

STORMWATER MANAGEMENT REPORT

for

Davenport Village Expansion

**101 – 708 Davenport Avenue
Block 9.01, Lot 43
Hainesport Township, Burlington County, New Jersey**

August 2019
Revised February 2022

Prepared for:

DV Hainesport LLC

c/o



DIOCESE OF CAMDEN

Diocesan Housing Services Corporation
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1.0 PROJECT DESCRIPTION

DV Hainesport LLC (Applicant) is seeking land use approvals for the construction of sixteen (16) additional affordable apartment units in two (2) buildings at Davenport Village in Hainesport Township, Burlington County, New Jersey. The site was previously developed in 2004 with 56 affordable apartments so with this expansion the total unit count on the site will be 72. The buildings and parking area expansion are proposed over what is currently tennis courts and an open space area on the northern end of the site closest to Marne Highway (County Route 537). The project includes construction of new buildings, parking area, driveway, expansion of the existing stormwater management facilities on site, landscape plantings and lighting.

The surrounding land uses are as follows:

1. To the north (across Marne Highway) – single family residential;
2. To the east – cemetery
3. To the south (across railroad) – industrial; and
4. To the west – single family residential.

There are three existing basins on the site that accept runoff from not only this project site, but also the residential subdivision to the west. Topographic elevations at the site (referenced to the North American Vertical Datum of 1988) range from 41 near the intersection of the access drive with Marne Highway to 38 on the side property line east of Basin #3 (Figure 3). Runoff flowing from the site travels in a generally northerly direction to the stormwater collection system in Marne Highway, which appears to eventually discharge into the South Branch of Rancocas Creek then to the Delaware River (NJDEP Watershed Management Area 18 – Lower Delaware).

The site is located within Flood Zone X (outside the 1%, 100-year flood event) as indicated on the FEMA Flood Insurance Rate Map for Burlington County, New Jersey (Figure 4).

According to the USDA Natural Resources Conservation Service (NRCS) New Jersey Soil Survey web data, the soil type on the project site is Tinton sand, 0 to 5% slopes, which are classified as Hydrologic Soil Group A.

2.0 DESIGN CRITERIA

The stormwater management analysis and design is in accordance with the Stormwater Management Rules at N.J.A.C. 7:8, subchapters 5 and 6, the New Jersey Stormwater Best Management Practices Manual, the New Jersey Residential Site Improvement Standards, the New Jersey Soil Erosion and Sediment Control Standards, and Hainesport Township code chapter 161.

In accordance with the New Jersey Department of Environmental Protection (NJDEP) Stormwater Management Rules at N.J.A.C. 7:8, the development of the project is classified as a "Major Development." A Major Development is defined therein as a development which ultimately disturbs one or more acres of land and/or increases impervious coverage by one-quarter of an acre or more. The three technical requirements of the Stormwater Management Rules at N.J.A.C. 7:8 that generally need to be addressed are groundwater recharge, runoff quantity and runoff quality.

- Groundwater Recharge Standard – N.J.A.C. 7:8-5.4(a)2.i sets forth the minimum design and performance standards for groundwater recharge where suitable soils exist. The design engineer, using the assumptions and factors for stormwater runoff and groundwater recharge calculations at N.J.A.C. 7:8-5.6, shall either:
 - (1) Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual preconstruction groundwater recharge volume for the site; or
 - (2) Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-developed to post-developed for the two-year storm is retained and infiltrated on site.
- Runoff Quantity Control Standard - N.J.A.C. 7:8-5.4(a)3 requires that in order to control stormwater runoff quantity impacts, the design engineer shall, using the assumptions and factors for stormwater runoff calculations at N.J.A.C. 7:8-5.6, complete one of the following:
 - (1) Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the 2-year, 10-year and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events; or
 - (2) Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the 2-year, 10-year and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area; or
 - (3) Design stormwater management measures so that the post-construction peak runoff rates for the 2-year, 10-year and 100-year storm events are 50, 75 and 80 percent, respectively, of the pre-

construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed.

- Runoff Quality Standard – N.J.A.C. 7:8-5.5 requires the stormwater management measures be designed to reduce the post-developed load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm by 80 percent of the anticipated load from the developed site, expressed as an annual average. The water quality design storm is 1.25 inches of rainfall in two hours. Water quality calculations shall take into account the distribution of rain from the water quality design storm. The calculation of the volume of runoff may take into account the implementation of non-structural and structural stormwater management measures.

3.0 TECHNIQUES OF ANALYSIS

In accordance with the stormwater runoff calculation methodology at N.J.A.C. 7:8-5.6, the quantity (volume and rate) of stormwater runoff is calculated based on the USDA NRCS methodology using the NRCS Runoff Equation and Dimensionless Unit Hydrograph, as described in Technical Release 55 - Urban Hydrology for Small Watersheds (TR-55), dated June 1986. A unit peak discharge factor of 285 is applied to the dimensionless unit hydrograph for runoff estimation on lands that are located within the coastal zones of New Jersey rather than the standard factor of 484. This is known as the Delmarva unit hydrograph and applies to this site as described in NJDEP Bulletin No. NJ-210-3-1; being in the coastal plain region with slopes less than 5%, low relief and storage areas in depressions. The Delmarva unit hydrograph will predict a lower peak discharge than that of the standard hydrograph, but the volume of stormwater runoff will not be affected by the factor change.

NRCS 24 hour design storm rainfall depths for New Jersey, as revised August 2012, are used in the calculations. The various Times of Concentration (T_c) were determined for pre and post-developed conditions using the hydraulically longest flow path. Where these times were less than 6 minutes a minimum of 6 minutes is used. The T_c flow path can be found on the Drainage Area Plans located in Appendix G. The pre and post-developed T_c calculations can be found in Appendices C and D.

Curve numbers (CN) were generated for the drainage areas for pre and post-developed conditions based on the soil group and existing or proposed land use. The CN calculations can be found in Appendices C and D for the respective routings. Note that impervious areas were calculated as separate subareas to generate hydrographs without weighted CNs as outlined in the BMP manual chapter 5.

Using the drainage areas, the TCs and CNs as input data, version 10.00-21 of *HydroCAD*, a hydrologic/hydraulic software program by HydroCad Software Solutions, LLC, was employed to generate runoff volumes and rates.

The existing stormwater management system on site was designed and approved immediately before the current stormwater management rules were adopted and utilized rainfall depths for the previously required design storms that are lower than current standards. The existing condition presented in this report was determined by routing the current design storms through the as-built stormwater management system, consisting of three staged basins, to arrive at the pre-construction conditions.

4.0 LAND COVER CONDITIONS

For the purpose of comparison of pre and post development conditions, the site is broken into five distinct drainage areas based on where they discharge to the existing stormwater system prior to eventual discharge to the County road system. The tables below summarize the pre and post developed cover conditions of the five general drainage areas, called Drainage Areas 1, 2A, 2B, 3 and 4.

The subject property is currently improved with pavement, buildings and landscaping as shown on the Drainage Area Plans in Appendix G and summarized below:

Table 4.1: Pre-Developed Cover Conditions

Drainage Shed Name	Drainage Shed Area (Ac.)	Roof & Paved Surfaces (Ac.)	Bare Soil (Ac.)	Open Space (Ac.)	Woods (Ac.)
Existing Drainage Area 1 (EXDA-1)	8.090	2.371	0.427	4.110	1.184
Existing Drainage Area 2A (EXDA-2A)	1.793	0.152	0.000	1.375	0.266
Existing Drainage Area 2B (EXDA-2B)	21.021	8.143	0.000	12.878	0.000
Existing Drainage Area 3 (EXDA-3)	3.392	0.544	0.000	2.661	0.187
Existing Drainage Area 4 (EXDA-4)	0.570	0.384	0.000	0.145	0.041
Total Tributary Area (TTA)	34.867	11.594	0.427	21.169	1.677

Table 4.2: Post-Developed Cover Conditions

Drainage Shed Name	Drainage Shed Area (Ac.)	Roof & Paved Surfaces (Ac.)	Bare Soil (Ac.)	Open Space (Ac.)	Woods (Ac.)
Proposed Drainage Area 1 (PRDA-1)	8.085	2.381	0.427	4.094	1.183
Proposed Drainage Area 2A (PRDA-2A)	1.793	0.152	0.000	1.375	0.266
Proposed Drainage Area 2B (PRDA-2B)	21.021	8.143	0.000	12.878	0.000

Proposed Drainage Area 3 (PRDA-3)	3.397	0.888	0.000	2.322	0.187
Proposed Drainage Area 4 (PRDA-4)	0.570	0.384	0.000	0.145	0.041
Total Tributary Area (TTA)	34.867	11.948	0.427	20.815	1.677

5.0 STORMWATER MANAGEMENT FACILITIES

The expanded stormwater management (SWM) facilities proposed for the project are designed to satisfy the Runoff Control Quantity Standard at N.J.A.C. 7:8-5.4(a)1, the Runoff Quality Standard at N.J.A.C. 7:8-5.5, and the Groundwater Recharge Standard at N.J.A.C. 7:8-5.4(a)2.i. The system includes expansion of existing excavated basins within the Applicant's property, enclosed by fencing and landscape buffer plantings, that are maintained by the Applicant/Owner.

The interconnected basins are designed to reduce flows from design storm events using outlet control structure orifices to pass lower flows, and an inlet box grate to pass higher flows. The outlet structures that exist on the site today that were approved in 2003 are not modified by this project; the additional storage volume necessary to accommodate the additional runoff created by the project is provided by expansion of the basin footprints in locations where available on site. The depth to the seasonal high water table is not altered, nor is the overall function of the system. The expanded basin footprints result in no increase to runoff leaving the site towards the County system for each design storm.

6.0 GROUNDWATER RECHARGE

In accordance with N.J.A.C. 7:8-5.4(a)2.i(1), the groundwater recharge requirement is to demonstrate through hydrologic and hydraulic analysis that the post-developed project site and its stormwater management measures maintain 100% of the site's pre-developed average annual groundwater recharge volume. The NJDEP Groundwater Recharge Spreadsheet (GRS) utilizing Geological Survey Release 32 (GSR-32) methodology and demonstrating the site's pre-developed average annual groundwater recharge volume is maintained is included as Appendix E.

7.0 RUNOFF QUANTITY

The stormwater management basins are designed to improve the amount of runoff discharging from the site generated by the required storm events. In accordance with N.J.A.C. 7:8-5.4, the post-development peak runoff rates for the 2-yr, 10-yr, and 100-yr storm events do not exceed the peak runoff flow rate or total runoff discharge volume to the downstream County system.

For the calculation of existing runoff the site was modeled as separate subareas based on proposed disturbance limits and land cover. The Existing Drainage Area Plan (Appendix G) defines the subareas and Appendix C contains the Pre-

Developed Runoff Calculations. The calculation of the post-development site runoff was performed in the same manner as the pre-developed with the site broken up into different drainage subareas based on the type of land cover and the proposed disturbance limits. The same existing drainage pattern was maintained with no additional direct discharge offsite. The Proposed Drainage Area Plan (Appendix G) defines the subareas and Appendix D contains the Post-Development Runoff Calculations. Tables 7.1 and 7.2 below show the reduction of pre and post-developed peak runoff rates for the project site:

**Table 7.1: Peak Rate and Volume of Runoff to County System
from Total Tributary Area**

Design Storm (year)	24-hour Rainfall Depth (in.)	<i>Pre-developed Total Peak Runoff (cfs)</i>	<i>Pre-developed Runoff Volume (Ac-ft)</i>	Post Developed Total Peak Runoff (cfs)	Post Developed Runoff Volume (Ac-ft)
2	3.36	1.11	0.100	1.11	0.100
10	5.18	1.73	0.161	1.73	0.161
100	8.81	4.11	3.520	4.04	3.424

Table 7.2: Peak Rate and Volume of Runoff to County System from Basin #3

Design Storm (year)	24-hour Rainfall Depth (in.)	<i>Pre-developed Total Peak Runoff (cfs)</i>	<i>Pre-developed Runoff Volume (Ac-ft)</i>	Post Developed Total Peak Runoff (cfs)	Post Developed Runoff Volume (Ac-ft)
2	3.36	0.00	0.000	0.00	0.000
10	5.18	0.00	0.000	0.00	0.000
100	8.81	4.03	3.225	3.96	3.129

As shown in the tables above and the calculations in Appendix D, the expanded system ensures no increase in flow rates as required by the regulations and reduces total runoff volume leaving the site during storm events.

8.0 RUNOFF QUALITY

In accordance with NJAC 7:8-5.2 and 5.5(a), a land development that creates 0.25 acres or more of new or additional impervious surface must include stormwater management measures that reduce the average annual total suspended solids (TSS) load in the post-construction runoff from the new impervious surface by 80%. Comparing the sum of the coverage conditions from Tables 4.1 and 4.2, the development results in an increase in impervious surface greater than 0.25 acres so the Runoff Quality Standard at NJAC 7:8-5.5 is applicable.

The basin system has no discharge for storms up to and including the 10-year storm and is designed to infiltrate a volume greater than the water quality storm volume produced by the project site. In accordance with Chapter 4 of the BMP Manual, infiltration structures are given a TSS removal rate of 80%. The calculations for the Water Quality Storm in Appendix D show that the entire volume of runoff is retained for infiltration. Since the volume of runoff retained in the basins is greater than or equal to the runoff generated by the WQ storm, the water quality requirement of the applicable regulations is met.

9.0 LOW IMPACT TECHNIQUES

The low impact techniques utilized are in the form of vegetated conveyance areas along the edges of the disturbed portions of the site. Since the site was previously developed and mostly cleared of vegetation, the proposed landscape buffering and open space will reduce the environmental impact of the development. A Low Impact Development Checklist is included in Appendix A.

10.0 SOIL EROSION AND SEDIMENT CONTROL

In addition to temporary soil erosion and sediment control measures during construction, the existing outfall to the County system is stable and will not be modified. No new discharge points are created by this project.

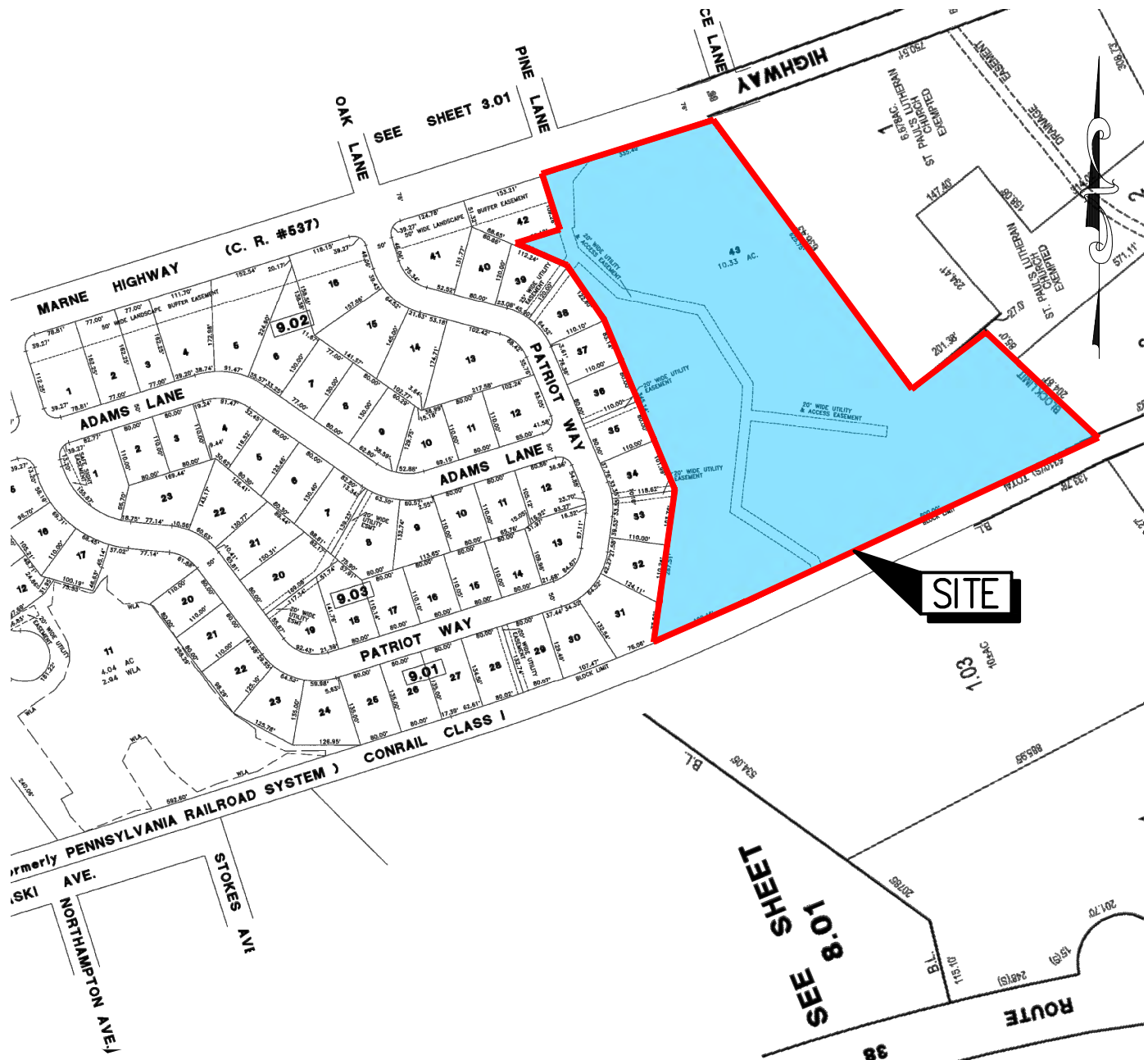
11.0 OFFSITE STABILITY

Offsite stability is provided through the reduction in the discharge flow rates from the 2 and 10 year storm events as outlined in the New Jersey Soil Erosion and Sediment Control Standards Chapter 21. As previously stated, the existing discharge point from the site is not being modified. Since it is currently stable and there is a reduction in flow rates discharging from that headwall from existing conditions, offsite stability is maintained.

12.0 CONCLUSION

As described above, the entire Stormwater Management System and its components are designed in accordance with applicable state and local municipal regulations and requirements and low impact stormwater management measures are utilized where practical. The infiltration basins are designed to accommodate the required design storms and provide runoff quantity reduction, water quality treatment and groundwater recharge as outlined in the State Stormwater Rules at N.J.A.C. 7:8 and Township ordinance chapter 161 while providing an environmentally responsible and economically feasible system.

FIGURES



SOURCE: OFFICIAL TAX MAP OF HAINESPORT TOWNSHIP, SHEET 3.02, DATED OCTOBER 24, 2000

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FIGURE 1 TAX MAP

DAVENPORT VILLAGE EXPANSION

HAINESPORT TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY

DATE:

8/13/2019

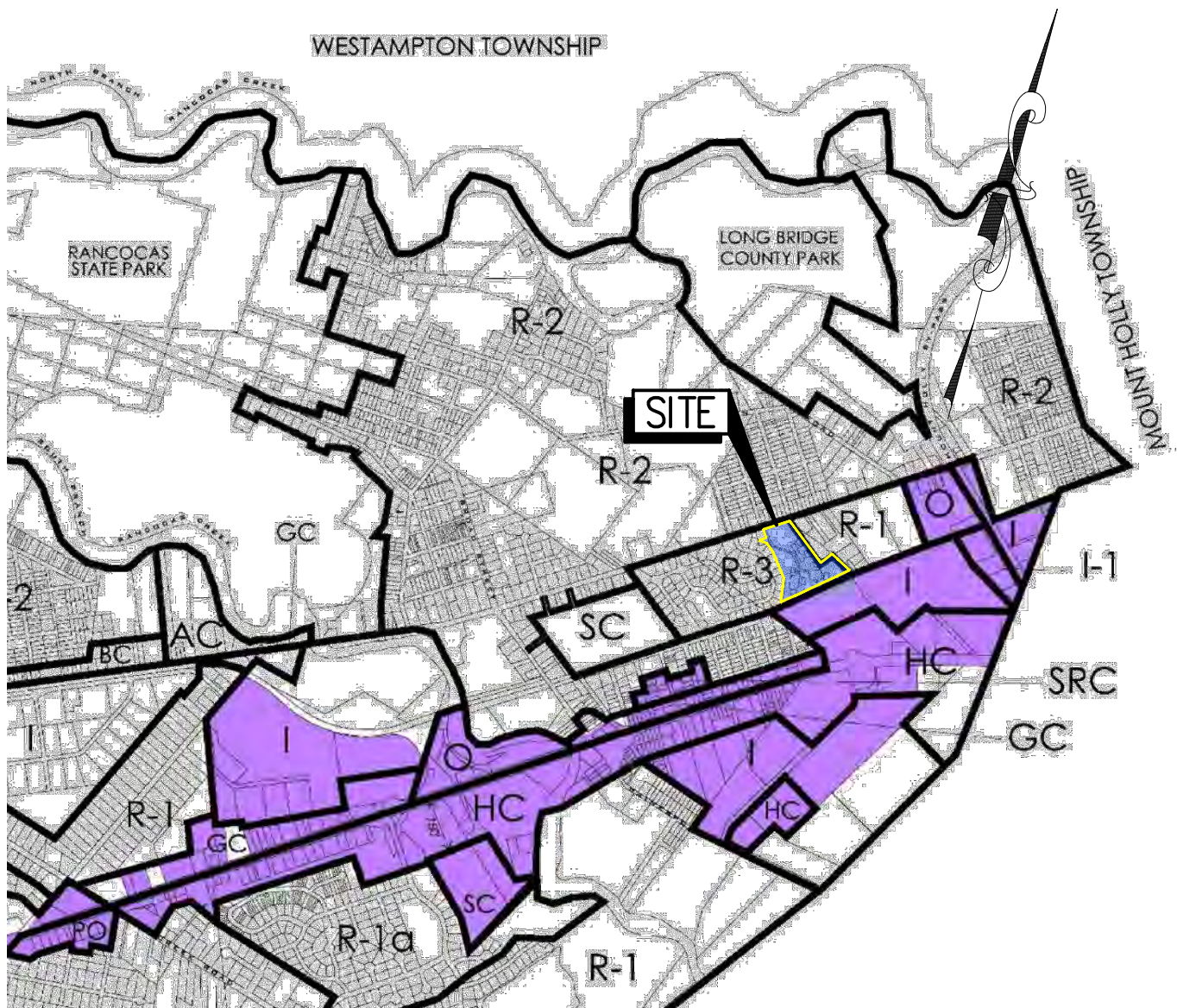
SCALE:

NO SCALE

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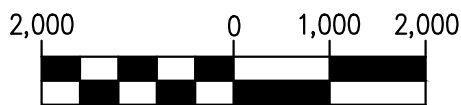
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CREATED ON 08/13/2019, LAST MODIFIED ON 08/14/2019



SOURCE: OFFICIAL ZONING MAP OF HAINESPORT TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY

GRAPHIC SCALE



1 INCH = 2,000 FEET

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FIGURE 2 ZONING MAP

DAVENPORT VILLAGE EXPANSION

HAINESPORT TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY

DATE:

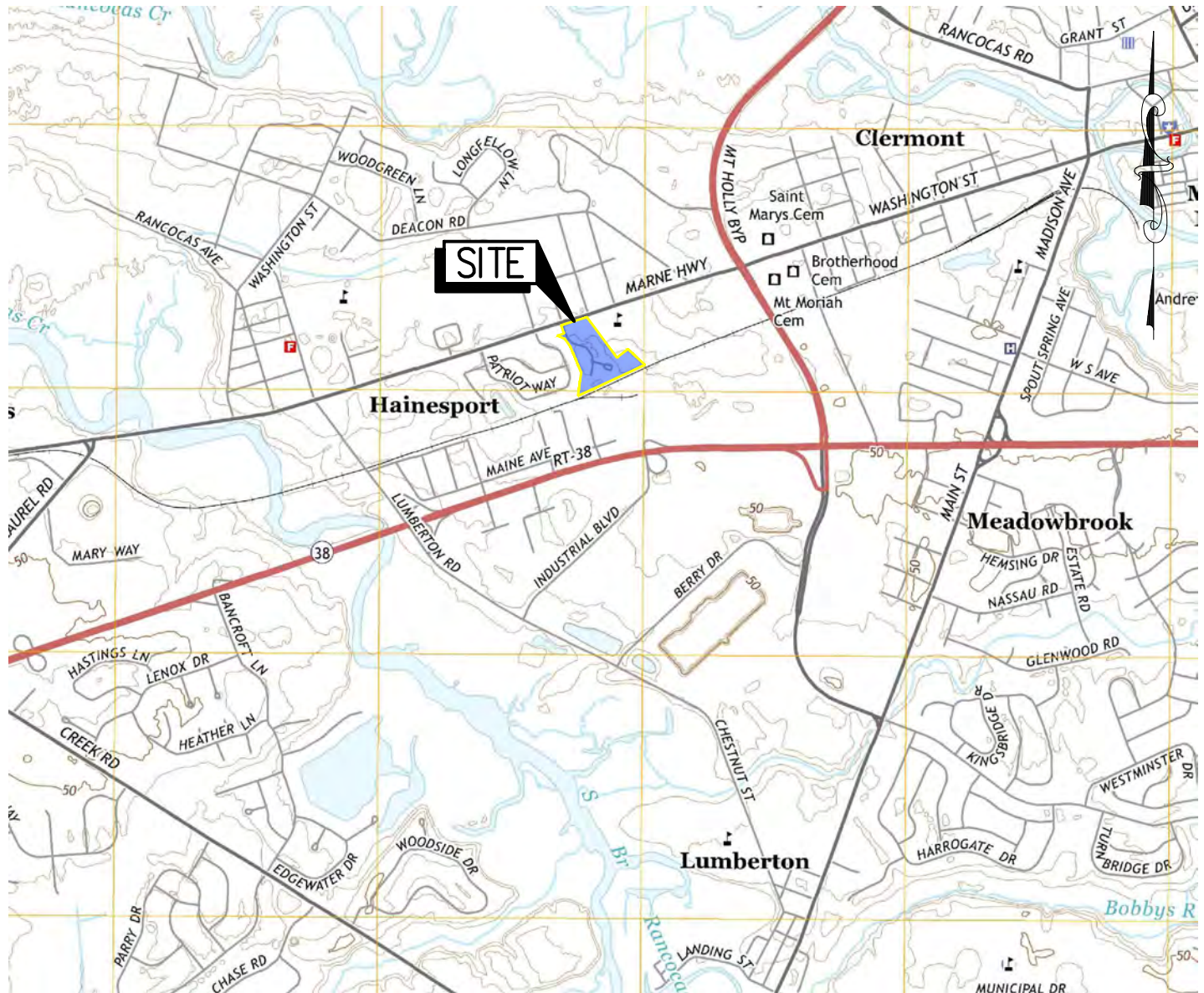
8/13/2019

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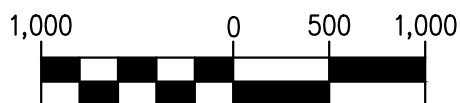
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SOURCE: OFFICIAL ZONING MAP OF HAINESPORT TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY

GRAPHIC SCALE



1 INCH = 1,000 FEET

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FIGURE 3 U.S.G.S. MAP DAVENPORT VILLAGE EXPANSION HAINESPORT TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY

DATE:

8/13/2019

SCALE:

1" = 2,000'

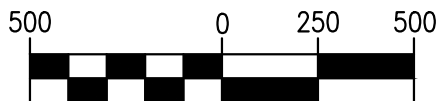
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SOURCE: SOILS DATA OBTAINED FROM NATURAL RESOURCES CONSERVATION SERVICES (NRCS)
U.S. DEPARTMENT OF AGRICULTURE.

GRAPHIC SCALE



1 INCH = 500 FEET

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FIGURE 4 SOILS MAP

DAVENPORT VILLAGE EXPANSION

HAINESPORT TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY

DATE:

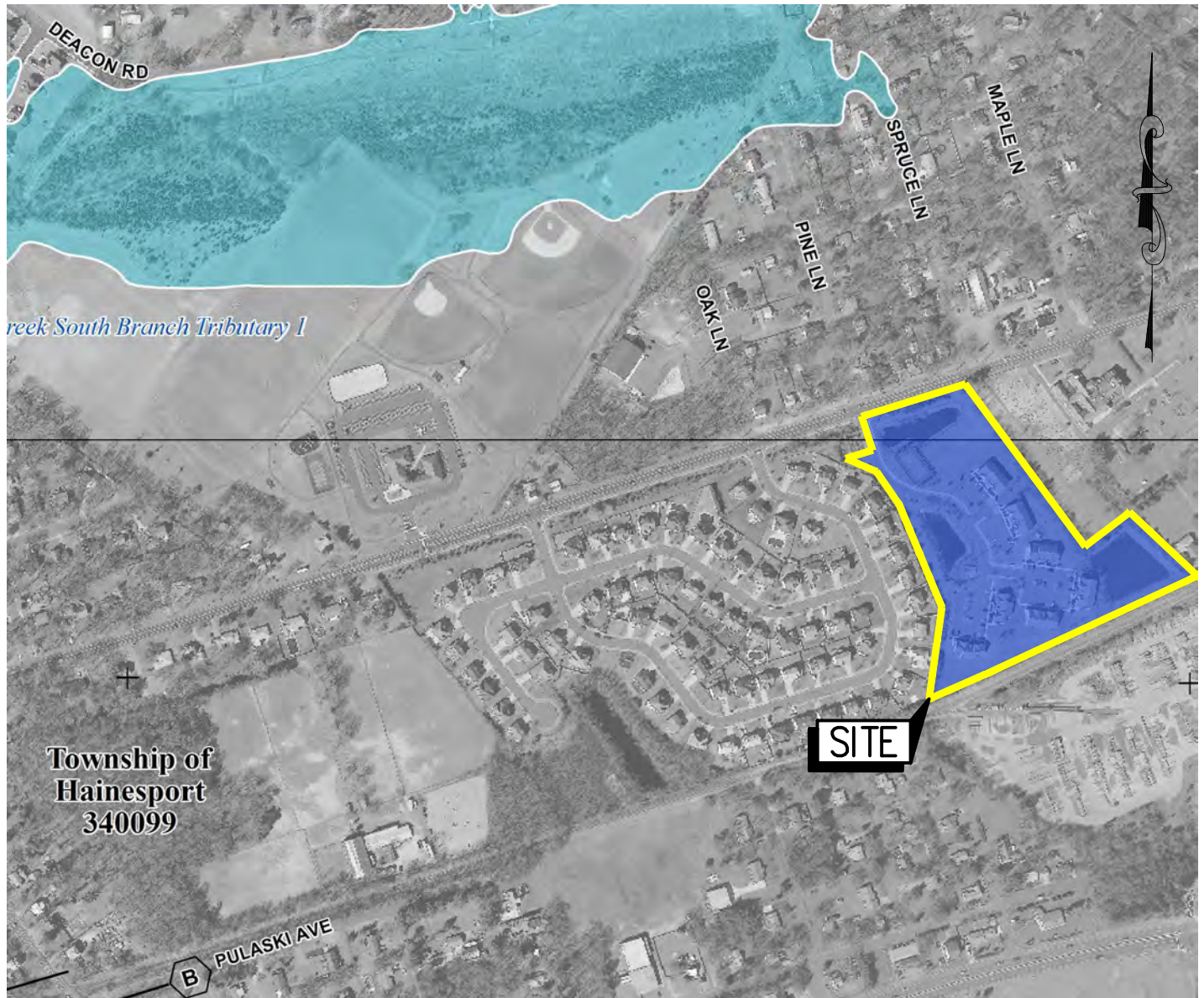
8/13/2019

SCALE:

1" = 500'

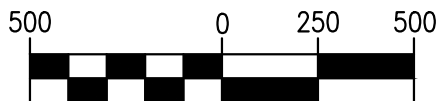
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SOURCE:
FEMA FLOOD INSURANCE RATE MAP FOR HAINESPORT TOWNSHIP, PANEL NO. 34005C0252F
EFFECTIVE DECEMBER 21, 2017

GRAPHIC SCALE



1 INCH = 500 FEET

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FIGURE 5 FLOOD MAP

DAVENPORT VILLAGE EXPANSION

HAINESPORT TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY

DATE:	8/13/2019	SCALE:	1" = 500'	DRAWN BY:	LAT
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APPENDIX A

Low Impact Development Checklist

New Jersey Stormwater Best Management Practices Manual

February 2004

Low Impact Development Checklist

Municipality: Hainesport Township

County: Burlington County

Date: August 2019

Review board or agency: Hainesport Township Planning Board
Burlington County Planning Board
Burlington County Soil Conservation District

Proposed land development name: Davenport Village Expansion

Lot(s): 43 Block(s): 9.01

Project or application number:

Applicant's name: DV Hainesport LLC

Applicant's address: 1845 Haddon Avenue
Camden, NJ 08103

Telephone: (856) 342-4130 Fax:

Email address: James.Reynolds@camdendiocese.org

Designer's name: Jason T. Sciullo, PE, PP; Sciullo Engineering Services, LLC

Designer's address: 9615 Ventnor Avenue, Suite 3, Margate, NJ 08402

Telephone: 609-300-5171 Fax: 609-939-3151

Email address: jsciullo@sciulloengineering.com

Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

The Development Plan that is the subject of this report is a major site plan for expansion of an existing residential apartment complex. Site improvements including paved driveways and parking areas, lighting, landscaping and onsite stormwater management facilities. The nonstructural stormwater management strategies that are required have been generally employed in the design of this development and include the following:

1. Protect areas that provide water quality benefits or areas particularly susceptible to

erosion and sediment loss.

- (a) The existing site is developed. This project includes reuse of an existing stormwater management outfall on site that is stable, protecting offsite stability and minimizing potential erosion and sediment loss.
2. Maximize the protection of natural vegetation.
 - (a) The project is being developed in accordance with permissible zoning standards, the development area has been previously disturbed, and no natural vegetation is being disturbed.
3. Minimize the decrease in the “time of concentration” from pre-construction to post-construction.
 - (a) The hydraulically longest flow paths are not changed as a result of the development. There are no changes to the time of concentration from pre to post construction.
4. Minimize land disturbance including clearing and grading.
 - (a) The site is cleared. Grading activities are the minimum necessary to obtain the necessary stormwater management volume.
5. Minimize soil compaction.
 - (a) Construction traffic will be limited to only those areas to be developed at the site including parking areas and drives.
6. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides.
 - (a) All landscaping and vegetative restoration will comply with the requirements of the Hainesport Township Land Development Ordinance.
7. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into stormwater runoff.
 - (a) Maintenance of the stormwater management facilities will require that any trash or debris must be removed periodically and disposed of according to regulations.
 - (b) Revegetation of disturbed areas with a permanent vegetative cover will be performed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey.

Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:

NJ Stormwater Management Rules (NJAC 7:8-5.1 et. seq.).
NJ Residential Site Improvement Standards (NJAC 5:21)

Hainesport Township Stormwater Management Ordinance Chapter 161.

Do regulations include nonstructural requirements? Yes: XX No:

If yes, briefly describe: See NJAC 7:8-5.3(b)1-9.

List LID-BMP's prohibited by local regulations: None

Pre-design meeting held? Yes: XX Date: July 16, 2019 No:

Meeting held with: Hainesport Township Planning Board Engineer and Planner

Pre-design site walk held? Yes: Date: No: XX

Site walk held with: NA

Other agencies with stormwater review jurisdiction:

Name: Hainesport Township Planning Board
Required Approval: Major Site Plan Approval

Name: Burlington County Planning Board
Required Approval: Site Plan Approval

Name: Burlington County Soil Conservation District
Required approval: Certification of Soil Erosion and Sediment Control Plan

Part 3: Nonstructural Strategies and LID-BMP's in Design

3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMP's that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed? Yes: X No:

If yes, was this inventory a factor in the site's layout and design? Yes: No: X

B. Does the site design utilize any of the following nonstructural LID-BMP's?

Preservation of natural areas? Yes: No: X If yes, specify % of site: NA

Native ground cover? Yes: No: X If yes, specify % of site: NA

Vegetated buffers? Yes: X No: If yes, specify % of site: 10%

C. Do the land development regulations require these nonstructural LID-BMP's?

Preservation of natural areas? Yes: No: XX If yes, specify % of site:

Native ground cover? Yes: No: XX If yes, specify % of site:

Vegetated buffers? Yes: XX No: If yes, specify % of site: 10' wide

D. If vegetated filter strips or buffers are utilized, specify their functions:

Reduce runoff volume increases through lower runoff coefficient: Yes: XX No:

Reduce runoff pollutant loads through runoff treatment: Yes: XX No:

Maintain groundwater recharge by preserving natural areas: Yes: XX No:

3.2 Minimize Land Disturbance

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMP's that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

A. Have inventories of existing site soils and slopes been performed? Yes: XX No:

If yes, were these inventories factors in the site's layout and design? Yes: No: XX

B. Does the development's design utilize any of the following nonstructural LID-BMP's?

Restrict permanent site disturbance by land owners? Yes: No: XX

If yes, how:

Restrict temporary site disturbance during construction? Yes: XX No:

If yes, how: Limit site disturbance to only those areas that are to be developed as part of the project.

Consider soils and slopes in selecting disturbance limits? Yes: XX No:

If yes, how: Site design incorporates natural topographic features and contours into the design of the grading plan and stormwater management system.

C. Specify percentage of site to be cleared: 0% Regraded: 10.5%

D. Specify percentage of cleared areas done so for buildings: 0%

For driveways and parking: 0% For roadways: 0%

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above? None.

F. Specify site's (area to be developed) hydrologic soil group (HSG) percentages:

HSG A: 100% HSG B: 0% HSG C: 0% HSG D: 0%

G. Specify percentage of each HSG that will be permanently disturbed:

HSG A: 10.5% HSG B: 0% HSG C: 0% HSG D: 0%

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

None. Entire site is HSG A.

I. Does the site include Karst topography? Yes: No: XX

If yes, discuss measures taken to limit Karst impacts:

3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMP's that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site (within area to be developed):

Existing: 3.067 acres (30%) Proposed: 3.396 acres (32.9%)

B. Specify maximum site impervious coverage allowed by regulations: 45%

C. Compare proposed street cartway widths with those required by regulations:

Type of Street	Proposed Cartway Width (feet)	Required Cartway Width (feet)
Residential access - low intensity	NA	NA
Residential access - medium intensity	NA	NA
Residential access - high intensity with parking	NA	NA
Residential access - high intensity without parking	NA	NA
Neighborhood	NA	NA
Minor collector -low intensity without parking	NA	NA
Minor collector - with one parking lane	NA	NA
Minor collector - with two parking lanes	NA	NA
Minor collector - without parking	NA	NA
Major collector	NA	NA
Private Drive	24	24

D. Compare proposed parking space dimensions with those required by regulations:

Proposed: onsite 9' x 18'

Regulations: 9' x 18'

E. Compare proposed number of parking spaces with those required by regulations (entire site):

Proposed: 148

Regulations: 143

F. Specify percentage of total site (current development) impervious cover created by buildings: 55%

By driveways and parking: 45%

By roadways: 0%

G. What design criteria and/or site changes would be required to reduce the percentages in F above? Reduce development yield and project value.

H. Specify percentage of total impervious area that will be unconnected:

Total site: 0% Buildings: 0% Driveways and parking: 0% Roads: 0%

I. Specify percentage of total impervious area that will be porous:

Total site: 0% Buildings: 0% Driveways and parking: 0% Roads: 0%

J. Specify percentage of total building roof area that will be vegetated: 0%

K. Specify percentage of total parking area located beneath buildings: 0%

L. Specify percentage of total parking located within multi-level parking deck: 0%

3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMP's that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

Storm sewer: 70%

Vegetated swale: 0%

Natural Channel: 0%

Stormwater management facility: 30%

Other: NA

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

- B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

None.

- C. In conveyance system sub areas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: none

Increase overland flow roughness: none

3.5 Preventative Source Controls

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMP's that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

- A. Trash Receptacles

Specify the number of trash receptacles provided: 1

Specify the spacing between the trash receptacles: NA

Compare trash receptacles proposed with those required by regulations:

Proposed: 1

Regulations: 0

- B. Pet Waste Stations

Specify the number of pet waste stations provided: none

Specify the spacing between the pet waste stations: none

Compare pet waste stations proposed with those required by regulations:

Proposed: NA

Regulations: NA

- C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: 100%

- D. Maintenance

Litter collection: Proposed: weekly Regulations: none

Pollutant: NA Location: NA

Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

No.	Nonstructural Strategy	Yes	No
1.	Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.	X	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.	X	
3.	Maximize the protection of natural drainage features and vegetation.	X	
4.	Minimize the decrease in the pre-construction time of concentration.	X	
5.	Minimize land disturbance including clearing and grading.	X	
6.	Minimize soil compaction.	X	
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.	X	
8.	Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.	X	
9.	Provide preventative source controls.	X	

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attach additional pages as necessary.

The Low Impact Design measures outlined and recommended within the applicable regulations have been incorporated into the design to the maximum extent practicable.

APPENDIX B

STORMWATER MANAGEMENT FACILITY MAINTENANCE MANUAL

STORMWATER MANAGEMENT FACILITY MAINTENANCE MANUAL**INSPECTION, MAINTENANCE AND CONTROL PLAN****A. PROJECT INFORMATION****I. DRAWINGS OF STORMWATER MANAGEMENT MEASURES:**

Site Stormwater Management Plans are included on the Project's Site Plan which is included herein by reference.

II. LOCATION OF STORMWATER MANAGEMENT MEASURES BY MEANS OF LATITUDE AND LONGITUDE AND BLOCK AND LOT:

The site's BMP's (Stormwater Management Facilities) are located at Block 9.01, Lot 43. The center of the site is approximately LAT: 39.985254, LONG: -74.814869

III. PREVENTATIVE CORRECTIVE MAINTENANCE TASKS AND SCHEDULES:

Refer to SECTION B.III for Summary of Maintenance Procedures.

IV. COST ESTIMATE:

Refer to SECTION B.IV, Cost of SWMF Maintenance Tasks

V. NAME OF PERSON RESPONSIBLE FOR INSPECTIONS AND MAINTENANCE:

Company / Individual:	DV Hainesport LLC
CONTACT:	James Reynolds
ADDRESS:	1845 Haddon Avenue
	Camden, New Jersey 08103
PHONE:	856-342-4130

B. PREVENTATIVE MAINTENANCE PROCEDURES**I. OBJECTIVES**

The purpose of preventative maintenance is to assure that a Stormwater Management Facility (SWMF) remains operational and safe at all times, while minimizing the need for emergency or corrective procedures.

II. OVERVIEW

A comprehensive SWMP maintenance program is comprised of several related requirements including:

- A. Providing adequate funding, staffing, equipment, and materials.

- B. Performing routine maintenance procedures on a regular basis.
- C. Performing emergency maintenance procedures and repairs in a timely manner.
- D. Conducting SWMF inspections to determine the need for and effectiveness of maintenance work.
- E. Providing training and instruction to maintenance personnel and inspections.
- F. Conducting periodic program reviews and evaluations to determine the overall effectiveness of the maintenance programs and the need for revised or additional maintenance procedures, personnel, and equipment.
- G. Instilling pride of workmanship and a commitment to excellence in program personnel.

III. SUMMARY OF MAINTENANCE PROCEDURES

A. PREVENTATIVE MAINTENANCE PROCEDURES

1. Grass Cutting

A regularly scheduled program of mowing and trimming of grass at SWMF's during the growing season will help to maintain a tightly knit turf and will also help to prevent diseases, pests, and the intrusion of weeds. The actual mowing requirements of an area should be tailored to the specific site conditions, grass type, and seasonal variations in the climate. In general, grass should not be allowed to grow more than 1 to 2 inches between cuttings. Allowing the grass to grow more than this amount prior to cutting it may result in damage to the blades growing points and limit its continued healthy growth. Agencies such as the local Soil Conservation District can provide valuable assistance in determining optimum mowing requirements.

2. Grass Maintenance

Grassed areas require periodic fertilizing, de-thatching, and soil conditioning in order to maintain healthy growth. Additionally, provisions should be made to re-seed and re-establish grass cover in areas damaged by sediment accumulation, storm water flow, or other causes. Agencies such as the local Soil Conservation District can provide valuable assistance in establishing a suitable grass maintenance program.

3. Vegetative Cover

Trees, shrubs, and ground cover require periodic maintenance, including fertilizing, pruning, and pest control in order to maintain healthy growth. Agencies such as the local Soil Conservation District can be of assistance in establishing a preventative maintenance program.

4. Removal and Disposal of Trash and Debris

A regularly scheduled program of debris and trash removal from SWMF's will reduce the chance of outlet structures, trash racks, and other components becoming clogged and

inoperable during storm events. Specific attention to the weirs within manholes as well as the oil and grease separators shall be included at each inspection. Additionally, removal of trash and debris will prevent possible damage to vegetated areas and eliminate potential mosquito breeding habitats. Disposal of debris and trash must comply with all local, county, state, and federal waste flow control regulations. Only suitable disposal and recycling sites should be utilized. Agencies such as the Division of Solid Waste Management of the New Jersey Department of Environmental Protection should be contacted for information on disposal regulations.

5. Sediment Removal and Disposal

The roof drainage collection and subterranean storage system are designed as a closed system through the use of gutter guards at the source of the runoff. No other surface runoff is expected to enter this system. Accumulated sediment should be removed before it threatens the operation or storage volume of a SWMF. This includes the sections of the roof drainage collection system, the eccentric manifold at each end of the subterranean basin. Removal of accumulated sediment in these pipes shall be accomplished with the use of Vactor equipment. Disposal of sediment must comply with all local, county, state, and federal regulations. Only suitable disposal sites should be utilized. The sediment removal program in infiltration facilities must also include provisions for monitoring the porosity of the sub-base, and replacement or cleansing of the pervious materials as necessary. Agencies such as the Division of Soil Waste Management of the New Jersey Department of Environmental Protection should be contacted for information on disposal regulations.

6. Mechanical Components

SWMF components, such as valves, sluice gates, pumps, fence gates, locks, and access hatches should remain functional at all times. Regularly scheduled maintenance should be performed in accordance with the manufacturers' recommendations. Additionally, all mechanical components should be operated at least once every three months to assure their continued performance.

7. Elimination of Potential Mosquito Breeding Habitats

The most effective mosquito control program is one that eliminates potential breeding habitats. Almost any stagnant pool of water can be attractive to mosquitoes, and the source of a large mosquito population. Ponded water in areas such as open cans and bottles, debris and sediment accumulations and areas of ground settlement provide ideal locations for mosquito breeding. A maintenance program dedicated to eliminating potential breeding areas is certainly preferable to controlling the health and nuisance effects of flying mosquitoes. The local Mosquito Control Commission can provide valuable information on establishing this maintenance program.

8. Inspection

Regularly scheduled inspections of the facility should be performed by qualified inspectors. The primary purpose of the inspections is to ascertain the operational condition of embankments, outlet structures, and other safety-related aspects. Inspections will also provide information on the effectiveness of regularly scheduled preventative and aesthetic maintenance procedures and will help to identify where changes are warranted. Finally, the facility inspections should be used to determine the need for and timing of corrective

maintenance procedures. In addition to regularly scheduled inspections, an informal inspection should be performed during every visit to a SWMF by maintenance or supervisory personnel. An inspection checklist and is included as part of this maintenance plan.

9. Reporting

The recording of all maintenance work and inspections provide valuable data on the facility condition. Along with the written reports, a chain of command for reporting and solving maintenance problems and addressing maintenance needs should be established.

B. CORRECTIVE MAINTENANCE PROCEDURES

1. Removal of Debris and Sediment

Sediment, debris, and trash should be removed immediately and properly disposed of in a timely manner. Equipment and personnel must be available to perform the removal work on short notice. The lack of an available disposal site should not delay the removal of trash, debris, and sediment. Temporary disposal sites may be utilized if necessary.

2. Structural Repairs

Structural damage to gutter guards, outlet and inlet structures, trash racks, and headwalls from vandalism, flood events, or other causes must be repaired promptly. Equipment, material, and personnel must be available to perform these repairs on short notice. The analysis of structural damage and the design and performance of structural repairs shall only be undertaken by qualified personnel.

3. Dam, Embankment, and Slope Repairs

Damage to dams, embankments, and side slopes must be repaired promptly. Typical problems include settlement, scouring, cracking, sloughing, seepage, and rutting. Equipment, materials, and personnel must be available to perform these repairs on short notice. The immediacy or the repairs will depend upon the nature of the damage and its effects on the safety and operation of the facility. The analysis of damage and the design and performance of geotechnical repairs should only be undertaken by qualified personnel.

4. Dewatering

It may be necessary to remove ponded water from within a malfunctioning SWMF. This ponding may be the result of a blocked principal outlet (detention facility), inoperable low level outlet (retention facility), loss of infiltration capacity (infiltration facility), or poor bottom drainage. Portable pumps may be necessary to remove the ponded water temporarily until a permanent solution can be implemented.

5. Extermination of Mosquitoes

If neglected, a SWMF can readily become an ideal mosquito breeding area. Extermination of mosquitoes will usually require the services of an expert, such as the local Mosquito Commission. Proper procedures carried out by trained personnel can control the mosquitoes with a minimum of damage or disturbance to the environment. If mosquito control in a facility becomes necessary, the preventative maintenance program should be re-evaluated, and

more emphasis placed on control of mosquito breeding habitats.

6. Erosion Repair

Vegetative cover or other protective measures are necessary to prevent the loss of soil from the erosive forces of wind and water. Where a re-seeding program has not been effective in maintaining a non-erosive vegetative cover, or other factors have exposed soils, to erosion, corrective steps should be initiated to prevent further loss of soil and any subsequent danger to the stability of the facility. Soil loss can be controlled by a variety of materials and methods, including riprap, gabion lining, sod, seeding, concrete lining, and re-grading. The local Conservation District can provide assistance in recommending materials and methodologies to control erosion.

7. Fence Repair

Fences are damaged by many factors, including vandalism and storm events. Timely repair will maintain the security of the site.

8. Elimination of Trees, Brush, Roots, and Animal Burrows

Large roots can impair the stability of dams, embankments, and side slopes and animal burrows. Burrows can present a safety hazard for maintenance personnel. Trees and brush with extensive, woody root systems should be completely removed from dams and embankments to prevent their destabilization and the creation of seepage routes. Roots should also be completely removed to prevent their decomposition within the dam or embankment. Root voids and burrows should be plugged by filling with material similar to the existing material, and capped just below grade with stone, concrete, or other material. If plugging of the burrows does not discourage the animals from returning, further measures should be taken to either remove the animal population or to make critical areas of the facility unattractive to them.

9. Snow and Ice Removal

Accumulations of snow and ice can threaten the functioning of a SWMF, particularly at inlets, outlets, and emergency spillways. Providing the equipment, materials, and personnel to monitor and remove snow and ice from these critical areas is necessary to assure the continued functioning of the facility during the winter months.

C. AESTHETIC MAINTENANCE PROCEDURES

1. Graffiti Removal

The timely removal of this eyesore will restore the aesthetic quality of a SWMF. Removal can be accomplished by painting or otherwise covering it, or removing it with scrapers, solvents, or cleansers. Timely removal is important to discourage further graffiti and other acts of vandalism.

2. Grass Trimming

Trimming of grass edges around structures and fences will provide for a neat and attractive appearance of the facility.

3. Control of Weeds

Although a regular grass maintenance program will keep weed intrusion to a minimum, some weeds will appear. Periodic weeding, either chemically or mechanically, will not only help to maintain a healthy turf, but will also keep grassed areas attractive.

4. Details

Careful, meticulous, and frequent attention to the performance of maintenance items such as painting, tree pruning, leaf collection, debris removal, and grass cutting will result in a SWMF that remains both functional and attractive.

D. CHECKLISTS AND LOGS

Included in this report are Tables and Sample Checklists and Logs regarding various aspects of SWMF maintenance and inspection.

IV. MAINTENANCE EQUIPMENT AND MATERIALS

A. GRASS MAINTENANCE EQUIPMENT

1. Tractor-Mounted Mowers
2. Riding Mowers
3. Hand Mowers
4. Gas Powered Trimmers
5. Gas Powered Edgers
6. Seed Spreaders
7. Fertilizer Spreaders
8. De-Thatching Equipment
9. Pesticide and Herbicide Application Equipment
10. Grass Clipping and Leaf Collection Equipment

B. VEGETATIVE COVER MAINTENANCE EQUIPMENT

1. Saws
2. Pruning Shears
3. Hedge Trimmers
4. Wood Chippers

C. TRANSPORTATION EQUIPMENT

1. Trucks for Transportation of Materials
2. Trucks for Transportation of Equipment
3. Vehicles for Transportation of Personnel

D. DEBRIS, TRASH, AND SEDIMENT REMOVAL EQUIPMENT

1. Loader
2. Backhoe
3. Grader
4. Vactor Equipment

E. MISCELLANEOUS EQUIPMENT

1. Shovels
2. Rakes

3. Picks
4. Wheelbarrows
5. Fence Repair Tools
6. Painting Equipment
7. Gloves
8. Standard Mechanics Tools
9. Tools for Maintenance of Equipment
10. Office Space
11. Office Equipment
12. Telephones
13. Safety Equipment
14. Tools for Concrete Work (Mixers, Form Materials, etc.)
15. Welding Equipment (for Repair of Trash Racks, etc.)

F. MATERIALS

1. Topsoil
2. Fill
3. Seed
4. Soil Amenities (Fertilizer, Lime, etc.)
5. Chemicals (Pesticides, Herbicides, etc.)
6. Mulch
7. Paint
8. Paint Removers (for Graffiti)
9. Spare Parts for Equipment
10. Oil and Grease for Equipment and SWMF Components
11. Concrete

V. SWMF MAINTENANCE EQUIPMENT AND MATERIAL COSTS

This estimate is taken from NJDEP Stormwater Management Facilities Manual Table 6-1 and adjusted for 2019 costs

GRASS MAINTENANCE EQUIPMENT

	Purchase (dollars)	Rent (per day) (dollars)
Hand Mower	300 - 500	25 - 40
Riding Mower	3,000 - 5,000	75 - 100
Tractor Mower	15,000 - 20,000	100 - 300
Trimmer / Edger	200 - 500	25 - 35
Spreader	100 - 200	20 - 30
Chemical Sprayer	200 - 500	25 - 40

VEGETATIVE COVER MAINTENANCE EQUIPMENT

	Purchase (dollars)	Rent (per day) (dollars)
Hand Saw	15	5
Chain Saw	300 - 500	15 - 35
Pruning Shears	25	5
Shrub Trimmer	200	25 - 35
Brush Chipper	1,000 - 5,000	50 - 150

TRANSPORTATION EQUIPMENT

	Purchase (dollars)	Lease (per month) (dollars)	Rent (per day) (dollars)
Van	10,000 - 15,000	400	50 - 70
Pickup Truck	10,000 - 15,000	400	50 - 70
Dump Truck	30,000 - 50,000	1,200	75 - 150
Light Duty Trailer	3,000 - 5,000	150	30 - 50
Heavy Duty Trailer	10,000 - 20,000	500	100 - 200

DEBRIS, TRASH, AND SEDIMENT REMOVAL EQUIPMENT

	Purchase (dollars)	Lease (per month) (dollars)	Rent (per day) (dollars)
Front End Loader	50,000 - 100,000	1,500 - 2,000	200 - 400
Backhoe	30,000 - 50,000	1,200	150 - 300
Excavator	100,000+	2,000	400 - 1,000
Grader	100,000+	2,000	400 - 1,000
Vactor Equipment	100,000+	2,000	400 - 1,000

MISCELLANEOUS EQUIPMENT

	Purchase (dollars)	Rent (per day) (dollars)
Shovel	15	5
Leaf Rake	15	5
Soil Rake	15	5
Pick	15	5
Wheelbarrow	100 - 200	10
Gloves	5	N / A
Portable Compressor	500 - 1,000	50 - 100
Portable Generator	500 - 1,000	50 - 100
Concrete Mixer	500 - 1,000	25 - 50
Welding Equipment	500 - 1,500	35 - 70

MATERIALS

	Purchase (dollars)
Topsoil	35 / cubic yard
Fill Soil	15 / cubic yard
Grass Seed	5 / pound
Soil Amenities (Fertilizer, Lime, etc)	0.05 / sq ft
Chemicals (Pesticides, Herbicides, etc)	10 / gallon
Mulch	25 / cubic yard
Paint	20 / gallon
Paint Remover	10 / gallon
Machine / Motor Lubricants	5 / gallon
Dry Mortar Mix	4 / 50 pound bag
Concrete Delivered to Site	60 - 100 / cubic yard

Notes:

1. These estimates are approximation of the probable construction costs in 2015 dollars and are based upon previous construction experience and should be used as an approximate budget figure only.

2. Estimated equipment costs are based upon Industrial / Commercial grade equipment.

VI. COST OF SWMF MAINTENANCE TASKS

Taken from NJDEP Stormwater Management Facilities Manual Table 6-2

PREVENTATIVE MAINTENANCE TASKS

	Small Facility (Man-Hours)	Large Facility (Man-Hours)
Grass Cutting	1	1 - 2
Grass Maintenance	0.5	1
Trash & Debris Removal	0.5	1
Sediment Removal	4	8
Mobilization	1	1
Inspection & Reporting	1	2

CORRECTIVE MAINTENANCE TASKS

	Small Facility (Man-Hours)	Large Facility (Man-Hours)
Trash & Debris Removal	4	8
Structural Repairs	2-4	40
Dewatering	4	8
Mosquito Extermination	1	2-4
Erosion Repair	4	8
Fence Repair	2-4	4-8
Snow & Ice Removal	1	2
Mobilization	2	2

AESTHETIC MAINTENANCE TASKS

	Small Facility (Man-Hours)	Large Facility (Man-Hours)
Grass Trimming	0.5	2
Weed Control	0.5	2
Landscape Maintenance	1 - 2	2 - 4
Graffiti Removal	2 - 4	4 - 8

Notes:

1. This estimate is an approximation of the man-hours as provided in the NJDEP Stormwater Facility Maintenance Manual. It is based upon previous construction experience and should be used as an approximate budget figure only.
2. Cost estimates are presented in terms of man-hours. These values should be used in conjunction with applicable personnel rates to determine labor costs for a specific program or facility.
3. Facility size definitions:
 Small Facility: Total SWMF Site Area $\frac{1}{4}$ Acre
 Large Facility: Total SWMF Site Area 1 Acre

Appropriate adjustments to the estimates presented should be made as necessary to account for actual SWMF size.

Table 6-3 Taken from NJDEP Stormwater Management Facilities Manual

WORKSHEET FOR DETERMINING DEVELOPER'S 10-YEAR MAINTENANCE BOND FOR PRIVATELY HELD SWMF's OR DEVELOPER'S CONTRIBUTION FOR MUNICIPAL MANAGEMENT OF SWMF's

SURFACE STORMWATER BASINS

Total Area of SWMF's = 2.53 Acres

Total Area of SWMF's Basin Bottom = 0.20 Acres

1. Mowing

A.	Rate per Hour for Labor & Equipment	40	\$	
B.	Base number of Hours for Labor and Equipment for Mobilization and Mowing Up to One Acre	2		
C.	Number of Hours for Mowing Additional Area (Based on One Hour Per Acre)	1.5		
D.	Hours per Mowing = B + C	2.5		
E.	Cost per Mowing = A x D		\$	100
F.	Number of Mowings per Year:	10		
G.	Annual Mowing Cost = E x F		\$	1000
H.	Materials		\$	100
I.	Total Cost = G + H		\$	1,100

2. Landscape Maintenance

A.	Rate per Hour for Labor & Equipment	40	\$	
B.	Number of Hours of Required Landscape Maintenance per Year	10		
C.	Annual Landscape Maintenance Cost = A x B		\$	400
D.	Total Cost of Original Landscaping (per Cost Estimate)	\$5,000		
E.	Replacement Factor (2% per Year)	x0.02		
F.	Annual Replacement Cost = D x E		\$	100
G.	Total Cost = C + F		\$	500

3. General Maintenance

A.	Rate per Hour for Labor & Equipment	40	\$	
B.	Number of Required Hours of General Maintenance per Occurrence	2		
C.	Cost per Occurrence = A x B		\$	80
D.	Number of Occurrences per Year	20		
E.	Total Cost = C x D		\$	1,600

4. Insurance

A.	Annual Insurance Cost	To be determined	\$	To be determined
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5. Scarify and De-Silt Basin – Every 5 years

A.	Rate per Hour for Labor & Equipment	50	\$	
B.	Number of Required Hours of General	100		

	Maintenance (@ 40 / acre)			
C.	Labor & Equipment Cost = A x B		\$	5,000
D.	Cost of Disposal per cubic yard	20	\$	
E.	Number of cubic yards (6" Deep Remove & Replace)	160		
F.	Disposal Cost = D x E		\$	3,200
G.	Cost per Occurrence = C + F		\$	8,200
H.	Duration factor = 0.2 (for 5 years)	0.2		
I.	Total Cost = G x H		\$	1,640

6. Inspection - Annual

A.	Rate per Hour for Labor	100		
B.	Number of Required Hours per Inspection	1		
C.	Total Cost = A x B		\$	100

7. Total First Year Cost

A.	Mowing (1.I)		\$	1,100
B.	Landscape Maintenance (2.G)		\$	500
C.	General Maintenance (3.E)		\$	1,600
D.	Insurance (4.A)		\$	To be determined
E.	Scarify and De-Silt (5.I) x 4 / 20 years		\$	1,640
F.	Inspection (6.C)		\$	100
G.	Total Cost for Year = SUM (A : F)		\$	4,940 + insurance

Total For 10 yr Maintenance Bond

A.	Total Cost = (7.G) x 10 years		\$	49,400+insurance
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OR

Calculation of Developer Contribution

A.	Total Cost = (7.G) x 10 years		\$	49400+insurance
B.	Developer Contribution Percentage	X 0.75		
C.	Total Developer Contribution = A x B		\$	37,050+insurance

NOTE: This estimate is an approximation of the probable cost in 2019 dollars. It is based upon previous construction experience and should be used as an approximate budget figure only.

VII. MAINTENANCE REQUIREMENTS FOR DRAINAGE SYSTEMS

SCHEDULE A

MAINTENANCE REQUIREMENTS FOR DRAINAGE SYSTEMS

The following are those minimum activities that shall be the responsibility of the designated entity for maintenance to ensure that the drainage system will operate as designed. The designated party is only responsible for those activities discussed below that apply to the type of drainage structures existing on the project.

Retention and Detention Basins

The following are minimum requirements for maintenance of these systems. Other items recommended by the design engineer are encouraged to ensure the system will function as designed.

In the event of standing water in the drainage system longer than 3 days (72 hours) after all maintenance activities have been conducted, the Municipal or County Engineer's Office shall be notified immediately.

(1) Inspection Schedule

Drainage systems must be inspected on a routine basis to ensure that they are functioning properly. Inspection shall be conducted a minimum of semi-annually and always after major storms.

(2) Inlet and Outlet Structure

All inlet and outlet structures shall be examined at the time of inspection for debris and accumulation of sediment which shall be removed from these structures.

(3) Maintenance of Vegetated Basins

- a) A dense turf with extensive root growth is encouraged to reduce erosion of the sides of the basin. Basin bottom shall be constructed of clean sand to enhance infiltration. Well established turf forming a porous turf will prevent the formation of an impermeable layer.
- b) Grasses of the fescue family are recommended for seeding primarily due to their adaptability to dry sandy soils, drought resistance, hardiness, and ability to withstand brief inundations. Fescues will also permit longer intervals between mowings.
- c) Mowing of the grass is required twice a year, once around June and again in September. Additional mowing is recommended to ensure the aesthetic quality of the site.
- d) Fertilization and liming is left to the discretion of the maintenance entity. A 10-6-4 ratio fertilizer at a rate of 500 lb. per acre (11 lb. per 1,000 sf) is provided for guidance.

(4) Maintenance of Gravel Bottom Retention Basins

- a) Sediment shall not be allowed to build up to the point where it reduces the rate of infiltration that the system was designed to accommodate. In the event of standing water greater than 3 days (72) hours because of siltation, the system must be thoroughly cleaned.
- b) If the system still remains inoperable after a thorough cleaning; the system must be removed and replaced so that the system will function as designed.

(5) Maintenance of Non-Vegetated Basins (Soil Floors)

- a) All sediment accumulated in the basin bottom must be removed. Sediment removal is only to be conducted when the basin is completely dry, after the silt layer has mud cracks and has separated from the basin floor.
- b) Tilling is required periodically and at least once annually, from June through September, to restore the natural infiltration capacity the system was designed for by overcoming the effects of surface compaction. All sediment must be removed prior to tilling the basin bottom.
- c) Rotary tillers or disc harrows should be used since precise blade control and equipment maneuverability are essential in small areas.
- d) After tilling the basin floor should be smooth and free of ridges and furrows to enable easy removal of sediment during future cleaning operations. The basin floor should slope toward a low-flow channel wherever applicable.

VIII. MAINTENANCE AND INSPECTION LOGS AND CHECKLISTS

SWM Maintenance List

Page 1 of 4

Maintenance Work Order and Checklist for Stormwater Management Facilities

Name of Facility: _____

Location: _____ Date: _____

Crew:			Work Started:		Time:	
Equipment:			Work Completed:		Time:	
Weather:			Total Man-hours for Work::			

A. Preventative Maintenance

	Items Required	Items Done	Comments and Special Instructions
1. Grass Cutting	√	√	
A. Bottoms			
B. Embankments and Side Slopes			
C. Perimeter Areas			
D. Access Areas and Roads			
E. Other:			

	Items Required	Items Done	Comments and Special Instructions
2. Grass Maintenance	√	√	
A. Fertilizing			
B. Re-Seeding			
C. De-Thatching			
D. Pest Control			
E. Other:			

	Items Required	Items Done	Comments and Special Instructions
3. Vegetative Cover	√	√	
A. Fertilizing			
B. Pruning			
C. Pest Control			
D. Other:			

	Items Required	Items Done	Comments and Special Instructions
4. Trash and Debris Removal	√	√	
A. Bottoms			
B. Embankments and Side Slopes			
C. Perimeter Areas			
D. Access Areas and Roads			
E. Inlets			
F. Outlets and Trash Racks			
G. Other:			

SWM Maintenance List**Page 2 of 4**

	Items Required √	Items Done √	Comments and Special Instructions
5. Sediment Removal			
A. Inlets			
B. Outlets and Trash Racks			
C. Bottoms			
E. Other			

	Items Required √	Items Done √	Comments and Special Instructions
6. Mechanical Components			
A. Valves			
B. Sluice Gates			
C. Pumps			
D. Fence Gates			
E. Locks			
F. Access Hatches			
G. Other:			

	Items Required √	Items Done √	Comments and Special Instructions
7. Elimination of Potential Mosquito Breeding Habitats			
A.			
B.			
C.			
D.			

	Items Required √	Items Done √	Comments and Special Instructions
8. Pond Maintenance			
A. Aeration Equipment			
B. Debris & Trash Removal			
C. Weed Removal			
D. Other:			

	Items Required √	Items Done √	Comments and Special Instructions
9. Other Preventative Maintenance			
A.			
B.			
C.			
D.			

SWM Maintenance List**Page 3 of 4****B. Corrective Maintenance**

Work Item	Items Required √	Items Done √	Location, Comments, and Special Instructions
1. Removal of Debris & Sediment			
2. Structural Repairs			
3. Dam, Embankment & Slope Repairs			
4. Dewatering			
5. Control of Mosquitoes			
6. Pond Maintenance			
7. Erosion Repair , Roots &			
8. Fence Repair			
9. Elimination of Trees, Brush and Animal Burrows			
10. Snow & Ice Removal			
11. Other			

C. Aesthetic Maintenance

Work Item	Items Required √	Items Done √	Location, Comments, and Special Instructions
1. Graffiti Removal			
2. Grass Trimming			
3. Weeding			
4. Other			

SWM Maintenance List

Page 4 of 4

Remarks: (Refer to Item No, If Applicable)

Work Order Prepared By: _____

Work Completed By: _____

SWM Maintenance Log

Page 1 of 3

Maintenance Log Stormwater Management Facilities

Name of Facility: _____

Location: _____ Date: _____

A. Preventative MaintenanceDate:

--	--	--	--	--	--	--	--	--	--

Work Item

(√) Completed

1. Grass Cutting

A. Bottoms										
B. Embankments and Side Slopes										
C. Perimeter Areas										
D. Access Areas and Roads										
E. Other:										

2. Grass Maintenance

A. Fertilizing										
B. Re-Seeding										
C. De-Thatching										
D. Pest Control										
E. Other:										

3. Vegetative Cover

A. Fertilizing										
B. Pruning										
C. Pest Control										
D. Other:										

4. Trash and Debris Removal

A. Bottoms										
B. Embankments and Side Slopes										
C. Perimeter Areas										
D. Access Areas and Roads										
E. Inlets:										
F. Outlets and Trash Racks										
G. Other:										

5. Sediment Removal

A. Inlets										
B. Outlets and Trash Racks										
C. Bottoms										
D. Other:										

SWM Maintenance Log

Page 2 of 3

Date:

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Work Item

(√) Completed

6. Mechanical Components

A. Valves										
B. Sluice Gates										
C. Pumps										
D. Fence Gates										
E. Locks										
F. Access Hatches										
G. Other										

7. Elimination of Potential Mosquito Breeding Habits

A.										
B.										
C.										

8. Pond Maintenance

A. Aeration Equipment										
B. Debris & Trash Removal										
C. Weed Removal										
D. Other:										

9. Other Preventative Maintenance

A.										
B.										
C.										
D.										

B. Corrective MaintenanceDate:

--	--	--	--	--	--	--	--	--	--

Work Item

(√) Completed

1. Removal of Debris & Sediment
2. Structural Repairs
3. Dam, Embankment & Slope Repairs
4. Dewatering
5. Pond Maintenance
6. Control of Mosquitoes
7. Erosion Repair
8. Fence Repair
9. Elimination of Trees, Brush, Roots & Animal Burrows
10. Snow & Ice Removal
11. Other

SWM Maintenance Log

Page 3 of 3

C. Aesthetic Maintenance

Date:

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Work Item (√) Completed

1. Graffiti Removal
2. Grass Trimming
3. Weeding
4. Other:

Remarks: (Refer to Item No, If Applicable)

Work Order Prepared By: _____

Work Completed By: _____

SWM Inspection List

Page 1 of 3

Inspection Checklist for Stormwater Management Facilities

Name of Facility: _____

Location: _____ Date: _____

Weather: _____

Facility Item	OK ¹	Routine ²	Urgent ³	Comments ⁴
---------------	-----------------	----------------------	---------------------	-----------------------

1. Embankments and Side Slopes

A. Vegetation				
B. Linings				
C. Erosion				
D. Settlement				
E. Sloughing				
F. Trash And Debris				
G. Seepage				
H. Aesthetics				
I. Other:				

2. Bottoms (Detention and Infiltration)

A. Vegetation				
B. Erosion				
C. Standing Water				
D. Settlement				
E. Trash and Debris				
F. Sediment				
G. Aesthetics				
H. Other:				

3. Low Flow Channels (Detention)

A. Vegetation				
B. Linings				
C. Erosion				
D. Settlement				
E. Standing Water				
F. Trash and Debris				
G. Sediment				
H. Other:				

1. The item checked is in good condition and the maintenance program is adequate.
2. The item checked requires attention but does not present an immediate threat to the facility function or other facility components.
3. The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.
4. Provide explanation and details if columns 2 or 3 are checked.

SWM Inspection List

Page 2 of 3

Facility Item	OK ¹	Routine ²	Urgent ³	Comments ⁴
4. Ponds (Retention)				
A. Vegetation				
B. Shoreline Erosion				
C. Aeration Equipment				
D. Trash and Debris				
E. Sediment				
F. Water Quality				
G. Other:				
5. Inlet Structure				
A. Condition of Structure				
B. Erosion				
C. Trash & Debris				
D. Sediment				
E. Aesthetics				
F. Other:				
6. Outlet Structure (Detention & Retention)				
A. Condition of Structure				
B. Erosion				
C. Trash & Debris				
D. Sediment				
E. Mechanical Components				
F. Aesthetics				
G. Other:				
7. Emergency Spillway				
A. Vegetation				
B. Lining				
C. Erosion				
D. Trash & Debris				
E. Other:				
8. Perimeter				
A. Vegetation				
B. Erosion				
C. Trash & Debris				
D. Fences & Gates				
E. Aesthetics				
F. Other:				
9. Access Roads				
A. Vegetation				
B. Road Surface				
C. Fences & Gates				
D. Erosion				
E. Aesthetics				
F. Other:				

1. The item checked is in good condition and the maintenance program is adequate.
2. The item checked requires attention but does not present an immediate threat to the facility function or other facility components.
3. The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.
4. Provide explanation and details if columns 2 or 3 are checked.

SWM Inspection List

Page 3 of 3

Facility Item	OK ¹	Routine ²	Urgent ³	Comments ⁴
10. Miscellaneous				
A. Effectiveness of Exist. Maint. Program				
B. Dam Inspections				
C. Potential Mosquito Habitats				
D. Mosquitoes				
E.				
F.				
G. :				

1. The item checked is in good condition and the maintenance program is adequate.
2. The item checked requires attention but does not present an immediate threat to the facility function or other facility components.
3. The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.
4. Provide explanation and details if columns 2 or 3 are checked.

Remarks: (Refer to Item No, If Applicable)

Inspector: _____

SWM Inspection

Page 1 of 3

Maintenance Log Stormwater Management Facilities

Name of Facility: _____

Location: _____ Date: _____

Date:

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Facility Item

Indicate Condition (i.e. 1, 2, or 3)

1. Embankments and Side Slopes

A. Vegetation										
B. Linings										
C. Erosion										
D. Settlement										
E. Sloughing:										
F. Trash and Debris										
G. Seepage										
H. Aesthetics										
I. Other										

2. Bottoms (Detention and Infiltration)

A. Vegetation										
B. Erosion										
C. Standing Water										
D. Settlement										
E. Trash and Debris										
F. Sediment										
G. Aesthetics										
H. Other										

3. Low Flow Channels (Detention)

A. Vegetation										
B. Linings										
C. Erosion										
D. Settlement:										
E. Standing Water										
F. Trash and Debris										
G. Sediment										
H. Other										

4. Ponds

A. Vegetation										
B. Shoreline Erosion										
C. Aeration Equipment										
D. Trash & Debris										
E. Sediment										
F. Water Quality										
G. Other:										

1 The item checked is in good condition and the maintenance program is adequate.

2 The item checked requires attention, but does not present an immediate threat to the facility function or other facility components.

3 The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.

SWM Maintenance Log

Page 2 of 3

Date:

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Facility Item

Indicate Condition (i.e. 1, 2, or 3)

5. Inlet Structure

A. Condition of Structure										
B. Erosion										
C. Trash & Debris										
D. Sediment:										
E. Aesthetics										
F. Other:										

6. Outlet Structure (Detention & Retention)

A. Condition of Structure										
B. Erosion										
C. Trash & Debris										
D. Sediment										
E. Mechanical Components										
F. Aesthetics										
G. Other										

7. Emergency Spillway

A. Vegetation										
B. Lining										
C. Trash & Debris										
D. Other:										

8. Perimeter

A. Vegetation										
B. Erosion										
C. Trash & Debris										
D. Fences & Gates:										
E. Aesthetics										
F. Other:										

9. Access Roads

A. Vegetation										
B. Road Surface										
C. Trash & Debris										
D. Fences & Gates										
E. Aesthetics										
F. Other:										

1 The item checked is in good condition and the maintenance program is adequate.

2 The item checked requires attention, but does not present an immediate threat to the facility function or other facility components.

3 The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.

SWM Maintenance Log

Page 3 of 3

10. Miscellaneous

A. Effectiveness of Exist. Maintenance Program										
B. Dam Inspections										
C. Potential Mosquito Habitats										
D. Mosquitoes										
E.										
F.										
G.										

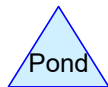
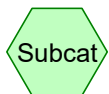
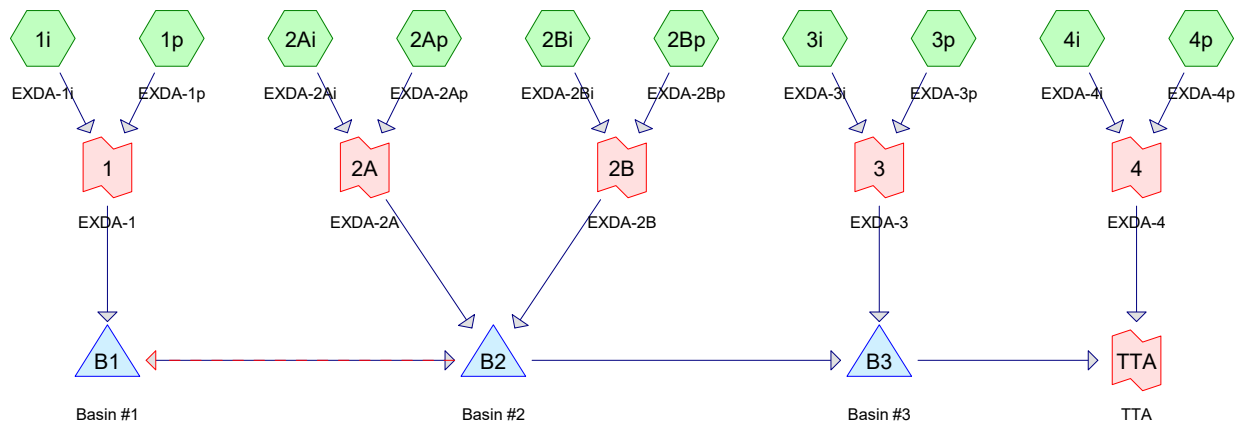
- 1 The item checked is in good condition and the maintenance program is adequate.
- 2 The item checked requires attention, but does not present an immediate threat to the facility function or other facility components.
- 3 The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.

Remarks: (Refer to Item No, If Applicable)

Prepared By: _____

APPENDIX C

PRE-DEVELOPED RUNOFF CALCULATIONS



Pre Developed Conditions

Prepared by Sciullo

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Project Notes

Rainfall events imported from "BurlingtonCounty.hcp"

Pre Developed Conditions

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	C	Default	24.00	1	3.36	2
2	10-Year	NOAA 24-hr	C	Default	24.00	1	5.18	2
3	100-Year	NOAA 24-hr	C	Default	24.00	1	8.81	2

Pre Developed Conditions

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
21.169	39	>75% Grass cover, Good, HSG A (1p, 2Ap, 2Bp, 3p, 4p)
0.427	72	Dirt roads, HSG A (1i)
11.594	98	Paved parking, HSG A (1i, 2Ai, 2Bi, 3i, 4i)
1.677	30	Woods, Good, HSG A (1p, 2Ap, 3p, 4p)
34.867	59	TOTAL AREA

Pre Developed Conditions

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
34.867	HSG A	1i, 1p, 2Ai, 2Ap, 2Bi, 2Bp, 3i, 3p, 4i, 4p
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
34.867		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
21.169	0.000	0.000	0.000	0.000	21.169	>75% Grass cover, Good	1p, 2Ap, 2Bp, 3p, 4p
0.427	0.000	0.000	0.000	0.000	0.427	Dirt roads	1i
11.594	0.000	0.000	0.000	0.000	11.594	Paved parking	1i, 2Ai, 2Bi, 3i, 4i
1.677	0.000	0.000	0.000	0.000	1.677	Woods, Good	1p, 2Ap, 3p, 4p
34.867	0.000	0.000	0.000	0.000	34.867	TOTAL AREA	

Pre Developed Conditions

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	2Bi	0.00	0.00	1,387.0	0.0020	0.013	0.0	18.0	0.0
2	2Bp	0.00	0.00	1,387.0	0.0020	0.013	0.0	18.0	0.0
3	B1	31.50	32.43	625.0	-0.0015	0.013	0.0	30.0	0.0
4	B2	32.35	31.41	253.0	0.0037	0.013	0.0	30.0	0.0
5	B2	32.43	31.50	625.0	0.0015	0.013	0.0	30.0	0.0
6	B3	33.42	33.15	65.0	0.0042	0.013	0.0	24.0	0.0

Pre Developed Conditions

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Appendix C
NOAA 24-hr C 2-Year Rainfall=3.36"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1i: EXDA-1i	Runoff Area=121,845 sf 84.75% Impervious Runoff Depth=2.81" Flow Length=275' Tc=22.2 min CN=WQ Runoff=3.98 cfs 0.654 af
Subcatchment 1p: EXDA-1p	Runoff Area=230,565 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=275' Tc=22.2 min CN=WQ Runoff=0.00 cfs 0.001 af
Subcatchment 2Ai: EXDA-2Ai	Runoff Area=6,630 sf 100.00% Impervious Runoff Depth=3.13" Flow Length=267' Tc=15.9 min CN=98 Runoff=0.29 cfs 0.040 af
Subcatchment 2Ap: EXDA-2Ap	Runoff Area=71,475 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=267' Tc=15.9 min CN=WQ Runoff=0.00 cfs 0.000 af
Subcatchment 2Bi: EXDA-2Bi	Runoff Area=354,705 sf 100.00% Impervious Runoff Depth=3.13" Flow Length=1,831' Tc=36.2 min CN=98 Runoff=9.80 cfs 2.122 af
Subcatchment 2Bp: EXDA-2Bp	Runoff Area=560,985 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=1,831' Tc=36.2 min CN=39 Runoff=0.01 cfs 0.004 af
Subcatchment 3i: EXDA-3i	Runoff Area=23,700 sf 100.00% Impervious Runoff Depth=3.13" Flow Length=328' Tc=47.6 min CN=98 Runoff=0.56 cfs 0.142 af
Subcatchment 3p: EXDA-3p	Runoff Area=124,055 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=328' Tc=47.6 min CN=WQ Runoff=0.00 cfs 0.001 af
Subcatchment 4i: EXDA-4i	Runoff Area=16,740 sf 100.00% Impervious Runoff Depth=3.13" Tc=6.0 min CN=98 Runoff=1.11 cfs 0.100 af
Subcatchment 4p: EXDA-4p	Runoff Area=8,095 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=WQ Runoff=0.00 cfs 0.000 af
Pond B1: Basin #1	Peak Elev=36.26' Storage=91,665 cf Inflow=9.00 cfs 2.744 af 30.0" Round Culvert n=0.013 L=625.0' S=-0.0015 '/' Outflow=0.40 cfs 0.761 af
Pond B2: Basin #2	Peak Elev=36.26' Storage=38,308 cf Inflow=10.00 cfs 2.927 af Primary=0.00 cfs 0.000 af Secondary=5.99 cfs 2.089 af Outflow=5.99 cfs 2.089 af
Pond B3: Basin #3	Peak Elev=34.01' Storage=9,288 cf Inflow=0.56 cfs 0.143 af Outflow=0.00 cfs 0.000 af
Link 1: EXDA-1	Inflow=3.98 cfs 0.655 af Primary=3.98 cfs 0.655 af
Link 2A: EXDA-2A	Inflow=0.29 cfs 0.040 af Primary=0.29 cfs 0.040 af
Link 2B: EXDA-2B	Inflow=9.80 cfs 2.125 af Primary=9.80 cfs 2.125 af

Pre Developed Conditions

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Appendix C
NOAA 24-hr C 2-Year Rainfall=3.36"

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Link 3: EXDA-3

Inflow=0.56 cfs 0.143 af
Primary=0.56 cfs 0.143 af

Link 4: EXDA-4

Inflow=1.11 cfs 0.100 af
Primary=1.11 cfs 0.100 af

Link TTA: TTA

Inflow=1.11 cfs 0.100 af
Primary=1.11 cfs 0.100 af

Total Runoff Area = 34.867 ac Runoff Volume = 3.064 af Average Runoff Depth = 1.05"
66.75% Pervious = 23.273 ac 33.25% Impervious = 11.594 ac

Pre Developed Conditions

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Appendix C
NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 1i: EXDA-1i

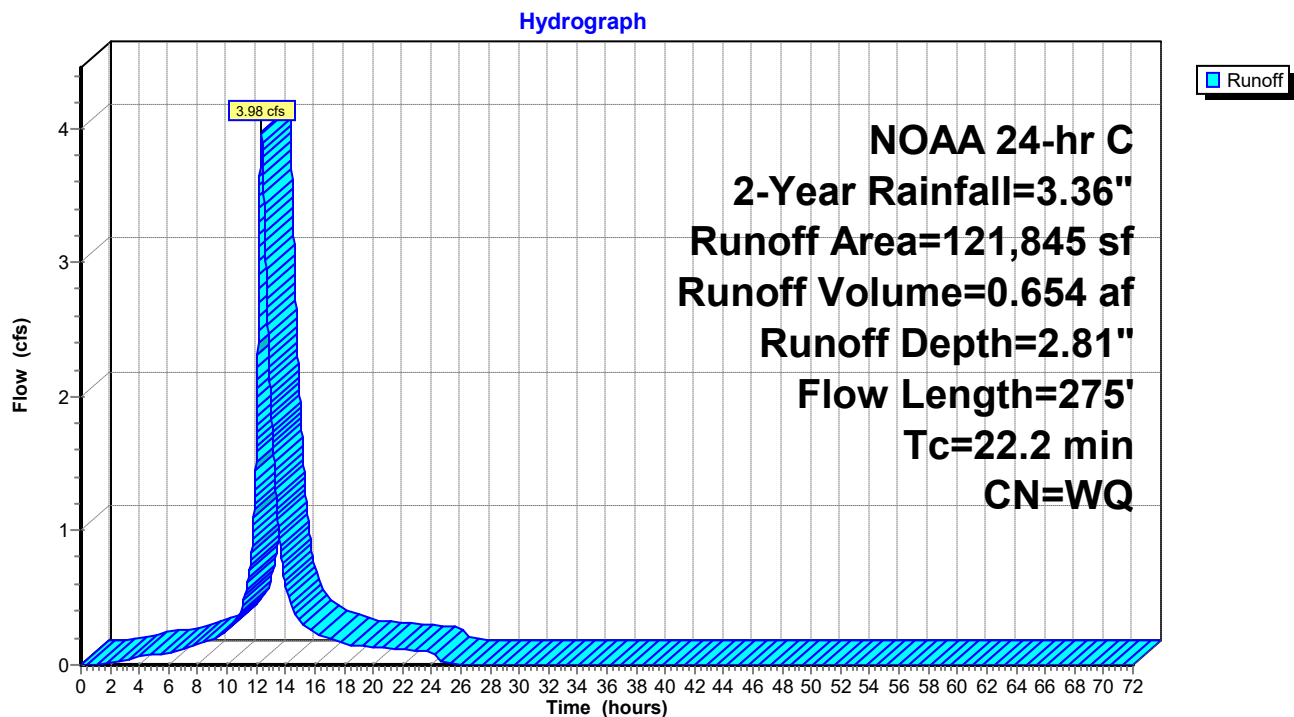
Runoff = 3.98 cfs @ 12.34 hrs, Volume= 0.654 af, Depth= 2.81"
Routed to Link 1 : EXDA-1

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
103,260	98	Paved parking, HSG A
18,585	72	Dirt roads, HSG A
121,845		Weighted Average
18,585	72	15.25% Pervious Area
103,260	98	84.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment EXDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment EXDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1i: EXDA-1i



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Appendix C

NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 1p: EXDA-1p

Runoff = 0.00 cfs @ 24.08 hrs, Volume= 0.001 af, Depth= 0.00"
Routed to Link 1 : EXDA-1

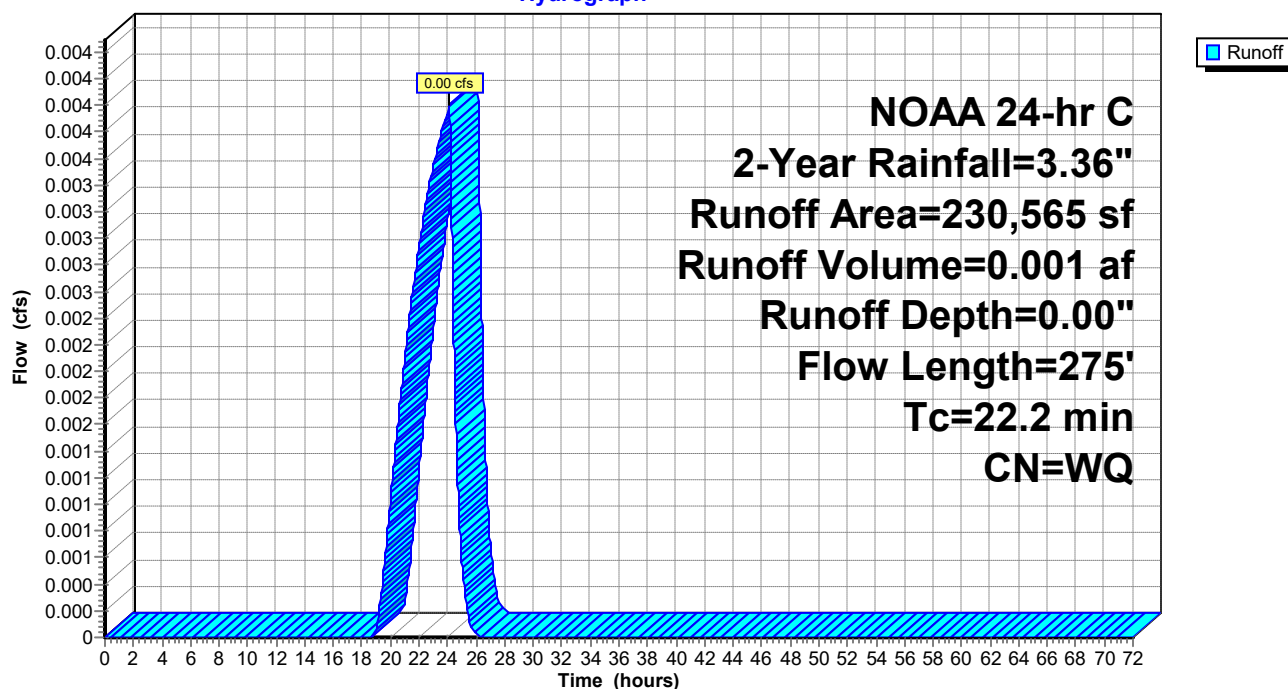
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
179,010	39	>75% Grass cover, Good, HSG A
51,555	30	Woods, Good, HSG A
230,565		Weighted Average
230,565	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment EXDA-1.1 Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment EXDA-1.2 Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1p: EXDA-1p

Hydrograph



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Appendix C
NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 2Ai: EXDA-2Ai

Runoff = 0.29 cfs @ 12.26 hrs, Volume= 0.040 af, Depth= 3.13"
Routed to Link 2A : EXDA-2A

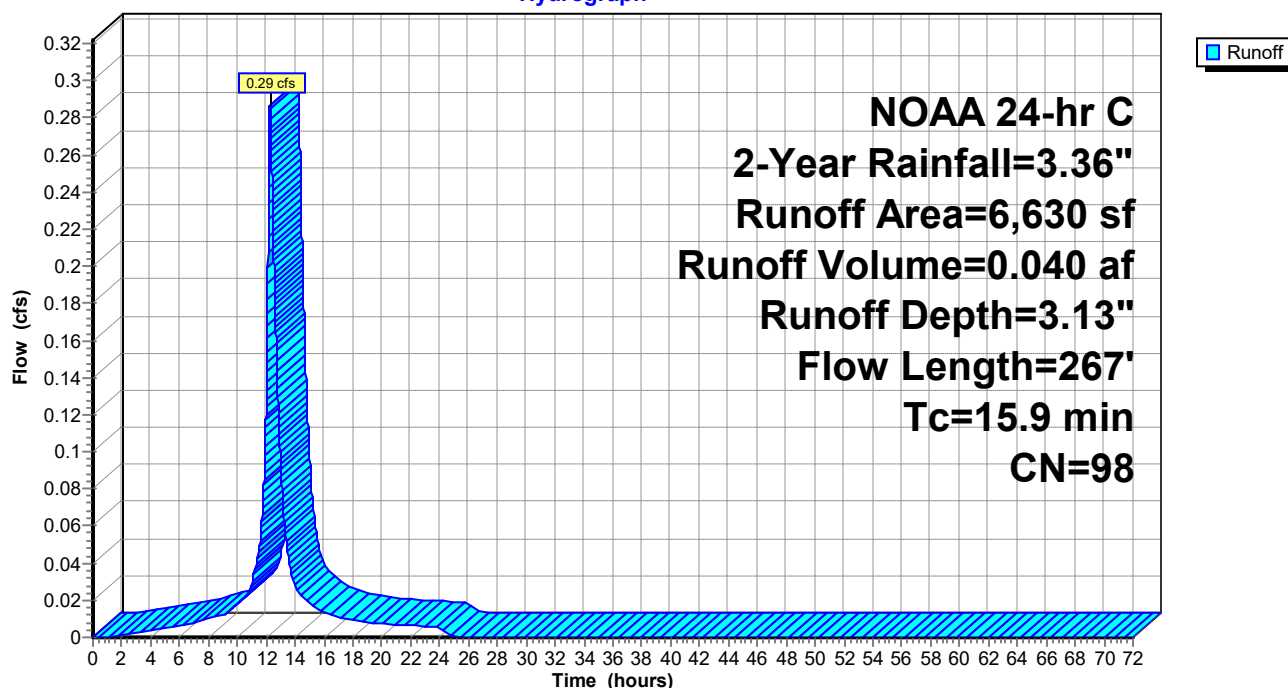
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
6,630	98	Paved parking, HSG A
6,630	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment EXDA-2A.1 Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment EXDA-2A.2 Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ai: EXDA-2Ai

Hydrograph



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Appendix C

NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 2Ap: EXDA-2Ap

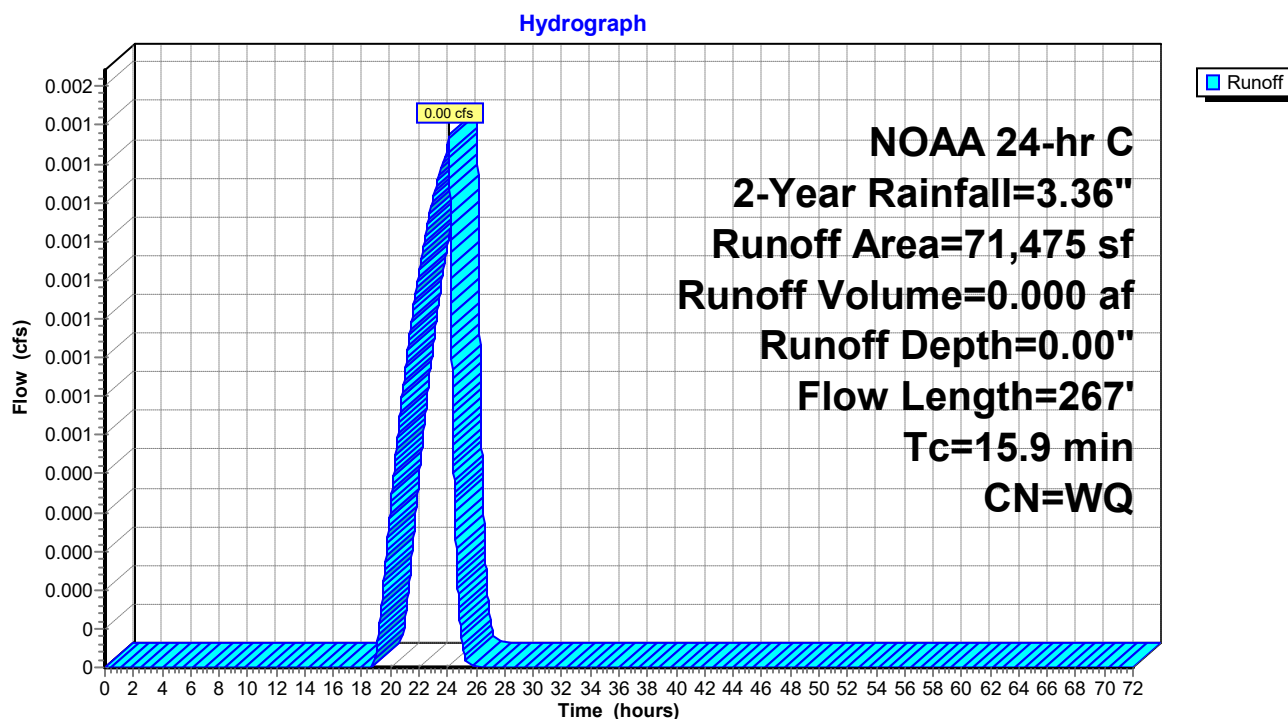
Runoff = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 2A : EXDA-2A

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
59,895	39	>75% Grass cover, Good, HSG A
11,580	30	Woods, Good, HSG A
71,475		Weighted Average
71,475	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment EXDA-2A.1 Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment EXDA-2A.2 Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ap: EXDA-2Ap



Pre Developed Conditions

NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 2Bi: EXDA-2Bi

Runoff = 9.80 cfs @ 12.55 hrs, Volume= 2.122 af, Depth= 3.13"
 Routed to Link 2B : EXDA-2B

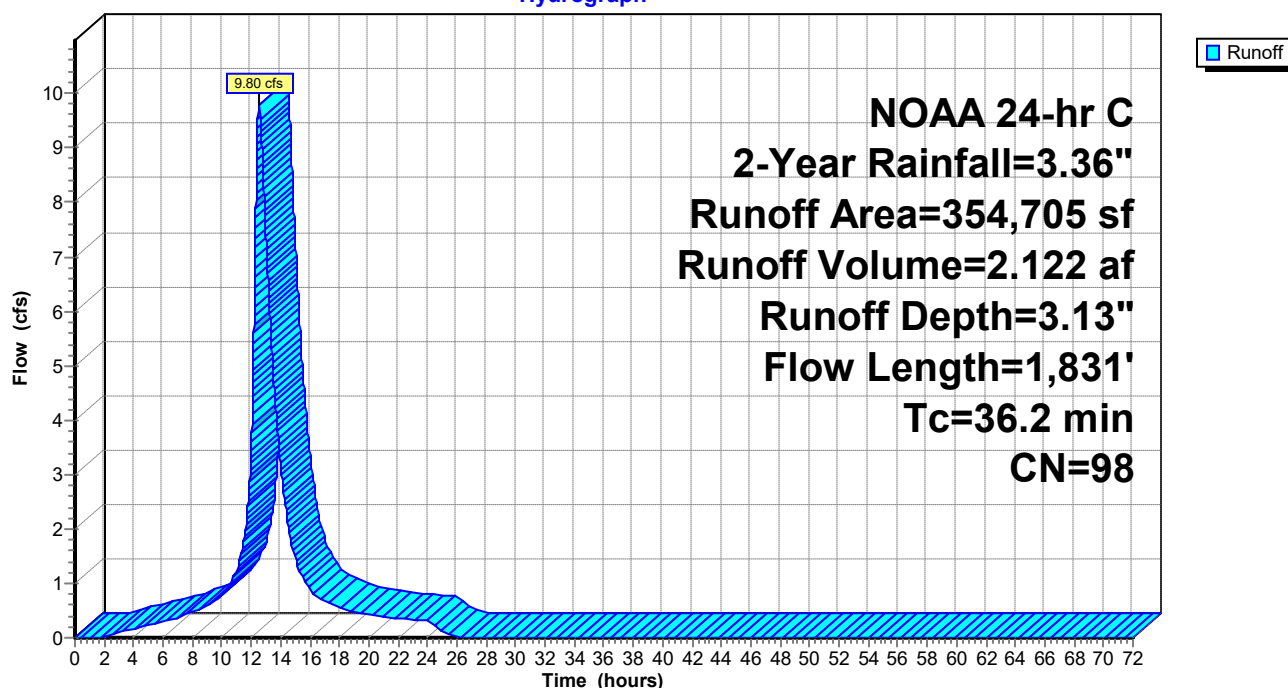
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
354,705	98	Paved parking, HSG A
354,705	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment EXDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment EXDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment EXDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment EXDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bi: EXDA-2Bi

Hydrograph



Pre Developed Conditions

NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 2Bp: EXDA-2Bp

Runoff = 0.01 cfs @ 24.13 hrs, Volume= 0.004 af, Depth= 0.00"
 Routed to Link 2B : EXDA-2B

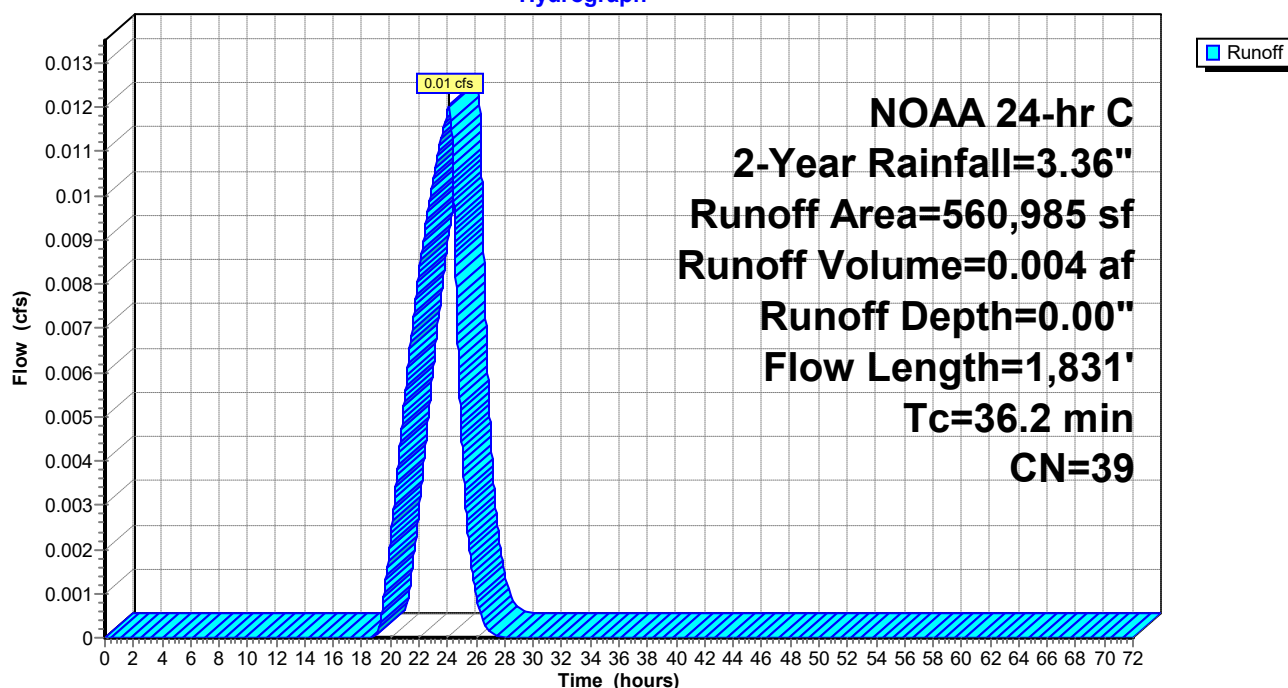
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
560,985	39	>75% Grass cover, Good, HSG A
560,985	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment EXDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment EXDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment EXDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment EXDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bp: EXDA-2Bp

Hydrograph



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Appendix C

NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 3i: EXDA-3i

Runoff = 0.56 cfs @ 12.69 hrs, Volume= 0.142 af, Depth= 3.13"
Routed to Link 3 : EXDA-3

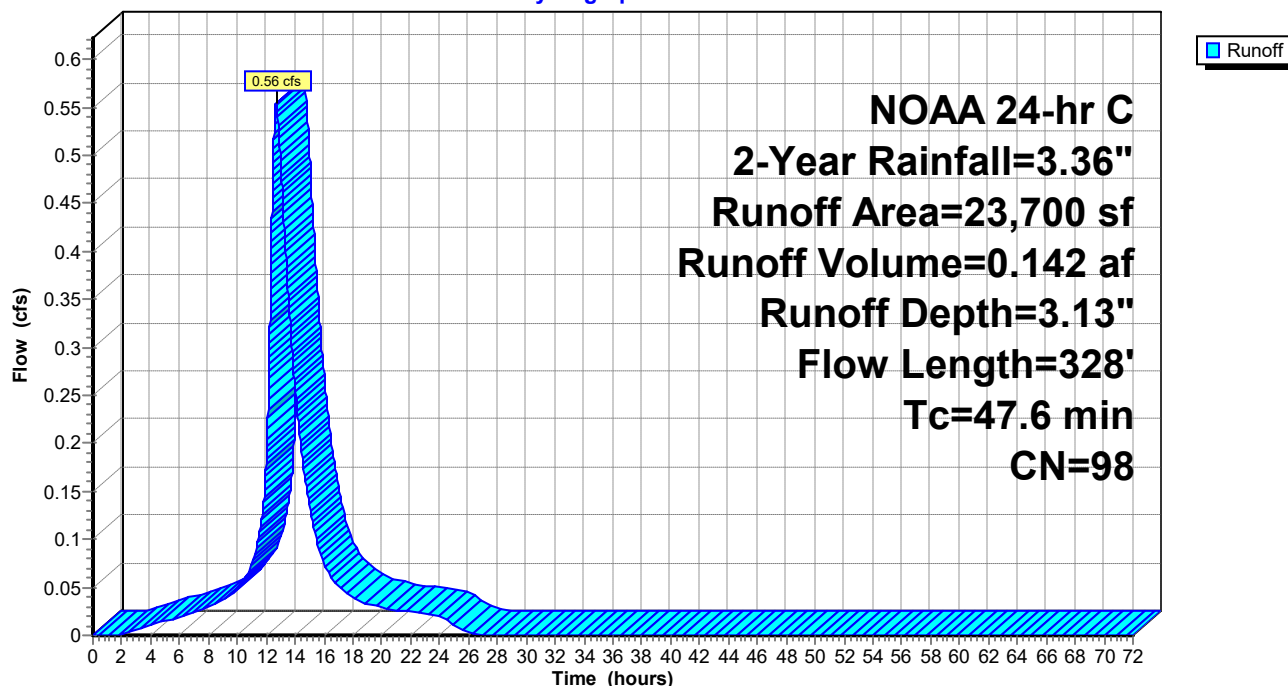
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
23,700	98	Paved parking, HSG A
23,700	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment EXDA-3.1 Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment EXDA-3.2 Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3i: EXDA-3i

Hydrograph



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NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 3p: EXDA-3p

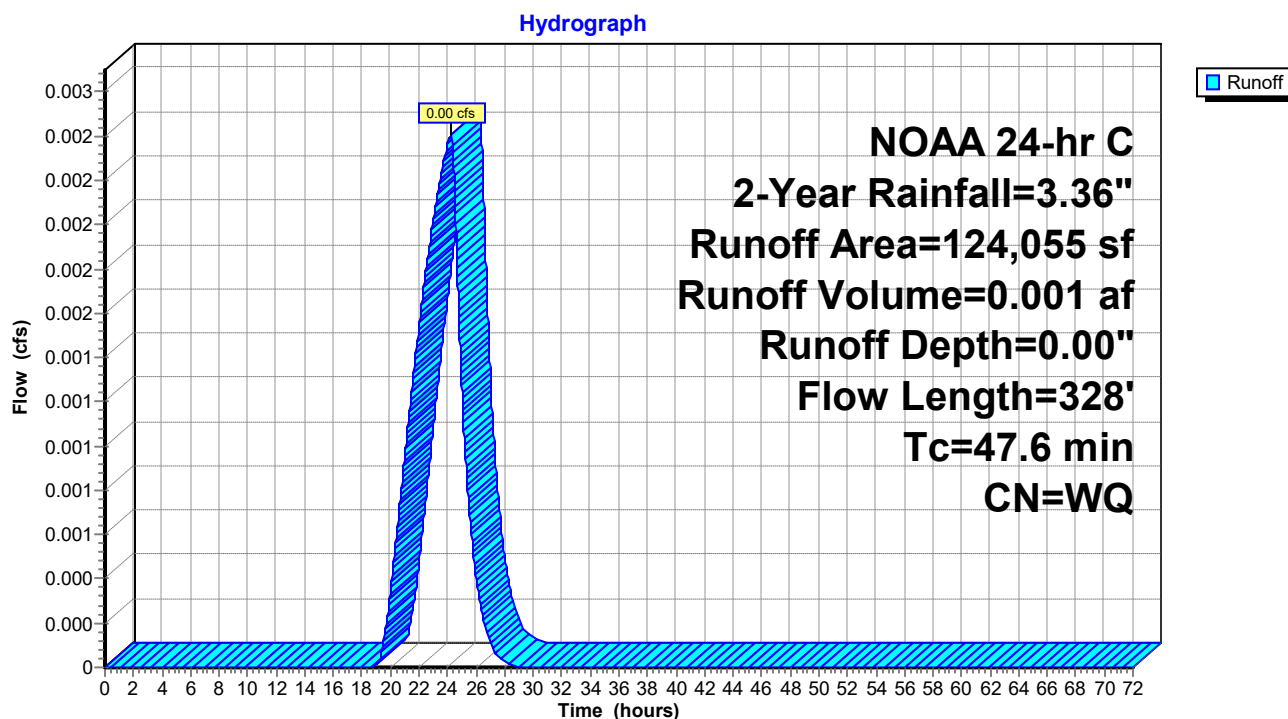
Runoff = 0.00 cfs @ 24.22 hrs, Volume= 0.001 af, Depth= 0.00"
Routed to Link 3 : EXDA-3

Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
115,905	39	>75% Grass cover, Good, HSG A
8,150	30	Woods, Good, HSG A
124,055		Weighted Average
124,055	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment EXDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment EXDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3p: EXDA-3p



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Appendix C

NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 4i: EXDA-4i

Runoff = 1.11 cfs @ 12.14 hrs, Volume= 0.100 af, Depth= 3.13"
Routed to Link 4 : EXDA-4

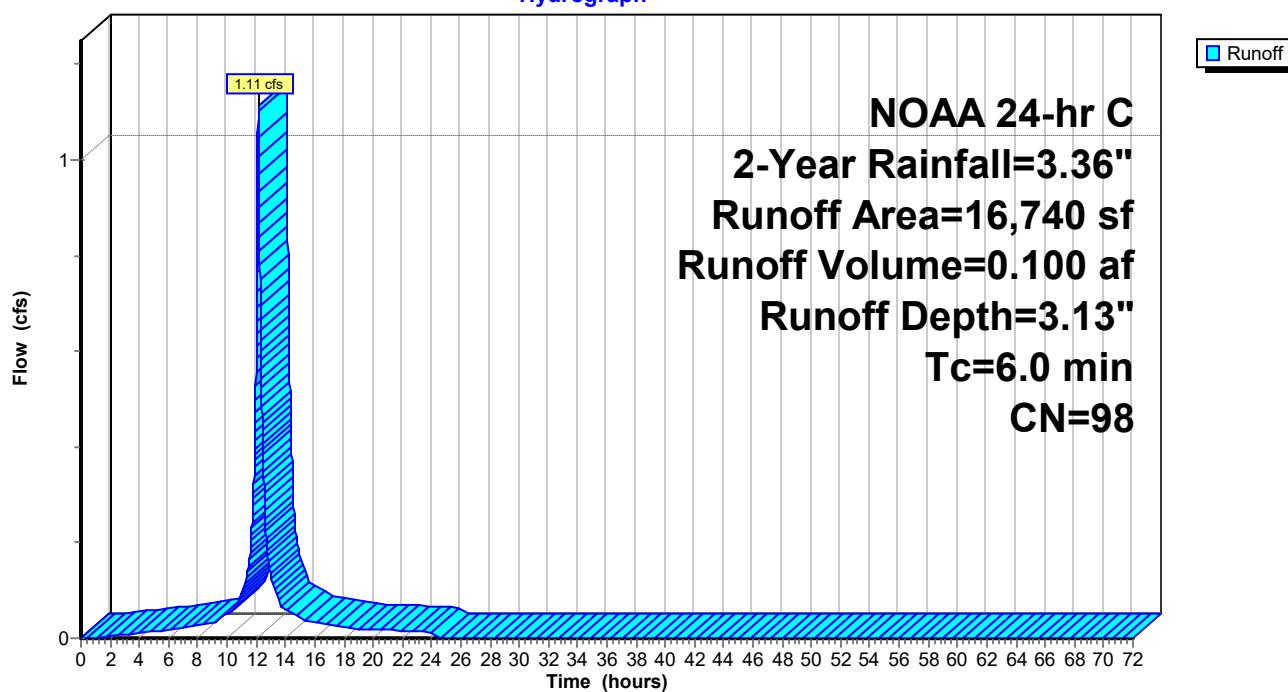
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
16,740	98	Paved parking, HSG A
16,740	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment EXDA-4.1

Subcatchment 4i: EXDA-4i

Hydrograph



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Appendix C

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Summary for Subcatchment 4p: EXDA-4p

Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 4 : EXDA-4

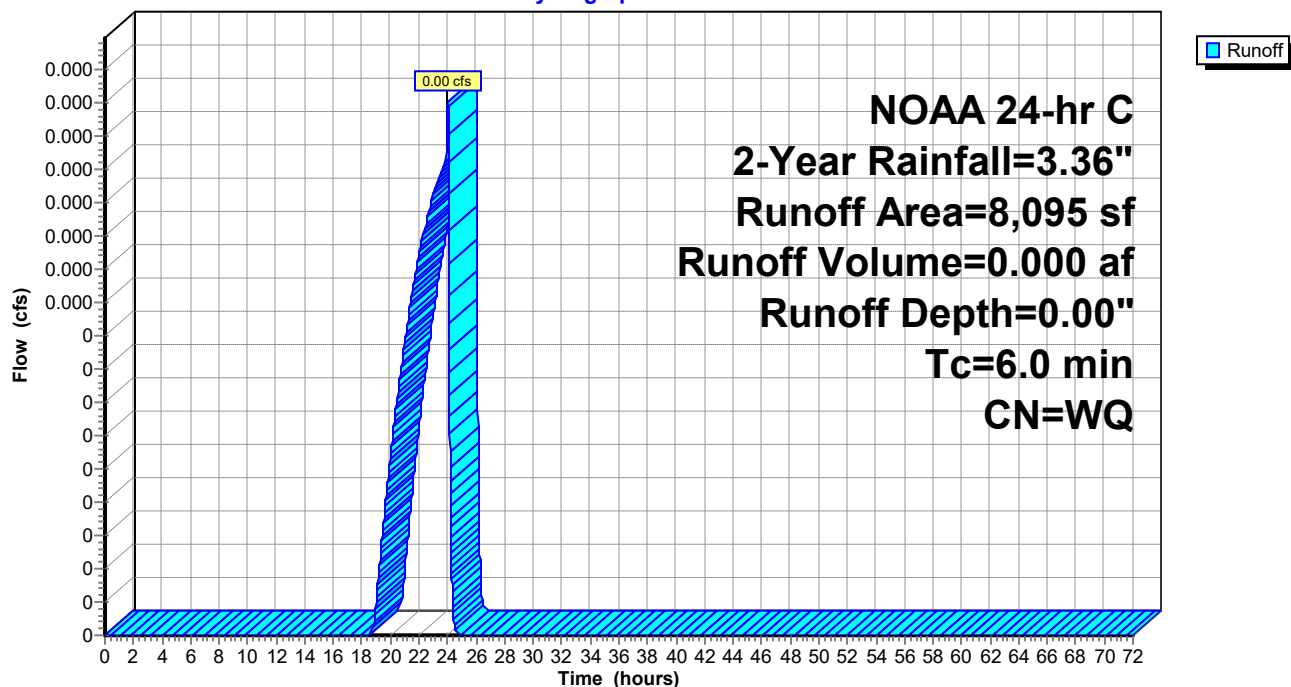
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
6,330	39	>75% Grass cover, Good, HSG A
1,765	30	Woods, Good, HSG A
8,095		Weighted Average
8,095	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment EXDA-4.1

Subcatchment 4p: EXDA-4p

Hydrograph



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Summary for Pond B1: Basin #1

Inflow = 9.00 cfs @ 12.61 hrs, Volume= 2.744 af
 Outflow = 0.40 cfs @ 25.42 hrs, Volume= 0.761 af, Atten= 96%, Lag= 768.3 min
 Primary = 0.40 cfs @ 25.42 hrs, Volume= 0.761 af
 Routed to Pond B2 : Basin #2

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 15,925 sf Storage= 5,275 cf

Peak Elev= 36.26' @ 28.01 hrs Surf.Area= 35,904 sf Storage= 91,665 cf (86,390 cf above start)

Plug-Flow detention time= 2,328.1 min calculated for 0.640 af (23% of inflow)

Center-of-Mass det. time= 1,346.1 min (2,668.1 - 1,322.0)

Volume	Invert	Avail.Storage	Storage Description
#1	31.50'	264,335 cf	Basin 1 - Existing Contours (Prismatic) Listed below (Recalc)
#2	38.40'	7,196 cf	Low Area - Existing Contours (Prismatic) Listed below (Recalc)
		271,531 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.50	0	0	0
32.00	270	68	68
33.00	1,455	863	930
34.00	30,395	15,925	16,855
35.00	32,725	31,560	48,415
36.00	35,215	33,970	82,385
37.00	37,855	36,535	118,920
38.00	41,075	39,465	158,385
39.00	49,965	45,520	203,905
40.00	70,895	60,430	264,335

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
38.40	10	0	0
39.00	1,050	318	318
40.00	12,705	6,878	7,196

Device	Routing	Invert	Outlet Devices
#1	Primary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.50' / 32.43' S= -0.0015 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=0.21 cfs @ 25.42 hrs HW=36.26' TW=36.26' (Dynamic Tailwater)↑**1=30" Culvert** (Outlet Controls 0.21 cfs @ 0.04 fps)

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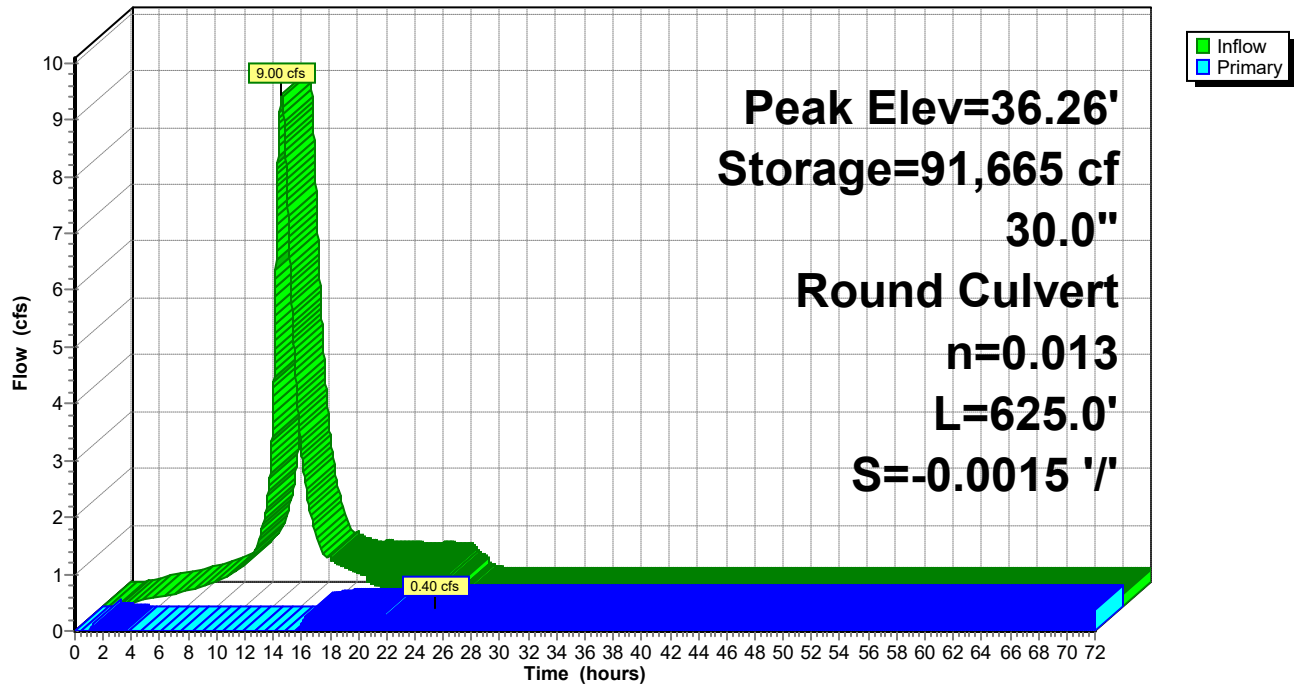
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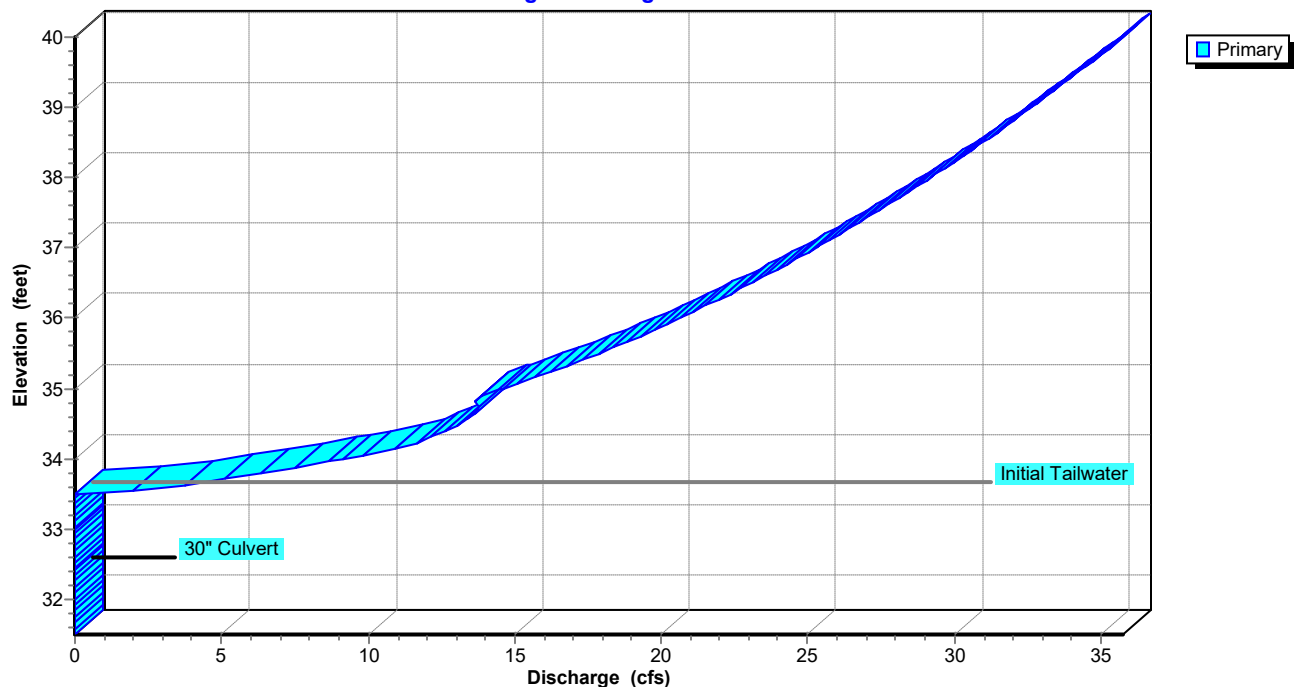
Pond B1: Basin #1

Hydrograph



Pond B1: Basin #1

Stage-Discharge



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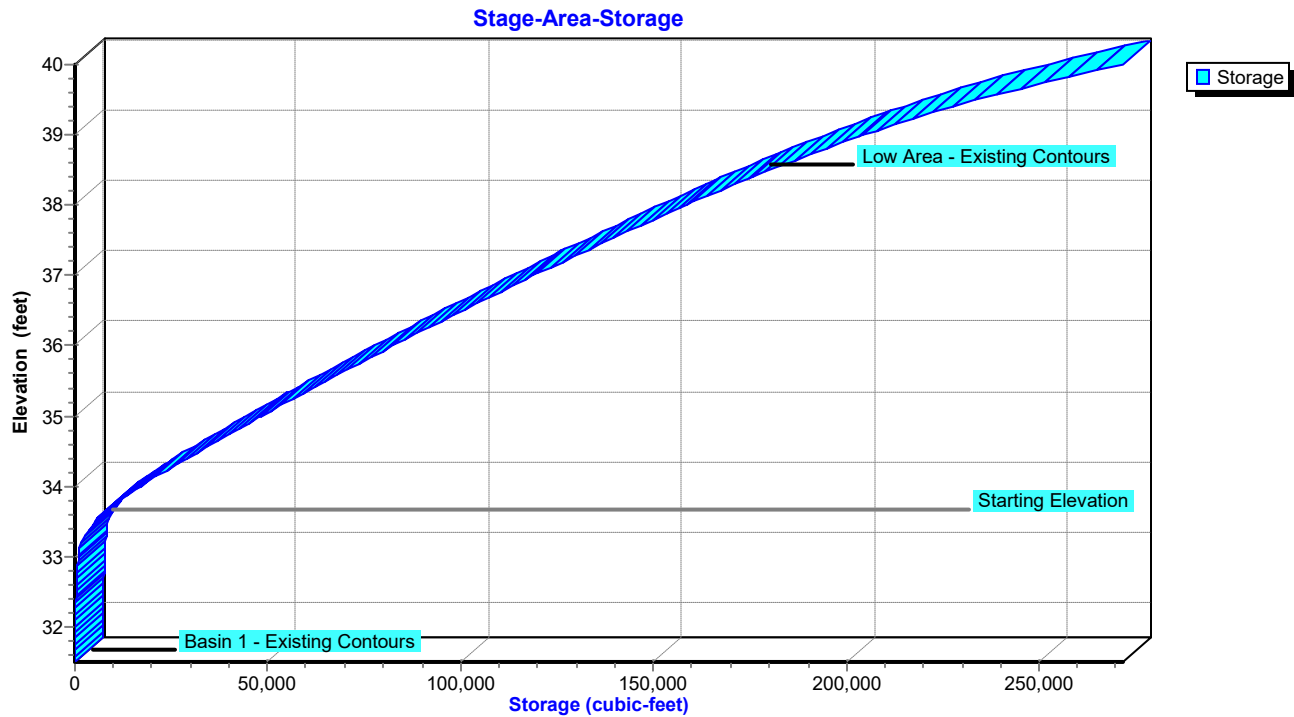
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Appendix C
NOAA 24-hr C 2-Year Rainfall=3.36"

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Pond B1: Basin #1



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Summary for Pond B2: Basin #2

Inflow = 10.00 cfs @ 12.55 hrs, Volume= 2.927 af
 Outflow = 5.99 cfs @ 12.73 hrs, Volume= 2.089 af, Atten= 40%, Lag= 10.3 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Pond B3 : Basin #3
 Secondary = 5.99 cfs @ 12.73 hrs, Volume= 2.089 af
 Routed to Pond B1 : Basin #1

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 6,488 sf Storage= 1,790 cf

Peak Elev= 36.26' @ 27.99 hrs Surf.Area= 15,447 sf Storage= 38,308 cf (36,517 cf above start)

Plug-Flow detention time= 743.2 min calculated for 2.048 af (70% of inflow)

Center-of-Mass det. time= 196.7 min (1,488.2 - 1,291.5)

Volume	Invert	Avail.Storage	Storage Description
#1	32.43'	136,127 cf	Basin 2 - Existing Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
32.43	0	0	0
33.00	315	90	90
34.00	12,660	6,488	6,577
35.00	13,855	13,258	19,835
36.00	15,100	14,478	34,312
37.00	16,425	15,763	50,075
38.00	17,895	17,160	67,235
39.00	23,945	20,920	88,155
40.00	72,000	47,973	136,127

Device	Routing	Invert	Outlet Devices
#1	Primary	32.35'	30.0" Round 30" Culvert L= 253.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.35' / 31.41' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	36.37'	12.0" Vert. 12" Orifice C= 0.600 Limited to weir flow at low heads 6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	37.90'	
#4	Secondary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.43' / 31.50' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

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Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.50' TW=33.50' (Dynamic Tailwater)

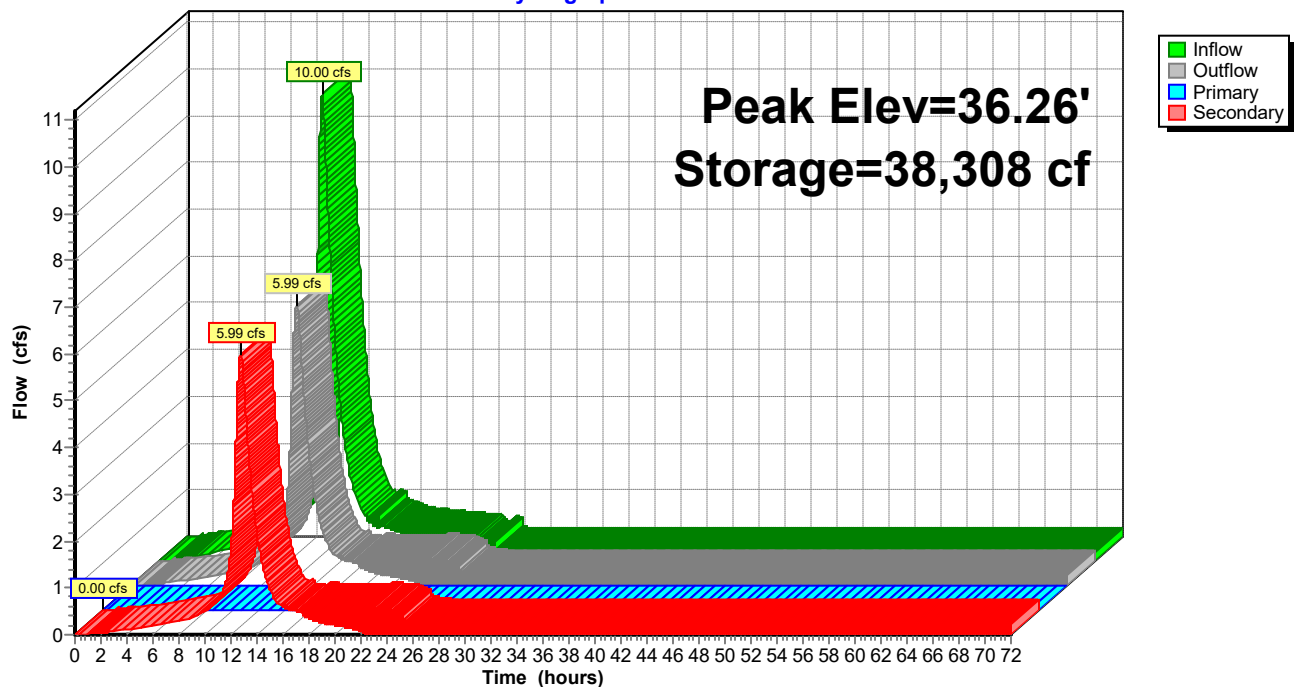
1=30" Culvert (Controls 0.00 cfs)

2=12" Orifice (Controls 0.00 cfs)

3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=5.84 cfs @ 12.73 hrs HW=35.01' TW=34.83' (Dynamic Tailwater)

4=30" Culvert (Outlet Controls 5.84 cfs @ 1.43 fps)

Pond B2: Basin #2**Hydrograph**

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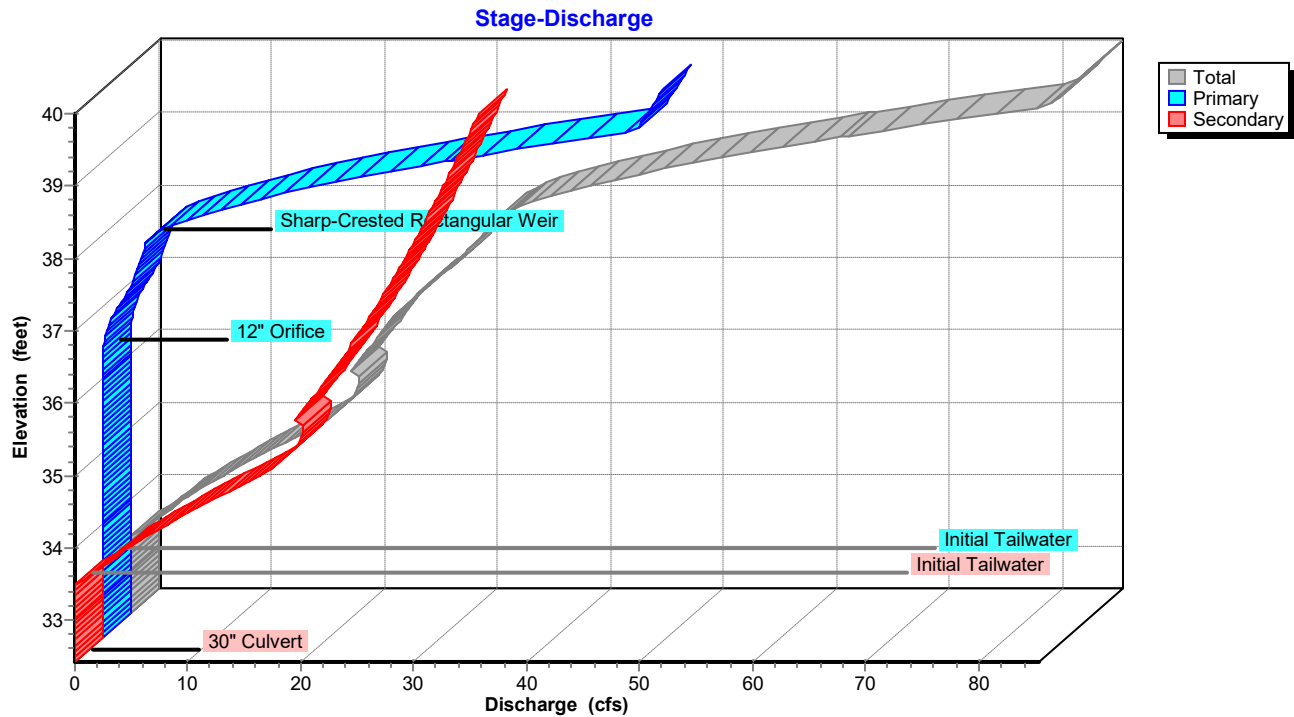
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Appendix C
NOAA 24-hr C 2-Year Rainfall=3.36"

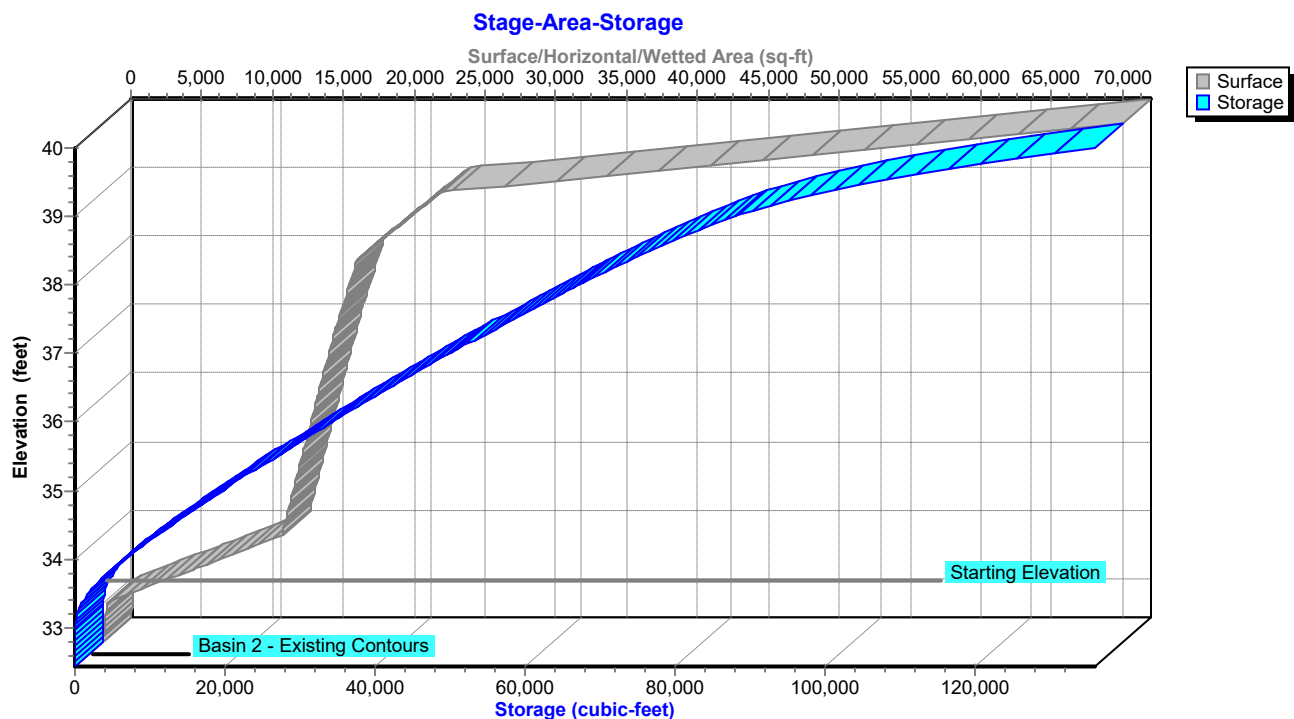
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Pond B2: Basin #2



Pond B2: Basin #2



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Summary for Pond B3: Basin #3

Inflow = 0.56 cfs @ 12.70 hrs, Volume= 0.143 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 Link TTA : TTA

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 8,403 sf Storage= 3,080 cf

Peak Elev= 34.01' @ 29.21 hrs Surf.Area= 15,665 sf Storage= 9,288 cf (6,208 cf above start)

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	31.44'	195,235 cf	Basin 3 - Existing Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.44	0	0	0
32.00	135	38	38
33.00	1,165	650	688
34.00	15,640	8,403	9,090
35.00	17,655	16,648	25,738
36.00	19,910	18,783	44,520
37.00	24,090	22,000	66,520
38.00	38,775	31,433	97,953
39.00	50,395	44,585	142,538
40.00	55,000	52,698	195,235

Device	Routing	Invert	Outlet Devices
#1	Primary	33.42'	24.0" Round 24" Culvert L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 33.42' / 33.15' S= 0.0042 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	38.22'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.50' TW=0.00' (Dynamic Tailwater)↑ **1=24" Culvert** (Passes 0.00 cfs of 0.02 cfs potential flow)↑ **2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pre Developed Conditions

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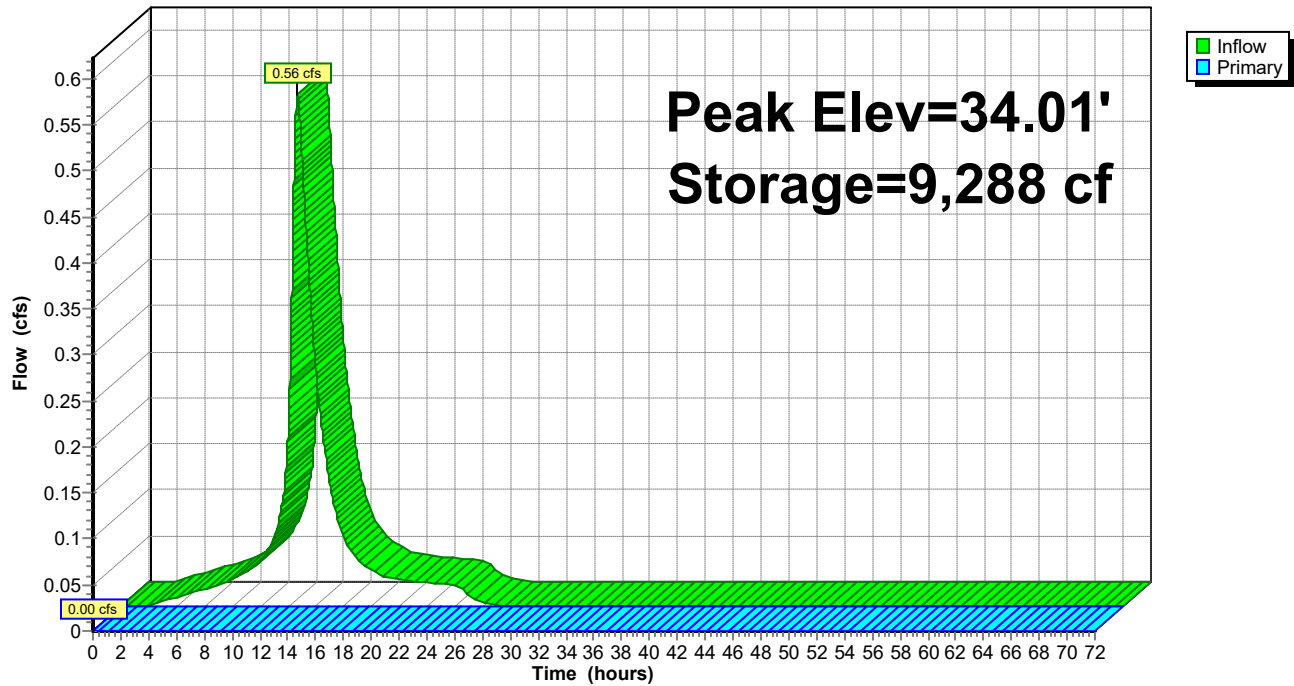
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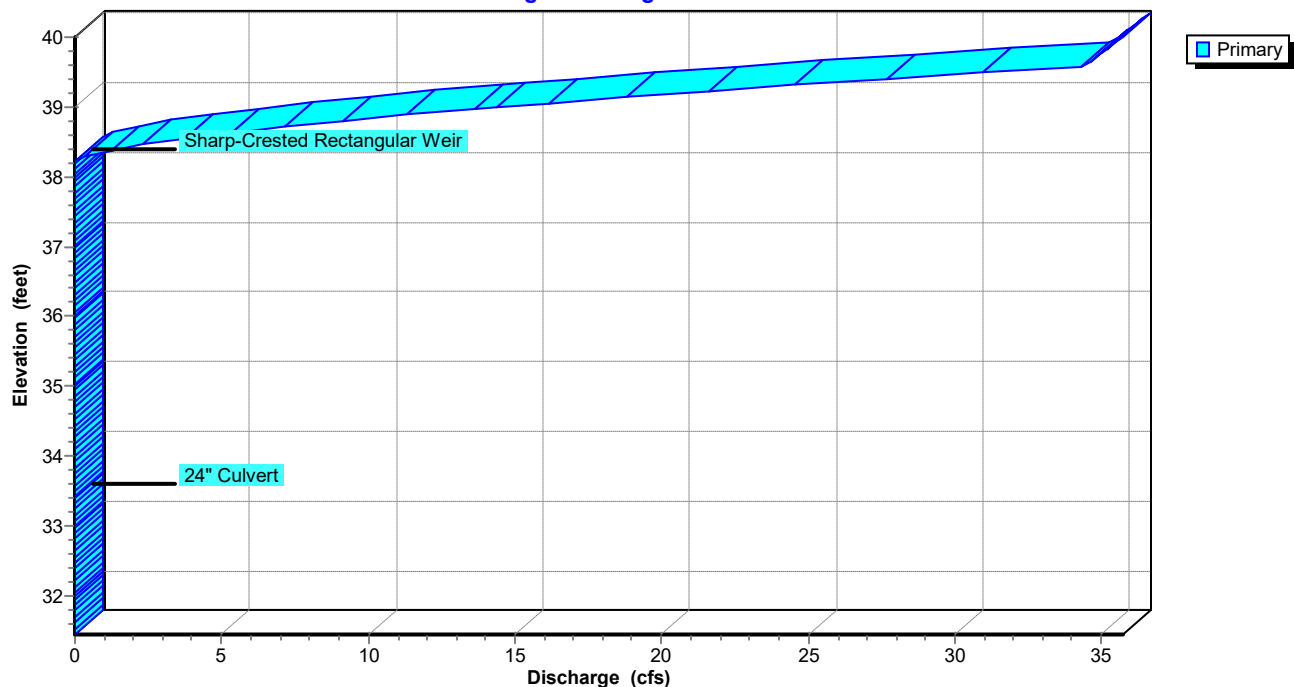
Pond B3: Basin #3

Hydrograph



Pond B3: Basin #3

Stage-Discharge



Pre Developed Conditions

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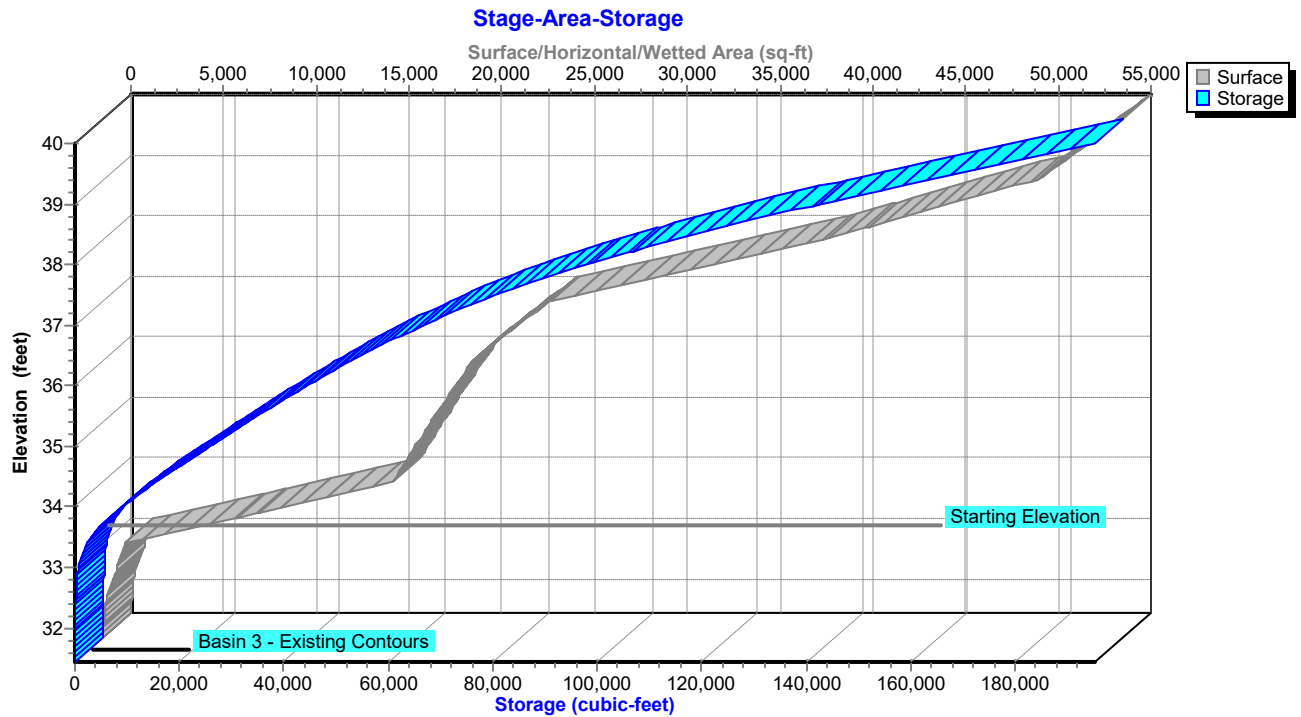
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Appendix C
NOAA 24-hr C 2-Year Rainfall=3.36"

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Pond B3: Basin #3



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Appendix C

NOAA 24-hr C 2-Year Rainfall=3.36"

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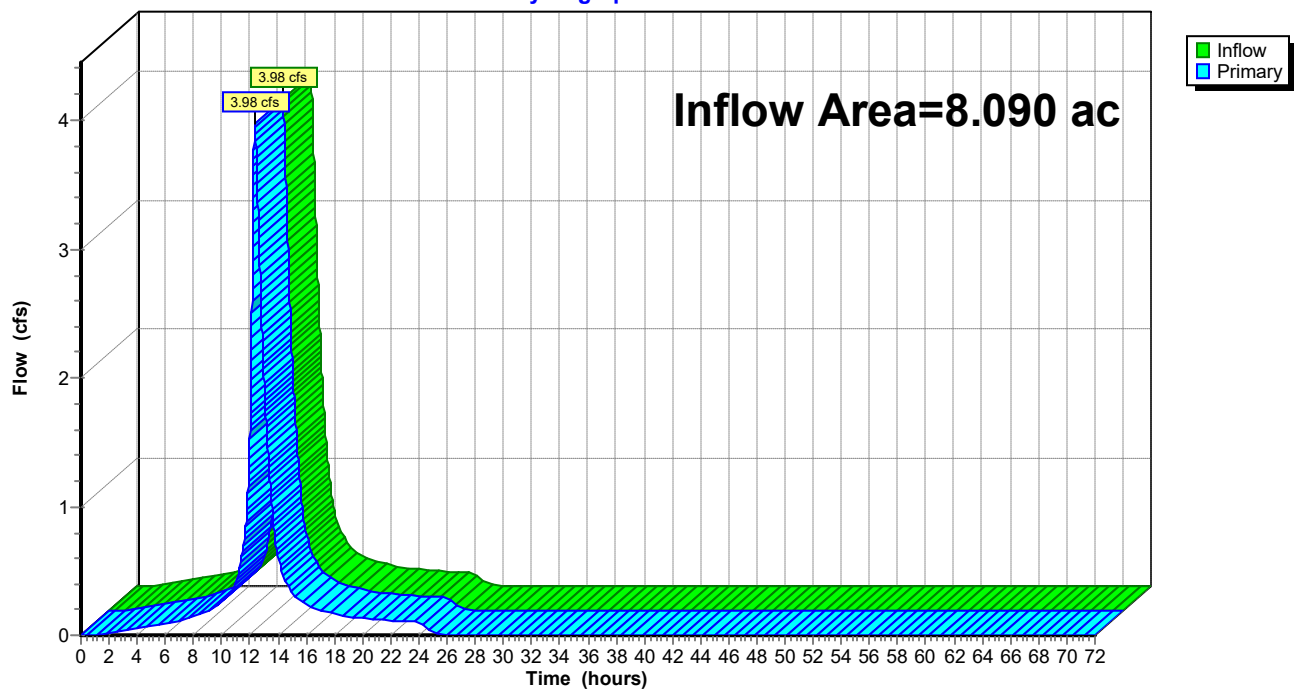
Summary for Link 1: EXDA-1

Inflow Area = 8.090 ac, 29.30% Impervious, Inflow Depth = 0.97" for 2-Year event
Inflow = 3.98 cfs @ 12.34 hrs, Volume= 0.655 af
Primary = 3.98 cfs @ 12.35 hrs, Volume= 0.655 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B1 : Basin #1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 1: EXDA-1

Hydrograph



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Appendix C
NOAA 24-hr C 2-Year Rainfall=3.36"

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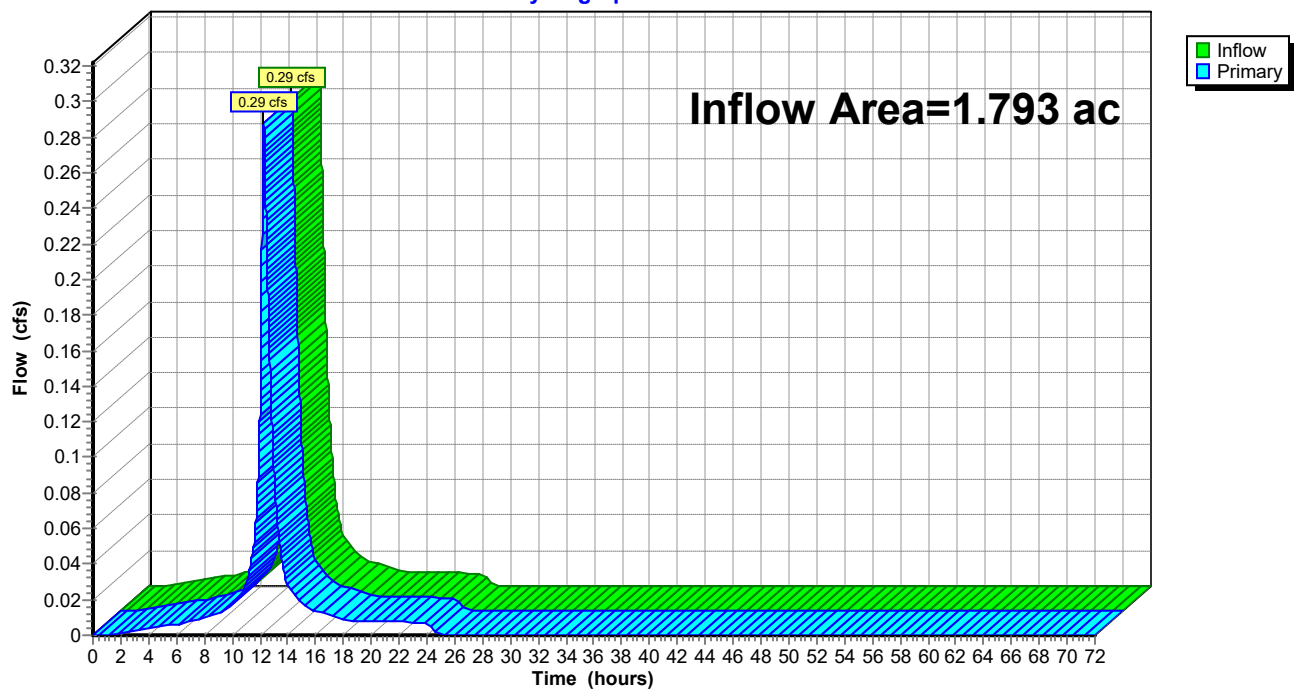
Summary for Link 2A: EXDA-2A

Inflow Area = 1.793 ac, 8.49% Impervious, Inflow Depth = 0.27" for 2-Year event
Inflow = 0.29 cfs @ 12.26 hrs, Volume= 0.040 af
Primary = 0.29 cfs @ 12.27 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2A: EXDA-2A

Hydrograph



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Appendix C

NOAA 24-hr C 2-Year Rainfall=3.36"

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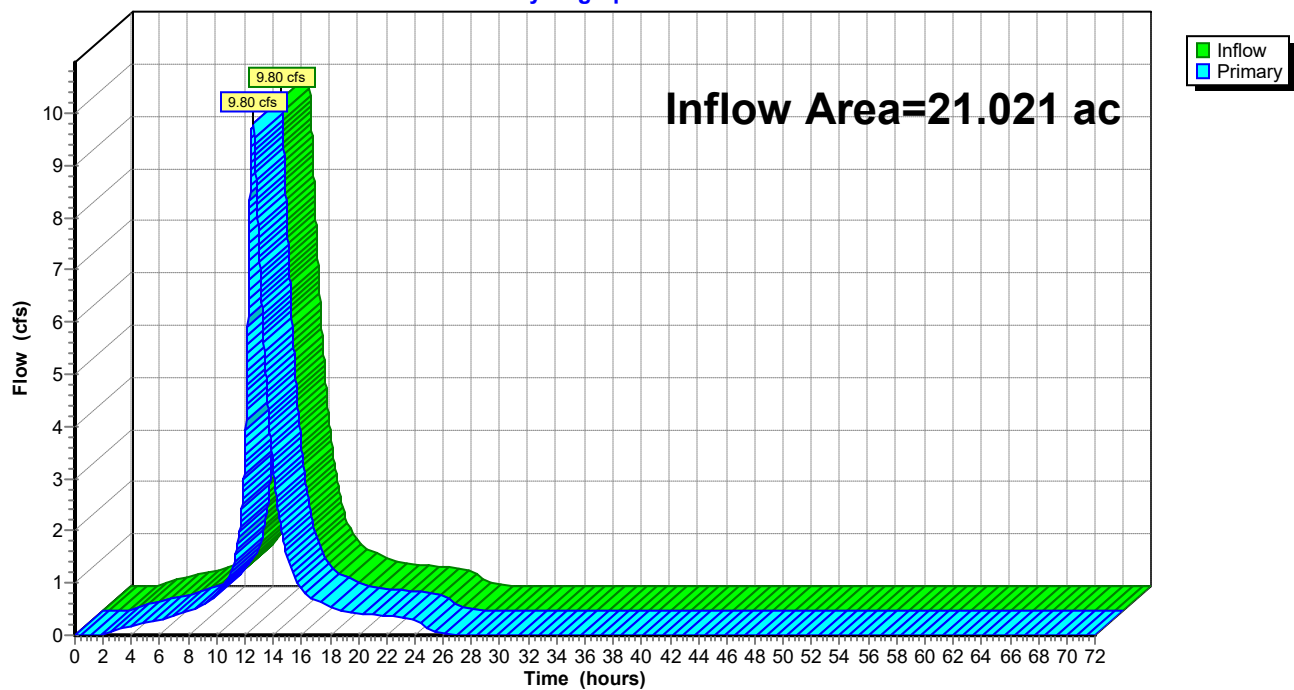
Summary for Link 2B: EXDA-2B

Inflow Area = 21.021 ac, 38.74% Impervious, Inflow Depth = 1.21" for 2-Year event
Inflow = 9.80 cfs @ 12.55 hrs, Volume= 2.125 af
Primary = 9.80 cfs @ 12.56 hrs, Volume= 2.125 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2B: EXDA-2B

Hydrograph



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Appendix C
NOAA 24-hr C 2-Year Rainfall=3.36"

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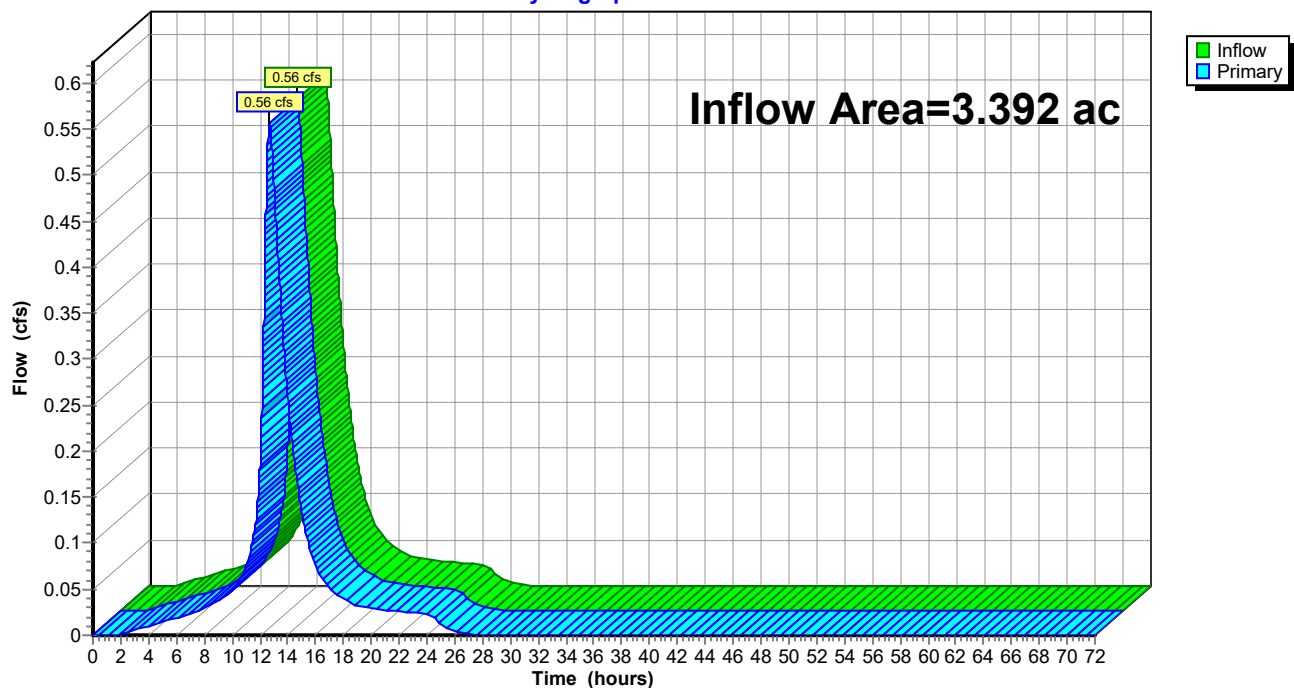
Summary for Link 3: EXDA-3

Inflow Area = 3.392 ac, 16.04% Impervious, Inflow Depth = 0.50" for 2-Year event
Inflow = 0.56 cfs @ 12.69 hrs, Volume= 0.143 af
Primary = 0.56 cfs @ 12.70 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B3 : Basin #3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3: EXDA-3

Hydrograph



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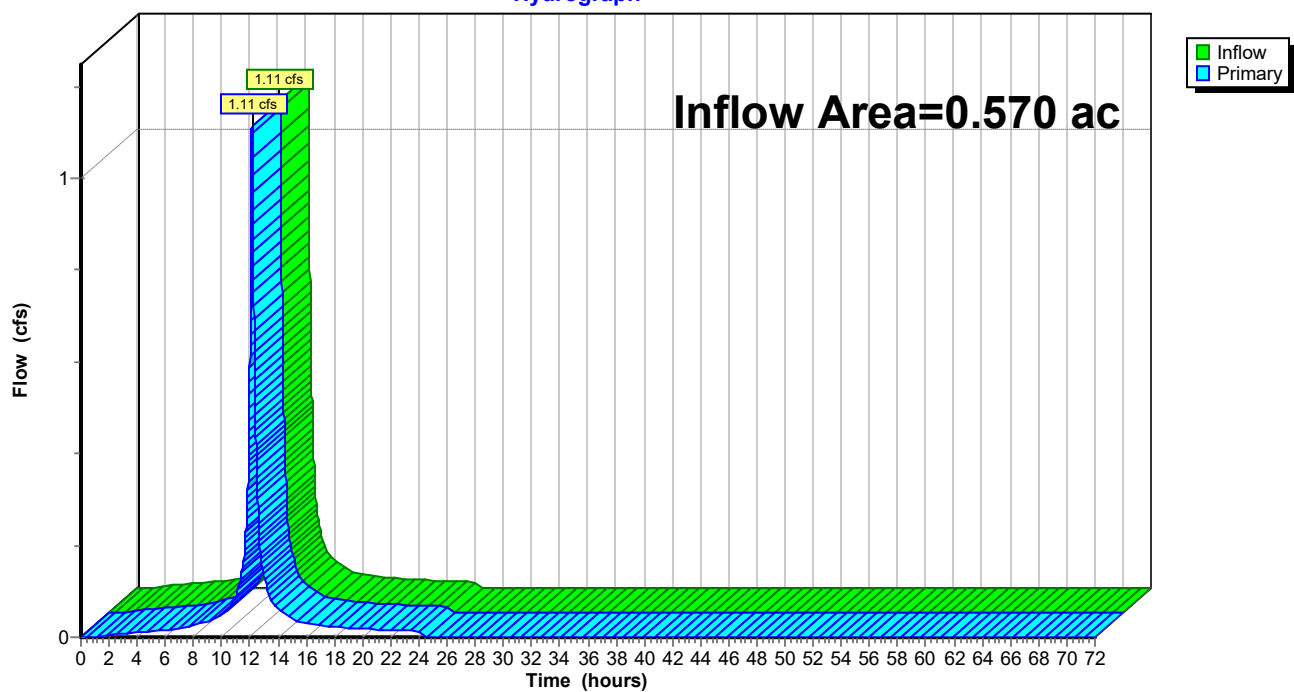
Summary for Link 4: EXDA-4

Inflow Area = 0.570 ac, 67.40% Impervious, Inflow Depth = 2.11" for 2-Year event
Inflow = 1.11 cfs @ 12.14 hrs, Volume= 0.100 af
Primary = 1.11 cfs @ 12.15 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.6 min
Routed to Link TTA : TTA

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 4: EXDA-4

Hydrograph



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NOAA 24-hr C 2-Year Rainfall=3.36"

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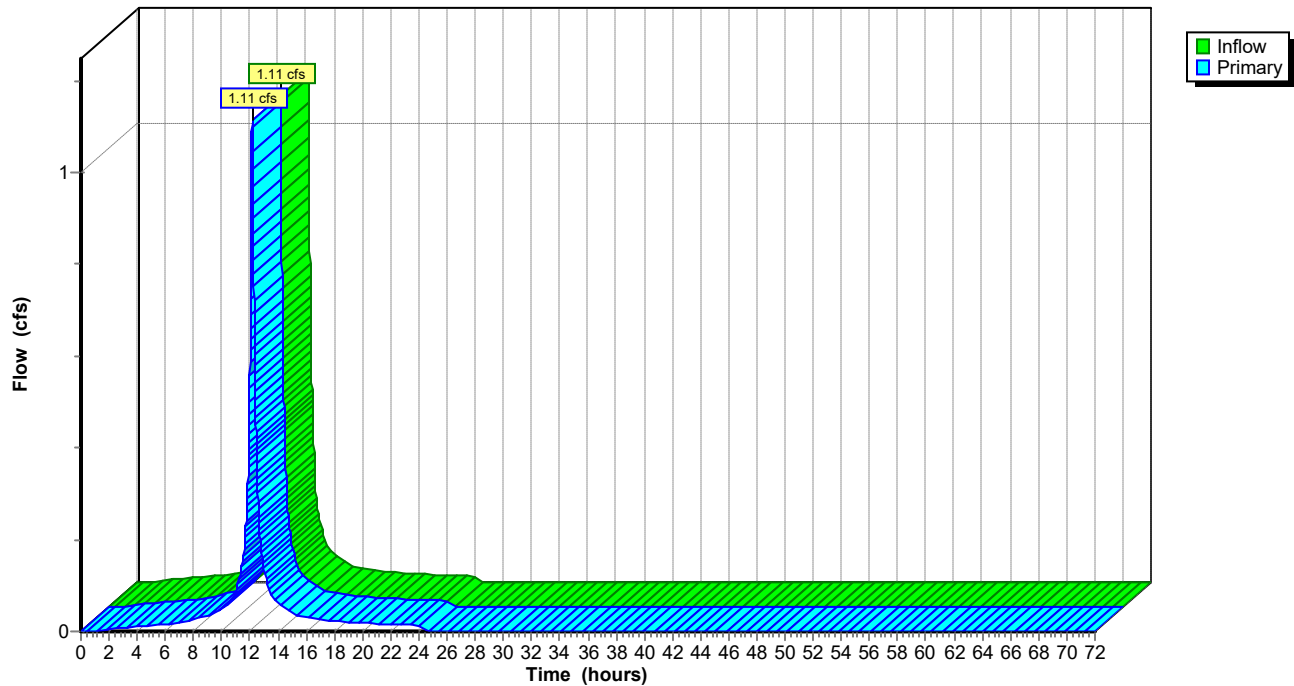
Summary for Link TTA: TTA

Inflow = 1.11 cfs @ 12.15 hrs, Volume= 0.100 af
Primary = 1.11 cfs @ 12.16 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.6 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link TTA: TTA

Hydrograph



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Appendix C
NOAA 24-hr C 10-Year Rainfall=5.18"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1i: EXDA-1i	Runoff Area=121,845 sf 84.75% Impervious Runoff Depth=4.55" Flow Length=275' Tc=22.2 min CN=WQ Runoff=6.38 cfs 1.060 af
Subcatchment 1p: EXDA-1p	Runoff Area=230,565 sf 0.00% Impervious Runoff Depth=0.19" Flow Length=275' Tc=22.2 min CN=WQ Runoff=0.17 cfs 0.083 af
Subcatchment 2Ai: EXDA-2Ai	Runoff Area=6,630 sf 100.00% Impervious Runoff Depth=4.94" Flow Length=267' Tc=15.9 min CN=98 Runoff=0.45 cfs 0.063 af
Subcatchment 2Ap: EXDA-2Ap	Runoff Area=71,475 sf 0.00% Impervious Runoff Depth=0.20" Flow Length=267' Tc=15.9 min CN=WQ Runoff=0.06 cfs 0.028 af
Subcatchment 2Bi: EXDA-2Bi	Runoff Area=354,705 sf 100.00% Impervious Runoff Depth=4.94" Flow Length=1,831' Tc=36.2 min CN=98 Runoff=15.24 cfs 3.354 af
Subcatchment 2Bp: EXDA-2Bp	Runoff Area=560,985 sf 0.00% Impervious Runoff Depth=0.24" Flow Length=1,831' Tc=36.2 min CN=39 Runoff=0.46 cfs 0.255 af
Subcatchment 3i: EXDA-3i	Runoff Area=23,700 sf 100.00% Impervious Runoff Depth=4.94" Flow Length=328' Tc=47.6 min CN=98 Runoff=0.86 cfs 0.224 af
Subcatchment 3p: EXDA-3p	Runoff Area=124,055 sf 0.00% Impervious Runoff Depth=0.22" Flow Length=328' Tc=47.6 min CN=WQ Runoff=0.09 cfs 0.053 af
Subcatchment 4i: EXDA-4i	Runoff Area=16,740 sf 100.00% Impervious Runoff Depth=4.94" Tc=6.0 min CN=98 Runoff=1.73 cfs 0.158 af
Subcatchment 4p: EXDA-4p	Runoff Area=8,095 sf 0.00% Impervious Runoff Depth=0.19" Tc=6.0 min CN=WQ Runoff=0.01 cfs 0.003 af
Pond B1: Basin #1	Peak Elev=37.05' Storage=120,961 cf Inflow=13.75 cfs 3.504 af 30.0" Round Culvert n=0.013 L=625.0' S=-0.0015 '/' Outflow=0.58 cfs 0.923 af
Pond B2: Basin #2	Peak Elev=37.05' Storage=50,950 cf Inflow=15.68 cfs 4.622 af Primary=1.61 cfs 1.163 af Secondary=8.47 cfs 2.362 af Outflow=8.47 cfs 3.525 af
Pond B3: Basin #3	Peak Elev=36.97' Storage=65,800 cf Inflow=1.74 cfs 1.440 af Outflow=0.00 cfs 0.000 af
Link 1: EXDA-1	Inflow=6.39 cfs 1.142 af Primary=6.39 cfs 1.142 af
Link 2A: EXDA-2A	Inflow=0.45 cfs 0.090 af Primary=0.45 cfs 0.090 af
Link 2B: EXDA-2B	Inflow=15.33 cfs 3.609 af Primary=15.33 cfs 3.609 af

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Appendix C

NOAA 24-hr C 10-Year Rainfall=5.18"

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Link 3: EXDA-3

Inflow=0.89 cfs 0.277 af
Primary=0.89 cfs 0.277 af

Link 4: EXDA-4

Inflow=1.73 cfs 0.161 af
Primary=1.73 cfs 0.161 af

Link TTA: TTA

Inflow=1.73 cfs 0.161 af
Primary=1.73 cfs 0.161 af

Total Runoff Area = 34.867 ac Runoff Volume = 5.280 af Average Runoff Depth = 1.82"
66.75% Pervious = 23.273 ac 33.25% Impervious = 11.594 ac

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Summary for Subcatchment 1i: EXDA-1i

Runoff = 6.38 cfs @ 12.34 hrs, Volume= 1.060 af, Depth= 4.55"
 Routed to Link 1 : EXDA-1

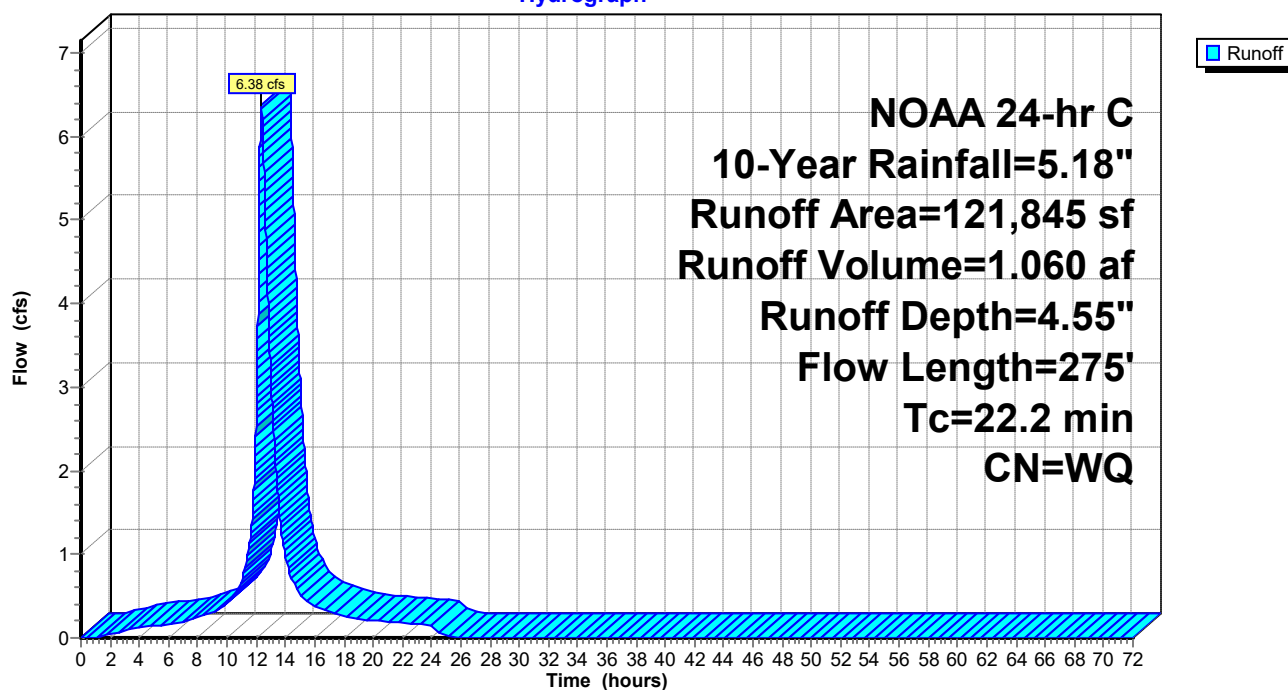
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
103,260	98	Paved parking, HSG A
18,585	72	Dirt roads, HSG A
121,845		Weighted Average
18,585	72	15.25% Pervious Area
103,260	98	84.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment EXDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment EXDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1i: EXDA-1i

Hydrograph



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NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 1p: EXDA-1p

Runoff = 0.17 cfs @ 13.27 hrs, Volume= 0.083 af, Depth= 0.19"
 Routed to Link 1 : EXDA-1

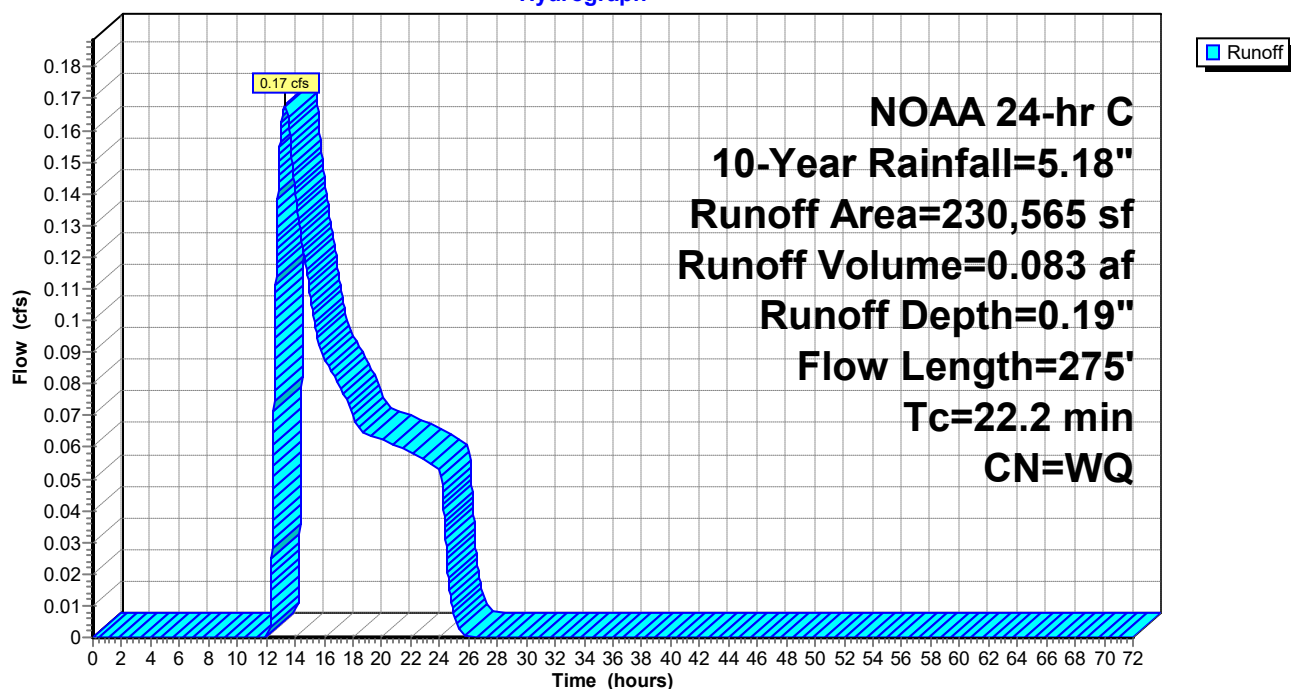
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
179,010	39	>75% Grass cover, Good, HSG A
51,555	30	Woods, Good, HSG A
230,565		Weighted Average
230,565	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment EXDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment EXDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1p: EXDA-1p

Hydrograph



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Summary for Subcatchment 2Ai: EXDA-2Ai

Runoff = 0.45 cfs @ 12.26 hrs, Volume= 0.063 af, Depth= 4.94"
 Routed to Link 2A : EXDA-2A

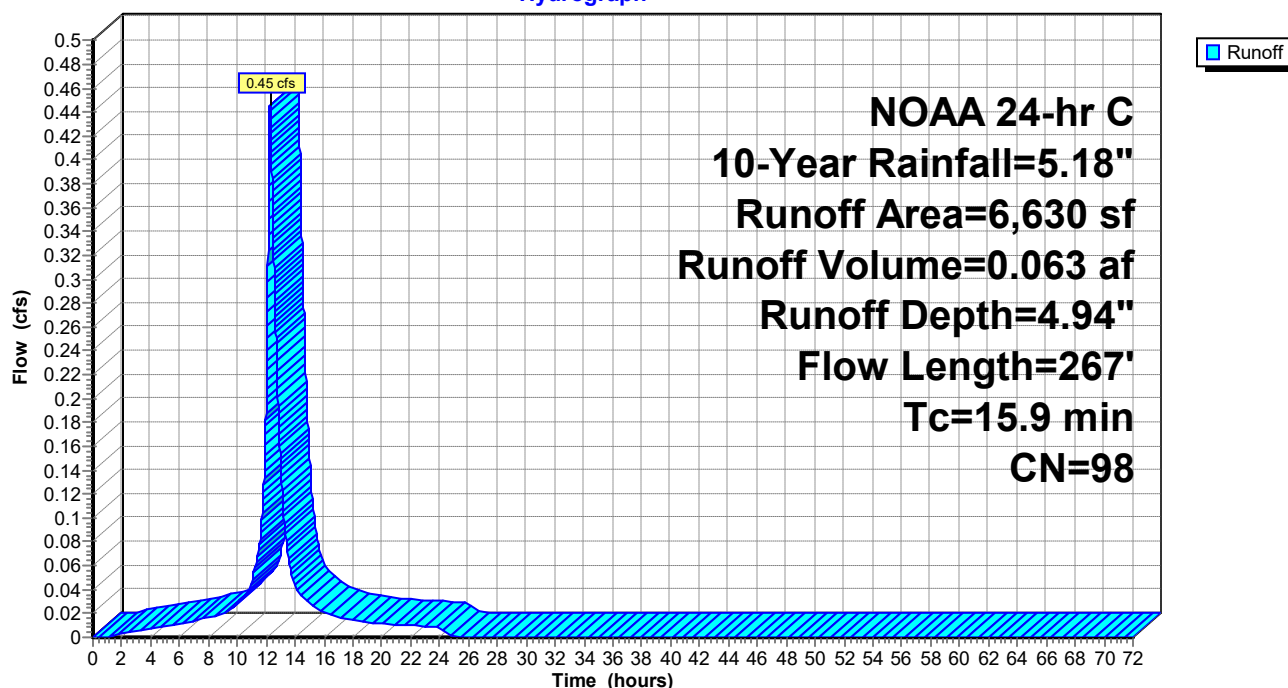
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
6,630	98	Paved parking, HSG A
6,630	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment EXDA-2A.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment EXDA-2A.2
					Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ai: EXDA-2Ai

Hydrograph



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NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 2Ap: EXDA-2Ap

Runoff = 0.06 cfs @ 13.07 hrs, Volume= 0.028 af, Depth= 0.20"
 Routed to Link 2A : EXDA-2A

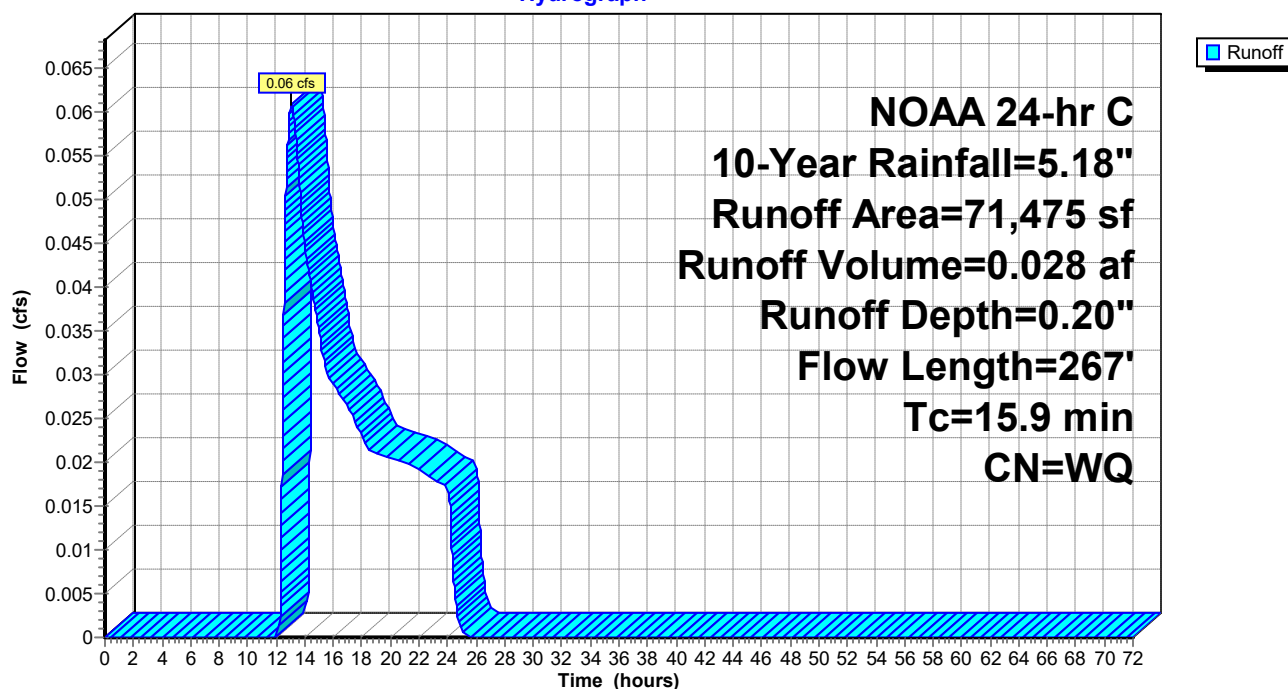
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
59,895	39	>75% Grass cover, Good, HSG A
11,580	30	Woods, Good, HSG A
71,475		Weighted Average
71,475	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment EXDA-2A.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment EXDA-2A.2
					Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ap: EXDA-2Ap

Hydrograph



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Summary for Subcatchment 2Bi: EXDA-2Bi

Runoff = 15.24 cfs @ 12.55 hrs, Volume= 3.354 af, Depth= 4.94"
 Routed to Link 2B : EXDA-2B

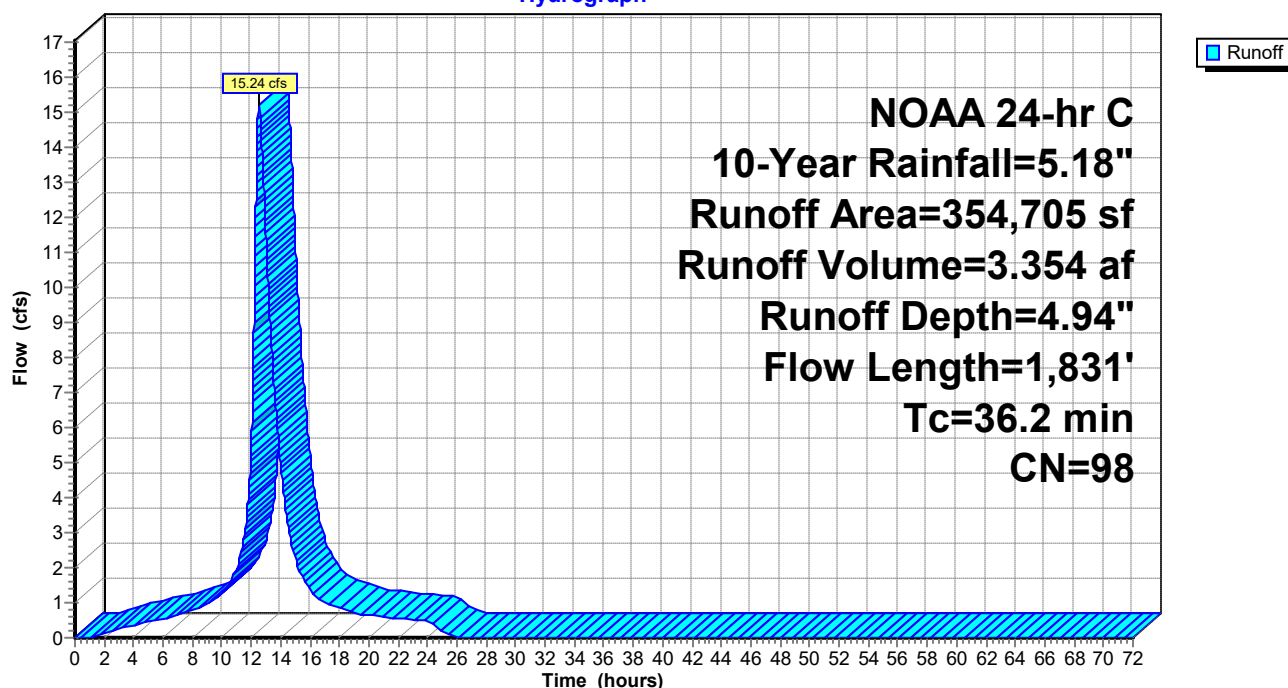
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
354,705	98	Paved parking, HSG A
354,705	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment EXDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment EXDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment EXDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment EXDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bi: EXDA-2Bi

Hydrograph



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NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 2Bp: EXDA-2Bp

Runoff = 0.46 cfs @ 13.67 hrs, Volume= 0.255 af, Depth= 0.24"
 Routed to Link 2B : EXDA-2B

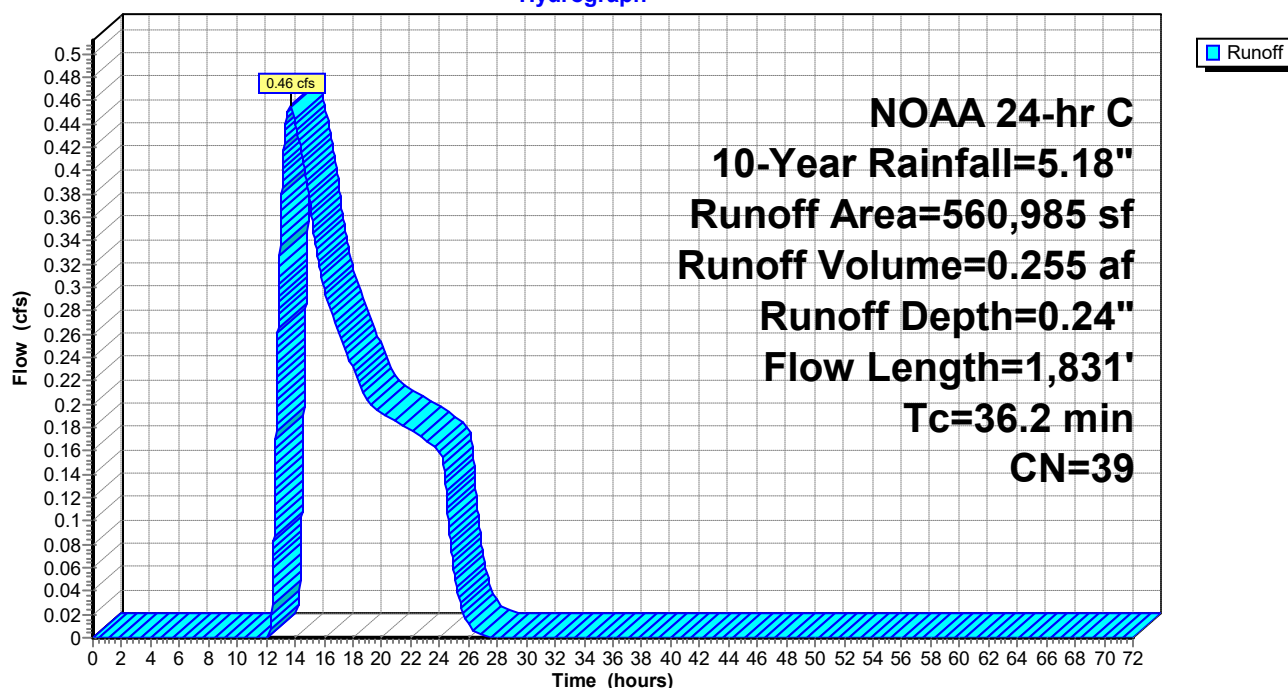
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
560,985	39	>75% Grass cover, Good, HSG A
560,985	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment EXDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment EXDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment EXDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment EXDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bp: EXDA-2Bp

Hydrograph



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NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 3i: EXDA-3i

Runoff = 0.86 cfs @ 12.69 hrs, Volume= 0.224 af, Depth= 4.94"
 Routed to Link 3 : EXDA-3

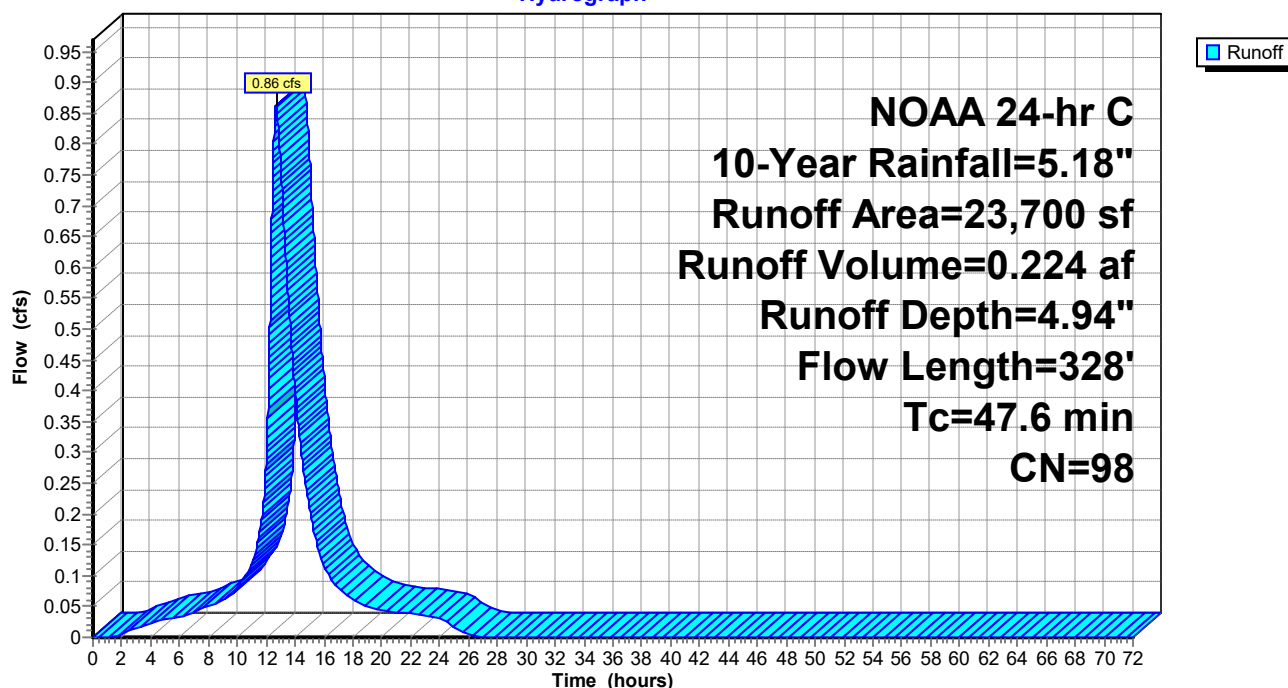
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
23,700	98	Paved parking, HSG A
23,700	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment EXDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment EXDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3i: EXDA-3i

Hydrograph



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NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 3p: EXDA-3p

Runoff = 0.09 cfs @ 13.96 hrs, Volume= 0.053 af, Depth= 0.22"
 Routed to Link 3 : EXDA-3

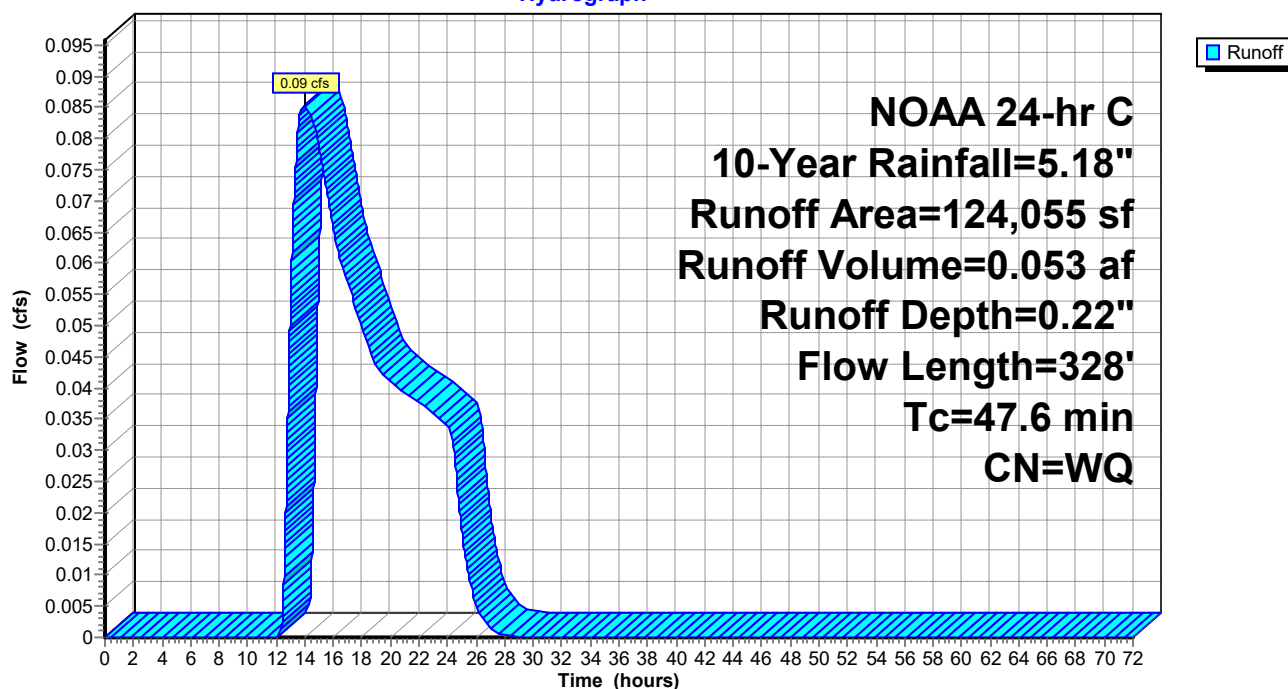
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
115,905	39	>75% Grass cover, Good, HSG A
8,150	30	Woods, Good, HSG A
124,055		Weighted Average
124,055	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment EXDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment EXDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3p: EXDA-3p

Hydrograph



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NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 4i: EXDA-4i

Runoff = 1.73 cfs @ 12.14 hrs, Volume= 0.158 af, Depth= 4.94"
 Routed to Link 4 : EXDA-4

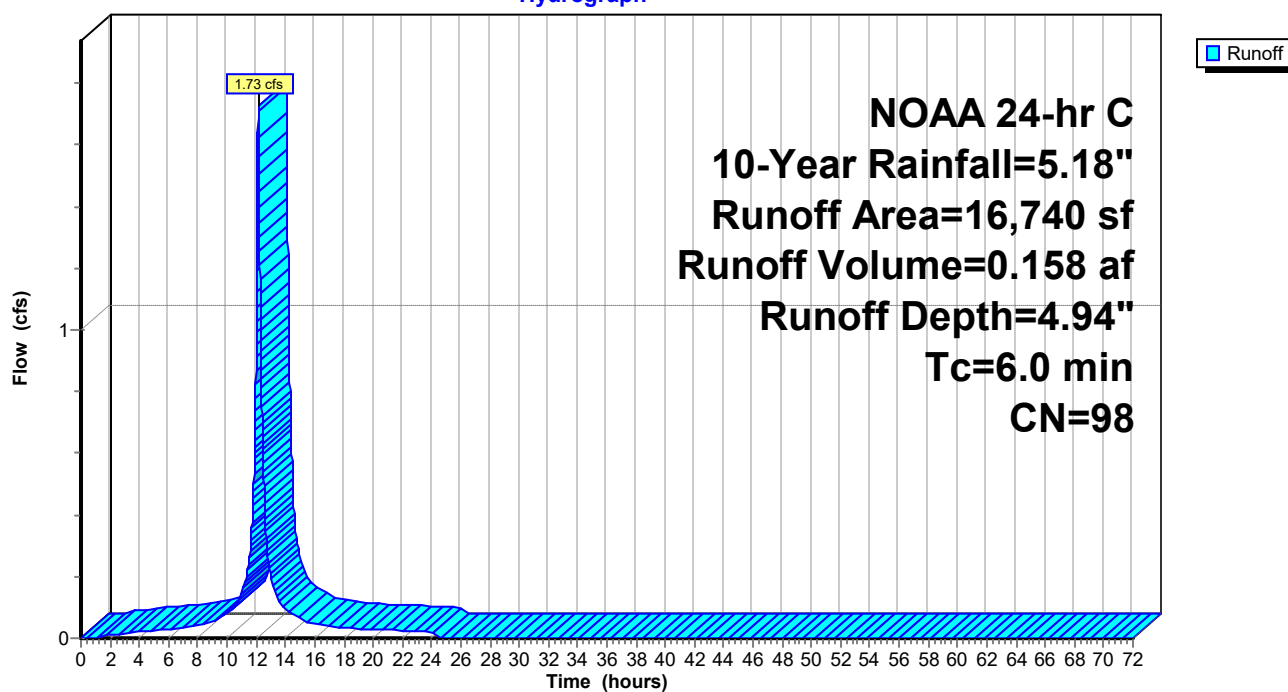
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
16,740	98	Paved parking, HSG A
16,740	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment EXDA-4.1

Subcatchment 4i: EXDA-4i

Hydrograph



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Appendix C

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Summary for Subcatchment 4p: EXDA-4p

Runoff = 0.01 cfs @ 12.55 hrs, Volume= 0.003 af, Depth= 0.19"
Routed to Link 4 : EXDA-4

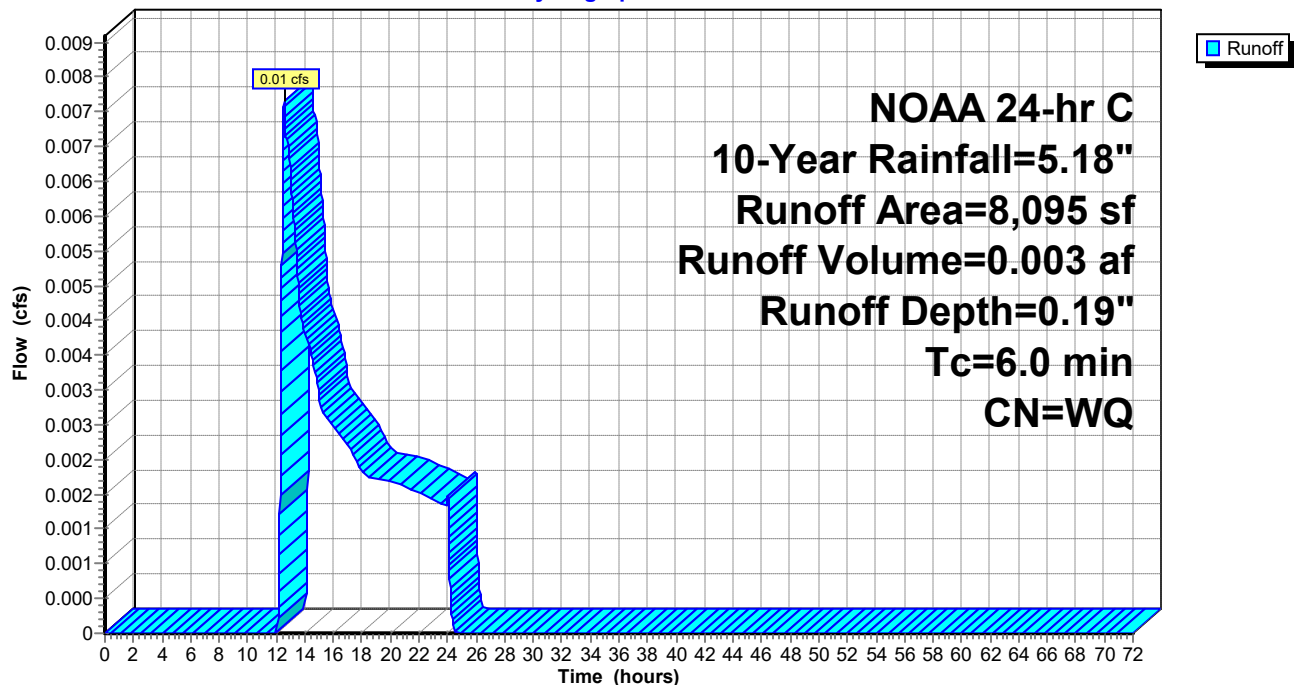
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
6,330	39	>75% Grass cover, Good, HSG A
1,765	30	Woods, Good, HSG A
8,095		Weighted Average
8,095	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment EXDA-4.1

Subcatchment 4p: EXDA-4p

Hydrograph



Pre Developed Conditions

NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Pond B1: Basin #1

Inflow = 13.75 cfs @ 12.57 hrs, Volume= 3.504 af
 Outflow = 0.58 cfs @ 16.59 hrs, Volume= 0.923 af, Atten= 96%, Lag= 241.5 min
 Primary = 0.58 cfs @ 16.59 hrs, Volume= 0.923 af
 Routed to Pond B2 : Basin #2

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 15,925 sf Storage= 5,275 cf

Peak Elev= 37.05' @ 17.46 hrs Surf.Area= 38,028 sf Storage= 120,961 cf (115,686 cf above start)

Plug-Flow detention time= 1,985.9 min calculated for 0.801 af (23% of inflow)

Center-of-Mass det. time= 1,203.7 min (2,346.1 - 1,142.3)

Volume	Invert	Avail.Storage	Storage Description
#1	31.50'	264,335 cf	Basin 1 - Existing Contours (Prismatic) Listed below (Recalc)
#2	38.40'	7,196 cf	Low Area - Existing Contours (Prismatic) Listed below (Recalc)
		271,531 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.50	0	0	0
32.00	270	68	68
33.00	1,455	863	930
34.00	30,395	15,925	16,855
35.00	32,725	31,560	48,415
36.00	35,215	33,970	82,385
37.00	37,855	36,535	118,920
38.00	41,075	39,465	158,385
39.00	49,965	45,520	203,905
40.00	70,895	60,430	264,335

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
38.40	10	0	0
39.00	1,050	318	318
40.00	12,705	6,878	7,196

Device	Routing	Invert	Outlet Devices
#1	Primary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.50' / 32.43' S= -0.0015 ' S= -0.0015 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=0.45 cfs @ 16.59 hrs HW=37.05' TW=37.04' (Dynamic Tailwater)

↑1=30" Culvert (Outlet Controls 0.45 cfs @ 0.09 fps)

Pre Developed Conditions

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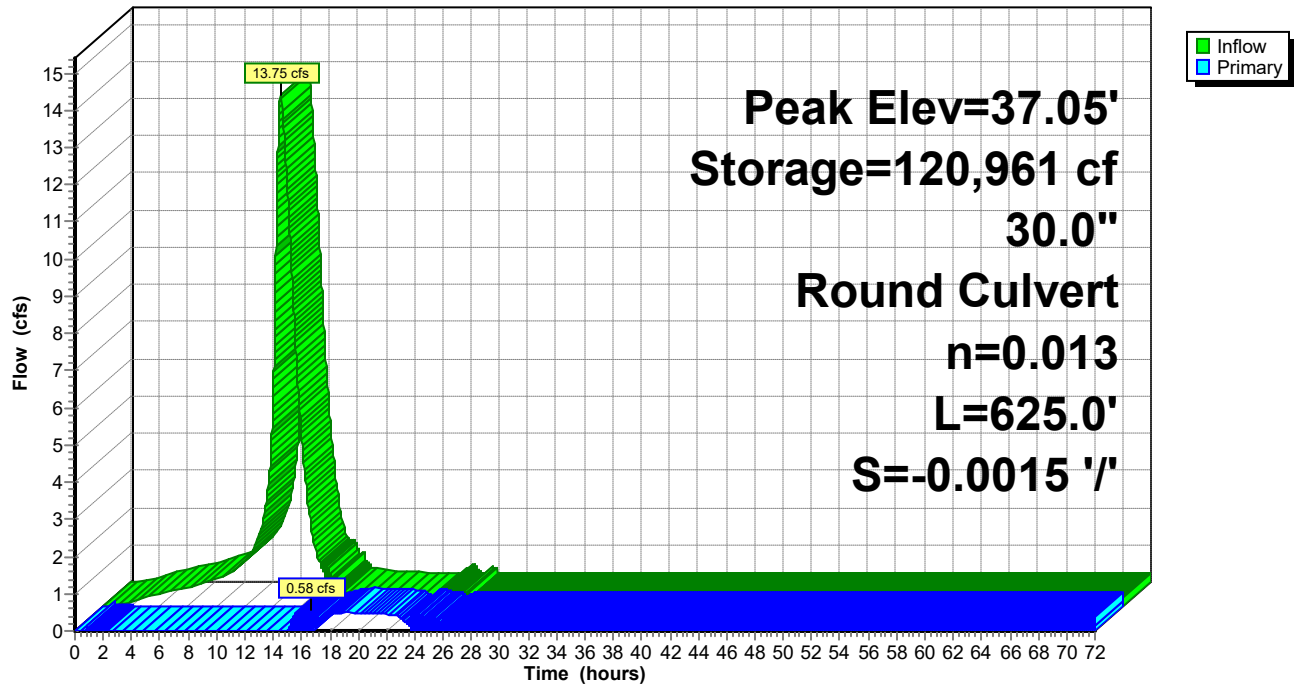
Appendix C
NOAA 24-hr C 10-Year Rainfall=5.18"

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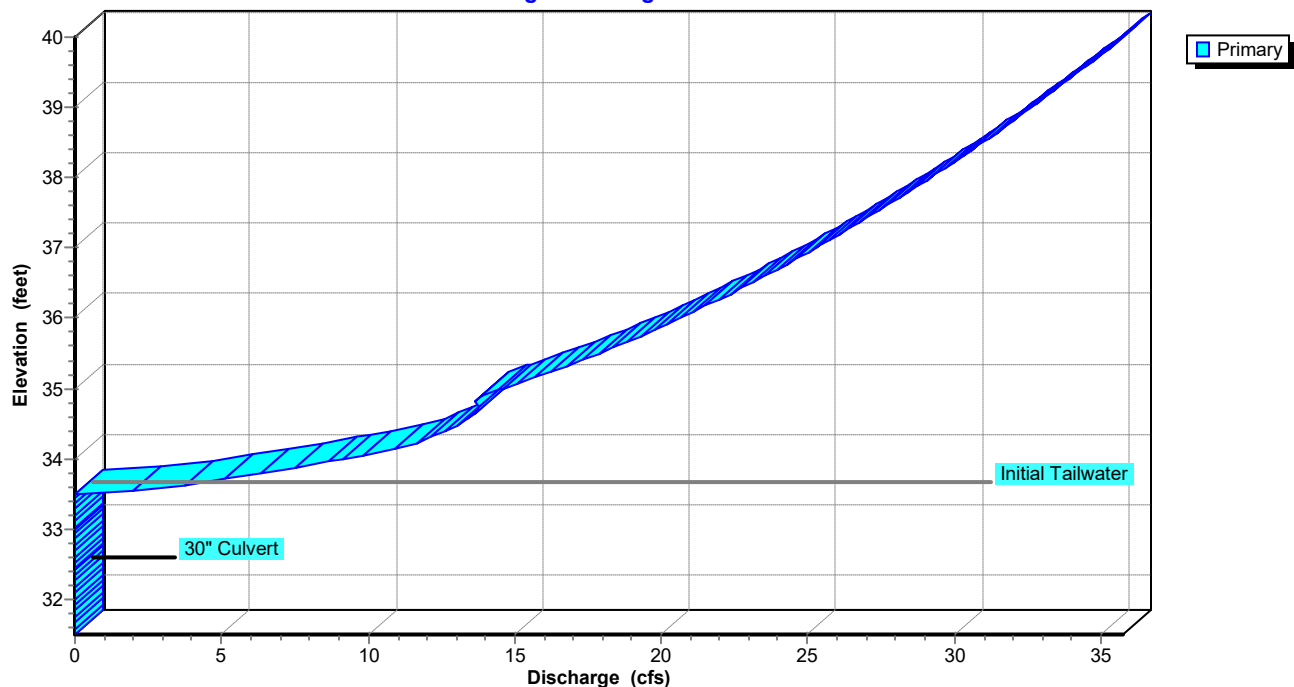
Pond B1: Basin #1

Hydrograph



Pond B1: Basin #1

Stage-Discharge



Pre Developed Conditions

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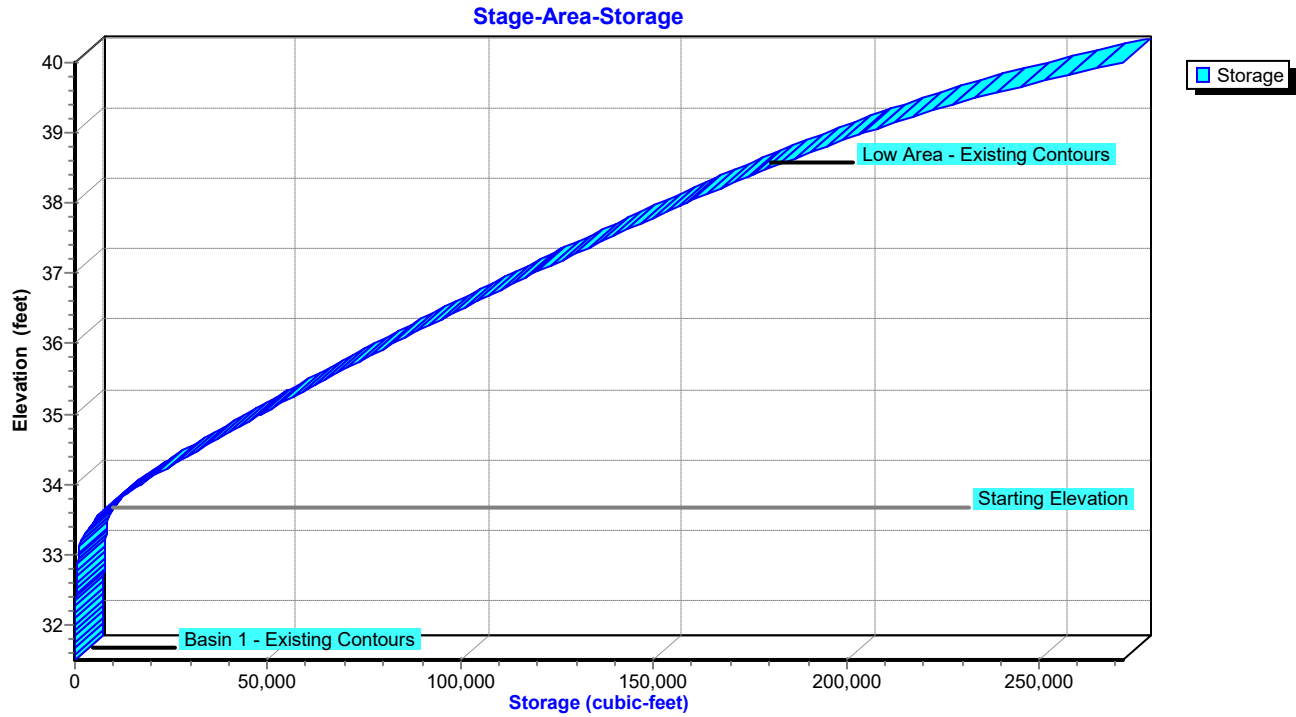
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Appendix C
NOAA 24-hr C 10-Year Rainfall=5.18"

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Pond B1: Basin #1



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Summary for Pond B2: Basin #2

Inflow = 15.68 cfs @ 12.56 hrs, Volume= 4.622 af
 Outflow = 8.47 cfs @ 12.63 hrs, Volume= 3.525 af, Atten= 46%, Lag= 4.6 min
 Primary = 1.61 cfs @ 17.43 hrs, Volume= 1.163 af
 Routed to Pond B3 : Basin #3
 Secondary = 8.47 cfs @ 12.63 hrs, Volume= 2.362 af
 Routed to Pond B1 : Basin #1

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 6,488 sf Storage= 1,790 cf

Peak Elev= 37.05' @ 17.43 hrs Surf.Area= 16,503 sf Storage= 50,950 cf (49,160 cf above start)

Plug-Flow detention time= 488.7 min calculated for 3.484 af (75% of inflow)

Center-of-Mass det. time= 129.7 min (1,252.5 - 1,122.8)

Volume	Invert	Avail.Storage	Storage Description
#1	32.43'	136,127 cf	Basin 2 - Existing Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
32.43	0	0	0
33.00	315	90	90
34.00	12,660	6,488	6,577
35.00	13,855	13,258	19,835
36.00	15,100	14,478	34,312
37.00	16,425	15,763	50,075
38.00	17,895	17,160	67,235
39.00	23,945	20,920	88,155
40.00	72,000	47,973	136,127

Device	Routing	Invert	Outlet Devices
#1	Primary	32.35'	30.0" Round 30" Culvert L= 253.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.35' / 31.41' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	36.37'	12.0" Vert. 12" Orifice C= 0.600 Limited to weir flow at low heads 6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	37.90'	
#4	Secondary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.43' / 31.50' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

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Primary OutFlow Max=1.61 cfs @ 17.43 hrs HW=37.05' TW=35.22' (Dynamic Tailwater)

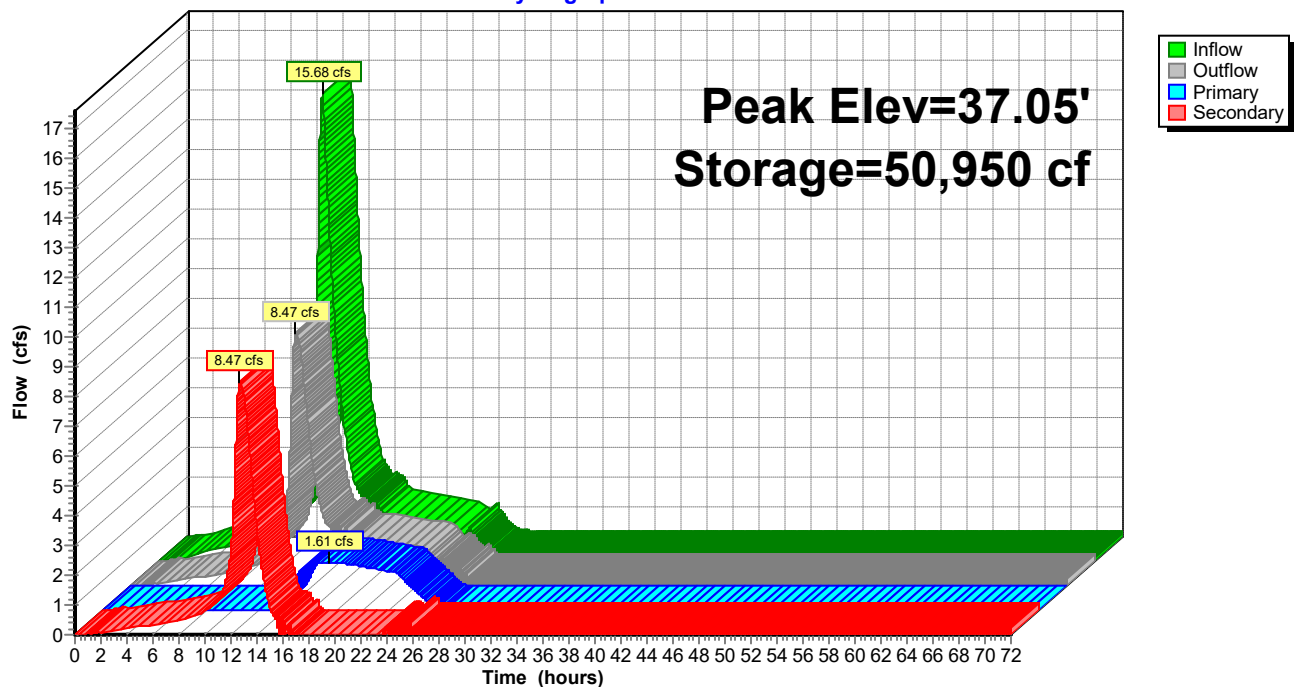
1=30" Culvert (Passes 1.61 cfs of 27.23 cfs potential flow)

2=12" Orifice (Orifice Controls 1.61 cfs @ 2.81 fps)

3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=8.27 cfs @ 12.63 hrs HW=35.69' TW=35.40' (Dynamic Tailwater)

4=30" Culvert (Outlet Controls 8.27 cfs @ 1.69 fps)

Pond B2: Basin #2**Hydrograph**

Pre Developed Conditions

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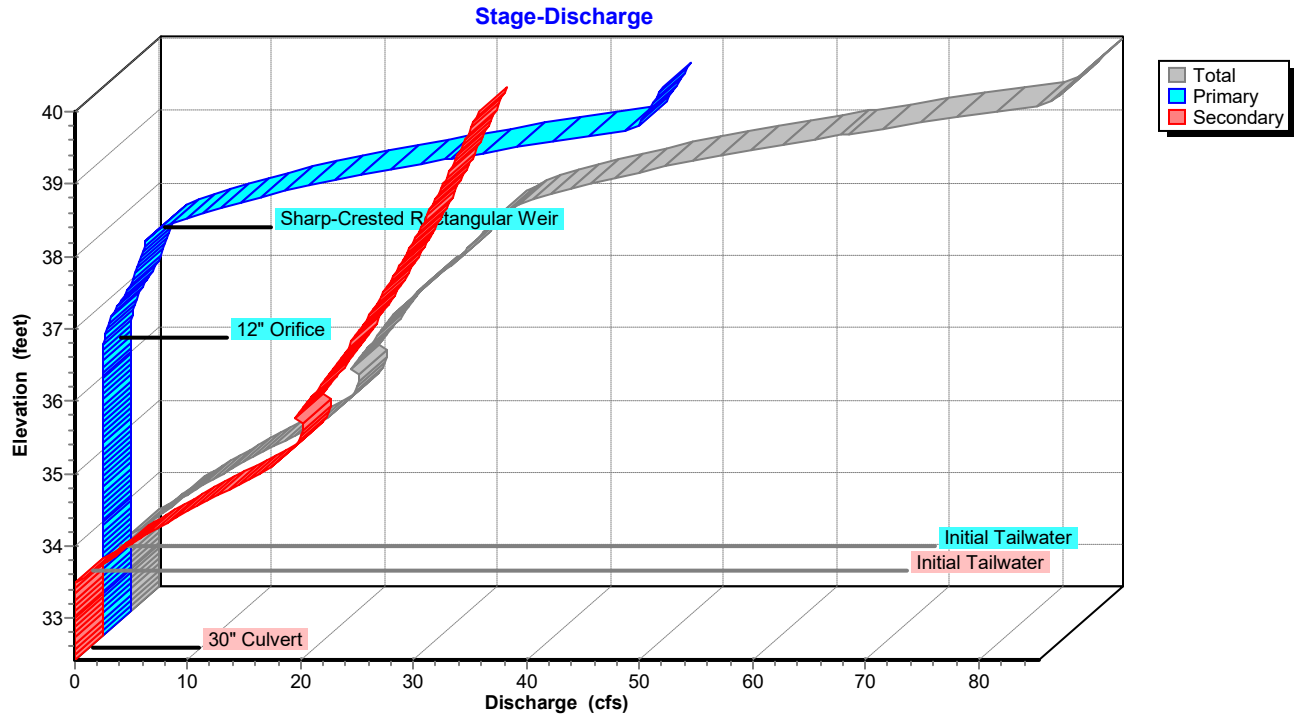
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Appendix C
NOAA 24-hr C 10-Year Rainfall=5.18"

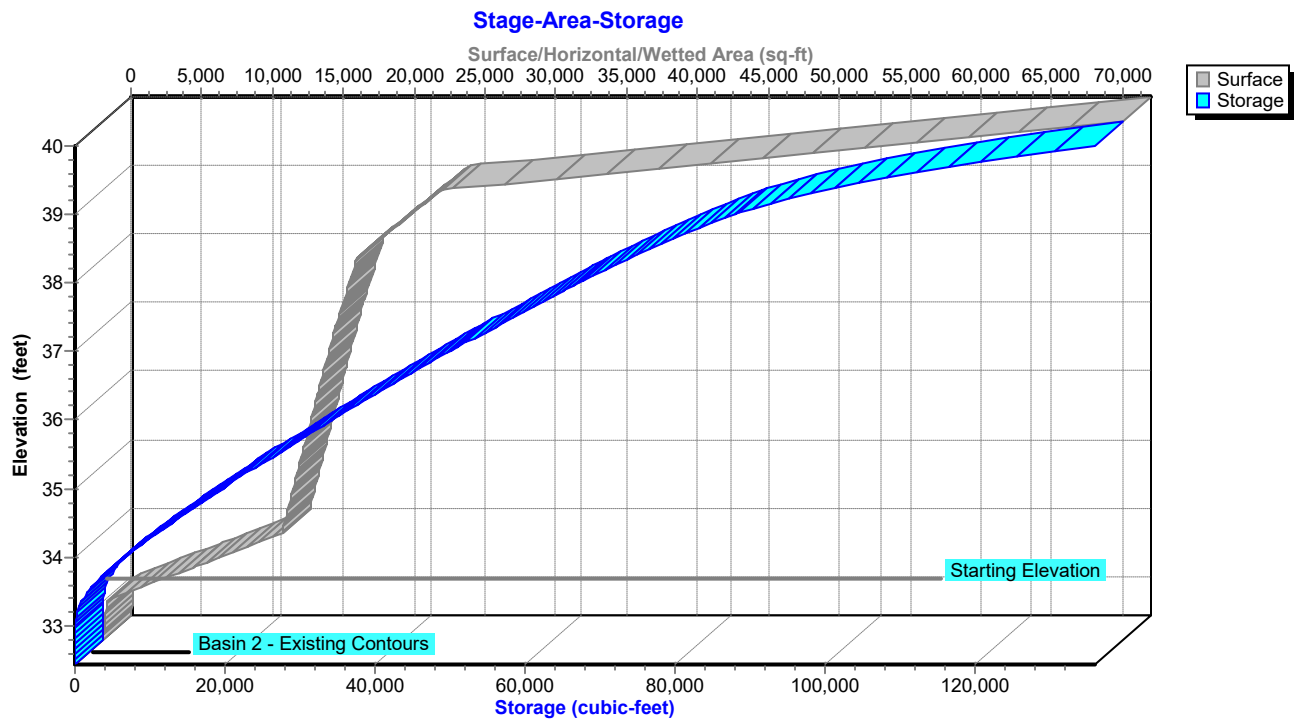
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Pond B2: Basin #2



Pond B2: Basin #2



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Summary for Pond B3: Basin #3

Inflow = 1.74 cfs @ 16.92 hrs, Volume= 1.440 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 Link TTA : TTA

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 8,403 sf Storage= 3,080 cf

Peak Elev= 36.97' @ 29.21 hrs Surf.Area= 23,965 sf Storage= 65,800 cf (62,720 cf above start)

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	31.44'	195,235 cf	Basin 3 - Existing Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.44	0	0	0
32.00	135	38	38
33.00	1,165	650	688
34.00	15,640	8,403	9,090
35.00	17,655	16,648	25,738
36.00	19,910	18,783	44,520
37.00	24,090	22,000	66,520
38.00	38,775	31,433	97,953
39.00	50,395	44,585	142,538
40.00	55,000	52,698	195,235

Device	Routing	Invert	Outlet Devices
#1	Primary	33.42'	24.0" Round 24" Culvert L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 33.42' / 33.15' S= 0.0042 ' S= 0.0042 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	38.22'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.50' TW=0.00' (Dynamic Tailwater)↑ **1=24" Culvert** (Passes 0.00 cfs of 0.02 cfs potential flow)↑ **2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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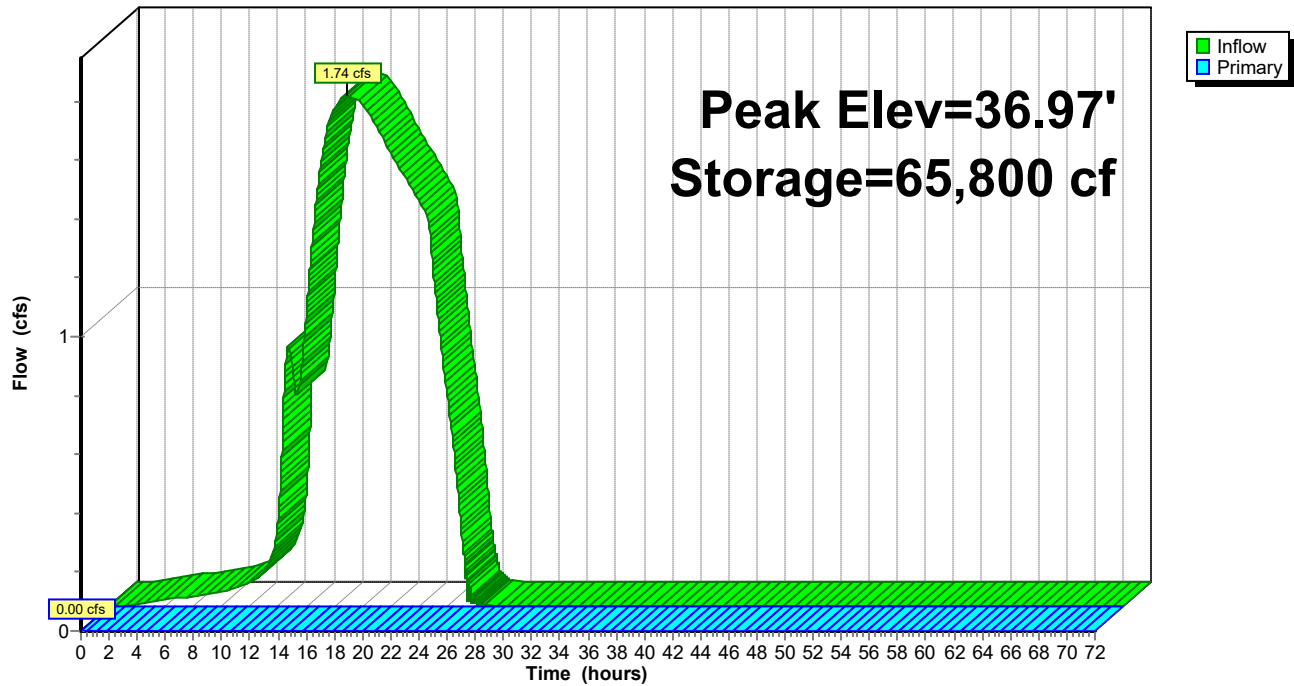
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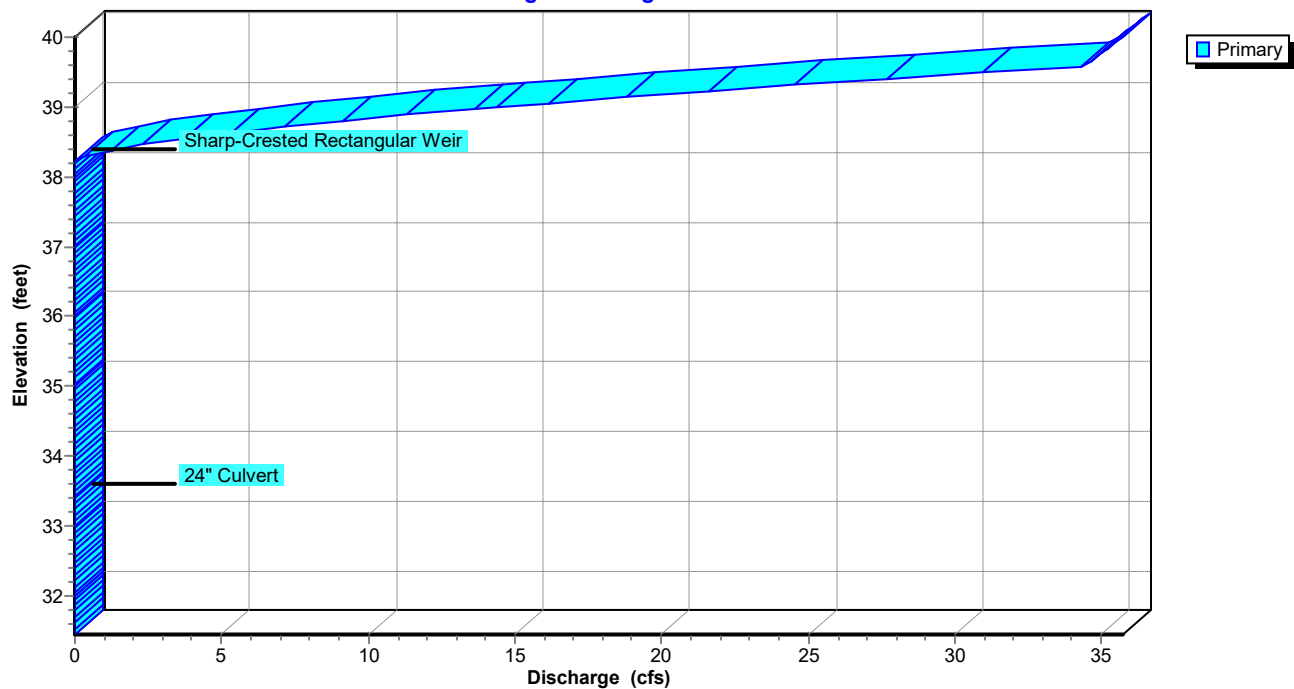
Pond B3: Basin #3

Hydrograph



Pond B3: Basin #3

Stage-Discharge



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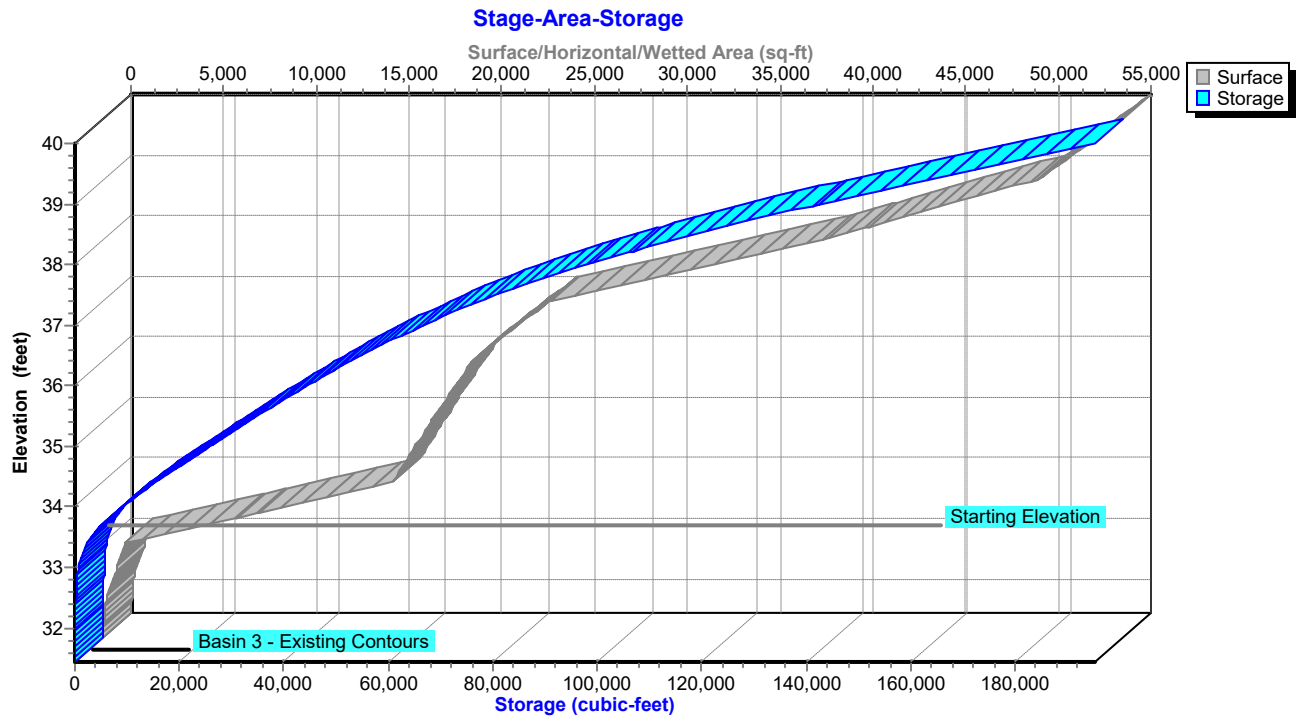
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Pond B3: Basin #3



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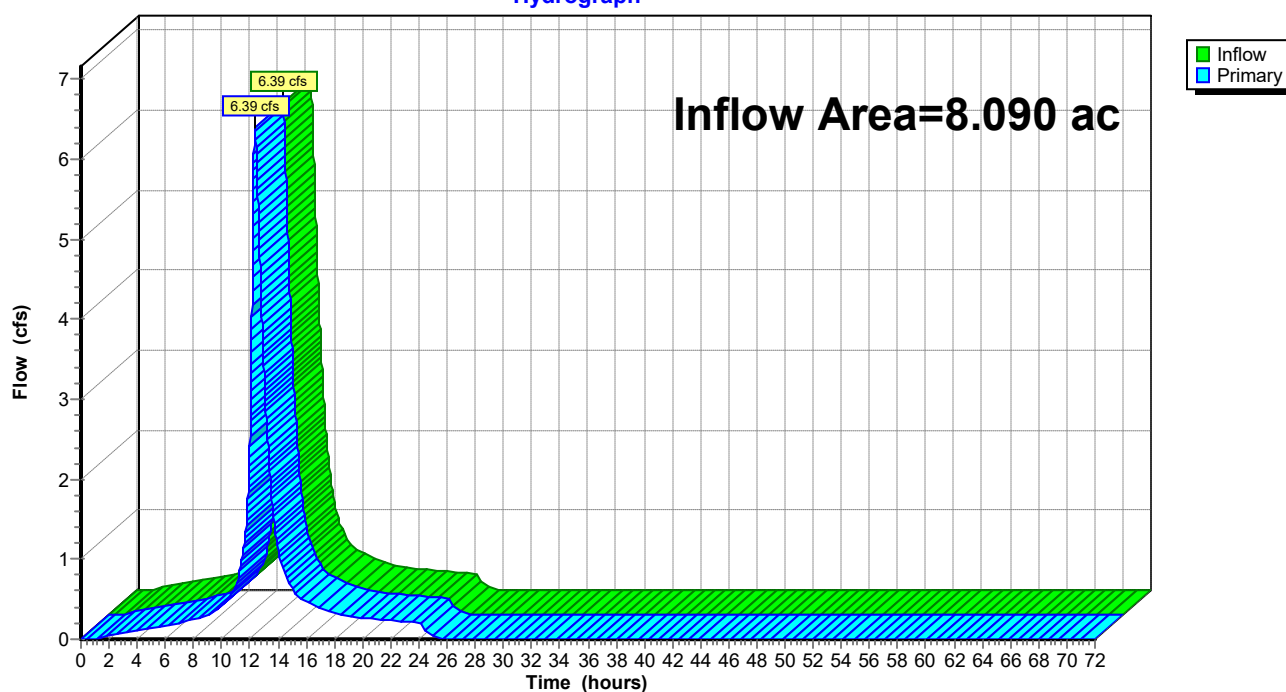
Summary for Link 1: EXDA-1

Inflow Area = 8.090 ac, 29.30% Impervious, Inflow Depth = 1.69" for 10-Year event
 Inflow = 6.39 cfs @ 12.34 hrs, Volume= 1.142 af
 Primary = 6.39 cfs @ 12.35 hrs, Volume= 1.142 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B1 : Basin #1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 1: EXDA-1

Hydrograph



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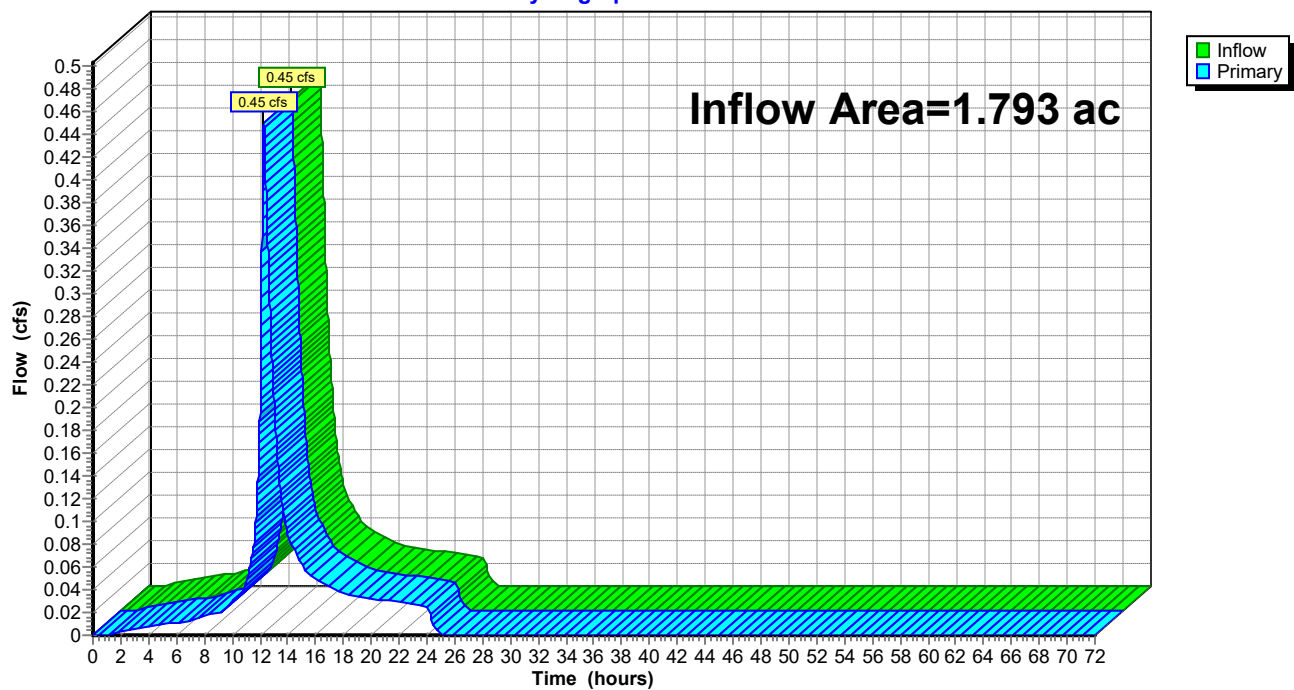
Summary for Link 2A: EXDA-2A

Inflow Area = 1.793 ac, 8.49% Impervious, Inflow Depth = 0.60" for 10-Year event
 Inflow = 0.45 cfs @ 12.26 hrs, Volume= 0.090 af
 Primary = 0.45 cfs @ 12.27 hrs, Volume= 0.090 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2A: EXDA-2A

Hydrograph



Pre Developed Conditions

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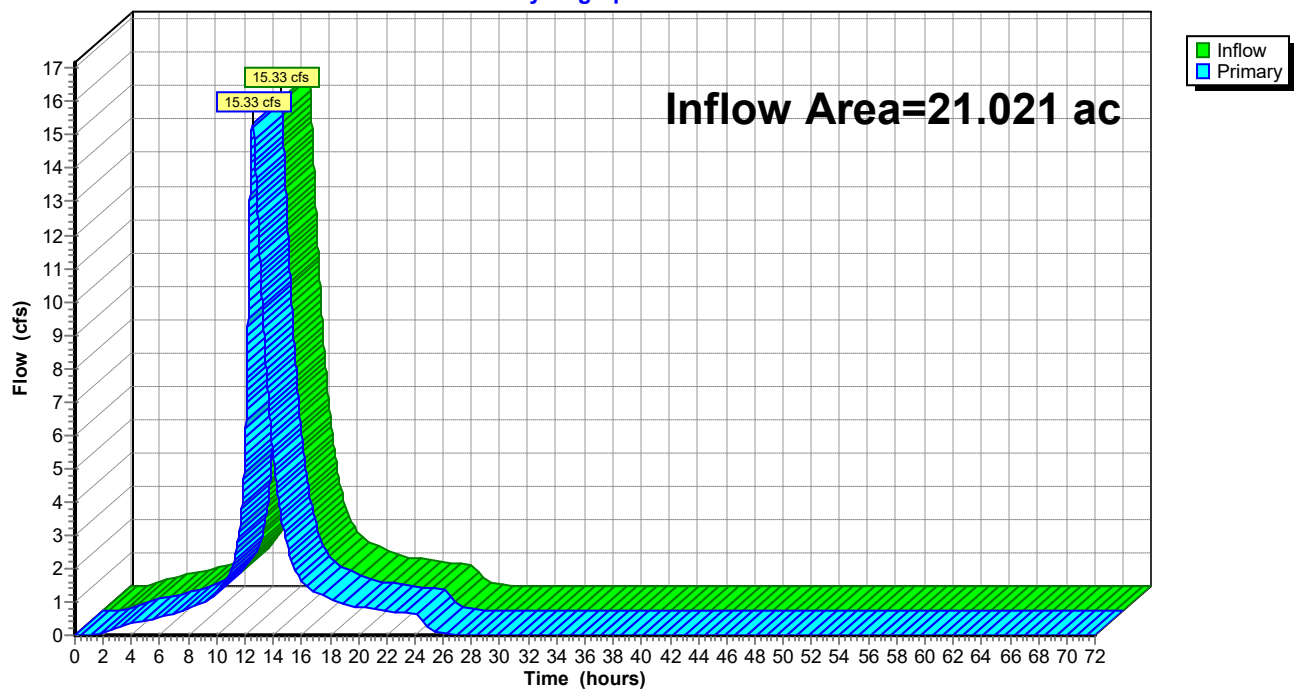
Summary for Link 2B: EXDA-2B

Inflow Area = 21.021 ac, 38.74% Impervious, Inflow Depth = 2.06" for 10-Year event
Inflow = 15.33 cfs @ 12.55 hrs, Volume= 3.609 af
Primary = 15.33 cfs @ 12.56 hrs, Volume= 3.609 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2B: EXDA-2B

Hydrograph



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NOAA 24-hr C 10-Year Rainfall=5.18"

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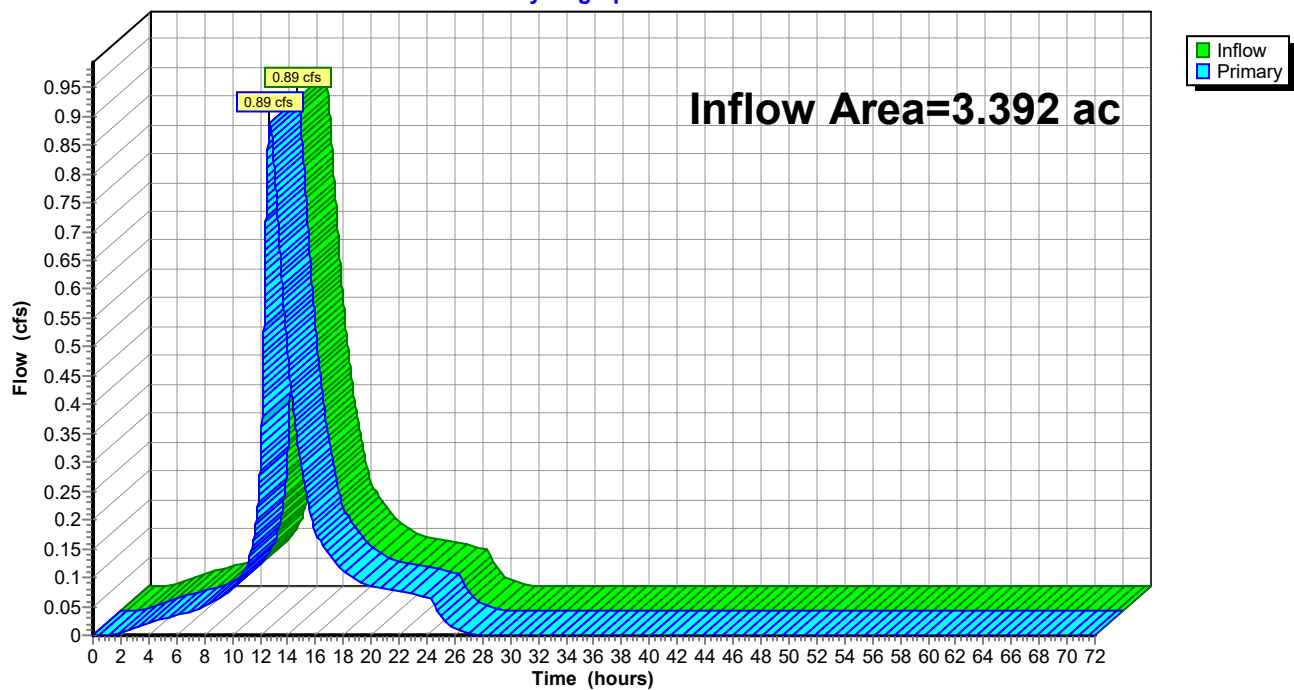
Summary for Link 3: EXDA-3

Inflow Area = 3.392 ac, 16.04% Impervious, Inflow Depth = 0.98" for 10-Year event
 Inflow = 0.89 cfs @ 12.70 hrs, Volume= 0.277 af
 Primary = 0.89 cfs @ 12.71 hrs, Volume= 0.277 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B3 : Basin #3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3: EXDA-3

Hydrograph



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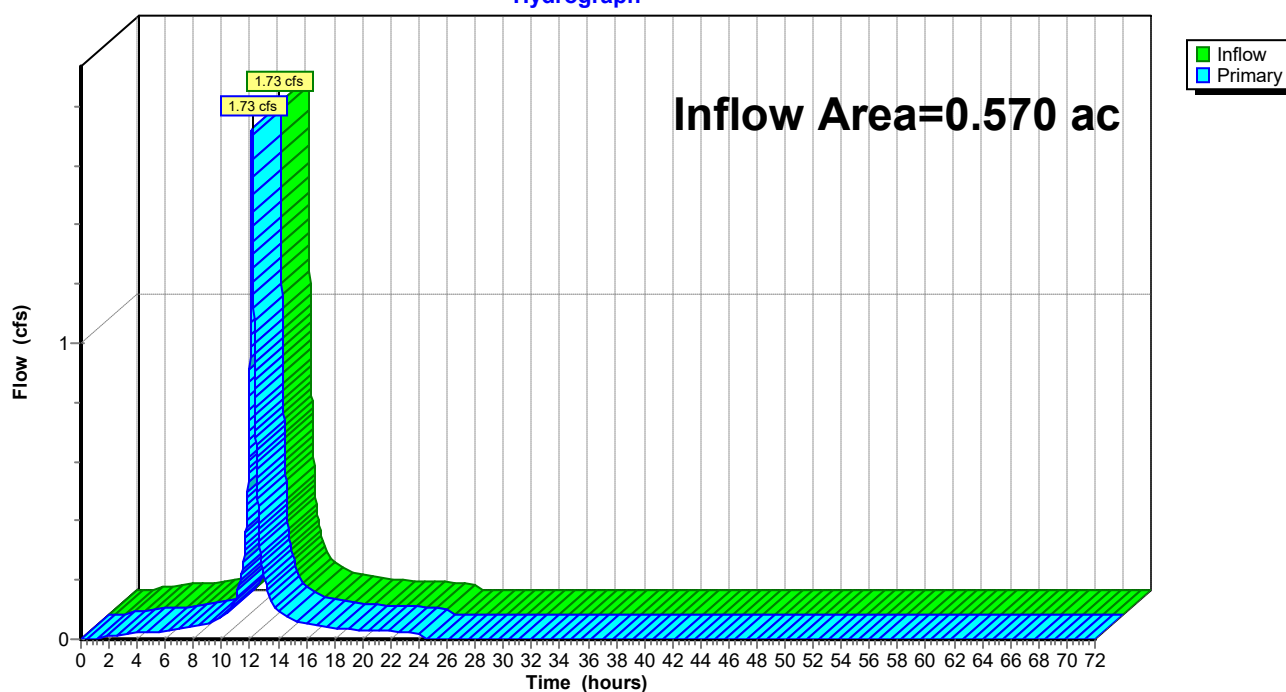
Summary for Link 4: EXDA-4

Inflow Area = 0.570 ac, 67.40% Impervious, Inflow Depth = 3.39" for 10-Year event
 Inflow = 1.73 cfs @ 12.14 hrs, Volume= 0.161 af
 Primary = 1.73 cfs @ 12.15 hrs, Volume= 0.161 af, Atten= 0%, Lag= 0.6 min
 Routed to Link TTA : TTA

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 4: EXDA-4

Hydrograph



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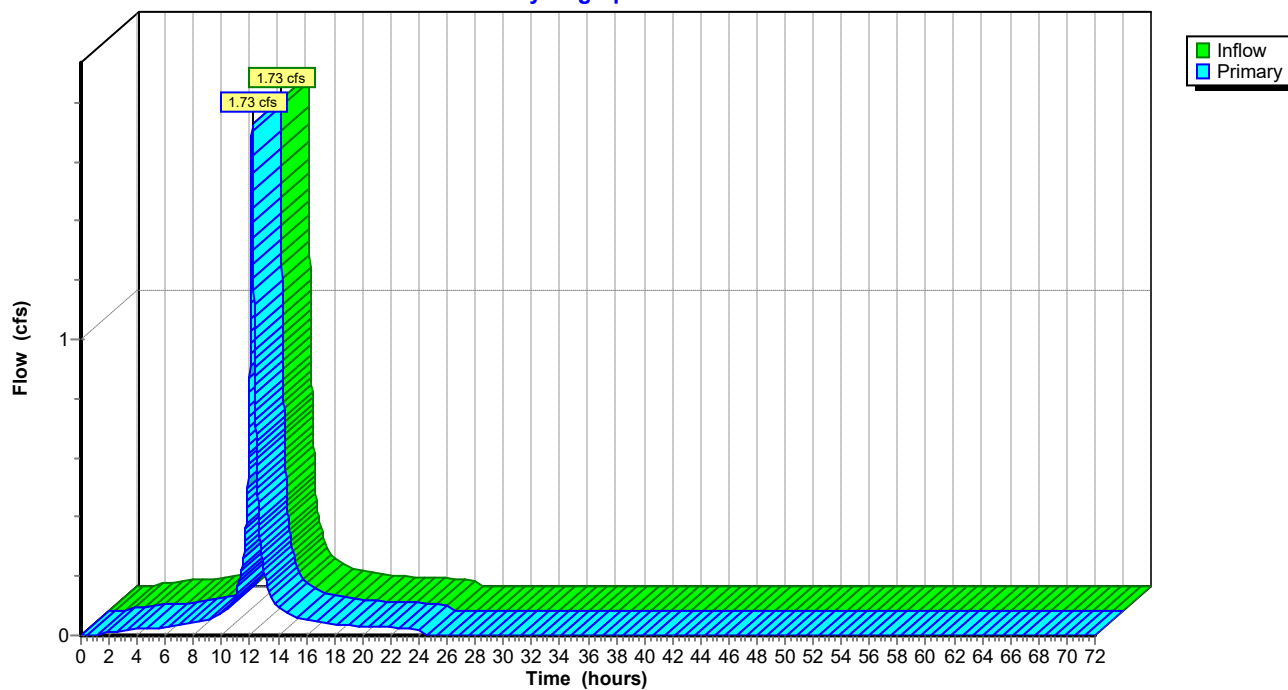
Summary for Link TTA: TTA

Inflow = 1.73 cfs @ 12.15 hrs, Volume= 0.161 af
Primary = 1.73 cfs @ 12.16 hrs, Volume= 0.161 af, Atten= 0%, Lag= 0.6 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link TTA: TTA

Hydrograph



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Appendix C
NOAA 24-hr C 100-Year Rainfall=8.81"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1i: EXDA-1i	Runoff Area=121,845 sf 84.75% Impervious Runoff Depth=8.09" Flow Length=275' Tc=22.2 min CN=WQ Runoff=11.27 cfs 1.885 af
Subcatchment 1p: EXDA-1p	Runoff Area=230,565 sf 0.00% Impervious Runoff Depth=1.32" Flow Length=275' Tc=22.2 min CN=WQ Runoff=2.55 cfs 0.580 af
Subcatchment 2Ai: EXDA-2Ai	Runoff Area=6,630 sf 100.00% Impervious Runoff Depth=8.57" Flow Length=267' Tc=15.9 min CN=98 Runoff=0.76 cfs 0.109 af
Subcatchment 2Ap: EXDA-2Ap	Runoff Area=71,475 sf 0.00% Impervious Runoff Depth=1.37" Flow Length=267' Tc=15.9 min CN=WQ Runoff=1.00 cfs 0.187 af
Subcatchment 2Bi: EXDA-2Bi	Runoff Area=354,705 sf 100.00% Impervious Runoff Depth=8.57" Flow Length=1,831' Tc=36.2 min CN=98 Runoff=26.05 cfs 5.815 af
Subcatchment 2Bp: EXDA-2Bp	Runoff Area=560,985 sf 0.00% Impervious Runoff Depth=1.51" Flow Length=1,831' Tc=36.2 min CN=39 Runoff=5.79 cfs 1.625 af
Subcatchment 3i: EXDA-3i	Runoff Area=23,700 sf 100.00% Impervious Runoff Depth=8.57" Flow Length=328' Tc=47.6 min CN=98 Runoff=1.48 cfs 0.389 af
Subcatchment 3p: EXDA-3p	Runoff Area=124,055 sf 0.00% Impervious Runoff Depth=1.46" Flow Length=328' Tc=47.6 min CN=WQ Runoff=1.03 cfs 0.345 af
Subcatchment 4i: EXDA-4i	Runoff Area=16,740 sf 100.00% Impervious Runoff Depth=8.57" Tc=6.0 min CN=98 Runoff=2.95 cfs 0.274 af
Subcatchment 4p: EXDA-4p	Runoff Area=8,095 sf 0.00% Impervious Runoff Depth=1.32" Tc=6.0 min CN=WQ Runoff=0.18 cfs 0.020 af
Pond B1: Basin #1	Peak Elev=38.60' Storage=184,599 cf Inflow=24.90 cfs 5.135 af 30.0" Round Culvert n=0.013 L=625.0' S=-0.0015 '/' Outflow=2.30 cfs 1.404 af
Pond B2: Basin #2	Peak Elev=38.60' Storage=78,954 cf Inflow=32.84 cfs 9.140 af Primary=12.46 cfs 4.874 af Secondary=14.09 cfs 2.669 af Outflow=22.42 cfs 7.543 af
Pond B3: Basin #3	Peak Elev=38.56' Storage=121,554 cf Inflow=13.94 cfs 5.608 af Outflow=4.03 cfs 3.225 af
Link 1: EXDA-1	Inflow=13.53 cfs 2.465 af Primary=13.53 cfs 2.465 af
Link 2A: EXDA-2A	Inflow=1.72 cfs 0.296 af Primary=1.72 cfs 0.296 af
Link 2B: EXDA-2B	Inflow=31.39 cfs 7.440 af Primary=31.39 cfs 7.440 af

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Appendix C
NOAA 24-hr C 100-Year Rainfall=8.81"

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Link 3: EXDA-3

Inflow=2.44 cfs 0.734 af
Primary=2.44 cfs 0.734 af

Link 4: EXDA-4

Inflow=3.12 cfs 0.295 af
Primary=3.12 cfs 0.295 af

Link TTA: TTA

Inflow=4.11 cfs 3.520 af
Primary=4.11 cfs 3.520 af

Total Runoff Area = 34.867 ac Runoff Volume = 11.230 af Average Runoff Depth = 3.87"
66.75% Pervious = 23.273 ac 33.25% Impervious = 11.594 ac

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Appendix C
NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Subcatchment 1i: EXDA-1i

Runoff = 11.27 cfs @ 12.33 hrs, Volume= 1.885 af, Depth= 8.09"
Routed to Link 1 : EXDA-1

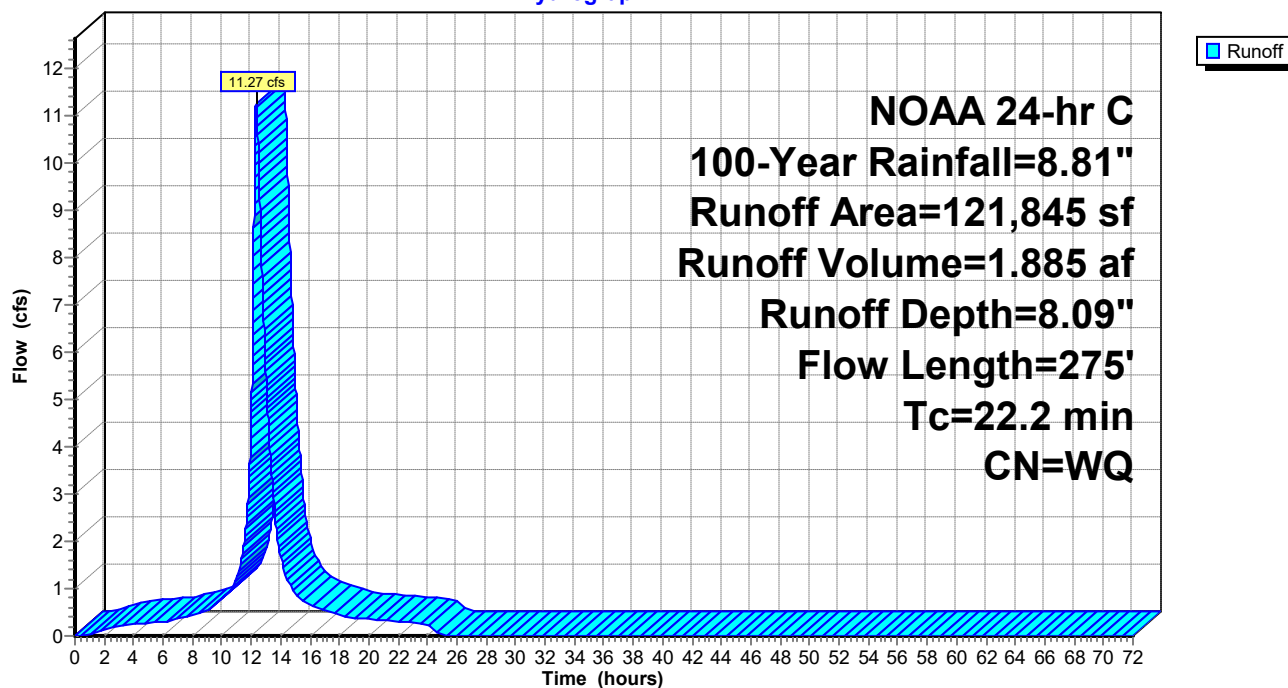
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
103,260	98	Paved parking, HSG A
18,585	72	Dirt roads, HSG A
121,845		Weighted Average
18,585	72	15.25% Pervious Area
103,260	98	84.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment EXDA-1.1 Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment EXDA-1.2 Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1i: EXDA-1i

Hydrograph



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Summary for Subcatchment 1p: EXDA-1p

Runoff = 2.55 cfs @ 12.53 hrs, Volume= 0.580 af, Depth= 1.32"
 Routed to Link 1 : EXDA-1

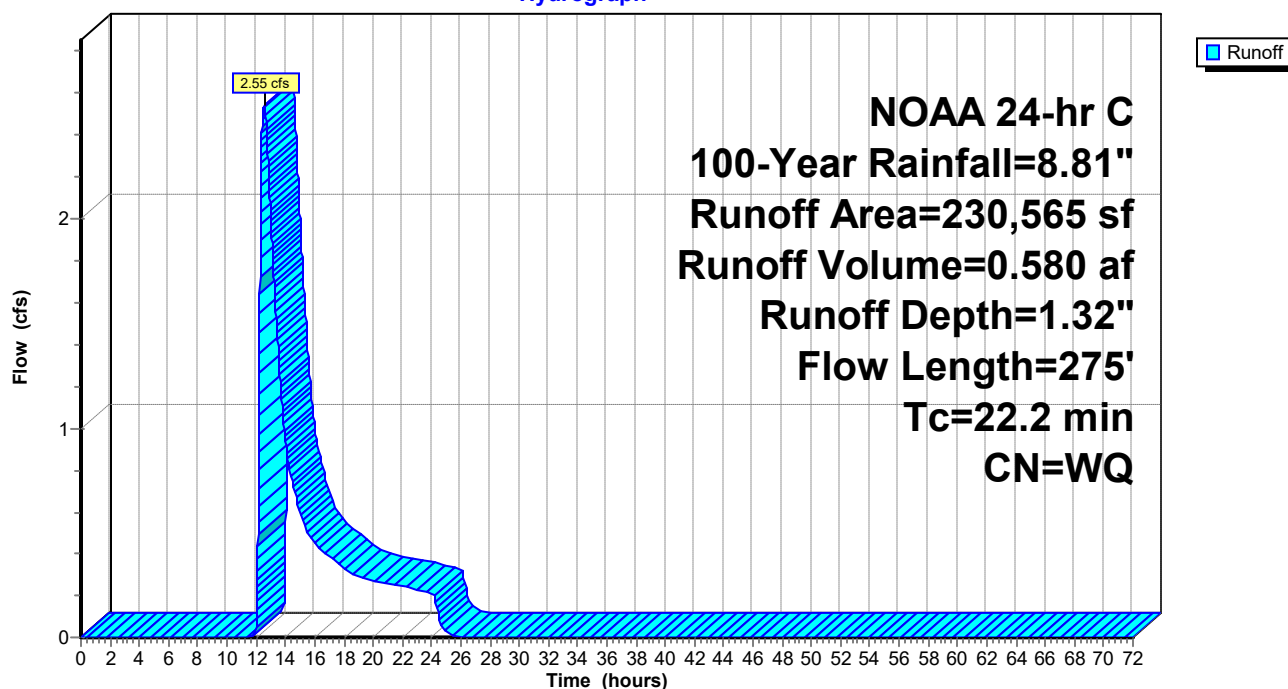
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
179,010	39	>75% Grass cover, Good, HSG A
51,555	30	Woods, Good, HSG A
230,565		Weighted Average
230,565	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment EXDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment EXDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1p: EXDA-1p

Hydrograph



Pre Developed Conditions

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Appendix C
NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Subcatchment 2Ai: EXDA-2Ai

Runoff = 0.76 cfs @ 12.26 hrs, Volume= 0.109 af, Depth= 8.57"
Routed to Link 2A : EXDA-2A

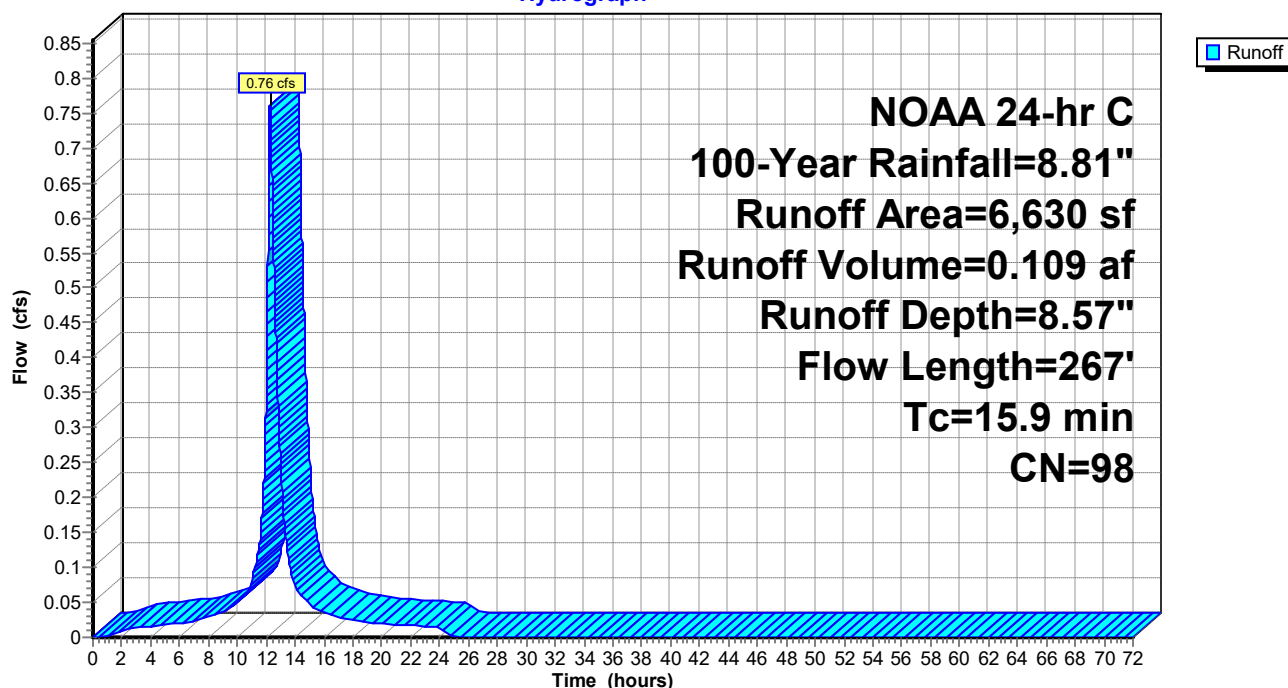
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
6,630	98	Paved parking, HSG A
6,630	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment EXDA-2A.1 Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment EXDA-2A.2 Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ai: EXDA-2Ai

Hydrograph



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Summary for Subcatchment 2Ap: EXDA-2Ap

Runoff = 1.00 cfs @ 12.37 hrs, Volume= 0.187 af, Depth= 1.37"
 Routed to Link 2A : EXDA-2A

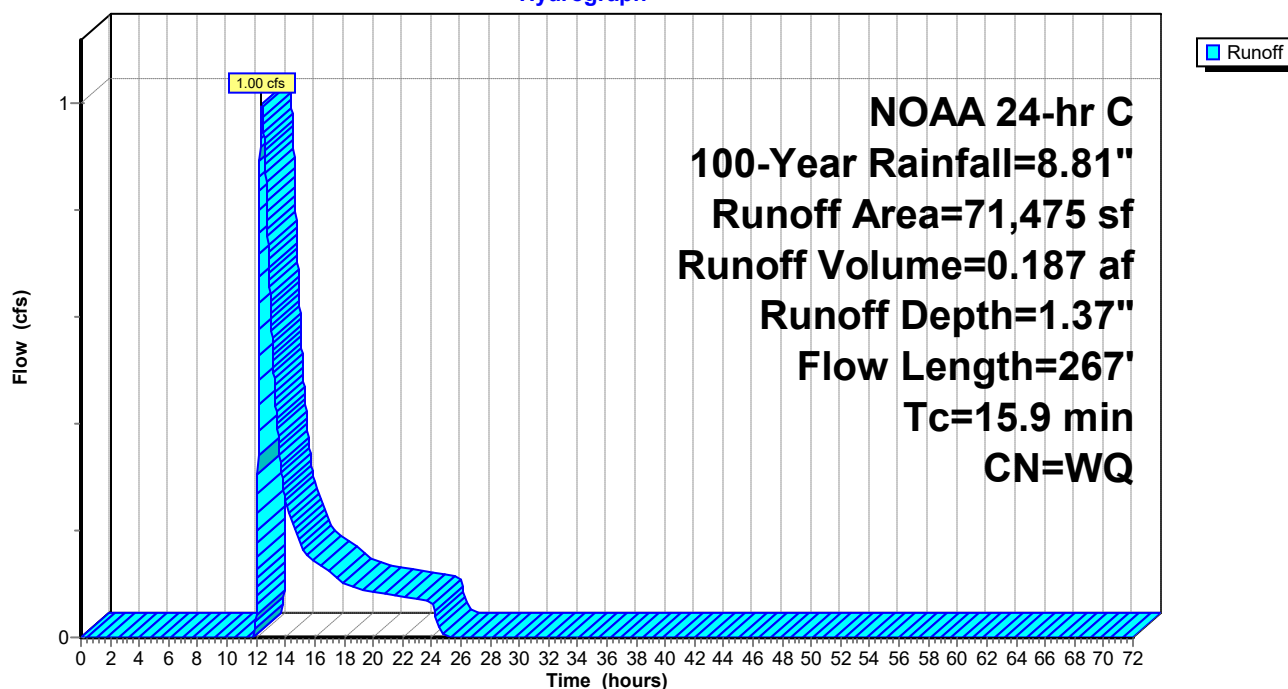
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
59,895	39	>75% Grass cover, Good, HSG A
11,580	30	Woods, Good, HSG A
71,475		Weighted Average
71,475	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment EXDA-2A.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment EXDA-2A.2
					Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ap: EXDA-2Ap

Hydrograph



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Summary for Subcatchment 2Bi: EXDA-2Bi

Runoff = 26.05 cfs @ 12.55 hrs, Volume= 5.815 af, Depth= 8.57"
 Routed to Link 2B : EXDA-2B

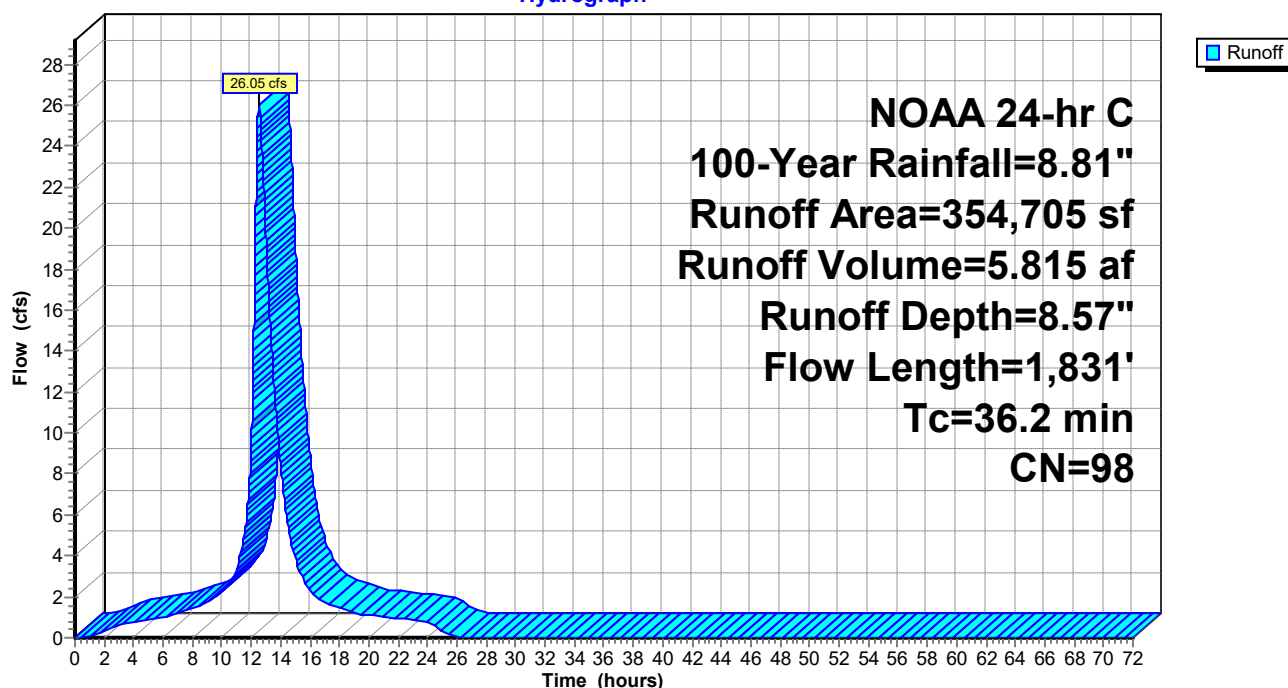
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
354,705	98	Paved parking, HSG A
354,705	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment EXDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment EXDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment EXDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment EXDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bi: EXDA-2Bi

Hydrograph



Pre Developed Conditions

NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Subcatchment 2Bp: EXDA-2Bp

Runoff = 5.79 cfs @ 12.79 hrs, Volume= 1.625 af, Depth= 1.51"
 Routed to Link 2B : EXDA-2B

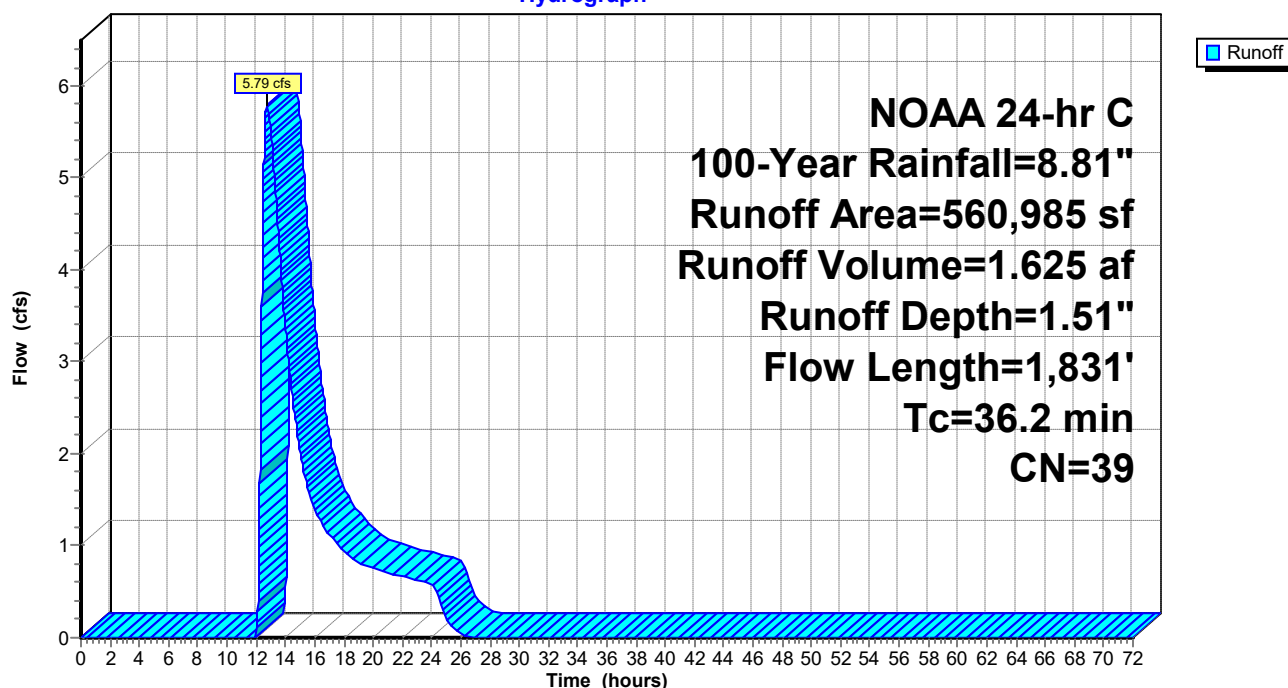
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
560,985	39	>75% Grass cover, Good, HSG A
560,985	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment EXDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment EXDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment EXDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment EXDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bp: EXDA-2Bp

Hydrograph



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Appendix C
NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Subcatchment 3i: EXDA-3i

Runoff = 1.48 cfs @ 12.69 hrs, Volume= 0.389 af, Depth= 8.57"
Routed to Link 3 : EXDA-3

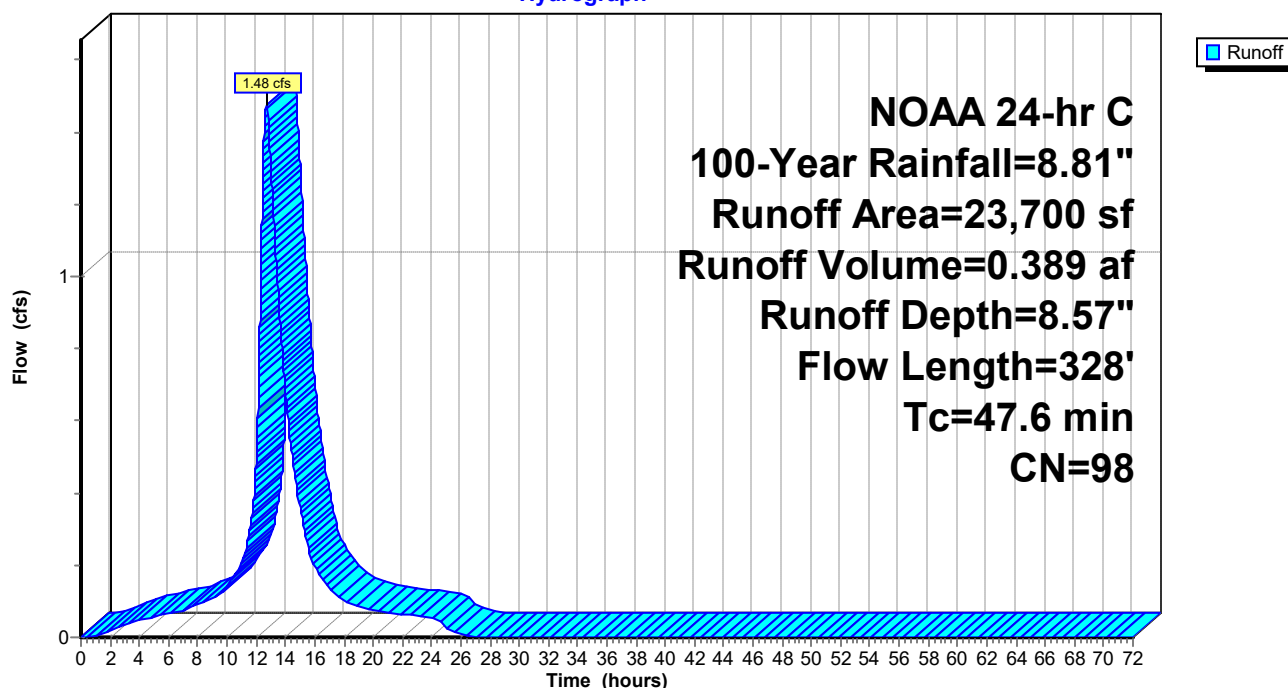
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
23,700	98	Paved parking, HSG A
23,700	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment EXDA-3.1 Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment EXDA-3.2 Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3i: EXDA-3i

Hydrograph



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NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Subcatchment 3p: EXDA-3p

Runoff = 1.03 cfs @ 13.01 hrs, Volume= 0.345 af, Depth= 1.46"
 Routed to Link 3 : EXDA-3

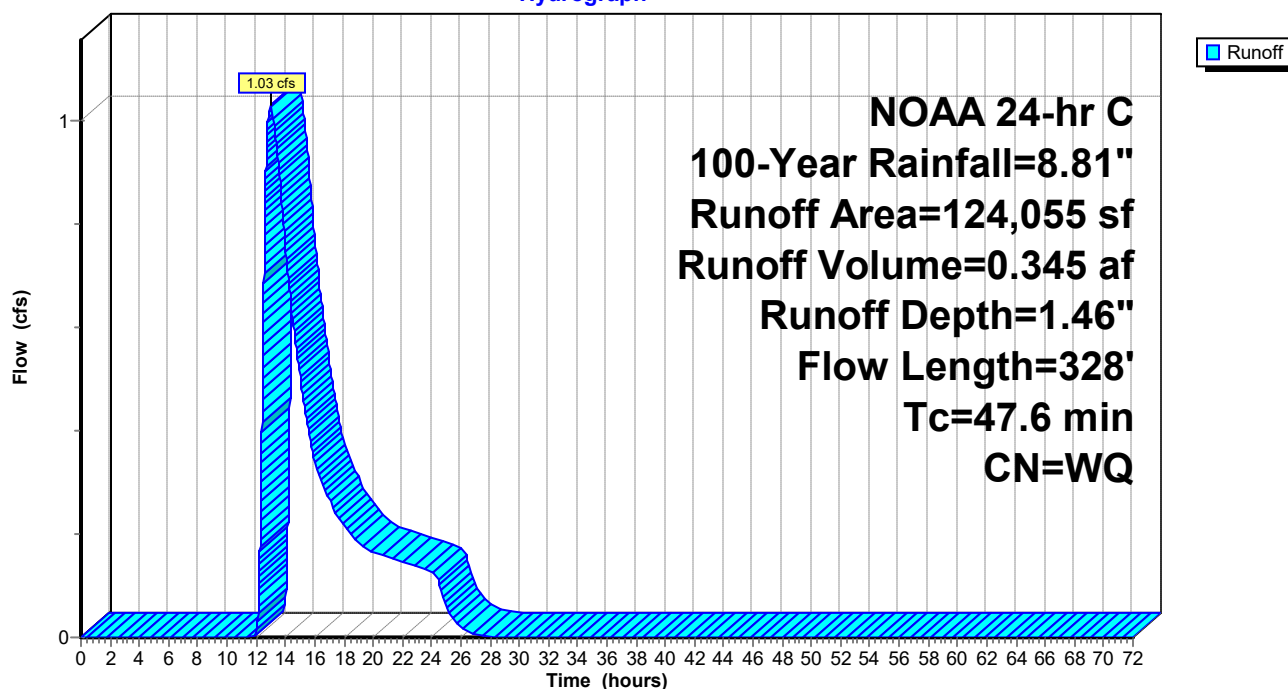
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
115,905	39	>75% Grass cover, Good, HSG A
8,150	30	Woods, Good, HSG A
124,055		Weighted Average
124,055	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment EXDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment EXDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3p: EXDA-3p

Hydrograph



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Summary for Subcatchment 4i: EXDA-4i

Runoff = 2.95 cfs @ 12.14 hrs, Volume= 0.274 af, Depth= 8.57"
Routed to Link 4 : EXDA-4

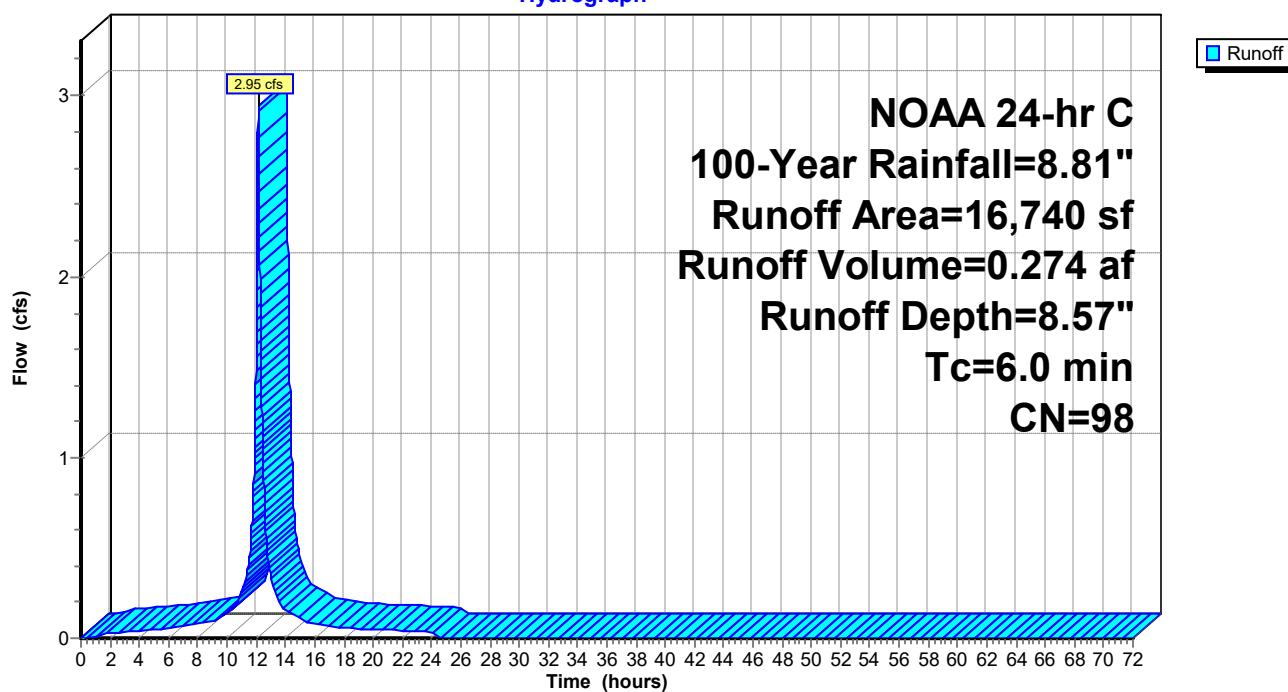
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
16,740	98	Paved parking, HSG A
16,740	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment EXDA-4.1

Subcatchment 4i: EXDA-4i

Hydrograph



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Appendix C

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Summary for Subcatchment 4p: EXDA-4p

Runoff = 0.18 cfs @ 12.16 hrs, Volume= 0.020 af, Depth= 1.32"
Routed to Link 4 : EXDA-4

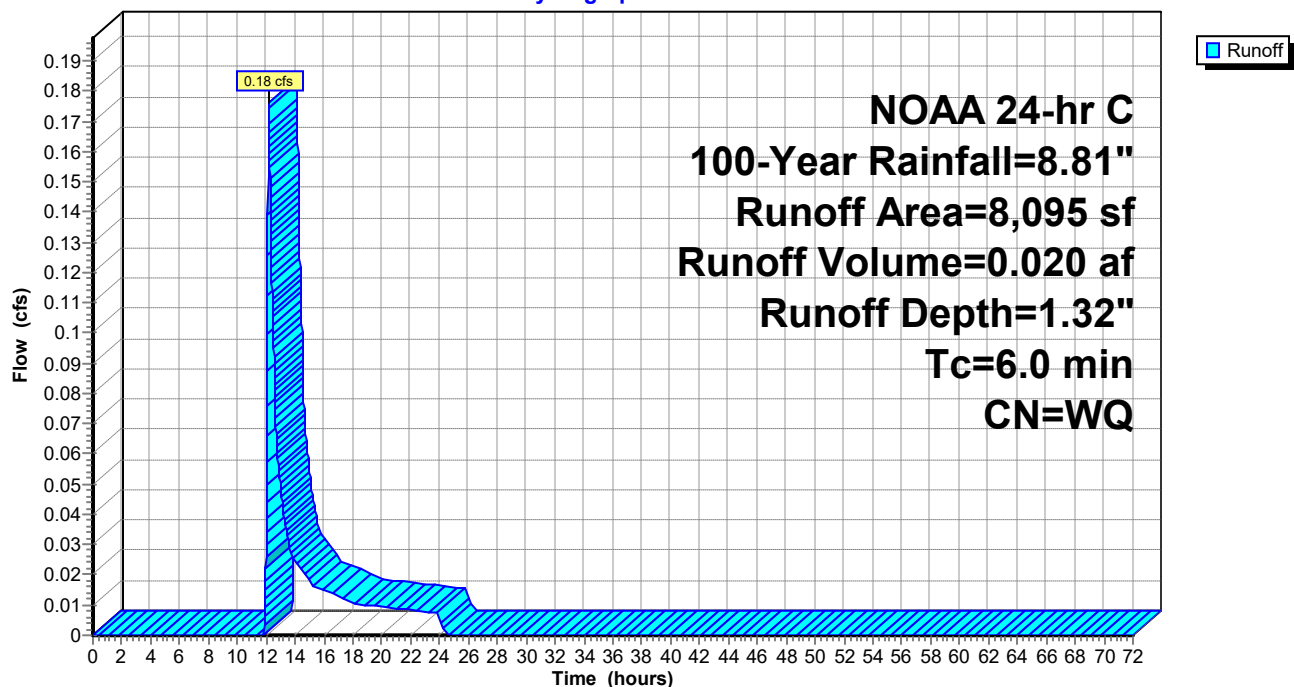
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
6,330	39	>75% Grass cover, Good, HSG A
1,765	30	Woods, Good, HSG A
8,095		Weighted Average
8,095	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment EXDA-4.1

Subcatchment 4p: EXDA-4p

Hydrograph



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Summary for Pond B1: Basin #1

Inflow = 24.90 cfs @ 12.57 hrs, Volume= 5.135 af
 Outflow = 2.30 cfs @ 14.60 hrs, Volume= 1.404 af, Atten= 91%, Lag= 121.5 min
 Primary = 2.30 cfs @ 14.60 hrs, Volume= 1.404 af
 Routed to Pond B2 : Basin #2

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 15,925 sf Storage= 5,275 cf

Peak Elev= 38.60' @ 17.46 hrs Surf.Area= 46,750 sf Storage= 184,599 cf (179,324 cf above start)

Plug-Flow detention time= 1,346.8 min calculated for 1.283 af (25% of inflow)

Center-of-Mass det. time= 855.2 min (1,783.0 - 927.8)

Volume	Invert	Avail.Storage	Storage Description
#1	31.50'	264,335 cf	Basin 1 - Existing Contours (Prismatic) Listed below (Recalc)
#2	38.40'	7,196 cf	Low Area - Existing Contours (Prismatic) Listed below (Recalc)
		271,531 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.50	0	0	0
32.00	270	68	68
33.00	1,455	863	930
34.00	30,395	15,925	16,855
35.00	32,725	31,560	48,415
36.00	35,215	33,970	82,385
37.00	37,855	36,535	118,920
38.00	41,075	39,465	158,385
39.00	49,965	45,520	203,905
40.00	70,895	60,430	264,335

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
38.40	10	0	0
39.00	1,050	318	318
40.00	12,705	6,878	7,196

Device	Routing	Invert	Outlet Devices
#1	Primary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.50' / 32.43' S= -0.0015 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=2.31 cfs @ 14.60 hrs HW=38.46' TW=38.43' (Dynamic Tailwater)↑**1=30" Culvert** (Outlet Controls 2.31 cfs @ 0.47 fps)

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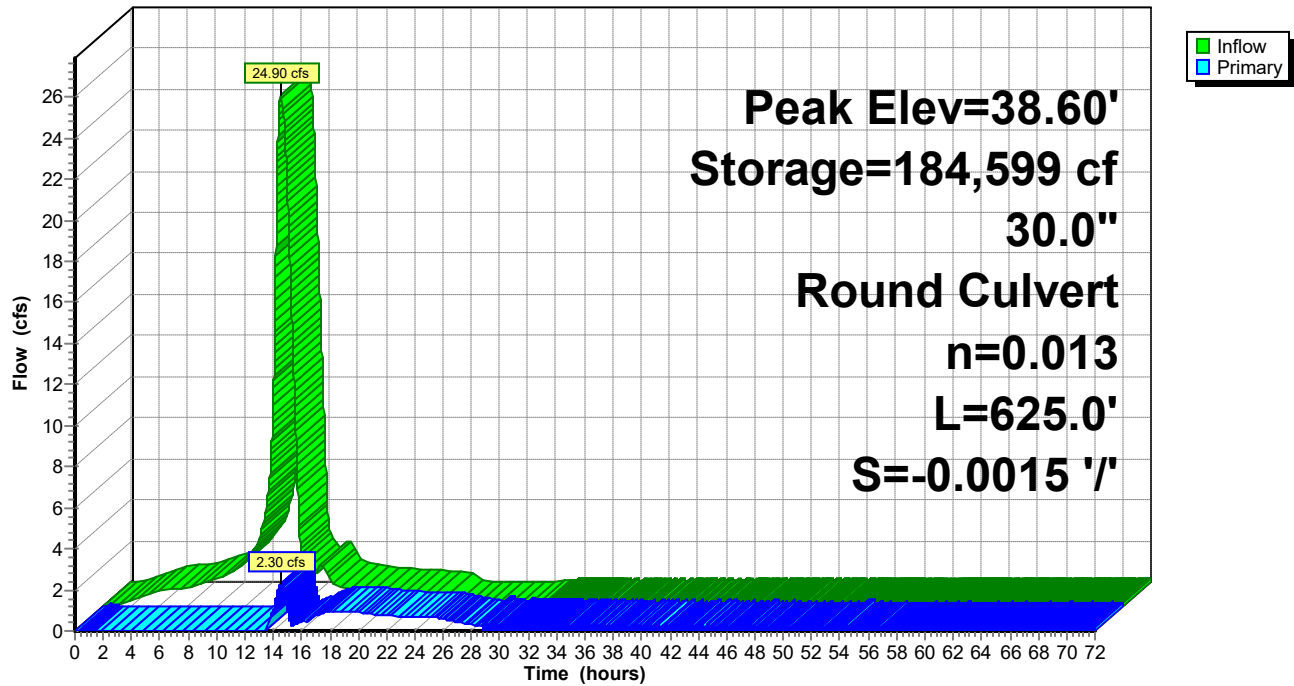
Appendix C
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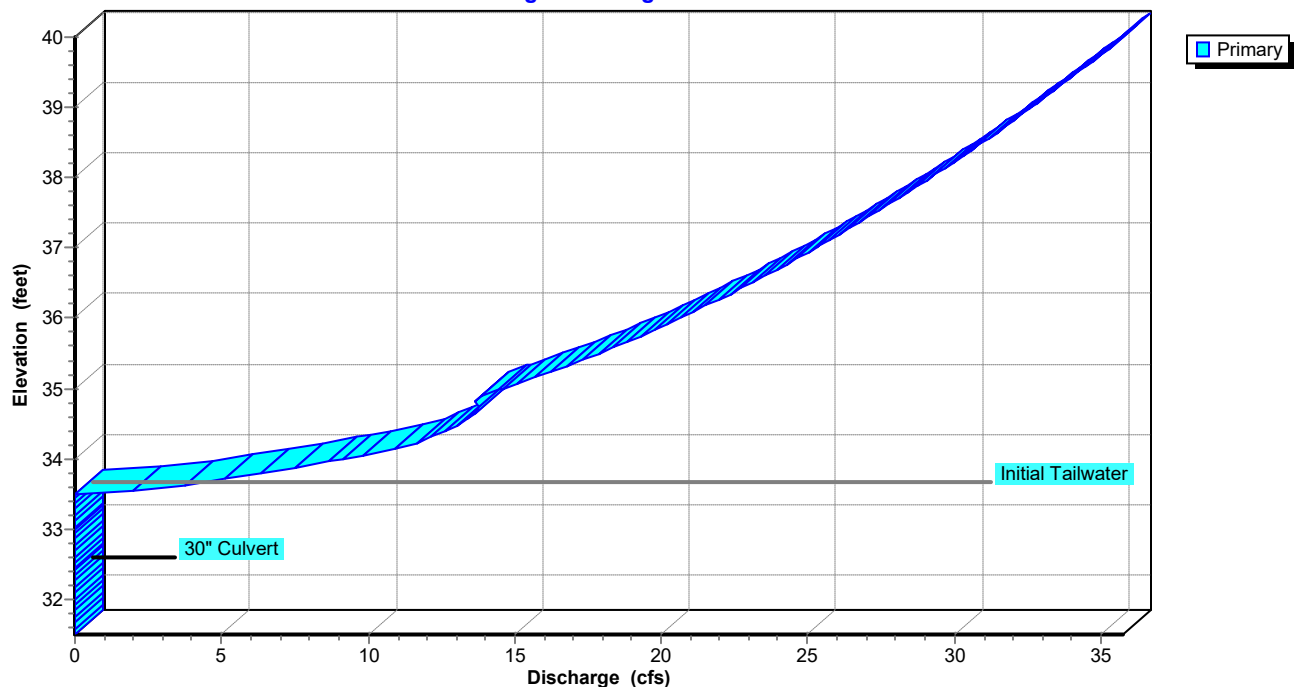
Pond B1: Basin #1

Hydrograph



Pond B1: Basin #1

Stage-Discharge



Pre Developed Conditions

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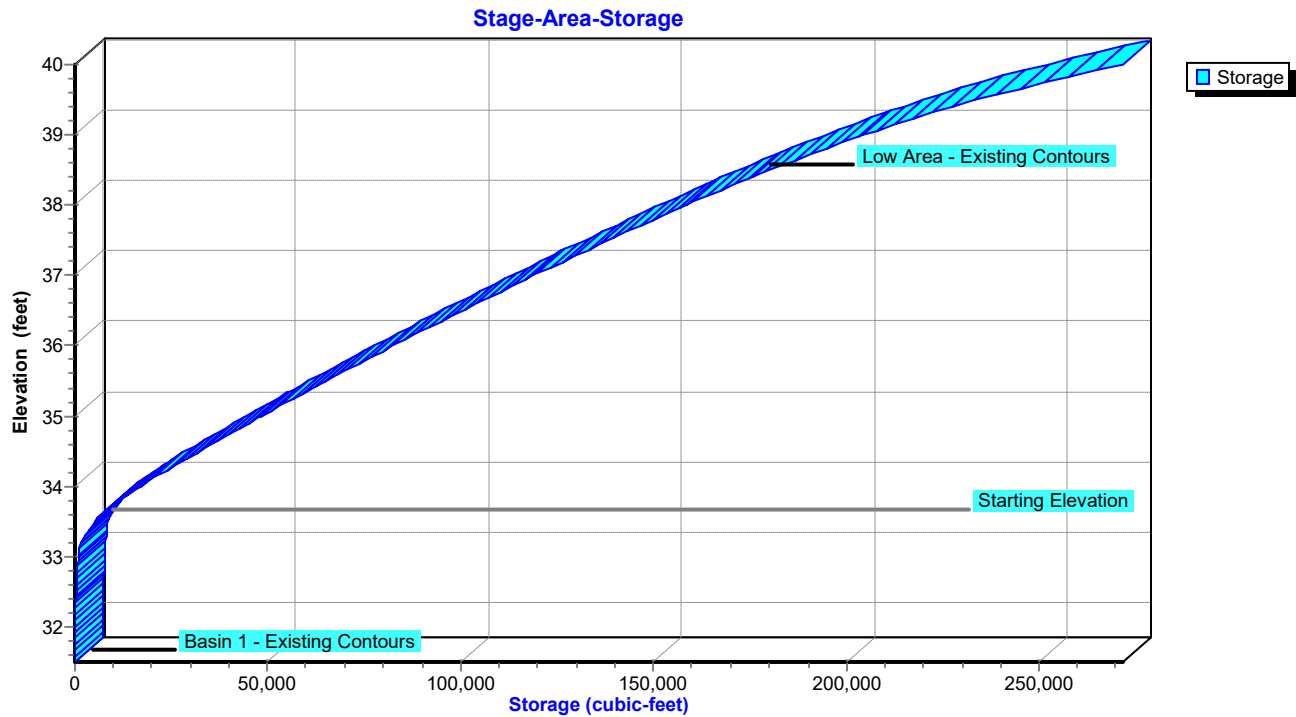
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Pond B1: Basin #1



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Summary for Pond B2: Basin #2

Inflow = 32.84 cfs @ 12.56 hrs, Volume= 9.140 af
 Outflow = 22.42 cfs @ 13.05 hrs, Volume= 7.543 af, Atten= 32%, Lag= 29.4 min
 Primary = 12.46 cfs @ 13.98 hrs, Volume= 4.874 af
 Routed to Pond B3 : Basin #3
 Secondary = 14.09 cfs @ 12.80 hrs, Volume= 2.669 af
 Routed to Pond B1 : Basin #1

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 6,488 sf Storage= 1,790 cf

Peak Elev= 38.60' @ 17.39 hrs Surf.Area= 21,495 sf Storage= 78,954 cf (77,164 cf above start)

Plug-Flow detention time= 270.2 min calculated for 7.502 af (82% of inflow)

Center-of-Mass det. time= 81.4 min (1,056.9 - 975.5)

Volume	Invert	Avail.Storage	Storage Description
#1	32.43'	136,127 cf	Basin 2 - Existing Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
32.43	0	0	0
33.00	315	90	90
34.00	12,660	6,488	6,577
35.00	13,855	13,258	19,835
36.00	15,100	14,478	34,312
37.00	16,425	15,763	50,075
38.00	17,895	17,160	67,235
39.00	23,945	20,920	88,155
40.00	72,000	47,973	136,127

Device	Routing	Invert	Outlet Devices
#1	Primary	32.35'	30.0" Round 30" Culvert L= 253.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.35' / 31.41' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	36.37'	12.0" Vert. 12" Orifice C= 0.600 Limited to weir flow at low heads 6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	37.90'	
#4	Secondary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.43' / 31.50' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

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Primary OutFlow Max=12.43 cfs @ 13.98 hrs HW=38.43' TW=37.07' (Dynamic Tailwater)

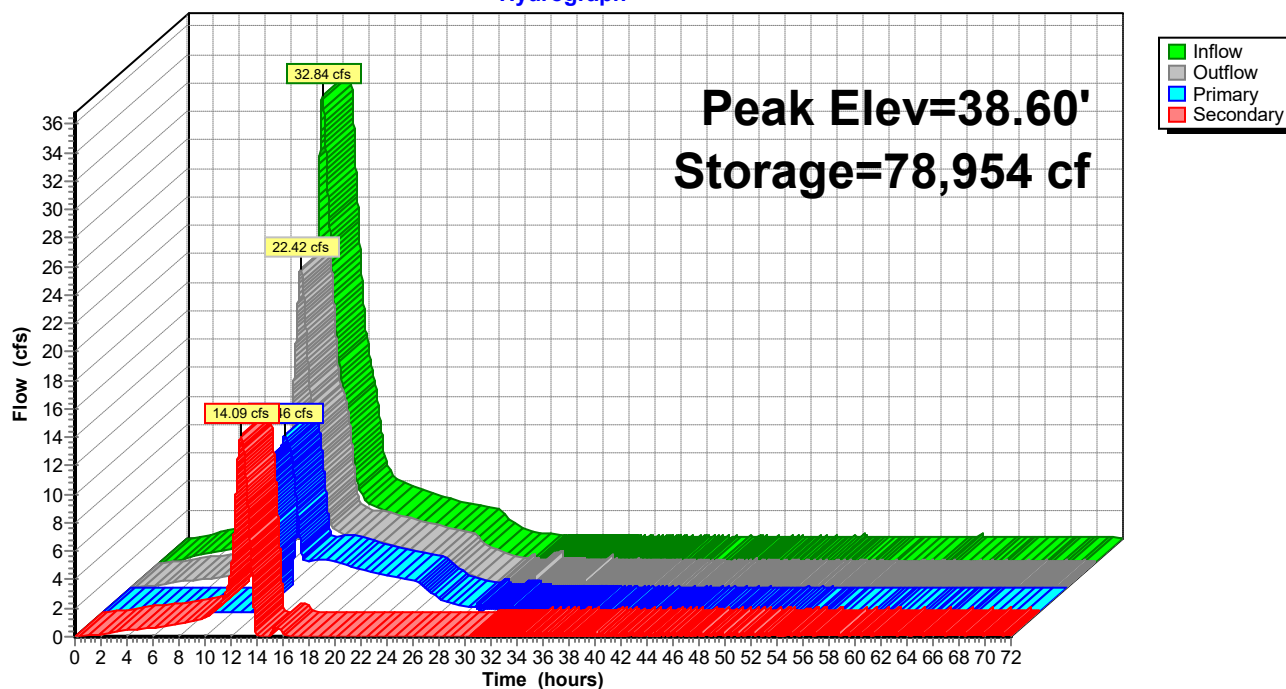
1=30" Culvert (Passes 12.43 cfs of 23.45 cfs potential flow)

2=12" Orifice (Orifice Controls 4.41 cfs @ 5.62 fps)

3=Sharp-Crested Rectangular Weir (Weir Controls 8.02 cfs @ 2.55 fps)

Secondary OutFlow Max=13.92 cfs @ 12.80 hrs HW=38.01' TW=37.10' (Dynamic Tailwater)

4=30" Culvert (Outlet Controls 13.92 cfs @ 2.83 fps)

Pond B2: Basin #2**Hydrograph**

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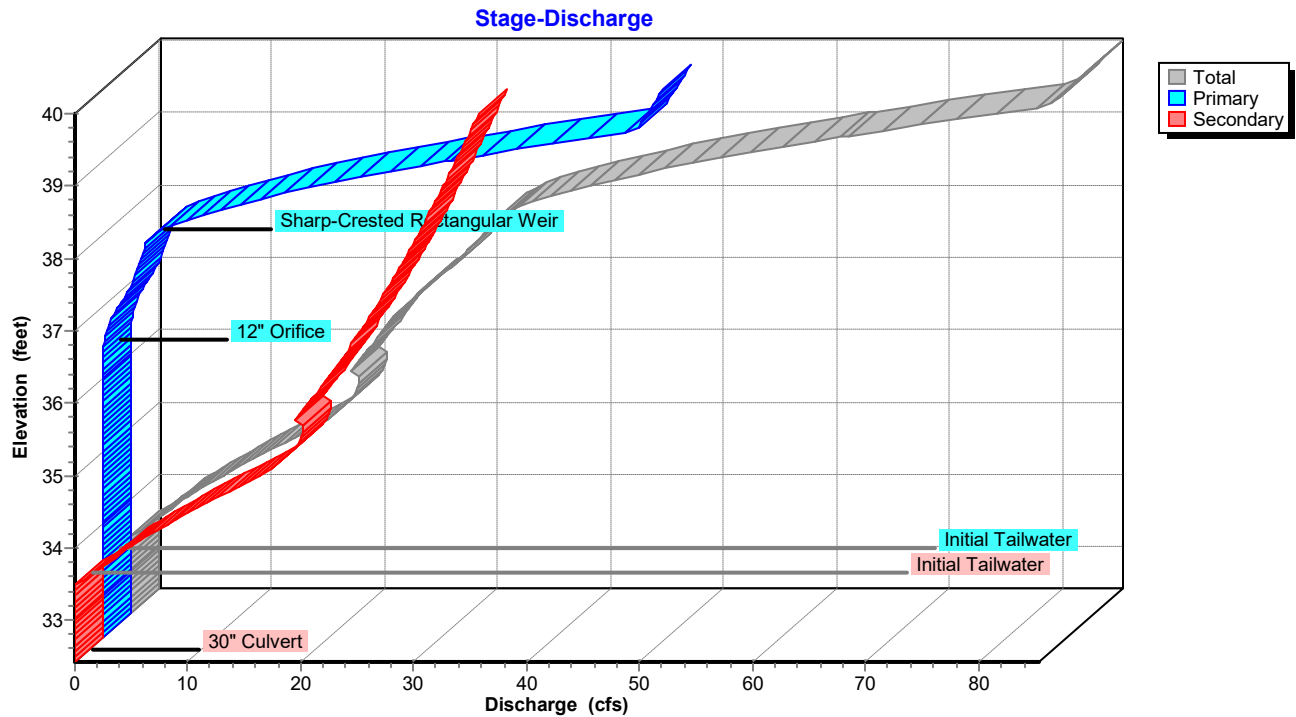
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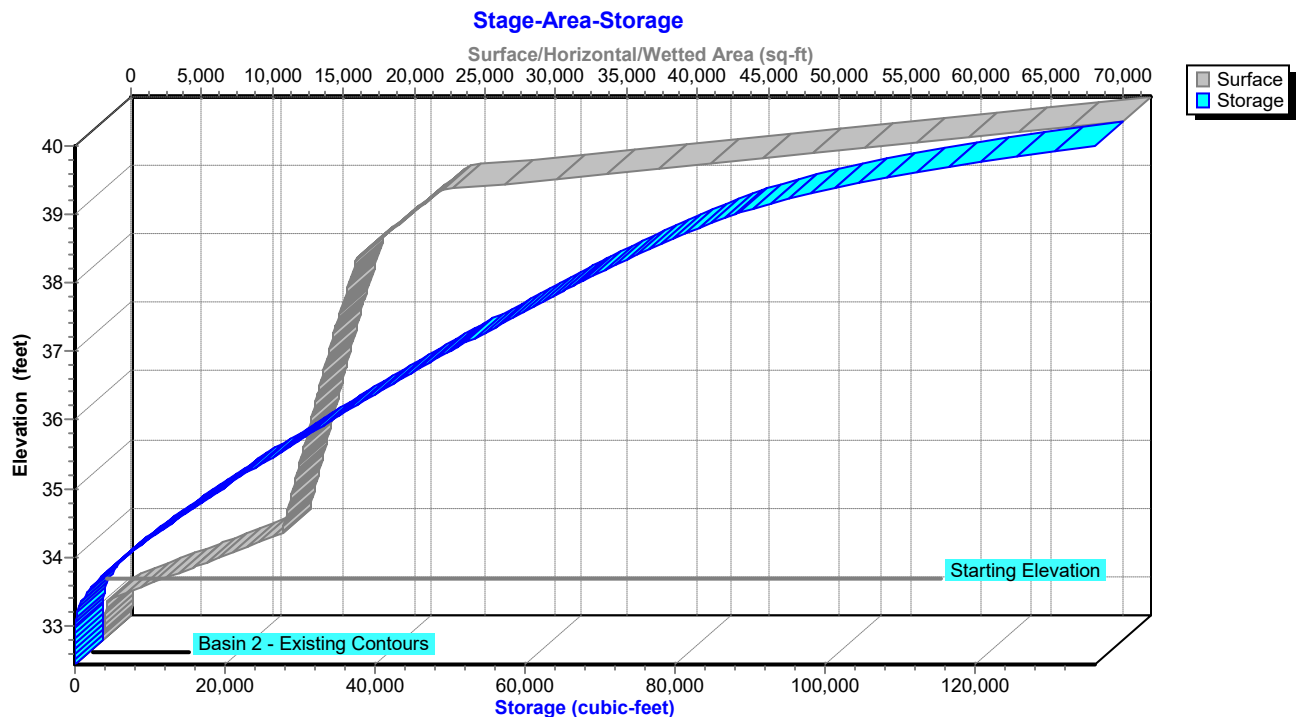
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Pond B2: Basin #2



Pond B2: Basin #2



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Summary for Pond B3: Basin #3

Inflow = 13.94 cfs @ 13.93 hrs, Volume= 5.608 af
 Outflow = 4.03 cfs @ 17.51 hrs, Volume= 3.225 af, Atten= 71%, Lag= 214.5 min
 Primary = 4.03 cfs @ 17.51 hrs, Volume= 3.225 af
 Routed to Link TTA : TTA

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 8,403 sf Storage= 3,080 cf

Peak Elev= 38.56' @ 17.51 hrs Surf.Area= 45,299 sf Storage= 121,554 cf (118,474 cf above start)

Plug-Flow detention time= 458.6 min calculated for 3.154 af (56% of inflow)

Center-of-Mass det. time= 247.3 min (1,294.5 - 1,047.1)

Volume	Invert	Avail.Storage	Storage Description
#1	31.44'	195,235 cf	Basin 3 - Existing Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.44	0	0	0
32.00	135	38	38
33.00	1,165	650	688
34.00	15,640	8,403	9,090
35.00	17,655	16,648	25,738
36.00	19,910	18,783	44,520
37.00	24,090	22,000	66,520
38.00	38,775	31,433	97,953
39.00	50,395	44,585	142,538
40.00	55,000	52,698	195,235

Device	Routing	Invert	Outlet Devices
#1	Primary	33.42'	24.0" Round 24" Culvert L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 33.42' / 33.15' S= 0.0042 ' / S= 0.0042 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	38.22'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=4.03 cfs @ 17.51 hrs HW=38.56' TW=0.00' (Dynamic Tailwater)↑ **1=24" Culvert** (Passes 4.03 cfs of 30.64 cfs potential flow)↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 4.03 cfs @ 1.99 fps)

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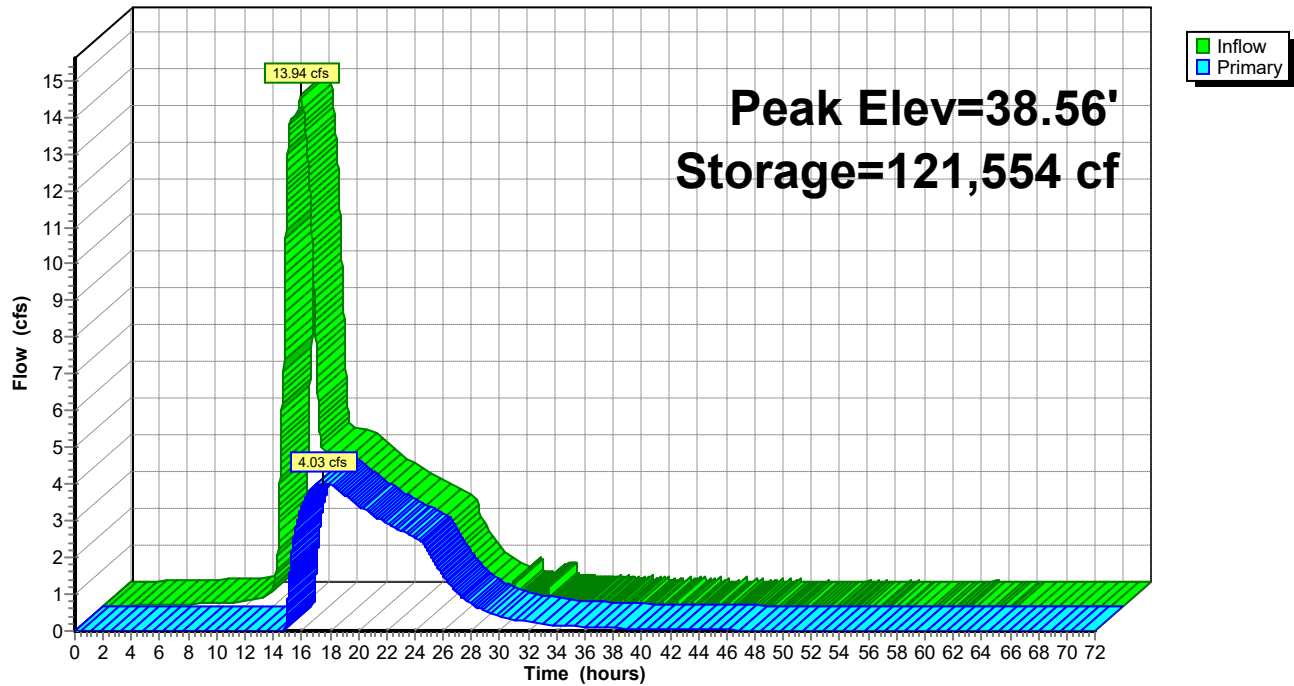
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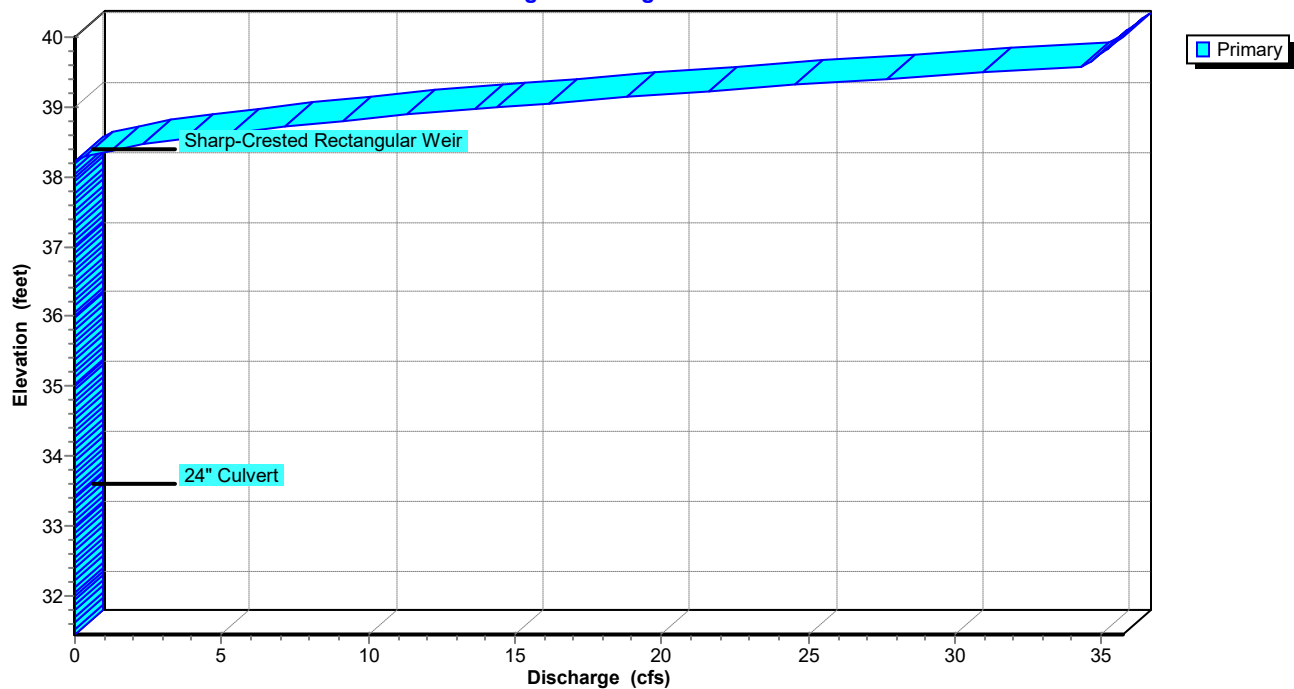
Pond B3: Basin #3

Hydrograph



Pond B3: Basin #3

Stage-Discharge



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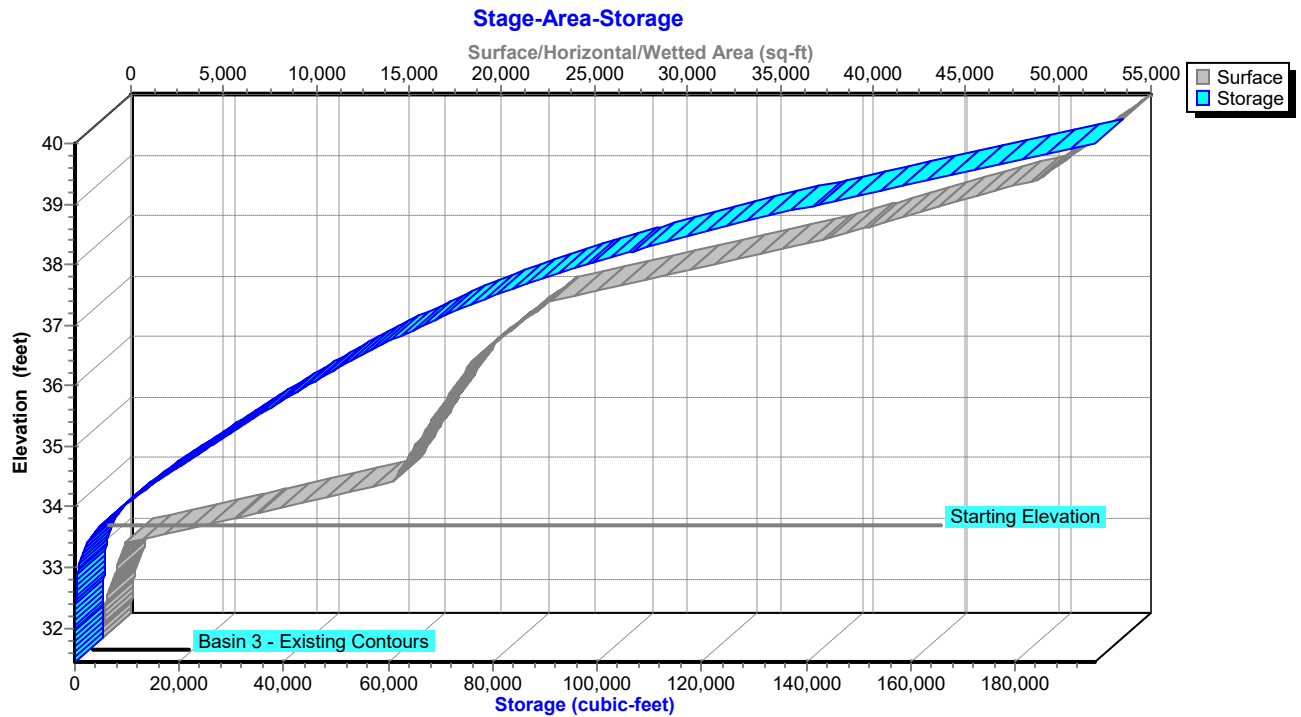
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Pond B3: Basin #3



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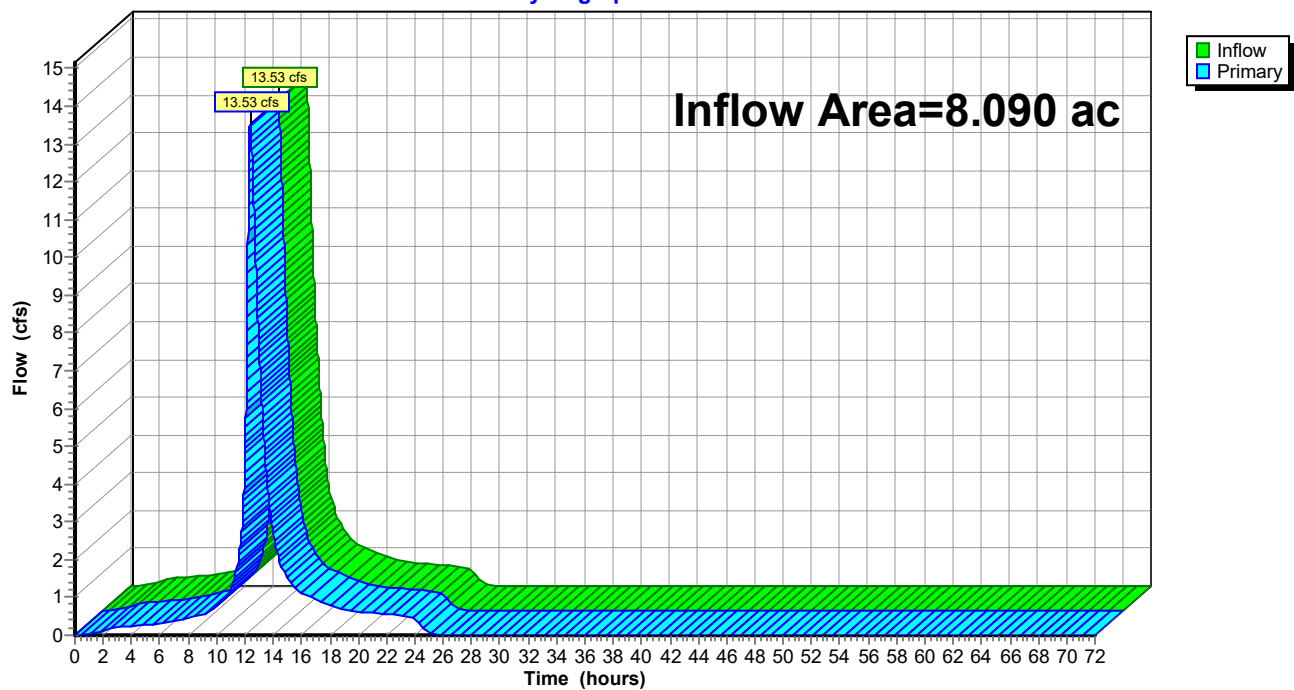
Summary for Link 1: EXDA-1

Inflow Area = 8.090 ac, 29.30% Impervious, Inflow Depth = 3.66" for 100-Year event
Inflow = 13.53 cfs @ 12.37 hrs, Volume= 2.465 af
Primary = 13.53 cfs @ 12.38 hrs, Volume= 2.465 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B1 : Basin #1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 1: EXDA-1

Hydrograph



Pre Developed Conditions

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Appendix C
NOAA 24-hr C 100-Year Rainfall=8.81"

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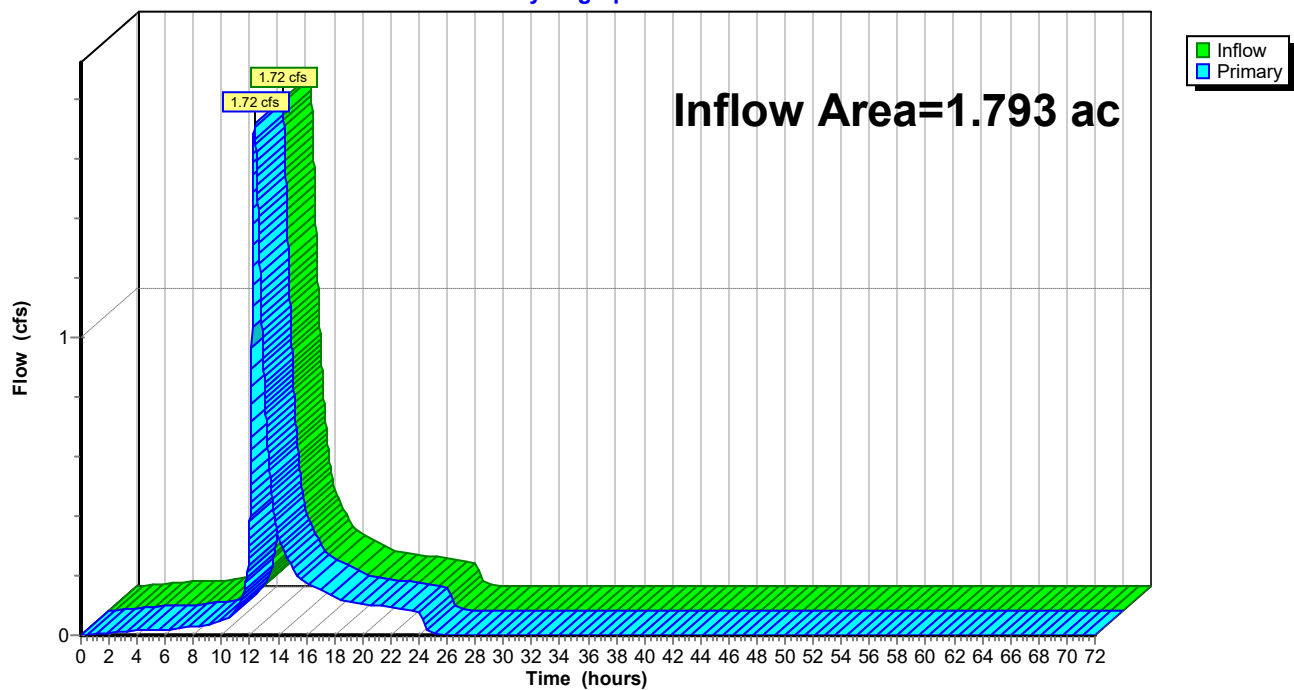
Summary for Link 2A: EXDA-2A

Inflow Area = 1.793 ac, 8.49% Impervious, Inflow Depth = 1.98" for 100-Year event
Inflow = 1.72 cfs @ 12.30 hrs, Volume= 0.296 af
Primary = 1.72 cfs @ 12.31 hrs, Volume= 0.296 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2A: EXDA-2A

Hydrograph



Pre Developed Conditions

NOAA 24-hr C 100-Year Rainfall=8.81"

Prepared by Sciallo

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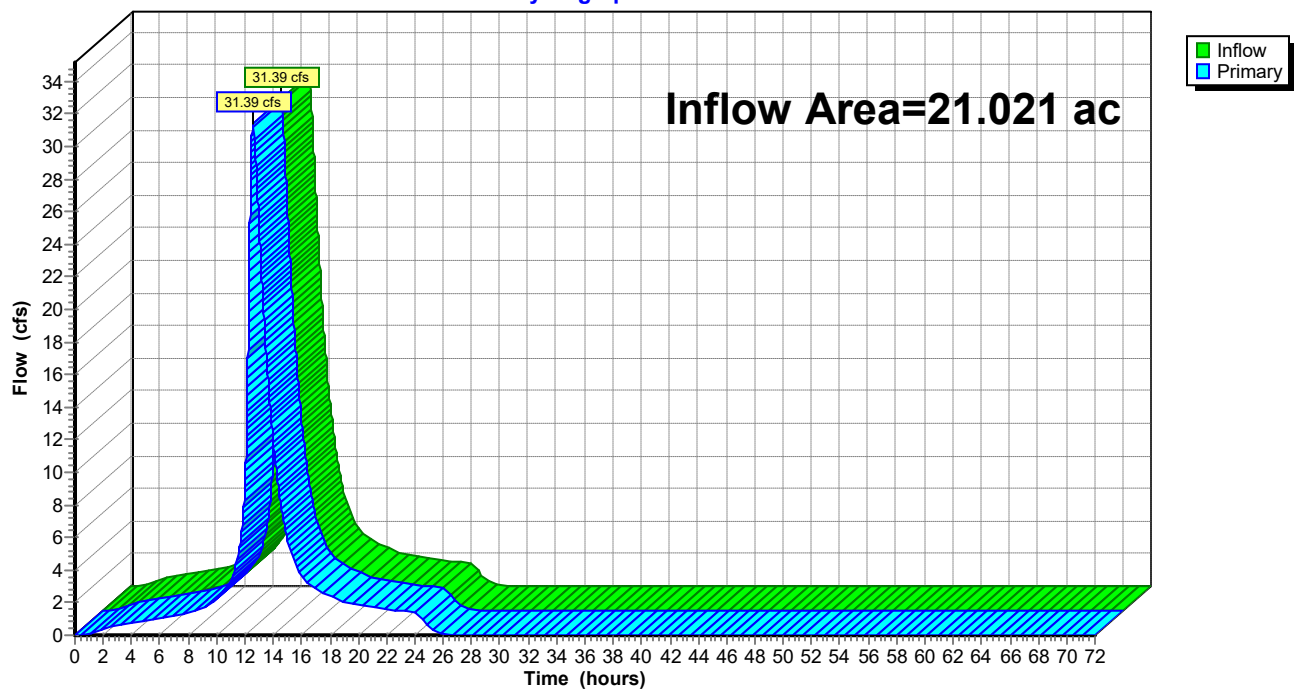
Summary for Link 2B: EXDA-2B

Inflow Area = 21.021 ac, 38.74% Impervious, Inflow Depth = 4.25" for 100-Year event
Inflow = 31.39 cfs @ 12.55 hrs, Volume= 7.440 af
Primary = 31.39 cfs @ 12.56 hrs, Volume= 7.440 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2B: EXDA-2B

Hydrograph



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Appendix C

NOAA 24-hr C 100-Year Rainfall=8.81"

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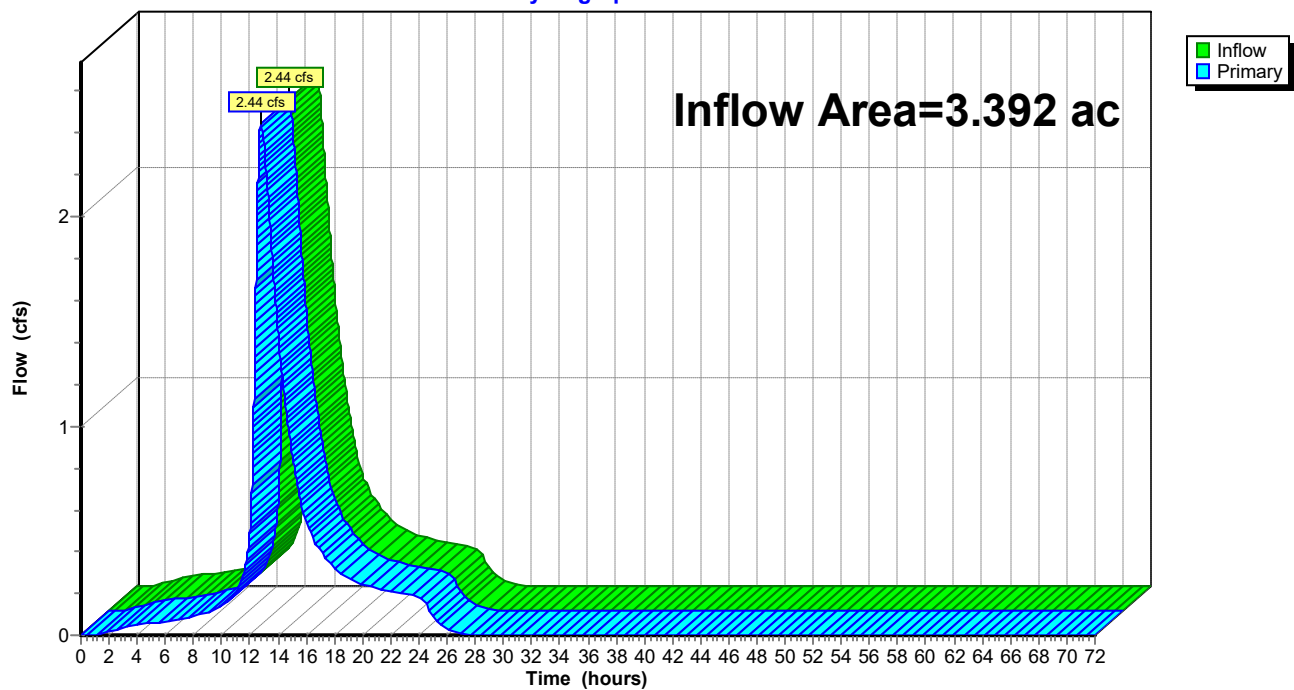
Summary for Link 3: EXDA-3

Inflow Area = 3.392 ac, 16.04% Impervious, Inflow Depth = 2.60" for 100-Year event
Inflow = 2.44 cfs @ 12.80 hrs, Volume= 0.734 af
Primary = 2.44 cfs @ 12.81 hrs, Volume= 0.734 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B3 : Basin #3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3: EXDA-3

Hydrograph



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Appendix C

NOAA 24-hr C 100-Year Rainfall=8.81"

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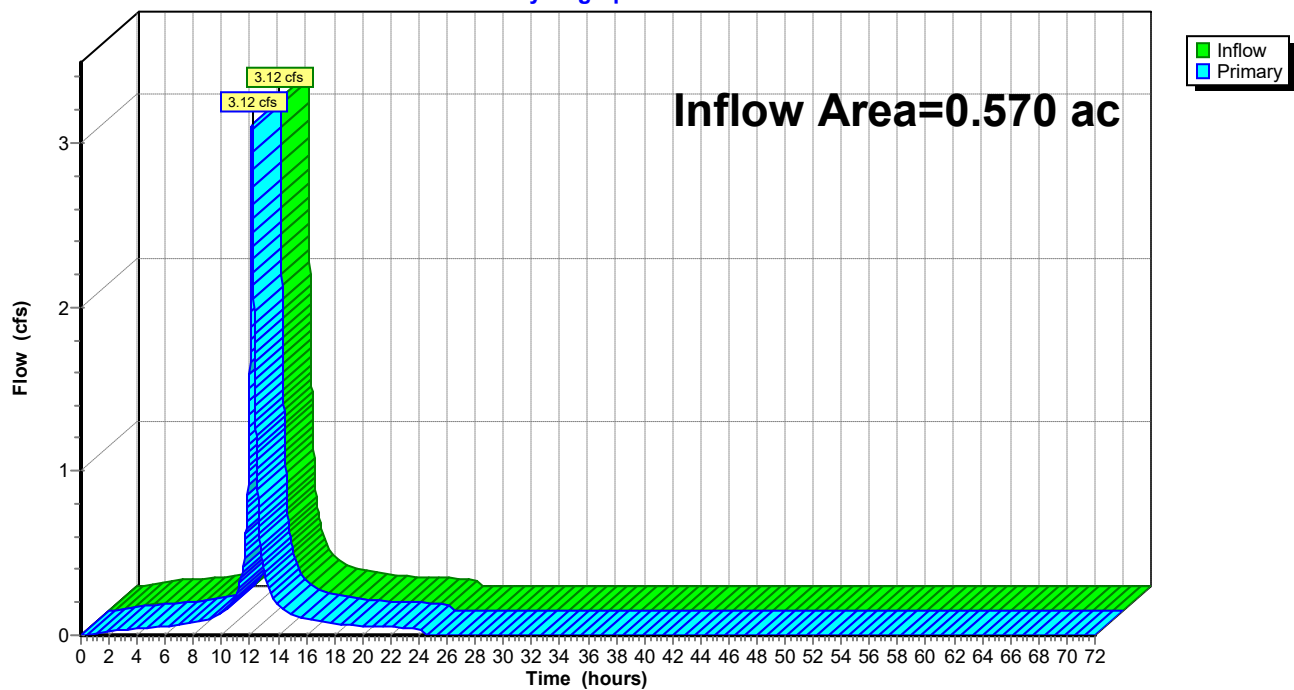
Summary for Link 4: EXDA-4

Inflow Area = 0.570 ac, 67.40% Impervious, Inflow Depth = 6.21" for 100-Year event
Inflow = 3.12 cfs @ 12.14 hrs, Volume= 0.295 af
Primary = 3.12 cfs @ 12.15 hrs, Volume= 0.295 af, Atten= 0%, Lag= 0.6 min
Routed to Link TTA : TTA

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 4: EXDA-4

Hydrograph



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Appendix C
NOAA 24-hr C 100-Year Rainfall=8.81"

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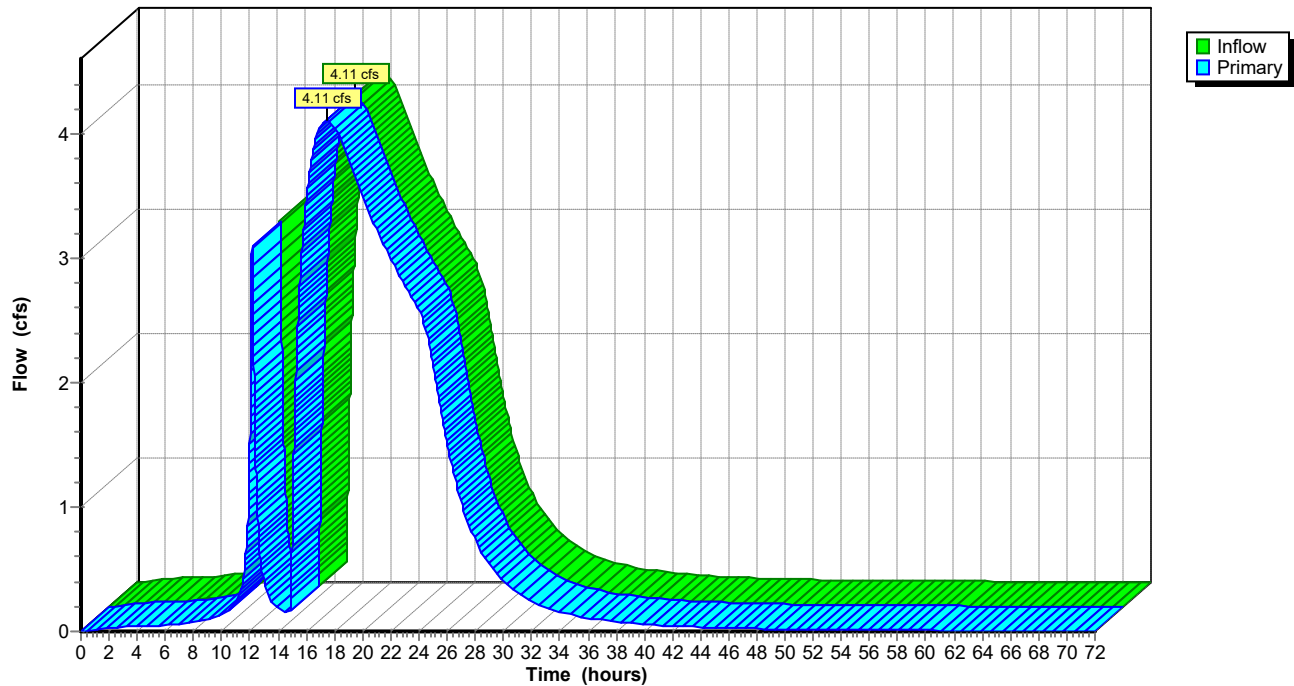
Summary for Link TTA: TTA

Inflow = 4.11 cfs @ 17.46 hrs, Volume= 3.520 af
Primary = 4.11 cfs @ 17.47 hrs, Volume= 3.520 af, Atten= 0%, Lag= 0.6 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

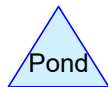
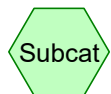
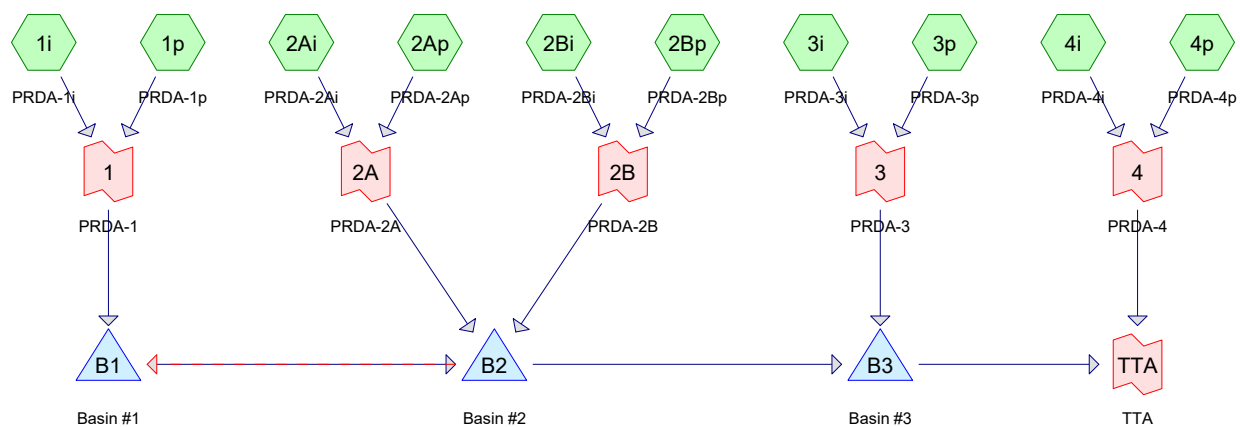
Link TTA: TTA

Hydrograph



APPENDIX D

POST-DEVELOPED RUNOFF CALCULATIONS



Routing Diagram for Post Developed Conditions
 Prepared by Sciallo, Printed 2/9/2022
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Post Developed Conditions

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Project Notes

Rainfall events imported from "BurlingtonCounty.hcp"

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	C	Default	24.00	1	3.36	2
2	10-Year	NOAA 24-hr	C	Default	24.00	1	5.18	2
3	100-Year	NOAA 24-hr	C	Default	24.00	1	8.81	2
4	NJDEP WQ	NJ DEP 2-hr		Default	2.00	1	1.25	2

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
20.815	39	>75% Grass cover, Good, HSG A (1p, 2Ap, 2Bp, 3p, 4p)
0.427	72	Dirt roads, HSG A (1i)
11.948	98	Paved parking, HSG A (1i, 2Ai, 2Bi, 3i, 4i)
1.677	30	Woods, Good, HSG A (1p, 2Ap, 3p, 4p)
34.867	59	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
34.867	HSG A	1i, 1p, 2Ai, 2Ap, 2Bi, 2Bp, 3i, 3p, 4i, 4p
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
34.867		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
20.815	0.000	0.000	0.000	0.000	20.815	>75% Grass cover, Good	1p, 2Ap, 2Bp, 3p, 4p
0.427	0.000	0.000	0.000	0.000	0.427	Dirt roads	1i
11.948	0.000	0.000	0.000	0.000	11.948	Paved parking	1i, 2Ai, 2Bi, 3i, 4i
1.677	0.000	0.000	0.000	0.000	1.677	Woods, Good	1p, 2Ap, 3p, 4p
34.867	0.000	0.000	0.000	0.000	34.867	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	2Bi	0.00	0.00	1,387.0	0.0020	0.013	0.0	18.0	0.0
2	2Bp	0.00	0.00	1,387.0	0.0020	0.013	0.0	18.0	0.0
3	B1	31.50	32.43	625.0	-0.0015	0.013	0.0	30.0	0.0
4	B2	32.35	31.41	253.0	0.0037	0.013	0.0	30.0	0.0
5	B2	32.43	31.50	625.0	0.0015	0.013	0.0	30.0	0.0
6	B3	33.42	33.15	65.0	0.0042	0.013	0.0	24.0	0.0

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Appendix D
NOAA 24-hr C 2-Year Rainfall=3.36"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1i: PRDA-1i	Runoff Area=122,285 sf 84.80% Impervious Runoff Depth=2.81" Flow Length=275' Tc=22.2 min CN=WQ Runoff=3.99 cfs 0.657 af
Subcatchment 1p: PRDA-1p	Runoff Area=229,900 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=275' Tc=22.2 min CN=WQ Runoff=0.00 cfs 0.001 af
Subcatchment 2Ai: PRDA-2Ai	Runoff Area=6,630 sf 100.00% Impervious Runoff Depth=3.13" Flow Length=267' Tc=15.9 min CN=98 Runoff=0.29 cfs 0.040 af
Subcatchment 2Ap: PRDA-2Ap	Runoff Area=71,475 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=267' Tc=15.9 min CN=WQ Runoff=0.00 cfs 0.000 af
Subcatchment 2Bi: PRDA-2Bi	Runoff Area=354,705 sf 100.00% Impervious Runoff Depth=3.13" Flow Length=1,831' Tc=36.2 min CN=98 Runoff=9.80 cfs 2.122 af
Subcatchment 2Bp: PRDA-2Bp	Runoff Area=560,985 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=1,831' Tc=36.2 min CN=39 Runoff=0.01 cfs 0.004 af
Subcatchment 3i: PRDA-3i	Runoff Area=38,695 sf 100.00% Impervious Runoff Depth=3.13" Flow Length=328' Tc=47.6 min CN=98 Runoff=0.91 cfs 0.231 af
Subcatchment 3p: PRDA-3p	Runoff Area=109,285 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=328' Tc=47.6 min CN=WQ Runoff=0.00 cfs 0.001 af
Subcatchment 4i: PRDA-4i	Runoff Area=16,740 sf 100.00% Impervious Runoff Depth=3.13" Tc=6.0 min CN=98 Runoff=1.11 cfs 0.100 af
Subcatchment 4p: PRDA-4p	Runoff Area=8,095 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=WQ Runoff=0.00 cfs 0.000 af
Pond B1: Basin #1	Peak Elev=36.03' Storage=84,896 cf Inflow=8.03 cfs 2.472 af 30.0" Round Culvert n=0.013 L=625.0' S=-0.0015 '/' Outflow=0.34 cfs 0.675 af
Pond B2: Basin #2	Peak Elev=36.03' Storage=48,478 cf Inflow=10.00 cfs 2.840 af Primary=0.00 cfs 0.000 af Secondary=5.09 cfs 1.814 af Outflow=5.09 cfs 1.814 af
Pond B3: Basin #3	Peak Elev=34.24' Storage=15,513 cf Inflow=0.91 cfs 0.232 af Outflow=0.00 cfs 0.000 af
Link 1: PRDA-1	Inflow=3.99 cfs 0.658 af Primary=3.99 cfs 0.658 af
Link 2A: PRDA-2A	Inflow=0.29 cfs 0.040 af Primary=0.29 cfs 0.040 af
Link 2B: PRDA-2B	Inflow=9.80 cfs 2.125 af Primary=9.80 cfs 2.125 af

Post Developed Conditions

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Appendix D

NOAA 24-hr C 2-Year Rainfall=3.36"

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Link 3: PRDA-3

Inflow=0.91 cfs 0.232 af

Primary=0.91 cfs 0.232 af

Link 4: PRDA-4

Inflow=1.11 cfs 0.100 af

Primary=1.11 cfs 0.100 af

Link TTA: TTA

Inflow=1.11 cfs 0.100 af

Primary=1.11 cfs 0.100 af

Total Runoff Area = 34.867 ac Runoff Volume = 3.156 af Average Runoff Depth = 1.09"
65.73% Pervious = 22.918 ac 34.27% Impervious = 11.948 ac

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NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 1i: PRDA-1i

Runoff = 3.99 cfs @ 12.34 hrs, Volume= 0.657 af, Depth= 2.81"
 Routed to Link 1 : PRDA-1

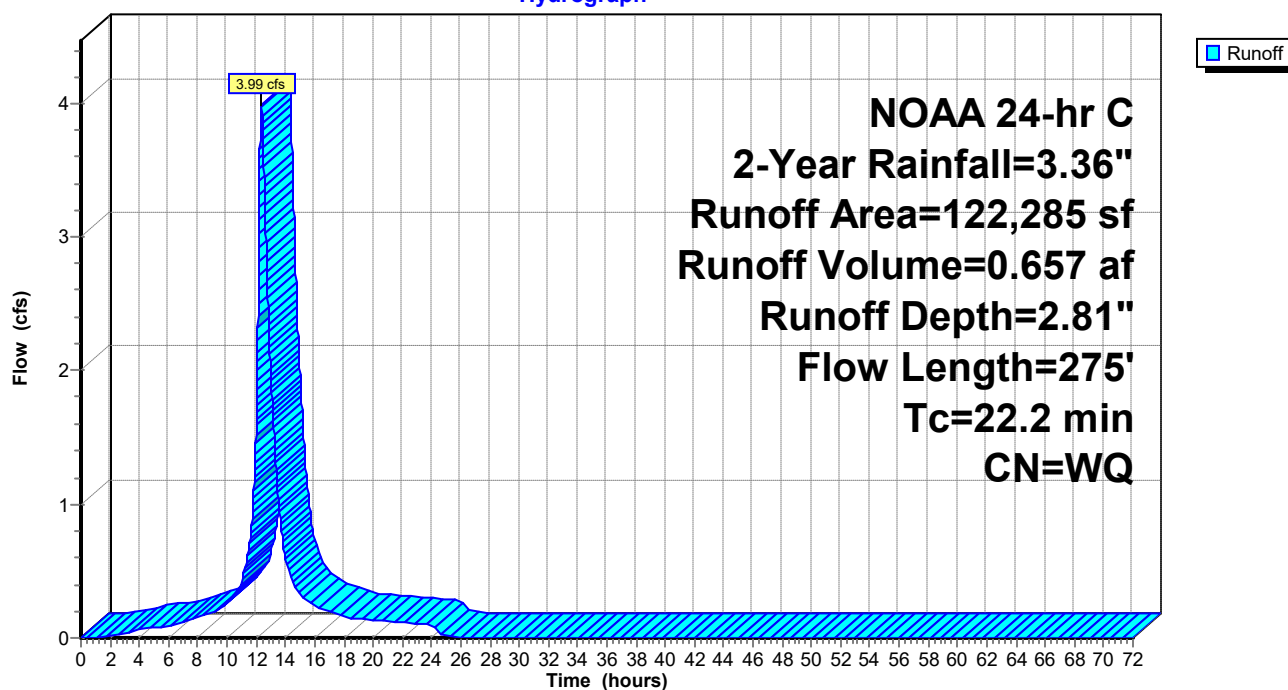
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
103,700	98	Paved parking, HSG A
18,585	72	Dirt roads, HSG A
122,285		Weighted Average
18,585	72	15.20% Pervious Area
103,700	98	84.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment PRDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment PRDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1i: PRDA-1i

Hydrograph



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NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 1p: PRDA-1p

Runoff = 0.00 cfs @ 24.08 hrs, Volume= 0.001 af, Depth= 0.00"
 Routed to Link 1 : PRDA-1

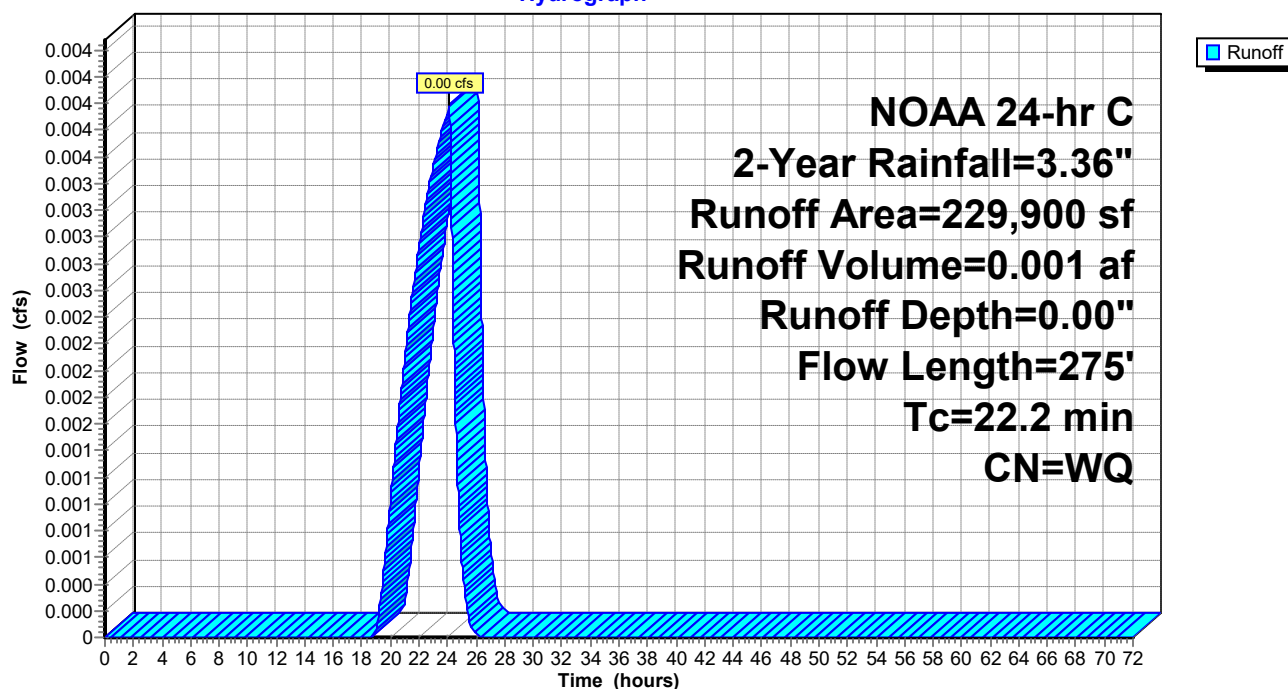
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
178,350	39	>75% Grass cover, Good, HSG A
51,550	30	Woods, Good, HSG A
229,900		Weighted Average
229,900	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment PRDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment PRDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1p: PRDA-1p

Hydrograph



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NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 2Ai: PRDA-2Ai

Runoff = 0.29 cfs @ 12.26 hrs, Volume= 0.040 af, Depth= 3.13"
 Routed to Link 2A : PRDA-2A

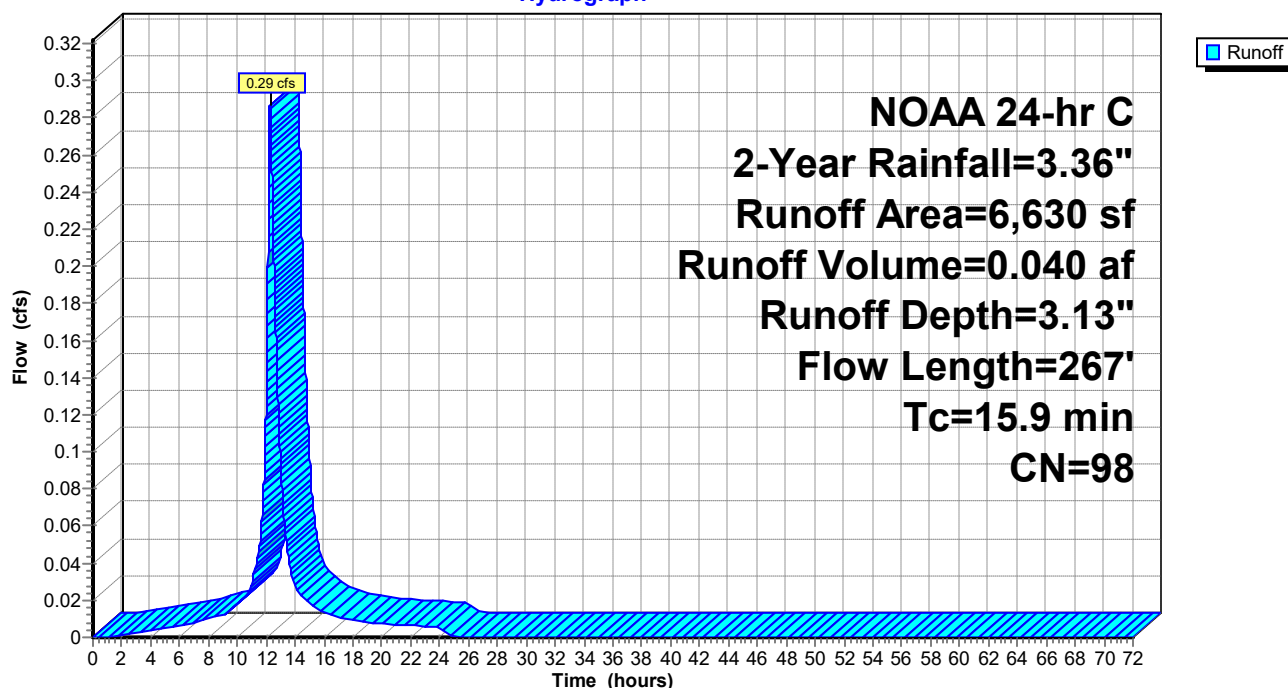
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
6,630	98	Paved parking, HSG A
6,630	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment PRDA-2A.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment PRDA-2A.2
					Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ai: PRDA-2Ai

Hydrograph



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NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 2Ap: PRDA-2Ap

Runoff = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Link 2A : PRDA-2A

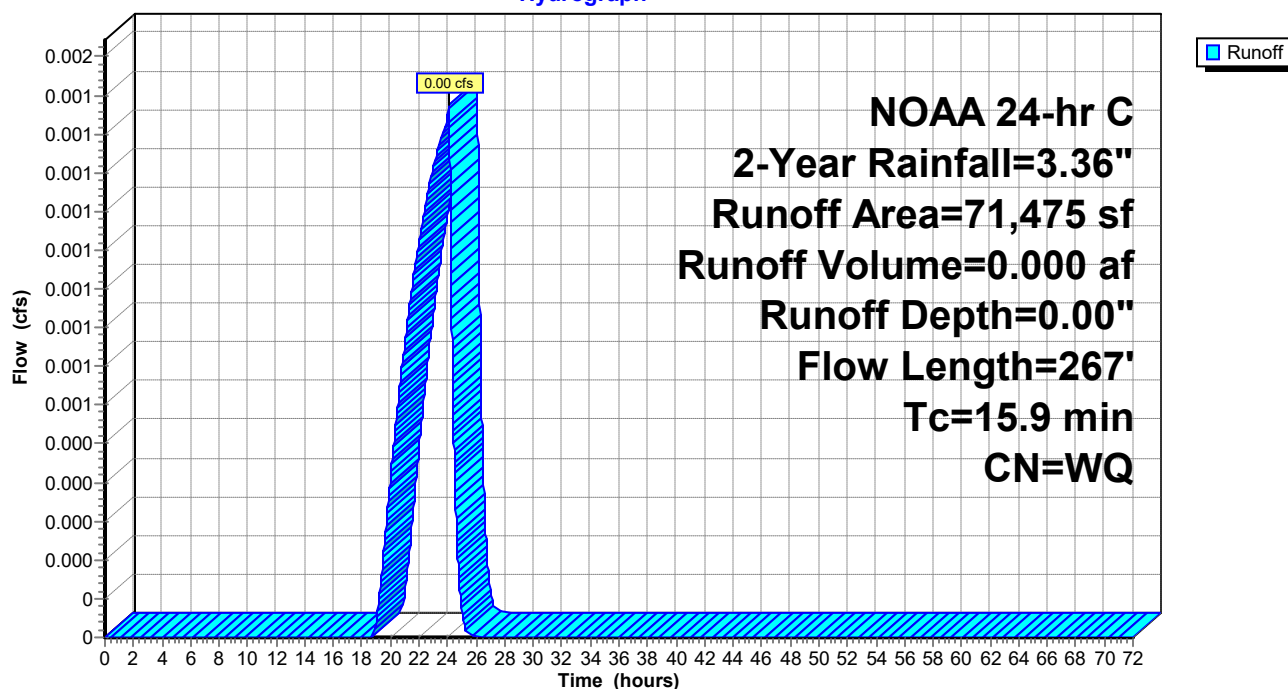
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
59,900	39	>75% Grass cover, Good, HSG A
11,575	30	Woods, Good, HSG A
71,475		Weighted Average
71,475	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment PRDA-2A.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment PRDA-2A.2
					Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ap: PRDA-2Ap

Hydrograph



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NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 2Bi: PRDA-2Bi

Runoff = 9.80 cfs @ 12.55 hrs, Volume= 2.122 af, Depth= 3.13"
 Routed to Link 2B : PRDA-2B

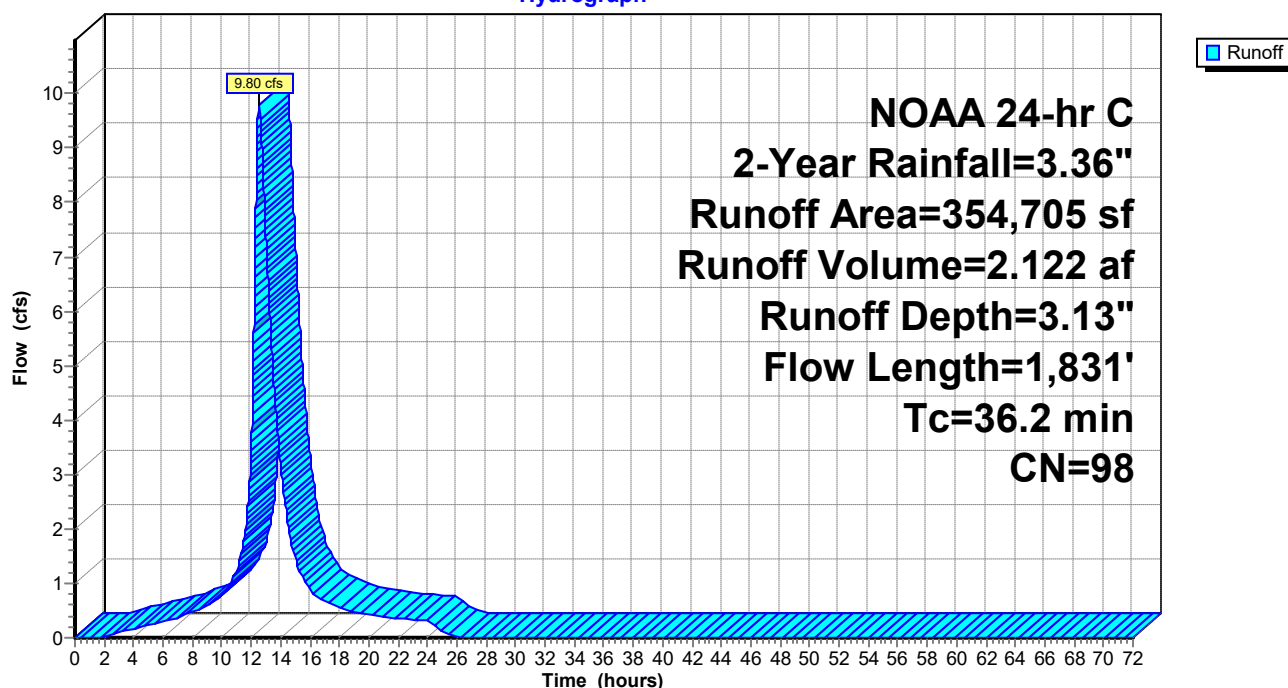
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
354,705	98	Paved parking, HSG A
354,705	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment PRDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment PRDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment PRDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment PRDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bi: PRDA-2Bi

Hydrograph



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NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 2Bp: PRDA-2Bp

Runoff = 0.01 cfs @ 24.13 hrs, Volume= 0.004 af, Depth= 0.00"
 Routed to Link 2B : PRDA-2B

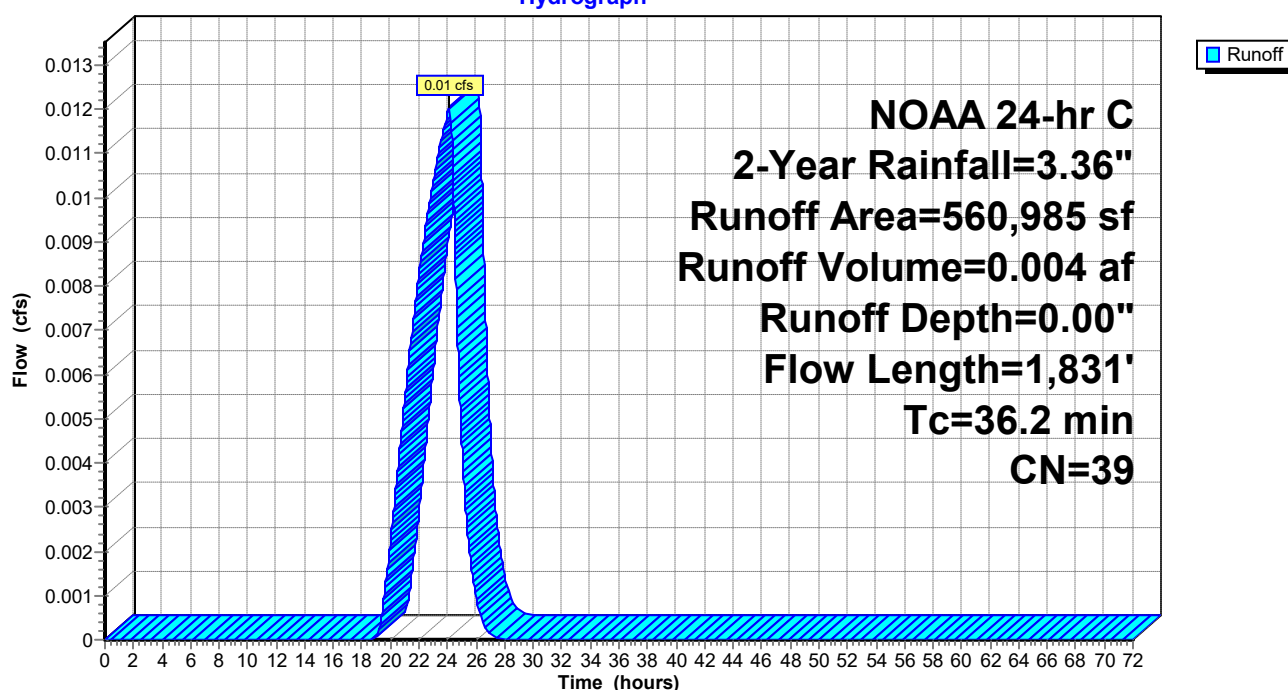
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
560,985	39	>75% Grass cover, Good, HSG A
560,985	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment PRDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment PRDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment PRDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment PRDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bp: PRDA-2Bp

Hydrograph



Post Developed Conditions

NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 3i: PRDA-3i

Runoff = 0.91 cfs @ 12.69 hrs, Volume= 0.231 af, Depth= 3.13"
 Routed to Link 3 : PRDA-3

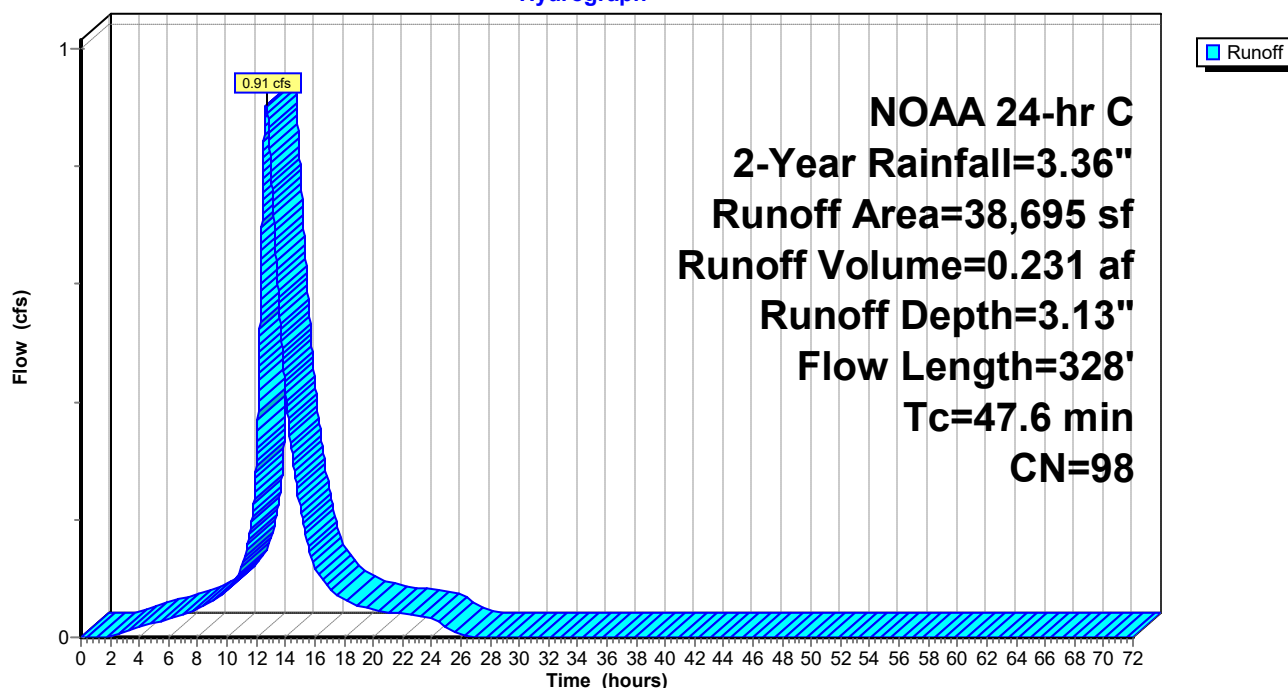
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
38,695	98	Paved parking, HSG A
38,695	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment PRDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment PRDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3i: PRDA-3i

Hydrograph



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NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 3p: PRDA-3p

Runoff = 0.00 cfs @ 24.22 hrs, Volume= 0.001 af, Depth= 0.00"
 Routed to Link 3 : PRDA-3

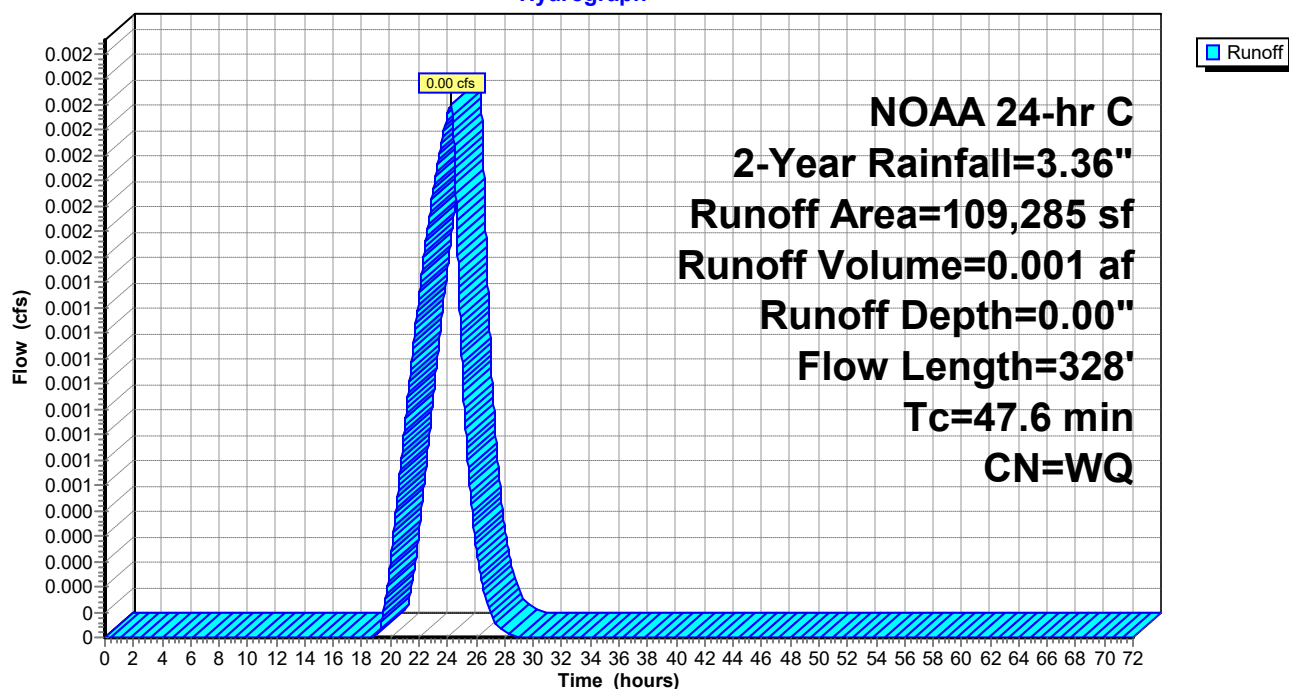
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
101,135	39	>75% Grass cover, Good, HSG A
8,150	30	Woods, Good, HSG A
109,285		Weighted Average
109,285	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment PRDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment PRDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3p: PRDA-3p

Hydrograph



Post Developed Conditions

NOAA 24-hr C 2-Year Rainfall=3.36"

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Summary for Subcatchment 4i: PRDA-4i

Runoff = 1.11 cfs @ 12.14 hrs, Volume= 0.100 af, Depth= 3.13"
 Routed to Link 4 : PRDA-4

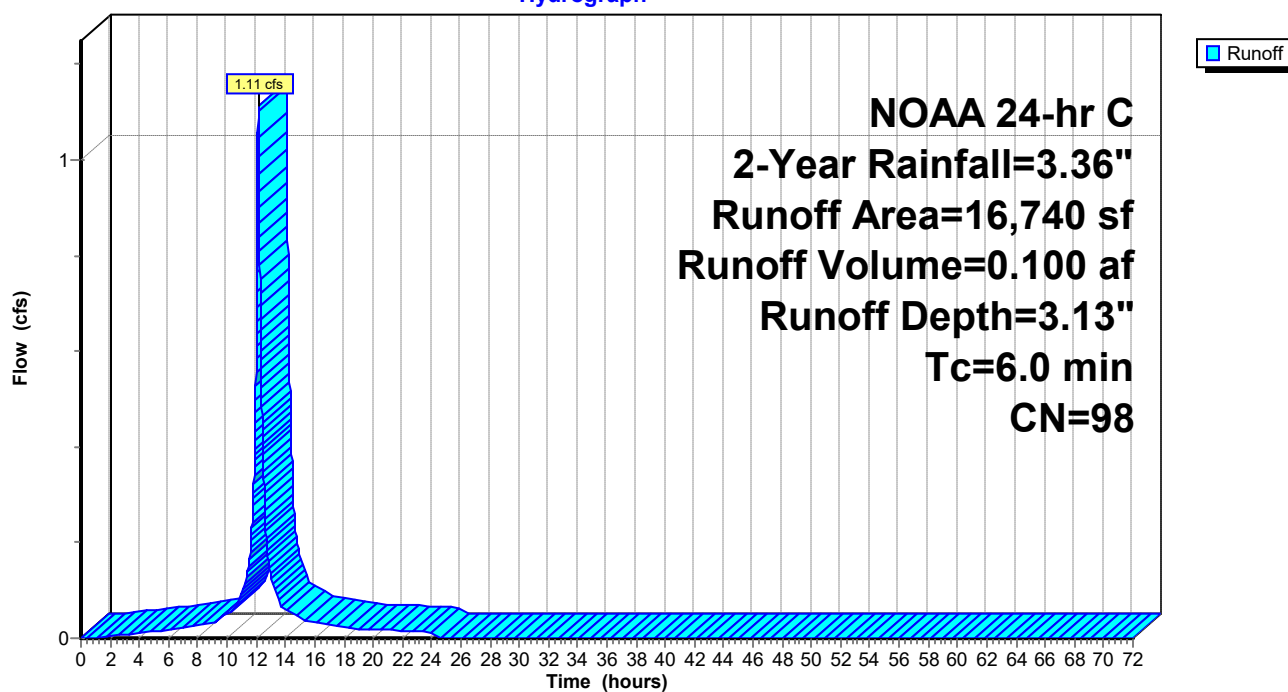
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
16,740	98	Paved parking, HSG A
16,740	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment PRDA-4.1

Subcatchment 4i: PRDA-4i

Hydrograph



Summary for Subcatchment 4p: PRDA-4p

Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 4 : PRDA-4

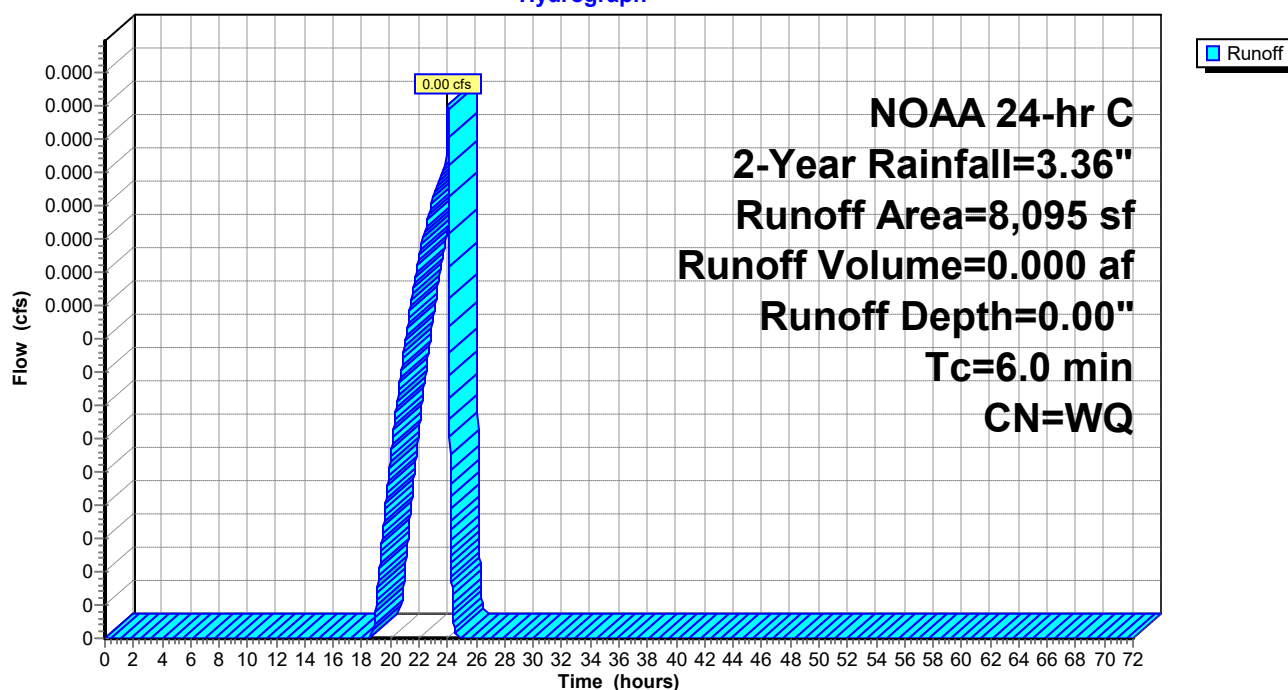
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
6,330	39	>75% Grass cover, Good, HSG A
1,765	30	Woods, Good, HSG A
8,095		Weighted Average
8,095	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment PRDA-4.1

Subcatchment 4p: PRDA-4p

Hydrograph



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Summary for Pond B1: Basin #1

Inflow = 8.03 cfs @ 12.62 hrs, Volume= 2.472 af
 Outflow = 0.34 cfs @ 26.07 hrs, Volume= 0.675 af, Atten= 96%, Lag= 806.7 min
 Primary = 0.34 cfs @ 26.07 hrs, Volume= 0.675 af
 Routed to Pond B2 : Basin #2

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 16,675 sf Storage= 6,588 cf

Peak Elev= 36.03' @ 28.02 hrs Surf.Area= 35,291 sf Storage= 84,896 cf (78,308 cf above start)

Plug-Flow detention time= 2,406.2 min calculated for 0.523 af (21% of inflow)

Center-of-Mass det. time= 1,318.4 min (2,618.1 - 1,299.8)

Volume	Invert	Avail.Storage	Storage Description
#1	31.50'	265,835 cf	Basin 1 - Pr/Ex Contours (Prismatic) Listed below (Recalc)
#2	38.40'	7,196 cf	Low Area - Existing Contours (Prismatic) Listed below (Recalc)
		273,031 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.50	0	0	0
32.00	270	68	68
33.00	2,955	1,613	1,680
34.00	30,395	16,675	18,355
35.00	32,725	31,560	49,915
36.00	35,215	33,970	83,885
37.00	37,855	36,535	120,420
38.00	41,075	39,465	159,885
39.00	49,965	45,520	205,405
40.00	70,895	60,430	265,835

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
38.40	10	0	0
39.00	1,050	318	318
40.00	12,705	6,878	7,196

Device	Routing	Invert	Outlet Devices
#1	Primary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.50' / 32.43' S= -0.0015 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=0.23 cfs @ 26.07 hrs HW=36.03' TW=36.03' (Dynamic Tailwater)↑**1=30" Culvert** (Outlet Controls 0.23 cfs @ 0.05 fps)

Post Developed Conditions

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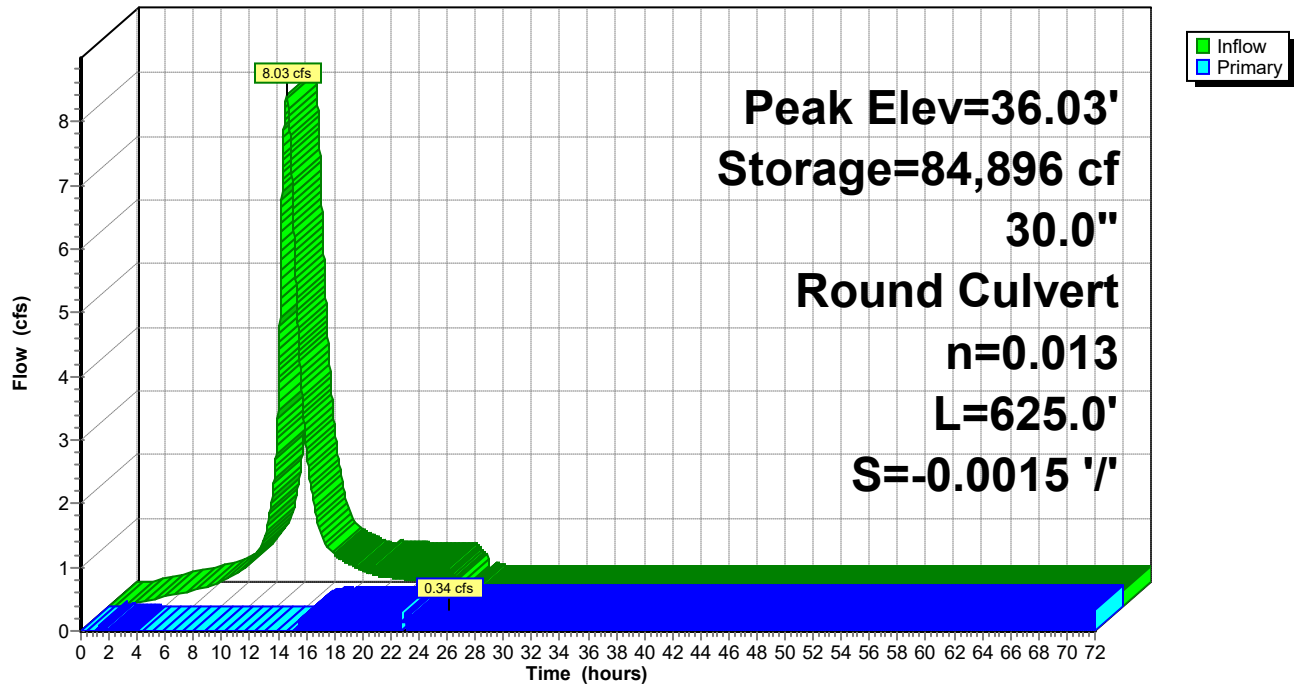
Appendix D
NOAA 24-hr C 2-Year Rainfall=3.36"

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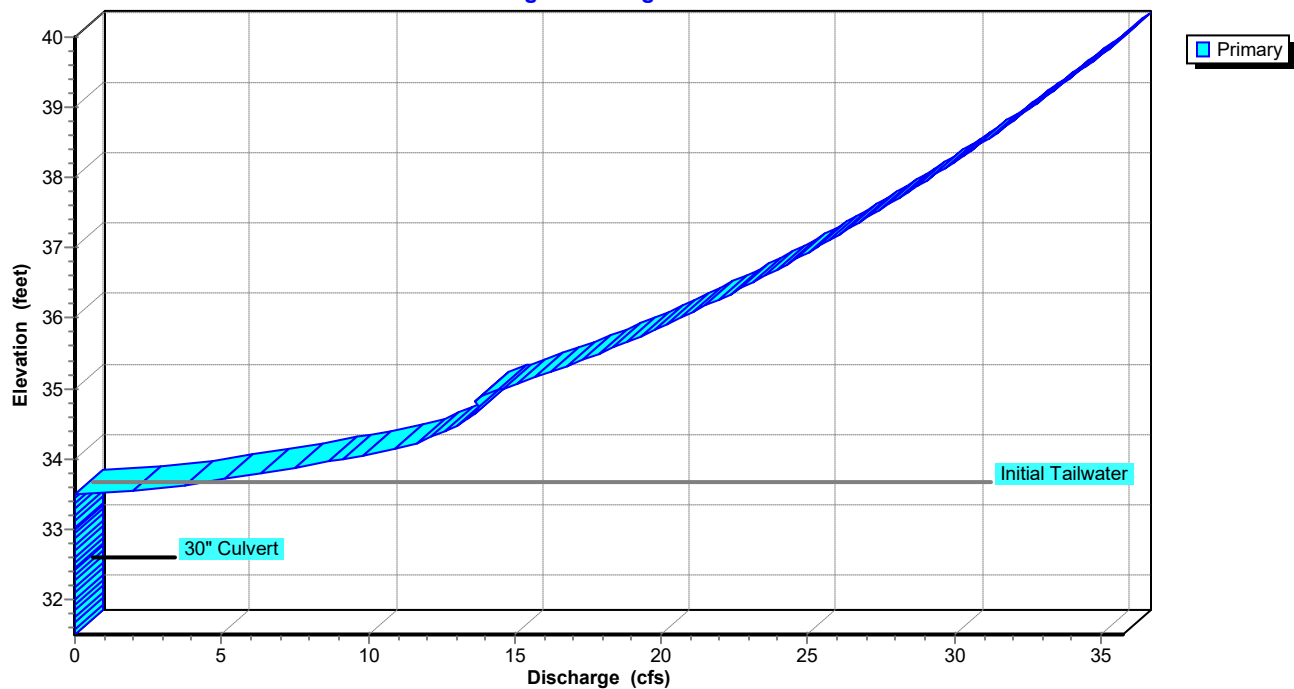
Pond B1: Basin #1

Hydrograph



Pond B1: Basin #1

Stage-Discharge



Post Developed Conditions

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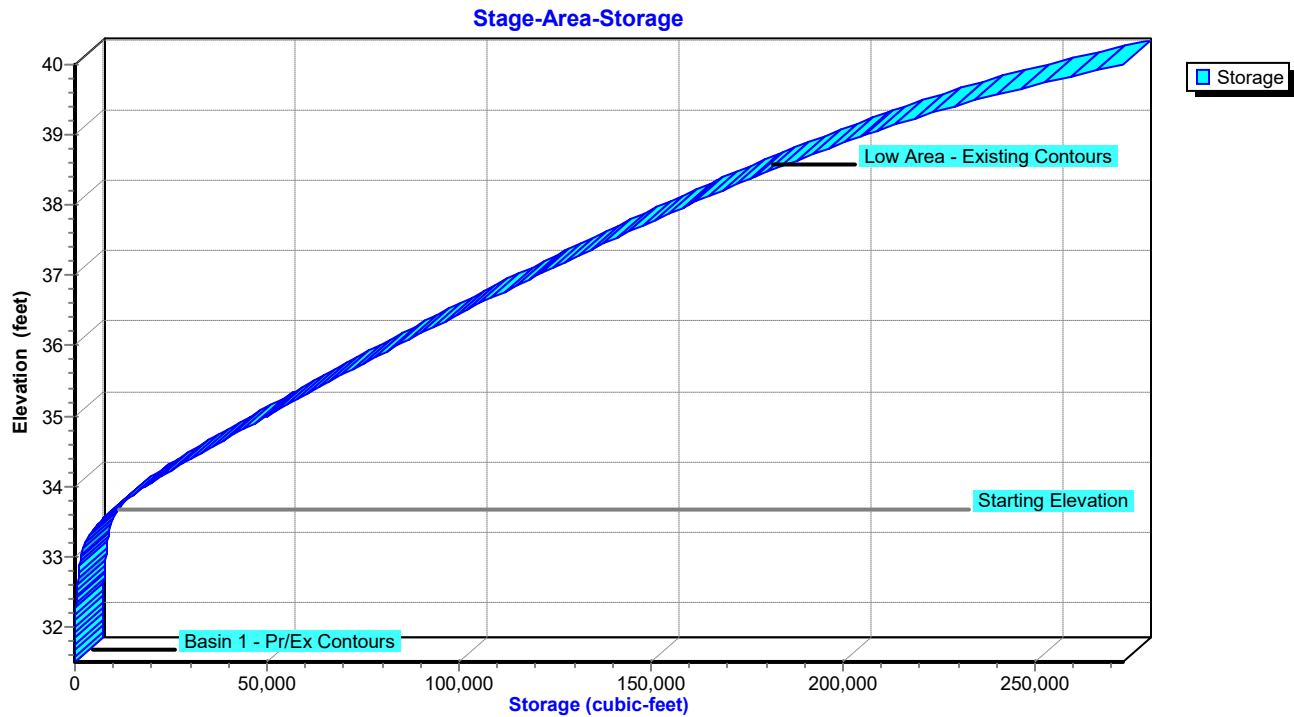
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Appendix D
NOAA 24-hr C 2-Year Rainfall=3.36"

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Pond B1: Basin #1



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Summary for Pond B2: Basin #2

Inflow = 10.00 cfs @ 12.55 hrs, Volume= 2.840 af
 Outflow = 5.09 cfs @ 12.77 hrs, Volume= 1.814 af, Atten= 49%, Lag= 12.9 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Pond B3 : Basin #3
 Secondary = 5.09 cfs @ 12.77 hrs, Volume= 1.814 af
 Routed to Pond B1 : Basin #1

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 9,728 sf Storage= 3,769 cf

Peak Elev= 36.03' @ 28.00 hrs Surf.Area= 20,586 sf Storage= 48,478 cf (44,708 cf above start)

Plug-Flow detention time= 816.0 min calculated for 1.728 af (61% of inflow)

Center-of-Mass det. time= 246.3 min (1,484.1 - 1,237.8)

Volume	Invert	Avail.Storage	Storage Description
#1	32.43'	173,433 cf	Basin 2 - Pr/Ex Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
32.43	0	0	0
33.00	2,500	713	713
34.00	16,955	9,728	10,440
35.00	18,700	17,828	28,268
36.00	20,530	19,615	47,883
37.00	22,470	21,500	69,383
38.00	24,590	23,530	92,913
39.00	32,225	28,408	121,320
40.00	72,000	52,113	173,433

Device	Routing	Invert	Outlet Devices
#1	Primary	32.35'	30.0" Round 30" Culvert L= 253.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.35' / 31.41' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	36.37'	12.0" Vert. 12" Orifice C= 0.600 Limited to weir flow at low heads
#3	Device 1	37.90'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height
#4	Secondary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.43' / 31.50' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

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Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.50' TW=33.50' (Dynamic Tailwater)

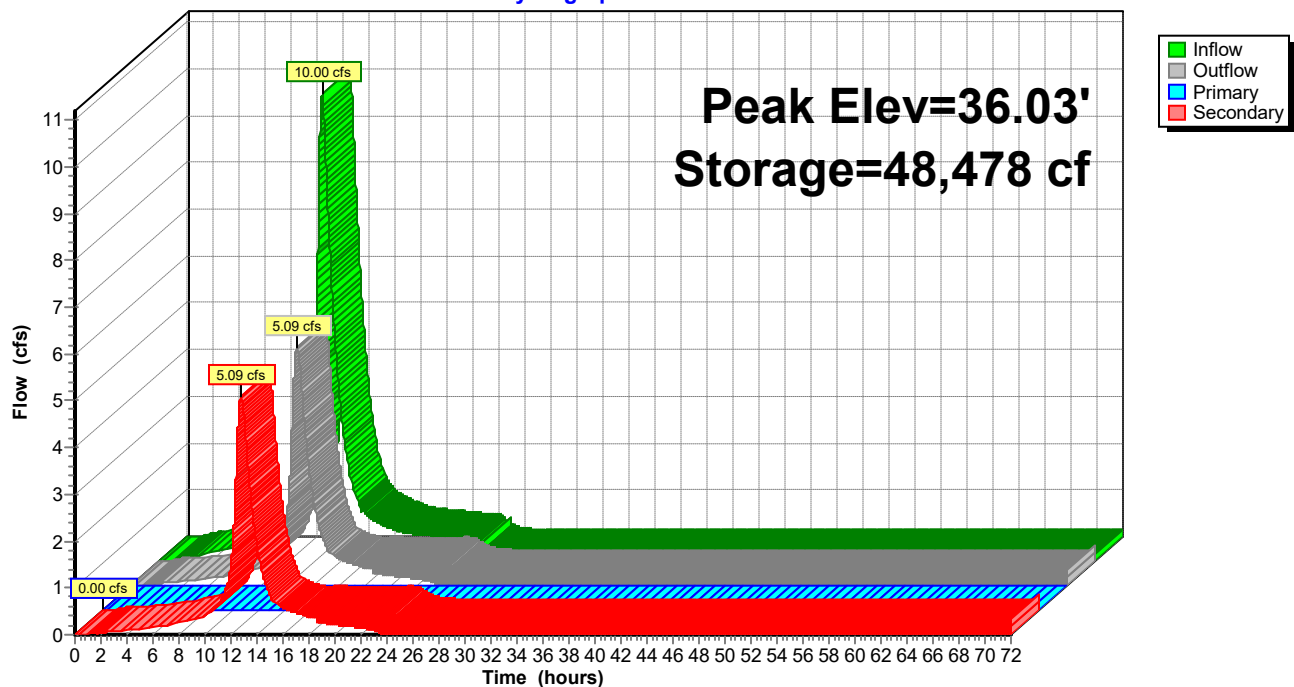
1=30" Culvert (Controls 0.00 cfs)

2=12" Orifice (Controls 0.00 cfs)

3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=4.95 cfs @ 12.77 hrs HW=34.90' TW=34.75' (Dynamic Tailwater)

4=30" Culvert (Outlet Controls 4.95 cfs @ 1.27 fps)

Pond B2: Basin #2**Hydrograph**

Post Developed Conditions

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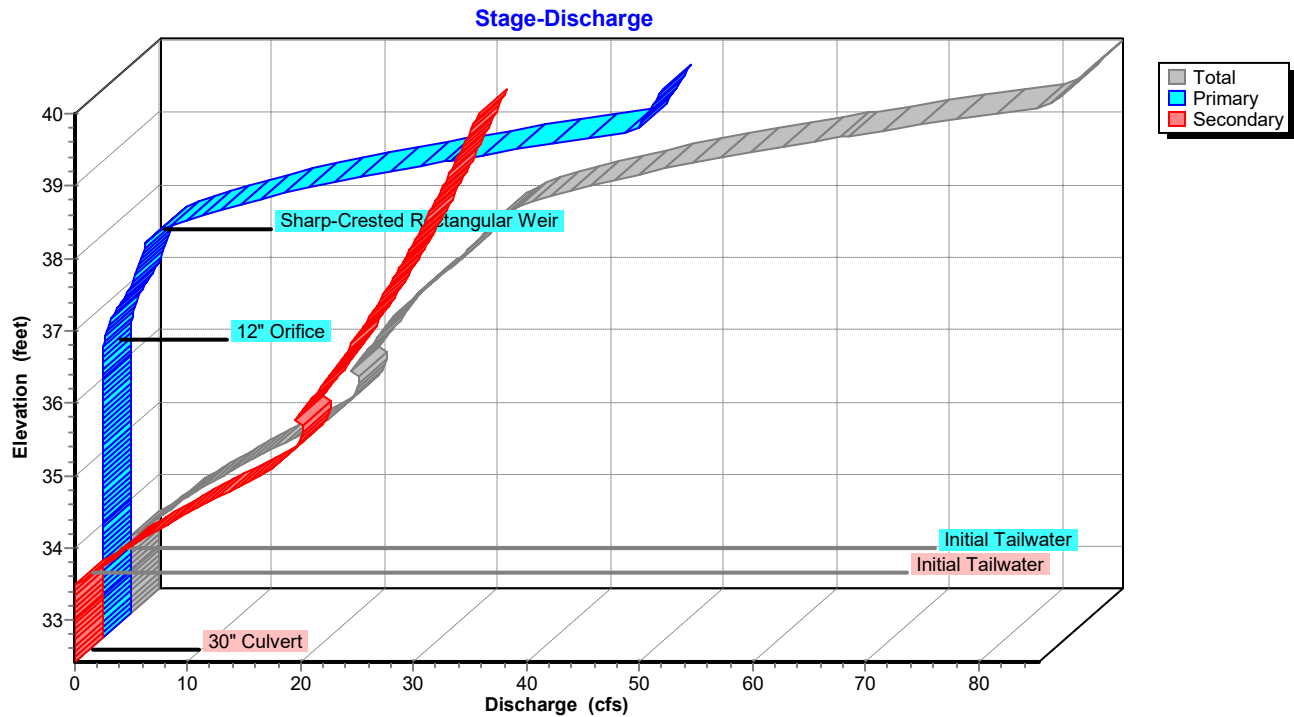
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Appendix D
NOAA 24-hr C 2-Year Rainfall=3.36"

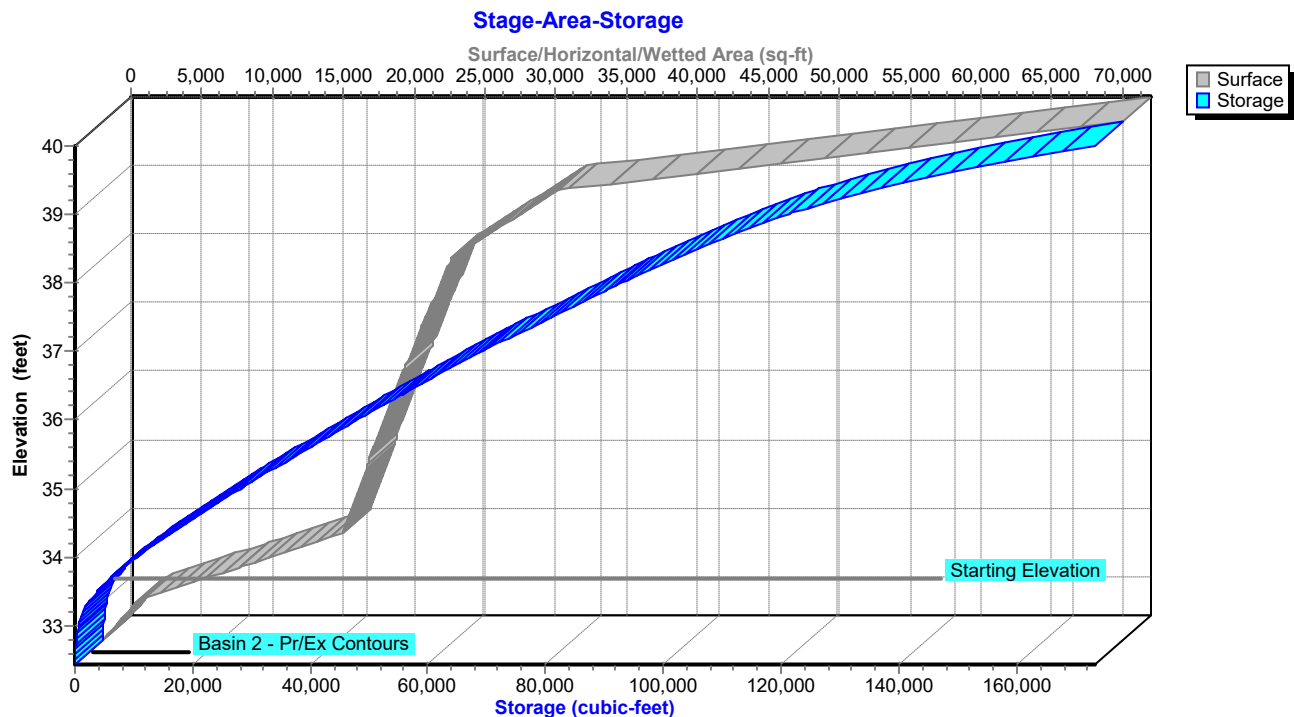
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Pond B2: Basin #2



Pond B2: Basin #2



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Summary for Pond B3: Basin #3

Inflow = 0.91 cfs @ 12.70 hrs, Volume= 0.232 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 Link TTA : TTA

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 9,568 sf Storage= 5,403 cf

Peak Elev= 34.24' @ 29.21 hrs Surf.Area= 16,115 sf Storage= 15,513 cf (10,110 cf above start)

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	31.44'	162,050 cf	Basin 3 - Pr/Ex Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.44	0	0	0
32.00	500	140	140
33.00	3,495	1,998	2,137
34.00	15,640	9,568	11,705
35.00	17,620	16,630	28,335
36.00	19,755	18,688	47,023
37.00	21,945	20,850	67,873
38.00	25,055	23,500	91,373
39.00	30,055	27,555	118,928
40.00	56,190	43,123	162,050

Device	Routing	Invert	Outlet Devices
#1	Primary	33.42'	24.0" Round 24" Culvert L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 33.42' / 33.15' S= 0.0042 ' / S= 0.0042 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	38.22'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.50' TW=0.00' (Dynamic Tailwater)↑ **1=24" Culvert** (Passes 0.00 cfs of 0.02 cfs potential flow)↑ **2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

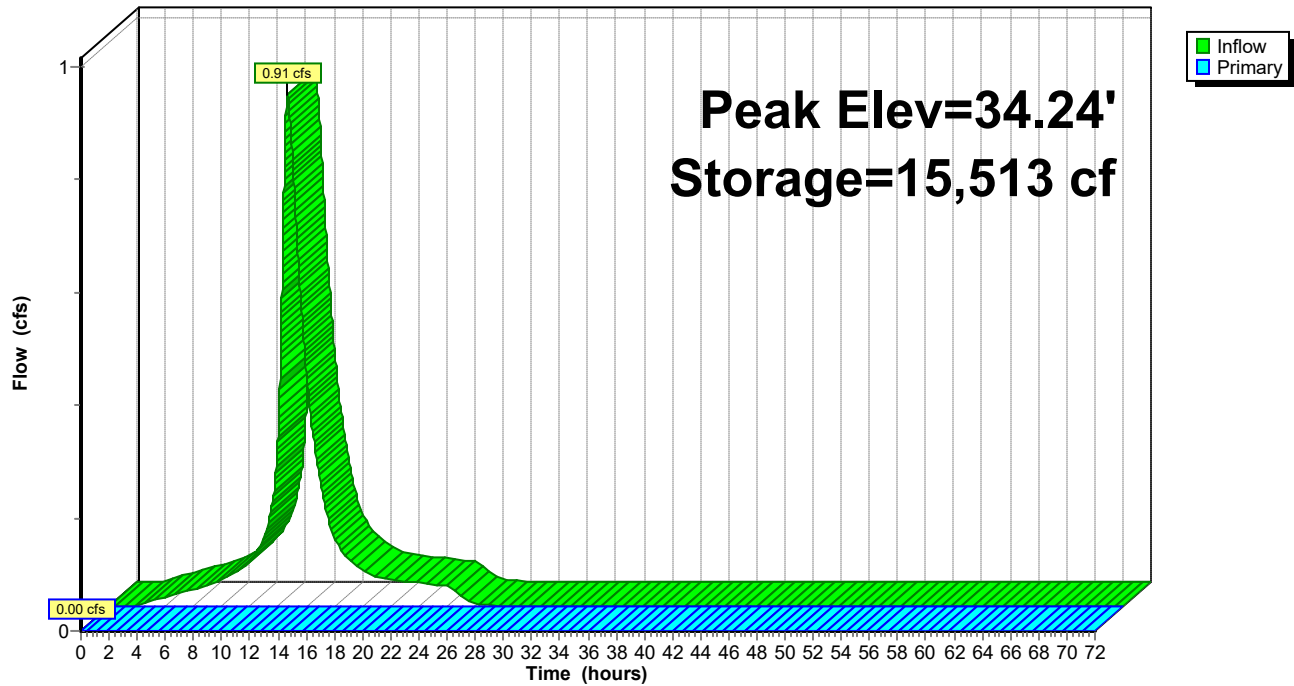
Post Developed Conditions

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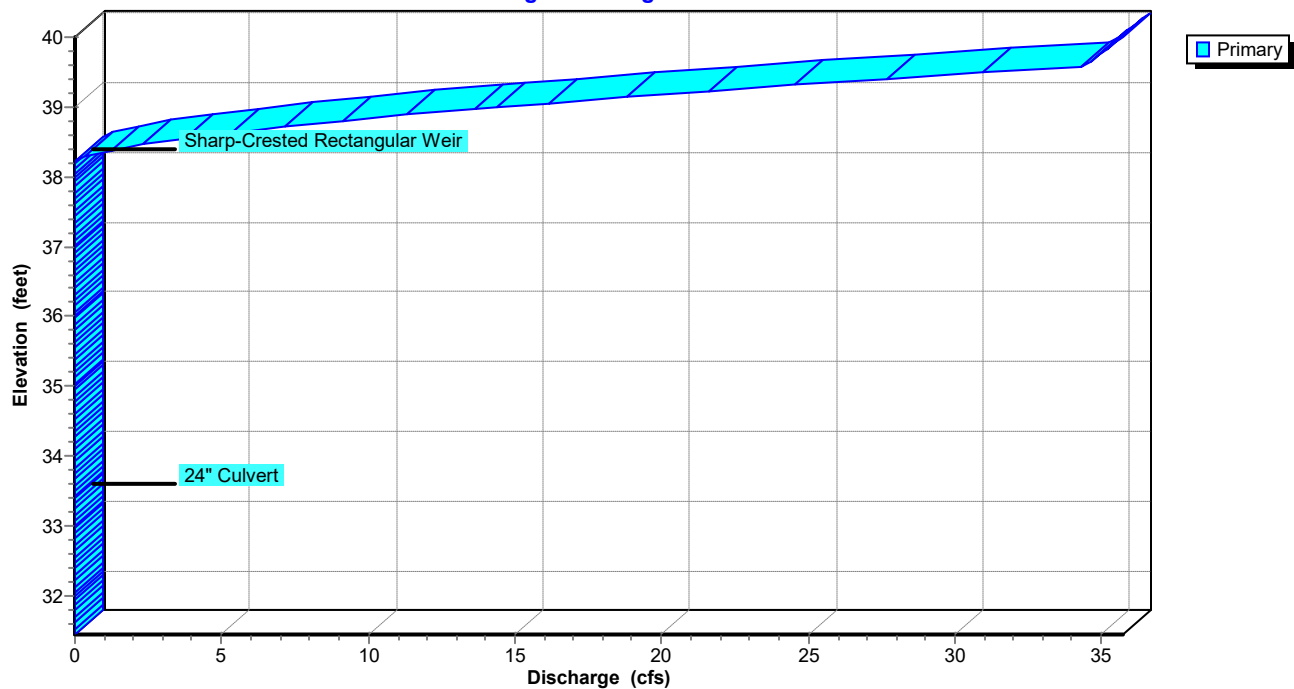
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Pond B3: Basin #3

Hydrograph

**Pond B3: Basin #3**

Stage-Discharge



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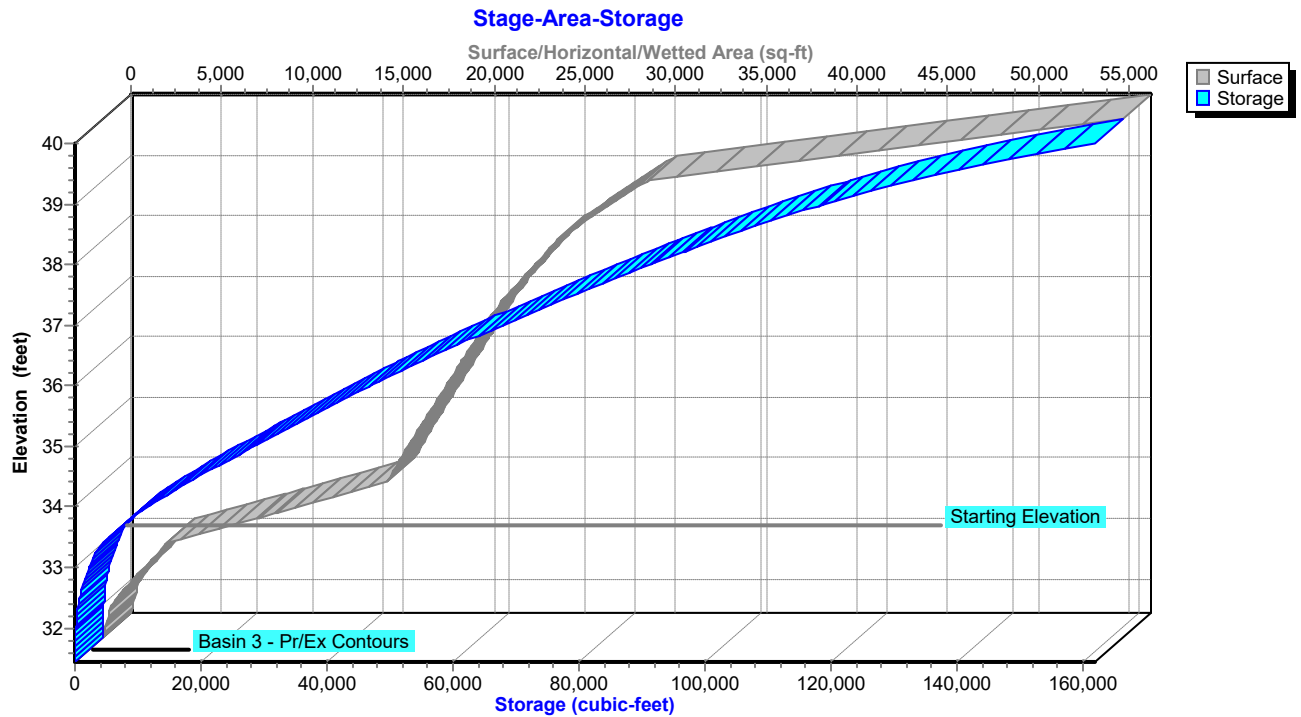
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Pond B3: Basin #3



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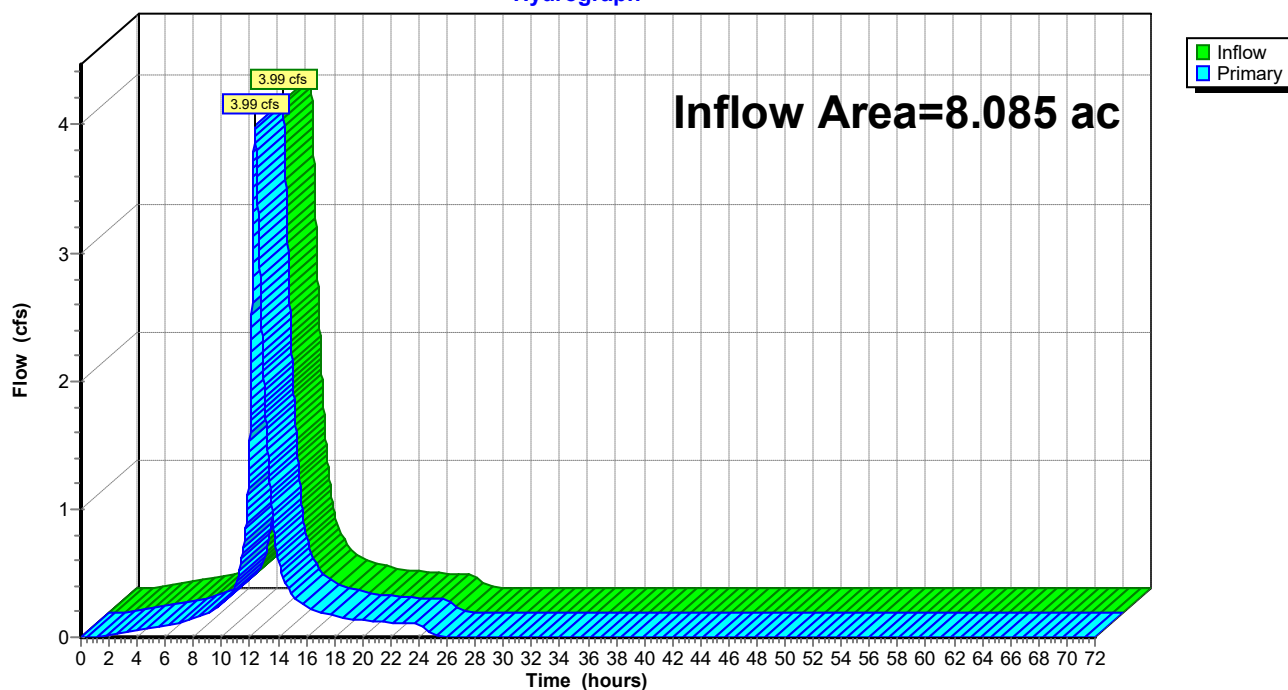
Summary for Link 1: PRDA-1

Inflow Area = 8.085 ac, 29.44% Impervious, Inflow Depth = 0.98" for 2-Year event
 Inflow = 3.99 cfs @ 12.34 hrs, Volume= 0.658 af
 Primary = 3.99 cfs @ 12.35 hrs, Volume= 0.658 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B1 : Basin #1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 1: PRDA-1

Hydrograph



Post Developed Conditions

NOAA 24-hr C 2-Year Rainfall=3.36"

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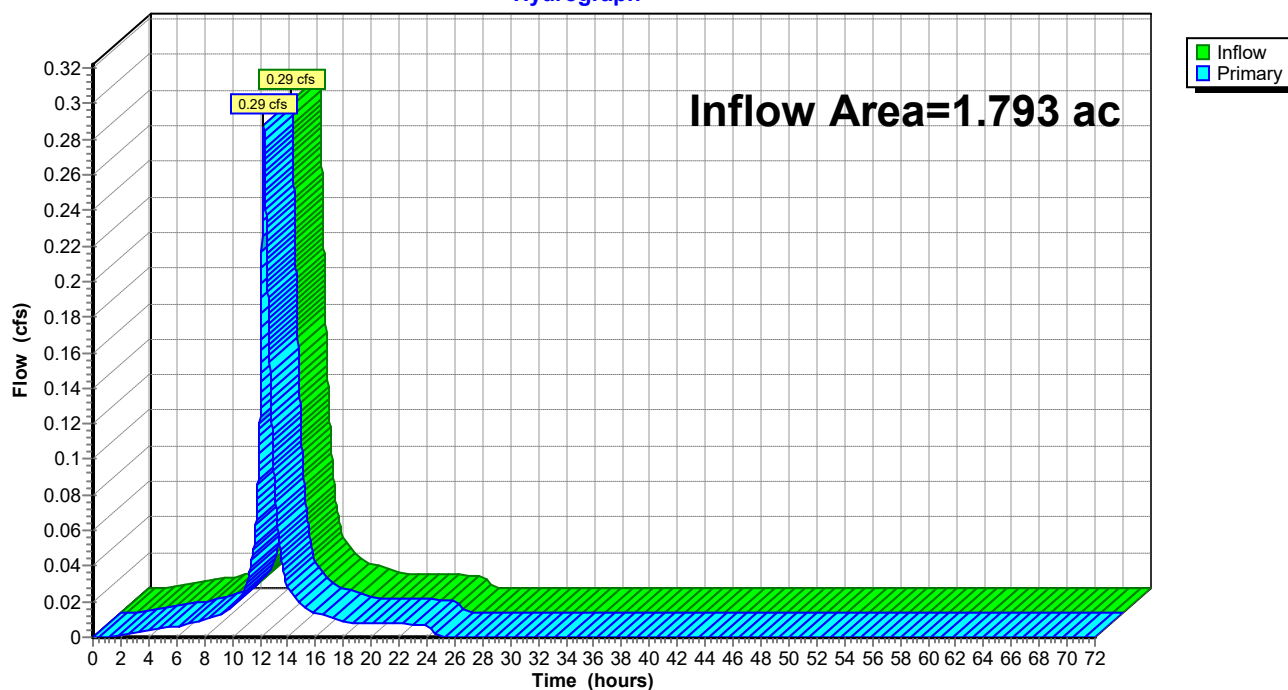
Summary for Link 2A: PRDA-2A

Inflow Area = 1.793 ac, 8.49% Impervious, Inflow Depth = 0.27" for 2-Year event
Inflow = 0.29 cfs @ 12.26 hrs, Volume= 0.040 af
Primary = 0.29 cfs @ 12.27 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2A: PRDA-2A

Hydrograph



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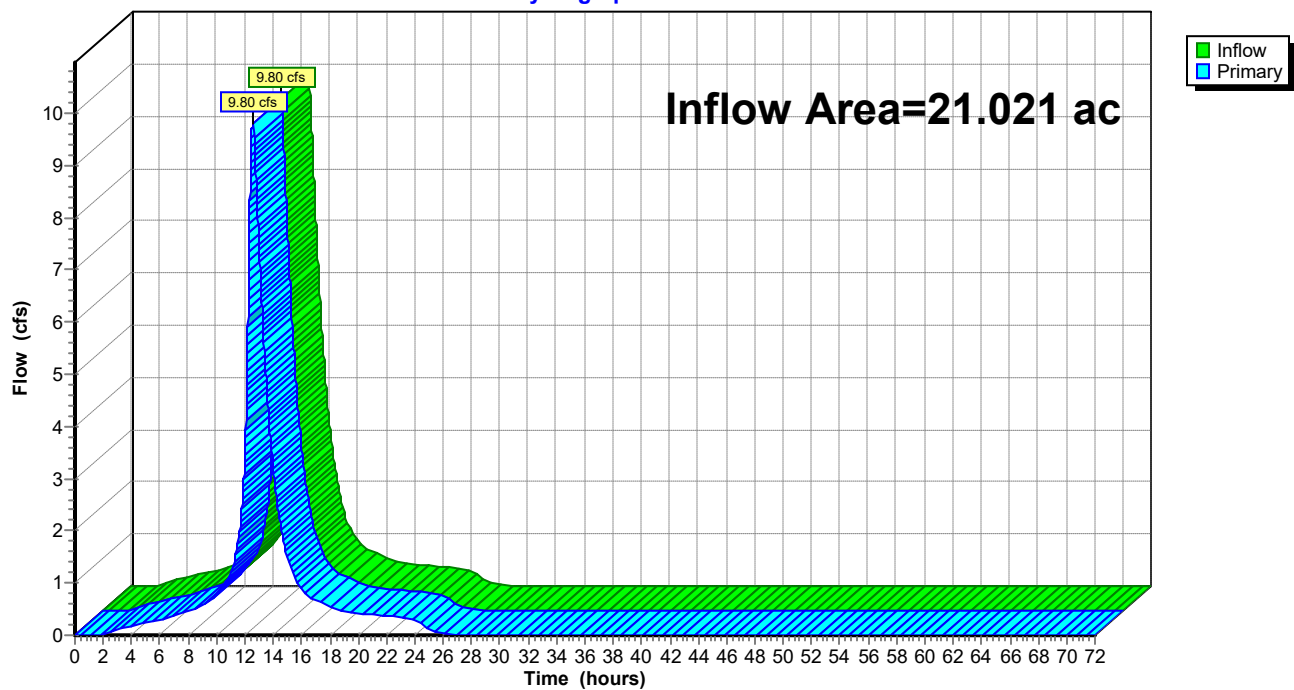
Summary for Link 2B: PRDA-2B

Inflow Area = 21.021 ac, 38.74% Impervious, Inflow Depth = 1.21" for 2-Year event
 Inflow = 9.80 cfs @ 12.55 hrs, Volume= 2.125 af
 Primary = 9.80 cfs @ 12.56 hrs, Volume= 2.125 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2B: PRDA-2B

Hydrograph



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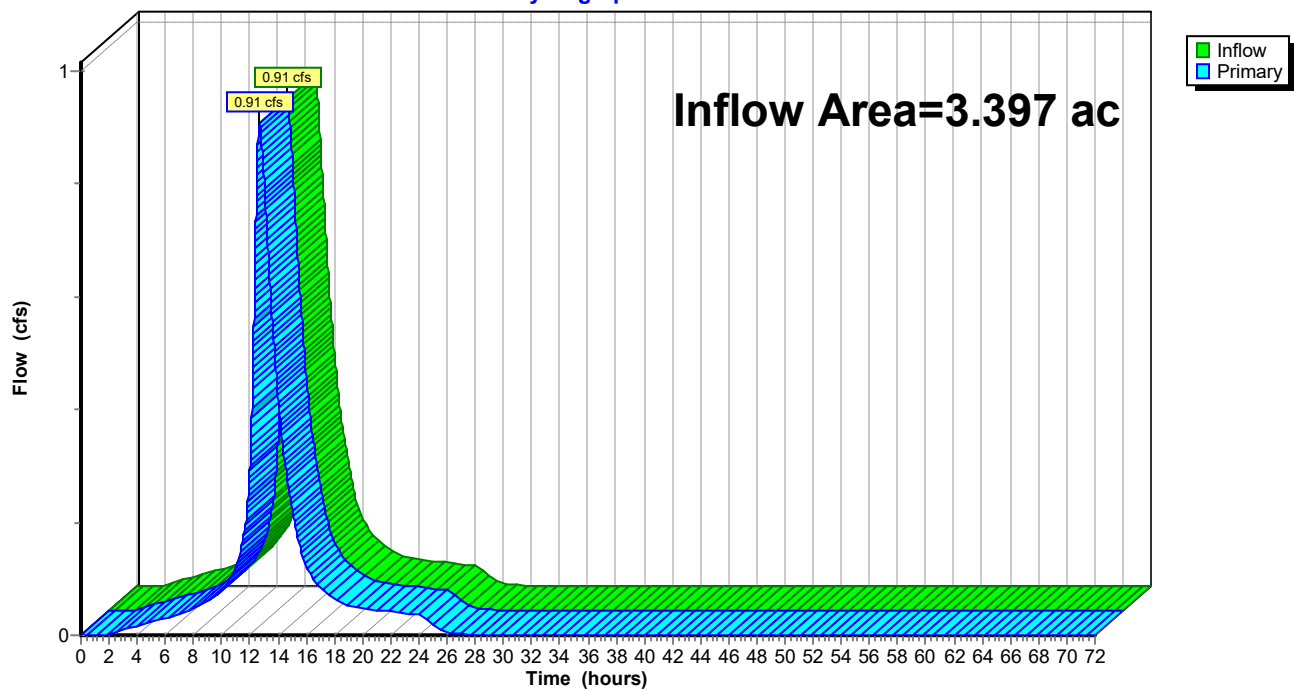
Summary for Link 3: PRDA-3

Inflow Area = 3.397 ac, 26.15% Impervious, Inflow Depth = 0.82" for 2-Year event
 Inflow = 0.91 cfs @ 12.69 hrs, Volume= 0.232 af
 Primary = 0.91 cfs @ 12.70 hrs, Volume= 0.232 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B3 : Basin #3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3: PRDA-3

Hydrograph



Post Developed Conditions

NOAA 24-hr C 2-Year Rainfall=3.36"

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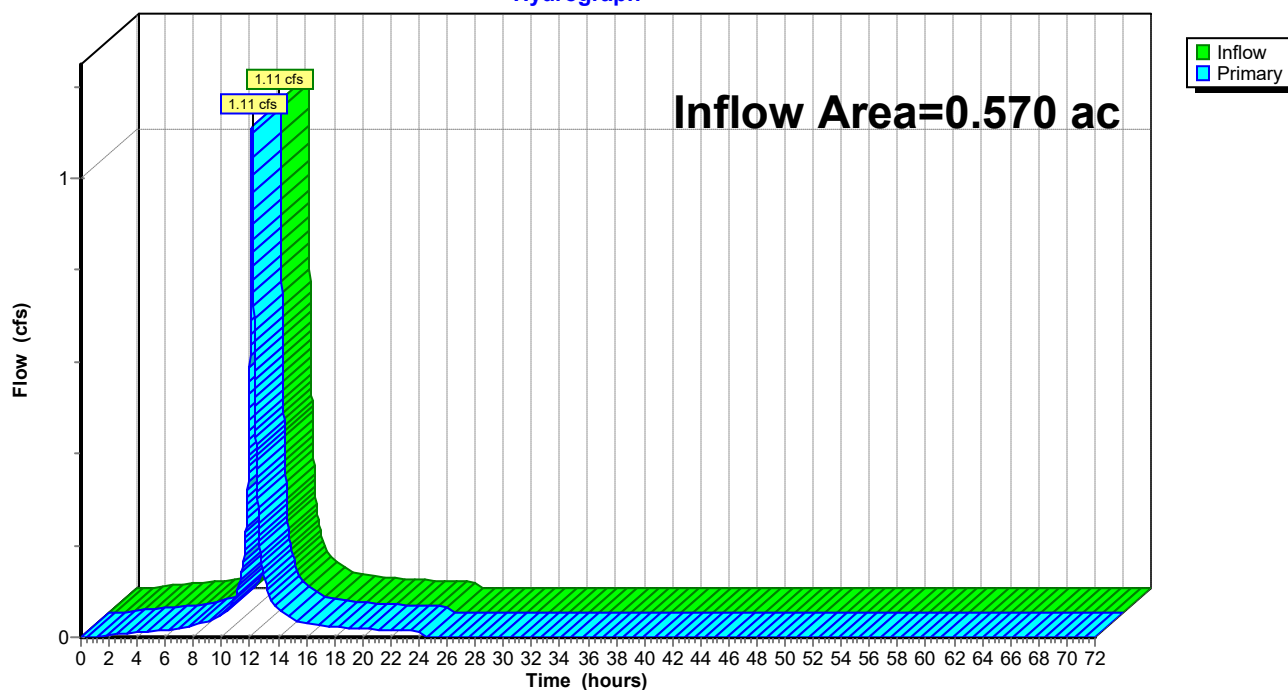
Summary for Link 4: PRDA-4

Inflow Area = 0.570 ac, 67.40% Impervious, Inflow Depth = 2.11" for 2-Year event
Inflow = 1.11 cfs @ 12.14 hrs, Volume= 0.100 af
Primary = 1.11 cfs @ 12.15 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.6 min
Routed to Link TTA : TTA

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 4: PRDA-4

Hydrograph



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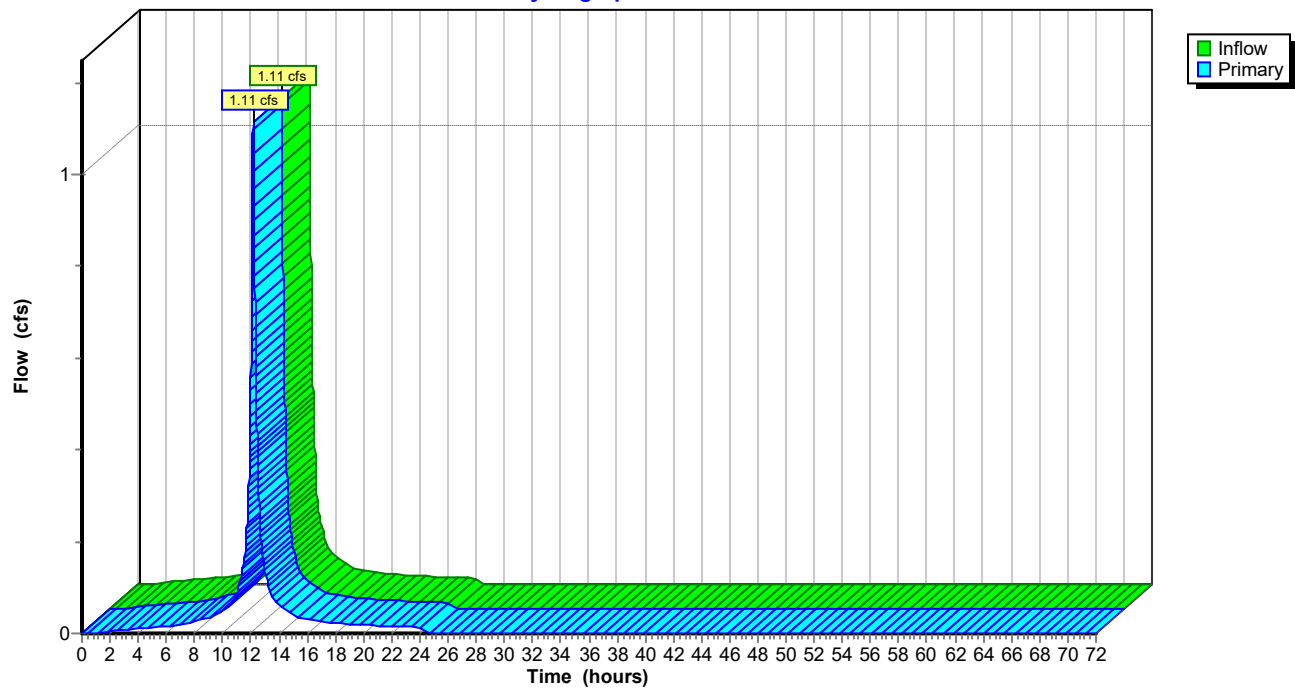
Summary for Link TTA: TTA

Inflow = 1.11 cfs @ 12.15 hrs, Volume= 0.100 af
Primary = 1.11 cfs @ 12.16 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.6 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link TTA: TTA

Hydrograph



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Appendix D
NOAA 24-hr C 10-Year Rainfall=5.18"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1i: PRDA-1i	Runoff Area=122,285 sf 84.80% Impervious Runoff Depth=4.55" Flow Length=275' Tc=22.2 min CN=WQ Runoff=6.41 cfs 1.064 af
Subcatchment 1p: PRDA-1p	Runoff Area=229,900 sf 0.00% Impervious Runoff Depth=0.19" Flow Length=275' Tc=22.2 min CN=WQ Runoff=0.17 cfs 0.082 af
Subcatchment 2Ai: PRDA-2Ai	Runoff Area=6,630 sf 100.00% Impervious Runoff Depth=4.94" Flow Length=267' Tc=15.9 min CN=98 Runoff=0.45 cfs 0.063 af
Subcatchment 2Ap: PRDA-2Ap	Runoff Area=71,475 sf 0.00% Impervious Runoff Depth=0.20" Flow Length=267' Tc=15.9 min CN=WQ Runoff=0.06 cfs 0.028 af
Subcatchment 2Bi: PRDA-2Bi	Runoff Area=354,705 sf 100.00% Impervious Runoff Depth=4.94" Flow Length=1,831' Tc=36.2 min CN=98 Runoff=15.24 cfs 3.354 af
Subcatchment 2Bp: PRDA-2Bp	Runoff Area=560,985 sf 0.00% Impervious Runoff Depth=0.24" Flow Length=1,831' Tc=36.2 min CN=39 Runoff=0.46 cfs 0.255 af
Subcatchment 3i: PRDA-3i	Runoff Area=38,695 sf 100.00% Impervious Runoff Depth=4.94" Flow Length=328' Tc=47.6 min CN=98 Runoff=1.41 cfs 0.366 af
Subcatchment 3p: PRDA-3p	Runoff Area=109,285 sf 0.00% Impervious Runoff Depth=0.22" Flow Length=328' Tc=47.6 min CN=WQ Runoff=0.07 cfs 0.046 af
Subcatchment 4i: PRDA-4i	Runoff Area=16,740 sf 100.00% Impervious Runoff Depth=4.94" Tc=6.0 min CN=98 Runoff=1.73 cfs 0.158 af
Subcatchment 4p: PRDA-4p	Runoff Area=8,095 sf 0.00% Impervious Runoff Depth=0.19" Tc=6.0 min CN=WQ Runoff=0.01 cfs 0.003 af
Pond B1: Basin #1	Peak Elev=36.93' Storage=117,897 cf Inflow=12.50 cfs 3.118 af 30.0" Round Culvert n=0.013 L=625.0' S=-0.0015 '/' Outflow=0.52 cfs 0.641 af
Pond B2: Basin #2	Peak Elev=36.93' Storage=67,878 cf Inflow=15.68 cfs 4.341 af Primary=1.16 cfs 0.943 af Secondary=7.49 cfs 1.972 af Outflow=7.49 cfs 2.915 af
Pond B3: Basin #3	Peak Elev=36.84' Storage=64,446 cf Inflow=1.43 cfs 1.355 af Outflow=0.00 cfs 0.000 af
Link 1: PRDA-1	Inflow=6.42 cfs 1.146 af Primary=6.42 cfs 1.146 af
Link 2A: PRDA-2A	Inflow=0.45 cfs 0.090 af Primary=0.45 cfs 0.090 af
Link 2B: PRDA-2B	Inflow=15.33 cfs 3.609 af Primary=15.33 cfs 3.609 af

Post Developed Conditions

NOAA 24-hr C 10-Year Rainfall=5.18"

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Link 3: PRDA-3Inflow=1.43 cfs 0.412 af
Primary=1.43 cfs 0.412 af**Link 4: PRDA-4**Inflow=1.73 cfs 0.161 af
Primary=1.73 cfs 0.161 af**Link TTA: TTA**Inflow=1.73 cfs 0.161 af
Primary=1.73 cfs 0.161 af**Total Runoff Area = 34.867 ac Runoff Volume = 5.419 af Average Runoff Depth = 1.87"**
65.73% Pervious = 22.918 ac 34.27% Impervious = 11.948 ac

Post Developed Conditions

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Summary for Subcatchment 1i: PRDA-1i

Runoff = 6.41 cfs @ 12.34 hrs, Volume= 1.064 af, Depth= 4.55"
 Routed to Link 1 : PRDA-1

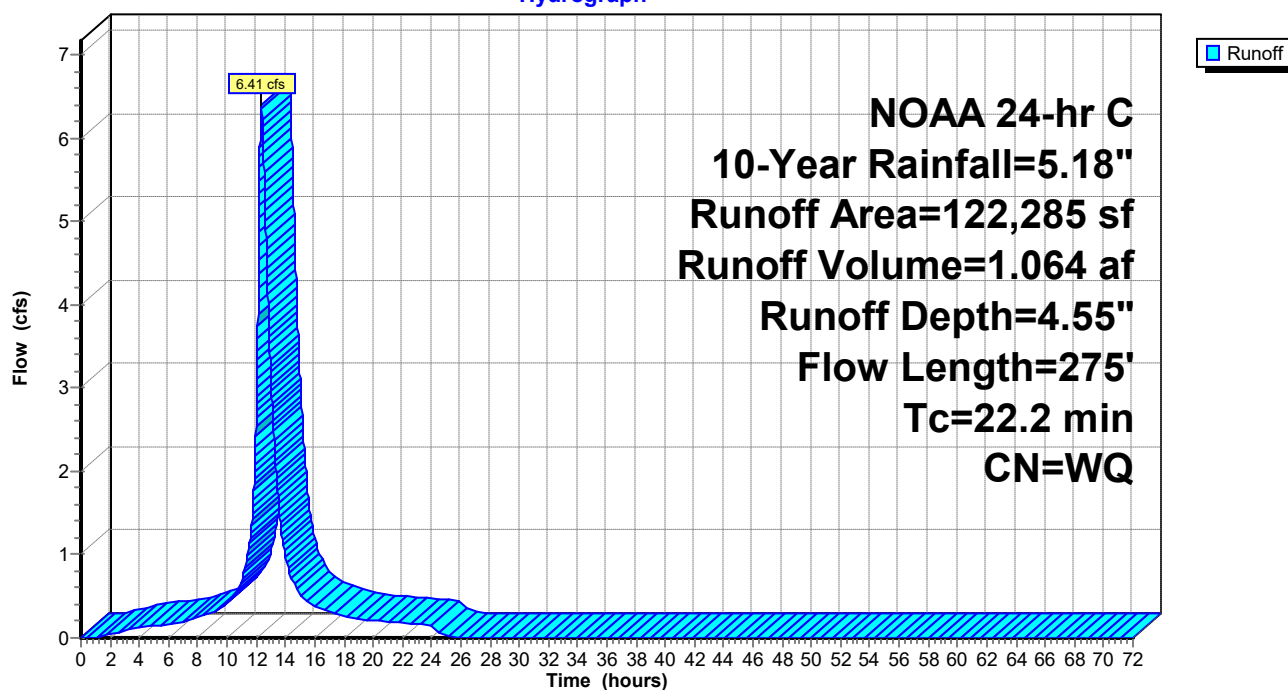
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
103,700	98	Paved parking, HSG A
18,585	72	Dirt roads, HSG A
122,285		Weighted Average
18,585	72	15.20% Pervious Area
103,700	98	84.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment PRDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment PRDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1i: PRDA-1i

Hydrograph



Post Developed Conditions

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Summary for Subcatchment 1p: PRDA-1p

Runoff = 0.17 cfs @ 13.27 hrs, Volume= 0.082 af, Depth= 0.19"
 Routed to Link 1 : PRDA-1

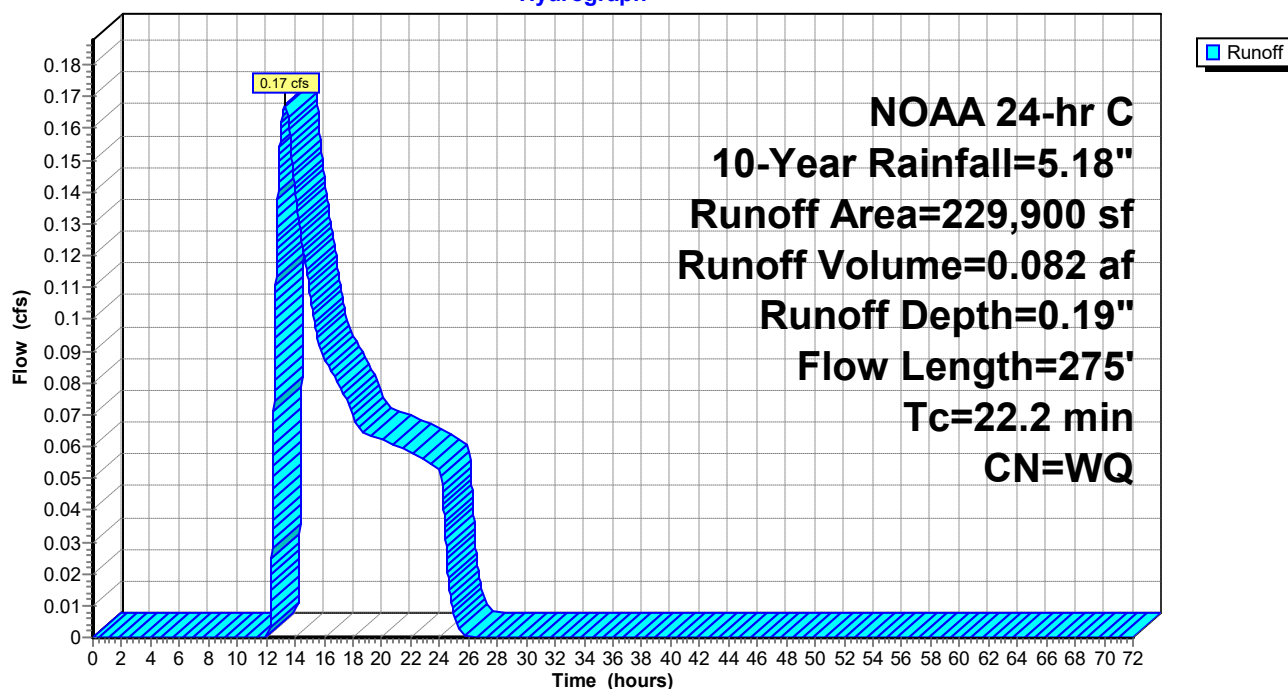
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
178,350	39	>75% Grass cover, Good, HSG A
51,550	30	Woods, Good, HSG A
229,900		Weighted Average
229,900	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment PRDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment PRDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1p: PRDA-1p

Hydrograph



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Summary for Subcatchment 2Ai: PRDA-2Ai

Runoff = 0.45 cfs @ 12.26 hrs, Volume= 0.063 af, Depth= 4.94"
 Routed to Link 2A : PRDA-2A

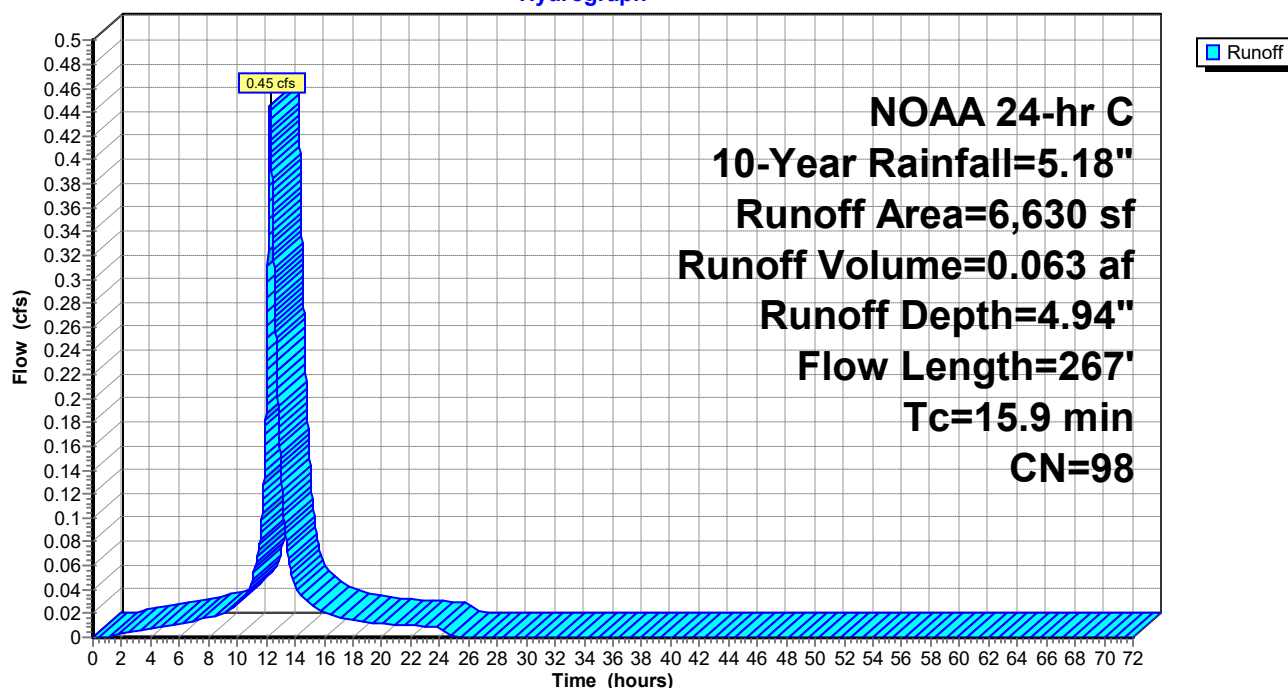
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
6,630	98	Paved parking, HSG A
6,630	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment PRDA-2A.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment PRDA-2A.2
					Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ai: PRDA-2Ai

Hydrograph



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NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 2Ap: PRDA-2Ap

Runoff = 0.06 cfs @ 13.07 hrs, Volume= 0.028 af, Depth= 0.20"
 Routed to Link 2A : PRDA-2A

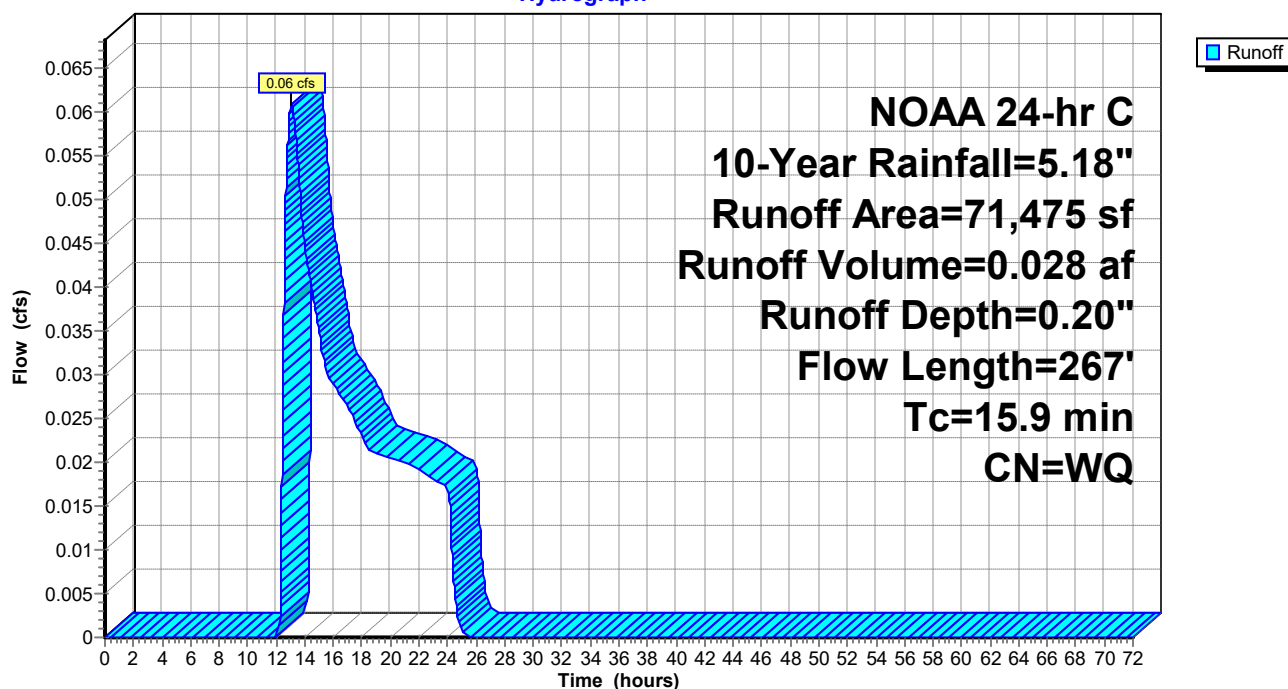
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
59,900	39	>75% Grass cover, Good, HSG A
11,575	30	Woods, Good, HSG A
71,475		Weighted Average
71,475	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment PRDA-2A.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment PRDA-2A.2
					Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ap: PRDA-2Ap

Hydrograph



Post Developed Conditions

NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 2Bi: PRDA-2Bi

Runoff = 15.24 cfs @ 12.55 hrs, Volume= 3.354 af, Depth= 4.94"
 Routed to Link 2B : PRDA-2B

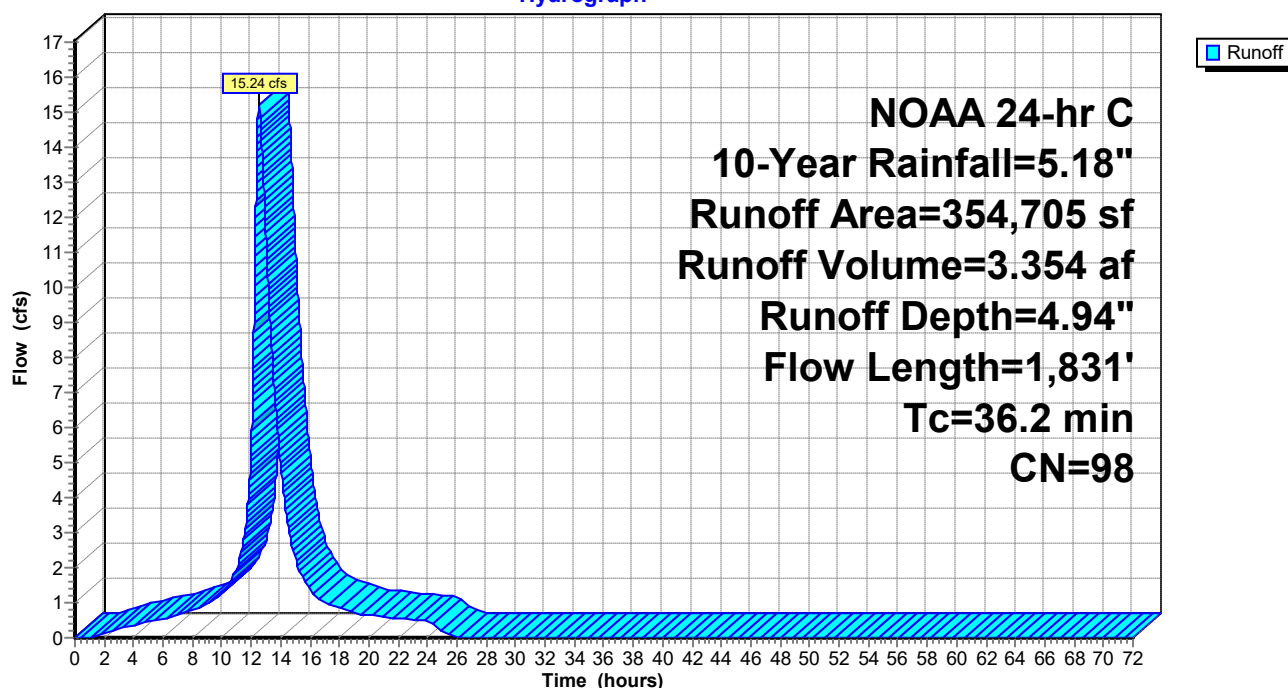
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
354,705	98	Paved parking, HSG A
354,705	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment PRDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment PRDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment PRDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment PRDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bi: PRDA-2Bi

Hydrograph



Post Developed Conditions

NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 2Bp: PRDA-2Bp

Runoff = 0.46 cfs @ 13.67 hrs, Volume= 0.255 af, Depth= 0.24"
 Routed to Link 2B : PRDA-2B

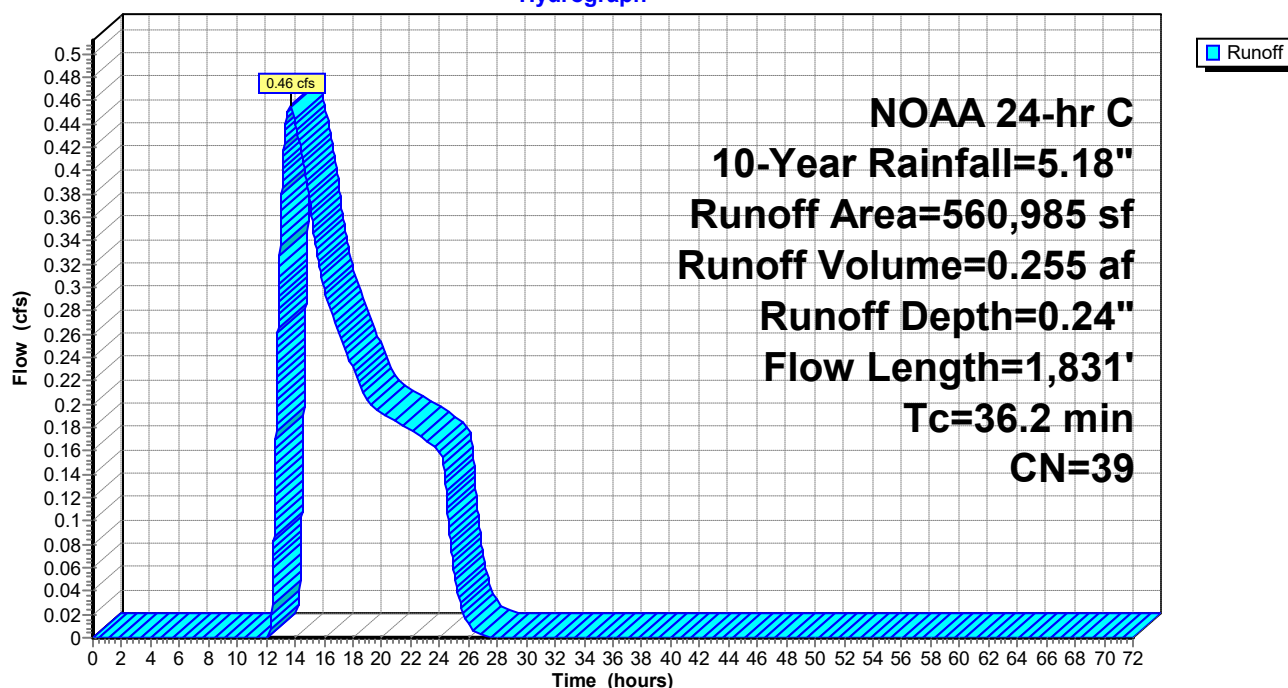
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
560,985	39	>75% Grass cover, Good, HSG A
560,985	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment PRDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment PRDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment PRDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment PRDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bp: PRDA-2Bp

Hydrograph



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NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 3i: PRDA-3i

Runoff = 1.41 cfs @ 12.69 hrs, Volume= 0.366 af, Depth= 4.94"
 Routed to Link 3 : PRDA-3

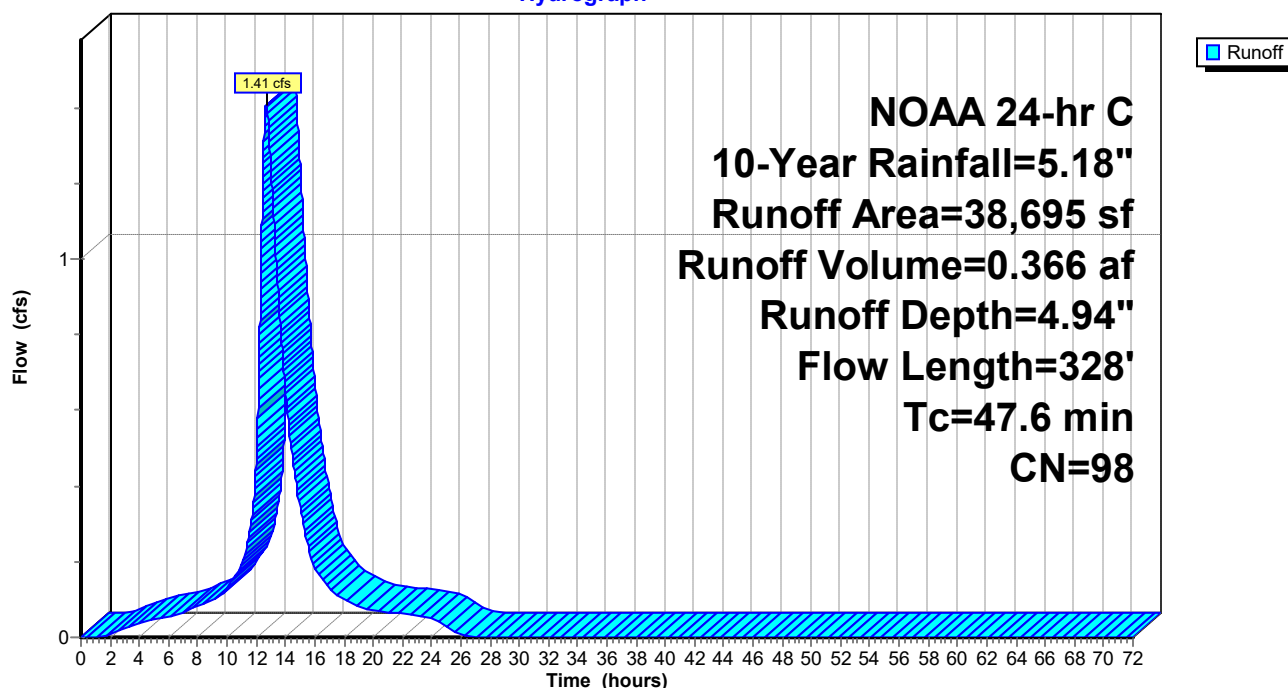
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
38,695	98	Paved parking, HSG A
38,695	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment PRDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment PRDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3i: PRDA-3i

Hydrograph



Post Developed Conditions

NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 3p: PRDA-3p

Runoff = 0.07 cfs @ 13.96 hrs, Volume= 0.046 af, Depth= 0.22"
 Routed to Link 3 : PRDA-3

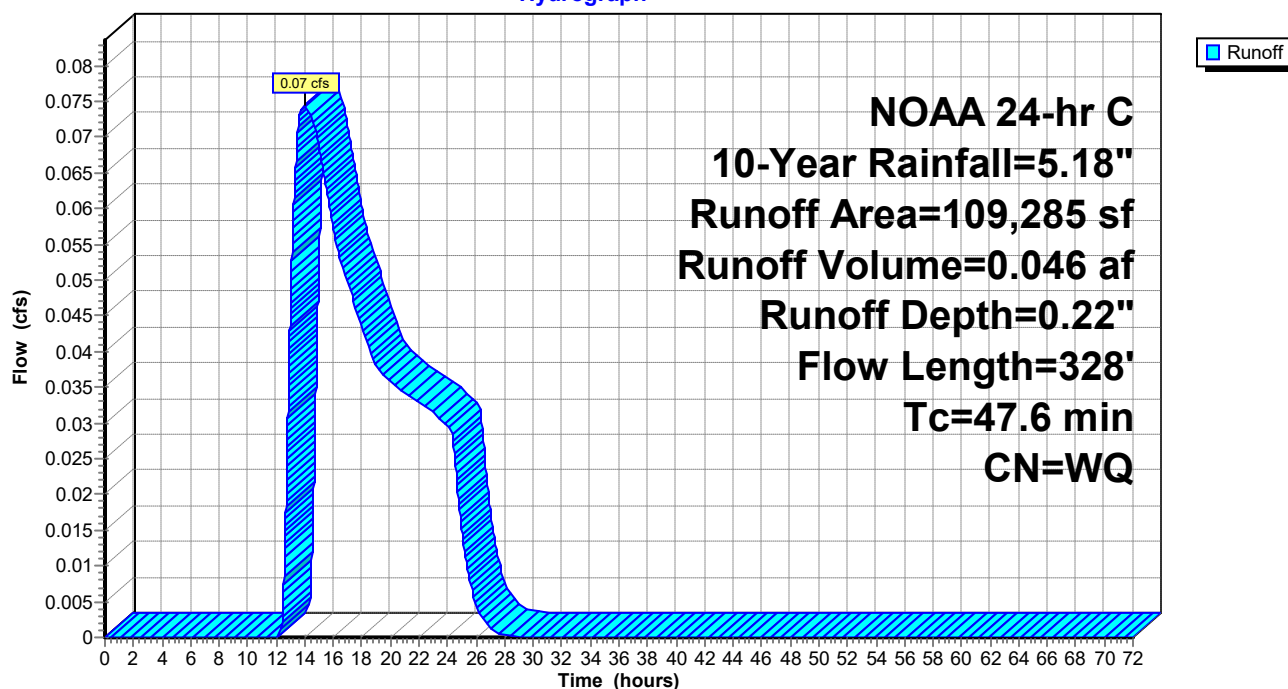
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
101,135	39	>75% Grass cover, Good, HSG A
8,150	30	Woods, Good, HSG A
109,285		Weighted Average
109,285	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment PRDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment PRDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3p: PRDA-3p

Hydrograph



Post Developed Conditions

NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Subcatchment 4i: PRDA-4i

Runoff = 1.73 cfs @ 12.14 hrs, Volume= 0.158 af, Depth= 4.94"
 Routed to Link 4 : PRDA-4

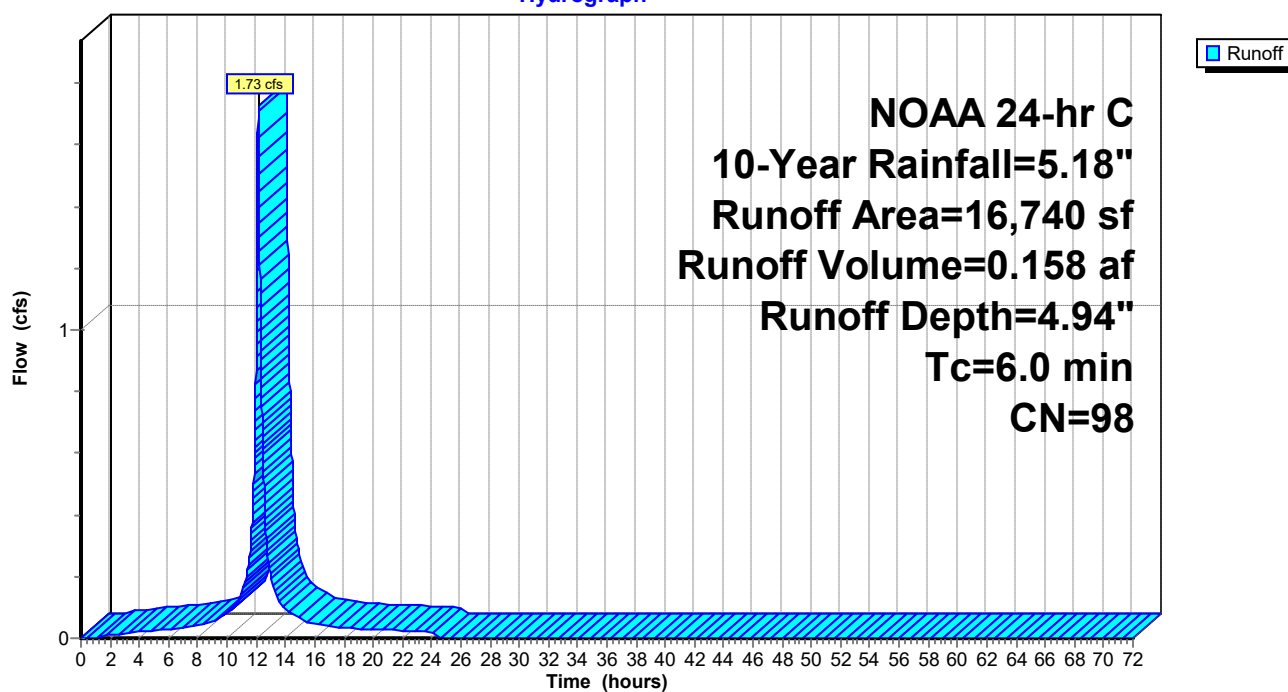
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
16,740	98	Paved parking, HSG A
16,740	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment PRDA-4.1

Subcatchment 4i: PRDA-4i

Hydrograph



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Summary for Subcatchment 4p: PRDA-4p

Runoff = 0.01 cfs @ 12.55 hrs, Volume= 0.003 af, Depth= 0.19"
 Routed to Link 4 : PRDA-4

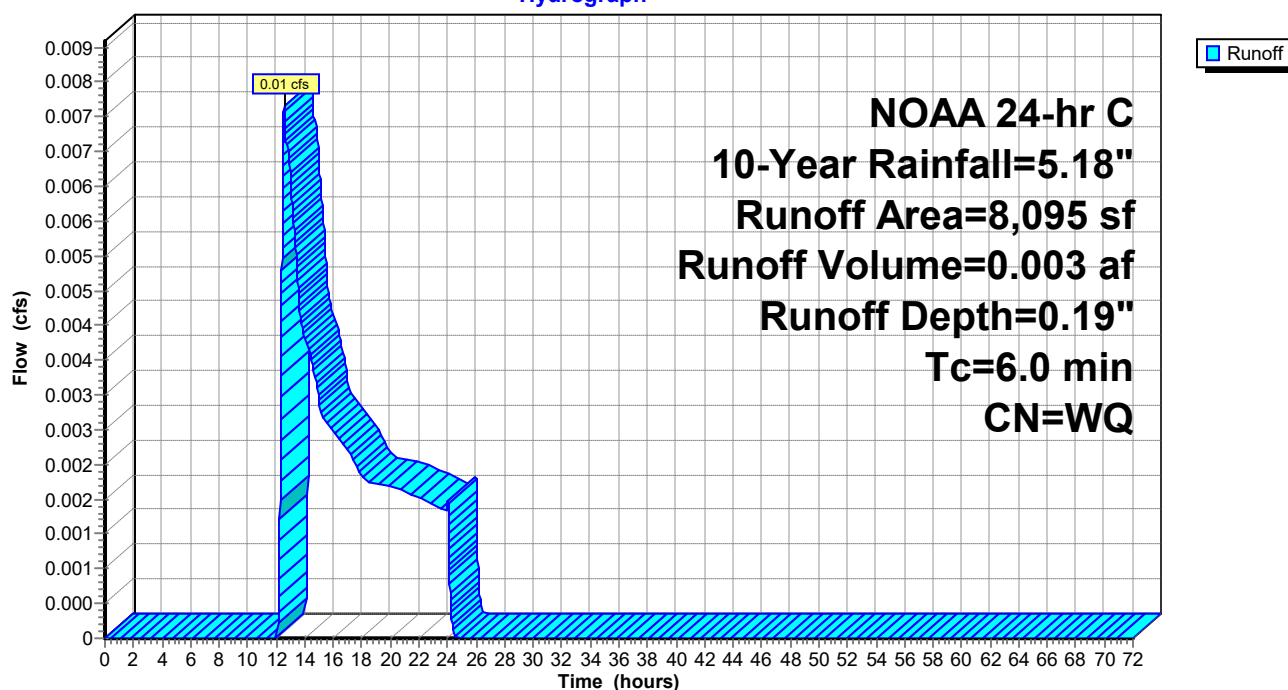
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 10-Year Rainfall=5.18"

Area (sf)	CN	Description
6,330	39	>75% Grass cover, Good, HSG A
1,765	30	Woods, Good, HSG A
8,095		Weighted Average
8,095	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment PRDA-4.1

Subcatchment 4p: PRDA-4p

Hydrograph



Post Developed Conditions

NOAA 24-hr C 10-Year Rainfall=5.18"

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Summary for Pond B1: Basin #1

Inflow = 12.50 cfs @ 12.59 hrs, Volume= 3.118 af
 Outflow = 0.52 cfs @ 17.43 hrs, Volume= 0.641 af, Atten= 96%, Lag= 290.1 min
 Primary = 0.52 cfs @ 17.43 hrs, Volume= 0.641 af
 Routed to Pond B2 : Basin #2

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 16,675 sf Storage= 6,588 cf

Peak Elev= 36.93' @ 19.74 hrs Surf.Area= 37,679 sf Storage= 117,897 cf (111,309 cf above start)

Plug-Flow detention time= 2,158.6 min calculated for 0.490 af (16% of inflow)

Center-of-Mass det. time= 1,252.2 min (2,293.0 - 1,040.8)

Volume	Invert	Avail.Storage	Storage Description
#1	31.50'	265,835 cf	Basin 1 - Pr/Ex Contours (Prismatic) Listed below (Recalc)
#2	38.40'	7,196 cf	Low Area - Existing Contours (Prismatic) Listed below (Recalc)
		273,031 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.50	0	0	0
32.00	270	68	68
33.00	2,955	1,613	1,680
34.00	30,395	16,675	18,355
35.00	32,725	31,560	49,915
36.00	35,215	33,970	83,885
37.00	37,855	36,535	120,420
38.00	41,075	39,465	159,885
39.00	49,965	45,520	205,405
40.00	70,895	60,430	265,835

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
38.40	10	0	0
39.00	1,050	318	318
40.00	12,705	6,878	7,196

Device	Routing	Invert	Outlet Devices
#1	Primary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.50' / 32.43' S= -0.0015 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=0.33 cfs @ 17.43 hrs HW=36.91' TW=36.90' (Dynamic Tailwater)↑**1=30" Culvert** (Outlet Controls 0.33 cfs @ 0.07 fps)

Post Developed Conditions

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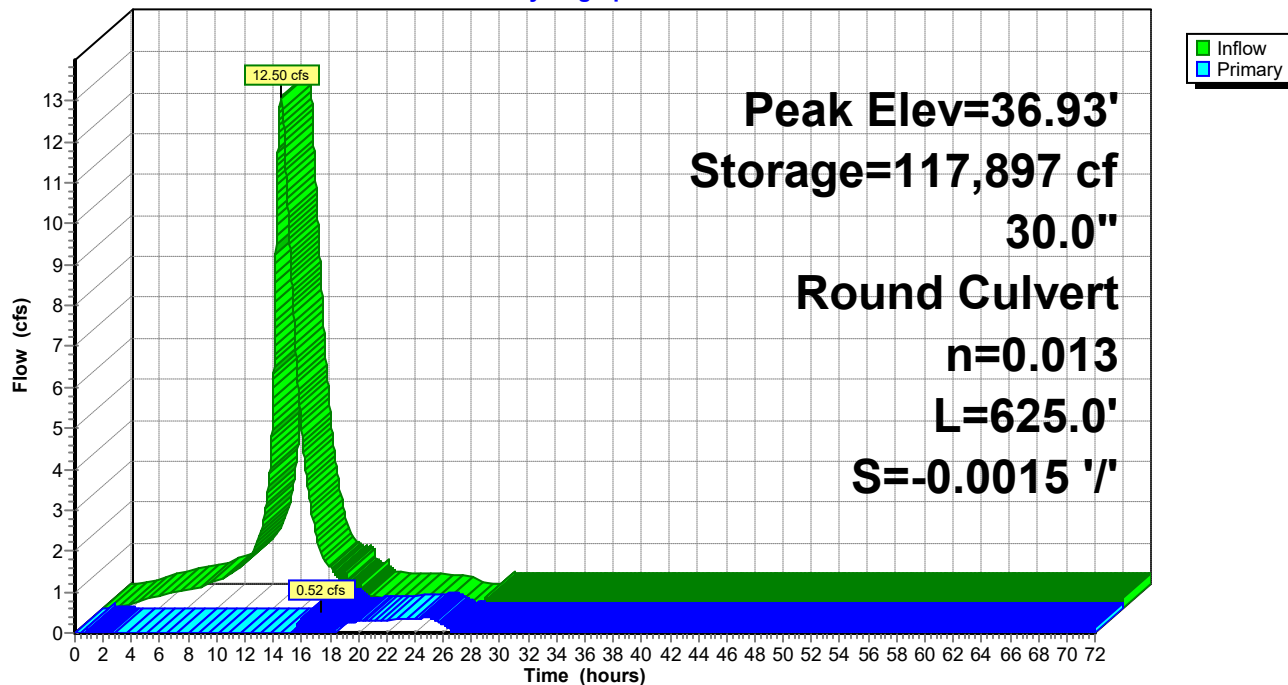
NOAA 24-hr C 10-Year Rainfall=5.18"

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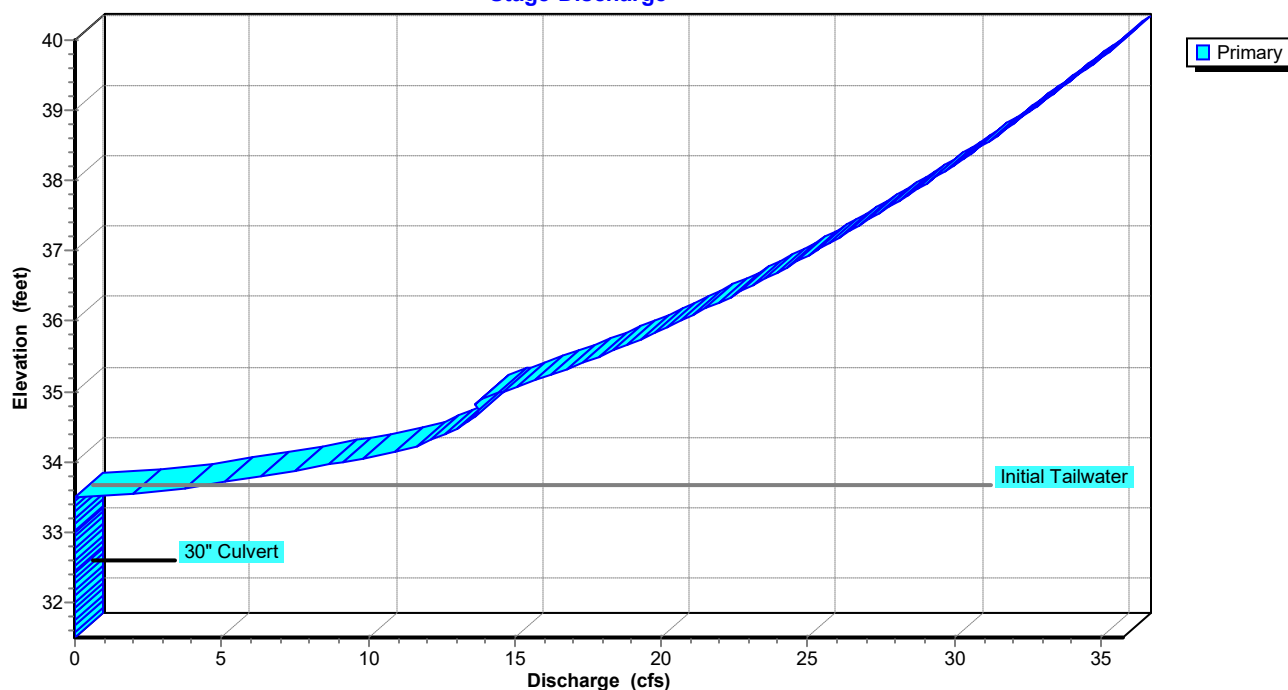
Pond B1: Basin #1

Hydrograph



Pond B1: Basin #1

Stage-Discharge



Post Developed Conditions

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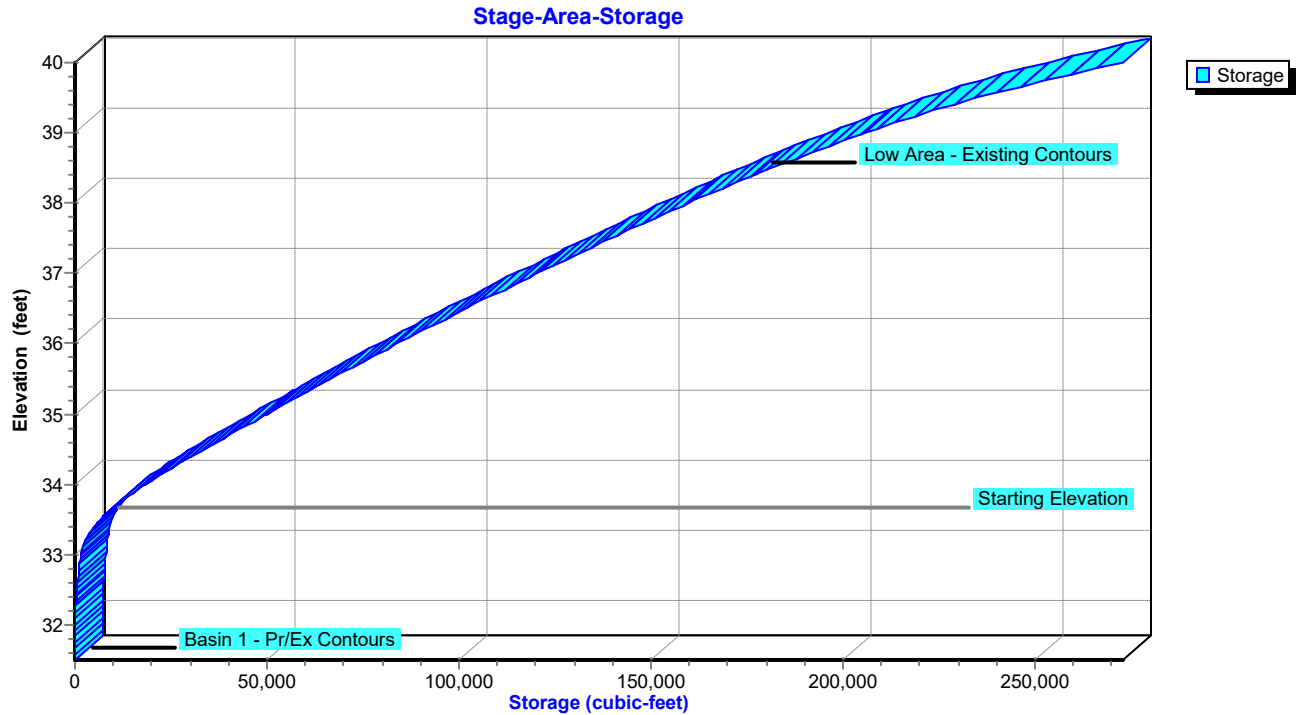
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Appendix D
NOAA 24-hr C 10-Year Rainfall=5.18"

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Pond B1: Basin #1



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Summary for Pond B2: Basin #2

Inflow = 15.68 cfs @ 12.56 hrs, Volume= 4.341 af
 Outflow = 7.49 cfs @ 12.73 hrs, Volume= 2.915 af, Atten= 52%, Lag= 10.4 min
 Primary = 1.16 cfs @ 19.71 hrs, Volume= 0.943 af
 Routed to Pond B3 : Basin #3
 Secondary = 7.49 cfs @ 12.73 hrs, Volume= 1.972 af
 Routed to Pond B1 : Basin #1

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 9,728 sf Storage= 3,769 cf

Peak Elev= 36.93' @ 19.71 hrs Surf.Area= 22,340 sf Storage= 67,878 cf (64,108 cf above start)

Plug-Flow detention time= 502.0 min calculated for 2.828 af (65% of inflow)

Center-of-Mass det. time= 158.8 min (1,194.6 - 1,035.8)

Volume	Invert	Avail.Storage	Storage Description
#1	32.43'	173,433 cf	Basin 2 - Pr/Ex Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
32.43	0	0	0
33.00	2,500	713	713
34.00	16,955	9,728	10,440
35.00	18,700	17,828	28,268
36.00	20,530	19,615	47,883
37.00	22,470	21,500	69,383
38.00	24,590	23,530	92,913
39.00	32,225	28,408	121,320
40.00	72,000	52,113	173,433

Device	Routing	Invert	Outlet Devices
#1	Primary	32.35'	30.0" Round 30" Culvert L= 253.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.35' / 31.41' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	36.37'	12.0" Vert. 12" Orifice C= 0.600 Limited to weir flow at low heads 6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	37.90'	
#4	Secondary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.43' / 31.50' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

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Primary OutFlow Max=1.16 cfs @ 19.71 hrs HW=36.93' TW=35.58' (Dynamic Tailwater)

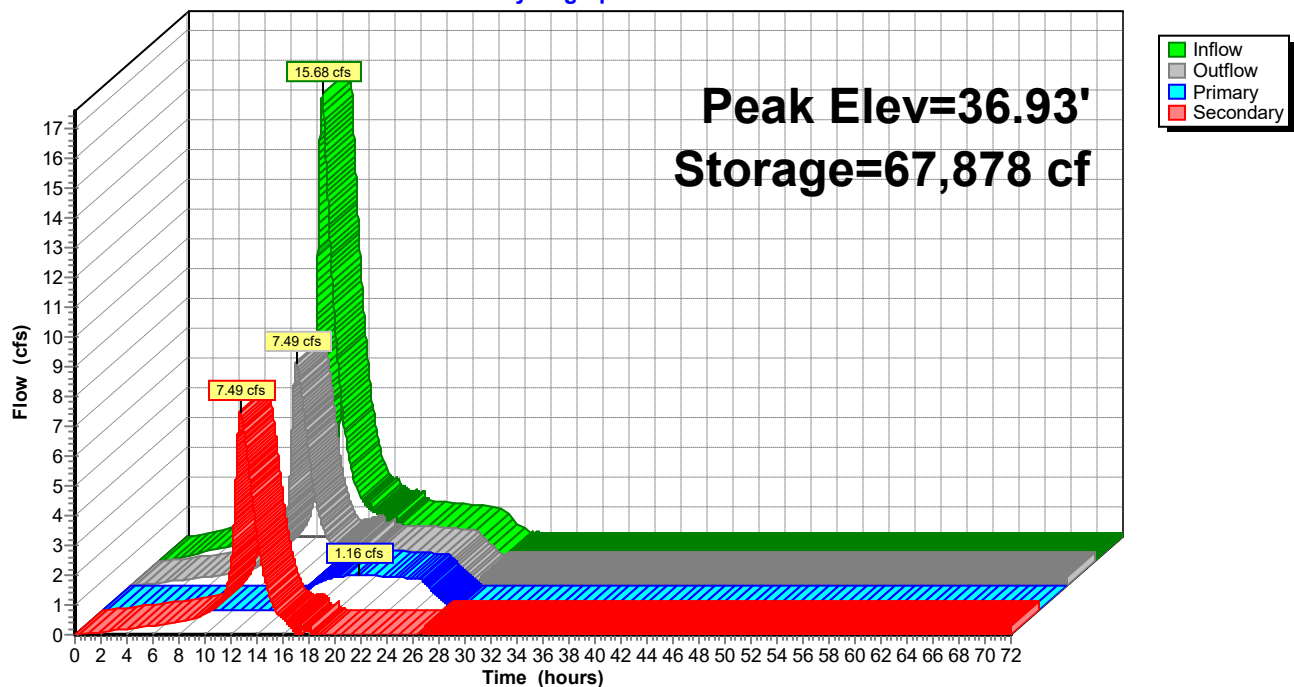
1=30" Culvert (Passes 1.16 cfs of 23.39 cfs potential flow)

2=12" Orifice (Orifice Controls 1.16 cfs @ 2.55 fps)

3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=7.28 cfs @ 12.73 hrs HW=35.59' TW=35.37' (Dynamic Tailwater)

4=30" Culvert (Outlet Controls 7.28 cfs @ 1.51 fps)

Pond B2: Basin #2**Hydrograph**

Post Developed Conditions

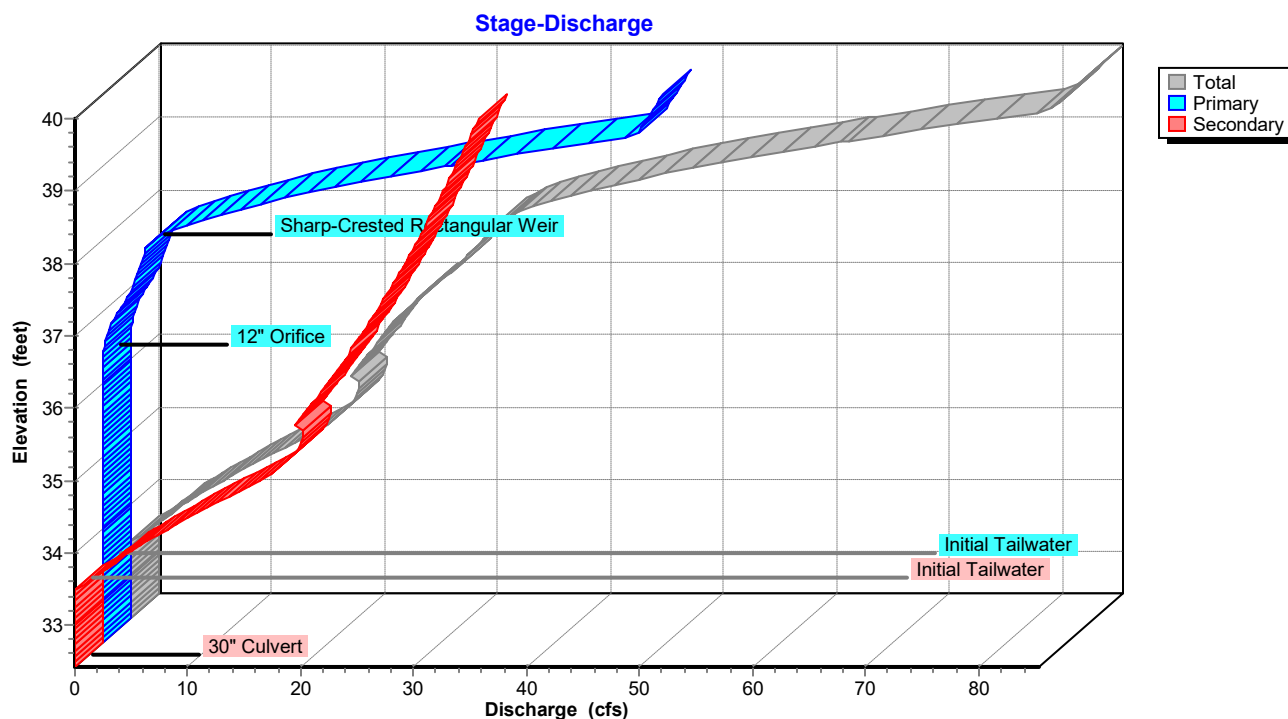
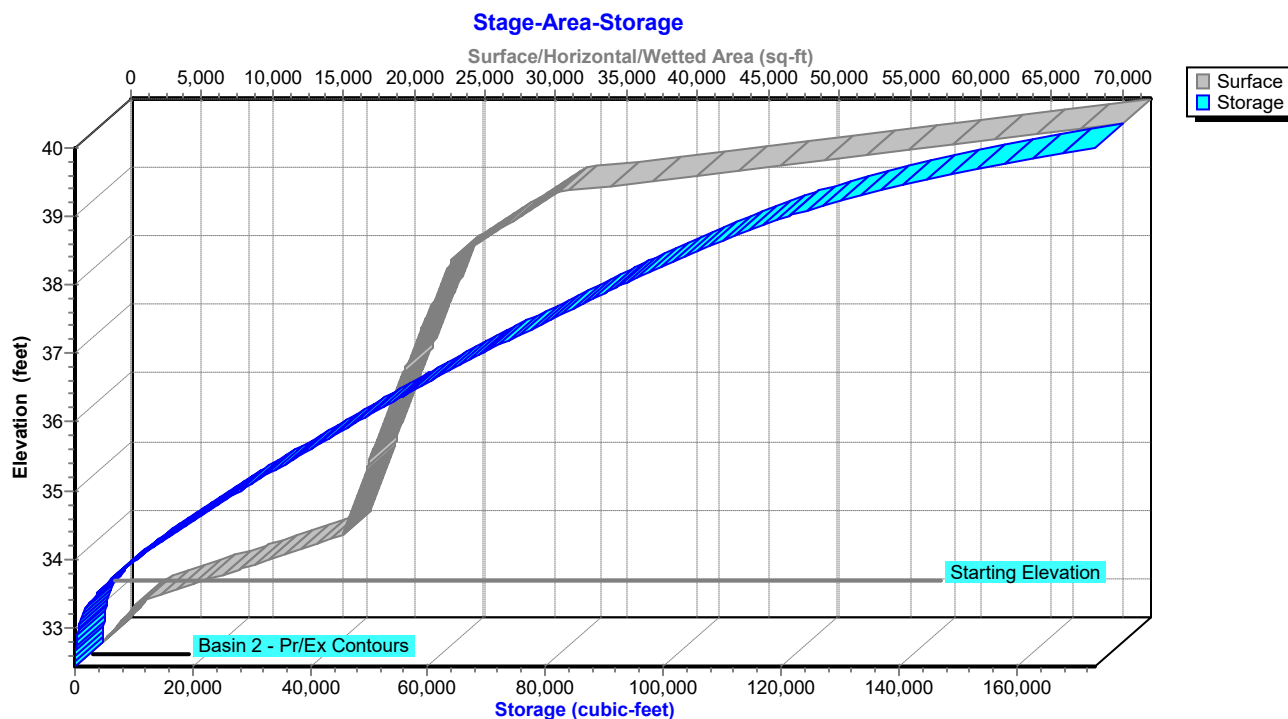
NOAA 24-hr C 10-Year Rainfall=5.18"

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Pond B2: Basin #2**Pond B2: Basin #2**

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Summary for Pond B3: Basin #3

Inflow = 1.43 cfs @ 12.70 hrs, Volume= 1.355 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 Link TTA : TTA

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 9,568 sf Storage= 5,403 cf

Peak Elev= 36.84' @ 29.21 hrs Surf.Area= 21,600 sf Storage= 64,446 cf (59,043 cf above start)

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	31.44'	162,050 cf	Basin 3 - Pr/Ex Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.44	0	0	0
32.00	500	140	140
33.00	3,495	1,998	2,137
34.00	15,640	9,568	11,705
35.00	17,620	16,630	28,335
36.00	19,755	18,688	47,023
37.00	21,945	20,850	67,873
38.00	25,055	23,500	91,373
39.00	30,055	27,555	118,928
40.00	56,190	43,123	162,050

Device	Routing	Invert	Outlet Devices
#1	Primary	33.42'	24.0" Round 24" Culvert L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 33.42' / 33.15' S= 0.0042 ' / S= 0.0042 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	38.22'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.50' TW=0.00' (Dynamic Tailwater)↑ **1=24" Culvert** (Passes 0.00 cfs of 0.02 cfs potential flow)↑ **2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

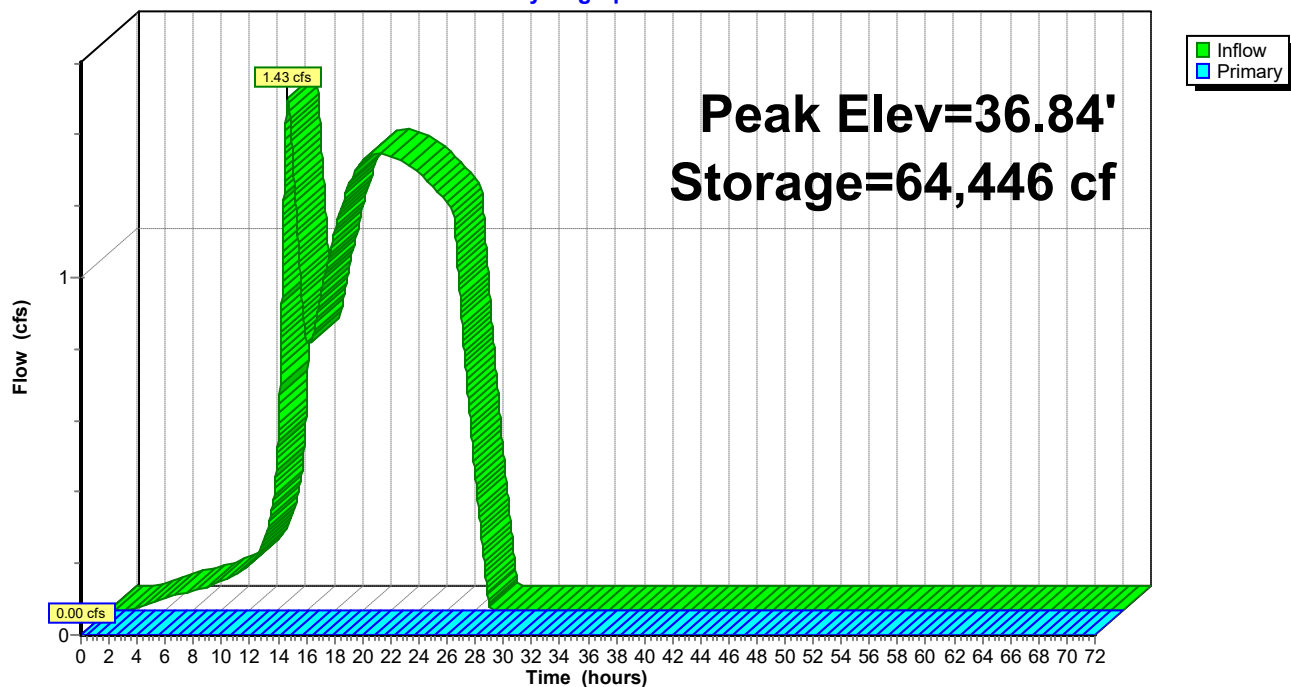
Post Developed Conditions

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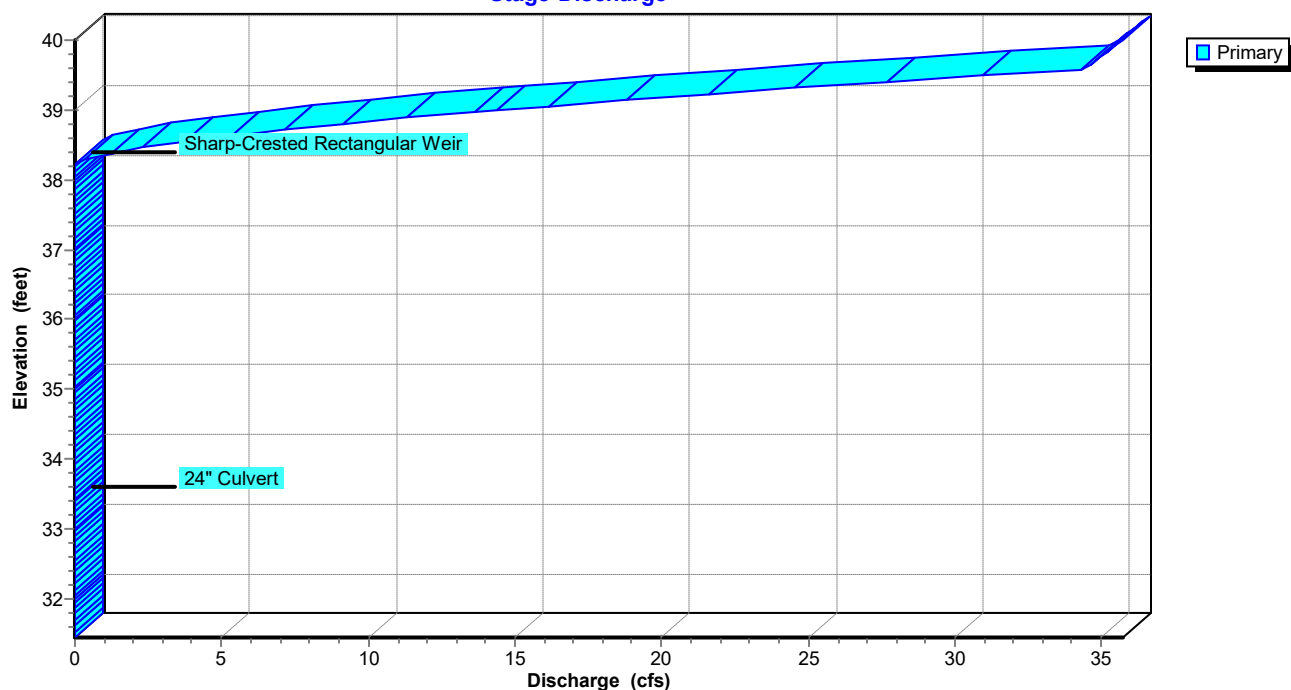
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Pond B3: Basin #3

Hydrograph

**Pond B3: Basin #3**

Stage-Discharge



Post Developed Conditions

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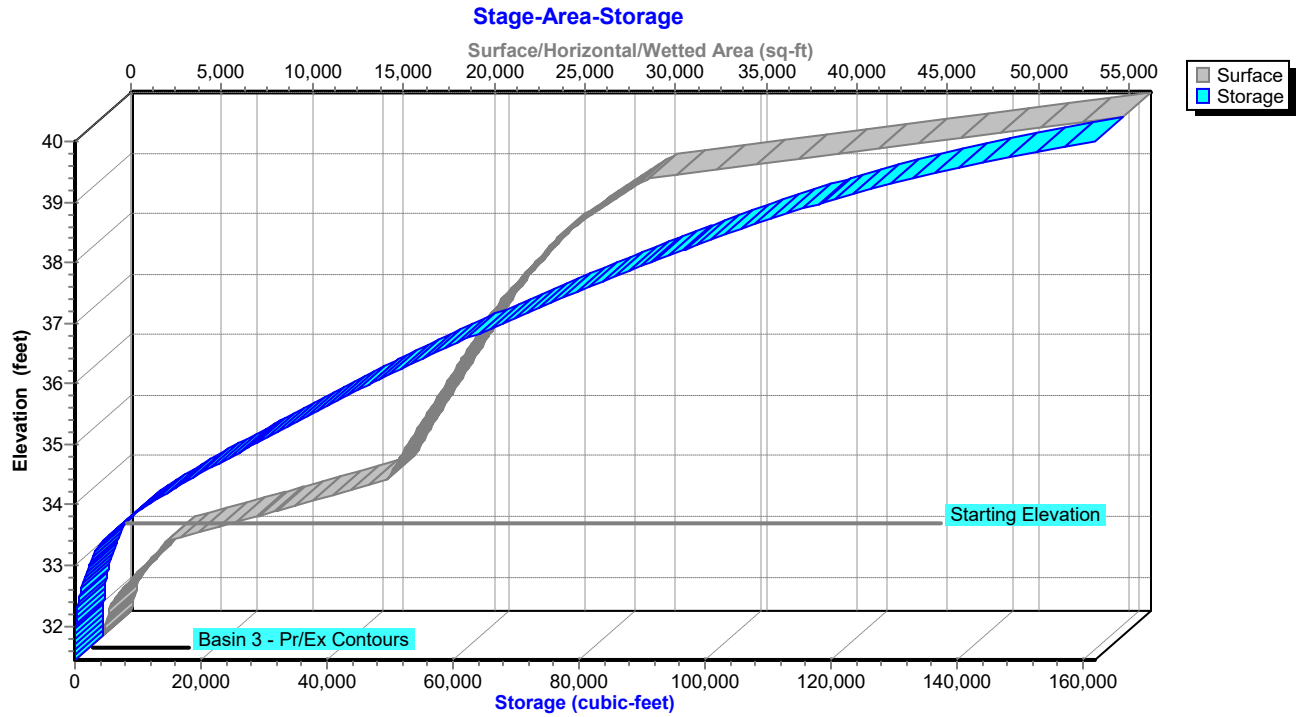
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Appendix D
NOAA 24-hr C 10-Year Rainfall=5.18"

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Pond B3: Basin #3



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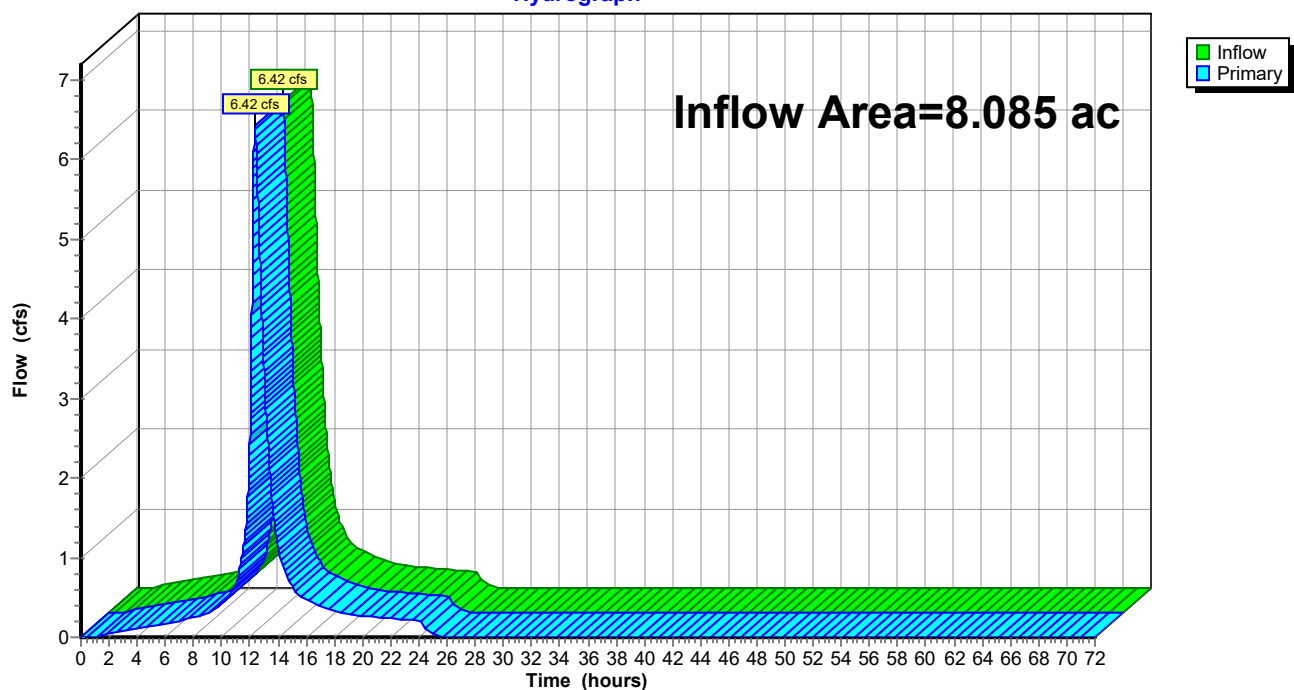
Summary for Link 1: PRDA-1

Inflow Area = 8.085 ac, 29.44% Impervious, Inflow Depth = 1.70" for 10-Year event
Inflow = 6.42 cfs @ 12.34 hrs, Volume= 1.146 af
Primary = 6.42 cfs @ 12.35 hrs, Volume= 1.146 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B1 : Basin #1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 1: PRDA-1

Hydrograph



Post Developed Conditions

NOAA 24-hr C 10-Year Rainfall=5.18"

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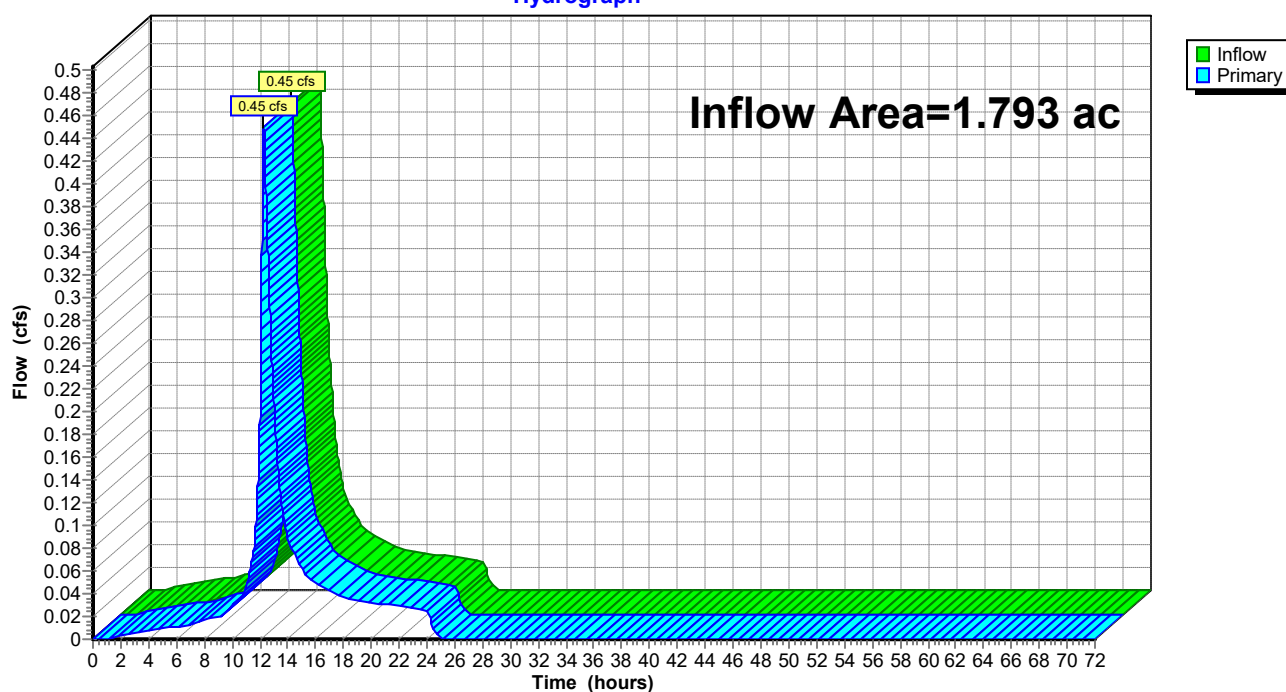
Summary for Link 2A: PRDA-2A

Inflow Area = 1.793 ac, 8.49% Impervious, Inflow Depth = 0.60" for 10-Year event
 Inflow = 0.45 cfs @ 12.26 hrs, Volume= 0.090 af
 Primary = 0.45 cfs @ 12.27 hrs, Volume= 0.090 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2A: PRDA-2A

Hydrograph



Post Developed Conditions

NOAA 24-hr C 10-Year Rainfall=5.18"

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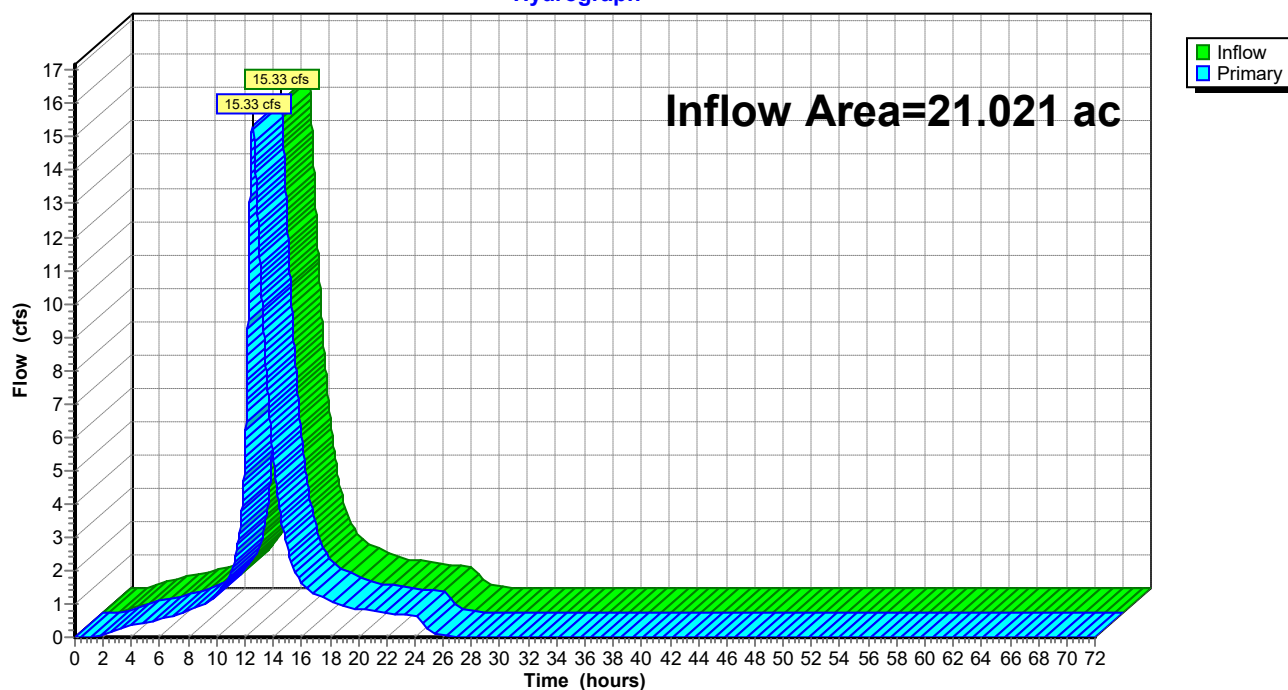
Summary for Link 2B: PRDA-2B

Inflow Area = 21.021 ac, 38.74% Impervious, Inflow Depth = 2.06" for 10-Year event
Inflow = 15.33 cfs @ 12.55 hrs, Volume= 3.609 af
Primary = 15.33 cfs @ 12.56 hrs, Volume= 3.609 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2B: PRDA-2B

Hydrograph



Post Developed Conditions

NOAA 24-hr C 10-Year Rainfall=5.18"

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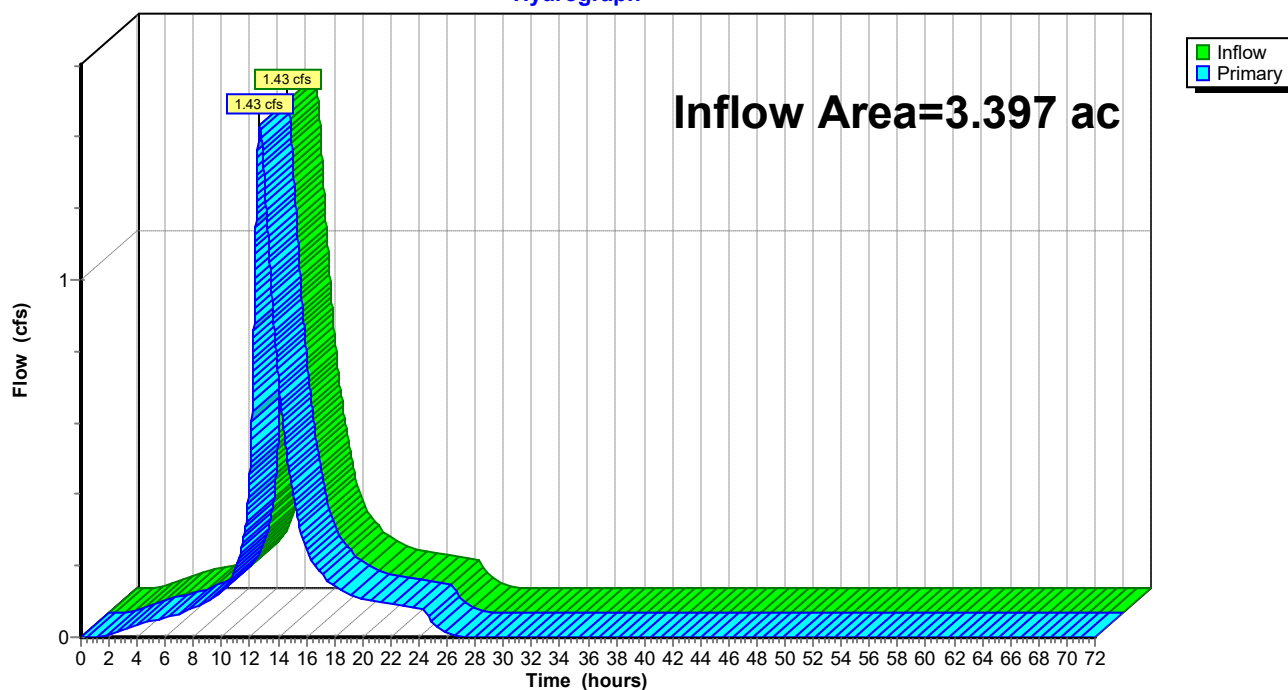
Summary for Link 3: PRDA-3

Inflow Area = 3.397 ac, 26.15% Impervious, Inflow Depth = 1.46" for 10-Year event
Inflow = 1.43 cfs @ 12.69 hrs, Volume= 0.412 af
Primary = 1.43 cfs @ 12.70 hrs, Volume= 0.412 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B3 : Basin #3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3: PRDA-3

Hydrograph



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NOAA 24-hr C 10-Year Rainfall=5.18"

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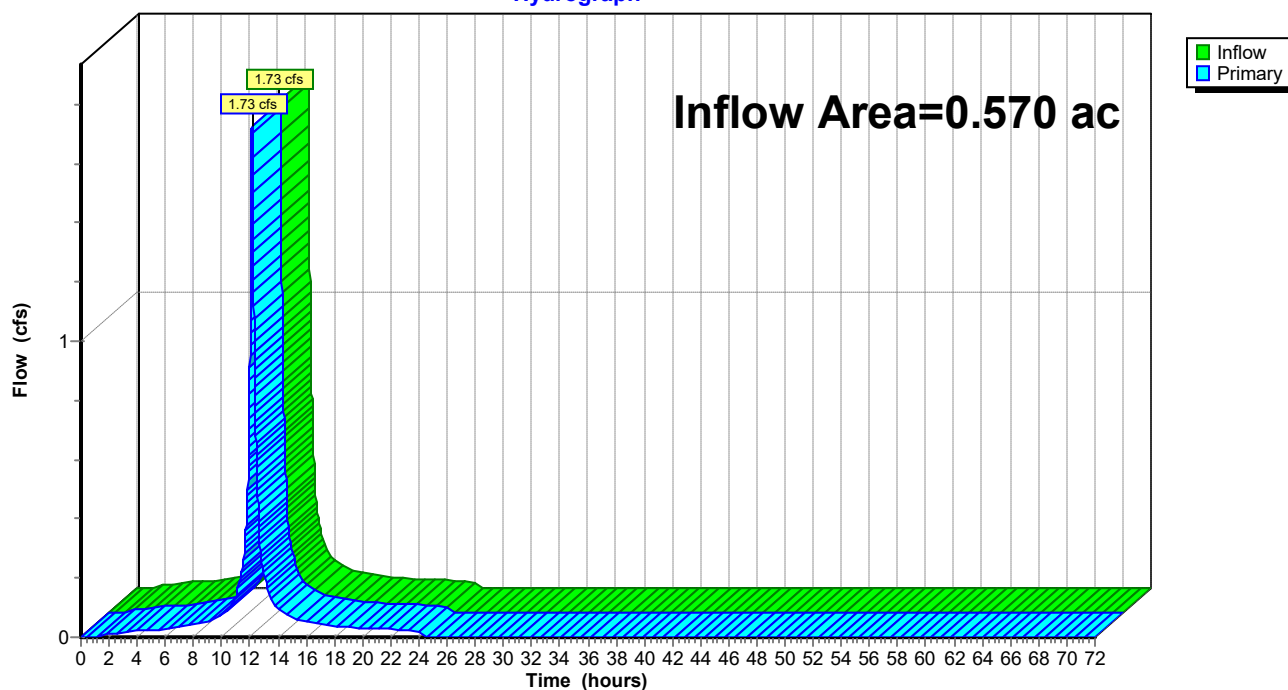
Summary for Link 4: PRDA-4

Inflow Area = 0.570 ac, 67.40% Impervious, Inflow Depth = 3.39" for 10-Year event
Inflow = 1.73 cfs @ 12.14 hrs, Volume= 0.161 af
Primary = 1.73 cfs @ 12.15 hrs, Volume= 0.161 af, Atten= 0%, Lag= 0.6 min
Routed to Link TTA : TTA

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 4: PRDA-4

Hydrograph



Post Developed Conditions

NOAA 24-hr C 10-Year Rainfall=5.18"

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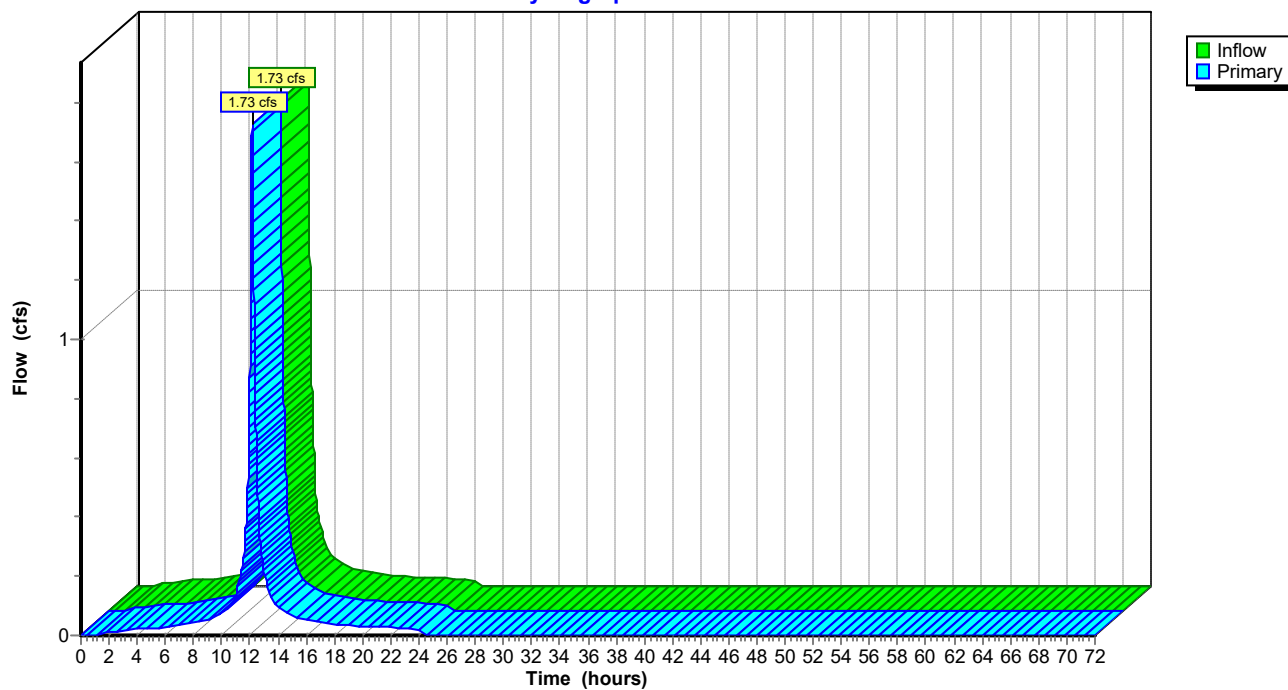
Summary for Link TTA: TTA

Inflow = 1.73 cfs @ 12.15 hrs, Volume= 0.161 af
Primary = 1.73 cfs @ 12.16 hrs, Volume= 0.161 af, Atten= 0%, Lag= 0.6 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link TTA: TTA

Hydrograph



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Appendix D
NOAA 24-hr C 100-Year Rainfall=8.81"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1i: PRDA-1i	Runoff Area=122,285 sf 84.80% Impervious Runoff Depth=8.09" Flow Length=275' Tc=22.2 min CN=WQ Runoff=11.31 cfs 1.893 af
Subcatchment 1p: PRDA-1p	Runoff Area=229,900 sf 0.00% Impervious Runoff Depth=1.31" Flow Length=275' Tc=22.2 min CN=WQ Runoff=2.54 cfs 0.578 af
Subcatchment 2Ai: PRDA-2Ai	Runoff Area=6,630 sf 100.00% Impervious Runoff Depth=8.57" Flow Length=267' Tc=15.9 min CN=98 Runoff=0.76 cfs 0.109 af
Subcatchment 2Ap: PRDA-2Ap	Runoff Area=71,475 sf 0.00% Impervious Runoff Depth=1.37" Flow Length=267' Tc=15.9 min CN=WQ Runoff=1.00 cfs 0.187 af
Subcatchment 2Bi: PRDA-2Bi	Runoff Area=354,705 sf 100.00% Impervious Runoff Depth=8.57" Flow Length=1,831' Tc=36.2 min CN=98 Runoff=26.05 cfs 5.815 af
Subcatchment 2Bp: PRDA-2Bp	Runoff Area=560,985 sf 0.00% Impervious Runoff Depth=1.51" Flow Length=1,831' Tc=36.2 min CN=39 Runoff=5.79 cfs 1.625 af
Subcatchment 3i: PRDA-3i	Runoff Area=38,695 sf 100.00% Impervious Runoff Depth=8.57" Flow Length=328' Tc=47.6 min CN=98 Runoff=2.41 cfs 0.634 af
Subcatchment 3p: PRDA-3p	Runoff Area=109,285 sf 0.00% Impervious Runoff Depth=1.45" Flow Length=328' Tc=47.6 min CN=WQ Runoff=0.90 cfs 0.303 af
Subcatchment 4i: PRDA-4i	Runoff Area=16,740 sf 100.00% Impervious Runoff Depth=8.57" Tc=6.0 min CN=98 Runoff=2.95 cfs 0.274 af
Subcatchment 4p: PRDA-4p	Runoff Area=8,095 sf 0.00% Impervious Runoff Depth=1.32" Tc=6.0 min CN=WQ Runoff=0.18 cfs 0.020 af
Pond B1: Basin #1	Peak Elev=38.59' Storage=185,822 cf Inflow=22.95 cfs 4.985 af 30.0" Round Culvert n=0.013 L=625.0' S=-0.0015 '/' Outflow=1.60 cfs 1.251 af
Pond B2: Basin #2	Peak Elev=38.59' Storage=108,730 cf Inflow=32.84 cfs 8.987 af Primary=10.30 cfs 4.296 af Secondary=12.21 cfs 2.514 af Outflow=17.32 cfs 6.811 af
Pond B3: Basin #3	Peak Elev=38.56' Storage=106,123 cf Inflow=11.96 cfs 5.233 af Outflow=3.96 cfs 3.129 af
Link 1: PRDA-1	Inflow=13.57 cfs 2.471 af Primary=13.57 cfs 2.471 af
Link 2A: PRDA-2A	Inflow=1.72 cfs 0.296 af Primary=1.72 cfs 0.296 af
Link 2B: PRDA-2B	Inflow=31.39 cfs 7.440 af Primary=31.39 cfs 7.440 af

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NOAA 24-hr C 100-Year Rainfall=8.81"

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Link 3: PRDA-3Inflow=3.24 cfs 0.937 af
Primary=3.24 cfs 0.937 af**Link 4: PRDA-4**Inflow=3.12 cfs 0.295 af
Primary=3.12 cfs 0.295 af**Link TTA: TTA**Inflow=4.04 cfs 3.424 af
Primary=4.04 cfs 3.424 af**Total Runoff Area = 34.867 ac Runoff Volume = 11.439 af Average Runoff Depth = 3.94"**
65.73% Pervious = 22.918 ac 34.27% Impervious = 11.948 ac

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Summary for Subcatchment 1i: PRDA-1i

Runoff = 11.31 cfs @ 12.33 hrs, Volume= 1.893 af, Depth= 8.09"
 Routed to Link 1 : PRDA-1

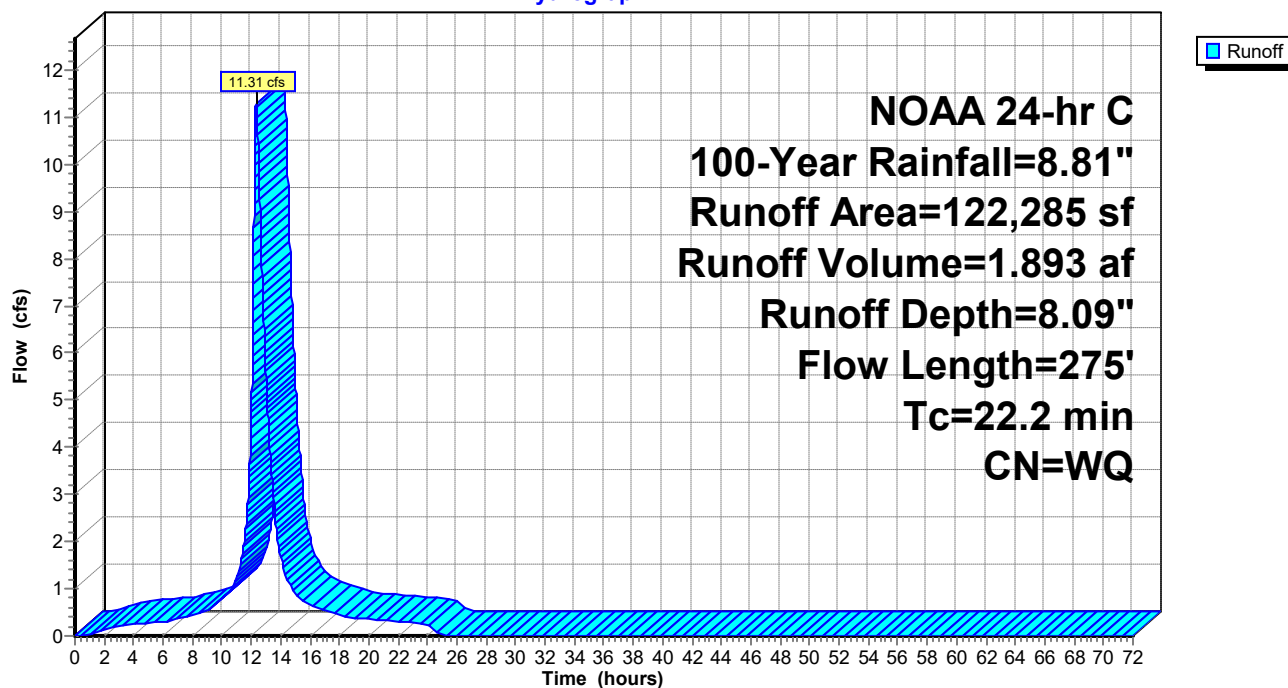
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
103,700	98	Paved parking, HSG A
18,585	72	Dirt roads, HSG A
122,285		Weighted Average
18,585	72	15.20% Pervious Area
103,700	98	84.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment PRDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment PRDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1i: PRDA-1i

Hydrograph



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Summary for Subcatchment 1p: PRDA-1p

Runoff = 2.54 cfs @ 12.53 hrs, Volume= 0.578 af, Depth= 1.31"
 Routed to Link 1 : PRDA-1

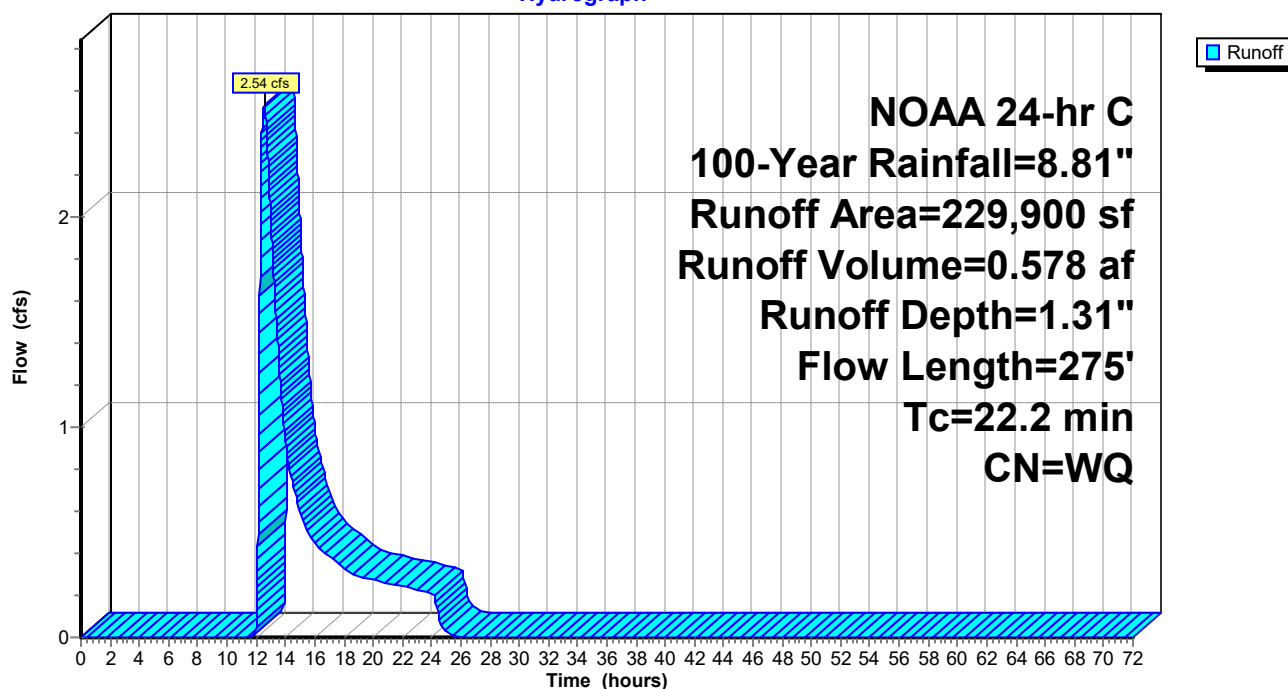
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
178,350	39	>75% Grass cover, Good, HSG A
51,550	30	Woods, Good, HSG A
229,900		Weighted Average
229,900	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment PRDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment PRDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1p: PRDA-1p

Hydrograph



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Summary for Subcatchment 2Ai: PRDA-2Ai

Runoff = 0.76 cfs @ 12.26 hrs, Volume= 0.109 af, Depth= 8.57"
 Routed to Link 2A : PRDA-2A

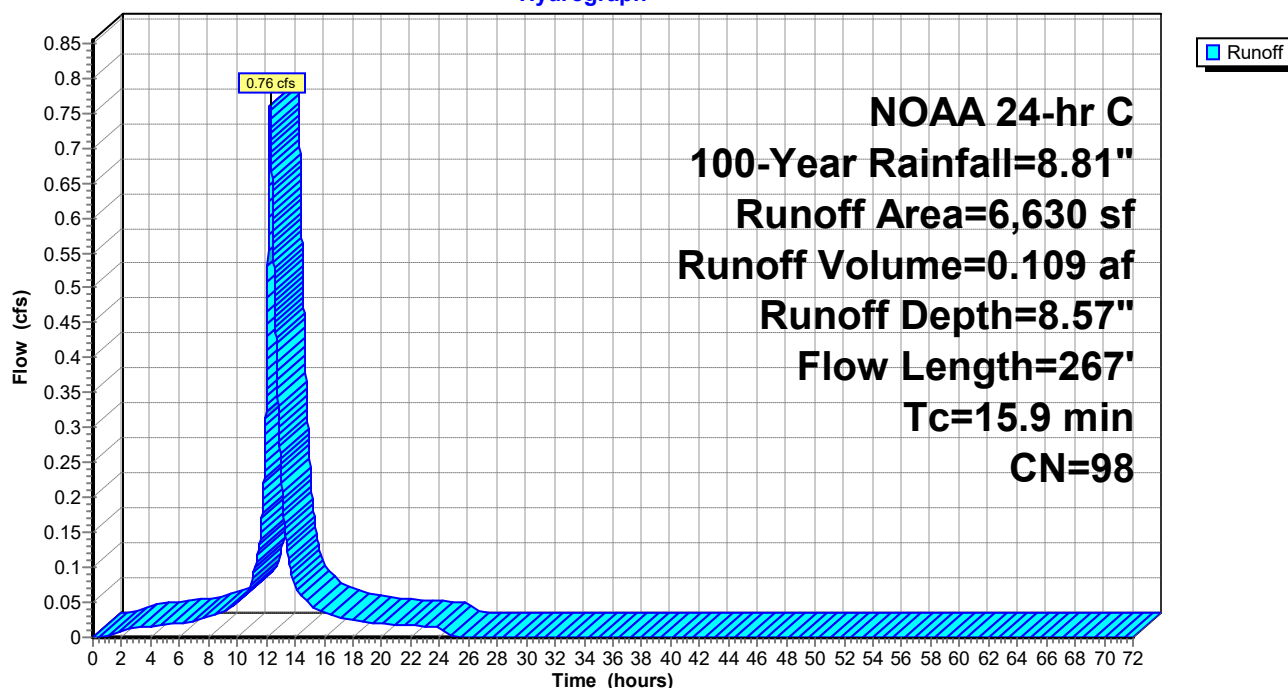
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
6,630	98	Paved parking, HSG A
6,630	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment PRDA-2A.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment PRDA-2A.2
					Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ai: PRDA-2Ai

Hydrograph



Post Developed Conditions

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Summary for Subcatchment 2Ap: PRDA-2Ap

Runoff = 1.00 cfs @ 12.37 hrs, Volume= 0.187 af, Depth= 1.37"
 Routed to Link 2A : PRDA-2A

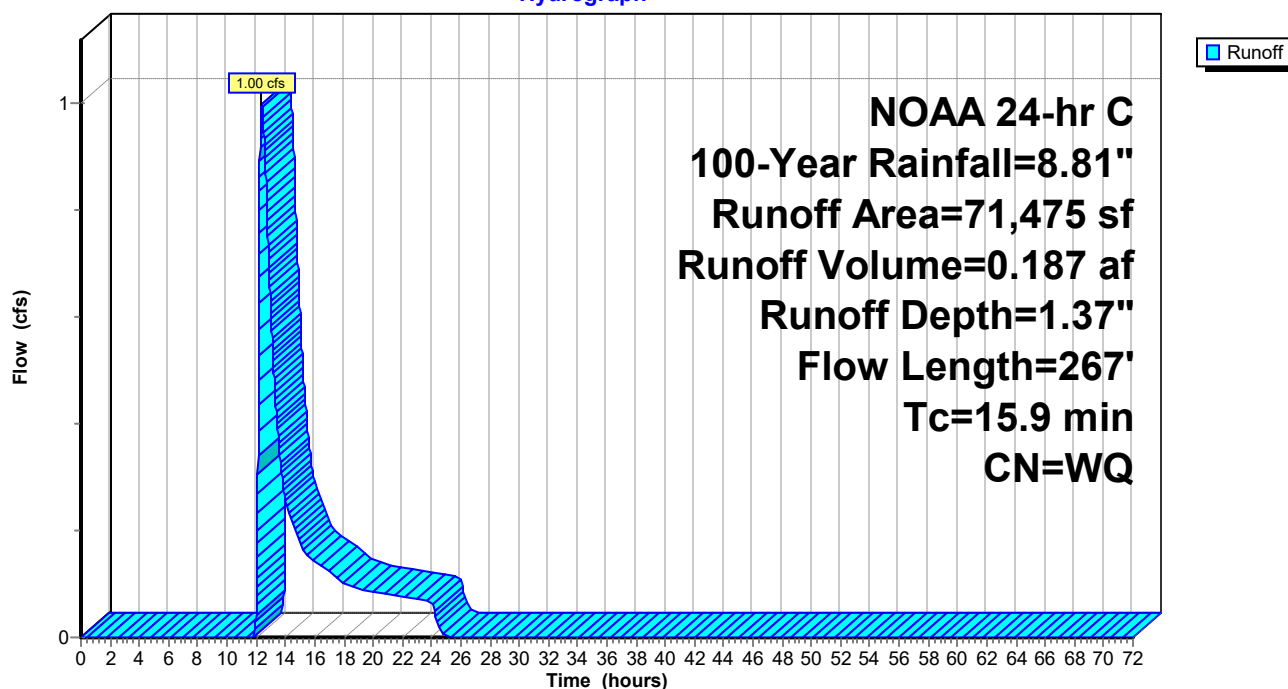
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
59,900	39	>75% Grass cover, Good, HSG A
11,575	30	Woods, Good, HSG A
71,475		Weighted Average
71,475	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment PRDA-2A.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment PRDA-2A.2
					Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ap: PRDA-2Ap

Hydrograph



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Summary for Subcatchment 2Bi: PRDA-2Bi

Runoff = 26.05 cfs @ 12.55 hrs, Volume= 5.815 af, Depth= 8.57"
 Routed to Link 2B : PRDA-2B

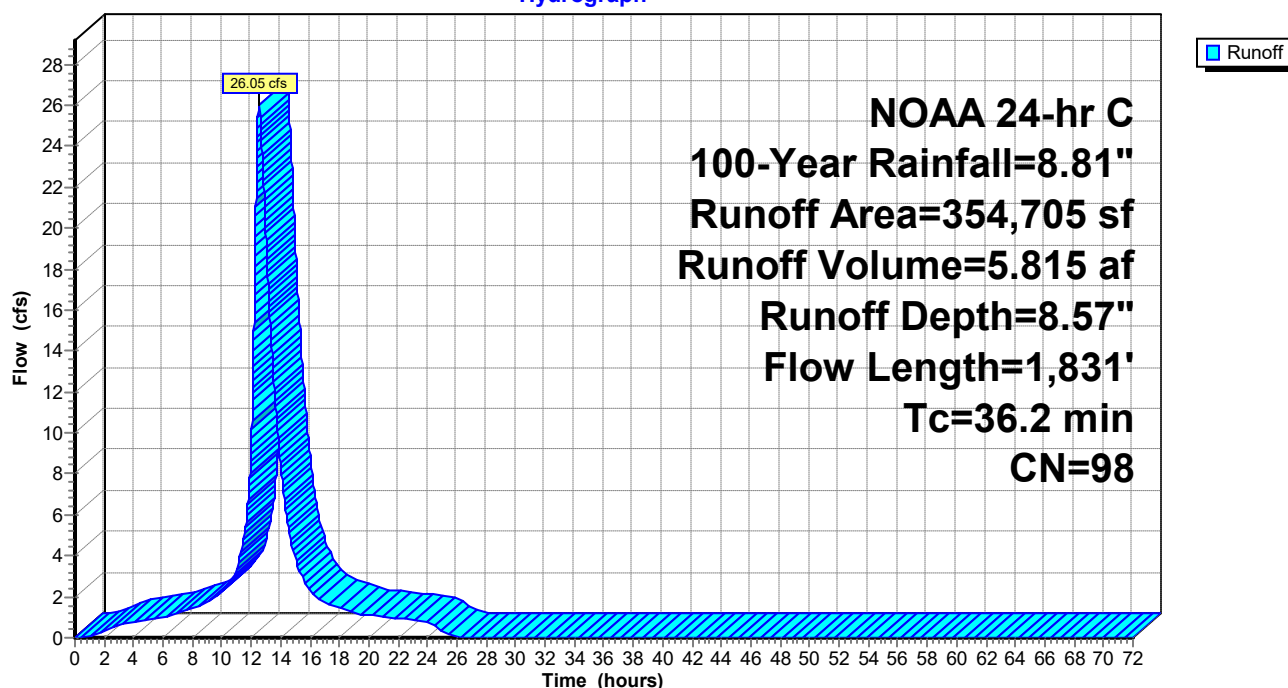
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
354,705	98	Paved parking, HSG A
354,705	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment PRDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment PRDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment PRDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment PRDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bi: PRDA-2Bi

Hydrograph



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NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Subcatchment 2Bp: PRDA-2Bp

Runoff = 5.79 cfs @ 12.79 hrs, Volume= 1.625 af, Depth= 1.51"
 Routed to Link 2B : PRDA-2B

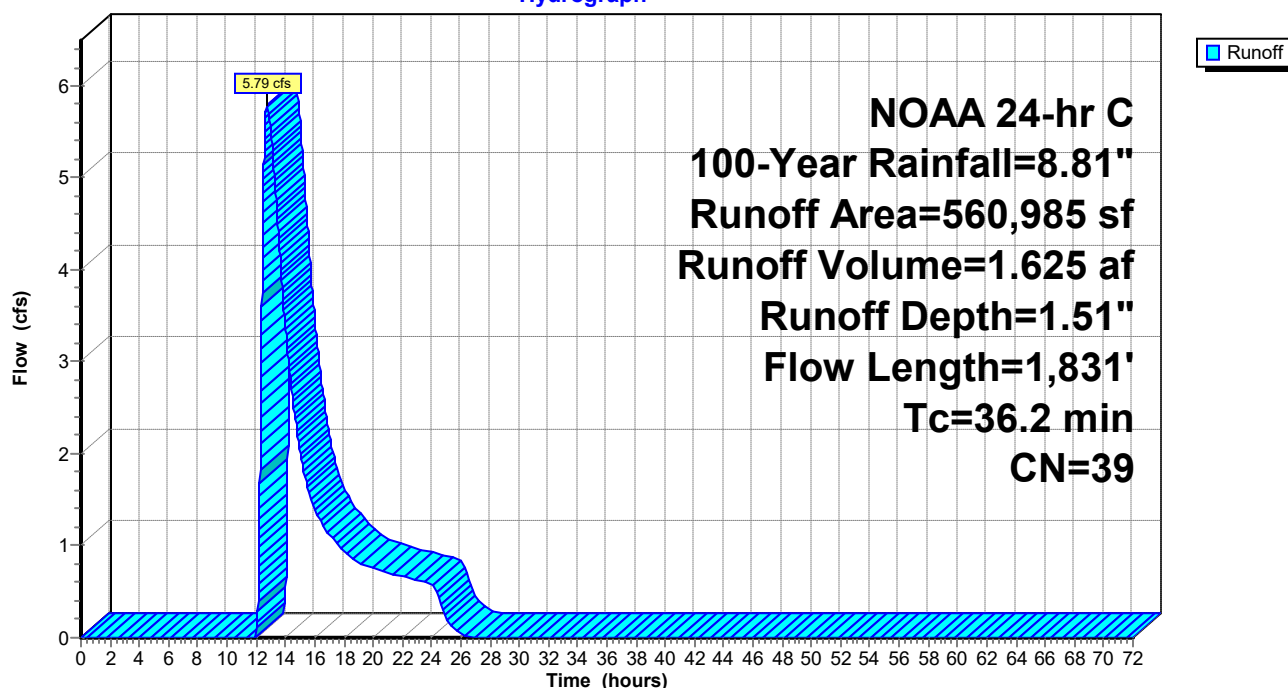
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
560,985	39	>75% Grass cover, Good, HSG A
560,985	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment PRDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment PRDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment PRDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment PRDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bp: PRDA-2Bp

Hydrograph



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NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Subcatchment 3i: PRDA-3i

Runoff = 2.41 cfs @ 12.69 hrs, Volume= 0.634 af, Depth= 8.57"
 Routed to Link 3 : PRDA-3

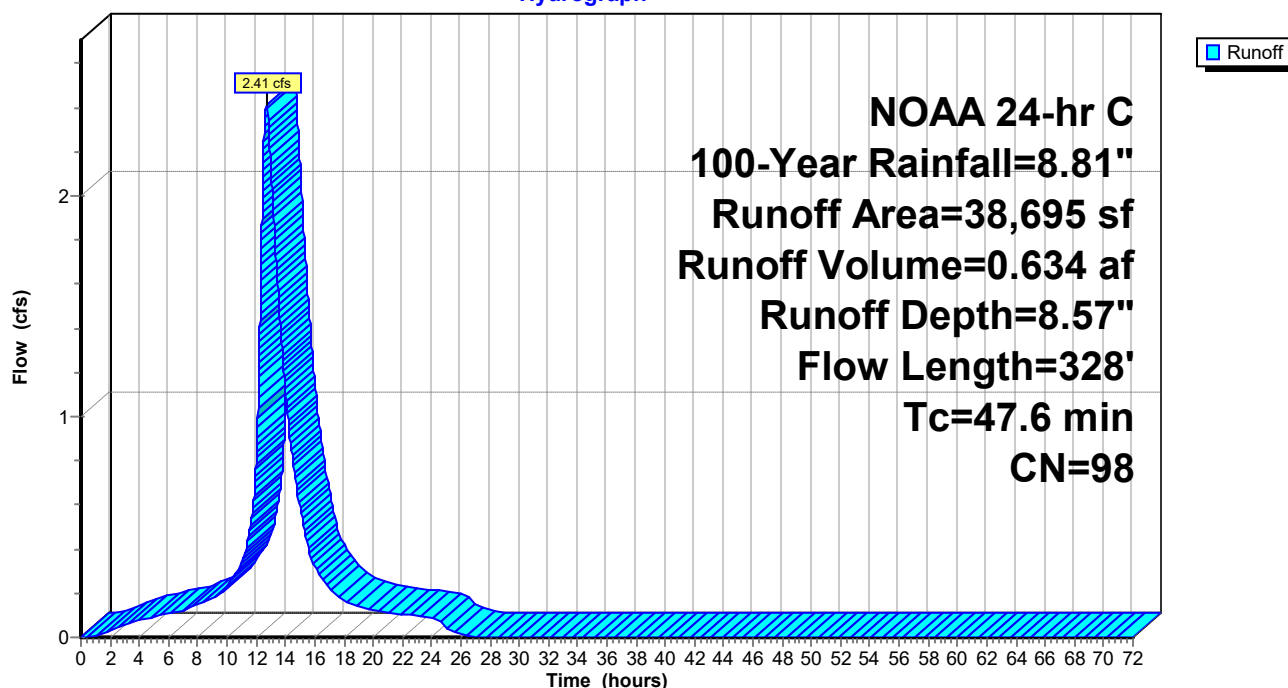
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
38,695	98	Paved parking, HSG A
38,695	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment PRDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment PRDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3i: PRDA-3i

Hydrograph



Post Developed Conditions

NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Subcatchment 3p: PRDA-3p

Runoff = 0.90 cfs @ 13.01 hrs, Volume= 0.303 af, Depth= 1.45"
 Routed to Link 3 : PRDA-3

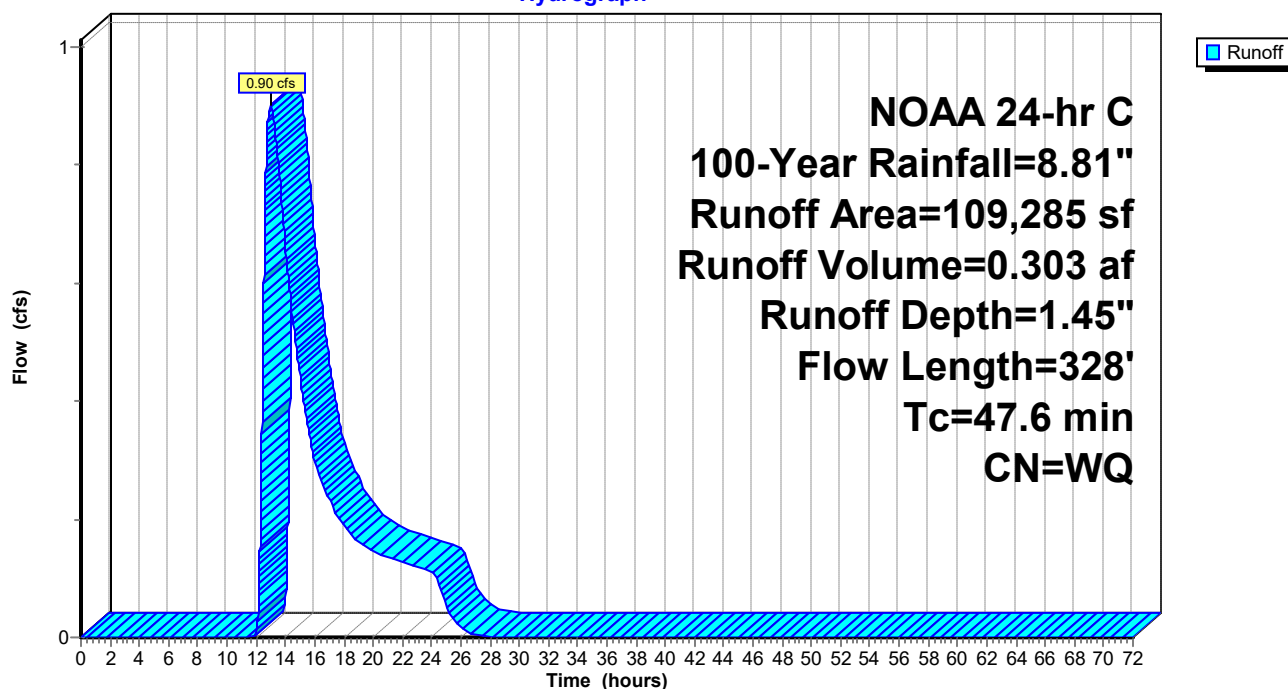
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
101,135	39	>75% Grass cover, Good, HSG A
8,150	30	Woods, Good, HSG A
109,285		Weighted Average
109,285	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment PRDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment PRDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3p: PRDA-3p

Hydrograph



Post Developed Conditions

NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Subcatchment 4i: PRDA-4i

Runoff = 2.95 cfs @ 12.14 hrs, Volume= 0.274 af, Depth= 8.57"
 Routed to Link 4 : PRDA-4

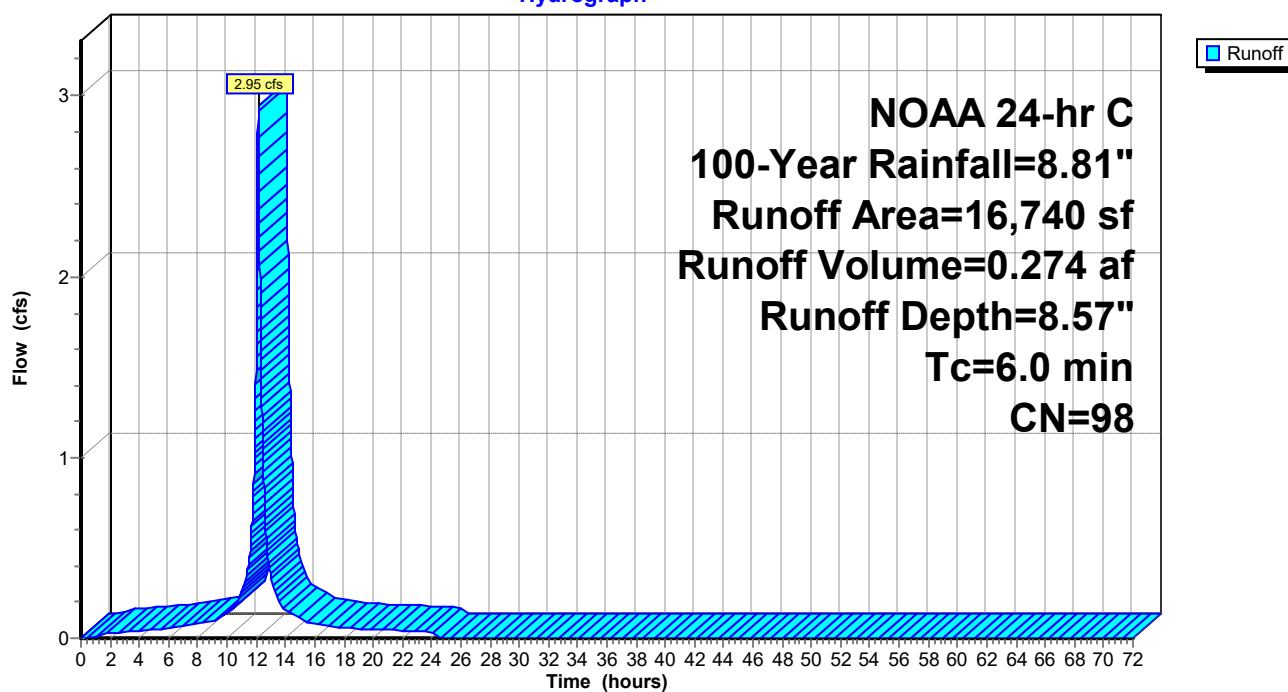
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
16,740	98	Paved parking, HSG A
16,740	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment PRDA-4.1

Subcatchment 4i: PRDA-4i

Hydrograph



Post Developed Conditions

NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Subcatchment 4p: PRDA-4p

Runoff = 0.18 cfs @ 12.16 hrs, Volume= 0.020 af, Depth= 1.32"
 Routed to Link 4 : PRDA-4

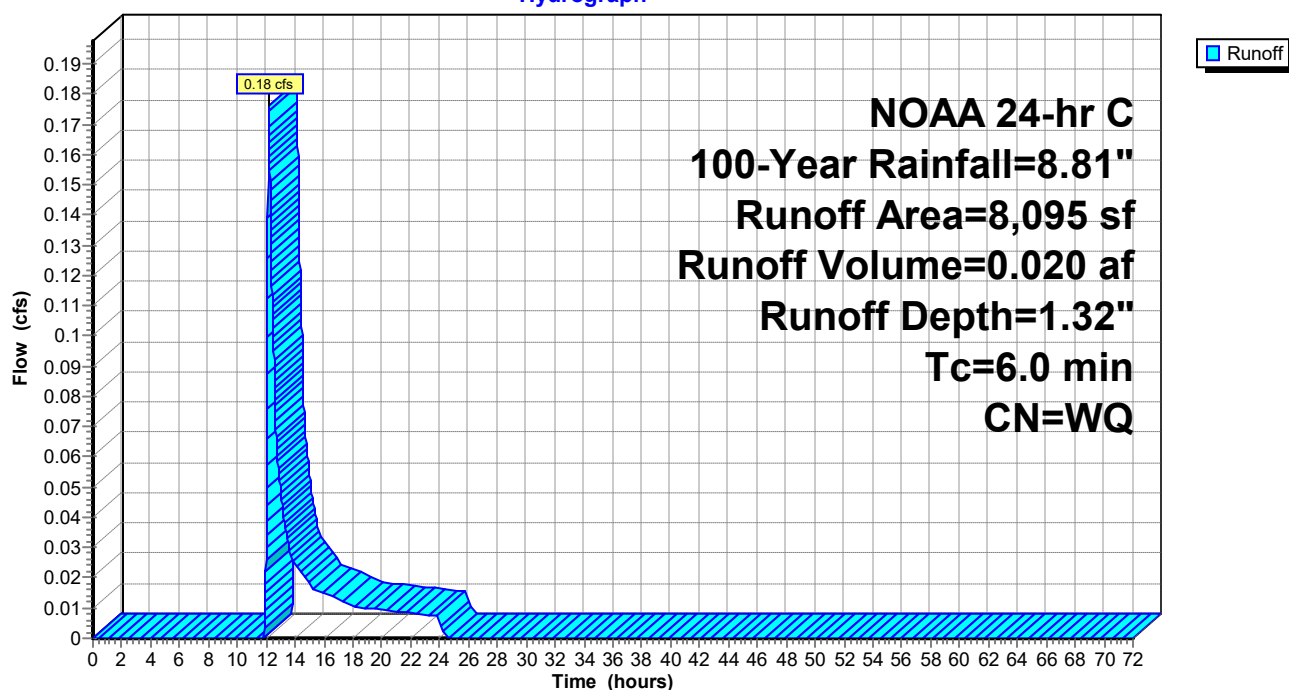
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year Rainfall=8.81"

Area (sf)	CN	Description
6,330	39	>75% Grass cover, Good, HSG A
1,765	30	Woods, Good, HSG A
8,095		Weighted Average
8,095	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment PRDA-4.1

Subcatchment 4p: PRDA-4p

Hydrograph



Post Developed Conditions

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Summary for Pond B1: Basin #1

Inflow = 22.95 cfs @ 12.58 hrs, Volume= 4.985 af
 Outflow = 1.60 cfs @ 14.73 hrs, Volume= 1.251 af, Atten= 93%, Lag= 129.0 min
 Primary = 1.60 cfs @ 14.73 hrs, Volume= 1.251 af
 Routed to Pond B2 : Basin #2

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 16,675 sf Storage= 6,588 cf

Peak Elev= 38.59' @ 17.64 hrs Surf.Area= 46,687 sf Storage= 185,822 cf (179,234 cf above start)

Plug-Flow detention time= 1,434.6 min calculated for 1.099 af (22% of inflow)

Center-of-Mass det. time= 898.7 min (1,822.0 - 923.3)

Volume	Invert	Avail.Storage	Storage Description
#1	31.50'	265,835 cf	Basin 1 - Pr/Ex Contours (Prismatic) Listed below (Recalc)
#2	38.40'	7,196 cf	Low Area - Existing Contours (Prismatic) Listed below (Recalc)
		273,031 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.50	0	0	0
32.00	270	68	68
33.00	2,955	1,613	1,680
34.00	30,395	16,675	18,355
35.00	32,725	31,560	49,915
36.00	35,215	33,970	83,885
37.00	37,855	36,535	120,420
38.00	41,075	39,465	159,885
39.00	49,965	45,520	205,405
40.00	70,895	60,430	265,835

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
38.40	10	0	0
39.00	1,050	318	318
40.00	12,705	6,878	7,196

Device	Routing	Invert	Outlet Devices
#1	Primary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.50' / 32.43' S= -0.0015 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=1.59 cfs @ 14.73 hrs HW=38.38' TW=38.36' (Dynamic Tailwater)↑**1=30" Culvert** (Outlet Controls 1.59 cfs @ 0.32 fps)

Post Developed Conditions

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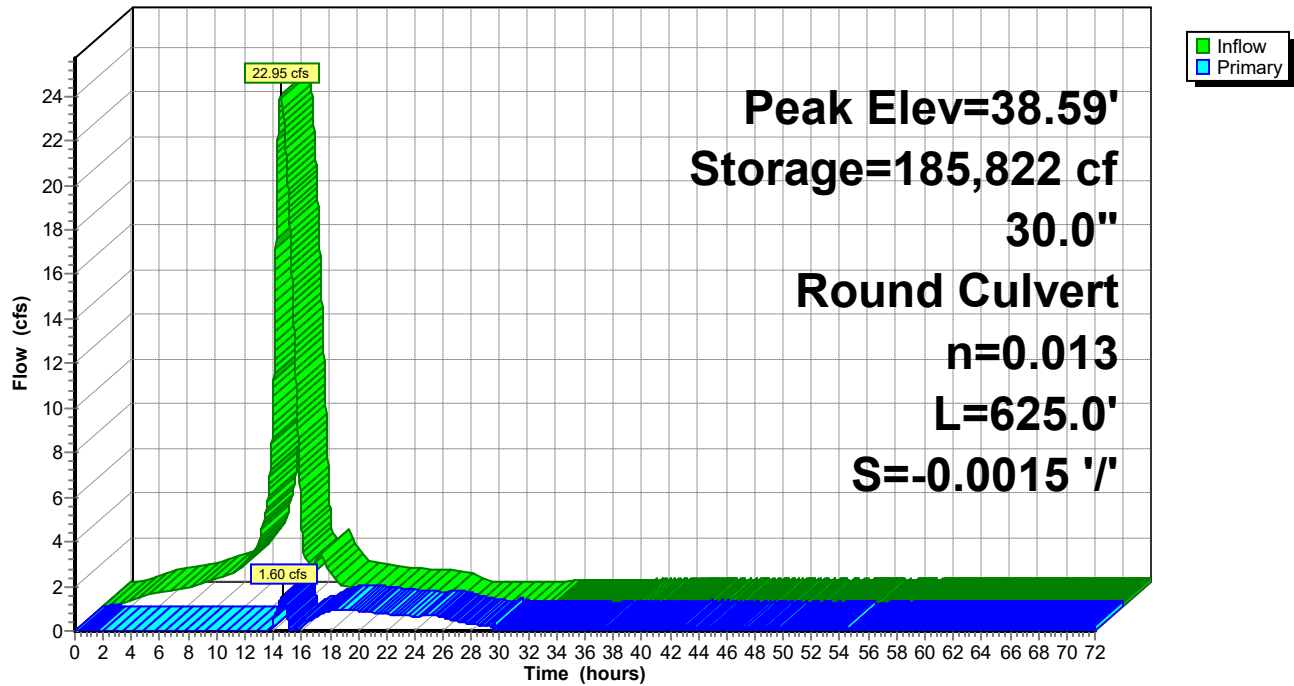
Appendix D
NOAA 24-hr C 100-Year Rainfall=8.81"

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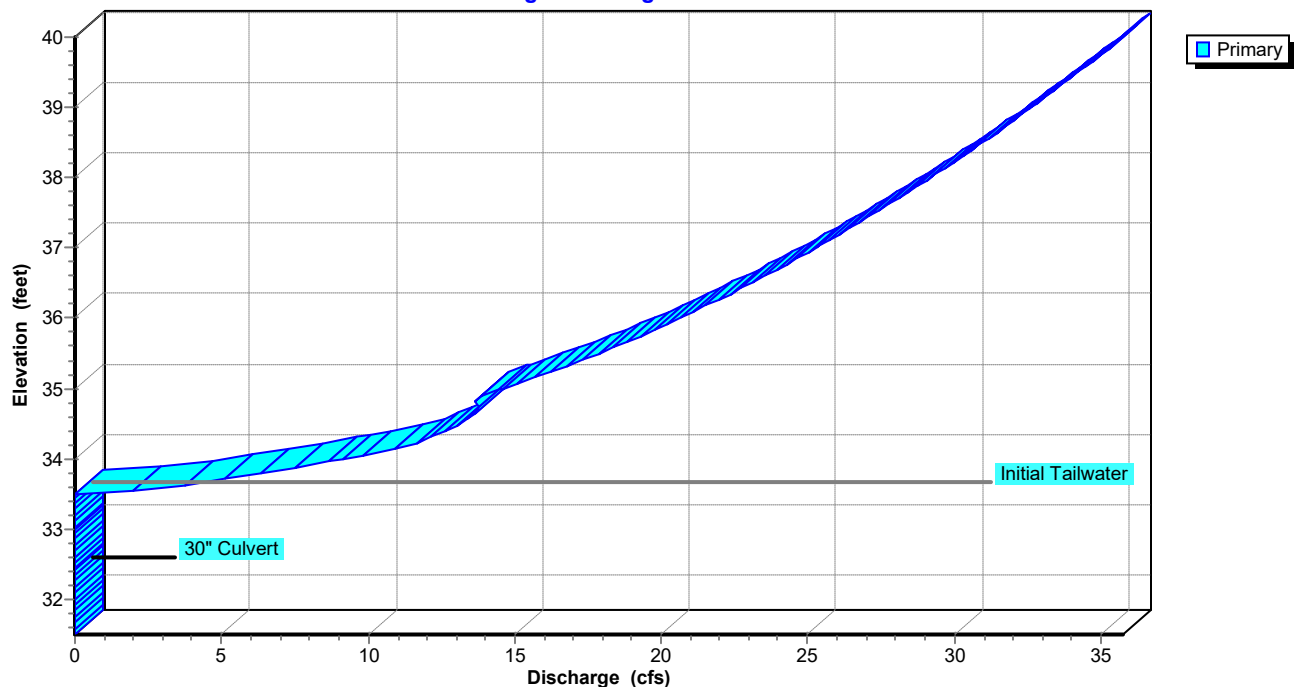
Pond B1: Basin #1

Hydrograph



Pond B1: Basin #1

Stage-Discharge



Post Developed Conditions

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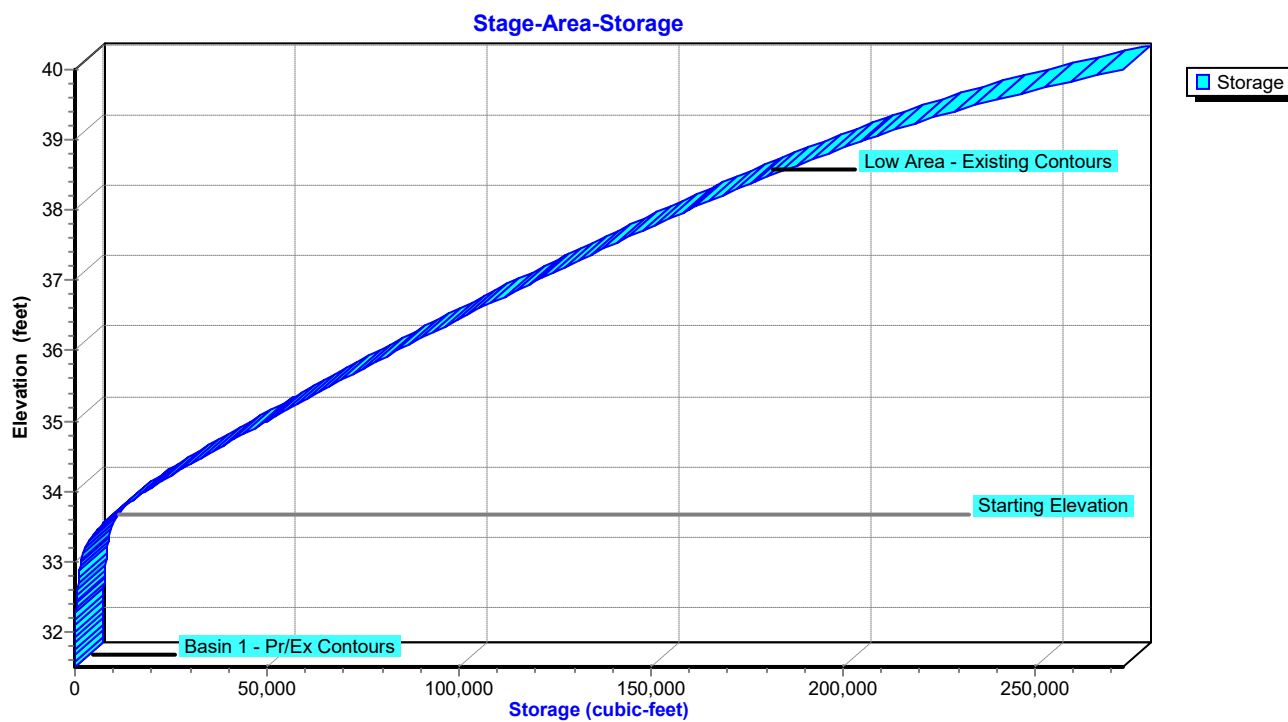
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Appendix D
NOAA 24-hr C 100-Year Rainfall=8.81"

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Pond B1: Basin #1



Post Developed Conditions

NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Pond B2: Basin #2

Inflow = 32.84 cfs @ 12.56 hrs, Volume= 8.987 af
 Outflow = 17.32 cfs @ 13.28 hrs, Volume= 6.811 af, Atten= 47%, Lag= 43.4 min
 Primary = 10.30 cfs @ 14.16 hrs, Volume= 4.296 af
 Routed to Pond B3 : Basin #3
 Secondary = 12.21 cfs @ 12.85 hrs, Volume= 2.514 af
 Routed to Pond B1 : Basin #1

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 9,728 sf Storage= 3,769 cf

Peak Elev= 38.59' @ 17.57 hrs Surf.Area= 29,089 sf Storage= 108,730 cf (104,960 cf above start)

Plug-Flow detention time= 334.3 min calculated for 6.723 af (75% of inflow)

Center-of-Mass det. time= 114.2 min (1,081.3 - 967.1)

Volume	Invert	Avail.Storage	Storage Description
#1	32.43'	173,433 cf	Basin 2 - Pr/Ex Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
32.43	0	0	0
33.00	2,500	713	713
34.00	16,955	9,728	10,440
35.00	18,700	17,828	28,268
36.00	20,530	19,615	47,883
37.00	22,470	21,500	69,383
38.00	24,590	23,530	92,913
39.00	32,225	28,408	121,320
40.00	72,000	52,113	173,433

Device	Routing	Invert	Outlet Devices
#1	Primary	32.35'	30.0" Round 30" Culvert L= 253.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.35' / 31.41' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	36.37'	12.0" Vert. 12" Orifice C= 0.600 Limited to weir flow at low heads 6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	37.90'	
#4	Secondary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.43' / 31.50' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Post Developed Conditions

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Primary OutFlow Max=10.27 cfs @ 14.16 hrs HW=38.34' TW=36.99' (Dynamic Tailwater)

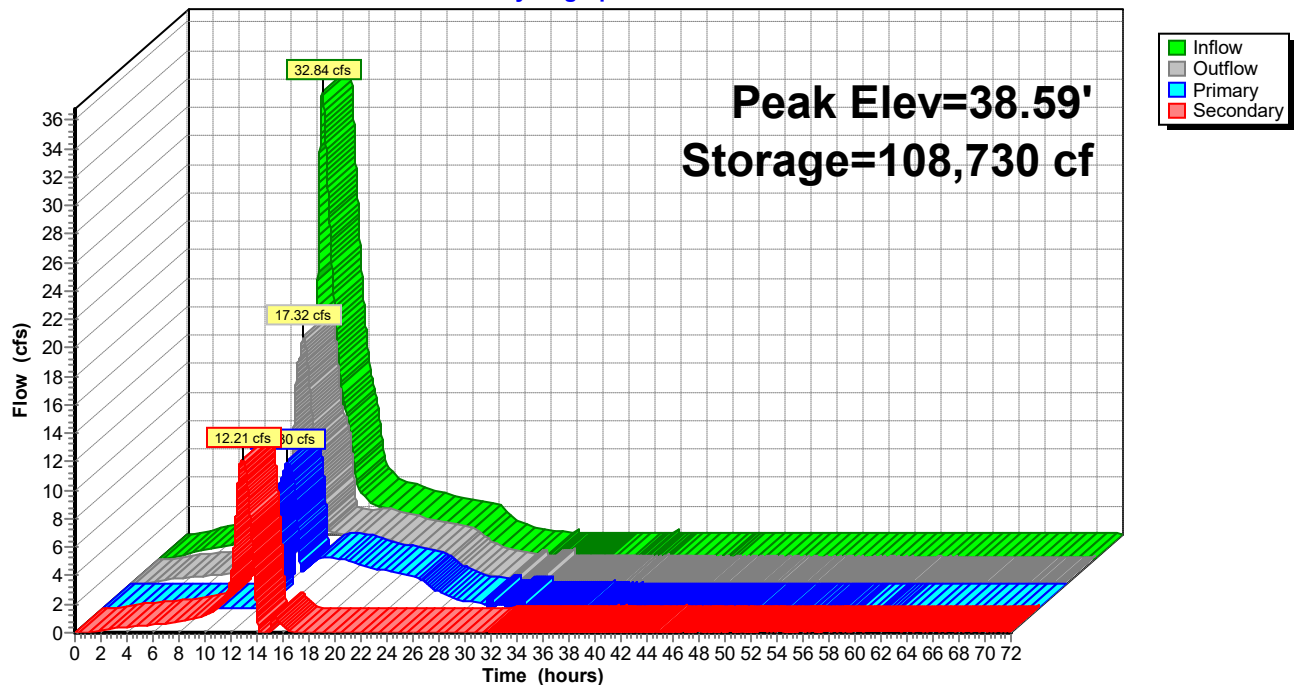
1=30" Culvert (Passes 10.27 cfs of 23.31 cfs potential flow)

2=12" Orifice (Orifice Controls 4.39 cfs @ 5.58 fps)

3=Sharp-Crested Rectangular Weir (Weir Controls 5.88 cfs @ 2.28 fps)

Secondary OutFlow Max=12.03 cfs @ 12.85 hrs HW=37.62' TW=36.94' (Dynamic Tailwater)

4=30" Culvert (Outlet Controls 12.03 cfs @ 2.45 fps)

Pond B2: Basin #2**Hydrograph**

Post Developed Conditions

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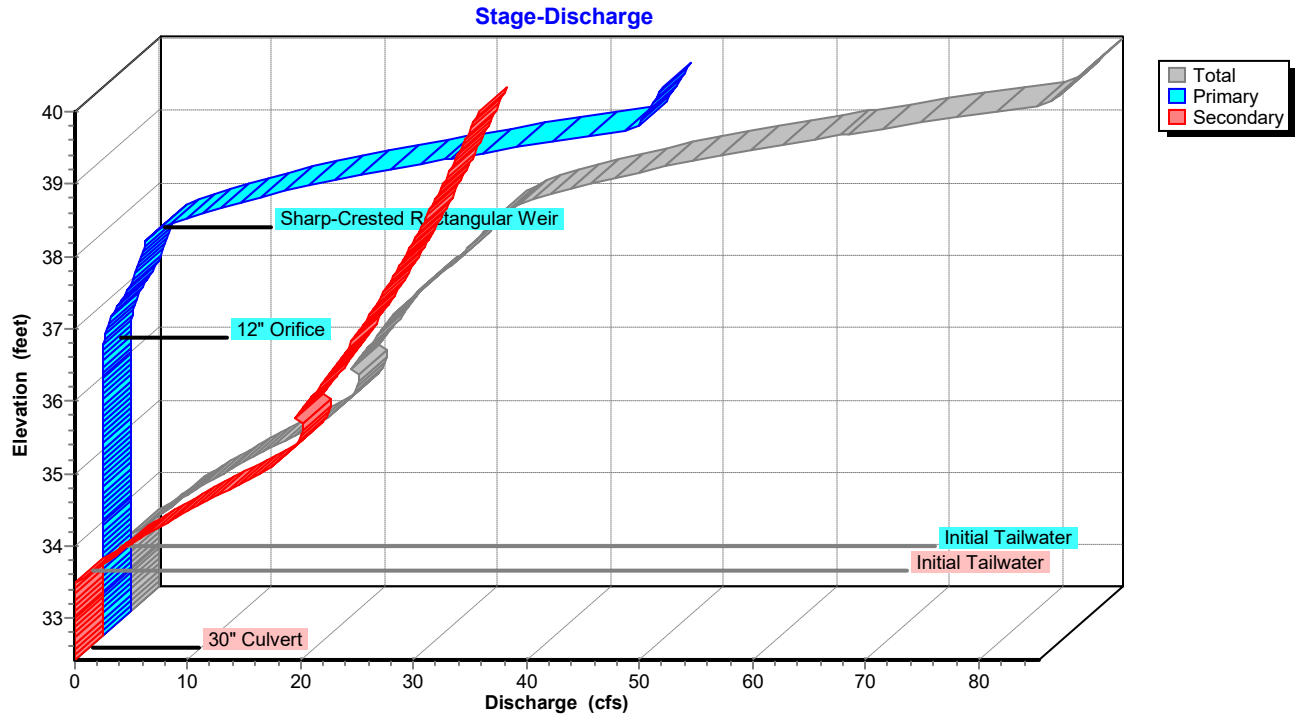
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Appendix D
NOAA 24-hr C 100-Year Rainfall=8.81"

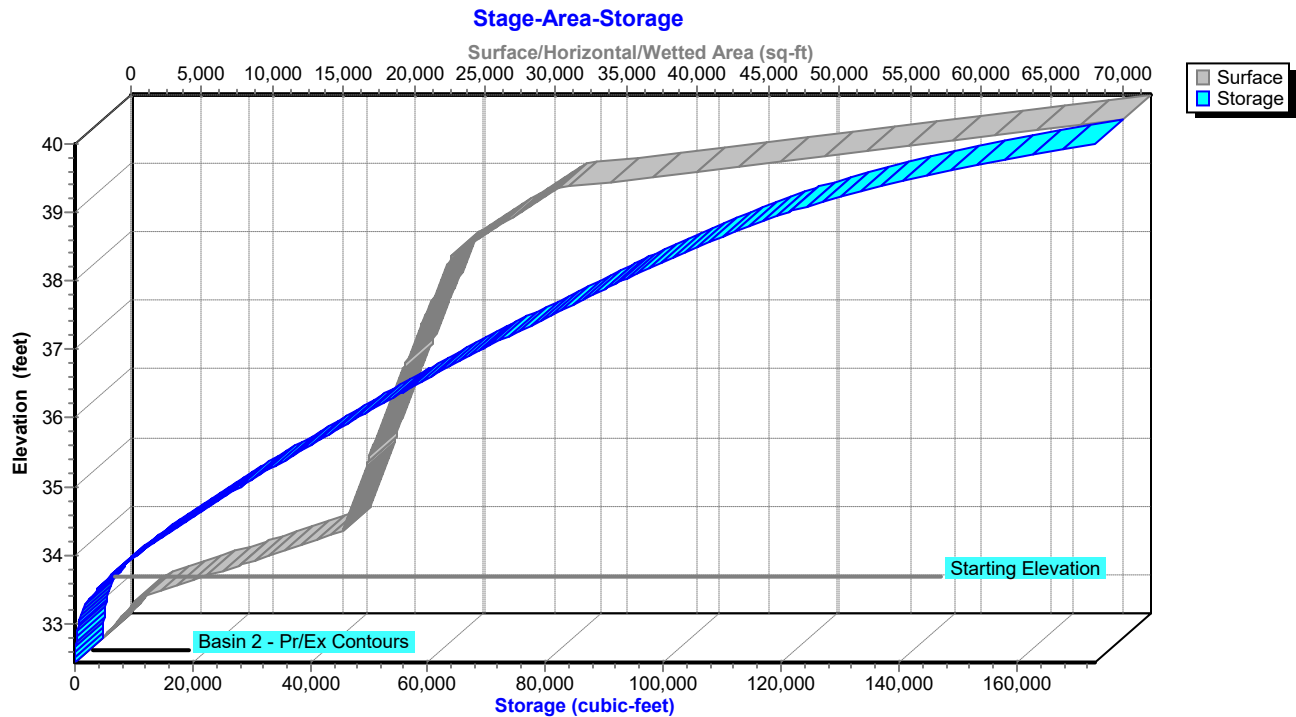
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Pond B2: Basin #2



Pond B2: Basin #2



Post Developed Conditions

NOAA 24-hr C 100-Year Rainfall=8.81"

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Summary for Pond B3: Basin #3

Inflow = 11.96 cfs @ 14.11 hrs, Volume= 5.233 af
 Outflow = 3.96 cfs @ 17.61 hrs, Volume= 3.129 af, Atten= 67%, Lag= 210.0 min
 Primary = 3.96 cfs @ 17.61 hrs, Volume= 3.129 af
 Routed to Link TTA : TTA

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 9,568 sf Storage= 5,403 cf

Peak Elev= 38.56' @ 17.61 hrs Surf.Area= 27,843 sf Storage= 106,123 cf (100,720 cf above start)

Plug-Flow detention time= 446.1 min calculated for 3.005 af (57% of inflow)

Center-of-Mass det. time= 221.5 min (1,288.8 - 1,067.3)

Volume	Invert	Avail.Storage	Storage Description
#1	31.44'	162,050 cf	Basin 3 - Pr/Ex Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.44	0	0	0
32.00	500	140	140
33.00	3,495	1,998	2,137
34.00	15,640	9,568	11,705
35.00	17,620	16,630	28,335
36.00	19,755	18,688	47,023
37.00	21,945	20,850	67,873
38.00	25,055	23,500	91,373
39.00	30,055	27,555	118,928
40.00	56,190	43,123	162,050

Device	Routing	Invert	Outlet Devices
#1	Primary	33.42'	24.0" Round 24" Culvert L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 33.42' / 33.15' S= 0.0042 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	38.22'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=3.96 cfs @ 17.61 hrs HW=38.56' TW=0.00' (Dynamic Tailwater)↑ **1=24" Culvert** (Passes 3.96 cfs of 30.62 cfs potential flow)↑ **2=Sharp-Crested Rectangular Weir** (Weir Controls 3.96 cfs @ 1.98 fps)

Post Developed Conditions

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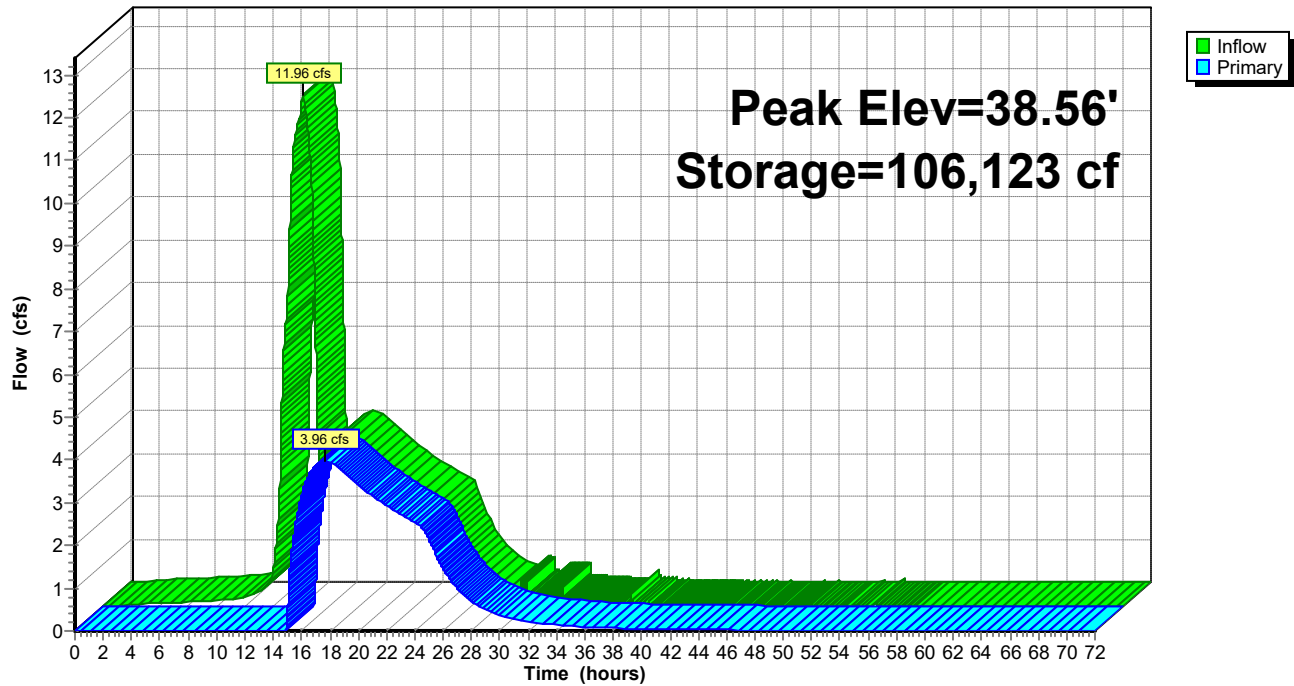
Appendix D
NOAA 24-hr C 100-Year Rainfall=8.81"

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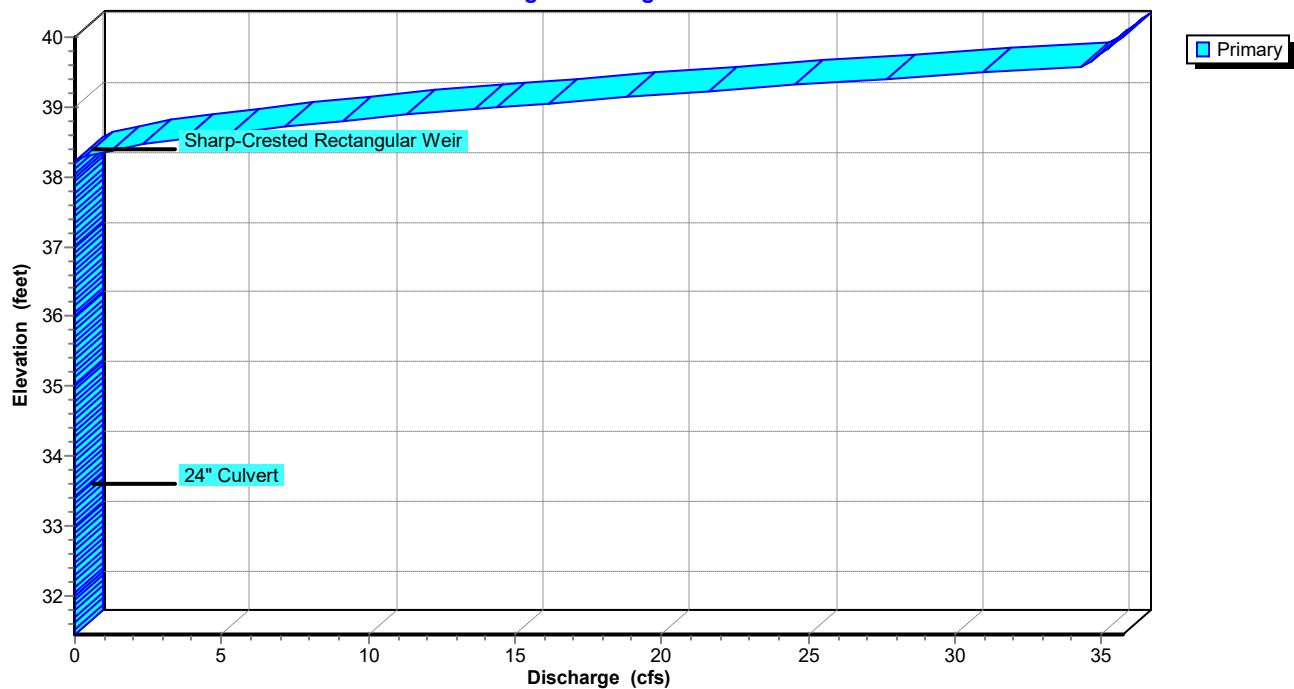
Pond B3: Basin #3

Hydrograph



Pond B3: Basin #3

Stage-Discharge



Post Developed Conditions

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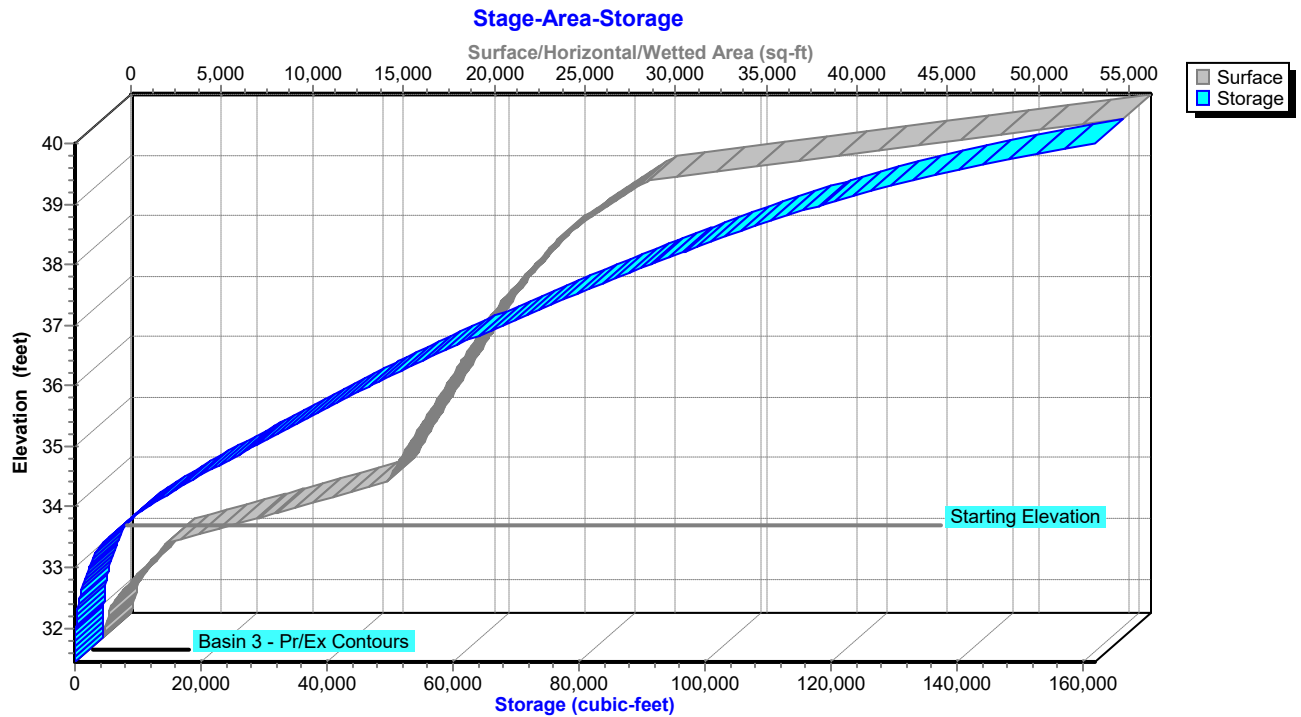
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Pond B3: Basin #3



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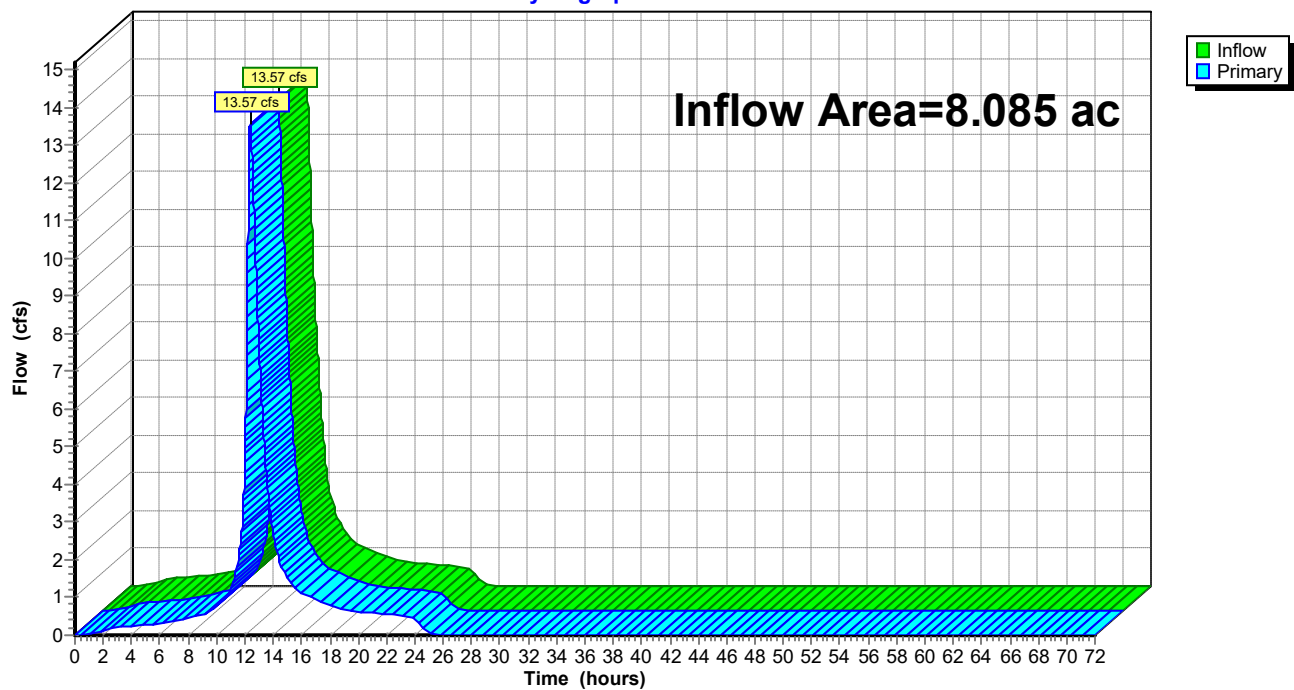
Summary for Link 1: PRDA-1

Inflow Area = 8.085 ac, 29.44% Impervious, Inflow Depth = 3.67" for 100-Year event
Inflow = 13.57 cfs @ 12.37 hrs, Volume= 2.471 af
Primary = 13.57 cfs @ 12.38 hrs, Volume= 2.471 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B1 : Basin #1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 1: PRDA-1

Hydrograph



Post Developed Conditions

NOAA 24-hr C 100-Year Rainfall=8.81"

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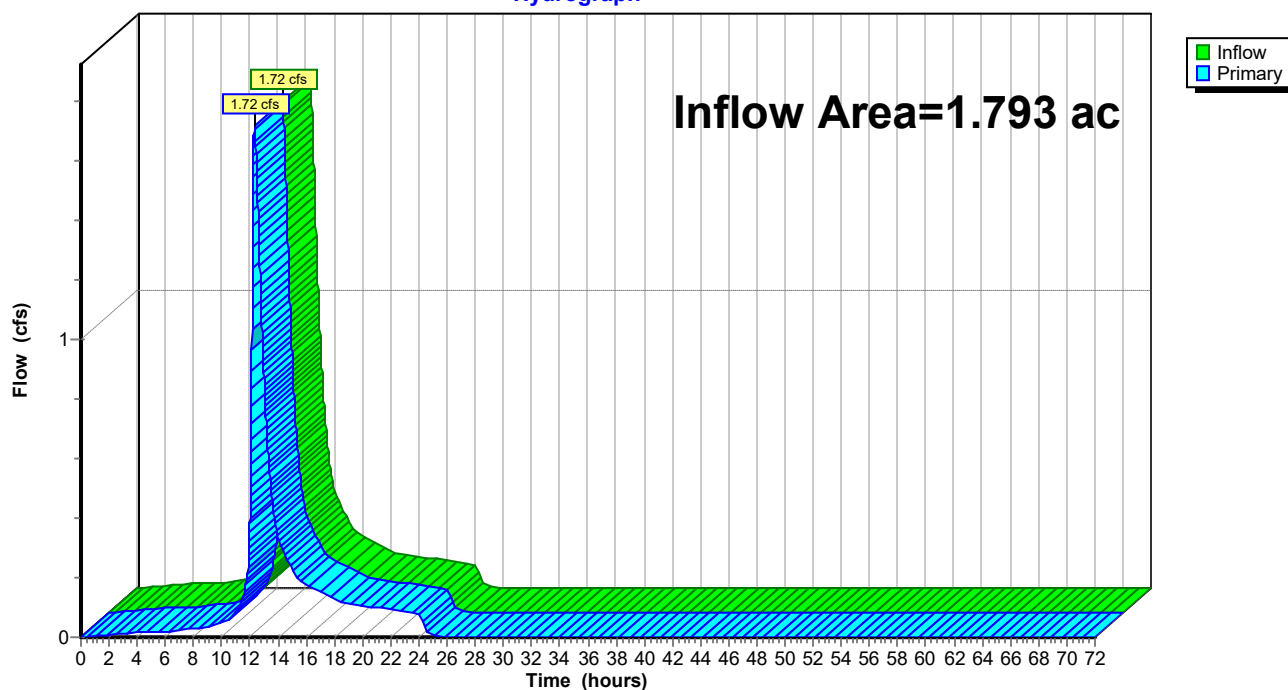
Summary for Link 2A: PRDA-2A

Inflow Area = 1.793 ac, 8.49% Impervious, Inflow Depth = 1.98" for 100-Year event
Inflow = 1.72 cfs @ 12.30 hrs, Volume= 0.296 af
Primary = 1.72 cfs @ 12.31 hrs, Volume= 0.296 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2A: PRDA-2A

Hydrograph



Post Developed Conditions

NOAA 24-hr C 100-Year Rainfall=8.81"

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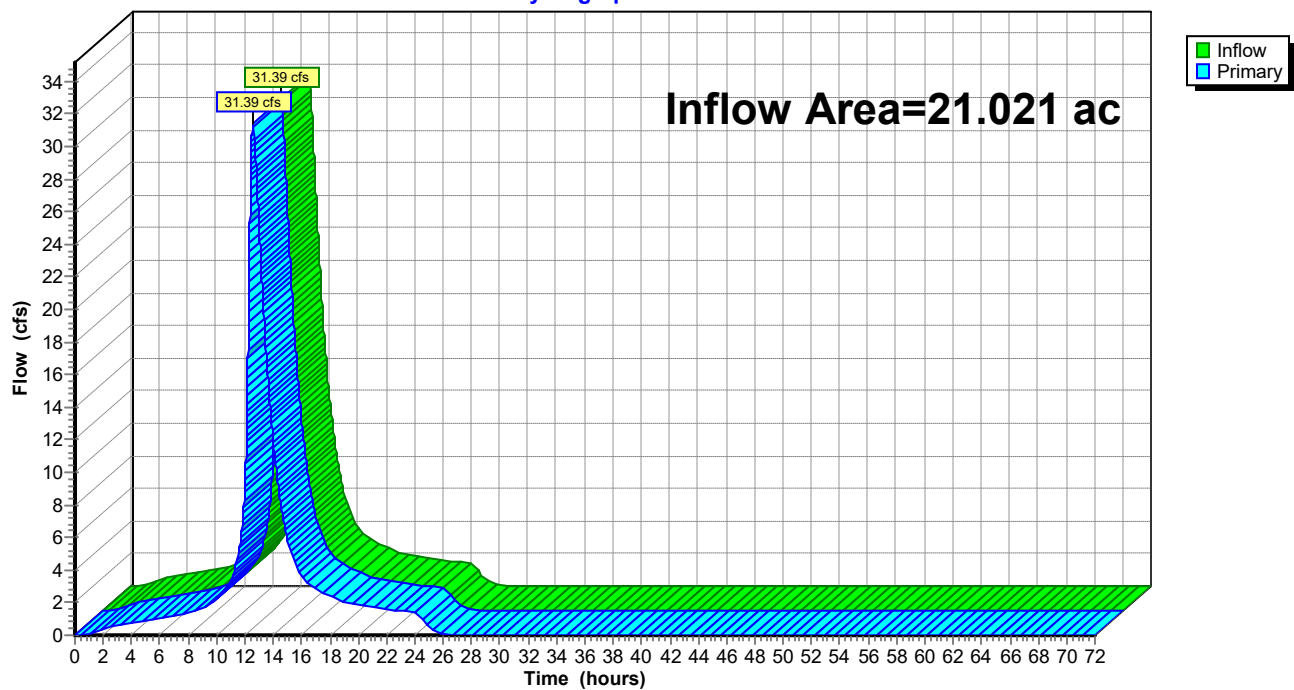
Summary for Link 2B: PRDA-2B

Inflow Area = 21.021 ac, 38.74% Impervious, Inflow Depth = 4.25" for 100-Year event
 Inflow = 31.39 cfs @ 12.55 hrs, Volume= 7.440 af
 Primary = 31.39 cfs @ 12.56 hrs, Volume= 7.440 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2B: PRDA-2B

Hydrograph



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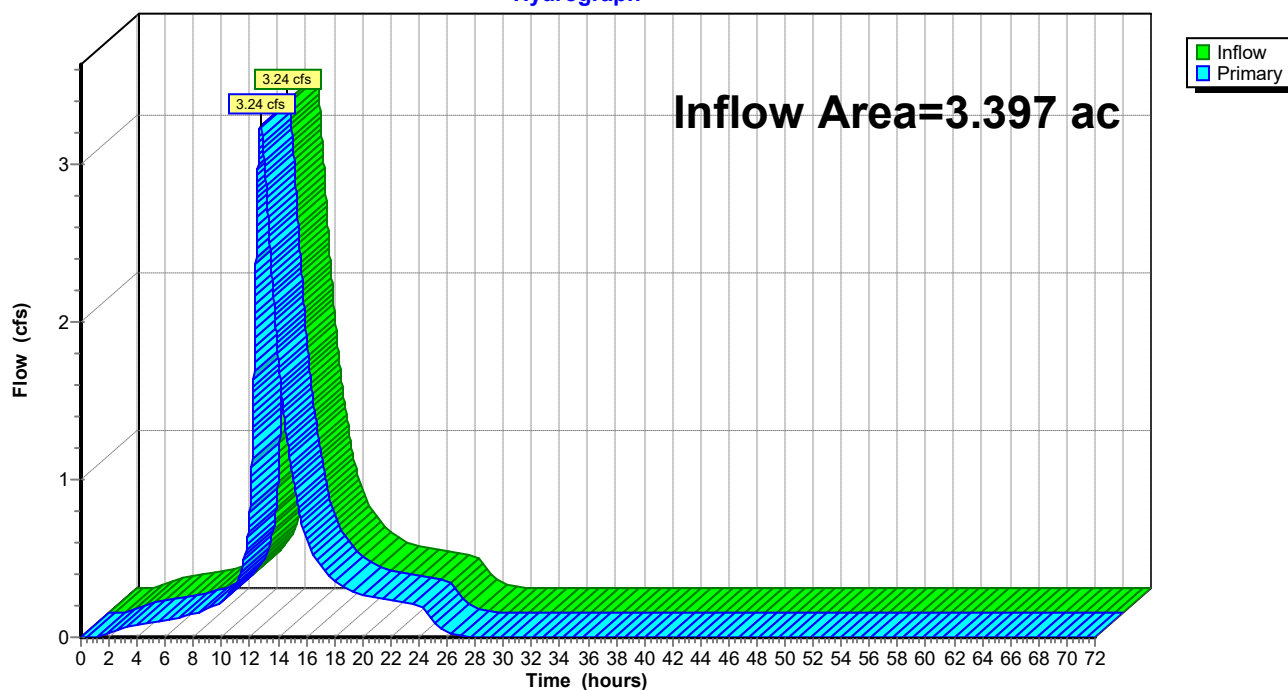
Summary for Link 3: PRDA-3

Inflow Area = 3.397 ac, 26.15% Impervious, Inflow Depth = 3.31" for 100-Year event
 Inflow = 3.24 cfs @ 12.70 hrs, Volume= 0.937 af
 Primary = 3.24 cfs @ 12.71 hrs, Volume= 0.937 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B3 : Basin #3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3: PRDA-3

Hydrograph



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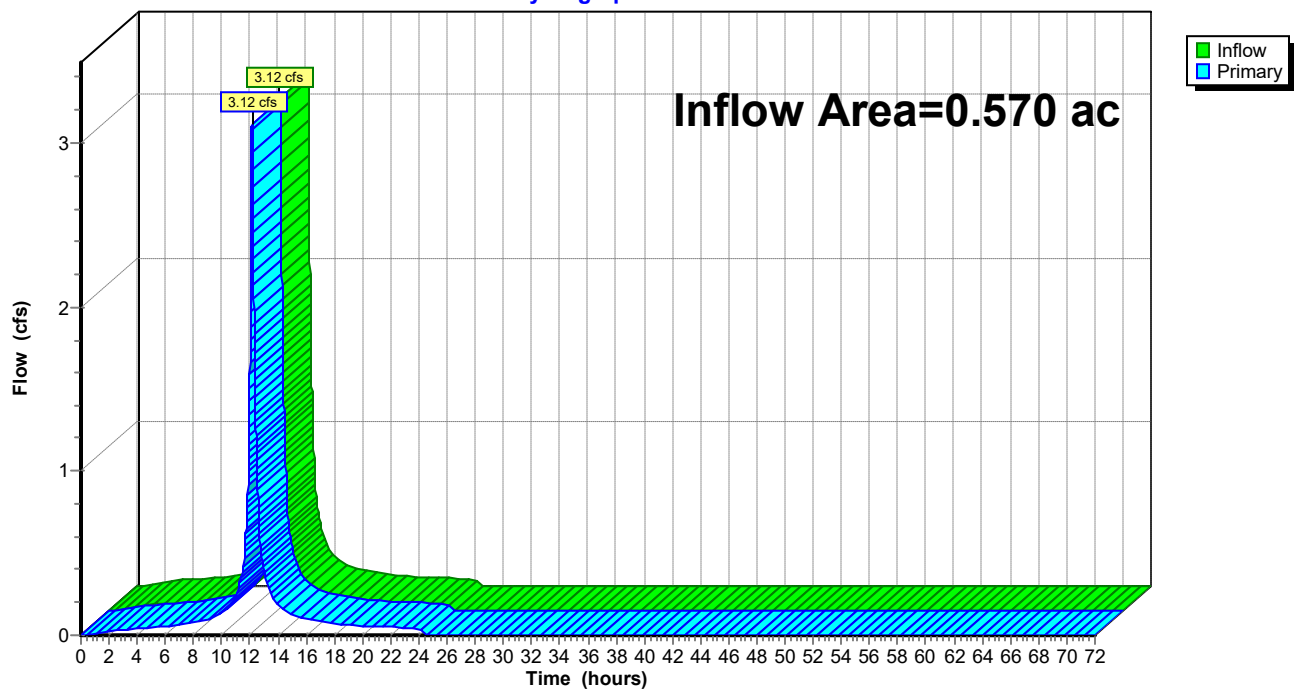
Summary for Link 4: PRDA-4

Inflow Area = 0.570 ac, 67.40% Impervious, Inflow Depth = 6.21" for 100-Year event
 Inflow = 3.12 cfs @ 12.14 hrs, Volume= 0.295 af
 Primary = 3.12 cfs @ 12.15 hrs, Volume= 0.295 af, Atten= 0%, Lag= 0.6 min
 Routed to Link TTA : TTA

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 4: PRDA-4

Hydrograph



Post Developed Conditions

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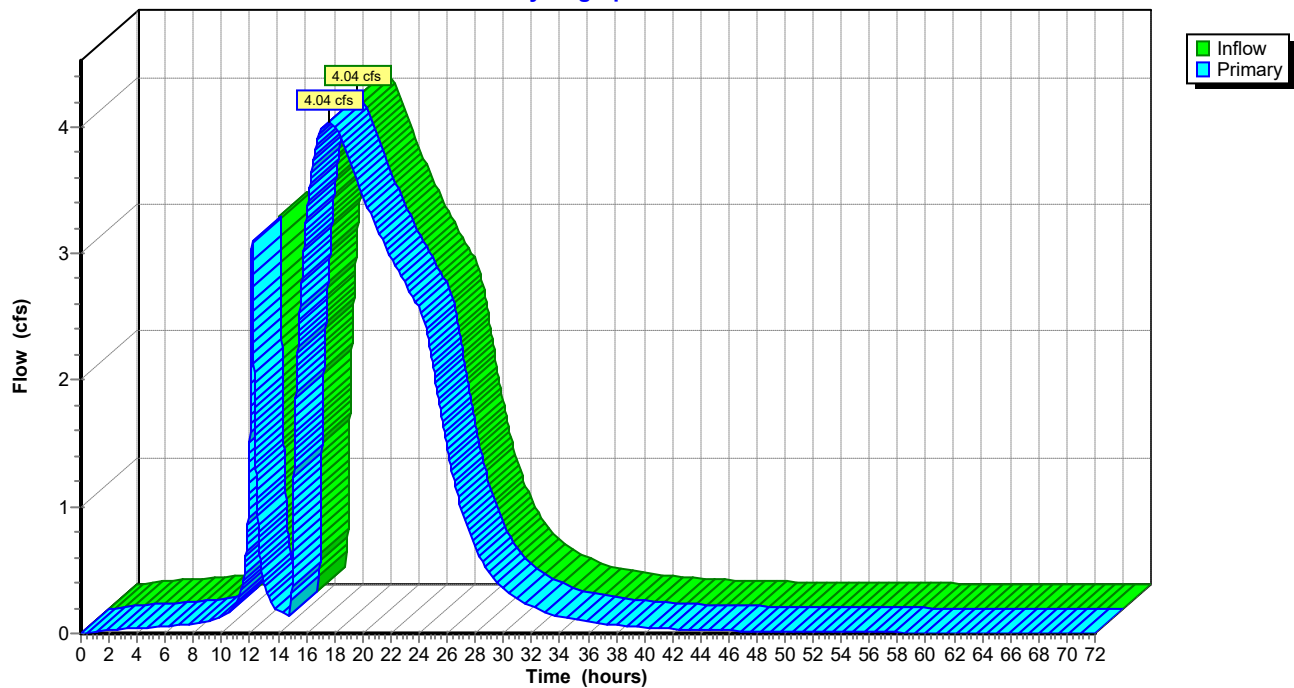
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Summary for Link TTA: TTA

Inflow = 4.04 cfs @ 17.57 hrs, Volume= 3.424 af
Primary = 4.04 cfs @ 17.58 hrs, Volume= 3.424 af, Atten= 0%, Lag= 0.6 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link TTA: TTA**Hydrograph**

Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
 Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q
 Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1i: PRDA-1i	Runoff Area=122,285 sf 84.80% Impervious Runoff Depth=0.89" Flow Length=275' Tc=22.2 min CN=WQ Runoff=2.76 cfs 0.207 af
Subcatchment 1p: PRDA-1p	Runoff Area=229,900 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=275' Tc=22.2 min CN=WQ Runoff=0.00 cfs 0.000 af
Subcatchment 2Ai: PRDA-2Ai	Runoff Area=6,630 sf 100.00% Impervious Runoff Depth=1.03" Flow Length=267' Tc=15.9 min CN=98 Runoff=0.22 cfs 0.013 af
Subcatchment 2Ap: PRDA-2Ap	Runoff Area=71,475 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=267' Tc=15.9 min CN=WQ Runoff=0.00 cfs 0.000 af
Subcatchment 2Bi: PRDA-2Bi	Runoff Area=354,705 sf 100.00% Impervious Runoff Depth=1.03" Flow Length=1,831' Tc=36.2 min CN=98 Runoff=6.60 cfs 0.702 af
Subcatchment 2Bp: PRDA-2Bp	Runoff Area=560,985 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=1,831' Tc=36.2 min CN=39 Runoff=0.00 cfs 0.000 af
Subcatchment 3i: PRDA-3i	Runoff Area=38,695 sf 100.00% Impervious Runoff Depth=1.03" Flow Length=328' Tc=47.6 min CN=98 Runoff=0.59 cfs 0.077 af
Subcatchment 3p: PRDA-3p	Runoff Area=109,285 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=328' Tc=47.6 min CN=WQ Runoff=0.00 cfs 0.000 af
Subcatchment 4i: PRDA-4i	Runoff Area=16,740 sf 100.00% Impervious Runoff Depth=1.03" Tc=6.0 min CN=98 Runoff=0.91 cfs 0.033 af
Subcatchment 4p: PRDA-4p	Runoff Area=8,095 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=WQ Runoff=0.00 cfs 0.000 af
Pond B1: Basin #1	Peak Elev=34.45' Storage=32,281 cf Inflow=4.88 cfs 1.173 af 30.0" Round Culvert n=0.013 L=625.0' S=-0.0015 '/' Outflow=0.27 cfs 0.583 af
Pond B2: Basin #2	Peak Elev=34.45' Storage=18,260 cf Inflow=6.74 cfs 1.299 af Primary=0.00 cfs 0.000 af Secondary=3.26 cfs 0.966 af Outflow=3.26 cfs 0.966 af
Pond B3: Basin #3	Peak Elev=33.79' Storage=8,728 cf Inflow=0.59 cfs 0.077 af Outflow=0.00 cfs 0.000 af
Link 1: PRDA-1	Inflow=2.76 cfs 0.207 af Primary=2.76 cfs 0.207 af
Link 2A: PRDA-2A	Inflow=0.22 cfs 0.013 af Primary=0.22 cfs 0.013 af
Link 2B: PRDA-2B	Inflow=6.60 cfs 0.702 af Primary=6.60 cfs 0.702 af

Post Developed Conditions

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Appendix D

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Link 3: PRDA-3

Inflow=0.59 cfs 0.077 af
Primary=0.59 cfs 0.077 af

Link 4: PRDA-4

Inflow=0.91 cfs 0.033 af
Primary=0.91 cfs 0.033 af

Link TTA: TTA

Inflow=0.91 cfs 0.033 af
Primary=0.91 cfs 0.033 af

Total Runoff Area = 34.867 ac Runoff Volume = 1.032 af Average Runoff Depth = 0.36"
65.73% Pervious = 22.918 ac 34.27% Impervious = 11.948 ac

Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Subcatchment 1i: PRDA-1i

Runoff = 2.76 cfs @ 1.33 hrs, Volume= 0.207 af, Depth= 0.89"
 Routed to Link 1 : PRDA-1

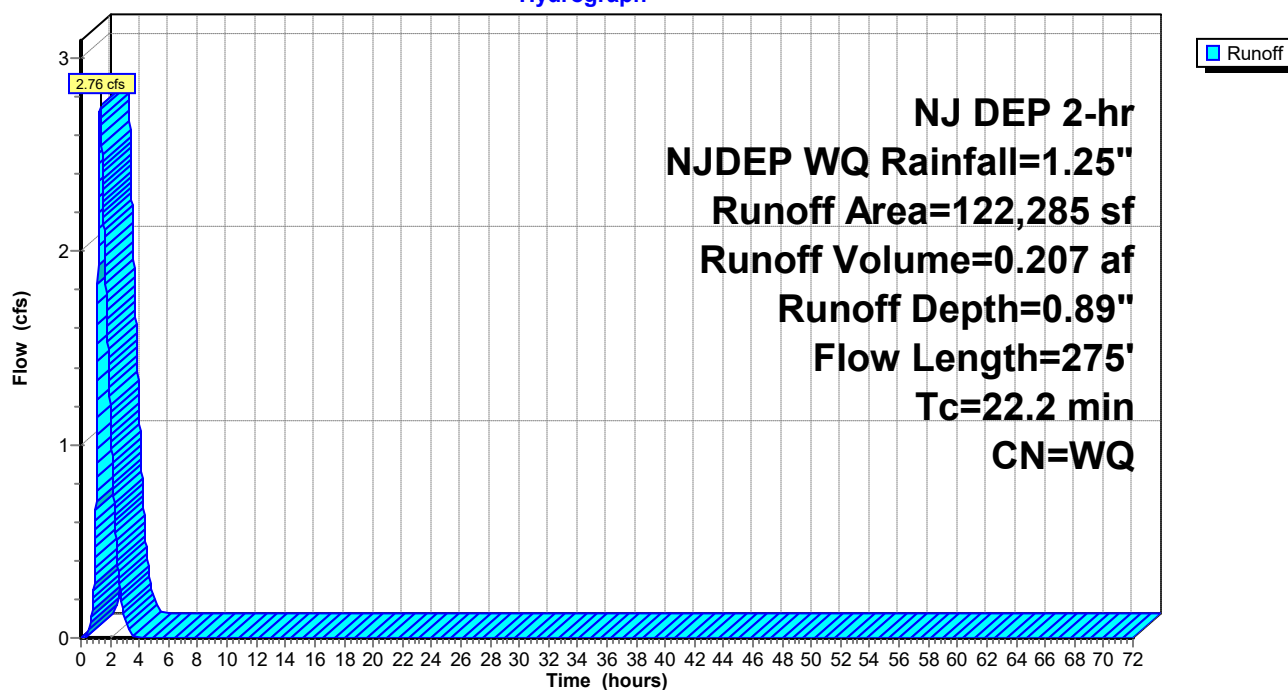
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (sf)	CN	Description
103,700	98	Paved parking, HSG A
18,585	72	Dirt roads, HSG A
122,285		Weighted Average
18,585	72	15.20% Pervious Area
103,700	98	84.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment PRDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment PRDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1i: PRDA-1i

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Subcatchment 1p: PRDA-1p

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Link 1 : PRDA-1

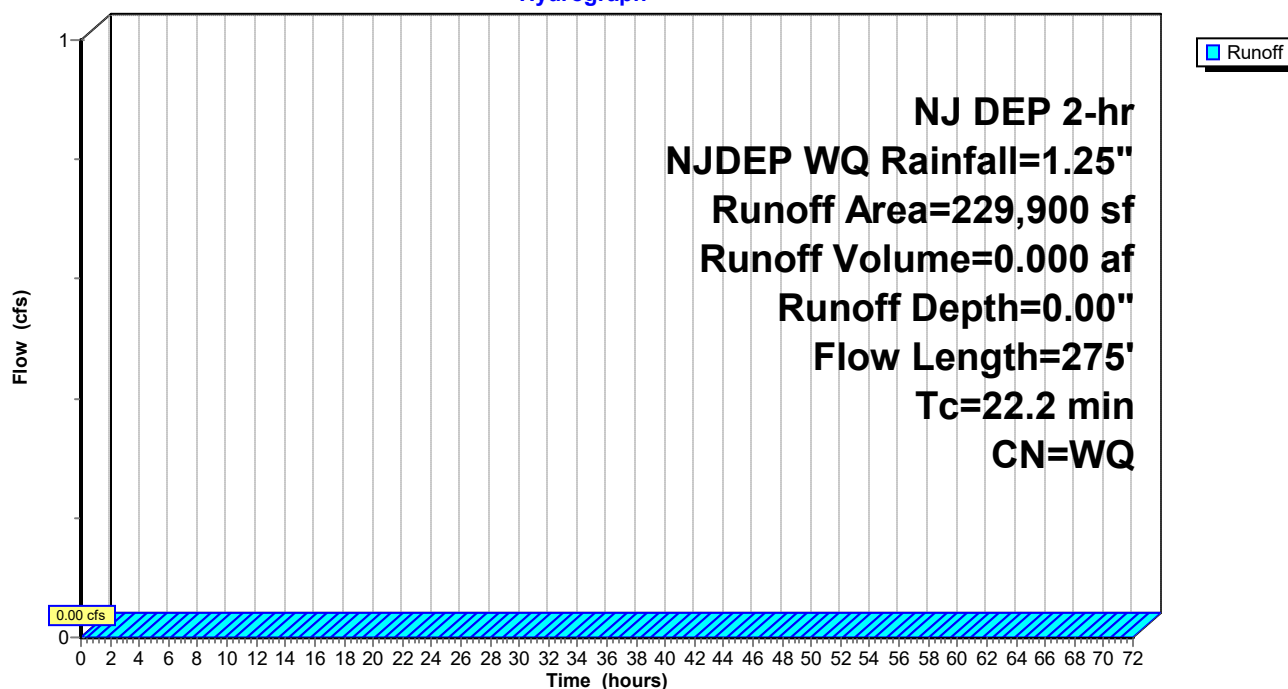
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (sf)	CN	Description
178,350	39	>75% Grass cover, Good, HSG A
51,550	30	Woods, Good, HSG A
229,900		Weighted Average
229,900	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	100	0.0070	0.08		Sheet Flow, Segment PRDA-1.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	175	0.0360	3.05		Shallow Concentrated Flow, Segment PRDA-1.2
					Unpaved Kv= 16.1 fps
22.2	275	Total			

Subcatchment 1p: PRDA-1p

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Subcatchment 2Ai: PRDA-2Ai

Runoff = 0.22 cfs @ 1.24 hrs, Volume= 0.013 af, Depth= 1.03"
 Routed to Link 2A : PRDA-2A

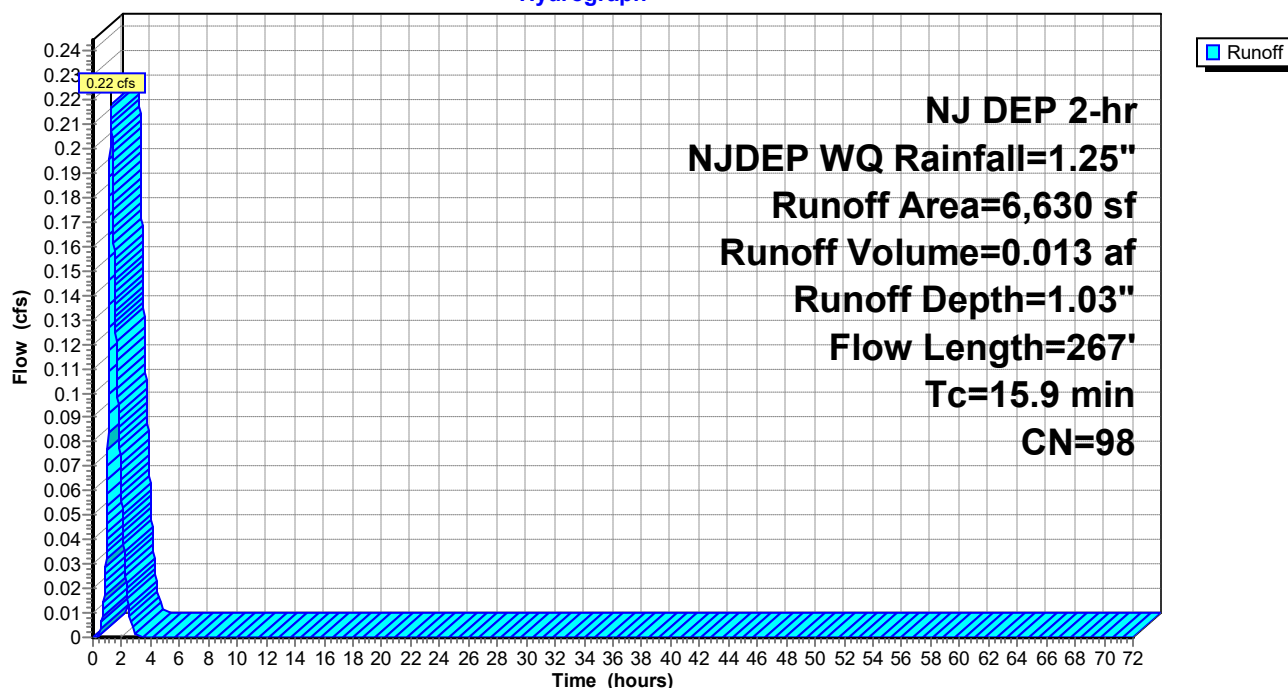
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (sf)	CN	Description
6,630	98	Paved parking, HSG A
6,630	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment PRDA-2A.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment PRDA-2A.2
					Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ai: PRDA-2Ai

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Subcatchment 2Ap: PRDA-2Ap

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Link 2A : PRDA-2A

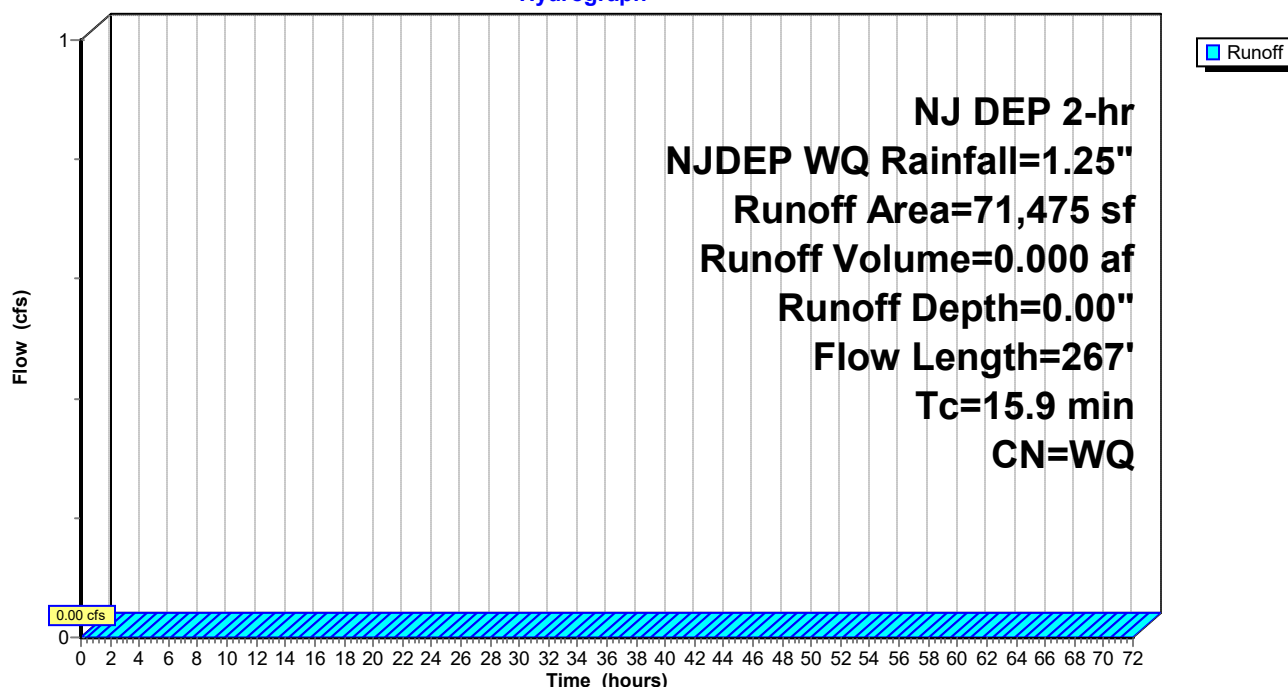
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (sf)	CN	Description
59,900	39	>75% Grass cover, Good, HSG A
11,575	30	Woods, Good, HSG A
71,475		Weighted Average
71,475	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	100	0.0170	0.11		Sheet Flow, Segment PRDA-2A.1
					Grass: Dense n= 0.240 P2= 3.36"
1.0	167	0.0330	2.92		Shallow Concentrated Flow, Segment PRDA-2A.2
					Unpaved Kv= 16.1 fps
15.9	267	Total			

Subcatchment 2Ap: PRDA-2Ap

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Subcatchment 2Bi: PRDA-2Bi

Runoff = 6.60 cfs @ 1.53 hrs, Volume= 0.702 af, Depth= 1.03"
 Routed to Link 2B : PRDA-2B

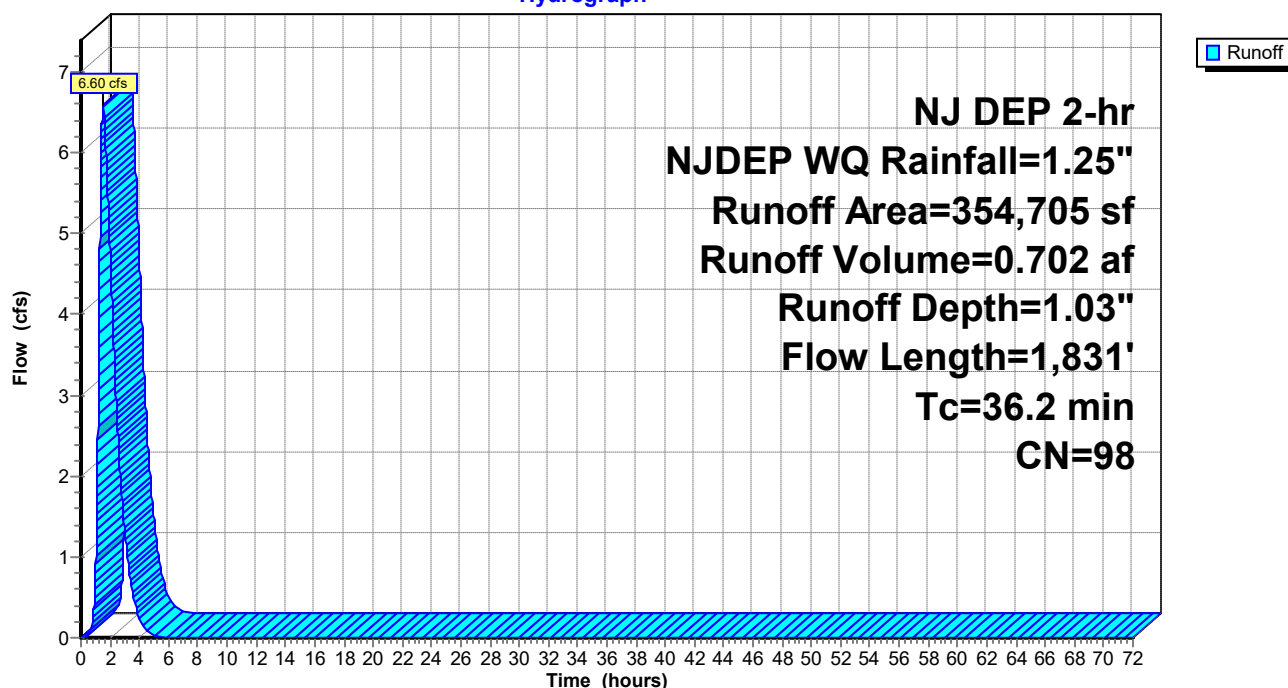
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (sf)	CN	Description
354,705	98	Paved parking, HSG A
354,705	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment PRDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment PRDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment PRDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment PRDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bi: PRDA-2Bi

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Subcatchment 2Bp: PRDA-2Bp

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Link 2B : PRDA-2B

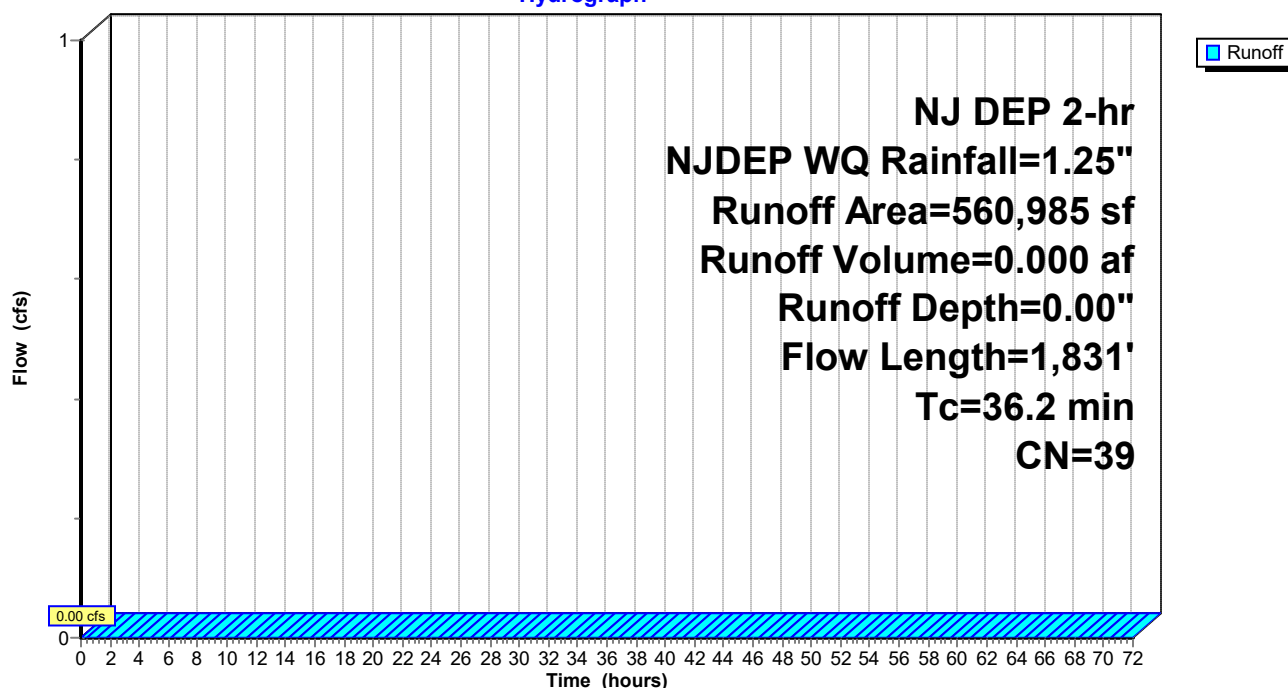
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (sf)	CN	Description
560,985	39	>75% Grass cover, Good, HSG A
560,985	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	100	0.0050	0.07		Sheet Flow, Segment PRDA-2B.1 Grass: Dense n= 0.240 P2= 3.36"
0.9	102	0.0150	1.97		Shallow Concentrated Flow, Segment PRDA-2B.2 Unpaved Kv= 16.1 fps
2.4	242	0.0070	1.70		Shallow Concentrated Flow, Segment PRDA-2B.3 Paved Kv= 20.3 fps
8.7	1,387	0.0020	2.66	4.70	Pipe Channel, Segment PRDA-2B.4 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
36.2	1,831	Total			

Subcatchment 2Bp: PRDA-2Bp

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Subcatchment 3i: PRDA-3i

Runoff = 0.59 cfs @ 1.69 hrs, Volume= 0.077 af, Depth= 1.03"
 Routed to Link 3 : PRDA-3

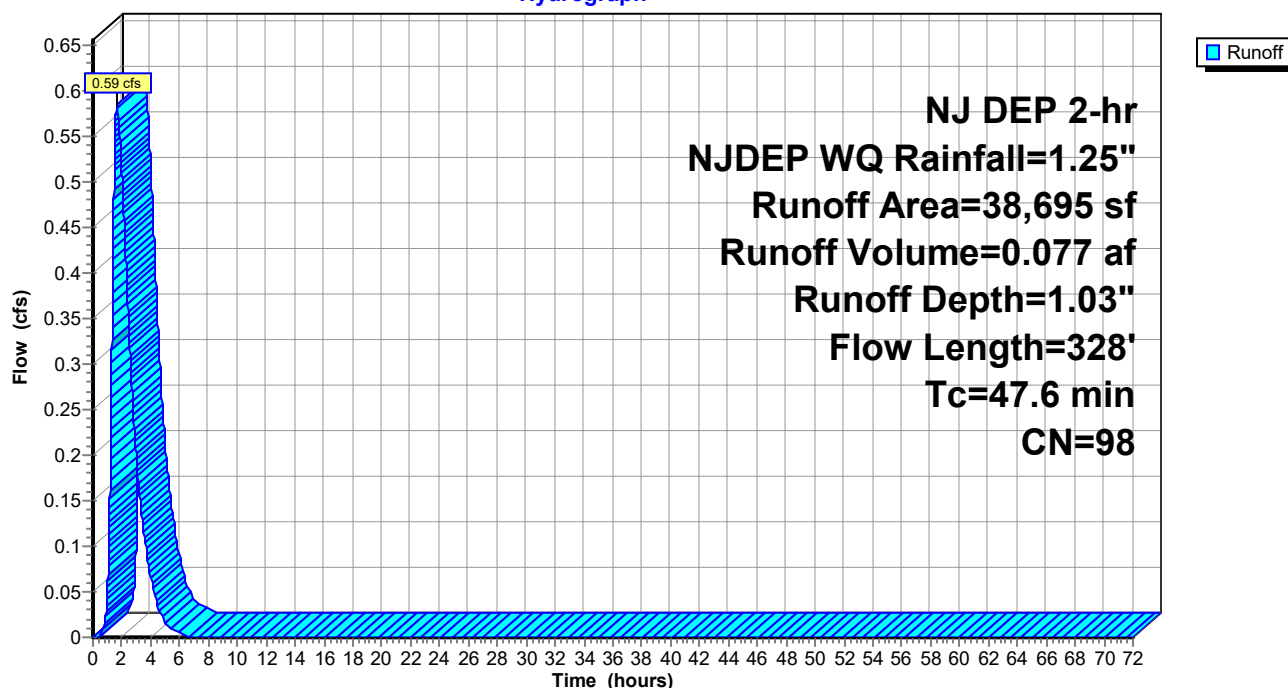
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (sf)	CN	Description
38,695	98	Paved parking, HSG A
38,695	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment PRDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment PRDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3i: PRDA-3i

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Subcatchment 3p: PRDA-3p

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Link 3 : PRDA-3

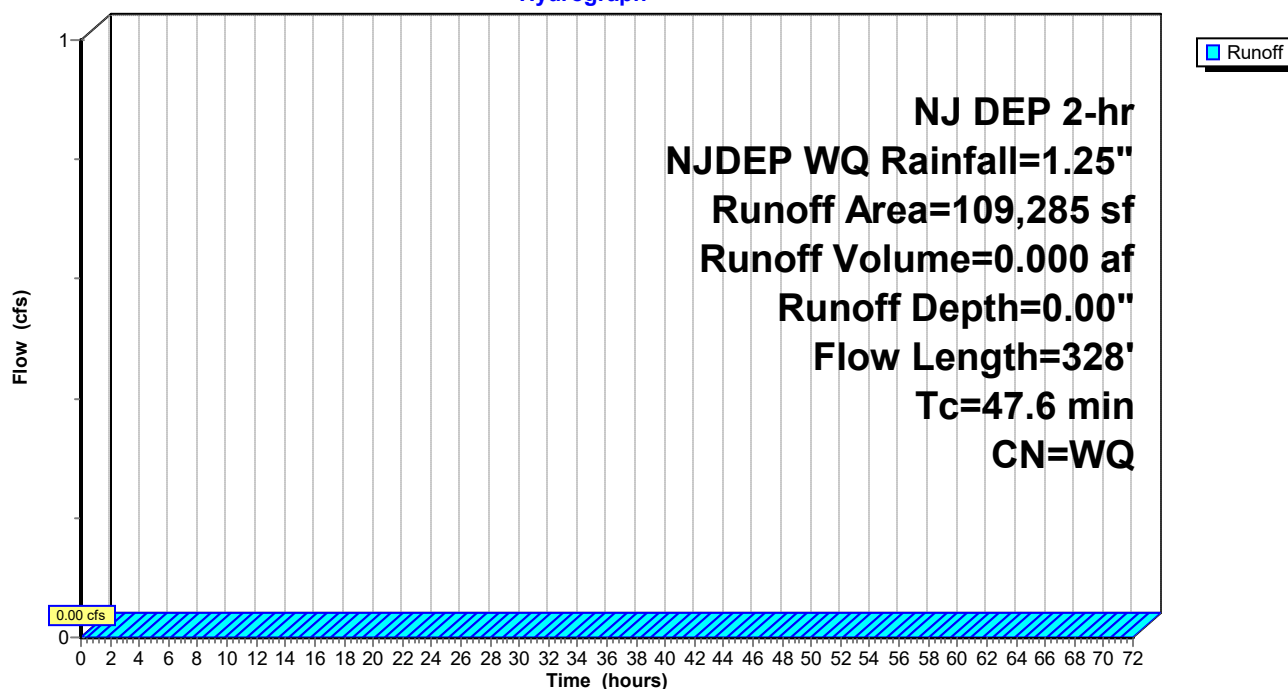
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (sf)	CN	Description
101,135	39	>75% Grass cover, Good, HSG A
8,150	30	Woods, Good, HSG A
109,285		Weighted Average
109,285	38	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.2	100	0.0010	0.04		Sheet Flow, Segment PRDA-3.1
					Grass: Dense n= 0.240 P2= 3.36"
1.4	228	0.0300	2.79		Shallow Concentrated Flow, Segment PRDA-3.2
					Unpaved Kv= 16.1 fps
47.6	328	Total			

Subcatchment 3p: PRDA-3p

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Subcatchment 4i: PRDA-4i

Runoff = 0.91 cfs @ 1.12 hrs, Volume= 0.033 af, Depth= 1.03"
 Routed to Link 4 : PRDA-4

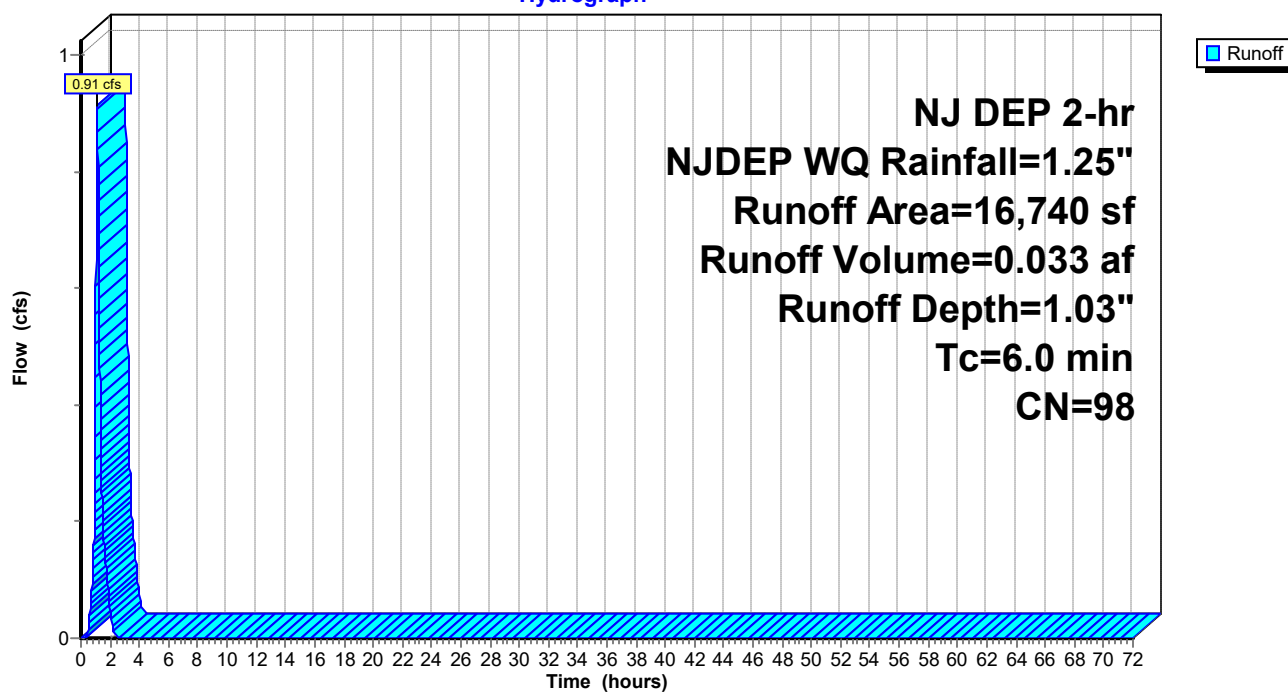
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (sf)	CN	Description
16,740	98	Paved parking, HSG A
16,740	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment PRDA-4.1

Subcatchment 4i: PRDA-4i

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Subcatchment 4p: PRDA-4p

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Link 4 : PRDA-4

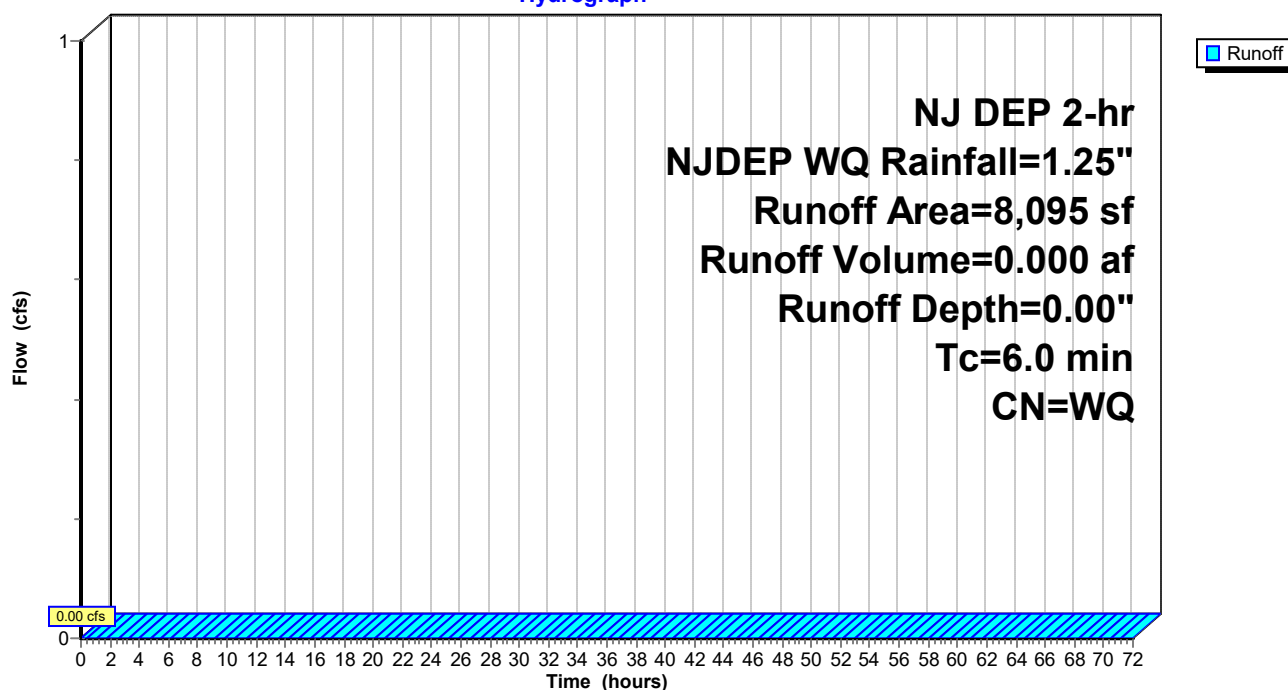
Runoff by SCS TR-20 method, UH=Delmarva, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Area (sf)	CN	Description
6,330	39	>75% Grass cover, Good, HSG A
1,765	30	Woods, Good, HSG A
8,095		Weighted Average
8,095	37	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Segment PRDA-4.1

Subcatchment 4p: PRDA-4p

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Pond B1: Basin #1

Inflow = 4.88 cfs @ 1.70 hrs, Volume= 1.173 af
 Outflow = 0.27 cfs @ 5.98 hrs, Volume= 0.583 af, Atten= 94%, Lag= 256.4 min
 Primary = 0.27 cfs @ 5.98 hrs, Volume= 0.583 af
 Routed to Pond B2 : Basin #2

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 16,675 sf Storage= 6,588 cf

Peak Elev= 34.45' @ 6.05 hrs Surf.Area= 31,444 sf Storage= 32,281 cf (25,694 cf above start)

Plug-Flow detention time= 2,711.3 min calculated for 0.432 af (37% of inflow)

Center-of-Mass det. time= 1,088.0 min (2,284.3 - 1,196.3)

Volume	Invert	Avail.Storage	Storage Description
#1	31.50'	265,835 cf	Basin 1 - Pr/Ex Contours (Prismatic) Listed below (Recalc)
#2	38.40'	7,196 cf	Low Area - Existing Contours (Prismatic) Listed below (Recalc)
		273,031 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.50	0	0	0
32.00	270	68	68
33.00	2,955	1,613	1,680
34.00	30,395	16,675	18,355
35.00	32,725	31,560	49,915
36.00	35,215	33,970	83,885
37.00	37,855	36,535	120,420
38.00	41,075	39,465	159,885
39.00	49,965	45,520	205,405
40.00	70,895	60,430	265,835

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
38.40	10	0	0
39.00	1,050	318	318
40.00	12,705	6,878	7,196

Device	Routing	Invert	Outlet Devices
#1	Primary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 31.50' / 32.43' S= -0.0015 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Primary OutFlow Max=0.15 cfs @ 5.98 hrs HW=34.45' TW=34.45' (Dynamic Tailwater)↑ **1=30" Culvert** (Outlet Controls 0.15 cfs @ 0.03 fps)

Post Developed Conditions

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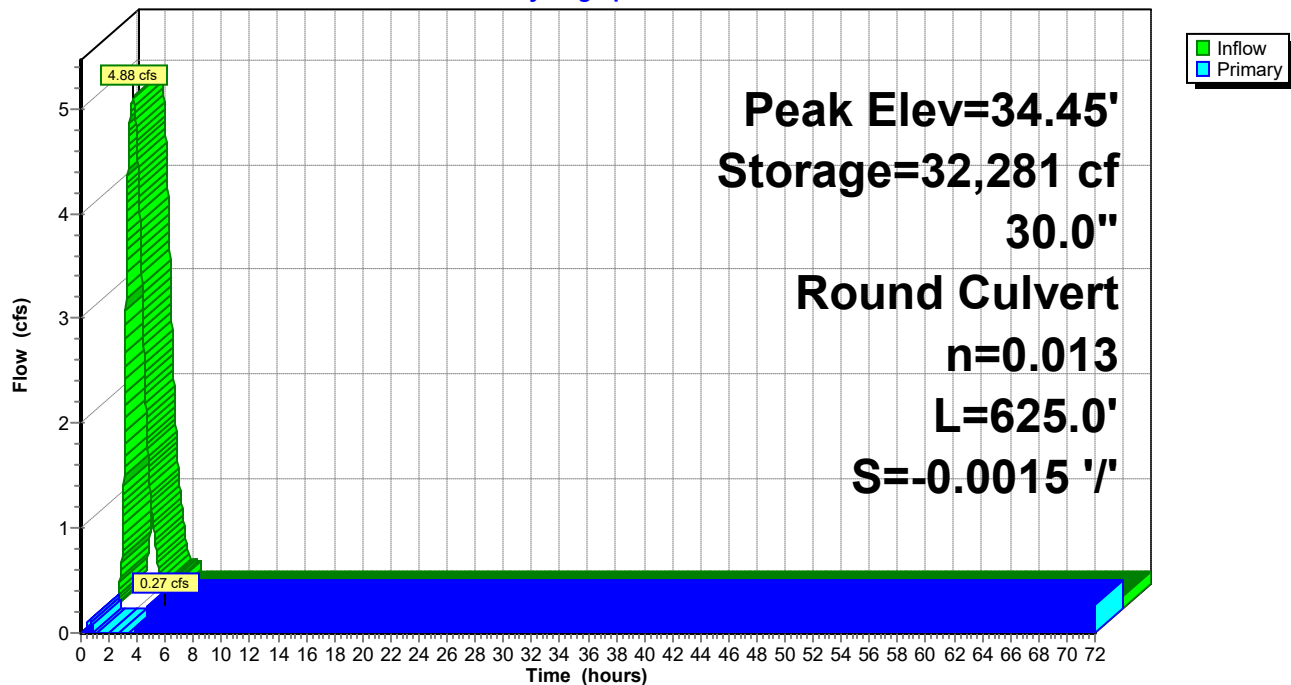
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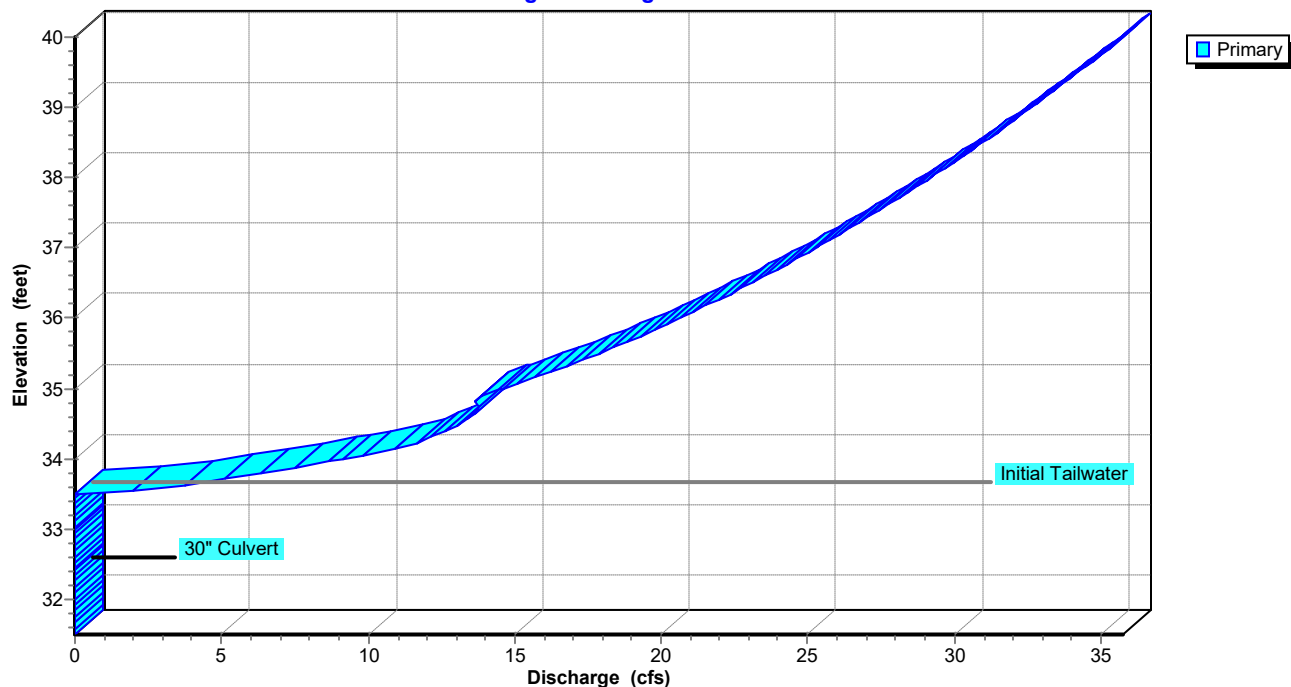
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Pond B1: Basin #1

Hydrograph

**Pond B1: Basin #1**

Stage-Discharge



Post Developed Conditions

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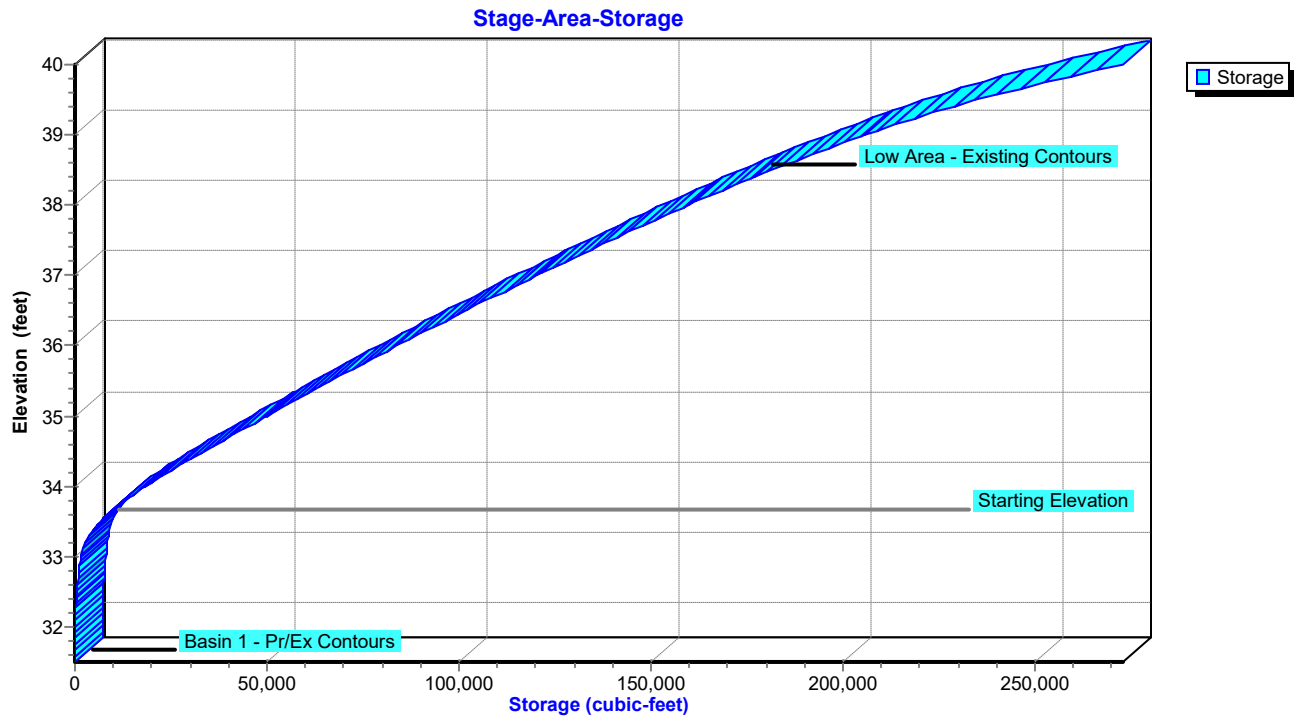
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Appendix D
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Pond B1: Basin #1



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Pond B2: Basin #2

Inflow = 6.74 cfs @ 1.54 hrs, Volume= 1.299 af
 Outflow = 3.26 cfs @ 1.90 hrs, Volume= 0.966 af, Atten= 52%, Lag= 21.8 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Pond B3 : Basin #3
 Secondary = 3.26 cfs @ 1.90 hrs, Volume= 0.966 af
 Routed to Pond B1 : Basin #1

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 33.50' Surf.Area= 9,728 sf Storage= 3,769 cf

Peak Elev= 34.45' @ 6.03 hrs Surf.Area= 17,742 sf Storage= 18,260 cf (14,490 cf above start)

Plug-Flow detention time= 1,312.7 min calculated for 0.880 af (68% of inflow)

Center-of-Mass det. time= 339.2 min (1,431.8 - 1,092.6)

Volume	Invert	Avail.Storage	Storage Description
#1	32.43'	173,433 cf	Basin 2 - Pr/Ex Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
32.43	0	0	0
33.00	2,500	713	713
34.00	16,955	9,728	10,440
35.00	18,700	17,828	28,268
36.00	20,530	19,615	47,883
37.00	22,470	21,500	69,383
38.00	24,590	23,530	92,913
39.00	32,225	28,408	121,320
40.00	72,000	52,113	173,433

Device	Routing	Invert	Outlet Devices
#1	Primary	32.35'	30.0" Round 30" Culvert L= 253.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.35' / 31.41' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	36.37'	12.0" Vert. 12" Orifice C= 0.600 Limited to weir flow at low heads 6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height
#3	Device 1	37.90'	
#4	Secondary	32.43'	30.0" Round 30" Culvert L= 625.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 32.43' / 31.50' S= 0.0015 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf

Post Developed Conditions

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Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.50' TW=33.50' (Dynamic Tailwater)

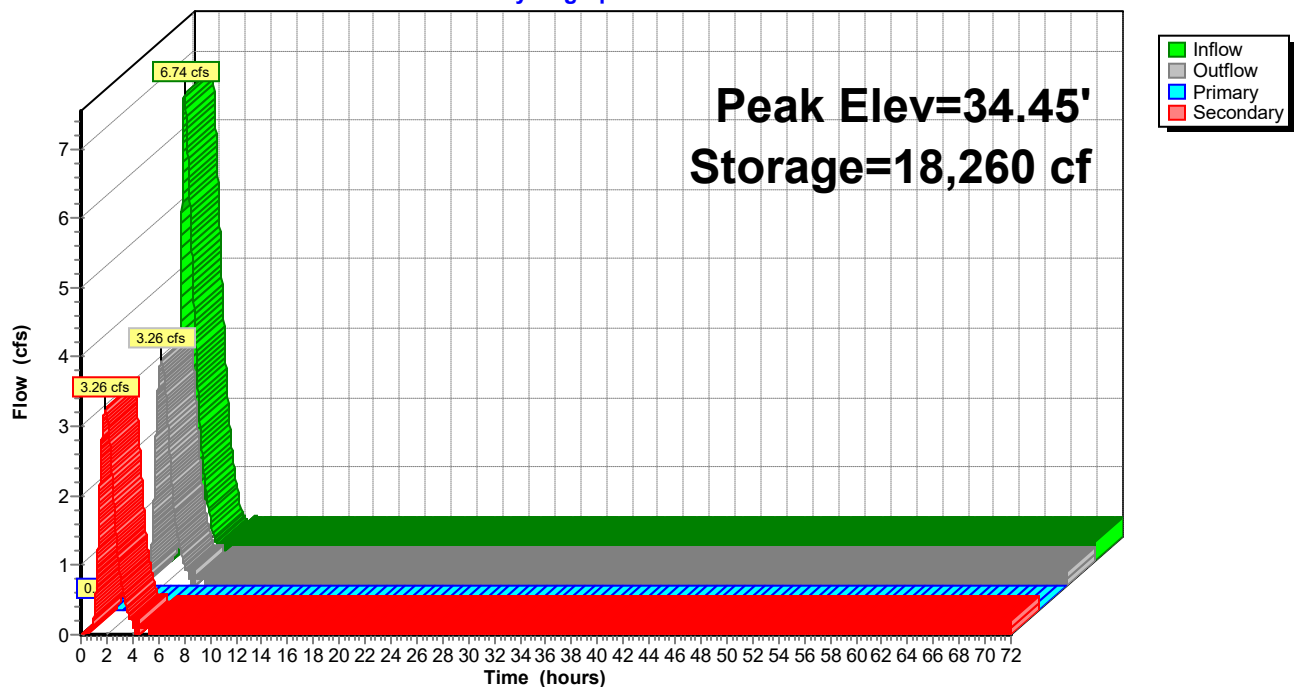
1=30" Culvert (Controls 0.00 cfs)

2=12" Orifice (Controls 0.00 cfs)

3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=3.20 cfs @ 1.90 hrs HW=34.19' TW=34.03' (Dynamic Tailwater)

4=30" Culvert (Outlet Controls 3.20 cfs @ 1.21 fps)

Pond B2: Basin #2**Hydrograph**

Post Developed Conditions

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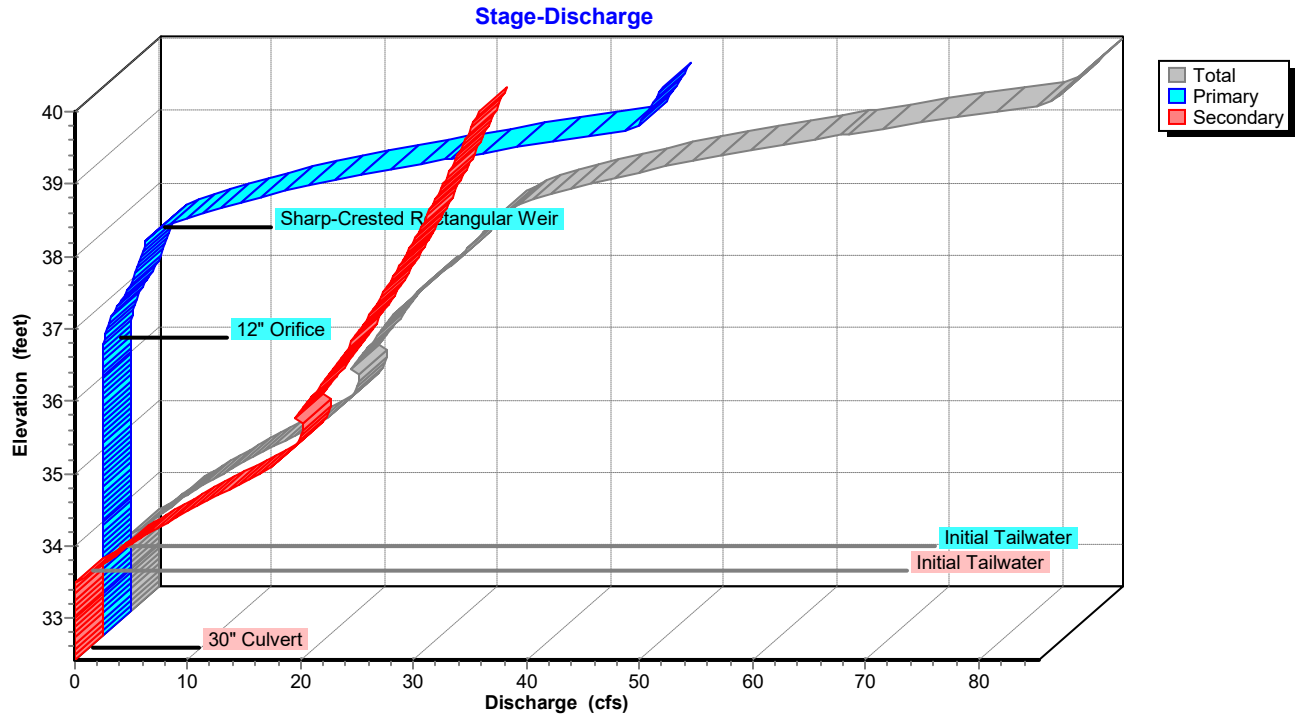
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Appendix D
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

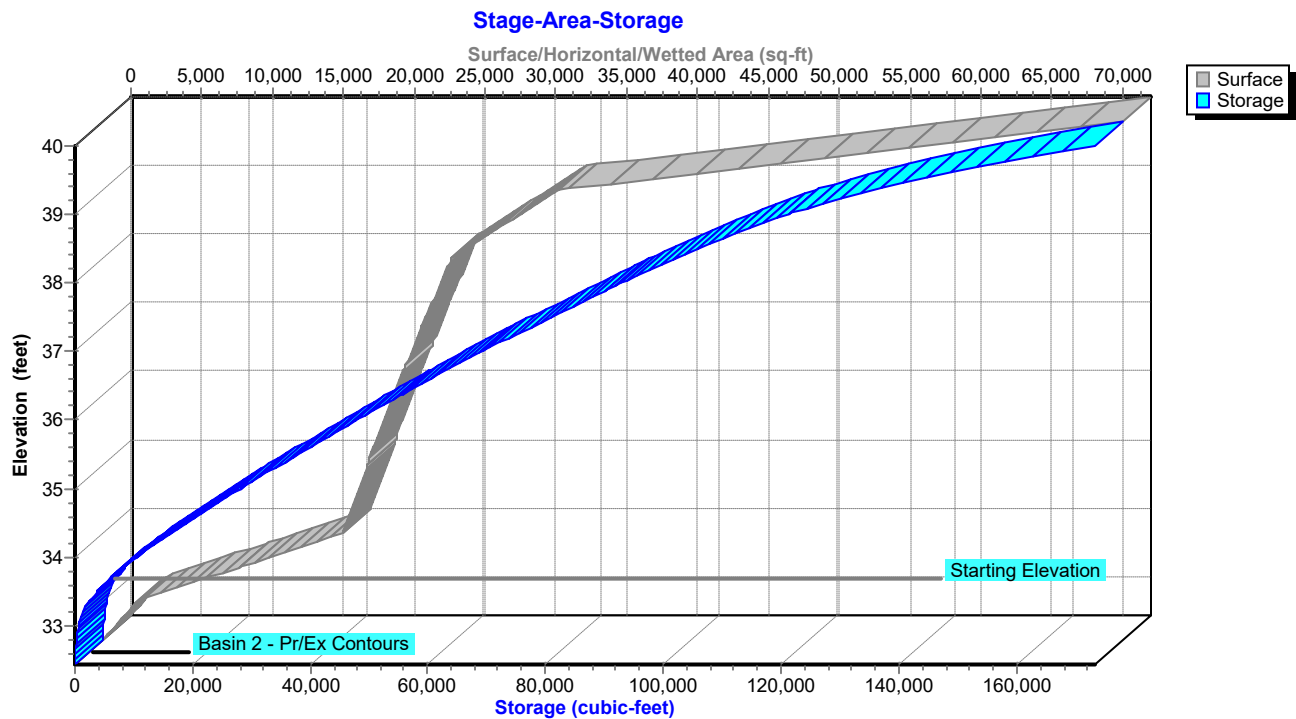
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Pond B2: Basin #2



Pond B2: Basin #2



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Summary for Pond B3: Basin #3

Inflow = 0.59 cfs @ 1.70 hrs, Volume= 0.077 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 Link TTA : TTA

Routing by Sim-Route method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 33.50' Surf.Area= 9,568 sf Storage= 5,403 cf
 Peak Elev= 33.79' @ 7.21 hrs Surf.Area= 13,126 sf Storage= 8,728 cf (3,325 cf above start)

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	31.44'	162,050 cf	Basin 3 - Pr/Ex Contours (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
31.44	0	0	0
32.00	500	140	140
33.00	3,495	1,998	2,137
34.00	15,640	9,568	11,705
35.00	17,620	16,630	28,335
36.00	19,755	18,688	47,023
37.00	21,945	20,850	67,873
38.00	25,055	23,500	91,373
39.00	30,055	27,555	118,928
40.00	56,190	43,123	162,050

Device	Routing	Invert	Outlet Devices
#1	Primary	33.42'	24.0" Round 24" Culvert L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 33.42' / 33.15' S= 0.0042 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	38.22'	6.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=33.50' TW=0.00' (Dynamic Tailwater)

↑ **1=24" Culvert** (Passes 0.00 cfs of 0.02 cfs potential flow)
 ↑ **2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Post Developed Conditions

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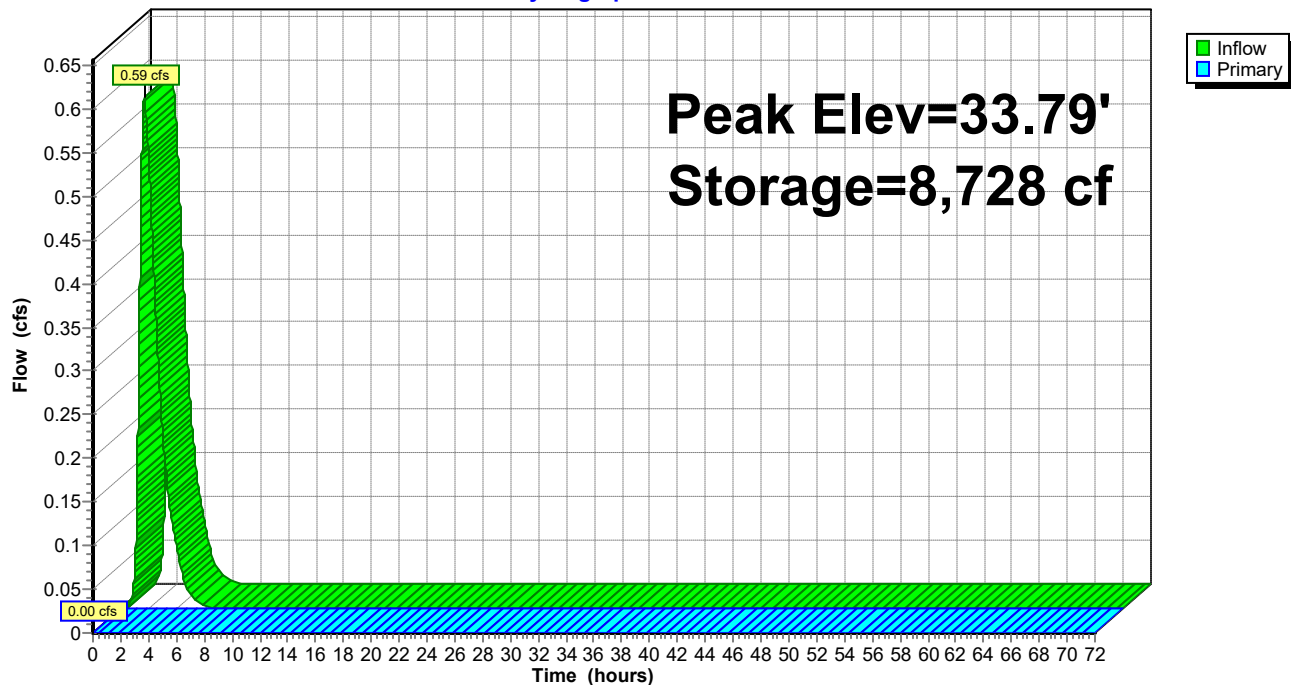
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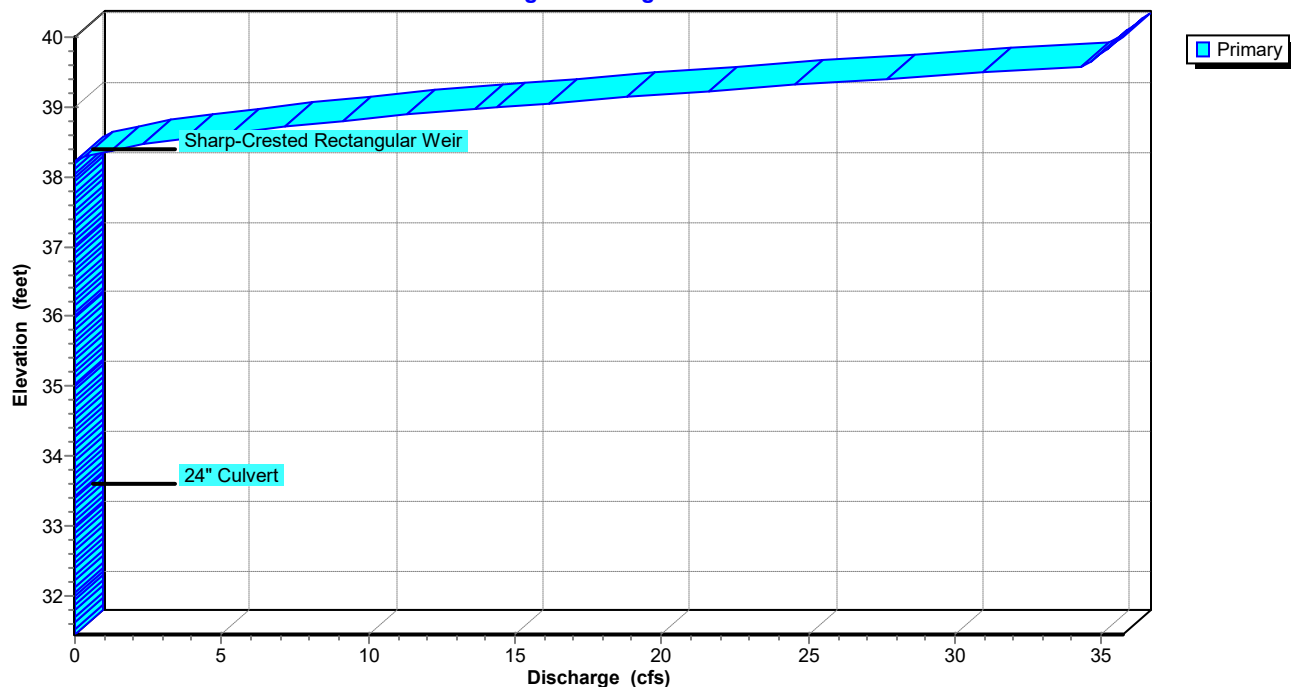
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Pond B3: Basin #3

Hydrograph

**Pond B3: Basin #3**

Stage-Discharge



Post Developed Conditions

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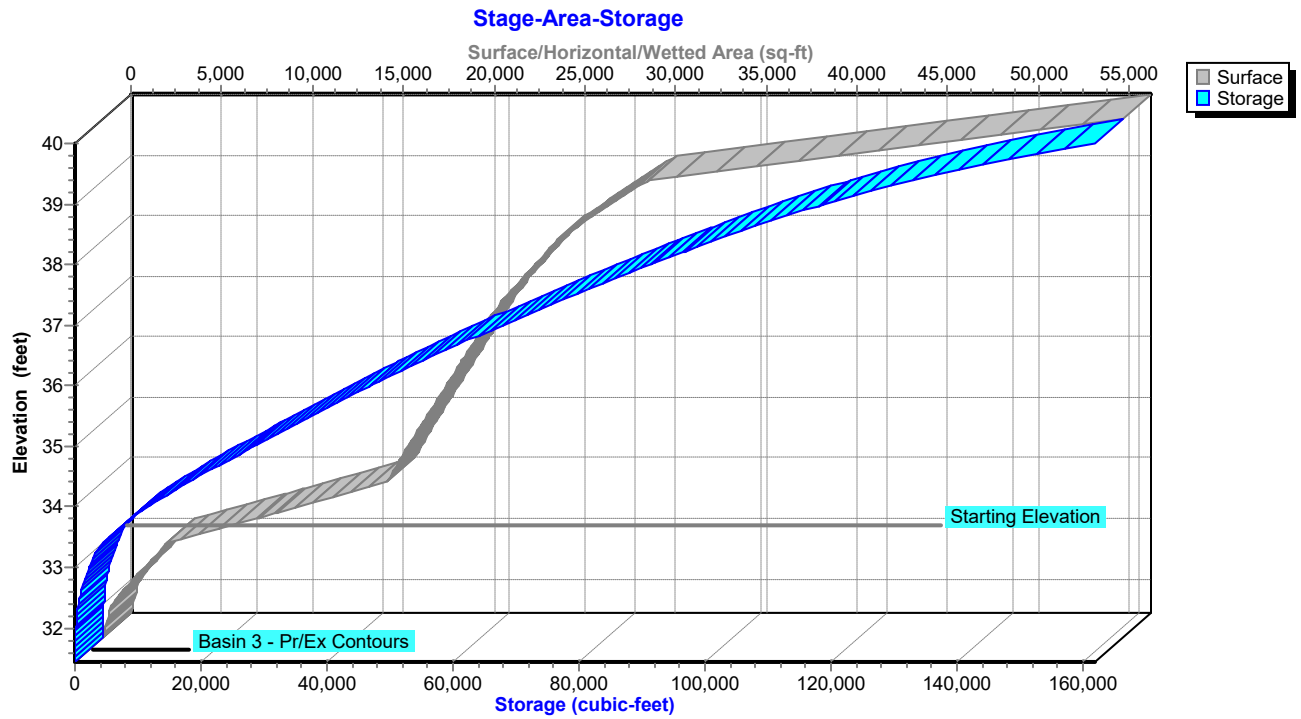
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Appendix D
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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Pond B3: Basin #3



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Prepared by Sciullo

Printed 2/9/2022

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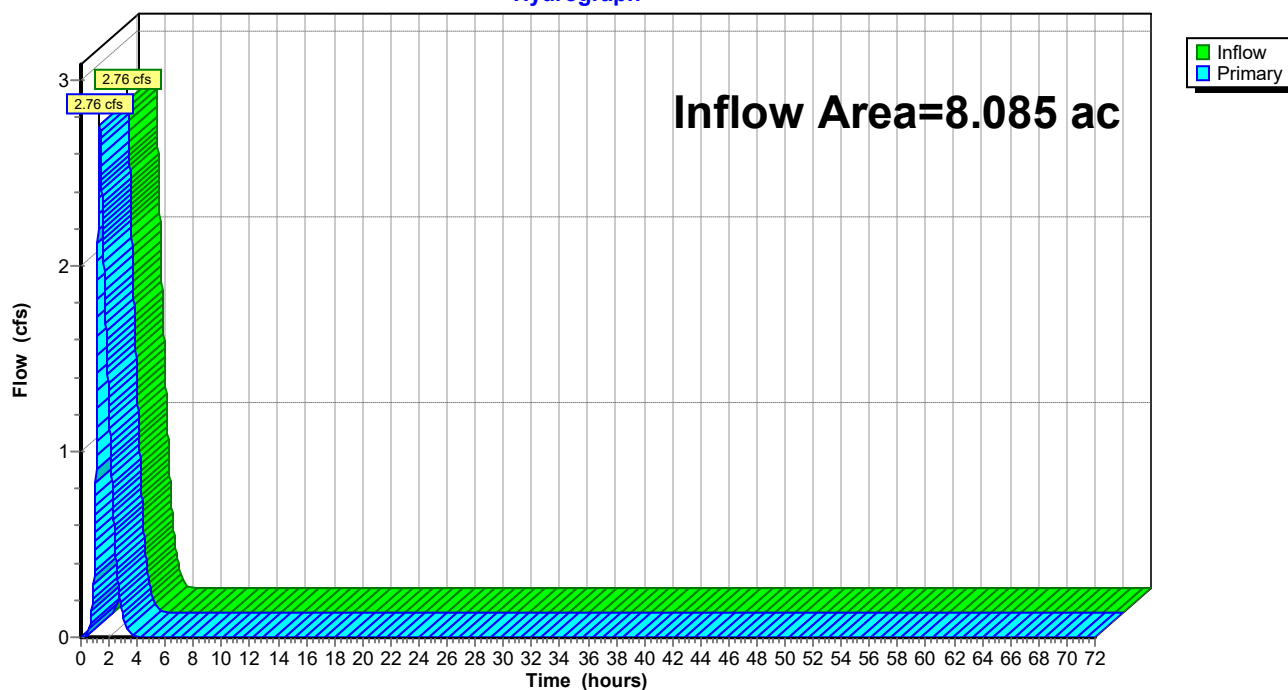
Summary for Link 1: PRDA-1

Inflow Area = 8.085 ac, 29.44% Impervious, Inflow Depth = 0.31" for NJDEP WQ event
 Inflow = 2.76 cfs @ 1.33 hrs, Volume= 0.207 af
 Primary = 2.76 cfs @ 1.34 hrs, Volume= 0.207 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B1 : Basin #1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 1: PRDA-1

Hydrograph



Post Developed Conditions

Prepared by Sciullo

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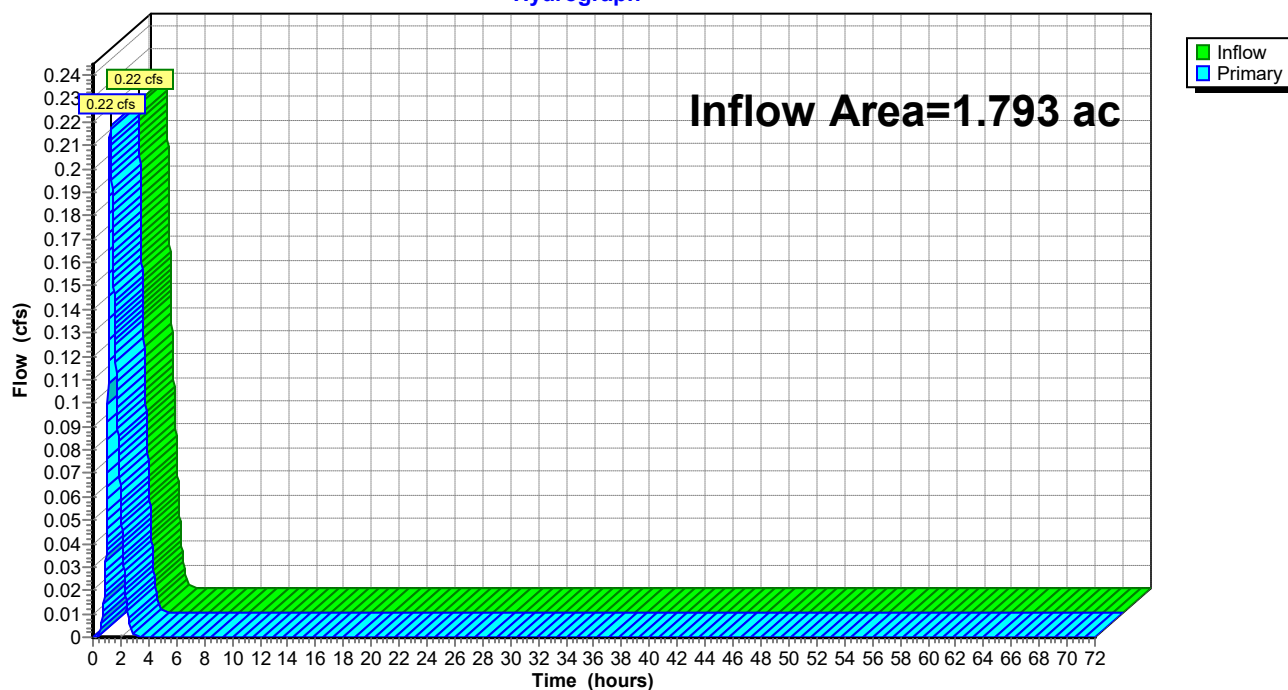
Summary for Link 2A: PRDA-2A

Inflow Area = 1.793 ac, 8.49% Impervious, Inflow Depth = 0.09" for NJDEP WQ event
 Inflow = 0.22 cfs @ 1.24 hrs, Volume= 0.013 af
 Primary = 0.22 cfs @ 1.25 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2A: PRDA-2A

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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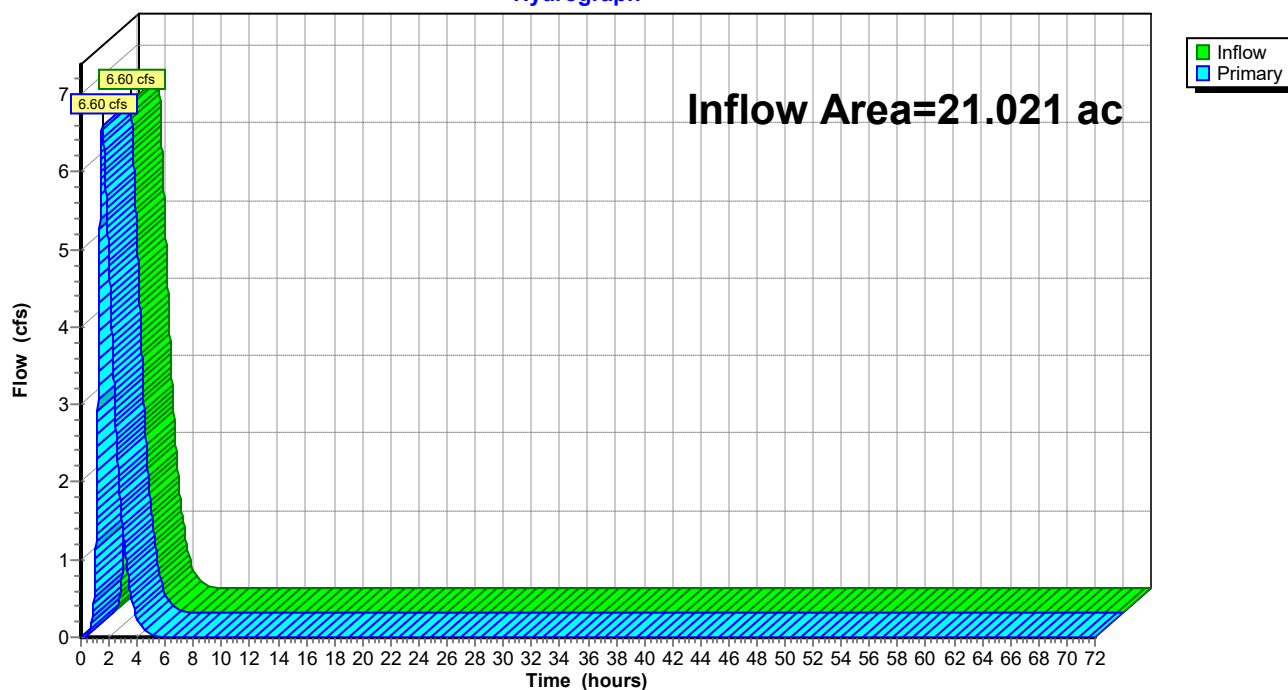
Summary for Link 2B: PRDA-2B

Inflow Area = 21.021 ac, 38.74% Impervious, Inflow Depth = 0.40" for NJDEP WQ event
Inflow = 6.60 cfs @ 1.53 hrs, Volume= 0.702 af
Primary = 6.60 cfs @ 1.54 hrs, Volume= 0.702 af, Atten= 0%, Lag= 0.6 min
Routed to Pond B2 : Basin #2

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 2B: PRDA-2B

Hydrograph



Post Developed Conditions

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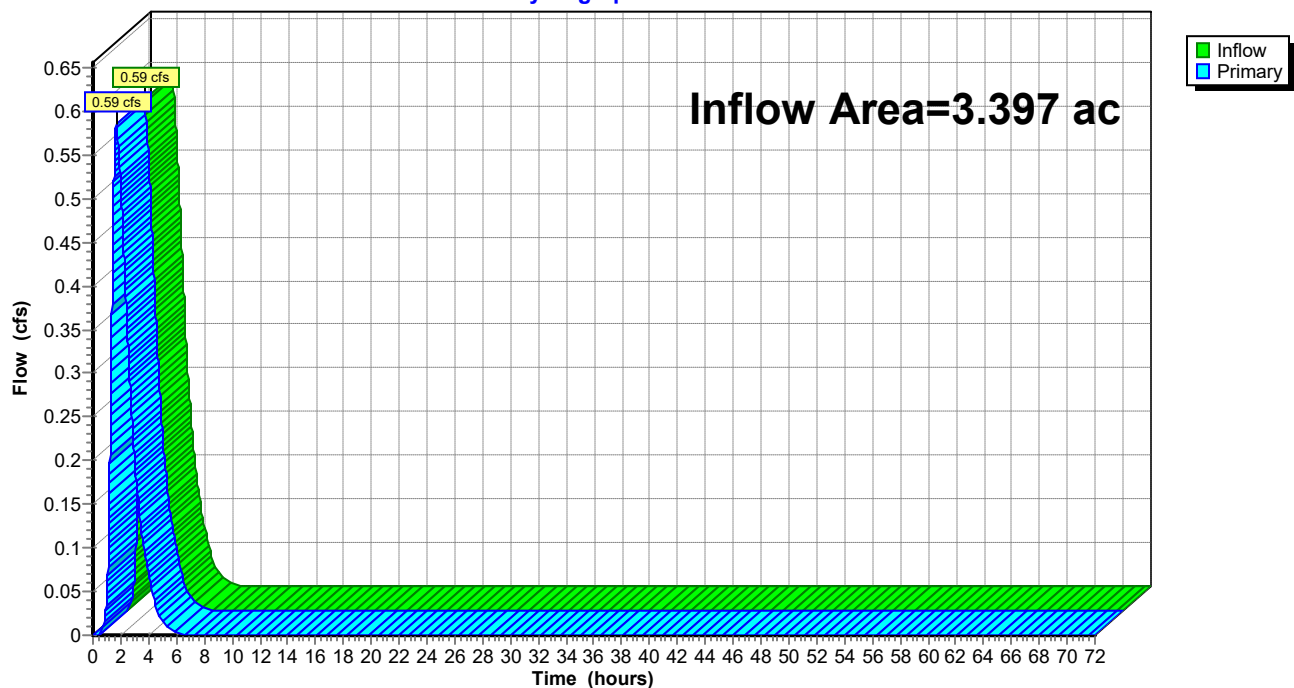
Summary for Link 3: PRDA-3

Inflow Area = 3.397 ac, 26.15% Impervious, Inflow Depth = 0.27" for NJDEP WQ event
 Inflow = 0.59 cfs @ 1.69 hrs, Volume= 0.077 af
 Primary = 0.59 cfs @ 1.70 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.6 min
 Routed to Pond B3 : Basin #3

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 3: PRDA-3

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

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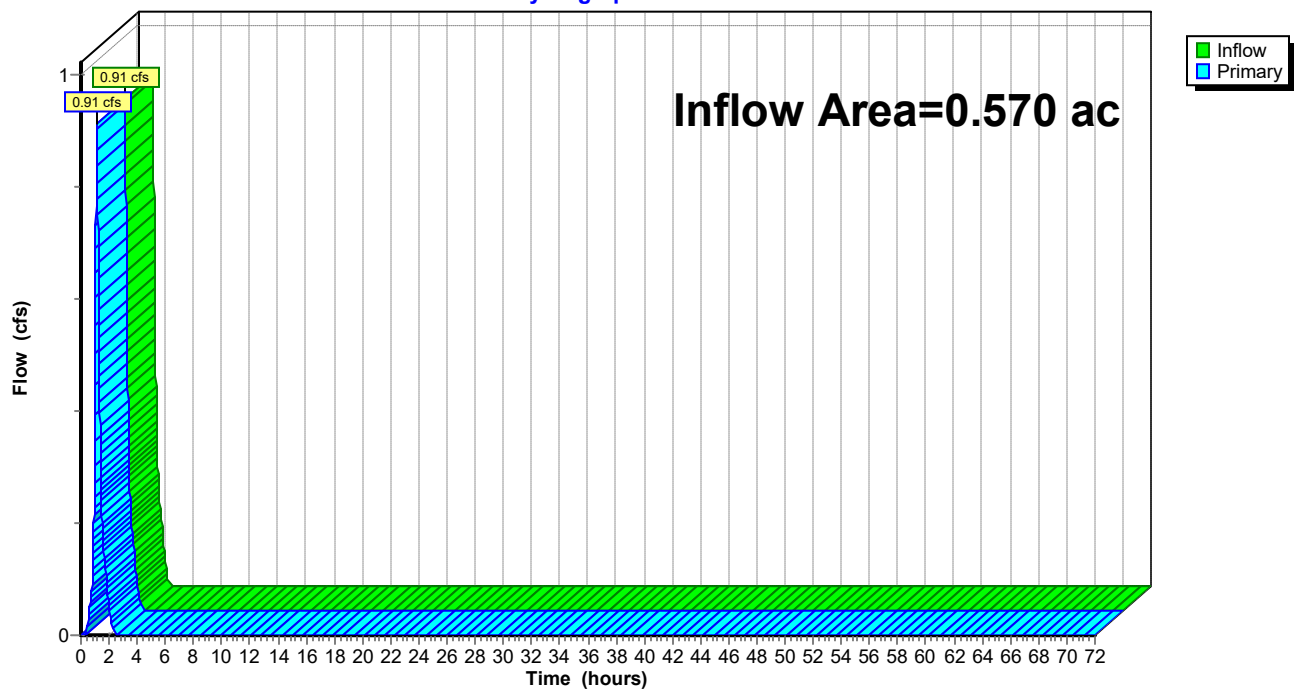
Summary for Link 4: PRDA-4

Inflow Area = 0.570 ac, 67.40% Impervious, Inflow Depth = 0.70" for NJDEP WQ event
Inflow = 0.91 cfs @ 1.12 hrs, Volume= 0.033 af
Primary = 0.91 cfs @ 1.13 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.6 min
Routed to Link TTA : TTA

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 4: PRDA-4

Hydrograph



Post Developed Conditions

NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

Prepared by Sciullo

Printed 2/9/2022

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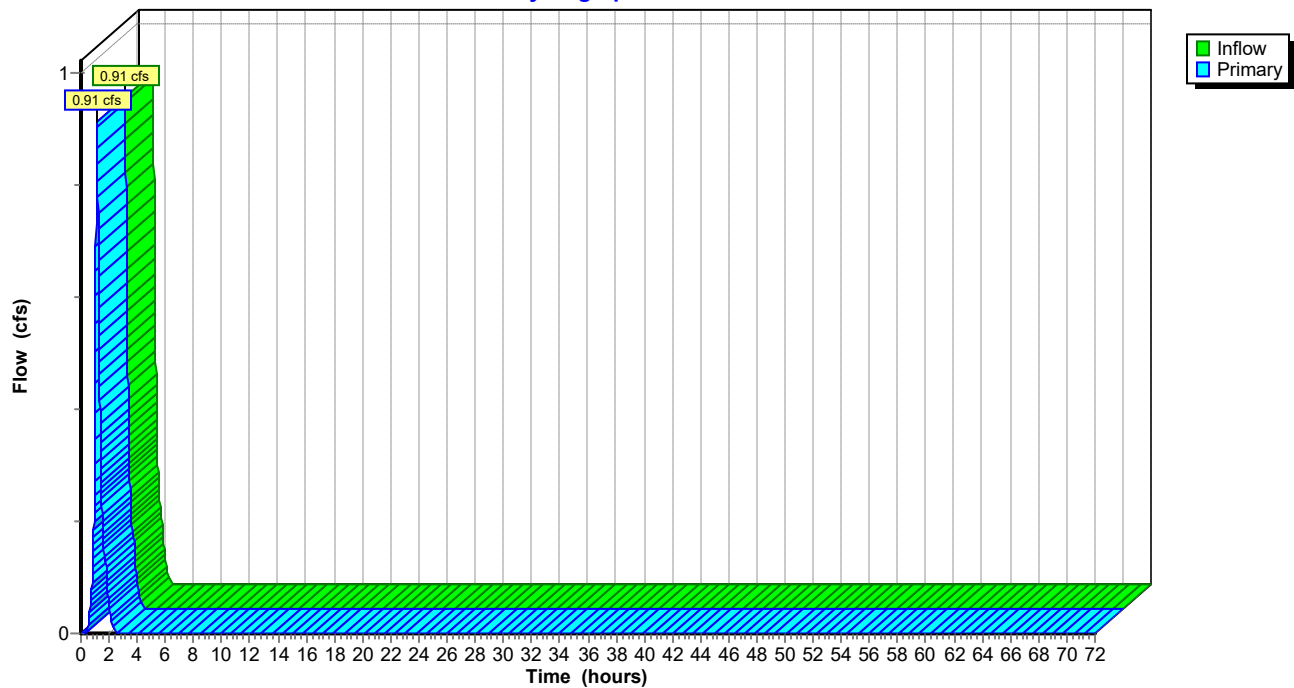
Summary for Link TTA: TTA

Inflow = 0.91 cfs @ 1.13 hrs, Volume= 0.033 af
Primary = 0.91 cfs @ 1.14 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.6 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link TTA: TTA

Hydrograph



APPENDIX E

GROUNDWATER RECHARGE CALCULATIONS

Annual Groundwater Recharge Analysis (based on GSR-

Project Name: Davenport Village Expansion

Select Township ↓
Average Annual P (in)
Climatic Factor

Description: Apartment Development

BURLINGTON CO., HAINESPORT

Analysis Date: 02/09/22

Pre-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.544	Impervious areas	Tinton	0.0	-
2	2.661	Open space	Tinton	15.0	145,089
3	0.187	Woods	Tinton	14.0	9,488
4					
5					
6					
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	3.4			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				12.6	154,577

Post-Developed Conditions					
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.888	Impervious areas	Tinton	0.0	-
2	2.322	Open space	Tinton	15.0	126,605
3	0.182	Woods	Tinton	14.0	9,235
4					
5					
6					
7					
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	3.4			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				11.0	135,840

Annual Recharge Requirements Calculation ↓

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

% of Pre-Developed Annual Recharge to Preserve

Post-Development Annual Recharge 18,737 (cubic feet)

Large Efficiency Parameters Calculations (area average)

RWC= 2.45 (in)	DRWC= 2.45 (in)
ERWC = 0.71 (in)	EDRWC= 0.71 (in)

APPENDIX F

STORM SEWER CALCULATIONS



STORM SEWER CALCULATIONS

Project: Davenport Village Expansion, Hainesport Twp., Burlington County, NJ

Computed By: JTS Date: 8/13/2019

Revised By: Revisec

Revised By: Revisec

Sheet 1 Of 1

Pipe Material: HDPEP

"n" Factor: 0.010

25 Year Storm

Location	From	To	Inc. Area Ac	C	Equiv. Area C * A	Total Area C * A	Tc min	I in/hr	Q CFS	Slope ft/ft	Pipe Dia. in	V FPS	Pipe Length ft	Flow Time min.	Pipe Cap. CFS	Ground Elev.			Invert Elev.		
																Upper End	Lower End	Upper End	Lower End	Upper End	Lower End
I-3	I-2	I-2	0.11	0.68	0.08	0.08	6.00	7.70	0.59	0.0050	15	4.84	50	0.17	5.94	39.05	39.05	35.04	34.79	35.04	34.79
I-2	I-1	I-1	0.11	0.68	0.08	0.08	6.00	7.70	0.59	0.0050	15	4.84	40	0.14	5.94	39.05	38.70	34.79	34.59	34.79	34.59
I-1	I-1	HW-1	0.12	0.66	0.08	0.15	6.00	7.70	1.18	0.0050	15	4.84	18	0.06	5.94	38.70	38.00	34.59	34.50	34.59	34.50



CONDUIT OUTLET PROTECTION CALCULATIONS

Project: Davenport Village Expansion
Computed By: JTS
Revised By:
Project Number DHC 001.01

Date: 8/13/2019
Date:

Structure No.	HW-1	
25 Yr. Discharge (Q25)	1.18 cfs	$q = \text{unit discharge} = Q25/W_o = 0.94$
Do =	1.25 feet	HW-1 Inv. 34.5
Wo =	1.25 feet	2Yr. Basin elevation 36
Tailwater (TW) =	0.25 feet	
Apron Length (La) =	$((q \times 3) / Do^{0.5})$	
La =	2.53 feet	
Apron Width (W) =	$3 \times W_o + 0.4(La)$	
W =	4.76 feet	
Median Stone Dia.(D50) =	$(0.016/TW) \times (q)^{1.33}$	
(D50)	0.06 feet	Use 6" min.

APPENDIX G

DRAINAGE AREA PLANS



- EXISTING UTILITY INFORMATION SHOWN ON THESE PLANS IS FURNISHED BY THE UTILITY COMPANIES AND/OR THE SURVEYOR AND THE ACCURACY THEREOF IS NOT THE RESPONSIBILITY OF SCULLO ENGINEERING SERVICES, LLC. IT IS THE RESPONSIBILITY OF THE OWNERS AND/OR CONTRACTOR TO CALL 1-800-272-1000 FOR FIELD LOCATION OF UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION.
- THESE PLANS ARE NOT FOR CONSTRUCTION UNTIL "ISSUED FOR CONSTRUCTION" APPEARS IN THE TITLEBLOCK.

2B.1, SHEET FLOW
100' GRASS @ 0.5%

2B.2, SHALLOW CONCENTRATED FLOW
102' @ 1.5% UNPAVED

2B.3, SHALLOW CONCENTRATED FLOW
242' @ 0.7% PAVED

2B.4, PIPE FLOW
1,387' @ 0.2%

PRDA-2B

PROPOSED DRAINAGE AREA (PRDA-2B)
IMPERVIOUS 8.143 AC
BARE SOIL 0.000 AC
OPEN SPACE 12.878 AC
WOODED 0.000 AC
TOTAL = 21.021 AC

PROPOSED DRAINAGE AREA (PRDA-2A)
IMPERVIOUS 0.152 AC
BARE SOIL 0.000 AC
OPEN SPACE 1.375 AC
WOODED 0.266 AC
TOTAL = 1.793 AC

PROPOSED DRAINAGE AREA (PRDA-1)
IMPERVIOUS 2.371 AC
BARE SOIL 0.427 AC
OPEN SPACE 4.110 AC
WOODED 1.184 AC
TOTAL = 8.090 AC

PRDA-2A

PRDA-1

PRDA-2A

PRDA-3

PRDA-4

PROPOSED DRAINAGE AREA (PRDA-4)
IMPERVIOUS 0.384 AC
BARE SOIL 0.000 AC
OPEN SPACE 0.145 AC
WOODED 0.041 AC
TOTAL = 0.570 AC

PROPOSED DRAINAGE AREA (PRDA-4)
IMPERVIOUS 0.865 AC
BARE SOIL 0.000 AC
OPEN SPACE 2.345 AC
WOODED 0.187 AC
TOTAL = 3.397 AC

3.1, SHEET FLOW
100' GRASS @ 0.1%

1.1, SHEET FLOW
100' GRASS @ 0.7%

1.2, SHALLOW CONCENTRATED FLOW
175' @ 3.6% UNPAVED

3.2, SHALLOW CONCENTRATED FLOW
228' @ 3.0% UNPAVED

BASIN 3

BASIN 2

BASIN 1

MARNE HIGHWAY (COUNTY ROUTE #537)
(76' WDE)

GRAPHIC SCALE



1 INCH = 100 FEET

DAVENPORT VILLAGE EXPANSION

BLOCK 9.01, LOT 43
HANESPORT TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY

PROPOSED DRAINAGE AREA PLAN



DIOCESE OF CAMDEN 1845 HADDON AVENUE
Diocesan Housing Services Corporation CAMDEN, NEW JERSEY 08103

PROJECT NO.
DHC 001.01
SCALE
1" = 100'

SHEET
2 OF 2

DRAWING NO.
C1402

DATE 8/13/2019
ISSUE NO. 1
SUBMISSION/REVISION
BY JTS
APPR.

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