



**ALLEN & MAJOR  
ASSOCIATES, INC.**

# **SUPPLEMENTAL DRAINAGE REPORT**

6 Forge Parkway  
Franklin, Massachusetts



**APPLICANT:**

Donegal, LLC  
PO Box 4430  
Manchester, NH 03108

**PREPARED BY:**

Allen & Major Associates, Inc.  
400 Harvey Road  
Manchester, NH 03103



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**A&M PROJECT NO.:**

1362-25



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**SECTION 1.0 -  
DRAINAGE REPORT**



## **Introduction**

The purpose of this drainage report is to provide an overview of the proposed stormwater management system (SMS) for the proposed construction of a 36,000 square foot building, 51 parking spaces, and paved loading docks located at 6 Forge Parkway in Franklin, MA. The report will show by means of narrative, calculations and exhibits that the proposed stormwater management system will meet or exceed the Massachusetts Department of Environmental Protection (MassDEP) stormwater standards, and the Town's Stormwater Management Regulations.

The proposed SMS incorporates structural and non-structural Best Management Practices (BMPs) to provide stormwater peak flow mitigation, quality treatment, and conveyance. The SMS for the proposed development includes a series of deep sump catch basins, proprietary water quality devices, chamber infiltration systems, an outlet control structure, and bioretention system.

## **Site Categorization for Stormwater Regulations**

The proposed site improvements at 6 Forge Parkway are considered a new development under the DEP Stormwater Management Standards due to the net increase in impervious area.

## **Site Location and Access**

The site is a single lot with 207± feet of frontage on Forge Parkway, entirely within the Town of Franklin. The parcel is located approximately 1,000± feet west of Interstate 495 and is directly south of Route 140. The parcel is abutted to the west by a hotel, to the east by railroad and undeveloped woodland, and to the south by an office building. The parcel is located within the Town's Industrial zone. The site shares driveway access to Forge Parkway with the Residence Inn, located at 4 Forge Parkway, the abutter to the west.

## **Existing Site Conditions**

The project site is located at 6 Forge Parkway, Franklin, Massachusetts, and is identified on the town Assessor's Map 272 as Parcel 5 and is approximately 5.91 acres. The project site is on the north side of Forge Parkway and is covered by scrub-brush and woods. A significant portion of the property was cleared in the early 2000's but was never developed. The site's topography ranges from moderate to steep slopes. The high point on-site is approximately elevation 296 in the southwestern corner of the site; the low point on-site is approximately elevation 221 in the northeastern corner of the site. The existing impervious area on-site is approximately 6,000 square feet, which includes the existing driveway to 4 Forge Parkway.

On the property presently, stormwater flows to three distinct locations, or "Study Points". Stormwater from the southwestern portion of the site flows towards the adjacent lot, 4 Forge Parkway (Study Point #1). Flow from a small portion in the northwest of the site flows overland towards route 140 (Study Point #2). Stormwater from more than half of the site on the eastern side flows overland and discharges to the wetlands on the northeast side of the site (Study Point #3). It was at these three study points that surface drainage flows were analyzed for the following analysis.



### **Existing Soil Conditions**

The on-site soils were identified using the USDA Natural Resources Conservation Services (NRCS) Soil Survey for Norfolk County, which indicates that the soils on-site consist of Charlton-Hollis-Rock outcrop complex and Canton fine sandy loam. Charlton-Hollis-Rock outcrop complex is categorized as Hydrologic Soil Group Type "A". Canton fine sandy loam is categorized as Hydrologic Soil Group Type "B". A copy of the NRCS Custom Soil Resource Report is included in the appendix of this report.

Further investigation of the underlying soils has been conducted by performing a series of test pits across the site. On November 15 and 16, 2023, GeoEngineers, the project Geotechnical Engineer, witnessed and logged eight test pits in various locations. The test pits showed that the underlying soils are loamy sands. Copies of the test pit logs are included in the appendix of this report. An exfiltration rate for the loamy sands was determined to be 2.41 inches per hour using Table 2.3.3 1982 Rawls Rate, Massachusetts Stormwater Handbook, Volume 3, Chapter 1.

### **FEMA Floodplain/Environmental Due Diligence**

There are no portions of the site located within the FEMA Zone "AE" Special Flood Hazard Area Subject to Inundation by the 1% Annual Chance Flood (100-year floodplain) per the official Flood Insurance Rate Map (FIRM) effective date July 17, 2012, community panel 25021C0308E. See section 3 of this report for a copy of the FEMA FIRM.

### **Environmentally Sensitive Zones**

The Commonwealth of Massachusetts asserts control over numerous protected and regulated areas including: Areas of Critical Environmental Concern (ACEC); Outstanding Resource Waters (ORWs); Priority and Protected Habitat for rare and endangered species, and areas protected under the Wetlands Protection Act. The subject property is not located within any of these regulated areas.

### **Drainage Analysis Methodology**

A peak rate of runoff will be determined using techniques and data found in the following:

1. Urban Hydrology for Small Watersheds – Technical Release 55 by the United States Department of Agriculture Soils Conservation Service, June 1986. Runoff curve numbers and 24-hour precipitation values were obtained from this reference.
2. HydroCAD © Stormwater Modeling System by HydroCAD Software Solutions LLC, version 10.20-4a. The HydroCAD program was used to generate runoff hydrographs for the watershed areas, to determine discharge/ stage/storage characteristics for the stormwater BMPs, to perform drainage routing and to combine the results of the runoff hydrographs. HydroCAD uses the TR-20 methodology of the SCS Unit Hydrograph procedure (SCS-UH).



### **Proposed Conditions – Peak Rate of Runoff**

The stormwater runoff analysis of the existing and proposed conditions includes an estimate of the peak rate of runoff from various rainfall events. Peak runoff rates were developed using TR55 Urban Hydrology for Small Watersheds, developed by the U.S. Department of Commerce, Engineering Division and the HydroCAD computer program. Further, the analysis has been prepared in accordance with the MassDEP and the Town of Franklin requirements and standard engineering practices. The peak rate of runoff has been estimated for each watershed during the 2, 10, 25, and 100-year storm events.

The proposed stormwater management system for the site consists of deep sump catch basins, proprietary water quality devices, a Stormtech MC-3500 chamber infiltration system with isolator row, a bioretention system, a Stormtech SC-740 chamber infiltration system, and an outlet control structure. These systems have been designed in accordance with the MA DEP Stormwater Management Policy to recharge groundwater and reduce the rate of runoff from the parcel.

A portion of the new driveway entrance and adjacent hillside will continue to generate stormwater that ultimately discharges to the 4 Forge Parkway property (Study Point #1). This runoff will be intercepted by two Rain Guardian Turret devices which are curb inlet structures that provide pretreatment of trash and debris and discharge to the ground surface. The runoff will then spill over a rip rap apron which discharges to a bioretention system. The bioretention system media and plants will provide further treatment of the runoff. The bioretention system is overlaid on top of a Stormtech SC-740 chamber infiltration system. Runoff will flow freely through the bioretention system media into the infiltration system. An overflow grate will be installed into the infiltration system, which will allow stormwater to enter the system, should it be necessary during large storm events. This system will infiltrate all runoff up to the 25-year design storm event while larger storm events will overflow to a landscaped island on the 4 Forge Parkway property. (Study Point #1).

Stormwater generated on the northwesterly corner of the site will flow overland to the Route 140 right-of-way (Study Point #2). The ground cover in this relatively small portion of the site is landscaped and does not include any impervious cover.

Stormwater generated on the main portion of the developed site will be captured within a series of catch basins, directed to one of two proprietary water quality devices and flow to the Stormtech MC-3500 chamber infiltration system. All pavement runoff will be treated within the system's isolator row. Approximately half of the roof runoff will be piped directly to the infiltration. This system will infiltrate the 2-year design storm event while larger storm events will overflow through an outlet control structure to the hillside on the east side of the site and eventually to the easterly wetlands (Study Point #3).



The stormwater runoff model indicates that the proposed site development reduces the rate of runoff during all storm events at the identified Study Points. The following tables provide a summary of the estimated peak rate, in cubic feet per second (CFS) at each of the Study Points for each of the design storm events. The HydroCAD worksheets are included in Section 4 and 5 of this report.

<b>STUDY POINT #1 (Flow to 4 Forge Parkway property)</b>				
	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	0.17	0.26	0.34	0.65
Proposed Flow (CFS)	0.00	0.00	0.00	0.40
<b>Change (CFS)</b>	<b>-0.17</b>	<b>-0.26</b>	<b>-0.34</b>	<b>-0.25</b>

<b>STUDY POINT #2 (Flow to Route 140 right-of-way)</b>				
	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	0.00	0.00	0.00	0.06
Proposed Flow (CFS)	0.00	0.00	0.00	0.00
<b>Change (CFS)</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>-0.06</b>

<b>STUDY POINT #3 (Flow to wetlands)</b>				
	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	6.08	10.80	15.15	25.12
Proposed Flow (CFS)	5.34	9.71	13.62	23.46
<b>Change (CFS)</b>	<b>-0.74</b>	<b>-1.09</b>	<b>-1.53</b>	<b>-1.66</b>

### MASSDEP Stormwater Performance Standards

The MA DEP Stormwater Management Policy was developed to improve water quality by implementing performance standards for stormwater management. The intent is to implement the stormwater management standards through the review of Notice of Intent filings by the issuing authority (Conservation Commission or DEP). The following section outlines how the proposed Stormwater Management System meets the standards set forth by the Policy.

BMP's implemented in the design include:

- Deep Sump Catch Basins
- Proprietary water quality devices
- Stormtech MC-3500 Infiltration System
- Stormtech SC-740 Infiltration System
- Bioretention System
- Outlet Control Structure

Stormwater Best Management Practices (BMP's) have been incorporated into the design of the project to mitigate the anticipated pollutant loading. An Operations and Maintenance Plan has been developed for the project, which addresses the long-term maintenance requirements of the proposed system.



Temporary erosion and sedimentation controls will be incorporated into the construction phase of the project. These temporary controls may include tubular silt barriers, inlet sediment traps, slope stabilization, and stabilized construction entrances.

The Massachusetts Department of Environmental Protection has established ten (10) Stormwater Management Standards. A project that meets or exceeds the standards is presumed to satisfy the regulatory requirements regarding stormwater management. The Standards are enumerated below as well as descriptions and supporting calculations as to how the Project will comply with the Standards:

1. *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

The proposed development will not introduce any new outfalls with direct discharge to a wetland area or waters of the Commonwealth of Massachusetts. All discharges will be treated for water quality and the rate will not be increased over existing conditions.

2. *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

The proposed development has been designed so that the post-development peak discharge rates do not exceed the predevelopment peak discharge rates. A summary of the existing and proposed discharge rates is included within this document.

3. *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

The existing annual recharge for the site has been approximated in the proposed condition. The proposed subsurface infiltration systems are designed to meet this requirement. Stormwater runoff generated from the impervious areas of the proposed development are routed through the Stormtech MC-3500 and SC-740 chamber infiltration systems. The proposed Recharge Volume is based on the Static Method per the MA DEP Stormwater Management Standards, Volume 3, Chapter 1. See the appendix located in section 6 of this report for stormwater recharge calculations.



4. *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:*
  - *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*
  - *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
  - *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

Standard #4 is met when structural stormwater best management practices are sized to capture and treat the required water quality volume and pretreatment is provided in accordance with the Massachusetts Stormwater Handbook. Standard #4 also requires that suitable source control measures are identified in the Long-term Pollution Prevention Plan. The water quality volume for the site development is captured and treated using proprietary water quality devices, the Stormtech MC-3500 and SC-740 chamber infiltration systems, and the bioretention system.

The implemented BMPs have been designed to treat the contributing water quality volume. These water quality calculations can be seen within the appendix of this report.

The proposed stormwater management system has been designed to remove greater than 80% of the average annual post-construction load for each treatment train. The TSS removal calculations can be seen within the appendix of this report.

5. *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

The site is not considered a land use with higher potential pollutant loads..

6. *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to*



*Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.*

The project site does not discharge stormwater within a Zone II or Interim Wellhead Protection Area or near a critical area. Critical Areas are Outstanding Resource Waters as designated in 314 CMR 4.00, Special Resource Waters as designated in 314 CMR 4.00, recharge areas for public water supplies as defined in 310 CMR 22.02, bathing beaches as defined in 105 CMR 445.000, cold-water fisheries as defined in 314 CMR 9.02 and 310 CMR 10.04, and shellfish growing areas as defined in 314 CMR 9.02 and 310 CMR 10.04.

- 7. A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

The proposed project is not considered a re-development project under the Stormwater Management Handbook guidelines as there is an increase in the amount of impervious area.

- 8. A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction has been developed. A detailed Site Preparation Plan in the Permit Drawings has been prepared, outlining the erosion and sedimentation controls to be used. The proponent will prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) prior to commencement of construction activities that will result in the disturbance of one acre of land or more.

- 9. A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

A Long-Term Operation & Maintenance (O&M) Plan has been developed for the proposed stormwater management system and is included within this document. See Section 2.0 of this report.

- 10. All illicit discharges to the stormwater management system are prohibited.*

There are no expected illicit discharges to the stormwater management system.

See the following pages for the MassDEP Stormwater Checklist.



### **Town of Franklin Stormwater Management Bylaw Standards**

In addition to the MassDEP Stormwater Standards, the Town of Franklin has established its own Stormwater Management Bylaw, the standards of which are outlined in Section 153-16 of the General Legislation Bylaws. In addition to requiring that project's meet federal and state requirements, including the MassDEP Stormwater Standards above, the Stormwater Management Bylaw requires that all stormwater management systems for new developments shall be designed to:

- (a) Retain the volume of runoff equivalent to one inch multiplied by the impervious surface on the site.*

The project proposes to increase the impervious area on site by 97,622 square feet. One inch over this area is 8,132 cubic feet. The two systems that use infiltration provide a total of 13,205 cubic feet of storage below the lowest overflow outlet. This standard is met.

- (b) Remove 90% of the average annual load of total suspended solids (TSS) and 60% of the average annual load of total phosphorus (TP)*

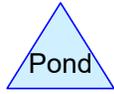
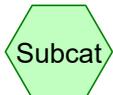
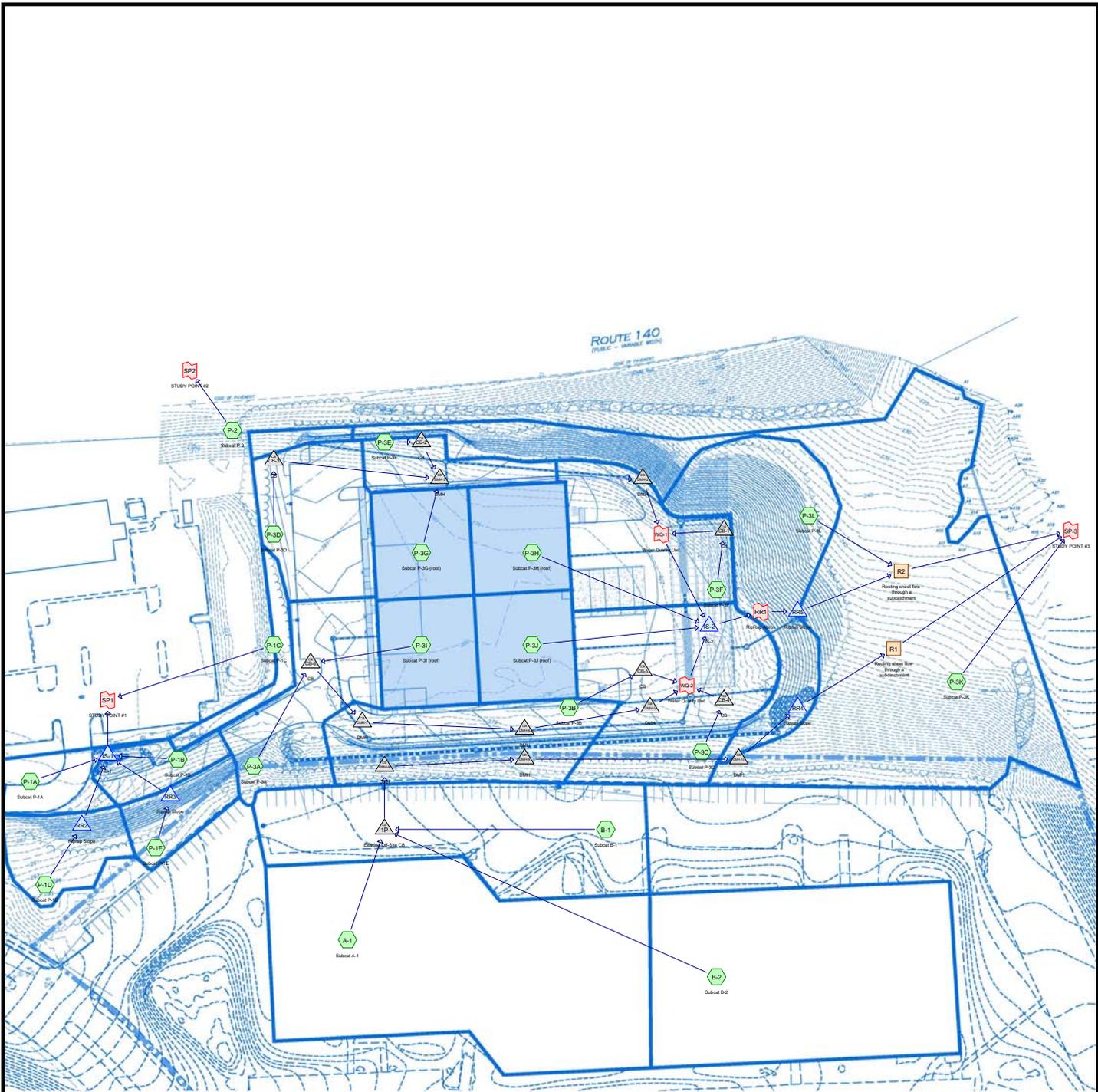
Stormwater runoff from the proposed parking lot will be treated by the various BMPs described above prior to discharge to the subsurface infiltration systems. The subsurface infiltration systems have been designed to infiltrate a volume that far exceeds the Water Quality Volume. The treatment provided by the combination of these BMPs exceeds 90% TSS removal. TSS removal calculations can be found in the appendix of this report. Phosphorus removal is provided by the infiltration systems. As mentioned above, the infiltration systems are designed to infiltrate a volume that far exceeds the Water Quality Volume. The systems have been designed such that **all** runoff from the 2-year storm event is infiltrated. The MassDEP Stormwater handbook, Volume 2, Chapter 2 specifies that infiltration basins provide between 60% and 70% phosphorus removal. Therefore, this requirement is met.



**SECTION 5.0 -  
PROPOSED DRAINAGE  
ANALYSIS**



## Proposed HydroCAD



**Routing Diagram for 1362-25 - Proposed HydroCAD\_rev1**  
 Prepared by Allen & Major Associates, Inc, Printed 5/21/2024  
 HydroCAD® 10.20-5a s/n 02881 © 2023 HydroCAD Software Solutions LLC

**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
43,332	39	>75% Grass cover, Good, HSG A (B-1, P-1A, P-1B, P-1C, P-1D, P-1E, P-2, P-3A, P-3B, P-3C, P-3D, P-3E, P-3K)
30,275	61	>75% Grass cover, Good, HSG B (P-3C, P-3E, P-3F, P-3K, P-3L)
4,800	62	>Stone Rip Rap, Good, HSG A (P-1D, P-1E, P-2, P-3A, P-3D, P-3K)
7,134	68	>Stone Rip Rap, Good, HSG B (P-3C, P-3K, P-3L)
166,299	98	Paved parking, HSG A (A-1, B-1, B-2, P-1A, P-1B, P-1E, P-3A, P-3B, P-3C, P-3D, P-3E, P-3F)
28,683	98	Paved parking, HSG B (P-3C, P-3E, P-3F, P-3L)
35,032	98	Roofs, HSG A (P-3G, P-3H, P-3I, P-3J)
968	98	Roofs, HSG B (P-3H)
11,940	30	Woods, Good, HSG A (P-1C, P-1D, P-1E, P-2, P-3A, P-3B, P-3C, P-3D, P-3K)
62,335	55	Woods, Good, HSG B (P-3C, P-3K, P-3L)
<b>390,798</b>	<b>79</b>	<b>TOTAL AREA</b>

**1362-25 - Proposed HydroCAD\_rev1**

**Soil Listing (all nodes)**

Area (sq-ft)	Soil Group	Subcatchment Numbers
261,403	HSG A	A-1, B-1, B-2, P-1A, P-1B, P-1C, P-1D, P-1E, P-2, P-3A, P-3B, P-3C, P-3D, P-3E, P-3F, P-3G, P-3H, P-3I, P-3J, P-3K
129,395	HSG B	P-3C, P-3E, P-3F, P-3H, P-3K, P-3L
0	HSG C	
0	HSG D	
0	Other	
<b>390,798</b>		<b>TOTAL AREA</b>

**Summary for Subcatchment A-1: Subcat A-1**

Runoff = 3.85 cfs @ 12.11 hrs, Volume= 14,304 cf, Depth= 3.04"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
56,517	98	Paved parking, HSG A
56,517	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment B-1: Subcat B-1**

Runoff = 1.95 cfs @ 12.08 hrs, Volume= 6,785 cf, Depth= 2.65"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
3,889	39	>75% Grass cover, Good, HSG A
26,806	98	Paved parking, HSG A
30,695		Weighted Average
3,889	39	12.67% Pervious Area
26,806	98	87.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	117	0.0200	1.44		<b>Sheet Flow, Paved parking</b> Smooth surfaces n= 0.011 P2= 3.28"
0.9	163	0.0200	2.87		<b>Shallow Concentrated Flow, Paved Parking Lot</b> Paved Kv= 20.3 fps
2.3	280	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment B-2: Subcat B-2**

Runoff = 3.07 cfs @ 12.11 hrs, Volume= 11,386 cf, Depth= 3.04"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
44,985	98	Paved parking, HSG A
44,985	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment P-1A: Subcat P-1A**

Runoff = 0.24 cfs @ 12.08 hrs, Volume= 834 cf, Depth= 1.71"  
 Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

**1362-25 - Proposed HydroCAD\_rev1**

Prepared by Allen & Major Associates, Inc  
 HydroCAD® 10.20-5a s/n 02881 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 2-year Rainfall=3.27"

Printed 5/21/2024

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Area (sf)	CN	Description
2,565	39	>75% Grass cover, Good, HSG A
3,294	98	Paved parking, HSG A
5,859		Weighted Average
2,565	39	43.78% Pervious Area
3,294	98	56.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	67	0.0300	1.51		<b>Sheet Flow, A-B</b> Smooth surfaces n= 0.011 P2= 3.28"
0.7	67	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1B: Subcat P-1B**

Runoff = 0.20 cfs @ 12.08 hrs, Volume= 677 cf, Depth= 1.72"  
 Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
2,046	39	>75% Grass cover, Good, HSG A
2,675	98	Paved parking, HSG A
4,722		Weighted Average
2,046	39	43.34% Pervious Area
2,675	98	56.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	34	0.0300	1.32		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
0.4	34	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1C: Subcat P-1C**

Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0 cf, Depth= 0.00"  
 Routed to Link SP1 : STUDY POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
2,460	39	>75% Grass cover, Good, HSG A
964	30	Woods, Good, HSG A
3,424		Weighted Average
3,424	36	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-1D: Subcat P-1D**

Runoff = 0.02 cfs @ 12.12 hrs, Volume= 79 cf, Depth= 0.13"  
 Routed to Pond RR2 : Riprap Slope

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

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Type III 24-hr 2-year Rainfall=3.27"

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Area (sf)	CN	Description
1,126	39	>75% Grass cover, Good, HSG A
1,840	62	>Stone Rip Rap, Good, HSG A
4,547	30	Woods, Good, HSG A
7,513		Weighted Average
7,513	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.1673	0.16		<b>Sheet Flow, A-B</b> Woods: Light underbrush n= 0.400 P2= 3.28"
0.1	18	0.1673	2.05		<b>Shallow Concentrated Flow, B-C</b> Woodland Kv= 5.0 fps
5.3	68	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1E: Subcat P-1E**

Runoff = 0.03 cfs @ 12.10 hrs, Volume= 134 cf, Depth= 0.28"  
 Routed to Pond RR3 : Riprap Slope

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
2,868	39	>75% Grass cover, Good, HSG A
1,801	62	>Stone Rip Rap, Good, HSG A
225	98	Paved parking, HSG A
813	30	Woods, Good, HSG A
5,707		Weighted Average
5,482	45	96.06% Pervious Area
225	98	3.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	21	0.1200	0.12		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.28"
0.3	41	0.0992	2.20		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
3.3	62	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-2: Subcat P-2**

Runoff = 0.00 cfs @ 12.12 hrs, Volume= 5 cf, Depth= 0.04"  
 Routed to Link SP2 : STUDY POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
746	39	>75% Grass cover, Good, HSG A
107	62	>Stone Rip Rap, Good, HSG A
734	30	Woods, Good, HSG A
1,587		Weighted Average
1,587	36	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-3A: Subcat P-3A**

Runoff = 0.60 cfs @ 12.09 hrs, Volume= 2,092 cf, Depth= 1.65"  
 Routed to Pond CB-6 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
5,602	39	>75% Grass cover, Good, HSG A
250	62	>Stone Rip Rap, Good, HSG A
8,221	98	Paved parking, HSG A
1,098	30	Woods, Good, HSG A
15,170		Weighted Average
6,950	38	45.81% Pervious Area
8,221	98	54.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	47	0.1200	0.14		<b>Sheet Flow, A-B</b>
					Woods: Light underbrush n= 0.400 P2= 3.28"
0.5	106	0.0300	3.52		<b>Shallow Concentrated Flow, B-C</b>
					Paved Kv= 20.3 fps
6.2	153	Total			

**Summary for Subcatchment P-3B: Subcat P-3B**

Runoff = 0.46 cfs @ 12.10 hrs, Volume= 1,696 cf, Depth= 1.15"  
 Routed to Pond CB-5 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
9,329	39	>75% Grass cover, Good, HSG A
6,696	98	Paved parking, HSG A
1,685	30	Woods, Good, HSG A
17,711		Weighted Average
11,014	38	62.19% Pervious Area
6,696	98	37.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	47	0.1200	0.14		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.28"
1.8	254	0.0140	2.40		<b>Shallow Concentrated Flow,</b>
					Paved Kv= 20.3 fps
7.5	301	Total			

**Summary for Subcatchment P-3C: Subcat P-3C**

Runoff = 1.27 cfs @ 12.08 hrs, Volume= 4,440 cf, Depth= 2.10"  
 Routed to Pond CB-4 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

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Type III 24-hr 2-year Rainfall=3.27"

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Area (sf)	CN	Description
5,279	39	>75% Grass cover, Good, HSG A
1,565	61	>75% Grass cover, Good, HSG B
12	68	>Stone Rip Rap, Good, HSG B
2,364	98	Paved parking, HSG A
14,929	98	Paved parking, HSG B
1,229	30	Woods, Good, HSG A
14	55	Woods, Good, HSG B
25,392		Weighted Average
8,099	42	31.90% Pervious Area
17,293	98	68.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	158	0.0200	1.53		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
1.7	158	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-3D: Subcat P-3D**

Runoff = 0.68 cfs @ 12.08 hrs, Volume= 2,365 cf, Depth= 2.05"  
 Routed to Pond CB-3 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
3,871	39	>75% Grass cover, Good, HSG A
1	62	>Stone Rip Rap, Good, HSG A
9,341	98	Paved parking, HSG A
619	30	Woods, Good, HSG A
13,831		Weighted Average
4,491	38	32.47% Pervious Area
9,341	98	67.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0360	1.53		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
0.4	85	0.0360	3.85		<b>Shallow Concentrated Flow, B-C</b> Paved Kv= 20.3 fps
0.9	135	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-3E: Subcat P-3E**

Runoff = 0.37 cfs @ 12.08 hrs, Volume= 1,287 cf, Depth= 2.53"  
 Routed to Pond CB-2 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
925	39	>75% Grass cover, Good, HSG A
125	61	>75% Grass cover, Good, HSG B
4,721	98	Paved parking, HSG A
346	98	Paved parking, HSG B
6,117		Weighted Average
1,050	42	17.17% Pervious Area
5,067	98	82.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-3F: Subcat P-3F**

Runoff = 1.03 cfs @ 12.08 hrs, Volume= 3,618 cf, Depth= 2.61"  
 Routed to Pond CB-1 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
2,781	61	>75% Grass cover, Good, HSG B
455	98	Paved parking, HSG A
13,407	98	Paved parking, HSG B
16,643		Weighted Average
2,781	61	16.71% Pervious Area
13,862	98	83.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TR-55 MIN

**Summary for Subcatchment P-3G: Subcat P-3G (roof)**

Runoff = 0.61 cfs @ 12.11 hrs, Volume= 2,278 cf, Depth= 3.04"  
 Routed to Pond DMH-3 : DMH

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry, Internal roof drains

**Summary for Subcatchment P-3H: Subcat P-3H (roof)**

Runoff = 0.61 cfs @ 12.11 hrs, Volume= 2,278 cf, Depth= 3.04"  
 Routed to Pond IS-2 : IS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
8,032	98	Roofs, HSG A
968	98	Roofs, HSG B
9,000		Weighted Average
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry, Internal roof drains

**Summary for Subcatchment P-3I: Subcat P-3I (roof)**

Runoff = 0.61 cfs @ 12.11 hrs, Volume= 2,278 cf, Depth= 3.04"  
 Routed to Pond CB-6 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry, Internal roof drains

**Summary for Subcatchment P-3J: Subcat P-3J (roof)**

Runoff = 0.61 cfs @ 12.11 hrs, Volume= 2,278 cf, Depth= 3.04"  
 Routed to Pond IS-2 : IS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry, Internal roof drains

**Summary for Subcatchment P-3K: Subcat P-3K**

Runoff = 0.25 cfs @ 12.35 hrs, Volume= 2,010 cf, Depth= 0.31"  
 Routed to Link SP-3 : STUDY POINT #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
2,624	39	>75% Grass cover, Good, HSG A
8,980	61	>75% Grass cover, Good, HSG B
801	62	>Stone Rip Rap, Good, HSG A
3,956	68	>Stone Rip Rap, Good, HSG B
250	30	Woods, Good, HSG A
60,357	55	Woods, Good, HSG B
76,968		Weighted Average
76,968	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.2500	0.11		<b>Sheet Flow, A-B</b> Woods: Dense underbrush n= 0.800 P2= 3.28"
3.6	359	0.1100	1.66		<b>Shallow Concentrated Flow, B-C</b> Woodland Kv= 5.0 fps
11.3	409	Total			

**Summary for Subcatchment P-3L: Subcat P-3L**

Runoff = 0.20 cfs @ 12.12 hrs, Volume= 911 cf, Depth= 0.50"  
 Routed to Reach R2 : Routing sheet flow through a subcatchment

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 2-year Rainfall=3.27"

Area (sf)	CN	Description
16,823	61	>75% Grass cover, Good, HSG B
3,167	68	>Stone Rip Rap, Good, HSG B
1	98	Paved parking, HSG B
1,964	55	Woods, Good, HSG B
21,955		Weighted Average
21,954	61	100.00% Pervious Area
1	98	0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	81	0.4000	0.25		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.28"
5.4	81	Total, Increased to minimum Tc = 6.0 min			

**Summary for Reach R1: Routing sheet flow through a subcatchment**

A subcatchment performs runoff calculations, including the associated Tc and CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 2.27" for 2-year event  
 Inflow = 8.71 cfs @ 12.10 hrs, Volume= 25,010 cf  
 Outflow = 5.09 cfs @ 12.23 hrs, Volume= 25,010 cf, Atten= 42%, Lag= 7.6 min  
 Routed to Link SP-3 : STUDY POINT #3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Max. Velocity= 0.22 fps, Min. Travel Time= 20.9 min  
 Avg. Velocity = 0.05 fps, Avg. Travel Time= 91.9 min

Peak Storage= 6,396 cf @ 12.23 hrs  
 Average Depth at Peak Storage= 0.19' , Surface Width= 138.33'  
 Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 113.05 cfs

100.00' x 1.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush  
 Side Slope Z-value= 100.0 ' / Top Width= 300.00'  
 Length= 280.0' Slope= 0.1590 ' / '  
 Inlet Invert= 265.92', Outlet Invert= 221.40'



**Summary for Reach R2: Routing sheet flow through a subcatchment**

A subcatchment performs runoff calculations, including the associated Tc and CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

[80] Warning: Exceeded Pond RR5 by 4.93' @ 13.49 hrs (433.32 cfs 111,991,419 cf)

Inflow Area = 152,820 sf, 63.13% Impervious, Inflow Depth = 0.07" for 2-year event  
 Inflow = 0.20 cfs @ 12.12 hrs, Volume= 911 cf  
 Outflow = 0.03 cfs @ 13.49 hrs, Volume= 911 cf, Atten= 83%, Lag= 82.4 min  
 Routed to Link SP-3 : STUDY POINT #3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Max. Velocity= 0.03 fps, Min. Travel Time= 136.6 min  
 Avg. Velocity= 0.03 fps, Avg. Travel Time= 136.6 min

Peak Storage= 270 cf @ 13.49 hrs  
 Average Depth at Peak Storage= 0.01', Surface Width= 101.91'  
 Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 113.05 cfs

100.00' x 1.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush  
 Side Slope Z-value= 100.0 '/' Top Width= 300.00'  
 Length= 280.0' Slope= 0.1590 '/'  
 Inlet Invert= 265.92', Outlet Invert= 221.40'



**Summary for Pond 1P: Existing Off-Site CB**

[58] Hint: Peaked 2.15' above defined flood level

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 2.95" for 2-year event  
 Inflow = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf  
 Outflow = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf  
 Routed to Pond DMH-8 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 292.01' @ 12.10 hrs  
 Flood Elev= 289.86'

Device	Routing	Invert	Outlet Devices
#1	Primary	283.08'	<b>12.0" Round Culvert</b> L= 118.0' Ke= 0.500 Inlet / Outlet Invert= 283.08' / 278.95' S= 0.0350 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

**Primary OutFlow** Max=8.80 cfs @ 12.10 hrs HW=291.99' TW=282.91' (Dynamic Tailwater)  
 ←**1=Culvert** (Outlet Controls 8.80 cfs @ 11.20 fps)

**Summary for Pond CB-1: CB**

Inflow Area = 16,643 sf, 83.29% Impervious, Inflow Depth = 2.61" for 2-year event  
 Inflow = 1.03 cfs @ 12.08 hrs, Volume= 3,618 cf  
 Outflow = 1.03 cfs @ 12.08 hrs, Volume= 3,618 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.03 cfs @ 12.08 hrs, Volume= 3,618 cf  
 Routed to Link WQ-1 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.76' @ 12.08 hrs  
 Flood Elev= 272.52'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.22'	<b>12.0" Round Culvert</b> L= 45.0' Ke= 0.500 Inlet / Outlet Invert= 269.22' / 268.77' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.03 cfs @ 12.08 hrs HW=269.76' TW=0.00' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 1.03 cfs @ 3.43 fps)

**Summary for Pond CB-2: CB**

Inflow Area = 6,117 sf, 82.83% Impervious, Inflow Depth = 2.53" for 2-year event  
 Inflow = 0.37 cfs @ 12.08 hrs, Volume= 1,287 cf  
 Outflow = 0.37 cfs @ 12.08 hrs, Volume= 1,287 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.37 cfs @ 12.08 hrs, Volume= 1,287 cf  
 Routed to Pond DMH-3 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 270.82' @ 12.09 hrs  
 Flood Elev= 273.92'

Device	Routing	Invert	Outlet Devices
#1	Primary	270.46'	<b>12.0" Round Culvert</b> L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 270.46' / 270.23' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.37 cfs @ 12.08 hrs HW=270.82' TW=270.61' (Dynamic Tailwater)

↑**1=Culvert** (Outlet Controls 0.37 cfs @ 2.18 fps)

**Summary for Pond CB-3: CB**

Inflow Area = 13,831 sf, 67.53% Impervious, Inflow Depth = 2.05" for 2-year event  
 Inflow = 0.68 cfs @ 12.08 hrs, Volume= 2,365 cf  
 Outflow = 0.68 cfs @ 12.08 hrs, Volume= 2,365 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.68 cfs @ 12.08 hrs, Volume= 2,365 cf  
 Routed to Pond DMH-3 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 271.82' @ 12.08 hrs  
 Flood Elev= 274.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	271.40'	<b>12.0" Round Culvert</b> L= 126.0' Ke= 0.500 Inlet / Outlet Invert= 271.40' / 270.23' S= 0.0093 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.68 cfs @ 12.08 hrs HW=271.82' TW=270.61' (Dynamic Tailwater)

↑**1=Culvert** (Outlet Controls 0.68 cfs @ 3.19 fps)

**Summary for Pond CB-4: CB**

Inflow Area = 25,392 sf, 68.10% Impervious, Inflow Depth = 2.10" for 2-year event  
 Inflow = 1.27 cfs @ 12.08 hrs, Volume= 4,440 cf  
 Outflow = 1.27 cfs @ 12.08 hrs, Volume= 4,440 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.27 cfs @ 12.08 hrs, Volume= 4,440 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.86' @ 12.08 hrs  
 Flood Elev= 272.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.24'	<b>12.0" Round Culvert</b> L= 44.0' Ke= 0.500 Inlet / Outlet Invert= 269.24' / 268.80' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.27 cfs @ 12.08 hrs HW=269.86' TW=0.00' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 1.27 cfs @ 3.58 fps)

**Summary for Pond CB-5: CB**

Inflow Area = 17,711 sf, 37.81% Impervious, Inflow Depth = 1.15" for 2-year event  
 Inflow = 0.46 cfs @ 12.10 hrs, Volume= 1,696 cf  
 Outflow = 0.46 cfs @ 12.10 hrs, Volume= 1,696 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.46 cfs @ 12.10 hrs, Volume= 1,696 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 271.70' @ 12.10 hrs  
 Flood Elev= 275.46'

Device	Routing	Invert	Outlet Devices
#1	Primary	271.36'	<b>12.0" Round Culvert</b> L= 65.0' Ke= 0.500 Inlet / Outlet Invert= 271.36' / 269.55' S= 0.0278 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.46 cfs @ 12.10 hrs HW=271.70' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 0.46 cfs @ 1.98 fps)

**Summary for Pond CB-6: CB**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 2.17" for 2-year event  
 Inflow = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf  
 Outflow = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf  
 Routed to Pond DMH-7 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 275.32' @ 12.10 hrs  
 Flood Elev= 278.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	274.74'	<b>12.0" Round Culvert</b> L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 274.74' / 273.79' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.20 cfs @ 12.10 hrs HW=275.32' TW=274.27' (Dynamic Tailwater)  
 ↑**1=Culvert** (Outlet Controls 1.20 cfs @ 3.70 fps)

**Summary for Pond DMH-10: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 2.95" for 2-year event  
 Inflow = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf  
 Outflow = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf  
 Routed to Pond RR4 : Riprap Slope

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 275.60' @ 12.10 hrs  
 Flood Elev= 279.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	274.28'	<b>30.0" Round Culvert</b> L= 9.0' Ke= 0.500 Inlet / Outlet Invert= 274.28' / 274.00' S= 0.0311 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=8.80 cfs @ 12.10 hrs HW=275.59' TW=269.09' (Dynamic Tailwater)  
 ↑**1=Culvert** (Barrel Controls 8.80 cfs @ 4.89 fps)

**Summary for Pond DMH-2: DMH**

Inflow Area = 28,949 sf, 80.86% Impervious, Inflow Depth = 2.46" for 2-year event  
 Inflow = 1.65 cfs @ 12.09 hrs, Volume= 5,930 cf  
 Outflow = 1.65 cfs @ 12.09 hrs, Volume= 5,930 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.65 cfs @ 12.09 hrs, Volume= 5,930 cf  
 Routed to Link WQ-1 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.07' @ 12.09 hrs  
 Flood Elev= 274.78'

Device	Routing	Invert	Outlet Devices
#1	Primary	268.42'	<b>15.0" Round Culvert</b> L= 64.0' Ke= 0.500 Inlet / Outlet Invert= 268.42' / 267.87' S= 0.0086 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=1.65 cfs @ 12.09 hrs HW=269.07' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Barrel Controls 1.65 cfs @ 3.69 fps)

**Summary for Pond DMH-3: DMH**

Inflow Area = 28,949 sf, 80.86% Impervious, Inflow Depth = 2.46" for 2-year event  
 Inflow = 1.65 cfs @ 12.09 hrs, Volume= 5,930 cf  
 Outflow = 1.65 cfs @ 12.09 hrs, Volume= 5,930 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.65 cfs @ 12.09 hrs, Volume= 5,930 cf  
 Routed to Pond DMH-2 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 270.61' @ 12.09 hrs  
 Flood Elev= 274.41'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.98'	<b>15.0" Round Culvert</b> L= 168.0' Ke= 0.500 Inlet / Outlet Invert= 269.98' / 268.52' S= 0.0087 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=1.65 cfs @ 12.09 hrs HW=270.61' TW=269.07' (Dynamic Tailwater)  
 ↑**1=Culvert** (Outlet Controls 1.65 cfs @ 3.88 fps)

**Summary for Pond DMH-5: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 2.17" for 2-year event  
 Inflow = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf  
 Outflow = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 267.91' @ 12.10 hrs  
 Flood Elev= 274.16'

Device	Routing	Invert	Outlet Devices
#1	Primary	267.34'	<b>12.0" Round Culvert</b> L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 267.34' / 266.88' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.20 cfs @ 12.10 hrs HW=267.91' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 1.20 cfs @ 2.58 fps)

**Summary for Pond DMH-6: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 2.17" for 2-year event  
 Inflow = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf  
 Outflow = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf  
 Routed to Pond DMH-5 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 272.74' @ 12.10 hrs  
 Flood Elev= 277.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	272.17'	<b>12.0" Round Culvert</b> L= 147.0' Ke= 0.500 Inlet / Outlet Invert= 272.17' / 269.87' S= 0.0156 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.20 cfs @ 12.10 hrs HW=272.74' TW=267.91' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 1.20 cfs @ 2.58 fps)

**Summary for Pond DMH-7: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 2.17" for 2-year event  
 Inflow = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf  
 Outflow = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.20 cfs @ 12.10 hrs, Volume= 4,370 cf  
 Routed to Pond DMH-6 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 274.27' @ 12.10 hrs  
 Flood Elev= 279.73'

Device	Routing	Invert	Outlet Devices
#1	Primary	273.70'	<b>12.0" Round Culvert</b> L= 143.0' Ke= 0.500 Inlet / Outlet Invert= 273.70' / 272.27' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.20 cfs @ 12.10 hrs HW=274.27' TW=272.74' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 1.20 cfs @ 2.58 fps)

**Summary for Pond DMH-8: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 2.95" for 2-year event  
 Inflow = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf  
 Outflow = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf  
 Routed to Pond DMH-9 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 282.91' @ 12.10 hrs  
 Flood Elev= 286.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	281.70'	<b>30.0" Round Culvert</b> L= 170.0' Ke= 0.500 Inlet / Outlet Invert= 281.70' / 278.93' S= 0.0163 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=8.80 cfs @ 12.10 hrs HW=282.91' TW=280.04' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 8.80 cfs @ 3.74 fps)

**Summary for Pond DMH-9: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 2.95" for 2-year event  
 Inflow = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf  
 Outflow = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf  
 Routed to Pond DMH-10 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 280.04' @ 12.10 hrs  
 Flood Elev= 284.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	278.83'	<b>30.0" Round Culvert</b> L= 274.0' Ke= 0.500 Inlet / Outlet Invert= 278.83' / 274.38' S= 0.0162 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=8.80 cfs @ 12.10 hrs HW=280.04' TW=275.59' (Dynamic Tailwater)  
 ←**1=Culvert** (Inlet Controls 8.80 cfs @ 3.74 fps)

**Summary for Pond IS-1: IS-1**

Inflow Area = 23,802 sf, 26.02% Impervious, Inflow Depth = 0.76" for 2-year event  
 Inflow = 0.44 cfs @ 12.08 hrs, Volume= 1,511 cf  
 Outflow = 0.04 cfs @ 11.69 hrs, Volume= 1,511 cf, Atten= 91%, Lag= 0.0 min  
 Discarded = 0.04 cfs @ 11.69 hrs, Volume= 1,511 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Routed to Link SP1 : STUDY POINT #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 272.77' @ 12.92 hrs Surf.Area= 658 sf Storage= 520 cf  
 Flood Elev= 278.00' Surf.Area= 1,559 sf Storage= 2,035 cf

Plug-Flow detention time= 89.1 min calculated for 1,511 cf (100% of inflow)  
 Center-of-Mass det. time= 89.1 min ( 845.3 - 756.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	1,272 cf	<b>surface storage (Irregular)</b> Listed below (Recalc)
#2	275.00'	78 cf	<b>media storage (Irregular)</b> Listed below (Recalc) 260 cf Overall x 30.0% Voids
#3A	271.50'	627 cf	<b>20.50"W x 32.10"L x 3.50"H Field A</b> 2,303 cf Overall - 735 cf Embedded = 1,568 cf x 40.0% Voids
#4A	272.00'	735 cf	<b>ADS_StormTech SC-740 +Cap</b> x 16 Inside #3 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12"L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56"L with 0.44' Overlap 16 Chambers in 4 Rows
		2,713 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
277.00	435	96.0	0	0	435
278.00	771	118.0	595	595	825
279.00	588	81.0	677	1,272	1,419

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
275.00	130	53.0	0	0	130
277.00	130	53.0	260	260	236

Device	Routing	Invert	Outlet Devices
#0	Primary	279.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	271.50'	<b>0.04 cfs Exfiltration at all elevations</b> Phase-In= 0.01'
#2	Primary	277.80'	<b>9.0' long x 4.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50

5.00 5.50  
 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88  
 3.07 3.32

**Discarded OutFlow** Max=0.04 cfs @ 11.69 hrs HW=271.58' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=271.50' TW=0.00' (Dynamic Tailwater)

↑**2=Broad-Crested Rectangular Weir**( Controls 0.00 cfs)

**Summary for Pond IS-2: IS-2**

GEO-TP-5 indicates silty sand to a depth of 14' below grade with no refusal. The infiltration rate for loamy sand is 2.41 inches per hour (Rawls Rates)

Redox was encountered at 9' below grade or elevation 263.0

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 2.26" for 2-year event  
 Inflow = 6.81 cfs @ 12.09 hrs, Volume= 24,610 cf  
 Outflow = 0.44 cfs @ 11.46 hrs, Volume= 24,610 cf, Atten= 94%, Lag= 0.0 min  
 Discarded = 0.44 cfs @ 11.46 hrs, Volume= 24,610 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Routed to Link RR1 : RipRap Apron

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 267.65' @ 13.66 hrs Surf.Area= 8,100 sf Storage= 10,013 cf  
 Flood Elev= 271.25' Surf.Area= 8,547 sf Storage= 27,413 cf

Plug-Flow detention time= 178.1 min calculated for 24,607 cf (100% of inflow)  
 Center-of-Mass det. time= 178.1 min ( 936.1 - 758.0 )

Volume	Invert	Avail.Storage	Storage Description
#1A	265.75'	13,527 cf	<b>52.42'W x 150.10'L x 6.00'H Field A Z=0.3</b> 49,420 cf Overall - 15,602 cf Embedded = 33,818 cf x 40.0% Voids
#2A	266.50'	15,602 cf	<b>ADS_StormTech MC-3500 d +Cap</b> x 140 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 140 Chambers in 7 Rows Cap Storage= 14.9 cf x 2 x 7 rows = 208.6 cf
		29,129 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	265.75'	<b>0.44 cfs Exfiltration at all elevations</b> Phase-In= 0.01'
#2	Primary	267.00'	<b>10.0" Round Culvert</b> L= 29.0' Ke= 0.500 Inlet / Outlet Invert= 267.00' / 265.92' S= 0.0372 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	269.40'	<b>4.0' long x 6.26' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Discarded OutFlow** Max=0.44 cfs @ 11.46 hrs HW=265.85' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.44 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=265.75' TW=0.00' (Dynamic Tailwater)

↑**2=Culvert** ( Controls 0.00 cfs)

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

**Summary for Pond RR2: Riprap Slope**

Inflow Area = 7,513 sf, 0.00% Impervious, Inflow Depth = 0.13" for 2-year event  
 Inflow = 0.02 cfs @ 12.12 hrs, Volume= 79 cf  
 Outflow = 0.02 cfs @ 12.12 hrs, Volume= 79 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.02 cfs @ 12.12 hrs, Volume= 79 cf  
 Primary = 0.00 cfs @ 24.30 hrs, Volume= 0 cf  
 Routed to Pond IS-1 : IS-1

**1362-25 - Proposed HydroCAD\_rev1**

Prepared by Allen & Major Associates, Inc  
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Type III 24-hr 2-year Rainfall=3.27"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 280.00' @ 0.00 hrs Surf.Area= 111 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 0.0 min ( 907.6 - 907.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	280.00'	328 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 821 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
280.00	111	0	0
281.00	111	111	111
282.00	111	111	222
283.00	103	107	329
284.00	75	89	418
285.00	73	74	492
286.00	70	72	564
287.00	68	69	633
288.00	66	67	700
289.00	62	64	764
290.00	52	57	821

Device	Routing	Invert	Outlet Devices
#1	Discarded	280.00'	<b>0.37 cfs Exfiltration at all elevations</b>
#2	Primary	280.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.00 cfs @ 12.12 hrs HW=280.00' (Free Discharge)  
 ↑**1=Exfiltration** (Passes 0.00 cfs of 0.37 cfs potential flow)

**Primary OutFlow** Max=0.00 cfs @ 24.30 hrs HW=280.00' TW=271.50' (Dynamic Tailwater)  
 ↑**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Summary for Pond RR3: Riprap Slope**

Inflow Area = 5,707 sf, 3.94% Impervious, Inflow Depth = 0.28" for 2-year event  
 Inflow = 0.03 cfs @ 12.10 hrs, Volume= 134 cf  
 Outflow = 0.03 cfs @ 12.10 hrs, Volume= 134 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.03 cfs @ 12.10 hrs, Volume= 134 cf  
 Primary = 0.00 cfs @ 24.30 hrs, Volume= 0 cf  
 Routed to Pond IS-1 : IS-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 280.00' @ 0.00 hrs Surf.Area= 116 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 0.0 min ( 843.8 - 843.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	280.00'	464 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 1,160 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
280.00	116	0	0
281.00	116	116	116
282.00	116	116	232
283.00	116	116	348
284.00	116	116	464
285.00	116	116	580
286.00	116	116	696
287.00	116	116	812
288.00	116	116	928
289.00	116	116	1,044
290.00	116	116	1,160

Device	Routing	Invert	Outlet Devices
#1	Discarded	280.00'	<b>0.37 cfs Exfiltration at all elevations</b>
#2	Primary	280.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=280.00' (Free Discharge)

↑1=Exfiltration (Passes 0.00 cfs of 0.37 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 24.30 hrs HW=280.00' TW=271.50' (Dynamic Tailwater)

↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

### Summary for Pond RR4: Riprap Slope

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 2.95" for 2-year event  
 Inflow = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf  
 Outflow = 8.81 cfs @ 12.10 hrs, Volume= 32,475 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.10 cfs @ 5.67 hrs, Volume= 7,466 cf  
 Primary = 8.71 cfs @ 12.10 hrs, Volume= 25,010 cf  
 Routed to Reach R1 : Routing sheet flow through a subcatchment

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.09' @ 12.10 hrs Surf.Area= 112 sf Storage= 44 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 1.3 min ( 758.7 - 757.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	268.00'	225 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 563 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
268.00	87	0	0
269.00	110	99	99
270.00	126	118	217
271.00	96	111	328
272.00	76	86	414
273.00	63	70	483
274.00	97	80	563

Device	Routing	Invert	Outlet Devices
#1	Discarded	268.00'	<b>0.10 cfs Exfiltration at all elevations</b>
#2	Primary	269.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.10 cfs @ 5.67 hrs HW=268.06' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=8.70 cfs @ 12.10 hrs HW=269.09' TW=266.08' (Dynamic Tailwater)

↑2=Broad-Crested Rectangular Weir (Weir Controls 8.70 cfs @ 0.83 fps)

**Summary for Pond RR5: Riprap Slope**

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 0.00" for 2-year event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Routed to Reach R2 : Routing sheet flow through a subcatchment

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 261.00' @ 0.00 hrs Surf.Area= 14 sf Storage= 0 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	261.00'	35 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 89 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
261.00	14	0	0
262.00	34	24	24
263.00	26	30	54
264.00	18	22	76
265.00	7	13	89

Device	Routing	Invert	Outlet Devices
#1	Discarded	261.00'	<b>0.10 cfs Exfiltration at all elevations</b>
#2	Primary	261.50'	<b>14.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=261.00' (Free Discharge)  
 ↳1=Exfiltration (Passes 0.00 cfs of 0.10 cfs potential flow)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=261.00' TW=265.92' (Dynamic Tailwater)  
 ↳2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Summary for Link RR1: RipRap Apron**

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 0.00" for 2-year event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min  
 Routed to Pond RR5 : Riprap Slope

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

**Summary for Link SP-3: STUDY POINT #3**

Inflow Area = 361,985 sf, 62.10% Impervious, Inflow Depth = 0.93" for 2-year event  
 Inflow = 5.34 cfs @ 12.23 hrs, Volume= 27,931 cf  
 Primary = 5.34 cfs @ 12.23 hrs, Volume= 27,931 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link SP1: STUDY POINT #1**

Inflow Area = 27,226 sf, 22.75% Impervious, Inflow Depth = 0.00" for 2-year event  
 Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0 cf  
 Primary = 0.00 cfs @ 24.01 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link SP2: STUDY POINT #2**

Inflow Area = 1,587 sf, 0.00% Impervious, Inflow Depth = 0.04" for 2-year event  
Inflow = 0.00 cfs @ 12.12 hrs, Volume= 5 cf  
Primary = 0.00 cfs @ 12.12 hrs, Volume= 5 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link WQ-1: Water Quality Unit**

Inflow Area = 45,592 sf, 81.75% Impervious, Inflow Depth = 2.51" for 2-year event  
Inflow = 2.68 cfs @ 12.09 hrs, Volume= 9,548 cf  
Primary = 2.68 cfs @ 12.09 hrs, Volume= 9,548 cf, Atten= 0%, Lag= 0.0 min  
Routed to Pond IS-2 : IS-2

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

**Summary for Link WQ-2: Water Quality Unit**

Inflow Area = 67,273 sf, 61.26% Impervious, Inflow Depth = 1.87" for 2-year event  
Inflow = 2.93 cfs @ 12.09 hrs, Volume= 10,506 cf  
Primary = 2.93 cfs @ 12.09 hrs, Volume= 10,506 cf, Atten= 0%, Lag= 0.0 min  
Routed to Pond IS-2 : IS-2

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

**Summary for Subcatchment A-1: Subcat A-1**

Runoff = 5.81 cfs @ 12.11 hrs, Volume= 21,963 cf, Depth= 4.66"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
56,517	98	Paved parking, HSG A
56,517	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment B-1: Subcat B-1**

Runoff = 2.95 cfs @ 12.08 hrs, Volume= 10,475 cf, Depth= 4.10"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
3,889	39	>75% Grass cover, Good, HSG A
26,806	98	Paved parking, HSG A
30,695		Weighted Average
3,889	39	12.67% Pervious Area
26,806	98	87.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	117	0.0200	1.44		<b>Sheet Flow, Paved parking</b> Smooth surfaces n= 0.011 P2= 3.28"
0.9	163	0.0200	2.87		<b>Shallow Concentrated Flow, Paved Parking Lot</b> Paved Kv= 20.3 fps
2.3	280	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment B-2: Subcat B-2**

Runoff = 4.63 cfs @ 12.11 hrs, Volume= 17,482 cf, Depth= 4.66"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
44,985	98	Paved parking, HSG A
44,985	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment P-1A: Subcat P-1A**

Runoff = 0.36 cfs @ 12.08 hrs, Volume= 1,319 cf, Depth= 2.70"  
 Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

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Area (sf)	CN	Description
2,565	39	>75% Grass cover, Good, HSG A
3,294	98	Paved parking, HSG A
5,859		Weighted Average
2,565	39	43.78% Pervious Area
3,294	98	56.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	67	0.0300	1.51		<b>Sheet Flow, A-B</b> Smooth surfaces n= 0.011 P2= 3.28"
0.7	67	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1B: Subcat P-1B**

Runoff = 0.29 cfs @ 12.08 hrs, Volume= 1,070 cf, Depth= 2.72"  
 Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
2,046	39	>75% Grass cover, Good, HSG A
2,675	98	Paved parking, HSG A
4,722		Weighted Average
2,046	39	43.34% Pervious Area
2,675	98	56.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	34	0.0300	1.32		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
0.4	34	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1C: Subcat P-1C**

Runoff = 0.00 cfs @ 12.50 hrs, Volume= 37 cf, Depth= 0.13"  
 Routed to Link SP1 : STUDY POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
2,460	39	>75% Grass cover, Good, HSG A
964	30	Woods, Good, HSG A
3,424		Weighted Average
3,424	36	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-1D: Subcat P-1D**

Runoff = 0.06 cfs @ 12.10 hrs, Volume= 229 cf, Depth= 0.37"  
 Routed to Pond RR2 : Riprap Slope

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

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Area (sf)	CN	Description
1,126	39	>75% Grass cover, Good, HSG A
1,840	62	>Stone Rip Rap, Good, HSG A
4,547	30	Woods, Good, HSG A
7,513		Weighted Average
7,513	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.1673	0.16		<b>Sheet Flow, A-B</b> Woods: Light underbrush n= 0.400 P2= 3.28"
0.1	18	0.1673	2.05		<b>Shallow Concentrated Flow, B-C</b> Woodland Kv= 5.0 fps
5.3	68	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1E: Subcat P-1E**

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 337 cf, Depth= 0.71"  
 Routed to Pond RR3 : Riprap Slope

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
2,868	39	>75% Grass cover, Good, HSG A
1,801	62	>Stone Rip Rap, Good, HSG A
225	98	Paved parking, HSG A
813	30	Woods, Good, HSG A
5,707		Weighted Average
5,482	45	96.06% Pervious Area
225	98	3.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	21	0.1200	0.12		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.28"
0.3	41	0.0992	2.20		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
3.3	62	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-2: Subcat P-2**

Runoff = 0.00 cfs @ 12.10 hrs, Volume= 24 cf, Depth= 0.18"  
 Routed to Link SP2 : STUDY POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
746	39	>75% Grass cover, Good, HSG A
107	62	>Stone Rip Rap, Good, HSG A
734	30	Woods, Good, HSG A
1,587		Weighted Average
1,587	36	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-3A: Subcat P-3A**

Runoff = 0.91 cfs @ 12.09 hrs, Volume= 3,308 cf, Depth= 2.62"  
 Routed to Pond CB-6 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
5,602	39	>75% Grass cover, Good, HSG A
250	62	>Stone Rip Rap, Good, HSG A
8,221	98	Paved parking, HSG A
1,098	30	Woods, Good, HSG A
15,170		Weighted Average
6,950	38	45.81% Pervious Area
8,221	98	54.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	47	0.1200	0.14		<b>Sheet Flow, A-B</b>
					Woods: Light underbrush n= 0.400 P2= 3.28"
0.5	106	0.0300	3.52		<b>Shallow Concentrated Flow, B-C</b>
					Paved Kv= 20.3 fps
6.2	153	Total			

**Summary for Subcatchment P-3B: Subcat P-3B**

Runoff = 0.70 cfs @ 12.10 hrs, Volume= 2,743 cf, Depth= 1.86"  
 Routed to Pond CB-5 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
9,329	39	>75% Grass cover, Good, HSG A
6,696	98	Paved parking, HSG A
1,685	30	Woods, Good, HSG A
17,711		Weighted Average
11,014	38	62.19% Pervious Area
6,696	98	37.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	47	0.1200	0.14		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.28"
1.8	254	0.0140	2.40		<b>Shallow Concentrated Flow,</b>
					Paved Kv= 20.3 fps
7.5	301	Total			

**Summary for Subcatchment P-3C: Subcat P-3C**

Runoff = 1.95 cfs @ 12.08 hrs, Volume= 6,973 cf, Depth= 3.30"  
 Routed to Pond CB-4 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

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Area (sf)	CN	Description
5,279	39	>75% Grass cover, Good, HSG A
1,565	61	>75% Grass cover, Good, HSG B
12	68	>Stone Rip Rap, Good, HSG B
2,364	98	Paved parking, HSG A
14,929	98	Paved parking, HSG B
1,229	30	Woods, Good, HSG A
14	55	Woods, Good, HSG B
25,392		Weighted Average
8,099	42	31.90% Pervious Area
17,293	98	68.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	158	0.0200	1.53		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
1.7	158	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-3D: Subcat P-3D**

Runoff = 1.03 cfs @ 12.08 hrs, Volume= 3,688 cf, Depth= 3.20"  
 Routed to Pond CB-3 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
3,871	39	>75% Grass cover, Good, HSG A
1	62	>Stone Rip Rap, Good, HSG A
9,341	98	Paved parking, HSG A
619	30	Woods, Good, HSG A
13,831		Weighted Average
4,491	38	32.47% Pervious Area
9,341	98	67.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0360	1.53		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
0.4	85	0.0360	3.85		<b>Shallow Concentrated Flow, B-C</b> Paved Kv= 20.3 fps
0.9	135	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-3E: Subcat P-3E**

Runoff = 0.56 cfs @ 12.08 hrs, Volume= 1,997 cf, Depth= 3.92"  
 Routed to Pond CB-2 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
925	39	>75% Grass cover, Good, HSG A
125	61	>75% Grass cover, Good, HSG B
4,721	98	Paved parking, HSG A
346	98	Paved parking, HSG B
6,117		Weighted Average
1,050	42	17.17% Pervious Area
5,067	98	82.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-3F: Subcat P-3F**

Runoff = 1.61 cfs @ 12.08 hrs, Volume= 5,690 cf, Depth= 4.10"  
 Routed to Pond CB-1 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
2,781	61	>75% Grass cover, Good, HSG B
455	98	Paved parking, HSG A
13,407	98	Paved parking, HSG B
16,643		Weighted Average
2,781	61	16.71% Pervious Area
13,862	98	83.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TR-55 MIN

**Summary for Subcatchment P-3G: Subcat P-3G (roof)**

Runoff = 0.93 cfs @ 12.11 hrs, Volume= 3,497 cf, Depth= 4.66"  
 Routed to Pond DMH-3 : DMH

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry, Internal roof drains

**Summary for Subcatchment P-3H: Subcat P-3H (roof)**

Runoff = 0.93 cfs @ 12.11 hrs, Volume= 3,497 cf, Depth= 4.66"  
 Routed to Pond IS-2 : IS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
8,032	98	Roofs, HSG A
968	98	Roofs, HSG B
9,000		Weighted Average
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry, Internal roof drains

**Summary for Subcatchment P-3I: Subcat P-3I (roof)**

Runoff = 0.93 cfs @ 12.11 hrs, Volume= 3,497 cf, Depth= 4.66"  
 Routed to Pond CB-6 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

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Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment P-3J: Subcat P-3J (roof)**

Runoff = 0.93 cfs @ 12.11 hrs, Volume= 3,497 cf, Depth= 4.66"  
 Routed to Pond IS-2 : IS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment P-3K: Subcat P-3K**

Runoff = 1.39 cfs @ 12.18 hrs, Volume= 6,388 cf, Depth= 1.00"  
 Routed to Link SP-3 : STUDY POINT #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
2,624	39	>75% Grass cover, Good, HSG A
8,980	61	>75% Grass cover, Good, HSG B
801	62	>Stone Rip Rap, Good, HSG A
3,956	68	>Stone Rip Rap, Good, HSG B
250	30	Woods, Good, HSG A
60,357	55	Woods, Good, HSG B
76,968		Weighted Average
76,968	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.2500	0.11		<b>Sheet Flow, A-B</b>
					Woods: Dense underbrush n= 0.800 P2= 3.28"
3.6	359	0.1100	1.66		<b>Shallow Concentrated Flow, B-C</b>
					Woodland Kv= 5.0 fps
11.3	409	Total			

**Summary for Subcatchment P-3L: Subcat P-3L**

Runoff = 0.72 cfs @ 12.10 hrs, Volume= 2,466 cf, Depth= 1.35"  
 Routed to Reach R2 : Routing sheet flow through a subcatchment

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 10-year Rainfall=4.90"

Area (sf)	CN	Description
16,823	61	>75% Grass cover, Good, HSG B
3,167	68	>Stone Rip Rap, Good, HSG B
1	98	Paved parking, HSG B
1,964	55	Woods, Good, HSG B
21,955		Weighted Average
21,954	61	100.00% Pervious Area
1	98	0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	81	0.4000	0.25		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.28"
5.4	81	Total, Increased to minimum Tc = 6.0 min			

### Summary for Reach R1: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc and CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 3.80" for 10-year event  
 Inflow = 13.19 cfs @ 12.10 hrs, Volume= 41,904 cf  
 Outflow = 8.24 cfs @ 12.22 hrs, Volume= 41,904 cf, Atten= 38%, Lag= 6.8 min  
 Routed to Link SP-3 : STUDY POINT #3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Max. Velocity= 0.26 fps, Min. Travel Time= 17.9 min  
 Avg. Velocity = 0.06 fps, Avg. Travel Time= 82.9 min

Peak Storage= 8,829 cf @ 12.22 hrs  
 Average Depth at Peak Storage= 0.25' , Surface Width= 150.37'  
 Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 113.05 cfs

100.00' x 1.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush  
 Side Slope Z-value= 100.0 ' / Top Width= 300.00'  
 Length= 280.0' Slope= 0.1590 ' / '  
 Inlet Invert= 265.92', Outlet Invert= 221.40'



### Summary for Reach R2: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc and CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

[80] Warning: Exceeded Pond RR5 by 4.95' @ 12.54 hrs (435.83 cfs 112,032,146 cf)

Inflow Area = 152,820 sf, 63.13% Impervious, Inflow Depth = 0.19" for 10-year event  
 Inflow = 0.72 cfs @ 12.10 hrs, Volume= 2,466 cf  
 Outflow = 0.18 cfs @ 12.54 hrs, Volume= 2,466 cf, Atten= 75%, Lag= 26.7 min  
 Routed to Link SP-3 : STUDY POINT #3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Max. Velocity= 0.07 fps, Min. Travel Time= 70.6 min  
 Avg. Velocity= 0.04 fps, Avg. Travel Time= 127.5 min

Peak Storage= 766 cf @ 12.54 hrs  
 Average Depth at Peak Storage= 0.03', Surface Width= 105.33'  
 Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 113.05 cfs

100.00' x 1.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush  
 Side Slope Z-value= 100.0 '/' Top Width= 300.00'  
 Length= 280.0' Slope= 0.1590 '/'  
 Inlet Invert= 265.92', Outlet Invert= 221.40'



**Summary for Pond 1P: Existing Off-Site CB**

[58] Hint: Peaked 14.09' above defined flood level

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 4.53" for 10-year event  
 Inflow = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf  
 Outflow = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf  
 Routed to Pond DMH-8 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 303.95' @ 12.10 hrs  
 Flood Elev= 289.86'

Device	Routing	Invert	Outlet Devices
#1	Primary	283.08'	<b>12.0" Round Culvert</b> L= 118.0' Ke= 0.500 Inlet / Outlet Invert= 283.08' / 278.95' S= 0.0350 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

**Primary OutFlow** Max=13.28 cfs @ 12.10 hrs HW=303.90' TW=283.23' (Dynamic Tailwater)  
 ←**1=Culvert** (Outlet Controls 13.28 cfs @ 16.91 fps)

**Summary for Pond CB-1: CB**

Inflow Area = 16,643 sf, 83.29% Impervious, Inflow Depth = 4.10" for 10-year event  
 Inflow = 1.61 cfs @ 12.08 hrs, Volume= 5,690 cf  
 Outflow = 1.61 cfs @ 12.08 hrs, Volume= 5,690 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.61 cfs @ 12.08 hrs, Volume= 5,690 cf  
 Routed to Link WQ-1 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.93' @ 12.08 hrs  
 Flood Elev= 272.52'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.22'	<b>12.0" Round Culvert</b> L= 45.0' Ke= 0.500 Inlet / Outlet Invert= 269.22' / 268.77' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.61 cfs @ 12.08 hrs HW=269.93' TW=0.00' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 1.61 cfs @ 3.77 fps)

**Summary for Pond CB-2: CB**

Inflow Area = 6,117 sf, 82.83% Impervious, Inflow Depth = 3.92" for 10-year event  
 Inflow = 0.56 cfs @ 12.08 hrs, Volume= 1,997 cf  
 Outflow = 0.56 cfs @ 12.08 hrs, Volume= 1,997 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.56 cfs @ 12.08 hrs, Volume= 1,997 cf  
 Routed to Pond DMH-3 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 270.96' @ 12.09 hrs  
 Flood Elev= 273.92'

Device	Routing	Invert	Outlet Devices
#1	Primary	270.46'	<b>12.0" Round Culvert</b> L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 270.46' / 270.23' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.56 cfs @ 12.08 hrs HW=270.95' TW=270.78' (Dynamic Tailwater)

↑**1=Culvert** (Outlet Controls 0.56 cfs @ 2.11 fps)

**Summary for Pond CB-3: CB**

Inflow Area = 13,831 sf, 67.53% Impervious, Inflow Depth = 3.20" for 10-year event  
 Inflow = 1.03 cfs @ 12.08 hrs, Volume= 3,688 cf  
 Outflow = 1.03 cfs @ 12.08 hrs, Volume= 3,688 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.03 cfs @ 12.08 hrs, Volume= 3,688 cf  
 Routed to Pond DMH-3 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 271.94' @ 12.08 hrs  
 Flood Elev= 274.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	271.40'	<b>12.0" Round Culvert</b> L= 126.0' Ke= 0.500 Inlet / Outlet Invert= 271.40' / 270.23' S= 0.0093 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.03 cfs @ 12.08 hrs HW=271.94' TW=270.78' (Dynamic Tailwater)

↑**1=Culvert** (Outlet Controls 1.03 cfs @ 3.44 fps)

**Summary for Pond CB-4: CB**

Inflow Area = 25,392 sf, 68.10% Impervious, Inflow Depth = 3.30" for 10-year event  
 Inflow = 1.95 cfs @ 12.08 hrs, Volume= 6,973 cf  
 Outflow = 1.95 cfs @ 12.08 hrs, Volume= 6,973 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.95 cfs @ 12.08 hrs, Volume= 6,973 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 270.05' @ 12.08 hrs  
 Flood Elev= 272.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.24'	<b>12.0" Round Culvert</b> L= 44.0' Ke= 0.500 Inlet / Outlet Invert= 269.24' / 268.80' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.95 cfs @ 12.08 hrs HW=270.05' TW=0.00' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 1.95 cfs @ 3.92 fps)

**Summary for Pond CB-5: CB**

Inflow Area = 17,711 sf, 37.81% Impervious, Inflow Depth = 1.86" for 10-year event  
 Inflow = 0.70 cfs @ 12.10 hrs, Volume= 2,743 cf  
 Outflow = 0.70 cfs @ 12.10 hrs, Volume= 2,743 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.70 cfs @ 12.10 hrs, Volume= 2,743 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 271.78' @ 12.10 hrs  
 Flood Elev= 275.46'

Device	Routing	Invert	Outlet Devices
#1	Primary	271.36'	<b>12.0" Round Culvert</b> L= 65.0' Ke= 0.500 Inlet / Outlet Invert= 271.36' / 269.55' S= 0.0278 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.70 cfs @ 12.10 hrs HW=271.78' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 0.70 cfs @ 2.21 fps)

**Summary for Pond CB-6: CB**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 3.38" for 10-year event  
 Inflow = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf  
 Outflow = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf  
 Routed to Pond DMH-7 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 275.49' @ 12.10 hrs  
 Flood Elev= 278.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	274.74'	<b>12.0" Round Culvert</b> L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 274.74' / 273.79' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.81 cfs @ 12.10 hrs HW=275.49' TW=274.44' (Dynamic Tailwater)  
 ↑**1=Culvert** (Outlet Controls 1.81 cfs @ 4.00 fps)

**Summary for Pond DMH-10: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 4.53" for 10-year event  
 Inflow = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf  
 Outflow = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf  
 Routed to Pond RR4 : Riprap Slope

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 275.97' @ 12.10 hrs  
 Flood Elev= 279.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	274.28'	<b>30.0" Round Culvert</b> L= 9.0' Ke= 0.500 Inlet / Outlet Invert= 274.28' / 274.00' S= 0.0311 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=13.28 cfs @ 12.10 hrs HW=275.97' TW=269.12' (Dynamic Tailwater)  
 ↑**1=Culvert** (Barrel Controls 13.28 cfs @ 5.30 fps)

**Summary for Pond DMH-2: DMH**

Inflow Area = 28,949 sf, 80.86% Impervious, Inflow Depth = 3.81" for 10-year event  
 Inflow = 2.49 cfs @ 12.09 hrs, Volume= 9,182 cf  
 Outflow = 2.49 cfs @ 12.09 hrs, Volume= 9,182 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.49 cfs @ 12.09 hrs, Volume= 9,182 cf  
 Routed to Link WQ-1 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.26' @ 12.09 hrs  
 Flood Elev= 274.78'

Device	Routing	Invert	Outlet Devices
#1	Primary	268.42'	<b>15.0" Round Culvert</b> L= 64.0' Ke= 0.500 Inlet / Outlet Invert= 268.42' / 267.87' S= 0.0086 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=2.49 cfs @ 12.09 hrs HW=269.26' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Barrel Controls 2.49 cfs @ 4.04 fps)

**Summary for Pond DMH-3: DMH**

Inflow Area = 28,949 sf, 80.86% Impervious, Inflow Depth = 3.81" for 10-year event  
 Inflow = 2.49 cfs @ 12.09 hrs, Volume= 9,182 cf  
 Outflow = 2.49 cfs @ 12.09 hrs, Volume= 9,182 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.49 cfs @ 12.09 hrs, Volume= 9,182 cf  
 Routed to Pond DMH-2 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 270.79' @ 12.09 hrs  
 Flood Elev= 274.41'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.98'	<b>15.0" Round Culvert</b> L= 168.0' Ke= 0.500 Inlet / Outlet Invert= 269.98' / 268.52' S= 0.0087 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=2.49 cfs @ 12.09 hrs HW=270.79' TW=269.26' (Dynamic Tailwater)  
 ↑**1=Culvert** (Outlet Controls 2.49 cfs @ 4.22 fps)

**Summary for Pond DMH-5: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 3.38" for 10-year event  
 Inflow = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf  
 Outflow = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 268.08' @ 12.10 hrs  
 Flood Elev= 274.16'

Device	Routing	Invert	Outlet Devices
#1	Primary	267.34'	<b>12.0" Round Culvert</b> L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 267.34' / 266.88' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.81 cfs @ 12.10 hrs HW=268.08' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 1.81 cfs @ 2.92 fps)

**Summary for Pond DMH-6: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 3.38" for 10-year event  
 Inflow = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf  
 Outflow = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf  
 Routed to Pond DMH-5 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 272.91' @ 12.10 hrs  
 Flood Elev= 277.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	272.17'	<b>12.0" Round Culvert</b> L= 147.0' Ke= 0.500 Inlet / Outlet Invert= 272.17' / 269.87' S= 0.0156 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.81 cfs @ 12.10 hrs HW=272.91' TW=268.08' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 1.81 cfs @ 2.92 fps)

**Summary for Pond DMH-7: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 3.38" for 10-year event  
 Inflow = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf  
 Outflow = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.82 cfs @ 12.10 hrs, Volume= 6,805 cf  
 Routed to Pond DMH-6 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 274.44' @ 12.10 hrs  
 Flood Elev= 279.73'

Device	Routing	Invert	Outlet Devices
#1	Primary	273.70'	<b>12.0" Round Culvert</b> L= 143.0' Ke= 0.500 Inlet / Outlet Invert= 273.70' / 272.27' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.81 cfs @ 12.10 hrs HW=274.44' TW=272.91' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 1.81 cfs @ 2.92 fps)

**Summary for Pond DMH-8: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 4.53" for 10-year event  
 Inflow = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf  
 Outflow = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf  
 Routed to Pond DMH-9 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 283.23' @ 12.10 hrs  
 Flood Elev= 286.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	281.70'	<b>30.0" Round Culvert</b> L= 170.0' Ke= 0.500 Inlet / Outlet Invert= 281.70' / 278.93' S= 0.0163 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=13.28 cfs @ 12.10 hrs HW=283.23' TW=280.36' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 13.28 cfs @ 4.21 fps)

**Summary for Pond DMH-9: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 4.53" for 10-year event  
 Inflow = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf  
 Outflow = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf  
 Routed to Pond DMH-10 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 280.36' @ 12.10 hrs  
 Flood Elev= 284.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	278.83'	<b>30.0" Round Culvert</b> L= 274.0' Ke= 0.500 Inlet / Outlet Invert= 278.83' / 274.38' S= 0.0162 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=13.28 cfs @ 12.10 hrs HW=280.36' TW=275.97' (Dynamic Tailwater)  
 1=Culvert (Inlet Controls 13.28 cfs @ 4.21 fps)

**Summary for Pond IS-1: IS-1**

Inflow Area = 23,802 sf, 26.02% Impervious, Inflow Depth = 1.20" for 10-year event  
 Inflow = 0.66 cfs @ 12.08 hrs, Volume= 2,389 cf  
 Outflow = 0.04 cfs @ 11.28 hrs, Volume= 2,389 cf, Atten= 94%, Lag= 0.0 min  
 Discarded = 0.04 cfs @ 11.28 hrs, Volume= 2,389 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Routed to Link SP1 : STUDY POINT #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 273.71' @ 13.83 hrs Surf.Area= 658 sf Storage= 954 cf  
 Flood Elev= 278.00' Surf.Area= 1,559 sf Storage= 2,035 cf

Plug-Flow detention time= 188.5 min calculated for 2,389 cf (100% of inflow)  
 Center-of-Mass det. time= 188.5 min ( 944.6 - 756.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	1,272 cf	<b>surface storage (Irregular)</b> Listed below (Recalc)
#2	275.00'	78 cf	<b>media storage (Irregular)</b> Listed below (Recalc) 260 cf Overall x 30.0% Voids
#3A	271.50'	627 cf	<b>20.50"W x 32.10'L x 3.50"H Field A</b> 2,303 cf Overall - 735 cf Embedded = 1,568 cf x 40.0% Voids
#4A	272.00'	735 cf	<b>ADS_StormTech SC-740 +Cap</b> x 16 Inside #3 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 16 Chambers in 4 Rows
		2,713 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
277.00	435	96.0	0	0	435
278.00	771	118.0	595	595	825
279.00	588	81.0	677	1,272	1,419

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
275.00	130	53.0	0	0	130
277.00	130	53.0	260	260	236

Device	Routing	Invert	Outlet Devices
#0	Primary	279.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	271.50'	<b>0.04 cfs Exfiltration at all elevations</b> Phase-In= 0.01'
#2	Primary	277.80'	<b>9.0' long x 4.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50

5.00 5.50  
Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88  
3.07 3.32

Discarded OutFlow Max=0.04 cfs @ 11.28 hrs HW=271.58' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=271.50' TW=0.00' (Dynamic Tailwater)

↑2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

### Summary for Pond IS-2: IS-2

GEO-TP-5 indicates silty sand to a depth of 14' below grade with no refusal. The infiltration rate for loamy sand is 2.41 inches per hour (Rawls Rates)

Redox was encountered at 9' below grade or elevation 263.0

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 3.52" for 10-year event  
Inflow = 10.37 cfs @ 12.09 hrs, Volume= 38,389 cf  
Outflow = 0.44 cfs @ 10.53 hrs, Volume= 38,389 cf, Atten= 96%, Lag= 0.0 min  
Discarded = 0.44 cfs @ 10.53 hrs, Volume= 38,389 cf  
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Routed to Link RR1 : RipRap Apron

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 269.08' @ 15.05 hrs Surf.Area= 8,276 sf Storage= 18,673 cf

Flood Elev= 271.25' Surf.Area= 8,547 sf Storage= 27,413 cf

Plug-Flow detention time= 356.8 min calculated for 38,384 cf (100% of inflow)

Center-of-Mass det. time= 356.8 min ( 1,110.3 - 753.5 )

Volume	Invert	Avail.Storage	Storage Description
#1A	265.75'	13,527 cf	<b>52.42'W x 150.10'L x 6.00'H Field A Z=0.3</b> 49,420 cf Overall - 15,602 cf Embedded = 33,818 cf x 40.0% Voids
#2A	266.50'	15,602 cf	<b>ADS_StormTech MC-3500 d +Cap</b> x 140 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 140 Chambers in 7 Rows Cap Storage= 14.9 cf x 2 x 7 rows = 208.6 cf
		29,129 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	265.75'	<b>0.44 cfs Exfiltration at all elevations</b> Phase-In= 0.01'
#2	Primary	267.00'	<b>10.0" Round Culvert</b> L= 29.0' Ke= 0.500 Inlet / Outlet Invert= 267.00' / 265.92' S= 0.0372 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	269.40'	<b>4.0' long x 6.26' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

Discarded OutFlow Max=0.44 cfs @ 10.53 hrs HW=265.85' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.44 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=265.75' TW=0.00' (Dynamic Tailwater)

↑2=Culvert ( Controls 0.00 cfs)

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

### Summary for Pond RR2: Riprap Slope

Inflow Area = 7,513 sf, 0.00% Impervious, Inflow Depth = 0.37" for 10-year event  
Inflow = 0.06 cfs @ 12.10 hrs, Volume= 229 cf  
Outflow = 0.06 cfs @ 12.10 hrs, Volume= 229 cf, Atten= 0%, Lag= 0.0 min  
Discarded = 0.06 cfs @ 12.10 hrs, Volume= 229 cf  
Primary = 0.00 cfs @ 24.34 hrs, Volume= 0 cf  
Routed to Pond IS-1 : IS-1

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Type III 24-hr 10-year Rainfall=4.90"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 280.00' @ 0.00 hrs Surf.Area= 111 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 0.0 min ( 883.4 - 883.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	280.00'	328 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 821 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
280.00	111	0	0
281.00	111	111	111
282.00	111	111	222
283.00	103	107	329
284.00	75	89	418
285.00	73	74	492
286.00	70	72	564
287.00	68	69	633
288.00	66	67	700
289.00	62	64	764
290.00	52	57	821

Device	Routing	Invert	Outlet Devices
#1	Discarded	280.00'	<b>0.37 cfs Exfiltration at all elevations</b>
#2	Primary	280.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.00 cfs @ 12.10 hrs HW=280.00' (Free Discharge)  
 ↳ **1=Exfiltration** (Passes 0.00 cfs of 0.37 cfs potential flow)

**Primary OutFlow** Max=0.00 cfs @ 24.34 hrs HW=280.00' TW=271.50' (Dynamic Tailwater)  
 ↳ **2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Summary for Pond RR3: Riprap Slope**

Inflow Area = 5,707 sf, 3.94% Impervious, Inflow Depth = 0.71" for 10-year event  
 Inflow = 0.09 cfs @ 12.09 hrs, Volume= 337 cf  
 Outflow = 0.09 cfs @ 12.09 hrs, Volume= 337 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.09 cfs @ 12.09 hrs, Volume= 337 cf  
 Primary = 0.00 cfs @ 24.34 hrs, Volume= 0 cf  
 Routed to Pond IS-1 : IS-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 280.00' @ 0.00 hrs Surf.Area= 116 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 0.0 min ( 858.0 - 858.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	280.00'	464 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 1,160 cf Overall x 40.0% Voids

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
280.00	116	0	0
281.00	116	116	116
282.00	116	116	232
283.00	116	116	348
284.00	116	116	464
285.00	116	116	580
286.00	116	116	696
287.00	116	116	812
288.00	116	116	928
289.00	116	116	1,044
290.00	116	116	1,160

Device	Routing	Invert	Outlet Devices
#1	Discarded	280.00'	<b>0.37 cfs Exfiltration at all elevations</b>
#2	Primary	280.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.00 cfs @ 12.09 hrs HW=280.00' (Free Discharge)

↑**1=Exfiltration** (Passes 0.00 cfs of 0.37 cfs potential flow)

**Primary OutFlow** Max=0.00 cfs @ 24.34 hrs HW=280.00' TW=271.50' (Dynamic Tailwater)

↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

**Summary for Pond RR4: Riprap Slope**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 4.53" for 10-year event  
 Inflow = 13.29 cfs @ 12.10 hrs, Volume= 49,920 cf  
 Outflow = 13.29 cfs @ 12.10 hrs, Volume= 49,922 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.10 cfs @ 3.38 hrs, Volume= 8,017 cf  
 Primary = 13.19 cfs @ 12.10 hrs, Volume= 41,904 cf  
 Routed to Reach R1 : Routing sheet flow through a subcatchment

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.12' @ 12.10 hrs Surf.Area= 112 sf Storage= 45 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 1.0 min ( 751.1 - 750.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	268.00'	225 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 563 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
268.00	87	0	0
269.00	110	99	99
270.00	126	118	217
271.00	96	111	328
272.00	76	86	414
273.00	63	70	483
274.00	97	80	563

Device	Routing	Invert	Outlet Devices
#1	Discarded	268.00'	<b>0.10 cfs Exfiltration at all elevations</b>
#2	Primary	269.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.10 cfs @ 3.38 hrs HW=268.06' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

**Primary OutFlow** Max=13.18 cfs @ 12.10 hrs HW=269.12' TW=266.14' (Dynamic Tailwater)

↑**2=Broad-Crested Rectangular Weir**(Weir Controls 13.18 cfs @ 0.95 fps)

**Summary for Pond RR5: Riprap Slope**

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 0.00" for 10-year event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Routed to Reach R2 : Routing sheet flow through a subcatchment

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 261.00' @ 0.00 hrs Surf.Area= 14 sf Storage= 0 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	261.00'	35 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 89 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
261.00	14	0	0
262.00	34	24	24
263.00	26	30	54
264.00	18	22	76
265.00	7	13	89

Device	Routing	Invert	Outlet Devices
#1	Discarded	261.00'	<b>0.10 cfs Exfiltration at all elevations</b>
#2	Primary	261.50'	<b>14.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=261.00' (Free Discharge)  
 ↳1=Exfiltration (Passes 0.00 cfs of 0.10 cfs potential flow)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=261.00' TW=265.92' (Dynamic Tailwater)  
 ↳2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Summary for Link RR1: RipRap Apron**

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 0.00" for 10-year event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min  
 Routed to Pond RR5 : Riprap Slope

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

**Summary for Link SP-3: STUDY POINT #3**

Inflow Area = 361,985 sf, 62.10% Impervious, Inflow Depth = 1.68" for 10-year event  
 Inflow = 9.71 cfs @ 12.21 hrs, Volume= 50,758 cf  
 Primary = 9.71 cfs @ 12.21 hrs, Volume= 50,758 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link SP1: STUDY POINT #1**

Inflow Area = 27,226 sf, 22.75% Impervious, Inflow Depth = 0.02" for 10-year event  
 Inflow = 0.00 cfs @ 12.50 hrs, Volume= 37 cf  
 Primary = 0.00 cfs @ 12.50 hrs, Volume= 37 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link SP2: STUDY POINT #2**

Inflow Area = 1,587 sf, 0.00% Impervious, Inflow Depth = 0.18" for 10-year event  
Inflow = 0.00 cfs @ 12.10 hrs, Volume= 24 cf  
Primary = 0.00 cfs @ 12.10 hrs, Volume= 24 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link WQ-1: Water Quality Unit**

Inflow Area = 45,592 sf, 81.75% Impervious, Inflow Depth = 3.91" for 10-year event  
Inflow = 4.10 cfs @ 12.09 hrs, Volume= 14,873 cf  
Primary = 4.10 cfs @ 12.09 hrs, Volume= 14,873 cf, Atten= 0%, Lag= 0.0 min  
Routed to Pond IS-2 : IS-2

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

**Summary for Link WQ-2: Water Quality Unit**

Inflow Area = 67,273 sf, 61.26% Impervious, Inflow Depth = 2.95" for 10-year event  
Inflow = 4.45 cfs @ 12.09 hrs, Volume= 16,521 cf  
Primary = 4.45 cfs @ 12.09 hrs, Volume= 16,521 cf, Atten= 0%, Lag= 0.0 min  
Routed to Pond IS-2 : IS-2

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

**Summary for Subcatchment A-1: Subcat A-1**

Runoff = 7.34 cfs @ 12.11 hrs, Volume= 27,936 cf, Depth= 5.93"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
56,517	98	Paved parking, HSG A
56,517	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment B-1: Subcat B-1**

Runoff = 3.73 cfs @ 12.08 hrs, Volume= 13,411 cf, Depth= 5.24"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
3,889	39	>75% Grass cover, Good, HSG A
26,806	98	Paved parking, HSG A
30,695		Weighted Average
3,889	39	12.67% Pervious Area
26,806	98	87.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	117	0.0200	1.44		<b>Sheet Flow, Paved parking</b> Smooth surfaces n= 0.011 P2= 3.28"
0.9	163	0.0200	2.87		<b>Shallow Concentrated Flow, Paved Parking Lot</b> Paved Kv= 20.3 fps
2.3	280	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment B-2: Subcat B-2**

Runoff = 5.84 cfs @ 12.11 hrs, Volume= 22,236 cf, Depth= 5.93"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
44,985	98	Paved parking, HSG A
44,985	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment P-1A: Subcat P-1A**

Runoff = 0.46 cfs @ 12.08 hrs, Volume= 1,734 cf, Depth= 3.55"  
 Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

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Type III 24-hr 25-year Rainfall=6.17"

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Area (sf)	CN	Description
2,565	39	>75% Grass cover, Good, HSG A
3,294	98	Paved parking, HSG A
5,859		Weighted Average
2,565	39	43.78% Pervious Area
3,294	98	56.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	67	0.0300	1.51		<b>Sheet Flow, A-B</b> Smooth surfaces n= 0.011 P2= 3.28"
0.7	67	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1B: Subcat P-1B**

Runoff = 0.37 cfs @ 12.08 hrs, Volume= 1,407 cf, Depth= 3.58"  
 Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
2,046	39	>75% Grass cover, Good, HSG A
2,675	98	Paved parking, HSG A
4,722		Weighted Average
2,046	39	43.34% Pervious Area
2,675	98	56.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	34	0.0300	1.32		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
0.4	34	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1C: Subcat P-1C**

Runoff = 0.01 cfs @ 12.33 hrs, Volume= 109 cf, Depth= 0.38"  
 Routed to Link SP1 : STUDY POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
2,460	39	>75% Grass cover, Good, HSG A
964	30	Woods, Good, HSG A
3,424		Weighted Average
3,424	36	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-1D: Subcat P-1D**

Runoff = 0.11 cfs @ 12.10 hrs, Volume= 419 cf, Depth= 0.67"  
 Routed to Pond RR2 : Riprap Slope

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

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Type III 24-hr 25-year Rainfall=6.17"

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Area (sf)	CN	Description
1,126	39	>75% Grass cover, Good, HSG A
1,840	62	>Stone Rip Rap, Good, HSG A
4,547	30	Woods, Good, HSG A
7,513		Weighted Average
7,513	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.1673	0.16		<b>Sheet Flow, A-B</b> Woods: Light underbrush n= 0.400 P2= 3.28"
0.1	18	0.1673	2.05		<b>Shallow Concentrated Flow, B-C</b> Woodland Kv= 5.0 fps
5.3	68	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1E: Subcat P-1E**

Runoff = 0.14 cfs @ 12.10 hrs, Volume= 567 cf, Depth= 1.19"  
 Routed to Pond RR3 : Riprap Slope

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
2,868	39	>75% Grass cover, Good, HSG A
1,801	62	>Stone Rip Rap, Good, HSG A
225	98	Paved parking, HSG A
813	30	Woods, Good, HSG A
5,707		Weighted Average
5,482	45	96.06% Pervious Area
225	98	3.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	21	0.1200	0.12		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.28"
0.3	41	0.0992	2.20		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
3.3	62	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-2: Subcat P-2**

Runoff = 0.01 cfs @ 12.13 hrs, Volume= 56 cf, Depth= 0.42"  
 Routed to Link SP2 : STUDY POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
746	39	>75% Grass cover, Good, HSG A
107	62	>Stone Rip Rap, Good, HSG A
734	30	Woods, Good, HSG A
1,587		Weighted Average
1,587	36	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-3A: Subcat P-3A**

Runoff = 1.15 cfs @ 12.09 hrs, Volume= 4,349 cf, Depth= 3.44"  
 Routed to Pond CB-6 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
5,602	39	>75% Grass cover, Good, HSG A
250	62	>Stone Rip Rap, Good, HSG A
8,221	98	Paved parking, HSG A
1,098	30	Woods, Good, HSG A
15,170		Weighted Average
6,950	38	45.81% Pervious Area
8,221	98	54.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	47	0.1200	0.14		<b>Sheet Flow, A-B</b>
					Woods: Light underbrush n= 0.400 P2= 3.28"
0.5	106	0.0300	3.52		<b>Shallow Concentrated Flow, B-C</b>
					Paved Kv= 20.3 fps
6.2	153	Total			

**Summary for Subcatchment P-3B: Subcat P-3B**

Runoff = 0.89 cfs @ 12.11 hrs, Volume= 3,708 cf, Depth= 2.51"  
 Routed to Pond CB-5 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
9,329	39	>75% Grass cover, Good, HSG A
6,696	98	Paved parking, HSG A
1,685	30	Woods, Good, HSG A
17,711		Weighted Average
11,014	38	62.19% Pervious Area
6,696	98	37.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	47	0.1200	0.14		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.28"
1.8	254	0.0140	2.40		<b>Shallow Concentrated Flow,</b>
					Paved Kv= 20.3 fps
7.5	301	Total			

**Summary for Subcatchment P-3C: Subcat P-3C**

Runoff = 2.49 cfs @ 12.08 hrs, Volume= 9,056 cf, Depth= 4.28"  
 Routed to Pond CB-4 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

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Type III 24-hr 25-year Rainfall=6.17"

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Area (sf)	CN	Description
5,279	39	>75% Grass cover, Good, HSG A
1,565	61	>75% Grass cover, Good, HSG B
12	68	>Stone Rip Rap, Good, HSG B
2,364	98	Paved parking, HSG A
14,929	98	Paved parking, HSG B
1,229	30	Woods, Good, HSG A
14	55	Woods, Good, HSG B
25,392		Weighted Average
8,099	42	31.90% Pervious Area
17,293	98	68.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	158	0.0200	1.53		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
1.7	158	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-3D: Subcat P-3D**

Runoff = 1.30 cfs @ 12.08 hrs, Volume= 4,782 cf, Depth= 4.15"  
 Routed to Pond CB-3 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
3,871	39	>75% Grass cover, Good, HSG A
1	62	>Stone Rip Rap, Good, HSG A
9,341	98	Paved parking, HSG A
619	30	Woods, Good, HSG A
13,831		Weighted Average
4,491	38	32.47% Pervious Area
9,341	98	67.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0360	1.53		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
0.4	85	0.0360	3.85		<b>Shallow Concentrated Flow, B-C</b> Paved Kv= 20.3 fps
0.9	135	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-3E: Subcat P-3E**

Runoff = 0.71 cfs @ 12.08 hrs, Volume= 2,565 cf, Depth= 5.03"  
 Routed to Pond CB-2 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
925	39	>75% Grass cover, Good, HSG A
125	61	>75% Grass cover, Good, HSG B
4,721	98	Paved parking, HSG A
346	98	Paved parking, HSG B
6,117		Weighted Average
1,050	42	17.17% Pervious Area
5,067	98	82.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-3F: Subcat P-3F**

Runoff = 2.08 cfs @ 12.08 hrs, Volume= 7,344 cf, Depth= 5.29"  
 Routed to Pond CB-1 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
2,781	61	>75% Grass cover, Good, HSG B
455	98	Paved parking, HSG A
13,407	98	Paved parking, HSG B
16,643		Weighted Average
2,781	61	16.71% Pervious Area
13,862	98	83.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TR-55 MIN

**Summary for Subcatchment P-3G: Subcat P-3G (roof)**

Runoff = 1.17 cfs @ 12.11 hrs, Volume= 4,449 cf, Depth= 5.93"  
 Routed to Pond DMH-3 : DMH

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry, Internal roof drains

**Summary for Subcatchment P-3H: Subcat P-3H (roof)**

Runoff = 1.17 cfs @ 12.11 hrs, Volume= 4,449 cf, Depth= 5.93"  
 Routed to Pond IS-2 : IS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
8,032	98	Roofs, HSG A
968	98	Roofs, HSG B
9,000		Weighted Average
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry, Internal roof drains

**Summary for Subcatchment P-3I: Subcat P-3I (roof)**

Runoff = 1.17 cfs @ 12.11 hrs, Volume= 4,449 cf, Depth= 5.93"  
 Routed to Pond CB-6 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

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Type III 24-hr 25-year Rainfall=6.17"

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Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment P-3J: Subcat P-3J (roof)**

Runoff = 1.17 cfs @ 12.11 hrs, Volume= 4,449 cf, Depth= 5.93"  
 Routed to Pond IS-2 : IS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment P-3K: Subcat P-3K**

Runoff = 2.65 cfs @ 12.17 hrs, Volume= 10,882 cf, Depth= 1.70"  
 Routed to Link SP-3 : STUDY POINT #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
2,624	39	>75% Grass cover, Good, HSG A
8,980	61	>75% Grass cover, Good, HSG B
801	62	>Stone Rip Rap, Good, HSG A
3,956	68	>Stone Rip Rap, Good, HSG B
250	30	Woods, Good, HSG A
60,357	55	Woods, Good, HSG B
76,968		Weighted Average
76,968	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.2500	0.11		<b>Sheet Flow, A-B</b> Woods: Dense underbrush n= 0.800 P2= 3.28"
3.6	359	0.1100	1.66		<b>Shallow Concentrated Flow, B-C</b> Woodland Kv= 5.0 fps
11.3	409	Total			

**Summary for Subcatchment P-3L: Subcat P-3L**

Runoff = 1.23 cfs @ 12.09 hrs, Volume= 3,964 cf, Depth= 2.17"  
 Routed to Reach R2 : Routing sheet flow through a subcatchment

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 25-year Rainfall=6.17"

Area (sf)	CN	Description
16,823	61	>75% Grass cover, Good, HSG B
3,167	68	>Stone Rip Rap, Good, HSG B
1	98	Paved parking, HSG B
1,964	55	Woods, Good, HSG B
21,955		Weighted Average
21,954	61	100.00% Pervious Area
1	98	0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	81	0.4000	0.25		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.28"
5.4	81	Total, Increased to minimum Tc = 6.0 min			

**Summary for Reach R1: Routing sheet flow through a subcatchment**

A subcatchment performs runoff calculations, including the associated Tc and CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 5.03" for 25-year event  
 Inflow = 16.68 cfs @ 12.10 hrs, Volume= 55,362 cf  
 Outflow = 10.77 cfs @ 12.21 hrs, Volume= 55,362 cf, Atten= 35%, Lag= 6.4 min  
 Routed to Link SP-3 : STUDY POINT #3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Max. Velocity= 0.28 fps, Min. Travel Time= 16.4 min  
 Avg. Velocity = 0.06 fps, Avg. Travel Time= 77.1 min

Peak Storage= 10,585 cf @ 12.21 hrs  
 Average Depth at Peak Storage= 0.29' , Surface Width= 158.50'  
 Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 113.05 cfs

100.00' x 1.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush  
 Side Slope Z-value= 100.0 ' / Top Width= 300.00'  
 Length= 280.0' Slope= 0.1590 ' /'  
 Inlet Invert= 265.92', Outlet Invert= 221.40'



**Summary for Reach R2: Routing sheet flow through a subcatchment**

A subcatchment performs runoff calculations, including the associated Tc and CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

[80] Warning: Exceeded Pond RR5 by 4.96' @ 12.41 hrs (438.01 cfs 108,310,286 cf)

Inflow Area = 152,820 sf, 63.13% Impervious, Inflow Depth = 0.70" for 25-year event  
 Inflow = 3.60 cfs @ 12.71 hrs, Volume= 8,918 cf  
 Outflow = 1.07 cfs @ 12.98 hrs, Volume= 8,918 cf, Atten= 70%, Lag= 16.3 min  
 Routed to Link SP-3 : STUDY POINT #3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Max. Velocity= 0.13 fps, Min. Travel Time= 36.3 min  
 Avg. Velocity= 0.04 fps, Avg. Travel Time= 111.2 min

Peak Storage= 2,334 cf @ 12.98 hrs  
 Average Depth at Peak Storage= 0.08' , Surface Width= 115.47'  
 Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 113.05 cfs

100.00' x 1.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush  
 Side Slope Z-value= 100.0 '/' Top Width= 300.00'  
 Length= 280.0' Slope= 0.1590 '/'  
 Inlet Invert= 265.92', Outlet Invert= 221.40'



**Summary for Pond 1P: Existing Off-Site CB**

[58] Hint: Peaked 26.63' above defined flood level

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 5.77" for 25-year event  
 Inflow = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf  
 Outflow = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf  
 Routed to Pond DMH-8 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 316.49' @ 12.10 hrs  
 Flood Elev= 289.86'

Device	Routing	Invert	Outlet Devices
#1	Primary	283.08'	<b>12.0" Round Culvert</b> L= 118.0' Ke= 0.500 Inlet / Outlet Invert= 283.08' / 278.95' S= 0.0350 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

**Primary OutFlow** Max=16.77 cfs @ 12.10 hrs HW=316.42' TW=283.47' (Dynamic Tailwater)  
 ←**1=Culvert** (Outlet Controls 16.77 cfs @ 21.35 fps)

**Summary for Pond CB-1: CB**

Inflow Area = 16,643 sf, 83.29% Impervious, Inflow Depth = 5.29" for 25-year event  
 Inflow = 2.08 cfs @ 12.08 hrs, Volume= 7,344 cf  
 Outflow = 2.08 cfs @ 12.08 hrs, Volume= 7,344 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.08 cfs @ 12.08 hrs, Volume= 7,344 cf  
 Routed to Link WQ-1 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 270.06' @ 12.08 hrs  
 Flood Elev= 272.52'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.22'	<b>12.0" Round Culvert</b> L= 45.0' Ke= 0.500 Inlet / Outlet Invert= 269.22' / 268.77' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.07 cfs @ 12.08 hrs HW=270.06' TW=0.00' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 2.07 cfs @ 3.97 fps)

**Summary for Pond CB-2: CB**

Inflow Area = 6,117 sf, 82.83% Impervious, Inflow Depth = 5.03" for 25-year event  
 Inflow = 0.71 cfs @ 12.08 hrs, Volume= 2,565 cf  
 Outflow = 0.71 cfs @ 12.08 hrs, Volume= 2,565 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.71 cfs @ 12.08 hrs, Volume= 2,565 cf  
 Routed to Pond DMH-3 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 271.07' @ 12.09 hrs  
 Flood Elev= 273.92'

Device	Routing	Invert	Outlet Devices
#1	Primary	270.46'	<b>12.0" Round Culvert</b> L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 270.46' / 270.23' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.71 cfs @ 12.08 hrs HW=271.07' TW=270.92' (Dynamic Tailwater)

↑**1=Culvert** (Outlet Controls 0.71 cfs @ 2.05 fps)

**Summary for Pond CB-3: CB**

Inflow Area = 13,831 sf, 67.53% Impervious, Inflow Depth = 4.15" for 25-year event  
 Inflow = 1.30 cfs @ 12.08 hrs, Volume= 4,782 cf  
 Outflow = 1.30 cfs @ 12.08 hrs, Volume= 4,782 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.30 cfs @ 12.08 hrs, Volume= 4,782 cf  
 Routed to Pond DMH-3 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 272.03' @ 12.09 hrs  
 Flood Elev= 274.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	271.40'	<b>12.0" Round Culvert</b> L= 126.0' Ke= 0.500 Inlet / Outlet Invert= 271.40' / 270.23' S= 0.0093 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.30 cfs @ 12.08 hrs HW=272.03' TW=270.92' (Dynamic Tailwater)

↑**1=Culvert** (Outlet Controls 1.30 cfs @ 3.56 fps)

**Summary for Pond CB-4: CB**

Inflow Area = 25,392 sf, 68.10% Impervious, Inflow Depth = 4.28" for 25-year event  
 Inflow = 2.49 cfs @ 12.08 hrs, Volume= 9,056 cf  
 Outflow = 2.49 cfs @ 12.08 hrs, Volume= 9,056 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.49 cfs @ 12.08 hrs, Volume= 9,056 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 270.20' @ 12.08 hrs  
 Flood Elev= 272.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.24'	<b>12.0" Round Culvert</b> L= 44.0' Ke= 0.500 Inlet / Outlet Invert= 269.24' / 268.80' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.49 cfs @ 12.08 hrs HW=270.20' TW=0.00' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 2.49 cfs @ 4.11 fps)

**Summary for Pond CB-5: CB**

Inflow Area = 17,711 sf, 37.81% Impervious, Inflow Depth = 2.51" for 25-year event  
 Inflow = 0.89 cfs @ 12.11 hrs, Volume= 3,708 cf  
 Outflow = 0.89 cfs @ 12.11 hrs, Volume= 3,708 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.89 cfs @ 12.11 hrs, Volume= 3,708 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 271.84' @ 12.11 hrs  
 Flood Elev= 275.46'

Device	Routing	Invert	Outlet Devices
#1	Primary	271.36'	<b>12.0" Round Culvert</b> L= 65.0' Ke= 0.500 Inlet / Outlet Invert= 271.36' / 269.55' S= 0.0278 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.89 cfs @ 12.11 hrs HW=271.84' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 0.89 cfs @ 2.37 fps)

**Summary for Pond CB-6: CB**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 4.37" for 25-year event  
 Inflow = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf  
 Outflow = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf  
 Routed to Pond DMH-7 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 275.63' @ 12.10 hrs  
 Flood Elev= 278.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	274.74'	<b>12.0" Round Culvert</b> L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 274.74' / 273.79' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.30 cfs @ 12.10 hrs HW=275.63' TW=274.57' (Dynamic Tailwater)  
 ↑**1=Culvert** (Outlet Controls 2.30 cfs @ 4.16 fps)

**Summary for Pond DMH-10: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 5.77" for 25-year event  
 Inflow = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf  
 Outflow = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf  
 Routed to Pond RR4 : Riprap Slope

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 276.24' @ 12.10 hrs  
 Flood Elev= 279.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	274.28'	<b>30.0" Round Culvert</b> L= 9.0' Ke= 0.500 Inlet / Outlet Invert= 274.28' / 274.00' S= 0.0311 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=16.77 cfs @ 12.10 hrs HW=276.24' TW=269.15' (Dynamic Tailwater)  
 ↑**1=Culvert** (Barrel Controls 16.77 cfs @ 5.57 fps)

**Summary for Pond DMH-2: DMH**

Inflow Area = 28,949 sf, 80.86% Impervious, Inflow Depth = 4.89" for 25-year event  
 Inflow = 3.15 cfs @ 12.09 hrs, Volume= 11,795 cf  
 Outflow = 3.15 cfs @ 12.09 hrs, Volume= 11,795 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 3.15 cfs @ 12.09 hrs, Volume= 11,795 cf  
 Routed to Link WQ-1 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.39' @ 12.09 hrs  
 Flood Elev= 274.78'

Device	Routing	Invert	Outlet Devices
#1	Primary	268.42'	<b>15.0" Round Culvert</b> L= 64.0' Ke= 0.500 Inlet / Outlet Invert= 268.42' / 267.87' S= 0.0086 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=3.15 cfs @ 12.09 hrs HW=269.39' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Barrel Controls 3.15 cfs @ 4.25 fps)

**Summary for Pond DMH-3: DMH**

Inflow Area = 28,949 sf, 80.86% Impervious, Inflow Depth = 4.89" for 25-year event  
 Inflow = 3.15 cfs @ 12.09 hrs, Volume= 11,795 cf  
 Outflow = 3.15 cfs @ 12.09 hrs, Volume= 11,795 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 3.15 cfs @ 12.09 hrs, Volume= 11,795 cf  
 Routed to Pond DMH-2 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 270.92' @ 12.09 hrs  
 Flood Elev= 274.41'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.98'	<b>15.0" Round Culvert</b> L= 168.0' Ke= 0.500 Inlet / Outlet Invert= 269.98' / 268.52' S= 0.0087 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=3.15 cfs @ 12.09 hrs HW=270.92' TW=269.39' (Dynamic Tailwater)  
 ↑**1=Culvert** (Outlet Controls 3.15 cfs @ 4.41 fps)

**Summary for Pond DMH-5: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 4.37" for 25-year event  
 Inflow = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf  
 Outflow = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 268.21' @ 12.10 hrs  
 Flood Elev= 274.16'

Device	Routing	Invert	Outlet Devices
#1	Primary	267.34'	<b>12.0" Round Culvert</b> L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 267.34' / 266.88' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.30 cfs @ 12.10 hrs HW=268.21' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 2.30 cfs @ 3.17 fps)

**Summary for Pond DMH-6: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 4.37" for 25-year event  
 Inflow = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf  
 Outflow = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf  
 Routed to Pond DMH-5 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 273.04' @ 12.10 hrs  
 Flood Elev= 277.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	272.17'	<b>12.0" Round Culvert</b> L= 147.0' Ke= 0.500 Inlet / Outlet Invert= 272.17' / 269.87' S= 0.0156 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.30 cfs @ 12.10 hrs HW=273.04' TW=268.21' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 2.30 cfs @ 3.17 fps)

**Summary for Pond DMH-7: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 4.37" for 25-year event  
 Inflow = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf  
 Outflow = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.31 cfs @ 12.10 hrs, Volume= 8,798 cf  
 Routed to Pond DMH-6 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 274.57' @ 12.10 hrs  
 Flood Elev= 279.73'

Device	Routing	Invert	Outlet Devices
#1	Primary	273.70'	<b>12.0" Round Culvert</b> L= 143.0' Ke= 0.500 Inlet / Outlet Invert= 273.70' / 272.27' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.30 cfs @ 12.10 hrs HW=274.57' TW=273.04' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 2.30 cfs @ 3.17 fps)

**Summary for Pond DMH-8: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 5.77" for 25-year event  
 Inflow = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf  
 Outflow = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf  
 Routed to Pond DMH-9 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 283.47' @ 12.10 hrs  
 Flood Elev= 286.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	281.70'	<b>30.0" Round Culvert</b> L= 170.0' Ke= 0.500 Inlet / Outlet Invert= 281.70' / 278.93' S= 0.0163 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=16.77 cfs @ 12.10 hrs HW=283.47' TW=280.60' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 16.77 cfs @ 4.52 fps)

**Summary for Pond DMH-9: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 5.77" for 25-year event  
 Inflow = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf  
 Outflow = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf  
 Routed to Pond DMH-10 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 280.60' @ 12.10 hrs  
 Flood Elev= 284.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	278.83'	<b>30.0" Round Culvert</b> L= 274.0' Ke= 0.500 Inlet / Outlet Invert= 278.83' / 274.38' S= 0.0162 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=16.77 cfs @ 12.10 hrs HW=280.60' TW=276.24' (Dynamic Tailwater)  
 1=Culvert (Inlet Controls 16.77 cfs @ 4.52 fps)

**Summary for Pond IS-1: IS-1**

Inflow Area = 23,802 sf, 26.02% Impervious, Inflow Depth = 1.58" for 25-year event  
 Inflow = 0.83 cfs @ 12.08 hrs, Volume= 3,141 cf  
 Outflow = 0.04 cfs @ 10.74 hrs, Volume= 3,141 cf, Atten= 95%, Lag= 0.0 min  
 Discarded = 0.04 cfs @ 10.74 hrs, Volume= 3,141 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Routed to Link SP1 : STUDY POINT #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 276.30' @ 14.87 hrs Surf.Area= 788 sf Storage= 1,413 cf  
 Flood Elev= 278.00' Surf.Area= 1,559 sf Storage= 2,035 cf

Plug-Flow detention time= 295.6 min calculated for 3,141 cf (100% of inflow)  
 Center-of-Mass det. time= 295.6 min ( 1,053.0 - 757.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	1,272 cf	<b>surface storage (Irregular)</b> Listed below (Recalc)
#2	275.00'	78 cf	<b>media storage (Irregular)</b> Listed below (Recalc) 260 cf Overall x 30.0% Voids
#3A	271.50'	627 cf	<b>20.50"W x 32.10"L x 3.50"H Field A</b> 2,303 cf Overall - 735 cf Embedded = 1,568 cf x 40.0% Voids
#4A	272.00'	735 cf	<b>ADS_StormTech SC-740 +Cap</b> x 16 Inside #3 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12"L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56"L with 0.44' Overlap 16 Chambers in 4 Rows
		2,713 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
277.00	435	96.0	0	0	435
278.00	771	118.0	595	595	825
279.00	588	81.0	677	1,272	1,419
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
275.00	130	53.0	0	0	130
277.00	130	53.0	260	260	236

Device	Routing	Invert	Outlet Devices
#0	Primary	279.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	271.50'	<b>0.04 cfs Exfiltration at all elevations</b> Phase-In= 0.01'
#2	Primary	277.80'	<b>9.0' long x 4.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50

5.00 5.50  
 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88  
 3.07 3.32

Discarded OutFlow Max=0.04 cfs @ 10.74 hrs HW=271.58' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=271.50' TW=0.00' (Dynamic Tailwater)

↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

**Summary for Pond IS-2: IS-2**

GEO-TP-5 indicates silty sand to a depth of 14' below grade with no refusal. The infiltration rate for loamy sand is 2.41 inches per hour (Rawls Rates)

Redox was encountered at 9' below grade or elevation 263.0

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 4.55" for 25-year event  
 Inflow = 13.19 cfs @ 12.09 hrs, Volume= 49,599 cf  
 Outflow = 2.02 cfs @ 12.60 hrs, Volume= 49,599 cf, Atten= 85%, Lag= 30.3 min  
 Discarded = 0.44 cfs @ 9.74 hrs, Volume= 43,329 cf  
 Primary = 1.58 cfs @ 12.60 hrs, Volume= 6,269 cf  
 Routed to Link RR1 : RipRap Apron

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.65' @ 12.60 hrs Surf.Area= 8,347 sf Storage= 21,635 cf  
 Flood Elev= 271.25' Surf.Area= 8,547 sf Storage= 27,413 cf

Plug-Flow detention time= 355.3 min calculated for 49,592 cf (100% of inflow)  
 Center-of-Mass det. time= 355.3 min ( 1,107.3 - 752.0 )

Volume	Invert	Avail.Storage	Storage Description
#1A	265.75'	13,527 cf	<b>52.42'W x 150.10'L x 6.00'H Field A Z=0.3</b> 49,420 cf Overall - 15,602 cf Embedded = 33,818 cf x 40.0% Voids
#2A	266.50'	15,602 cf	<b>ADS_StormTech MC-3500 d +Cap</b> x 140 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 140 Chambers in 7 Rows Cap Storage= 14.9 cf x 2 x 7 rows = 208.6 cf
		29,129 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	265.75'	<b>0.44 cfs Exfiltration at all elevations</b> Phase-In= 0.01'
#2	Primary	267.00'	<b>10.0" Round Culvert</b> L= 29.0' Ke= 0.500 Inlet / Outlet Invert= 267.00' / 265.92' S= 0.0372 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	269.40'	<b>4.0' long x 6.26' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

Discarded OutFlow Max=0.44 cfs @ 9.74 hrs HW=265.85' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.44 cfs)

Primary OutFlow Max=1.58 cfs @ 12.60 hrs HW=269.65' TW=0.00' (Dynamic Tailwater)

↑2=Culvert (Passes 1.58 cfs of 3.92 cfs potential flow)

↑3=Sharp-Crested Rectangular Weir (Weir Controls 1.58 cfs @ 1.62 fps)

**Summary for Pond RR2: Riprap Slope**

Inflow Area = 7,513 sf, 0.00% Impervious, Inflow Depth = 0.67" for 25-year event  
 Inflow = 0.11 cfs @ 12.10 hrs, Volume= 419 cf  
 Outflow = 0.11 cfs @ 12.10 hrs, Volume= 419 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.11 cfs @ 12.10 hrs, Volume= 419 cf  
 Primary = 0.00 cfs @ 24.34 hrs, Volume= 0 cf  
 Routed to Pond IS-1 : IS-1

**1362-25 - Proposed HydroCAD\_rev1**

Prepared by Allen & Major Associates, Inc  
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Type III 24-hr 25-year Rainfall=6.17"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 280.00' @ 0.00 hrs Surf.Area= 111 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 0.0 min ( 886.9 - 886.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	280.00'	328 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 821 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
280.00	111	0	0
281.00	111	111	111
282.00	111	111	222
283.00	103	107	329
284.00	75	89	418
285.00	73	74	492
286.00	70	72	564
287.00	68	69	633
288.00	66	67	700
289.00	62	64	764
290.00	52	57	821

Device	Routing	Invert	Outlet Devices
#1	Discarded	280.00'	<b>0.37 cfs Exfiltration at all elevations</b>
#2	Primary	280.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.00 cfs @ 12.10 hrs HW=280.00' (Free Discharge)  
 ↑**1=Exfiltration** (Passes 0.00 cfs of 0.37 cfs potential flow)

**Primary OutFlow** Max=0.00 cfs @ 24.34 hrs HW=280.00' TW=272.97' (Dynamic Tailwater)  
 ↑**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Summary for Pond RR3: Riprap Slope**

Inflow Area = 5,707 sf, 3.94% Impervious, Inflow Depth = 1.19" for 25-year event  
 Inflow = 0.14 cfs @ 12.10 hrs, Volume= 567 cf  
 Outflow = 0.14 cfs @ 12.10 hrs, Volume= 567 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.14 cfs @ 12.10 hrs, Volume= 567 cf  
 Primary = 0.00 cfs @ 24.34 hrs, Volume= 0 cf  
 Routed to Pond IS-1 : IS-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 280.00' @ 0.00 hrs Surf.Area= 116 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	280.00'	464 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 1,160 cf Overall x 40.0% Voids

**1362-25 - Proposed HydroCAD\_rev1**

Prepared by Allen & Major Associates, Inc  
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Type III 24-hr 25-year Rainfall=6.17"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
280.00	116	0	0
281.00	116	116	116
282.00	116	116	232
283.00	116	116	348
284.00	116	116	464
285.00	116	116	580
286.00	116	116	696
287.00	116	116	812
288.00	116	116	928
289.00	116	116	1,044
290.00	116	116	1,160

Device	Routing	Invert	Outlet Devices
#1	Discarded	280.00'	<b>0.37 cfs Exfiltration at all elevations</b>
#2	Primary	280.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.00 cfs @ 12.10 hrs HW=280.00' (Free Discharge)

↑**1=Exfiltration** (Passes 0.00 cfs of 0.37 cfs potential flow)

**Primary OutFlow** Max=0.00 cfs @ 24.34 hrs HW=280.00' TW=272.97' (Dynamic Tailwater)

↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

**Summary for Pond RR4: Riprap Slope**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 5.77" for 25-year event  
 Inflow = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf  
 Outflow = 16.78 cfs @ 12.10 hrs, Volume= 63,584 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.10 cfs @ 2.45 hrs, Volume= 8,222 cf  
 Primary = 16.68 cfs @ 12.10 hrs, Volume= 55,362 cf  
 Routed to Reach R1 : Routing sheet flow through a subcatchment

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.15' @ 12.10 hrs Surf.Area= 112 sf Storage= 46 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 0.8 min ( 747.5 - 746.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	268.00'	225 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 563 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
268.00	87	0	0
269.00	110	99	99
270.00	126	118	217
271.00	96	111	328
272.00	76	86	414
273.00	63	70	483
274.00	97	80	563

Device	Routing	Invert	Outlet Devices
#1	Discarded	268.00'	<b>0.10 cfs Exfiltration at all elevations</b>
#2	Primary	269.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.10 cfs @ 2.45 hrs HW=268.07' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

**Primary OutFlow** Max=16.67 cfs @ 12.10 hrs HW=269.15' TW=266.18' (Dynamic Tailwater)

↑**2=Broad-Crested Rectangular Weir**(Weir Controls 16.67 cfs @ 1.03 fps)

**Summary for Pond RR5: Riprap Slope**

[93] Warning: Storage range exceeded by 0.99'  
 [90] Warning: Qout>Qin may require smaller dt or Finer Routing  
 [87] Warning: Oscillations may require smaller dt or Finer Routing (severity=150)

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 0.57" for 25-year event  
 Inflow = 1.58 cfs @ 12.60 hrs, Volume= 6,269 cf  
 Outflow = 3.51 cfs @ 12.71 hrs, Volume= 6,258 cf, Atten= 0%, Lag= 6.7 min  
 Discarded = 0.10 cfs @ 12.42 hrs, Volume= 1,304 cf  
 Primary = 3.41 cfs @ 12.71 hrs, Volume= 4,954 cf  
 Routed to Reach R2 : Routing sheet flow through a subcatchment

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 265.99' @ 12.95 hrs Surf.Area= 7 sf Storage= 35 cf

Plug-Flow detention time= 1.5 min calculated for 6,257 cf (100% of inflow)  
 Center-of-Mass det. time= 1.2 min ( 807.1 - 805.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	261.00'	35 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 89 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
261.00	14	0	0
262.00	34	24	24
263.00	26	30	54
264.00	18	22	76
265.00	7	13	89

Device	Routing	Invert	Outlet Devices
#1	Discarded	261.00'	<b>0.10 cfs Exfiltration at all elevations</b>
#2	Primary	261.50'	<b>14.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.10 cfs @ 12.42 hrs HW=261.25' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

**Primary OutFlow** Max=0.00 cfs @ 12.71 hrs HW=265.99' TW=265.99' (Dynamic Tailwater)  
 ↑**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Summary for Link RR1: RipRap Apron**

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 0.57" for 25-year event  
 Inflow = 1.58 cfs @ 12.60 hrs, Volume= 6,269 cf  
 Primary = 1.58 cfs @ 12.60 hrs, Volume= 6,269 cf, Atten= 0%, Lag= 0.0 min  
 Routed to Pond RR5 : Riprap Slope

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

**Summary for Link SP-3: STUDY POINT #3**

Inflow Area = 361,985 sf, 62.10% Impervious, Inflow Depth = 2.49" for 25-year event  
 Inflow = 13.62 cfs @ 12.20 hrs, Volume= 75,161 cf  
 Primary = 13.62 cfs @ 12.20 hrs, Volume= 75,161 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link SP1: STUDY POINT #1**

Inflow Area = 27,226 sf, 22.75% Impervious, Inflow Depth = 0.05" for 25-year event  
Inflow = 0.01 cfs @ 12.33 hrs, Volume= 109 cf  
Primary = 0.01 cfs @ 12.33 hrs, Volume= 109 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link SP2: STUDY POINT #2**

Inflow Area = 1,587 sf, 0.00% Impervious, Inflow Depth = 0.42" for 25-year event  
Inflow = 0.01 cfs @ 12.13 hrs, Volume= 56 cf  
Primary = 0.01 cfs @ 12.13 hrs, Volume= 56 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link WQ-1: Water Quality Unit**

Inflow Area = 45,592 sf, 81.75% Impervious, Inflow Depth = 5.04" for 25-year event  
Inflow = 5.22 cfs @ 12.09 hrs, Volume= 19,139 cf  
Primary = 5.22 cfs @ 12.09 hrs, Volume= 19,139 cf, Atten= 0%, Lag= 0.0 min  
Routed to Pond IS-2 : IS-2

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

**Summary for Link WQ-2: Water Quality Unit**

Inflow Area = 67,273 sf, 61.26% Impervious, Inflow Depth = 3.85" for 25-year event  
Inflow = 5.67 cfs @ 12.09 hrs, Volume= 21,562 cf  
Primary = 5.67 cfs @ 12.09 hrs, Volume= 21,562 cf, Atten= 0%, Lag= 0.0 min  
Routed to Pond IS-2 : IS-2

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

**Summary for Subcatchment A-1: Subcat A-1**

Runoff = 10.46 cfs @ 12.11 hrs, Volume= 40,220 cf, Depth= 8.54"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
56,517	98	Paved parking, HSG A
56,517	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment B-1: Subcat B-1**

Runoff = 5.42 cfs @ 12.08 hrs, Volume= 19,562 cf, Depth= 7.65"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
3,889	39	>75% Grass cover, Good, HSG A
26,806	98	Paved parking, HSG A
30,695		Weighted Average
3,889	39	12.67% Pervious Area
26,806	98	87.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	117	0.0200	1.44		<b>Sheet Flow, Paved parking</b> Smooth surfaces n= 0.011 P2= 3.28"
0.9	163	0.0200	2.87		<b>Shallow Concentrated Flow, Paved Parking Lot</b> Paved Kv= 20.3 fps
2.3	280	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment B-2: Subcat B-2**

Runoff = 8.33 cfs @ 12.11 hrs, Volume= 32,014 cf, Depth= 8.54"  
 Routed to Pond 1P : Existing Off-Site CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
44,985	98	Paved parking, HSG A
44,985	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment P-1A: Subcat P-1A**

Runoff = 0.72 cfs @ 12.09 hrs, Volume= 2,665 cf, Depth= 5.46"  
 Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

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Area (sf)	CN	Description
2,565	39	>75% Grass cover, Good, HSG A
3,294	98	Paved parking, HSG A
5,859		Weighted Average
2,565	39	43.78% Pervious Area
3,294	98	56.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	67	0.0300	1.51		<b>Sheet Flow, A-B</b> Smooth surfaces n= 0.011 P2= 3.28"
0.7	67	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1B: Subcat P-1B**

Runoff = 0.59 cfs @ 12.09 hrs, Volume= 2,160 cf, Depth= 5.49"  
 Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
2,046	39	>75% Grass cover, Good, HSG A
2,675	98	Paved parking, HSG A
4,722		Weighted Average
2,046	39	43.34% Pervious Area
2,675	98	56.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	34	0.0300	1.32		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
0.4	34	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1C: Subcat P-1C**

Runoff = 0.07 cfs @ 12.11 hrs, Volume= 357 cf, Depth= 1.25"  
 Routed to Link SP1 : STUDY POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
2,460	39	>75% Grass cover, Good, HSG A
964	30	Woods, Good, HSG A
3,424		Weighted Average
3,424	36	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-1D: Subcat P-1D**

Runoff = 0.24 cfs @ 12.10 hrs, Volume= 1,014 cf, Depth= 1.62"  
 Routed to Pond RR2 : Riprap Slope

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

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Area (sf)	CN	Description
1,126	39	>75% Grass cover, Good, HSG A
1,840	62	>Stone Rip Rap, Good, HSG A
4,547	30	Woods, Good, HSG A
7,513		Weighted Average
7,513	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.1673	0.16		<b>Sheet Flow, A-B</b> Woods: Light underbrush n= 0.400 P2= 3.28"
0.1	18	0.1673	2.05		<b>Shallow Concentrated Flow, B-C</b> Woodland Kv= 5.0 fps
5.3	68	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-1E: Subcat P-1E**

Runoff = 0.33 cfs @ 12.10 hrs, Volume= 1,186 cf, Depth= 2.49"  
 Routed to Pond RR3 : Riprap Slope

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
2,868	39	>75% Grass cover, Good, HSG A
1,801	62	>Stone Rip Rap, Good, HSG A
225	98	Paved parking, HSG A
813	30	Woods, Good, HSG A
5,707		Weighted Average
5,482	45	96.06% Pervious Area
225	98	3.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	21	0.1200	0.12		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.28"
0.3	41	0.0992	2.20		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
3.3	62	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-2: Subcat P-2**

Runoff = 0.03 cfs @ 12.11 hrs, Volume= 168 cf, Depth= 1.27"  
 Routed to Link SP2 : STUDY POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
746	39	>75% Grass cover, Good, HSG A
107	62	>Stone Rip Rap, Good, HSG A
734	30	Woods, Good, HSG A
1,587		Weighted Average
1,587	36	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-3A: Subcat P-3A**

Runoff = 1.80 cfs @ 12.09 hrs, Volume= 6,694 cf, Depth= 5.30"  
 Routed to Pond CB-6 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
5,602	39	>75% Grass cover, Good, HSG A
250	62	>Stone Rip Rap, Good, HSG A
8,221	98	Paved parking, HSG A
1,098	30	Woods, Good, HSG A
15,170		Weighted Average
6,950	38	45.81% Pervious Area
8,221	98	54.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	47	0.1200	0.14		<b>Sheet Flow, A-B</b>
					Woods: Light underbrush n= 0.400 P2= 3.28"
0.5	106	0.0300	3.52		<b>Shallow Concentrated Flow, B-C</b>
					Paved Kv= 20.3 fps
6.2	153	Total			

**Summary for Subcatchment P-3B: Subcat P-3B**

Runoff = 1.51 cfs @ 12.11 hrs, Volume= 6,018 cf, Depth= 4.08"  
 Routed to Pond CB-5 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
9,329	39	>75% Grass cover, Good, HSG A
6,696	98	Paved parking, HSG A
1,685	30	Woods, Good, HSG A
17,711		Weighted Average
11,014	38	62.19% Pervious Area
6,696	98	37.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	47	0.1200	0.14		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.28"
1.8	254	0.0140	2.40		<b>Shallow Concentrated Flow,</b>
					Paved Kv= 20.3 fps
7.5	301	Total			

**Summary for Subcatchment P-3C: Subcat P-3C**

Runoff = 3.74 cfs @ 12.08 hrs, Volume= 13,567 cf, Depth= 6.41"  
 Routed to Pond CB-4 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

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Area (sf)	CN	Description
5,279	39	>75% Grass cover, Good, HSG A
1,565	61	>75% Grass cover, Good, HSG B
12	68	>Stone Rip Rap, Good, HSG B
2,364	98	Paved parking, HSG A
14,929	98	Paved parking, HSG B
1,229	30	Woods, Good, HSG A
14	55	Woods, Good, HSG B
25,392		Weighted Average
8,099	42	31.90% Pervious Area
17,293	98	68.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	158	0.0200	1.53		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
1.7	158	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-3D: Subcat P-3D**

Runoff = 1.96 cfs @ 12.09 hrs, Volume= 7,163 cf, Depth= 6.21"  
 Routed to Pond CB-3 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
3,871	39	>75% Grass cover, Good, HSG A
1	62	>Stone Rip Rap, Good, HSG A
9,341	98	Paved parking, HSG A
619	30	Woods, Good, HSG A
13,831		Weighted Average
4,491	38	32.47% Pervious Area
9,341	98	67.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0360	1.53		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.28"
0.4	85	0.0360	3.85		<b>Shallow Concentrated Flow, B-C</b> Paved Kv= 20.3 fps
0.9	135	Total, Increased to minimum Tc = 6.0 min			

**Summary for Subcatchment P-3E: Subcat P-3E**

Runoff = 1.04 cfs @ 12.08 hrs, Volume= 3,764 cf, Depth= 7.38"  
 Routed to Pond CB-2 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
925	39	>75% Grass cover, Good, HSG A
125	61	>75% Grass cover, Good, HSG B
4,721	98	Paved parking, HSG A
346	98	Paved parking, HSG B
6,117		Weighted Average
1,050	42	17.17% Pervious Area
5,067	98	82.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry, TR-55 MIN</b>

**Summary for Subcatchment P-3F: Subcat P-3F**

Runoff = 3.04 cfs @ 12.08 hrs, Volume= 10,804 cf, Depth= 7.79"  
 Routed to Pond CB-1 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
2,781	61	>75% Grass cover, Good, HSG B
455	98	Paved parking, HSG A
13,407	98	Paved parking, HSG B
16,643		Weighted Average
2,781	61	16.71% Pervious Area
13,862	98	83.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, TR-55 MIN

**Summary for Subcatchment P-3G: Subcat P-3G (roof)**

Runoff = 1.67 cfs @ 12.11 hrs, Volume= 6,405 cf, Depth= 8.54"  
 Routed to Pond DMH-3 : DMH

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry, Internal roof drains

**Summary for Subcatchment P-3H: Subcat P-3H (roof)**

Runoff = 1.67 cfs @ 12.11 hrs, Volume= 6,405 cf, Depth= 8.54"  
 Routed to Pond IS-2 : IS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
8,032	98	Roofs, HSG A
968	98	Roofs, HSG B
9,000		Weighted Average
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					Direct Entry, Internal roof drains

**Summary for Subcatchment P-3I: Subcat P-3I (roof)**

Runoff = 1.67 cfs @ 12.11 hrs, Volume= 6,405 cf, Depth= 8.54"  
 Routed to Pond CB-6 : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment P-3J: Subcat P-3J (roof)**

Runoff = 1.67 cfs @ 12.11 hrs, Volume= 6,405 cf, Depth= 8.54"  
 Routed to Pond IS-2 : IS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
9,000	98	Roofs, HSG A
9,000	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					<b>Direct Entry, Internal roof drains</b>

**Summary for Subcatchment P-3K: Subcat P-3K**

Runoff = 5.78 cfs @ 12.16 hrs, Volume= 22,013 cf, Depth= 3.43"  
 Routed to Link SP-3 : STUDY POINT #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
2,624	39	>75% Grass cover, Good, HSG A
8,980	61	>75% Grass cover, Good, HSG B
801	62	>Stone Rip Rap, Good, HSG A
3,956	68	>Stone Rip Rap, Good, HSG B
250	30	Woods, Good, HSG A
60,357	55	Woods, Good, HSG B
76,968		Weighted Average
76,968	56	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.2500	0.11		<b>Sheet Flow, A-B</b> Woods: Dense underbrush n= 0.800 P2= 3.28"
3.6	359	0.1100	1.66		<b>Shallow Concentrated Flow, B-C</b> Woodland Kv= 5.0 fps
11.3	409	Total			

**Summary for Subcatchment P-3L: Subcat P-3L**

Runoff = 2.41 cfs @ 12.09 hrs, Volume= 7,516 cf, Depth= 4.11"  
 Routed to Reach R2 : Routing sheet flow through a subcatchment

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-year Rainfall=8.78"

Area (sf)	CN	Description
16,823	61	>75% Grass cover, Good, HSG B
3,167	68	>Stone Rip Rap, Good, HSG B
1	98	Paved parking, HSG B
1,964	55	Woods, Good, HSG B
21,955		Weighted Average
21,954	61	100.00% Pervious Area
1	98	0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	81	0.4000	0.25		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.28"
5.4	81	Total, Increased to minimum Tc = 6.0 min			

### Summary for Reach R1: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc and CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 7.57" for 100-year event  
 Inflow = 23.94 cfs @ 12.10 hrs, Volume= 83,366 cf  
 Outflow = 16.14 cfs @ 12.20 hrs, Volume= 83,366 cf, Atten= 33%, Lag= 5.9 min  
 Routed to Link SP-3 : STUDY POINT #3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Max. Velocity= 0.32 fps, Min. Travel Time= 14.4 min  
 Avg. Velocity = 0.07 fps, Avg. Travel Time= 68.8 min

Peak Storage= 13,976 cf @ 12.20 hrs  
 Average Depth at Peak Storage= 0.37' , Surface Width= 173.11'  
 Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 113.05 cfs

100.00' x 1.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush  
 Side Slope Z-value= 100.0 ' / ' Top Width= 300.00'  
 Length= 280.0' Slope= 0.1590 ' / '  
 Inlet Invert= 265.92', Outlet Invert= 221.40'



### Summary for Reach R2: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc and CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

[80] Warning: Exceeded Pond RR5 by 4.97' @ 12.09 hrs (439.47 cfs 105,846,170 cf)

Inflow Area = 152,820 sf, 63.13% Impervious, Inflow Depth = 2.41" for 100-year event  
 Inflow = 6.77 cfs @ 12.14 hrs, Volume= 30,747 cf  
 Outflow = 5.06 cfs @ 12.73 hrs, Volume= 30,747 cf, Atten= 25%, Lag= 35.4 min  
 Routed to Link SP-3 : STUDY POINT #3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Max. Velocity= 0.22 fps, Min. Travel Time= 21.0 min  
 Avg. Velocity = 0.05 fps, Avg. Travel Time= 94.8 min

Peak Storage= 6,368 cf @ 12.73 hrs  
 Average Depth at Peak Storage= 0.19' , Surface Width= 138.19'  
 Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 113.05 cfs

100.00' x 1.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush  
 Side Slope Z-value= 100.0 '/' Top Width= 300.00'  
 Length= 280.0' Slope= 0.1590 '/'  
 Inlet Invert= 265.92', Outlet Invert= 221.40'



**Summary for Pond 1P: Existing Off-Site CB**

[58] Hint: Peaked 61.85' above defined flood level

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 8.33" for 100-year event  
 Inflow = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf  
 Outflow = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf  
 Routed to Pond DMH-8 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 351.71' @ 12.10 hrs  
 Flood Elev= 289.86'

Device	Routing	Invert	Outlet Devices
#1	Primary	283.08'	<b>12.0" Round Culvert</b> L= 118.0' Ke= 0.500 Inlet / Outlet Invert= 283.08' / 278.95' S= 0.0350 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

**Primary OutFlow** Max=24.01 cfs @ 12.10 hrs HW=351.56' TW=283.97' (Dynamic Tailwater)  
 ↑**1=Culvert** (Outlet Controls 24.01 cfs @ 30.57 fps)

**Summary for Pond CB-1: CB**

Inflow Area = 16,643 sf, 83.29% Impervious, Inflow Depth = 7.79" for 100-year event  
 Inflow = 3.04 cfs @ 12.08 hrs, Volume= 10,804 cf  
 Outflow = 3.04 cfs @ 12.08 hrs, Volume= 10,804 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 3.04 cfs @ 12.08 hrs, Volume= 10,804 cf  
 Routed to Link WQ-1 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 270.37' @ 12.08 hrs  
 Flood Elev= 272.52'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.22'	<b>12.0" Round Culvert</b> L= 45.0' Ke= 0.500 Inlet / Outlet Invert= 269.22' / 268.77' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.04 cfs @ 12.08 hrs HW=270.37' TW=0.00' (Dynamic Tailwater)

↑**1=Culvert** (Inlet Controls 3.04 cfs @ 3.87 fps)

### Summary for Pond CB-2: CB

Inflow Area = 6,117 sf, 82.83% Impervious, Inflow Depth = 7.38" for 100-year event  
 Inflow = 1.04 cfs @ 12.08 hrs, Volume= 3,764 cf  
 Outflow = 1.04 cfs @ 12.08 hrs, Volume= 3,764 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.04 cfs @ 12.08 hrs, Volume= 3,764 cf  
 Routed to Pond DMH-3 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 271.35' @ 12.09 hrs  
 Flood Elev= 273.92'

Device	Routing	Invert	Outlet Devices
#1	Primary	270.46'	<b>12.0" Round Culvert</b> L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 270.46' / 270.23' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.04 cfs @ 12.08 hrs HW=271.34' TW=271.23' (Dynamic Tailwater)

↑**1=Culvert** (Outlet Controls 1.04 cfs @ 1.88 fps)

### Summary for Pond CB-3: CB

Inflow Area = 13,831 sf, 67.53% Impervious, Inflow Depth = 6.21" for 100-year event  
 Inflow = 1.96 cfs @ 12.09 hrs, Volume= 7,163 cf  
 Outflow = 1.96 cfs @ 12.09 hrs, Volume= 7,163 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.96 cfs @ 12.09 hrs, Volume= 7,163 cf  
 Routed to Pond DMH-3 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 272.25' @ 12.09 hrs  
 Flood Elev= 274.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	271.40'	<b>12.0" Round Culvert</b> L= 126.0' Ke= 0.500 Inlet / Outlet Invert= 271.40' / 270.23' S= 0.0093 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.95 cfs @ 12.09 hrs HW=272.25' TW=271.23' (Dynamic Tailwater)

↑**1=Culvert** (Outlet Controls 1.95 cfs @ 3.70 fps)

### Summary for Pond CB-4: CB

Inflow Area = 25,392 sf, 68.10% Impervious, Inflow Depth = 6.41" for 100-year event  
 Inflow = 3.74 cfs @ 12.08 hrs, Volume= 13,567 cf  
 Outflow = 3.74 cfs @ 12.08 hrs, Volume= 13,567 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 3.74 cfs @ 12.08 hrs, Volume= 13,567 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 270.82' @ 12.08 hrs  
 Flood Elev= 272.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.24'	<b>12.0" Round Culvert</b> L= 44.0' Ke= 0.500 Inlet / Outlet Invert= 269.24' / 268.80' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.74 cfs @ 12.08 hrs HW=270.81' TW=0.00' (Dynamic Tailwater)

↑**1=Culvert** (Barrel Controls 3.74 cfs @ 4.76 fps)

**Summary for Pond CB-5: CB**

Inflow Area = 17,711 sf, 37.81% Impervious, Inflow Depth = 4.08" for 100-year event  
 Inflow = 1.51 cfs @ 12.11 hrs, Volume= 6,018 cf  
 Outflow = 1.51 cfs @ 12.11 hrs, Volume= 6,018 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.51 cfs @ 12.11 hrs, Volume= 6,018 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 272.02' @ 12.11 hrs  
 Flood Elev= 275.46'

Device	Routing	Invert	Outlet Devices
#1	Primary	271.36'	<b>12.0" Round Culvert</b> L= 65.0' Ke= 0.500 Inlet / Outlet Invert= 271.36' / 269.55' S= 0.0278 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.51 cfs @ 12.11 hrs HW=272.02' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 1.51 cfs @ 2.76 fps)

**Summary for Pond CB-6: CB**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 6.50" for 100-year event  
 Inflow = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf  
 Outflow = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf  
 Routed to Pond DMH-7 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 276.63' @ 12.10 hrs  
 Flood Elev= 278.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	274.74'	<b>12.0" Round Culvert</b> L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 274.74' / 273.79' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.44 cfs @ 12.10 hrs HW=276.62' TW=275.28' (Dynamic Tailwater)  
 ↑**1=Culvert** (Outlet Controls 3.44 cfs @ 4.38 fps)

**Summary for Pond DMH-10: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 8.33" for 100-year event  
 Inflow = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf  
 Outflow = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf  
 Routed to Pond RR4 : Riprap Slope

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 276.79' @ 12.10 hrs  
 Flood Elev= 279.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	274.28'	<b>30.0" Round Culvert</b> L= 9.0' Ke= 0.500 Inlet / Outlet Invert= 274.28' / 274.00' S= 0.0311 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=24.01 cfs @ 12.10 hrs HW=276.79' TW=269.19' (Dynamic Tailwater)  
 ↑**1=Culvert** (Barrel Controls 24.01 cfs @ 6.07 fps)

**Summary for Pond DMH-2: DMH**

Inflow Area = 28,949 sf, 80.86% Impervious, Inflow Depth = 7.18" for 100-year event  
 Inflow = 4.63 cfs @ 12.09 hrs, Volume= 17,332 cf  
 Outflow = 4.63 cfs @ 12.09 hrs, Volume= 17,332 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 4.63 cfs @ 12.09 hrs, Volume= 17,332 cf  
 Routed to Link WQ-1 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.70' @ 12.09 hrs  
 Flood Elev= 274.78'

Device	Routing	Invert	Outlet Devices
#1	Primary	268.42'	<b>15.0" Round Culvert</b> L= 64.0' Ke= 0.500 Inlet / Outlet Invert= 268.42' / 267.87' S= 0.0086 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=4.62 cfs @ 12.09 hrs HW=269.69' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Barrel Controls 4.62 cfs @ 4.59 fps)

**Summary for Pond DMH-3: DMH**

Inflow Area = 28,949 sf, 80.86% Impervious, Inflow Depth = 7.18" for 100-year event  
 Inflow = 4.63 cfs @ 12.09 hrs, Volume= 17,332 cf  
 Outflow = 4.63 cfs @ 12.09 hrs, Volume= 17,332 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 4.63 cfs @ 12.09 hrs, Volume= 17,332 cf  
 Routed to Pond DMH-2 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 271.23' @ 12.09 hrs  
 Flood Elev= 274.41'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.98'	<b>15.0" Round Culvert</b> L= 168.0' Ke= 0.500 Inlet / Outlet Invert= 269.98' / 268.52' S= 0.0087 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=4.62 cfs @ 12.09 hrs HW=271.23' TW=269.69' (Dynamic Tailwater)  
 ↑**1=Culvert** (Outlet Controls 4.62 cfs @ 4.67 fps)

**Summary for Pond DMH-5: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 6.50" for 100-year event  
 Inflow = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf  
 Outflow = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf  
 Routed to Link WQ-2 : Water Quality Unit

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 268.67' @ 12.10 hrs  
 Flood Elev= 274.16'

Device	Routing	Invert	Outlet Devices
#1	Primary	267.34'	<b>12.0" Round Culvert</b> L= 23.0' Ke= 0.500 Inlet / Outlet Invert= 267.34' / 266.88' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.44 cfs @ 12.10 hrs HW=268.67' TW=0.00' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 3.44 cfs @ 4.38 fps)

**Summary for Pond DMH-6: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 6.50" for 100-year event  
 Inflow = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf  
 Outflow = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf  
 Routed to Pond DMH-5 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 273.50' @ 12.10 hrs  
 Flood Elev= 277.33'

Device	Routing	Invert	Outlet Devices
#1	Primary	272.17'	<b>12.0" Round Culvert</b> L= 147.0' Ke= 0.500 Inlet / Outlet Invert= 272.17' / 269.87' S= 0.0156 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.44 cfs @ 12.10 hrs HW=273.50' TW=268.67' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 3.44 cfs @ 4.38 fps)

**Summary for Pond DMH-7: DMH**

Inflow Area = 24,170 sf, 71.25% Impervious, Inflow Depth = 6.50" for 100-year event  
 Inflow = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf  
 Outflow = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 3.45 cfs @ 12.10 hrs, Volume= 13,099 cf  
 Routed to Pond DMH-6 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 275.29' @ 12.10 hrs  
 Flood Elev= 279.73'

Device	Routing	Invert	Outlet Devices
#1	Primary	273.70'	<b>12.0" Round Culvert</b> L= 143.0' Ke= 0.500 Inlet / Outlet Invert= 273.70' / 272.27' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.44 cfs @ 12.10 hrs HW=275.28' TW=273.50' (Dynamic Tailwater)  
 ↑**1=Culvert** (Outlet Controls 3.44 cfs @ 4.38 fps)

**Summary for Pond DMH-8: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 8.33" for 100-year event  
 Inflow = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf  
 Outflow = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf  
 Routed to Pond DMH-9 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 283.97' @ 12.10 hrs  
 Flood Elev= 286.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	281.70'	<b>30.0" Round Culvert</b> L= 170.0' Ke= 0.500 Inlet / Outlet Invert= 281.70' / 278.93' S= 0.0163 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=24.01 cfs @ 12.10 hrs HW=283.97' TW=281.10' (Dynamic Tailwater)  
 ↑**1=Culvert** (Inlet Controls 24.01 cfs @ 5.13 fps)

**Summary for Pond DMH-9: DMH**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 8.33" for 100-year event  
 Inflow = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf  
 Outflow = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf  
 Routed to Pond DMH-10 : DMH

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 281.10' @ 12.10 hrs  
 Flood Elev= 284.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	278.83'	<b>30.0" Round Culvert</b> L= 274.0' Ke= 0.500 Inlet / Outlet Invert= 278.83' / 274.38' S= 0.0162 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf

**Primary OutFlow** Max=24.01 cfs @ 12.10 hrs HW=281.10' TW=276.79' (Dynamic Tailwater)  
 1=Culvert (Inlet Controls 24.01 cfs @ 5.13 fps)

**Summary for Pond IS-1: IS-1**

Inflow Area = 23,802 sf, 26.02% Impervious, Inflow Depth = 2.43" for 100-year event  
 Inflow = 1.31 cfs @ 12.09 hrs, Volume= 4,825 cf  
 Outflow = 0.36 cfs @ 12.45 hrs, Volume= 4,825 cf, Atten= 73%, Lag= 22.0 min  
 Discarded = 0.04 cfs @ 9.59 hrs, Volume= 4,085 cf  
 Primary = 0.32 cfs @ 12.45 hrs, Volume= 740 cf  
 Routed to Link SP1 : STUDY POINT #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 277.86' @ 12.45 hrs Surf.Area= 1,506 sf Storage= 1,931 cf  
 Flood Elev= 278.00' Surf.Area= 1,559 sf Storage= 2,035 cf

Plug-Flow detention time= 354.1 min calculated for 4,824 cf (100% of inflow)  
 Center-of-Mass det. time= 354.1 min ( 1,113.5 - 759.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	277.00'	1,272 cf	<b>surface storage (Irregular)</b> Listed below (Recalc)
#2	275.00'	78 cf	<b>media storage (Irregular)</b> Listed below (Recalc) 260 cf Overall x 30.0% Voids
#3A	271.50'	627 cf	<b>20.50"W x 32.10"L x 3.50"H Field A</b> 2,303 cf Overall - 735 cf Embedded = 1,568 cf x 40.0% Voids
#4A	272.00'	735 cf	<b>ADS_StormTech SC-740 +Cap</b> x 16 Inside #3 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12"L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56"L with 0.44' Overlap 16 Chambers in 4 Rows
		2,713 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
277.00	435	96.0	0	0	435
278.00	771	118.0	595	595	825
279.00	588	81.0	677	1,272	1,419
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
275.00	130	53.0	0	0	130
277.00	130	53.0	260	260	236

Device	Routing	Invert	Outlet Devices
#0	Primary	279.00'	<b>Automatic Storage Overflow</b> (Discharged without head)
#1	Discarded	271.50'	<b>0.04 cfs Exfiltration at all elevations</b> Phase-In= 0.01'
#2	Primary	277.80'	<b>9.0' long x 4.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50

5.00 5.50  
 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88  
 3.07 3.32

**Discarded OutFlow** Max=0.04 cfs @ 9.59 hrs HW=271.58' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

**Primary OutFlow** Max=0.32 cfs @ 12.45 hrs HW=277.86' TW=0.00' (Dynamic Tailwater)

↑**2=Broad-Crested Rectangular Weir**(Weir Controls 0.32 cfs @ 0.58 fps)

**Summary for Pond IS-2: IS-2**

GEO-TP-5 indicates silty sand to a depth of 14' below grade with no refusal. The infiltration rate for loamy sand is 2.41 inches per hour (Rawls Rates)

Redox was encountered at 9' below grade or elevation 263.0

[58] Hint: Peaked 0.16' above defined flood level

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 6.75" for 100-year event  
 Inflow = 19.59 cfs @ 12.09 hrs, Volume= 73,629 cf  
 Outflow = 5.69 cfs @ 12.44 hrs, Volume= 73,629 cf, Atten= 71%, Lag= 21.0 min  
 Discarded = 0.44 cfs @ 8.66 hrs, Volume= 48,438 cf  
 Primary = 5.25 cfs @ 12.44 hrs, Volume= 25,191 cf  
 Routed to Link RR1 : RipRap Apron

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 271.41' @ 12.44 hrs Surf.Area= 8,567 sf Storage= 27,968 cf  
 Flood Elev= 271.25' Surf.Area= 8,547 sf Storage= 27,413 cf

Plug-Flow detention time= 282.7 min calculated for 73,618 cf (100% of inflow)  
 Center-of-Mass det. time= 282.7 min ( 1,033.3 - 750.6 )

Volume	Invert	Avail.Storage	Storage Description
#1A	265.75'	13,527 cf	<b>52.42'W x 150.10'L x 6.00'H Field A Z=0.3</b> 49,420 cf Overall - 15,602 cf Embedded = 33,818 cf x 40.0% Voids
#2A	266.50'	15,602 cf	<b>ADS_StormTech MC-3500 d +Cap</b> x 140 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 140 Chambers in 7 Rows Cap Storage= 14.9 cf x 2 x 7 rows = 208.6 cf
		29,129 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	265.75'	<b>0.44 cfs Exfiltration at all elevations</b> Phase-In= 0.01'
#2	Primary	267.00'	<b>10.0" Round Culvert</b> L= 29.0' Ke= 0.500 Inlet / Outlet Invert= 267.00' / 265.92' S= 0.0372 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	269.40'	<b>4.0' long x 6.26' rise Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Discarded OutFlow** Max=0.44 cfs @ 8.66 hrs HW=265.85' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.44 cfs)

**Primary OutFlow** Max=5.25 cfs @ 12.44 hrs HW=271.41' TW=0.00' (Dynamic Tailwater)

↑**2=Culvert** (Inlet Controls 5.25 cfs @ 9.62 fps)

↑**3=Sharp-Crested Rectangular Weir**(Passes 5.25 cfs of 33.57 cfs potential flow)

**Summary for Pond RR2: Riprap Slope**

**1362-25 - Proposed HydroCAD\_rev1**

Prepared by Allen & Major Associates, Inc  
 HydroCAD® 10.20-5a s/n 02881 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 100-year Rainfall=8.78"

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Inflow Area = 7,513 sf, 0.00% Impervious, Inflow Depth = 1.62" for 100-year event  
 Inflow = 0.24 cfs @ 12.10 hrs, Volume= 1,014 cf  
 Outflow = 0.24 cfs @ 12.10 hrs, Volume= 1,014 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.24 cfs @ 12.10 hrs, Volume= 1,014 cf  
 Primary = 0.00 cfs @ 12.10 hrs, Volume= 0 cf  
 Routed to Pond IS-1 : IS-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 280.00' @ 12.10 hrs Surf.Area= 111 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 0.0 min ( 875.2 - 875.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	280.00'	328 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 821 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
280.00	111	0	0
281.00	111	111	111
282.00	111	111	222
283.00	103	107	329
284.00	75	89	418
285.00	73	74	492
286.00	70	72	564
287.00	68	69	633
288.00	66	67	700
289.00	62	64	764
290.00	52	57	821

Device	Routing	Invert	Outlet Devices
#1	Discarded	280.00'	<b>0.37 cfs Exfiltration at all elevations</b>
#2	Primary	280.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.37 cfs @ 12.10 hrs HW=280.00' (Free Discharge)  
 ↳1=Exfiltration (Exfiltration Controls 0.37 cfs)

**Primary OutFlow** Max=0.00 cfs @ 12.10 hrs HW=280.00' TW=274.33' (Dynamic Tailwater)  
 ↳2=Broad-Crested Rectangular Weir (Weir Controls 0.00 cfs)

**Summary for Pond RR3: Riprap Slope**

Inflow Area = 5,707 sf, 3.94% Impervious, Inflow Depth = 2.49" for 100-year event  
 Inflow = 0.33 cfs @ 12.10 hrs, Volume= 1,186 cf  
 Outflow = 0.33 cfs @ 12.10 hrs, Volume= 1,186 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.33 cfs @ 12.10 hrs, Volume= 1,186 cf  
 Primary = 0.00 cfs @ 12.10 hrs, Volume= 0 cf  
 Routed to Pond IS-1 : IS-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 280.00' @ 12.10 hrs Surf.Area= 116 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 0.0 min ( 847.9 - 847.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	280.00'	464 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 1,160 cf Overall x 40.0% Voids

**1362-25 - Proposed HydroCAD\_rev1**

Prepared by Allen & Major Associates, Inc  
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Type III 24-hr 100-year Rainfall=8.78"

Printed 5/21/2024

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
280.00	116	0	0
281.00	116	116	116
282.00	116	116	232
283.00	116	116	348
284.00	116	116	464
285.00	116	116	580
286.00	116	116	696
287.00	116	116	812
288.00	116	116	928
289.00	116	116	1,044
290.00	116	116	1,160

Device	Routing	Invert	Outlet Devices
#1	Discarded	280.00'	<b>0.37 cfs Exfiltration at all elevations</b>
#2	Primary	280.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.37 cfs @ 12.10 hrs HW=280.00' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.37 cfs)

**Primary OutFlow** Max=0.00 cfs @ 12.10 hrs HW=280.00' TW=274.30' (Dynamic Tailwater)

↑**2=Broad-Crested Rectangular Weir**(Weir Controls 0.00 cfs @ 0.02 fps)

**Summary for Pond RR4: Riprap Slope**

Inflow Area = 132,196 sf, 97.06% Impervious, Inflow Depth = 8.33" for 100-year event  
 Inflow = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf  
 Outflow = 24.04 cfs @ 12.10 hrs, Volume= 91,796 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.10 cfs @ 1.33 hrs, Volume= 8,430 cf  
 Primary = 23.94 cfs @ 12.10 hrs, Volume= 83,366 cf  
 Routed to Reach R1 : Routing sheet flow through a subcatchment

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 269.19' @ 12.10 hrs Surf.Area= 113 sf Storage= 48 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 0.6 min ( 743.0 - 742.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	268.00'	225 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 563 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
268.00	87	0	0
269.00	110	99	99
270.00	126	118	217
271.00	96	111	328
272.00	76	86	414
273.00	63	70	483
274.00	97	80	563

Device	Routing	Invert	Outlet Devices
#1	Discarded	268.00'	<b>0.10 cfs Exfiltration at all elevations</b>
#2	Primary	269.00'	<b>111.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.10 cfs @ 1.33 hrs HW=268.07' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

**Primary OutFlow** Max=23.91 cfs @ 12.10 hrs HW=269.19' TW=266.24' (Dynamic Tailwater)

↑**2=Broad-Crested Rectangular Weir**(Weir Controls 23.91 cfs @ 1.16 fps)

### Summary for Pond RR5: Riprap Slope

[93] Warning: Storage range exceeded by 1.11'

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=228)

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 2.31" for 100-year event  
 Inflow = 5.25 cfs @ 12.44 hrs, Volume= 25,191 cf  
 Outflow = 5.78 cfs @ 12.44 hrs, Volume= 25,178 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.10 cfs @ 12.10 hrs, Volume= 1,947 cf  
 Primary = 5.68 cfs @ 12.44 hrs, Volume= 23,231 cf  
 Routed to Reach R2 : Routing sheet flow through a subcatchment

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 266.11' @ 12.74 hrs Surf.Area= 7 sf Storage= 35 cf

Plug-Flow detention time= 0.5 min calculated for 25,174 cf (100% of inflow)  
 Center-of-Mass det. time= 0.4 min ( 789.6 - 789.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	261.00'	35 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 89 cf Overall x 40.0% Voids
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
261.00	14	0	0
262.00	34	24	24
263.00	26	30	54
264.00	18	22	76
265.00	7	13	89

Device	Routing	Invert	Outlet Devices
#1	Discarded	261.00'	<b>0.10 cfs Exfiltration at all elevations</b>
#2	Primary	261.50'	<b>14.0' long x 1.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

**Discarded OutFlow** Max=0.10 cfs @ 12.10 hrs HW=262.25' (Free Discharge)

↳ **1=Exfiltration** (Exfiltration Controls 0.10 cfs)

**Primary OutFlow** Max=5.68 cfs @ 12.44 hrs HW=266.09' TW=266.09' (Dynamic Tailwater)

↳ **2=Broad-Crested Rectangular Weir**(Weir Controls 5.68 cfs @ 0.09 fps)

### Summary for Link RR1: RipRap Apron

Inflow Area = 130,865 sf, 73.72% Impervious, Inflow Depth = 2.31" for 100-year event  
 Inflow = 5.25 cfs @ 12.44 hrs, Volume= 25,191 cf  
 Primary = 5.25 cfs @ 12.44 hrs, Volume= 25,191 cf, Atten= 0%, Lag= 0.0 min  
 Routed to Pond RR5 : Riprap Slope

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

### Summary for Link SP-3: STUDY POINT #3

Inflow Area = 361,985 sf, 62.10% Impervious, Inflow Depth = 4.51" for 100-year event  
 Inflow = 23.46 cfs @ 12.20 hrs, Volume= 136,126 cf  
 Primary = 23.46 cfs @ 12.20 hrs, Volume= 136,126 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link SP1: STUDY POINT #1**

Inflow Area = 27,226 sf, 22.75% Impervious, Inflow Depth = 0.48" for 100-year event  
Inflow = 0.35 cfs @ 12.45 hrs, Volume= 1,097 cf  
Primary = 0.35 cfs @ 12.45 hrs, Volume= 1,097 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link SP2: STUDY POINT #2**

Inflow Area = 1,587 sf, 0.00% Impervious, Inflow Depth = 1.27" for 100-year event  
Inflow = 0.03 cfs @ 12.11 hrs, Volume= 168 cf  
Primary = 0.03 cfs @ 12.11 hrs, Volume= 168 cf, Atten= 0%, Lag= 0.0 min

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

**Summary for Link WQ-1: Water Quality Unit**

Inflow Area = 45,592 sf, 81.75% Impervious, Inflow Depth = 7.41" for 100-year event  
Inflow = 7.66 cfs @ 12.09 hrs, Volume= 28,135 cf  
Primary = 7.66 cfs @ 12.09 hrs, Volume= 28,135 cf, Atten= 0%, Lag= 0.0 min  
Routed to Pond IS-2 : IS-2

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

**Summary for Link WQ-2: Water Quality Unit**

Inflow Area = 67,273 sf, 61.26% Impervious, Inflow Depth = 5.83" for 100-year event  
Inflow = 8.65 cfs @ 12.09 hrs, Volume= 32,683 cf  
Primary = 8.65 cfs @ 12.09 hrs, Volume= 32,683 cf, Atten= 0%, Lag= 0.0 min  
Routed to Pond IS-2 : IS-2

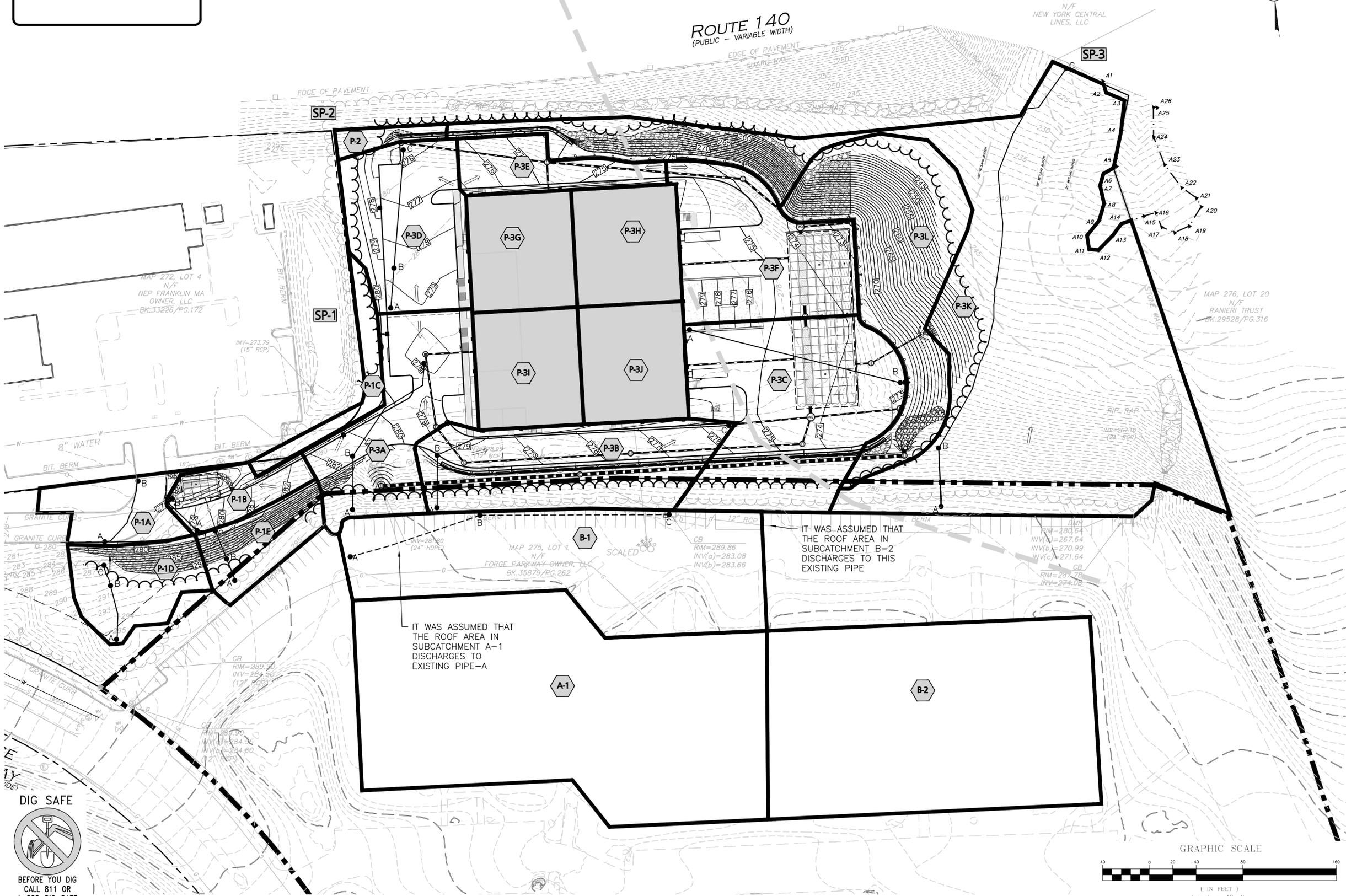
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



## Proposed Watershed Plan

**LEGEND**

- SUBCATCHMENT BOUNDARY
- SUBCATCHMENT LABEL
- SCS SOILS BOUNDARY
- Tc FLOW PATH
- FLOW DIRECTION



REV	DATE	DESCRIPTION
4	05-21-24	MISC. UPDATES PER TOWN COMMENTS
3	04-18-24	MISC. UPDATES PER TOWN COMMENTS
2	04-01-24	MISC. UPDATES PER TOWN COMMENTS
1	02-27-24	MISC. UPDATES PER TOWN COMMENTS

APPLICANT/OWNER:  
 DONEGAL, LLC  
 PO BOX 4430  
 MANCHESTER, NH 03108

PROJECT:  
**PROPOSED INDUSTRIAL BUILDING**  
 6 FORGE PARKWAY  
 FRANKLIN, MA  
 PARCEL ID: 272-005-000-000

PROJECT NO. 1362-25 DATE: 01-04-24

SCALE: 1" = 40' DWG.: C1362-25\_WatershedProposed

DESIGNED BY: SM CHECKED BY: MAM

PREPARED BY:

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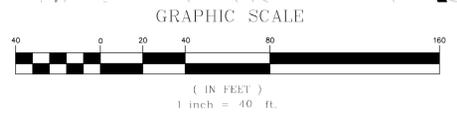
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**SECTION 6.0 -  
APPENDIX**



## MA Groundwater Recharge Calculation



<b>Project No.</b>	1362-25	<b>Sheet</b>	1 of 2
<b>Project Description</b>	6 Forge Parkway		
	Franklin, MA		
<b>Calculated By</b>	SM	<b>Date</b>	03/28/24
<b>Checked By</b>	MAM	<b>Date</b>	03/28/24

**Standard # 3: Groundwater Recharge**

Proposed recharge system: Stormtech MC-3500 Chamber Infiltration System

In accordance with *MADEP – Volume 2, Technical Guide for Compliance with Massachusetts Stormwater Management Standards, dated January 2008*

A soils require a Volume to recharge of	<b>0.60 inches</b>
B soils require a Volume to recharge of	<b>0.35 inches</b>
C soils require a Volume to recharge of	<b>0.25 inches</b>
D soils require a Volume to recharge of	<b>0.10 inches</b>

Impervious area within: A-soils =	74,314 sf	Weighted Groundwater Recharge Depth =	<b>0.53 in</b>
Impervious area within: B-soils =	26,729 sf		
Impervious area within: C-soils =	sf		
Impervious area within: D-soils =	sf		

**Total Site Volume required to be recharged =**  
 101,043 sf x 1" / 12 x 0.53 in = 4,495 cf  
 Adjacent offsite contributing volume = 6,415 cf  
**Total volume = 10,911 cf**

Site volume recharge provided by = volume within the infiltration system below the invert out. See the HydroCAD stage storage table within the Appendix of the Drainage Report  
 = **13,205** cf Total Volume Recharged > **10,911 cf** ( OK )



<b>Project No.</b>	1362-25	<b>Sheet</b>	2 of 2
<b>Project Description</b>	6 Forge Parkway		
	Franklin, MA		
<b>Calculated By</b>	MM	<b>Date</b>	05/14/24
<b>Checked By</b>	MAM	<b>Date</b>	05/14/24

**Standard # 3: Groundwater Recharge (OFFSITE AREA)**

Proposed recharge system: Stormtech MC-3500 Chamber Infiltration System

In accordance with *MADEP – Volume 2, Technical Guide for Compliance with Massachusetts Stormwater Management Standards, dated January 2008*

A soils require a Volume to recharge of	<b>0.60 inches</b>
B soils require a Volume to recharge of	<b>0.35 inches</b>
C soils require a Volume to recharge of	<b>0.25 inches</b>
D soils require a Volume to recharge of	<b>0.10 inches</b>

Impervious area within: A-soils =	128,309 sf	Weighted Groundwater Recharge Depth =	<b>0.60 in</b>
Impervious area within: B-soils =	0 sf		
Impervious area within: C-soils =	sf		
Impervious area within: D-soils =	sf		

**Total Site Volume required to be recharged =**  
 $128,309 \text{ sf} \times 1" / 12 \times 0.60 \text{ in} = \mathbf{6,415 \text{ cf}}$

Site volume recharge provided by = volume within the infiltration system below the invert out. See the HydroCAD stage storage table within the Appendix of the Drainage Report  
 = **13,205** cf Total Volume Recharged > **6,415 cf** ( OK )