STORMWATER MANAGEMENT REPORT

For

PROJECT MOOSE
LOT 13, KIMO DRIVE
ESSEX, VERMONT

Prepared for:

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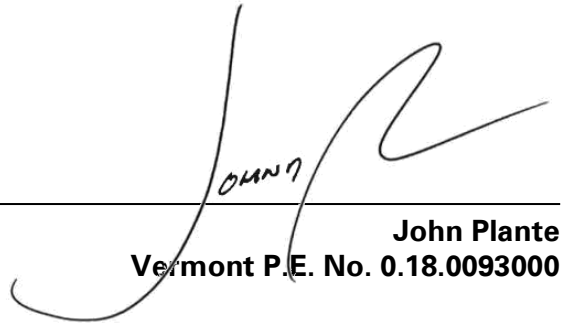

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EXECUTIVE SUMMARY

This stormwater management report is prepared in support of the proposed distribution center located on Lot 13 of the Saxon Hill Industrial Park Phase II, Six Lot Industrial Subdivision in the Town of Essex, Vermont, also known as Project Moose. The project will include the construction of a proposed distribution facility and its associated parking areas, driveways, sidewalks, landscaping, lighting, and utility improvements. This report addresses the engineering design of the stormwater conveyance and management systems introduced as part of the proposed project.

The site, which is approximately 23 acres, is bordered by an existing solar panel array and surrounding undeveloped properties. To the east is an undeveloped lot, Parcel 72-8, now or formerly owned by Allen Brook Development, LLC. To the north is also an undeveloped lot, Parcel 72-14, now or formerly owned by the Town of Essex. To the west will be a proposed roadway along with three undeveloped lots per the Saxon Hill Subdivision, Lots 10, 11, and 12, now or formerly owned by Allen Brook Development, LLC, (See Figure 1). The subject property is also largely undeveloped, consisting of mostly woodlands and meadow, with a dirt road running through the middle of the site. On the northern portion of the property there are a series of Class III and Class II wetlands, which will be avoided as part of this project. The filling of one Class III wetland is proposed on the southern end of the development. There are no stormwater treatment measures currently on site.

The proposed stormwater management system has been designed in general compliance with the 2017 Vermont Stormwater Management Manual and the Town of Essex Stormwater Ordinance (Chapter 10.20 of the Town Ordinance). This report demonstrates that the proposed stormwater system will effectively manage the quality and quantity of stormwater runoff for the proposed development in accordance with the above referenced stormwater treatment standards. Stormwater treatment practices (STPs) have been incorporated to promote treatment which include sumped catch basins, infiltration basins, underground infiltration chambers, and hydrodynamic separators. In addition, the installation of erosion and sedimentation controls during demolition and construction periods is specified, as well as long-term stabilization and pollution prevention on the site.

It is the opinion of this office and the findings of this report that the proposed stormwater system, as designed, will effectively manage the stormwater runoff quality and quantity for the proposed redevelopment. The design in this report is further supported by the "Project Moose" civil plans prepared by Langan dated January 30, 2025.

1.0 INTRODUCTION

1.1 General

This stormwater management report is prepared in support of the proposed development by Scannell Properties in the Town of Essex, Vermont, known as Project Moose. The project is located on a proposed lot within the Saxon Hill Industrial Park Subdivision, totaling approximately ±23 acres. This report addresses the engineering design of the stormwater conveyance and management systems introduced on these lots.

1.2 Site Location

The site is bordered by an existing solar panel array to the south and surrounding undeveloped properties. To the east is an undeveloped lot, Parcel 72-8, now or formerly owned by Allen Brook Development, LLC. To the north is an undeveloped lot, Parcel 72-14, now or formerly owned by the Town of Essex. To the west are three lots incorporated in the Saxon Hill Subdivision, Lots 10, 11, and 12, now or formerly owned by Allen Brook Development, LLC (See Figure 1).

1.3 Existing Conditions & Receiving Waters

The site is currently vacant, consisting of woodlands and meadow with a dirt road running through the middle of the site. There is a significant variation in topography of across the site, which generally slopes from east to west, ranging from elevation 526 to elevation 476. The northern half of the site is occupied by trees and shrubs, along with a series of Class II and Class III wetlands. These wetlands were delineated by TCE as part of their Natural Resources Memorandum prepared on November 9th, 2023. The southwestern portion of the site contains evergreen trees planted within the footprint of historic sand pit operations. An isolated Class III wetland is located on the southern portion of the site, which is proposed to be filled as part of the development. There is no stormwater collection or treatment infrastructure on site.

Hydrologically, the site is located within the Lower Winooski Basin. Based on the soil conditions and cover types on-site, it is assumed most of the stormwater infiltrates into the existing soils. During larger storm events, stormwater sheet flows off-site to the south and west, where it ultimately makes its way to the Winooski River. Further explanation of each subwatershed is explained later in this report.

1.4 Project Description

The proposed project consists of the construction of an approximately 107,000 square foot distribution facility with associated parking, loading, drive aisles, landscaping, site lighting, stormwater drainage improvements, and utility infrastructure.

Under proposed conditions, the stormwater runoff patterns from the site will generally be maintained. The proposed stormwater management system is designed to maintain existing stormwater discharge points, while also promoting stormwater infiltration practices using surface infiltration basins and underground infiltration chambers. Conserving natural vegetation where possible and minimizing impervious cover were approaches used for the site design and stormwater management strategy. To minimize land disturbance and protect most of the Class II and III on-site wetlands, most of the development is in the center and southern portion of the site. The proposed siting of the building also maintains access to the local trail networks in the project vicinity and honors a 100' no-build buffer along the eastern border of the property.

1.5 FEMA

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map of Chittenden County, Vermont for the Town of Essex community-panel number 50007C0281D with an effective date of July 18, 2011, the site is located entirely within Zone X (Unshaded) (See Figure 3).

Zone X (Unshaded) is described by FEMA as areas determined to be outside the 0.2-percent-annual-chance (or 500-year) floodplain. No base flood elevations or base flood depths are shown within these zones.

1.6 Soil Conditions

According to the USDA Natural Resources Conservation Service Web Soil Survey, the site soil type is predominantly Adams and Windsor loamy sands, with areas of Agawam fine sandy loam. The Web Soil Survey has classified the soil types on site as hydrologic soil group A.

Table 1: NRCS Soil Survey

Hydrologic Soil Group – Summary by Map Unit- State of Vermont

Map Unit Symbol	Map Unit Name	Rating
AdA	Adams and Windsor loamy sands, 0 to 5 percent slopes	A
AdB	Adams and Windsor loamy sands, 5 to 12 percent slopes	A
AgE	Agawam fine sandy loam, 30 to 60 percent slopes	A

Soils are classified into hydrologic soil groups (HSG) to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs, which are A, B, C and D, are one element used to determine runoff curve numbers and analyzing stormwater characteristics of a site.

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.

All soils within the limit of disturbance are classified as hydrological soil group A (see Figure 4 and Appendix E). To verify soil conditions, groundwater levels, and infiltration rates, a series of infiltration tests and test pits were performed. See Drawing CG201 – Infiltration Test Location Plan, for results and locations of these test.

2.0 STORMWATER MANAGEMENT

2.1 Stormwater Management Regulations and Guidelines

The purpose of the Stormwater Management Plan is to provide long-term protection of natural resources in and around the site. This is achieved by implementing stormwater quality and quantity control measures designed to reduce pollutant discharge from the site and control discharge rates.

The following regulations and guidelines were referenced for this project:

- Chapter 10.20 – Stormwater, Town Ordinance, Municipal Code of Essex, Vermont, Adopted November 16, 2005, Effective November 21, 2005.
- Town of Essex Official Zoning Regulations, Effective October 9, 2023.
- 2017 Vermont Stormwater Management Manual Rule and Design Guidance, Vermont Agency of Natural Resources, Effective July 1, 2017.

The Stormwater Ordinance of the Town of Essex requires all site designs to establish stormwater management practices to control the peak flow rates in accordance with the Vermont Stormwater Management Manual, latest revision. The project's stormwater management design generally complies with the Town of Essex Stormwater Ordinance and Vermont Stormwater Management Manual Rule, to the maximum extent achievable.

2.2 Design Methodology

The peak runoff discharge for the existing and proposed conditions were analyzed using the Soil Conservation Service (SCS) methodology, which outlines procedures for calculating peak rates of runoff resulting from precipitation events, and procedures for developing runoff hydrographs. Values for area, curve number and time of concentration were calculated for the existing and proposed conditions.

The curve number "CN" is a land-sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. Since exfiltration is modeled as part of the HydroCAD routing, a weighted CN was used in lieu of the modified CN values as described in the Vermont Stormwater Management Manual. All soils within the watersheds on site are classified as hydrologic soil group A as previously described.

The time of concentration, Tc, is defined as the time for runoff to travel from the hydraulically most distant point in the watershed to a point of interest. Values of time of concentration were determined for existing and proposed conditions using hydraulic length and average catchment slope, based on the Watershed Lag Method (Lag/CN Method) as described in the Vermont Stormwater Management Manual.

For this study, a 24-hour Type II rainfall distribution, which is derived from the NOAA Atlas 14 rainfall data, was used to determine the peak flow rate to all points of discharge from the site. The storms analyzed include the following:

- A 1-year, 24-hour storm consisting of 1.95 inches of rainfall.
- A 10-year, 24-hour storm consisting of 3.37 inches of rainfall.
- A 25-year, 24-hour storm consisting of 4.04 inches of rainfall.
- A 100-year, 24-hour storm consisting of 5.06 inches of rainfall.

These events are based on the "NOAA Atlas 14, Volume 10, Version 3 Point Precipitation Frequency Estimates" Essex Junction, Vermont at latitude: 44.5078°, longitude: -73.1153°. These rates can be found in Appendix F to this report.

2.3 Existing Runoff Discharges (See Appendix A for Calculations)

The existing drainage conditions have been delineated into four major watershed areas Watershed A, B, C and D (see EXWS). These correspond to the following points of interest:

- P.O.I. A: Off-site to the proposed subdivision right-of-way.
- P.O.I. B: Off-site to the adjacent property to the south.
- P.O.I. C: Off-site to the southeast.
- P.O.I. D: Off-site to the west, to the wetland system.

Watershed A, consisting of ±13 acres, covers a majority of the central portion of the site. This watershed is comprised of mostly woods and grasses and is almost entirely pervious. Runoff from this watershed flows overland to the west, where it flows into the proposed subdivision right-of-way.

Watershed B, consisting of ±4.2 acres, covers the southern portion of the site. This watershed is comprised of woods and grasses and is entirely pervious. Runoff from this watershed flows overland to the south, onto the solar field on the adjacent property.

Watershed C, consisting of ±1.5 acres, covers the eastern boundary of the site. This watershed is comprised of woods and grasses and is entirely pervious. Runoff from this watershed flows overland to the southeast, into an existing ravine adjacent to the property.

Watershed D, consisting of ±4.2 acres, covers the northern portion of the site. This watershed is comprised of woods and grasses, along with a series of Class II and Class III wetlands. Runoff from this watershed flows overland to the west, where it enters the wetland system that continues off-site.

2.4 Proposed Runoff Discharges (See Appendix B for Calculations)

The proposed drainage condition maintains the existing four points of interest and further delineates the watersheds into resulting in 9 total sub-watersheds: Watershed A-1, A-2, A-3, A-4, B-1, B-2, B-3, C, & D. (See PR-WS)

Watershed A-1, consisting of ±4.8 acres, covers the northwestern portion of the development. This watershed captures runoff from the western half of the building roof, the truck court, and the associate drive-aisle. Runoff is captured in catch basins and roof drains and is routed via a closed pipe network to Infiltration Basin A-1, which is sized to infiltrate the 100-year storm.

Watershed A-2, consisting of ±3.1 acres, covers most of the van parking lot and a portion of the van access drive. Runoff is captured in catch basins and is routed via a closed pipe network to Underground Infiltration System A-2, which is sized to infiltrate the 100-year storm. This system is made up of 368 ADS Stormtech SC-800 Infiltration Chambers.

Watershed A-3, consisting of ±3.0 acres, covers the western portion of the van parking lot and the landscaped area along the western site boundary. Runoff is captured in catch basins and is routed via a closed pipe network to Infiltration Basin A-3, which is sized to infiltrate the 100-year storm.

Watershed A-4, consisting of ±1.1 acres, covers the western portion of the van access drive. Runoff for this watershed sheet flows to a series of leak-offs, discharging directly in Infiltration Basin A-4, which is sized to infiltrate the 100-year storm. Any additional flows over the 100-year storm are routed to Infiltration Basin A-3 via an outlet control structure.

Watershed B-1, consisting of ±3.2 acres, covers the associate surface parking lot and the eastern portion of the van access drive. Runoff is captured in catch basins and roof drains and is routed via a closed pipe network to Infiltration Basin B-1, which is sized to infiltrate the 100-year storm.

Watershed B-2, consisting of ±3.0 acres, covers the northeastern portion of the development. This watershed captures runoff from the eastern half of the building roof, the van access drive, and some upgradient pervious areas. Runoff is captured in catch basins and roof drains and is routed via a closed pipe network to Underground Infiltration System B-2, which is sized to infiltrate the 100-year storm. This system is made up of 212 ADS Stormtech SC-800 Infiltration Chambers.

Watershed B-3, consisting of ±0.83 acres, covers landscaped area south of the van drive aisle. Runoff from this watershed sheet flows to the solar field, similar to the existing condition.

Watershed C, consisting of ±1.5 acres, covers the eastern boundary of the site. This watershed is comprised of woods and grasses and is entirely pervious. Runoff from this watershed flows overland to the southeast, into an existing ravine adjacent to the property. This watershed is not changed in the proposed condition.

Watershed D, consisting of ±2.3 acres, covers the northern portion of the site. This watershed is comprised of woods and grasses, along with a series of Class II and Class III wetlands. Runoff from this watershed flows overland to the west, where it enters the wetland system that continues off-site.

2.5 Vermont Stormwater Management Treatment Standards

A summary of the Vermont Stormwater Management Treatment Standards and a method of ensuring compliance with each standard are summarized below:

1. **Post-Construction Soil Depth and Quality Standard (Section 2.2.1)**: Maintain or restore healthy on-site soils. Preserve naturally occurring, undisturbed soil and vegetation that provide important stormwater functions including: water infiltration; nutrient and pollutant adsorption; sediment and pollutant biofiltration; water interflow storage and transmission; and pollutant decomposition. Required elements of post-construction soil depth and quality treatment include:
   - Soil retention: retain, in an undisturbed state, the duff layer and native topsoil to the maximum extent practicable.
   - Soil quality: provide a topsoil layer meeting minimum organic matter requirements of §3.20 of the Vermont Stormwater Treatment Standards.

   Compliance: Within the limits of development, the project will establish minimum soil quality and depth to provide improved on-site management of stormwater flow and water quality where soils are disturbed. For areas beyond the limits of development, naturally occurring soil and vegetation will be preserved during construction. Undisturbed portions of the site will be fenced off to be protected from compaction, grading, and stripping activities.

2. **Groundwater Recharge Standard (Section 2.2.3):** Infiltrate or disconnect the calculated Recharge Volume (R_{ev}) using practices acceptable for meeting the Groundwater Recharge Standard. The average annual recharge rate for the prevailing hydrologic soil group(s) shall be maintained to preserve existing water table elevations. The recharge volume is determined as a function of annual pre-development recharge for a given soil group, average annual rainfall volume, and amount of impervious cover at a site.

   Compliance: The required Recharge Volume (R_{ev}) will be infiltrated via a combination of surface infiltration basins and underground infiltration chambers. These STPs have been sized to infiltrate the 100-year storm, which is significantly greater than the required R_{ev}. See summary table below for a comparison between the required recharge volume and the provided infiltration volume. Refer Appendix C of this report for groundwater recharge volume calculations.

Groundwater Recharge Standard	
Re_v Required	0.58 af
Treatment Volume Provided	3.95 af

3. **Water Quality Treatment Standard (Section 2.2.4):** Capture and treat the runoff from the 90th percentile rainfall event, which is equivalent to the first inch of rainfall. The following criteria shall be applied:

   - The Water Quality Treatment Volume (WQ_v) shall be treated with Stormwater Treatment Practices (STPs) designated as Tier I, Tier II, or Tier III (organized by order of design preference).
   - The sizing of water quality STPs shall be based on the drainage area contributing to the practices providing treatments.
   - If off-site runoff is rerouted, the designer shall ensure that such rerouting will not cause erosion or flooding in the area water is discharged.

   Compliance: The required WQ_v will be captured via a closed network of pipes and routed to a combination of infiltration basins and infiltration chambers on site. These Tier 1 STPs have been sized to infiltrate the 100-year storm, which is significantly greater than the WQ_v. See the table below, which compares the required WQ_v for each STP to the infiltration volume provided within each STP, which is defined as the volume infiltrated during the 100-year storm, shown it the HydroCAD model. Refer to Appendix C of this report for required water quality volume calculations.

Water Quality Treatment Standard		
STP	**WQV (af)**	**Treatment Volume Provided (af)**
Infiltration Basin A-1	0.22	0.89
Infiltration System A-2	0.21	0.99
Infiltration Basin A-3	0.14	0.46
Infiltration Basin A-4	0.04	0.19
Infiltration Basin B-1	0.14	0.58
Infiltration System B-2	0.18	0.85
Total	**0.93**	**3.95**

4. **Channel Protection Standard (Section 2.2.5):** Control the post-developed runoff from the 1-year 24-hour storm by one of or a combination of the

following methods:

- Hydrologic Condition Method – match the post-development runoff volume to the pre-development runoff volume from the 1-year 24-hour storm.
- Extended Detention Method – Provide 12 of 24-hour detention of the 1-year 24-hour storm.
- Alternative Extended Detention Method – demonstrate that the post-developed peak discharge from the site, after providing distributed and non-structural treatment, is not greater than the peak discharge from the site when modeled as if 12-hour detention of the 1-year 24-hour storm were provided.

Compliance: By utilizing the Hydrologic Condition Method, the post-development runoff volume matches the pre-development runoff volumes at all design points from the 1-year 24-hour storm. The proposed infiltration practices are designed to effectively capture and infiltrate the volume from the 1-year, 24-hour storm. Refer to the table below summarizing the pre & post peak discharges at each point of interest, and Appendices A & B for supporting calculations from the HydroCAD model.

Peak-Flow (1-year, 24 hr Storm, cfs)			
Point of Interest (P.O.I.)	**Pre-Development**	**Post-Development**	**Delta**
P.O.I. A (Off-site to Subdivision Roadway)	0.17	0.00	100%
P.O.I B (Off-site to Southern Parcel)	0.00	0.00	0%
P.O.I. C (Off-site to Southeast)	0.00	0.00	0%
P.O.I. D (Off-site to West, to wetland system)	0.00	0.00	0%

5. **Overbank Flood Protection Standard (Section 2.2.6):** Control the post-developed peak discharge from the 10-year storm to 10-year pre-development peak rates.

Compliance: The proposed stormwater management plan meets or reduces the peak discharge for all design storms at all points of interest. Refer to the table below summarizing the pre & post peak discharges at each point of interest, and Appendices A & B for supporting calculations from the HydroCAD model.

Peak-Flow (10-year, 24 hr Storm, cfs)			
Point of Interest (P.O.I.)	**Pre-Development**	**Post-Development**	**Delta**
P.O.I. A (Off-site to Subdivision Roadway)	0.93	0.00	100%
P.O.I B (Off-site to Southern Parcel)	0.00	0.00	0%
P.O.I. C (Off-site to Southeast)	0.00	0.00	0%
P.O.I. D (Off-site to West, to wetland system)	0.00	0.00	0%

6. **Extreme Flood Protection Standard (Section 2.2.7):** Control the peak discharge from the 100-year storm to the 100-year pre-development peak rates.

   Compliance: The proposed stormwater management plan meets or reduces the peak discharge for all design storms at all points of interest. Refer to the table below summarizing the pre & post peak discharges at each point of interest, and Appendices A & B for supporting calculations from the HydroCAD model.

Peak-Flow (100-year, 24 hr Storm, cfs)			
Point of Interest (P.O.I.)	**Pre-Development**	**Post-Development**	**Delta**
P.O.I. A (Off-site to Subdivision Roadway)	2.12	0.00	100%
P.O.I B (Off-site to Southern Parcel)	0.02	0.01	50%
P.O.I. C (Off-site to Southeast)	0.01	0.00	100%
P.O.I. D (Off-site to West, to wetland system)	0.03	0.00	100%

3.0 STORMWATER QUALITY (SEE APPENDIX C FOR CALCULATIONS)

3.1 Stormwater Quality Improvements

The proposed stormwater management system utilizes a variety of Tier I treatment practices as defined in the Vermont Stormwater Manual to promote stormwater quality. The practices used in this design, including four surface infiltration basins and two underground infiltration systems, are expected to achieve sufficient pollutant removal as dictated by the Vermont Stormwater Manual. To protect the long-term functionality of these STPs, pretreatment measures such as sumped catch basins, sediment forebays, isolator rows, and hydrodynamic separators are utilized prior to stormwater entering the STPs.

Below are descriptions of the various water quality measures used for this project.

Sumped Catch Basins

All catch basin structures will include a 2-foot-deep sump, per the Town of Essex standard catch basin detail. This allows for the settlement of suspended particulates as the runoff flows through the closed pipe conveyance line and to the discharge locations. Captured materials in the sump locations can be removed by vacuuming, avoiding degradation of downstream treatment features.

Isolator Rows

Both underground infiltration systems will be constructed of StormTech Chambers or approved equal which allow for the installation of Isolator rows. Isolator rows provide the required pretreatment of run off directed to the underground systems by passing the water through a woven geotextile fabric, removing suspended solid and protecting the functionality of the below grade infiltration practice. The pretreatment volume (25% of the overall WQV) of the initial stormwater entering the underground systems will be directed into the isolator rows prior to entering the rest of the system.

Water Quality Units (Hydrodynamic Separators)

Hydrodynamic separators are proposed as another method of pre-treatment prior to discharging into the proposed infiltration practices. Each water quality unit is sized to provide the full water quality treatment for the watershed based on the water quality flow (WQF) and have a suitable bypass flow rate to convey the 25-year design storm.

RainGuardian

The RainGuardian is a proprietary pre-treatment device that collects and distributes sheet flow to its downstream STP. This RainGuardian is used as a pre-treatment measure for Infiltration Basin A-4, as a proper sediment forebay was not achievable due to limited space.

Infiltration Basins

The proposed stormwater management system includes four infiltration basins (Infiltration Basin A-1, A-2, A-4, and B-1). To provide a form of pre-treatment, each basin includes a two-foot-deep sediment forebay sized for 50% of the WQV.

These basins are sized to infiltrate the 100-year storm without engaging the emergency spillway. Multiple test pits and infiltration tests were conducted within the footprint of each basin and underground system as part of the

project's geotechnical investigation. The infiltration rate used as a basis for design ranged from 1 in/hr to 5 in/hr, which were calculated by selecting the slowest individual infiltration test within each basin and applying a factor of safety of 2.0. A maximum of 5 in/hr was used as a conservative measure. See table below for a summary of design infiltration rates of each basin and underground infiltration system.

Infiltration Rates for STPs			
STP	**Average Field Infiltration Rate**	**Slowest Field Infiltration Rate**	**Design Infiltration Rate**
Infiltration Basin A-1	14 in/hr	8 in/hr	4 in/hr
Infiltration System A-2	5.75 in/hr	2 in/hr	1 in/hr
Infiltration Basin A-3	13.75 in/hr	3 in/hr	1.5 in/hr
Infiltration Basin A-4	28.5 in/hr	27 in/hr	5 in/hr
Infiltration Basin B-1	9 in/hr	7 in/hr	3.5 in/hr
Infiltration System B-2	46 in/hr	29 in/hr	5 in/hr

Underground Infiltration Systems

Two underground infiltration systems are proposed as part of the stormwater management design (System A-2 and B-2). Similar to the surface infiltration basins, these systems are designed to infiltrate the 100-year storm. Each system is equipped with an outlet control structure with a weir set at the top of chamber elevation, allowing for an outlet in case of extreme storm events. Overflow is routed to other surface infiltration basins on-site.

Underground Infiltration System A-2 will be constructed with 368 ADS SC-800 Stormtech Infiltration Chambers (or approved equal), surrounded in clean, crushed stone. This provides for 0.70 acre-feet of total storage, and is designed to infiltrate 0.65 acre-feet at 1 in/hr. This system is equipped with an isolator row and hydrodynamic separators upstream to protect the infiltration capacity of the chambers.

Underground Infiltration System B-2 will be constructed with 212 ADS SC-800 Stormtech Infiltration Chambers (or approved equal), surrounded in clean, crushed stone. This provides for 0.42 acre-feet of total storage, and is designed to infiltrate 0.38 acre-feet at 5 in/hr. This system is equipped with an isolator row and hydrodynamic separators upstream to protect the infiltration capacity of the chambers.

4.0 STORM DRAINAGE COLLECTION SYSTEM DESIGN (SEE APPENDIX D FOR CALCULATIONS)

4.1 Design Criteria

The proposed subsurface stormwater conveyance system is designed to accommodate the 25-year storm run off without overtopping.

4.2 Design Methodology

The storm drainage system was analyzed using the Rational Method for estimating runoff for a 25-year design storm event. The site was divided into subareas, each contributing runoff to an individual catch basin inlet or roof drain. A value for area, time of concentration, and runoff coefficient was calculated for each contributing subarea.

Values of time of concentration were selected based on land cover and flow path slope from the hydraulically most distant point in the subarea to the appropriate inlet. The average runoff coefficient, which is the ratio of peak runoff rate to the average rainfall rate for the period known as the time of concentration, was chosen using the following values:

CONDITION	C
Grass/Landscaping	0.30
Paved/Impervious/Roof Areas	0.90

Rainfall intensities were selected from the intensity-duration-frequency curve for Vermont as presented in the "NOAA Atlas 14, Volume 10, Version 3 Point Precipitation Frequency Estimates: VT" Essex Junction, VT Latitude: 44.5078°, Longitude: -73.1153°. Storm drainage pipes were then sized based on calculated flows using Manning's Equation and were verified by solving for the hydraulic grade line. Starting hydraulic grade lines for the pipe networks were set to the calculated maximum water elevations for the 25-year-design storm event within the analyzed drainage network.

4.3 Storm Drainage Collection Summary

The runoff from the development will be collected using a conventional roof drain, catch basin, and manhole system. The collection system was designed to convey the 25-year storm without overtopping proposed catch basins or manholes. In the

case of larger storm events, additional flows beyond the capacity of the system will be directed overland, away from sensitive site features and safely downstream. All models were conducted using tail water conditions defined by the maximum elevation of water located at the outfall under the 25-year ponding condition.

5.0 CONCLUSION

The proposed stormwater management system has been designed in general accordance with the Town of Essex requirements and the 2017 Vermont Stormwater Treatment Standards. The system incorporates stormwater quality measures to promote groundwater recharge and minimize passage of pollutants to downstream receiving waters. It has also been designed to provide peak runoff rate attenuation to reduce peak flows leaving the site under proposed conditions. It is the opinion of this office and the findings of this report that the proposed stormwater management system, as designed, will effectively manage quality and quantity of stormwater runoff for the proposed development.

6.0 REFERENCES

1. Town of Essex Official Zoning Regulations, Effective October 9, 2023.

2. Chapter 10.20 – Stormwater, Town Ordinance, Municipal Code of Essex, Vermont, Adopted November 16, 2005, Effective November 21, 2005.

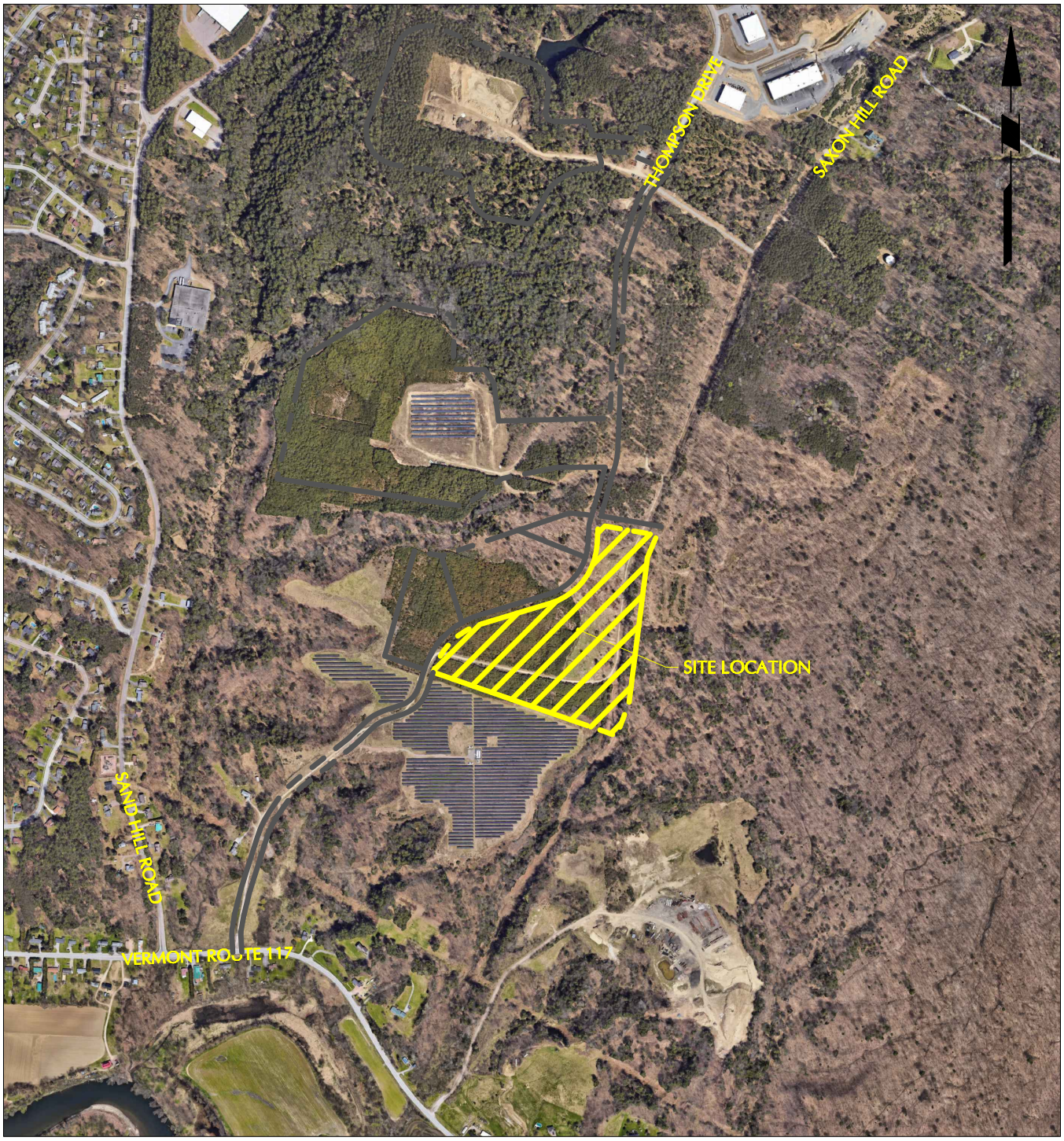
3. 2017 Vermont Stormwater Management Manual Rule and Design Guidance, Vermont Agency of Natural Resources, Effective July 1, 2017.

4. Soil Survey State of Vermont, United States Department of Agriculture, Survey Area Data version 20, June 2020.

5. Urban Hydrology for Small Watersheds, Technical Release 55, United States Department of Agriculture, Soil Conservation Service, June 1986.

6. NOAA Atlas 14 Rainfall Depths & Intensities, https://hdsc.nws.noaa.gov/hdsc/pfds/

FIGURES



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ACCESSED DIGITALLY JUNE 2024

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SCALE IN FEET

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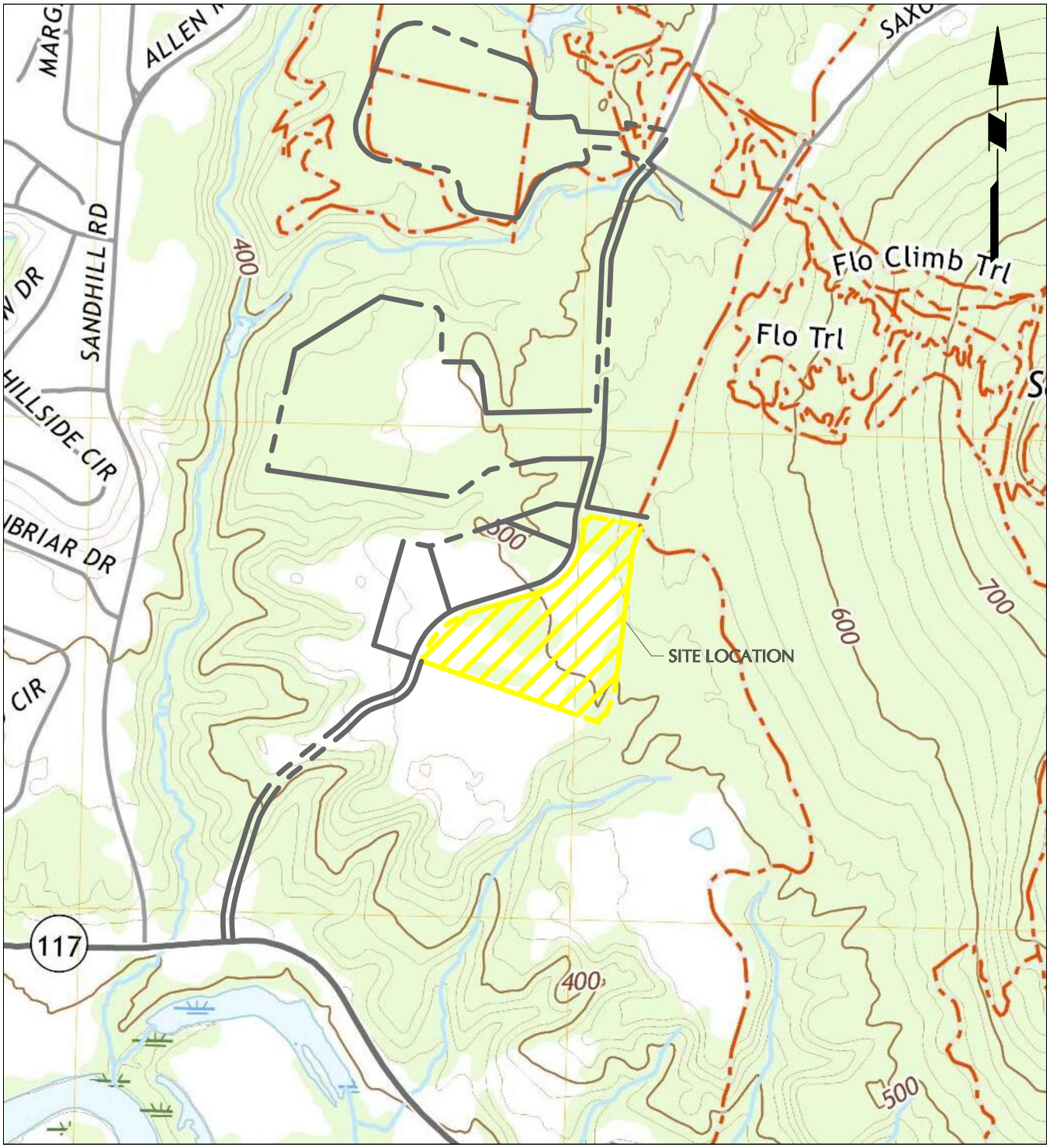
Project
PROJECT MOOSE
ESSEX
CHITTENDEN COUNTY VERMONT

Drawing Title
AERIAL LOCATION MAP

Project No. 140278401
Date 06/24/2024
Drawn By LT
Checked By TSO

Figure
FIG. 1
Sheet 1 of 1

Project No. 140278401



REFERENCE: ESSEX JUNCTION QUADRANGLE
VERMONT 7.5 MINUTE SERIES
USGS MAP OF ESSEX JUNCTION, VERMONT
NGA REFE NO. USGSX24K14562

1000 0 500 1000
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ESSEX
CHITTENDEN COUNTY VERMONT

Drawing Title
USGS LOCATION MAP

Project No. 140278401
Date 06/24/2024
Drawn By LT
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Figure
FIG. 2
Sheet 1 of 1

Project No. 140278401

Date: 10/21/2024 Time: 09:39 User: bpalma Style Table: Langan.stb Layout: FIG. 2 Document Code: FG01-140278401-0202-CS101-0102

REFERENCE: "FLOOD INSURANCE RATE MAP"
CHITTENDEN COUNTY, VERMONT
MAP NUMBER 50007C0281D
EFFECTIVE DATE 7/18/2011
ACCESSED DIGITALLY JUNE 2024

1000 0 500 1000
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Project
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ESSEX
CHITTENDEN COUNTY VERMONT

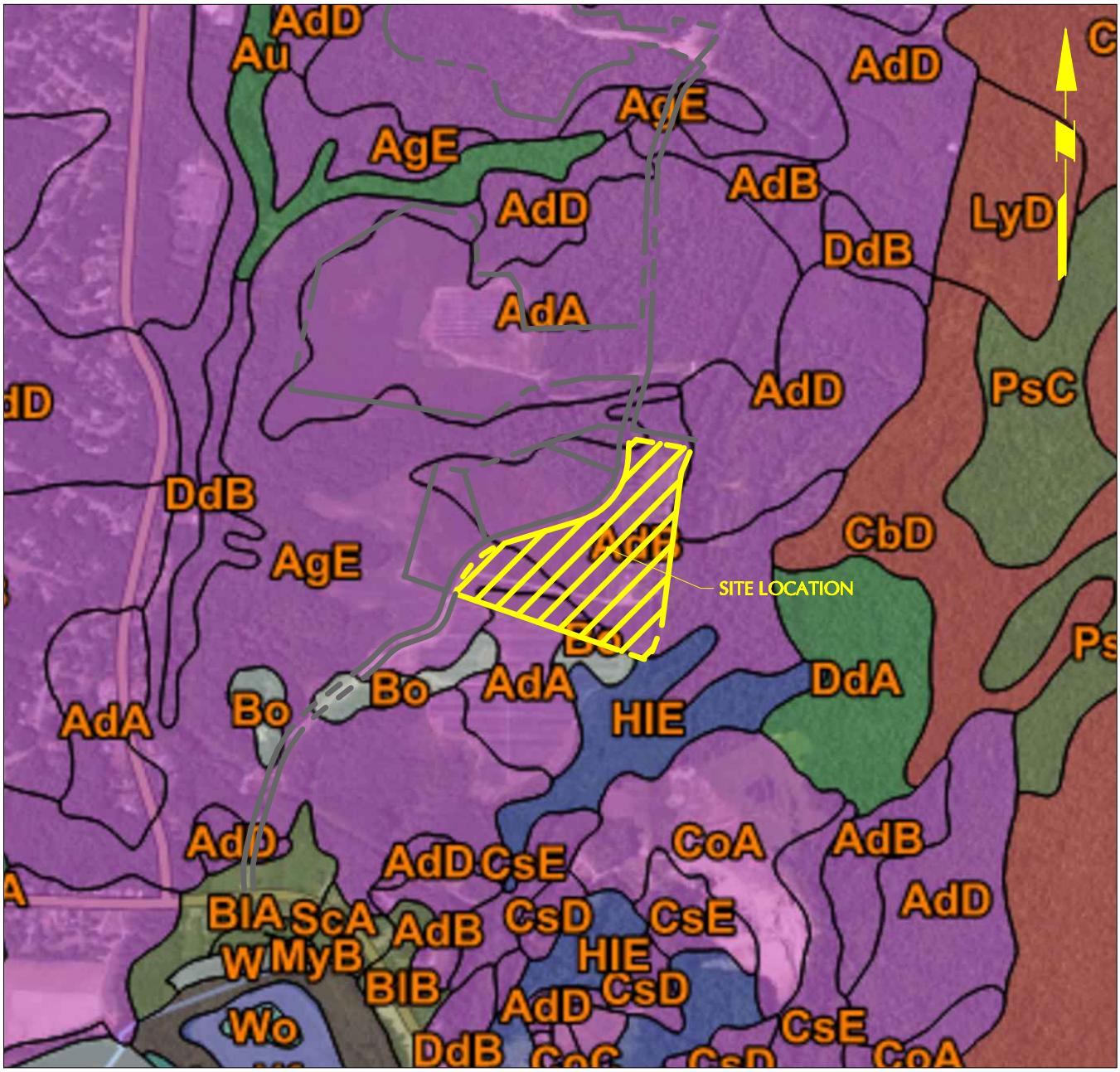
Drawing Title
FEMA FLOOD MAP

Project No. 140278401
Date 06/24/2024
Drawn By LT
Checked By TSO

Figure
FIG. 3
Sheet 1 of 1

Project No. 140278401

Date: 10/21/2024 Time: 09:44 User: bpalma Style Table: Langan.stb Layout: FIG. 3 Document Code: FG01-140278401-0202-CS101-0103



SOIL LEGEND

ID	TYPE	RATING
AdA	ADAMS AND WINDSOR LOAMY SANDS, 0 TO 5 PERCENT SLOPES	A
AdB	ADAMS AND WINDSOR LOAMY SANDS, 5 TO 12 PERCENT SLOPES	A
AgE	AGAWAM FINE SANDY LOAM, 30 TO 60 PERCENT SLOPES	A
HIE	HARTLAND VERY FINE SANDY LOAM, 25 TO 60 PERCENT SLOPES	B
Bo	BLOWN OUT LAND	N/A

MAP REFRENCE: WEB SOIL SURVEY CREATED BY USDA DATED 7/15/2024

1000 0 500 1000

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Project: PROJECT MOOSE
ESSEX
CHITTENDEN COUNTY VERMONT

Drawing Title: NRCS SOIL MAP

Project No. 140278401
Date 06/25/2024
Drawn By LT
Checked By IJAB

Figure FIG. 4
Sheet 1 of 1

DRAWINGS

LEGEND	
HYDROLOGIC SOIL GROUP DELINEATION LINE	
WETLAND LIMITS	
WATERSHED BOUNDARY	
TIME OF CONCENTRATION LINE	
WATERSHED SYMBOL	
PROPERTY LINE	

WETLAND SYSTEM

POINT OF INTEREST D:
WETLAND SYSTEM

WATERSHED D
TOTAL AREA: 4.16 ACRES
PERVIOUS AREA: 4.16 ACRES
IMPERVIOUS AREA: 0.00 ACRES
CN: 34
TC: 15.7 MINS

HSG: A
USDA SOIL TYPE: AdA

HSG: A
USDA SOIL TYPE: AdB

WATERSHED A
TOTAL AREA: 13.06 ACRES
PERVIOUS AREA: 12.10 ACRES
IMPERVIOUS AREA: 0.95 ACRES
CN: 36
TC: 23.7 MINS

WATERSHED BOUNDARY
(TYP)

WATERSHED C
TOTAL AREA: 1.49 ACRES
PERVIOUS AREA: 1.49 ACRES
IMPERVIOUS AREA: 0.00 ARCES
CN: 33
TC: 5.8 MINS

SUBDIVISION PROPERTY LINE SUBMITTED UNDER A SEPARATE COVER BY OTHERS

ROW LINE SUBMITTED UNDER A SEPARATE COVER BY OTHERS

HSG: A
USDA SOIL TYPE: AdB

HSG: A
USDA SOIL TYPE: AgE

FLOW PATH
(TYP)

POINT OF INTEREST A:
OFF-SITE TO ROADWAY

POINT OF INTEREST C:
OFF-SITE SOUTHEAST

HSG: A
USDA SOIL TYPE: AgE

HSG: A
USDA SOIL TYPE: AdA

HSG: A
USDA SOIL TYPE: AdB

HSG: A
USDA SOIL TYPE: AdA

WATERSHED B
TOTAL AREA: 4.21 ACRES
PERVIOUS AREA: 4.21 ACRES
IMPERVIOUS AREA: 0.00 ACRES
CN: 33
TC: 16.6 MINS

POINT OF INTEREST B:
TO SOUTHERN PROPERTY

80 0 40 80
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Revisions		

Signature Date

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Project
PROJECT MOOSE
ESSEX
CHITTENDEN COUNTY VERMONT

Drawing Title
EXISTING WATERSHED MAP

Project No.	Drawing No.
140278401	EX-WS
Date: 09/04/2024	
Drawn By: BCP	
Checked By: DTG	

LANGAN
Project No. 140278401

Date: 1/13/2025 Time: 17:03 User: ibrown Style Table: Langan.stb Layout: EX-WS Document Code: 140278401-0201-CG103-0101

LEGEND	
HYDROLOGIC SOIL GROUP DELINEATION LINE	
WETLAND LIMITS	
WATERSHED BOUNDARY	
FLOW PATH	
WATERSHED SYMBOL	
POND SYMBOL	
PROPERTY LINE	

WATERSHED D
TOTAL AREA: 2.31 ACRES
PERVIOUS AREA: 2.31 ACRES
IMPERVIOUS AREA: 0.00 ACRES
CN: 30
TC: 12.1 MIN.

POINT OF INTEREST D
WETLAND SYSTEM

WETLAND LIMITS (TYP)

PROPOSED SUBDIVISION
ROADWAY (BY OTHERS)

WATERSHED A-1
TOTAL AREA: 4.77 ACRES
PERVIOUS AREA: 2.08 ACRES
IMPERVIOUS AREA: 2.69 ACRES
CN: 72
TC: 4.3 MIN.

WATERSHED A-2
TOTAL AREA: 3.11 ACRES
PERVIOUS AREA: 0.45 ACRES
IMPERVIOUS AREA: 2.66 ACRES
CN: 89
TC: 1.0 MIN.

INFILTRATION
BASIN A-1

WATERSHED
BOUNDARY (TYP)

UNDERGROUND
INFILTRATION SYSTEM B-2

WATERSHED B-2
TOTAL AREA: 3.06 ACRES
PERVIOUS AREA: 0.86 ACRES
IMPERVIOUS AREA: 2.20 ACRES
CN: 84
TC: 1.2 MIN.

PROPOSED
DISTRIBUTION
FACITLIY

POINT OF INTEREST A
OFF-SITE TO ROADWAY

WATERSHED A-3
TOTAL AREA: 3.00 ACRES
PERVIOUS AREA: 1.25 ACRES
IMPERVIOUS AREA: 1.75 ACRES
CN: 73
TC: 3.1 MIN.

WATERSHED C
TOTAL AREA: 1.49 ACRES
PERVIOUS AREA: 1.49 ACRES
IMPERVIOUS AREA: 0.00 ACRES
CN: 30
TC: 6 MIN.

WATERSHED B-1
TOTAL AREA: 3.22 ACRES
PERVIOUS AREA: 1.48 ACRES
IMPERVIOUS AREA: 1.74 ACRES
CN: 71
TC: 3.3 MIN.

INFILTRATION
BASIN A-3

INFILTRATION
BASIN A-4

POINT OF INTEREST C:
OFF-SITE SOUTHEAST

INFILTRATION
BASIN B-1

POINT OF INTEREST B
TO SOUTHERN
PROPERTY

UNDERGROUND
INFILTRATION SYSTEM A-2

WATERSHED A-4
TOTAL AREA: 1.11 ACRES
PERVIOUS AREA: 0.55 ACRES
IMPERVIOUS AREA: 0.56 ACRES
CN: 69
TC: 1.4 MIN.

HYDROLIGICAL
SOIL GROUP LINE
(TYP)

WATERSHED B-3
TOTAL AREA: 0.84 ACRES
PERVIOUS AREA: 0.84 ACRES
IMPERVIOUS AREA: 0.00 ACRES
CN: 37
TC: 4.9 MIN.

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Revisions		

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Project
PROJECT MOOSE
ESSEX
CHITTENDEN COUNTY VERMONT

Drawing Title
PROPOSED
WATERSHED MAP

Project No.	Drawing No.
140278401	PR-WS
Date: 09/01/2024	
Drawn By: BCP	
Checked By: DTG	

Project No. 140278401

Date: 1/28/2025 Time: 16:55 User: bpalma Style Table: Langan.stb Layout: PR-WS Document Code: 140278401-0201-CG104-0101

LOT 12:
±1.69 ACRES

LOT 11
±7.70 ACRES

DRAINAGE AREA BOUNDARY (TYP)

STORM CONVEYANCE PIPE (TYP)

SUBDIVISION ROADWAY DESIGNED BY OTHERS

INFILTRATION BASIN A-1

INFILTRATION BASIN A-3

INFILTRATION BASIN A-4

INFILTRATION BASIN B-1

UNDERGROUND INFILTRATION SYSTEM A-2

UNDERGROUND INFILTRATION SYSTEM B-2

KIMO DRIVE

CCB-03 (A-1)
CLCB-02 (A-1)
CLCB-01 (A-1)
CCB-01 (B-2)
RL-01 (A-1)
RL-05 (B-2)
RL-06 (B-2)
RL-02 (A-1)
RL-04 (B-2)
RL-07 (B-2)
CCB-02 (B-2)
RL-03 (A-1)
RL-03 (B-2)
RL-08 (B-2)
RL-04 (A-1)
RL-02 (B-2)
RL-09 (B-2)
RL-10 (B-2)
RL-05 (A-1)
RL-01 (B-2)
RL-11 (B-2)
CCB-03 (B-2)
CCB-01 (A-3)
CCB-05 (A-2)
CCB-02 (A-3)
CCB-07 (A-2)
CCB-03 (A-3)
CCB-04 (A-3)
CCB-08 (A-2)
CCB-04 (A-2)
CCB-03 (A-2)
CCB-02 (A-2)
CCB-01 (A-2)
CCB-01 (B-1)
CCB-03 (B-1)
CCB-04 (B-1)
CCB-02 (B-2)
CCB-05 (B-1)

SCALE IN FEET
60 0 20 40 60

Date	Description	No.
Revisions		

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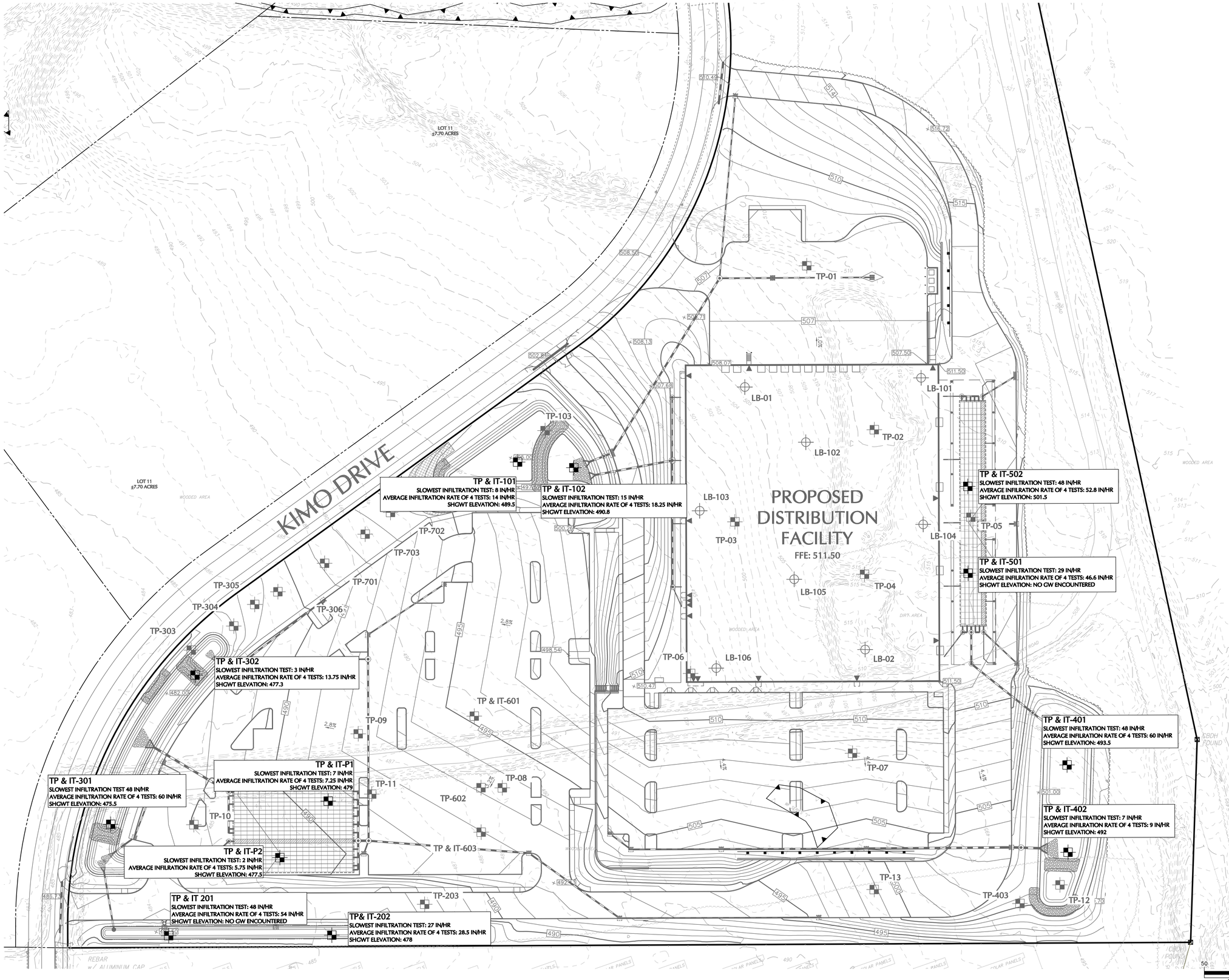
Project
PROJECT MOOSE
ESSEX
CHITTENDEN COUNTY VERMONT

Drawing Title
DRAINAGE AREA MAP

Project No.	Drawing No.
140278401	DACB
Date: 01/06/2025	
Drawn By: CJC	
Checked By: DTG	

LANGAN
Project No. 140278401

Date: 1/28/2025 Time: 16:50 User: bpalma Style Table: Langan.stb Layout: DACB Document Code: 140278401-0201-CG104-0102



GENERAL NOTES

1. LOCATIONS OF BORINGS AND TEST PITS ARE APPROXIMATE.
2. BOUNDARY AND TOPOGRAPHIC INFORMATION OBTAINED FROM A PLAN TITLED "ALTA/NSPS LAND TILTE SURVEY" PREPARED BY LANGAN AND DATED 18 JUNE 2024.
3. ELEVATIONS REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
4. TEST PITS TP-01 THROUGH TP-13 WERE EXCAVATED BY KINGS TRUCKING & EXCAVATING, CORP. ON 8 AND 9 AUGUST 2024 UNDER THE FULL-TIME OBSERVATION OF A LANGAN FIELD ENGINEER.
5. BORINGS LB-01 AND LB-02 WERE DRILLED BY CASCADE REMEDIATION SERVICES, LLC. ON 12 AUGUST 2024 UNDER THE FULL-TIME OBSERVATION OF A LANGAN FIELD ENGINEER.
6. BORINGS LB-101 THROUGH LB-106 WERE DRILLED BY SOILTESTING, INC. ON 4 NOVEMBER 2024 THROUGH 8 NOVEMBER 2024 UNDER THE FULL-TIME OBSERVATION OF A LANGAN FIELD ENGINEER.
7. TEST PITS TP-101 THROUGH TP-703 WERE EXCAVATED BY KINGS TRUCKING & EXCAVATING, CORP. ON 18 NOVEMBER 2024 THROUGH 22 NOVEMBER 2024 UNDER THE FULL-TIME OBSERVATION OF A LANGAN FIELD ENGINEER.

LEGEND

- LB-00 — LANGAN BORINGS
- TP & IT-000 — LANGAN TEST PITS / INFILTRATION TESTS
- PROPOSED BUILDING FOOTPRINT
- PROPERTY LINE

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Project

PROJECT MOOSE

ESSEX
CHITTENDEN COUNTY VERMONT

Drawing Title

INFILTRATION TESTING LOCATION PLAN

Project No.	Drawing No.
140278401	CG201
Date: 01/07/2025	
Drawn By: CJC	
Checked By: DTG	

LANGAN Project No. 140278401

APPENDIX A

Existing Stormwater Discharge Calculations

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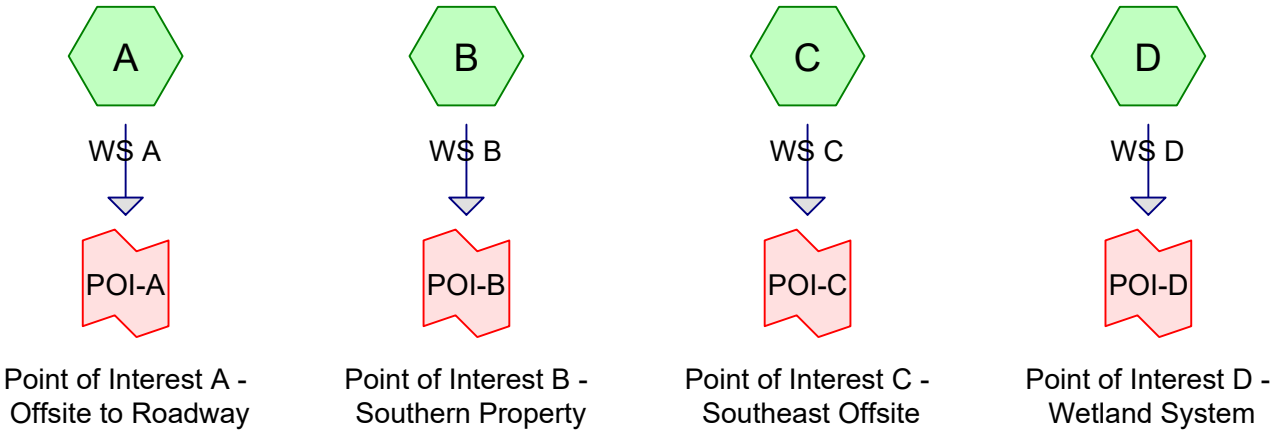
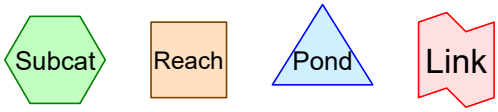


Point of Interest A - Offsite to Roadway

Point of Interest B - Southern Property

Point of Interest C - Southeast Offsite

Point of Interest D - Wetland System



Routing Diagram for Project Moose - EXWS - HydroCAD Model
Prepared by Langan Engineering, Printed 1/14/2025

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
8.225	35	Brush, Fair, HSG A (A, B, C, D)
0.953	72	Dirt roads, HSG A (A)
1.650	30	Woods, Good, HSG A (C, D)
12.086	32	Woods/grass comb., Good, HSG A (A, B)
22.914	**35**	**TOTAL AREA**

Time span=1.00-48.00 hrs, dt=0.01 hrs, 4701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A: WS A Runoff Area=13.055 ac 0.00% Impervious Runoff Depth=0.02"
Tc=23.7 min CN=WQ Runoff=0.17 cfs 0.022 af

Subcatchment B: WS B Runoff Area=4.205 ac 0.00% Impervious Runoff Depth=0.00"
Tc=16.6 min CN=WQ Runoff=0.00 cfs 0.000 af

Subcatchment C: WS C Runoff Area=1.490 ac 0.00% Impervious Runoff Depth=0.00"
Tc=5.8 min CN=WQ Runoff=0.00 cfs 0.000 af

Subcatchment D: WS D Runoff Area=4.164 ac 0.00% Impervious Runoff Depth=0.00"
Tc=15.7 min CN=WQ Runoff=0.00 cfs 0.000 af

Link POI-A: Point of Interest A - Offsite to Roadway Inflow=0.17 cfs 0.022 af
Primary=0.17 cfs 0.022 af

Link POI-B: Point of Interest B - Southern Property Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-C: Point of Interest C - Southeast Offsite Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-D: Point of Interest D - Wetland System Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 22.914 ac Runoff Volume = 0.022 af Average Runoff Depth = 0.01"
100.00% Pervious = 22.914 ac 0.00% Impervious = 0.000 ac

Time span=1.00-48.00 hrs, dt=0.01 hrs, 4701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A: WS A Runoff Area=13.055 ac 0.00% Impervious Runoff Depth=0.08"
Tc=23.7 min CN=WQ Runoff=0.93 cfs 0.082 af

Subcatchment B: WS B Runoff Area=4.205 ac 0.00% Impervious Runoff Depth=0.00"
Tc=16.6 min CN=WQ Runoff=0.00 cfs 0.000 af

Subcatchment C: WS C Runoff Area=1.490 ac 0.00% Impervious Runoff Depth=0.00"
Tc=5.8 min CN=WQ Runoff=0.00 cfs 0.000 af

Subcatchment D: WS D Runoff Area=4.164 ac 0.00% Impervious Runoff Depth=0.00"
Tc=15.7 min CN=WQ Runoff=0.00 cfs 0.000 af

Link POI-A: Point of Interest A - Offsite to Roadway Inflow=0.93 cfs 0.082 af
Primary=0.93 cfs 0.082 af

Link POI-B: Point of Interest B - Southern Property Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-C: Point of Interest C - Southeast Offsite Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-D: Point of Interest D - Wetland System Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 22.914 ac Runoff Volume = 0.082 af Average Runoff Depth = 0.04"
100.00% Pervious = 22.914 ac 0.00% Impervious = 0.000 ac

Time span=1.00-48.00 hrs, dt=0.01 hrs, 4701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A: WS A Runoff Area=13.055 ac 0.00% Impervious Runoff Depth=0.11"
Tc=23.7 min CN=WQ Runoff=1.38 cfs 0.120 af

Subcatchment B: WS B Runoff Area=4.205 ac 0.00% Impervious Runoff Depth=0.00"
Tc=16.6 min CN=WQ Runoff=0.00 cfs 0.000 af

Subcatchment C: WS C Runoff Area=1.490 ac 0.00% Impervious Runoff Depth=0.00"
Tc=5.8 min CN=WQ Runoff=0.00 cfs 0.000 af

Subcatchment D: WS D Runoff Area=4.164 ac 0.00% Impervious Runoff Depth=0.00"
Tc=15.7 min CN=WQ Runoff=0.00 cfs 0.001 af

Link POI-A: Point of Interest A - Offsite to Roadway Inflow=1.38 cfs 0.120 af
Primary=1.38 cfs 0.120 af

Link POI-B: Point of Interest B - Southern Property Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-C: Point of Interest C - Southeast Offsite Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-D: Point of Interest D - Wetland System Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Total Runoff Area = 22.914 ac Runoff Volume = 0.122 af Average Runoff Depth = 0.06"
100.00% Pervious = 22.914 ac 0.00% Impervious = 0.000 ac

Time span=1.00-48.00 hrs, dt=0.01 hrs, 4701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment A: WS A Runoff Area=13.055 ac 0.00% Impervious Runoff Depth=0.21"
Tc=23.7 min CN=WQ Runoff=2.12 cfs 0.225 af

Subcatchment B: WS B Runoff Area=4.205 ac 0.00% Impervious Runoff Depth=0.04"
Tc=16.6 min CN=WQ Runoff=0.02 cfs 0.015 af

Subcatchment C: WS C Runoff Area=1.490 ac 0.00% Impervious Runoff Depth=0.06"
Tc=5.8 min CN=WQ Runoff=0.01 cfs 0.008 af

Subcatchment D: WS D Runoff Area=4.164 ac 0.00% Impervious Runoff Depth=0.07"
Tc=15.7 min CN=WQ Runoff=0.03 cfs 0.024 af

Link POI-A: Point of Interest A - Offsite to Roadway Inflow=2.12 cfs 0.225 af
Primary=2.12 cfs 0.225 af

Link POI-B: Point of Interest B - Southern Property Inflow=0.02 cfs 0.015 af
Primary=0.02 cfs 0.015 af

Link POI-C: Point of Interest C - Southeast Offsite Inflow=0.01 cfs 0.008 af
Primary=0.01 cfs 0.008 af

Link POI-D: Point of Interest D - Wetland System Inflow=0.03 cfs 0.024 af
Primary=0.03 cfs 0.024 af

Total Runoff Area = 22.914 ac Runoff Volume = 0.271 af Average Runoff Depth = 0.14"
100.00% Pervious = 22.914 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment A: WS A

Runoff = 2.12 cfs @ 12.17 hrs, Volume= 0.225 af, Depth= 0.21"
Routed to Link POI-A : Point of Interest A - Offsite to Roadway

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
8.829	32	Woods/grass comb., Good, HSG A
3.273	35	Brush, Fair, HSG A
0.953	72	Dirt roads, HSG A
13.055		Weighted Average
13.055		100.00% Pervious Area

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

Summary for Subcatchment B: WS B

Runoff = 0.02 cfs @ 24.00 hrs, Volume= 0.015 af, Depth= 0.04"
Routed to Link POI-B : Point of Interest B - Southern Property

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
3.257	32	Woods/grass comb., Good, HSG A
0.948	35	Brush, Fair, HSG A
4.205		Weighted Average
4.205		100.00% Pervious Area

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

Summary for Subcatchment C: WS C

Runoff = 0.01 cfs @ 15.10 hrs, Volume= 0.008 af, Depth= 0.06"
Routed to Link POI-C : Point of Interest C - Southeast Offsite

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
0.531	30	Woods, Good, HSG A
0.959	35	Brush, Fair, HSG A
1.490		Weighted Average
1.490		100.00% Pervious Area

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

Summary for Subcatchment D: WS D

Runoff = 0.03 cfs @ 15.30 hrs, Volume= 0.024 af, Depth= 0.07"
Routed to Link POI-D : Point of Interest D - Wetland System

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
1.119	30	Woods, Good, HSG A
3.045	35	Brush, Fair, HSG A
4.164		Weighted Average
4.164		100.00% Pervious Area

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

Summary for Link POI-A: Point of Interest A - Offsite to Roadway

Inflow Area = 13.055 ac, 0.00% Impervious, Inflow Depth = 0.21" for 100-yr event
Inflow = 2.12 cfs @ 12.17 hrs, Volume= 0.225 af
Primary = 2.12 cfs @ 12.17 hrs, Volume= 0.225 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs

Summary for Link POI-B: Point of Interest B - Southern Property

Inflow Area = 4.205 ac, 0.00% Impervious, Inflow Depth = 0.04" for 100-yr event
Inflow = 0.02 cfs @ 24.00 hrs, Volume= 0.015 af
Primary = 0.02 cfs @ 24.00 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs

Summary for Link POI-C: Point of Interest C - Southeast Offsite

Inflow Area = 1.490 ac, 0.00% Impervious, Inflow Depth = 0.06" for 100-yr event
Inflow = 0.01 cfs @ 15.10 hrs, Volume= 0.008 af
Primary = 0.01 cfs @ 15.10 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs

Summary for Link POI-D: Point of Interest D - Wetland System

Inflow Area = 4.164 ac, 0.00% Impervious, Inflow Depth = 0.07" for 100-yr event
Inflow = 0.03 cfs @ 15.30 hrs, Volume= 0.024 af
Primary = 0.03 cfs @ 15.30 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs

Watershed Lag Method - Existing Condtion

Hydraulic Length (ft) = $l = 209A^{0.6}$

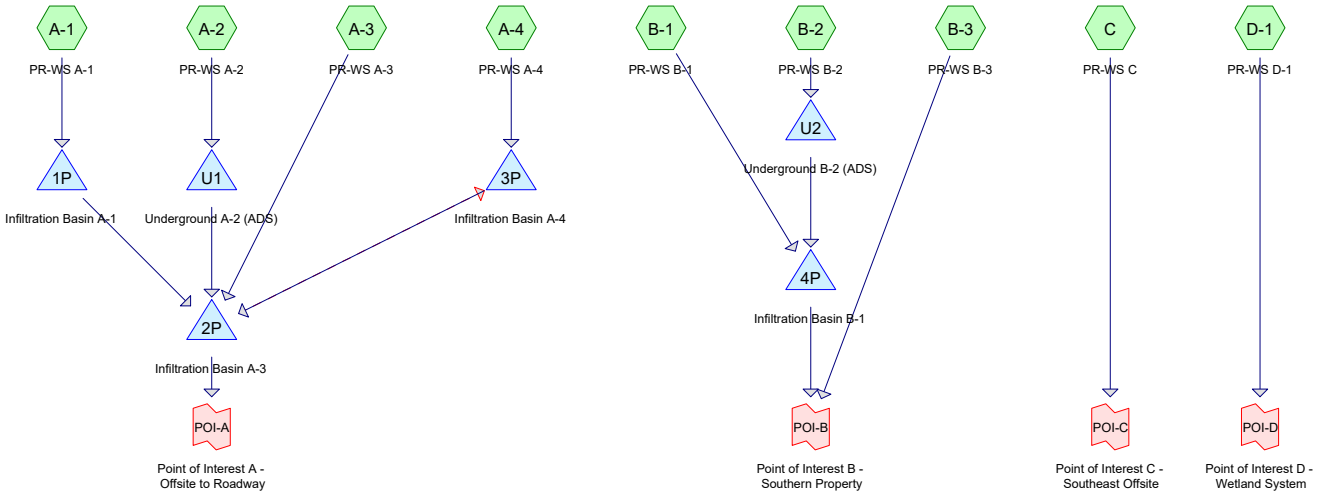
Average catchment slope (%) = $Y = 100CI/A$

Variable	Watershed A	Watershed B	Watershed C	Watershed D
C (LF)	43,866	10,779	11,459	13,292
I (FT)	1	1	1	1
A (Acres)	13.15	4.2	1.49	4.4
A (SF)	572,676	183,169	64,910	193,842
Hydraulic Length l (ft)	980.62	494.42	265.50	508.41
Average Catchment SlopeY (%)	7.66	5.88	17.65	6.86

APPENDIX B

Proposed Stormwater Discharge Calculations

LANGAN



Subcat Reach Pond Link

Routing Diagram for Project Moose - PRWS - HydroCAD Model
Prepared by Langan Engineering, Printed 1/28/2025

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.954	39	>75% Grass cover, Good, HSG A (A-1, A-2, A-3, A-4, B-1, B-2, B-3, D-1)
0.079	35	Brush, Fair, HSG A (B-3)
0.495	72	Dirt roads, HSG A (B-1, B-2)
2.486	30	Meadow, non-grazed, HSG A (B-1, B-2, C, D-1)
8.652	98	Paved parking, HSG A (A-1, A-2, A-3, A-4, B-1, B-2)
2.941	98	Roofs, HSG A (A-1, B-2)
2.139	30	Woods, Good, HSG A (B-1, B-2, C, D-1)
0.166	32	Woods/grass comb., Good, HSG A (B-3)
22.912	**68**	**TOTAL AREA**

Time span=1.00-48.00 hrs, dt=0.01 hrs, 4701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment A-1: PR-WS A-1 Runoff Area=4.773 ac 56.34% Impervious Runoff Depth=0.27"
Tc=4.3 min CN=72 Runoff=2.02 cfs 0.108 af

Subcatchment A-2: PR-WS A-2 Runoff Area=3.111 ac 85.50% Impervious Runoff Depth=0.99"
Tc=1.0 min CN=89 Runoff=6.54 cfs 0.256 af

Subcatchment A-3: PR-WS A-3 Runoff Area=3.003 ac 58.24% Impervious Runoff Depth=0.30"
Tc=3.1 min CN=73 Runoff=1.54 cfs 0.075 af

Subcatchment A-4: PR-WS A-4 Runoff Area=1.108 ac 50.45% Impervious Runoff Depth=0.20"
Tc=1.4 min CN=69 Runoff=0.33 cfs 0.018 af

Subcatchment B-1: PR-WS B-1 Runoff Area=3.216 ac 54.01% Impervious Runoff Depth=0.25"
Tc=3.3 min CN=71 Runoff=1.23 cfs 0.066 af

Subcatchment B-2: PR-WS B-2 Runoff Area=3.060 ac 71.86% Impervious Runoff Depth=0.71"
Tc=1.2 min CN=84 Runoff=4.66 cfs 0.181 af

Subcatchment B-3: PR-WS B-3 Runoff Area=0.838 ac 0.00% Impervious Runoff Depth=0.00"
Tc=4.9 min CN=37 Runoff=0.00 cfs 0.000 af

Subcatchment C: PR-WS C Runoff Area=64,910 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment D-1: PR-WS D-1 Runoff Area=2.313 ac 0.00% Impervious Runoff Depth=0.00"
Tc=12.1 min CN=30 Runoff=0.00 cfs 0.000 af

Pond 1P: Infiltration Basin A-1 Peak Elev=495.09' Storage=612 cf Inflow=2.02 cfs 0.108 af
Discarded=0.59 cfs 0.108 af Primary=0.00 cfs 0.000 af Outflow=0.59 cfs 0.108 af

Pond 2P: Infiltration Basin A-3 Peak Elev=482.19' Storage=822 cf Inflow=1.54 cfs 0.075 af
Discarded=0.15 cfs 0.075 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.075 af

Pond 3P: Infiltration Basin A-4 Peak Elev=482.53' Storage=46 cf Inflow=0.33 cfs 0.018 af
Discarded=0.19 cfs 0.018 af Primary=0.00 cfs 0.000 af Outflow=0.19 cfs 0.018 af

Pond 4P: Infiltration Basin B-1 Peak Elev=497.56' Storage=316 cf Inflow=1.23 cfs 0.066 af
Discarded=0.43 cfs 0.066 af Primary=0.00 cfs 0.000 af Outflow=0.43 cfs 0.066 af

Pond U1: Underground A-2 (ADS) Peak Elev=484.21' Storage=4,915 cf Inflow=6.54 cfs 0.256 af
Discarded=0.30 cfs 0.256 af Primary=0.00 cfs 0.000 af Outflow=0.30 cfs 0.256 af

Pond U2: Underground B-2 (ADS) Peak Elev=506.04' Storage=1,848 cf Inflow=4.66 cfs 0.181 af
Discarded=0.90 cfs 0.181 af Primary=0.00 cfs 0.000 af Outflow=0.90 cfs 0.181 af

Link POI-A: Point of Interest A - Offsite to Roadway Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-B: Point of Interest B - Southern Property Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-C: Point of Interest C - Southeast Offsite Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-D: Point of Interest D - Wetland System Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 22.912 ac Runoff Volume = 0.704 af Average Runoff Depth = 0.37"
49.40% Pervious = 11.319 ac 50.60% Impervious = 11.593 ac

Time span=1.00-48.00 hrs, dt=0.01 hrs, 4701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment A-1: PR-WS A-1 Runoff Area=4.773 ac 56.34% Impervious Runoff Depth=1.04"
Tc=4.3 min CN=72 Runoff=9.37 cfs 0.412 af

Subcatchment A-2: PR-WS A-2 Runoff Area=3.111 ac 85.50% Impervious Runoff Depth=2.24"
Tc=1.0 min CN=89 Runoff=14.23 cfs 0.580 af

Subcatchment A-3: PR-WS A-3 Runoff Area=3.003 ac 58.24% Impervious Runoff Depth=1.09"
Tc=3.1 min CN=73 Runoff=6.54 cfs 0.274 af

Subcatchment A-4: PR-WS A-4 Runoff Area=1.108 ac 50.45% Impervious Runoff Depth=0.88"
Tc=1.4 min CN=69 Runoff=2.03 cfs 0.081 af

Subcatchment B-1: PR-WS B-1 Runoff Area=3.216 ac 54.01% Impervious Runoff Depth=0.98"
Tc=3.3 min CN=71 Runoff=6.20 cfs 0.263 af

Subcatchment B-2: PR-WS B-2 Runoff Area=3.060 ac 71.86% Impervious Runoff Depth=1.83"
Tc=1.2 min CN=84 Runoff=11.75 cfs 0.466 af

Subcatchment B-3: PR-WS B-3 Runoff Area=0.838 ac 0.00% Impervious Runoff Depth=0.00"
Tc=4.9 min CN=37 Runoff=0.00 cfs 0.000 af

Subcatchment C: PR-WS C Runoff Area=64,910 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment D-1: PR-WS D-1 Runoff Area=2.313 ac 0.00% Impervious Runoff Depth=0.00"
Tc=12.1 min CN=30 Runoff=0.00 cfs 0.000 af

Pond 1P: Infiltration Basin A-1 Peak Elev=495.96' Storage=6,892 cf Inflow=9.37 cfs 0.412 af
Discarded=0.59 cfs 0.412 af Primary=0.00 cfs 0.000 af Outflow=0.59 cfs 0.412 af

Pond 2P: Infiltration Basin A-3 Peak Elev=483.27' Storage=6,661 cf Inflow=6.54 cfs 0.274 af
Discarded=0.15 cfs 0.274 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.274 af

Pond 3P: Infiltration Basin A-4 Peak Elev=483.02' Storage=1,062 cf Inflow=2.03 cfs 0.081 af
Discarded=0.19 cfs 0.081 af Primary=0.00 cfs 0.000 af Outflow=0.19 cfs 0.081 af

Pond 4P: Infiltration Basin B-1 Peak Elev=498.21' Storage=4,148 cf Inflow=6.20 cfs 0.263 af
Discarded=0.43 cfs 0.263 af Primary=0.00 cfs 0.000 af Outflow=0.43 cfs 0.263 af

Pond U1: Underground A-2 (ADS) Peak Elev=485.07' Storage=14,098 cf Inflow=14.23 cfs 0.580 af
Discarded=0.30 cfs 0.580 af Primary=0.00 cfs 0.000 af Outflow=0.30 cfs 0.580 af

Pond U2: Underground B-2 (ADS) Peak Elev=506.95' Storage=7,571 cf Inflow=11.75 cfs 0.466 af
Discarded=0.90 cfs 0.466 af Primary=0.00 cfs 0.000 af Outflow=0.90 cfs 0.466 af

Link POI-A: Point of Interest A - Offsite to Roadway Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-B: Point of Interest B - Southern Property Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-C: Point of Interest C - Southeast Offsite Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-D: Point of Interest D - Wetland System Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 22.912 ac Runoff Volume = 2.076 af Average Runoff Depth = 1.09"
49.40% Pervious = 11.319 ac 50.60% Impervious = 11.593 ac

Time span=1.00-48.00 hrs, dt=0.01 hrs, 4701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment A-1: PR-WS A-1 Runoff Area=4.773 ac 56.34% Impervious Runoff Depth=1.49"
Tc=4.3 min CN=72 Runoff=13.57 cfs 0.592 af

Subcatchment A-2: PR-WS A-2 Runoff Area=3.111 ac 85.50% Impervious Runoff Depth=2.86"
Tc=1.0 min CN=89 Runoff=17.89 cfs 0.742 af

Subcatchment A-3: PR-WS A-3 Runoff Area=3.003 ac 58.24% Impervious Runoff Depth=1.56"
Tc=3.1 min CN=73 Runoff=9.36 cfs 0.389 af

Subcatchment A-4: PR-WS A-4 Runoff Area=1.108 ac 50.45% Impervious Runoff Depth=1.29"
Tc=1.4 min CN=69 Runoff=3.05 cfs 0.119 af

Subcatchment B-1: PR-WS B-1 Runoff Area=3.216 ac 54.01% Impervious Runoff Depth=1.42"
Tc=3.3 min CN=71 Runoff=9.07 cfs 0.381 af

Subcatchment B-2: PR-WS B-2 Runoff Area=3.060 ac 71.86% Impervious Runoff Depth=2.41"
Tc=1.2 min CN=84 Runoff=15.28 cfs 0.614 af

Subcatchment B-3: PR-WS B-3 Runoff Area=0.838 ac 0.00% Impervious Runoff Depth=0.02"
Tc=4.9 min CN=37 Runoff=0.00 cfs 0.002 af

Subcatchment C: PR-WS C Runoff Area=64,910 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment D-1: PR-WS D-1 Runoff Area=2.313 ac 0.00% Impervious Runoff Depth=0.00"
Tc=12.1 min CN=30 Runoff=0.00 cfs 0.000 af

Pond 1P: Infiltration Basin A-1 Peak Elev=496.53' Storage=11,655 cf Inflow=13.57 cfs 0.592 af
Discarded=0.59 cfs 0.592 af Primary=0.00 cfs 0.000 af Outflow=0.59 cfs 0.592 af

Pond 2P: Infiltration Basin A-3 Peak Elev=483.87' Storage=10,768 cf Inflow=9.36 cfs 0.389 af
Discarded=0.15 cfs 0.389 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.389 af

Pond 3P: Infiltration Basin A-4 Peak Elev=483.35' Storage=1,943 cf Inflow=3.05 cfs 0.119 af
Discarded=0.19 cfs 0.119 af Primary=0.00 cfs 0.000 af Outflow=0.19 cfs 0.119 af

Pond 4P: Infiltration Basin B-1 Peak Elev=498.67' Storage=7,178 cf Inflow=9.07 cfs 0.381 af
Discarded=0.43 cfs 0.381 af Primary=0.00 cfs 0.000 af Outflow=0.43 cfs 0.381 af

Pond U1: Underground A-2 (ADS) Peak Elev=485.60' Storage=19,268 cf Inflow=17.89 cfs 0.742 af
Discarded=0.30 cfs 0.742 af Primary=0.00 cfs 0.000 af Outflow=0.30 cfs 0.742 af

Pond U2: Underground B-2 (ADS) Peak Elev=507.52' Storage=10,922 cf Inflow=15.28 cfs 0.614 af
Discarded=0.90 cfs 0.614 af Primary=0.00 cfs 0.000 af Outflow=0.90 cfs 0.614 af

Link POI-A: Point of Interest A - Offsite to Roadway Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-B: Point of Interest B - Southern Property Inflow=0.00 cfs 0.002 af
Primary=0.00 cfs 0.002 af

Link POI-C: Point of Interest C - Southeast Offsite Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-D: Point of Interest D - Wetland System Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 22.912 ac Runoff Volume = 2.839 af Average Runoff Depth = 1.49"
49.40% Pervious = 11.319 ac 50.60% Impervious = 11.593 ac

Time span=1.00-48.00 hrs, dt=0.01 hrs, 4701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment A-1: PR-WS A-1 Runoff Area=4.773 ac 56.34% Impervious Runoff Depth=2.24"
Tc=4.3 min CN=72 Runoff=20.47 cfs 0.893 af

Subcatchment A-2: PR-WS A-2 Runoff Area=3.111 ac 85.50% Impervious Runoff Depth=3.83"
Tc=1.0 min CN=89 Runoff=23.45 cfs 0.993 af

Subcatchment A-3: PR-WS A-3 Runoff Area=3.003 ac 58.24% Impervious Runoff Depth=2.33"
Tc=3.1 min CN=73 Runoff=13.95 cfs 0.582 af

Subcatchment A-4: PR-WS A-4 Runoff Area=1.108 ac 50.45% Impervious Runoff Depth=2.00"
Tc=1.4 min CN=69 Runoff=4.73 cfs 0.185 af

Subcatchment B-1: PR-WS B-1 Runoff Area=3.216 ac 54.01% Impervious Runoff Depth=2.16"
Tc=3.3 min CN=71 Runoff=13.81 cfs 0.579 af

Subcatchment B-2: PR-WS B-2 Runoff Area=3.060 ac 71.86% Impervious Runoff Depth=3.33"
Tc=1.2 min CN=84 Runoff=20.69 cfs 0.848 af

Subcatchment B-3: PR-WS B-3 Runoff Area=0.838 ac 0.00% Impervious Runoff Depth=0.15"
Tc=4.9 min CN=37 Runoff=0.01 cfs 0.010 af

Subcatchment C: PR-WS C Runoff Area=64,910 sf 0.00% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.001 af

Subcatchment D-1: PR-WS D-1 Runoff Area=2.313 ac 0.00% Impervious Runoff Depth=0.01"
Tc=12.1 min CN=30 Runoff=0.00 cfs 0.001 af

Pond 1P: Infiltration Basin A-1 Peak Elev=497.42' Storage=20,316 cf Inflow=20.47 cfs 0.893 af
Discarded=0.59 cfs 0.893 af Primary=0.00 cfs 0.000 af Outflow=0.59 cfs 0.893 af

Pond 2P: Infiltration Basin A-3 Peak Elev=484.65' Storage=17,077 cf Inflow=13.95 cfs 0.582 af
Discarded=0.15 cfs 0.456 af Primary=0.00 cfs 0.000 af Secondary=0.08 cfs 0.041 af Outflow=0.23 cfs 0.497 af

Pond 3P: Infiltration Basin A-4 Peak Elev=483.85' Storage=3,644 cf Inflow=4.73 cfs 0.226 af
Discarded=0.19 cfs 0.226 af Primary=0.00 cfs 0.000 af Outflow=0.19 cfs 0.226 af

Pond 4P: Infiltration Basin B-1 Peak Elev=499.39' Storage=12,760 cf Inflow=13.81 cfs 0.579 af
Discarded=0.43 cfs 0.579 af Primary=0.00 cfs 0.000 af Outflow=0.43 cfs 0.579 af

Pond U1: Underground A-2 (ADS) Peak Elev=486.69' Storage=27,761 cf Inflow=23.45 cfs 0.993 af
Discarded=0.30 cfs 0.993 af Primary=0.00 cfs 0.000 af Outflow=0.30 cfs 0.993 af

Pond U2: Underground B-2 (ADS) Peak Elev=508.71' Storage=16,491 cf Inflow=20.69 cfs 0.848 af
Discarded=0.90 cfs 0.848 af Primary=0.00 cfs 0.000 af Outflow=0.90 cfs 0.848 af

Link POI-A: Point of Interest A - Offsite to Roadway Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link POI-B: Point of Interest B - Southern Property Inflow=0.01 cfs 0.010 af
Primary=0.01 cfs 0.010 af

Link POI-C: Point of Interest C - Southeast Offsite Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Link POI-D: Point of Interest D - Wetland System Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Total Runoff Area = 22.912 ac Runoff Volume = 4.092 af Average Runoff Depth = 2.14"
49.40% Pervious = 11.319 ac 50.60% Impervious = 11.593 ac

Summary for Subcatchment A-1: PR-WS A-1

Runoff = 20.47 cfs @ 11.96 hrs, Volume= 0.893 af, Depth= 2.24"
Routed to Pond 1P : Infiltration Basin A-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
2.084	39	>75% Grass cover, Good, HSG A
1.454	98	Paved parking, HSG A
1.235	98	Roofs, HSG A
4.773	72	Weighted Average
2.084		43.66% Pervious Area
2.689		56.34% Impervious Area

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

Summary for Subcatchment A-2: PR-WS A-2

Runoff = 23.45 cfs @ 11.91 hrs, Volume= 0.993 af, Depth= 3.83"
Routed to Pond U1 : Underground A-2 (ADS)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
2.660	98	Paved parking, HSG A
0.451	39	>75% Grass cover, Good, HSG A
3.111	89	Weighted Average
0.451		14.50% Pervious Area
2.660		85.50% Impervious Area

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

Summary for Subcatchment A-3: PR-WS A-3

Runoff = 13.95 cfs @ 11.94 hrs, Volume= 0.582 af, Depth= 2.33"
Routed to Pond 2P : Infiltration Basin A-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
1.749	98	Paved parking, HSG A
1.254	39	>75% Grass cover, Good, HSG A
3.003	73	Weighted Average
1.254		41.76% Pervious Area
1.749		58.24% Impervious Area

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

Summary for Subcatchment A-4: PR-WS A-4

Runoff = 4.73 cfs @ 11.92 hrs, Volume= 0.185 af, Depth= 2.00"
Routed to Pond 3P : Infiltration Basin A-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
0.559	98	Paved parking, HSG A
0.549	39	>75% Grass cover, Good, HSG A
1.108	69	Weighted Average
0.549		49.55% Pervious Area
0.559		50.45% Impervious Area

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

Summary for Subcatchment B-1: PR-WS B-1

Runoff = 13.81 cfs @ 11.94 hrs, Volume= 0.579 af, Depth= 2.16"
Routed to Pond 4P : Infiltration Basin B-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
1.737	98	Paved parking, HSG A
0.793	39	>75% Grass cover, Good, HSG A
0.398	30	Woods, Good, HSG A
0.105	30	Meadow, non-grazed, HSG A
0.183	72	Dirt roads, HSG A
3.216	71	Weighted Average
1.479		45.99% Pervious Area
1.737		54.01% Impervious Area

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

Summary for Subcatchment B-2: PR-WS B-2

Runoff = 20.69 cfs @ 11.91 hrs, Volume= 0.848 af, Depth= 3.33"
Routed to Pond U2 : Underground B-2 (ADS)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
1.706	98	Roofs, HSG A
0.493	98	Paved parking, HSG A
0.181	39	>75% Grass cover, Good, HSG A
0.235	30	Woods, Good, HSG A
0.133	30	Meadow, non-grazed, HSG A
0.312	72	Dirt roads, HSG A
3.060	84	Weighted Average
0.861		28.14% Pervious Area
2.199		71.86% Impervious Area

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

Summary for Subcatchment B-3: PR-WS B-3

Runoff = 0.01 cfs @ 12.92 hrs, Volume= 0.010 af, Depth= 0.15"
Routed to Link POI-B : Point of Interest B - Southern Property

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
0.166	32	Woods/grass comb., Good, HSG A
0.079	35	Brush, Fair, HSG A
0.593	39	>75% Grass cover, Good, HSG A
0.838	37	Weighted Average
0.838		100.00% Pervious Area

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

Summary for Subcatchment C: PR-WS C

Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af, Depth= 0.01"
Routed to Link POI-C : Point of Interest C - Southeast Offsite

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (sf)	CN	Description
23,122	30	Woods, Good, HSG A
41,788	30	Meadow, non-grazed, HSG A
64,910	30	Weighted Average
64,910		100.00% Pervious Area

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

Summary for Subcatchment D-1: PR-WS D-1

Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.001 af, Depth= 0.01"
Routed to Link POI-D : Point of Interest D - Wetland System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-yr Rainfall=5.06"

Area (ac)	CN	Description
0.975	30	Woods, Good, HSG A
1.289	30	Meadow, non-grazed, HSG A
0.049	39	>75% Grass cover, Good, HSG A
2.313	30	Weighted Average
2.313		100.00% Pervious Area

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

Summary for Pond 1P: Infiltration Basin A-1

Inflow Area = 4.773 ac, 56.34% Impervious, Inflow Depth = 0.27" for 1-yr event
Inflow = 2.02 cfs @ 11.97 hrs, Volume= 0.108 af
Outflow = 0.59 cfs @ 11.91 hrs, Volume= 0.108 af, Atten= 71%, Lag= 0.0 min
Discarded = 0.59 cfs @ 11.91 hrs, Volume= 0.108 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 495.09' @ 12.09 hrs Surf.Area= 6,536 sf Storage= 612 cf

Plug-Flow detention time= 4.8 min calculated for 0.108 af (100% of inflow)
Center-of-Mass det. time= 4.8 min (916.3 - 911.5)

Volume	Invert	Avail.Storage	Storage Description
#1	495.00'	39,324 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

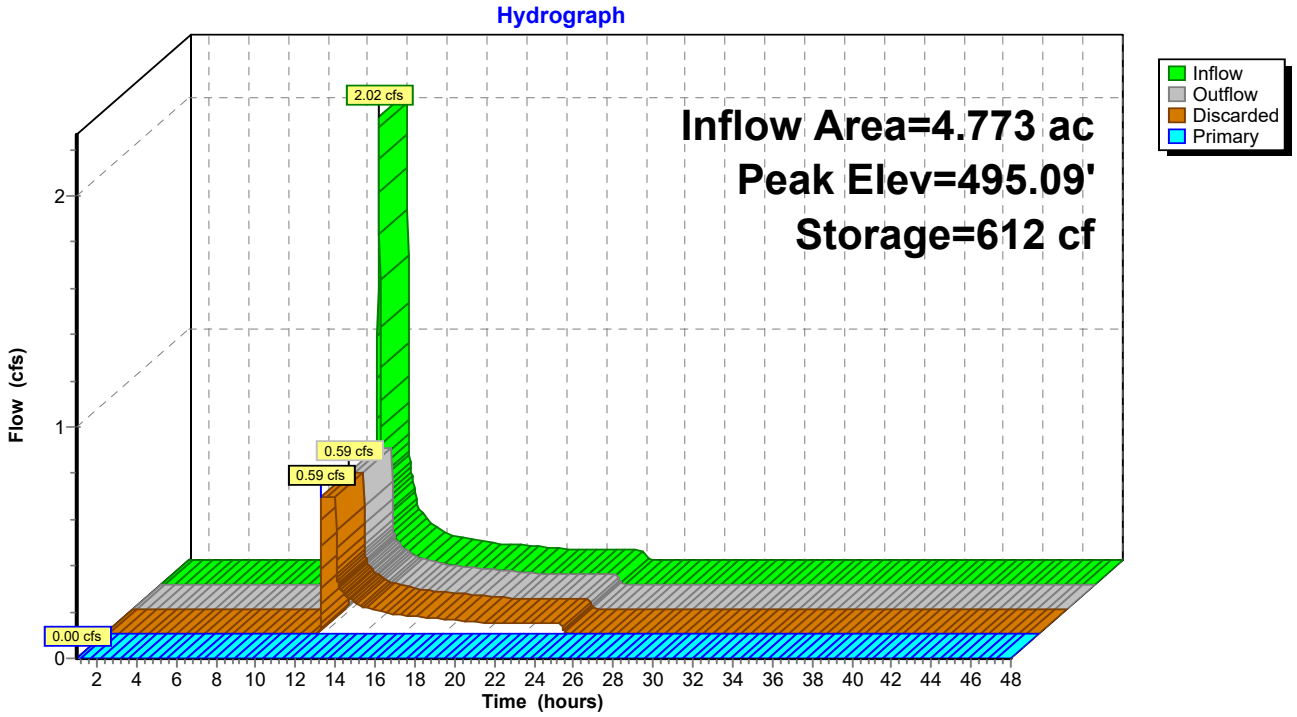
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
495.00	6,386	0	0
496.00	7,968	7,177	7,177
497.00	9,747	8,858	16,035
498.00	11,768	10,758	26,792
499.00	13,295	12,532	39,324

Device	Routing	Invert	Outlet Devices
#1	Primary	497.50'	**20.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	495.00'	**4.000 in/hr Exfiltration over Surface area below 495.01'** Phase-In= 0.01'

Discarded OutFlow Max=0.59 cfs @ 11.91 hrs HW=495.01' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.59 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=495.00' TW=482.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin A-1



Summary for Pond 2P: Infiltration Basin A-3

Inflow = 1.54 cfs @ 11.95 hrs, Volume= 0.075 af
Outflow = 0.15 cfs @ 11.87 hrs, Volume= 0.075 af, Atten= 91%, Lag= 0.0 min
Discarded = 0.15 cfs @ 11.87 hrs, Volume= 0.075 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Link POI-A : Point of Interest A - Offsite to Roadway
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 3P : Infiltration Basin A-4

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 482.19' @ 12.61 hrs Surf.Area= 4,495 sf Storage= 822 cf

Plug-Flow detention time= 42.5 min calculated for 0.075 af (100% of inflow)
Center-of-Mass det. time= 42.5 min (946.4 - 903.9)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	30,958 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.00	4,183	0	0
483.00	5,833	5,008	5,008
484.00	7,601	6,717	11,725
485.00	9,703	8,652	20,377
486.00	11,458	10,581	30,958

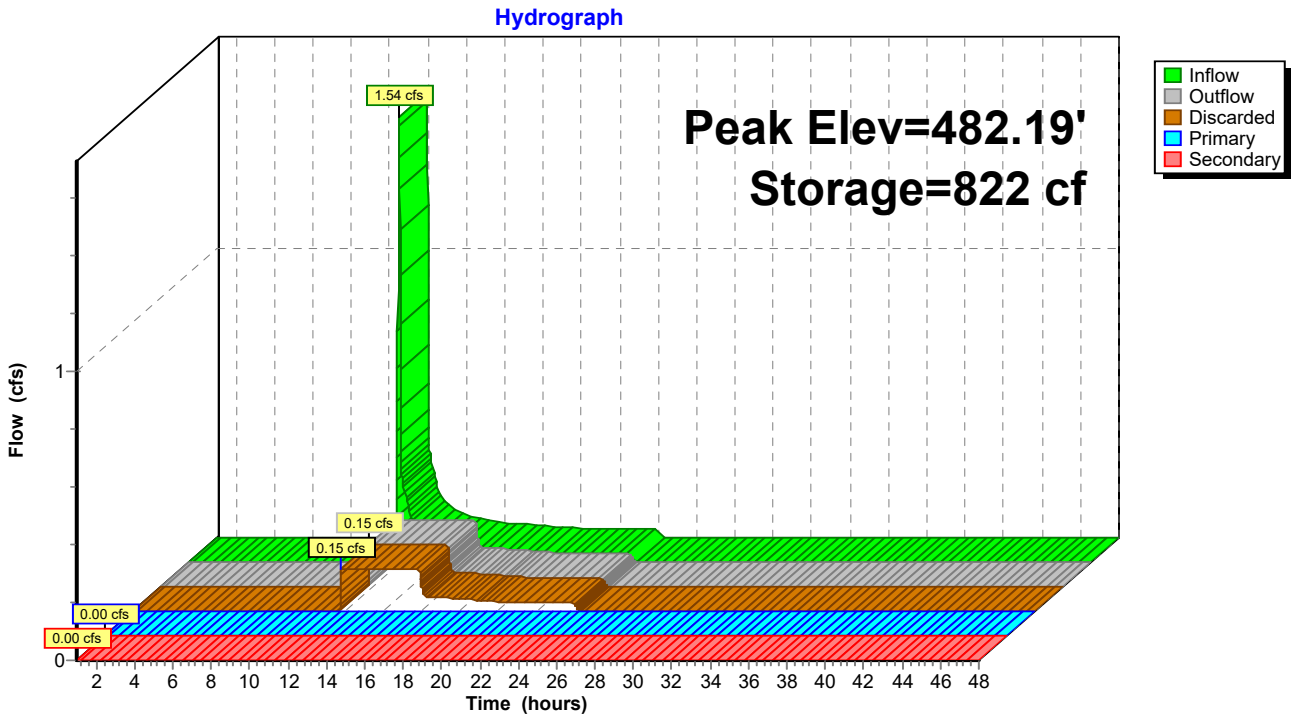
Device	Routing	Invert	Outlet Devices
#1	Primary	485.00'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	482.00'	**1.500 in/hr Exfiltration over Surface area below 482.01'** Phase-In= 0.01'
#3	Secondary	484.50'	**15.0" Round Culvert** L= 75.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 482.00' / 484.50' S= -0.0333 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Discarded OutFlow Max=0.15 cfs @ 11.87 hrs HW=482.01' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=482.00' TW=0.00' (Dynamic Tailwater)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=482.00' TW=482.50' (Dynamic Tailwater)
↑**3=Culvert** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin A-3



Summary for Pond 3P: Infiltration Basin A-4

Inflow = 0.33 cfs @ 11.94 hrs, Volume= 0.018 af
Outflow = 0.19 cfs @ 11.92 hrs, Volume= 0.018 af, Atten= 43%, Lag= 0.0 min
Discarded = 0.19 cfs @ 11.92 hrs, Volume= 0.018 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 482.53' @ 12.00 hrs Surf.Area= 1,656 sf Storage= 46 cf

Plug-Flow detention time= 1.7 min calculated for 0.018 af (100% of inflow)
Center-of-Mass det. time= 1.7 min (933.0 - 931.3)

Volume	Invert	Avail.Storage	Storage Description
#1	482.50'	12,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

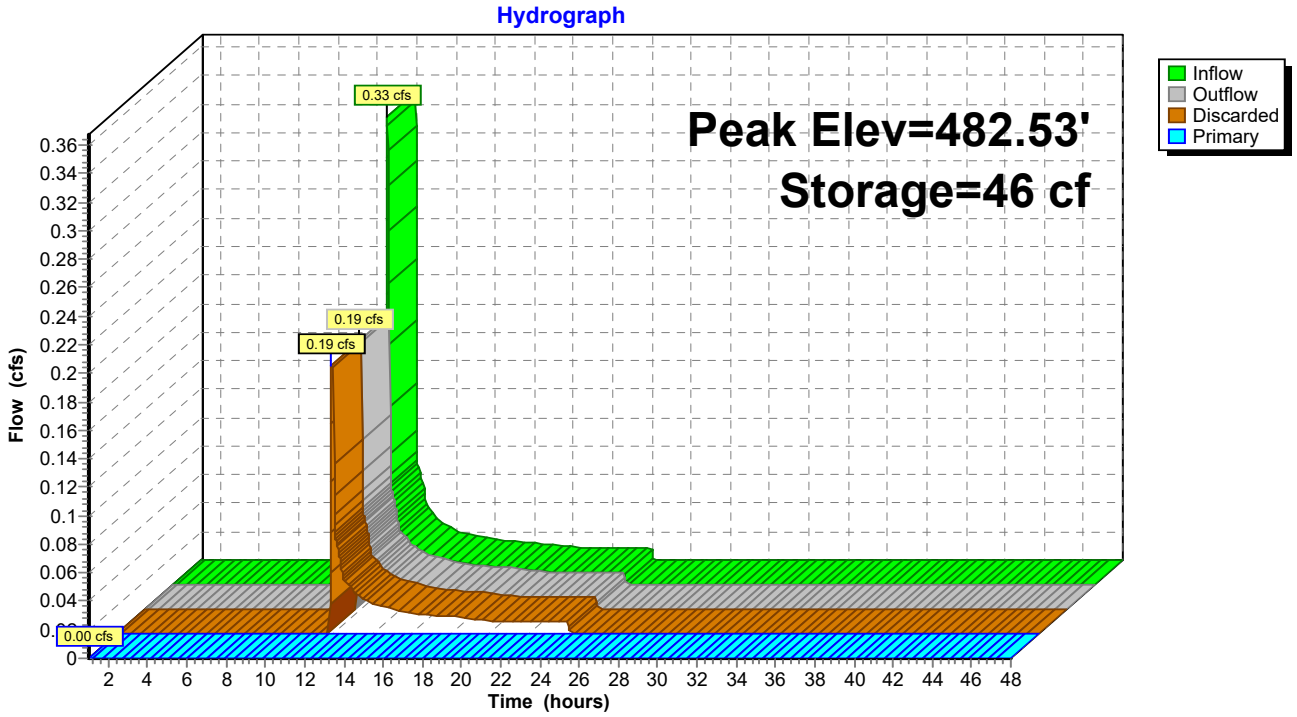
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.50	1,611	0	0
483.50	3,202	2,407	2,407
484.50	4,922	4,062	6,469
485.50	6,663	5,793	12,261

Device	Routing	Invert	Outlet Devices
#1	Primary	482.50'	**15.0" Round Culvert** L= 75.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 482.50' / 482.00' S= 0.0067 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Device 1	484.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	482.50'	**5.000 in/hr Exfiltration over Surface area below 482.51'** Phase-In= 0.01'

Discarded OutFlow Max=0.19 cfs @ 11.92 hrs HW=482.51' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=482.50' TW=482.00' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: Infiltration Basin A-4



Summary for Pond 4P: Infiltration Basin B-1

Inflow Area = 6.276 ac, 62.72% Impervious, Inflow Depth = 0.13" for 1-yr event
Inflow = 1.23 cfs @ 11.96 hrs, Volume= 0.066 af
Outflow = 0.43 cfs @ 11.92 hrs, Volume= 0.066 af, Atten= 65%, Lag= 0.0 min
Discarded = 0.43 cfs @ 11.92 hrs, Volume= 0.066 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Link POI-B : Point of Interest B - Southern Property

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 497.56' @ 12.05 hrs Surf.Area= 5,339 sf Storage= 316 cf

Plug-Flow detention time= 3.6 min calculated for 0.066 af (100% of inflow)
Center-of-Mass det. time= 3.6 min (921.2 - 917.6)

Volume	Invert	Avail.Storage	Storage Description
#1	497.50'	29,897 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

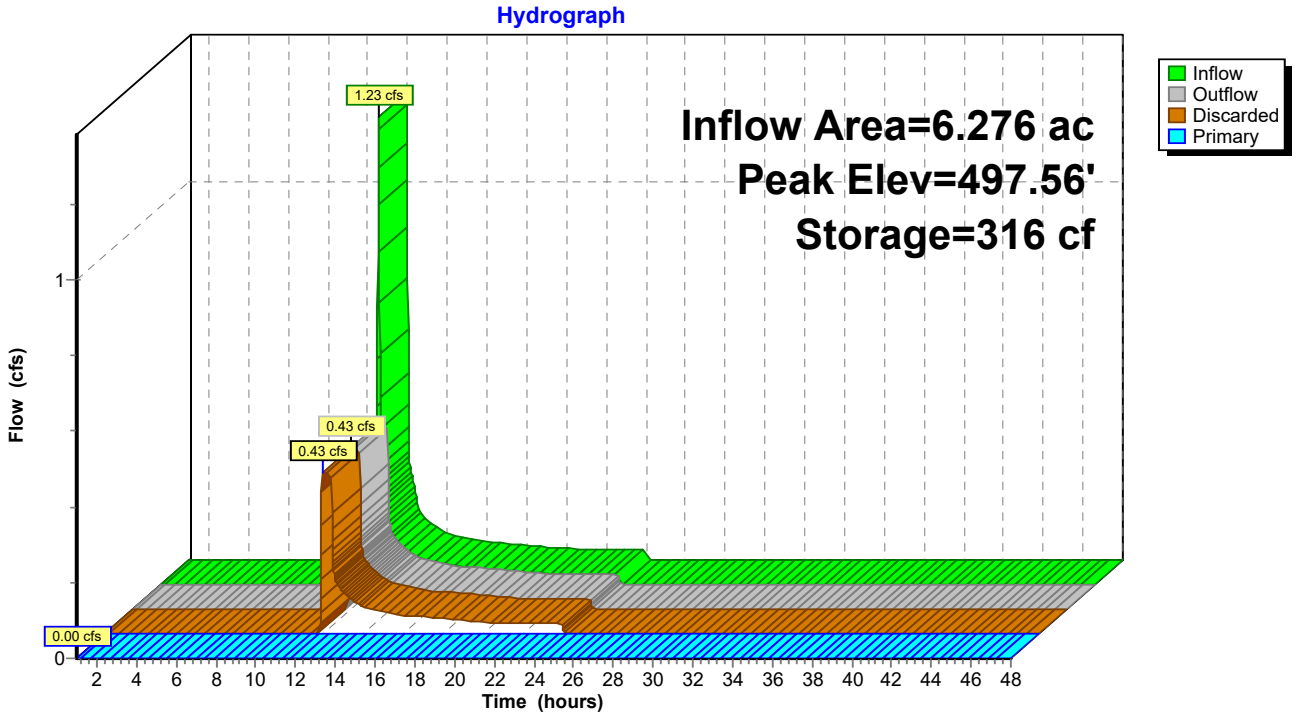
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
497.50	5,246	0	0
498.50	6,799	6,023	6,023
499.50	8,522	7,661	13,683
500.00	10,648	4,793	18,476
501.00	12,194	11,421	29,897

Device	Routing	Invert	Outlet Devices
#1	Primary	500.00'	**20.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	497.50'	**3.500 in/hr Exfiltration over Surface area below 497.51'** Phase-In= 0.01'

Discarded OutFlow Max=0.43 cfs @ 11.92 hrs HW=497.51' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.43 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=497.50' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Infiltration Basin B-1



Summary for Pond U1: Underground A-2 (ADS)

Inflow Area = 3.111 ac, 85.50% Impervious, Inflow Depth = 0.99" for 1-yr event
Inflow = 6.54 cfs @ 11.91 hrs, Volume= 0.256 af
Outflow = 0.30 cfs @ 11.56 hrs, Volume= 0.256 af, Atten= 95%, Lag= 0.0 min
Discarded = 0.30 cfs @ 11.56 hrs, Volume= 0.256 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 484.21' @ 12.94 hrs Surf.Area= 12,977 sf Storage= 4,915 cf

Plug-Flow detention time= 144.3 min calculated for 0.256 af (100% of inflow)
Center-of-Mass det. time= 144.3 min (969.0 - 824.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	483.50'	11,975 cf	**77.50'W x 167.45'L x 3.75'H Field A** 48,665 cf Overall - 18,727 cf Embedded = 29,938 cf x 40.0% Voids
#2A	484.00'	18,727 cf	**ADS_StormTech SC-800 +Cap** x 368 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 368 Chambers in 16 Rows Cap Storage= 3.4 cf x 2 x 16 rows = 109.4 cf
		30,703 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	484.00'	**18.0" Round Culvert** L= 135.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 484.00' / 482.00' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	486.75'	**4.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#3	Discarded	483.50'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.30 cfs @ 11.56 hrs HW=483.51' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=483.50' TW=482.00' (Dynamic Tailwater)
↑**1=Culvert** (Controls 0.00 cfs)
↑**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond U1: Underground A-2 (ADS) - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-800 +Cap (ADS StormTech®SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 16 rows = 109.4 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

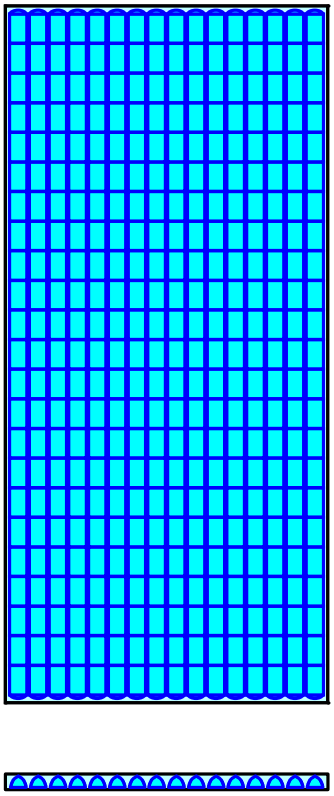
23 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 165.45' Row Length +12.0" End Stone x 2 = 167.45' Base Length
16 Rows x 51.0" Wide + 6.0" Spacing x 15 + 12.0" Side Stone x 2 = 77.50' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

368 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 16 Rows = 18,727.4 cf Chamber Storage

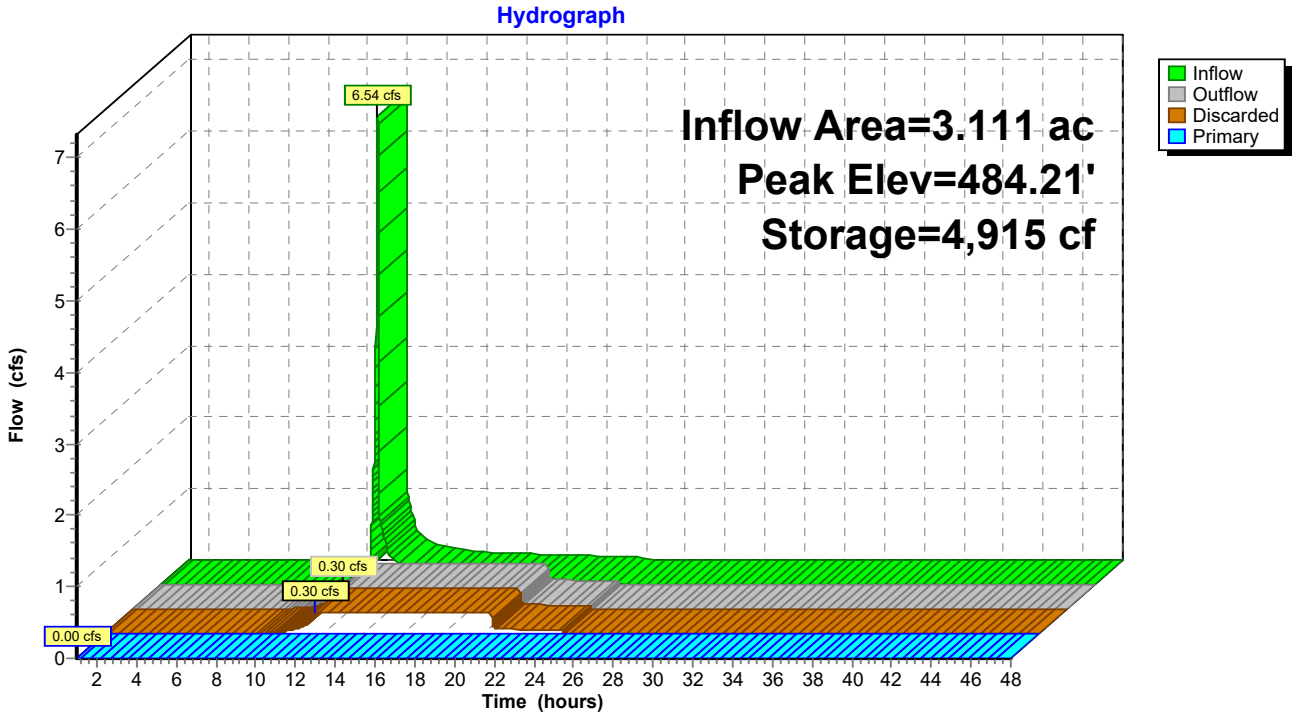
48,665.2 cf Field - 18,727.4 cf Chambers = 29,937.8 cf Stone x 40.0% Voids = 11,975.1 cf Stone Storage

Chamber Storage + Stone Storage = 30,702.5 cf = 0.705 af
Overall Storage Efficiency = 63.1%
Overall System Size = 167.45' x 77.50' x 3.75'

368 Chambers
1,802.4 cy Field
1,108.8 cy Stone



Pond U1: Underground A-2 (ADS)



Summary for Pond U2: Underground B-2 (ADS)

Inflow Area = 3.060 ac, 71.86% Impervious, Inflow Depth = 0.71" for 1-yr event
Inflow = 4.66 cfs @ 11.92 hrs, Volume= 0.181 af
Outflow = 0.90 cfs @ 11.73 hrs, Volume= 0.181 af, Atten= 81%, Lag= 0.0 min
Discarded = 0.90 cfs @ 11.73 hrs, Volume= 0.181 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Infiltration Basin B-1

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 506.04' @ 12.02 hrs Surf.Area= 7,809 sf Storage= 1,848 cf

Plug-Flow detention time= 9.9 min calculated for 0.181 af (100% of inflow)
Center-of-Mass det. time= 9.9 min (857.1 - 847.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	505.50'	7,413 cf	**20.50'W x 380.95'L x 3.75'H Field A** 29,286 cf Overall - 10,753 cf Embedded = 18,533 cf x 40.0% Voids
#2A	506.00'	10,753 cf	**ADS_StormTech SC-800 +Cap** x 212 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 212 Chambers in 4 Rows Cap Storage= 3.4 cf x 2 x 4 rows = 27.4 cf
		18,166 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	506.00'	**18.0" Round Culvert** L= 170.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 506.00' / 497.50' S= 0.0500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	508.75'	**4.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#3	Discarded	505.50'	**5.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.90 cfs @ 11.73 hrs HW=505.51' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.90 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=505.50' TW=497.50' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond U2: Underground B-2 (ADS) - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-800 +Cap (ADS StormTech®SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 4 rows = 27.4 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

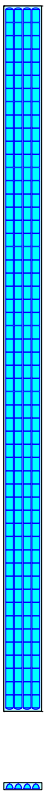
53 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 378.95' Row Length +12.0" End Stone x 2 = 380.95' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

212 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 4 Rows = 10,752.9 cf Chamber Storage

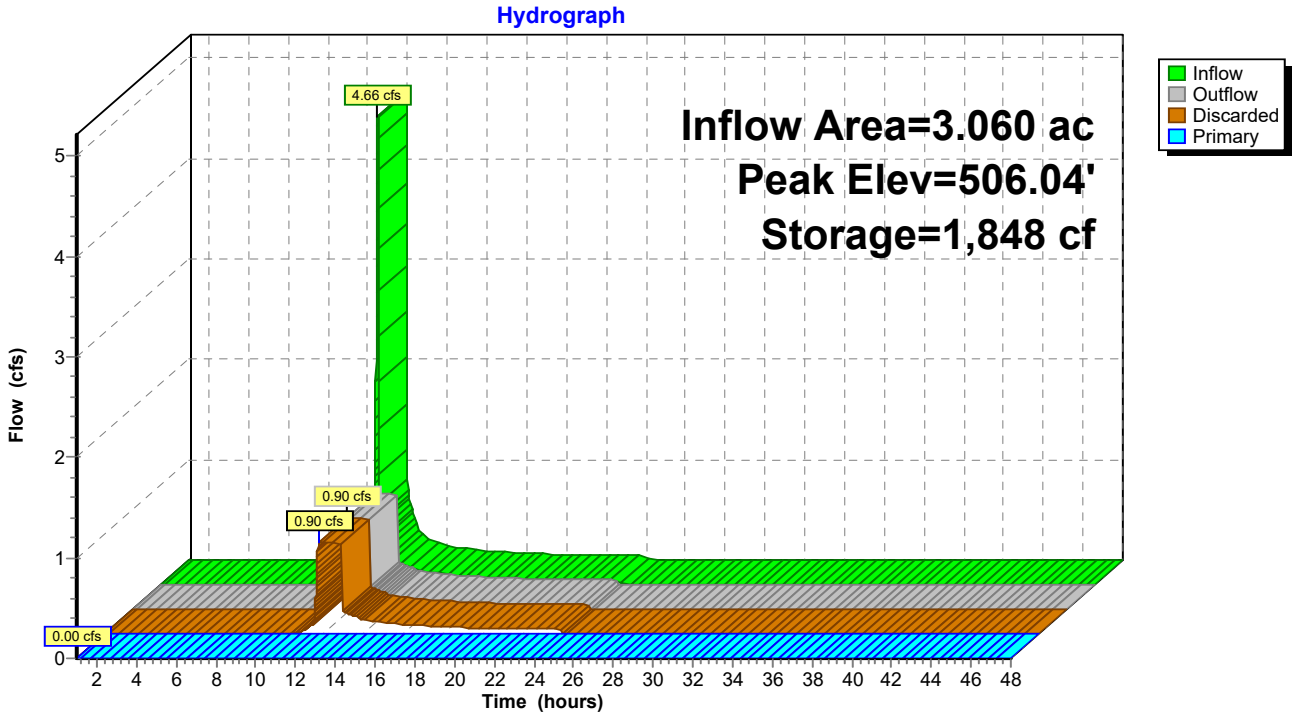
29,285.5 cf Field - 10,752.9 cf Chambers = 18,532.6 cf Stone x 40.0% Voids = 7,413.0 cf Stone Storage

Chamber Storage + Stone Storage = 18,166.0 cf = 0.417 af
Overall Storage Efficiency = 62.0%
Overall System Size = 380.95' x 20.50' x 3.75'

212 Chambers
1,084.6 cy Field
686.4 cy Stone



Pond U2: Underground B-2 (ADS)



Summary for Pond 1P: Infiltration Basin A-1

Inflow Area = 4.773 ac, 56.34% Impervious, Inflow Depth = 1.04" for 10-yr event
Inflow = 9.37 cfs @ 11.96 hrs, Volume= 0.412 af
Outflow = 0.59 cfs @ 11.68 hrs, Volume= 0.412 af, Atten= 94%, Lag= 0.0 min
Discarded = 0.59 cfs @ 11.68 hrs, Volume= 0.412 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 495.96' @ 12.92 hrs Surf.Area= 7,911 sf Storage= 6,892 cf

Plug-Flow detention time= 101.4 min calculated for 0.412 af (100% of inflow)
Center-of-Mass det. time= 101.4 min (961.8 - 860.4)

Volume	Invert	Avail.Storage	Storage Description
#1	495.00'	39,324 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

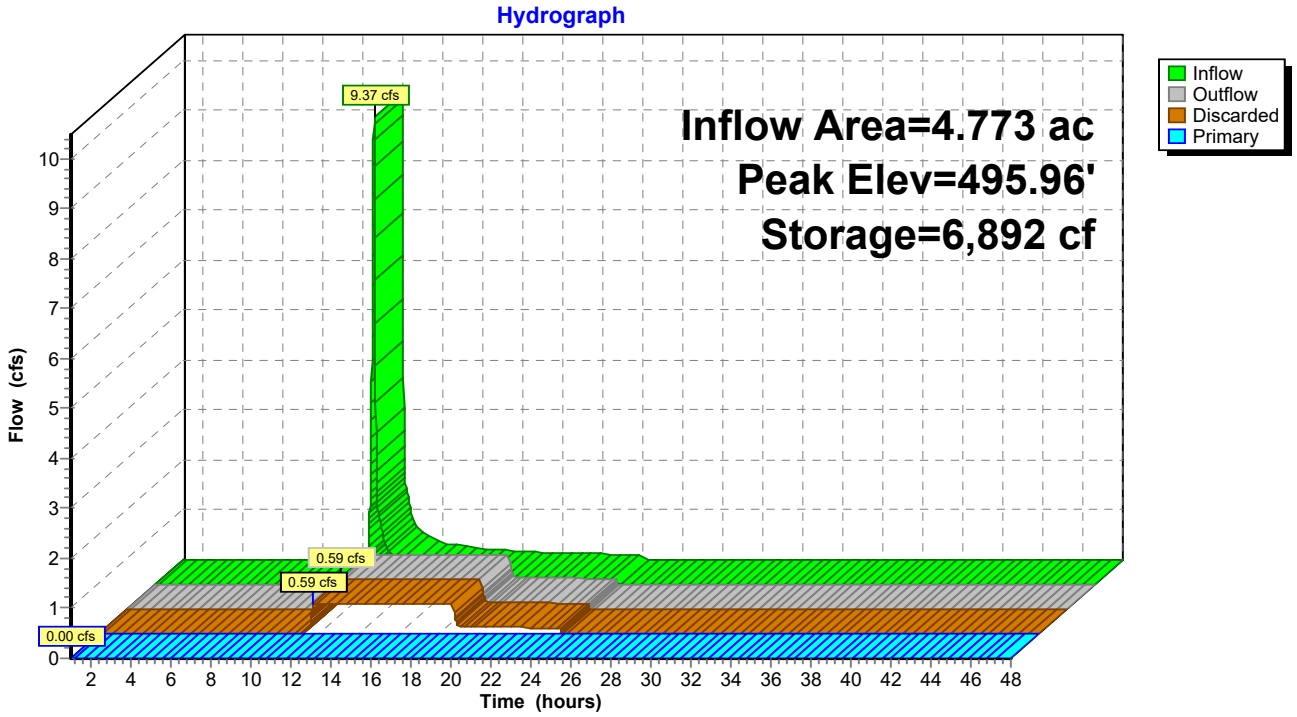
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
495.00	6,386	0	0
496.00	7,968	7,177	7,177
497.00	9,747	8,858	16,035
498.00	11,768	10,758	26,792
499.00	13,295	12,532	39,324

Device	Routing	Invert	Outlet Devices
#1	Primary	497.50'	**20.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	495.00'	**4.000 in/hr Exfiltration over Surface area below 495.01'** Phase-In= 0.01'

Discarded OutFlow Max=0.59 cfs @ 11.68 hrs HW=495.01' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.59 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=495.00' TW=482.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin A-1



Summary for Pond 2P: Infiltration Basin A-3

Inflow = 6.54 cfs @ 11.94 hrs, Volume= 0.274 af
Outflow = 0.15 cfs @ 11.59 hrs, Volume= 0.274 af, Atten= 98%, Lag= 0.0 min
Discarded = 0.15 cfs @ 11.59 hrs, Volume= 0.274 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Link POI-A : Point of Interest A - Offsite to Roadway
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 3P : Infiltration Basin A-4

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 483.27' @ 15.99 hrs Surf.Area= 6,314 sf Storage= 6,661 cf

Plug-Flow detention time= 507.1 min calculated for 0.273 af (100% of inflow)
Center-of-Mass det. time= 507.1 min (1,363.2 - 856.0)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	30,958 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.00	4,183	0	0
483.00	5,833	5,008	5,008
484.00	7,601	6,717	11,725
485.00	9,703	8,652	20,377
486.00	11,458	10,581	30,958

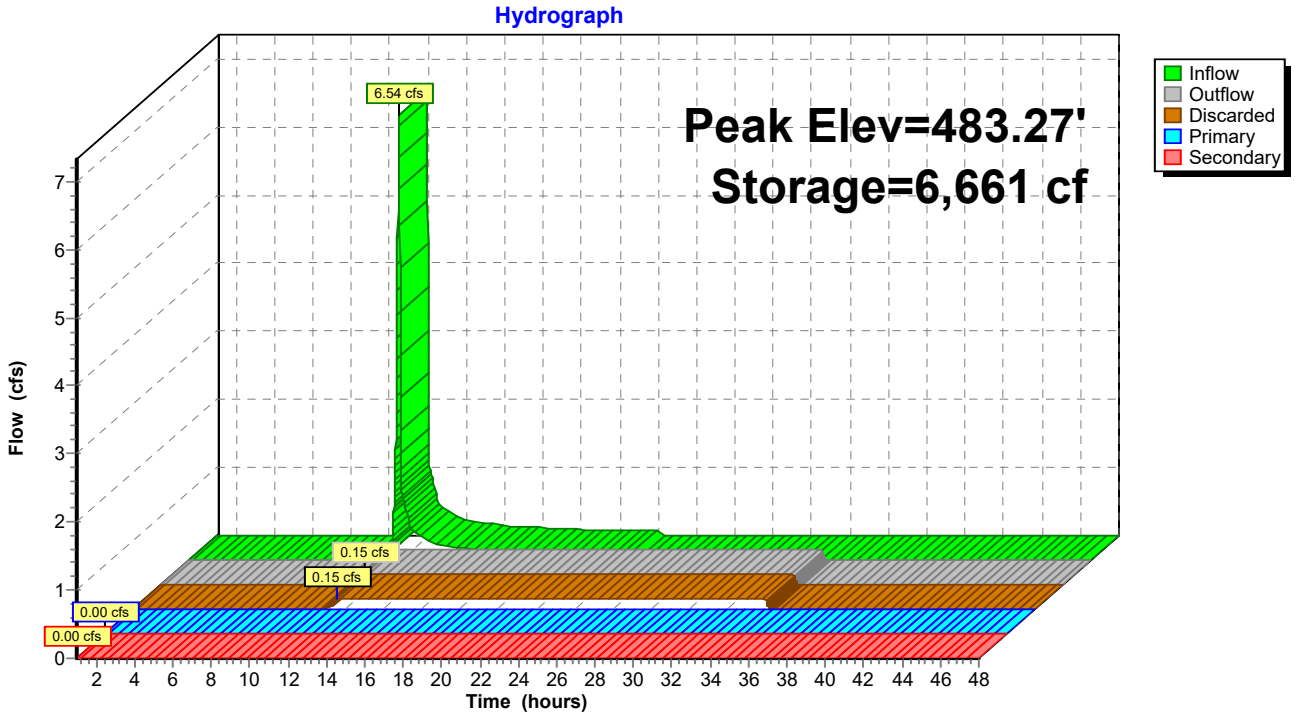
Device	Routing	Invert	Outlet Devices
#1	Primary	485.00'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	482.00'	**1.500 in/hr Exfiltration over Surface area below 482.01'** Phase-In= 0.01'
#3	Secondary	484.50'	**15.0" Round Culvert** L= 75.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 482.00' / 484.50' S= -0.0333 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Discarded OutFlow Max=0.15 cfs @ 11.59 hrs HW=482.01' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=482.00' TW=0.00' (Dynamic Tailwater)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=482.00' TW=482.50' (Dynamic Tailwater)
↑**3=Culvert** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin A-3



Summary for Pond 3P: Infiltration Basin A-4

Inflow = 2.03 cfs @ 11.92 hrs, Volume= 0.081 af
Outflow = 0.19 cfs @ 11.72 hrs, Volume= 0.081 af, Atten= 91%, Lag= 0.0 min
Discarded = 0.19 cfs @ 11.72 hrs, Volume= 0.081 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 483.02' @ 12.42 hrs Surf.Area= 2,444 sf Storage= 1,062 cf

Plug-Flow detention time= 39.7 min calculated for 0.081 af (100% of inflow)
Center-of-Mass det. time= 39.7 min (907.7 - 868.0)

Volume	Invert	Avail.Storage	Storage Description
#1	482.50'	12,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

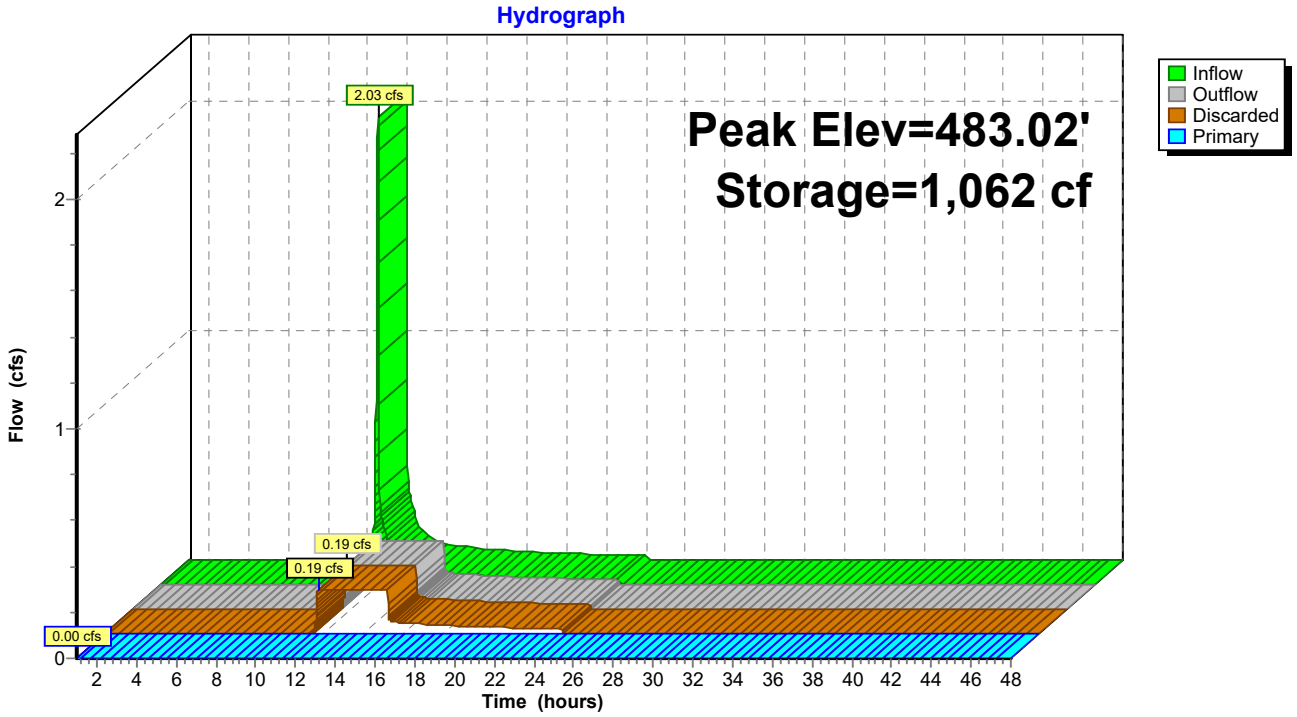
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.50	1,611	0	0
483.50	3,202	2,407	2,407
484.50	4,922	4,062	6,469
485.50	6,663	5,793	12,261

Device	Routing	Invert	Outlet Devices
#1	Primary	482.50'	**15.0" Round Culvert** L= 75.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 482.50' / 482.00' S= 0.0067 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Device 1	484.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	482.50'	**5.000 in/hr Exfiltration over Surface area below 482.51'** Phase-In= 0.01'

Discarded OutFlow Max=0.19 cfs @ 11.72 hrs HW=482.51' (Free Discharge)
↑└**3=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=482.50' TW=482.00' (Dynamic Tailwater)
↑└**1=Culvert** (Controls 0.00 cfs)
↑└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: Infiltration Basin A-4



Summary for Pond 4P: Infiltration Basin B-1

Inflow Area = 6.276 ac, 62.72% Impervious, Inflow Depth = 0.50" for 10-yr event
Inflow = 6.20 cfs @ 11.95 hrs, Volume= 0.263 af
Outflow = 0.43 cfs @ 11.69 hrs, Volume= 0.263 af, Atten= 93%, Lag= 0.0 min
Discarded = 0.43 cfs @ 11.69 hrs, Volume= 0.263 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Link POI-B : Point of Interest B - Southern Property

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 498.21' @ 12.74 hrs Surf.Area= 6,356 sf Storage= 4,148 cf

Plug-Flow detention time= 81.0 min calculated for 0.263 af (100% of inflow)
Center-of-Mass det. time= 81.0 min (943.8 - 862.8)

Volume	Invert	Avail.Storage	Storage Description
#1	497.50'	29,897 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

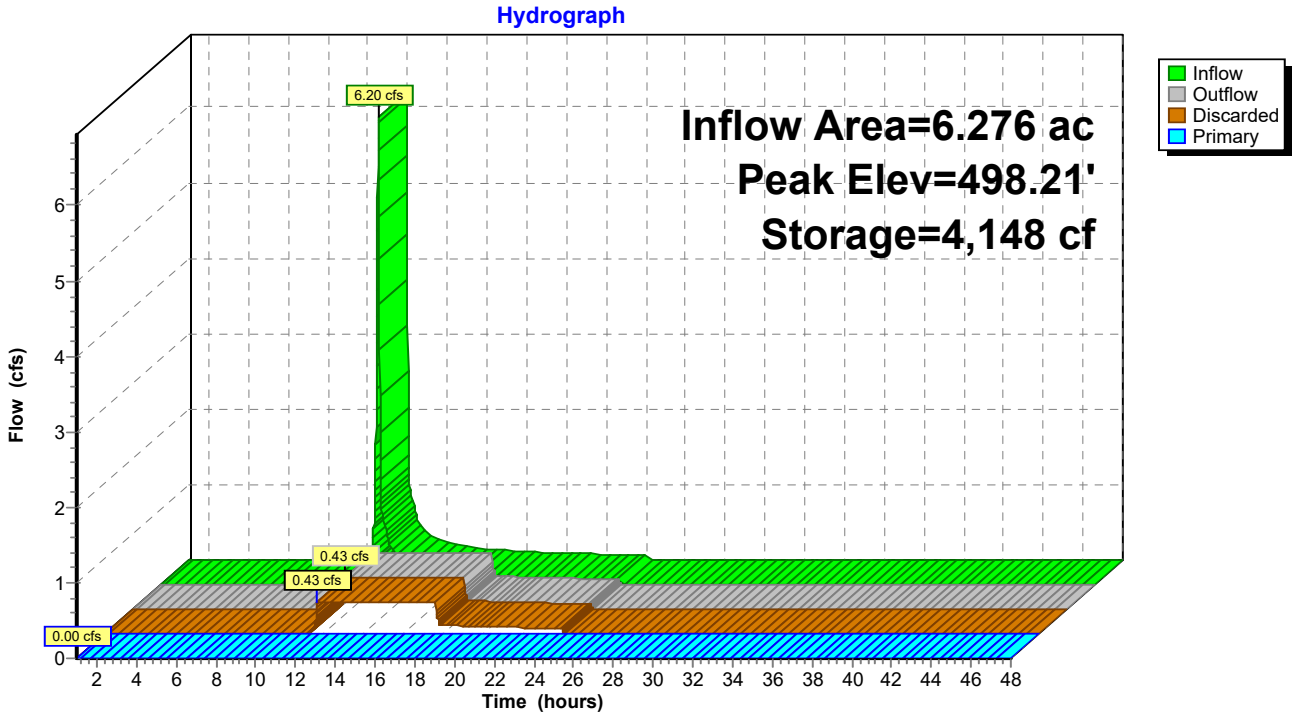
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
497.50	5,246	0	0
498.50	6,799	6,023	6,023
499.50	8,522	7,661	13,683
500.00	10,648	4,793	18,476
501.00	12,194	11,421	29,897

Device	Routing	Invert	Outlet Devices
#1	Primary	500.00'	**20.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	497.50'	**3.500 in/hr Exfiltration over Surface area below 497.51'** Phase-In= 0.01'

Discarded OutFlow Max=0.43 cfs @ 11.69 hrs HW=497.51' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.43 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=497.50' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Infiltration Basin B-1



Summary for Pond U1: Underground A-2 (ADS)

Inflow Area = 3.111 ac, 85.50% Impervious, Inflow Depth = 2.24" for 10-yr event
Inflow = 14.23 cfs @ 11.91 hrs, Volume= 0.580 af
Outflow = 0.30 cfs @ 10.75 hrs, Volume= 0.580 af, Atten= 98%, Lag= 0.0 min
Discarded = 0.30 cfs @ 10.75 hrs, Volume= 0.580 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 485.07' @ 14.78 hrs Surf.Area= 12,977 sf Storage= 14,098 cf

Plug-Flow detention time= 459.6 min calculated for 0.580 af (100% of inflow)
Center-of-Mass det. time= 459.6 min (1,260.9 - 801.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	483.50'	11,975 cf	**77.50'W x 167.45'L x 3.75'H Field A** 48,665 cf Overall - 18,727 cf Embedded = 29,938 cf x 40.0% Voids
#2A	484.00'	18,727 cf	**ADS_StormTech SC-800 +Cap** x 368 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 368 Chambers in 16 Rows Cap Storage= 3.4 cf x 2 x 16 rows = 109.4 cf
		30,703 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	484.00'	**18.0" Round Culvert** L= 135.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 484.00' / 482.00' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	486.75'	**4.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#3	Discarded	483.50'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.30 cfs @ 10.75 hrs HW=483.51' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=483.50' TW=482.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond U1: Underground A-2 (ADS) - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-800 +Cap (ADS StormTech®SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 16 rows = 109.4 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

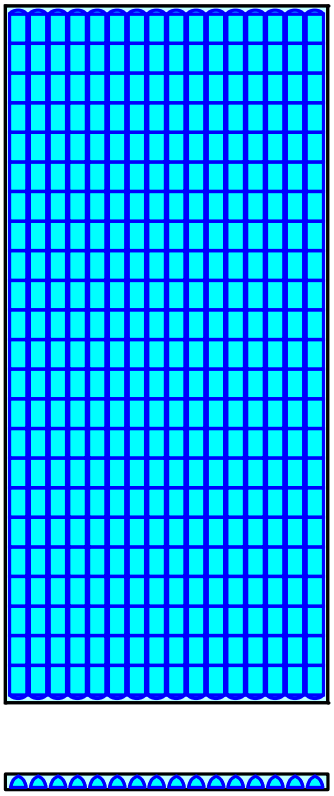
23 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 165.45' Row Length +12.0" End Stone x 2 = 167.45' Base Length
16 Rows x 51.0" Wide + 6.0" Spacing x 15 + 12.0" Side Stone x 2 = 77.50' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

368 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 16 Rows = 18,727.4 cf Chamber Storage

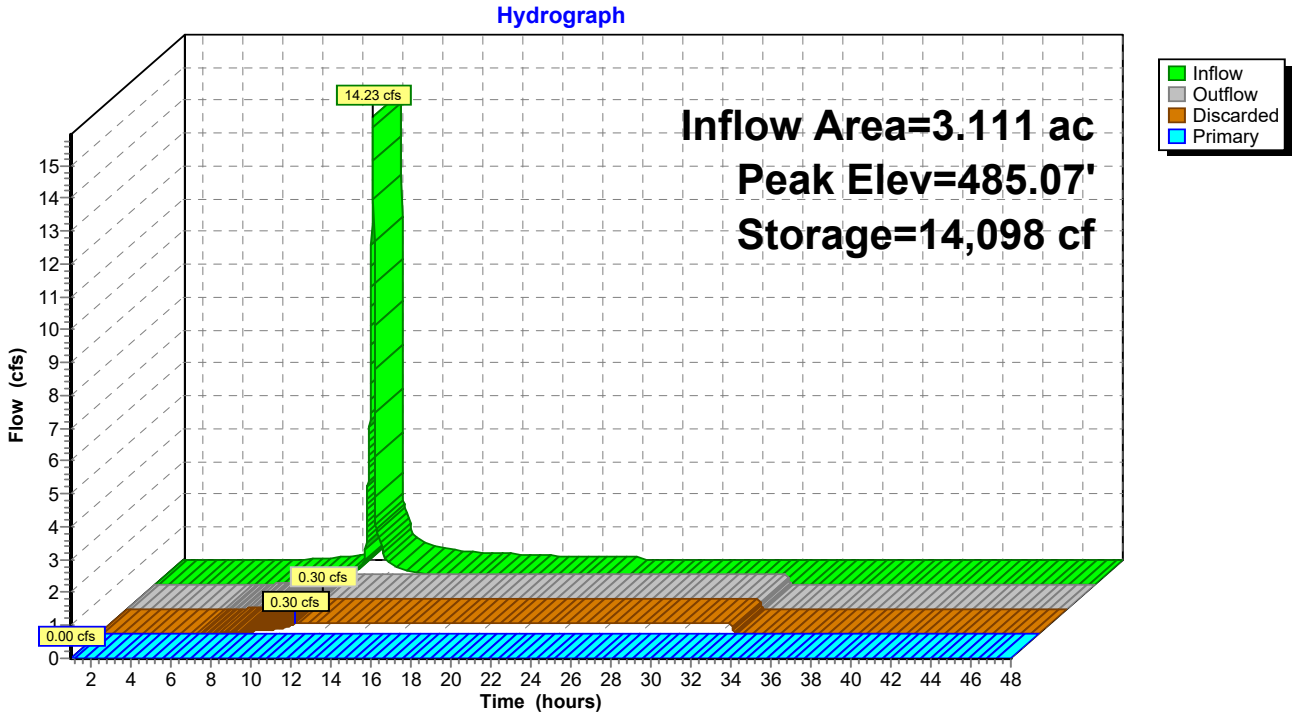
48,665.2 cf Field - 18,727.4 cf Chambers = 29,937.8 cf Stone x 40.0% Voids = 11,975.1 cf Stone Storage

Chamber Storage + Stone Storage = 30,702.5 cf = 0.705 af
Overall Storage Efficiency = 63.1%
Overall System Size = 167.45' x 77.50' x 3.75'

368 Chambers
1,802.4 cy Field
1,108.8 cy Stone



Pond U1: Underground A-2 (ADS)



Summary for Pond U2: Underground B-2 (ADS)

Inflow Area = 3.060 ac, 71.86% Impervious, Inflow Depth = 1.83" for 10-yr event
Inflow = 11.75 cfs @ 11.92 hrs, Volume= 0.466 af
Outflow = 0.90 cfs @ 11.57 hrs, Volume= 0.466 af, Atten= 92%, Lag= 0.0 min
Discarded = 0.90 cfs @ 11.57 hrs, Volume= 0.466 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Infiltration Basin B-1

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 506.95' @ 12.41 hrs Surf.Area= 7,809 sf Storage= 7,571 cf

Plug-Flow detention time= 60.5 min calculated for 0.465 af (100% of inflow)
Center-of-Mass det. time= 60.5 min (880.1 - 819.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	505.50'	7,413 cf	**20.50'W x 380.95'L x 3.75'H Field A** 29,286 cf Overall - 10,753 cf Embedded = 18,533 cf x 40.0% Voids
#2A	506.00'	10,753 cf	**ADS_StormTech SC-800 +Cap** x 212 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 212 Chambers in 4 Rows Cap Storage= 3.4 cf x 2 x 4 rows = 27.4 cf
		18,166 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	506.00'	**18.0" Round Culvert** L= 170.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 506.00' / 497.50' S= 0.0500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	508.75'	**4.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#3	Discarded	505.50'	**5.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.90 cfs @ 11.57 hrs HW=505.51' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.90 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=505.50' TW=497.50' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond U2: Underground B-2 (ADS) - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-800 +Cap (ADS StormTech®SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 4 rows = 27.4 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

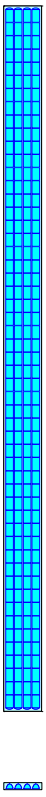
53 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 378.95' Row Length +12.0" End Stone x 2 = 380.95' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

212 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 4 Rows = 10,752.9 cf Chamber Storage

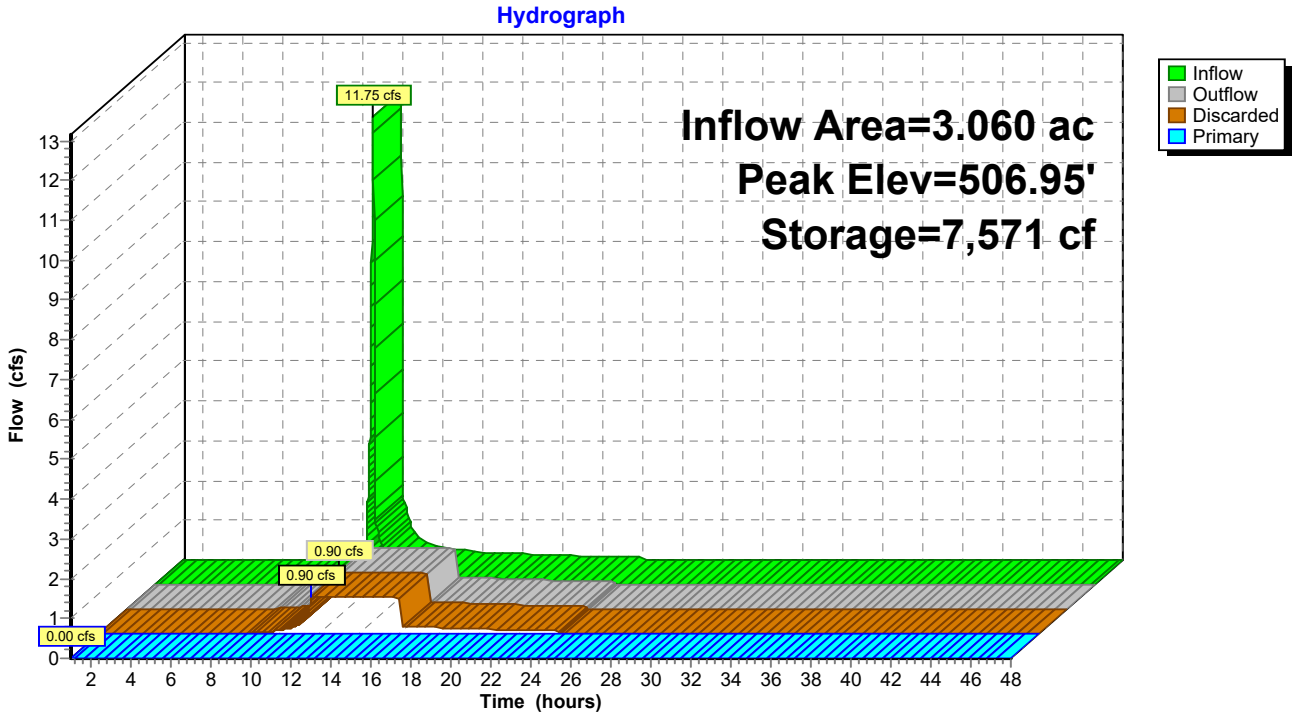
29,285.5 cf Field - 10,752.9 cf Chambers = 18,532.6 cf Stone x 40.0% Voids = 7,413.0 cf Stone Storage

Chamber Storage + Stone Storage = 18,166.0 cf = 0.417 af
Overall Storage Efficiency = 62.0%
Overall System Size = 380.95' x 20.50' x 3.75'

212 Chambers
1,084.6 cy Field
686.4 cy Stone



Pond U2: Underground B-2 (ADS)



Summary for Pond 1P: Infiltration Basin A-1

Inflow Area = 4.773 ac, 56.34% Impervious, Inflow Depth = 1.49" for 25-yr event
Inflow = 13.57 cfs @ 11.96 hrs, Volume= 0.592 af
Outflow = 0.59 cfs @ 11.62 hrs, Volume= 0.592 af, Atten= 96%, Lag= 0.0 min
Discarded = 0.59 cfs @ 11.62 hrs, Volume= 0.592 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 496.53' @ 13.50 hrs Surf.Area= 8,912 sf Storage= 11,655 cf

Plug-Flow detention time= 193.7 min calculated for 0.592 af (100% of inflow)
Center-of-Mass det. time= 193.7 min (1,042.9 - 849.2)

Volume	Invert	Avail.Storage	Storage Description
#1	495.00'	39,324 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

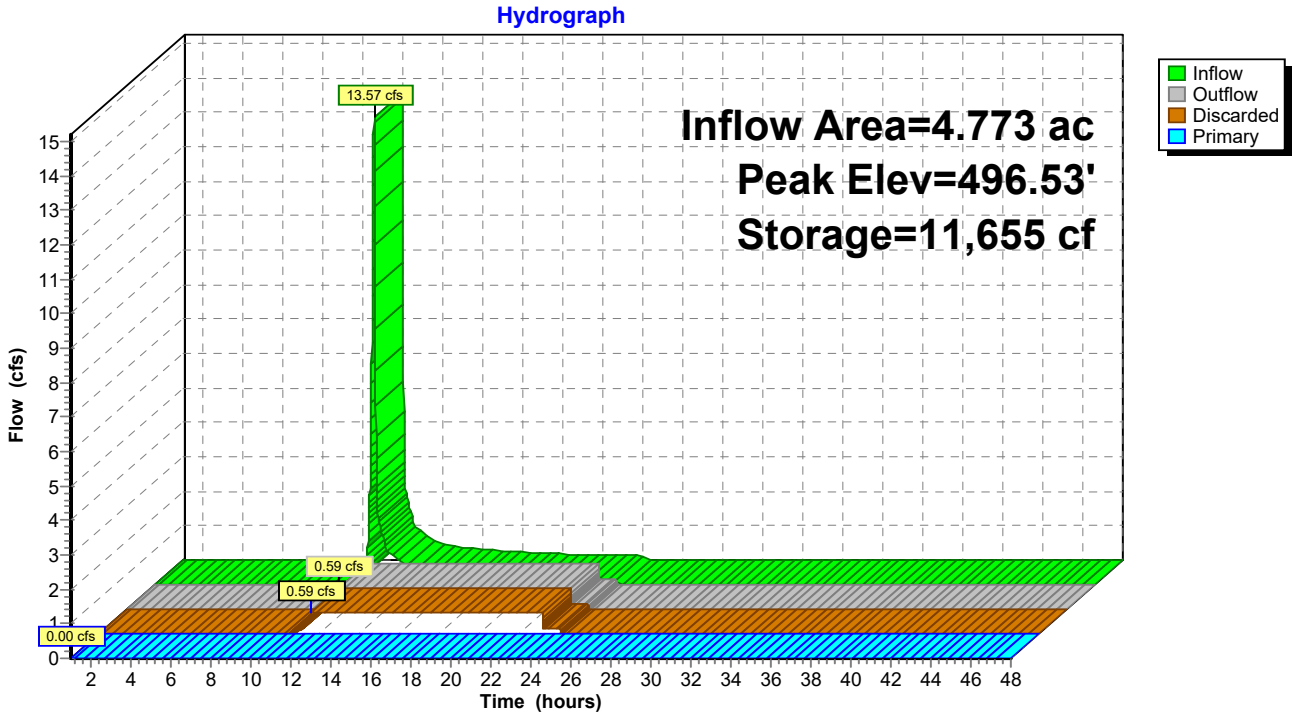
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
495.00	6,386	0	0
496.00	7,968	7,177	7,177
497.00	9,747	8,858	16,035
498.00	11,768	10,758	26,792
499.00	13,295	12,532	39,324

Device	Routing	Invert	Outlet Devices
#1	Primary	497.50'	**20.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	495.00'	**4.000 in/hr Exfiltration over Surface area below 495.01'** Phase-In= 0.01'

Discarded OutFlow Max=0.59 cfs @ 11.62 hrs HW=495.01' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.59 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=495.00' TW=482.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin A-1



Summary for Pond 2P: Infiltration Basin A-3

Inflow = 9.36 cfs @ 11.94 hrs, Volume= 0.389 af
Outflow = 0.15 cfs @ 11.32 hrs, Volume= 0.389 af, Atten= 98%, Lag= 0.0 min
Discarded = 0.15 cfs @ 11.32 hrs, Volume= 0.389 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Link POI-A : Point of Interest A - Offsite to Roadway
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 3P : Infiltration Basin A-4

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 483.87' @ 18.40 hrs Surf.Area= 7,375 sf Storage= 10,768 cf

Plug-Flow detention time= 779.7 min calculated for 0.389 af (100% of inflow)
Center-of-Mass det. time= 779.7 min (1,624.9 - 845.2)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	30,958 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.00	4,183	0	0
483.00	5,833	5,008	5,008
484.00	7,601	6,717	11,725
485.00	9,703	8,652	20,377
486.00	11,458	10,581	30,958

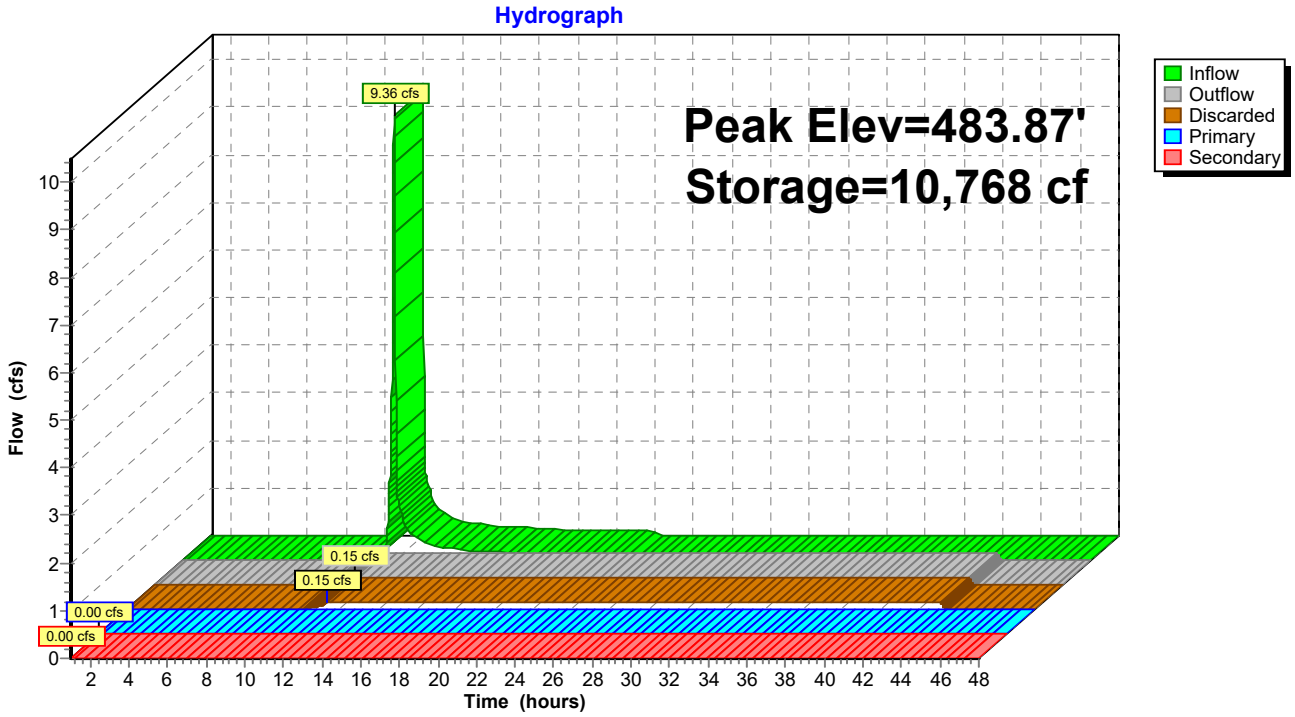
Device	Routing	Invert	Outlet Devices
#1	Primary	485.00'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	482.00'	**1.500 in/hr Exfiltration over Surface area below 482.01'** Phase-In= 0.01'
#3	Secondary	484.50'	**15.0" Round Culvert** L= 75.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 482.00' / 484.50' S= -0.0333 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Discarded OutFlow Max=0.15 cfs @ 11.32 hrs HW=482.01' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=482.00' TW=0.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=482.00' TW=482.50' (Dynamic Tailwater)
└**3=Culvert** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin A-3



Summary for Pond 3P: Infiltration Basin A-4

Inflow = 3.05 cfs @ 11.92 hrs, Volume= 0.119 af
Outflow = 0.19 cfs @ 11.63 hrs, Volume= 0.119 af, Atten= 94%, Lag= 0.0 min
Discarded = 0.19 cfs @ 11.63 hrs, Volume= 0.119 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 483.35' @ 12.71 hrs Surf.Area= 2,963 sf Storage= 1,943 cf

Plug-Flow detention time= 86.3 min calculated for 0.119 af (100% of inflow)
Center-of-Mass det. time= 86.3 min (941.6 - 855.3)

Volume	Invert	Avail.Storage	Storage Description
#1	482.50'	12,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

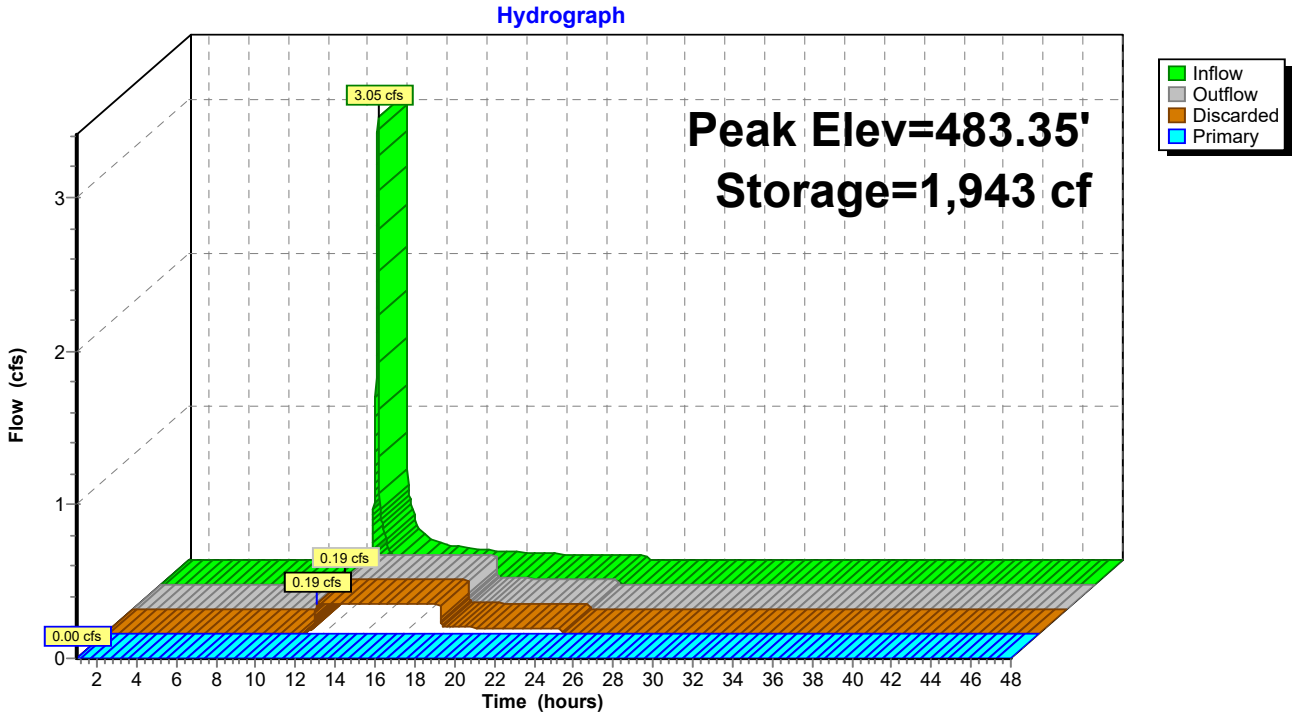
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.50	1,611	0	0
483.50	3,202	2,407	2,407
484.50	4,922	4,062	6,469
485.50	6,663	5,793	12,261

Device	Routing	Invert	Outlet Devices
#1	Primary	482.50'	**15.0" Round Culvert** L= 75.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 482.50' / 482.00' S= 0.0067 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Device 1	484.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	482.50'	**5.000 in/hr Exfiltration over Surface area below 482.51'** Phase-In= 0.01'

Discarded OutFlow Max=0.19 cfs @ 11.63 hrs HW=482.51' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=482.50' TW=482.00' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: Infiltration Basin A-4



Summary for Pond 4P: Infiltration Basin B-1

Inflow Area = 6.276 ac, 62.72% Impervious, Inflow Depth = 0.73" for 25-yr event
Inflow = 9.07 cfs @ 11.95 hrs, Volume= 0.381 af
Outflow = 0.43 cfs @ 11.62 hrs, Volume= 0.381 af, Atten= 95%, Lag= 0.0 min
Discarded = 0.43 cfs @ 11.62 hrs, Volume= 0.381 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Link POI-B : Point of Interest B - Southern Property

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 498.67' @ 13.29 hrs Surf.Area= 7,086 sf Storage= 7,178 cf

Plug-Flow detention time= 160.4 min calculated for 0.381 af (100% of inflow)
Center-of-Mass det. time= 160.4 min (1,011.5 - 851.1)

Volume	Invert	Avail.Storage	Storage Description
#1	497.50'	29,897 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

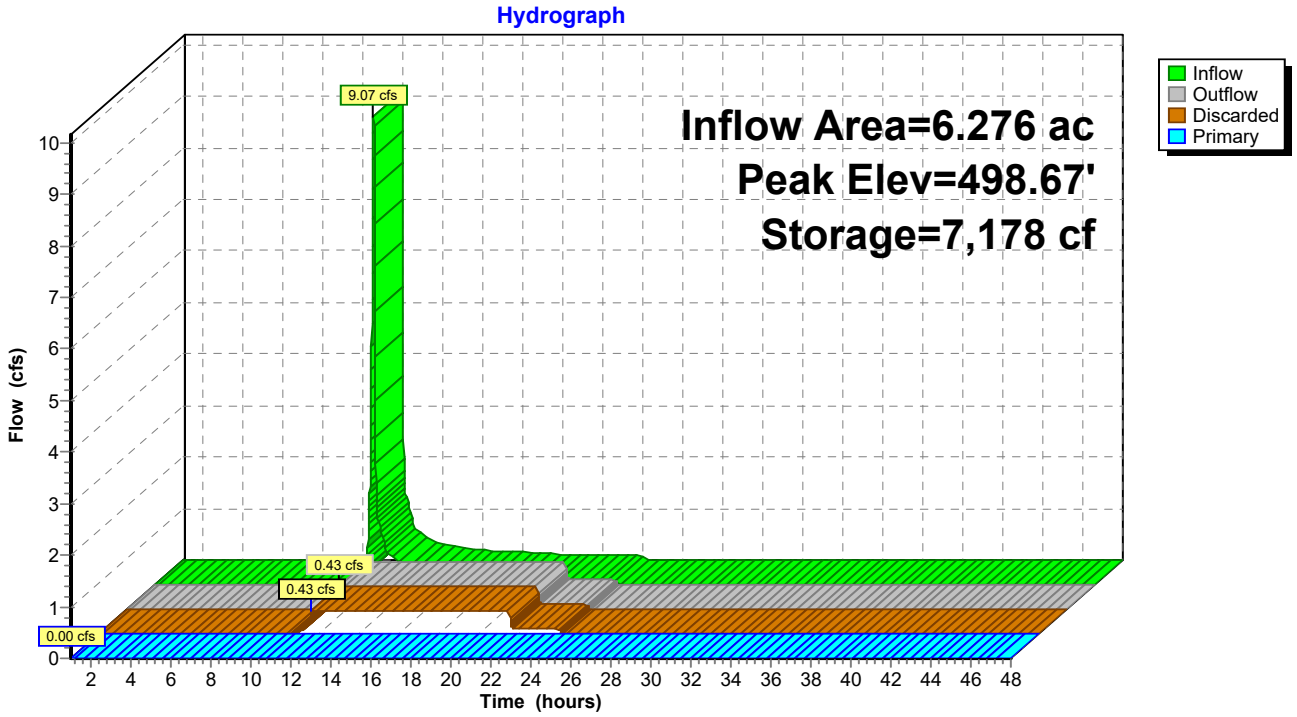
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
497.50	5,246	0	0
498.50	6,799	6,023	6,023
499.50	8,522	7,661	13,683
500.00	10,648	4,793	18,476
501.00	12,194	11,421	29,897

Device	Routing	Invert	Outlet Devices
#1	Primary	500.00'	**20.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	497.50'	**3.500 in/hr Exfiltration over Surface area below 497.51'** Phase-In= 0.01'

Discarded OutFlow Max=0.43 cfs @ 11.62 hrs HW=497.51' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.43 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=497.50' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Infiltration Basin B-1



Summary for Pond U1: Underground A-2 (ADS)

Inflow Area = 3.111 ac, 85.50% Impervious, Inflow Depth = 2.86" for 25-yr event
Inflow = 17.89 cfs @ 11.91 hrs, Volume= 0.742 af
Outflow = 0.30 cfs @ 10.34 hrs, Volume= 0.742 af, Atten= 98%, Lag= 0.0 min
Discarded = 0.30 cfs @ 10.34 hrs, Volume= 0.742 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 485.60' @ 15.64 hrs Surf.Area= 12,977 sf Storage= 19,268 cf

Plug-Flow detention time= 619.5 min calculated for 0.741 af (100% of inflow)
Center-of-Mass det. time= 619.5 min (1,413.9 - 794.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	483.50'	11,975 cf	**77.50'W x 167.45'L x 3.75'H Field A** 48,665 cf Overall - 18,727 cf Embedded = 29,938 cf x 40.0% Voids
#2A	484.00'	18,727 cf	**ADS_StormTech SC-800 +Cap** x 368 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 368 Chambers in 16 Rows Cap Storage= 3.4 cf x 2 x 16 rows = 109.4 cf
		30,703 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	484.00'	**18.0" Round Culvert** L= 135.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 484.00' / 482.00' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	486.75'	**4.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#3	Discarded	483.50'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.30 cfs @ 10.34 hrs HW=483.51' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=483.50' TW=482.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond U1: Underground A-2 (ADS) - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-800 +Cap (ADS StormTech®SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 16 rows = 109.4 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

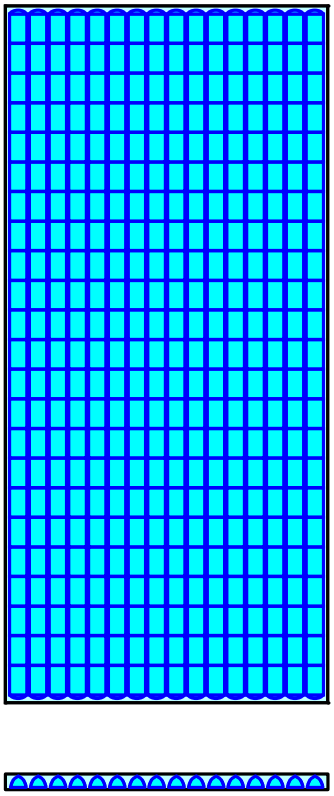
23 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 165.45' Row Length +12.0" End Stone x 2 = 167.45' Base Length
16 Rows x 51.0" Wide + 6.0" Spacing x 15 + 12.0" Side Stone x 2 = 77.50' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

368 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 16 Rows = 18,727.4 cf Chamber Storage

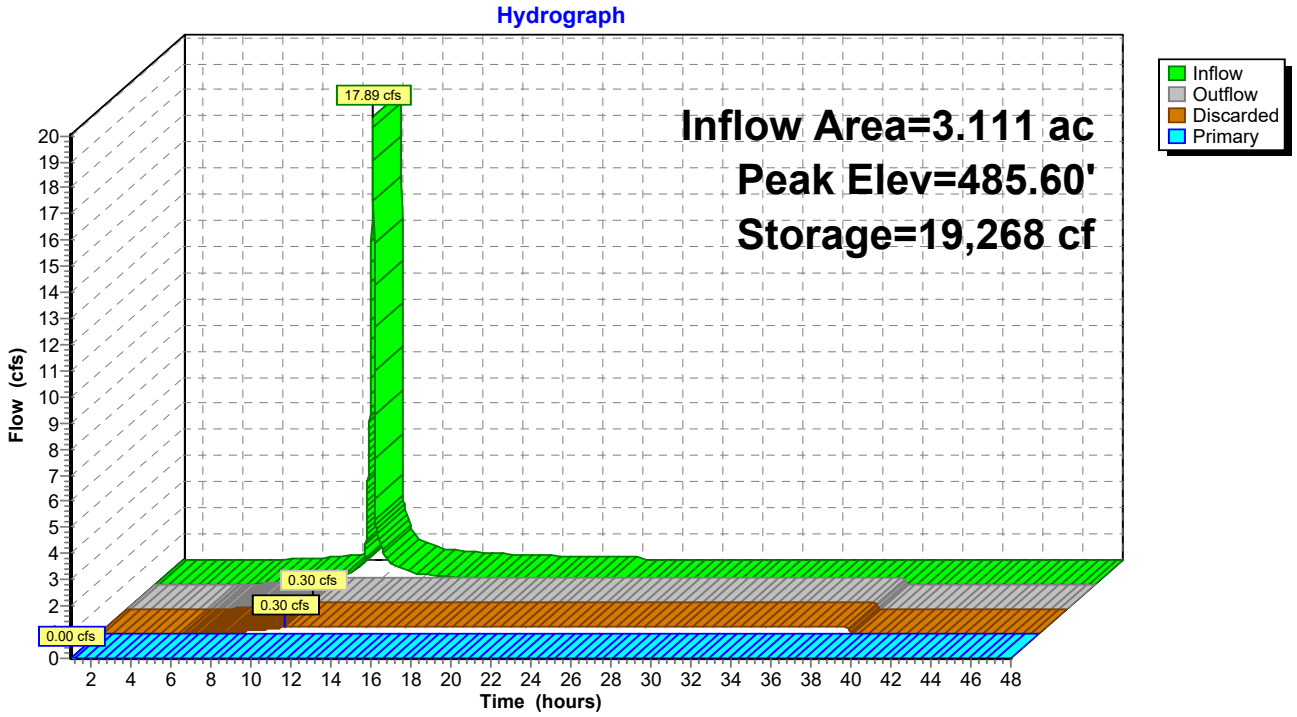
48,665.2 cf Field - 18,727.4 cf Chambers = 29,937.8 cf Stone x 40.0% Voids = 11,975.1 cf Stone Storage

Chamber Storage + Stone Storage = 30,702.5 cf = 0.705 af
Overall Storage Efficiency = 63.1%
Overall System Size = 167.45' x 77.50' x 3.75'

368 Chambers
1,802.4 cy Field
1,108.8 cy Stone



Pond U1: Underground A-2 (ADS)



Summary for Pond U2: Underground B-2 (ADS)

Inflow Area = 3.060 ac, 71.86% Impervious, Inflow Depth = 2.41" for 25-yr event
Inflow = 15.28 cfs @ 11.92 hrs, Volume= 0.614 af
Outflow = 0.90 cfs @ 11.54 hrs, Volume= 0.614 af, Atten= 94%, Lag= 0.0 min
Discarded = 0.90 cfs @ 11.54 hrs, Volume= 0.614 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Infiltration Basin B-1

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 507.52' @ 12.52 hrs Surf.Area= 7,809 sf Storage= 10,922 cf

Plug-Flow detention time= 94.2 min calculated for 0.613 af (100% of inflow)
Center-of-Mass det. time= 94.2 min (905.9 - 811.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	505.50'	7,413 cf	**20.50'W x 380.95'L x 3.75'H Field A** 29,286 cf Overall - 10,753 cf Embedded = 18,533 cf x 40.0% Voids
#2A	506.00'	10,753 cf	**ADS_StormTech SC-800 +Cap** x 212 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 212 Chambers in 4 Rows Cap Storage= 3.4 cf x 2 x 4 rows = 27.4 cf
		18,166 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	506.00'	**18.0" Round Culvert** L= 170.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 506.00' / 497.50' S= 0.0500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	508.75'	**4.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#3	Discarded	505.50'	**5.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.90 cfs @ 11.54 hrs HW=505.51' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.90 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=505.50' TW=497.50' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond U2: Underground B-2 (ADS) - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-800 +Cap (ADS StormTech®SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 4 rows = 27.4 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

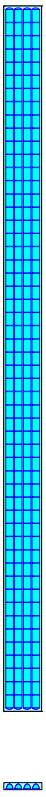
53 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 378.95' Row Length +12.0" End Stone x 2 = 380.95' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

212 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 4 Rows = 10,752.9 cf Chamber Storage

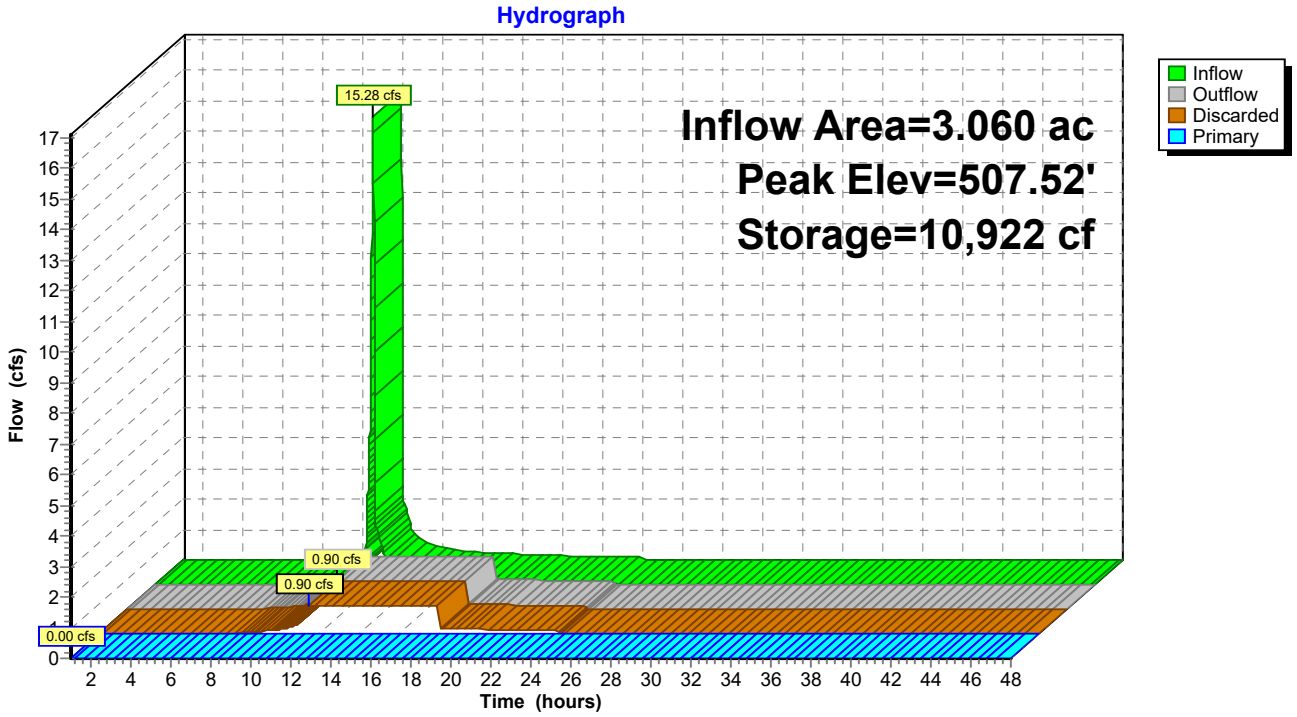
29,285.5 cf Field - 10,752.9 cf Chambers = 18,532.6 cf Stone x 40.0% Voids = 7,413.0 cf Stone Storage

Chamber Storage + Stone Storage = 18,166.0 cf = 0.417 af
Overall Storage Efficiency = 62.0%
Overall System Size = 380.95' x 20.50' x 3.75'

212 Chambers
1,084.6 cy Field
686.4 cy Stone



Pond U2: Underground B-2 (ADS)



Summary for Pond 1P: Infiltration Basin A-1

Inflow Area = 4.773 ac, 56.34% Impervious, Inflow Depth = 2.24" for 100-yr event
Inflow = 20.47 cfs @ 11.96 hrs, Volume= 0.893 af
Outflow = 0.59 cfs @ 11.43 hrs, Volume= 0.893 af, Atten= 97%, Lag= 0.0 min
Discarded = 0.59 cfs @ 11.43 hrs, Volume= 0.893 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 497.42' @ 14.52 hrs Surf.Area= 10,598 sf Storage= 20,316 cf

Plug-Flow detention time= 360.5 min calculated for 0.892 af (100% of inflow)
Center-of-Mass det. time= 360.5 min (1,197.6 - 837.1)

Volume	Invert	Avail.Storage	Storage Description
#1	495.00'	39,324 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

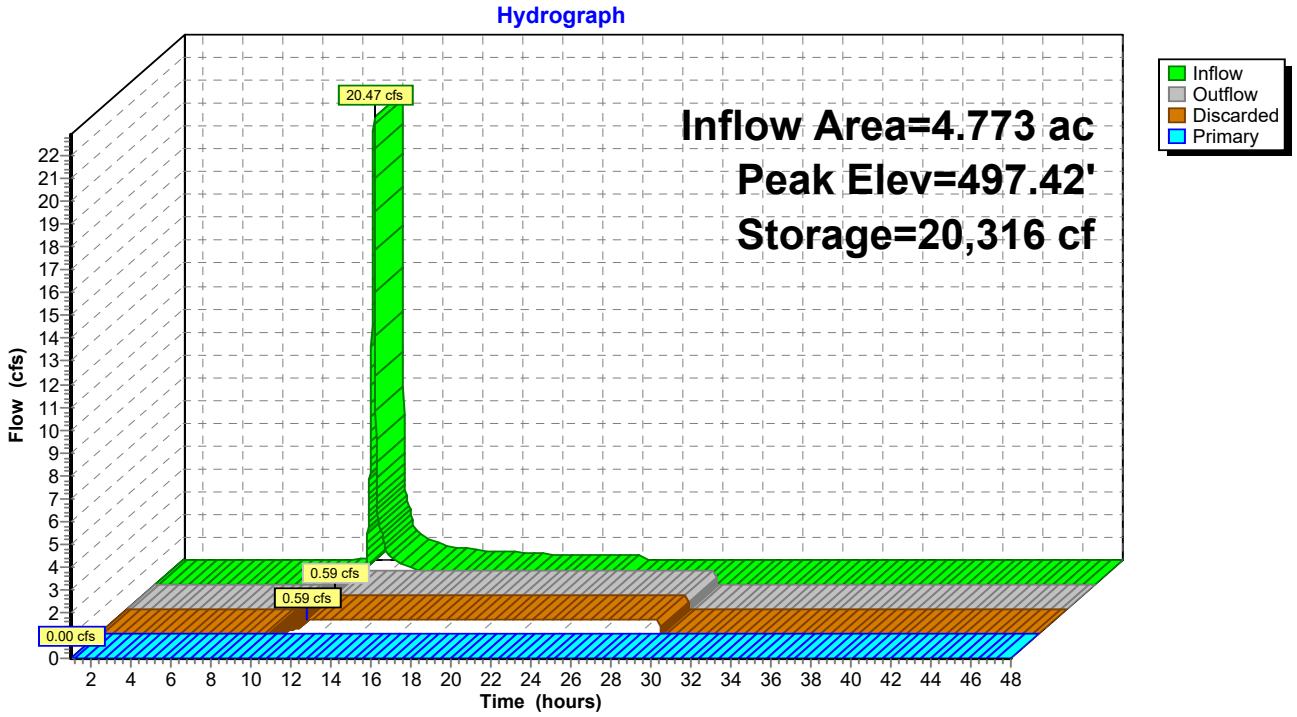
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
495.00	6,386	0	0
496.00	7,968	7,177	7,177
497.00	9,747	8,858	16,035
498.00	11,768	10,758	26,792
499.00	13,295	12,532	39,324

Device	Routing	Invert	Outlet Devices
#1	Primary	497.50'	**20.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	495.00'	**4.000 in/hr Exfiltration over Surface area below 495.01'** Phase-In= 0.01'

Discarded OutFlow Max=0.59 cfs @ 11.43 hrs HW=495.01' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.59 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=495.00' TW=482.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin A-1



Summary for Pond 2P: Infiltration Basin A-3

Inflow = 13.95 cfs @ 11.94 hrs, Volume= 0.582 af
Outflow = 0.23 cfs @ 17.41 hrs, Volume= 0.497 af, Atten= 98%, Lag= 328.0 min
Discarded = 0.15 cfs @ 10.80 hrs, Volume= 0.456 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Link POI-A : Point of Interest A - Offsite to Roadway
Secondary = 0.08 cfs @ 17.41 hrs, Volume= 0.041 af
Routed to Pond 3P : Infiltration Basin A-4

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 484.65' @ 17.41 hrs Surf.Area= 8,960 sf Storage= 17,077 cf

Plug-Flow detention time= 929.5 min calculated for 0.496 af (85% of inflow)
Center-of-Mass det. time= 860.7 min (1,694.1 - 833.4)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	30,958 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.00	4,183	0	0
483.00	5,833	5,008	5,008
484.00	7,601	6,717	11,725
485.00	9,703	8,652	20,377
486.00	11,458	10,581	30,958

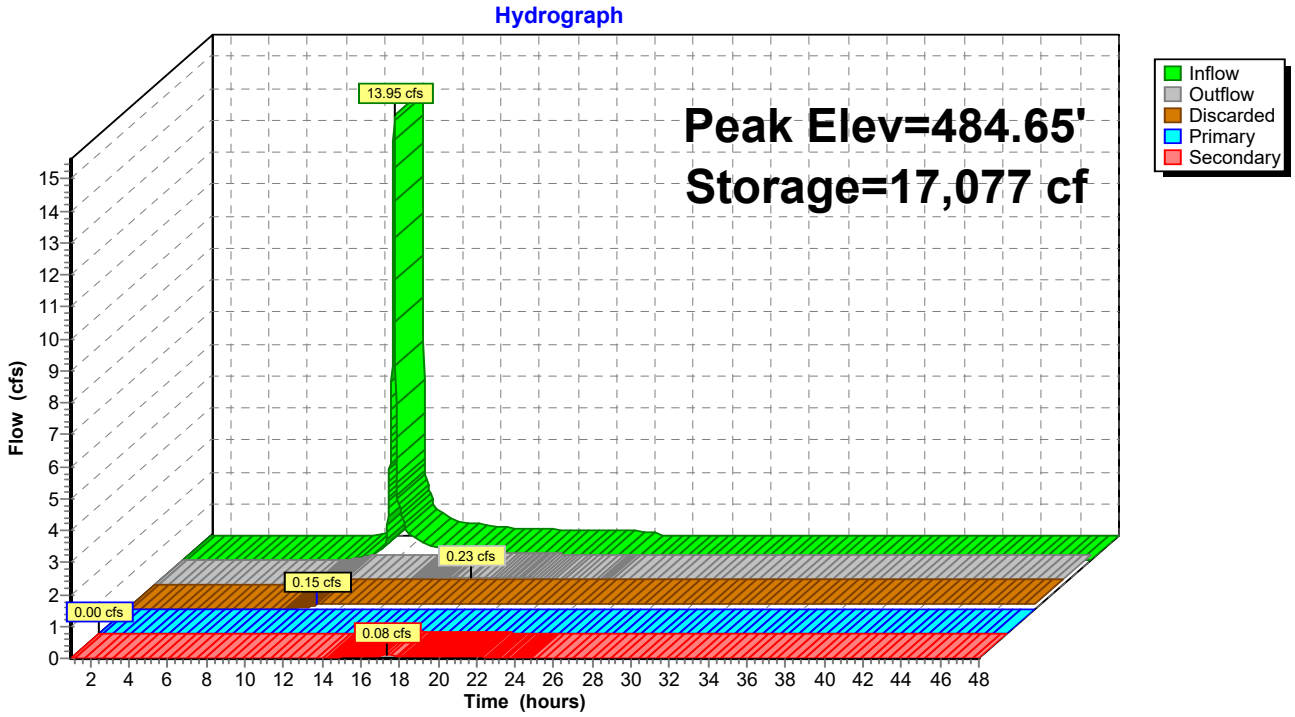
Device	Routing	Invert	Outlet Devices
#1	Primary	485.00'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	482.00'	**1.500 in/hr Exfiltration over Surface area below 482.01'** Phase-In= 0.01'
#3	Secondary	484.50'	**15.0" Round Culvert** L= 75.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 482.00' / 484.50' S= -0.0333 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Discarded OutFlow Max=0.15 cfs @ 10.80 hrs HW=482.01' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=482.00' TW=0.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.08 cfs @ 17.41 hrs HW=484.65' TW=483.72' (Dynamic Tailwater)
└**3=Culvert** (Inlet Controls 0.08 cfs @ 1.03 fps)

Pond 2P: Infiltration Basin A-3



Summary for Pond 3P: Infiltration Basin A-4

Inflow = 4.73 cfs @ 11.92 hrs, Volume= 0.226 af
Outflow = 0.19 cfs @ 11.56 hrs, Volume= 0.226 af, Atten= 96%, Lag= 0.0 min
Discarded = 0.19 cfs @ 11.56 hrs, Volume= 0.226 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 483.85' @ 13.38 hrs Surf.Area= 3,809 sf Storage= 3,644 cf

Plug-Flow detention time= 215.4 min calculated for 0.226 af (100% of inflow)
Center-of-Mass det. time= 215.4 min (1,107.4 - 892.1)

Volume	Invert	Avail.Storage	Storage Description
#1	482.50'	12,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

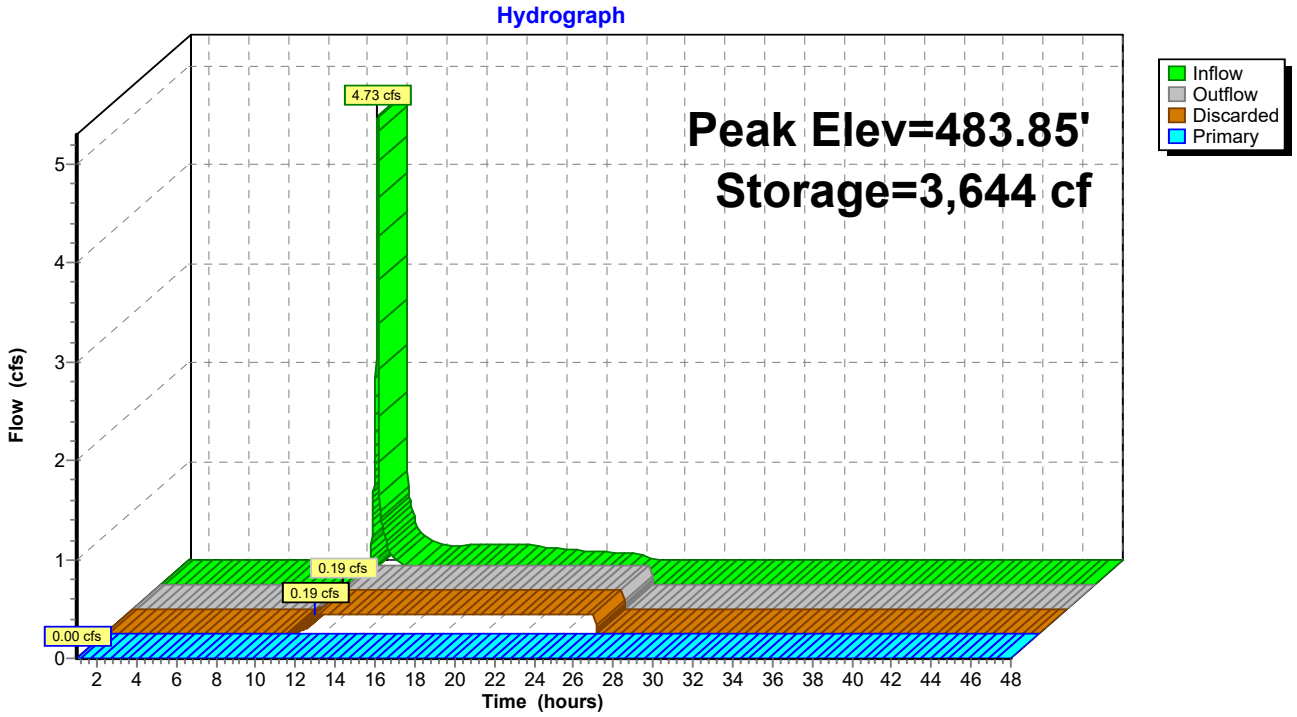
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.50	1,611	0	0
483.50	3,202	2,407	2,407
484.50	4,922	4,062	6,469
485.50	6,663	5,793	12,261

Device	Routing	Invert	Outlet Devices
#1	Primary	482.50'	**15.0" Round Culvert** L= 75.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 482.50' / 482.00' S= 0.0067 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Device 1	484.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	482.50'	**5.000 in/hr Exfiltration over Surface area below 482.51'** Phase-In= 0.01'

Discarded OutFlow Max=0.19 cfs @ 11.56 hrs HW=482.51' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=482.50' TW=482.00' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: Infiltration Basin A-4



Summary for Pond 4P: Infiltration Basin B-1

Inflow Area = 6.276 ac, 62.72% Impervious, Inflow Depth = 1.11" for 100-yr event
Inflow = 13.81 cfs @ 11.94 hrs, Volume= 0.579 af
Outflow = 0.43 cfs @ 11.51 hrs, Volume= 0.579 af, Atten= 97%, Lag= 0.0 min
Discarded = 0.43 cfs @ 11.51 hrs, Volume= 0.579 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Link POI-B : Point of Interest B - Southern Property

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 499.39' @ 14.04 hrs Surf.Area= 8,333 sf Storage= 12,760 cf

Plug-Flow detention time= 312.9 min calculated for 0.579 af (100% of inflow)
Center-of-Mass det. time= 312.9 min (1,151.6 - 838.7)

Volume	Invert	Avail.Storage	Storage Description
#1	497.50'	29,897 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

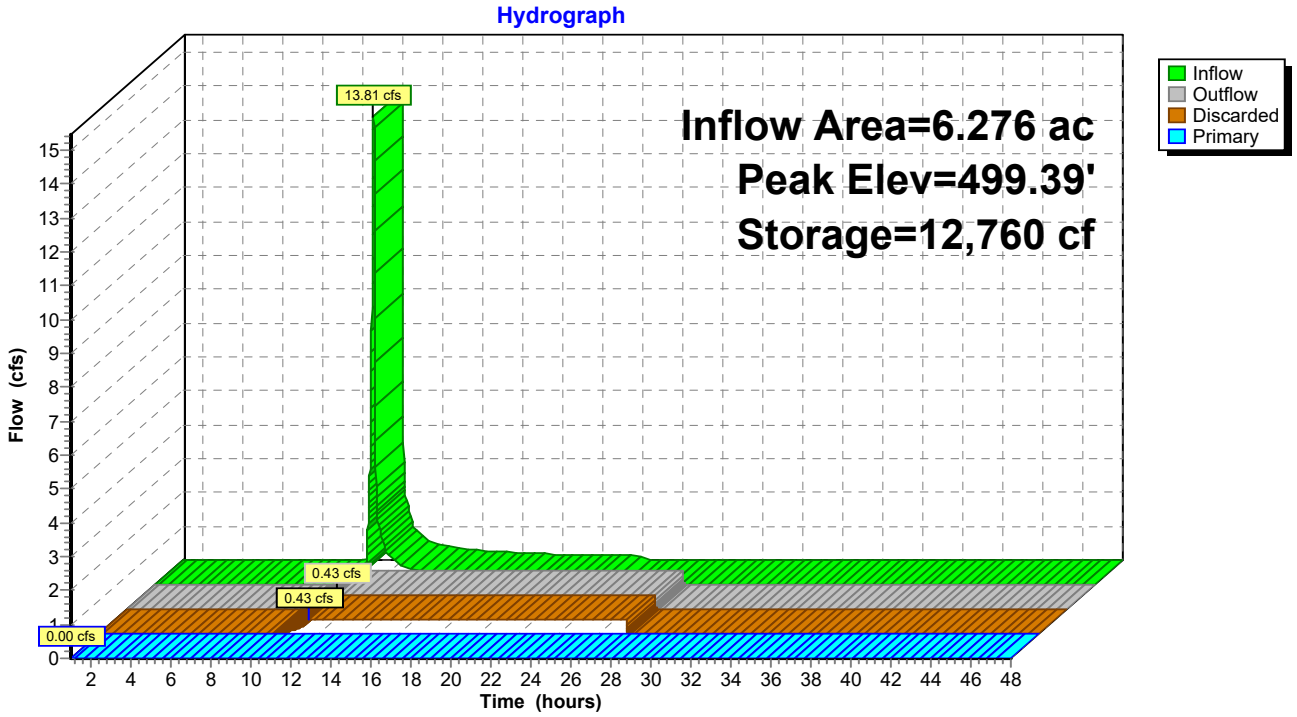
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
497.50	5,246	0	0
498.50	6,799	6,023	6,023
499.50	8,522	7,661	13,683
500.00	10,648	4,793	18,476
501.00	12,194	11,421	29,897

Device	Routing	Invert	Outlet Devices
#1	Primary	500.00'	**20.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	497.50'	**3.500 in/hr Exfiltration over Surface area below 497.51'** Phase-In= 0.01'

Discarded OutFlow Max=0.43 cfs @ 11.51 hrs HW=497.51' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.43 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=497.50' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Infiltration Basin B-1



Summary for Pond U1: Underground A-2 (ADS)

Inflow Area = 3.111 ac, 85.50% Impervious, Inflow Depth = 3.83" for 100-yr event
Inflow = 23.45 cfs @ 11.91 hrs, Volume= 0.993 af
Outflow = 0.30 cfs @ 9.72 hrs, Volume= 0.993 af, Atten= 99%, Lag= 0.0 min
Discarded = 0.30 cfs @ 9.72 hrs, Volume= 0.993 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 2P : Infiltration Basin A-3

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 486.69' @ 17.26 hrs Surf.Area= 12,977 sf Storage= 27,761 cf

Plug-Flow detention time= 870.5 min calculated for 0.993 af (100% of inflow)
Center-of-Mass det. time= 870.6 min (1,656.8 - 786.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	483.50'	11,975 cf	**77.50'W x 167.45'L x 3.75'H Field A** 48,665 cf Overall - 18,727 cf Embedded = 29,938 cf x 40.0% Voids
#2A	484.00'	18,727 cf	**ADS_StormTech SC-800 +Cap** x 368 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 368 Chambers in 16 Rows Cap Storage= 3.4 cf x 2 x 16 rows = 109.4 cf
		30,703 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	484.00'	**18.0" Round Culvert** L= 135.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 484.00' / 482.00' S= 0.0148 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	486.75'	**4.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#3	Discarded	483.50'	**1.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.30 cfs @ 9.72 hrs HW=483.51' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=483.50' TW=482.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond U1: Underground A-2 (ADS) - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-800 +Cap (ADS StormTech®SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 16 rows = 109.4 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

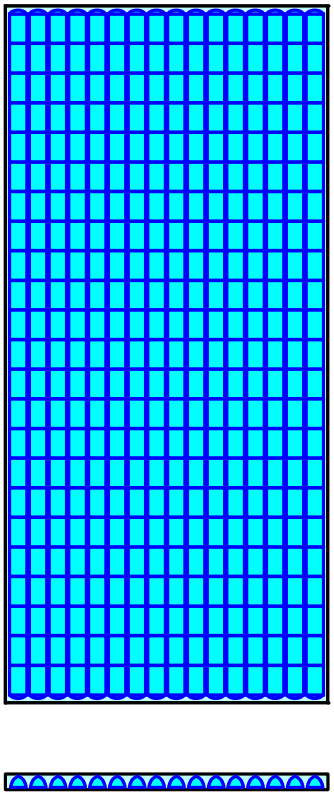
23 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 165.45' Row Length +12.0" End Stone x 2 = 167.45' Base Length
16 Rows x 51.0" Wide + 6.0" Spacing x 15 + 12.0" Side Stone x 2 = 77.50' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

368 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 16 Rows = 18,727.4 cf Chamber Storage

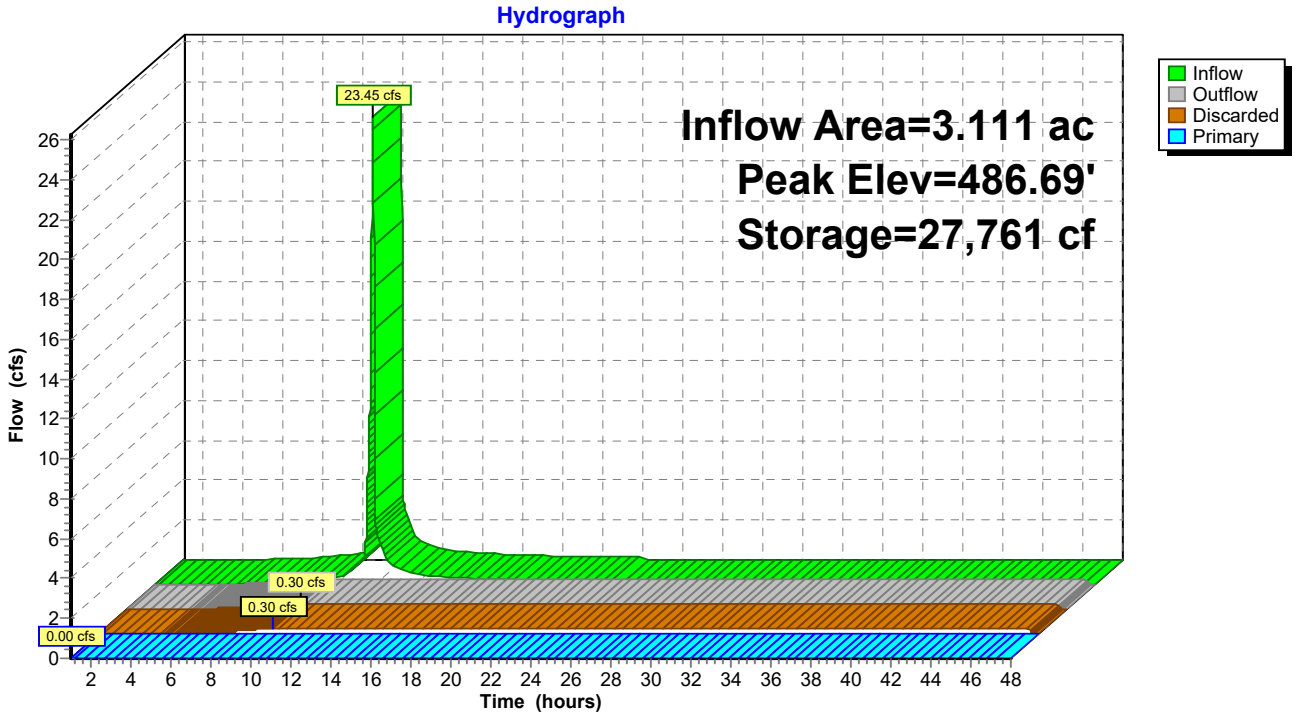
48,665.2 cf Field - 18,727.4 cf Chambers = 29,937.8 cf Stone x 40.0% Voids = 11,975.1 cf Stone Storage

Chamber Storage + Stone Storage = 30,702.5 cf = 0.705 af
Overall Storage Efficiency = 63.1%
Overall System Size = 167.45' x 77.50' x 3.75'

368 Chambers
1,802.4 cy Field
1,108.8 cy Stone



Pond U1: Underground A-2 (ADS)



Summary for Pond U2: Underground B-2 (ADS)

Inflow Area = 3.060 ac, 71.86% Impervious, Inflow Depth = 3.33" for 100-yr event
Inflow = 20.69 cfs @ 11.91 hrs, Volume= 0.848 af
Outflow = 0.90 cfs @ 11.37 hrs, Volume= 0.848 af, Atten= 96%, Lag= 0.0 min
Discarded = 0.90 cfs @ 11.37 hrs, Volume= 0.848 af
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af
Routed to Pond 4P : Infiltration Basin B-1

Routing by Sim-Route method, Time Span= 1.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 508.71' @ 12.93 hrs Surf.Area= 7,809 sf Storage= 16,491 cf

Plug-Flow detention time= 153.5 min calculated for 0.848 af (100% of inflow)
Center-of-Mass det. time= 153.5 min (956.0 - 802.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	505.50'	7,413 cf	**20.50'W x 380.95'L x 3.75'H Field A** 29,286 cf Overall - 10,753 cf Embedded = 18,533 cf x 40.0% Voids
#2A	506.00'	10,753 cf	**ADS_StormTech SC-800 +Cap** x 212 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 212 Chambers in 4 Rows Cap Storage= 3.4 cf x 2 x 4 rows = 27.4 cf
		18,166 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	506.00'	**18.0" Round Culvert** L= 170.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 506.00' / 497.50' S= 0.0500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	508.75'	**4.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#3	Discarded	505.50'	**5.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.90 cfs @ 11.37 hrs HW=505.51' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.90 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=505.50' TW=497.50' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond U2: Underground B-2 (ADS) - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-800 +Cap (ADS StormTech®SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 4 rows = 27.4 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

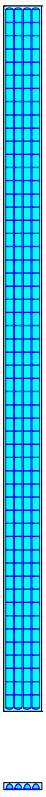
53 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 378.95' Row Length +12.0" End Stone x 2 = 380.95' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

212 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 4 Rows = 10,752.9 cf Chamber Storage

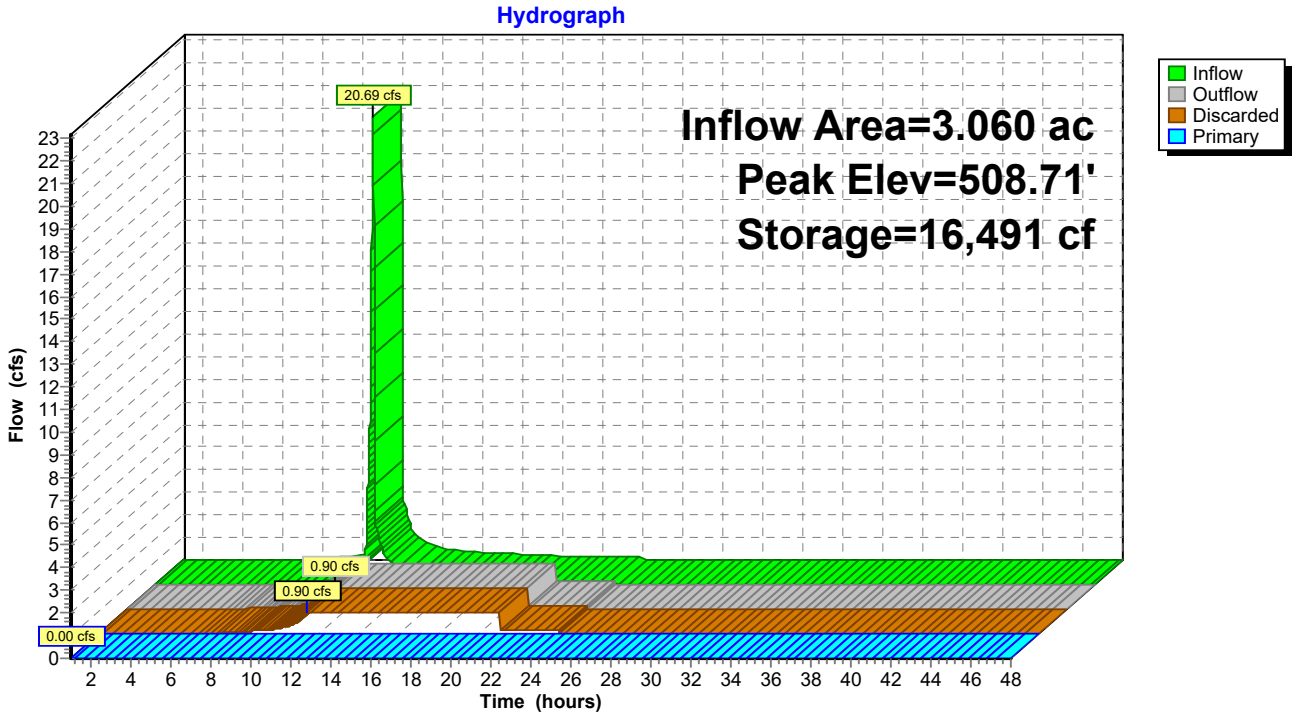
29,285.5 cf Field - 10,752.9 cf Chambers = 18,532.6 cf Stone x 40.0% Voids = 7,413.0 cf Stone Storage

Chamber Storage + Stone Storage = 18,166.0 cf = 0.417 af
Overall Storage Efficiency = 62.0%
Overall System Size = 380.95' x 20.50' x 3.75'

212 Chambers
1,084.6 cy Field
686.4 cy Stone



Pond U2: Underground B-2 (ADS)



Watershed Lag Method - Proposed Condtion

Hydraulic Length (ft) = $l = 209A^{0.6}$

Average catchment slope (%) = $Y = 100CI/A$

Variable	Watershed A-1	Watershed A-2	Watershed A-3	Watershed A-4	Watershed B-1	Watershed B-2	Watershed B-3	Watershed C	Watershed D-1
C (LF)	12,964	9,993	10,103	6,543	10,391	2,959	5,409	11,569	7,713
I (FT)	1	1	1	1	1	1	1	1	1
A (Acres)	4.77	0.95	3.00	1.11	3.22	3.06	0.84	1.49	2.31
A (SF)	207,945	41,265	130,813	48,249	140,098	133,311	36,526	64,909	100,779
Hydraulic Length l (ft)	533.90	202.32	404.28	222.22	421.26	408.90	188.04	265.51	345.71
Average Catchment SlopeY (%)	6.23	24.22	7.72	13.56	7.42	2.22	14.81	17.82	7.65

APPENDIX C

Stormwater Quality Calculations

LANGAN

Groundwater Recharge Volume Calculation

2017 Vermont Stormwater Management Manual Rule and Design Guidance
§ 2.2.3

$$Re_v = \frac{(F)(A)(I)}{12}$$

Re_v Recharge Volume (acre-feet)
F Recharge Factor (dimensionless, see Table 2-4)
A Site Area (acres)
I Site Imperviousness (expressed as a decimal percent)

	NRCS Hydrolic Soil Group	AC
Site Area	A	22.91
Existing Impervious Area	A	0.50
Proposed Impervious Area	A	11.59
Site Imperviousness	A	0.51
Total Developed Area		22.91
Re_v Required (af)		**0.58**

STP	**Re_v Provided (af)**
Infiltration Basin A-1	0.62
Infiltration System A-2	0.65
Infiltration Basin A-3	0.47
Infiltration Basin A-4	0.15
Infiltration Basin B-1	0.42
Infiltration System B-2	0.38
Total	**2.68**

Groundwater Recharge Standard	
Re_v Required	0.58 af
Treatment Volume Provided	3.95 af

Table 2-4	
Recharge Factors Based on Hydrologic Soil Group (HSG)	
HSG	Recharge Factor (F)
A	0.60
B	0.35
C	0.25
D	waived

Table 2-3. List of Practices Acceptable for Meeting the Groundwater Recharge Standard

Type	**Practice**
Non-Structural	Simple Disconnection
	Disconnection to Filter Strips and Vegetated Buffers
	Reforestation
Structural	Infiltration Trenches and Basins
	Permeable Pavements
	Filtering Systems (designed for infiltration)
	Bioretention (designed for infiltration)
	Dry Swales (designed for infiltration)

Water Quality Volume Calculation

2017 Vermont Stormwater Management Manual Rule and Design Guidance

§ 2.2.4

$$WQ_v = \frac{(P)(R_v)(A)}{12}$$

WQ_v Water Quality Treatment Volume (acre-feet)

R_v Volumetric runoff coefficient, equal to: [0.05 + 0.009(I)]

A Site Area (acres)

I Site Imperviousness (expressed as a decimal percent)

P 1.0 inch across Vermont

			Reference Table	AC
			Site Area	22.91
I:	53.00		Proposed Impervious Area	12.07
R_v:	0.53		Site Imperviousness	0.53
A:	22.91			
WQ_v:	**1.01**	ac-ft		

Watershed A-1			Reference Table	AC
			Watershed Area	4.77
I:	56.39		Proposed Impervious Area	2.69
R_v:	0.56		Watershed Imperviousness	0.56
A:	4.77			
WQ_v:	**0.22**	ac-ft		
Pretreatment Volume:	**0.11**	ac-ft	*50% of WQV	
Pretreatment Volume (CF)	**4826.99**	CF		

Watershed A-2			Reference Table	AC
			Watershed Area	3.11
I:	85.53		Proposed Impervious Area	2.66
R_v:	0.82		Watershed Imperviousness	0.86
A:	3.11			
WQ_v:	**0.21**	ac-ft		
Pretreatment Volume:	**0.02**	ac-ft		
Pretreatment Volume (CF)	**925.47**	CF		

Watershed A-3			Reference Table	AC
			Watershed Area	3.00
I:	58.33		Proposed Impervious Area	1.75
R_v:	0.58		Watershed Imperviousness	0.58
A:	3.00			
WQ_v:	**0.14**	ac-ft		
Pretreatment Volume:	**0.04**	ac-ft	*25% of WQV	
Pretreatment Volume (CF)	**1565.44**	CF		

Watershed A-4			Reference Table	AC
			Watershed Area	1.10
I:	50.91		Proposed Impervious Area	0.56
R_v:	0.51		Watershed Imperviousness	0.51
A:	1.10			
WQ_v:	**0.05**	ac-ft		

Watershed B-1			Reference Table	AC
			Watershed Area	3.22
I:	54.04		Proposed Impervious Area	1.74
R_v:	0.54		Watershed Imperviousness	0.54
A:	3.22			
WQ_v:	**0.14**	ac-ft		
Pretreatment Volume:	**0.07**	ac-ft	*50% of WQV	
Pretreatment Volume (CF)	**3134.51**	CF		

Watershed B-2			Reference Table	AC
			Watershed Area	3.06
I:	71.90		Proposed Impervious Area	2.20
R_v:	0.70		Watershed Imperviousness	0.72
A:	3.06			
WQ_v:	**0.18**	ac-ft		

APPENDIX D

Stormwater Collection System Calculations

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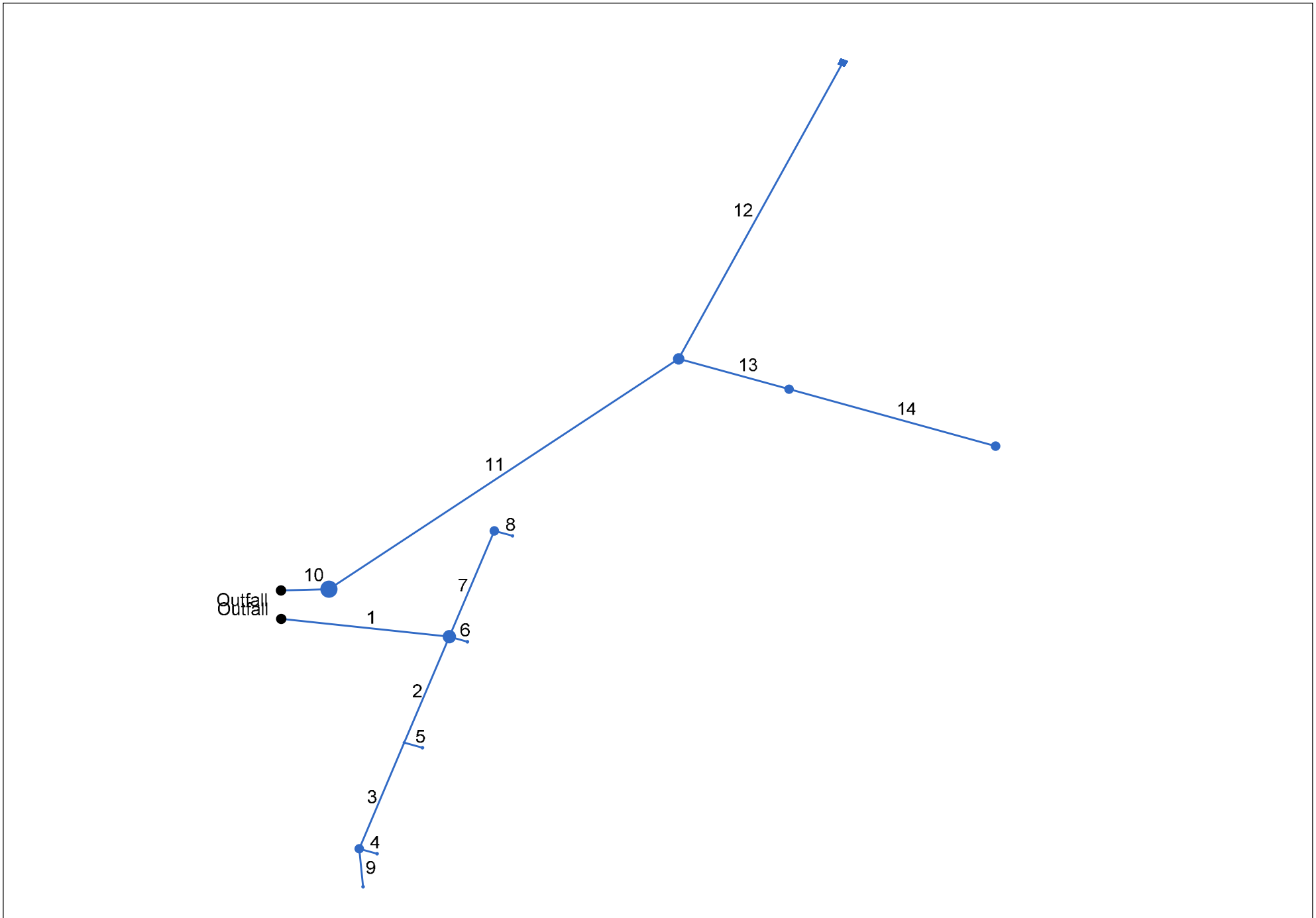
Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Network A-1.stm	Number of lines: 14	Date: 1/8/2025

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	PIPE-160	7.96	18	Cir	88.855	495.00	496.78	2.003	497.00	497.87	n/a	497.87 j	End	Manhole
2	PIPE-126	4.84	15	Cir	72.800	502.55	503.28	1.003	503.31	504.17	n/a	504.17	1	Manhole
3	PIPE-121	3.33	15	Cir	72.800	503.28	504.01	1.003	504.17	504.74	n/a	504.74 j	2	Grate
4	PIPE-123	1.64	6	Cir	10.000	504.30	504.50	2.000	504.80*	505.53*	1.08	506.61	3	Grate
5	PIPE-122	1.64	6	Cir	10.000	504.30	504.50	2.000	504.80*	505.53*	1.08	506.61	2	Grate
6	PIPE-125	1.64	6	Cir	10.000	504.30	504.50	2.000	504.80*	505.53*	1.08	506.61	1	Grate
7	PIPE-128	1.70	12	Cir	72.700	503.57	504.30	1.004	504.03	504.85	0.34	504.85	1	Grate
8	PIPE-124	1.71	6	Cir	10.000	504.30	504.50	2.000	504.85*	505.64*	1.17	506.82	7	Grate
9	PIPE-120	1.71	6	Cir	24.805	504.00	504.50	2.016	504.74*	506.70*	1.17	507.87	3	Grate
10	PIPE-159	12.04	18	Cir	25.032	495.00	495.50	1.997	497.00*	497.28*	0.48	497.76	End	Manhole
11	PIPE-139	9.68	18	Cir	236.688	495.50	499.01	1.483	497.76	500.21	n/a	500.21 j	10	Manhole
12	PIPE-129	1.16	12	Cir	210.752	501.40	505.09	1.751	501.72	505.54	n/a	505.54	11	Grate
13	PIPE-132	8.88	15	Cir	61.038	499.01	499.62	0.999	500.26*	501.24*	0.41	501.65	11	Grate
14	PIPE-107	3.98	12	Cir	114.492	499.62	500.77	1.004	501.65*	502.87*	0.40	503.27	13	Grate

Project File: Network A-1.stm | Number of lines: 14 | Run Date: 1/8/2025

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	88.855	0.00	1.22	0.00	0.00	1.10	0.0	5.6	7.2	7.96	16.10	5.14	18	2.00	495.00	496.78	497.00	497.87	497.42	510.37	PIPE-160
2	1	72.800	0.00	0.73	0.00	0.00	0.66	0.0	5.4	7.4	4.84	7.01	5.66	15	1.00	502.55	503.28	503.31	504.17	510.37	510.33	PIPE-126
3	2	72.800	0.00	0.49	0.00	0.00	0.44	0.0	5.0	7.6	3.33	7.01	4.00	15	1.00	503.28	504.01	504.17	504.74	510.33	510.37	PIPE-121
4	3	10.000	0.24	0.24	0.90	0.22	0.22	5.0	5.0	7.6	1.64	0.86	8.34	6	2.00	504.30	504.50	504.80	505.53	510.37	511.42	PIPE-123
5	2	10.000	0.24	0.24	0.90	0.22	0.22	5.0	5.0	7.6	1.64	0.86	8.34	6	2.00	504.30	504.50	504.80	505.53	510.33	511.42	PIPE-122
6	1	10.000	0.24	0.24	0.90	0.22	0.22	5.0	5.0	7.6	1.64	0.86	8.34	6	2.00	504.30	504.50	504.80	505.53	510.37	511.42	PIPE-125
7	1	72.700	0.00	0.25	0.00	0.00	0.23	0.0	5.0	7.6	1.70	3.87	4.29	12	1.00	503.57	504.30	504.03	504.85	510.37	510.46	PIPE-128
8	7	10.000	0.25	0.25	0.90	0.23	0.23	5.0	5.0	7.6	1.71	0.86	8.69	6	2.00	504.30	504.50	504.85	505.64	510.46	511.42	PIPE-124
9	3	24.805	0.25	0.25	0.90	0.23	0.23	5.0	5.0	7.6	1.71	0.86	8.69	6	2.02	504.00	504.50	504.74	506.70	510.37	511.42	PIPE-120
10	End	25.032	0.85	3.06	0.49	0.42	1.78	5.0	6.5	6.8	12.04	16.08	6.81	18	2.00	495.00	495.50	497.00	497.28	497.36	501.26	PIPE-159
11	10	236.688	0.00	2.21	0.00	0.00	1.36	0.0	5.8	7.1	9.68	13.85	5.93	18	1.48	495.50	499.01	497.76	500.21	501.26	506.75	PIPE-139
12	11	210.752	0.17	0.17	0.90	0.15	0.15	5.0	5.0	7.6	1.16	5.10	4.30	12	1.75	501.40	505.09	501.72	505.54	506.75	510.44	PIPE-129
13	11	61.038	1.22	2.04	0.56	0.68	1.21	5.0	5.4	7.4	8.88	6.99	7.24	15	1.00	499.01	499.62	500.26	501.24	506.75	505.99	PIPE-132
14	13	114.492	0.82	0.82	0.64	0.52	0.52	5.0	5.0	7.6	3.98	3.87	5.07	12	1.00	499.62	500.77	501.65	502.87	505.99	505.87	PIPE-107

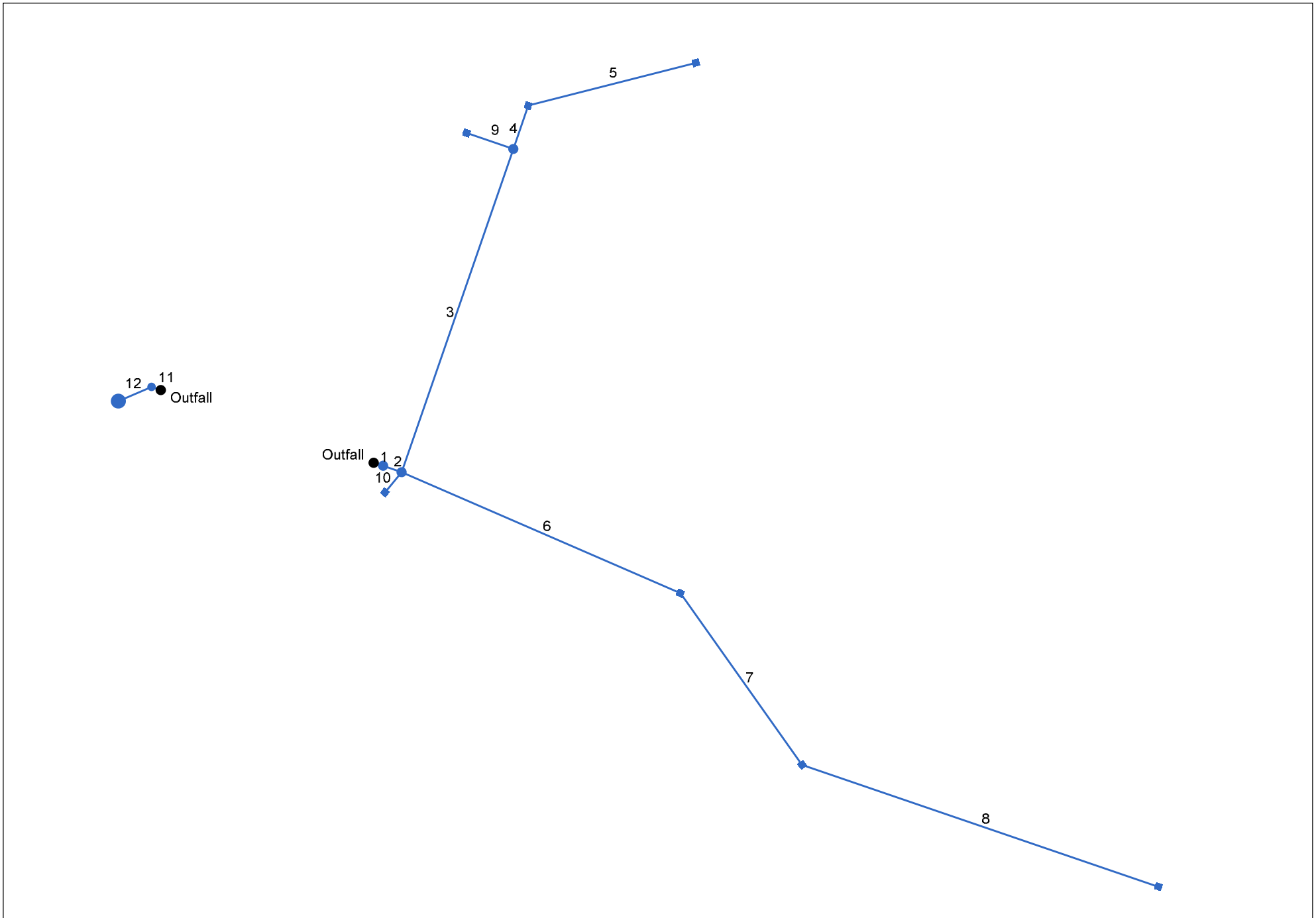
Project File: Network A-1.stm

Number of lines: 14

Run Date: 1/8/2025

NOTES:Intensity = 34.74 / (Inlet time + 3.60) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Network A-2.stm	Number of lines: 12	Date: 1/8/2025

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	PIPE-210	12.78	24	Cir	6.002	484.42	484.54	1.999	485.59	485.82	0.08	485.82	End	Manhole
2	PIPE-209	12.80	24	Cir	11.995	484.54	484.60	0.500	485.82	485.89	n/a	485.89	1	Manhole
3	PIPE-191	2.16	18	Cir	209.068	484.60	486.07	0.703	485.89	486.62	n/a	486.62 j	2	Manhole
4	PIPE-186	1.30	12	Cir	28.113	486.67	486.95	0.996	487.07	487.43	n/a	487.43	3	Grate
5	PIPE-185	0.84	12	Cir	105.333	486.95	489.13	2.070	487.43	489.51	n/a	489.51 j	4	Grate
6	PIPE-190	5.98	18	Cir	185.141	484.60	485.53	0.502	485.89	486.47	n/a	486.47 j	2	Grate
7	PIPE-189	5.06	15	Cir	128.477	485.53	486.81	0.996	486.47	487.72	n/a	487.72 j	6	Grate
8	PIPE-188	2.96	12	Cir	229.306	486.81	489.95	1.369	487.72	490.69	n/a	490.69 j	7	Grate
9	PIPE-193	0.93	12	Cir	30.182	486.07	486.37	0.994	486.62	486.77	n/a	486.77 j	3	Grate
10	PIPE-208	6.13	12	Cir	15.900	484.94	485.10	1.006	485.94*	486.34*	0.95	487.29	2	Grate
11	PIPE-196	3.63	12	Cir	6.000	484.26	484.29	0.500	485.59*	485.64*	0.24	485.88	End	Manhole
12	PIPE-195	3.65	12	Cir	22.088	484.29	484.40	0.498	485.88*	486.08*	0.34	486.42	11	Grate

Project File: Network A-2.stm | Number of lines: 12 | Run Date: 1/8/2025

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	6.002	0.00	2.48	0.00	0.00	1.98	0.0	7.2	6.4	12.78	34.65	6.34	24	2.00	484.42	484.54	485.59	485.82	490.29	490.35	PIPE-210
2	1	11.995	0.00	2.48	0.00	0.00	1.98	0.0	7.2	6.5	12.80	17.33	6.00	24	0.50	484.54	484.60	485.82	485.89	490.35	490.47	PIPE-209
3	2	209.068	0.00	0.36	0.00	0.00	0.30	0.0	5.8	7.1	2.16	9.54	2.49	18	0.70	484.60	486.07	485.89	486.62	490.47	492.29	PIPE-191
4	3	28.113	0.08	0.22	0.87	0.07	0.18	5.0	5.7	7.2	1.30	3.85	3.95	12	1.00	486.67	486.95	487.07	487.43	492.29	492.09	PIPE-186
5	4	105.333	0.14	0.14	0.79	0.11	0.11	5.0	5.0	7.6	0.84	5.55	2.64	12	2.07	486.95	489.13	487.43	489.51	492.09	494.28	PIPE-185
6	2	185.141	0.23	1.18	0.68	0.16	0.87	5.0	6.3	6.9	5.98	8.06	4.41	18	0.50	484.60	485.53	485.89	486.47	490.47	492.10	PIPE-190
7	6	128.477	0.49	0.95	0.66	0.32	0.71	5.0	5.9	7.1	5.06	6.98	5.18	15	1.00	485.53	486.81	486.47	487.72	492.10	492.36	PIPE-189
8	7	229.306	0.46	0.46	0.85	0.39	0.39	5.0	5.0	7.6	2.96	4.51	4.36	12	1.37	486.81	489.95	487.72	490.69	492.36	495.50	PIPE-188
9	3	30.182	0.14	0.14	0.88	0.12	0.12	5.0	5.0	7.6	0.93	3.85	2.61	12	0.99	486.07	486.37	486.62	486.77	492.29	491.47	PIPE-193
10	2	15.900	0.94	0.94	0.86	0.81	0.81	5.0	5.0	7.6	6.13	3.87	7.80	12	1.01	484.94	485.10	485.94	486.34	490.47	490.20	PIPE-208
11	End	6.000	0.00	0.56	0.00	0.00	0.48	0.0	5.1	7.5	3.63	2.73	4.62	12	0.50	484.26	484.29	485.59	485.64	488.44	488.31	PIPE-196
12	11	22.088	0.56	0.56	0.86	0.48	0.48	5.0	5.0	7.6	3.65	2.72	4.65	12	0.50	484.29	484.40	485.88	486.08	488.31	488.00	PIPE-195

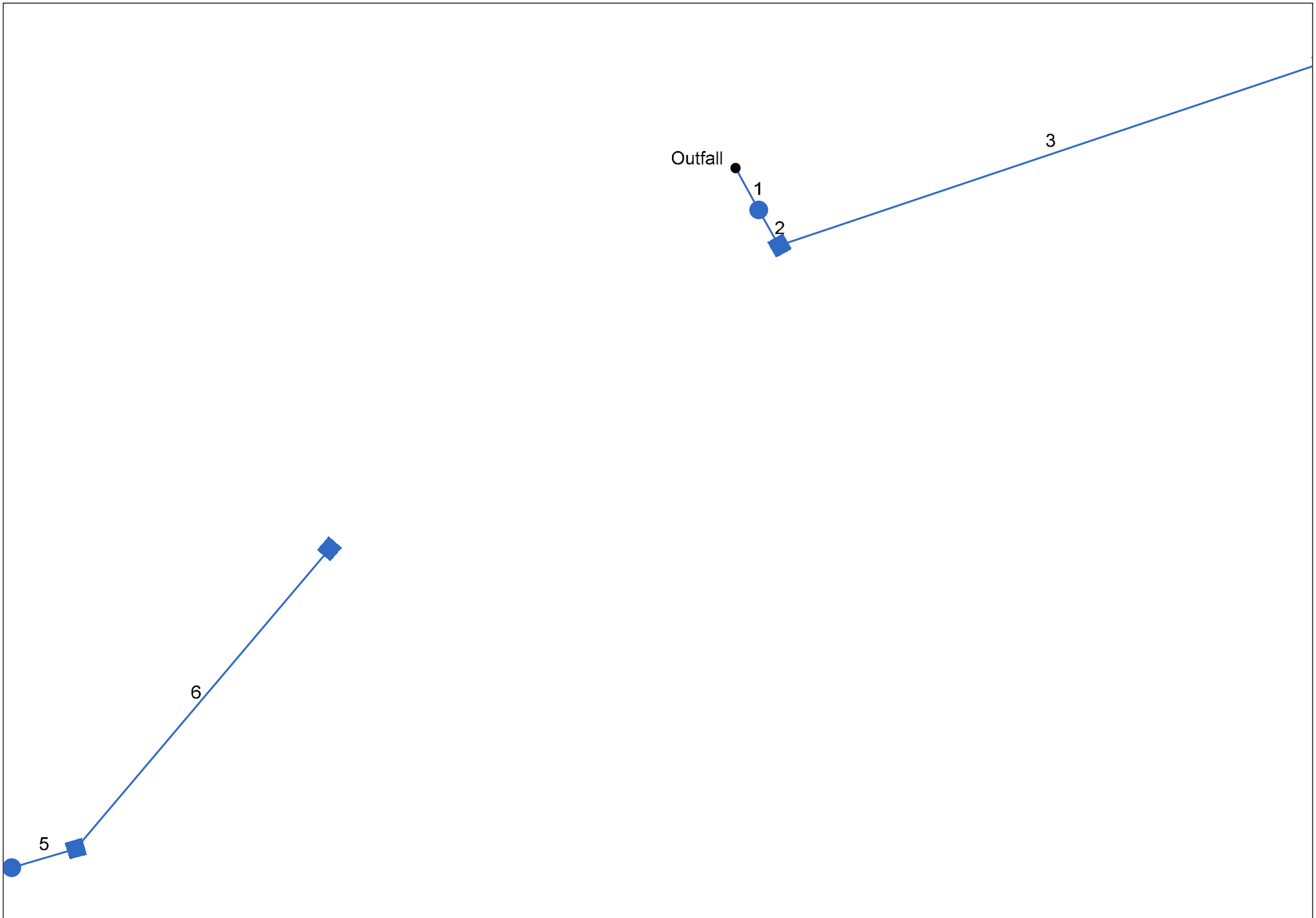
Project File: Network A-2.stm

Number of lines: 12

Run Date: 1/8/2025

NOTES:Intensity = 34.74 / (Inlet time + 3.60) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Network A-3.stm	Number of lines: 6	Date: 1/8/2025

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	PIPE-204	7.65	15	Cir	11.364	482.00	482.23	2.024	484.00*	484.14*	0.09	484.23	End	Manhole
2	PIPE-203	7.66	15	Cir	9.771	482.55	482.65	1.023	484.23*	484.34*	0.90	485.24	1	Grate
3	PIPE-200	5.88	15	Cir	135.793	482.65	484.31	1.222	485.24*	486.20*	0.36	486.56	2	Grate
4	PIPE-207	4.66	15	Cir	14.400	482.00	482.07	0.486	484.00*	484.06*	0.03	484.10	End	Manhole
5	PIPE-206	4.68	15	Cir	15.773	482.07	482.15	0.507	484.10*	484.17*	0.21	484.37	4	Grate
6	PIPE-205	3.00	12	Cir	93.242	482.19	483.35	1.244	484.37*	484.94*	0.23	485.16	5	Grate

Project File: Network A-3.stm | Number of lines: 6 | Run Date: 1/8/2025

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	11.364	0.00	1.30	0.00	0.00	1.05	0.0	5.5	7.3	7.65	9.95	6.23	15	2.02	482.00	482.23	484.00	484.14	483.46	488.17	PIPE-204
2	1	9.771	0.33	1.30	0.83	0.27	1.05	5.0	5.5	7.3	7.66	7.08	6.24	15	1.02	482.55	482.65	484.23	484.34	488.17	488.26	PIPE-203
3	2	135.793	0.97	0.97	0.80	0.78	0.78	5.0	5.0	7.6	5.88	7.73	4.79	15	1.22	482.65	484.31	485.24	486.20	488.26	489.92	PIPE-200
4	End	14.400	0.00	0.76	0.00	0.00	0.64	0.0	5.5	7.3	4.66	4.88	3.80	15	0.49	482.00	482.07	484.00	484.06	483.46	486.31	PIPE-207
5	4	15.773	0.30	0.76	0.81	0.24	0.64	5.0	5.4	7.3	4.68	4.98	3.82	15	0.51	482.07	482.15	484.10	484.17	486.31	486.02	PIPE-206
6	5	93.242	0.46	0.46	0.86	0.40	0.40	5.0	5.0	7.6	3.00	4.30	3.82	12	1.24	482.19	483.35	484.37	484.94	486.02	487.19	PIPE-205

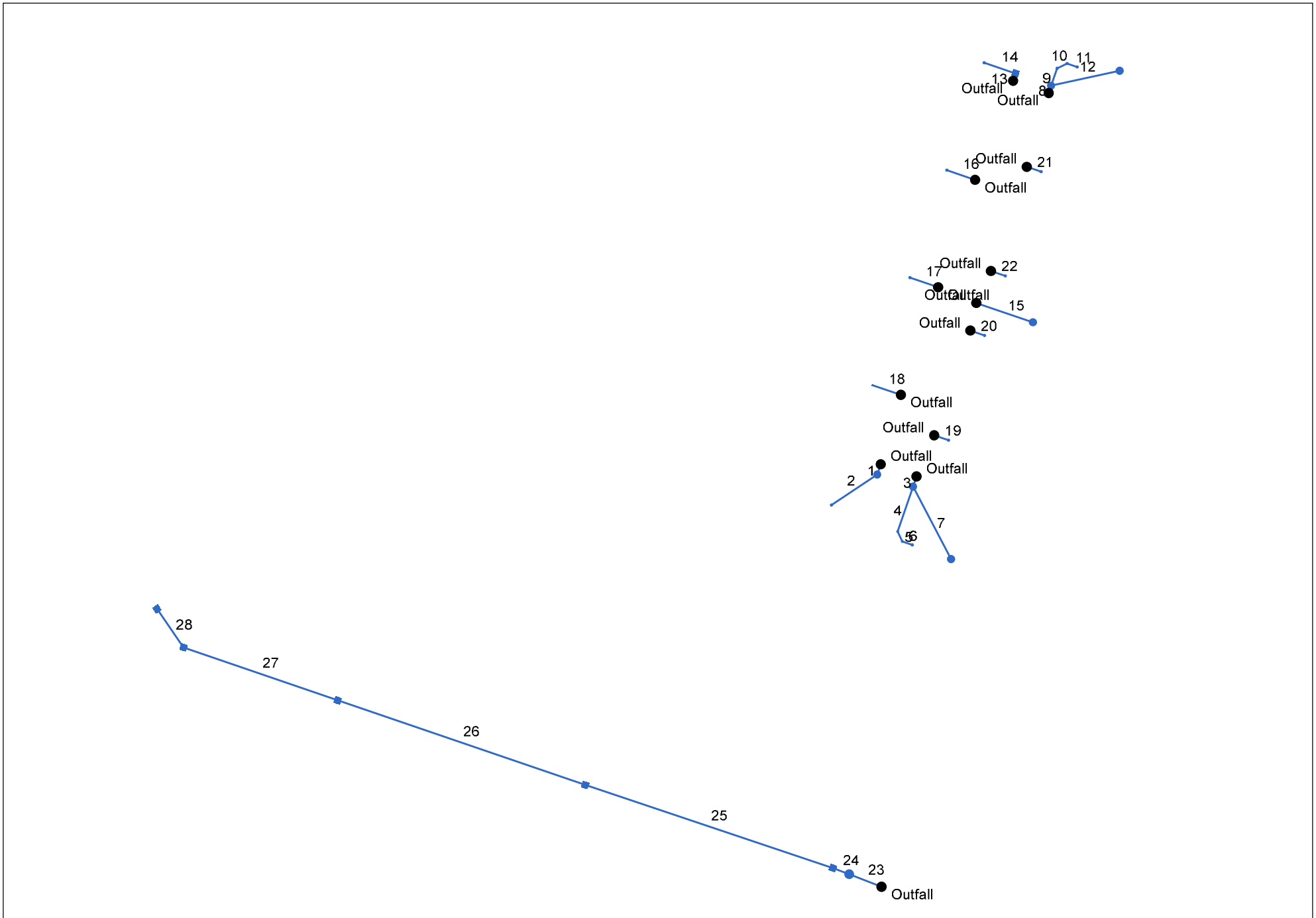
Project File: Network A-3.stm

Number of lines: 6

Run Date: 1/8/2025

NOTES:Intensity = 34.74 / (Inlet time + 3.60) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Network B-1.stm	Number of lines: 28	Date: 1/8/2025

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	PIPE-99	1.69	12	Cir	6.981	507.65	507.68	0.430	508.20	508.27	0.13	508.40	End	Manhole
2	PIPE-94	1.71	8	Cir	35.138	508.06	508.23	0.484	508.73*	509.32*	0.37	509.69	1	Grate
3	PIPE-166	1.06	12	Cir	6.871	506.09	506.16	1.019	506.52	506.59	0.13	506.59	End	Manhole
4	PIPE-177	0.54	4	Cir	30.478	507.72	507.87	0.492	508.05*	510.18*	0.45	510.63	3	Manhole
5	PIPE-176	0.54	4	Cir	7.071	507.87	507.90	0.424	510.63*	511.13*	0.45	511.58	4	Manhole
6	PIPE-175	0.55	4	Cir	6.693	507.90	507.94	0.598	511.58*	512.05*	0.61	512.66	5	Grate
7	PIPE-164	0.55	12	Cir	52.495	506.16	506.71	1.048	506.59	507.02	n/a	507.02 j	3	Grate
8	PIPE-168	4.61	12	Cir	4.911	506.33	506.35	0.408	507.22	507.35	0.48	507.83	End	Manhole
9	PIPE-181	0.54	4	Cir	11.771	507.79	507.84	0.425	508.12*	508.94*	0.45	509.40	8	Manhole
10	PIPE-180	0.54	4	Cir	7.071	507.84	507.88	0.566	509.40*	509.89*	0.45	510.35	9	Manhole
11	PIPE-179	0.55	4	Cir	6.791	507.88	507.91	0.442	510.35*	510.83*	0.61	511.43	10	Grate
12	PIPE-167	4.11	12	Cir	44.717	506.35	506.57	0.492	507.83*	508.33*	0.43	508.76	8	Grate
13	PIPE-178	1.70	12	Cir	4.911	507.26	507.29	0.611	507.81	507.84	n/a	507.84	End	Manhole
14	PIPE-90	1.71	8	Cir	21.167	507.29	507.50	0.992	507.96*	508.32*	0.37	508.69	13	Grate
15	PIPE-170	0.61	15	Cir	38.109	506.11	506.32	0.551	506.42	506.63	0.11	506.63	End	Grate
16	PIPE-91	1.64	8	Cir	19.016	506.33	507.50	6.153	506.93	508.09	n/a	508.09 j	End	Grate
17	PIPE-92	1.64	8	Cir	19.016	506.33	507.50	6.153	506.93	508.09	n/a	508.09 j	End	Grate
18	PIPE-93	1.64	8	Cir	19.016	506.33	507.50	6.153	506.93	508.09	n/a	508.09 j	End	Grate
19	PIPE-174	0.55	4	Cir	9.568	506.33	506.52	1.986	506.66*	507.31*	0.61	507.92	End	Grate
20	PIPE-173	0.55	4	Cir	9.568	506.31	506.50	1.986	506.64*	507.29*	0.61	507.90	End	Grate
21	PIPE-171	0.55	4	Cir	9.568	506.31	506.50	1.986	506.64*	507.29*	0.61	507.90	End	Grate
22	PIPE-172	0.55	4	Cir	9.622	506.31	506.50	1.975	506.64*	507.29*	0.61	507.90	End	Grate
23	PIPE-215	12.89	24	Cir	22.189	497.50	497.61	0.496	499.50	499.55	0.04	499.59	End	Manhole
24	PIPE-163	12.92	24	Cir	11.133	497.61	497.66	0.449	499.59	499.62	0.13	499.75	23	Grate

Project File: Network B-1.stm | Number of lines: 28 | Run Date: 1/8/2025

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	PIPE-162	12.49	24	Cir	167.003	497.66	498.50	0.503	499.75	500.11	0.16	500.28	24	Grate
26	PIPE-161	8.11	18	Cir	167.000	498.50	499.33	0.497	500.28*	501.12*	0.16	501.29	25	Grate
27	PIPE-27	3.58	15	Cir	103.994	499.51	500.03	0.500	501.29*	501.56*	0.13	501.69	26	Grate
28	PIPE-26	2.05	12	Cir	30.092	500.03	500.18	0.498	501.69*	501.77*	0.11	501.88	27	Grate

Project File: Network B-1.stm | Number of lines: 28 | Run Date: 1/8/2025

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	6.981	0.00	0.25	0.00	0.00	0.23	0.0	5.1	7.5	1.69	2.53	3.64	12	0.43	507.65	507.68	508.20	508.27	511.29	511.29	PIPE-99
2	1	35.138	0.25	0.25	0.90	0.23	0.23	5.0	5.0	7.6	1.71	0.91	4.89	8	0.48	508.06	508.23	508.73	509.32	511.29	511.45	PIPE-94
3	End	6.871	0.00	0.16	0.00	0.00	0.14	0.0	5.4	7.3	1.06	3.89	3.26	12	1.02	506.09	506.16	506.52	506.59	511.14	511.11	PIPE-166
4	3	30.478	0.00	0.08	0.00	0.00	0.07	0.0	5.0	7.6	0.54	0.14	6.24	4	0.49	507.72	507.87	508.05	510.18	511.11	511.05	PIPE-177
5	4	7.071	0.00	0.08	0.00	0.00	0.07	0.0	5.0	7.6	0.54	0.13	6.25	4	0.42	507.87	507.90	510.63	511.13	511.05	510.94	PIPE-176
6	5	6.693	0.08	0.08	0.90	0.07	0.07	5.0	5.0	7.6	0.55	0.16	6.25	4	0.60	507.90	507.94	511.58	512.05	510.94	510.81	PIPE-175
7	3	52.495	0.08	0.08	0.90	0.07	0.07	5.0	5.0	7.6	0.55	3.95	2.18	12	1.05	506.16	506.71	506.59	507.02	511.11	510.31	PIPE-164
8	End	4.911	0.00	1.26	0.00	0.00	0.61	0.0	5.1	7.5	4.61	2.46	6.04	12	0.41	506.33	506.35	507.22	507.35	511.11	511.11	PIPE-168
9	8	11.771	0.00	0.08	0.00	0.00	0.07	0.0	5.0	7.6	0.54	0.13	6.24	4	0.42	507.79	507.84	508.12	508.94	511.11	511.05	PIPE-181
10	9	7.071	0.00	0.08	0.00	0.00	0.07	0.0	5.0	7.6	0.54	0.15	6.25	4	0.57	507.84	507.88	509.40	509.89	511.05	510.93	PIPE-180
11	10	6.791	0.08	0.08	0.90	0.07	0.07	5.0	5.0	7.6	0.55	0.14	6.25	4	0.44	507.88	507.91	510.35	510.83	510.93	510.79	PIPE-179
12	8	44.717	1.18	1.18	0.46	0.54	0.54	5.0	5.0	7.6	4.11	2.71	5.24	12	0.49	506.35	506.57	507.83	508.33	511.11	510.18	PIPE-167
13	End	4.911	0.00	0.25	0.00	0.00	0.23	0.0	5.1	7.5	1.70	3.02	3.82	12	0.61	507.26	507.29	507.81	507.84	511.29	511.29	PIPE-178
14	13	21.167	0.25	0.25	0.90	0.23	0.23	5.0	5.0	7.6	1.71	1.30	4.89	8	0.99	507.29	507.50	507.96	508.32	511.29	511.45	PIPE-90
15	End	38.109	0.09	0.09	0.90	0.08	0.08	5.0	5.0	7.6	0.61	5.19	2.61	15	0.55	506.11	506.32	506.42	506.63	510.76	510.19	PIPE-170
16	End	19.016	0.24	0.24	0.90	0.22	0.22	5.0	5.0	7.6	1.64	3.25	4.98	8	6.15	506.33	507.50	506.93	508.09	511.34	511.44	PIPE-91
17	End	19.016	0.24	0.24	0.90	0.22	0.22	5.0	5.0	7.6	1.64	3.25	4.98	8	6.15	506.33	507.50	506.93	508.09	511.14	511.43	PIPE-92
18	End	19.016	0.24	0.24	0.90	0.22	0.22	5.0	5.0	7.6	1.64	3.25	4.98	8	6.15	506.33	507.50	506.93	508.09	511.32	511.43	PIPE-93
19	End	9.568	0.08	0.08	0.90	0.07	0.07	5.0	5.0	7.6	0.55	0.29	6.26	4	1.99	506.33	506.52	506.66	507.31	511.22	511.17	PIPE-174
20	End	9.568	0.08	0.08	0.90	0.07	0.07	5.0	5.0	7.6	0.55	0.29	6.26	4	1.99	506.31	506.50	506.64	507.29	510.91	510.77	PIPE-173
21	End	9.568	0.08	0.08	0.90	0.07	0.07	5.0	5.0	7.6	0.55	0.29	6.26	4	1.99	506.31	506.50	506.64	507.29	511.19	511.14	PIPE-171
22	End	9.622	0.08	0.08	0.90	0.07	0.07	5.0	5.0	7.6	0.55	0.29	6.26	4	1.97	506.31	506.50	506.64	507.29	510.94	510.80	PIPE-172

Project File: Network B-1.stm | Number of lines: 28 | Run Date: 1/8/2025

NOTES:Intensity = 34.74 / (Inlet time + 3.60) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	End	22.189	0.00	1.94	0.00	0.00	1.65	0.0	7.1	6.5	12.89	17.25	4.12	24	0.50	497.50	497.61	499.50	499.55	500.24	502.70	PIPE-215
24	23	11.133	0.15	1.94	0.90	0.14	1.65	5.0	7.0	6.5	12.92	16.42	4.12	24	0.45	497.61	497.66	499.59	499.62	502.70	503.25	PIPE-163
25	24	167.003	0.80	1.79	0.85	0.68	1.51	5.0	6.4	6.8	12.49	17.38	4.29	24	0.50	497.66	498.50	499.75	500.11	503.25	503.50	PIPE-162
26	25	167.000	0.75	0.99	0.86	0.65	0.83	5.0	5.8	7.1	8.11	8.02	4.59	18	0.50	498.50	499.33	500.28	501.12	503.50	503.50	PIPE-161
27	26	103.994	0.05	0.24	0.79	0.04	0.19	5.0	5.2	7.5	3.58	4.95	2.91	15	0.50	499.51	500.03	501.29	501.56	503.50	504.13	PIPE-27
28	27	30.092	0.19	0.19	0.77	0.15	0.15	5.0	5.0	7.6	2.05	2.72	2.61	12	0.50	500.03	500.18	501.69	501.77	504.13	503.79	PIPE-26

Project File: Network B-1.stm

Number of lines: 28

Run Date: 1/8/2025

NOTES:Intensity = 34.74 / (Inlet time + 3.60) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

APPENDIX E

NOAA Atlas 14 Rainfall Depths & Intensities/ NRCS Soil Survey

LANGAN

NOAA Atlas 14, Volume 10, Version 3 ESSEX JUNCTION 1 N
Station ID: 43-2843
Location name: Essex Junction, Vermont, USA*
Latitude: 44.5078°, Longitude: -73.1153°
Elevation:
Elevation (station metadata): 340 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.306 (0.243-0.387)	0.361 (0.287-0.458)	0.452 (0.358-0.575)	0.528 (0.415-0.673)	0.632 (0.478-0.835)	0.712 (0.526-0.956)	0.793 (0.564-1.09)	0.876 (0.594-1.24)	0.987 (0.642-1.45)	1.07 (0.679-1.60)
10-min	0.433 (0.344-0.548)	0.512 (0.406-0.649)	0.641 (0.507-0.815)	0.748 (0.588-0.956)	0.896 (0.677-1.18)	1.01 (0.745-1.36)	1.12 (0.799-1.55)	1.24 (0.842-1.76)	1.40 (0.910-2.05)	1.52 (0.962-2.27)
15-min	0.509 (0.404-0.645)	0.602 (0.478-0.763)	0.754 (0.596-0.958)	0.880 (0.691-1.12)	1.05 (0.797-1.39)	1.19 (0.875-1.59)	1.32 (0.940-1.82)	1.46 (0.990-2.07)	1.64 (1.07-2.41)	1.79 (1.13-2.66)
30-min	0.700 (0.556-0.886)	0.827 (0.656-1.05)	1.04 (0.818-1.32)	1.21 (0.949-1.54)	1.45 (1.09-1.91)	1.63 (1.20-2.18)	1.81 (1.29-2.50)	2.00 (1.36-2.84)	2.25 (1.47-3.30)	2.45 (1.55-3.65)
60-min	0.891 (0.708-1.13)	1.05 (0.835-1.33)	1.32 (1.04-1.67)	1.54 (1.21-1.96)	1.84 (1.39-2.43)	2.07 (1.53-2.78)	2.30 (1.64-3.18)	2.54 (1.72-3.61)	2.86 (1.86-4.19)	3.10 (1.97-4.63)
2-hr	1.12 (0.891-1.40)	1.30 (1.04-1.64)	1.61 (1.28-2.03)	1.86 (1.47-2.37)	2.22 (1.68-2.91)	2.48 (1.84-3.31)	2.76 (1.97-3.78)	3.04 (2.07-4.28)	3.41 (2.23-4.96)	3.70 (2.35-5.48)
3-hr	1.25 (1.00-1.56)	1.45 (1.16-1.82)	1.79 (1.43-2.25)	2.07 (1.64-2.61)	2.45 (1.87-3.21)	2.75 (2.04-3.65)	3.04 (2.19-4.16)	3.36 (2.29-4.71)	3.78 (2.47-5.47)	4.10 (2.61-6.05)
6-hr	1.47 (1.19-1.83)	1.72 (1.39-2.14)	2.12 (1.70-2.65)	2.45 (1.96-3.08)	2.91 (2.24-3.79)	3.26 (2.45-4.31)	3.62 (2.62-4.94)	4.01 (2.75-5.59)	4.56 (2.99-6.56)	5.00 (3.19-7.32)
12-hr	1.69 (1.38-2.09)	1.99 (1.62-2.47)	2.48 (2.01-3.08)	2.89 (2.32-3.60)	3.45 (2.67-4.47)	3.87 (2.93-5.11)	4.31 (3.16-5.89)	4.82 (3.32-6.69)	5.56 (3.66-7.95)	6.18 (3.96-8.99)
24-hr	1.95 (1.60-2.40)	2.31 (1.89-2.84)	2.89 (2.35-3.56)	3.37 (2.73-4.18)	4.04 (3.15-5.20)	4.53 (3.45-5.95)	5.06 (3.73-6.88)	5.68 (3.92-7.82)	6.59 (4.36-9.35)	7.35 (4.73-10.6)
2-day	2.30 (1.90-2.81)	2.70 (2.22-3.30)	3.36 (2.75-4.11)	3.90 (3.17-4.80)	4.65 (3.64-5.94)	5.21 (3.98-6.78)	5.80 (4.29-7.81)	6.48 (4.50-8.86)	7.47 (4.96-10.5)	8.29 (5.35-11.9)
3-day	2.56 (2.12-3.11)	2.99 (2.47-3.63)	3.68 (3.03-4.49)	4.26 (3.48-5.22)	5.06 (3.98-6.43)	5.66 (4.34-7.33)	6.29 (4.66-8.41)	7.00 (4.87-9.53)	8.03 (5.34-11.3)	8.87 (5.74-12.7)
4-day	2.78 (2.31-3.37)	3.23 (2.67-3.92)	3.96 (3.27-4.82)	4.57 (3.74-5.58)	5.40 (4.26-6.85)	6.03 (4.64-7.78)	6.69 (4.96-8.92)	7.43 (5.18-10.1)	8.50 (5.66-11.9)	9.37 (6.07-13.3)
7-day	3.35 (2.79-4.03)	3.85 (3.21-4.64)	4.67 (3.88-5.65)	5.36 (4.41-6.51)	6.30 (4.99-7.93)	7.01 (5.41-8.98)	7.75 (5.76-10.2)	8.57 (6.00-11.6)	9.74 (6.51-13.5)	10.7 (6.94-15.1)
10-day	3.89 (3.25-4.67)	4.44 (3.71-5.34)	5.35 (4.45-6.44)	6.10 (5.04-7.38)	7.13 (5.66-8.93)	7.91 (6.12-10.1)	8.72 (6.50-11.5)	9.61 (6.75-12.9)	10.9 (7.28-15.0)	11.9 (7.73-16.7)
20-day	5.57 (4.69-6.64)	6.26 (5.26-7.47)	7.38 (6.18-8.84)	8.32 (6.92-10.0)	9.61 (7.67-11.9)	10.6 (8.23-13.4)	11.6 (8.65-15.1)	12.7 (8.94-16.9)	14.1 (9.49-19.4)	15.2 (9.94-21.3)
30-day	6.99 (5.91-8.30)	7.79 (6.57-9.25)	9.09 (7.64-10.8)	10.2 (8.49-12.2)	11.7 (9.34-14.4)	12.8 (9.98-16.1)	14.0 (10.4-18.0)	15.1 (10.7-20.1)	16.7 (11.3-22.9)	17.9 (11.7-25.0)
45-day	8.77 (7.44-10.4)	9.70 (8.22-11.5)	11.2 (9.47-13.3)	12.5 (10.5-14.9)	14.2 (11.4-17.5)	15.6 (12.1-19.4)	16.9 (12.6-21.6)	18.2 (12.9-24.1)	20.0 (13.5-27.2)	21.3 (14.0-29.5)
60-day	10.3 (8.74-12.1)	11.3 (9.61-13.3)	13.0 (11.0-15.4)	14.4 (12.1-17.1)	16.3 (13.2-20.0)	17.8 (14.0-22.2)	19.3 (14.5-24.6)	20.8 (14.8-27.4)	22.7 (15.4-30.8)	24.1 (15.8-33.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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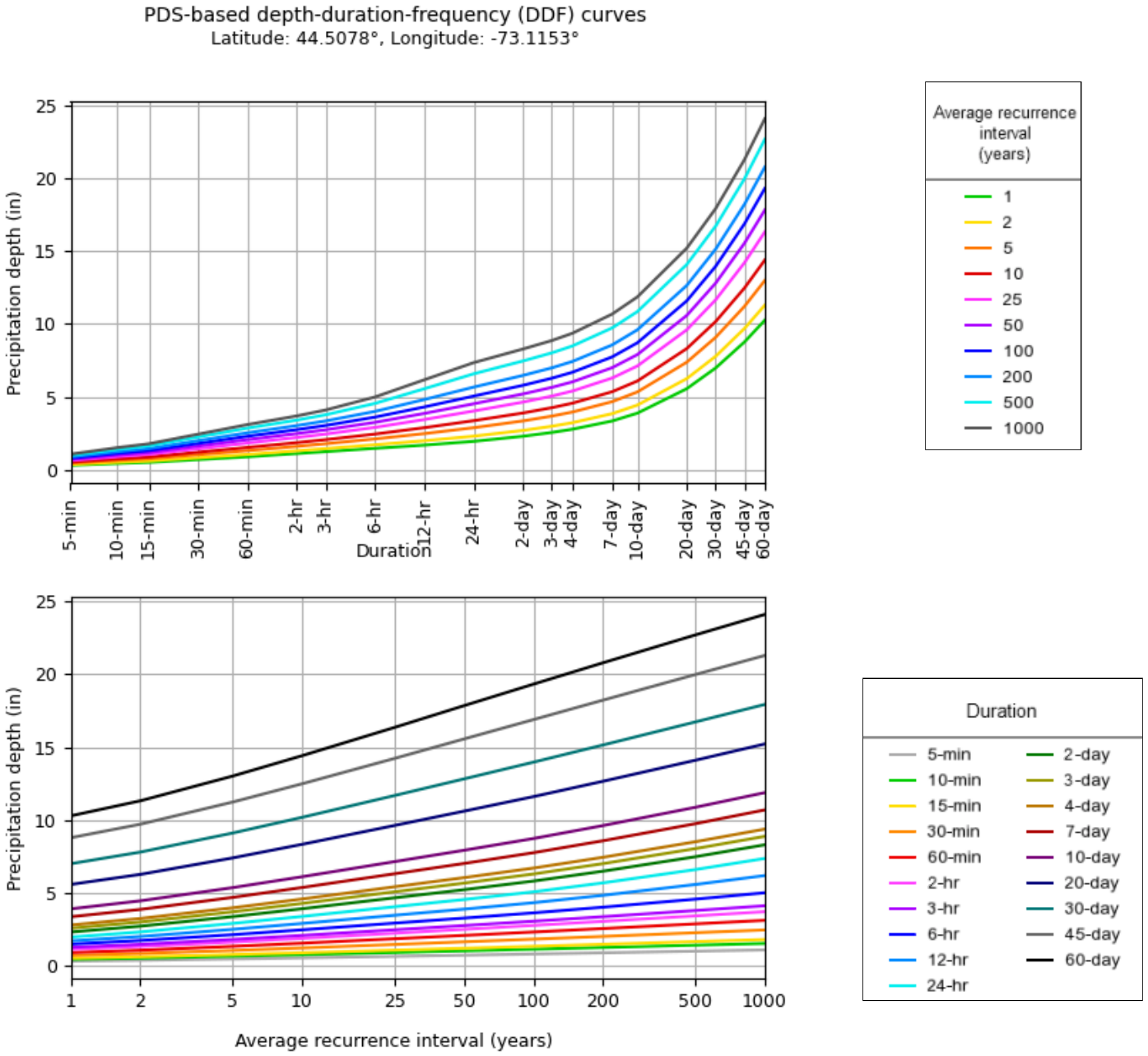
PF graphical



NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Mon Jul 22 18:58:33 2024

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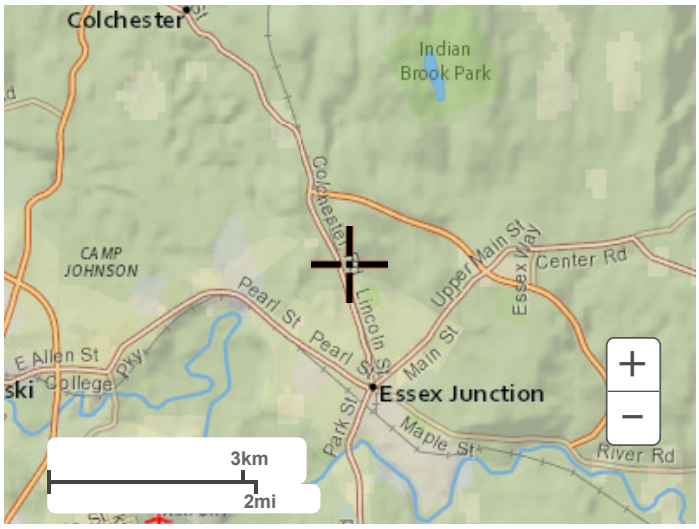
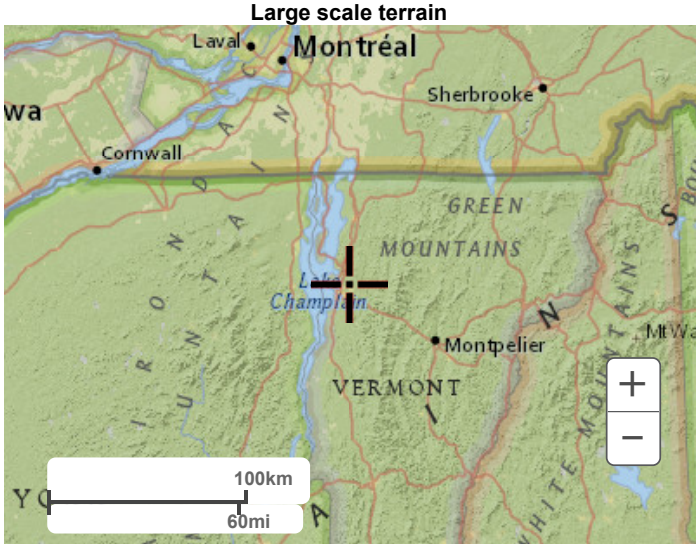
Maps & aerials

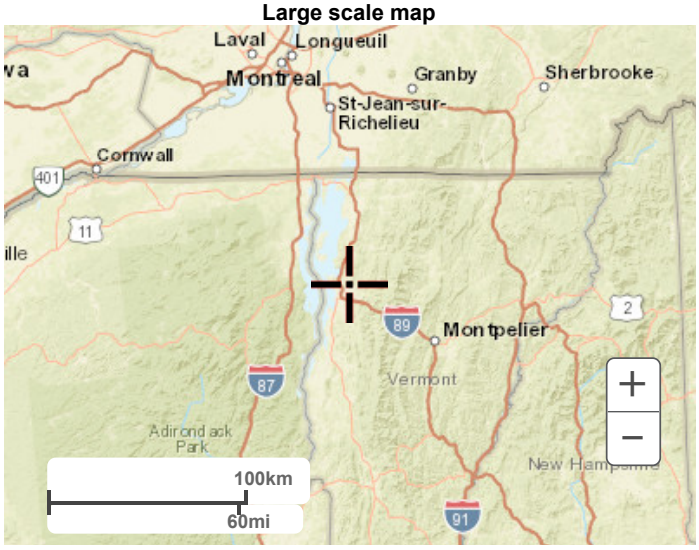
Small scale terrain



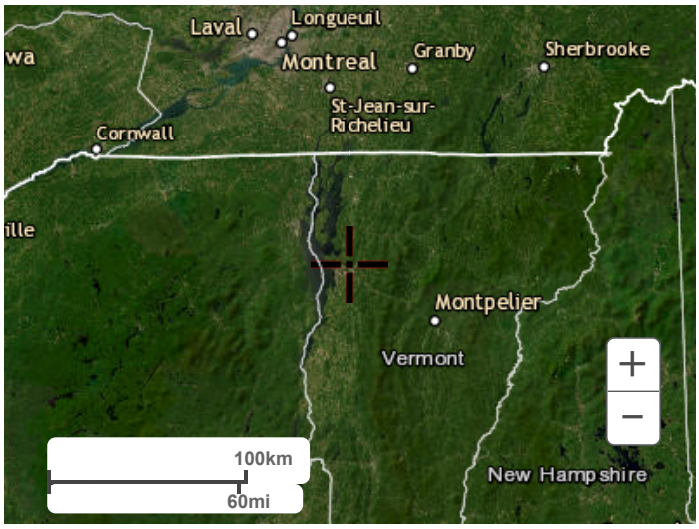
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX F

Operation and Maintenance Manual

LANGAN

Operation and Maintenance Manual
Project Moose
Essex, Vermont

Regular inspection and maintenance of the stormwater management system and uphill areas is necessary to ensure proper long-term operation. These costs will be the responsibility of the developer. Inspections of the stormwater management system should be conducted monthly based on the following table:

Site Areas:

General inspections shall be conducted monthly and after a storm event resulting in more than 2.5" of rain over a 24-hour period (1 year storm).

Inspection and Maintenance

Check for:	***Corrective Measure:***
Erosion	Install erosion control measures and provide stabilization measures.
Spillage	Contain spill as close to source as possible with a dike of absorbent materials installed to protect drainage inlets, stormwater areas, or downstream wetlands and streams. All hazardous waste material, including absorbent materials must be disposed of by a licensed hazardous waste transporter and disposed of in an environmentally acceptable manner
Sediment Accumulation	Stabilize any disturbed areas uphill of where the sedimentation is occurring. Use temporary erosion control measures (i.e. silt fence, straw bales) to filter stormwater runoff.
Trash	Pick up and dispose of trash and litter in an environmentally acceptable manner.

Routine Maintenance

Maintenance Measure:	***Frequency:***
Surface Sweeping	Parking area and truck court paved areas shall be swept annually between April 1st and July 1st.

Catch Basins and Pipe:

All catch basins shall be inspected annually between May 1st and September 15th.

Inspection and Maintenance

Check for:	***Corrective Measure:***
Trash, Sediment, Snow, Ice and Debris at Grate	Remove trash, sediment, snow/ice and debris and dispose of in an environmentally acceptable manner.
Sediment & Trash Accumulation in Sump	Remove sediment from sumps if depth of deposits is greater than one-half the depth from the bottom of the catch basin to the invert of the lowest pipe in the basin.
Pipe blockages	Flush pipes to remove blockages. TV inspect as required.

At a minimum, the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Sediment Removal	Minimum once per year, between May 1st and September 15th: Remove sediment and trash from catch basin sumps and grates and pipe inverts. Dispose of sediment and trash in an environmentally acceptable manner. Catch basins shall be cleaned when accumulated material exceeds 1 foot.

Outlet Control Structures:

Outlet control structures shall be inspected monthly.

Inspection and Maintenance

Check for:	***Corrective Measure:***
Sediment & Debris Accumulation	Debris and sediment shall be removed as needed or at least once per year between May 1st and September 15th.
Pipe blockages	Flush pipes to remove blockages. TV inspect as required.

At a minimum, the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Sediment Removal	Minimum once per year, between May 1st and September 15th: Remove sediment and debris from sumps and grates and pipe inverts. Dispose of sediment and debris in an environmentally acceptable manner.

Sediment Forebays

Sediment forebays shall be inspected monthly. Forebays shall be inspected for invasive vegetation every 6 months.

Inspection and Maintenance

Check for:	***Corrective Measure:***
Sediment Accumulation	Remove sediment from the forebay as necessary. After removing sediment, replace any vegetation damaged during the clean-out by either reseeding or re-sodding.
Erosion	Install erosion control measures and provide stabilization measures. Undercut or eroded areas shall be repaired within 30 days of documentation.

At a minimum, the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Sediment Removal	Clean out and remove sediment at least four times per year. Check for sediment accumulation, rilling, gullying, and general damage to the

	sediment forebay. Sediment shall be disposed of off-site in a proper manner.
Mowing	Grass in sediment forebay shall not exceed 6".

Stormwater Infiltration Basins

Stormwater Infiltration Basins shall be inspected monthly. Inspect after every major storm during first 3 months of operation and monthly thereafter. Infiltration basins shall be inspected for invasive vegetation every 6 months.

Inspection and Maintenance

Check for:	***Corrective Measure:***
Erosion and cracking	Install erosion control measures and provide stabilization measures. Undercut or eroded areas shall be repaired within 30 days of documentation.
Sediment Accumulation	Remove sediment from the basin as necessary. Wait until floor of the basin is thoroughly dry before removing sediment.
Trash and Debris	Remove trash and debris and dispose of in an environmentally acceptable manner.
Signs of differential settlement	Repair and replace basin floor with suitable, permeable material. Use deep tilling to break up clogged surfaces, and revegetate immediately.
Invasive and excess vegetation	Remove excess vegetation from infiltration basin. Revegetate as needed.
Condition of rip-rap	Area should be cleared of all sediment deposits and invasive plant species. Damage and deterioration of the area shall be repaired immediately.

At a minimum, the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

Maintenance Measure:	***Frequency:***
Mowing	Twice a year: mow the buffer area, side slopes, and basin bottom. Remove trash and debris, grass clippings and accumulated organic matter.

Underground Infiltration Systems

Underground Infiltration Systems shall be inspected monthly. Inspect after every major storm during the first three months of operation and monthly thereafter.

Inspection and Maintenance

Check for:	***Corrective Measure:***
Sediment Accumulation	Remove sediment when accumulation exceeds 3 inches throughout the length of the row per manufacturer's specifications.
Trash and Debris	Remove trash and debris and dispose of in an environmentally acceptable manner.

At a minimum the following maintenance measures shall be provided at the frequency listed in the following table:

Operation and Maintenance Manual
Project Moose
Essex, Vermont
Routine Maintenance

Maintenance Measure:	***Frequency:***
Sediment Removal	Inspected at a minimum immediately after completion of the site's construction, every 6 months for the first year of operation and annually after the end of the first year. Remove sediment accumulation as required. Dispose of sediment in an environmentally acceptable manner.
Trash and Debris	Minimum once per year.

Water Quality Units

Water quality units shall be inspected and cleaned in strict accordance with the manufacturer's recommendations and requirements. Clean the units using the methods specified by the manufacturer.

Operation and Maintenance Manual
Project Moose
Essex, Vermont

STORMWATER MANAGEMENT SYSTEM INSPECTION AND MAINTENANCE CHECKLIST

Stormwater Management System Checklist Date: Date Since Last Precipitation Event:	Time:	Inspector: Site Conditions:
Inspection Item	**Satisfactory? Yes (Y) or No (N)**	**Comments or Corrective Measures Taken**
Site Areas		
Erosion	Y N	
Spillage	Y N	
Sediment Accumulation	Y N	
Trash	Y N	
Catch Basins and Pipe		
Trash, Sediment, and Debris at Inlet Grates	Y N	
Sediment & Trash Accumulation in Sump	Y N	
Pipe blockages	Y N	
Underground Infiltration System		
Sediment Accumulation	Y N	
Trash and Debris	Y N	
Water Quality Unit		
Sediment Accumulation	Y N	
Trash and Debris	Y N	
Hydrocarbons	Y N	
Infiltration Basin		
Sediment Accumulation	Y N	
Erosion and Cracking	Y N	
Signs of Differential Settlement	Y N	
Trash and Debris	Y N	
Invasive and Excess Vegetation	Y N	
Condition of Rip-Rap	Y N	
Outlet Control Structure		
Sediment, Trash, and Debris Accumulation	Y N	
Pipe Blockages	Y N	

Isolator® Row
O&M Manual

ADS StormTech™

The Isolator® Row

Introduction

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

The Isolator Row

The Isolator Row is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-7200 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for sediment settling and filtration as stormwater rises in the Isolator Row and passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow stormwater to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the adjacent stone and chambers storage areas from sediment accumulation.

ADS geotextile fabric is placed between the stone and the Isolator Row chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the chamber's sidewall. The non-woven fabric is not required over the SC-160, DC-780, MC-3500 or MC-7200 models as these chambers do not have perforated side walls.

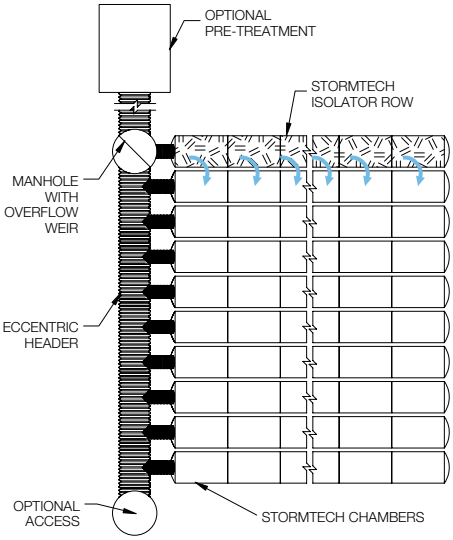
The Isolator Row is designed to capture the "first flush" runoff and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole provides access to the Isolator Row and includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row bypass through a manifold to the other chambers. This is achieved with an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row. After Stormwater flows through the Isolator Row and into the rest of the chamber system it is either exfiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

The Isolator Row may be part of a treatment train system. The treatment train design and pretreatment device selection by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, StormTech recommend using the Isolator Row to minimize maintenance requirements and maintenance costs.

Note: *See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.*

Looking down the Isolator Row from the manhole opening, woven geotextile Fabric is shown between the chamber and stone base.

StormTech Isolator Row with Overflow Spillway (*not to scale*)



Isolator Row Inspection/Maintenance

Inspection

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the **actual frequency of inspection and maintenance practices.**

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

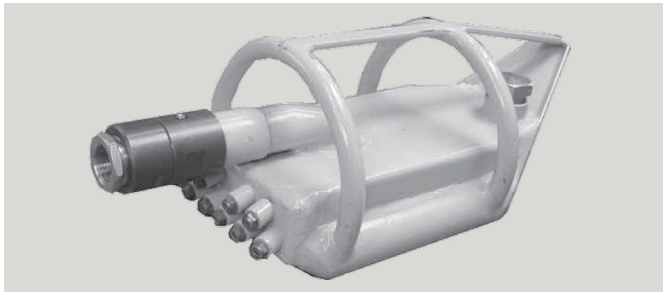
The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

Maintenance

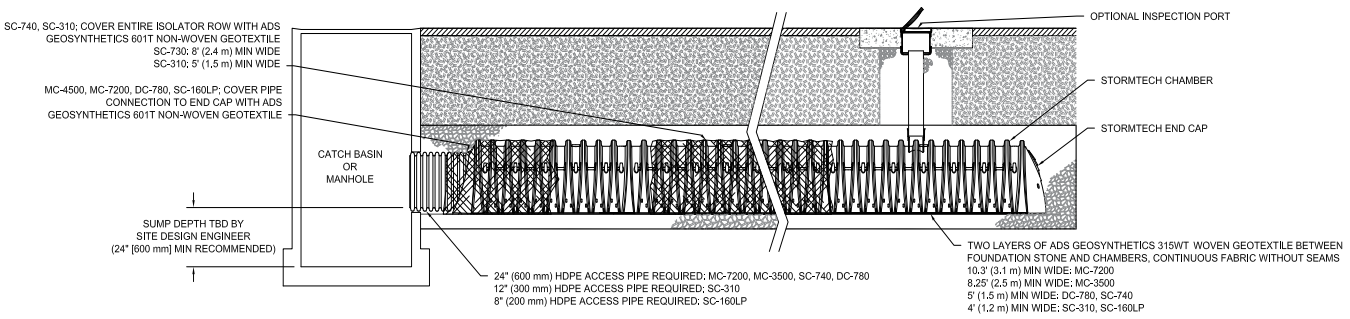
The Isolator Row was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. JetVac reels can vary in length. For ease of maintenance, ADS recommends Isolator Row lengths up to 200" (61 m). **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**



StormTech Isolator Row (not to scale)

Note: *Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-7200 chamber models and is not required over the entire Isolator Row.*



Isolator Row Step By Step Maintenance Procedures

Step 1

Inspect Isolator Row for sediment.

A) Inspection ports (if present)
   i. Remove lid from floor box frame
   ii. Remove cap from inspection riser
   iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
   iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.

B) All Isolator Row
   i. Remove cover from manhole at upstream end of Isolator Row
   ii. Using a flashlight, inspect down Isolator Row through outlet pipe
      1. Mirrors on poles or cameras may be used to avoid a confined space entry
      2. Follow OSHA regulations for confined space entry if entering manhole
   iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

Step 2

Clean out Isolator Row using the JetVac process.

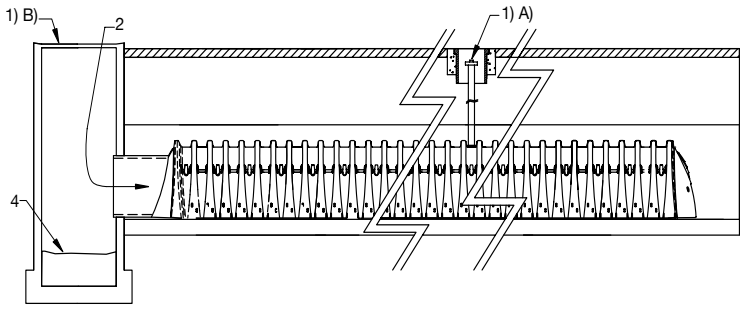
A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
B) Apply multiple passes of JetVac until backflush water is clean
C) Vacuum manhole sump as required

Step 3

Replace all caps, lids and covers, record observations and actions.

Step 4

Inspect & clean catch basins and manholes upstream of the StormTech system.



Sample Maintenance Log

Date	Stadia Rod Readings		Sedi-ment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

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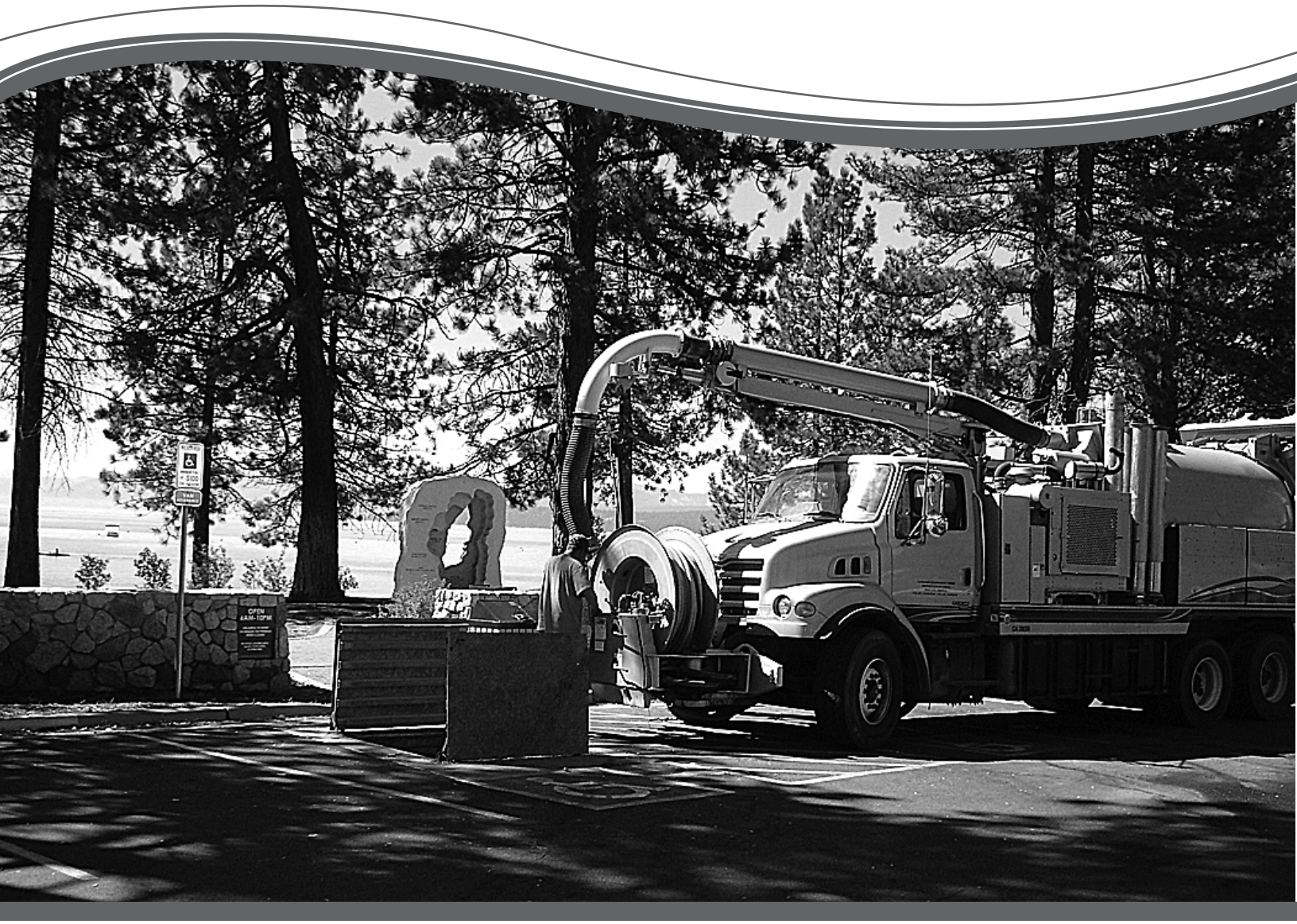
Cascade Separator® Inspection and Maintenance Guide



CASCADE
separator®

Maintenance

The Cascade Separator® system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects sediment and debris will depend upon on-site activities and site pollutant characteristics. For example, unstable soils or heavy winter sanding will cause the sediment storage sump to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (i.e. spring and fall). However, more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment wash-down areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

A visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet chamber, flumes or outlet channel. The inspection should also quantify the accumulation of hydrocarbons, trash and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided in this Inspection and Maintenance Guide.

Access to the Cascade Separator unit is typically achieved through one manhole access cover. The opening allows for inspection and cleanout of the center chamber (cylinder) and sediment storage sump, as well as inspection of the inlet chamber and slanted skirt. For large units, multiple manhole covers allow access to the chambers and sump.

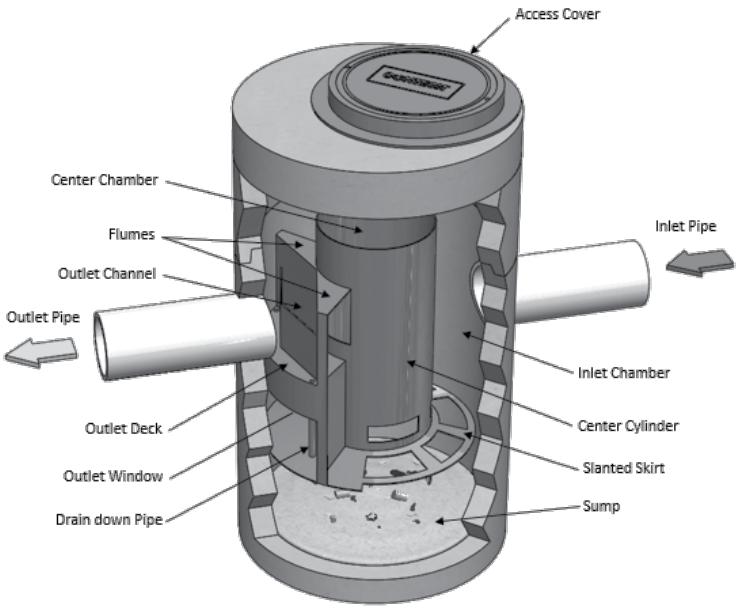
The Cascade Separator system should be cleaned before the level of sediment in the sump reaches the maximum sediment depth and/or when an appreciable level of hydrocarbons and trash has accumulated. If sorbent material is used, it must be replaced when significant discoloration has occurred. Performance may be impacted when maximum sediment storage capacity is exceeded. Contech recommends maintaining the system when sediment level reaches 50% of maximum storage volume. The level of sediment is easily determined by measuring the distance from the system outlet invert (standing water level) to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Finer, silty particles at the top of the pile typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the chart in this document to determine if the height of the sediment pile off the bottom of the sump floor exceeds 50% of the maximum sediment storage.

Cleaning

Cleaning of a Cascade Separator system should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole cover and insert the vacuum tube down through the center chamber and into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The areas outside the center chamber and the slanted skirt should also be washed off if pollutant build-up exists in these areas.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. Then the system should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and to ensure proper safety precautions. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the Cascade Separator system must be done in accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal. If any components are damaged, replacement parts can be ordered from the manufacturer.



Cascade Separator® Maintenance Indicators and Sediment Storage Capacities

Model Number	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CS-3	3	0.9	1.5	0.5	0.4	0.3
CS-4	4	1.2	2.5	0.8	0.7	0.5
CS-5	5	1.3	3	0.9	1.1	0.8
CS-6	6	1.8	3.5	1	1.6	1.2
CS-8	8	2.4	4.8	1.4	2.8	2.1
CS-10	10	3.0	6.2	1.9	4.4	3.3
CS-12	12	3.6	7.5	2.3	6.3	4.8

Note: The information in the chart is for standard units. Units may have been designed with non-standard sediment storage depth.

A Cascade Separator unit can be easily cleaned in less than 30 minutes.

A vacuum truck excavates pollutants from the systems.

Cascade Separator® Inspection & Maintenance Log

Cascade Model:			Location:		
Date	Depth Below Invert to Top of Sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The depth to sediment is determined by taking a measurement from the manhole outlet invert (standing water level) to the top of the sediment pile. Once this measurement is recorded, it should be compared to the chart in the maintenance guide to determine if the height of the sediment pile off the bottom of the sump floor exceeds 50% of the maximum sediment storage. Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.
2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

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CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

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CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

RAIN GUARDIAN

U.S. PATENT NOS. 8,501,016 AND 8,858,804


TURRET


FOXHOLE


BUNKER

PRETREATMENT FOR BIORETENTION

Rain Gardens • Swales • Filtration Basins • Infiltration Basins

Maintenance Guide

Rain Guardian pretreatment chambers simplify bioretention maintenance by collecting sand, leaves, grass clippings, and other debris in an easy to clean, confined location. Regularly maintaining the Rain Guardian sustains its functionality by maximizing storage and filtration capacities. Maintenance frequency is variable and depends on many factors such as rainfall frequency, drainage area size and land use type, and season of the year. The general cleaning process is similar for all Rain Guardian models (i.e. Bunker, Foxhole, and Turret).

Following rain events, inspect the pretreatment chamber for debris on the top grate, within the chamber, and on the vertical, drop-in filter wall. The maintenance steps described below should be completed if areas of the top grate are clogged, the chamber is >75% full, or the vertical filter wall is clogged. Maintenance should be completed when stormwater has completely drained from the bioretention practice. The filter wall allows the chamber to dry between rain events, which further simplifies maintenance by ensuring removed debris is largely dry. Ensure all debris collected during cleaning of the chamber is completely removed from the site and properly disposed of according to local environmental rules. Once cleaning is complete, reinstall the filter wall with filter fabric facing the inside of the chamber and replace the top grate. For the Foxhole, reinstall the top lid, including optional lid anchor screws if equipped.

Clear Debris from Top Grate

- Foxhole only—remove top lid, including optional lid anchor screws if equipped
- Leaf litter and garbage commonly accumulate on the top grate
- Simply remove and dispose of debris by hand or with a shovel prior to removing top grate

Remove Debris from Inside Chamber

- Remove top grate and place on paved inlet to avoid damage to nearby plants
- Remove and dispose of accumulated debris within chamber using a shovel

Clean Filter Wall

- Remove drop-in filter by lifting vertically
- Clean filter wall with a stiff bristled broom or rinse clean with pressurized water

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