

STORMWATER CALCULATIONS

555 Hopping Brook Road

Holliston, Massachusetts

Prepared For:

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2199 INNERBELT BUSINESS CENTER DRIVE
St. LOUIS, MO 63114

Prepared By:

**Engineering
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A handwritten signature in blue ink, appearing to read "Walter M. Lewinski", written over the bottom portion of the professional seal.

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PROJECT NARRATIVE

This project, “555 Hopping Brook Road”, is a commercial development that encompasses the construction of a building, parking, and driveways including drainage, septic system and utilities.

The calculations include off-site property as well as off-site stormwater detention basins as we are using the link 11L as our design analysis point to the west and 12L as our development point to the north.

DRAINAGE NARRATIVE

As required by the Town of Holliston, Massachusetts and MassDEP’s Stormwater Handbook, a storm water analysis was performed for the project at 555 Hopping Brook Road. The method of analysis is the SCS method for hydrologic conditions. The SCS method utilized TR-55 and “HydroCAD stormwater modeling system to analysis the 2-year, 10-year, 25-year and 100-year, 24 hour storm events. The “Rational Method” and “Manning’s Equation” was utilized for the 25-year storm for the analysis of the projects piped drainage system. The stormwater pipe design was calculated using “Stormwater Studio 2020v 3.0.0323” software for Manning’s equation using the 25-year storm.

The existing Cross Culverts channel (11R) in the wetland area have not changed from the original design, the existing detention basin will be increased in size to accommodate the runoff from a portion of this project.

Hydrologic Existing Conditions:

The existing site runoff generally flows toward the north and west. The predominant hydrologic soils group for the project is “Woodbridge fine sandy loam” with a hydrologic value of “C” and “Paxton fine sandy loam with a hydrologic value of “C” and a smaller area of “Charlton Hollis Rock Outcrop,” with a hydrologic value of “A” is present, this was also noted in a report titled “Permeability Testing and Measured groundwater levels, Hopping Brook Park, Holliston, MA,” prepared by The Geotechnical Group, Inc. dated August 2005. In this design an overall Hydrologic Group “C” was used for the pre-developed analysis as well as the post-developed analysis.

Subcatchment Area 1S drains to the wetland to the southwest and is generally wooded. Subcatchment 2S, also flows to the wetland area to the west is generally a wooded area.

The overall pre-developed flow to the west is represented by Link 1L, “Total PreDeveloped West”. Subcatchment 3S drains to the North and is labeled, “Total PreDeveloped North.”

Hydrologic Proposed Conditions:

Under proposed conditions the same design point locations were analyzed for peak flow discharge for the 2-year, 10-year, 25-year and 100-year, 24 hour storm events.

There are fifteen (15) Subcatchments, included in the proposed condition that flows to the west including the existing site at 465 Hopping Brook Road. Subcatchment 8S, 9S, 10S, 11S, 17S, 19S, 21S, and 22S represent developed portions of the parcel flowing to the west. Subcatchments 12S, 15S, 16S, and 18S represent Hopping Brook Road Subcatchments and Subcatchment 21S is an area that surround the detention basin directly. Other Subcatchments, 13S, 14S, and 20S are either undeveloped or partially developed areas that are wooded and also flow to the west.

There are five (6) Subcatchments that, included in the proposed condition that flow to the north. Subcatchments representing developed land are 23S, 24S and 25S. Subcatchment 26S is representing an area that is wooded and substantially undeveloped flowing to the north.

Contech Stormwater Management Structures have been added to the design for TSS removal.

The peak discharge results are in the following tables;

Events for Link 1L: Total PreDeveloped West

Event	Rainfall (inches)	Primary (cfs)	Volume (cubic-feet)
2-Year D	3.38	26.0	351,362
10-Year D	5.27	67.8	841,429
25-Year D	6.45	97.5	1,190,142
100-Year D	8.26	145.7	1,762,231

Events for Link 11L: Total Post Developed West

Event	Rainfall (inches)	Primary (cfs)	Volume (cubic-feet)
2-Year D	3.38	23.9	440,116
10-Year D	5.27	58.1	948,932
25-Year D	6.45	81.8	1,302,335
100-Year D	8.26	135.7	1,877,829

Events for Subcatchment 3S: Total PreDeveloped N

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)
2-Year D	3.38	13.0	181,965
10-Year D	5.27	33.8	435,763
25-Year D	6.45	48.6	616,357
100-Year D	8.26	72.6	912,633

Events for Link 12L: Total Post-Developed North

Event	Rainfall (inches)	Primary (cfs)	Volume (cubic-feet)
2-Year D	3.38	12.3	281,639
10-Year D	5.27	31.3	583,773
25-Year D	6.45	44.6	788,752
100-Year D	8.26	66.9	1,117,487

In conclusion, the 2-year, 10-year, 25-year and 100-year peak rates of runoff are predominately maintained under proposed conditions to the design points.

INFILTRATION/DETENTION BASIN SUMMARY

Infiltration/Detention basin “10P” was previously designed with two forebays to treat for TSS removal from the two inlet pipes from the roadway runoff, the northern most forebay will be replaced by a Contech CDS structural BMP and the detention/infiltration basin will be expanded in area and volume to accommodate this project, the outlet control structure has also been redesigned. A new proposed Infiltration/Detention basin “30P” is located at the northern end of the project.

Top of Berm for Basin 10P is 284.0

Events for Pond 10P: DB1

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year D	46.6	5.1	0.4	4.7	279.05	120,537
10-Year D	84.9	8.7	0.6	8.1	280.46	236,357
25-Year D	108.9	11.3	0.6	10.7	281.31	315,634
100-Year D	141.1	30.0	0.7	29.3	282.11	397,272

Top of Berm for Basin 30P is 330.7

Events for Pond 30P: DB2

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year D	47.1	5.7	0.3	5.4	327.03	109,285
10-Year D	83.1	14.2	0.5	13.7	328.16	179,254
25-Year D	105.8	20.2	0.6	19.7	328.71	223,646
100-Year D	140.9	35.4	0.6	34.8	329.35	284,641

DEP STORMWATER MANAGEMENT STANDARDS:

Standard 1. All proposed impervious surfaces are treated and will not cause erosion in adjacent wetlands and waters of the Commonwealth, as BMP measures are proposed in accordance with the design requirements of the Stormwater Management Handbook.

Standard 2. The proposed development peak discharge rates predominately meet predevelopment discharge rates for the 2-year, 10-year, 25-year and 100-year storm events for the design point.

Standard 3. 1,156,566 s.f. of additional impervious surfaces will be created as part of the proposed project, with the prior project at 465 Hopping Brook Road having 162,608 s.f. of impervious surfaces being recharged on site.

464,461 s.f of impervious flows to the west, and 692,105 s.f of impervious flows to the north.

The amount of recharge required to the west is $(464,461 \times 0.25/12) = 9,676$ c.f., based upon an underlying hydrologic soil group C. Recharge required to the north is $(692,105 \times 0.25/12) = 14,419$ c.f.

DEP's "Static" method of evaluating recharge was used for this project.

Storage provided in basin 10P-DB1(West), up to the elevation 276.36 of the lowest orifice is 10,721c.f.

Storage provided in basin 30P-DB2(North), up to the elevation 324.34 of the lowest orifice is 14,623c.f.

The drawdown time for each of the two basins are calculated using the formula;

$T_{(\text{drawdown})} = Rv/k(\text{bottom Area})$; Rv in this case is the storage provided, k is Rawl's rate for "C" soil.

$T(\text{West}) = 10,721/((0.27/12)(18,014)) = 26.53$ hours

$T(\text{North } 30P) = 14,623/((0.27/12)(22,205)) = 29.27$ hours

This project meets Standard 3 requirements.

Standard 4. TSS Removal of 80% or greater.

Contech Stormwater Management Structures have been added to the design using the required 1-inch of runoff for the design. The results range from 87.6% to 89.7% TSS removal.

The forebays for the infiltration/detention basins were designed using 0.1-inches of runoff since we meet the greater than 80% TSS removal with the Contech structures.

Three forebays were designed to meet the pretreatment criteria for infiltration basins.

Basin 10P Forebay: 148,863 s.f. of pavement, Required volume= $148,863 \times 0.1"/12 = 1,240$ c.f.

Volume provided = 1,754 c.f. ok!

Basin 30P;

Northeast Forebay: 105,700 s.f. of pavement, Required volume= $105,700 \times 0.1"/12 = 881$ c.f.

Volume provided = 6,107 c.f. ok!

Northwest Forebay: 201,108 s.f. of pavement, Required volume= $201,108 \times 0.1"/12 = 2,011$ c.f.

Volume provided = 8,316 c.f. ok!

This project meets Standard 4 requirements.

Standard 5. The TSS removal sheets for pre-treatment and full treatment are included in this report. This project meets Standard 5 requirements.

Standard 6. The proposed work is not within an Outstanding Resource Water. The 1.0-inch rule was used to calculate the water quality volume for the structural BMP's..

Standard 7. Not applicable.

Standard 8. Erosion and sediment control measures are proposed during construction. They include first the installation of an erosion control barrier and catch basin protection prior to construction. Construction period pollution prevention and erosion and sedimentation control plans were previously submitted under the previous amendment and remain the same.

Standard 9. An operation and maintenance plan will be submitted for approval.

Standard 10. An Illicit Discharge Compliance Statement will be submitted and included with the pollution prevention plan.

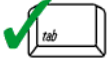


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Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



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Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

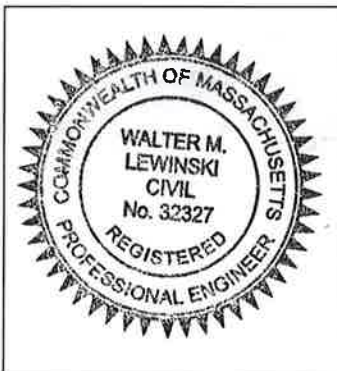
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Walter M. Lewinski 6-1-22
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- ☒ New development
- ☐ Redevelopment
- ☐ Mix of New Development and Redevelopment



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Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
 - ☐ Credit 1
 - ☐ Credit 2
 - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



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Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- ☐ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - ☒ Static
 - ☐ Simple Dynamic
 - ☐ Dynamic Field¹
- ☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
 - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
 - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



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Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - ☐ is within the Zone II or Interim Wellhead Protection Area
 - ☐ is near or to other critical areas
 - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - ☐ involves runoff from land uses with higher potential pollutant loads.
 - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☒ The BMP is sized (and calculations provided) based on:
 - ☒ The ½" or 1" Water Quality Volume or
 - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior** to the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



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Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - ☐ Limited Project
 - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - ☐ Bike Path and/or Foot Path
 - ☐ Redevelopment Project
 - ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- ☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



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Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

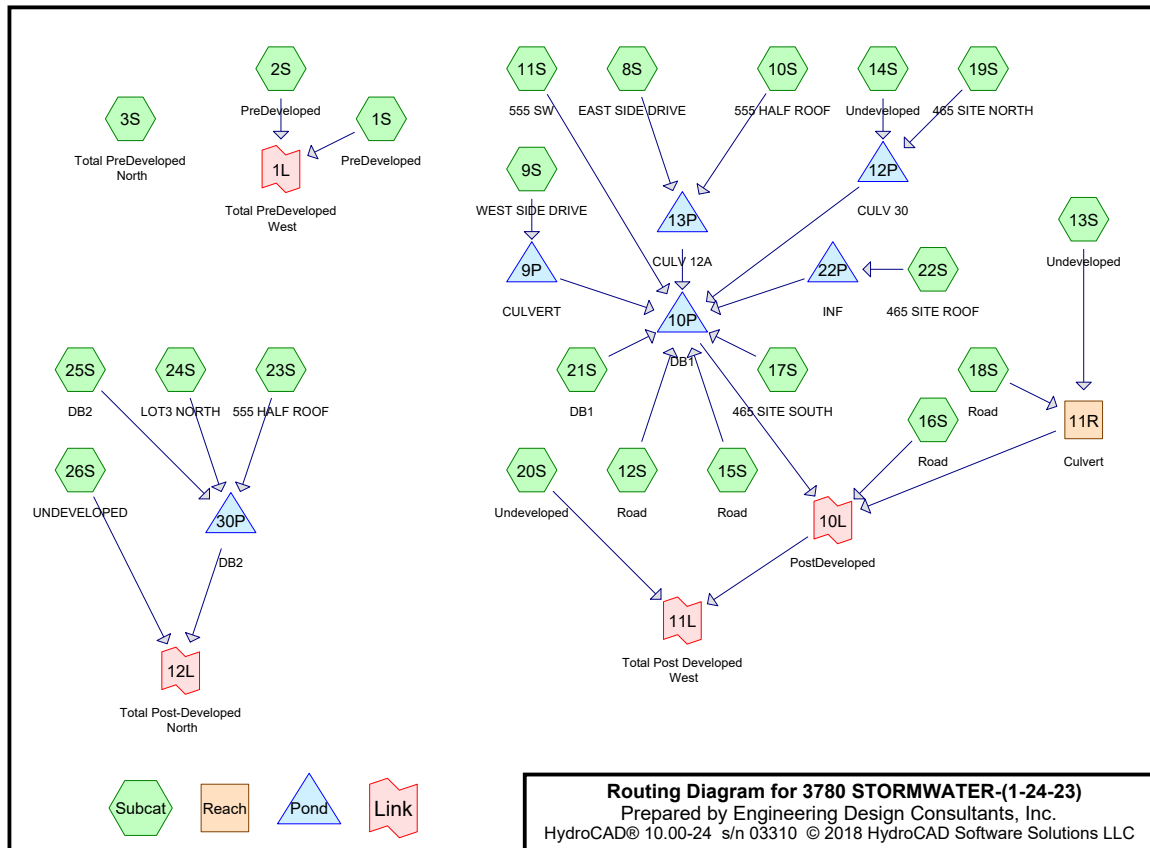
- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - ☒ Name of the stormwater management system owners;
 - ☒ Party responsible for operation and maintenance;
 - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
 - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
 - ☒ Description and delineation of public safety features;
 - ☒ Estimated operation and maintenance budget; and
 - ☒ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- ☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☐ An Illicit Discharge Compliance Statement is attached;
- ☒ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.



3780 STORMWATER-(1-24-23)

Prepared by Engineering Design Consultants, Inc.
 HydroCAD® 10.00-24 s/n 03310 © 2018 HydroCAD Software Solutions LLC

NRCC 24-hr D 2-Year D Rainfall=3.38"

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Summary for Subcatchment 1S: PreDeveloped

Runoff = 14.1 cfs @ 13.41 hrs, Volume= 197,891 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
2,540,256	70	Woods, Good, HSG C
2,540,256		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.8	483	0.0200	0.35		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.8	623	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
32.8	1,254	0.0650	0.64		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
97.9	2,410	Total			

Summary for Subcatchment 2S: PreDeveloped

Runoff = 12.5 cfs @ 13.15 hrs, Volume= 153,471 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
1,970,057	70	Woods, Good, HSG C
1,970,057		100.00% Pervious Area

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 2-Year D Rainfall=3.38"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
25.8	387	0.0100	0.25		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
6.2	196	0.0440	0.52		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
25.8	1,142	0.0870	0.74		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
79.3	1,775	Total			

Summary for Subcatchment 3S: Total PreDeveloped North

Runoff = 13.0 cfs @ 13.45 hrs, Volume= 181,965 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
2,335,823	70	Woods, Good, HSG C
2,335,823		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
27.6	641	0.0240	0.39		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.2	1,713	0.0610	0.62		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.6	267	0.0600	2.71	14.43	Parabolic Channel, W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.100 Earth, dense brush, high stage
96.9	2,671	Total			

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Summary for Subcatchment 8S: EAST SIDE DRIVE

Runoff = 2.9 cfs @ 12.26 hrs, Volume= 14,167 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
140,049	74	>75% Grass cover, Good, HSG C
6,776	70	Woods, Good, HSG C
146,825	74	Weighted Average
146,825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
6.9	937	0.0230	2.27		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.6	703	0.0450	7.48	37.40	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00' n= 0.030 Earth, grassed & winding
16.7	1,690	Total			

Summary for Subcatchment 9S: WEST SIDE DRIVE

Runoff = 2.1 cfs @ 12.26 hrs, Volume= 10,286 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
106,603	74	>75% Grass cover, Good, HSG C
106,603		100.00% Pervious Area

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NRCC 24-hr D 2-Year D Rainfall=3.38"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
6.9	937	0.0230	2.27		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.4	638	0.0450	7.48	37.40	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.00' Z= 3.0 ' /' Top.W=8.00' n= 0.030 Earth, grassed & winding
16.5	1,625	Total			

Summary for Subcatchment 10S: 555 HALF ROOF

Runoff = 17.5 cfs @ 12.15 hrs, Volume= 72,115 cf, Depth= 3.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
275,000	98	Roofs, HSG C
275,000		100.00% Impervious Area

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

Summary for Subcatchment 11S: 555 SW

Runoff = 9.2 cfs @ 12.28 hrs, Volume= 46,906 cf, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"**3780 STORMWATER-(1-24-23)**

NRCC 24-hr D 2-Year D Rainfall=3.38"

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Area (sf)		CN	Description		
90,464		74	>75% Grass cover, Good, HSG C		
160,091		98	Paved parking, HSG C		
250,555		89	Weighted Average		
90,464			36.11% Pervious Area		
160,091			63.89% Impervious Area		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0110	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.2	140	0.0110	0.73		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.3	296	0.0110	2.13		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.2	1,467	0.0170	7.75	13.70	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
19.1	1,953	Total			

Summary for Subcatchment 12S: Road

Runoff = 0.7 cfs @ 12.15 hrs, Volume= 2,661 cf, Depth= 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
9,362	98	Paved parking, HSG C
3,789	74	>75% Grass cover, Good, HSG C
13,151	91	Weighted Average
3,789		28.81% Pervious Area
9,362		71.19% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	44	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.5	122	0.0440	4.26		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	100	0.0400	9.07	7.13	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
8.1	266	Total			

Summary for Subcatchment 13S: Undeveloped

Runoff = 4.5 cfs @ 13.07 hrs, Volume= 50,918 cf, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
496,005	70	Woods, Good, HSG C
122,277	74	>75% Grass cover, Good, HSG C
618,282	71	Weighted Average
618,282		100.00% Pervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
20.8	599	0.0370	0.48		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
12.5	350	0.0350	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
3.1	163	0.1200	0.87		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
22.7	737	0.0470	0.54		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
71.4	1,899	Total			

Summary for Subcatchment 14S: Undeveloped

Runoff = 7.5 cfs @ 12.35 hrs, Volume= 43,932 cf, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
178,452	70	Woods, Good, HSG C
300,921	74	>75% Grass cover, Good, HSG C
479,373	73	Weighted Average
479,373		100.00% Pervious Area

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NRCC 24-hr D 2-Year D Rainfall=3.38"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0050	0.06		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.6	275	0.0370	2.89		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.4	225	0.2000	1.12		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.0	239	0.0650	3.82		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.1	357	0.0160	1.90		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
23.4	1,146	Total			

Summary for Subcatchment 15S: Road

Runoff = 1.9 cfs @ 12.13 hrs, Volume= 6,248 cf, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
20,008	98	Paved parking, HSG C
16,125	74	>75% Grass cover, Good, HSG C
36,133	87	Weighted Average
16,125		44.63% Pervious Area
20,008		55.37% Impervious Area

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NRCC 24-hr D 2-Year D Rainfall=3.38"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	16	0.0100	0.06		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.5	132	0.0460	4.35		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.3	110	0.0200	6.42	5.04	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
5.1	258	Total			Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment 16S: Road

Runoff = 1.6 cfs @ 12.13 hrs, Volume= 5,302 cf, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description			
18,005	92	Paved roads w/open ditches, 50% imp, HSG C			
2,688	98	Paved parking, HSG C			
9,970	74	>75% Grass cover, Good, HSG C			
30,663	87	Weighted Average			
18,973		61.87% Pervious Area			
11,691		38.13% Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry.

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NRCC 24-hr D 2-Year D Rainfall=3.38"

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Summary for Subcatchment 17S: 465 SITE SOUTH

Runoff = 1.7 cfs @ 12.25 hrs, Volume= 8,219 cf, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
21,889	74	>75% Grass cover, Good, HSG C
25,644	98	Unconnected pavement, HSG C
47,533	87	Weighted Average
21,889		46.05% Pervious Area
25,644		53.95% Impervious Area
25,644		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	38	0.0100	0.07		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
8.1	694	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
16.8	732	Total			

Summary for Subcatchment 18S: Road

Runoff = 1.3 cfs @ 12.13 hrs, Volume= 4,608 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
21,926	92	Paved roads w/open ditches, 50% imp, HSG C
10,963		50.00% Pervious Area
10,963		50.00% Impervious Area

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NRCC 24-hr D 2-Year D Rainfall=3.38"

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

Summary for Subcatchment 19S: 465 SITE NORTH

Runoff = 2.1 cfs @ 12.16 hrs, Volume= 7,635 cf, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
25,932	74	>75% Grass cover, Good, HSG C
21,980	98	Paved parking, HSG C
47,912	85	Weighted Average
25,932		54.12% Pervious Area
21,980		45.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	45	0.0050	0.67		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
7.6	658	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.7	703	Total			

Summary for Subcatchment 20S: Undeveloped

Runoff = 14.7 cfs @ 12.93 hrs, Volume= 159,686 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

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NRCC 24-hr D 2-Year D Rainfall=3.38"

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Area (sf)	CN	Description
1,809,628	70	Woods, Good, HSG C
240,208	74	>75% Grass cover, Good, HSG C
2,049,836	70	Weighted Average
2,049,836		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0210	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
13.2	293	0.0220	0.37		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
11.6	322	0.0340	0.46		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
27.3	1,193	0.0850	0.73		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
64.2	1,858	Total			

Summary for Subcatchment 21S: DB1

Runoff = 4.6 cfs @ 12.13 hrs, Volume= 15,669 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
162,392	74	>75% Grass cover, Good, HSG C
162,392		100.00% Pervious Area

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

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Summary for Subcatchment 22S: 465 SITE ROOF

Runoff = 6.7 cfs @ 12.17 hrs, Volume= 29,268 cf, Depth= 3.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
57,453	98	Roofs, HSG C
54,155	98	Roofs, HSG C
111,608	98	Weighted Average
111,608		100.00% Impervious Area

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

Summary for Subcatchment 23S: 555 HALF ROOF

Runoff = 18.6 cfs @ 12.14 hrs, Volume= 72,115 cf, Depth= 3.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
275,000	98	Roofs, HSG C
275,000		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,
0.7	483	0.0270	11.83	37.17	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
6.7	483	Total			

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Summary for Subcatchment 24S: LOT3 NORTH

Runoff = 27.5 cfs @ 12.23 hrs, Volume= 124,680 cf, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
248,887	74	>75% Grass cover, Good, HSG C
417,105	98	Paved parking, HSG C
665,992	89	Weighted Average
248,887		37.37% Pervious Area
417,105		62.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0540	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
4.8	200	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	184	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.0	1,300	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
14.8	1,734	Total			

Summary for Subcatchment 25S: DB2

Runoff = 6.0 cfs @ 12.18 hrs, Volume= 23,806 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"**3780 STORMWATER-(1-24-23)**

NRCC 24-hr D 2-Year D Rainfall=3.38"

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Area (sf)	CN	Description
246,734	74	>75% Grass cover, Good, HSG C
246,734		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0600	0.16		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.5	660	0.0450	3.18		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.5	119	0.0080	1.34		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
10.3	829	Total			

Summary for Subcatchment 26S: UNDEVELOPED

Runoff = 6.9 cfs @ 13.47 hrs, Volume= 98,205 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.38"

Area (sf)	CN	Description
1,184,876	70	Woods, Good, HSG C
75,742	74	>75% Grass cover, Good, HSG C
1,260,618	70	Weighted Average
1,260,618		100.00% Pervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
29.6	1,022	0.0530	0.58		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.6	586	0.0360	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
36.1	1,210	0.0500	0.56		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
98.6	2,868	Total			

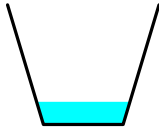
Summary for Reach 11R: Culvert

Inflow Area = 640,208 sf, 1.71% Impervious, Inflow Depth = 1.04" for 2-Year D event
 Inflow = 4.6 cfs @ 13.03 hrs, Volume= 55,526 cf
 Outflow = 4.6 cfs @ 13.03 hrs, Volume= 55,526 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 Max. Velocity= 3.72 fps, Min. Travel Time= 0.2 min
 Avg. Velocity = 1.52 fps, Avg. Travel Time= 0.5 min

Peak Storage= 62 cf @ 13.03 hrs
 Average Depth at Peak Storage= 0.57"
 Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

2.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
 Side Slope Z-value= 0.3 ' Top Width= 3.80'
 Length= 50.0' Slope= 0.0200 ' / '
 Inlet Invert= 280.00', Outlet Invert= 279.00'

**3780 STORMWATER-(1-24-23)**

NRCC 24-hr D 2-Year D Rainfall=3.38"

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Summary for Pond 9P: CULVERT

Inflow Area = 106,603 sf, 0.00% Impervious, Inflow Depth = 1.16" for 2-Year D event
 Inflow = 2.1 cfs @ 12.26 hrs, Volume= 10,286 cf
 Outflow = 2.1 cfs @ 12.29 hrs, Volume= 10,157 cf, Atten= 2%, Lag= 1.7 min
 Primary = 2.1 cfs @ 12.29 hrs, Volume= 10,157 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 Peak Elev= 294.66' @ 12.29 hrs Surf.Area= 537 sf Storage= 431 cf

Plug-Flow detention time= 15.9 min calculated for 10,157 cf (99% of inflow)
 Center-of-Mass det. time= 9.0 min (909.4 - 900.4)

Volume #1	Invert 293.00'	Avail.Storage 4,006 cf	Storage Description Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.00	0	0.0	0	0	0
294.00	385	92.0	128	128	675
296.00	925	120.0	1,271	1,400	1,193
298.00	1,723	157.0	2,607	4,006	2,054

Device	Routing	Invert	Outlet Devices
#1	Primary	294.00'	18.0" Round Culvert L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 294.00' / 293.00' S= 0.0133 ' / ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=2.1 cfs @ 12.29 hrs HW=294.66' (Free Discharge)
 1=Culvert (Inlet Controls 2.1 cfs @ 2.76 fps)

Summary for Pond 10P: DB1

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Inflow Area = 1,677,085 sf, 37.19% Impervious, Inflow Depth = 1.82" for 2-Year D event
 Inflow = 46.6 cfs @ 12.21 hrs, Volume= 254,969 cf
 Outflow = 5.1 cfs @ 13.90 hrs, Volume= 254,951 cf, Atten= 89%, Lag= 101.4 min
 Discarded = 0.4 cfs @ 13.90 hrs, Volume= 35,349 cf
 Primary = 4.7 cfs @ 13.90 hrs, Volume= 219,602 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 279.05' @ 13.90 hrs Surf.Area= 70,777 sf Storage= 120,537 cf

Plug-Flow detention time= 370.2 min calculated for 254,887 cf (100% of inflow)
 Center-of-Mass det. time= 371.1 min (1,206.0 - 834.9)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	603,909 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	273.00'	138 cf	4.00'D x 11.00'H Vertical Cone/Cylinder
		604,047 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
275.00	100	40.0	0	0	100
276.00	13,700	600.0	4,990	4,990	28,622
277.00	27,095	820.0	20,021	25,011	53,492
278.00	44,050	1,020.0	35,231	60,242	82,791
279.00	69,900	1,580.0	56,480	116,721	198,664
280.00	87,050	1,610.0	78,318	195,040	206,444
282.00	103,500	1,725.0	190,313	385,353	237,146
284.00	115,160	1,730.0	218,556	603,909	240,864

Device	Routing	Invert	Outlet Devices
#1	Primary	273.34'	24.0" Round Culvert L= 90.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 'ft' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	276.36'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	278.80'	0.7' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	281.40'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	283.50'	6.0' long x 10.0' breadth Emergency Spillway Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

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#6 Discarded 273.00' Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.4 cfs @ 13.90 hrs HW=279.05' (Free Discharge)
6=Exfiltration (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=4.7 cfs @ 13.90 hrs HW=279.05' (Free Discharge)
1=Culvert (Passes 4.7 cfs of 32.8 cfs potential flow)
2=Orifice/Grate (Orifice Controls 4.4 cfs @ 7.53 fps)
3=Sharp-Crested Rectangular Weir (Weir Controls 0.3 cfs @ 1.65 fps)
4=Orifice/Grate (Controls 0.0 cfs)
5=Emergency Spillway (Controls 0.0 cfs)

Summary for Pond 12P: CULV 30

Inflow Area = 527,285 sf, 4.17% Impervious, Inflow Depth = 1.17" for 2-Year D event
 Inflow = 8.3 cfs @ 12.33 hrs, Volume= 51,567 cf
 Outflow = 8.3 cfs @ 12.35 hrs, Volume= 51,567 cf, Atten= 1%, Lag= 1.1 min
 Discarded = 0.0 cfs @ 12.35 hrs, Volume= 372 cf
 Primary = 8.3 cfs @ 12.35 hrs, Volume= 51,195 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6
 Peak Elev= 281.17' @ 12.35 hrs Surf.Area= 844 sf Storage= 946 cf

Plug-Flow detention time= 6.3 min calculated for 51,554 cf (100% of inflow)
 Center-of-Mass det. time= 6.5 min (908.1 - 901.5)

Volume	Invert	Avail.Storage	Storage Description		
#1	279.50'	8,119 cf	Custom Stage Data (Conic) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
279.50	0	0	0	0	
280.00	610	102	102	610	
282.00	1,035	1,626	1,728	1,081	
284.00	1,570	2,586	4,315	1,673	
286.00	2,255	3,804	8,119	2,425	

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Device	Routing	Invert	Outlet Devices
#1	Primary	280.00'	30.0" Round Culvert L= 129.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 280.00' / 278.00' S= 0.0155 ' /' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf
#2	Discarded	279.50'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.35 hrs HW=281.16' (Free Discharge)**2=Exfiltration** (Exfiltration Controls 0.0 cfs)**Primary OutFlow** Max=8.2 cfs @ 12.35 hrs HW=281.16' (Free Discharge)**1=Culvert** (Inlet Controls 8.2 cfs @ 3.67 fps)**Summary for Pond 13P: CULV 12A**

Inflow Area = 421,825 sf, 65.19% Impervious, Inflow Depth = 2.45" for 2-Year D event
 Inflow = 19.6 cfs @ 12.16 hrs, Volume= 86,282 cf
 Outflow = 17.9 cfs @ 12.19 hrs, Volume= 86,282 cf, Atten= 9%, Lag= 2.3 min
 Primary = 17.9 cfs @ 12.19 hrs, Volume= 86,282 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6
 Peak Elev= 292.84' @ 12.19 hrs Surf.Area= 2,610 sf Storage= 2,891 cf

Plug-Flow detention time= 2.2 min calculated for 86,261 cf (100% of inflow)
 Center-of-Mass det. time= 2.2 min (786.4 - 784.2)

Volume	Invert	Avail.Storage	Storage Description		
#1	291.00'	28,701 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
291.00	100	40.0	0	0	100
292.00	2,142	200.0	902	902	3,158
294.00	3,334	230.0	5,432	6,334	4,271
296.00	4,670	270.0	7,967	14,300	5,939
298.00	6,352	323.0	10,979	25,279	8,510
298.50	7,345	340.0	3,421	28,701	9,422

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Device	Routing	Invert	Outlet Devices
#1	Primary	291.00'	30.0" Round Culvert L= 120.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 291.00' / 286.20' S= 0.0400 ' /' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf

Primary OutFlow Max=17.7 cfs @ 12.19 hrs HW=292.83' (Free Discharge)**1=Culvert** (Inlet Controls 17.7 cfs @ 4.60 fps)**Summary for Pond 22P: INF**

Inflow Area = 111,608 sf, 100.00% Impervious, Inflow Depth = 3.15" for 2-Year D event
 Inflow = 6.7 cfs @ 12.17 hrs, Volume= 29,268 cf
 Outflow = 5.9 cfs @ 12.22 hrs, Volume= 29,268 cf, Atten= 12%, Lag= 2.9 min
 Discarded = 0.0 cfs @ 12.22 hrs, Volume= 1,636 cf
 Primary = 5.9 cfs @ 12.22 hrs, Volume= 27,632 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4
 Peak Elev= 287.23' @ 12.22 hrs Surf.Area= 2,044 sf Storage= 2,515 cf

Plug-Flow detention time= 41.1 min calculated for 29,261 cf (100% of inflow)
 Center-of-Mass det. time= 41.2 min (804.0 - 762.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	285.50'	1,589 cf	28.00'W x 73.00'L x 3.21'H Field A 6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids
#2A	286.00'	2,587 cf	Cultec R-280HD x 60 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 6 rows
		4,175 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	286.00'	18.0" Round Culvert L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 286.00' / 285.14' S= 0.0430 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	285.50'	0.270 in/hr Exfiltration over Wetted area

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Discarded OutFlow Max=0.0 cfs @ 12.22 hrs HW=287.23' (Free Discharge)↳ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)**Primary OutFlow** Max=5.8 cfs @ 12.22 hrs HW=287.23' (Free Discharge)↳ **1=Culvert** (Inlet Controls 5.8 cfs @ 3.77 fps)**Summary for Pond 30P: DB2**

Inflow Area = 1,187,726 sf, 58.27% Impervious, Inflow Depth = 2.23" for 2-Year D event
 Inflow = 47.1 cfs @ 12.17 hrs, Volume= 220,602 cf
 Outflow = 5.7 cfs @ 13.35 hrs, Volume= 220,602 cf, Atten= 88%, Lag= 70.6 min
 Discarded = 0.3 cfs @ 13.35 hrs, Volume= 37,167 cf
 Primary = 5.4 cfs @ 13.35 hrs, Volume= 183,435 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4

Peak Elev= 327.03' @ 13.35 hrs Surf.Area= 50,988 sf Storage= 109,285 cf

Plug-Flow detention time= 436.6 min calculated for 220,547 cf (100% of inflow)

Center-of-Mass det. time= 437.5 min (1,254.4 - 816.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	323.00'	349,948 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
323.00	400	80.0	0.0	0	0	400
324.00	19,450	575.0	100.0	7,546	7,546	26,203
325.00	28,075	685.0	100.0	23,631	31,177	37,250
326.00	37,630	790.0	100.0	32,736	63,913	49,597
327.00	50,456	930.0	100.0	43,887	107,800	68,779
328.00	70,215	1,120.0	100.0	60,064	167,864	99,791
329.00	96,500	1,450.0	100.0	83,010	250,874	167,293
330.00	101,670	1,610.0	100.0	99,074	349,948	206,284

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Device	Routing	Invert	Outlet Devices
#1	Primary	323.00'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 323.00' / 319.50' S= 0.0500 1' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	324.34'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	326.50'	20.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir Cv= 2.69 (C= 3.36)
#4	Device 1	328.90'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	329.50'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir X 0.00 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#6	Discarded	323.00'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.3 cfs @ 13.35 hrs HW=327.03' (Free Discharge)↳ **6=Exfiltration** (Exfiltration Controls 0.3 cfs)**Primary OutFlow** Max=5.4 cfs @ 13.35 hrs HW=327.03' (Free Discharge)↳ **1=Culvert** (Passes 5.4 cfs of 26.3 cfs potential flow)↳ **2=Orifice/Grate** (Orifice Controls 4.0 cfs @ 7.26 fps)↳ **3=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.4 cfs @ 2.40 fps)↳ **4=Orifice/Grate** (Controls 0.0 cfs)↳ **5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)**Summary for Link 1L: Total PreDeveloped West**

Inflow Area = 4,510,313 sf, 0.00% Impervious, Inflow Depth = 0.93" for 2-Year D event
 Inflow = 26.0 cfs @ 13.31 hrs, Volume= 351,362 cf
 Primary = 26.0 cfs @ 13.31 hrs, Volume= 351,362 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

Summary for Link 10L: PostDeveloped

Inflow Area = 2,347,956 sf, 27.53% Impervious, Inflow Depth = 1.43" for 2-Year D event
 Inflow = 9.3 cfs @ 13.07 hrs, Volume= 280,430 cf
 Primary = 9.3 cfs @ 13.07 hrs, Volume= 280,430 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

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Summary for Link 11L: Total Post Developed West

Inflow Area = 4,397,792 sf, 14.70% Impervious, Inflow Depth = 1.20" for 2-Year D event
 Inflow = 23.9 cfs @ 12.95 hrs, Volume= 440,116 cf
 Primary = 23.9 cfs @ 12.95 hrs, Volume= 440,116 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

Summary for Link 12L: Total Post-Developed North

Inflow Area = 2,448,344 sf, 28.27% Impervious, Inflow Depth = 1.38" for 2-Year D event
 Inflow = 12.3 cfs @ 13.47 hrs, Volume= 281,639 cf
 Primary = 12.3 cfs @ 13.47 hrs, Volume= 281,639 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Summary for Subcatchment 1S: PreDeveloped

Runoff = 36.8 cfs @ 13.38 hrs, Volume= 473,901 cf, Depth= 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
2,540,256	70	Woods, Good, HSG C
2,540,256		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.8	483	0.0200	0.35		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.8	623	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
32.8	1,254	0.0650	0.64		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
97.9	2,410	Total			

Summary for Subcatchment 2S: PreDeveloped

Runoff = 32.6 cfs @ 13.12 hrs, Volume= 367,527 cf, Depth= 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
1,970,057	70	Woods, Good, HSG C
1,970,057		100.00% Pervious Area

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
25.8	387	0.0100	0.25		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
6.2	196	0.0440	0.52		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
25.8	1,142	0.0870	0.74		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
79.3	1,775	Total			

Summary for Subcatchment 3S: Total PreDeveloped North

Runoff = 33.8 cfs @ 13.34 hrs, Volume= 435,763 cf, Depth= 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
2,335,823	70	Woods, Good, HSG C
2,335,823		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
27.6	641	0.0240	0.39		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.2	1,713	0.0610	0.62		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.6	267	0.0600	2.71	14.43	Parabolic Channel, W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.100 Earth, dense brush, high stage
96.9	2,671	Total			

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Summary for Subcatchment 8S: EAST SIDE DRIVE

Runoff = 6.7 cfs @ 12.25 hrs, Volume= 31,585 cf, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
140,049	74	>75% Grass cover, Good, HSG C
6,776	70	Woods, Good, HSG C
146,825	74	Weighted Average
146,825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
6.9	937	0.0230	2.27		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.6	703	0.0450	7.48	37.40	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00' n= 0.030 Earth, grassed & winding
16.7	1,690	Total			

Summary for Subcatchment 9S: WEST SIDE DRIVE

Runoff = 4.9 cfs @ 12.25 hrs, Volume= 22,933 cf, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
106,603	74	>75% Grass cover, Good, HSG C
106,603		100.00% Pervious Area

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
6.9	937	0.0230	2.27		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.4	638	0.0450	7.48	37.40	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00' n= 0.030 Earth, grassed & winding
16.5	1,625	Total			

Summary for Subcatchment 10S: 555 HALF ROOF

Runoff = 27.5 cfs @ 12.15 hrs, Volume= 115,334 cf, Depth= 5.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
275,000	98	Roofs, HSG C
275,000		100.00% Impervious Area

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

Summary for Subcatchment 11S: 555 SW

Runoff = 16.2 cfs @ 12.27 hrs, Volume= 84,164 cf, Depth= 4.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 10-Year D Rainfall=5.27"

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Area (sf)	CN	Description
90,464	74	>75% Grass cover, Good, HSG C
160,091	98	Paved parking, HSG C
250,555	89	Weighted Average
90,464		36.11% Pervious Area
160,091		63.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0110	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.2	140	0.0110	0.73		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.3	296	0.0110	2.13		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.2	1,467	0.0170	7.75	13.70	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
19.1	1,953	Total			

Summary for Subcatchment 12S: Road

Runoff = 1.2 cfs @ 12.15 hrs, Volume= 4,652 cf, Depth= 4.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
9,362	98	Paved parking, HSG C
3,789	74	>75% Grass cover, Good, HSG C
13,151	91	Weighted Average
3,789		28.81% Pervious Area
9,362		71.19% Impervious Area

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	44	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.5	122	0.0440	4.26		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	100	0.0400	9.07	7.13	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
8.1	266	Total			

Summary for Subcatchment 13S: Undeveloped

Runoff = 11.3 cfs @ 12.97 hrs, Volume= 119,672 cf, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
496,005	70	Woods, Good, HSG C
122,277	74	>75% Grass cover, Good, HSG C
618,282	71	Weighted Average
618,282		100.00% Pervious Area

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
20.8	599	0.0370	0.48		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
12.5	350	0.0350	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
3.1	163	0.1200	0.87		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
22.7	737	0.0470	0.54		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
71.4	1,899	Total			

Summary for Subcatchment 14S: Undeveloped

Runoff = 17.8 cfs @ 12.34 hrs, Volume= 99,632 cf, Depth= 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
178,452	70	Woods, Good, HSG C
300,921	74	>75% Grass cover, Good, HSG C
479,373	73	Weighted Average
479,373		100.00% Pervious Area

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0050	0.06		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.6	275	0.0370	2.89		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.4	225	0.2000	1.12		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.0	239	0.0650	3.82		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.1	357	0.0160	1.90		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
23.4	1,146	Total			

Summary for Subcatchment 15S: Road

Runoff = 3.4 cfs @ 12.13 hrs, Volume= 11,509 cf, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
20,008	98	Paved parking, HSG C
16,125	74	>75% Grass cover, Good, HSG C
36,133	87	Weighted Average
16,125		44.63% Pervious Area
20,008		55.37% Impervious Area

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	16	0.0100	0.06		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.5	132	0.0460	4.35		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.3	110	0.0200	6.42	5.04	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
5.1	258	Total			Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment 16S: Road

Runoff = 2.9 cfs @ 12.13 hrs, Volume= 9,767 cf, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description			
18,005	92	Paved roads w/open ditches, 50% imp, HSG C			
2,688	98	Paved parking, HSG C			
9,970	74	>75% Grass cover, Good, HSG C			
30,663	87	Weighted Average			
18,973		61.87% Pervious Area			
11,691		38.13% Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry.

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Summary for Subcatchment 17S: 465 SITE SOUTH

Runoff = 3.1 cfs @ 12.25 hrs, Volume= 15,140 cf, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
21,889	74	>75% Grass cover, Good, HSG C
25,644	98	Unconnected pavement, HSG C
47,533	87	Weighted Average
21,889		46.05% Pervious Area
25,644		53.95% Impervious Area
25,644		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	38	0.0100	0.07		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
8.1	694	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
16.8	732	Total			

Summary for Subcatchment 18S: Road

Runoff = 2.2 cfs @ 12.13 hrs, Volume= 7,954 cf, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
21,926	92	Paved roads w/open ditches, 50% imp, HSG C
10,963		50.00% Pervious Area
10,963		50.00% Impervious Area

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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

Summary for Subcatchment 19S: 465 SITE NORTH

Runoff = 3.9 cfs @ 12.16 hrs, Volume= 14,447 cf, Depth= 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
25,932	74	>75% Grass cover, Good, HSG C
21,980	98	Paved parking, HSG C
47,912	85	Weighted Average
25,932		54.12% Pervious Area
21,980		45.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	45	0.0050	0.67		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
7.6	658	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.7	703	Total			

Summary for Subcatchment 20S: Undeveloped

Runoff = 38.5 cfs @ 12.90 hrs, Volume= 382,410 cf, Depth= 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Area (sf)	CN	Description
1,809,628	70	Woods, Good, HSG C
240,208	74	>75% Grass cover, Good, HSG C
2,049,836	70	Weighted Average
2,049,836		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0210	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
13.2	293	0.0220	0.37		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
11.6	322	0.0340	0.46		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
27.3	1,193	0.0850	0.73		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
64.2	1,858	Total			

Summary for Subcatchment 21S: DB1

Runoff = 10.6 cfs @ 12.13 hrs, Volume= 34,934 cf, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
162,392	74	>75% Grass cover, Good, HSG C
162,392		100.00% Pervious Area

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

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Summary for Subcatchment 22S: 465 SITE ROOF

Runoff = 10.5 cfs @ 12.17 hrs, Volume= 46,808 cf, Depth= 5.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
57,453	98	Roofs, HSG C
54,155	98	Roofs, HSG C
111,608	98	Weighted Average
111,608		100.00% Impervious Area

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

Summary for Subcatchment 23S: 555 HALF ROOF

Runoff = 29.1 cfs @ 12.13 hrs, Volume= 115,334 cf, Depth= 5.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
275,000	98	Roofs, HSG C
275,000		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,
0.7	483	0.0270	11.83	37.17	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
6.7	483	Total			

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Summary for Subcatchment 24S: LOT3 NORTH

Runoff = 48.2 cfs @ 12.22 hrs, Volume= 223,714 cf, Depth= 4.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
248,887	74	>75% Grass cover, Good, HSG C
417,105	98	Paved parking, HSG C
665,992	89	Weighted Average
248,887		37.37% Pervious Area
417,105		62.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0540	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
4.8	200	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	184	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.0	1,300	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
14.8	1,734	Total			

Summary for Subcatchment 25S: DB2

Runoff = 13.7 cfs @ 12.18 hrs, Volume= 53,078 cf, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"**3780 STORMWATER-(1-24-23)**

NRCC 24-hr D 10-Year D Rainfall=5.27"

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Area (sf)	CN	Description
246,734	74	>75% Grass cover, Good, HSG C
246,734		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0600	0.16		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.5	660	0.0450	3.18		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.5	119	0.0080	1.34		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
10.3	829	Total			

Summary for Subcatchment 26S: UNDEVELOPED

Runoff = 18.1 cfs @ 13.37 hrs, Volume= 235,177 cf, Depth= 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=5.27"

Area (sf)	CN	Description
1,184,876	70	Woods, Good, HSG C
75,742	74	>75% Grass cover, Good, HSG C
1,260,618	70	Weighted Average
1,260,618		100.00% Pervious Area

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
29.6	1,022	0.0530	0.58		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.6	586	0.0360	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
36.1	1,210	0.0500	0.56		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
98.6	2,868	Total			

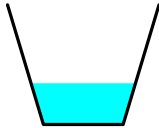
Summary for Reach 11R: Culvert

Inflow Area = 640,208 sf, 1.71% Impervious, Inflow Depth = 2.39" for 10-Year D event
 Inflow = 11.5 cfs @ 12.96 hrs, Volume= 127,627 cf
 Outflow = 11.5 cfs @ 12.96 hrs, Volume= 127,627 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 Max. Velocity= 4.84 fps, Min. Travel Time= 0.2 min
 Avg. Velocity = 1.91 fps, Avg. Travel Time= 0.4 min

Peak Storage= 119 cf @ 12.96 hrs
 Average Depth at Peak Storage= 1.03'
 Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

2.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
 Side Slope Z-value= 0.3 ' Top Width= 3.80'
 Length= 50.0' Slope= 0.0200 ' / '
 Inlet Invert= 280.00', Outlet Invert= 279.00'

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Summary for Pond 9P: CULVERT

Inflow Area = 106,603 sf, 0.00% Impervious, Inflow Depth = 2.58" for 10-Year D event
 Inflow = 4.9 cfs @ 12.25 hrs, Volume= 22,933 cf
 Outflow = 4.8 cfs @ 12.28 hrs, Volume= 22,804 cf, Atten= 2%, Lag= 1.6 min
 Primary = 4.8 cfs @ 12.28 hrs, Volume= 22,804 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 Peak Elev= 295.08' @ 12.28 hrs Surf.Area= 647 sf Storage= 678 cf

Plug-Flow detention time= 9.5 min calculated for 22,798 cf (99% of inflow)
 Center-of-Mass det. time= 6.2 min (876.4 - 870.2)

Volume	Invert	Avail.Storage	Storage Description		
#1	293.00'	4,006 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.00	0	0.0	0	0	0
294.00	385	92.0	128	128	675
296.00	925	120.0	1,271	1,400	1,193
298.00	1,723	157.0	2,607	4,006	2,054

Device	Routing	Invert	Outlet Devices		
#1	Primary	294.00'	18.0" Round Culvert L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 294.00' / 293.00' S= 0.0133 ' / ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf		

Primary OutFlow Max=4.8 cfs @ 12.28 hrs HW=295.07' (Free Discharge)
 1=Culvert (Inlet Controls 4.8 cfs @ 3.53 fps)

Summary for Pond 10P: DB1

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Inflow Area = 1,677,085 sf, 37.19% Impervious, Inflow Depth = 3.43" for 10-Year D event
 Inflow = 84.9 cfs @ 12.23 hrs, Volume= 478,922 cf
 Outflow = 8.7 cfs @ 14.05 hrs, Volume= 478,903 cf, Atten= 90%, Lag= 109.4 min
 Discarded = 0.6 cfs @ 14.05 hrs, Volume= 49,774 cf
 Primary = 8.1 cfs @ 14.05 hrs, Volume= 429,129 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 280.46' @ 14.05 hrs Surf.Area= 90,750 sf Storage= 236,357 cf

Plug-Flow detention time= 404.3 min calculated for 478,903 cf (100% of inflow)
 Center-of-Mass det. time= 404.1 min (1,225.5 - 821.4)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	603,909 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	273.00'	138 cf	4.00'D x 11.00'H Vertical Cone/Cylinder
			604,047 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
275.00	100	40.0	0	0	100
276.00	13,700	600.0	4,990	4,990	28,622
277.00	27,095	820.0	20,021	25,011	53,492
278.00	44,050	1,020.0	35,231	60,242	82,791
279.00	69,900	1,580.0	56,480	116,721	198,664
280.00	87,050	1,610.0	78,318	195,040	206,444
282.00	103,500	1,725.0	190,313	385,353	237,146
284.00	115,160	1,730.0	218,556	603,909	240,864

Device	Routing	Invert	Outlet Devices
#1	Primary	273.34'	24.0" Round Culvert L= 90.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' / Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	276.36'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	278.80'	0.7' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	281.40'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	283.50'	6.0' long x 10.0' breadth Emergency Spillway Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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#6 Discarded 273.00' Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.6 cfs @ 14.05 hrs HW=280.46' (Free Discharge)
6=Exfiltration (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=8.1 cfs @ 14.05 hrs HW=280.46' (Free Discharge)
1=Culvert (Passes 8.1 cfs of 37.4 cfs potential flow)
2=Orifice/Grate (Orifice Controls 5.6 cfs @ 9.45 fps)
3=Sharp-Crested Rectangular Weir (Weir Controls 2.6 cfs @ 4.22 fps)
4=Orifice/Grate (Controls 0.0 cfs)
5=Emergency Spillway (Controls 0.0 cfs)

Summary for Pond 12P: CULV 30

Inflow Area = 527,285 sf, 4.17% Impervious, Inflow Depth = 2.60" for 10-Year D event
 Inflow = 19.4 cfs @ 12.32 hrs, Volume= 114,079 cf
 Outflow = 19.3 cfs @ 12.34 hrs, Volume= 114,079 cf, Atten= 1%, Lag= 1.2 min
 Discarded = 0.0 cfs @ 12.34 hrs, Volume= 416 cf
 Primary = 19.3 cfs @ 12.34 hrs, Volume= 113,663 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6
 Peak Elev= 281.93' @ 12.34 hrs Surf.Area= 1,019 sf Storage= 1,659 cf

Plug-Flow detention time= 4.0 min calculated for 114,051 cf (100% of inflow)
 Center-of-Mass det. time= 4.2 min (877.0 - 872.8)

Volume	Invert	Avail.Storage	Storage Description	
#1	279.50'	8,119 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
279.50	0	0	0	0
280.00	610	102	102	610
282.00	1,035	1,626	1,728	1,081
284.00	1,570	2,586	4,315	1,673
286.00	2,255	3,804	8,119	2,425

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Device	Routing	Invert	Outlet Devices
#1	Primary	280.00'	30.0" Round Culvert L= 129.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 280.00' / 278.00' S= 0.0155 ' /' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf
#2	Discarded	279.50'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.34 hrs HW=281.93' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=19.2 cfs @ 12.34 hrs HW=281.93' (Free Discharge)
1=Culvert (Inlet Controls 19.2 cfs @ 4.73 fps)

Summary for Pond 13P: CULV 12A

Inflow Area = 421,825 sf, 65.19% Impervious, Inflow Depth = 4.18" for 10-Year D event
 Inflow = 32.6 cfs @ 12.16 hrs, Volume= 146,919 cf
 Outflow = 28.4 cfs @ 12.21 hrs, Volume= 146,919 cf, Atten= 13%, Lag= 3.1 min
 Primary = 28.4 cfs @ 12.21 hrs, Volume= 146,919 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6
 Peak Elev= 293.69' @ 12.21 hrs Surf.Area= 3,132 sf Storage= 5,332 cf

Plug-Flow detention time= 2.3 min calculated for 146,919 cf (100% of inflow)
 Center-of-Mass det. time= 2.3 min (779.5 - 777.2)

Volume	Invert	Avail.Storage	Storage Description		
#1	291.00'	28,701 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
291.00	100	40.0	0	0	100
292.00	2,142	200.0	902	902	3,158
294.00	3,334	230.0	5,432	6,334	4,271
296.00	4,670	270.0	7,967	14,300	5,939
298.00	6,352	323.0	10,979	25,279	8,510
298.50	7,345	340.0	3,421	28,701	9,422

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Device	Routing	Invert	Outlet Devices
#1	Primary	291.00'	30.0" Round Culvert L= 120.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 291.00' / 286.20' S= 0.0400 ' /' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf

Primary OutFlow Max=28.4 cfs @ 12.21 hrs HW=293.69' (Free Discharge)
1=Culvert (Inlet Controls 28.4 cfs @ 5.78 fps)

Summary for Pond 22P: INF

Inflow Area = 111,608 sf, 100.00% Impervious, Inflow Depth = 5.03" for 10-Year D event
 Inflow = 10.5 cfs @ 12.17 hrs, Volume= 46,808 cf
 Outflow = 9.0 cfs @ 12.22 hrs, Volume= 46,809 cf, Atten= 15%, Lag= 3.2 min
 Discarded = 0.0 cfs @ 12.22 hrs, Volume= 1,672 cf
 Primary = 9.0 cfs @ 12.22 hrs, Volume= 45,137 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4
 Peak Elev= 287.86' @ 12.22 hrs Surf.Area= 2,044 sf Storage= 3,412 cf

Plug-Flow detention time= 29.9 min calculated for 46,797 cf (100% of inflow)
 Center-of-Mass det. time= 30.0 min (783.3 - 753.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	285.50'	1,589 cf	28.00'W x 73.00'L x 3.21'H Field A 6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids
#2A	286.00'	2,587 cf	Cultec R-280HD x 60 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 6 rows
		4,175 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	286.00'	18.0" Round Culvert L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 286.00' / 285.14' S= 0.0430 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	285.50'	0.270 in/hr Exfiltration over Wetted area

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Discarded OutFlow Max=0.0 cfs @ 12.22 hrs HW=287.84' (Free Discharge)**2=Exfiltration** (Exfiltration Controls 0.0 cfs)**Primary OutFlow** Max=8.9 cfs @ 12.22 hrs HW=287.84' (Free Discharge)**1=Culvert** (Inlet Controls 8.9 cfs @ 5.03 fps)**Summary for Pond 30P: DB2**

Inflow Area = 1,187,726 sf, 58.27% Impervious, Inflow Depth = 3.96" for 10-Year D event
 Inflow = 83.1 cfs @ 12.17 hrs, Volume= 392,126 cf
 Outflow = 14.2 cfs @ 12.88 hrs, Volume= 392,126 cf, Atten= 83%, Lag= 42.3 min
 Discarded = 0.5 cfs @ 12.88 hrs, Volume= 43,530 cf
 Primary = 13.7 cfs @ 12.88 hrs, Volume= 348,596 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4
 Peak Elev= 328.16' @ 12.88 hrs Surf.Area= 74,088 sf Storage= 179,254 cf

Plug-Flow detention time= 349.5 min calculated for 392,126 cf (100% of inflow)
 Center-of-Mass det. time= 349.3 min (1,151.3 - 802.0)

Volume	Invert	Avail.Storage	Storage Description			
#1	323.00'	349,948 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
323.00	400	80.0	0.0	0	0	400
324.00	19,450	575.0	100.0	7,546	7,546	26,203
325.00	28,075	685.0	100.0	23,631	31,177	37,250
326.00	37,630	790.0	100.0	32,736	63,913	49,597
327.00	50,456	930.0	100.0	43,887	107,800	68,779
328.00	70,215	1,120.0	100.0	60,064	167,864	99,791
329.00	96,500	1,450.0	100.0	83,010	250,874	167,293
330.00	101,670	1,610.0	100.0	99,074	349,948	206,284

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Device	Routing	Invert	Outlet Devices
#1	Primary	323.00'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 323.00' / 319.50' S= 0.0500 ' / ' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	324.34'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	326.50'	20.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir Cv= 2.69 (C= 3.36)
#4	Device 1	328.90'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	329.50'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir X 0.00 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#6	Discarded	323.00'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.5 cfs @ 12.88 hrs HW=328.16' (Free Discharge)**6=Exfiltration** (Exfiltration Controls 0.5 cfs)**Primary OutFlow** Max=13.7 cfs @ 12.88 hrs HW=328.16' (Free Discharge)

1=Culvert (Passes 13.7 cfs of 30.8 cfs potential flow)
2=Orifice/Grate (Orifice Controls 4.8 cfs @ 8.88 fps)
3=Sharp-Crested Vee/Trap Weir (Weir Controls 8.9 cfs @ 4.13 fps)
4=Orifice/Grate (Controls 0.0 cfs)
5=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Summary for Link 1L: Total PreDeveloped West

Inflow Area = 4,510,313 sf, 0.00% Impervious, Inflow Depth = 2.24" for 10-Year D event
 Inflow = 67.8 cfs @ 13.22 hrs, Volume= 841,429 cf
 Primary = 67.8 cfs @ 13.22 hrs, Volume= 841,429 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

Summary for Link 10L: PostDeveloped

Inflow Area = 2,347,956 sf, 27.53% Impervious, Inflow Depth = 2.90" for 10-Year D event
 Inflow = 19.7 cfs @ 12.98 hrs, Volume= 566,522 cf
 Primary = 19.7 cfs @ 12.98 hrs, Volume= 566,522 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

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NRCC 24-hr D 10-Year D Rainfall=5.27"

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Summary for Link 11L: Total Post Developed West

Inflow Area = 4,397,792 sf, 14.70% Impervious, Inflow Depth = 2.59" for 10-Year D event
 Inflow = 58.1 cfs @ 12.91 hrs, Volume= 948,932 cf
 Primary = 58.1 cfs @ 12.91 hrs, Volume= 948,932 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

Summary for Link 12L: Total Post-Developed North

Inflow Area = 2,448,344 sf, 28.27% Impervious, Inflow Depth = 2.86" for 10-Year D event
 Inflow = 31.3 cfs @ 13.27 hrs, Volume= 583,773 cf
 Primary = 31.3 cfs @ 13.27 hrs, Volume= 583,773 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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Summary for Subcatchment 1S: PreDeveloped

Runoff = 52.8 cfs @ 13.37 hrs, Volume= 670,301 cf, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
2,540,256	70	Woods, Good, HSG C
2,540,256		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.8	483	0.0200	0.35		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.8	623	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
32.8	1,254	0.0650	0.64		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
97.9	2,410	Total			

Summary for Subcatchment 2S: PreDeveloped

Runoff = 46.7 cfs @ 13.11 hrs, Volume= 519,841 cf, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
1,970,057	70	Woods, Good, HSG C
1,970,057		100.00% Pervious Area

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
25.8	387	0.0100	0.25		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
6.2	196	0.0440	0.52		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
25.8	1,142	0.0870	0.74		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
79.3	1,775	Total			

Summary for Subcatchment 3S: Total PreDeveloped North

Runoff = 48.6 cfs @ 13.26 hrs, Volume= 616,357 cf, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
2,335,823	70	Woods, Good, HSG C
2,335,823		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
27.6	641	0.0240	0.39		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.2	1,713	0.0610	0.62		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.6	267	0.0600	2.71	14.43	Parabolic Channel, W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.100 Earth, dense brush, high stage
96.9	2,671	Total			

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Summary for Subcatchment 8S: EAST SIDE DRIVE

Runoff = 9.2 cfs @ 12.25 hrs, Volume= 43,641 cf, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
140,049	74	>75% Grass cover, Good, HSG C
6,776	70	Woods, Good, HSG C
146,825	74	Weighted Average
146,825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
6.9	937	0.0230	2.27		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.6	703	0.0450	7.48	37.40	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00' n= 0.030 Earth, grassed & winding
16.7	1,690	Total			

Summary for Subcatchment 9S: WEST SIDE DRIVE

Runoff = 6.8 cfs @ 12.25 hrs, Volume= 31,686 cf, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
106,603	74	>75% Grass cover, Good, HSG C
106,603		100.00% Pervious Area

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
6.9	937	0.0230	2.27		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.4	638	0.0450	7.48	37.40	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00' n= 0.030 Earth, grassed & winding
16.5	1,625	Total			

Summary for Subcatchment 10S: 555 HALF ROOF

Runoff = 33.7 cfs @ 12.15 hrs, Volume= 142,345 cf, Depth= 6.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
275,000	98	Roofs, HSG C
275,000		100.00% Impervious Area

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

Summary for Subcatchment 11S: 555 SW

Runoff = 20.5 cfs @ 12.27 hrs, Volume= 107,994 cf, Depth= 5.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"**3780 STORMWATER-(1-24-23)**

NRCC 24-hr D 25-Year D Rainfall=6.45"

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Area (sf)	CN	Description
90,464	74	>75% Grass cover, Good, HSG C
160,091	98	Paved parking, HSG C
250,555	89	Weighted Average
90,464		36.11% Pervious Area
160,091		63.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0110	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.2	140	0.0110	0.73		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.3	296	0.0110	2.13		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.2	1,467	0.0170	7.75	13.70	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
19.1	1,953	Total			

Summary for Subcatchment 12S: Road

Runoff = 1.5 cfs @ 12.15 hrs, Volume= 5,916 cf, Depth= 5.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
9,362	98	Paved parking, HSG C
3,789	74	>75% Grass cover, Good, HSG C
13,151	91	Weighted Average
3,789		28.81% Pervious Area
9,362		71.19% Impervious Area

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	44	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.5	122	0.0440	4.26		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	100	0.0400	9.07	7.13	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
8.1	266	Total			

Summary for Subcatchment 13S: Undeveloped

Runoff = 16.1 cfs @ 12.95 hrs, Volume= 168,244 cf, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
496,005	70	Woods, Good, HSG C
122,277	74	>75% Grass cover, Good, HSG C
618,282	71	Weighted Average
618,282		100.00% Pervious Area

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
20.8	599	0.0370	0.48		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
12.5	350	0.0350	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
3.1	163	0.1200	0.87		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
22.7	737	0.0470	0.54		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
71.4	1,899	Total			

Summary for Subcatchment 14S: Undeveloped

Runoff = 24.9 cfs @ 12.34 hrs, Volume= 138,442 cf, Depth= 3.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
178,452	70	Woods, Good, HSG C
300,921	74	>75% Grass cover, Good, HSG C
479,373	73	Weighted Average
479,373		100.00% Pervious Area

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0050	0.06		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.6	275	0.0370	2.89		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.4	225	0.2000	1.12		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.0	239	0.0650	3.82		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.1	357	0.0160	1.90		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
23.4	1,146	Total			

Summary for Subcatchment 15S: Road

Runoff = 4.3 cfs @ 12.13 hrs, Volume= 14,902 cf, Depth= 4.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
20,008	98	Paved parking, HSG C
16,125	74	>75% Grass cover, Good, HSG C
36,133	87	Weighted Average
16,125		44.63% Pervious Area
20,008		55.37% Impervious Area

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	16	0.0100	0.06		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.5	132	0.0460	4.35		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.3	110	0.0200	6.42	5.04	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
5.1	258	Total			Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment 16S: Road

Runoff = 3.6 cfs @ 12.13 hrs, Volume= 12,646 cf, Depth= 4.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description			
18,005	92	Paved roads w/open ditches, 50% imp, HSG C			
2,688	98	Paved parking, HSG C			
9,970	74	>75% Grass cover, Good, HSG C			
30,663	87	Weighted Average			
18,973		61.87% Pervious Area			
11,691		38.13% Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry.

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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Summary for Subcatchment 17S: 465 SITE SOUTH

Runoff = 4.0 cfs @ 12.25 hrs, Volume= 19,603 cf, Depth= 4.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
21,889	74	>75% Grass cover, Good, HSG C
25,644	98	Unconnected pavement, HSG C
47,533	87	Weighted Average
21,889		46.05% Pervious Area
25,644		53.95% Impervious Area
25,644		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	38	0.0100	0.07		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
8.1	694	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
16.8	732	Total			

Summary for Subcatchment 18S: Road

Runoff = 2.8 cfs @ 12.13 hrs, Volume= 10,072 cf, Depth= 5.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
21,926	92	Paved roads w/open ditches, 50% imp, HSG C
10,963		50.00% Pervious Area
10,963		50.00% Impervious Area

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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

Summary for Subcatchment 19S: 465 SITE NORTH

Runoff = 5.0 cfs @ 12.16 hrs, Volume= 18,879 cf, Depth= 4.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
25,932	74	>75% Grass cover, Good, HSG C
21,980	98	Paved parking, HSG C
47,912	85	Weighted Average
25,932		54.12% Pervious Area
21,980		45.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	45	0.0050	0.67		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
7.6	658	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.7	703	Total			

Summary for Subcatchment 20S: Undeveloped

Runoff = 55.2 cfs @ 12.89 hrs, Volume= 540,893 cf, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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Area (sf)	CN	Description
1,809,628	70	Woods, Good, HSG C
240,208	74	>75% Grass cover, Good, HSG C
2,049,836	70	Weighted Average
2,049,836		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0210	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
13.2	293	0.0220	0.37		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
11.6	322	0.0340	0.46		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
27.3	1,193	0.0850	0.73		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
64.2	1,858	Total			

Summary for Subcatchment 21S: DB1

Runoff = 14.6 cfs @ 12.13 hrs, Volume= 48,268 cf, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
162,392	74	>75% Grass cover, Good, HSG C
162,392		100.00% Pervious Area

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

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Summary for Subcatchment 22S: 465 SITE ROOF

Runoff = 12.9 cfs @ 12.17 hrs, Volume= 57,770 cf, Depth= 6.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
57,453	98	Roofs, HSG C
54,155	98	Roofs, HSG C
111,608	98	Weighted Average
111,608		100.00% Impervious Area

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

Summary for Subcatchment 23S: 555 HALF ROOF

Runoff = 35.6 cfs @ 12.13 hrs, Volume= 142,345 cf, Depth= 6.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
275,000	98	Roofs, HSG C
275,000		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,
0.7	483	0.0270	11.83	37.17	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
6.7	483	Total			

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Summary for Subcatchment 24S: LOT3 NORTH

Runoff = 61.0 cfs @ 12.22 hrs, Volume= 287,054 cf, Depth= 5.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
248,887	74	>75% Grass cover, Good, HSG C
417,105	98	Paved parking, HSG C
665,992	89	Weighted Average
248,887		37.37% Pervious Area
417,105		62.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0540	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
4.8	200	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	184	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.0	1,300	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
14.8	1,734	Total			

Summary for Subcatchment 25S: DB2

Runoff = 18.9 cfs @ 12.18 hrs, Volume= 73,337 cf, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"**3780 STORMWATER-(1-24-23)**

NRCC 24-hr D 25-Year D Rainfall=6.45"

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Area (sf)	CN	Description
246,734	74	>75% Grass cover, Good, HSG C
246,734		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0600	0.16		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.5	660	0.0450	3.18		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.5	119	0.0080	1.34		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
10.3	829	Total			

Summary for Subcatchment 26S: UNDEVELOPED

Runoff = 25.9 cfs @ 13.35 hrs, Volume= 332,641 cf, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.45"

Area (sf)	CN	Description
1,184,876	70	Woods, Good, HSG C
75,742	74	>75% Grass cover, Good, HSG C
1,260,618	70	Weighted Average
1,260,618		100.00% Pervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
29.6	1,022	0.0530	0.58		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.6	586	0.0360	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
36.1	1,210	0.0500	0.56		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
98.6	2,868	Total			

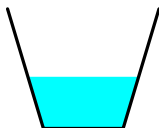
Summary for Reach 11R: Culvert

Inflow Area = 640,208 sf, 1.71% Impervious, Inflow Depth = 3.34" for 25-Year D event
 Inflow = 16.4 cfs @ 12.94 hrs, Volume= 178,316 cf
 Outflow = 16.4 cfs @ 12.95 hrs, Volume= 178,316 cf, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 Max. Velocity= 5.30 fps, Min. Travel Time= 0.2 min
 Avg. Velocity= 2.11 fps, Avg. Travel Time= 0.4 min

Peak Storage= 155 cf @ 12.95 hrs
 Average Depth at Peak Storage= 1.30'
 Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

2.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding
 Side Slope Z-value= 0.3 ' Top Width= 3.80'
 Length= 50.0' Slope= 0.0200 ' / '
 Inlet Invert= 280.00', Outlet Invert= 279.00'

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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Summary for Pond 9P: CULVERT

Inflow Area = 106,603 sf, 0.00% Impervious, Inflow Depth = 3.57" for 25-Year D event
 Inflow = 6.8 cfs @ 12.25 hrs, Volume= 31,686 cf
 Outflow = 6.6 cfs @ 12.28 hrs, Volume= 31,558 cf, Atten= 2%, Lag= 1.8 min
 Primary = 6.6 cfs @ 12.28 hrs, Volume= 31,558 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 Peak Elev= 295.35' @ 12.28 hrs Surf.Area= 723 sf Storage= 862 cf

Plug-Flow detention time= 7.9 min calculated for 31,558 cf (100% of inflow)
 Center-of-Mass det. time= 5.4 min (863.6 - 858.2)

Volume	Invert	Avail.Storage	Storage Description		
#1	293.00'	4,006 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.00	0	0.0	0	0	0
294.00	385	92.0	128	128	675
296.00	925	120.0	1,271	1,400	1,193
298.00	1,723	157.0	2,607	4,006	2,054

Device	Routing	Invert	Outlet Devices
#1	Primary	294.00'	18.0" Round Culvert L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 294.00' / 293.00' S= 0.0133 ' / ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=6.6 cfs @ 12.28 hrs HW=295.34' (Free Discharge)
 #1=Culvert (Inlet Controls 6.6 cfs @ 3.94 fps)

Summary for Pond 10P: DB1

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Inflow Area = 1,677,085 sf, 37.19% Impervious, Inflow Depth = 4.49" for 25-Year D event
 Inflow = 108.9 cfs @ 12.24 hrs, Volume= 627,197 cf
 Outflow = 11.3 cfs @ 14.01 hrs, Volume= 627,178 cf, Atten= 90%, Lag= 106.4 min
 Discarded = 0.6 cfs @ 14.01 hrs, Volume= 56,698 cf
 Primary = 10.7 cfs @ 14.01 hrs, Volume= 570,480 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 281.31' @ 14.01 hrs Surf.Area= 97,640 sf Storage= 315,634 cf

Plug-Flow detention time= 422.3 min calculated for 627,178 cf (100% of inflow)
 Center-of-Mass det. time= 422.1 min (1,237.2 - 815.1)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	603,909 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	273.00'	138 cf	4.00'D x 11.00'H Vertical Cone/Cylinder
		604,047 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
275.00	100	40.0	0	0	100
276.00	13,700	600.0	4,990	4,990	28,622
277.00	27,095	820.0	20,021	25,011	53,492
278.00	44,050	1,020.0	35,231	60,242	82,791
279.00	69,900	1,580.0	56,480	116,721	198,664
280.00	87,050	1,610.0	78,318	195,040	206,444
282.00	103,500	1,725.0	190,313	385,353	237,146
284.00	115,160	1,730.0	218,556	603,909	240,864

Device	Routing	Invert	Outlet Devices
#1	Primary	273.34'	24.0" Round Culvert L= 90.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' / Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	276.36'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	278.80'	0.7' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	281.40'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	283.50'	6.0' long x 10.0' breadth Emergency Spillway Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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#6 Discarded 273.00' Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.6 cfs @ 14.01 hrs HW=281.31' (Free Discharge)
6=Exfiltration (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=10.7 cfs @ 14.01 hrs HW=281.31' (Free Discharge)
1=Culvert (Passes 10.7 cfs of 39.9 cfs potential flow)
2=Orifice/Grate (Orifice Controls 6.1 cfs @ 10.43 fps)
3=Sharp-Crested Rectangular Weir (Weir Controls 4.5 cfs @ 5.18 fps)
4=Orifice/Grate (Controls 0.0 cfs)
5=Emergency Spillway (Controls 0.0 cfs)

Summary for Pond 12P: CULV 30

Inflow Area = 527,285 sf, 4.17% Impervious, Inflow Depth = 3.58" for 25-Year D event
 Inflow = 26.9 cfs @ 12.32 hrs, Volume= 157,321 cf
 Outflow = 26.6 cfs @ 12.35 hrs, Volume= 157,320 cf, Atten= 1%, Lag= 1.9 min
 Discarded = 0.0 cfs @ 12.35 hrs, Volume= 436 cf
 Primary = 26.6 cfs @ 12.35 hrs, Volume= 156,884 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6
 Peak Elev= 282.51' @ 12.35 hrs Surf.Area= 1,161 sf Storage= 2,290 cf

Plug-Flow detention time= 3.4 min calculated for 157,281 cf (100% of inflow)
 Center-of-Mass det. time= 3.5 min (864.8 - 861.3)

Volume	Invert	Avail.Storage	Storage Description	
#1	279.50'	8,119 cf	Custom Stage Data (Conic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
279.50	0	0	0	0
280.00	610	102	102	610
282.00	1,035	1,626	1,728	1,081
284.00	1,570	2,586	4,315	1,673
286.00	2,255	3,804	8,119	2,425

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NRCC 24-hr D 25-Year D Rainfall=6.45"

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Device	Routing	Invert	Outlet Devices
#1	Primary	280.00'	30.0" Round Culvert L= 129.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 280.00' / 278.00' S= 0.0155 ' /' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf
#2	Discarded	279.50'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.35 hrs HW=282.51' (Free Discharge)**2=Exfiltration** (Exfiltration Controls 0.0 cfs)**Primary OutFlow** Max=26.5 cfs @ 12.35 hrs HW=282.51' (Free Discharge)**1=Culvert** (Inlet Controls 26.5 cfs @ 5.40 fps)**Summary for Pond 13P: CULV 12A**

Inflow Area = 421,825 sf, 65.19% Impervious, Inflow Depth = 5.29" for 25-Year D event
 Inflow = 40.9 cfs @ 12.16 hrs, Volume= 185,986 cf
 Outflow = 34.1 cfs @ 12.22 hrs, Volume= 185,987 cf, Atten= 16%, Lag= 3.7 min
 Primary = 34.1 cfs @ 12.22 hrs, Volume= 185,987 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6

Peak Elev= 294.34' @ 12.22 hrs Surf.Area= 3,544 sf Storage= 7,494 cf

Plug-Flow detention time= 2.4 min calculated for 185,941 cf (100% of inflow)

Center-of-Mass det. time= 2.4 min (776.4 - 774.0)

Volume	Invert	Avail.Storage	Storage Description		
#1	291.00'	28,701 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
291.00	100	40.0	0	0	100
292.00	2,142	200.0	902	902	3,158
294.00	3,334	230.0	5,432	6,334	4,271
296.00	4,670	270.0	7,967	14,300	5,939
298.00	6,352	323.0	10,979	25,279	8,510
298.50	7,345	340.0	3,421	28,701	9,422

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 25-Year D Rainfall=6.45"

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Device	Routing	Invert	Outlet Devices
#1	Primary	291.00'	30.0" Round Culvert L= 120.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 291.00' / 286.20' S= 0.0400 ' /' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf

Primary OutFlow Max=34.0 cfs @ 12.22 hrs HW=294.32' (Free Discharge)**1=Culvert** (Inlet Controls 34.0 cfs @ 6.93 fps)**Summary for Pond 22P: INF**

Inflow Area = 111,608 sf, 100.00% Impervious, Inflow Depth = 6.21" for 25-Year D event
 Inflow = 12.9 cfs @ 12.17 hrs, Volume= 57,770 cf
 Outflow = 11.1 cfs @ 12.22 hrs, Volume= 57,772 cf, Atten= 14%, Lag= 3.1 min
 Discarded = 0.0 cfs @ 12.22 hrs, Volume= 1,686 cf
 Primary = 11.1 cfs @ 12.22 hrs, Volume= 56,086 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4

Peak Elev= 288.46' @ 12.22 hrs Surf.Area= 2,044 sf Storage= 3,972 cf

Plug-Flow detention time= 25.9 min calculated for 57,758 cf (100% of inflow)

Center-of-Mass det. time= 26.1 min (775.8 - 749.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	285.50'	1,589 cf	28.00'W x 73.00'L x 3.21'H Field A 6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids
#2A	286.00'	2,587 cf	Cultec R-280HD x 60 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 6 rows
		4,175 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	286.00'	18.0" Round Culvert L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 286.00' / 285.14' S= 0.0430 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	285.50'	0.270 in/hr Exfiltration over Wetted area

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 25-Year D Rainfall=6.45"

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Discarded OutFlow Max=0.0 cfs @ 12.22 hrs HW=288.43' (Free Discharge)
↳ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)**Primary OutFlow** Max=11.0 cfs @ 12.22 hrs HW=288.43' (Free Discharge)
↳ **1=Culvert** (Inlet Controls 11.0 cfs @ 6.25 fps)**Summary for Pond 30P: DB2**

Inflow Area = 1,187,726 sf, 58.27% Impervious, Inflow Depth = 5.08" for 25-Year D event
 Inflow = 105.8 cfs @ 12.17 hrs, Volume= 502,736 cf
 Outflow = 20.2 cfs @ 12.77 hrs, Volume= 502,736 cf, Atten= 81%, Lag= 35.6 min
 Discarded = 0.6 cfs @ 12.77 hrs, Volume= 46,625 cf
 Primary = 19.7 cfs @ 12.77 hrs, Volume= 456,111 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4
 Peak Elev= 328.71' @ 12.77 hrs Surf.Area= 88,319 sf Storage= 223,646 cf

Plug-Flow detention time= 313.8 min calculated for 502,611 cf (100% of inflow)
 Center-of-Mass det. time= 314.9 min (1,110.3 - 795.5)

Volume	Invert	Avail.Storage	Storage Description			
#1	323.00'	349,948 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
323.00	400	80.0	0.0	0	0	400
324.00	19,450	575.0	100.0	7,546	7,546	26,203
325.00	28,075	685.0	100.0	23,631	31,177	37,250
326.00	37,630	790.0	100.0	32,736	63,913	49,597
327.00	50,456	930.0	100.0	43,887	107,800	68,779
328.00	70,215	1,120.0	100.0	60,064	167,864	99,791
329.00	96,500	1,450.0	100.0	83,010	250,874	167,293
330.00	101,670	1,610.0	100.0	99,074	349,948	206,284

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 25-Year D Rainfall=6.45"

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Device	Routing	Invert	Outlet Devices
#1	Primary	323.00'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 323.00' / 319.50' S= 0.0500 ' /' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	324.34'	10.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	326.50'	20.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir Cv= 2.69 (C= 3.36)
#4	Device 1	328.90'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	329.50'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir X 0.00 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#6	Discarded	323.00'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.6 cfs @ 12.77 hrs HW=328.71' (Free Discharge)
↳ **6=Exfiltration** (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=19.7 cfs @ 12.77 hrs HW=328.71' (Free Discharge)
 ↳ **1=Culvert** (Passes 19.7 cfs of 32.8 cfs potential flow)
 ↳ **2=Orifice/Grate** (Orifice Controls 5.2 cfs @ 9.57 fps)
 ↳ **3=Sharp-Crested Vee/Trap Weir** (Weir Controls 14.4 cfs @ 4.71 fps)
 ↳ **4=Orifice/Grate** (Controls 0.0 cfs)
 ↳ **5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Link 1L: Total PreDeveloped West

Inflow Area = 4,510,313 sf, 0.00% Impervious, Inflow Depth = 3.17" for 25-Year D event
 Inflow = 97.5 cfs @ 13.18 hrs, Volume= 1,190,142 cf
 Primary = 97.5 cfs @ 13.18 hrs, Volume= 1,190,142 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

Summary for Link 10L: PostDeveloped

Inflow Area = 2,347,956 sf, 27.53% Impervious, Inflow Depth = 3.89" for 25-Year D event
 Inflow = 26.9 cfs @ 12.97 hrs, Volume= 761,442 cf
 Primary = 26.9 cfs @ 12.97 hrs, Volume= 761,442 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 1S: PreDeveloped

Runoff = 78.6 cfs @ 13.36 hrs, Volume= 992,507 cf, Depth= 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
2,540,256	70	Woods, Good, HSG C
2,540,256		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.8	483	0.0200	0.35		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.8	623	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
32.8	1,254	0.0650	0.64		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
97.9	2,410	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 1S: PreDeveloped

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	4.69	0.0	111.00	8.26	4.69	0.0
1.50	0.18	0.00	0.0	57.00	8.26	4.69	0.0	112.50	8.26	4.69	0.0
3.00	0.39	0.00	0.0	58.50	8.26	4.69	0.0	114.00	8.26	4.69	0.0
4.50	0.61	0.00	0.0	60.00	8.26	4.69	0.0	115.50	8.26	4.69	0.0
6.00	0.85	0.00	0.0	61.50	8.26	4.69	0.0	117.00	8.26	4.69	0.0
7.50	1.14	0.02	0.2	63.00	8.26	4.69	0.0	118.50	8.26	4.69	0.0
9.00	1.52	0.09	1.7	64.50	8.26	4.69	0.0	120.00	8.26	4.69	0.0
10.50	2.06	0.26	4.5	66.00	8.26	4.69	0.0				
12.00	3.96	1.30	14.1	67.50	8.26	4.69	0.0				
13.50	6.20	2.96	76.4	69.00	8.26	4.69	0.0				
15.00	6.74	3.41	29.0	70.50	8.26	4.69	0.0				
16.50	7.12	3.72	15.2	72.00	8.26	4.69	0.0				
18.00	7.41	3.96	11.0	73.50	8.26	4.69	0.0				
19.50	7.65	4.17	8.7	75.00	8.26	4.69	0.0				
21.00	7.87	4.36	7.8	76.50	8.26	4.69	0.0				
22.50	8.08	4.53	7.1	78.00	8.26	4.69	0.0				
24.00	8.26	4.69	6.5	79.50	8.26	4.69	0.0				
25.50	8.26	4.69	2.6	81.00	8.26	4.69	0.0				
27.00	8.26	4.69	0.3	82.50	8.26	4.69	0.0				
28.50	8.26	4.69	0.0	84.00	8.26	4.69	0.0				
30.00	8.26	4.69	0.0	85.50	8.26	4.69	0.0				
31.50	8.26	4.69	0.0	87.00	8.26	4.69	0.0				
33.00	8.26	4.69	0.0	88.50	8.26	4.69	0.0				
34.50	8.26	4.69	0.0	90.00	8.26	4.69	0.0				
36.00	8.26	4.69	0.0	91.50	8.26	4.69	0.0				
37.50	8.26	4.69	0.0	93.00	8.26	4.69	0.0				
39.00	8.26	4.69	0.0	94.50	8.26	4.69	0.0				
40.50	8.26	4.69	0.0	96.00	8.26	4.69	0.0				
42.00	8.26	4.69	0.0	97.50	8.26	4.69	0.0				
43.50	8.26	4.69	0.0	99.00	8.26	4.69	0.0				
45.00	8.26	4.69	0.0	100.50	8.26	4.69	0.0				
46.50	8.26	4.69	0.0	102.00	8.26	4.69	0.0				
48.00	8.26	4.69	0.0	103.50	8.26	4.69	0.0				
49.50	8.26	4.69	0.0	105.00	8.26	4.69	0.0				
51.00	8.26	4.69	0.0	106.50	8.26	4.69	0.0				
52.50	8.26	4.69	0.0	108.00	8.26	4.69	0.0				
54.00	8.26	4.69	0.0	109.50	8.26	4.69	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 2S: PreDeveloped

Runoff = 69.5 cfs @ 13.11 hrs, Volume= 769,724 cf, Depth= 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
1,970,057	70	Woods, Good, HSG C
1,970,057		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
25.8	387	0.0100	0.25		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
6.2	196	0.0440	0.52		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
25.8	1,142	0.0870	0.74		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
79.3	1,775	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 2S: PreDeveloped

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	4.69	0.0	111.00	8.26	4.69	0.0
1.50	0.18	0.00	0.0	57.00	8.26	4.69	0.0	112.50	8.26	4.69	0.0
3.00	0.39	0.00	0.0	58.50	8.26	4.69	0.0	114.00	8.26	4.69	0.0
4.50	0.61	0.00	0.0	60.00	8.26	4.69	0.0	115.50	8.26	4.69	0.0
6.00	0.85	0.00	0.0	61.50	8.26	4.69	0.0	117.00	8.26	4.69	0.0
7.50	1.14	0.02	0.3	63.00	8.26	4.69	0.0	118.50	8.26	4.69	0.0
9.00	1.52	0.09	1.6	64.50	8.26	4.69	0.0	120.00	8.26	4.69	0.0
10.50	2.06	0.26	4.1	66.00	8.26	4.69	0.0				
12.00	3.96	1.30	13.7	67.50	8.26	4.69	0.0				
13.50	6.20	2.96	56.5	69.00	8.26	4.69	0.0				
15.00	6.74	3.41	18.4	70.50	8.26	4.69	0.0				
16.50	7.12	3.72	10.5	72.00	8.26	4.69	0.0				
18.00	7.41	3.96	8.1	73.50	8.26	4.69	0.0				
19.50	7.65	4.17	6.5	75.00	8.26	4.69	0.0				
21.00	7.87	4.36	5.9	76.50	8.26	4.69	0.0				
22.50	8.08	4.53	5.4	78.00	8.26	4.69	0.0				
24.00	8.26	4.69	5.0	79.50	8.26	4.69	0.0				
25.50	8.26	4.69	1.2	81.00	8.26	4.69	0.0				
27.00	8.26	4.69	0.1	82.50	8.26	4.69	0.0				
28.50	8.26	4.69	0.0	84.00	8.26	4.69	0.0				
30.00	8.26	4.69	0.0	85.50	8.26	4.69	0.0				
31.50	8.26	4.69	0.0	87.00	8.26	4.69	0.0				
33.00	8.26	4.69	0.0	88.50	8.26	4.69	0.0				
34.50	8.26	4.69	0.0	90.00	8.26	4.69	0.0				
36.00	8.26	4.69	0.0	91.50	8.26	4.69	0.0				
37.50	8.26	4.69	0.0	93.00	8.26	4.69	0.0				
39.00	8.26	4.69	0.0	94.50	8.26	4.69	0.0				
40.50	8.26	4.69	0.0	96.00	8.26	4.69	0.0				
42.00	8.26	4.69	0.0	97.50	8.26	4.69	0.0				
43.50	8.26	4.69	0.0	99.00	8.26	4.69	0.0				
45.00	8.26	4.69	0.0	100.50	8.26	4.69	0.0				
46.50	8.26	4.69	0.0	102.00	8.26	4.69	0.0				
48.00	8.26	4.69	0.0	103.50	8.26	4.69	0.0				
49.50	8.26	4.69	0.0	105.00	8.26	4.69	0.0				
51.00	8.26	4.69	0.0	106.50	8.26	4.69	0.0				
52.50	8.26	4.69	0.0	108.00	8.26	4.69	0.0				
54.00	8.26	4.69	0.0	109.50	8.26	4.69	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 3S: Total PreDeveloped North

Runoff = 72.6 cfs @ 13.27 hrs, Volume= 912,633 cf, Depth= 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
2,335,823	70	Woods, Good, HSG C
2,335,823		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
27.6	641	0.0240	0.39		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.2	1,713	0.0610	0.62		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.6	267	0.0600	2.71	14.43	Parabolic Channel, W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.100 Earth, dense brush, high stage
96.9	2,671	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 3S: Total PreDeveloped North

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	4.69	0.0	111.00	8.26	4.69	0.0
1.50	0.18	0.00	0.0	57.00	8.26	4.69	0.0	112.50	8.26	4.69	0.0
3.00	0.39	0.00	0.0	58.50	8.26	4.69	0.0	114.00	8.26	4.69	0.0
4.50	0.61	0.00	0.0	60.00	8.26	4.69	0.0	115.50	8.26	4.69	0.0
6.00	0.85	0.00	0.0	61.50	8.26	4.69	0.0	117.00	8.26	4.69	0.0
7.50	1.14	0.02	0.2	63.00	8.26	4.69	0.0	118.50	8.26	4.69	0.0
9.00	1.52	0.09	1.6	64.50	8.26	4.69	0.0	120.00	8.26	4.69	0.0
10.50	2.06	0.26	4.2	66.00	8.26	4.69	0.0				
12.00	3.96	1.30	13.1	67.50	8.26	4.69	0.0				
13.50	6.20	2.96	70.1	69.00	8.26	4.69	0.0				
15.00	6.74	3.41	26.4	70.50	8.26	4.69	0.0				
16.50	7.12	3.72	13.9	72.00	8.26	4.69	0.0				
18.00	7.41	3.96	10.1	73.50	8.26	4.69	0.0				
19.50	7.65	4.17	8.0	75.00	8.26	4.69	0.0				
21.00	7.87	4.36	7.2	76.50	8.26	4.69	0.0				
22.50	8.08	4.53	6.6	78.00	8.26	4.69	0.0				
24.00	8.26	4.69	6.0	79.50	8.26	4.69	0.0				
25.50	8.26	4.69	2.4	81.00	8.26	4.69	0.0				
27.00	8.26	4.69	0.2	82.50	8.26	4.69	0.0				
28.50	8.26	4.69	0.0	84.00	8.26	4.69	0.0				
30.00	8.26	4.69	0.0	85.50	8.26	4.69	0.0				
31.50	8.26	4.69	0.0	87.00	8.26	4.69	0.0				
33.00	8.26	4.69	0.0	88.50	8.26	4.69	0.0				
34.50	8.26	4.69	0.0	90.00	8.26	4.69	0.0				
36.00	8.26	4.69	0.0	91.50	8.26	4.69	0.0				
37.50	8.26	4.69	0.0	93.00	8.26	4.69	0.0				
39.00	8.26	4.69	0.0	94.50	8.26	4.69	0.0				
40.50	8.26	4.69	0.0	96.00	8.26	4.69	0.0				
42.00	8.26	4.69	0.0	97.50	8.26	4.69	0.0				
43.50	8.26	4.69	0.0	99.00	8.26	4.69	0.0				
45.00	8.26	4.69	0.0	100.50	8.26	4.69	0.0				
46.50	8.26	4.69	0.0	102.00	8.26	4.69	0.0				
48.00	8.26	4.69	0.0	103.50	8.26	4.69	0.0				
49.50	8.26	4.69	0.0	105.00	8.26	4.69	0.0				
51.00	8.26	4.69	0.0	106.50	8.26	4.69	0.0				
52.50	8.26	4.69	0.0	108.00	8.26	4.69	0.0				
54.00	8.26	4.69	0.0	109.50	8.26	4.69	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 8S: EAST SIDE DRIVE

Runoff = 13.3 cfs @ 12.25 hrs, Volume= 63,121 cf, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
140,049	74	>75% Grass cover, Good, HSG C
6,776	70	Woods, Good, HSG C
146,825	74	Weighted Average
146,825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
6.9	937	0.0230	2.27		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.6	703	0.0450	7.48	37.40	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00' n= 0.030 Earth, grassed & winding
16.7	1,690	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 8S: EAST SIDE DRIVE

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	5.16	0.0	111.00	8.26	5.16	0.0
1.50	0.18	0.00	0.0	57.00	8.26	5.16	0.0	112.50	8.26	5.16	0.0
3.00	0.39	0.00	0.0	58.50	8.26	5.16	0.0	114.00	8.26	5.16	0.0
4.50	0.61	0.00	0.0	60.00	8.26	5.16	0.0	115.50	8.26	5.16	0.0
6.00	0.85	0.01	0.0	61.50	8.26	5.16	0.0	117.00	8.26	5.16	0.0
7.50	1.14	0.05	0.1	63.00	8.26	5.16	0.0	118.50	8.26	5.16	0.0
9.00	1.52	0.15	0.3	64.50	8.26	5.16	0.0	120.00	8.26	5.16	0.0
10.50	2.06	0.38	0.7	66.00	8.26	5.16	0.0				
12.00	3.96	1.56	4.7	67.50	8.26	5.16	0.0				
13.50	6.20	3.35	1.6	69.00	8.26	5.16	0.0				
15.00	6.74	3.82	0.9	70.50	8.26	5.16	0.0				
16.50	7.12	4.14	0.7	72.00	8.26	5.16	0.0				
18.00	7.41	4.40	0.5	73.50	8.26	5.16	0.0				
19.50	7.65	4.62	0.5	75.00	8.26	5.16	0.0				
21.00	7.87	4.81	0.4	76.50	8.26	5.16	0.0				
22.50	8.08	4.99	0.4	78.00	8.26	5.16	0.0				
24.00	8.26	5.16	0.4	79.50	8.26	5.16	0.0				
25.50	8.26	5.16	0.0	81.00	8.26	5.16	0.0				
27.00	8.26	5.16	0.0	82.50	8.26	5.16	0.0				
28.50	8.26	5.16	0.0	84.00	8.26	5.16	0.0				
30.00	8.26	5.16	0.0	85.50	8.26	5.16	0.0				
31.50	8.26	5.16	0.0	87.00	8.26	5.16	0.0				
33.00	8.26	5.16	0.0	88.50	8.26	5.16	0.0				
34.50	8.26	5.16	0.0	90.00	8.26	5.16	0.0				
36.00	8.26	5.16	0.0	91.50	8.26	5.16	0.0				
37.50	8.26	5.16	0.0	93.00	8.26	5.16	0.0				
39.00	8.26	5.16	0.0	94.50	8.26	5.16	0.0				
40.50	8.26	5.16	0.0	96.00	8.26	5.16	0.0				
42.00	8.26	5.16	0.0	97.50	8.26	5.16	0.0				
43.50	8.26	5.16	0.0	99.00	8.26	5.16	0.0				
45.00	8.26	5.16	0.0	100.50	8.26	5.16	0.0				
46.50	8.26	5.16	0.0	102.00	8.26	5.16	0.0				
48.00	8.26	5.16	0.0	103.50	8.26	5.16	0.0				
49.50	8.26	5.16	0.0	105.00	8.26	5.16	0.0				
51.00	8.26	5.16	0.0	106.50	8.26	5.16	0.0				
52.50	8.26	5.16	0.0	108.00	8.26	5.16	0.0				
54.00	8.26	5.16	0.0	109.50	8.26	5.16	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

Prepared by Engineering Design Consultants, Inc.

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Summary for Subcatchment 9S: WEST SIDE DRIVE

Runoff = 9.7 cfs @ 12.25 hrs, Volume= 45,829 cf, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
106,603	74	>75% Grass cover, Good, HSG C
106,603		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
6.9	937	0.0230	2.27		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.4	638	0.0450	7.48	37.40	Trap/Vee/Rect Channel Flow, Bot.W=2.00' D=1.00' Z= 3.0 ' / ' Top.W=8.00' n= 0.030 Earth, grassed & winding
16.5	1,625	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 9S: WEST SIDE DRIVE

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	5.16	0.0	111.00	8.26	5.16	0.0
1.50	0.18	0.00	0.0	57.00	8.26	5.16	0.0	112.50	8.26	5.16	0.0
3.00	0.39	0.00	0.0	58.50	8.26	5.16	0.0	114.00	8.26	5.16	0.0
4.50	0.61	0.00	0.0	60.00	8.26	5.16	0.0	115.50	8.26	5.16	0.0
6.00	0.85	0.01	0.0	61.50	8.26	5.16	0.0	117.00	8.26	5.16	0.0
7.50	1.14	0.05	0.1	63.00	8.26	5.16	0.0	118.50	8.26	5.16	0.0
9.00	1.52	0.15	0.2	64.50	8.26	5.16	0.0	120.00	8.26	5.16	0.0
10.50	2.06	0.38	0.5	66.00	8.26	5.16	0.0				
12.00	3.96	1.56	3.4	67.50	8.26	5.16	0.0				
13.50	6.20	3.35	1.2	69.00	8.26	5.16	0.0				
15.00	6.74	3.82	0.7	70.50	8.26	5.16	0.0				
16.50	7.12	4.14	0.5	72.00	8.26	5.16	0.0				
18.00	7.41	4.40	0.4	73.50	8.26	5.16	0.0				
19.50	7.65	4.62	0.3	75.00	8.26	5.16	0.0				
21.00	7.87	4.81	0.3	76.50	8.26	5.16	0.0				
22.50	8.08	4.99	0.3	78.00	8.26	5.16	0.0				
24.00	8.26	5.16	0.3	79.50	8.26	5.16	0.0				
25.50	8.26	5.16	0.0	81.00	8.26	5.16	0.0				
27.00	8.26	5.16	0.0	82.50	8.26	5.16	0.0				
28.50	8.26	5.16	0.0	84.00	8.26	5.16	0.0				
30.00	8.26	5.16	0.0	85.50	8.26	5.16	0.0				
31.50	8.26	5.16	0.0	87.00	8.26	5.16	0.0				
33.00	8.26	5.16	0.0	88.50	8.26	5.16	0.0				
34.50	8.26	5.16	0.0	90.00	8.26	5.16	0.0				
36.00	8.26	5.16	0.0	91.50	8.26	5.16	0.0				
37.50	8.26	5.16	0.0	93.00	8.26	5.16	0.0				
39.00	8.26	5.16	0.0	94.50	8.26	5.16	0.0				
40.50	8.26	5.16	0.0	96.00	8.26	5.16	0.0				
42.00	8.26	5.16	0.0	97.50	8.26	5.16	0.0				
43.50	8.26	5.16	0.0	99.00	8.26	5.16	0.0				
45.00	8.26	5.16	0.0	100.50	8.26	5.16	0.0				
46.50	8.26	5.16	0.0	102.00	8.26	5.16	0.0				
48.00	8.26	5.16	0.0	103.50	8.26	5.16	0.0				
49.50	8.26	5.16	0.0	105.00	8.26	5.16	0.0				
51.00	8.26	5.16	0.0	106.50	8.26	5.16	0.0				
52.50	8.26	5.16	0.0	108.00	8.26	5.16	0.0				
54.00	8.26	5.16	0.0	109.50	8.26	5.16	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 10S: 555 HALF ROOF

Runoff = 43.2 cfs @ 12.15 hrs, Volume= 183,793 cf, Depth= 8.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
275,000	98	Roofs, HSG C
275,000		100.00% Impervious Area

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

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 10S: 555 HALF ROOF

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	8.02	0.0	111.00	8.26	8.02	0.0
1.50	0.18	0.06	0.5	57.00	8.26	8.02	0.0	112.50	8.26	8.02	0.0
3.00	0.39	0.22	0.8	58.50	8.26	8.02	0.0	114.00	8.26	8.02	0.0
4.50	0.61	0.42	0.9	60.00	8.26	8.02	0.0	115.50	8.26	8.02	0.0
6.00	0.85	0.65	1.0	61.50	8.26	8.02	0.0	117.00	8.26	8.02	0.0
7.50	1.14	0.93	1.3	63.00	8.26	8.02	0.0	118.50	8.26	8.02	0.0
9.00	1.52	1.30	1.7	64.50	8.26	8.02	0.0	120.00	8.26	8.02	0.0
10.50	2.06	1.84	2.8	66.00	8.26	8.02	0.0				
12.00	3.96	3.72	20.9	67.50	8.26	8.02	0.0				
13.50	6.20	5.96	3.3	69.00	8.26	8.02	0.0				
15.00	6.74	6.51	1.9	70.50	8.26	8.02	0.0				
16.50	7.12	6.88	1.4	72.00	8.26	8.02	0.0				
18.00	7.41	7.17	1.1	73.50	8.26	8.02	0.0				
19.50	7.65	7.41	1.0	75.00	8.26	8.02	0.0				
21.00	7.87	7.63	0.9	76.50	8.26	8.02	0.0				
22.50	8.08	7.84	0.8	78.00	8.26	8.02	0.0				
24.00	8.26	8.02	0.8	79.50	8.26	8.02	0.0				
25.50	8.26	8.02	0.0	81.00	8.26	8.02	0.0				
27.00	8.26	8.02	0.0	82.50	8.26	8.02	0.0				
28.50	8.26	8.02	0.0	84.00	8.26	8.02	0.0				
30.00	8.26	8.02	0.0	85.50	8.26	8.02	0.0				
31.50	8.26	8.02	0.0	87.00	8.26	8.02	0.0				
33.00	8.26	8.02	0.0	88.50	8.26	8.02	0.0				
34.50	8.26	8.02	0.0	90.00	8.26	8.02	0.0				
36.00	8.26	8.02	0.0	91.50	8.26	8.02	0.0				
37.50	8.26	8.02	0.0	93.00	8.26	8.02	0.0				
39.00	8.26	8.02	0.0	94.50	8.26	8.02	0.0				
40.50	8.26	8.02	0.0	96.00	8.26	8.02	0.0				
42.00	8.26	8.02	0.0	97.50	8.26	8.02	0.0				
43.50	8.26	8.02	0.0	99.00	8.26	8.02	0.0				
45.00	8.26	8.02	0.0	100.50	8.26	8.02	0.0				
46.50	8.26	8.02	0.0	102.00	8.26	8.02	0.0				
48.00	8.26	8.02	0.0	103.50	8.26	8.02	0.0				
49.50	8.26	8.02	0.0	105.00	8.26	8.02	0.0				
51.00	8.26	8.02	0.0	106.50	8.26	8.02	0.0				
52.50	8.26	8.02	0.0	108.00	8.26	8.02	0.0				
54.00	8.26	8.02	0.0	109.50	8.26	8.02	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 11S: 555 SW

Runoff = 27.0 cfs @ 12.27 hrs, Volume= 144,946 cf, Depth= 6.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
90,464	74	>75% Grass cover, Good, HSG C
160,091	98	Paved parking, HSG C
250,555	89	Weighted Average
90,464		36.11% Pervious Area
160,091		63.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	50	0.0110	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.2	140	0.0110	0.73		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.3	296	0.0110	2.13		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.2	1,467	0.0170	7.75	13.70	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
19.1	1,953	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 11S: 555 SW

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	6.94	0.0	111.00	8.26	6.94	0.0
1.50	0.18	0.00	0.0	57.00	8.26	6.94	0.0	112.50	8.26	6.94	0.0
3.00	0.39	0.01	0.1	58.50	8.26	6.94	0.0	114.00	8.26	6.94	0.0
4.50	0.61	0.08	0.3	60.00	8.26	6.94	0.0	115.50	8.26	6.94	0.0
6.00	0.85	0.20	0.5	61.50	8.26	6.94	0.0	117.00	8.26	6.94	0.0
7.50	1.14	0.38	0.8	63.00	8.26	6.94	0.0	118.50	8.26	6.94	0.0
9.00	1.52	0.64	1.1	64.50	8.26	6.94	0.0	120.00	8.26	6.94	0.0
10.50	2.06	1.08	2.0	66.00	8.26	6.94	0.0				
12.00	3.96	2.78	10.0	67.50	8.26	6.94	0.0				
13.50	6.20	4.93	3.3	69.00	8.26	6.94	0.0				
15.00	6.74	5.46	1.8	70.50	8.26	6.94	0.0				
16.50	7.12	5.82	1.3	72.00	8.26	6.94	0.0				
18.00	7.41	6.11	1.0	73.50	8.26	6.94	0.0				
19.50	7.65	6.34	0.9	75.00	8.26	6.94	0.0				
21.00	7.87	6.56	0.8	76.50	8.26	6.94	0.0				
22.50	8.08	6.76	0.7	78.00	8.26	6.94	0.0				
24.00	8.26	6.94	0.7	79.50	8.26	6.94	0.0				
25.50	8.26	6.94	0.0	81.00	8.26	6.94	0.0				
27.00	8.26	6.94	0.0	82.50	8.26	6.94	0.0				
28.50	8.26	6.94	0.0	84.00	8.26	6.94	0.0				
30.00	8.26	6.94	0.0	85.50	8.26	6.94	0.0				
31.50	8.26	6.94	0.0	87.00	8.26	6.94	0.0				
33.00	8.26	6.94	0.0	88.50	8.26	6.94	0.0				
34.50	8.26	6.94	0.0	90.00	8.26	6.94	0.0				
36.00	8.26	6.94	0.0	91.50	8.26	6.94	0.0				
37.50	8.26	6.94	0.0	93.00	8.26	6.94	0.0				
39.00	8.26	6.94	0.0	94.50	8.26	6.94	0.0				
40.50	8.26	6.94	0.0	96.00	8.26	6.94	0.0				
42.00	8.26	6.94	0.0	97.50	8.26	6.94	0.0				
43.50	8.26	6.94	0.0	99.00	8.26	6.94	0.0				
45.00	8.26	6.94	0.0	100.50	8.26	6.94	0.0				
46.50	8.26	6.94	0.0	102.00	8.26	6.94	0.0				
48.00	8.26	6.94	0.0	103.50	8.26	6.94	0.0				
49.50	8.26	6.94	0.0	105.00	8.26	6.94	0.0				
51.00	8.26	6.94	0.0	106.50	8.26	6.94	0.0				
52.50	8.26	6.94	0.0	108.00	8.26	6.94	0.0				
54.00	8.26	6.94	0.0	109.50	8.26	6.94	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 12S: Road

Runoff = 2.0 cfs @ 12.15 hrs, Volume= 7,870 cf, Depth= 7.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
9,362	98	Paved parking, HSG C
3,789	74	>75% Grass cover, Good, HSG C
13,151	91	Weighted Average
3,789		28.81% Pervious Area
9,362		71.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	44	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.5	122	0.0440	4.26		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	100	0.0400	9.07	7.13	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
8.1	266	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 12S: Road

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	7.18	0.0	111.00	8.26	7.18	0.0
1.50	0.18	0.00	0.0	57.00	8.26	7.18	0.0	112.50	8.26	7.18	0.0
3.00	0.39	0.03	0.0	58.50	8.26	7.18	0.0	114.00	8.26	7.18	0.0
4.50	0.61	0.12	0.0	60.00	8.26	7.18	0.0	115.50	8.26	7.18	0.0
6.00	0.85	0.26	0.0	61.50	8.26	7.18	0.0	117.00	8.26	7.18	0.0
7.50	1.14	0.46	0.0	63.00	8.26	7.18	0.0	118.50	8.26	7.18	0.0
9.00	1.52	0.75	0.1	64.50	8.26	7.18	0.0	120.00	8.26	7.18	0.0
10.50	2.06	1.22	0.1	66.00	8.26	7.18	0.0				
12.00	3.96	2.98	1.0	67.50	8.26	7.18	0.0				
13.50	6.20	5.15	0.2	69.00	8.26	7.18	0.0				
15.00	6.74	5.69	0.1	70.50	8.26	7.18	0.0				
16.50	7.12	6.05	0.1	72.00	8.26	7.18	0.0				
18.00	7.41	6.34	0.1	73.50	8.26	7.18	0.0				
19.50	7.65	6.58	0.0	75.00	8.26	7.18	0.0				
21.00	7.87	6.80	0.0	76.50	8.26	7.18	0.0				
22.50	8.08	7.00	0.0	78.00	8.26	7.18	0.0				
24.00	8.26	7.18	0.0	79.50	8.26	7.18	0.0				
25.50	8.26	7.18	0.0	81.00	8.26	7.18	0.0				
27.00	8.26	7.18	0.0	82.50	8.26	7.18	0.0				
28.50	8.26	7.18	0.0	84.00	8.26	7.18	0.0				
30.00	8.26	7.18	0.0	85.50	8.26	7.18	0.0				
31.50	8.26	7.18	0.0	87.00	8.26	7.18	0.0				
33.00	8.26	7.18	0.0	88.50	8.26	7.18	0.0				
34.50	8.26	7.18	0.0	90.00	8.26	7.18	0.0				
36.00	8.26	7.18	0.0	91.50	8.26	7.18	0.0				
37.50	8.26	7.18	0.0	93.00	8.26	7.18	0.0				
39.00	8.26	7.18	0.0	94.50	8.26	7.18	0.0				
40.50	8.26	7.18	0.0	96.00	8.26	7.18	0.0				
42.00	8.26	7.18	0.0	97.50	8.26	7.18	0.0				
43.50	8.26	7.18	0.0	99.00	8.26	7.18	0.0				
45.00	8.26	7.18	0.0	100.50	8.26	7.18	0.0				
46.50	8.26	7.18	0.0	102.00	8.26	7.18	0.0				
48.00	8.26	7.18	0.0	103.50	8.26	7.18	0.0				
49.50	8.26	7.18	0.0	105.00	8.26	7.18	0.0				
51.00	8.26	7.18	0.0	106.50	8.26	7.18	0.0				
52.50	8.26	7.18	0.0	108.00	8.26	7.18	0.0				
54.00	8.26	7.18	0.0	109.50	8.26	7.18	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 13S: Undeveloped

Runoff = 23.9 cfs @ 12.94 hrs, Volume= 247,613 cf, Depth= 4.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
496,005	70	Woods, Good, HSG C
122,277	74	>75% Grass cover, Good, HSG C
618,282	71	Weighted Average
618,282		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
20.8	599	0.0370	0.48		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
12.5	350	0.0350	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
3.1	163	0.1200	0.87		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
22.7	737	0.0470	0.54		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
71.4	1,899	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 13S: Undeveloped

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	4.81	0.0	111.00	8.26	4.81	0.0
1.50	0.18	0.00	0.0	57.00	8.26	4.81	0.0	112.50	8.26	4.81	0.0
3.00	0.39	0.00	0.0	58.50	8.26	4.81	0.0	114.00	8.26	4.81	0.0
4.50	0.61	0.00	0.0	60.00	8.26	4.81	0.0	115.50	8.26	4.81	0.0
6.00	0.85	0.00	0.0	61.50	8.26	4.81	0.0	117.00	8.26	4.81	0.0
7.50	1.14	0.02	0.1	63.00	8.26	4.81	0.0	118.50	8.26	4.81	0.0
9.00	1.52	0.10	0.6	64.50	8.26	4.81	0.0	120.00	8.26	4.81	0.0
10.50	2.06	0.29	1.5	66.00	8.26	4.81	0.0				
12.00	3.96	1.36	5.0	67.50	8.26	4.81	0.0				
13.50	6.20	3.06	16.6	69.00	8.26	4.81	0.0				
15.00	6.74	3.51	5.4	70.50	8.26	4.81	0.0				
16.50	7.12	3.82	3.2	72.00	8.26	4.81	0.0				
18.00	7.41	4.07	2.5	73.50	8.26	4.81	0.0				
19.50	7.65	4.28	2.0	75.00	8.26	4.81	0.0				
21.00	7.87	4.47	1.9	76.50	8.26	4.81	0.0				
22.50	8.08	4.65	1.7	78.00	8.26	4.81	0.0				
24.00	8.26	4.81	1.6	79.50	8.26	4.81	0.0				
25.50	8.26	4.81	0.3	81.00	8.26	4.81	0.0				
27.00	8.26	4.81	0.0	82.50	8.26	4.81	0.0				
28.50	8.26	4.81	0.0	84.00	8.26	4.81	0.0				
30.00	8.26	4.81	0.0	85.50	8.26	4.81	0.0				
31.50	8.26	4.81	0.0	87.00	8.26	4.81	0.0				
33.00	8.26	4.81	0.0	88.50	8.26	4.81	0.0				
34.50	8.26	4.81	0.0	90.00	8.26	4.81	0.0				
36.00	8.26	4.81	0.0	91.50	8.26	4.81	0.0				
37.50	8.26	4.81	0.0	93.00	8.26	4.81	0.0				
39.00	8.26	4.81	0.0	94.50	8.26	4.81	0.0				
40.50	8.26	4.81	0.0	96.00	8.26	4.81	0.0				
42.00	8.26	4.81	0.0	97.50	8.26	4.81	0.0				
43.50	8.26	4.81	0.0	99.00	8.26	4.81	0.0				
45.00	8.26	4.81	0.0	100.50	8.26	4.81	0.0				
46.50	8.26	4.81	0.0	102.00	8.26	4.81	0.0				
48.00	8.26	4.81	0.0	103.50	8.26	4.81	0.0				
49.50	8.26	4.81	0.0	105.00	8.26	4.81	0.0				
51.00	8.26	4.81	0.0	106.50	8.26	4.81	0.0				
52.50	8.26	4.81	0.0	108.00	8.26	4.81	0.0				
54.00	8.26	4.81	0.0	109.50	8.26	4.81	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 14S: Undeveloped

Runoff = 36.1 cfs @ 12.33 hrs, Volume= 201,377 cf, Depth= 5.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
178,452	70	Woods, Good, HSG C
300,921	74	>75% Grass cover, Good, HSG C
479,373	73	Weighted Average
479,373		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	50	0.0050	0.06		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.6	275	0.0370	2.89		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.4	225	0.2000	1.12		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.0	239	0.0650	3.82		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.1	357	0.0160	1.90		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
23.4	1,146	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 14S: Undeveloped

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	5.04	0.0	111.00	8.26	5.04	0.0
1.50	0.18	0.00	0.0	57.00	8.26	5.04	0.0	112.50	8.26	5.04	0.0
3.00	0.39	0.00	0.0	58.50	8.26	5.04	0.0	114.00	8.26	5.04	0.0
4.50	0.61	0.00	0.0	60.00	8.26	5.04	0.0	115.50	8.26	5.04	0.0
6.00	0.85	0.00	0.1	61.50	8.26	5.04	0.0	117.00	8.26	5.04	0.0
7.50	1.14	0.04	0.4	63.00	8.26	5.04	0.0	118.50	8.26	5.04	0.0
9.00	1.52	0.13	0.8	64.50	8.26	5.04	0.0	120.00	8.26	5.04	0.0
10.50	2.06	0.35	1.9	66.00	8.26	5.04	0.0				
12.00	3.96	1.50	11.2	67.50	8.26	5.04	0.0				
13.50	6.20	3.25	5.7	69.00	8.26	5.04	0.0				
15.00	6.74	3.72	3.0	70.50	8.26	5.04	0.0				
16.50	7.12	4.04	2.2	72.00	8.26	5.04	0.0				
18.00	7.41	4.29	1.8	73.50	8.26	5.04	0.0				
19.50	7.65	4.50	1.5	75.00	8.26	5.04	0.0				
21.00	7.87	4.70	1.4	76.50	8.26	5.04	0.0				
22.50	8.08	4.88	1.3	78.00	8.26	5.04	0.0				
24.00	8.26	5.04	1.2	79.50	8.26	5.04	0.0				
25.50	8.26	5.04	0.0	81.00	8.26	5.04	0.0				
27.00	8.26	5.04	0.0	82.50	8.26	5.04	0.0				
28.50	8.26	5.04	0.0	84.00	8.26	5.04	0.0				
30.00	8.26	5.04	0.0	85.50	8.26	5.04	0.0				
31.50	8.26	5.04	0.0	87.00	8.26	5.04	0.0				
33.00	8.26	5.04	0.0	88.50	8.26	5.04	0.0				
34.50	8.26	5.04	0.0	90.00	8.26	5.04	0.0				
36.00	8.26	5.04	0.0	91.50	8.26	5.04	0.0				
37.50	8.26	5.04	0.0	93.00	8.26	5.04	0.0				
39.00	8.26	5.04	0.0	94.50	8.26	5.04	0.0				
40.50	8.26	5.04	0.0	96.00	8.26	5.04	0.0				
42.00	8.26	5.04	0.0	97.50	8.26	5.04	0.0				
43.50	8.26	5.04	0.0	99.00	8.26	5.04	0.0				
45.00	8.26	5.04	0.0	100.50	8.26	5.04	0.0				
46.50	8.26	5.04	0.0	102.00	8.26	5.04	0.0				
48.00	8.26	5.04	0.0	103.50	8.26	5.04	0.0				
49.50	8.26	5.04	0.0	105.00	8.26	5.04	0.0				
51.00	8.26	5.04	0.0	106.50	8.26	5.04	0.0				
52.50	8.26	5.04	0.0	108.00	8.26	5.04	0.0				
54.00	8.26	5.04	0.0	109.50	8.26	5.04	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 15S: Road

Runoff = 5.7 cfs @ 12.13 hrs, Volume= 20,183 cf, Depth= 6.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
20,008	98	Paved parking, HSG C
16,125	74	>75% Grass cover, Good, HSG C
36,133	87	Weighted Average
16,125		44.63% Pervious Area
20,008		55.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	16	0.0100	0.06		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.5	132	0.0460	4.35		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.3	110	0.0200	6.42	5.04	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
5.1	258	Total, Increased to minimum Tc = 6.0 min			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 15S: Road

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	6.70	0.0	111.00	8.26	6.70	0.0
1.50	0.18	0.00	0.0	57.00	8.26	6.70	0.0	112.50	8.26	6.70	0.0
3.00	0.39	0.00	0.0	58.50	8.26	6.70	0.0	114.00	8.26	6.70	0.0
4.50	0.61	0.05	0.0	60.00	8.26	6.70	0.0	115.50	8.26	6.70	0.0
6.00	0.85	0.15	0.1	61.50	8.26	6.70	0.0	117.00	8.26	6.70	0.0
7.50	1.14	0.31	0.1	63.00	8.26	6.70	0.0	118.50	8.26	6.70	0.0
9.00	1.52	0.55	0.2	64.50	8.26	6.70	0.0	120.00	8.26	6.70	0.0
10.50	2.06	0.96	0.3	66.00	8.26	6.70	0.0				
12.00	3.96	2.60	3.0	67.50	8.26	6.70	0.0				
13.50	6.20	4.71	0.4	69.00	8.26	6.70	0.0				
15.00	6.74	5.23	0.2	70.50	8.26	6.70	0.0				
16.50	7.12	5.59	0.2	72.00	8.26	6.70	0.0				
18.00	7.41	5.88	0.1	73.50	8.26	6.70	0.0				
19.50	7.65	6.11	0.1	75.00	8.26	6.70	0.0				
21.00	7.87	6.33	0.1	76.50	8.26	6.70	0.0				
22.50	8.08	6.52	0.1	78.00	8.26	6.70	0.0				
24.00	8.26	6.70	0.1	79.50	8.26	6.70	0.0				
25.50	8.26	6.70	0.0	81.00	8.26	6.70	0.0				
27.00	8.26	6.70	0.0	82.50	8.26	6.70	0.0				
28.50	8.26	6.70	0.0	84.00	8.26	6.70	0.0				
30.00	8.26	6.70	0.0	85.50	8.26	6.70	0.0				
31.50	8.26	6.70	0.0	87.00	8.26	6.70	0.0				
33.00	8.26	6.70	0.0	88.50	8.26	6.70	0.0				
34.50	8.26	6.70	0.0	90.00	8.26	6.70	0.0				
36.00	8.26	6.70	0.0	91.50	8.26	6.70	0.0				
37.50	8.26	6.70	0.0	93.00	8.26	6.70	0.0				
39.00	8.26	6.70	0.0	94.50	8.26	6.70	0.0				
40.50	8.26	6.70	0.0	96.00	8.26	6.70	0.0				
42.00	8.26	6.70	0.0	97.50	8.26	6.70	0.0				
43.50	8.26	6.70	0.0	99.00	8.26	6.70	0.0				
45.00	8.26	6.70	0.0	100.50	8.26	6.70	0.0				
46.50	8.26	6.70	0.0	102.00	8.26	6.70	0.0				
48.00	8.26	6.70	0.0	103.50	8.26	6.70	0.0				
49.50	8.26	6.70	0.0	105.00	8.26	6.70	0.0				
51.00	8.26	6.70	0.0	106.50	8.26	6.70	0.0				
52.50	8.26	6.70	0.0	108.00	8.26	6.70	0.0				
54.00	8.26	6.70	0.0	109.50	8.26	6.70	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 16S: Road

Runoff = 4.9 cfs @ 12.13 hrs, Volume= 17,128 cf, Depth= 6.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
18,005	92	Paved roads w/open ditches, 50% imp, HSG C
2,688	98	Paved parking, HSG C
9,970	74	>75% Grass cover, Good, HSG C
30,663	87	Weighted Average
18,973		61.87% Pervious Area
11,691		38.13% Impervious Area

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

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 16S: Road

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	6.70	0.0	111.00	8.26	6.70	0.0
1.50	0.18	0.00	0.0	57.00	8.26	6.70	0.0	112.50	8.26	6.70	0.0
3.00	0.39	0.00	0.0	58.50	8.26	6.70	0.0	114.00	8.26	6.70	0.0
4.50	0.61	0.05	0.0	60.00	8.26	6.70	0.0	115.50	8.26	6.70	0.0
6.00	0.85	0.15	0.1	61.50	8.26	6.70	0.0	117.00	8.26	6.70	0.0
7.50	1.14	0.31	0.1	63.00	8.26	6.70	0.0	118.50	8.26	6.70	0.0
9.00	1.52	0.55	0.1	64.50	8.26	6.70	0.0	120.00	8.26	6.70	0.0
10.50	2.06	0.96	0.2	66.00	8.26	6.70	0.0				
12.00	3.96	2.60	2.5	67.50	8.26	6.70	0.0				
13.50	6.20	4.71	0.3	69.00	8.26	6.70	0.0				
15.00	6.74	5.23	0.2	70.50	8.26	6.70	0.0				
16.50	7.12	5.59	0.2	72.00	8.26	6.70	0.0				
18.00	7.41	5.88	0.1	73.50	8.26	6.70	0.0				
19.50	7.65	6.11	0.1	75.00	8.26	6.70	0.0				
21.00	7.87	6.33	0.1	76.50	8.26	6.70	0.0				
22.50	8.08	6.52	0.1	78.00	8.26	6.70	0.0				
24.00	8.26	6.70	0.1	79.50	8.26	6.70	0.0				
25.50	8.26	6.70	0.0	81.00	8.26	6.70	0.0				
27.00	8.26	6.70	0.0	82.50	8.26	6.70	0.0				
28.50	8.26	6.70	0.0	84.00	8.26	6.70	0.0				
30.00	8.26	6.70	0.0	85.50	8.26	6.70	0.0				
31.50	8.26	6.70	0.0	87.00	8.26	6.70	0.0				
33.00	8.26	6.70	0.0	88.50	8.26	6.70	0.0				
34.50	8.26	6.70	0.0	90.00	8.26	6.70	0.0				
36.00	8.26	6.70	0.0	91.50	8.26	6.70	0.0				
37.50	8.26	6.70	0.0	93.00	8.26	6.70	0.0				
39.00	8.26	6.70	0.0	94.50	8.26	6.70	0.0				
40.50	8.26	6.70	0.0	96.00	8.26	6.70	0.0				
42.00	8.26	6.70	0.0	97.50	8.26	6.70	0.0				
43.50	8.26	6.70	0.0	99.00	8.26	6.70	0.0				
45.00	8.26	6.70	0.0	100.50	8.26	6.70	0.0				
46.50	8.26	6.70	0.0	102.00	8.26	6.70	0.0				
48.00	8.26	6.70	0.0	103.50	8.26	6.70	0.0				
49.50	8.26	6.70	0.0	105.00	8.26	6.70	0.0				
51.00	8.26	6.70	0.0	106.50	8.26	6.70	0.0				
52.50	8.26	6.70	0.0	108.00	8.26	6.70	0.0				
54.00	8.26	6.70	0.0	109.50	8.26	6.70	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 17S: 465 SITE SOUTH

Runoff = 5.3 cfs @ 12.25 hrs, Volume= 26,551 cf, Depth= 6.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
21,889	74	>75% Grass cover, Good, HSG C
25,644	98	Unconnected pavement, HSG C
47,533	87	Weighted Average
21,889		46.05% Pervious Area
25,644		53.95% Impervious Area
25,644		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	38	0.0100	0.07		Sheet Flow,
					Grass: Dense n= 0.240 P2= 3.20"
8.1	694	0.0050	1.44		Shallow Concentrated Flow,
					Paved Kv= 20.3 fps
16.8	732	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 17S: 465 SITE SOUTH

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	6.70	0.0	111.00	8.26	6.70	0.0
1.50	0.18	0.00	0.0	57.00	8.26	6.70	0.0	112.50	8.26	6.70	0.0
3.00	0.39	0.00	0.0	58.50	8.26	6.70	0.0	114.00	8.26	6.70	0.0
4.50	0.61	0.05	0.0	60.00	8.26	6.70	0.0	115.50	8.26	6.70	0.0
6.00	0.85	0.15	0.1	61.50	8.26	6.70	0.0	117.00	8.26	6.70	0.0
7.50	1.14	0.31	0.1	63.00	8.26	6.70	0.0	118.50	8.26	6.70	0.0
9.00	1.52	0.55	0.2	64.50	8.26	6.70	0.0	120.00	8.26	6.70	0.0
10.50	2.06	0.96	0.4	66.00	8.26	6.70	0.0				
12.00	3.96	2.60	2.0	67.50	8.26	6.70	0.0				
13.50	6.20	4.71	0.6	69.00	8.26	6.70	0.0				
15.00	6.74	5.23	0.3	70.50	8.26	6.70	0.0				
16.50	7.12	5.59	0.2	72.00	8.26	6.70	0.0				
18.00	7.41	5.88	0.2	73.50	8.26	6.70	0.0				
19.50	7.65	6.11	0.2	75.00	8.26	6.70	0.0				
21.00	7.87	6.33	0.2	76.50	8.26	6.70	0.0				
22.50	8.08	6.52	0.1	78.00	8.26	6.70	0.0				
24.00	8.26	6.70	0.1	79.50	8.26	6.70	0.0				
25.50	8.26	6.70	0.0	81.00	8.26	6.70	0.0				
27.00	8.26	6.70	0.0	82.50	8.26	6.70	0.0				
28.50	8.26	6.70	0.0	84.00	8.26	6.70	0.0				
30.00	8.26	6.70	0.0	85.50	8.26	6.70	0.0				
31.50	8.26	6.70	0.0	87.00	8.26	6.70	0.0				
33.00	8.26	6.70	0.0	88.50	8.26	6.70	0.0				
34.50	8.26	6.70	0.0	90.00	8.26	6.70	0.0				
36.00	8.26	6.70	0.0	91.50	8.26	6.70	0.0				
37.50	8.26	6.70	0.0	93.00	8.26	6.70	0.0				
39.00	8.26	6.70	0.0	94.50	8.26	6.70	0.0				
40.50	8.26	6.70	0.0	96.00	8.26	6.70	0.0				
42.00	8.26	6.70	0.0	97.50	8.26	6.70	0.0				
43.50	8.26	6.70	0.0	99.00	8.26	6.70	0.0				
45.00	8.26	6.70	0.0	100.50	8.26	6.70	0.0				
46.50	8.26	6.70	0.0	102.00	8.26	6.70	0.0				
48.00	8.26	6.70	0.0	103.50	8.26	6.70	0.0				
49.50	8.26	6.70	0.0	105.00	8.26	6.70	0.0				
51.00	8.26	6.70	0.0	106.50	8.26	6.70	0.0				
52.50	8.26	6.70	0.0	108.00	8.26	6.70	0.0				
54.00	8.26	6.70	0.0	109.50	8.26	6.70	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 18S: Road

Runoff = 3.6 cfs @ 12.13 hrs, Volume= 13,340 cf, Depth= 7.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
21,926	92	Paved roads w/open ditches, 50% imp, HSG C
10,963		50.00% Pervious Area
10,963		50.00% Impervious Area

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

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 18S: Road

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	7.30	0.0	111.00	8.26	7.30	0.0
1.50	0.18	0.00	0.0	57.00	8.26	7.30	0.0	112.50	8.26	7.30	0.0
3.00	0.39	0.04	0.0	58.50	8.26	7.30	0.0	114.00	8.26	7.30	0.0
4.50	0.61	0.14	0.0	60.00	8.26	7.30	0.0	115.50	8.26	7.30	0.0
6.00	0.85	0.30	0.1	61.50	8.26	7.30	0.0	117.00	8.26	7.30	0.0
7.50	1.14	0.51	0.1	63.00	8.26	7.30	0.0	118.50	8.26	7.30	0.0
9.00	1.52	0.81	0.1	64.50	8.26	7.30	0.0	120.00	8.26	7.30	0.0
10.50	2.06	1.29	0.2	66.00	8.26	7.30	0.0				
12.00	3.96	3.08	1.9	67.50	8.26	7.30	0.0				
13.50	6.20	5.26	0.3	69.00	8.26	7.30	0.0				
15.00	6.74	5.80	0.1	70.50	8.26	7.30	0.0				
16.50	7.12	6.17	0.1	72.00	8.26	7.30	0.0				
18.00	7.41	6.46	0.1	73.50	8.26	7.30	0.0				
19.50	7.65	6.70	0.1	75.00	8.26	7.30	0.0				
21.00	7.87	6.92	0.1	76.50	8.26	7.30	0.0				
22.50	8.08	7.12	0.1	78.00	8.26	7.30	0.0				
24.00	8.26	7.30	0.1	79.50	8.26	7.30	0.0				
25.50	8.26	7.30	0.0	81.00	8.26	7.30	0.0				
27.00	8.26	7.30	0.0	82.50	8.26	7.30	0.0				
28.50	8.26	7.30	0.0	84.00	8.26	7.30	0.0				
30.00	8.26	7.30	0.0	85.50	8.26	7.30	0.0				
31.50	8.26	7.30	0.0	87.00	8.26	7.30	0.0				
33.00	8.26	7.30	0.0	88.50	8.26	7.30	0.0				
34.50	8.26	7.30	0.0	90.00	8.26	7.30	0.0				
36.00	8.26	7.30	0.0	91.50	8.26	7.30	0.0				
37.50	8.26	7.30	0.0	93.00	8.26	7.30	0.0				
39.00	8.26	7.30	0.0	94.50	8.26	7.30	0.0				
40.50	8.26	7.30	0.0	96.00	8.26	7.30	0.0				
42.00	8.26	7.30	0.0	97.50	8.26	7.30	0.0				
43.50	8.26	7.30	0.0	99.00	8.26	7.30	0.0				
45.00	8.26	7.30	0.0	100.50	8.26	7.30	0.0				
46.50	8.26	7.30	0.0	102.00	8.26	7.30	0.0				
48.00	8.26	7.30	0.0	103.50	8.26	7.30	0.0				
49.50	8.26	7.30	0.0	105.00	8.26	7.30	0.0				
51.00	8.26	7.30	0.0	106.50	8.26	7.30	0.0				
52.50	8.26	7.30	0.0	108.00	8.26	7.30	0.0				
54.00	8.26	7.30	0.0	109.50	8.26	7.30	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

Prepared by Engineering Design Consultants, Inc.

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Summary for Subcatchment 19S: 465 SITE NORTH

Runoff = 6.7 cfs @ 12.16 hrs, Volume= 25,810 cf, Depth= 6.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
25,932	74	>75% Grass cover, Good, HSG C
21,980	98	Paved parking, HSG C
47,912	85	Weighted Average
25,932		54.12% Pervious Area
21,980		45.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	45	0.0050	0.67		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
7.6	658	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.7	703	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 19S: 465 SITE NORTH

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	6.46	0.0	111.00	8.26	6.46	0.0
1.50	0.18	0.00	0.0	57.00	8.26	6.46	0.0	112.50	8.26	6.46	0.0
3.00	0.39	0.00	0.0	58.50	8.26	6.46	0.0	114.00	8.26	6.46	0.0
4.50	0.61	0.03	0.0	60.00	8.26	6.46	0.0	115.50	8.26	6.46	0.0
6.00	0.85	0.11	0.1	61.50	8.26	6.46	0.0	117.00	8.26	6.46	0.0
7.50	1.14	0.24	0.1	63.00	8.26	6.46	0.0	118.50	8.26	6.46	0.0
9.00	1.52	0.46	0.2	64.50	8.26	6.46	0.0	120.00	8.26	6.46	0.0
10.50	2.06	0.84	0.4	66.00	8.26	6.46	0.0				
12.00	3.96	2.42	3.1	67.50	8.26	6.46	0.0				
13.50	6.20	4.49	0.5	69.00	8.26	6.46	0.0				
15.00	6.74	5.01	0.3	70.50	8.26	6.46	0.0				
16.50	7.12	5.36	0.2	72.00	8.26	6.46	0.0				
18.00	7.41	5.64	0.2	73.50	8.26	6.46	0.0				
19.50	7.65	5.88	0.2	75.00	8.26	6.46	0.0				
21.00	7.87	6.09	0.2	76.50	8.26	6.46	0.0				
22.50	8.08	6.29	0.1	78.00	8.26	6.46	0.0				
24.00	8.26	6.46	0.1	79.50	8.26	6.46	0.0				
25.50	8.26	6.46	0.0	81.00	8.26	6.46	0.0				
27.00	8.26	6.46	0.0	82.50	8.26	6.46	0.0				
28.50	8.26	6.46	0.0	84.00	8.26	6.46	0.0				
30.00	8.26	6.46	0.0	85.50	8.26	6.46	0.0				
31.50	8.26	6.46	0.0	87.00	8.26	6.46	0.0				
33.00	8.26	6.46	0.0	88.50	8.26	6.46	0.0				
34.50	8.26	6.46	0.0	90.00	8.26	6.46	0.0				
36.00	8.26	6.46	0.0	91.50	8.26	6.46	0.0				
37.50	8.26	6.46	0.0	93.00	8.26	6.46	0.0				
39.00	8.26	6.46	0.0	94.50	8.26	6.46	0.0				
40.50	8.26	6.46	0.0	96.00	8.26	6.46	0.0				
42.00	8.26	6.46	0.0	97.50	8.26	6.46	0.0				
43.50	8.26	6.46	0.0	99.00	8.26	6.46	0.0				
45.00	8.26	6.46	0.0	100.50	8.26	6.46	0.0				
46.50	8.26	6.46	0.0	102.00	8.26	6.46	0.0				
48.00	8.26	6.46	0.0	103.50	8.26	6.46	0.0				
49.50	8.26	6.46	0.0	105.00	8.26	6.46	0.0				
51.00	8.26	6.46	0.0	106.50	8.26	6.46	0.0				
52.50	8.26	6.46	0.0	108.00	8.26	6.46	0.0				
54.00	8.26	6.46	0.0	109.50	8.26	6.46	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 20S: Undeveloped

Runoff = 82.2 cfs @ 12.89 hrs, Volume= 800,894 cf, Depth= 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
1,809,628	70	Woods, Good, HSG C
240,208	74	>75% Grass cover, Good, HSG C
2,049,836	70	Weighted Average
2,049,836		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0210	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
13.2	293	0.0220	0.37		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
11.6	322	0.0340	0.46		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
27.3	1,193	0.0850	0.73		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
64.2	1,858	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 20S: Undeveloped

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	4.69	0.0	111.00	8.26	4.69	0.0
1.50	0.18	0.00	0.0	57.00	8.26	4.69	0.0	112.50	8.26	4.69	0.0
3.00	0.39	0.00	0.0	58.50	8.26	4.69	0.0	114.00	8.26	4.69	0.0
4.50	0.61	0.00	0.0	60.00	8.26	4.69	0.0	115.50	8.26	4.69	0.0
6.00	0.85	0.00	0.0	61.50	8.26	4.69	0.0	117.00	8.26	4.69	0.0
7.50	1.14	0.02	0.4	63.00	8.26	4.69	0.0	118.50	8.26	4.69	0.0
9.00	1.52	0.09	1.9	64.50	8.26	4.69	0.0	120.00	8.26	4.69	0.0
10.50	2.06	0.26	4.9	66.00	8.26	4.69	0.0				
12.00	3.96	1.30	17.6	67.50	8.26	4.69	0.0				
13.50	6.20	2.96	49.1	69.00	8.26	4.69	0.0				
15.00	6.74	3.41	16.3	70.50	8.26	4.69	0.0				
16.50	7.12	3.72	10.3	72.00	8.26	4.69	0.0				
18.00	7.41	3.96	8.1	73.50	8.26	4.69	0.0				
19.50	7.65	4.17	6.6	75.00	8.26	4.69	0.0				
21.00	7.87	4.36	6.1	76.50	8.26	4.69	0.0				
22.50	8.08	4.53	5.6	78.00	8.26	4.69	0.0				
24.00	8.26	4.69	5.1	79.50	8.26	4.69	0.0				
25.50	8.26	4.69	0.6	81.00	8.26	4.69	0.0				
27.00	8.26	4.69	0.0	82.50	8.26	4.69	0.0				
28.50	8.26	4.69	0.0	84.00	8.26	4.69	0.0				
30.00	8.26	4.69	0.0	85.50	8.26	4.69	0.0				
31.50	8.26	4.69	0.0	87.00	8.26	4.69	0.0				
33.00	8.26	4.69	0.0	88.50	8.26	4.69	0.0				
34.50	8.26	4.69	0.0	90.00	8.26	4.69	0.0				
36.00	8.26	4.69	0.0	91.50	8.26	4.69	0.0				
37.50	8.26	4.69	0.0	93.00	8.26	4.69	0.0				
39.00	8.26	4.69	0.0	94.50	8.26	4.69	0.0				
40.50	8.26	4.69	0.0	96.00	8.26	4.69	0.0				
42.00	8.26	4.69	0.0	97.50	8.26	4.69	0.0				
43.50	8.26	4.69	0.0	99.00	8.26	4.69	0.0				
45.00	8.26	4.69	0.0	100.50	8.26	4.69	0.0				
46.50	8.26	4.69	0.0	102.00	8.26	4.69	0.0				
48.00	8.26	4.69	0.0	103.50	8.26	4.69	0.0				
49.50	8.26	4.69	0.0	105.00	8.26	4.69	0.0				
51.00	8.26	4.69	0.0	106.50	8.26	4.69	0.0				
52.50	8.26	4.69	0.0	108.00	8.26	4.69	0.0				
54.00	8.26	4.69	0.0	109.50	8.26	4.69	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

Prepared by Engineering Design Consultants, Inc.

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Summary for Subcatchment 21S: DB1

Runoff = 21.0 cfs @ 12.13 hrs, Volume= 69,813 cf, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
162,392	74	>75% Grass cover, Good, HSG C
162,392		100.00% Pervious Area

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

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 21S: DB1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	5.16	0.0	111.00	8.26	5.16	0.0
1.50	0.18	0.00	0.0	57.00	8.26	5.16	0.0	112.50	8.26	5.16	0.0
3.00	0.39	0.00	0.0	58.50	8.26	5.16	0.0	114.00	8.26	5.16	0.0
4.50	0.61	0.00	0.0	60.00	8.26	5.16	0.0	115.50	8.26	5.16	0.0
6.00	0.85	0.01	0.0	61.50	8.26	5.16	0.0	117.00	8.26	5.16	0.0
7.50	1.14	0.05	0.2	63.00	8.26	5.16	0.0	118.50	8.26	5.16	0.0
9.00	1.52	0.15	0.3	64.50	8.26	5.16	0.0	120.00	8.26	5.16	0.0
10.50	2.06	0.38	0.8	66.00	8.26	5.16	0.0				
12.00	3.96	1.56	10.4	67.50	8.26	5.16	0.0				
13.50	6.20	3.35	1.6	69.00	8.26	5.16	0.0				
15.00	6.74	3.82	0.9	70.50	8.26	5.16	0.0				
16.50	7.12	4.14	0.7	72.00	8.26	5.16	0.0				
18.00	7.41	4.40	0.6	73.50	8.26	5.16	0.0				
19.50	7.65	4.62	0.5	75.00	8.26	5.16	0.0				
21.00	7.87	4.81	0.5	76.50	8.26	5.16	0.0				
22.50	8.08	4.99	0.4	78.00	8.26	5.16	0.0				
24.00	8.26	5.16	0.4	79.50	8.26	5.16	0.0				
25.50	8.26	5.16	0.0	81.00	8.26	5.16	0.0				
27.00	8.26	5.16	0.0	82.50	8.26	5.16	0.0				
28.50	8.26	5.16	0.0	84.00	8.26	5.16	0.0				
30.00	8.26	5.16	0.0	85.50	8.26	5.16	0.0				
31.50	8.26	5.16	0.0	87.00	8.26	5.16	0.0				
33.00	8.26	5.16	0.0	88.50	8.26	5.16	0.0				
34.50	8.26	5.16	0.0	90.00	8.26	5.16	0.0				
36.00	8.26	5.16	0.0	91.50	8.26	5.16	0.0				
37.50	8.26	5.16	0.0	93.00	8.26	5.16	0.0				
39.00	8.26	5.16	0.0	94.50	8.26	5.16	0.0				
40.50	8.26	5.16	0.0	96.00	8.26	5.16	0.0				
42.00	8.26	5.16	0.0	97.50	8.26	5.16	0.0				
43.50	8.26	5.16	0.0	99.00	8.26	5.16	0.0				
45.00	8.26	5.16	0.0	100.50	8.26	5.16	0.0				
46.50	8.26	5.16	0.0	102.00	8.26	5.16	0.0				
48.00	8.26	5.16	0.0	103.50	8.26	5.16	0.0				
49.50	8.26	5.16	0.0	105.00	8.26	5.16	0.0				
51.00	8.26	5.16	0.0	106.50	8.26	5.16	0.0				
52.50	8.26	5.16	0.0	108.00	8.26	5.16	0.0				
54.00	8.26	5.16	0.0	109.50	8.26	5.16	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 22S: 465 SITE ROOF

Runoff = 16.5 cfs @ 12.17 hrs, Volume= 74,592 cf, Depth= 8.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
57,453	98	Roofs, HSG C
54,155	98	Roofs, HSG C
111,608	98	Weighted Average
111,608		100.00% Impervious Area

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

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 22S: 465 SITE ROOF

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	8.02	0.0	111.00	8.26	8.02	0.0
1.50	0.18	0.06	0.2	57.00	8.26	8.02	0.0	112.50	8.26	8.02	0.0
3.00	0.39	0.22	0.3	58.50	8.26	8.02	0.0	114.00	8.26	8.02	0.0
4.50	0.61	0.42	0.4	60.00	8.26	8.02	0.0	115.50	8.26	8.02	0.0
6.00	0.85	0.65	0.4	61.50	8.26	8.02	0.0	117.00	8.26	8.02	0.0
7.50	1.14	0.93	0.5	63.00	8.26	8.02	0.0	118.50	8.26	8.02	0.0
9.00	1.52	1.30	0.7	64.50	8.26	8.02	0.0	120.00	8.26	8.02	0.0
10.50	2.06	1.84	1.1	66.00	8.26	8.02	0.0				
12.00	3.96	3.72	7.6	67.50	8.26	8.02	0.0				
13.50	6.20	5.96	1.4	69.00	8.26	8.02	0.0				
15.00	6.74	6.51	0.8	70.50	8.26	8.02	0.0				
16.50	7.12	6.88	0.6	72.00	8.26	8.02	0.0				
18.00	7.41	7.17	0.5	73.50	8.26	8.02	0.0				
19.50	7.65	7.41	0.4	75.00	8.26	8.02	0.0				
21.00	7.87	7.63	0.4	76.50	8.26	8.02	0.0				
22.50	8.08	7.84	0.3	78.00	8.26	8.02	0.0				
24.00	8.26	8.02	0.3	79.50	8.26	8.02	0.0				
25.50	8.26	8.02	0.0	81.00	8.26	8.02	0.0				
27.00	8.26	8.02	0.0	82.50	8.26	8.02	0.0				
28.50	8.26	8.02	0.0	84.00	8.26	8.02	0.0				
30.00	8.26	8.02	0.0	85.50	8.26	8.02	0.0				
31.50	8.26	8.02	0.0	87.00	8.26	8.02	0.0				
33.00	8.26	8.02	0.0	88.50	8.26	8.02	0.0				
34.50	8.26	8.02	0.0	90.00	8.26	8.02	0.0				
36.00	8.26	8.02	0.0	91.50	8.26	8.02	0.0				
37.50	8.26	8.02	0.0	93.00	8.26	8.02	0.0				
39.00	8.26	8.02	0.0	94.50	8.26	8.02	0.0				
40.50	8.26	8.02	0.0	96.00	8.26	8.02	0.0				
42.00	8.26	8.02	0.0	97.50	8.26	8.02	0.0				
43.50	8.26	8.02	0.0	99.00	8.26	8.02	0.0				
45.00	8.26	8.02	0.0	100.50	8.26	8.02	0.0				
46.50	8.26	8.02	0.0	102.00	8.26	8.02	0.0				
48.00	8.26	8.02	0.0	103.50	8.26	8.02	0.0				
49.50	8.26	8.02	0.0	105.00	8.26	8.02	0.0				
51.00	8.26	8.02	0.0	106.50	8.26	8.02	0.0				
52.50	8.26	8.02	0.0	108.00	8.26	8.02	0.0				
54.00	8.26	8.02	0.0	109.50	8.26	8.02	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 23S: 555 HALF ROOF

Runoff = 45.7 cfs @ 12.13 hrs, Volume= 183,793 cf, Depth= 8.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
275,000	98	Roofs, HSG C
275,000		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,
0.7	483	0.0270	11.83	37.17	Pipe Channel,
					24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'
					n= 0.013
6.7	483	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 23S: 555 HALF ROOF

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	8.02	0.0	111.00	8.26	8.02	0.0
1.50	0.18	0.06	0.5	57.00	8.26	8.02	0.0	112.50	8.26	8.02	0.0
3.00	0.39	0.22	0.8	58.50	8.26	8.02	0.0	114.00	8.26	8.02	0.0
4.50	0.61	0.42	0.9	60.00	8.26	8.02	0.0	115.50	8.26	8.02	0.0
6.00	0.85	0.65	1.0	61.50	8.26	8.02	0.0	117.00	8.26	8.02	0.0
7.50	1.14	0.93	1.4	63.00	8.26	8.02	0.0	118.50	8.26	8.02	0.0
9.00	1.52	1.30	1.7	64.50	8.26	8.02	0.0	120.00	8.26	8.02	0.0
10.50	2.06	1.84	2.8	66.00	8.26	8.02	0.0				
12.00	3.96	3.72	23.9	67.50	8.26	8.02	0.0				
13.50	6.20	5.96	3.2	69.00	8.26	8.02	0.0				
15.00	6.74	6.51	1.8	70.50	8.26	8.02	0.0				
16.50	7.12	6.88	1.4	72.00	8.26	8.02	0.0				
18.00	7.41	7.17	1.1	73.50	8.26	8.02	0.0				
19.50	7.65	7.41	1.0	75.00	8.26	8.02	0.0				
21.00	7.87	7.63	0.9	76.50	8.26	8.02	0.0				
22.50	8.08	7.84	0.8	78.00	8.26	8.02	0.0				
24.00	8.26	8.02	0.8	79.50	8.26	8.02	0.0				
25.50	8.26	8.02	0.0	81.00	8.26	8.02	0.0				
27.00	8.26	8.02	0.0	82.50	8.26	8.02	0.0				
28.50	8.26	8.02	0.0	84.00	8.26	8.02	0.0				
30.00	8.26	8.02	0.0	85.50	8.26	8.02	0.0				
31.50	8.26	8.02	0.0	87.00	8.26	8.02	0.0				
33.00	8.26	8.02	0.0	88.50	8.26	8.02	0.0				
34.50	8.26	8.02	0.0	90.00	8.26	8.02	0.0				
36.00	8.26	8.02	0.0	91.50	8.26	8.02	0.0				
37.50	8.26	8.02	0.0	93.00	8.26	8.02	0.0				
39.00	8.26	8.02	0.0	94.50	8.26	8.02	0.0				
40.50	8.26	8.02	0.0	96.00	8.26	8.02	0.0				
42.00	8.26	8.02	0.0	97.50	8.26	8.02	0.0				
43.50	8.26	8.02	0.0	99.00	8.26	8.02	0.0				
45.00	8.26	8.02	0.0	100.50	8.26	8.02	0.0				
46.50	8.26	8.02	0.0	102.00	8.26	8.02	0.0				
48.00	8.26	8.02	0.0	103.50	8.26	8.02	0.0				
49.50	8.26	8.02	0.0	105.00	8.26	8.02	0.0				
51.00	8.26	8.02	0.0	106.50	8.26	8.02	0.0				
52.50	8.26	8.02	0.0	108.00	8.26	8.02	0.0				
54.00	8.26	8.02	0.0	109.50	8.26	8.02	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 24S: LOT3 NORTH

Runoff = 80.5 cfs @ 12.22 hrs, Volume= 385,277 cf, Depth= 6.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
248,887	74	>75% Grass cover, Good, HSG C
417,105	98	Paved parking, HSG C
665,992	89	Weighted Average
248,887		37.37% Pervious Area
417,105		62.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0540	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
4.8	200	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	184	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
3.0	1,300	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
14.8	1,734	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 24S: LOT3 NORTH

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	6.94	0.0	111.00	8.26	6.94	0.0
1.50	0.18	0.00	0.0	57.00	8.26	6.94	0.0	112.50	8.26	6.94	0.0
3.00	0.39	0.01	0.3	58.50	8.26	6.94	0.0	114.00	8.26	6.94	0.0
4.50	0.61	0.08	0.9	60.00	8.26	6.94	0.0	115.50	8.26	6.94	0.0
6.00	0.85	0.20	1.4	61.50	8.26	6.94	0.0	117.00	8.26	6.94	0.0
7.50	1.14	0.38	2.1	63.00	8.26	6.94	0.0	118.50	8.26	6.94	0.0
9.00	1.52	0.64	3.1	64.50	8.26	6.94	0.0	120.00	8.26	6.94	0.0
10.50	2.06	1.08	5.4	66.00	8.26	6.94	0.0				
12.00	3.96	2.78	31.9	67.50	8.26	6.94	0.0				
13.50	6.20	4.93	8.3	69.00	8.26	6.94	0.0				
15.00	6.74	5.46	4.6	70.50	8.26	6.94	0.0				
16.50	7.12	5.82	3.5	72.00	8.26	6.94	0.0				
18.00	7.41	6.11	2.7	73.50	8.26	6.94	0.0				
19.50	7.65	6.34	2.4	75.00	8.26	6.94	0.0				
21.00	7.87	6.56	2.2	76.50	8.26	6.94	0.0				
22.50	8.08	6.76	2.0	78.00	8.26	6.94	0.0				
24.00	8.26	6.94	1.8	79.50	8.26	6.94	0.0				
25.50	8.26	6.94	0.0	81.00	8.26	6.94	0.0				
27.00	8.26	6.94	0.0	82.50	8.26	6.94	0.0				
28.50	8.26	6.94	0.0	84.00	8.26	6.94	0.0				
30.00	8.26	6.94	0.0	85.50	8.26	6.94	0.0				
31.50	8.26	6.94	0.0	87.00	8.26	6.94	0.0				
33.00	8.26	6.94	0.0	88.50	8.26	6.94	0.0				
34.50	8.26	6.94	0.0	90.00	8.26	6.94	0.0				
36.00	8.26	6.94	0.0	91.50	8.26	6.94	0.0				
37.50	8.26	6.94	0.0	93.00	8.26	6.94	0.0				
39.00	8.26	6.94	0.0	94.50	8.26	6.94	0.0				
40.50	8.26	6.94	0.0	96.00	8.26	6.94	0.0				
42.00	8.26	6.94	0.0	97.50	8.26	6.94	0.0				
43.50	8.26	6.94	0.0	99.00	8.26	6.94	0.0				
45.00	8.26	6.94	0.0	100.50	8.26	6.94	0.0				
46.50	8.26	6.94	0.0	102.00	8.26	6.94	0.0				
48.00	8.26	6.94	0.0	103.50	8.26	6.94	0.0				
49.50	8.26	6.94	0.0	105.00	8.26	6.94	0.0				
51.00	8.26	6.94	0.0	106.50	8.26	6.94	0.0				
52.50	8.26	6.94	0.0	108.00	8.26	6.94	0.0				
54.00	8.26	6.94	0.0	109.50	8.26	6.94	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

Prepared by Engineering Design Consultants, Inc.

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Summary for Subcatchment 25S: DB2

Runoff = 27.2 cfs @ 12.18 hrs, Volume= 106,072 cf, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
246,734	74	>75% Grass cover, Good, HSG C
246,734		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0600	0.16		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.5	660	0.0450	3.18		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.5	119	0.0080	1.34		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
10.3	829	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 25S: DB2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	5.16	0.0	111.00	8.26	5.16	0.0
1.50	0.18	0.00	0.0	57.00	8.26	5.16	0.0	112.50	8.26	5.16	0.0
3.00	0.39	0.00	0.0	58.50	8.26	5.16	0.0	114.00	8.26	5.16	0.0
4.50	0.61	0.00	0.0	60.00	8.26	5.16	0.0	115.50	8.26	5.16	0.0
6.00	0.85	0.01	0.1	61.50	8.26	5.16	0.0	117.00	8.26	5.16	0.0
7.50	1.14	0.05	0.2	63.00	8.26	5.16	0.0	118.50	8.26	5.16	0.0
9.00	1.52	0.15	0.5	64.50	8.26	5.16	0.0	120.00	8.26	5.16	0.0
10.50	2.06	0.38	1.2	66.00	8.26	5.16	0.0				
12.00	3.96	1.56	11.2	67.50	8.26	5.16	0.0				
13.50	6.20	3.35	2.6	69.00	8.26	5.16	0.0				
15.00	6.74	3.82	1.5	70.50	8.26	5.16	0.0				
16.50	7.12	4.14	1.1	72.00	8.26	5.16	0.0				
18.00	7.41	4.40	0.9	73.50	8.26	5.16	0.0				
19.50	7.65	4.62	0.8	75.00	8.26	5.16	0.0				
21.00	7.87	4.81	0.7	76.50	8.26	5.16	0.0				
22.50	8.08	4.99	0.7	78.00	8.26	5.16	0.0				
24.00	8.26	5.16	0.6	79.50	8.26	5.16	0.0				
25.50	8.26	5.16	0.0	81.00	8.26	5.16	0.0				
27.00	8.26	5.16	0.0	82.50	8.26	5.16	0.0				
28.50	8.26	5.16	0.0	84.00	8.26	5.16	0.0				
30.00	8.26	5.16	0.0	85.50	8.26	5.16	0.0				
31.50	8.26	5.16	0.0	87.00	8.26	5.16	0.0				
33.00	8.26	5.16	0.0	88.50	8.26	5.16	0.0				
34.50	8.26	5.16	0.0	90.00	8.26	5.16	0.0				
36.00	8.26	5.16	0.0	91.50	8.26	5.16	0.0				
37.50	8.26	5.16	0.0	93.00	8.26	5.16	0.0				
39.00	8.26	5.16	0.0	94.50	8.26	5.16	0.0				
40.50	8.26	5.16	0.0	96.00	8.26	5.16	0.0				
42.00	8.26	5.16	0.0	97.50	8.26	5.16	0.0				
43.50	8.26	5.16	0.0	99.00	8.26	5.16	0.0				
45.00	8.26	5.16	0.0	100.50	8.26	5.16	0.0				
46.50	8.26	5.16	0.0	102.00	8.26	5.16	0.0				
48.00	8.26	5.16	0.0	103.50	8.26	5.16	0.0				
49.50	8.26	5.16	0.0	105.00	8.26	5.16	0.0				
51.00	8.26	5.16	0.0	106.50	8.26	5.16	0.0				
52.50	8.26	5.16	0.0	108.00	8.26	5.16	0.0				
54.00	8.26	5.16	0.0	109.50	8.26	5.16	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 26S: UNDEVELOPED

Runoff = 38.7 cfs @ 13.28 hrs, Volume= 492,538 cf, Depth= 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
1,184,876	70	Woods, Good, HSG C
75,742	74	>75% Grass cover, Good, HSG C
1,260,618	70	Weighted Average
1,260,618		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
29.6	1,022	0.0530	0.58		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.6	586	0.0360	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
36.1	1,210	0.0500	0.56		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
98.6	2,868	Total			

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Subcatchment 26S: UNDEVELOPED

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	55.50	8.26	4.69	0.0	111.00	8.26	4.69	0.0
1.50	0.18	0.00	0.0	57.00	8.26	4.69	0.0	112.50	8.26	4.69	0.0
3.00	0.39	0.00	0.0	58.50	8.26	4.69	0.0	114.00	8.26	4.69	0.0
4.50	0.61	0.00	0.0	60.00	8.26	4.69	0.0	115.50	8.26	4.69	0.0
6.00	0.85	0.00	0.0	61.50	8.26	4.69	0.0	117.00	8.26	4.69	0.0
7.50	1.14	0.02	0.1	63.00	8.26	4.69	0.0	118.50	8.26	4.69	0.0
9.00	1.52	0.09	0.8	64.50	8.26	4.69	0.0	120.00	8.26	4.69	0.0
10.50	2.06	0.26	2.2	66.00	8.26	4.69	0.0				
12.00	3.96	1.30	7.0	67.50	8.26	4.69	0.0				
13.50	6.20	2.96	37.8	69.00	8.26	4.69	0.0				
15.00	6.74	3.41	14.5	70.50	8.26	4.69	0.0				
16.50	7.12	3.72	7.6	72.00	8.26	4.69	0.0				
18.00	7.41	3.96	5.5	73.50	8.26	4.69	0.0				
19.50	7.65	4.17	4.3	75.00	8.26	4.69	0.0				
21.00	7.87	4.36	3.9	76.50	8.26	4.69	0.0				
22.50	8.08	4.53	3.5	78.00	8.26	4.69	0.0				
24.00	8.26	4.69	3.2	79.50	8.26	4.69	0.0				
25.50	8.26	4.69	1.3	81.00	8.26	4.69	0.0				
27.00	8.26	4.69	0.1	82.50	8.26	4.69	0.0				
28.50	8.26	4.69	0.0	84.00	8.26	4.69	0.0				
30.00	8.26	4.69	0.0	85.50	8.26	4.69	0.0				
31.50	8.26	4.69	0.0	87.00	8.26	4.69	0.0				
33.00	8.26	4.69	0.0	88.50	8.26	4.69	0.0				
34.50	8.26	4.69	0.0	90.00	8.26	4.69	0.0				
36.00	8.26	4.69	0.0	91.50	8.26	4.69	0.0				
37.50	8.26	4.69	0.0	93.00	8.26	4.69	0.0				
39.00	8.26	4.69	0.0	94.50	8.26	4.69	0.0				
40.50	8.26	4.69	0.0	96.00	8.26	4.69	0.0				
42.00	8.26	4.69	0.0	97.50	8.26	4.69	0.0				
43.50	8.26	4.69	0.0	99.00	8.26	4.69	0.0				
45.00	8.26	4.69	0.0	100.50	8.26	4.69	0.0				
46.50	8.26	4.69	0.0	102.00	8.26	4.69	0.0				
48.00	8.26	4.69	0.0	103.50	8.26	4.69	0.0				
49.50	8.26	4.69	0.0	105.00	8.26	4.69	0.0				
51.00	8.26	4.69	0.0	106.50	8.26	4.69	0.0				
52.50	8.26	4.69	0.0	108.00	8.26	4.69	0.0				
54.00	8.26	4.69	0.0	109.50	8.26	4.69	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Reach 11R: Culvert

Inflow Area = 640,208 sf, 1.71% Impervious, Inflow Depth = 4.89" for 100-Year D event
 Inflow = 24.2 cfs @ 12.94 hrs, Volume= 260,953 cf
 Outflow = 24.2 cfs @ 12.94 hrs, Volume= 260,953 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

Max. Velocity= 5.83 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.37 fps, Avg. Travel Time= 0.4 min

Peak Storage= 208 cf @ 12.94 hrs

Average Depth at Peak Storage= 1.66'

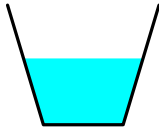
Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

2.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding

Side Slope Z-value= 0.3 ' Top Width= 3.80'

Length= 50.0' Slope= 0.0200 ' /'

Inlet Invert= 280.00', Outlet Invert= 279.00'

**3780 STORMWATER-(1-24-23)**

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Reach 11R: Culvert

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.0	0	280.00	0.0	111.00	0.0	0	280.00	0.0
3.00	0.0	2	280.02	0.0	114.00	0.0	0	280.00	0.0
6.00	0.1	4	280.04	0.1	117.00	0.0	0	280.00	0.0
9.00	0.7	18	280.18	0.7	120.00	0.0	0	280.00	0.0
12.00	6.9	82	280.74	6.9					
15.00	5.5	70	280.64	5.5					
18.00	2.6	42	280.40	2.6					
21.00	1.9	34	280.33	1.9					
24.00	1.6	30	280.29	1.6					
27.00	0.0	1	280.01	0.0					
30.00	0.0	0	280.00	0.0					
33.00	0.0	0	280.00	0.0					
36.00	0.0	0	280.00	0.0					
39.00	0.0	0	280.00	0.0					
42.00	0.0	0	280.00	0.0					
45.00	0.0	0	280.00	0.0					
48.00	0.0	0	280.00	0.0					
51.00	0.0	0	280.00	0.0					
54.00	0.0	0	280.00	0.0					
57.00	0.0	0	280.00	0.0					
60.00	0.0	0	280.00	0.0					
63.00	0.0	0	280.00	0.0					
66.00	0.0	0	280.00	0.0					
69.00	0.0	0	280.00	0.0					
72.00	0.0	0	280.00	0.0					
75.00	0.0	0	280.00	0.0					
78.00	0.0	0	280.00	0.0					
81.00	0.0	0	280.00	0.0					
84.00	0.0	0	280.00	0.0					
87.00	0.0	0	280.00	0.0					
90.00	0.0	0	280.00	0.0					
93.00	0.0	0	280.00	0.0					
96.00	0.0	0	280.00	0.0					
99.00	0.0	0	280.00	0.0					
102.00	0.0	0	280.00	0.0					
105.00	0.0	0	280.00	0.0					
108.00	0.0	0	280.00	0.0					

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Pond 9P: CULVERT

Inflow Area = 106,603 sf, 0.00% Impervious, Inflow Depth = 5.16" for 100-Year D event
 Inflow = 9.7 cfs @ 12.25 hrs, Volume= 45,829 cf
 Outflow = 9.2 cfs @ 12.29 hrs, Volume= 45,701 cf, Atten= 5%, Lag= 2.9 min
 Primary = 9.2 cfs @ 12.29 hrs, Volume= 45,701 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
 Peak Elev= 295.92' @ 12.29 hrs Surf.Area= 898 sf Storage= 1,324 cf

Plug-Flow detention time= 6.5 min calculated for 45,701 cf (100% of inflow)
 Center-of-Mass det. time= 4.7 min (849.2 - 844.5)

Volume	Invert	Avail.Storage	Storage Description		
#1	293.00'	4,006 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.00	0	0.0	0	0	0
294.00	385	92.0	128	128	675
296.00	925	120.0	1,271	1,400	1,193
298.00	1,723	157.0	2,607	4,006	2,054

Device	Routing	Invert	Outlet Devices		
#1	Primary	294.00'	18.0" Round Culvert L= 75.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 294.00' / 293.00' S= 0.0133 ' / Cc= 0.900 n= 0.013, Flow Area= 1.77 sf		

Primary OutFlow Max=9.2 cfs @ 12.29 hrs HW=295.91' (Free Discharge)

1=Culvert (Inlet Controls 9.2 cfs @ 5.19 fps)

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Pond 9P: CULVERT

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.0	0	293.00	0.0	111.00	0.0	128	294.00	0.0
3.00	0.0	0	293.00	0.0	114.00	0.0	128	294.00	0.0
6.00	0.0	28	293.60	0.0	117.00	0.0	128	294.00	0.0
9.00	0.2	207	294.19	0.2	120.00	0.0	128	294.00	0.0
12.00	3.4	526	294.83	3.1					
15.00	0.7	281	294.36	0.7					
18.00	0.4	241	294.27	0.4					
21.00	0.3	229	294.24	0.3					
24.00	0.3	219	294.22	0.3					
27.00	0.0	128	294.00	0.0					
30.00	0.0	128	294.00	0.0					
33.00	0.0	128	294.00	0.0					
36.00	0.0	128	294.00	0.0					
39.00	0.0	128	294.00	0.0					
42.00	0.0	128	294.00	0.0					
45.00	0.0	128	294.00	0.0					
48.00	0.0	128	294.00	0.0					
51.00	0.0	128	294.00	0.0					
54.00	0.0	128	294.00	0.0					
57.00	0.0	128	294.00	0.0					
60.00	0.0	128	294.00	0.0					
63.00	0.0	128	294.00	0.0					
66.00	0.0	128	294.00	0.0					
69.00	0.0	128	294.00	0.0					
72.00	0.0	128	294.00	0.0					
75.00	0.0	128	294.00	0.0					
78.00	0.0	128	294.00	0.0					
81.00	0.0	128	294.00	0.0					
84.00	0.0	128	294.00	0.0					
87.00	0.0	128	294.00	0.0					
90.00	0.0	128	294.00	0.0					
93.00	0.0	128	294.00	0.0					
96.00	0.0	128	294.00	0.0					
99.00	0.0	128	294.00	0.0					
102.00	0.0	128	294.00	0.0					
105.00	0.0	128	294.00	0.0					
108.00	0.0	128	294.00	0.0					

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Pond 10P: DB1

Inflow Area = 1,677,085 sf, 37.19% Impervious, Inflow Depth = 6.16" for 100-Year D event
 Inflow = 141.1 cfs @ 12.23 hrs, Volume= 861,197 cf
 Outflow = 30.0 cfs @ 13.04 hrs, Volume= 861,172 cf, Atten= 79%, Lag= 48.2 min
 Discarded = 0.7 cfs @ 13.04 hrs, Volume= 62,319 cf
 Primary = 29.3 cfs @ 13.04 hrs, Volume= 798,854 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 282.11' @ 13.04 hrs Surf.Area= 104,159 sf Storage= 397,272 cf

Plug-Flow detention time= 377.7 min calculated for 861,172 cf (100% of inflow)
 Center-of-Mass det. time= 377.5 min (1,184.9 - 807.4)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	603,909 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	273.00'	138 cf	4.00'D x 11.00'H Vertical Cone/Cylinder
		604,047 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
275.00	100	40.0	0	0	100
276.00	13,700	600.0	4,990	4,990	28,622
277.00	27,095	820.0	20,021	25,011	53,492
278.00	44,050	1,020.0	35,231	60,242	82,791
279.00	69,900	1,580.0	56,480	116,721	198,664
280.00	87,050	1,610.0	78,318	195,040	206,444
282.00	103,500	1,725.0	190,313	385,353	237,146
284.00	115,160	1,730.0	218,556	603,909	240,864

Device	Routing	Invert	Outlet Devices
#1	Primary	273.34'	24.0" Round Culvert L= 90.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' / S= 0.0782 ' / Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	276.36'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	278.80'	0.7' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	281.40'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

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#5 Primary 283.50' **6.0' long x 10.0' breadth Emergency Spillway**
 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
 #6 Discarded 273.00' **0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.7 cfs @ 13.04 hrs HW=282.11' (Free Discharge)
 6=Exfiltration (Exfiltration Controls 0.7 cfs)

Primary OutFlow Max=29.3 cfs @ 13.04 hrs HW=282.11' (Free Discharge)
 1=Culvert (Passes 29.3 cfs of 42.2 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 6.7 cfs @ 11.30 fps)
 3=Sharp-Crested Rectangular Weir (Weir Controls 6.9 cfs @ 5.95 fps)
 4=Orifice/Grate (Weir Controls 15.8 cfs @ 2.76 fps)
 5=Emergency Spillway (Controls 0.0 cfs)

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Hydrograph for Pond 10P: DB1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.0	0	273.00	0.0	0.0	0.0
6.00	2.3	19,108	276.76	1.2	0.1	1.1
12.00	69.6	163,151	279.62	6.7	0.5	6.2
18.00	6.4	306,421	281.21	11.0	0.6	10.4
24.00	4.3	215,207	280.23	8.3	0.6	7.7
30.00	0.0	88,382	278.55	4.3	0.4	4.0
36.00	0.0	21,318	276.86	1.6	0.2	1.4
42.00	0.0	11,241	276.39	0.1	0.1	0.0
48.00	0.0	8,850	276.25	0.1	0.1	0.0
54.00	0.0	6,711	276.12	0.1	0.1	0.0
60.00	0.0	4,787	275.98	0.1	0.1	0.0
66.00	0.0	3,213	275.85	0.1	0.1	0.0
72.00	0.0	2,032	275.71	0.0	0.0	0.0
78.00	0.0	1,187	275.57	0.0	0.0	0.0
84.00	0.0	621	275.44	0.0	0.0	0.0
90.00	0.0	277	275.31	0.0	0.0	0.0
96.00	0.0	100	275.17	0.0	0.0	0.0
102.00	0.0	33	275.03	0.0	0.0	0.0
108.00	0.0	24	274.90	0.0	0.0	0.0
114.00	0.0	22	274.77	0.0	0.0	0.0
120.00	0.0	21	274.63	0.0	0.0	0.0

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Summary for Pond 12P: CULV 30

Inflow Area = 527,285 sf, 4.17% Impervious, Inflow Depth = 5.17" for 100-Year D event
 Inflow = 38.9 cfs @ 12.32 hrs, Volume= 227,187 cf
 Outflow = 37.8 cfs @ 12.37 hrs, Volume= 227,190 cf, Atten= 3%, Lag= 2.8 min
 Discarded = 0.0 cfs @ 12.37 hrs, Volume= 462 cf
 Primary = 37.8 cfs @ 12.37 hrs, Volume= 226,729 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6
 Peak Elev= 283.81' @ 12.37 hrs Surf.Area= 1,515 sf Storage= 4,026 cf

Plug-Flow detention time= 2.9 min calculated for 227,134 cf (100% of inflow)
 Center-of-Mass det. time= 3.0 min (851.0 - 848.0)

Volume	Invert	Avail.Storage	Storage Description
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#1	279.50'	8,119 cf	Custom Stage Data (Conic) Listed below (Recalc)
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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
279.50	0	0	0	0
280.00	610	102	102	610
282.00	1,035	1,626	1,728	1,081
284.00	1,570	2,586	4,315	1,673
286.00	2,255	3,804	8,119	2,425

Device	Routing	Invert	Outlet Devices
--------	---------	--------	----------------

#1	Primary	280.00'	30.0" Round Culvert L= 129.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 280.00' / 278.00' S= 0.0155 ' / ' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf
#2	Discarded	279.50'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.37 hrs HW=283.81' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=37.8 cfs @ 12.37 hrs HW=283.81' (Free Discharge)

↑ **1=Culvert** (Inlet Controls 37.8 cfs @ 7.70 fps)

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Hydrograph for Pond 12P: CULV 30

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.0	0	279.50	0.0	0.0	0.0
6.00	0.1	173	280.11	0.1	0.0	0.1
12.00	14.3	1,277	281.54	13.4	0.0	13.4
18.00	1.9	458	280.54	2.0	0.0	1.9
24.00	1.3	386	280.44	1.3	0.0	1.3
30.00	0.0	57	279.91	0.0	0.0	0.0
36.00	0.0	18	279.78	0.0	0.0	0.0
42.00	0.0	3	279.64	0.0	0.0	0.0
48.00	0.0	0	279.51	0.0	0.0	0.0
54.00	0.0	0	279.50	0.0	0.0	0.0
60.00	0.0	0	279.50	0.0	0.0	0.0
66.00	0.0	0	279.50	0.0	0.0	0.0
72.00	0.0	0	279.50	0.0	0.0	0.0
78.00	0.0	0	279.50	0.0	0.0	0.0
84.00	0.0	0	279.50	0.0	0.0	0.0
90.00	0.0	0	279.50	0.0	0.0	0.0
96.00	0.0	0	279.50	0.0	0.0	0.0
102.00	0.0	0	279.50	0.0	0.0	0.0
108.00	0.0	0	279.50	0.0	0.0	0.0
114.00	0.0	0	279.50	0.0	0.0	0.0
120.00	0.0	0	279.50	0.0	0.0	0.0

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Summary for Pond 13P: CULV 12A

Inflow Area = 421,825 sf, 65.19% Impervious, Inflow Depth = 7.02" for 100-Year D event
 Inflow = 53.7 cfs @ 12.16 hrs, Volume= 246,914 cf
 Outflow = 42.0 cfs @ 12.24 hrs, Volume= 246,907 cf, Atten= 22%, Lag= 4.6 min
 Primary = 42.0 cfs @ 12.24 hrs, Volume= 246,907 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6
 Peak Elev= 295.41' @ 12.24 hrs Surf.Area= 4,256 sf Storage= 11,690 cf

Plug-Flow detention time= 2.6 min calculated for 246,845 cf (100% of inflow)
 Center-of-Mass det. time= 2.6 min (772.7 - 770.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	291.00'	28,701 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
291.00	100	40.0	0	0	100	
292.00	2,142	200.0	902	902	3,158	
294.00	3,334	230.0	5,432	6,334	4,271	
296.00	4,670	270.0	7,967	14,300	5,939	
298.00	6,352	323.0	10,979	25,279	8,510	
298.50	7,345	340.0	3,421	28,701	9,422	

Device	Routing	Invert	Outlet Devices			
#1	Primary	291.00'	30.0" Round Culvert L= 120.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 291.00' / 286.20' S= 0.0400 1' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf			

Primary OutFlow Max=42.0 cfs @ 12.24 hrs HW=295.41' (Free Discharge)

1=Culvert (Inlet Controls 42.0 cfs @ 8.56 fps)

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Hydrograph for Pond 13P: CULV 12A

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.0	0	291.00	0.0	111.00	0.0	0	291.00	0.0
3.00	0.8	89	291.33	0.8	114.00	0.0	0	291.00	0.0
6.00	1.1	121	291.39	1.0	117.00	0.0	0	291.00	0.0
9.00	2.0	231	291.54	2.0	120.00	0.0	0	291.00	0.0
12.00	25.6	3,416	293.04	20.8					
15.00	2.8	342	291.65	2.8					
18.00	1.6	192	291.49	1.6					
21.00	1.3	156	291.45	1.3					
24.00	1.1	128	291.40	1.1					
27.00	0.0	0	291.00	0.0					
30.00	0.0	0	291.00	0.0					
33.00	0.0	0	291.00	0.0					
36.00	0.0	0	291.00	0.0					
39.00	0.0	0	291.00	0.0					
42.00	0.0	0	291.00	0.0					
45.00	0.0	0	291.00	0.0					
48.00	0.0	0	291.00	0.0					
51.00	0.0	0	291.00	0.0					
54.00	0.0	0	291.00	0.0					
57.00	0.0	0	291.00	0.0					
60.00	0.0	0	291.00	0.0					
63.00	0.0	0	291.00	0.0					
66.00	0.0	0	291.00	0.0					
69.00	0.0	0	291.00	0.0					
72.00	0.0	0	291.00	0.0					
75.00	0.0	0	291.00	0.0					
78.00	0.0	0	291.00	0.0					
81.00	0.0	0	291.00	0.0					
84.00	0.0	0	291.00	0.0					
87.00	0.0	0	291.00	0.0					
90.00	0.0	0	291.00	0.0					
93.00	0.0	0	291.00	0.0					
96.00	0.0	0	291.00	0.0					
99.00	0.0	0	291.00	0.0					
102.00	0.0	0	291.00	0.0					
105.00	0.0	0	291.00	0.0					
108.00	0.0	0	291.00	0.0					

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Summary for Pond 22P: INF

Inflow Area = 111,608 sf, 100.00% Impervious, Inflow Depth = 8.02" for 100-Year D event
 Inflow = 16.5 cfs @ 12.17 hrs, Volume= 74,592 cf
 Outflow = 15.0 cfs @ 12.17 hrs, Volume= 74,198 cf, Atten= 9%, Lag= 0.0 min
 Discarded = 0.0 cfs @ 12.15 hrs, Volume= 1,702 cf
 Primary = 15.0 cfs @ 12.17 hrs, Volume= 72,497 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4
 Peak Elev= 289.85' @ 12.17 hrs Surf.Area= 2,044 sf Storage= 4,175 cf

Plug-Flow detention time= 25.7 min calculated for 74,180 cf (99% of inflow)
 Center-of-Mass det. time= 22.2 min (768.1 - 746.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	285.50'	1,589 cf	28.00'W x 73.00'L x 3.21'H Field A 6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids
#2A	286.00'	2,587 cf	Cultec R-280HD x 60 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 6 rows
4,175 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	286.00'	18.0" Round Culvert L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 286.00' / 285.14' S= 0.0430 ' / ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Discarded	285.50'	0.270 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.0 cfs @ 12.15 hrs HW=289.69' (Free Discharge)

2=Exfiltration (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=14.8 cfs @ 12.17 hrs HW=289.77' (Free Discharge)

1=Culvert (Inlet Controls 14.8 cfs @ 8.37 fps)

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Hydrograph for Pond 22P: INF

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.0	0	285.50	0.0	0.0	0.0
6.00	0.4	897	286.27	0.4	0.0	0.4
12.00	7.6	2,525	287.24	5.9	0.0	5.9
18.00	0.5	933	286.29	0.5	0.0	0.5
24.00	0.3	829	286.24	0.3	0.0	0.3
30.00	0.0	247	285.80	0.0	0.0	0.0
36.00	0.0	3	285.50	0.0	0.0	0.0
42.00	0.0	0	285.50	0.0	0.0	0.0
48.00	0.0	0	285.50	0.0	0.0	0.0
54.00	0.0	0	285.50	0.0	0.0	0.0
60.00	0.0	0	285.50	0.0	0.0	0.0
66.00	0.0	0	285.50	0.0	0.0	0.0
72.00	0.0	0	285.50	0.0	0.0	0.0
78.00	0.0	0	285.50	0.0	0.0	0.0
84.00	0.0	0	285.50	0.0	0.0	0.0
90.00	0.0	0	285.50	0.0	0.0	0.0
96.00	0.0	0	285.50	0.0	0.0	0.0
102.00	0.0	0	285.50	0.0	0.0	0.0
108.00	0.0	0	285.50	0.0	0.0	0.0
114.00	0.0	0	285.50	0.0	0.0	0.0
120.00	0.0	0	285.50	0.0	0.0	0.0

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Summary for Pond 30P: DB2

Inflow Area = 1,187,726 sf, 58.27% Impervious, Inflow Depth = 6.82" for 100-Year D event
 Inflow = 140.9 cfs @ 12.17 hrs, Volume= 675,142 cf
 Outflow = 35.4 cfs @ 12.61 hrs, Volume= 675,149 cf, Atten= 75%, Lag= 26.3 min
 Discarded = 0.6 cfs @ 12.61 hrs, Volume= 50,200 cf
 Primary = 34.8 cfs @ 12.61 hrs, Volume= 624,949 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4
 Peak Elev= 329.35' @ 12.61 hrs Surf.Area= 98,277 sf Storage= 284,641 cf

Plug-Flow detention time= 273.5 min calculated for 674,980 cf (100% of inflow)
 Center-of-Mass det. time= 274.6 min (1,062.5 - 787.9)

Volume	Invert	Avail.Storage	Storage Description			
#1	323.00'	349,948 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
323.00	400	80.0	0.0	0	0	400
324.00	19,450	575.0	100.0	7,546	7,546	26,203
325.00	28,075	685.0	100.0	23,631	31,177	37,250
326.00	37,630	790.0	100.0	32,736	63,913	49,597
327.00	50,456	930.0	100.0	43,887	107,800	68,779
328.00	70,215	1,120.0	100.0	60,064	167,864	99,791
329.00	96,500	1,450.0	100.0	83,010	250,874	167,293
330.00	101,670	1,610.0	100.0	99,074	349,948	206,284

Device	Routing	Invert	Outlet Devices			
#1	Primary	323.00'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 323.00' / 319.50' S= 0.0500 'l' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf			
#2	Device 1	324.34'	10.0" Vert. Orifice/Grate C= 0.600			
#3	Device 1	326.50'	20.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir Cv= 2.69 (C= 3.36)			
#4	Device 1	328.90'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads			
#5	Primary	329.50'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir X 0.00 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64			

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#6 Discarded 323.00' **0.270 in/hr Exfiltration over Surface area****Discarded OutFlow** Max=0.6 cfs @ 12.61 hrs HW=329.35' (Free Discharge)↳ **6=Exfiltration** (Exfiltration Controls 0.6 cfs)**Primary OutFlow** Max=35.0 cfs @ 12.61 hrs HW=329.35' (Free Discharge)↳ **1=Culvert** (Inlet Controls 35.0 cfs @ 11.13 fps)↳ **2=Orifice/Grate** (Passes < 5.6 cfs potential flow)↳ **3=Sharp-Crested Vee/Trap Weir** (Passes < 22.6 cfs potential flow)↳ **4=Orifice/Grate** (Passes < 7.8 cfs potential flow)↳ **5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)**3780 STORMWATER-(1-24-23)**

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Hydrograph for Pond 30P: DB2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.0	0	323.00	0.0	0.0	0.0
6.00	2.4	22,078	324.66	0.5	0.2	0.4
12.00	67.0	152,388	327.77	10.7	0.4	10.2
18.00	4.7	134,817	327.49	8.5	0.4	8.1
24.00	3.1	92,972	326.69	4.2	0.3	4.0
30.00	0.0	32,483	325.05	1.6	0.2	1.4
36.00	0.0	18,285	324.50	0.3	0.1	0.1
42.00	0.0	14,537	324.34	0.1	0.1	0.0
48.00	0.0	11,620	324.20	0.1	0.1	0.0
54.00	0.0	8,850	324.07	0.1	0.1	0.0
60.00	0.0	6,286	323.93	0.1	0.1	0.0
66.00	0.0	4,236	323.80	0.1	0.1	0.0
72.00	0.0	2,686	323.66	0.1	0.1	0.0
78.00	0.0	1,568	323.52	0.0	0.0	0.0
84.00	0.0	810	323.39	0.0	0.0	0.0
90.00	0.0	342	323.25	0.0	0.0	0.0
96.00	0.0	94	323.12	0.0	0.0	0.0
102.00	0.0	9	323.01	0.0	0.0	0.0
108.00	0.0	1	323.00	0.0	0.0	0.0
114.00	0.0	0	323.00	0.0	0.0	0.0
120.00	0.0	0	323.00	0.0	0.0	0.0

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

Prepared by Engineering Design Consultants, Inc.

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Summary for Link 1L: Total PreDeveloped West

Inflow Area = 4,510,313 sf, 0.00% Impervious, Inflow Depth = 4.69" for 100-Year D event
 Inflow = 145.7 cfs @ 13.17 hrs, Volume= 1,762,231 cf
 Primary = 145.7 cfs @ 13.17 hrs, Volume= 1,762,231 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

Prepared by Engineering Design Consultants, Inc.

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Hydrograph for Link 1L: Total PreDeveloped West

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	0.00	0.0	55.50	0.0	0.00	0.0	111.00	0.0	0.00	0.0
1.50	0.0	0.00	0.0	57.00	0.0	0.00	0.0	112.50	0.0	0.00	0.0
3.00	0.0	0.00	0.0	58.50	0.0	0.00	0.0	114.00	0.0	0.00	0.0
4.50	0.0	0.00	0.0	60.00	0.0	0.00	0.0	115.50	0.0	0.00	0.0
6.00	0.0	0.00	0.0	61.50	0.0	0.00	0.0	117.00	0.0	0.00	0.0
7.50	0.5	0.00	0.5	63.00	0.0	0.00	0.0	118.50	0.0	0.00	0.0
9.00	3.3	0.00	3.3	64.50	0.0	0.00	0.0	120.00	0.0	0.00	0.0
10.50	8.6	0.00	8.6	66.00	0.0	0.00	0.0				
12.00	27.8	0.00	27.8	67.50	0.0	0.00	0.0				
13.50	132.8	0.00	132.8	69.00	0.0	0.00	0.0				
15.00	47.4	0.00	47.4	70.50	0.0	0.00	0.0				
16.50	25.7	0.00	25.7	72.00	0.0	0.00	0.0				
18.00	19.1	0.00	19.1	73.50	0.0	0.00	0.0				
19.50	15.3	0.00	15.3	75.00	0.0	0.00	0.0				
21.00	13.7	0.00	13.7	76.50	0.0	0.00	0.0				
22.50	12.6	0.00	12.6	78.00	0.0	0.00	0.0				
24.00	11.5	0.00	11.5	79.50	0.0	0.00	0.0				
25.50	3.8	0.00	3.8	81.00	0.0	0.00	0.0				
27.00	0.3	0.00	0.3	82.50	0.0	0.00	0.0				
28.50	0.0	0.00	0.0	84.00	0.0	0.00	0.0				
30.00	0.0	0.00	0.0	85.50	0.0	0.00	0.0				
31.50	0.0	0.00	0.0	87.00	0.0	0.00	0.0				
33.00	0.0	0.00	0.0	88.50	0.0	0.00	0.0				
34.50	0.0	0.00	0.0	90.00	0.0	0.00	0.0				
36.00	0.0	0.00	0.0	91.50	0.0	0.00	0.0				
37.50	0.0	0.00	0.0	93.00	0.0	0.00	0.0				
39.00	0.0	0.00	0.0	94.50	0.0	0.00	0.0				
40.50	0.0	0.00	0.0	96.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0	97.50	0.0	0.00	0.0				
43.50	0.0	0.00	0.0	99.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0	100.50	0.0	0.00	0.0				
46.50	0.0	0.00	0.0	102.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0	103.50	0.0	0.00	0.0				
49.50	0.0	0.00	0.0	105.00	0.0	0.00	0.0				
51.00	0.0	0.00	0.0	106.50	0.0	0.00	0.0				
52.50	0.0	0.00	0.0	108.00	0.0	0.00	0.0				
54.00	0.0	0.00	0.0	109.50	0.0	0.00	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

Prepared by Engineering Design Consultants, Inc.

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Summary for Link 10L: PostDeveloped

Inflow Area = 2,347,956 sf, 27.53% Impervious, Inflow Depth = 5.50" for 100-Year D event
 Inflow = 54.0 cfs @ 12.97 hrs, Volume= 1,076,935 cf
 Primary = 54.0 cfs @ 12.97 hrs, Volume= 1,076,935 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Link 10L: PostDeveloped

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	0.00	0.0	55.50	0.0	0.00	0.0	111.00	0.0	0.00	0.0
1.50	0.0	0.00	0.0	57.00	0.0	0.00	0.0	112.50	0.0	0.00	0.0
3.00	0.0	0.00	0.0	58.50	0.0	0.00	0.0	114.00	0.0	0.00	0.0
4.50	0.2	0.00	0.2	60.00	0.0	0.00	0.0	115.50	0.0	0.00	0.0
6.00	1.2	0.00	1.2	61.50	0.0	0.00	0.0	117.00	0.0	0.00	0.0
7.50	2.2	0.00	2.2	63.00	0.0	0.00	0.0	118.50	0.0	0.00	0.0
9.00	3.4	0.00	3.4	64.50	0.0	0.00	0.0	120.00	0.0	0.00	0.0
10.50	5.4	0.00	5.4	66.00	0.0	0.00	0.0				
12.00	15.7	0.00	15.7	67.50	0.0	0.00	0.0				
13.50	43.9	0.00	43.9	69.00	0.0	0.00	0.0				
15.00	21.6	0.00	21.6	70.50	0.0	0.00	0.0				
16.50	14.8	0.00	14.8	72.00	0.0	0.00	0.0				
18.00	13.1	0.00	13.1	73.50	0.0	0.00	0.0				
19.50	11.7	0.00	11.7	75.00	0.0	0.00	0.0				
21.00	10.8	0.00	10.8	76.50	0.0	0.00	0.0				
22.50	10.0	0.00	10.0	78.00	0.0	0.00	0.0				
24.00	9.4	0.00	9.4	79.50	0.0	0.00	0.0				
25.50	7.0	0.00	7.0	81.00	0.0	0.00	0.0				
27.00	5.5	0.00	5.5	82.50	0.0	0.00	0.0				
28.50	4.5	0.00	4.5	84.00	0.0	0.00	0.0				
30.00	4.0	0.00	4.0	85.50	0.0	0.00	0.0				
31.50	3.5	0.00	3.5	87.00	0.0	0.00	0.0				
33.00	2.9	0.00	2.9	88.50	0.0	0.00	0.0				
34.50	2.3	0.00	2.3	90.00	0.0	0.00	0.0				
36.00	1.4	0.00	1.4	91.50	0.0	0.00	0.0				
37.50	0.5	0.00	0.5	93.00	0.0	0.00	0.0				
39.00	0.2	0.00	0.2	94.50	0.0	0.00	0.0				
40.50	0.1	0.00	0.1	96.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0	97.50	0.0	0.00	0.0				
43.50	0.0	0.00	0.0	99.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0	100.50	0.0	0.00	0.0				
46.50	0.0	0.00	0.0	102.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0	103.50	0.0	0.00	0.0				
49.50	0.0	0.00	0.0	105.00	0.0	0.00	0.0				
51.00	0.0	0.00	0.0	106.50	0.0	0.00	0.0				
52.50	0.0	0.00	0.0	108.00	0.0	0.00	0.0				
54.00	0.0	0.00	0.0	109.50	0.0	0.00	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

Prepared by Engineering Design Consultants, Inc.

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Summary for Link 11L: Total Post Developed West

Inflow Area = 4,397,792 sf, 14.70% Impervious, Inflow Depth = 5.12" for 100-Year D event
 Inflow = 135.7 cfs @ 12.90 hrs, Volume= 1,877,829 cf
 Primary = 135.7 cfs @ 12.90 hrs, Volume= 1,877,829 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Hydrograph for Link 11L: Total Post Developed West

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	0.00	0.0	55.50	0.0	0.00	0.0	111.00	0.0	0.00	0.0
1.50	0.0	0.00	0.0	57.00	0.0	0.00	0.0	112.50	0.0	0.00	0.0
3.00	0.0	0.00	0.0	58.50	0.0	0.00	0.0	114.00	0.0	0.00	0.0
4.50	0.2	0.00	0.2	60.00	0.0	0.00	0.0	115.50	0.0	0.00	0.0
6.00	1.2	0.00	1.2	61.50	0.0	0.00	0.0	117.00	0.0	0.00	0.0
7.50	2.6	0.00	2.6	63.00	0.0	0.00	0.0	118.50	0.0	0.00	0.0
9.00	5.4	0.00	5.4	64.50	0.0	0.00	0.0	120.00	0.0	0.00	0.0
10.50	10.2	0.00	10.2	66.00	0.0	0.00	0.0				
12.00	33.3	0.00	33.3	67.50	0.0	0.00	0.0				
13.50	93.1	0.00	93.1	69.00	0.0	0.00	0.0				
15.00	37.9	0.00	37.9	70.50	0.0	0.00	0.0				
16.50	25.1	0.00	25.1	72.00	0.0	0.00	0.0				
18.00	21.2	0.00	21.2	73.50	0.0	0.00	0.0				
19.50	18.4	0.00	18.4	75.00	0.0	0.00	0.0				
21.00	16.9	0.00	16.9	76.50	0.0	0.00	0.0				
22.50	15.6	0.00	15.6	78.00	0.0	0.00	0.0				
24.00	14.5	0.00	14.5	79.50	0.0	0.00	0.0				
25.50	7.6	0.00	7.6	81.00	0.0	0.00	0.0				
27.00	5.5	0.00	5.5	82.50	0.0	0.00	0.0				
28.50	4.5	0.00	4.5	84.00	0.0	0.00	0.0				
30.00	4.0	0.00	4.0	85.50	0.0	0.00	0.0				
31.50	3.5	0.00	3.5	87.00	0.0	0.00	0.0				
33.00	2.9	0.00	2.9	88.50	0.0	0.00	0.0				
34.50	2.3	0.00	2.3	90.00	0.0	0.00	0.0				
36.00	1.4	0.00	1.4	91.50	0.0	0.00	0.0				
37.50	0.5	0.00	0.5	93.00	0.0	0.00	0.0				
39.00	0.2	0.00	0.2	94.50	0.0	0.00	0.0				
40.50	0.1	0.00	0.1	96.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0	97.50	0.0	0.00	0.0				
43.50	0.0	0.00	0.0	99.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0	100.50	0.0	0.00	0.0				
46.50	0.0	0.00	0.0	102.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0	103.50	0.0	0.00	0.0				
49.50	0.0	0.00	0.0	105.00	0.0	0.00	0.0				
51.00	0.0	0.00	0.0	106.50	0.0	0.00	0.0				
52.50	0.0	0.00	0.0	108.00	0.0	0.00	0.0				
54.00	0.0	0.00	0.0	109.50	0.0	0.00	0.0				

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

Prepared by Engineering Design Consultants, Inc.

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Summary for Link 12L: Total Post-Developed North

Inflow Area = 2,448,344 sf, 28.27% Impervious, Inflow Depth = 5.48" for 100-Year D event
 Inflow = 66.9 cfs @ 13.14 hrs, Volume= 1,117,487 cf
 Primary = 66.9 cfs @ 13.14 hrs, Volume= 1,117,487 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

3780 STORMWATER-(1-24-23)

NRCC 24-hr D 100-Year D Rainfall=8.26"

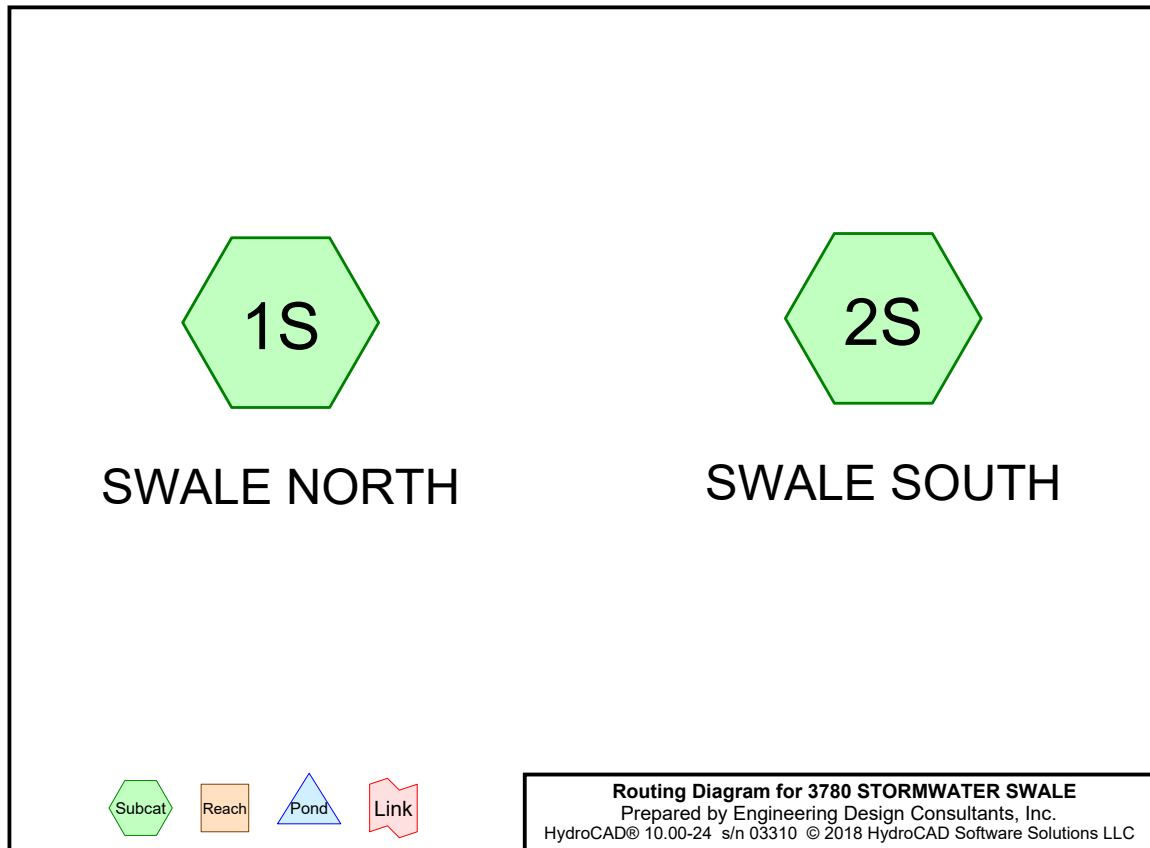
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Hydrograph for Link 12L: Total Post-Developed North

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	0.00	0.0	55.50	0.0	0.00	0.0	111.00	0.0	0.00	0.0
1.50	0.0	0.00	0.0	57.00	0.0	0.00	0.0	112.50	0.0	0.00	0.0
3.00	0.0	0.00	0.0	58.50	0.0	0.00	0.0	114.00	0.0	0.00	0.0
4.50	0.0	0.00	0.0	60.00	0.0	0.00	0.0	115.50	0.0	0.00	0.0
6.00	0.4	0.00	0.4	61.50	0.0	0.00	0.0	117.00	0.0	0.00	0.0
7.50	1.5	0.00	1.5	63.00	0.0	0.00	0.0	118.50	0.0	0.00	0.0
9.00	3.1	0.00	3.1	64.50	0.0	0.00	0.0	120.00	0.0	0.00	0.0
10.50	5.3	0.00	5.3	66.00	0.0	0.00	0.0				
12.00	17.2	0.00	17.2	67.50	0.0	0.00	0.0				
13.50	62.5	0.00	62.5	69.00	0.0	0.00	0.0				
15.00	30.7	0.00	30.7	70.50	0.0	0.00	0.0				
16.50	18.8	0.00	18.8	72.00	0.0	0.00	0.0				
18.00	13.6	0.00	13.6	73.50	0.0	0.00	0.0				
19.50	10.6	0.00	10.6	75.00	0.0	0.00	0.0				
21.00	9.0	0.00	9.0	76.50	0.0	0.00	0.0				
22.50	8.0	0.00	8.0	78.00	0.0	0.00	0.0				
24.00	7.2	0.00	7.2	79.50	0.0	0.00	0.0				
25.50	4.6	0.00	4.6	81.00	0.0	0.00	0.0				
27.00	2.8	0.00	2.8	82.50	0.0	0.00	0.0				
28.50	2.1	0.00	2.1	84.00	0.0	0.00	0.0				
30.00	1.4	0.00	1.4	85.50	0.0	0.00	0.0				
31.50	0.7	0.00	0.7	87.00	0.0	0.00	0.0				
33.00	0.4	0.00	0.4	88.50	0.0	0.00	0.0				
34.50	0.2	0.00	0.2	90.00	0.0	0.00	0.0				
36.00	0.1	0.00	0.1	91.50	0.0	0.00	0.0				
37.50	0.1	0.00	0.1	93.00	0.0	0.00	0.0				
39.00	0.0	0.00	0.0	94.50	0.0	0.00	0.0				
40.50	0.0	0.00	0.0	96.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0	97.50	0.0	0.00	0.0				
43.50	0.0	0.00	0.0	99.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0	100.50	0.0	0.00	0.0				
46.50	0.0	0.00	0.0	102.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0	103.50	0.0	0.00	0.0				
49.50	0.0	0.00	0.0	105.00	0.0	0.00	0.0				
51.00	0.0	0.00	0.0	106.50	0.0	0.00	0.0				
52.50	0.0	0.00	0.0	108.00	0.0	0.00	0.0				
54.00	0.0	0.00	0.0	109.50	0.0	0.00	0.0				

**3780 STORMWATER SWALE**

NRCC 24-hr D 100-Year D Rainfall=8.26"

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Summary for Subcatchment 1S: SWALE NORTH

Runoff = 13.35 cfs @ 12.13 hrs, Volume= 0.569 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 10.00-13.00 hrs, dt= 0.05 hrs

NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
105,938	74	>75% Grass cover, Good, HSG C
105,938		100.00% Pervious Area

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

Summary for Subcatchment 2S: SWALE SOUTH

Runoff = 4.49 cfs @ 12.13 hrs, Volume= 0.191 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 10.00-13.00 hrs, dt= 0.05 hrs

NRCC 24-hr D 100-Year D Rainfall=8.26"

Area (sf)	CN	Description
35,608	74	>75% Grass cover, Good, HSG C
35,608		100.00% Pervious Area

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

Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: 3780 - 555 HOPPING BROOK RD HOLLISTON
01-26-2023

Line ID	Line Length (ft)	Drain Area (ac)	Total Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Pipe Travel (min)	Tc System (min)	i Syst (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Q Capt (cfs)	Q Bypass (cfs)	Q Carry (cfs)	Q Total (cfs)	Capac. Full (cfs)	Line Size (in)	Line Slope (ft/ft)	n-value Pipe	Vel Ave (ft/s)	Normal Depth (ft)	Invert Up (ft)	Invert Dn (ft)	Grnd/Rim Elev Up (ft)	Grnd/Rim Elev Dn (ft)	
CB A12 to DMH A13	18.02	2.034	2.034	0.79	6.0	0.02	6.0	7.89	12.68	1.50	16.09	0.00	1.90	16.09	36.52	18	0.1209	0.013	10.94	0.65	344.73	342.55	351.73	352.02	
CB A10 to DMH A11	15.39	0.718	0.718	0.81	6.0	0.03	6.0	7.89	4.59	0.00	2.69	1.90	0.00	4.59	14.66	18	0.0195	0.013	2.60	0.58	345.10	344.80	352.91	353.08	
CB A8 to DMH A9	12.23	1.511	1.511	0.80	6.0	0.03	6.0	7.89	9.54	0.00	9.54	0.00	0.00	9.54	9.96	18	0.009	0.013	5.40	1.18	346.53	346.42	353.05	353.35	
CB A6 to DMH A7	18.69	2.613	2.613	0.79	6.0	0.03	6.0	7.89	16.29	0.00	23.87	0.00	7.57	23.87	14.98	18	0.0203	0.013	9.22	1.50	347.94	347.56	353.05	353.39	
CB A4 to DMH A5	13.92	1.650	1.650	0.77	6.0	0.04	6.0	7.89	10.03	0.00	6.13	7.57	3.68	13.71	9.34	18	0.0079	0.013	5.68	1.39	349.71	349.60	354.42	354.45	
CB A2 to DMH A3	27.23	0.533	0.533	0.74	6.0	0.06	6.0	7.89	3.11	0.00	1.52	1.59	0.00	3.11	5.59	12	0.0246	0.013	3.96	0.53	351.87	351.20	356.04	355.75	
CB A1 to DMH A3	26.88	0.748	0.748	0.73	6.0	0.07	6.0	7.89	4.31	0.00	2.22	2.09	0.00	4.31	4.18	12	0.0138	0.013	5.49	0.85	351.57	351.20	355.74	355.75	
DMH A3 to DMH A5	184.11	0.000	1.281	0.00	0.0	0.59	6.1	7.84	7.37	0.00	....	....	....	....	8.15	18	0.006	0.013	4.17	1.12	350.70	349.59	355.75	354.45	
DMH A5 to DMH A7	274.18	0.000	2.931	0.00	0.0	0.72	6.7	7.46	16.49	0.00	....	....	....	....	17.55	24	0.006	0.013	5.25	1.54	349.10	347.45	354.45	353.39	
DMH A7 to DMH A9	256.00	0.000	5.544	0.00	0.0	0.58	7.4	7.06	30.17	0.00	....	....	....	....	31.81	30	0.006	0.013	6.15	1.94	346.95	345.41	353.39	353.35	
DMH A9 to DMH A11	267.82	0.000	7.055	0.00	0.0	0.58	8.0	6.77	37.14	0.00	....	....	....	....	33.06	30	0.0065	0.013	7.57	2.50	345.42	343.68	353.35	353.08	
DMH A11 to DMH A13	261.61	0.000	7.773	0.00	0.0	0.51	8.6	6.52	39.54	0.00	....	....	....	....	57.88	36	0.0075	0.013	7.03	1.82	343.70	341.73	353.08	352.02	
DMH A13 to DMH A15	14.14	0.000	9.807	0.00	0.0	0.02	9.1	6.32	48.46	0.00	....	....	....	....	110.75	36	0.0276	0.013	9.38	1.41	341.23	340.84	352.02	344.88	
DMH A15 to HDWL	114.12	0.000	9.807	0.00	0.0	0.12	9.1	6.31	48.42	0.00	....	....	....	....	118.47	36	0.0316	0.013	11.15	1.36	338.60	335.00	352.71	335.00	

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs. Project File: Drainage System A.sws

Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

01-26-2023

Line ID	Line Length (ft)	Drain Area (ac)	Total Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Pipe Travel (min)	Tc System (min)	i Syst (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Q Capt (cfs)	Q Bypass (cfs)	Q Carry (cfs)	Q Total (cfs)	Capac. Full (cfs)	Line Size (in)	Line Slope (ft/ft)	n-value Pipe	Vel Ave (ft/s)	Normal Depth (ft)	Invert Up (ft)	Invert Dn (ft)	Grnd/Rim Elev Up (ft)	Grnd/Rim Elev Dn (ft)	
CB B9 to DMH B10	45.09	0.133	0.133	0.89	6.0	0.10	6.0	7.89	0.93	0.00	0.93	0.00	0.00	0.93	9.78	12	0.0754	0.013	2.14	0.21	350.60	347.20	355.43	352.16	
CB B6 to DMH B8	35.81	0.406	0.406	0.88	6.0	0.06	6.0	7.89	2.82	0.00	2.82	0.00	0.00	2.82	9.41	12	0.0698	0.013	6.86	0.38	351.53	349.03	355.67	353.72	
CB B7 to DMH B8	30.93	0.351	0.351	0.88	6.0	0.06	6.0	7.89	2.44	0.00	2.44	0.00	0.00	2.44	7.71	12	0.0469	0.013	5.93	0.39	350.48	349.03	355.64	353.72	
CB B4 to DMH B5	25.02	0.243	0.243	0.80	6.0	0.09	6.0	7.89	1.53	0.00	0.92	0.62	0.00	1.53	3.96	12	0.0124	0.013	2.63	0.43	350.19	349.88	354.36	353.72	
CB B3 to DMH B5	24.83	0.303	0.303	0.82	6.0	0.08	6.0	7.89	1.96	0.00	1.09	0.87	0.00	1.96	4.04	12	0.0129	0.013	3.36	0.49	350.20	349.88	354.36	353.72	
CB B1 to DMH B2	35.07	0.491	0.491	0.88	6.0	0.06	6.0	7.89	3.41	0.00	3.41	0.00	0.00	3.41	7.54	12	0.0448	0.013	4.76	0.47	352.00	350.43	356.83	354.88	
DMH B2 to DMH B5	45.21	0.000	0.491	0.00	0.0	0.15	6.1	7.85	3.39	0.00	....	....	....	....	3.55	12	0.01	0.013	5.14	0.78	350.33	349.88	354.88	353.72	
DMH B5 to DMH B8	85.07	0.000	1.037	0.00	0.0	0.23	6.2	7.75	6.78	0.00	....	....	....	....	10.50	18	0.01	0.013	5.75	0.88	349.38	348.53	353.72	353.72	
DMH B8 to DMH B10	164.61	0.000	1.794	0.00	0.0	0.38	6.4	7.60	11.71	0.00	....	....	....	....	22.64	24	0.01	0.013	4.80	1.02	348.03	346.38	353.72	352.16	
DMH B10 to DMH B12	12.07	0.000	1.927	0.00	0.0	0.03	6.8	7.37	12.23	0.00	....	....	....	....	22.55	24	0.0099	0.013	6.08	1.05	346.38	346.26	352.16	352.01	
DMH B12 to HDWL B11	195.50	0.000	1.927	0.00	0.0	0.26	6.8	7.35	12.20	0.00	....	....	....	....	48.18	24	0.0454	0.013	8.89	0.69	342.87	334.00	352.01	337.00	

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System B.sws

Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

01-26-2023

Line ID	Line Length (ft)	Drain Area (ac)	Total Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Pipe Travel (min)	Tc System (min)	i Syst (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Q Capt (cfs)	Q Bypass (cfs)	Q Carry (cfs)	Q Total (cfs)	Capac. Full (cfs)	Line Size (in)	Line Slope (ft/ft)	n-value Pipe	Vel Ave (ft/s)	Normal Depth (ft)	Invert Up (ft)	Invert Dn (ft)	Grnd/Rim Elev Up (ft)	Grnd/Rim Elev Dn (ft)	
CB C9 to DMH C10	87.86	0.482	0.482	0.88	6.0	0.13	6.0	7.89	3.35	0.00	3.35	0.00	0.00	3.35	10.20	12	0.0821	0.013	7.99	0.39	353.38	346.17	357.56	357.81	
CB C7 to DMH C8	93.70	0.895	0.895	0.83	6.0	0.12	6.0	7.89	5.86	0.00	5.86	0.00	0.00	5.86	9.33	12	0.0686	0.013	9.71	0.58	348.32	341.89	352.53	354.57	
CB C5 to DMH C6	79.76	0.546	0.546	0.83	6.0	0.14	6.0	7.89	3.58	0.00	3.58	0.00	0.00	3.58	7.41	12	0.0433	0.013	7.01	0.49	347.11	343.66	351.31	353.60	
CB C4 to DMH C6	81.89	0.546	0.546	0.83	6.0	0.15	6.0	7.89	3.58	0.00	3.58	0.00	0.00	3.58	7.31	12	0.0421	0.013	6.99	0.49	347.11	343.66	351.31	353.60	
CB C2 to DMH C3	79.65	0.546	0.546	0.83	6.0	0.26	6.0	7.89	3.58	0.00	3.58	0.00	0.00	3.58	3.57	12	0.01	0.013	5.18	0.82	347.11	346.31	351.32	353.60	
CB C1 to DMH C3	82.52	0.546	0.546	0.83	6.0	0.27	6.0	7.89	3.58	0.00	3.58	0.00	0.00	3.58	3.57	12	0.0101	0.013	5.18	0.82	347.12	346.29	351.34	353.60	
DMH C3 to DMH C6	262.83	0.000	1.092	0.00	0.0	0.69	6.3	7.71	6.99	0.00	....	....	....	....	10.50	18	0.01	0.013	5.90	0.89	345.79	343.16	353.60	353.60	
DMH C6 to DMH C8	177.72	0.000	2.184	0.00	0.0	0.40	7.0	7.29	13.21	0.00	....	....	....	....	22.57	24	0.01	0.013	5.19	1.10	342.66	340.89	353.60	354.57	
DMH C8 to DMH C10	269.06	0.000	3.079	0.00	0.0	0.57	7.4	7.07	18.06	0.00	....	....	....	....	22.62	24	0.01	0.013	6.44	1.35	340.89	338.20	354.57	357.81	
DMH C10 to DMH C12	213.95	0.000	3.561	0.00	0.0	0.45	7.9	6.79	20.23	0.00	....	....	....	....	22.30	24	0.0097	0.013	7.74	1.49	338.20	336.12	357.81	343.00	
DMH C12 to HDWL C11	120.56	0.000	3.561	0.00	0.0	0.25	8.4	6.59	19.63	0.00	....	....	....	....	22.94	24	0.0103	0.013	7.69	1.42	336.12	334.88	343.00	337.00	

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System C.sws

Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...
01-27-2023

Line ID	Line Length (ft)	Drain Area (ac)	Total Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Pipe Travel (min)	Tc System (min)	i Syst (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Q Capt (cfs)	Q Bypass (cfs)	Q Carry (cfs)	Q Total (cfs)	Capac. Full (cfs)	Line Size (in)	Line Slope (ft/ft)	n-value Pipe	Vel Ave (ft/s)	Normal Depth (ft)	Invert Up (ft)	Invert Dn (ft)	Grnd/Rim Elev Up (ft)	Grnd/Rim Elev Dn (ft)	
CB E18 to DMH E20	12.22	0.133	0.133	0.90	6.0	0.03	6.0	7.89	0.94	0.00	0.91	0.36	0.33	1.28	9.39	12	0.0696	0.013	4.39	0.21	294.40	293.55	298.57	298.03	
CB E15 to DMH E16	22.78	0.163	0.163	0.85	6.0	0.05	6.0	7.89	1.09	0.00	1.28	0.70	0.89	1.98	9.43	12	0.0701	0.013	2.09	0.23	307.86	306.26	312.02	311.69	
CB E10 to DMH E12	13.96	0.122	0.122	0.90	6.0	0.03	6.0	7.89	0.87	0.00	1.11	0.53	0.78	1.64	9.48	12	0.0709	0.013	1.10	0.20	318.80	317.81	323.47	323.22	
CB D6 to DMH D8	10.32	0.547	0.547	0.84	6.0	0.03	6.0	7.89	3.63	0.00	3.63	0.00	0.00	3.63	3.51	12	0.0097	0.013	5.08	0.85	347.12	347.02	351.32	351.55	
CB D7 to DMH D8	22.20	0.546	0.546	0.83	6.0	0.07	6.0	7.89	3.58	0.00	3.58	0.00	0.00	3.58	3.54	12	0.0099	0.013	5.15	0.83	347.11	346.89	351.31	351.55	
CB D4 to DMH D5	11.83	0.803	0.803	0.81	6.0	0.03	6.0	7.89	5.13	0.00	11.47	0.00	6.34	11.47	10.57	18	0.0101	0.013	3.23	0.74	347.07	346.95	351.78	352.00	
CB D2 to DMH D3	32.77	1.468	1.468	0.72	6.0	0.05	6.0	7.89	8.34	0.00	3.00	5.34	0.00	8.34	4.40	12	0.0153	0.013	10.62	1.00	351.13	350.63	355.29	355.23	
CB D1 to DMH D3	39.64	0.353	0.353	0.78	6.0	0.10	6.0	7.89	2.17	0.00	1.18	0.99	0.00	2.17	5.66	12	0.0252	0.013	3.57	0.43	351.63	350.63	355.79	355.23	
DMH D3 to DMH D5	150.89	0.000	1.821	0.00	0.0	0.26	6.1	7.82	10.42	0.00	....	....	....	....	35.18	24	0.0242	0.013	4.48	0.75	349.98	346.33	355.23	352.00	
DMH D5 to DMH D8	251.01	0.000	2.624	0.00	0.0	0.45	6.4	7.65	15.17	0.00	....	....	....	....	29.84	24	0.0174	0.013	5.70	1.01	346.33	341.96	352.00	351.55	
DMH D8 to DMH D9	19.95	0.000	3.717	0.00	0.0	0.02	6.8	7.38	21.36	0.00	....	....	....	....	64.05	24	0.0802	0.013	9.99	0.80	341.96	340.36	351.55	349.22	
DMH D9 to DMH D10	28.80	0.000	3.717	0.00	0.0	0.03	6.8	7.37	21.33	0.00	....	....	....	....	64.19	24	0.0805	0.013	10.42	0.79	336.05	333.73	349.22	342.20	
DMH D10 to DMH D11	29.15	0.000	3.717	0.00	0.0	0.03	6.8	7.35	21.28	0.00	....	....	....	....	63.81	24	0.0796	0.013	10.40	0.80	329.42	327.10	342.20	332.48	
DMH D11 TO DMH D12	29.06	0.000	3.717	0.00	0.0	0.05	6.9	7.33	21.23	0.00	....	....	....	....	31.95	24	0.02	0.013	6.76	1.19	323.87	323.29	332.48	329.69	
CB E7 to DMH E9	34.59	0.165	0.165	0.90	6.0	0.07	6.0	7.89	1.17	0.00	1.18	0.78	0.78	1.95	9.42	12	0.07	0.013	2.42	0.24	334.88	332.46	339.03	337.65	
CB E8 to DMH E9	34.06	0.227	0.227	0.85	6.0	0.06	6.0	7.89	1.52	0.00	1.25	0.87	0.61	2.13	9.41	12	0.0699	0.013	2.85	0.27	334.87	332.49	338.71	337.65	
CB E4 to DMH E6	33.41	0.225	0.225	0.90	6.0	0.10	6.0	7.89	1.60	0.00	1.17	0.78	0.35	1.95	5.04	12	0.0201	0.013	2.21	0.39	343.32	342.65	347.96	347.24	
CB E5 to DMH E6	31.01	0.195	0.195	0.85	6.0	0.08	6.0	7.89	1.31	0.00	1.05	0.61	0.35	1.66	6.03	12	0.0287	0.013	2.41	0.32	343.54	342.65	348.00	347.24	
CB E2 to DMH E3	33.18	0.168	0.168	0.90	6.0	0.08	6.0	7.89	1.19	0.00	0.84	0.35	0.00	1.19	7.13	12	0.0401	0.013	2.57	0.28	350.78	349.45	354.88	354.72	
CB E1 to DMH E3	30.55	0.174	0.174	0.81	6.0	0.07	6.0	7.89	1.11	0.00	0.76	0.35	0.00	1.11	7.43	12	0.0435	0.013	2.46	0.26	350.78	349.45	355.52	354.72	
DMH E3 to DMH E6	309.44	0.000	0.342	0.00	0.0	0.80	6.1	7.84	2.29	0.00	....	....	....	....	5.24	12	0.0217	0.013	3.61	0.46	349.35	342.65	354.72	347.24	
DMH E6 to DMH E9	369.15	0.000	0.762	0.00	0.0	0.75	6.9	7.33	4.84	0.00	....	....	....	....	5.89	12	0.0273	0.013	7.37	0.69	342.55	332.46	347.24	337.65	
DMH E9 to DMH D10	180.27	0.000	1.154	0.00	0.0	0.28	7.6	6.93	6.95	0.00	....	....	....	....	22.36	18	0.0453	0.013	4.72	0.57	331.96	323.79	337.65	329.69	
DMH D10 to DMH E12	147.51	0.000	4.871	0.00	0.0	0.17	7.9	6.80	26.50	0.00	....	....	....	....	47.15	24	0.0435	0.013	8.66	1.07	323.29	316.88	329.69	323.22	
CB E11 to DMH E12	21.84	0.213	0.213	0.85	6.0	0.04	6.0	7.89	1.43	0.00	1.42	0.89	0.87	2.30	9.43	12	0.0701	0.013	2.13	0.26	319.34	317.81	323.51	323.22	
DMH E12 to DMH E13	103.10	0.000	5.206	0.00	0.0	0.11	8.1	6.72	28.16	0.00	....	....	....	....	49.41	24	0.0477	0.013	9.15	1.08	316.88	311.96	323.22	318.60	
DMH E13 TO DMH E16	151.85	0.000	5.206	0.00	0.0	0.17	8.2	6.67	27.95	0.00	....	....	....	....	47.97	24	0.045	0.013	9.09	1.10	311.96	305.13	318.60	311.69	
CB E14 to DMH E16	15.74	0.094	0.094	0.90	6.0	0.04	6.0	7.89	0.67	0.00	0.87	0.33	0.53	1.20	9.41	12	0.0699	0.013	1.22	0.18	307.86	306.76	312.03	311.69	
DMH E16 to DMH E17	157.43	0.000	5.463	0.00	0.0	0.17	8.4	6.60	29.12	0.00	....	....	....	....	48.00	24	0.045	0.013	9.43	1.12	305.13	298.04	311.69	304.58	
DMH E17 to DMH E20	177.92	0.000	5.463	0.00	0.0	0.20	8.5	6.53	28.79	0.00	....	....	....	....	47.96	24	0.045	0.013	9.33	1.12	298.04	290.04	304.58	298.03	
CB E19 to DMH E20	25.61	0.200	0.200	0.85	6.0	0.05	6.0	7.89	1.34	0.00	1.29	0.75	0.70	2.04	8.93	12	0.0629	0.013	2.60	0.26	293.96	292.35	298.13	298.03	
DMH E20 to DMH E22	14.00	0.000	5.796	0.00	0.0	0.02	8.7	6.45	30.31	0.00	....	....	....	....	47.61	24	0.0443	0.013	9.65	1.16	290.04	289.42	298.03	293.19	
DMH E22 to HDWL E21	166.81	0.000	5.796	0.00	0.0	0.19	8.7	6.44	30.28	0.00	....	....	....	....	47.61	24	0.0443	0.013	12.38	1.16	289.39	282.00	293.19	288.35	

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System D-E.sws

Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

01-26-2023

Line ID	Line Length (ft)	Drain Area (ac)	Total Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Pipe Travel (min)	Tc System (min)	i Syst (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Q Capt (cfs)	Q Bypass (cfs)	Q Carry (cfs)	Q Total (cfs)	Capac. Full (cfs)	Line Size (in)	Line Slope (ft/ft)	n-value Pipe	Vel Ave (ft/s)	Normal Depth (ft)	Invert Up (ft)	Invert Dn (ft)	Grnd/Rim Elev Up (ft)	Grnd/Rim Elev Dn (ft)	
DMH F1 to DMH F2	227.50	3.156	3.156	0.90	6.0	0.57	6.0	7.89	22.42	0.00	...	...	...	...	29.91	30	0.0053	0.013	5.42	1.61	350.11	348.90	355.91	359.57	
DMH F2 to DMH F3	227.50	0.000	3.156	0.00	0.0	0.59	6.6	7.52	21.35	0.00	...	...	...	...	29.03	30	0.0005	0.013	4.61	1.59	348.97	347.83	359.57	358.02	
DMH F3 to DMH F4	246.35	0.000	3.156	0.00	0.0	0.66	7.2	7.17	20.38	0.00	...	...	...	...	28.98	30	0.0005	0.013	6.58	1.55	347.83	346.60	358.02	361.38	
DMH F4 to DMH F8	246.36	0.000	3.156	0.00	0.0	0.67	7.8	6.84	19.44	0.00	...	...	...	...	28.98	30	0.0005	0.013	6.33	1.50	346.60	345.37	361.38	355.97	
DMH F5 to DMH F6	227.50	3.156	3.156	0.90	6.0	0.58	6.0	7.89	22.42	0.00	...	...	...	...	29.03	30	0.0005	0.013	5.67	1.65	349.23	348.09	355.90	359.57	
DMH F6 to DMH F7	227.50	0.000	3.156	0.00	0.0	0.60	6.6	7.51	21.33	0.00	...	...	...	...	28.90	30	0.0005	0.013	5.01	1.60	348.09	346.96	359.57	359.32	
DMH F7 to DMH F8	275.06	0.000	3.156	0.00	0.0	0.73	7.2	7.17	20.35	0.00	...	...	...	...	29.05	30	0.0005	0.013	6.40	1.54	346.96	345.58	359.32	355.97	
DMH F8 to HDWL F9	129.27	0.000	6.312	0.00	0.0	0.23	8.5	6.55	37.19	0.00	...	...	...	...	66.37	36	0.0099	0.013	6.47	1.61	341.60	340.32	355.97	344.16	

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System F.sws

Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

01-26-2023

Line ID	Line Length (ft)	Drain Area (ac)	Total Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Pipe Travel (min)	Tc System (min)	i Syst (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Q Capt (cfs)	Q Bypass (cfs)	Q Carry (cfs)	Q Total (cfs)	Capac. Full (cfs)	Line Size (in)	Line Slope (ft/ft)	n-value Pipe	Vel Ave (ft/s)	Normal Depth (ft)	Invert Up (ft)	Invert Dn (ft)	Grnd/Rim Elev Up (ft)	Grnd/Rim Elev Dn (ft)	
DMH G1 to DMH G2	227.50	3.156	3.156	0.90	6.0	0.58	6.0	7.89	22.42	0.00	....	....	....	....	28.90	30	0.005	0.013	6.83	1.65	349.13	348.00	355.90	355.90	
DMH G2 to DMH G3	242.50	0.000	3.156	0.00	0.0	0.63	6.6	7.51	21.33	0.00	....	....	....	....	29.09	30	0.005	0.013	6.13	1.59	348.00	346.78	355.90	359.00	
DMH G3 to DMH G4	152.13	0.000	3.156	0.00	0.0	0.18	7.2	7.15	20.30	0.00	....	....	....	....	87.41	30	0.0454	0.013	9.69	0.82	346.78	339.87	359.00	352.61	
DMH G4 to HDWL G5	146.65	0.000	3.156	0.00	0.0	0.18	7.4	7.05	20.03	0.00	....	....	....	....	82.05	30	0.04	0.013	5.31	0.84	339.87	334.00	352.61	337.00	

Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

01-26-2023

Line ID	Line Length (ft)	Drain Area (ac)	Total Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Pipe Travel (min)	Tc System (min)	i Syst (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Q Capt (cfs)	Q Bypass (cfs)	Q Carry (cfs)	Q Total (cfs)	Capac. Full (cfs)	Line Size (in)	Line Slope (ft/ft)	n-value Pipe	Vel Ave (ft/s)	Normal Depth (ft)	Invert Up (ft)	Invert Dn (ft)	Grnd/Rim Elev Up (ft)	Grnd/Rim Elev Dn (ft)	
DMH H1 to DMH H2	227.50	3.156	3.156	0.90	6.0	0.58	6.0	7.89	22.42	0.00	....	....	....	....	28.90	30	0.005	0.013	6.83	1.65	349.13	348.00	355.90	355.90	
DMH H2 to DMH H3	227.50	0.000	3.156	0.00	0.0	0.59	6.6	7.51	21.33	0.00	....	....	....	....	29.03	30	0.005	0.013	6.12	1.59	348.00	346.86	355.90	356.12	
DMH H3 to DMH H4	278.79	0.000	3.156	0.00	0.0	0.44	7.2	7.17	20.35	0.00	....	....	....	....	58.02	30	0.02	0.013	8.33	1.02	346.86	341.28	356.12	356.12	
DMH H4 to HDWL H5	295.44	0.000	3.156	0.00	0.0	0.45	7.6	6.94	19.71	0.00	....	....	....	....	64.38	30	0.0246	0.013	5.25	0.95	341.28	334.00	356.12	337.00	

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System H.sws

Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

01-26-2023

Line ID	Line Length (ft)	Drain Area (ac)	Total Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Pipe Travel (min)	Tc System (min)	i Syst (in/hr)	Total Runoff (cfs)	Known Q (cfs)	Q Capt (cfs)	Q Bypass (cfs)	Q Carry (cfs)	Q Total (cfs)	Capac. Full (cfs)	Line Size (in)	Line Slope (ft/ft)	n-value Pipe	Vel Ave (ft/s)	Normal Depth (ft)	Invert Up (ft)	Invert Dn (ft)	Grnd/Rim Elev Up (ft)	Grnd/Rim Elev Dn (ft)	
CB J2 to DMH J3	21.21	0.168	0.168	0.90	6.0	0.05	6.0	7.89	1.19	0.75	1.54	0.41	0.00	1.94	6.48	12	0.0331	0.013	4.98	0.38	290.74	290.04	294.81	294.57	
CB J1 to DMH J3	18.82	0.063	0.063	0.90	6.0	0.05	6.0	7.89	0.45	0.36	0.77	0.04	0.00	0.81	7.87	12	0.0488	0.013	4.08	0.22	290.96	290.04	294.81	294.57	
DMH J3 to HDWL J4	87.94	0.000	0.231	0.00	0.0	0.13	6.0	7.86	1.63	0.00	....	....	....	....	10.08	12	0.0801	0.013	7.41	0.36	289.04	282.00	294.57	285.84	

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System J.sws

	A	B	C	D	E	F	G	H	I
1	Trapezoidal Riprap-Lined Waterway Design.xlsm								
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	5/24/2022			11/15/2019		
4	Checked by		Date						
5	<i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i>								
6	Design flow, Q=	9.7	cfs			WW horiz. Length=	48.0	ft	
7	Slope, S=	0.03	ft/ft	=	33.33	:1	U/S WW F.L. elev=	293.0	ft
8	Bottom Width, W=	10	ft			D/S WW F.L. elev=	291.6	ft	
9	Side slope, Z=	2.5	:1			Waterway drop=	1.4	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	48.0	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	1.24	in			Spreadsheet formatting key:			
13	D50 used=	6.00	in			XXX	=Input cells		
14	n=	0.037				X.XX	=Output from "Solve" button		
15	Freeboard=	1.00	ft			X.XX	=Other computed output		
16						Red text	=Instructions, warnings, info		
17	Flow depth, d=	0.30	ft	Calculated					
18	Critical depth, d _c =	0.30	ft						
19	Critical slope, S _c =	0.030	ft/ft	0.7S _c =	0.0210	ft/ft			
20				1.3S _c =	0.0390	ft/ft			
21	Design slope, S=	0.0300	ft/ft	0.7S _c < S < 1.3S _c . Select a different slope or bottom width.					
22	Velocity=	3.00	fps			Est. riprap unit wt=	0.02	Tons/CY	
23				Rock shape =	Angular	Rock Gs =	2.65		
24	Riprap thickness:			Required riprap gradation for D50 selected					
25	Minimum=	1.00	ft	%	Rock dia., inches		Rock weight, lb		
26	Provided=	2.00	ft	Smaller	min.	max.	min.	max.	
27				100	9.0	12.0	53	126	
28	Sideslope height:			85	7.8	10.8	35	92	
29	Minimum=	1.30	ft	50	6.0	9.0	16	53	
30	Provided=	2.00	ft	10	4.8	7.8	8	35	
31									
32									
33									
34									
35									
36	Quantities:								
37	Riprap volume=	94.4	CY						
38	Approx. weight=	1.9	Tons						
39	Geotextile area=	249.0	SY*						
40									
41									
42	*Geotextile area								
43	includes actual covered								
44	surfaces only (no extra								
45	for laps or anchorage)								
46									

WW CROSS SECTION

WW PROFILE

Outlet 9P

Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd
 Designer: WML
 Date: 5/24/2022

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 6.0 in.
 Rock_{ww} thickness = 2.0 Feet.

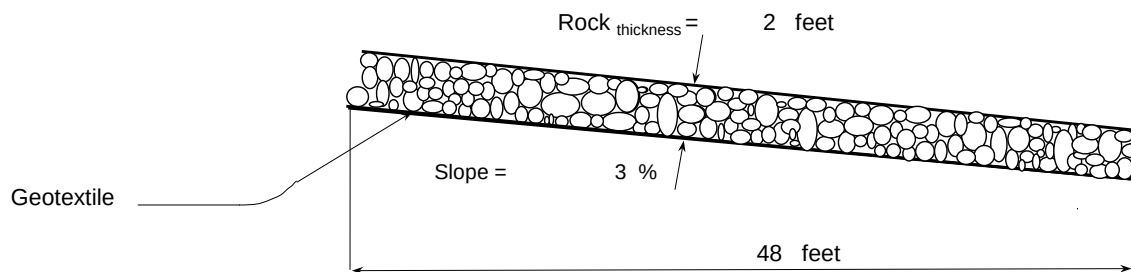
Rock Gradation Envelope

% Passing	Diameter, in. (weight, lbs.)
D ₁₀₀ -----	9 - 12 (52 - 122)
D ₈₅ -----	8 - 11 (34 - 89)
D ₅₀ -----	6 - 9 (15 - 52)
D ₁₀ -----	5 - 8 (8 - 34)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

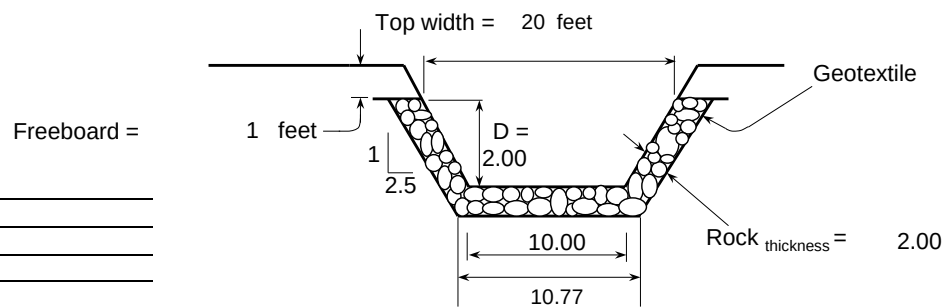
Quantities

Rock = 94 yd³
 Geotextile (WCS-13)^a = 249 yd²

Notes: ^a Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



Profile Along Centerline of Rock Lined Waterway



Rock Lined WW Cross Section

Profile, Cross Sections, and Quantities



Date	5/24/22	File Name
WML		
Drawn		
Checkd	0	1/0/00
Approved		
		Sheet ___ of ___

Outlet 9P

	A	B	C	D	E	F	G	H	I
1	Trapezoidal Riprap-Lined Waterway Design.xlsm								
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	5/24/2022			11/15/2019		
4	Checked by		Date						
5	<i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i>								
6	Design flow, Q=	61	cfs			WW horiz. Length=	244.0	ft	
7	Slope, S=	0.028	ft/ft	=	35.71	:1	U/S WW F.L. elev=	330.0	ft
8	Bottom Width, W=	10	ft			D/S WW F.L. elev=	323.2	ft	
9	Side slope, Z=	2.5	:1			Waterway drop=	6.8	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	244.1	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	3.11	in			Spreadsheet formatting key:			
13	D50 used=	6.00	in			XXX	=Input cells		
14	n=	0.036				X.XX	=Output from "Solve" button		
15	Freeboard=	1.00	ft			X.XX	=Other computed output		
16						Red text	=Instructions, warnings, info		
17	Flow depth, d=	0.89	ft	Calculated					
18	Critical depth, d _c =	0.96	ft						
19	Critical slope, S _c =	0.021	ft/ft	0.7S _c =	0.0147	ft/ft			
20				1.3S _c =	0.0274	ft/ft			
21	Design slope, S=	0.0280	ft/ft	Design slope OK. Flow is Supercritical.					
22	Velocity=	5.61	fps			Est. riprap unit wt=	1.4	Tons/CY	
23				Rock shape = Angular		Rock Gs =	2.65		
24	Riprap thickness:			Required riprap gradation for D50 selected					
25	Minimum=	1.00	ft	%	Rock dia., inches		Rock weight, lb		
26	Provided=	2.00	ft	Smaller	min.	max.	min.	max.	
27				100	9.0	12.0	53	126	
28	Sideslope height:			85	7.8	10.8	35	92	
29	Minimum=	1.89	ft	50	6.0	9.0	16	53	
30	Provided=	2.00	ft	10	4.8	7.8	8	35	
31									
32									
33									
34									
35									
36	Quantities:								
37	Riprap volume=	479.9	CY						
38	Approx. weight=	671.8	Tons						
39	Geotextile area=	1187.6	SY*						
40									
41									
42	*Geotextile area								
43	includes actual covered								
44	surfaces only (no extra								
45	for laps or anchorage)								
46									

WW CROSS SECTION

WW PROFILE

Outlets A14 & B11

Outlets A14 & B11

Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd
 Designer: WML
 Date: 5/24/2022

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D₅₀ dia. = 6.0 in.
 Rock_{ww} thickness = 2.0 Feet.

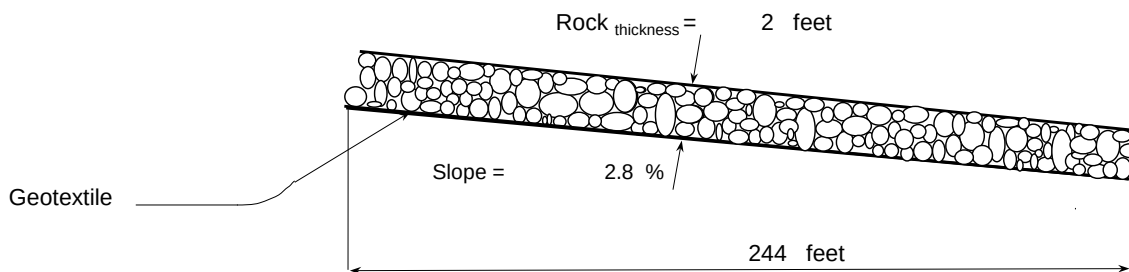
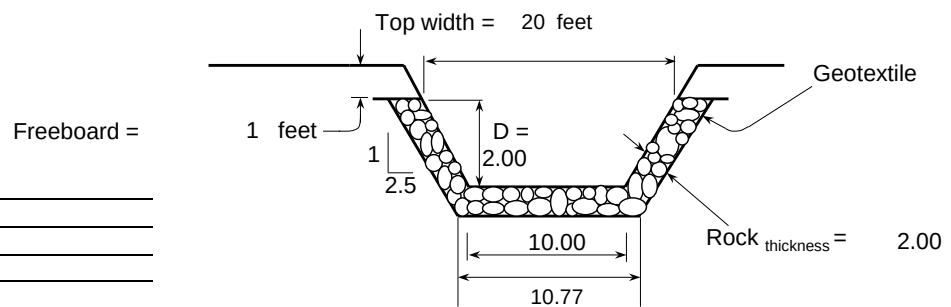
Rock Gradation Envelope

<u>% Passing</u>	<u>Diameter, in. (weight, lbs.)</u>
D ₁₀₀ -----	9 - 12 (52 - 122)
D ₈₅ -----	8 - 11 (34 - 89)
D ₅₀ -----	6 - 9 (15 - 52)
D ₁₀ -----	5 - 8 (8 - 34)
Coefficient of Uniformity, (D ₆₀)/(D ₁₀) < 1.7	

Quantities

Rock = 480 yd³
 Geotextile (WCS-13)^a = 1188 yd²

Notes: ^a Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.

**Profile Along Centerline of Rock Lined Waterway****Rock Lined WW Cross Section****Profile, Cross Sections, and Quantities**

Date _____ File Name _____
 WML _____ 5/24/22
 Drawn _____
 Checkd _____ 0 1/0/00
 Approved _____ Sheet ___ of ___

	A	B	C	D	E	F	G	H	I
1	Trapezoidal Riprap-Lined Waterway Design.xlsm								
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	5/24/2022			11/15/2019		
4	Checked by		Date						
5	<i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i>								
6	Design flow, Q=	20.3	cfs			WW horiz. Length=	75.0	ft	
7	Slope, S=	0.09	ft/ft	=	11.11	:1	U/S WW F.L. elev=	330.9	ft
8	Bottom Width, W=	10	ft			D/S WW F.L. elev=	324.1	ft	
9	Side slope, Z=	3	:1			Waterway drop=	6.8	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	75.3	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	4.39	in			Spreadsheet formatting key:			
13	D50 used=	6.00	in			XXX	=Input cells		
14	n=	0.043				X.XX	=Output from "Solve" button		
15	Freeboard=	1.00	ft			X.XX	=Other computed output		
16						Red text	=Instructions, warnings, info		
17	Flow depth, d=	0.37	ft	Calculated					
18	Critical depth, d _c =	0.48	ft						
19	Critical slope, S _c =	0.036	ft/ft	0.7S _c =	0.0253	ft/ft			
20				1.3S _c =	0.0470	ft/ft			
21	Design slope, S=	0.0900	ft/ft	Design slope OK. Flow is Supercritical.					
22	Velocity=	4.98	fps			Est. riprap unit wt=	1.4	Tons/CY	
23				Rock shape =	Angular	Rock Gs =	2.65		
24	Riprap thickness:			Required riprap gradation for D50 selected					
25	Minimum=	1.00	ft	%	Rock dia., inches		Rock weight, lb		
26	Provided=	2.00	ft	Smaller	min.	max.	min.	max.	
27				100	9.0	12.0	53	126	
28	Sideslope height:			85	7.8	10.8	35	92	
29	Minimum=	1.37	ft	50	6.0	9.0	16	53	
30	Provided=	2.00	ft	10	4.8	7.8	8	35	
31									
32									
33									
34									
35									
36	Quantities:								
37	Riprap volume=	163.4	CY						
38	Approx. weight=	228.8	Tons						
39	Geotextile area=	428.2	SY*						
40									
41									
42	*Geotextile area								
43	includes actual covered								
44	surfaces only (no extra								
45	for laps or anchorage)								
46									

WW CROSS SECTION

WW PROFILE

Outlet C11

Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd
 Designer: WML
 Date: 5/24/2022

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 6.0 in.
 Rock_{ww} thickness = 2.0 Feet.

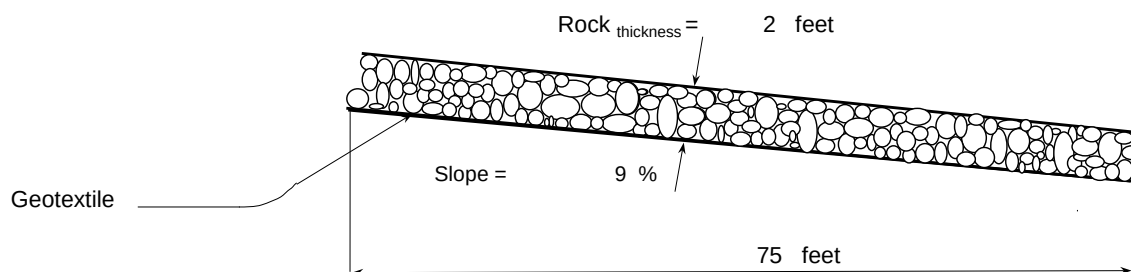
Rock Gradation Envelope

% Passing	Diameter, in. (weight, lbs.)
D_{100} -----	9 - 12 (52 - 122)
D_{85} -----	8 - 11 (34 - 89)
D_{50} -----	6 - 9 (15 - 52)
D_{10} -----	5 - 8 (8 - 34)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

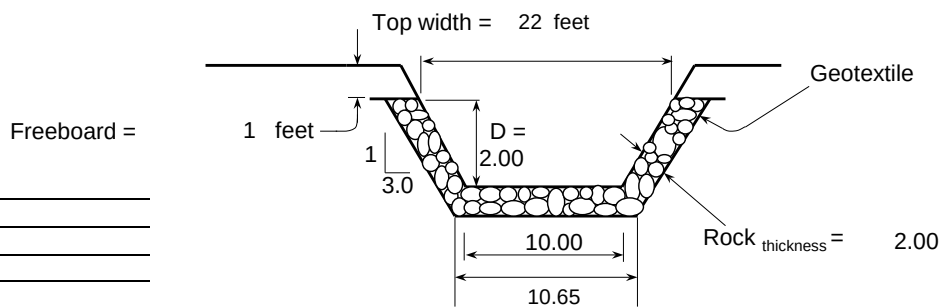
Quantities

Rock = 163 yd³
 Geotextile (WCS-13)^a = 428 yd²

Notes: ^a Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



Profile Along Centerline of Rock Lined Waterway



Rock Lined WW Cross Section

Profile, Cross Sections, and Quantities



Date	5/24/22	File Name
WML		
Drawn		
Checkd	0	1/0/00
Approved		
		Sheet ___ of ___

Outlet C11

	A	B	C	D	E	F	G	H	I
1	Trapezoidal Riprap-Lined Waterway Design.xlsm								
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	5/24/2022			11/15/2019		
4	Checked by		Date						
5	<i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i>								
6	Design flow, Q=	41	cfs			WW horiz. Length=	290.0	ft	
7	Slope, S=	0.16	ft/ft	=	6.25	:1	U/S WW F.L. elev=	340.3	ft
8	Bottom Width, W=	10	ft			D/S WW F.L. elev=	293.9	ft	
9	Side slope, Z=	2.5	:1			Waterway drop=	46.4	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	293.7	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	8.02	in			Spreadsheet formatting key:			
13	D50 used=	12.00	in			XXX	=Input cells		
14	n=	0.052				X.XX	=Output from "Solve" button		
15	Freeboard=	1.00	ft			X.XX	=Other computed output		
16						Red text	=Instructions, warnings, info		
17	Flow depth, d=	0.53	ft	Calculated					
18	Critical depth, d _c =	0.75	ft						
19	Critical slope, S _c =	0.046	ft/ft	0.7S _c =	0.0322	ft/ft			
20				1.3S _c =	0.0599	ft/ft			
21	Design slope, S=	0.1600	ft/ft	Design slope OK. Flow is Supercritical.					
22	Velocity=	6.90	fps			Est. riprap unit wt=	1.4	Tons/CY	
23				Rock shape = Angular		Rock Gs =	2.65		
24	Riprap thickness:			Required riprap gradation for D50 selected					
25	Minimum=	2.00	ft	%	Rock dia., inches		Rock weight, lb		
26	Provided=	2.00	ft	Smaller	min.	max.	min.	max.	
27				100	18.0	24.0	425	1007	
28	Sideslope height:			85	15.6	21.6	277	734	
29	Minimum=	1.53	ft	50	12.0	18.0	126	425	
30	Provided=	2.00	ft	10	9.6	15.6	64	277	
31									
32									
33									
34									
35									
36	Quantities:								
37	Riprap volume=	577.4	CY						
38	Approx. weight=	808.3	Tons						
39	Geotextile area=	1425.0	SY*						
40									
41									
42	*Geotextile area								
43	includes actual covered								
44	surfaces only (no extra								
45	for laps or anchorage)								
46									

Outlet F9

Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd
 Designer: WML
 Date: 5/24/2022

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 12.0 in.
 Rock_{ww} thickness = 2.0 Feet.

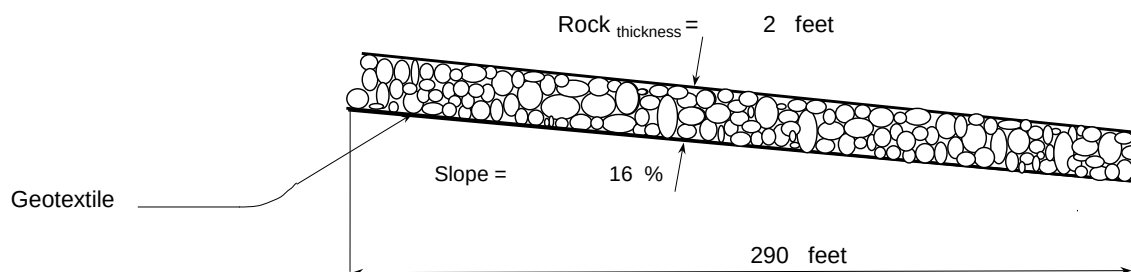
Rock Gradation Envelope

<u>% Passing</u>	<u>Diameter, in. (weight, lbs.)</u>
D ₁₀₀ -----	18 - 24 (413 - 978)
D ₈₅ -----	16 - 22 (269 - 713)
D ₅₀ -----	12 - 18 (122 - 413)
D ₁₀ -----	10 - 16 (63 - 269)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

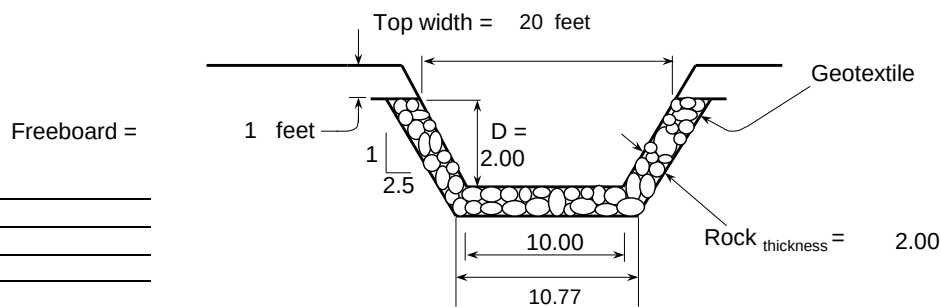
Quantities

Rock = 577 yd³
 Geotextile (WCS-13)^a = 1425 yd²

Notes: ^a Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



Profile Along Centerline of Rock Lined Waterway



Rock Lined WW Cross Section

Profile, Cross Sections, and Quantities



Date	5/24/22	File Name
WML		
Drawn		
Checkd	0	1/0/00
Approved		

Outlet F9

	A	B	C	D	E	F	G	H	I
1	Trapezoidal Riprap-Lined Waterway Design.xlsm								
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	5/24/2022			11/15/2019		
4	Checked by		Date						
5	<i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i>								
6	Design flow, Q=	61	cfs			WW horiz. Length=	244.0	ft	
7	Slope, S=	0.028	ft/ft	=	35.71	:1	U/S WW F.L. elev=	330.0	ft
8	Bottom Width, W=	10	ft			D/S WW F.L. elev=	323.2	ft	
9	Side slope, Z=	2.5	:1			Waterway drop=	6.8	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	244.1	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	3.11	in			Spreadsheet formatting key:			
13	D50 used=	6.00	in			XXX	=Input cells		
14	n=	0.036				X.XX	=Output from "Solve" button		
15	Freeboard=	1.00	ft			X.XX	=Other computed output		
16						Red text	=Instructions, warnings, info		
17	Flow depth, d=	0.89	ft	Calculated					
18	Critical depth, d _c =	0.96	ft						
19	Critical slope, S _c =	0.021	ft/ft	0.7S _c =	0.0147	ft/ft			
20				1.3S _c =	0.0274	ft/ft			
21	Design slope, S=	0.0280	ft/ft	Design slope OK. Flow is Supercritical.					
22	Velocity=	5.61	fps			Est. riprap unit wt=	1.4	Tons/CY	
23				Rock shape = Angular		Rock Gs =	2.65		
24	Riprap thickness:			Required riprap gradation for D50 selected					
25	Minimum=	1.00	ft	%	Rock dia., inches		Rock weight, lb		
26	Provided=	2.00	ft	Smaller	min.	max.	min.	max.	
27				100	9.0	12.0	53	126	
28	Sideslope height:			85	7.8	10.8	35	92	
29	Minimum=	1.89	ft	50	6.0	9.0	16	53	
30	Provided=	2.00	ft	10	4.8	7.8	8	35	
31									
32									
33									
34									
35									
36	Quantities:								
37	Riprap volume=	479.9	CY						
38	Approx. weight=	671.8	Tons						
39	Geotextile area=	1187.6	SY*						
40									
41									
42	*Geotextile area								
43	includes actual covered								
44	surfaces only (no extra								
45	for laps or anchorage)								
46									

Outlet G5

Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd
 Designer: WML
 Date: 5/24/2022

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 6.0 in.
 Rock_{ww} thickness = 2.0 Feet.

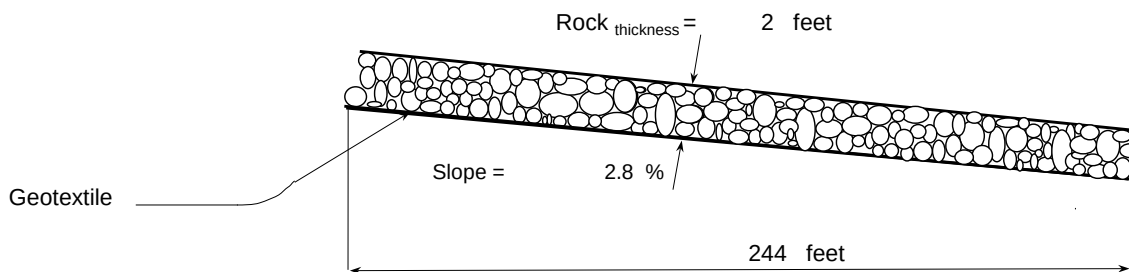
Rock Gradation Envelope

<u>% Passing</u>	<u>Diameter, in. (weight, lbs.)</u>
D ₁₀₀ -----	9 - 12 (52 - 122)
D ₈₅ -----	8 - 11 (34 - 89)
D ₅₀ -----	6 - 9 (15 - 52)
D ₁₀ -----	5 - 8 (8 - 34)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

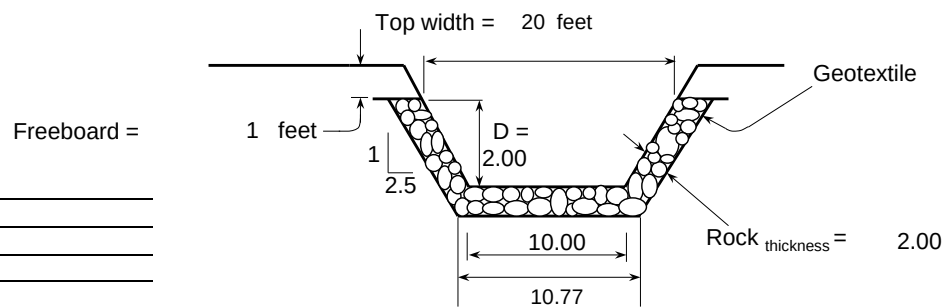
Quantities

Rock = 480 yd³
 Geotextile (WCS-13)^a = 1188 yd²

Notes: ^a Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



Profile Along Centerline of Rock Lined Waterway



Rock Lined WW Cross Section

Profile, Cross Sections, and Quantities



Date	5/24/22	File Name
WML		
Drawn		
Checkd	0	1/0/00
Approved		
		Sheet ___ of ___

Outlet G5

	A	B	C	D	E	F	G	H	I
1	Trapezoidal Riprap-Lined Waterway Design.xlsm								
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	5/24/2022			11/15/2019		
4	Checked by		Date						
5	<i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i>								
6	Design flow, Q=	19.71	cfs			WW horiz. Length=	36.0	ft	
7	Slope, S=	0.16	ft/ft	=	6.25	:1	U/S WW F.L. elev=	330.0	ft
8	Bottom Width, W=	10	ft			D/S WW F.L. elev=	324.2	ft	
9	Side slope, Z=	3	:1			Waterway drop=	5.8	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	36.5	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	5.44	in			Spreadsheet formatting key:			
13	D50 used=	12.00	in			XXX	=Input cells		
14	n=	0.052				X.XX	=Output from "Solve" button		
15	Freeboard=	1.00	ft			X.XX	=Other computed output		
16						Red text	=Instructions, warnings, info		
17	Flow depth, d=	0.34	ft	Calculated					
18	Critical depth, d _c =	0.47	ft						
19	Critical slope, S _c =	0.053	ft/ft	0.7S _c =	0.0369	ft/ft			
20				1.3S _c =	0.0686	ft/ft			
21	Design slope, S=	0.1600	ft/ft	Design slope OK. Flow is Supercritical.					
22	Velocity=	5.26	fps			Est. riprap unit wt=	1.4	Tons/CY	
23				Rock shape =	Angular	Rock Gs =	2.65		
24	Riprap thickness:			Required riprap gradation for D50 selected					
25	Minimum=	2.00	ft	%	Rock dia., inches		Rock weight, lb		
26	Provided=	2.00	ft	Smaller	min.	max.	min.	max.	
27				100	18.0	24.0	425	1007	
28	Sideslope height:			85	15.6	21.6	277	734	
29	Minimum=	1.34	ft	50	12.0	18.0	126	425	
30	Provided=	2.00	ft	10	9.6	15.6	64	277	
31									
32									
33									
34									
35									
36	Quantities:								
37	Riprap volume=	79.1	CY						
38	Approx. weight=	110.8	Tons						
39	Geotextile area=	218.5	SY*						
40									
41									
42	*Geotextile area								
43	includes actual covered								
44	surfaces only (no extra								
45	for laps or anchorage)								
46									

WW CROSS SECTION

WW PROFILE

Outlet H5

Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd
 Designer: WML
 Date: 5/24/2022

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 12.0 in.
 Rock_{WW} thickness = 2.0 Feet.

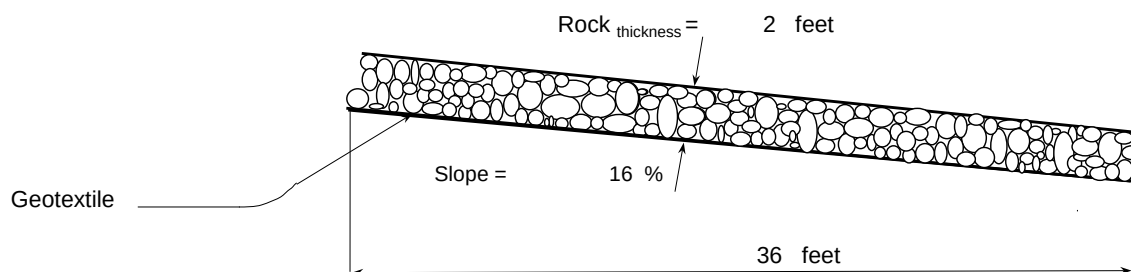
Rock Gradation Envelope

<u>% Passing</u>	<u>Diameter, in. (weight, lbs.)</u>
D ₁₀₀ -----	18 - 24 (413 - 978)
D ₈₅ -----	16 - 22 (269 - 713)
D ₅₀ -----	12 - 18 (122 - 413)
D ₁₀ -----	10 - 16 (63 - 269)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

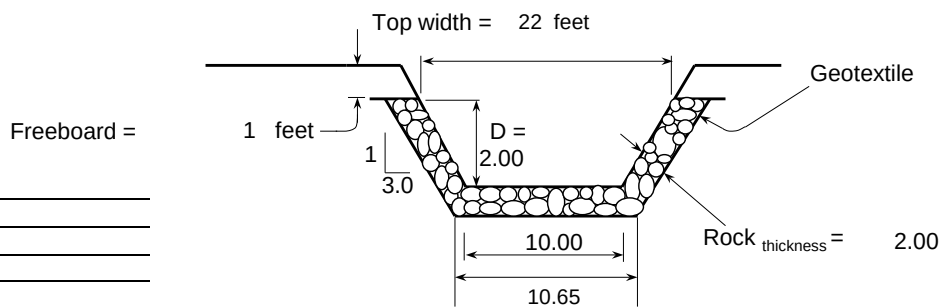
Quantities

Rock = 79 yd³
 Geotextile (WCS-13)^a = 218 yd²

Notes: ^a Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



Profile Along Centerline of Rock Lined Waterway



Rock Lined WW Cross Section

Profile, Cross Sections, and Quantities



Date	5/24/22	File Name
WML		
Drawn		
Checkd	0	1/0/00
Approved		
		Sheet ___ of ___

Outlet H5

	A	B	C	D	E	F	G	H	I
1	Trapezoidal Riprap-Lined Waterway Design.xlsm								
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	5/24/2022			11/15/2019		
4	Checked by		Date						
5	<i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i>								
6	Design flow, Q=	36.1	cfs			WW horiz. Length=	36.0	ft	
7	Slope, S=	0.33	ft/ft	=	3.03	:1	U/S WW F.L. elev=	330.0	ft
8	Bottom Width, W=	10	ft			D/S WW F.L. elev=	318.1	ft	
9	Side slope, Z=	3	:1			Waterway drop=	11.9	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	37.9	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	9.37	in			Spreadsheet formatting key:			
13	D50 used=	12.00	in			XXX	=Input cells		
14	n=	0.058				X.XX	=Output from "Solve" button		
15	Freeboard=	1.00	ft			X.XX	=Other computed output		
16						Red text	=Instructions, warnings, info		
17	Flow depth, d=	0.42	ft	Calculated					
18	Critical depth, d _c =	0.69	ft						
19	Critical slope, S _c =	0.059	ft/ft	0.7S _c =	0.0410	ft/ft			
20				1.3S _c =	0.0761	ft/ft			
21	Design slope, S=	0.3300	ft/ft	Design slope OK. Flow is Supercritical.					
22	Velocity=	7.69	fps			Est. riprap unit wt=	1.4	Tons/CY	
23				Rock shape =	Angular	Rock Gs =	2.65		
24	Riprap thickness:			Required riprap gradation for D50 selected					
25	Minimum=	2.00	ft	%	Rock dia., inches		Rock weight, lb		
26	Provided=	2.00	ft	Smaller	min.	max.	min.	max.	
27				100	18.0	24.0	425	1007	
28	Sideslope height:			85	15.6	21.6	277	734	
29	Minimum=	1.42	ft	50	12.0	18.0	126	425	
30	Provided=	2.00	ft	10	9.6	15.6	64	277	
31									
32									
33									
34									
35									
36	Quantities:								
37	Riprap volume=	82.3	CY						
38	Approx. weight=	115.2	Tons						
39	Geotextile area=	226.3	SY*						
40									
41									
42	*Geotextile area								
43	includes actual covered								
44	surfaces only (no extra								
45	for laps or anchorage)								
46									

WW CROSS SECTION

WW PROFILE

Outlet Basin #2

Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd
 Designer: WML
 Date: 5/24/2022

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 12.0 in.
 Rock_{ww} thickness = 2.0 Feet.

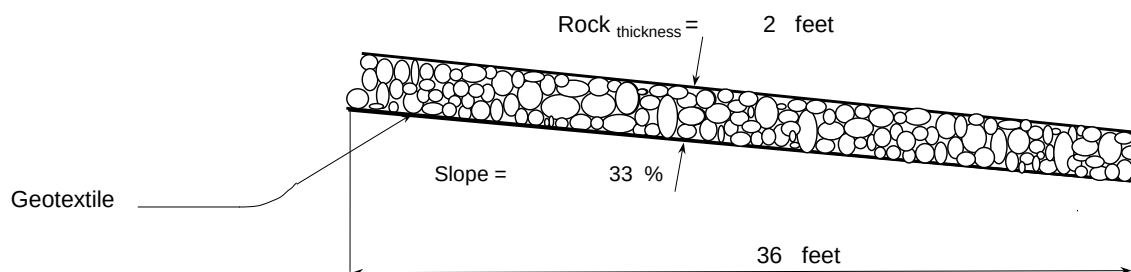
Rock Gradation Envelope

% Passing	Diameter, in. (weight, lbs.)
D ₁₀₀ -----	18 - 24 (413 - 978)
D ₈₅ -----	16 - 22 (269 - 713)
D ₅₀ -----	12 - 18 (122 - 413)
D ₁₀ -----	10 - 16 (63 - 269)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

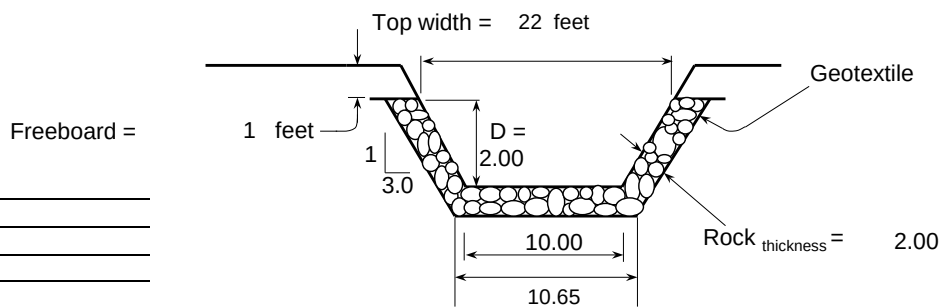
Quantities

Rock = 82 yd³
 Geotextile (WCS-13)^a = 226 yd²

Notes: ^a Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



Profile Along Centerline of Rock Lined Waterway



Rock Lined WW Cross Section

Profile, Cross Sections, and Quantities



Date	5/24/22	File Name
WML		
Drawn		
Checkd	0	1/0/00
Approved		
		Sheet ___ of ___

Outlet Basin #2

	A	B	C	D	E	F	G	H	I
1	Trapezoidal Riprap-Lined Waterway Design.xlsm								
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	5/24/2022			11/15/2019		
4	Checked by		Date						
5	<i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i>								
6	Design flow, Q=	14.16	cfs			WW horiz. Length=	1425.0	ft	
7	Slope, S=	0.041	ft/ft	=	24.39	:1	U/S WW F.L. elev=	368.5	ft
8	Bottom Width, W=	3	ft			D/S WW F.L. elev=	310.1	ft	
9	Side slope, Z=	2.5	:1			Waterway drop=	58.4	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	1426.2	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	3.67	in			Spreadsheet formatting key:			
13	D50 used=	6.00	in			XXX	=Input cells		
14	n=	0.038				X.XX	=Output from "Solve" button		
15	Freeboard=	1.00	ft			X.XX	=Other computed output		
16						Red text	=Instructions, warnings, info		
17	Flow depth, d=	0.65	ft		Calculated				
18	Critical depth, d _c =	0.72	ft						
19	Critical slope, S _c =	0.028	ft/ft		0.7S _c =	0.0195	ft/ft		
20					1.3S _c =	0.0362	ft/ft		
21	Design slope, S=	0.0410	ft/ft		Design slope OK. Flow is Supercritical.				
22	Velocity=	4.71	fps			Est. riprap unit wt=	1.4	Tons/CY	
23					Rock shape = Angular		Rock Gs =	2.65	
24	Riprap thickness:			Required riprap gradation for D50 selected					
25	Minimum=	1.00	ft	%	Rock dia., inches		Rock weight, lb		
26	Provided=	2.00	ft	Smaller	min.	max.	min.	max.	
27				100	9.0	12.0	53	126	
28	Sideslope height:			85	7.8	10.8	35	92	
29	Minimum=	1.65	ft	50	6.0	9.0	16	53	
30	Provided=	2.00	ft	10	4.8	7.8	8	35	
31									
32									
33									
34									
35									
36	Quantities:								
37	Riprap volume=	2064.4	CY						
38	Approx. weight=	2890.1	Tons						
39	Geotextile area=	5733.7	SY*						
40									
41									
42	*Geotextile area								
43	includes actual covered								
44	surfaces only (no extra								
45	for laps or anchorage)								
46									

WW CROSS SECTION

WW PROFILE

Swale (East Berm) North

Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd
 Designer: WML
 Date: 5/24/2022

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 6.0 in.
 Rock_{WW} thickness = 2.0 Feet.

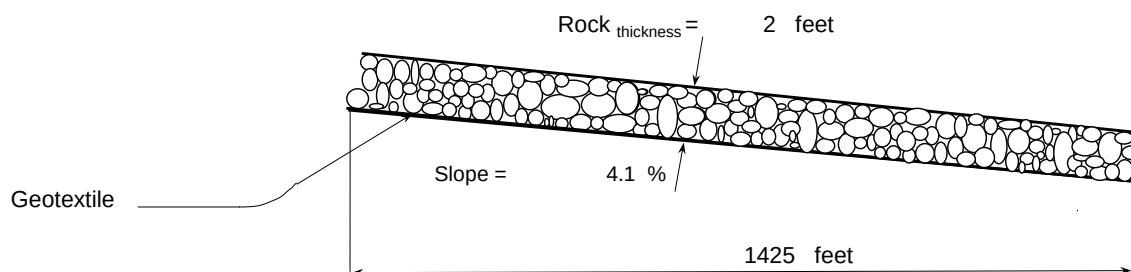
Rock Gradation Envelope

% Passing	Diameter, in. (weight, lbs.)
D_{100} -----	9 - 12 (52 - 122)
D_{85} -----	8 - 11 (34 - 89)
D_{50} -----	6 - 9 (15 - 52)
D_{10} -----	5 - 8 (8 - 34)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

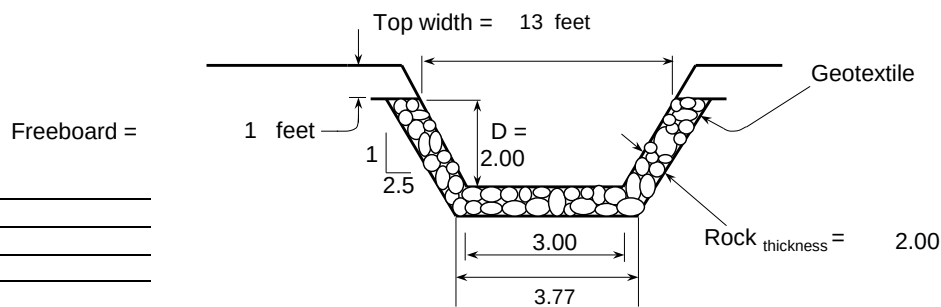
Quantities

Rock = 2064 yd³
 Geotextile (WCS-13)^a = 5734 yd²

Notes: ^a Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



Profile Along Centerline of Rock Lined Waterway



Rock Lined WW Cross Section

Profile, Cross Sections, and Quantities



Date	5/24/22	File Name
WML		
Drawn		
Checkd	0	1/0/00
Approved		

	A	B	C	D	E	F	G	H	I
1	Trapezoidal Riprap-Lined Waterway Design.xlsm								
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	5/24/2022			11/15/2019		
4	Checked by		Date						
5	<i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i>								
6	Design flow, Q=	4.76	cfs			WW horiz. Length=	596.0	ft	
7	Slope, S=	0.025	ft/ft =	40.00	:1	U/S WW F.L. elev=	368.5	ft	
8	Bottom Width, W=	3	ft			D/S WW F.L. elev=	353.6	ft	
9	Side slope, Z=	2.5	:1			Waterway drop=	14.9	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	596.2	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	1.39	in			Spreadsheet formatting key:			
13	D50 used=	6.00	in			XXX	=Input cells		
14	n=	0.036				X.XX	=Output from "Solve" button		
15	Freeboard=	1.00	ft			X.XX	=Other computed output		
16						Red text	=Instructions, warnings, info		
17	Flow depth, d=	0.40	ft	Calculated					
18	Critical depth, d _c =	0.38	ft						
19	Critical slope, S _c =	0.028	ft/ft	0.7S _c =	0.0198	ft/ft			
20				1.3S _c =	0.0368	ft/ft			
21	Design slope, S=	0.0250	ft/ft	0.7S _c < S < 1.3S _c . Select a different slope or bottom width.					
22	Velocity=	3.02	fps			Est. riprap unit wt=	1.4	Tons/CY	
23				Rock shape =	Angular	Rock Gs =	2.65		
24	Riprap thickness:			Required riprap gradation for D50 selected					
25	Minimum=	1.00	ft	%	Rock dia., inches	Rock weight, lb			
26	Provided=	2.00	ft	Smaller	min.	max.	min.	max.	
27				100	9.0	12.0	53	126	
28	Sideslope height:			85	7.8	10.8	35	92	
29	Minimum=	1.40	ft	50	6.0	9.0	16	53	
30	Provided=	2.00	ft	10	4.8	7.8	8	35	
31									
32									
33									
34									
35									
36	Quantities:								
37	Riprap volume=	863.0	CY						
38	Approx. weight=	1208.1	Tons						
39	Geotextile area=	2406.2	SY*						
40									
41									
42	*Geotextile area								
43	includes actual covered								
44	surfaces only (no extra								
45	for laps or anchorage)								
46									

WW CROSS SECTION

WW PROFILE

Swale (East Berm) South

Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd
 Designer: WML
 Date: 5/24/2022

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 6.0 in.
 Rock_{ww} thickness = 2.0 Feet.

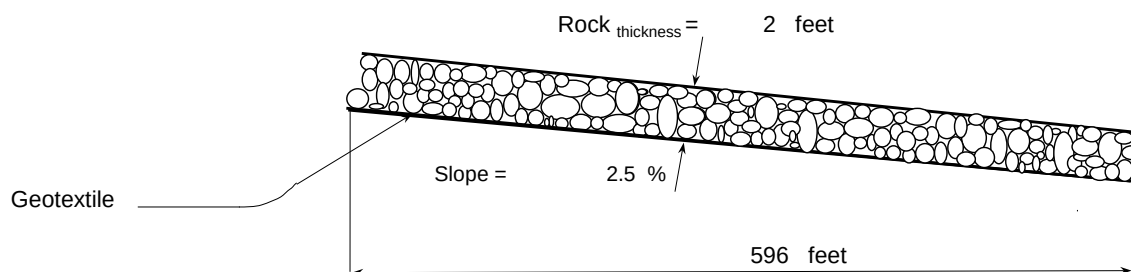
Rock Gradation Envelope

<u>% Passing</u>	<u>Diameter, in. (weight, lbs.)</u>
D ₁₀₀ -----	9 - 12 (52 - 122)
D ₈₅ -----	8 - 11 (34 - 89)
D ₅₀ -----	6 - 9 (15 - 52)
D ₁₀ -----	5 - 8 (8 - 34)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

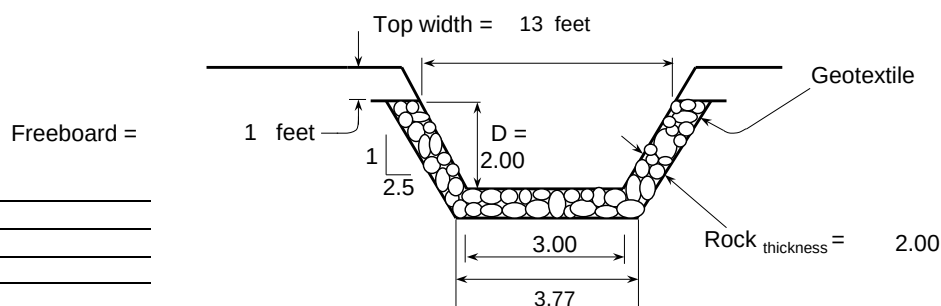
Quantities

Rock = 863 yd³
 Geotextile (WCS-13)^a = 2406 yd²

Notes: ^a Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



Profile Along Centerline of Rock Lined Waterway



Rock Lined WW Cross Section

Profile, Cross Sections, and Quantities



Date	5/24/22	File Name
WML		
Drawn		
Checkd	0	1/0/00
Approved		
		Sheet ___ of ___

Swale (East Berm) South

Plungepool DN-6

RIPRAP LINED PLUNGE POOL FOR CANTILEVER OUTLET (Version 8/2015)
(Reference Design Note No. 6 (Second Edition), Jan. 23, 1986)

JOB: 555 Hopping Brook road
DESIGNER: WML
CHECKER:

Date: 5/23/2022
Date:

INPUT DATA:

Conduit Diameter	D =	4.00	ft
Conduit Discharge:	Q =	134.50	cfs
Conduit Slope at Outlet:	S =	0.04	ft/ft
Conduit Outlet Invert Elevation:	EI, CO =	282.00	ft
Tailwater Elevation:	EI, TW =	278.00	ft
Outlet Channel Invert Elevation:	EI, CH =	282.00	ft

Water Density:	RHO =	1.00	
Bed/Riprap Particle Density: (Default 2.64)	RHOS =	2.64	
D ₅₀ Riprap Size (inches):	12*RS =	24.00	inches
D ₅₀ Riprap Size (feet):	RS =	2.00	ft
Riprap Thickness: (2.5*D, 50 recommended)	RT =	2.50	ft
Bedding Thickness: (6 inch min. rec.) (Enter 0 for geotextile)	BT =	1.00	ft
Side Slope Ratio:	Zw =	2.00	ft/ft
Upstream End Slope Ratio:	Zlu =	3.00	ft/ft
Downstream End Slope Ratio:	Zld =	2.00	ft/ft
Combined End Slope Ratio:	Z1 =	2.00	ft/ft

OUTPUT---POOL LOCATION AND DIMENSIONS:

Vert. Dist. from Tailwater to Conduit Invert:	Zp =	4.00	ft
Submergence Check: (If Zp < 0, Use Zp = 0)	Use Zp =	4.00	ft
Beaching Check: $[Q/(gD^5)^{0.5} \leq (1.0+25*D,50/D)]$		O.K.	
Beaching Controlled			
Distance from Conduit Exit to C/L Pool:	Xm =	8.27	ft
Pool depth at C/L Below Conduit Invert:	Zp+0.8Zm =	6.43	ft
Pool Bottom Elev:	EI, PB =	275.57	ft
Pool Bottom Length:	2Lr2 =	2.12	ft
Pool Bottom Width:	2Wr2 =	1.95	ft
Upstream Pool Length at Tailwater Elev.:	Lru =	8.34	ft
Downstream Pool Length at Tailwater Elev.:	Lrd =	5.91	ft
Pool Width at Tailwater Elev.:	2Wr =	11.66	ft
Check Side Slope Ratio: (Wr>=We)		O.K.	
Side Slope Ratio Zw O.K.			
Check Min. End Slope Ratio: (Lru & Lrd >= Le)		O.K.	
End Slope Ratios O.K.			
Check Upstream Length: (Lru >= Xm)		O.K.	
End Slope Ratio Zlu O.K.			
Pool Bottom Elev. at Bottom of Riprap:	EI, BR =	273.07	ft
Pool Bottom Elev. at Bottom of Bedding:	EI, BB =	272.07	ft

OUTPUT---VOLUMES BELOW WATER SURFACE ELEVATION:

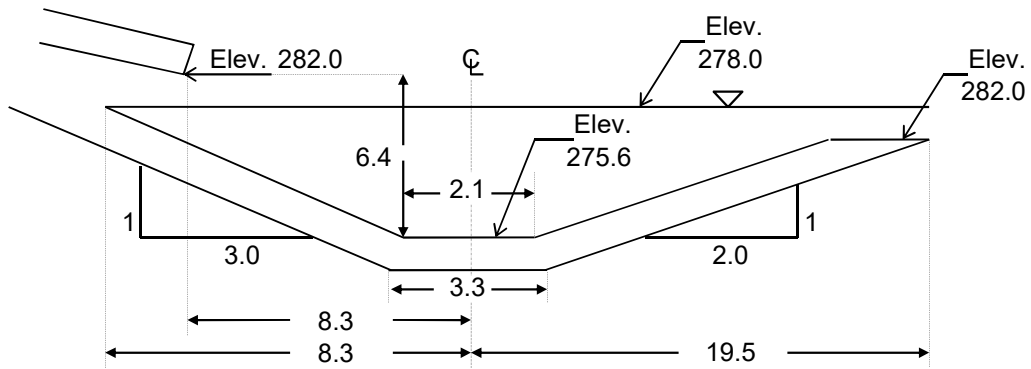
Volume of Excavation (measured from bottom surface of bedding):	V,pbs =	62.3	cu yd
Volume of Rock Riprap:	V,rs =	32.1	cu yd
Volume of Bedding:	V,bs =	25.2	cu yd

Spreadsheet developed by D. Hurtz, Midwest NTC, 1/90

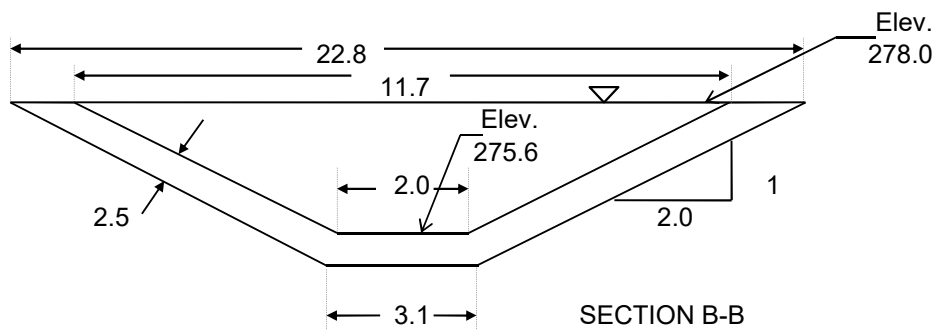
Spreadsheet modified by M. Dreischmeier, Eau Claire TC, Wis., 3/98 and 5/2005

Plungepool DN-6

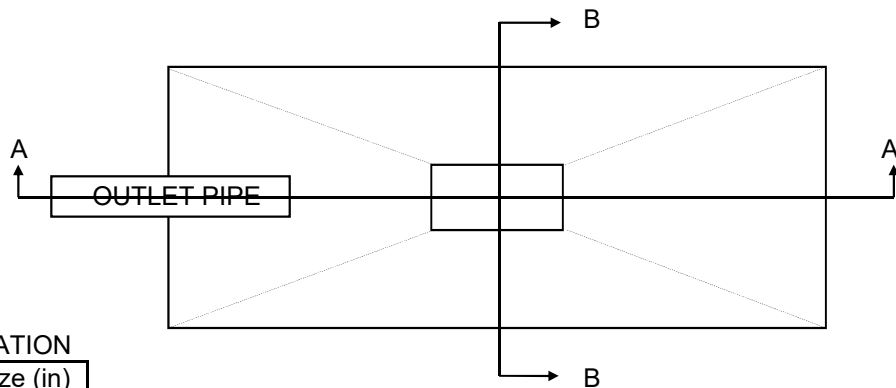
RIPRAP LINED PLUNGE POOL FOR CANTILEVER OUTLET
 Reference Design Note No. 6 (Second Edition), Jan. 23, 1986



SECTION A-A



SECTION B-B



ROCK GRADATION

% Passing	Size (in)
100	48
60-85	36
25-50	24
5-20	12
0-5	4.8

555 Hopping Brook road
 LANDOWNER

DESIGNER: WML
 SHEET ____ OF ____

National Flood Hazard Layer FIRMette



42°10'26.07"N



71°27'5.39"W

USGS The National Map: Orthoimagery. Data refreshed April 2019. eff. 7/1/2012



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

Without Base Flood Elevation (BFE)
Zone A, V, AE

With BFE or Depth
Zone AE, AO, AH, VE, AP

Regulatory Floodway

SPECIAL FLOOD HAZARD AREAS

15

0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile
Zone X

Future Conditions 1% Annual Chance Flood Hazard
Zone X

Area with Reduced Flood Risk due to Levee. See Notes.
Zone X

Area with Flood Risk due to Levee
Zone D

OTHER AREAS OF FLOOD HAZARD

NO SCREEN

Effective LOMRs

Area of Minimal Flood Hazard
Zone X

Area of Undetermined Flood Hazard
Zone D

OTHER AREAS

GENERAL STRUCTURES

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

Cross Sections with 1% Annual Chance

Water Surface Elevation

Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

OTHER FEATURES

Digital Data Available

No Digital Data Available

Unmapped

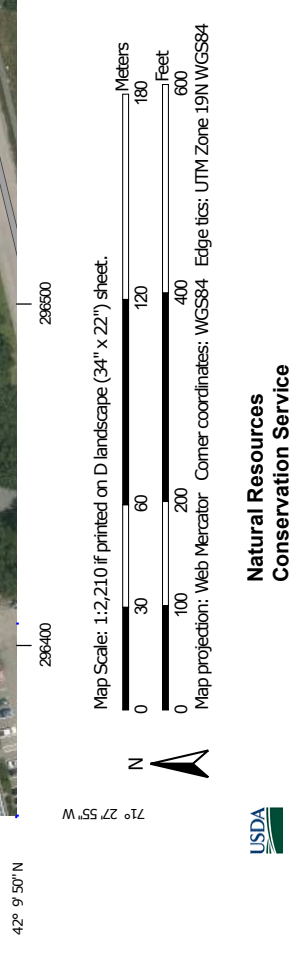
MAP PANELS

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

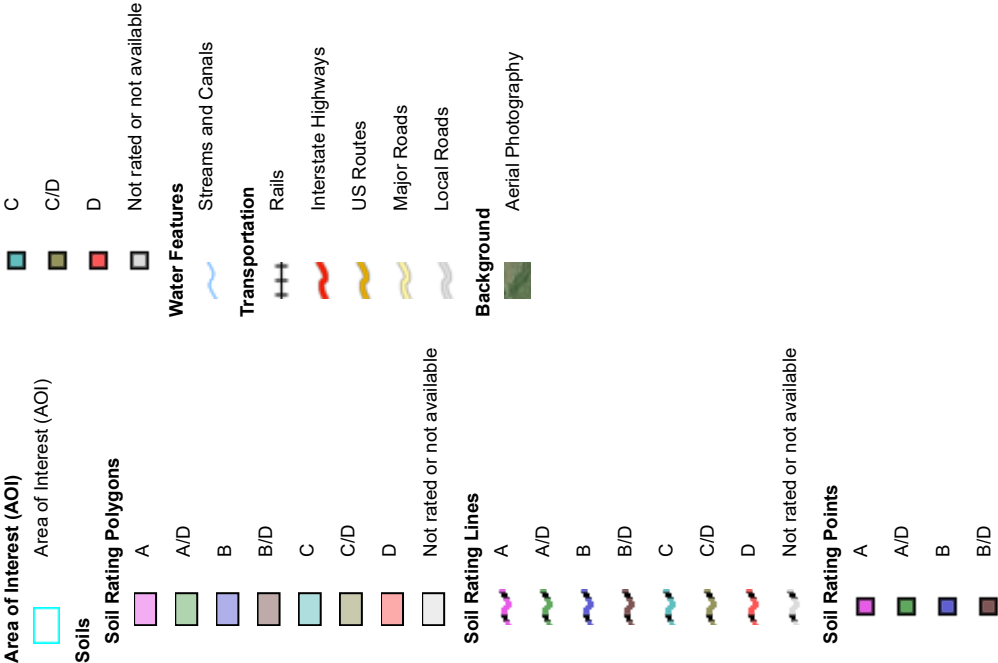
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **1/31/2020 at 8:45:21 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



MAP LEGEND



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.
Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 19, Sep 12, 2019

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 28, 2019—Aug 15, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
51A	Swansea muck, 0 to 1 percent slopes	B/D	1.7	0.9%
52A	Freetown muck, 0 to 1 percent slopes	B/D	1.6	0.9%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	D	1.3	0.7%
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	4.1	2.3%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	8.4	4.7%
253C	Hinckley loamy sand, 8 to 15 percent slopes	A	1.0	0.6%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	C	4.9	2.7%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	C	28.6	16.0%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	C	2.4	1.3%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	1.9	1.1%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	122.6	68.5%
311C	Woodbridge fine sandy loam, 8 to 15 percent slopes, very stony	C/D	0.5	0.3%
Totals for Area of Interest			179.0	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Project: 555 Hopping Brook Road
Location: Holliston, MA
Prepared For: Engineering Design Consultants



Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the t_c , read the unit peak discharge (q_u) from Figure 1 or Table in Figure 2. q_u is expressed in the following units: cfs/mi²/watershed inches (csm/in).

Compute Q Rate using the following equation:

$$Q = (q_u) (A) (WQV)$$

where:

Q = flow rate associated with first 1" of runoff

q_u = the unit peak discharge, in csm/in.

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (1" in this case)

NEAR

Structure Name	Impv. (acres)	A (miles ²)	t_c (min)	t_c (hr)	WQV (in)	q_u (csm/in.)	Q (cfs)
DMH A13	3.97	0.0062047	8.6	0.143	1.00	736.00	4.57
DMH B10	1.57	0.0024500	6.8	0.113	1.00	774.00	1.90
DMH C12	2.43	0.0037922	7.9	0.132	1.00	755.00	2.86
DMH E22	3.24	0.0050563	8.9	0.148	1.00	736.00	3.72
DMH J3	0.23	0.0003609	6.0	0.100	1.00	774.00	0.28

The WQf sizing calculation selects the minimum size CDS/Cascade/StormCeptor model capable of operating at the computed WQf peak flowrate prior to bypassing. It assumes free discharge of the WQf through the unit and ignores the routing effect of any upstream storm drain piping. As with all hydrodynamic separators, there will be some impact to the Hydraulic Gradient of the corresponding drainage system, and evaluation of this impact should be considered in the design.

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method



555 HOPPING BROOK ROAD
HOLLISTON, MA
NEAR A13

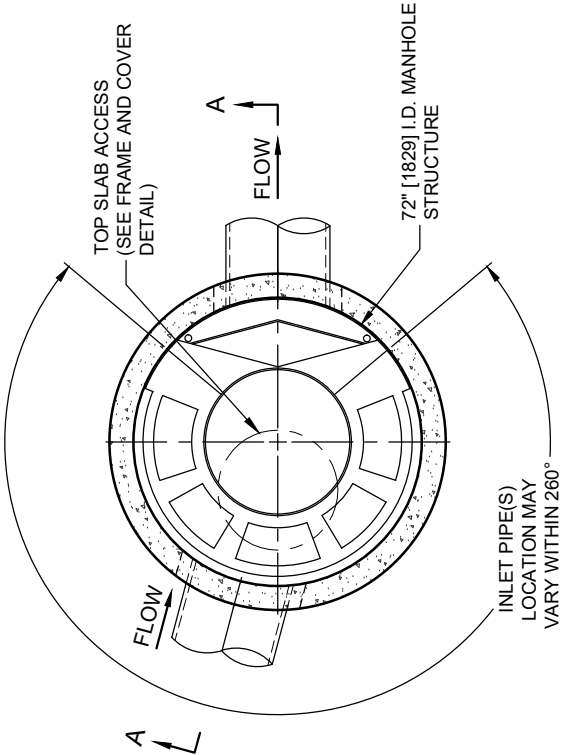


AREA	3.97	acres	CASCADE MODEL	CS-6
WEIGHTED C	0.95			
TC	6.00	minutes	RAINFALL STATION	68

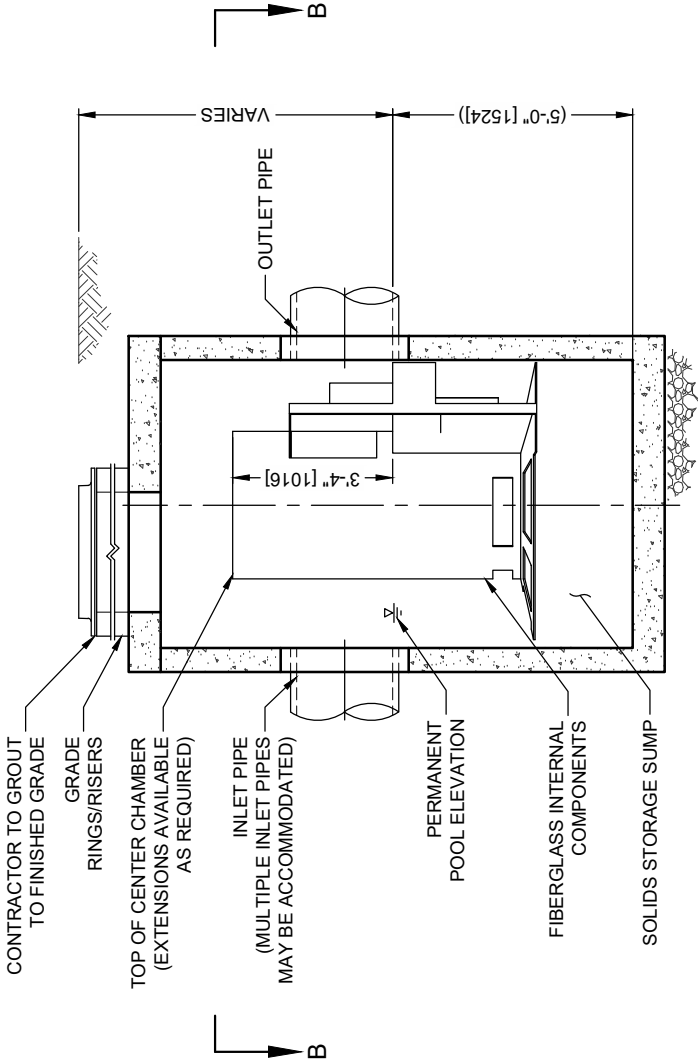
Rainfall Intensity ¹ (in/hr)	Percent Rainfall Volume ¹	Hydraulic Loading Rate (gpm/ft ²)	Removal Efficiency (%)	Incremental Removal (%)
0.02	9.3%	1.20	100.0	9.3
0.04	9.5%	2.39	100.0	9.5
0.06	8.7%	3.59	100.0	8.7
0.08	10.1%	4.79	100.0	10.1
0.10	7.2%	5.99	100.0	7.2
0.12	6.0%	7.18	100.0	6.0
0.14	6.3%	8.38	100.0	6.3
0.16	5.6%	9.58	100.0	5.6
0.18	4.7%	10.78	100.0	4.7
0.20	3.6%	11.97	100.0	3.6
0.25	8.2%	14.97	97.8	8.0
0.50	14.9%	29.93	83.8	12.5
0.75	3.2%	44.90	69.7	2.2
1.00	1.2%	59.87	55.6	0.7
1.50	0.7%	89.80	27.5	0.2
2.00	0.8%	115.09	3.6	0.0
				94.6
Removal Efficiency Adjustment ² =				6.5%
Predicted % Annual Rainfall Treated =				93.5%
Predicted Net Annual Load Removal Efficiency =				88.2%

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



PLAN VIEW B-B
NOT TO SCALE



ELEVATION A-A
NOT TO SCALE

CASCADE
separator™

CASCADE SEPARATOR DESIGN NOTES

CS-6 RATED TREATMENT CAPACITY IS 5.6 CFS, OR PER LOCAL REGULATIONS. THE STANDARD CS-6 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

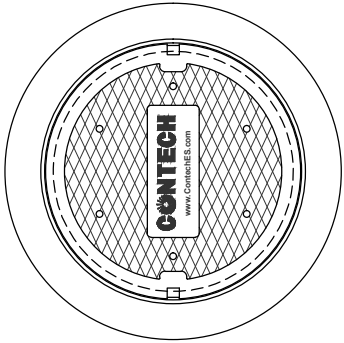
CONFIGURATION DESCRIPTION

GRATED INLET ONLY (NO INLET PIPE)

GRATED INLET WITH INLET PIPE OR PIPES

CURB INLET ONLY (NO INLET PIPE)

CURB INLET WITH INLET PIPE OR PIPES



FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE

SITE SPECIFIC
DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (cfs [L/s])			
PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
RIM ELEVATION			
PIPE DATA:			
INLET PIPE 1	INVERT	MATERIAL	DIAMETER
INLET PIPE 2			
OUTLET PIPE			

GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
- CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
- CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
- ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

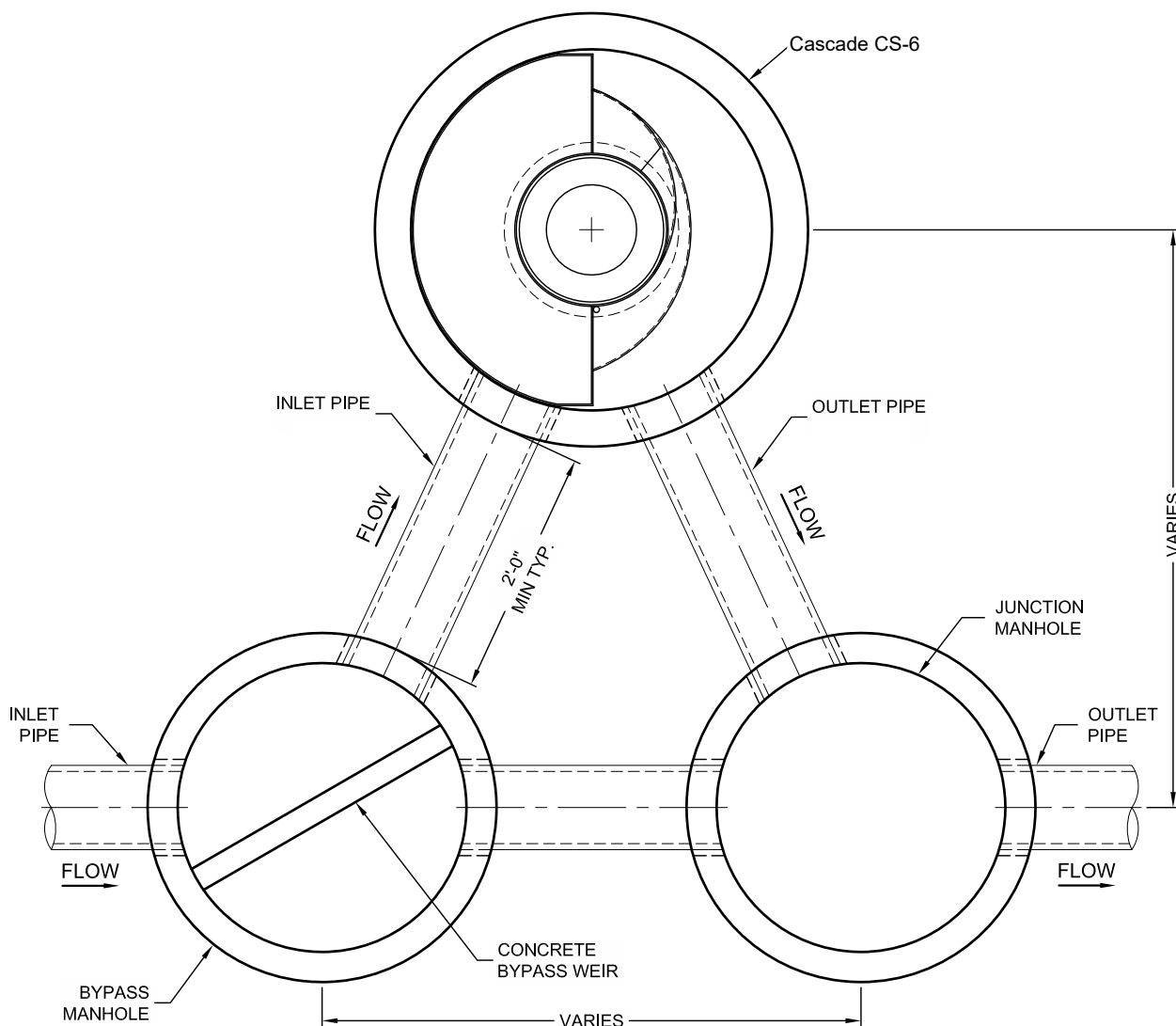
INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH
ENGINEERED SOLUTIONS LLC

www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CS-6
CASCADE SEPARATOR
STANDARD DETAIL



THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CONTECH[®]
ENGINEERED SOLUTIONS LLC

www.ContechES.com

9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069

800-338-1122 513-645-7000 513-645-7993 FAX

STORMWATER TREATMENT SYSTEM TYPICAL OFFLINE LAYOUT WITH BYPASS & JUNCTION MANHOLE STRUCTURES

DATE: 03/12/13

SCALE: NONE

PROJECT No.: N/A

SEQ. No.: N/A

DRAWN: N/A

CHECKED: N/A

Engineering Design Consultants, Inc. 32 Tumpike Road Southborough, MA 01772 (508) 486-0225

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method



555 HOPPING BROOK ROAD
HOLLISTON, MA
B10



AREA	1.57	acres	CASCADE MODEL	CS-4
WEIGHTED C	0.95			
TC	6.80	minutes	RAINFALL STATION	68

Rainfall Intensity ¹ (in/hr)	Percent Rainfall Volume ¹	Hydraulic Loading Rate (gpm/ft ²)	Removal Efficiency (%)	Incremental Removal (%)
0.02	9.3%	1.07	100.0	9.3
0.04	9.5%	2.13	100.0	9.5
0.06	8.7%	3.20	100.0	8.7
0.08	10.1%	4.26	100.0	10.1
0.10	7.2%	5.33	100.0	7.2
0.12	6.0%	6.39	100.0	6.0
0.14	6.3%	7.46	100.0	6.3
0.16	5.6%	8.52	100.0	5.6
0.18	4.7%	9.59	100.0	4.7
0.20	3.6%	10.65	100.0	3.6
0.25	8.2%	13.32	99.4	8.1
0.50	14.9%	26.64	86.9	13.0
0.75	3.2%	39.95	74.3	2.4
1.00	1.2%	53.27	61.8	0.8
1.50	0.7%	76.08	38.5	0.3
2.00	0.8%	76.08	28.8	0.2
				95.7
Removal Efficiency Adjustment ² =				6.5%
Predicted % Annual Rainfall Treated =				93.3%
Predicted Net Annual Load Removal Efficiency =				89.2%

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CASCADE SEPARATOR DESIGN NOTES

CS-4 RATED TREATMENT CAPACITY IS 2.0 CFS, OR PER LOCAL REGULATIONS. THE STANDARD CS-4 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION

GRATED INLET ONLY (NO INLET PIPE)

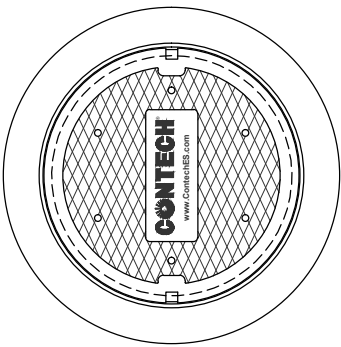
GRATED INLET WITH INLET PIPE OR PIPES

CURB INLET ONLY (NO INLET PIPE)

CURB INLET WITH INLET PIPE OR PIPES

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
RIM ELEVATION	
PIPE DATA:	
INLET PIPE 1	
INLET PIPE 2	
OUTLET PIPE	



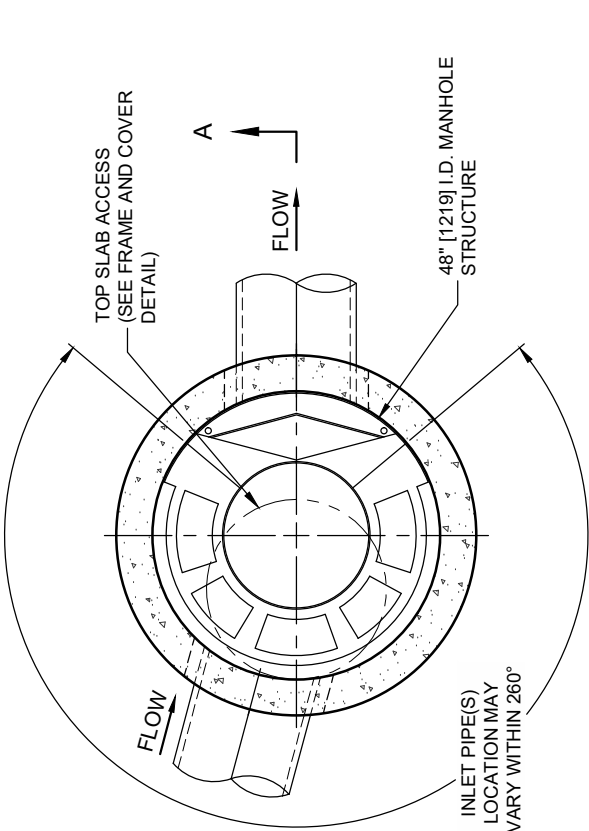
FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE

GENERAL NOTES

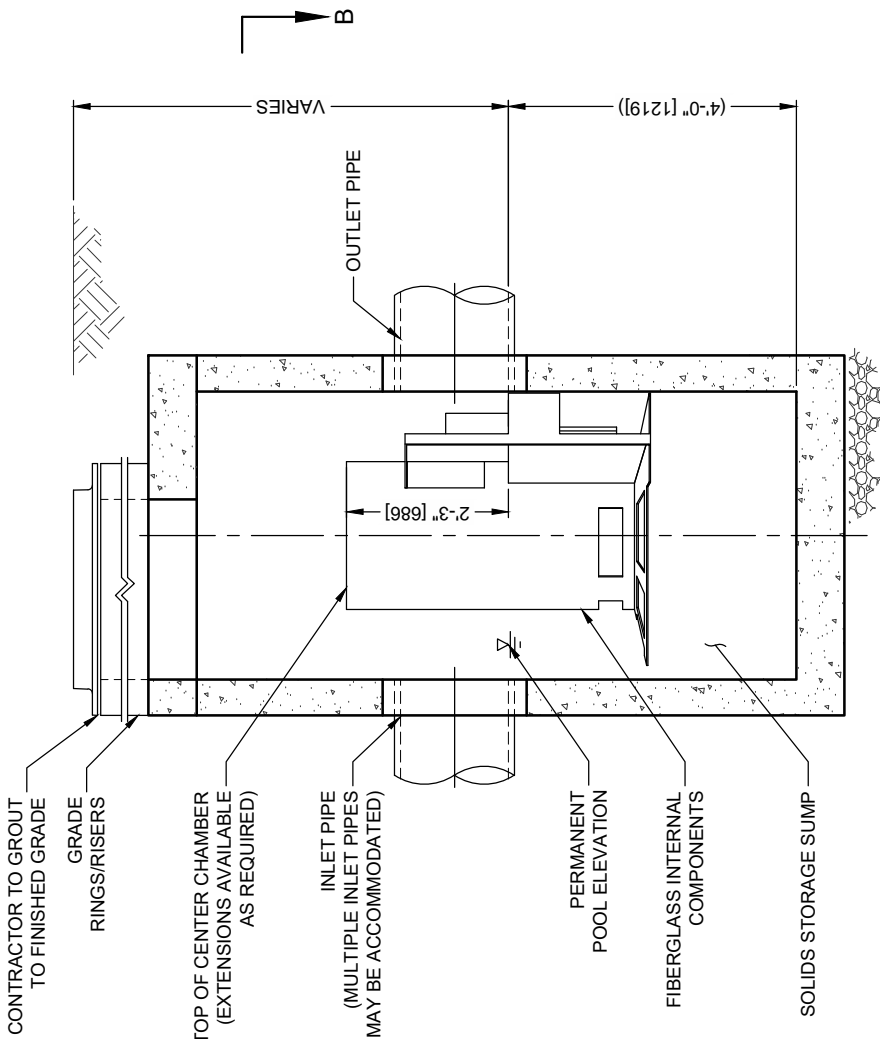
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEER SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES

- A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
- C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.



PLAN VIEW B-B
NOT TO SCALE



ELEVATION A-A
NOT TO SCALE

CASCADE™ separator

The logo for CONTECH ENGINEERED SOLUTIONS LLC. The word "CONTECH" is in a large, bold, sans-serif font. The letter "O" is replaced by a stylized sunburst or gear-like icon. To the right of "CONTECH", the words "ENGINEERED SOLUTIONS LLC" are written in a smaller, bold, sans-serif font, stacked vertically.

www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CS-4
CASCADE SEPARATOR
STANDARD DETAIL

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method



555 HOPPING BROOK ROAD
HOLLISTON, MA
C12

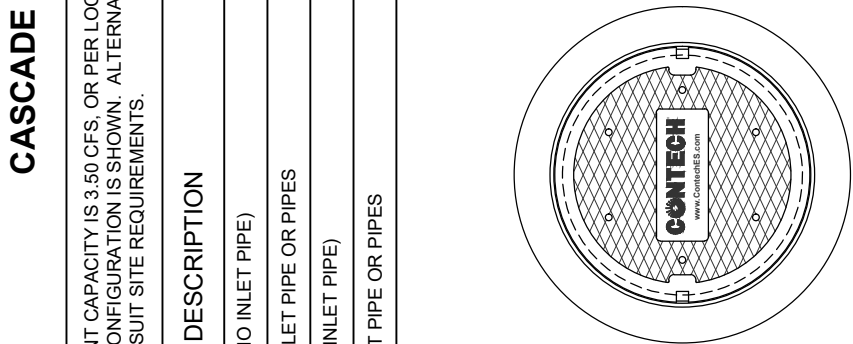
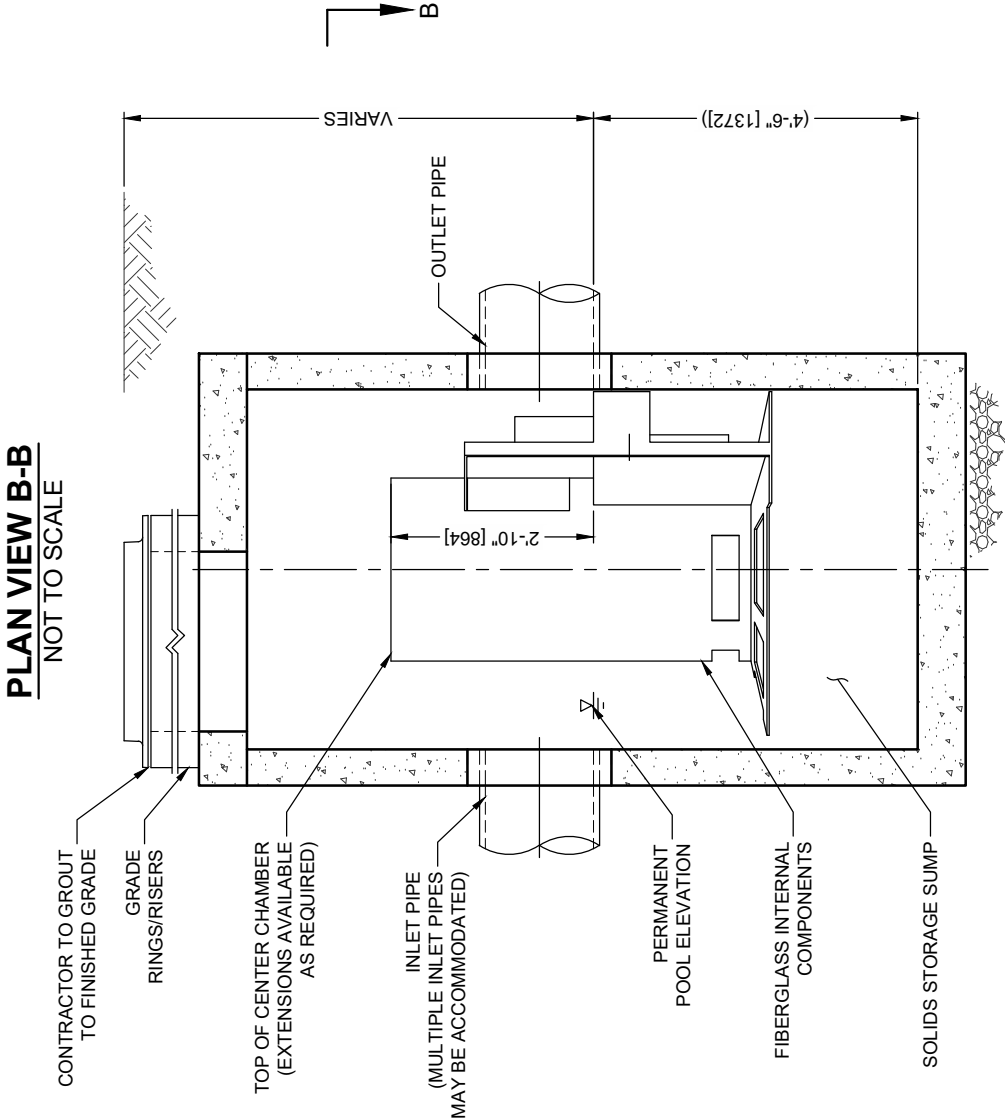
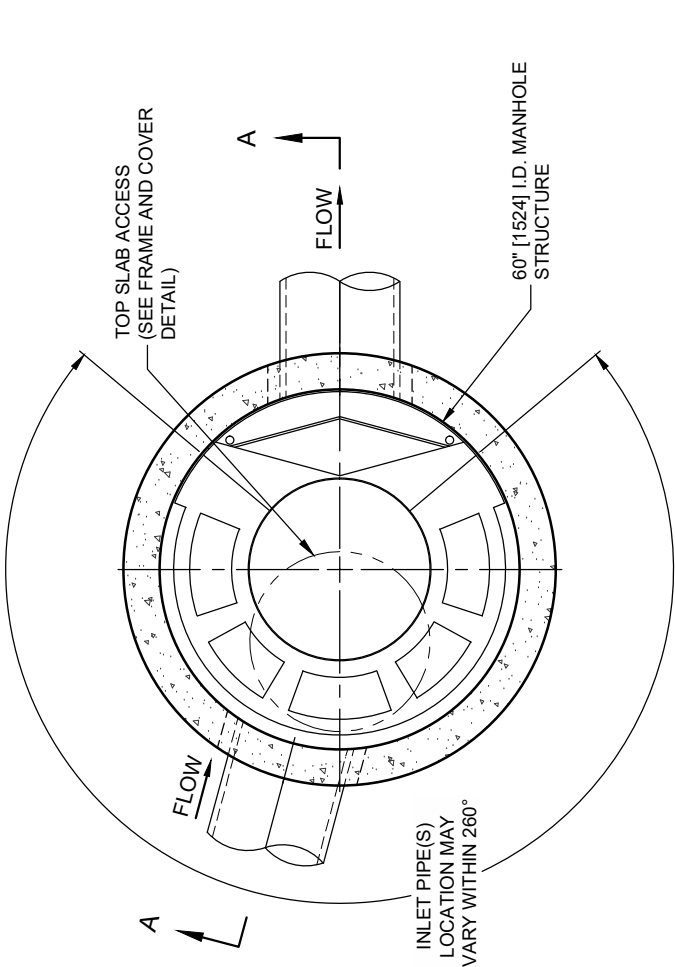


AREA	2.43	acres	CASCADE MODEL	CS-5
WEIGHTED C	0.95			
TC	7.90	minutes	RAINFALL STATION	68

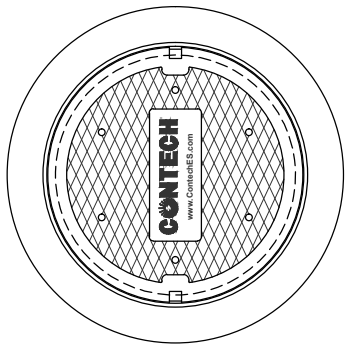
Rainfall Intensity ¹ (in/hr)	Percent Rainfall Volume ¹	Hydraulic Loading Rate (gpm/ft ²)	Removal Efficiency (%)	Incremental Removal (%)
0.02	9.3%	1.06	100.0	9.3
0.04	9.5%	2.11	100.0	9.5
0.06	8.7%	3.17	100.0	8.7
0.08	10.1%	4.22	100.0	10.1
0.10	7.2%	5.28	100.0	7.2
0.12	6.0%	6.33	100.0	6.0
0.14	6.3%	7.39	100.0	6.3
0.16	5.6%	8.44	100.0	5.6
0.18	4.7%	9.50	100.0	4.7
0.20	3.6%	10.55	100.0	3.6
0.25	8.2%	13.19	99.5	8.1
0.50	14.9%	26.38	87.1	13.0
0.75	3.2%	39.58	74.7	2.4
1.00	1.2%	52.77	62.3	0.8
1.50	0.7%	79.15	37.5	0.3
2.00	0.8%	80.01	27.8	0.2
				95.7
Removal Efficiency Adjustment ² =				6.5%
Predicted % Annual Rainfall Treated =				93.4%
Predicted Net Annual Load Removal Efficiency =				89.3%

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE



CASCADE SEPARATOR DESIGN NOTES

CS-5 RATED TREATMENT CAPACITY IS 3.50 CFS, OR PER LOCAL REGULATIONS. THE STANDARD CS-5 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS'.

CONFIGURATION DESCRIPTION

GRATED INLET ONLY (NO INLET PIPE)

GRATED INLET WITH INLET PIPE OR PIPES

CURB INLET ONLY (NO INLET PIPE)

CURB INLET WITH INLET PIPE OR PIPES

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (cfs [L/s])			
PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
RIM ELEVATION			
PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
NOTES / SPECIAL REQUIREMENTS:			

GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
- CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
- CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
- ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

ELEVATION A-A
NOT TO SCALE

CASCADE separator™

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CS-5
CASCADE SEPARATOR
STANDARD DETAIL

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method



555 HOPPING BROOK ROAD
HOLLISTON, MA
E22



AREA	3.24	acres	CASCADE MODEL	CS-6
WEIGHTED C	0.95			
TC	8.90	minutes	RAINFALL STATION	68

Rainfall Intensity ¹ (in/hr)	Percent Rainfall Volume ¹	Hydraulic Loading Rate (gpm/ft ²)	Removal Efficiency (%)	Incremental Removal (%)
0.02	9.3%	0.98	100.0	9.3
0.04	9.5%	1.95	100.0	9.5
0.06	8.7%	2.93	100.0	8.7
0.08	10.1%	3.91	100.0	10.1
0.10	7.2%	4.89	100.0	7.2
0.12	6.0%	5.86	100.0	6.0
0.14	6.3%	6.84	100.0	6.3
0.16	5.6%	7.82	100.0	5.6
0.18	4.7%	8.79	100.0	4.7
0.20	3.6%	9.77	100.0	3.6
0.25	8.2%	12.22	100.0	8.2
0.50	14.9%	24.43	88.9	13.3
0.75	3.2%	36.65	77.5	2.5
1.00	1.2%	48.86	66.0	0.8
1.50	0.7%	73.29	43.0	0.3
2.00	0.8%	97.72	20.0	0.2
				96.2
Removal Efficiency Adjustment ² =				6.5%
Predicted % Annual Rainfall Treated =				93.5%
Predicted Net Annual Load Removal Efficiency =				89.7%

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CASCADE SEPARATOR DESIGN NOTES

CS-6 RATED TREATMENT CAPACITY IS 5.6 CFS, OR PER LOCAL REGULATIONS. THE STANDARD CS-6 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION

GRATED INLET ONLY (NO INLET PIPE)

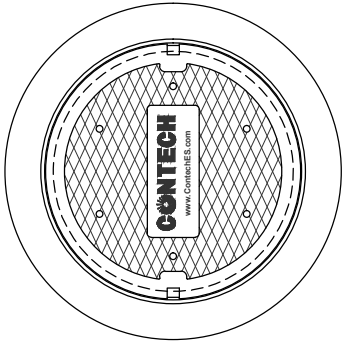
GRATED INLET WITH INLET PIPE OR PIPES

CURB INLET ONLY (NO INLET PIPE)

CURB INLET WITH INLET PIPE OR PIPES

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (cfs [L/s])			
PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
RIM ELEVATION			
PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
NOTES / SPECIAL REQUIREMENTS:			



FRAME AND COVER

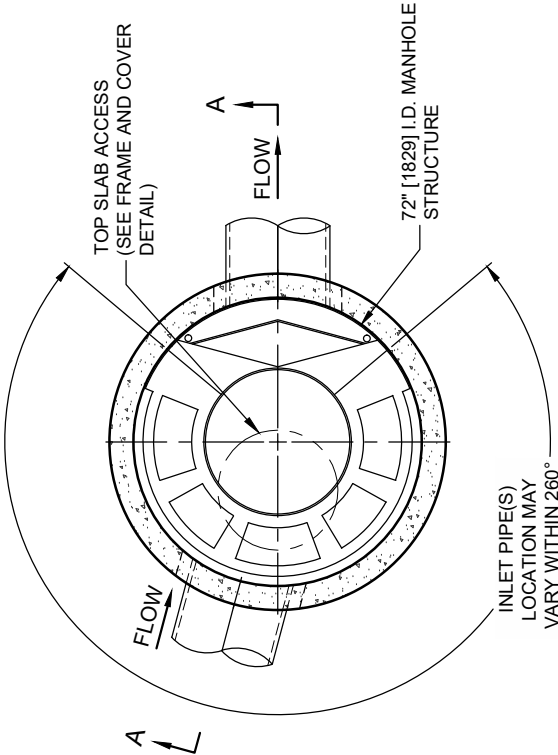
(DIAMETER VARIES)
NOT TO SCALE

GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
- CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
- CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
- ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

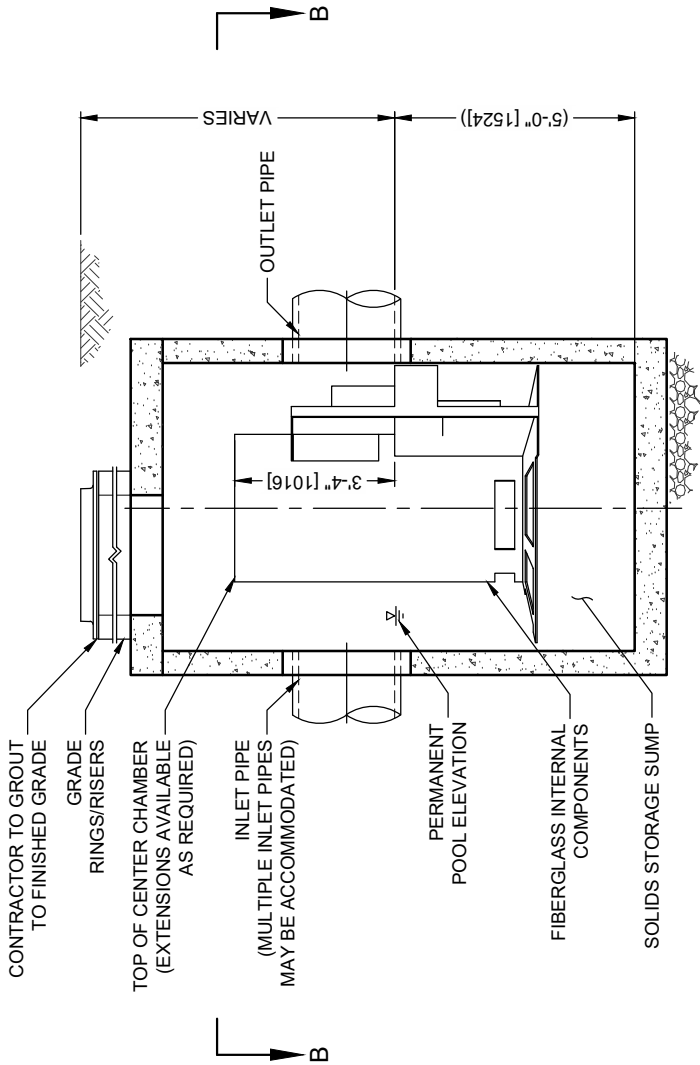
INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.



PLAN VIEW B-B

NOT TO SCALE



ELEVATION A-A

NOT TO SCALE



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CASCADE separator™

CS-6 CASCADE SEPARATOR STANDARD DETAIL

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**555 HOPPING BROOK ROAD
HOLLISTON, MA**

Area **0.23 ac**
Weighted C **0.9**
 t_c **6 min**
CDS Model **1515-3**

Unit Site Designation **DMH J3**
Rainfall Station # **68**

CDS Treatment Capacity **1.0 cfs**

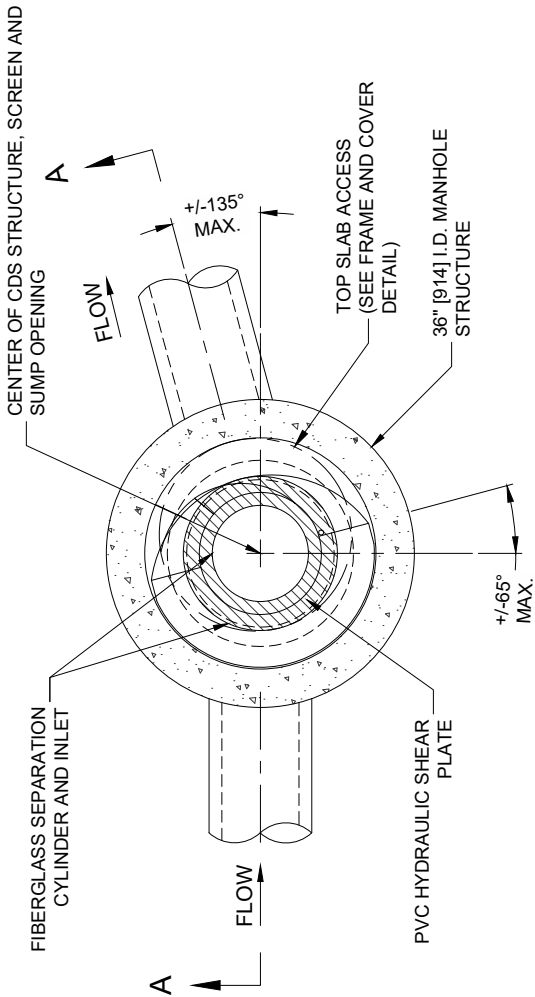
<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	9.3%	9.3%	0.00	0.00	9.0
0.04	9.5%	18.8%	0.01	0.01	9.2
0.06	8.7%	27.5%	0.01	0.01	8.4
0.08	10.1%	37.6%	0.02	0.02	9.7
0.10	7.2%	44.8%	0.02	0.02	6.9
0.12	6.0%	50.8%	0.02	0.02	5.7
0.14	6.3%	57.1%	0.03	0.03	6.0
0.16	5.6%	62.7%	0.03	0.03	5.3
0.18	4.7%	67.4%	0.04	0.04	4.4
0.20	3.6%	71.0%	0.04	0.04	3.4
0.25	8.2%	79.1%	0.05	0.05	7.6
0.50	14.9%	94.0%	0.10	0.10	13.4
0.75	3.2%	97.3%	0.16	0.16	2.8
1.00	1.2%	98.5%	0.21	0.21	1.0
1.50	0.7%	99.2%	0.31	0.31	0.5
2.00	0.8%	100.0%	0.42	0.42	0.5
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					94.0
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.5%
Predicted Net Annual Load Removal Efficiency =					87.6%

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

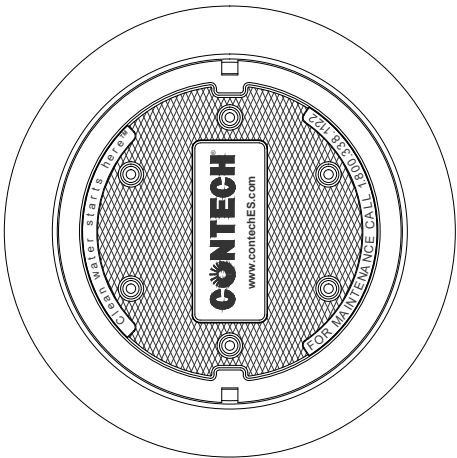
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 1.0 CFS, OR PER LOCAL REGULATIONS.
THE STANDARD CDS1515-3-C CONFIGURATION IS SHOWN.



PLAN VIEW B-B
N.T.S.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

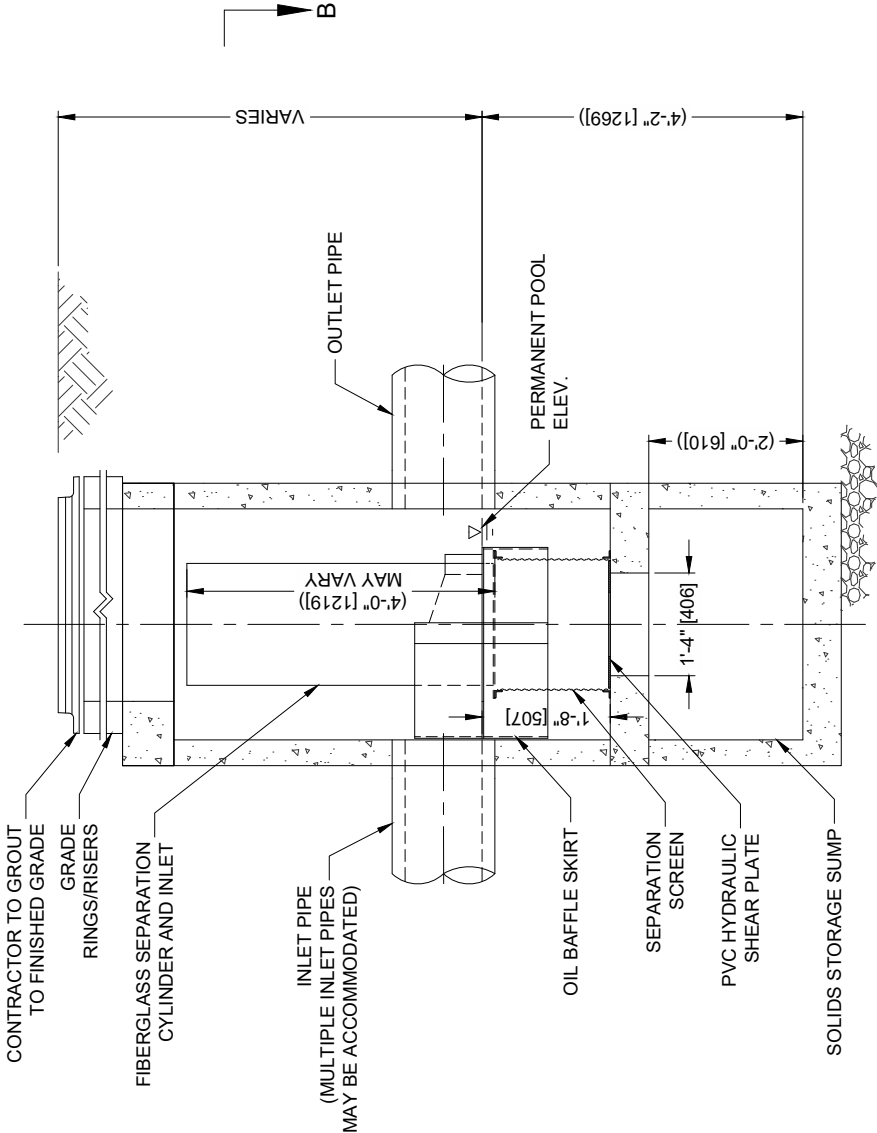
SITE SPECIFIC DATA REQUIREMENTS					
STRUCTURE ID					
WATER QUALITY FLOW RATE (CFS OR L/s)			*		
PEAK FLOW RATE (CFS OR L/s)			*		
RETURN PERIOD OF PEAK FLOW (YRS)			*		
SCREEN APERTURE (2400 OR 4700)			*		
PIPE DATA:					
I.E.		MATERIAL		DIAMETER	
INLET PIPE 1		*		*	
INLET PIPE 2		*		*	
OUTLET PIPE		*		*	
RIM ELEVATION					
*					
ANTI-FLOTATION BALLAST			WIDTH		HEIGHT
			*		*
NOTES/SPECIAL REQUIREMENTS:					
* PER ENGINEER OF RECORD					

GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
- CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
- STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO..
- IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
- CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.



ELEVATION A-A
N.T.S.

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CDS1515-3-C
ONLINE CDS
STANDARD DETAIL



THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE
FOLLOWING PATENTS: U.S. PATENT NO. 7,811,111
RELATED FOREIGN PATENTS OR OTHER PATENT PENDING.

J4
IMPERVIOUS
10062.36

[illegible]

SUBCATCHMENT AREAS (SQUARE FEET)

EXISTING SUBCATCHMENTS		PROPOSED SUBCATCHMENTS	
1S	2,540,256	8S	146,825
2S	1,970,057	9S	106,603
3S	2,335,823	10S	275,000
	<u>6,846,136</u>	11S	250,555
		12S	13,151
		13S	618,282
		14S	479,373
		15S	36,133
		16S	30,663
		17S	47,533
		18S	21,926
		19S	47,912
		20S	2,049,836
		21S	162,392
		22S	111,608
		23S	275,000
		24S	665,992
		25S	246,734
		26S	<u>1,260,618</u>
			6,846,136

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2008

Location: 555 Hopping Brook Rd. - Near DM4 A-13 Pre-Treatment

A	B	C	D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
Deep Symp Hooded CB's	0.25	1.00	0.25	0.75
Contech CS-6	0.88	0.75	0.66	0.09

Separate Form Needs to be Completed for Each Outlet or BMP Train

91%

Total TSS Removal =

Project: 3780 Hopping Brook
 Prepared By: WHL
 Date: 2-7-23

*Equals remaining load from previous BMP (E) which enters the BMP

TSS Removal Calculation Worksheet

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Near DMH A-B

A BMP ¹	B TSS Removal		C Starting TSS		D Amount		E Remaining	
	Rate ¹		Load*		Removed (B*C)		Load (C-D)	
Deep Sump CB's	0.25		1.00		0.25		0.75	
Contech C5-L	0.88		0.75		0.66		0.09	
Forebay	0.25		0.09		0.02		0.07	
Installation Basin	0.80		0.07		0.06		0.01	

Separate Form Needs to
be Completed for Each
Outlet or BMP Train

Total TSS Removal =

99%

Project: 3780 Hopping Brk.
 Prepared By: WJ
 Date: 2-7-23

*Equals remaining load from previous BMP (E)
which enters the BMP

TSS Removal
Calculation Worksheet

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2009

Location: DM #1 B10 Pre-Treatment

A	B	C	D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
Deep Sump Hooded CB's	0.25	1.00	0.25	0.75
Contech CS-4	0.89	0.75	0.67	0.08

TSS Removal Calculation Worksheet

Separate Form Needs to be Completed for Each Outlet or BMP Train

Total TSS Removal =

92%

Project: 3780 Hopping Brook
 Prepared By: WJ
 Date: 2-7-23

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location:

DMH B10

A

B

C

D

E

BMP¹

TSS Removal

Rate¹

Starting TSS

Load*

Amount

Removed (B*C)

Remaining

Load (C-D)

Deep Sump Hooked CB's	0.25	1.00	0.25	0.75
Cortech CS-4	0.89	0.75	0.67	0.08
Forebay	0.25	0.08	0.02	0.06
Infiltration Basin	0.80	0.06	0.05	0.01

TSS Removal
Calculation WorksheetSeparate Form Needs to
be Completed for Each
Outlet or BMP Train

Total TSS Removal =

99%

Project:

3780 Hopping Brk.

Prepared By:

WJ

Date:

2-7-23

*Equals remaining load from previous BMP (E)
which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location: DMH d12 Pre-Treatment

A	B	C	D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
Deep Sump Hooded CB's	0.25	1.00	0.25	0.75
Contech CS-5	0.89	0.75	0.67	0.08

Separate Form Needs to be Completed for Each Outlet or BMP Train

Total TSS Removal =

92%

Project: 3780 Happy Bk.
 Prepared By: WJ
 Date: 2-7-23

*Equals remaining load from previous BMP (E) which enters the BMP

TSS Removal Calculation Worksheet

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location:

DMH C12

A	B	C	D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
Deep Sump Hooded CB's	0.25	1.00	0.25	0.75
Contech CS-5	0.89	0.75	0.67	0.08
Forebay	0.25	0.08	0.02	0.06
Infiltration Basin	0.80	0.06	0.05	0.01

TSS Removal Calculation Worksheet

Separate Form Needs to be Completed for Each Outlet or BMP Train

Total TSS Removal =

99%

Project:

3700 Hopping Brook

Prepared By:

MM

Date:

2-7-23

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2008

Location: Driv Ezz Pre-treatment

A	B	C	D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
Deep Sump Hauled CB's	0.25	1.00	0.25	0.75
Contech CS-6	0.90	0.75	0.68	0.08

Separate Form Needs to be Completed for Each Outlet or BMP Train

Total TSS Removal =

93%

Project: 3780 Hopping Brks
 Prepared By: WJ
 Date: 2-7-23

*Equals remaining load from previous BMP (E) which enters the BMP

TSS Removal Calculation Worksheet

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location: DMH E22

TSS Removal Calculation Worksheet					
A	B	C	D	E	
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)	
Deep Sump Hooded CBs	0.25	1.00	0.25	0.75	
Centtech CS-6	0.90	0.75	0.68	0.08	
Forever	0.25	0.08	0.02	0.06	
Infiltration Basin	0.90	0.06	0.05	0.01	

Separate Form Needs to
be Completed for Each
Outlet or BMP Train

Total TSS Removal =

100% ±

Project: 3780 Logging Bmk
 Prepared By: WJ
 Date: 2-7-23

*Equals remaining load from previous BMP (E)
which enters the BMP

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2008

Location:

DWH J3

Pre Treatment

A

BMP¹

B

TSS Removal

Rate¹

C

Starting TSS

Load*

D

Amount

Removed (B*C)

E

Remaining

Load (C-D)

Deep Sump Hooded CB's	0.25	1.00	0.25	0.75
Cortech CDS 1515-3	0.88	0.75	0.66	0.09
			.	

TSS Removal
Calculation Worksheet

Separate Form Needs to
be Completed for Each
Outlet or BMP Train

Total TSS Removal =

91%

Project:

37ED Higgins Brook

Prepared By:

WJL

Date:

2-7-23

*Equals remaining load from previous BMP (E)
which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location: DH H J3

A	B	C	D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
Deep Sump Hauled CB's	0.25	1.00	0.25	0.75
Contech CDS 1515-3	0.88	0.75	0.66	0.09
Forebay	0.25	0.09	0.02	0.07
Infiltration Basin	0.80	0.07	0.06	0.01

Separate Form Needs to
be Completed for Each
Outlet or BMP Train

Total TSS Removal =

99%

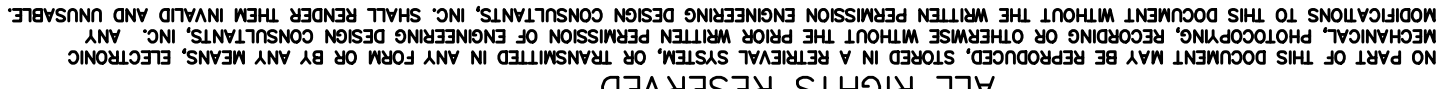
Project: 3780 Hopping Brook
 Prepared By: WJ
 Date: 2-7-23

*Equals remaining load from previous BMP (E)
which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection



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REV #	DATE	DESCRIPTION	PEER REVIEW COMMENTS
2	1/24/23		
1	9/01/22		
0			

REV #	DATE	DESCRIPTION	PEER REVIEW COMMENTS
2	1/24/23		
1	9/01/22		
0			

PEER REVIEW COMMENTS	SITE PLAN APPROVAL	DESCRIPTION
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PEER REVIEW COMMENTS	SITE PLAN APPROVAL	DESCRIPTION
----------------------	--------------------	-------------

Matthew P. Lawrence

Matthew P. Lawrence

⑤

⑤

Southborough, Massachusetts
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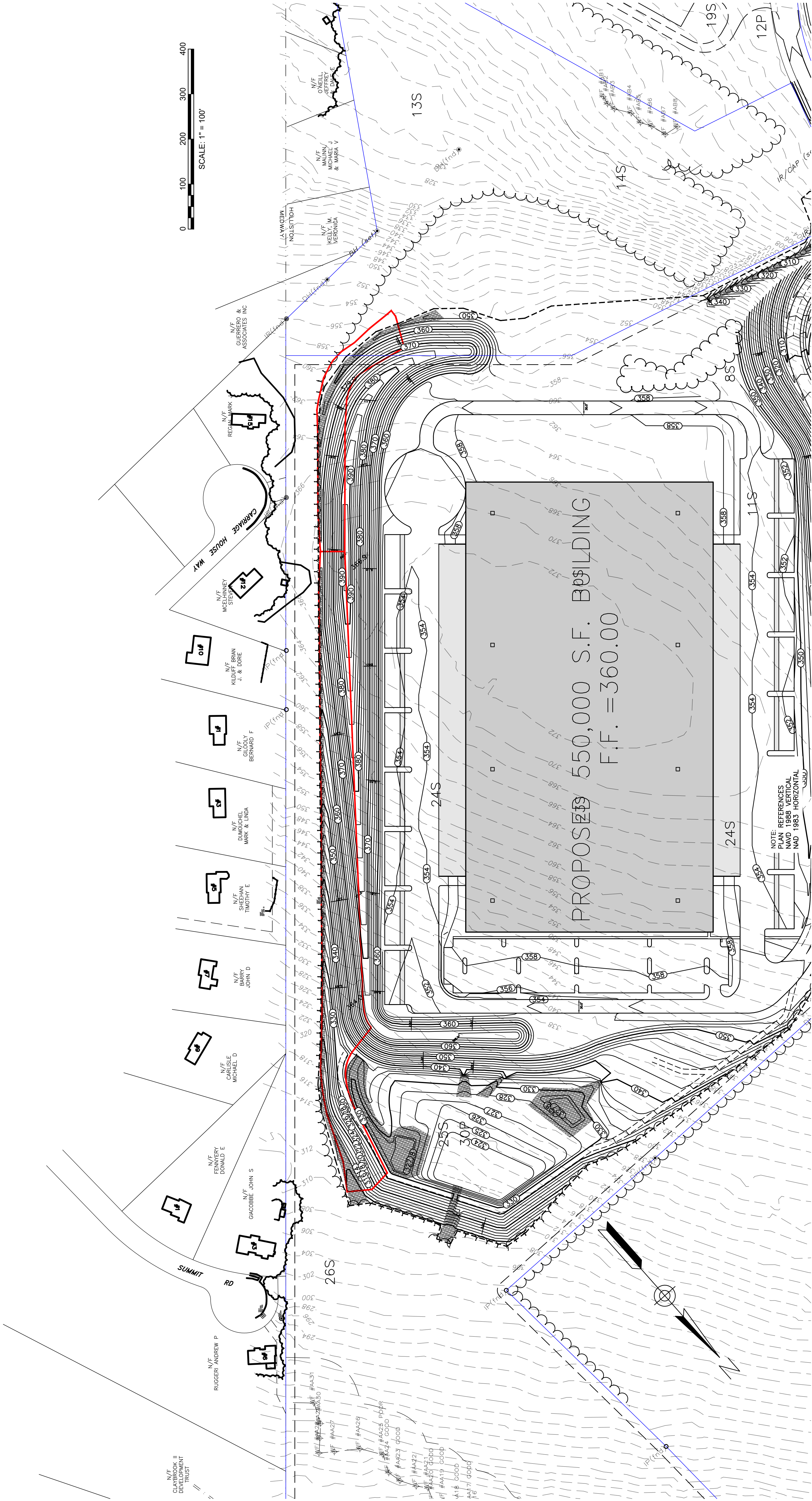
(MIDDLESEX COUNTY)(MIDDLESEX COUNTY)

CRG ACQUISITION, LLC
99 INNERBELT BUSINESS CENTER DRIVE
SAINT LOUIS, MO 63114

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99 INNERBELT BUSINESS CENTER DRIVE
SAINT LOUIS, MO 63114

31 of 3631 of 36

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DATE	DESCRIPTION	REV
1/24/23	PEER REVIEW COMMENTS	5
9/07/22	SITE PLAN APPROVAL	4
		3
		2
		1
		0
DATE BY:	MAIL	
DATE BY:	PSB	
DATE BY:	PSB	



Engineering Design Consultants, Inc.
32 Turnpike Road
Southborough, Massachusetts
PH: (508) 480-0225 FAX: (508) 832-5751

PROJECT:
555 HOPPING BROOK ROAD
HOLLISTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

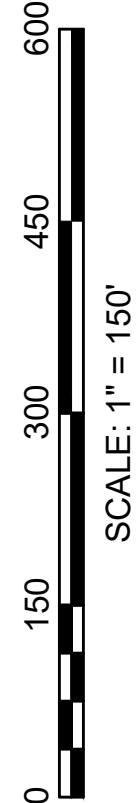
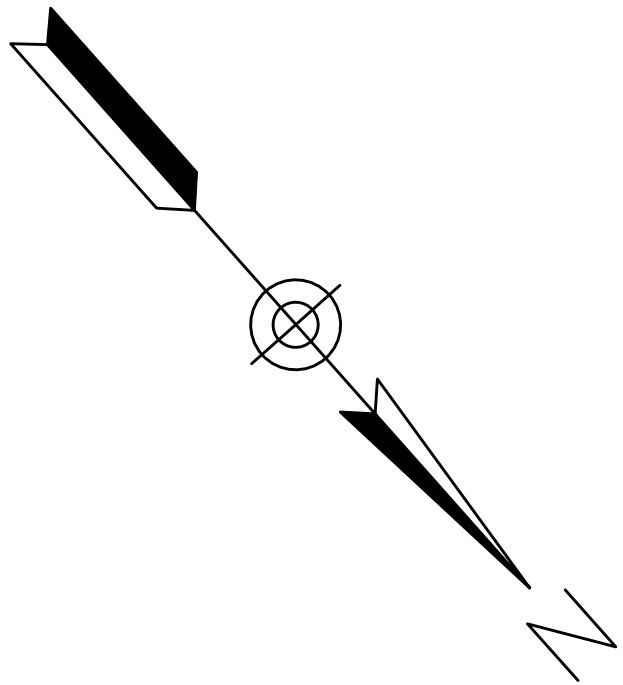
TITLE:
SWALE RUNOFF AREAS
555 HOPPING BROOK ROAD
HOLLISTON, MA 01746

DRAWN/APPRAVED:
CRG ACQUISITION, LLC
2199 INNERBELT BUSINESS CENTER DRIVE
SAINT LOUIS, MO 63114

FILE NO. 3760 SITE PLANS
SWALES
DATE: SEPTEMBER 1, 2022
DEFINITE PLAN NO.: 32 of 36
32



LEGEND	
SYMBOL	DESCRIPTION
2S	SUBCATCHMENT LABEL
1L	LINK SUMMARY LOCATION
————	SUBCATCHMENT AREA OUTLINE
— — — —	TIME OF CONCENTRATION LINE



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[illegible]

PREPARED BY:



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Southborough, Massachusetts

ph:(508) 480-0225 fax:(800)832-5781

555 HOPPING BROOK ROAD
HOLLISTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

3. 11. 11

TYNER/APPLICANT:

PRE-DEVELOPMENT RUNOFF AREAS
555 HOPPING BROOK ROAD

HOLLISTON, MA 01746

CRG ACQUISITION, LLC
2199 INNERBELT BUSINESS CENTER DRIVE
SAINT LOUIS, MO 63114

FILE NO.: 3780 SITE PLANS

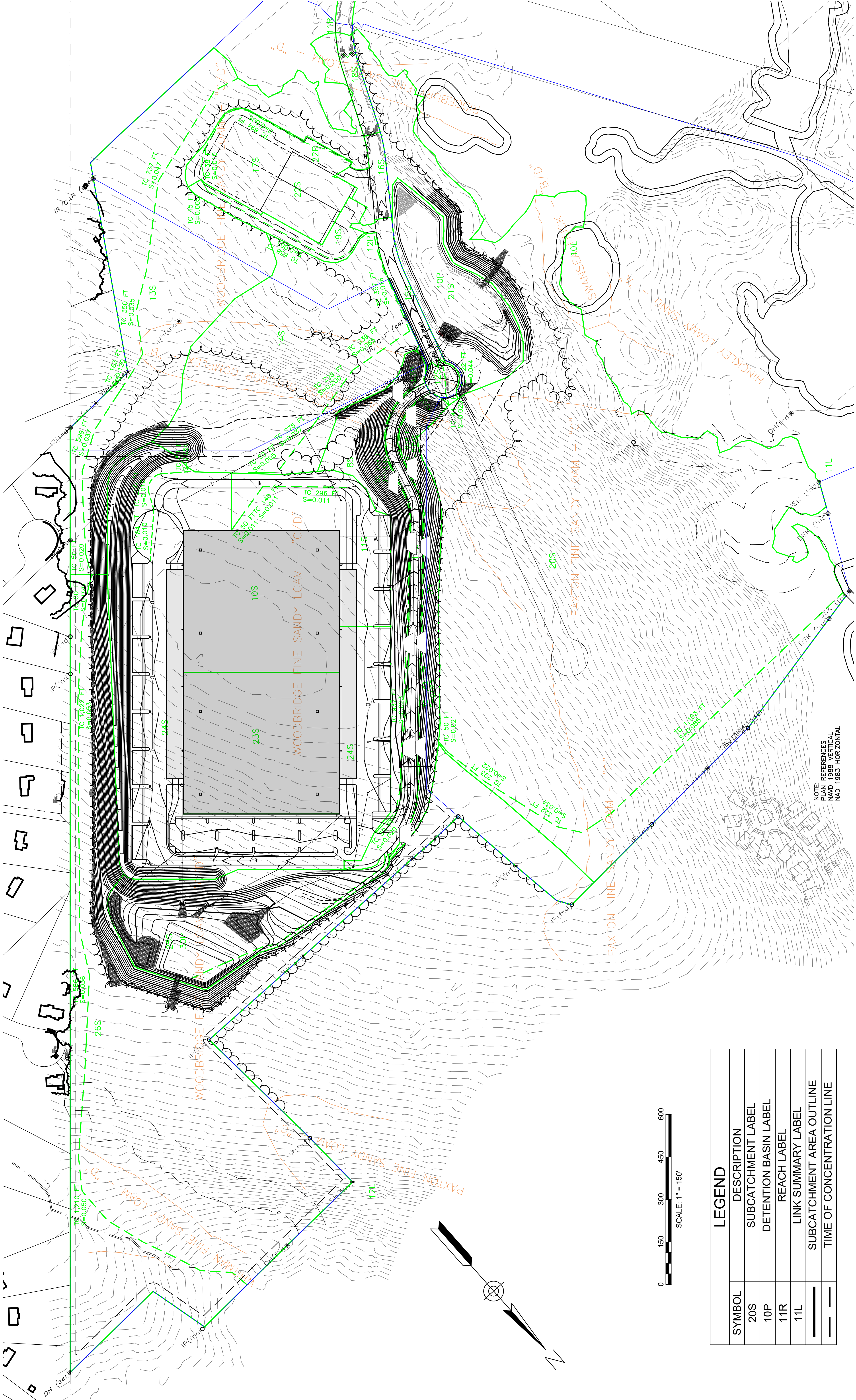
PRE-DEV

DATE: SEPTEMBER 1, 2022

PLAN NO.: 29 of 36

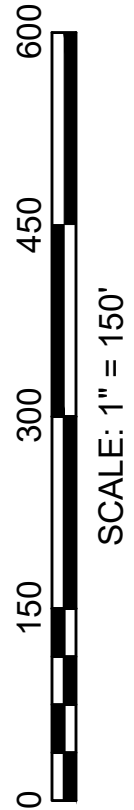
29

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NOTE:
PLAN REFERENCES
NAVD 1988 VERTICAL
NAD 1983 HORIZONTAL

LEGEND	
SYMBOL	DESCRIPTION
20S	SUBCATCHMENT LABEL
10P	DETENTION BASIN LABEL
11R	REACH LABEL
11L	LINK SUMMARY LABEL
—	SUBCATCHMENT AREA OUTLINE
—	TIME OF CONCENTRATION LINE



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REVISIONS	DATE	DESCRIPTION
5		
4		
3		
2		
1	1/24/23	PEER REVIEW COMMENTS
	9/01/22	SITE PLAN APPROVAL



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SAINT LOUIS, MO 63114

FILE NO. 3760 SITE PLANS
POST-DEV
DATE: SEPTEMBER 1, 2022
DRAWING PLAN NO.
30 of 36
30

