Proactive by Design

STORMWATER MANAGEMENT PLAN

Loft's at Clark's Pond Homeowner Association
15 Cedar Street
Amesbury, MA 01913

July 2025
File No. 03.0035466.00

PREPARED FOR:
Loft's at Clark's Pond Homeowner Association
Amesbury, Massachusetts

GZA GeoEnvironmental, Inc.
188 Valley Street, Suite 300 | Providence, RI 02909
401-421-4140

Offices Nationwide
www.gza.com

Copyright© 2024 GZA GeoEnvironmental, Inc

1.0 INTRODUCTION

In conjunction with the Conservation Commission Notice of Intent application, and behalf of our client, the Loft's at Clark's Pond Homeowner Association, GZA has prepared this Stormwater Management Plan (SWMP) for proposed design to mitigate stormwater related flooding impacting the exterior and interior of building #2 located at 15 Cedar Street in Amesbury, Massachusetts (the "Site"). The proposed stormwater improvements have been designed in accordance with the Massachusetts Stormwater Handbook, revised 2008 (Design Manual) and the current edition of Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Area (Erosion Control Handbook), revised 2003.

	Organization	Contact Person	Address	Phone Number
Site Owner/ Applicant	Loft's at Clark's Pond Homeowner Association	Nick Beck	15 & 25 Cedar Street, Amesbury, MA	413-530-9814
Stormwater Engineer	GZA GeoEnvironmental, Inc. (GZA)	Steve D'Ambrosio, P.E.	1350 Main Street Suite 1400 Springfield, MA	413-726-2126

This SWMP is subject to the Limitations included in **Appendix A.**

The Drawing Set, included in **Appendix H** show the existing site conditions, and proposed stormwater management system.

In accordance with the Design Manual, a completed Stormwater Management Checklist is included in **Appendix B**.

2.0 EXISTING SITE CONDITIONS AND BACKGROUND

The Loft's at Clarks Pond is a condominium complex that is located at 15 & 25 Cedar Street in Amesbury, Massachusetts (the Site), Map 40 Lots 236, 237 and 238. The complex has two residential buildings with associated parking and a gazebo with an outdoor lawn area. The southern portions of the lots are bounded by the Back River which is downgradient from buildings. The Site is abutted to the east and west by residential houses and to the north by industrial/commercial buildings. Building #2 (the "building") experiences flooding at the north entrance that has caused interior damage to the basement and the first floor of the building. The Client has indicated that significant flooding occurred on August 18, 2023, and September 13, 2023, when storms produced approximately 3.7-inches and 2.3-inches, respectively, as reported by the National Oceanic and Atmospheric Administration (NOAA). During these storm events, the stormwater flowing down Cedar Street and "R" Street ponded along the roadway curbing and overtopped onto the facility's landscaped areas in the northwest corner of the Site and ultimately flowed to a low area at the Building 2 north door and flooded the building. The building roof drains have also been observed to become overwhelmed and discharge stormwater into this area. Roof drains on the southeastern corner of the building discharge onto the ground surface, causing flooding and icing of the walkways which is a safety concern for the residents.

The homeowner's association has installed a small pump in a yard drain located to the west of the Building 2 north door entrance that discharges to the parking lot on the South side of the building that is used during storm events. The Client has also indicated that this system has been operated by a generator, since large storm events have historically caused electrical service failure in

the area. Other temporary measures of sand and concrete bags have been used to create a cofferdam in front of the north entrance.

GZA performed topographic survey and an existing drainage pipe survey using CCTV to prepare an existing conditions plan that illustrates the roof drainage system and the stormwater management system within the parking lot. During these field activities, GZA observed that the existing roof drainage system located on the north and west side of the building was previously designed to infiltrate stormwater within existing Site soils. The roof drainage system on the eastern side of the building conveyed stormwater to the stormwater management system installed in the eastern parking lot area. The western roof drainage system also infiltrated water adjacent to the building foundation wall which was also determined to contribute to flooding within the building, with an additional outlet that discharges stormwater into a catch basin (CB-3) located on "R" Street. CB-3 is connected to the City of Amesbury stormwater conveyance system which ultimately discharges into the Back River.

3.0 SUBSURFACE CONDITIONS

The soils identified by the United States Department of Agriculture (USDA) Natural Resources Conservation Service consists of map unit symbols 602 and 254D. 602 is classified as "Urban land" and has an unranked Hydric Soil Rating (HSR). 254D is classified as "Merrimac fine sandy loam, 15-25 percent slopes and has a HSR of A. Due to the unranked HSR for a significant portion of the Site, GZA witnessed five (5) test pits (designated TP-1 through TP-5) on July 1, 2025 to evaluate subsurface conditions in areas potentially suitable for infiltration of roof runoff. Test pits were excavated in bot USDA classified soil areas 602 and 254D. Tests pits were excavated by M.T. Mayo Corporation of Woburn, Massachusetts to depths of approximately 4 to 9 feet below ground surface (bgs) using a CAT 306 excavator. The target depth for the test pits was 8-feet; some test pits were terminated shallower than the target depth due to obstructions within the test pit, or deeper than 8 feet where possible.

GZA personnel observed the test pits and prepared the test pit logs included in **Appendix C**. Soil samples were visually classified according to the Modified Burmister classification system and the groundwater table and seasonal high water table were noted on the logs if encountered. As-excavated test pit locations were collected with a hand-held GPS unit upon completion and are shown on the existing conditions figure in **Appendix H**. The generalized subsurface profile at the site generally consists of topsoil at the ground surface, underlain by fill and/or urban fill. The subsurface conditions are described in greater detail in the following sections.

Topsoil

An approximately 6- to 8-inch layer of topsoil was encountered at the ground surface in all borings. Topsoil material consisted of silt with fine to coarse sand and trace roots.

Fill

The fill extended to depths ranging from 8-inches to 8.3 feet below the existing ground surface (bgs). (elevation 21.5 to 10.5 feet). The fill generally consisted of fine to coarse sand with varying amounts of boulders, gravel and silt. Materials indicative of fill that were observed were metal, rubber, brick, and concrete. Excavation through the fill material was generally moderate to difficult in effort.

Urban Fill

The urban fill extended to depths ranging from 8-inch to 7.3 feet bgs. (elevations 19.7 to 12.7 feet). The fill generally consisted of a mixture of sand and silt, with trace debris (glass, brick, metal, plastic, etc.). Excavation through the fill material was generally moderate to difficult in effort.

Groundwater

Groundwater levels were measured in the test pits at the time of excavation in three (TP-1, TP-2, and TP-5) test pits. Groundwater observations were made at the time and under the conditions stated in the exploration logs. Generally, in the areas to the south of building #2, groundwater was observed at approximately 7.5-8.5ft bgs, and the seasonal high-water table was observed by iron staining and redox features at approximately 4.5-5.5-ft bgs. In the area to the north of building #2, only one test pit (TP-5) encountered groundwater. It was observed at approximately 6-ft bgs and seasonal high-water table was observed at approximately 3-ft bgs. Due to obstructions also observed within the test pit, there is potential for the groundwater in this area to be perched on historical concrete structures that remain in the subsurface.

It is anticipated that groundwater levels will vary due to variations in rainfall and other factors different than those prevailing at the time the explorations were performed, and the measurements were made. It should be noted that the seasonally lowest groundwater levels typically occur during the late summer and fall months. Refer to the test pit logs in **Appendix C** for additional details on groundwater observations.

4.0 DEVELOPED SITE CONDITIONS

The Project includes the installation and replacement of roof drainage pipes along the building to then be connected into the existing stormwater management system. The existing stormwater management system includes a perforated pipe (located along the western side of the building) being discharged into the municipal stormwater system via catch basin "CB3" located on R Street. The existing perforated pipes located on the north and west side of the building will either be fully replaced with new PVC pipes or be removed, as shown in the proposed design plan in **Appendix H**. Additionally, existing drainage pipes will be replaced with larger PVC pipes with new pipe inverts in an attempt to minimize flooding of the existing catch basins and lawn drains. These proposed drainage pipes will collect stormwater runoff from the building's roof top and upgradient landscaped area and direct it into the existing catch basins in the parking lot, which travels through the previously installed Vortex water quality treatment units and ultimately discharge to the Back River via an 18" RCP outlet.

Stormwater from the north and south building's roof have separate conveyance systems that ultimately are directed into different drainage pipe systems. The south portion of the building's roof runoff will be captured by five (5) existing roof drains, then be directed into catch basin "H" located within the existing parking lot via a proposed 6-inch PVC pipe. Improvements to the western roof drainage system will include the cutting and capping of the existing pipe being discharged into the municipal catch basin on R Street. Similarly, the north portion of the building's roof runoff will be captured by six (6) existing roof drains, which will then be directed into catch basin "I" located within the existing parking lot via 12-inch PVC pipe. Both proposed drainage systems will connect into the existing 18" RCP stormwater system, which drain through the existing vortex water quality treatment units then discharges into the Back River via the 18" RCP outlet. It should be noted that vortex catch basins are utilized to capture and retain trash, debris and sediment.

This proposed design includes no increase of impervious surfaces and reduces runoff being directed into the municipality's stormwater system. Drainage paths have been slightly altered with the improvements to the conveyance system, however ultimately the stormwater in the existing and proposed condition discharges to the Back River.

5.0 STORMWATER MANAGEMENT STANDARDS

The Design Manual, Volume 1, Chapter 1, entitled: "Storm Water Management Standards" requires that stormwater management systems associated with proposed development projects meet certain stormwater management performance standards. The following sections summarize the applicability of each stormwater management performance standard and describe how the project meets each standard that applies. A post-development hydrologic and hydraulic analysis, and a description of the proposed stormwater management system are also included in Section 6 of this report.

It should be noted that under Standard 7, this project is a redevelopment project meaning Standards 1, 2, 3, 4, 5, and 6 are required to be met only to the maximum extent practicable while Standards 8, 9, and 10 must be met fully.

5.1 STANDARD 1: UNTREATED STORMWATER

Standard 1 requires that no new stormwater conveyance system discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

Response: The proposed drainage systems will be directed into the existing stormwater management system which includes Vortex water quality treatment units upgradient from the Back River. The alterations to the existing stormwater management system do not significantly increase discharge flows or velocity, therefore stormwater runoff will not cause erosion into the Back River. Additionally, the existing 18" RCP outlet is protected with a large riprap apron to prevent erosion at the outlet.

5.2 STANDARD 2: POST-DEVELOPMENT PEAK DISCHARGE RATES

Standard 2 requires that stormwater management systems be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates.

Response: According to Standard 7, this project is a redevelopment project. As such, this Standard is only required to be met to maximum extent practicable. While the post-development peak discharge rates do minimally exceed the pre-development rates for the 2-yr and 10-yr 24-hr storm event due to removing flow from the municipal system, the flow increase is less than a 1% increase from the pre-development peak discharge rates. This increase is due to eliminating the western roof drain system discharge pipe into the City of Amesbury's stormwater conveyance system in R Street. Removing this discharge pipe and reconfiguring the on-Site drainage system allows the roof runoff to travel through the on-Site stormwater management system, including the vortex units, allowing for stormwater to be treated prior to the discharge point at the Back River. To manage this minimal increase to the Site outfall, on Site BMPs, such as below ground detention systems, would need to be implemented to detain a minimal amount of water. In addition, the Site subsurface conditions were observed to be urban fill, which are not suitable for onsite infiltration BMPs. Due to the minimal increase in peak discharge values, we believe that we have met this Standard to the maximum extent practicable.

5.3 STANDARD 3: GROUNDWATER RECHARGE

Standard 3 requires that stormwater be recharged within the same sub-watershed to maintain groundwater base flow at pre-development recharge levels. Adhering to this standard ensures that the level of the groundwater table, stream base flow, and soil moisture remain the same for pre- and post-development Site conditions.

Response: In the existing condition, roof drainage piping along the western and northern portions of the building have perforated sections to allow for recharge into the groundwater table. Due to their close proximity to the building foundation (within 10-ft), these perforated pipes should be removed to mitigate against water seepage through foundation walls and damage to the building. Other potential areas of infiltration were evaluated. GZA performed test pits, as described above, in the location of potential infiltration areas. Soils were observed to be composed of urban fill throughout the test pits and into the groundwater table. Based on standard design practices described in Volume 2, Chapter 2 and Volume 3, Chapter 1 of the Stormwater Handbook, infiltration should not be performed within areas of urban fill.

5.4 STANDARD 4: WATER QUALITY

The intent of this standard is to protect the waters of the State by reducing the mass of pollutants discharged to surface waters and to reduce the risk of erosion and sedimentation by implementing the BMPs outlined in the Design Manual. BMPs must be designed to accommodate the Water Quality Volume (WQv), which, for this project, is the runoff from the first 0.5 inch of

precipitation that falls on impervious surfaces (existing and proposed) at the Site. The WQV is referred to as the first flush and has been shown to contain the majority of contaminants from a typical stormwater runoff event. The selection process for proposed BMPs implemented on the Site is dependent on the types of contaminants in the first flush. Once a BMP is selected it must be sized appropriately to contain or treat the water quality volume. The total treatment train for stormwater BMPs selected for the site must achieve a TSS removal rate of 80%. The TSS removal percentage for stormwater BMP's is included in Volume 1 Chapter 1 of the Design Manual. In addition, a Long-Term Pollution Control Plan must be developed for the site.

Response: Pollutants discharged to surfaces water through sheet flow, erosion, and sedimentation will not occur with the construction of the proposed drainage systems. Stormwater flow to the vortex units and existing outlet drainage system has been calculated under the proposed condition and the result indicate that there is capacity to treat the minimal increase of stormwater runoff during the 2-yr storm event. As mentioned above, this increase is due to the elimination of the western roof drain discharging to the City of Amesbury's stormwater system within R Street. It is unknown how or if the municipality's stormwater system addressed pollutant discharge. Therefore, the portion of the drainage system that is now being directed on-Site will be treated through the vortex catch basins, improving water quality.

A Long-Term Pollution Prevention Plan (LTPP) is included below:

- ***Good Housekeeping***

  The facility will be maintained in a clean and orderly manner to reduce the potential to contribute pollutants to storm water discharges.

- ***Materials and Waste Products Storage***

  Materials and waste products will be property contained and transported off site and will not be stored outdoors on this site.

- ***Vehicle Washing***

  Vehicle washing will not be performed on this site.

- ***Routine Inspections and Maintenance of Stormwater BMPs***

  Stormwater BMPs will be maintained and inspected in accordance with Operations and Maintenance Report.

- ***Spill Prevention and Response***

  Spill response kits will be available on site during construction

- ***Maintenance of Lawns, Gardens, and Other Landscaped Areas***

  There are landscaped areas on Site surrounding the building. These areas will be maintained in accordance with the Operations and Maintenance Report.

- ***Storage and Use of Fertilizers, Herbicides, and Pesticides***

  Fertilizers, Herbicides and Pesticides will not be stored or used on this site.

- ***Pet Waste Management***

  Trash cans and waste bags will be provided along with signage to encourage pet waste pick-up.

- ***Operation and Management of Septic Systems***

  There will be no septic systems present on this site.

- ***Proper Management of Deicing Chemicals and Snow***

  Limited salting or sanding will be performed at the facility access driveway, parking lot and pedestrian walkway.

5.5 STANDARD 5: LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS

Land uses with higher potential pollutant loads (LUHPPLs) generally have a higher risk of discharging pollutants to the waters of the state. As listed in the Design Manual the following land uses and activities are classified as LUHPPLs:

- Areas within an industrial site (as defined in 310 CMR 22) that are the location of activities subject to the NPDES Multi-Sector General Permit;
- Auto fueling facilities (i.e., gas stations);
- Exterior vehicle storage, service, maintenance, and equipment cleaning areas;
- Marinas and boatyards
- Parking lots with high-intensity use; and
- Confined disposal facilities and disposal sites.

For these types of Sites, specific BMPs must be used, and typically require a NPDES Multi-Sector General Permit (MSGP) for Industrial Activity.

Response: This Site is not a LUHPPL Site, and a MSGP for stormwater discharge is not required.

5.6 STANDARD 6: PROTECTION OF CRITICAL AREAS

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Design Manual.

Critical areas are Outstanding Resource Waters as designated in 314 CMR 4.00, Special Resource Waters as designated in 314 CMR 4.00, recharge areas for public water supplies as defined in 310 CMR 22.02 (Zone Is, Zone IIs and Interim Wellhead Protection Areas for groundwater sources and Zone A for surface water sources), bathing beaches as defined in 105 CMR 445.000, cold-water fisheries as defined in 314 CMR 9.02 and 310 CMR 10.04, and shellfish growing areas as defined in 314 CMR 9.02 and 310 CMR 10.04.

Response: This Site does not discharge near or to a critical area as designated by 314 CMR 4.00.

5.7 STANDARD 7: REDEVELOPMENT PROJECTS

Redevelopment projects are defined to include the following:

1. Maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving;

2. Development, rehabilitation, expansion, and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area; and

3. Remedial projects specifically designed to provide improved stormwater management, such as projects to separate storm drains and sanitary sewers and stormwater retrofit projects.

Response: This project is considered to be a re-development project as noted in bullet #2 (above) as the proposed design does not result in an increase in impervious areas.

5.8 STANDARD 8: EROSION & SEDIMENT CONTROLS

All development sites require the use of source control and pollution prevention measures to minimize the impact that the land use may have on stormwater runoff quality. The intent of this standard is to prevent, to the maximum extent practicable, pollutants from coming into contact with stormwater runoff.

Response: Temporary erosion and sediment controls for construction have been incorporated into the proposed design and are shown on the proposed condition plan, in general accordance with the Erosion Control Handbook. Erosion and sediment controls are outlined below:

A. Construction Phase

The construction phase of the proposed project requires the installation of erosion and sediment controls and their maintenance. During the construction phase the following major earthwork activities and their sequence in the construction phase will be as follows:

1. *Mobilization.*
2. *Installation of temporary erosion control measures.*
3. *Brick pavers removal activities.*
4. *Excavation of trenches and Installation of proposed drainage system.*
5. *Connection into existing stormwater management system.*
6. *Landscape and Site restoration.*

In the following practices, the specified activities and controls are minimums only. They should be increased as needed to ensure proper functioning and that their intent to control erosion and sedimentation is met.

Specific controls and practices include:

1. *Erosion Control Blanket – Blanket to be installed on all slopes steeper that 33%.*
2. *Temporary Stabilization - Soil stockpiles that remain in place for at least 6 months shall be stabilized with temporary seed and mulch no later than 30 days from the last construction activity in that area.*
3. *Catch Basin Inlet Protection – Drop inlet sediment bags will be installed at each catch basin inlets to ensure sediment and/or debris will not enter the existing stormwater system during the construction phase.*

4. *Permanent Stabilization - Disturbed portions of the site where construction activities are complete shall be stabilized with permanent seeding no later than 14 days after the last construction activity. The permanent seed mix shall be in accordance with the design plans.*

Other Miscellaneous Controls:

1. *Waste Materials - All waste will be collected and stored in a securely covered metal dumpster as provided by a licensed solid waste management company. The dumpster shall meet all local and state regulations. The dumpster will be emptied as necessary. No construction waste materials shall be buried on-site.*

2. *Hazardous Waste - All hazardous waste materials shall be disposed of in a manner specified by local or state regulations or by the manufacturer.*

3. *Sanitary Waste - All sanitary waste will be collected from the portable units as required by local regulation.*

B. Maintenance and Inspections during Construction:

The following are the minimum requirements for maintenance and inspection of the above controls to ensure they are functioning as intended and to ensure that additional measures are installed, if and when the need arises.

1. *All control measures will be inspected at least once each week and following any storm event of 0.5 inches or greater. If no rain gauge is present on-site, then inspections shall be following any storm event.*

2. *All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report. Sufficient stockpiles of erosion control material shall be kept on-site in reserve in the event that immediate repair is required.*

3. *Accumulated sediment will be removed from silt fence when it has reached one-third the height of the fence.*

4. *Silt fence/hay bale/compost sock barriers will be inspected for depth of sediment, tears, gaps, etc., to see if the fabric or bales are secure and firmly in the ground.*

5. *Temporary and permanent seeding and planting will be inspected for bare spots, washouts, and healthy growth until fully established.*

5.9 STANDARD 9: STORMWATER MANAGEMENT SYSTEM OPERATION AND MAINTENANCE

This standard requires that an operations and maintenance plan is developed to ensure that stormwater management systems function properly for the lifetime of the system.

*Response: See **Appendix G** attached for the Site's operations and maintenance plan.*

5.10 STANDARD 10: ILLICIT DISCHARGES

This standard is meant to eliminate illicit discharges to stormwater management systems. Illicit discharges are defined as discharges to the stormwater management system that do not consist entirely of stormwater. An illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation,

uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents. In addition projects within Wetlands jurisdiction must demonstrate compliance with this requirement by submitting to the issuing authority an Illicit Discharge Compliance Statement verifying that no illicit discharges exist on the site and by including in the pollution prevention plan measures to prevent illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease.

Response: The stormwater management system has been designed to collect, convey, and manage only stormwater runoff generated from the existing facility. An Illicit Discharge Compliance Statement is attached as ***Appendix F****.*

6.0 SITE HYDROLOGIC AND HYDRAULIC MODELING

A hydrologic and hydraulic analysis (H & H) was performed in accordance with Volume 3 of the Design Manual. The hydrologic analysis was performed using HydroCAD® Version 10 stormwater modeling system computer program. Hydrographs for each watershed were developed using the SCS Synthetic Unit Hydrograph Method with a Type III 24-hour rainfall distribution. Hydrographs were developed with NOAA Atlas 14, precipitation data for the 2-, 10- and 100-year 24- hour storm event with rainfall depths of 3.39 inches, 5.36 inches and 8.50 inches, respectively.

6.1 PRE-DEVELOPMENT HYDROLOGIC AND HYDRAULIC SUMMARY

The Site was delineated into two watersheds/drainage areas using existing topography and the existing drainage system. The existing Site generally drains in four (4) directions; three of the directions go towards the existing drainage systems (towards catch basins "H", "I", and "G") and one goes towards the municipal stormwater system on R Street. The Site was modeled to discharge at one (1) Design Point called "18" RCP Bell Outlet". The pre-development drainage areas are delineated are identified on attached Sheet 1 of **Appendix H**. Based on information obtained from the USDA web soil survey and test pit observations, approximately half of the existing soils on the Site are considered urban fill and unclassified, therefore those existing soils were modeled as having a hydraulic soil rating of "D". About half of the area is covered with impervious surfaces, such as pavement and the existing building, in fair condition. The remaining area of the Site consists of the existing brick pavers and lawn/grass cover which is in fair condition.

The following table summarizes the input parameters of the pre-development watershed area.

Pre-Development Stormwater Modeling					
Drainage Area	Size (square feet)	Weighted Cn	Tc (min.)	Flow Length (feet)	Percent Impervious
North Area	21,509	92	8.3	264	59%
Southeast Area	6,204	98	2.3	231	100%
Southwest Area	9,492	70	6.7	193	45%
Roof Drain	2,975	98	1.4	138	100%

The following table summarizes the peak discharge rates for the pre-development watershed area for the three design storm frequencies:

Pre-Development Modeling Drainage Area Results			
Drainage Area	Design Storm Frequency		
	2-year Peak Flow (cfs)	10-year Peak Flow (cfs)	100-year Peak Flow (cfs)
Back River	2.03	3.62	6.21

6.2 POST-DEVELOPMENT HYDROLOGIC AND HYDRAULIC SUMMARY

The post-development watershed/drainage areas were delineated according to the Site's proposed stormwater management improvements. The pre-development drainage area perimeters and characteristics were modified according to approximate post-development storm water runoff flow patterns. The post-development drainage areas are delineated and are identified on attached Sheet 2 of **Appendix H**. The primary differences between the pre- and post-development stormwater runoff conditions are:

- The perforated pipe along the western side of the building is proposed to be replaced by a 6" solid PVC and re-directed to the existing on-Site stormwater management system.
- The replacement of the 4" solid PVC along the north and east of the building with a 12" solid PVC and change of inverts to and from the existing catch basins.

- The removal of the perforated 4" pipe located within 10-ft of the building entrance on the north side.

Post-Development Stormwater Modeling					
Drainage Area	Size (square feet)	Weighted Cn	Tc (min.)	Flow Length (feet)	Percent Impervious
North Area	17,623	90	8.3	264	49%
Southeast Area	6,204	98	2.3	231	100%
Southwest Area	7,826	65	6.7	193	33%
South Roof Drain	4,641	98	2.2	36	100%
North Roof Drain	3,886	98	0.7	220	100%

The following table summarizes the peak stormwater runoff discharge rates for each proposed drainage area and the design storm frequencies:

Post-Development Modeling Drainage Area Results			
Drainage Area	Design Storm Frequency		
	2-year Peak Flow (cfs)	10-year Peak Flow (cfs)	100-year Peak Flow (cfs)
Back River	2.07	3.63	6.19

6.3 PRE- VS POST REDEVELOPMENT COMPARISON

As noted below, during the 2-year and 10-year storm events there is a minimal increase in the peak flow between the pre- and post-development condition. The proposed stormwater management system mitigates roof runoff draining into the municipality's stormwater system. The proposed stormwater management system will improve stormwater quality by directing on-Site stormwater through the existing vortex manhole systems.

The following table compares the peak stormwater runoff discharge rates for each proposed drainage area and the design storm frequencies:

Pre- and Post-Development Comparison at Back River			
Model	Design Storm Frequency		
	2-year Peak Flow (cfs)	10-year Peak Flow (cfs)	100-year Peak Flow (cfs)
Pre-Development	2.03	3.62	6.21
Post-Development	2.07	3.63	6.19

Outlet protection for the 18-inch RCP outfall located at the Back River was evaluated to confirm that the minimal increase in peak discharge rates would not cause any erosion. In the existing condition, the outlet is protected by a riprap apron. In the pre-development model, the peak velocity at the outfall is 3.39 feet/sec during the 100-year storm event, and in the post-development condition 3.38 feet/sec, therefore there is no increase in flow velocity and the receiving area is adequately protected by the existing riprap apron.

APPENDIX A

LIMITATIONS

USE OF REPORT

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

STANDARD OF CARE

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Proposal for Services and/or Report and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. Conditions other than described in this report may be found at the subject location(s).

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made. Specifically, GZA does not and cannot represent that the Site contains no hazardous material, oil, or other latent condition beyond that observed by GZA during its study. Additionally, GZA makes no warranty that any response action or recommended action will achieve all of its objectives or that the findings of this study will be upheld by a local, state or federal agency.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

SUBSURFACE CONDITIONS

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. Water level readings have been made, as described in this Report, in and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The observed water table may be other than indicated in the Report.

COMPLIANCE WITH CODES AND REGULATIONS

7. We used reasonable care in identifying and interpreting applicable codes and regulations necessary to execute our scope of work. These codes and regulations are subject to various, and possibly contradictory, interpretations. Interpretations and compliance with codes and regulations by other parties is beyond our control.

SCREENING AND ANALYTICAL TESTING

8. GZA collected environmental samples at the locations identified in the Report. These samples were analyzed for the specific parameters identified in the report. Additional constituents, for which analyses were not conducted, may be present in soil, groundwater, surface water, sediment and/or air. Future Site activities and uses may result in a requirement for additional testing.

9. Our interpretation of field screening and laboratory data is presented in the Report. Unless otherwise noted, we relied upon the laboratory's QA/QC program to validate these data.

10. Variations in the types and concentrations of contaminants observed at a given location or time may occur due to release mechanisms, disposal practices, changes in flow paths, and/or the influence of various physical, chemical, biological or radiological processes. Subsequently observed concentrations may be other than indicated in the Report.

INTERPRETATION OF DATA

11. Our opinions are based on available information as described in the Report, and on our professional judgment. Additional observations made over time, and/or space, may not support the opinions provided in the Report.

ADDITIONAL INFORMATION

12. In the event that the Client or others authorized to use this report obtain additional information on environmental or hazardous waste issues at the Site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the conclusions stated in this report.

ADDITIONAL SERVICES

13. GZA recommends that we be retained to provide services during any future investigations, design, implementation activities, construction, and/or property development/ redevelopment at the Site. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

APPENDIX B

STORMWATER MANAGEMENT CHECKLIST

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

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

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

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

---

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

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

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

Steven T. D'Ambrosio 07/14/25

Signature and Date

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation See attached Stormwater Management Plan

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☐ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge See attached Stormwater Management Plan

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality See attached Stormwater Management Plan

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

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs) N/A; see attached Stormwater Management Plan

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas N/A; see attached Stormwater Management Plan

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

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

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☒ Redevelopment portion of mix of new and redevelopment.

☒ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

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

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☒ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

APPENDIX C

TEST PIT LOGS

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Clark's Pond Stormwater
The Lofts at Clark's Pond
Amesbury, Massachusetts

EXPLORATION NO.: TP-1
SHEET: 1 of 1
PROJECT NO: 35466
REVIEWED BY: JK

Logged By: Greg DiMillio
Contractor: M.T. Mayo Corp
Foreman: Mike Halpin

Test Pit Location: See Plan
Ground Surface Elev. (ft.): 20
Date Start: 7/1/2025
Date Finish: 7/1/2025

H. Datum:
V. Datum: NAVD88

Equipment: CAT
Model: 306
Reach (ft.): 10
Capacity (cu.yd.): 0.25

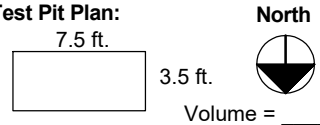
Weather: Cloudy, 70s
Time Start: 8:37
Time Finish: 10:00

Groundwater Depth (ft.)

Date	Time	Depth (ft.)	Symbol
7/1/25	9:30	8.5	▽

Depth (ft)	Stratum Description (Modified Burmister Classification)	Elev. (ft.)	Excavation Effort	Boulder Count Qty./Class	Remark
	Dark brown, SILT, little fine to medium Sand, trace fine to coarse Gravel, trace Roots, dry (TOPSOIL)	19.7	M		
1			M	2A	
2	Gray, fine to medium SAND, some Gravel, little Silt, trace Debris (brick, shells, wood, metal, cinders) (URBAN FILL)		M		
3		17.0	M		
	Tan, fine SAND and SILT, little fine to coarse Gravel, trace Debris, moist (FILL)	16.5			
4	Dark gray, fine to medium SAND, little Silt, little fine to coarse Graveel, trace Debris (FILL)	15.8	M		
5	Tan, SILT, some fine to coarse Sand, some fine to coarse Gravel, trace Debris, moist (URBAN FILL)	14.5	M		1
6			M		
7	Red, SILT and fine to coarse Sand, trace Debris (Glass, Deteriorated Brick, Metal, Plastic), wet (URBAN FILL)	12.7	M		
	Light brown, fine to medium SAND, some Silt, little Gravel, wet (FILL)	12.0			
8	Red/Black, SILT, some fine to medium Sand, some fine to coarse Gravel (wet), trace Brick, trace Glass, trace Wood, wet (FILL)	11.2	M	2A	2
9	End of exploration at 8.83 feet.				
10					

Test Pit Plan:



Volume = 9 ± cu.yd.

LEGEND:
▽ Observed Water Level

Proportions Used:

Trace (Tr)	0-10%
Little (Li)	10-20%
Some (So)	20-35%
And	35-50%

Excavation Effort:

Easy	E
Moderate	M
Difficult	D

Boulder Size Range Designation:

Diameter	Letter Designation
6 to 16 in.	A
16 to 36 in.	B
> 36 in.	C

REMARKS

1 - Seasonal highwater table 4 ft 6 in below ground surface.
2 - Test pit terminated due to groundwater infiltration at 8 ft 6 in below ground surface.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: TP-1

GZA TEMPLATE TEST PIT; 7/7/2025; 8:14:55 AM

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Clark's Pond Stormwater
The Lofts at Clark's Pond
Amesbury, Massachusetts

EXPLORATION NO.: TP-2
SHEET: 1 of 1
PROJECT NO: 35466
REVIEWED BY: JK

Logged By: Greg DiMillio
Contractor: M.T. Mayo Corp
Foreman: Mike Halpin

Test Pit Location: See Plan
Ground Surface Elev. (ft.): 18.5
Date Start: 7/1/2025
Date Finish: 7/1/2025

H. Datum:
V. Datum: NAVD88

Equipment: CAT
Model: 306
Reach (ft.): 10
Capacity (cu.yd.): 0.25

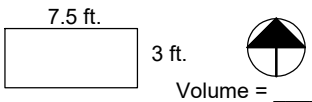
Weather: Cloudy, 70s
Time Start: 10:06
Time Finish: 11:20

Groundwater Depth (ft.)

Date	Time	Depth (ft.)	Symbol
7/1/25	10:50	7.75	▼

Depth (ft)	Stratum Description (Modified Burmister Classification)	Elev. (ft.)	Excavation Effort	Boulder Count Qty./Class	Remark
	Dark brown, SILT, little fine to medium Sand, trace Roots, dry (TOPSOIL)	18.0	E		
1	Dark brown, fine to medium SAND, some Silt, little Gravel, trace Brick, dry (FILL)	17.0	D	4A	
2	Brown, GRAVEL, little Silt, trace fine to medium Sand, moist (FILL)	16.3	M	1A	
3			M		
4			M		
	Black, fine to medium SAND, little Silt, little Gravel, trace Debris (metal, bricks), moist 1-1.5' thick pocket of rounded coarse Gravel				
5			M		1
6			E		
		11.8			
7	6 ft to 7.5 ft East wall- 1.5' thick pocket of reddish/black, SILTY CLAY, little fine to coarse Sand, little Debris (glass, wood, roots, metal)(Fill)		E		
8	▼	10.5			2
	End of exploration at 8 feet.				
9					
10					

Test Pit Plan:



Volume = 7 ± cu.yd.

LEGEND:
▼ Observed Water Level

Proportions Used:

Trace (Tr)	0-10%
Little (Li)	10-20%
Some (So)	20-35%
And	35-50%

Excavation Effort:

Easy	E
Moderate	M
Difficult	D

Boulder Size Range Designation:

Diameter	Letter Designation
6 to 16 in.	A
16 to 36 in.	B
> 36 in.	C

REMARKS

1 - Seasonal highwater table 5 ft 2 in below ground surface.
2 - Test pit terminated due to groundwater infiltration.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: TP-2

GZA TEMPLATE TEST PIT; 7/7/2025; 8:14:56 AM

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Clark's Pond Stormwater
The Lofts at Clark's Pond
Amesbury, Massachusetts

EXPLORATION NO.: TP-3
SHEET: 1 of 1
PROJECT NO: 35466
REVIEWED BY: JK

Logged By: Greg DiMillio
Contractor: M.T. Mayo Corp
Foreman: Mike Halpin

Test Pit Location: See Plan
Ground Surface Elev. (ft.): 20
Date Start: 7/1/2025
Date Finish: 7/1/2025

H. Datum:
V. Datum: NAVD88

Equipment: CAT
Model: 306
Reach (ft.): 10
Capacity (cu.yd.): 0.25

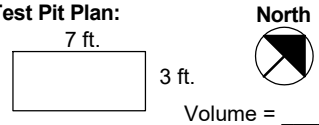
Weather: Cloudy, 80s
Time Start: 11:25
Time Finish: 12:25

Groundwater Depth (ft.)

Date	Time	Depth (ft.)	Symbol
7/1/25	12:00	NE	▽ ▼ ▽

Depth (ft)	Stratum Description (Modified Burmister Classification)	Elev. (ft.)	Excavation Effort	Boulder Count Qty./Class	Remark
0	Dark brown, SILT, little fine to medium Sand, trace Roots, dry (TOPSOIL)	19.3	E		
1	Tan, fine SAND and SILT, trace fine Gravel, moist, redox layer at transition (FILL)	18.7	E		
2			E		1
3	Brown, fine to coarse SAND, little Silt, little fine to coarse Gravel, trace Debris (metal, wood, brick), moist (FILL)		M	1A	
4			D		
		15.3			2
5	End of exploration at 4.75 feet.				
6					
7					
8					
9					
10					

Test Pit Plan:



Volume = 4 ± cu.yd.

LEGEND:
▼ Observed Water Level

Proportions Used:

Trace (Tr)	0-10%
Little (Li)	10-20%
Some (So)	20-35%
And	35-50%

Excavation Effort:

Easy	E
Moderate	M
Difficult	D

Boulder Size Range Designation:

Diameter	Letter Designation
6 to 16 in.	A
16 to 36 in.	B
> 36 in.	C

REMARKS

1 - Redox features observed generally around buried metal.
2 - Test pit terminated due to buried concrete slab.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: TP-3

GZA TEMPLATE TEST PIT; 7/7/2025; 8:14:56 AM

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Clark's Pond Stormwater
The Lofts at Clark's Pond
Amesbury, Massachusetts

EXPLORATION NO.: TP-4
SHEET: 1 of 1
PROJECT NO: 35466
REVIEWED BY: JK

Logged By: Greg DiMillio
Contractor: M.T. Mayo Corp
Foreman: Mike Halpin

Test Pit Location: See Plan
Ground Surface Elev. (ft.): 21
Date Start: 7/1/2025
Date Finish: 7/1/2025

H. Datum:
V. Datum: NAVD88

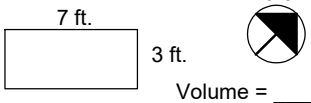
Equipment: CAT
Model: 306
Reach (ft.): 10
Capacity (cu.yd.): 0.25

Weather: Cloudy, 80s
Time Start: 12:25
Time Finish: 12:57

Groundwater Depth (ft.)			
Date	**Time**	**Depth (ft.)**	**Symbol**
7/1/25	12:45	NE	▽ ▼ ▽

Depth (ft)	Stratum Description (Modified Burmister Classification)	Elev. (ft.)	Excavation Effort	Boulder Count Qty./Class	Remark
	Dark brown, SILT, little fine to medium Sand, trace Roots, dry (TOPSOIL)	20.5	E		
1			D		
2	Brown, fine to medium SAND, some fine to coarse Gravel, little Silt, trace Debris (wood), dry (FILL)		D		
3		17.5	E		1
4	Tan, fine to medium SAND, trace Silt, moist (Bedding Sand)	16.7			2
	End of exploration at 4.33 feet.				
5					
6					
7					
8					
9					
10					

Test Pit Plan:



Volume = 3 ± cu.yd.

LEGEND:
▼ Observed Water Level

Proportions Used:

Trace (Tr)	0-10%
Little (Li)	10-20%
Some (So)	20-35%
And	35-50%

Excavation Effort:

Easy	E
Moderate	M
Difficult	D

Boulder Size Range Designation:

Diameter	Letter Designation
6 to 16 in.	A
16 to 36 in.	B
> 36 in.	C

REMARKS

1 - Yellow caution tape encountered at approximately 3' bgs. Contractor used air knife to loosen soil and confirm presence of buried utilities.
2 - Test pit terminated due to presence of buried utilities.

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: TP-4

GZA TEMPLATE TEST PIT; 7/7/2025; 8:14:56 AM

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Clark's Pond Stormwater
The Lofts at Clark's Pond
Amesbury, Massachusetts

EXPLORATION NO.: TP-5
SHEET: 1 of 1
PROJECT NO: 35466
REVIEWED BY: JK

Logged By: Greg DiMillio
Contractor: M.T. Mayo Corp
Foreman: Mike Halpin

Test Pit Location: See Plan
Ground Surface Elev. (ft.): 22
Date Start: 7/1/2025
Date Finish: 7/1/2025

H. Datum:
V. Datum: NAVD88

Equipment: CAT
Model: 306
Reach (ft.): 10
Capacity (cu.yd.): 0.25

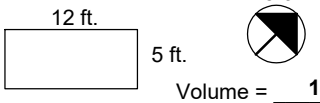
Weather: Cloudy, 80s
Time Start: 1:15
Time Finish: 2:30

Groundwater Depth (ft.)

Date	Time	Depth (ft.)	Symbol
7/1/25	2:00	6.0	▼

Depth (ft)	Stratum Description (Modified Burmister Classification)	Elev. (ft.)	Excavation Effort	Boulder Count Qty./Class	Remark
	Dark brown, SILT, little fine to medium Sand, trace Roots, dry (TOPSOIL)	21.5	E		
1	Tan, fine to medium SAND, some Silt, trace fine to coarse Gravel, moist (FILL)	20.7	D	5A	
2	Brown, fine to medium SAND, some Cobbles/Boulders, little Silt, trace Debris (metal, rubber), moist (FILL)		M		
3		19.0	M	2B, 5A	1
4	Gray, SILT, trace fine Sand, trace fine Gravel, moist, fully mottled (SILT)		D		
5	End of exploration at 5 feet.	17.0	M		2
6	▼ End of exploration at 6.5 feet.	15.5			3
7					
8					
9					
10					

Test Pit Plan:



Volume = **14 ±** cu.yd.

LEGEND: ▼ Observed Water Level

Proportions Used:

Trace (Tr)	0-10%
Little (Li)	10-20%
Some (So)	20-35%
And	35-50%

Excavation Effort:

Easy	E
Moderate	M
Difficult	D

Boulder Size Range Designation:

Diameter	Letter Designation
6 to 16 in.	A
16 to 36 in.	B
> 36 in.	C

REMARKS

1 - Seasonal highwater table 3 ft in east wall below ground surface.
2 - End of exploration at approximately 5 ft due to concrete in east.
3 - Test pit terminated due to groundwater infiltration.

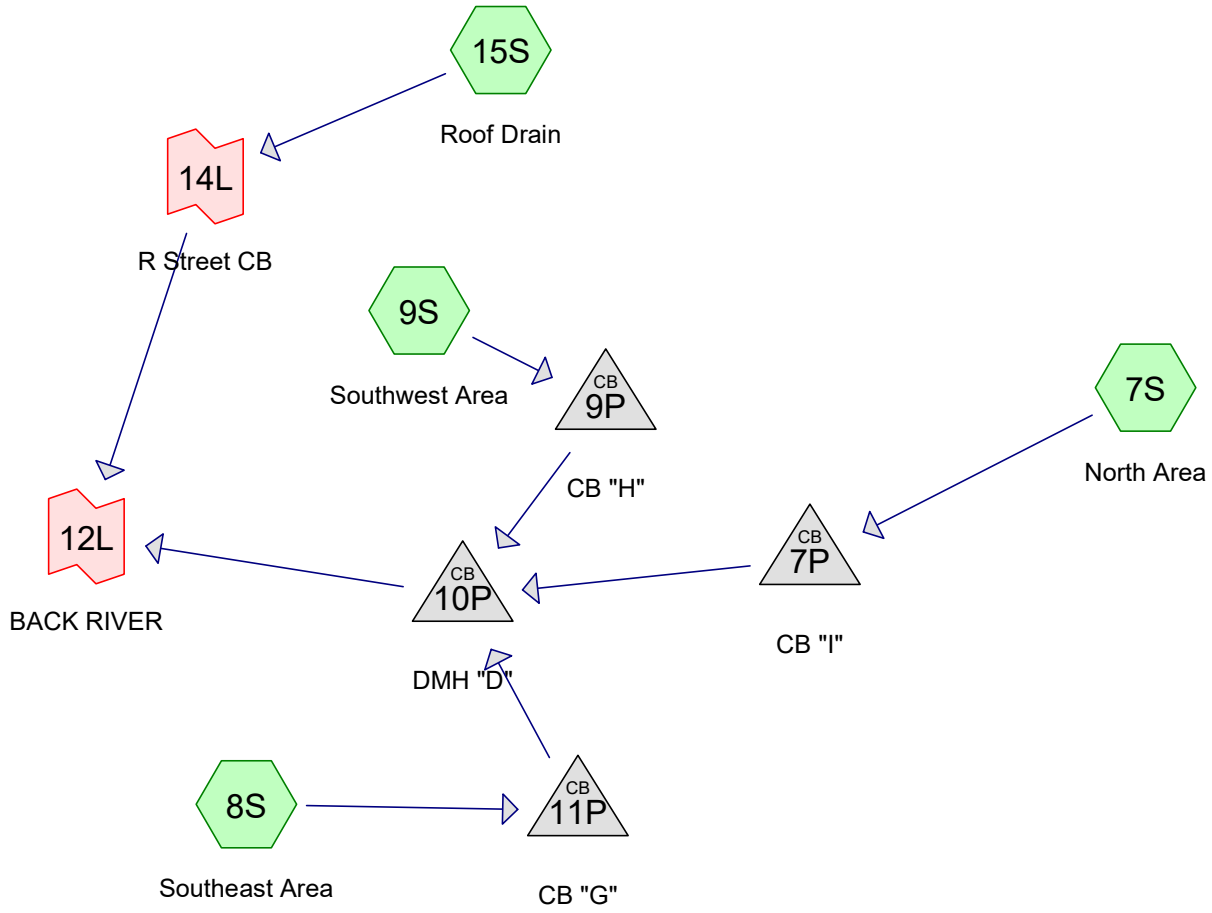
See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: TP-5

GZA TEMPLATE TEST PIT; 7/7/2025; 8:14:57 AM

APPENDIX D

HYDROCAD 10 POST DEVELOPMENT STORMWATER MODELING



Subcat Reach Pond Link

Routing Diagram for Existing Conditions - Clarks Pond Stormwater
Prepared by GZA GeoEnvironmental, Inc, Printed 7/14/2025
HydroCAD® 10.20-6a s/n 07899 © 2024 HydroCAD Software Solutions LLC

Project Notes

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC	P2 (inches)
1	2-Year	Type III 24-hr		Default	24.00	1	3.39	2	3.39
2	10-Year	Type III 24-hr		Default	24.00	1	5.36	2	3.39
3	100-Year	Type III 24-hr		Default	24.00	1	8.50	2	3.39

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.091	39	>75% Grass cover, Good, HSG A (9S)
0.173	80	>75% Grass cover, Good, HSG D (7S)
0.030	76	Brick Pavers, HSG A (9S)
0.032	96	Brick Pavers, HSG D (7S)
0.202	98	Paved roads w/curbs & sewers, HSG A (8S, 9S)
0.200	98	Paved roads w/curbs & sewers, HSG D (7S)
0.107	98	Roofs, HSG A (9S, 15S)
0.089	98	Roofs, HSG D (7S)
0.922	**88**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.429	HSG A	8S, 9S, 15S
0.000	HSG B	
0.000	HSG C	
0.494	HSG D	7S
0.000	Other	
0.922		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.091	0.000	0.000	0.173	0.000	0.263	>75% Grass cover, Good	7S, 9S
0.030	0.000	0.000	0.032	0.000	0.061	Brick Pavers	7S, 9S
0.202	0.000	0.000	0.200	0.000	0.402	Paved roads w/curbs & sewers	7S, 8S, 9S
0.107	0.000	0.000	0.089	0.000	0.196	Roofs	7S, 9S, 15S
0.429	**0.000**	**0.000**	**0.494**	**0.000**	**0.922**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	15S	0.00	0.00	60.0	0.0100	0.010	0.0	6.0	0.0	
2	15S	0.00	0.00	27.0	0.0100	0.010	0.0	4.0	0.0	
3	7P	12.81	12.80	12.0	0.0008	0.012	0.0	15.0	0.0	
4	9P	13.15	13.02	10.0	0.0130	0.013	0.0	15.0	0.0	
5	10P	12.19	10.92	136.0	0.0093	0.013	0.0	18.0	0.0	
6	11P	13.18	12.87	12.0	0.0258	0.012	0.0	15.0	0.0	

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 7S: North Area Runoff Area=21,509 sf 58.55% Impervious Runoff Depth=2.53"
Flow Length=264' Tc=8.3 min CN=92 Runoff=1.32 cfs 0.104 af

Subcatchment 8S: Southeast Area Runoff Area=6,204 sf 100.00% Impervious Runoff Depth=3.16"
Flow Length=231' Tc=2.3 min CN=98 Runoff=0.54 cfs 0.037 af

Subcatchment 9S: Southwest Area Runoff Area=9,492 sf 44.82% Impervious Runoff Depth=0.94"
Flow Length=193' Tc=6.7 min CN=70 Runoff=0.21 cfs 0.017 af

Subcatchment 15S: Roof Drain Runoff Area=2,975 sf 100.00% Impervious Runoff Depth=3.16"
Flow Length=138' Slope=0.0100 '/' Tc=1.4 min CN=98 Runoff=0.27 cfs 0.018 af

Pond 7P: CB "I" Peak Elev=13.49' Inflow=1.32 cfs 0.104 af
15.0" Round Culvert n=0.012 L=12.0' S=0.0008 '/' Outflow=1.32 cfs 0.104 af

Pond 9P: CB "H" Peak Elev=13.37' Inflow=0.21 cfs 0.017 af
15.0" Round Culvert n=0.013 L=10.0' S=0.0130 '/' Outflow=0.21 cfs 0.017 af

Pond 10P: DMH "D" Peak Elev=12.81' Inflow=1.87 cfs 0.159 af
18.0" Round Culvert n=0.013 L=136.0' S=0.0093 '/' Outflow=1.87 cfs 0.159 af

Pond 11P: CB "G" Peak Elev=13.48' Inflow=0.54 cfs 0.037 af
15.0" Round Culvert n=0.012 L=12.0' S=0.0258 '/' Outflow=0.54 cfs 0.037 af

Link 12L: BACK RIVER Inflow=2.03 cfs 0.177 af
Primary=2.03 cfs 0.177 af

Link 14L: R Street CB Inflow=0.27 cfs 0.018 af
Primary=0.27 cfs 0.018 af

Total Runoff Area = 0.922 ac Runoff Volume = 0.177 af Average Runoff Depth = 2.30"
35.22% Pervious = 0.325 ac 64.78% Impervious = 0.597 ac

Summary for Subcatchment 7S: North Area

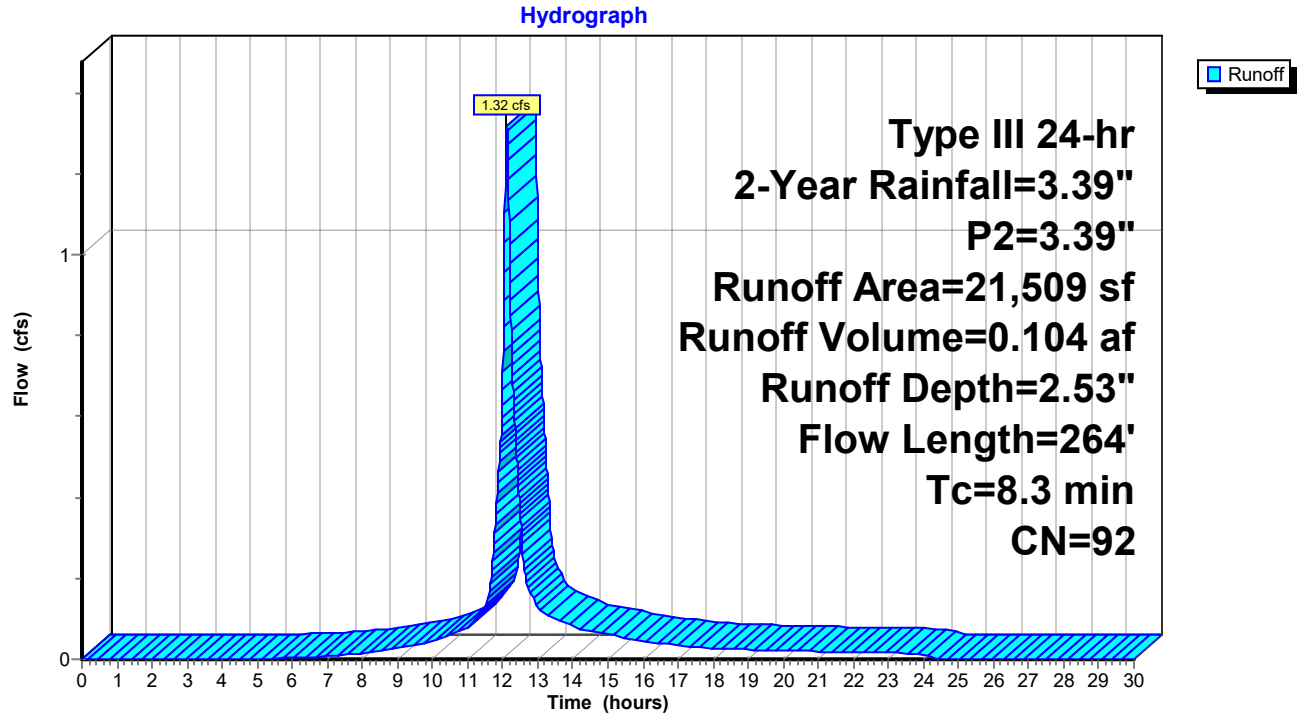
Runoff = 1.32 cfs @ 12.11 hrs, Volume= 0.104 af, Depth= 2.53"
Routed to Pond 7P : CB "I"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.39", P2=3.39"

	Area (sf)	CN	Description
	8,708	98	Paved roads w/curbs & sewers, HSG D
	7,530	80	>75% Grass cover, Good, HSG D
*	1,385	96	Brick Pavers, HSG D
	3,886	98	Roofs, HSG D
	21,509	92	Weighted Average
	8,915		41.45% Pervious Area
	12,594		58.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	112	0.0580	0.27		**Sheet Flow, over lawn** Grass: Short n= 0.150 P2= 3.39"
0.7	37	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	115	0.0240	2.49		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	264	Total			

Subcatchment 7S: North Area



Summary for Subcatchment 8S: Southeast Area

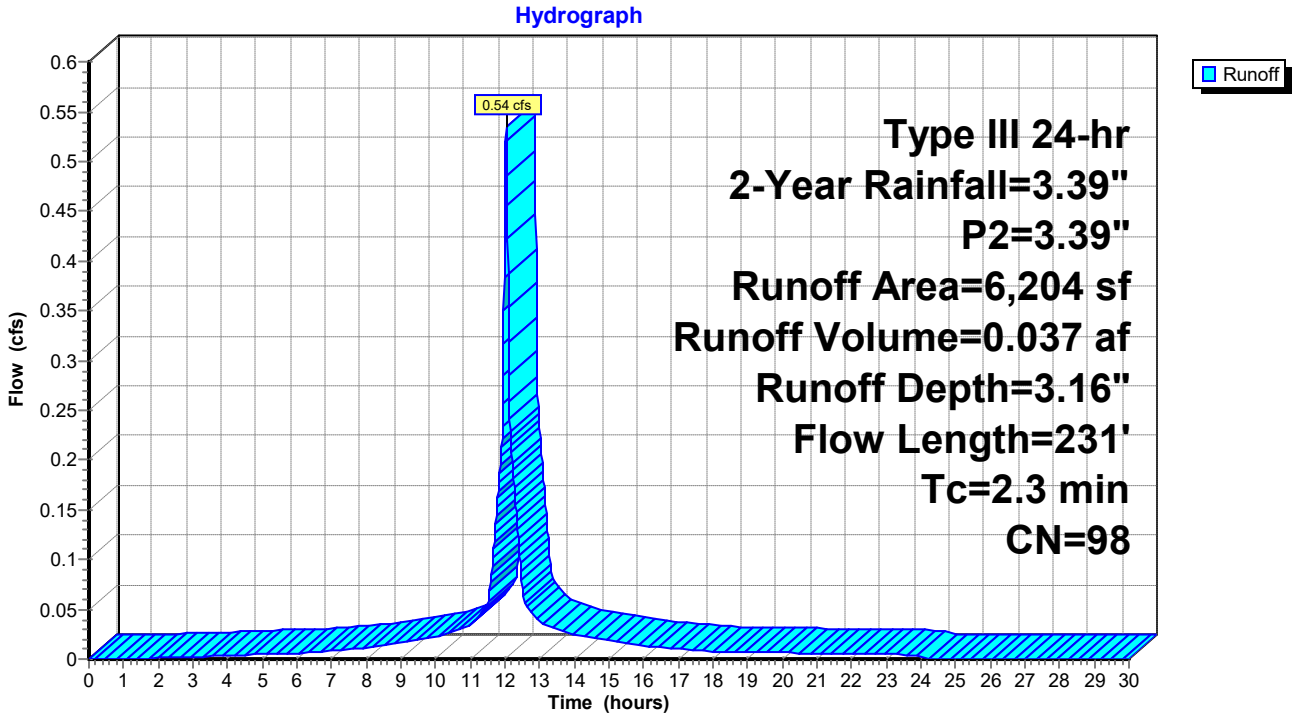
Runoff = 0.54 cfs @ 12.03 hrs, Volume= 0.037 af, Depth= 3.16"
Routed to Pond 11P : CB "G"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.39", P2=3.39"

Area (sf)	CN	Description
6,204	98	Paved roads w/curbs & sewers, HSG A
6,204		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.26		**Sheet Flow, Sheet flow over paved parking area (100')** Smooth surfaces n= 0.011 P2= 3.39"
1.0	131	0.0120	2.22		**Shallow Concentrated Flow, Shallow conc flow over paved R St** Paved Kv= 20.3 fps
2.3	231	Total			

Subcatchment 8S: Southeast Area



Summary for Subcatchment 9S: Southwest Area

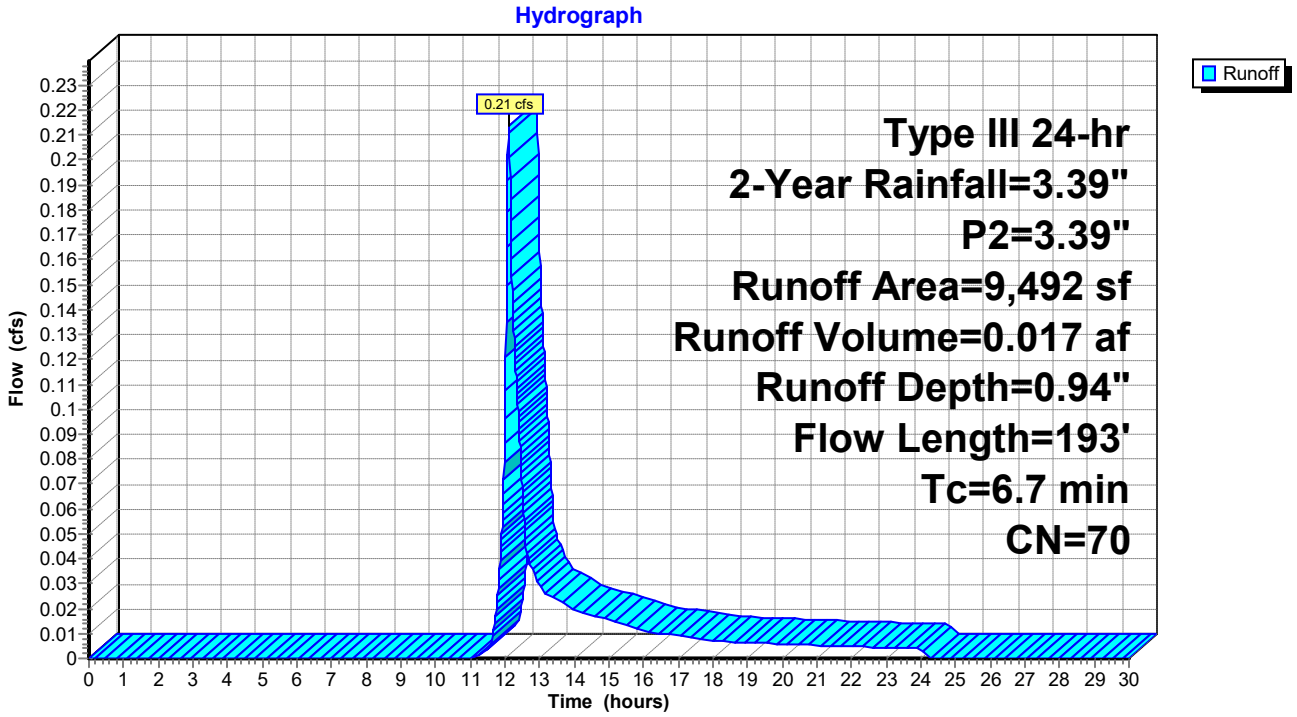
Runoff = 0.21 cfs @ 12.11 hrs, Volume= 0.017 af, Depth= 0.94"
Routed to Pond 9P : CB "H"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.39", P2=3.39"

	Area (sf)	CN	Description
	3,945	39	>75% Grass cover, Good, HSG A
	2,588	98	Paved roads w/curbs & sewers, HSG A
	1,666	98	Roofs, HSG A
*	1,293	76	Brick Pavers, HSG A
	9,492	70	Weighted Average
	5,238		55.18% Pervious Area
	4,254		44.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	26	0.0190	0.09		**Sheet Flow, sheet flow over lawn area (90')** Grass: Dense n= 0.240 P2= 3.39"
0.9	94	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	39	0.0130	0.80		**Shallow Concentrated Flow, Shallow conc flow over driveway** Short Grass Pasture Kv= 7.0 fps
0.2	34	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.7	193	Total			

Subcatchment 9S: Southwest Area



Summary for Subcatchment 15S: Roof Drain

[47] Hint: Peak is 107% of capacity of segment #3

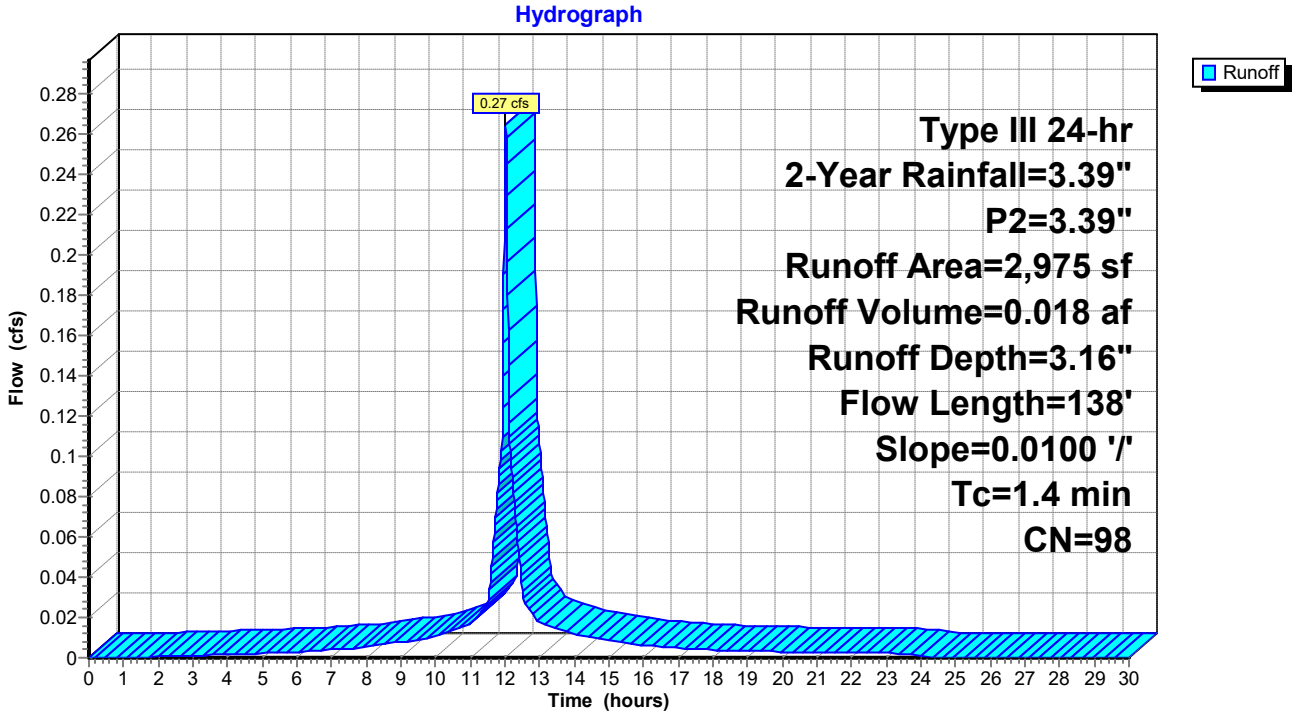
Runoff = 0.27 cfs @ 12.02 hrs, Volume= 0.018 af, Depth= 3.16"
Routed to Link 14L : R Street CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.39", P2=3.39"

Area (sf)	CN	Description
2,975	98	Roofs, HSG A
2,975		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	51	0.0100	0.94		**Sheet Flow, sheet flow over roof** Smooth surfaces n= 0.011 P2= 3.39"
0.3	60	0.0100	3.71	0.73	**Pipe Channel, Pipe** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
0.2	27	0.0100	2.84	0.25	**Pipe Channel, Pipe** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.010 PVC, smooth interior
1.4	138	Total			

Subcatchment 15S: Roof Drain



Summary for Pond 7P: CB "I"

[57] Hint: Peaked at 13.49' (Flood elevation advised)

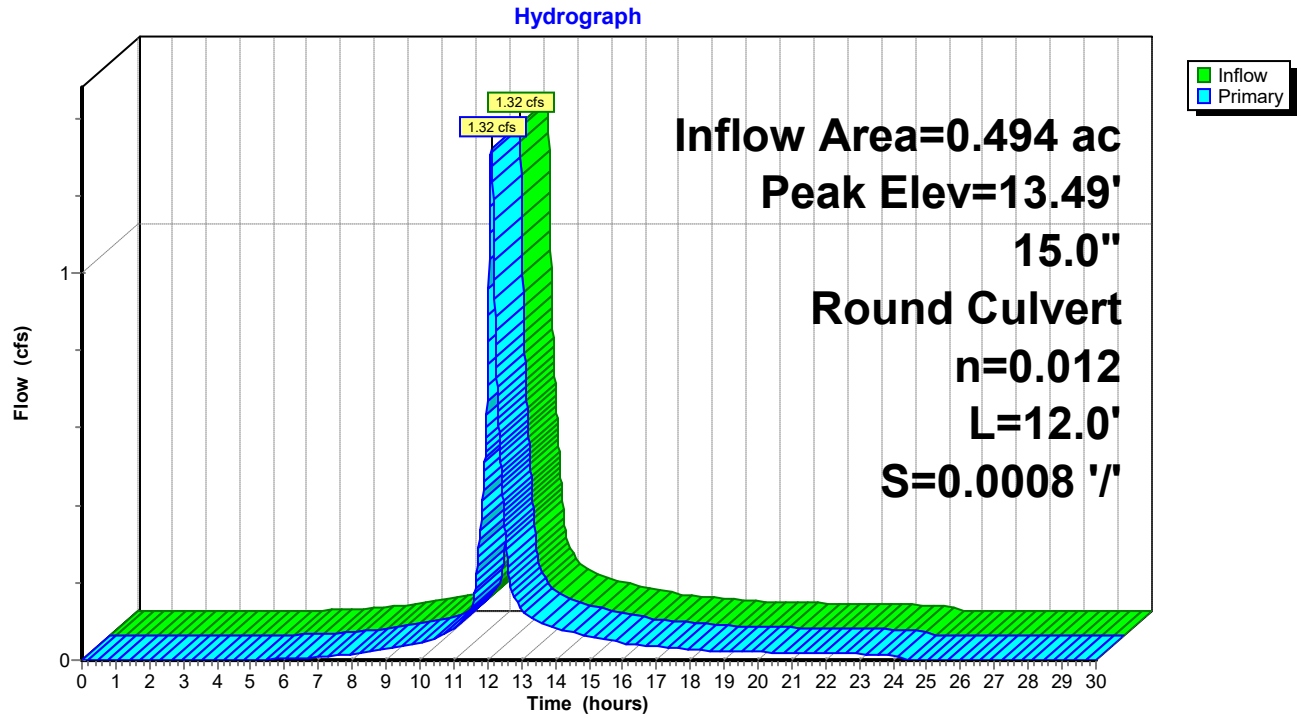
Inflow Area = 0.494 ac, 58.55% Impervious, Inflow Depth = 2.53" for 2-Year event
Inflow = 1.32 cfs @ 12.11 hrs, Volume= 0.104 af
Outflow = 1.32 cfs @ 12.11 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min
Primary = 1.32 cfs @ 12.11 hrs, Volume= 0.104 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.49' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.81'	**15.0" Round Culvert** L= 12.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 12.81' / 12.80' S= 0.0008 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=1.32 cfs @ 12.11 hrs HW=13.49' TW=12.81' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.32 cfs @ 2.79 fps)

Pond 7P: CB "I"



Summary for Pond 9P: CB "H"

[57] Hint: Peaked at 13.37' (Flood elevation advised)

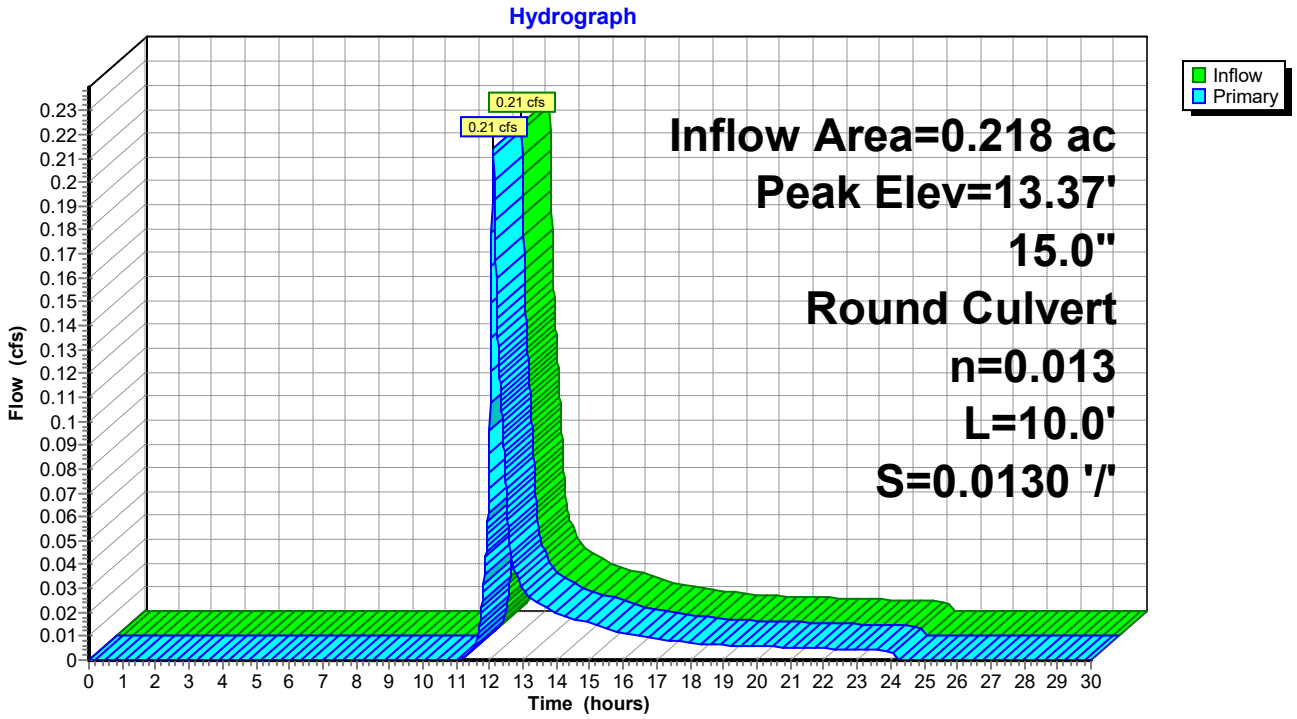
Inflow Area = 0.218 ac, 44.82% Impervious, Inflow Depth = 0.94" for 2-Year event
Inflow = 0.21 cfs @ 12.11 hrs, Volume= 0.017 af
Outflow = 0.21 cfs @ 12.11 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min
Primary = 0.21 cfs @ 12.11 hrs, Volume= 0.017 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.37' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.15'	**15.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.15' / 13.02' S= 0.0130 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf

Primary OutFlow Max=0.21 cfs @ 12.11 hrs HW=13.37' TW=12.81' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.21 cfs @ 2.30 fps)

Pond 9P: CB "H"



Summary for Pond 10P: DMH "D"

[57] Hint: Peaked at 12.81' (Flood elevation advised)

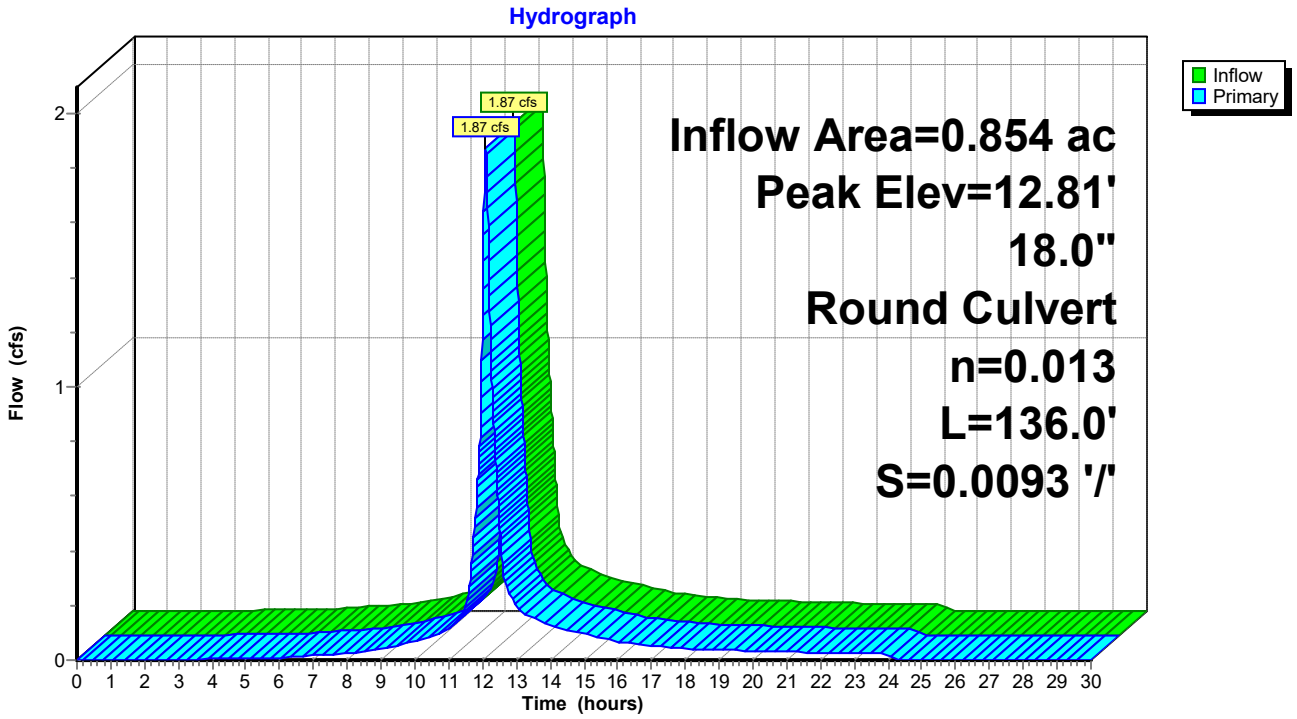
Inflow Area = 0.854 ac, 61.96% Impervious, Inflow Depth = 2.23" for 2-Year event
Inflow = 1.87 cfs @ 12.09 hrs, Volume= 0.159 af
Outflow = 1.87 cfs @ 12.09 hrs, Volume= 0.159 af, Atten= 0%, Lag= 0.0 min
Primary = 1.87 cfs @ 12.09 hrs, Volume= 0.159 af
Routed to Link 12L : BACK RIVER

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 12.81' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.19'	**18.0" Round To Back River** L= 136.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 12.19' / 10.92' S= 0.0093 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.87 cfs @ 12.09 hrs HW=12.81' TW=0.00' (Dynamic Tailwater)
1=To Back River (Inlet Controls 1.87 cfs @ 2.69 fps)

Pond 10P: DMH "D"



Summary for Pond 11P: CB "G"

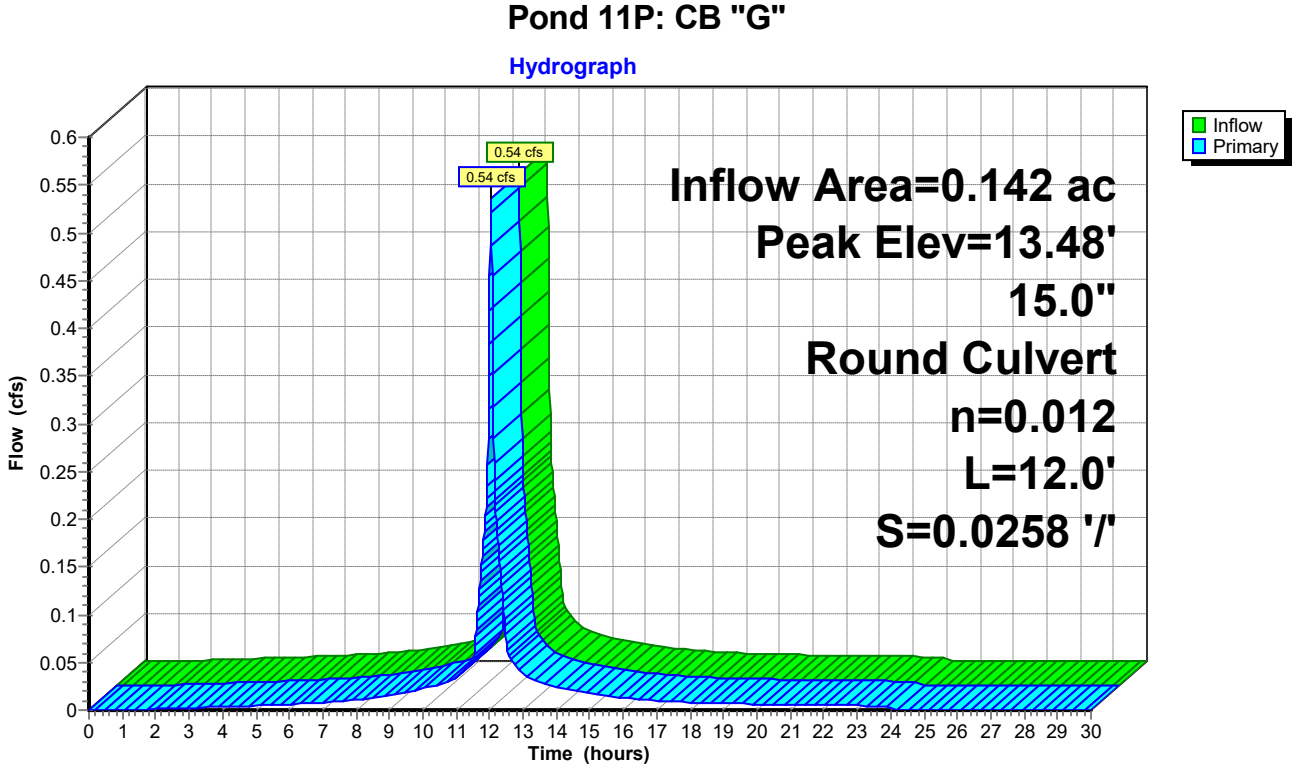
[57] Hint: Peaked at 13.48' (Flood elevation advised)

Inflow Area = 0.142 ac,100.00% Impervious, Inflow Depth = 3.16" for 2-Year event
Inflow = 0.54 cfs @ 12.03 hrs, Volume= 0.037 af
Outflow = 0.54 cfs @ 12.03 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Primary = 0.54 cfs @ 12.03 hrs, Volume= 0.037 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.48' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.18'	**15.0" Round Culvert** L= 12.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.18' / 12.87' S= 0.0258 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=0.53 cfs @ 12.03 hrs HW=13.48' TW=12.76' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.53 cfs @ 2.34 fps)

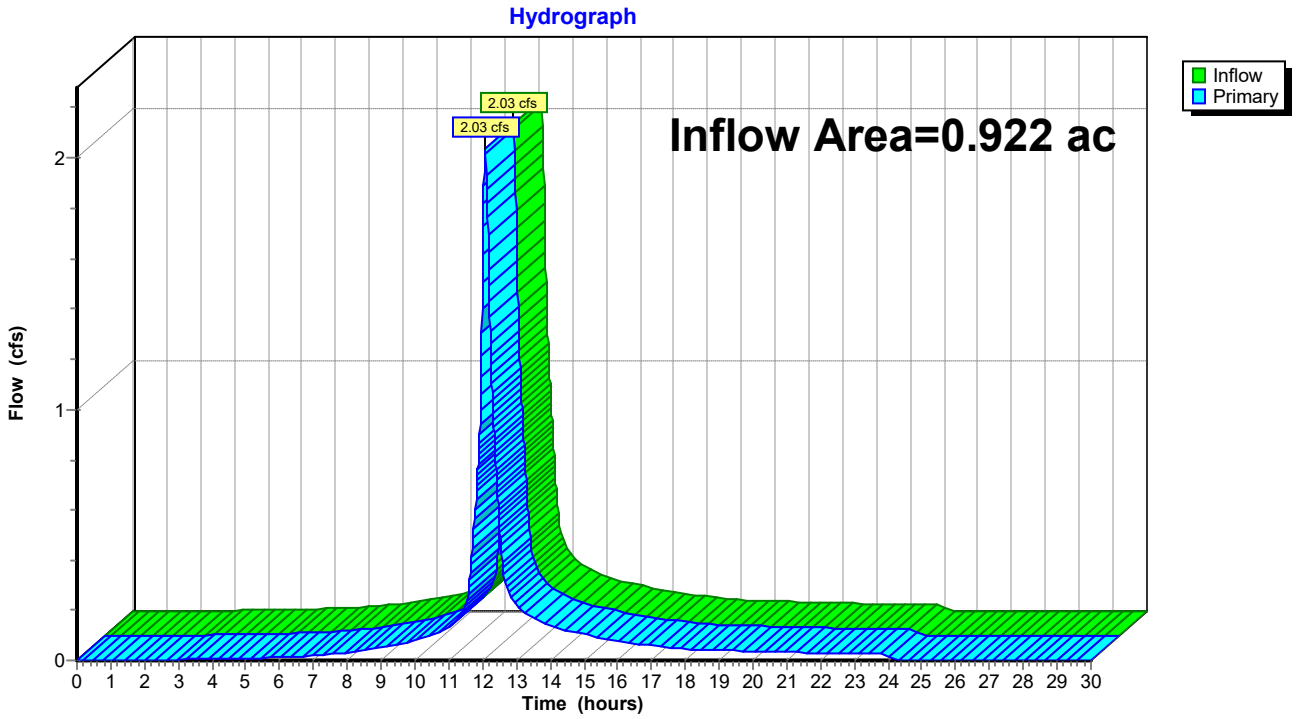


Summary for Link 12L: BACK RIVER

Inflow Area = 0.922 ac, 64.78% Impervious, Inflow Depth = 2.30" for 2-Year event
Inflow = 2.03 cfs @ 12.09 hrs, Volume= 0.177 af
Primary = 2.03 cfs @ 12.09 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 12L: BACK RIVER

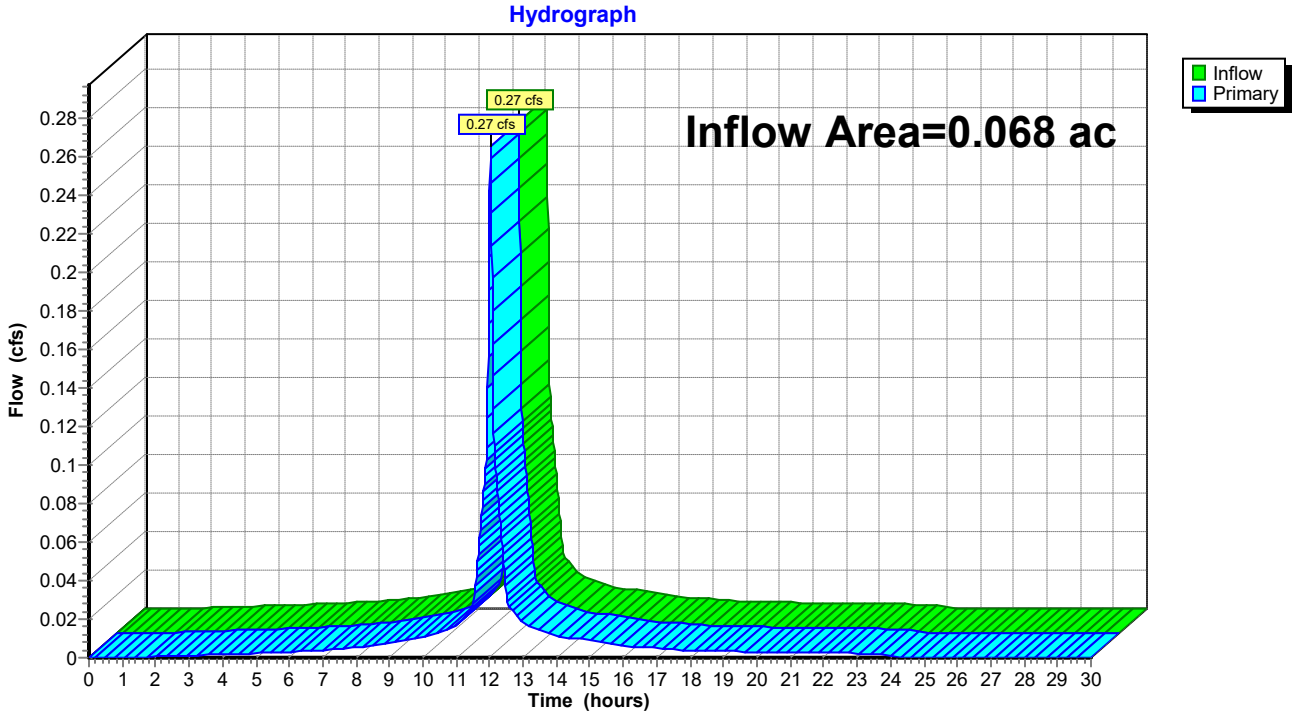


Summary for Link 14L: R Street CB

Inflow Area = 0.068 ac,100.00% Impervious, Inflow Depth = 3.16" for 2-Year event
Inflow = 0.27 cfs @ 12.02 hrs, Volume= 0.018 af
Primary = 0.27 cfs @ 12.02 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min
Routed to Link 12L : BACK RIVER

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 14L: R Street CB



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 7S: North Area Runoff Area=21,509 sf 58.55% Impervious Runoff Depth=4.44"
Flow Length=264' Tc=8.3 min CN=92 Runoff=2.25 cfs 0.183 af

Subcatchment 8S: Southeast Area Runoff Area=6,204 sf 100.00% Impervious Runoff Depth=5.12"
Flow Length=231' Tc=2.3 min CN=98 Runoff=0.85 cfs 0.061 af

Subcatchment 9S: Southwest Area Runoff Area=9,492 sf 44.82% Impervious Runoff Depth=2.31"
Flow Length=193' Tc=6.7 min CN=70 Runoff=0.57 cfs 0.042 af

Subcatchment 15S: Roof Drain Runoff Area=2,975 sf 100.00% Impervious Runoff Depth=5.12"
Flow Length=138' Slope=0.0100 '/' Tc=1.4 min CN=98 Runoff=0.42 cfs 0.029 af

Pond 7P: CB "I" Peak Elev=13.72' Inflow=2.25 cfs 0.183 af
15.0" Round Culvert n=0.012 L=12.0' S=0.0008 '/' Outflow=2.25 cfs 0.183 af

Pond 9P: CB "H" Peak Elev=13.52' Inflow=0.57 cfs 0.042 af
15.0" Round Culvert n=0.013 L=10.0' S=0.0130 '/' Outflow=0.57 cfs 0.042 af

Pond 10P: DMH "D" Peak Elev=13.06' Inflow=3.36 cfs 0.285 af
18.0" Round Culvert n=0.013 L=136.0' S=0.0093 '/' Outflow=3.36 cfs 0.285 af

Pond 11P: CB "G" Peak Elev=13.57' Inflow=0.85 cfs 0.061 af
15.0" Round Culvert n=0.012 L=12.0' S=0.0258 '/' Outflow=0.85 cfs 0.061 af

Link 12L: BACK RIVER Inflow=3.62 cfs 0.315 af
Primary=3.62 cfs 0.315 af

Link 14L: R Street CB Inflow=0.42 cfs 0.029 af
Primary=0.42 cfs 0.029 af

Total Runoff Area = 0.922 ac Runoff Volume = 0.315 af Average Runoff Depth = 4.09"
35.22% Pervious = 0.325 ac 64.78% Impervious = 0.597 ac

Summary for Subcatchment 7S: North Area

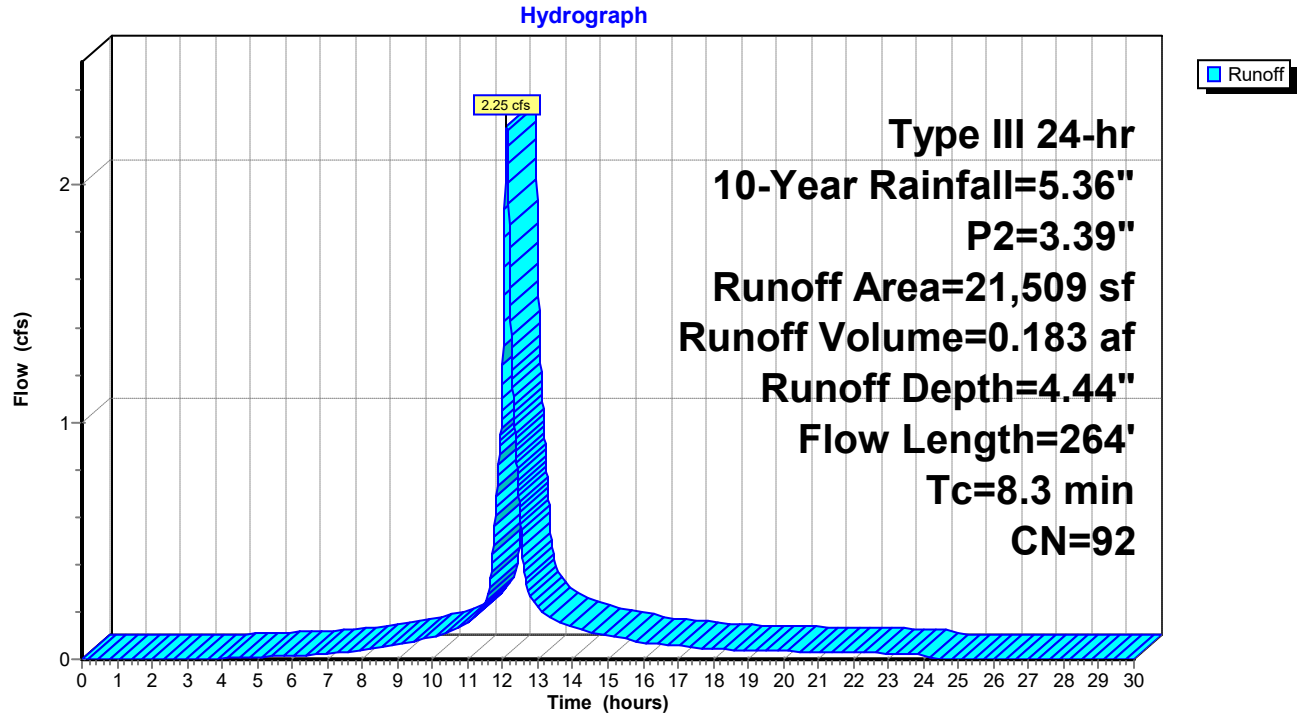
Runoff = 2.25 cfs @ 12.11 hrs, Volume= 0.183 af, Depth= 4.44"
Routed to Pond 7P : CB "I"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.36", P2=3.39"

	Area (sf)	CN	Description
	8,708	98	Paved roads w/curbs & sewers, HSG D
	7,530	80	>75% Grass cover, Good, HSG D
*	1,385	96	Brick Pavers, HSG D
	3,886	98	Roofs, HSG D
	21,509	92	Weighted Average
	8,915		41.45% Pervious Area
	12,594		58.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	112	0.0580	0.27		**Sheet Flow, over lawn** Grass: Short n= 0.150 P2= 3.39"
0.7	37	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	115	0.0240	2.49		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	264	Total			

Subcatchment 7S: North Area



Summary for Subcatchment 8S: Southeast Area

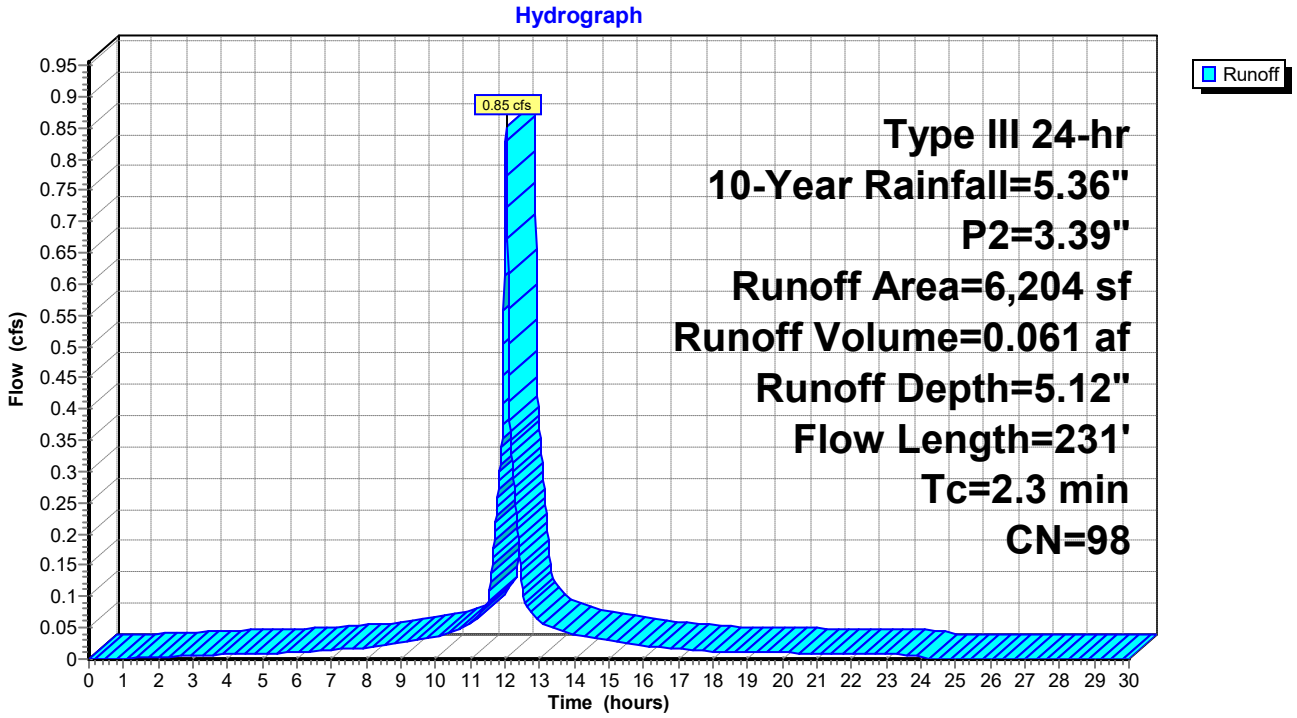
Runoff = 0.85 cfs @ 12.03 hrs, Volume= 0.061 af, Depth= 5.12"
Routed to Pond 11P : CB "G"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.36", P2=3.39"

Area (sf)	CN	Description
6,204	98	Paved roads w/curbs & sewers, HSG A
6,204		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.26		**Sheet Flow, Sheet flow over paved parking area (100')** Smooth surfaces n= 0.011 P2= 3.39"
1.0	131	0.0120	2.22		**Shallow Concentrated Flow, Shallow conc flow over paved R St** Paved Kv= 20.3 fps
2.3	231	Total			

Subcatchment 8S: Southeast Area



Summary for Subcatchment 9S: Southwest Area

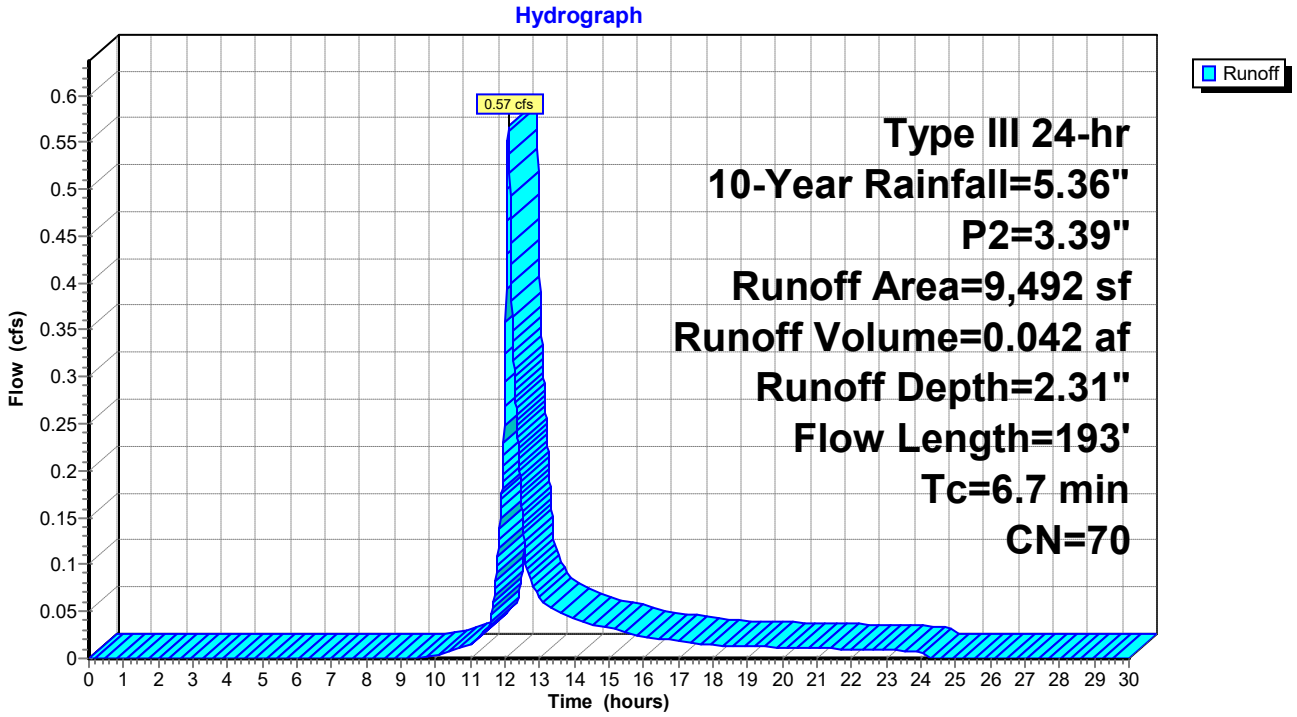
Runoff = 0.57 cfs @ 12.10 hrs, Volume= 0.042 af, Depth= 2.31"
Routed to Pond 9P : CB "H"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.36", P2=3.39"

	Area (sf)	CN	Description
	3,945	39	>75% Grass cover, Good, HSG A
	2,588	98	Paved roads w/curbs & sewers, HSG A
	1,666	98	Roofs, HSG A
*	1,293	76	Brick Pavers, HSG A
	9,492	70	Weighted Average
	5,238		55.18% Pervious Area
	4,254		44.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	26	0.0190	0.09		**Sheet Flow, sheet flow over lawn area (90')** Grass: Dense n= 0.240 P2= 3.39"
0.9	94	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	39	0.0130	0.80		**Shallow Concentrated Flow, Shallow conc flow over driveway** Short Grass Pasture Kv= 7.0 fps
0.2	34	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.7	193	Total			

Subcatchment 9S: Southwest Area



Summary for Subcatchment 15S: Roof Drain

[47] Hint: Peak is 171% of capacity of segment #3

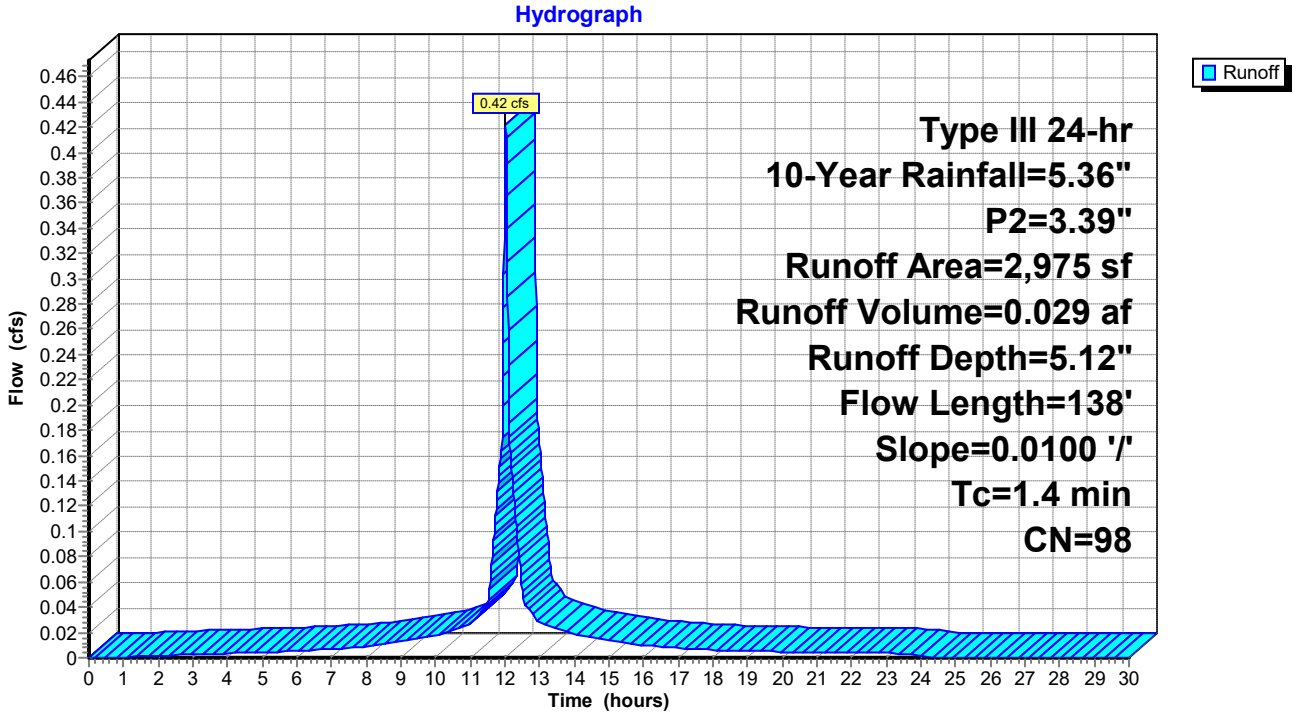
Runoff = 0.42 cfs @ 12.02 hrs, Volume= 0.029 af, Depth= 5.12"
Routed to Link 14L : R Street CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.36", P2=3.39"

Area (sf)	CN	Description
2,975	98	Roofs, HSG A
2,975		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	51	0.0100	0.94		**Sheet Flow, sheet flow over roof** Smooth surfaces n= 0.011 P2= 3.39"
0.3	60	0.0100	3.71	0.73	**Pipe Channel, Pipe** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
0.2	27	0.0100	2.84	0.25	**Pipe Channel, Pipe** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.010 PVC, smooth interior
1.4	138	Total			

Subcatchment 15S: Roof Drain



Summary for Pond 7P: CB "I"

[57] Hint: Peaked at 13.72' (Flood elevation advised)

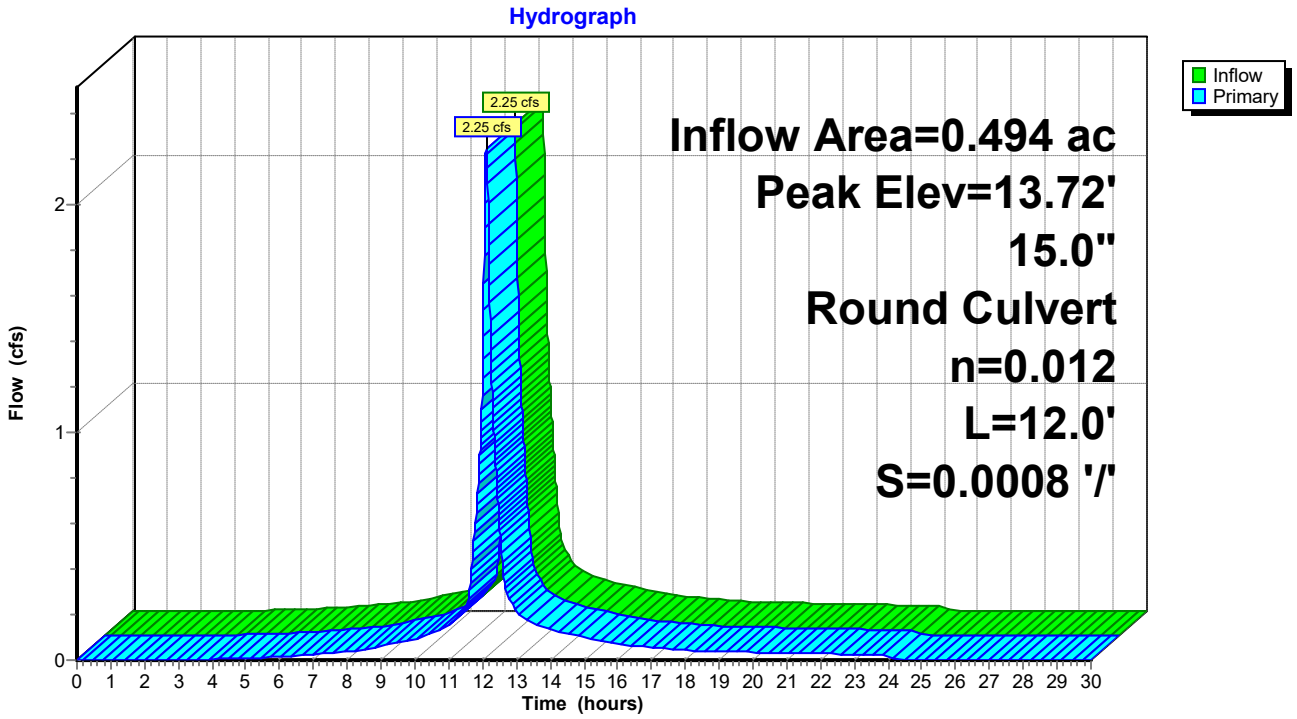
Inflow Area = 0.494 ac, 58.55% Impervious, Inflow Depth = 4.44" for 10-Year event
Inflow = 2.25 cfs @ 12.11 hrs, Volume= 0.183 af
Outflow = 2.25 cfs @ 12.11 hrs, Volume= 0.183 af, Atten= 0%, Lag= 0.0 min
Primary = 2.25 cfs @ 12.11 hrs, Volume= 0.183 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.72' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.81'	**15.0" Round Culvert** L= 12.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 12.81' / 12.80' S= 0.0008 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=2.25 cfs @ 12.11 hrs HW=13.72' TW=13.05' (Dynamic Tailwater)
1=Culvert (Barrel Controls 2.25 cfs @ 3.28 fps)

Pond 7P: CB "I"



Summary for Pond 9P: CB "H"

[57] Hint: Peaked at 13.52' (Flood elevation advised)

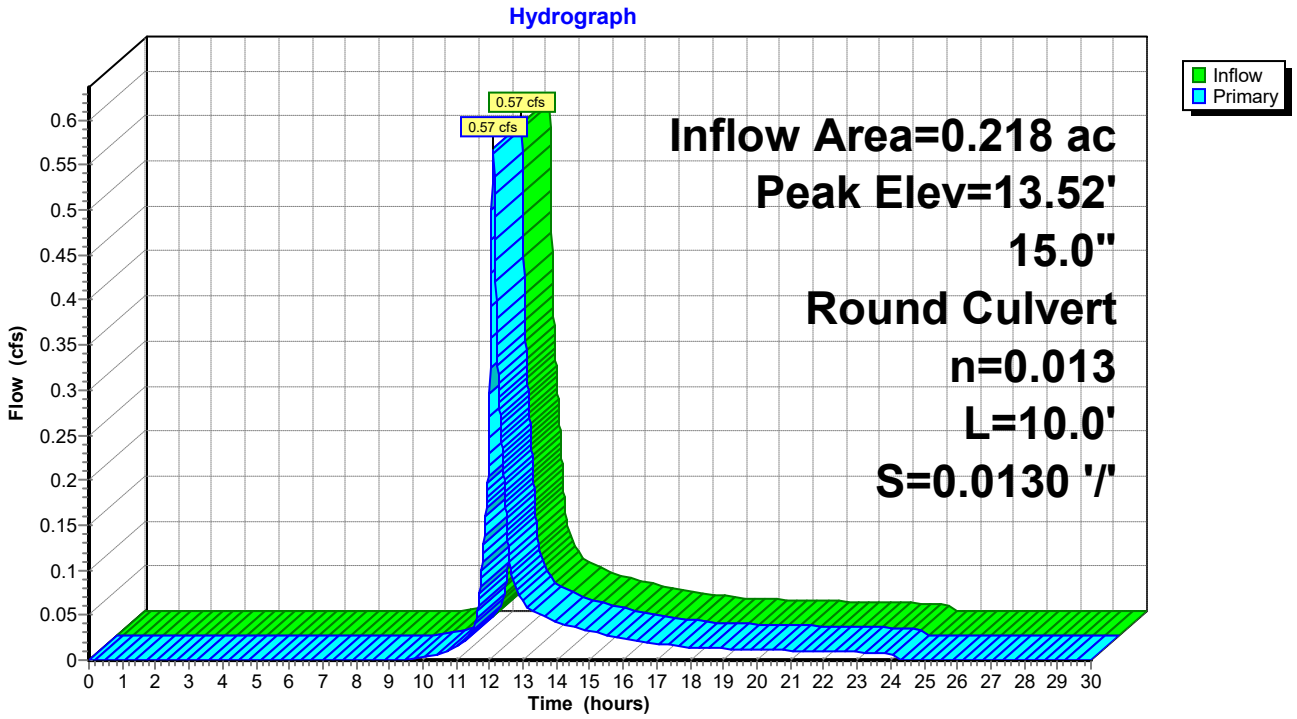
Inflow Area = 0.218 ac, 44.82% Impervious, Inflow Depth = 2.31" for 10-Year event
Inflow = 0.57 cfs @ 12.10 hrs, Volume= 0.042 af
Outflow = 0.57 cfs @ 12.10 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min
Primary = 0.57 cfs @ 12.10 hrs, Volume= 0.042 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.52' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.15'	**15.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.15' / 13.02' S= 0.0130 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf

Primary OutFlow Max=0.57 cfs @ 12.10 hrs HW=13.52' TW=13.06' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.57 cfs @ 2.85 fps)

Pond 9P: CB "H"



Summary for Pond 10P: DMH "D"

[57] Hint: Peaked at 13.06' (Flood elevation advised)

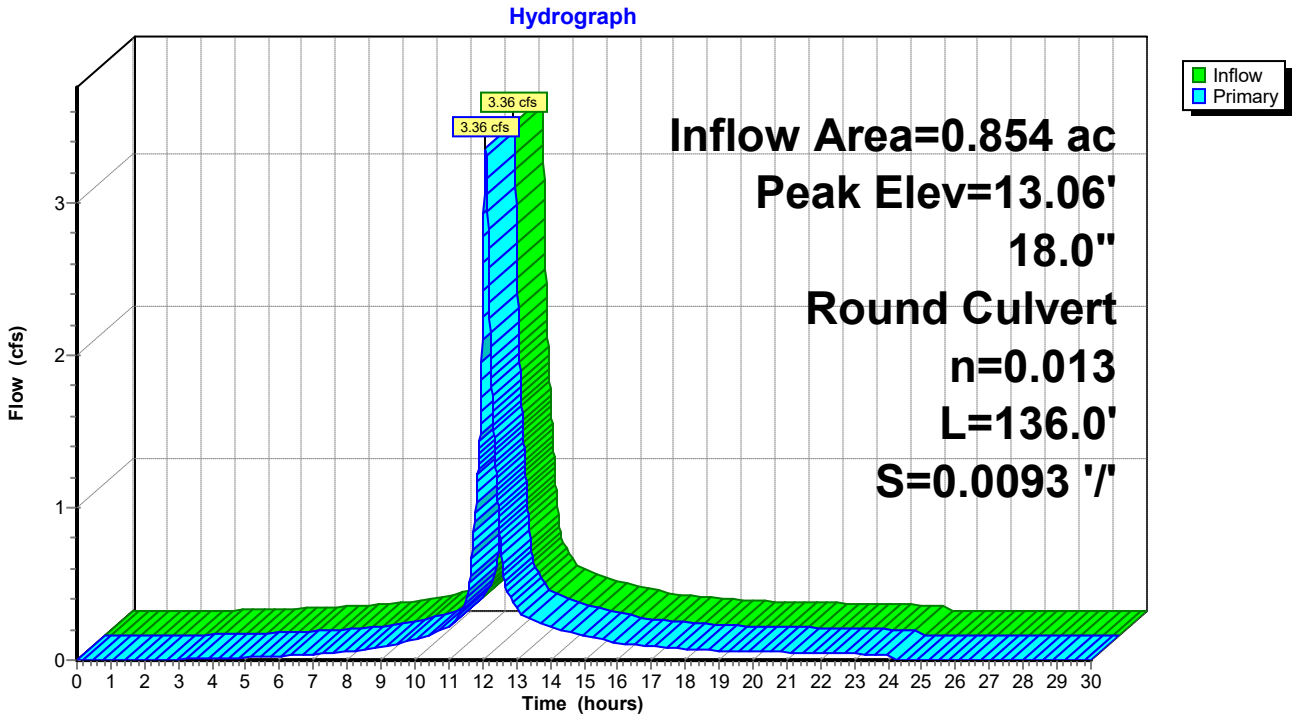
Inflow Area = 0.854 ac, 61.96% Impervious, Inflow Depth = 4.01" for 10-Year event
Inflow = 3.36 cfs @ 12.09 hrs, Volume= 0.285 af
Outflow = 3.36 cfs @ 12.09 hrs, Volume= 0.285 af, Atten= 0%, Lag= 0.0 min
Primary = 3.36 cfs @ 12.09 hrs, Volume= 0.285 af
Routed to Link 12L : BACK RIVER

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.06' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.19'	**18.0" Round To Back River** L= 136.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 12.19' / 10.92' S= 0.0093 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.36 cfs @ 12.09 hrs HW=13.06' TW=0.00' (Dynamic Tailwater)
↑—**1=To Back River** (Inlet Controls 3.36 cfs @ 3.17 fps)

Pond 10P: DMH "D"



Summary for Pond 11P: CB "G"

[57] Hint: Peaked at 13.57' (Flood elevation advised)

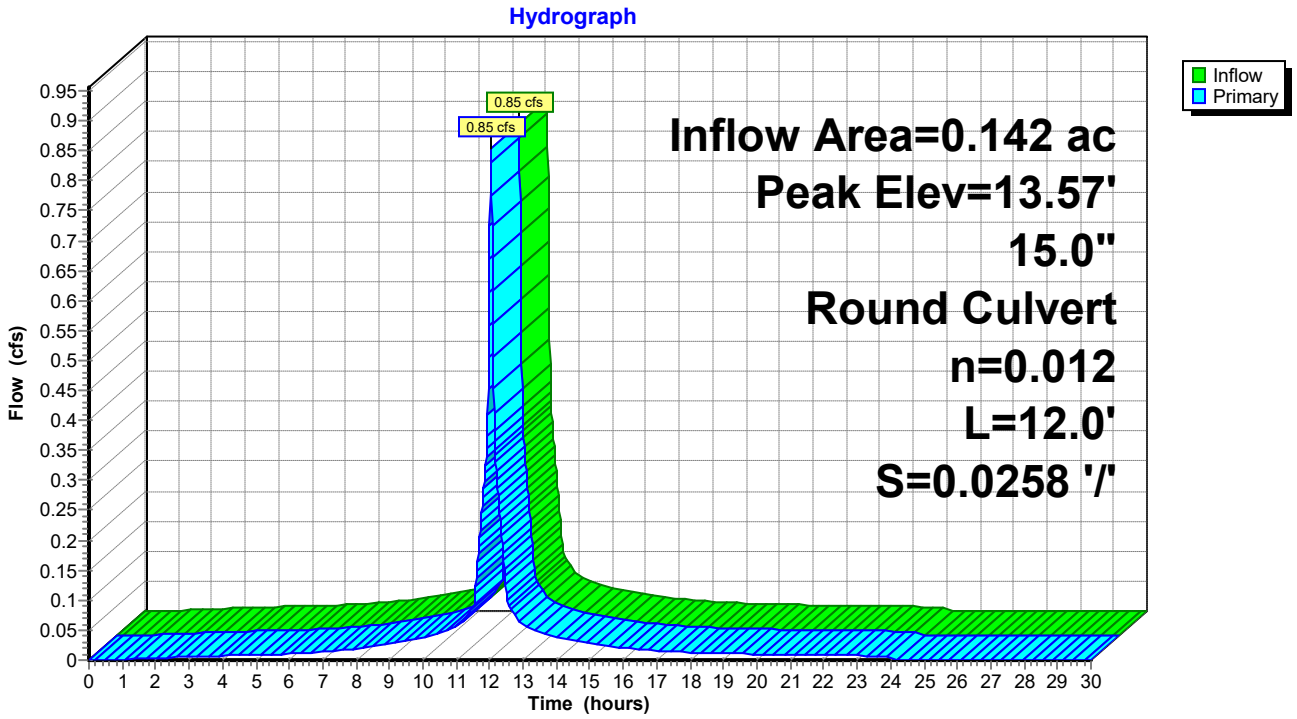
Inflow Area = 0.142 ac,100.00% Impervious, Inflow Depth = 5.12" for 10-Year event
Inflow = 0.85 cfs @ 12.03 hrs, Volume= 0.061 af
Outflow = 0.85 cfs @ 12.03 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min
Primary = 0.85 cfs @ 12.03 hrs, Volume= 0.061 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.57' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.18'	**15.0" Round Culvert** L= 12.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.18' / 12.87' S= 0.0258 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=0.85 cfs @ 12.03 hrs HW=13.57' TW=12.98' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.85 cfs @ 3.90 fps)

Pond 11P: CB "G"

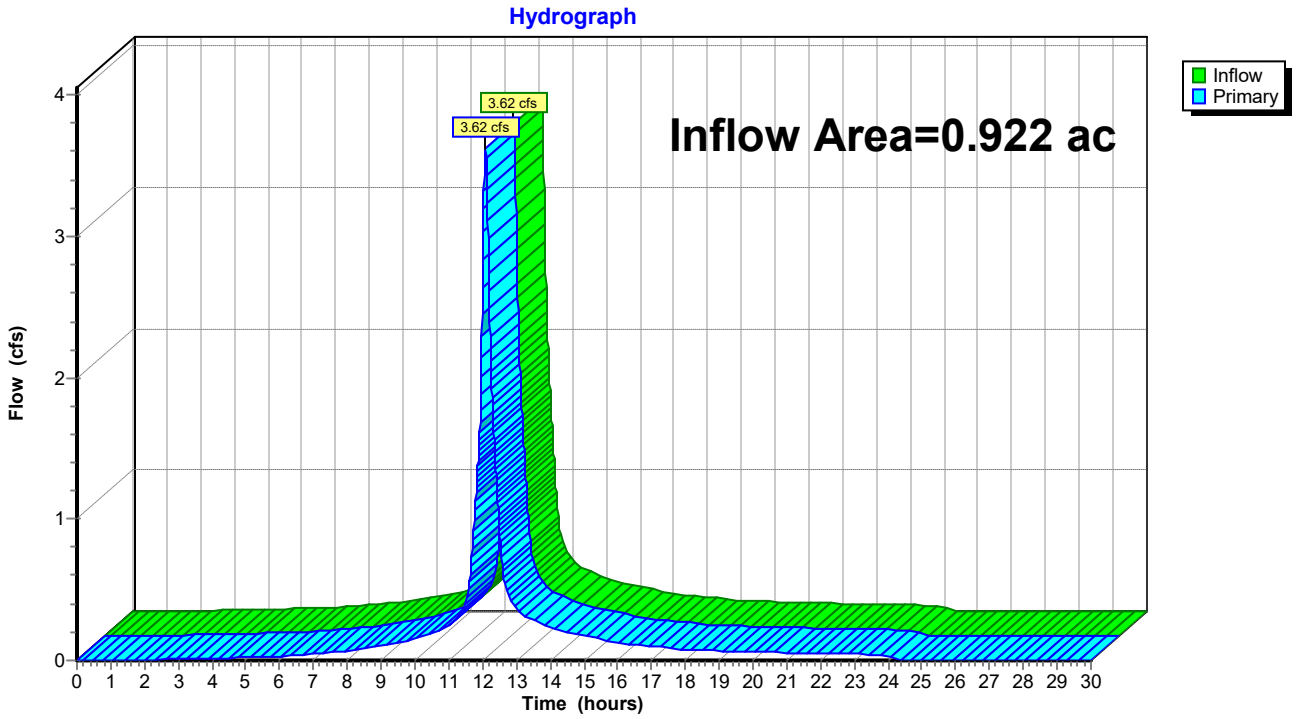


Summary for Link 12L: BACK RIVER

Inflow Area = 0.922 ac, 64.78% Impervious, Inflow Depth = 4.09" for 10-Year event
Inflow = 3.62 cfs @ 12.09 hrs, Volume= 0.315 af
Primary = 3.62 cfs @ 12.09 hrs, Volume= 0.315 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 12L: BACK RIVER

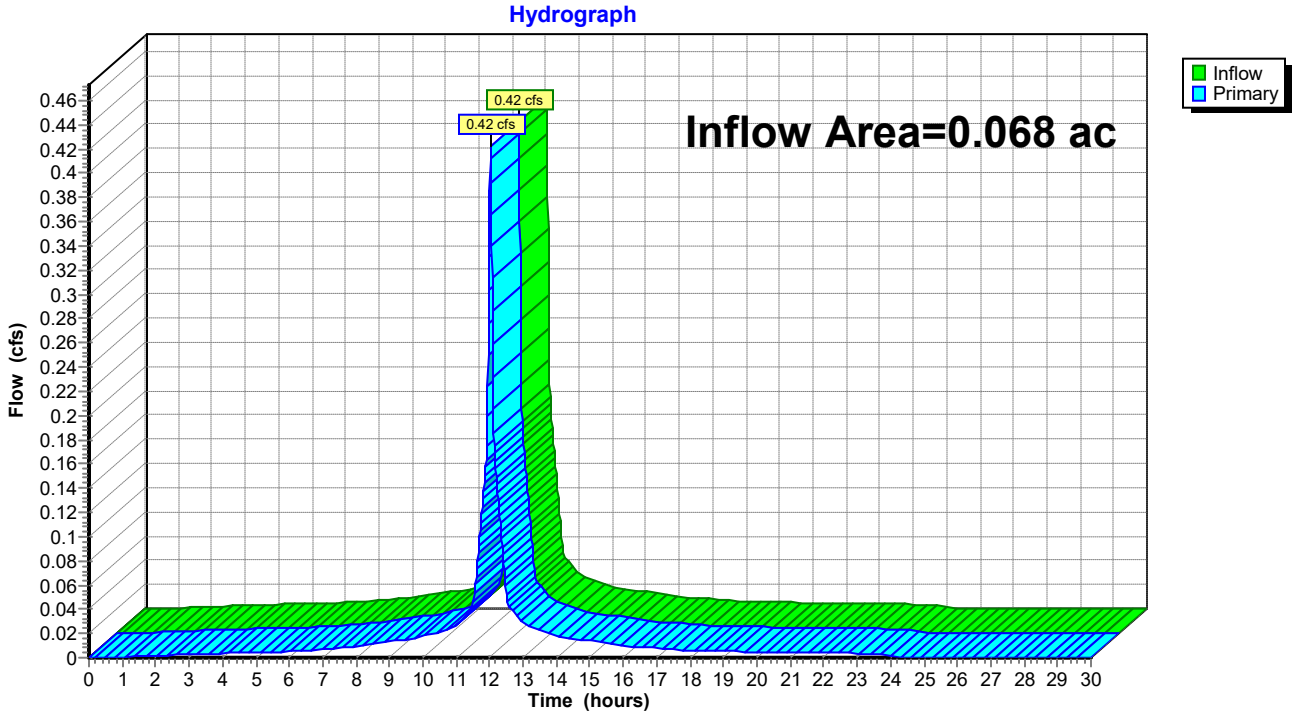


Summary for Link 14L: R Street CB

Inflow Area = 0.068 ac,100.00% Impervious, Inflow Depth = 5.12" for 10-Year event
Inflow = 0.42 cfs @ 12.02 hrs, Volume= 0.029 af
Primary = 0.42 cfs @ 12.02 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min
Routed to Link 12L : BACK RIVER

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 14L: R Street CB



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 7S: North Area Runoff Area=21,509 sf 58.55% Impervious Runoff Depth=7.54"
Flow Length=264' Tc=8.3 min CN=92 Runoff=3.71 cfs 0.310 af

Subcatchment 8S: Southeast Area Runoff Area=6,204 sf 100.00% Impervious Runoff Depth=8.26"
Flow Length=231' Tc=2.3 min CN=98 Runoff=1.36 cfs 0.098 af

Subcatchment 9S: Southwest Area Runoff Area=9,492 sf 44.82% Impervious Runoff Depth=4.90"
Flow Length=193' Tc=6.7 min CN=70 Runoff=1.22 cfs 0.089 af

Subcatchment 15S: Roof Drain Runoff Area=2,975 sf 100.00% Impervious Runoff Depth=8.26"
Flow Length=138' Slope=0.0100 '/' Tc=1.4 min CN=98 Runoff=0.67 cfs 0.047 af

Pond 7P: CB "I" Peak Elev=14.04' Inflow=3.71 cfs 0.310 af
15.0" Round Culvert n=0.012 L=12.0' S=0.0008 '/' Outflow=3.71 cfs 0.310 af

Pond 9P: CB "H" Peak Elev=13.71' Inflow=1.22 cfs 0.089 af
15.0" Round Culvert n=0.013 L=10.0' S=0.0130 '/' Outflow=1.22 cfs 0.089 af

Pond 10P: DMH "D" Peak Elev=13.41' Inflow=5.79 cfs 0.497 af
18.0" Round Culvert n=0.013 L=136.0' S=0.0093 '/' Outflow=5.79 cfs 0.497 af

Pond 11P: CB "G" Peak Elev=13.70' Inflow=1.36 cfs 0.098 af
15.0" Round Culvert n=0.012 L=12.0' S=0.0258 '/' Outflow=1.36 cfs 0.098 af

Link 12L: BACK RIVER Inflow=6.21 cfs 0.544 af
Primary=6.21 cfs 0.544 af

Link 14L: R Street CB Inflow=0.67 cfs 0.047 af
Primary=0.67 cfs 0.047 af

Total Runoff Area = 0.922 ac Runoff Volume = 0.544 af Average Runoff Depth = 7.08"
35.22% Pervious = 0.325 ac 64.78% Impervious = 0.597 ac

Summary for Subcatchment 7S: North Area

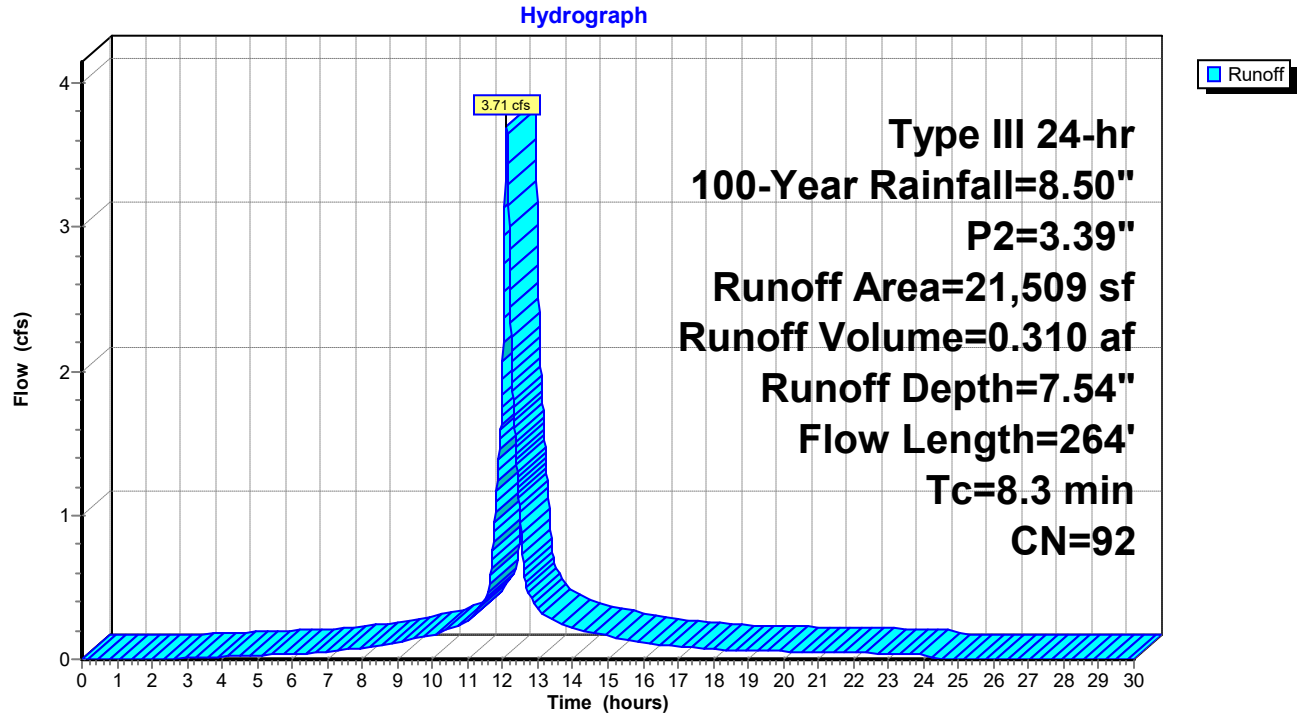
Runoff = 3.71 cfs @ 12.11 hrs, Volume= 0.310 af, Depth= 7.54"
Routed to Pond 7P : CB "I"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50", P2=3.39"

	Area (sf)	CN	Description
	8,708	98	Paved roads w/curbs & sewers, HSG D
	7,530	80	>75% Grass cover, Good, HSG D
*	1,385	96	Brick Pavers, HSG D
	3,886	98	Roofs, HSG D
	21,509	92	Weighted Average
	8,915		41.45% Pervious Area
	12,594		58.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	112	0.0580	0.27		**Sheet Flow, over lawn** Grass: Short n= 0.150 P2= 3.39"
0.7	37	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	115	0.0240	2.49		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	264	Total			

Subcatchment 7S: North Area



Summary for Subcatchment 8S: Southeast Area

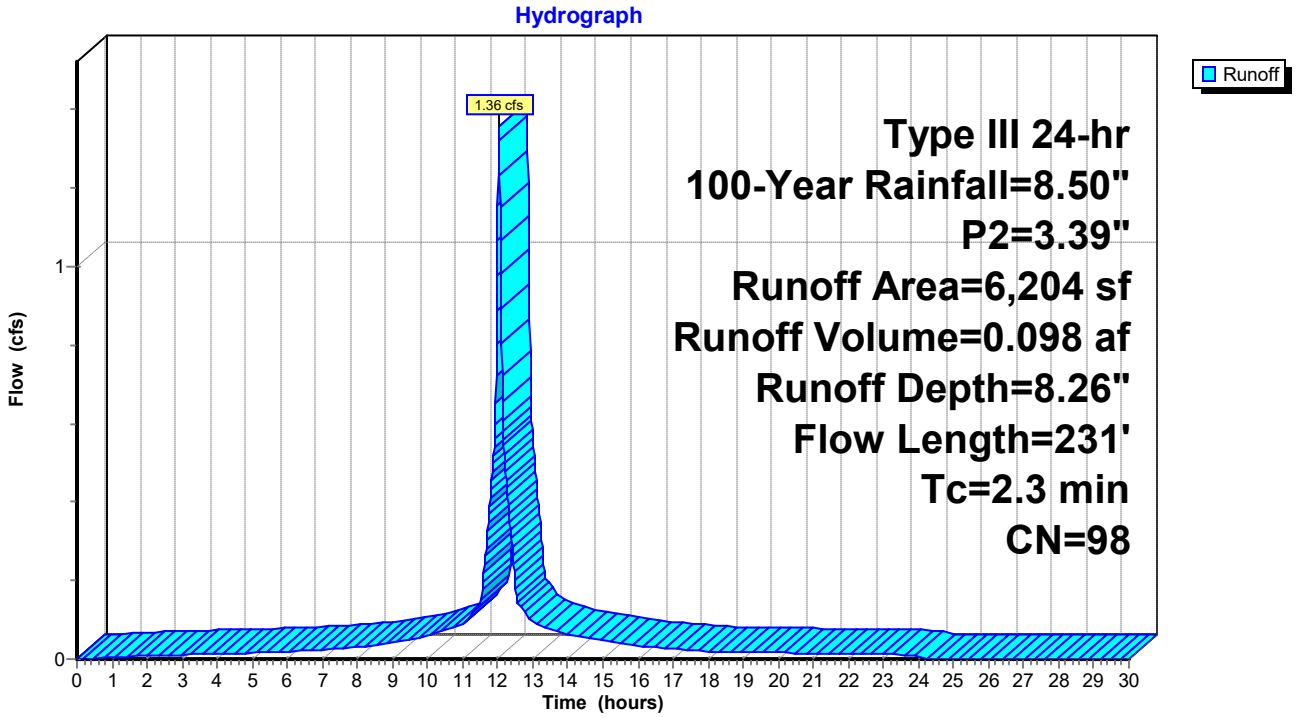
Runoff = 1.36 cfs @ 12.03 hrs, Volume= 0.098 af, Depth= 8.26"
Routed to Pond 11P : CB "G"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50", P2=3.39"

Area (sf)	CN	Description
6,204	98	Paved roads w/curbs & sewers, HSG A
6,204		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.26		**Sheet Flow, Sheet flow over paved parking area (100')** Smooth surfaces n= 0.011 P2= 3.39"
1.0	131	0.0120	2.22		**Shallow Concentrated Flow, Shallow conc flow over paved R St** Paved Kv= 20.3 fps
2.3	231	Total			

Subcatchment 8S: Southeast Area



Summary for Subcatchment 9S: Southwest Area

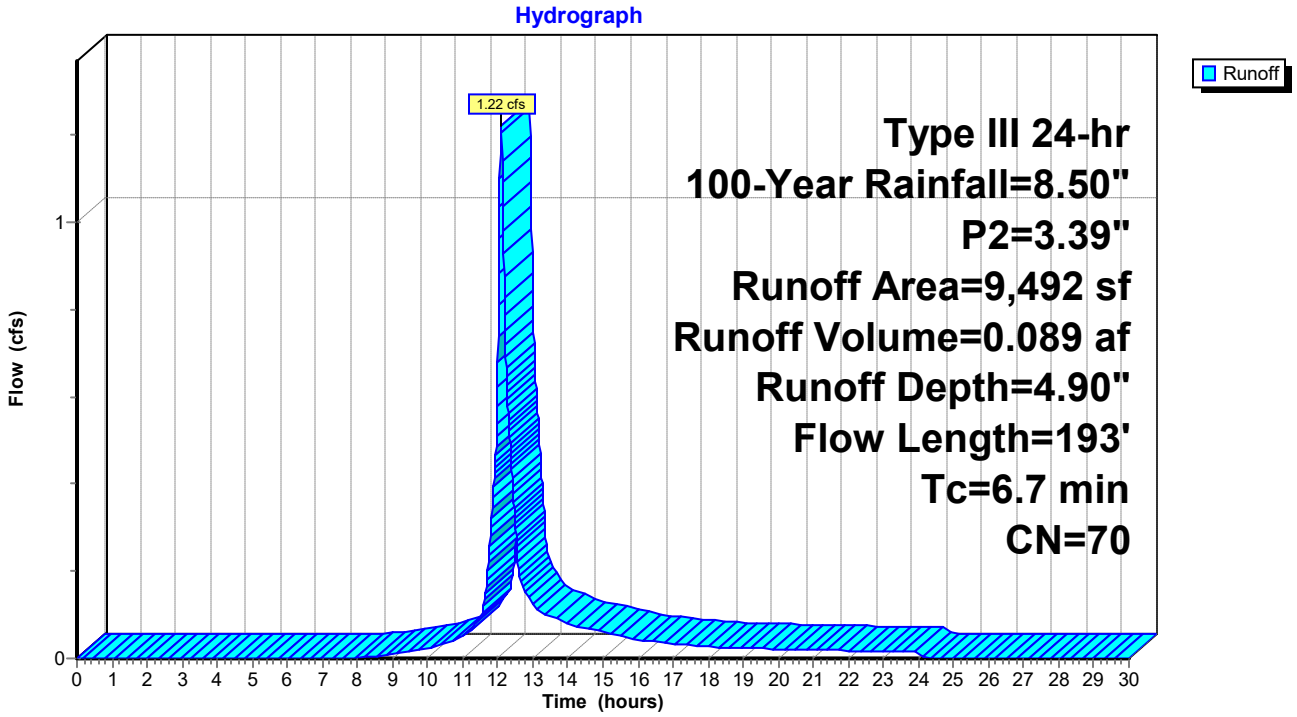
Runoff = 1.22 cfs @ 12.10 hrs, Volume= 0.089 af, Depth= 4.90"
Routed to Pond 9P : CB "H"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50", P2=3.39"

	Area (sf)	CN	Description
	3,945	39	>75% Grass cover, Good, HSG A
	2,588	98	Paved roads w/curbs & sewers, HSG A
	1,666	98	Roofs, HSG A
*	1,293	76	Brick Pavers, HSG A
	9,492	70	Weighted Average
	5,238		55.18% Pervious Area
	4,254		44.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	26	0.0190	0.09		**Sheet Flow, sheet flow over lawn area (90')** Grass: Dense n= 0.240 P2= 3.39"
0.9	94	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	39	0.0130	0.80		**Shallow Concentrated Flow, Shallow conc flow over driveway** Short Grass Pasture Kv= 7.0 fps
0.2	34	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.7	193	Total			

Subcatchment 9S: Southwest Area



Summary for Subcatchment 15S: Roof Drain

[47] Hint: Peak is 271% of capacity of segment #3

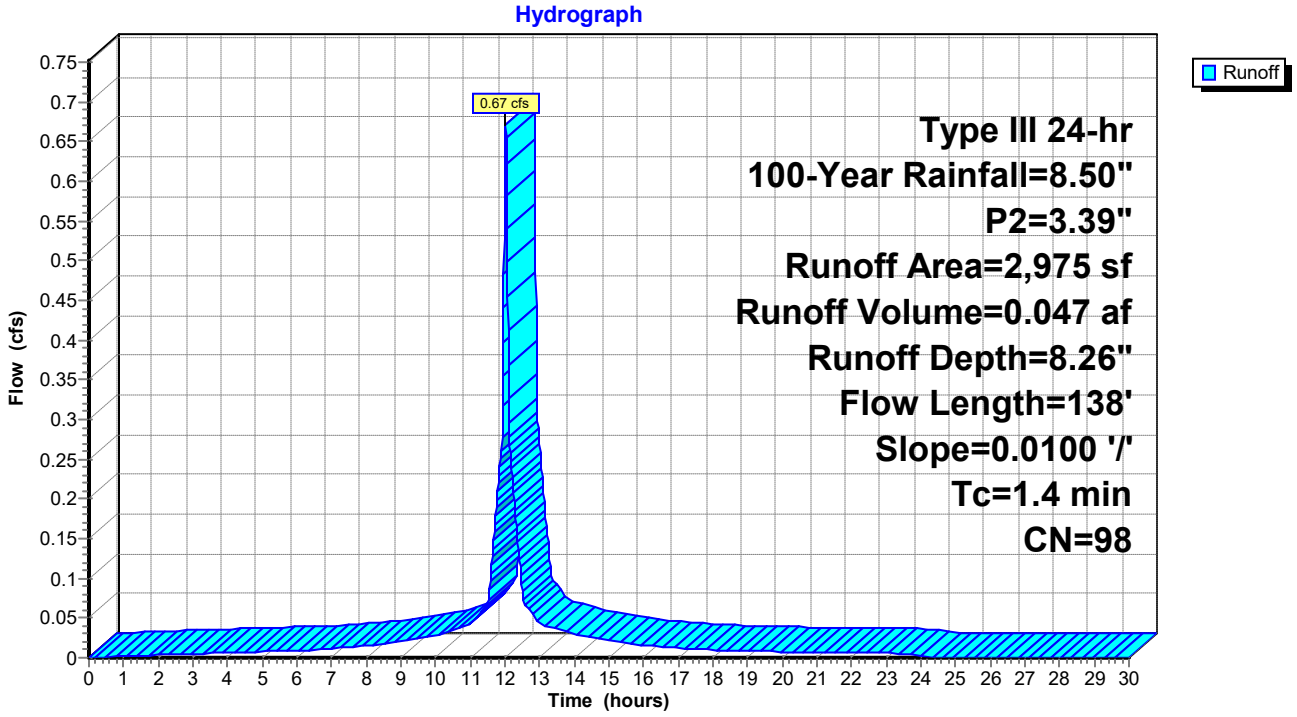
Runoff = 0.67 cfs @ 12.02 hrs, Volume= 0.047 af, Depth= 8.26"
Routed to Link 14L : R Street CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50", P2=3.39"

Area (sf)	CN	Description
2,975	98	Roofs, HSG A
2,975		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	51	0.0100	0.94		**Sheet Flow, sheet flow over roof** Smooth surfaces n= 0.011 P2= 3.39"
0.3	60	0.0100	3.71	0.73	**Pipe Channel, Pipe** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
0.2	27	0.0100	2.84	0.25	**Pipe Channel, Pipe** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.010 PVC, smooth interior
1.4	138	Total			

Subcatchment 15S: Roof Drain



Summary for Pond 7P: CB "I"

[57] Hint: Peaked at 14.04' (Flood elevation advised)

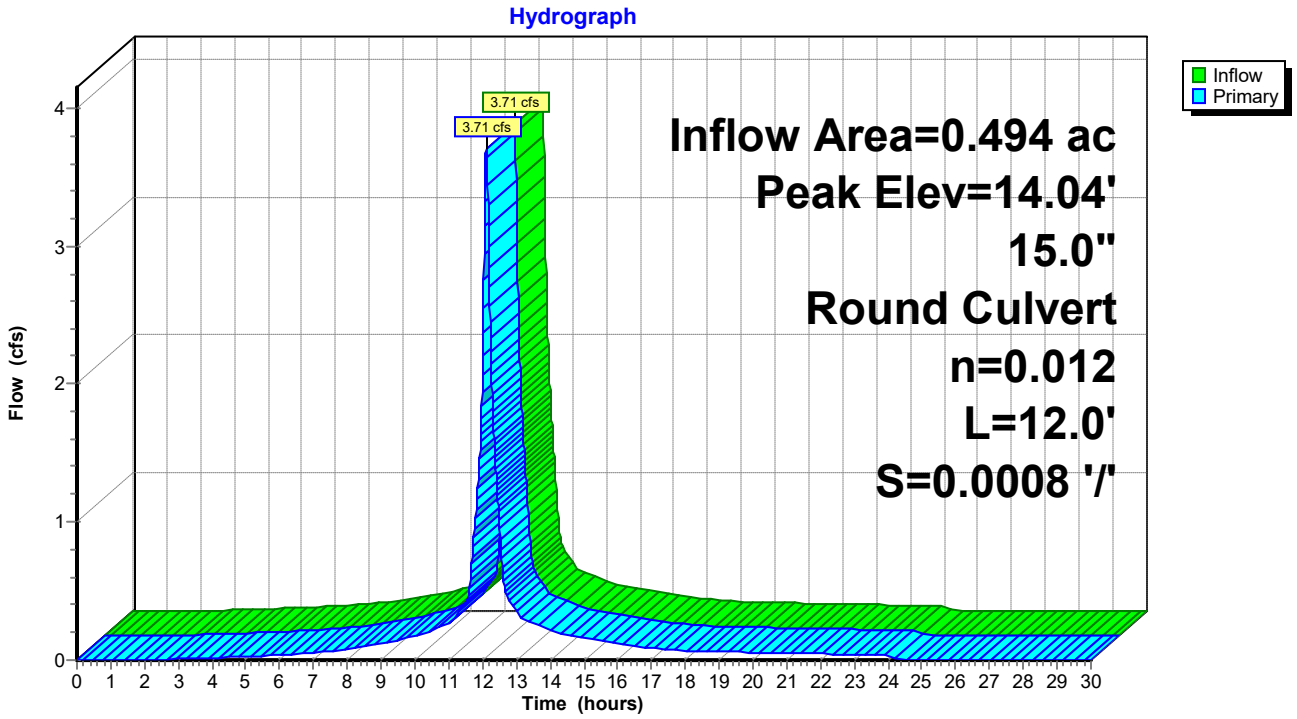
Inflow Area = 0.494 ac, 58.55% Impervious, Inflow Depth = 7.54" for 100-Year event
Inflow = 3.71 cfs @ 12.11 hrs, Volume= 0.310 af
Outflow = 3.71 cfs @ 12.11 hrs, Volume= 0.310 af, Atten= 0%, Lag= 0.0 min
Primary = 3.71 cfs @ 12.11 hrs, Volume= 0.310 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 14.04' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.81'	**15.0" Round Culvert** L= 12.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 12.81' / 12.80' S= 0.0008 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=3.70 cfs @ 12.11 hrs HW=14.03' TW=13.39' (Dynamic Tailwater)
1=Culvert (Barrel Controls 3.70 cfs @ 3.83 fps)

Pond 7P: CB "I"



Summary for Pond 9P: CB "H"

[57] Hint: Peaked at 13.71' (Flood elevation advised)

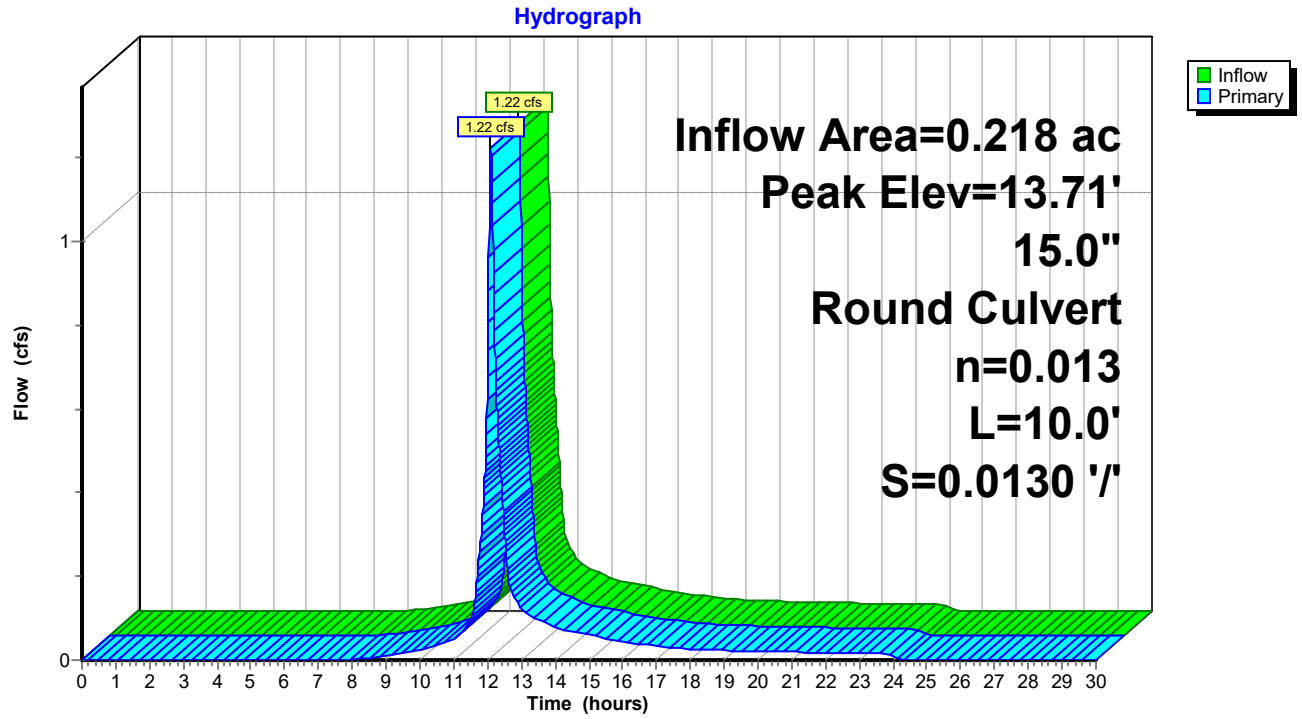
Inflow Area = 0.218 ac, 44.82% Impervious, Inflow Depth = 4.90" for 100-Year event
Inflow = 1.22 cfs @ 12.10 hrs, Volume= 0.089 af
Outflow = 1.22 cfs @ 12.10 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.0 min
Primary = 1.22 cfs @ 12.10 hrs, Volume= 0.089 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.71' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.15'	**15.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.15' / 13.02' S= 0.0130 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf

Primary OutFlow Max=1.22 cfs @ 12.10 hrs HW=13.71' TW=13.41' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.22 cfs @ 3.36 fps)

Pond 9P: CB "H"



Summary for Pond 10P: DMH "D"

[57] Hint: Peaked at 13.41' (Flood elevation advised)

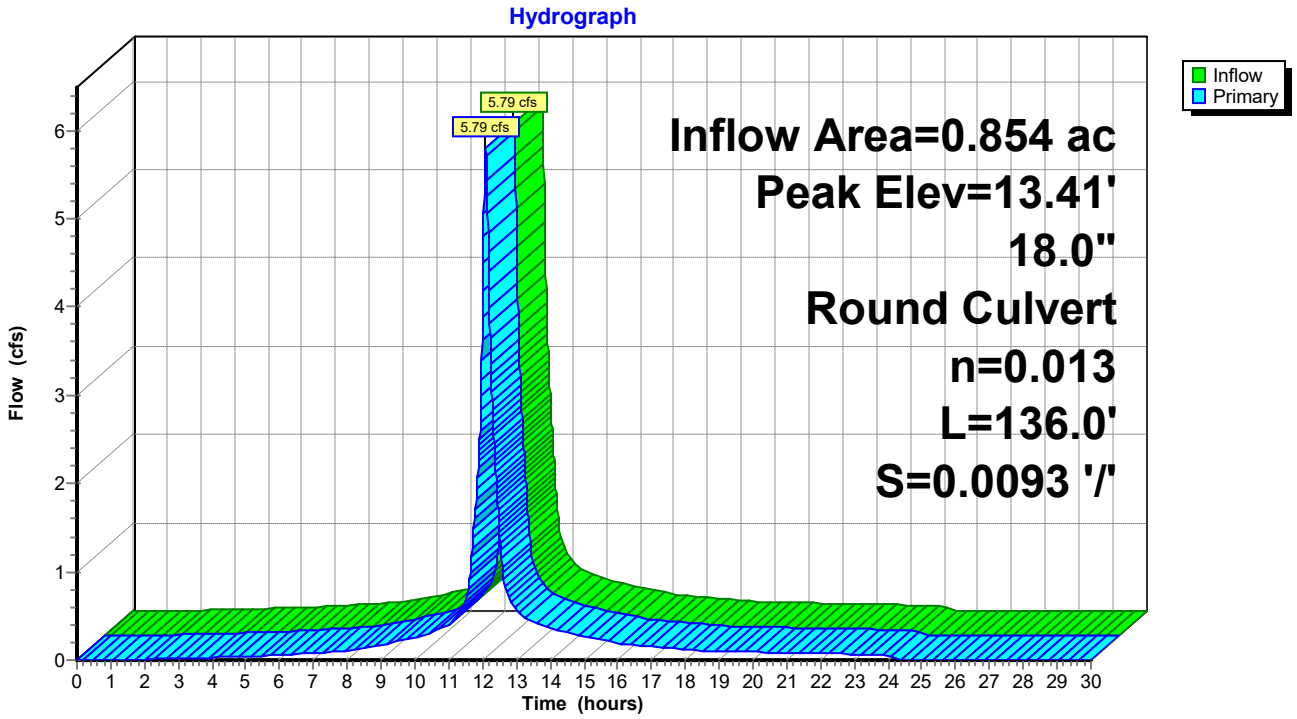
Inflow Area = 0.854 ac, 61.96% Impervious, Inflow Depth = 6.99" for 100-Year event
Inflow = 5.79 cfs @ 12.09 hrs, Volume= 0.497 af
Outflow = 5.79 cfs @ 12.09 hrs, Volume= 0.497 af, Atten= 0%, Lag= 0.0 min
Primary = 5.79 cfs @ 12.09 hrs, Volume= 0.497 af
Routed to Link 12L : BACK RIVER

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.41' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.19'	**18.0" Round To Back River** L= 136.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 12.19' / 10.92' S= 0.0093 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.79 cfs @ 12.09 hrs HW=13.41' TW=0.00' (Dynamic Tailwater)
↑—**1=To Back River** (Inlet Controls 5.79 cfs @ 3.76 fps)

Pond 10P: DMH "D"



Summary for Pond 11P: CB "G"

[57] Hint: Peaked at 13.70' (Flood elevation advised)

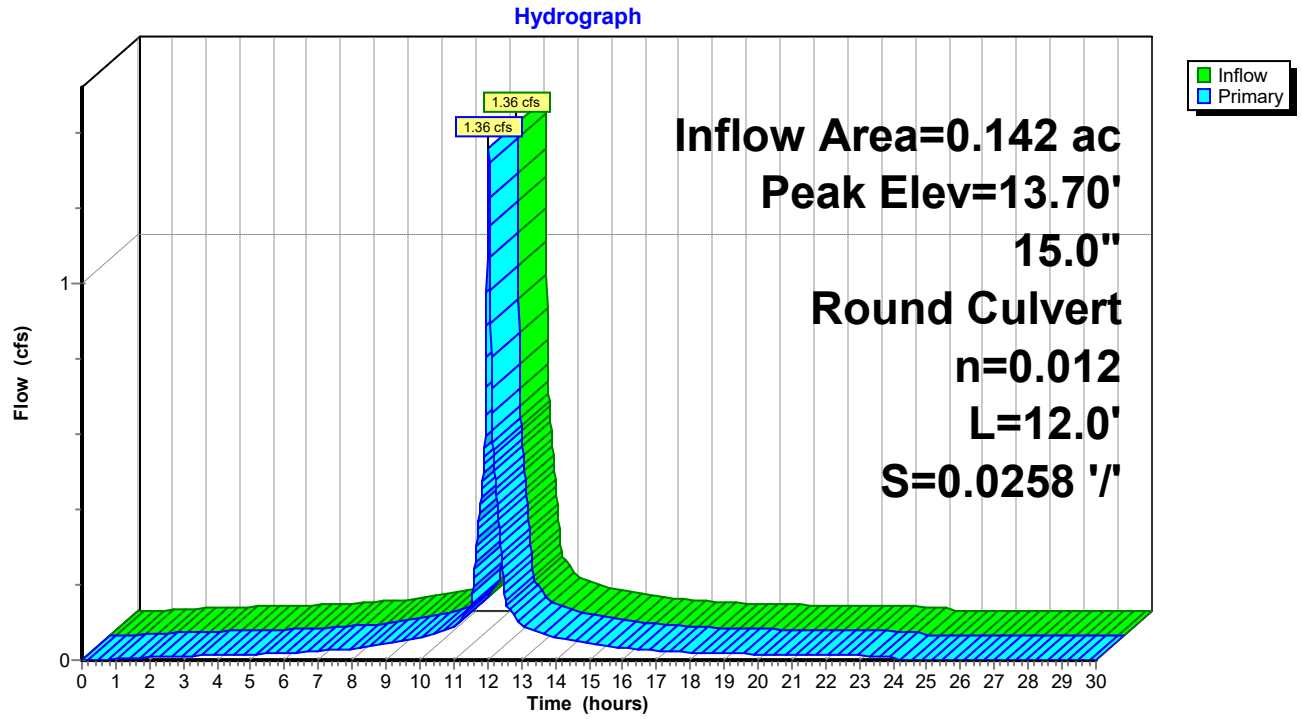
Inflow Area = 0.142 ac,100.00% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 1.36 cfs @ 12.03 hrs, Volume= 0.098 af
Outflow = 1.36 cfs @ 12.03 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min
Primary = 1.36 cfs @ 12.03 hrs, Volume= 0.098 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.70' @ 12.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.18'	**15.0" Round Culvert** L= 12.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.18' / 12.87' S= 0.0258 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=1.32 cfs @ 12.03 hrs HW=13.69' TW=13.28' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.32 cfs @ 4.12 fps)

Pond 11P: CB "G"

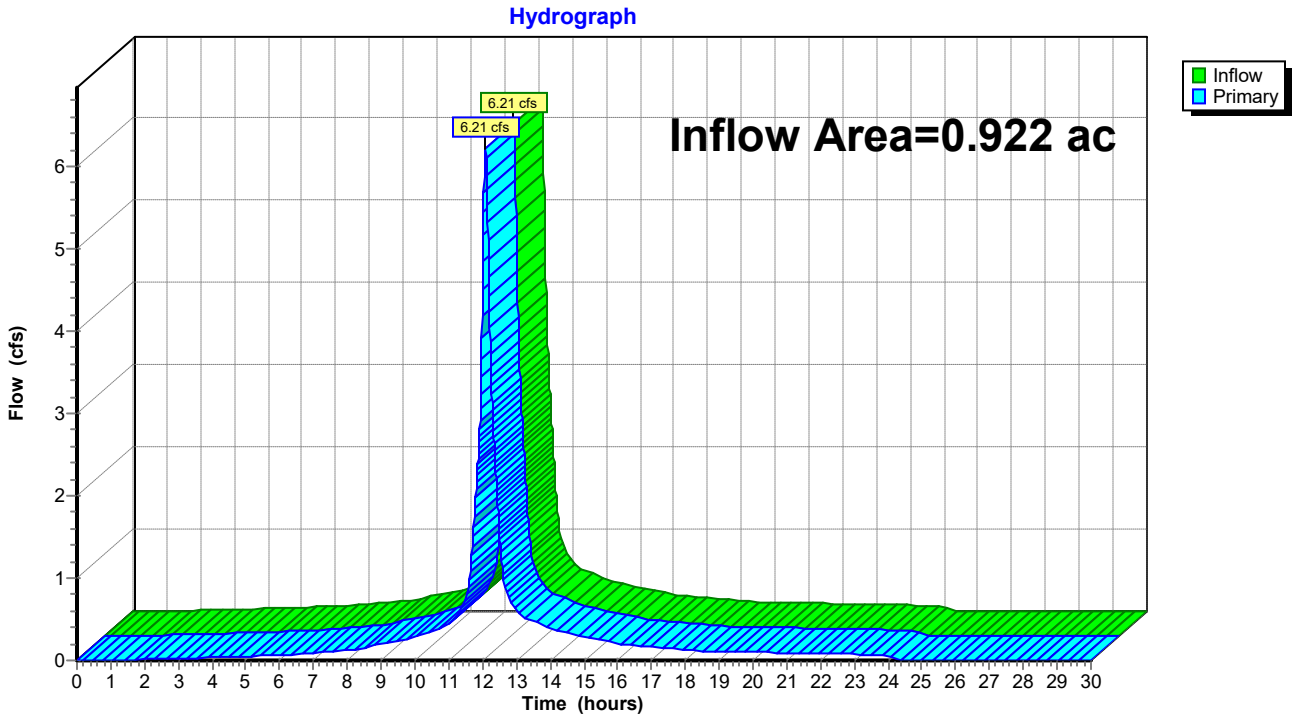


Summary for Link 12L: BACK RIVER

Inflow Area = 0.922 ac, 64.78% Impervious, Inflow Depth = 7.08" for 100-Year event
Inflow = 6.21 cfs @ 12.09 hrs, Volume= 0.544 af
Primary = 6.21 cfs @ 12.09 hrs, Volume= 0.544 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 12L: BACK RIVER

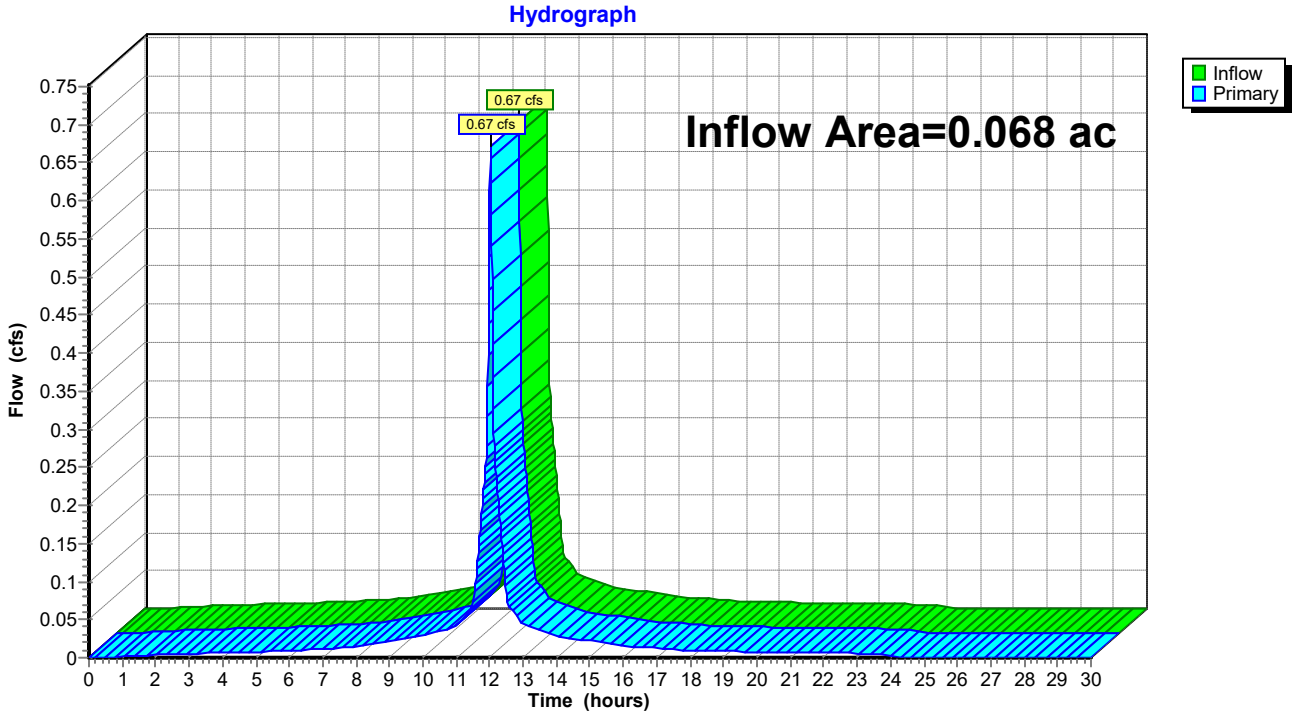


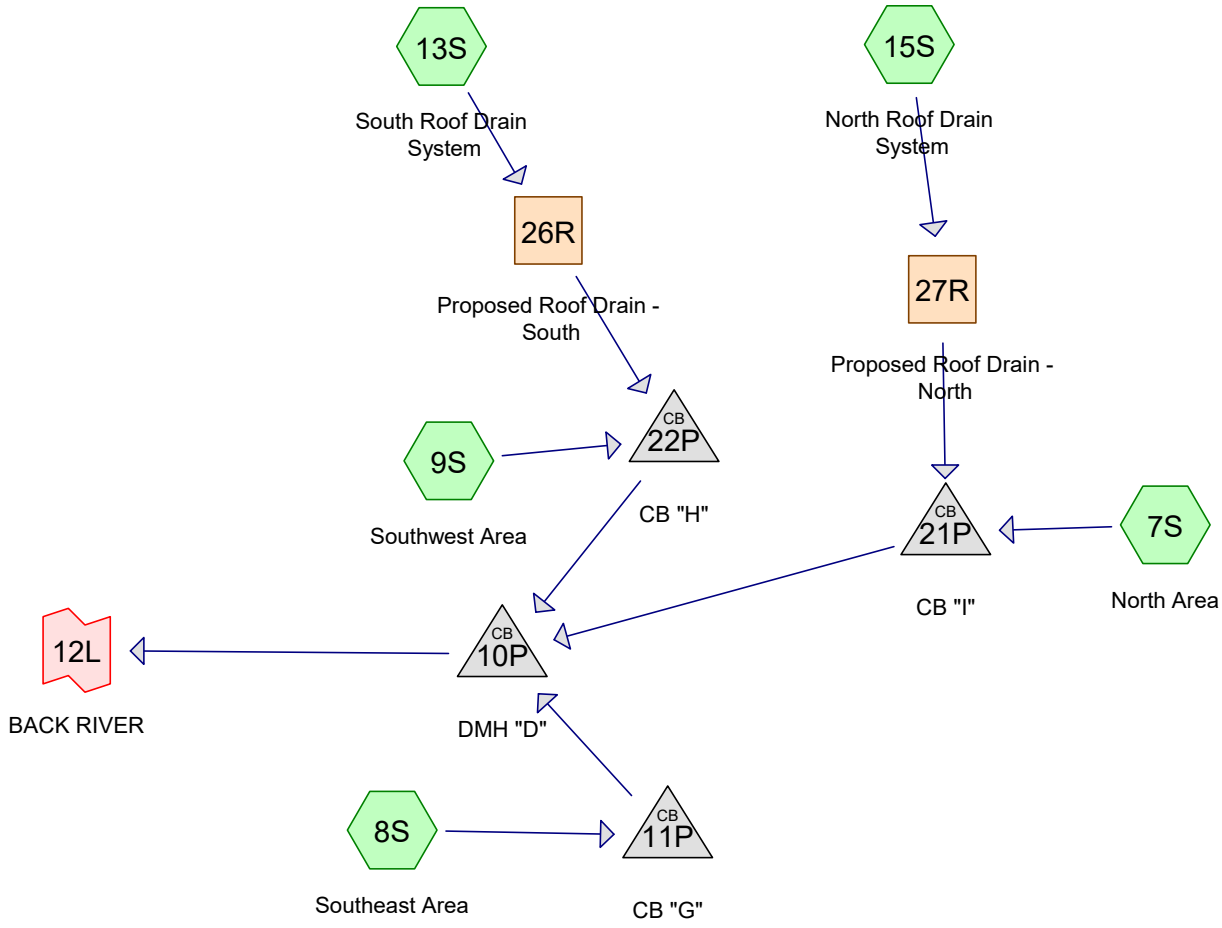
Summary for Link 14L: R Street CB

Inflow Area = 0.068 ac,100.00% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 0.67 cfs @ 12.02 hrs, Volume= 0.047 af
Primary = 0.67 cfs @ 12.02 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.0 min
Routed to Link 12L : BACK RIVER

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 14L: R Street CB





Subcat Reach Pond Link

Routing Diagram for Proposed Conditions - Clarks Pond Stormwater
Prepared by GZA GeoEnvironmental, Inc, Printed 7/14/2025
HydroCAD® 10.20-6a s/n 07899 © 2024 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "Existing Conditions - Clarks Pond Stormwater.hcp"
Rainfall events imported from "Existing Conditions - Clarks Pond Stormwater.hcp"

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC	P2 (inches)
1	2-Year	Type III 24-hr		Default	24.00	1	3.39	2	3.39
2	10-Year	Type III 24-hr		Default	24.00	1	5.36	2	3.39
3	100-Year	Type III 24-hr		Default	24.00	1	8.50	2	3.39

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.091	39	>75% Grass cover, Good, HSG A (9S)
0.173	80	>75% Grass cover, Good, HSG D (7S)
0.030	76	Brick Pavers, HSG A (9S)
0.032	96	Brick Pavers, HSG D (7S)
0.202	98	Paved roads w/curbs & sewers, HSG A (8S, 9S)
0.200	98	Paved roads w/curbs & sewers, HSG D (7S)
0.196	98	Roofs, HSG A (13S, 15S)
0.922	**88**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.518	HSG A	8S, 9S, 13S, 15S
0.000	HSG B	
0.000	HSG C	
0.405	HSG D	7S
0.000	Other	
0.922		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.091	0.000	0.000	0.173	0.000	0.263	>75% Grass cover, Good	7S, 9S
0.030	0.000	0.000	0.032	0.000	0.061	Brick Pavers	7S, 9S
0.202	0.000	0.000	0.200	0.000	0.402	Paved roads w/curbs & sewers	7S, 8S, 9S
0.196	0.000	0.000	0.000	0.000	0.196	Roofs	13S, 15S
0.518	**0.000**	**0.000**	**0.405**	**0.000**	**0.922**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	15S	0.00	0.00	190.0	0.0205	0.012	0.0	12.0	0.0	
2	26R	19.90	16.00	206.0	0.0189	0.010	0.0	6.0	0.0	
3	27R	18.00	14.10	190.0	0.0205	0.010	0.0	12.0	0.0	
4	10P	12.19	10.92	136.0	0.0093	0.013	0.0	18.0	0.0	
5	11P	13.18	12.87	12.0	0.0258	0.012	0.0	15.0	0.0	
6	21P	12.83	12.82	12.0	0.0008	0.012	0.0	15.0	0.0	
7	22P	13.15	13.02	10.0	0.0130	0.013	0.0	15.0	0.0	

Summary for Subcatchment 7S: North Area

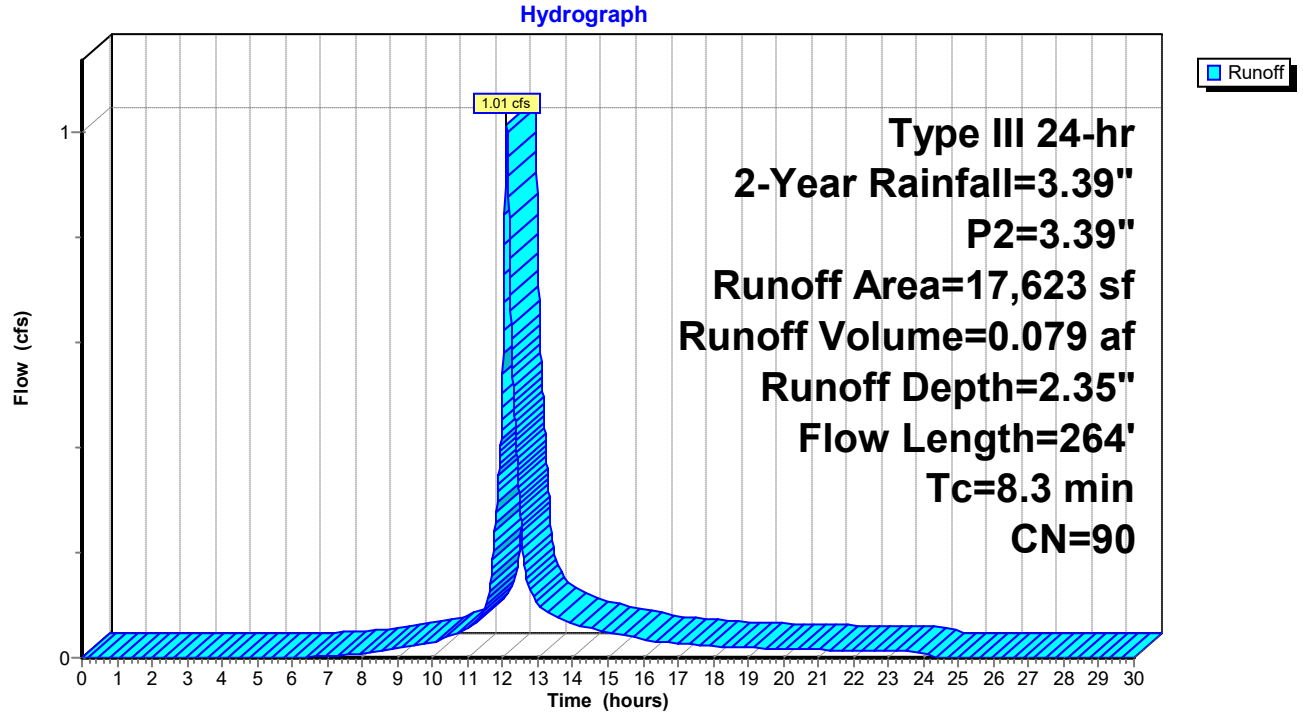
Runoff = 1.01 cfs @ 12.11 hrs, Volume= 0.079 af, Depth= 2.35"
Routed to Pond 21P : CB "I"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.39", P2=3.39"

	Area (sf)	CN	Description
	8,708	98	Paved roads w/curbs & sewers, HSG D
	7,530	80	>75% Grass cover, Good, HSG D
*	1,385	96	Brick Pavers, HSG D
	17,623	90	Weighted Average
	8,915		50.59% Pervious Area
	8,708		49.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	112	0.0580	0.27		**Sheet Flow, over lawn** Grass: Short n= 0.150 P2= 3.39"
0.7	37	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	115	0.0240	2.49		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	264	Total			

Subcatchment 7S: North Area



Summary for Subcatchment 8S: Southeast Area

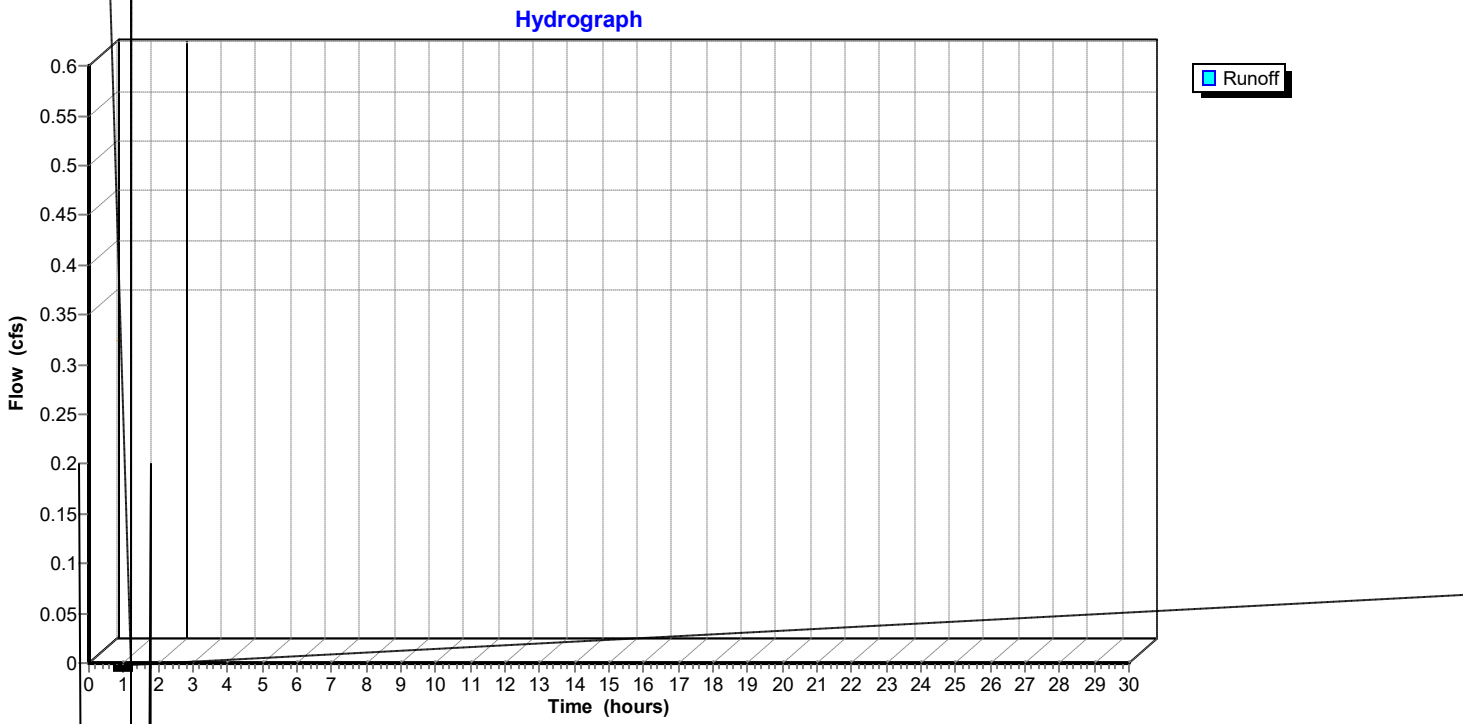
Runoff = 0.54 cfs @ 12.03 hrs, Volume= 0.037 af, Depth= 3.16"
Routed to Pond 11P : CB "G"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.39", P2=3.39"

Area (sf)	CN	Description
6,204	98	Paved roads w/curbs & sewers, HSG A
6,204		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.26		**Sheet Flow, Sheet flow over paved parking area (100')** Smooth surfaces n= 0.011 P2= 3.39"
1.0	131	0.0120	2.22		**Shallow Concentrated Flow, Shallow conc flow over paved R St** Paved Kv= 20.3 fps
2.3	231	Total			

Subcatchment 8S: Southeast Area



Summary for Subcatchment 9S: Southwest Area

Runoff = 0.12 cfs @ 12.11 hrs, Volume= 0.010 af, Depth= 0.70"
Routed to Pond 22P : CB "H"

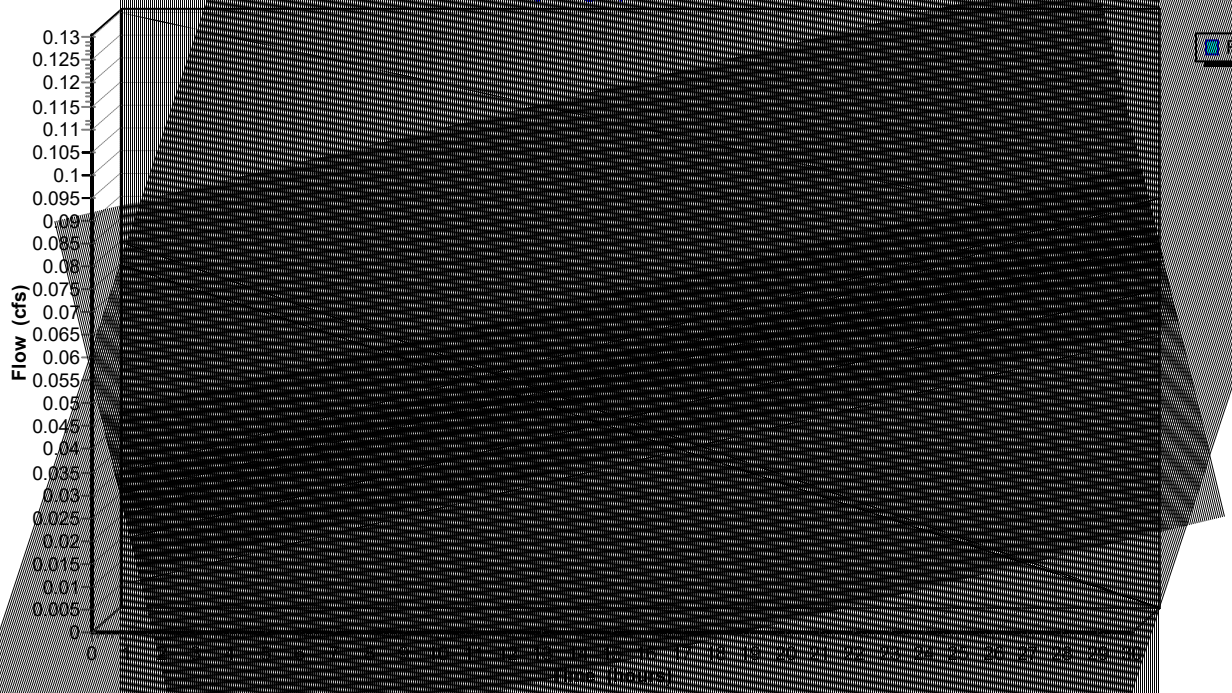
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.39", P2=3.39"

Area (sf)	CN	Description
3,945	39	>75% Grass cover, Good, HSG A
2,588	98	Paved roads w/curbs & sewers, HSG A
1,293	76	Brick Pavers, HSG A
7,826	65	Weighted Average
5,238		66.93% Pervious Area
2,588		33.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	26	0.0190	0.09		**Sheet Flow, sheet flow over lawn area (90')** Grass: Dense n= 0.240 P2= 3.39"
0.9	94	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	39	0.0130	0.80		**Shallow Concentrated Flow, Shallow conc flow over driveway** Short Grass Pasture Kv= 7.0 fps
0.2	34	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.7	193	Total			

SubCatchment 4S: Southwest Area

Hydrograph



Summary for Subcatchment 13S: South Roof Drain System

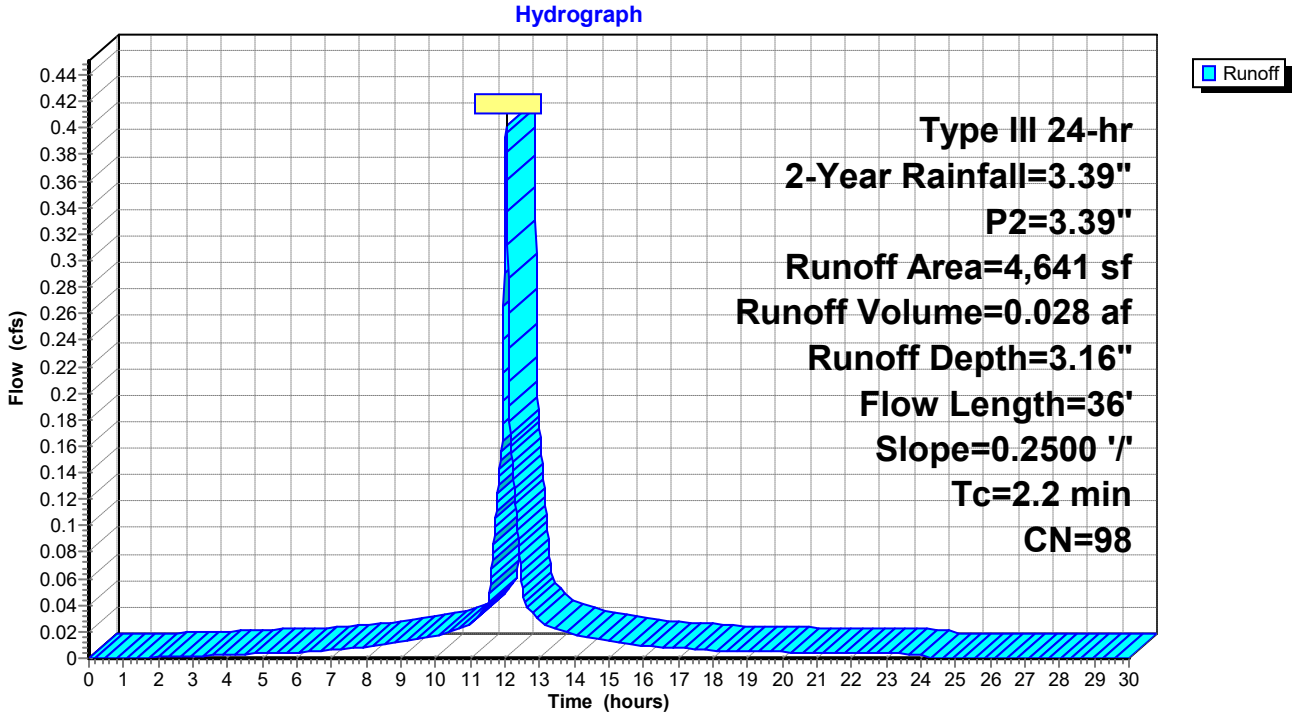
Runoff = 0.40 cfs @ 12.03 hrs, Volume= 0.028 af, Depth= 3.16"
Routed to Reach 26R : Proposed Roof Drain - South

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.39", P2=3.39"

Area (sf)	CN	Description
4,641	98	Roofs, HSG A
4,641		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	36	0.2500	0.27		**Sheet Flow, across roof** Grass: Dense n= 0.240 P2= 3.39"

Subcatchment 13S: South Roof Drain System



Summary for Subcatchment 15S: North Roof Drain System

[49] Hint: Tc<2dt may require smaller dt

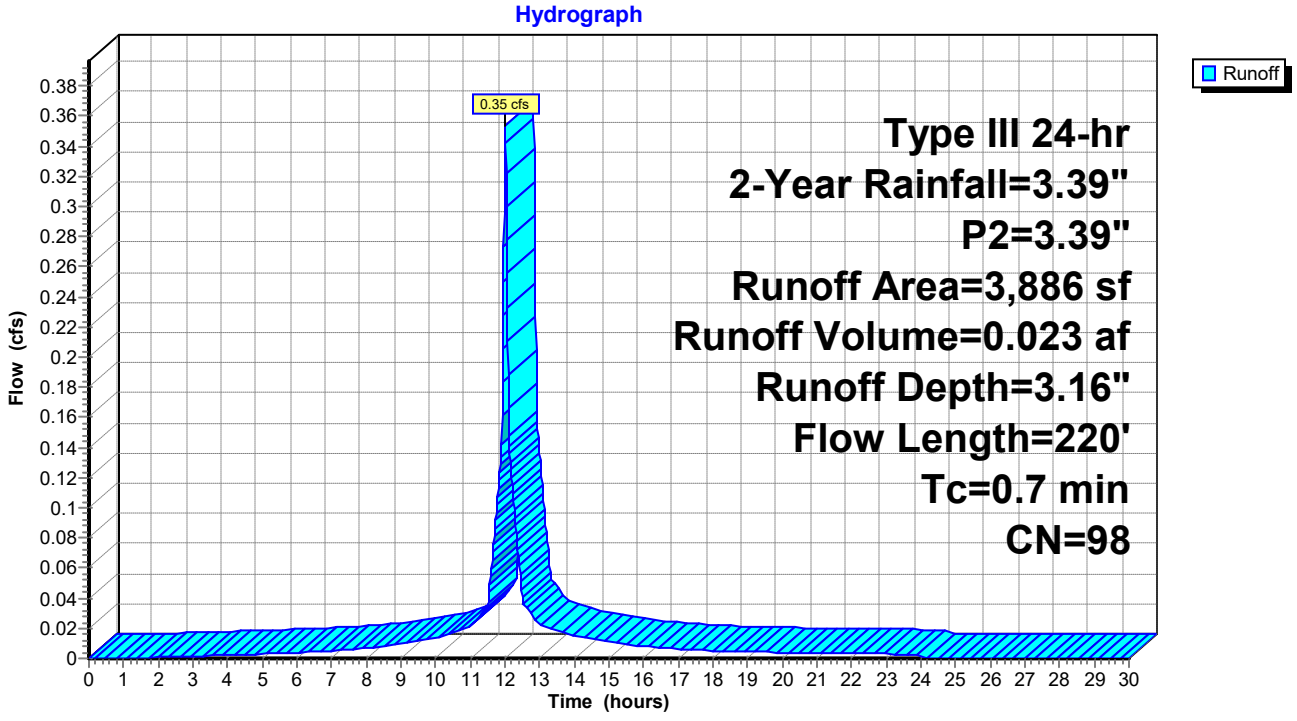
Runoff = 0.35 cfs @ 12.01 hrs, Volume= 0.023 af, Depth= 3.16"
Routed to Reach 27R : Proposed Roof Drain - North

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.39", P2=3.39"

Area (sf)	CN	Description
3,886	98	Roofs, HSG A
3,886		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	30	0.2500	3.06		**Sheet Flow, over roof** Smooth surfaces n= 0.011 P2= 3.39"
0.5	190	0.0205	7.04	5.53	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Corrugated PP, smooth interior
0.7	220	Total			

Subcatchment 15S: North Roof Drain System



Summary for Reach 26R: Proposed Roof Drain - South

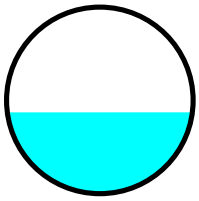
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.107 ac,100.00% Impervious, Inflow Depth = 3.16" for 2-Year event
Inflow = 0.40 cfs @ 12.03 hrs, Volume= 0.028 af
Outflow = 0.40 cfs @ 12.04 hrs, Volume= 0.028 af, Atten= 1%, Lag= 0.5 min
Routed to Pond 22P : CB "H"

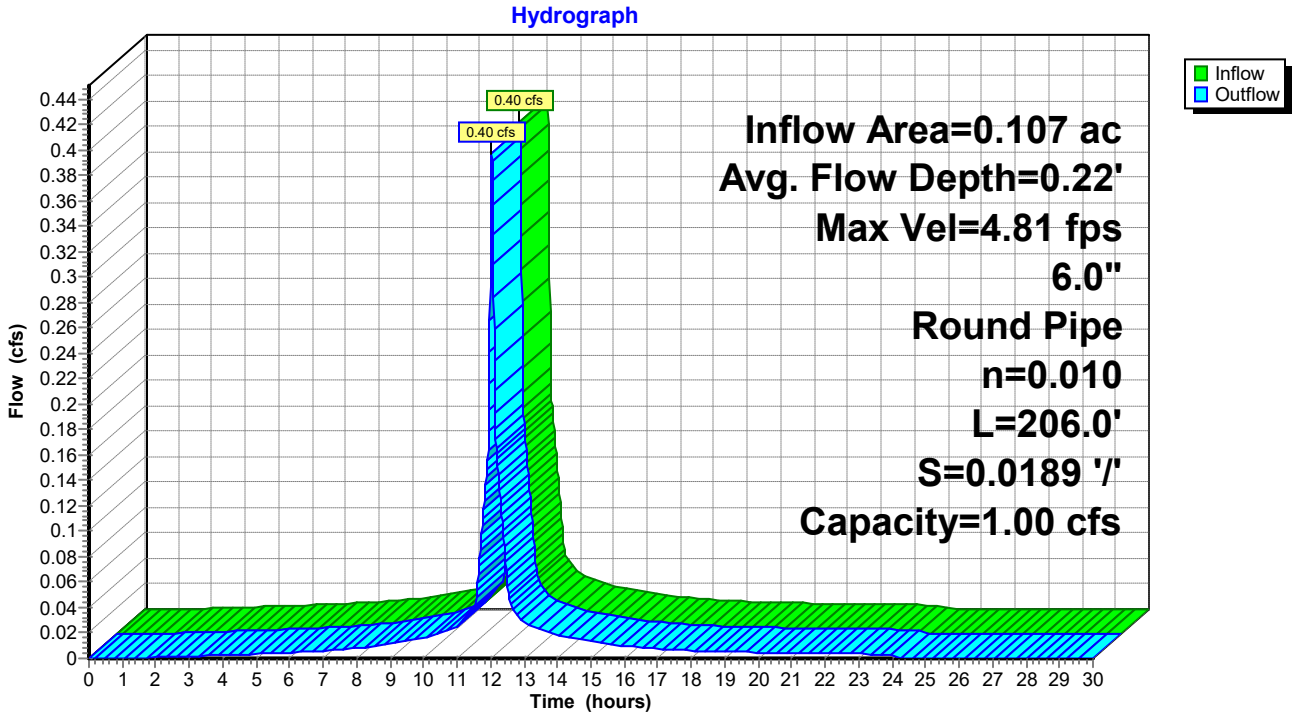
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.81 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.54 fps, Avg. Travel Time= 2.2 min

Peak Storage= 17 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 0.50'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.00 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 206.0' Slope= 0.0189 '/'
Inlet Invert= 19.90', Outlet Invert= 16.00'



Reach 26R: Proposed Roof Drain - South



Summary for Reach 27R: Proposed Roof Drain - North

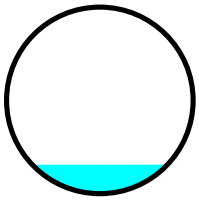
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.089 ac,100.00% Impervious, Inflow Depth = 3.16" for 2-Year event
Inflow = 0.35 cfs @ 12.01 hrs, Volume= 0.023 af
Outflow = 0.35 cfs @ 12.02 hrs, Volume= 0.023 af, Atten= 2%, Lag= 0.5 min
Routed to Pond 21P : CB "I"

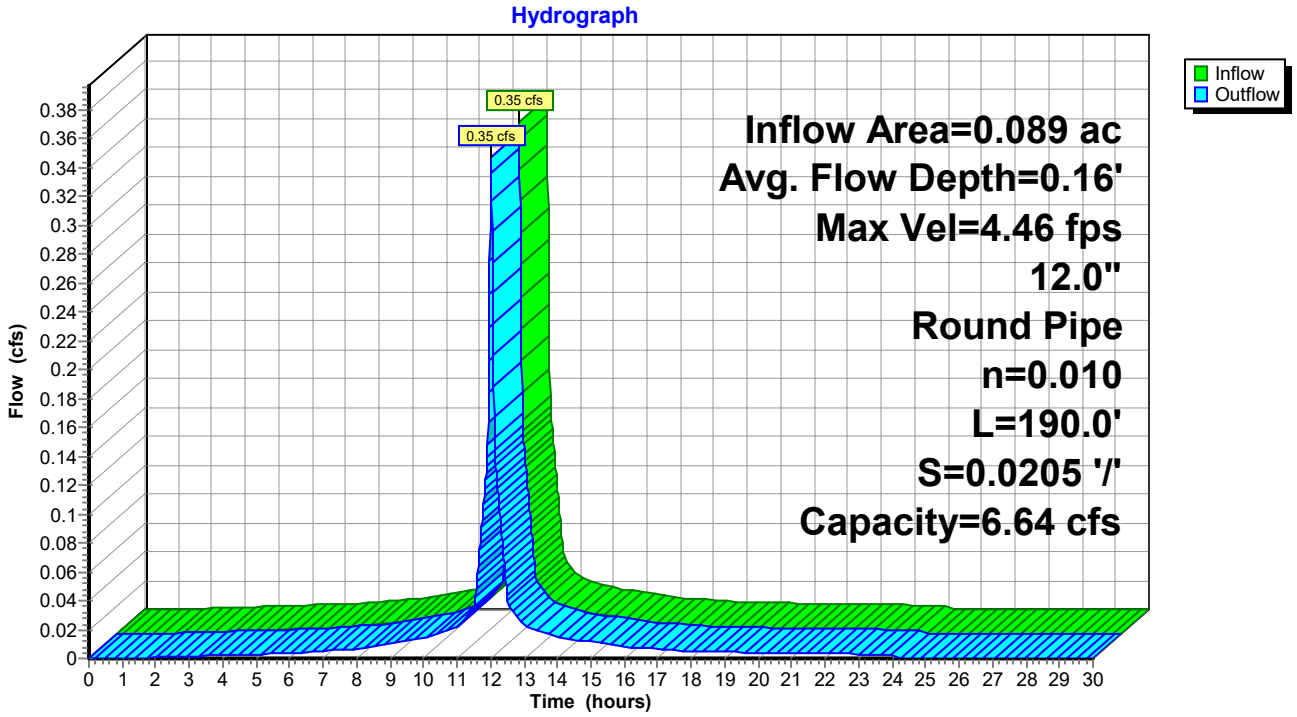
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.46 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.39 fps, Avg. Travel Time= 2.3 min

Peak Storage= 15 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 0.72'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.64 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 190.0' Slope= 0.0205 '/'
Inlet Invert= 18.00', Outlet Invert= 14.10'



Reach 27R: Proposed Roof Drain - North



Summary for Pond 10P: DMH "D"

[57] Hint: Peaked at 12.85' (Flood elevation advised)

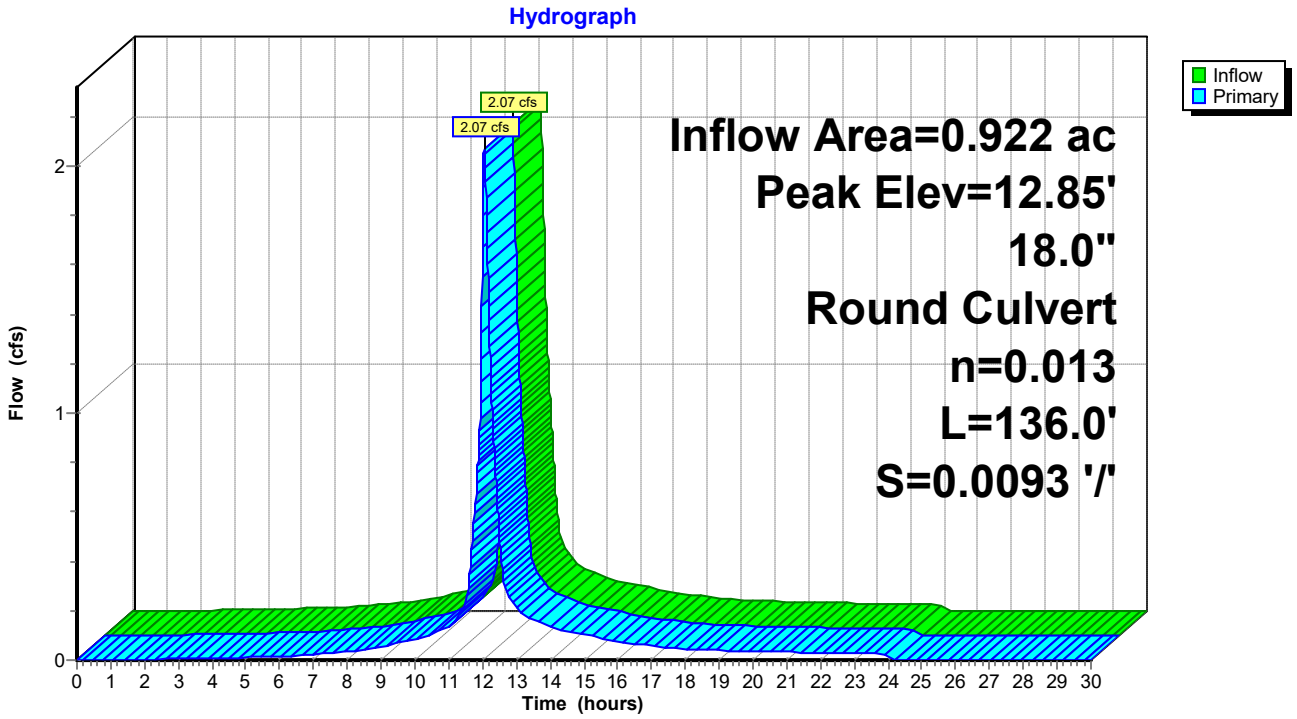
Inflow Area = 0.922 ac, 64.78% Impervious, Inflow Depth = 2.32" for 2-Year event
Inflow = 2.07 cfs @ 12.06 hrs, Volume= 0.178 af
Outflow = 2.07 cfs @ 12.06 hrs, Volume= 0.178 af, Atten= 0%, Lag= 0.0 min
Primary = 2.07 cfs @ 12.06 hrs, Volume= 0.178 af
Routed to Link 12L : BACK RIVER

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 12.85' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.19'	**18.0" Round To Back River** L= 136.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 12.19' / 10.92' S= 0.0093 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

Primary OutFlow Max=2.07 cfs @ 12.06 hrs HW=12.85' TW=0.00' (Dynamic Tailwater)
↑—**1=To Back River** (Inlet Controls 2.07 cfs @ 2.77 fps)

Pond 10P: DMH "D"



Summary for Pond 11P: CB "G"

[57] Hint: Peaked at 13.48' (Flood elevation advised)

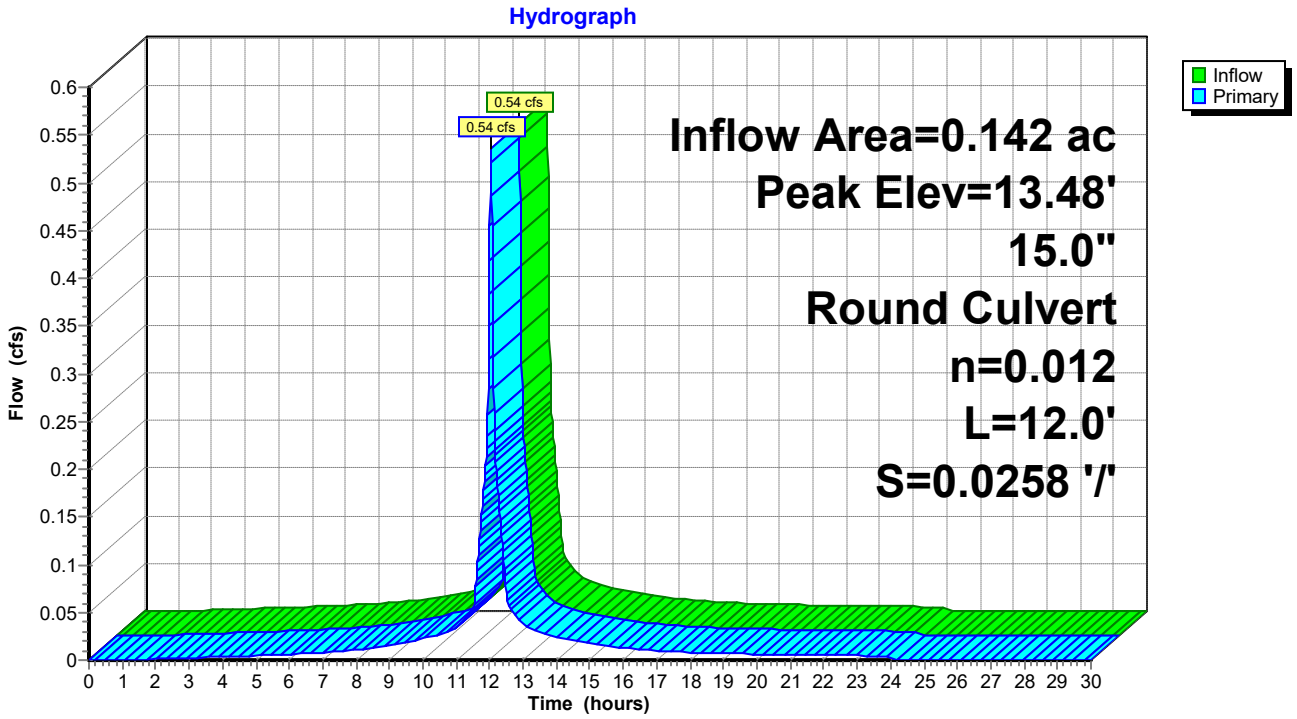
Inflow Area = 0.142 ac,100.00% Impervious, Inflow Depth = 3.16" for 2-Year event
Inflow = 0.54 cfs @ 12.03 hrs, Volume= 0.037 af
Outflow = 0.54 cfs @ 12.03 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Primary = 0.54 cfs @ 12.03 hrs, Volume= 0.037 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.48' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.18'	**15.0" Round Culvert** L= 12.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.18' / 12.87' S= 0.0258 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=0.53 cfs @ 12.03 hrs HW=13.48' TW=12.84' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.53 cfs @ 2.34 fps)

Pond 11P: CB "G"



Summary for Pond 21P: CB "I"

[57] Hint: Peaked at 13.51' (Flood elevation advised)

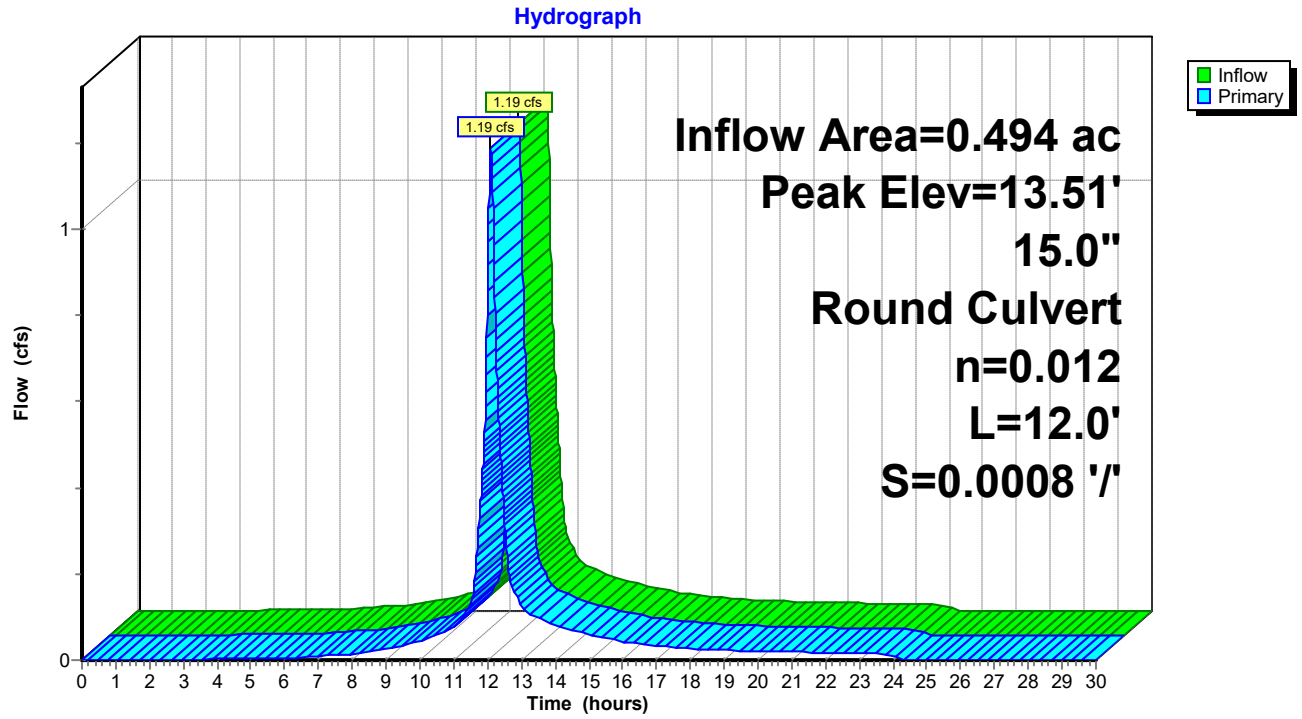
Inflow Area = 0.494 ac, 58.55% Impervious, Inflow Depth = 2.49" for 2-Year event
Inflow = 1.19 cfs @ 12.10 hrs, Volume= 0.103 af
Outflow = 1.19 cfs @ 12.10 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min
Primary = 1.19 cfs @ 12.10 hrs, Volume= 0.103 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.51' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.83'	**15.0" Round Culvert** L= 12.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 12.83' / 12.82' S= 0.0008 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=1.19 cfs @ 12.10 hrs HW=13.51' TW=12.83' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.19 cfs @ 2.54 fps)

Pond 21P: CB "I"



Summary for Pond 22P: CB "H"

[57] Hint: Peaked at 13.48' (Flood elevation advised)

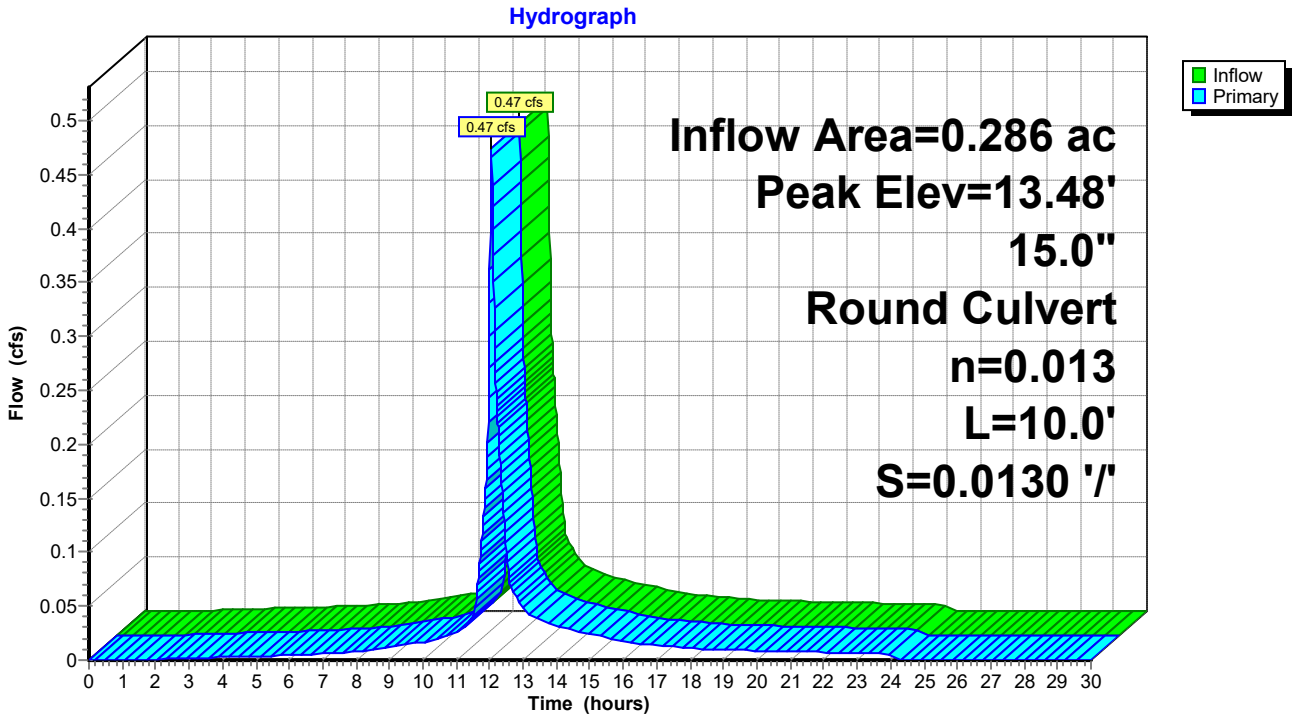
Inflow Area = 0.286 ac, 57.99% Impervious, Inflow Depth = 1.61" for 2-Year event
Inflow = 0.47 cfs @ 12.05 hrs, Volume= 0.038 af
Outflow = 0.47 cfs @ 12.05 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min
Primary = 0.47 cfs @ 12.05 hrs, Volume= 0.038 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.48' @ 12.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.15'	**15.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.15' / 13.02' S= 0.0130 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf

Primary OutFlow Max=0.47 cfs @ 12.05 hrs HW=13.48' TW=12.85' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.47 cfs @ 2.74 fps)

Pond 22P: CB "H"

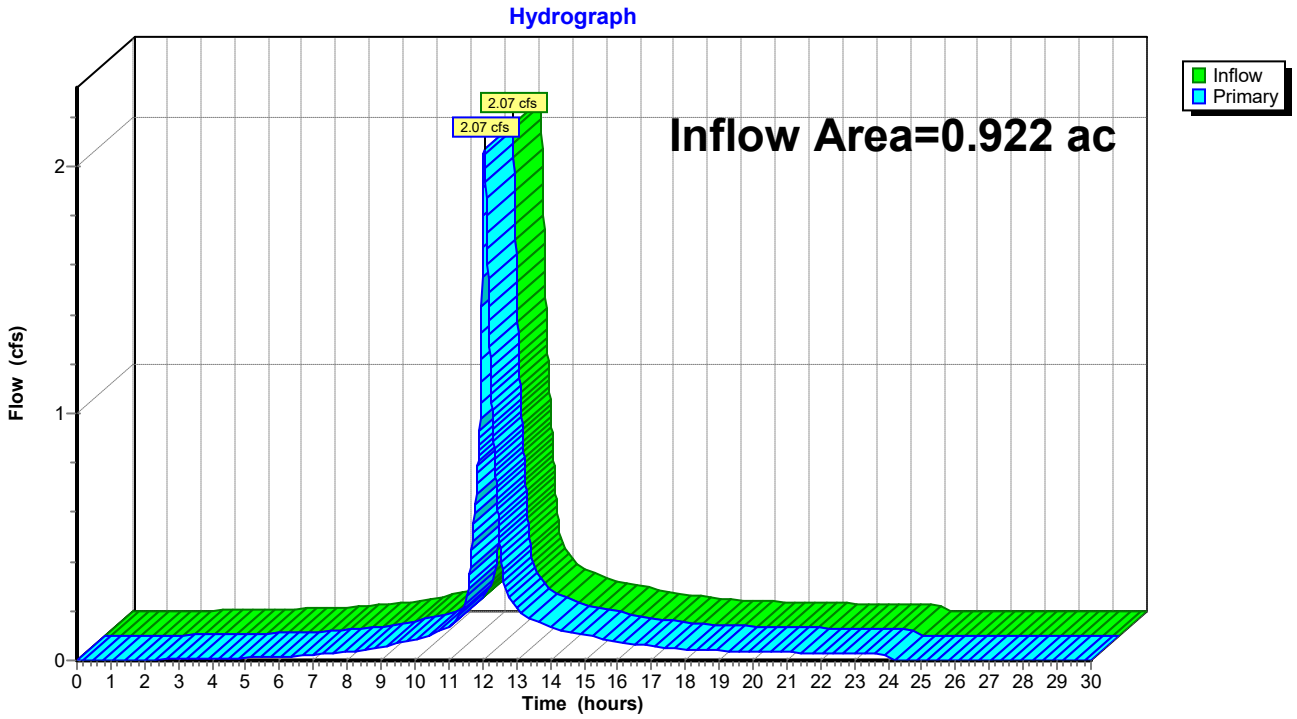


Summary for Link 12L: BACK RIVER

Inflow Area = 0.922 ac, 64.78% Impervious, Inflow Depth = 2.32" for 2-Year event
Inflow = 2.07 cfs @ 12.06 hrs, Volume= 0.178 af
Primary = 2.07 cfs @ 12.06 hrs, Volume= 0.178 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 12L: BACK RIVER



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 7S: North Area Runoff Area=17,623 sf 49.41% Impervious Runoff Depth=4.22"
Flow Length=264' Tc=8.3 min CN=90 Runoff=1.78 cfs 0.142 af

Subcatchment 8S: Southeast Area Runoff Area=6,204 sf 100.00% Impervious Runoff Depth=5.12"
Flow Length=231' Tc=2.3 min CN=98 Runoff=0.85 cfs 0.061 af

Subcatchment 9S: Southwest Area Runoff Area=7,826 sf 33.07% Impervious Runoff Depth=1.90"
Flow Length=193' Tc=6.7 min CN=65 Runoff=0.38 cfs 0.028 af

Subcatchment 13S: South Roof Drain Runoff Area=4,641 sf 100.00% Impervious Runoff Depth=5.12"
Flow Length=36' Slope=0.2500 '/' Tc=2.2 min CN=98 Runoff=0.64 cfs 0.045 af

Subcatchment 15S: North Roof Drain Runoff Area=3,886 sf 100.00% Impervious Runoff Depth=5.12"
Flow Length=220' Tc=0.7 min CN=98 Runoff=0.56 cfs 0.038 af

Reach 26R: Proposed Roof Drain - Avg. Flow Depth=0.29' Max Vel=5.41 fps Inflow=0.64 cfs 0.045 af
6.0" Round Pipe n=0.010 L=206.0' S=0.0189 '/' Capacity=1.00 cfs Outflow=0.63 cfs 0.045 af

Reach 27R: Proposed Roof Drain - North Avg. Flow Depth=0.20' Max Vel=5.12 fps Inflow=0.56 cfs 0.038 af
12.0" Round Pipe n=0.010 L=190.0' S=0.0205 '/' Capacity=6.64 cfs Outflow=0.55 cfs 0.038 af

Pond 10P: DMH "D" Peak Elev=13.10' Inflow=3.63 cfs 0.315 af
18.0" Round Culvert n=0.013 L=136.0' S=0.0093 '/' Outflow=3.63 cfs 0.315 af

Pond 11P: CB "G" Peak Elev=13.57' Inflow=0.85 cfs 0.061 af
15.0" Round Culvert n=0.012 L=12.0' S=0.0258 '/' Outflow=0.85 cfs 0.061 af

Pond 21P: CB "I" Peak Elev=13.74' Inflow=2.05 cfs 0.180 af
15.0" Round Culvert n=0.012 L=12.0' S=0.0008 '/' Outflow=2.05 cfs 0.180 af

Pond 22P: CB "H" Peak Elev=13.63' Inflow=0.93 cfs 0.074 af
15.0" Round Culvert n=0.013 L=10.0' S=0.0130 '/' Outflow=0.93 cfs 0.074 af

Link 12L: BACK RIVER Inflow=3.63 cfs 0.315 af
Primary=3.63 cfs 0.315 af

Total Runoff Area = 0.922 ac Runoff Volume = 0.315 af Average Runoff Depth = 4.10"
35.22% Pervious = 0.325 ac 64.78% Impervious = 0.597 ac

Summary for Subcatchment 7S: North Area

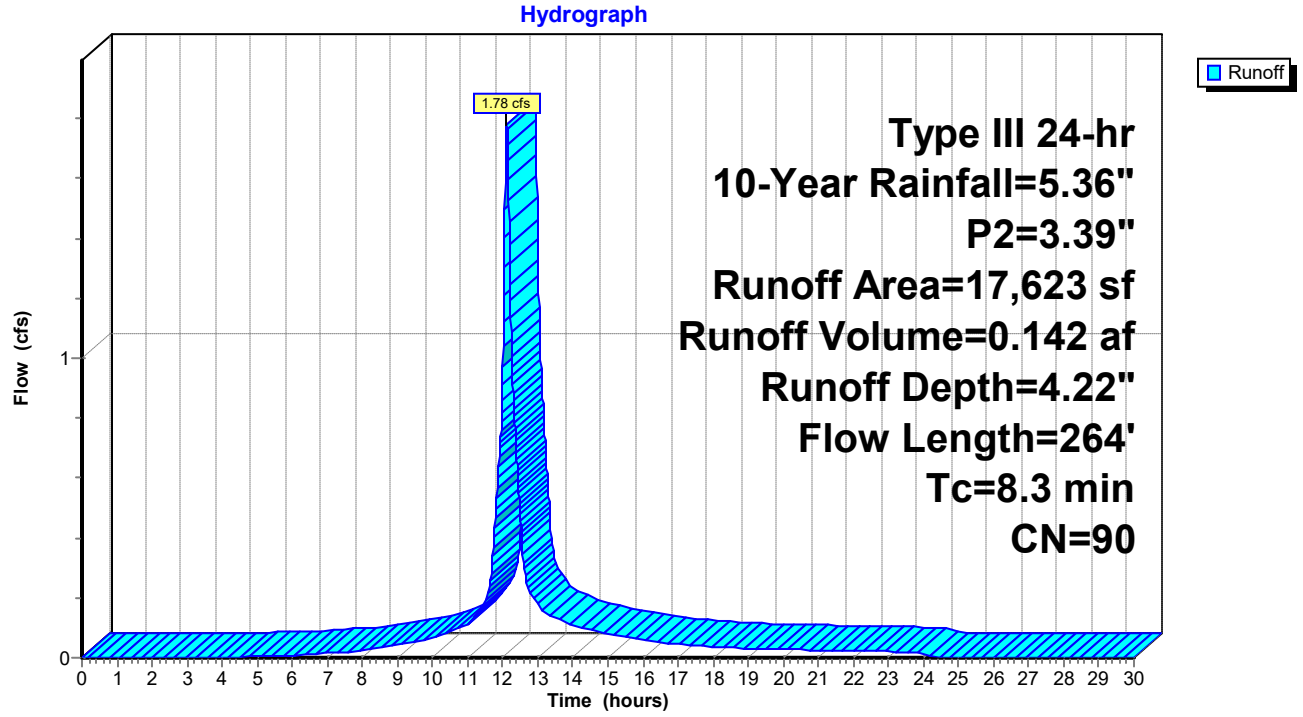
Runoff = 1.78 cfs @ 12.11 hrs, Volume= 0.142 af, Depth= 4.22"
Routed to Pond 21P : CB "I"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.36", P2=3.39"

	Area (sf)	CN	Description
	8,708	98	Paved roads w/curbs & sewers, HSG D
	7,530	80	>75% Grass cover, Good, HSG D
*	1,385	96	Brick Pavers, HSG D
	17,623	90	Weighted Average
	8,915		50.59% Pervious Area
	8,708		49.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	112	0.0580	0.27		**Sheet Flow, over lawn** Grass: Short n= 0.150 P2= 3.39"
0.7	37	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	115	0.0240	2.49		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	264	Total			

Subcatchment 7S: North Area



Summary for Subcatchment 8S: Southeast Area

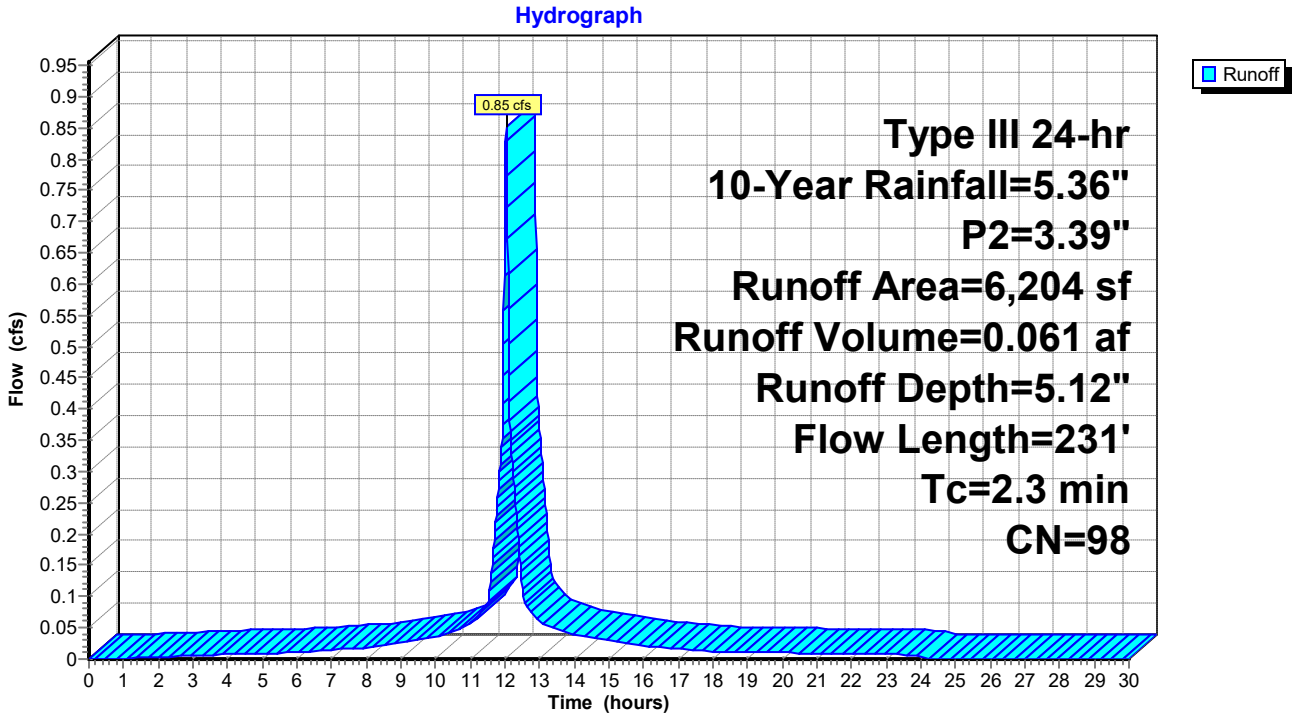
Runoff = 0.85 cfs @ 12.03 hrs, Volume= 0.061 af, Depth= 5.12"
Routed to Pond 11P : CB "G"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.36", P2=3.39"

Area (sf)	CN	Description
6,204	98	Paved roads w/curbs & sewers, HSG A
6,204		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.26		**Sheet Flow, Sheet flow over paved parking area (100')** Smooth surfaces n= 0.011 P2= 3.39"
1.0	131	0.0120	2.22		**Shallow Concentrated Flow, Shallow conc flow over paved R St** Paved Kv= 20.3 fps
2.3	231	Total			

Subcatchment 8S: Southeast Area



Summary for Subcatchment 9S: Southwest Area

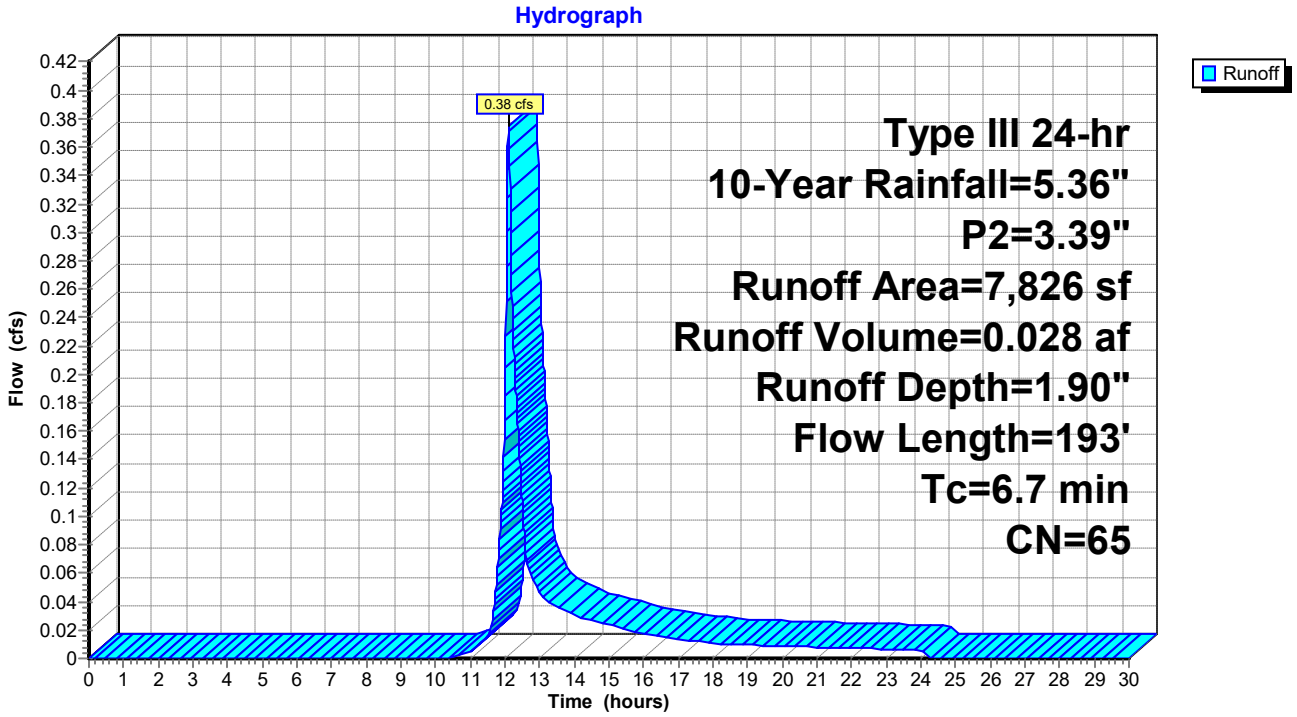
Runoff = 0.38 cfs @ 12.10 hrs, Volume= 0.028 af, Depth= 1.90"
Routed to Pond 22P : CB "H"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.36", P2=3.39"

Area (sf)	CN	Description
3,945	39	>75% Grass cover, Good, HSG A
2,588	98	Paved roads w/curbs & sewers, HSG A
1,293	76	Brick Pavers, HSG A
7,826	65	Weighted Average
5,238		66.93% Pervious Area
2,588		33.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	26	0.0190	0.09		**Sheet Flow, sheet flow over lawn area (90')** Grass: Dense n= 0.240 P2= 3.39"
0.9	94	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	39	0.0130	0.80		**Shallow Concentrated Flow, Shallow conc flow over driveway** Short Grass Pasture Kv= 7.0 fps
0.2	34	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.7	193	Total			

Subcatchment 9S: Southwest Area



Summary for Subcatchment 13S: South Roof Drain System

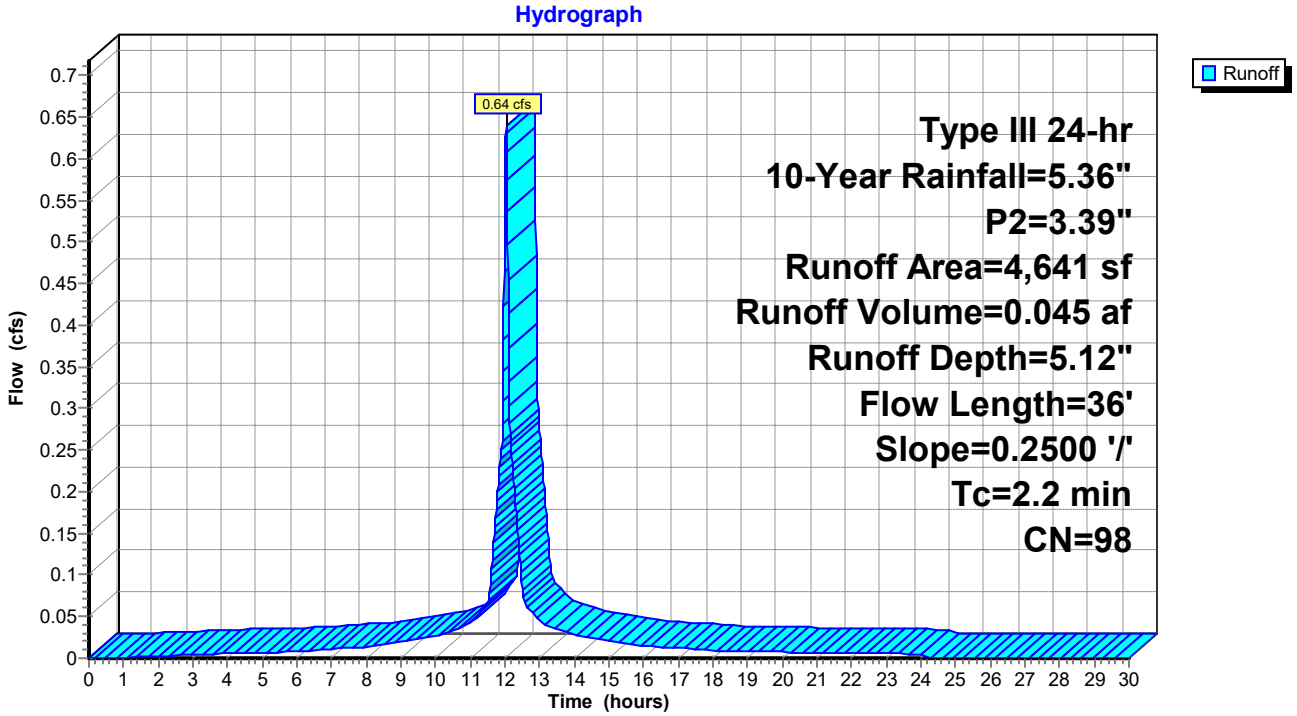
Runoff = 0.64 cfs @ 12.03 hrs, Volume= 0.045 af, Depth= 5.12"
Routed to Reach 26R : Proposed Roof Drain - South

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.36", P2=3.39"

Area (sf)	CN	Description
4,641	98	Roofs, HSG A
4,641		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	36	0.2500	0.27		**Sheet Flow, across roof** Grass: Dense n= 0.240 P2= 3.39"

Subcatchment 13S: South Roof Drain System



Summary for Subcatchment 15S: North Roof Drain System

[49] Hint: Tc<2dt may require smaller dt

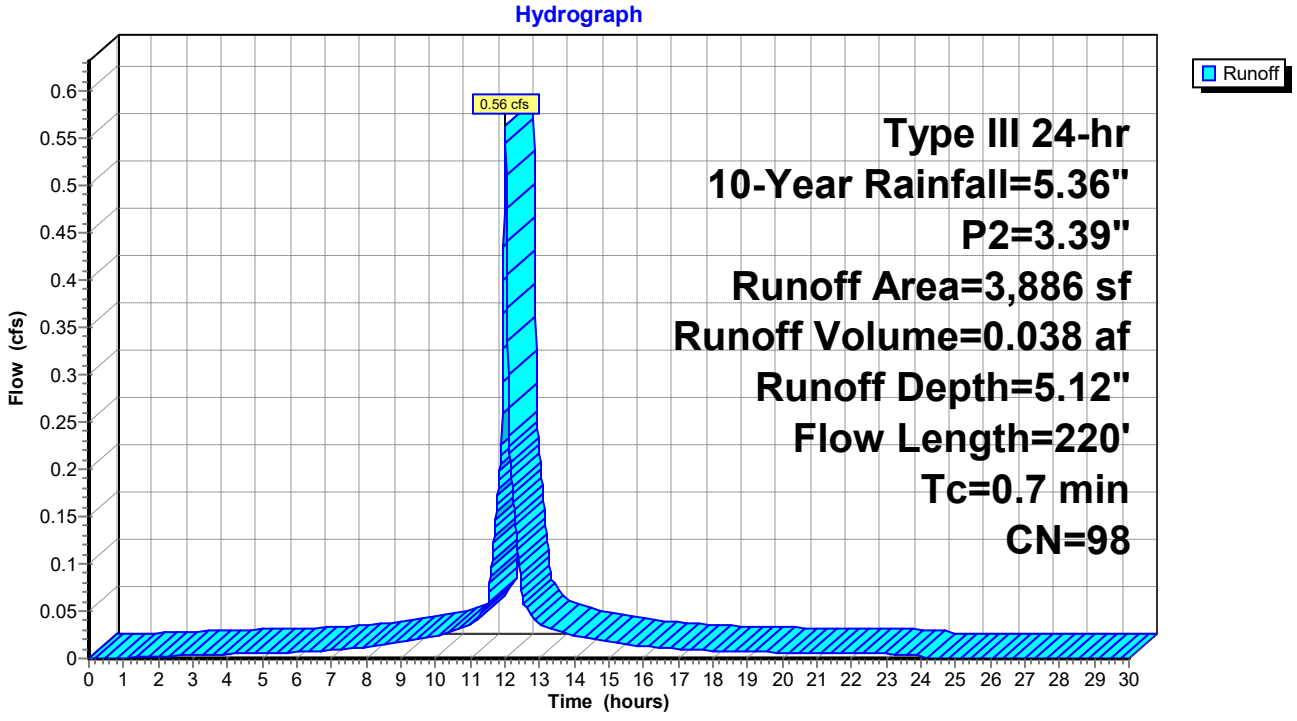
Runoff = 0.56 cfs @ 12.01 hrs, Volume= 0.038 af, Depth= 5.12"
Routed to Reach 27R : Proposed Roof Drain - North

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.36", P2=3.39"

Area (sf)	CN	Description
3,886	98	Roofs, HSG A
3,886		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	30	0.2500	3.06		**Sheet Flow, over roof** Smooth surfaces n= 0.011 P2= 3.39"
0.5	190	0.0205	7.04	5.53	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Corrugated PP, smooth interior
0.7	220	Total			

Subcatchment 15S: North Roof Drain System



Summary for Reach 26R: Proposed Roof Drain - South

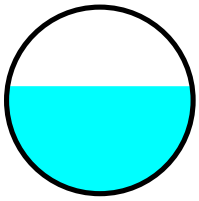
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.107 ac,100.00% Impervious, Inflow Depth = 5.12" for 10-Year event
Inflow = 0.64 cfs @ 12.03 hrs, Volume= 0.045 af
Outflow = 0.63 cfs @ 12.04 hrs, Volume= 0.045 af, Atten= 1%, Lag= 0.5 min
Routed to Pond 22P : CB "H"

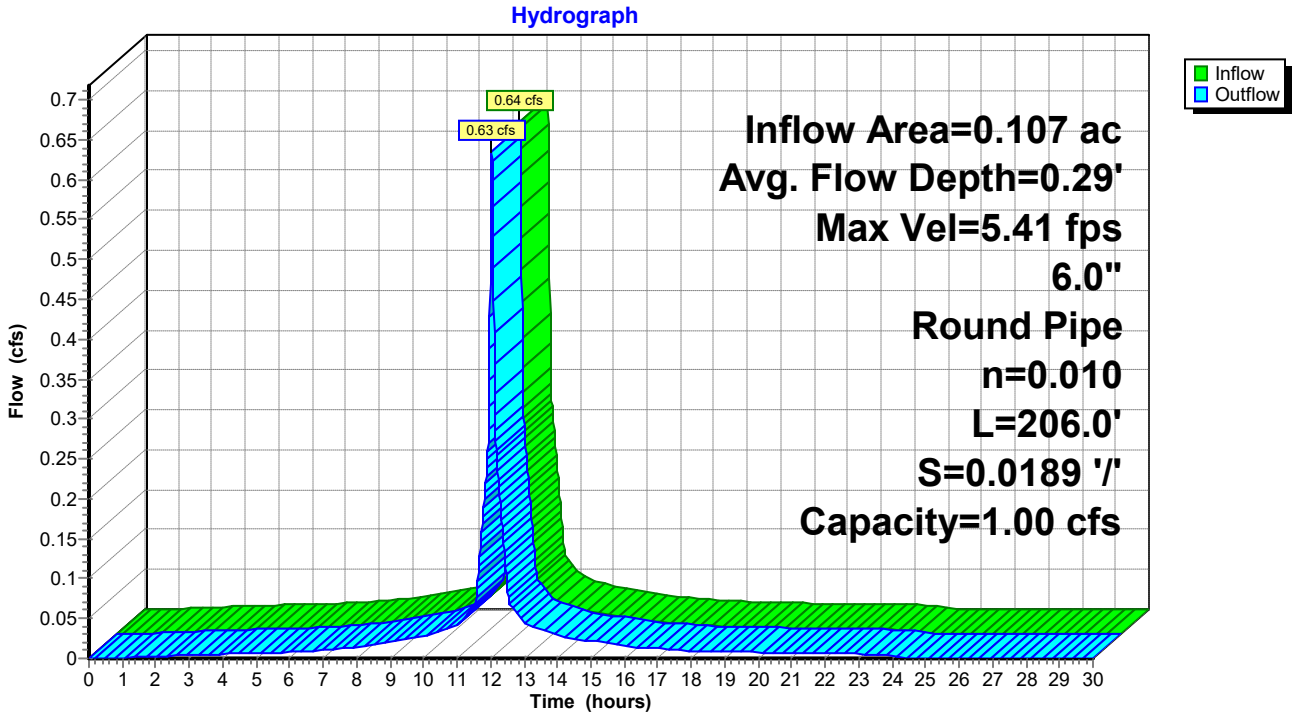
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.41 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.78 fps, Avg. Travel Time= 1.9 min

Peak Storage= 24 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.29' , Surface Width= 0.49'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.00 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 206.0' Slope= 0.0189 '/'
Inlet Invert= 19.90', Outlet Invert= 16.00'



Reach 26R: Proposed Roof Drain - South



Summary for Reach 27R: Proposed Roof Drain - North

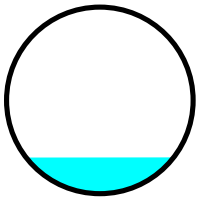
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.089 ac,100.00% Impervious, Inflow Depth = 5.12" for 10-Year event
Inflow = 0.56 cfs @ 12.01 hrs, Volume= 0.038 af
Outflow = 0.55 cfs @ 12.02 hrs, Volume= 0.038 af, Atten= 2%, Lag= 0.4 min
Routed to Pond 21P : CB "I"

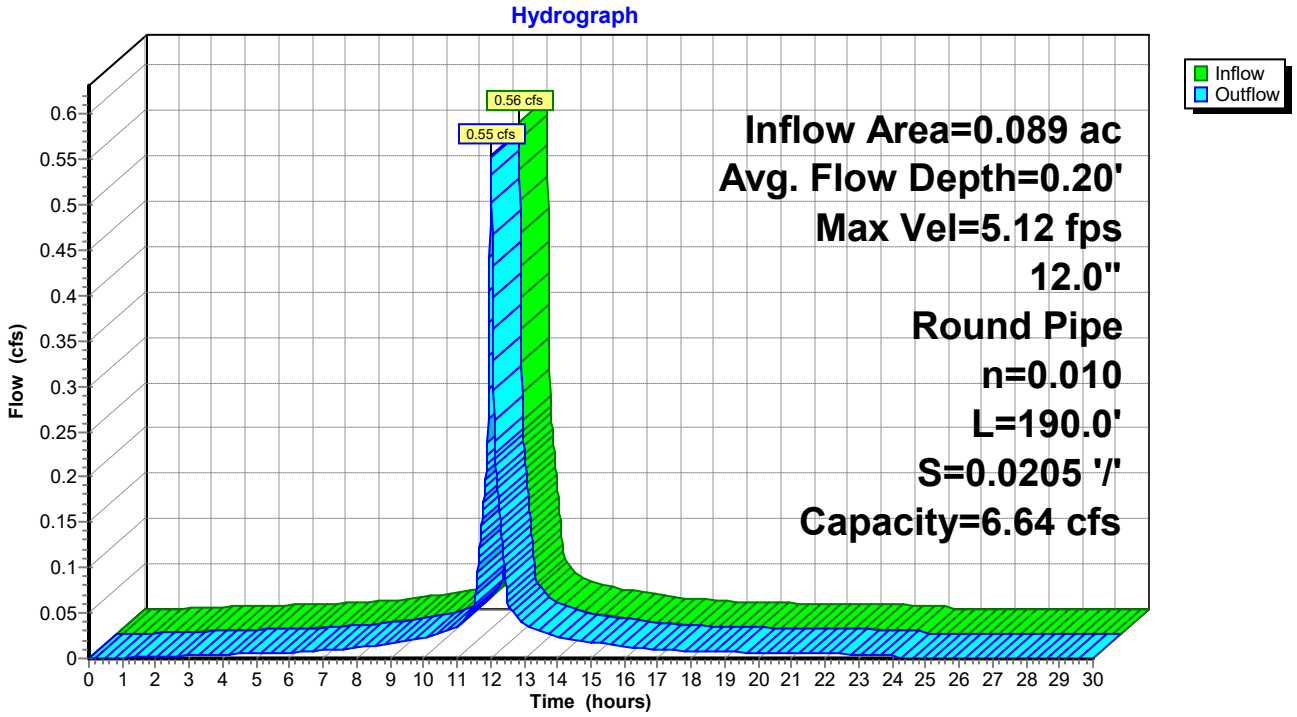
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.12 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.60 fps, Avg. Travel Time= 2.0 min

Peak Storage= 21 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.20' , Surface Width= 0.79'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.64 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 190.0' Slope= 0.0205 '/'
Inlet Invert= 18.00', Outlet Invert= 14.10'



Reach 27R: Proposed Roof Drain - North



Summary for Pond 10P: DMH "D"

[57] Hint: Peaked at 13.10' (Flood elevation advised)

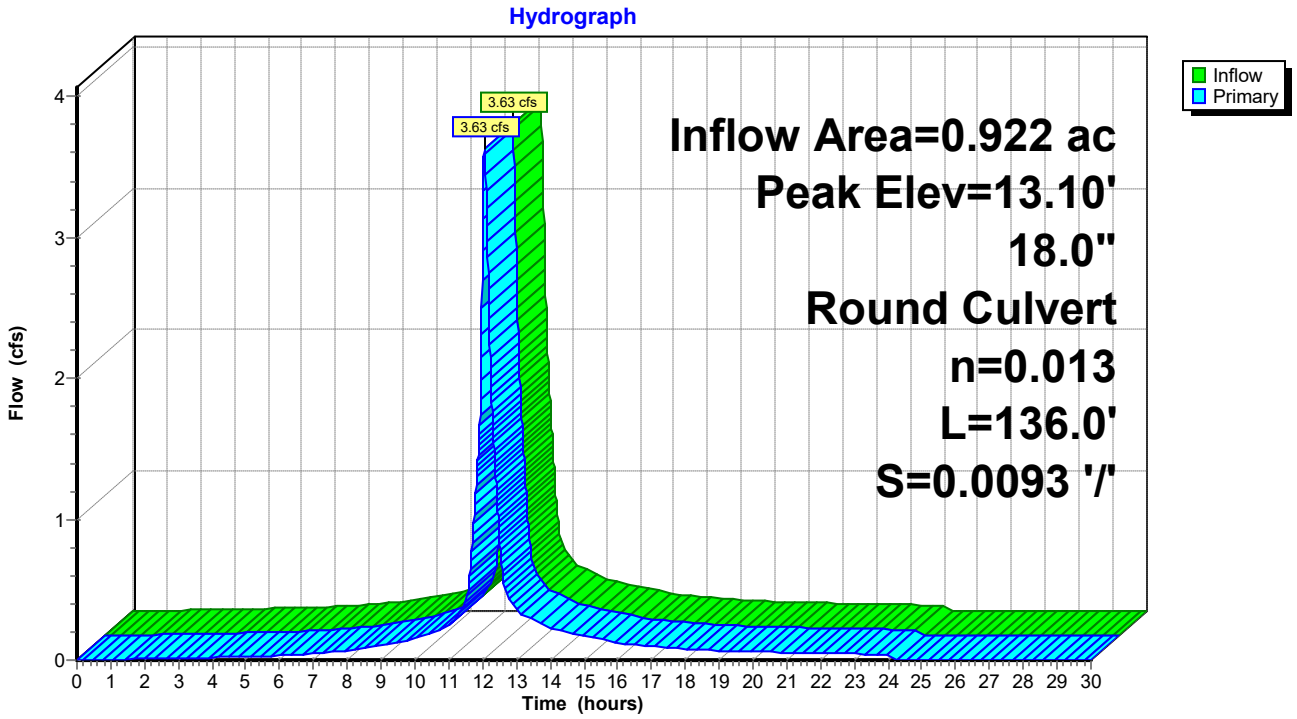
Inflow Area = 0.922 ac, 64.78% Impervious, Inflow Depth = 4.10" for 10-Year event
Inflow = 3.63 cfs @ 12.06 hrs, Volume= 0.315 af
Outflow = 3.63 cfs @ 12.06 hrs, Volume= 0.315 af, Atten= 0%, Lag= 0.0 min
Primary = 3.63 cfs @ 12.06 hrs, Volume= 0.315 af
Routed to Link 12L : BACK RIVER

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.10' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.19'	**18.0" Round To Back River** L= 136.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 12.19' / 10.92' S= 0.0093 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

Primary OutFlow Max=3.63 cfs @ 12.06 hrs HW=13.10' TW=0.00' (Dynamic Tailwater)
↑—**1=To Back River** (Inlet Controls 3.63 cfs @ 3.24 fps)

Pond 10P: DMH "D"



Summary for Pond 11P: CB "G"

[57] Hint: Peaked at 13.57' (Flood elevation advised)

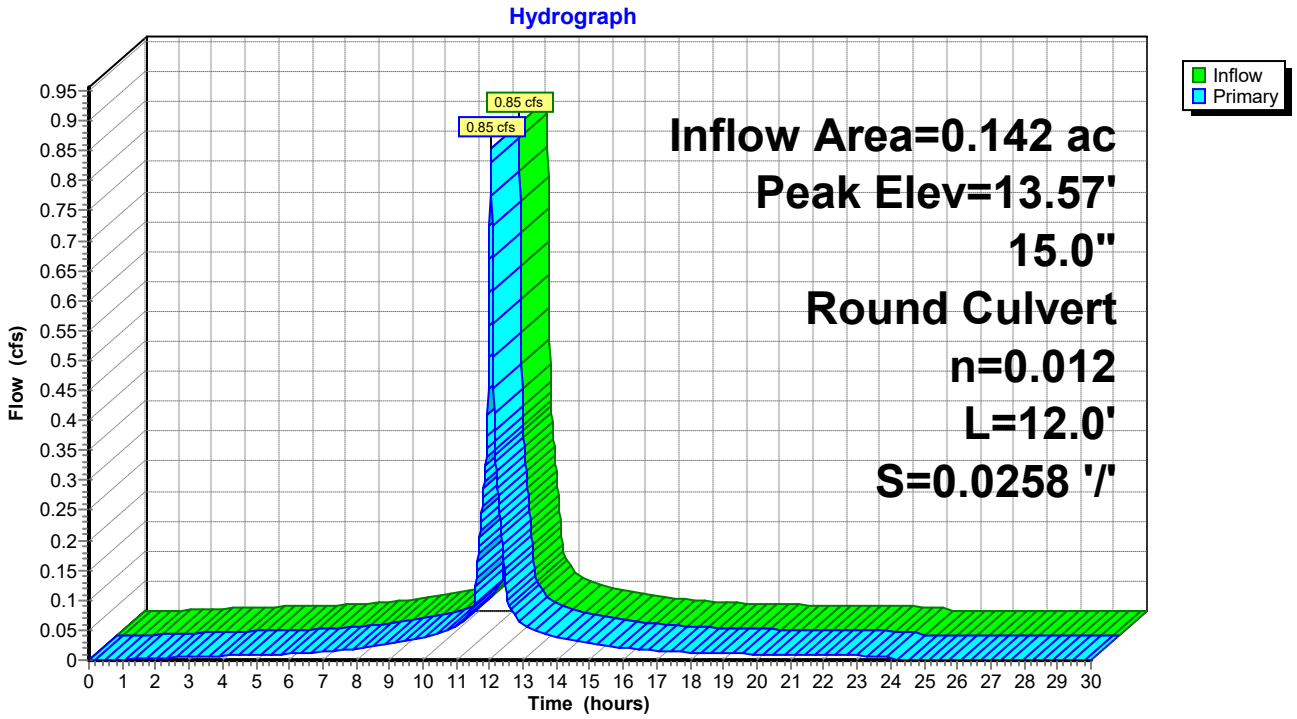
Inflow Area = 0.142 ac,100.00% Impervious, Inflow Depth = 5.12" for 10-Year event
Inflow = 0.85 cfs @ 12.03 hrs, Volume= 0.061 af
Outflow = 0.85 cfs @ 12.03 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min
Primary = 0.85 cfs @ 12.03 hrs, Volume= 0.061 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.57' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.18'	**15.0" Round Culvert** L= 12.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.18' / 12.87' S= 0.0258 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=0.85 cfs @ 12.03 hrs HW=13.57' TW=13.08' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.85 cfs @ 3.90 fps)

Pond 11P: CB "G"



Summary for Pond 21P: CB "I"

[57] Hint: Peaked at 13.74' (Flood elevation advised)

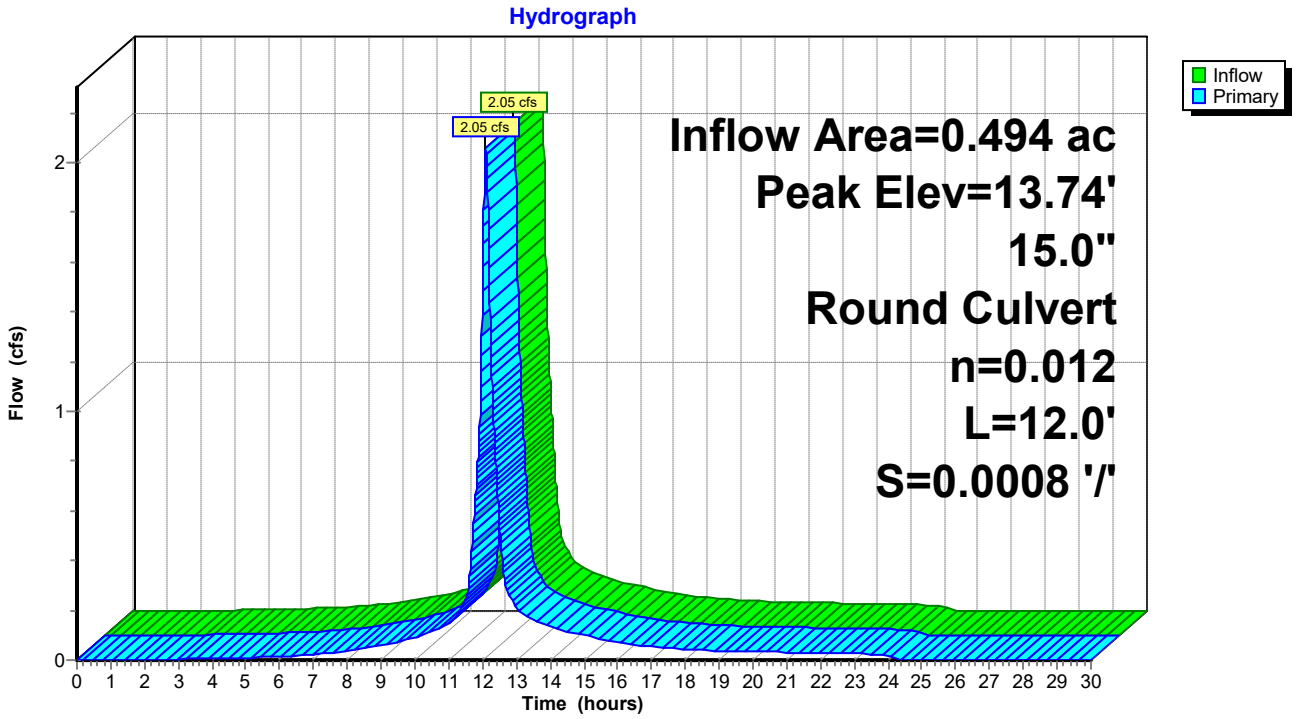
Inflow Area = 0.494 ac, 58.55% Impervious, Inflow Depth = 4.39" for 10-Year event
Inflow = 2.05 cfs @ 12.10 hrs, Volume= 0.180 af
Outflow = 2.05 cfs @ 12.10 hrs, Volume= 0.180 af, Atten= 0%, Lag= 0.0 min
Primary = 2.05 cfs @ 12.10 hrs, Volume= 0.180 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.74' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.83'	**15.0" Round Culvert** L= 12.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 12.83' / 12.82' S= 0.0008 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=2.05 cfs @ 12.10 hrs HW=13.74' TW=13.07' (Dynamic Tailwater)
1=Culvert (Barrel Controls 2.05 cfs @ 2.98 fps)

Pond 21P: CB "I"



Summary for Pond 22P: CB "H"

[57] Hint: Peaked at 13.63' (Flood elevation advised)

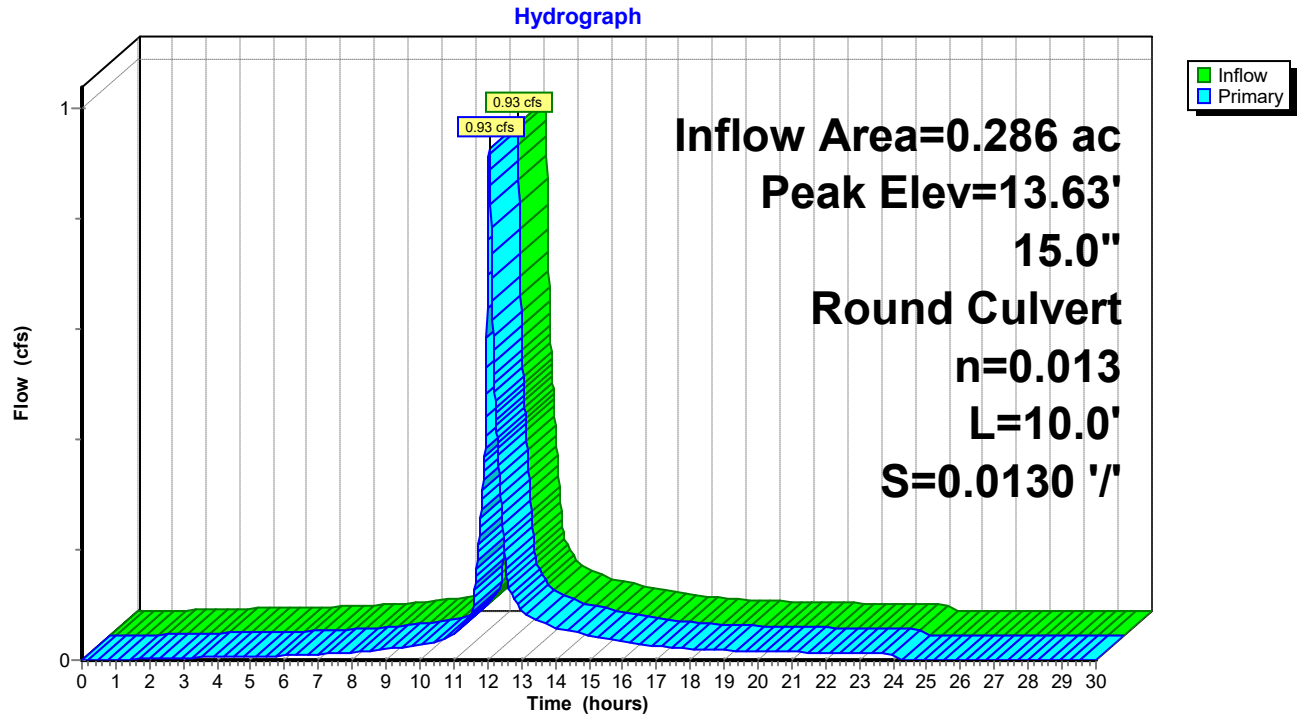
Inflow Area = 0.286 ac, 57.99% Impervious, Inflow Depth = 3.10" for 10-Year event
Inflow = 0.93 cfs @ 12.05 hrs, Volume= 0.074 af
Outflow = 0.93 cfs @ 12.05 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
Primary = 0.93 cfs @ 12.05 hrs, Volume= 0.074 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.63' @ 12.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.15'	**15.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.15' / 13.02' S= 0.0130 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf

Primary OutFlow Max=0.92 cfs @ 12.05 hrs HW=13.63' TW=13.10' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.92 cfs @ 3.17 fps)

Pond 22P: CB "H"

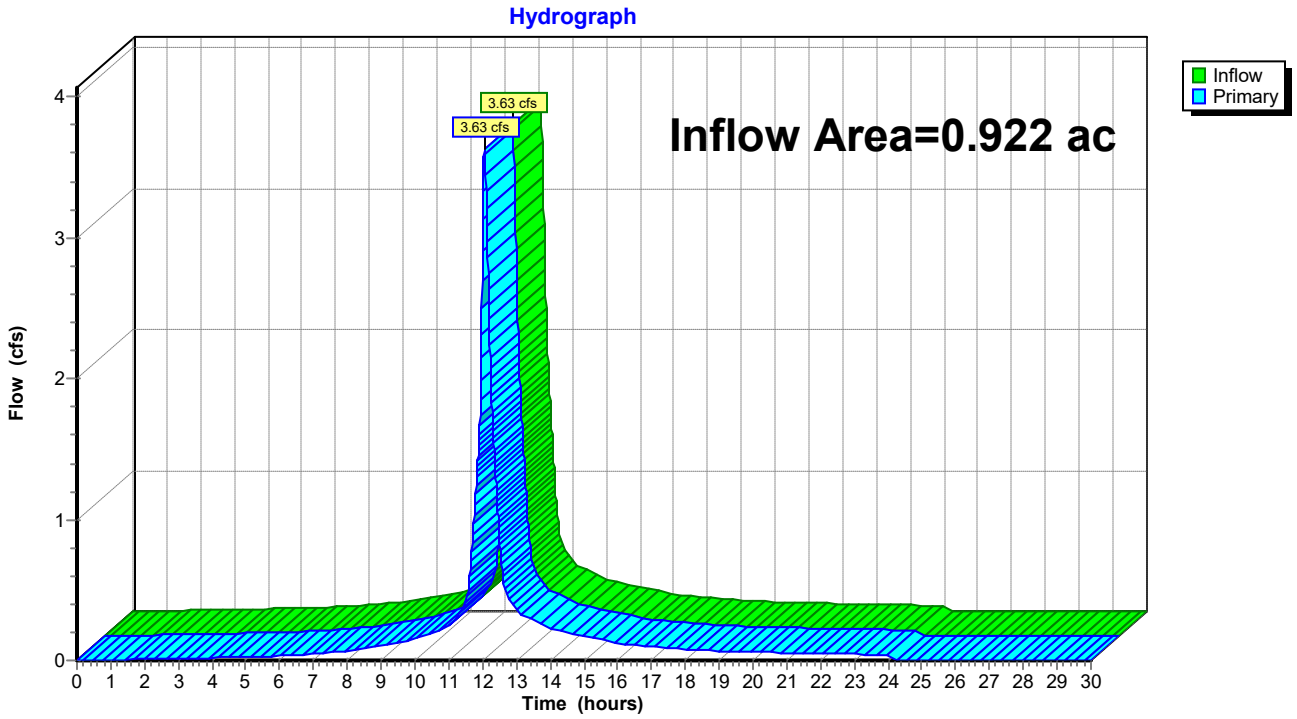


Summary for Link 12L: BACK RIVER

Inflow Area = 0.922 ac, 64.78% Impervious, Inflow Depth = 4.10" for 10-Year event
Inflow = 3.63 cfs @ 12.06 hrs, Volume= 0.315 af
Primary = 3.63 cfs @ 12.06 hrs, Volume= 0.315 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 12L: BACK RIVER



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 7S: North Area Runoff Area=17,623 sf 49.41% Impervious Runoff Depth=7.30"
Flow Length=264' Tc=8.3 min CN=90 Runoff=2.98 cfs 0.246 af

Subcatchment 8S: Southeast Area Runoff Area=6,204 sf 100.00% Impervious Runoff Depth=8.26"
Flow Length=231' Tc=2.3 min CN=98 Runoff=1.36 cfs 0.098 af

Subcatchment 9S: Southwest Area Runoff Area=7,826 sf 33.07% Impervious Runoff Depth=4.30"
Flow Length=193' Tc=6.7 min CN=65 Runoff=0.88 cfs 0.064 af

Subcatchment 13S: South Roof Drain Runoff Area=4,641 sf 100.00% Impervious Runoff Depth=8.26"
Flow Length=36' Slope=0.2500 '/' Tc=2.2 min CN=98 Runoff=1.02 cfs 0.073 af

Subcatchment 15S: North Roof Drain Runoff Area=3,886 sf 100.00% Impervious Runoff Depth=8.26"
Flow Length=220' Tc=0.7 min CN=98 Runoff=0.90 cfs 0.061 af

Reach 26R: Proposed Roof Drain - Avg. Flow Depth=0.41' Max Vel=5.83 fps Inflow=1.02 cfs 0.073 af
6.0" Round Pipe n=0.010 L=206.0' S=0.0189 '/' Capacity=1.00 cfs Outflow=1.00 cfs 0.073 af

Reach 27R: Proposed Roof Drain - North Avg. Flow Depth=0.25' Max Vel=5.87 fps Inflow=0.90 cfs 0.061 af
12.0" Round Pipe n=0.010 L=190.0' S=0.0205 '/' Capacity=6.64 cfs Outflow=0.88 cfs 0.061 af

Pond 10P: DMH "D" Peak Elev=13.47' Inflow=6.19 cfs 0.543 af
18.0" Round Culvert n=0.013 L=136.0' S=0.0093 '/' Outflow=6.19 cfs 0.543 af

Pond 11P: CB "G" Peak Elev=13.75' Inflow=1.36 cfs 0.098 af
15.0" Round Culvert n=0.012 L=12.0' S=0.0258 '/' Outflow=1.36 cfs 0.098 af

Pond 21P: CB "I" Peak Elev=14.07' Inflow=3.42 cfs 0.307 af
15.0" Round Culvert n=0.012 L=12.0' S=0.0008 '/' Outflow=3.42 cfs 0.307 af

Pond 22P: CB "H" Peak Elev=13.84' Inflow=1.74 cfs 0.138 af
15.0" Round Culvert n=0.013 L=10.0' S=0.0130 '/' Outflow=1.74 cfs 0.138 af

Link 12L: BACK RIVER Inflow=6.19 cfs 0.543 af
Primary=6.19 cfs 0.543 af

Total Runoff Area = 0.922 ac Runoff Volume = 0.543 af Average Runoff Depth = 7.07"
35.22% Pervious = 0.325 ac 64.78% Impervious = 0.597 ac

Summary for Subcatchment 7S: North Area

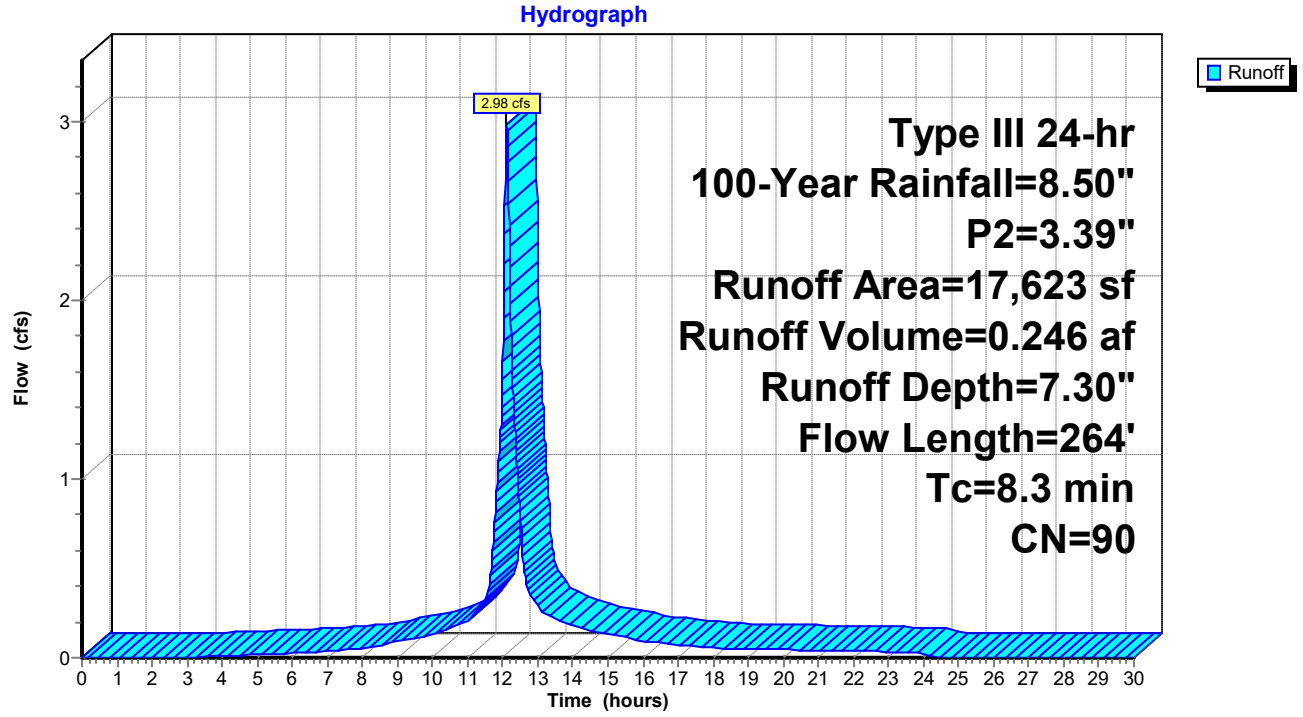
Runoff = 2.98 cfs @ 12.11 hrs, Volume= 0.246 af, Depth= 7.30"
Routed to Pond 21P : CB "I"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50", P2=3.39"

	Area (sf)	CN	Description
	8,708	98	Paved roads w/curbs & sewers, HSG D
	7,530	80	>75% Grass cover, Good, HSG D
*	1,385	96	Brick Pavers, HSG D
	17,623	90	Weighted Average
	8,915		50.59% Pervious Area
	8,708		49.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	112	0.0580	0.27		**Sheet Flow, over lawn** Grass: Short n= 0.150 P2= 3.39"
0.7	37	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.8	115	0.0240	2.49		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	264	Total			

Subcatchment 7S: North Area



Summary for Subcatchment 8S: Southeast Area

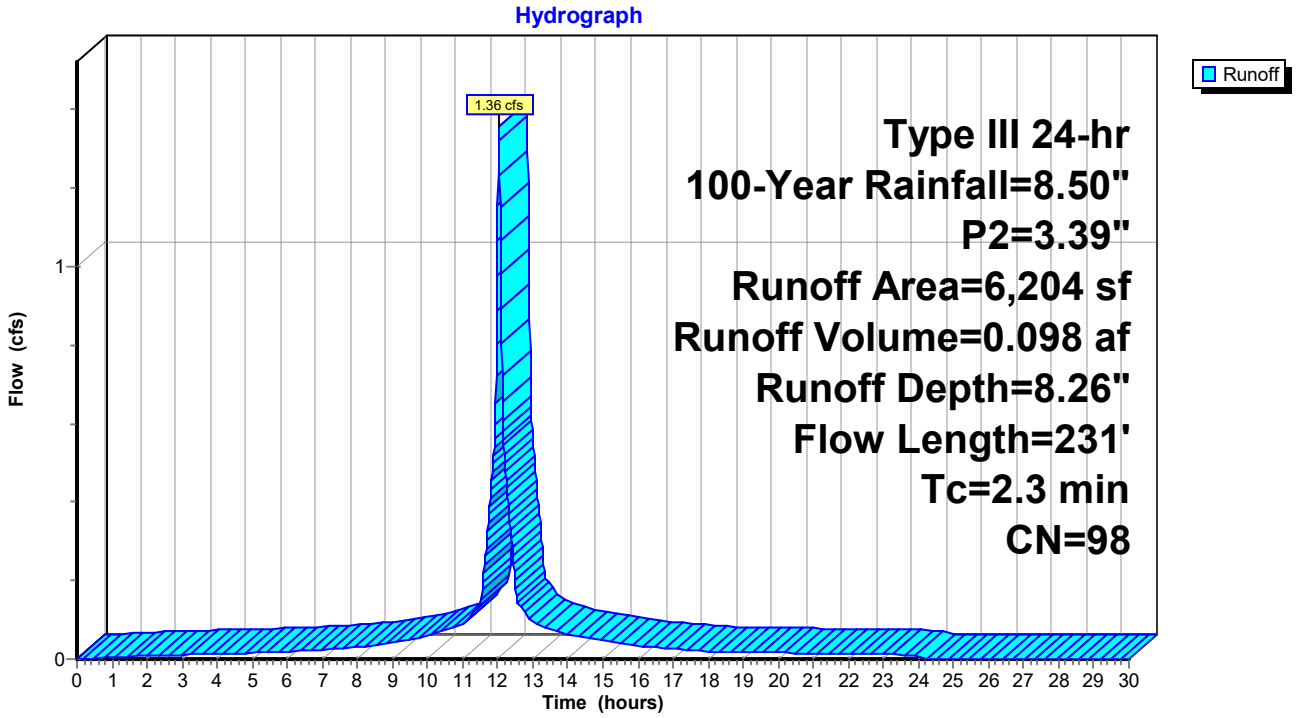
Runoff = 1.36 cfs @ 12.03 hrs, Volume= 0.098 af, Depth= 8.26"
Routed to Pond 11P : CB "G"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50", P2=3.39"

Area (sf)	CN	Description
6,204	98	Paved roads w/curbs & sewers, HSG A
6,204		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.26		**Sheet Flow, Sheet flow over paved parking area (100')** Smooth surfaces n= 0.011 P2= 3.39"
1.0	131	0.0120	2.22		**Shallow Concentrated Flow, Shallow conc flow over paved R St** Paved Kv= 20.3 fps
2.3	231	Total			

Subcatchment 8S: Southeast Area



Summary for Subcatchment 9S: Southwest Area

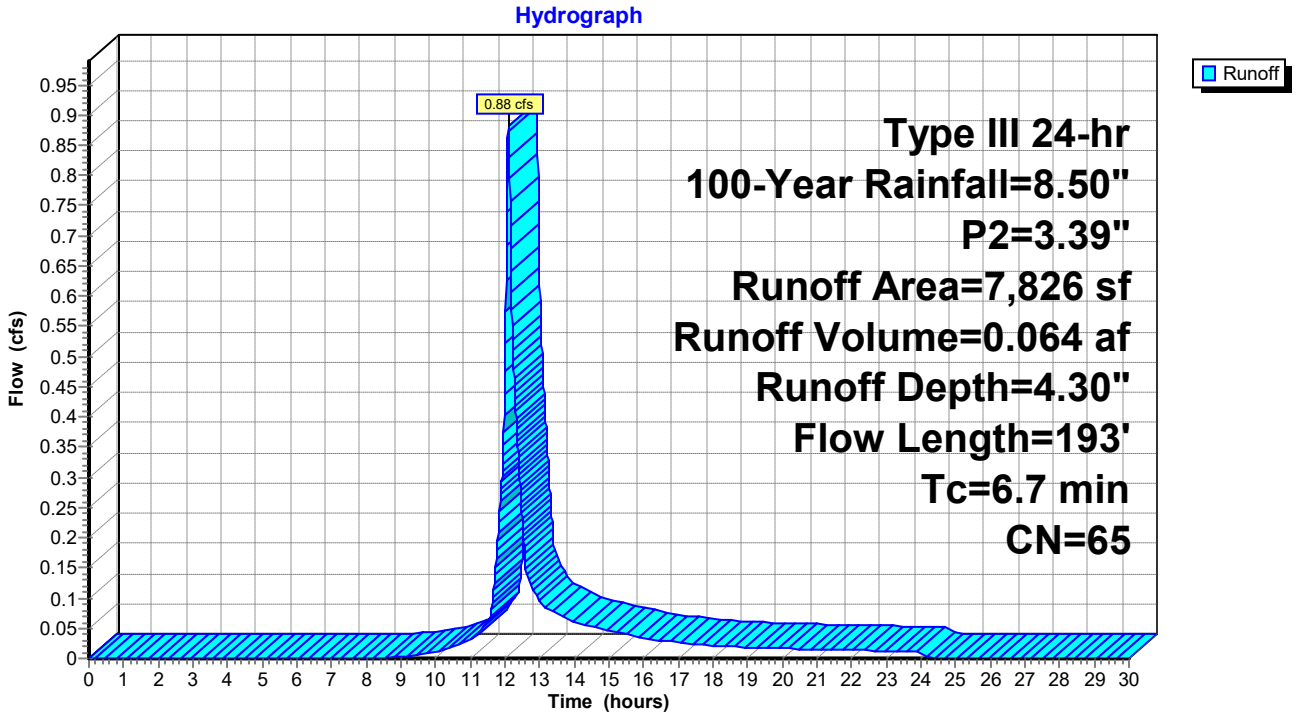
Runoff = 0.88 cfs @ 12.10 hrs, Volume= 0.064 af, Depth= 4.30"
Routed to Pond 22P : CB "H"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50", P2=3.39"

Area (sf)	CN	Description
3,945	39	>75% Grass cover, Good, HSG A
2,588	98	Paved roads w/curbs & sewers, HSG A
1,293	76	Brick Pavers, HSG A
7,826	65	Weighted Average
5,238		66.93% Pervious Area
2,588		33.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	26	0.0190	0.09		**Sheet Flow, sheet flow over lawn area (90')** Grass: Dense n= 0.240 P2= 3.39"
0.9	94	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	39	0.0130	0.80		**Shallow Concentrated Flow, Shallow conc flow over driveway** Short Grass Pasture Kv= 7.0 fps
0.2	34	0.0250	2.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.7	193	Total			

Subcatchment 9S: Southwest Area



Summary for Subcatchment 13S: South Roof Drain System

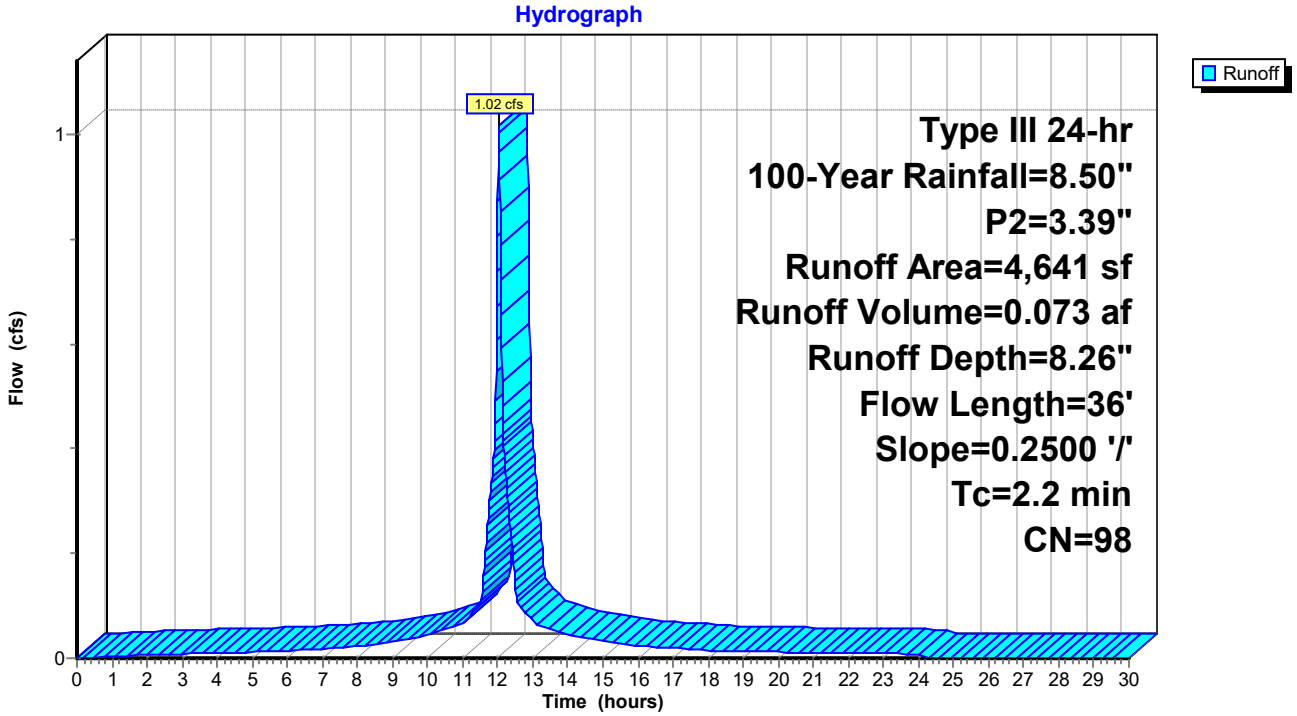
Runoff = 1.02 cfs @ 12.03 hrs, Volume= 0.073 af, Depth= 8.26"
Routed to Reach 26R : Proposed Roof Drain - South

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50", P2=3.39"

Area (sf)	CN	Description
4,641	98	Roofs, HSG A
4,641		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	36	0.2500	0.27		**Sheet Flow, across roof** Grass: Dense n= 0.240 P2= 3.39"

Subcatchment 13S: South Roof Drain System



Summary for Subcatchment 15S: North Roof Drain System

[49] Hint: Tc<2dt may require smaller dt

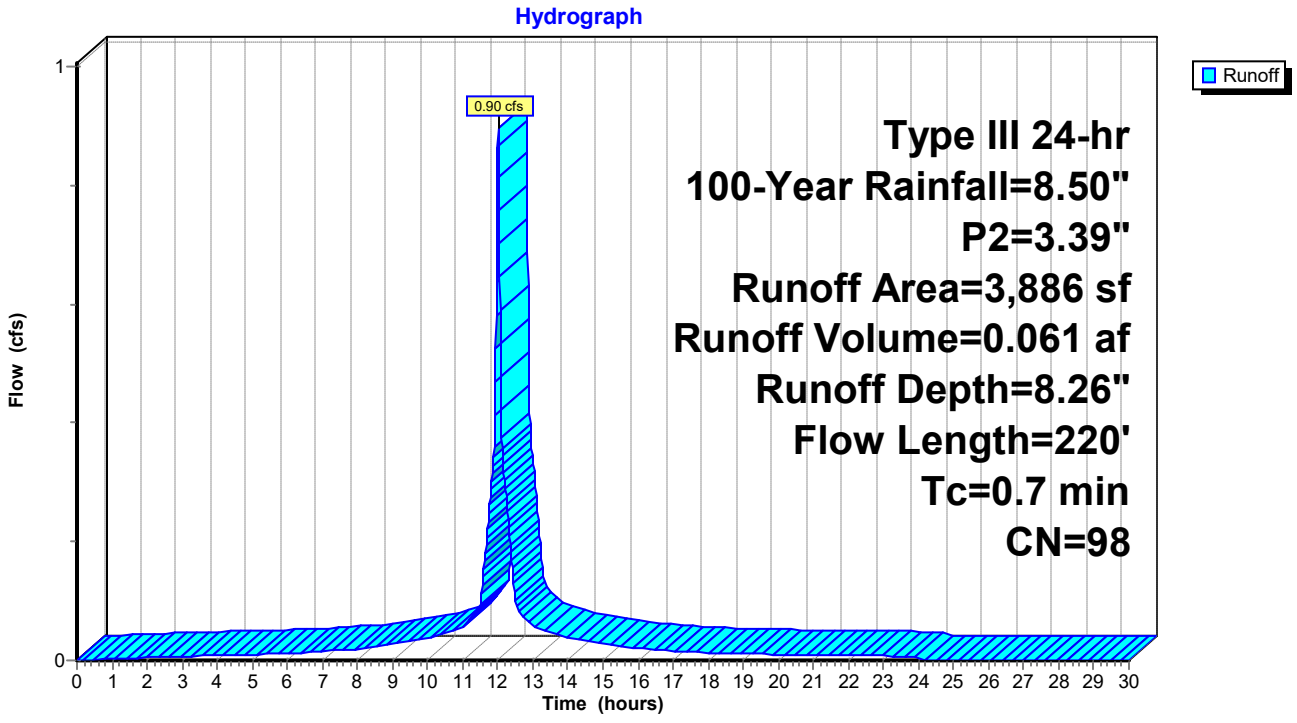
Runoff = 0.90 cfs @ 12.01 hrs, Volume= 0.061 af, Depth= 8.26"
Routed to Reach 27R : Proposed Roof Drain - North

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50", P2=3.39"

Area (sf)	CN	Description
3,886	98	Roofs, HSG A
3,886		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	30	0.2500	3.06		**Sheet Flow, over roof** Smooth surfaces n= 0.011 P2= 3.39"
0.5	190	0.0205	7.04	5.53	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Corrugated PP, smooth interior
0.7	220	Total			

Subcatchment 15S: North Roof Drain System



Summary for Reach 26R: Proposed Roof Drain - South

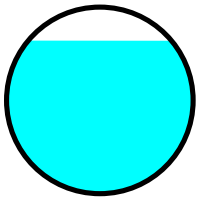
[52] Hint: Inlet/Outlet conditions not evaluated
[55] Hint: Peak inflow is 102% of Manning's capacity

Inflow Area = 0.107 ac,100.00% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 1.02 cfs @ 12.03 hrs, Volume= 0.073 af
Outflow = 1.00 cfs @ 12.04 hrs, Volume= 0.073 af, Atten= 1%, Lag= 0.6 min
Routed to Pond 22P : CB "H"

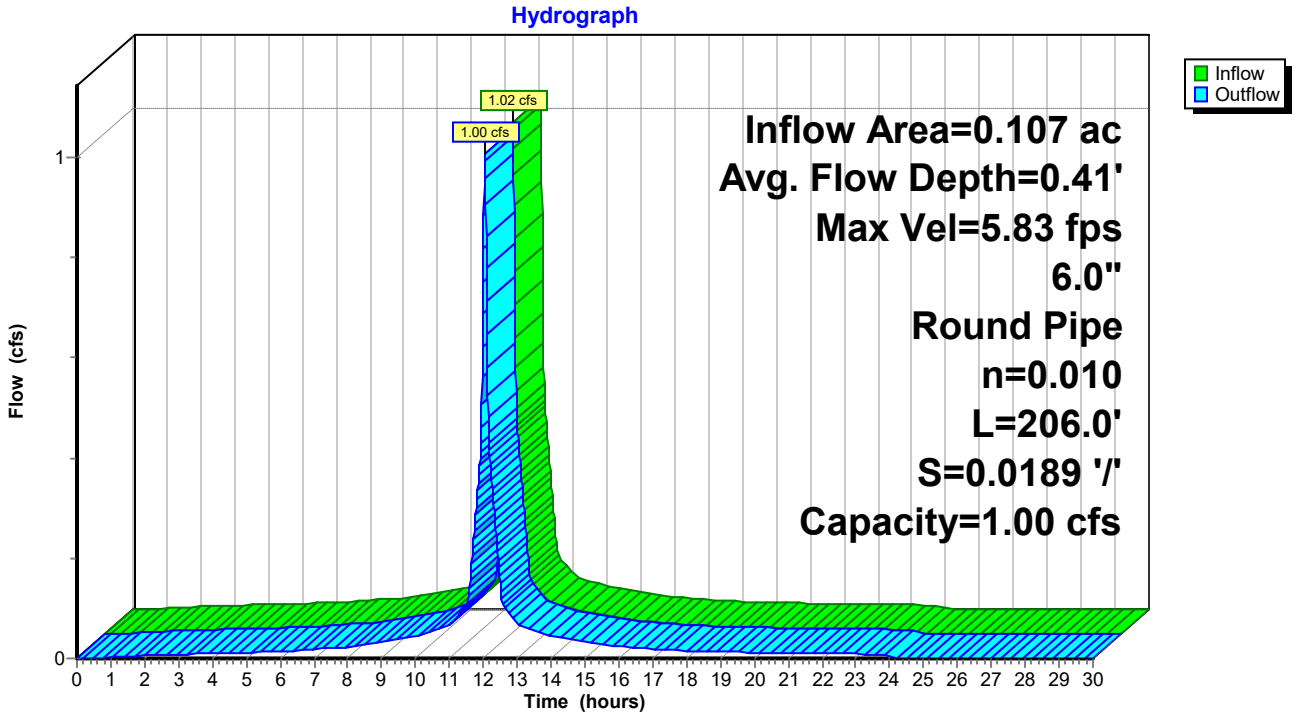
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.83 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.06 fps, Avg. Travel Time= 1.7 min

Peak Storage= 36 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.41' , Surface Width= 0.38'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 1.00 cfs

6.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 206.0' Slope= 0.0189 '/'
Inlet Invert= 19.90', Outlet Invert= 16.00'



Reach 26R: Proposed Roof Drain - South



Summary for Reach 27R: Proposed Roof Drain - North

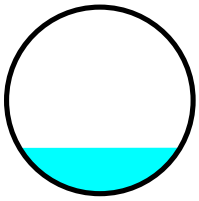
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.089 ac,100.00% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 0.90 cfs @ 12.01 hrs, Volume= 0.061 af
Outflow = 0.88 cfs @ 12.02 hrs, Volume= 0.061 af, Atten= 2%, Lag= 0.4 min
Routed to Pond 21P : CB "I"

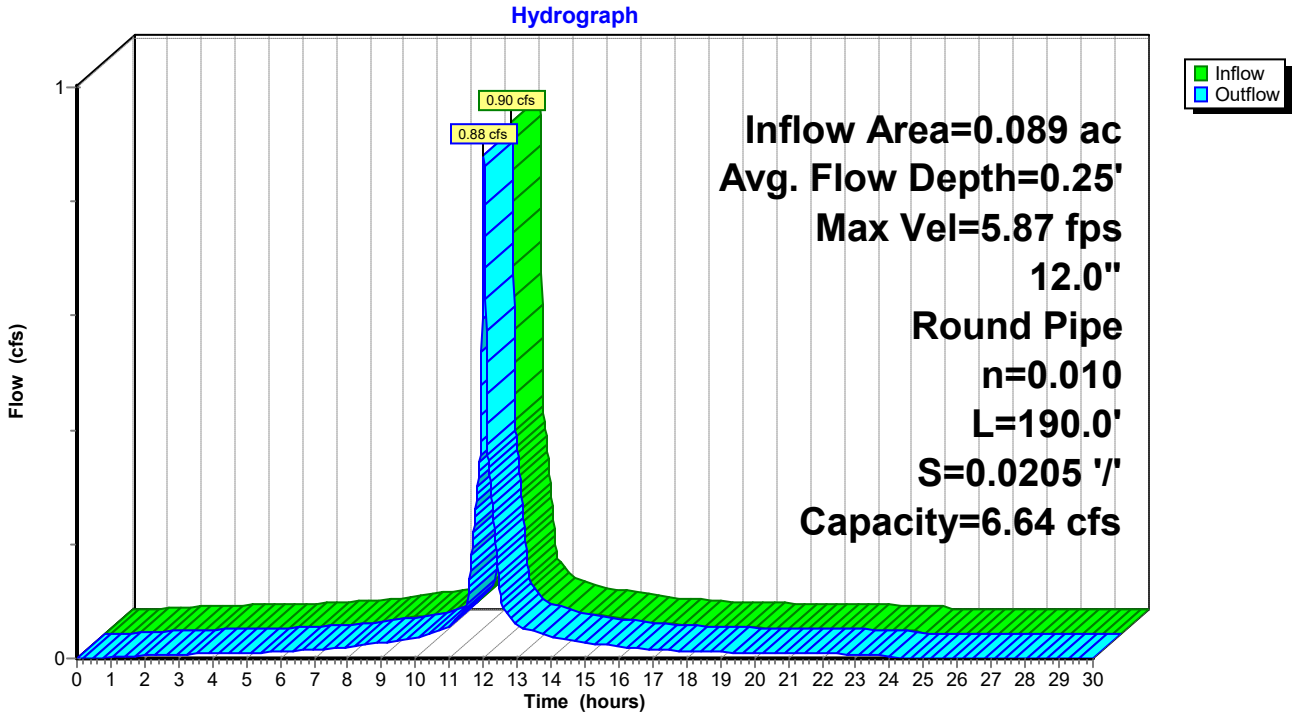
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.87 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.84 fps, Avg. Travel Time= 1.7 min

Peak Storage= 29 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.25' , Surface Width= 0.86'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.64 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 190.0' Slope= 0.0205 '/'
Inlet Invert= 18.00', Outlet Invert= 14.10'



Reach 27R: Proposed Roof Drain - North



Summary for Pond 10P: DMH "D"

[57] Hint: Peaked at 13.47' (Flood elevation advised)

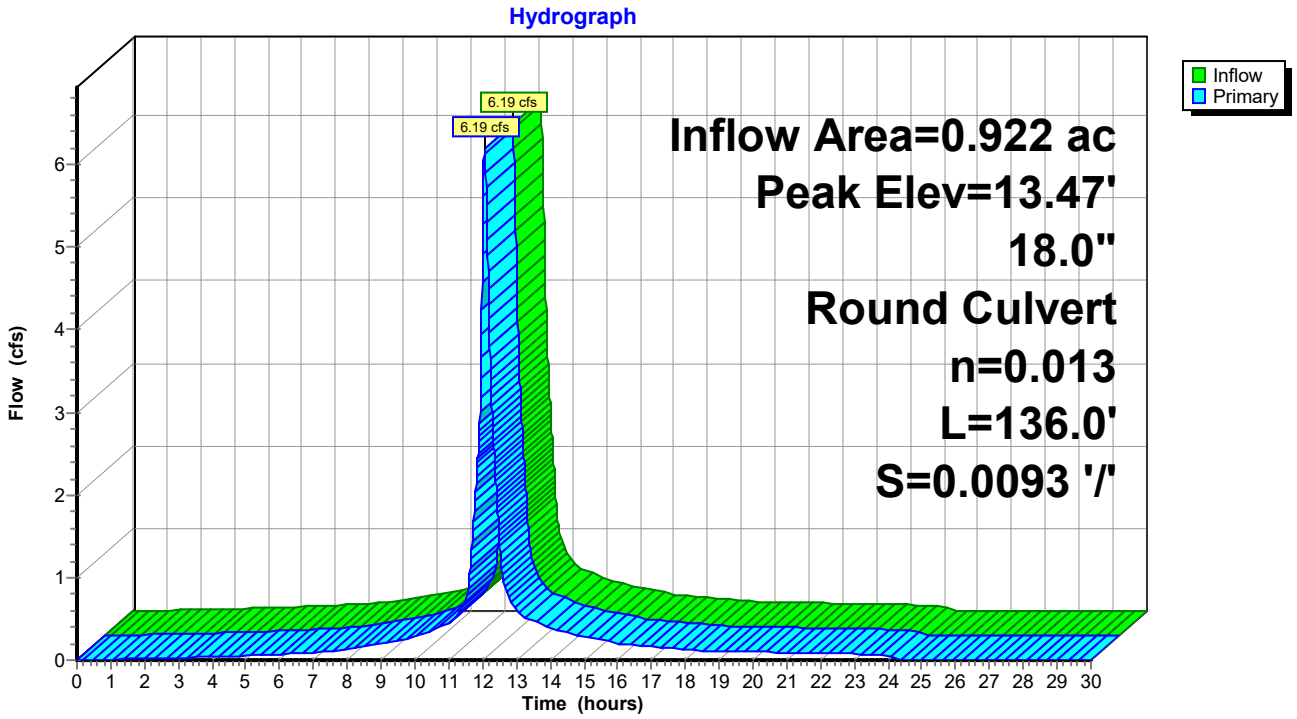
Inflow Area = 0.922 ac, 64.78% Impervious, Inflow Depth = 7.07" for 100-Year event
Inflow = 6.19 cfs @ 12.07 hrs, Volume= 0.543 af
Outflow = 6.19 cfs @ 12.07 hrs, Volume= 0.543 af, Atten= 0%, Lag= 0.0 min
Primary = 6.19 cfs @ 12.07 hrs, Volume= 0.543 af
Routed to Link 12L : BACK RIVER

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.47' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.19'	**18.0" Round To Back River** L= 136.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 12.19' / 10.92' S= 0.0093 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf

Primary OutFlow Max=6.19 cfs @ 12.07 hrs HW=13.47' TW=0.00' (Dynamic Tailwater)
↑—**1=To Back River** (Inlet Controls 6.19 cfs @ 3.85 fps)

Pond 10P: DMH "D"



Summary for Pond 11P: CB "G"

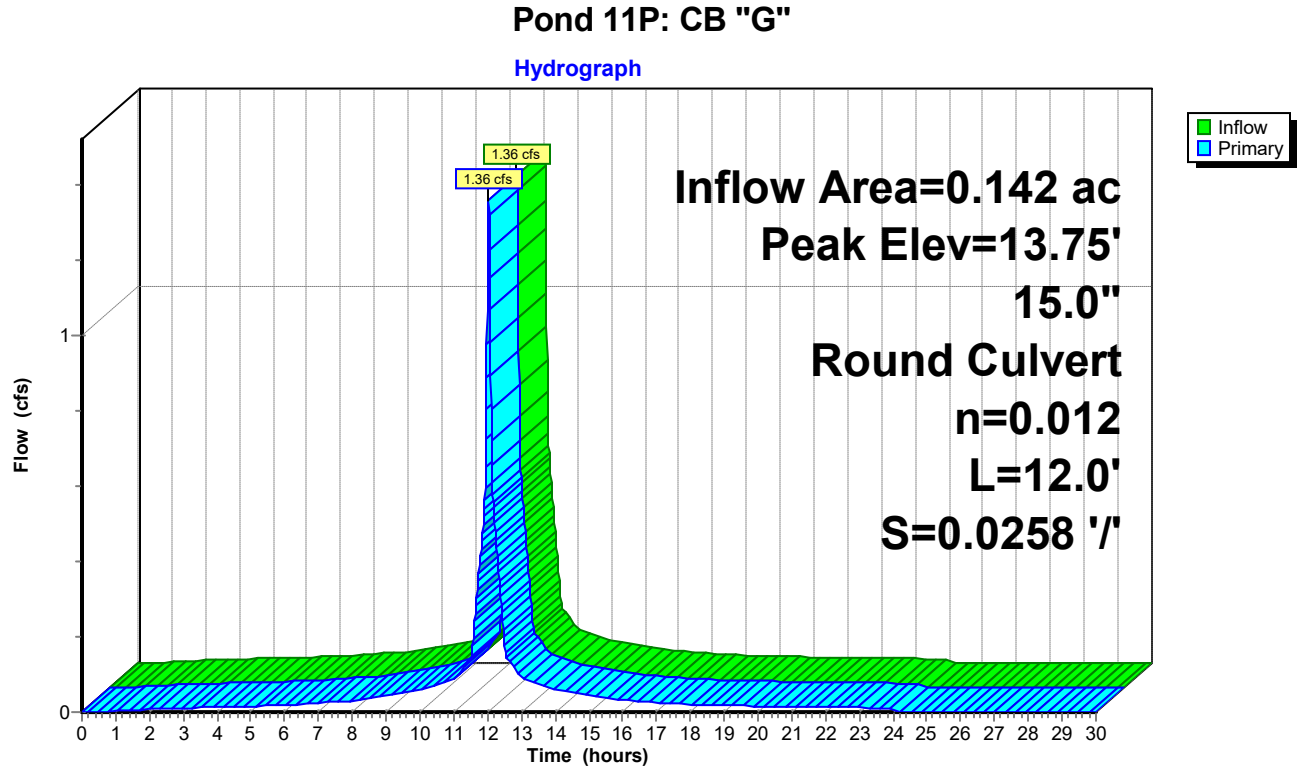
[57] Hint: Peaked at 13.75' (Flood elevation advised)

Inflow Area = 0.142 ac,100.00% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 1.36 cfs @ 12.03 hrs, Volume= 0.098 af
Outflow = 1.36 cfs @ 12.03 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min
Primary = 1.36 cfs @ 12.03 hrs, Volume= 0.098 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.75' @ 12.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.18'	**15.0" Round Culvert** L= 12.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.18' / 12.87' S= 0.0258 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=1.29 cfs @ 12.03 hrs HW=13.74' TW=13.43' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.29 cfs @ 3.58 fps)



Summary for Pond 21P: CB "I"

[57] Hint: Peaked at 14.07' (Flood elevation advised)

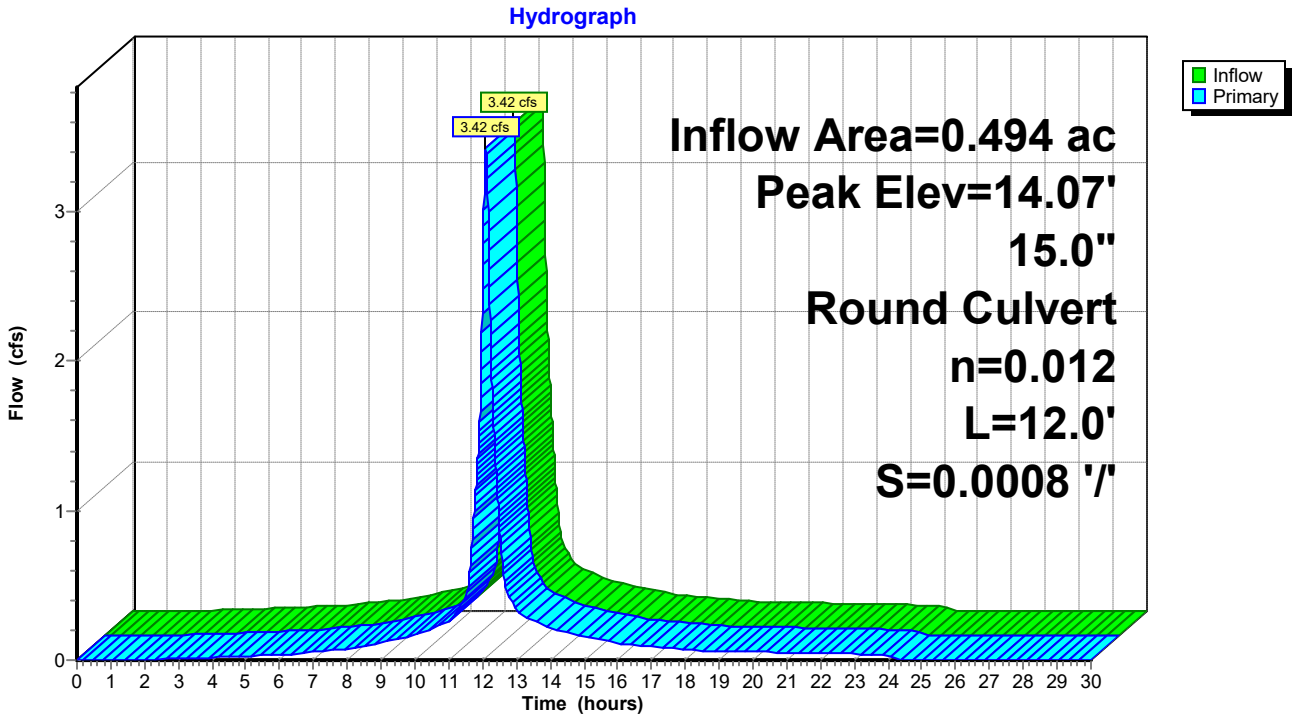
Inflow Area = 0.494 ac, 58.55% Impervious, Inflow Depth = 7.47" for 100-Year event
Inflow = 3.42 cfs @ 12.10 hrs, Volume= 0.307 af
Outflow = 3.42 cfs @ 12.10 hrs, Volume= 0.307 af, Atten= 0%, Lag= 0.0 min
Primary = 3.42 cfs @ 12.10 hrs, Volume= 0.307 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 14.07' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	12.83'	**15.0" Round Culvert** L= 12.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 12.83' / 12.82' S= 0.0008 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

Primary OutFlow Max=3.41 cfs @ 12.10 hrs HW=14.07' TW=13.43' (Dynamic Tailwater)
1=Culvert (Barrel Controls 3.41 cfs @ 3.49 fps)

Pond 21P: CB "I"



Summary for Pond 22P: CB "H"

[57] Hint: Peaked at 13.84' (Flood elevation advised)

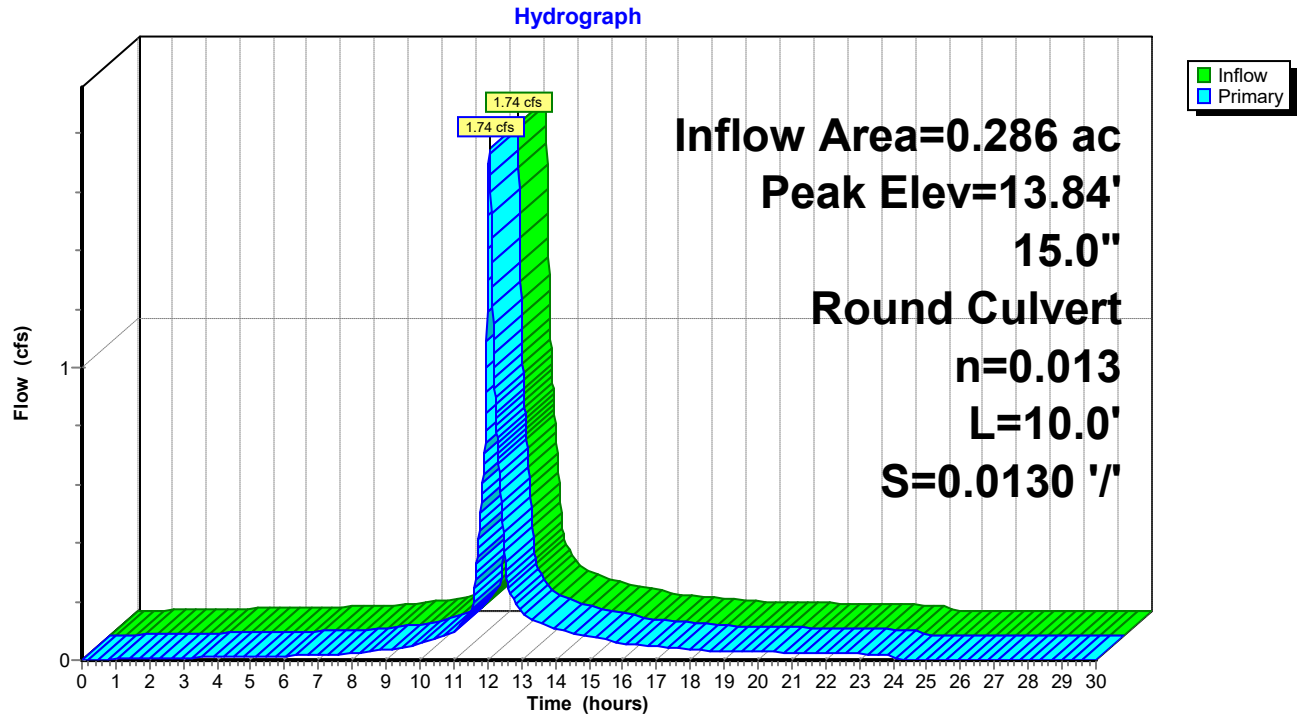
Inflow Area = 0.286 ac, 57.99% Impervious, Inflow Depth = 5.78" for 100-Year event
Inflow = 1.74 cfs @ 12.06 hrs, Volume= 0.138 af
Outflow = 1.74 cfs @ 12.06 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min
Primary = 1.74 cfs @ 12.06 hrs, Volume= 0.138 af
Routed to Pond 10P : DMH "D"

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.84' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	13.15'	**15.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 13.15' / 13.02' S= 0.0130 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf

Primary OutFlow Max=1.74 cfs @ 12.06 hrs HW=13.84' TW=13.47' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.74 cfs @ 3.63 fps)

Pond 22P: CB "H"

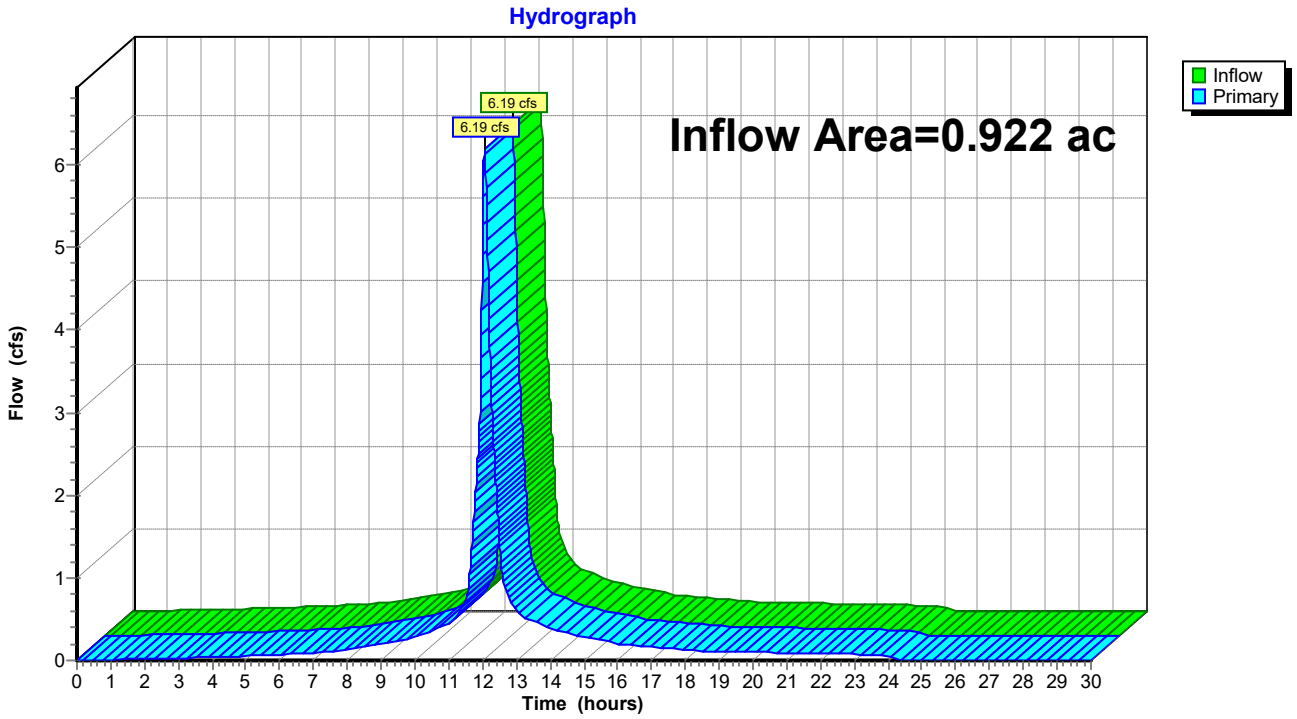


Summary for Link 12L: BACK RIVER

Inflow Area = 0.922 ac, 64.78% Impervious, Inflow Depth = 7.07" for 100-Year event
Inflow = 6.19 cfs @ 12.07 hrs, Volume= 0.543 af
Primary = 6.19 cfs @ 12.07 hrs, Volume= 0.543 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 12L: BACK RIVER



APPENDIX E

NRCS SOIL REPORT

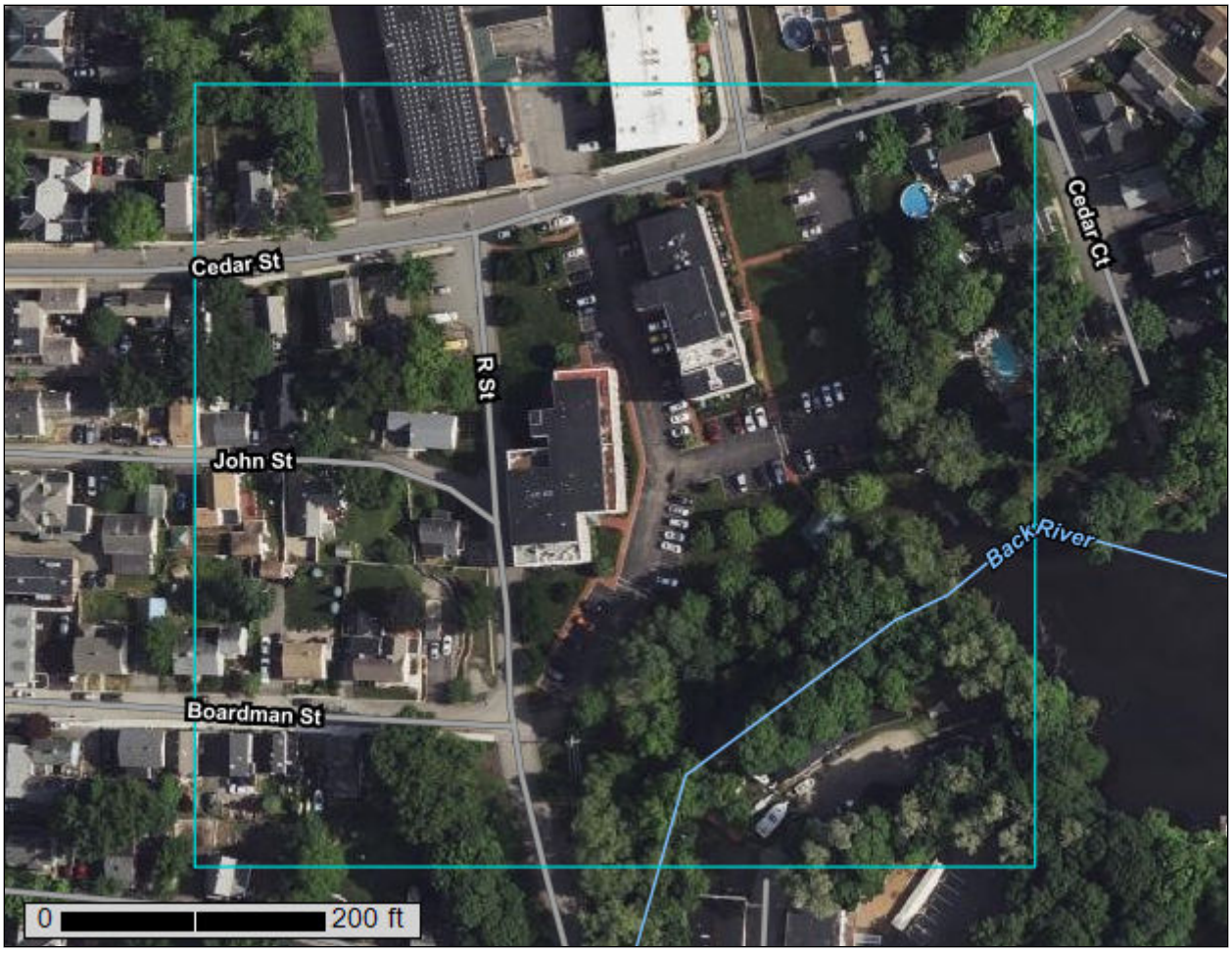
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Essex County, Massachusetts, Northern Part



February 28, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

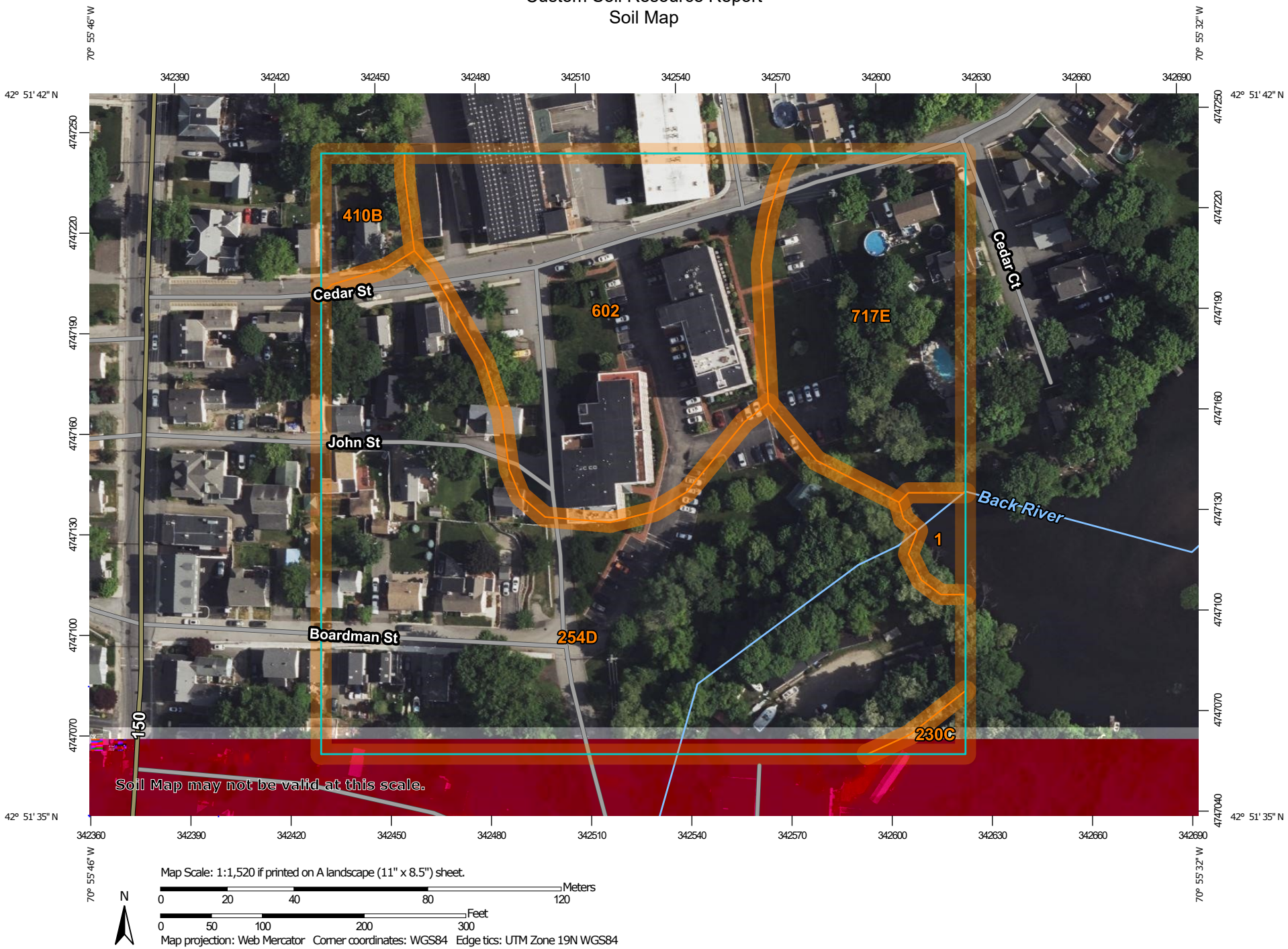
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,520 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 20, Aug 27, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	0.1	1.4%
230C	Unadilla very fine sandy loam, 8 to 15 percent slopes	0.1	0.7%
254D	Merrimac fine sandy loam, 15 to 25 percent slopes	4.5	51.9%
410B	Sutton fine sandy loam, 3 to 8 percent slopes	0.2	2.7%
602	Urban land	2.3	27.0%
717E	Rock outcrop-Charlton-Hollis complex, 15 to 35 percent slopes	1.4	16.3%
Totals for Area of Interest		**8.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Essex County, Massachusetts, Northern Part

1—Water

Map Unit Setting

National map unit symbol: vjx4
Frost-free period: 125 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

230C—Unadilla very fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: vjx1
Elevation: 600 to 1,800 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Unadilla and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Unadilla

Setting

Landform: Lakebeds (relict)
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Soft coarse-silty glaciolacustrine deposits

Typical profile

H1 - 0 to 9 inches: very fine sandy loam
H2 - 9 to 53 inches: very fine sandy loam
H3 - 53 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water supply, 0 to 60 inches: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F144AY024NY - Well Drained Eolian Outwash
Hydric soil rating: No

Minor Components

Belgrade

Percent of map unit: 20 percent
Hydric soil rating: No

254D—Merrimac fine sandy loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2tyrg
Elevation: 0 to 1,890 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Outwash terraces, dunes, outwash plains, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Agawam

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Side slope, crest, riser, tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

410B—Sutton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w69j
Elevation: 0 to 1,410 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sutton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sutton

Setting

Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 5 inches: fine sandy loam
Bw1 - 5 to 17 inches: fine sandy loam
Bw2 - 17 to 25 inches: sandy loam
C1 - 25 to 39 inches: gravelly sandy loam
C2 - 39 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 12 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D

Ecological site: F144AY008CT - Moist Till Uplands
Hydric soil rating: No

Minor Components

Charlton
Percent of map unit: 9 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge
Percent of map unit: 5 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Leicester
Percent of map unit: 5 percent
Landform: Ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman
Percent of map unit: 1 percent
Landform: Drumlins, ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

602—Urban land

Map Unit Setting
National map unit symbol: vjx3
Frost-free period: 125 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 80 percent
Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Excavated and filled land

Minor Components

Udorthents

Percent of map unit: 10 percent
Hydric soil rating: No

Merrimac

Percent of map unit: 2 percent
Hydric soil rating: No

Hinckley

Percent of map unit: 2 percent
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Hydric soil rating: No

Charlton

Percent of map unit: 2 percent
Hydric soil rating: No

Paxton

Percent of map unit: 2 percent
Hydric soil rating: No

717E—Rock outcrop-Charlton-Hollis complex, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: vjrb
Elevation: 0 to 260 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 125 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Rock outcrop: 40 percent
Charlton and similar soils: 30 percent
Hollis and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting

Parent material: Granite and gneiss

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Description of Charlton

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable coarse-loamy eolian deposits over friable coarse-loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 4 inches: fine sandy loam
H2 - 4 to 28 inches: gravelly fine sandy loam
H3 - 28 to 60 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Hollis

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex

Parent material: Shallow, friable loamy eolian deposits over granite and gneiss

Typical profile

O - 0 to 1 inches: muck
H2 - 1 to 6 inches: fine sandy loam
H3 - 6 to 17 inches: gravelly fine sandy loam
H4 - 17 to 20 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 10 to 60 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Minor Components

Sutton

Percent of map unit: 5 percent
Hydric soil rating: No

Leicester

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Chatfield

Percent of map unit: 5 percent
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX F

ILLICIT DISCHARGE COMPLIANCE STATEMENT

Appendix F: Illicit Discharge Compliance Statement

It is the intent of the applicant, the Loft's at Clark's Pond Homeowner Association, to control illicit disposal into the stormwater management system. There will be no connection to the stormwater management system containing other liquids, chemicals, or solids.

Anne E Everet-Speck 14 July 2025

Loft's at Clark's Pond Homeowner Association Representative

APPENDIX G

OPERATIONS AND MAINTENANCE INSPECTION LOG

Proactive by Design

STORMWATER MANAGEMENT SYSTEMS: OPERATION AND MAINTENANCE (O&M) PLAN

Loft's at Clark's Pond Homeowner Association
25 Cedar Street
Amesbury, MA 01913

July 11, 2025
GZA File No.: 03.0035466.00

PREPARED FOR:
Loft's at Clark's Pond Homeowner Association
Amesbury, Massachusetts

GZA GeoEnvironmental, Inc.
188 Valley Street Suite 300 | Providence, RI 02909
401-421-4140

ATTACHMENT:

STORMWATER MANAGEMENT SYSTEM INSPECTION SHEET

1.0 INTRODUCTION

Standard 9 of the *Massachusetts Stormwater Handbook and Stormwater Standards* requires that an operations and maintenance plan is developed to ensure that stormwater management systems function properly for the lifetime of the system.

The Site is located at 25 Cedar Street, Amesbury, Massachusetts. The project includes the installation and replacement of drainage pipes along the building and then connected into the existing stormwater management system. The stormwater management system for the project consists of roof drains, catch basins and vortex catch basins. A stormwater management system inspection sheet is attached, and inspection activities are described herein.

The Loft's at Clark's Pond Homeowner Association are the owners of the stormwater management systems and will be responsible for its operation and maintenance.

2.0 ROOF DRAINS

Roof drains and downspouts shall be inspected at least once a year to ensure no clogging of accumulation of debris or sediment has occurred.

3.0 CATCH BASINS AND VORTEX CATCH BASINS

Catch basins and Vortex catch basins shall be inspected per the manufacturer's schedule but at a minimum be once a year. This is to ensure that it is operating as intended and for the accumulation of sediment, trash and debris. The accumulation of sediment, trash and debris will be removed and be lawfully disposed of.

4.0 FUNDING SOURCES

Funding for routine inspections and maintenance of the stormwater management system will be provided by the Loft's at Clark's Pond Homeowner Association.

STORMWATER MANAGEMENT SYSTEM INSPECTION SHEET
Loft's at Clark's Pond Homeowner Association
25 Cedar Street
Amesbury, MA 01913

DATE:
TIME:
INSPECTOR:
REASON FOR INSPECTION: **ANNUAL** **CORRECTIVE**

Maintenance Item	Condition	Corrective action needed
Roof Drains		
Inspect to ensure that roof drains are operating as designed		
Check for accumulated sediment, trash, and debris		

Maintenance Item	Condition	Corrective action needed
Catch Basins and Vortex Catch Basins		
Inspect to ensure that catch basins are operating as designed		
Check for accumulated sediment, trash, and debris		

ADDITIONAL COMMENTS

APPENDIX H

DRAWING SET AND WATERSHED MAPS

LOFT'S AT CLARKS POND

STORMWATER MANAGEMENT & DRAINAGE IMPROVEMENT DESIGN

15 CEDAR ST,
AMESBURY MA 01913

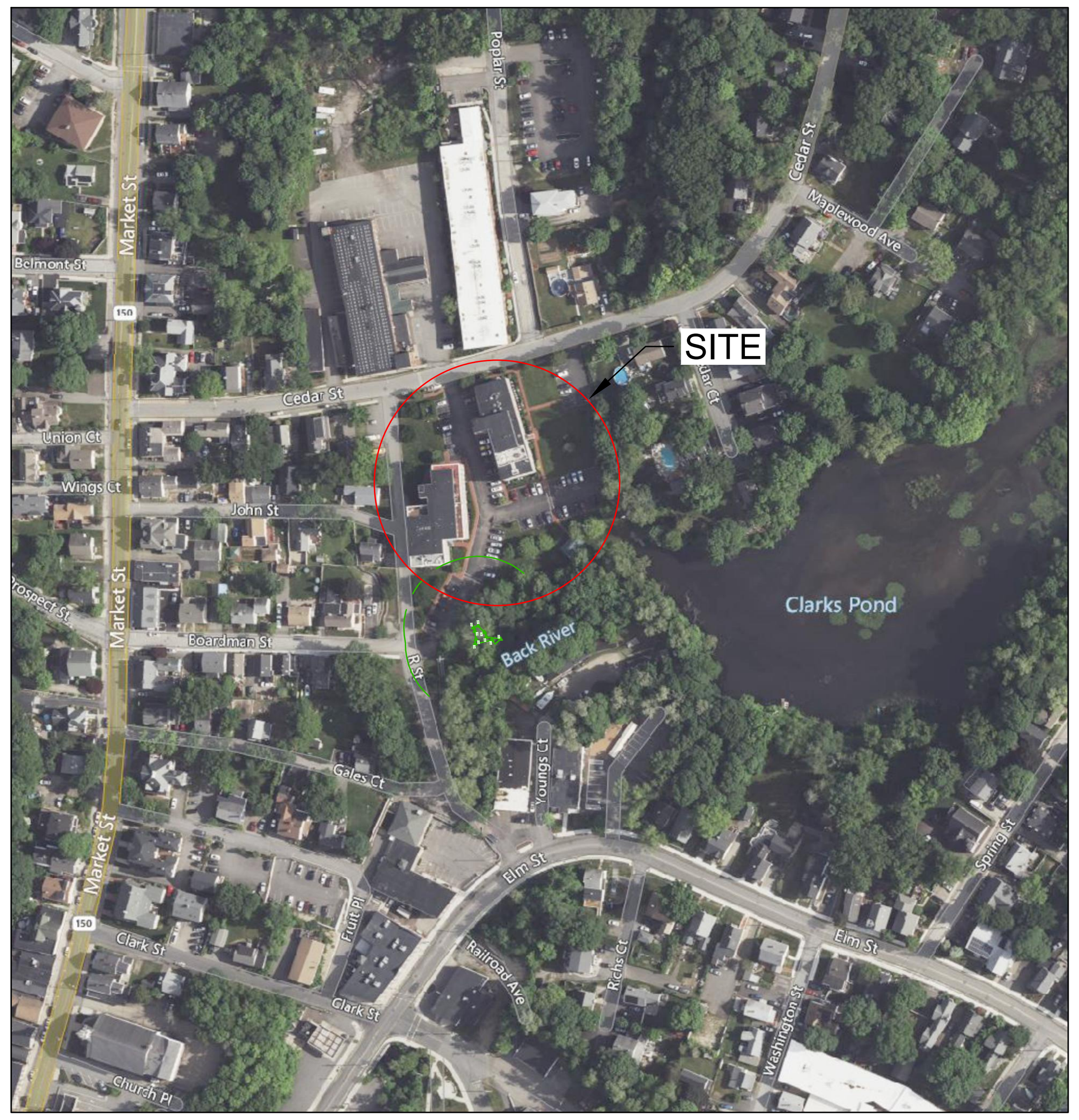
JULY 2025

PREPARED FOR:

LOFT'S AT CLARK'S POND
HOMEOWNER ASSOCIATION
15 CEDAR STREET
AMESBURY, MA 01913

DESIGNED BY:

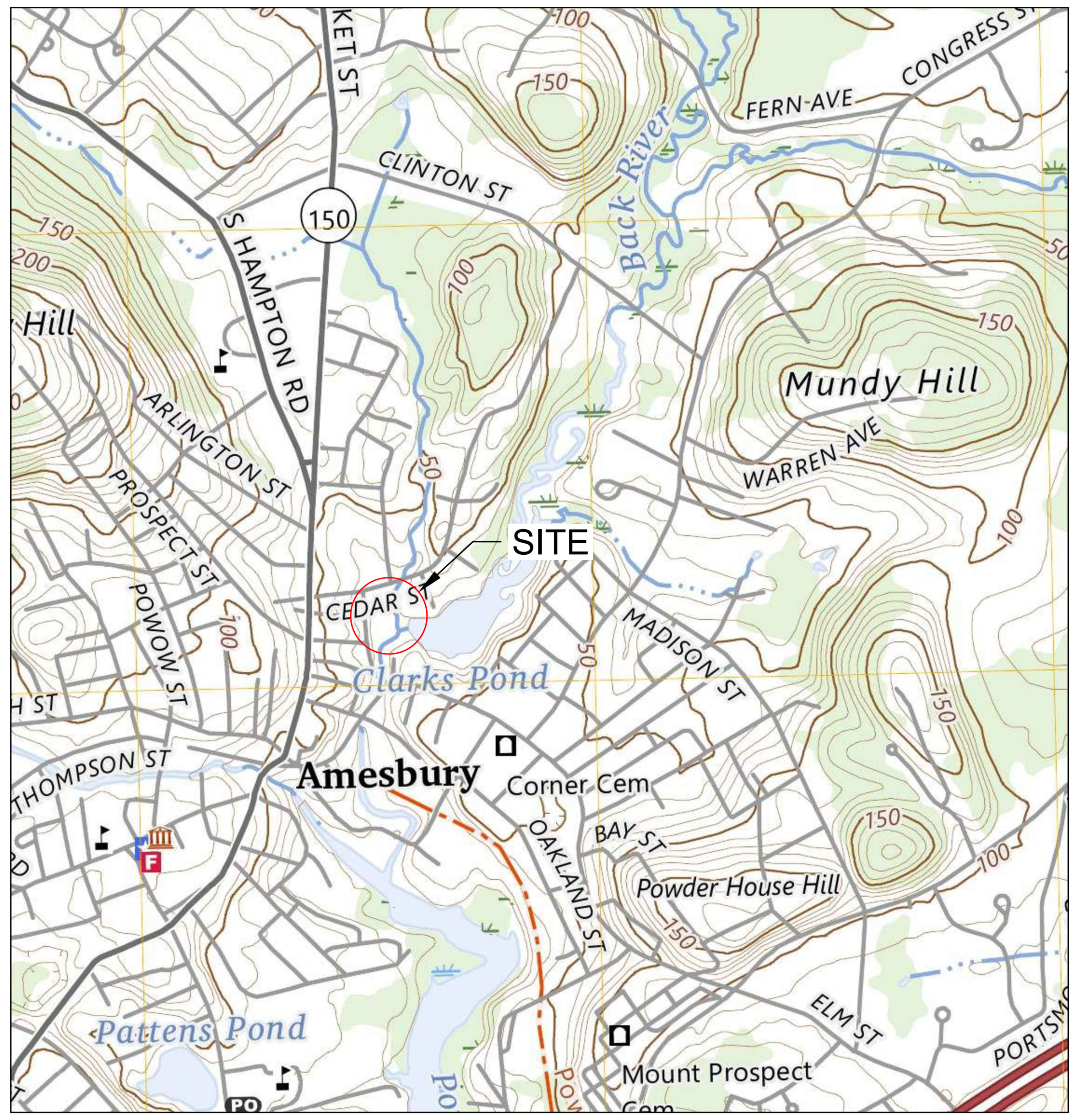
GZA GEOENVIRONMENTAL, INC.
188 VALLEY STREET, SUITE 300
PROVIDENCE, RI 02909



PROJECT VICINITY MAP

0 250 500 1,000
SCALE IN FEET

SOURCE: BASE MAP FROM MASSACHUSETTS MASSMAPPER GIS.



PROJECT LOCUS MAP

0 500 1,000 2,000
SCALE IN FEET

SOURCE: BASE MAP FROM USGS 7.5-MINUTE SERIES NEWBURYPORT WEST QUADRANGLE 2024.
CONTOUR ELEVATIONS REFERENCE NAVD88 SHOWN IN 10 FOOT INTERVALS

SHEET LIST TABLE	
SHEET #	SHEET TITLE
-	COVER AND INDEX OF DRAWINGS
1	EXISTING CONDITIONS PLAN
2	EXISTING WATERSHED PLAN
3	PROPOSED CONDITIONS PLAN
4	PROPOSED WATERSHED PLAN
5	DETAILS

STEVEN T. D'AMBROSIO CIVIL No. 46916 REGISTERED PROFESSIONAL ENGINEER, COMMONWEALTH OF MASSACHUSETTS
07/14/25

NO.	ISSUE/DESCRIPTION	BY	DATE

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

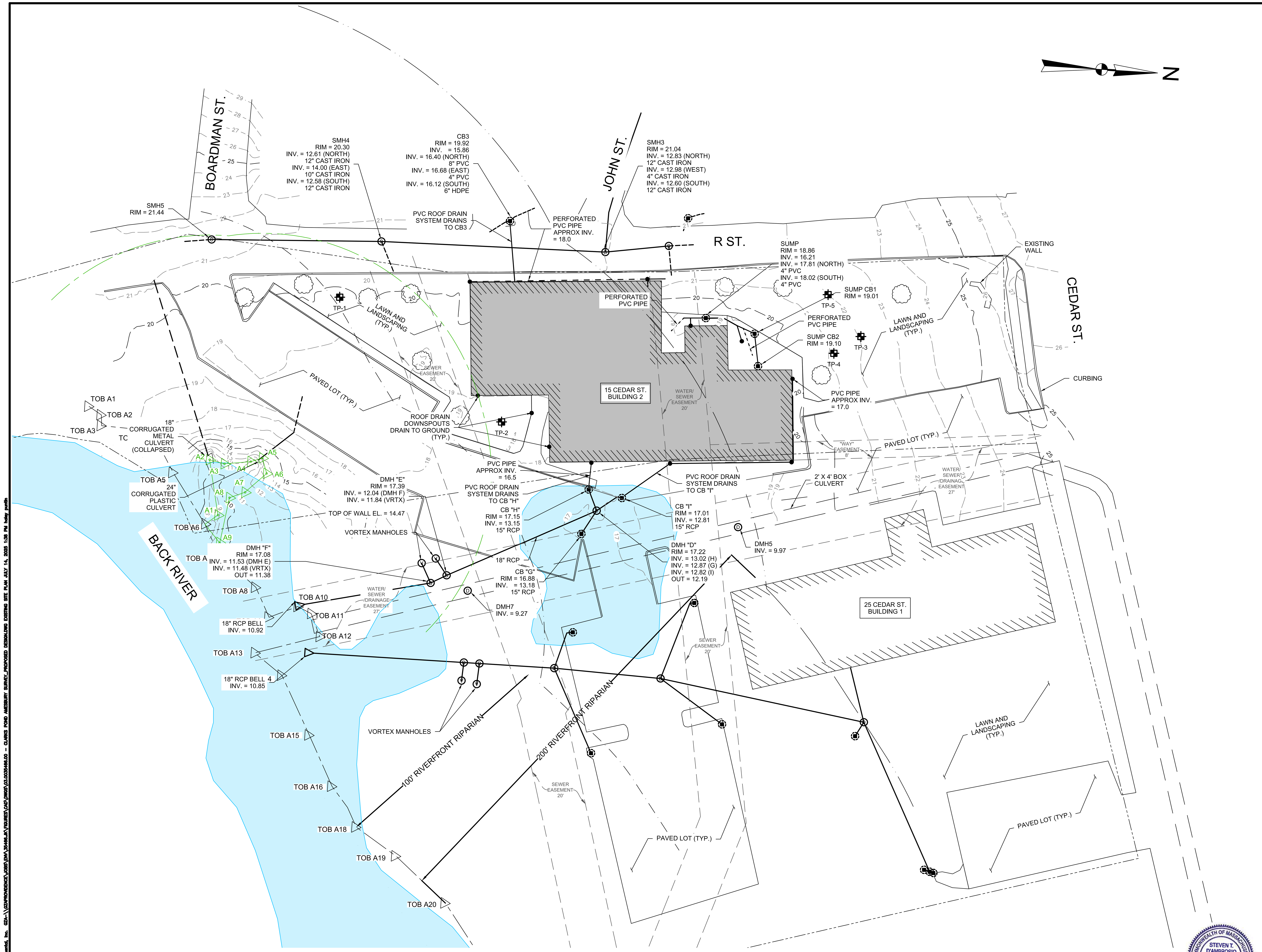
LOFT'S AT CLARKS POND
STORMWATER MANAGEMENT & DRAINAGE IMPROVEMENT DESIGN
15 CEDAR ST, AMESBURY MA 01913

COVER AND INDEX OF DRAWINGS

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
LOFT'S AT CLARK'S POND
HOMEOWNER ASSOCIATION
15 CEDAR STREET
AMESBURY, MA 01913

PROJ MGR: JK	REVIEWED BY: JK	CHECKED BY: ABB	DRAWING
DESIGNED BY: JJZ	DRAWN BY: EJW	SCALE: AS SHOWN	
DATE: July 2025	PROJECT NO. 03.0035466.00	REVISION NO.	- SHEET NO.



EXISTING SITE PLAN

SCALE: 1"=20'

LEGEND

- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- APPROXIMATE PROPERTY LINE
- ROOF DRAIN SYSTEM PIPING
- ROOF DRAIN SYSTEM PERFORATED PIPING
- TOB A1 — TOP OF BANK WITH FLAGS
- 100-FOOT RIVERFRONT AREA
- 200-FOOT RIVERFRONT AREA
- FEMA 100-YEAR FLOOD ZONE (ZONE A) (BORDERING LAND SUBJECT TO FLOODING)
- A1 — WETLAND FLAGS
- 100-FOOT BUFFER ZONE
- EASEMENTS
- EXISTING DRAIN MANHOLE
- EXISTING DRAIN MANHOLE
- EXISTING DRAIN MANHOLE
- EXISTING CATCH BASIN
- ROOF DRAIN DOWNSPOUT
- EXISTING TREE
- TP-1 — TEST PITS

GENERAL NOTES

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE NAD83, US FEET.
2. ELEVATIONS ARE IN FEET AND REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. LIMITED TOPOGRAPHIC SURVEY PERFORMED BY GZA GEOENVIRONMENTAL, INC., ON NOVEMBER 13, 2024 AND REPRESENTS CONDITIONS AT THE TIME OF THE SURVEY.
4. APPROXIMATE PROPERTY LINES AND AERIAL IMAGERY DOWNLOADED FROM MASSGIS'S MASSMAPPER ONLINE INTERACTIVE MAP.
5. STORMWATER SYSTEM INFORMATION PRODUCED FROM DIGITAL DOCUMENT PRODUCED BY MILLENNIUM ENGINEERING, INC. TITLED "AS-BUILT PLAN" DATED AUGUST 2008.
6. DRAWINGS ARE NOT CONSIDERED A LAND SURVEY.
7. TEST PITS WERE PERFORMED BY M.T. MAYO CORPORATION ON JULY 1, 2025 AND OBSERVED BY GZA.
8. TOP OF BANK DELINEATION WAS PERFORMED BY GZA ON JULY 1, 2025.

0 10 20 40
SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

LOFT'S AT CLARKS POND
STORMWATER MANAGEMENT & DRAINAGE IMPROVEMENT DESIGN
15 CEDAR ST, AMESBURY MA 01913

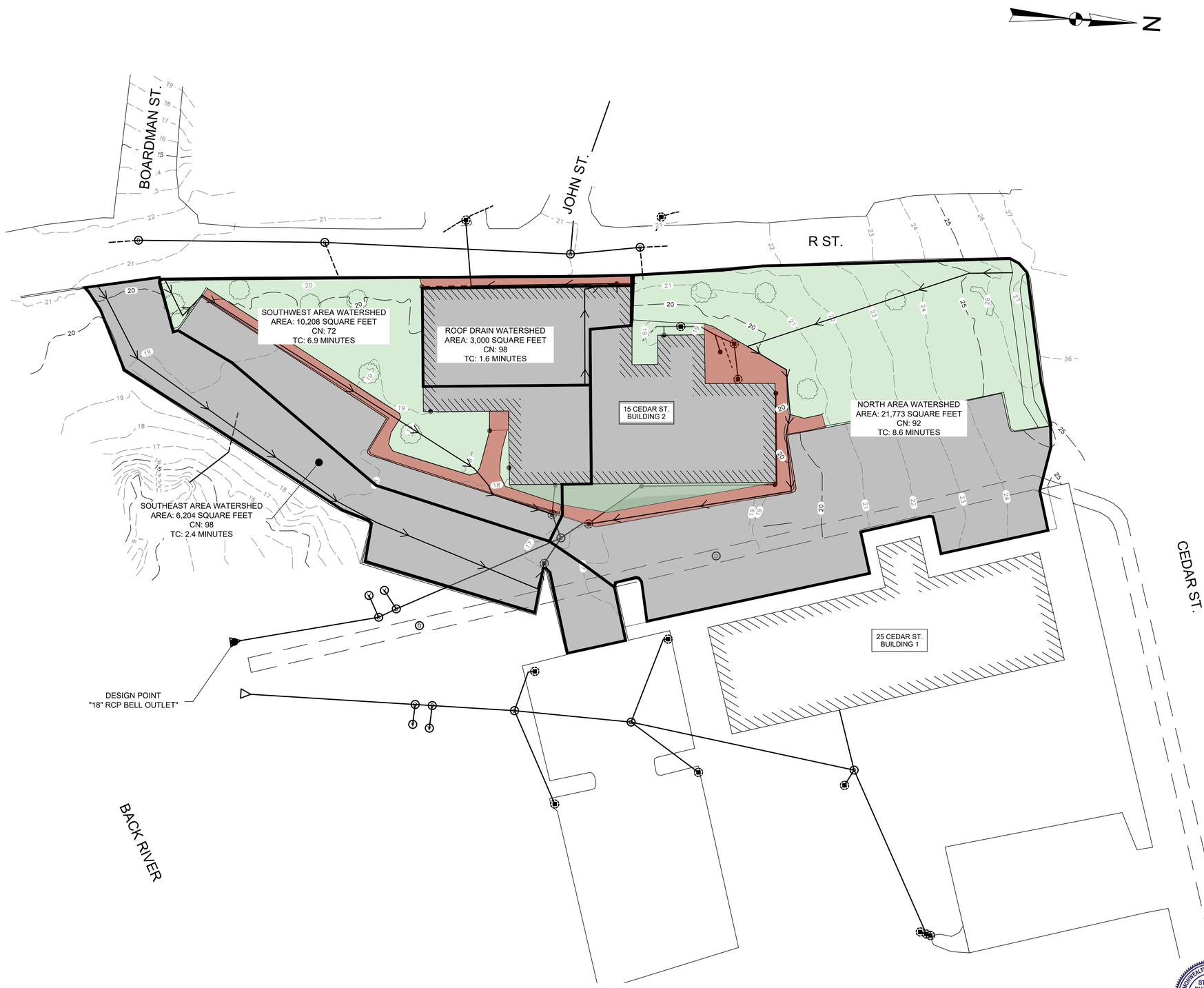
EXISTING SITE PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
LOFT'S AT CLARK'S POND HOMEOWNER ASSOCIATION
15 CEDAR STREET
AMESBURY, MA 01913

COMMONWEALTH OF MASSACHUSETTS
STEVEN T. D'AMBROSIO
CIVIL
No. 46916
REGISTERED PROFESSIONAL ENGINEER

PROJ MGR: JK	REVIEWED BY: JK	CHECKED BY: ABB	DRAWING
DESIGNED BY: JJZ	DRAWN BY: EJW	SCALE: AS SHOWN	1
DATE: July 2025	PROJECT NO. 03.0035466.00	REVISION NO.	SHEET NO.



LEGEND

- WATERSHED BOUNDARY
- TIME OF CONCENTRATION (TC)
- IMPERVIOUS LAND COVER (PAVED ROAD, ROOFS)
- PERVIOUS LAND COVER (GRASS COVER, BRICK PAVERS)

GENERAL NOTES

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE NAD83, US FEET.
2. ELEVATIONS ARE IN FEET AND REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. LIMITED TOPOGRAPHIC SURVEY PERFORMED BY GZA GEOENVIRONMENTAL, INC., ON NOVEMBER 13, 2024 AND REPRESENTS CONDITIONS AT THE TIME OF THE SURVEY.
4. APPROXIMATE PROPERTY LINES AND AERIAL IMAGERY DOWNLOADED FROM MASSGIS'S MASSMAPPER ONLINE INTERACTIVE MAP.
5. STORMWATER SYSTEM INFORMATION PRODUCED FROM DIGITAL DOCUMENT PRODUCED BY MILLENNIUM ENGINEERING, INC. TITLED "AS-BUILT PLAN" DATED AUGUST 2008.
6. DRAWINGS ARE NOT CONSIDERED A LAND SURVEY.
7. TEST PITS WERE PERFORMED BY M.T. MAYO CORPORATION ON JULY 1, 2025 AND OBSERVED BY GZA.
8. TOP OF BANK DELINEATION WAS PERFORMED BY GZA ON JULY 1, 2025.

0 10 20 40
SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

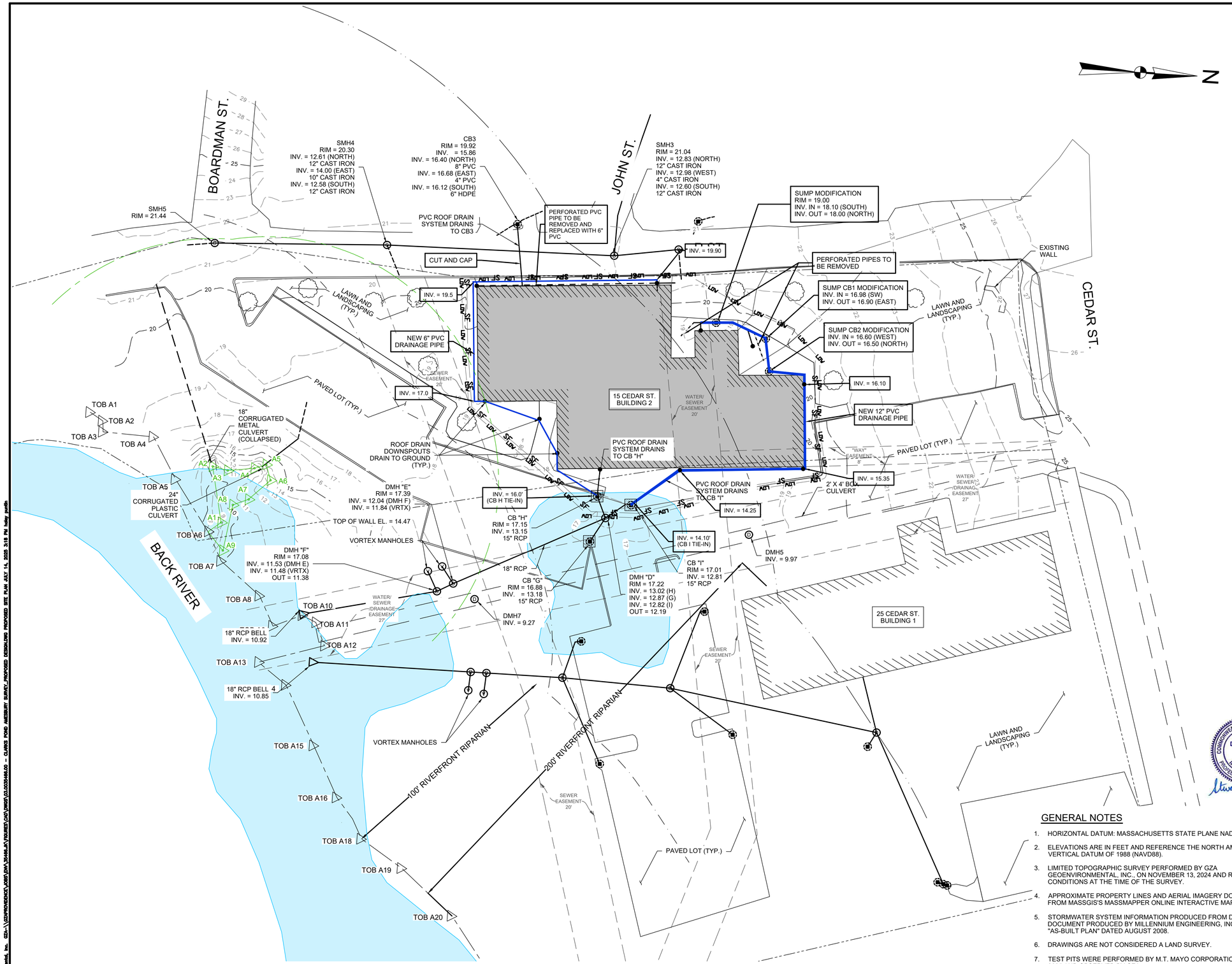
LOFT'S AT CLARKS POND
STORMWATER MANAGEMENT & DRAINAGE IMPROVEMENT DESIGN
15 CEDAR ST, AMESBURY MA 01913

EXISTING WATERSHED PLAN

COMMONWEALTH OF MASSACHUSETTS
STEVEN T. D'AMBROSIO
CIVIL
No. 46016
REGISTERED PROFESSIONAL ENGINEER
07/14/25

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: LOFT'S AT CLARK'S POND HOMEOWNER ASSOCIATION 15 CEDAR STREET AMESBURY, MA 01913	
PROJ MGR: JK	REVIEWED BY: JK	CHECKED BY: ABB	DRAWING 2
DESIGNED BY: JJZ	DRAWN BY: EJW	SCALE: AS SHOWN	SHEET NO.
DATE: July 2025	PROJECT NO. 03.0035466.00	REVISION NO.	

©2025 GZA GeoEnvironmental, Inc. G:\...\EXISTING WATERSHED PLAN.dwg, 7/14/2025 1:38 PM, haley.parillo



PROPOSED SITE PLAN

SCALE: 1"=20'

LEGEND

- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- APPROXIMATE PROPERTY LINE
- ROOF DRAIN SYSTEM PIPING
- ROOF DRAIN SYSTEM PERFORATED PIPING
- TOB A1 — TOP OF BANK WITH FLAGS
- 100-FOOT RIVERFRONT AREA
- 200-FOOT RIVERFRONT AREA
- FEMA 100-YEAR FLOOD ZONE (ZONE A) (BORDERING LAND SUBJECT TO FLOODING)
- A1 — WETLAND FLAGS
- 100-FOOT BUFFER ZONE
- EASEMENTS
- (S) EXISTING DRAIN MANHOLE
- (V) EXISTING DRAIN MANHOLE
- (D) EXISTING DRAIN MANHOLE
- EXISTING CATCH BASIN
- ROOF DRAIN DOWNSPOUT
- EXISTING TREE
- TP-1 — TEST PITS
- PROPOSED STORMWATER FEATURES
- SF SF — PROPOSED FILTREXX COMPOST SOXX (OR EQUIVALENT)
- LOW LOW — LIMIT OF WORK
- PROPOSED CATCH BASIN INLET PROTECTION

SITE RESTORATION NOTES:

1. SITE WILL BE RESORTED TO EXISTING GRADE POST CONSTRUCTION WORK.
2. AREAS OF DISTURBANCE WILL BE RESTORED TO THE PRE-CONSTRUCTION CONDITIONS. PROPOSED SEED MIX SHALL BE APPROVED BY THE ENGINEER.
3. SEEDING SHALL OCCUR BETWEEN APRIL 15TH AND SEPTEMBER 15TH.
4. IN ADDITION TO THOSE AREAS SPECIFICALLY DESIGNATED ON THE PLANS, ALL DISTURBED AREAS INCLUDING THE CONTRACTOR STOCKPILE AND STAGING AREAS MUST BE RESTORED TO MATCH THE PRE-CONSTRUCTION CONDITION.

SOIL EROSION AND SEDIMENT CONTROL NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR ALL SOIL EROSION AND SEDIMENT CONTROLS (SESC) AND IN ACCORDANCE WITH THE PROJECT DOCUMENTS.
2. NOTE THE SESC SHOWN ON THESE PLANS ARE THE MINIMUM QUANTITY/TYPE OF EROSION CONTROL DEVICES AND MATERIAL DEEMED REQUIRED BY GZA TO MEET THE OBJECTIVE OF THE MA SESC HANDBOOK. THE SESC IS A WORKING DOCUMENT AND WILL CONTINUE TO EVOLVE THROUGHOUT CONSTRUCTION AS NECESSARY.
3. ALL EROSION, RUNOFF AND SEDIMENT CONTROL MEASURE TO BE INSTALLED PER THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS, LATEST EDITION AND WITH THE REGULATIONS/ORDINANCES OF LOCAL AUTHORITIES HAVING JURISDICTION.
4. ALL SESC ARE TO BE INSTALLED PRIOR TO THE START OF THE WORK AND ARE TO BE MAINTAINED THROUGHOUT CONTROL AND UNTIL THE SITE IS FULLY STABILIZED.

0 10 20 40
SCALE IN FEET

COMMONWEALTH OF MASSACHUSETTS
STEVEN T. D'AMBROSIO
CIVIL
No. 46916
REGISTERED PROFESSIONAL ENGINEER
07/14/25

GENERAL NOTES

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE NAD83, US FEET.
2. ELEVATIONS ARE IN FEET AND REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. LIMITED TOPOGRAPHIC SURVEY PERFORMED BY GZA GEOENVIRONMENTAL, INC., ON NOVEMBER 13, 2024 AND REPRESENTS CONDITIONS AT THE TIME OF THE SURVEY.
4. APPROXIMATE PROPERTY LINES AND AERIAL IMAGERY DOWNLOADED FROM MASSGIS'S MASSMAPPER ONLINE INTERACTIVE MAP.
5. STORMWATER SYSTEM INFORMATION PRODUCED FROM DIGITAL DOCUMENT PRODUCED BY MILLENNIUM ENGINEERING, INC. TITLED "AS-BUILT PLAN" DATED AUGUST 2008.
6. DRAWINGS ARE NOT CONSIDERED A LAND SURVEY.
7. TEST PITS WERE PERFORMED BY M.T. MAYO CORPORATION ON JULY 1, 2025 AND OBSERVED BY GZA.
8. TOP OF BANK DELINEATION WAS PERFORMED BY GZA ON JULY 1, 2025.

NO.	ISSUE/DESCRIPTION	BY	DATE

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

LOFT'S AT CLARKS POND
STORMWATER MANAGEMENT & DRAINAGE IMPROVEMENT DESIGN
15 CEDAR ST, AMESBURY MA 01913

PROPOSED SITE PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
LOFT'S AT CLARK'S POND
HOMEOWNER ASSOCIATION
15 CEDAR STREET
AMESBURY, MA 01913

PROJ MGR: JK	REVIEWED BY: JK	CHECKED BY: TG	DRAWING 3
DESIGNED BY: JEL	DRAWN BY: JEL	SCALE: AS SHOWN	
DATE: July 2025	PROJECT NO. 03.0035466.00	REVISION NO.	SHEET NO.

©2025 - GZA GeoEnvironmental, Inc. - G:\...\DRAWINGS\...\PROPOSED SITE PLAN 7/14/2025 3:18 PM Haley Jurelis

LEGEND

- WATERSHED BOUNDARY
- TIME OF CONCENTRATION (TC)
- IMPERVIOUS LAND COVER (PAVED ROAD, ROOFS)
- PERVIOUS LAND COVER (GRASS COVER, BRICK PAVERS)
- PROPOSED STORMWATER FEATURES

GENERAL NOTES

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE NAD83, US FEET.
2. ELEVATIONS ARE IN FEET AND REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. LIMITED TOPOGRAPHIC SURVEY PERFORMED BY GZA GEOENVIRONMENTAL, INC., ON NOVEMBER 13, 2024 AND REPRESENTS CONDITIONS AT THE TIME OF THE SURVEY.
4. APPROXIMATE PROPERTY LINES AND AERIAL IMAGERY DOWNLOADED FROM MASSGIS'S MASSMAPPER ONLINE INTERACTIVE MAP.
5. STORMWATER SYSTEM INFORMATION PRODUCED FROM DIGITAL DOCUMENT PRODUCED BY MILLENNIUM ENGINEERING, INC. TITLED "AS-BUILT PLAN" DATED AUGUST 2008.
6. DRAWINGS ARE NOT CONSIDERED A LAND SURVEY.
7. TEST PITS WERE PERFORMED BY M.T. MAYO CORPORATION ON JULY 1, 2025 AND OBSERVED BY GZA.
8. TOP OF BANK DELINEATION WAS PERFORMED BY GZA ON JULY 1, 2025.

0 10 20 40
SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

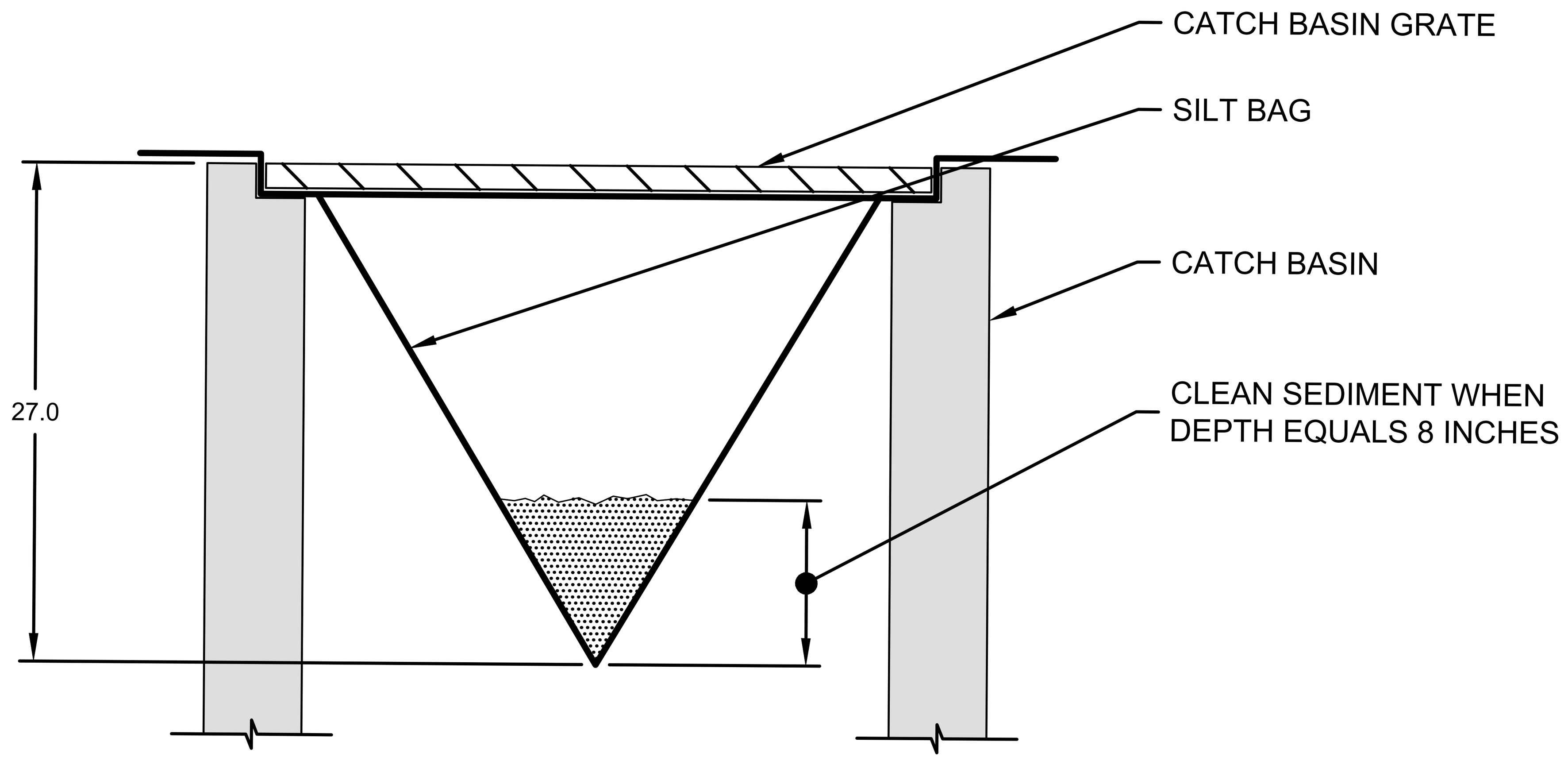
LOFT'S AT CLARKS POND
STORMWATER MANAGEMENT & DRAINAGE IMPROVEMENT DESIGN
15 CEDAR ST, AMESBURY MA 01913

PROPOSED WATERSHED PLAN

COMMONWEALTH OF MASSACHUSETTS
STEVEN T. D'AMBROSIO
CIVIL
No. 40816
REGISTERED
PROFESSIONAL ENGINEER
07/14/25

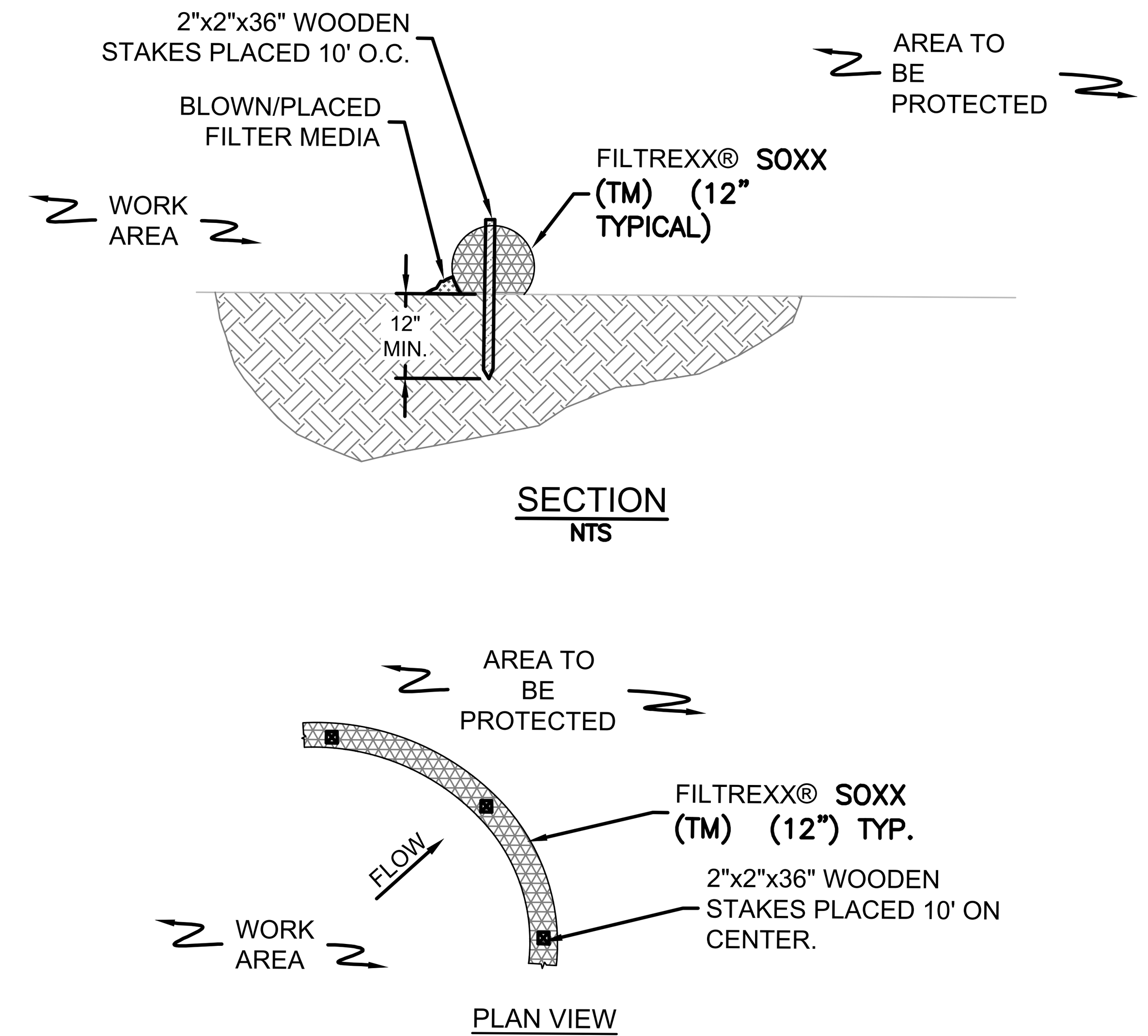
PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: LOFT'S AT CLARK'S POND HOMEOWNER ASSOCIATION 15 CEDAR STREET AMESBURY, MA 01913	
PROJ MGR: JK	REVIEWED BY: JK	CHECKED BY: ABB	DRAWING 4
DESIGNED BY: JJZ	DRAWN BY: EJW	SCALE: AS SHOWN	SHEET NO.
DATE: July 2025	PROJECT NO. 03.0035466.00	REVISION NO.	

©2025 GZA GeoEnvironmental, Inc. G:\...\PROVIDENCE\JOBS\03A\35466.A\FIGURES\CAD\DWGS\03.0035466.00 - CLARKS POND AMESBURY SURVEY_PROPOSED DESIGN.DWG MAY 14, 2025 1:26 PM kelley.pustin



CATCH BASIN INLET PROTECTION DETAIL

NOT TO SCALE

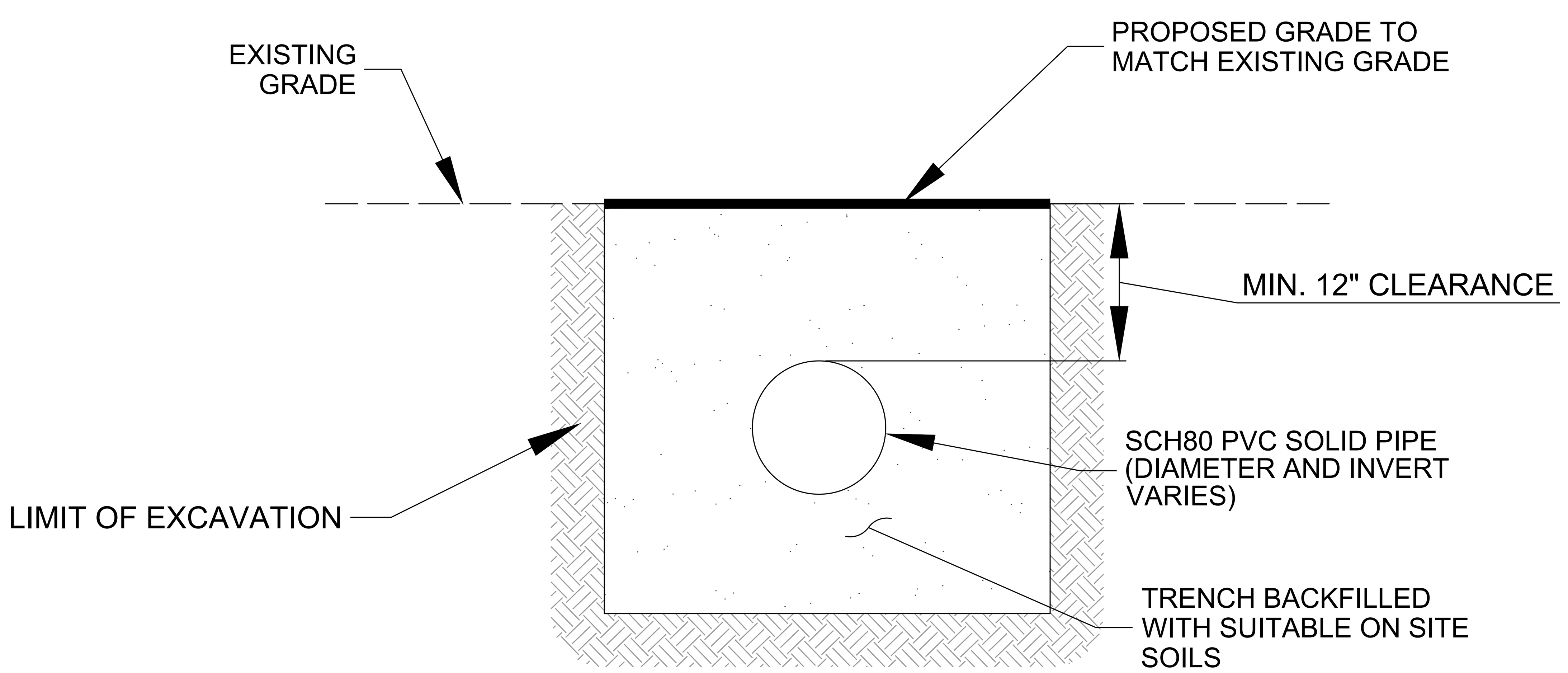


FILTREXX COMPOST SOXX

NOT TO SCALE

NOTES:

1. PRODUCT TO BE FILTREXX SILT SOXX OR APPROVED EQUAL BY NATIONAL GRID ENVIRONMENTAL.
2. ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
3. FILTER MEDIA FILL TO MEET APPLICATION REQUIREMENTS.
4. COMPOST MATERIAL TO BE DISPERSED ON SITE AS DETERMINED BY NATIONAL GRID ENVIRONMENTAL.



DRAINAGE PIPE TRENCH DETAIL

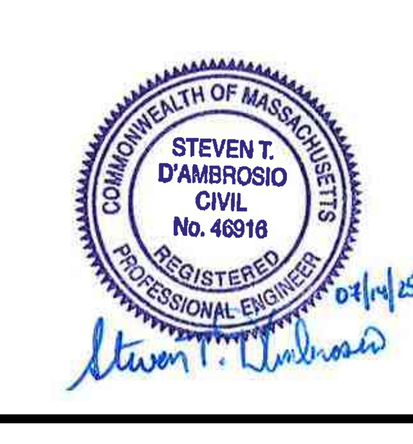
NOT TO SCALE

NO.	ISSUE/DESCRIPTION	BY	DATE

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

LOFT'S AT CLARKS POND
STORMWATER MANAGEMENT & DRAINAGE IMPROVEMENT DESIGN
15 CEDAR ST, AMESBURY MA 01913

DETAILS



PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
LOFT'S AT CLARK'S POND
HOMEOWNER ASSOCIATION
15 CEDAR STREET
AMESBURY, MA 01913

PROJ MGR: JK	REVIEWED BY: JK	CHECKED BY: TG	DRAWING 5 SHEET NO.
DESIGNED BY: JEL	DRAWN BY: JEL	SCALE: AS SHOWN	
DATE: July 2025	PROJECT NO. 03.0035466.00	REVISION NO.	

GZA GeoEnvironmental, Inc.