwater Treatment Device* by Hydro International, dated December 29, 2015. Beyond this, FB Environmental and Hydro International have no relationships that would constitute a conflict of interest, as outlined in *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology* (NJDEP 2013). For example, we have no ownership stake, do not receive commissions, do not have licensing agreements, and do not receive funds or grants beyond those associated with the testing program.

Forrest Bell — December 31, 2015

Signed: Date:

[1] Available at http://www.nj.gov/dep/stormwater/treatment.html

1 of 1

Center for Environmental Systems
Stevens Institute of Technology
One Castle Point
Hoboken, NJ 07030-0000

January 9, 2016

Titus Magnanao
NJDEP
Division of Water Quality
Bureau of Non-Point Pollution Control
401-02B
PO Box 420
Trenton, NJ 08625-0420

Dear Mr. Magnanao,

Based on my review, evaluation and assessment of the testing conducted on the First Defense® HC (FDHC) Stormwater Treatment Device by Hydro International and observed by FB Environmental Associates, the test protocol requirements contained in the "New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" (NJDEP HDS Protocol) were met or exceeded. Specifically:

Test Sediment Feed

The mean PSD of Hydro Internationals test sediments comply with the PSD criteria established by the NJDEP HDS protocol. The Hydro International removal efficiency test sediment PSD analysis was plotted against the NJDEP removal efficiency test PSD specification. The test sediment was shown to be slightly finer than the sediment blend specified by the protocol. The Hydro International scour test sediment PSD analysis was plotted against the NJDEP removal efficiency test PSD specification and shown to be much finer than specified by the protocol.

Removal Efficiency Testing

In accordance with the NJDEP HDS Protocol, removal efficiency testing was executed on the 4-ft. laboratory unit in order to establish the ability of the FDHC to remove the specified test sediment at 25%, 50%, 75%, 100% and 125% of the target MTFR. Prior to the start of testing Hydro International reviewed existing data and decided to utilize a target MTFR of 675 gpm (1.50 cfs). This target was chosen based on the ultimate goal of demonstrating greater than 50% annualized weighted solids removal as defined in the NJDEP HDS Protocol. The flow rates, feed rates and influent concentration all met the NJDEP HDS test protocol's coefficient of variance requirements and the background concentration for all five test runs never exceeded 20 mg/L.

Scour Testing

In order to demonstrate the ability of the FDHC to be used as an online treatment device scour testing was conducted at greater than 200% of MTFR in accordance with the NJDEP HDS Protocol. The average flow rate during the online scour test was 3.24 cfs, which represents 216% of the MTFR (MTFR = 1.50 cfs). Background concentrations were 2 mg/L throughout the scour testing, which complies with the 20 mg/L maximum background concentration specified by the test protocol. Unadjusted effluent concentrations ranged from 2 mg/L to 4 mg/L with a mean of 2.1 mg/L. When adjusted for background concentrations, the effluent concentrations range from 0 to 2 mg/L with a mean of 0.1 mg/L. These results confirm that the 4-ft. FDHC did not scour at 216% MTFR and meets the criteria for online use.

Maintenance Frequency

The predicted maintenance frequency for all models is 44 months.

Sincerely,

Richard S. Magee, Sc.D., P.E., BCEE

8. References

ASTM D422-63. *Standard Test Method for Particle-size Analysis of Soils.*

ASTM D3977-97. *Standard Test Methods for Determining Concentrations in Water Samples*.

Hydro International 2014. *Quality Assurance Project Plan for FDHC® NJDEP Testing.* Prepared by H.I.L. Technology, Inc. dba Hydro International. October, 2015.

NJDEP 2013a. *New Jersey Department of Environmental Protection Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology.* Trenton, NJ. January 25, 2013.

NJDEP 2013b. *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device.* Trenton, NJ. January 25, 2013.

VERIFICATION APPENDIX

Introduction

- Manufacturer – Hydro International, 94 Hutchins Drive, Portland, ME 04102. *General Phone: (207)756-6200. Website:* www.hydro-int.com/us.

- MTD – First Defense® HC Stormwater Treatment Device. Verified First Defense® HC Models are shown in **Table A-1.**

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- TSS Removal Rate – 50%

- Online and offline installation

Detailed Specification

- NJDEP sizing tables attached as **Table A-1** and **Table A-2**.

- New Jersey requires that the peak flow rate of the NJWQ Design Storm event of 1.25 inch in 2 hours shall be used to determine the appropriate size for the MTD.

- Pick weights and installation procedures vary slightly with model size. Hydro International provides contractors with project-specific unit pick weights and installation instructions prior to delivery.

- Maximum recommended sediment depth prior to cleanout is 9 inches for all model sizes.

- For a reference maintenance plan, download the First Defense® HC Operation and Maintenance Manual at:

  https://www.hydro-int.com/en/resources/first-defense-operations-maintenance-manual

- Under N.J.A.C. 7:8-5.5, NJDEP stormwater design requirements do not allow a hydrodynamic separator such as the First Defense® HC to be used in series with another hydrodynamic separator to achieve an enhanced total suspended solids (TSS) removal rate.

Table A-1 MTFRs and Required Sediment Removal Intervals for FDHC Models (Revised May 2021)

First Defense® HC Model	Manhole Diameter (ft)	NJDEP 50% TSS Maximum Treatment Flow Rate (cfs)	Treatment Area (ft^2)	Hydraulic Loading Rate (gpm/ft^2)	50% Max Sediment Storage Volume (ft^3)	Required Sediment Removal Interval[1] (months)
3-ft	3	0.85	7.1	53.58	5.30	44
4-ft	4	1.50	12.6	53.58	9.42	44
5-ft	5	2.35	19.6	53.58	14.7	44
6-ft	6	3.38	28.3	53.58	21.2	44
7-ft	7	4.60	38.5	53.58	28.9	44
8-ft	8	6.00	50.2	53.58	37.7	44
10-ft	10	9.38	78.5	53.58	58.9	44

[1]Required sediment removal interval was calculated using the equation specified in Appendix B Part B of the NJDEP Laboratory Protocol for HDS MTDs:

$$\textbf{Sediment Removal Interval (months)} = \frac{\textbf{(50\% HDS MTD Max Sediment Storage Volume * 3.57)}}{\textbf{(MTFR * TSS Removal Efficiency)}}$$

Table A-2 Standard Dimensions for FDHC Models (Revised May 2021)

FD Optimum Model and Diameter	Maximum Treatment Flow Rate (cfs)	50% Max Sediment Storage Volume (ft^3)	Chamber Depth (ft)	Treated Chamber Depth[1] (ft)	Sediment Sump Depth (ft)	Aspect Ratio Treatment Depth: Diameter	Maximum Pipe Diameter (inch)
3-ft	0.85	5.33	3.75	3.00	1.5	1.00	18
4-ft	1.50	9.42	5.00	4.25	1.5	1.06	24
5-ft	2.35	14.7	5.25	4.50	1.5	0.90	24
6-ft	3.38	21.2	6.25	5.50	1.5	0.92	32
7-ft	4.60	28.9	7.25	6.50	1.5	0.93	42
8-ft	6.00	37.7	8.00	7.25	1.5	0.91	48
10-ft	9.38	58.9	10.25	9.50	1.5	0.95	60

[1]Treated Chamber Depth is the chamber depth minus ½ the sediment sump depth. Larger models (>250% MTFR of the tested unit) must be geometrically proportionate to the tested unit (4-ft model). A variance of 15% is allowable. For units <250% MTFR the depth must be equal or greater than the depth of the unit treated.

APPENDIX J

Pipe Sizing Calculations

INSITE
ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.

DRAINAGE SYSTEM CALCULATIONS
Design Storm: 10-Year

PROJECT: **Pawling Commons**
JOB NUMBER: **18135.100**
BY: JJS DATE: 1-30-2024
CHK: EJP DATE: 1-30-2024

STRUCTURE		IMPERVIOUS AREA			PERVIOUS AREA			CA	TIME OF CONC. (min.)			I	Q (cfs)		PIPE DESIGN				
FROM	TO	A (ac.)	C	CA	A (ac.)	C	CA		INLET	PIPE	TOTAL		DESIGN	CAP.	V(ft/s)	n	s (%)	L (ft)	DIA (in)
BLDG	HDS 13	**0.30**	0.9	0.27	**0.00**	0.3	0.00	0.27	**6**	-	6	**6.24**	1.7	4.6	5.4	**0.012**	**1.4**	**14**	**12**
HDS 13	DMH 2	**0.00**	0.9	0.00	**0.00**	0.3	0.00	0.27	**6**	-	6	**6.24**	1.7	2.7	3.7	**0.012**	**0.5**	**97**	**12**
CB 12	HDS 11	**0.30**	0.9	0.27	**0.20**	0.3	0.06	0.33	**6**	-	6	**6.24**	2.1	3.0	4.1	**0.012**	**0.6**	**113**	**12**
HDS 11	DMH 10	**0.00**	0.9	0.00	**0.00**	0.3	0.00	0.33	**6**	-	6	**6.24**	2.1	3.9	5.0	**0.012**	**1.0**	**9**	**12**
CB 9	HDS 8	**0.10**	0.9	0.09	**0.00**	0.3	0.00	0.09	**6**	-	6	**6.24**	0.6	3.0	2.9	**0.012**	**0.6**	**53**	**12**
HDS 8	Ex DI	**0.00**	0.9	0.00	**0.00**	0.3	0.00	0.09	**6**	-	6	**6.24**	0.6	3.0	2.9	**0.012**	**0.6**	**31**	**12**
BLDG	HDS 7	**0.08**	0.9	0.07	**0.00**	0.3	0.00	0.07	**6**	-	6	**6.24**	0.4	0.6	3.4	**0.012**	**1.0**	**40**	**6**
BLDG	YD 7A	**0.08**	0.9	0.07	**0.00**	0.3	0.00	0.07	**6**	-	6	**6.24**	0.4	0.9	4.5	**0.012**	**2.1**	**66**	**6**
YD 7A	HDS 7	**0.00**	0.9	0.00	**0.01**	0.3	0.00	0.07	**6**	-	6	**6.24**	0.4	4.2	3.5	**0.012**	**1.2**	**69**	**12**
HDS 7	Ex DI	**0.00**	0.9	0.00	**0.00**	0.3	0.00	0.14	**6**	-	6	**6.24**	0.9	3.9	4.0	**0.012**	**1.0**	**49**	**12**
CB 6	CB 5	**0.20**	0.9	0.18	**0.10**	0.3	0.03	0.21	**6**	-	6	**6.24**	1.3	3.9	4.5	**0.012**	**1.0**	**71**	**12**
CB 5	CB 4	**0.15**	0.9	0.14	**0.10**	0.3	0.03	0.38	**6**	-	6	**6.24**	2.4	3.9	5.2	**0.012**	**1.0**	**59**	**12**
CB 4	FS 3	**0.10**	0.9	0.09	**0.00**	0.3	0.00	0.47	**6**	-	6	**6.24**	2.9	3.9	5.4	**0.012**	**1.0**	**78**	**12**
FS 3	DMH 2	**PIPES SIZED IN HYDROCAD**																	
DMH 2	ES 1	**DESIGN FLOW CALCULATED FROM HYDROCAD**											3.5	4.2	6.0	**0.012**	**1.2**	**68**	**12**
FS 3	1.1P	**PIPES SIZED IN HYDROCAD**																	
1.1P	DMH 2	**PIPES SIZED IN HYDROCAD**																	

FIGURES

Z:\E\18135100 Pawling Commons\Stormwater\Figures\Figure 1 - Location Map.dwg, 10/26/2023 1:54:23 PM, ependleton, 1:1

PROJECT: PAWLING COMMONS 63 EAST MAIN STREET, VILLAGE OF PAWLING, DUTCHESS COUNTY, NEW YORK	INSITE ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.	DATE: 10–31–2023 SCALE: 1" = 500' PROJECT NO.: 18135.100
LOCATION MAP	3 Garrett Place • Carmel, New York 10512 Phone (845) 225–9690 • Fax (845) 225–9717 www.insite–eng.com	FIGURE: 1

SOILS LEGEND

SOILS	DESCRIPTION	HYDROLOGICAL GROUP
GIB	Galway–Farmington Urban land complex, undulating, rocky	C

LEGEND

PRE 2	SUBCATCHMENT
—SF→	TIME OF CONCENTRATION SHEET FLOW
—SCF→	TIME OF CONCENTRATION SHALLOW CONCENTRATED FLOW
DESIGN LINE	DESIGN LINE
DESIGN POINT	DESIGN POINT
	SUBCATCHMENT CONTRIBUTING AREA

GRAPHIC SCALE

0 15 30 60

(IN FEET)
1 inch = 30 ft.

ALTERATION OF THIS DOCUMENT, UNLESS UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, IS A VIOLATION OF SECTION 7209 OF ARTICLE 145 OF THE EDUCATION LAW.

NO.	DATE	REVISION	BY

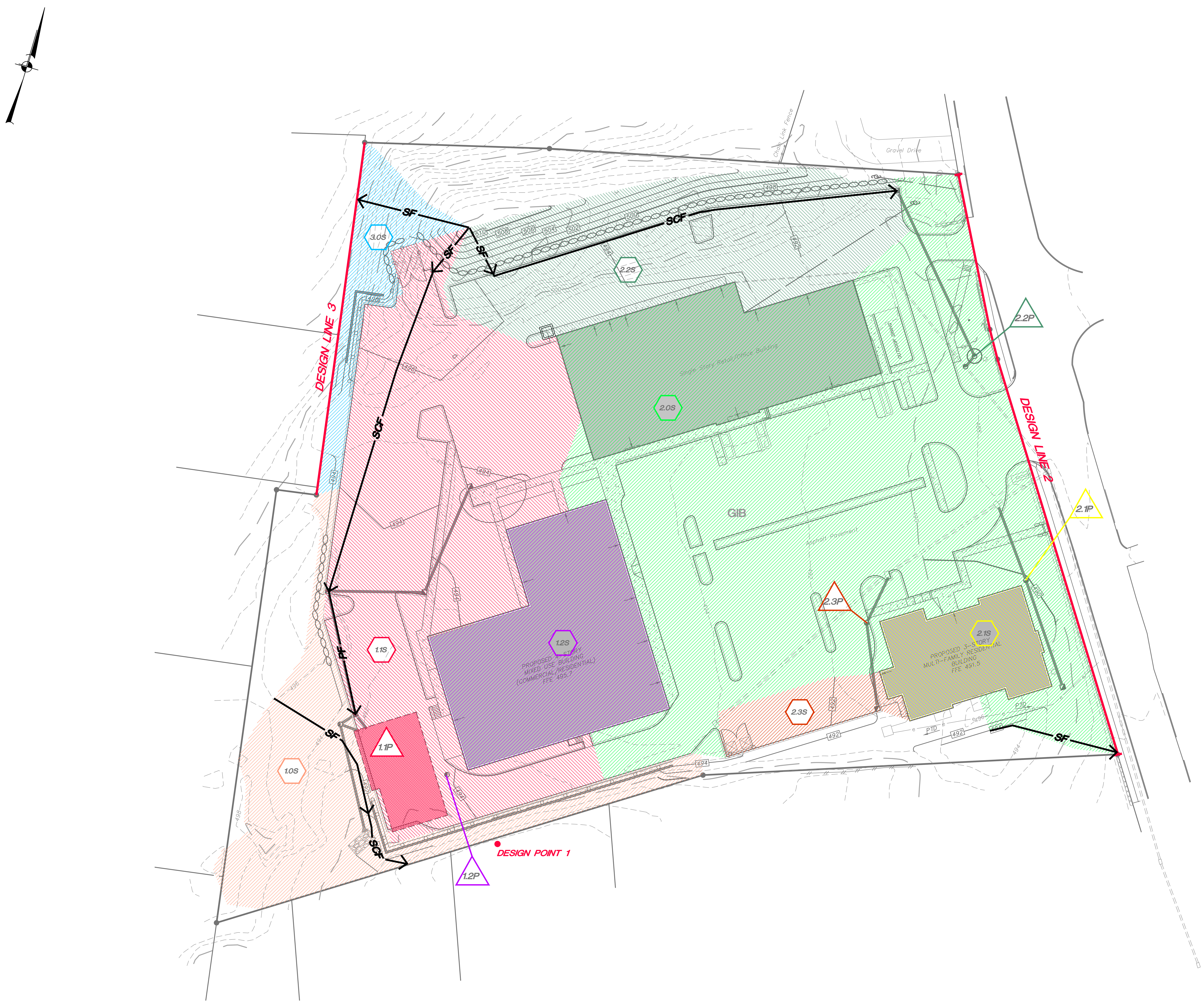
INSITE
ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.
3 Garrett Place
Carmel, NY 10512
(845) 225-9690
(845) 225-9717 fax
www.insite-eng.com

PROJECT:
PAWLING COMMONS

DRAWING:
PRE–DEVELOPMENT DRAINAGE MAP

PROJECT NUMBER	18135.100	PROJECT MANAGER	J.M.W.
DATE	10–31–23	DRAWN BY	J.J.S.
SCALE	1" = 30'	CHECKED BY	E.J.P.

DRAWING NO.
FIG–2



SOILS LEGEND

SOILS	DESCRIPTION	HYDROLOGICAL GROUP
GIB	Galway–Farmington Urban land complex, undulating, rocky	C

LEGEND

2.0S	SUBCATCHMENT
1.1P	STORMWATER MANAGEMENT PRACTICE
SF	TIME OF CONCENTRATION SHEET FLOW
SCF	TIME OF CONCENTRATION SHALLOW CONCENTRATED FLOW
PF	TIME OF CONCENTRATION PIPE FLOW
DESIGN LINE	DESIGN LINE
DESIGN POINT	DESIGN POINT
	SUBCATCHMENT CONTRIBUTING AREA
	STORMWATER MANAGEMENT / GREEN INFRASTRUCTURE PRACTICE AREA

GRAPHIC SCALE

0 15 30 60

(IN FEET)
1 inch = 30 ft.

NO.	DATE	REVISION	BY
1	12–29–23	REVISED FOR PLANNING BOARD SUBMISSION	EJP

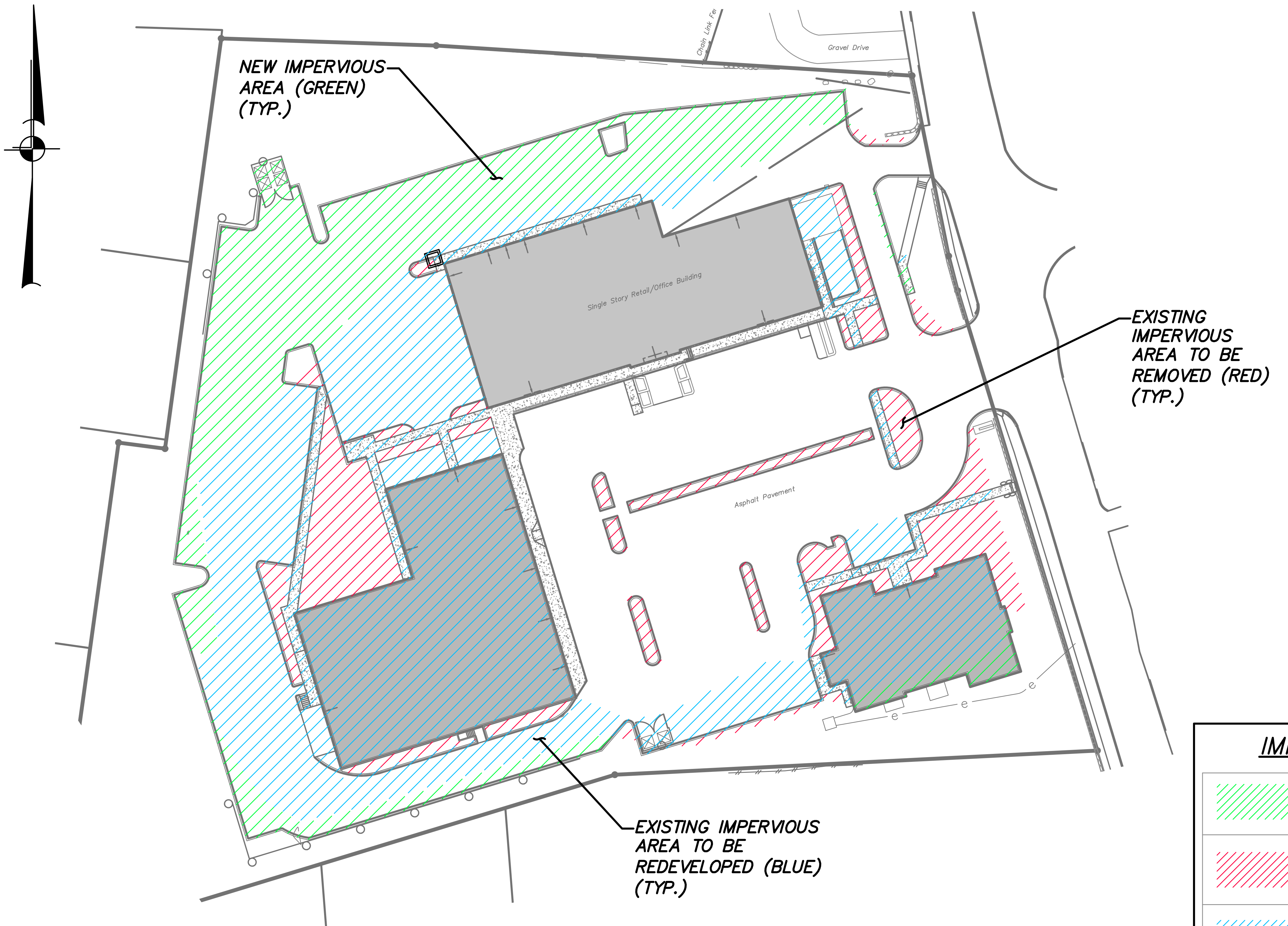
INSITE ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.
3 Garrett Place
Carmel, NY 10512
(845) 225–9690
(845) 225–9717 fax
www.insite–eng.com

PROJECT:
PAWLING COMMONS

DRAWING:
POST DEVELOPMENT DRAINAGE MAP

PROJECT NUMBER	18135.100	PROJECT MANAGER	J.M.W.
DATE	10–31–23	DRAWN BY	J.J.S.
SCALE	1" = 30'	CHECKED BY	E.J.P.

DRAWING NO.
FIG–3



IMPERVIOUS AREA SUMMARY TABLE

(green hatch)	NEW IMPERVIOUS AREA	0.5 AC±
(red hatch)	EXISTING IMPERVIOUS AREA TO BE REMOVED	0.3 AC±
(blue hatch)	EXISTING IMPERVIOUS AREA TO BE REDEVELOPED	1.1 AC±

PROJECT:

PAWLING COMMONS

63 E MAIN STREET, TOWN OF PAWLING, DUTCHESS COUNTY, NEW YORK

DRAWING:

IMPERVIOUS OVERLAY PLAN

PREPARED BY:

INSITE
ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.
3 Garrett Place • Carmel, New York 10512
Phone (845) 225-9690 • Fax (845) 225-9717
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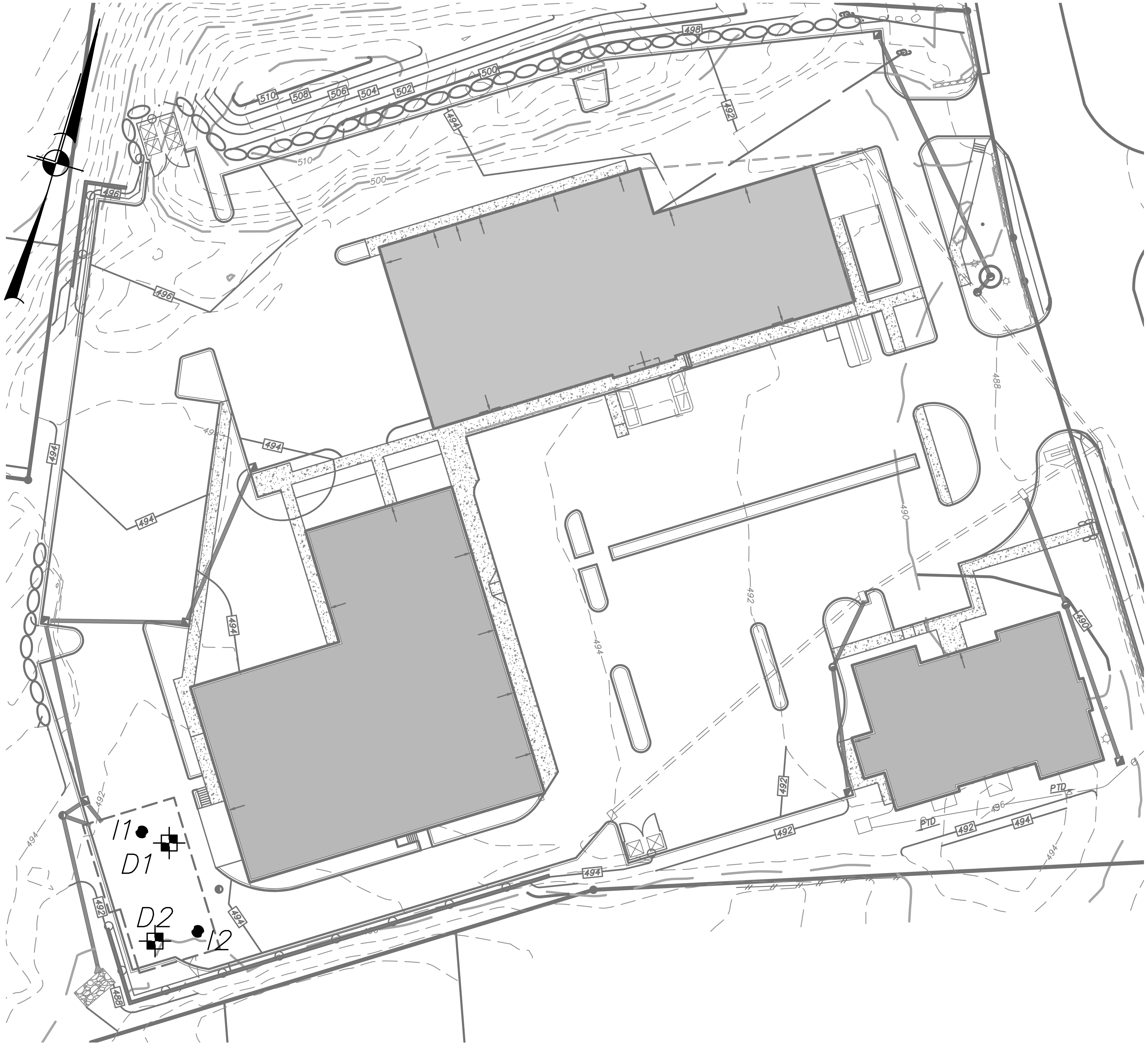
GRAPHIC SCALE

0 30 60 120

(IN FEET)
1 inch = 60 ft.

DATE:	12-29-2023
SCALE:	1" = 60'
PROJECT NO.:	18135.100
FIGURE:	4



LEGEND

D1 — DEEP TEST HOLE
I1 — INFILTRATION TEST HOLE

INFILTRATION TEST RESULTS:
INFILTRATION TESTS PERFORMED ON: 10-2-2023
INFILTRATION TESTS PERFORMED BY: IVAN BOYADZHIEV (INSITE ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.)
I-1: 5" IN./HR. AT 72" DEPTH
I-2: 1.5" IN./HR. AT 54" DEPTH

DEEP HOLE TEST RESULTS:
DEEP TESTS PERFORMED ON: 9-26-2023
DEEP TESTS OBSERVED BY:
EVAN PENDLETON, PE (INSITE ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.)

D-1:	0"-12"	MISCELLANEOUS FILL WITH MILLINGS
	12"-16"	ASPHALT
	16"-84"+	BROWN SANDY LOAM WITH COBBLES
D-2:	0"-12"	MISCELLANEOUS FILL WITH MILLINGS
	12"-16"	ASPHALT
	16"-72"+	BROWN SILTY FINE SAND LOAM WITH COBBLES

NOTE: NO LEDGE ROCK, MOTTLING, OR GROUNDWATER OBSERVED.

INFILTRATION TEST DATA

TEST HOLE	RUN #	TIME	MEASUREMENT	DROP / TIME	INFILTRATION RATE
I1	1	8:20	59"	6" / 60 MIN	6 IN/HR
		9:20	65"		
	2	9:27	60"	6" / 60 MIN	6 IN/HR
		10:27	66"		
	3	10:28	60"	5" / 60 MIN	5 IN/HR
		11:28	65"		
	4	11:30	60"	5" / 60 MIN	5 IN/HR
		12:30	65"		
I2	1	8:17	95"	1.5" / 60 MIN	1.5 IN/HR
		9:17	96.5"		
	2	9:24	95"	1.5" / 60 MIN	1.5 IN/HR
		10:24	96.5"		
	3	10:25	95"	1.5" / 60 MIN	1.5 IN/HR
		11:25	96.5"		
	4	11:33	95"	1.5" / 60 MIN	1.5 IN/HR
		12:33	96.5"		

PROJECT: PAWLING COMMONS

DRAWING: SOIL TESTING

PREPARED BY:
INSITE
ENGINEERING, SURVEYING & LANDSCAPE ARCHITECTURE, P.C.
3 Garrett Place • Carmel, New York 10512
Phone (845) 225-9690 • Fax (845) 225-9717
www.insite-eng.com

GRAPHIC SCALE
50 0 25 50 100
(IN FEET)
1 inch = 50 ft.

DATE: 1-30-24
SCALE: 1" = 50'
PROJECT NO.: 16226.100
FIGURE: 5