



## **Easton Staff Development Review MEETING AGENDA**

Wednesday, March 27, 2024 - 10:00 AM  
Council Chambers, Easton Town Office  
14 S Harrison Street

### **1. Staff Review**

#### **a. Staff review only time: 10:00 AM - 11:00 AM**

Easton Staff Development Review (ESDR) meetings are an opportunity for staff to meet with applicants to discuss our preliminary review of their application. At the ESDR meeting, staff also confirm with the applicant the next steps in the review process.

No public comments will be taken at this meeting, but there will be opportunities for public comment at future Planning Commission and/or Town Council public hearings.

### **2. Discussion Items**

- |           |                            |                                                                                                                                                             |
|-----------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>a.</b> | <b>Application Number:</b> | 2024 - 06                                                                                                                                                   |
|           | <b>Location:</b>           | 28640 Mary's Court - Talbot County<br>Public Safety Complex<br>Tax Map 0025, Grid 0022, Parcel 0046,<br>Lot 14                                              |
|           | <b>Applicant:</b>          | Davis, Bowen & Friedel, Inc. c/o Robert<br>J. Duma, P.E.                                                                                                    |
|           | <b>Request:</b>            | Sketch Site Plan review for the addition<br>of a sally port to the existing commercial<br>building with associated parking, and<br>other site improvements. |



**Town of Easton**  
Engineering, Planning and Zoning  
14 South Harrison Street, Easton, MD 21601

**RECEIVED**  
**MAR 08 2024**  
**TOWN OF EASTON**

## Easton Staff Development Review

### Property Information

|                      |                                       |                        |                                                                  |        |      |     |    |
|----------------------|---------------------------------------|------------------------|------------------------------------------------------------------|--------|------|-----|----|
| Address              | 28640 Marys Ct, Easton, MD 21601-0000 |                        |                                                                  |        |      |     |    |
| Tax Map              | 0025                                  | Grid                   | 0022                                                             | Parcel | 0046 | Lot | 14 |
| Deed Reference:      | Liber                                 | 03016                  | Folio                                                            | 00022  |      |     |    |
| Plat Reference:      | Liber                                 | 87                     | Folio                                                            | 11     |      |     |    |
| Base Zoning District | BC                                    | Historic District      | Y <input type="checkbox"/> N <input checked="" type="checkbox"/> |        |      |     |    |
|                      |                                       | Planning Redevelopment | Y <input type="checkbox"/> N <input checked="" type="checkbox"/> |        |      |     |    |

Purpose of Application / Description of Work:

Work includes the addition of a sally port to the existing commercial building on the property. Other site improvements include the installation of natural gas service, installation of emergency generator, relocation of the trash dumpster, installation of a new parking lot, and the footprint of a future maintenance/storage building.

### Owner

|                 |                                                                              |       |                            |
|-----------------|------------------------------------------------------------------------------|-------|----------------------------|
| Name            | Raymond P. Clarke, County Engineer, Talbot County Department of Public Works |       |                            |
| Mailing Address | 215 Bay Street, Suite 6, Easton, Maryland 21601                              |       |                            |
| Telephone No.   | (410) 770-8170                                                               | Email | rclarke@talbotcountymd.gov |

### Applicant / Agent

|                 |                                                             |       |                |
|-----------------|-------------------------------------------------------------|-------|----------------|
| Name            | Robert J. Duma, P.E., Associate                             |       |                |
| Mailing Address | 106 N. Washington Street, Suite 103, Easton, Maryland 21601 |       |                |
| Telephone No.   | 443-366-9038                                                | Email | rjd@dbfinc.com |

### Surveyor / Engineer

|                 |                                                             |             |                |                 |            |
|-----------------|-------------------------------------------------------------|-------------|----------------|-----------------|------------|
| Name            | Robert J. Duma, P.E.                                        | License No. | 38830          | Expiration Date | 12-29-2024 |
| Mailing Address | 106 N. Washington Street, Suite 103, Easton, Maryland 21601 |             |                |                 |            |
| Telephone No.   | 443-366-9038                                                | Email       | rjd@dbfinc.com |                 |            |

***Any modifications during review shall warrant an updated application.***

***I do hereby solemnly declare and affirm that the information provided by this application and the documents attached hereto accurately represent the conditions of the request and that submission of an incomplete application will be returned for correction prior to processing.***

Signature of Applicant or Agent

Date

03-05-2024

Printed Name of Applicant or Agent

Robert J. Duma, P.E.

*For Office Use Only*

Easton Staff Development Review Meeting Required Y ☒ N ☐ 2024 - 1156  
Easton Staff Development Review Meeting Date 03/27/2024 ESDR 24-06  
Completeness Check Date

Revisions/Resubmissions Required Y ☐ N ☐

Resubmission Date  Documents Received Y ☐ N ☐

Staff Determination

|  |
|--|
|  |
|  |
|  |
|  |

Planning Commission Required Y ☐ N ☐

BOZA Required Y ☐ N ☐

Historic District Commission Required Y ☐ N ☐

Resubmission for ESDR Required Y ☐ N ☐

Staff Signature  Date

Revised 02-2019

**APPENDIX B**  
**SKETCH PLAN**  
**SUBMITTAL CHECKLIST**

**NOTE: THIS CHECKLIST REPRESENTS THE MINIMUM INFORMATION TO BE SUBMITTED ON A SITE PLAN. ADDITIONAL INFORMATION MAY BE REQUIRED FOR UNIQUE SITUATIONS.**

**COMPLETE THE CHECKLIST AND SUBMIT IT WITH THE PLAN. IF AN ITEM IS NOT APPLICABLE, ENTER "N/A".**

- |                                                                                                                                                                                                                            |                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1. Location map,                                                                                                                                                                                                           |    |
| 2. Boundary,                                                                                                                                                                                                               |    |
| 3. Topography,                                                                                                                                                                                                             |    |
| 4. General proposed land uses drawn to scale, and                                                                                                                                                                          |    |
| 5. The Forest Stand Delineation as detailed in the Town of Easton's Forest Conservation Ordinance.                                                                                                                         | N/A*                                                                                  |
| 6. The location of any easements, rights-of-way or any other encumbrances which pertain to the property subject to the site plan review.                                                                                   |  |
| 7. Conditions of concern, for example, water courses, wetlands, floodplains, or other environmentally sensitive features.                                                                                                  |  |
| 8. Location of refuse collection, exterior lighting, fencing, and all pedestrian walkways and sidewalks.                                                                                                                   |  |
| 9. General location and description (r.e. intended function, proposed species, etc.) of proposed landscaping.                                                                                                              |  |
| 10. Location of parking including layout and landscaping.                                                                                                                                                                  |  |
| 11. Conceptual building elevations or renderings illustrating the character, scale, and materials of all proposed structures. Such elevations or renderings shall be sealed by a licensed professional as described above. |  |
| 12. A statement describing the extent to which the application complies with the Recommended Design Principles for Easton set forth on pages 29-31 of the Comprehensive Plan.                                              |  |

Ring W. Lardner, P.E.  
W. Zachary Crouch, P.E.  
Michael E. Wheedleton, AIA, LEED GA  
Jason P. Loar, P.E.  
Jamie L. Sechler, P.E.

**TALBOT COUNTY PUBLIC SAFETY COMPLEX  
TOWN OF EASTON, TALBOT COUNTY, MARYLAND  
DBF #1503A030**

**MARCH 5, 2024**

*Statement describing the extent to which the application complies with the Recommended Design Principles for Easton set forth on pages 29-31 of the Comprehensive Plan*

The proposed project utilizes the existing site design, landscaping, and building design where possible. The existing landscaping and pervious features are kept where feasible. The proposed features are requirements of the sally port and garage building and the necessary traffic movements around these critical facilities. The proposed project will serve the Talbot County Sheriff's Department and Department of Emergency Services well and the architecture and site design will provide a nice aesthetic to the critical work being performed on the site.

## APPENDIX B-2

### SKETCH STORMWATER MANAGEMENT PLAN SUBMITTAL CHECKLIST

EFFECTIVE MAY 4, 2010

NOTE: THE FOLLOWING CHECKLIST REPRESENTS THE MINIMUM INFORMATION TO BE SUBMITTED FOR SUPPORT OF A STORMWATER MANAGEMENT CONCEPT PLAN, SITE DEVELOPMENT PLAN, AND/OR FINAL DESIGN PLAN. THE TOWN MAY REQUEST ADDITIONAL INFORMATION AS DEEMED NECESSARY.

COMPLETE THE APPROPRIATE CHECKLIST AND SUBMIT IT WITH THE PLANS, APPLICATION FORM, NARRATIVE OR REPORT, AND FEE. ITEMS IN BOLD ARE REQUIRED FOR CONCEPT AND/OR SITE DEVELOPMENT PHASE REVIEW.

#### I. Sketch Plan Submittal

##### A. Site and Resource Map

Natural Resources Identified on Plan, including, but not limited to:

Please use these responses for the following:

(Provided = P; Not Provided = NP; Not Applicable = N/A)

|                                                                                  |     |     |
|----------------------------------------------------------------------------------|-----|-----|
| Tidal and Non-Tidal Wetland Boundaries                                           | N/A |     |
| Wetland Buffers                                                                  |     | N/A |
| Floodplain Boundaries and Elevations                                             | N/A |     |
| Streams and other Waterways                                                      | N/A |     |
| Stream Buffers                                                                   | N/A |     |
| Forest Boundaries                                                                |     | P   |
| Forest Buffers                                                                   | N/A |     |
| Critical Areas                                                                   | N/A |     |
| Steep Slopes (>25%)                                                              | N/A |     |
| Erodible Soils                                                                   | N/A |     |
| Areas of High Recharge                                                           | N/A |     |
| Springs                                                                          |     | N/A |
| Soil Types and Hydrologic Soil Groups                                            | P   |     |
| Bedrock and/or other Geologic Features                                           | N/A |     |
| Vegetative Cover                                                                 |     | P   |
| Existing Drainage Areas and Flow Patterns                                        | P   |     |
| Existing Stormwater Outfalls                                                     | P   |     |
| Site and Resource Map field verified by a properly licensed design professional. | P   |     |

Existing contours (1' max intervals) and utilities shown. P

Large tracts of contiguous open spaces, forested areas and other important resources protected by conservation easements.

P

Opportunities for afforestation identified.

N/A

Wetland, stream and forest buffers enhanced and/or

expanded.

N/A

## B. Site Fingerprinting and Development Layout

Locations of proposed impervious areas provided.

P

Proposed contours (1' max intervals) and utilities shown.

NP

Preliminary locations of proposed Environmental Site Design (ESD) practices provided.

P

Locations of stormwater outfalls and conveyance provided with offsite storm drains, culverts and grass channels with size and slope.

P

Limit of disturbance and extent of clearing & grading.

P

Site natural resources protected during construction.  
If site natural resources must be disturbed during construction, please include an explanation in the stormwater narrative.

P

Better Site Design Techniques incorporated, including:

Sheetflow and overland flow provided wherever possible

P

Building footprint and site layout designed to protect conservation areas

P

Proposed streets, rights of way, and/or sidewalks with modifications to reduce impervious area

P

Landscaped medians and/or cul-de-sacs

N/A

Stormwater management features in medians or cul-de-sacs

N/A

Private open road section with grass channels and/or biofilters

N/A

Minimize numbers of parking spaces and sizes

P

Narrow frontages to reduce road length

N/A

Site graded to encourage runoff from impervious areas to pervious areas or other natural conveyance systems

P

## C. Stormwater Narrative

Title Page includes:

Job Name

P

Owner/Developer

P

Design Professional

P

Date Prepared

P

Seal and Signature (properly licensed Design Professional)

P

Project is identified as new development or redevelopment.  
(Redevelopment projects have  $\geq 40\%$  total site imperviousness)

P

Project and streets designed for 2-year and 10-year quantitative management. P

Project is identified as being within the Tanyard Branch Watershed. (Projects within this watershed must manage proposed 10-year storm flows to the existing 2-year storm discharge rate.) N/A

A narrative that supports the concept and describes how the design will achieve:

|                                                                                                              |          |
|--------------------------------------------------------------------------------------------------------------|----------|
| Natural resource protection and enhancement                                                                  | <u>P</u> |
| Maintenance of natural flow patterns                                                                         | <u>P</u> |
| Reduction of impervious areas through better site design, alternative surfaces, and non-structural practices | <u>P</u> |
| Implementation of ESD planning techniques and practices to the Maximum Extent Practicable (MEP)              | <u>P</u> |
| Preliminary ESD sizing calculations provided                                                                 | <u>P</u> |
| Integration of erosion and sediment controls (ESC) into the stormwater strategy                              | <u>P</u> |

D. Sketch Plan Meeting

Following the Sketch Plan submittal, a meeting will be scheduled between the Town of Easton Planning & Zoning, Town Engineer, the Talbot County Soil Conservation District (SCD) ESC reviewer, the owner/developer, the SWM and ESC designer(s), and any other reviewers deemed necessary by the Town of Easton and/or the Talbot County SCD. Official Minutes from the Sketch Plan Meeting must be submitted for review and acceptance by all parties. These minutes must accompany all future submittals. ✓

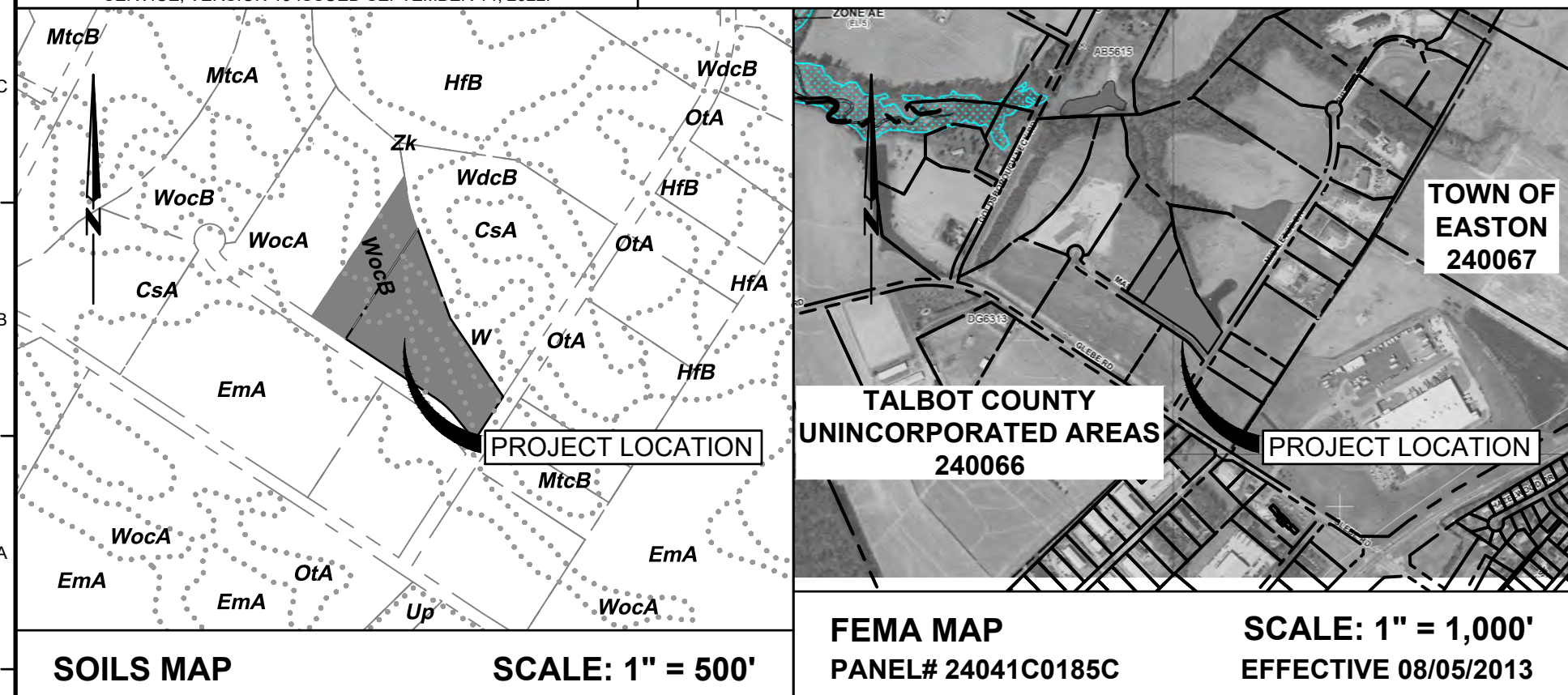
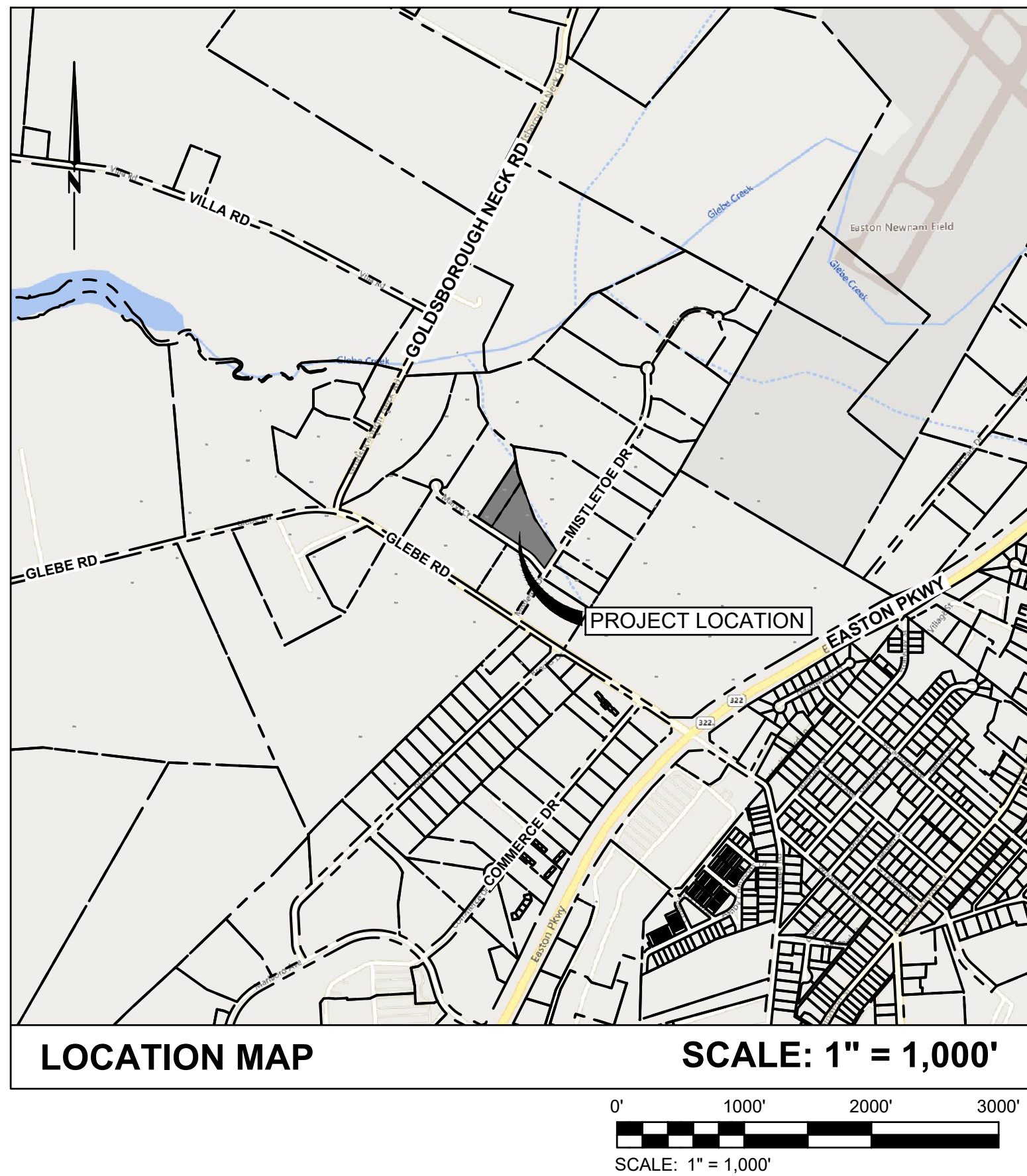
This checklist completed by \_\_\_\_\_ Date \_\_\_\_\_

**PHASE 3: SALLY-PORT & GARAGE BUILDING**  
**TOWN OF EASTON**  
**EASTON, TALBOT COUNTY**  
**MARYLAND**  
**DBF# 1503A030**  
**MARCH 2024**

|                  | <u>EXISTING</u>    | <u>PROPOSED</u>    |
|------------------|--------------------|--------------------|
| SITE AREA        | 4.832 AC (100.00%) | 4.832 AC (100.00%) |
| WOODS            | 0.976 AC (20.20%)  | 0.976 AC (20.20%)  |
| IMPERVIOUS COVER | 1.411 AC (29.20%)  | 1.456 AC (30.13%)  |

**SOILS MAP**

**SCALE: 0 100**



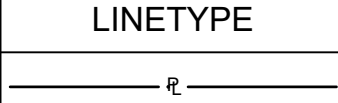
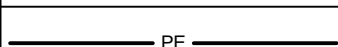
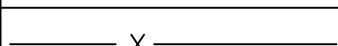
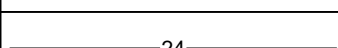
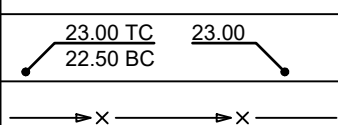
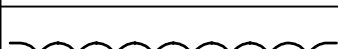
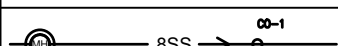
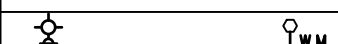
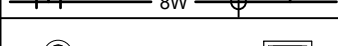
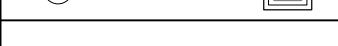
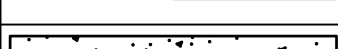
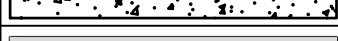
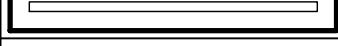
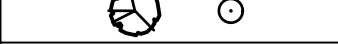
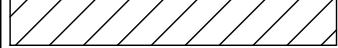
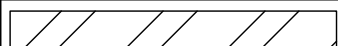
## TALBOT SOIL CONSERVATION DISTRICT \_\_\_\_\_ DATE \_\_\_\_\_

|                                                                                                                                                                                                                                              |              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
|                                                                                                                                                           |              |
| Professional Certification: I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Engineer in the laws of the State of Maryland.<br>License No. 36830, Expiration Date: 12-29-24 |              |
| <b>DAVIS BOWEN &amp; FRIEDEL, INC.</b><br><b>ARCHITECTS • ENGINEERS • SURVEYORS</b><br>MILLERS FALLS ROAD<br>410.776.4744<br>SALEM, MARYLAND<br>210.343.9091                                                                                 |              |
|                                                                                                                                                           |              |
| <b>TALBOT COUNTY</b><br><b>PUBLIC SAFETY COMPLEX</b><br><b>PHASE 3: SALLY-PORT &amp; GARAGE BUILDING</b><br><b>28640 MARY'S COURT, EASTON MD</b>                                                                                             |              |
| DATE                                                                                                                                                                                                                                         |              |
| COMMENTS                                                                                                                                                                                                                                     |              |
| Date:                                                                                                                                                                                                                                        | MARCH 2024   |
| Scale:                                                                                                                                                                                                                                       | AS SHOWN     |
| Dwn.By:                                                                                                                                                                                                                                      | NSB          |
| Proj.No.:                                                                                                                                                                                                                                    | 1503A030     |
| <b>TITLE SHEET</b>                                                                                                                                                                                                                           |              |
| Dwg.No.:                                                                                                                                                                                                                                     | <b>C-001</b> |

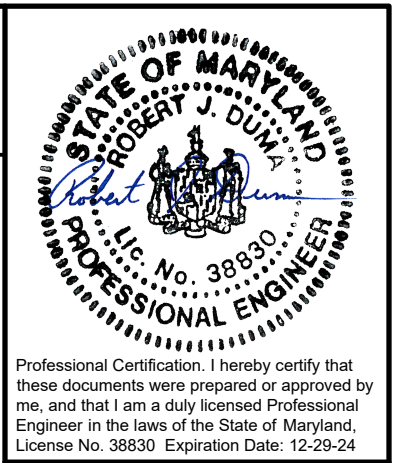
1. ACCORDING TO FEMA/FIRM FLOOD MAP 20401C001870, DATED 7/20/2016, PROJECT DISTURBANCES ARE IN ZONE X, AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.
2. BEFORE ANY EXCAVATION IS PERFORMED, CONTRACTOR SHALL CALL "MISS UTILITY OF DELMARVA" (1-800-441-8355) AT LEAST 48 HOURS PRIOR TO EXCAVATION, TO HAVE EXISTING UNDERGROUND UTILITIES LOCATED AND MARKED.
3. THE CONTRACTOR SHALL ASSUME ALL RESPONSIBILITY FOR ANY DEVIATION FROM THESE PLANS UNLESS WRITTEN APPROVAL HAS BEEN PROVIDED BY THE OWNER OR ENGINEER.
4. ALL MATERIALS AND METHODS OF CONSTRUCTION SHALL CONFORM TO THE CONTRACT DOCUMENTS, INCLUDING PLANS, NOTES AND SPECIFICATIONS. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION FOR CLARIFICATION PRIOR TO SUBMITTING A BID.
5. THE CONTRACT DOCUMENTS DO NOT INCLUDE THE NECESSARY COMPONENTS OF CONSTRUCTION SAFETY, ALL CONSTRUCTION MUST BE PERFORMED IN COMPLIANCE WITH THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970, AS AMENDED, AND ALL RULES AND REGULATIONS THERE TO APPURTENANT.
6. RIGHT-OF-WAY LINES ARE ASSUMED WHERE SHOWN ON THE PLANS. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL RIGHT-OF-WAY LINES AND EASEMENTS PRIOR TO BEGINNING CONSTRUCTION AS NECESSARY FOR CONSTRUCTION. AT PROPOSED UTILITIES ARE TO BE CONSTRUCTED WITHIN TOWN OF EASTON RIGHT-OF-WAYS OR PERMISSION OBTAINED BY THE OWNER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL TEMPORARY CONSTRUCTION EASEMENTS NECESSARY TO COMPLETE THE WORK. THE CONTRACTOR SHALL PROVIDE ALL STAKEOUTS NECESSARY FOR THE INSTALLATION OF THE WORK.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF TRAFFIC IN ALL WORK AREAS IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS. TRAFFIC CONTROL, REGULATORY, WARNING AND INFORMATIONAL SIGNS SHALL REMAIN FUNCTIONAL AND VISIBLE TO THE APPROPRIATE LANES OF TRAFFIC AT ALL TIMES, WITH THE RELOCATION KEPT TO A MINIMUM DISTANCE.
8. EXISTING UTILITY LOCATIONS ARE SHOWN ACCORDING TO THE BEST AVAILABLE INFORMATION, AND ARE SHOWN ONLY FOR THE CONTRACTOR'S CONVENIENCE. THE CONTRACTOR SHALL TEST PIT TO VERIFY LOCATION, SIZE, MATERIALS AND INVERT OF ALL EXISTING UTILITIES. ANY DAMAGE TO EXISTING UTILITIES DURING CONSTRUCTION, WHETHER OR NOT SHOWN ON THE DRAWINGS, SHALL BE REPAIRED BY THE CONTRACTOR, TO THE UTILITY OWNER'S SATISFACTION, AT THE CONTRACTOR'S EXPENSE.
9. WHENEVER EXCAVATION DISRUPTS GUY WIRES OR ENDANGERS EXISTING UTILITY POLES, THE POLE SHALL BE BRACED AND/OR GUY WIRES RELOCATED IN ACCORDANCE WITH THE UTILITY OWNER'S REQUIREMENTS AT THE CONTRACTOR'S EXPENSE.
10. CONTRACTOR SHALL EXERCISE EXTREME CARE AND CAUTION TO PROTECT ALL TREES, SHRUBS, AND LANDSCAPING FROM DAMAGE DURING CONSTRUCTION OPERATIONS UNLESS SPECIFICALLY DESIGNATED TO BE REMOVED. DAMAGED LANDSCAPING SHALL BE REPLACED IN-KIND, TO THE SATISFACTION OF THE PROPERTY OWNER.
11. CONTRACTOR SHALL REMOVE AND IMMEDIATELY REPLACE, RELOCATE, RESET, OR RECONSTRUCT ALL OBSTRUCTIONS IN THE WORK AREA, INCLUDING, BUT NOT LIMITED TO: SIGNS, LANDSCAPING, CULVERTS, FENCES, PROPERTY MARKERS, AND OTHER NATURAL OR MAN-MADE OBSTRUCTIONS ENCOUNTERED. ALL ASSOCIATED COST SHALL BE INCLUDED IN THE APPROPRIATE PRICES BID.
12. ALL PAVING, CURBS, GUTTERS, SIDEWALKS, STORMDRAINS, STRUCTURES, CASTINGS, ETC., NOT DESIGNATED FOR REPLACEMENT, DAMAGED BY THE CONTRACTOR, SHALL BE REMOVED AND REPLACED IN-KIND AT THE CONTRACTOR'S EXPENSE.
13. THE CONTRACTOR SHALL TOPSOIL, SEED AND MULCH ALL UNPAVED AREAS DISTURBED DURING CONSTRUCTION, ACCORDING TO THE EROSION AND SEDIMENT CONTROL PLAN AND/OR THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
14. FITTINGS SHOWN ON THE PLANS ILLUSTRATE ANTICIPATED SIZE AND ANGLE OF DEFLECTION. THIS INFORMATION IS SHOWN FOR GENERAL INFORMATION AND IS NOT GUARANTEED. ACTUAL SIZES AND ANGLES MAY VARY DUE TO FIELD CONDITIONS.
15. CONTRACTOR SHALL MAINTAIN UTILITY SERVICE TO USERS AT ALL TIMES. WHEN TEMPORARY INTERRUPTIONS ARE NECESSARY, THEY SHALL BE KEPT TO A MINIMUM. 48 HOURS NOTICE SHALL BE GIVEN TO THE TOWN AND PROPERTY OWNERS PRIOR TO SERVICE TRANSFERS OR ANY SERVICE DISRUPTIONS.
16. PRIOR TO PAVING, ALL UTILITIES, SIDEWALKS, VALVE BOXES, FRAMES AND GRATES SHALL BE ADJUSTED TO GRADE.
17. LIMITS OF SIDEWALK AND CURB CONSTRUCTION SHOWN ON THE PLANS ARE APPROXIMATE, AND ARE INTENDED TO COINCIDE WITH THE NEAREST EXISTING JOINT. ALL SIDEWALK AND CURB CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE MOST RECENT ADA GUIDELINES. COST FOR CONCRETE SIDEWALK, CURB AND GUTTER REPLACEMENT SHALL BE INCLUDED IN THE PLANS, OR APPROVED BY THE OWNER SHALL BE PAID FOR IN ACCORDANCE WITH THE UNIT PRICE BIDS.

- [illegible]

| LINETYPE | DESCRIPTION                                      |
|----------|--------------------------------------------------|
|          | PROPERTY LINE                                    |
|          | RIGHT-OF-WAY LINE                                |
|          | EASEMENT                                         |
|          | FENCE                                            |
|          | CONTOUR                                          |
|          | SPOT ELEVATIONS: SURFACE                         |
|          | SWALE                                            |
|          | EDGE OF WOODS                                    |
|          | SANITARY SEWER - SEWER MAIN, MANHOLE, & CLEANOUT |
|          | WATER SERVICE -                                  |
|          | STORM SEWER - STORMDRAIN, MANHOLE, & INLET       |
|          | CURB, CURB & GUTTER                              |
|          | CONCRETE - SIDEWALK, PAD, OR PAVING              |
|          | FULL DEPTH PAVEMENT - LIGHT / HEAVY              |
|          | BUILDING                                         |
|          | TREES & BUSH - DECIDUOUS & EVERGREEN             |
|          | SIGNS & MAILBOXES                                |

| LINETYPE                                                                            | DESCRIPTION                                               |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------|
|  | PROPERTY LINE                                             |
|  | RIGHT-OF-WAY LINE                                         |
|  | EASEMENT                                                  |
|  | FENCE                                                     |
|  | CONTOUR                                                   |
|  | SPOT ELEVATIONS: SURFACE<br>TOP OF CURB<br>BOTTOM OF CURB |
|  | SWALE                                                     |
|  | EDGE OF WOODS                                             |
|  | SANITARY SEWER - MANHOLE, CLEANOUT, & FLOW ARROW          |
|  | WATER SERVICE - VALVE, WATER METER, & FIRE HYDRANT        |
|  | STORM SEWER - MANHOLE, PIPE, & DRAINAGE INLET             |
|  | CURB, CURB & GUTTER                                       |
|  | CONCRETE - SIDEWALK, PAD, OR PAVING                       |
|  | FULL DEPTH PAVEMENT - LIGHT                               |
|  | FULL DEPTH PAVEMENT - HEAVY                               |
|  | BUILDING                                                  |
|  | TREES & BUSHES - DECIDUOUS                                |
|  | TREES & BUSHES - EVERGREEN                                |
|  | ITEMS TO BE DEMOLISHED                                    |
|  | SIGNS                                                     |
|  | SITE NOTES                                                |
|  | PARKING COUNT                                             |
|  | PR. MICROBIO EXPANSION                                    |
|  | SILT FENCE                                                |
|  | SUPER SILT FENCE                                          |
|  | DRAINAGE AREA BOUNDARY                                    |





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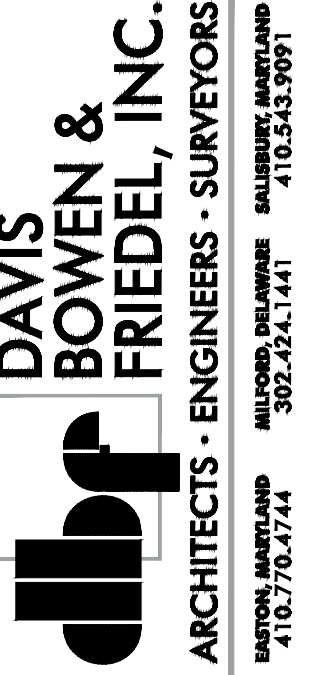
**TALBOT COUNTY  
PUBLIC SAFETY COMPLEX  
PHASE 3: SALLY-PORT & GARAGE BUILDING  
28640 MARY'S COURT, EASTON MD**

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| Date:     | MARCH 2024 |
| Scale:    | 1"=30'     |
| Dwn.By:   | NSB        |
| Proj.No.: | 1503A030   |

**EXISTING  
CONDITIONS  
PLAN**

Dwg.No.:  
**V-101**



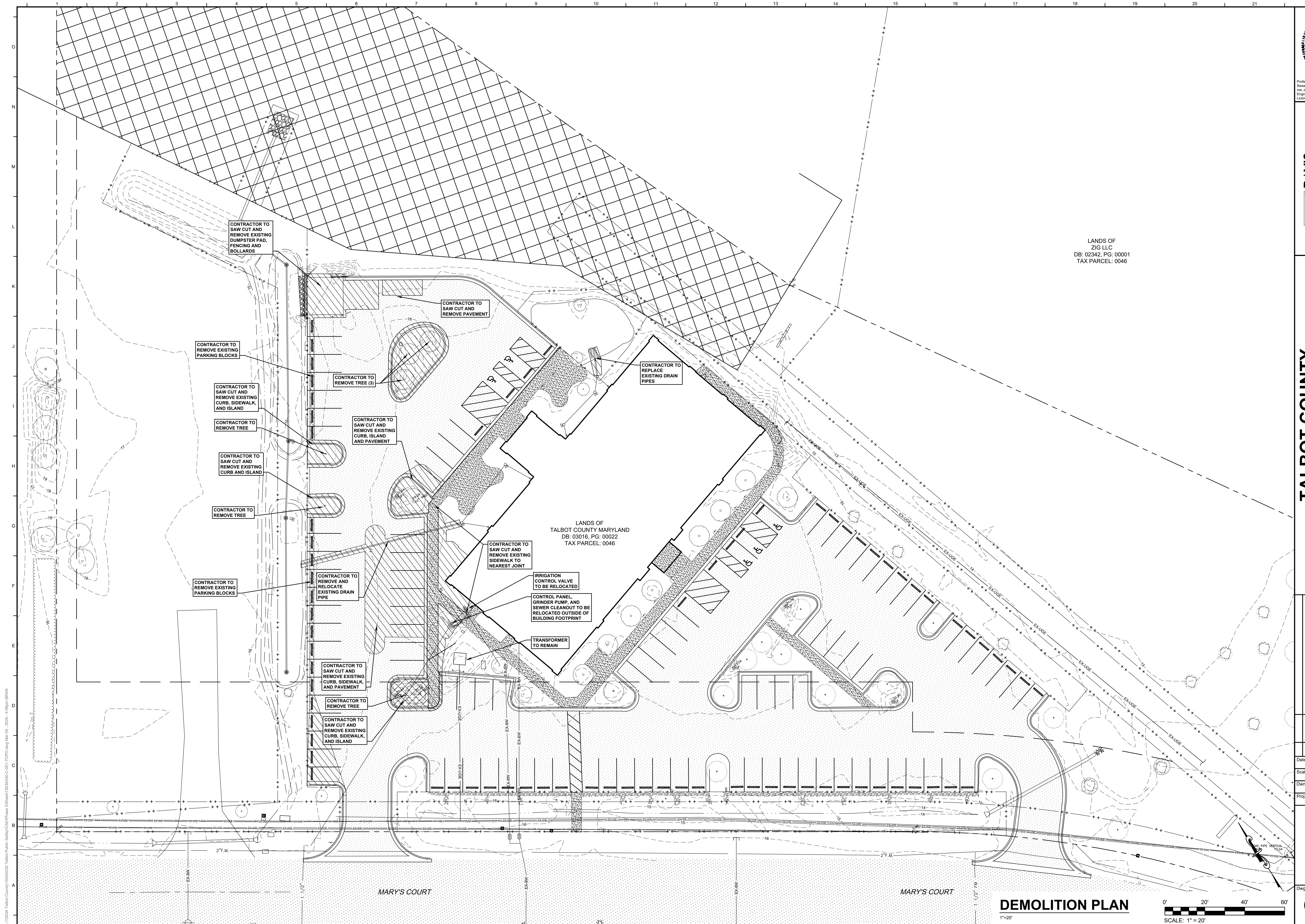
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**PUBLIC SAFETY COMPLEX**  
**PHASE 3: SALLY-PORT & GARAGE BUILDING**  
**28640 MARY'S COURT, EASTON MD**

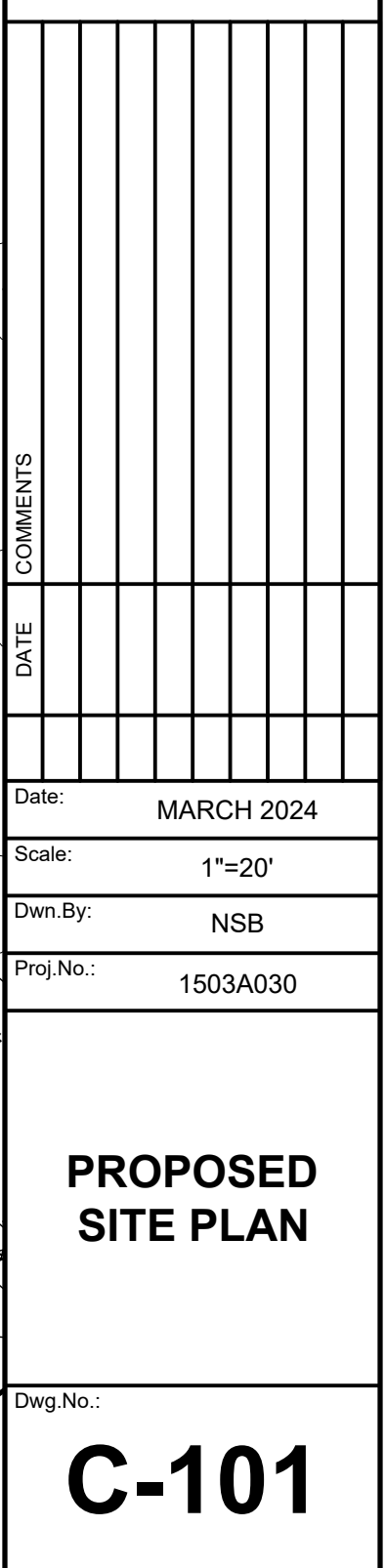
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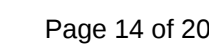
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|------------|------------|
| Month:     | MARCH 2024 |
| Scale:     | 1"=20'     |
| Drawn By:  | NSB        |
| Sheet No.: | 1503A030   |

## DEMOLITION PLAN

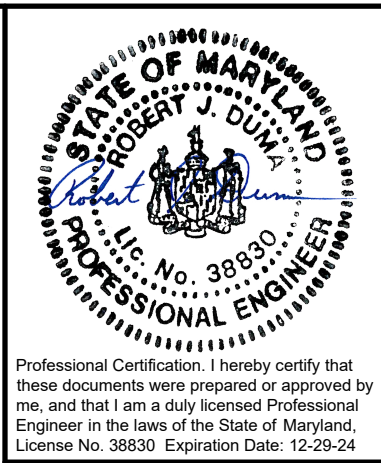
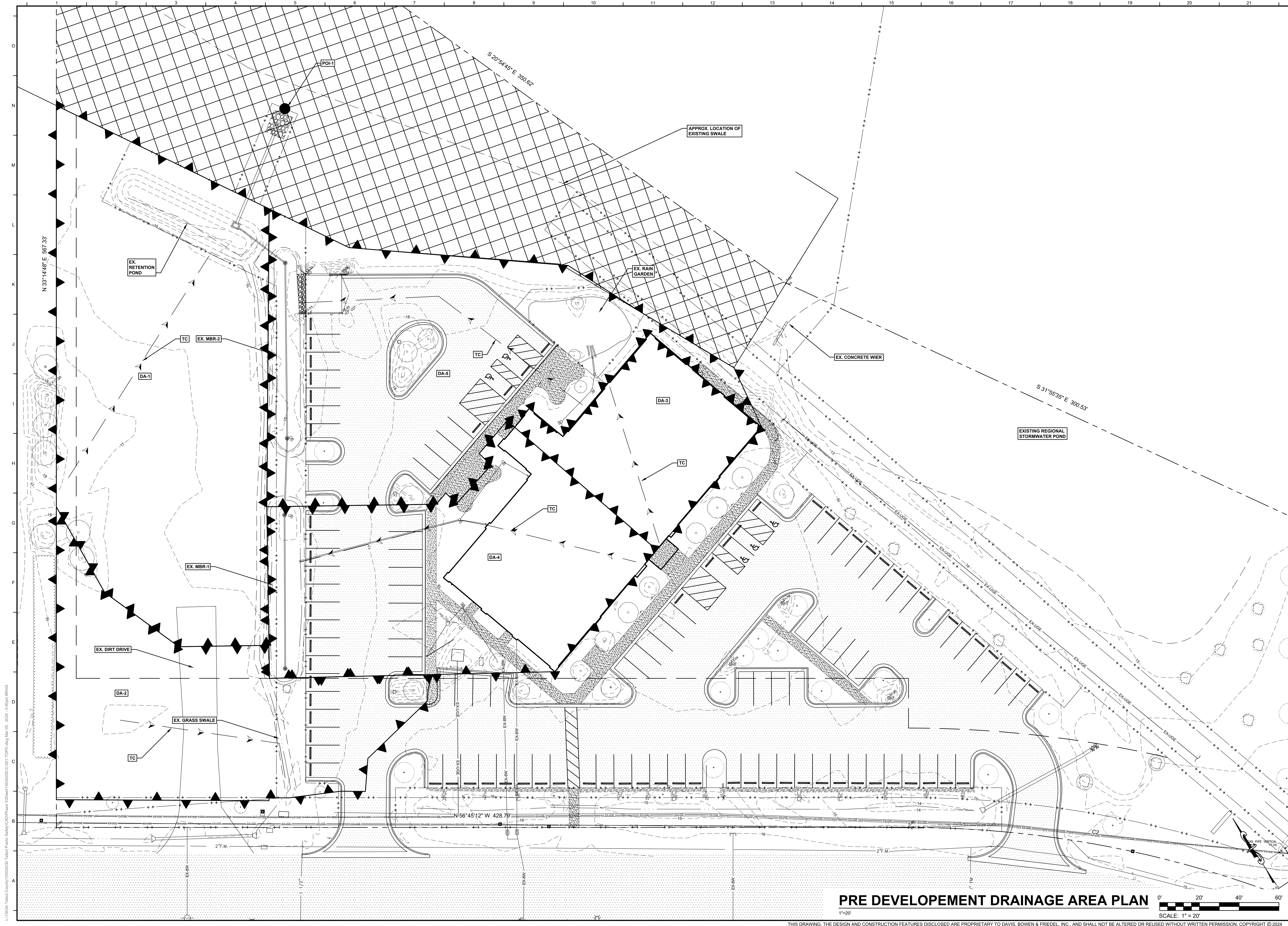
**CD101**









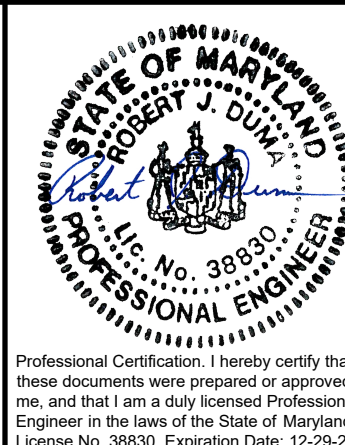
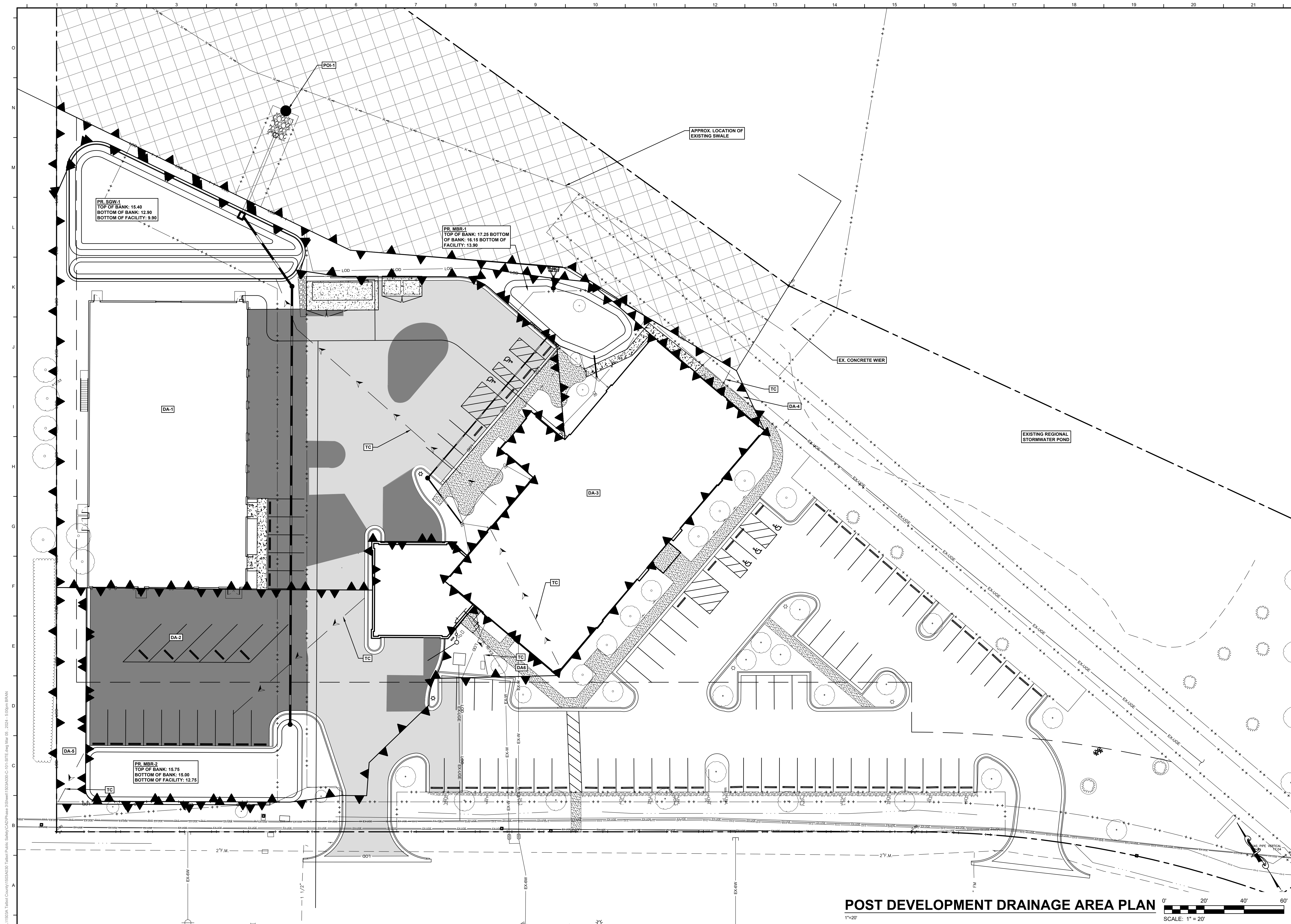


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**PUBLIC SAFETY COMPLEX**  
**PHASE 3: SALLY-PORT & GARAGE BUILDING**  
**28640 MARY'S COURT, EASTON MD**

|                                           |            |
|-------------------------------------------|------------|
| Date:                                     | MARCH 2024 |
| Scale:                                    | 1"=20'     |
| Dwn.By:                                   | NSB        |
| Proj.No.:                                 | 1503A030   |
| Dwg.No.:                                  |            |
| <b>PRE DEVELOPEMENT DRAINAGE AREA MAP</b> |            |
| <b>SWM-1</b>                              |            |

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410-543-2921

**TALBOT COUNTY  
PUBLIC SAFETY COMPLEX  
PHASE 3: SALLY-PORT & GARAGE BUILDING  
28640 MARY'S COURT, EASTON MD**

[illegible]

# POST DEVELOPMENT DRAINAGE AREA MAP

Dwg.No.:





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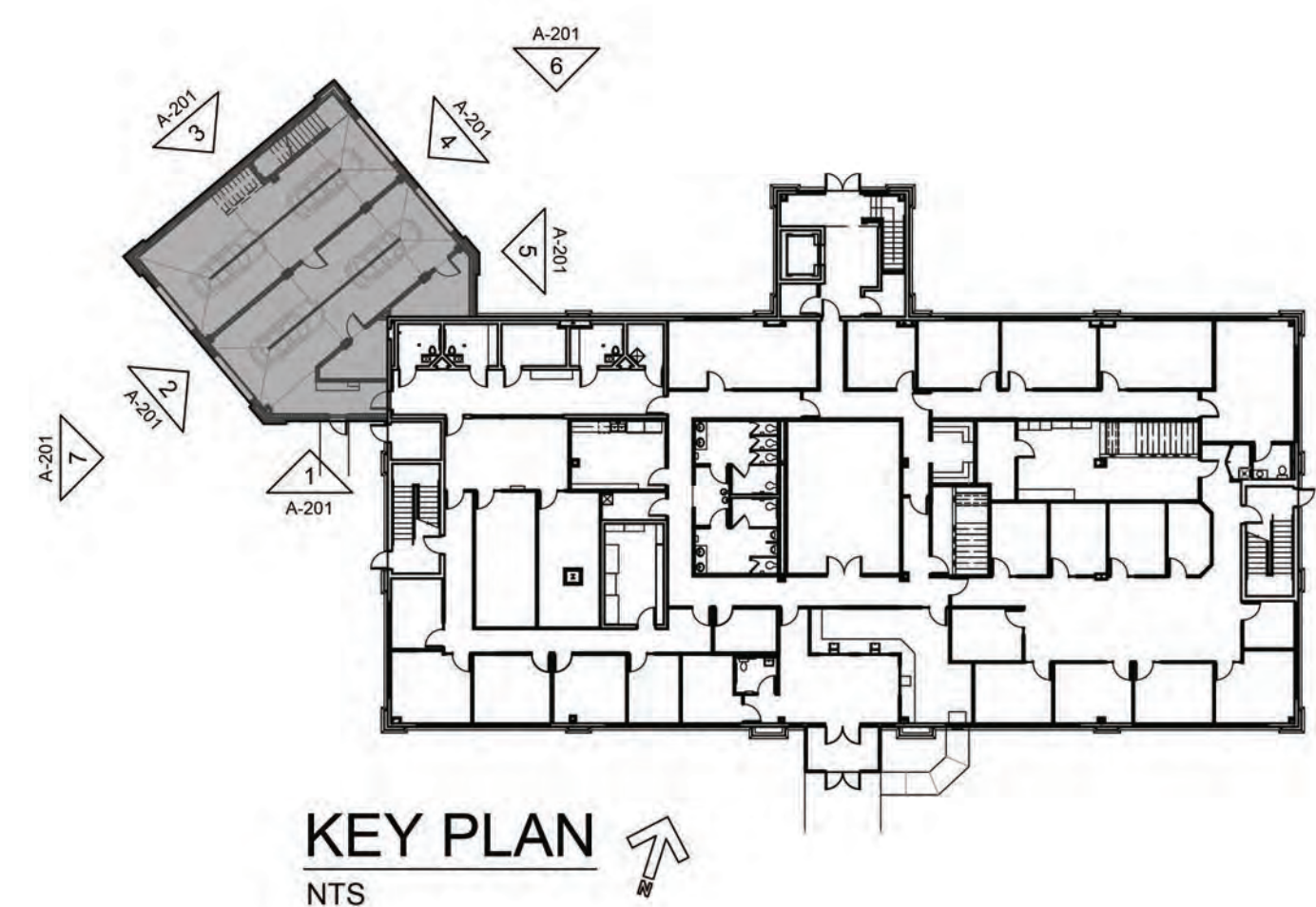
**ALBOL COUNTY  
PUBLIC SAFETY COMPLEX  
PHASE II: SALLY-PORT ADDITION  
28640 MARY'S COURT, EASTON MD, 21601**

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|-------|-----------------|
| Date: | August 22, 2023 |
| File: | 1/8" = 1'-0"    |
| By:   | LWS             |
| No.:  | 1503A030.A01    |

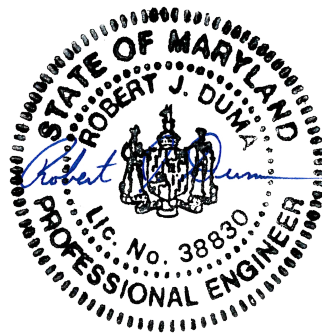
## CONCEPTUAL BUILDING ELEVATIONS

**A-201**



**CONCEPT STORMWATER MANAGEMENT REPORT  
FOR  
TALBOT COUNTY PUBLIC SAFETY COMPLEX  
PHASE 3: SALLY-PORT & GARAGE BUILDING  
PROJECT**

Talbot County, Maryland



Prepared By:  
Davis, Bowen & Friedel, Inc.  
601 E. Main Street  
Salisbury, Maryland 21804

March 2024

DBF #1503A030

## Table of Contents

- I. Stormwater Management Narrative
- II. Pre and Post Development Hydrocad Report
- III. Soil Maps

### Appendix

- A. 2016 Final Stormwater Management Report for Highland TCP, LLC Lot 14, Talbot Commerce Park

Stormwater Management Narrative  
For Concept Review  
Talbot County Public Safety Complex  
Phase 3: Sally-Port & Garage Building  
March 5, 2024  
DBF #1503A030.A01

***Introduction***

This narrative addresses the stormwater management requirements for the Talbot County Public Safety Complex, Phase 3: Sally-Port & Garage Building. The project is located on Tax Map 25, Grid 22, Parcel 46, Lot 14. The existing parcel is 4.83 acres, and consists of a two-story office building, parking areas, sidewalks, access drives and existing stormwater facilities. The existing site and stormwater facilities were designed to meet the requirements of the Town of Easton Stormwater Management Ordinance and Maryland Stormwater Design Manual, and was approved by the Town of Easton in 2016 under the cover ‘Highland TCP, LLC Lot 14, Talbot Commerce Park’ designed and submitted by Lane Engineering Inc.

The proposed Talbot County Public Safety Complex Phase 3: Sally-Port & Garage Building project is the third phase of converting the existing two-story office building into a new Talbot County Public Safety Complex. Phase 1 consisted of interior renovations to the existing building. Phase 3 consists of the addition of a secure sally-port on the Western Corner of the building, a detached garage building, the expansion of the existing parking lot, a site generator, a portion of sidewalk encircling the northeast side of the existing building, several permanent signs, and a small portion of sidewalk on the southern side of the building.

The existing site soils consist of C and C/D designated soils, including Elkton Silt Loam and Woodstown Loam. Infiltration tests were performed as part of the ‘Highland TCP’ project and an exfiltration rate of 0.24in/hr was determined for the existing rain garden and micro-biofiltration facilities. No exfiltration was used in designing the proposed modifications to the existing facilities.

| Symbol | Name                   | HSG |
|--------|------------------------|-----|
| EmA    | Elkton Silt Loam, 0-2% | C/D |
| WocA   | Woodstown loam, 0-2%   | C   |
| WocB   | Woodstown loam, 2-5%   | C   |

### ***Methodology***

The site is classified as redevelopment because the existing site imperviousness is greater than 40%. However, since the existing stormwater management was designed and approved in 2016, meeting modern stormwater requirements we believe that the existing facilities are adequately sized to treat the existing impervious cover. The proposed improvements will remove two micro-bioretenion facilities, a rain garden, part of a grass swale, and the retention pond to the north of the site. The ESDv, calculated in the 2016 stormwater design, provided by these facilities will be fully accounted for by the proposed stormwater facilities in addition to the required treatment for the proposed impervious areas. By doing so, the proposed stormwater design exceeds the typical redevelopment requirements.

The previous stormwater design has runoff flowing to one of two locations, the first being a regional stormwater management system located to the east of the site. The southern half of the existing site flows to this system through a series of grass swales and was previously approved in 2016 without needing to meet quantity requirements as the existing stormwater pond provides sufficient storage. The second location that existing runoff flows to is a discharge pipe located in the forest conservation to the north of the site. The existing two-story building, and northern half of the site flow through a series of micro-bioretenion ponds to a retention pond before entering the discharge pipe. ESD quantity requirements will be calculated and met for all flow at this location.

### ***Stormwater Management***

The existing stormwater management facilities consist of two micro-bioretenion ponds, one rain garden and several grass swales to achieve the previously required ESDv. The proposed stormwater design will eliminate the two micro-bioretenion ponds, the rain garden, and part of a grass swale. In their place treatment will be achieved through two larger micro-bioretenion ponds, and a submerged gravel wetland. These facilities were determined to be the best available stormwater management practices to achieve the necessary treatment within the poor soils onsite, and with limited available space onsite.

Pre-development drainage area DA-2 drains to the regional stormwater management system, and as such an evaluation of stormwater quantity has not been developed. Pre-development drainage areas DA-1, DA-3, DA-4, & DA-5 drain to the existing discharge pipe to the north of the site. A pre-development hydrocad model has been developed to model the discharge at this point.

Post-development drainage areas DA-5, & DA-6 drain to the regional stormwater management system, and as such an evaluation of stormwater quantity has not been developed. Post-development drainage areas DA-1, DA-2, DA-3, and DA-4 drain to the existing discharge pipe to the north of the site. A post-development hydrocad model has been developed to model the discharge at this point.

The existing rain garden previously treated half of the existing two-story building, runoff was not captured by this facility, and instead discharged via overland flow into the existing parking lot which then entered an existing micro-bioretenention facility. The proposed stormwater design will replace the rain garden facility with a larger micro-bioretenention facility and capture and treat all runoff from the existing two-story building, any discharge is rerouted away from the existing parking lot.

Please refer to the enclosed ESDv calculations for a breakdown of treatment requirements for the site and treatment achieved by each facility.

| Pre-Development Area Summary Table |                       |                     |              |                  |                   |
|------------------------------------|-----------------------|---------------------|--------------|------------------|-------------------|
| Area                               | Impervious Area (AC.) | Pervious Area (AC.) | % Impervious | Total Area (AC.) | Point of Analysis |
| DA-1                               | 0.000                 | 0.563               | 0.00%        | 0.563            | POI-1             |
| DA-2                               | 0.057                 | 0.315               | 15.32%       | 0.372            | N/A               |
| DA-3                               | 0.141                 | 0.000               | 100%         | 0.141            | POI-1             |
| DA-4                               | 0.270                 | 0.094               | 74.18%       | 0.364            | POI-1             |
| DA-5                               | 0.241                 | 0.200               | 57.25%       | 0.421            | POI-1             |

| Post-Development Area Summary Table |                       |                     |              |                  |                   |
|-------------------------------------|-----------------------|---------------------|--------------|------------------|-------------------|
| Area                                | Impervious Area (AC.) | Pervious Area (AC.) | % Impervious | Total Area (AC.) | Point of Analysis |
| DA-1                                | 0.643                 | 0.263               | 70.97%       | 0.906            | POI-1             |
| DA-2                                | 0.343                 | 0.088               | 79.58%       | 0.431            | POI-1             |
| DA-3                                | 0.292                 | 0.058               | 83.43%       | 0.350            | POI-1             |
| DA-4                                | 0.000                 | 0.072               | 0.00%        | 0.072            | POI-1             |
| DA-5                                | 0.000                 | 0.039               | 00.00%       | 0.039            | N/A               |
| DA-6                                | 0.008                 | 0.019               | 29.62%       | 0.027            | N/A               |

### **Summary**

The enclosed ESDv calculations illustrate that the proposed submerged gravel wetland and two micro-bioretenment facilities will provide more than sufficient treatment for the proposed site improvements. The enclosed Hydrocad models for the pre and post-development conditions illustrate that the post-development runoff to the northern drainage discharge pipe are held to the 2-year and 10-year predevelopment rates, summarized in the table below. As discussed previously, the drainage areas that drain to the regional stormwater management system were not required to be modelled to determine discharge rates to meet stormwater quantity requirements.

| POI-1    |       |      |
|----------|-------|------|
|          | PRE   | POST |
| 2-Year   | 1.62  | 1.34 |
| 10-Year  | 3.99  | 2.13 |
| 100-Year | 11.02 | 4.57 |

During construction, surface runoff will be diverted away from the stormwater facilities, as per the design manual construction criteria for this practice. Construction will be performed with lightweight, wide-tracked equipment to minimize disturbance and compaction. The proposed SWM facilities will be protected from any disturbance, including construction vehicle traffic, during construction of the proposed site improvements. Perimeter controls such as silt fencing will be used to divert and/or treat stormwater runoff that may flow to SWM areas. Excavated materials will be placed in a contained area, and any pumping operations necessary for dewatering during construction will discharge filtered water to a stable outlet.

Michael R. Wigley, AIA, LEED AP  
W. Zachary Crouch, P.E.  
Michael E. Wheelleton, AIA  
Jason P. Loar, P.E.  
Ring W. Lardner, P.E.  
Jamie L. Sechler, P.E.

Site Name: **Talbot County Public Safety**  
Location: Talbot County  
Date: 3/5/2024

By: NSB  
Checked:

**Step 1. Determine Pre-Developed Conditions**

| Overall Site               |          |
|----------------------------|----------|
| Total Site Area, A =       | 1.859 ac |
| Existing Impervious Area = | 0.746 ac |
| % Imperviousness, I =      | 40%      |

**Existing Site I > 40% Therefore subject to Redevelopment Requirements**

| Limit of Disturbance |          |
|----------------------|----------|
| Total LOD Area =     | 1.510 ac |

Composite RCN for "Woods in Good Condition"

| HSG   | RCN | Area  | %   |
|-------|-----|-------|-----|
| A     | 38  | 0.000 | 0%  |
| B     | 55  | 0.000 | 0%  |
| C     | 70  | 1.580 | 85% |
| D     | 77  | 0.279 | 15% |
| RCN = |     | 71    |     |

**Step 2. Determine Target Pe Using Table 5.3**

I = % Imperviousness

Pe = Rainfall Target from Table 5.3

(Use the more conservative value)

|                            |                    |
|----------------------------|--------------------|
| Proposed Impervious Area = | 1.327 ac           |
| I =                        | 71 %               |
| Pe =                       | A soils 0.0 inches |
|                            | B soils 0.0 inches |
|                            | C soils 2.0 inches |
|                            | D soils 1.8 inches |
| Target Pe=                 | 2.0 inches         |

**Step 3. Compute ESDv:  
Redevelopment:**

P = 1.0" = Water Quality rainfall depth (Eastern Rainfall Zone)

Rv = 0.05 + (0.009 x I), I=67%

A = 50% of Existing Impervious Area in LOD = 1.411 ac. x 50%

WQv = (P)(Rv)(A)/12

|              |          |
|--------------|----------|
| Rv =         | 0.95     |
| A=           | 0.373 ac |
| Target ESDv= | 1,287 cf |

**\*\*Existing conditions were developed following modern SWM practices, existing facilities provide more than 50% water quality treatment. For all existing facilities being removed, the previously claimed ESDv has been accounted for, exceeding the requirements for redevelopment.\*\***

**New Development:**

Qe = Runoff depth used to size ESD practices

Qe = Pe x Rv

Rv = 0.05 + (0.009\*I)

ESDv = (Qe x A)/12

|                          |             |
|--------------------------|-------------|
| Rv =                     | 0.69        |
| Qe =                     | 1.39 inches |
| Target ESDv =            | 9,348 cf    |
| Removed Facilities ESDv= | 3,546 cf    |
| Total Target ESDv=       | 12,894 cf   |

**Table 1. Drainage Area Information**

| Drainage Area (DA) | Imp. Area (ac) | Pervious Area (ac) | Total Area (ac) | Approx. % Site | Target ESDv (cf) | Provided ESDv (cf) | Difference (cf) |
|--------------------|----------------|--------------------|-----------------|----------------|------------------|--------------------|-----------------|
| SGW-1              | 0.643          | 0.263              | 0.906           | 49%            | 4,532            | 9,632              | -5,100          |
| MBR-1              | 0.292          | 0.058              | 0.292           | 16%            | 2,035            | 2,603              | -568            |
| MBR-2              | 0.343          | 0.088              | 0.431           | 23%            | 2,399            | 6,110              | -3,711          |
| <b>Total</b>       | <b>0.935</b>   | <b>0.321</b>       | <b>1.198</b>    | <b>64%</b>     | <b>6,567</b>     | <b>18,345</b>      | <b>-9,379</b>   |

Compute Actual Pe:  $Pe = (ESDv \times 12) / (Rv \times A)$  Actual Pe= 2.9 inches

Site Name: Talbot County Public Safety  
 Location: Talbot County  
 Date: 3/5/2024

By: NSB  
 Checked:

### Drainage Area - SGW-1

#### Micro-Scale Practice Design

|                                               |              |                                  |
|-----------------------------------------------|--------------|----------------------------------|
| DA=                                           | 0.906        | Total Drainage Area (ac)         |
| Imp Area=                                     | 0.643        | Impervious Area (ac)             |
| Pct. Imp.=                                    | 71%          | Drainage Area Percent Impervious |
| HSG=                                          | C            | Soil Type                        |
| Pe=                                           | 2.0          | inches (From Site Calculation)   |
| Rv=                                           | 0.689        | Volumetric Runoff Coefficient    |
| WQv=                                          | 2,266        | Water Quality Volume (cf)        |
| <b>ESD<sub>V-REQUIRED</sub> Preliminary =</b> | <b>4,532</b> | Target ESD Volume (cf)           |

#### SGW #1 :Submerged Gravel Wetland - Stormwater Credit Computation

|                                         |               |                          |
|-----------------------------------------|---------------|--------------------------|
| Af=                                     | 2,354         | SGW Surface Area (sq ft) |
| Storage Volume <sub>Provided</sub> =    | 9,632         | (cf)                     |
| <b>ESD<sub>V CREDIT</sub>=</b>          | <b>9,632</b>  | <b>cf</b>                |
| <b>10% Pre-treatment Required=</b>      | <b>453</b>    |                          |
| <b>Pre-treatment Provided=</b>          | <b>682</b>    |                          |
| <b>75% of ESD<sub>v</sub> Required=</b> | <b>3,399</b>  |                          |
| <b>Storage above wetland bed=</b>       | <b>6,807</b>  |                          |
| <b>ESD<sub>V REMAINING</sub>=</b>       | <b>-5,100</b> | <b>cf</b>                |

| <b>Submerged Gravel Wetland Treatment Requirements:</b>                                                            | <b>Provided</b> |
|--------------------------------------------------------------------------------------------------------------------|-----------------|
| 1) Pre-treatment shall be provided for 10% of the total ESD <sub>v</sub>                                           | 15.0%           |
| 2) Storage for 75% of ESD <sub>v</sub> for the entire drainage area contributing to the wetland shall be provided. | 150%            |
| 3) Storage calculations shall account for the porosity of the gravel media.                                        | 40%             |
| 4) The gravel substrate shall be no deeper than four feet.                                                         | 2ft             |

Site Name: Talbot County Public Safety  
Location: Talbot County  
Date: 3/5/2024

By: NSB  
Checked:

### Drainage Area - MBR-1

#### Micro-Scale Practice Design

|                                               |              |                                  |
|-----------------------------------------------|--------------|----------------------------------|
| DA=                                           | 0.350        | Total Drainage Area (ac)         |
| Imp Area=                                     | 0.292        | Impervious Area (ac)             |
| Pct. Imp.=                                    | 83%          | Drainage Area Percent Impervious |
| HSG=                                          | C            | Soil Type                        |
| Pe=                                           | 2.0          | inches (From Site Calculation)   |
| Rv=                                           | 0.801        | Volumetric Runoff Coefficient    |
| WQv=                                          | 1,017        | Water Quality Volume (cf)        |
| <b>ESD<sub>V-REQUIRED</sub> Preliminary =</b> | <b>2,035</b> | <b>Target ESD Volume (cf)</b>    |

#### MBR-1 - Micro Bioretention - Stormwater Credit Computation

|                                      |              |                          |
|--------------------------------------|--------------|--------------------------|
| Af=                                  | 1,041        | MBR Surface Area (sq ft) |
| Storage Volume <sub>Required</sub> = | 1,952        | (cf) 75% ESDv            |
| Storage Volume <sub>Provided</sub> = | 2,353        | (cf)                     |
| P <sub>E</sub> Credit=               | 1.0          |                          |
| <b>ESD<sub>V CREDIT</sub>=</b>       | <b>2,603</b> | <b>cf</b>                |

|                                   |             |           |
|-----------------------------------|-------------|-----------|
| <b>ESD<sub>V REMAINING</sub>=</b> | <b>-318</b> | <b>cf</b> |
|-----------------------------------|-------------|-----------|

| Micro-Bioretention Requirements                                                                                                                                                | Provided |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1) Drainage area to any individual practice shall be 20,000 ft <sup>2</sup> or less. Larger areas may require pretreatment and soils testing to verify the infiltration rates. | ✓        |
| 2) Micro-bioreatention practices shall capture and store at least 75% of the ESDv.                                                                                             | 116%     |
| 3) The surface area of micro-bioretention practices shall be atleast 2% of the contributing drainage area.                                                                     | ✓        |
| 4) Filter beds shall be between 24 and 48 inches deep.                                                                                                                         | 2ft      |
| 5) Filter beds shall not intercept groundwater.                                                                                                                                | ✓        |
| 6) A surface mulch layer should be provided to enhance plant serivival and inhibit weed growth.                                                                                | ✓        |

Site Name: Talbot County Public Safety  
 Location: Talbot County  
 Date: 3/5/2024

By: NSB  
 Checked:

### Drainage Area - MBR-2

#### Micro-Scale Practice Design

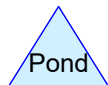
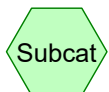
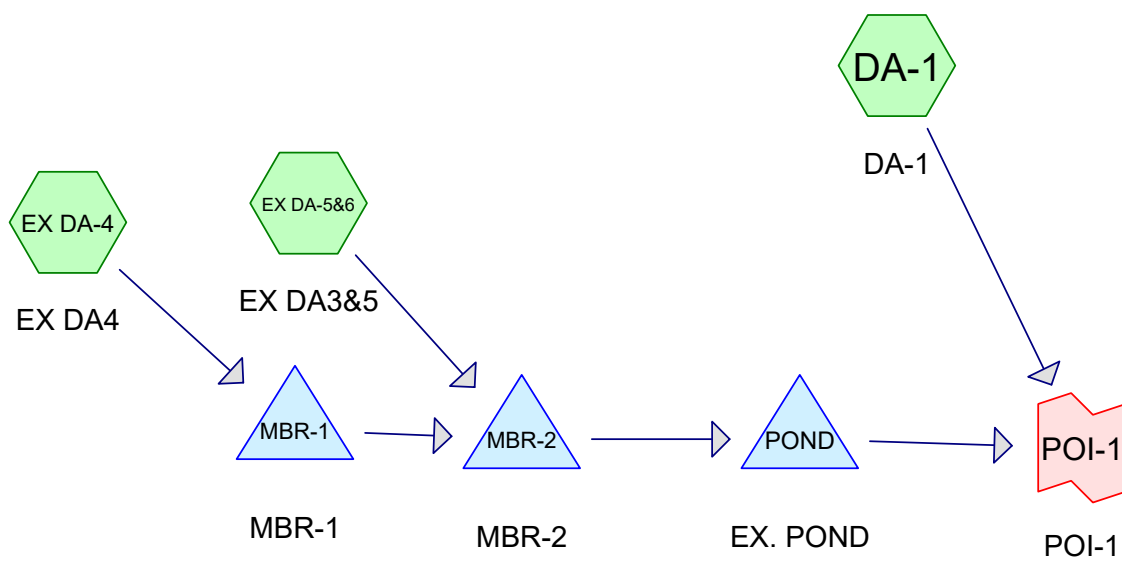
|                                               |              |                                  |
|-----------------------------------------------|--------------|----------------------------------|
| DA=                                           | 0.431        | Total Drainage Area (ac)         |
| Imp Area=                                     | 0.343        | Impervious Area (ac)             |
| Pct. Imp.=                                    | 80%          | Drainage Area Percent Impervious |
| HSG=                                          | C            | Soil Type                        |
| Pe=                                           | 2.0          | inches (From Site Calculation)   |
| Rv=                                           | 0.767        | Volumetric Runoff Coefficient    |
| WQv=                                          | 1,199        | Water Quality Volume (cf)        |
| <b>ESD<sub>V-REQUIRED</sub> Preliminary =</b> | <b>2,399</b> | <b>Target ESD Volume (cf)</b>    |

#### MBR-1 - Micro Bioretention - Stormwater Credit Computation

|                                      |              |                          |
|--------------------------------------|--------------|--------------------------|
| Af=                                  | 2,444        | MBR Surface Area (sq ft) |
| Storage Volume <sub>Required</sub> = | 1,799        | (cf) 75% ESDv            |
| Storage Volume <sub>Provided</sub> = | 4,268        | (cf)                     |
| P <sub>E</sub> Credit=               | 2.0          |                          |
| <b>ESD<sub>V CREDIT</sub>=</b>       | <b>6,110</b> | <b>cf</b>                |

|                                   |               |           |
|-----------------------------------|---------------|-----------|
| <b>ESD<sub>V REMAINING</sub>=</b> | <b>-1,869</b> | <b>cf</b> |
|-----------------------------------|---------------|-----------|

| Micro-Bioretention Requirements                                                                                                                                                | Provided |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1) Drainage area to any individual practice shall be 20,000 ft <sup>2</sup> or less. Larger areas may require pretreatment and soils testing to verify the infiltration rates. | ✓        |
| 2) Micro-bioreatention practices shall capture and store at least 75% of the ESDv.                                                                                             | 178%     |
| 3) The surface area of micro-bioretention practices shall be atleast 2% of the contributing drainage area.                                                                     | ✓        |
| 4) Filter beds shall be between 24 and 48 inches deep.                                                                                                                         | 2ft      |
| 5) Filter beds shall not intercept groundwater.                                                                                                                                | ✓        |
| 6) A surface mulch layer should be provided to enhance plant serivival and inhibit weed growth.                                                                                | ✓        |



**Routing Diagram for PRE**  
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**Rainfall Events Listing**

| Event# | Event Name | Storm Type    | Curve | Mode    | Duration (hours) | B/B | Depth (inches) | AMC |
|--------|------------|---------------|-------|---------|------------------|-----|----------------|-----|
| 1      | 2-YR       | Type II 24-hr |       | Default | 24.00            | 1   | 3.40           | 2   |
| 2      | 10-YR      | Type II 24-hr |       | Default | 24.00            | 1   | 5.30           | 2   |
| 3      | 100-YR     | Type II 24-hr |       | Default | 24.00            | 1   | 7.60           | 2   |

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**Area Listing (all nodes)**

| Area<br>(acres) | CN        | Description<br>(subcatchment-numbers)                    |
|-----------------|-----------|----------------------------------------------------------|
| 0.857           | 74        | >75% Grass cover, Good, HSG C (DA-1, EX DA-4, EX DA-5&6) |
| 0.652           | 98        | Paved parking, HSG C (EX DA-4, EX DA-5&6)                |
| <b>1.510</b>    | <b>84</b> | <b>TOTAL AREA</b>                                        |

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**Soil Listing (all nodes)**

| Area<br>(acres) | Soil<br>Group | Subcatchment<br>Numbers  |
|-----------------|---------------|--------------------------|
| 0.000           | HSG A         |                          |
| 0.000           | HSG B         |                          |
| 1.510           | HSG C         | DA-1, EX DA-4, EX DA-5&6 |
| 0.000           | HSG D         |                          |
| 0.000           | Other         |                          |
| <b>1.510</b>    |               | <b>TOTAL AREA</b>        |

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**Ground Covers (all nodes)**

| HSG-A<br>(acres) | HSG-B<br>(acres) | HSG-C<br>(acres) | HSG-D<br>(acres) | Other<br>(acres) | Total<br>(acres) | Ground<br>Cover        | Subcatchment<br>Numbers        |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------------|--------------------------------|
| 0.000            | 0.000            | 0.857            | 0.000            | 0.000            | 0.857            | >75% Grass cover, Good | DA-1, EX<br>DA-4, EX<br>DA-5&6 |
| 0.000            | 0.000            | 0.652            | 0.000            | 0.000            | 0.652            | Paved parking          | EX DA-4,<br>EX<br>DA-5&6       |
| <b>0.000</b>     | <b>0.000</b>     | <b>1.510</b>     | <b>0.000</b>     | <b>0.000</b>     | <b>1.510</b>     | <b>TOTAL AREA</b>      |                                |

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**Pipe Listing (all nodes)**

| Line# | Node<br>Number | In-Invert<br>(feet) | Out-Invert<br>(feet) | Length<br>(feet) | Slope<br>(ft/ft) | n     | Width<br>(inches) | Diam/Height<br>(inches) | Inside-Fill<br>(inches) | Node<br>Name |
|-------|----------------|---------------------|----------------------|------------------|------------------|-------|-------------------|-------------------------|-------------------------|--------------|
| 1     | POND           | 12.27               | 12.20                | 50.0             | 0.0014           | 0.013 | 0.0               | 15.0                    | 0.0                     |              |

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Type II 24-hr 2-YR Rainfall=3.40"

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Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment DA-1: DA-1** Runoff Area=24,519 sf 0.00% Impervious Runoff Depth=1.17"  
Flow Length=132' Slope=0.0100 '/' Tc=12.8 min CN=74 Runoff=0.90 cfs 0.055 af

**Subcatchment EX DA-4: EX DA4** Runoff Area=15,861 sf 74.21% Impervious Runoff Depth=2.54"  
Tc=5.0 min CN=92 Runoff=1.61 cfs 0.077 af

**Subcatchment EX DA-5&6: EX DA3&5** Runoff Area=25,387 sf 65.59% Impervious Runoff Depth=2.35"  
Tc=5.0 min CN=90 Runoff=2.43 cfs 0.114 af

**Pond MBR-1: MBR-1** Peak Elev=15.34' Storage=2,255 cf Inflow=1.61 cfs 0.077 af  
Discarded=0.02 cfs 0.054 af Primary=0.02 cfs 0.002 af Outflow=0.04 cfs 0.056 af

**Pond MBR-2: MBR-2** Peak Elev=15.26' Storage=1,701 cf Inflow=2.43 cfs 0.116 af  
Discarded=0.02 cfs 0.049 af Primary=2.28 cfs 0.056 af Outflow=2.31 cfs 0.105 af

**Pond POND: EX. POND** Peak Elev=13.40' Storage=704 cf Inflow=2.28 cfs 0.056 af  
Discarded=0.01 cfs 0.002 af Primary=0.74 cfs 0.054 af Outflow=0.75 cfs 0.056 af

**Link POI-1: POI-1** Inflow=1.62 cfs 0.109 af  
Primary=1.62 cfs 0.109 af

**Total Runoff Area = 1.510 ac Runoff Volume = 0.246 af Average Runoff Depth = 1.96"**  
**56.78% Pervious = 0.857 ac 43.22% Impervious = 0.652 ac**

**PRE**

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Type II 24-hr 2-YR Rainfall=3.40"

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**Summary for Subcatchment DA-1: DA-1**

Runoff = 0.90 cfs @ 12.06 hrs, Volume= 0.055 af, Depth= 1.17"  
Routed to Link POI-1 : POI-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
Type II 24-hr 2-YR Rainfall=3.40"

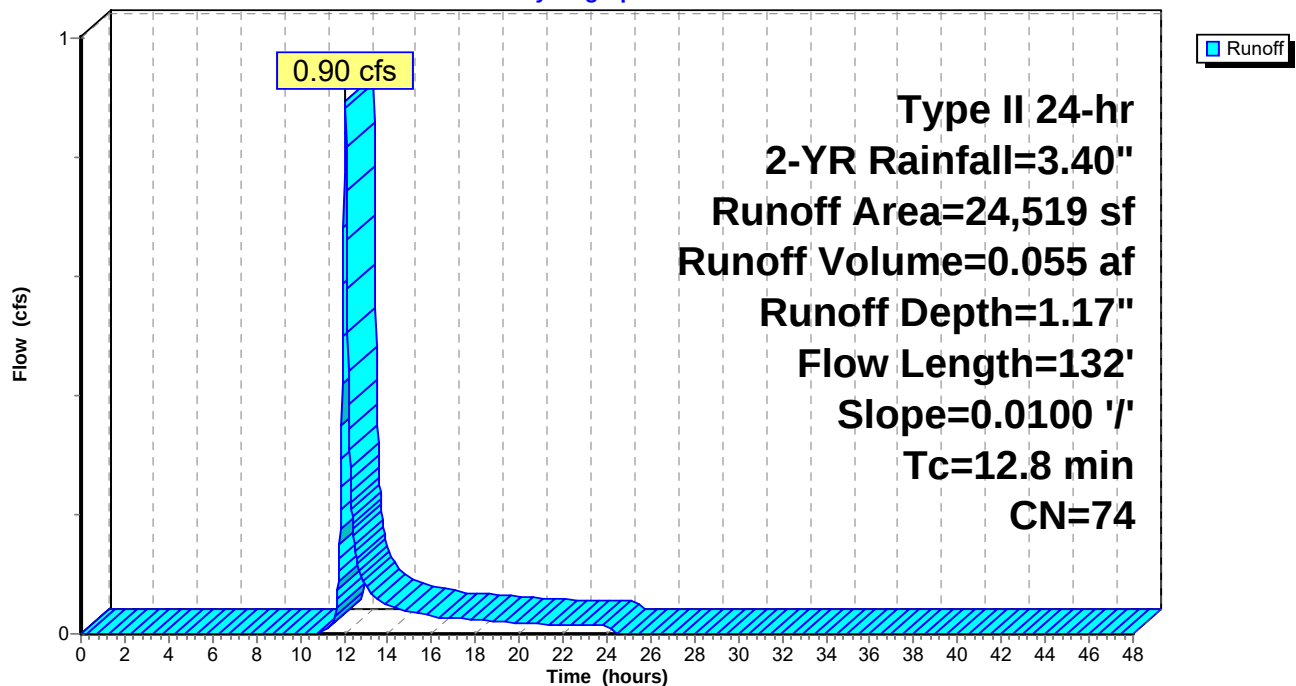
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 24,519    | 74 | >75% Grass cover, Good, HSG C |
| 24,519    |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 12.5     | 100           | 0.0100        | 0.13              |                | Sheet Flow,<br>Grass: Short n= 0.150 P2= 3.40"     |
| 0.3      | 32            | 0.0100        | 1.61              |                | Shallow Concentrated Flow,<br>Unpaved Kv= 16.1 fps |
| 12.8     | 132           | Total         |                   |                |                                                    |

**Subcatchment DA-1: DA-1**

Hydrograph



PRE

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Type II 24-hr 2-YR Rainfall=3.40"

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### Summary for Subcatchment EX DA-4: EX DA4

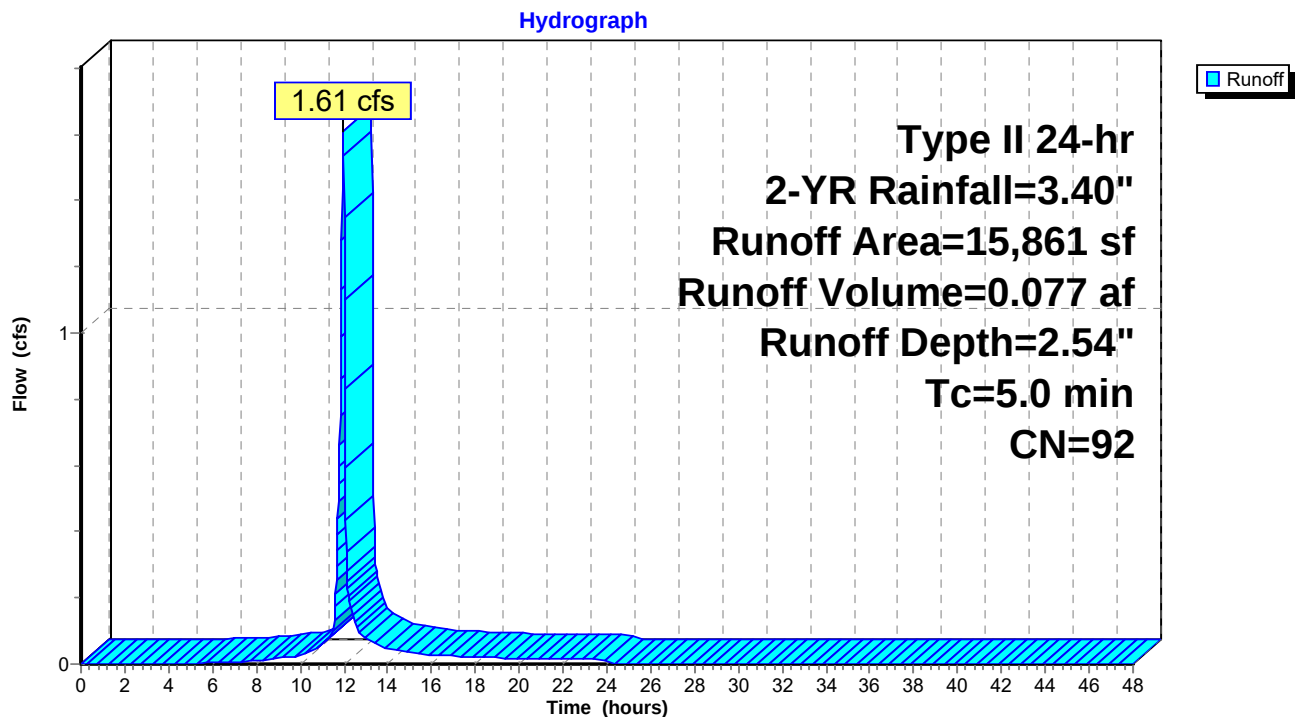
Runoff = 1.61 cfs @ 11.96 hrs, Volume= 0.077 af, Depth= 2.54"  
Routed to Pond MBR-1 : MBR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
Type II 24-hr 2-YR Rainfall=3.40"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 11,771    | 98 | Paved parking, HSG C          |
| 4,090     | 74 | >75% Grass cover, Good, HSG C |
| 15,861    | 92 | Weighted Average              |
| 4,090     |    | 25.79% Pervious Area          |
| 11,771    |    | 74.21% Impervious Area        |

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

### Subcatchment EX DA-4: EX DA4



Summary for Subcatchment EX DA-5&6: EX DA3&5

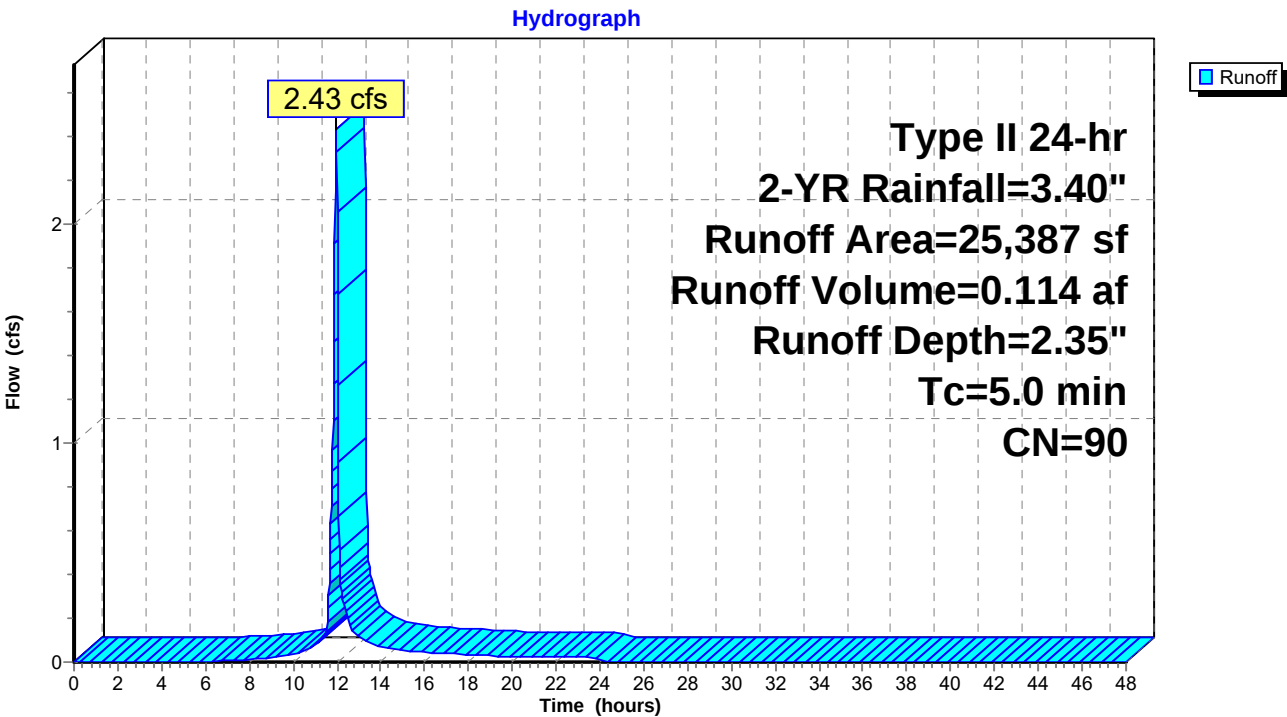
Runoff = 2.43 cfs @ 11.96 hrs, Volume= 0.114 af, Depth= 2.35"  
Routed to Pond MBR-2 : MBR-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
Type II 24-hr 2-YR Rainfall=3.40"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 8,736     | 74 | >75% Grass cover, Good, HSG C |
| 16,651    | 98 | Paved parking, HSG C          |
| 25,387    | 90 | Weighted Average              |
| 8,736     |    | 34.41% Pervious Area          |
| 16,651    |    | 65.59% Impervious Area        |

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

Subcatchment EX DA-5&6: EX DA3&5



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Type II 24-hr 2-YR Rainfall=3.40"

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**Summary for Pond MBR-1: MBR-1**

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=30)

Inflow Area = 0.364 ac, 74.21% Impervious, Inflow Depth = 2.54" for 2-YR event  
 Inflow = 1.61 cfs @ 11.96 hrs, Volume= 0.077 af  
 Outflow = 0.04 cfs @ 14.46 hrs, Volume= 0.056 af, Atten= 97%, Lag= 150.1 min  
 Discarded = 0.02 cfs @ 14.46 hrs, Volume= 0.054 af  
 Primary = 0.02 cfs @ 14.46 hrs, Volume= 0.002 af  
 Routed to Pond MBR-2 : MBR-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 15.34' @ 14.46 hrs Surf.Area= 3,756 sf Storage= 2,255 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 756.4 min ( 1,547.9 - 791.5 )

| Volume | Invert | Avail.Storage | Storage Description                                                           |
|--------|--------|---------------|-------------------------------------------------------------------------------|
| #1     | 12.83' | 2,160 cf      | <b>20.00'W x 90.00'L x 3.00'H Prismatic</b><br>5,400 cf Overall x 40.0% Voids |
| #2     | 14.83' | 446 cf        | <b>10.00'W x 80.00'L x 0.50'H Prismatic Z=2.0</b>                             |
| #3     | 15.33' | 331 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                    |
|        |        | 2,936 cf      | Total Available Storage                                                       |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.33               | 968                  | 180.0            | 0                         | 0                         | 968                 |
| 15.50               | 1,115                | 192.0            | 177                       | 177                       | 1,325               |
| 15.60               | 2,000                | 200.0            | 154                       | 331                       | 1,575               |

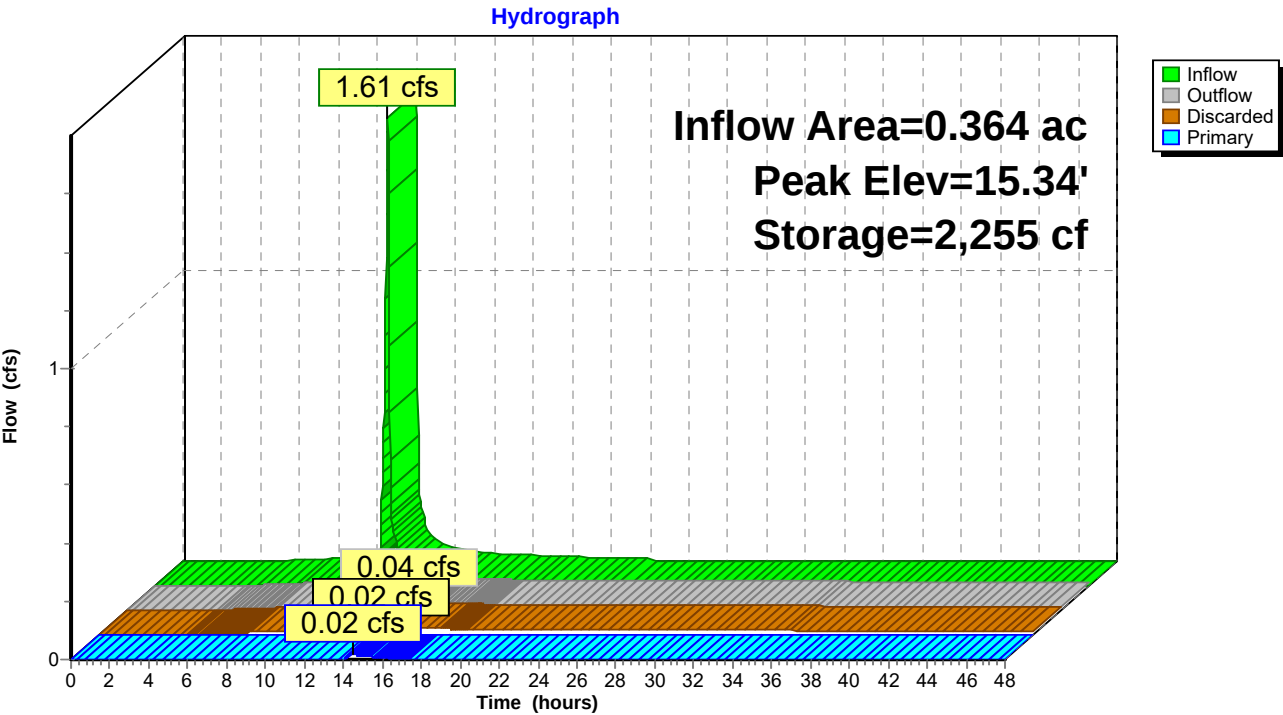
| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.33' | <b>17.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64<br>2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74 |
| #2     | Discarded | 12.83' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                                                                                                                  |

**Discarded OutFlow** Max=0.02 cfs @ 14.46 hrs HW=15.34' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=0.02 cfs @ 14.46 hrs HW=15.34' TW=15.11' (Dynamic Tailwater)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.18 fps)

PRE

Pond MBR-1: MBR-1



**Summary for Pond MBR-2: MBR-2**

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth = 1.47" for 2-YR event  
 Inflow = 2.43 cfs @ 11.96 hrs, Volume= 0.116 af  
 Outflow = 2.31 cfs @ 11.98 hrs, Volume= 0.105 af, Atten= 5%, Lag= 1.5 min  
 Discarded = 0.02 cfs @ 11.98 hrs, Volume= 0.049 af  
 Primary = 2.28 cfs @ 11.98 hrs, Volume= 0.056 af  
 Routed to Pond POND : EX. POND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 15.26' @ 11.98 hrs Surf.Area= 3,858 sf Storage= 1,701 cf

Plug-Flow detention time= 360.4 min calculated for 0.105 af (90% of inflow)  
 Center-of-Mass det. time= 310.7 min ( 1,113.0 - 802.4 )

| Volume | Invert | Avail.Storage | Storage Description                                                            |
|--------|--------|---------------|--------------------------------------------------------------------------------|
| #1     | 12.60' | 880 cf        | <b>10.00'W x 110.00'L x 2.00'H Prismatic</b><br>2,200 cf Overall x 40.0% Voids |
| #2     | 14.60' | 611 cf        | <b>10.00'W x 110.00'L x 0.50'H Prismatic Z=2.0</b>                             |
| #3     | 15.10' | 580 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                     |
|        |        | 2,070 cf      | Total Available Storage                                                        |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.10               | 1,301                | 237.0            | 0                         | 0                         | 1,301               |
| 15.50               | 1,602                | 253.0            | 580                       | 580                       | 1,933               |

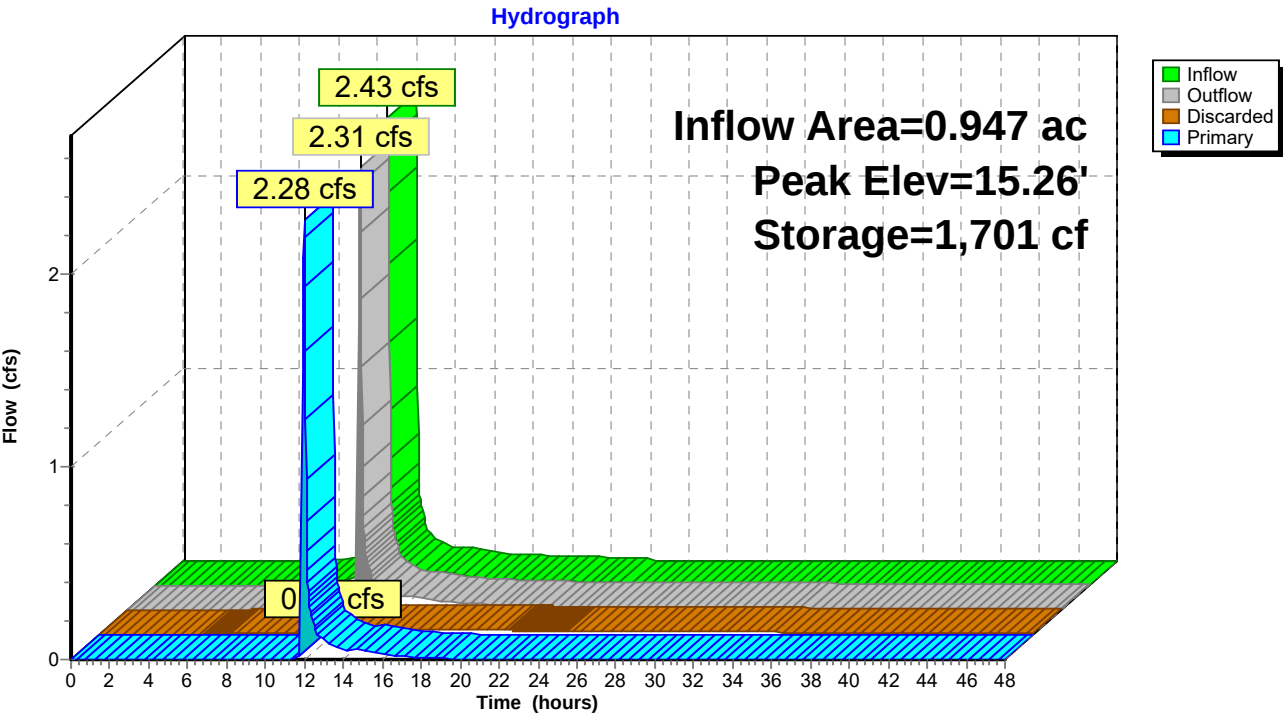
| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                     |
|--------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.10' | <b>15.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #2     | Discarded | 12.60' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                   |

**Discarded OutFlow** Max=0.02 cfs @ 11.98 hrs HW=15.25' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=2.26 cfs @ 11.98 hrs HW=15.25' TW=12.98' (Dynamic Tailwater)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 2.26 cfs @ 0.98 fps)

PRE

Pond MBR-2: MBR-2



**PRE**

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Type II 24-hr 2-YR Rainfall=3.40"

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**Summary for Pond POND: EX. POND**

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth = 0.70" for 2-YR event  
 Inflow = 2.28 cfs @ 11.98 hrs, Volume= 0.056 af  
 Outflow = 0.75 cfs @ 12.10 hrs, Volume= 0.056 af, Atten= 67%, Lag= 6.9 min  
 Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.002 af  
 Primary = 0.74 cfs @ 12.10 hrs, Volume= 0.054 af  
 Routed to Link POI-1 : POI-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 13.40' @ 12.10 hrs Surf.Area= 964 sf Storage= 704 cf

Plug-Flow detention time= 13.6 min calculated for 0.055 af (100% of inflow)  
 Center-of-Mass det. time= 13.6 min ( 793.5 - 780.0 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------|
| #1                  | 12.40'               | 4,422 cf         | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet)                                  | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 12.40               | 253                  | 133.0            | 0                                                          | 0                         | 253                 |
| 12.70               | 679                  | 152.0            | 135                                                        | 135                       | 686                 |
| 15.20               | 1,932                | 197.0            | 3,130                                                      | 3,265                     | 2,010               |
| 15.50               | 3,140                | 264.0            | 754                                                        | 4,018                     | 4,469               |
| 15.60               | 5,000                | 575.0            | 403                                                        | 4,422                     | 25,233              |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                                                     |
|--------|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 12.27' | <b>15.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.27' / 12.20' S= 0.0014 ' /' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf |
| #2     | Device 1  | 12.40' | <b>5.7" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                         |
| #3     | Device 1  | 13.79' | <b>5.4" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                         |
| #4     | Device 1  | 15.20' | <b>12.0' long Sharp-Crested Vee/Trap Weir</b> Cv= 2.62 (C= 3.28)                                                                                                                                                   |
| #5     | Discarded | 12.40' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                                                   |

**Discarded OutFlow** Max=0.01 cfs @ 12.10 hrs HW=13.40' (Free Discharge)  
 ↳ **5=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.74 cfs @ 12.10 hrs HW=13.40' TW=0.00' (Dynamic Tailwater)  
 ↳ **1=Culvert** (Passes 0.74 cfs of 2.68 cfs potential flow)  
 ↳ **2=Orifice/Grate** (Orifice Controls 0.74 cfs @ 4.19 fps)  
 ↳ **3=Orifice/Grate** ( Controls 0.00 cfs)  
 ↳ **4=Sharp-Crested Vee/Trap Weir** ( Controls 0.00 cfs)

PRE

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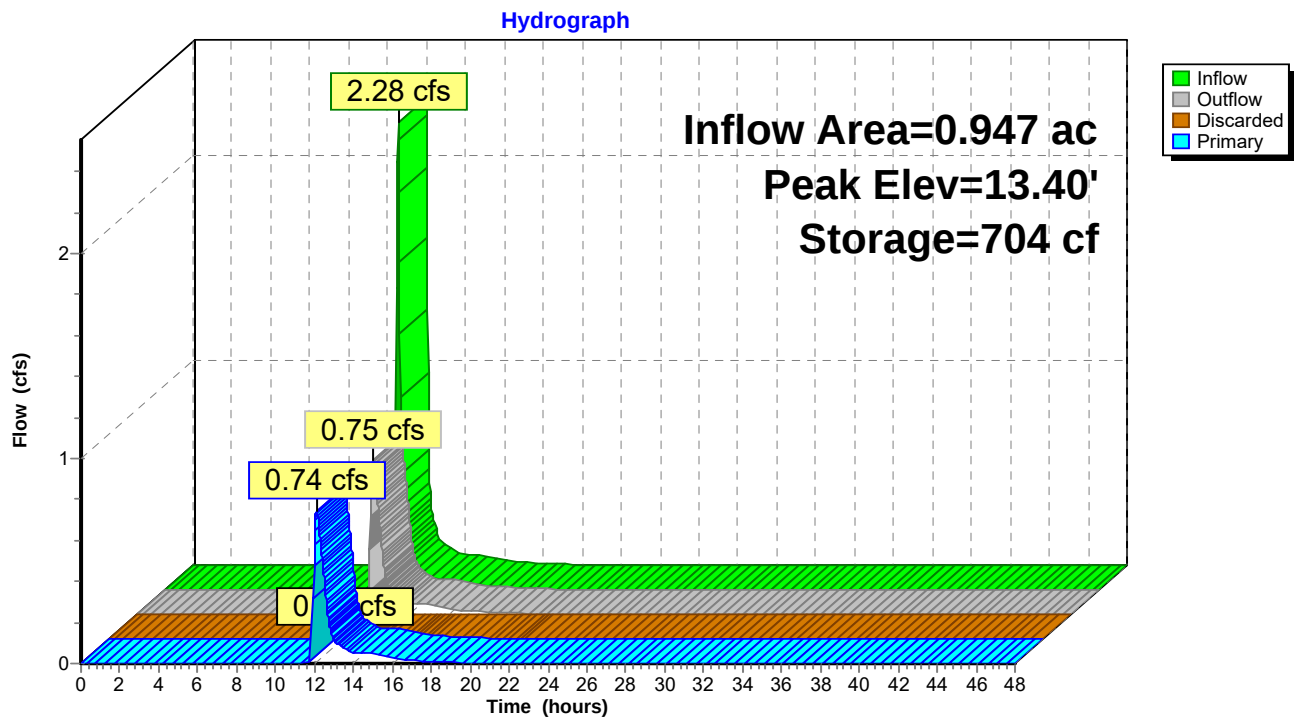
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Type II 24-hr 2-YR Rainfall=3.40"

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### Pond POND: EX. POND



PRE

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Type II 24-hr 2-YR Rainfall=3.40"

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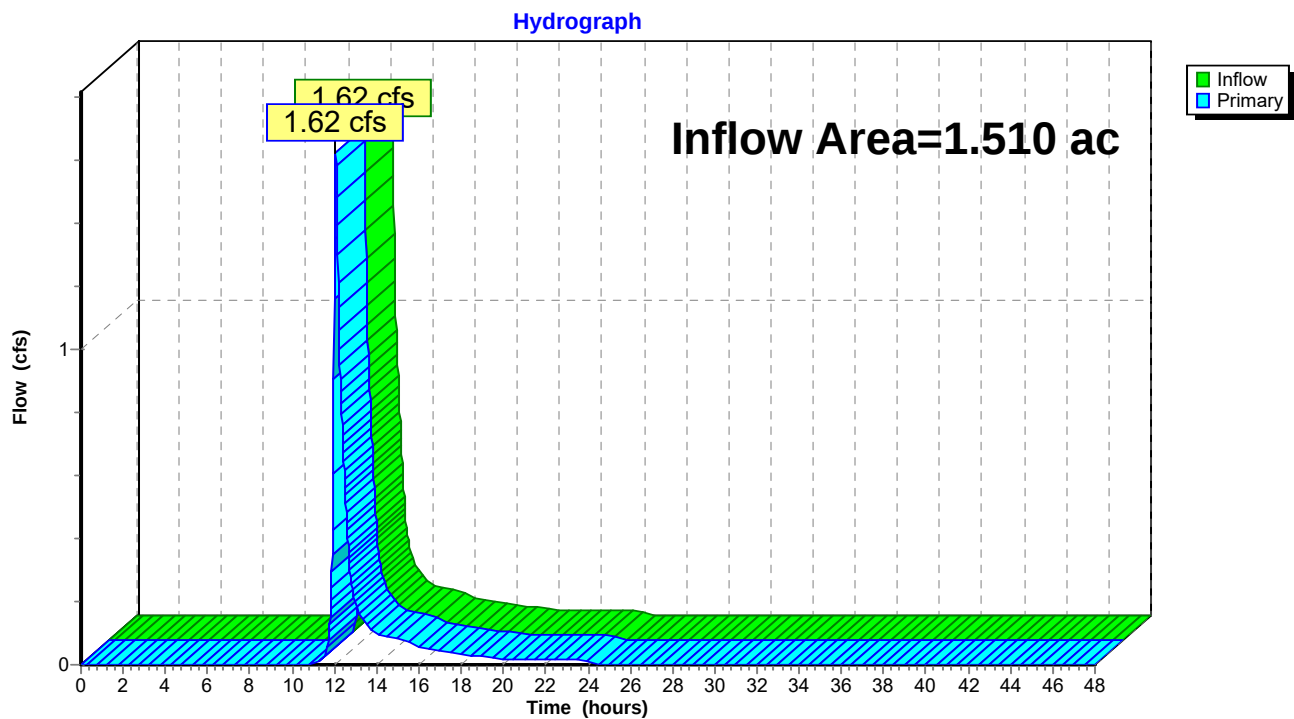
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### Summary for Link POI-1: POI-1

Inflow Area = 1.510 ac, 43.22% Impervious, Inflow Depth = 0.86" for 2-YR event  
Inflow = 1.62 cfs @ 12.07 hrs, Volume= 0.109 af  
Primary = 1.62 cfs @ 12.07 hrs, Volume= 0.109 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

### Link POI-1: POI-1



**PRE**

Type II 24-hr 10-YR Rainfall=5.30"

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Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment DA-1: DA-1** Runoff Area=24,519 sf 0.00% Impervious Runoff Depth=2.61"  
Flow Length=132' Slope=0.0100 '/' Tc=12.8 min CN=74 Runoff=2.05 cfs 0.122 af

**Subcatchment EX DA-4: EX DA4** Runoff Area=15,861 sf 74.21% Impervious Runoff Depth=4.38"  
Tc=5.0 min CN=92 Runoff=2.67 cfs 0.133 af

**Subcatchment EX DA-5&6: EX DA3&5** Runoff Area=25,387 sf 65.59% Impervious Runoff Depth=4.17"  
Tc=5.0 min CN=90 Runoff=4.15 cfs 0.202 af

**Pond MBR-1: MBR-1** Peak Elev=15.47' Storage=2,496 cf Inflow=2.67 cfs 0.133 af  
Discarded=0.03 cfs 0.060 af Primary=2.09 cfs 0.051 af Outflow=2.12 cfs 0.111 af

**Pond MBR-2: MBR-2** Peak Elev=15.38' Storage=1,882 cf Inflow=5.82 cfs 0.253 af  
Discarded=0.03 cfs 0.052 af Primary=5.57 cfs 0.190 af Outflow=5.60 cfs 0.242 af

**Pond POND: EX. POND** Peak Elev=14.90' Storage=2,712 cf Inflow=5.57 cfs 0.190 af  
Discarded=0.01 cfs 0.003 af Primary=2.00 cfs 0.187 af Outflow=2.01 cfs 0.190 af

**Link POI-1: POI-1** Inflow=3.99 cfs 0.309 af  
Primary=3.99 cfs 0.309 af

**Total Runoff Area = 1.510 ac Runoff Volume = 0.458 af Average Runoff Depth = 3.64"**  
**56.78% Pervious = 0.857 ac 43.22% Impervious = 0.652 ac**

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Type II 24-hr 10-YR Rainfall=5.30"

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Summary for Subcatchment DA-1: DA-1

Runoff = 2.05 cfs @ 12.05 hrs, Volume= 0.122 af, Depth= 2.61"  
Routed to Link POI-1 : POI-1

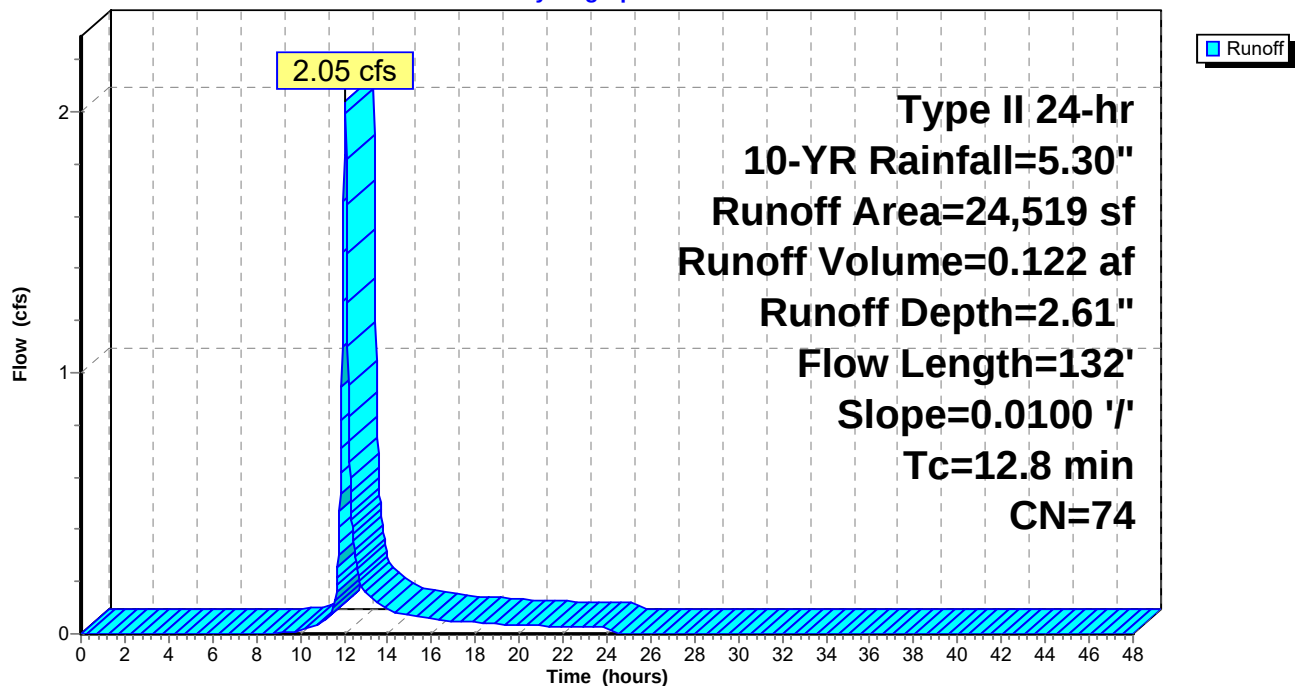
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
Type II 24-hr 10-YR Rainfall=5.30"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 24,519    | 74 | >75% Grass cover, Good, HSG C |
| 24,519    |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 12.5     | 100           | 0.0100        | 0.13              |                | Sheet Flow,<br>Grass: Short n= 0.150 P2= 3.40"     |
| 0.3      | 32            | 0.0100        | 1.61              |                | Shallow Concentrated Flow,<br>Unpaved Kv= 16.1 fps |
| 12.8     | 132           | Total         |                   |                |                                                    |

Subcatchment DA-1: DA-1

Hydrograph



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### Summary for Subcatchment EX DA-4: EX DA4

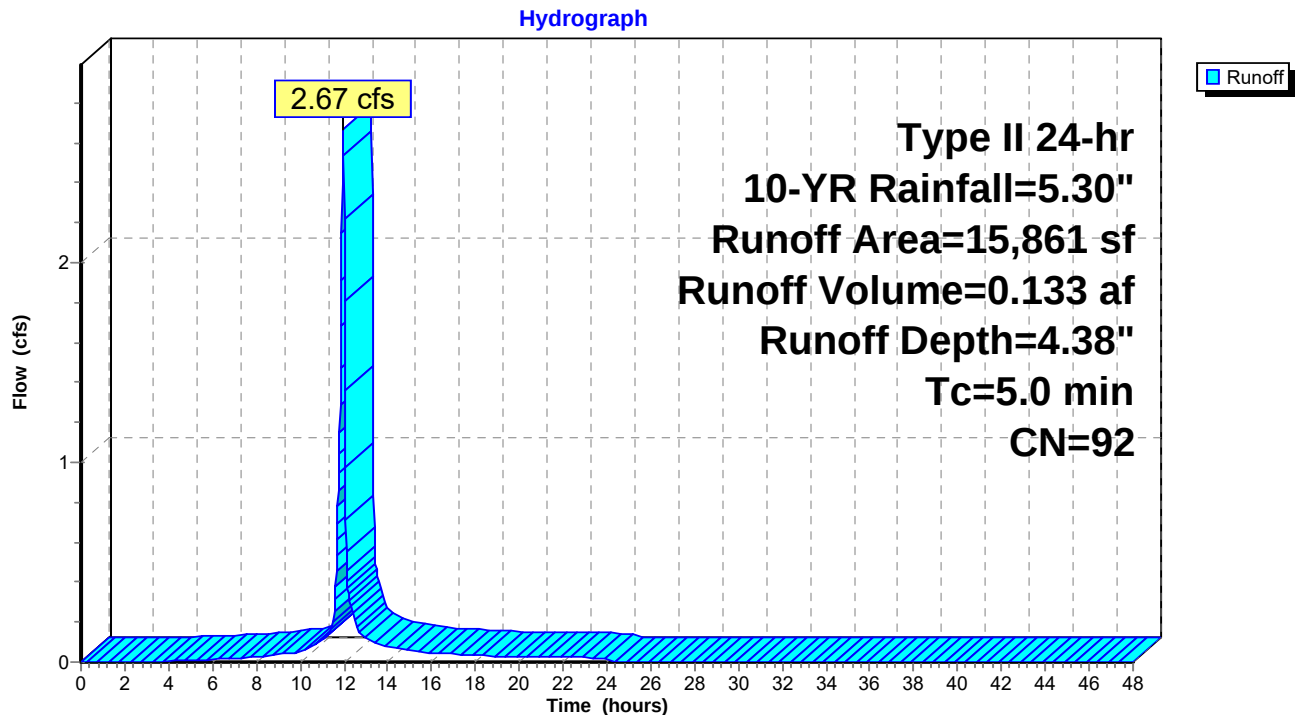
Runoff = 2.67 cfs @ 11.96 hrs, Volume= 0.133 af, Depth= 4.38"  
Routed to Pond MBR-1 : MBR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
Type II 24-hr 10-YR Rainfall=5.30"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 11,771    | 98 | Paved parking, HSG C          |
| 4,090     | 74 | >75% Grass cover, Good, HSG C |
| 15,861    | 92 | Weighted Average              |
| 4,090     |    | 25.79% Pervious Area          |
| 11,771    |    | 74.21% Impervious Area        |

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

### Subcatchment EX DA-4: EX DA4



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### Summary for Subcatchment EX DA-5&6: EX DA3&5

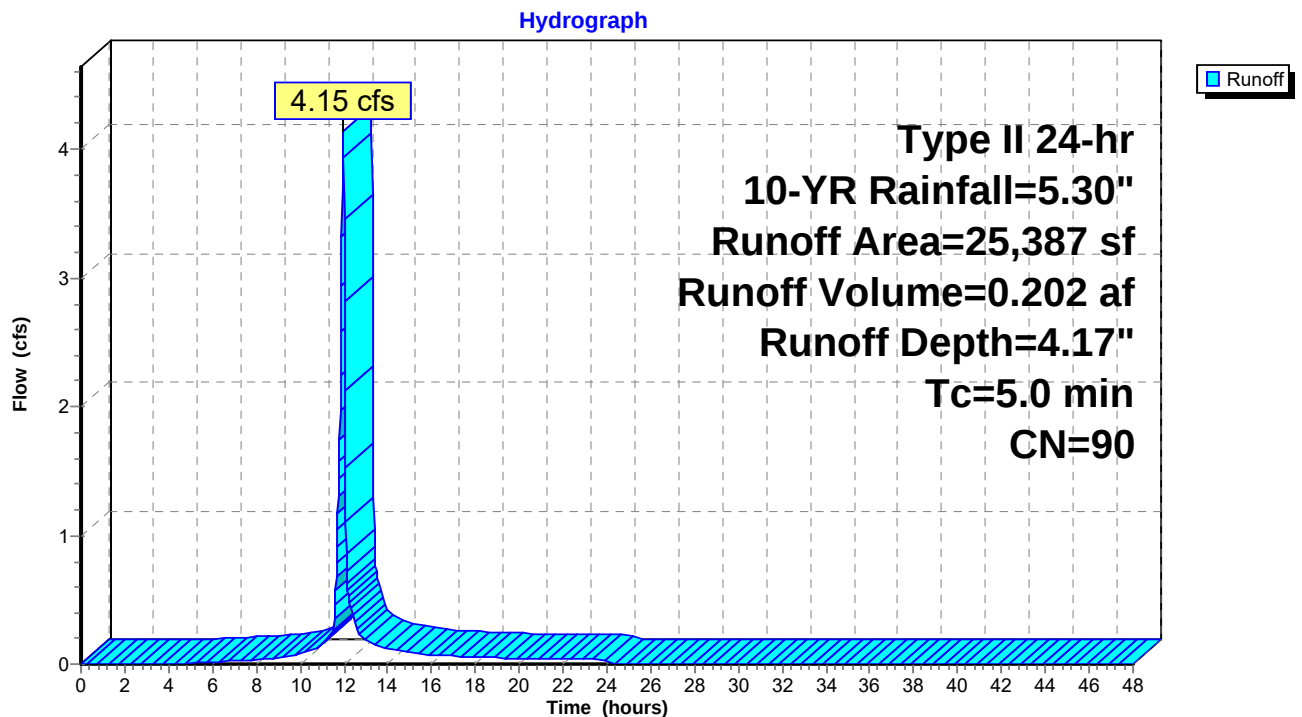
Runoff = 4.15 cfs @ 11.96 hrs, Volume= 0.202 af, Depth= 4.17"  
Routed to Pond MBR-2 : MBR-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
Type II 24-hr 10-YR Rainfall=5.30"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 8,736     | 74 | >75% Grass cover, Good, HSG C |
| 16,651    | 98 | Paved parking, HSG C          |
| 25,387    | 90 | Weighted Average              |
| 8,736     |    | 34.41% Pervious Area          |
| 16,651    |    | 65.59% Impervious Area        |

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

### Subcatchment EX DA-5&6: EX DA3&5



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**Summary for Pond MBR-1: MBR-1**

Inflow Area = 0.364 ac, 74.21% Impervious, Inflow Depth = 4.38" for 10-YR event  
 Inflow = 2.67 cfs @ 11.96 hrs, Volume= 0.133 af  
 Outflow = 2.12 cfs @ 12.00 hrs, Volume= 0.111 af, Atten= 21%, Lag= 2.8 min  
 Discarded = 0.03 cfs @ 12.01 hrs, Volume= 0.060 af  
 Primary = 2.09 cfs @ 12.00 hrs, Volume= 0.051 af  
 Routed to Pond MBR-2 : MBR-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 15.47' @ 12.01 hrs Surf.Area= 3,875 sf Storage= 2,496 cf

Plug-Flow detention time= 471.3 min calculated for 0.111 af (84% of inflow)  
 Center-of-Mass det. time= 400.3 min ( 1,176.9 - 776.6 )

| Volume | Invert | Avail.Storage | Storage Description                                                           |
|--------|--------|---------------|-------------------------------------------------------------------------------|
| #1     | 12.83' | 2,160 cf      | <b>20.00'W x 90.00'L x 3.00'H Prismatic</b><br>5,400 cf Overall x 40.0% Voids |
| #2     | 14.83' | 446 cf        | <b>10.00'W x 80.00'L x 0.50'H Prismatic Z=2.0</b>                             |
| #3     | 15.33' | 331 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                    |
|        |        | 2,936 cf      | Total Available Storage                                                       |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.33               | 968                  | 180.0            | 0                         | 0                         | 968                 |
| 15.50               | 1,115                | 192.0            | 177                       | 177                       | 1,325               |
| 15.60               | 2,000                | 200.0            | 154                       | 331                       | 1,575               |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.33' | <b>17.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64<br>2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74 |
| #2     | Discarded | 12.83' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                                                                                                                  |

**Discarded OutFlow** Max=0.03 cfs @ 12.01 hrs HW=15.47' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.03 cfs)

**Primary OutFlow** Max=2.02 cfs @ 12.00 hrs HW=15.47' TW=15.38' (Dynamic Tailwater)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 2.02 cfs @ 0.84 fps)

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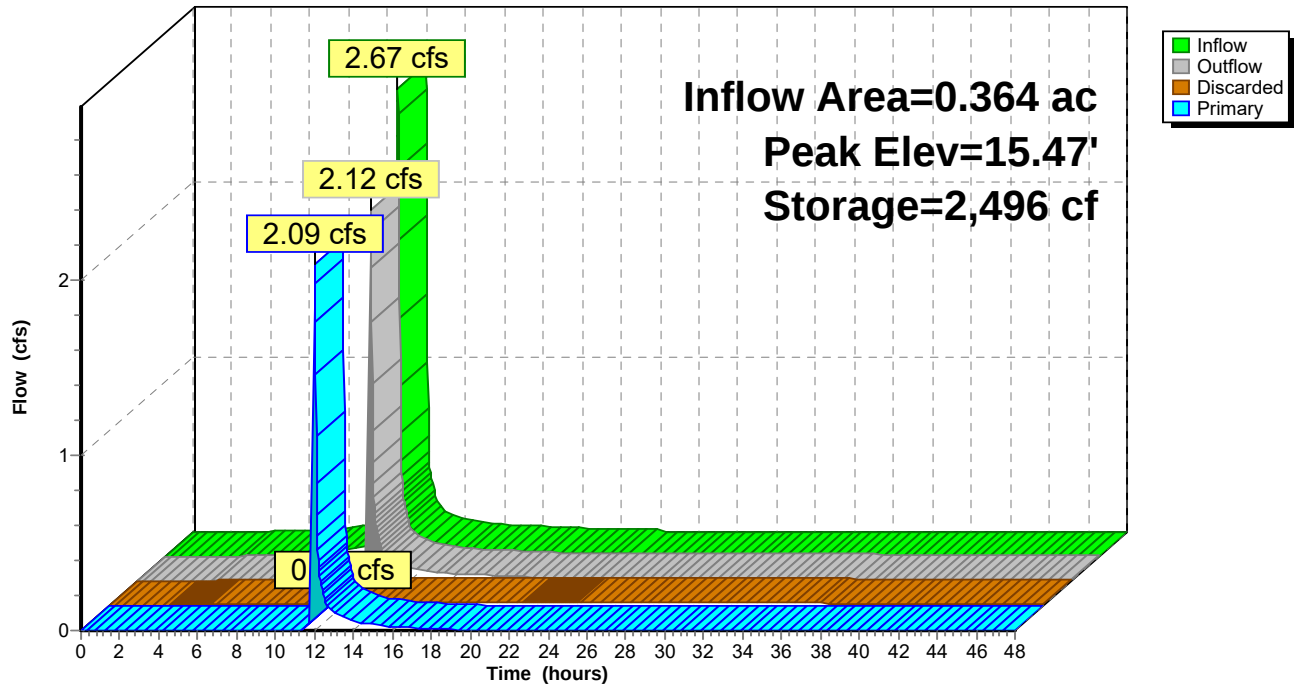
Type II 24-hr 10-YR Rainfall=5.30"

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### Pond MBR-1: MBR-1

#### Hydrograph



**Summary for Pond MBR-2: MBR-2**

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth = 3.21" for 10-YR event  
 Inflow = 5.82 cfs @ 11.99 hrs, Volume= 0.253 af  
 Outflow = 5.60 cfs @ 12.00 hrs, Volume= 0.242 af, Atten= 4%, Lag= 0.9 min  
 Discarded = 0.03 cfs @ 12.00 hrs, Volume= 0.052 af  
 Primary = 5.57 cfs @ 12.00 hrs, Volume= 0.190 af  
 Routed to Pond POND : EX. POND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 15.38' @ 12.00 hrs Surf.Area= 3,952 sf Storage= 1,882 cf

Plug-Flow detention time= 169.8 min calculated for 0.242 af (96% of inflow)  
 Center-of-Mass det. time= 144.3 min ( 928.4 - 784.1 )

| Volume | Invert | Avail.Storage | Storage Description                                                            |
|--------|--------|---------------|--------------------------------------------------------------------------------|
| #1     | 12.60' | 880 cf        | <b>10.00'W x 110.00'L x 2.00'H Prismatic</b><br>2,200 cf Overall x 40.0% Voids |
| #2     | 14.60' | 611 cf        | <b>10.00'W x 110.00'L x 0.50'H Prismatic Z=2.0</b>                             |
| #3     | 15.10' | 580 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                     |
|        |        | 2,070 cf      | Total Available Storage                                                        |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.10               | 1,301                | 237.0            | 0                         | 0                         | 1,301               |
| 15.50               | 1,602                | 253.0            | 580                       | 580                       | 1,933               |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                     |
|--------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.10' | <b>15.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #2     | Discarded | 12.60' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                   |

**Discarded OutFlow** Max=0.03 cfs @ 12.00 hrs HW=15.38' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.03 cfs)

**Primary OutFlow** Max=5.57 cfs @ 12.00 hrs HW=15.38' TW=14.43' (Dynamic Tailwater)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 5.57 cfs @ 1.33 fps)

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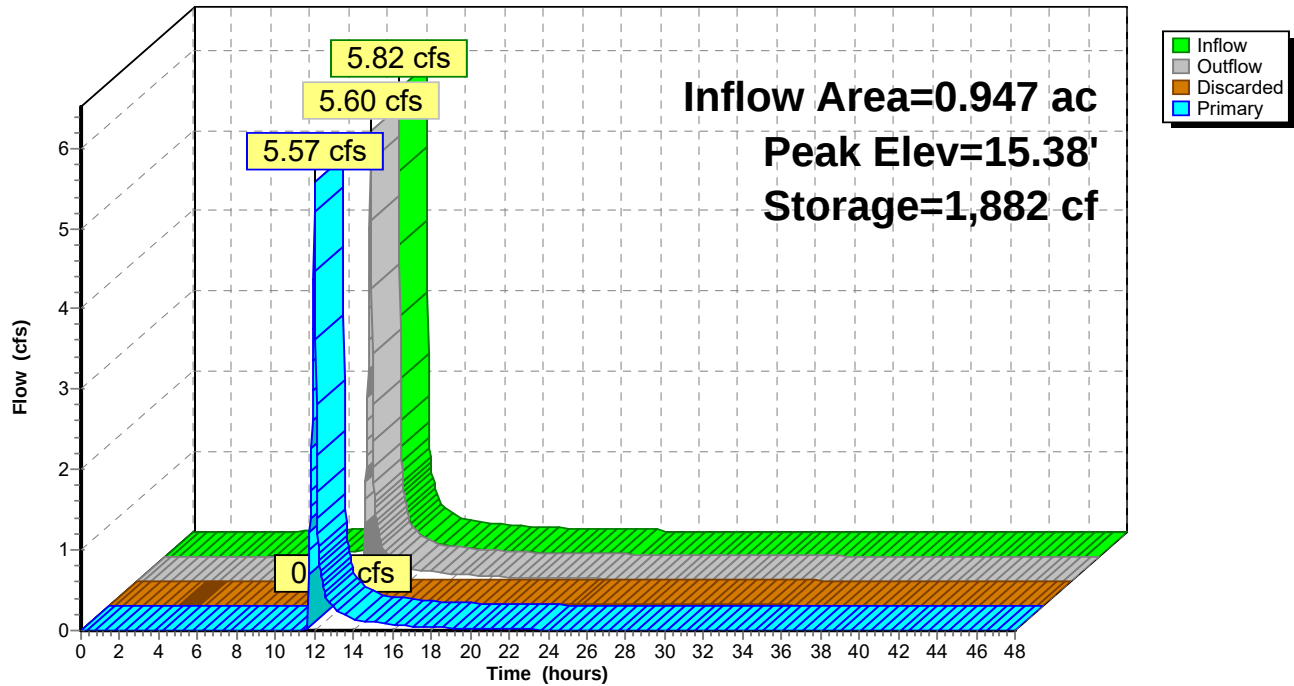
Type II 24-hr 10-YR Rainfall=5.30"

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## Pond MBR-2: MBR-2

Hydrograph



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**Summary for Pond POND: EX. POND**

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth = 2.41" for 10-YR event  
 Inflow = 5.57 cfs @ 12.00 hrs, Volume= 0.190 af  
 Outflow = 2.01 cfs @ 12.11 hrs, Volume= 0.190 af, Atten= 64%, Lag= 6.4 min  
 Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.003 af  
 Primary = 2.00 cfs @ 12.11 hrs, Volume= 0.187 af  
 Routed to Link POI-1 : POI-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 14.90' @ 12.11 hrs Surf.Area= 1,747 sf Storage= 2,712 cf

Plug-Flow detention time= 17.3 min calculated for 0.190 af (100% of inflow)  
 Center-of-Mass det. time= 17.3 min ( 803.4 - 786.1 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------|
| #1                  | 12.40'               | 4,422 cf         | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet)                                  | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 12.40               | 253                  | 133.0            | 0                                                          | 0                         | 253                 |
| 12.70               | 679                  | 152.0            | 135                                                        | 135                       | 686                 |
| 15.20               | 1,932                | 197.0            | 3,130                                                      | 3,265                     | 2,010               |
| 15.50               | 3,140                | 264.0            | 754                                                        | 4,018                     | 4,469               |
| 15.60               | 5,000                | 575.0            | 403                                                        | 4,422                     | 25,233              |

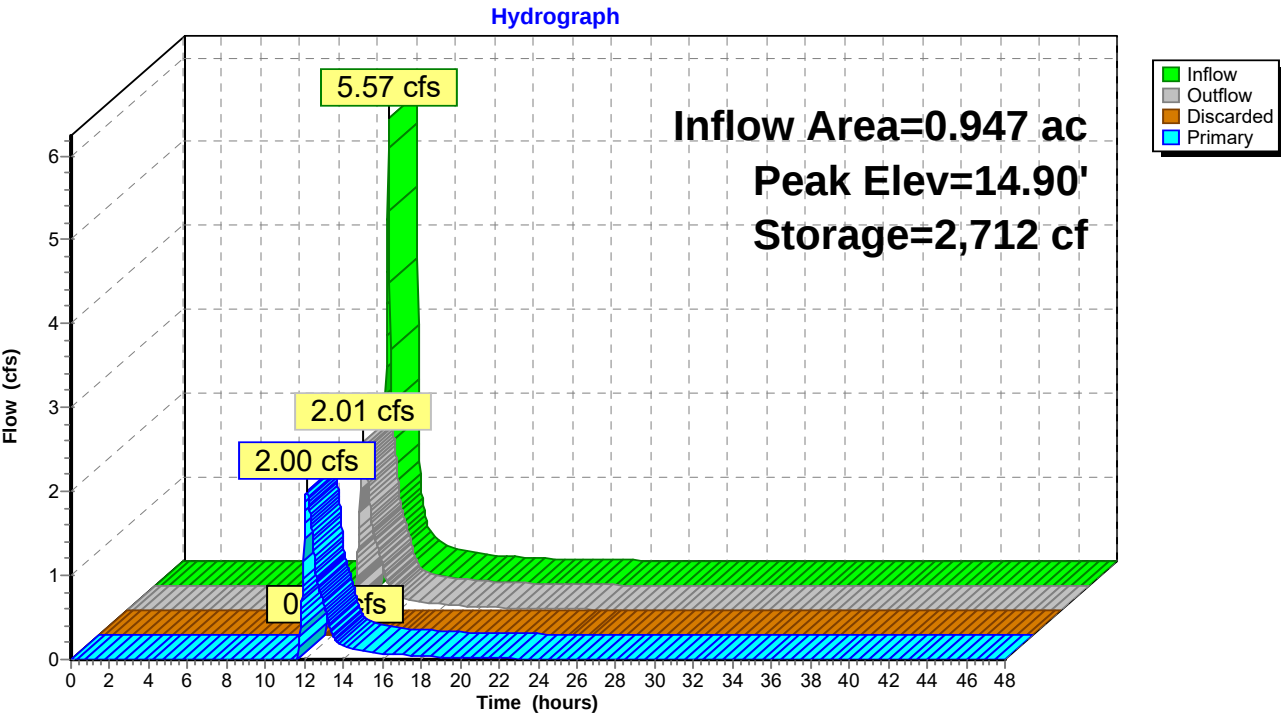
| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                                                                |
|--------|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 12.27' | <b>15.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.27' / 12.20' S= 0.0014 ' / S= 0.0014 ' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf |
| #2     | Device 1  | 12.40' | <b>5.7" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                                    |
| #3     | Device 1  | 13.79' | <b>5.4" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                                    |
| #4     | Device 1  | 15.20' | <b>12.0' long Sharp-Crested Vee/Trap Weir</b> Cv= 2.62 (C= 3.28)                                                                                                                                                              |
| #5     | Discarded | 12.40' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                                                              |

**Discarded OutFlow** Max=0.01 cfs @ 12.11 hrs HW=14.90' (Free Discharge)  
 ↳ **5=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=2.00 cfs @ 12.11 hrs HW=14.90' TW=0.00' (Dynamic Tailwater)  
 ↳ **1=Culvert** (Passes 2.00 cfs of 7.25 cfs potential flow)  
 ↳ **2=Orifice/Grate** (Orifice Controls 1.28 cfs @ 7.24 fps)  
 ↳ **3=Orifice/Grate** (Orifice Controls 0.72 cfs @ 4.52 fps)  
 ↳ **4=Sharp-Crested Vee/Trap Weir** ( Controls 0.00 cfs)

PRE

Pond POND: EX. POND



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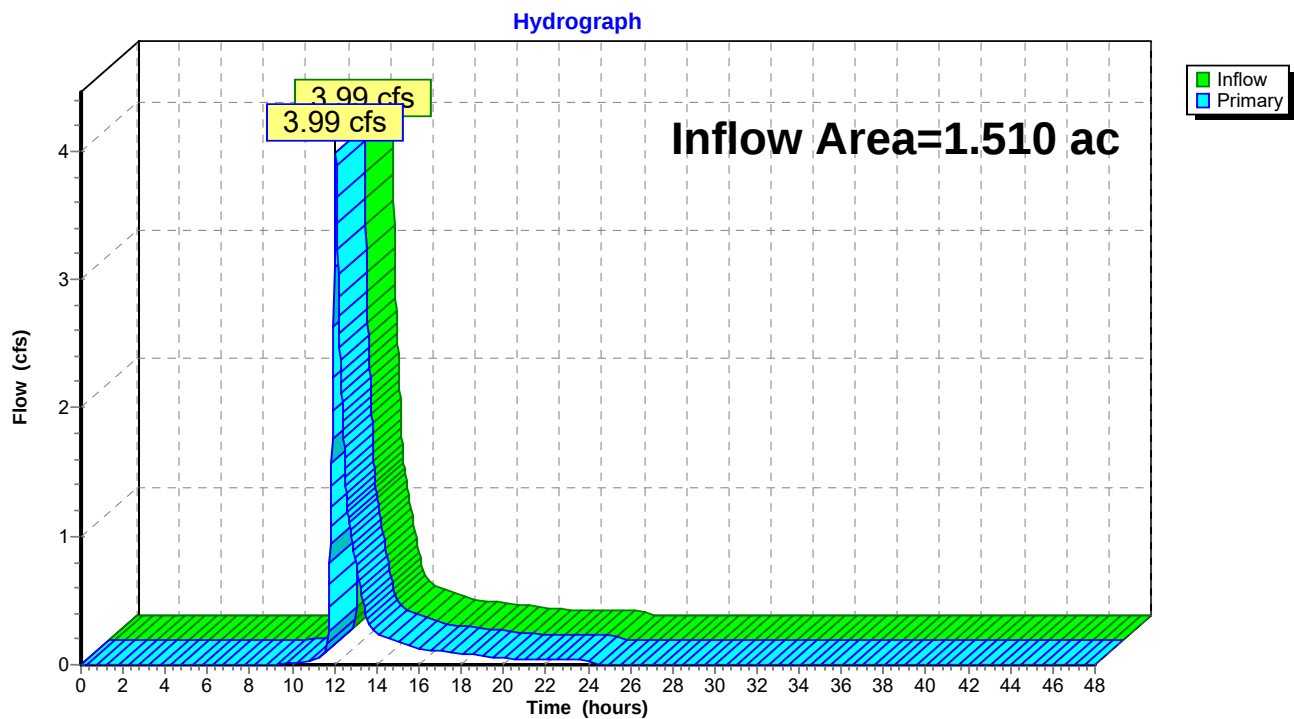
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### Summary for Link POI-1: POI-1

Inflow Area = 1.510 ac, 43.22% Impervious, Inflow Depth = 2.46" for 10-YR event  
Inflow = 3.99 cfs @ 12.06 hrs, Volume= 0.309 af  
Primary = 3.99 cfs @ 12.06 hrs, Volume= 0.309 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

### Link POI-1: POI-1



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Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment DA-1: DA-1** Runoff Area=24,519 sf 0.00% Impervious Runoff Depth=4.57"  
Flow Length=132' Slope=0.0100 '/' Tc=12.8 min CN=74 Runoff=3.57 cfs 0.214 af

**Subcatchment EX DA-4: EX DA4** Runoff Area=15,861 sf 74.21% Impervious Runoff Depth=6.65"  
Tc=5.0 min CN=92 Runoff=3.94 cfs 0.202 af

**Subcatchment EX DA-5&6: EX DA3&5** Runoff Area=25,387 sf 65.59% Impervious Runoff Depth=6.41"  
Tc=5.0 min CN=90 Runoff=6.20 cfs 0.311 af

**Pond MBR-1: MBR-1** Peak Elev=15.58' Storage=2,709 cf Inflow=3.94 cfs 0.202 af  
Discarded=0.03 cfs 0.062 af Primary=3.56 cfs 0.118 af Outflow=3.59 cfs 0.180 af

**Pond MBR-2: MBR-2** Peak Elev=15.55' Storage=2,070 cf Inflow=9.65 cfs 0.429 af  
Discarded=0.03 cfs 0.055 af Primary=9.42 cfs 0.363 af Outflow=9.44 cfs 0.418 af

**Pond POND: EX. POND** Peak Elev=15.47' Storage=3,915 cf Inflow=9.42 cfs 0.363 af  
Discarded=0.02 cfs 0.004 af Primary=7.75 cfs 0.359 af Outflow=7.78 cfs 0.363 af

**Link POI-1: POI-1** Inflow=11.02 cfs 0.573 af  
Primary=11.02 cfs 0.573 af

**Total Runoff Area = 1.510 ac Runoff Volume = 0.727 af Average Runoff Depth = 5.78"**  
**56.78% Pervious = 0.857 ac 43.22% Impervious = 0.652 ac**

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Type II 24-hr 100-YR Rainfall=7.60"

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### Summary for Subcatchment DA-1: DA-1

Runoff = 3.57 cfs @ 12.05 hrs, Volume= 0.214 af, Depth= 4.57"  
Routed to Link POI-1 : POI-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
Type II 24-hr 100-YR Rainfall=7.60"

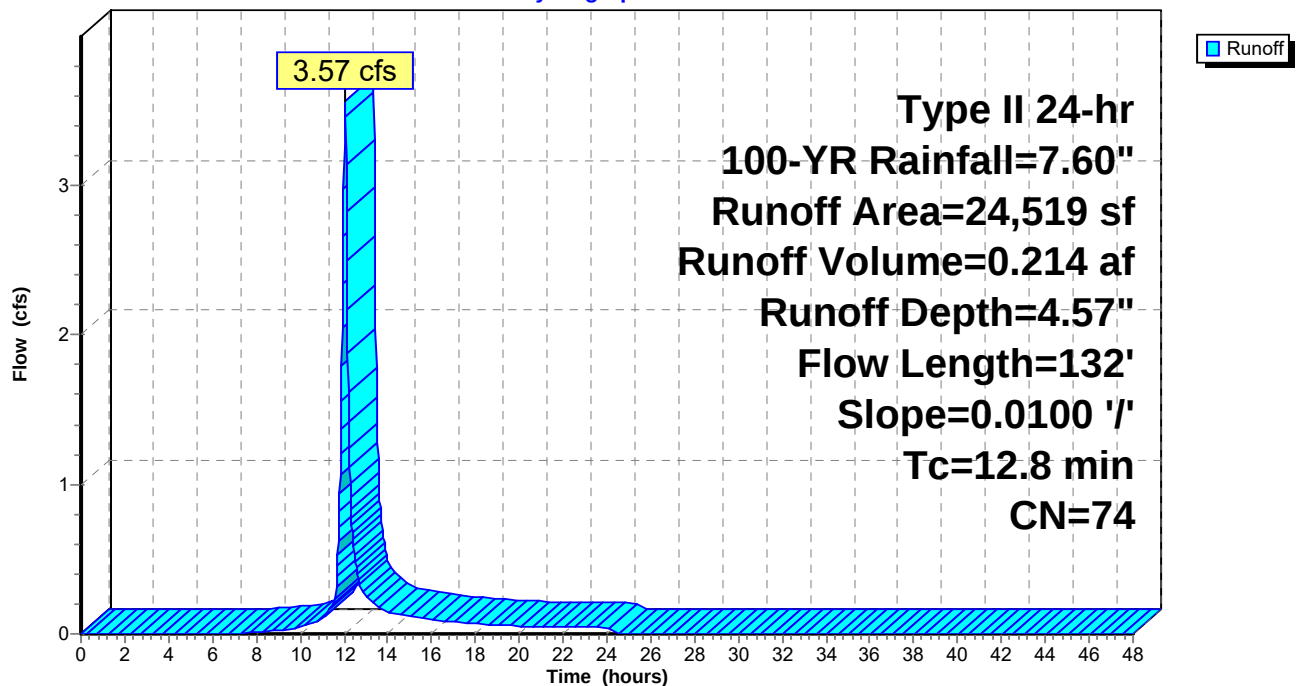
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 24,519    | 74 | >75% Grass cover, Good, HSG C |
| 24,519    |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 12.5     | 100           | 0.0100        | 0.13              |                | Sheet Flow,<br>Grass: Short n= 0.150 P2= 3.40"     |
| 0.3      | 32            | 0.0100        | 1.61              |                | Shallow Concentrated Flow,<br>Unpaved Kv= 16.1 fps |
| 12.8     | 132           | Total         |                   |                |                                                    |

### Subcatchment DA-1: DA-1

Hydrograph



Summary for Subcatchment EX DA-4: EX DA4

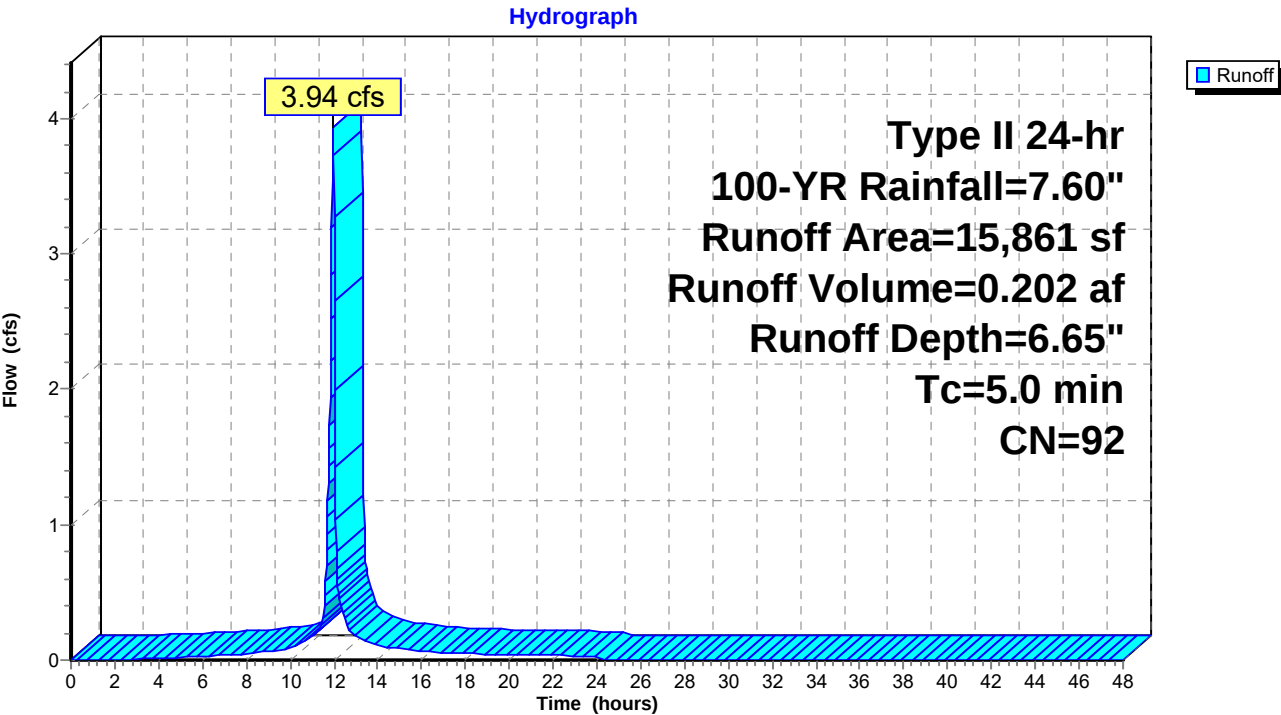
Runoff = 3.94 cfs @ 11.96 hrs, Volume= 0.202 af, Depth= 6.65"  
Routed to Pond MBR-1 : MBR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
Type II 24-hr 100-YR Rainfall=7.60"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 11,771    | 98 | Paved parking, HSG C          |
| 4,090     | 74 | >75% Grass cover, Good, HSG C |
| 15,861    | 92 | Weighted Average              |
| 4,090     |    | 25.79% Pervious Area          |
| 11,771    |    | 74.21% Impervious Area        |

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

Subcatchment EX DA-4: EX DA4



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Type II 24-hr 100-YR Rainfall=7.60"

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### Summary for Subcatchment EX DA-5&6: EX DA3&5

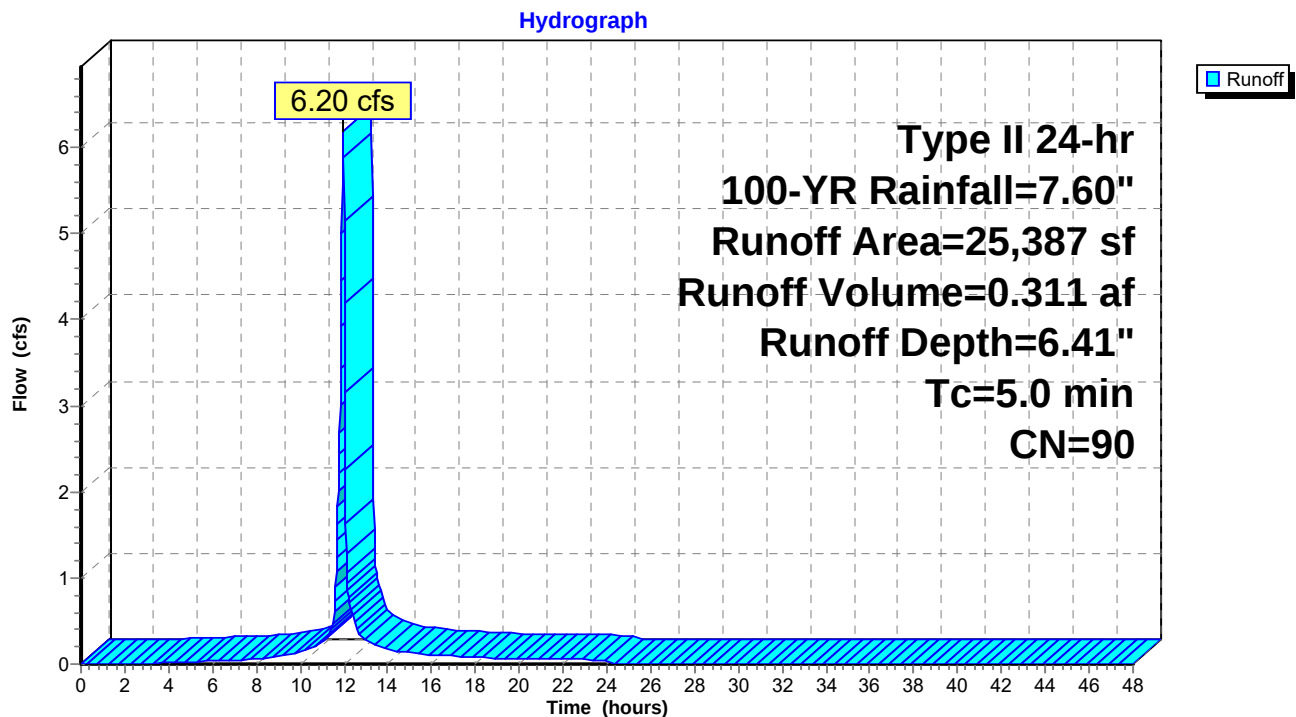
Runoff = 6.20 cfs @ 11.96 hrs, Volume= 0.311 af, Depth= 6.41"  
Routed to Pond MBR-2 : MBR-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
Type II 24-hr 100-YR Rainfall=7.60"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 8,736     | 74 | >75% Grass cover, Good, HSG C |
| 16,651    | 98 | Paved parking, HSG C          |
| 25,387    | 90 | Weighted Average              |
| 8,736     |    | 34.41% Pervious Area          |
| 16,651    |    | 65.59% Impervious Area        |

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

### Subcatchment EX DA-5&6: EX DA3&5



**Summary for Pond MBR-1: MBR-1**

Inflow Area = 0.364 ac, 74.21% Impervious, Inflow Depth = 6.65" for 100-YR event  
 Inflow = 3.94 cfs @ 11.96 hrs, Volume= 0.202 af  
 Outflow = 3.59 cfs @ 11.97 hrs, Volume= 0.180 af, Atten= 9%, Lag= 1.0 min  
 Discarded = 0.03 cfs @ 12.02 hrs, Volume= 0.062 af  
 Primary = 3.56 cfs @ 11.97 hrs, Volume= 0.118 af  
 Routed to Pond MBR-2 : MBR-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 15.58' @ 12.02 hrs Surf.Area= 4,550 sf Storage= 2,709 cf

Plug-Flow detention time= 316.4 min calculated for 0.180 af (89% of inflow)  
 Center-of-Mass det. time= 261.7 min ( 1,027.6 - 765.9 )

| Volume | Invert | Avail.Storage | Storage Description                                                           |
|--------|--------|---------------|-------------------------------------------------------------------------------|
| #1     | 12.83' | 2,160 cf      | <b>20.00'W x 90.00'L x 3.00'H Prismatic</b><br>5,400 cf Overall x 40.0% Voids |
| #2     | 14.83' | 446 cf        | <b>10.00'W x 80.00'L x 0.50'H Prismatic Z=2.0</b>                             |
| #3     | 15.33' | 331 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                    |
|        |        | 2,936 cf      | Total Available Storage                                                       |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.33               | 968                  | 180.0            | 0                         | 0                         | 968                 |
| 15.50               | 1,115                | 192.0            | 177                       | 177                       | 1,325               |
| 15.60               | 2,000                | 200.0            | 154                       | 331                       | 1,575               |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.33' | <b>17.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64<br>2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74 |
| #2     | Discarded | 12.83' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                                                                                                                  |

**Discarded OutFlow** Max=0.03 cfs @ 12.02 hrs HW=15.58' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.03 cfs)

**Primary OutFlow** Max=3.08 cfs @ 11.97 hrs HW=15.56' TW=15.51' (Dynamic Tailwater)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 3.08 cfs @ 0.77 fps)

PRE

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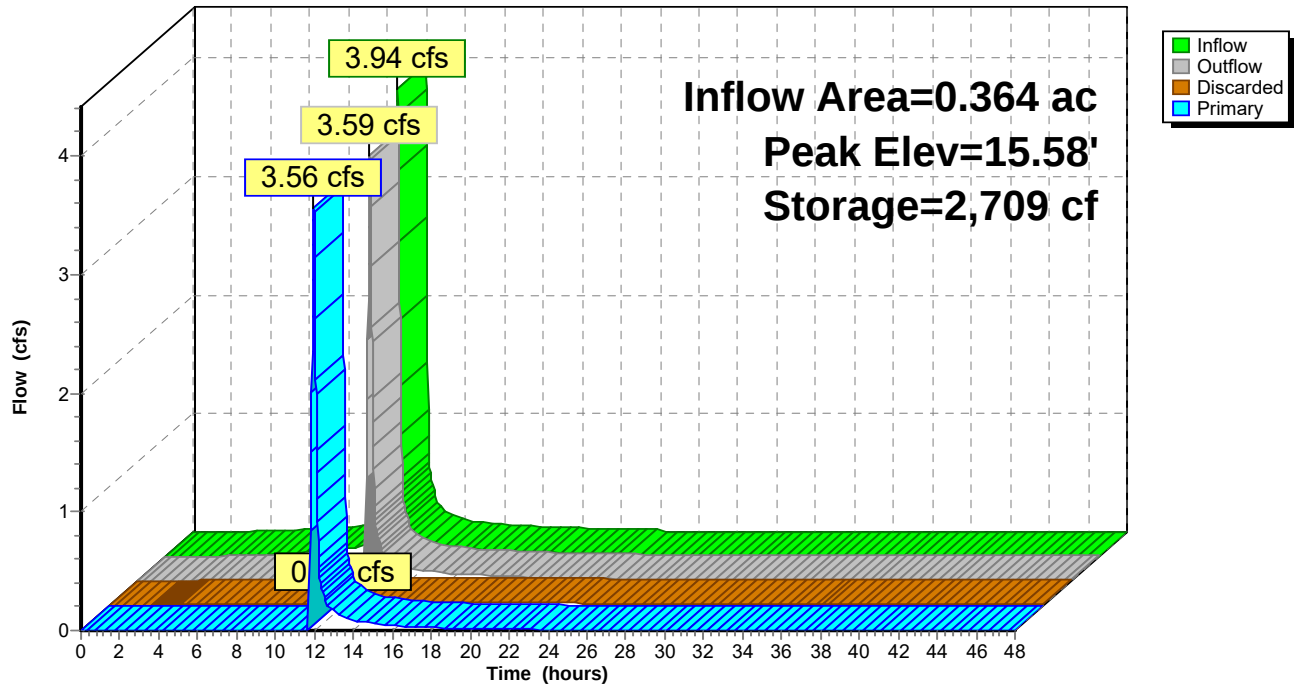
Type II 24-hr 100-YR Rainfall=7.60"

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### Pond MBR-1: MBR-1

Hydrograph



**Summary for Pond MBR-2: MBR-2**

[93] Warning: Storage range exceeded by 0.05'

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth = 5.44" for 100-YR event  
 Inflow = 9.65 cfs @ 11.96 hrs, Volume= 0.429 af  
 Outflow = 9.44 cfs @ 11.97 hrs, Volume= 0.418 af, Atten= 2%, Lag= 0.2 min  
 Discarded = 0.03 cfs @ 11.98 hrs, Volume= 0.055 af  
 Primary = 9.42 cfs @ 11.97 hrs, Volume= 0.363 af  
 Routed to Pond POND : EX. POND

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 15.55' @ 12.00 hrs Surf.Area= 4,046 sf Storage= 2,070 cf

Plug-Flow detention time= 107.3 min calculated for 0.417 af (97% of inflow)  
 Center-of-Mass det. time= 91.7 min ( 868.7 - 777.0 )

| Volume | Invert | Avail.Storage | Storage Description                                                            |
|--------|--------|---------------|--------------------------------------------------------------------------------|
| #1     | 12.60' | 880 cf        | <b>10.00'W x 110.00'L x 2.00'H Prismatic</b><br>2,200 cf Overall x 40.0% Voids |
| #2     | 14.60' | 611 cf        | <b>10.00'W x 110.00'L x 0.50'H Prismatic Z=2.0</b>                             |
| #3     | 15.10' | 580 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                     |
|        |        | 2,070 cf      | Total Available Storage                                                        |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.10               | 1,301                | 237.0            | 0                         | 0                         | 1,301               |
| 15.50               | 1,602                | 253.0            | 580                       | 580                       | 1,933               |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                     |
|--------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.10' | <b>15.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #2     | Discarded | 12.60' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                   |

**Discarded OutFlow** Max=0.03 cfs @ 11.98 hrs HW=15.52' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.03 cfs)

**Primary OutFlow** Max=7.90 cfs @ 11.97 hrs HW=15.50' TW=15.32' (Dynamic Tailwater)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 7.90 cfs @ 1.32 fps)

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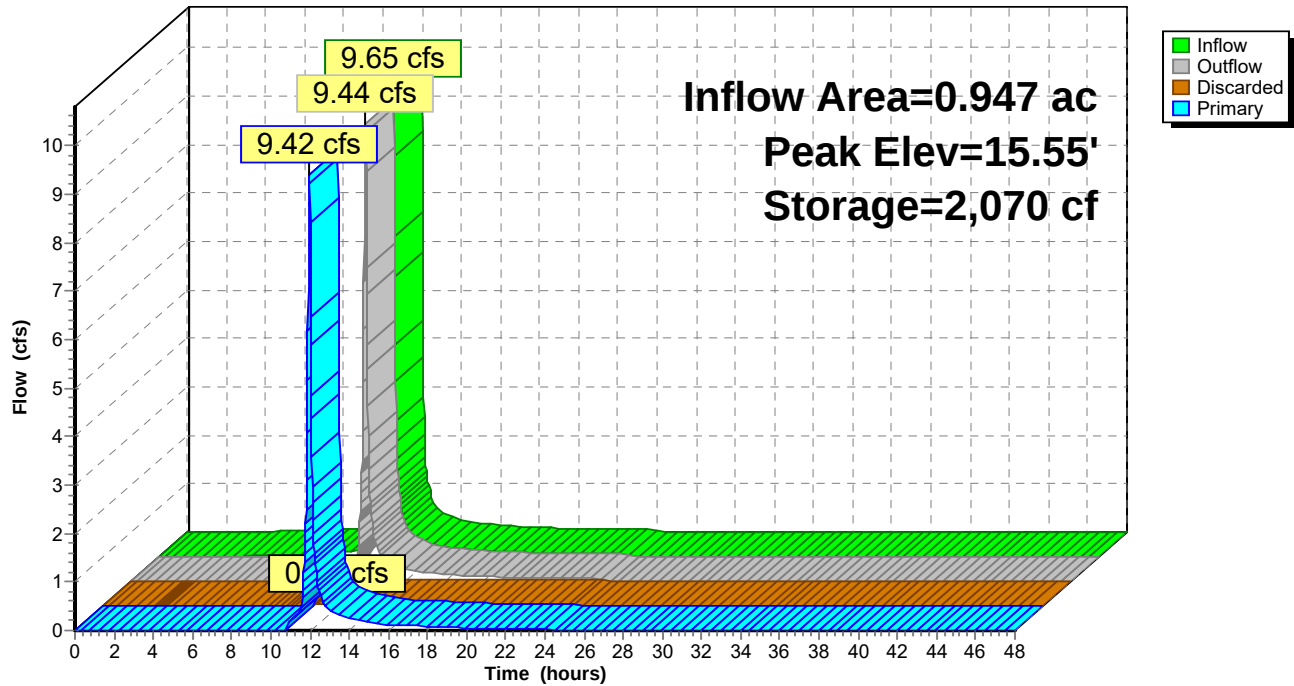
Type II 24-hr 100-YR Rainfall=7.60"

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### Pond MBR-2: MBR-2

#### Hydrograph



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Type II 24-hr 100-YR Rainfall=7.60"

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**Summary for Pond POND: EX. POND**

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth = 4.60" for 100-YR event  
 Inflow = 9.42 cfs @ 11.97 hrs, Volume= 0.363 af  
 Outflow = 7.78 cfs @ 12.01 hrs, Volume= 0.363 af, Atten= 17%, Lag= 2.6 min  
 Discarded = 0.02 cfs @ 12.01 hrs, Volume= 0.004 af  
 Primary = 7.75 cfs @ 12.01 hrs, Volume= 0.359 af  
 Routed to Link POI-1 : POI-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs  
 Peak Elev= 15.47' @ 12.01 hrs Surf.Area= 2,990 sf Storage= 3,915 cf

Plug-Flow detention time= 15.3 min calculated for 0.363 af (100% of inflow)  
 Center-of-Mass det. time= 15.3 min ( 803.2 - 787.8 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------|
| #1                  | 12.40'               | 4,422 cf         | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet)                                  | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 12.40               | 253                  | 133.0            | 0                                                          | 0                         | 253                 |
| 12.70               | 679                  | 152.0            | 135                                                        | 135                       | 686                 |
| 15.20               | 1,932                | 197.0            | 3,130                                                      | 3,265                     | 2,010               |
| 15.50               | 3,140                | 264.0            | 754                                                        | 4,018                     | 4,469               |
| 15.60               | 5,000                | 575.0            | 403                                                        | 4,422                     | 25,233              |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                                                    |
|--------|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 12.27' | <b>15.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.27' / 12.20' S= 0.0014 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf |
| #2     | Device 1  | 12.40' | <b>5.7" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                        |
| #3     | Device 1  | 13.79' | <b>5.4" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                        |
| #4     | Device 1  | 15.20' | <b>12.0' long Sharp-Crested Vee/Trap Weir</b> Cv= 2.62 (C= 3.28)                                                                                                                                                  |
| #5     | Discarded | 12.40' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                                                  |

**Discarded OutFlow** Max=0.02 cfs @ 12.01 hrs HW=15.46' (Free Discharge)  
 ↳ **5=Exfiltration** (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=7.57 cfs @ 12.01 hrs HW=15.46' TW=0.00' (Dynamic Tailwater)  
 ↳ **1=Culvert** (Passes 7.57 cfs of 8.55 cfs potential flow)  
 ↳ **2=Orifice/Grate** (Orifice Controls 1.43 cfs @ 8.09 fps)  
 ↳ **3=Orifice/Grate** (Orifice Controls 0.92 cfs @ 5.79 fps)  
 ↳ **4=Sharp-Crested Vee/Trap Weir** (Weir Controls 5.22 cfs @ 1.67 fps)

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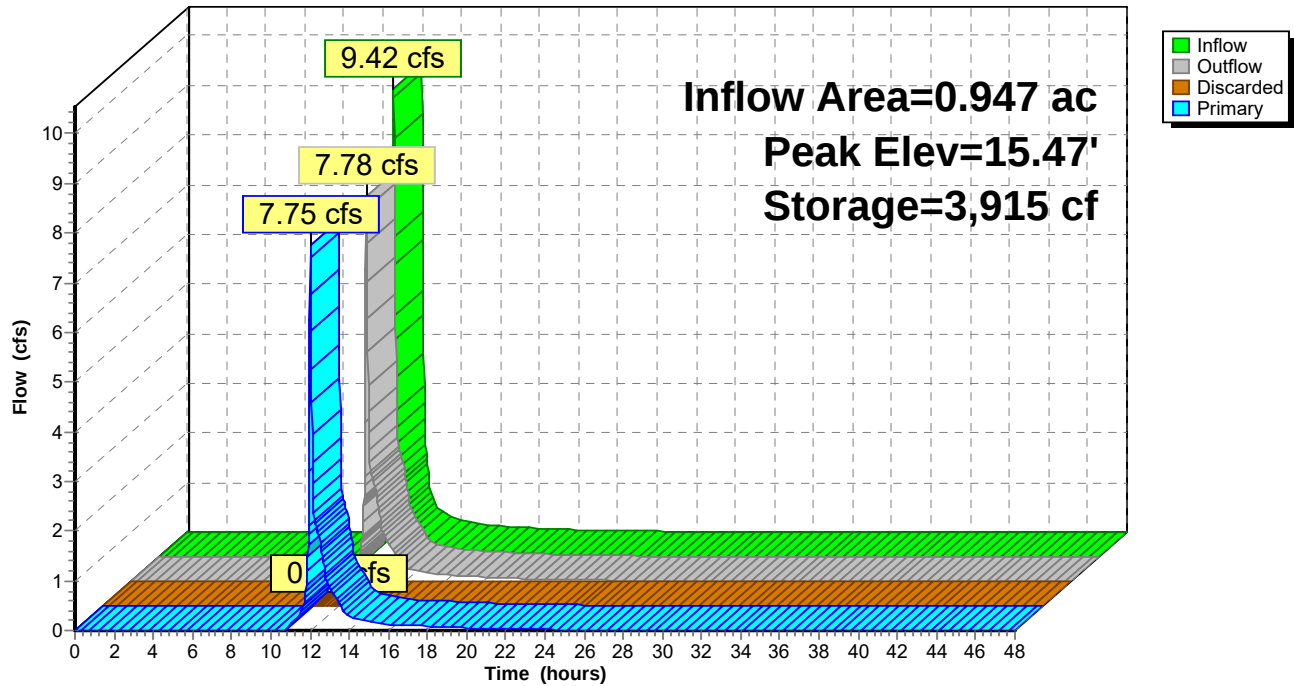
Type II 24-hr 100-YR Rainfall=7.60"

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### Pond POND: EX. POND

Hydrograph



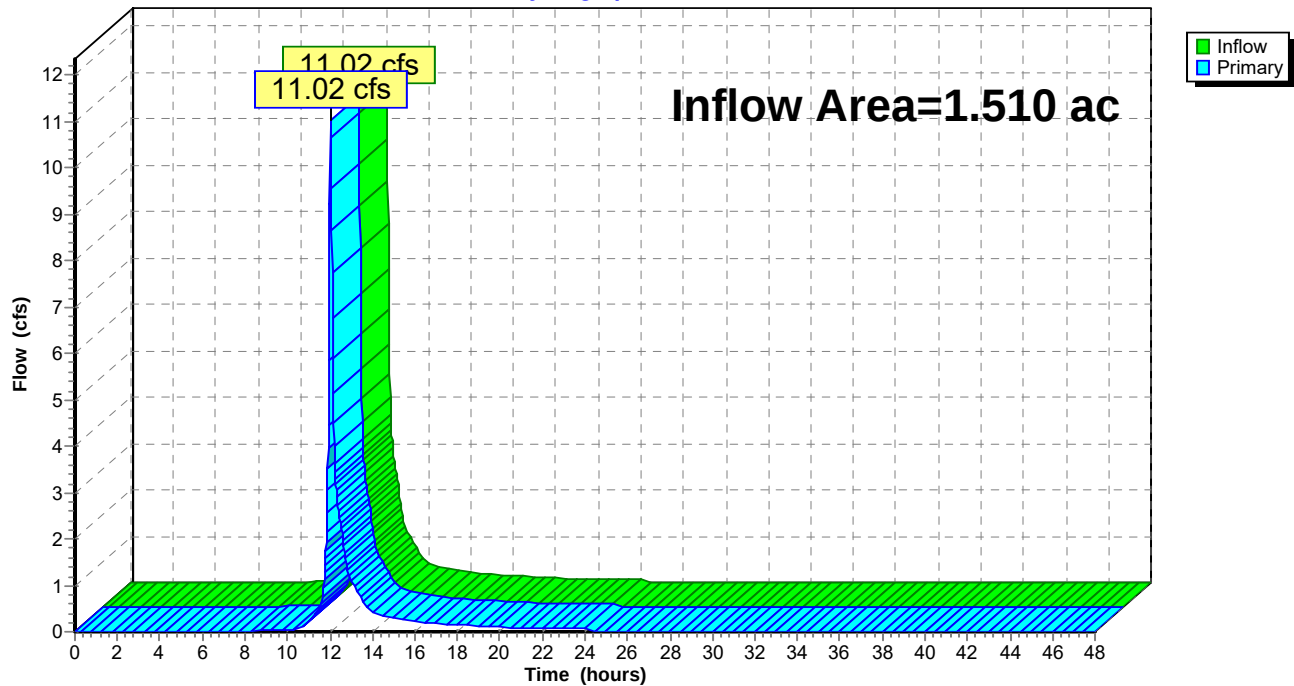
**Summary for Link POI-1: POI-1**

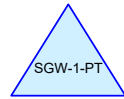
Inflow Area = 1.510 ac, 43.22% Impervious, Inflow Depth = 4.56" for 100-YR event  
Inflow = 11.02 cfs @ 12.01 hrs, Volume= 0.573 af  
Primary = 11.02 cfs @ 12.01 hrs, Volume= 0.573 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

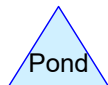
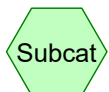
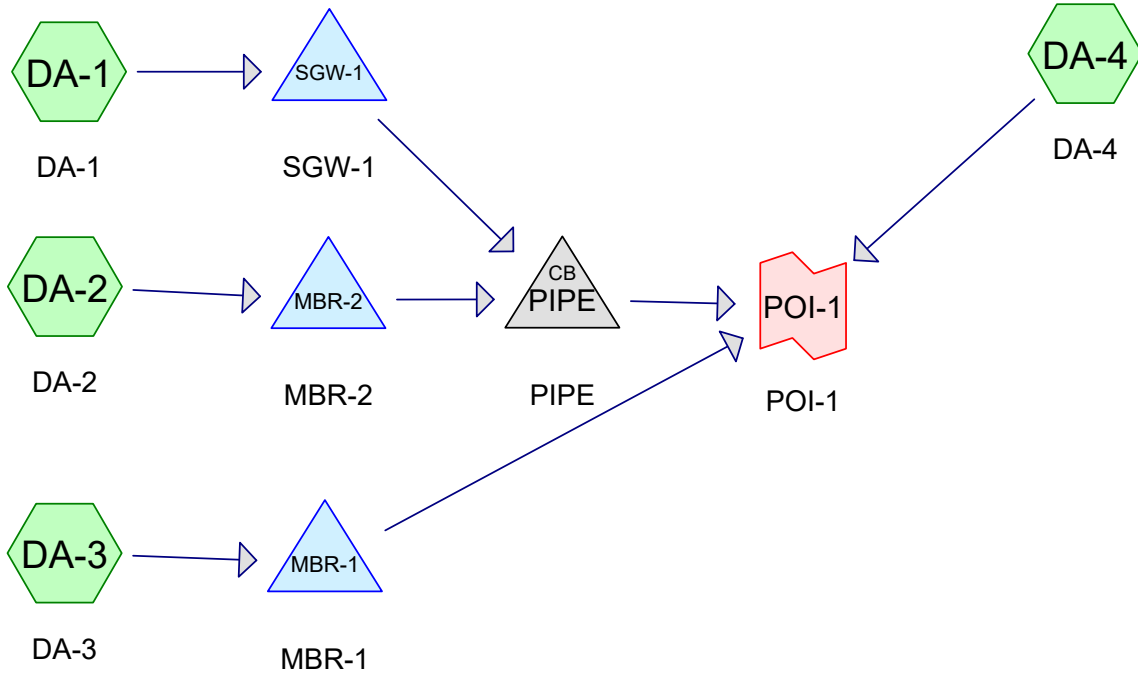
**Link POI-1: POI-1**

Hydrograph





### SGW PRETREATMENT



### Routing Diagram for POST

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### Rainfall Events Listing

| Event# | Event Name | Storm Type    | Curve | Mode    | Duration (hours) | B/B | Depth (inches) | AMC |
|--------|------------|---------------|-------|---------|------------------|-----|----------------|-----|
| 1      | 2-YR       | Type II 24-hr |       | Default | 24.00            | 1   | 3.40           | 2   |
| 2      | 10-YR      | Type II 24-hr |       | Default | 24.00            | 1   | 5.30           | 2   |
| 3      | 100-YR     | Type II 24-hr |       | Default | 24.00            | 1   | 7.60           | 2   |

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### Area Listing (all nodes)

| Area<br>(acres) | CN        | Description<br>(subcatchment-numbers)            |
|-----------------|-----------|--------------------------------------------------|
| 0.088           | 79        | 50-75% Grass cover, Fair, HSG C (DA-2)           |
| 0.780           | 74        | >75% Grass cover, Good, HSG C (DA-1, DA-3, DA-4) |
| 0.036           | 80        | >75% Grass cover, Good, HSG D (DA-4)             |
| 0.888           | 98        | Paved parking, HSG C (DA-1, DA-2, DA-3)          |
| <b>1.792</b>    | <b>86</b> | <b>TOTAL AREA</b>                                |

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### Soil Listing (all nodes)

| Area<br>(acres) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 0.000           | HSG A         |                         |
| 0.000           | HSG B         |                         |
| 1.756           | HSG C         | DA-1, DA-2, DA-3, DA-4  |
| 0.036           | HSG D         | DA-4                    |
| 0.000           | Other         |                         |
| <b>1.792</b>    |               | <b>TOTAL AREA</b>       |

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**Ground Covers (all nodes)**

| HSG-A<br>(acres) | HSG-B<br>(acres) | HSG-C<br>(acres) | HSG-D<br>(acres) | Other<br>(acres) | Total<br>(acres) | Ground<br>Cover          | Subcatchment<br>Numbers |
|------------------|------------------|------------------|------------------|------------------|------------------|--------------------------|-------------------------|
| 0.000            | 0.000            | 0.088            | 0.000            | 0.000            | 0.088            | 50-75% Grass cover, Fair | DA-2                    |
| 0.000            | 0.000            | 0.780            | 0.036            | 0.000            | 0.816            | >75% Grass cover, Good   | DA-1,<br>DA-3,<br>DA-4  |
| 0.000            | 0.000            | 0.888            | 0.000            | 0.000            | 0.888            | Paved parking            | DA-1,<br>DA-2,<br>DA-3  |
| <b>0.000</b>     | <b>0.000</b>     | <b>1.756</b>     | <b>0.036</b>     | <b>0.000</b>     | <b>1.792</b>     | <b>TOTAL AREA</b>        |                         |

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### Pipe Listing (all nodes)

| Line# | Node<br>Number | In-Invert<br>(feet) | Out-Invert<br>(feet) | Length<br>(feet) | Slope<br>(ft/ft) | n     | Width<br>(inches) | Diam/Height<br>(inches) | Inside-Fill<br>(inches) | Node<br>Name |
|-------|----------------|---------------------|----------------------|------------------|------------------|-------|-------------------|-------------------------|-------------------------|--------------|
| 1     | MBR-1          | 13.90               | 13.90                | 5.0              | 0.0000           | 0.013 | 0.0               | 12.0                    | 0.0                     |              |
| 2     | MBR-1          | 13.90               | 13.90                | 100.0            | 0.0000           | 0.013 | 0.0               | 6.0                     | 0.0                     |              |
| 3     | MBR-2          | 12.75               | 12.40                | 320.0            | 0.0011           | 0.013 | 0.0               | 12.0                    | 0.0                     |              |
| 4     | MBR-2          | 12.75               | 12.75                | 100.0            | 0.0000           | 0.013 | 0.0               | 6.0                     | 0.0                     |              |
| 5     | PIPE           | 12.40               | 12.00                | 75.0             | 0.0053           | 0.013 | 0.0               | 15.0                    | 0.0                     |              |
| 6     | SGW-1          | 12.40               | 12.30                | 50.0             | 0.0020           | 0.013 | 0.0               | 12.0                    | 0.0                     |              |
| 7     | SGW-1          | 9.90                | 9.90                 | 5.0              | 0.0000           | 0.013 | 0.0               | 4.0                     | 0.0                     |              |

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Type II 24-hr 2-YR Rainfall=3.40"

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

|                                        |                                                                                                                       |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment DA-1: DA-1</b>         | Runoff Area=0.939 ac 26.94% Impervious Runoff Depth=1.56"<br>Tc=5.0 min CN=80 Runoff=2.72 cfs 0.122 af                |
| <b>Subcatchment DA-2: DA-2</b>         | Runoff Area=18,771 sf 79.64% Impervious Runoff Depth=2.74"<br>Tc=5.0 min CN=94 Runoff=2.00 cfs 0.098 af               |
| <b>Subcatchment DA-3: DA-3</b>         | Runoff Area=0.350 ac 83.43% Impervious Runoff Depth=2.74"<br>Tc=5.0 min CN=94 Runoff=1.63 cfs 0.080 af                |
| <b>Subcatchment DA-4: DA-4</b>         | Runoff Area=0.072 ac 0.00% Impervious Runoff Depth=1.36"<br>Tc=5.0 min CN=77 Runoff=0.18 cfs 0.008 af                 |
| <b>Pond MBR-1: MBR-1</b>               | Peak Elev=16.17' Storage=954 cf Inflow=1.63 cfs 0.080 af<br>Outflow=0.68 cfs 0.080 af                                 |
| <b>Pond MBR-2: MBR-2</b>               | Peak Elev=14.40' Storage=1,618 cf Inflow=2.00 cfs 0.098 af<br>Outflow=0.55 cfs 0.098 af                               |
| <b>Pond PIPE: PIPE</b>                 | Peak Elev=12.80' Inflow=0.55 cfs 0.155 af<br>15.0" Round Culvert n=0.013 L=75.0' S=0.0053 ' Outflow=0.55 cfs 0.155 af |
| <b>Pond SGW-1: SGW-1</b>               | Peak Elev=13.00' Storage=3,061 cf Inflow=2.72 cfs 0.122 af<br>Outflow=0.13 cfs 0.057 af                               |
| <b>Pond SGW-1-PT: SGW PRETREATMENT</b> | Peak Elev=0.00' Storage=0 cf                                                                                          |
| <b>Link POI-1: POI-1</b>               | Inflow=1.34 cfs 0.242 af<br>Primary=1.34 cfs 0.242 af                                                                 |

**Total Runoff Area = 1.792 ac Runoff Volume = 0.308 af Average Runoff Depth = 2.06"**  
**50.43% Pervious = 0.904 ac 49.57% Impervious = 0.888 ac**

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Type II 24-hr 2-YR Rainfall=3.40"

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## Summary for Subcatchment DA-1: DA-1

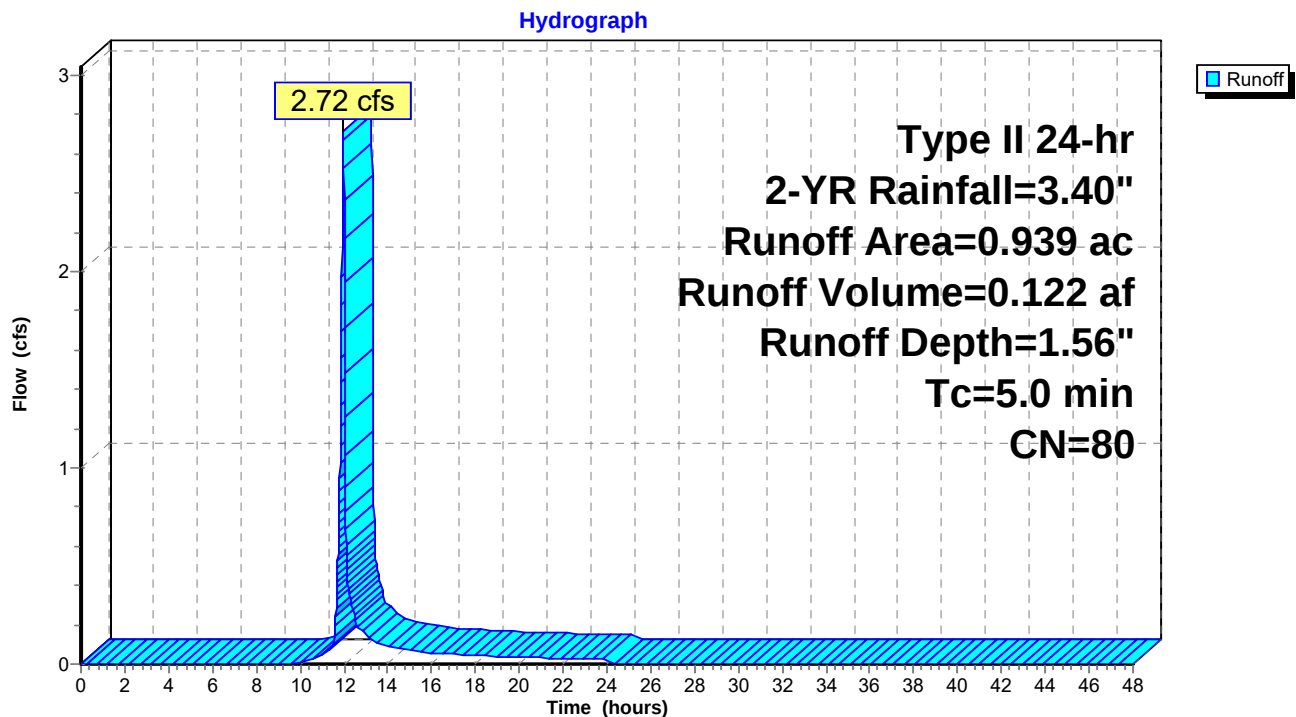
Runoff = 2.72 cfs @ 11.96 hrs, Volume= 0.122 af, Depth= 1.56"  
Routed to Pond SGW-1 : SGW-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-YR Rainfall=3.40"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.253     | 98 | Paved parking, HSG C          |
| 0.686     | 74 | >75% Grass cover, Good, HSG C |
| 0.939     | 80 | Weighted Average              |
| 0.686     |    | 73.06% Pervious Area          |
| 0.253     |    | 26.94% Impervious Area        |

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

## Subcatchment DA-1: DA-1



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Type II 24-hr 2-YR Rainfall=3.40"

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## Summary for Subcatchment DA-2: DA-2

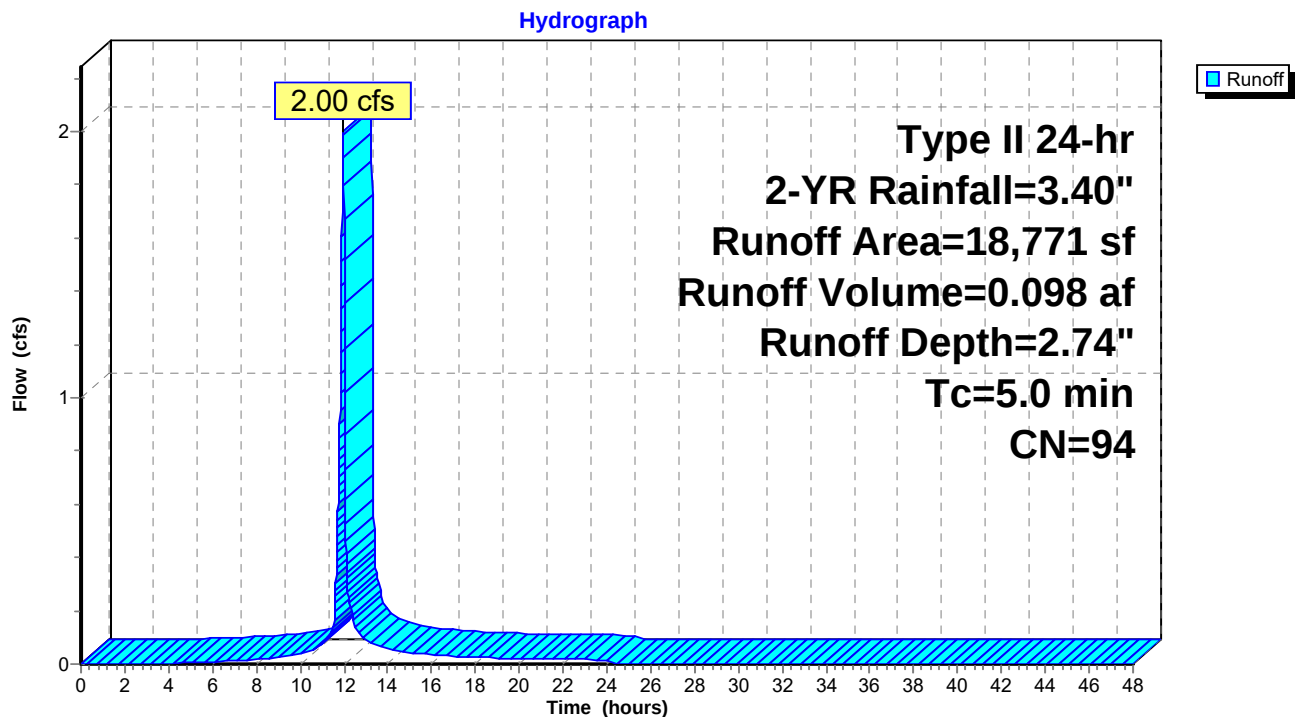
Runoff = 2.00 cfs @ 11.96 hrs, Volume= 0.098 af, Depth= 2.74"  
Routed to Pond MBR-2 : MBR-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-YR Rainfall=3.40"

| Area (sf) | CN | Description                     |
|-----------|----|---------------------------------|
| 3,821     | 79 | 50-75% Grass cover, Fair, HSG C |
| 14,950    | 98 | Paved parking, HSG C            |
| 18,771    | 94 | Weighted Average                |
| 3,821     |    | 20.36% Pervious Area            |
| 14,950    |    | 79.64% Impervious Area          |

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

## Subcatchment DA-2: DA-2



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Type II 24-hr 2-YR Rainfall=3.40"

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## Summary for Subcatchment DA-3: DA-3

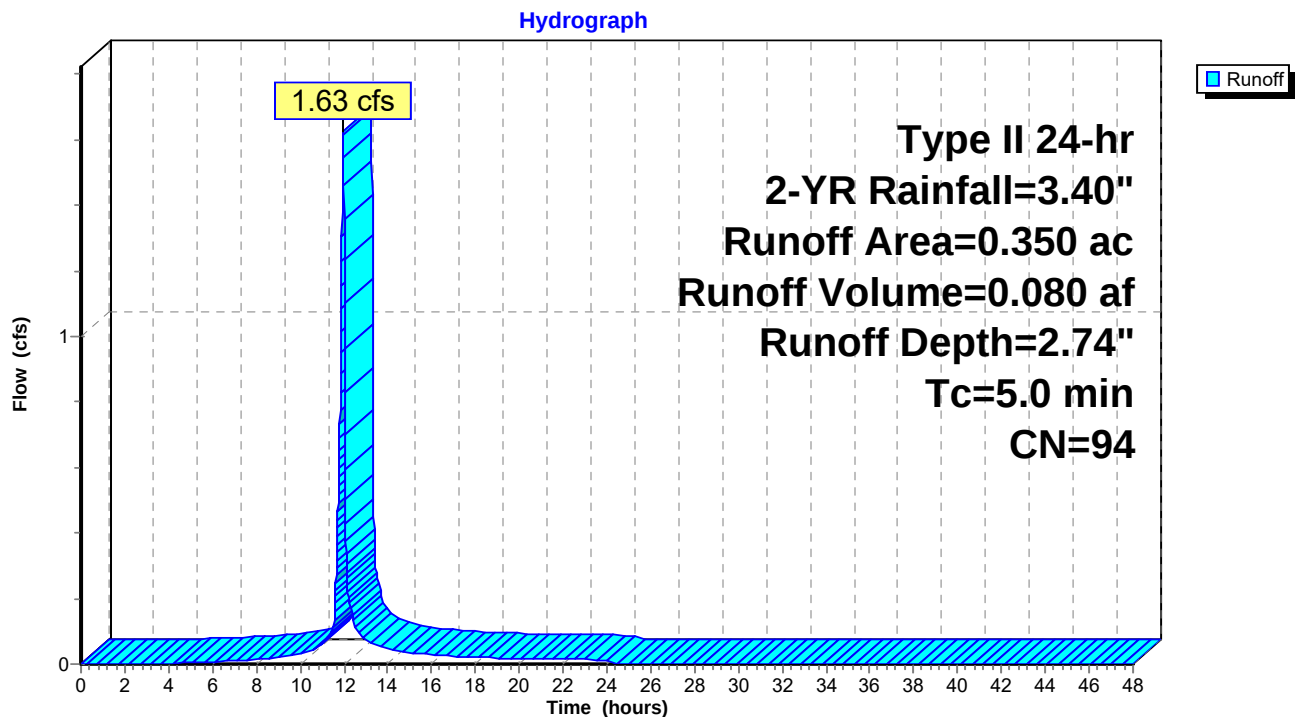
Runoff = 1.63 cfs @ 11.96 hrs, Volume= 0.080 af, Depth= 2.74"  
Routed to Pond MBR-1 : MBR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-YR Rainfall=3.40"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.292     | 98 | Paved parking, HSG C          |
| 0.058     | 74 | >75% Grass cover, Good, HSG C |
| 0.350     | 94 | Weighted Average              |
| 0.058     |    | 16.57% Pervious Area          |
| 0.292     |    | 83.43% Impervious Area        |

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

## Subcatchment DA-3: DA-3



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Type II 24-hr 2-YR Rainfall=3.40"

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## Summary for Subcatchment DA-4: DA-4

Runoff = 0.18 cfs @ 11.97 hrs, Volume= 0.008 af, Depth= 1.36"  
Routed to Link POI-1 : POI-1

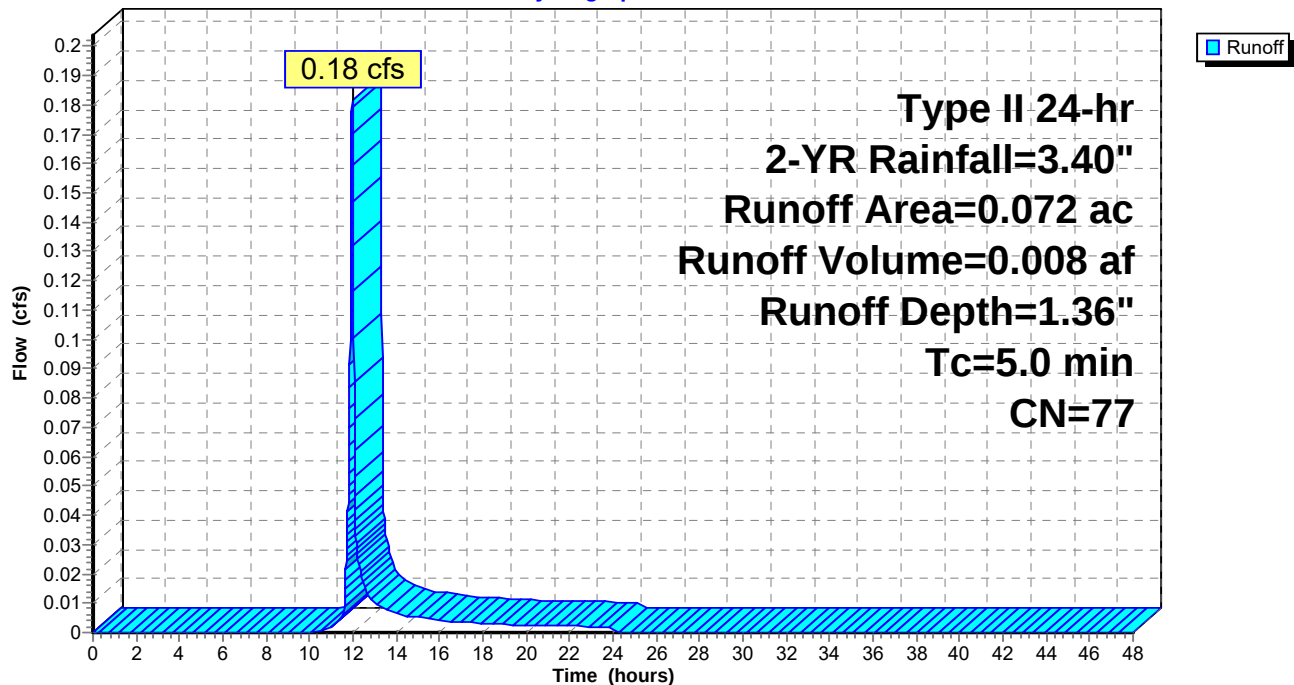
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 2-YR Rainfall=3.40"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.036     | 74 | >75% Grass cover, Good, HSG C |
| 0.036     | 80 | >75% Grass cover, Good, HSG D |
| 0.072     | 77 | Weighted Average              |
| 0.072     |    | 100.00% Pervious Area         |

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

## Subcatchment DA-4: DA-4

Hydrograph



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**Summary for Pond MBR-1: MBR-1**

Inflow Area = 0.350 ac, 83.43% Impervious, Inflow Depth = 2.74" for 2-YR event  
 Inflow = 1.63 cfs @ 11.96 hrs, Volume= 0.080 af  
 Outflow = 0.68 cfs @ 12.05 hrs, Volume= 0.080 af, Atten= 58%, Lag= 5.7 min  
 Primary = 0.68 cfs @ 12.05 hrs, Volume= 0.080 af  
 Routed to Link POI-1 : POI-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 16.17' @ 12.05 hrs Surf.Area= 1,048 sf Storage= 954 cf

Plug-Flow detention time= 38.4 min calculated for 0.080 af (100% of inflow)  
 Center-of-Mass det. time= 37.2 min ( 818.1 - 780.9 )

| Volume | Invert | Avail.Storage | Storage Description                                        |
|--------|--------|---------------|------------------------------------------------------------|
| #1     | 13.90' | 2,353 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Voids<br>(%) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|--------------|---------------------------|---------------------------|
| 13.90               | 1,041                | 0.0          | 0                         | 0                         |
| 16.15               | 1,041                | 40.0         | 937                       | 937                       |
| 17.25               | 1,533                | 100.0        | 1,416                     | 2,353                     |

| Device | Routing  | Invert | Outlet Devices                                                                                                                                                                                                              |
|--------|----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 13.90' | <b>12.0" Round Culvert</b><br>L= 5.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 13.90' / 13.90' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf  |
| #2     | Device 1 | 13.90' | <b>6.0" Round Culvert</b><br>L= 100.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 13.90' / 13.90' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf |
| #3     | Device 1 | 16.75' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600<br>Limited to weir flow at low heads                                                                                                                                              |

**Primary OutFlow** Max=0.68 cfs @ 12.05 hrs HW=16.17' TW=0.00' (Dynamic Tailwater)

1=Culvert (Passes 0.68 cfs of 5.03 cfs potential flow)  
 2=Culvert (Barrel Controls 0.68 cfs @ 3.48 fps)  
 3=Orifice/Grate ( Controls 0.00 cfs)

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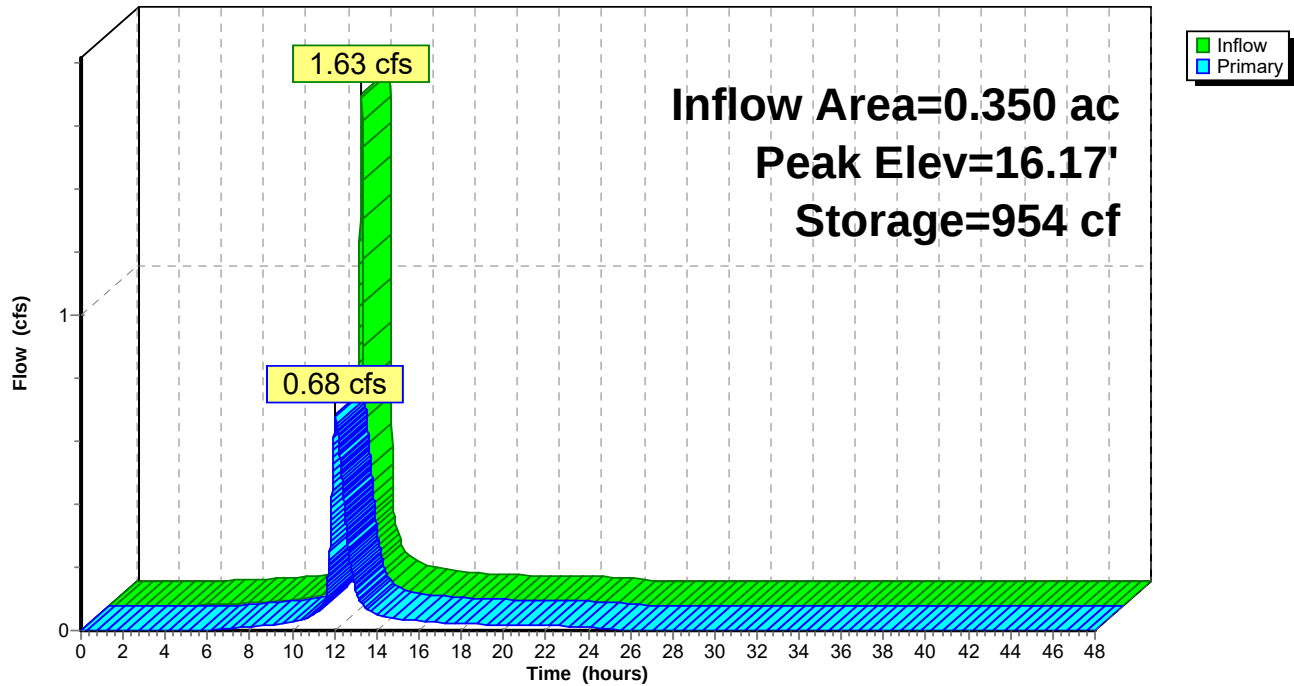
Type II 24-hr 2-YR Rainfall=3.40"

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**Pond MBR-1: MBR-1**

Hydrograph



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**Summary for Pond MBR-2: MBR-2**

Inflow Area = 0.431 ac, 79.64% Impervious, Inflow Depth = 2.74" for 2-YR event  
 Inflow = 2.00 cfs @ 11.96 hrs, Volume= 0.098 af  
 Outflow = 0.55 cfs @ 12.08 hrs, Volume= 0.098 af, Atten= 72%, Lag= 7.2 min  
 Primary = 0.55 cfs @ 12.08 hrs, Volume= 0.098 af  
 Routed to Pond PIPE : PIPE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 14.40' @ 12.08 hrs Surf.Area= 2,444 sf Storage= 1,618 cf

Plug-Flow detention time= 81.3 min calculated for 0.098 af (99% of inflow)  
 Center-of-Mass det. time= 76.6 min ( 857.5 - 780.9 )

| Volume              | Invert               | Avail.Storage | Storage Description                                        |                           |
|---------------------|----------------------|---------------|------------------------------------------------------------|---------------------------|
| #1                  | 12.75'               | 4,268 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |                           |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Voids<br>(%)  | Inc.Store<br>(cubic-feet)                                  | Cum.Store<br>(cubic-feet) |
| 12.75               | 2,444                | 0.0           | 0                                                          | 0                         |
| 15.00               | 2,444                | 40.0          | 2,200                                                      | 2,200                     |
| 15.75               | 3,071                | 100.0         | 2,068                                                      | 4,268                     |

| Device | Routing  | Invert | Outlet Devices                                                                                                                                                                                                     |
|--------|----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 12.75' | <b>12.0" Round Culvert</b><br>L= 320.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.75' / 12.40' S= 0.0011 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2     | Device 1 | 12.75' | <b>6.0" Round Culvert</b><br>L= 100.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.75' / 12.75' S= 0.0000 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf  |
| #3     | Device 1 | 15.25' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600<br>Limited to weir flow at low heads                                                                                                                                     |

**Primary OutFlow** Max=0.55 cfs @ 12.08 hrs HW=14.40' TW=12.80' (Dynamic Tailwater)

- 1=Culvert (Passes 0.55 cfs of 1.86 cfs potential flow)
- 2=Culvert (Barrel Controls 0.55 cfs @ 2.81 fps)
- 3=Orifice/Grate ( Controls 0.00 cfs)

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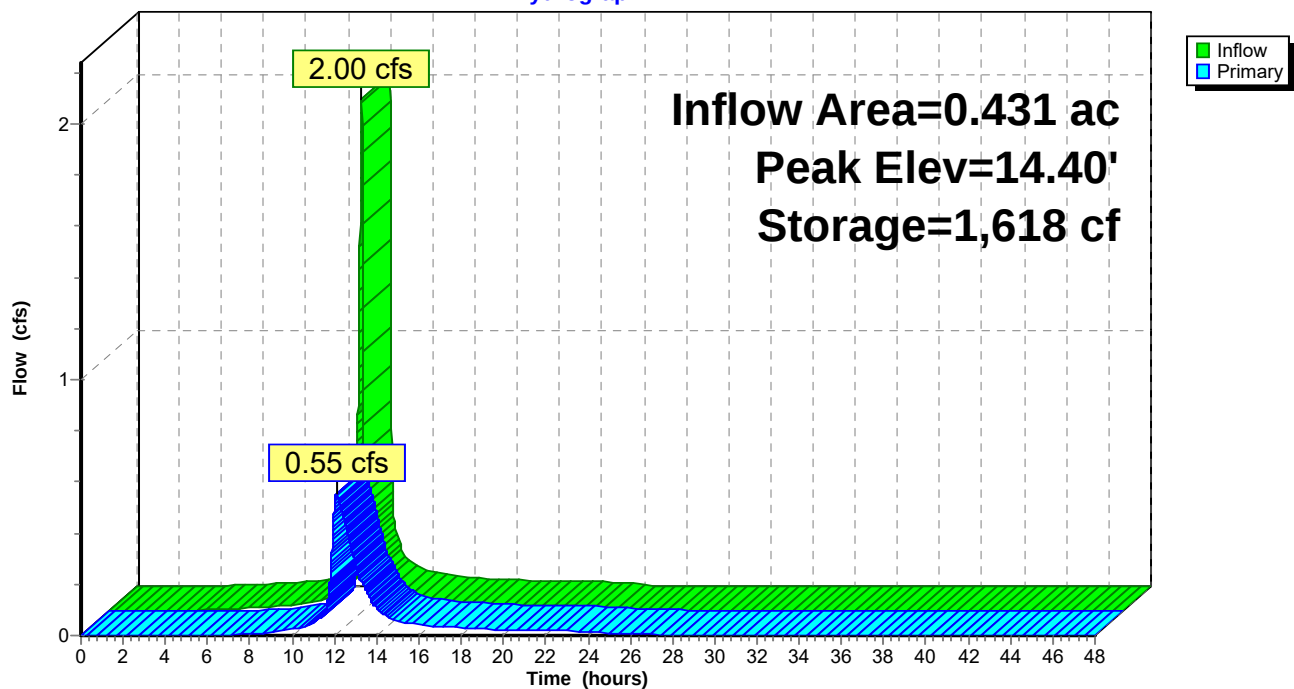
Type II 24-hr 2-YR Rainfall=3.40"

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## Pond MBR-2: MBR-2

### Hydrograph



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## Summary for Pond PIPE: PIPE

Inflow Area = 1.370 ac, 43.52% Impervious, Inflow Depth > 1.35" for 2-YR event  
Inflow = 0.55 cfs @ 12.08 hrs, Volume= 0.155 af  
Outflow = 0.55 cfs @ 12.08 hrs, Volume= 0.155 af, Atten= 0%, Lag= 0.0 min  
Primary = 0.55 cfs @ 12.08 hrs, Volume= 0.155 af  
Routed to Link POI-1 : POI-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 12.80' @ 12.08 hrs

Flood Elev= 15.00'

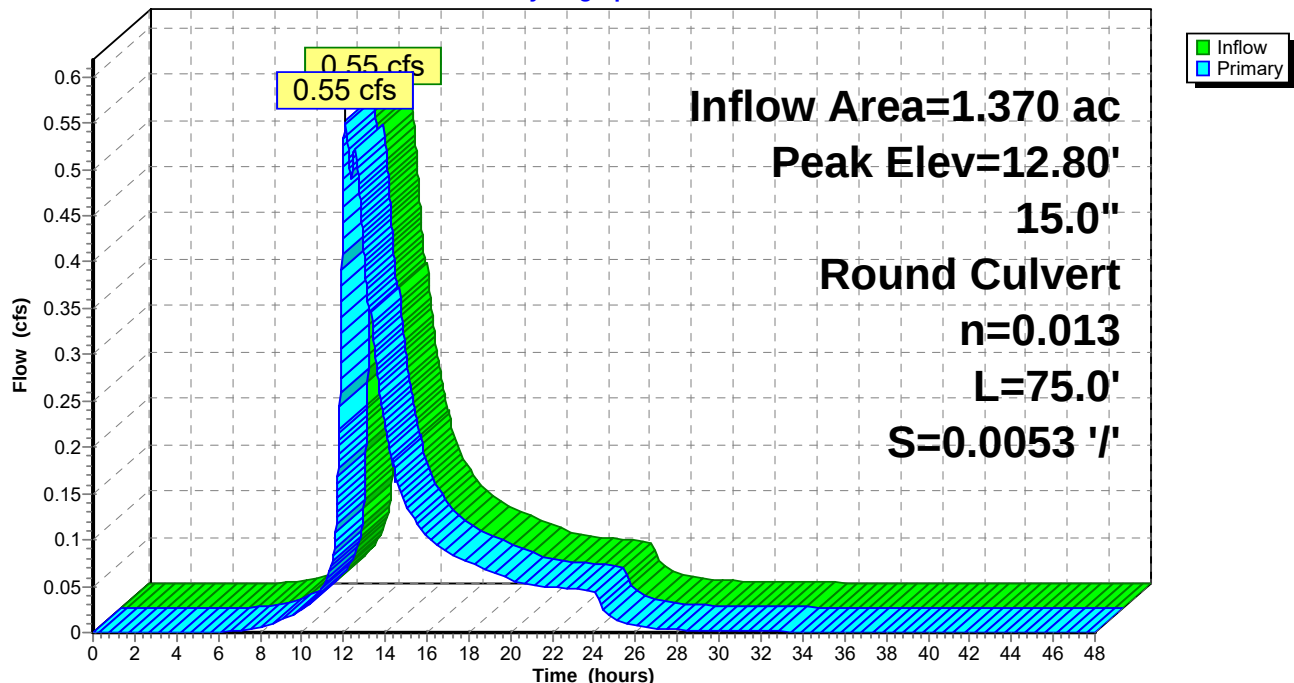
| Device | Routing | Invert | Outlet Devices                                                                                                                                                                                                   |
|--------|---------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 12.40' | <b>15.0" Round Culvert</b><br>L= 75.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.40' / 12.00' S= 0.0053 '/ Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf |

**Primary OutFlow** Max=0.55 cfs @ 12.08 hrs HW=12.80' TW=0.00' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 0.55 cfs @ 2.47 fps)

## Pond PIPE: PIPE

Hydrograph



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Type II 24-hr 2-YR Rainfall=3.40"

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**Summary for Pond SGW-1: SGW-1**

Inflow Area = 0.939 ac, 26.94% Impervious, Inflow Depth = 1.56" for 2-YR event  
 Inflow = 2.72 cfs @ 11.96 hrs, Volume= 0.122 af  
 Outflow = 0.13 cfs @ 13.20 hrs, Volume= 0.057 af, Atten= 95%, Lag= 73.9 min  
 Primary = 0.13 cfs @ 13.20 hrs, Volume= 0.057 af  
 Routed to Pond PIPE : PIPE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 13.00' @ 13.20 hrs Surf.Area= 2,433 sf Storage= 3,061 cf

Plug-Flow detention time= 297.1 min calculated for 0.057 af (47% of inflow)  
 Center-of-Mass det. time= 171.2 min ( 1,006.7 - 835.5 )

| Volume | Invert | Avail.Storage | Storage Description                                        |
|--------|--------|---------------|------------------------------------------------------------|
| #1     | 9.90'  | 11,877 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Voids<br>(%) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|--------------|---------------------------|---------------------------|
| 9.90                | 2,354                | 0.0          | 0                         | 0                         |
| 12.90               | 2,354                | 40.0         | 2,825                     | 2,825                     |
| 13.90               | 3,152                | 100.0        | 2,753                     | 5,578                     |
| 14.90               | 4,013                | 100.0        | 3,583                     | 9,160                     |
| 15.00               | 5,420                | 100.0        | 472                       | 9,632                     |
| 15.40               | 5,806                | 100.0        | 2,245                     | 11,877                    |

| Device | Routing  | Invert | Outlet Devices                                                                                                                                                                                                                  |
|--------|----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 12.40' | <b>12.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.40' / 12.30' S= 0.0020 ' S= 0.0020 ' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf     |
| #2     | Device 1 | 12.90' | <b>2.0' long Sharp-Crested Vee/Trap Weir</b> Cv= 2.62 (C= 3.28)                                                                                                                                                                 |
| #3     | Device 2 | 9.90'  | <b>4.0" Round Culvert</b><br>L= 5.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 9.90' / 9.90' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf         |
| #4     | Device 1 | 15.00' | <b>24.0" W x 24.0" H Vert. Orifice/Grate</b> C= 0.600<br>Limited to weir flow at low heads                                                                                                                                      |
| #5     | Primary  | 15.25' | <b>50.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00<br>Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31<br>3.30 3.31 3.32 |

**Primary OutFlow** Max=0.13 cfs @ 13.20 hrs HW=13.00' TW=12.71' (Dynamic Tailwater)

- 1=Culvert (Passes 0.13 cfs of 0.76 cfs potential flow)  
 2=Sharp-Crested Vee/Trap Weir (Passes 0.13 cfs of 0.20 cfs potential flow)  
 3=Culvert (Inlet Controls 0.13 cfs @ 1.51 fps)  
 4=Orifice/Grate ( Controls 0.00 cfs)  
 5=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

POST

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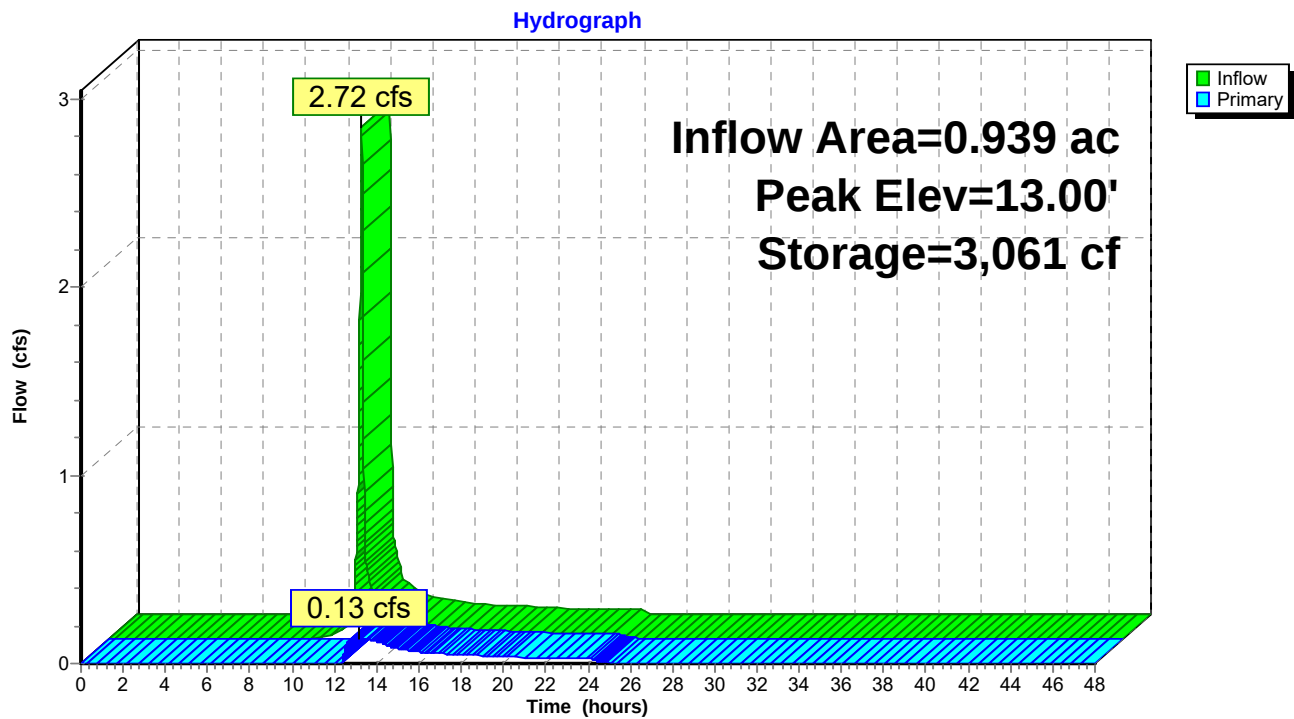
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Type II 24-hr 2-YR Rainfall=3.40"

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### Pond SGW-1: SGW-1



**POST***Type II 24-hr 2-YR Rainfall=3.40"*

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**Summary for Pond SGW-1-PT: SGW PRETREATMENT**

[43] Hint: Has no inflow (Outflow=Zero)

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 14.15'               | 682 cf                    | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 14.15               | 647                  | 0                         | 0                                                          |
| 14.90               | 1,172                | 682                       | 682                                                        |

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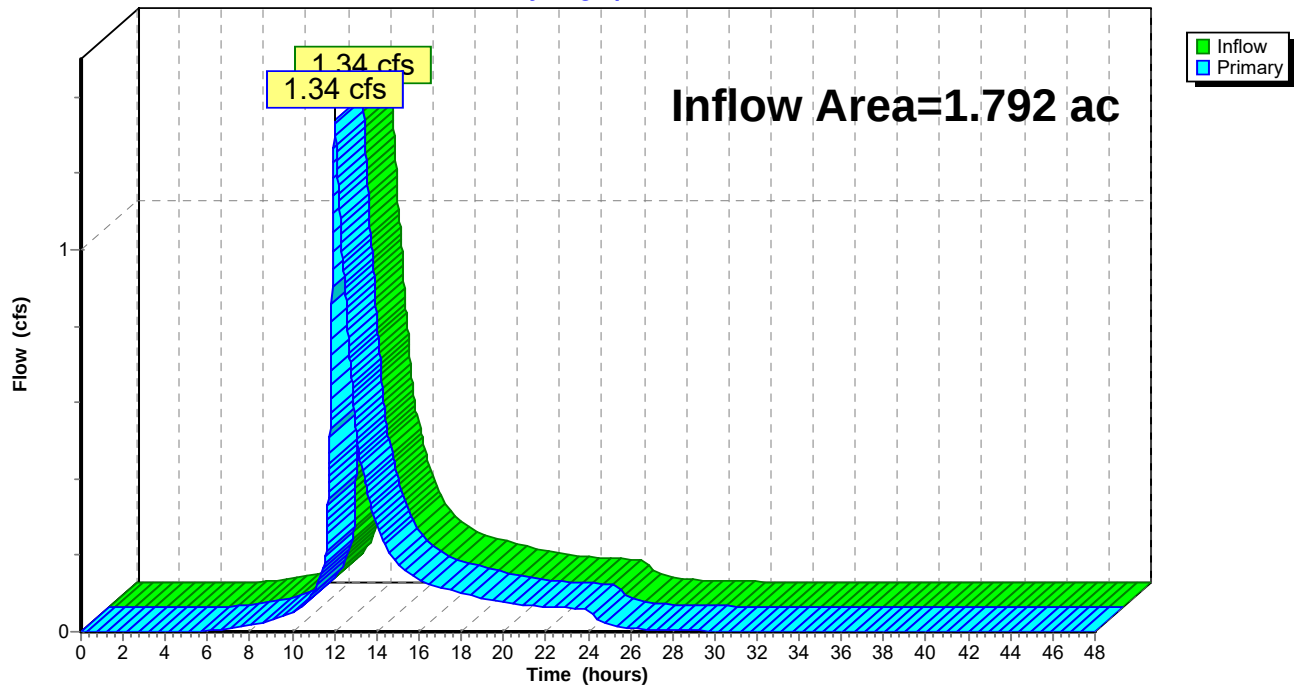
## Summary for Link POI-1: POI-1

Inflow Area = 1.792 ac, 49.57% Impervious, Inflow Depth > 1.62" for 2-YR event  
Inflow = 1.34 cfs @ 12.02 hrs, Volume= 0.242 af  
Primary = 1.34 cfs @ 12.02 hrs, Volume= 0.242 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

### Link POI-1: POI-1

Hydrograph



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Type II 24-hr 10-YR Rainfall=5.30"

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

|                                        |                                                                                                                       |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment DA-1: DA-1</b>         | Runoff Area=0.939 ac 26.94% Impervious Runoff Depth=3.16"<br>Tc=5.0 min CN=80 Runoff=5.41 cfs 0.247 af                |
| <b>Subcatchment DA-2: DA-2</b>         | Runoff Area=18,771 sf 79.64% Impervious Runoff Depth=4.60"<br>Tc=5.0 min CN=94 Runoff=3.25 cfs 0.165 af               |
| <b>Subcatchment DA-3: DA-3</b>         | Runoff Area=0.350 ac 83.43% Impervious Runoff Depth=4.60"<br>Tc=5.0 min CN=94 Runoff=2.64 cfs 0.134 af                |
| <b>Subcatchment DA-4: DA-4</b>         | Runoff Area=0.072 ac 0.00% Impervious Runoff Depth=2.88"<br>Tc=5.0 min CN=77 Runoff=0.38 cfs 0.017 af                 |
| <b>Pond MBR-1: MBR-1</b>               | Peak Elev=16.79' Storage=1,697 cf Inflow=2.64 cfs 0.134 af<br>Outflow=0.81 cfs 0.134 af                               |
| <b>Pond MBR-2: MBR-2</b>               | Peak Elev=15.19' Storage=2,671 cf Inflow=3.25 cfs 0.165 af<br>Outflow=0.71 cfs 0.165 af                               |
| <b>Pond PIPE: PIPE</b>                 | Peak Elev=12.98' Inflow=1.11 cfs 0.347 af<br>15.0" Round Culvert n=0.013 L=75.0' S=0.0053 ' Outflow=1.11 cfs 0.347 af |
| <b>Pond SGW-1: SGW-1</b>               | Peak Elev=13.95' Storage=5,746 cf Inflow=5.41 cfs 0.247 af<br>Outflow=0.42 cfs 0.182 af                               |
| <b>Pond SGW-1-PT: SGW PRETREATMENT</b> | Peak Elev=0.00' Storage=0 cf                                                                                          |
| <b>Link POI-1: POI-1</b>               | Inflow=2.13 cfs 0.498 af<br>Primary=2.13 cfs 0.498 af                                                                 |

**Total Runoff Area = 1.792 ac Runoff Volume = 0.564 af Average Runoff Depth = 3.78"**  
**50.43% Pervious = 0.904 ac 49.57% Impervious = 0.888 ac**

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Type II 24-hr 10-YR Rainfall=5.30"

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## Summary for Subcatchment DA-1: DA-1

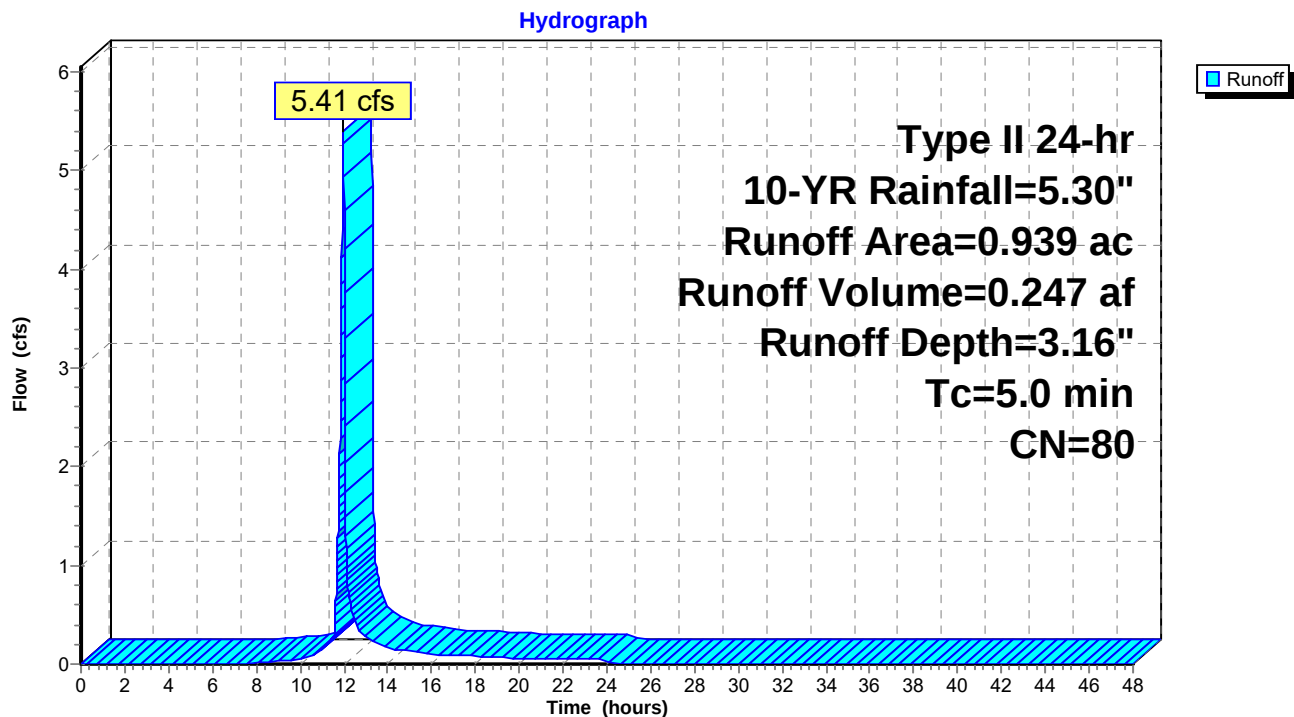
Runoff = 5.41 cfs @ 11.96 hrs, Volume= 0.247 af, Depth= 3.16"  
Routed to Pond SGW-1 : SGW-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-YR Rainfall=5.30"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.253     | 98 | Paved parking, HSG C          |
| 0.686     | 74 | >75% Grass cover, Good, HSG C |
| 0.939     | 80 | Weighted Average              |
| 0.686     |    | 73.06% Pervious Area          |
| 0.253     |    | 26.94% Impervious Area        |

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

## Subcatchment DA-1: DA-1



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## Summary for Subcatchment DA-2: DA-2

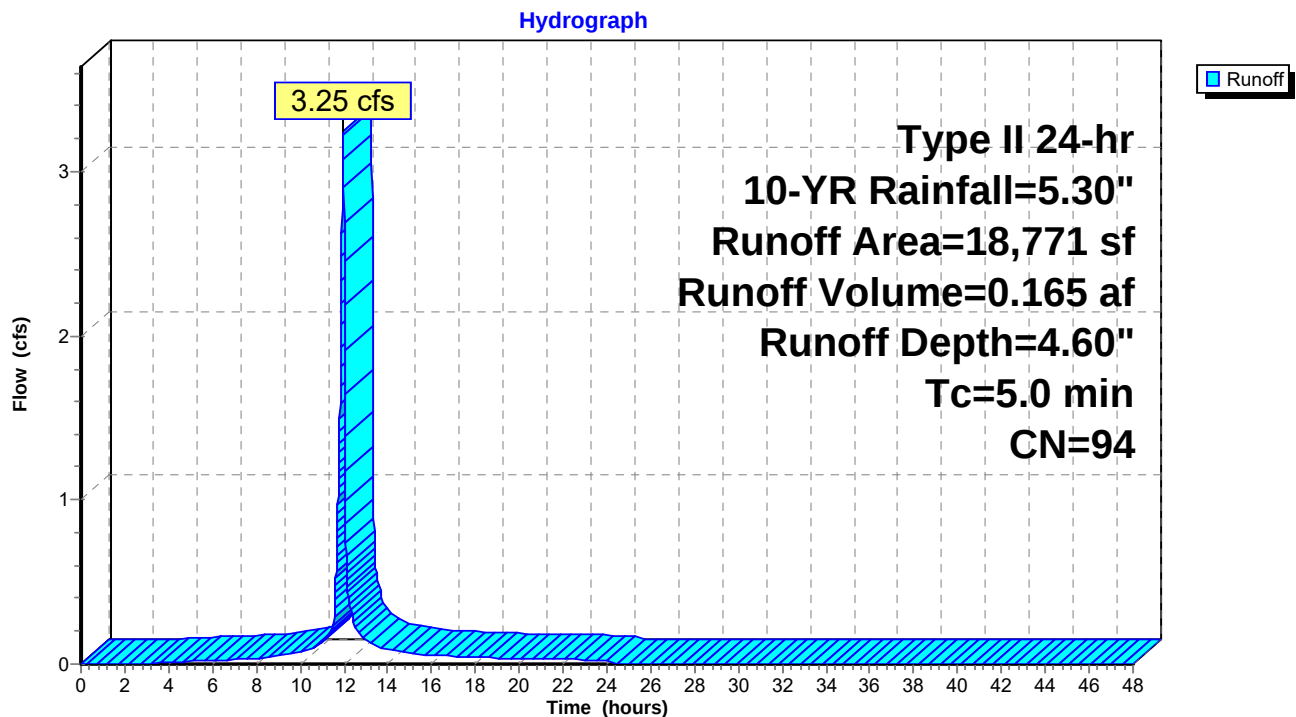
Runoff = 3.25 cfs @ 11.96 hrs, Volume= 0.165 af, Depth= 4.60"  
Routed to Pond MBR-2 : MBR-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-YR Rainfall=5.30"

| Area (sf) | CN | Description                     |
|-----------|----|---------------------------------|
| 3,821     | 79 | 50-75% Grass cover, Fair, HSG C |
| 14,950    | 98 | Paved parking, HSG C            |
| 18,771    | 94 | Weighted Average                |
| 3,821     |    | 20.36% Pervious Area            |
| 14,950    |    | 79.64% Impervious Area          |

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

## Subcatchment DA-2: DA-2



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## Summary for Subcatchment DA-3: DA-3

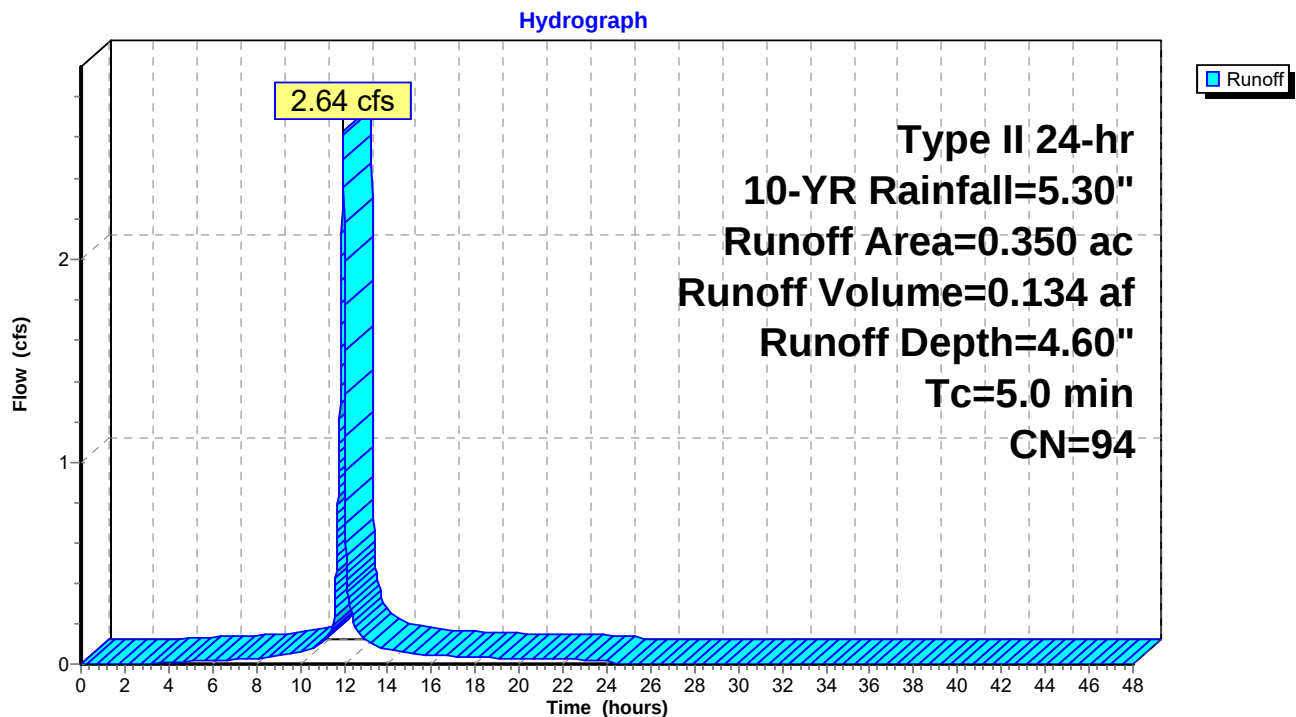
Runoff = 2.64 cfs @ 11.96 hrs, Volume= 0.134 af, Depth= 4.60"  
Routed to Pond MBR-1 : MBR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-YR Rainfall=5.30"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.292     | 98 | Paved parking, HSG C          |
| 0.058     | 74 | >75% Grass cover, Good, HSG C |
| 0.350     | 94 | Weighted Average              |
| 0.058     |    | 16.57% Pervious Area          |
| 0.292     |    | 83.43% Impervious Area        |

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

## Subcatchment DA-3: DA-3



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Type II 24-hr 10-YR Rainfall=5.30"  
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Summary for Subcatchment DA-4: DA-4

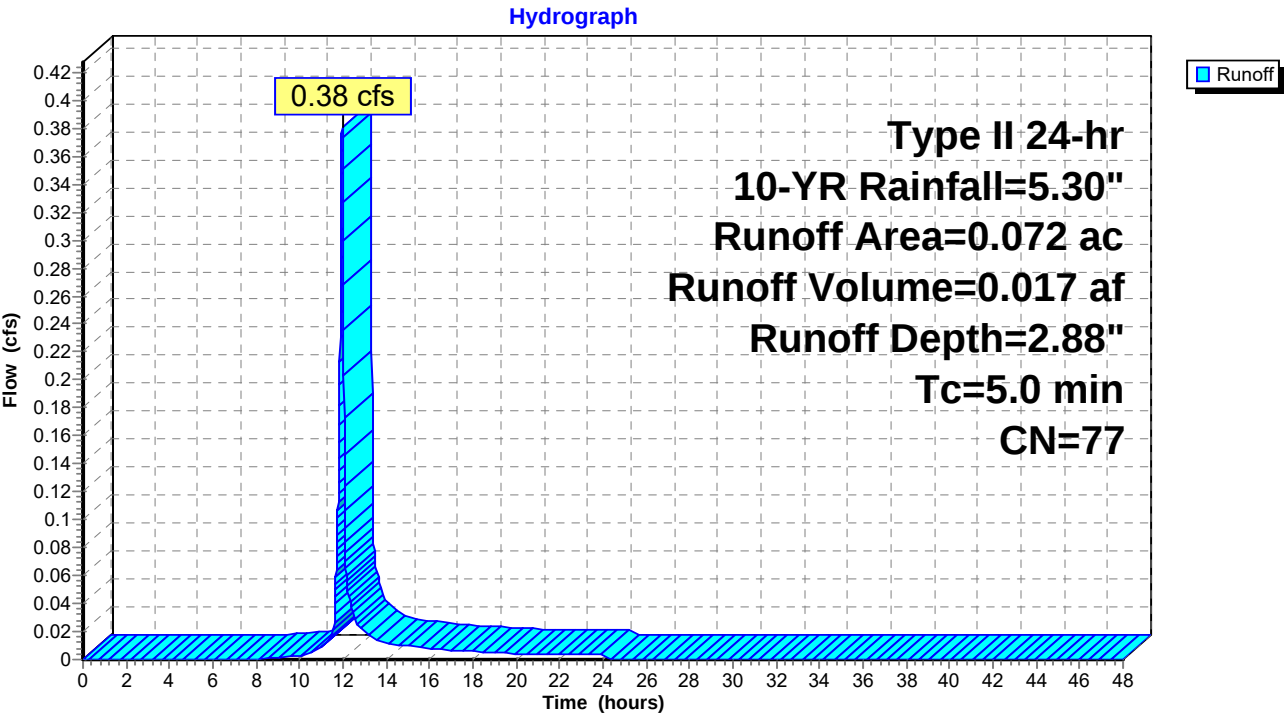
Runoff = 0.38 cfs @ 11.96 hrs, Volume= 0.017 af, Depth= 2.88"  
Routed to Link POI-1 : POI-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10-YR Rainfall=5.30"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.036     | 74 | >75% Grass cover, Good, HSG C |
| 0.036     | 80 | >75% Grass cover, Good, HSG D |
| 0.072     | 77 | Weighted Average              |
| 0.072     |    | 100.00% Pervious Area         |

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

Subcatchment DA-4: DA-4



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Type II 24-hr 10-YR Rainfall=5.30"

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**Summary for Pond MBR-1: MBR-1**

Inflow Area = 0.350 ac, 83.43% Impervious, Inflow Depth = 4.60" for 10-YR event  
 Inflow = 2.64 cfs @ 11.96 hrs, Volume= 0.134 af  
 Outflow = 0.81 cfs @ 12.07 hrs, Volume= 0.134 af, Atten= 69%, Lag= 6.8 min  
 Primary = 0.81 cfs @ 12.07 hrs, Volume= 0.134 af  
 Routed to Link POI-1 : POI-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 16.79' @ 12.07 hrs Surf.Area= 1,328 sf Storage= 1,697 cf

Plug-Flow detention time= 34.6 min calculated for 0.134 af (100% of inflow)  
 Center-of-Mass det. time= 34.0 min ( 801.4 - 767.4 )

| Volume              | Invert               | Avail.Storage | Storage Description                                        |                           |
|---------------------|----------------------|---------------|------------------------------------------------------------|---------------------------|
| #1                  | 13.90'               | 2,353 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |                           |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Voids<br>(%)  | Inc.Store<br>(cubic-feet)                                  | Cum.Store<br>(cubic-feet) |
| 13.90               | 1,041                | 0.0           | 0                                                          | 0                         |
| 16.15               | 1,041                | 40.0          | 937                                                        | 937                       |
| 17.25               | 1,533                | 100.0         | 1,416                                                      | 2,353                     |

| Device | Routing  | Invert | Outlet Devices                                                                                                                                                                                                              |
|--------|----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 13.90' | <b>12.0" Round Culvert</b><br>L= 5.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 13.90' / 13.90' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf  |
| #2     | Device 1 | 13.90' | <b>6.0" Round Culvert</b><br>L= 100.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 13.90' / 13.90' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf |
| #3     | Device 1 | 16.75' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600<br>Limited to weir flow at low heads                                                                                                                                              |

**Primary OutFlow** Max=0.81 cfs @ 12.07 hrs HW=16.79' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.81 cfs of 5.85 cfs potential flow)
- 2=Culvert (Barrel Controls 0.79 cfs @ 4.05 fps)
- 3=Orifice/Grate (Orifice Controls 0.01 cfs @ 0.69 fps)

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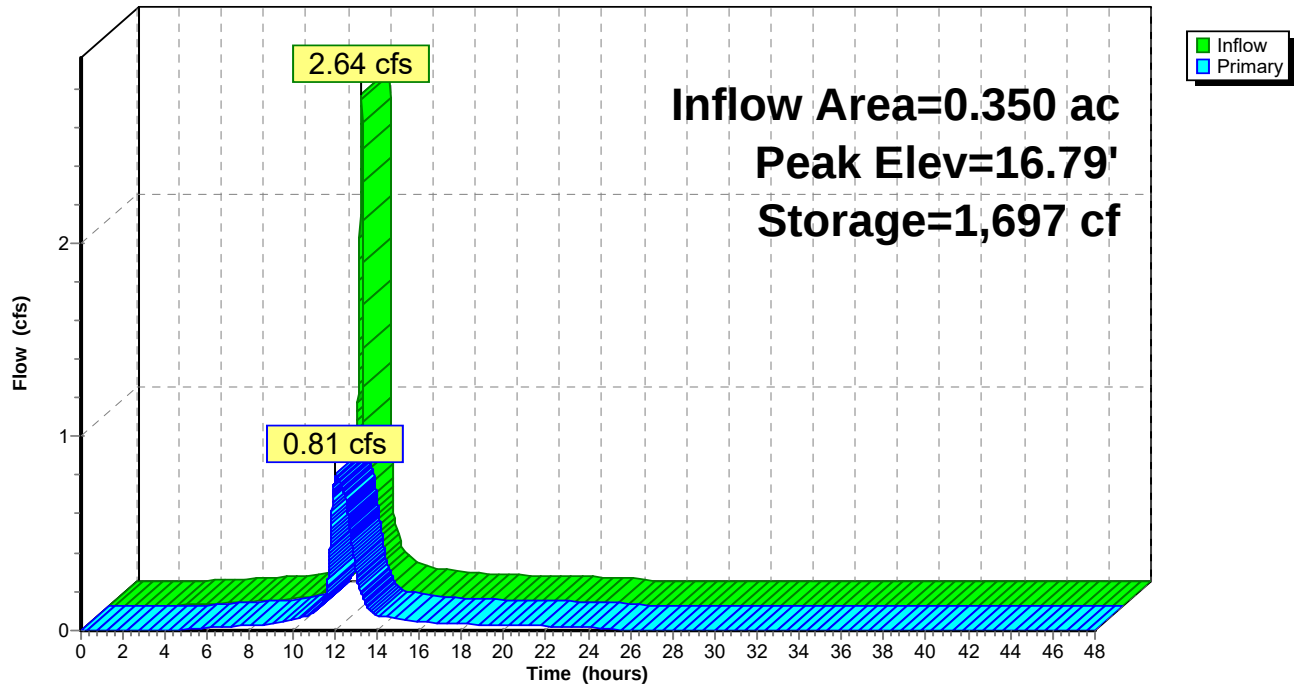
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**Pond MBR-1: MBR-1**

Hydrograph



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**Summary for Pond MBR-2: MBR-2**

Inflow Area = 0.431 ac, 79.64% Impervious, Inflow Depth = 4.60" for 10-YR event  
 Inflow = 3.25 cfs @ 11.96 hrs, Volume= 0.165 af  
 Outflow = 0.71 cfs @ 12.09 hrs, Volume= 0.165 af, Atten= 78%, Lag= 8.2 min  
 Primary = 0.71 cfs @ 12.09 hrs, Volume= 0.165 af  
 Routed to Pond PIPE : PIPE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 15.19' @ 12.09 hrs Surf.Area= 2,600 sf Storage= 2,671 cf

Plug-Flow detention time= 71.2 min calculated for 0.165 af (100% of inflow)  
 Center-of-Mass det. time= 68.4 min ( 835.8 - 767.4 )

| Volume | Invert | Avail.Storage | Storage Description                                        |
|--------|--------|---------------|------------------------------------------------------------|
| #1     | 12.75' | 4,268 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Voids<br>(%) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|--------------|---------------------------|---------------------------|
| 12.75               | 2,444                | 0.0          | 0                         | 0                         |
| 15.00               | 2,444                | 40.0         | 2,200                     | 2,200                     |
| 15.75               | 3,071                | 100.0        | 2,068                     | 4,268                     |

| Device | Routing  | Invert | Outlet Devices                                                                                                                                                                                                     |
|--------|----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 12.75' | <b>12.0" Round Culvert</b><br>L= 320.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.75' / 12.40' S= 0.0011 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2     | Device 1 | 12.75' | <b>6.0" Round Culvert</b><br>L= 100.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.75' / 12.75' S= 0.0000 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf  |
| #3     | Device 1 | 15.25' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600<br>Limited to weir flow at low heads                                                                                                                                     |

**Primary OutFlow** Max=0.71 cfs @ 12.09 hrs HW=15.19' TW=12.97' (Dynamic Tailwater)

1=Culvert (Passes 0.71 cfs of 2.48 cfs potential flow)  
 2=Culvert (Barrel Controls 0.71 cfs @ 3.64 fps)  
 3=Orifice/Grate ( Controls 0.00 cfs)

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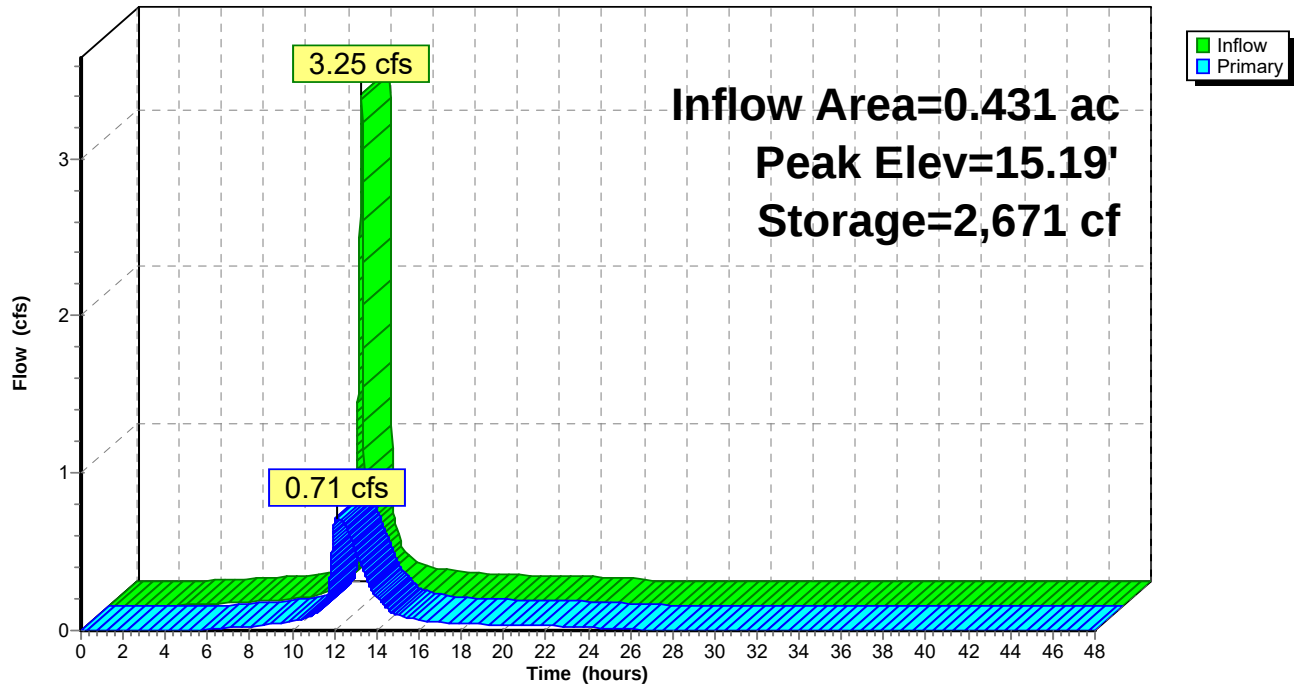
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**Pond MBR-2: MBR-2**

Hydrograph



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Summary for Pond PIPE: PIPE

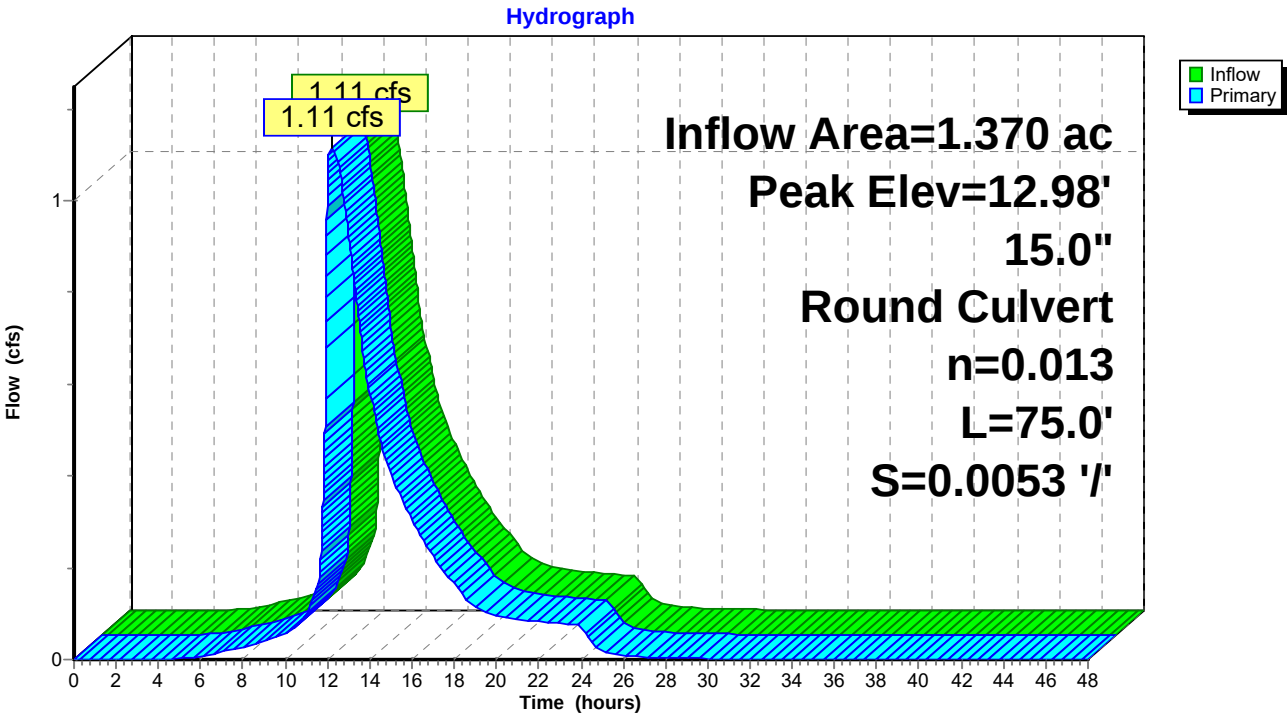
Inflow Area = 1.370 ac, 43.52% Impervious, Inflow Depth > 3.04" for 10-YR event  
Inflow = 1.11 cfs @ 12.19 hrs, Volume= 0.347 af  
Outflow = 1.11 cfs @ 12.19 hrs, Volume= 0.347 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.11 cfs @ 12.19 hrs, Volume= 0.347 af  
Routed to Link POI-1 : POI-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Peak Elev= 12.98' @ 12.19 hrs  
Flood Elev= 15.00'

| Device | Routing | Invert | Outlet Devices                                                                                                                                                                                                   |
|--------|---------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 12.40' | <b>15.0" Round Culvert</b><br>L= 75.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.40' / 12.00' S= 0.0053 '/ Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf |

Primary OutFlow Max=1.11 cfs @ 12.19 hrs HW=12.98' TW=0.00' (Dynamic Tailwater)  
1=Culvert (Barrel Controls 1.11 cfs @ 2.96 fps)

Pond PIPE: PIPE



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Type II 24-hr 10-YR Rainfall=5.30"

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**Summary for Pond SGW-1: SGW-1**

Inflow Area = 0.939 ac, 26.94% Impervious, Inflow Depth = 3.16" for 10-YR event  
 Inflow = 5.41 cfs @ 11.96 hrs, Volume= 0.247 af  
 Outflow = 0.42 cfs @ 12.71 hrs, Volume= 0.182 af, Atten= 92%, Lag= 45.2 min  
 Primary = 0.42 cfs @ 12.71 hrs, Volume= 0.182 af  
 Routed to Pond PIPE : PIPE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 13.95' @ 12.51 hrs Surf.Area= 3,198 sf Storage= 5,746 cf

Plug-Flow detention time= 216.5 min calculated for 0.182 af (74% of inflow)  
 Center-of-Mass det. time= 121.2 min ( 936.5 - 815.3 )

| Volume | Invert | Avail.Storage | Storage Description                                        |
|--------|--------|---------------|------------------------------------------------------------|
| #1     | 9.90'  | 11,877 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Voids<br>(%) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|--------------|---------------------------|---------------------------|
| 9.90                | 2,354                | 0.0          | 0                         | 0                         |
| 12.90               | 2,354                | 40.0         | 2,825                     | 2,825                     |
| 13.90               | 3,152                | 100.0        | 2,753                     | 5,578                     |
| 14.90               | 4,013                | 100.0        | 3,583                     | 9,160                     |
| 15.00               | 5,420                | 100.0        | 472                       | 9,632                     |
| 15.40               | 5,806                | 100.0        | 2,245                     | 11,877                    |

| Device | Routing  | Invert | Outlet Devices                                                                                                                                                                                                                  |
|--------|----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 12.40' | <b>12.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.40' / 12.30' S= 0.0020 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf               |
| #2     | Device 1 | 12.90' | <b>2.0' long Sharp-Crested Vee/Trap Weir</b> Cv= 2.62 (C= 3.28)                                                                                                                                                                 |
| #3     | Device 2 | 9.90'  | <b>4.0" Round Culvert</b><br>L= 5.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 9.90' / 9.90' S= 0.0000 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf                   |
| #4     | Device 1 | 15.00' | <b>24.0" W x 24.0" H Vert. Orifice/Grate</b> C= 0.600<br>Limited to weir flow at low heads                                                                                                                                      |
| #5     | Primary  | 15.25' | <b>50.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00<br>Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31<br>3.30 3.31 3.32 |

**Primary OutFlow** Max=0.42 cfs @ 12.71 hrs HW=13.94' TW=12.95' (Dynamic Tailwater)

1=Culvert (Passes 0.42 cfs of 2.88 cfs potential flow)  
 2=Sharp-Crested Vee/Trap Weir (Passes 0.42 cfs of 6.95 cfs potential flow)  
 3=Culvert (Inlet Controls 0.42 cfs @ 4.79 fps)  
 4=Orifice/Grate ( Controls 0.00 cfs)  
 5=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

POST

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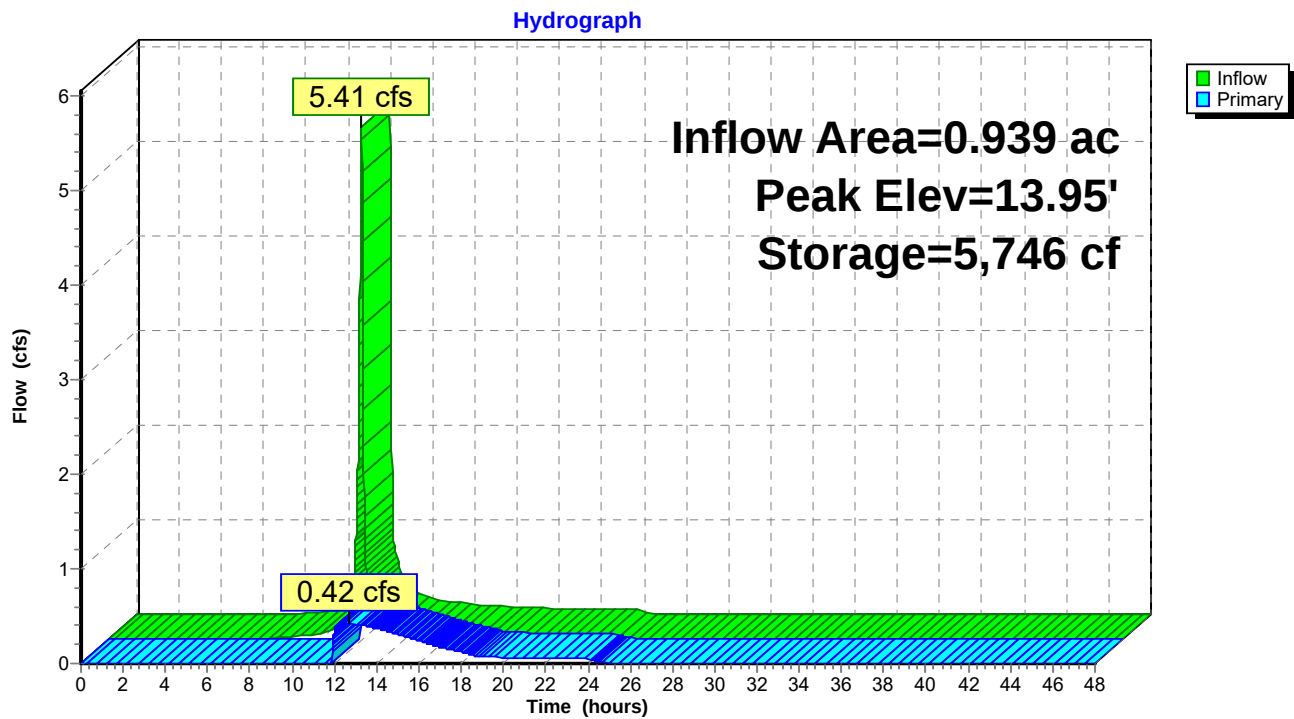
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### Pond SGW-1: SGW-1



**POST***Type II 24-hr 10-YR Rainfall=5.30"*

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**Summary for Pond SGW-1-PT: SGW PRETREATMENT**

[43] Hint: Has no inflow (Outflow=Zero)

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 14.15'               | 682 cf                    | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 14.15               | 647                  | 0                         | 0                                                          |
| 14.90               | 1,172                | 682                       | 682                                                        |

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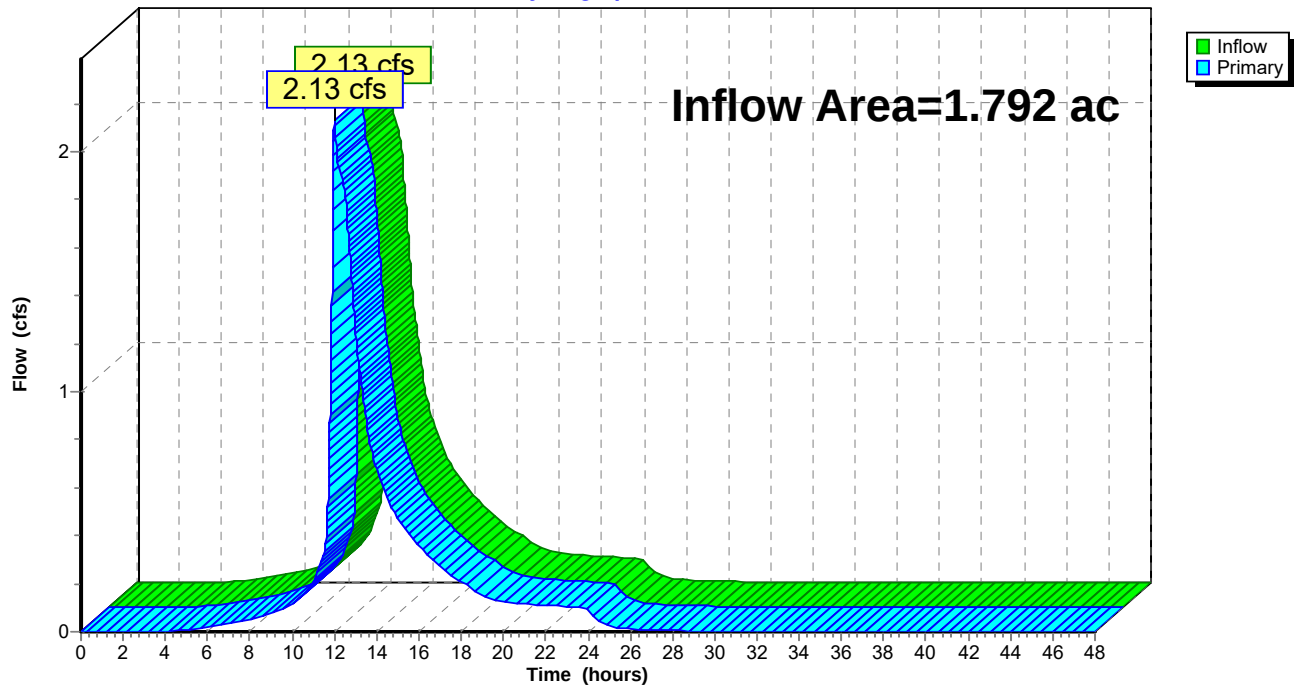
## Summary for Link POI-1: POI-1

Inflow Area = 1.792 ac, 49.57% Impervious, Inflow Depth > 3.34" for 10-YR event  
Inflow = 2.13 cfs @ 12.00 hrs, Volume= 0.498 af  
Primary = 2.13 cfs @ 12.00 hrs, Volume= 0.498 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

### Link POI-1: POI-1

Hydrograph



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Type II 24-hr 100-YR Rainfall=7.60"

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

|                                        |                                                                                                                       |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment DA-1: DA-1</b>         | Runoff Area=0.939 ac 26.94% Impervious Runoff Depth=5.25"<br>Tc=5.0 min CN=80 Runoff=8.76 cfs 0.411 af                |
| <b>Subcatchment DA-2: DA-2</b>         | Runoff Area=18,771 sf 79.64% Impervious Runoff Depth=6.88"<br>Tc=5.0 min CN=94 Runoff=4.74 cfs 0.247 af               |
| <b>Subcatchment DA-3: DA-3</b>         | Runoff Area=0.350 ac 83.43% Impervious Runoff Depth=6.88"<br>Tc=5.0 min CN=94 Runoff=3.85 cfs 0.201 af                |
| <b>Subcatchment DA-4: DA-4</b>         | Runoff Area=0.072 ac 0.00% Impervious Runoff Depth=4.91"<br>Tc=5.0 min CN=77 Runoff=0.64 cfs 0.029 af                 |
| <b>Pond MBR-1: MBR-1</b>               | Peak Elev=17.23' Storage=2,317 cf Inflow=3.85 cfs 0.201 af<br>Outflow=2.21 cfs 0.201 af                               |
| <b>Pond MBR-2: MBR-2</b>               | Peak Elev=15.60' Storage=3,824 cf Inflow=4.74 cfs 0.247 af<br>Outflow=1.54 cfs 0.246 af                               |
| <b>Pond PIPE: PIPE</b>                 | Peak Elev=13.22' Inflow=2.09 cfs 0.593 af<br>15.0" Round Culvert n=0.013 L=75.0' S=0.0053 ' Outflow=2.09 cfs 0.593 af |
| <b>Pond SGW-1: SGW-1</b>               | Peak Elev=15.07' Storage=9,988 cf Inflow=8.76 cfs 0.411 af<br>Outflow=0.70 cfs 0.346 af                               |
| <b>Pond SGW-1-PT: SGW PRETREATMENT</b> | Peak Elev=0.00' Storage=0 cf                                                                                          |
| <b>Link POI-1: POI-1</b>               | Inflow=4.57 cfs 0.823 af<br>Primary=4.57 cfs 0.823 af                                                                 |

**Total Runoff Area = 1.792 ac Runoff Volume = 0.888 af Average Runoff Depth = 5.95"**  
**50.43% Pervious = 0.904 ac 49.57% Impervious = 0.888 ac**

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Type II 24-hr 100-YR Rainfall=7.60"

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## Summary for Subcatchment DA-1: DA-1

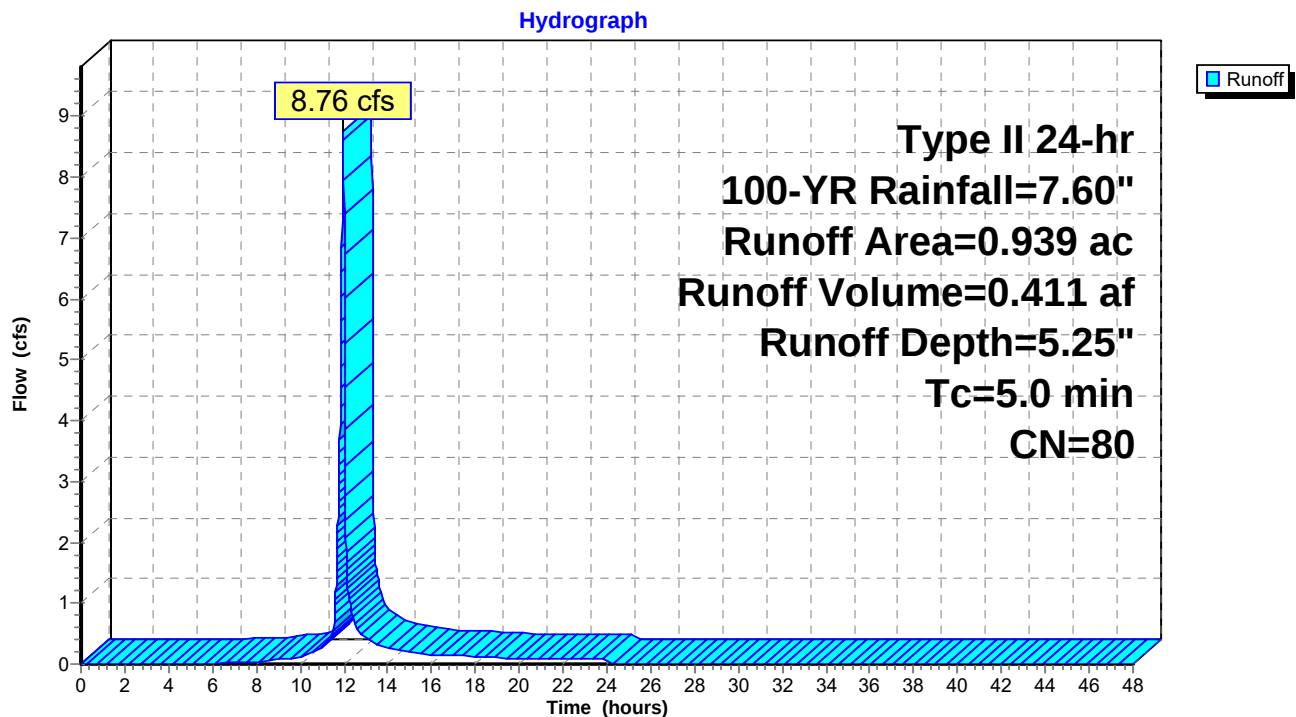
Runoff = 8.76 cfs @ 11.96 hrs, Volume= 0.411 af, Depth= 5.25"  
Routed to Pond SGW-1 : SGW-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-YR Rainfall=7.60"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.253     | 98 | Paved parking, HSG C          |
| 0.686     | 74 | >75% Grass cover, Good, HSG C |
| 0.939     | 80 | Weighted Average              |
| 0.686     |    | 73.06% Pervious Area          |
| 0.253     |    | 26.94% Impervious Area        |

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

## Subcatchment DA-1: DA-1



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## Summary for Subcatchment DA-2: DA-2

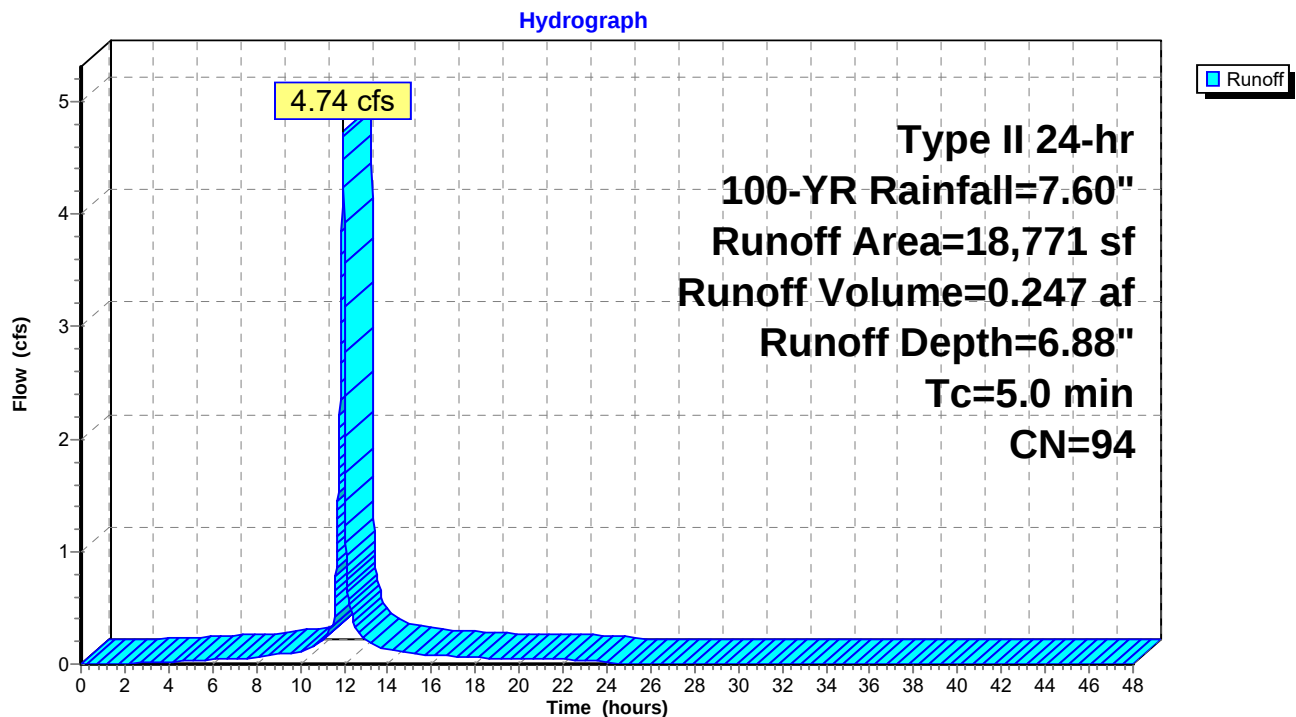
Runoff = 4.74 cfs @ 11.96 hrs, Volume= 0.247 af, Depth= 6.88"  
Routed to Pond MBR-2 : MBR-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-YR Rainfall=7.60"

| Area (sf) | CN | Description                     |
|-----------|----|---------------------------------|
| 3,821     | 79 | 50-75% Grass cover, Fair, HSG C |
| 14,950    | 98 | Paved parking, HSG C            |
| 18,771    | 94 | Weighted Average                |
| 3,821     |    | 20.36% Pervious Area            |
| 14,950    |    | 79.64% Impervious Area          |

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

## Subcatchment DA-2: DA-2



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Type II 24-hr 100-YR Rainfall=7.60"

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## Summary for Subcatchment DA-3: DA-3

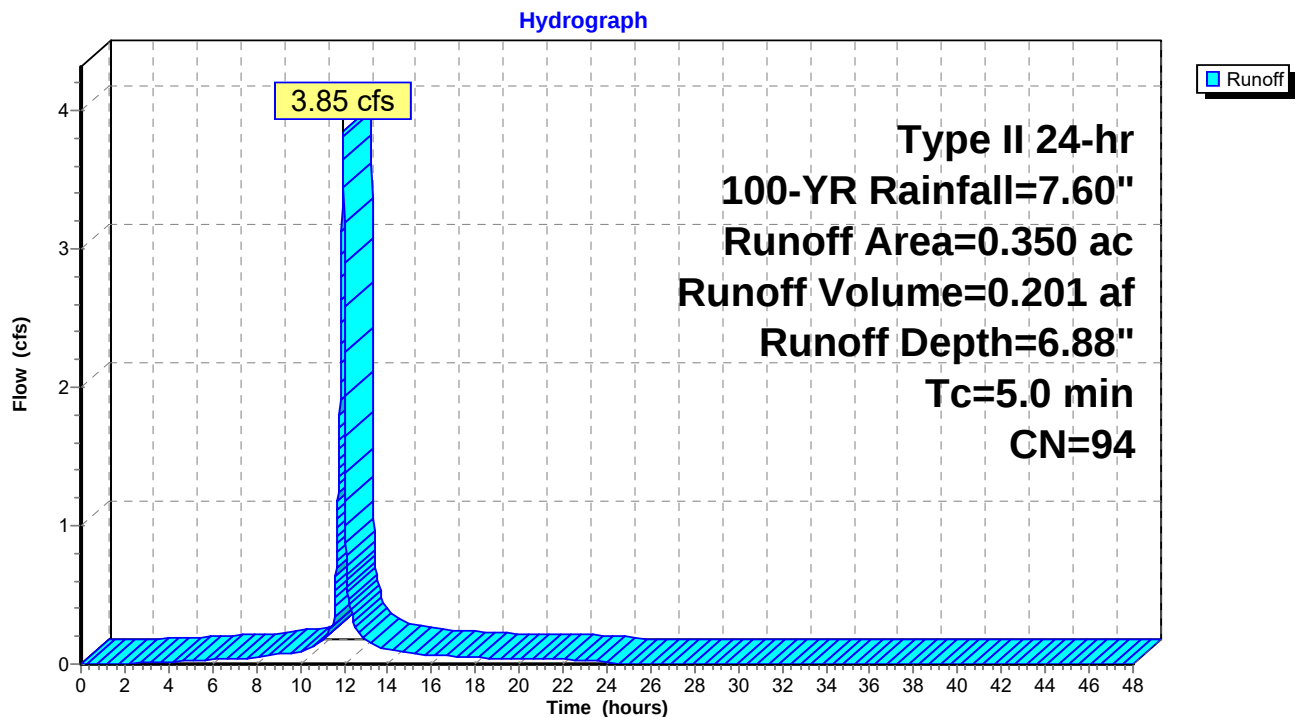
Runoff = 3.85 cfs @ 11.96 hrs, Volume= 0.201 af, Depth= 6.88"  
Routed to Pond MBR-1 : MBR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-YR Rainfall=7.60"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.292     | 98 | Paved parking, HSG C          |
| 0.058     | 74 | >75% Grass cover, Good, HSG C |
| 0.350     | 94 | Weighted Average              |
| 0.058     |    | 16.57% Pervious Area          |
| 0.292     |    | 83.43% Impervious Area        |

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

## Subcatchment DA-3: DA-3



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Type II 24-hr 100-YR Rainfall=7.60"

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## Summary for Subcatchment DA-4: DA-4

Runoff = 0.64 cfs @ 11.96 hrs, Volume= 0.029 af, Depth= 4.91"  
Routed to Link POI-1 : POI-1

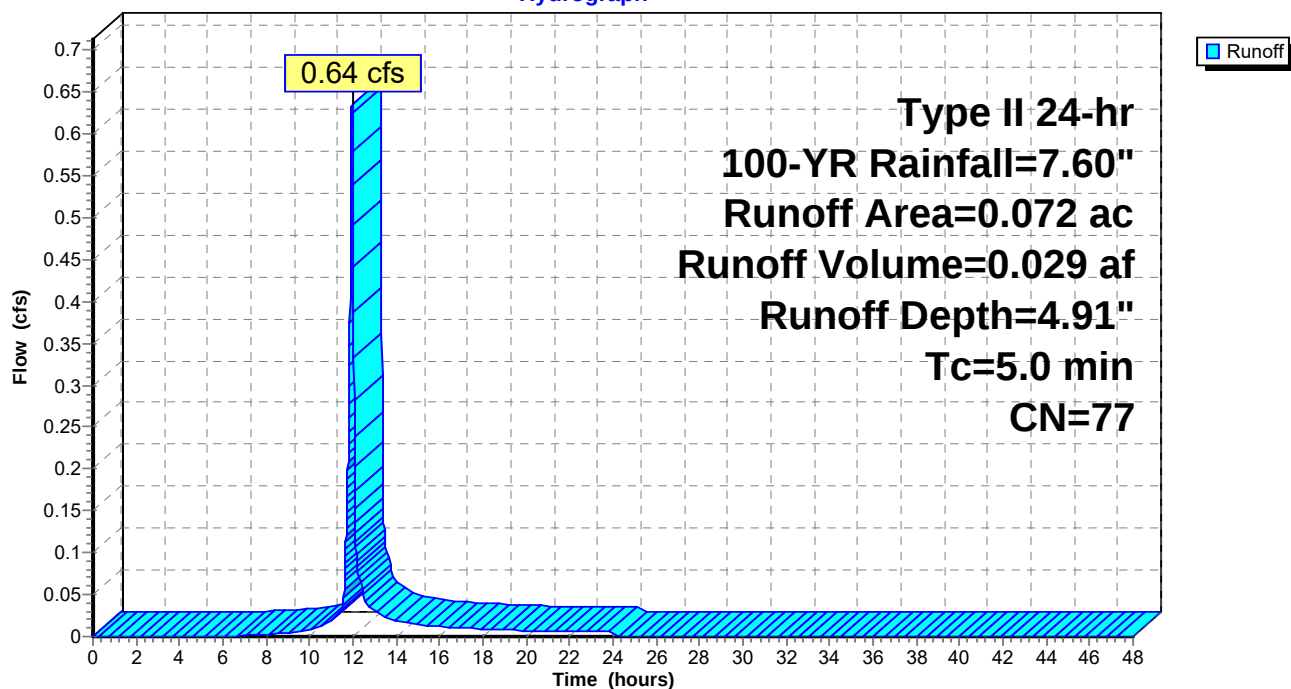
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100-YR Rainfall=7.60"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.036     | 74 | >75% Grass cover, Good, HSG C |
| 0.036     | 80 | >75% Grass cover, Good, HSG D |
| 0.072     | 77 | Weighted Average              |
| 0.072     |    | 100.00% Pervious Area         |

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

## Subcatchment DA-4: DA-4

Hydrograph



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**Summary for Pond MBR-1: MBR-1**

Inflow Area = 0.350 ac, 83.43% Impervious, Inflow Depth = 6.88" for 100-YR event  
 Inflow = 3.85 cfs @ 11.96 hrs, Volume= 0.201 af  
 Outflow = 2.21 cfs @ 12.03 hrs, Volume= 0.201 af, Atten= 43%, Lag= 4.5 min  
 Primary = 2.21 cfs @ 12.03 hrs, Volume= 0.201 af  
 Routed to Link POI-1 : POI-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 17.23' @ 12.03 hrs Surf.Area= 1,523 sf Storage= 2,317 cf

Plug-Flow detention time= 30.3 min calculated for 0.201 af (100% of inflow)  
 Center-of-Mass det. time= 29.9 min ( 787.8 - 757.9 )

| Volume | Invert | Avail.Storage | Storage Description                                        |
|--------|--------|---------------|------------------------------------------------------------|
| #1     | 13.90' | 2,353 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Voids<br>(%) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|--------------|---------------------------|---------------------------|
| 13.90               | 1,041                | 0.0          | 0                         | 0                         |
| 16.15               | 1,041                | 40.0         | 937                       | 937                       |
| 17.25               | 1,533                | 100.0        | 1,416                     | 2,353                     |

| Device | Routing  | Invert | Outlet Devices                                                                                                                                                                                                              |
|--------|----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 13.90' | <b>12.0" Round Culvert</b><br>L= 5.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 13.90' / 13.90' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf  |
| #2     | Device 1 | 13.90' | <b>6.0" Round Culvert</b><br>L= 100.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 13.90' / 13.90' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf |
| #3     | Device 1 | 16.75' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600<br>Limited to weir flow at low heads                                                                                                                                              |

**Primary OutFlow** Max=2.21 cfs @ 12.03 hrs HW=17.23' TW=0.00' (Dynamic Tailwater)

1=Culvert (Passes 2.21 cfs of 6.36 cfs potential flow)  
 2=Culvert (Barrel Controls 0.86 cfs @ 4.40 fps)  
 3=Orifice/Grate (Orifice Controls 1.35 cfs @ 2.35 fps)

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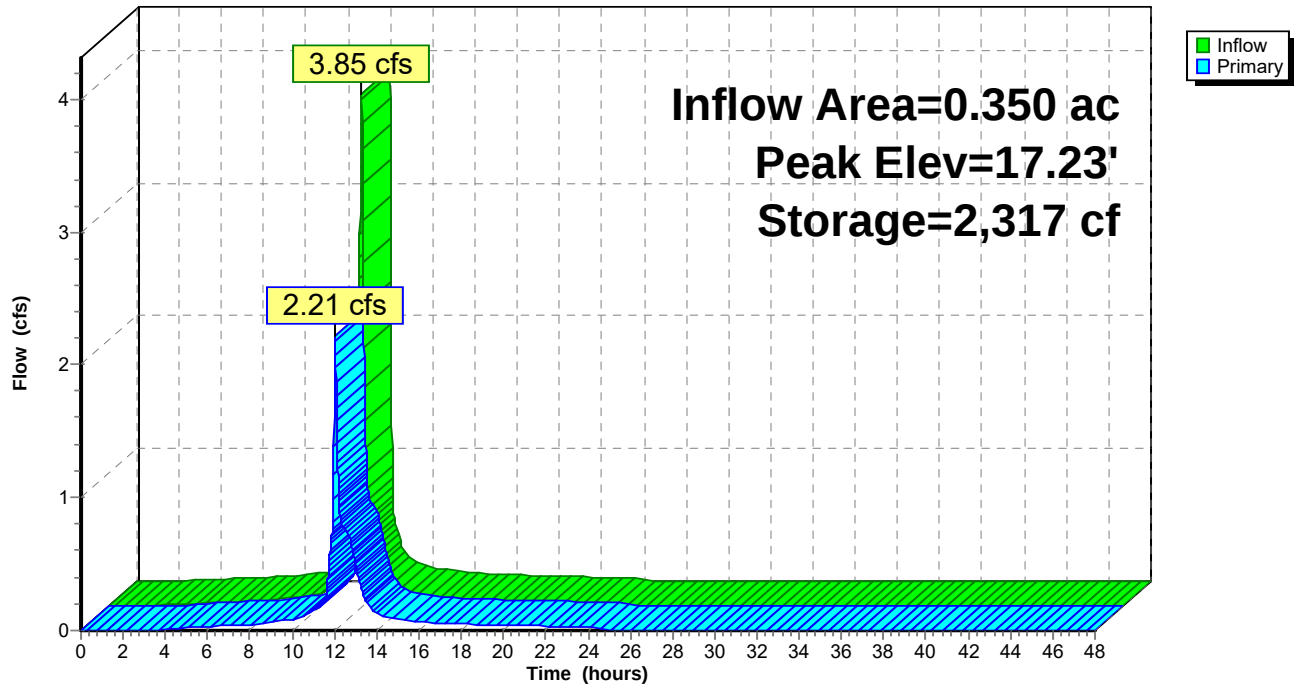
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**Pond MBR-1: MBR-1**

Hydrograph



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**Summary for Pond MBR-2: MBR-2**

Inflow Area = 0.431 ac, 79.64% Impervious, Inflow Depth = 6.88" for 100-YR event  
 Inflow = 4.74 cfs @ 11.96 hrs, Volume= 0.247 af  
 Outflow = 1.54 cfs @ 12.07 hrs, Volume= 0.246 af, Atten= 67%, Lag= 6.6 min  
 Primary = 1.54 cfs @ 12.07 hrs, Volume= 0.246 af  
 Routed to Pond PIPE : PIPE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 15.60' @ 12.07 hrs Surf.Area= 2,948 sf Storage= 3,824 cf

Plug-Flow detention time= 64.5 min calculated for 0.246 af (100% of inflow)  
 Center-of-Mass det. time= 62.5 min ( 820.4 - 757.9 )

| Volume | Invert | Avail.Storage | Storage Description                                        |
|--------|--------|---------------|------------------------------------------------------------|
| #1     | 12.75' | 4,268 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Voids<br>(%) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|--------------|---------------------------|---------------------------|
| 12.75               | 2,444                | 0.0          | 0                         | 0                         |
| 15.00               | 2,444                | 40.0         | 2,200                     | 2,200                     |
| 15.75               | 3,071                | 100.0        | 2,068                     | 4,268                     |

| Device | Routing  | Invert | Outlet Devices                                                                                                                                                                                                     |
|--------|----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 12.75' | <b>12.0" Round Culvert</b><br>L= 320.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.75' / 12.40' S= 0.0011 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2     | Device 1 | 12.75' | <b>6.0" Round Culvert</b><br>L= 100.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.75' / 12.75' S= 0.0000 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf  |
| #3     | Device 1 | 15.25' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600<br>Limited to weir flow at low heads                                                                                                                                     |

**Primary OutFlow** Max=1.54 cfs @ 12.07 hrs HW=15.60' TW=13.22' (Dynamic Tailwater)

1=Culvert (Passes 1.54 cfs of 2.75 cfs potential flow)  
 2=Culvert (Barrel Controls 0.79 cfs @ 4.01 fps)  
 3=Orifice/Grate (Orifice Controls 0.75 cfs @ 2.02 fps)

POST

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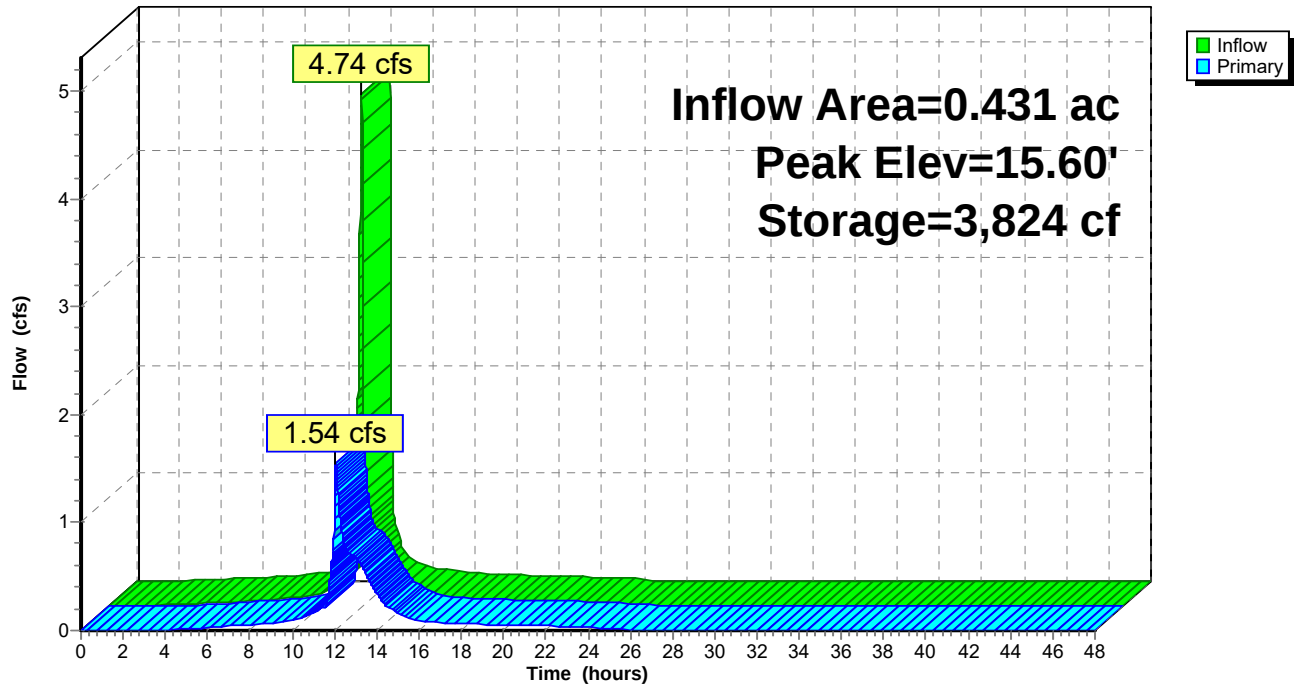
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### Pond MBR-2: MBR-2

Hydrograph



# POST

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## Summary for Pond PIPE: PIPE

Inflow Area = 1.370 ac, 43.52% Impervious, Inflow Depth > 5.19" for 100-YR event  
Inflow = 2.09 cfs @ 12.07 hrs, Volume= 0.593 af  
Outflow = 2.09 cfs @ 12.07 hrs, Volume= 0.593 af, Atten= 0%, Lag= 0.0 min  
Primary = 2.09 cfs @ 12.07 hrs, Volume= 0.593 af  
Routed to Link POI-1 : POI-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Peak Elev= 13.22' @ 12.07 hrs

Flood Elev= 15.00'

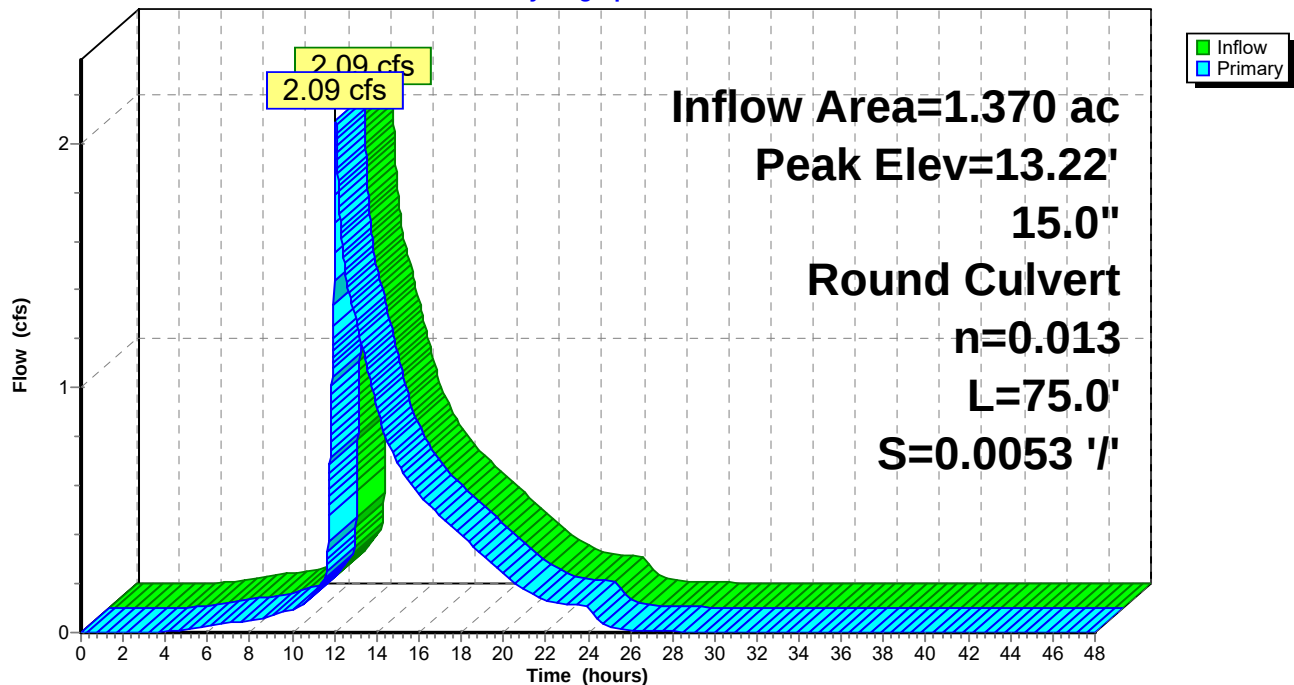
| Device | Routing | Invert | Outlet Devices                                                                                                                                                                                                   |
|--------|---------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 12.40' | <b>15.0" Round Culvert</b><br>L= 75.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.40' / 12.00' S= 0.0053 '/ Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf |

**Primary OutFlow** Max=2.09 cfs @ 12.07 hrs HW=13.22' TW=0.00' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 2.09 cfs @ 3.46 fps)

## Pond PIPE: PIPE

Hydrograph



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**Summary for Pond SGW-1: SGW-1**

Inflow Area = 0.939 ac, 26.94% Impervious, Inflow Depth = 5.25" for 100-YR event  
 Inflow = 8.76 cfs @ 11.96 hrs, Volume= 0.411 af  
 Outflow = 0.70 cfs @ 12.49 hrs, Volume= 0.346 af, Atten= 92%, Lag= 31.9 min  
 Primary = 0.70 cfs @ 12.49 hrs, Volume= 0.346 af  
 Routed to Pond PIPE : PIPE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 15.07' @ 12.48 hrs Surf.Area= 5,483 sf Storage= 9,988 cf

Plug-Flow detention time= 228.1 min calculated for 0.346 af (84% of inflow)  
 Center-of-Mass det. time= 157.8 min ( 958.6 - 800.8 )

| Volume | Invert | Avail.Storage | Storage Description                                        |
|--------|--------|---------------|------------------------------------------------------------|
| #1     | 9.90'  | 11,877 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Voids<br>(%) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|--------------|---------------------------|---------------------------|
| 9.90                | 2,354                | 0.0          | 0                         | 0                         |
| 12.90               | 2,354                | 40.0         | 2,825                     | 2,825                     |
| 13.90               | 3,152                | 100.0        | 2,753                     | 5,578                     |
| 14.90               | 4,013                | 100.0        | 3,583                     | 9,160                     |
| 15.00               | 5,420                | 100.0        | 472                       | 9,632                     |
| 15.40               | 5,806                | 100.0        | 2,245                     | 11,877                    |

| Device | Routing  | Invert | Outlet Devices                                                                                                                                                                                                                  |
|--------|----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 12.40' | <b>12.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 12.40' / 12.30' S= 0.0020 ' S= 0.0020 ' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf     |
| #2     | Device 1 | 12.90' | <b>2.0' long Sharp-Crested Vee/Trap Weir</b> Cv= 2.62 (C= 3.28)                                                                                                                                                                 |
| #3     | Device 2 | 9.90'  | <b>4.0" Round Culvert</b><br>L= 5.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 9.90' / 9.90' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf         |
| #4     | Device 1 | 15.00' | <b>24.0" W x 24.0" H Vert. Orifice/Grate</b> C= 0.600<br>Limited to weir flow at low heads                                                                                                                                      |
| #5     | Primary  | 15.25' | <b>50.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00<br>Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31<br>3.30 3.31 3.32 |

**Primary OutFlow** Max=0.70 cfs @ 12.49 hrs HW=15.07' TW=13.07' (Dynamic Tailwater)

1=Culvert (Passes 0.70 cfs of 4.78 cfs potential flow)  
 2=Sharp-Crested Vee/Trap Weir (Passes 0.59 cfs of 20.86 cfs potential flow)  
 3=Culvert (Inlet Controls 0.59 cfs @ 6.79 fps)  
 4=Orifice/Grate (Orifice Controls 0.11 cfs @ 0.82 fps)  
 5=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

POST

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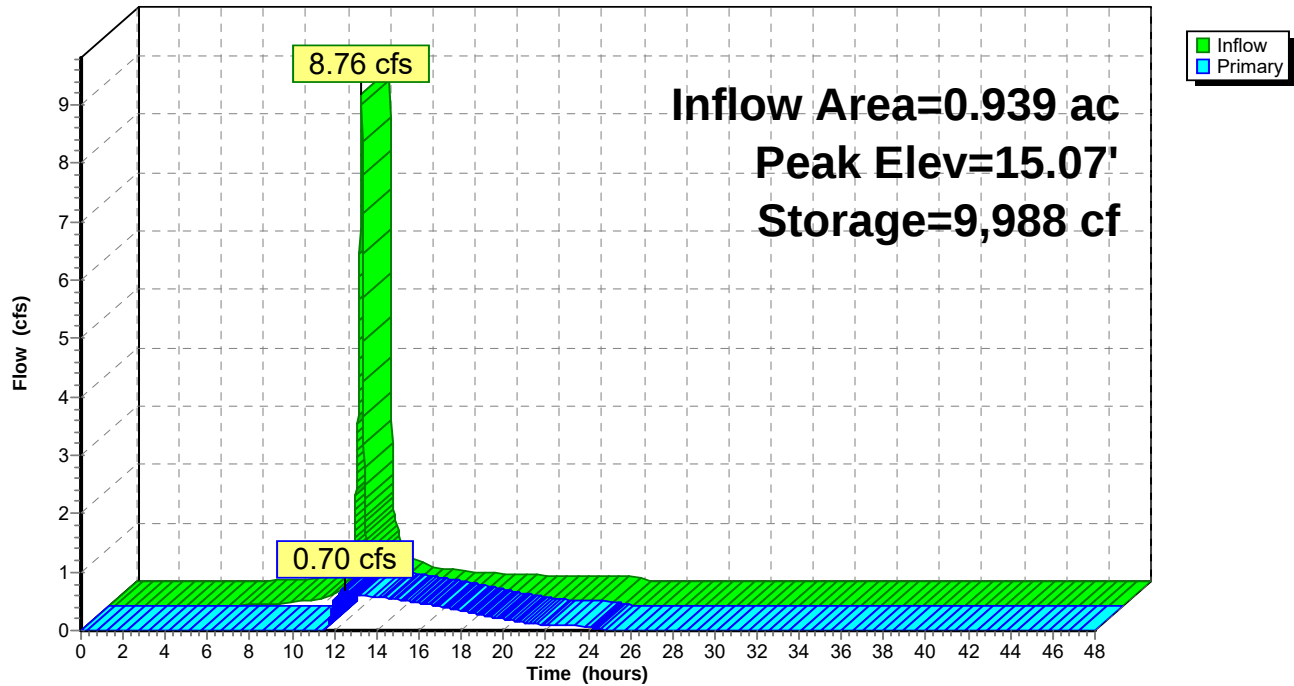
Type II 24-hr 100-YR Rainfall=7.60"

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### Pond SGW-1: SGW-1

Hydrograph



**POST**

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**Summary for Pond SGW-1-PT: SGW PRETREATMENT**

[43] Hint: Has no inflow (Outflow=Zero)

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 14.15'               | 682 cf                    | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 14.15               | 647                  | 0                         | 0                                                          |
| 14.90               | 1,172                | 682                       | 682                                                        |

# POST

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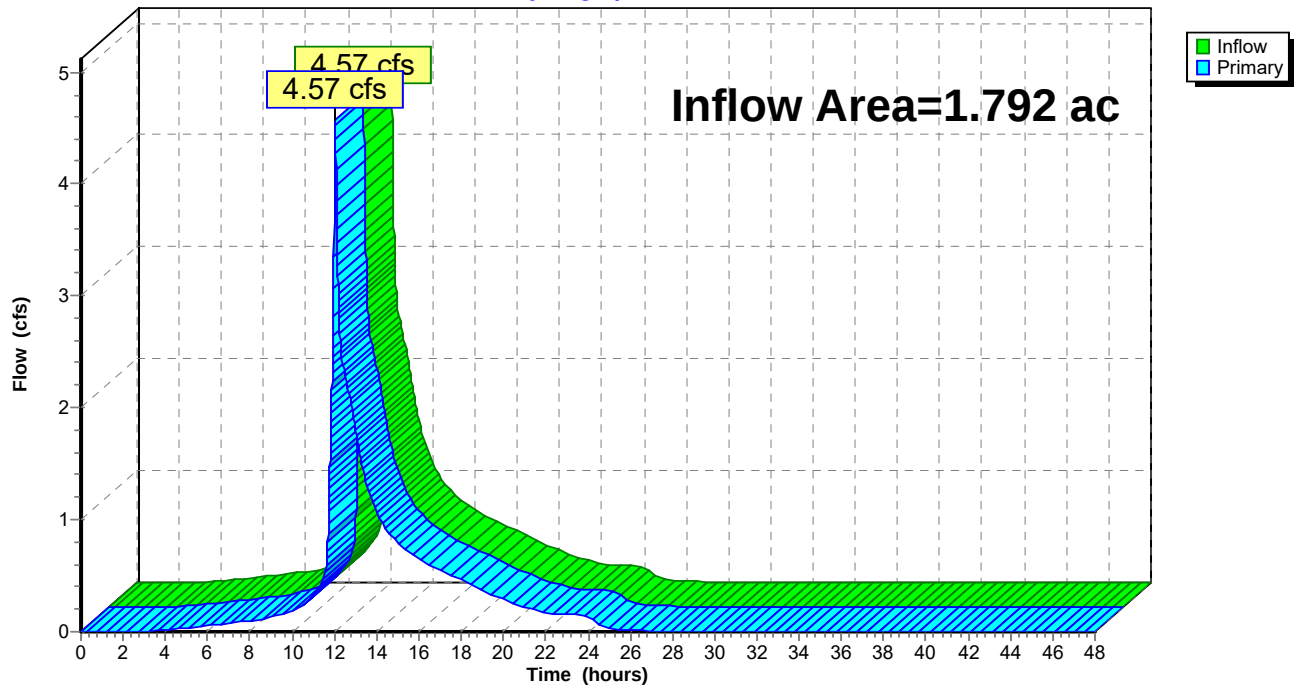
## Summary for Link POI-1: POI-1

Inflow Area = 1.792 ac, 49.57% Impervious, Inflow Depth = 5.51" for 100-YR event  
Inflow = 4.57 cfs @ 12.03 hrs, Volume= 0.823 af  
Primary = 4.57 cfs @ 12.03 hrs, Volume= 0.823 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

### Link POI-1: POI-1

Hydrograph



## Appendix A

---

# *FINAL STORMWATER MANAGEMENT REPORT*

---

For

**Highland TCP, LLC  
Lot 14, Talbot Commerce Park**

Contract Purchaser/Developer

Highland TCP, LLC  
James Real Estate Services, LLC  
8859 Mistletoe Drive, Suite F  
Easton, MD 21601  
410-310-1350

Design Professional

Lane Engineering, Inc.  
117 Bay Street  
Easton, Maryland 21601  
410-822-8003

Date Prepared

April 25, 2016

Prepared by

Waqar Cheema, P.E.  
Design Engineer



PROFESSIONAL CERTIFICATION: I hereby certify that this document was prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 48165; Expiration Date: 12/28/2017.

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---

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### APPENDIX LIST

APPENDIX A – NRCS Soils Map

APPENDIX B – Existing and Proposed Drainage Area Exhibits

APPENDIX C – ESD Calculations

APPENDIX D – HydroCAD Computations for Proposed Micro Bio-retentions and SWM Pond

# HIGHLAND TCP, LLC (TALBOT COMMERCE PARK) FINAL STORMWATER MANAGEMENT REPORT

---

## 1. INTRODUCTION

---

The following narrative addresses stormwater management quality and quantity requirements for the site as described in the current Town of Easton Stormwater Management Ordinance. The 2000 Maryland Stormwater Design Manual Volumes I and II (Manual), as amended in 2009, is referenced in meeting these requirements.

The report has been updated incorporating the comments received from the Town of Easton Engineering Department on April 14, 2016.

## 2. GENERAL SITE AND PROJECT INFORMATION

---

The project location reference is Tax Map 25, Grid 22, Tax Parcel 46, Lot 14, which is a platted lot within the Talbot Commerce Park. The lot area is 4.832 acres. The public road and utility improvements necessary to serve the Talbot Commerce Park, including Lot 14 are complete.

The proposed site improvements consist of a two-story 12,000 square foot footprint office building with, parking areas, sidewalks, access drives, utilities, landscaping and other site improvements. This building and the associated site improvements will be located in the southeast end of the property.

## 3. STORMWATER MANAGEMENT

---

### 3.1 EXISTING SOILS CONDITIONS

---

The existing site is an empty grassed lot. The soils in this area of the site are poor (Woodstown Sandy Loam and Elkton Silt Loam), with types "C" and "C/D" designations.

A Preliminary Subsurface Investigation and Geotechnical Evaluation Report was prepared by Hardin Kight Associates Inc.

Infiltration test report at the west side of the site indicates an exfiltration rate of 0.24 in/hr. This value is used for the stormwater quantity management calculations.

NRCS Soils map and Geotechnical evaluation report are presented in Appendix A.

### 3.2 ENVIRONMENTAL SITE DESIGN (ESD) PRACTICES - QUALITY

---

ESD requirements must be addressed for the project LOD. For this project the ESD analysis area contains approximately 2.07 acres (90,162 sf) with approximately 59,248 sf of impervious cover.

The proposed limits of construction on Lot 14 have been minimized and only include the area needed for the construction of site improvements.

#### 3.2.1 PROPOSED DRAINAGE PLAN

---

The Lot 14 site construction area is defined by a Limit of Disturbance (LOD) boundary that is 2.07 acres (90,162 sf) in size. The site is divided into six (6) main Drainage Areas as shown in the Exhibit in Appendix B.

The north-east of the developed site (DA-1) will be graded to direct the runoff to a system of wide flat bottom swales that will ultimately discharge into the existing pond on the north side.

South-east of the developed site (DA-2) will also be graded to direct the runoff to a system of wide flat bottom swales that will ultimately discharge into the existing pond on the north side.

South-west of the developed site (DA-3) will be graded to direct the runoff to a system of wide flat bottom swales that will ultimately discharge into the existing pond on the east side of Goldsborough Neck Road behind University of Maryland Extension building.

The north-west of the developed site (DA-4 & 5) will be graded to direct the runoff to the proposed micro bio-retention (MBR) areas in two locations that will ultimately discharge into the proposed pond before safely discharging into the conservation area on the north.

A portion of the building roof drainage area (DA-6) will drain into proposed rain garden area created inside the northern parking island that will ultimately discharge into the proposed pond as well.

### 3.2.2 ESD PRACTICES

---

The stormwater quantity, including the  $C_p$  storm, is being managed through two existing and one proposed pond, the ESD practices shall be used to treat the runoff from 1 inch of rainfall only (i.e.,  $P_E = 1$  inch).

Available ESD techniques were evaluated for use at the site in accordance with the Manual and are described as follows:

#### *Alternative Surfaces*

---

- Green roofs, permeable pavements and reinforced turf areas are not designed for this site. Green roof systems are not well suited to commercial applications and are inherently expensive and maintenance intensive, the costs for which cannot be supported by the project budget.
- The site soils are less conducive to infiltration, which is desirable for permeable pavements. Public access commercial sites and professional office buildings, with significant foot traffic, are not well suited for permeable pavements as they can be difficult to navigate and can create additional liability concerns. Permeable pavements are not well suited to sites that have heavy truck traffic use for structural and longevity reasons.
- Reinforced turf areas are commonly used for emergency equipment access or for areas that receive minimal vehicular use. Emergency equipment can service the building with the paved surfaces designed for the site needs and additional access areas are not necessary.

#### *Nonstructural practices*

---

- Due to the lack of available sheetflow flow paths adjacent to the site, disconnection of rooftop, non-rooftop runoff and sheetflow to the conservation area is not feasible.

#### *Micro-scale practices*

---

- Rainwater Harvesting – Opportunities for on-site reuse of harvested rainwater is limited. Operations and maintenance, especially during cold-weather periods, is also a concern.
- Submerged Gravel Wetlands – While soils on site are suitable for this practice, the elevation of local groundwater is unknown. Additionally, the drainage area needed to maintain submerged flow conditions is unavailable.
- Landscape Infiltration – Soil maps indicate type C and C/D hydric soils which are not conducive to infiltration. Furthermore, the drainage area limitation (<10,000 sf) cannot be met.

- Infiltration Berms – Soil maps indicate type C and C/D hydric soils which are not conducive to infiltration.
- Dry Wells – Soil maps indicate type C and C/D hydric soils which are not conducive to infiltration. The ESD<sub>v</sub> provided is low and drainage areas larger than 500sf should be designed per infiltration practice requirements.
- **Micro Bio-retention** – The soils present at the site are suitable for this practice. Impervious area runoff from local internal drainage areas is directed towards micro bio-retention (MBR) areas that are located adjacent to the parking lot south side of the site. Each MBR design is in accordance with the section requirements shown in the Manual and each has been designed to contain a portion of the total required ESD<sub>v</sub>. Underdrains will be provided and connected to the proposed pond. The overflow provided in the MBRs will allow safe passage of larger storm events and will direct stormwater to the proposed stormwater management pond on north-west boundary of the site. The proposed MBR systems have been designed with six inches of temporary storage above the MBR floor elevation. The total storage provided includes this temporary storage and the storage located within the installed MBR soils.
- **Rain Gardens** – A rain garden is proposed for water quality treatment from the roof top of the proposed building. The design is in accordance with the Manual.
- **Swales** – A grass swale practice is effectively being implemented on site by use of the wide flat bottom swales that will convey runoff from the parking areas to the existing pond. The channel slope is nearly flat, with resulting flow velocities that are low. Swales can be established on various soil types.

Of the available, and suitable, non-structural and micro-scale practices appropriate for use on this commercial site, micro Bio-retention, Rain garden and grass swales represent the most appropriate BMPs for use.

### 3.2.3 ESD CALCULATION

The Environmental Site Design (ESD) calculations are included in Appendix C and the summary of the design is presented below.

| Drainage Area                                                           | ESD Practice                                                  | Area Treated (sf) | Impervious Area (sf) | Target ESD <sub>v</sub> (cf) | Provided ESD <sub>v</sub> (cf) | ESD <sub>v</sub> Difference (Prov-Targ) |
|-------------------------------------------------------------------------|---------------------------------------------------------------|-------------------|----------------------|------------------------------|--------------------------------|-----------------------------------------|
| DA-1                                                                    | Proposed Site Development Design - Grass Swales (M-8)         | 17,774            | 11,188               | 913                          | 613                            | (300)                                   |
| DA-2                                                                    | Proposed Site Development Design - Grass Swales (M-8)         | 26,582            | 16,527               | 1,350                        | 933                            | (417)                                   |
| DA-3                                                                    | Proposed Site Development Design - Grass Swales (M-8)         | 4,556             | 2,931                | 239                          | 380                            | 141                                     |
| DA-4                                                                    | Proposed Site Development Design - Micro-Bioretenention (M-6) | 15,861            | 11,771               | 949                          | 1,028                          | 79                                      |
| DA-5                                                                    | Proposed Site Development Design - Micro-Bioretenention (M-6) | 19,348            | 10,612               | 877                          | 1,399                          | 522                                     |
| DA-6                                                                    | Proposed Site Development Design - Rain Gardens (M-7)         | 6,039             | 6,039                | 477                          | 506                            | 29                                      |
| Total Area Treated:                                                     |                                                               | 90,160            | 59,068               |                              |                                |                                         |
| Total ESD <sub>v</sub> Target:                                          |                                                               |                   |                      | 4,805                        |                                |                                         |
| Total ESD <sub>v</sub> Provided:                                        |                                                               |                   |                      |                              | 4,859                          | 54                                      |
| Total Target ESD <sub>v</sub> Calculated Considering Entire Site as DA: |                                                               |                   |                      |                              | 4,819                          |                                         |

ESD<sub>v</sub> provided by the proposed practices is more than the ESD<sub>v</sub> required hence the ESD requirement has been met.

### 3.3 QUANTITY MANAGEMENT

---

Stormwater quantity management is required per the Town of Easton SWM ordinance, which requires management of the 2 & 10-year peak storm runoff rate and safe conveyance of the 100-year peak storm.

Talbot Commerce Park is served by a regional stormwater management system associated with, and approved with, the original subdivision and public improvements. More than half of the project area which includes the drainage areas DA 1, 2 & 3 is draining into this stormwater management system and hence an evaluation of stormwater quantity is not required for these areas.

The remaining project area which includes the drainage areas DA 4, 5 & 6 are not managed by any regional stormwater management system and hence a retention pond is proposed downstream of the micro-bio retentions (MBRs). This pond is designed to convey the post-development runoff rate less than or equal to the pre-development runoff rate.

Pre- and post-development flow conditions were analyzed for these areas having the same study point, point of discharge, (POD-1) at the location of site where stormwater discharges into the conservation area. Existing drainage area exhibit is provided in Appendix B.

The proposed Drainage Areas exhibit is provided in Appendix B.

HydroCAD software was used to validate that the stormwater design will meet the town's requirements. HydroCAD computations are included in Appendix D.

These proposed site drainage areas (DA 4, 5 & 6) are graded to direct the runoff to the ESD practices (MBRs and Rain garden) which overflows and drains into the proposed pond. The pond will ultimately discharge into the conservation area through an orifice at a peak runoff rate of less than the pre-developed conditions.

Drainage area maps are attached and correlate with the hydraulic analysis. Below are the results of the analysis:

| <b>Drainage Area<br/>DA: 4+5+6</b> | <b>Pre-Development<br/>Condition</b> | <b>Post-Development<br/>Condition</b> |
|------------------------------------|--------------------------------------|---------------------------------------|
| 2 Year Peak, Q (cfs)               | 0.92                                 | 0.92                                  |
| 10 Year Peak, Q (cfs)              | 2.21                                 | 2.19                                  |

The analysis results show that the 2 and 10 year storm events developed condition peak runoff rates are less than or equal to the existing conditions peak runoff rates. The 100 year storm event will be safely conveyed into the existing discharge locations.

### 4. CONCLUSION

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The project design meets the intent of the Town of Easton's Stormwater Management Ordinance for both water quality treatment and water quantity control.

Of the available, and suitable, non-structural ESD practices appropriate for use on this commercial site, micro bio-retention, rain garden and grass swales represent the most appropriate BMPs for use.

As demonstrated, the project design has incorporated planning and development strategies and has evaluated ESD practices including Alternative Surfaces, Non-Structural Practices and Micro-Scale Practices for application and compatibility with the existing site conditions, project design objectives and required ESD design parameters. ESD has been met to the MEP for this industrial site.

Quantitative management is required only for the drainage areas at the north-west of the site and will consist of above and below grade detention within the proposed two MBR locations and a detention pond. The quantitative management also meets town requirements.

It is respectfully requested that the stormwater analysis and report and project design be approved as presented.

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# *APPENDIX A*

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- NRCS SOILS MAP
- GEOTECHNICAL EVALUATION REPORT

Soil Map—Talbot County, Maryland  
(Highland TCP, LLC)

76° 51' W

76° 4' 51' W

38° 47' 38" N

38° 47' 38" N



38° 47' 28" N

38° 47' 28" N

76° 51' W

76° 4' 51' W



Map Scale: 1:1,530 if printed on A portrait (8.5" x 11") sheet.

0 20 40 80 120 Meters

0 50 100 200 300 Feet

Map projection: Web Mercator Corner coordinates: WGS84



Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey

11/17/2015  
Page 1 of 2  
Page 126 of 202

## Map Unit Legend

| Talbot County, Maryland (MD041)    |                                           |              |                |
|------------------------------------|-------------------------------------------|--------------|----------------|
| Map Unit Symbol                    | Map Unit Name                             | Acres in AOI | Percent of AOI |
| EmA                                | Elkton silt loam, 0 to 2 percent slopes   | 1.1          | 22.1%          |
| MtB                                | Mattapex silt loam, 2 to 5 percent slopes | 0.0          | 0.2%           |
| W                                  | Water                                     | 0.4          | 8.3%           |
| WoA                                | Woodstown loam, 0 to 2 percent slopes     | 1.4          | 28.0%          |
| WoB                                | Woodstown loam, 2 to 5 percent slopes     | 1.5          | 30.8%          |
| Zk                                 | Zekiah silt loam, frequently flooded      | 0.5          | 10.6%          |
| <b>Totals for Area of Interest</b> |                                           | <b>4.9</b>   | <b>100.0%</b>  |



December 29, 2015

Our Job No.: 15681

**HIGHLAND TCP, LLC  
8859 Mistletoe Drive  
Suite F  
Easton, Maryland 21601**

Attention: Mr. Doug James

Reference: Preliminary Subsurface Investigation and Geotechnical  
Evaluation for Lot 14 – Talbot Commerce Park  
Talbot County - Easton, Maryland

Dear Mr. James:

In accordance with our proposal, we have completed an investigation and geotechnical evaluation for the construction proposed at Lot 14 in the Talbot Commerce Park located in Easton, Maryland. The purpose of this investigation is to evaluate the subsurface soil and groundwater conditions on the project site and prepare preliminary recommendations for site development and the design of foundations, slabs, pavements and stormwater management (SWM) facilities. This investigation included review of geological literature available for the subject property, drilling standard penetration test borings and shallow hand auger probes, and performance of field infiltration tests. Our findings, analysis and preliminary recommendations are presented herein.

We were provided with an electronic version of the preliminary site plan and existing conditions plan, prepared by Lane Engineering LLC, entitled: *Site Plan, Lot 14 Highland TCP, LLC Talbot Commerce Park*, dated September 10, 2015.

## **SITE DESCRIPTION**

The site is located on the east side of Mary Road, in the Talbot Commerce Park, in Easton, Maryland. The site consists of approximately 4.8 acres lying in the northeast corner of the intersection of Mary Road and Mistletoe Drive. The site generally consists of an open, grassed building lot.

The site surface drains naturally from the south to north, towards the existing SWM pond and Forest Conservation Area, located along the north property boundary line. The ground surface was generally dry and stable throughout the site at the time of the investigation. Water was present in the existing SWM pond.

## **PROPOSED CONSTRUCTION**

The proposed development will include construction of a commercial office building with associated pavements, utilities and storm-water management (SWM) features. We understand that the building will most likely be a 1 story pre-engineered metal building with a concrete slab-on-grade. We understand that the SWM Ponds will be designed as retention basins and the excavated soils will be used for mass site grading for building pads and roadways. From review of existing conditions, it is assumed that cuts and fills on the order of 1 to 2 feet are anticipated. At the time of this investigation, site grading plans and construction drawings were not available.

## **INVESTIGATION**

In order to examine the soil conditions on this site we have directed the drilling of 4 standard penetration test (SPT) borings and 4 shallow hand auger probes. The test borings, labeled as Borings B-1 through B-4, were drilled within the proposed building locations. The test borings were advanced with hollow stem augers and were drilled to depths ranging from 21 to 25 feet below the existing ground surface. The auger probes are labeled as Auger Probes AP-1 through AP-4 and were drilled in the proposed pavement areas to depths of 5 feet below the current surface. In addition 2 auger probes, labeled Auger Probe I-1 and I-2, were drilled in the locations of the proposed SWM features. The SWM auger probes were drilled to depths of 9 feet below the existing surface. The locations of the borings and auger probes are shown on the attached Boring Location Plan, included as Figure 1. The Boring Location Plan is a version of the electronic site plan, modified to indicate the boring and auger probe locations.

Standard penetration tests (SPT) were taken at close intervals in the borings from the surface to ten feet and at five foot intervals thereafter. Standard penetration testing involves driving a 2-inch O.D., 1¾ -inch I.D., split spoon sampler with a 140-pound hammer free-falling 30-inches. The SPT N-value, given as blows per foot (bpf), is defined as the total number of blows required to drive the sampler from 6-inches to 18-inches. Split spoon samples were obtained and transported to our laboratory for review and classification. The samples were visually identified in general accordance with Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) ASTM Designation D-2488. Detailed descriptions of the soils are indicated on the attached test boring logs.

In addition to the test borings and auger probes drilled, 2 infiltration tests were conducted. The tests were conducted following the Maryland Department of Environment *2000 Maryland Stormwater Design Manual, Testing Requirements for Infiltration Bioretention and Sand Filters* (appendix D.1). The infiltration tests were conducted at 2.5 and 3.0 below the existing ground surface. The infiltration rates were found to range from

0.25 and 0.30 inches per hour. The infiltration test data sheets are included at the end of this report.

## **GEOLOGY**

According to the *Geologic Map of Talbot County, Maryland, (Owens and Denny 1986)*, the geologic unit underlying the site is the Kent Island Formation.

The Kent Island Formation is described as interstratified silt, sand, and clay. In places, the fine sediment contains abundant organic matter. The eastern limit of the Kent Island plain is a prominent west-facing escarpment. The toe of the scarp is about elevation 25, and the crest ranges from elevation 50 to 60. The Formation ranges from about 10 to 60 feet in thickness. The base of the unit is at the bottom of a gravel bed overlying a dark-gray, clayey silt, or loose white micaceous sand, which is the lower part of the Chesapeake Group.

In Talbot County, the Chesapeake Group is undivided and is generally described as largely interbedded, gray to dark-gray, massive to finely laminated silt and clayey silt and yellow to white, fine-grained, massive, loose, micaceous, slightly feldspathic quartz sand.

## **SUBSURFACE CONDITIONS**

The subsurface conditions encountered in the test borings and auger probes are consistent with the findings of the geology as described above. Topsoil at the existing surface was found to range from 2 to 3 inches in thickness. Below the topsoil the soils encountered consist primarily of sand underlain with clay. The sands are generally silty, and contain varying amounts of clay. The sand extends to depths of 7.5 to 10 feet below the existing surface. Clay was encountered at depths of 7.5 to 10 feet below the surface. The clay is estimated to be approximately 10 feet in thickness.

Previously placed uncontrolled fill was identified at test Boring B-1. The fill consists of sand and extends from the existing surface to a depth of 5 feet below the surface. The fill is underlain with 6 inches of topsoil.

The standard penetration test resistance 'N' values indicate that the natural sands can be characterized as loose to medium dense. The fill soils are loose to medium dense. The clay is soft to stiff.

Water was encountered at depths of 8 to 14 feet below the ground surface at the time of test drilling. After 24 hours, the depth to groundwater was recorded at depths of 3.5 to 5 feet below the ground surface.

## **ANALYSIS/DISCUSSION**

Based on our findings the site is satisfactory for the proposed construction given that the following geotechnical recommendations are followed. Based on the results of this investigation, the subsurface conditions encountered are satisfactory to support the proposed structures with spread footing foundations. Based on our evaluation of the SPT data, spread footing foundations can be proportioned for an allowable soil contact pressure equal to 1,500 pounds per square foot (psf).

The previously placed fill identified in the vicinity of Boring B-1 will have to be improved prior to placement of new fill and foundations. The improvement can be accomplished by undercutting, manipulating and reconstructing the existing fill soils in a controlled manner. Based on our findings we anticipate that the majority of the existing near surface fill soils can be reused as controlled compacted fill. It may be necessary to undercut, separate and replace unsuitable wet or organic soils that were identified within the existing fill soils.

The silty soils present at the ground surface, are moisture sensitive and will require close evaluation during site development. To reduce the cost associated with undercutting and/or stabilizing unsatisfactory soils, we recommend that site grading operations be planned for the dry season. We anticipate that the silty soils located immediately below the topsoil layer will exhibit movement under the weight of construction equipment, especially during wet periods. During the wet season, the near surface silty-clayey soils may become unworkable, and if disturbed by construction equipment, may require undercut/over-excavation or alternative stabilization methods. Positive surface drainage must be maintained at all times.

The soils encountered in the proposed SWM Pond areas appear satisfactory for use as fill provided the natural moisture content of the materials are dried to within 2% of the optimum moisture content for compaction. Moisture conditioning (drying) the excavated materials will likely be required. Clayey-sand will be encountered from the surface to depths of 1.5 to 3 feet below the surface. During the wet season, it will be difficult to dry and manipulate the clayey soils, and it may not be practical to use the clayey materials as structural fill. During the wet season, it may be cost effective to stockpile the clayey soils for use as fill during the dry season, or place the clayey materials in non-structural fill areas, or in areas planned for development at later phases. The cleaner sands encountered below a depth of 3 feet below the surface, are more granular soils and can be manipulated and dried with less difficulty.

The auger probes and infiltration tests performed for this investigation were conducted at arbitrary depths to obtain test data for preliminary design of the SWM features. From review of the auger probe findings, and infiltration test data, the soil conditions identified on the site do not appear conducive for infiltration due to the presence of fine grained soils. Based on these preliminary findings the SWM facilities should be designed as

conventional retention/detention facilities. When the final site grading plans are completed, our office should be contacted to conduct supplemental borings and infiltration tests at the appropriate design elevations.

The depth to groundwater may impact site development, SWM pond excavation, and utility construction. De-watering will be required for excavations made below a depth of 3 to 5 below the existing ground surface. We anticipate that the depth to groundwater will decrease during the wet season. It may be necessary to provide temporary dewatering during construction using conventional sump and pump techniques. The effectiveness of the de-watering operation will have an effect on the quality of the soil materials excavated from the SWM ponds, and the degree of drying required to achieve moisture contents within 2% of the optimum moisture content for compaction.

Laboratory testing and the design of pavements was not part of the scope of services for this preliminary investigation. However, based on our findings we anticipate that the Town of Easton pavement sections will be satisfactory for the proposed parking and drive isles. Once the final site grading plans and construction drawings are completed, our office should be contacted for additional review and comment. For budgeting purposes, we have provided preliminary pavement recommendations in the following section.

## **PRELIMINARY RECOMMENDATIONS**

Based on our findings we have prepared the following preliminary recommendations for site development. These recommendations are considered preliminary pending our review of the final site development and construction drawings.

### **Site Preparation and Earthwork Grading**

1. We recommend that earthwork grading be planned for the dry season. We recommend that all stormwater management devices be installed as quickly as possible.
2. We recommend that areas to receive fill be stripped of vegetation and topsoil prior to placing fill. The limits of stripping must extend a minimum of 5 feet beyond structure limits and 2 feet beyond pavement limits. We recommend that the ground surface to receive fill be proofrolled with a loaded tandem axle dump truck and approved by the geotechnical engineer prior to placement of fill.
3. Prior to placement of fill we recommend that the existing ground surface be compacted with a minimum of 4 passes using a 10 ton static weight vibratory compactor capable of imposing an impact force greater than 25,000 pounds. The compaction process must be performed at the stripped subgrade or below, and extend a minimum of 5 feet beyond the structure limits. We recommend that the

compaction process be monitored by Hardin-Kight Associates, Inc.

4. Upon approval of the existing subgrade, we recommend that structural fill be placed and compacted in uniform 8 inch thick layers. The material used for fill construction should meet the classification of SP, SM, SC, SW, GM, GP, and GW in accordance with USCS. We recommend that the excavated soils from the SWM Pond be moisture conditioned to within 2% of optimum for compaction. We recommend that fill below structures and pavements be compacted to a minimum of 95% of the dry maximum densities determined by the standard moisture density relationship test (ASTM D-698). We recommend that all fill placement be monitored by a geotechnical engineer or his representative.
5. We recommend that the maximum slope (cut or fill) not exceed 2:1 horizontal to vertical.
6. We recommend that the contract documents include provisions for the contractor to provide aerating/drying the excavated borrow soils from the SWM Ponds. We anticipate that de-watering will be required for the SWM Pond excavation below a depth of about 3 to 5 feet.
7. We recommend that site development and construction of structural fill be monitored by the geotechnical engineer or his representative.
8. We recommend that we be given the opportunity to review the final grading plans and construction drawings as they become available.

## **Foundations**

1. We recommend that the buildings be supported on shallow spread footing foundations bearing on firm natural subsoil or suitably compacted fill and designed for an allowable soil pressure equal to 1,500 psf. We recommend the footings be located a minimum depth of 24-inches below the finished grade for frost protection. We recommend that the footings contain a minimum of two #4 steel reinforcing bars placed continuous in the footings.
2. We recommend that footing excavations be inspected and tested by a representative of the geotechnical engineer prior to concrete placement. The geotechnical engineer or his representative shall confirm that the soils below the foundations, and to a depth of at least 3 feet below the footing bottom, are satisfactory for the support of spread footing foundations as designed. If the soils below the foundations are found to be unsatisfactory, the footing shall be modified by the geotechnical engineer in conjunction with the structural engineer.

### **Slab-On-Grade**

1. We recommend that ground floor slabs be designed as floating slabs, not rigidly connected to bearing walls or foundations to accommodate differential settlement. The slab may rest on the wall or foundation, but should not be structurally connected. The slab may be designed based on a modulus of subgrade reaction  $k = 150$  PCI provided the slab subgrade is constructed with granular soils compacted to a minimum of 95% of ASTM D698.
2. We recommend that a minimum 4-inch thick drainage layer, consisting of free draining sand or gravel, be placed beneath floor slabs to improve drainage and provide a firm level surface for concrete placement. We recommend that a plastic vapor barrier be provided between the concrete and drainage layer.

### **Pavements**

1. We recommend that the subgrade soils in areas to receive pavements be compacted to a minimum of 98% of the maximum dry density as determined in accordance with the Standard Moisture Density Relationship Test (ASTM D698).
2. We recommend that the finished base course stone be compacted to a minimum of 100% of ASTM D698.
3. We recommend that the finished base course stone be proofrolled with a loaded tandem axel dump truck and approved by the geotechnical engineer prior to placement of hot-mix asphalt.
4. For preliminary budgeting purposes we recommend the following pavement sections:

#### **Travel Lanes/Heavy Duty Area**

2" Surface Course Hot Mix Asphalt  
3" Base Course Hot Mix Asphalt  
6" Crushed Stone (compacted to 100% ASTM D698)

#### **Parking Areas/Light Duty**

1.5" Surface Course Hot Mix Asphalt  
2.5" Base Course Hot Mix Asphalt  
6" Crushed Stone (compacted to 100% ASTM D698)

## **Construction Inspection and Testing**

We recommend that the owner retain the services of a geotechnical engineer to:

1. Monitor site development and earthwork grading operations including approval of the ground surface prior to placement of fill, proofrolling, and performance of compaction tests.
2. Observe foundation construction, including inspection of the footing excavations, and perform penetration tests to confirm subfoundation soil suitability, to a minimum depth of 3 feet below the bottom of the footing.
3. Observe construction of SWM facilities.
4. To monitor pavement construction.

## **CONCLUSIONS**

Based on the findings of this investigation, the site is satisfactory for the proposed construction. The subsurface conditions are satisfactory for support of conventional foundations and slabs provided that the recommendations contained herein are followed. We anticipate that the excavated soils from the SWM features will require drying prior to use as fill. The quality of the materials and degree of manipulation required to achieve satisfactory moisture contents for compaction will depend upon the effectiveness of the de-watering operation maintained during excavation and the time of year of construction.

We recommend that we be given the opportunity to review the final grading plans and construction drawings as they become available. We recommend that our office be contacted to prepare final geotechnical recommendations once the site development drawings become finalized.

The recommendations included in this report are based on the findings at the test boring and auger probe locations and the understanding that we will be retained to monitor site development and fill construction.

## **LIMITATIONS**

This report was prepared in accordance with generally accepted practice for geotechnical engineering in this area. It is intended for the use of the client for the specific site, as shown on the boring location plan. The recommendations are based on the general description of the site development as characterized above. If the project is substantially modified, this office should be notified so that we can review our recommendations to

determine what impact the changes will have.

The soil and water conditions discussed herein represent the conditions encountered at the locations of the exploratory borings and auger probes as shown on the boring location plan. Variations in the soils between the boring and probe locations and below the depths explored should be anticipated.

Test borings and auger probe logs, and a boring location plan are enclosed for your reference. If you have any questions, please feel free to contact this office.

Very truly yours.

HARDIN-KIGHT ASSOCIATES, INC

Paul M. Till

Justin A. Frizzell, P.E.

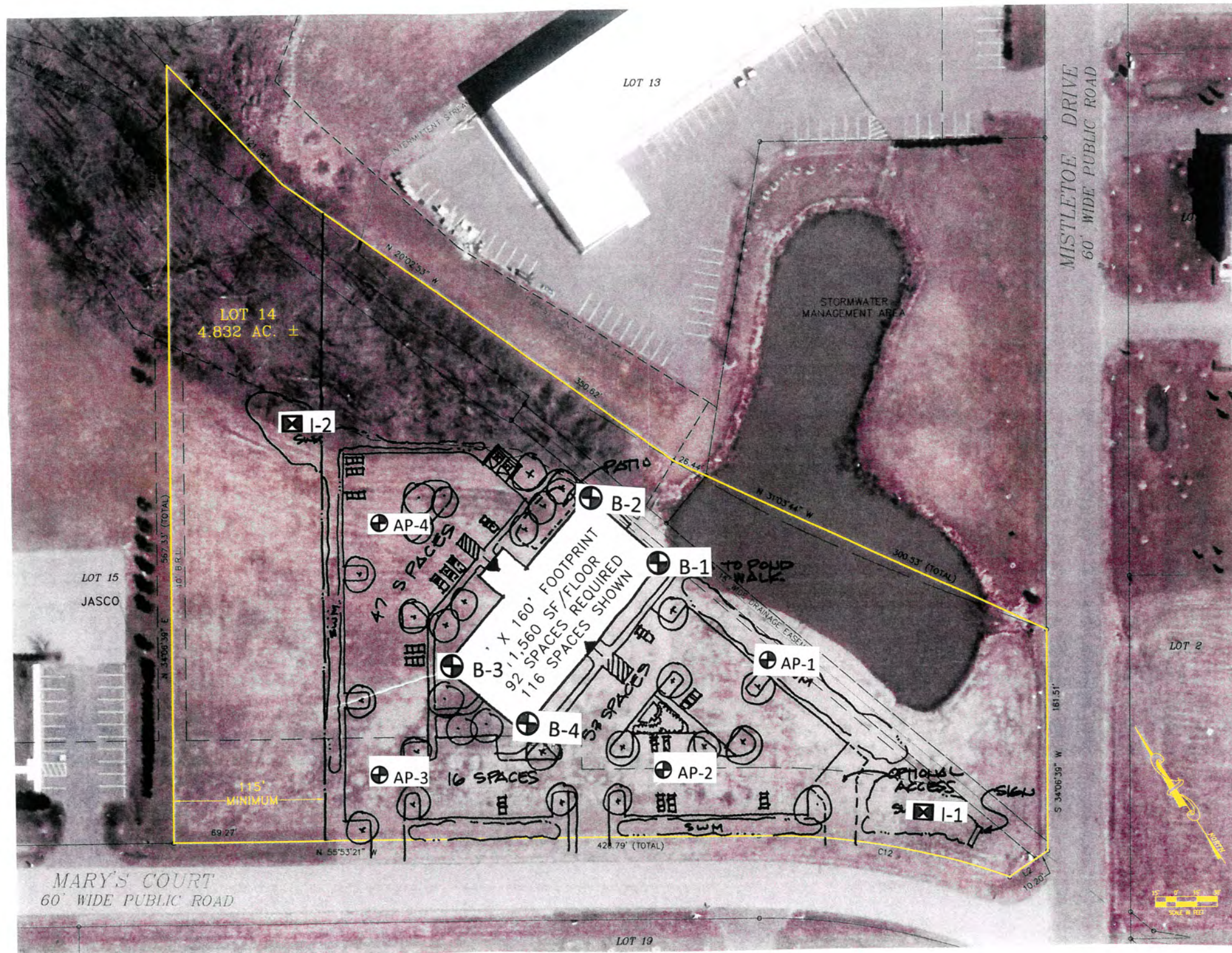


FIGURE 1

-  INFILTRATION LOCATIONS
-  BORING LOCATIONS
-  AUGER PROBE LOCATIONS

|          |        |                                                                                                                     |                |
|----------|--------|---------------------------------------------------------------------------------------------------------------------|----------------|
| PROJECT: | 15681  | LOT 14 – TALBOT COMMERCE PARK<br>MARY'S COURT, EASTON, MARYLAND<br>BORING, INFILTRATION & AUGER PROBE LOCATION PLAN | DATE: 12-2015  |
| SCALE:   | N.T.S. |                                                                                                                     | DRAWN BY: AB   |
| DRAWING: |        |                                                                                                                     | CHECKED BY: PT |
| FILE:    |        | HARDIN-KIGHT ASSOCIATES, INC.<br>CONSULTING ENGINEERS                                                               |                |

## Infiltration Test Report

|                                                                          |                         |                              |                         |                                             |                        |                          |                          |
|--------------------------------------------------------------------------|-------------------------|------------------------------|-------------------------|---------------------------------------------|------------------------|--------------------------|--------------------------|
| Project: Lot 14 Talbot Commerce Park                                     |                         |                              |                         | Job Number 15681                            |                        | Facility ID:             |                          |
| Boring: I-1                                                              |                         | Surface Elev.:               |                         | Dist. & Direction of Offset                 |                        |                          |                          |
| Boring Depth: 9                                                          |                         | Facility Bottom Elev.:       |                         | Target BoP Depth: 3                         |                        |                          |                          |
| 24hr. Water Depth:                                                       |                         | 24hr. Water Elev.:           |                         |                                             |                        |                          |                          |
| Depth Between BoF & 24hr. Water:                                         |                         |                              |                         | If Less Then:                               |                        |                          |                          |
| Pipe Type: PVC                                                           |                         | Pipe ID: I-1                 | Pipe Length 3' 4"       |                                             | Pipe Set Date: 12/1/15 | By: KB                   |                          |
| Augered To: 3                                                            |                         | Pushed From 3 to 3' 4"       |                         | Using: Sledge                               |                        |                          |                          |
| Pipe Cleaned Out By:                                                     |                         | Depth to BoP from ToP: 3' 4" |                         |                                             | Pipe Setting Notes:    |                          |                          |
| Stick-up: None                                                           |                         | BoP Depth: 3'-4"             |                         | BoP Elev.:                                  |                        |                          |                          |
| Gravel:                                                                  |                         | Depth to Gravel from ToP:    |                         | Amount Placed:                              |                        |                          |                          |
| Presoak Date: 12/1/2015                                                  |                         | Time: 9:00 AM                |                         | Water Level 12.0                            |                        | By: KB                   |                          |
| Presoak Return: 12/1/2015                                                |                         | Time: 10:00 AM               |                         | Water Level 12.5                            |                        | Depth to BoP from ToP    |                          |
| Presoak Notes:                                                           |                         |                              |                         |                                             |                        |                          |                          |
| Estimated Infiltr. Rate:                                                 |                         | in/hr.                       |                         | According to: USDA visual class. Sandy Loam |                        |                          |                          |
| Infiltr. Test Date: 12/1/2015                                            |                         | Infiltr. Test By: KB         |                         | Results Checked By:                         |                        |                          |                          |
| Start                                                                    |                         | Stop                         |                         |                                             |                        |                          |                          |
| Time                                                                     | Depth to Water from ToP | Time                         | Depth to Water from ToP | Depth Diff. in feet / inches                |                        | Time in Hours            | Infiltration Rate in/hr. |
| 10:00                                                                    | 1.04                    | 11:00                        | 1.06                    | 0.02 / 0.24                                 |                        | 1.00                     | 0.24                     |
| 11:00                                                                    | 1.06                    | 12:00                        | 1.09                    | 0.03 / 0.36                                 |                        | 1.00                     | 0.36                     |
| 12:00                                                                    | 1.09                    | 13:00                        | 1.11                    | 0.02 / 0.24                                 |                        | 1.00                     | 0.24                     |
| 13:00                                                                    | 1.11                    | 14:00                        | 1.14                    | 0.03 / 0.36                                 |                        | 1.00                     | 0.36                     |
|                                                                          |                         |                              |                         |                                             |                        |                          |                          |
|                                                                          |                         |                              |                         |                                             |                        |                          |                          |
|                                                                          |                         |                              |                         | Average of last 3 readings                  |                        |                          | 0.36                     |
|                                                                          |                         |                              |                         |                                             |                        |                          |                          |
|                                                                          |                         |                              |                         |                                             |                        |                          |                          |
|                                                                          |                         |                              |                         |                                             |                        |                          |                          |
|                                                                          |                         |                              |                         |                                             |                        |                          |                          |
|                                                                          |                         |                              |                         |                                             |                        |                          |                          |
| At End of Test: <input type="checkbox"/> pulled pipe and backfilled hole |                         |                              |                         |                                             |                        | Average = 0.36 inch/hour |                          |

N/A - Not Available or Applicable | N/E - Not Encountered | ToP - Top of Pipe | BoP - Bottom of Pipe | BoF - Bottom of Facility

Record time to nearest minute | Presoak & Infiltr. Test Water Levels to Nearest 0.01' : All Other Lengths, Depths or Elevations to Nearest 0.1'

## Infiltration Test Report

|                                                                          |                         |                              |                         |                                             |               |                               |  |
|--------------------------------------------------------------------------|-------------------------|------------------------------|-------------------------|---------------------------------------------|---------------|-------------------------------|--|
| Project: Lot 14 Talbot Commerce Park                                     |                         |                              |                         | Job Number 15681                            |               | Facility ID:                  |  |
| Boring: I-2                                                              |                         | Surface Elev.:               |                         | Dist. & Direction of Offset                 |               |                               |  |
| Boring Depth: 9                                                          |                         | Facility Bottom Elev.:       |                         | Target BoP Depth: 3                         |               |                               |  |
| 24hr. Water Depth:                                                       |                         | 24hr. Water Elev:            |                         |                                             |               |                               |  |
| Depth Between BoF & 24hr. Water:                                         |                         |                              |                         | If Less Then:                               |               |                               |  |
| Pipe Type: PVC                                                           |                         | Pipe ID: I-2                 |                         | Pipe Length 2" - 8"                         |               | Pipe Set Date: 12/1/15 By: KB |  |
| Augered To: 2'-6"                                                        |                         | Pushed From 2'-6" to 2'-8"   |                         | Using: Sledge                               |               |                               |  |
| Pipe Cleaned Out By:                                                     |                         | Depth to BoP from ToP: 2'-8" |                         | Pipe Setting Notes:                         |               |                               |  |
| Stick-up: None                                                           |                         | BoP Depth: 2'-6"             |                         | BoP Elev.:                                  |               |                               |  |
| Gravel:                                                                  |                         | Depth to Gravel from ToP:    |                         | Amount Placed:                              |               |                               |  |
| Presoak Date: 12/1/2015                                                  |                         | Time: 9:15 AM                |                         | Water Level 8.0"                            |               | By: KB                        |  |
| Presoak Return: 12/1/2015                                                |                         | Time: 10:15 AM               |                         | Water Level 8.3"                            |               | Depth to BoP from ToP         |  |
| Presoak Notes:                                                           |                         |                              |                         |                                             |               |                               |  |
| Estimated Infiltr. Rate:                                                 |                         | in/hr.                       |                         | According to: USDA visual class. Sandy Loam |               |                               |  |
| Infiltr. Test Date: 12/1/2015                                            |                         | Infiltr. Test By: KB         |                         | Results Checked By:                         |               |                               |  |
| Start                                                                    |                         | Stop                         |                         |                                             |               |                               |  |
| Time                                                                     | Depth to Water from ToP | Time                         | Depth to Water from ToP | Depth Diff. in feet / inches                | Time in Hours | Infiltration Rate in/hr.      |  |
| 10:15                                                                    | 0.69                    | 11:15                        | 0.71                    | 0.02 / 0.24                                 | 1.00          | 0.24                          |  |
| 11:15                                                                    | 0.71                    | 12:15                        | 0.73                    | 0.02 / 0.24                                 | 1.00          | 0.24                          |  |
| 12:15                                                                    | 0.73                    | 13:15                        | 0.75                    | 0.02 / 0.24                                 | 1.00          | 0.24                          |  |
| 13:15                                                                    | 0.75                    | 14:15                        | 0.77                    | 0.02 / 0.24                                 | 1.00          | 0.24                          |  |
|                                                                          |                         |                              |                         |                                             |               |                               |  |
|                                                                          |                         |                              |                         |                                             |               |                               |  |
|                                                                          |                         |                              |                         | Average of last 3 readings                  |               | 0.24                          |  |
|                                                                          |                         |                              |                         |                                             |               |                               |  |
|                                                                          |                         |                              |                         |                                             |               |                               |  |
|                                                                          |                         |                              |                         |                                             |               |                               |  |
|                                                                          |                         |                              |                         |                                             |               |                               |  |
|                                                                          |                         |                              |                         |                                             |               |                               |  |
| At End of Test: <input type="checkbox"/> pulled pipe and backfilled hole |                         |                              |                         |                                             |               | Average = 0.24 inch/hour      |  |

N/A - Not Available or Applicable | N/E - Not Encountered | ToP - Top of Pipe | BoP - Bottom of Pipe | BoF - Bottom of Facility

Record time to nearest minute | Presoak & Infiltr. Test Water Levels to Nearest 0.01' : All Other Lengths, Depths or Elevations to Nearest 0.1'

# Record of Soil Exploration

Contracted With: HIGHLAND TCP, LLC  
Projects Name: LOT 14 – TALBOT COMMERCE PARK  
Location: MARY'S COURT – EASTON, MARYLAND

Auger Probe: I-1 (page 1 of 2)  
Job #: 15681

Datum -  
Surf. Elev.  
Date Started 12/1/15

Sampler

Foreman -  
Inspector KB/CL  
Date Finished 12/1/15

| Elev. | Soil Description<br><small>Color, Moisture, Density<br/>Plasticity, Size Proportions</small> | Strata<br>Depth | Depth<br>Scale | Boring & Sample<br>Notes                                                                                      |
|-------|----------------------------------------------------------------------------------------------|-----------------|----------------|---------------------------------------------------------------------------------------------------------------|
|       | Brown, moist, fine SAND, some silt and clay (SM/SC) "POSSIBLE FILL"                          |                 |                | 3 inches topsoil & grass at surface                                                                           |
|       |                                                                                              |                 | 1.0            |                                                                                                               |
|       |                                                                                              |                 | 2.0            |                                                                                                               |
|       |                                                                                              | 3.0             | 3.0            | infiltration test conducted at 3 feet below existing surface. See infiltration test data I-1 for test results |
|       | Tan, moist, fine SAND, little to some silt (SM)                                              |                 |                |                                                                                                               |
|       |                                                                                              |                 | 4.0            |                                                                                                               |
|       |                                                                                              | 4.5             |                |                                                                                                               |
|       | Grey, moist, fine SAND, some clay little fine to medium gravel (SC)                          |                 |                |                                                                                                               |
|       |                                                                                              |                 | 5.0            |                                                                                                               |
|       |                                                                                              |                 | 6.0            |                                                                                                               |
|       |                                                                                              |                 | 7.0            |                                                                                                               |
|       |                                                                                              | 8.0             | 8.0            | water encountered at 8.0 feet                                                                                 |
|       |                                                                                              |                 |                |                                                                                                               |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION \_\_8.0\_\_ FT  
AFTER 1.0 HRS \_\_5.5\_\_ FT  
AFTER 24 HRS \_\_\_\_\_ FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

# Record of Soil Exploration

Contracted With: HIGHLAND TCP, LLC  
Projects Name: LOT 14 – TALBOT COMMERCE PARK  
Location: MARY'S COURT – EASTON, MARYLAND  
Sampler

Auger Probe: I-1 (page 2 of 2)  
Job #: 15681

Datum -  
Surf. Elev.  
Date Started 12/1/15

Foreman -  
Inspector KB/CL  
Date Finished 12/1/15

| Elev. | Soil Description<br><small>Color, Moisture, Density<br/>Plasticity, Size Proportions</small> | Strata<br>Depth | Depth<br>Scale | Boring & Sample<br>Notes |
|-------|----------------------------------------------------------------------------------------------|-----------------|----------------|--------------------------|
|       | Grey, moist to wet, fine to medium<br>SAND, some to little silt (SM)                         | 9.0             | 9.0            |                          |
|       | Bottom of Auger Probe at 9.0 feet                                                            |                 | 10.0           |                          |
|       |                                                                                              |                 | 11.0           |                          |
|       |                                                                                              |                 | 12.0           |                          |
|       |                                                                                              |                 | 13.0           |                          |
|       |                                                                                              |                 | 14.0           |                          |
|       |                                                                                              |                 | 15.0           |                          |
|       |                                                                                              |                 | 16.0           |                          |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION \_\_\_\_\_ FT  
AFTER HRS \_\_\_\_\_ FT  
AFTER 24 HRS \_\_\_\_\_ FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

# Record of Soil Exploration

Contracted With: HIGHLAND TCP, LLC  
Projects Name: LOT 14 – TALBOT COMMERCE PARK  
Location: MARY'S COURT – EASTON, MARYLAND  
Sampler

Auger Probe: I-2 (page 1 of 2)  
Job #: 15681

Datum -  
Surf. Elev.  
Date Started 12/1/15

Foreman -  
Inspector KB/CL  
Date Finished 12/1/15

| Elev. | Soil Description<br><small>Color, Moisture, Density<br/>Plasticity, Size Proportions</small> | Strata<br>Depth | Depth<br>Scale           | Boring & Sample<br>Notes                                                                                                                                     |
|-------|----------------------------------------------------------------------------------------------|-----------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       | Brown, moist, fine SAND, some silt and clay (SM/SC)                                          |                 | 1.0<br>2.0<br>3.0<br>3.5 | 3 inches topsoil and grass at surface<br><br>infiltration test conducted at 2.5 feet below existing surface. See infiltration test data I-2 for test results |
|       | Dark grey, moist, fine SAND, some silt (SM)                                                  |                 | 4.0<br>4.5               | water encountered at 8.5 feet                                                                                                                                |
|       | Brown/dark grey to olive, moist, fine SAND, some clay, little fine to medium Gravel (SC)     |                 | 5.0<br>6.0<br>7.0<br>8.0 |                                                                                                                                                              |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION \_\_8.0\_\_ FT  
AFTER 5 HRS \_\_5.0\_\_ FT  
AFTER 24 HRS \_\_\_\_\_ FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

# Record of Soil Exploration

Contracted With: HIGHLAND TCP, LLC  
Projects Name: LOT 14 – TALBOT COMMERCE PARK  
Location: MARY'S COURT – EASTON, MARYLAND  
Sampler

Auger Probe: I-2 (page 2 of 2)  
Job #: 15681

Datum -  
Surf. Elev.  
Date Started 12/1/15

Foreman -  
Inspector KB/CL  
Date Finished 12/1/15

| Elev. | Soil Description<br>Color, Moisture, Density<br>Plasticity, Size Proportions               | Strata<br>Depth | Depth<br>Scale | Boring & Sample<br>Notes |
|-------|--------------------------------------------------------------------------------------------|-----------------|----------------|--------------------------|
|       | Brown/dark grey to olive, moist, fine SAND<br>some clay, little fine to medium gravel (SC) | 8.5             |                |                          |
|       | Grey, wet, fine to medium SAND, little<br>to some silt (SM)                                | 9.0             | 9.0            |                          |
|       | Bottom of Auger Probe at 9.0 feet                                                          |                 | 10.0           |                          |
|       |                                                                                            |                 | 11.0           |                          |
|       |                                                                                            |                 | 12.0           |                          |
|       |                                                                                            |                 | 13.0           |                          |
|       |                                                                                            |                 | 14.0           |                          |
|       |                                                                                            |                 | 15.0           |                          |
|       |                                                                                            |                 | 16.0           |                          |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION \_\_\_\_\_ FT  
AFTER HRS \_\_\_\_\_ FT  
AFTER 24 HRS \_\_\_\_\_ FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

# Record of Soil Exploration

Contracted With: HIGHLAND TCP, LLC  
Projects Name: LOT 14 – TALBOT COMMERCE PARK  
Location: MARY'S COURT – EASTON, MARYLAND

Boring: B - 1  
Job #: 15681

Sampler  
Datum - Hammer Wt. 140 Lbs. Rock Core Dia. -  
Surf. Elev. Hammer Drop 30 in. Hole Diameter 4"  
Date Started 11/23/15 Pipe Size 2 in. Boring Method HSA/MD  
Foreman  
Inspector PAUL TILL  
Date Finished 11/23/15

| Elev. | Soil Description<br>Color, Moisture, Density<br>Plasticity, Size Proportions   | Strata<br>Depth | Depth<br>Scale | Sample |            |     |      |      | Boring & Sample<br>Notes                                                                                                  |
|-------|--------------------------------------------------------------------------------|-----------------|----------------|--------|------------|-----|------|------|---------------------------------------------------------------------------------------------------------------------------|
|       |                                                                                |                 |                | Cond   | Blows / 6" | No. | Type | Rec. |                                                                                                                           |
|       | Tan/grey, moist, loose to medium dense, fine, silty-clayey SAND (SC/SM) "FILL" | 5.0             | 5              | I      | 2-2-3      | 1   | DS   | 11"  | 2 inches topsoil & grass at existing surface<br>cemented sand lens in S-4<br>Water encountered at 14 feet. while drilling |
|       |                                                                                | 6.0             |                | I      | 2-4-7      | 2   | DS   | 15"  |                                                                                                                           |
|       | Topsoil                                                                        |                 |                | D      | 1-2-1      | 3   | DS   | 8"   |                                                                                                                           |
|       | Rust, moist, loose, fine SAND with clay (SC)                                   | 10.0            | 10             | I      | 1-2-4      | 4   | DS   | 15"  |                                                                                                                           |
|       | Grey to grey/olive, stiff CLAY (CL)                                            |                 |                | I      | 3-3-4      | 5   | DS   | 18"  | cave at 23 feet                                                                                                           |
|       |                                                                                |                 | 15             | I      | 3-3-5      | 6   | DS   | 18"  |                                                                                                                           |
|       |                                                                                | 20.0            | 20             | D      | 8-9-12     | 7   | DS   | 18"  |                                                                                                                           |
|       | Grey/olive, wet, medium dense, fine SAND with silt & shell fragments (SM)      | 25.0            | 25             | D      | 7-7-9      | 8   | DS   |      |                                                                                                                           |
|       | Bottom of Boring at 25.0 feet                                                  |                 |                |        |            |     |      |      |                                                                                                                           |
|       |                                                                                |                 | 30             |        |            |     |      |      |                                                                                                                           |
|       |                                                                                |                 | 35             |        |            |     |      |      |                                                                                                                           |
|       |                                                                                |                 | 40             |        |            |     |      |      |                                                                                                                           |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION 8.0 FT  
AFTER 6 HRS 5.0 FT  
AFTER 24 HRS FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

STANDARD PENETRATION TEST - DRIVING 2" OD SAMPLER WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS

# Record of Soil Exploration

Contracted With: **HIGHLAND TCP, LLC**  
Projects Name: **LOT 14 – TALBOT COMMERCE PARK**  
Location: **MARY'S COURT – EASTON, MARYLAND**

Boring: **B - 2**  
Job #: **15681**

Datum: - Hammer Wt. **140** Lbs. Rock Core Dia. -  
Surf. Elev. Hammer Drop **30** in. Hole Diameter **4"**  
Date Started **11/23/15** Pipe Size **2** in. Boring Method **HSA/MD**  
Foreman: **PAUL TILL**  
Inspector: **PAUL TILL**  
Date Finished: **11/23/15**

| Elev. | Soil Description<br>Color, Moisture, Density<br>Plasticity, Size Proportions | Strata<br>Depth | Depth<br>Scale | Sample |            |     |      |      | Boring & Sample<br>Notes                                        |
|-------|------------------------------------------------------------------------------|-----------------|----------------|--------|------------|-----|------|------|-----------------------------------------------------------------|
|       |                                                                              |                 |                | Cond   | Blows / 6" | No. | Type | Rec. |                                                                 |
|       | Rust/tan/grey, moist, loose, fine, silty-clayey SAND (SC/SM)                 |                 |                | D      | 4-3-2      | 1   | DS   | 15"  | 2 inches topsoil & grass at surface                             |
|       |                                                                              |                 |                | D      | 2-2-3      | 2   | DS   | 13"  | Water encountered at 9 feet while drilling                      |
|       |                                                                              |                 | 5              | I      | 2-2-3      | 3   | DS   | 12"  |                                                                 |
|       |                                                                              | 7.5             |                |        |            |     |      |      |                                                                 |
|       | Grey, stiff CLAY (CL)                                                        |                 |                | I      | 2-3-5      | 4   | DS   | 16"  | Auger refusal at 10 feet. Offset hole 20 feet south & continued |
|       |                                                                              |                 | 10             | I      | 4-6-6      | 5   | DS   | 18"  |                                                                 |
|       |                                                                              |                 |                |        |            |     |      |      |                                                                 |
|       |                                                                              |                 | 15             | I      | 4-6-5      | 6   | DS   | 18"  | caved at 9.5 feet                                               |
|       |                                                                              | 18.0            |                |        |            |     |      |      |                                                                 |
|       | Grey, wet, medium, fine SAND with clay & shells (SM/SC)                      |                 |                |        |            |     |      |      |                                                                 |
|       |                                                                              |                 | 20             |        | 6-8-11     | 7   | DS   |      |                                                                 |
|       |                                                                              | 21.5            |                |        |            |     |      |      |                                                                 |
|       | Bottom of Boring at 21.5 feet                                                |                 |                |        |            |     |      |      |                                                                 |
|       |                                                                              |                 | 25             |        |            |     |      |      |                                                                 |
|       |                                                                              |                 | 30             |        |            |     |      |      |                                                                 |
|       |                                                                              |                 | 35             |        |            |     |      |      |                                                                 |
|       |                                                                              |                 | 40             |        |            |     |      |      |                                                                 |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION 6.0 FT  
AFTER 4 HRS 3.5 FT  
AFTER 24 HRS        FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

STANDARD PENETRATION TEST - DRIVING 2" OD SAMPLER WITH 140# HAMMER FALLING 30"; COUNT MADE AT 6" INTERVALS

# Record of Soil Exploration

Contracted With: HIGHLAND TCP, LLC  
Projects Name: LOT 14 – TALBOT COMMERCE PARK  
Location: MARY'S COURT – EASTON, MARYLAND

Boring: B - 3  
Job #: 15681

Datum - Hammer Wt. 140 Lbs. Rock Core Dia. -  
Surr. Elev. Hammer Drop 30 in. Hole Diameter 4"  
Date Started 11/23/15 Pipe Size 2 in. Boring Method HSA/MD  
Foreman  
Inspector PAUL TILL  
Date Finished 11/23/15

| Elev. | Soil Description<br>Color, Moisture, Density<br>Plasticity, Size Proportions         | Strata<br>Depth | Depth<br>Scale | Sample |            |     |      |      | Boring & Sample<br>Notes                                                              |
|-------|--------------------------------------------------------------------------------------|-----------------|----------------|--------|------------|-----|------|------|---------------------------------------------------------------------------------------|
|       |                                                                                      |                 |                | Cond   | Blows / 6" | No. | Type | Rec. |                                                                                       |
|       | Tan to rust, moist to wet, loose to medium dense, fine SAND with silt & clay (SM/SC) |                 |                | D      | 2-2-3      | 1   | DS   | 13"  | 2 inches topsoil & grass at surface<br><br>water encountered at 8 feet while drilling |
|       |                                                                                      |                 |                | D      | 6-7-4      | 2   | DS   | 14"  |                                                                                       |
|       |                                                                                      |                 | 5              | D      | 3-4-4      | 3   | DS   | 15"  |                                                                                       |
|       |                                                                                      | 10.0            | 10             | D      | 2-2-3      | 4   | DS   | 17"  |                                                                                       |
|       | Grey/olive, soft to stiff CLAY (CL)                                                  |                 |                | I      | 1-2-2      | 5   | DS   | 17"  | Pocket penetrometer reading in samples<br>S-5 1.0 TSF<br>S-6 1.5 TSF                  |
|       |                                                                                      |                 | 15             | I      | 1-2-3      | 6   | DS   | 18"  |                                                                                       |
|       |                                                                                      | 21.5            | 20             |        | 2-4-5      | 7   | DS   | 18"  |                                                                                       |
|       | Bottom of Boring at 21.5 feet                                                        |                 | 25             |        |            |     |      |      |                                                                                       |
|       |                                                                                      |                 | 30             |        |            |     |      |      |                                                                                       |
|       |                                                                                      |                 | 35             |        |            |     |      |      |                                                                                       |
|       |                                                                                      |                 | 40             |        |            |     |      |      |                                                                                       |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION \_\_\_ FT  
AFTER \_\_\_ HRS \_\_\_ FT  
AFTER \_\_\_ 24 HRS \_\_\_ FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

STANDARD PENETRATION TEST - DRIVING 2" OD SAMPLER WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS

# Record of Soil Exploration

Contracted With: **HIGHLAND TCP, LLC**  
Projects Name: **LOT 14 – TALBOT COMMERCE PARK**  
Location: **MARY'S COURT – EASTON, MARYLAND**

Boring: **B - 4**  
Job #: **15681**

Sampler  
Datum - Hammer Wt. **140** Lbs. Rock Core Dia. -  
Surf. Elev. Hammer Drop **30** in. Hole Diameter **4"**  
Date Started **11/23/15** Pipe Size **2** in. Boring Method **HSA/MD**  
Foreman  
Inspector **PAUL TILL**  
Date Finished **11/23/15**

| Elev. | Soil Description<br>Color, Moisture, Density<br>Plasticity, Size Proportions    | Strata<br>Depth | Depth<br>Scale | Sample |            |     |      |      | Boring & Sample<br>Notes                    |
|-------|---------------------------------------------------------------------------------|-----------------|----------------|--------|------------|-----|------|------|---------------------------------------------|
|       |                                                                                 |                 |                | Cond   | Blows / 6" | No. | Type | Rec. |                                             |
|       | Tan/brown, moist, soft SILT with some fine SAND (ML)                            | 1.0             |                | I      | 2-2-3      | 1   | DS   | 11"  | 2 inches topsoil & grass at surface         |
|       | Rust to grey, moist to wet, loose, fine to medium SAND with silt & clay (SC/SM) |                 | 5              | I      | 4-5-4      | 2   | DS   | 10"  |                                             |
|       |                                                                                 |                 |                | I      | 2-2-3      | 3   | DS   | 12"  |                                             |
|       |                                                                                 | 10.0            | 10             | I      | 2-2-3      | 4   | DS   | 18"  | water encountered at 8 feet. while drilling |
|       | Grey, very soft to very stiff CLAY with some fine sand (CL)                     |                 | 15             | D      | 1-1-1      | 5   | DS   | 18"  |                                             |
|       |                                                                                 |                 | 20             |        | 3-3-5      | 6   | DS   | 18"  | Hole caved at 20 feet                       |
|       | Bottom of Boring at 21.5 feet                                                   | 21.0            | 21             | I      | 7-10-11    | 7   | DS   | 18"  |                                             |
|       |                                                                                 |                 | 25             |        |            |     |      |      |                                             |
|       |                                                                                 |                 | 30             |        |            |     |      |      |                                             |
|       |                                                                                 |                 | 35             |        |            |     |      |      |                                             |
|       |                                                                                 |                 | 40             |        |            |     |      |      |                                             |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION \_ 8.0 \_ FT  
AFTER \_ HRS \_ FT  
AFTER \_ 24 HRS \_ FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

STANDARD PENETRATION TEST - DRIVING 2" OD SAMPLER WITH 140# HAMMER FALLING 30": COUNT MADE AT 6" INTERVALS

# Record of Soil Exploration

Contracted With: **HIGHLAND TCP, LLC**  
Projects Name: **LOT 14 – TALBOT COMMERCE PARK**  
Location: **MARY'S COURT – EASTON, MARYLAND**  
Sampler

Auger Probe: **AP-1**  
Job #: **15681**

Datum: **-**  
Surf. Elev.: **-**  
Date Started: **12/1/15**

Foreman: **-**  
Inspector: **KB/CL**  
Date Finished: **12/1/15**

| Elev. | Soil Description<br>Color, Moisture, Density<br>Plasticity, Size Proportions                            | Strata<br>Depth | Depth<br>Scale | Boring & Sample<br>Notes              |
|-------|---------------------------------------------------------------------------------------------------------|-----------------|----------------|---------------------------------------|
|       | Tan, moist, fine, silty SAND (SM)                                                                       | 1.0             | 1.0            | 3 inches topsoil and grass at surface |
|       | Brown with rust, moist, fine SAND, some clay (SC)                                                       | 4.0             | 2.0            |                                       |
|       | Rust, grey, brown, moist, fine to medium SAND, some silt and clay, little fine to medium gravel (SM/SC) | 5.0             | 3.0            |                                       |
|       | Bottom of Auger Probe at 5.0 feet                                                                       |                 | 4.0            |                                       |
|       |                                                                                                         |                 | 5.0            |                                       |
|       |                                                                                                         |                 | 6.0            |                                       |
|       |                                                                                                         |                 | 7.0            |                                       |
|       |                                                                                                         |                 | 8.0            |                                       |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION \_dry\_\_\_\_ FT  
AFTER HRS \_\_\_\_\_ FT  
AFTER 24 HRS \_\_\_\_\_ FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

# Record of Soil Exploration

Contracted With: HIGHLAND TCP, LLC  
Projects Name: LOT 14 – TALBOT COMMERCE PARK  
Location: MARY'S COURT – EASTON, MARYLAND  
Sampler

Auger Probe: AP-2  
Job #: 15681

Datum -  
Surf. Elev.  
Date Started 12/1/15

Foreman -  
Inspector KB/CL  
Date Finished 12/1/15

| Elev. | Soil Description<br>Color, Moisture, Density<br>Plasticity, Size Proportions | Strata<br>Depth | Depth<br>Scale | Boring & Sample<br>Notes              |
|-------|------------------------------------------------------------------------------|-----------------|----------------|---------------------------------------|
|       | Brown, moist, fine SAND, silt and clay (SC/SM)                               | 1.0             | 1.0            | 2 inches topsoil and grass at surface |
|       | Tan/grey, moist, fine SAND, some clay (SC)                                   | 3.0             | 2.0            |                                       |
|       | Grey, rust, moist, fine to medium SAND, some silt and clay (SC/SM)           | 5.0             | 3.0            |                                       |
|       | Bottom of Auger Probe at 5.0 feet                                            |                 | 4.0            |                                       |
|       |                                                                              |                 | 5.0            |                                       |
|       |                                                                              |                 | 6.0            |                                       |
|       |                                                                              |                 | 7.0            |                                       |
|       |                                                                              |                 | 8.0            |                                       |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION \_\_\_\_\_ FT  
AFTER HRS \_\_\_\_\_ FT  
AFTER 24 HRS \_\_\_\_\_ FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

# Record of Soil Exploration

Contracted With: HIGHLAND TCP, LLC  
Projects Name: LOT 14 – TALBOT COMMERCE PARK  
Location: MARY'S COURT – EASTON, MARYLAND  
Sampler

Auger Probe: AP-3  
Job #: 15681

Datum -  
Surf. Elev.  
Date Started 12/1/15

Foreman -  
Inspector KB/CL  
Date Finished 12/1/15

| Elev. | Soil Description<br>Color, Moisture, Density<br>Plasticity, Size Proportions                      | Strata<br>Depth | Depth<br>Scale | Boring & Sample<br>Notes              |
|-------|---------------------------------------------------------------------------------------------------|-----------------|----------------|---------------------------------------|
|       | Tan, moist, fine SAND, some silt and clay (SC/SM)                                                 | 1.0             | 1.0            | 2 inches topsoil and grass at surface |
|       | Brown, moist, fine SAND, some clay (SC)                                                           | 3.0             | 2.0            |                                       |
|       | Tan, orange, moist, fine to medium SAND, some silt, trace clay, little fine to coarse gravel (SM) | 5.0             | 3.0            |                                       |
|       | Bottom of Auger Probe at 5.0 feet                                                                 |                 | 4.0            |                                       |
|       |                                                                                                   |                 | 5.0            |                                       |
|       |                                                                                                   |                 | 6.0            |                                       |
|       |                                                                                                   |                 | 7.0            |                                       |
|       |                                                                                                   |                 | 8.0            |                                       |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION \_dry\_\_\_\_ FT  
AFTER HRS \_\_\_\_\_ FT  
AFTER 24 HRS \_\_\_\_\_ FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

# Record of Soil Exploration

Contracted With: HIGHLAND TCP, LLC  
Projects Name: LOT 14 – TALBOT COMMERCE PARK  
Location: MARY'S COURT – EASTON, MARYLAND  
Sampler

Auger Probe: AP-4  
Job #: 15681

Datum -  
Surf. Elev.  
Date Started 12/1/15

Foreman -  
Inspector KB/CL  
Date Finished 12/1/15

| Elev. | Soil Description<br>Color, Moisture, Density<br>Plasticity, Size Proportions                  | Strata<br>Depth | Depth<br>Scale | Boring & Sample<br>Notes              |
|-------|-----------------------------------------------------------------------------------------------|-----------------|----------------|---------------------------------------|
|       | Tan, moist, fine SAND, some silt and clay (SC/SM)                                             | 1.0             | 1.0            | 3 inches topsoil and grass at surface |
|       | Tan, moist, fine SAND, little silt (SM)                                                       | 3.0             | 2.0            |                                       |
|       | Grey, tan, moist, fine to medium SAND some silt and clay, trace fine to medium gravel (SM/SC) | 4.5             | 3.0            |                                       |
|       | Tan, rust, moist, fine to medium SAND some clay (SC)                                          | 5.0             | 4.0            |                                       |
|       | Bottom of Auger Probe at 5.0 feet                                                             |                 | 5.0            |                                       |
|       |                                                                                               |                 | 6.0            |                                       |
|       |                                                                                               |                 | 7.0            |                                       |
|       |                                                                                               |                 | 8.0            |                                       |

## Sampler Type

DS - DRIVEN SPLIT SPOON  
PT - PRESSED SHELBY TUBE  
CA - CONTINUOUS FLIGHT AUGER  
RC - ROCK CORE

## Sample Conditions

D - DISINTEGRATED  
I - INTACT  
U - UNDISTURBED  
L - LOST

## Ground Water Depth

AT COMPLETION \_\_\_\_\_ FT  
AFTER HRS \_\_\_\_\_ FT  
AFTER 24 HRS \_\_\_\_\_ FT

## Boring Method

HSA - HOLLOW STEM AUGERS  
CFA - CONTINUOUS FLIGHT AUGERS  
DC - DRIVEN CASING  
MD - MUD DRILLING

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# *APPENDIX B*

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- EXISTING DRAINAGE AREA EXHIBIT
- PROPOSED DRAINAGE AREA EXHIBIT





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# *APPENDIX C*

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- ESD CALCULATIONS

## Maryland Environmental Site Design (ESD) Computations

Project: Highland TCP By WC Job # 140262  
 Location: Lot 14, Mary's Court, Easton, MD 21601 Date 4/21/2016 File # A037

### Step 1 - Determine Stormwater Management Requirements

*Initial Site Assessment (Site Data):*

Total Disturbance Area (LOD): **90,162** sf 2.07 ac

Soil Types:

| HSG     | A | B | C             | D |
|---------|---|---|---------------|---|
| Area    |   |   | <b>90,162</b> |   |
| Percent |   |   | 100.0         |   |

#### Proposed Layout

Impervious Cover: **59,248** sf 1.36 ac

Percent Impervious (I) 66 %

*Determine RCNs for Wooded Conditions:*

| HSG     | A  | B  | C      | D  |
|---------|----|----|--------|----|
| Area    |    |    | 90,162 |    |
| Percent |    |    | 100.0  |    |
| RCN     | 38 | 55 | 70     | 77 |

Weighted RCN: **70**

*Determine ESD Targets:*

$$R_v = 0.05 + 0.009(I)$$

$$= 0.64$$

From Table 5.3 and

%I = 66

| HSG          | A | B | C          | D |
|--------------|---|---|------------|---|
| Area         |   |   | 90,162     |   |
| Target $P_E$ |   |   | <b>1.0</b> |   |

Composite Target  $P_E$  (in.): **1.00** (Treatment for  $P_E = 1$  in.)

$$ESD_v = \frac{(P_E)(R_v)(A)}{12}$$

$$= 4,819 \text{ cf}$$

### Step 2 - Preliminary ESD Options

Please refer to the Stormwater Management Report

### Step 3 - ESD Design

Evaluation of specific ESD treatment practices for the project on the following sheets.

# DA-1 DRAINAGE AREA

## Determine Stormwater Management Requirements

*Initial Site Assessment (Site Data):*

Total Drainage Area: 17,774 sf      0.41 ac

Soil Types:

|         |   |   |        |   |
|---------|---|---|--------|---|
| HSG     | A | B | C      | D |
| Area    |   |   | 17,774 |   |
| Percent |   |   | 100.0  |   |

### Proposed Layout

Impervious Cover: 11,188 sf 0.26 ac

|                        |      |
|------------------------|------|
| Percent Impervious (I) | 63 % |
|------------------------|------|

*Determine RCNs for Wooded Conditions:*

| HSG     | A  | B  | C      | D  |
|---------|----|----|--------|----|
| Area    |    |    | 17,774 |    |
| Percent |    |    | 100.0  |    |
| RCN     | 38 | 55 | 70     | 77 |

Weighted RCN: 70

*Determine ESD Targets:*

$$R_v = 0.05 + 0.009(I) = 0.62$$

From Table 5.3 and  
%I = 63

|                       |   |   |        |   |
|-----------------------|---|---|--------|---|
| HSG                   | A | B | C      | D |
| Area                  |   |   | 17,774 |   |
| Target P <sub>E</sub> |   |   | 1.0    |   |

Composite Target  $P_E$  (in.): **1.00** (Treatment for  $P_E = 1$  in.)  
(Draining into existing pond)

$$ESD_v = \frac{(P_E)(R_v)(A)}{12}$$

= **913** **cf** (Target)

**Proposed Site Development Design - Grass Swales (M-8)**

|                         |           |                    |      |
|-------------------------|-----------|--------------------|------|
|                         |           | Runoff Coefficient |      |
| Total Drainage Area:    | 17,774 sf |                    |      |
| Impervious Area         | 11,188 sf | $C_1 =$            | 0.85 |
| Pervious Area           | 6,586 sf  | $C_2 =$            | 0.12 |
| Percent Impervious (I)  | 63 %      |                    |      |
| $R_v = 0.05 + 0.009(I)$ | 0.62      |                    |      |

|                      |        |                          |         |
|----------------------|--------|--------------------------|---------|
| Swale bottom width = | 8 ft   | Surface area ( $A_f$ ) = | 1840 sf |
| Swale length =       | 230 ft |                          |         |

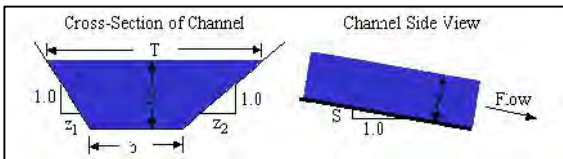
$$P_E = \frac{(10'')(A_f)}{DA} = 1.04 \text{ in}$$

$$ESD_v = \frac{(P_E)(R_v)(A)}{12} = 945 \text{ cf}$$

|                                  |        |            |
|----------------------------------|--------|------------|
| Maximum flow depth for $ESD_v$ = | 4 in   |            |
| $ESD_v$ based on 4" depth =      | 613 cf | (Provided) |

Check for compliance with design criteria:

| Grass Swales Design Criteria:                                                                                | Provided |
|--------------------------------------------------------------------------------------------------------------|----------|
| Drainage area should be less than 1 acre.                                                                    | 0.41     |
| Swales shall have a bottom width between 2 and 8 feet.                                                       | 8.0      |
| The channel slope shall be less than or equal to 4.0%.                                                       | 1%       |
| The maximum flow velocity for the $ESD_v$ shall be less than or equal to 1.0 fps                             | 0.46     |
| Swales shall be designed to safely convey the 10-year, 24-hour storm at a non-erosive                        | ✓        |
| Channel side slopes shall be 3:1 or flatter.                                                                 | ✓        |
| A thick vegetative cover shall be provided for proper function.                                              | ✓        |
| Grass swales shall be as long as the treated surface.                                                        | ✓        |
| The surface area ( $A_f$ ) of the Grass swale bottom shall be at least 2% of the contributing drainage area. | 10%      |
| The maximum flow depth for $ESD_v$ treatment should be 4 inches for Grass swales.                            | 4.0      |
| Grass swales channel should have a roughness coefficient (Manning's n) value of 0.15                         | 0.15     |



$$Q = VA \quad V = \frac{k}{n} R^{2/3} S^{1/2} \quad R = \frac{A}{P} \quad A = \frac{y}{2} (b + T)$$

$$P = b + y \left( \sqrt{1 + z_1^2} + \sqrt{1 + z_2^2} \right) \quad T = b + y(z_1 + z_2)$$

Check for 10-year, 24-hour storm

|         |        |         |                         |      |      |
|---------|--------|---------|-------------------------|------|------|
| $Z_1 =$ | 3      | ft      | $T =$                   | 10.5 | ft   |
| $Z_2 =$ | 3      | ft      | $A =$                   | 3.9  | sf   |
| $b =$   | 8      | ft      | $P =$                   | 10.6 |      |
| $S =$   | 0.0082 |         | $R =$                   | 0.36 |      |
| $y =$   | 5      | 0.42 ft | $V =$                   | 0.46 | ft/s |
| $n =$   | 0.15   |         | $Q_{\text{Capacity}} =$ | 1.8  | cfs  |

Using rational formula

|                       |                               |
|-----------------------|-------------------------------|
| $Q = ciA$             |                               |
| $c =$                 | 0.58                          |
| $i =$                 | 7 in/hr (10 yr; 24 hr); 5 min |
| $A =$                 | 17,774 sft                    |
| $Q_{\text{Actual}} =$ | 1.67 cfs                      |

## DA-2 DRAINAGE AREA

### Determine Stormwater Management Requirements

*Initial Site Assessment (Site Data):*

Total Drainage Area:

26,582 sf                      0.61 ac

Soil Types:

| HSG     | A | B | C      | D |
|---------|---|---|--------|---|
| Area    |   |   | 26,582 |   |
| Percent |   |   | 100.0  |   |

#### Proposed Layout

Impervious Cover:

16,527 sf                      0.38 ac

Percent Impervious (I)

62 %

*Determine RCNs for Wooded Conditions:*

| HSG     | A  | B  | C      | D  |
|---------|----|----|--------|----|
| Area    |    |    | 26,582 |    |
| Percent |    |    | 100.0  |    |
| RCN     | 38 | 55 | 70     | 77 |

Weighted RCN:                      **70**

*Determine ESD Targets:*

$$R_v = 0.05 + 0.009(I)$$

$$= 0.61$$

From Table 5.3 and

%I = 62

| HSG          | A | B | C      | D |
|--------------|---|---|--------|---|
| Area         |   |   | 26,582 |   |
| Target $P_E$ |   |   | 1.0    |   |

Composite Target  $P_E$  (in.):

**1.00** (Treatment for  $P_E = 1$  in.)

(Draining into existing pond)

$$ESD_v = \frac{(P_E)(R_v)(A)}{12}$$

$$= \mathbf{1,350 \text{ cf}} \quad (\text{Target})$$

**Proposed Site Development Design - Grass Swales (M-8)**

|                         |           |                    |
|-------------------------|-----------|--------------------|
| Total Drainage Area:    | 26,582 sf | Runoff Coefficient |
| Impervious Area         | 16,527 sf | $C_1 = 0.85$       |
| Pervious Area           | 10,055 sf | $C_2 = 0.12$       |
| Percent Impervious (I)  | 62 %      |                    |
| $R_v = 0.05 + 0.009(I)$ | 0.61      |                    |

|                      |        |                          |         |
|----------------------|--------|--------------------------|---------|
| Swale bottom width = | 8 ft   | Surface area ( $A_f$ ) = | 2800 sf |
| Swale length =       | 350 ft |                          |         |

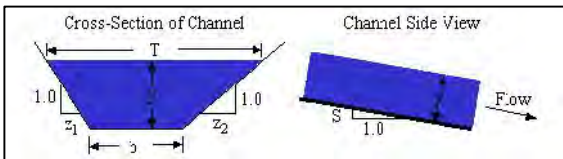
$$P_E = \frac{(10'')(A_f)}{DA} = 1.05 \text{ in}$$

$$ESD_v = \frac{(P_E)(R_v)(A)}{12} = 1,422 \text{ cf}$$

|                                  |                   |
|----------------------------------|-------------------|
| Maximum flow depth for $ESD_v$ = | 4 in              |
| $ESD_v$ based on 4" depth =      | 933 cf (Provided) |

Check for compliance with design criteria:

| <b>Grass Swales Design Criteria:</b>                                                                         | <b>Provided</b> |
|--------------------------------------------------------------------------------------------------------------|-----------------|
| Drainage area should be less than 1 acre.                                                                    | 0.61            |
| Swales shall have a bottom width between 2 and 8 feet.                                                       | 8.0             |
| The channel slope shall be less than or equal to 4.0%.                                                       | 0.53%           |
| The maximum flow velocity for the $ESD_v$ shall be less than or equal to 1.0 fps                             | 0.45            |
| Swales shall be designed to safely convey the 10-year, 24-hour storm at a non-erosive                        | ✓               |
| Channel side slopes shall be 3:1 or flatter.                                                                 | ✓               |
| A thick vegetative cover shall be provided for proper function.                                              | ✓               |
| Grass swales shall be as long as the treated surface.                                                        | ✓               |
| The surface area ( $A_f$ ) of the Grass swale bottom shall be at least 2% of the contributing drainage area. | 11%             |
| The maximum flow depth for $ESD_v$ treatment should be 4 inches for Grass swales.                            | 4.0             |
| Grass swales channel should have a roughness coefficient (Manning's n) value of 0.15                         | 0.15            |



$$Q = VA \quad V = \frac{k}{n} R^{2/3} S^{1/2} \quad R = \frac{A}{P} \quad A = \frac{y}{2} (b + T)$$

$$P = b + y \left( \sqrt{1 + z_1^2} + \sqrt{1 + z_2^2} \right) \quad T = b + y(z_1 + z_2)$$

Check for 10-year, 24-hour storm

|                 |                                  |
|-----------------|----------------------------------|
| $Z_1 = 3$ ft    | $T = 11.5$ ft                    |
| $Z_2 = 3$ ft    | $A = 5.7$ sf                     |
| $b = 8$ ft      | $P = 11.7$                       |
| $S = 0.0053$    | $R = 0.49$                       |
| $y = 7$ 0.58 ft | $V = 0.45$ ft/s                  |
| $n = 0.15$      | $Q_{\text{Capacity}} = 2.54$ cfs |

Using rational formula

|                                     |
|-------------------------------------|
| $Q = ciA$                           |
| $c = 0.57$                          |
| $i = 7$ in/hr (10 yr; 24 hr); 5 min |
| $A = 26,582$ sft                    |
| $Q_{\text{Actual}} = 2.47$ cfs      |

### DA-3 DRAINAGE AREA

#### Determine Stormwater Management Requirements

*Initial Site Assessment (Site Data):*

Total Drainage Area:  
Soil Types:

4,556 sf                      0.10 ac

| HSG     | A | B | C     | D |
|---------|---|---|-------|---|
| Area    |   |   | 4,556 |   |
| Percent |   |   | 100.0 |   |

#### Proposed Layout

Impervious Cover:  
Percent Impervious (I)

2,931 sf                      0.07 ac  
64 %

*Determine RCNs for Wooded Conditions:*

| HSG     | A  | B  | C     | D  |
|---------|----|----|-------|----|
| Area    |    |    | 4,556 |    |
| Percent |    |    | 100.0 |    |
| RCN     | 38 | 55 | 70    | 77 |

Weighted RCN:                      **70**

*Determine ESD Targets:*

$$R_v = 0.05 + 0.009(I)$$

$$= 0.63$$

From Table 5.3 and  
%I = 64

| HSG          | A | B | C     | D |
|--------------|---|---|-------|---|
| Area         |   |   | 4,556 |   |
| Target $P_E$ |   |   | 1.0   |   |

Composite Target  $P_E$  (in.):                      **1.00** (Treatment for  $P_E = 1$  in.)  
(Draining into existing pond)

$$ESD_v = \frac{(P_E)(R_v)(A)}{12}$$

=      **239**      **cf**                      (Target)

**Proposed Site Development Design - Grass Swales (M-8)**

|                         |          |                    |      |
|-------------------------|----------|--------------------|------|
|                         |          | Runoff Coefficient |      |
| Total Drainage Area:    | 4,556 sf |                    |      |
| Impervious Area         | 2,931 sf | $C_1 =$            | 0.85 |
| Pervious Area           | 1,625 sf | $C_2 =$            | 0.12 |
| Percent Impervious (I)  | 64 %     |                    |      |
| $R_v = 0.05 + 0.009(I)$ | 0.63     |                    |      |

|                      |        |                          |         |
|----------------------|--------|--------------------------|---------|
| Swale bottom width = | 5.5 ft | Surface area ( $A_f$ ) = | 1139 sf |
| Swale length =       | 207 ft |                          |         |

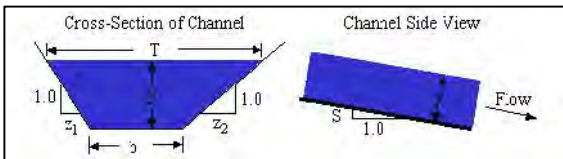
$$P_E = \frac{(10'')(A_f)}{DA} = 2.50 \text{ in}$$

$$ESD_v = \frac{(P_E)(R_v)(A)}{12} = 597 \text{ cf}$$

|                                  |        |            |
|----------------------------------|--------|------------|
| Maximum flow depth for $ESD_v$ = | 4 in   |            |
| $ESD_v$ based on 4" depth =      | 380 cf | (Provided) |

Check for compliance with design criteria:

| Grass Swales Design Criteria:                                                                                | Provided |
|--------------------------------------------------------------------------------------------------------------|----------|
| Drainage area should be less than 1 acre.                                                                    | 0.10     |
| Swales shall have a bottom width between 2 and 8 feet.                                                       | 5.5      |
| The channel slope shall be less than or equal to 4.0%.                                                       | 0.60%    |
| The maximum flow velocity for the $ESD_v$ shall be less than or equal to 1.0 fps                             | 0.33     |
| Swales shall be designed to safely convey the 10-year, 24-hour storm at a non-erosive                        | ✓        |
| Channel side slopes shall be 3:1 or flatter.                                                                 | ✓        |
| A thick vegetative cover shall be provided for proper function.                                              | ✓        |
| Grass swales shall be as long as the treated surface.                                                        | ✓        |
| The surface area ( $A_f$ ) of the Grass swale bottom shall be at least 2% of the contributing drainage area. | 25%      |
| The maximum flow depth for $ESD_v$ treatment should be 4 inches for Grass swales.                            | 4.0      |
| Grass swales channel should have a roughness coefficient (Manning's n) value of 0.15                         | 0.15     |



$$Q = VA \quad V = \frac{k}{n} R^{2/3} S^{1/2} \quad R = \frac{A}{P} \quad A = \frac{y}{2} (b + T)$$

$$P = b + y \left( \sqrt{1 + z_1^2} + \sqrt{1 + z_2^2} \right) \quad T = b + y(z_1 + z_2)$$

Check for 10-year, 24-hour storm

|         |        |         |                         |      |      |
|---------|--------|---------|-------------------------|------|------|
| $Z_1 =$ | 3      | ft      | $T =$                   | 7.5  | ft   |
| $Z_2 =$ | 3      | ft      | $A =$                   | 2.2  | sf   |
| $b =$   | 5.5    | ft      | $P =$                   | 7.6  |      |
| $S =$   | 0.0060 |         | $R =$                   | 0.28 |      |
| $y =$   | 4      | 0.33 ft | $V =$                   | 0.33 | ft/s |
| $n =$   | 0.15   |         | $Q_{\text{Capacity}} =$ | 0.72 | cfs  |

Using rational formula

|                       |                               |
|-----------------------|-------------------------------|
| $Q = ciA$             |                               |
| $c =$                 | 0.59                          |
| $i =$                 | 7 in/hr (10 yr; 24 hr); 5 min |
| $A =$                 | 4,556 sft                     |
| $Q_{\text{Actual}} =$ | 0.44 cfs                      |

## DA-4 DRAINAGE AREA

### Determine Stormwater Management Requirements

*Initial Site Assessment (Site Data):*

Total Drainage Area:  
Soil Types:

|         | 15,861 | sf | 0.36   | ac |
|---------|--------|----|--------|----|
| HSG     | A      | B  | C      | D  |
| Area    |        |    | 15,861 |    |
| Percent |        |    | 100.0  |    |

#### Proposed Layout

Impervious Cover:  
Percent Impervious (I)

11,771 sf                      0.27 ac  
74 %

*Determine RCNs for Wooded Conditions:*

| HSG     | A  | B  | C      | D  |
|---------|----|----|--------|----|
| Area    |    |    | 15,861 |    |
| Percent |    |    | 100.0  |    |
| RCN     | 38 | 55 | 70     | 77 |

Weighted RCN:                      **70**

*Determine ESD Targets:*

$$R_v = 0.05 + 0.009(I) \\ = 0.72$$

From Table 5.3 and  
%I = 74

| HSG          | A | B | C      | D |
|--------------|---|---|--------|---|
| Area         |   |   | 15,861 |   |
| Target $P_E$ |   |   | 1.0    |   |

Composite Target  $P_E$  (in.):                      **1.00** (Treatment for  $P_E = 1$  in.)  
(Draining into new pond)

$$ESD_v = \frac{(P_E)(R_v)(A)}{12}$$

$$= \mathbf{949 \text{ cf}} \quad (\text{Target})$$

75% of the Required Target =                      712 cf

**Proposed Site Development Design - Micro-Bioretenention (M-6)**

Based on the Cpv storm (2.8 in.): Max allowable ESD<sub>v</sub> that can be used:

$$ESD_v = \frac{(P_E)(R_v)(A)}{12} = 2,657 \text{ cf}$$

The computed ESD<sub>v</sub> provided is:

$$\begin{aligned} ESD_v &= (\text{Ponding storage}) + (\text{Storage in media}) \\ &= 1,028 \text{ cf} \quad (\text{Provided}) \end{aligned}$$

$$\text{Surface Area} = 791 \text{ sf} \quad \text{Media Depth} = 2 \text{ ft}$$

$$\text{Ponding depth} = 0.5 \text{ ft} \quad \text{Porosity} = 0.4$$

Check for compliance with design criteria:

| Micro-Bioretenention Design Criteria:                                                         | Provided |
|-----------------------------------------------------------------------------------------------|----------|
| Runoff shall enter, flowthrough, and exit in safe and non-erosive manner                      | ✓        |
| Drainage area to any individual practice shall be 20,000 sf or less.                          | 15,861   |
| Micro-Bioretenention practices shall capture and store at least 75% of the ESD <sub>v</sub> . | ✓        |
| The surface area of the practice shall be at least 2% of the contributing drainage area       | 5.0%     |
| Filter beds shall be between 24 and 48 inches deep                                            | 24       |
| Filter beds shall not intercept groundwater                                                   | ✓        |
| Planting soil, mulch and underdrain systems shall conform to specs in Manual Appendix B.4     | ✓        |
| Locate at least 30' from water supply wells and 25' from septic systems                       | ✓        |
| Any trees planted in practice shall be located to avoid future problems with overhead lines   | ✓        |
| Size and locate practices to meet minimum local requirements for clearance from utilities     | ✓        |

## DA-5 DRAINAGE AREA

### Determine Stormwater Management Requirements

*Initial Site Assessment (Site Data):*

Total Drainage Area:  
Soil Types:

|         | 19,348 | sf | 0.44   | ac |
|---------|--------|----|--------|----|
| HSG     | A      | B  | C      | D  |
| Area    |        |    | 19,348 |    |
| Percent |        |    | 100.0  |    |

#### Proposed Layout

Impervious Cover:  
Percent Impervious (I)

10,612 sf                      0.24 ac  
55 %

*Determine RCNs for Wooded Conditions:*

| HSG     | A  | B  | C      | D  |
|---------|----|----|--------|----|
| Area    |    |    | 19,348 |    |
| Percent |    |    | 100.0  |    |
| RCN     | 38 | 55 | 70     | 77 |

Weighted RCN:                      **70**

*Determine ESD Targets:*

$$R_v = 0.05 + 0.009(I) \\ = 0.54$$

From Table 5.3 and  
%I = 55

| HSG          | A | B | C      | D |
|--------------|---|---|--------|---|
| Area         |   |   | 19,348 |   |
| Target $P_E$ |   |   | 1.0    |   |

Composite Target  $P_E$  (in.):                      **1.00** (Treatment for  $P_E = 1$  in.)  
(Draining into new pond)

$$ESD_v = \frac{(P_E)(R_v)(A)}{12}$$

$$= \mathbf{877 \text{ cf}} \quad (\text{Target})$$

75% of the Required Target =                      657 cf

**Proposed Site Development Design - Micro-Bioretenention (M-6)**

Based on the Cpv storm (2.8 in.): Max allowable ESDv that can be used:

$$ESD_v = \frac{(P_E)(R_v)(A)}{12} = 2,454 \text{ cf}$$

The computed ESD<sub>v</sub> provided is:

$$ESD_v = (\text{Ponding storage}) + (\text{Storage in media}) \\ = 1,399 \text{ cf} \quad (\text{Provided})$$

$$\text{Surface Area} = 1,076 \text{ sf} \quad \text{Media Depth} = 2 \text{ ft}$$

$$\text{Ponding depth} = 0.5 \text{ ft} \quad \text{Porosity} = 0.4$$

Check for compliance with design criteria:

| Micro-Bioretenention Design Criteria:                                                         | Provided |
|-----------------------------------------------------------------------------------------------|----------|
| Runoff shall enter, flowthrough, and exit in safe and non-erosive manner                      | ✓        |
| Drainage area to any individual practice shall be 20,000 sf or less.                          | 19,348   |
| Micro-Bioretenention practices shall capture and store at least 75% of the ESD <sub>v</sub> . | ✓        |
| The surface area of the practice shall be at least 2% of the contributing drainage area       | 5.6%     |
| Filter beds shall be between 24 and 48 inches deep                                            | 24       |
| Filter beds shall not intercept groundwater                                                   | ✓        |
| Planting soil, mulch and underdrain systems shall conform to specs in Manual Appendix B.4     | ✓        |
| Locate at least 30' from water supply wells and 25' from septic systems                       | ✓        |
| Any trees planted in practice shall be located to avoid future problems with overhead lines   | ✓        |
| Size and locate practices to meet minimum local requirements for clearance from utilities     | ✓        |

## DA-6 DRAINAGE AREA

### Determine Stormwater Management Requirements

*Initial Site Assessment (Site Data):*

Total Drainage Area:  
Soil Types:

| 6,039   | sf | 0.14 | ac    |   |  |
|---------|----|------|-------|---|--|
| HSG     | A  | B    | C     | D |  |
| Area    |    |      | 6,024 |   |  |
| Percent |    |      | 99.8  |   |  |

#### Proposed Layout

Impervious Cover:  
Percent Impervious (I)

6,039 sf      0.14 ac  
100 %

*Determine RCNs for Wooded Conditions:*

| HSG           | A  | B  | C     | D  |
|---------------|----|----|-------|----|
| Area          |    |    | 6,024 |    |
| Percent       |    |    | 99.8  |    |
| RCN           | 38 | 55 | 70    | 77 |
| Weighted RCN: |    | 70 |       |    |

*Determine ESD Targets:*

$$R_v = 0.05 + 0.009(I)$$

$$= 0.95$$

From Table 5.3 and  
%I = 100

| HSG          | A | B | C     | D |
|--------------|---|---|-------|---|
| Area         |   |   | 6,024 |   |
| Target $P_E$ |   |   | 1.0   |   |

Composite Target  $P_E$  (in.):      **1.00**      (Treatment for  $P_E = 1$  in.)  
(Draining into new pond)

$$ESD_v = \frac{(P_E)(R_v)(A)}{12}$$

$$= \quad \mathbf{477} \quad \mathbf{cf} \quad (\text{Target})$$

**Proposed Site Development Design - Rain Gardens (M-7)**

Based on the Cpv storm (2.8 in.): Max allowable  $ESD_v$  that can be used:

$$ESD_v = \frac{(P_E)(R_v)(A)}{12} = 1,339 \text{ cf}$$

$$\text{Rain Garden Surface area } (A_f) = 843 \text{ sf}$$

$$P_E = \frac{(10'')(A_f)}{DA} = 1.40$$

$$ESD_v = \frac{(P_E)(R_v)(A)}{12} = 667 \text{ cf}$$

The computed  $ESD_v$  provided is:

$$ESD_v = (\text{Ponding storage}) + (\text{Storage in media}) \\ = 506 \text{ cf} \quad (\text{Provided})$$

$$\text{Surface Area} = 843 \text{ sf} \quad \text{Media Depth} = 1.5 \text{ ft}$$

$$\text{Ponding depth} = \text{ft} \quad \text{Porosity} = 0.4$$

Check for compliance with design criteria:

| <b>Rain Garden Design Criteria:</b>                                                                                | <b>Provided</b> |
|--------------------------------------------------------------------------------------------------------------------|-----------------|
| <input type="checkbox"/> Runoff shall enter, flowthrough, and exit in safe and non-erosive manner                  | ✓               |
| <input type="checkbox"/> Drainage area to any individual practice shall be 10,000 ft <sup>2</sup> or less          | 6039            |
| <input type="checkbox"/> The surface area of the practice shall be at least 2% of the contributing drainage area   | 8%              |
| <input type="checkbox"/> Min 6"-12" planting soil provided                                                         | 18              |
| <input type="checkbox"/> Mulch Layer provided                                                                      | ✓               |
| <input type="checkbox"/> Planting soil, mulch and underdrain systems shall conform to specs in Manual Appendix B.4 | ✓               |
| <input type="checkbox"/> Landscaping plan and information provided                                                 | ✓               |
| <input type="checkbox"/> Location will not interfere with infrastructure                                           | ✓               |

## Site Development Summary

| Drainage Area                                                           | ESD Practice                                                | Area Treated (sf) | Impervious Area (sf) | Target ESD <sub>v</sub> (cf) | Provided ESD <sub>v</sub> (cf) | ESD <sub>v</sub> Difference (Prov-Targ) |
|-------------------------------------------------------------------------|-------------------------------------------------------------|-------------------|----------------------|------------------------------|--------------------------------|-----------------------------------------|
| DA-1                                                                    | Proposed Site Development Design - Grass Swales (M-8)       | 17,774            | 11,188               | 913                          | 613                            | (300)                                   |
| DA-2                                                                    | Proposed Site Development Design - Grass Swales (M-8)       | 26,582            | 16,527               | 1,350                        | 933                            | (417)                                   |
| DA-3                                                                    | Proposed Site Development Design - Grass Swales (M-8)       | 4,556             | 2,931                | 239                          | 380                            | 141                                     |
| DA-4                                                                    | Proposed Site Development Design - Micro-Bioretention (M-6) | 15,861            | 11,771               | 949                          | 1,028                          | 79                                      |
| DA-5                                                                    | Proposed Site Development Design - Micro-Bioretention (M-6) | 19,348            | 10,612               | 877                          | 1,399                          | 522                                     |
| DA-6                                                                    | Proposed Site Development Design - Rain Gardens (M-7)       | 6,039             | 6,039                | 477                          | 506                            | 29                                      |
| Total Area Treated:                                                     |                                                             | <b>90,160</b>     | <b>59,068</b>        |                              |                                |                                         |
| Total ESD <sub>v</sub> Target:                                          |                                                             |                   |                      | <b>4,805</b>                 |                                |                                         |
| Total ESD <sub>v</sub> Provided:                                        |                                                             |                   |                      |                              | <b>4,859</b>                   | <b>54</b>                               |
| Total Target ESD <sub>v</sub> Calculated Considering Entire Site as DA: |                                                             |                   |                      |                              | <b>4,819</b>                   |                                         |

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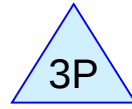
# *APPENDIX D*

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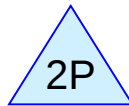
- HYDROCAD COMPUTATIONS for PROPOSED MBRs and SWM POND



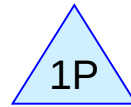
Pre Development



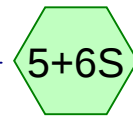
Pond



MBR2



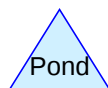
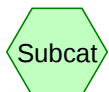
MBR



DA5+6



DA4



**Drainage Diagram for 140262\_Lot 14\_Rev\_after\_comments**  
Prepared by {enter your company name here}, Printed 4/25/2016  
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**140262\_Lot 14\_Rev\_after\_comments**

Prepared by {enter your company name here}

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Page 2

**Area Listing (all nodes)**

| Area<br>(acres) | CN | Description<br>(subcatchment-numbers)        |
|-----------------|----|----------------------------------------------|
| 1.869           | 74 | >75% Grass cover, Good, HSG C (4S,5+6S,Exis) |
| 0.652           | 98 | Paved parking & roofs (4S,5+6S)              |
| <b>2.522</b>    |    | <b>TOTAL AREA</b>                            |

**140262\_Lot 14\_Rev\_after\_comments**

Type II 24-hr 2 YR Rainfall=3.40"

Prepared by {enter your company name here}

Printed 4/25/2016

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Page 3

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points

Runoff by SCS TR-20 method, UH=Delmarva

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment4S: DA4**

Runoff Area=15,861 sf 74.21% Impervious Runoff Depth&gt;2.54"

Tc=5.0 min CN=92 Runoff=1.34 cfs 0.077 af

**Subcatchment5+6S: DA5+6**

Runoff Area=25,387 sf 65.59% Impervious Runoff Depth&gt;2.35"

Flow Length=98' Slope=0.0014 '/' Tc=5.0 min CN=90 Runoff=2.02 cfs 0.114 af

**SubcatchmentExis: Pre Development**

Runoff Area=68,606 sf 0.00% Impervious Runoff Depth&gt;1.15"

Flow Length=243' Tc=30.0 min CN=74 Runoff=0.92 cfs 0.151 af

**Pond 1P: MBR**

Peak Elev=15.43' Storage=1,182 cf Inflow=1.34 cfs 0.077 af

Discarded=0.02 cfs 0.019 af Primary=1.22 cfs 0.033 af Outflow=1.24 cfs 0.052 af

**Pond 2P: MBR2**

Peak Elev=15.28' Storage=1,741 cf Inflow=3.13 cfs 0.147 af

Discarded=0.03 cfs 0.026 af Primary=2.93 cfs 0.087 af Outflow=2.95 cfs 0.113 af

**Pond 3P: Pond**

Peak Elev=13.79' Storage=1,124 cf Inflow=2.93 cfs 0.087 af

Discarded=0.01 cfs 0.002 af Primary=0.92 cfs 0.085 af Outflow=0.92 cfs 0.087 af

**Total Runoff Area = 2.522 ac Runoff Volume = 0.342 af Average Runoff Depth = 1.63"**  
**74.13% Pervious = 1.869 ac 25.87% Impervious = 0.652 ac**

**Summary for Subcatchment 4S: DA4**

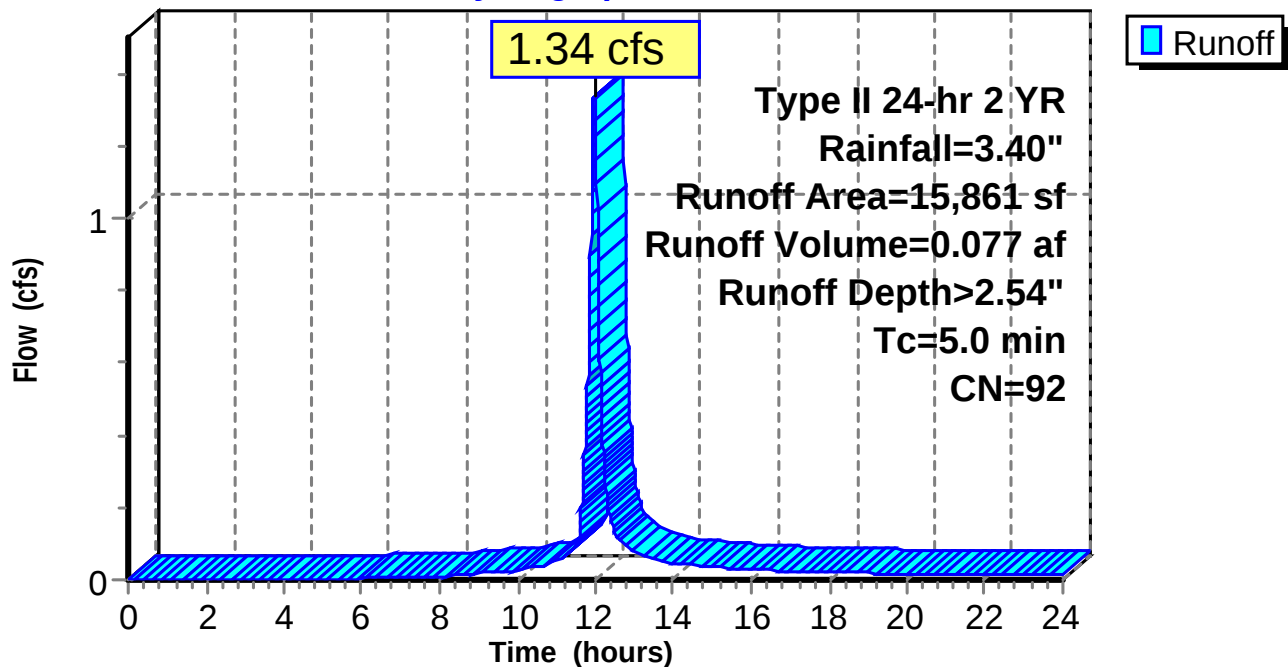
Runoff = 1.34 cfs @ 11.97 hrs, Volume= 0.077 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type II 24-hr 2 YR Rainfall=3.40"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 11,771    | 98 | Paved parking & roofs         |
| 4,090     | 74 | >75% Grass cover, Good, HSG C |
| 15,861    | 92 | Weighted Average              |
| 4,090     |    | Pervious Area                 |
| 11,771    |    | Impervious Area               |

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

**Subcatchment 4S: DA4****Hydrograph**

### Summary for Subcatchment 5+6S: DA5+6

Runoff = 2.02 cfs @ 11.97 hrs, Volume= 0.114 af, Depth> 2.35"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

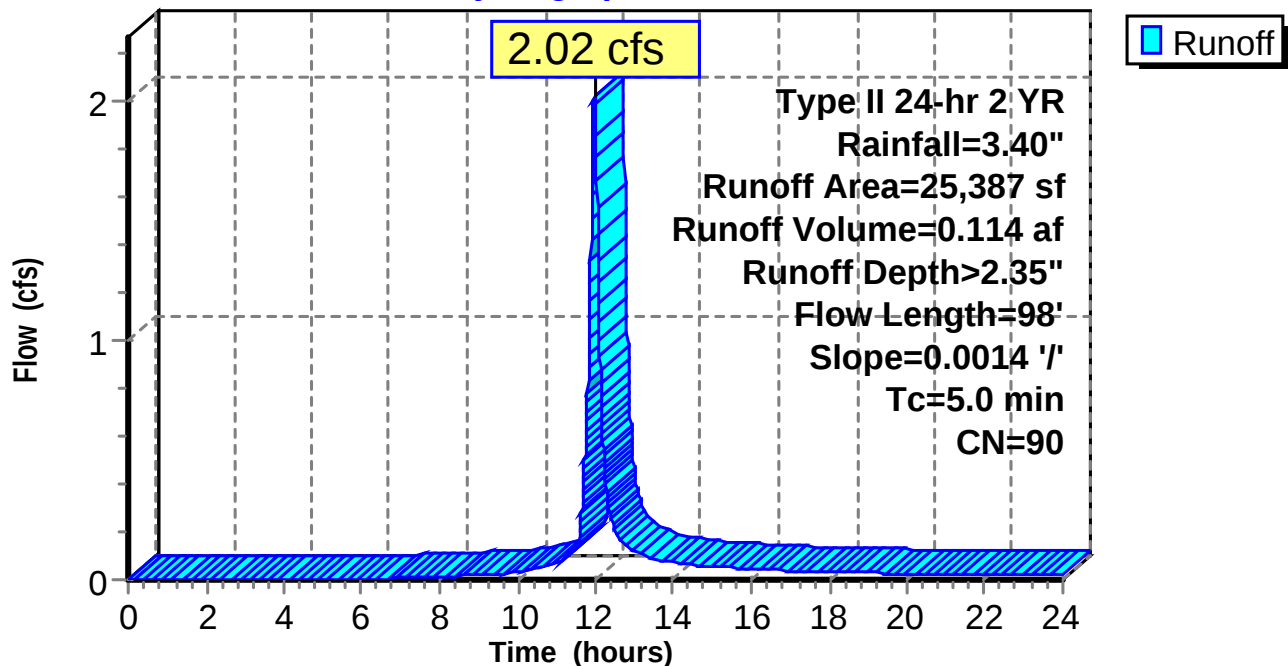
Type II 24-hr 2 YR Rainfall=3.40"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 16,651    | 98 | Paved parking & roofs         |
| 8,736     | 74 | >75% Grass cover, Good, HSG C |
| 25,387    | 90 | Weighted Average              |
| 8,736     |    | Pervious Area                 |
| 16,651    |    | Impervious Area               |

| Tc (min)                           | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description     |
|------------------------------------|---------------|---------------|-------------------|----------------|-----------------|
| 5.0                                | 98            | 0.0014        | 0.32              |                | Sheet Flow, A-B |
| Smooth surfaces n= 0.011 P2= 1.50" |               |               |                   |                |                 |

### Subcatchment 5+6S: DA5+6

#### Hydrograph



**Summary for Subcatchment Exis: Pre Development**

Runoff = 0.92 cfs @ 12.27 hrs, Volume= 0.151 af, Depth> 1.15"

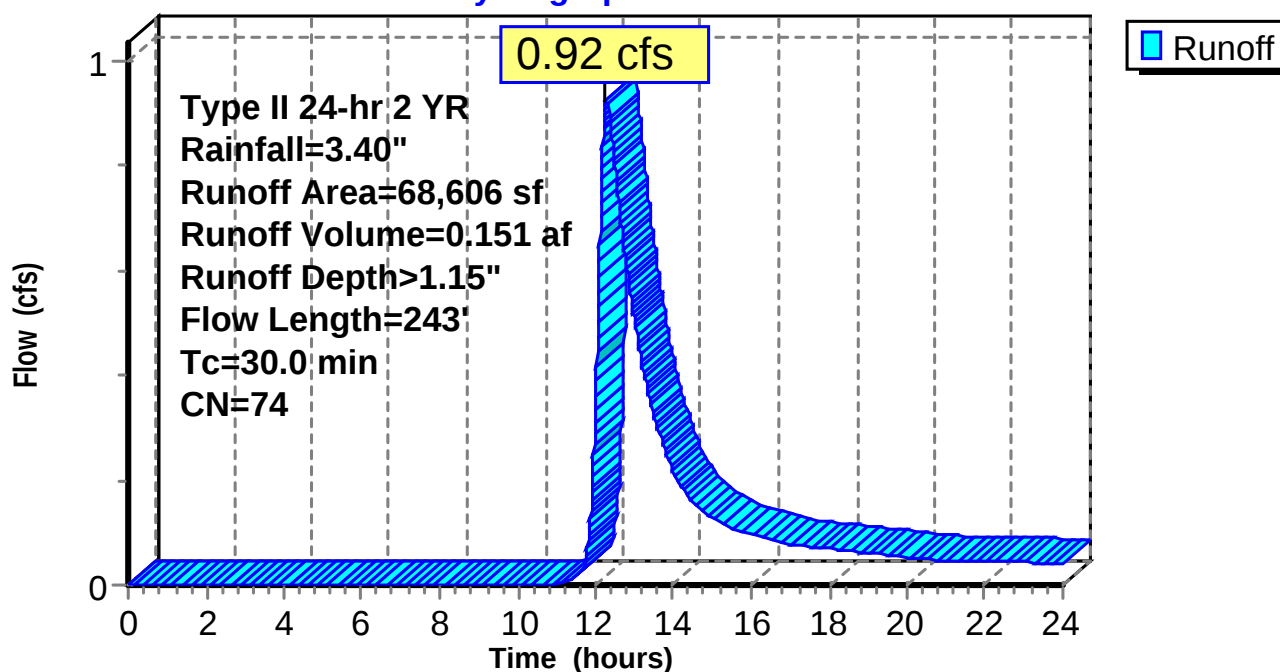
Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type II 24-hr 2 YR Rainfall=3.40"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 68,606    | 74 | >75% Grass cover, Good, HSG C |
| 68,606    |    | Pervious Area                 |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                 |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------|
| 29.1     | 107           | 0.0014        | 0.06              |                | <b>Sheet Flow, A-B</b>                      |
|          |               |               |                   |                | Grass: Short n= 0.150 P2= 3.40"             |
| 0.9      | 136           | 0.0075        | 2.58              | 18.07          | <b>Channel Flow, Ditch</b>                  |
|          |               |               |                   |                | Area= 7.0 sf Perim= 15.0' r= 0.47' n= 0.030 |
| 30.0     | 243           | Total         |                   |                |                                             |

**Subcatchment Exis: Pre Development****Hydrograph**

**Summary for Pond 1P: MBR**

Inflow Area = 0.364 ac, 74.21% Impervious, Inflow Depth > 2.54" for 2 YR event  
 Inflow = 1.34 cfs @ 11.97 hrs, Volume= 0.077 af  
 Outflow = 1.24 cfs @ 12.01 hrs, Volume= 0.052 af, Atten= 8%, Lag= 2.3 min  
 Discarded = 0.02 cfs @ 12.01 hrs, Volume= 0.019 af  
 Primary = 1.22 cfs @ 12.01 hrs, Volume= 0.033 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 15.43' @ 12.01 hrs Surf.Area= 2,833 sf Storage= 1,182 cf

Plug-Flow detention time=(not calculated: outflow precedes inflow)

Center-of-Mass det. time= 56.0 min ( 849.4 - 793.4 )

| Volume | Invert | Avail.Storage | Storage Description                                                           |
|--------|--------|---------------|-------------------------------------------------------------------------------|
| #1     | 12.83' | 640 cf        | <b>10.00'W x 80.00'L x 2.00'H Prismatic</b><br>1,600 cf Overall x 40.0% Voids |
| #2     | 14.83' | 446 cf        | <b>10.00'W x 80.00'L x 0.50'H Prismatic Z=2.0</b>                             |
| #3     | 15.33' | 331 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                    |
|        |        | 1,416 cf      | Total Available Storage                                                       |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.33               | 968                  | 180.0            | 0                         | 0                         | 968                 |
| 15.50               | 1,115                | 192.0            | 177                       | 177                       | 1,325               |
| 15.60               | 2,000                | 200.0            | 154                       | 331                       | 1,575               |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.33' | <b>17.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64<br>2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74 |
| #2     | Discarded | 12.83' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                                                                                                                  |

**Discarded OutFlow** Max=0.02 cfs @ 12.01 hrs HW=15.43' (Free Discharge)

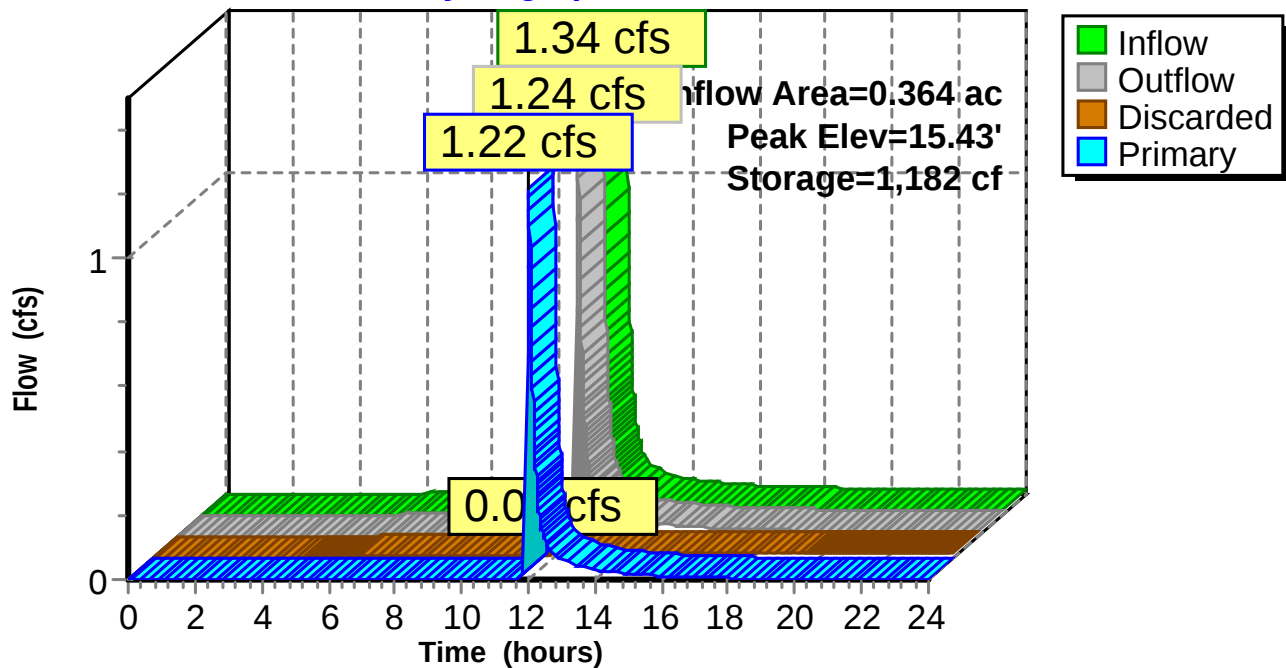
↑ **2=Exfiltration** (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=1.22 cfs @ 12.01 hrs HW=15.43' TW=15.28' (Dynamic Tailwater)

↑ **1=Broad-Crested Rectangular Weir**(Weir Controls 1.22 cfs @ 0.75 fps)

## Pond 1P: MBR

## Hydrograph



**Summary for Pond 2P: MBR2**

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth > 1.86" for 2 YR event  
 Inflow = 3.13 cfs @ 12.00 hrs, Volume= 0.147 af  
 Outflow = 2.95 cfs @ 12.02 hrs, Volume= 0.113 af, Atten= 6%, Lag= 1.5 min  
 Discarded = 0.03 cfs @ 12.02 hrs, Volume= 0.026 af  
 Primary = 2.93 cfs @ 12.02 hrs, Volume= 0.087 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 15.28' @ 12.02 hrs Surf.Area= 3,879 sf Storage= 1,741 cf

Plug-Flow detention time=111.5 min calculated for 0.113 af (77% of inflow)

Center-of-Mass det. time= 35.6 min ( 830.7 - 795.1 )

| Volume | Invert | Avail.Storage | Storage Description                                                            |
|--------|--------|---------------|--------------------------------------------------------------------------------|
| #1     | 12.60' | 880 cf        | <b>10.00'W x 110.00'L x 2.00'H Prismaoid</b><br>2,200 cf Overall x 40.0% Voids |
| #2     | 14.60' | 611 cf        | <b>10.00'W x 110.00'L x 0.50'H Prismaoid Z=2.0</b>                             |
| #3     | 15.10' | 580 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                     |
|        |        | 2,070 cf      | Total Available Storage                                                        |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.10               | 1,301                | 237.0            | 0                         | 0                         | 1,301               |
| 15.50               | 1,602                | 253.0            | 580                       | 580                       | 1,933               |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                     |
|--------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.10' | <b>15.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #2     | Discarded | 12.60' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                   |

**Discarded OutFlow** Max=0.03 cfs @ 12.02 hrs HW=15.28' (Free Discharge)

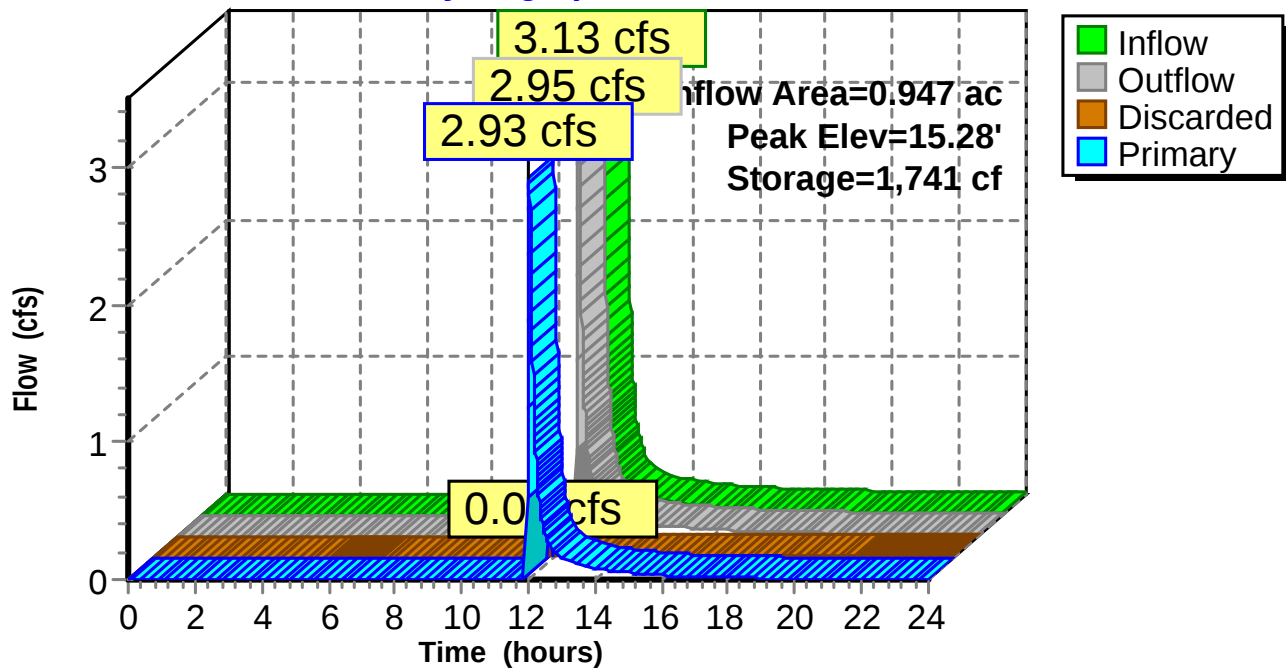
↑ **2=Exfiltration** (Exfiltration Controls 0.03 cfs)

**Primary OutFlow** Max=2.92 cfs @ 12.02 hrs HW=15.28' TW=13.09' (Dynamic Tailwater)

↑ **1=Broad-Crested Rectangular Weir**(Weir Controls 2.92 cfs @ 1.07 fps)

## Pond 2P: MBR2

## Hydrograph



**Summary for Pond 3P: Pond**

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth = 1.10" for 2 YR event  
 Inflow = 2.93 cfs @ 12.02 hrs, Volume= 0.087 af  
 Outflow = 0.92 cfs @ 12.22 hrs, Volume= 0.087 af, Atten= 68%, Lag= 12.0 min  
 Discarded = 0.01 cfs @ 12.22 hrs, Volume= 0.002 af  
 Primary = 0.92 cfs @ 12.22 hrs, Volume= 0.085 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 13.79' @ 12.22 hrs Surf.Area= 1,149 sf Storage= 1,124 cf

Plug-Flow detention time= 15.4 min calculated for 0.086 af (100% of inflow)  
 Center-of-Mass det. time= 15.4 min ( 791.5 - 776.2 )

| Volume | Invert | Avail.Storage | Storage Description                                        |
|--------|--------|---------------|------------------------------------------------------------|
| #1     | 12.40' | 4,422 cf      | <b>Custom Stage Data (Irregular)</b> listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 12.40               | 253                  | 133.0            | 0                         | 0                         | 253                 |
| 12.70               | 679                  | 152.0            | 135                       | 135                       | 686                 |
| 15.20               | 1,932                | 197.0            | 3,130                     | 3,265                     | 2,010               |
| 15.50               | 3,140                | 264.0            | 754                       | 4,018                     | 4,469               |
| 15.60               | 5,000                | 575.0            | 403                       | 4,422                     | 25,233              |

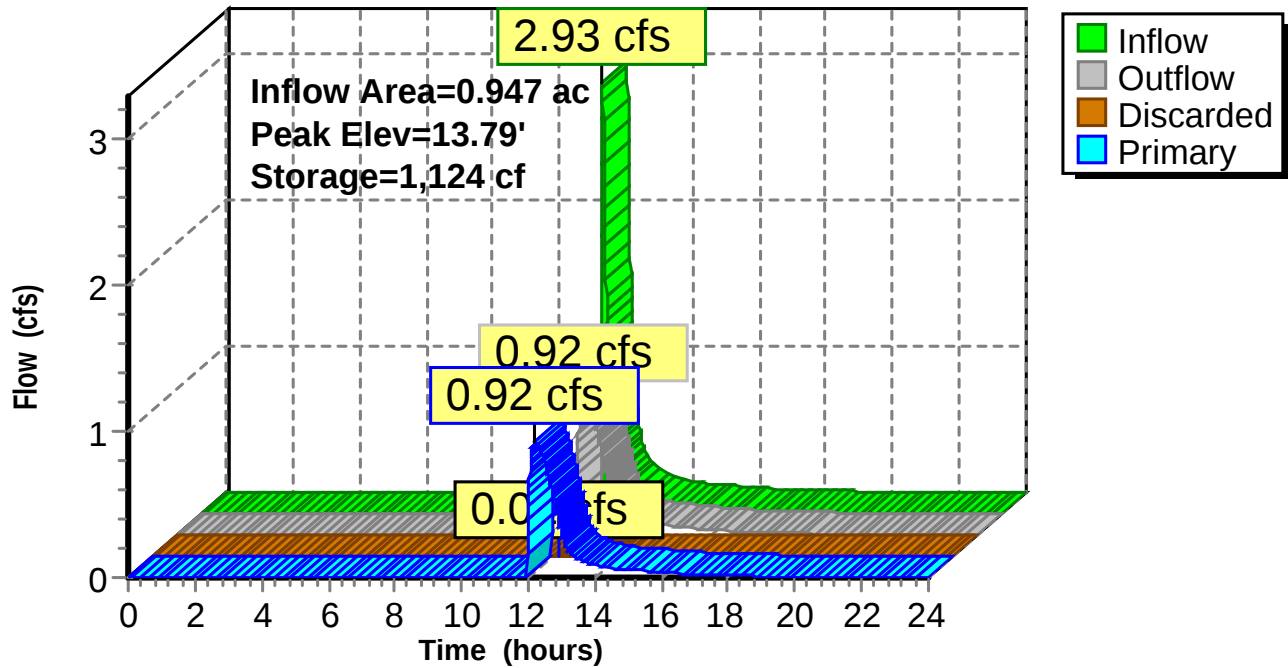
| Device | Routing   | Invert | Outlet Devices                                                                                                                             |
|--------|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 12.27' | <b>15.0" x 50.0' long Culvert</b> RCP, square edge headwall, Ke= 0.500<br>Outlet Invert= 12.20' S= 0.0014 ' S= 0.0014 ' Cc= 0.900 n= 0.013 |
| #2     | Device 1  | 12.40' | <b>5.7" Vert. Orifice/Grate</b> C= 0.600                                                                                                   |
| #3     | Device 1  | 13.79' | <b>5.4" Vert. Orifice/Grate</b> C= 0.600                                                                                                   |
| #4     | Device 1  | 15.20' | <b>12.0' long Sharp-Crested Rectangular Weir</b> 0 End Contraction(s)                                                                      |
| #5     | Discarded | 12.40' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                           |

**Discarded OutFlow** Max=0.01 cfs @ 12.22 hrs HW=13.79' (Free Discharge)  
 ↑ **5=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.92 cfs @ 12.22 hrs HW=13.79' (Free Discharge)  
 ↑ **1=Culvert** (Passes 0.92 cfs of 4.07 cfs potential flow)  
 ↑ **2=Orifice/Grate** (Orifice Controls 0.92 cfs @ 5.18 fps)  
 ↑ **3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.23 fps)  
 ↑ **4=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)

### Pond 3P: Pond

#### Hydrograph



**140262\_Lot 14\_Rev\_after\_comments**

Type II 24-hr 10 YR Rainfall=5.30"

Prepared by {enter your company name here}

Printed 4/25/2016

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points

Runoff by SCS TR-20 method, UH=Delmarva

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment4S: DA4**

Runoff Area=15,861 sf 74.21% Impervious Runoff Depth&gt;4.38"

Tc=5.0 min CN=92 Runoff=2.24 cfs 0.133 af

**Subcatchment5+6S: DA5+6**

Runoff Area=25,387 sf 65.59% Impervious Runoff Depth&gt;4.16"

Flow Length=98' Slope=0.0014 '/' Tc=5.0 min CN=90 Runoff=3.47 cfs 0.202 af

**SubcatchmentExis: Pre Development**

Runoff Area=68,606 sf 0.00% Impervious Runoff Depth&gt;2.57"

Flow Length=243' Tc=30.0 min CN=74 Runoff=2.21 cfs 0.337 af

**Pond 1P: MBR**

Peak Elev=15.48' Storage=1,237 cf Inflow=2.24 cfs 0.133 af

Discarded=0.02 cfs 0.021 af Primary=2.16 cfs 0.086 af Outflow=2.18 cfs 0.108 af

**Pond 2P: MBR2**

Peak Elev=15.38' Storage=1,880 cf Inflow=5.61 cfs 0.288 af

Discarded=0.03 cfs 0.029 af Primary=5.53 cfs 0.225 af Outflow=5.55 cfs 0.254 af

**Pond 3P: Pond**

Peak Elev=15.19' Storage=3,248 cf Inflow=5.53 cfs 0.225 af

Discarded=0.01 cfs 0.003 af Primary=2.19 cfs 0.222 af Outflow=2.21 cfs 0.225 af

**Total Runoff Area = 2.522 ac Runoff Volume = 0.672 af Average Runoff Depth = 3.20"**  
**74.13% Pervious = 1.869 ac 25.87% Impervious = 0.652 ac**

### Summary for Subcatchment 4S: DA4

Runoff = 2.24 cfs @ 11.97 hrs, Volume= 0.133 af, Depth> 4.38"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

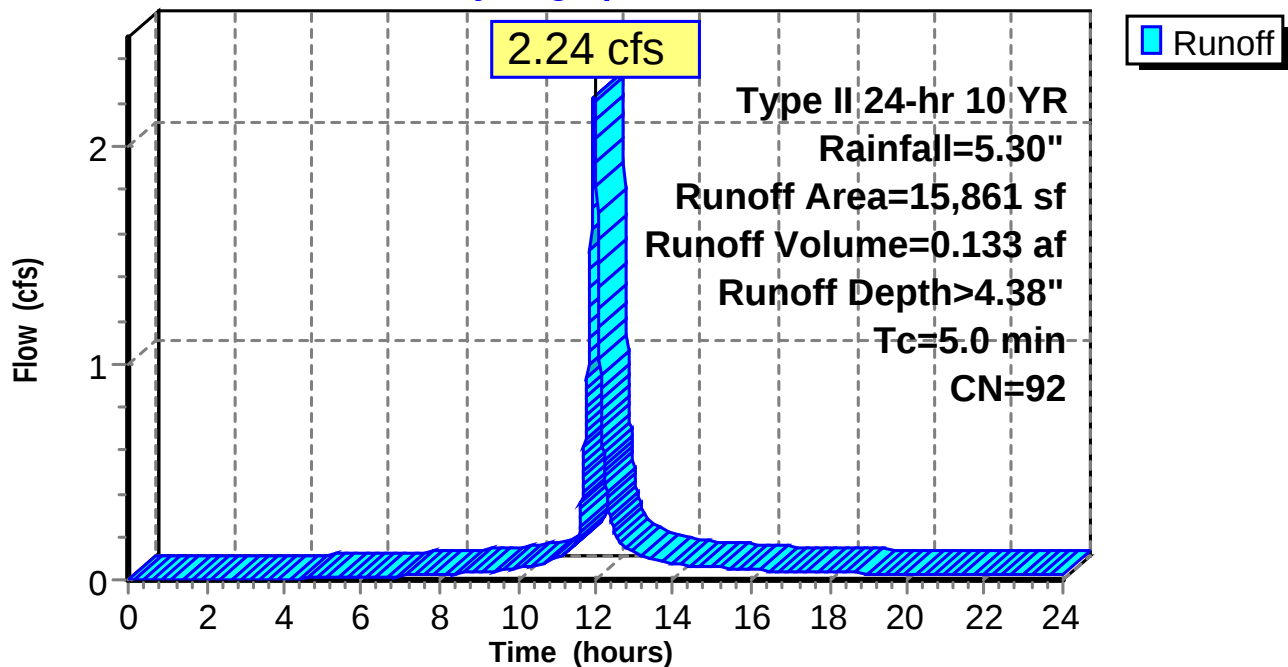
Type II 24-hr 10 YR Rainfall=5.30"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 11,771    | 98 | Paved parking & roofs         |
| 4,090     | 74 | >75% Grass cover, Good, HSG C |
| 15,861    | 92 | Weighted Average              |
| 4,090     |    | Pervious Area                 |
| 11,771    |    | Impervious Area               |

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

### Subcatchment 4S: DA4

#### Hydrograph



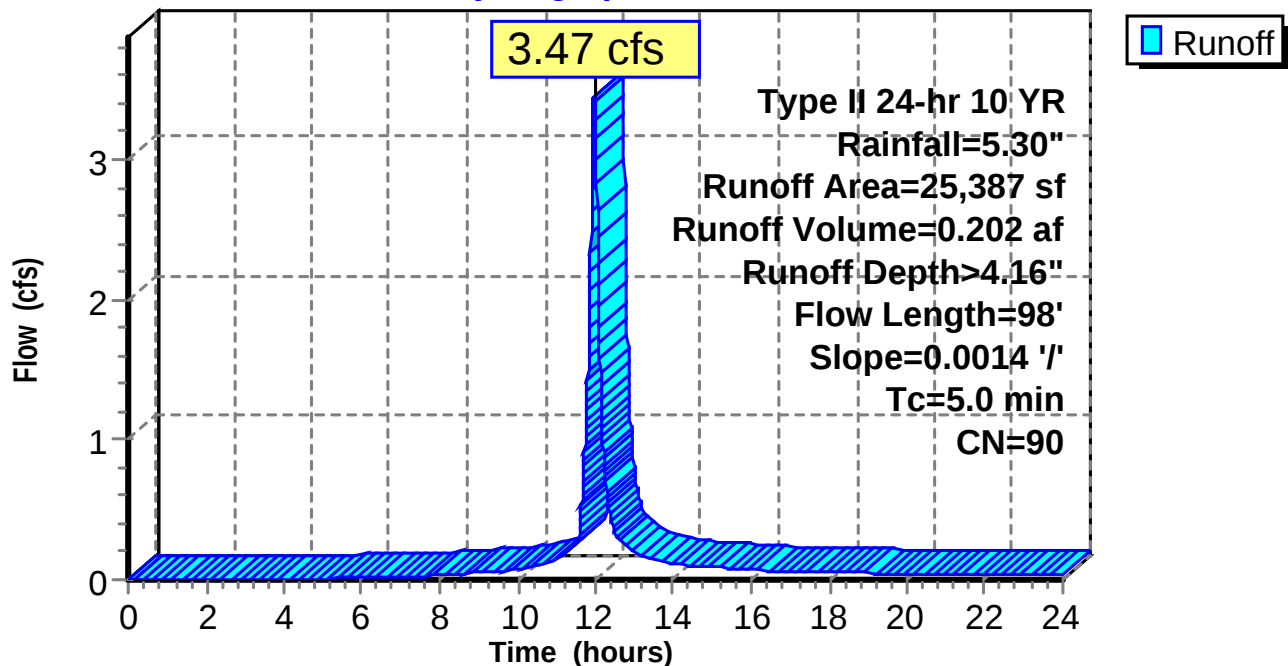
**Summary for Subcatchment 5+6S: DA5+6**

Runoff = 3.47 cfs @ 11.97 hrs, Volume= 0.202 af, Depth> 4.16"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type II 24-hr 10 YR Rainfall=5.30"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 16,651    | 98 | Paved parking & roofs         |
| 8,736     | 74 | >75% Grass cover, Good, HSG C |
| 25,387    | 90 | Weighted Average              |
| 8,736     |    | Pervious Area                 |
| 16,651    |    | Impervious Area               |

| Tc (min)                           | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description     |
|------------------------------------|---------------|---------------|-------------------|----------------|-----------------|
| 5.0                                | 98            | 0.0014        | 0.32              |                | Sheet Flow, A-B |
| Smooth surfaces n= 0.011 P2= 1.50" |               |               |                   |                |                 |

**Subcatchment 5+6S: DA5+6****Hydrograph**

**Summary for Subcatchment Exis: Pre Development**

Runoff = 2.21 cfs @ 12.27 hrs, Volume= 0.337 af, Depth> 2.57"

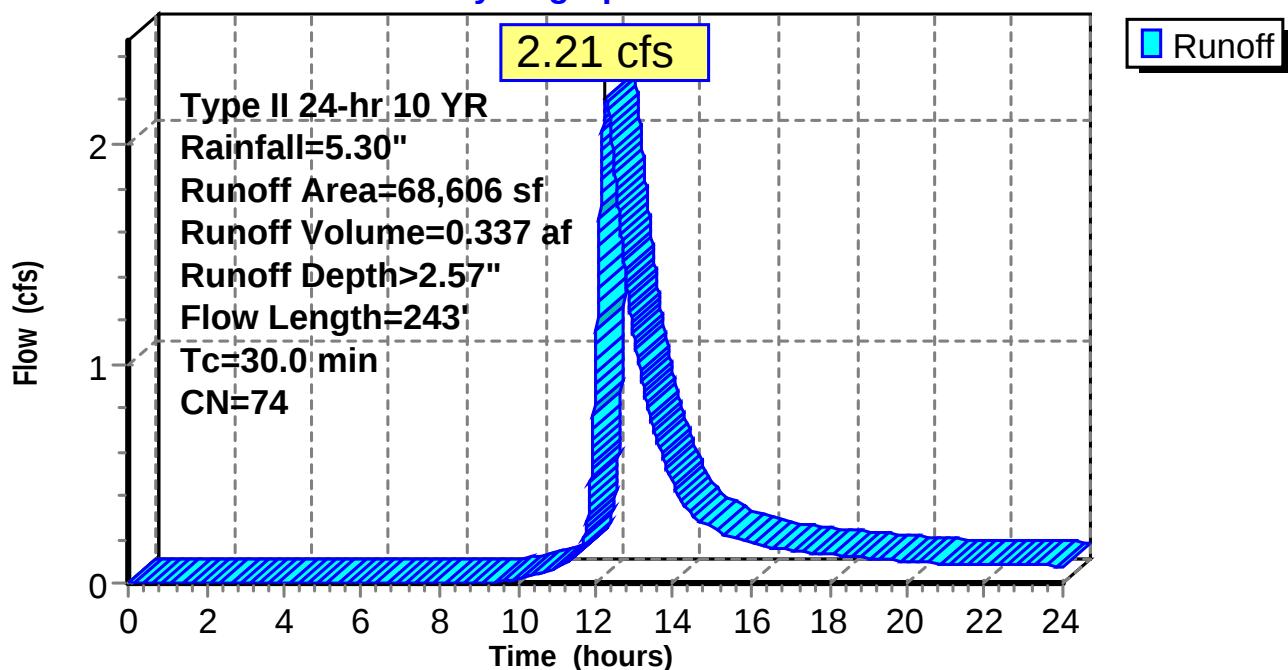
Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type II 24-hr 10 YR Rainfall=5.30"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 68,606    | 74 | >75% Grass cover, Good, HSG C |
| 68,606    |    | Pervious Area                 |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                 |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------|
| 29.1     | 107           | 0.0014        | 0.06              |                | <b>Sheet Flow, A-B</b>                      |
|          |               |               |                   |                | Grass: Short n= 0.150 P2= 3.40"             |
| 0.9      | 136           | 0.0075        | 2.58              | 18.07          | <b>Channel Flow, Ditch</b>                  |
|          |               |               |                   |                | Area= 7.0 sf Perim= 15.0' r= 0.47' n= 0.030 |
| 30.0     | 243           | Total         |                   |                |                                             |

**Subcatchment Exis: Pre Development****Hydrograph**

**Summary for Pond 1P: MBR**

Inflow Area = 0.364 ac, 74.21% Impervious, Inflow Depth > 4.38" for 10 YR event  
 Inflow = 2.24 cfs @ 11.97 hrs, Volume= 0.133 af  
 Outflow = 2.18 cfs @ 11.99 hrs, Volume= 0.108 af, Atten= 2%, Lag= 1.0 min  
 Discarded = 0.02 cfs @ 11.99 hrs, Volume= 0.021 af  
 Primary = 2.16 cfs @ 11.99 hrs, Volume= 0.086 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 15.48' @ 11.99 hrs Surf.Area= 2,879 sf Storage= 1,237 cf

Plug-Flow detention time=116.4 min calculated for 0.108 af (81% of inflow)

Center-of-Mass det. time= 39.8 min ( 818.4 - 778.6 )

| Volume | Invert | Avail.Storage | Storage Description                                                           |
|--------|--------|---------------|-------------------------------------------------------------------------------|
| #1     | 12.83' | 640 cf        | <b>10.00'W x 80.00'L x 2.00'H Prismatic</b><br>1,600 cf Overall x 40.0% Voids |
| #2     | 14.83' | 446 cf        | <b>10.00'W x 80.00'L x 0.50'H Prismatic Z=2.0</b>                             |
| #3     | 15.33' | 331 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                    |
|        |        | 1,416 cf      | Total Available Storage                                                       |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.33               | 968                  | 180.0            | 0                         | 0                         | 968                 |
| 15.50               | 1,115                | 192.0            | 177                       | 177                       | 1,325               |
| 15.60               | 2,000                | 200.0            | 154                       | 331                       | 1,575               |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.33' | <b>17.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64<br>2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74 |
| #2     | Discarded | 12.83' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                                                                                                                  |

**Discarded OutFlow** Max=0.02 cfs @ 11.99 hrs HW=15.48' (Free Discharge)

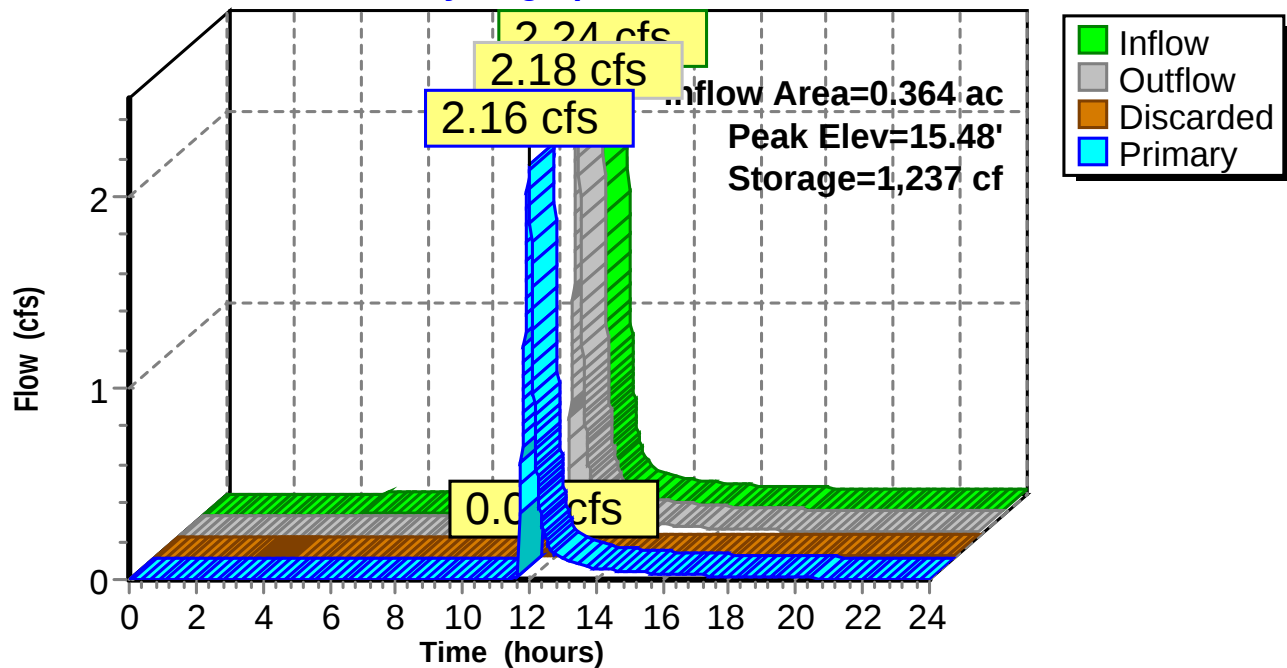
↑ **2=Exfiltration** (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=2.15 cfs @ 11.99 hrs HW=15.48' TW=15.38' (Dynamic Tailwater)

↑ **1=Broad-Crested Rectangular Weir**(Weir Controls 2.15 cfs @ 0.86 fps)

## Pond 1P: MBR

## Hydrograph



**Summary for Pond 2P: MBR2**

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth > 3.65" for 10 YR event  
 Inflow = 5.61 cfs @ 11.98 hrs, Volume= 0.288 af  
 Outflow = 5.55 cfs @ 11.99 hrs, Volume= 0.254 af, Atten= 1%, Lag= 0.8 min  
 Discarded = 0.03 cfs @ 11.99 hrs, Volume= 0.029 af  
 Primary = 5.53 cfs @ 11.99 hrs, Volume= 0.225 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 15.38' @ 11.99 hrs Surf.Area= 3,951 sf Storage= 1,880 cf

Plug-Flow detention time= 76.7 min calculated for 0.254 af (88% of inflow)

Center-of-Mass det. time= 23.8 min ( 808.5 - 784.7 )

| Volume | Invert | Avail.Storage | Storage Description                                                            |
|--------|--------|---------------|--------------------------------------------------------------------------------|
| #1     | 12.60' | 880 cf        | <b>10.00'W x 110.00'L x 2.00'H Prismatic</b><br>2,200 cf Overall x 40.0% Voids |
| #2     | 14.60' | 611 cf        | <b>10.00'W x 110.00'L x 0.50'H Prismatic Z=2.0</b>                             |
| #3     | 15.10' | 580 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                     |
|        |        | 2,070 cf      | Total Available Storage                                                        |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.10               | 1,301                | 237.0            | 0                         | 0                         | 1,301               |
| 15.50               | 1,602                | 253.0            | 580                       | 580                       | 1,933               |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                     |
|--------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.10' | <b>15.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #2     | Discarded | 12.60' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                   |

**Discarded OutFlow** Max=0.03 cfs @ 11.99 hrs HW=15.38' (Free Discharge)

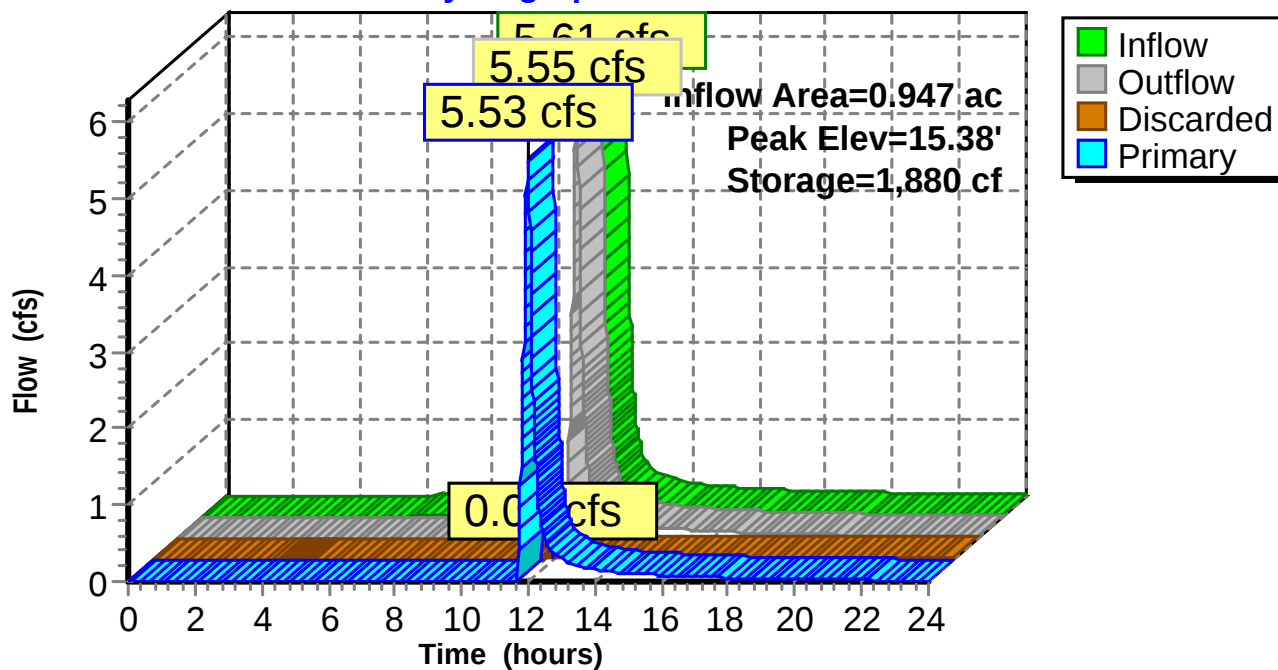
↑ **2=Exfiltration** (Exfiltration Controls 0.03 cfs)

**Primary OutFlow** Max=5.53 cfs @ 11.99 hrs HW=15.38' TW=14.56' (Dynamic Tailwater)

↑ **1=Broad-Crested Rectangular Weir**(Weir Controls 5.53 cfs @ 1.33 fps)

## Pond 2P: MBR2

## Hydrograph



**Summary for Pond 3P: Pond**

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth > 2.85" for 10 YR event  
 Inflow = 5.53 cfs @ 11.99 hrs, Volume= 0.225 af  
 Outflow = 2.21 cfs @ 12.15 hrs, Volume= 0.225 af, Atten= 60%, Lag= 9.7 min  
 Discarded = 0.01 cfs @ 12.15 hrs, Volume= 0.003 af  
 Primary = 2.19 cfs @ 12.15 hrs, Volume= 0.222 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 15.19' @ 12.15 hrs Surf.Area= 1,927 sf Storage= 3,248 cf

Plug-Flow detention time=18.4 min calculated for 0.225 af (100% of inflow)  
 Center-of-Mass det. time= 17.2 min ( 803.7 - 786.5 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------|
| #1                  | 12.40'               | 4,422 cf         | <b>Custom Stage Data (Irregular)</b> listed below (Recalc) |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet)                                  | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 12.40               | 253                  | 133.0            | 0                                                          | 0                         | 253                 |
| 12.70               | 679                  | 152.0            | 135                                                        | 135                       | 686                 |
| 15.20               | 1,932                | 197.0            | 3,130                                                      | 3,265                     | 2,010               |
| 15.50               | 3,140                | 264.0            | 754                                                        | 4,018                     | 4,469               |
| 15.60               | 5,000                | 575.0            | 403                                                        | 4,422                     | 25,233              |

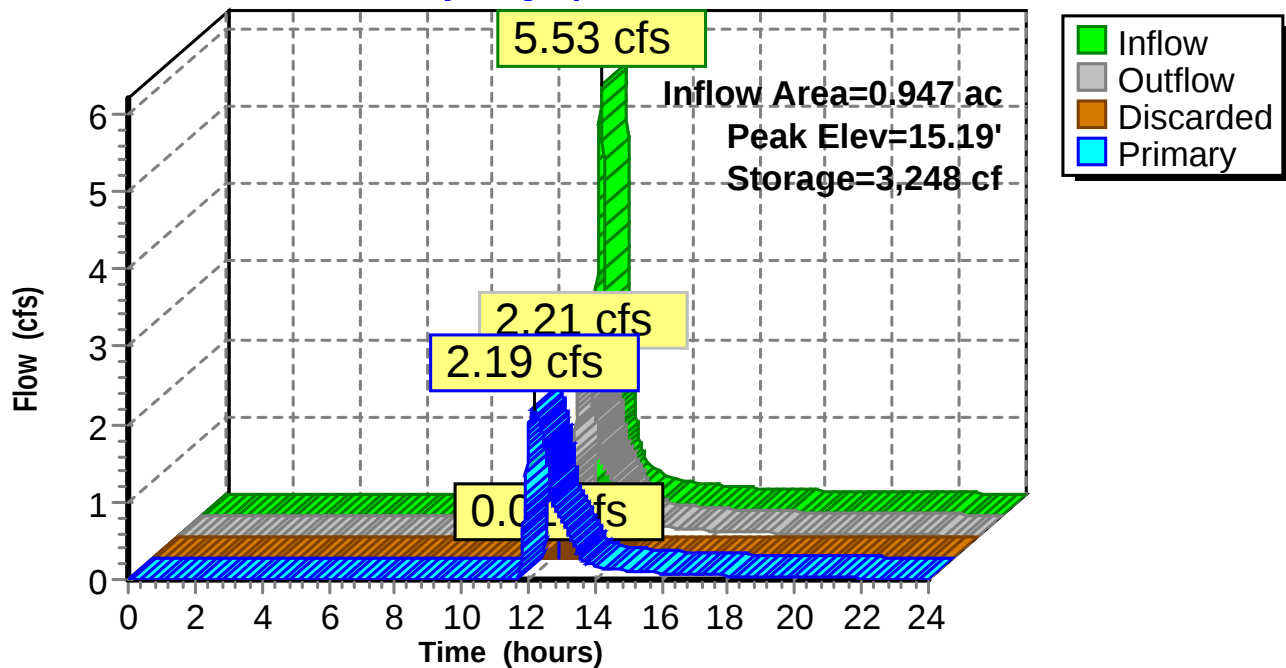
| Device | Routing   | Invert | Outlet Devices                                                                                                                   |
|--------|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 12.27' | <b>15.0" x 50.0' long Culvert</b> RCP, square edge headwall, Ke= 0.500<br>Outlet Invert= 12.20' S= 0.0014 ' ' Cc= 0.900 n= 0.013 |
| #2     | Device 1  | 12.40' | <b>5.7" Vert. Orifice/Grate</b> C= 0.600                                                                                         |
| #3     | Device 1  | 13.79' | <b>5.4" Vert. Orifice/Grate</b> C= 0.600                                                                                         |
| #4     | Device 1  | 15.20' | <b>12.0' long Sharp-Crested Rectangular Weir</b> 0 End Contraction(s)                                                            |
| #5     | Discarded | 12.40' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                 |

**Discarded OutFlow** Max=0.01 cfs @ 12.15 hrs HW=15.19' (Free Discharge)  
 ↑ **5=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=2.19 cfs @ 12.15 hrs HW=15.19' (Free Discharge)  
 ↑ **1=Culvert** (Passes 2.19 cfs of 7.96 cfs potential flow)  
 ↑ **2=Orifice/Grate** (Orifice Controls 1.36 cfs @ 7.69 fps)  
 ↑ **3=Orifice/Grate** (Orifice Controls 0.83 cfs @ 5.22 fps)  
 ↑ **4=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond 3P: Pond

## Hydrograph



**140262\_Lot 14\_Rev\_after\_comments**

Type II 24-hr 100 YR Rainfall=7.60"

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Printed 4/25/2016

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points

Runoff by SCS TR-20 method, UH=Delmarva

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment4S: DA4**

Runoff Area=15,861 sf 74.21% Impervious Runoff Depth&gt;6.64"

Tc=5.0 min CN=92 Runoff=3.31 cfs 0.201 af

**Subcatchment5+6S: DA5+6**

Runoff Area=25,387 sf 65.59% Impervious Runoff Depth&gt;6.40"

Flow Length=98' Slope=0.0014 '/' Tc=5.0 min CN=90 Runoff=5.20 cfs 0.311 af

**SubcatchmentExis: Pre Development**

Runoff Area=68,606 sf 0.00% Impervious Runoff Depth&gt;4.51"

Flow Length=243' Tc=30.0 min CN=74 Runoff=3.95 cfs 0.592 af

**Pond 1P: MBR**

Peak Elev=15.57' Storage=1,354 cf Inflow=3.31 cfs 0.201 af

Discarded=0.02 cfs 0.023 af Primary=3.12 cfs 0.153 af Outflow=3.14 cfs 0.176 af

**Pond 2P: MBR2**

Peak Elev=15.54' Storage=2,070 cf Inflow=8.31 cfs 0.464 af

Discarded=0.03 cfs 0.031 af Primary=8.11 cfs 0.398 af Outflow=8.14 cfs 0.430 af

**Pond 3P: Pond**

Peak Elev=15.43' Storage=3,823 cf Inflow=8.11 cfs 0.398 af

Discarded=0.02 cfs 0.004 af Primary=6.80 cfs 0.393 af Outflow=6.82 cfs 0.397 af

**Total Runoff Area = 2.522 ac Runoff Volume = 1.104 af Average Runoff Depth = 5.26"**  
**74.13% Pervious = 1.869 ac 25.87% Impervious = 0.652 ac**

**Summary for Subcatchment 4S: DA4**

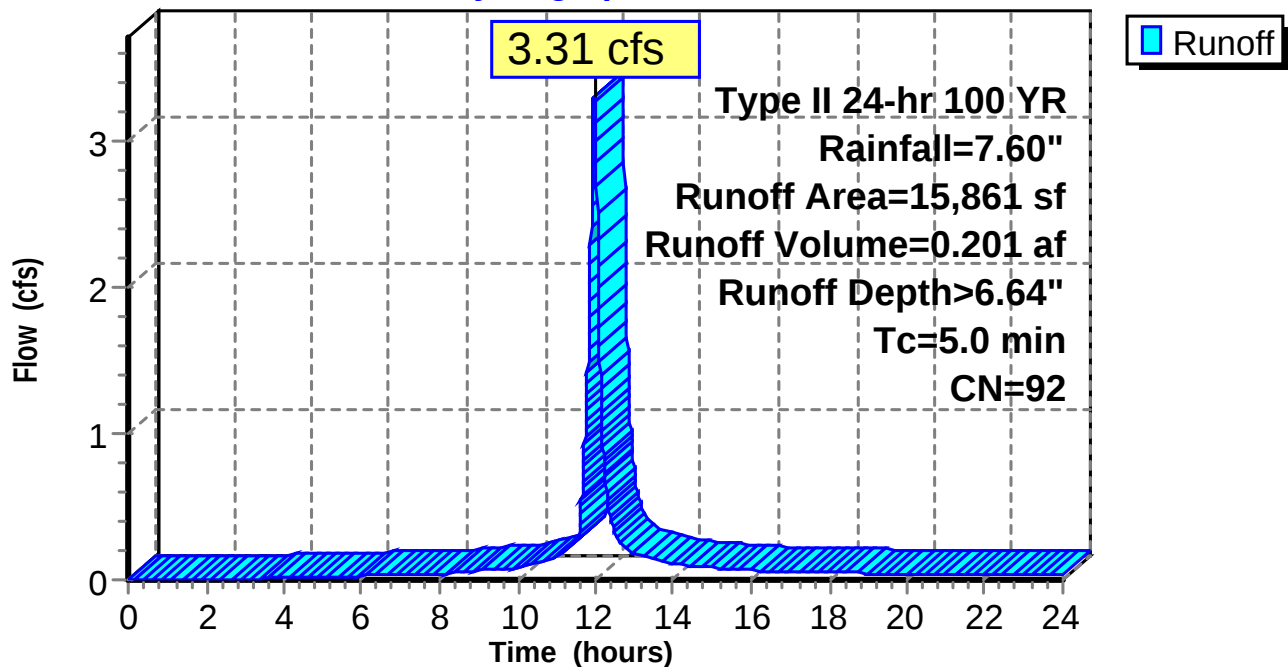
Runoff = 3.31 cfs @ 11.97 hrs, Volume= 0.201 af, Depth> 6.64"

Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type II 24-hr 100 YR Rainfall=7.60"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 11,771    | 98 | Paved parking & roofs         |
| 4,090     | 74 | >75% Grass cover, Good, HSG C |
| 15,861    | 92 | Weighted Average              |
| 4,090     |    | Pervious Area                 |
| 11,771    |    | Impervious Area               |

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

**Subcatchment 4S: DA4****Hydrograph**

### Summary for Subcatchment 5+6S: DA5+6

Runoff = 5.20 cfs @ 11.97 hrs, Volume= 0.311 af, Depth> 6.40"

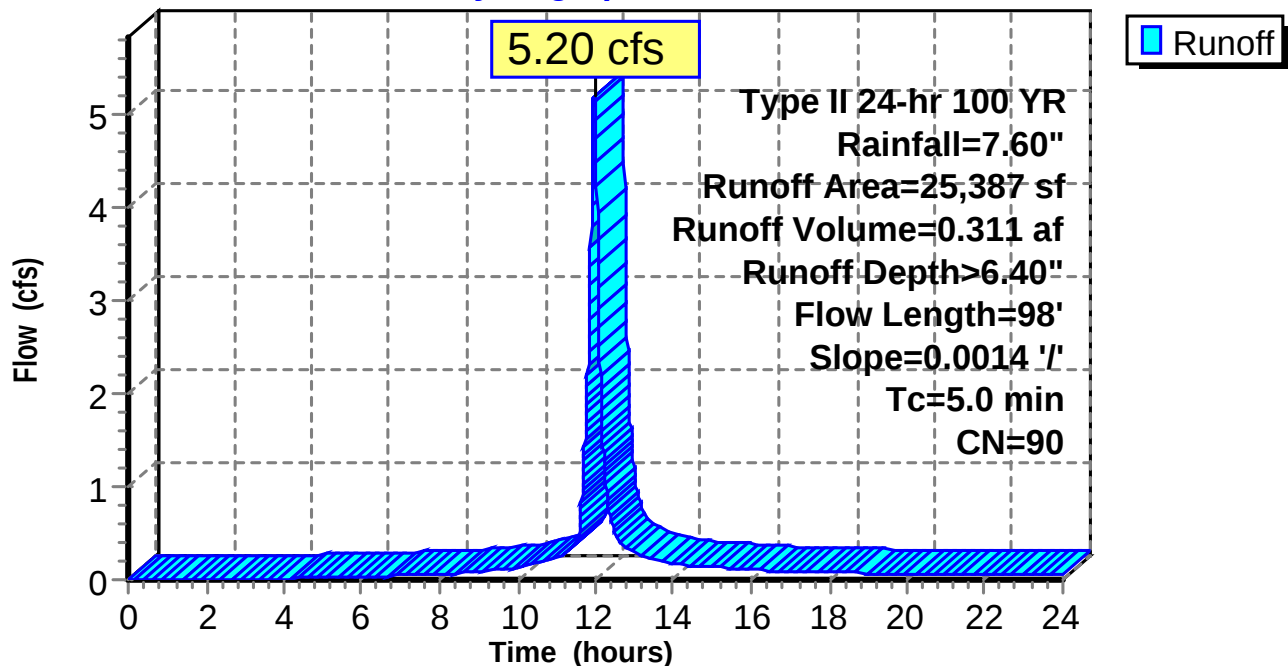
Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type II 24-hr 100 YR Rainfall=7.60"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 16,651    | 98 | Paved parking & roofs         |
| 8,736     | 74 | >75% Grass cover, Good, HSG C |
| 25,387    | 90 | Weighted Average              |
| 8,736     |    | Pervious Area                 |
| 16,651    |    | Impervious Area               |

| Tc (min)                           | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description     |
|------------------------------------|---------------|---------------|-------------------|----------------|-----------------|
| 5.0                                | 98            | 0.0014        | 0.32              |                | Sheet Flow, A-B |
| Smooth surfaces n= 0.011 P2= 1.50" |               |               |                   |                |                 |

### Subcatchment 5+6S: DA5+6

#### Hydrograph



**Summary for Subcatchment Exis: Pre Development**

Runoff = 3.95 cfs @ 12.27 hrs, Volume= 0.592 af, Depth> 4.51"

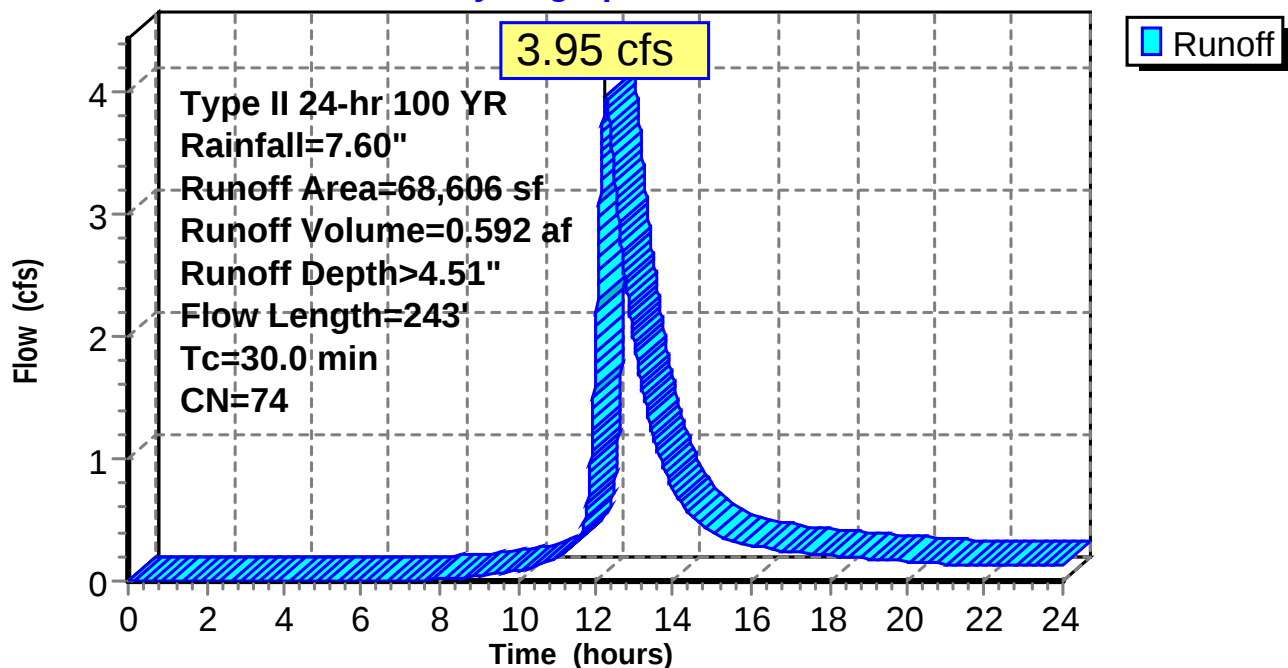
Runoff by SCS TR-20 method, UH=Delmarva, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Type II 24-hr 100 YR Rainfall=7.60"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 68,606    | 74 | >75% Grass cover, Good, HSG C |
| 68,606    |    | Pervious Area                 |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                 |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------|
| 29.1     | 107           | 0.0014        | 0.06              |                | <b>Sheet Flow, A-B</b>                      |
|          |               |               |                   |                | Grass: Short n= 0.150 P2= 3.40"             |
| 0.9      | 136           | 0.0075        | 2.58              | 18.07          | <b>Channel Flow, Ditch</b>                  |
|          |               |               |                   |                | Area= 7.0 sf Perim= 15.0' r= 0.47' n= 0.030 |
| 30.0     | 243           | Total         |                   |                |                                             |

**Subcatchment Exis: Pre Development****Hydrograph**

**Summary for Pond 1P: MBR**

Inflow Area = 0.364 ac, 74.21% Impervious, Inflow Depth > 6.64" for 100 YR event  
 Inflow = 3.31 cfs @ 11.97 hrs, Volume= 0.201 af  
 Outflow = 3.14 cfs @ 11.98 hrs, Volume= 0.176 af, Atten= 5%, Lag= 0.3 min  
 Discarded = 0.02 cfs @ 12.03 hrs, Volume= 0.023 af  
 Primary = 3.12 cfs @ 11.98 hrs, Volume= 0.153 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 15.57' @ 12.03 hrs Surf.Area= 3,453 sf Storage= 1,354 cf

Plug-Flow detention time=95.8 min calculated for 0.176 af (88% of inflow)

Center-of-Mass det. time= 36.2 min ( 804.2 - 768.0 )

| Volume | Invert | Avail.Storage | Storage Description                                                           |
|--------|--------|---------------|-------------------------------------------------------------------------------|
| #1     | 12.83' | 640 cf        | <b>10.00'W x 80.00'L x 2.00'H Prismatic</b><br>1,600 cf Overall x 40.0% Voids |
| #2     | 14.83' | 446 cf        | <b>10.00'W x 80.00'L x 0.50'H Prismatic Z=2.0</b>                             |
| #3     | 15.33' | 331 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                    |
|        |        | 1,416 cf      | Total Available Storage                                                       |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.33               | 968                  | 180.0            | 0                         | 0                         | 968                 |
| 15.50               | 1,115                | 192.0            | 177                       | 177                       | 1,325               |
| 15.60               | 2,000                | 200.0            | 154                       | 331                       | 1,575               |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.33' | <b>17.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64<br>2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74 |
| #2     | Discarded | 12.83' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                                                                                                                  |

**Discarded OutFlow** Max=0.02 cfs @ 12.03 hrs HW=15.57' (Free Discharge)

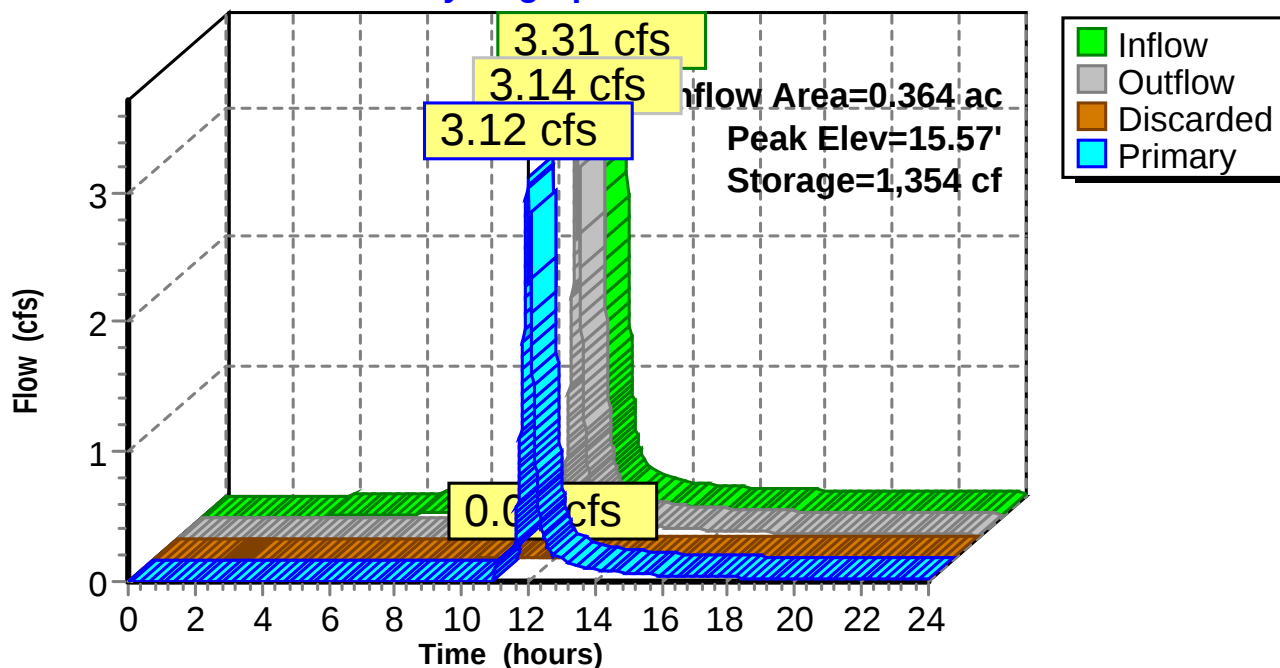
↑ **2=Exfiltration** (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=2.92 cfs @ 11.98 hrs HW=15.54' TW=15.47' (Dynamic Tailwater)

↑ **1=Broad-Crested Rectangular Weir**(Weir Controls 2.92 cfs @ 0.82 fps)

## Pond 1P: MBR

## Hydrograph



**Summary for Pond 2P: MBR2**

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth > 5.88" for 100 YR event  
 Inflow = 8.31 cfs @ 11.97 hrs, Volume= 0.464 af  
 Outflow = 8.14 cfs @ 12.00 hrs, Volume= 0.430 af, Atten= 2%, Lag= 1.6 min  
 Discarded = 0.03 cfs @ 12.00 hrs, Volume= 0.031 af  
 Primary = 8.11 cfs @ 12.00 hrs, Volume= 0.398 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 15.54' @ 12.02 hrs Surf.Area= 4,046 sf Storage= 2,070 cf

Plug-Flow detention time=60.1 min calculated for 0.430 af (93% of inflow)

Center-of-Mass det. time= 21.3 min ( 799.3 - 777.9 )

| Volume | Invert | Avail.Storage | Storage Description                                                            |
|--------|--------|---------------|--------------------------------------------------------------------------------|
| #1     | 12.60' | 880 cf        | <b>10.00'W x 110.00'L x 2.00'H Prismatic</b><br>2,200 cf Overall x 40.0% Voids |
| #2     | 14.60' | 611 cf        | <b>10.00'W x 110.00'L x 0.50'H Prismatic Z=2.0</b>                             |
| #3     | 15.10' | 580 cf        | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc)                     |
|        |        | 2,070 cf      | Total Available Storage                                                        |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 15.10               | 1,301                | 237.0            | 0                         | 0                         | 1,301               |
| 15.50               | 1,602                | 253.0            | 580                       | 580                       | 1,933               |

| Device | Routing   | Invert | Outlet Devices                                                                                                                                                                     |
|--------|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 15.10' | <b>15.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #2     | Discarded | 12.60' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                                                                   |

**Discarded OutFlow** Max=0.03 cfs @ 12.00 hrs HW=15.53' (Free Discharge)

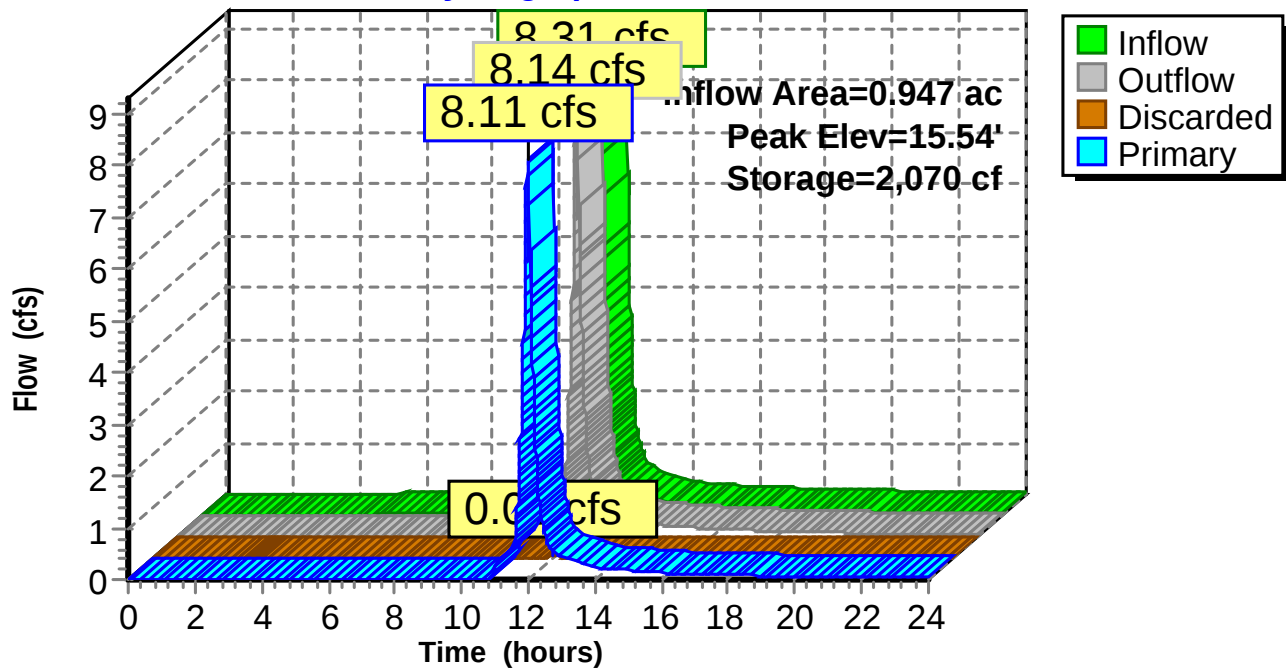
↑ **2=Exfiltration** (Exfiltration Controls 0.03 cfs)

**Primary OutFlow** Max=7.45 cfs @ 12.00 hrs HW=15.52' TW=15.41' (Dynamic Tailwater)

↑ **1=Broad-Crested Rectangular Weir**(Weir Controls 7.45 cfs @ 1.17 fps)

## Pond 2P: MBR2

## Hydrograph



**Summary for Pond 3P: Pond**

Inflow Area = 0.947 ac, 68.91% Impervious, Inflow Depth > 5.05" for 100 YR event  
 Inflow = 8.11 cfs @ 12.00 hrs, Volume= 0.398 af  
 Outflow = 6.82 cfs @ 12.03 hrs, Volume= 0.397 af, Atten= 16%, Lag= 2.0 min  
 Discarded = 0.02 cfs @ 12.03 hrs, Volume= 0.004 af  
 Primary = 6.80 cfs @ 12.03 hrs, Volume= 0.393 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
 Peak Elev= 15.43' @ 12.03 hrs Surf.Area= 2,852 sf Storage= 3,823 cf

Plug-Flow detention time=15.4 min calculated for 0.397 af (100% of inflow)  
 Center-of-Mass det. time= 14.0 min ( 801.9 - 787.9 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------|
| #1                  | 12.40'               | 4,422 cf         | <b>Custom Stage Data (Irregular)</b> listed below (Recalc) |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet)                                  | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 12.40               | 253                  | 133.0            | 0                                                          | 0                         | 253                 |
| 12.70               | 679                  | 152.0            | 135                                                        | 135                       | 686                 |
| 15.20               | 1,932                | 197.0            | 3,130                                                      | 3,265                     | 2,010               |
| 15.50               | 3,140                | 264.0            | 754                                                        | 4,018                     | 4,469               |
| 15.60               | 5,000                | 575.0            | 403                                                        | 4,422                     | 25,233              |

| Device | Routing   | Invert | Outlet Devices                                                                                                                   |
|--------|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 12.27' | <b>15.0" x 50.0' long Culvert</b> RCP, square edge headwall, Ke= 0.500<br>Outlet Invert= 12.20' S= 0.0014 ' ' Cc= 0.900 n= 0.013 |
| #2     | Device 1  | 12.40' | <b>5.7" Vert. Orifice/Grate</b> C= 0.600                                                                                         |
| #3     | Device 1  | 13.79' | <b>5.4" Vert. Orifice/Grate</b> C= 0.600                                                                                         |
| #4     | Device 1  | 15.20' | <b>12.0' long Sharp-Crested Rectangular Weir</b> 0 End Contraction(s)                                                            |
| #5     | Discarded | 12.40' | <b>0.240 in/hr Exfiltration over Wetted area</b>                                                                                 |

**Discarded OutFlow** Max=0.02 cfs @ 12.03 hrs HW=15.43' (Free Discharge)  
 ↑ **5=Exfiltration** (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=6.79 cfs @ 12.03 hrs HW=15.43' (Free Discharge)  
 ↑ **1=Culvert** (Passes 6.79 cfs of 8.50 cfs potential flow)  
 ↑ **2=Orifice/Grate** (Orifice Controls 1.43 cfs @ 8.05 fps)  
 ↑ **3=Orifice/Grate** (Orifice Controls 0.91 cfs @ 5.74 fps)  
 ↑ **4=Sharp-Crested Rectangular Weir** (Weir Controls 4.46 cfs @ 1.58 fps)

## Pond 3P: Pond

## Hydrograph

