PRELIMINARY STORMWATER MANAGEMENT PLAN

Prepared for

Field Home
2300 Catherine Street
Town of Yorktown, NY

Prepared by:

Site Design Consultants
251F Underhill Avenue
Yorktown Heights, New York 10598
914-962-4488

Joseph C. Riina, P.E.
NYS Lic. No. 64431

August 17, 2023

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Field Home
2300 Catherine Street
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Applicant:

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Danbury, CT 06810

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List of Required Approvals and Applications:

Town of Yorktown Site Plan Approval – approval pending

Town of Yorktown Building Permit – approval pending

New York State Department of Environmental Conservation
General Permit GP-0-20-001 "Notice of Intent"

New York State Department of Environmental Conservation
SWPPP MS4 Acceptance Form

New York State Department of Environmental Conservation
"Notice of Termination"

New York City Department of Environmental Protection

1.0 Project Description

The subject property is located at 2300 Catherine Street in the Town of Yorktown, Westchester County, New York (see Figure 1.1 – Location Map and Figure 1-2 – Vicinity Map). The site consists of two parcels totaling 50.51 acres, currently split zoned in the RSP-3 and R1-40 Districts. The Applicant is proposing to rezone the two parcels into the RSP-2 District. Upon the rezoning, the Applicant is proposing to re-subdivide the parcels into two new parcels: (i) the 118-unit residential development would be constructed on approximately 37.55 acres of the total site area of 48.05; and (ii) a 2.46-acre parcel on which the existing Field Home Building would remain. State-of-the-art storm water management practices and controls are incorporated in the design of the project to retain, treat, and infiltrate storm water generated on-site by the development.

The topography of the project site ranges from 0 to greater than 25 percent slopes, portions of which will be developed on slopes greater than 15 percent. The site slopes generally to the north and east. An unnamed stream, including adjoining local freshwater wetlands, lie along the eastern portions of property site. The stream flows both north and south and is a sub-tributary of the Hunter Brook situated 0.70 miles south of the site. Most of the property is comprised of a hardwood deciduous forest including forested wetland areas. An existing soccer field lies within the southeast portion of the site which is currently used by residents of the Town of Yorktown including adjoining towns.

It is proposed to construct 118 Carraige Homes as attached units. The project will be accessed by a new roadway system which will have two connection points to Catherine Street. The project will also have an amenity space with a clubhouse, pool, and pickleball courts. Stormwater runoff for the project will be .....

As required by the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-20-001, Part IIIA.8, an historic resource screening determination was conducted. This was done using the online tools at the NYS Office of Parks, Recreation and Historic Places (OPRHP) website. This screening determined that there are no areas with historic or archeological sensitivity near the site. Figure 1.3 – NYS OPRHP Historic Resource Map was created from the website showing sensitive areas in Yorktown.

The following Report and Plans included in Appendix M describe, in detail, the design and implementation of the Stormwater Management Plan.

2.0 Stormwater Regulatory Requirements

2.1 Stormwater Impacts

Urban stormwater impacts relate to significant changes to stormwater quantity and quality as a result of land development. "Urban Development has a profound influence on the quality of New York's waters."[1] This proposed development will change the runoff characteristics of this site altering the quantity and quality of the surface stormwater. The impacts of this must be mitigated by managing the stormwater prior to discharge. This would be accomplished by the capture and treatment of surface runoff prior to discharge.

Development of a site alters the surface hydrology therefore changing the characteristics of the surface and groundwater discharge of runoff. Changing the surface conditions alters a site's natural ability to store, treat, or infiltrate runoff. The change also allows for the discharge of potentially damaging pollutants and sediments to adjoining water bodies. This can occur during the construction phase, and long-term after development. During the construction phase, graded and destabilized, areas are subject

[1] New York State Stormwater Management Design Manual, January 2015, Page 2-1.

to erosion which can cause the displacement of sediment. After development, changes in the surface conditions, such as impervious surfaces, roofs and pavement, or lawn surfaces can generate pollutants which would be collected and discharged through runoff. Some of the pollutants of concern are: Total Suspended Solids (TSS); Biological Oxygen Demand (BOD); Total Phosphorus (TP); and Total Nitrogen (TN), as well as oil or grease, and chloride.

The most common sources of these pollutants from developed sites are atmospheric deposition, fertilizers, pesticides, and leaked discharges from vehicle. These pollutants would collect on these impervious surfaces and quickly wash off during even the smallest storm event.

In the planning and design of the development, stormwater will be managed to minimize potential impacts. A Stormwater Management and Pollution Prevention Plan will be prepared. This Plan will deal with all aspects of the stormwater management programs such as identifying potential pollutant sources, design of temporary and permanent features, implementation, and maintenance.

2.2 Regulatory Obligation

2.2.1 USEPA/NYSDEC

The Federal Government's Clean Water Act (CWA), Section 402 states "Stormwater discharges from certain construction activities are unlawful unless they are authorized by a National Pollutant Discharge Elimination System ("NPDES") permit or by a state permit program." New York State is a NPDES delegated State. The necessary permitting is administered through the State Pollutant Discharge Elimination System (SPDES) under the General Permit, GP-0-20-001, for Stormwater Discharges from Construction Activity. The Permit requires that any development meeting the disturbance thresholds listed in Tables 1 and 2 of Appendix B of the General Permit must prepare a SWPPP. Activities listed in Table 1 requires preparation of only an Erosion and Sediment Control Plan. Those listed in Table 2 would additionally require post-construction stormwater management practices. This project requires an E&SC and a SWPPP.

The proposed disturbance for this project is greater than one acre. As such, a Notice of Intent must be filed in accordance with the NYSDEC GP 0-20-001 and at a minimum an Erosion and Sediment Control Plan must be prepared. The project is located in the Hunter Brook Basin which is a sub-watershed of the Croton River Basin. This basin is not listed as a TMDL Watershed or discharging to an impaired water body.

This project requires filing a Notice of Intent under the New York State Department of Environmental Conservation General Permit 0-20-001. This project has a disturbance which is more than one acre. It is not located in an Enhanced Phosphorous Watershed (EPW). Therefore, this project requires the preparation of a full Stormwater Pollution Prevention Plan.

The Plan identifies the potential sources of pollution, and a design prepared and implemented to reduce pollutant loadings. This project will be required to prepare the following to be in compliance:

- Notice of Intent registered with the NYS DEC;
- MS4 SWPPP Acceptance Form signed by an authorized representative of the Municipality;
- Prepare an Erosion and Sediment Control Plan;
- Design and implement a stormwater quality treatment system to capture and treat the stormwater runoff volume generated by the 1-year rainfall event;
- Design and implement a stormwater management system to capture and attenuate all storm events up to the 100-year storm.

2.2.2 Local Municipality

In addition, this project requires approval under Chapter 248, Stormwater Management and Erosion and Sediment Control, of the Town of Yorktown Code. The Code requires compliance for projects with a land disturbance activity of 5,000 s.f. or more. The Code requires compliance with the NYS DEC GP-0-20-001

2.2.3 NYC DEP

This site is located within a Main Street Designated Area as set forth by the New York State City Department of Environmental Protection. Therefore, the project is required to comply with Section 18-39 (a) (11) (i) of "Rules and Regulations for the Protection from Contamination, Degradation, and Pollution of the New York City Water Supply and its Sources." The Regulations require mitigating construction activities increasing impervious areas. This result will be a change in the pollutant loadings. Therefore, requiring the capture and treatment of the 1-year, 24-hour storm. In order to provide a positive benefit to downstream surface waters, a treatment component must be designed into the project. The Design must also show proper Erosion and Sediment Controls during the construction of the project.

The technical standards providing guidance in the preparation of the E&SC and SWPPP are the latest revisions of the following:

- "New York Standards & Specifications for Erosion and Sediment Control" (NYSSESC) published by the Empire State Chapter of the Soil and Water Conservation Society; and;
- "New York State Stormwater Management Design Manual" prepared by the Center of Watershed Protection, for the NYS DEC;
- Town of Yorktown – Town Code Chapter 248 Stormwater Management and Erosion and Sediment Control;
- NYC DEP Watershed – Chapter 18 of Title 15 of the Rules of the City of New York – Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and Sources.

3.0 Reducing Pollutant Impacts

3.1 Sources of Impact

For this project, the potential for contamination of stormwater occurs both during construction and after the completion of development. The goal to achieve reduced impacts involves containment and treatment of the various pollutants.

Each phase will require temporary sediment and erosion control measures. The greatest source of pollutants during these phases is the potential of soil erosion. The nature of the construction plan is to have exposed soils which can erode and potentially discharge to sensitive areas. During construction, existing vegetation is removed exposing soils. Also, stockpiling of soils takes place. These conditions, if not stabilized, are subject to erosion during rainfall events and wind conditions. Sediment discharged to a wetland can destroy vegetation and habitat affecting the function of the wetland. This degradation potential can be irreversible and eliminate its function in the ecosystem. Increases in turbidity to open water bodies such as streams, ponds, etc., are an additional environmental impact.

The implementation of proper erosion control measures and sediment containment along with a planned construction sequence can minimize or eliminate these potential impacts. The selection and implementation of erosion and sediment practices are described in a later section of this Report.

The post-development state of this project not only will yield a potential for sediment discharges or Total Suspended Solids (TSS), but also other pollutants which can impact the adjacent water bodies.

The contaminants of highest concern are Total Phosphorus (TP), Total Nitrogen (TN), and Biochemical Oxygen Demand (BOD). Modification of the surface conditions of the site, specifically increasing the impervious nature of the ground cover, increases the concentration and potential discharge of these pollutants. The development of the site reduces native vegetative cover, and therefore affects the land's natural ability to store, treat or infiltrate runoff. This includes impervious surfaces, such as roads, buildings, and also landscaped areas, specifically lawns. These increases in imperviousness allow for greater concentrations or pollutants to collect and be carried off by runoff. Some of the pollutants are deposited by atmospheric conditions. However, other sources are applied or discharged to the surface of the site. The landscape areas are subject to fertilizers, weed control, and pesticide products. This too is a large potential for pollutants which if discharged untreated could have long term impacts. A full listing of the potential pollutants which can be considered in stormwater can be found in Table 2.1 of the New York State Stormwater Management Design Manual (NYS SMDM).

The concentrations are collected in stormwater runoff and rapidly discharge to the adjacent water bodies if not treated properly. The pollutants are collected and conveyed during the initial part of the storm event or the 90% rainfall. This is 90% of the average annual stormwater runoff volume. For this part of the State, it is equivalent to approximately 1.4 inches. This is also commonly referred to as the "first flush." The requirement of the NYSDEC SPDES General Permit GP-0-20-001 requires that this volume of runoff is to be collected and treated by the means described in the NYS SMDM. The method to be used is the unified stormwater sizing criteria in which a water quality volume is determined, and a practice is selected which best fits the criteria provided. This is described further in Section 6.0.

Further treatment is required to enhance the phosphorus removal since this project is located within the NYC Croton Reservoir East of Hudson which is a phosphorus enhanced watershed. As stated earlier, in order to comply with the NYS DEC Enhanced Phosphorus Removal Standards, the WQv to be treated to be the one-year, 24-hour storm.

3.2 Stormwater Management During Construction

The Erosion and Sediment Control Plan will be implemented during all phases of construction until the completion of the project. This will minimize or eliminate the potential short-term adverse impacts which may occur during construction. After completion, the erosion and sediment control will become a maintenance plan to ensure that permanent erosion and sediment controls continue to function and prevent the transport of sediments.

The Erosion and Sediment Control plan includes the Sequence of Construction and designed measures to be installed, operated and maintained during all aspects of construction. The appropriate measures were selected and detailed in the Plan for implementation by the site contractor. The main objective of the plan is to prevent erosion from occurring by stabilization of the construction site where possible. Sediment controls are to be used as a containment system to allow the removal of sediment from runoff to the greatest extent possible before leaving the work site. Control methods and standards utilized are provided in the NYSSESC.

Potential sources of de-stabilization of the site have been determined so that proper measures will be used. The locations and methods designed for erosion and sediment control measures change as the construction sequence progresses. The priority is to stabilize disturbed areas subject to erosion and use containment and/or filtering practices where sediment may concentrate. Some of the practices and methods that will be used for this project are:

- Minimization of open disturbance by use of stabilizers such as seed, mulch, and erosion blankets, stone, etc. Areas not subject to construction traffic for extended periods will be temporarily stabilized.
- The work areas will be contained. Down grade perimeters will be lined with barriers such as silt fence, diversions, berms, etc.

- Where possible, clean stormwater will be diverted away or around the work site to reduce the amount of runoff requiring treatment.
- Sediment traps will be constructed where heavy concentrations of runoff may accumulate.
- Dust control measures will be maintained on-site such as water trucks.
- Runoff will be prevented from gaining erosive velocities on long slopes. This can be achieved with seed and mulch, erosion control blankets, curb dams and multiple rows of silt fence.
- Existing drainage structures will be protected from sediment-laden runoff.
- Regular weekly inspections and reports (see Appendix K for report form) to be filed with the Operator and Town.

Additional methods of practices may be employed dependent on the situation. The NYSSESC consists of NYS DEC accepted and recommended practices. The design requirements of temporary and permanent erosion and sediment control practices of this Manual have been followed.

During construction, runoff will sheet flow towards the perimeter of the property. Along the perimeter, silt fencing shall be placed which will intercept any sediment laden flows. Additional stabilization measures such as erosion blankets and site stabilization will help regulate storm flows during construction.

Prior to completion of the project, all permanent structural features will be cleaned, restored, and re-vegetated as necessary. The erosion and sediment control phase of the project is complete when all work is done, and all areas are stabilized. The post-construction Stormwater Management Inspection and Maintenance Agreement (Schedule "B" in Appendix L) will describe the long-term inspection schedule, periodic maintenance requirements, and the responsible party.

3.3 Stormwater Management Post-Construction

The post-construction design of the project must be included in the Stormwater Pollution Prevention and Stormwater Management Plans to minimize or eliminate potential long-term adverse impacts which might be caused by surface runoff from the site. This will deal with the management of the stormwater upon completion and operation of the site. The plan will be an analysis of all potential impacts due to stormwater and the means of protecting adjoining water bodies.

The management plan begins with conceptual designs of the collection and conveyance system and the proposed treatment practices. The treatment practices are subject to different parameters and must be designed to best fit the site including green infrastructure planning. Some of the limitations that may be encountered include soil types and properties, depth to groundwater or bedrock, distance to structures, and maintenance. A list of acceptable practices can be found in Chapters 3, 5, and 10 of the NYS Stormwater Design Manual (SMDM). Chapter 3 states "The Practices on this list are selected based on the following criteria:

1. Can capture and treat the full water quality volume (WQV)
2. Are capable of 80% TSS removal and 40% TP removal
3. Have acceptable longevity in the field
4. Have a pre-treatment mechanism."

Green Infrastructure Practices include:

I. Preservation of Natural Resources
II. Reduction of Impervious Cover
III. Runoff Reduction Techniques

The five broad groups of standard stormwater management practices are:

I. Stormwater Ponds
II. Stormwater Wetlands
III. Infiltration Practices
IV. Filtering Practices
V. Open-channel Practices

These practices "are presumed to meet water quality requirements set forth in this manual if designed in accordance with the sizing criteria presented in Chapter 4 and constructed in accordance with the performance criteria in Chapter 6."[2]

Green Infrastructure – Runoff Reduction

Chapter 3 of the NYS DEC introduces a planning process for site development which has "increased emphasis on a holistic approach" to urban stormwater runoff management. This is to be done by reducing pollutant-laden runoff by the use of green infrastructure which promotes replication of pre-development hydrology. This is done by designing selected practices which will allow for infiltration, ground water recharge, reuse, recycling and evaporation/evapotranspiration of surface runoff Water Quality Volumes from developed areas.

The implementation of this planning process is defined in a five-step approach as follows:

1. Preservation of features and reduction of impervious surfaces.
2. Determination of the project's Water Quality Volume.
3. Incorporating green infrastructure and standard stormwater management practices that provide a Runoff Reduction Volume Capacity.
4. Use of standard stormwater management practices to treat Water Quality Volume not addressed by green infrastructure.
5. Design of storage facility for volume and peak rate volumes.

This methodology is provided in more detail in Chapter 3 of the SMDM as well as the Flow Chart at the end of Chapter 3 (see Figure 3.1).

This process is required for new and redevelopment projects. Chapter 4 Section 4.3 requires the calculation of Runoff Reduction Volume (RRv) and that 100% of post-development Water Quality Volume should be treated on-site using green infrastructure or standard SMP's. If this goal cannot be met, at a minimum, a specific reduction factor(s) based on the hydrologic soil group (HSG) can be applied but justification must be provided as to why the pre-construction condition cannot be met.

Redevelopment

This proposed development meets the Application Criteria for a redevelopment project as defined in Chapter 9 of the SMDM and site-specific constraints prevent the proper sizing and installation of any of the standard management practices listed above, therefore, alternative sizing and stormwater management controls may be used. Section 9.3.1 Application Criteria states that to make such determination, the following criteria must be met:

1. An already impervious area is reconstructed, and;
2. There is inadequate space for controlling stormwater runoff from the reconstructed area, or;

[2] Pg. 3-7 NYS Stormwater Management Design Manual, January 2015.

3. The physical constraints of the site do not allow meeting the required elements of the standards practices.

Acceptable alternative stormwater practices include:

I. Rain Gardens
II. Cisterns
III. Green Roofs
IV. Stormwater Planters
V. Permeable Paving (including modular block)
VI. Select proprietary Products (Hydrodynamic Practices, etc.)

After the preliminary selection of treatment practices, the water quality volume size will be determined.

The treatment methods could be a single practice or a combination of practices. The previously described controlling factors will initially eliminate some treatment methods. The remaining practices will be selected based on feasible locations, functionability, maintenance factors, and cost. An additional factor is to try and select practices which will not only provide an environmental benefit, but also aesthetic value.

4.0 Site Characteristics

4.1 Soils

On-site soils were classified by using the USDA Natural Resources Conservation Service (NRCS) Websoil survey for Westchester County, NY, see Figure 4.1 – Soil Map.

The predominant soil types for this project are Paxton, a fine Sandy Loam. This soil is a poor to well-drained soil that is subject to seasonal groundwater. The Hydrologic classification of all this soil is "C". The erosion hazard level for these soils are slight to moderate. These soil properties are essential in the design and proper construction management of the site. Independent soil tests were performed, and the results are located in the Appendix E of this Report.

- Paxton Loam – fine sandy loam, sandy loam, gravelly loam, well-drained soils – slight to moderate erosion hazard;

Deep Test Soil Logs and soil percolation test data are included in Appendix E of this Report. The locations of these deep soil tests are indicated on the Construction Drawings. On-site soil investigation and knowledge of the soil groups facilitated the selection of coefficient values used for the pre- and post-development pollutant load scenarios. Additionally, curve numbers were determined for use in the analysis.

4.2 Hydrology

The proposed improvements will not significantly change the surface runoff patterns. Currently, the surface runoff pattern is in one of two directions. Surface runoff mostly flows in a northerly and easterly direction toward a local wetland / unnamed stream corridor on the far east side of the property. This stream will eventually terminate in a NYS DEC wetland north of Route 202. The surface runoff pattern is a combination of sheet flow and concentrated flow. The majority of the site is wooded except for an existing soccer field. The topography of the site is moderate to steep and slopes downward to the north and east.

Under the proposed condition, the general direction of the surface runoff will not be altered. Almost the entire amount of surface runoff from the impervious areas will be collected and treated. The proposed improvements as shown will result in an increase in the imperviousness of the drainage areas.

Therefore, there will be an increase in the volume of runoff as well as the pollutant loads generated by the site for a given rainfall event. This will be mitigated with stormwater management practices. Throughout the project stormwater will be conveyed and collected via swales and curbs to inlets and then piped to the stormwater practices. The system will be comprised of water quality practices and attenuation. Runoff reduction will be addressed through the implementation of rainwater harvesting which will store the initial runoff volume for reuse as irrigation for the project. Additional water quality treatment will take place in two Pocket Wetlands which the NYS DEC Stormwater Design Manual considers standard practices. In the same practices additional volume is provided for attenuation of storm events up to the 100 year storm. In each of the storm events the peak flow at the given design points do not exceed the existing peak rates.

In the planning, design and construction of the development, stormwater will be managed to minimize or eliminate potential off-site impacts. The proper implementation of temporary sediment and erosion control measures are used to achieve this goal. An Erosion and Sediment Control Plan has been established and will be implemented during all phases of construction until the completion of the project. The Erosion and Sediment Control Plan incorporates the sequence of construction and designed measures to be installed, operated and maintained during all aspects of each phase. The erosion and sediment controls are designed in accordance with the NYS Standards and Specifications for Erosion and Sediment Control.

5.0 Hydrologic Analysis

The method used to compute project runoff was the Soil Conservation Service TR-55. The basis for the analysis was the Type III, 24-hour storm, for the 1 year, 2 year, 10 year, 25 year, and 100-year storm event. The rainfall depth for the respective storm events are 2.78, 3.41, 5.13, 6.49, and 9.28. The runoff coefficient "CN" and Time of Concentration for existing and post-development conditions were computed using Standard TR-55 criteria.

5.1 Pre-Development Condition

The analysis of the site in the present or existing condition assumes two design points. Design Point 1 is at the northwestern corner of the site at Catherine Street. Design Point 2 is at the northeastern corner where the stream exits the property. For the analysis the limits of the watershed are limited to what is relative to the project. A runoff curve number Cn and Time of Concentration Tc was calculated for each watershed. The peak runoff was then determined at each design point.

The Drainage Basin sizes, curve numbers and travel times used in the analysis are summarized in the Table below:

Pre-Development Conditions Watershed Analysis Variables

Drainage Basin	Area (acres)	Curve Number CN	Travel Time, Tc (min)
Pre DA#1	23.34	74	18.7
Pre DA#2	9.77	83	30.2
Pre DA#3	62.93	78	5

5.2 Post-Development Condition

In the prost development scenario the two same design points are the basis for the analysis. Tributary to Design Point 1 are Post DA# 2, 3, &6. Design Point 2 tributary areas are DA# 1, 4 &5. The flow paths of change in these cases.

Throughout the project stormwater will be conveyed and collected via swales and curbs to inlets and then piped to the stormwater practices. The system will be comprised of water quality practices and attenuation. Runoff reduction will be addressed through the implementation of rainwater harvesting which will store the initial runoff volume for reuse as irrigation for the project. Additional water quality treatment will take place in two Pocket Wetlands which the NYS DEC Stormwater Design Manual considers standard practices. In the same practices additional volume is provided for attenuation of storm events up to the 100 year storm. In each of the storm events the peak flow at the given design points do not exceed the existing peak rates.

In the planning, design and construction of the development, stormwater will be managed to minimize or eliminate potential off-site impacts. The proper implementation of temporary sediment and erosion control measures are used to achieve this goal. An Erosion and Sediment Control Plan has been established and will be implemented during all phases of construction until the completion of the project. The Erosion and Sediment Control Plan incorporates the sequence of construction and designed measures to be installed, operated and maintained during all aspects of each phase. The erosion and sediment controls are designed in accordance with the NYS Standards and Specifications for Erosion and Sediment Control.

The hydrologic analysis assumes that full soil restoration as required in Chapter 5 (Table 5.3) of SMDM will be implemented. The areas of soil restoration will be shown on the E&SC Plan if required.

The Drainage Basin sizes, curve numbers and travel times used in the analysis are summarized in the Table below:

Post-Development Conditions Watershed Analysis Variables

Drainage Basin	Area (acres)	Curve Number CN	Travel Time, Tc (min)
Design Point 1			
Post DA# 2	13.62	89	9.4
Post DA# 3	1.82	85	5.0
Post DA# 6	13.751	76	18.7
Design Point 2			
Post DA# 1	10.84	96	5.0
Post DA# 4	2.76	82	11.6
Post DA # 5	42.60	78	5.0

6.0 Unified Stormwater Sizing Criteria

6.1 Methodology

To satisfy the requirements of the NYS DEC General Permit and the Town of Yorktown, a combination of Green Infrastructure Techniques and standard practices have been selected. These practices meet attenuation as well as stormwater quality goals. The guidelines and practices used in selecting and the sizing analyses are found in Chapters 4, 5, and 6 of the NYS DEC Stormwater Management Design Manual.

6.2 Water Quality Volume (WQv)

The Treatment volumes are determined as prescribed by the standard methods as outlined in the NYS DEC SMDM. This Water Quality Volume WQv requirement is normally based on the 90% rainfall event. This equates to 90% of the average rainfall for the specific region. However, for this project, the treatment volumes exceed that requirement by treating the 1-year storm event. This site is located in the

Croton Watershed which is an enhanced phosphorous basin. This requires implementation of the enhanced phosphorus standards for the capture and treatment of the runoff from the 1-year, 24-hour rainfall event, which represents the water quality volume.

The 1-year, 24-hour runoff volume required to be captured and treated has been further defined as the runoff volume from the contributing drainage areas for the proposed project. The volume proposed to be captured will be that volume generated by a 1-year, 24-hour storm or greater. With the design provided, this entire volume will be captured and retained for an extended period of 24-hours for pollutants to settle out of the contained runoff. Excess stormwater above the water quality volume will be diverted to subsurface storage for larger storm events

6.3 Runoff Reduction (RRv)

Green infrastructure design as part of the planning process enables the reduction of runoff from a project. These practices in turn reduce the requirements of water quality treatment and flood protection. The selection of green infrastructure practices is developed using a five-step process detailed in Section 3 of the SMDM.

6.4 Stream Channel Protection Volume Requirements (CPv)

This requirement is for the protection of stream channels from receiving erosive velocities. This goal is accomplished by providing 24-hour extended detention of the one-year, 24-hour storm event that remains after runoff reduction is applied to the project. Trout waters may be exempted to only provide 12-hour detention. It is also not required if the discharge is to a pipe or hardened channel. The detention time is measured by the center of mass method or plug flow calculation method. Further criteria for the application of the Cpv can be found in Section 4.4 of the SMDM.

6.5 Overbank Flood Control (Qp)

The purpose of this sizing criteria for overbank flood control is to avoid an increase in the frequency and magnitude of out-of-bank flooding that may be the result of development. These are flow events where channel capacity is exceeded and spill over to flood plains. To meet the criteria, the proposed stormwater management system for the project must attenuate the 10-year, 24-hour storm event to pre-development peak discharge rate. Detailed criteria can be found in Section 4.5 of the SMDM.

6.6 Extreme Flood Control Criteria (Qf)

The purpose of the extreme flood analysis is to prevent flood damage from large storm events by maintaining predevelopment 100-year flood plain boundaries and protecting the integrity of stormwater management practices. The basis of the analysis is to maintain pre-development peak rates of runoff for the 100-year, 24-hour storm event with proper stormwater management. Detailed criteria can be found in Section 4.6 of the SMDM.

A summary of peak discharge rates at each design point for the pre and post-developed storm events analyzed for each drainage basin is summarized in the tables below:

Design Point 1:

Storm Event (year)	Pre-Developed Peak Flow (cfs)	Post-Developed Peak Flow (cfs)	Net Change of Peak Flow (cfs)	Percent Reduction
1	13.44	9.18	-4.26	31%
2	21.18	14.05	-7.13	34%
10	46.43	29.40	-17.03	37%
25	68.14	54.41	-13.73	20%
100	114.59	102.23	-12.36	11%

Design Point 2:

Storm Event (year)	Pre-Developed Peak Flow (cfs)	Post-Developed Peak Flow (cfs)	Net Change of Peak Flow (cfs)	Percent Reduction
1	64.77	42.04	-22.73	35%
2	98.72	64.74	-33.98	34%
10	205.19	136.39	-68.80	34%
25	294.57	197.14	-97.43	33%
100	477.41	347.62	-129.79	27%

As can be seen by the results, peak discharge rates are decreased for all scenarios.

7.0 Stormwater Management Practices Selection, Justification and Design

The stormwater management practices selection process detailed in Chapters 3 and 7 of the NYS Stormwater Management Design Manual was followed to help select the practices chosen. These Chapters provide a series of matrices which allows logical selection of treatment practices based on several factors. The factors are as follows:

1. Land Use – Residential;
2. Physical Feasibility – location, slope, drainage area, groundwater table;
3. Watershed / Regional Factors – near Croton Reservoir;
4. Stormwater Management Capability – can meet all requirements;
5. Community and Environmental Factors – meets all requirements.

The matrices are provided in Appendix G of this Report. The matrices have been commented on or redacted to show elimination criteria through this stepped approach and eventual possible alternatives for treatment.

Thermal impacts are not a major concern on this project. The most likely location where a rise in the water temperature might occur is within the Pocket Wetland. This, however, will be mitigated by establishing trees and plantings which will provide shade. Further cooling would also take place when the stormwater passes through the subsurface stormwater management system prior to open discharge. Therefore, the stormwater collection and management will not contribute to the heating of stormwater where it will have a downstream thermal impact.

Stormwater Wetlands – (W-4) Pocket Wetland:

The pocket wetland is a practice that has a combination of a forebay, marsh areas, permanent pool and extended detention. It was chosen most suitable because of the five factors stated above. It is ideal for a low-density development which is the case here. The location is at a low enough elevation where the improvements to the site are captured and treated. The drainage area is less than five acres. This location has a very manageable slope, therefore, the wetland layout works well with the topography. The groundwater table at this location was witnessed via a test hole at an elevation of 24" from the ground surface. Therefore, the permanent pool elevation was set to coincide with this level insure stability of the permanent pool. The phosphorus removal rating is good and therefore meets design goals.

Thermal impacts are not a concern because the location chosen for the pocket wetland is already well shaded. To further improve these conditions, additional plantings will be added to increase the shading on the pocket wetland.

Minimum Water Quality Volume (WQv): The required water volumes below for a 1 year storm event. The volumes provided meet or exceed the minimum. The water quality volume is mainly provided in the form of rainwater harvesting in the underground cistern system in combination with the Pocket Wetland.

Water Quality Volume

Drainage Area	WQv based on 90% Rainfall Event	WQv based on 1-year Rainfall Event	Pretreatment Provided	WQv Provided	RRv Provided	Storm Year Treated
Post DA# 1	TBD	92,696 cf	Inlet/Forebay	92,753 cf	92,753 cf	1 year
Post DA# 2	TBD	85,029 cf	Inlet/Forebay	85,209 cf	85,209 cf	1 year

Inlet Protection and Pre-Treatment: A forebay has been provided at the inflow point of the pocket wetland. The forebay will be stabilized with a rip-rap outlet protection at the inlet points, and a rip rap weir at the outlet to prevent erosive conditions

The forebay will be easily accessible for maintenance. A fixed vertical depth marker will be installed to measure depths of accumulated sediment.

Microtopography: The bed of the stormwater wetlands has internal flow path.

Landscaping Plan and Buffers/Setbacks: Landscaping has been provided for basin interior and buffers. A 25' wetland buffer is required as well as a 40' buffer to all structures. All setbacks are met.

Maintenance Access: the property owner will be responsible for maintenance of the stormwater practices and drainage collection. Therefore, access easements are not required. All stormwater improvements have clear and easy access to the property owner.

Non-clogging Low Flow Orifice: A low flow orifice has been provided in the form of a stepped weir. This will allow slow release of water levels above the permanent pool.

Rise in Embankment: Not required.

Pond Drain: Not required. There is a small amount of permanent water volume in the wetland. If any maintenance is required, the water can be pumped out of the outlet.

Adjustable Gate Valve: Not required.

Safety Features: The side slopes are designed to be less than the 3:1 maximum slope requirement. A safety bench is not required since the side slopes are 4:1.

Sizing Calculations: See water routing calculations in Appendix C

The selection of the treatment practice was based on evaluating the site to determine what would best fit the conditions providing maximum benefits. The goal was to select practices which would meet treatment and attenuation standards and minimize the disturbance footprint. The selection of Stormwater Practices was based on the surface and subsurface conditions of the site. In addition, the site design concept is to create a natural and environmentally sensitive setting. The high groundwater table made practices with an underdrain a necessity.

See Routing Calculations in Appendix F and H for sizing calculations.

Subsurface Stormwater Management Storage (SSMS):

The SSMS for this project has been designed strictly as a means of storage for Rainwater Harvesting or detention. The storage will provide for stormwater volumes of the Water Quality Volume. Pretreatment for the rainwater harvesting will be provided by a debris screen located in the bypass structure that directs runoff into the cistern. The system will consist of a series of circular high-density polyethylene pipes interconnected with header pipes. Once stormwater volumes exceed the water quality levels, the water will bypass through an upstream control structure to downstream infiltration and detention. From the SSMS, the stormwater will discharge to detention chambers which will release runoff at a controlled rate of discharge and low velocity. In addition, the SSMS will help reduce thermal impacts by allowing cooling of stormwater.

The selection of the treatment practice was based on evaluating the site to determine what would best fit the conditions providing maximum benefits. The goal was to select practices which would meet treatment and attenuation standards and minimize the disturbance footprint. The selection of Stormwater Practices was based on the surface and subsurface conditions of the site. In addition, the site design concept is to create a natural and environmentally sensitive setting. The well-drained soils made it very conducive to the use of infiltration and the recharge of surface water which provided high value treatment.

In General:

- Controls should be inspected periodically for the first few months after construction and on a semi-annual basis thereafter. They should also be inspected after major storm events (greater than 0.5 inches).
- All stormwater controls shall be inspected and cleaned of any debris or sediment.
- Any erosion shall be repaired and stabilized with seeding and mulch or stone.

Please note that additional notes regarding maintenance activities are contained on the project Construction Drawings and should be adhered to during and after construction.

The selection and justification of green practices can be found in Appendix G of this Report. The design of the practices can be found in Appendix H of this Report.

8.0 Erosion and Sediment Control

Erosion and sediment control practices were selected and designed in accordance with the NYSSESC. The practices proposed for this project are described below. Standard details and specifications are included in Appendix J as well as on the Construction Plans. Initial locations of each practice are shown on the Plans. As construction progresses it may become necessary to repair, replace or relocate these practices as conditions warrant.

Stabilized Construction Entrance:

This has been specified for the entrance of the driveway. The installation will occur at the beginning of the project as described in the Suggested Construction Sequence. It will be maintained to prevent the tracking of sediment off-site.

Silt / Sediment Fence and Haybales:

Silt fence and haybales have been specified to control and contain sediment from leaving areas under disturbance to undisturbed areas. The fence shall be installed as best as possible following the contours and will be spaced in accordance with the NYSSESC. The fence will be inspected daily, repaired, and sediment removed as necessary.

Soil Stockpile:

Areas are provided for temporary stockpiling of delivered soil material for the construction. These areas will be contained with sediment fence to prevent the movement of sediment. The stockpiles, if not active for more than seven (7) days, will be seeded and mulched. The stockpile areas were placed to best suit the proposed construction activity. The stockpile will be installed as described in the Construction Sequence.

Temporary and Permanent Vegetative Cover:

This stabilization measure may be temporary and in other cases permanent vegetative cover is used. The vegetative cover specifications are based on the NYSSESC Manual. On the Constructions Plans are notes, locations, and specifications as to the vegetative cover requirements. In the notes, there are specific situations and time constraints related to stabilization of disturbed areas. The specifications give seed and fertilizer mixes as well as placement. Any disturbed area expected to remain exposed for more than seven (7) days shall receive temporary vegetative cover.

Storm Drain Inlet Protection:

The inlet protection is specified to provide a permeable barrier around drainage inlets to reduce sediment content in runoff before entering the storm drain system.

Erosion Blankets:

Erosion blankets and seeding shall be used for the stabilization of slopes 3:1 or greater or as otherwise specified. The blankets shall be installed as per the Plans and Details, and the manufacturer's specifications. They shall be stapled or staked in place as per the manufacturer's specifications. The blankets may be installed at locations other than those shown on the Plans as directed by the Town Engineer, Project Engineer, or other persons inspecting the site under the direction of the aforementioned.

Soil Restoration:

Soil restoration is a required practice for construction projects where soil compaction occurs to soils which will be permanently vegetated. This compaction is typically a result of heavy vehicle traffic, cutting or filling, and areas which may receive heavy surcharges. This becomes more pronounced in soils with greater fines content, specifically when wet. These actions can change soil properties which affect its ability to drain or absorb surface water and will also affect the survivability of vegetation. In order to maintain the integrity of the Stormwater Management Plan, these areas must receive soil restoration. See Figure 8.1 taken from the NYSSMDM for requirements.

This project has soils which fall in the hydrologic soil group HSG "C." Therefore, for most instances, soil restorations are required for the development areas subject to permanent vegetation. Soil restoration can be done by tilling or aerating the soil to a depth of 12-inches. In heavy traffic areas, 3-inches of compost shall be placed over the compacted areas prior to the tilling. After the restoration, a 3/8" metal bar should be able to be hand pushed into the soil. Areas within the drip-line of trees should not be tilled.

Rock Outlet Protection:

Rock outlet protection is specified at discharge points of pipes and channels to reduce depth, velocity, and the energy of water to avoid downstream erosion. The sizing criteria used is from the NYSSESC Manual.

Water Bars:

Water bars shall be used for diversion of surface runoff to limit the accumulation of erosive velocities of water. The water bars shall be installed as per the Plans and Details. The water bars may be installed at locations other than those shown on the Plans as directed by the Town Engineer, Project Engineer, or other persons inspecting the site under the direction of the aforementioned.

Temporary Sediment Basin:

The sediment basin's locations are the point of concentration of runoff and therefore the logical place to collect sediment. Within the Erosion Control Notes and Construction Sequence, there are specific requirements for the installation and maintenance during construction. Upon stabilization of the site, the sediment will be removed. The size of the sediment basin as per the NYSSESC Manual is based on 3600 cubic feet per acre of drainage area. The following tabulations are the sizes provided.

Other Controls:

Waste Disposal:

Solid, sanitary and toxic waste must be disposed of in a proper manner in accordance with applicable local, state and federal regulations. It is prohibited to burn, bury or pour out onto ground or into the storm sewers any solvents, paints, stains, gasoline, diesel fuel, used motor oil, hydraulic fluid, anti-freeze, cement curing compounds, or other toxic or hazardous wastes. The Contractor shall be responsible for disposal of all waste off site.

Concrete Truck Washout:

Wash out of cement trucks should occur in a designated diked area where the washings can be collected and disposed of properly when they harden.

Dust Control:

Generation of dust shall be minimized by limiting the extent of exposed soils and re-establishing vegetative cover in these areas as soon as possible. Additional and/or temporary methods to minimize dust may include wetting, mulching, spray adhesives, stone covering and wind barriers.

Stabilization:

The Contractor shall initiate stabilization measures as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than seven (7) days after the construction activity in that portion of the site that has temporarily or permanently ceased. This requirement does not apply in the following instance:

Where the initiation of stabilization measures by the 7th day after construction activity temporarily or permanently ceased is precluded by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as practicable.

All areas not designated as buildings, roads, driveways, parking lots, walks, or aprons shall be established as lawn or vegetative areas. Permanent planting and vegetation shall be provided per approved Landscaping Plan.

9.0 Construction Sequence

A key objective of the SWPPP is to reduce erosion and sedimentation potentials for the project. As a means to accomplish this, a suggested construction sequence was developed to assist the developer with incorporating, into the project, various controls designed to reduce such potentials. The sequence considers the performance of development activities in a phased approach, in conjunction with the installation, construction and monitoring of erosion and sedimentation control devices prior to and during construction. The Overall Disturbance for the project exceeds 12 acres. However, the project will be phased in order to manage disturbance in smaller segments to minimize potential for sediment transport.

Appendix D contains the project specific Suggested Construction Sequence. Essentially, the sequence has been broken down into various activities designed to ensure that certain erosion/sedimentation controls are in place, prior to and during construction, in recognition of site development.

Prior to any construction activities, the Owner, Engineer and any Contactors to perform land-disturbing activities shall meet to review this SWPPP to insure a thorough understanding of its contents and overall intent. Certifications to this effect shall be signed by the Owner and Contractor. Certifications are provided on the Construction Plans and in Appendix C.

The Responsible Party during and after Construction is as follows:

Toll Brothers
42 Old Ridgebury Road
Danbury, CT 06810

10.0 Inspection and Reporting

Unless notified by the NYSDEC, the Owner or Operator shall have a qualified inspector conduct site inspections in accordance with the Permit requirements; for a site with on-going soil disturbance activities, a qualified inspector shall conduct a site inspection at least once every seven (7) calendar days. If a project has received prior written approval by the NYSDEC for the disturbance of greater than five (5)

acres of soils at any one time, the inspection frequency shall be increased to a minimum of two (2) per seven (7) calendar day period separated by two (2) calendar days for as long as the five (5) acre threshold is exceeded. The qualified inspector, as defined in SPEDES General Permit guidelines, shall prepare an inspection report subsequent to each and every inspection. At a minimum, the Inspection Report shall include and/or address the following:

1. Date and time of inspection.

2. Name and title of person(s) performing inspection.

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

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

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

6. Identification of all erosion and sediment control practices that need repair or maintenance.

7. Identification of all erosion and sediment control practice that were not installed properly or are not functioning, as designed and need to be reinstalled or replaced.

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

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

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

11. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing correction actions. The qualified inspector shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed.

Within one business day of the completion of an inspection, the qualified inspector shall notify the Owner or Operator and appropriate Contractor (or Subcontractor) of any corrective actions that need to be taken. The Contractor (or Subcontractor) shall begin implementing the corrective action within one business day of this notification and shall complete the corrective actions in a reasonable time frame. All Inspection Reports shall be signed by the qualified inspector. A sample Inspection Report is included in Appendix K.

The Owner or Operator shall maintain a record of all Inspection Reports in a site log book until all disturbed areas have achieved final stabilization and the N.O.T. has been submitted to the DEC. The site log book shall be maintained on site and be made available to the permitting authority upon request.

Prior to filing of the Notice of Termination or the end of permit term, the Owner or Operator shall have the qualified professional perform a final site inspection. The qualified professional shall be provided with a certified final asbuilt survey. The survey shall locate and provide detailed information for the permanent stormwater facilities. The information provided shall include, and not be limited to, the following: rim and invert elevations of all structures, outlets, weirs, etc.; pipe material and sizes; basin dimensions, elevations and topography; and any other pertinent information specific to the stormwater practice constructed.

Upon final review of the asbuilt survey and completed site improvements, the qualified professional shall certify that the site has undergone final stabilization 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.

The qualified professional shall then complete the Notice of Termination (NOT) to be signed by the Owner. The NOT with the required supporting documentation shall be submitted to the MS4 for signature of approval which will then be forwarded to the NYS DEC.

11.0 Installation and Maintenance of Stormwater Management Practices

11.1 During Construction

The Contractor shall be responsible for the installation and maintenance of all temporary erosion control measures. The Contractor shall also be responsible for the installation of permanent control measures. The Operator shall be responsible for the maintenance of all permanent control measures.

All temporary erosion control measures installed on the project site shall be observed and maintained to ensure that they are operating as intended as follows:

1. Temporary measures will be inspected by the trained Contractor daily. Any necessary repairs, replacements, or upgrades will be made immediately.

2. Accumulated sediments will be removed as required to keep the measures functional. In the case of silt fencing and haybales (if applicable), remove deposits where accumulations reach half the height of the fence or bale. In the case of sediment basins, remove deposits whenever their capacity has been reduced by fifty percent (50%) from the design capacity.

3. All erosion of the silt fence will be repaired immediately with compacted backfill materials.

4. Disturbed areas, stockpile areas, areas used for storage of materials that are exposed to precipitation, shall be inspected for evidence of, or the potential for, pollutants entering the drainage system or downstream.

5. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

6. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site sediment tracking.

7. The permanent storm drainage system shall be inspected and cleaned of all sediment prior to completion of project.

11.2 After Construction

The long-term operation and maintenance of the Stormwater Management System will be the responsibility of the Owner. A legally binding document will be signed detailing the responsible parties and required actions.

A sample of the Stormwater Management Inspection and Maintenance Agreement is included, as Schedule "B" in Appendix L.

The following is the proposed Inspection and Maintenance Schedule:

Control to be Inspected	Inspection Frequency	Maintenance Threshold Criteria	Maintenance Procedure
Drain Inlets	Quarterly	3"+ accumulated sediment	Remove debris and sediment annually.
Detention	Annually	3"+ accumulated sediment	Remove debris and sediment annually.
Pocket Wetland	Quarterly	3"+ accumulated sediment	Remove accumulated sediment and debris; weed and replace plants as needed.
Tree Planting	Quarterly	Ponding for more than 48 hours	Remove accumulated sediment and debris; weed and replace dead trees with new ones and mulch as needed.

Recommended Maintenance Access:

Drain Inlets:

Access through grate structure and remove debris and sediment with hand tools or vacuum truck.

Detention:

Access through grate structure and remove debris and sediment with hand tools or vacuum truck.

In General:

- Controls should be inspected periodically for the first few months after construction and on a semi-annual basis thereafter. They should also be inspected after major storm events (greater than 0.5 inches).
- All stormwater controls shall be inspected and cleaned of any debris or sediment.
- Any erosion shall be repaired and stabilized with seeding and mulch or stone.

- Maintenance and access shall comply with all local, state and federal safety codes and guidelines. Please note that additional notes regarding maintenance activities are contained on the project Construction Drawings and should be adhered to during and after construction.

12.0 Owner / Contractor Responsibilities

12.1 Owner / Operator Certification Statement

The _____ is the Owner/Operator of the project for the purpose of this Permit (see Appendix A). The Owner must sign a copy of the Owner's Certification Statement before construction commences (see Appendix C).

12.2 Contractor Certification Statement

The Owner is responsible for ensuring all Contractors and Subcontractors associated with site work construction activities identified within this SWPPP, agree to implement applicable provisions of the SWPPP and sign a copy of the Contractor Certification Statement (see Appendix C) before construction commences.

In addition, the Owner/Operator is responsible to make sure that all Contractors and Subcontractors shall identify at least one person representing the Company at the site will be responsible for implementation of the SWPPP. This person will be known as the Trained Contractor and will have the required 4-hour Certification. This Certification is available through the NYS DEC. The listing of courses can be found at the NYS DEC Website.

12.3 Retention of Records

The Owner shall retain a copy of the most current SWPPP at the construction site, from the date construction is initiated at the site, until the date of construction at the site is completed and the N.O.T. has been filed.

Once work is completed, the Owner shall submit to the NYSDEC a Notice of Termination (see Appendix A).

The Owner shall retain copies of the N.O.I, N.O.T., Acknowledgement Letter, MS4 SWPPP Acceptance Form, SWPPP and all reports required by the General Permit for a period of five (5) years from the date that the site achieves final stabilization, unless the NYSDEC specifies another time period in writing.

13.0 Conclusion

The Stormwater Management Plan has been established for this project in accordance with the requirements of NYS DEC GP-0-20-001 and the Town Code of Yorktown. This plan will effectively control stormwater generated by this project during and after construction. The management of the stormwater is based on controlling increases in peak runoff as well as water quality. The design of the water quality component not only will treat runoff due to the project, but also that which is currently not treated. Overall, it would improve even the existing conditions.

The final design of the project will detail the proposed practices and will establish the method with which they will be constructed. The detail will include layout, grading, plantings, outlet structures, and any other component as required for the design based on the Erosion and Sediment Control established in this Report. These will be part of the project Construction Drawings. The Sequence of Construction and required maintenance will also be set forth as part of the final Construction Plan. The full Construction

Plan shall be considered part of the Stormwater Management Plan or Stormwater Pollution Prevention Plan.

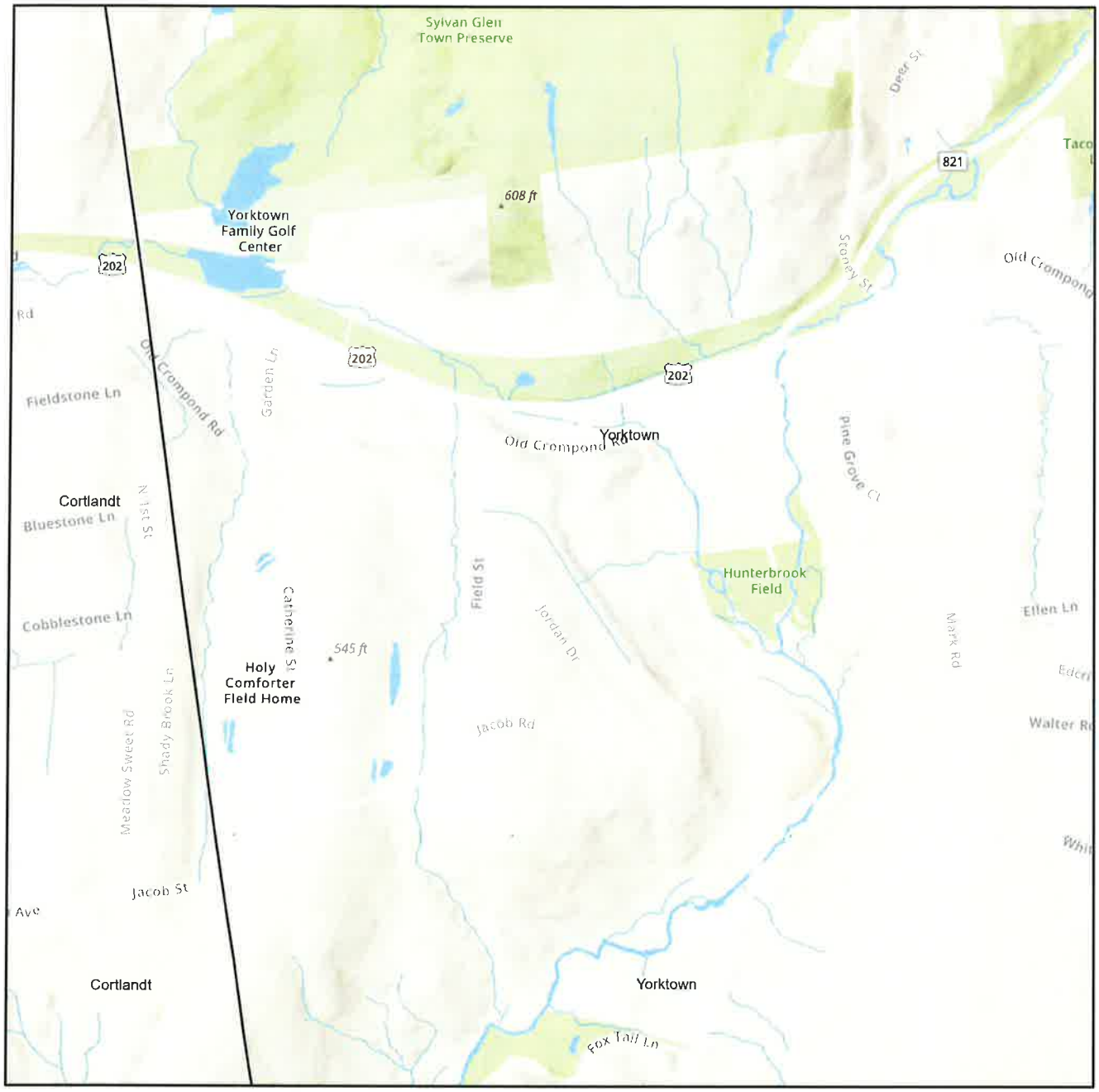
The effectiveness of the stormwater practices selected in design will be insured by implementing a Maintenance Plan. The Maintenance Plan details specific activities, safeguards and provisions to be monitored and performed by specified frequencies. By adhering to the Maintenance Plan, optimum performance of the stormwater practices can be expected.

Based on the results of the analysis and recommended maintenance practices for the collection and treatment system, the proposed stormwater control designs will provide maximum control efficiency, high effectiveness for removal of pollutants of concern, and the best attainable post-development pollutant loading scenario.

In conclusion, the Stormwater Management Plan will not create negative downstream impacts as a result of this project.

Joseph C. Riina, P.E.
8/17/2023

Mapping Westchester County



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0 850 1,700 3,400 ft

Municipal Boundaries

N

GIS
http://giswww.westchestergov.com
Michaelian Office Building
148 Martine Avenue Rm 214
White Plains, New York 10601

FIG 1.1 Location Map

Fieldhome at Catherine Street

Town of Yorktown Westchester County, New York

Site Design Consultants

Civil Engineers • Land Planners

251 F Underhill Avenue Yorktown Heights, NY 10598
(914) 962-4488 - Fax (914) 962-7386
www.sitedesignconsultants.com

NOT TO SCALE
DATE:8/31/2023

NOTE - UNAUTHORIZED ALTERATIONS OR ADDITIONS TO THIS DRAWING IS A VIOLATION OF SECTION 7209 (2) OF THE NEW YORK STATE EDUCATION LAW

Mapping Westchester County

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0 425 850 1,700 ft

Municipal Boundaries

N

GIS
http://giswww.westchestergov.com
Michaelian Office Building
148 Martine Avenue Rm 214
White Plains, New York 10601

FIG 1.2 Vicinity Map

Fieldhome at Catherine Street

Town of Yorktown Westchester County, New York

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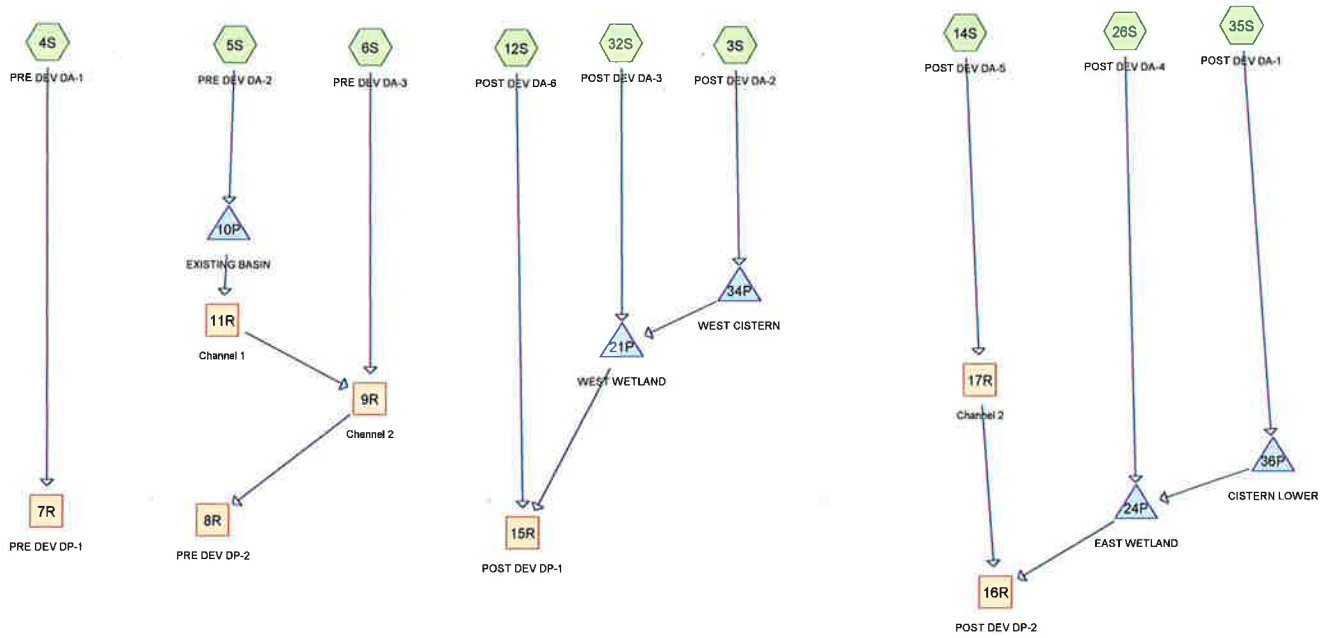
APPENDIX A

Hydrologic Analysis



Subcat Reach Pond Link

Routing Diagram for 21-66 Catherine Street Rev 8-09-23
Prepared by Site Design Consultants, Printed 8/30/2023
HydroCAD® 10.20-3c s/n 11619 © 2023 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 7139 NY Westchester

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	Type III 24-hr		Default	24.00	1	2.80	2
2	2-Year	Type III 24-hr		Default	24.00	1	3.41	2
3	10-Year	Type III 24-hr		Default	24.00	1	5.13	2
4	25-Year	Type III 24-hr		Default	24.00	1	6.49	2
5	100-Year	Type III 24-hr		Default	24.00	1	9.28	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
22.198	74	>75% Grass cover, Good, HSG C (3S, 5S, 6S, 14S, 26S, 32S, 35S)
6.755	74	Pasture/grassland/range, Good, HSG C (4S, 12S)
33.498	98	Paved parking, HSG C (3S, 4S, 5S, 6S, 12S, 14S, 35S)
0.820	98	Paved roads w/curbs & sewers, HSG C (32S)
1.100	98	Water Surface, HSG C (26S)
26.327	70	Woods, Good, HSG C (4S, 5S, 12S, 26S)
89.781	77	Woods, Poor, HSG C (6S, 14S)
0.941	83	Woods, Poor, HSG D (6S)
181.420	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
180.479	HSG C	3S, 4S, 5S, 6S, 12S, 14S, 26S, 32S, 35S
0.941	HSG D	6S
0.000	Other	
181.420		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	22.198	0.000	0.000	22.198	>75% Grass cover, Good	3S, 5S, 6S, 14S, 26S, 32S, 35S
0.000	0.000	6.755	0.000	0.000	6.755	Pasture/grassland/range, Good	4S, 12S
0.000	0.000	33.498	0.000	0.000	33.498	Paved parking	3S, 4S, 5S, 6S, 12S, 14S, 35S
0.000	0.000	0.820	0.000	0.000	0.820	Paved roads w/curbs & sewers	32S
0.000	0.000	1.100	0.000	0.000	1.100	Water Surface	26S
0.000	0.000	26.327	0.000	0.000	26.327	Woods, Good	4S, 5S, 12S, 26S

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	89.781	0.941	0.000	90.722	Woods, Poor	6S, 14S
0.000	**0.000**	**180.479**	**0.941**	**0.000**	**181.420**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Nam
1	10P	471.00	468.90	119.0	0.0176	0.012	0.0	15.0	0.0	
2	21P	395.00	390.00	45.0	0.1111	0.012	0.0	24.0	0.0	
3	34P	399.00	398.00	100.0	0.0100	0.012	0.0	12.0	0.0	
4	36P	398.00	393.00	100.0	0.0500	0.012	0.0	12.0	0.0	

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3S: POST DEV DA-2 Runoff Area=13.620 ac 64.39% Impervious Runoff Depth=1.72"
Flow Length=1,344' Tc=9.4 min CN=89 Runoff=24.01 cfs 1.952 af

Subcatchment 4S: PRE DEV DA-1 Runoff Area=23.344 ac 12.28% Impervious Runoff Depth=0.78"
Flow Length=1,887' Tc=18.7 min CN=74 Runoff=13.44 cfs 1.525 af

Subcatchment 5S: PRE DEV DA-2 Runoff Area=9.770 ac 37.67% Impervious Runoff Depth=1.29"
Flow Length=928' Tc=30.2 min CN=83 Runoff=8.22 cfs 1.048 af

Subcatchment 6S: PRE DEV DA-3 Runoff Area=62.928 ac 4.42% Impervious Runoff Depth=0.99"
Tc=0.0 min CN=78 Runoff=80.84 cfs 5.185 af

Subcatchment 12S: POST DEV DA-6 Runoff Area=13.751 ac 20.84% Impervious Runoff Depth=0.88"
Flow Length=1,887' Tc=18.7 min CN=76 Runoff=9.18 cfs 1.012 af

Subcatchment 14S: POST DEV DA-5 Runoff Area=42.596 ac 6.53% Impervious Runoff Depth=0.99"
Tc=0.0 min CN=78 Runoff=54.72 cfs 3.510 af

Subcatchment 26S: POST DEV DA-4 Runoff Area=2.756 ac 39.91% Impervious Runoff Depth=1.22"
Flow Length=217' Tc=11.6 min CN=82 Runoff=3.22 cfs 0.281 af

Subcatchment 32S: POST DEV DA-3 Runoff Area=1.815 ac 45.18% Impervious Runoff Depth=1.42"
Tc=5.0 min CN=85 Runoff=3.03 cfs 0.215 af

Subcatchment 35S: POST DEV DA-1 Runoff Area=10.840 ac 89.94% Impervious Runoff Depth=2.36"
Tc=5.0 min CN=96 Runoff=28.29 cfs 2.128 af

Reach 7R: PRE DEV DP-1 Inflow=13.44 cfs 1.525 af
Outflow=13.44 cfs 1.525 af

Reach 8R: PRE DEV DP-2 Inflow=64.77 cfs 6.233 af
Outflow=64.77 cfs 6.233 af

Reach 9R: Channel 2 Avg. Flow Depth=0.90' Max Vel=6.12 fps Inflow=81.34 cfs 6.233 af
n=0.050 L=1,930.0' S=0.0620 '/' Capacity=268.86 cfs Outflow=64.77 cfs 6.233 af

Reach 11R: Channel 1 Avg. Flow Depth=0.07' Max Vel=1.13 fps Inflow=0.84 cfs 1.048 af
n=0.050 L=345.0' S=0.0470 '/' Capacity=234.05 cfs Outflow=0.84 cfs 1.048 af

Reach 15R: POST DEV DP-1 Inflow=9.18 cfs 1.012 af
Outflow=9.18 cfs 1.012 af

Reach 16R: POST DEV DP-2 Inflow=42.04 cfs 3.820 af
Outflow=42.04 cfs 3.820 af

Reach 17R: Channel 2 Avg. Flow Depth=0.70' Max Vel=5.27 fps Inflow=54.72 cfs 3.510 af
n=0.050 L=1,930.0' S=0.0620 '/' Capacity=268.86 cfs Outflow=41.93 cfs 3.510 af

Pond 10P: EXISTING BASIN Peak Elev=474.35' Storage=0.522 af Inflow=8.22 cfs 1.048 af
Outflow=0.84 cfs 1.048 af

Pond 21P: WEST WETLAND Peak Elev=400.73' Storage=9,367 cf Inflow=3.03 cfs 0.215 af
Outflow=0.00 cfs 0.000 af

Pond 24P: EAST WETLAND Peak Elev=390.12' Storage=1.510 af Inflow=3.22 cfs 0.327 af
Outflow=0.57 cfs 0.310 af

Pond 34P: WEST CISTERN Peak Elev=399.11' Storage=1.952 af Inflow=24.01 cfs 1.952 af
12.0" Round Culvert n=0.012 L=100.0' S=0.0100 '/' Outflow=0.00 cfs 0.000 af

Pond 36P: CISTERN LOWER Peak Elev=398.16' Storage=2.118 af Inflow=28.29 cfs 2.128 af
Outflow=0.10 cfs 0.046 af

Total Runoff Area = 181.420 ac Runoff Volume = 16.855 af Average Runoff Depth = 1.11"
80.48% Pervious = 146.002 ac 19.52% Impervious = 35.418 ac

Summary for Subcatchment 3S: POST DEV DA-2

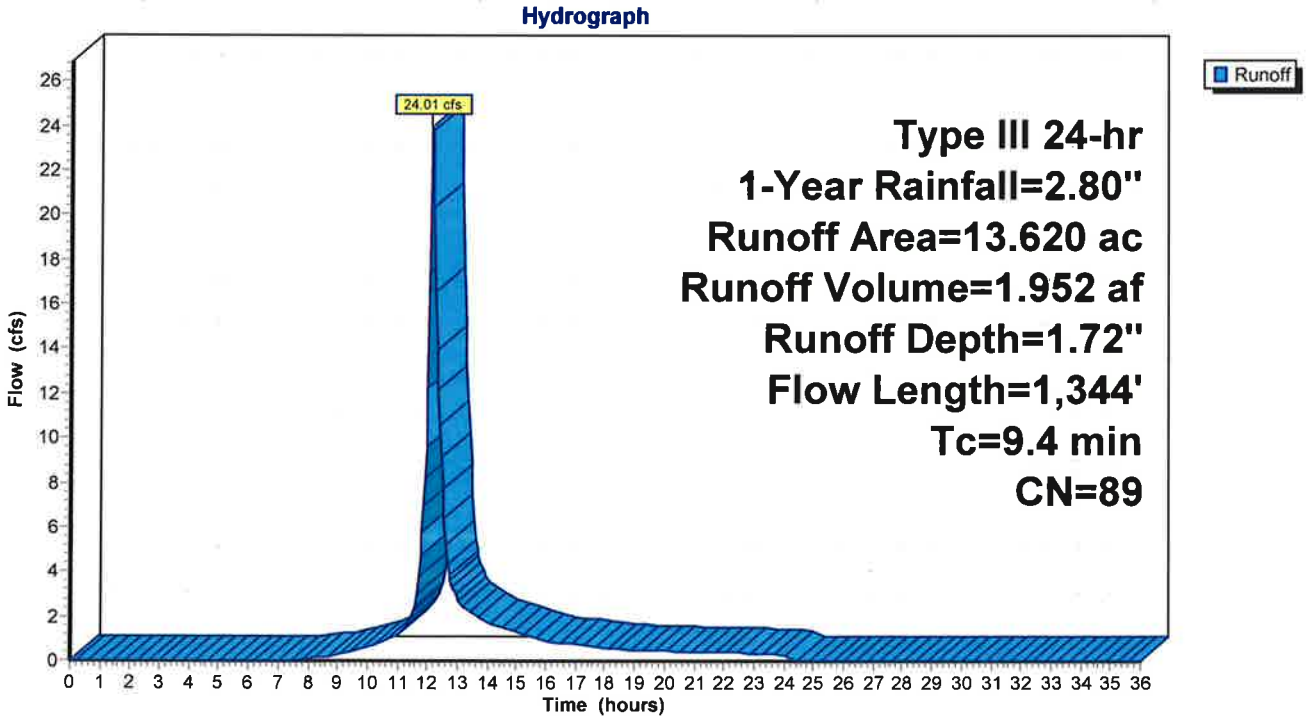
Runoff = 24.01 cfs @ 12.13 hrs, Volume= 1.952 af, Depth= 1.72"
Routed to Pond 34P : WEST CISTERN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
8.770	98	Paved parking, HSG C
4.850	74	>75% Grass cover, Good, HSG C
13.620	89	Weighted Average
4.850		35.61% Pervious Area
8.770		64.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	100	0.0950	0.22		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
0.5	227	0.2200	7.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	1,017	0.0220	11.82	18.91	**Channel Flow,** Area= 1.6 sf Perim= 3.1' r= 0.52' n= 0.012
9.4	1,344	Total			

Subcatchment 3S: POST DEV DA-2



Summary for Subcatchment 4S: PRE DEV DA-1

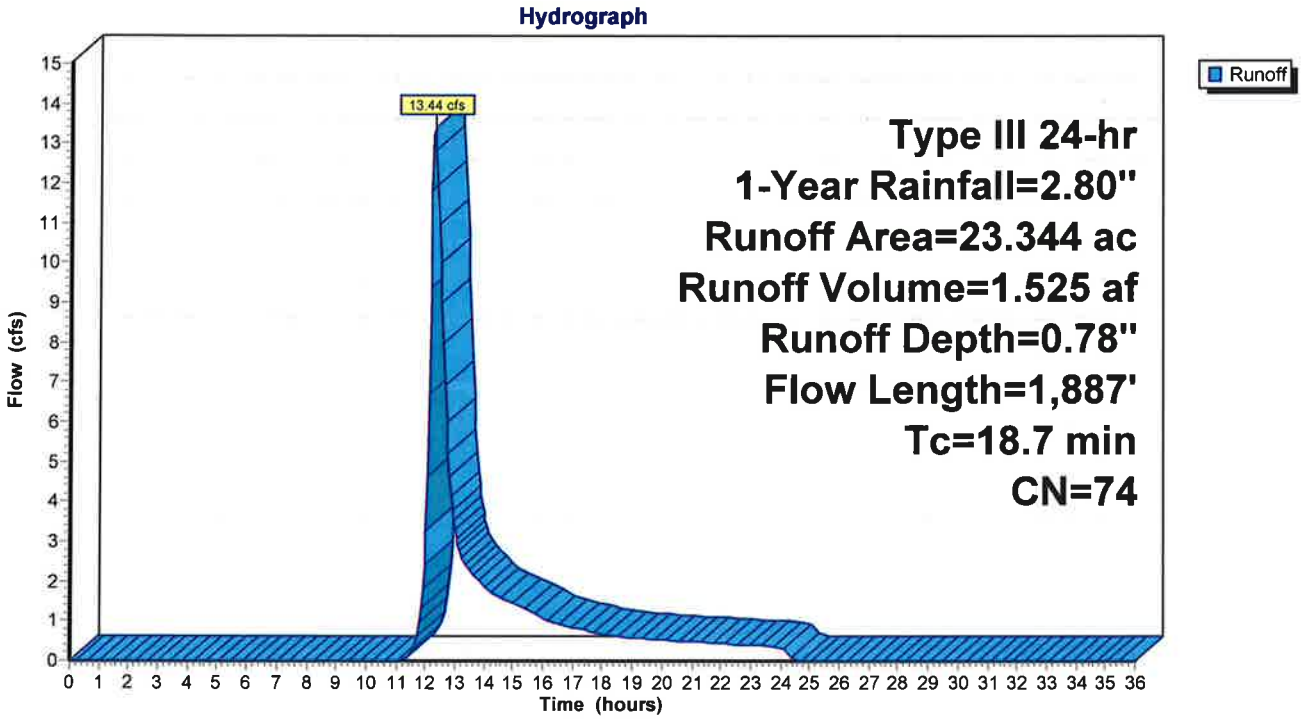
Runoff = 13.44 cfs @ 12.29 hrs, Volume= 1.525 af, Depth= 0.78"
Routed to Reach 7R : PRE DEV DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
15.478	70	Woods, Good, HSG C
5.000	74	Pasture/grassland/range, Good, HSG C
2.866	98	Paved parking, HSG C
23.344	74	Weighted Average
20.478		87.72% Pervious Area
2.866		12.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	507	0.0870	4.75		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	1,120	0.1700	27.00	27.00	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.2	160	0.0250	11.53	16.14	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
18.7	1,887	Total			

Subcatchment 4S: PRE DEV DA-1



Summary for Subcatchment 5S: PRE DEV DA-2

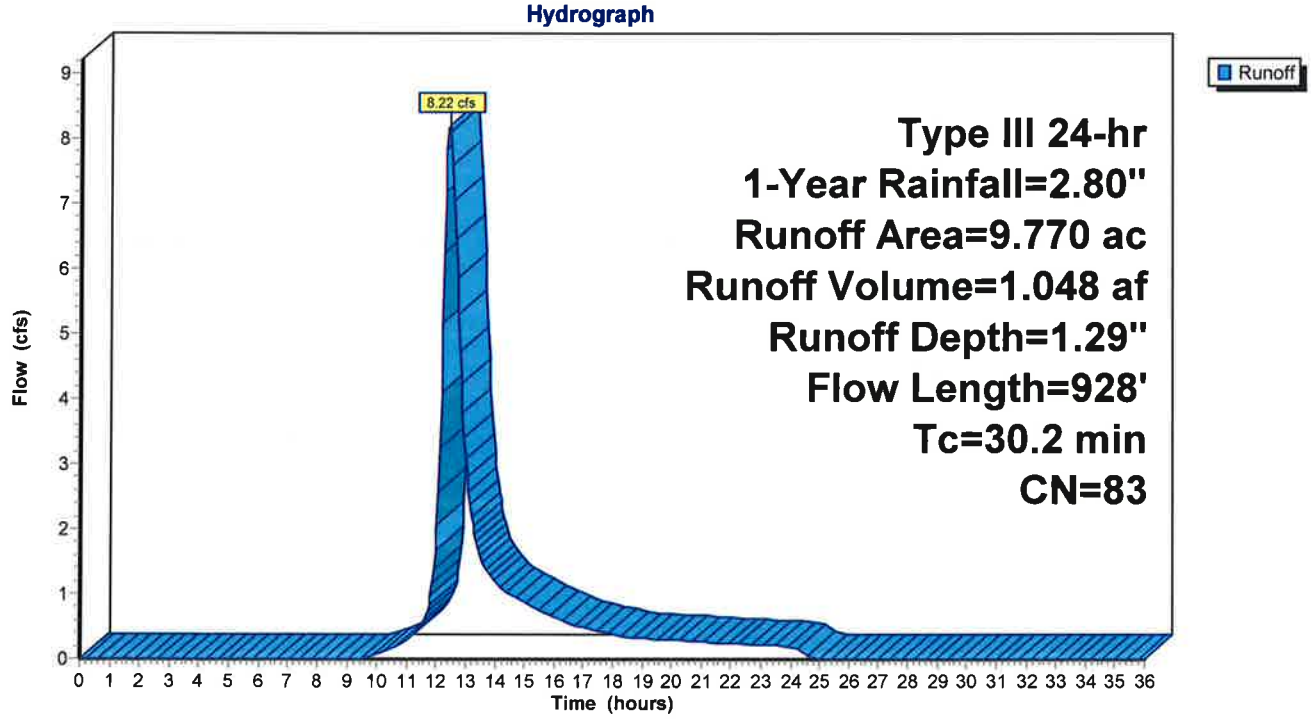
Runoff = 8.22 cfs @ 12.43 hrs, Volume= 1.048 af, Depth= 1.29"
Routed to Pond 10P : EXISTING BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
3.680	98	Paved parking, HSG C
5.611	74	>75% Grass cover, Good, HSG C
0.479	70	Woods, Good, HSG C
9.770	83	Weighted Average
6.090		62.33% Pervious Area
3.680		37.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.3	130	0.0150	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.8	543	0.0270	10.76	10.76	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.1	255	0.1800	30.93	43.30	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
30.2	928	Total			

Subcatchment 5S: PRE DEV DA-2



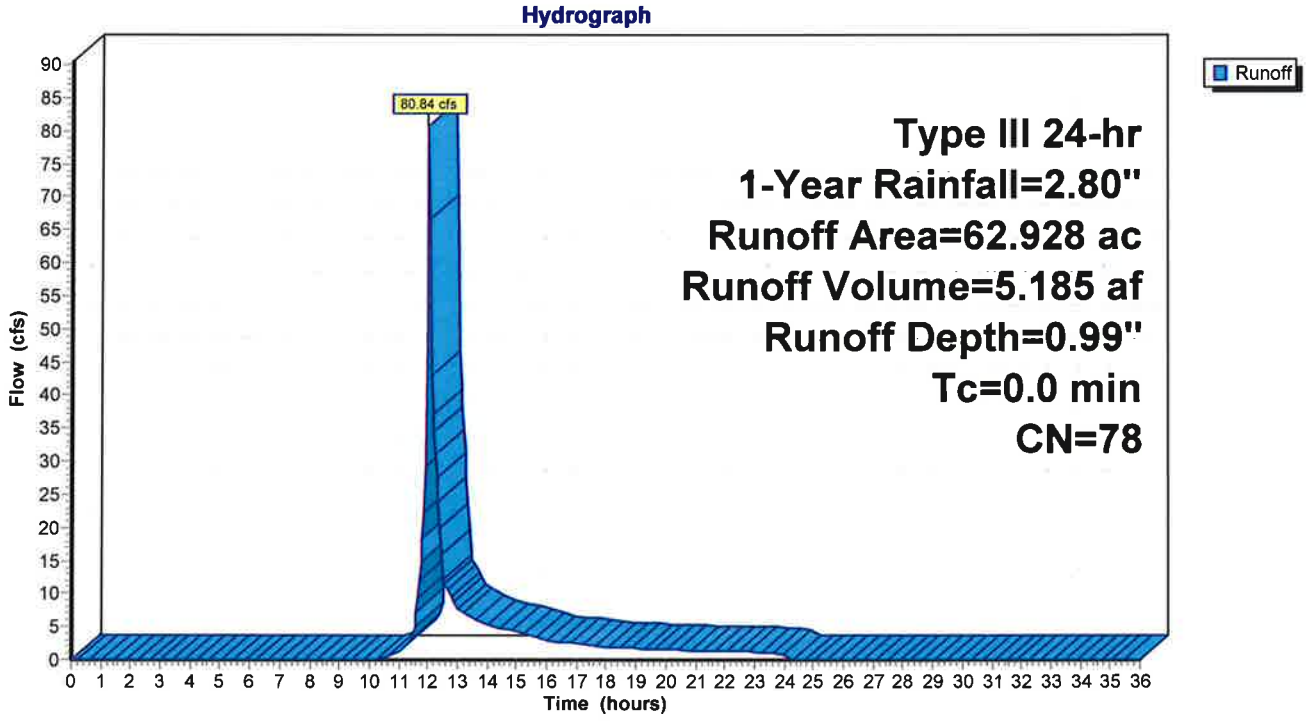
Summary for Subcatchment 6S: PRE DEV DA-3

Runoff = 80.84 cfs @ 12.01 hrs, Volume= 5.185 af, Depth= 0.99"
Routed to Reach 9R : Channel 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
2.783	98	Paved parking, HSG C
5.613	74	>75% Grass cover, Good, HSG C
53.591	77	Woods, Poor, HSG C
0.941	83	Woods, Poor, HSG D
62.928	78	Weighted Average
60.145		95.58% Pervious Area
2.783		4.42% Impervious Area

Subcatchment 6S: PRE DEV DA-3



Summary for Subcatchment 12S: POST DEV DA-6

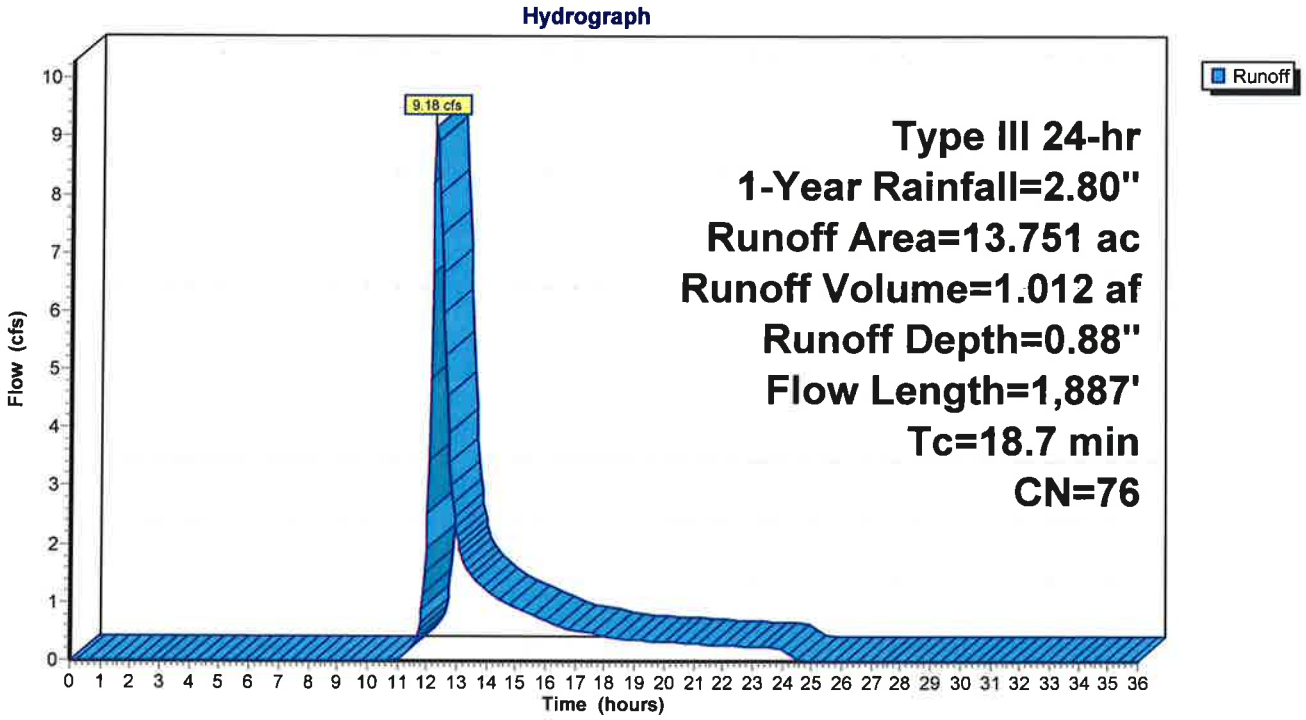
Runoff = 9.18 cfs @ 12.28 hrs, Volume= 1.012 af, Depth= 0.88"
Routed to Reach 15R : POST DEV DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
9.130	70	Woods, Good, HSG C
1.755	74	Pasture/grassland/range, Good, HSG C
2.866	98	Paved parking, HSG C
13.751	76	Weighted Average
10.885		79.16% Pervious Area
2.866		20.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	507	0.0870	4.75		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	1,120	0.1700	27.00	27.00	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.2	160	0.0250	11.53	16.14	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
18.7	1,887	Total			

Subcatchment 12S: POST DEV DA-6



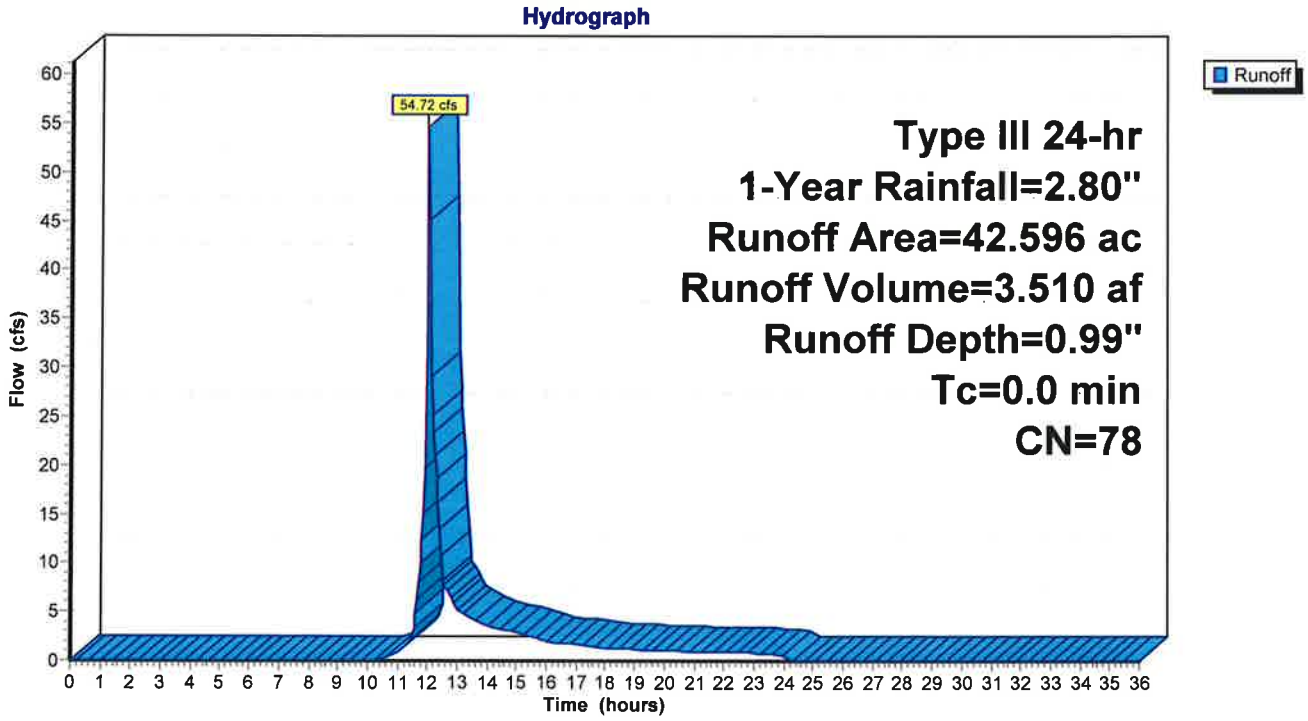
Summary for Subcatchment 14S: POST DEV DA-5

Runoff = 54.72 cfs @ 12.01 hrs, Volume= 3.510 af, Depth= 0.99"
Routed to Reach 17R : Channel 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
2.783	98	Paved parking, HSG C
3.623	74	>75% Grass cover, Good, HSG C
36.190	77	Woods, Poor, HSG C
42.596	78	Weighted Average
39.813		93.47% Pervious Area
2.783		6.53% Impervious Area

Subcatchment 14S: POST DEV DA-5



Summary for Subcatchment 26S: POST DEV DA-4

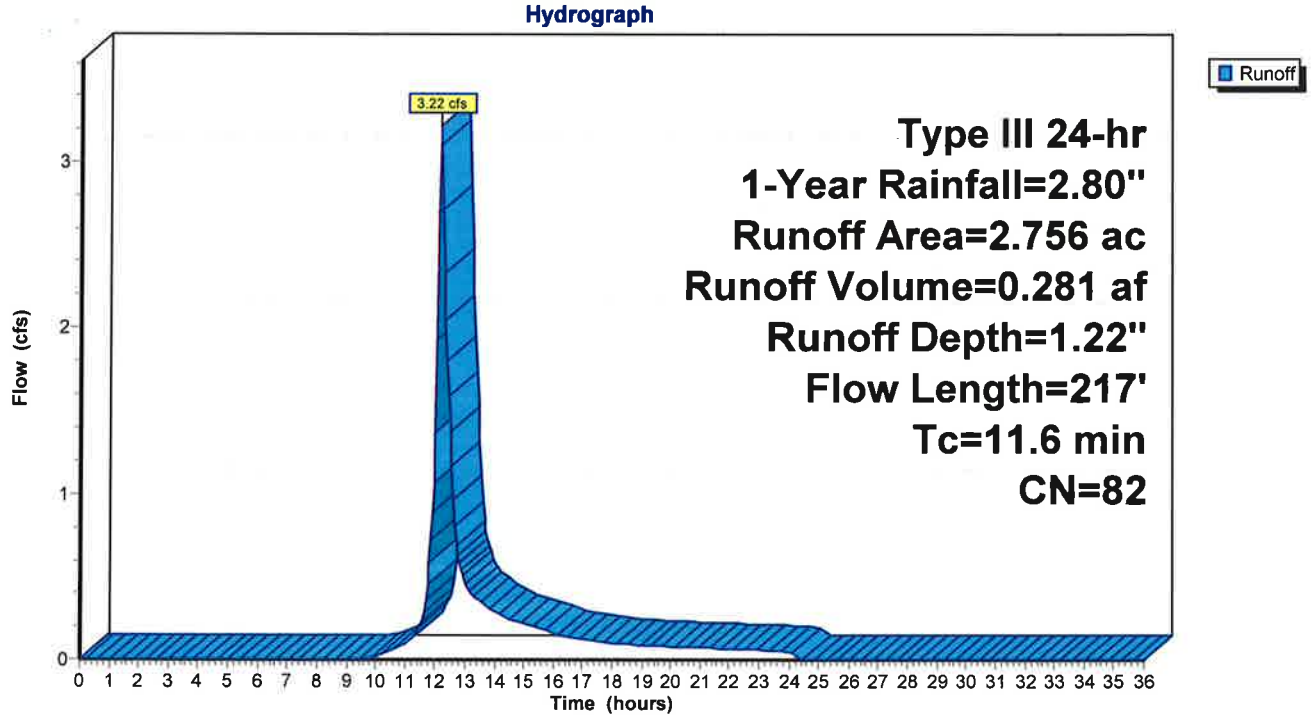
Runoff = 3.22 cfs @ 12.17 hrs, Volume= 0.281 af, Depth= 1.22"
Routed to Pond 24P : EAST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
1.100	98	Water Surface, HSG C
1.240	70	Woods, Good, HSG C
0.416	74	>75% Grass cover, Good, HSG C
2.756	82	Weighted Average
1.656		60.09% Pervious Area
1.100		39.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0400	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
1.0	117	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.6	217	Total			

Subcatchment 26S: POST DEV DA-4



Summary for Subcatchment 32S: POST DEV DA-3

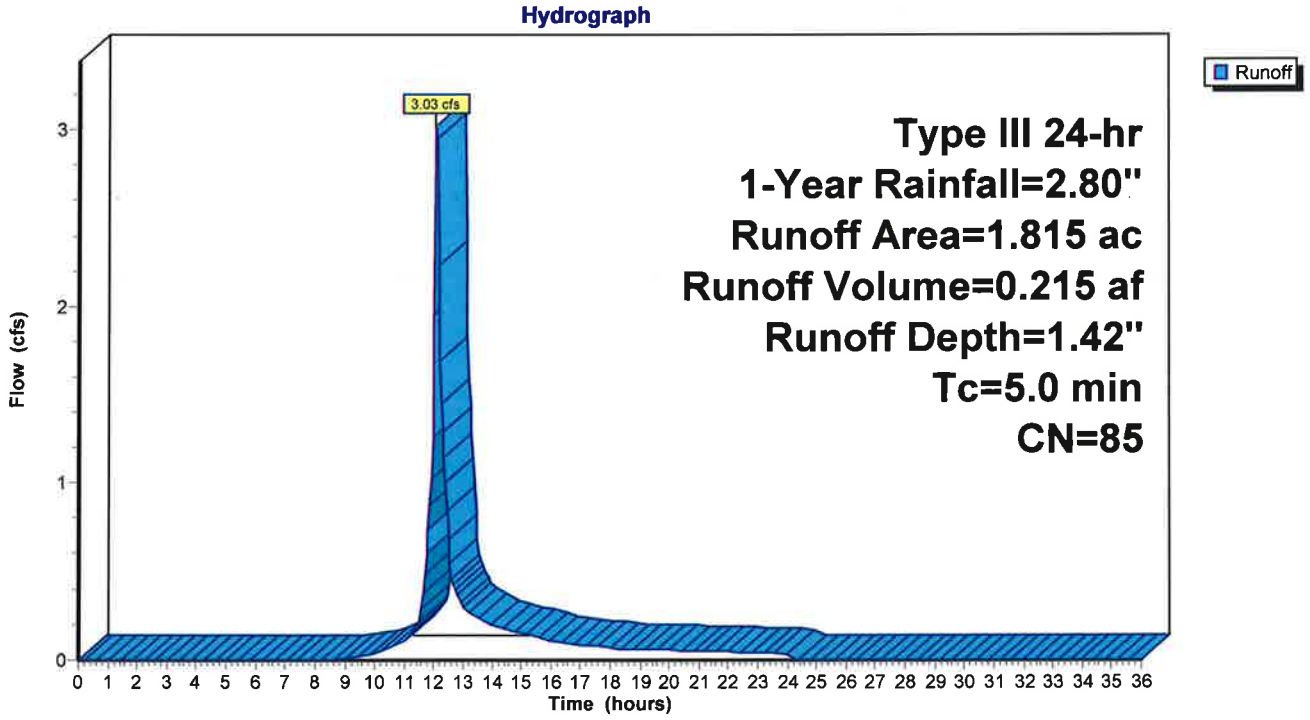
Runoff = 3.03 cfs @ 12.08 hrs, Volume= 0.215 af, Depth= 1.42"
Routed to Pond 21P : WEST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
0.995	74	>75% Grass cover, Good, HSG C
0.820	98	Paved roads w/curbs & sewers, HSG C
1.815	85	Weighted Average
0.995		54.82% Pervious Area
0.820		45.18% Impervious Area

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

Subcatchment 32S: POST DEV DA-3



Summary for Subcatchment 35S: POST DEV DA-1

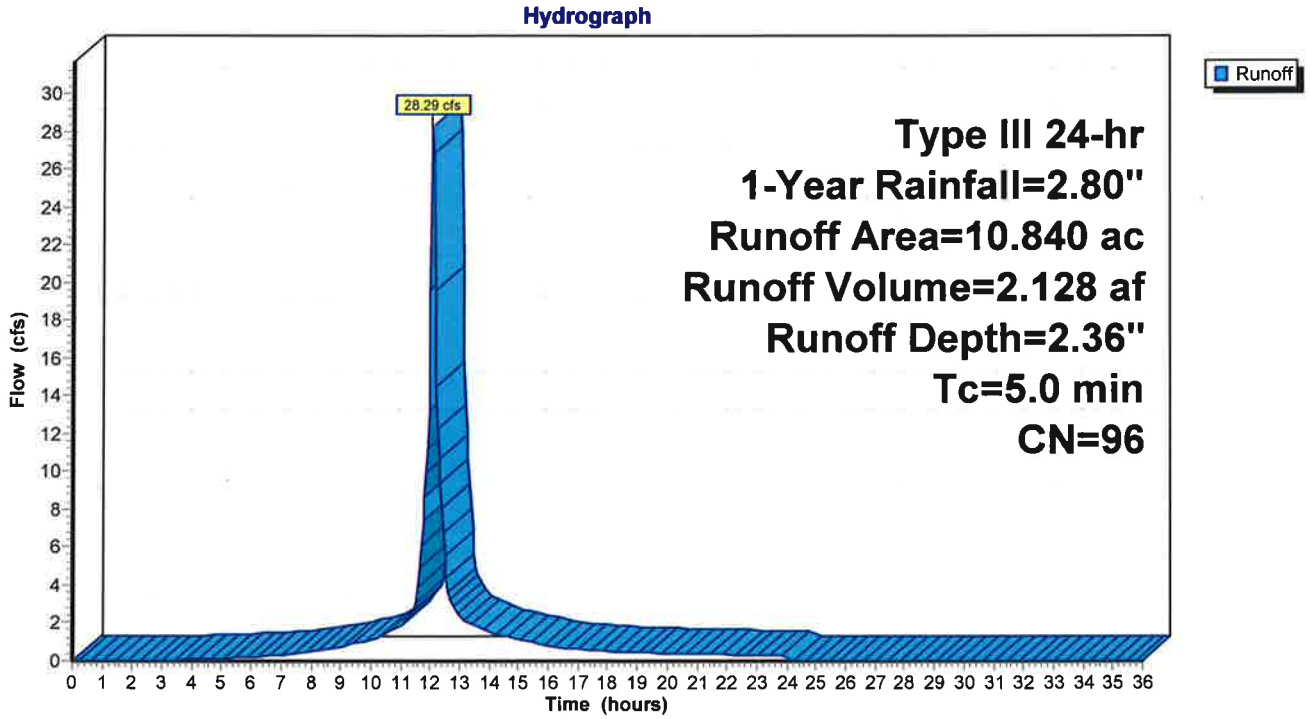
Runoff = 28.29 cfs @ 12.07 hrs, Volume= 2.128 af, Depth= 2.36"
Routed to Pond 36P : CISTERN LOWER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.80"

Area (ac)	CN	Description
9.750	98	Paved parking, HSG C
1.090	74	>75% Grass cover, Good, HSG C
10.840	96	Weighted Average
1.090		10.06% Pervious Area
9.750		89.94% Impervious Area

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

Subcatchment 35S: POST DEV DA-1

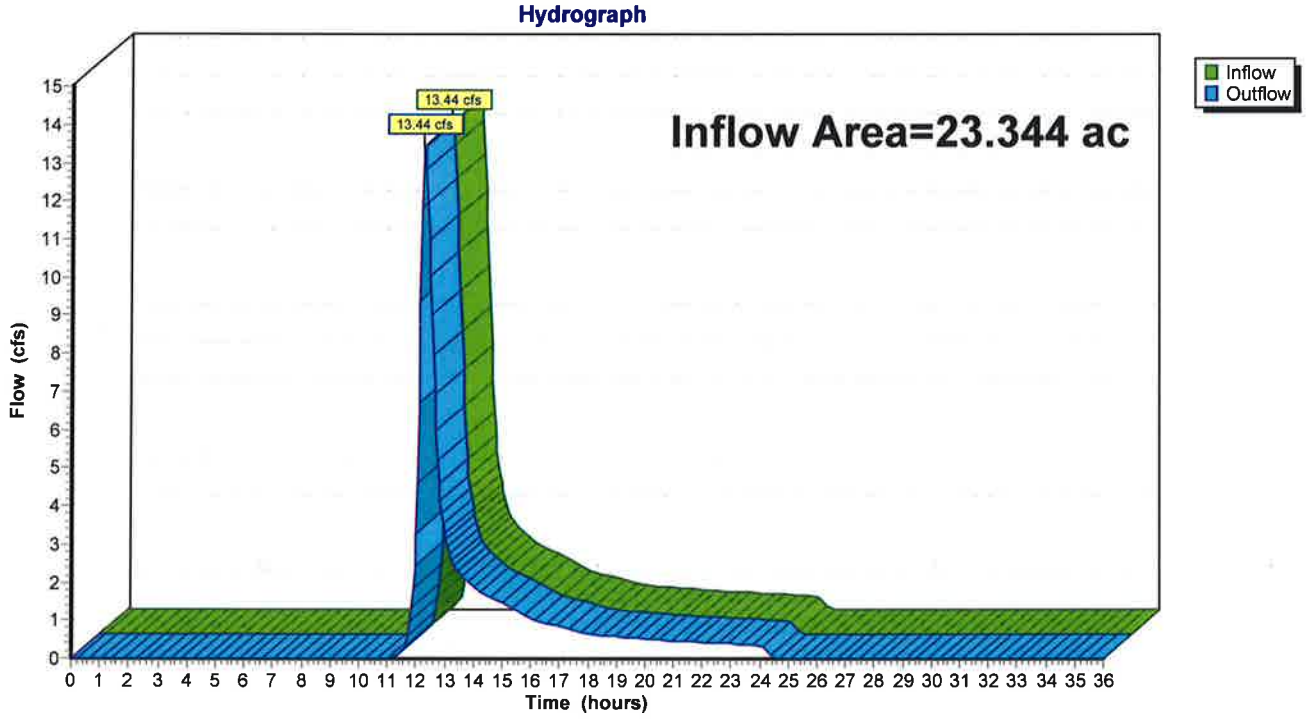


Summary for Reach 7R: PRE DEV DP-1

Inflow Area = 23.344 ac, 12.28% Impervious, Inflow Depth = 0.78" for 1-Year event
Inflow = 13.44 cfs @ 12.29 hrs, Volume= 1.525 af
Outflow = 13.44 cfs @ 12.29 hrs, Volume= 1.525 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 7R: PRE DEV DP-1

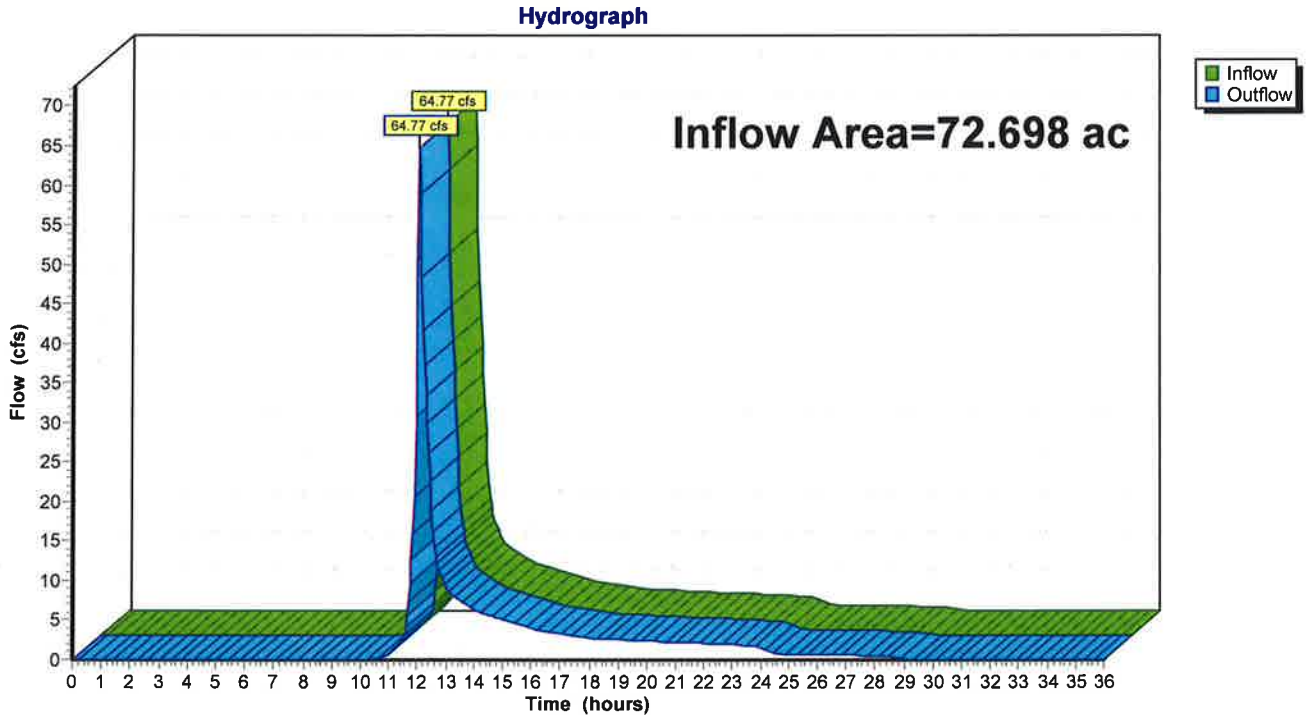


Summary for Reach 8R: PRE DEV DP-2

Inflow Area = 72.698 ac, 8.89% Impervious, Inflow Depth = 1.03" for 1-Year event
Inflow = 64.77 cfs @ 12.06 hrs, Volume= 6.233 af
Outflow = 64.77 cfs @ 12.06 hrs, Volume= 6.233 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 8R: PRE DEV DP-2



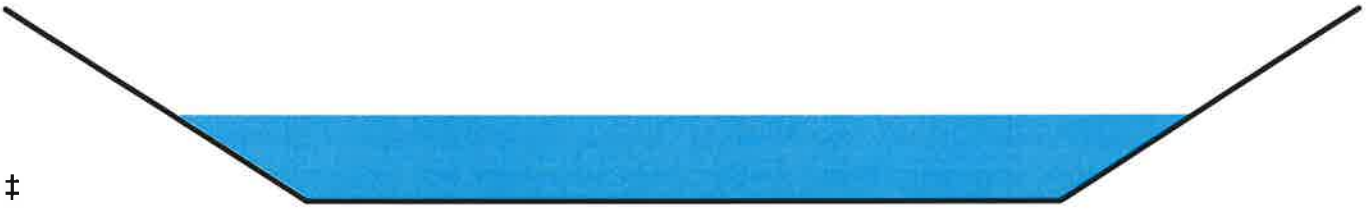
Summary for Reach 9R: Channel 2

Inflow Area = 72.698 ac, 8.89% Impervious, Inflow Depth = 1.03" for 1-Year event
Inflow = 81.34 cfs @ 12.01 hrs, Volume= 6.233 af
Outflow = 64.77 cfs @ 12.06 hrs, Volume= 6.233 af, Atten= 20%, Lag= 3.2 min
Routed to Reach 8R : PRE DEV DP-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.12 fps, Min. Travel Time= 5.3 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 21.6 min

Peak Storage= 20,395 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.90' , Surface Width= 13.58'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 268.86 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 1,930.0' Slope= 0.0620 '/'
Inlet Invert= 452.69', Outlet Invert= 333.03'



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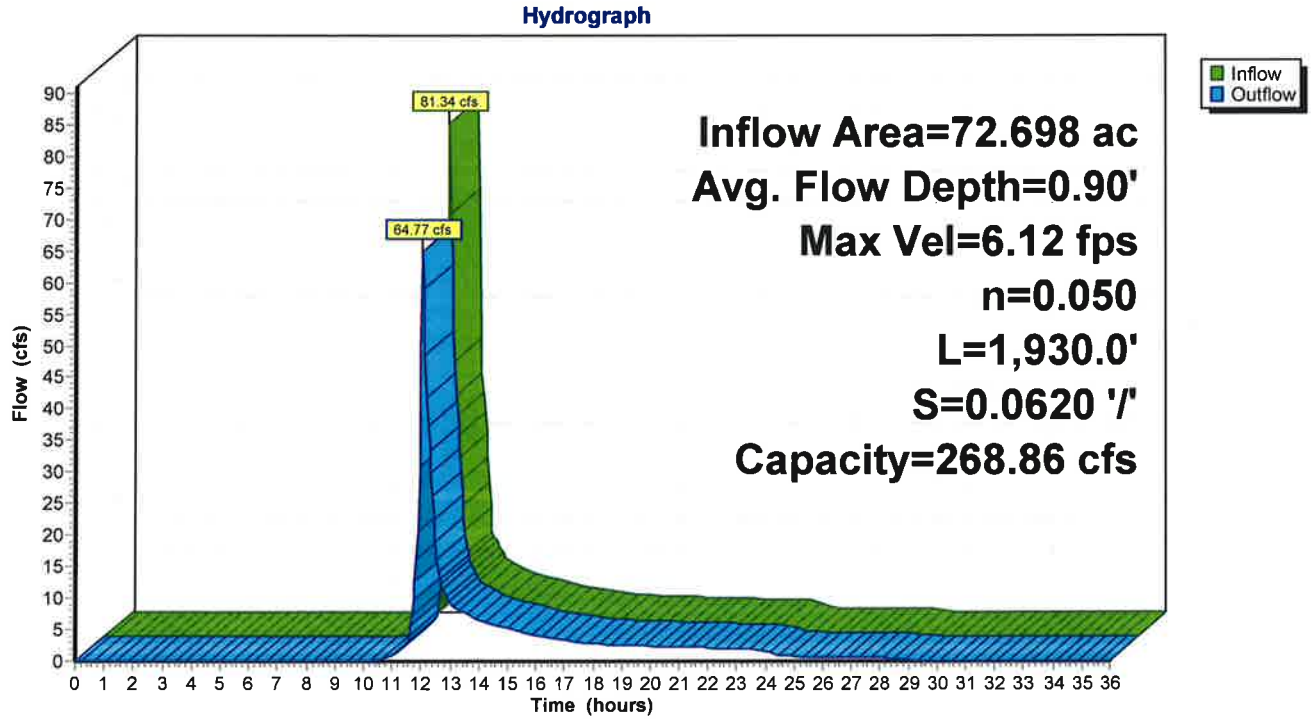
Reach 9R: Channel 2



Summary for Reach 11R: Channel 1

Inflow Area = 9.770 ac, 37.67% Impervious, Inflow Depth = 1.29" for 1-Year event
Inflow = 0.84 cfs @ 15.13 hrs, Volume= 1.048 af
Outflow = 0.84 cfs @ 15.19 hrs, Volume= 1.048 af, Atten= 0%, Lag= 3.2 min
Routed to Reach 9R : Channel 2

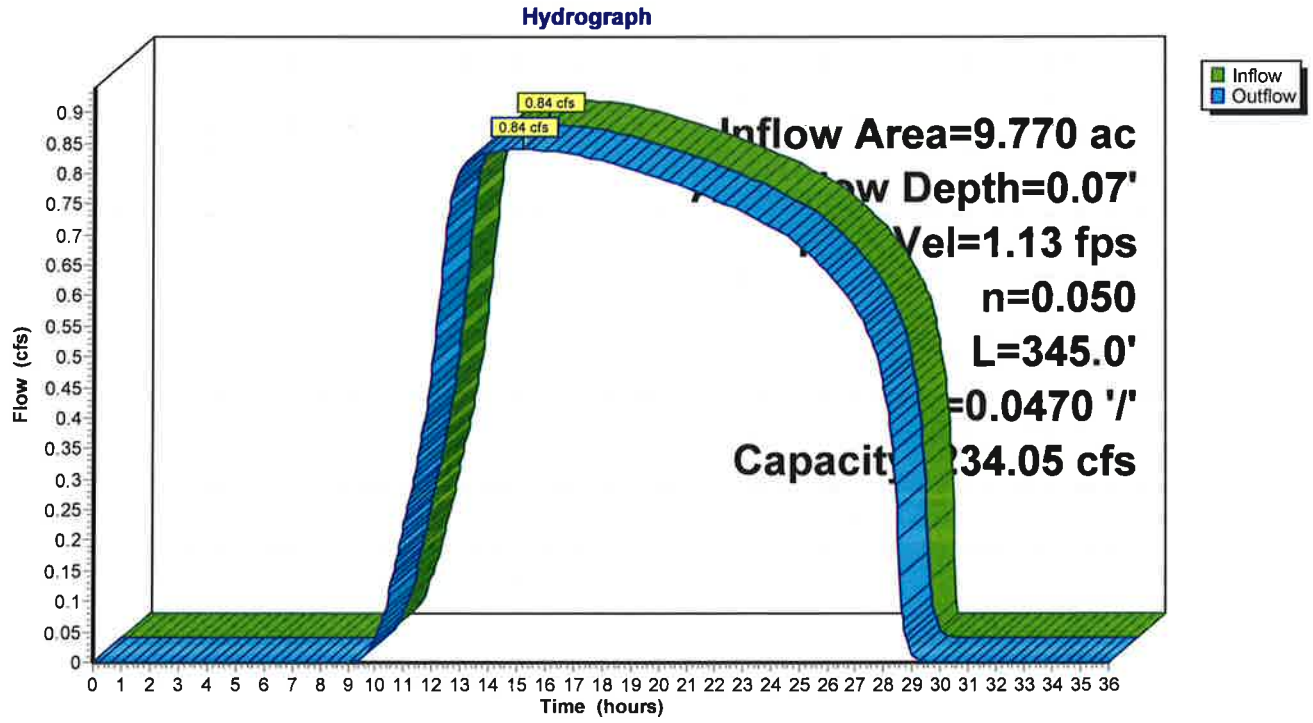
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.13 fps, Min. Travel Time= 5.1 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 6.0 min

Peak Storage= 257 cf @ 15.19 hrs
Average Depth at Peak Storage= 0.07' , Surface Width= 10.29'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 234.05 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 345.0' Slope= 0.0470 '/'
Inlet Invert= 468.90', Outlet Invert= 452.69'

‡

Reach 11R: Channel 1

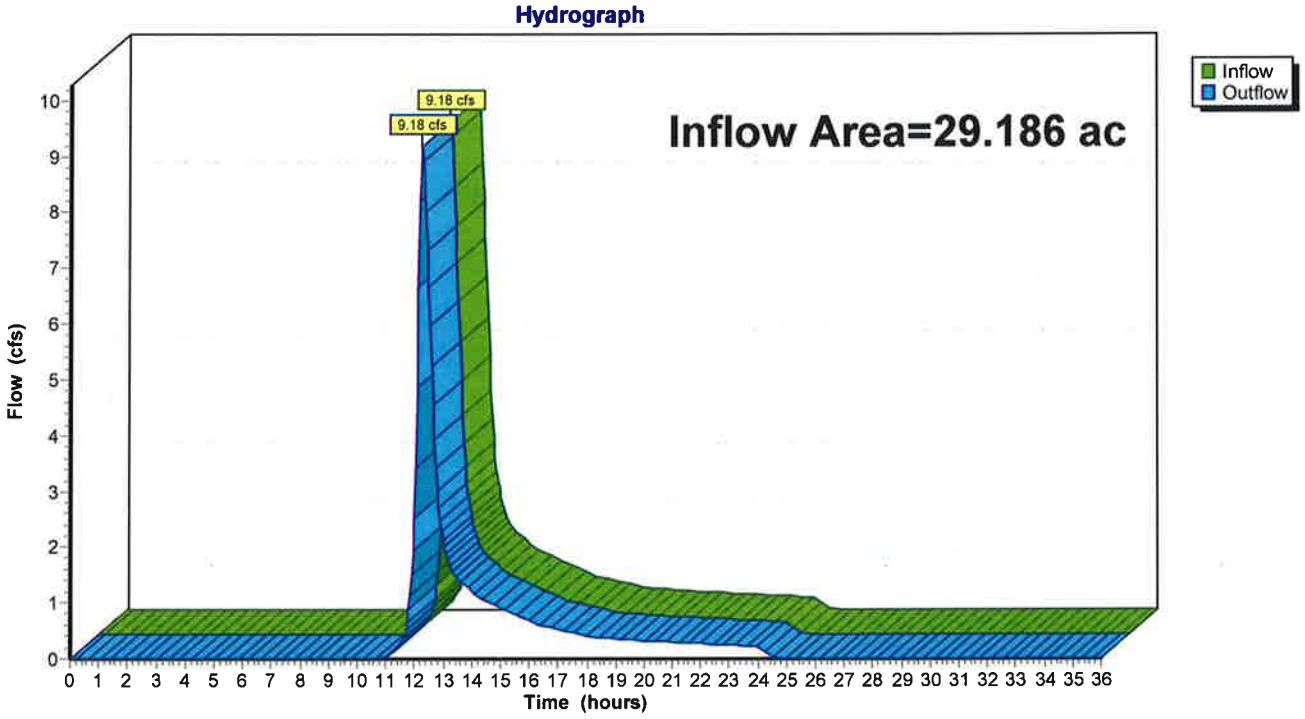


Summary for Reach 15R: POST DEV DP-1

Inflow Area = 29.186 ac, 42.68% Impervious, Inflow Depth = 0.42" for 1-Year event
Inflow = 9.18 cfs @ 12.28 hrs, Volume= 1.012 af
Outflow = 9.18 cfs @ 12.28 hrs, Volume= 1.012 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 15R: POST DEV DP-1

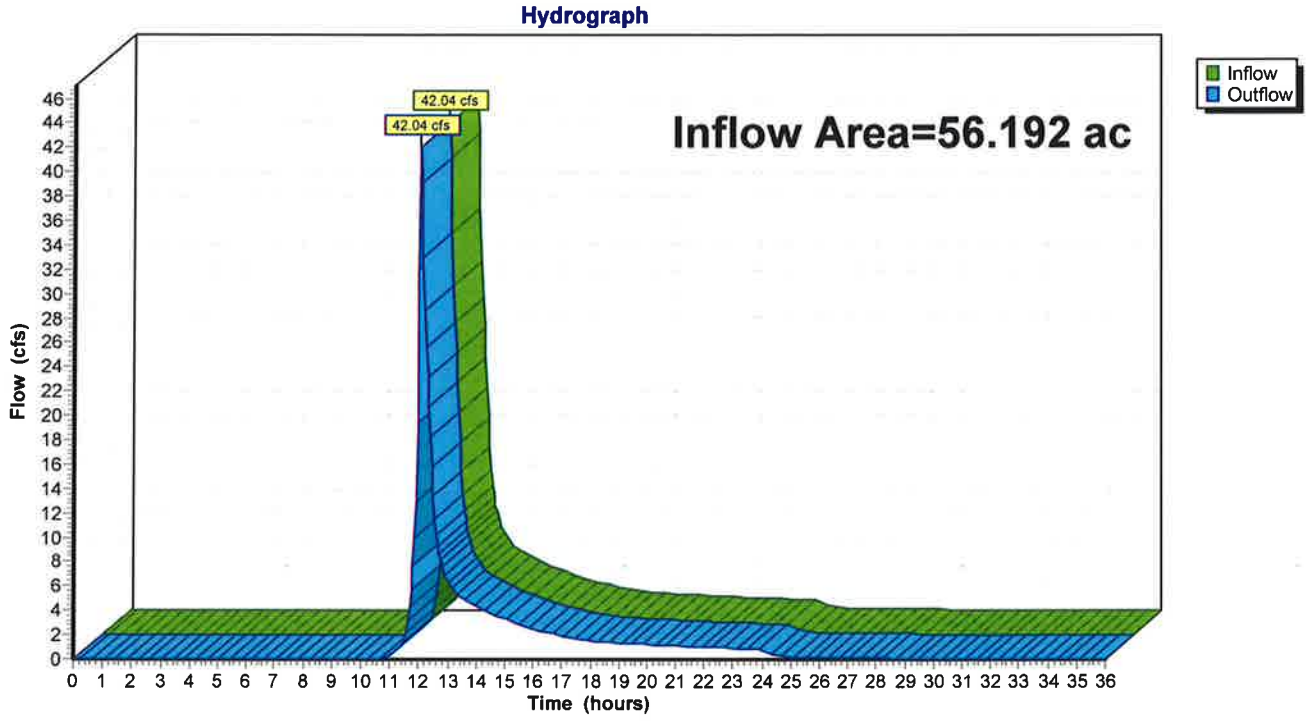


Summary for Reach 16R: POST DEV DP-2

Inflow Area = 56.192 ac, 24.26% Impervious, Inflow Depth > 0.82" for 1-Year event
Inflow = 42.04 cfs @ 12.07 hrs, Volume= 3.820 af
Outflow = 42.04 cfs @ 12.07 hrs, Volume= 3.820 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 16R: POST DEV DP-2



Summary for Reach 17R: Channel 2

Inflow Area = 42.596 ac, 6.53% Impervious, Inflow Depth = 0.99" for 1-Year event
Inflow = 54.72 cfs @ 12.01 hrs, Volume= 3.510 af
Outflow = 41.93 cfs @ 12.07 hrs, Volume= 3.510 af, Atten= 23%, Lag= 3.4 min
Routed to Reach 16R : POST DEV DP-2

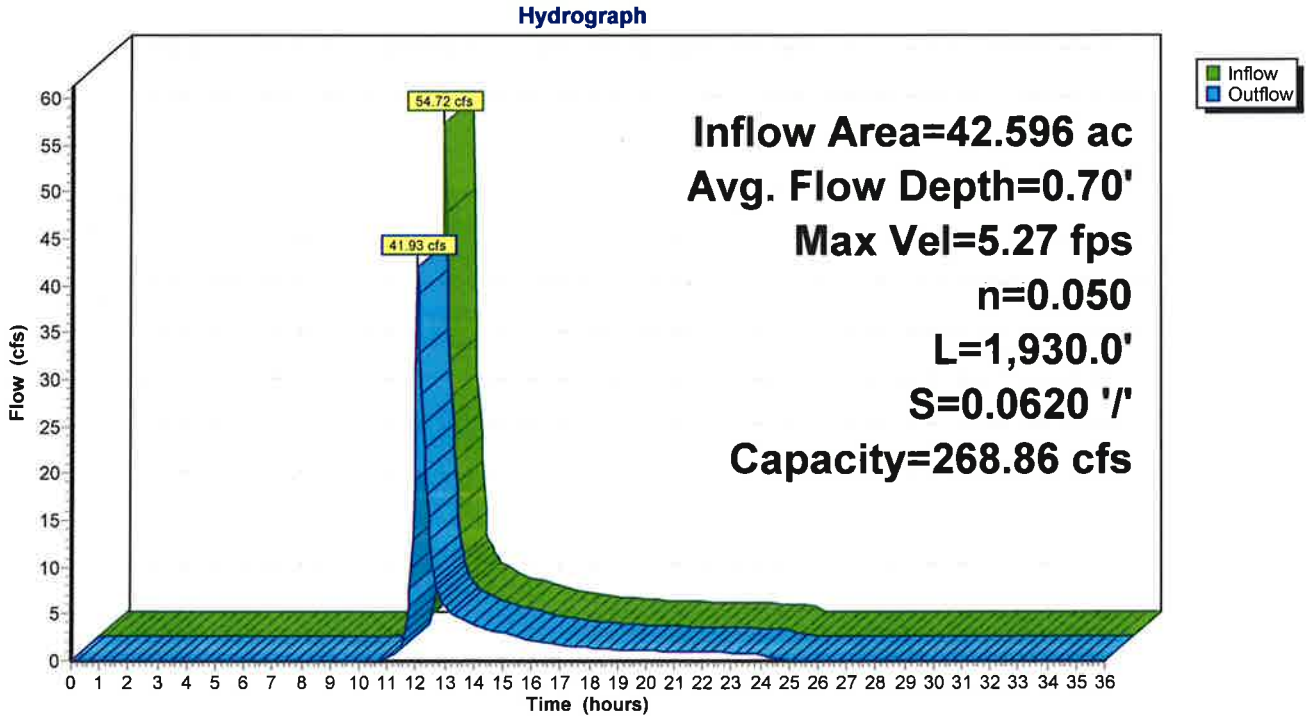
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.27 fps, Min. Travel Time= 6.1 min
Avg. Velocity = 1.28 fps, Avg. Travel Time= 25.1 min

Peak Storage= 15,305 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.70' , Surface Width= 12.78'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 268.86 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 1,930.0' Slope= 0.0620 '/'
Inlet Invert= 452.69', Outlet Invert= 333.03'

‡

Reach 17R: Channel 2



Summary for Pond 10P: EXISTING BASIN

Inflow Area = 9.770 ac, 37.67% Impervious, Inflow Depth = 1.29" for 1-Year event
Inflow = 8.22 cfs @ 12.43 hrs, Volume= 1.048 af
Outflow = 0.84 cfs @ 15.13 hrs, Volume= 1.048 af, Atten= 90%, Lag= 162.1 min
Primary = 0.84 cfs @ 15.13 hrs, Volume= 1.048 af
Routed to Reach 11R : Channel 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 474.35' @ 15.13 hrs Surf.Area= 0.402 ac Storage= 0.522 af

Plug-Flow detention time= 298.5 min calculated for 1.047 af (100% of inflow)
Center-of-Mass det. time= 298.4 min (1,160.2 - 861.9)

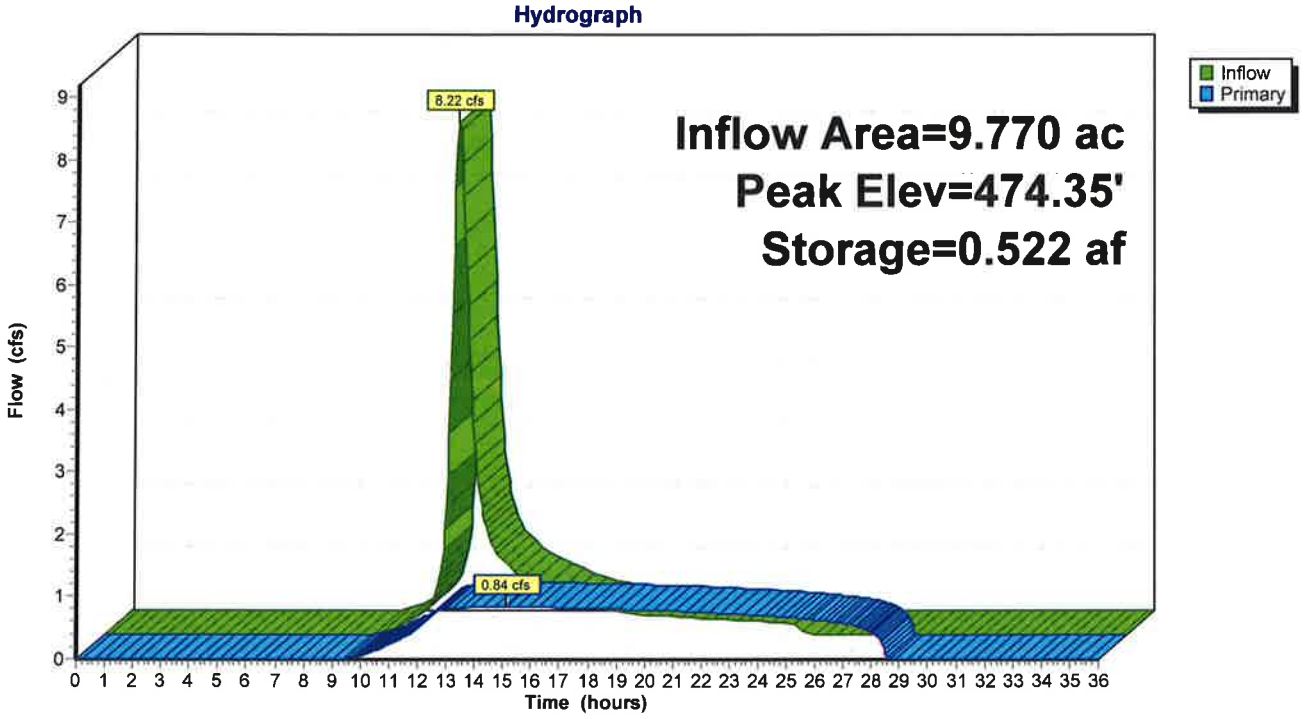
Volume	Invert	Avail.Storage	Storage Description
#1	471.00'	3.035 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
471.00	0.000	0.000	0.000
472.00	0.039	0.019	0.019
474.00	0.334	0.373	0.392
476.00	0.718	1.052	1.444
478.00	0.872	1.590	3.035

Device	Routing	Invert	Outlet Devices
#1	Device 3	471.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	476.00'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	471.00'	**15.0" Round Culvert** L= 119.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 471.00' / 468.90' S= 0.0176 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#4	Primary	471.00'	**Special & User-Defined** Elev. (feet) 471.00 471.17 478.00 Disch. (cfs) 0.000 0.090 0.090

Primary OutFlow Max=0.84 cfs @ 15.13 hrs HW=474.35' TW=468.97' (Dynamic Tailwater)
- **3=Culvert** (Passes 0.75 cfs of 8.61 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.75 cfs @ 8.60 fps)
  - **2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
- **4=Special & User-Defined** (Custom Controls 0.09 cfs)

Pond 10P: EXISTING BASIN



Summary for Pond 21P: WEST WETLAND

Inflow Area = 15.435 ac, 62.13% Impervious, Inflow Depth = 0.17" for 1-Year event
Inflow = 3.03 cfs @ 12.08 hrs, Volume= 0.215 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 15R : POST DEV DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 400.73' @ 24.35 hrs Surf.Area= 38,937 sf Storage= 9,367 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

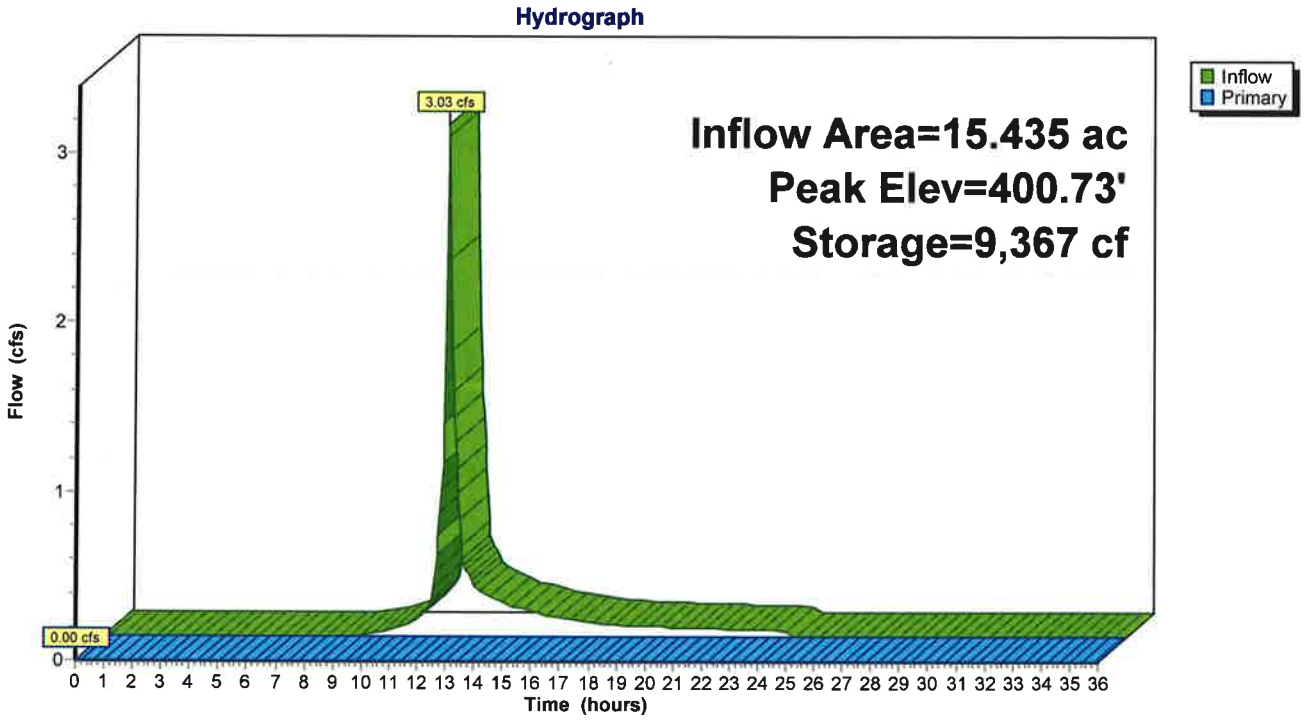
Volume	Invert	Avail.Storage	Storage Description
#1	400.50'	155,009 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
400.50	38,427	0	0
402.00	41,700	60,095	60,095
404.00	53,214	94,914	155,009

Device	Routing	Invert	Outlet Devices
#0	Primary	404.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Device 2	401.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	395.00'	**24.0" Round Culvert** L= 45.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 395.00' / 390.00' S= 0.1111 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#3	Primary	402.00'	**143.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=400.50' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 0.00 cfs of 28.31 cfs potential flow)
↑—**1=Orifice/Grate** (Controls 0.00 cfs)
—**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond 21P: WEST WETLAND



Summary for Pond 24P: EAST WETLAND

Inflow Area = 13.596 ac, 79.80% Impervious, Inflow Depth > 0.29" for 1-Year event
Inflow = 3.22 cfs @ 12.17 hrs, Volume= 0.327 af
Outflow = 0.57 cfs @ 12.81 hrs, Volume= 0.310 af, Atten= 82%, Lag= 38.6 min
Primary = 0.57 cfs @ 12.81 hrs, Volume= 0.310 af
Routed to Reach 16R : POST DEV DP-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 390.00' Storage= 1.389 af
Peak Elev= 390.12' @ 12.81 hrs Storage= 1.510 af (0.121 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 160.4 min (1,118.5 - 958.1)

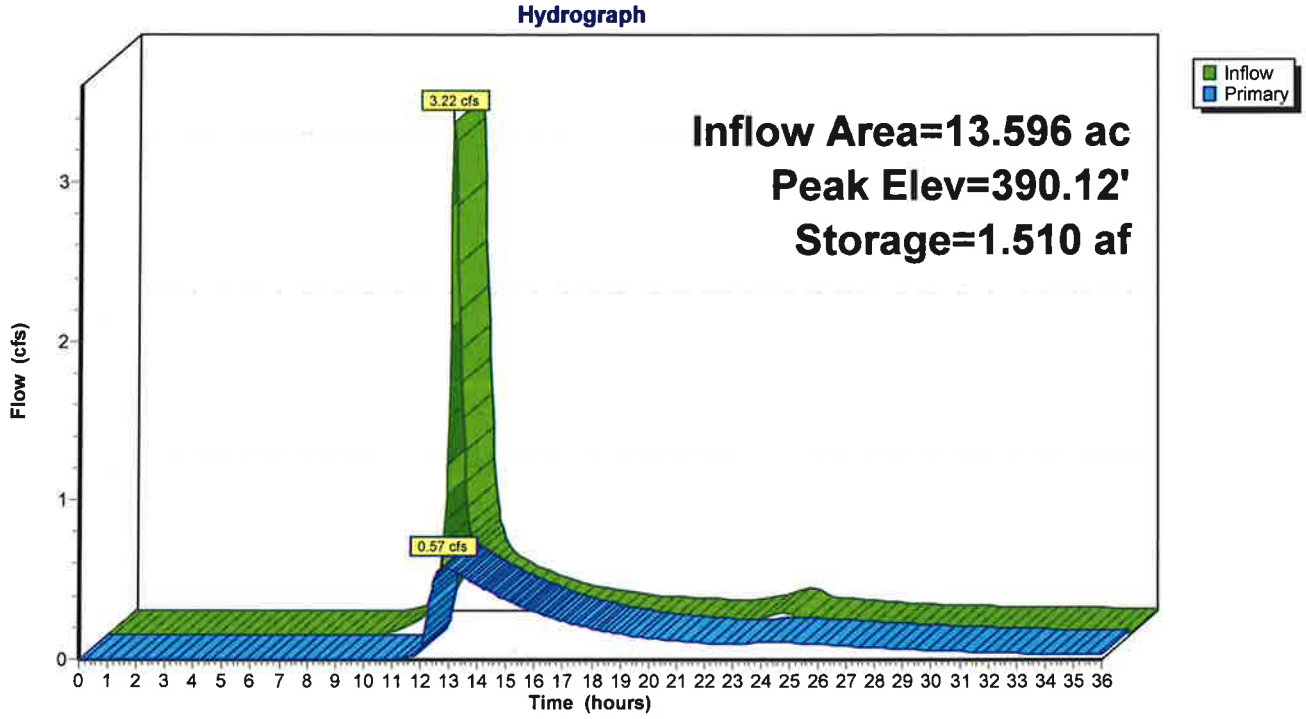
Volume	Invert	Avail.Storage	Storage Description
#1	384.00'	4.344 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
384.00	0.000
388.50	0.530
389.50	0.973
390.00	1.389
393.00	4.344

Device	Routing	Invert	Outlet Devices
#1	Primary	390.00'	**143.0 deg x 4.0' long x 3.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.57 cfs @ 12.81 hrs HW=390.12' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.57 cfs @ 1.07 fps)

Pond 24P: EAST WETLAND



Summary for Pond 34P: WEST CISTERN

Inflow Area = 13.620 ac, 64.39% Impervious, Inflow Depth = 1.72" for 1-Year event
Inflow = 24.01 cfs @ 12.13 hrs, Volume= 1.952 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 21P : WEST WETLAND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 399.11' @ 24.55 hrs Surf.Area= 0.689 ac Storage= 1.952 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	394.50'	0.902 af	**99.08'W x 303.00'L x 5.50'H Field A** 3.791 af Overall - 1.535 af Embedded = 2.256 af x 40.0% Voids
#2A	395.00'	1.281 af	**ADS N-12 48"** x 225 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 225 Chambers in 15 Rows
		2.183 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	400.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	399.00'	**12.0" Round Culvert** L= 100.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 399.00' / 398.00' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=394.50' TW=400.50' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond 34P: WEST CISTERN - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12® Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

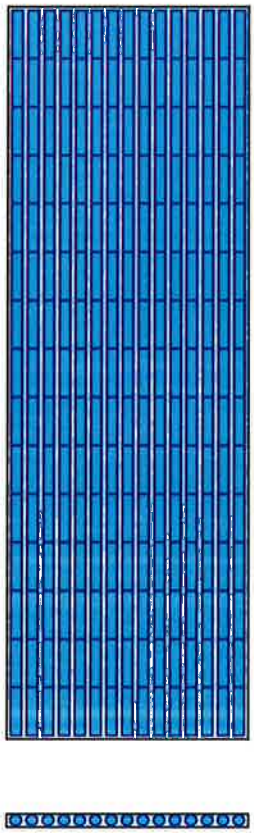
15 Chambers/Row x 20.00' Long = 300.00' Row Length +18.0" End Stone x 2 = 303.00' Base Length
15 Rows x 54.0" Wide + 24.5" Spacing x 14 + 18.0" Side Stone x 2 = 99.08' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

225 Chambers x 248.0 cf = 55,800.0 cf Chamber Storage
225 Chambers x 297.0 cf = 66,820.3 cf Displacement

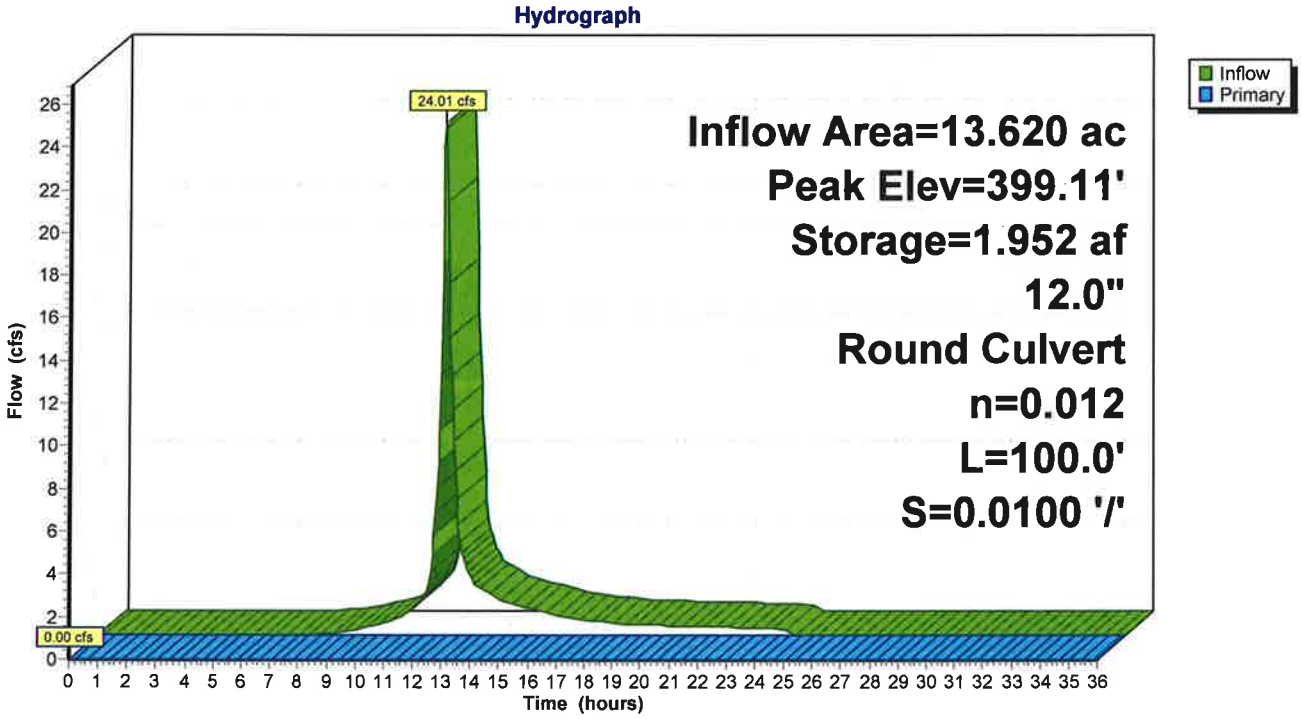
165,127.9 cf Field - 66,820.3 cf Chambers = 98,307.5 cf Stone x 40.0% Voids = 39,323.0 cf Stone Storage

Chamber Storage + Stone Storage = 95,123.0 cf = 2.184 af
Overall Storage Efficiency = 57.6%
Overall System Size = 303.00' x 99.08' x 5.50'

225 Chambers
6,115.8 cy Field
3,641.0 cy Stone



Pond 34P: WEST CISTERN



Summary for Pond 36P: CISTERN LOWER

Inflow Area = 10.840 ac, 89.94% Impervious, Inflow Depth = 2.36" for 1-Year event
Inflow = 28.29 cfs @ 12.07 hrs, Volume= 2.128 af
Outflow = 0.10 cfs @ 24.09 hrs, Volume= 0.046 af, Atten= 100%, Lag= 721.0 min
Primary = 0.10 cfs @ 24.09 hrs, Volume= 0.046 af
Routed to Pond 24P : EAST WETLAND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 398.16' @ 24.09 hrs Surf.Area= 0.742 ac Storage= 2.118 af

Plug-Flow detention time= 1,277.1 min calculated for 0.046 af (2% of inflow)
Center-of-Mass det. time= 851.4 min (1,628.4 - 777.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	393.50'	0.971 af	**144.88'W x 223.00'L x 5.50'H Field A** 4.079 af Overall - 1.651 af Embedded = 2.429 af x 40.0% Voids
#2A	394.00'	1.378 af	**ADS N-12 48"** x 242 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 242 Chambers in 22 Rows
		2.349 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	399.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	398.00'	**12.0" Round Culvert** L= 100.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 398.00' / 393.00' S= 0.0500 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Primary	398.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.10 cfs @ 24.09 hrs HW=398.16' TW=390.04' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.10 cfs @ 1.22 fps)
└—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 36P: CISTERN LOWER - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12® Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

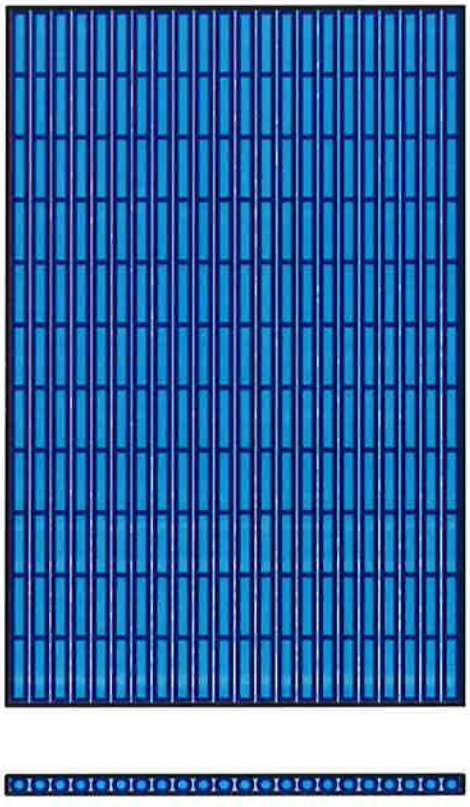
11 Chambers/Row x 20.00' Long = 220.00' Row Length +18.0" End Stone x 2 = 223.00' Base Length
22 Rows x 54.0" Wide + 24.5" Spacing x 21 + 18.0" Side Stone x 2 = 144.88' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

242 Chambers x 248.0 cf = 60,016.0 cf Chamber Storage
242 Chambers x 297.0 cf = 71,869.0 cf Displacement

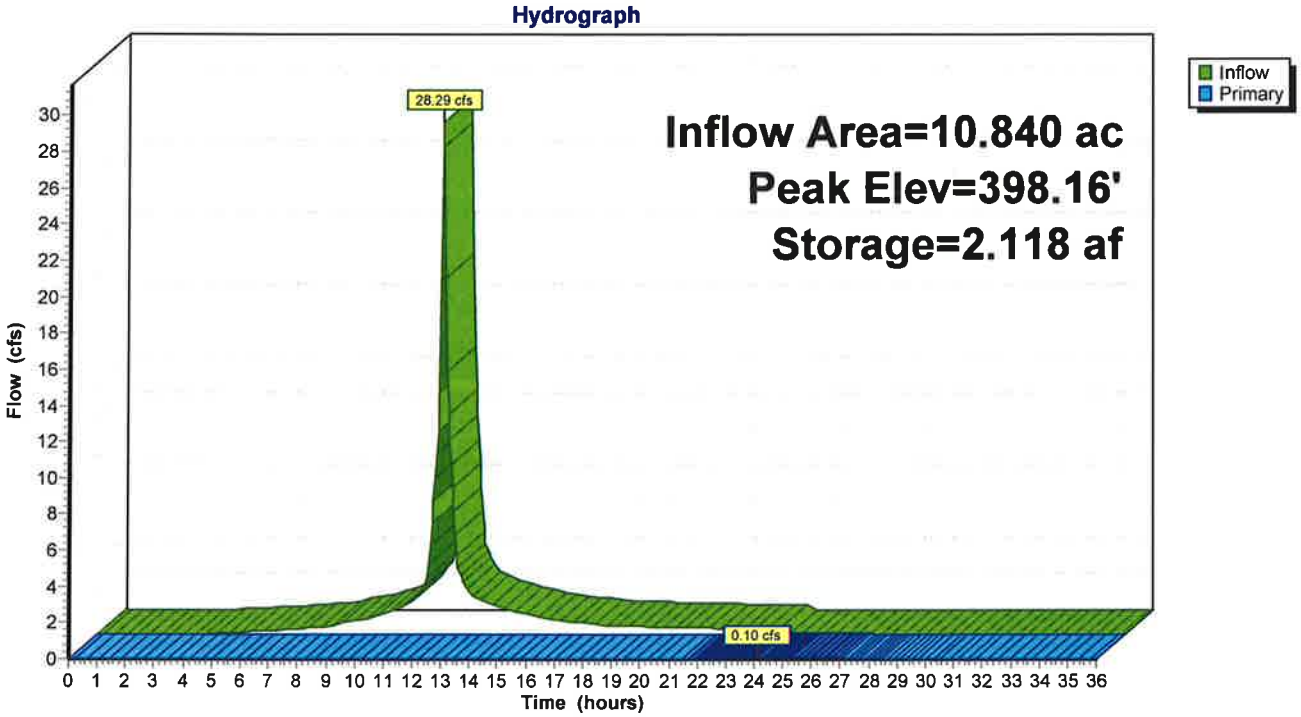
177,695.1 cf Field - 71,869.0 cf Chambers = 105,826.1 cf Stone x 40.0% Voids = 42,330.5 cf Stone Storage

Chamber Storage + Stone Storage = 102,346.5 cf = 2.350 af
Overall Storage Efficiency = 57.6%
Overall System Size = 223.00' x 144.88' x 5.50'

242 Chambers
6,581.3 cy Field
3,919.5 cy Stone



Pond 36P: CISTERN LOWER



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3S: POST DEV DA-2 Runoff Area=13.620 ac 64.39% Impervious Runoff Depth=2.27"
Flow Length=1,344' Tc=9.4 min CN=89 Runoff=31.54 cfs 2.581 af

Subcatchment 4S: PRE DEV DA-1 Runoff Area=23.344 ac 12.28% Impervious Runoff Depth=1.18"
Flow Length=1,887' Tc=18.7 min CN=74 Runoff=21.18 cfs 2.292 af

Subcatchment 5S: PRE DEV DA-2 Runoff Area=9.770 ac 37.67% Impervious Runoff Depth=1.78"
Flow Length=928' Tc=30.2 min CN=83 Runoff=11.48 cfs 1.452 af

Subcatchment 6S: PRE DEV DA-3 Runoff Area=62.928 ac 4.42% Impervious Runoff Depth=1.43"
Tc=0.0 min CN=78 Runoff=119.58 cfs 7.495 af

Subcatchment 12S: POST DEV DA-6 Runoff Area=13.751 ac 20.84% Impervious Runoff Depth=1.30"
Flow Length=1,887' Tc=18.7 min CN=76 Runoff=14.05 cfs 1.490 af

Subcatchment 14S: POST DEV DA-5 Runoff Area=42.596 ac 6.53% Impervious Runoff Depth=1.43"
Tc=0.0 min CN=78 Runoff=80.94 cfs 5.074 af

Subcatchment 26S: POST DEV DA-4 Runoff Area=2.756 ac 39.91% Impervious Runoff Depth=1.71"
Flow Length=217' Tc=11.6 min CN=82 Runoff=4.55 cfs 0.392 af

Subcatchment 32S: POST DEV DA-3 Runoff Area=1.815 ac 45.18% Impervious Runoff Depth=1.94"
Tc=5.0 min CN=85 Runoff=4.13 cfs 0.293 af

Subcatchment 35S: POST DEV DA-1 Runoff Area=10.840 ac 89.94% Impervious Runoff Depth=2.96"
Tc=5.0 min CN=96 Runoff=35.05 cfs 2.671 af

Reach 7R: PRE DEV DP-1 Inflow=21.18 cfs 2.292 af
Outflow=21.18 cfs 2.292 af

Reach 8R: PRE DEV DP-2 Inflow=98.72 cfs 8.946 af
Outflow=98.72 cfs 8.946 af

Reach 9R: Channel 2 Avg. Flow Depth=1.14' Max Vel=7.04 fps Inflow=120.14 cfs 8.947 af
n=0.050 L=1,930.0' S=0.0620 '/' Capacity=268.86 cfs Outflow=98.72 cfs 8.946 af

Reach 11R: Channel 1 Avg. Flow Depth=0.08' Max Vel=1.16 fps Inflow=0.91 cfs 1.452 af
n=0.050 L=345.0' S=0.0470 '/' Capacity=234.05 cfs Outflow=0.91 cfs 1.452 af

Reach 15R: POST DEV DP-1 Inflow=14.05 cfs 1.717 af
Outflow=14.05 cfs 1.717 af

Reach 16R: POST DEV DP-2 Inflow=64.74 cfs 6.031 af
Outflow=64.74 cfs 6.031 af

Reach 17R: Channel 2 Avg. Flow Depth=0.89' Max Vel=6.12 fps Inflow=80.94 cfs 5.074 af
n=0.050 L=1,930.0' S=0.0620 '/' Capacity=268.86 cfs Outflow=64.53 cfs 5.074 af

Pond 10P: EXISTING BASIN Peak Elev=474.97' Storage=0.804 af Inflow=11.48 cfs 1.452 af
Outflow=0.91 cfs 1.452 af

Pond 21P: WEST WETLAND Peak Elev=401.08' Storage=23,376 cf Inflow=4.13 cfs 0.691 af
Outflow=0.50 cfs 0.227 af

Pond 24P: EAST WETLAND Peak Elev=390.20' Storage=1.581 af Inflow=4.55 cfs 0.979 af
Outflow=1.19 cfs 0.957 af

Pond 34P: WEST CISTERN Peak Elev=400.00' Storage=2.183 af Inflow=31.54 cfs 2.581 af
12.0" Round Culvert n=0.012 L=100.0' S=0.0100 '/' Outflow=1.08 cfs 0.398 af

Pond 36P: CISTERN LOWER Peak Elev=398.40' Storage=2.175 af Inflow=35.05 cfs 2.671 af
Outflow=1.31 cfs 0.586 af

Total Runoff Area = 181.420 ac Runoff Volume = 23.740 af Average Runoff Depth = 1.57"
80.48% Pervious = 146.002 ac 19.52% Impervious = 35.418 ac

Summary for Subcatchment 3S: POST DEV DA-2

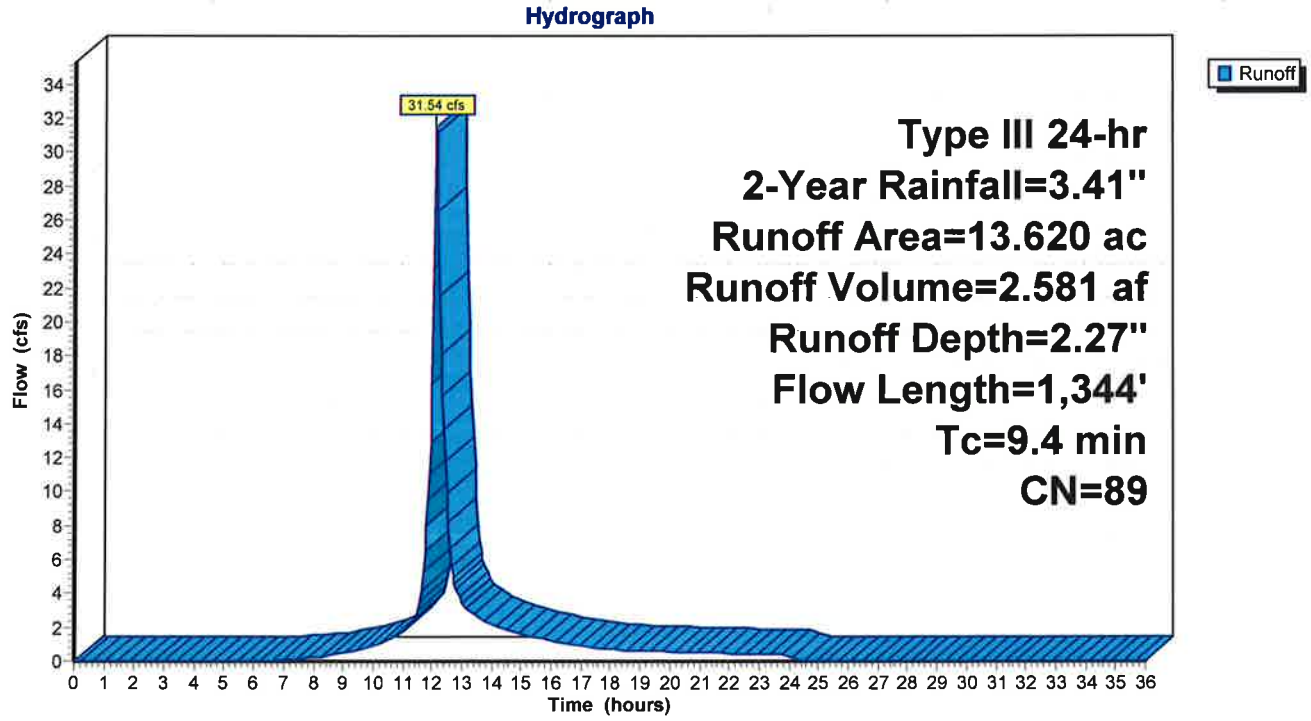
Runoff = 31.54 cfs @ 12.13 hrs, Volume= 2.581 af, Depth= 2.27"
Routed to Pond 34P : WEST CISTERN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.41"

Area (ac)	CN	Description
8.770	98	Paved parking, HSG C
4.850	74	>75% Grass cover, Good, HSG C
13.620	89	Weighted Average
4.850		35.61% Pervious Area
8.770		64.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	100	0.0950	0.22		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
0.5	227	0.2200	7.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	1,017	0.0220	11.82	18.91	**Channel Flow,** Area= 1.6 sf Perim= 3.1' r= 0.52' n= 0.012
9.4	1,344	Total			

Subcatchment 3S: POST DEV DA-2



Summary for Subcatchment 4S: PRE DEV DA-1

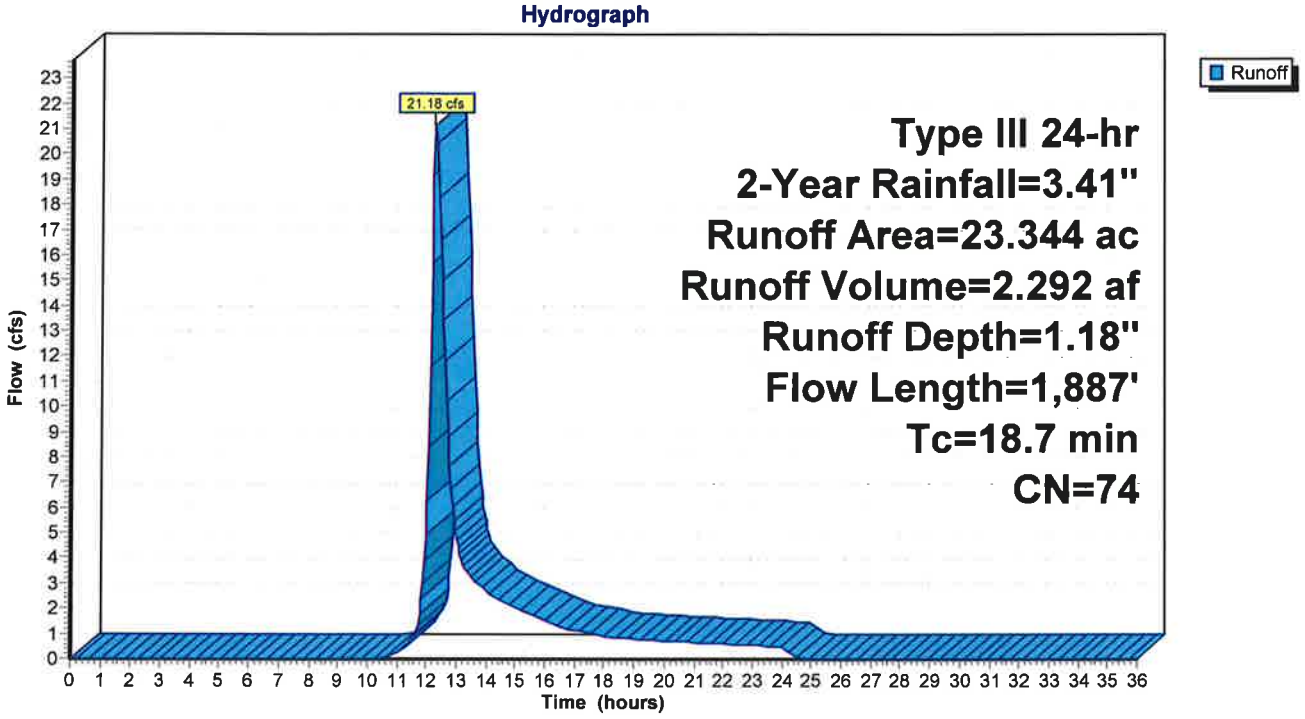
Runoff = 21.18 cfs @ 12.28 hrs, Volume= 2.292 af, Depth= 1.18"
Routed to Reach 7R : PRE DEV DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.41"

Area (ac)	CN	Description
15.478	70	Woods, Good, HSG C
5.000	74	Pasture/grassland/range, Good, HSG C
2.866	98	Paved parking, HSG C
23.344	74	Weighted Average
20.478		87.72% Pervious Area
2.866		12.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	507	0.0870	4.75		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	1,120	0.1700	27.00	27.00	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.2	160	0.0250	11.53	16.14	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
18.7	1,887	Total			

Subcatchment 4S: PRE DEV DA-1



Summary for Subcatchment 5S: PRE DEV DA-2

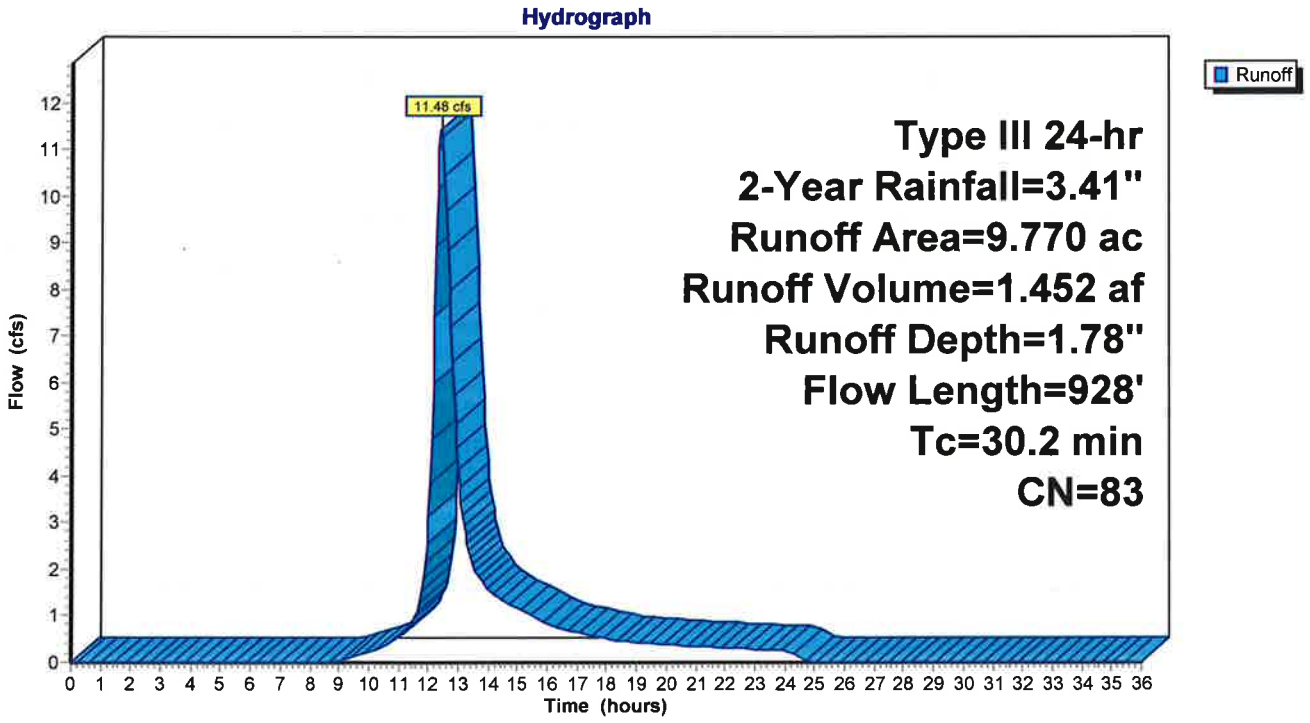
Runoff = 11.48 cfs @ 12.42 hrs, Volume= 1.452 af, Depth= 1.78"
Routed to Pond 10P : EXISTING BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.41"

Area (ac)	CN	Description
3.680	98	Paved parking, HSG C
5.611	74	>75% Grass cover, Good, HSG C
0.479	70	Woods, Good, HSG C
9.770	83	Weighted Average
6.090		62.33% Pervious Area
3.680		37.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.3	130	0.0150	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.8	543	0.0270	10.76	10.76	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.1	255	0.1800	30.93	43.30	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
30.2	928	Total			

Subcatchment 5S: PRE DEV DA-2



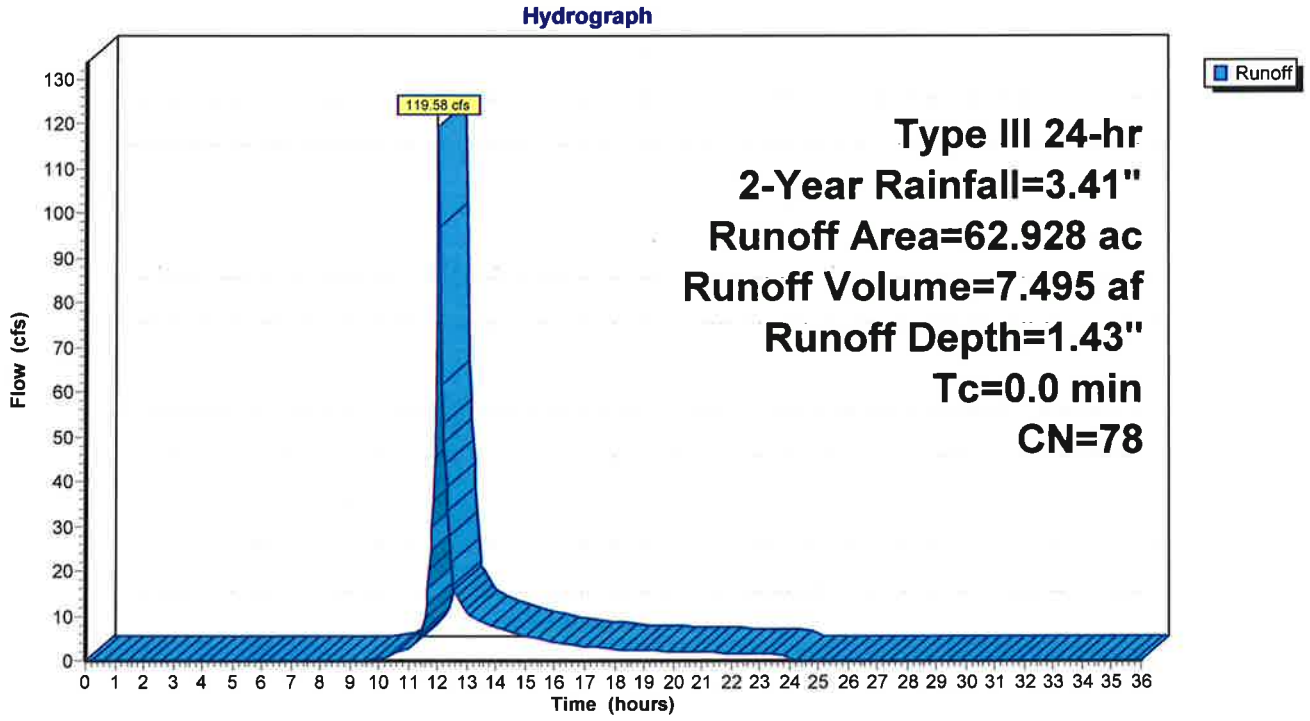
Summary for Subcatchment 6S: PRE DEV DA-3

Runoff = 119.58 cfs @ 12.01 hrs, Volume= 7.495 af, Depth= 1.43"
Routed to Reach 9R : Channel 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.41"

Area (ac)	CN	Description
2.783	98	Paved parking, HSG C
5.613	74	>75% Grass cover, Good, HSG C
53.591	77	Woods, Poor, HSG C
0.941	83	Woods, Poor, HSG D
62.928	78	Weighted Average
60.145		95.58% Pervious Area
2.783		4.42% Impervious Area

Subcatchment 6S: PRE DEV DA-3



Summary for Subcatchment 12S: POST DEV DA-6

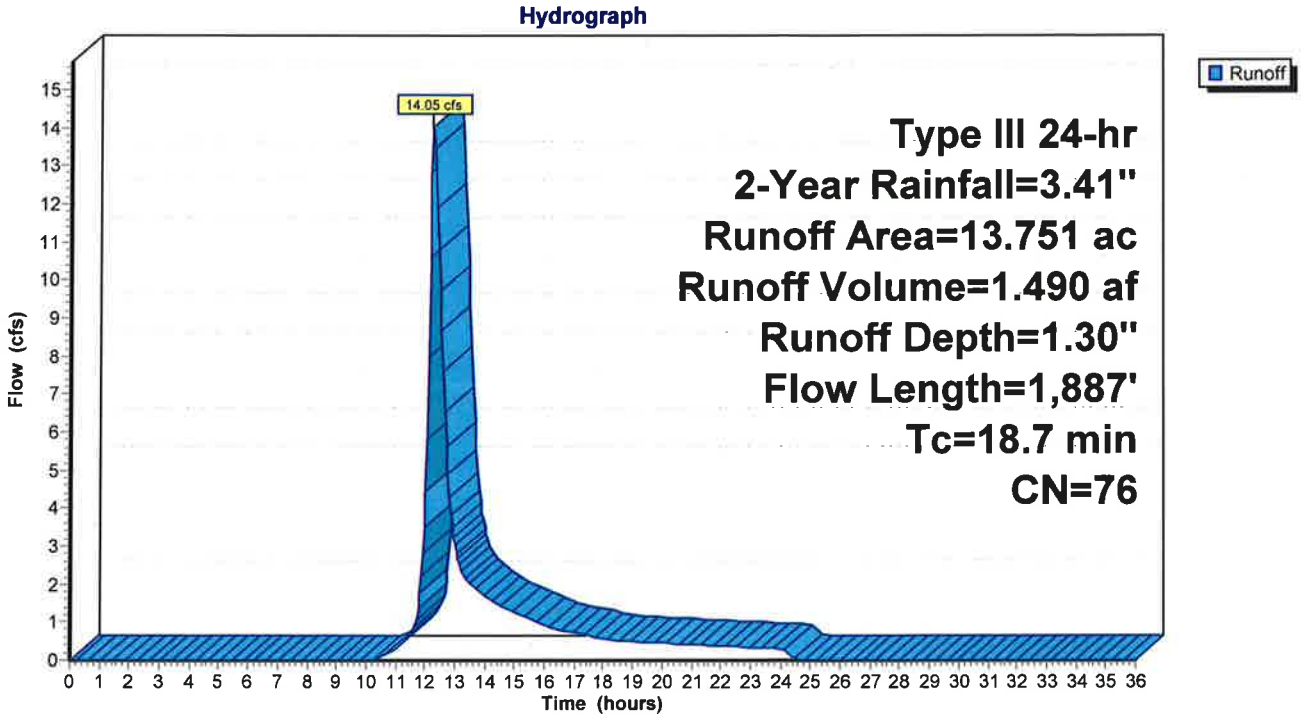
Runoff = 14.05 cfs @ 12.27 hrs, Volume= 1.490 af, Depth= 1.30"
Routed to Reach 15R : POST DEV DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.41"

Area (ac)	CN	Description
9.130	70	Woods, Good, HSG C
1.755	74	Pasture/grassland/range, Good, HSG C
2.866	98	Paved parking, HSG C
13.751	76	Weighted Average
10.885		79.16% Pervious Area
2.866		20.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	507	0.0870	4.75		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	1,120	0.1700	27.00	27.00	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.2	160	0.0250	11.53	16.14	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
18.7	1,887	Total			

Subcatchment 12S: POST DEV DA-6



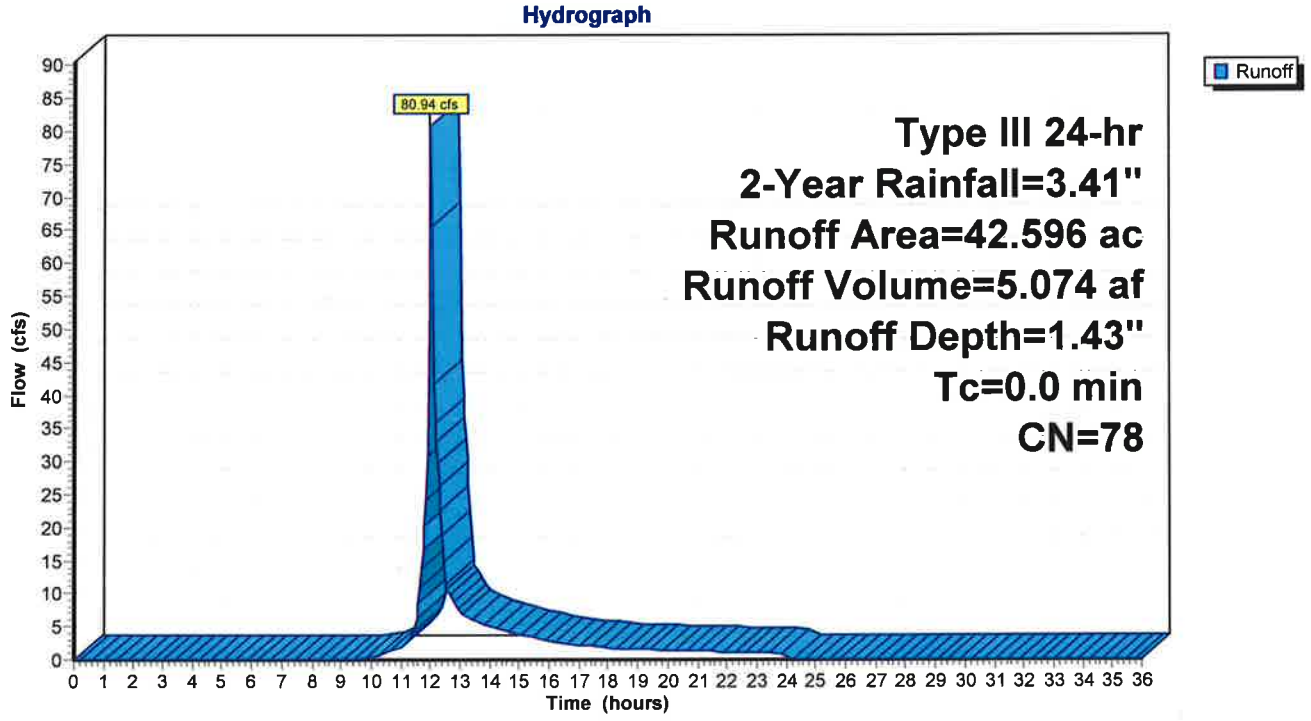
Summary for Subcatchment 14S: POST DEV DA-5

Runoff = 80.94 cfs @ 12.01 hrs, Volume= 5.074 af, Depth= 1.43"
Routed to Reach 17R : Channel 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.41"

Area (ac)	CN	Description
2.783	98	Paved parking, HSG C
3.623	74	>75% Grass cover, Good, HSG C
36.190	77	Woods, Poor, HSG C
42.596	78	Weighted Average
39.813		93.47% Pervious Area
2.783		6.53% Impervious Area

Subcatchment 14S: POST DEV DA-5



Summary for Subcatchment 26S: POST DEV DA-4

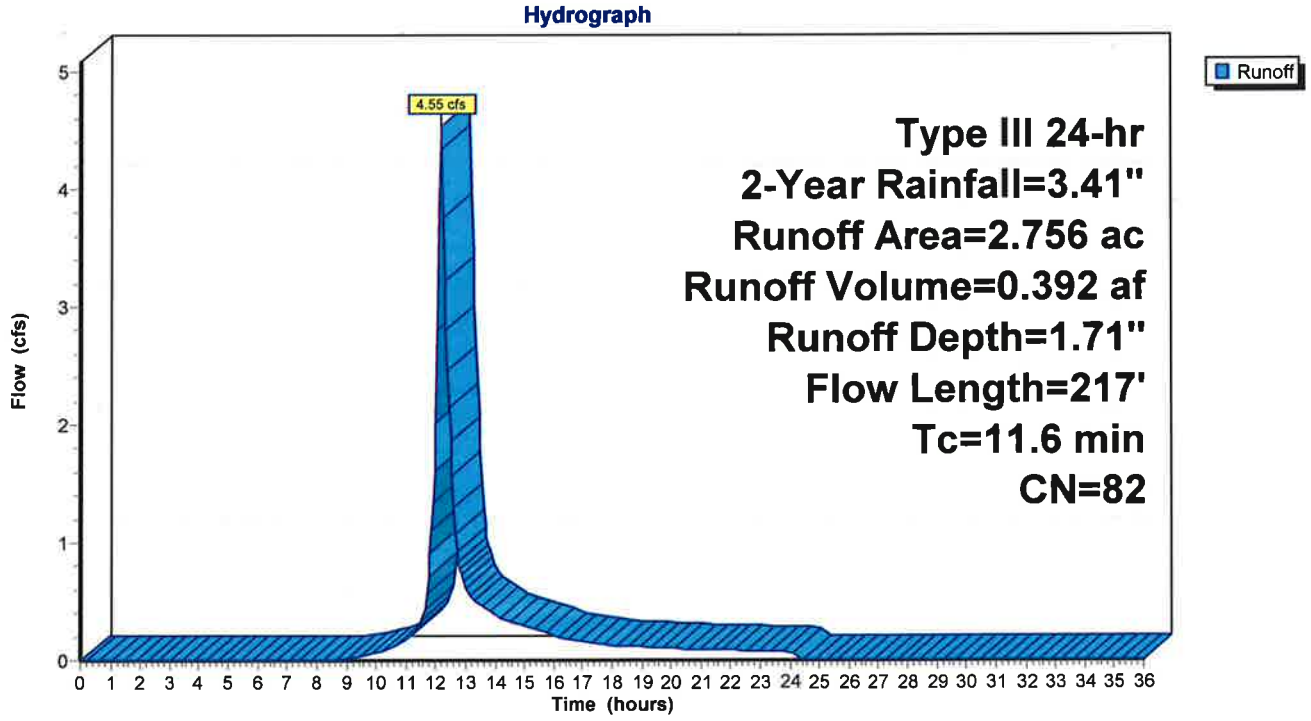
Runoff = 4.55 cfs @ 12.17 hrs, Volume= 0.392 af, Depth= 1.71"
Routed to Pond 24P : EAST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.41"

Area (ac)	CN	Description
1.100	98	Water Surface, HSG C
1.240	70	Woods, Good, HSG C
0.416	74	>75% Grass cover, Good, HSG C
2.756	82	Weighted Average
1.656		60.09% Pervious Area
1.100		39.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0400	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
1.0	117	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.6	217	Total			

Subcatchment 26S: POST DEV DA-4



Summary for Subcatchment 32S: POST DEV DA-3

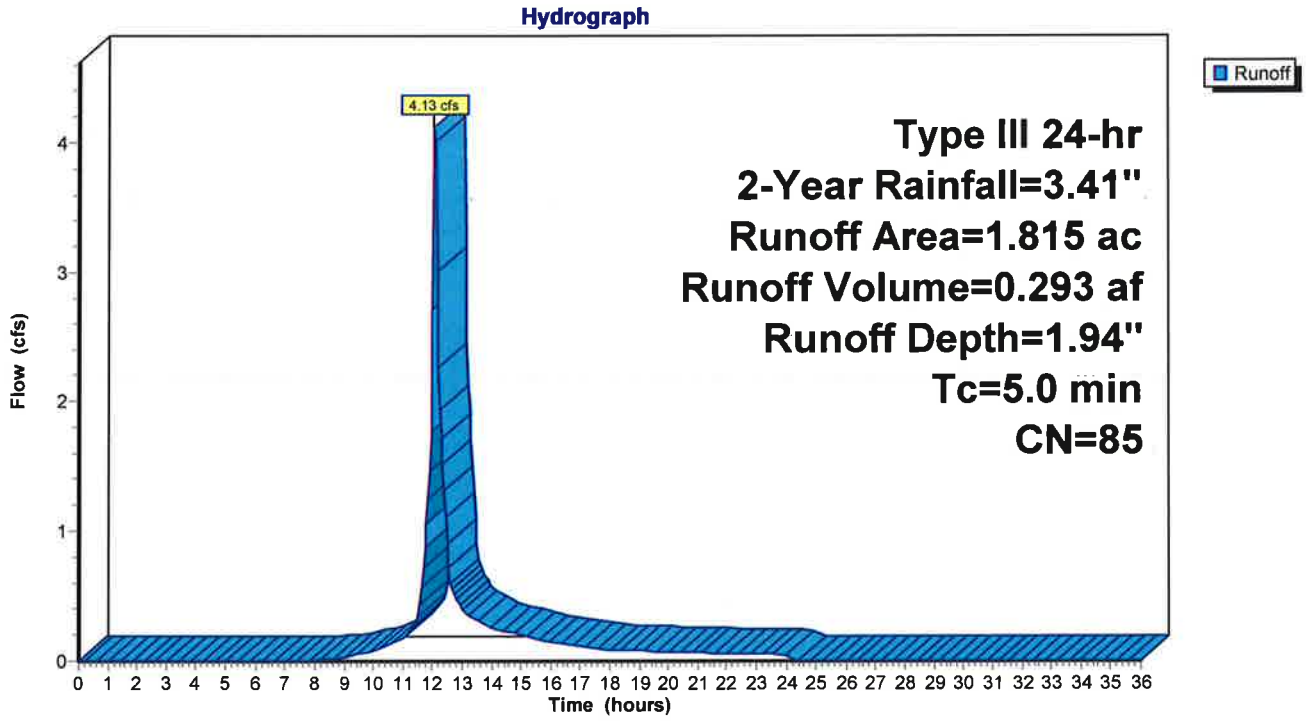
Runoff = 4.13 cfs @ 12.08 hrs, Volume= 0.293 af, Depth= 1.94"
Routed to Pond 21P : WEST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.41"

Area (ac)	CN	Description
0.995	74	>75% Grass cover, Good, HSG C
0.820	98	Paved roads w/curbs & sewers, HSG C
1.815	85	Weighted Average
0.995		54.82% Pervious Area
0.820		45.18% Impervious Area

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

Subcatchment 32S: POST DEV DA-3



Summary for Subcatchment 35S: POST DEV DA-1

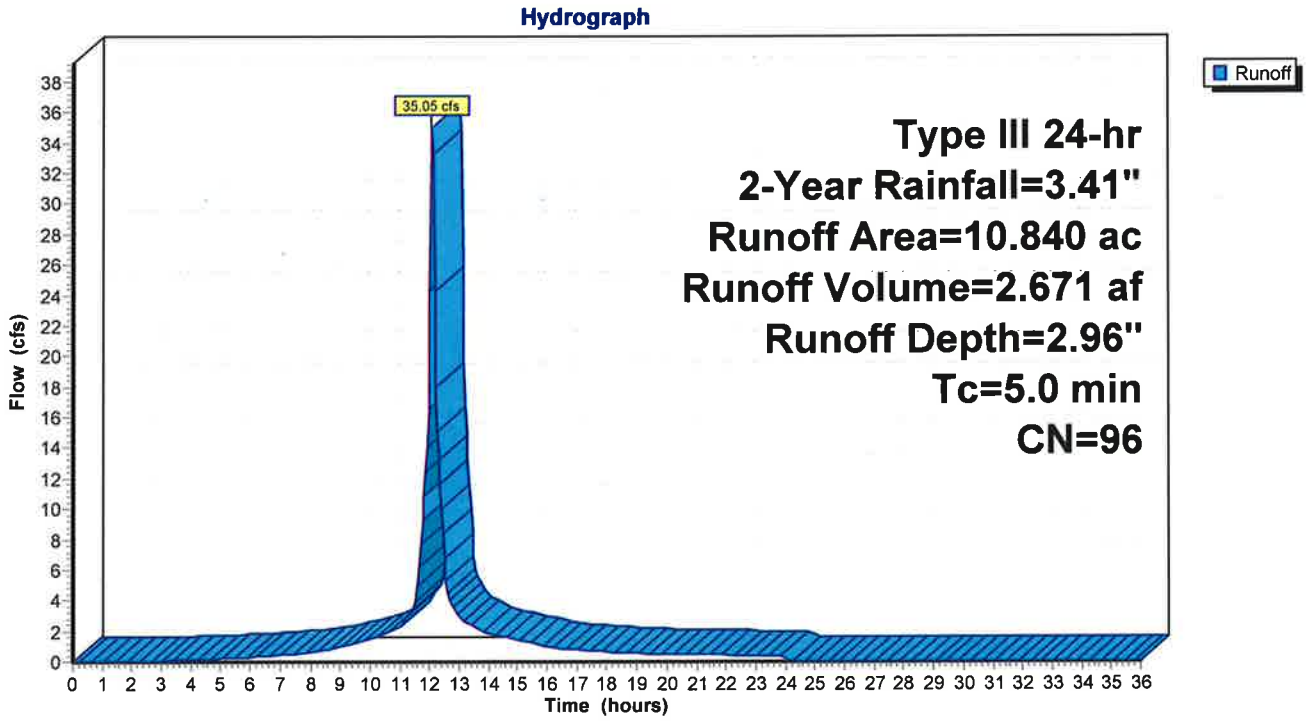
Runoff = 35.05 cfs @ 12.07 hrs, Volume= 2.671 af, Depth= 2.96"
Routed to Pond 36P : CISTERN LOWER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.41"

Area (ac)	CN	Description
9.750	98	Paved parking, HSG C
1.090	74	>75% Grass cover, Good, HSG C
10.840	96	Weighted Average
1.090		10.06% Pervious Area
9.750		89.94% Impervious Area

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

Subcatchment 35S: POST DEV DA-1

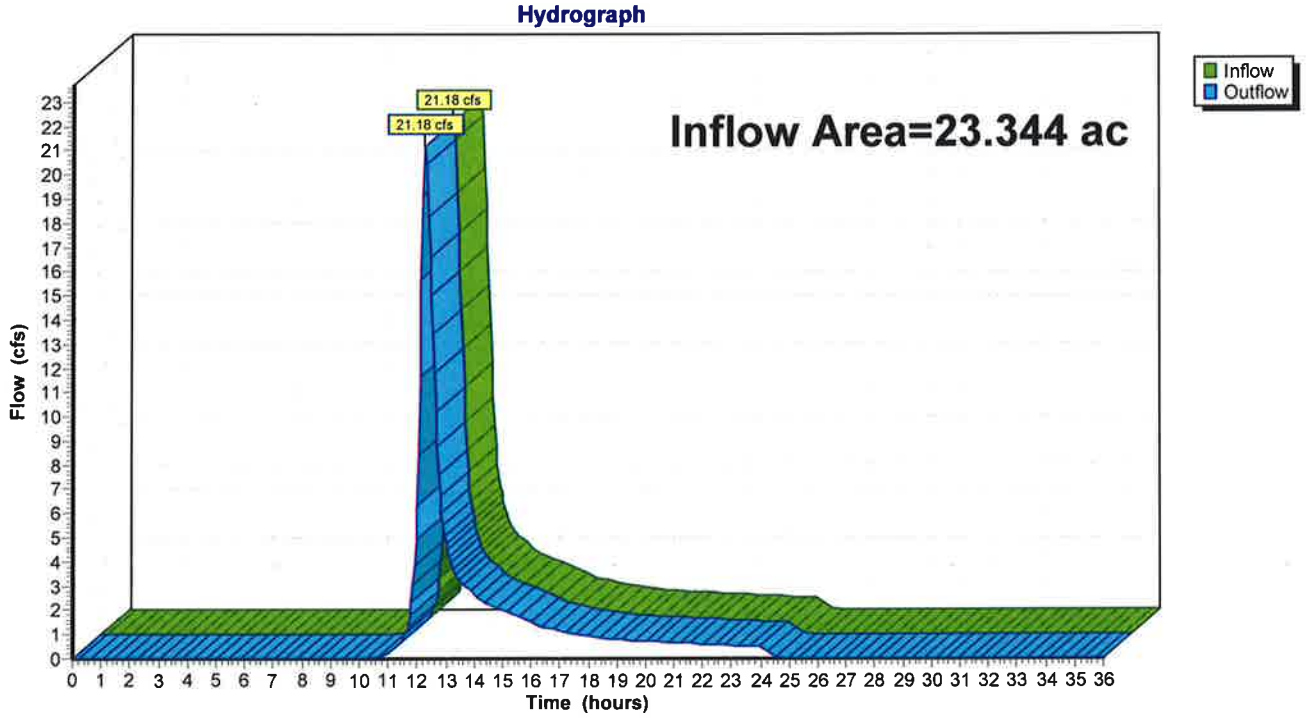


Summary for Reach 7R: PRE DEV DP-1

Inflow Area = 23.344 ac, 12.28% Impervious, Inflow Depth = 1.18" for 2-Year event
Inflow = 21.18 cfs @ 12.28 hrs, Volume= 2.292 af
Outflow = 21.18 cfs @ 12.28 hrs, Volume= 2.292 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 7R: PRE DEV DP-1

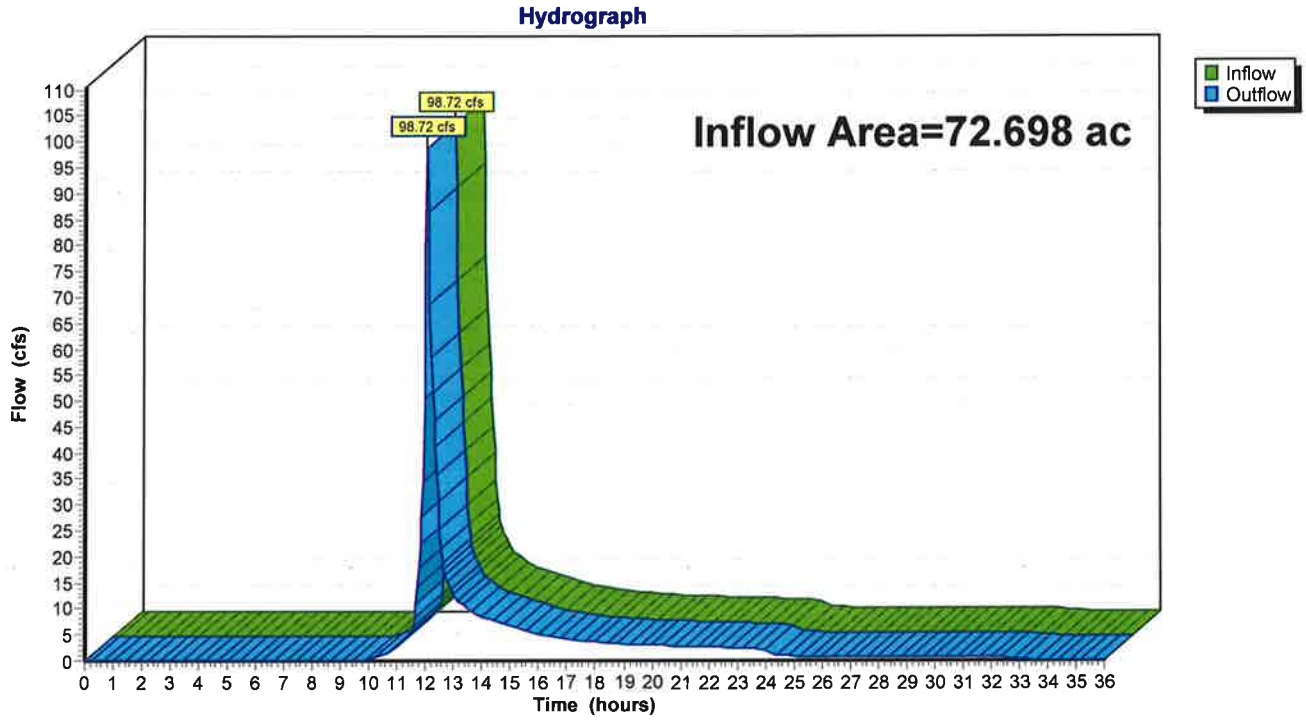


Summary for Reach 8R: PRE DEV DP-2

Inflow Area = 72.698 ac, 8.89% Impervious, Inflow Depth > 1.48" for 2-Year event
Inflow = 98.72 cfs @ 12.05 hrs, Volume= 8.946 af
Outflow = 98.72 cfs @ 12.05 hrs, Volume= 8.946 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 8R: PRE DEV DP-2



Summary for Reach 9R: Channel 2

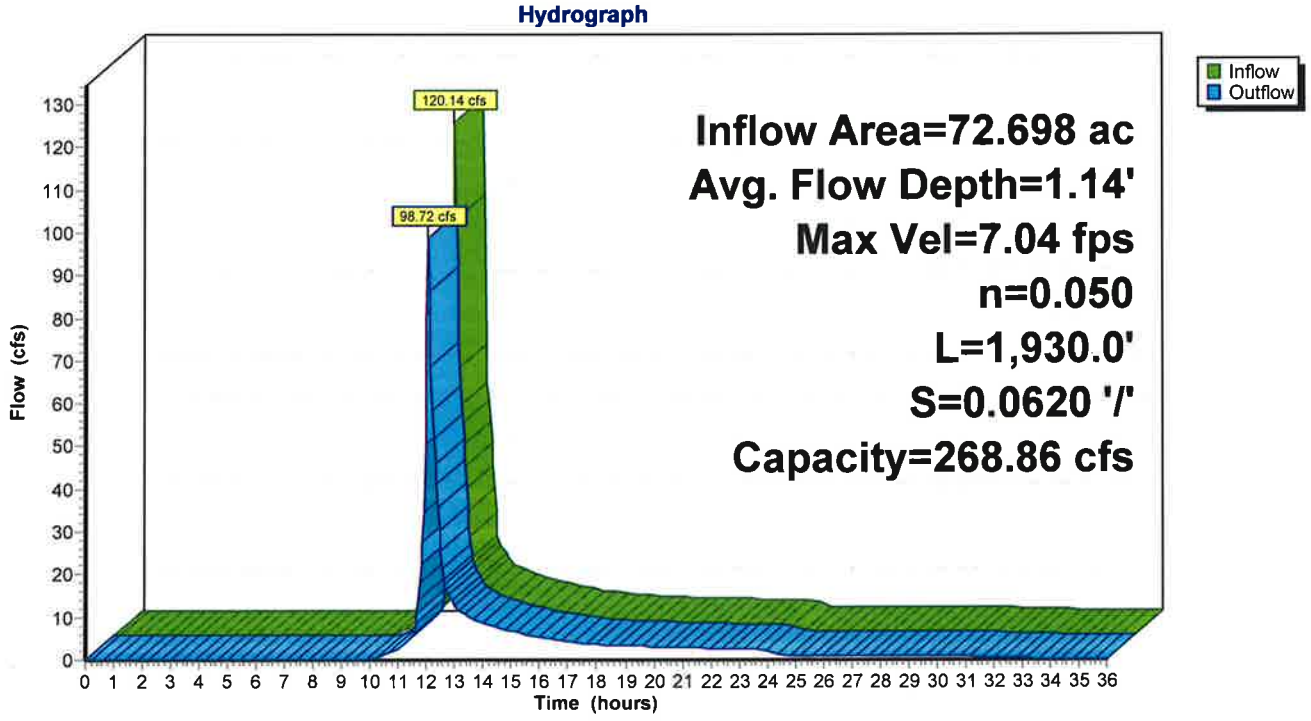
Inflow Area = 72.698 ac, 8.89% Impervious, Inflow Depth = 1.48" for 2-Year event
Inflow = 120.14 cfs @ 12.01 hrs, Volume= 8.947 af
Outflow = 98.72 cfs @ 12.05 hrs, Volume= 8.946 af, Atten= 18%, Lag= 2.9 min
Routed to Reach 8R : PRE DEV DP-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.04 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 1.72 fps, Avg. Travel Time= 18.7 min

Peak Storage= 27,059 cf @ 12.05 hrs
Average Depth at Peak Storage= 1.14' , Surface Width= 14.57'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 268.86 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 1,930.0' Slope= 0.0620 '/'
Inlet Invert= 452.69', Outlet Invert= 333.03'

Reach 9R: Channel 2



Summary for Reach 11R: Channel 1

Inflow Area = 9.770 ac, 37.67% Impervious, Inflow Depth = 1.78" for 2-Year event
Inflow = 0.91 cfs @ 15.79 hrs, Volume= 1.452 af
Outflow = 0.91 cfs @ 15.84 hrs, Volume= 1.452 af, Atten= 0%, Lag= 3.2 min
Routed to Reach 9R : Channel 2

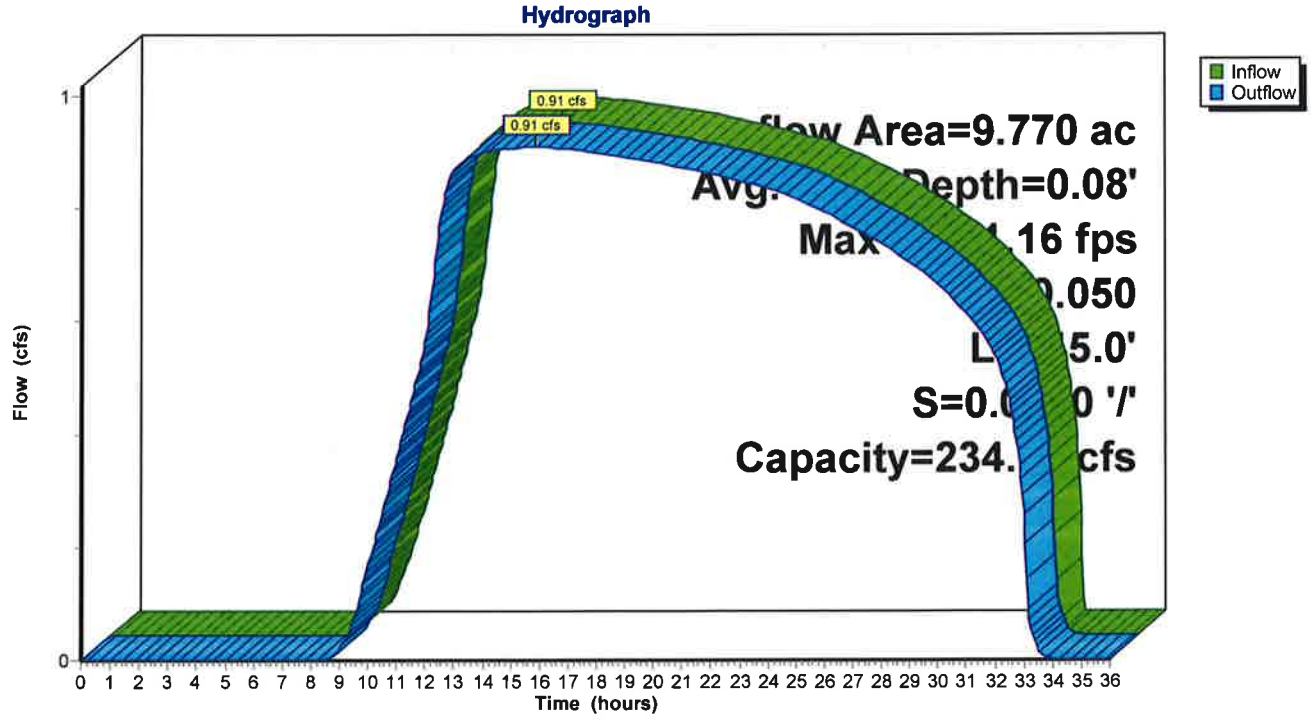
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.16 fps, Min. Travel Time= 5.0 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 5.7 min

Peak Storage= 271 cf @ 15.84 hrs
Average Depth at Peak Storage= 0.08' , Surface Width= 10.31'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 234.05 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 345.0' Slope= 0.0470 '/'
Inlet Invert= 468.90', Outlet Invert= 452.69'

‡

Reach 11R: Channel 1

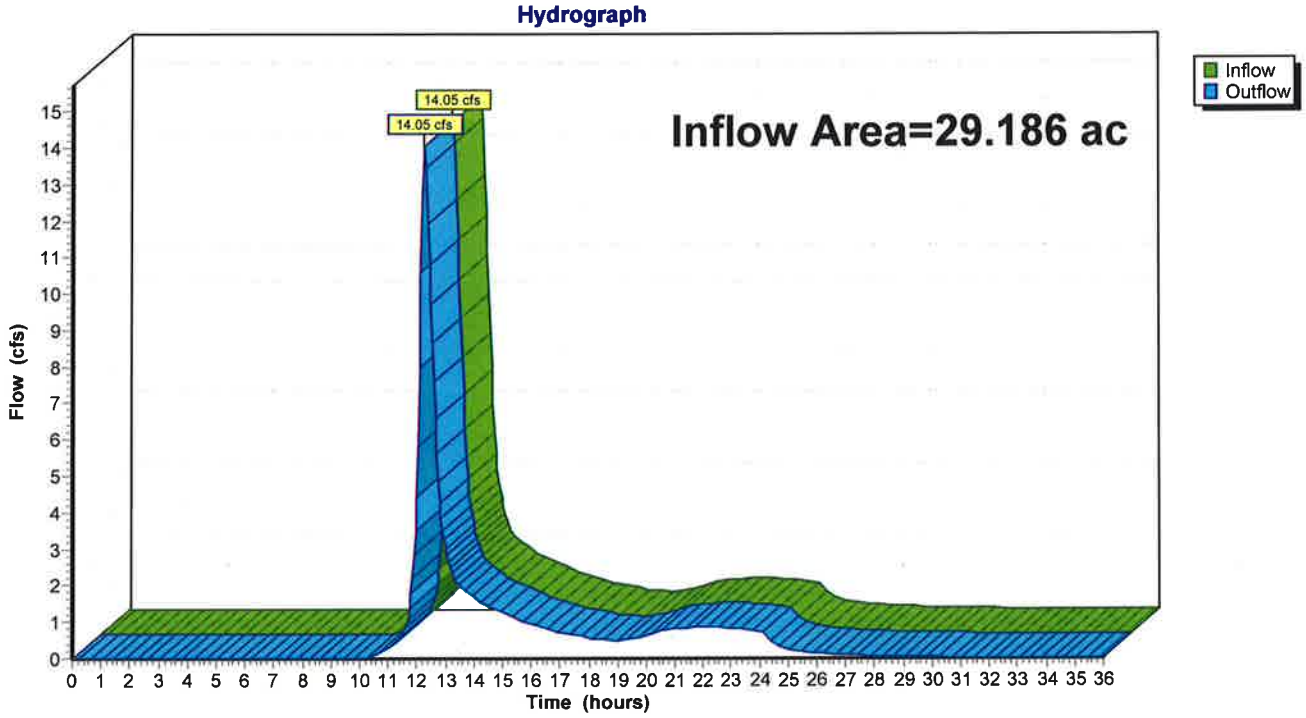


Summary for Reach 15R: POST DEV DP-1

Inflow Area = 29.186 ac, 42.68% Impervious, Inflow Depth > 0.71" for 2-Year event
Inflow = 14.05 cfs @ 12.27 hrs, Volume= 1.717 af
Outflow = 14.05 cfs @ 12.27 hrs, Volume= 1.717 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 15R: POST DEV DP-1

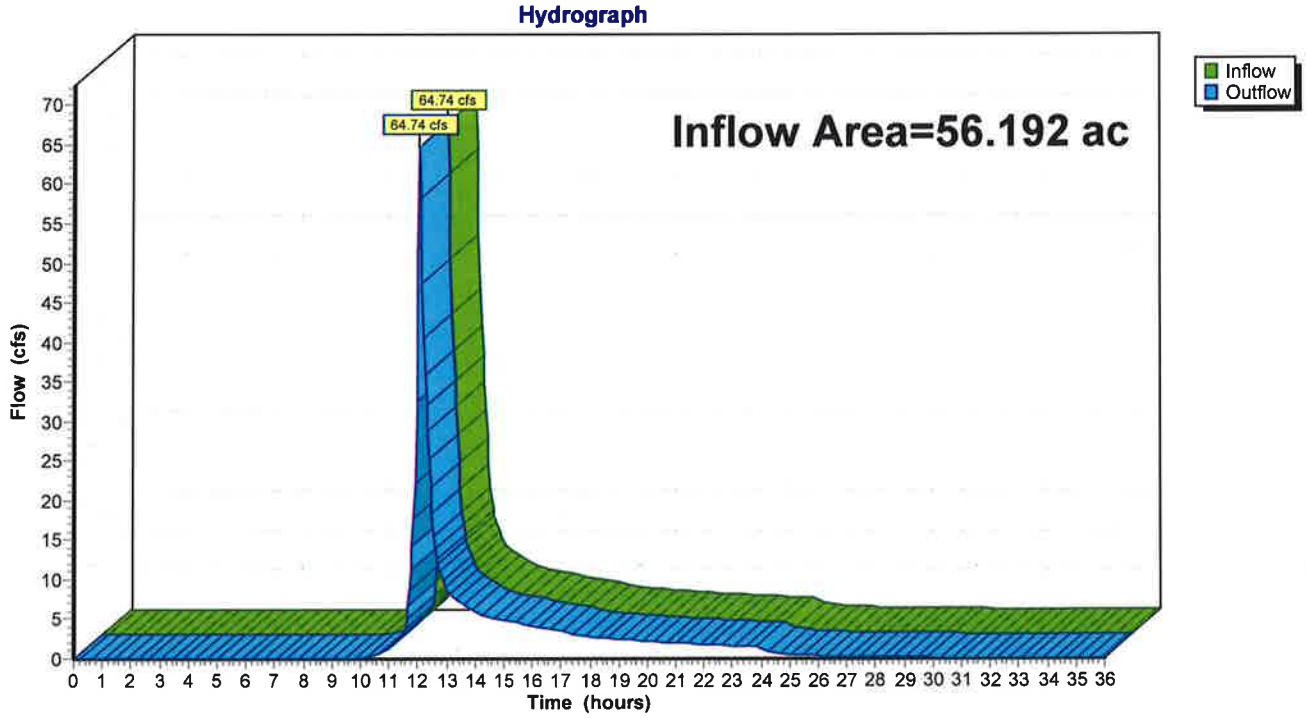


Summary for Reach 16R: POST DEV DP-2

Inflow Area = 56.192 ac, 24.26% Impervious, Inflow Depth > 1.29" for 2-Year event
Inflow = 64.74 cfs @ 12.06 hrs, Volume= 6.031 af
Outflow = 64.74 cfs @ 12.06 hrs, Volume= 6.031 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 16R: POST DEV DP-2



Summary for Reach 17R: Channel 2

Inflow Area = 42.596 ac, 6.53% Impervious, Inflow Depth = 1.43" for 2-Year event
Inflow = 80.94 cfs @ 12.01 hrs, Volume= 5.074 af
Outflow = 64.53 cfs @ 12.06 hrs, Volume= 5.074 af, Atten= 20%, Lag= 3.1 min
Routed to Reach 16R : POST DEV DP-2

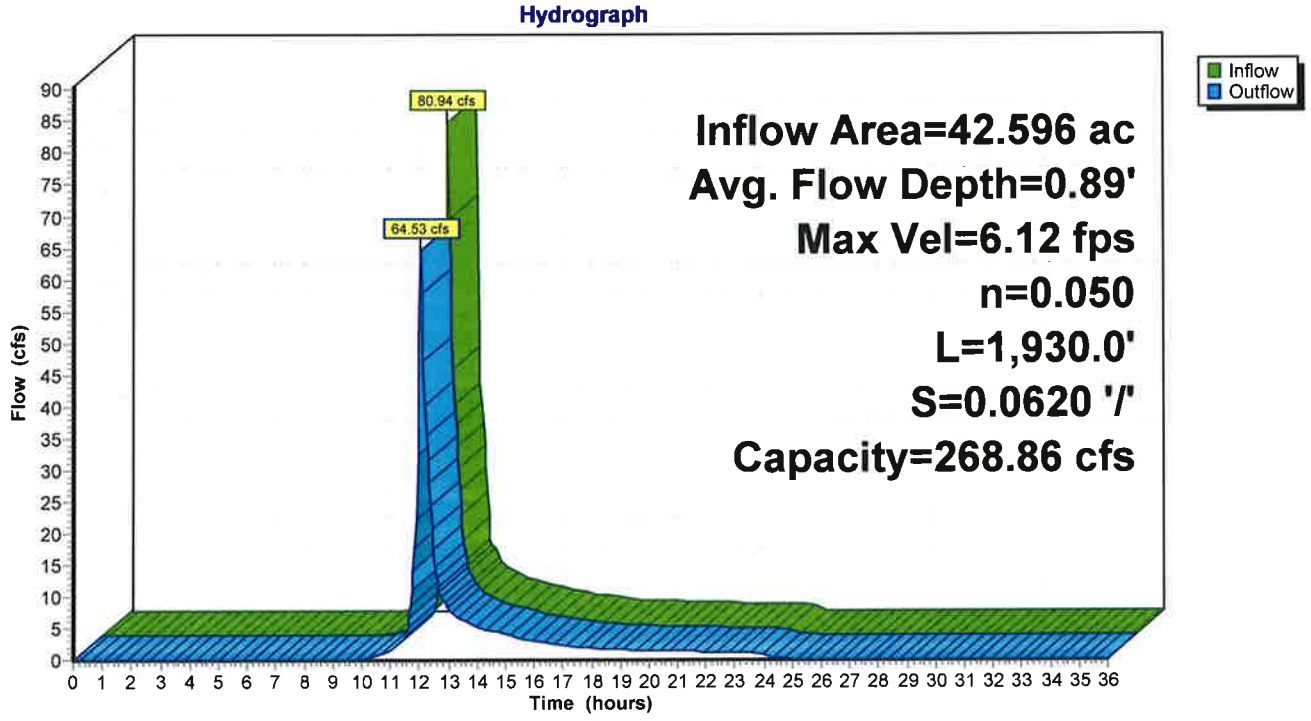
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.12 fps, Min. Travel Time= 5.3 min
Avg. Velocity = 1.42 fps, Avg. Travel Time= 22.7 min

Peak Storage= 20,339 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.89' , Surface Width= 13.58'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 268.86 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 1,930.0' Slope= 0.0620 '/'
Inlet Invert= 452.69', Outlet Invert= 333.03'

‡

Reach 17R: Channel 2



Summary for Pond 10P: EXISTING BASIN

Inflow Area = 9.770 ac, 37.67% Impervious, Inflow Depth = 1.78" for 2-Year event
Inflow = 11.48 cfs @ 12.42 hrs, Volume= 1.452 af
Outflow = 0.91 cfs @ 15.79 hrs, Volume= 1.452 af, Atten= 92%, Lag= 201.9 min
Primary = 0.91 cfs @ 15.79 hrs, Volume= 1.452 af
Routed to Reach 11R : Channel 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 474.97' @ 15.79 hrs Surf.Area= 0.519 ac Storage= 0.804 af

Plug-Flow detention time= 420.6 min calculated for 1.450 af (100% of inflow)
Center-of-Mass det. time= 420.7 min (1,273.1 - 852.4)

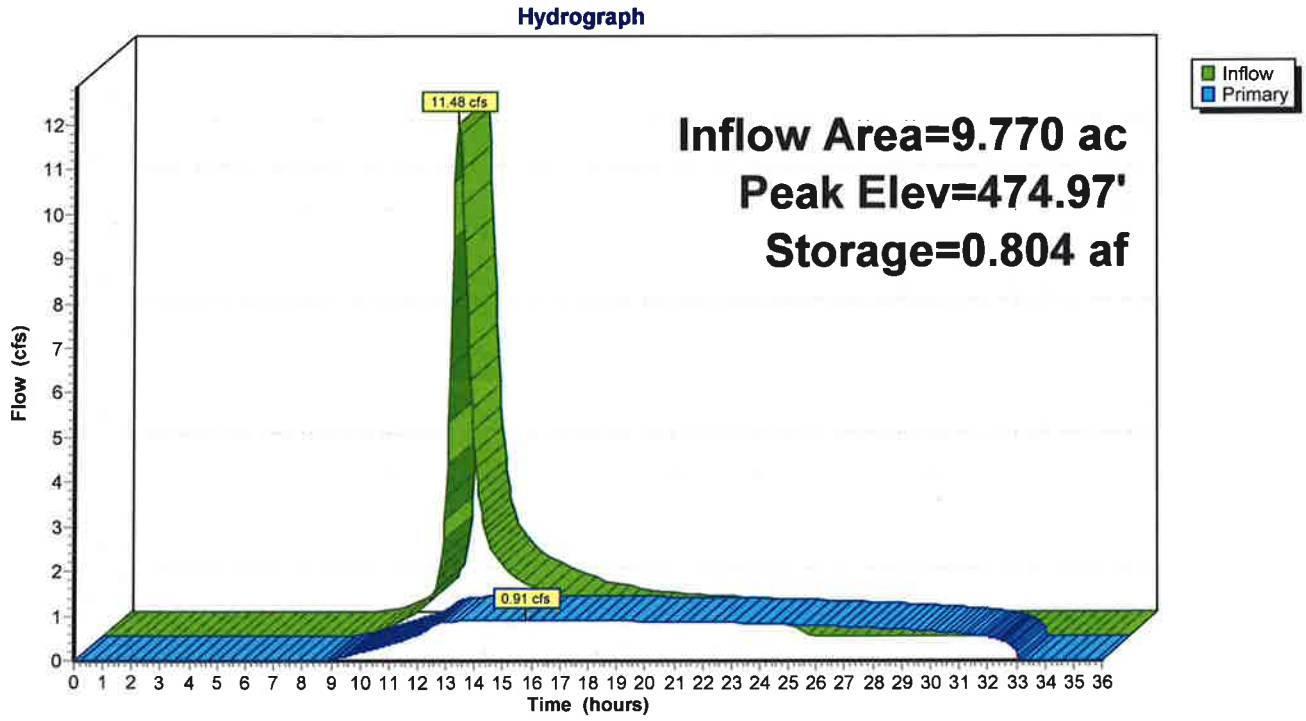
Volume	Invert	Avail.Storage	Storage Description
#1	471.00'	3.035 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
471.00	0.000	0.000	0.000
472.00	0.039	0.019	0.019
474.00	0.334	0.373	0.392
476.00	0.718	1.052	1.444
478.00	0.872	1.590	3.035

Device	Routing	Invert	Outlet Devices
#1	Device 3	471.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	476.00'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	471.00'	**15.0" Round Culvert** L= 119.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 471.00' / 468.90' S= 0.0176 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#4	Primary	471.00'	**Special & User-Defined** Elev. (feet) 471.00 471.17 478.00 Disch. (cfs) 0.000 0.090 0.090

Primary OutFlow Max=0.91 cfs @ 15.79 hrs HW=474.97' TW=468.98' (Dynamic Tailwater)
- **3=Culvert** (Passes 0.82 cfs of 9.53 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.82 cfs @ 9.38 fps)
  - **2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
- **4=Special & User-Defined** (Custom Controls 0.09 cfs)

Pond 10P: EXISTING BASIN



Summary for Pond 21P: WEST WETLAND

Inflow Area = 15.435 ac, 62.13% Impervious, Inflow Depth = 0.54" for 2-Year event
Inflow = 4.13 cfs @ 12.08 hrs, Volume= 0.691 af
Outflow = 0.50 cfs @ 22.62 hrs, Volume= 0.227 af, Atten= 88%, Lag= 632.7 min
Primary = 0.50 cfs @ 22.62 hrs, Volume= 0.227 af
Routed to Reach 15R : POST DEV DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 401.08' @ 22.62 hrs Surf.Area= 39,700 sf Storage= 23,376 cf

Plug-Flow detention time= 666.8 min calculated for 0.226 af (33% of inflow)
Center-of-Mass det. time= 383.6 min (1,407.1 - 1,023.5)

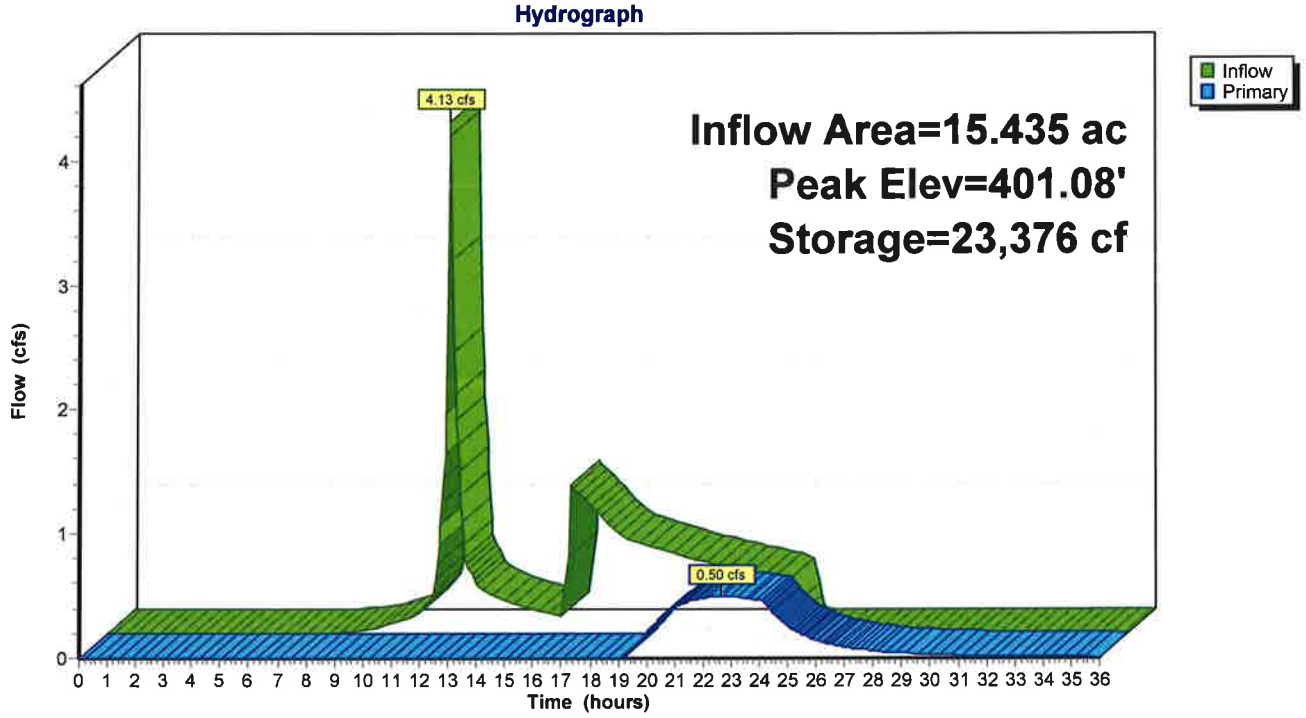
Volume	Invert	Avail.Storage	Storage Description
#1	400.50'	155,009 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
400.50	38,427	0	0
402.00	41,700	60,095	60,095
404.00	53,214	94,914	155,009

Device	Routing	Invert	Outlet Devices
#0	Primary	404.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Device 2	401.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	395.00'	**24.0" Round Culvert** L= 45.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 395.00' / 390.00' S= 0.1111 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#3	Primary	402.00'	**143.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.50 cfs @ 22.62 hrs HW=401.08' TW=0.00' (Dynamic Tailwater)
- **2=Culvert** (Passes 0.50 cfs of 30.09 cfs potential flow)
  - **1=Orifice/Grate** (Weir Controls 0.50 cfs @ 0.94 fps)
- **3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond 21P: WEST WETLAND



Summary for Pond 24P: EAST WETLAND

Inflow Area = 13.596 ac, 79.80% Impervious, Inflow Depth > 0.86" for 2-Year event
Inflow = 4.55 cfs @ 12.17 hrs, Volume= 0.979 af
Outflow = 1.19 cfs @ 16.31 hrs, Volume= 0.957 af, Atten= 74%, Lag= 248.5 min
Primary = 1.19 cfs @ 16.31 hrs, Volume= 0.957 af
Routed to Reach 16R : POST DEV DP-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 390.00' Storage= 1.389 af
Peak Elev= 390.20' @ 16.31 hrs Storage= 1.581 af (0.192 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 125.5 min (1,149.8 - 1,024.3)

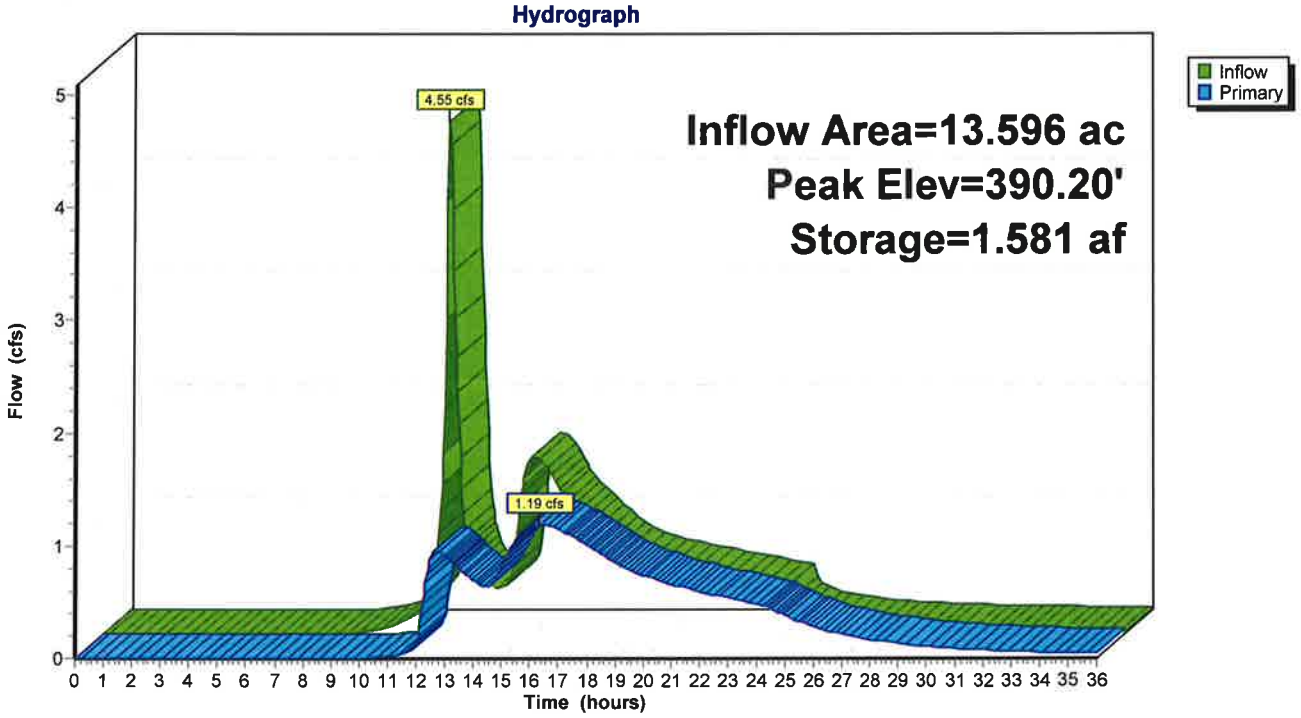
Volume	Invert	Avail.Storage	Storage Description
#1	384.00'	4.344 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
384.00	0.000
388.50	0.530
389.50	0.973
390.00	1.389
393.00	4.344

Device	Routing	Invert	Outlet Devices
#1	Primary	390.00'	**143.0 deg x 4.0' long x 3.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=1.19 cfs @ 16.31 hrs HW=390.20' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.19 cfs @ 1.33 fps)

Pond 24P: EAST WETLAND



Summary for Pond 34P: WEST CISTERN

Inflow Area = 13.620 ac, 64.39% Impervious, Inflow Depth = 2.27" for 2-Year event
Inflow = 31.54 cfs @ 12.13 hrs, Volume= 2.581 af
Outflow = 1.08 cfs @ 16.30 hrs, Volume= 0.398 af, Atten= 97%, Lag= 250.0 min
Primary = 1.08 cfs @ 16.30 hrs, Volume= 0.398 af
Routed to Pond 21P : WEST WETLAND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 400.00' @ 16.25 hrs Surf.Area= 0.689 ac Storage= 2.183 af

Plug-Flow detention time= 534.4 min calculated for 0.397 af (15% of inflow)
Center-of-Mass det. time= 360.1 min (1,171.8 - 811.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	394.50'	0.902 af	**99.08'W x 303.00'L x 5.50'H Field A** 3.791 af Overall - 1.535 af Embedded = 2.256 af x 40.0% Voids
#2A	395.00'	1.281 af	**ADS N-12 48"** x 225 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 225 Chambers in 15 Rows
		2.183 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	400.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	399.00'	**12.0" Round Culvert** L= 100.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 399.00' / 398.00' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 16.30 hrs HW=400.00' TW=400.77' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond 34P: WEST CISTERN - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12® Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

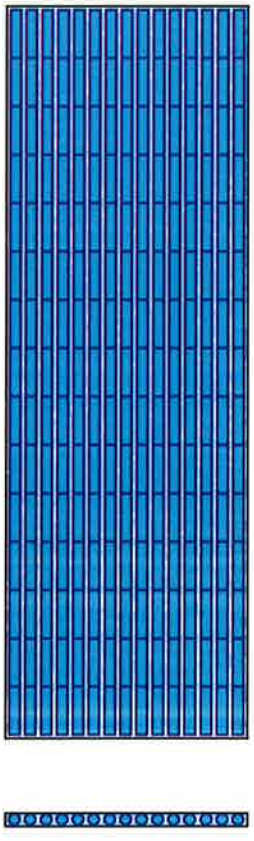
15 Chambers/Row x 20.00' Long = 300.00' Row Length +18.0" End Stone x 2 = 303.00' Base Length
15 Rows x 54.0" Wide + 24.5" Spacing x 14 + 18.0" Side Stone x 2 = 99.08' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

225 Chambers x 248.0 cf = 55,800.0 cf Chamber Storage
225 Chambers x 297.0 cf = 66,820.3 cf Displacement

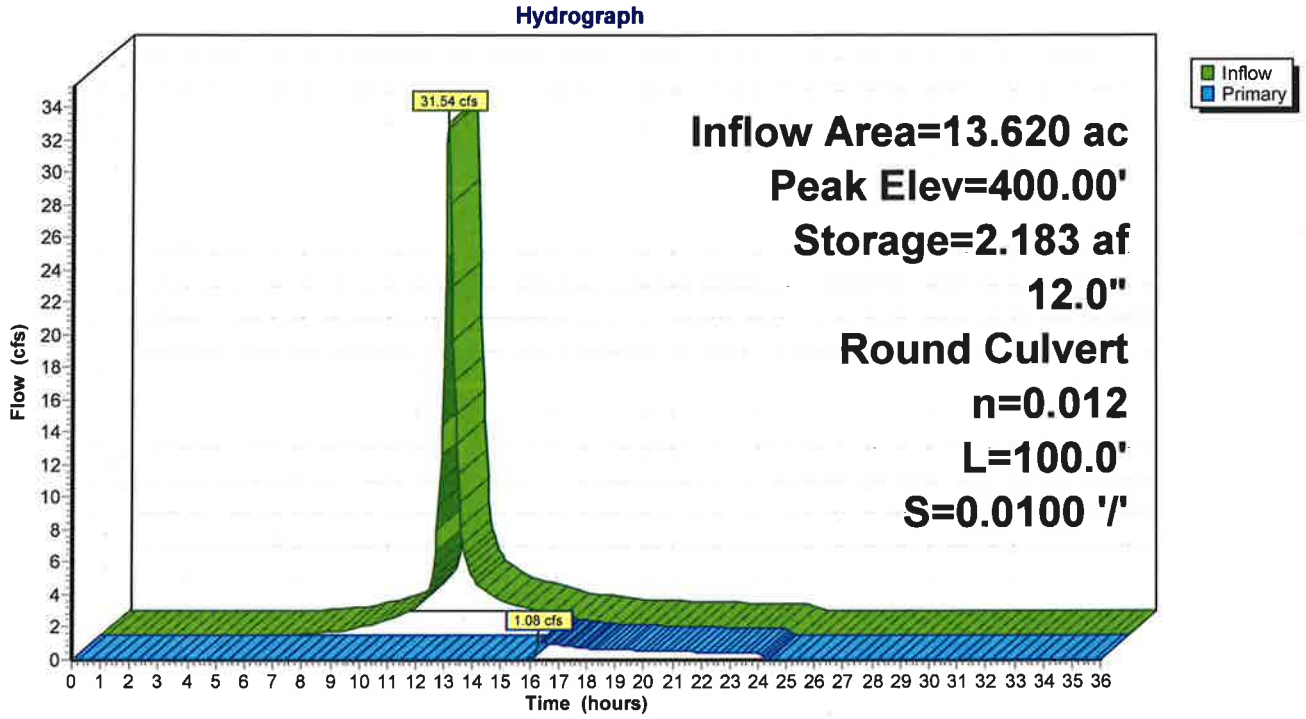
165,127.9 cf Field - 66,820.3 cf Chambers = 98,307.5 cf Stone x 40.0% Voids = 39,323.0 cf Stone Storage

Chamber Storage + Stone Storage = 95,123.0 cf = 2.184 af
Overall Storage Efficiency = 57.6%
Overall System Size = 303.00' x 99.08' x 5.50'

225 Chambers
6,115.8 cy Field
3,641.0 cy Stone



Pond 34P: WEST CISTERN



Summary for Pond 36P: CISTERN LOWER

Inflow Area = 10.840 ac, 89.94% Impervious, Inflow Depth = 2.96" for 2-Year event
Inflow = 35.05 cfs @ 12.07 hrs, Volume= 2.671 af
Outflow = 1.31 cfs @ 15.23 hrs, Volume= 0.586 af, Atten= 96%, Lag= 189.5 min
Primary = 1.31 cfs @ 15.23 hrs, Volume= 0.586 af
Routed to Pond 24P : EAST WETLAND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 398.40' @ 15.23 hrs Surf.Area= 0.742 ac Storage= 2.175 af

Plug-Flow detention time= 575.2 min calculated for 0.586 af (22% of inflow)
Center-of-Mass det. time= 377.3 min (1,148.7 - 771.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	393.50'	0.971 af	**144.88'W x 223.00'L x 5.50'H Field A** 4.079 af Overall - 1.651 af Embedded = 2.429 af x 40.0% Voids
#2A	394.00'	1.378 af	**ADS N-12 48"** x 242 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 242 Chambers in 22 Rows
		2.349 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	399.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	398.00'	**12.0" Round Culvert** L= 100.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 398.00' / 393.00' S= 0.0500 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Primary	398.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.31 cfs @ 15.23 hrs HW=398.40' TW=390.17' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.56 cfs @ 1.90 fps)
└—**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.75 cfs @ 1.27 fps)

Pond 36P: CISTERN LOWER - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12® Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

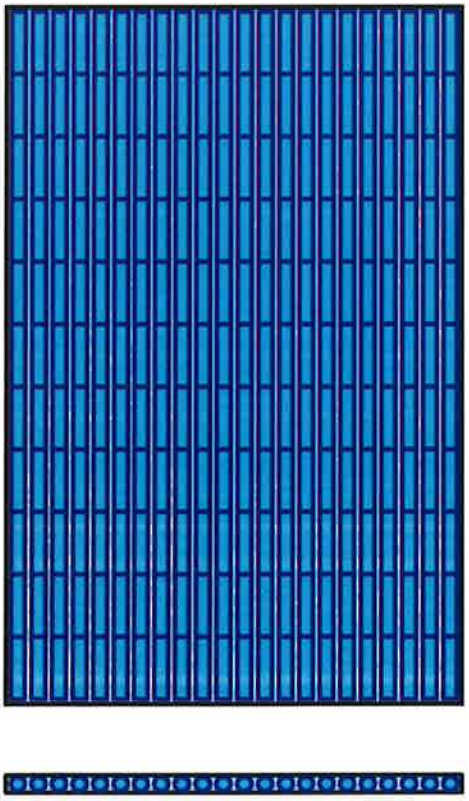
11 Chambers/Row x 20.00' Long = 220.00' Row Length +18.0" End Stone x 2 = 223.00' Base Length
22 Rows x 54.0" Wide + 24.5" Spacing x 21 + 18.0" Side Stone x 2 = 144.88' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

242 Chambers x 248.0 cf = 60,016.0 cf Chamber Storage
242 Chambers x 297.0 cf = 71,869.0 cf Displacement

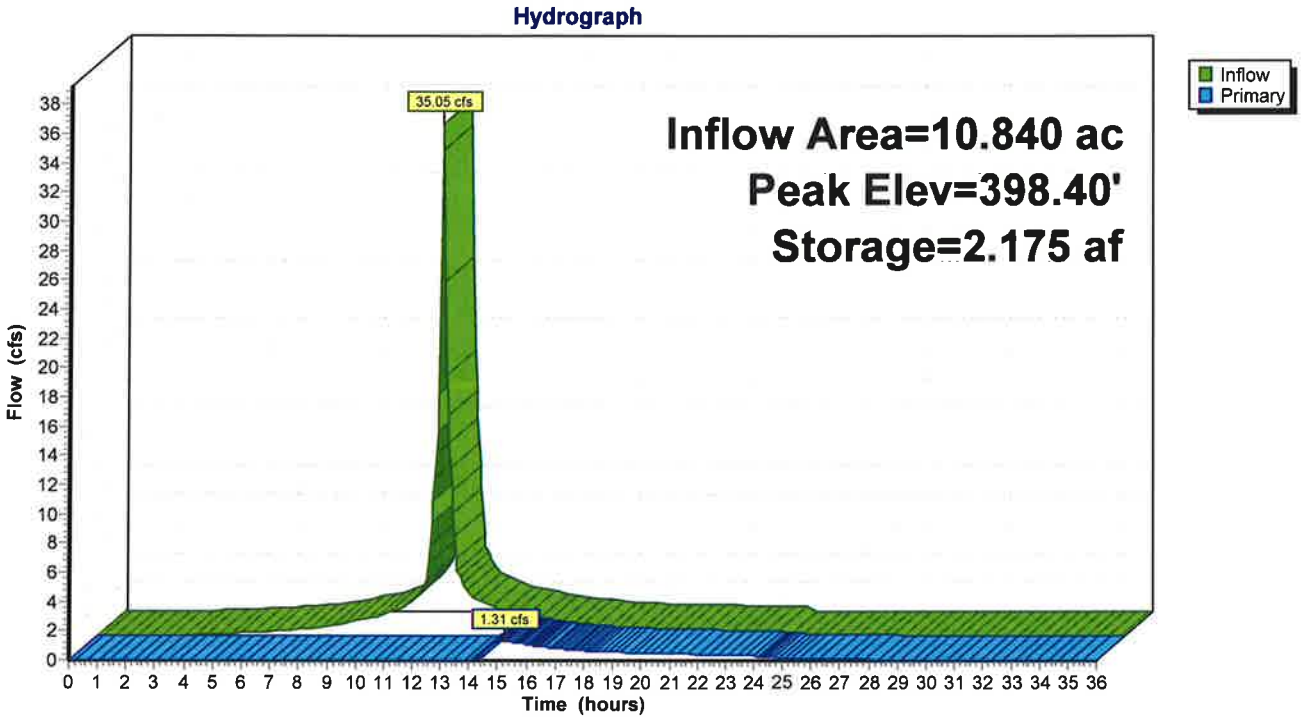
177,695.1 cf Field - 71,869.0 cf Chambers = 105,826.1 cf Stone x 40.0% Voids = 42,330.5 cf Stone Storage

Chamber Storage + Stone Storage = 102,346.5 cf = 2.350 af
Overall Storage Efficiency = 57.6%
Overall System Size = 223.00' x 144.88' x 5.50'

242 Chambers
6,581.3 cy Field
3,919.5 cy Stone



Pond 36P: CISTERN LOWER



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3S: POST DEV DA-2 Runoff Area=13.620 ac 64.39% Impervious Runoff Depth=3.90"
Flow Length=1,344' Tc=9.4 min CN=89 Runoff=52.91 cfs 4.423 af

Subcatchment 4S: PRE DEV DA-1 Runoff Area=23.344 ac 12.28% Impervious Runoff Depth=2.47"
Flow Length=1,887' Tc=18.7 min CN=74 Runoff=46.43 cfs 4.802 af

Subcatchment 5S: PRE DEV DA-2 Runoff Area=9.770 ac 37.67% Impervious Runoff Depth=3.29"
Flow Length=928' Tc=30.2 min CN=83 Runoff=21.16 cfs 2.680 af

Subcatchment 6S: PRE DEV DA-3 Runoff Area=62.928 ac 4.42% Impervious Runoff Depth=2.82"
Tc=0.0 min CN=78 Runoff=239.40 cfs 14.801 af

Subcatchment 12S: POST DEV DA-6 Runoff Area=13.751 ac 20.84% Impervious Runoff Depth=2.64"
Flow Length=1,887' Tc=18.7 min CN=76 Runoff=29.40 cfs 3.029 af

Subcatchment 14S: POST DEV DA-5 Runoff Area=42.596 ac 6.53% Impervious Runoff Depth=2.82"
Tc=0.0 min CN=78 Runoff=162.05 cfs 10.019 af

Subcatchment 26S: POST DEV DA-4 Runoff Area=2.756 ac 39.91% Impervious Runoff Depth=3.20"
Flow Length=217' Tc=11.6 min CN=82 Runoff=8.51 cfs 0.734 af

Subcatchment 32S: POST DEV DA-3 Runoff Area=1.815 ac 45.18% Impervious Runoff Depth=3.49"
Tc=5.0 min CN=85 Runoff=7.38 cfs 0.528 af

Subcatchment 35S: POST DEV DA-1 Runoff Area=10.840 ac 89.94% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=96 Runoff=53.92 cfs 4.211 af

Reach 7R: PRE DEV DP-1 Inflow=46.43 cfs 4.802 af
Outflow=46.43 cfs 4.802 af

Reach 8R: PRE DEV DP-2 Inflow=205.19 cfs 17.072 af
Outflow=205.19 cfs 17.072 af

Reach 9R: Channel 2 Avg. Flow Depth=1.72' Max Vel=8.85 fps Inflow=240.11 cfs 17.102 af
n=0.050 L=1,930.0' S=0.0620 '/' Capacity=268.86 cfs Outflow=205.19 cfs 17.072 af

Reach 11R: Channel 1 Avg. Flow Depth=0.13' Max Vel=1.63 fps Inflow=2.20 cfs 2.307 af
n=0.050 L=345.0' S=0.0470 '/' Capacity=234.05 cfs Outflow=2.20 cfs 2.301 af

Reach 15R: POST DEV DP-1 Inflow=29.40 cfs 5.331 af
Outflow=29.40 cfs 5.331 af

Reach 16R: POST DEV DP-2 Inflow=136.39 cfs 12.857 af
Outflow=136.39 cfs 12.857 af

Reach 17R: Channel 2 Avg. Flow Depth=1.37' Max Vel=7.79 fps Inflow=162.05 cfs 10.019 af
n=0.050 L=1,930.0' S=0.0620 '/' Capacity=268.86 cfs Outflow=135.69 cfs 10.019 af

Pond 10P: EXISTING BASIN Peak Elev=476.15' Storage=1.555 af Inflow=21.16 cfs 2.680 af
Outflow=2.20 cfs 2.307 af

Pond 21P: WEST WETLAND Peak Elev=401.46' Storage=38,608 cf Inflow=30.55 cfs 2.767 af
Outflow=6.49 cfs 2.302 af

Pond 24P: EAST WETLAND Peak Elev=390.69' Storage=2.070 af Inflow=27.46 cfs 2.861 af
Outflow=10.03 cfs 2.838 af

Pond 34P: WEST CISTERN Peak Elev=400.00' Storage=2.183 af Inflow=52.91 cfs 4.423 af
12.0" Round Culvert n=0.012 L=100.0' S=0.0100 '/' Outflow=28.05 cfs 2.239 af

Pond 36P: CISTERN LOWER Peak Elev=399.00' Storage=2.349 af Inflow=53.92 cfs 4.211 af
Outflow=21.68 cfs 2.127 af

Total Runoff Area = 181.420 ac Runoff Volume = 45.225 af Average Runoff Depth = 2.99"
80.48% Pervious = 146.002 ac 19.52% Impervious = 35.418 ac

Summary for Subcatchment 3S: POST DEV DA-2

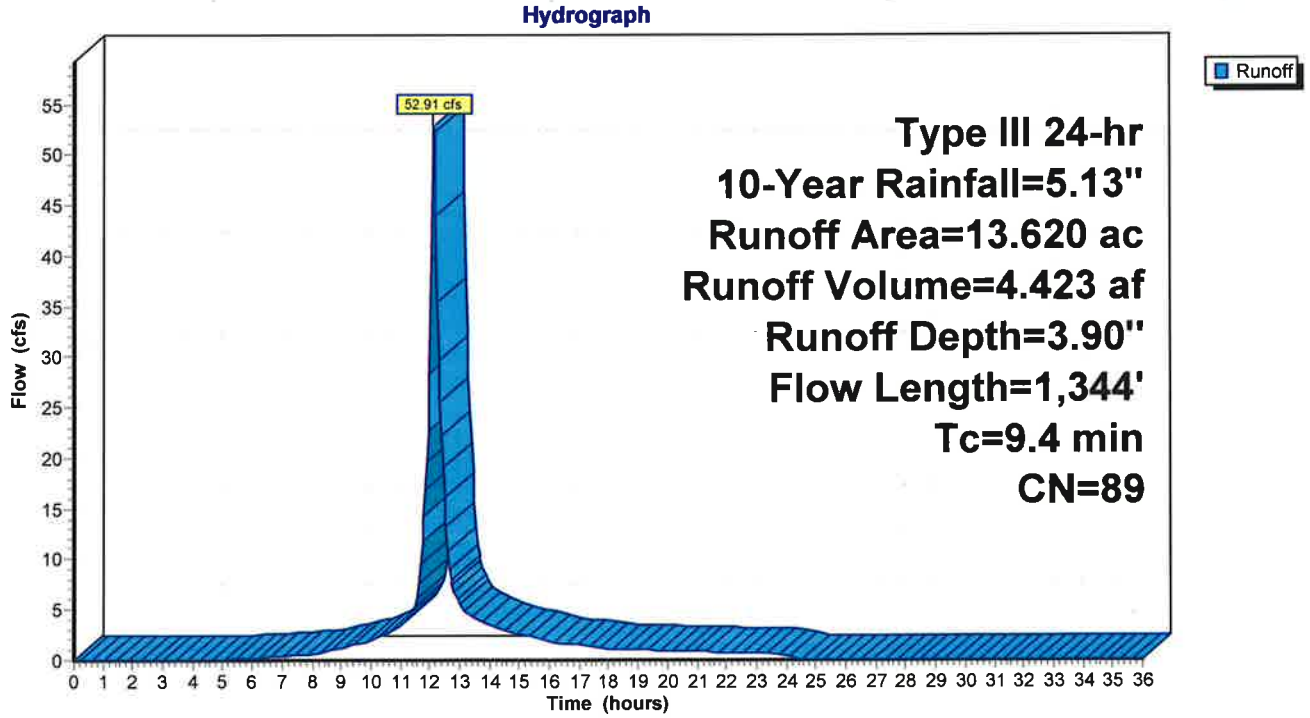
Runoff = 52.91 cfs @ 12.13 hrs, Volume= 4.423 af, Depth= 3.90"
Routed to Pond 34P : WEST CISTERN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (ac)	CN	Description
8.770	98	Paved parking, HSG C
4.850	74	>75% Grass cover, Good, HSG C
13.620	89	Weighted Average
4.850		35.61% Pervious Area
8.770		64.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	100	0.0950	0.22		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
0.5	227	0.2200	7.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	1,017	0.0220	11.82	18.91	**Channel Flow,** Area= 1.6 sf Perim= 3.1' r= 0.52' n= 0.012
9.4	1,344	Total			

Subcatchment 3S: POST DEV DA-2



Summary for Subcatchment 4S: PRE DEV DA-1

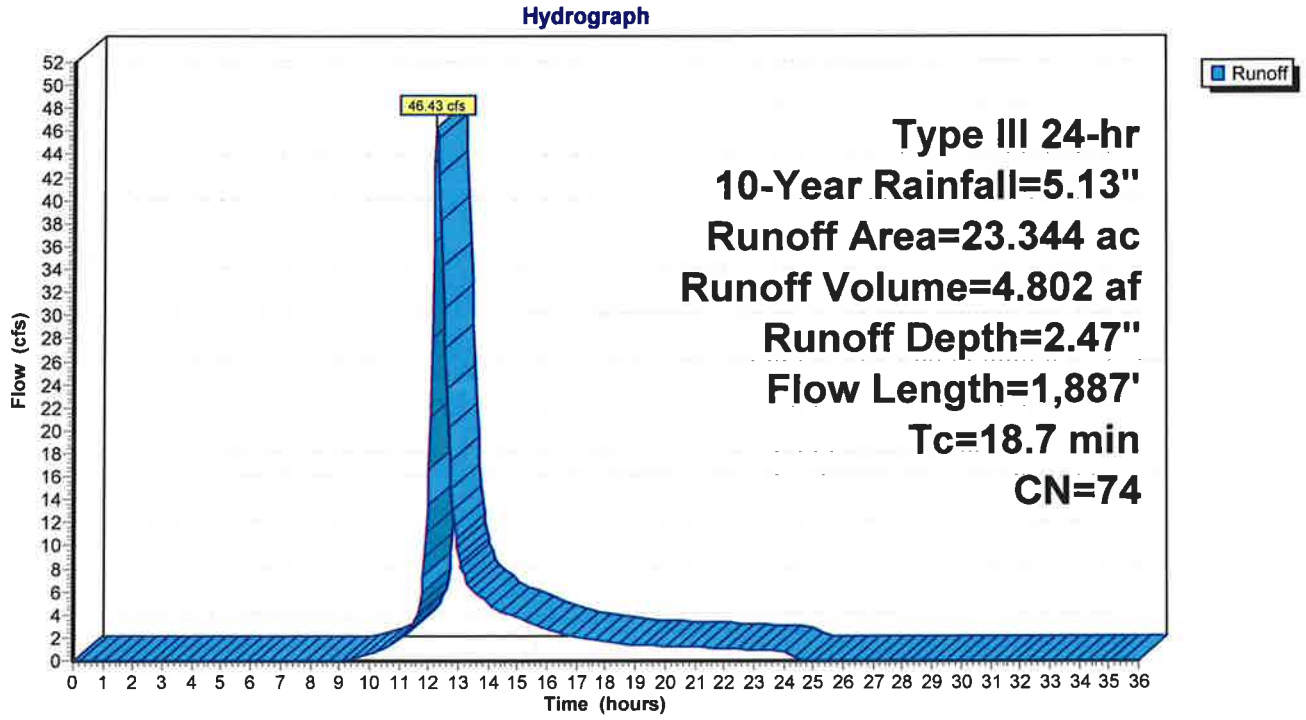
Runoff = 46.43 cfs @ 12.26 hrs, Volume= 4.802 af, Depth= 2.47"
Routed to Reach 7R : PRE DEV DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (ac)	CN	Description
15.478	70	Woods, Good, HSG C
5.000	74	Pasture/grassland/range, Good, HSG C
2.866	98	Paved parking, HSG C
23.344	74	Weighted Average
20.478		87.72% Pervious Area
2.866		12.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	507	0.0870	4.75		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	1,120	0.1700	27.00	27.00	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.2	160	0.0250	11.53	16.14	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
18.7	1,887	Total			

Subcatchment 4S: PRE DEV DA-1



Summary for Subcatchment 5S: PRE DEV DA-2

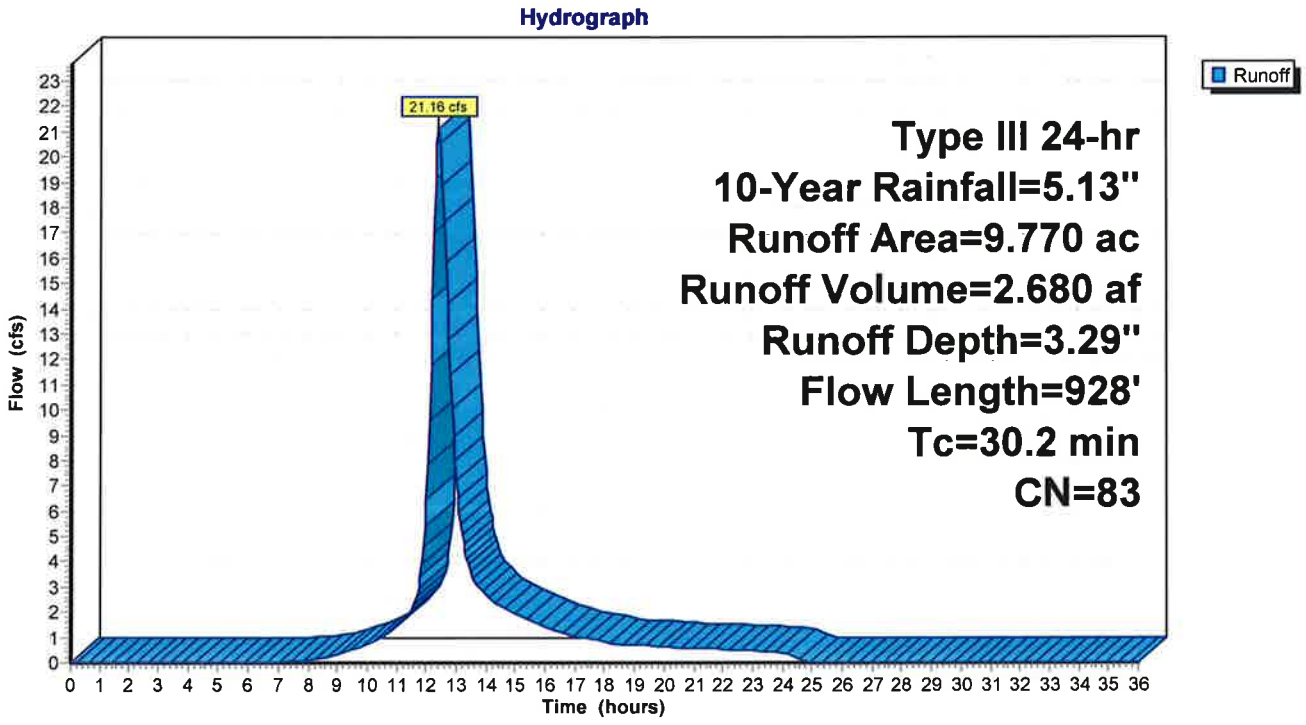
Runoff = 21.16 cfs @ 12.41 hrs, Volume= 2.680 af, Depth= 3.29"
Routed to Pond 10P : EXISTING BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (ac)	CN	Description
3.680	98	Paved parking, HSG C
5.611	74	>75% Grass cover, Good, HSG C
0.479	70	Woods, Good, HSG C
9.770	83	Weighted Average
6.090		62.33% Pervious Area
3.680		37.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.3	130	0.0150	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.8	543	0.0270	10.76	10.76	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.1	255	0.1800	30.93	43.30	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
30.2	928	Total			

Subcatchment 5S: PRE DEV DA-2



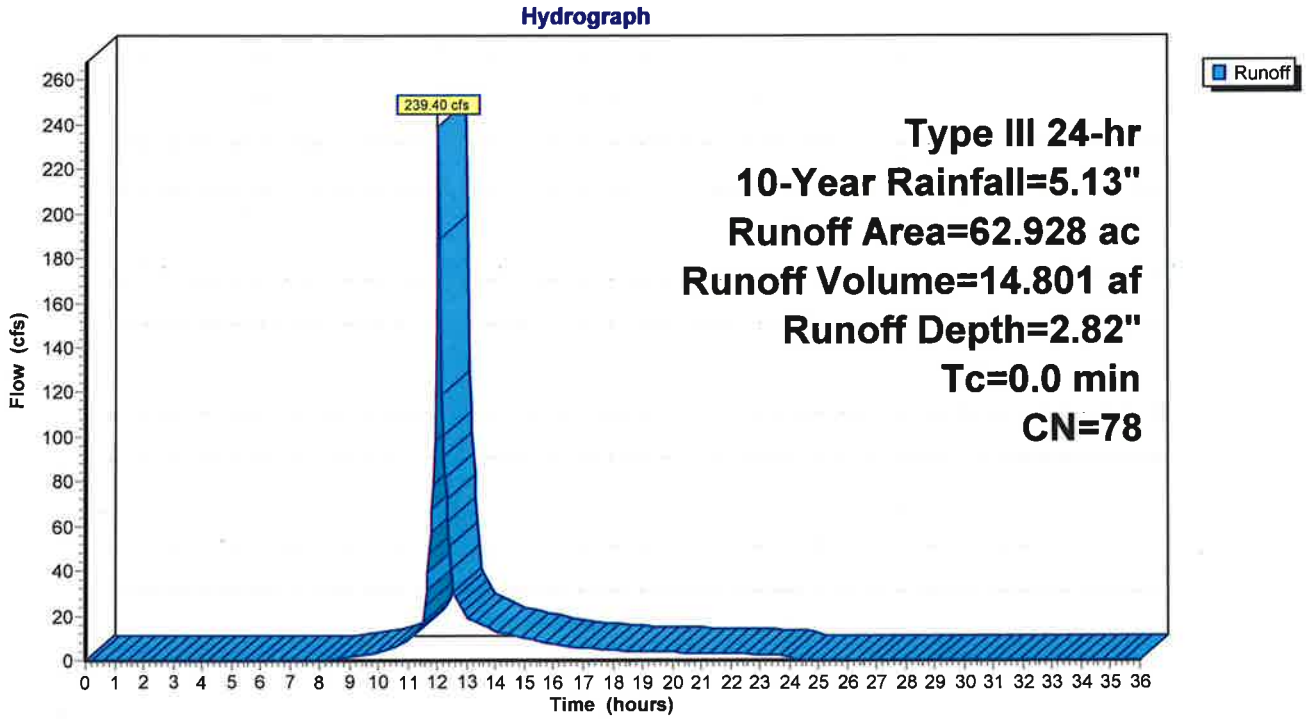
Summary for Subcatchment 6S: PRE DEV DA-3

Runoff = 239.40 cfs @ 12.00 hrs, Volume= 14.801 af, Depth= 2.82"
Routed to Reach 9R : Channel 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (ac)	CN	Description
2.783	98	Paved parking, HSG C
5.613	74	>75% Grass cover, Good, HSG C
53.591	77	Woods, Poor, HSG C
0.941	83	Woods, Poor, HSG D
62.928	78	Weighted Average
60.145		95.58% Pervious Area
2.783		4.42% Impervious Area

Subcatchment 6S: PRE DEV DA-3



Summary for Subcatchment 12S: POST DEV DA-6

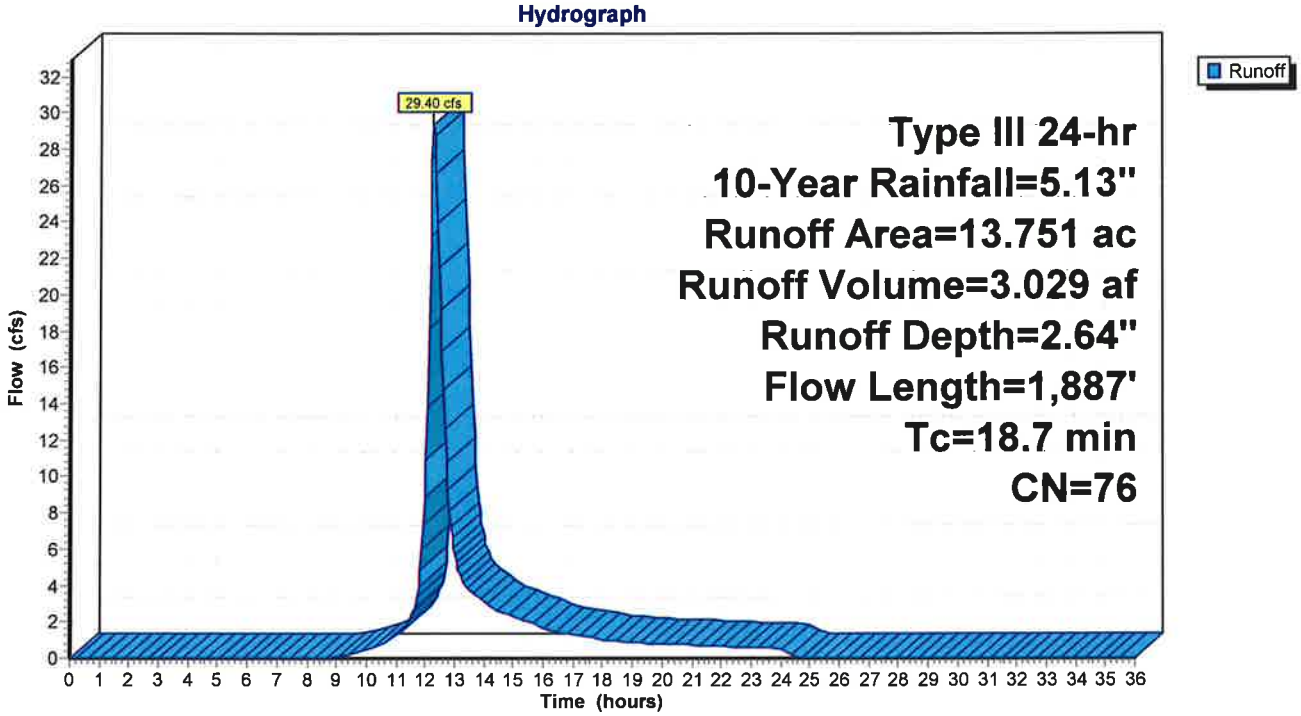
Runoff = 29.40 cfs @ 12.26 hrs, Volume= 3.029 af, Depth= 2.64"
Routed to Reach 15R : POST DEV DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (ac)	CN	Description
9.130	70	Woods, Good, HSG C
1.755	74	Pasture/grassland/range, Good, HSG C
2.866	98	Paved parking, HSG C
13.751	76	Weighted Average
10.885		79.16% Pervious Area
2.866		20.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	507	0.0870	4.75		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	1,120	0.1700	27.00	27.00	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.2	160	0.0250	11.53	16.14	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
18.7	1,887	Total			

Subcatchment 12S: POST DEV DA-6



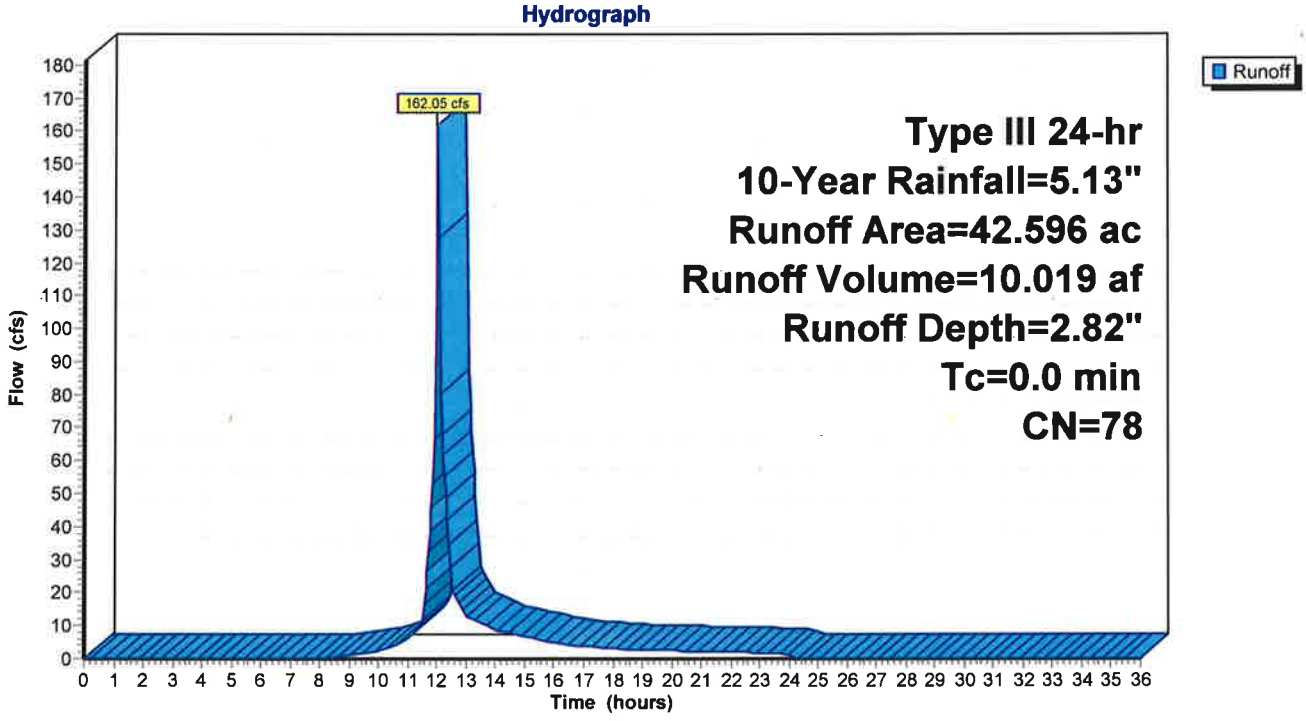
Summary for Subcatchment 14S: POST DEV DA-5

Runoff = 162.05 cfs @ 12.00 hrs, Volume= 10.019 af, Depth= 2.82"
Routed to Reach 17R : Channel 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (ac)	CN	Description
2.783	98	Paved parking, HSG C
3.623	74	>75% Grass cover, Good, HSG C
36.190	77	Woods, Poor, HSG C
42.596	78	Weighted Average
39.813		93.47% Pervious Area
2.783		6.53% Impervious Area

Subcatchment 14S: POST DEV DA-5



Summary for Subcatchment 26S: POST DEV DA-4

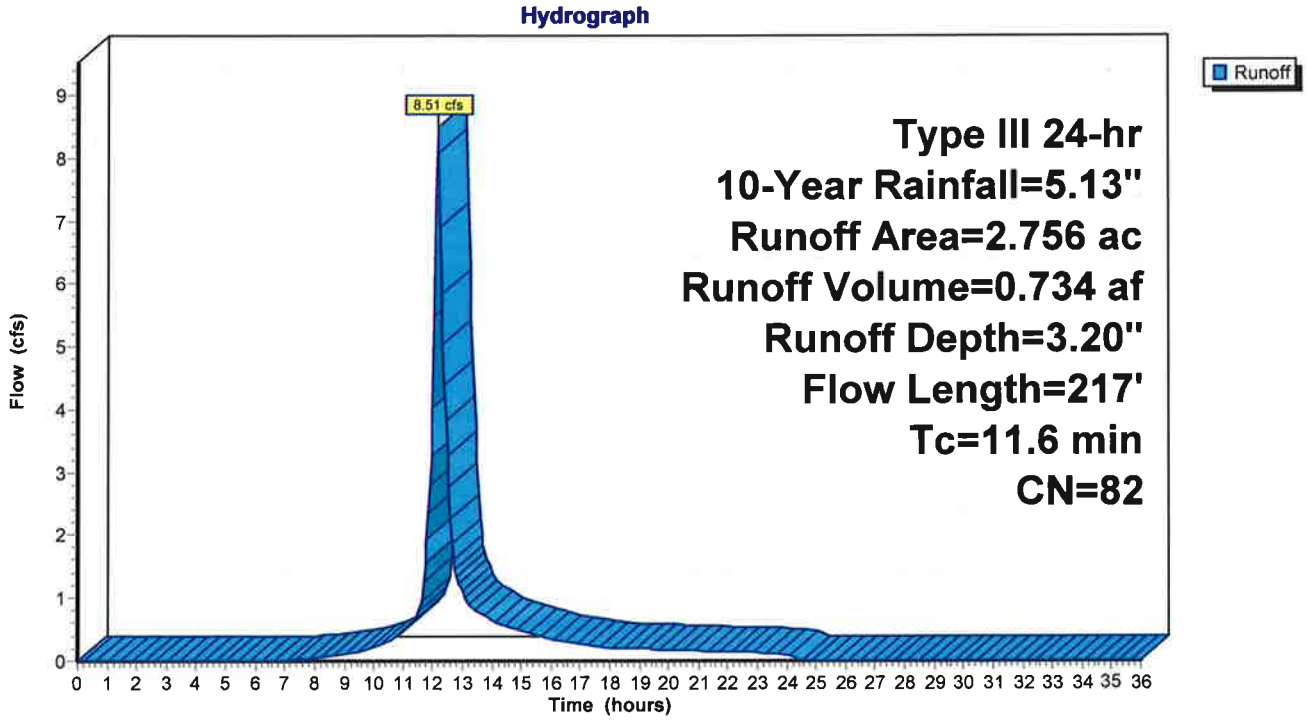
Runoff = 8.51 cfs @ 12.16 hrs, Volume= 0.734 af, Depth= 3.20"
Routed to Pond 24P : EAST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (ac)	CN	Description
1.100	98	Water Surface, HSG C
1.240	70	Woods, Good, HSG C
0.416	74	>75% Grass cover, Good, HSG C
2.756	82	Weighted Average
1.656		60.09% Pervious Area
1.100		39.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0400	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
1.0	117	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.6	217	Total			

Subcatchment 26S: POST DEV DA-4



Summary for Subcatchment 32S: POST DEV DA-3

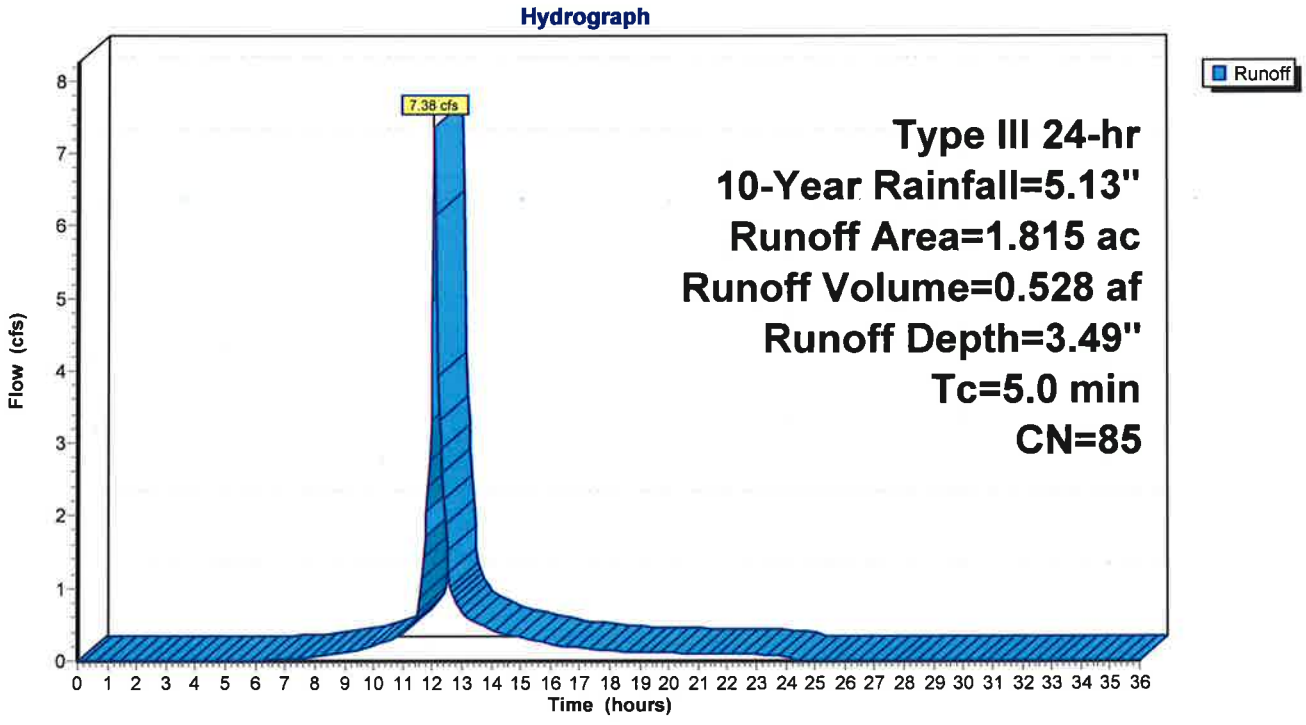
Runoff = 7.38 cfs @ 12.07 hrs, Volume= 0.528 af, Depth= 3.49"
Routed to Pond 21P : WEST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (ac)	CN	Description
0.995	74	>75% Grass cover, Good, HSG C
0.820	98	Paved roads w/curbs & sewers, HSG C
1.815	85	Weighted Average
0.995		54.82% Pervious Area
0.820		45.18% Impervious Area

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

Subcatchment 32S: POST DEV DA-3



Summary for Subcatchment 35S: POST DEV DA-1

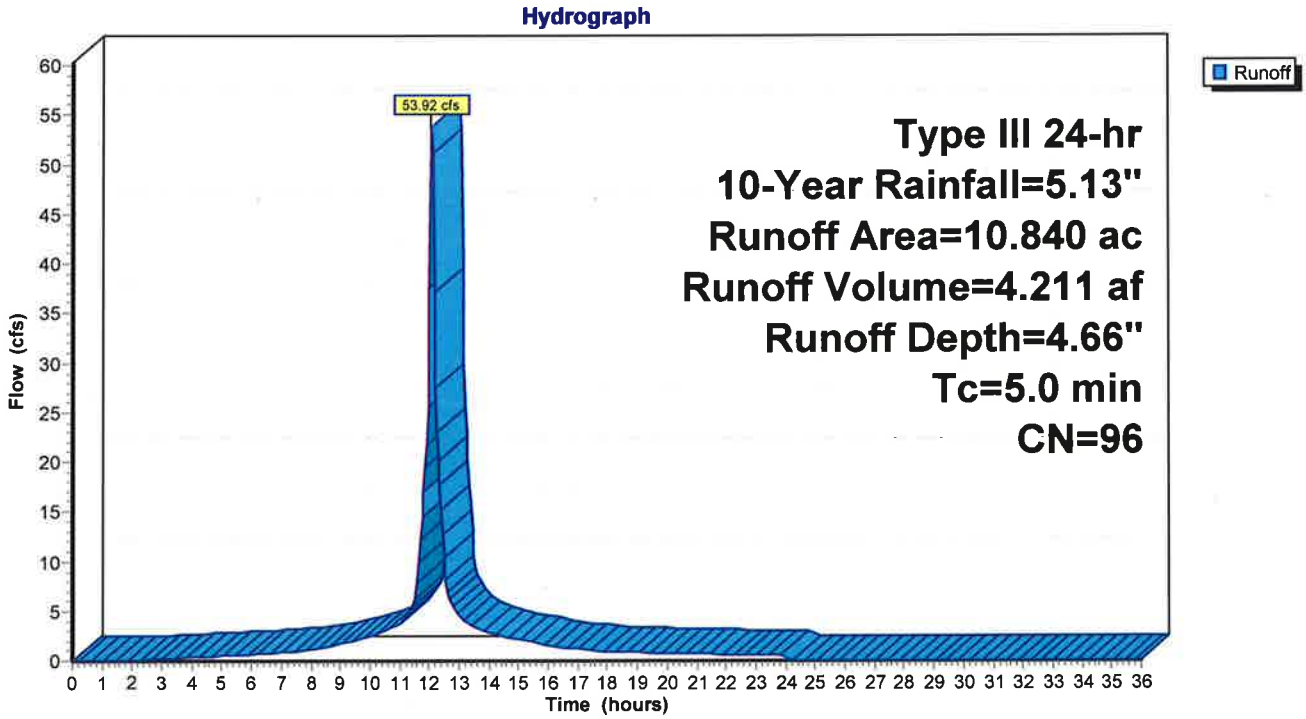
Runoff = 53.92 cfs @ 12.07 hrs, Volume= 4.211 af, Depth= 4.66"
Routed to Pond 36P : CISTERN LOWER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.13"

Area (ac)	CN	Description
9.750	98	Paved parking, HSG C
1.090	74	>75% Grass cover, Good, HSG C
10.840	96	Weighted Average
1.090		10.06% Pervious Area
9.750		89.94% Impervious Area

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

Subcatchment 35S: POST DEV DA-1

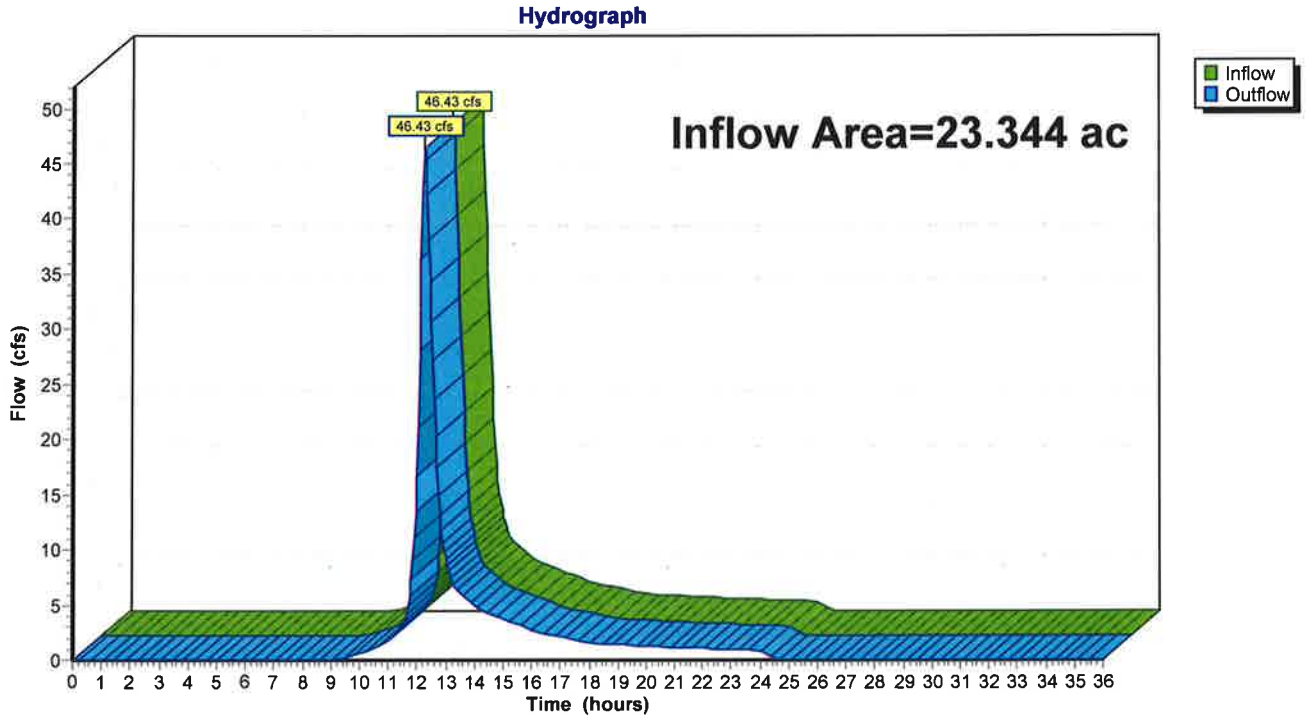


Summary for Reach 7R: PRE DEV DP-1

Inflow Area = 23.344 ac, 12.28% Impervious, Inflow Depth = 2.47" for 10-Year event
Inflow = 46.43 cfs @ 12.26 hrs, Volume= 4.802 af
Outflow = 46.43 cfs @ 12.26 hrs, Volume= 4.802 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 7R: PRE DEV DP-1

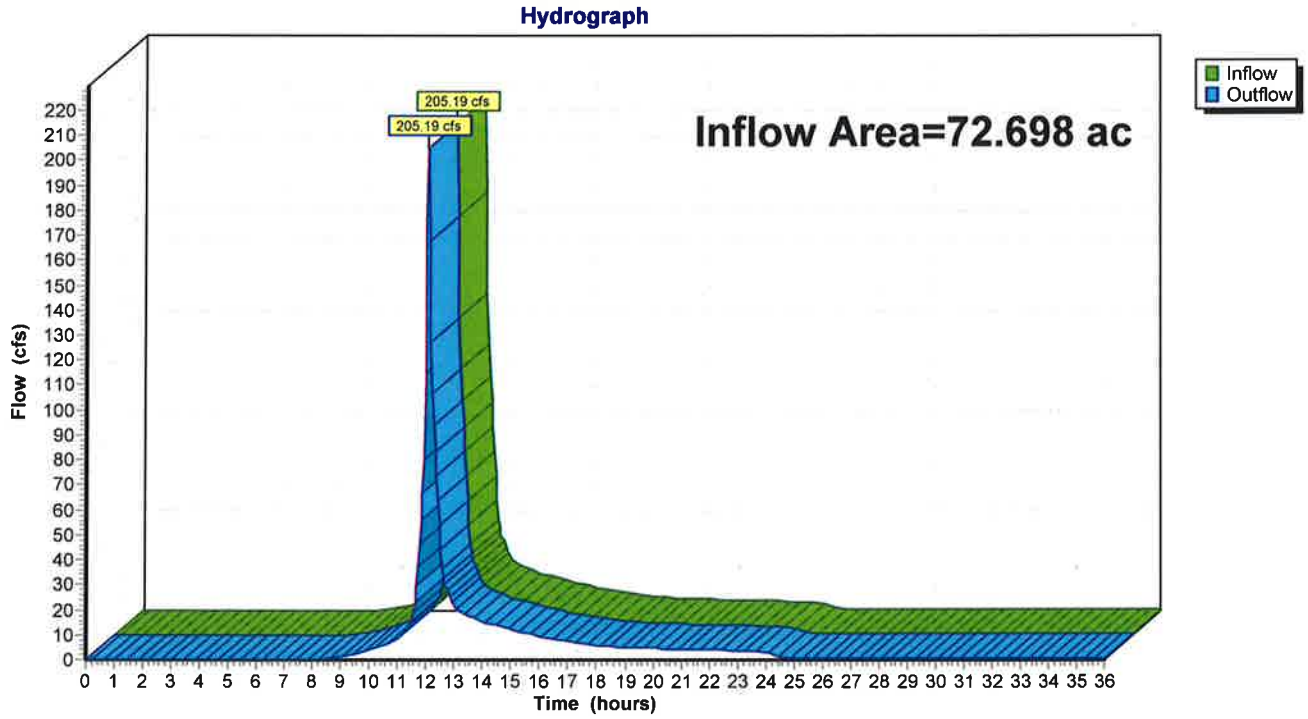


Summary for Reach 8R: PRE DEV DP-2

Inflow Area = 72.698 ac, 8.89% Impervious, Inflow Depth > 2.82" for 10-Year event
Inflow = 205.19 cfs @ 12.05 hrs, Volume= 17.072 af
Outflow = 205.19 cfs @ 12.05 hrs, Volume= 17.072 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 8R: PRE DEV DP-2



Summary for Reach 9R: Channel 2

Inflow Area = 72.698 ac, 8.89% Impervious, Inflow Depth > 2.82" for 10-Year event
Inflow = 240.11 cfs @ 12.00 hrs, Volume= 17.102 af
Outflow = 205.19 cfs @ 12.05 hrs, Volume= 17.072 af, Atten= 15%, Lag= 2.5 min
Routed to Reach 8R : PRE DEV DP-2

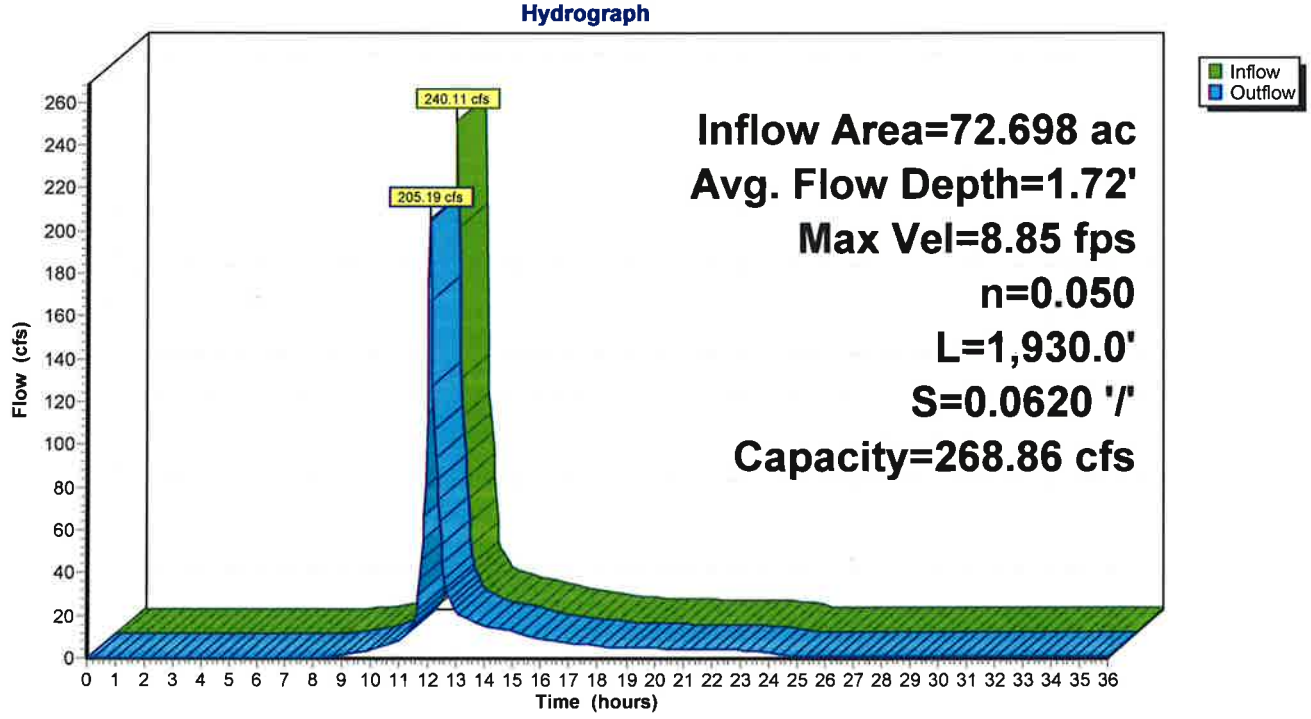
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.85 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 2.12 fps, Avg. Travel Time= 15.2 min

Peak Storage= 44,728 cf @ 12.05 hrs
Average Depth at Peak Storage= 1.72' , Surface Width= 16.89'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 268.86 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 1,930.0' Slope= 0.0620 '/'
Inlet Invert= 452.69', Outlet Invert= 333.03'

‡

Reach 9R: Channel 2



Summary for Reach 11R: Channel 1

Inflow Area = 9.770 ac, 37.67% Impervious, Inflow Depth > 2.83" for 10-Year event
Inflow = 2.20 cfs @ 14.49 hrs, Volume= 2.307 af
Outflow = 2.20 cfs @ 14.53 hrs, Volume= 2.301 af, Atten= 0%, Lag= 2.3 min
Routed to Reach 9R : Channel 2

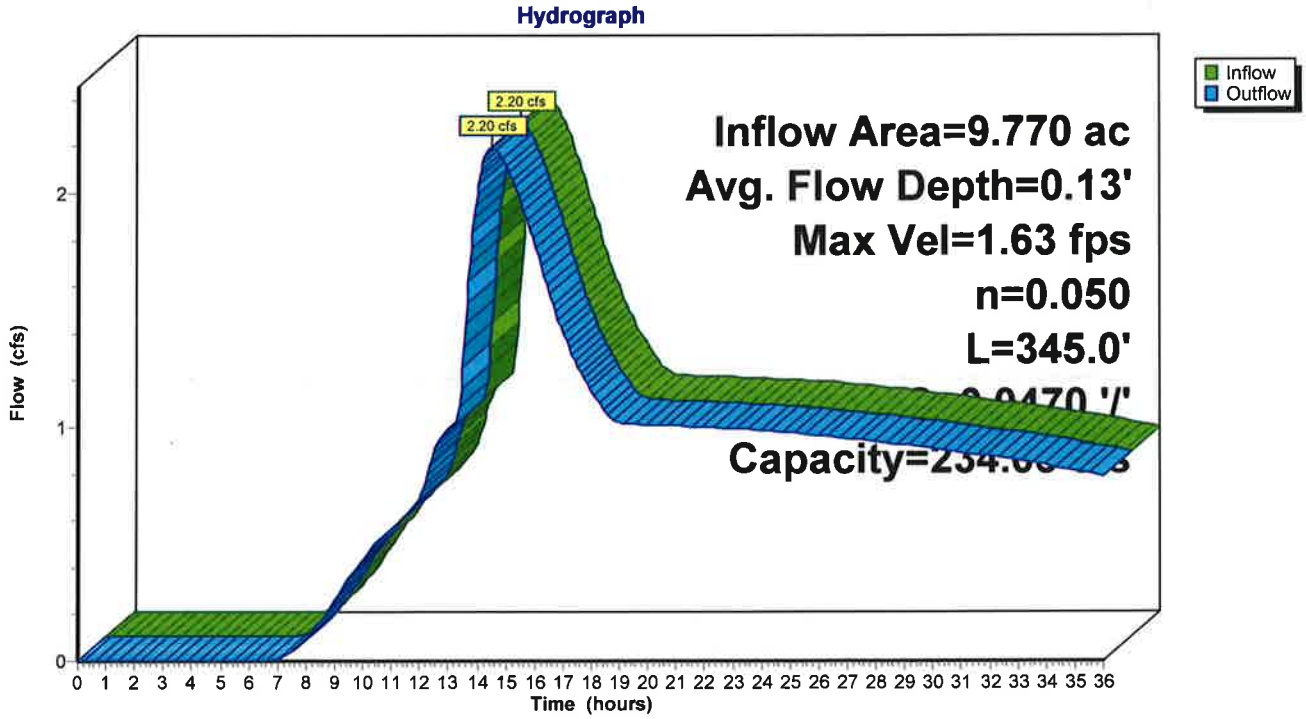
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.63 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 1.14 fps, Avg. Travel Time= 5.0 min

Peak Storage= 464 cf @ 14.53 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 10.52'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 234.05 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 345.0' Slope= 0.0470 '/'
Inlet Invert= 468.90', Outlet Invert= 452.69'

‡

Reach 11R: Channel 1

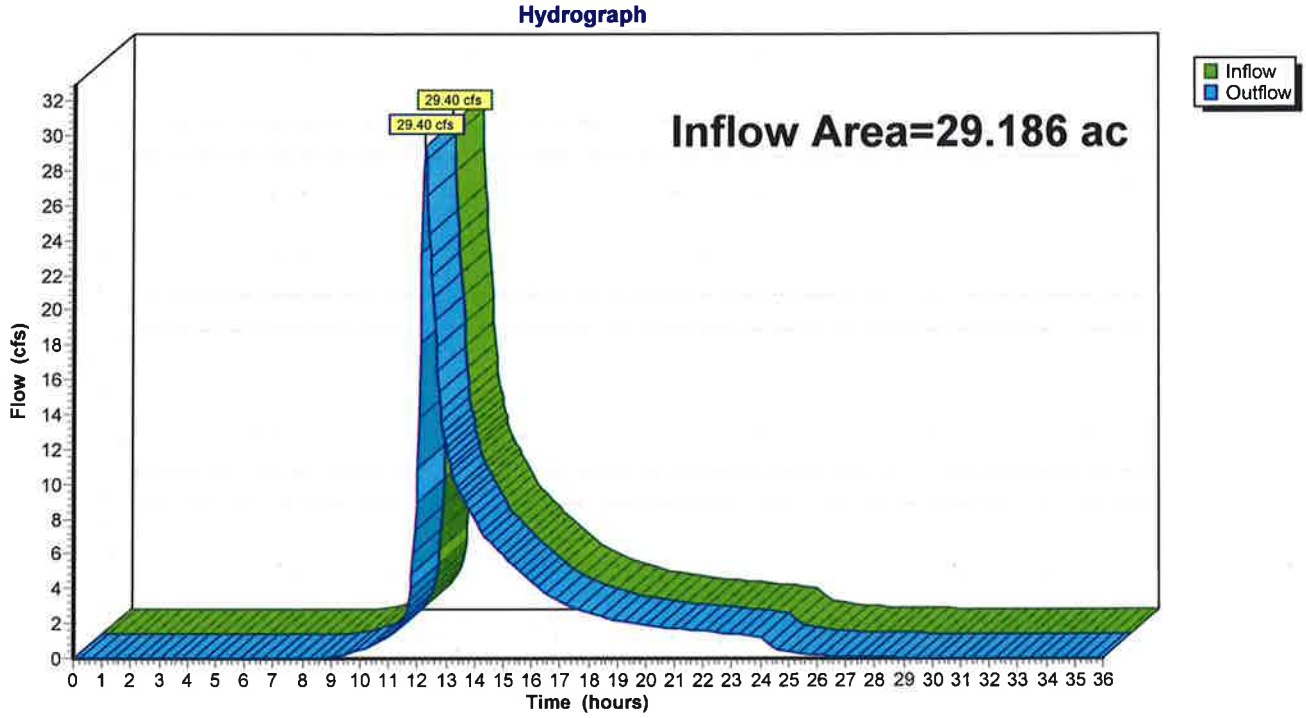


Summary for Reach 15R: POST DEV DP-1

Inflow Area = 29.186 ac, 42.68% Impervious, Inflow Depth > 2.19" for 10-Year event
Inflow = 29.40 cfs @ 12.26 hrs, Volume= 5.331 af
Outflow = 29.40 cfs @ 12.26 hrs, Volume= 5.331 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 15R: POST DEV DP-1

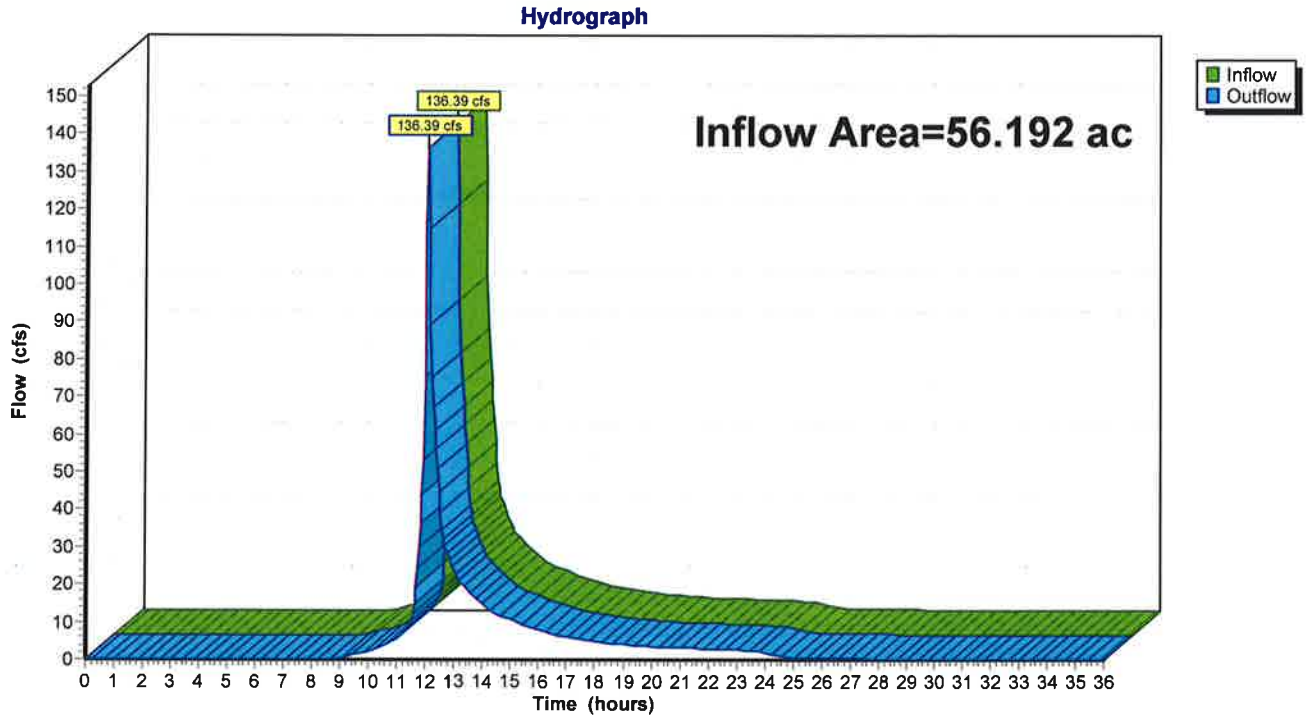


Summary for Reach 16R: POST DEV DP-2

Inflow Area = 56.192 ac, 24.26% Impervious, Inflow Depth > 2.75" for 10-Year event
Inflow = 136.39 cfs @ 12.05 hrs, Volume= 12.857 af
Outflow = 136.39 cfs @ 12.05 hrs, Volume= 12.857 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 16R: POST DEV DP-2



Summary for Reach 17R: Channel 2

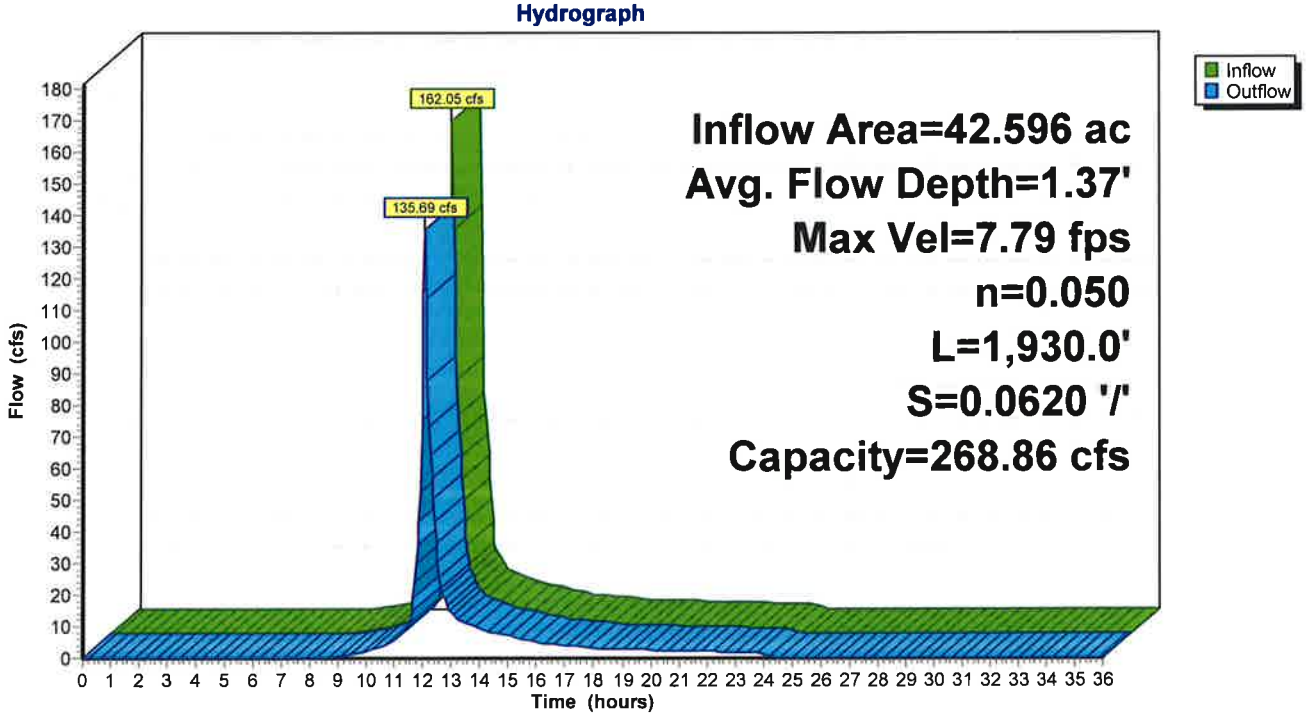
Inflow Area = 42.596 ac, 6.53% Impervious, Inflow Depth = 2.82" for 10-Year event
Inflow = 162.05 cfs @ 12.00 hrs, Volume= 10.019 af
Outflow = 135.69 cfs @ 12.05 hrs, Volume= 10.019 af, Atten= 16%, Lag= 2.7 min
Routed to Reach 16R : POST DEV DP-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.79 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 1.72 fps, Avg. Travel Time= 18.7 min

Peak Storage= 33,608 cf @ 12.05 hrs
Average Depth at Peak Storage= 1.37' , Surface Width= 15.47'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 268.86 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 1,930.0' Slope= 0.0620 '/'
Inlet Invert= 452.69', Outlet Invert= 333.03'

Reach 17R: Channel 2



Summary for Pond 10P: EXISTING BASIN

Inflow Area = 9.770 ac, 37.67% Impervious, Inflow Depth = 3.29" for 10-Year event
Inflow = 21.16 cfs @ 12.41 hrs, Volume= 2.680 af
Outflow = 2.20 cfs @ 14.49 hrs, Volume= 2.307 af, Atten= 90%, Lag= 124.8 min
Primary = 2.20 cfs @ 14.49 hrs, Volume= 2.307 af
Routed to Reach 11R : Channel 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 476.15' @ 14.49 hrs Surf.Area= 0.730 ac Storage= 1.555 af

Plug-Flow detention time= 534.1 min calculated for 2.307 af (86% of inflow)
Center-of-Mass det. time= 472.7 min (1,307.6 - 834.8)

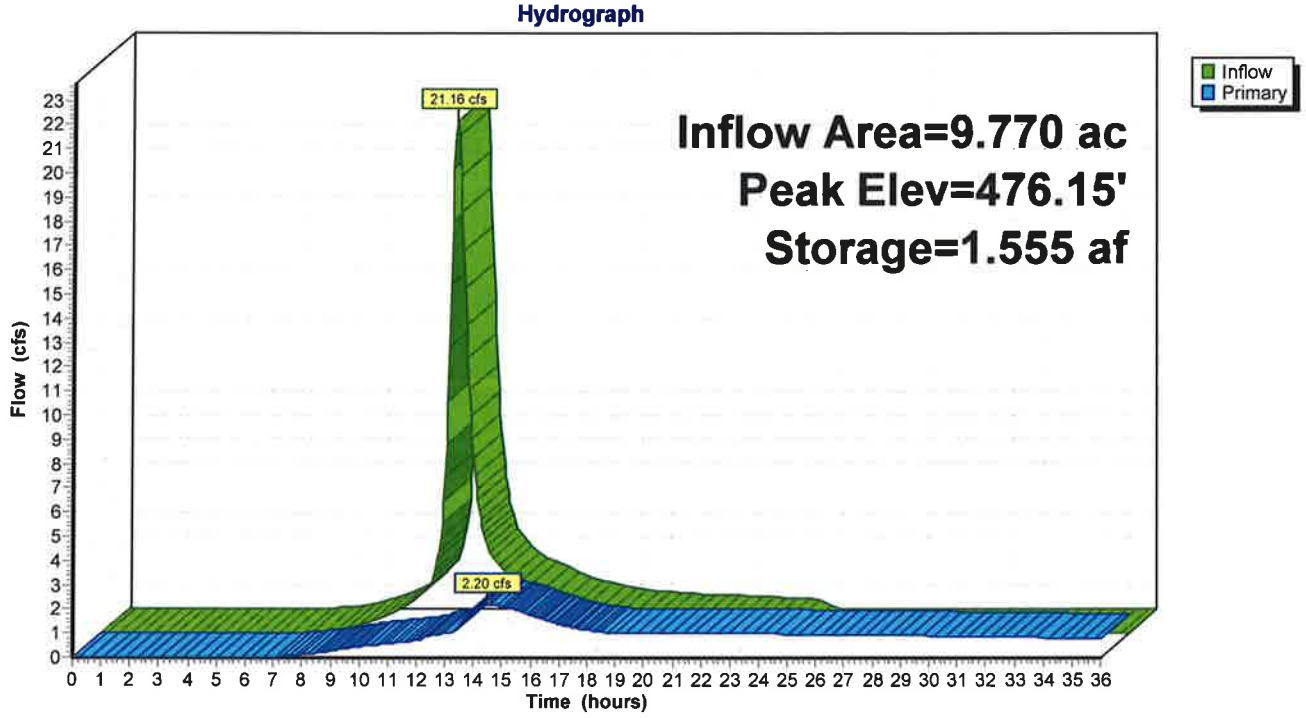
Volume	Invert	Avail.Storage	Storage Description
#1	471.00'	3.035 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
471.00	0.000	0.000	0.000
472.00	0.039	0.019	0.019
474.00	0.334	0.373	0.392
476.00	0.718	1.052	1.444
478.00	0.872	1.590	3.035

Device	Routing	Invert	Outlet Devices
#1	Device 3	471.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	476.00'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	471.00'	**15.0" Round Culvert** L= 119.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 471.00' / 468.90' S= 0.0176 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#4	Primary	471.00'	**Special & User-Defined** Elev. (feet) 471.00 471.17 478.00 Disch. (cfs) 0.000 0.090 0.090

Primary OutFlow Max=2.20 cfs @ 14.49 hrs HW=476.15' TW=469.03' (Dynamic Tailwater)
- **3=Culvert** (Passes 2.11 cfs of 11.09 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.94 cfs @ 10.75 fps)
  - **2=Sharp-Crested Rectangular Weir** (Weir Controls 1.17 cfs @ 1.28 fps)
- **4=Special & User-Defined** (Custom Controls 0.09 cfs)

Pond 10P: EXISTING BASIN



Summary for Pond 21P: WEST WETLAND

Inflow Area = 15.435 ac, 62.13% Impervious, Inflow Depth = 2.15" for 10-Year event
Inflow = 30.55 cfs @ 12.36 hrs, Volume= 2.767 af
Outflow = 6.49 cfs @ 13.00 hrs, Volume= 2.302 af, Atten= 79%, Lag= 38.5 min
Primary = 6.49 cfs @ 13.00 hrs, Volume= 2.302 af
Routed to Reach 15R : POST DEV DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 401.46' @ 13.00 hrs Surf.Area= 40,530 sf Storage= 38,608 cf

Plug-Flow detention time= 171.8 min calculated for 2.299 af (83% of inflow)
Center-of-Mass det. time= 101.0 min (990.4 - 889.5)

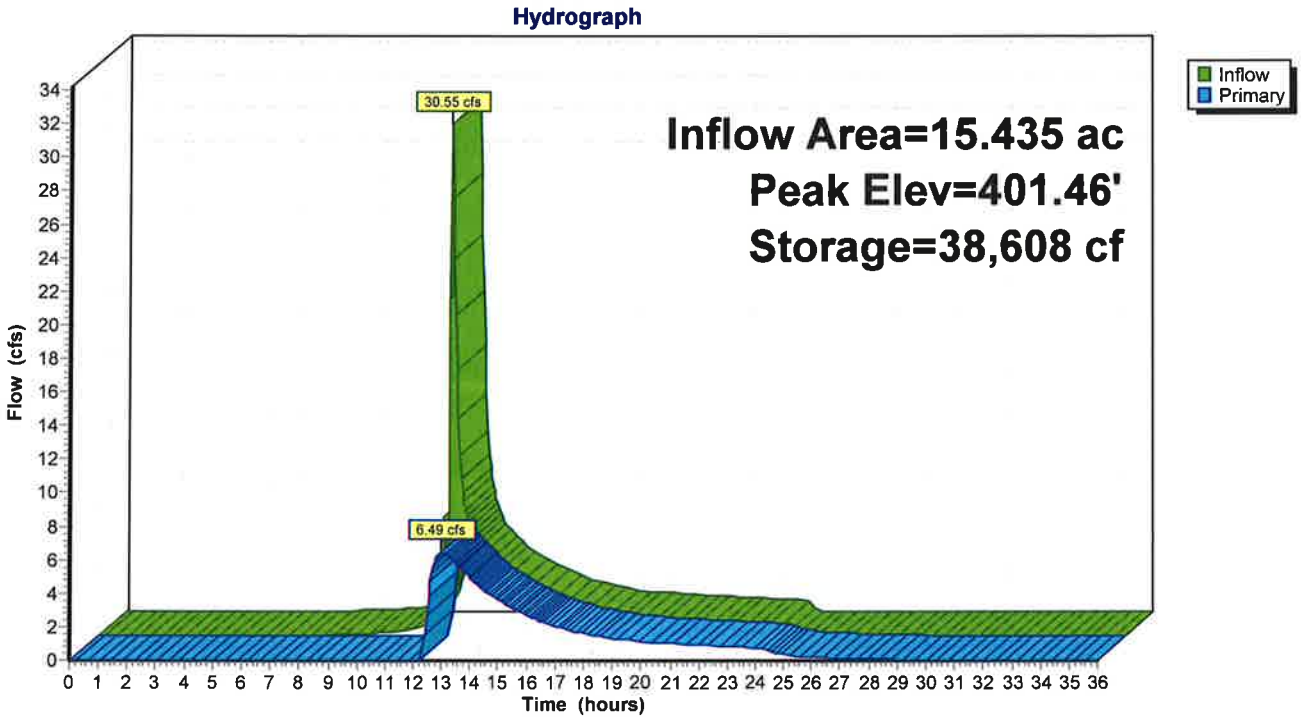
Volume	Invert	Avail.Storage	Storage Description
#1	400.50'	155,009 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
400.50	38,427	0	0
402.00	41,700	60,095	60,095
404.00	53,214	94,914	155,009

Device	Routing	Invert	Outlet Devices
#0	Primary	404.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Device 2	401.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	395.00'	**24.0" Round Culvert** L= 45.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 395.00' / 390.00' S= 0.1111 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#3	Primary	402.00'	**143.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=6.49 cfs @ 13.00 hrs HW=401.46' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 6.49 cfs of 31.20 cfs potential flow)
↑—**1=Orifice/Grate** (Weir Controls 6.49 cfs @ 2.23 fps)
—**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond 21P: WEST WETLAND



Summary for Pond 24P: EAST WETLAND

Inflow Area = 13.596 ac, 79.80% Impervious, Inflow Depth > 2.52" for 10-Year event
Inflow = 27.46 cfs @ 12.30 hrs, Volume= 2.861 af
Outflow = 10.03 cfs @ 12.70 hrs, Volume= 2.838 af, Atten= 63%, Lag= 24.0 min
Primary = 10.03 cfs @ 12.70 hrs, Volume= 2.838 af
Routed to Reach 16R : POST DEV DP-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 390.00' Storage= 1.389 af
Peak Elev= 390.69' @ 12.70 hrs Storage= 2.070 af (0.681 af above start)

Plug-Flow detention time= 401.9 min calculated for 1.447 af (51% of inflow)
Center-of-Mass det. time= 79.1 min (975.3 - 896.1)

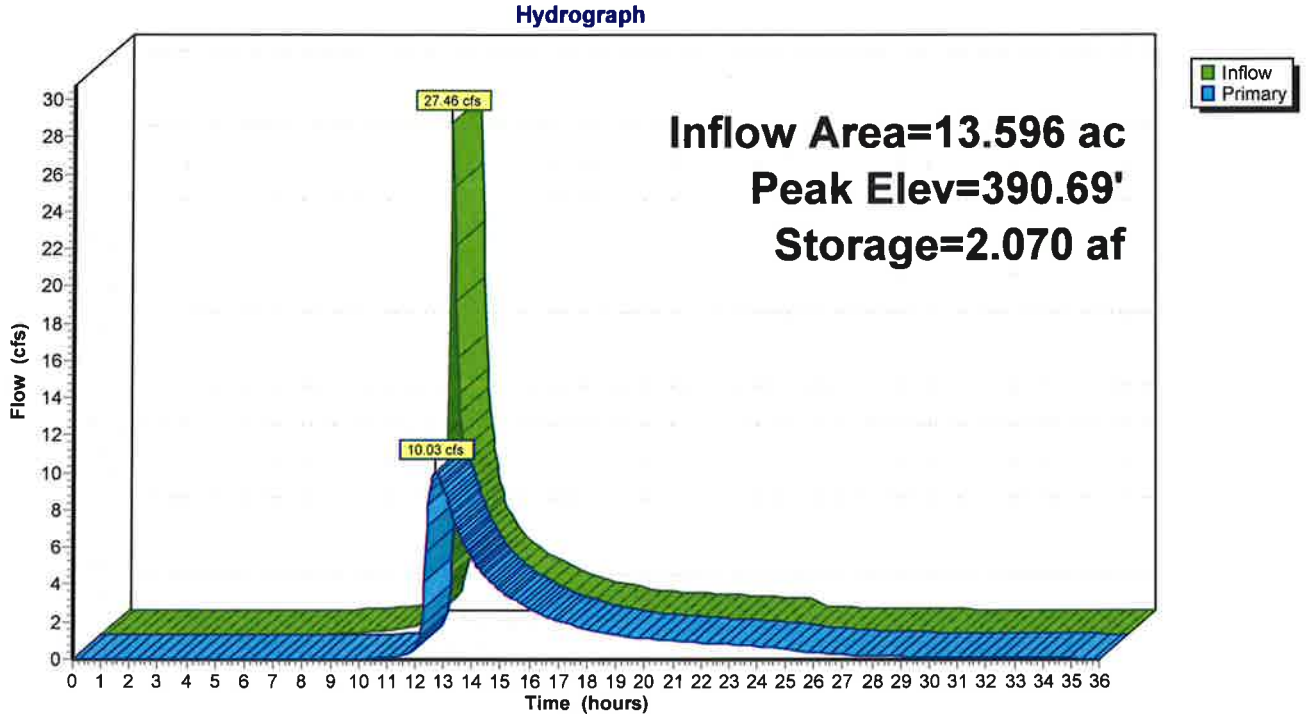
Volume	Invert	Avail.Storage	Storage Description
#1	384.00'	4.344 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
384.00	0.000
388.50	0.530
389.50	0.973
390.00	1.389
393.00	4.344

Device	Routing	Invert	Outlet Devices
#1	Primary	390.00'	**143.0 deg x 4.0' long x 3.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=10.03 cfs @ 12.70 hrs HW=390.69' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 10.03 cfs @ 2.39 fps)

Pond 24P: EAST WETLAND



Summary for Pond 34P: WEST CISTERN

Inflow Area = 13.620 ac, 64.39% Impervious, Inflow Depth = 3.90" for 10-Year event
Inflow = 52.91 cfs @ 12.13 hrs, Volume= 4.423 af
Outflow = 28.05 cfs @ 12.36 hrs, Volume= 2.239 af, Atten= 47%, Lag= 13.9 min
Primary = 28.05 cfs @ 12.36 hrs, Volume= 2.239 af
Routed to Pond 21P : WEST WETLAND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 400.00' @ 12.30 hrs Surf.Area= 0.689 ac Storage= 2.183 af

Plug-Flow detention time= 224.8 min calculated for 2.239 af (51% of inflow)
Center-of-Mass det. time= 112.6 min (909.2 - 796.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	394.50'	0.902 af	**99.08'W x 303.00'L x 5.50'H Field A** 3.791 af Overall - 1.535 af Embedded = 2.256 af x 40.0% Voids
#2A	395.00'	1.281 af	**ADS N-12 48"** x 225 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 225 Chambers in 15 Rows
		2.183 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	400.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	399.00'	**12.0" Round Culvert** L= 100.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 399.00' / 398.00' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.36 hrs HW=400.00' TW=400.98' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond 34P: WEST CISTERN - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12® Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

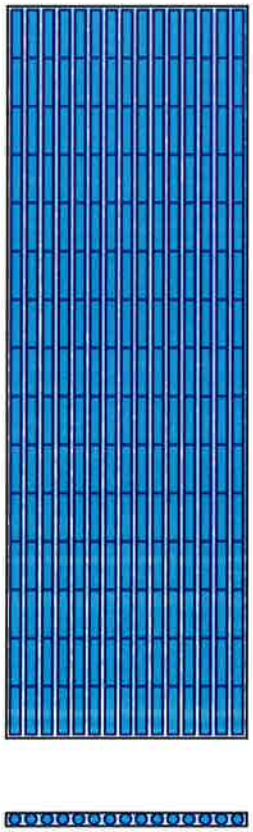
15 Chambers/Row x 20.00' Long = 300.00' Row Length +18.0" End Stone x 2 = 303.00' Base Length
15 Rows x 54.0" Wide + 24.5" Spacing x 14 + 18.0" Side Stone x 2 = 99.08' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

225 Chambers x 248.0 cf = 55,800.0 cf Chamber Storage
225 Chambers x 297.0 cf = 66,820.3 cf Displacement

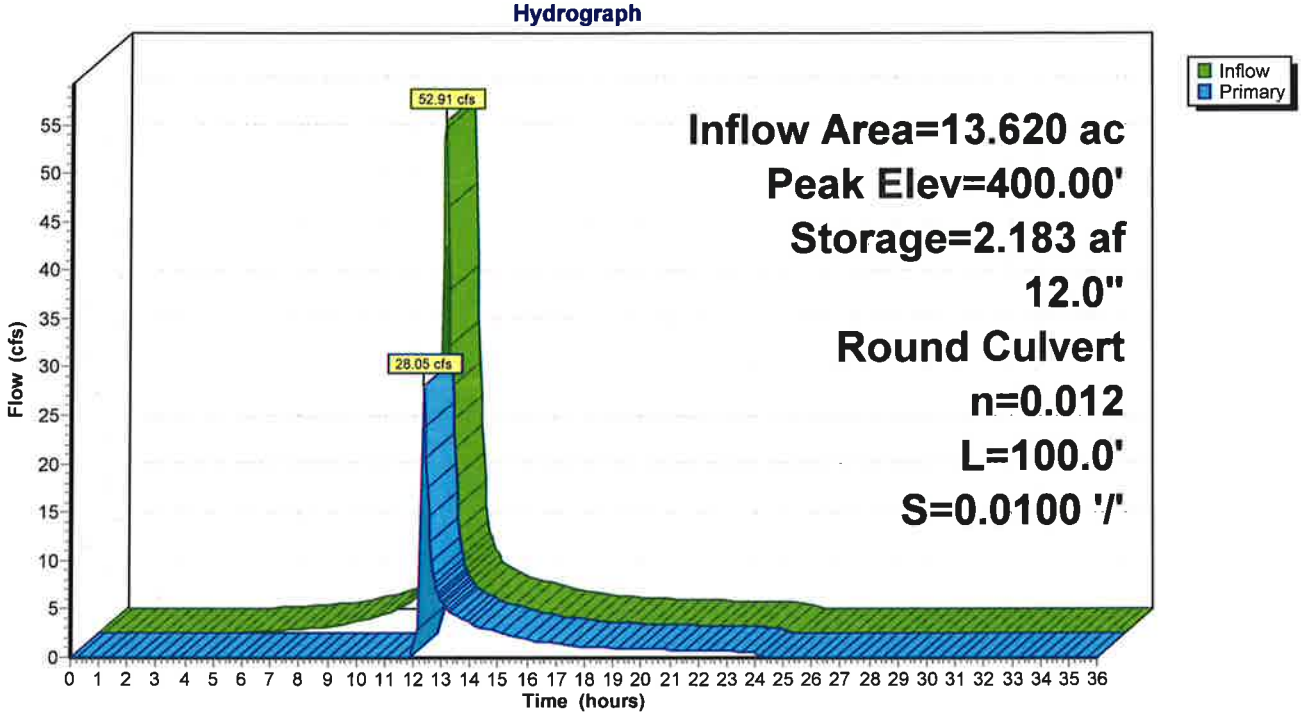
165,127.9 cf Field - 66,820.3 cf Chambers = 98,307.5 cf Stone x 40.0% Voids = 39,323.0 cf Stone Storage

Chamber Storage + Stone Storage = 95,123.0 cf = 2.184 af
Overall Storage Efficiency = 57.6%
Overall System Size = 303.00' x 99.08' x 5.50'

225 Chambers
6,115.8 cy Field
3,641.0 cy Stone



Pond 34P: WEST CISTERN



Summary for Pond 36P: CISTERN LOWER

Inflow Area = 10.840 ac, 89.94% Impervious, Inflow Depth = 4.66" for 10-Year event
Inflow = 53.92 cfs @ 12.07 hrs, Volume= 4.211 af
Outflow = 21.68 cfs @ 12.31 hrs, Volume= 2.127 af, Atten= 60%, Lag= 14.1 min
Primary = 21.68 cfs @ 12.31 hrs, Volume= 2.127 af
Routed to Pond 24P : EAST WETLAND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 399.00' @ 12.25 hrs Surf.Area= 0.742 ac Storage= 2.349 af

Plug-Flow detention time= 282.4 min calculated for 2.127 af (50% of inflow)
Center-of-Mass det. time= 161.4 min (922.2 - 760.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	393.50'	0.971 af	**144.88'W x 223.00'L x 5.50'H Field A** 4.079 af Overall - 1.651 af Embedded = 2.429 af x 40.0% Voids
#2A	394.00'	1.378 af	**ADS N-12 48"** x 242 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 242 Chambers in 22 Rows
		2.349 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	399.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	398.00'	**12.0" Round Culvert** L= 100.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 398.00' / 393.00' S= 0.0500 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Primary	398.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=10.54 cfs @ 12.31 hrs HW=399.00' TW=390.43' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.36 cfs @ 3.00 fps)
└—**2=Sharp-Crested Rectangular Weir** (Weir Controls 8.18 cfs @ 2.83 fps)

Pond 36P: CISTERN LOWER - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12® Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

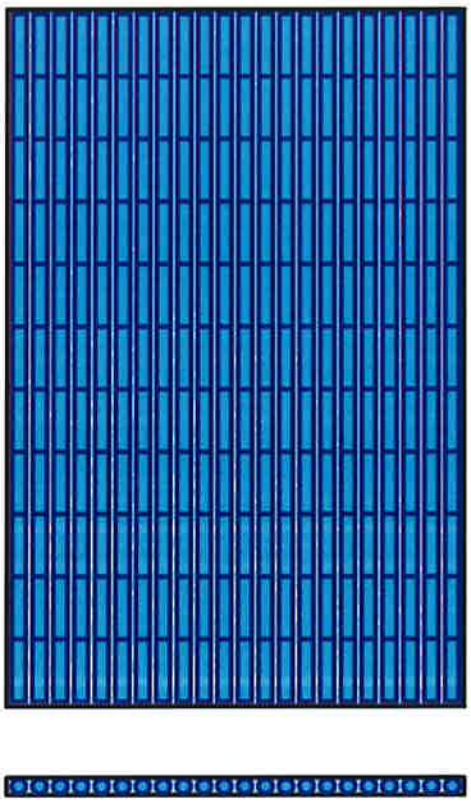
11 Chambers/Row x 20.00' Long = 220.00' Row Length +18.0" End Stone x 2 = 223.00' Base Length
22 Rows x 54.0" Wide + 24.5" Spacing x 21 + 18.0" Side Stone x 2 = 144.88' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

242 Chambers x 248.0 cf = 60,016.0 cf Chamber Storage
242 Chambers x 297.0 cf = 71,869.0 cf Displacement

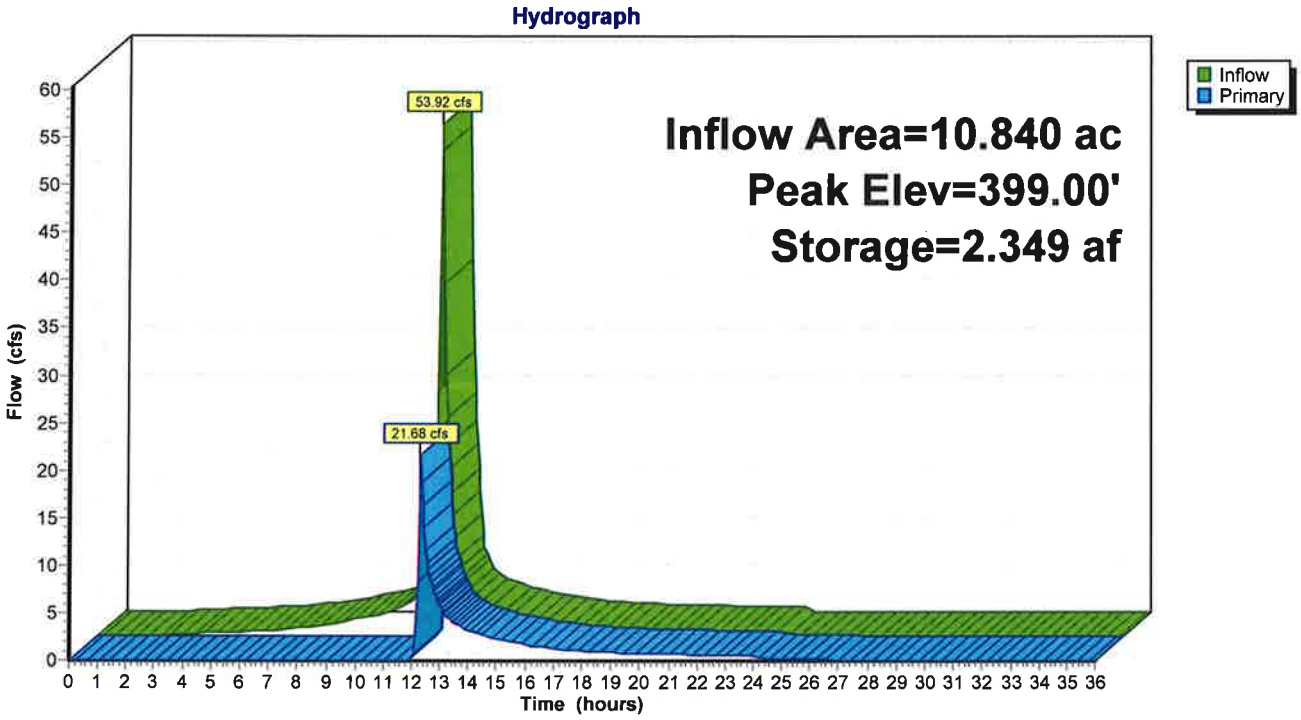
177,695.1 cf Field - 71,869.0 cf Chambers = 105,826.1 cf Stone x 40.0% Voids = 42,330.5 cf Stone Storage

Chamber Storage + Stone Storage = 102,346.5 cf = 2.350 af
Overall Storage Efficiency = 57.6%
Overall System Size = 223.00' x 144.88' x 5.50'

242 Chambers
6,581.3 cy Field
3,919.5 cy Stone



Pond 36P: CISTERN LOWER



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3S: POST DEV DA-2 Runoff Area=13.620 ac 64.39% Impervious Runoff Depth=5.21"
Flow Length=1,344' Tc=9.4 min CN=89 Runoff=69.71 cfs 5.915 af

Subcatchment 4S: PRE DEV DA-1 Runoff Area=23.344 ac 12.28% Impervious Runoff Depth=3.60"
Flow Length=1,887' Tc=18.7 min CN=74 Runoff=68.14 cfs 7.005 af

Subcatchment 5S: PRE DEV DA-2 Runoff Area=9.770 ac 37.67% Impervious Runoff Depth=4.55"
Flow Length=928' Tc=30.2 min CN=83 Runoff=29.01 cfs 3.703 af

Subcatchment 6S: PRE DEV DA-3 Runoff Area=62.928 ac 4.42% Impervious Runoff Depth=4.01"
Tc=0.0 min CN=78 Runoff=339.20 cfs 21.054 af

Subcatchment 12S: POST DEV DA-6 Runoff Area=13.751 ac 20.84% Impervious Runoff Depth=3.81"
Flow Length=1,887' Tc=18.7 min CN=76 Runoff=42.43 cfs 4.362 af

Subcatchment 14S: POST DEV DA-5 Runoff Area=42.596 ac 6.53% Impervious Runoff Depth=4.01"
Tc=0.0 min CN=78 Runoff=229.61 cfs 14.252 af

Subcatchment 26S: POST DEV DA-4 Runoff Area=2.756 ac 39.91% Impervious Runoff Depth=4.44"
Flow Length=217' Tc=11.6 min CN=82 Runoff=11.74 cfs 1.020 af

Subcatchment 32S: POST DEV DA-3 Runoff Area=1.815 ac 45.18% Impervious Runoff Depth=4.77"
Tc=5.0 min CN=85 Runoff=9.96 cfs 0.721 af

Subcatchment 35S: POST DEV DA-1 Runoff Area=10.840 ac 89.94% Impervious Runoff Depth=6.02"
Tc=5.0 min CN=96 Runoff=68.72 cfs 5.434 af

Reach 7R: PRE DEV DP-1 Inflow=68.14 cfs 7.005 af
Outflow=68.14 cfs 7.005 af

Reach 8R: PRE DEV DP-2 Inflow=294.57 cfs 24.273 af
Outflow=294.57 cfs 24.273 af

Reach 9R: Channel 2 Avg. Flow Depth=2.11' Max Vel=9.85 fps Inflow=339.99 cfs 24.303 af
n=0.050 L=1,930.0' S=0.0620 '/' Capacity=268.86 cfs Outflow=294.57 cfs 24.273 af

Reach 11R: Channel 1 Avg. Flow Depth=0.28' Max Vel=2.65 fps Inflow=7.91 cfs 3.255 af
n=0.050 L=345.0' S=0.0470 '/' Capacity=234.05 cfs Outflow=7.90 cfs 3.249 af

Reach 15R: POST DEV DP-1 Inflow=54.41 cfs 8.349 af
Outflow=54.41 cfs 8.349 af

Reach 16R: POST DEV DP-2 Inflow=197.14 cfs 18.598 af
Outflow=197.14 cfs 18.598 af

Reach 17R: Channel 2 Avg. Flow Depth=1.68' Max Vel=8.72 fps Inflow=229.61 cfs 14.252 af
n=0.050 L=1,930.0' S=0.0620 '/' Capacity=268.86 cfs Outflow=195.74 cfs 14.252 af

Pond 10P: EXISTING BASIN Peak Elev=476.50' Storage=1.814 af Inflow=29.01 cfs 3.703 af
Outflow=7.91 cfs 3.255 af

Pond 21P: WEST WETLAND Peak Elev=402.13' Storage=66,215 cf Inflow=80.43 cfs 4.452 af
Outflow=16.12 cfs 3.987 af

Pond 24P: EAST WETLAND Peak Elev=391.14' Storage=2.512 af Inflow=80.70 cfs 4.369 af
Outflow=25.29 cfs 4.347 af

Pond 34P: WEST CISTERN Peak Elev=400.00' Storage=2.183 af Inflow=69.71 cfs 5.915 af
12.0" Round Culvert n=0.012 L=100.0' S=0.0100 '/' Outflow=74.27 cfs 3.731 af

Pond 36P: CISTERN LOWER Peak Elev=399.00' Storage=2.349 af Inflow=68.72 cfs 5.434 af
Outflow=69.78 cfs 3.349 af

Total Runoff Area = 181.420 ac Runoff Volume = 63.466 af Average Runoff Depth = 4.20"
80.48% Pervious = 146.002 ac 19.52% Impervious = 35.418 ac

Summary for Subcatchment 3S: POST DEV DA-2

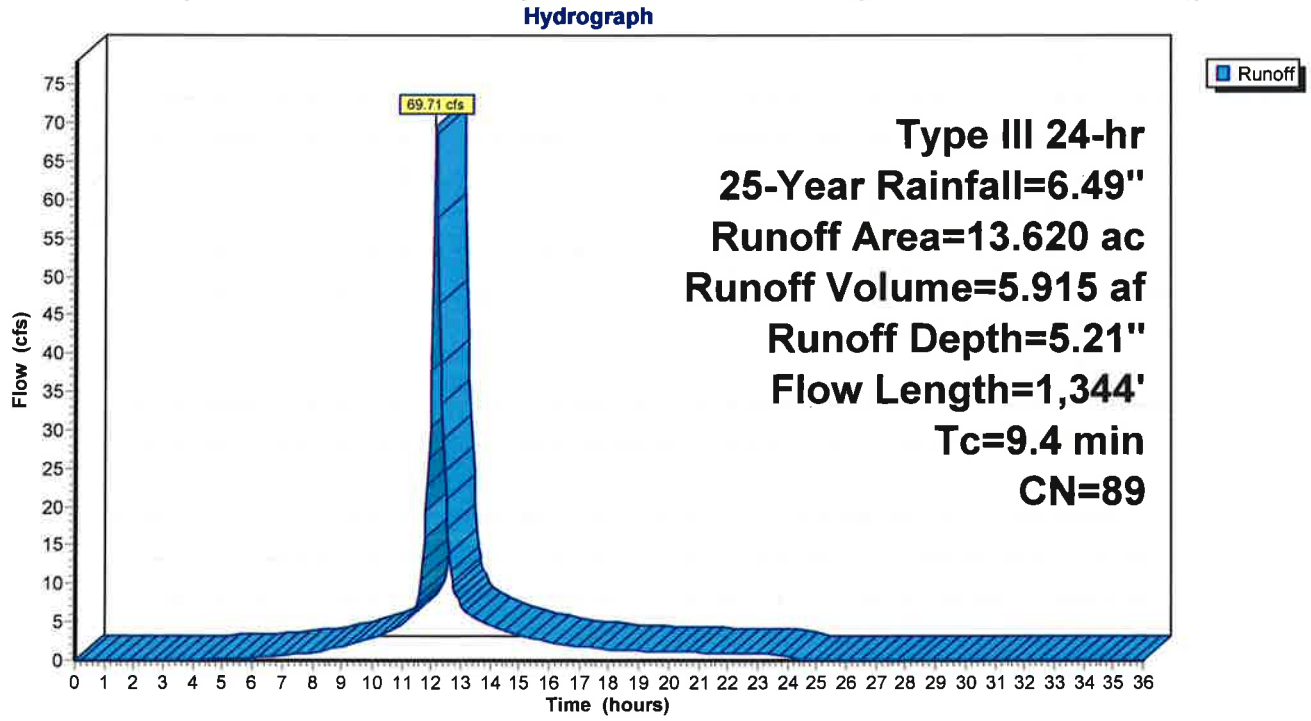
Runoff = 69.71 cfs @ 12.13 hrs, Volume= 5.915 af, Depth= 5.21"
Routed to Pond 34P : WEST CISTERN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.49"

Area (ac)	CN	Description
8.770	98	Paved parking, HSG C
4.850	74	>75% Grass cover, Good, HSG C
13.620	89	Weighted Average
4.850		35.61% Pervious Area
8.770		64.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	100	0.0950	0.22		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
0.5	227	0.2200	7.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	1,017	0.0220	11.82	18.91	**Channel Flow,** Area= 1.6 sf Perim= 3.1' r= 0.52' n= 0.012
9.4	1,344	Total			

Subcatchment 3S: POST DEV DA-2



Summary for Subcatchment 4S: PRE DEV DA-1

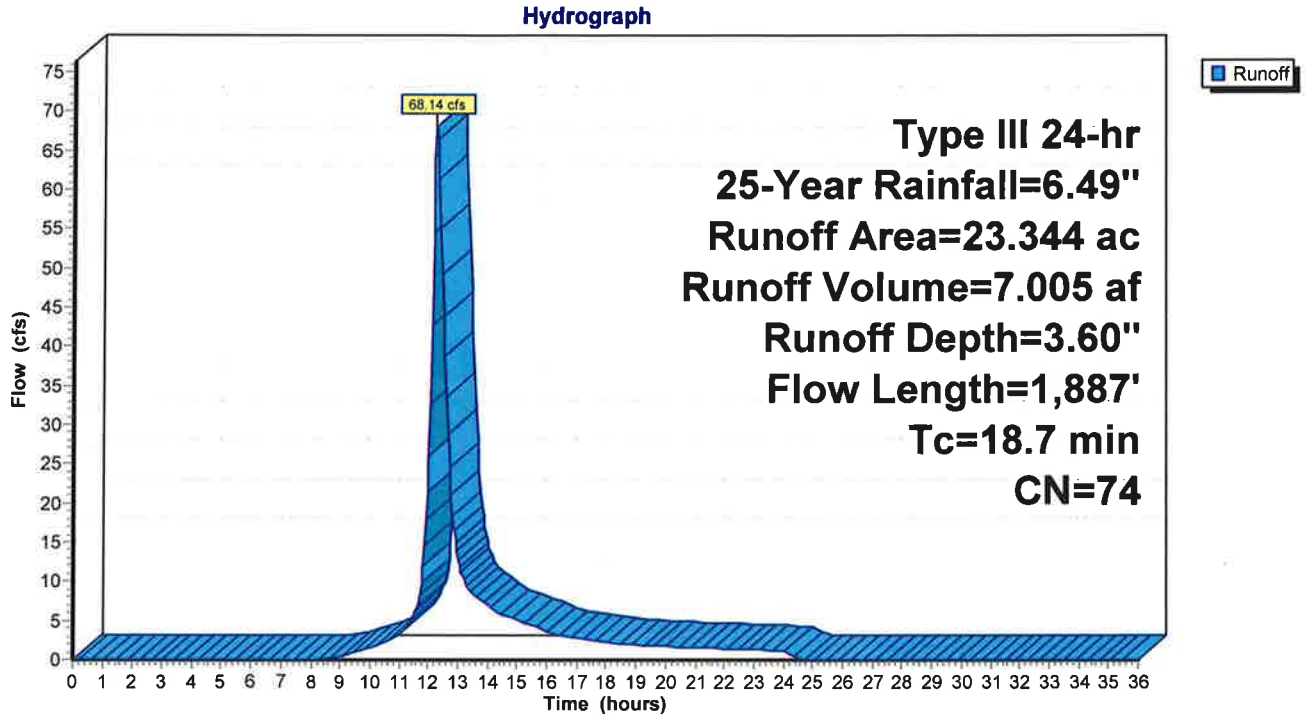
Runoff = 68.14 cfs @ 12.26 hrs, Volume= 7.005 af, Depth= 3.60"
Routed to Reach 7R : PRE DEV DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.49"

Area (ac)	CN	Description
15.478	70	Woods, Good, HSG C
5.000	74	Pasture/grassland/range, Good, HSG C
2.866	98	Paved parking, HSG C
23.344	74	Weighted Average
20.478		87.72% Pervious Area
2.866		12.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	507	0.0870	4.75		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	1,120	0.1700	27.00	27.00	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.2	160	0.0250	11.53	16.14	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
18.7	1,887	Total			

Subcatchment 4S: PRE DEV DA-1



Summary for Subcatchment 5S: PRE DEV DA-2

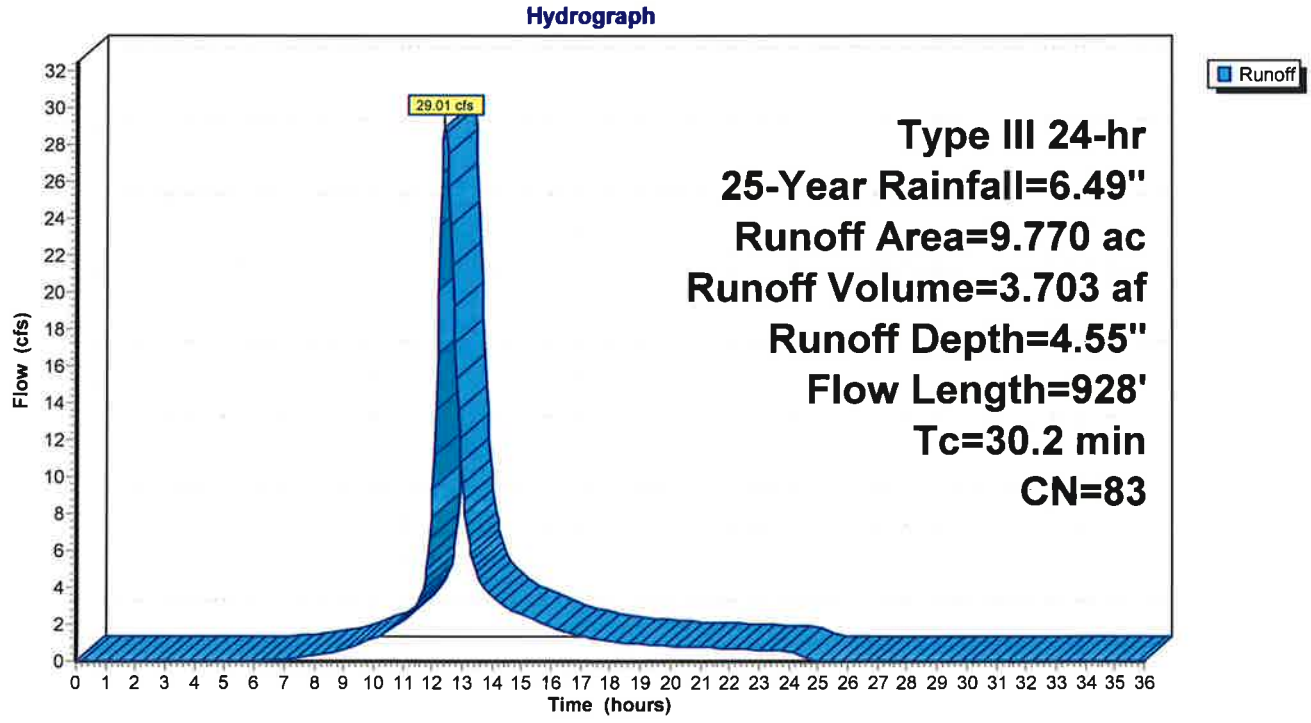
Runoff = 29.01 cfs @ 12.41 hrs, Volume= 3.703 af, Depth= 4.55"
Routed to Pond 10P : EXISTING BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.49"

Area (ac)	CN	Description
3.680	98	Paved parking, HSG C
5.611	74	>75% Grass cover, Good, HSG C
0.479	70	Woods, Good, HSG C
9.770	83	Weighted Average
6.090		62.33% Pervious Area
3.680		37.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.3	130	0.0150	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.8	543	0.0270	10.76	10.76	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.1	255	0.1800	30.93	43.30	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
30.2	928	Total			

Subcatchment 5S: PRE DEV DA-2



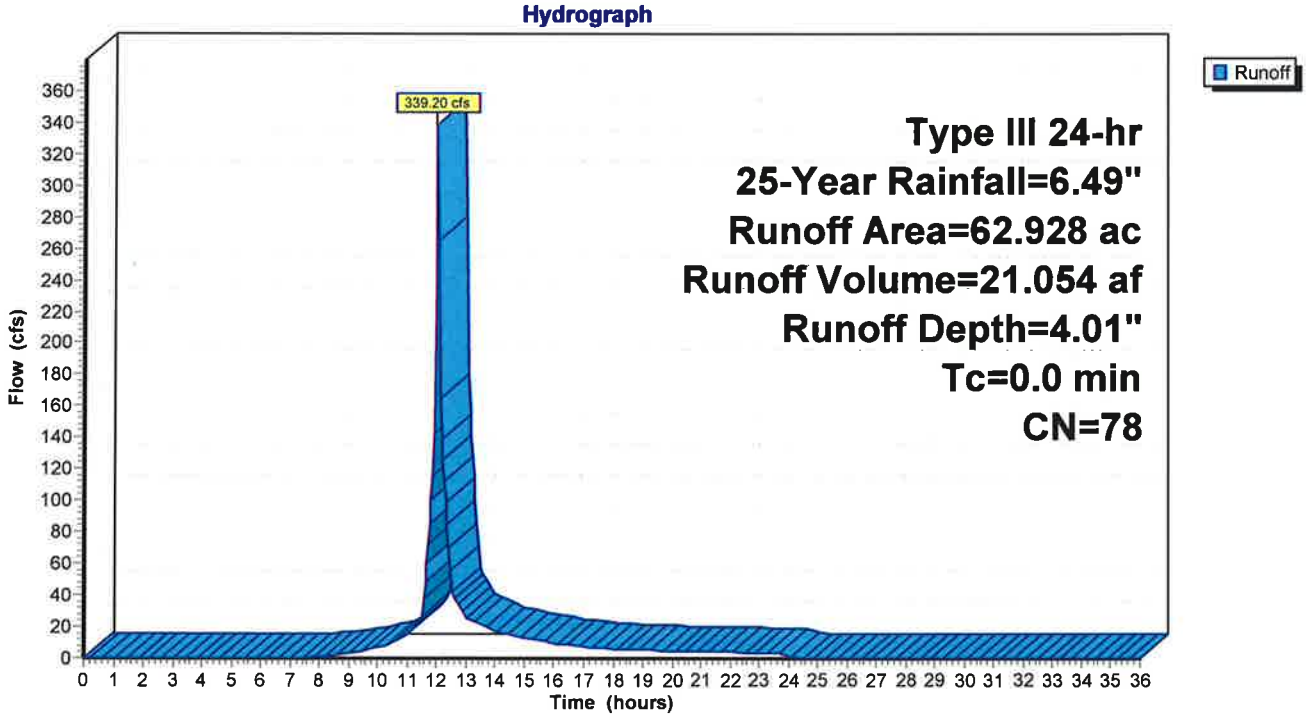
Summary for Subcatchment 6S: PRE DEV DA-3

Runoff = 339.20 cfs @ 12.00 hrs, Volume= 21.054 af, Depth= 4.01"
Routed to Reach 9R : Channel 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.49"

Area (ac)	CN	Description
2.783	98	Paved parking, HSG C
5.613	74	>75% Grass cover, Good, HSG C
53.591	77	Woods, Poor, HSG C
0.941	83	Woods, Poor, HSG D
62.928	78	Weighted Average
60.145		95.58% Pervious Area
2.783		4.42% Impervious Area

Subcatchment 6S: PRE DEV DA-3



Summary for Subcatchment 12S: POST DEV DA-6

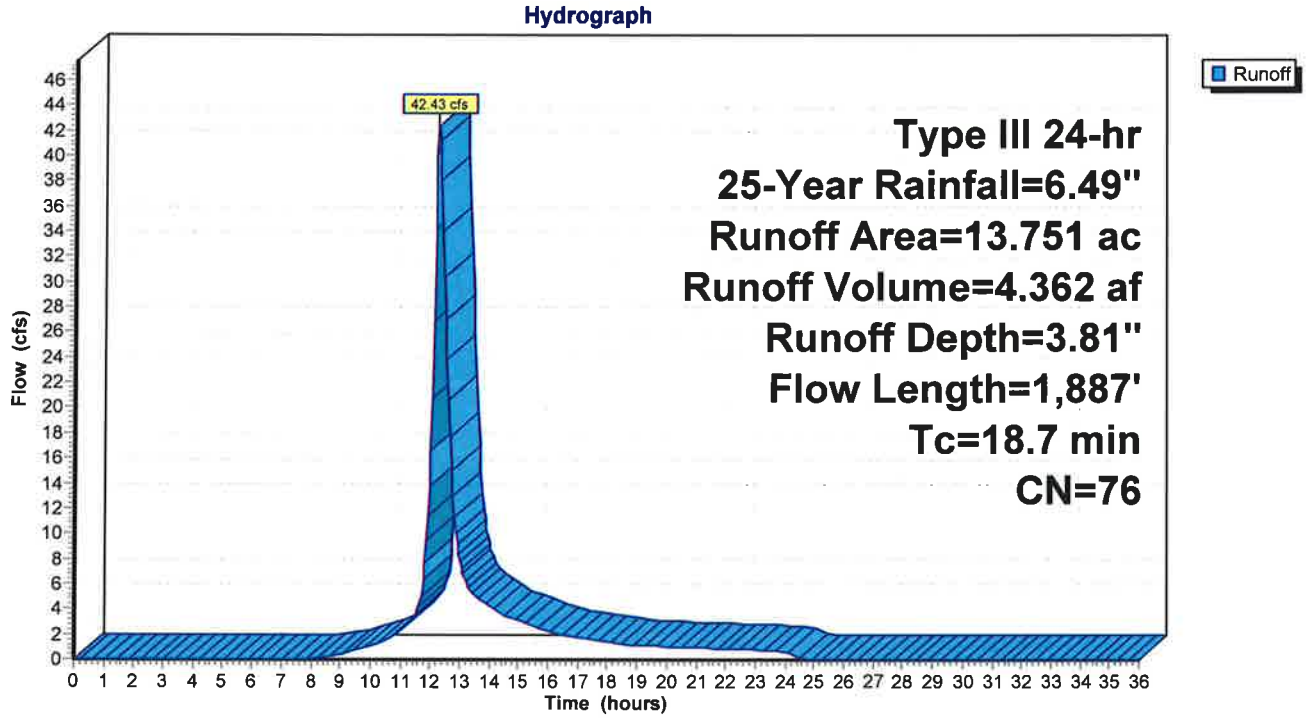
Runoff = 42.43 cfs @ 12.26 hrs, Volume= 4.362 af, Depth= 3.81"
Routed to Reach 15R : POST DEV DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.49"

Area (ac)	CN	Description
9.130	70	Woods, Good, HSG C
1.755	74	Pasture/grassland/range, Good, HSG C
2.866	98	Paved parking, HSG C
13.751	76	Weighted Average
10.885		79.16% Pervious Area
2.866		20.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	507	0.0870	4.75		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	1,120	0.1700	27.00	27.00	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.2	160	0.0250	11.53	16.14	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
18.7	1,887	Total			

Subcatchment 12S: POST DEV DA-6



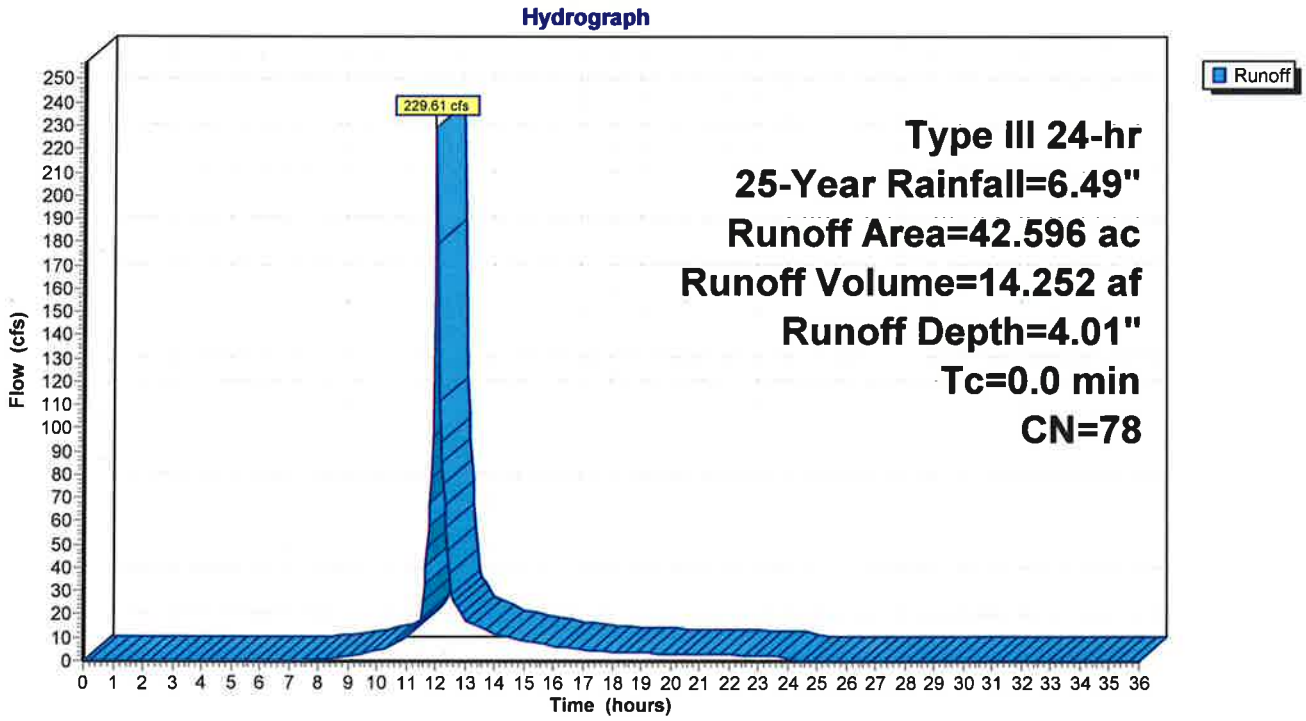
Summary for Subcatchment 14S: POST DEV DA-5

Runoff = 229.61 cfs @ 12.00 hrs, Volume= 14.252 af, Depth= 4.01"
Routed to Reach 17R : Channel 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.49"

Area (ac)	CN	Description
2.783	98	Paved parking, HSG C
3.623	74	>75% Grass cover, Good, HSG C
36.190	77	Woods, Poor, HSG C
42.596	78	Weighted Average
39.813		93.47% Pervious Area
2.783		6.53% Impervious Area

Subcatchment 14S: POST DEV DA-5



Summary for Subcatchment 26S: POST DEV DA-4

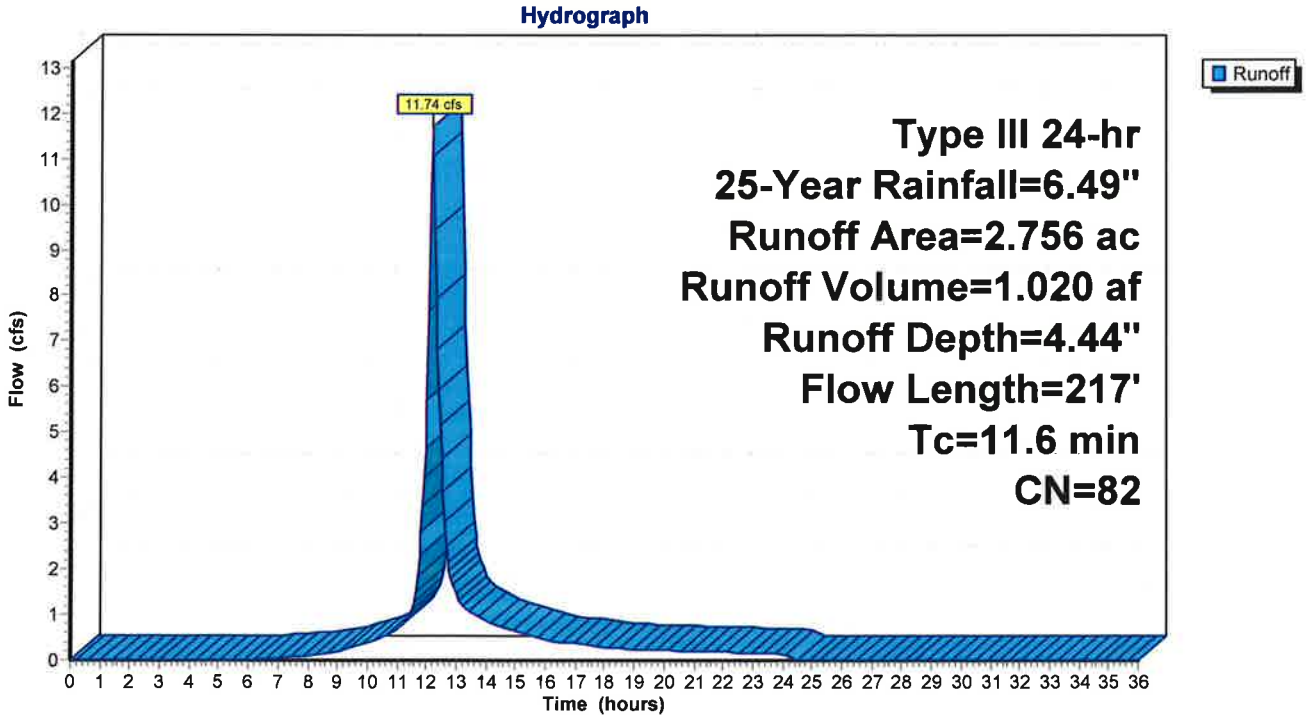
Runoff = 11.74 cfs @ 12.16 hrs, Volume= 1.020 af, Depth= 4.44"
Routed to Pond 24P : EAST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.49"

Area (ac)	CN	Description
1.100	98	Water Surface, HSG C
1.240	70	Woods, Good, HSG C
0.416	74	>75% Grass cover, Good, HSG C
2.756	82	Weighted Average
1.656		60.09% Pervious Area
1.100		39.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0400	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
1.0	117	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.6	217	Total			

Subcatchment 26S: POST DEV DA-4



Summary for Subcatchment 32S: POST DEV DA-3

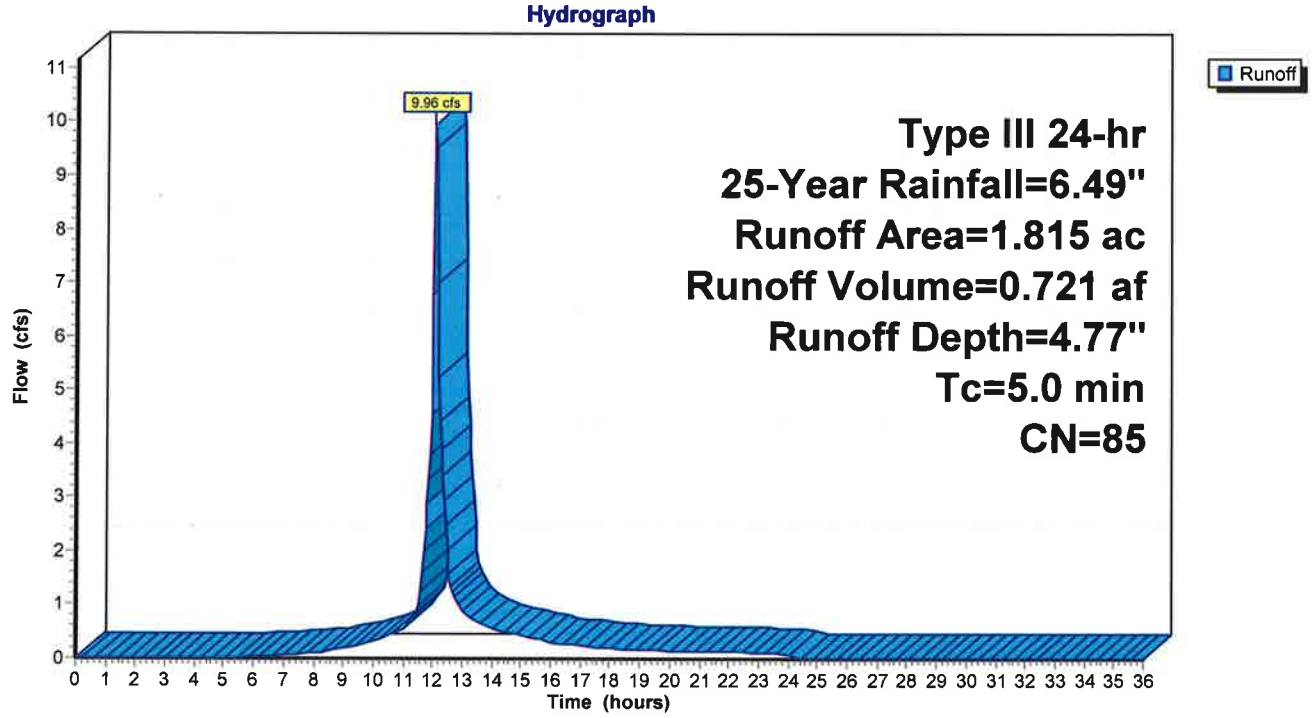
Runoff = 9.96 cfs @ 12.07 hrs, Volume= 0.721 af, Depth= 4.77"
Routed to Pond 21P : WEST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.49"

Area (ac)	CN	Description
0.995	74	>75% Grass cover, Good, HSG C
0.820	98	Paved roads w/curbs & sewers, HSG C
1.815	85	Weighted Average
0.995		54.82% Pervious Area
0.820		45.18% Impervious Area

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

Subcatchment 32S: POST DEV DA-3



Summary for Subcatchment 35S: POST DEV DA-1

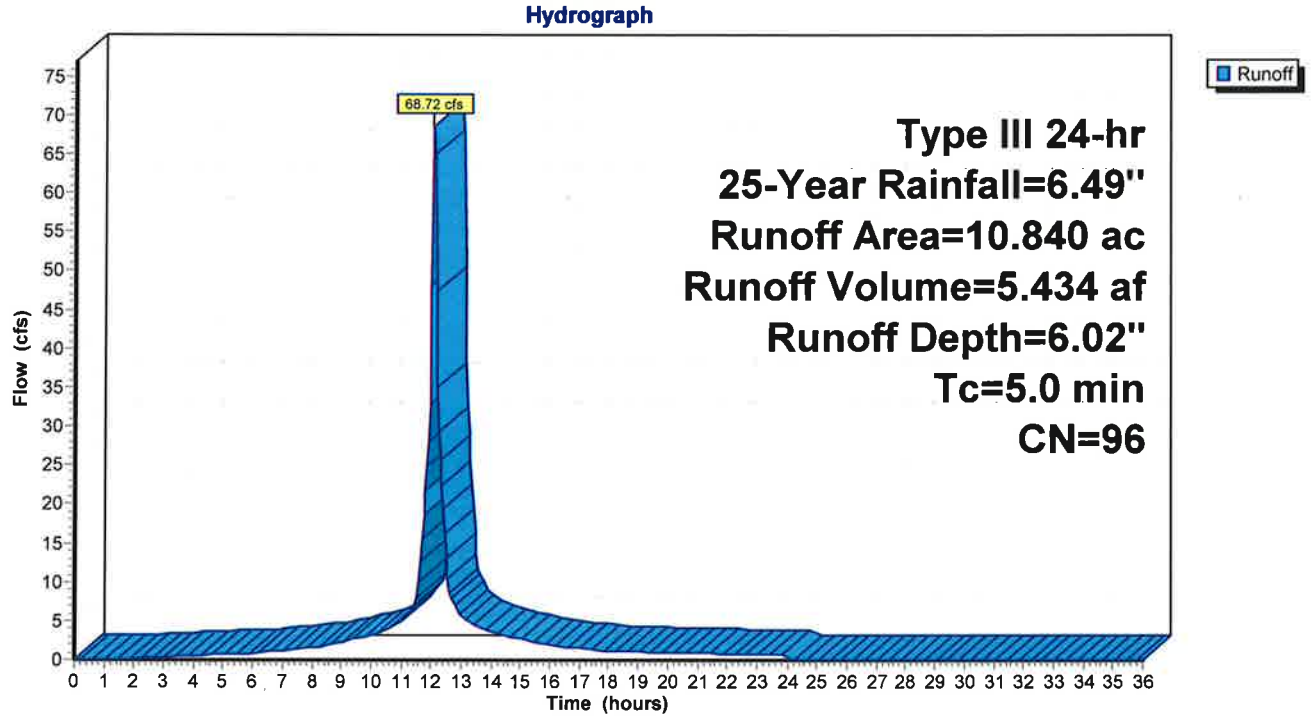
Runoff = 68.72 cfs @ 12.07 hrs, Volume= 5.434 af, Depth= 6.02"
Routed to Pond 36P : CISTERN LOWER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.49"

Area (ac)	CN	Description
9.750	98	Paved parking, HSG C
1.090	74	>75% Grass cover, Good, HSG C
10.840	96	Weighted Average
1.090		10.06% Pervious Area
9.750		89.94% Impervious Area

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

Subcatchment 35S: POST DEV DA-1

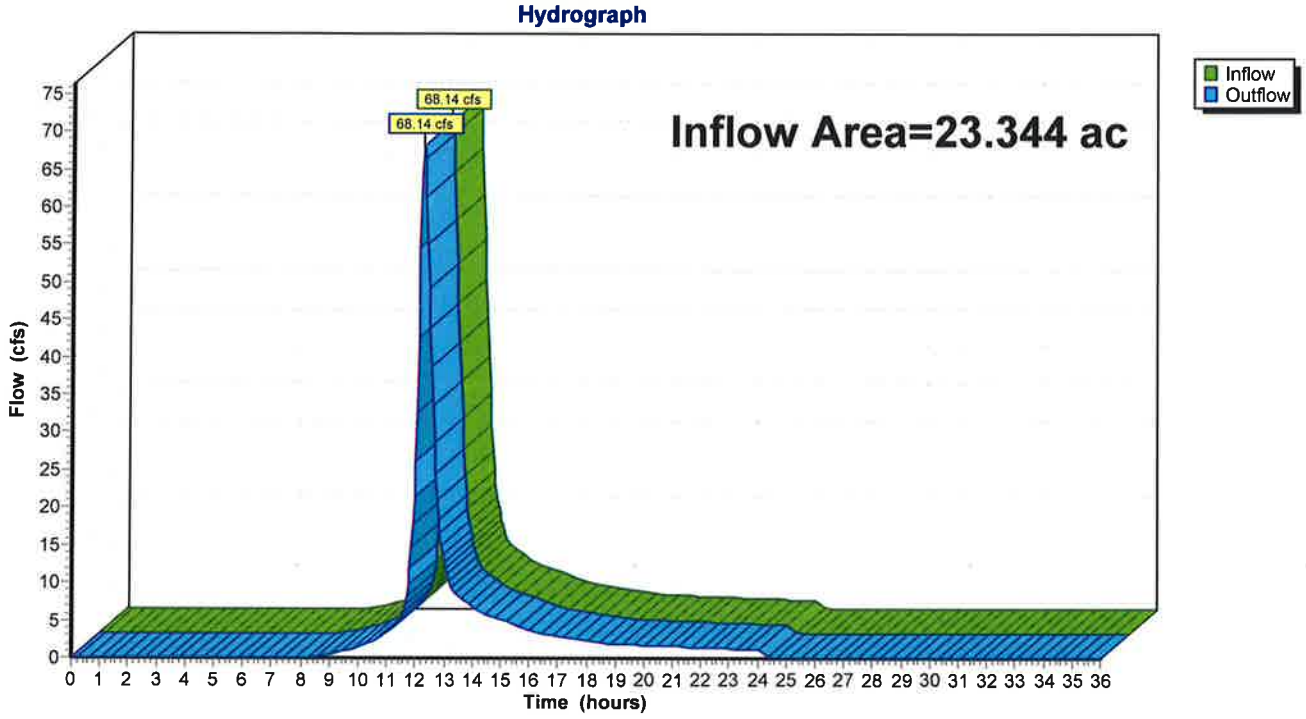


Summary for Reach 7R: PRE DEV DP-1

Inflow Area = 23.344 ac, 12.28% Impervious, Inflow Depth = 3.60" for 25-Year event
Inflow = 68.14 cfs @ 12.26 hrs, Volume= 7.005 af
Outflow = 68.14 cfs @ 12.26 hrs, Volume= 7.005 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 7R: PRE DEV DP-1

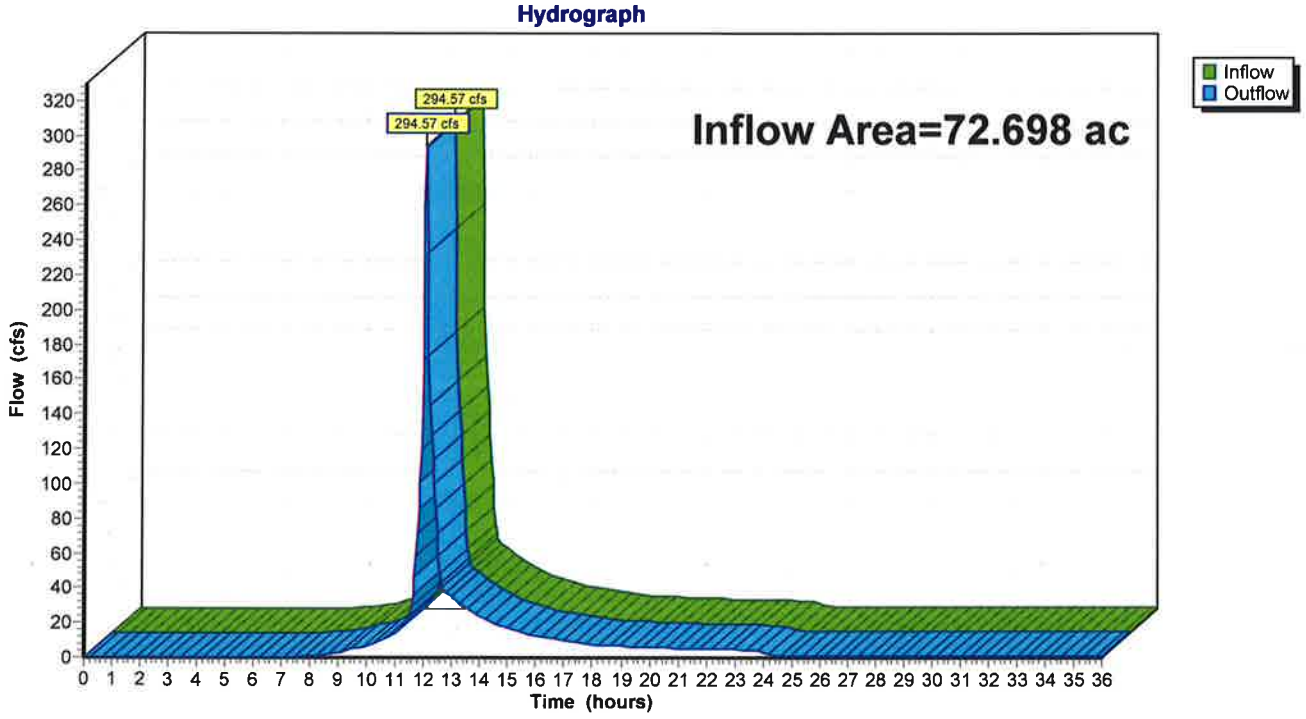


Summary for Reach 8R: PRE DEV DP-2

Inflow Area = 72.698 ac, 8.89% Impervious, Inflow Depth > 4.01" for 25-Year event
Inflow = 294.57 cfs @ 12.04 hrs, Volume= 24.273 af
Outflow = 294.57 cfs @ 12.04 hrs, Volume= 24.273 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 8R: PRE DEV DP-2



Summary for Reach 9R: Channel 2

Inflow Area = 72.698 ac, 8.89% Impervious, Inflow Depth > 4.01" for 25-Year event
Inflow = 339.99 cfs @ 12.00 hrs, Volume= 24.303 af
Outflow = 294.57 cfs @ 12.04 hrs, Volume= 24.273 af, Atten= 13%, Lag= 2.3 min
Routed to Reach 8R : PRE DEV DP-2

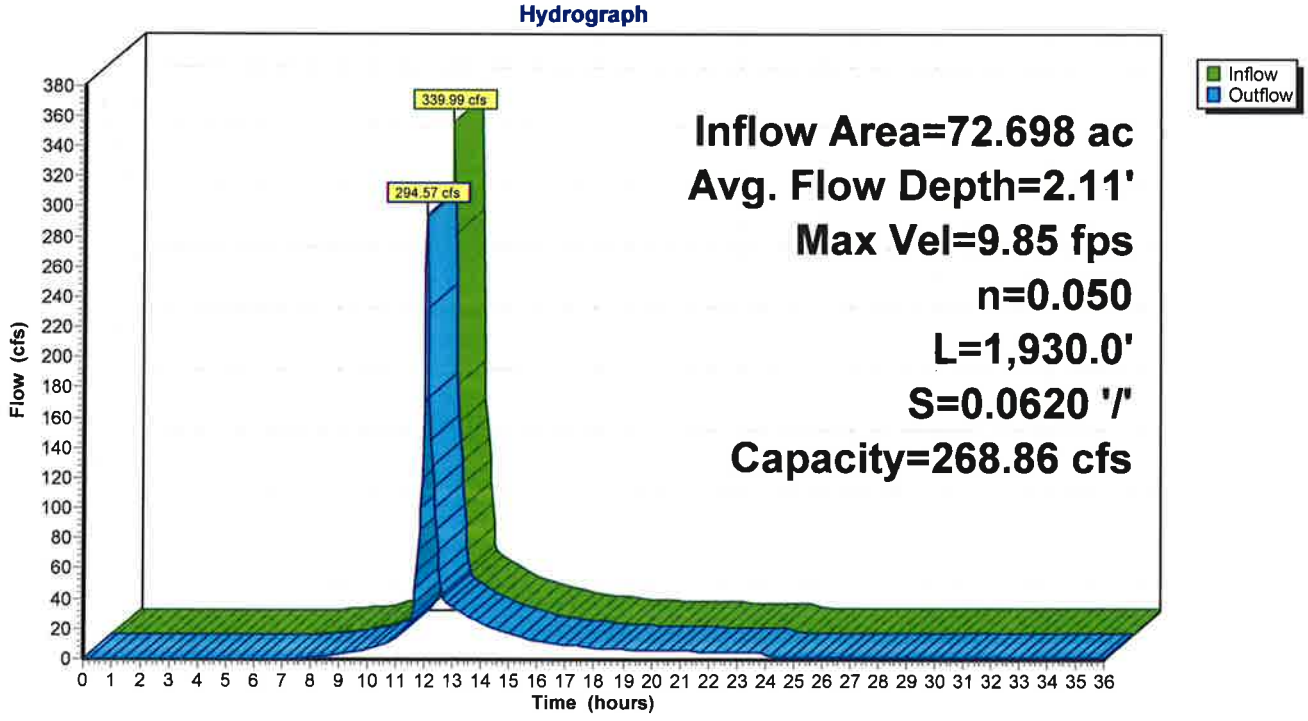
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.85 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 2.31 fps, Avg. Travel Time= 13.9 min

Peak Storage= 57,689 cf @ 12.04 hrs
Average Depth at Peak Storage= 2.11' , Surface Width= 18.42'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 268.86 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 1,930.0' Slope= 0.0620 '/'
Inlet Invert= 452.69', Outlet Invert= 333.03'

‡

Reach 9R: Channel 2



Summary for Reach 11R: Channel 1

Inflow Area = 9.770 ac, 37.67% Impervious, Inflow Depth > 4.00" for 25-Year event
Inflow = 7.91 cfs @ 13.11 hrs, Volume= 3.255 af
Outflow = 7.90 cfs @ 13.13 hrs, Volume= 3.249 af, Atten= 0%, Lag= 1.4 min
Routed to Reach 9R : Channel 2

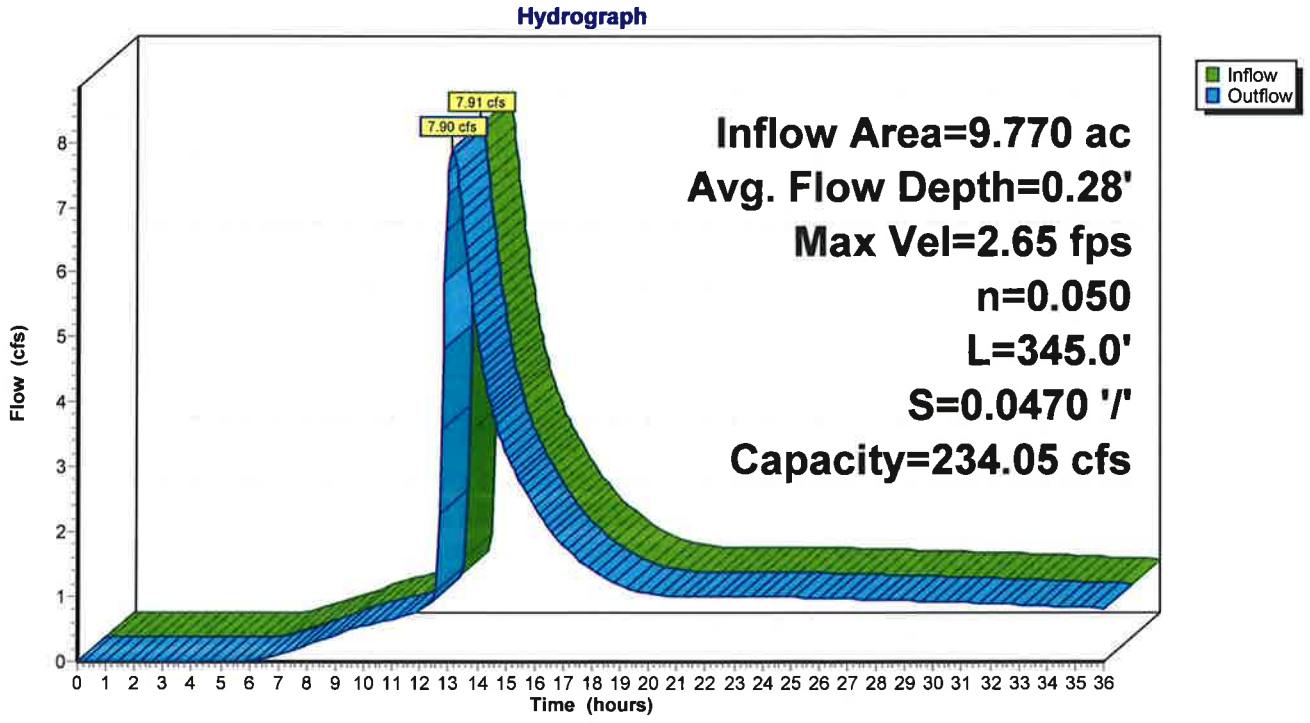
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.65 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 4.7 min

Peak Storage= 1,027 cf @ 13.13 hrs
Average Depth at Peak Storage= 0.28' , Surface Width= 11.13'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 234.05 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 345.0' Slope= 0.0470 '/'
Inlet Invert= 468.90', Outlet Invert= 452.69'

‡

Reach 11R: Channel 1

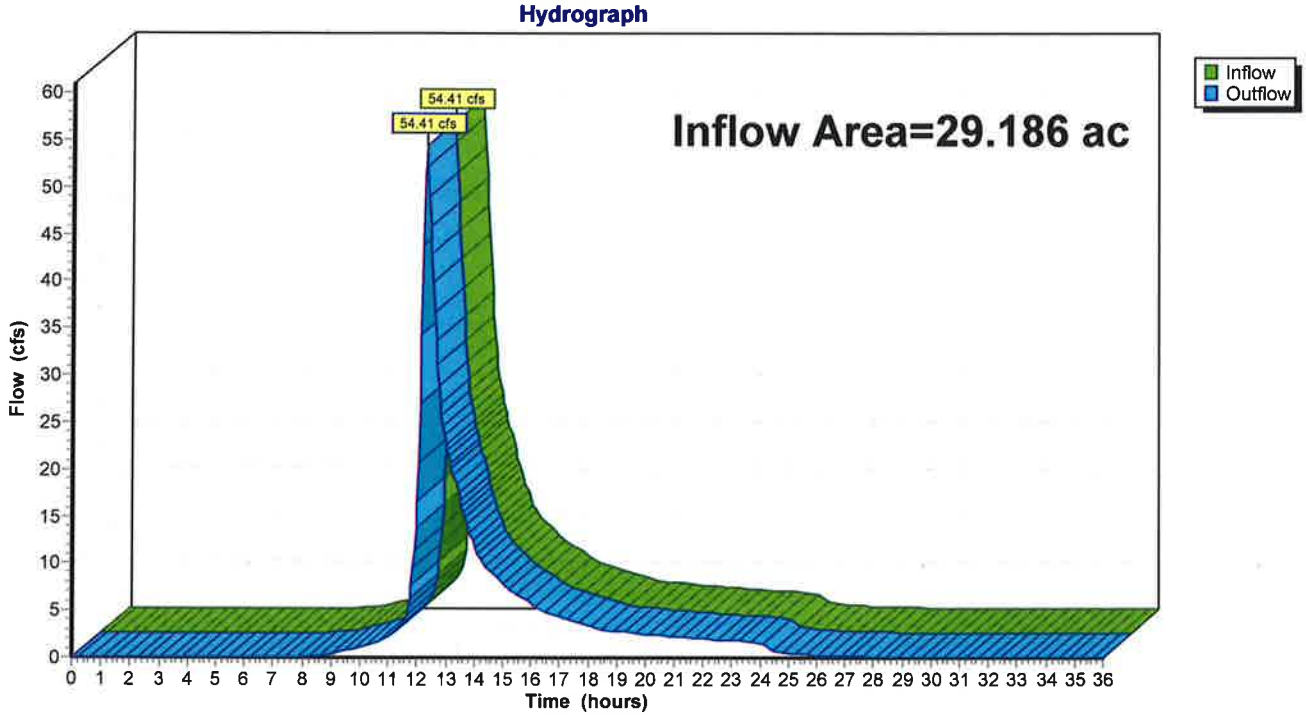


Summary for Reach 15R: POST DEV DP-1

Inflow Area = 29.186 ac, 42.68% Impervious, Inflow Depth > 3.43" for 25-Year event
Inflow = 54.41 cfs @ 12.30 hrs, Volume= 8.349 af
Outflow = 54.41 cfs @ 12.30 hrs, Volume= 8.349 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 15R: POST DEV DP-1

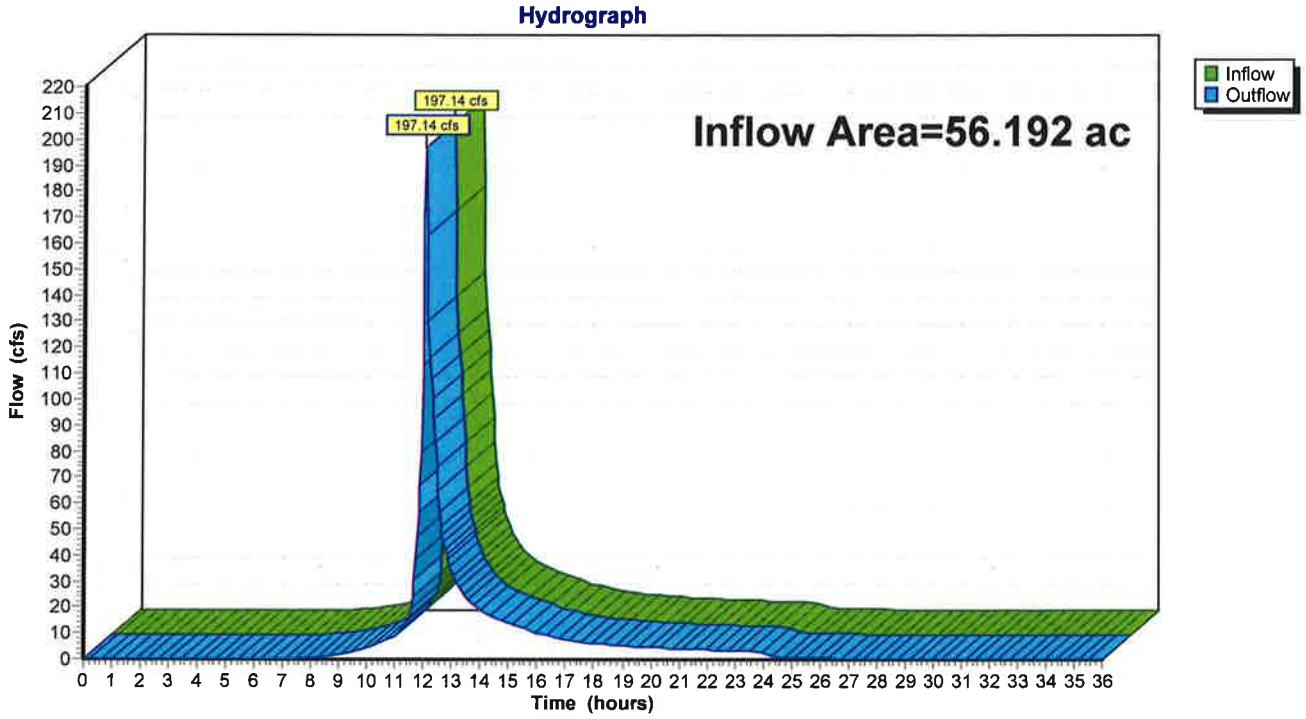


Summary for Reach 16R: POST DEV DP-2

Inflow Area = 56.192 ac, 24.26% Impervious, Inflow Depth > 3.97" for 25-Year event
Inflow = 197.14 cfs @ 12.05 hrs, Volume= 18.598 af
Outflow = 197.14 cfs @ 12.05 hrs, Volume= 18.598 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 16R: POST DEV DP-2



Summary for Reach 17R: Channel 2

Inflow Area = 42.596 ac, 6.53% Impervious, Inflow Depth = 4.01" for 25-Year event
Inflow = 229.61 cfs @ 12.00 hrs, Volume= 14.252 af
Outflow = 195.74 cfs @ 12.04 hrs, Volume= 14.252 af, Atten= 15%, Lag= 2.5 min
Routed to Reach 16R : POST DEV DP-2

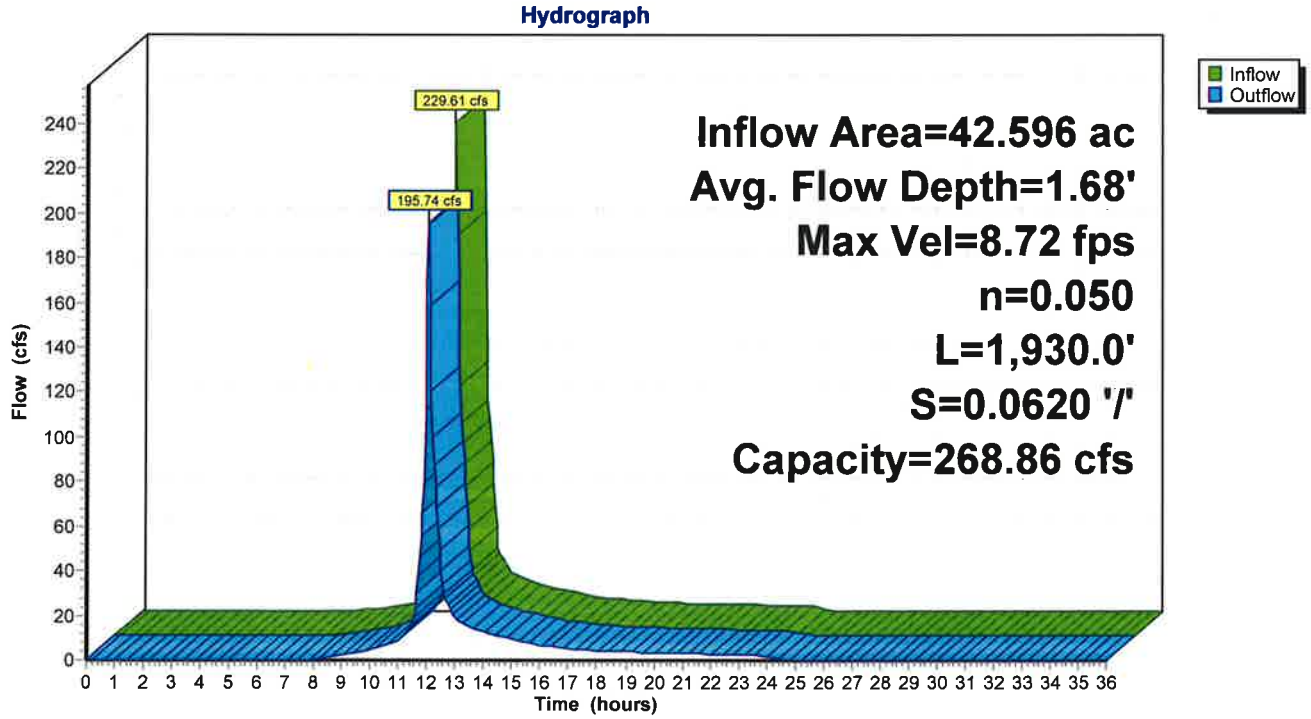
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.72 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 1.90 fps, Avg. Travel Time= 16.9 min

Peak Storage= 43,285 cf @ 12.04 hrs
Average Depth at Peak Storage= 1.68' , Surface Width= 16.72'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 268.86 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 1,930.0' Slope= 0.0620 '/'
Inlet Invert= 452.69', Outlet Invert= 333.03'

‡

Reach 17R: Channel 2



Summary for Pond 10P: EXISTING BASIN

Inflow Area = 9.770 ac, 37.67% Impervious, Inflow Depth = 4.55" for 25-Year event
Inflow = 29.01 cfs @ 12.41 hrs, Volume= 3.703 af
Outflow = 7.91 cfs @ 13.11 hrs, Volume= 3.255 af, Atten= 73%, Lag= 41.9 min
Primary = 7.91 cfs @ 13.11 hrs, Volume= 3.255 af
Routed to Reach 11R : Channel 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 476.50' @ 13.11 hrs Surf.Area= 0.757 ac Storage= 1.814 af

Plug-Flow detention time= 403.4 min calculated for 3.255 af (88% of inflow)
Center-of-Mass det. time= 347.8 min (1,173.5 - 825.7)

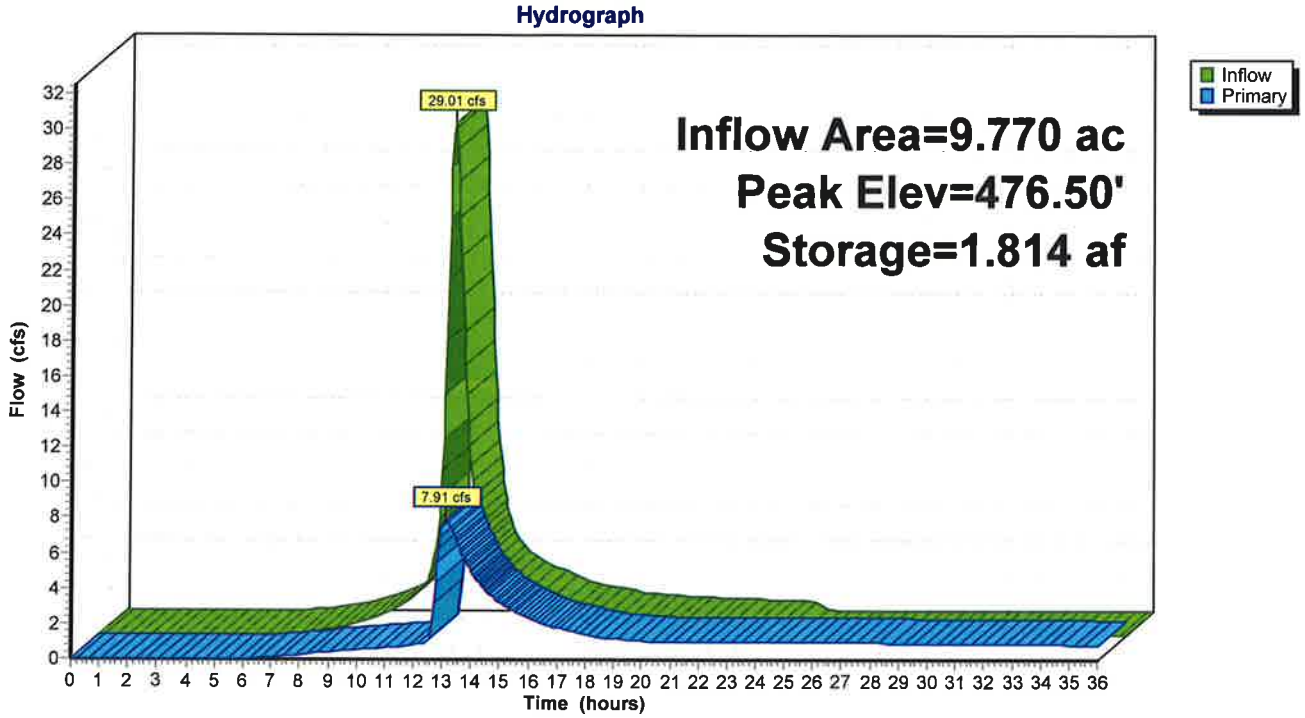
Volume	Invert	Avail.Storage	Storage Description
#1	471.00'	3.035 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
471.00	0.000	0.000	0.000
472.00	0.039	0.019	0.019
474.00	0.334	0.373	0.392
476.00	0.718	1.052	1.444
478.00	0.872	1.590	3.035

Device	Routing	Invert	Outlet Devices
#1	Device 3	471.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	476.00'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	471.00'	**15.0" Round Culvert** L= 119.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 471.00' / 468.90' S= 0.0176 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#4	Primary	471.00'	**Special & User-Defined** Elev. (feet) 471.00 471.17 478.00 Disch. (cfs) 0.000 0.090 0.090

Primary OutFlow Max=7.90 cfs @ 13.11 hrs HW=476.50' TW=469.18' (Dynamic Tailwater)
- **3=Culvert** (Passes 7.81 cfs of 11.51 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 0.97 cfs @ 11.12 fps)
  - **2=Sharp-Crested Rectangular Weir** (Weir Controls 6.84 cfs @ 2.31 fps)
- **4=Special & User-Defined** (Custom Controls 0.09 cfs)

Pond 10P: EXISTING BASIN



Summary for Pond 21P: WEST WETLAND

Inflow Area = 15.435 ac, 62.13% Impervious, Inflow Depth = 3.46" for 25-Year event
Inflow = 80.43 cfs @ 12.17 hrs, Volume= 4.452 af
Outflow = 16.12 cfs @ 12.62 hrs, Volume= 3.987 af, Atten= 80%, Lag= 26.7 min
Primary = 16.12 cfs @ 12.62 hrs, Volume= 3.987 af
Routed to Reach 15R : POST DEV DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 402.13' @ 12.62 hrs Surf.Area= 42,442 sf Storage= 66,215 cf

Plug-Flow detention time= 122.7 min calculated for 3.982 af (89% of inflow)
Center-of-Mass det. time= 74.1 min (931.3 - 857.2)

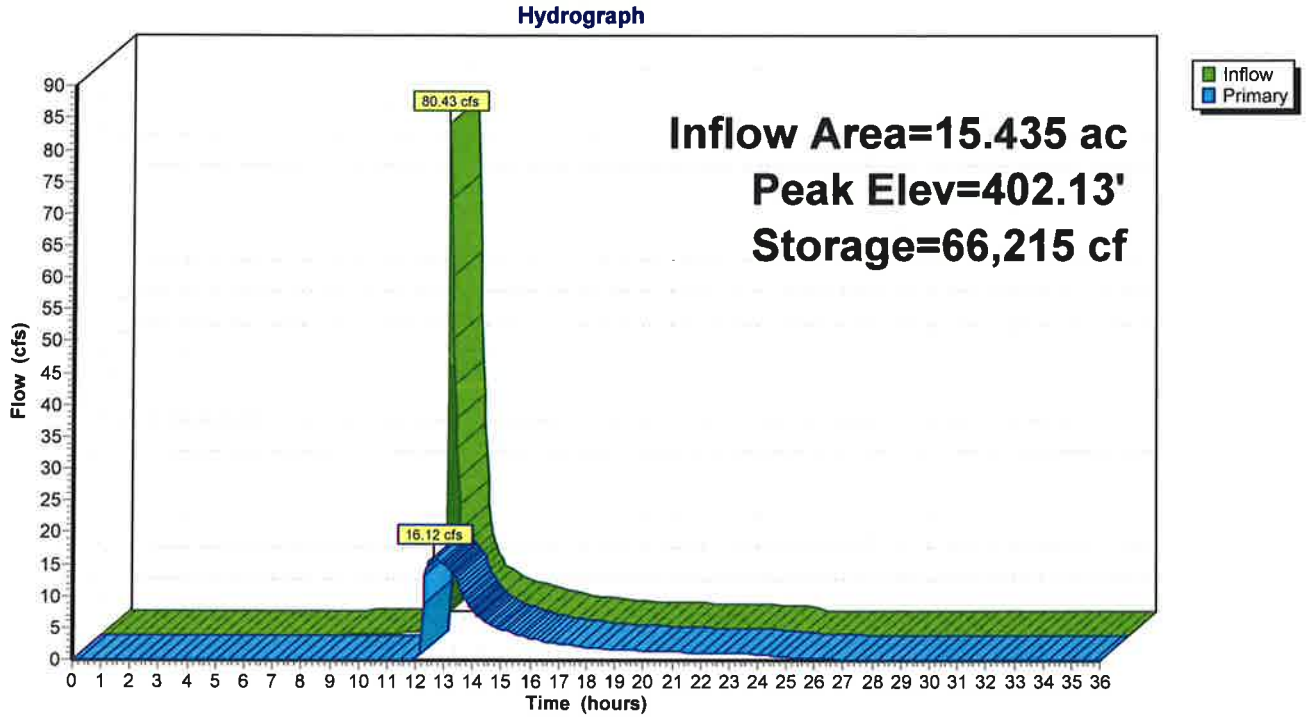
Volume	Invert	Avail.Storage	Storage Description
#1	400.50'	155,009 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
400.50	38,427	0	0
402.00	41,700	60,095	60,095
404.00	53,214	94,914	155,009

Device	Routing	Invert	Outlet Devices
#0	Primary	404.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Device 2	401.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	395.00'	**24.0" Round Culvert** L= 45.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 395.00' / 390.00' S= 0.1111 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#3	Primary	402.00'	**143.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=16.11 cfs @ 12.62 hrs HW=402.13' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 16.06 cfs of 33.04 cfs potential flow)
↑—**1=Orifice/Grate** (Orifice Controls 16.06 cfs @ 5.11 fps)
—**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.04 cfs @ 0.88 fps)

Pond 21P: WEST WETLAND



Summary for Pond 24P: EAST WETLAND

Inflow Area = 13.596 ac, 79.80% Impervious, Inflow Depth > 3.86" for 25-Year event
Inflow = 80.70 cfs @ 12.12 hrs, Volume= 4.369 af
Outflow = 25.29 cfs @ 12.42 hrs, Volume= 4.347 af, Atten= 69%, Lag= 18.2 min
Primary = 25.29 cfs @ 12.42 hrs, Volume= 4.347 af
Routed to Reach 16R : POST DEV DP-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 390.00' Storage= 1.389 af
Peak Elev= 391.14' @ 12.42 hrs Storage= 2.512 af (1.123 af above start)

Plug-Flow detention time= 262.6 min calculated for 2.958 af (68% of inflow)
Center-of-Mass det. time= 64.5 min (928.0 - 863.5)

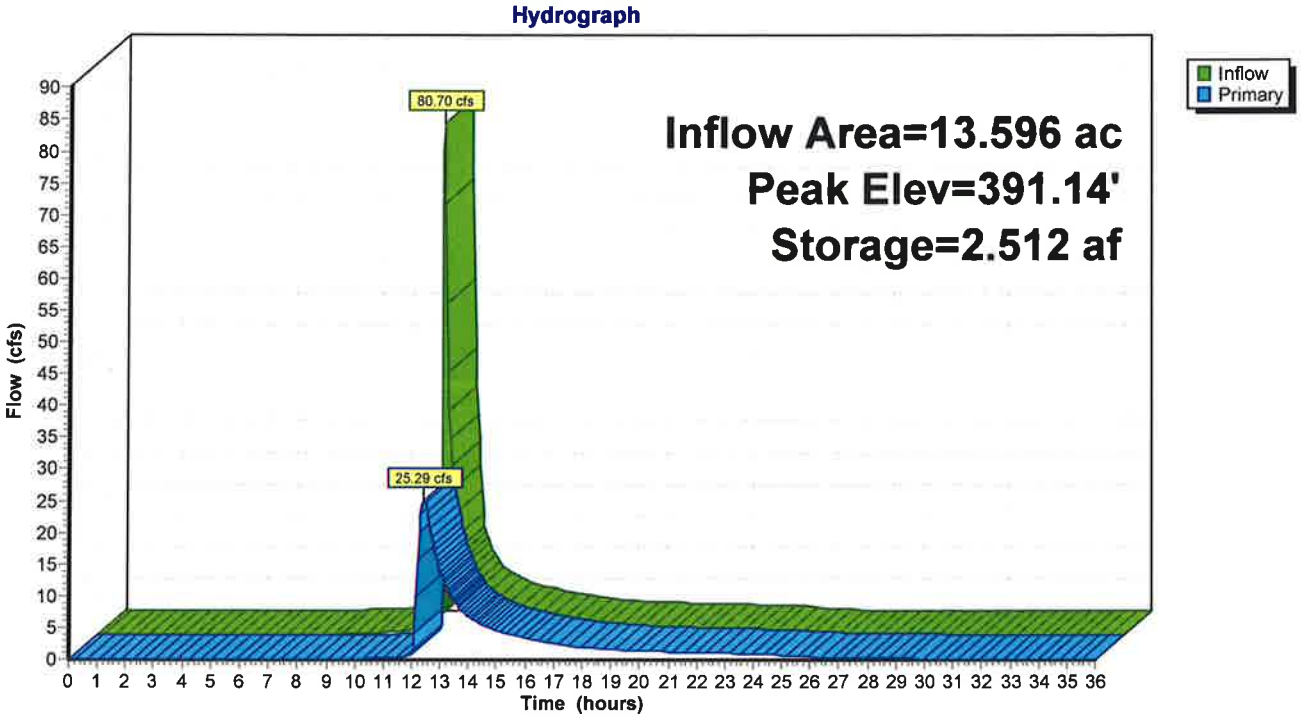
Volume	Invert	Avail.Storage	Storage Description
#1	384.00'	4.344 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
384.00	0.000
388.50	0.530
389.50	0.973
390.00	1.389
393.00	4.344

Device	Routing	Invert	Outlet Devices
#1	Primary	390.00'	**143.0 deg x 4.0' long x 3.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=25.20 cfs @ 12.42 hrs HW=391.14' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 25.20 cfs @ 2.99 fps)

Pond 24P: EAST WETLAND



Summary for Pond 34P: WEST CISTERN

Inflow Area = 13.620 ac, 64.39% Impervious, Inflow Depth = 5.21" for 25-Year event
Inflow = 69.71 cfs @ 12.13 hrs, Volume= 5.915 af
Outflow = 74.27 cfs @ 12.17 hrs, Volume= 3.731 af, Atten= 0%, Lag= 2.5 min
Primary = 74.27 cfs @ 12.17 hrs, Volume= 3.731 af
Routed to Pond 21P : WEST WETLAND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 400.00' @ 12.15 hrs Surf.Area= 0.689 ac Storage= 2.183 af

Plug-Flow detention time= 179.9 min calculated for 3.731 af (63% of inflow)
Center-of-Mass det. time= 80.1 min (868.9 - 788.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	394.50'	0.902 af	**99.08'W x 303.00'L x 5.50'H Field A** 3.791 af Overall - 1.535 af Embedded = 2.256 af x 40.0% Voids
#2A	395.00'	1.281 af	**ADS N-12 48"** x 225 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 225 Chambers in 15 Rows
		2.183 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	400.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	399.00'	**12.0" Round Culvert** L= 100.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 399.00' / 398.00' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.17 hrs HW=400.00' TW=401.14' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond 34P: WEST CISTERN - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12® Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

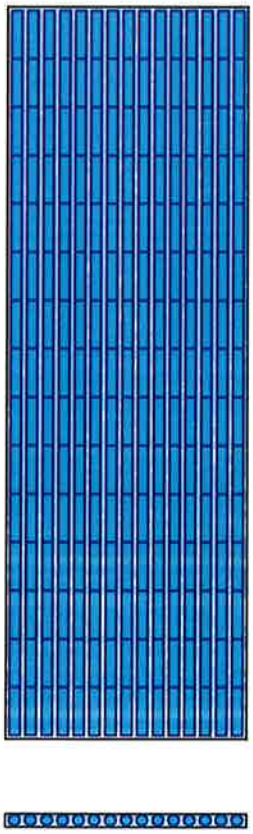
15 Chambers/Row x 20.00' Long = 300.00' Row Length +18.0" End Stone x 2 = 303.00' Base Length
15 Rows x 54.0" Wide + 24.5" Spacing x 14 + 18.0" Side Stone x 2 = 99.08' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

225 Chambers x 248.0 cf = 55,800.0 cf Chamber Storage
225 Chambers x 297.0 cf = 66,820.3 cf Displacement

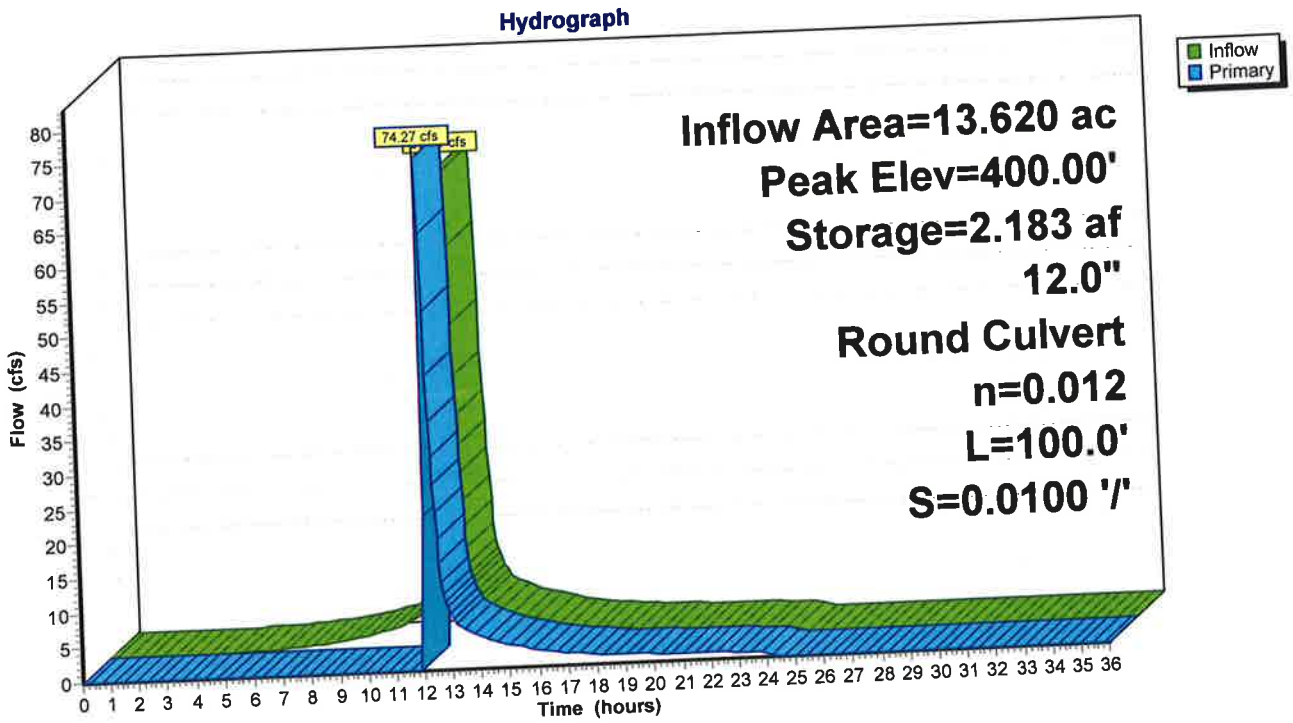
165,127.9 cf Field - 66,820.3 cf Chambers = 98,307.5 cf Stone x 40.0% Voids = 39,323.0 cf Stone Storage

Chamber Storage + Stone Storage = 95,123.0 cf = 2.184 af
Overall Storage Efficiency = 57.6%
Overall System Size = 303.00' x 99.08' x 5.50'

225 Chambers
6,115.8 cy Field
3,641.0 cy Stone



Pond 34P: WEST CISTERN



Summary for Pond 36P: CISTERN LOWER

Inflow Area = 10.840 ac, 89.94% Impervious, Inflow Depth = 6.02" for 25-Year event
Inflow = 68.72 cfs @ 12.07 hrs, Volume= 5.434 af
Outflow = 69.78 cfs @ 12.12 hrs, Volume= 3.349 af, Atten= 0%, Lag= 2.8 min
Primary = 69.78 cfs @ 12.12 hrs, Volume= 3.349 af
Routed to Pond 24P : EAST WETLAND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 399.00' @ 12.05 hrs Surf.Area= 0.742 ac Storage= 2.349 af

Plug-Flow detention time= 229.2 min calculated for 3.349 af (62% of inflow)
Center-of-Mass det. time= 123.9 min (879.5 - 755.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	393.50'	0.971 af	**144.88'W x 223.00'L x 5.50'H Field A** 4.079 af Overall - 1.651 af Embedded = 2.429 af x 40.0% Voids
#2A	394.00'	1.378 af	**ADS N-12 48"** x 242 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 242 Chambers in 22 Rows
		2.349 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	399.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	398.00'	**12.0" Round Culvert** L= 100.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 398.00' / 393.00' S= 0.0500 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Primary	398.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=10.54 cfs @ 12.12 hrs HW=399.00' TW=390.51' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.36 cfs @ 3.00 fps)
└—**2=Sharp-Crested Rectangular Weir** (Weir Controls 8.18 cfs @ 2.83 fps)

Pond 36P: CISTERN LOWER - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12® Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

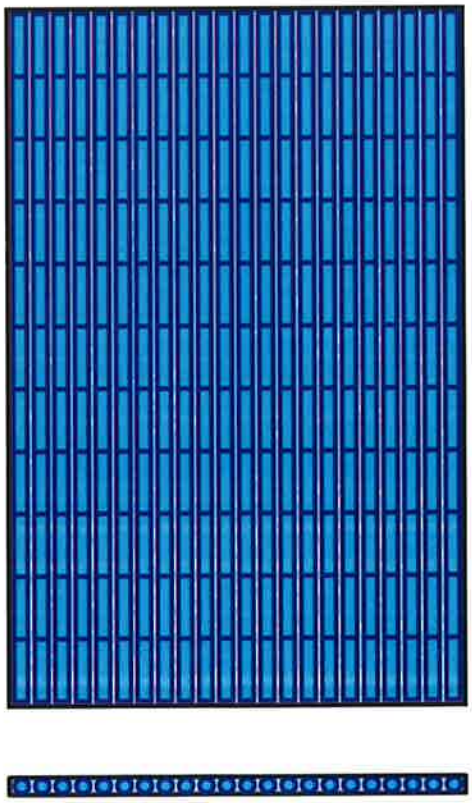
11 Chambers/Row x 20.00' Long = 220.00' Row Length +18.0" End Stone x 2 = 223.00' Base Length
22 Rows x 54.0" Wide + 24.5" Spacing x 21 + 18.0" Side Stone x 2 = 144.88' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

242 Chambers x 248.0 cf = 60,016.0 cf Chamber Storage
242 Chambers x 297.0 cf = 71,869.0 cf Displacement

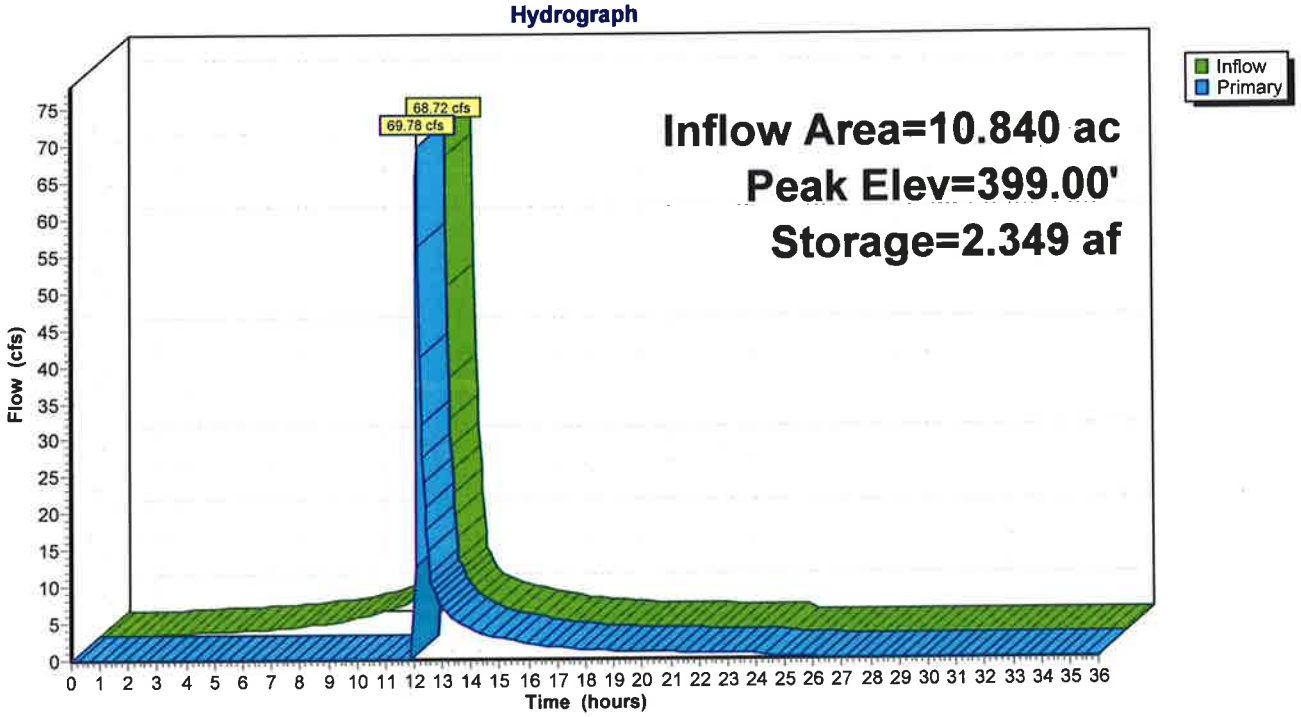
177,695.1 cf Field - 71,869.0 cf Chambers = 105,826.1 cf Stone x 40.0% Voids = 42,330.5 cf Stone Storage

Chamber Storage + Stone Storage = 102,346.5 cf = 2.350 af
Overall Storage Efficiency = 57.6%
Overall System Size = 223.00' x 144.88' x 5.50'

242 Chambers
6,581.3 cy Field
3,919.5 cy Stone



Pond 36P: CISTERN LOWER



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3S: POST DEV DA-2 Runoff Area=13.620 ac 64.39% Impervious Runoff Depth=7.95"
Flow Length=1,344' Tc=9.4 min CN=89 Runoff=103.81 cfs 9.018 af

Subcatchment 4S: PRE DEV DA-1 Runoff Area=23.344 ac 12.28% Impervious Runoff Depth=6.08"
Flow Length=1,887' Tc=18.7 min CN=74 Runoff=114.59 cfs 11.837 af

Subcatchment 5S: PRE DEV DA-2 Runoff Area=9.770 ac 37.67% Impervious Runoff Depth=7.21"
Flow Length=928' Tc=30.2 min CN=83 Runoff=45.14 cfs 5.867 af

Subcatchment 6S: PRE DEV DA-3 Runoff Area=62.928 ac 4.42% Impervious Runoff Depth=6.58"
Tc=0.0 min CN=78 Runoff=547.66 cfs 34.532 af

Subcatchment 12S: POST DEV DA-6 Runoff Area=13.751 ac 20.84% Impervious Runoff Depth=6.34"
Flow Length=1,887' Tc=18.7 min CN=76 Runoff=70.01 cfs 7.260 af

Subcatchment 14S: POST DEV DA-5 Runoff Area=42.596 ac 6.53% Impervious Runoff Depth=6.58"
Tc=0.0 min CN=78 Runoff=370.71 cfs 23.374 af

Subcatchment 26S: POST DEV DA-4 Runoff Area=2.756 ac 39.91% Impervious Runoff Depth=7.08"
Flow Length=217' Tc=11.6 min CN=82 Runoff=18.38 cfs 1.627 af

Subcatchment 32S: POST DEV DA-3 Runoff Area=1.815 ac 45.18% Impervious Runoff Depth=7.45"
Tc=5.0 min CN=85 Runoff=15.24 cfs 1.127 af

Subcatchment 35S: POST DEV DA-1 Runoff Area=10.840 ac 89.94% Impervious Runoff Depth=8.80"
Tc=5.0 min CN=96 Runoff=98.93 cfs 7.948 af

Reach 7R: PRE DEV DP-1 Inflow=114.59 cfs 11.837 af
Outflow=114.59 cfs 11.837 af

Reach 8R: PRE DEV DP-2 Inflow=477.41 cfs 39.824 af
Outflow=477.41 cfs 39.824 af

Reach 9R: Channel 2 Avg. Flow Depth=2.85' Max Vel=11.01 fps Inflow=548.56 cfs 39.855 af
n=0.050 L=1,930.0' S=0.0620 '/' Capacity=268.86 cfs Outflow=477.41 cfs 39.824 af

Reach 11R: Channel 1 Avg. Flow Depth=0.38' Max Vel=3.18 fps Inflow=12.84 cfs 5.329 af
n=0.050 L=345.0' S=0.0470 '/' Capacity=234.05 cfs Outflow=12.84 cfs 5.323 af

Reach 15R: POST DEV DP-1 Inflow=102.23 cfs 14.757 af
Outflow=102.23 cfs 14.757 af

Reach 16R: POST DEV DP-2 Inflow=347.62 cfs 30.841 af
Outflow=347.62 cfs 30.841 af

Reach 17R: Channel 2 Avg. Flow Depth=2.22' Max Vel=10.07 fps Inflow=370.71 cfs 23.374 af
n=0.050 L=1,930.0' S=0.0620 '/' Capacity=268.86 cfs Outflow=321.59 cfs 23.374 af

Pond 10P: EXISTING BASIN Peak Elev=477.60' Storage=2.694 af Inflow=45.14 cfs 5.867 af
Outflow=12.84 cfs 5.329 af

Pond 21P: WEST WETLAND Peak Elev=403.41' Storage=126,783 cf Inflow=112.21 cfs 7.962 af
Outflow=40.74 cfs 7.497 af

Pond 24P: EAST WETLAND Peak Elev=391.85' Storage=3.211 af Inflow=111.35 cfs 7.489 af
Outflow=65.40 cfs 7.466 af

Pond 34P: WEST CISTERN Peak Elev=400.00' Storage=2.183 af Inflow=103.81 cfs 9.018 af
12.0" Round Culvert n=0.012 L=100.0' S=0.0100 '/' Outflow=101.64 cfs 6.835 af

Pond 36P: CISTERN LOWER Peak Elev=399.00' Storage=2.349 af Inflow=98.93 cfs 7.948 af
Outflow=95.07 cfs 5.863 af

Total Runoff Area = 181.420 ac Runoff Volume = 102.590 af Average Runoff Depth = 6.79"
80.48% Pervious = 146.002 ac 19.52% Impervious = 35.418 ac

Summary for Subcatchment 3S: POST DEV DA-2

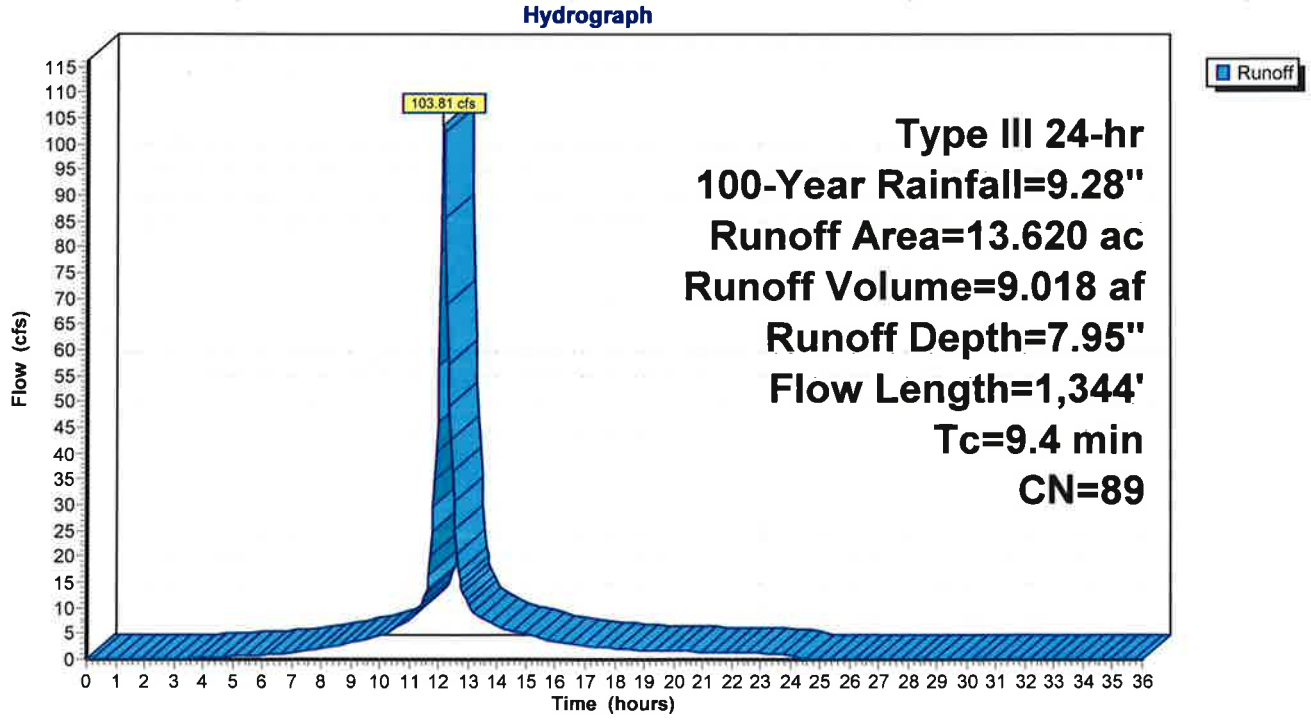
Runoff = 103.81 cfs @ 12.13 hrs, Volume= 9.018 af, Depth= 7.95"
Routed to Pond 34P : WEST CISTERN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
8.770	98	Paved parking, HSG C
4.850	74	>75% Grass cover, Good, HSG C
13.620	89	Weighted Average
4.850		35.61% Pervious Area
8.770		64.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	100	0.0950	0.22		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
0.5	227	0.2200	7.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	1,017	0.0220	11.82	18.91	**Channel Flow,** Area= 1.6 sf Perim= 3.1' r= 0.52' n= 0.012
9.4	1,344	Total			

Subcatchment 3S: POST DEV DA-2



Summary for Subcatchment 4S: PRE DEV DA-1

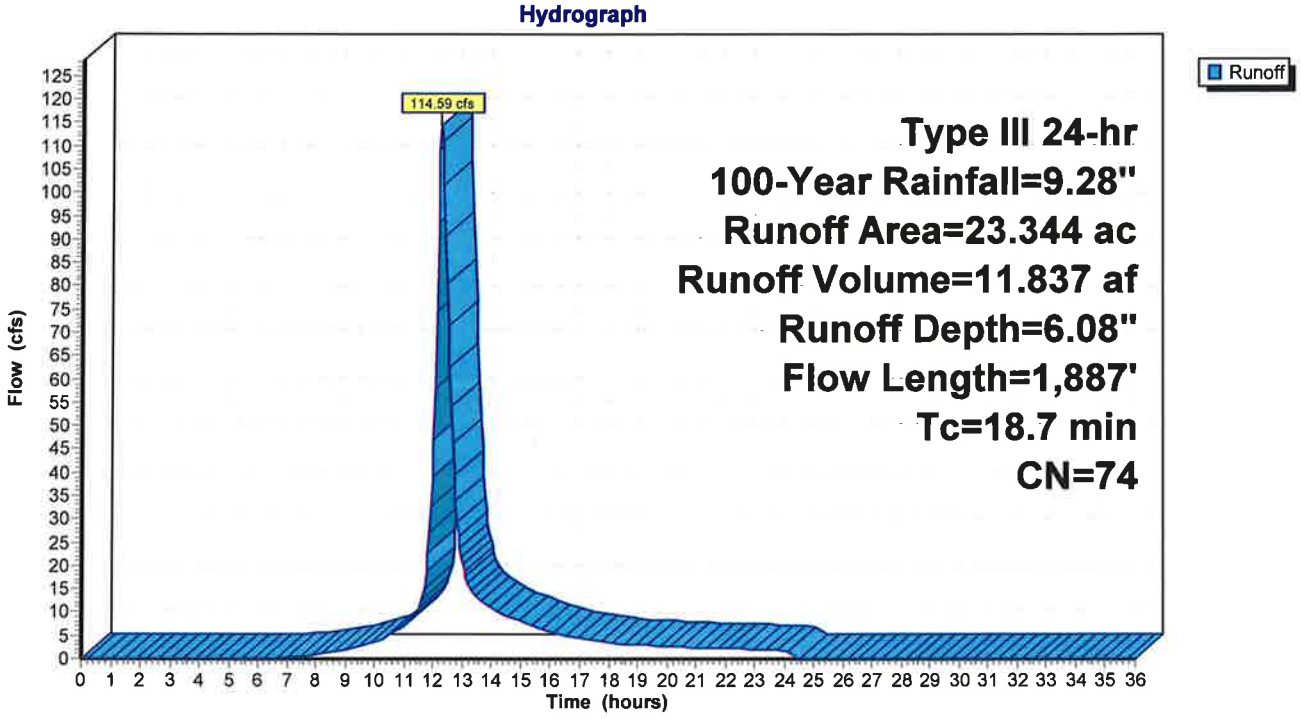
Runoff = 114.59 cfs @ 12.26 hrs, Volume= 11.837 af, Depth= 6.08"
Routed to Reach 7R : PRE DEV DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
15.478	70	Woods, Good, HSG C
5.000	74	Pasture/grassland/range, Good, HSG C
2.866	98	Paved parking, HSG C
23.344	74	Weighted Average
20.478		87.72% Pervious Area
2.866		12.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	507	0.0870	4.75		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	1,120	0.1700	27.00	27.00	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.2	160	0.0250	11.53	16.14	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
18.7	1,887	Total			

Subcatchment 4S: PRE DEV DA-1



Summary for Subcatchment 5S: PRE DEV DA-2

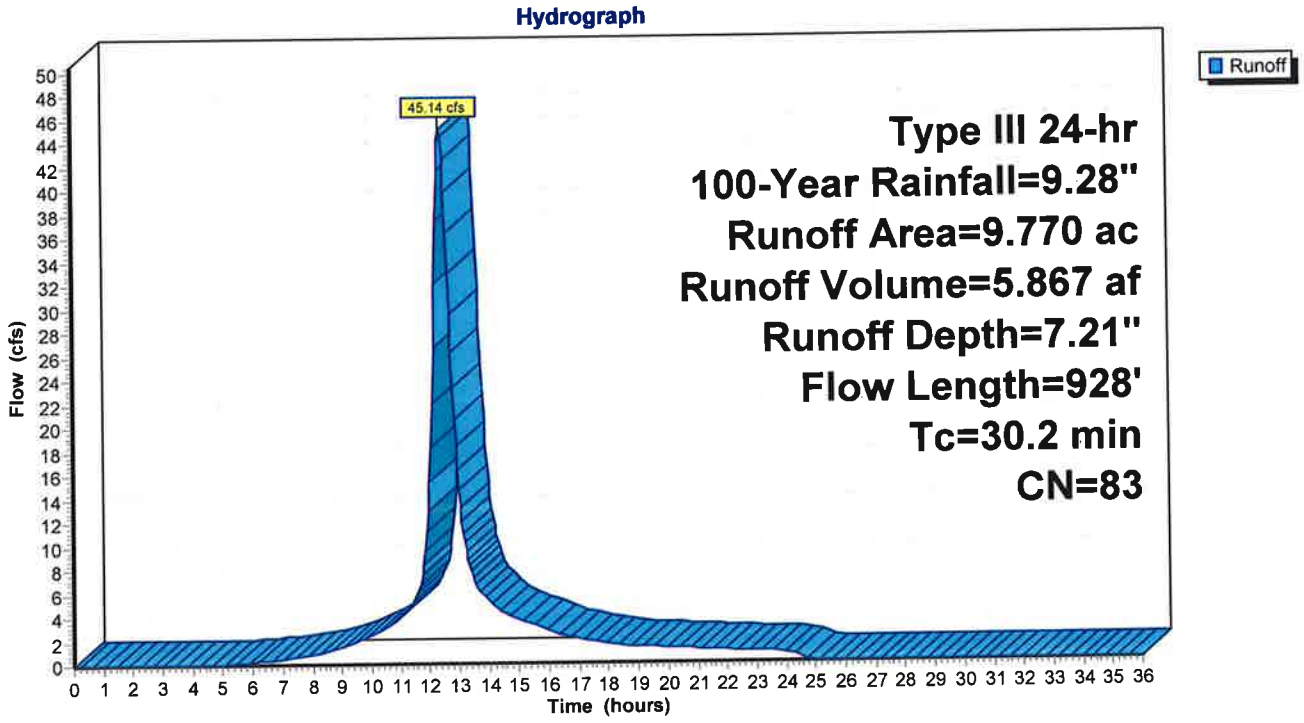
Runoff = 45.14 cfs @ 12.40 hrs, Volume= 5.867 af, Depth= 7.21"
Routed to Pond 10P : EXISTING BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
3.680	98	Paved parking, HSG C
5.611	74	>75% Grass cover, Good, HSG C
0.479	70	Woods, Good, HSG C
9.770	83	Weighted Average
6.090		62.33% Pervious Area
3.680		37.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.3	130	0.0150	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.8	543	0.0270	10.76	10.76	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.1	255	0.1800	30.93	43.30	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
30.2	928	Total			

Subcatchment 5S: PRE DEV DA-2



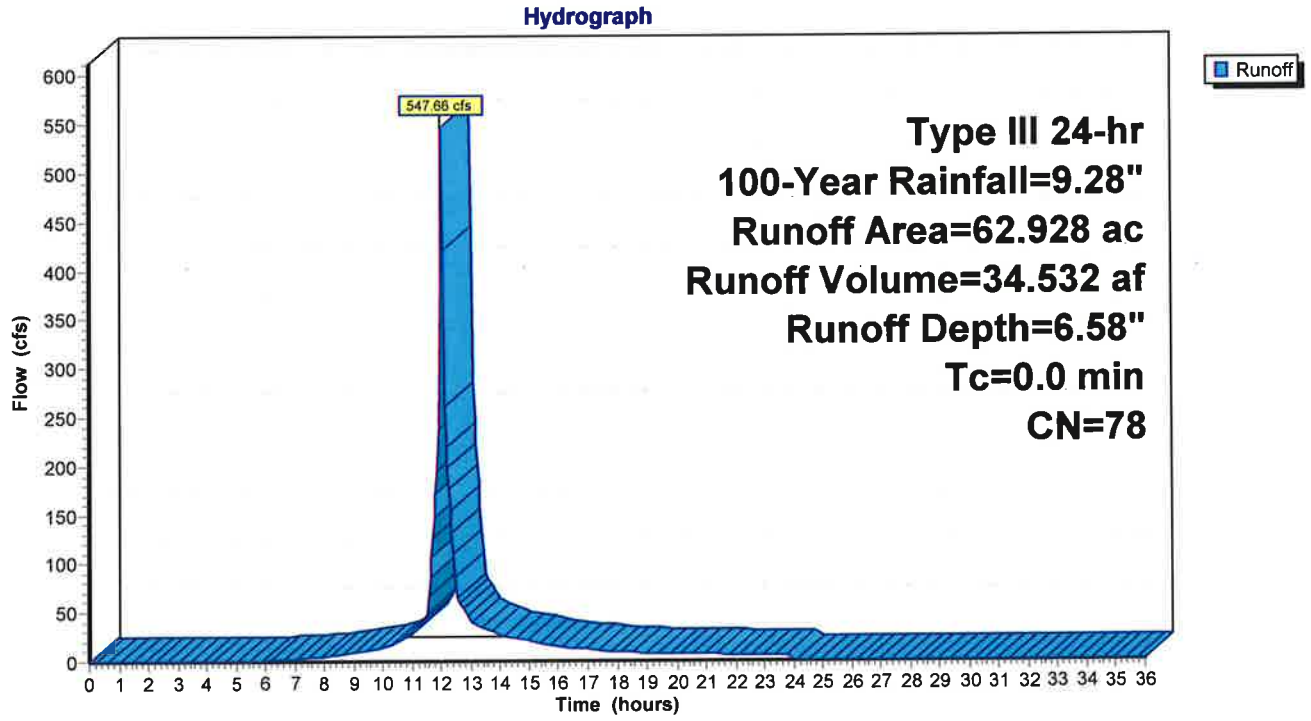
Summary for Subcatchment 6S: PRE DEV DA-3

Runoff = 547.66 cfs @ 12.00 hrs, Volume= 34.532 af, Depth= 6.58"
Routed to Reach 9R : Channel 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
2.783	98	Paved parking, HSG C
5.613	74	>75% Grass cover, Good, HSG C
53.591	77	Woods, Poor, HSG C
0.941	83	Woods, Poor, HSG D
62.928	78	Weighted Average
60.145		95.58% Pervious Area
2.783		4.42% Impervious Area

Subcatchment 6S: PRE DEV DA-3



Summary for Subcatchment 12S: POST DEV DA-6

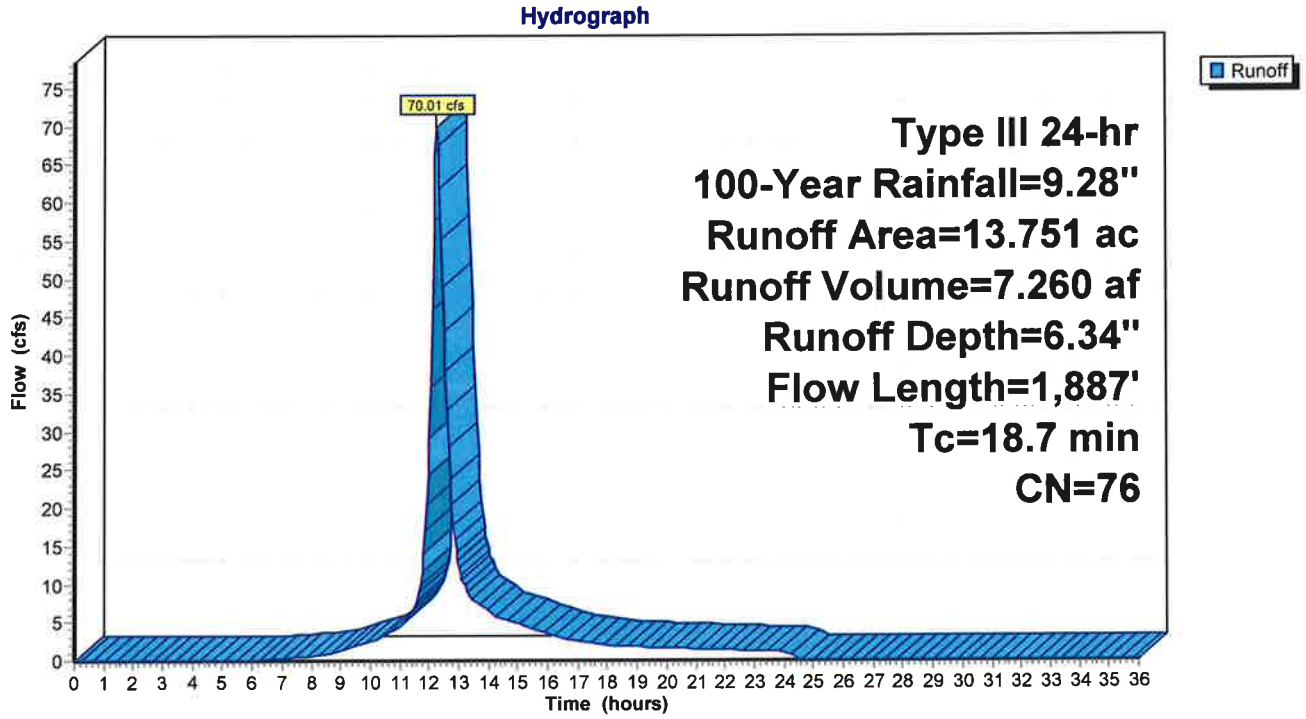
Runoff = 70.01 cfs @ 12.25 hrs, Volume= 7.260 af, Depth= 6.34"
Routed to Reach 15R : POST DEV DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
9.130	70	Woods, Good, HSG C
1.755	74	Pasture/grassland/range, Good, HSG C
2.866	98	Paved parking, HSG C
13.751	76	Weighted Average
10.885		79.16% Pervious Area
2.866		20.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.8	507	0.0870	4.75		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	1,120	0.1700	27.00	27.00	**Channel Flow,** Area= 1.0 sf Perim= 2.6' r= 0.38' n= 0.012
0.2	160	0.0250	11.53	16.14	**Channel Flow,** Area= 1.4 sf Perim= 3.1' r= 0.45' n= 0.012
18.7	1,887	Total			

Subcatchment 12S: POST DEV DA-6



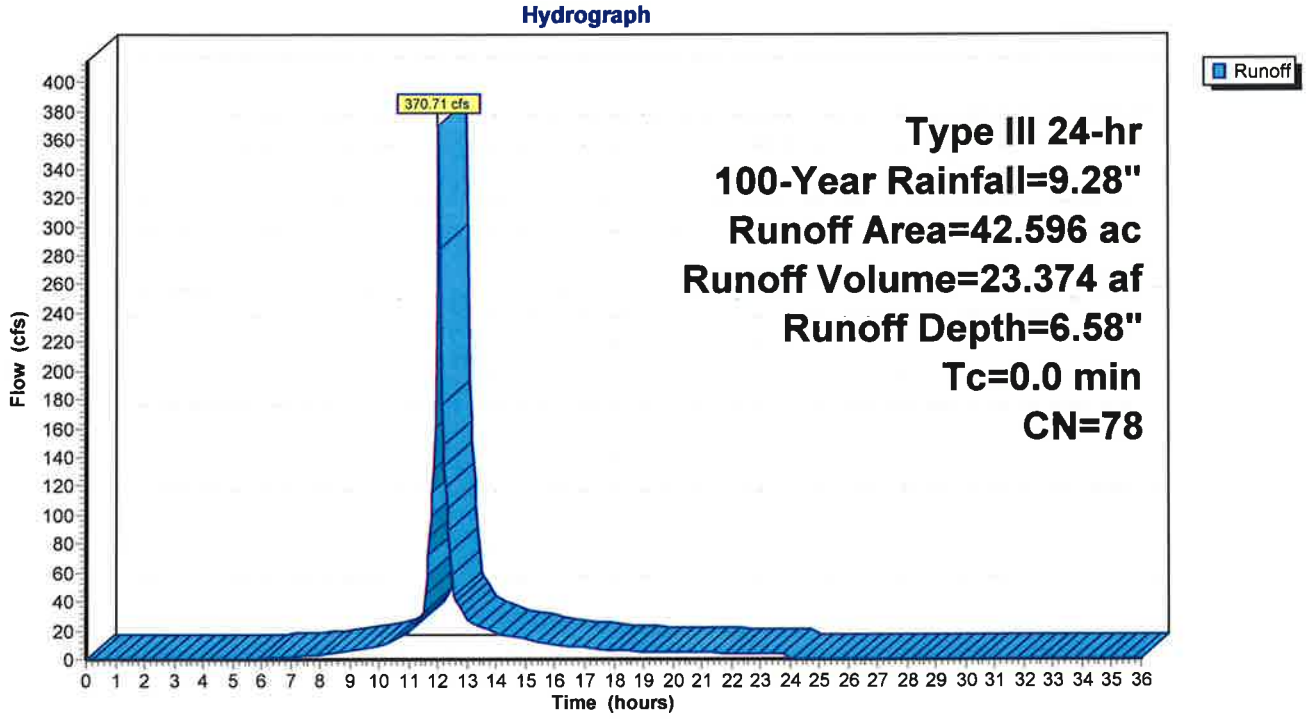
Summary for Subcatchment 14S: POST DEV DA-5

Runoff = 370.71 cfs @ 12.00 hrs, Volume= 23.374 af, Depth= 6.58"
Routed to Reach 17R : Channel 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
2.783	98	Paved parking, HSG C
3.623	74	>75% Grass cover, Good, HSG C
36.190	77	Woods, Poor, HSG C
42.596	78	Weighted Average
39.813		93.47% Pervious Area
2.783		6.53% Impervious Area

Subcatchment 14S: POST DEV DA-5



Summary for Subcatchment 26S: POST DEV DA-4

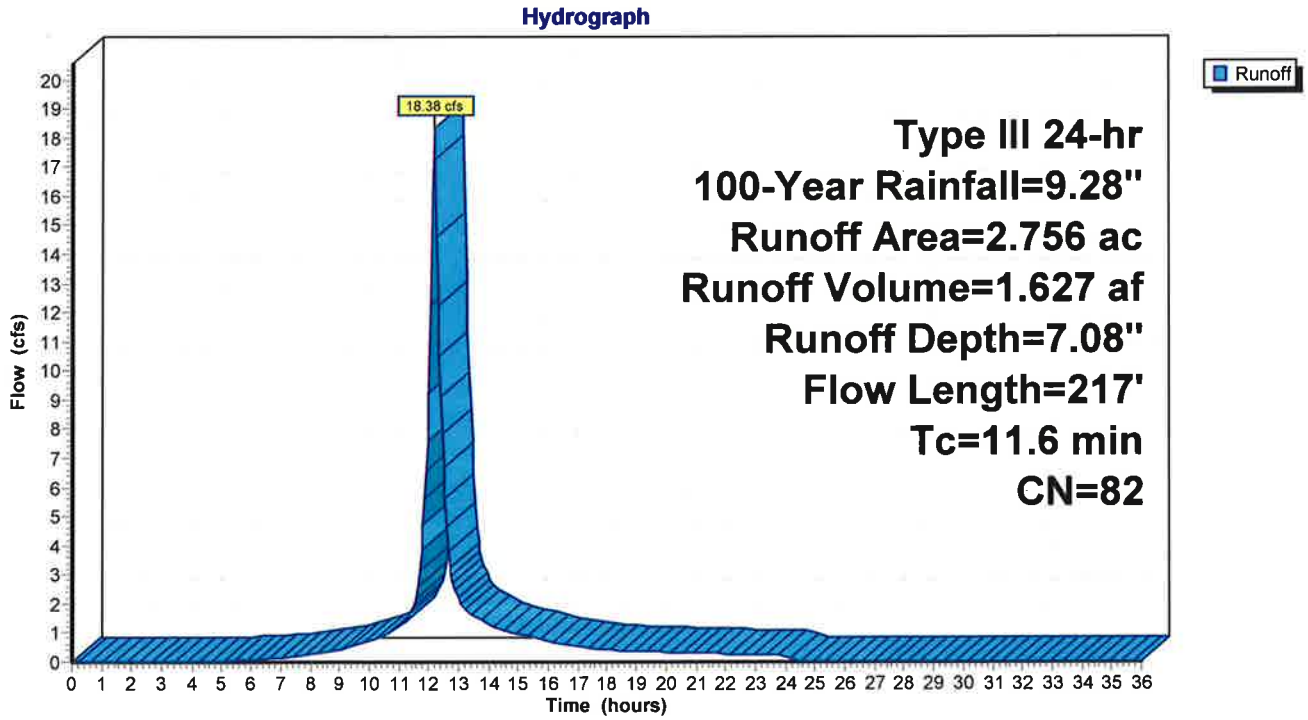
Runoff = 18.38 cfs @ 12.16 hrs, Volume= 1.627 af, Depth= 7.08"
Routed to Pond 24P : EAST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
1.100	98	Water Surface, HSG C
1.240	70	Woods, Good, HSG C
0.416	74	>75% Grass cover, Good, HSG C
2.756	82	Weighted Average
1.656		60.09% Pervious Area
1.100		39.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0400	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
1.0	117	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.6	217	Total			

Subcatchment 26S: POST DEV DA-4



Summary for Subcatchment 32S: POST DEV DA-3

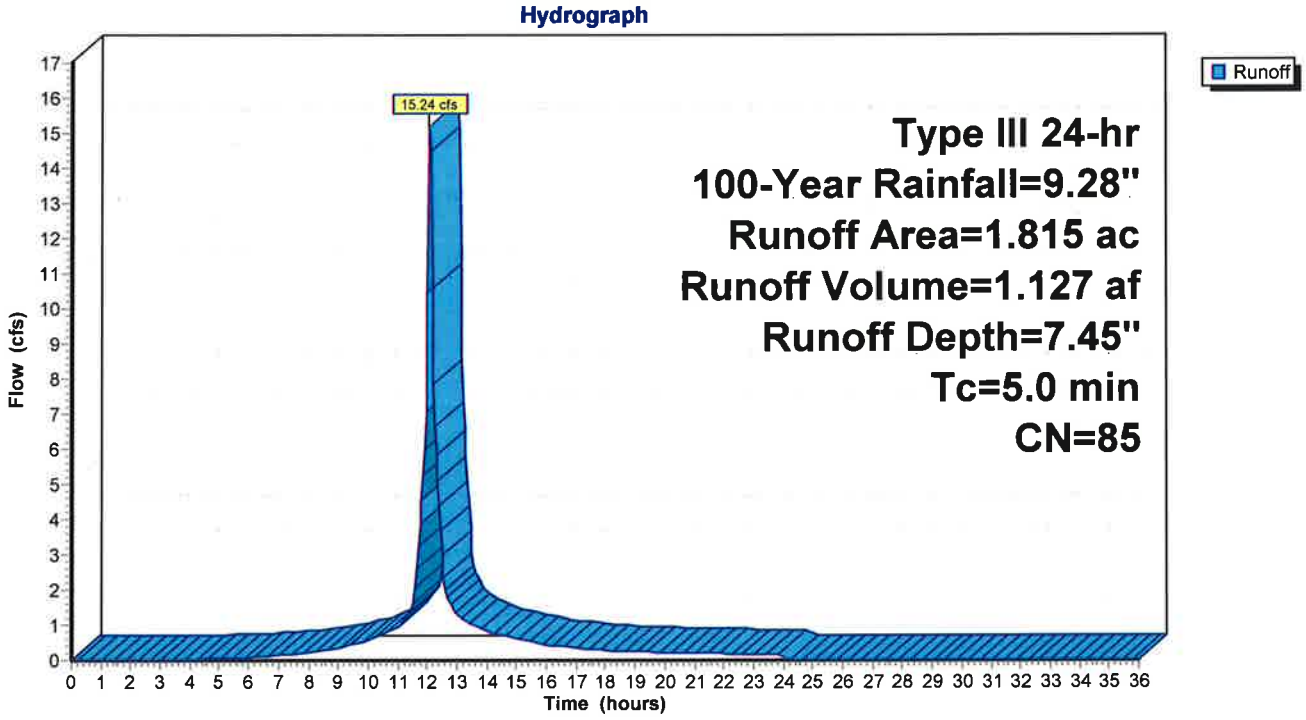
Runoff = 15.24 cfs @ 12.07 hrs, Volume= 1.127 af, Depth= 7.45"
Routed to Pond 21P : WEST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
0.995	74	>75% Grass cover, Good, HSG C
0.820	98	Paved roads w/curbs & sewers, HSG C
1.815	85	Weighted Average
0.995		54.82% Pervious Area
0.820		45.18% Impervious Area

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

Subcatchment 32S: POST DEV DA-3



Summary for Subcatchment 35S: POST DEV DA-1

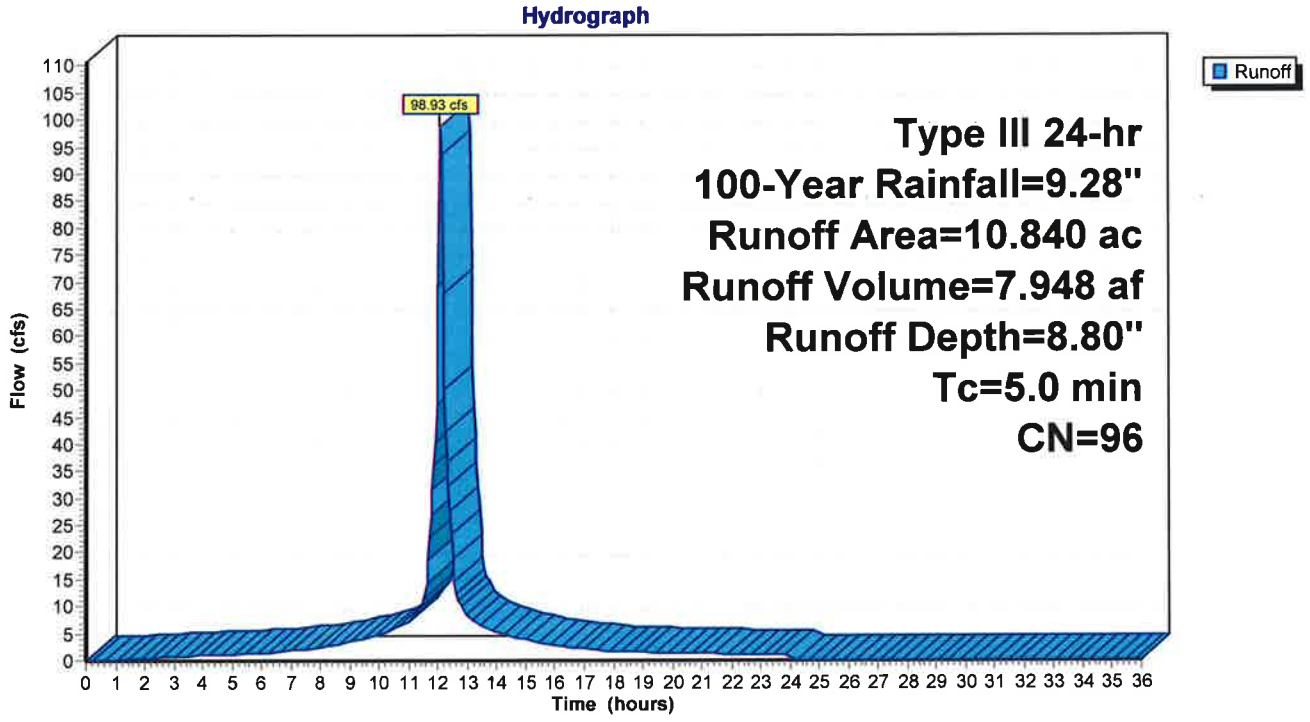
Runoff = 98.93 cfs @ 12.07 hrs, Volume= 7.948 af, Depth= 8.80"
Routed to Pond 36P : CISTERN LOWER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
9.750	98	Paved parking, HSG C
1.090	74	>75% Grass cover, Good, HSG C
10.840	96	Weighted Average
1.090		10.06% Pervious Area
9.750		89.94% Impervious Area

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

Subcatchment 35S: POST DEV DA-1

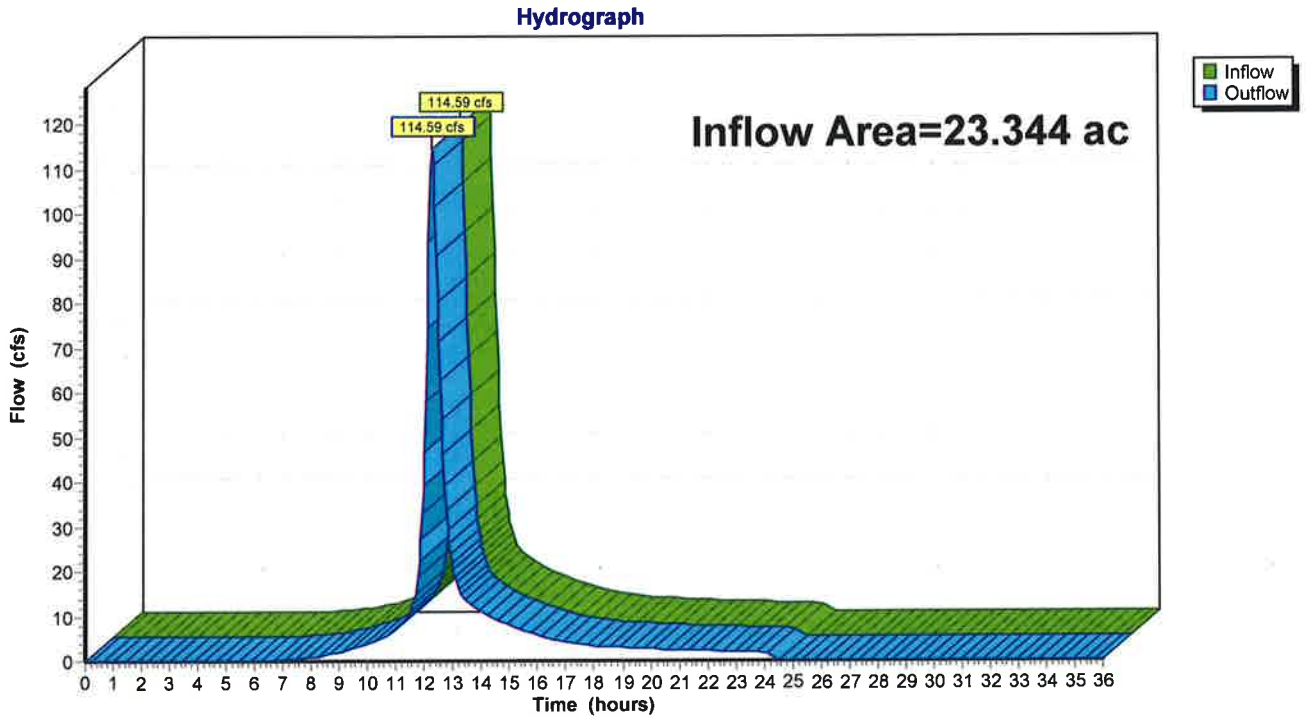


Summary for Reach 7R: PRE DEV DP-1

Inflow Area = 23.344 ac, 12.28% Impervious, Inflow Depth = 6.08" for 100-Year event
Inflow = 114.59 cfs @ 12.26 hrs, Volume= 11.837 af
Outflow = 114.59 cfs @ 12.26 hrs, Volume= 11.837 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 7R: PRE DEV DP-1

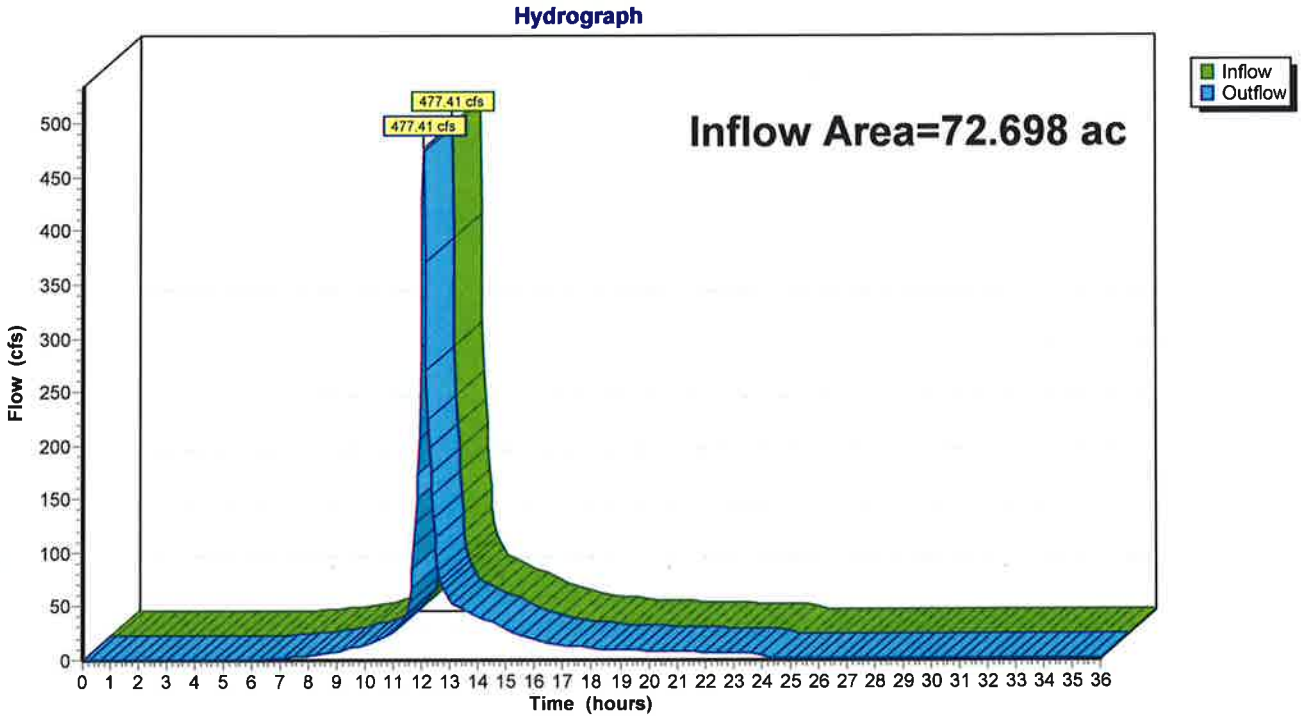


Summary for Reach 8R: PRE DEV DP-2

Inflow Area = 72.698 ac, 8.89% Impervious, Inflow Depth > 6.57" for 100-Year event
Inflow = 477.41 cfs @ 12.04 hrs, Volume= 39.824 af
Outflow = 477.41 cfs @ 12.04 hrs, Volume= 39.824 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 8R: PRE DEV DP-2



Summary for Reach 9R: Channel 2

Inflow Area = 72.698 ac, 8.89% Impervious, Inflow Depth > 6.58" for 100-Year event
Inflow = 548.56 cfs @ 12.00 hrs, Volume= 39.855 af
Outflow = 477.41 cfs @ 12.04 hrs, Volume= 39.824 af, Atten= 13%, Lag= 2.2 min
Routed to Reach 8R : PRE DEV DP-2

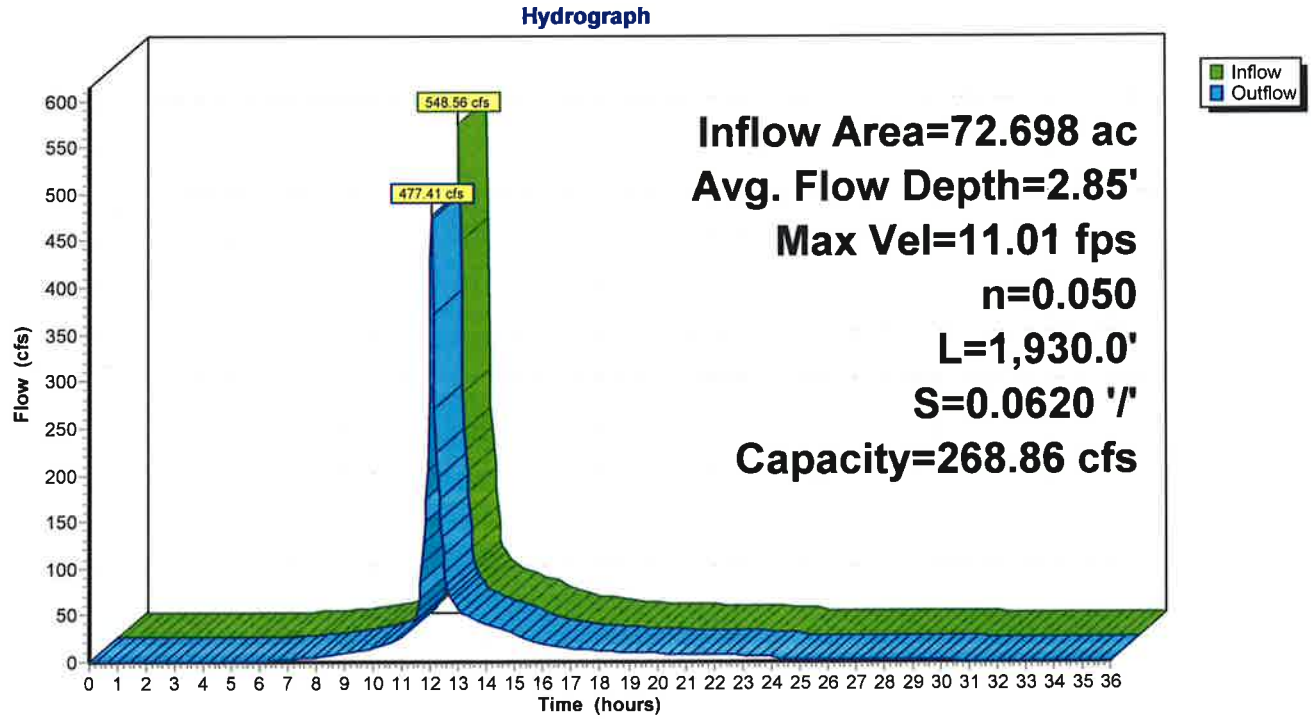
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.01 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 2.64 fps, Avg. Travel Time= 12.2 min

Peak Storage= 83,593 cf @ 12.04 hrs
Average Depth at Peak Storage= 2.85' , Surface Width= 21.41'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 268.86 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 1,930.0' Slope= 0.0620 '/'
Inlet Invert= 452.69', Outlet Invert= 333.03'

‡

Reach 9R: Channel 2



Summary for Reach 11R: Channel 1

Inflow Area = 9.770 ac, 37.67% Impervious, Inflow Depth > 6.55" for 100-Year event
Inflow = 12.84 cfs @ 13.07 hrs, Volume= 5.329 af
Outflow = 12.84 cfs @ 13.09 hrs, Volume= 5.323 af, Atten= 0%, Lag= 1.2 min
Routed to Reach 9R : Channel 2

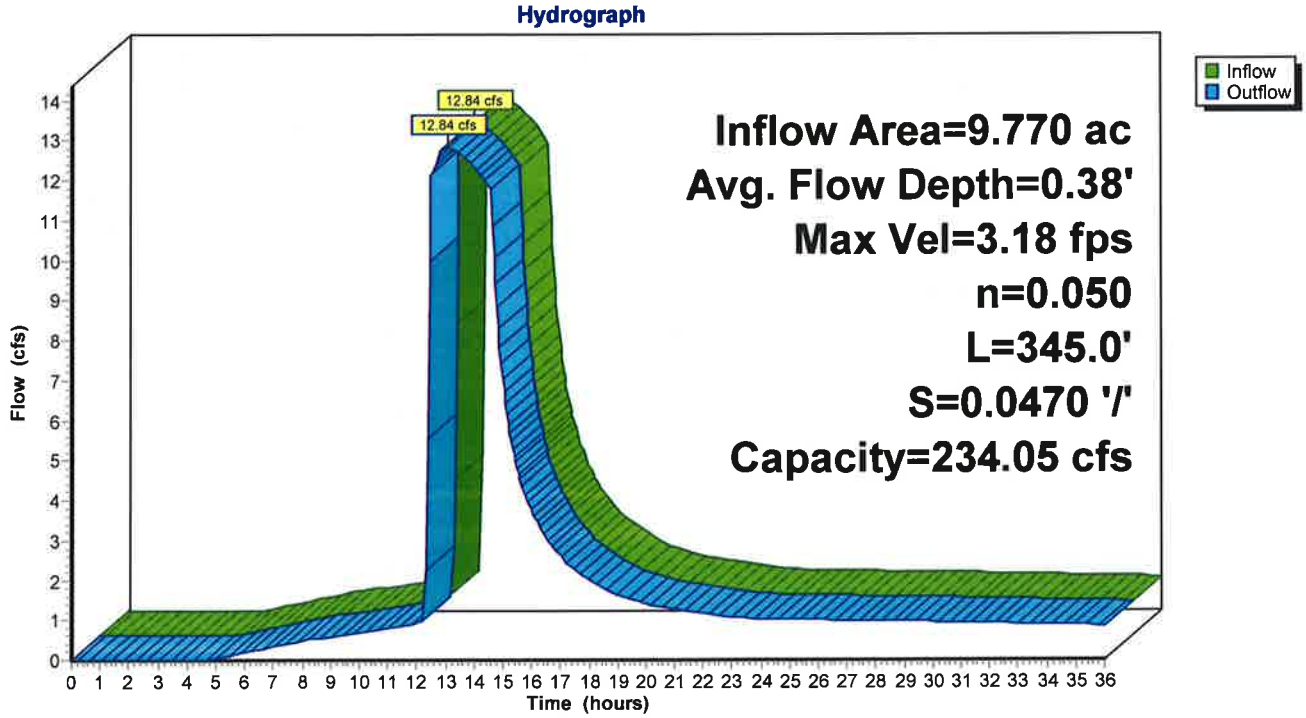
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.18 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.35 fps, Avg. Travel Time= 4.2 min

Peak Storage= 1,394 cf @ 13.09 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 11.50'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 234.05 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 345.0' Slope= 0.0470 '/'
Inlet Invert= 468.90', Outlet Invert= 452.69'

‡

Reach 11R: Channel 1

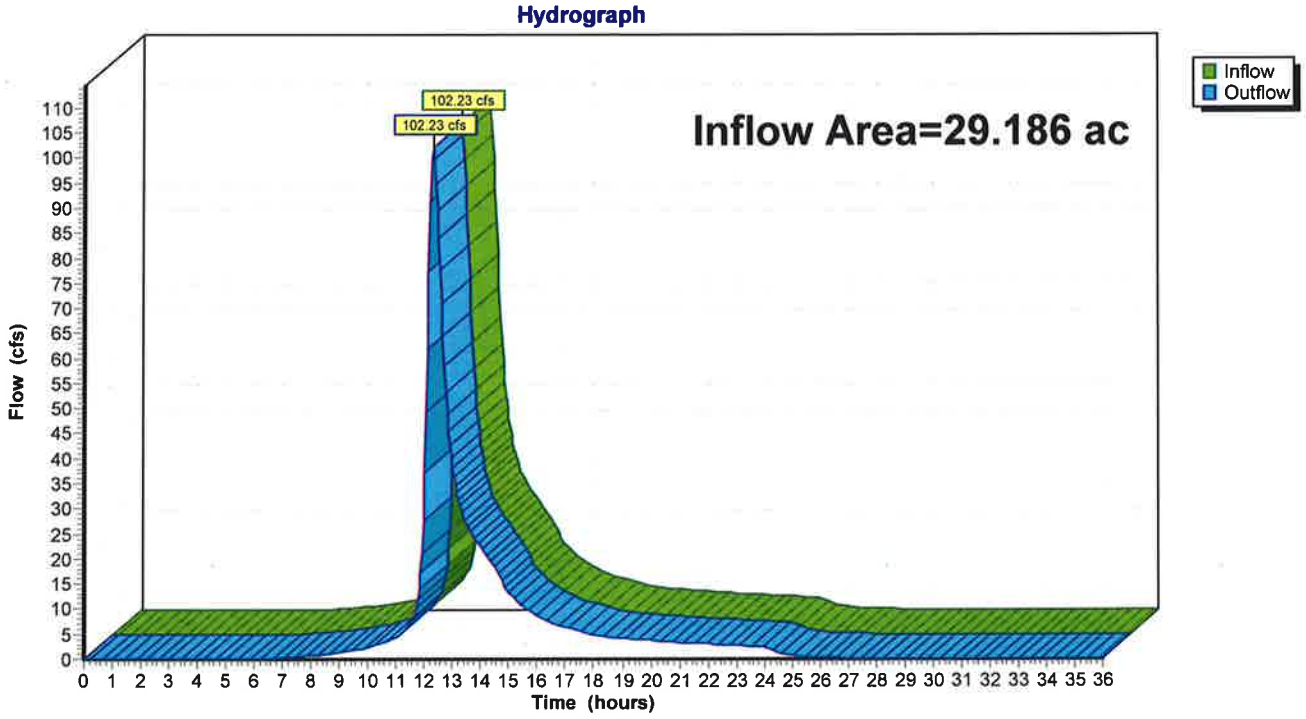


Summary for Reach 15R: POST DEV DP-1

Inflow Area = 29.186 ac, 42.68% Impervious, Inflow Depth = 6.07" for 100-Year event
Inflow = 102.23 cfs @ 12.30 hrs, Volume= 14.757 af
Outflow = 102.23 cfs @ 12.30 hrs, Volume= 14.757 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 15R: POST DEV DP-1

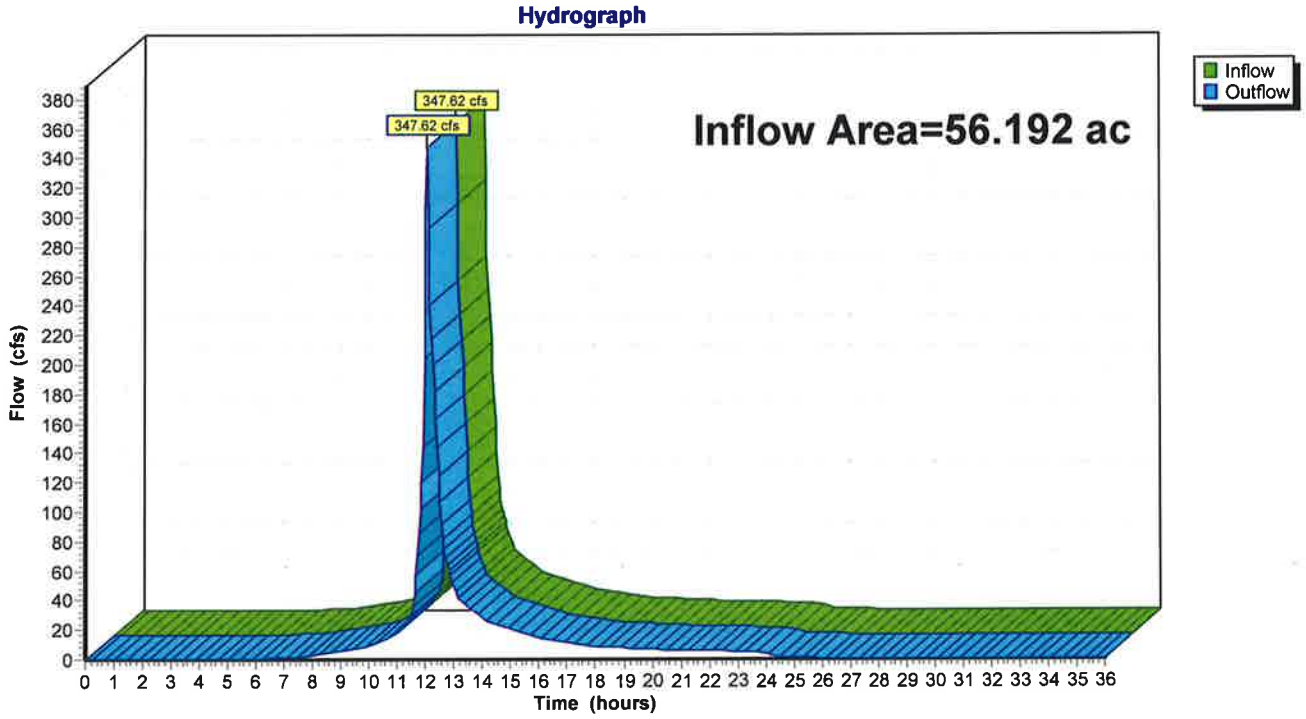


Summary for Reach 16R: POST DEV DP-2

Inflow Area = 56.192 ac, 24.26% Impervious, Inflow Depth > 6.59" for 100-Year event
Inflow = 347.62 cfs @ 12.05 hrs, Volume= 30.841 af
Outflow = 347.62 cfs @ 12.05 hrs, Volume= 30.841 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach 16R: POST DEV DP-2



Summary for Reach 17R: Channel 2

Inflow Area = 42.596 ac, 6.53% Impervious, Inflow Depth = 6.58" for 100-Year event
Inflow = 370.71 cfs @ 12.00 hrs, Volume= 23.374 af
Outflow = 321.59 cfs @ 12.04 hrs, Volume= 23.374 af, Atten= 13%, Lag= 2.3 min
Routed to Reach 16R : POST DEV DP-2

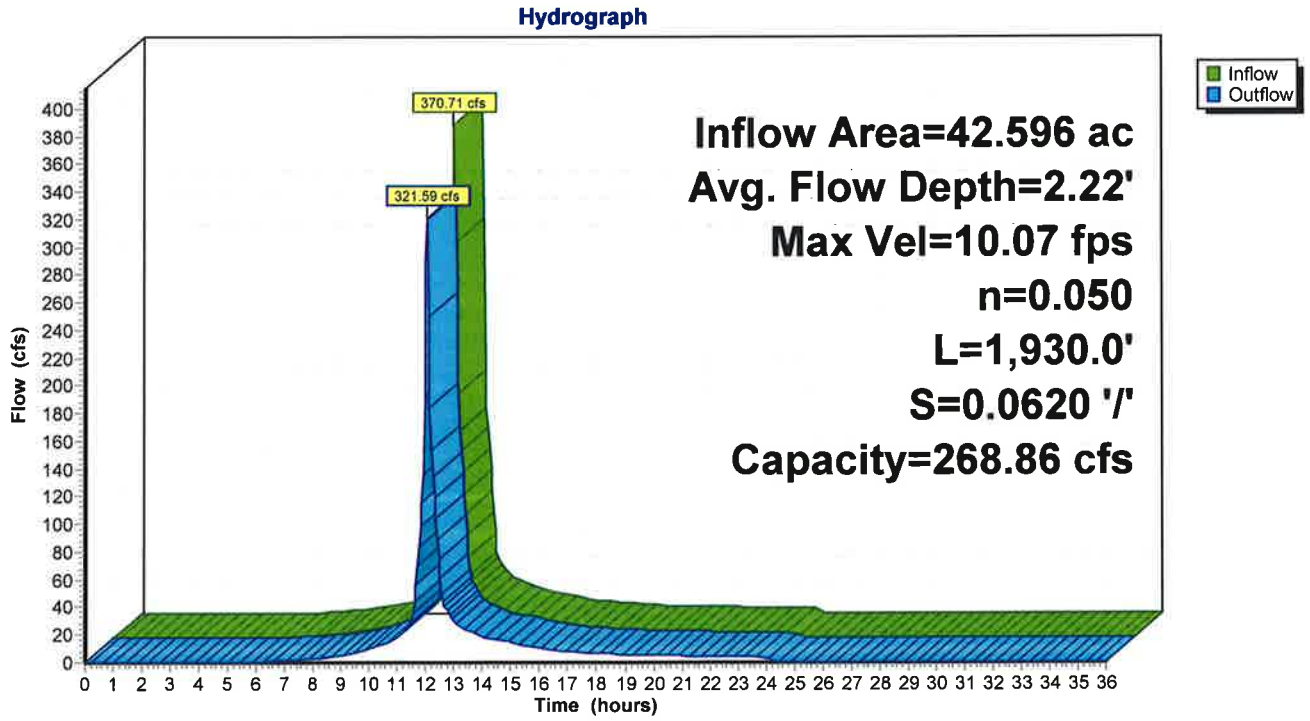
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.07 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 2.20 fps, Avg. Travel Time= 14.6 min

Peak Storage= 61,514 cf @ 12.04 hrs
Average Depth at Peak Storage= 2.22' , Surface Width= 18.86'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 268.86 cfs

10.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 2.0 '/' Top Width= 18.00'
Length= 1,930.0' Slope= 0.0620 '/'
Inlet Invert= 452.69', Outlet Invert= 333.03'

‡

Reach 17R: Channel 2



Summary for Pond 10P: EXISTING BASIN

Inflow Area = 9.770 ac, 37.67% Impervious, Inflow Depth = 7.21" for 100-Year event
Inflow = 45.14 cfs @ 12.40 hrs, Volume= 5.867 af
Outflow = 12.84 cfs @ 13.07 hrs, Volume= 5.329 af, Atten= 72%, Lag= 39.8 min
Primary = 12.84 cfs @ 13.07 hrs, Volume= 5.329 af
Routed to Reach 11R : Channel 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 477.60' @ 13.07 hrs Surf.Area= 0.841 ac Storage= 2.694 af

Plug-Flow detention time= 282.4 min calculated for 5.329 af (91% of inflow)
Center-of-Mass det. time= 236.7 min (1,049.6 - 812.9)

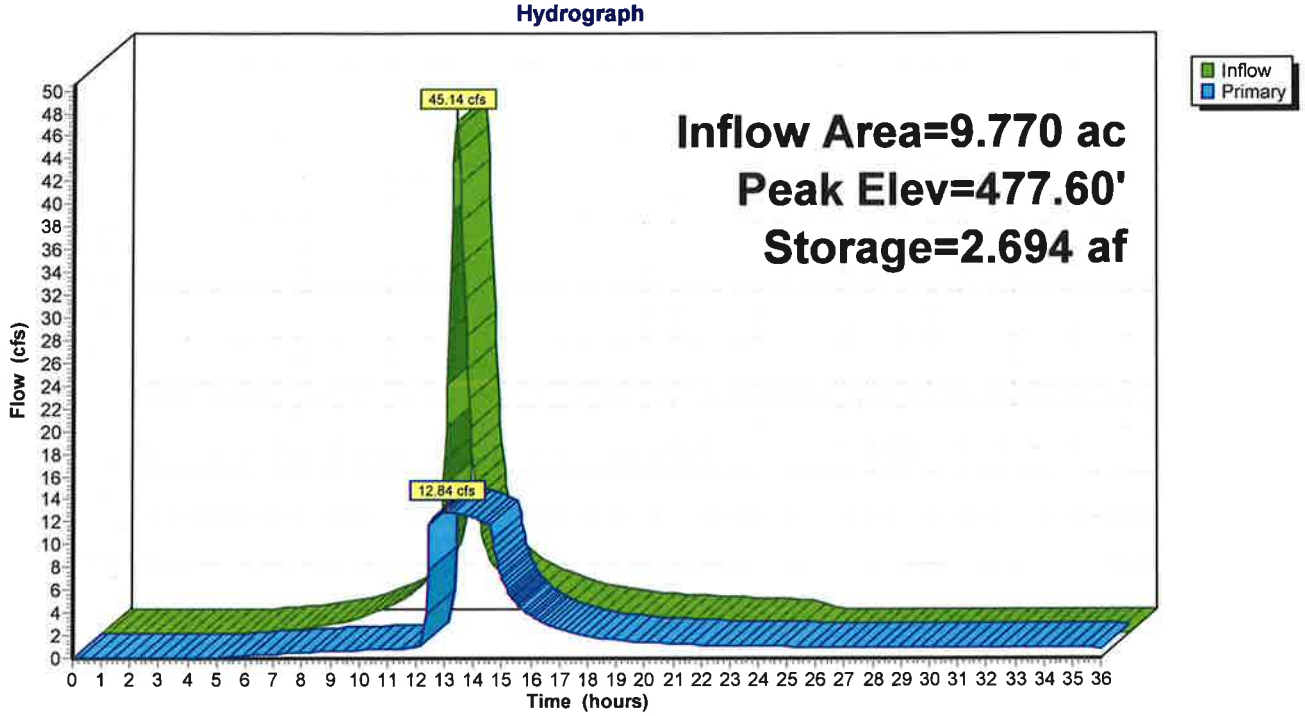
Volume	Invert	Avail.Storage	Storage Description
#1	471.00'	3.035 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
471.00	0.000	0.000	0.000
472.00	0.039	0.019	0.019
474.00	0.334	0.373	0.392
476.00	0.718	1.052	1.444
478.00	0.872	1.590	3.035

Device	Routing	Invert	Outlet Devices
#1	Device 3	471.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	476.00'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	471.00'	**15.0" Round Culvert** L= 119.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 471.00' / 468.90' S= 0.0176 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#4	Primary	471.00'	**Special & User-Defined** Elev. (feet) 471.00 471.17 478.00 Disch. (cfs) 0.000 0.090 0.090

Primary OutFlow Max=12.84 cfs @ 13.07 hrs HW=477.60' TW=469.28' (Dynamic Tailwater)
- **3=Culvert** (Inlet Controls 12.75 cfs @ 10.39 fps)
  - **1=Orifice/Grate** (Passes < 1.07 cfs potential flow)
  - **2=Sharp-Crested Rectangular Weir** (Passes < 37.64 cfs potential flow)
- **4=Special & User-Defined** (Custom Controls 0.09 cfs)

Pond 10P: EXISTING BASIN



Summary for Pond 21P: WEST WETLAND

Inflow Area = 15.435 ac, 62.13% Impervious, Inflow Depth = 6.19" for 100-Year event
Inflow = 112.21 cfs @ 12.15 hrs, Volume= 7.962 af
Outflow = 40.74 cfs @ 12.47 hrs, Volume= 7.497 af, Atten= 64%, Lag= 19.4 min
Primary = 40.74 cfs @ 12.47 hrs, Volume= 7.497 af
Routed to Reach 15R : POST DEV DP-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 403.41' @ 12.47 hrs Surf.Area= 49,790 sf Storage= 126,783 cf

Plug-Flow detention time= 93.0 min calculated for 7.487 af (94% of inflow)
Center-of-Mass det. time= 63.2 min (893.7 - 830.6)

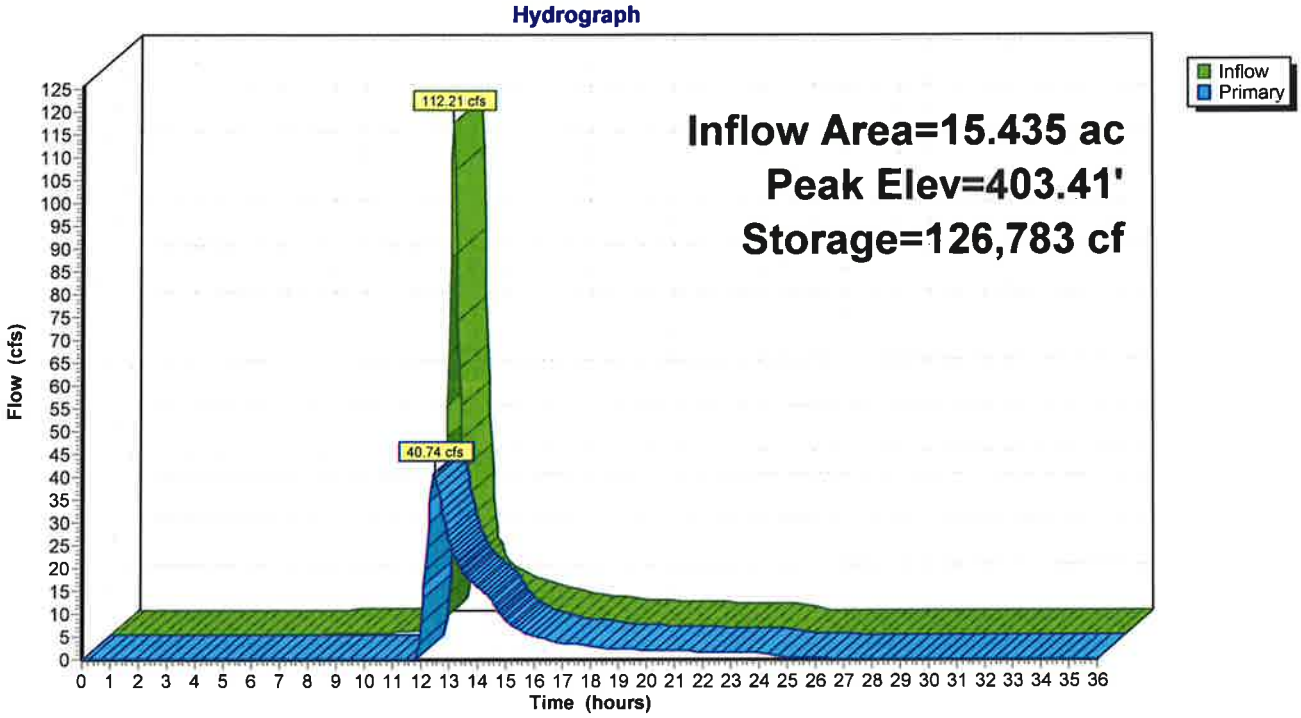
Volume	Invert	Avail.Storage	Storage Description
#1	400.50'	155,009 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
400.50	38,427	0	0
402.00	41,700	60,095	60,095
404.00	53,214	94,914	155,009

Device	Routing	Invert	Outlet Devices
#0	Primary	404.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Device 2	401.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	395.00'	**24.0" Round Culvert** L= 45.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 395.00' / 390.00' S= 0.1111 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#3	Primary	402.00'	**143.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=40.62 cfs @ 12.47 hrs HW=403.40' TW=0.00' (Dynamic Tailwater)
- **2=Culvert** (Passes 23.44 cfs of 36.31 cfs potential flow)
  - **1=Orifice/Grate** (Orifice Controls 23.44 cfs @ 7.46 fps)
- **3=Sharp-Crested Vee/Trap Weir** (Weir Controls 17.18 cfs @ 2.92 fps)

Pond 21P: WEST WETLAND



Summary for Pond 24P: EAST WETLAND

Inflow Area = 13.596 ac, 79.80% Impervious, Inflow Depth > 6.61" for 100-Year event
Inflow = 111.35 cfs @ 12.10 hrs, Volume= 7.489 af
Outflow = 65.40 cfs @ 12.24 hrs, Volume= 7.466 af, Atten= 41%, Lag= 8.3 min
Primary = 65.40 cfs @ 12.24 hrs, Volume= 7.466 af
Routed to Reach 16R : POST DEV DP-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Starting Elev= 390.00' Storage= 1.389 af
Peak Elev= 391.85' @ 12.24 hrs Storage= 3.211 af (1.822 af above start)

Plug-Flow detention time= 165.0 min calculated for 6.069 af (81% of inflow)
Center-of-Mass det. time= 49.9 min (884.6 - 834.7)

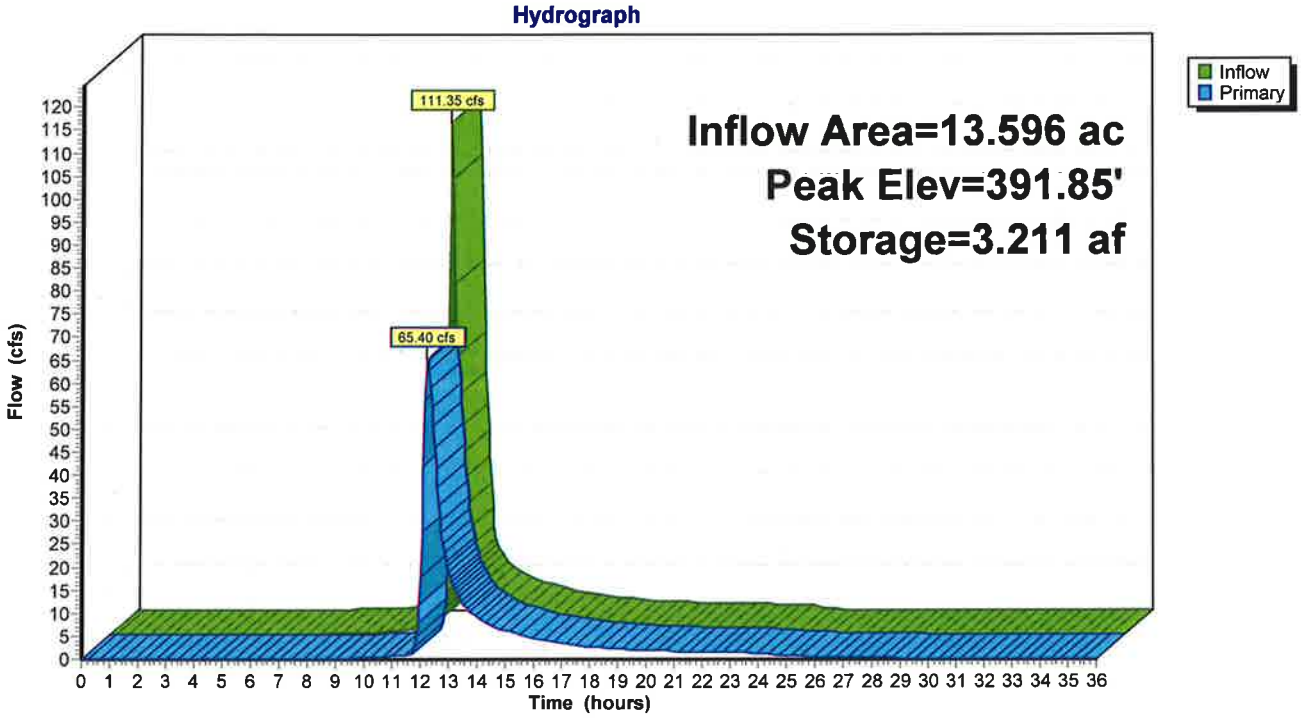
Volume	Invert	Avail.Storage	Storage Description
#1	384.00'	4.344 af	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (acre-feet)
384.00	0.000
388.50	0.530
389.50	0.973
390.00	1.389
393.00	4.344

Device	Routing	Invert	Outlet Devices
#1	Primary	390.00'	**143.0 deg x 4.0' long x 3.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=65.15 cfs @ 12.24 hrs HW=391.85' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 65.15 cfs @ 3.71 fps)

Pond 24P: EAST WETLAND



Summary for Pond 34P: WEST CISTERN

Inflow Area = 13.620 ac, 64.39% Impervious, Inflow Depth = 7.95" for 100-Year event
Inflow = 103.81 cfs @ 12.13 hrs, Volume= 9.018 af
Outflow = 101.64 cfs @ 12.16 hrs, Volume= 6.835 af, Atten= 2%, Lag= 1.6 min
Primary = 101.64 cfs @ 12.16 hrs, Volume= 6.835 af
Routed to Pond 21P : WEST WETLAND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 400.00' @ 11.80 hrs Surf.Area= 0.689 ac Storage= 2.183 af

Plug-Flow detention time= 142.6 min calculated for 6.825 af (76% of inflow)
Center-of-Mass det. time= 60.3 min (838.1 - 777.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	394.50'	0.902 af	**99.08'W x 303.00'L x 5.50'H Field A** 3.791 af Overall - 1.535 af Embedded = 2.256 af x 40.0% Voids
#2A	395.00'	1.281 af	**ADS N-12 48"** x 225 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 225 Chambers in 15 Rows
		2.183 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	400.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	399.00'	**12.0" Round Culvert** L= 100.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 399.00' / 398.00' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.16 hrs HW=400.00' TW=402.51' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond 34P: WEST CISTERN - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12® Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

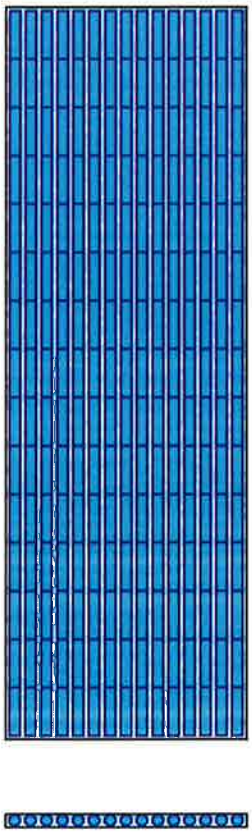
15 Chambers/Row x 20.00' Long = 300.00' Row Length +18.0" End Stone x 2 = 303.00' Base Length
15 Rows x 54.0" Wide + 24.5" Spacing x 14 + 18.0" Side Stone x 2 = 99.08' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

225 Chambers x 248.0 cf = 55,800.0 cf Chamber Storage
225 Chambers x 297.0 cf = 66,820.3 cf Displacement

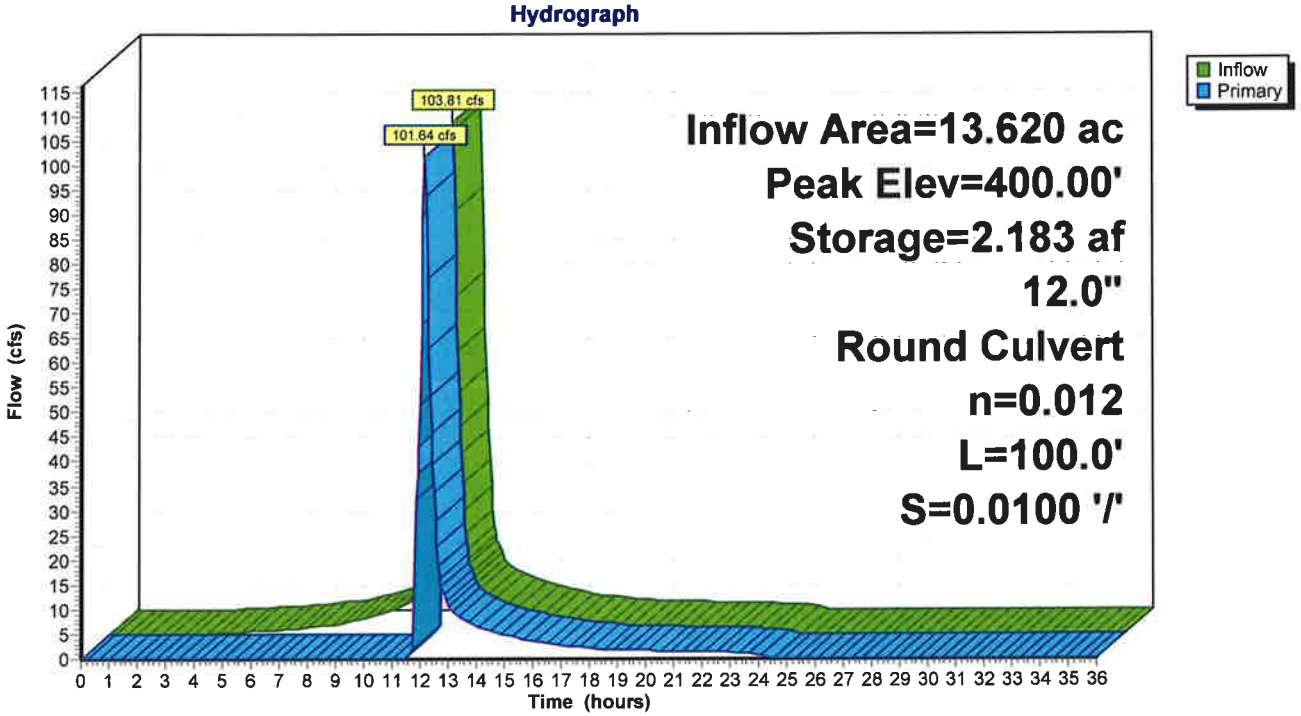
165,127.9 cf Field - 66,820.3 cf Chambers = 98,307.5 cf Stone x 40.0% Voids = 39,323.0 cf Stone Storage

Chamber Storage + Stone Storage = 95,123.0 cf = 2.184 af
Overall Storage Efficiency = 57.6%
Overall System Size = 303.00' x 99.08' x 5.50'

225 Chambers
6,115.8 cy Field
3,641.0 cy Stone



Pond 34P: WEST CISTERN



Summary for Pond 36P: CISTERN LOWER

Inflow Area = 10.840 ac, 89.94% Impervious, Inflow Depth = 8.80" for 100-Year event
Inflow = 98.93 cfs @ 12.07 hrs, Volume= 7.948 af
Outflow = 95.07 cfs @ 12.10 hrs, Volume= 5.863 af, Atten= 4%, Lag= 1.7 min
Primary = 95.07 cfs @ 12.10 hrs, Volume= 5.863 af
Routed to Pond 24P : EAST WETLAND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 399.00' @ 11.80 hrs Surf.Area= 0.742 ac Storage= 2.349 af

Plug-Flow detention time= 183.2 min calculated for 5.855 af (74% of inflow)
Center-of-Mass det. time= 96.1 min (844.9 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	393.50'	0.971 af	**144.88'W x 223.00'L x 5.50'H Field A** 4.079 af Overall - 1.651 af Embedded = 2.429 af x 40.0% Voids
#2A	394.00'	1.378 af	**ADS N-12 48"** x 242 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf 242 Chambers in 22 Rows
		2.349 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	399.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	398.00'	**12.0" Round Culvert** L= 100.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 398.00' / 393.00' S= 0.0500 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Primary	398.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=10.54 cfs @ 12.10 hrs HW=399.00' TW=391.47' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.36 cfs @ 3.00 fps)
└—**2=Sharp-Crested Rectangular Weir** (Weir Controls 8.18 cfs @ 2.83 fps)

Pond 36P: CISTERN LOWER - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12® Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.85 sf x 20.00'L = 297.0 cf

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

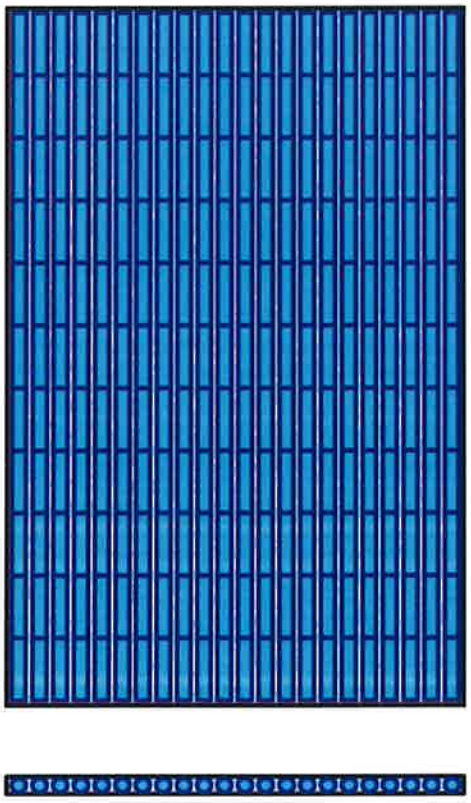
11 Chambers/Row x 20.00' Long = 220.00' Row Length +18.0" End Stone x 2 = 223.00' Base Length
22 Rows x 54.0" Wide + 24.5" Spacing x 21 + 18.0" Side Stone x 2 = 144.88' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

242 Chambers x 248.0 cf = 60,016.0 cf Chamber Storage
242 Chambers x 297.0 cf = 71,869.0 cf Displacement

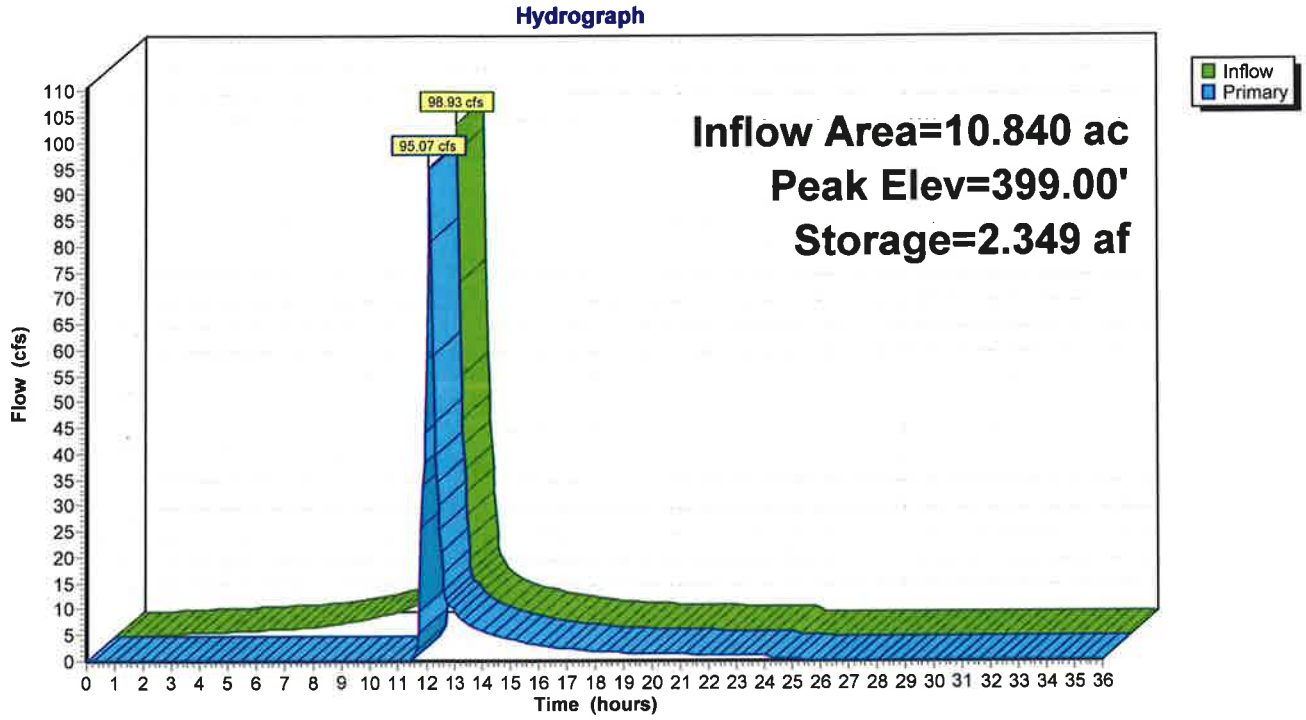
177,695.1 cf Field - 71,869.0 cf Chambers = 105,826.1 cf Stone x 40.0% Voids = 42,330.5 cf Stone Storage

Chamber Storage + Stone Storage = 102,346.5 cf = 2.350 af
Overall Storage Efficiency = 57.6%
Overall System Size = 223.00' x 144.88' x 5.50'

242 Chambers
6,581.3 cy Field
3,919.5 cy Stone



Pond 36P: CISTERN LOWER



Events for Subcatchment 3S: POST DEV DA-2

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-Year	2.80	24.01	1.952	1.72
2-Year	3.41	31.54	2.581	2.27
10-Year	5.13	52.91	4.423	3.90
25-Year	6.49	69.71	5.915	5.21
100-Year	**9.28**	**103.81**	**9.018**	**7.95**

Events for Subcatchment 4S: PRE DEV DA-1

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-Year	2.80	13.44	1.525	0.78
2-Year	3.41	21.18	2.292	1.18
10-Year	5.13	46.43	4.802	2.47
25-Year	6.49	68.14	7.005	3.60
100-Year	**9.28**	**114.59**	**11.837**	**6.08**

Events for Subcatchment 5S: PRE DEV DA-2

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-Year	2.80	8.22	1.048	1.29
2-Year	3.41	11.48	1.452	1.78
10-Year	5.13	21.16	2.680	3.29
25-Year	6.49	29.01	3.703	4.55
100-Year	**9.28**	**45.14**	**5.867**	**7.21**

Events for Subcatchment 6S: PRE DEV DA-3

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-Year	2.80	80.84	5.185	0.99
2-Year	3.41	119.58	7.495	1.43
10-Year	5.13	239.40	14.801	2.82
25-Year	6.49	339.20	21.054	4.01
100-Year	**9.28**	**547.66**	**34.532**	**6.58**

Events for Subcatchment 12S: POST DEV DA-6

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-Year	2.80	9.18	1.012	0.88
2-Year	3.41	14.05	1.490	1.30
10-Year	5.13	29.40	3.029	2.64
25-Year	6.49	42.43	4.362	3.81
100-Year	**9.28**	**70.01**	**7.260**	**6.34**

Events for Subcatchment 14S: POST DEV DA-5

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-Year	2.80	54.72	3.510	0.99
2-Year	3.41	80.94	5.074	1.43
10-Year	5.13	162.05	10.019	2.82
25-Year	6.49	229.61	14.252	4.01
100-Year	**9.28**	**370.71**	**23.374**	**6.58**

Events for Subcatchment 26S: POST DEV DA-4

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-Year	2.80	3.22	0.281	1.22
2-Year	3.41	4.55	0.392	1.71
10-Year	5.13	8.51	0.734	3.20
25-Year	6.49	11.74	1.020	4.44
100-Year	**9.28**	**18.38**	**1.627**	**7.08**

Events for Subcatchment 32S: POST DEV DA-3

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-Year	2.80	3.03	0.215	1.42
2-Year	3.41	4.13	0.293	1.94
10-Year	5.13	7.38	0.528	3.49
25-Year	6.49	9.96	0.721	4.77
100-Year	**9.28**	**15.24**	**1.127**	**7.45**

Events for Subcatchment 35S: POST DEV DA-1

Event	Rainfall (inches)	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
1-Year	2.80	28.29	2.128	2.36
2-Year	3.41	35.05	2.671	2.96
10-Year	5.13	53.92	4.211	4.66
25-Year	6.49	68.72	5.434	6.02
100-Year	**9.28**	**98.93**	**7.948**	**8.80**

Events for Reach 7R: PRE DEV DP-1

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
1-Year	13.44	13.44	**0.00**	**0**
2-Year	21.18	21.18	0.00	0
10-Year	46.43	46.43	0.00	0
25-Year	68.14	68.14	0.00	0
100-Year	**114.59**	**114.59**	0.00	0

Events for Reach 8R: PRE DEV DP-2

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
1-Year	64.77	64.77	**0.00**	**0**
2-Year	98.72	98.72	0.00	0
10-Year	205.19	205.19	0.00	0
25-Year	294.57	294.57	0.00	0
100-Year	**477.41**	**477.41**	0.00	0

Events for Reach 9R: Channel 2

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
1-Year	81.34	64.77	453.59	20,395
2-Year	120.14	98.72	453.83	27,059
10-Year	240.11	205.19	454.41	44,728
25-Year	339.99	294.57	454.80	57,689
100-Year	**548.56**	**477.41**	**455.54**	**83,593**

Events for Reach 11R: Channel 1

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
1-Year	0.84	0.84	468.97	257
2-Year	0.91	0.91	468.98	271
10-Year	2.20	2.20	469.03	464
25-Year	7.91	7.90	469.18	1,027
100-Year	**12.84**	**12.84**	**469.28**	**1,394**

Events for Reach 15R: POST DEV DP-1

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
1-Year	9.18	9.18	**0.00**	**0**
2-Year	14.05	14.05	0.00	0
10-Year	29.40	29.40	0.00	0
25-Year	54.41	54.41	0.00	0
100-Year	**102.23**	**102.23**	0.00	0

Events for Reach 16R: POST DEV DP-2

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
1-Year	42.04	42.04	**0.00**	**0**
2-Year	64.74	64.74	0.00	0
10-Year	136.39	136.39	0.00	0
25-Year	197.14	197.14	0.00	0
100-Year	**347.62**	**347.62**	0.00	0

Events for Reach 17R: Channel 2

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
1-Year	54.72	41.93	453.39	15,305
2-Year	80.94	64.53	453.58	20,339
10-Year	162.05	135.69	454.06	33,608
25-Year	229.61	195.74	454.37	43,285
100-Year	**370.71**	**321.59**	**454.91**	**61,514**

Events for Pond 10P: EXISTING BASIN

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (acre-feet)
1-Year	8.22	0.84	474.35	0.522
2-Year	11.48	0.91	474.97	0.804
10-Year	21.16	2.20	476.15	1.555
25-Year	29.01	7.91	476.50	1.814
100-Year	**45.14**	**12.84**	**477.60**	**2.694**

Events for Pond 21P: WEST WETLAND

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-Year	3.03	0.00	400.73	9,367
2-Year	4.13	0.50	401.08	23,376
10-Year	30.55	6.49	401.46	38,608
25-Year	80.43	16.12	402.13	66,215
100-Year	**112.21**	**40.74**	**403.41**	**126,783**

Events for Pond 24P: EAST WETLAND

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (acre-feet)
1-Year	3.22	0.57	390.12	1.510
2-Year	4.55	1.19	390.20	1.581
10-Year	27.46	10.03	390.69	2.070
25-Year	80.70	25.29	391.14	2.512
100-Year	**111.35**	**65.40**	**391.85**	**3.211**

Events for Pond 34P: WEST CISTERN

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (acre-feet)
1-Year	24.01	0.00	399.11	1.952
2-Year	31.54	1.08	**400.00**	**2.183**
10-Year	52.91	28.05	400.00	2.183
25-Year	69.71	74.27	400.00	2.183
100-Year	**103.81**	**101.64**	400.00	2.183

Events for Pond 36P: CISTERN LOWER

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (acre-feet)
1-Year	28.29	0.10	398.16	2.118
2-Year	35.05	1.31	398.40	2.175
10-Year	53.92	21.68	**399.00**	**2.349**
25-Year	68.72	69.78	399.00	2.349
100-Year	**98.93**	**95.07**	399.00	2.349

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APPENDIX B

SMP Selection

Green Infrastructure Planning Evaluation

Group	Practice	Description	Comments
Preservation of Natural Resources	Preservation of Undisturbed Areas	Delineate and place into permanent conservation easement undisturbed forests, native vegetated areas, riparian corridors, wetlands, and natural terrain.	Undisturbed portions of the site will be protected and remain in natural state.
	Preservation of Buffers	Define, delineate and place in permanent conservation easement naturally vegetated buffers along perennial streams, rivers, shorelines and wetlands.	5
	Reduction of Clearing and Grading	Limit clearing and grading to the minimum amount needed for roads, driveways, foundations, utilities and stormwater management facilities.	The project disturbance has been minimized to the greatest extent possible.
	Locating Development in Less Sensitive Areas	Avoid sensitive resource areas such as floodplains, steep slopes, erodible soils, wetlands, mature forests and critical habitats by locating development to fit the terrain in areas that will create the lease impact.	All sensitive areas have been avoided. Improvements within floodway either provide enhancement or will have no increased impacts.
	Open Space Design	Use clustering, conservation design or open space design to reduce impervious cover, preserve more open space and protect water resources.	5
	Soil Restoration	Restore the original properties and porosity of the soil by deep till and amendment with compost to reduce the generation of runoff and enhance the runoff reduction performance of practices such as downspout disconnections, grass channels, filter strips, and tree clusters.	Not applicable. "C" Soils.
Reduction of Impervious Cover	Roadway Reduction	Minimize roadway widths and lengths to reduce site impervious area.	3
	Sidewalk Reduction	Minimize sidewalk lengths and widths to reduce site impervious area.	3
	Driveway Reduction	Minimize driveway lengths and widths to reduce site impervious area.	3
	Cul-de-sac Reduction	Minimize the number of cul-de-sacs and incorporate landscaped areas to reduce their impervious cover.	1
	Building Footprint Reduction	Reduce the impervious footprint of residences and commercial buildings by using alternate or taller buildings while maintaining the same floor to area ratio.	3

	Parking Reduction	Reduce imperviousness on parking lots by eliminating unneeded spaces, providing compact car spaces and efficient parking lanes, minimizing stall dimensions, using porous pavement surfaces in overflow parking areas, and using multi-storied parking decks where appropriate.	Porous Pavers Proposed
Runoff Reduction Techniques	Conservation of natural areas	Retain the pre-development hydrologic and water quality Conservation of characteristics of undisturbed natural areas, stream and wetland natural areas buffers by restoring and/or permanently conserving these areas on a site.	This has been done. The undisturbed natural areas are beyond the project boundaries will remain in its natural state.
	Sheetflow to riparian buffers or filter strips	Undisturbed natural areas such as forested conservation areas and stream buffers or vegetated filter strips and riparian buffers can be used to treat and control stormwater runoff from some areas of a development project.	5
	Vegetated open swale	The natural drainage paths, or properly designed vegetated channels, can be used instead of constructing underground storm sewers or concrete open channels to increase time of concentration, reduce the peak discharge, and provide infiltration.	1
	Tree planting/tree box	Plant or conserve trees to reduce stormwater runoff, increase nutrient uptake, and provide bank stabilization. Trees can be used for applications such as landscaping, stormwater management practice areas, conservation areas and erosion and sediment control.	Tree Planting is proposed for this project
	Disconnection of rooftop runoff	Direct runoff from residential rooftop areas and upland overland runoff flow to designated pervious areas to reduce runoff volumes and rates	2
	Stream daylighting for redevelopment projects	Stream daylight previously-culverted/piped streams to restore natural habitats, better attenuate runoff by increasing the storage size, promoting infiltration, and help reduce pollutant loads.	5
	Rain garden	Manage and treat small volumes of stormwater runoff using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression.	Rain Garden Proposed

	Green roof	Capture runoff by a layer of vegetation and soil installed on top of a conventional flat or sloped roof. The rooftop vegetation allows evaporation and evapotranspiration processes to reduce volume and discharge rate of runoff entering conveyance system.	1
	Stormwater planter	Small landscaped stormwater treatment devices that can be designed as infiltration or filtering practices. Stormwater planters use soil infiltration and biogeochemical processes to decrease stormwater quantity and improve water quality.	Stormwater Planters Proposed
	Rain tank/Cistern	Capture and store stormwater runoff to be used for irrigation systems or filtered and reused for non-contact activities.	1
	Porous Pavement	Pervious types of pavements that provide an alternative to conventional paved surfaces, designed to infiltrate rainfall through the surface, thereby reducing stormwater runoff from a site and providing some pollutant uptake in the underlying soils.	Porous Pavers Proposed
Pond	Micropool Extended Detention Pool (P-1)	Pond that treats the majority of the water quality volume through extended detention, and incorporates a micropool at the outlet of the pond to prevent sediment resuspension.	1
	Wet Pond (P-2)	Pond that provides storage for the entire water quality volume in the permanent pool.	1
	Wet Extended Detention (P-3)	Pond that treats a portion of the water quality volume by detaining storm flows above a permanent pool for a specified minimum detention time.	1
	Multiple Pond System (P-4)	A group of ponds that collectively treat the water quality volume.	1
	Pocket Pond (P-5)	A stormwater pond design adapted for the treatment of runoff from small drainage areas that has little or no baseflow available to maintain water elevations and relies on ground water to maintain a permanent pool.	1
Wetland	Shallow Wetland (W-1)	A wetland that provides water quality treatment entirely in a wet shallow marsh.	1

	Extended Detention Wetland (W-2)	A wetland system that provides some fraction of the water quality volume by detaining storm flows above the marsh surface.	1
	Pond/ Wetland System (W-3)	A wetland system that provides a portion of the water quality volume in the permanent pool of a wet pond that precedes the marsh for a specified minimum detention time.	1
	Pocket Wetland (W-4)	A shallow wetland design adapted for the treatment of runoff from small drainage areas that has variable water levels and relies on groundwater for its permanent pool.	This practice is being proposed for this project
Infiltration	Infiltration Trench (I-1)	An infiltration practice that stores the water quality volume in the void spaces of a gravel trench before it is infiltrated into the ground.	1
	Infiltration Basin (I-2)	An infiltration practice that stores the water quality volume in a shallow depression, before it is infiltrated it into the ground.	1
	Dry Well (I-3)	An infiltration practice similar in design to the infiltration trench, and best suited for treatment of rooftop runoff.	Subsurface Infiltration is proposed on this project
Filtering Practices	Surface Sand Filter (F-1)	A filtering practice that treats stormwater by settling out larger particles in a sediment chamber, and then filtering stormwater through a sand matrix.	1
	Underground Sand Filter (F2)	A filtering practice that treats stormwater as it flows through underground settling and filtering chambers.	1
	Perimeter Sand Filter (F-3)	A filter that incorporates a sediment chamber and filer bed as parallel vaults adjacent to a parking lot.	1
	Organic Filter (F-4)	A filtering practice that uses an organic medium such as compost in the filter, in the place of sand.	1
	Bioretention (F-5)	A shallow depression that treats stormwater as it flows through a soil matrix and is returned to the storm drain system.	1
Open Channels	Dry Swale (O-1)	An open drainage channel or depression explicitly designed to detain and promote the filtration of stormwater runoff into the soil media.	1
	Wet Swale (O-2)	An open drainage channel or depression designed to retain water or intercept groundwater for water quality	1

		treatment.	

Comment Notes:

1. This improvement is not proposed for the project and does not apply.
2. This practice cannot be applied to this project. It is either deemed (a) inappropriate by the NYS DEC; (b) does not fit the type of project; or (c) cannot be engineered because of practical difficulties such as constructability, maintenance issues, durability, stability or other cause.
3. Minimized to the greatest extent possible within applicable codes.
4. Similar type of practice used.
5. Not applicable.

APPENDIX C

Standard and Specifications for Erosion and Sediment Control Measures

STANDARD AND SPECIFICATIONS FOR STABILIZED CONSTRUCTION ENTRANCE

Definition

A stabilized pad of aggregate underlain with geotextile located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area.

Purpose

The purpose of stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction entrance shall be used at all points of construction ingress and egress.

Design Criteria

See Figure 5A.35 on page 5A.76 for details.

Aggregate Size: Use a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.

Thickness: Not less than six (6) inches.

Width: 12-foot minimum but not less than the full width of points where ingress or egress occurs. 24-foot minimum if there is only one access to the site.

Length: As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum would apply).

Geotextile: To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single-family residence lot. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

Criteria for Geotextile

The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties as shown:

Fabric Properties[3]	Light Duty[1] Roads Grade Subgrade	Heavy Duty[2] Haul Roads Rough Graded	Test Method
Grab Tensile Strength (lbs)	200	220	ASTM D1682
Elongation at Failure (%)	50	60	ASTM D1682
Mullen Brust Strength (lbs)	190	430	ASTM D3786
Puncture Strength (lbs)	40	125	ASTM D751 modified
Equivalent Opening Size	40-80	40-80	US Std Sieve CW-02215
Aggregate Depth	6	10	--

[1]Light Duty Road: Area sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Acceptable materials are Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

[2]Heavy Duty Road: Area sites with only rough grading, and where most travel would be multi-axle vehicles. Acceptable materials are Trevira Spunbond 1135, Mirafi 600X, or equivalent.

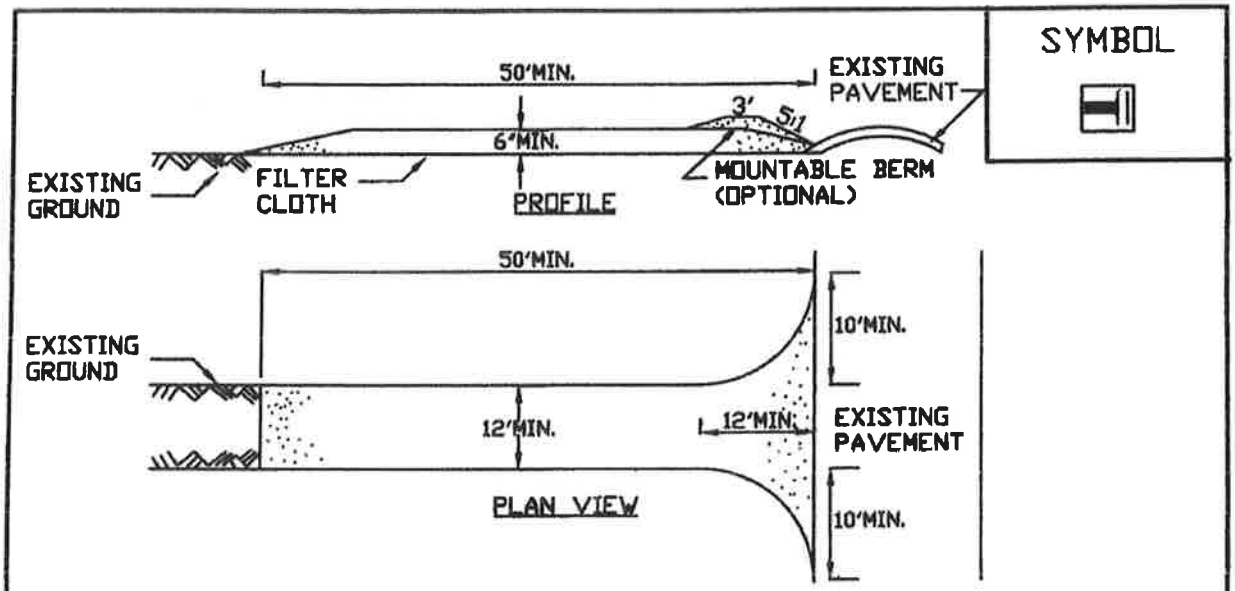
[3]Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

Maintenance

The entrance shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.

Figure 5A.35
Stabilized Construction Entrance

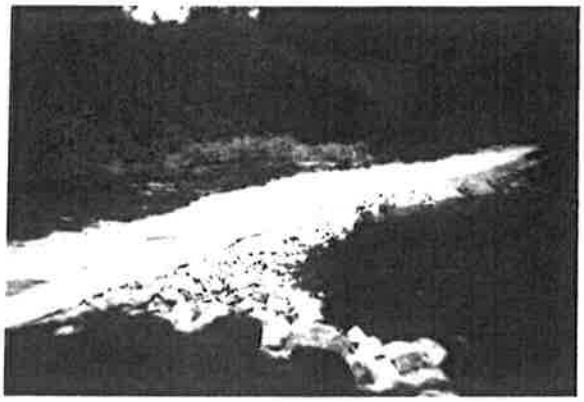


CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACTED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STABILIZED CONSTRUCTION ENTRANCE

STANDARD AND SPECIFICATIONS FOR CONSTRUCTION ROAD STABILIZATION



Definition

The stabilization of temporary construction access routes, on-site vehicle transportation routes, and construction parking areas.

Purpose

To control erosion on temporary construction routes and parking areas.

Condition Where Practice Applies

All traffic routes and parking areas for temporary use by construction traffic.

Design Criteria

Construction roads should be located to reduce erosion potential, minimize impact on existing site resources, and maintain operations in a safe manner. Highly erosive soils, wet or rocky areas, and steep slopes should be avoided. Roads should be routed where seasonal water tables are deeper than 18 inches. Surface runoff and control should be in accordance with other standards.

Road Grade – A maximum grade of 12% is recommended, although grades up to 15% are possible for short distances.

Road Width – 14 foot minimum for one-way traffic or 24 foot minimum for two-way traffic.

Side Slope of Road Embankment – 2:1 or flatter.

Ditch Capacity – On-site roadside ditch and culvert capacities shall be the 10 yr. peak runoff.

Composition – Use a 6-inch layer of NYS DOT sub-base Types 1,2,3, 4 or equivalent as specified in NYS – Standards and Specifications for Highways.

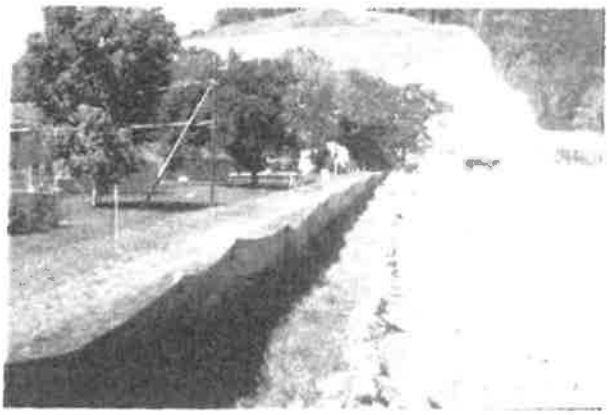
Construction Specifications

1. Clear and strip roadbed and parking areas of all vegetation, roots, and other objectionable material.
2. Locate parking areas on naturally flat areas as available. Keep grades sufficient for drainage, but not more than 2 to 3 percent.
3. Provide surface drainage and divert excess runoff to stabilized areas.
4. Maintain cut and fill slopes to 2:1 or flatter and stabilized with vegetation as soon as grading is accomplished.
5. Spread 6-inch layer of sub-base material evenly over the full width of the road and smooth to avoid depressions.
6. Provide appropriate sediment control measures to prevent offsite sedimentation.

Maintenance

Inspect construction roads and parking areas periodically for condition of surface. Topdress with new gravel as needed. Check ditches for erosion and sedimentation after rainfall events. Maintain vegetation in a health, vigorous condition. Areas producing sediment should be treated immediately.

STANDARD AND SPECIFICATIONS FOR SILT FENCE



Definition

A temporary barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil.

Purpose

The purpose of a silt fence is to reduce runoff velocity and effect deposition of transported sediment load. Limits imposed by ultraviolet stability of the fabric will dictate the maximum period the silt fence may be used (approximately one year).

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope lengths contributing runoff to a silt fence placed on a slope are:

Slope Steepness	Maximum Length (ft.)
2:1	25
3:1	50
4:1	75
5:1 or flatter	100

2. Maximum drainage area for overland flow to a silt fence shall not exceed ¼ acre per 100 feet of fence, with maximum ponding depth of 1.5 feet behind the fence; and

3. Erosion would occur in the form of sheet erosion; and

4. There is no concentration of water flowing to the barrier.

Design Criteria

Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff. All silt fences shall be placed as close to the areas as possible, but at least 10 feet from the toe of a slope to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized.

Sensitive areas to be protected by silt fence may need to be reinforced by using heavy wire fencing for added support to prevent collapse.

Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. A detail of the silt fence shall be shown on the plan. See Figure 5A.8 on page 5A.21 for details.

Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	90	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682

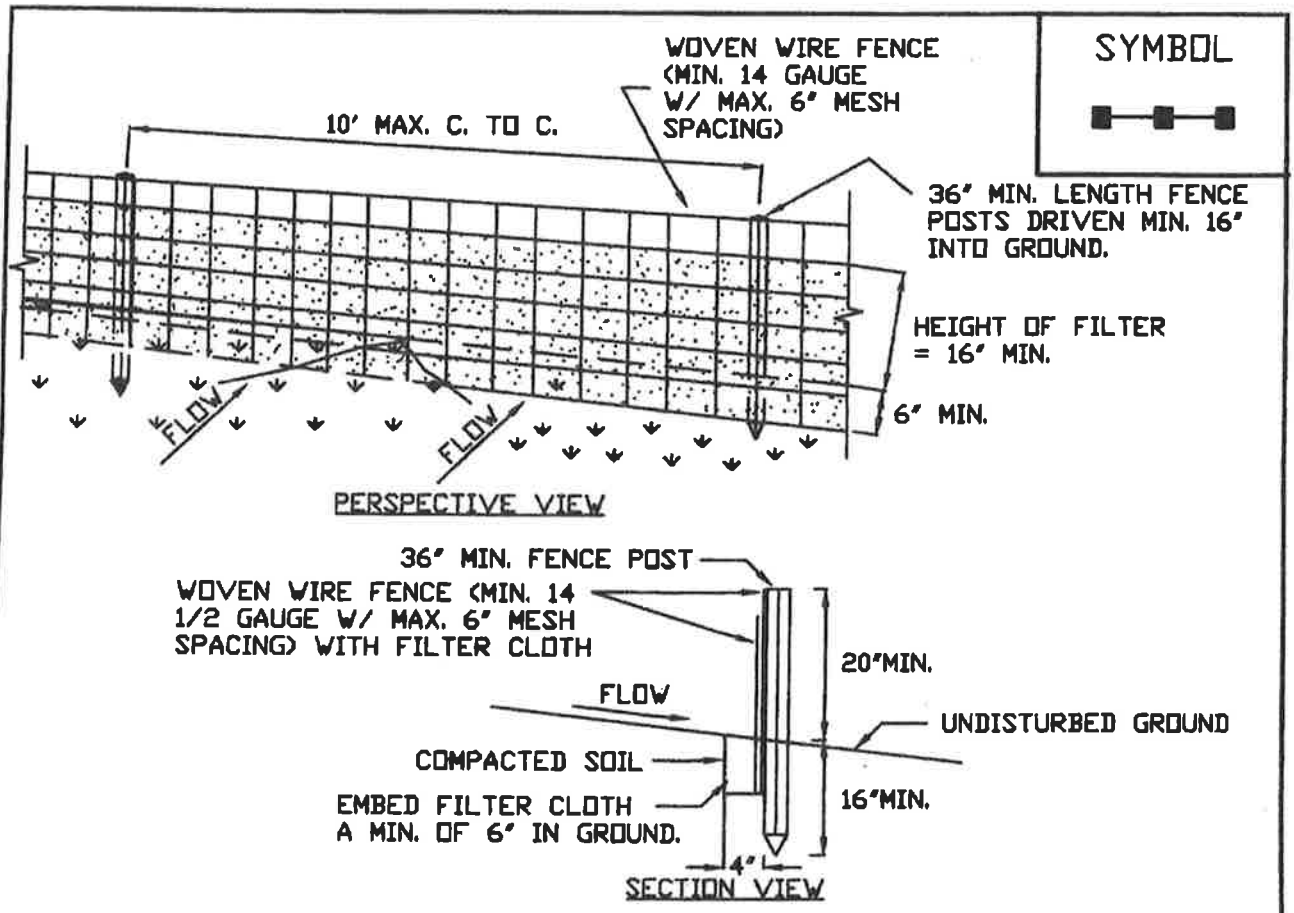
Mullen Burst Strength (PSI)	190	ASTM D3786
Puncture Strength (lbs)	40	ASTM D751 (modified)
Slurry Flow Rate (gal/min/sf)	0.3	
Equivalent Opening Size	40-80	US Std Sieve CW-02215
Ultraviolet Radiation Stability (%)	90	ASTM G-26

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.0 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot.

3. Wire Fence (for fabricated units): Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

4. Prefabricated Units: Envirofence, Geofab, or approved equal, may be used in lieu of the above method providing the unit is installed per details shown in Figure 5A.8.

Figure 5A.8
Silt Fence



CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	SILT FENCE

STANDARD AND SPECIFICATIONS FOR STRAW BALE DIKE

Definition

A temporary barrier of straw, or similar material, used to intercept sediment laden runoff from small drainage areas of disturbed soil.

Purpose

The purpose of a bale dike is to reduce runoff velocity and effect deposition of the transported sediment load. Straw bale dikes have an estimated design life of three (3) months.

Conditions Where Practice Applies

The straw bale dike is used where:

1. No other practice is feasible.
2. There is no concentration of water in a channel or other drainage way above the barrier.
3. Erosion would occur in the form of sheet erosion.
4. Length of slope above the straw bale dike does not exceed these limits.

Constructed Slope	Percent Slope	Slope Length (ft.)
2:1	50	25
3:1	33	50
4:1	25	75

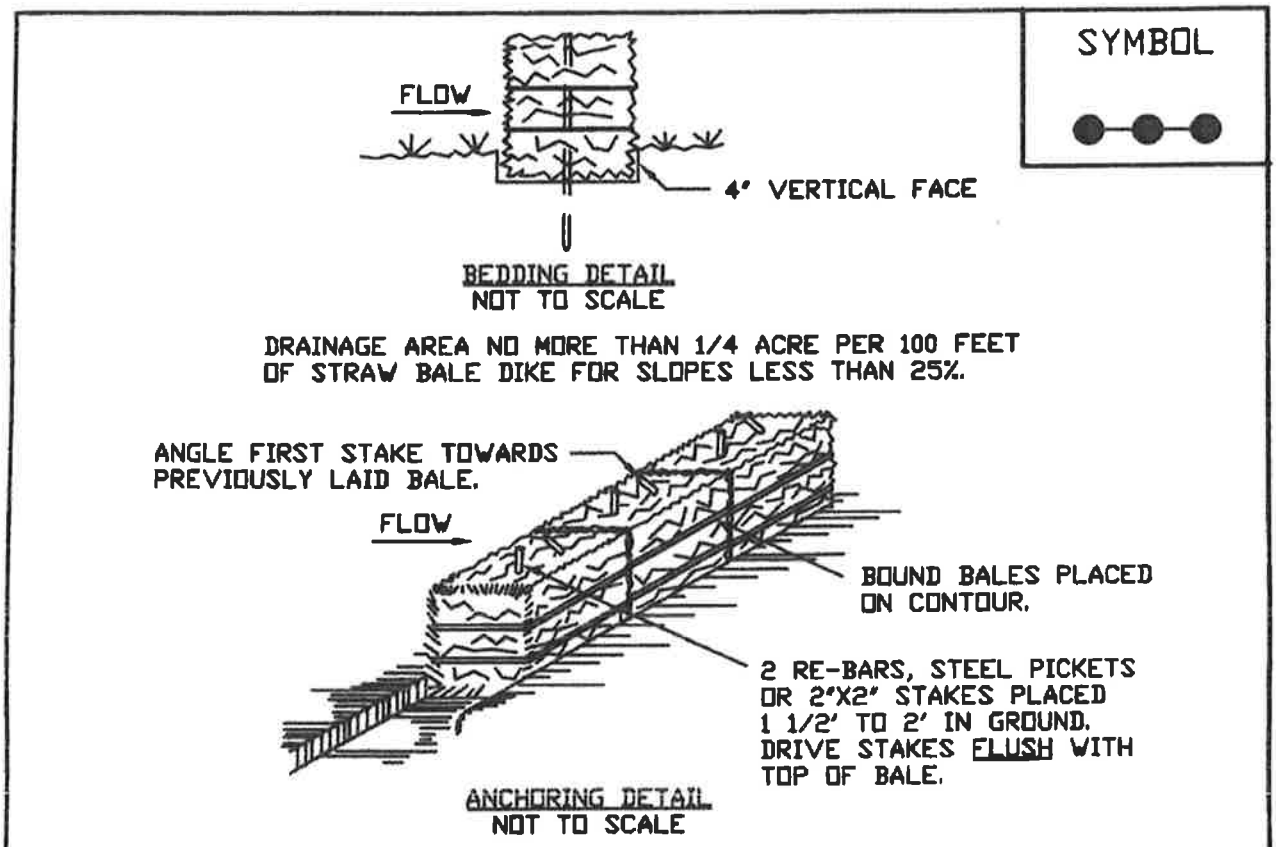
Where slope gradient changes through the drainage area, steepness refers to the steepest slope section contributing to the straw bale dike.

The practice may also be used for a single family lot if the slope is less than 15 percent. The contributing drainage areas in this instance shall be less than one quarter of an acre per 100 feet of fence and the length of slope above the dike shall be less than 200 feet.

Design Criteria

The above table is adequate, in general, for a one-inch rainfall event. Larger storms could cause failure of this practice. Use of this practice in sensitive areas for longer than one month should be specifically designed to store expected runoff. All bales shall be placed on the contour with cut edge of bale adhering to the ground. See Figure 5A.7 on page 5A.18 or details.

Figure 5A.7
Straw Bale Dike

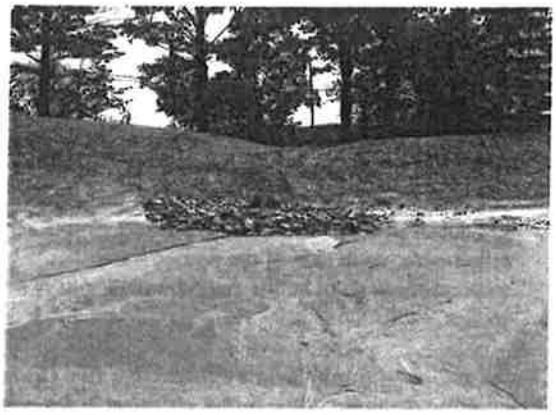


CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED AT THE TOE OF A SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF (4) INCHES, AND PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR REPLACEMENT SHALL BE MADE PROMTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULLNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STRAW BALE DIKE

STANDARD AND SPECIFICATIONS FOR SEDIMENT TRAP



Definition

A temporary sediment control device formed by excavation and/or embankment to intercept sediment laden runoff and retain the sediment.

Purpose

The purpose of the structure is to intercept sediment-laden runoff and trap the sediment in order to protect drainage ways, properties, and rights-of-way below the sediment trap from sedimentation.

Conditions Where Practice Applies

A sediment trap is usually installed in a drainage way, at a storm drain inlet, or other points of collection from a disturbed area.

Sediment traps should be used to artificially break up the natural drainage area into smaller sections where a larger device (sediment basin) would be less effective.

Design Criteria

If any of the design criteria presented here cannot be met, see Standard and Specification for Sediment Basin on page 5A.49.

Drainage Area

The drainage area for sediment traps shall be in accordance with the specific type of sediment trap used (Type I through V).

Location

Sediment traps shall be located so that they can be installed prior to grading or filling in the drainage area they are to protect. Traps must not be located any closer than 20 feet from a proposed building foundation if the trap is to function during building construction. Locate traps to obtain maximum storage benefit from the terrain and for ease of cleanout and disposal of the trapped sediment.

Trap Size

The volume of a sediment trap as measured at the elevation of the crest of the outlet shall be at least 3,600 cubic feet per acre of drainage area. The volume of a constructed trap shall be calculated using standard mathematical procedures. The volume of a natural sediment trap may be approximated by the equation: Volume (cu.ft.) = 0.4 x surface area (sq.ft.) x maximum depth (ft.).

Trap Cleanout

Sediment shall be removed and the trap restored to the original dimensions when the sediment has accumulated to ½ of the design depth of the trap. Sediment removed from the trap shall be deposited in a protected area and in such a manner that it will not erode.

Embankment

All embankments for sediment traps shall not exceed five (5) feet in height as measured at the low point of the original ground along the centerline of the embankment. Embankments shall have a minimum four (4) foot wide top and side slopes of 2:1 or flatter. The embankment shall be compacted by traversing with equipment while it is being constructed. The embankment shall be stabilized with seed and mulch as soon as it is completed

The elevation of the top of any dike directing water to any sediment trap will equal or exceed the maximum height of the outlet structure along the entire length of the trap.

Excavation

All excavation operations shall be carried out in such a manner that erosion and water pollution shall be minimal. Excavated portions of sediment traps shall have 1:1 or flatter slopes.

Outlet

The outlet shall be designed, constructed, and maintained in such a manner that sediment does not leave the trap and that erosion at or below the outlet does not occur.

Sediment traps must outlet onto stabilized (preferable undisturbed) ground, into a watercourse, stabilized channel, or into a storm drain system. Distance between inlet and outlet should be maximized to the longest length practicable.

Trap Details Needed on Erosion and Sediment Control Plans

Each trap shall be delineated on the plans in such a manner that it will not be confused with any other features. Each trap on a plan shall indicate all the information necessary to properly construct and maintain the structure. If the drawings are such that this information cannot be delineated on the drawings, then a table shall be developed. If a table is developed, then each trap on a plan shall have a number and the numbers shall be consecutive.

The following information shall be shown for each trap in a summary table format on the plans.

1. Trap number
2. Type of trap
3. Drainage area
4. Storage required
5. Storage provided (if applicable)
6. Outlet length or pipe sizes
7. Storage depth below outlet or cleanout elevation
8. Embankment height and elevation (if applicable)

Type of Sediment Traps

There are five (5) specific types of sediment traps which vary according to their function, location, or drainage area.

I. Pipe Outlet Sediment Trap
II. Grass Outlet Sediment Trap
III. Catch Basin Sediment Trap
IV. Stone Outlet Sediment Trap
V. Riprap Outlet Sediment Trap

I. Pipe Outlet Sediment Trap

A Pipe Outlet Sediment Trap consists of a trap formed by embankment or excavation. The outlet for the trap is through a perforated riser and a pipe through the embankment. The outlet pipe and riser shall be made of steel, corrugated metal or other suitable material. The top of the embankment shall be at least 1 ½ feet above the crest of the riser. The top 2/3 of the riser shall be perforated with one (1) inch nominal diameter holes or slits spaced six (6) inches vertically and horizontally placed in the concave portion of the corrugated pipe.

No holes or slits will be allowed within six (6) inches of the top of the horizontal barrel. All pipe connections shall be watertight. The riser shall be wrapped with ½ to ¼ inch hardware cloth wire then wrapped with filter cloth with a sieve size between #40-80 and secured with strapping or connecting band at the top and bottom of the cloth. The cloth shall cover an area at least six (6) inches above the highest hole and six (6) inches below the lowest hole. The top of the riser pipe shall not be covered with filter cloth. The riser shall have a base with sufficient weight to prevent flotation of the riser. Two approved bases are:

1. A concrete base 12 in. thick with the riser embedded 9 in. into the concrete base, or

2. One quarter inch, minimum, thick steel plate attached to the riser by a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2.5 feet of stone, gravel, or earth placed on it to prevent flotation. In either case, each side of the square base measurement shall be the riser diameter plus 24 inches.

Pipe outlet sediment traps shall be limited to a five (5) acre maximum drainage area. Pipe outlet sediment traps may be interchangeable in the field with stone outlet or riprap sediment traps provided that these sediment traps are constructed in accordance with the detail and specifications for that trap.

Select pipe diameter from the following table:

Minimum Sizes

Barrel Diameter[1] (in.)	Riser Diameter[1] (in.)	Maximum Drainage Area (ac.)
12	15	1
15	18	2
18	21	3
21	24	4
21	27	5

[1] Barrel diameter may be same size as riser diameter.

See details for Pipe Outlet Sediment Trap ST-I in Figure 5A.16 (1) and 5A.16 (2) on pages 5A.38 and 5A.39.

II. Grass Outlet Sediment Trap

A Grass Outlet Sediment Trap consists of a trap formed by excavating the earth to create a holding area. The trap has a discharge point over natural existing grass. The outlet crest width (feet) shall be equal to four (4) times the drainage area (acres) with a minimum width of four (4) feet. The outlet shall be free of any restrictions to flow. The outlet lip must remain undisturbed and level. The volume of this trap shall be computed at the elevation of the crest of the outlet. Grass outlet sediment traps shall be limited to a five (5) acre maximum drainage area.

See details for Grass Outlet Sediment Trap ST-II in Figure 5A.17 on page 5A.40.

III. Catch Basin Sediment Trap

A Catch Basin Sediment Trap consists of a basin formed by excavation on natural ground that discharges through an opening in a storm drain inlet structure. This opening can either be the inlet opening or a temporary opening made by omitting bricks or blocks in the inlet.

A yard drain inlet or an inlet in the median strip of a dual highway could use the inlet opening for the type outlet. The trap should be out of the roadway so as not to interfere with future compaction or construction. Placing the trap on the opposite side of the opening and diverting water from the roadway to the trap is one means of doing this. Catch basin sediment traps shall be limited to a three (3) acre maximum drainage area. The volume of this trap is measured at the elevation of the crest of the outlet (invert of the inlet opening).

See details for Catch Basin Sediment Trap ST-III in Figure 5A.18 on page 5A.41.

IV. Stone Outlet Sediment Trap

A Stone Outlet Sediment Trap consists of a trap formed by an embankment or excavation. The outlet of this trap is over a stone section placed on level ground. The minimum length (feet) of the outlet shall be equal to four (4) times the drainage area (acres).

Required storage shall be 3,600 cubic feet per acre of drainage area.

The outlet crest (top of stone in weir section) shall be level, at least one (1) foot below top of embankment and no more than one (1) foot above ground beneath the outlet. Stone used in the outlet shall be small riprap (4 in. x 8 in.). To provide more efficient trapping effect, a layer of filter cloth should be embedded one (1) foot back into the upstream face of the outlet stone or a one (1) foot thick layer of two (2) inch or finer aggregate shall be placed on the upstream face of the outlet.

Stone Outlet Sediment Traps may be interchangeable in the field with pipe or riprap outlet sediment traps provided they are constructed in accordance with the detail and specifications for those traps. Stone outlet sediment traps shall be limited to a five (5) acre maximum drainage area.

See details for Stone Outlet Sediment Trap ST-IV in Figure 5A.19 on page 5A.42.

V. Riprap Outlet Sediment Trap

A Riprap Outlet Sediment Trap consists of a trap formed by an excavation and embankment. The outlet for this trap shall be through a partially excavated channel lined with riprap. This outlet channel shall discharge onto a stabilized area or to a stable watercourse. The riprap outlet sediment trap may be used for drainage areas of up to a maximum of 15 acres.

Design Criteria for Riprap Outlet Sediment Trap

1. The total contributing drainage area (disturbed or undisturbed either on or off the developing property) shall not exceed 15 acres.
2. The storage needs for this trap shall be computed using 3600 cubic feet of required storage for each acre of drainage area. The storage volume provided can be figured by computing the volume of storage area available behind the outlet structure up to an elevation of one (1) foot below the level weir crest.
3. The maximum height of embankment shall not exceed five (5) feet.
4. The elevation of the top of any dike directing water to a riprap outlet sediment trap will equal or exceed the minimum elevation of the embankment along the entire length of this trap.

Riprap Outlet Sediment Trap ST-V
(for Stone Lined Channel)

Contributing Drainage Area (ac.)	Depth of Channel (a) (ft.)	Length of Weir (b) (ft.)
1	1.5	4.0
2	1.5	5.0
3	1.5	6.0
4	1.5	10.0
5	1.5	12.0
6	1.5	14.0
7	1.5	16.0
8	2.0	10.0
9	2.0	10.0
10	2.0	12.0
11	2.0	14.0
12	2.0	14.0
13	2.0	16.0
14	2.0	16.0
15	2.0	18.0

See details for Riprap Outlet Sediment Trap ST-V on Figures 5A.20(1) and 5A.20(2) on pages 5A.43 and 5A.44.

Optional Dewatering Methods

Optional dewatering devices may be designed for use with sediment traps. Included are two methods, which may be used. See Figure 5A.21 on page 5A.45 for details.

Figure 5A.16(1)
Pipe Outlet Sediment Trap: ST-I

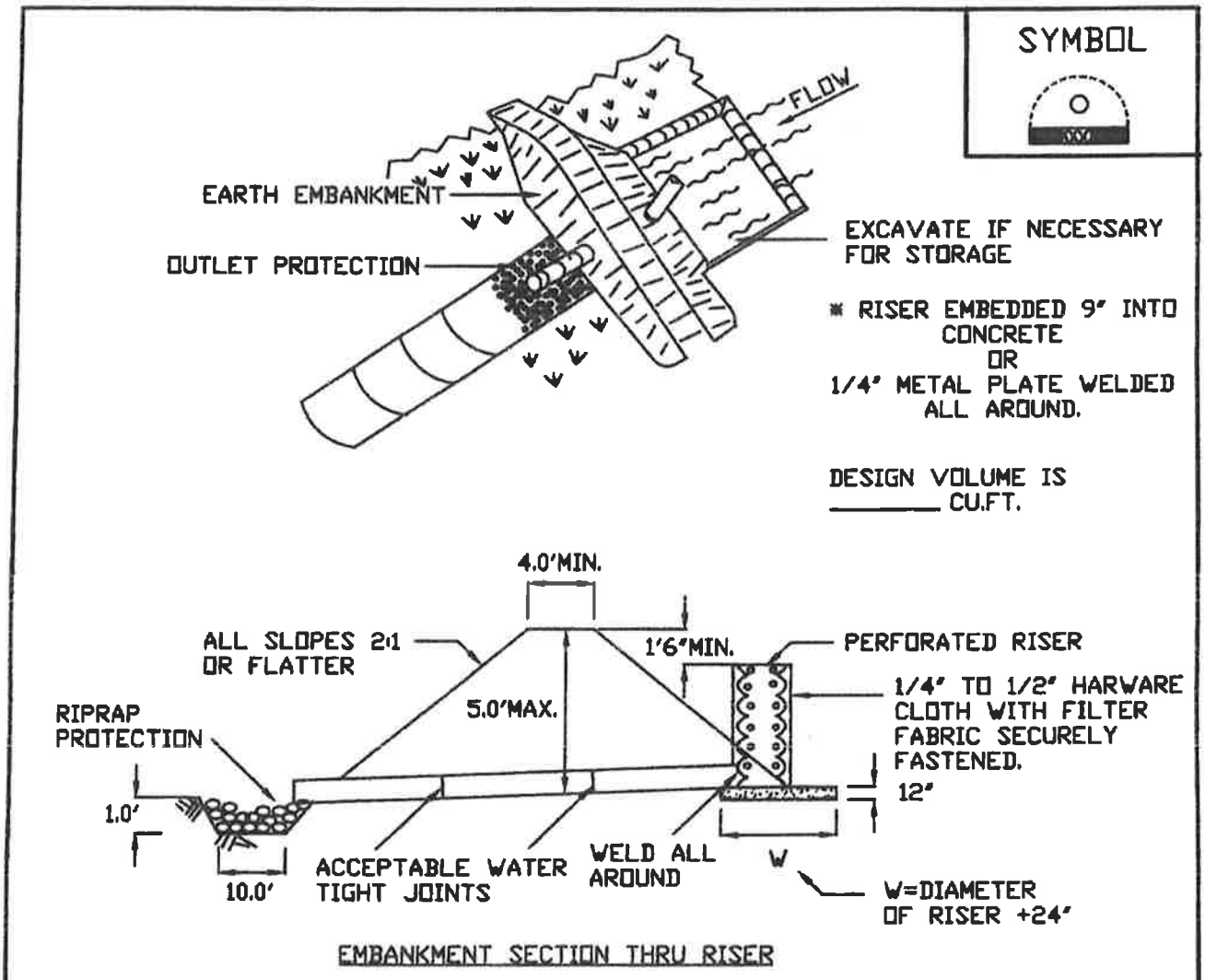


Figure 5A.16(2)
Pipe Outlet Sediment Trap: ST-I—Construction Specifications

SYMBOL

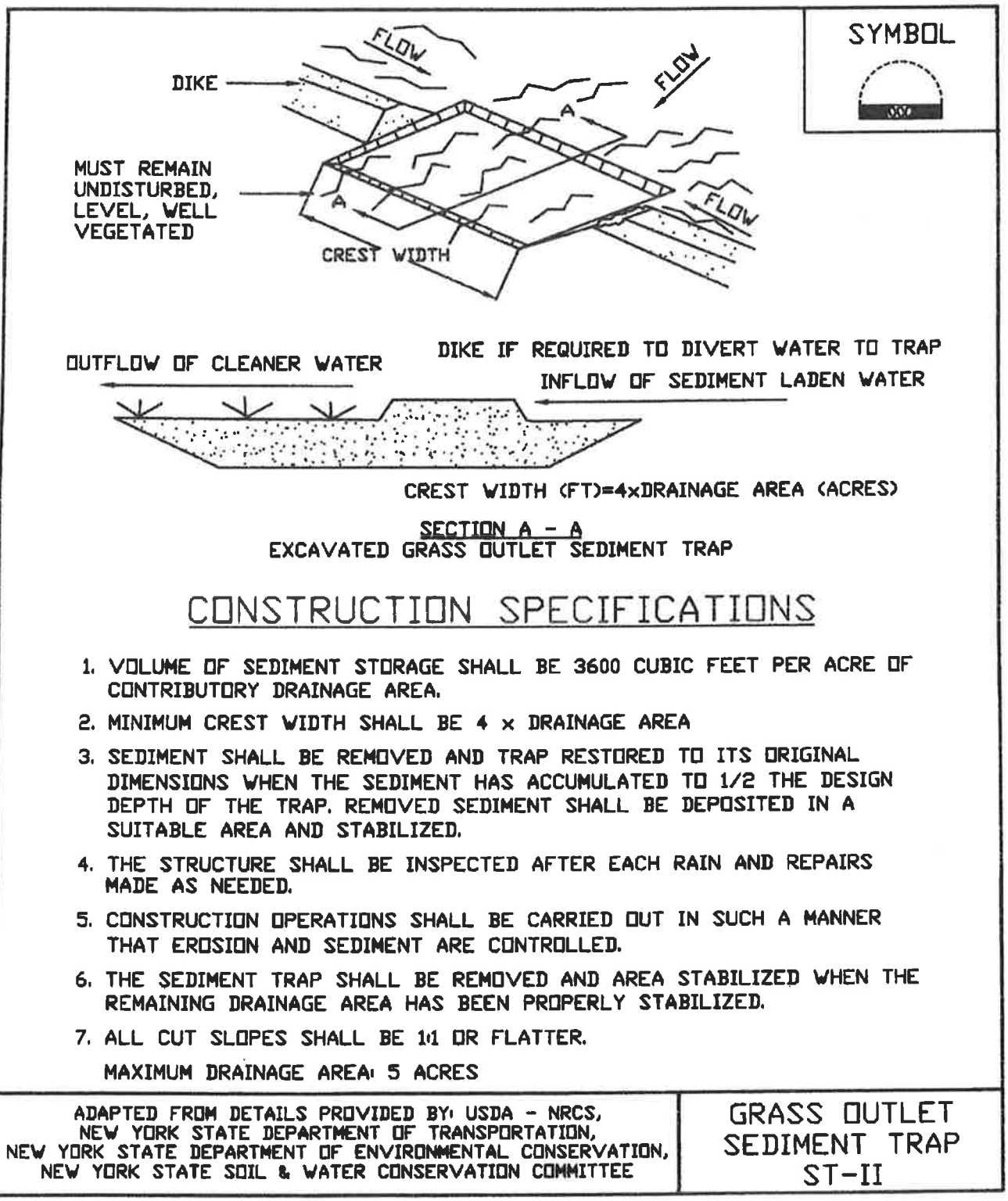
CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL, OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE.
4. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND STABILIZED.
5. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
6. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
7. THE STRUCTURE SHALL BE REMOVED AND AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
8. ALL FILL SLOPES SHALL BE 2:1 OR FLATTER; CUT SLOPES 1:1 OR FLATTER.
9. ALL PIPE CONNECTIONS SHALL BE WATERTIGHT.
10. THE TOP 2/3 OF THE RISER SHALL BE PERFORATED WITH ONE (1) INCH DIAMETER HOLES OR SLITS SPACED SIX (6) INCHES VERTICALLY AND HORIZONTALLY AND PLACED IN THE CONCAVE PORTION OF PIPE. NO HOLES WILL BE ALLOWED WITHIN SIX (6) INCHES OF THE HORIZONTAL BARREL.
11. THE RISER SHALL BE WRAPPED WITH 1/4 TO 1/2 INCH HARDWARE CLOTH WIRE THEN WRAPPED WITH FILTER CLOTH (HAVING AN EQUIVALENT SIEVE SIZE OF 40-80). THE FILTER CLOTH SHALL EXTEND SIX (6) INCHES ABOVE THE HIGHEST HOLE AND SIX (6) INCHES BELOW THE LOWEST HOLE. WHERE ENDS OF THE FILTER CLOTH COME TOGETHER, THEY SHALL BE OVER-LAPPED, FOLDED AND STAPLED TO PREVENT BYPASS.
12. STRAPS OR CONNECTING BANDS SHALL BE USED TO HOLD THE FILTER CLOTH AND WIRE FABRIC IN PLACE. THEY SHALL BE PLACED AT THE TOP AND BOTTOM OF THE CLOTH.
13. FILL MATERIAL AROUND THE PIPE SPILLWAY SHALL BE HAND COMPACTED IN FOUR (4) INCH LAYERS. A MINIMUM OF TWO (2) FEET OF HAND COMPACTED BACKFILL SHALL BE PLACED OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.
14. THE RISER SHALL BE ANCHORED WITH EITHER A CONCRETE BASE OR STEEL PLATE BASE TO PREVENT FLOTATION. FOR CONCRETE BASED THE DEPTH SHALL BE TWELVE (12) INCHES WITH THE RISER EMBEDDED NINE (9) INCHES. A 1/4 INCH MINIMUM THICKNESS STEEL PLATE SHALL BE ATTACHED TO THE RISER BY A CONTINUOUS WELD AROUND THE BOTTOM TO FORM A WATERTIGHT CONNECTION AND THEN PLACE TWO (2) FEET OF STONE, GRAVEL, OR TAMPED EARTH ON THE PLATE.

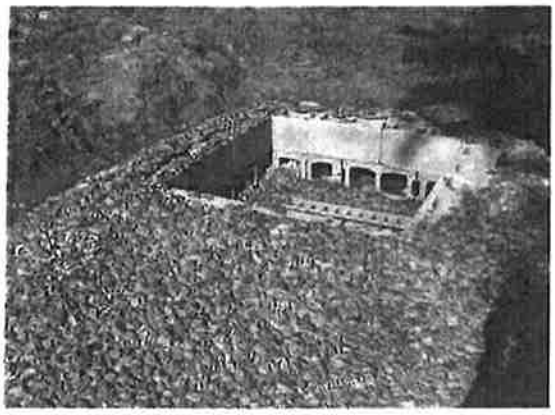
ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

PIPE OUTLET
SEDIMENT TRAP
ST-I

Figure 5A.17
Grass Outlet Sediment Trap: ST-II



STANDARD AND SPECIFICATIONS FOR STORM DRAIN INLET PROTECTION



Definition

A temporary, somewhat permeable barrier, installed around inlets in the form of a fence, berm or excavation around an opening, trapping water and thereby reducing the sediment content of sediment laden water by settling.

Purpose

To prevent heavily sediment laden water from entering a storm drain system through inlets.

Conditions Where Practice Applies

This practice shall be used where the drainage area to an inlet is disturbed, it is not possible to temporarily divert the storm drain outfall into a trapping device, and watertight blocking of inlets is not advisable. **It is not to be used in place of sediment trapping devices.** This may be used in conjunction with storm drain diversion to help prevent siltation of pipes installed with low slope angle.

Types of Storm Drain Inlet Practices

There are four (4) specific types of storm drain inlet protection practices that vary according to their function, location, drainage area, and availability of materials:

I. Excavated Drop Inlet Protection
II. Fabric Drop Inlet Protection
III. Stone & Block Drop Inlet Protection
IV. Curb Drop Inlet Protection

Design Criteria

Drainage Area – The drainage area for storm drain inlets shall not exceed one acre. The crest elevations of these practices shall provide storage and minimize bypass flow.

Type I – Excavated Drop Inlet Protection

See details for Excavated Drop Inlet Protection in Figure 5A.11 on page 5A.29.

Limit the drainage area to the inlet device to 1 acre. Excavated side slopes shall be no steeper than 2:1. The minimum depth shall be 1 foot and the maximum depth 2 feet as measured from the crest of the inlet structure. Shape the excavated basin to fit conditions with the longest dimension oriented toward the longest inflow area to provide maximum trap efficiency. The capacity of the excavated basin should be established to contain 900 cubic feet per acre of disturbed area. Weep holes, protected by fabric and stone, should be provided for draining the temporary pool.

Inspect and clean the excavated basin after every storm. Sediment should be removed when 50 percent of the storage volume is achieved This material should be incorporated into the site in a stabilized manner.

Type II – Fabric Drop Inlet Protection

See Figure 5A.12 for details on Filter Fabric Drop Inlet Protection on page 5A.30.

Limit the drainage area to 1 acre per inlet device. Land area slope immediately surrounding this device should not exceed 1 percent. The maximum height of the fabric above the inlet crest shall not exceed 1.5 feet unless reinforced.

The top of the barrier should be maintained to allow overflow to drop into the drop inlet and not bypass the inlet to unprotected lower areas. Support stakes for fabric shall be a minimum of 3 feet long, spaced a maximum 3 feet apart. They should be driven close to the inlet so any overflow drops into the inlet and not on the unprotected soil. Improved performance and sediment storage volume can be obtained by excavating the area.

Inspect the fabric barrier after each rain event and make repairs as needed. Remove sediment from the pool area as necessary with care not to undercut or damage the filter fabric. Upon stabilization of the drainage area, remove all materials and unstable sediment and dispose of properly. Bring the adjacent area of the drop inlet to grade, smooth and compact and stabilize in the appropriate manner to the site.

If straw bales are used in lieu of filter fabric, they should be placed tight with the cut edge adhering to the ground at least 3 inches below the elevation of the drop inlet. Two anchor stakes per bale shall be driven flush to bale surface. Straw bales will be replaced every 4 months until the area is stabilized.

Type III – Stone and Block Drop Inlet Protection

See Figure 5A.13 for details on Stone and Block Drop Inlet Protection on page 5A.31.

Limit the drainage area to 1 acre at the drop inlet. The stone barrier should have a minimum height of 1 foot and a maximum height of 2 feet. Do not use mortar. The height should be limited to prevent excess ponding and bypass flow.

Recess the first course of blocks at least 2 inches below the crest opening of the storm drain for lateral support. Subsequent courses can be supported laterally if needed by placing a 2x4 inch wood stud through the block openings perpendicular to the course. The bottom row should have a few blocks oriented so flow can drain through the block to dewater the basin area.

The stone should be placed just below the top of the blocks on slopes of 2:1 or flatter. Place hardware cloth of wire mesh with ½ inch openings over all block openings to hold stone in place.

As an optional design, the concrete blocks may be omitted and the entire structure constructed of stone, ringing the outlet ("doughnut"). The stone should be kept at a 3:1 slope toward the inlet to keep it from being washed into the inlet. A level area 1 foot wide and four inches below the crest will further prevent wash. Stone on the slope toward the inlet should be at least 3 inches in size for stability and 1 inch or smaller away from the inlet to control flow rate. The elevation of the top of the stone crest must be maintained 6 inches lower than the ground elevation down slope from the inlet to ensure that all storm flows pass over the stone into the storm drain and not past the structure. Temporary diking should be used as necessary to prevent bypass flow.

The barrier should be inspected after each rain event and repairs made where needed. Remove sediment as necessary to provide for accurate storage volume for subsequent rains. Upon stabilization of contributing drainage area, remove all materials and any unstable soil and dispose of properly.

Bring the disturbed area to proper grade, smooth, compact and stabilized in a manner appropriate to the site.

Type IV – Curb Drop Inlet Protection

See Figure 5A. 14 for details on Curb Drop Inlet Protection on page 5A.32.

The drainage area should be limited to 1 acre at the drop inlet. The wire mesh must be of sufficient strength to support the filter fabric and stone with the water fully impounded against it. Stone is to be 2 inches in size and clean. The filter fabric must be of a type approved for this purpose with an equivalent opening size (EOS) of 40-85. The protective structure will be constructed to extend beyond the inlet 2 feet in both directions. Assure that storm flow does not bypass the inlet by installing temporary dikes (such as sand bags) directing flow into the inlet. Make sure that the overflow weir is stable. Traffic safety shall be integrated with the use of this practice.

The structure should be inspected after every storm event. Any sediment should be removed and disposed of on the site. Any stone missing should be replaced. Check materials for proper anchorage and secure as necessary.

Figure 5A.11
Excavated Drop Inlet Protection

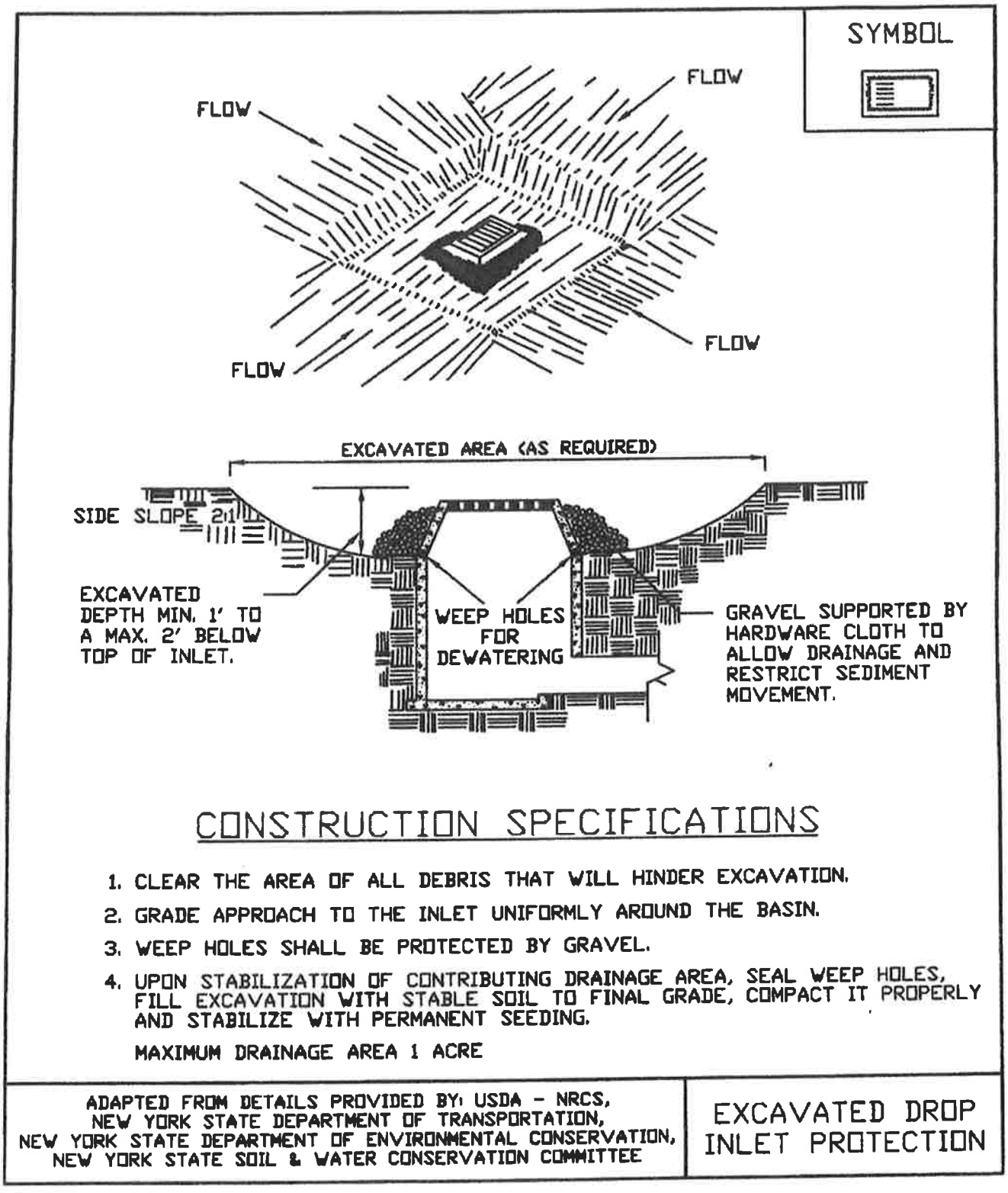
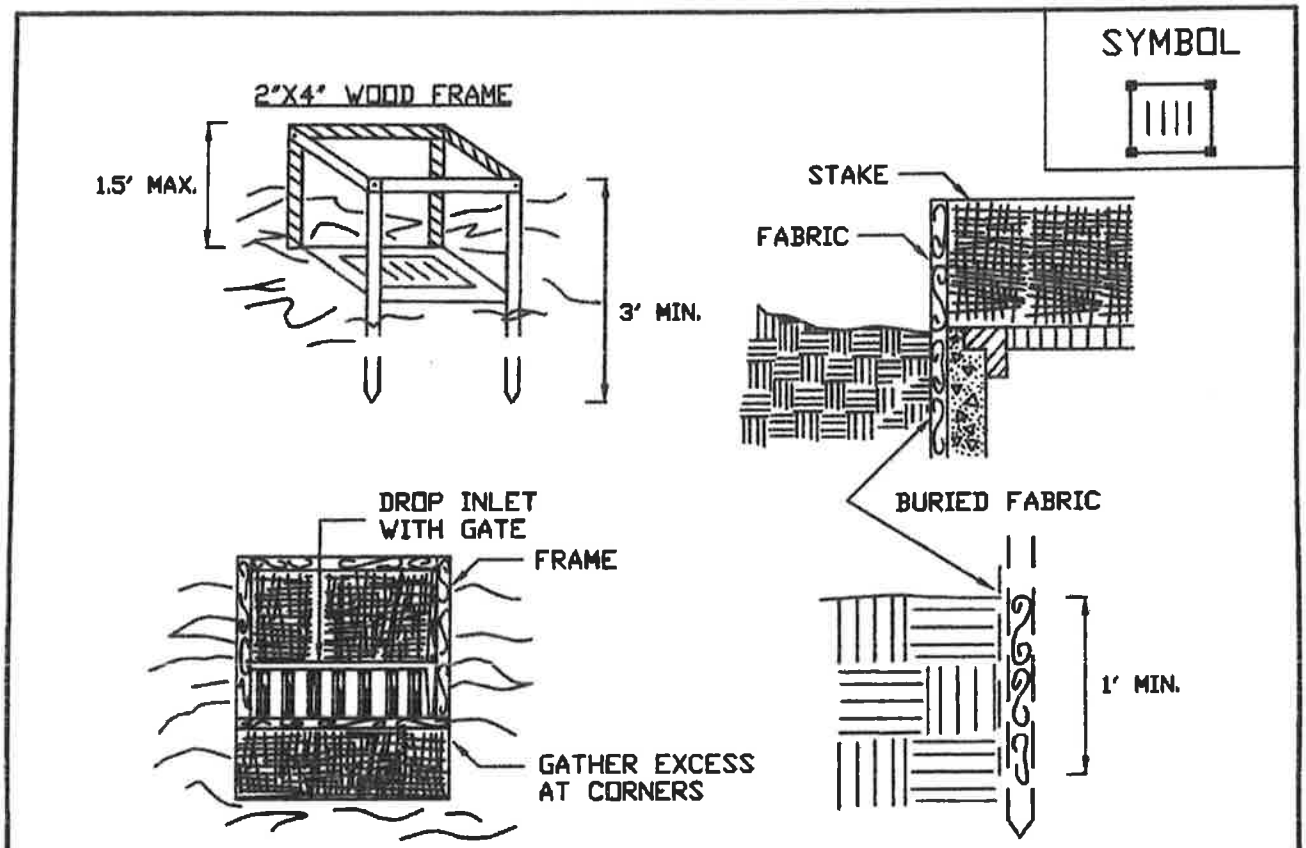


Figure 5A.12
Filter Fabric Drop Inlet Protection



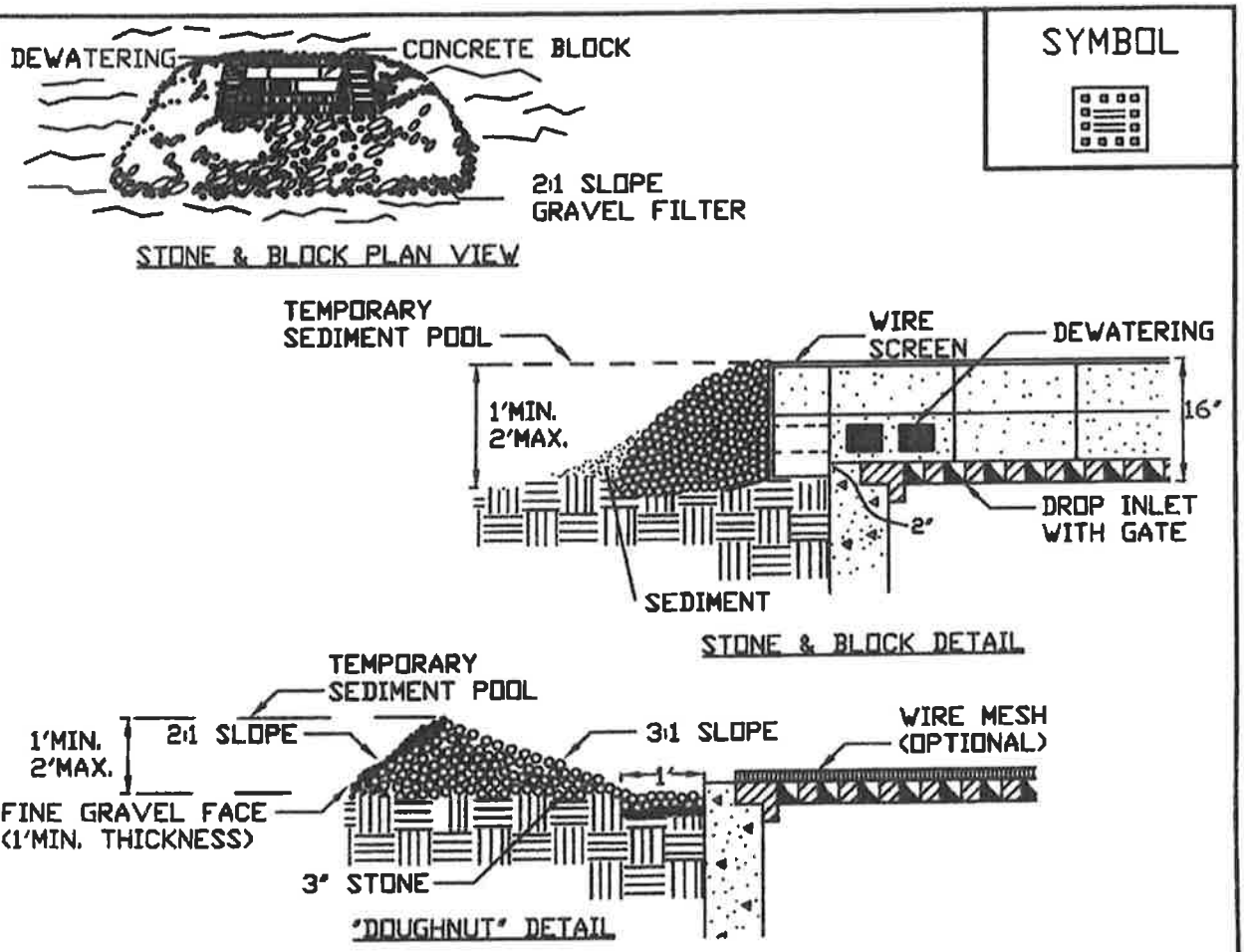
CONSTRUCTION SPECIFICATIONS

1. FILTER FABRIC SHALL HAVE AN EOS OF 40-85. BURLAP MAY BE USED FOR SHORT TERM APPLICATIONS.
2. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NEEDED THEY WILL BE OVERLAPPED TO THE NEXT STAKE.
3. STAKE MATERIALS WILL BE STANDARD 2" x 4" WOOD OR EQUIVALENT. METAL WITH A MINIMUM LENGTH OF 3 FEET.
4. SPACE STAKES EVENLY AROUND INLET 3 FEET APART AND DRIVE A MINIMUM 18 INCHES DEEP. SPANS GREATER THAN 3 FEET MAY BE BRIDGED WITH THE USE OF WIRE MESH BEHIND THE FILTER FABRIC FOR SUPPORT.
5. FABRIC SHALL BE EMBEDDED 1 FOOT MINIMUM BELOW GROUND AND BACKFILLED. IT SHALL BE SECURELY FASTENED TO THE STAKES AND FRAME.
6. A 2" x 4" WOOD FRAME SHALL BE COMPLETED AROUND THE CREST OF THE FABRIC FOR OVER FLOW STABILITY.

MAXIMUN DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA – NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	FILTER FABRIC DROP INLET PROTECTION

Figure 5A.13
Stone & Block Drop Inlet Protection



CONSTRUCTION SPECIFICATIONS

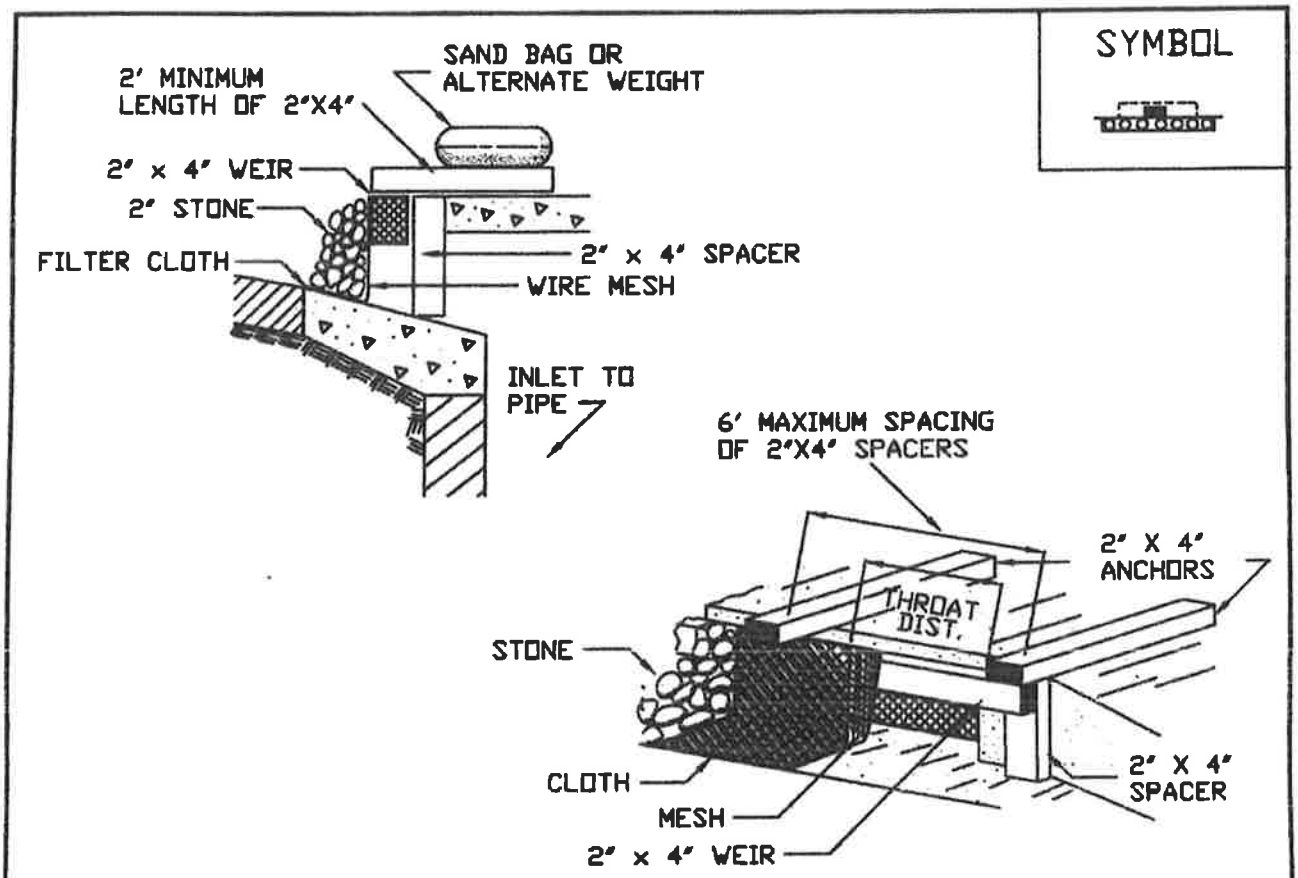
1. LAY ONE BLOCK ON EACH SIDE OF THE STRUCTURE ON ITS SIDE FOR DEWATERING. FOUNDATION SHALL BE 2 INCHES MINIMUM BELOW REST OF INLET AND BLOCKS SHALL BE PLACED AGAINST INLET FOR SUPPORT.
2. HARDWARE CLOTH OR 1/2" WIRE MESH SHALL BE PLACED OVER BLOCK OPENINGS TO SUPPORT STONE.
3. USE CLEAN STONE OR GRAVEL 1/2-3/4 INCH IN DIAMETER PLACED 2 INCHES BELOW TOP OF THE BLOCK ON A 2:1 SLOPE OR FLATTER.
4. FOR STONE STRUCTURES ONLY, A 1 FOOT THICK LAYER OF THE FILTER STONE WILL BE PLACED AGAINST THE 3 INCH STONE AS SHOWN ON THE DRAWINGS.

MAXIMUM DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA – NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STONE & BLOCK DROP INLET PROTECTION

Figure 5A.14
Curb Drop Inlet Protection



CONSTRUCTION SPECIFICATIONS

1. FILTER FABRIC SHALL HAVE AN AOS OF 40-85.
2. WOODEN FRAME SHALL BE CONSTRUCTED OF 2" x 4" CONSTRUCTION GRADE LUMBER.
3. WIRE MESH ACROSS THROAT SHALL BE A CONTINUOUS PIECE 30 INCH MINIMUM WIDTH WITH A LENGTH 4 FEET LONGER THAN THE THROAT. IT SHALL BE SHAPED AND SECURELY NAILED TO A 2" x 4" WEIR.
4. THE WEIR SHALL BE SECURELY NAILED TO 2" x 4" SPACERS 9 INCHES LONG SPACED NO MORE THAN 6 FEET APART.
5. THE ASSEMBLY SHALL BE PLACED AGAINST THE INLET AND SECURED BY 2" x 4" ANCHORS 2 FEET LONG EXTENDING ACROSS THE TOP OF THE INLET AND HELD IN PLACE BY SANDBAGS OR ALTERNATE WEIGHTS.

MAXIMUM DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

CURB DROP INLET PROTECTION

STANDARD AND SPECIFICATIONS FOR DUST CONTROL

Definition

The control of dust resulting from land-disturbing activities.

Purpose

To prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage, health hazards, and traffic safety problems.

Conditions Where Practice Applies

On construction roads, access points, and other disturbed areas subject to surface dust movement and dust blowing where off-site damage may occur if dust is not controlled.

Design Criteria

Construction operations should be scheduled to minimize the amount of area disturbed at one time. Buffer areas of vegetation should be left where practical. Temporary or permanent stabilization measures shall be installed. No specific design criteria is given; see construction specifications below for common methods of dust control.

Water quality must be considered when materials are selected for dust control. Where there is a potential for the material to wash off to a stream, ingredient information must be provided to the local permitting authority.

Construction Specifications

A. **Non-driving Areas** – These areas use products and materials applied or placed on soil surfaces to prevent airborne migration of soil particles.

Vegetative Cover – For disturbed areas not subject to traffic, vegetation provides the most practical method of dust control (see Section 3).

Mulch (including gravel mulch) – Mulch offers a fast effective means of controlling dust. This can also include rolled erosion control blankets.

Spray adhesives – These are products generally composed of polymers in a liquid or solid form that are mixed with water to form an emulsion that is sprayed on the soil surface with typical hydroseeding equipment. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations for the specific soils on the site. In no case should the application of these adhesives be made on wet soils or if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators and others working with the material.

B. **Driving Areas** – These areas utilize water, polymer emulsions, and barriers to prevent dust movement from the traffic surface into the air.

Sprinkling – The site may be sprayed with water until the surface is wet. This is especially effective on haul roads and access routes.

Polymer Additives – These polymers are mixed with water and applied to the driving surface by a water truck with a gravity feed drip bar, spray bar or automated distributor truck. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations. Incorporation of the emulsion into the soil will be done to the appropriate depth based on expected traffic. Compaction after incorporation will be by vibratory roller to a minimum of 95%. The prepared surface shall be moist and no application of the polymer will be made if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators working with the material.

Barriers – Woven geotextiles can be placed on the driving surface to effectively reduce dust throw and particle migration on haul roads. Stone can also be used for construction roads for effective dust control.

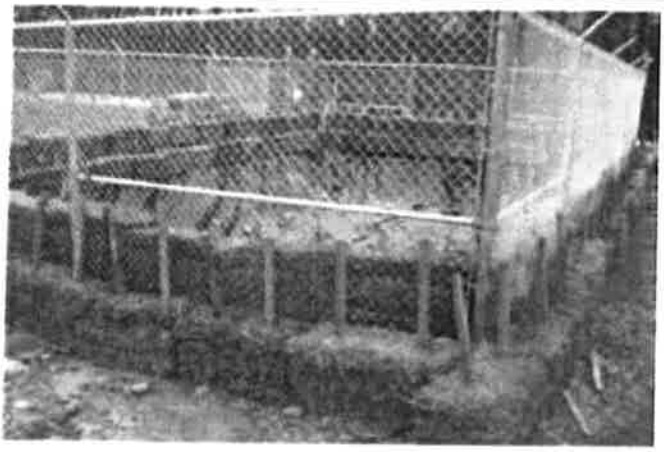
Windbreak – A silt fence or similar barrier can control air currents at intervals equal to ten times the barrier height. Preserve existing wind barrier vegetation as much as practical.

All Stormwater Pollution Prevention Plans must contain the NYS DEC issued "Conditions for Use" and "Application Instructions" for any polymers used on the site. This information can be obtained from the NYS DEC website.

Maintenance

Maintain dust control measures through dry weather periods until all disturbed areas are stabilized.

STANDARD AND SPECIFICATIONS FOR CONCRETE TRUCK WASHOUT



Definition & Scope

A temporary excavated or above ground lined constructed pit where concrete truck mixers and equipment can be washed after their loads have been discharged, to prevent highly alkaline runoff from entering storm drainage systems or leaching into soil.

Conditions Where Practice Applies

Washout facilities shall be provided for every project where concrete will be poured or otherwise formed on the site. This facility will receive highly alkaline wash water from the cleaning of chutes, mixers, hoppers, vibrators, placing equipment, trowels, and screeds. Under no circumstances will wash water from these operations be allowed to infiltrate into the soil or enter surface waters.

Design Criteria

Capacity: The washout facility should be sized to contain solids, wash water, and rainfall and sized to allow for the evaporation of the wash water and rainfall. Wash water shall be estimated at 7 gallons per chute and 50 gallons per hopper of the concrete pump truck and/or discharging drum. The minimum size shall be 8 feet by 8 feet at the bottom and 2 feet deep. If excavated, the side slopes shall be 2 horizontal to 1 vertical.

Location: Locate the facility a minimum of 100 feet from drainage swales, storm drain inlets, wetlands, streams and other surface waters. Prevent surface water from entering the structure except for the access road. Provide appropriate access with a gravel access road sloped down to the structure. Signs shall be placed to direct drivers to the facility after their load is discharged.

Liner: All washout facilities will be lined to prevent leaching of liquids into the ground. The liner shall be plastic sheeting with a minimum thickness of 10 mils with no holes or tears, and anchored beyond the top of the pit with an earthen berm, sand bags, stone, or other structural appurtenance except at the access point.

If pre-fabricated washouts are used they must ensure the capture and containment of the concrete wash and be sized based on the expected frequency of concrete pours. They shall be sited as noted in the location criteria.

Maintenance

- All concrete washout facilities shall be inspected daily. Damaged or leaking facilities shall be deactivated and repaired or replaced immediately. Excess rainwater that has accumulated over hardened concrete should be pumped to a stabilized area, such as a grass filter strip.
- Accumulated hardened material shall be removed when 75% of the storage capacity of the structure is filled. Any excess wash water shall be pumped into a containment vessel and properly disposed of off site.
- Dispose of the hardened material off-site in a construction/demolition landfill. On-site disposal may be allowed if this has been approved and accepted as part of the projects SWPPP. In that case, the material should be recycled as specified, or buried and covered with a minimum of 2 feet of clean compacted earthfill that is permanently stabilized to prevent erosion.
- The plastic liner shall be replaced with each cleaning of the washout facility.
- Inspect the project site frequently to ensure that no concrete discharges are taking place in non-designated areas.

APPENDIX K

Sample Inspection Reports

Pre-Construction Site Assessment Checklist Page 1 of 2

Name of Permitted Facility:	Permit Identification #: NYR	Date of Authorization:
Location:	SDC Project No.:	
Name and Telephone Number of Owner/Operator:	Name and Telephone Number of Site Inspector:	
Today's date: Day: S M T W T F S AM or PM	Weather / Temp:	

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

Yes	No	NA	Observations
			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) on-site? Where? _____
			Have all contractors involved with stormwater-related activities signed a contractor's certification?

2. Resource Protection:

Yes	No	NA	Observations
			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	Observations
			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 or protected.
			Appropriate practices to protect on-site or downstream surface water are installed.
			Are clearing and grading operations divided into areas < 5 acres?

Pre-Construction Site Assessment Checklist Page 2 of 2

4. Stabilized Construction Entrance:

Yes	No	NA	Observations
			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. Perimeter Sediment Controls:

Yes	No	NA	Observations
			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 hand disturbing activity.
			Sediment traps and barriers are installed.

6. Pollution Prevention for Waste and Hazardous Materials:

Yes	No	NA	Observations
			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 on-site. Where?_____.

Note: Provide comments below as necessary:

_____

_____

_____

_____

_____

_____

Construction Duration Inspections: Page 1 of 6

Name of Permitted Facility:	Permit Identification #: NYR	Date of Authorization:
Location:	SDC Project No.:	
Name and Telephone Number of Owner/Operator:	Name and Telephone Number of Site Inspector:	
Today's date: Day: S M T W T F S AM or PM	Weather / Temp:	

Permit Reference: Part IV.C.2.a (page 17):

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

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

Immediate report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

Construction Duration Inspections: Page 2 of 6

Identify location, nature of work, by contractor and subcontractors for each operation:

PLAN / SKETCH

Inspector (print name)	Date of Inspection
Qualified Professional (print name)	Qualified Professional Signature

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

Construction Duration Inspections: Page 3 of 6

Maintaining Water Quality

Yes	No	NA	Observations
			Is there an increase in turbidity causing a substantial contrast to natural conditions?
			Is there residue from oil and floating substances, visible oil film, or globules or grease?
			All disturbances are 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	Observations
			Is construction site litter and debris 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	Observations
			Maximum diameter pipe 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 and prevent sediment from entering stream during high flow.

Runoff Control Practices

1. Excavation Dewatering

Yes	No	NA	Observations
			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.

2. Level Spreader

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

Construction Duration Inspections: Page 4 of 6

3. Interceptor Dikes and Swales

Yes	No	NA	Observations
			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	Observations
			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	Observations
			Installed as per Plan
			Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

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

2. Revegetation

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

Sediment Control Practices

1. Stabilized Construction Entrance

Yes	No	NA	Observations
			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?

Construction Duration Inspections: Page 5 of 6

2. Silt Fence – Sediment accumulation is _____ % of design capacity.

Yes	No	NA	Observations
			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.

3. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated practices) – Sediment accumulation ____% of design capacity.

Yes	No	NA	Observations
			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 1 acre 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.

4. Temporary Sediment Trap – Sediment accumulation is _____% of design capacity.

Yes	No	NA	Observations
			Outlet structure is constructed per the approved plan or drawing.
			Geotextile fabric has been placed beneath rock fill.

5. Temporary Sediment Trap – Sediment accumulation is _____% of design capacity.

Yes	No	NA	Observations
			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.

Recommended maintenance or additional measures:

_____

_____

_____

_____

_____

Notes or Comments:

Construction Duration Inspections: Page 6 of 6

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 SWPP 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 and Reason:

Stormwater Management Pond/Wetland Construction Inspection Checklist

Name of Permitted Facility:	Permit Identification #: NYR	Date of Authorization:
Location:	SDC Project No.:	
Name and Telephone Number of Owner/Operator:	Name and Telephone Number of Site Inspector:	
Today's date: Day: S M T W T F S AM or PM	Weather / Temp:	

Permit Reference: Part IV.C.2.a (page 17):

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

Construction Sequence	Satisfactory/ Unsatisfactory	Comments
1. Pre-Construction / Materials and Equipment		
Pre-Construction Meeting		
Pipe and appurtenances on-site prior to construction and dimensions checked.		
1. Material (including protective coating, if specified).		
2. Diameter.		
3. Dimensions of metal riser or pre-cast concrete outlet structure.		
4. Required dimensions between water control structures (orifices, weirs, etc.) are in accordance with approved plans.		
5. Barrel stub for prefabricated pipe structures at proper angle for design barrel slope.		

Construction Sequence	Satisfactory/ Unsatisfactory	Comments
6. Number and dimensions of prefabricated anti-seep collars.		
7. Watertight connectors and gaskets.		
8. Outlet drain valve.		
Project benchmark near pond site.		
Equipment for temporary de-watering.		
2. Subgrade Preparation		
Area beneath embankment stripped of all vegetation, topsoil and organic matter.		
3. Pipe Spillway Installation		
Method of installation details on plans.		
A. Bed Preparation		
Installation trench excavated with specified side slopes.		
Stable, uniform, dry subgrade of relatively impervious material. (If subgrade is wet, contractor shall have defined steps before proceeding with installation.)		
Invert at proper elevation and grade.		
B. Pipe Placement – Metal / Plastic		
1. Watertight connectors and gaskets properly installed.		
2. Anti-seep collars properly spaced and having watertight connections to pipe.		
3. Backfill placed and tamped by hand under "haunches" of pipe.		

Construction Sequence	Satisfactory/ Unsatisfactory	Comments
4. Remaining backfill placed in max. 8 inch lifts using small power tamping equipment until 2-feet of cover over pipe is reached.		
Pipe Placement – Concrete Pipe		
1. Pipe set on blocks or concrete slab for pouring of low cradle.		
2. Pipe installed with rubber gasket joints with no spalling in gasket interface area.		
3. Excavation for lower half of anti-seep collars(s) with reinforcing steel set.		
4. Entire area where anti-seep collars(s) will come in contact with pipe coated with mastic or other approved waterproof sealant.		
5. Low cradle and bottom half of anti-seep collar installed as monolithic pour and of an approved mix.		
6. Upper half of anti-seep collars(s) formed with reinforcing steel set.		
7. Concrete for collar of an approved mix and vibrated into place (protected from freezing while curing, if necessary).		
8. Forms stripped and collar inspected for honeycomb prior to backfilling. Purge if necessary.		

Post-Development Stormwater Management Practice
Construction Inspection Checklist

Construction Sequence	Satisfactory/ Unsatisfactory	Comments
C. Backfilling		
Fill placed in maximum 8-inch lifts.		
Backfill taken minimum 2-feet above top of anti-seep collar elevation before traversing with heavy equipment.		
4. Riser / Outlet /Structure Installation		
Riser located within embankment.		
A. Metal riser		
1. Rise base excavated or formed on stable subgrade to design dimensions.		
2. Set on blocks to design elevations and plumbed.		
3. Reinforcing bars placed at right angles and projecting into sides of riser.		
4. Concrete poured as to fill inside of riser to invert of barrel.		
B. Pre-Cast Concrete Structure		
1. Dry and stable elevation.		
2. Riser base set to design elevation.		
3. If more than one section, no spalling in gasket interface area; gasket or approved caulking material placed securely.		
4. Watertight and structurally sound collar or gasket joint where structure connects to pipe spillway.		

Post-Development Stormwater Management Practice
Construction Inspection Checklist

Construction Sequence	Satisfactory/ Unsatisfactory	Comments
C. Poured Concrete Structure		
Footing excavated or formed on stable subgrade, to design dimensions with reinforcing steel set.		
Structure formed to design dimensions, with reinforcing steel set as per Plan.		
Concrete of an approved mix and vibrated into place (protect from freezing while curing, if necessary).		
Forms stripped and inspected for "honeycomb" prior to backfilling; parge if necessary.		
5. Embankment Construction		
Fill Material		
Compaction		
Embankment		
1. Fill placed in specified lifts and compacted with appropriate equipment.		
2. Constructed to design cross-section , side slopes and top width.		
3. Constructed to design elevation plus allowance for settlement.		
6. Impounded Area Construction		
Excavated / graded to design contours and side slopes.		
Inlet pipes have adequate outfall protection.		
Forebay(s).		
Pond benches.		

Construction Sequence	Satisfactory/ Unsatisfactory	Comments
7. Earth Emergency Spillway Construction		
Spillway located in cur or structurally stabilized with riprap, gabions, concrete, etc.		
Excavated to proper cross-section, side slopes and bottom width.		
Entrance channel, crest, and exit channel constructed to design grades and elevations.		
8. Outlet Protection		
A. End Section		
Securely in place and properly backfilled.		
B. Endwall		
Footing excavated or formed on stable subgrade, to design dimensions and reinforcing steel set, if specified.		
Endwall formed to design dimensions with reinforcing steel set as per Plan.		
Concrete of an approved mix and vibrated into place (protected from freezing, if necessary).		
Forms stripped and structure inspected for "honeycomb" prior to backfilling; parge if necessary.		
C. Riprap Apron / Channel		
Apron / Channel excavated to design cross-section with proper transition to existing ground.		

Construction Sequence	Satisfactory/ Unsatisfactory	Comments
Filter fabric in place.		
Stone sized as per Plan and uniformly placed at the thickness specified.		
9. Vegetative Stabilization		
Approved seed mixture or sod.		
Proper surface preparation and required soil amendments.		
Excelsior mat or other stabilization, as per Plan.		
10. Miscellaneous		
Drain for ponds having a permanent pool.		
Trash rack / anti-vortex device secured to outlet structure.		
Trash protection for low flow pipes, orifices, etc.		
Fencing (when required).		
Access road.		
Set aside for clean-out maintenance.		
11. Stormwater Wetlands		
Adequate water balance.		
Variety of depth zones present.		
Approved pondscaping plan in place. Reinforcement budget for additional plantings.		
Plants and materials ordered 6 months prior to construction.		
Construction planned to allow for adequate planting and establishment of plant community (April–June planting window).		
Wetland buffer area preserved to maximum extent possible.		

Comments:

Actions to be Taken:

APPENDIX L

Schedule "B"

DECLARATION OF COVENANTS, CONDITIONS, AND RESTRICTIONS FOR

Underhill Farm

DECLARATION made as of the ___ day of _____, 20__, by _____ with an address at _____ (hereinafter referred to as the "Declarant").

W I T N E S S E T H:

WHEREAS, Declarant is the owner of all that certain lot, piece or parcel of land situate, lying and being in the Town of Yorktown Heights, County of Westchester and State of New York, being designated as Section _____, Block ___ and Lot ___ as shown on that certain map entitled "[filed map name]" which was filed in the Office of the County Clerk of Westchester County on [_____] as Filed Map No. [_____] and which is more accurately bounded and described in the deed attached hereto as Exhibit 1 (the "Property"); and

WHEREAS, Declarant plans to undertake or is undertaking plans for the development or sale of land that will result in construction of an impervious surface in the East of Hudson Watershed in a Designated Main Street Area as referenced in the *Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and Its Sources*, Title 10 New York Codes, Rules and Regulations Part 128-3.9(b)(3)(x); Title 15 Rules of the City of New York Chapter 18-39(b)(3)(x) ("Watershed Regulations"); and

WHEREAS, the Watershed Regulations require Declarant to prepare a Stormwater Pollution Prevention Plan ("SWPPP") and submit the SWPPP to the New York City Department of Environmental Protection ("DEP") for its review and approval so that stormwater generated by precipitation during and after soil disturbing activities and runoff from newly created impervious surfaces is captured and treated, thus reducing or eliminating a pollution discharge; and

WHEREAS, Declarant has submitted a SWPPP application to DEP for the Property described above, Hanover Corner Incorporated (number TBD), and received an approval from DEP for such SWPPP, dated _____, such SWPPP approval and the maintenance obligations being attached hereto as Exhibit 2; and

WHEREAS, Declarant desires to declare the following covenants, conditions and restrictions to govern the future development, use and maintenance of any lots that are part of the Property that may be conveyed to future owners, including the Declarant's respective heirs, successors, and assigns, and to subject any deed of conveyance of any such lots to this Declaration, by reference thereto, to the covenants, conditions and restrictions described herein,

NOW, THEREFORE, Declarant hereby declares that the Property shall be held, sold, conveyed, transferred and occupied subject to the following covenants, conditions, and restrictions which are for the benefit of the City of New York as well as for the owners of the Property and which shall be perpetual so long as the provisions of the SWPPP continue to be required by the Watershed Regulations, shall run with the

Property and be binding on the Declarant, its heirs, successors and assigns and be binding upon each successive owner of any Property parcel or lot described in the subdivision plan and the heirs, successors and assigns of each subsequent party having or acquiring any right, title or interest in the Property or any part thereof.

1. Declarant hereby acknowledges, covenants, warrants, and represents that it shall install and maintain any and all erosion and sediment controls and stormwater management practices on the Property in accordance with the SWPPP approved by DEP, dated _____, and any and all amendments to the SWPPP that may be required and that DEP may approve.

2. Declarant's installation and maintenance of the erosion and sediment controls and stormwater management practices shall be for the benefit of the City of New York as well as for the owners of the Property.

3. Declarant's obligation to install and maintain any and all erosion and sediment controls and stormwater management practices on the Property in accordance with the DEP-approved SWPPP and any and all amendments to the SWPPP that DEP may approve shall be perpetual so long as the provisions of the SWPPP continue to be required by the Watershed Regulations.

4. Declarant hereby acknowledges, covenants and warrants that this Property shall be subject to the maintenance obligations set forth and described in the SWPPP, with respect to any stormwater management practices or treatment of runoff located on areas commonly owned by multiple property owners or a homeowners' association in the subdivision.

5. Declarant hereby covenants, warrants, and represents that any lease, mortgage, subdivision, or other transfer of the Property, or any interest therein, shall be subject to the restrictive covenants contained herein pertaining to the installation and maintenance of erosion and sediment control and stormwater management practices, and any deed, mortgage, or other instrument of conveyance shall be subject to and, specifically refer to, the attached SWPPP approval and shall specifically state that the interest thereby conveyed is subject to the covenants and restrictions contained herein and therein.

6. These covenants, conditions and restrictions shall be recorded at the Office of the County Clerk, shall run with the land and shall apply to, inure to the benefit of, and bind the Declarant and all subsequent heirs, executors, administrators, successors and assigns.

IN WITNESS WHEREOF, Declarant has executed this document on the date first above written.

_____

Signature

STATE OF NEW YORK)

)

COUNTY OF _____)

On _____, 20__, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his/her capacity, and that by his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____

Notary Public

Exhibit 1

Exhibit 2

The following is the proposed Inspection and Maintenance Schedule:

Control to be Inspected	Inspection Frequency	Maintenance Threshold Criteria	Maintenance Procedure
Drain Inlets	Quarterly	3"+ accumulated sediment	Remove debris and sediment annually.
Detention	Annually	3"+ accumulated sediment	Remove debris and sediment annually.
Pocket Wetland	Quarterly	3"+ accumulated sediment	Remove accumulated sediment and debris; weed and replace plants as needed.
Tree Planting	Quarterly	Ponding for more than 48 hours	Remove accumulated sediment and debris; weed and replace dead trees with new ones and mulch as needed.

APPENDIX M

Project Plans