STORMWATER REPORT

MULTIFAMILY DEVELOPMENT
25 ADAMS CIRCLE

ASSESSORS MAP 26 BLOCK 10-LOT 100
DEVENS, MASSACHUSETTS 01434

Applicant:

ADAMS CIRCLE, LLC
30 LOWELL JUNCTION ROAD
ANDOVER, MA 01810

Prepared By:

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CEC Project 348-019

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Civil & Environmental Consultants, Inc.

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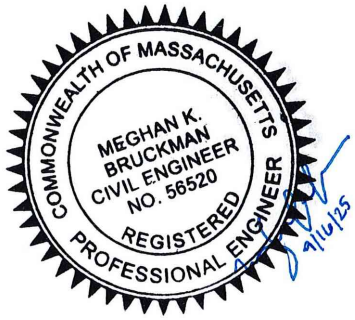


1.0 PROJECT NARRATIVE

1.1 INTRODUCTION

On behalf of Adams Circle, LLC (the Applicant), Civil & Environmental Consultants, Inc. (CEC) has prepared this stormwater report and analysis to demonstrate compliance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards and the Devens Enterprise Commission (DEC) design standards and bylaws.

The Applicant proposes to construct six duplexes with two 2-story 1,050 square foot units per duplex, a total of 12 residential units, on Assessors Map 26 Block 10 Lot 100 (the Site) located in the Devens Regional Enterprise Zone (Devens). The project also proposes driveways, drainage improvements, landscaping and associated infrastructure. It is important to note that the Site is in the process of being subdivided by the Massachusetts Development Finance Agency. Proposed property lines shown are based on the proposed lotting plan prepared by WSP USA, Inc. titled, "Level 1 Lotting Plan Adams Circle", prepared for Massachusetts Development Finance Agency dated 6/12/2025. At the date of report issue, it is our understanding that this lotting plan has not yet been finalized or recorded, as such proposed property lines are subject to change. The site will be serviced by municipal sewer and water services that are planned to be installed in the right-of-way in Adams Circle by the DEC as part of right-of-way improvements planned, and to be constructed, by DEC. The property is located within the Residential II Zoning District.

1.2 EXISTING CONDITIONS

The Site is mostly undeveloped with some existing utility infrastructure from the Site's prior use within the Devens Regional Enterprise Zone in Massachusetts. The existing land cover of the proposed project area consists mostly of grass with some dense wooded vegetation along the Site's eastern border. In accordance with Section 2.d.iii of Devens Stormwater Management regulations, "green field" conditions were modeled to assess the existing condition. No impervious coverage is included in the existing condition area take-offs and peak flow calculations. According to publicly available mapping data, there are no wetlands or other resource areas mapped on or within the immediate proximity of the Site. The Site is abutted by residential property to the north, Adams Circle paved roadway to the west, undeveloped land with dense wooded vegetation to the east, and undeveloped and commercial properties to the south. See Figure 1 for a Site Locus Map, Figure 2 for an Aerial Map, and Figure 4 for a Critical Areas Map.

Existing topography within the Site ranges from approximately 251 feet to 262 feet (NAVD88) with the lowest elevation of 251 feet along the western site boundary along Adams Circle and the highest elevation at the northeast corner of the site boundary. Refer to the Existing Conditions Plan included in the Civil Plan Set under separate cover for additional detail.

Stormwater runoff from the Site flows overland from east to west from undeveloped forested hillside across the Site to Adams Circle where runoff enters the Devens municipal drainage system through existing catch basins in the roadway. Adams Circle is identified as Design Point A (DP-A) in the pre- and post-hydrology assessments. See figures HYD-PRE and HYD-POST for subcatchment delineations and design point identification.

1.2.1 Existing Soils

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the Site is comprised of Quonset loamy sand (0-3% slopes), an HSG A soil, and Canton fine sandy loam (15-35% slopes), an HSG B soil. Soil testing was performed onsite which confirmed HSG A soils at performed boring locations, see the project Geotechnical Engineering Report referenced under Appendix B provided under separate cover for boring locations and soils analysis.

Based on the review of the NRCS Web Soil Report, site observations and information obtained from the borings performed 4/30/2025, the limit of Canton fine sandy loam was slightly revised along the northern portion of the delineation to follow the 254' contour representing the toe of slope in this area, and an infiltration rate of 2.41 inches/hour was used, consistent with the Rawl's rate for loamy sand, for the proposed bioswale and pervious pavement driveway areas.

1.2.2 Flood Zone

The subject property is not located within a special flood hazard zone as delineated on Federal Emergency Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Town of Harvard, Panel No. 250308, Map #25027C0311E effective July 4, 2011, and refer to Figure 3 for the FEMA Flood Insurance Rate Map (FIRM) Firmette for detailed project information.

1.3 PROPOSED PROJECT

The Applicant proposes to construct six duplexes with two single family homes per duplex: a total of 12 proposed single family homes across six proposed lots. The overall development will include the construction of a ±12,600 sq. ft. of building footprint, porous pavement driveways, swales and a bioswale to manage stormwater flows, landscaping, and utility infrastructure to connect within the proposed right of way within Adams Circle.

In the proposed condition, approximately 35% of the project area will be impervious area to accommodate the proposed residential use; this includes the proposed building footprints, driveway areas, and walkway areas. The remainder of Site will consist of landscaped/lawn areas and undisturbed vegetation. The existing drainage pattern onsite will be maintained to the extent practicable with runoff from impervious areas being routed to the proposed bioswale and porous

pavement prior to discharge via overland flow ultimately tributary to Adams Circle, identified as Design Point A (DP-A).

The proposed stormwater design mitigates and reduces peak runoff rates in the 2-, 10-, 25- and 100-year storms. See HydroCAD Drainage Analysis in Appendix C.

2.0 STORMWATER MANAGEMENT SYSTEMS

2.1 DESCRIPTION OF RUNOFF CONTROLS

The proposed stormwater management improvements consist of components designed to manage runoff from the Site. These components attenuate runoff discharge peaks, minimize erosion, minimize the transport of sediments, improve water quality, and minimize impacts to offsite areas.

The stormwater management system implements a treatment train of the Best Management Practices designed to provide 90% TSS (Total Suspended Solids) removal for stormwater runoff from the proposed driveways and impervious areas. The proposed stormwater management system will use the following specific control measures:

- Bioswale: Stormwater recharge and water quality volume for the proposed development is provided through the infiltration of tributary runoff from pervious areas, paved areas and clean runoff from the building's roof areas via the bioswale, which is located along the eastern project boundary. The bioswale will provide removal of total suspended solids (TSS) and Total Phosphorous (TP) as an added level of pretreatment of stormwater runoff. The bioswale should be inspected and cleaned in accordance with the O&M Plan.

  The use of bioswales for treatment of stormwater is accepted as good practice and is in accordance with sound professional standards.

- Porous Pavement: Porous pavement provides both water quality treatment and groundwater recharge for tributary stormwater runoff. The porous pavement provides efficient removal of total suspended solids (TSS). Porous pavement should be inspected and cleaned in accordance with the O&M Plan. See the Long-Term Pollution Prevention and O&M Plan included in Section 6.0 and Appendix D for supporting information.

  The use of porous pavement for treatment of stormwater is accepted as a good practice and is in accordance with sound professional standards.

- Emergency Spillway Outlet Protection: The proposed emergency spillway will provide outlet protection to reduce flows to non-erosive velocities to prevent erosion and conform to natural topography where appropriate.

The proposed runoff controls are detailed on the Site Plans included under separate cover.

2.2 CONSTRUCTION SEQUENCE PLAN

The purpose of the Construction Sequence Plan is to develop a working schedule for the implementation of the proposed stormwater improvements. Prior to initiating work, the siltation control barriers will be installed along the limit of work. Once the appropriate permits are obtained, the construction project will commence in the following sequence:

1. Install all necessary siltation barriers as shown on the design drawings.
2. Perform demolition of existing vegetation and existing utilities as shown on the design drawings.
3. Perform excavation for building foundation areas, bioswale and subsurface utilities.
4. Place clean fill/pavement base materials and install pavement base and curbing.
5. Construct buildings.
6. Install proposed final landscaping.
7. Remove existing erosion control measures.

All construction water will be collected and treated in accordance with the Erosion and Sediment Control Plan included in Section 5.0.

3.0 STORMWATER ANALYSIS

3.1 METHOD OF ANALYSIS

A hydrologic analysis has been performed for the Site comparing existing conditions and post-development conditions using a software program developed by HydroCAD Software Solutions LLC. This program analyzes site hydrology by the graphic peak discharge method documented in Technical Release No. 20 and Technical Release No. 55 published by the United States Department of Agriculture (USDA) Soil Conservation Service.

The following variables were developed for contributing watersheds (drainage areas) in order to complete the analysis:

- **Rainfall Depth:** A hydrologic analysis was performed for the 24-hour 2-year, 10-year, 25-year, 50-year, and 100-year, Type III storm events (3.14, 4.81, 5.85, 6.62, and 7.46 inches respectively) for each drainage area. The rainfall depths for the study area were obtained from available charts published in NOAA Rainfall Tables for the project location.

- **Runoff Curve Number (RCN):** The RCN is a hydrologic characteristic that contributes to the peak rate of runoff and volume from a given storm event. It is dependent upon soil conditions and land use. Generally, higher curve numbers are associated with less pervious soils and, hence, greater amounts of runoff. As previously noted, based on the NRCS Web Soil Survey Report and boring data, the Site is comprised of Hydrologic Soil Group (HSG) A and HSG B soils which were used in determining RCNs.

- **Time of Concentration:** The time of concentration is defined as the time it takes runoff to travel from the hydraulically most distant part of the watershed to the downstream point of interest. This parameter is dependent on the characteristics of the ground surface and condition of the travel path. Times of concentration were calculated for the various sub catchments using the HydroCAD program, with a minimum time of concentration of six (6) minutes used in accordance with the protocol outlined in Technical Release No. 55.

3.2 DRAINAGE AREAS

In order to perform the analysis, the contributing drainage areas for pre-development, existing, and post-development conditions were delineated. The delineation of the drainage areas was determined by the topography depicted on the Existing Conditions plan. Brief descriptions of the existing conditions and proposed conditions drainage areas are as follows:

- **Existing Conditions:** The existing Site is comprised of one drainage area, A1-EX, and the stormwater runoff was evaluated for one design point, the existing municipal drainage system

in Adams Circle, DP-A. Subcatchment A1-EX contains existing wooded and grassed area that drains overland to the existing municipal drainage system in Adams Circle (DP-A). No existing impervious area is modeled in the existing condition, consistent with the required "green field" requirements. Refer to Figure HYD-PRE for the existing conditions drainage areas. A summary of existing conditions drainage areas is listed below:

TABLE 3.1
EXISTING CONDITIONS

Drainage Area	Design Point	Area (ac.)	Curve Number	Time of Concentration (minutes)
A1-EX	DP-A	6.229	49	24.3

- **Proposed Conditions:** The proposed Site is divided into three (3) proposed drainage areas and stormwater runoff will flow to one design point, the existing municipal drainage system in Adams Circle, DP-A. See below for descriptions of each proposed drainage area:
    - A1-PR: Predominantly grassed and landscaped area with some impervious access paths that drain overland to DP-A.
    - A2-PR: Comprised of roof area, grassed area, and impervious driveway area tributary to the porous pavement modeled as P1, and is ultimately tributary to DP-A.
    - A3-PR: Comprised of roof area, wooded area, and grassed area the drains overland to the proposed bioswale, P2, and is ultimately tributary to DP-A.
    - Refer to Figure HYD-POST for the proposed conditions drainage areas.

A summary of the proposed conditions drainage areas are listed below:

TABLE 3.2
POST-DEVELOPMENT CONDITIONS

Drainage Area	Design Point	Area (ac.)	Curve Number	Time of Concentration (minutes)
A1-PR	DP-A	1.118	49	18.2
A2-PR		0.246	93	6.0
A3-PR		4.866	56	38.5

3.3 RESULTS OF ANALYSIS

A stormwater analysis was performed for the 24-hour 2-year, 10-year, 25-year, 50-year, and 100-year storm events in order to determine stormwater runoff rates once the proposed construction is complete. Detailed calculations are attached in Appendix C. A summary of the peak stormwater runoff is provided below in Table 3.3.

TABLE 3.3
PROJECT STORMWATER RUNOFF RATES

	Peak Runoff Rate (cfs)									
Design Point	2-Year		10-Year		25-Year		50-Year		100-Year	
	Ex.	*Prop.*	Ex.	*Prop.*	Ex.	*Prop.*	Ex.	*Prop.*	Ex.	*Prop.*
A	0.06	*0.01*	1.23	*0.21*	3.06	*1.61*	4.71	*3.28*	6.72	*5.22*

cfs = cubic feet per second

As shown above in Table 3.3, post-development runoff rates from the Site do not exceed existing runoff rates for the 2-, 10-, 25- and 50- and 100-year storm events. See Supporting calculations provided in Appendix C.

4.0 STORMWATER CONTROL SYSTEM DESIGN CRITERIA

4.1 MASSDEP STORMWATER MANAGEMENT POLICY

Stormwater discharge from the proposed Project is subject to the Massachusetts DEP Stormwater Management Policy (the Policy). The Policy is designed *"to protect the wetlands and waters of the Commonwealth from adverse impacts of storm water runoff."* To accomplish this goal, the Policy establishes ten (10) performance standards to control stormwater quantity and quality. These standards establish the level of required controls that can be achieved with site planning, structural and non-structural controls, and other best management practices (BMPs). The Stormwater Checklist is provided in Appendix A. Stormwater modeling methodology is discussed in detail in Section 3.0. Results of the stormwater modeling of the existing and proposed conditions are provided as Appendix C.

4.2 STORMWATER MANAGEMENT STANDARDS

The following section documents compliance with the MassDEP Stormwater Management Standards.

Standard 1

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

No new stormwater conveyances are proposed to discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

Standard 2

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

The post-development peak discharge rate to Site design point, DP-A, does not exceed pre-development rates for the 2-, 10-, 25-, 50-, and 100-year storm events. Stormwater modeling methodology is discussed in detail in Section 3.0. The HydroCAD model output is provided as Appendix C. A summary of the HydroCAD model results are provided above in Table 3.3, and in the subsequent description.

Standard 3

Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post-development site should approximate the annual recharge from the pre-development or existing site conditions, based on soil types.

The project is designed to comply with this criterion. In accordance with the stormwater standards, 0.60-inches of recharge must be provided for the increase in impervious areas onsite for HSG A soils. The proposed project results in 30,797 SF of new impervious area, requiring 1,540 cubic feet (CF) of groundwater recharge. The proposed bioswale and porous pavement provide approximately 8,998 CF of recharge, well in excess of the regulatory requirement.

A Saturated Hydraulic Conductivity rate of 2.41 in/hour was utilized to model exfiltration and to document compliance for drawdown of the stormwater in less than 72 hours. Supporting calculations are provided in Appendix C.

Standard 4

For new development, stormwater management systems must be designed to remove 80% of the average annual load (post-development conditions) of Total Suspended Solids (TSS). It is presumed that this standard is met when:

A. Suitable nonstructural practices for source control and pollution prevention are implemented;

B. *Stormwater management best practices (BMPs) are sized to capture the prescribed runoff volume; and*
C. *Stormwater management BMPs are maintained as designed.*

The proposed development reduces TSS generation through the proposed bioswale and porous pavement, consistent with the policy. Documentation has been provided in Appendix C supporting removal efficiency for the proposed BMPs.

The project has been designed to remove 90% of the average annual load of TSS. The stormwater BMPs have been sized to capture the prescribed water quality volume and are designed according to the specific performance criteria outlined in the Massachusetts Stormwater Management Manual.

See Water Quality Calculations, and TSS Calculations provided in Appendix C for supporting information.

A comprehensive Operations and Maintenance Plan (O&M) has been developed and is included in Section 6.0 of this report.

Standard 5
Stormwater discharges from a land use with a higher potential pollutant load (LUHPPL) require the use of specific stormwater management BMPs. The use of infiltration practices without pre-treatment is prohibited.

The proposed land use does not result in a LUHPPL.

Standard 6
Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas. Critical areas are Outstanding Resources Waters (ORWs), shellfish beds, bathing beaches, cold water fisheries, and recharge areas for public water supplies.

Upon review of publicly available mapping at the time of this report, the proposed project does not discharge to known critical areas.

Standard 7
Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. Where it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.

The proposed project is not a redevelopment.

Standard 8

Erosion and sediment controls must be implemented to prevent impacts during construction, or land disturbance activities.

Erosion and sediment controls are integral to the project improvements. The plan includes compost silt socks, which will be installed down-gradient of the proposed work area and silt sacks will be installed in the site catch basins during construction. A temporary stabilized construction exit will be constructed as well. Prior to, and during construction, the Site's Erosion and Sediment Control Plan, included in Section 5.0 of this report will be followed. These measures will be utilized throughout construction to prevent erosion, control sediments, and stabilize exposed soils as discussed in Section 5.0.

Standard 9

All stormwater management systems must have an operations and maintenance plan to ensure that systems function as designed.

A comprehensive Operations and Maintenance Plan (O&M) has been developed and is included in Section 6.0 of this report.

Standard 10

All illicit discharges to the stormwater management system are prohibited.

There are no known or proposed illicit discharges related to the proposed project. An Illicit Discharge Compliance Statement is provided in Appendix D.

5.0 CONSTRUCTION SEDIMENTATION AND EROSION CONTROL PLAN

5.1 INTRODUCTION

The greatest potential for sediment generation will occur during the construction. An extensive erosion and sedimentation program is proposed and will be diligently implemented during construction of the project. The erosion control program will minimize erosion and sedimentation that could potentially impact resources areas. Water quality will be maintained by minimizing erosion of exposed soils and siltation. Erosion control barriers will be installed and exposed soil areas re-vegetated as soon as possible after work in an area is completed.

This Erosion and Sedimentation Control Plan includes preliminary measures and requirements for management and implementation of erosion and sediment controls during construction. A detailed Stormwater Pollution Prevention Plan (SWPPP) will be prepared. The SWPPP will contain elements from this Erosion and Sediment Control Plan and will include additional and more detailed inspection and maintenance procedures as well as maintenance logs, forms, and additional erosion and sediment control measures.

Responsible Party for Plan Compliance:

Adams Circle, LLC.
30 Lowell Junction Road
Andover, MA 01810

Contact: Jillian Wahl
Email: jillian@reframe.systems

5.2 CONSTRUCTION AND WASTE MATERIALS EXPECTED ON-SITE

5.2.1 Construction Materials & Waste

Building products staged on site are to be protected by measures to minimize the exposure to stormwater or precipitation. Provided measures either can be a cover or similarly effective means to minimize the discharge of pollutants from these areas. Examples of effective means include locating activities away from resource areas and stormwater inlets or conveyances and directing wash waters to a sediment basin or sediment trap, using filtration devices, such as filter bags or sand filters, or using other similarly effective controls.

The contractor will utilize and secure dumpsters / roll offs as deemed appropriate for sorting, temporary storage and disposal of waste. Waste disposal will be completed by the Contractor or by a waste disposal firm. Containers will be removed and replaced if appropriate when they are

adequately filled or at the end of a specific construction task as deemed necessary by the construction supervisor.

The Contractor shall keep waste container lids closed when not in use and close lids at the end of the business day for those containers that are actively used throughout the day. For waste containers that do not have lids, provide either (1) cover (e.g., a tarp, plastic sheeting, temporary roof) to minimize exposure of wastes to precipitation, or (2) a similarly effective means designed to minimize the discharge of pollutants(e.g., secondary containment).

On business days, clean up and dispose of waste in designated waste containers. Clean up immediately if containers overflow.

5.2.2 Hazardous Waste

No Hazardous or toxic waste is anticipated to be present on site, refer to Phase I Report for the project site prepared under separate cover. If utilized or found to be present, the Plan will be modified. If applicable, any hazardous or toxic waste will be properly stored, managed and removed from the site pursuant to appropriate regulations, manufactures recommendations and Material Safety Data Sheets (MSDS).

5.2.3 Sanitary Waste

Portable sanitary facilities will be utilized at the site and pumped out at a time-frame sufficient to keep odor and material from disturbing personnel at the site or every 4 weeks.

For sanitary waste, position portable toilets so that they are secure and will not be tipped or knocked over and located away from waters of the U.S. and stormwater inlets or conveyances. Units will be inspected at least once per month and emptied regularly and as needed.

5.2.4 Concrete Waste

All concrete washings will be disposed on in a designated area away from wetlands and any property line. When the concrete hardens it be removed from the site.

5.3 CONSTRUCTION PHASE EROSION CONTROL MEASURES

The adjacent resource areas will be protected during construction by implementing siltation control measures, including the placement of compost silt socks as close as feasible to the downgradient limit of construction activity. The project may also implement other stabilization methods such as erosion netting and hydroseeding.

5.3.1 Short- and Long-Term Goals and Criteria

Short and long-term goals will include a variety of stabilizing sediment and erosion controls around the limit of work. All construction-phase erosion and sediment controls have been designed to retain sediment on-site to the extent practicable and limit runoff and the discharge of pollutants (sediment) from exposed areas of the Site.

All control measures will be installed and maintained in accordance with the manufacturer's specifications and good engineering practices. Weekly inspections and routine monitoring will be used to determine the effectiveness of controls in use.

Litter and solid construction debris potentially exposed to the stormwater will be prevented from becoming a pollution source through routine monitoring and the use of laborers to "pick" litter, as necessary.

5.3.2 Stabilization Practices

The construction site activities will include numerous stabilizing practices. Sediment and erosion controls such as erosion netting, mulching, and hydro-seeding may act as interim practices. Erosion netting material may include single net straw blankets or coconut blankets. Permanent stabilization practices will include the use of a hydro-seeding over vegetative support soil where additional exposure threatens stormwater quality. Seeding will be carried out with a seed mixture equal to the "Roadside Slope Mix" included below. All siltation barriers will remain in place until all exposed areas are re-vegetated.

PLANTING SCHEDULE FOR EXPOSED AREAS

1. All exposed areas will receive 6 inches of topsoil or compost material with the infiltration basin to receive 4 inches of loamy sand seeded at a rate of 2 pounds of red top, 15 pounds of creeping red fescue and 20 pounds tall fescue per acre
2. Seed will be equal to "Roadside Slope Mix" as specified by the Mass. Highway Department. Please refer to chart below for specifications. This mixture will be spread at a rate of 5 pounds per 1,000 square feet

TABLE 5.1 ROADSIDE SLOPE MIX			
Common Name	**Germination Proportion**	**Purity Minimum**	**Minimum**
Creeping Red Fescue	50%	85%	95%
Kentucky 3	30%	85%	95%
Domestic Rye	10%	90%	98%
Red Top	5%	85%	92%
Ladino Clover	5%	85%	96%

5.3.3 Structural Practices

Perimeter controls will consist of compost silt socks. In order to ensure effective performance, proper installation is required. 2" x 2" wooden stakes will be positioned on the downhill side (away from the job Site) of the silt socks. The posts will be driven at least one foot into the ground.

Stabilized construction exits will be constructed at each proposed lot within the project area. A cross slope will be placed at the entrances to direct runoff to the settling area. If deemed necessary after construction begins, a wash pad may be included to wash off vehicle wheels before leaving the Site.

5.4 NON-STRUCTURAL CONTROLS

5.4.1 Good Housekeeping

Non-structural controls are as effective as structural controls in sediment control. Non-structural controls to be used at the construction Site include:

- Regular sweeping of paved surfaces; and
- Prompt cleanup of any waste or spilled waste materials.

5.4.2 Exposure Minimization

Exposure will be minimized by providing both permanent and temporary soil stabilization (see Section 5.2.2) over areas that have been completely constructed, or areas that will not be revisited within a 30-day period.

Where practicable, industrial materials and activities will be protected from exposure to rain, snow, snowmelt, or runoff.

5.4.3 Preventative Maintenance

A preventative maintenance program includes the timely inspection and maintenance of stormwater management devices. Examples of preventative maintenance include:

- Removal of obstructions, if any, from inlets and outlets.
- Removal of accumulated sediment and vacuuming water from sumps.
- Repairing and re-planting slope areas that experience erosion.

5.4.4 Inspections

An experienced Construction Monitor will conduct inspections of construction areas once every 7 calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches or greater, or the occurrence of runoff from snowmelt sufficient to cause a discharge. Storm event information from a weather station representative of the Site's location may be used to determine if a storm event of 0.25 inches or greater has occurred on the Site. Total rainfall will be measured for any day of rainfall during normal business hours that measures 0.25 inches or greater. Construction areas an experienced Construction Monitor will inspect include:

- Disturbed areas of the construction Site that have not been finally stabilized,
- Areas used for storage of materials that are exposed to precipitation,
- Structural control measures,
- Locations where vehicles enter or exit the Site, and
- The stormwater management system and discharge outlets.

Disturbed areas and areas used for storage of materials that are exposed to precipitation will be inspected for evidence of, or the potential for, pollutants entering the drainage system.

Sediment and erosion control measures identified will be observed to ensure that they are operating correctly. The discharge locations or points will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the Site will be inspected for evidence of offsite sediment tracking.

Based on the results of these routine inspections, the Contractor will correct any deficiencies found as soon as practicable. Results of the inspections, corrective actions taken in response to any deficiencies, and any opportunities for improvement that are identified will be documented in an inspection report.

5.5 POLLUTION AND SPILL PREVENTION

5.5.1 Materials

The following materials are anticipated to be present onsite during construction:

- General construction materials
- Asphalt/concrete
- Paint
- Petroleum-based products
- Cleaning solvents

5.5.2 Material Management Practices

Good Housekeeping Practices

- Store only enough materials needed for current construction activities.
- All materials that are stored outside will be stored in a neat, orderly manner, in the original containers.
- Materials will be kept in their original containers with manufacturer's labels.
- Whenever possible, all materials should be used before disposing the container.
- The site contractor shall be responsible for daily inspections to ensure proper handling and disposal of materials on site.

Product Specific Practices

Petroleum/Fertilizer Products:

- Refueling vehicles shall be DOT certified and shall contain SPCC Plans in place along with emergency equipment to contain and clean up spills.
- All on site construction vehicles shall be inspected for leaks and receive regular preventive maintenance to reduce the chance of leakage.
- Petroleum-based products will be stored in tightly sealed containers, which are properly marked.
- All fertilizers will be stored in a dry protected area and only used according to manufacturer’s recommendation.

Paints:

- All containers will be tightly sealed and stored when not required for use.
- All procedures will be followed to minimize spills and to keep products in the original containers.

Concrete Trucks:

- The site contractor is responsible for designating a safe area, away from abutting property and resource areas, for excess concrete disposal.

Product Specific Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup during construction:

- Manufacturer recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- All spills will be cleaned up immediately after discovery.
- In any case or threat of explosion or life threatening condition, all personnel shall evacuate the area to safety and then contact the local fire department for assistance.
- The spill area will be ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- The site contractor shall be responsible for spill prevention and cleanup and will designate at least three personnel who will receive spill prevention and cleanup training. The names of the assigned three personnel will be posted in the material storage area in the field office on site.

5.6 RECORDKEEPING

The following records will be maintained on the Site:

1. Dates when major grading activities occur,
2. Dates when construction activities temporarily or permanently cease on a portion of the Site,
3. Dates when stabilization measures are initiated, and
4. In addition, the following records will also be kept:
    - The Order of Conditions; and any additional permit conditions/approvals,
    - All inspection reports, and
    - Any spill reports.

6.0 OPERATIONS AND MAINTENANCE (O&M) PLAN

6.1 GENERAL

Stormwater management systems with multiple components, such as the one proposed for the project, assures the cleanest possible discharges of stormwater to the environment. However, these systems must be routinely maintained to keep them in good working order. Additionally, this plan identifies potential sources of pollution that may affect the quality of stormwater discharges and describes the implementation of Long-Term Pollution Prevention practices to reduce potential pollutants in stormwater discharge. The party identified below will be responsible for the operation and maintenance of the stormwater management system and Site. Schedules and procedures for inspection and maintenance of the existing and proposed stormwater management system components are provided in the following sections.

Responsible Party for Plan Compliance:

Adams Circle, LLC.
30 Lowell Junction Road
Andover, MA 01810

Contact: Jillian Wahl
Email: jillian@reframe.systems

Upon transfer of ownership, the future owner shall assume the responsibilities for compliance with this O&M Plan.

Emergency Contact Information:
TBD

Estimated O&M Budget:

It is estimated that an annual budget of $2,000 - $3,000 should be allocated to performing routine inspections and maintenance identified in this O&M Plan.

6.2 ROUTINE INSPECTIONS

Inspections of the stormwater management system as a whole, and of the individual components of the system, will be carried out on a routine basis in accordance with the schedule identified in Section 6.3. Components to be inspected include the catch basins, and infiltration chambers. Each will be inspected for sediment buildup, presence of oil, color, and structural damage. The results

of each inspection will be entered into an inspection log. Refer to Table 6.1 for the inspection log forms.

6.3 MAINTENANCE PLAN

The Responsible Party will incorporate a routine maintenance program to assure proper operation of the stormwater management system. Maintenance will be performed on the results of the inspections in accordance with the schedules identified in Table 6.1 The program will include the following maintenance activities:

Bioswale

- Perform inspections twice during the first year and annually for leaf litter/other debris that might have accumulated within the bioswale. If leaf litter or other debris is impeding the functionality of the bioswale, it shall be removed immediately.
- Inlet swale shall be examined at least once a year and verify that no blockage has occurred.

Porous Pavement

- Perform inspections at least three times annually.
- Inspect the surface for evidence of sediment deposition, organic debris, water staining or ponding that may indicate surface ponding at least three times per year. If clogging is identified, schedule a vacuum sweeper to remove deposited material.
- Inspect pavement surface for signs of surface deterioration, such as slumping or cracking.

Stormwater Emergency Spillway

- Inspect once per year, typically in the spring.
- Inspect for washouts and repair if necessary.
- Remove vegetation and debris from blocking the outfall.

6.4 LONG TERM POLLUTION PREVENTION MAINTENANCE

The Responsible Party will incorporate a routine maintenance program to ensure the continued effectiveness of the structural water quality controls. Maintenance will be performed based on the results of inspections in accordance with the schedules identified below. The program will include the following maintenance activities:

Maintenance of Pavement Systems

Regular maintenance of pavement surfaces will prevent pollutants such as oil and grease, trash, and sediments from entering the stormwater management system. The following practices should be performed:

- Sweep or vacuum asphalt pavement areas annually with a commercial cleaning unit and dispose of removed material.
- Routinely pick up and remove litter from the parking areas, islands, and perimeter landscaping.

Maintenance of Vegetated Areas

Proper maintenance of vegetated areas can prevent the pollution of stormwater runoff by controlling the source of pollutants such as suspended sediments, excess nutrients, and chemicals from landscape care products. Practices that should be followed under the regular maintenance of the vegetated landscape include:

- Inspect planted areas on a semi-annual basis and remove any litter.
- Maintain planted areas adjacent to pavement to prevent soil washout.
- Immediately clean any soil deposited on pavement.
- Re-seed bare areas: install appropriate erosion control measures when native soil is exposed, or erosion channels are forming.
- Plant alternative mixture of grass species in the event of unsuccessful establishment.
- Grass vegetation should not be cut to a height less than four inches.
- Pesticide/Herbicide Usage – No pesticides are to be used unless a single spot treatment is required for a specific control application.
- Fertilizer usage should be avoided. If deemed necessary, slow-release fertilizer should be used. Fertilizer may be used to begin the establishment of vegetation in bare or damaged areas but should not be applied on a regular basis unless necessary.

Management of Snow and Ice

Should significant snow fall events occur, which result in stockpiled snow impacting the operation of the Project Site, through the temporary loss of parking or limiting access in any way, the property manager may choose to have snow removed from the site. All snow removal operations will be done in accordance with Massachusetts DEP guidelines BRPG01-01, effective date March 8, 2001.

Salt and Deicing Chemicals

The amount of sand to be used on the site shall be reduced to the minimum amount needed to provide safe pedestrian and vehicle travel. The following practices should be followed to control the amount of sand that comes into contact with stormwater runoff:

- Devices used for spreading salt should be capable of varying the rate of application based on the site-specific conditions.
- Sand should be stockpiled under covered storage facilities that prevent precipitation and adjacent runoff from coming in contact with the deicing materials.
- The use of any salts or deicing chemicals is strictly prohibited.

6.5 OWNER TRAINING

Training of owner and end-user is essential to achieving proper operation and maintenance of the stormwater management system. Therefore, those who are responsible for operation and maintenance will be trained on the following subjects:

- Environmental laws and regulations relating to stormwater,
- The components and goals of the current Erosion and Sediment Control Plan,
- Site specific permit conditions and requirements,
- General Facility spill response procedures,
- General good housekeeping procedures, and
- General material management procedures.

Refresher training sessions will be held once a year following the completion of the Site Compliance Evaluation.

6.6 RECORDKEEPING

Owner shall submit annual stormwater monitoring and maintenance reports to the DEC addressing inspection and maintenance of the BMPs. The reports shall include:

1. Descriptions of the condition of the BMPs;
2. Descriptions of maintenance performed; and
3. Receipts for maintenance performed.

For ease of reporting, the DEC and MassDevelopment have created standard annual reporting templates for owner use.

Table 6.1 - Stormwater Operations and Maintenance Log

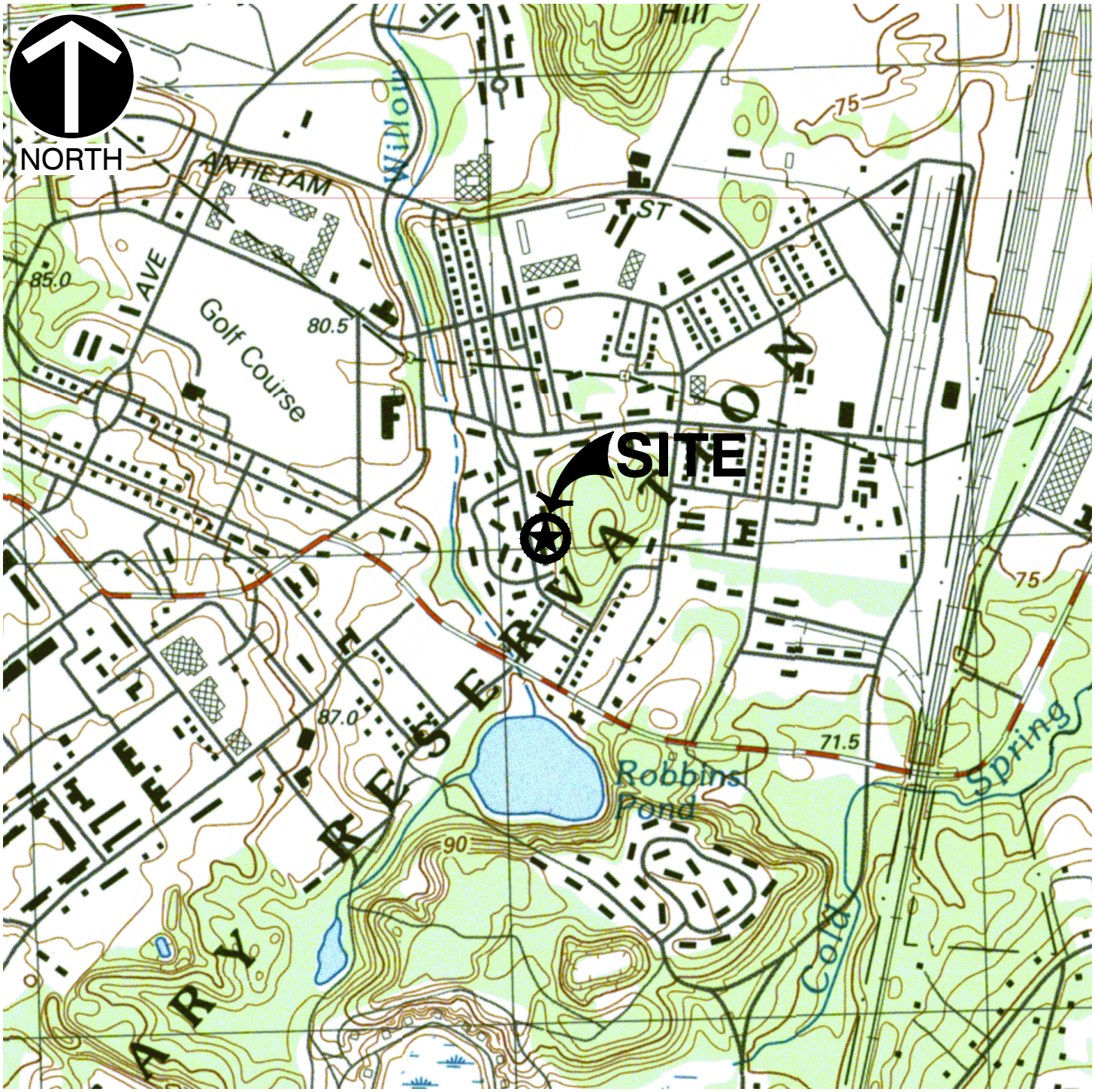
Project Name: 25 Adams Circle - Multifamily Redevelopment
Project Location: 25 Adams Circle, Devens, MA
Project Number: 348-019

Date: 9/15/2025
Prepared By: MKB
Approved By: BEP

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning or Repair Needed (List Items if Required)	Date of Cleaning or Repair	Performed by
Bioswale	Inspect monthly for the first three months. Then, at a minimum, the bioswale is to be inspected twice annually, typically in the spring and fall.			The bioswale will be inspected twice during for the first year and annually for leaf litter/other debris that might have accumulated within the bioswale. If leaf litter or other debris is impeding the functionality of the bioswale, it shall be removed immediately. The inlet swales, and emergency spillway will be examined at least once each year and verified that no blockage has occurred.			
Porous Pavement	Inspect minimum three times per year.			Inspect the surface for evidence of sediment deposition, organic debris, water staining or ponding that may indicate surface ponding at least three times per year. If clogging is identified, schedule a vacuum sweeper to remove deposited material. Inspect pavement surface for signs of surface deterioriation, such as slumping or cracking.			
Emergency Spillway	Inspect once per year, typically in the spring.			Inspect for washouts and repair if necessary. Remove vegetation and debris from blocking spillway.			
Vegetated Areas	Inspect twice per year, typically in the spring and fall.			Perform maintenance on a regular basis during the growing season. Mow grassed areas on a regular basis to maintain growth. Plant alternative mixture of grass species in the event of unsuccessful establishment. Grass vegetation should not be cut to a height less than six inches. Maintain planted areas adjacent to pavement to prevent soil washout and immediately clean any soil deposited on pavement. Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming. Remove trash, sediment debris and invasive vegetation.			

Stormwater Supervisor Contact Information:_____

FIGURES



REFERENCE

1. U.S.G.S. 7.5' TOPOGRAPHIC MAP, Q193918, Q193922, Q197918, AND Q197922 QUADRANGLES, MASSACHUSETTS DATED: JUNE 2001.

SCALE IN FEET

0 1,000 2,000

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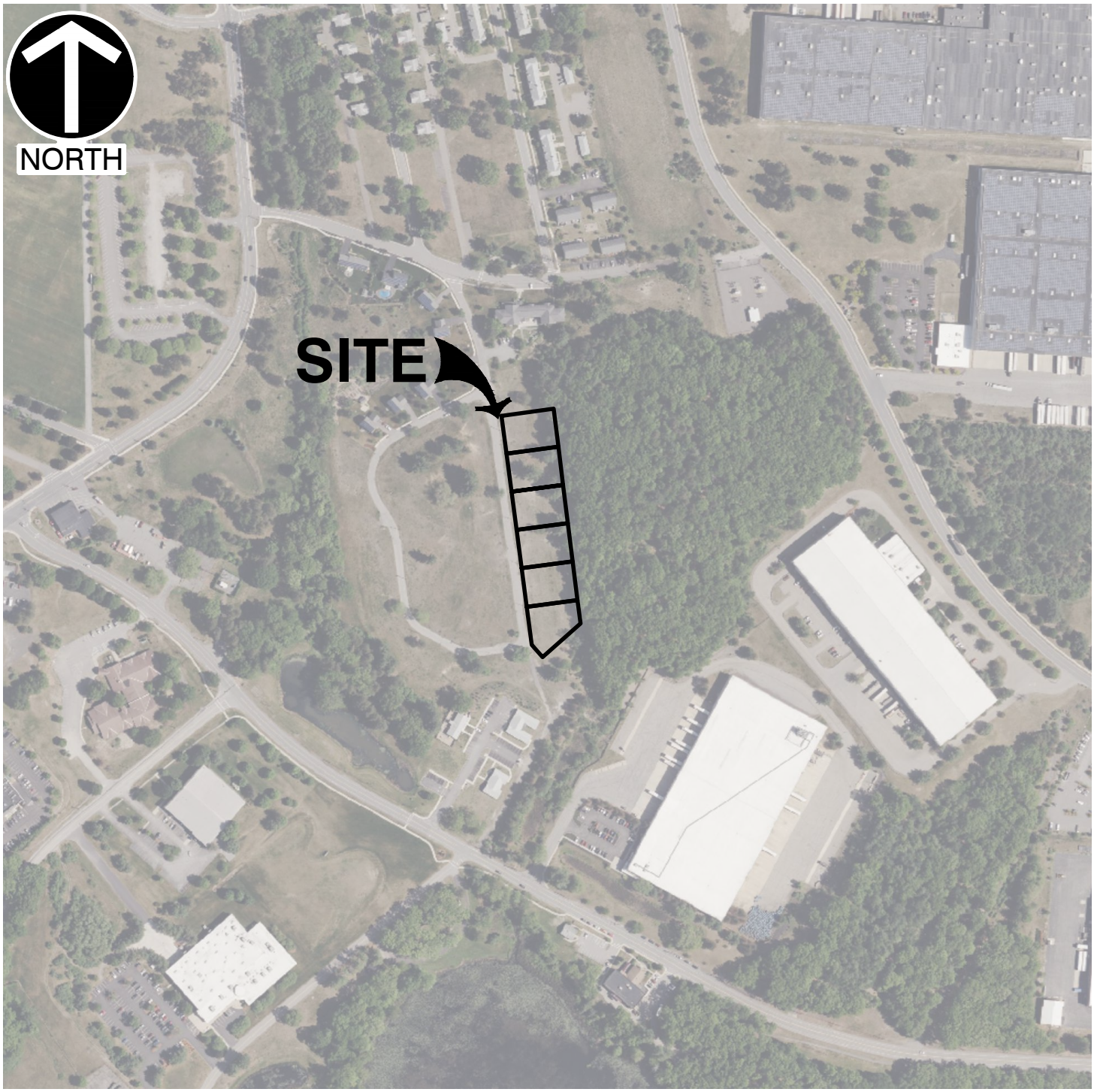
REFRAME SYSTEMS
MULTIFAMILY REDEVELOPMENT
25 ADAMS CIRCLE
DEVENS, MASSACHUSETTS

SITE LOCATION MAP

DRAWN BY:	AMB	CHECKED BY:	BEP	APPROVED BY:	MKB	FIGURE NO.:	1
DATE:	JULY 2025	DWG SCALE:	1"=1,000'	PROJECT NO:	348-019		

P:\340-000\348-019\-CADD\Dwg\SP01 - Stormwater Report Figures\348019-SP01-Site Location Map.dwg{FIGURE 1} LS:(7/25/2025 - iberl) - LP: 7/30/2025 2:52 PM



SCALE IN FEET

0 400 800

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AERIAL SITE PLAN

DRAWN BY:	AMB	CHECKED BY:	BEP	APPROVED BY:	MKB	FIGURE NO.:	2
DATE:	JULY 2025	DWG SCALE:	1"=400'	PROJECT NO:	348-019		

P:\340-000\348-019\-CADD\Dwg\SP01 - Stormwater Report Figures\348019-SP01-Site Location Map.dwg{FIGURE 2} LS:(7/25/2025 - iberl) - LP: 7/30/2025 2:52 PM

National Flood Hazard Layer FIRMette

FEMA

71°36'37"W 42°32'41"N

71°35'59"W 42°32'15"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

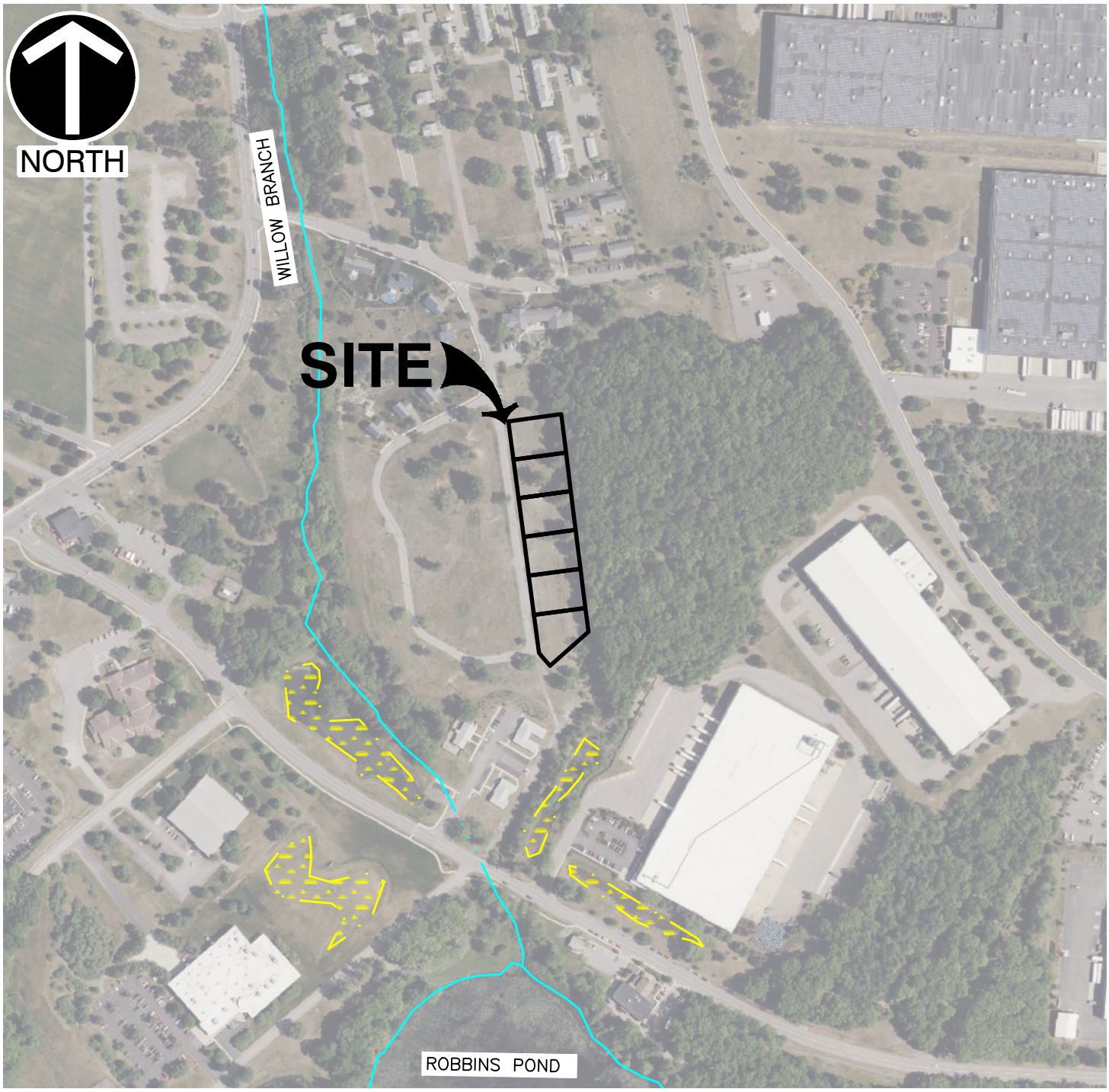
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/7/2025 at 3:02 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

FIGURE 3 - FEMA FIRMETTE



LEGEND

CRITICAL AREAS

WATER BODY (CRITICAL AREA)

SCALE IN FEET

0 400 800

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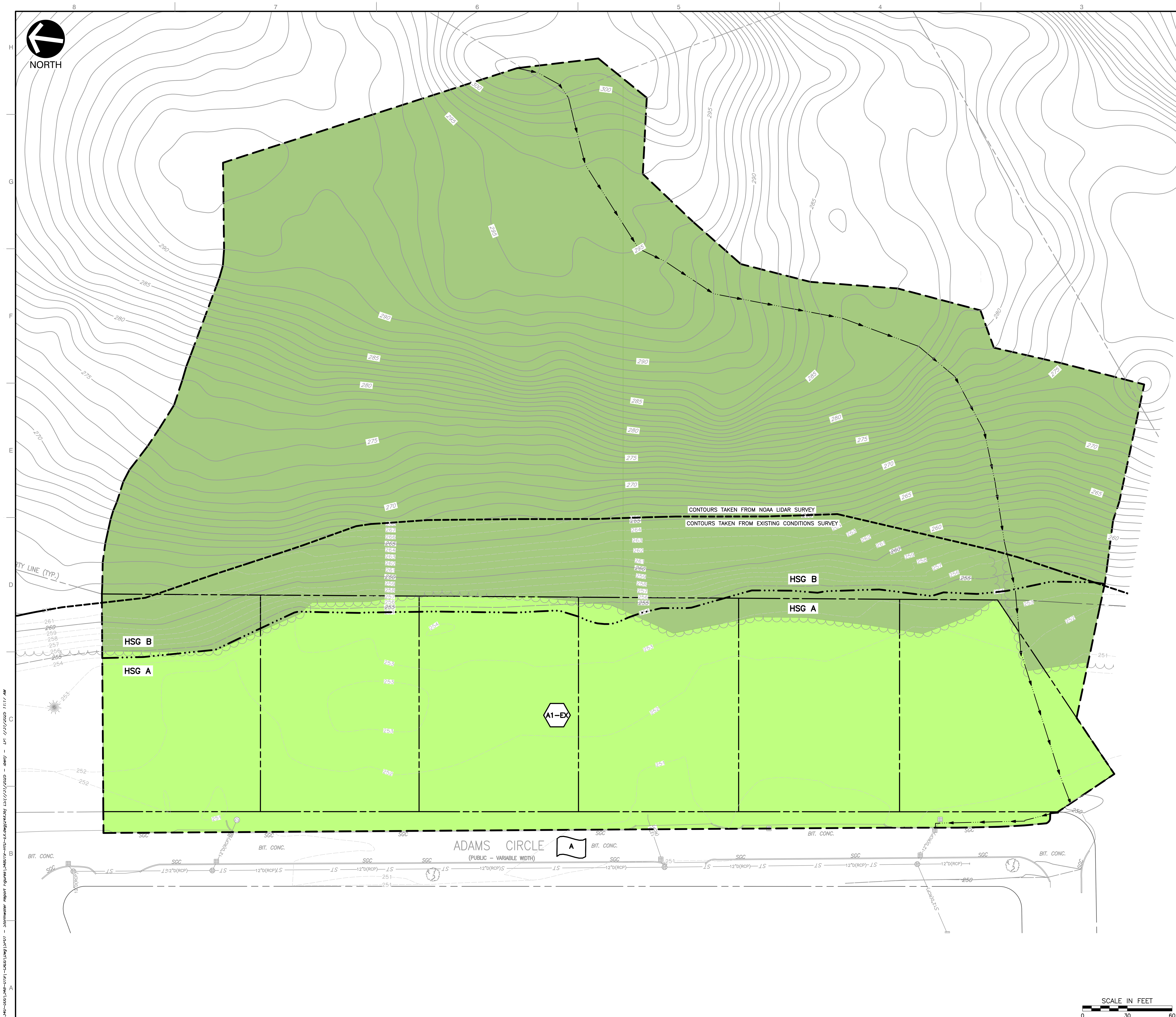
CRITICAL AREAS MAP

DRAWN BY:	MKB	CHECKED BY:	BEP	APPROVED BY:	MKB	FIGURE NO.:	4
DATE:	JULY 2025	DWG SCALE:	1"=400'	PROJECT NO:	348-019		

P:\340-000\348-019\-CADD\Dwg\SP01 - Stormwater Report Figures\348019-SP01-Site Location Map.dwg{FIGURE 4} LS:(7/31/2025 - mbruckman) - LP: 7/31/2025 12:16 PM



LEGEND

- A — DESIGN POINT
- A1 — SUBCATCHMENT AREA
- P1 — POND/DETENTION AREA
- SUBCATCHMENT BOUNDARY
- TIME OF CONCENTRATION PATH
- HYDROLOGIC SOIL GROUP BOUNDARY
- VEGETATED AREA
- WOODED AREA

REFERENCE

1. EXISTING SITE INFORMATION/TOPOGRAPHIC SURVEY WAS PERFORMED BY FELDMAN GEOSPATIAL AS SHOWN ON PLAN ENTITLED "EXISTING CONDITIONS PLAN OF LAND 25 ADAMS CIRCLE DEVENS (HARVARD), MASS.," DATED APRIL 24, 2025.
2. VERTICAL ELEVATIONS REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
3. THE SUBJECT PROPERTY IS LOCATED IN "OTHER AREAS" FLOOD "ZONE X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN) BASED ON THE FLOOD INSURANCE RATE MAP, MAP NO.: 25027C0311E, WITH A MAP REVISED DATE OF JULY 4, 2011.

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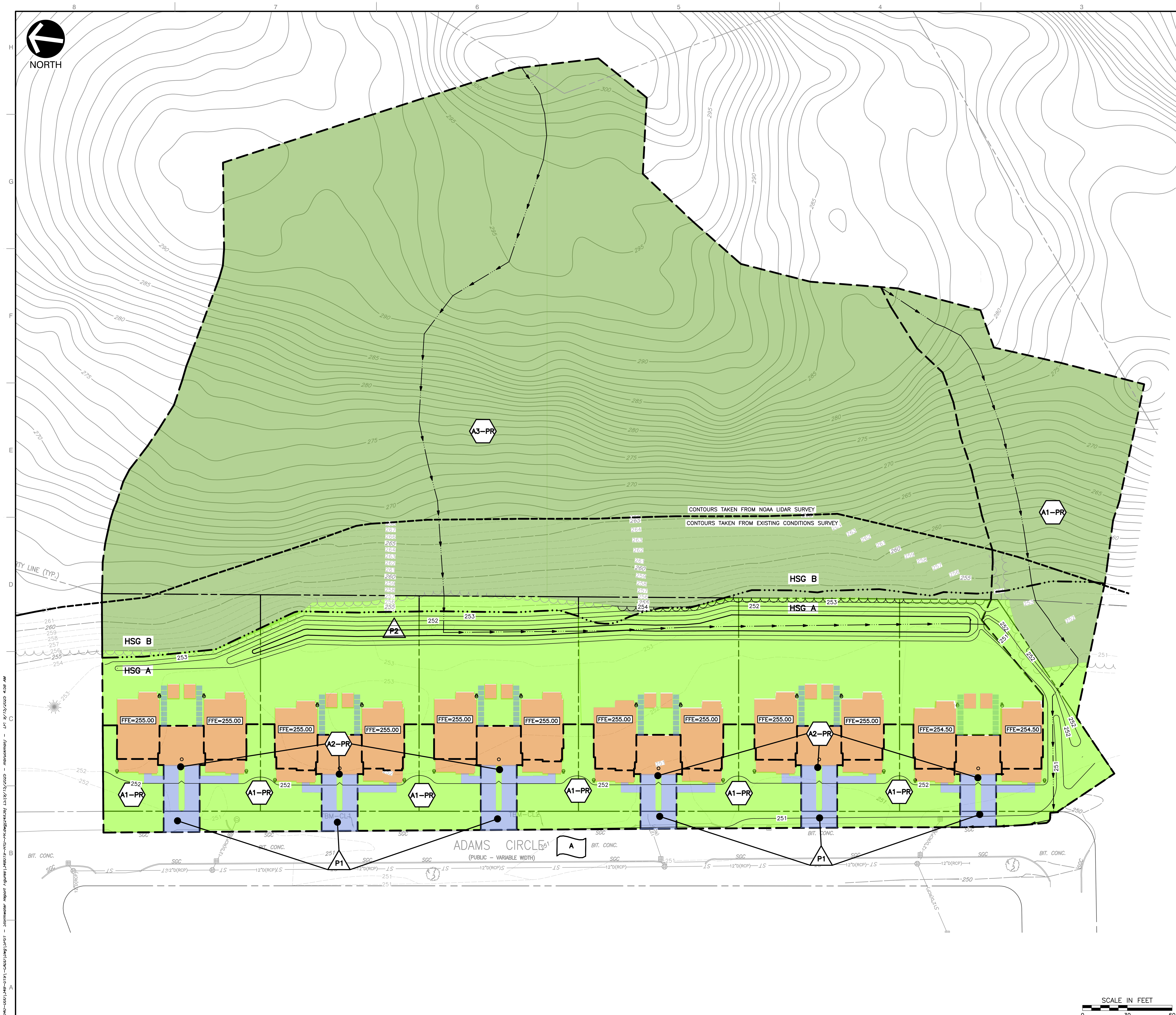
DRAWN BY:	ITB	CHECKED BY:	BEP	APPROVED BY:	MKB
DATE:	JULY 2025	DWG SCALE:	1"=30'	PROJECT NO:	348-019

EXISTING DRAINAGE AREA MAP

DRAWING NO.: **HYD-EX**



LEGEND

Symbol	Description
A	DESIGN POINT
A1	SUBCATCHMENT AREA
P1	POND/DETENTION AREA
	SUBCATCHMENT BOUNDARY
	TIME OF CONCENTRATION PATH
	HYDROLOGIC SOIL GROUP BOUNDARY
	VEGETATED AREA
	WOODED AREA
	PAVED AREA
	ROOF AREA

REFERENCE

1. EXISTING SITE INFORMATION/TOPOGRAPHIC SURVEY WAS PERFORMED BY FELDMAN GEOSPATIAL AS SHOWN ON PLAN ENTITLED "EXISTING CONDITIONS PLAN OF LAND 25 ADAMS CIRCLE DEVENS (HARVARD), MASS.," DATED APRIL 24, 2025.
2. VERTICAL ELEVATIONS REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
3. THE SUBJECT PROPERTY IS LOCATED IN "OTHER AREAS" FLOOD "ZONE X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN) BASED ON THE FLOOD INSURANCE RATE MAP, MAP NO.: 25027C0311E, WITH A MAP REVISED DATE OF JULY 4, 2011.
4. PROPOSED PROPERTY LINES SHOWN ARE BASED ON THE PROPOSED LOTTING PLAN PREPARED BY WSP USA INC. TITLED "LEVEL 1 LOTTING PLAN ADAMS CIRCLE" PREPARED FOR MASSACHUSETTS DEVELOPMENT FINANCE AGENCY, DATED 6/12/2025. AT THE DATE OF PLAN ISSUE, IT IS OUR UNDERSTANDING THAT THIS LOTTING PLAN HAS NOT YET BEEN FINALIZED OR RECORDED, AS SUCH PROPOSED PROPERTY LINES ARE SUBJECT TO CHANGE.

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REFRAME SYSTEMS MULTIFAMILY DEVELOPMENT 25 ADAMS CIRCLE DEVENS, MASSACHUSETTS

DRAWN BY:	ITB	CHECKED BY:	BEP	APPROVED BY:	MKB
DATE:	SEPT 2025	DWG SCALE:	1"=30'	PROJECT NO:	348-019

PROPOSED DRAINAGE AREA MAP

DRAWING NO.: **HYD-PR**

APPENDIX A

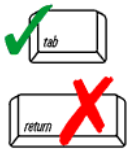
DEP STORMWATER CHECKLIST

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.

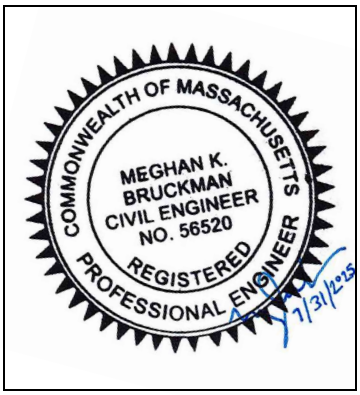
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



7/31/2025
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): Proposed Rain Garden & Proposed Porous Pavement

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

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☒ Simple Dynamic ☐ Dynamic 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

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)

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

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 B

GEOTECHNICAL INFORMATION

NRCS Soil Resource Report
Geotechnical Report *(under separate cover)*

NRCS Soil Resource Report

United States Department of Agriculture

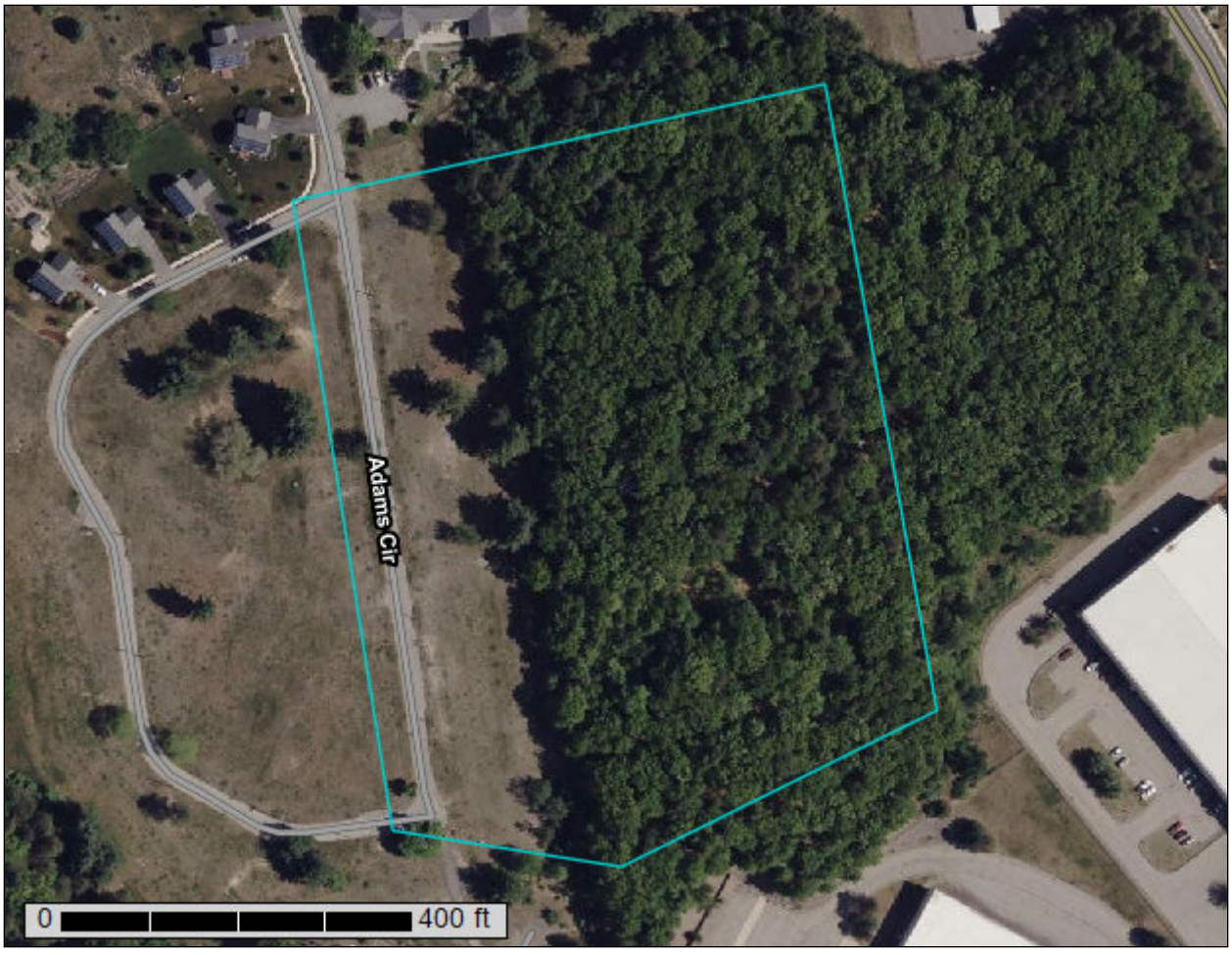
NRCS

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 Worcester County, Massachusetts, Northeastern Part

25 Adams Circle - Multifamily Development



July 30, 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.

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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.

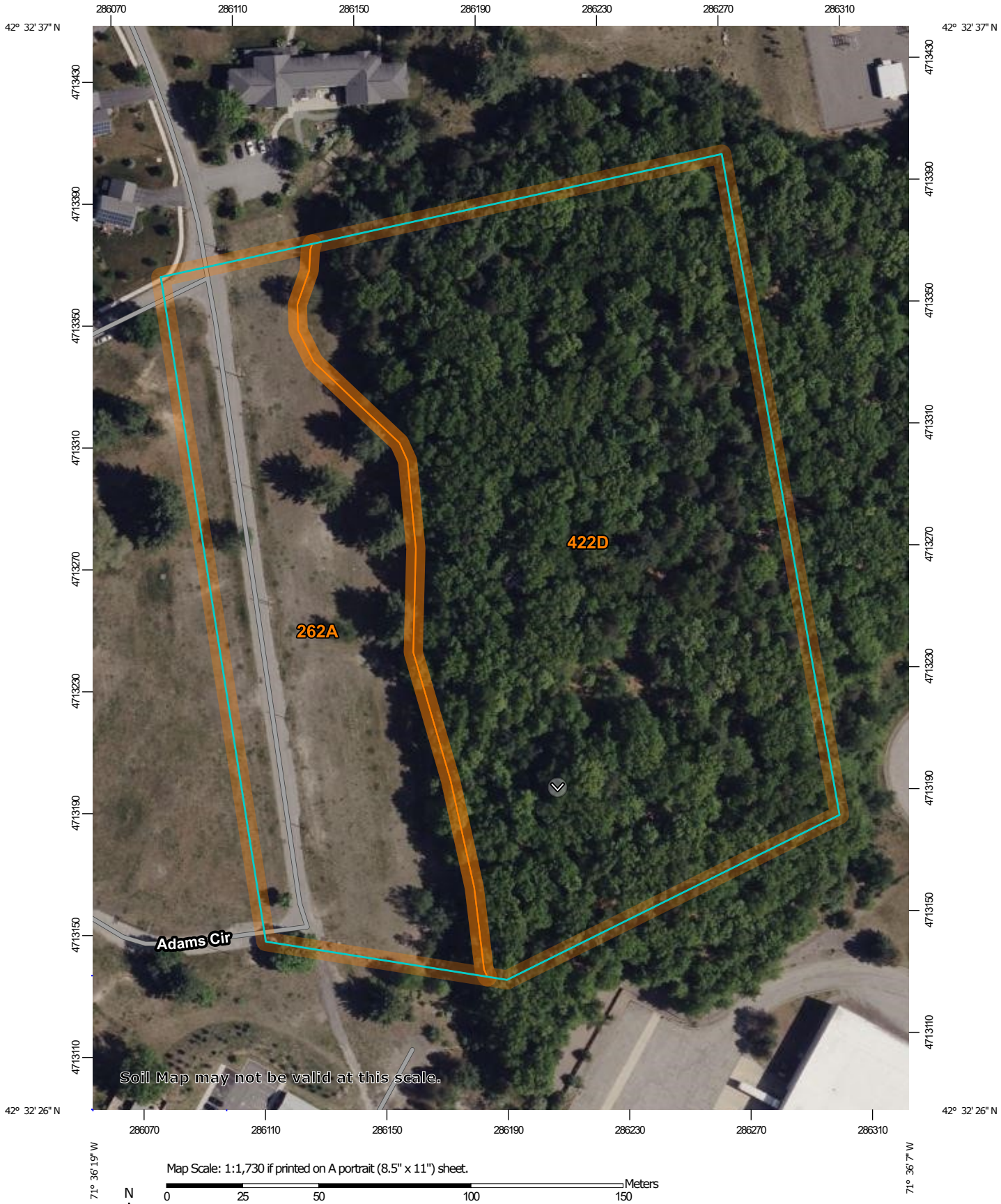
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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: 1:1,730 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

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 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Worcester County, Massachusetts, Northeastern Part
Survey Area Data: Version 19, 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

MAP LEGEND

MAP INFORMATION

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
262A	Quonset loamy sand, 0 to 3 percent slopes	3.6	32.7%
422D	Canton fine sandy loam, 15 to 35 percent slopes, extremely stony	7.5	67.3%
Totals for Area of Interest		**11.2**	**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.

Worcester County, Massachusetts, Northeastern Part

262A—Quonset loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: w3m5
Elevation: 0 to 1,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Quonset

Setting

Landform: Terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loose sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 3 inches: loamy sand
H2 - 3 to 6 inches: channery loamy sand
H3 - 6 to 18 inches: very channery loamy sand
H4 - 18 to 60 inches: stratified very channery coarse sand to very channery sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (2.00 to 20.00 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): 3s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent

Hydric soil rating: No

Windsor

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

Deerfield

Percent of map unit: 5 percent
Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

422D—Canton fine sandy loam, 15 to 35 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w81j
Elevation: 0 to 1,340 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Canton, Extremely Stony

Setting

Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 35 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent

Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Medium
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Montauk, extremely stony

Percent of map unit: 6 percent
Landform: Recessionial moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton, extremely stony

Percent of map unit: 6 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony

Percent of map unit: 4 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Hollis, extremely stony

Percent of map unit: 4 percent
Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

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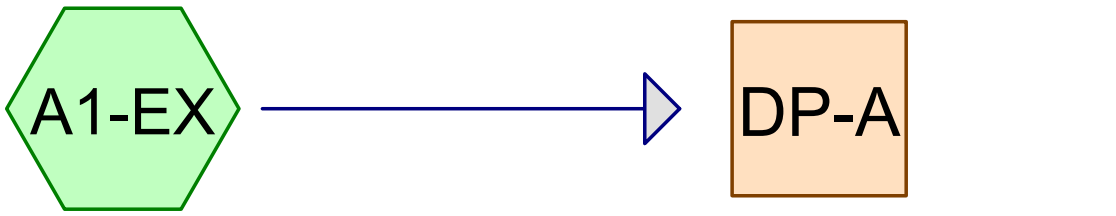
APPENDIX C

SUPPORTING CALCULATIONS

HydroCAD Drainage Analysis
TSS Calculations
Water Quality Volume Calculations
Groundwater Recharge Calculations

HydroCAD Drainage Analysis



A1-EX

ADAMS CIRCLE - MUNICIPAL SYSTEM

Subcat Reach Pond Link

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA10 24-hr	D	Default	24.00	1	3.14	2
2	10-Year	NOAA10 24-hr	D	Default	24.00	1	4.81	2
3	25-Year	NOAA10 24-hr	D	Default	24.00	1	5.85	2
4	50-Year	NOAA10 24-hr	D	Default	24.00	1	6.62	2
5	100-Year	NOAA10 24-hr	D	Default	24.00	1	7.46	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.051	39	>75% Grass cover, Good, HSG A (A1-EX)
0.050	61	>75% Grass cover, Good, HSG B (A1-EX)
0.173	30	Woods, Good, HSG A (A1-EX)
3.955	55	Woods, Good, HSG B (A1-EX)
6.230	**49**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.224	HSG A	A1-EX
4.006	HSG B	A1-EX
0.000	HSG C	
0.000	HSG D	
0.000	Other	
6.230		**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
2.051	0.050	0.000	0.000	0.000	2.102	>75% Grass cover, Good	A1-EX
0.173	3.955	0.000	0.000	0.000	4.129	Woods, Good	A1-EX
2.224	**4.006**	**0.000**	**0.000**	**0.000**	**6.230**	**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	A1-EX	0.00	0.00	592.0	0.0068	0.015	0.0	12.0	1.0	

Summary for Subcatchment A1-EX: A1-EX

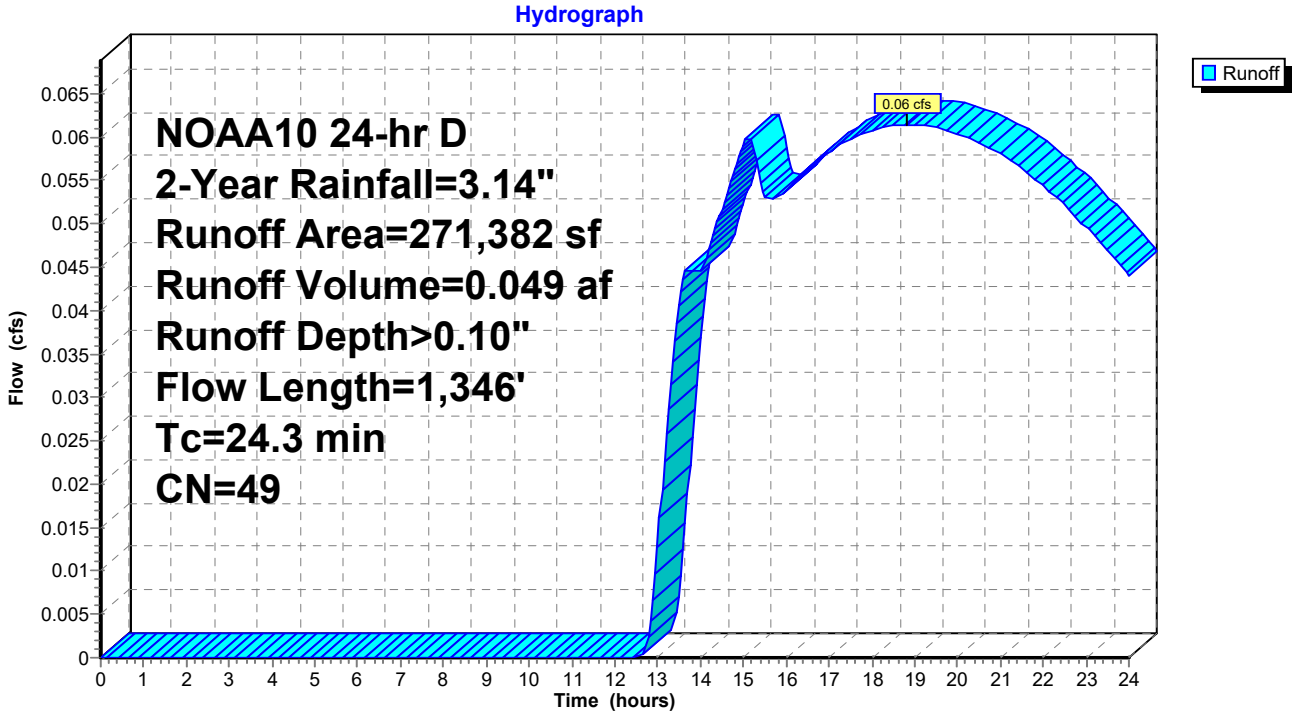
Runoff = 0.06 cfs @ 18.80 hrs, Volume= 0.049 af, Depth> 0.10"
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.14"

Area (sf)	CN	Description
89,344	39	>75% Grass cover, Good, HSG A
7,551	30	Woods, Good, HSG A
172,289	55	Woods, Good, HSG B
2,198	61	>75% Grass cover, Good, HSG B
271,382	49	Weighted Average
271,382		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	50	0.1000	0.07		**Sheet Flow, Wooded Area** Woods: Dense underbrush n= 0.800 P2= 3.20"
4.5	305	0.0500	1.12		**Shallow Concentrated Flow, Moderate sloped woods** Woodland Kv= 5.0 fps
1.3	160	0.1700	2.06		**Shallow Concentrated Flow, Steep woodlands** Woodland Kv= 5.0 fps
1.0	57	0.0350	0.94		**Shallow Concentrated Flow, Flat woodlands** Woodland Kv= 5.0 fps
2.3	122	0.0160	0.89		**Shallow Concentrated Flow, Grassed Area** Short Grass Pasture Kv= 7.0 fps
0.8	60	0.0035	1.20		**Shallow Concentrated Flow, Asphalt pavement** Paved Kv= 20.3 fps
3.1	592	0.0068	3.18	2.40	**Pipe Channel, Municipal Drain** 12.0" Round w/ 1.0" inside fill Area= 0.8 sf Perim= 3.1' r= 0.24' n= 0.015 Concrete sewer w/manholes & inlets
24.3	1,346	Total			

Subcatchment A1-EX: A1-EX

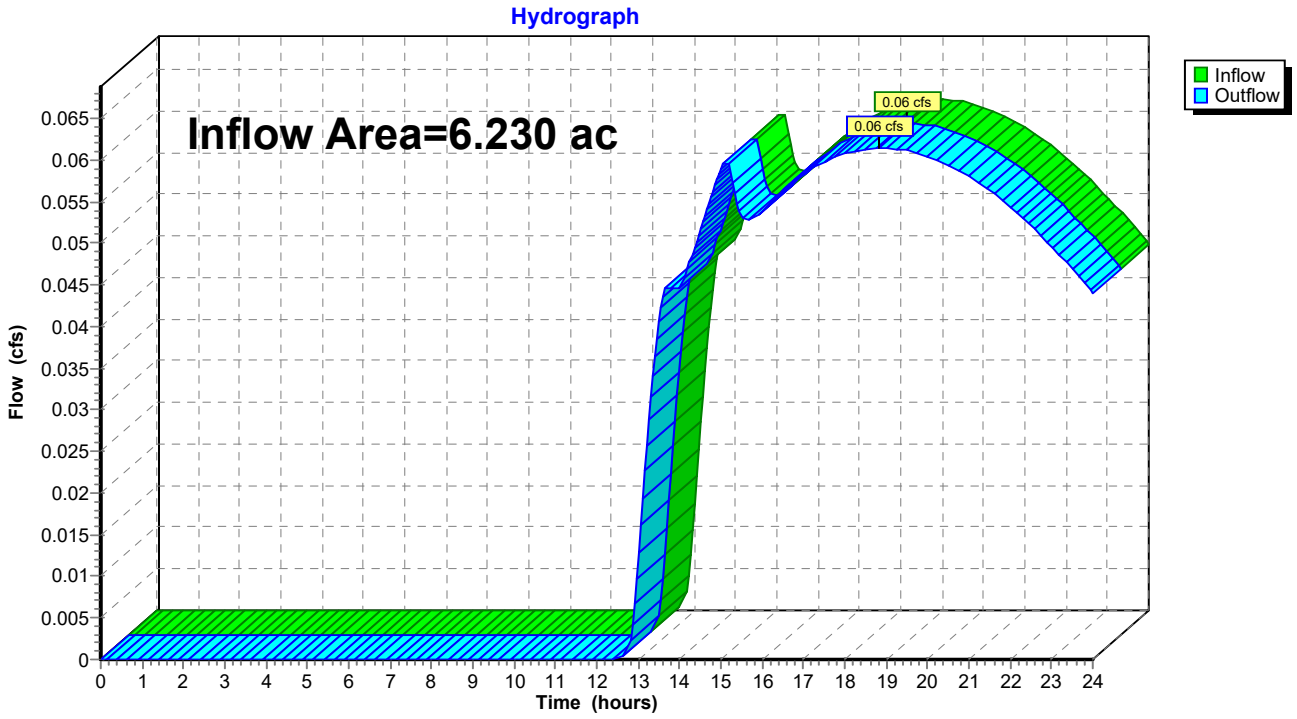


Summary for Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM

Inflow Area = 6.230 ac, 0.00% Impervious, Inflow Depth > 0.10" for 2-Year event
Inflow = 0.06 cfs @ 18.80 hrs, Volume= 0.049 af
Outflow = 0.06 cfs @ 18.80 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM



Summary for Subcatchment A1-EX: A1-EX

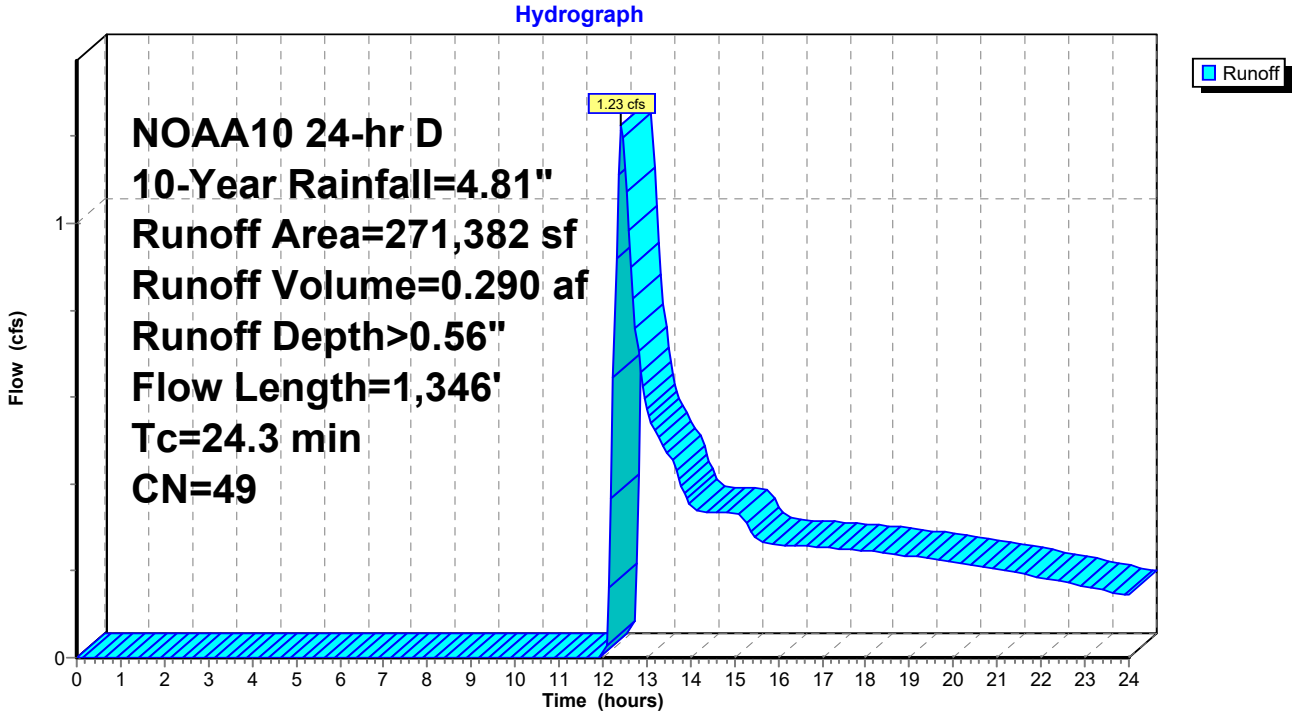
Runoff = 1.23 cfs @ 12.43 hrs, Volume= 0.290 af, Depth> 0.56"
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=4.81"

Area (sf)	CN	Description
89,344	39	>75% Grass cover, Good, HSG A
7,551	30	Woods, Good, HSG A
172,289	55	Woods, Good, HSG B
2,198	61	>75% Grass cover, Good, HSG B
271,382	49	Weighted Average
271,382		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	50	0.1000	0.07		**Sheet Flow, Wooded Area** Woods: Dense underbrush n= 0.800 P2= 3.20"
4.5	305	0.0500	1.12		**Shallow Concentrated Flow, Moderate sloped woods** Woodland Kv= 5.0 fps
1.3	160	0.1700	2.06		**Shallow Concentrated Flow, Steep woodlands** Woodland Kv= 5.0 fps
1.0	57	0.0350	0.94		**Shallow Concentrated Flow, Flat woodlands** Woodland Kv= 5.0 fps
2.3	122	0.0160	0.89		**Shallow Concentrated Flow, Grassed Area** Short Grass Pasture Kv= 7.0 fps
0.8	60	0.0035	1.20		**Shallow Concentrated Flow, Asphalt pavement** Paved Kv= 20.3 fps
3.1	592	0.0068	3.18	2.40	**Pipe Channel, Municipal Drain** 12.0" Round w/ 1.0" inside fill Area= 0.8 sf Perim= 3.1' r= 0.24' n= 0.015 Concrete sewer w/manholes & inlets
24.3	1,346	Total			

Subcatchment A1-EX: A1-EX

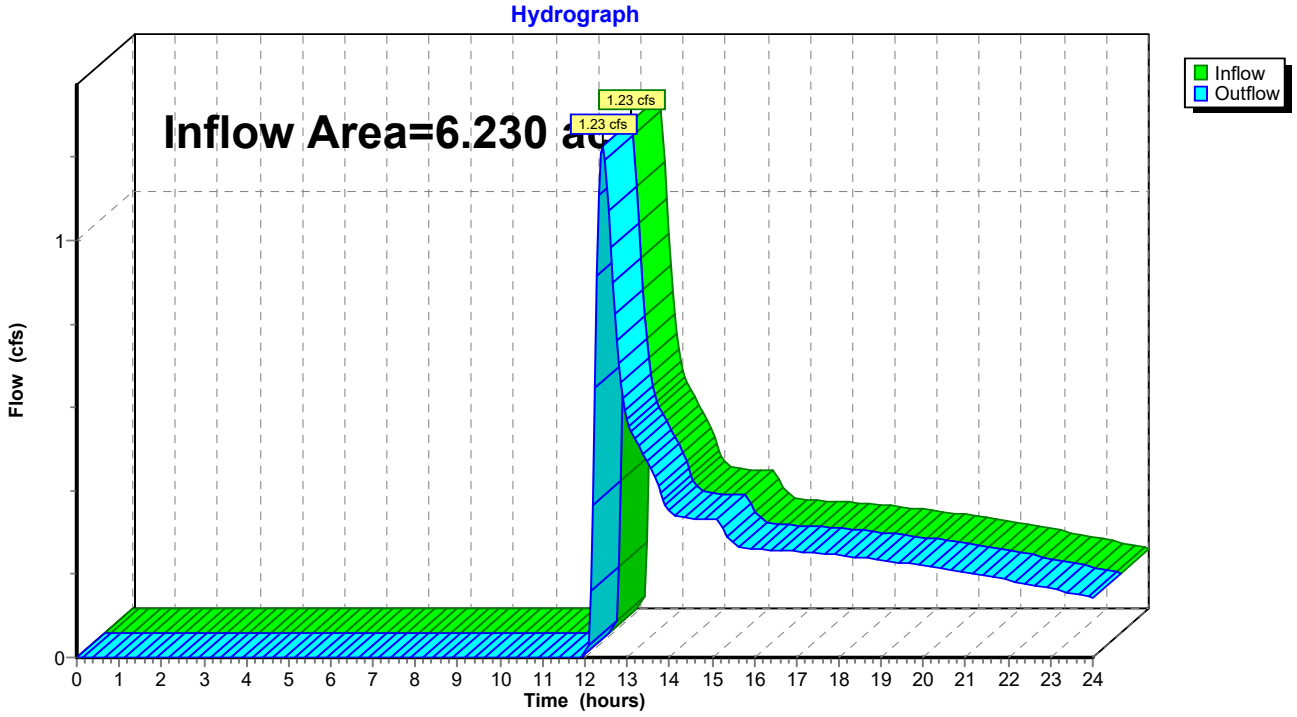


Summary for Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM

Inflow Area = 6.230 ac, 0.00% Impervious, Inflow Depth > 0.56" for 10-Year event
Inflow = 1.23 cfs @ 12.43 hrs, Volume= 0.290 af
Outflow = 1.23 cfs @ 12.43 hrs, Volume= 0.290 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM



Summary for Subcatchment A1-EX: A1-EX

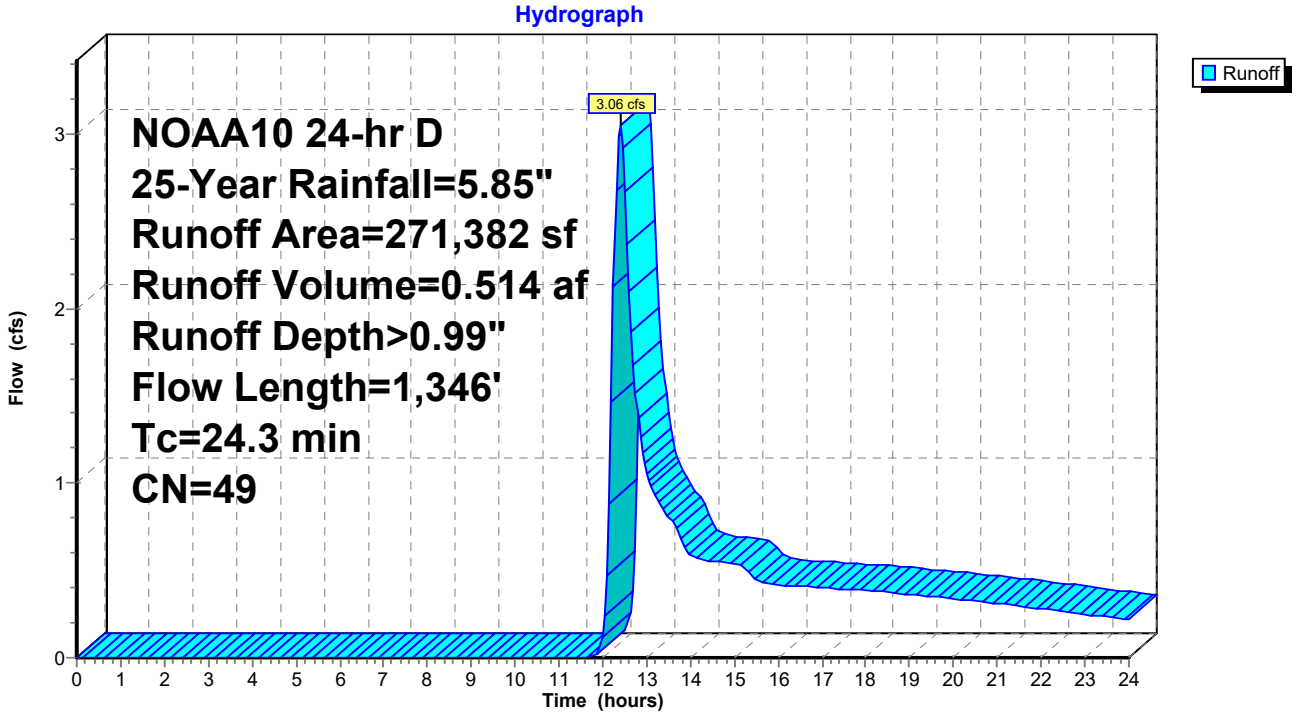
Runoff = 3.06 cfs @ 12.39 hrs, Volume= 0.514 af, Depth> 0.99"
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=5.85"

Area (sf)	CN	Description
89,344	39	>75% Grass cover, Good, HSG A
7,551	30	Woods, Good, HSG A
172,289	55	Woods, Good, HSG B
2,198	61	>75% Grass cover, Good, HSG B
271,382	49	Weighted Average
271,382		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	50	0.1000	0.07		**Sheet Flow, Wooded Area** Woods: Dense underbrush n= 0.800 P2= 3.20"
4.5	305	0.0500	1.12		**Shallow Concentrated Flow, Moderate sloped woods** Woodland Kv= 5.0 fps
1.3	160	0.1700	2.06		**Shallow Concentrated Flow, Steep woodlands** Woodland Kv= 5.0 fps
1.0	57	0.0350	0.94		**Shallow Concentrated Flow, Flat woodlands** Woodland Kv= 5.0 fps
2.3	122	0.0160	0.89		**Shallow Concentrated Flow, Grassed Area** Short Grass Pasture Kv= 7.0 fps
0.8	60	0.0035	1.20		**Shallow Concentrated Flow, Asphalt pavement** Paved Kv= 20.3 fps
3.1	592	0.0068	3.18	2.40	**Pipe Channel, Municipal Drain** 12.0" Round w/ 1.0" inside fill Area= 0.8 sf Perim= 3.1' r= 0.24' n= 0.015 Concrete sewer w/manholes & inlets
24.3	1,346	Total			

Subcatchment A1-EX: A1-EX

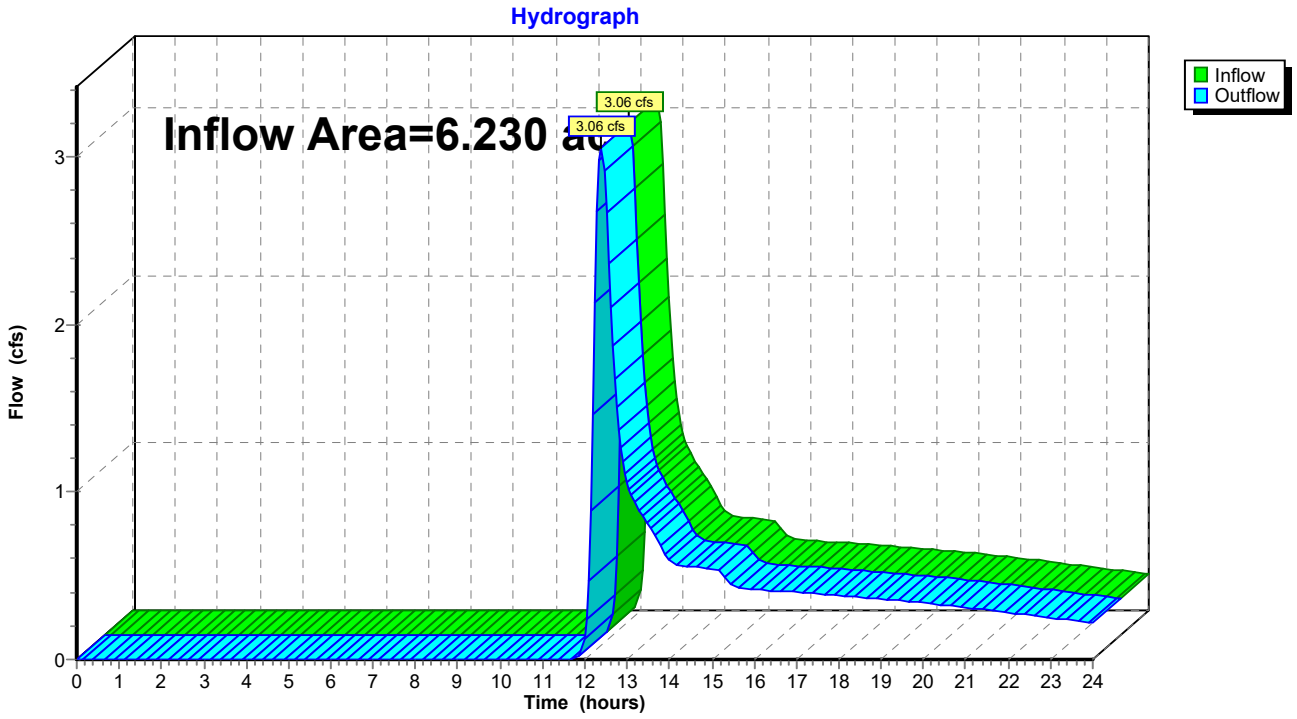


Summary for Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM

Inflow Area = 6.230 ac, 0.00% Impervious, Inflow Depth > 0.99" for 25-Year event
Inflow = 3.06 cfs @ 12.39 hrs, Volume= 0.514 af
Outflow = 3.06 cfs @ 12.39 hrs, Volume= 0.514 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM



Summary for Subcatchment A1-EX: A1-EX

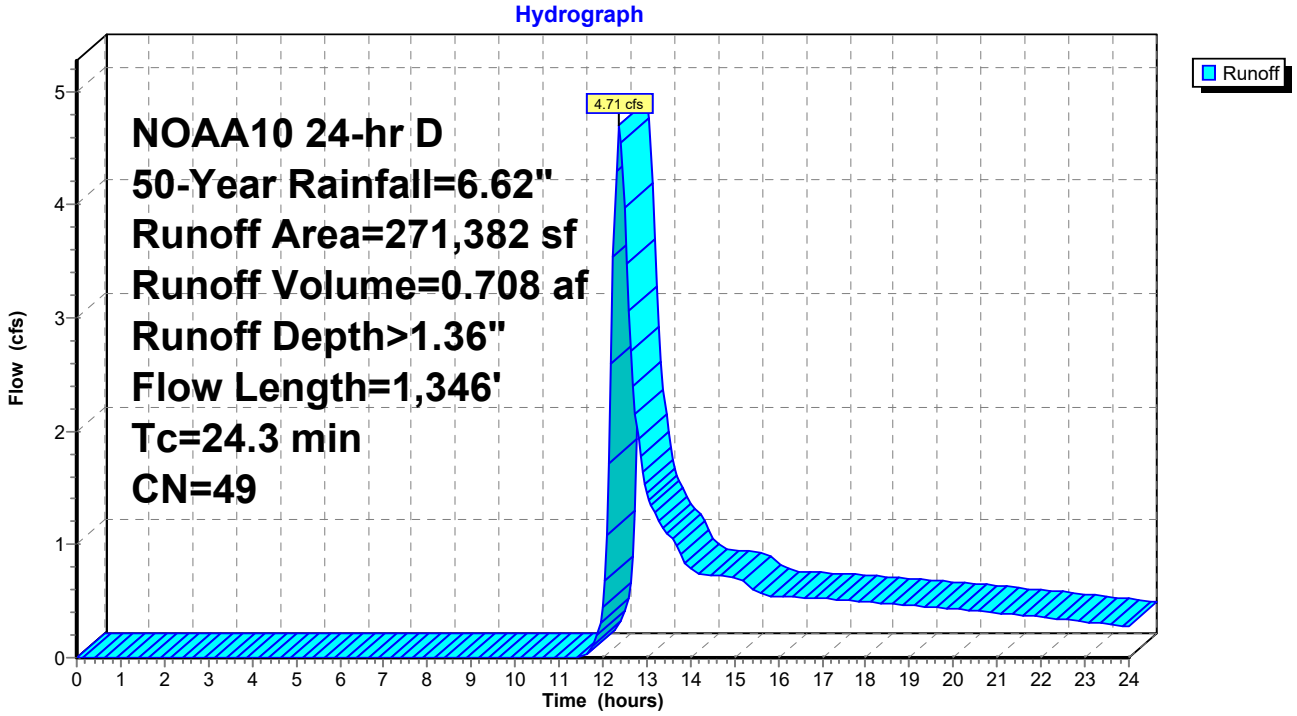
Runoff = 4.71 cfs @ 12.38 hrs, Volume= 0.708 af, Depth> 1.36"
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 50-Year Rainfall=6.62"

Area (sf)	CN	Description
89,344	39	>75% Grass cover, Good, HSG A
7,551	30	Woods, Good, HSG A
172,289	55	Woods, Good, HSG B
2,198	61	>75% Grass cover, Good, HSG B
271,382	49	Weighted Average
271,382		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	50	0.1000	0.07		**Sheet Flow, Wooded Area** Woods: Dense underbrush n= 0.800 P2= 3.20"
4.5	305	0.0500	1.12		**Shallow Concentrated Flow, Moderate sloped woods** Woodland Kv= 5.0 fps
1.3	160	0.1700	2.06		**Shallow Concentrated Flow, Steep woodlands** Woodland Kv= 5.0 fps
1.0	57	0.0350	0.94		**Shallow Concentrated Flow, Flat woodlands** Woodland Kv= 5.0 fps
2.3	122	0.0160	0.89		**Shallow Concentrated Flow, Grassed Area** Short Grass Pasture Kv= 7.0 fps
0.8	60	0.0035	1.20		**Shallow Concentrated Flow, Asphalt pavement** Paved Kv= 20.3 fps
3.1	592	0.0068	3.18	2.40	**Pipe Channel, Municipal Drain** 12.0" Round w/ 1.0" inside fill Area= 0.8 sf Perim= 3.1' r= 0.24' n= 0.015 Concrete sewer w/manholes & inlets
24.3	1,346	Total			

Subcatchment A1-EX: A1-EX

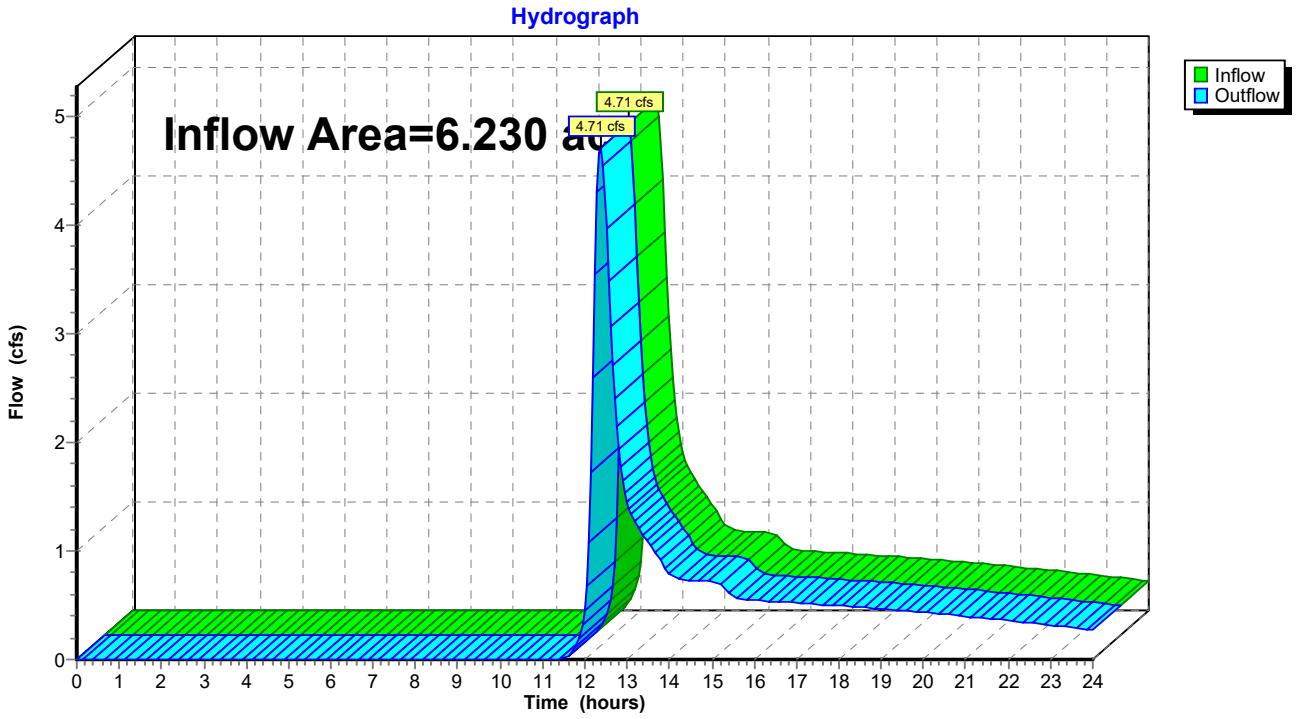


Summary for Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM

Inflow Area = 6.230 ac, 0.00% Impervious, Inflow Depth > 1.36" for 50-Year event
Inflow = 4.71 cfs @ 12.38 hrs, Volume= 0.708 af
Outflow = 4.71 cfs @ 12.38 hrs, Volume= 0.708 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM



Summary for Subcatchment A1-EX: A1-EX

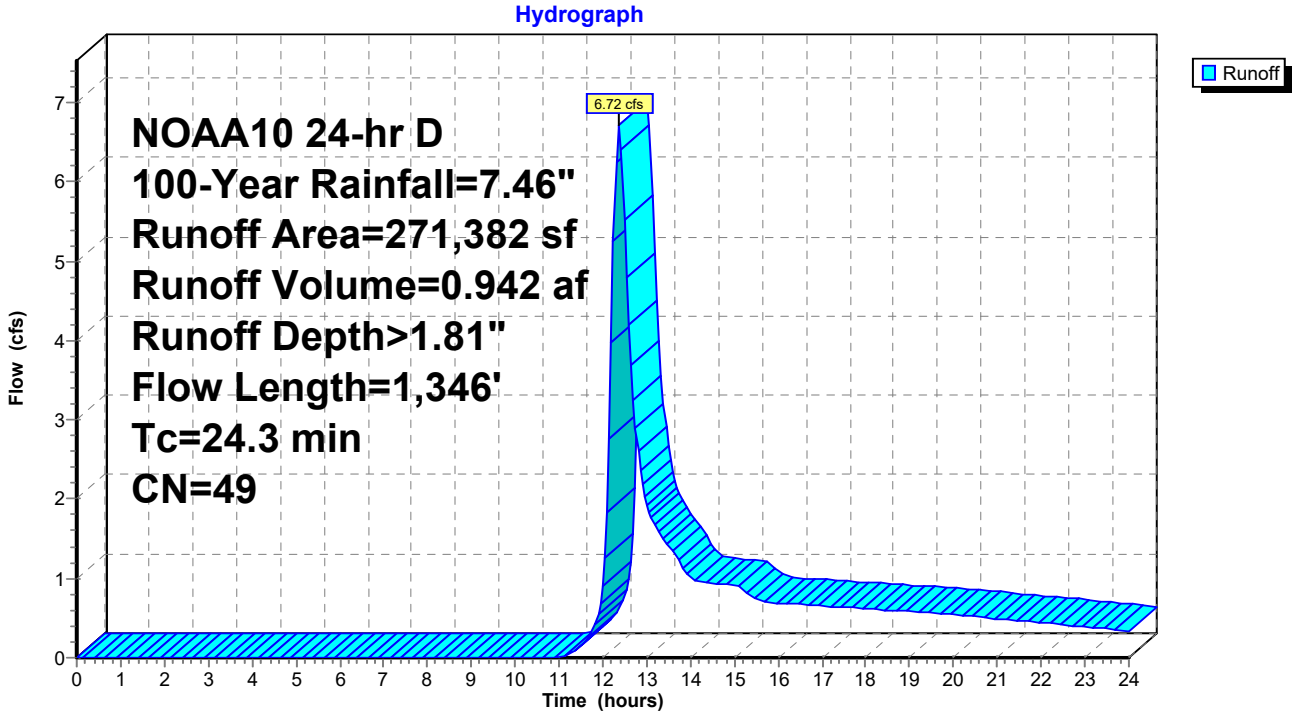
Runoff = 6.72 cfs @ 12.37 hrs, Volume= 0.942 af, Depth> 1.81"
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=7.46"

Area (sf)	CN	Description
89,344	39	>75% Grass cover, Good, HSG A
7,551	30	Woods, Good, HSG A
172,289	55	Woods, Good, HSG B
2,198	61	>75% Grass cover, Good, HSG B
271,382	49	Weighted Average
271,382		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	50	0.1000	0.07		**Sheet Flow, Wooded Area** Woods: Dense underbrush n= 0.800 P2= 3.20"
4.5	305	0.0500	1.12		**Shallow Concentrated Flow, Moderate sloped woods** Woodland Kv= 5.0 fps
1.3	160	0.1700	2.06		**Shallow Concentrated Flow, Steep woodlands** Woodland Kv= 5.0 fps
1.0	57	0.0350	0.94		**Shallow Concentrated Flow, Flat woodlands** Woodland Kv= 5.0 fps
2.3	122	0.0160	0.89		**Shallow Concentrated Flow, Grassed Area** Short Grass Pasture Kv= 7.0 fps
0.8	60	0.0035	1.20		**Shallow Concentrated Flow, Asphalt pavement** Paved Kv= 20.3 fps
3.1	592	0.0068	3.18	2.40	**Pipe Channel, Municipal Drain** 12.0" Round w/ 1.0" inside fill Area= 0.8 sf Perim= 3.1' r= 0.24' n= 0.015 Concrete sewer w/manholes & inlets
24.3	1,346	Total			

Subcatchment A1-EX: A1-EX

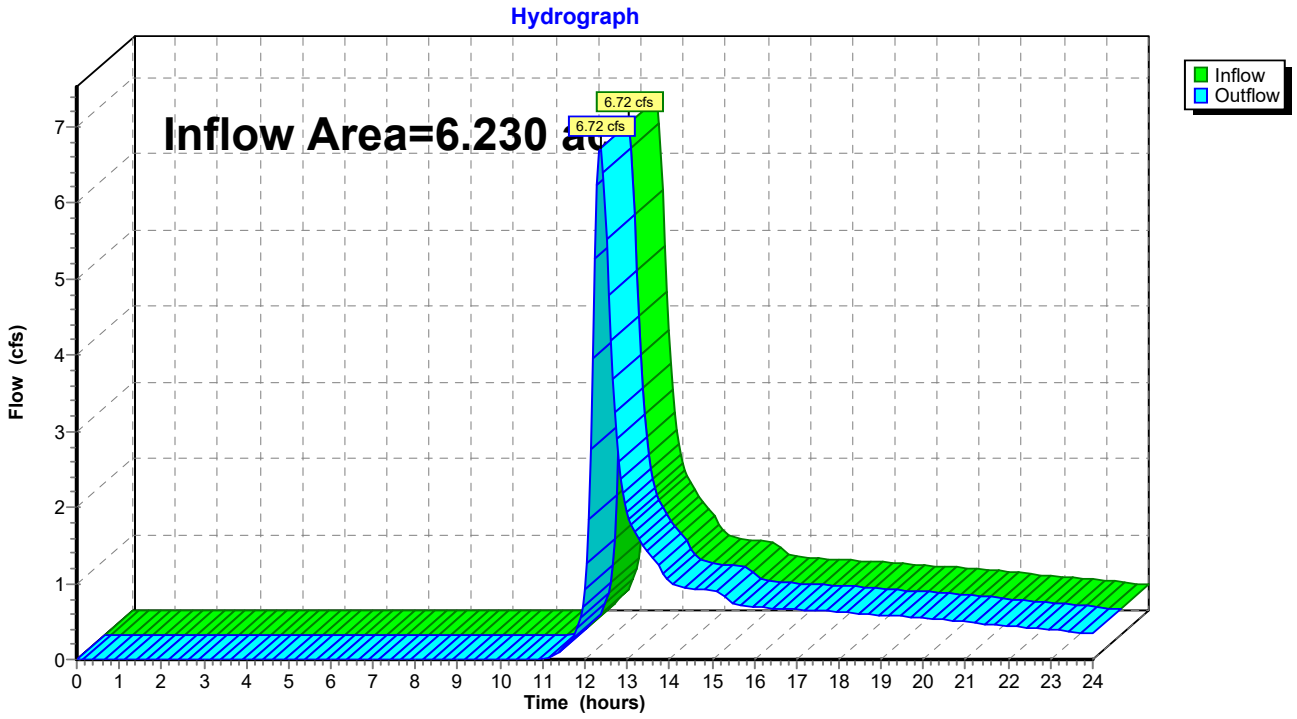


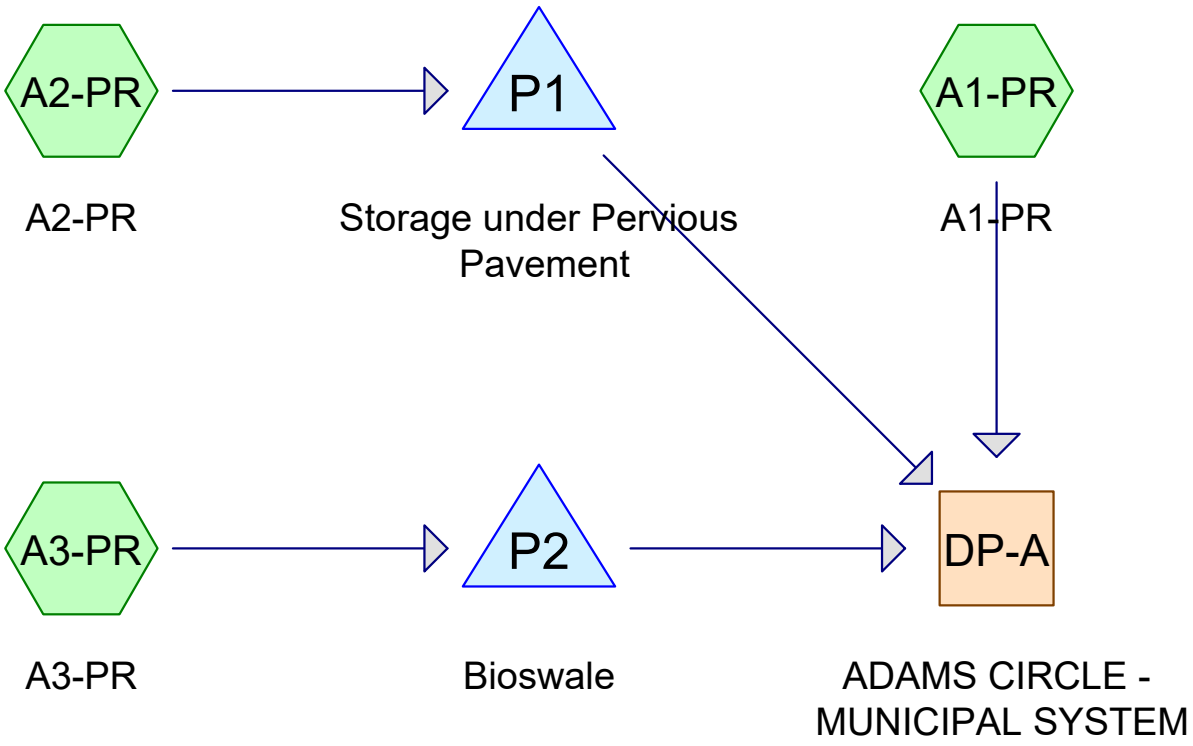
Summary for Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM

Inflow Area = 6.230 ac, 0.00% Impervious, Inflow Depth > 1.81" for 100-Year event
Inflow = 6.72 cfs @ 12.37 hrs, Volume= 0.942 af
Outflow = 6.72 cfs @ 12.37 hrs, Volume= 0.942 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM





Subcat Reach Pond Link

Routing Diagram for HydroCAD Proposed_rev1
Prepared by CEC Inc, Printed 9/16/2025

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA10 24-hr	D	Default	24.00	1	3.14	2
2	10-Year	NOAA10 24-hr	D	Default	24.00	1	4.81	2
3	25-Year	NOAA10 24-hr	D	Default	24.00	1	5.85	2
4	50-Year	NOAA10 24-hr	D	Default	24.00	1	6.62	2
5	100-Year	NOAA10 24-hr	D	Default	24.00	1	7.46	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.429	39	>75% Grass cover, Good, HSG A (A1-PR, A2-PR, A3-PR)
0.050	61	>75% Grass cover, Good, HSG B (A3-PR)
0.534	98	Roofs, HSG A (A1-PR, A2-PR, A3-PR)
0.173	98	Unconnected pavement, HSG A (A1-PR, A2-PR, A3-PR)
0.088	30	Woods, Good, HSG A (A1-PR, A3-PR)
3.956	55	Woods, Good, HSG B (A1-PR, A3-PR)
6.230	**56**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.224	HSG A	A1-PR, A2-PR, A3-PR
4.006	HSG B	A1-PR, A3-PR
0.000	HSG C	
0.000	HSG D	
0.000	Other	
6.230		**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
1.429	0.050	0.000	0.000	0.000	1.479	>75% Grass cover, Good	A1-PR, A2-PR, A3-PR
0.534	0.000	0.000	0.000	0.000	0.534	Roofs	A1-PR, A2-PR, A3-PR
0.173	0.000	0.000	0.000	0.000	0.173	Unconnected pavement	A1-PR, A2-PR, A3-PR
0.088	3.956	0.000	0.000	0.000	4.044	Woods, Good	A1-PR, A3-PR
2.224	**4.006**	**0.000**	**0.000**	**0.000**	**6.230**	**TOTAL AREA**	

Summary for Subcatchment A1-PR: A1-PR

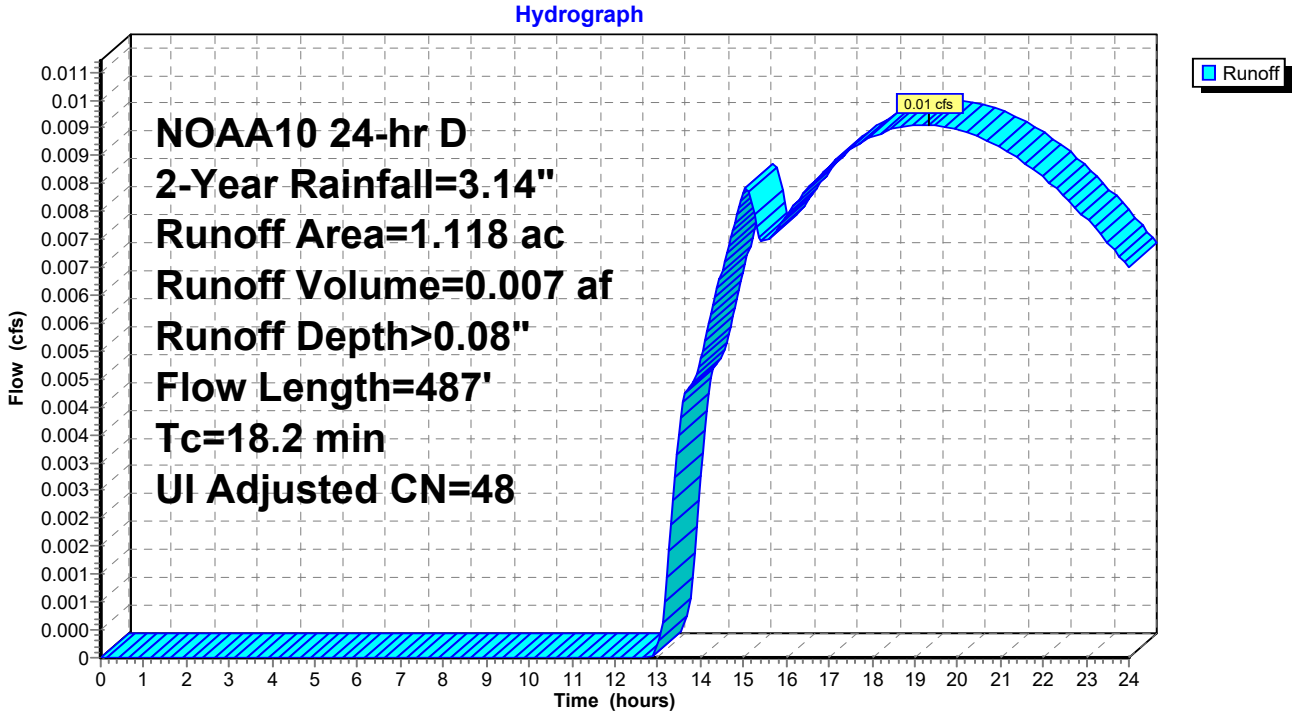
Runoff = 0.01 cfs @ 19.31 hrs, Volume= 0.007 af, Depth> 0.08"
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.14"

Area (ac)	CN	Adj	Description
0.556	39		>75% Grass cover, Good, HSG A
0.066	30		Woods, Good, HSG A
0.404	55		Woods, Good, HSG B
0.029	98		Unconnected pavement, HSG A
0.063	98		Roofs, HSG A
1.118	49	48	Weighted Average, UI Adjusted
1.026			91.77% Pervious Area
0.092			8.23% Impervious Area
0.029			31.52% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0600	0.06		**Sheet Flow, Woodland** Woods: Dense underbrush n= 0.800 P2= 3.20"
2.3	250	0.1300	1.80		**Shallow Concentrated Flow, Woodland Steep** Woodland Kv= 5.0 fps
2.1	187	0.0100	1.50		**Shallow Concentrated Flow, Grassed swale** Grassed Waterway Kv= 15.0 fps
18.2	487	Total			

Subcatchment A1-PR: A1-PR



Summary for Subcatchment A2-PR: A2-PR

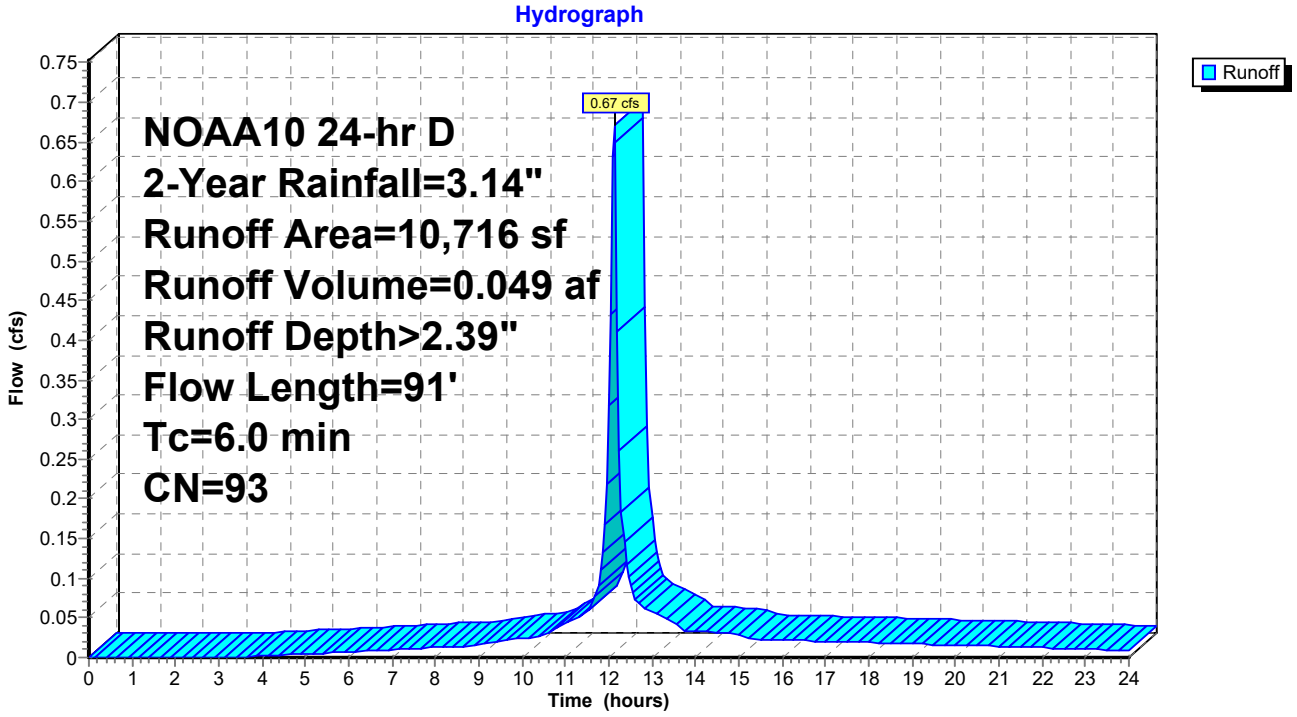
Runoff = 0.67 cfs @ 12.13 hrs, Volume= 0.049 af, Depth> 2.39"
Routed to Pond P1 : Storage under Pervious Pavement

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.14"

Area (sf)	CN	Description
4,704	98	Roofs, HSG A
5,141	98	Unconnected pavement, HSG A
871	39	>75% Grass cover, Good, HSG A
10,716	93	Weighted Average
871		8.13% Pervious Area
9,845		91.87% Impervious Area
5,141		52.22% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	91		0.25		**Direct Entry, Roofs and Gutters**

Subcatchment A2-PR: A2-PR



Summary for Subcatchment A3-PR: A3-PR

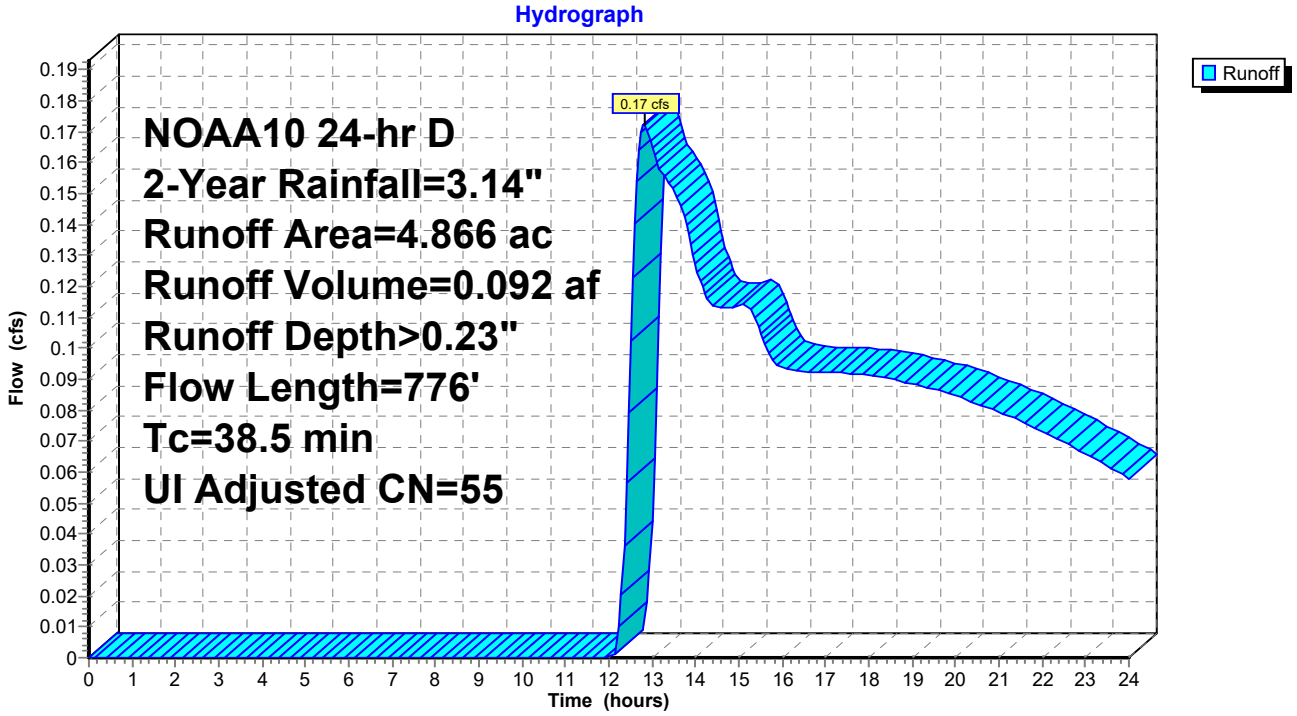
Runoff = 0.17 cfs @ 12.81 hrs, Volume= 0.092 af, Depth> 0.23"
Routed to Pond P2 : Bioswale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.14"

Area (ac)	CN	Adj	Description
0.853	39		>75% Grass cover, Good, HSG A
0.022	30		Woods, Good, HSG A
0.363	98		Roofs, HSG A
3.552	55		Woods, Good, HSG B
0.050	61		>75% Grass cover, Good, HSG B
0.026	98		Unconnected pavement, HSG A
4.866	56	55	Weighted Average, UI Adjusted
4.477			92.01% Pervious Area
0.389			7.99% Impervious Area
0.026			6.68% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.3	50	0.0100	0.03		**Sheet Flow, Woodland** Woods: Dense underbrush n= 0.800 P2= 3.20"
2.6	283	0.1270	1.78		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.0	10	0.3300	8.62		**Shallow Concentrated Flow, Grassed 3:1** Grassed Waterway Kv= 15.0 fps
7.6	433	0.0040	0.95		**Shallow Concentrated Flow, Detention Pond and swale** Grassed Waterway Kv= 15.0 fps
38.5	776	Total			

Subcatchment A3-PR: A3-PR

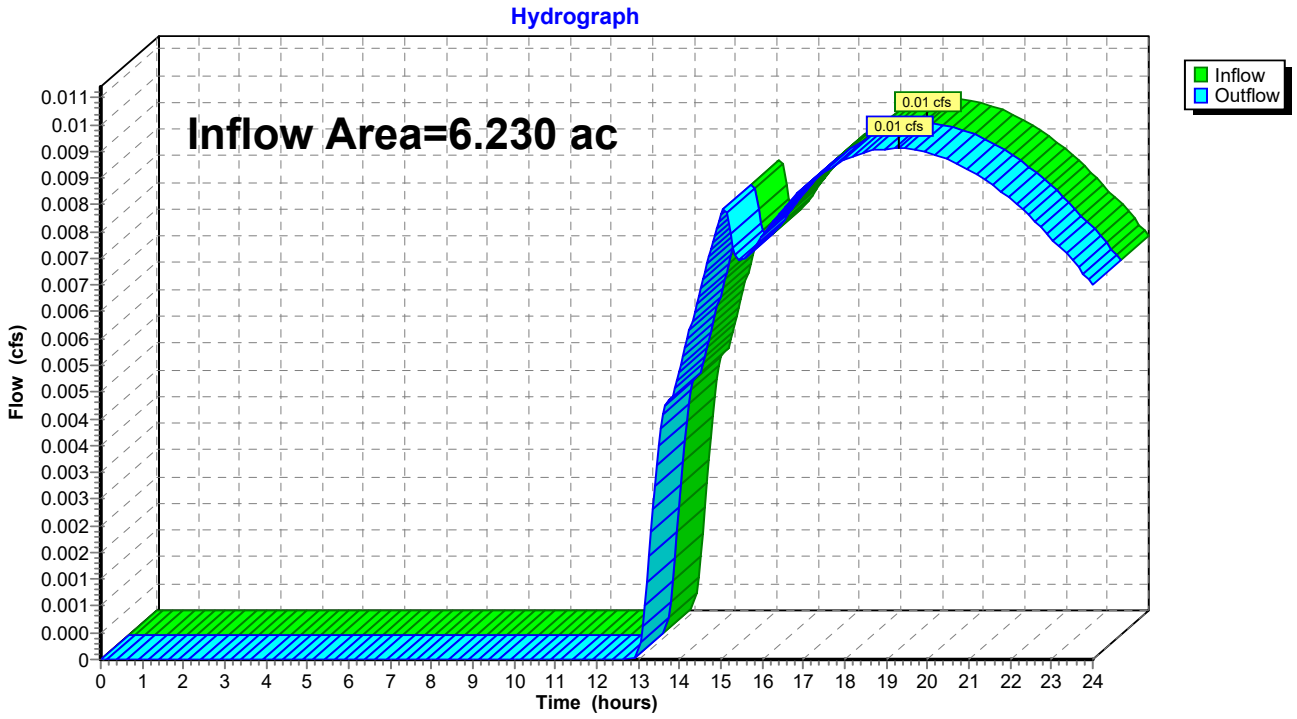


Summary for Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM

Inflow Area = 6.230 ac, 11.35% Impervious, Inflow Depth > 0.01" for 2-Year event
Inflow = 0.01 cfs @ 19.31 hrs, Volume= 0.007 af
Outflow = 0.01 cfs @ 19.31 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM



Summary for Pond P1: Storage under Pervious Pavement

Inflow Area = 0.246 ac, 91.87% Impervious, Inflow Depth > 2.39" for 2-Year event
Inflow = 0.67 cfs @ 12.13 hrs, Volume= 0.049 af
Outflow = 0.29 cfs @ 12.05 hrs, Volume= 0.049 af, Atten= 57%, Lag= 0.0 min
Discarded = 0.29 cfs @ 12.05 hrs, Volume= 0.049 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 250.10' @ 12.25 hrs Surf.Area= 5,141 sf Storage= 215 cf

Plug-Flow detention time= 3.9 min calculated for 0.049 af (100% of inflow)
Center-of-Mass det. time= 3.5 min (811.7 - 808.2)

Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	4,113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 10,282 cf Overall x 40.0% Voids

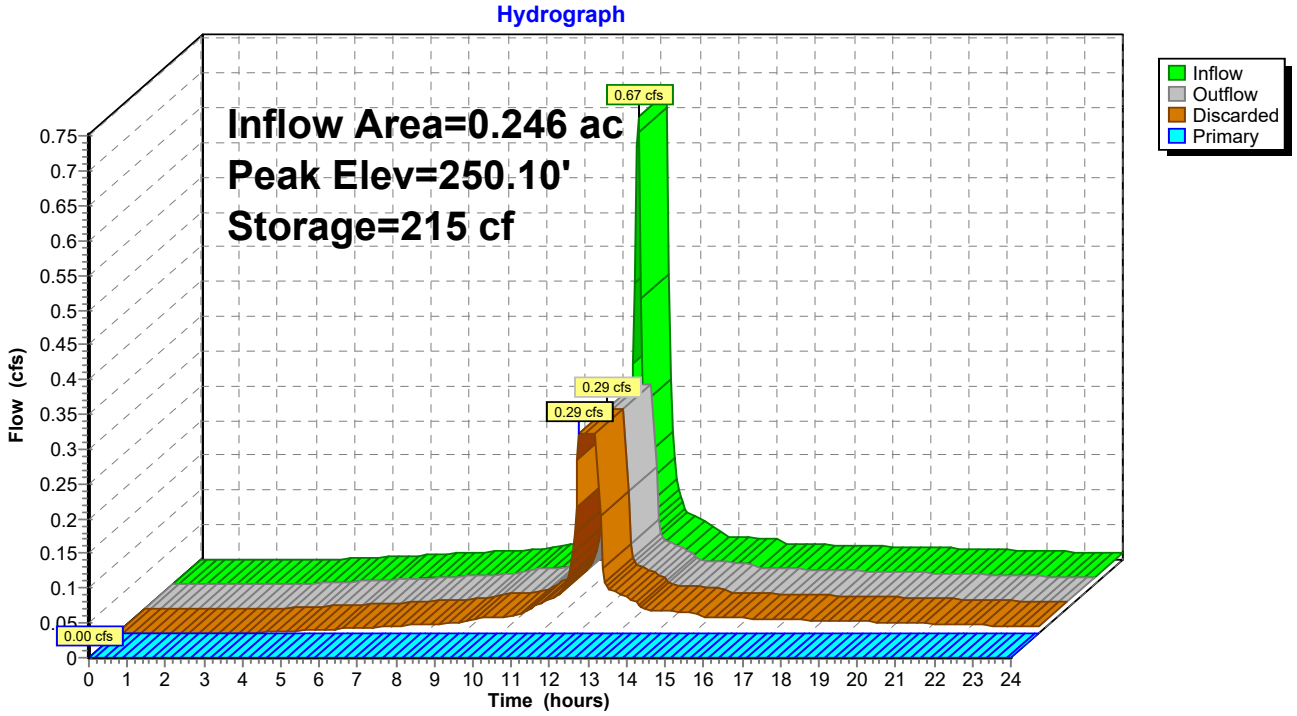
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
250.00	5,141	0	0
251.00	5,141	5,141	5,141
252.00	5,141	5,141	10,282

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	252.00'	**5,141.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.29 cfs @ 12.05 hrs HW=250.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=250.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: Storage under Pervious Pavement



Summary for Pond P2: Bioswale

Inflow Area = 4.866 ac, 7.99% Impervious, Inflow Depth > 0.23" for 2-Year event
Inflow = 0.17 cfs @ 12.81 hrs, Volume= 0.092 af
Outflow = 0.10 cfs @ 15.63 hrs, Volume= 0.089 af, Atten= 42%, Lag= 169.1 min
Discarded = 0.10 cfs @ 15.63 hrs, Volume= 0.089 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 249.32' @ 15.63 hrs Surf.Area= 1,796 sf Storage= 480 cf

Plug-Flow detention time= 62.7 min calculated for 0.089 af (96% of inflow)
Center-of-Mass det. time= 47.9 min (1,090.0 - 1,042.1)

Volume	Invert	Avail.Storage	Storage Description
#1	249.00'	14,297 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

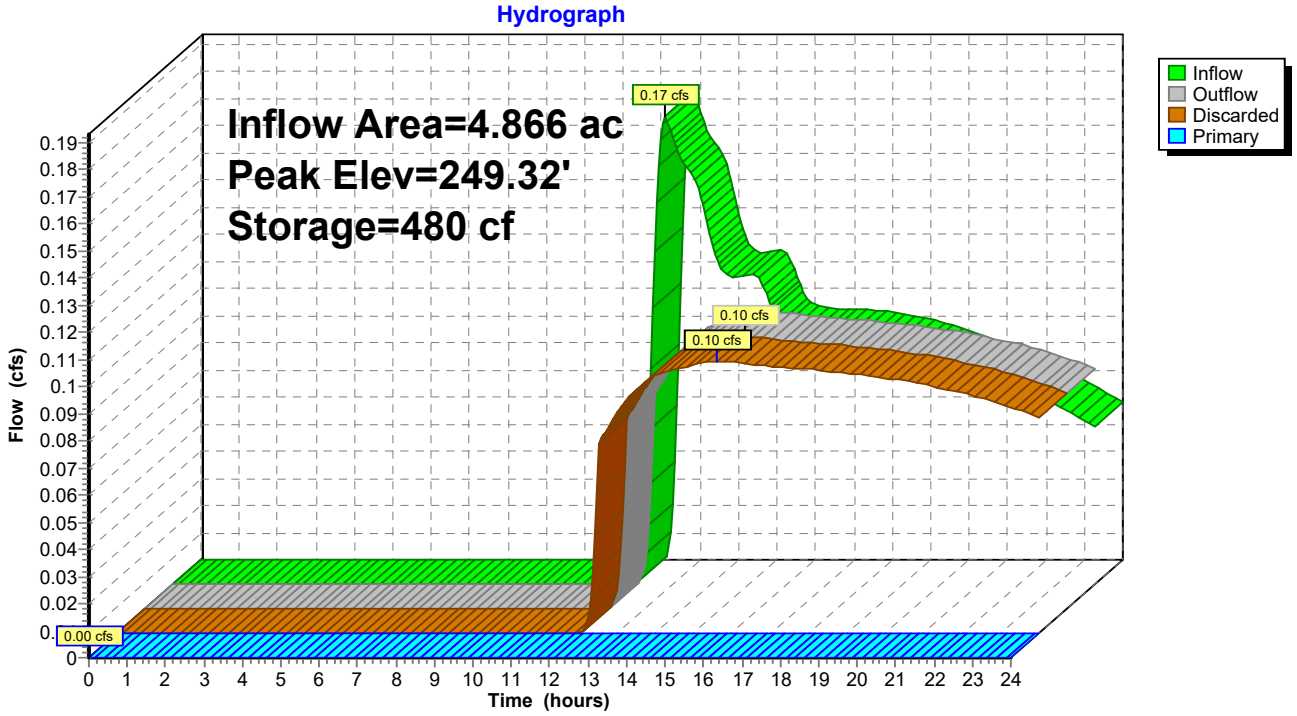
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
249.00	1,215	0	0
250.00	3,038	2,127	2,127
251.00	6,035	4,537	6,663
251.50	7,500	3,384	10,047
252.00	9,500	4,250	14,297

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	250.68'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.10 cfs @ 15.63 hrs HW=249.32' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=249.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2: Bioswale



Summary for Subcatchment A1-PR: A1-PR

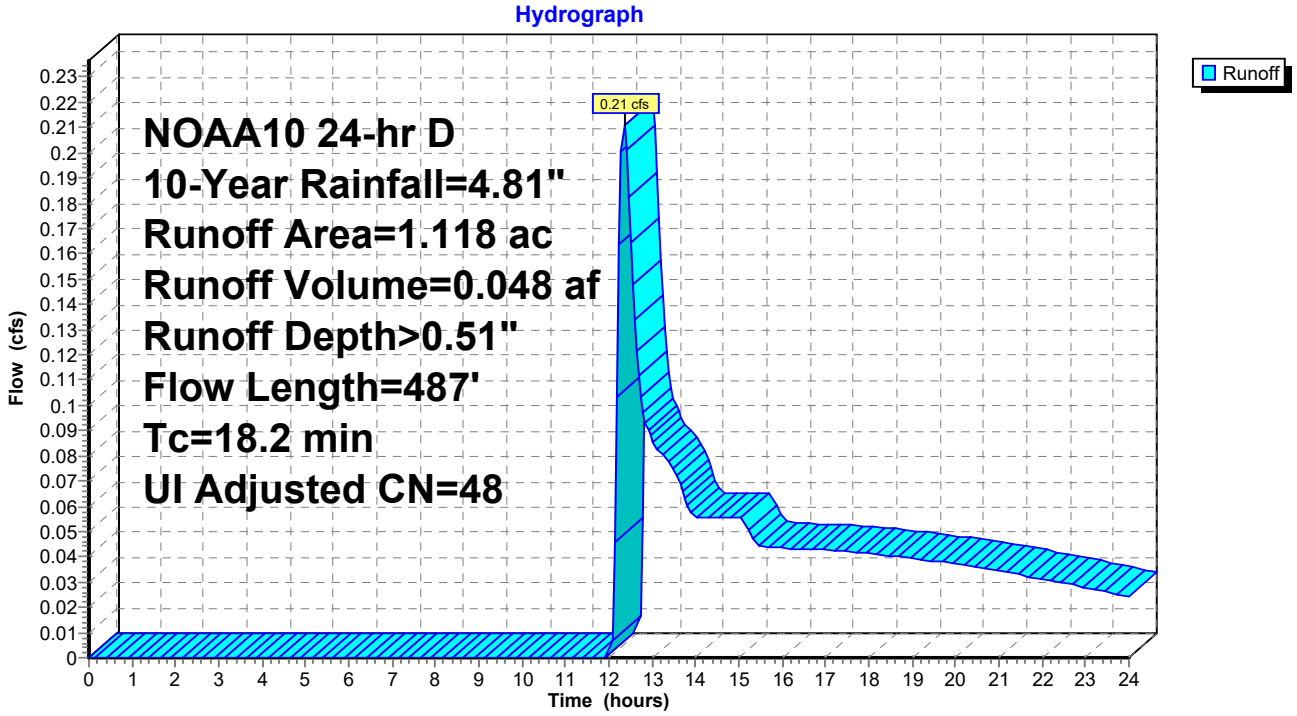
Runoff = 0.21 cfs @ 12.35 hrs, Volume= 0.048 af, Depth> 0.51"
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=4.81"

Area (ac)	CN	Adj	Description
0.556	39		>75% Grass cover, Good, HSG A
0.066	30		Woods, Good, HSG A
0.404	55		Woods, Good, HSG B
0.029	98		Unconnected pavement, HSG A
0.063	98		Roofs, HSG A
1.118	49	48	Weighted Average, UI Adjusted
1.026			91.77% Pervious Area
0.092			8.23% Impervious Area
0.029			31.52% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0600	0.06		**Sheet Flow, Woodland** Woods: Dense underbrush n= 0.800 P2= 3.20"
2.3	250	0.1300	1.80		**Shallow Concentrated Flow, Woodland Steep** Woodland Kv= 5.0 fps
2.1	187	0.0100	1.50		**Shallow Concentrated Flow, Grassed swale** Grassed Waterway Kv= 15.0 fps
18.2	487	Total			

Subcatchment A1-PR: A1-PR



Summary for Subcatchment A2-PR: A2-PR

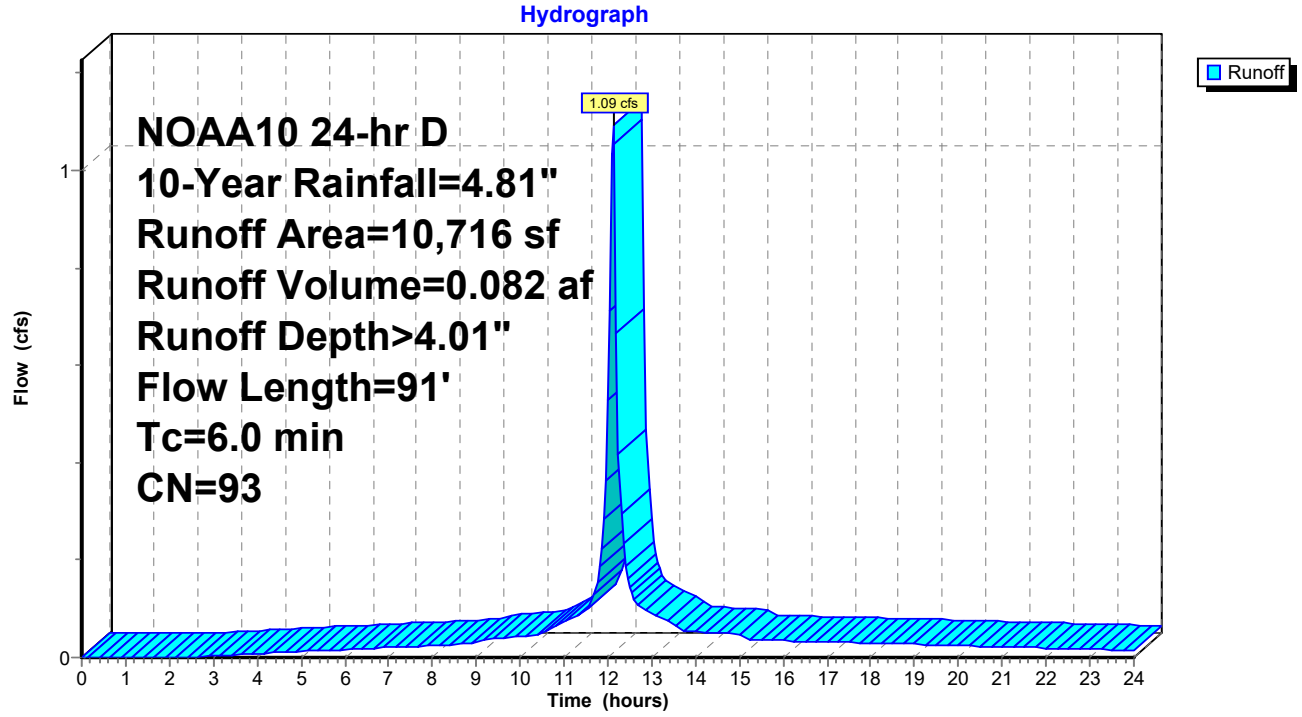
Runoff = 1.09 cfs @ 12.13 hrs, Volume= 0.082 af, Depth> 4.01"
Routed to Pond P1 : Storage under Pervious Pavement

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=4.81"

Area (sf)	CN	Description
4,704	98	Roofs, HSG A
5,141	98	Unconnected pavement, HSG A
871	39	>75% Grass cover, Good, HSG A
10,716	93	Weighted Average
871		8.13% Pervious Area
9,845		91.87% Impervious Area
5,141		52.22% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	91		0.25		**Direct Entry, Roofs and Gutters**

Subcatchment A2-PR: A2-PR



Summary for Subcatchment A3-PR: A3-PR

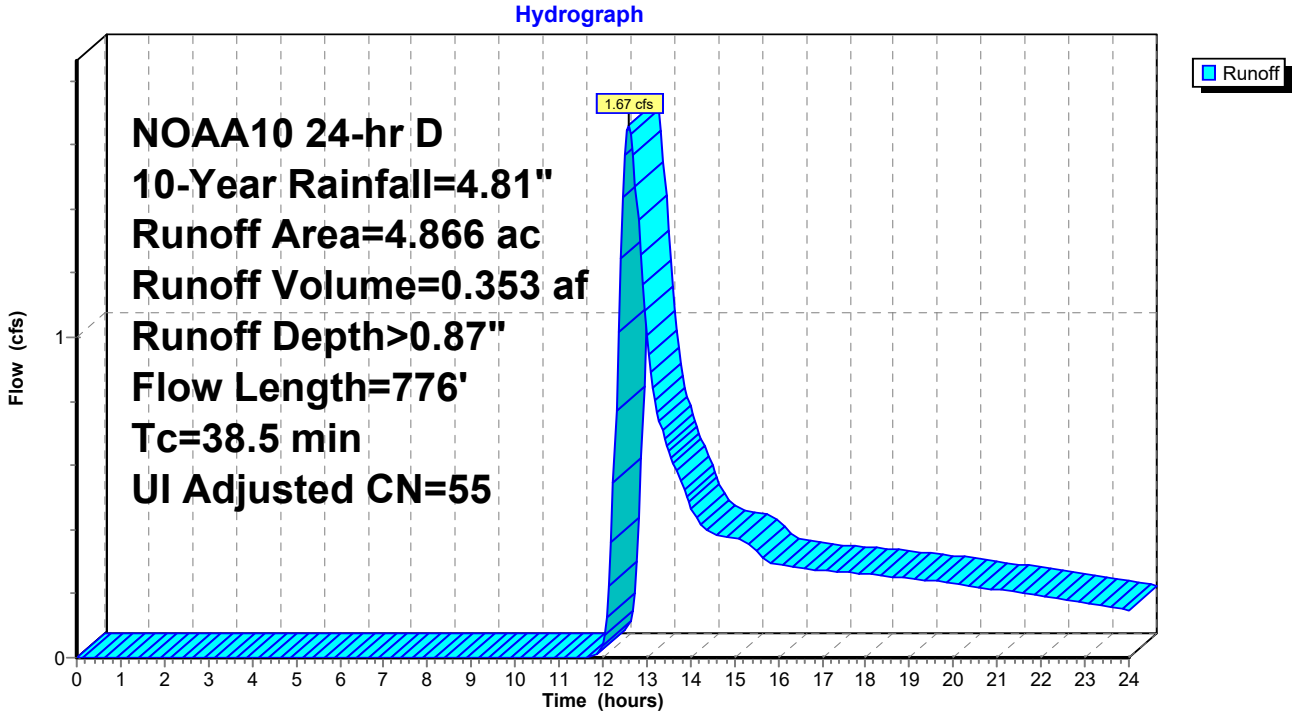
Runoff = 1.67 cfs @ 12.59 hrs, Volume= 0.353 af, Depth> 0.87"
Routed to Pond P2 : Bioswale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=4.81"

Area (ac)	CN	Adj	Description
0.853	39		>75% Grass cover, Good, HSG A
0.022	30		Woods, Good, HSG A
0.363	98		Roofs, HSG A
3.552	55		Woods, Good, HSG B
0.050	61		>75% Grass cover, Good, HSG B
0.026	98		Unconnected pavement, HSG A
4.866	56	55	Weighted Average, UI Adjusted
4.477			92.01% Pervious Area
0.389			7.99% Impervious Area
0.026			6.68% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.3	50	0.0100	0.03		**Sheet Flow, Woodland** Woods: Dense underbrush n= 0.800 P2= 3.20"
2.6	283	0.1270	1.78		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.0	10	0.3300	8.62		**Shallow Concentrated Flow, Grassed 3:1** Grassed Waterway Kv= 15.0 fps
7.6	433	0.0040	0.95		**Shallow Concentrated Flow, Detention Pond and swale** Grassed Waterway Kv= 15.0 fps
38.5	776	Total			

Subcatchment A3-PR: A3-PR

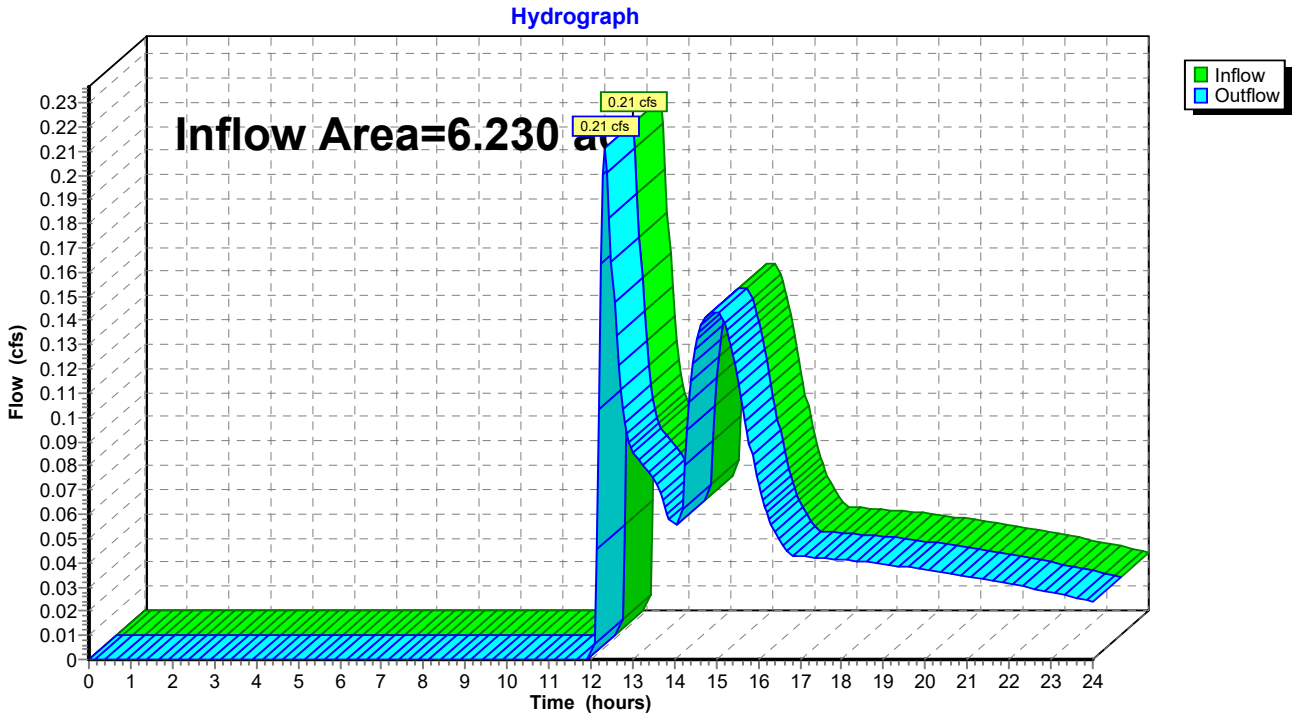


Summary for Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM

Inflow Area = 6.230 ac, 11.35% Impervious, Inflow Depth > 0.11" for 10-Year event
Inflow = 0.21 cfs @ 12.35 hrs, Volume= 0.059 af
Outflow = 0.21 cfs @ 12.35 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM



Summary for Pond P1: Storage under Pervious Pavement

Inflow Area = 0.246 ac, 91.87% Impervious, Inflow Depth > 4.01" for 10-Year event
Inflow = 1.09 cfs @ 12.13 hrs, Volume= 0.082 af
Outflow = 0.29 cfs @ 11.95 hrs, Volume= 0.082 af, Atten= 74%, Lag= 0.0 min
Discarded = 0.29 cfs @ 11.95 hrs, Volume= 0.082 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 250.26' @ 12.31 hrs Surf.Area= 5,141 sf Storage= 537 cf

Plug-Flow detention time= 8.0 min calculated for 0.082 af (100% of inflow)
Center-of-Mass det. time= 7.6 min (797.2 - 789.6)

Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	4,113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 10,282 cf Overall x 40.0% Voids

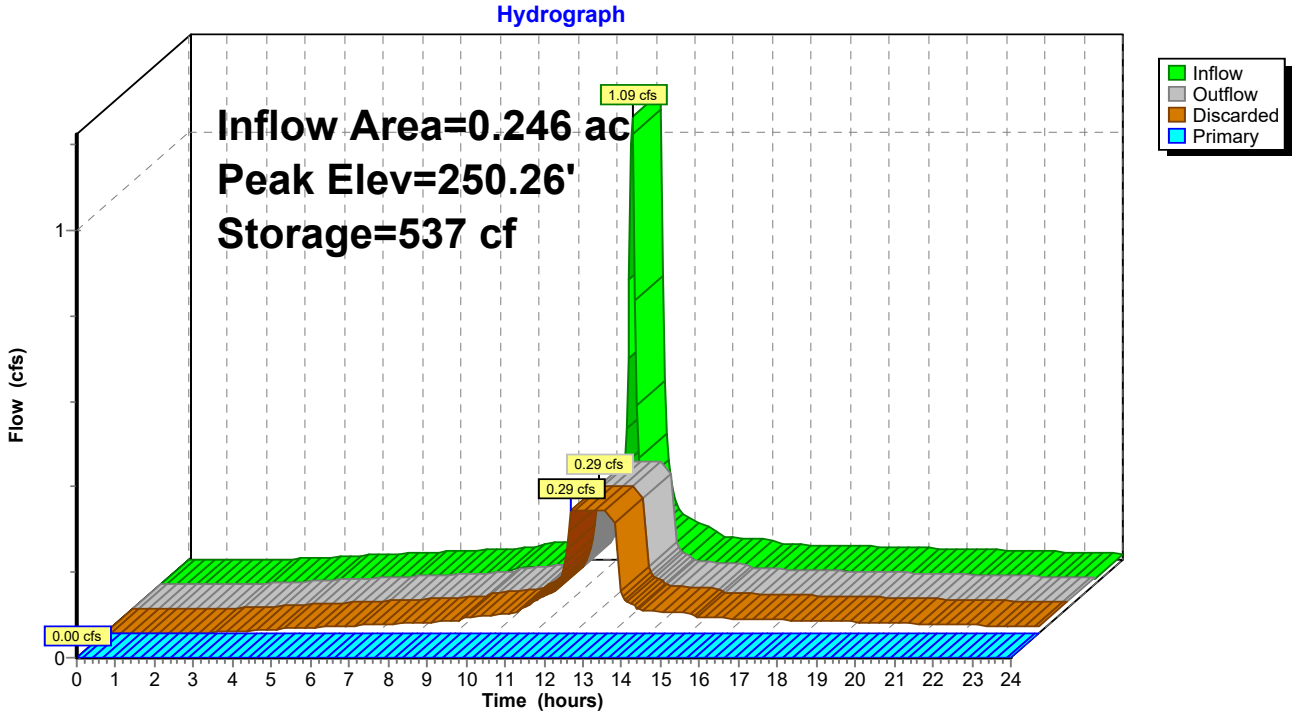
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
250.00	5,141	0	0
251.00	5,141	5,141	5,141
252.00	5,141	5,141	10,282

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	252.00'	**5,141.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.29 cfs @ 11.95 hrs HW=250.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=250.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: Storage under Pervious Pavement



Summary for Pond P2: Bioswale

Inflow Area = 4.866 ac, 7.99% Impervious, Inflow Depth > 0.87" for 10-Year event
Inflow = 1.67 cfs @ 12.59 hrs, Volume= 0.353 af
Outflow = 0.37 cfs @ 15.00 hrs, Volume= 0.269 af, Atten= 78%, Lag= 144.1 min
Discarded = 0.29 cfs @ 15.00 hrs, Volume= 0.258 af
Primary = 0.09 cfs @ 15.00 hrs, Volume= 0.011 af
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 250.70' @ 15.00 hrs Surf.Area= 5,136 sf Storage= 4,988 cf

Plug-Flow detention time= 212.5 min calculated for 0.269 af (76% of inflow)
Center-of-Mass det. time= 115.9 min (1,083.2 - 967.3)

Volume	Invert	Avail.Storage	Storage Description
#1	249.00'	14,297 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

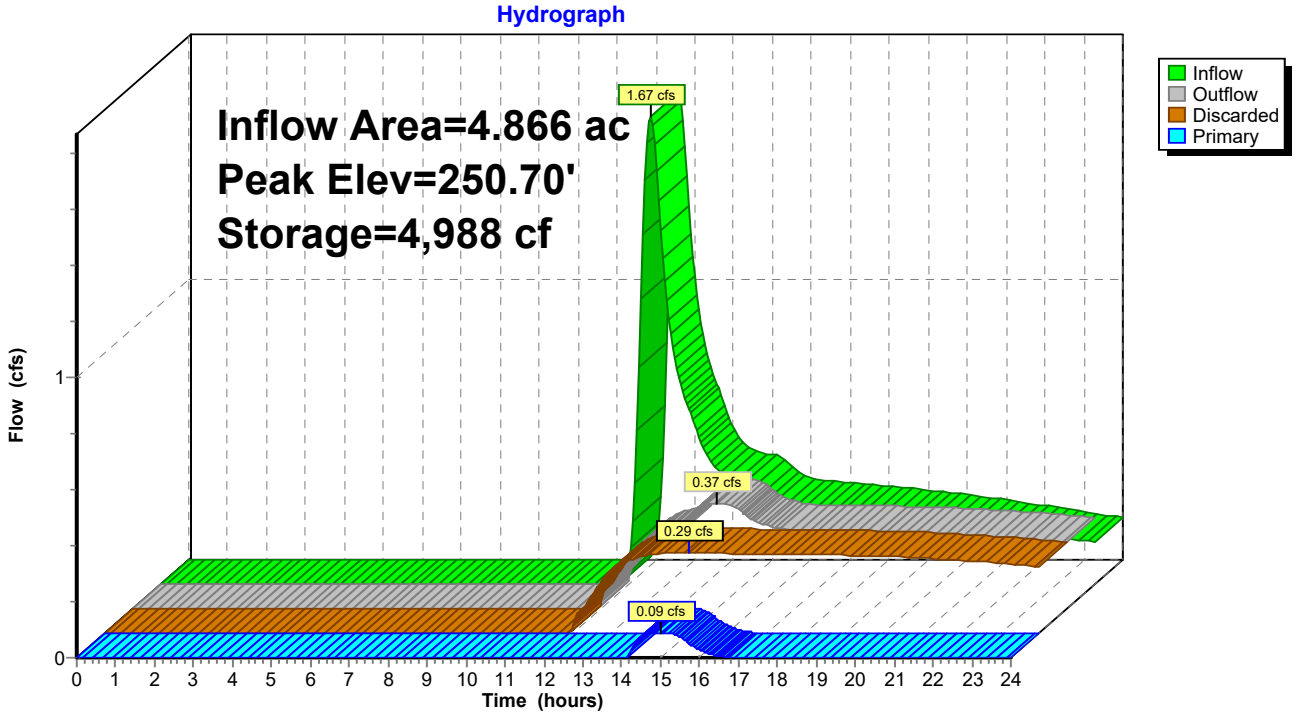
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
249.00	1,215	0	0
250.00	3,038	2,127	2,127
251.00	6,035	4,537	6,663
251.50	7,500	3,384	10,047
252.00	9,500	4,250	14,297

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	250.68'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.29 cfs @ 15.00 hrs HW=250.70' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.07 cfs @ 15.00 hrs HW=250.70' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.07 cfs @ 0.36 fps)

Pond P2: Bioswale



Summary for Subcatchment A1-PR: A1-PR

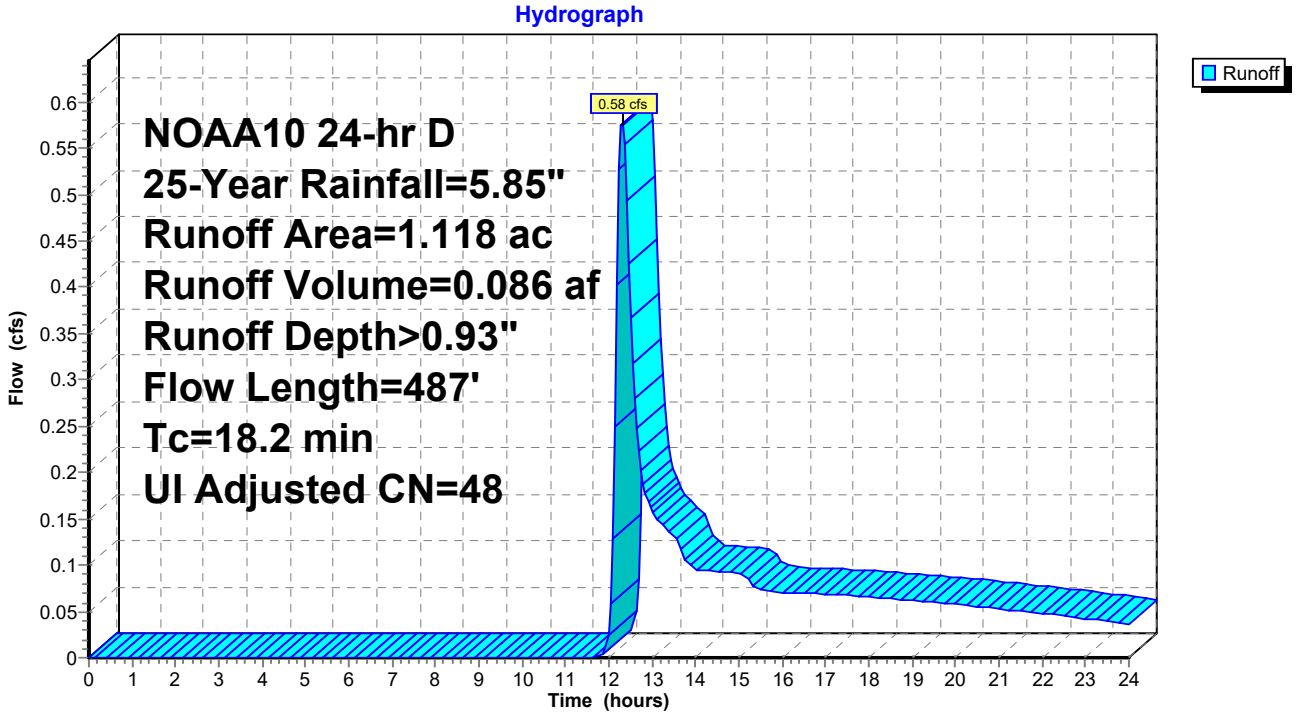
Runoff = 0.58 cfs @ 12.31 hrs, Volume= 0.086 af, Depth> 0.93"
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=5.85"

Area (ac)	CN	Adj	Description
0.556	39		>75% Grass cover, Good, HSG A
0.066	30		Woods, Good, HSG A
0.404	55		Woods, Good, HSG B
0.029	98		Unconnected pavement, HSG A
0.063	98		Roofs, HSG A
1.118	49	48	Weighted Average, UI Adjusted
1.026			91.77% Pervious Area
0.092			8.23% Impervious Area
0.029			31.52% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0600	0.06		**Sheet Flow, Woodland** Woods: Dense underbrush n= 0.800 P2= 3.20"
2.3	250	0.1300	1.80		**Shallow Concentrated Flow, Woodland Steep** Woodland Kv= 5.0 fps
2.1	187	0.0100	1.50		**Shallow Concentrated Flow, Grassed swale** Grassed Waterway Kv= 15.0 fps
18.2	487	Total			

Subcatchment A1-PR: A1-PR



Summary for Subcatchment A2-PR: A2-PR

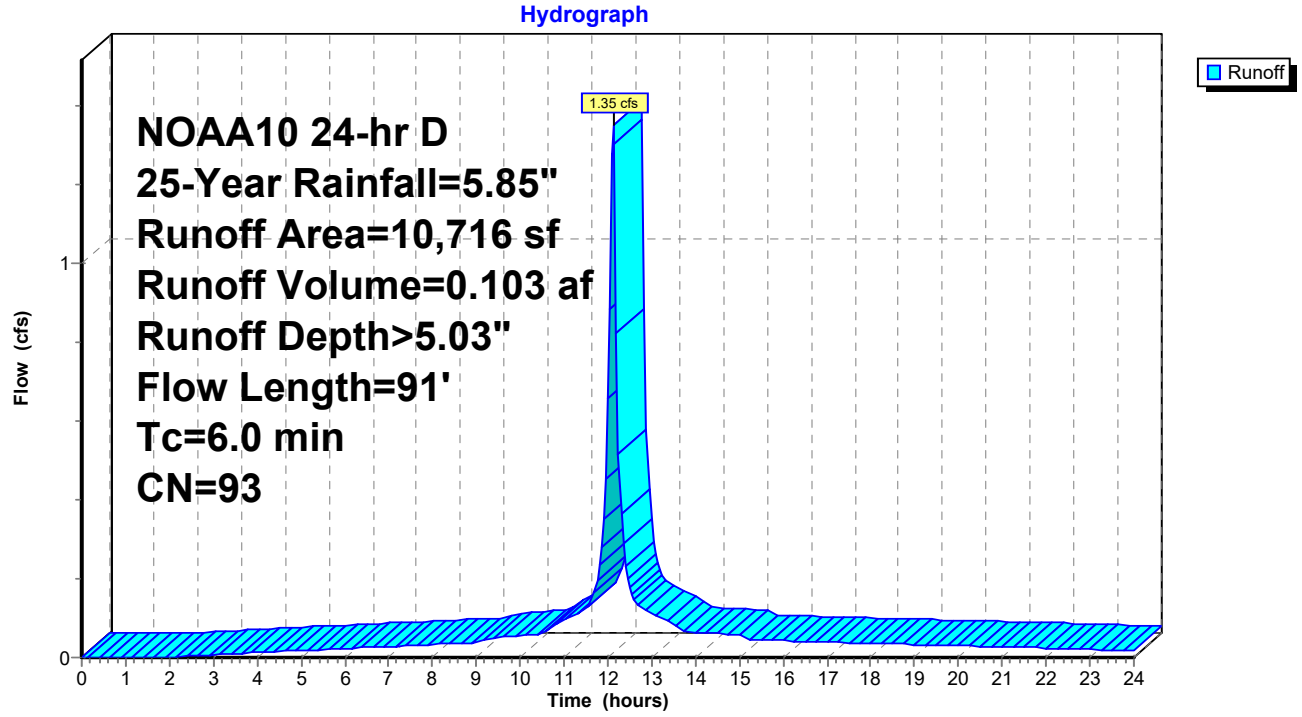
Runoff = 1.35 cfs @ 12.13 hrs, Volume= 0.103 af, Depth> 5.03"
Routed to Pond P1 : Storage under Pervious Pavement

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=5.85"

Area (sf)	CN	Description
4,704	98	Roofs, HSG A
5,141	98	Unconnected pavement, HSG A
871	39	>75% Grass cover, Good, HSG A
10,716	93	Weighted Average
871		8.13% Pervious Area
9,845		91.87% Impervious Area
5,141		52.22% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	91		0.25		**Direct Entry, Roofs and Gutters**

Subcatchment A2-PR: A2-PR



Summary for Subcatchment A3-PR: A3-PR

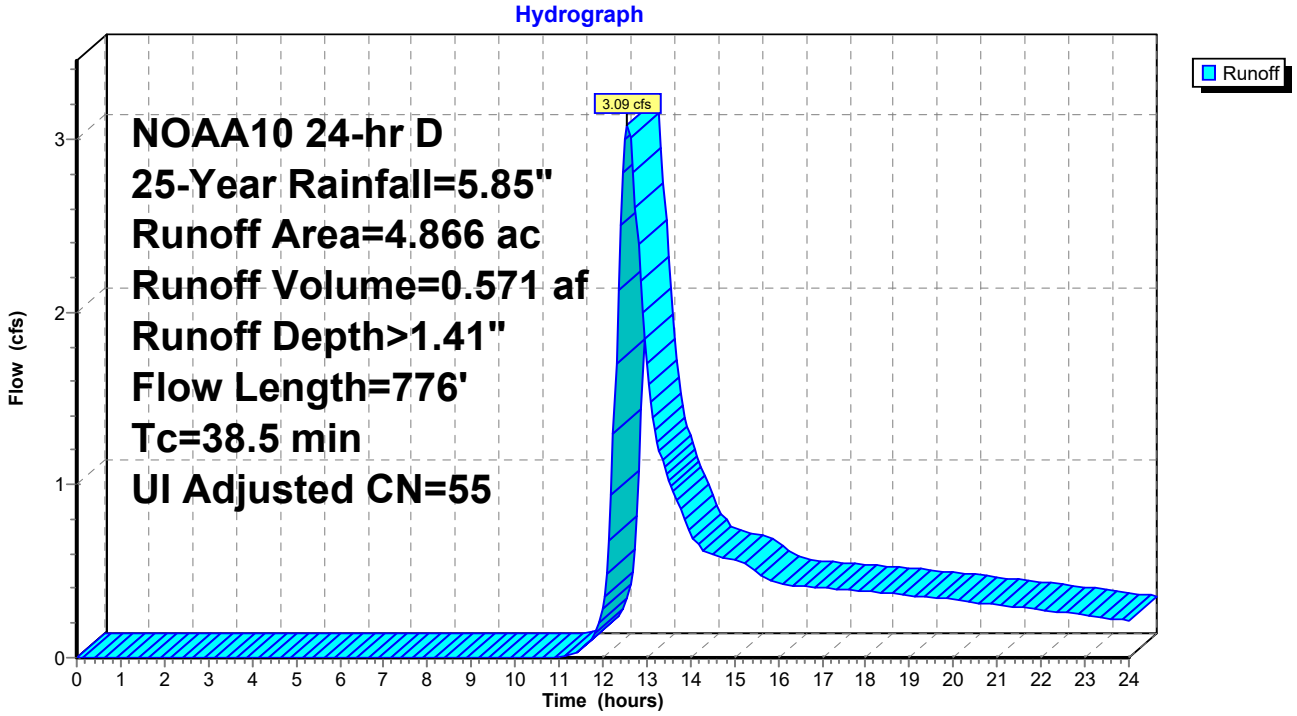
Runoff = 3.09 cfs @ 12.57 hrs, Volume= 0.571 af, Depth> 1.41"
Routed to Pond P2 : Bioswale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=5.85"

Area (ac)	CN	Adj	Description
0.853	39		>75% Grass cover, Good, HSG A
0.022	30		Woods, Good, HSG A
0.363	98		Roofs, HSG A
3.552	55		Woods, Good, HSG B
0.050	61		>75% Grass cover, Good, HSG B
0.026	98		Unconnected pavement, HSG A
4.866	56	55	Weighted Average, UI Adjusted
4.477			92.01% Pervious Area
0.389			7.99% Impervious Area
0.026			6.68% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.3	50	0.0100	0.03		**Sheet Flow, Woodland** Woods: Dense underbrush n= 0.800 P2= 3.20"
2.6	283	0.1270	1.78		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.0	10	0.3300	8.62		**Shallow Concentrated Flow, Grassed 3:1** Grassed Waterway Kv= 15.0 fps
7.6	433	0.0040	0.95		**Shallow Concentrated Flow, Detention Pond and swale** Grassed Waterway Kv= 15.0 fps
38.5	776	Total			

Subcatchment A3-PR: A3-PR

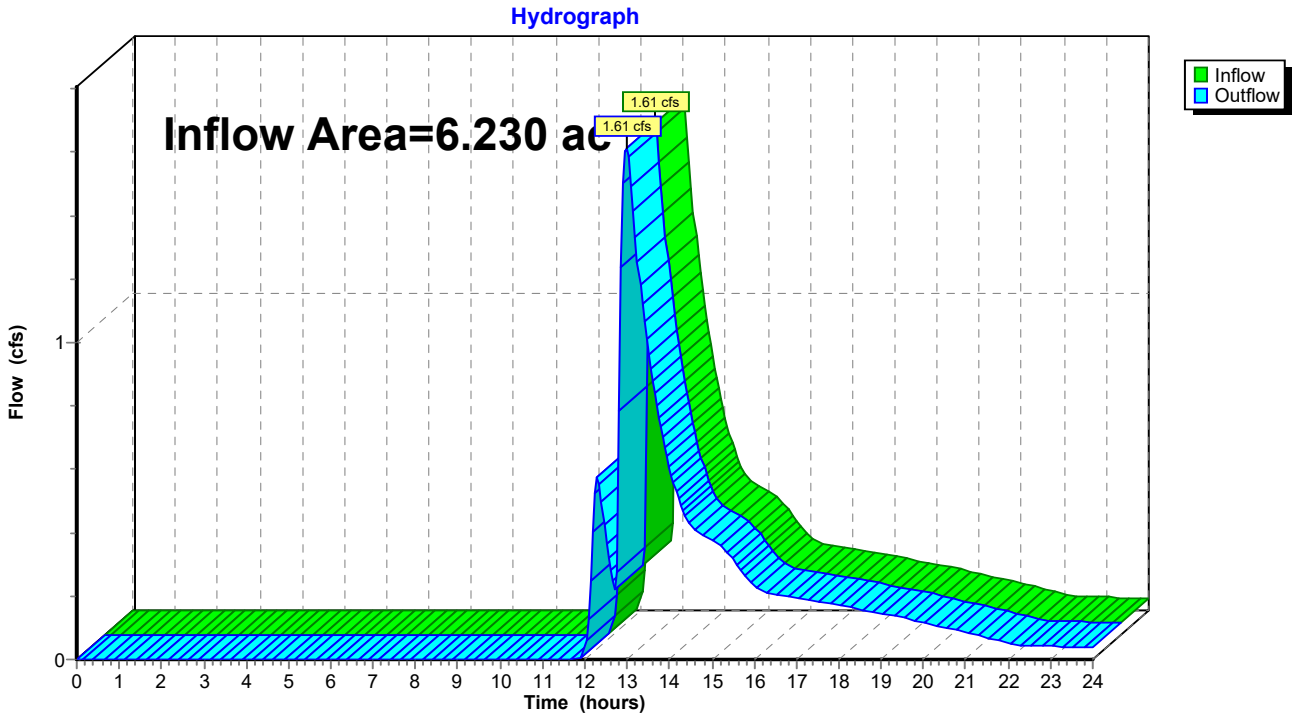


Summary for Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM

Inflow Area = 6.230 ac, 11.35% Impervious, Inflow Depth > 0.52" for 25-Year event
Inflow = 1.61 cfs @ 12.98 hrs, Volume= 0.270 af
Outflow = 1.61 cfs @ 12.98 hrs, Volume= 0.270 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM



Summary for Pond P1: Storage under Pervious Pavement

Inflow Area = 0.246 ac, 91.87% Impervious, Inflow Depth > 5.03" for 25-Year event
Inflow = 1.35 cfs @ 12.13 hrs, Volume= 0.103 af
Outflow = 0.29 cfs @ 11.90 hrs, Volume= 0.103 af, Atten= 79%, Lag= 0.0 min
Discarded = 0.29 cfs @ 11.90 hrs, Volume= 0.103 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 250.37' @ 12.35 hrs Surf.Area= 5,141 sf Storage= 766 cf

Plug-Flow detention time= 11.6 min calculated for 0.103 af (100% of inflow)
Center-of-Mass det. time= 11.2 min (793.2 - 782.0)

Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	4,113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 10,282 cf Overall x 40.0% Voids

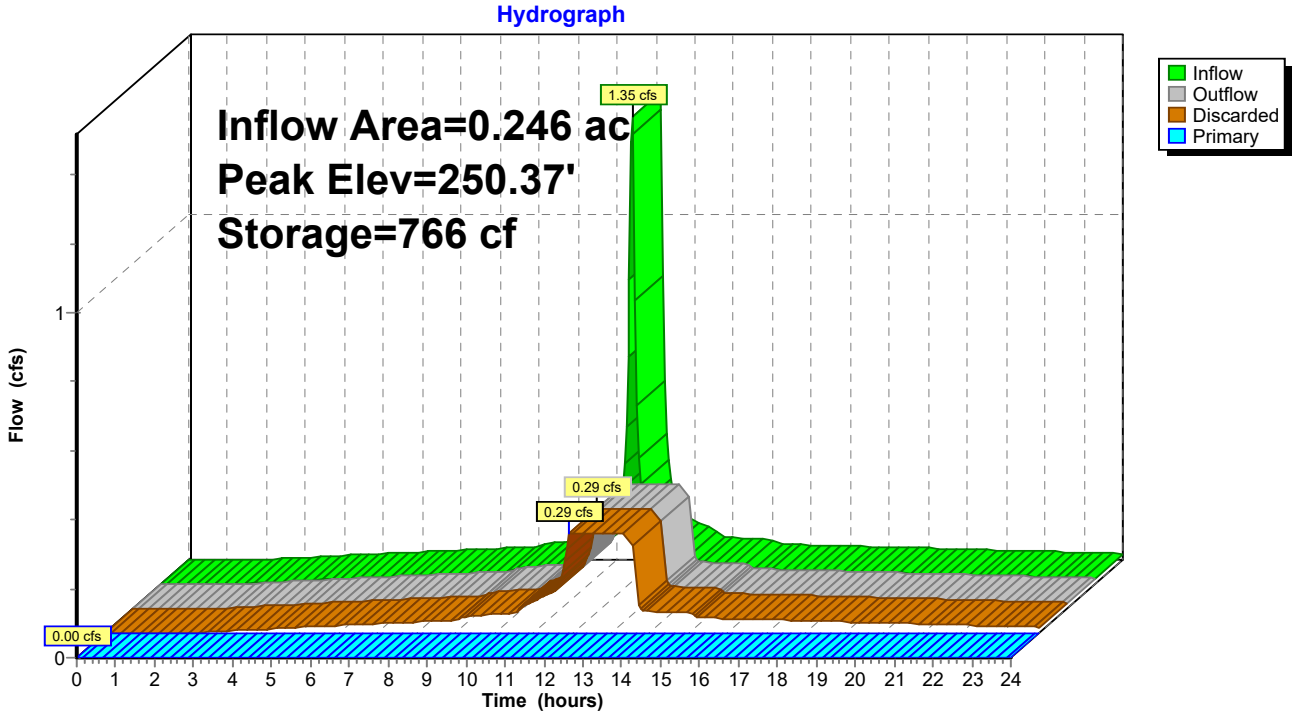
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
250.00	5,141	0	0
251.00	5,141	5,141	5,141
252.00	5,141	5,141	10,282

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	252.00'	**5,141.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.29 cfs @ 11.90 hrs HW=250.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=250.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: Storage under Pervious Pavement



Summary for Pond P2: Bioswale

Inflow Area = 4.866 ac, 7.99% Impervious, Inflow Depth > 1.41" for 25-Year event
Inflow = 3.09 cfs @ 12.57 hrs, Volume= 0.571 af
Outflow = 1.76 cfs @ 12.99 hrs, Volume= 0.465 af, Atten= 43%, Lag= 25.1 min
Discarded = 0.31 cfs @ 12.99 hrs, Volume= 0.281 af
Primary = 1.45 cfs @ 12.99 hrs, Volume= 0.184 af
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 250.83' @ 12.99 hrs Surf.Area= 5,520 sf Storage= 5,671 cf

Plug-Flow detention time= 138.3 min calculated for 0.464 af (81% of inflow)
Center-of-Mass det. time= 58.7 min (1,004.8 - 946.1)

Volume	Invert	Avail.Storage	Storage Description
#1	249.00'	14,297 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

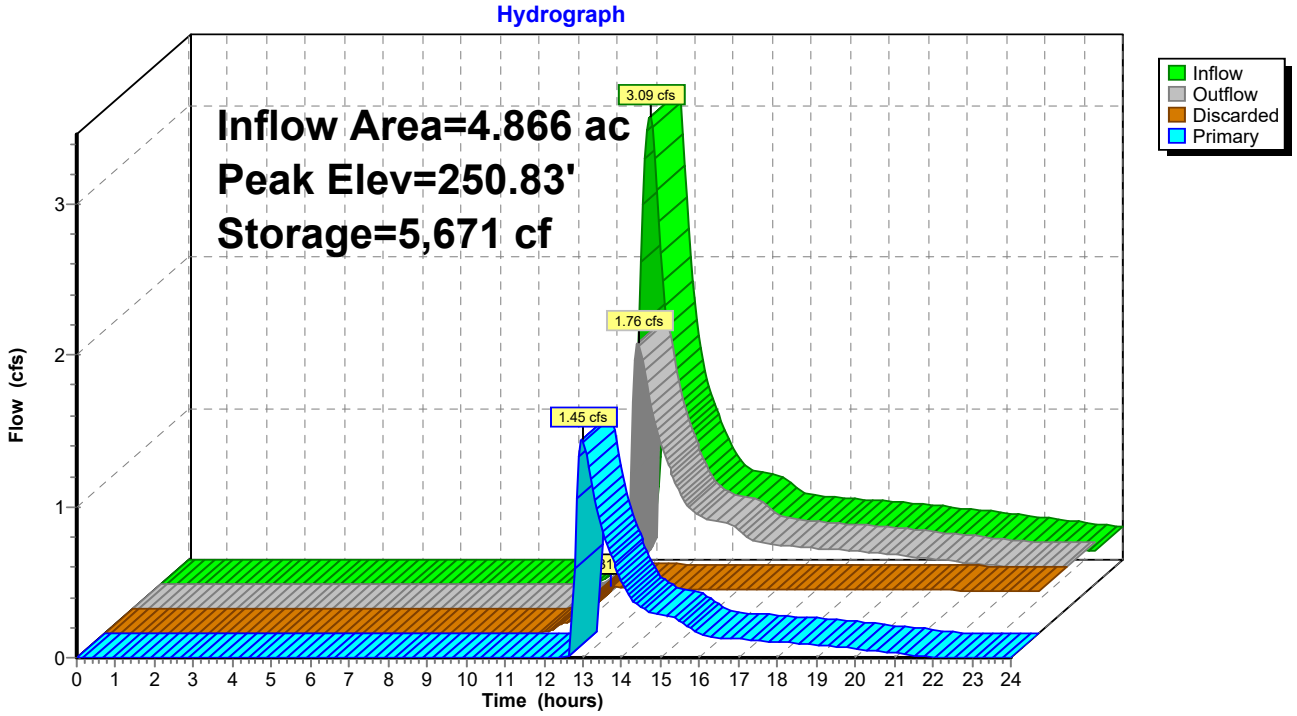
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
249.00	1,215	0	0
250.00	3,038	2,127	2,127
251.00	6,035	4,537	6,663
251.50	7,500	3,384	10,047
252.00	9,500	4,250	14,297

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	250.68'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.31 cfs @ 12.99 hrs HW=250.83' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=1.44 cfs @ 12.99 hrs HW=250.83' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 1.44 cfs @ 0.98 fps)

Pond P2: Bioswale



Summary for Subcatchment A1-PR: A1-PR

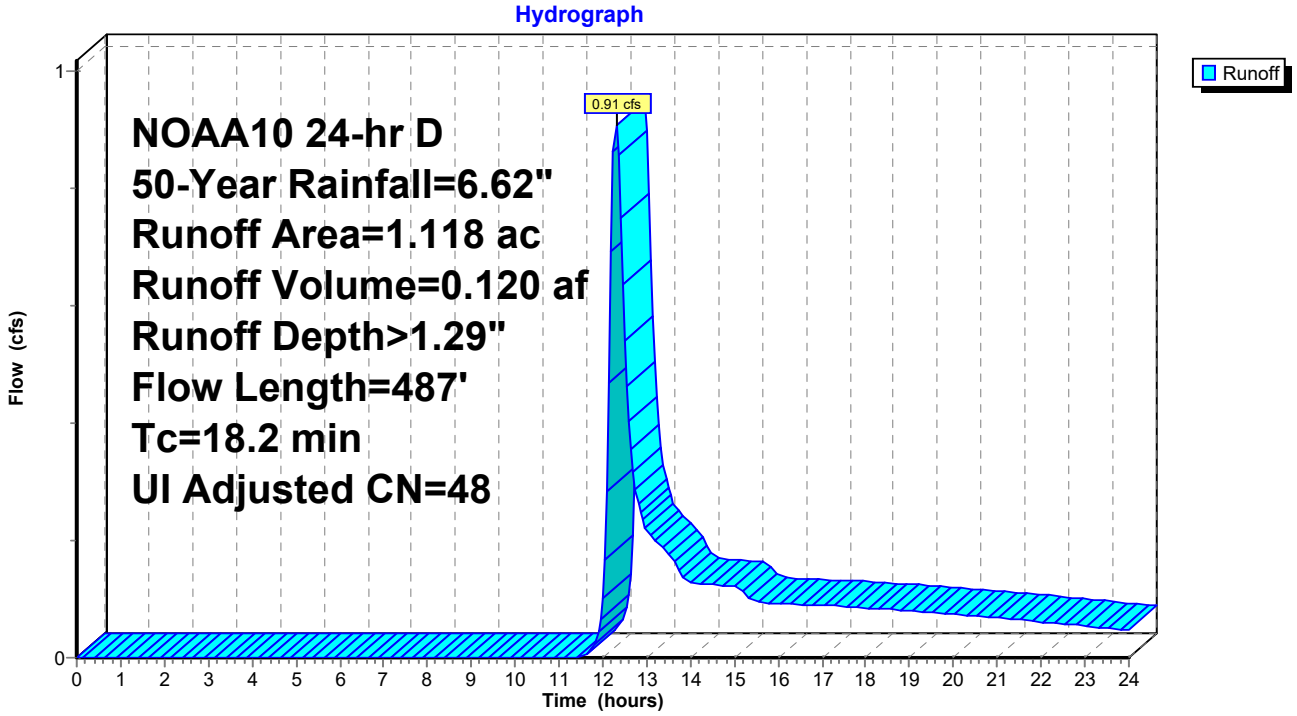
Runoff = 0.91 cfs @ 12.30 hrs, Volume= 0.120 af, Depth> 1.29"
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 50-Year Rainfall=6.62"

Area (ac)	CN	Adj	Description
0.556	39		>75% Grass cover, Good, HSG A
0.066	30		Woods, Good, HSG A
0.404	55		Woods, Good, HSG B
0.029	98		Unconnected pavement, HSG A
0.063	98		Roofs, HSG A
1.118	49	48	Weighted Average, UI Adjusted
1.026			91.77% Pervious Area
0.092			8.23% Impervious Area
0.029			31.52% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0600	0.06		**Sheet Flow, Woodland** Woods: Dense underbrush n= 0.800 P2= 3.20"
2.3	250	0.1300	1.80		**Shallow Concentrated Flow, Woodland Steep** Woodland Kv= 5.0 fps
2.1	187	0.0100	1.50		**Shallow Concentrated Flow, Grassed swale** Grassed Waterway Kv= 15.0 fps
18.2	487	Total			

Subcatchment A1-PR: A1-PR



Summary for Subcatchment A2-PR: A2-PR

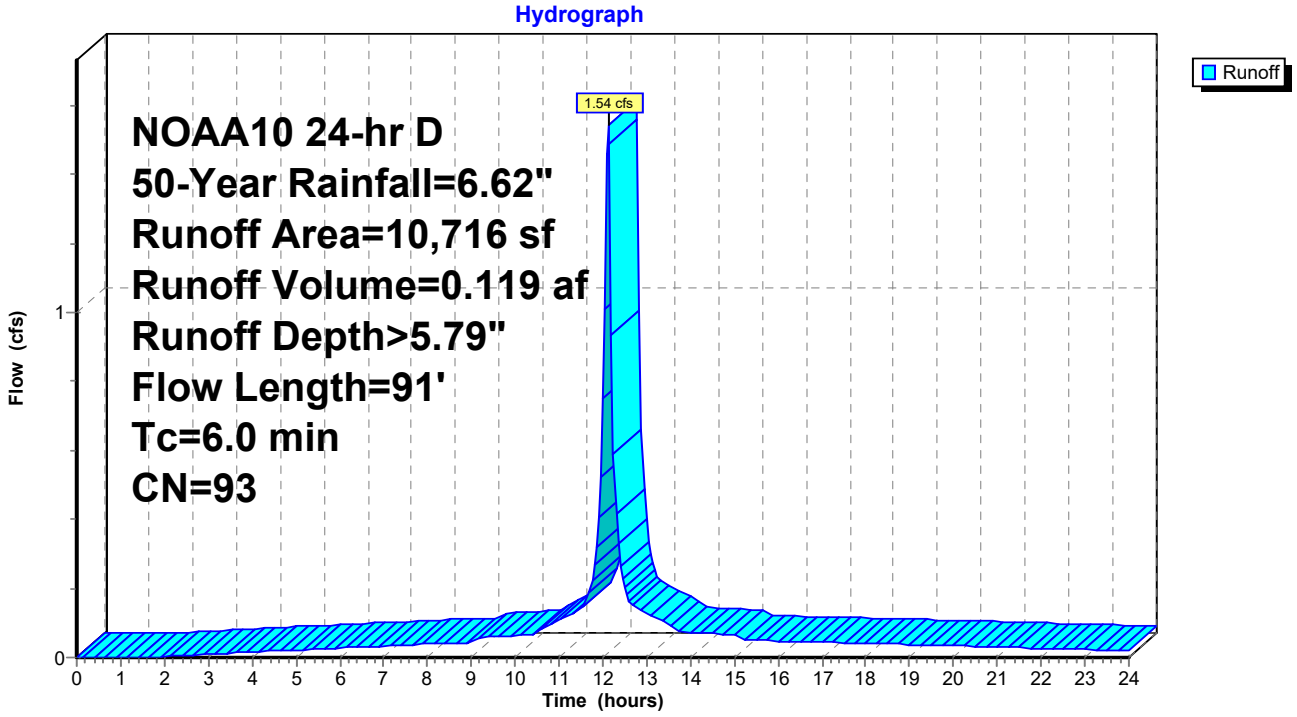
Runoff = 1.54 cfs @ 12.13 hrs, Volume= 0.119 af, Depth> 5.79"
Routed to Pond P1 : Storage under Pervious Pavement

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 50-Year Rainfall=6.62"

Area (sf)	CN	Description
4,704	98	Roofs, HSG A
5,141	98	Unconnected pavement, HSG A
871	39	>75% Grass cover, Good, HSG A
10,716	93	Weighted Average
871		8.13% Pervious Area
9,845		91.87% Impervious Area
5,141		52.22% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	91		0.25		**Direct Entry, Roofs and Gutters**

Subcatchment A2-PR: A2-PR



Summary for Subcatchment A3-PR: A3-PR

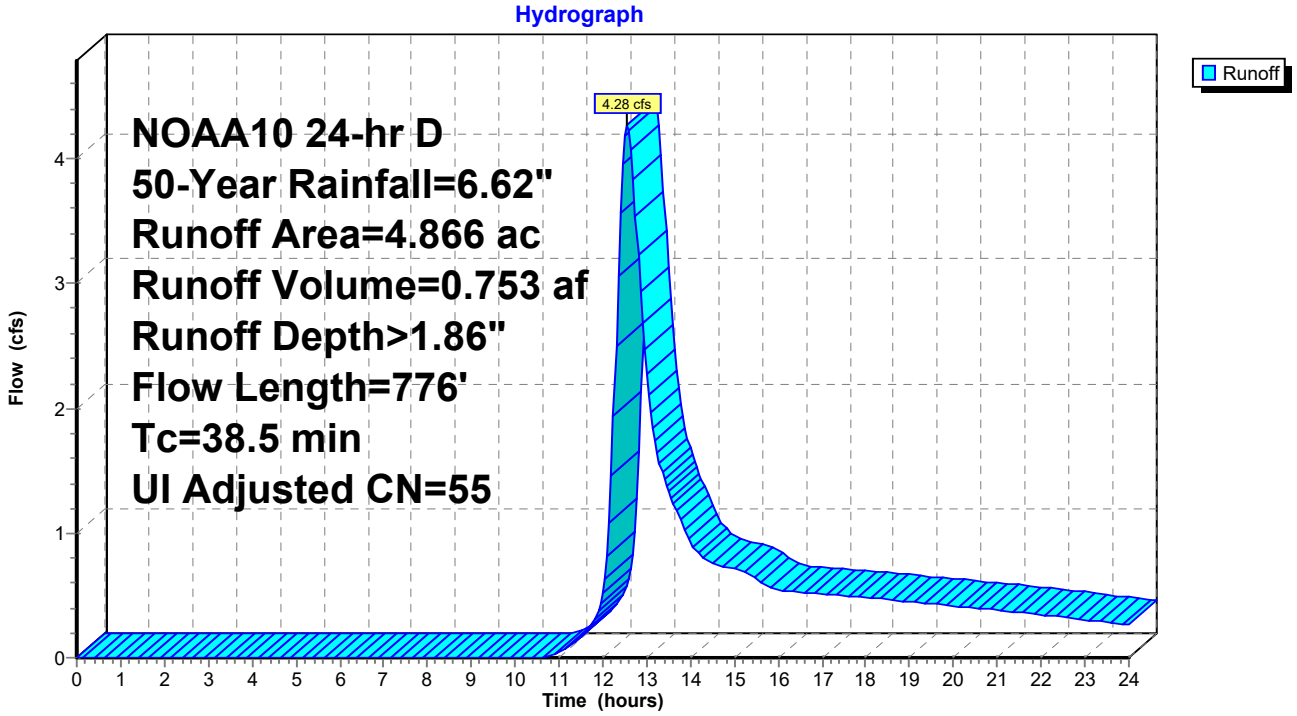
Runoff = 4.28 cfs @ 12.56 hrs, Volume= 0.753 af, Depth> 1.86"
Routed to Pond P2 : Bioswale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 50-Year Rainfall=6.62"

Area (ac)	CN	Adj	Description
0.853	39		>75% Grass cover, Good, HSG A
0.022	30		Woods, Good, HSG A
0.363	98		Roofs, HSG A
3.552	55		Woods, Good, HSG B
0.050	61		>75% Grass cover, Good, HSG B
0.026	98		Unconnected pavement, HSG A
4.866	56	55	Weighted Average, UI Adjusted
4.477			92.01% Pervious Area
0.389			7.99% Impervious Area
0.026			6.68% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.3	50	0.0100	0.03		**Sheet Flow, Woodland** Woods: Dense underbrush n= 0.800 P2= 3.20"
2.6	283	0.1270	1.78		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.0	10	0.3300	8.62		**Shallow Concentrated Flow, Grassed 3:1** Grassed Waterway Kv= 15.0 fps
7.6	433	0.0040	0.95		**Shallow Concentrated Flow, Detention Pond and swale** Grassed Waterway Kv= 15.0 fps
38.5	776	Total			

Subcatchment A3-PR: A3-PR

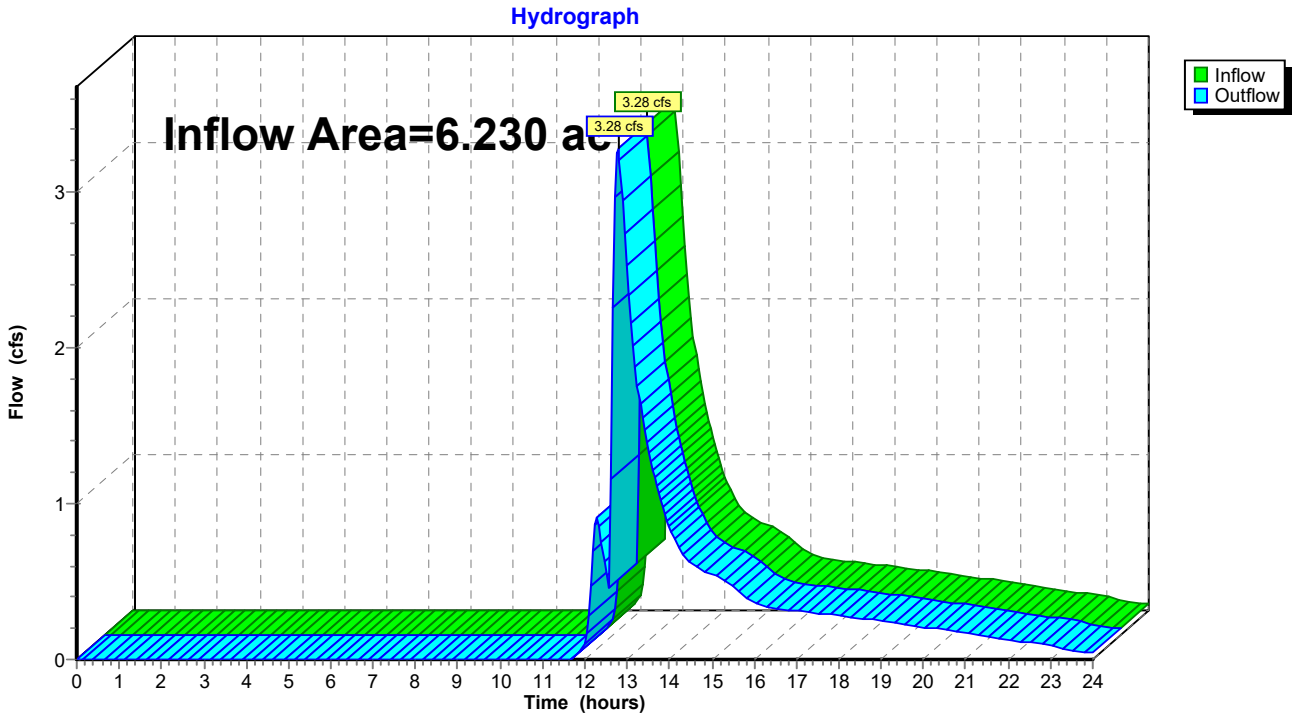


Summary for Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM

Inflow Area = 6.230 ac, 11.35% Impervious, Inflow Depth > 0.91" for 50-Year event
Inflow = 3.28 cfs @ 12.78 hrs, Volume= 0.471 af
Outflow = 3.28 cfs @ 12.78 hrs, Volume= 0.471 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM



Summary for Pond P1: Storage under Pervious Pavement

Inflow Area = 0.246 ac, 91.87% Impervious, Inflow Depth > 5.79" for 50-Year event
Inflow = 1.54 cfs @ 12.13 hrs, Volume= 0.119 af
Outflow = 0.29 cfs @ 11.90 hrs, Volume= 0.119 af, Atten= 81%, Lag= 0.0 min
Discarded = 0.29 cfs @ 11.90 hrs, Volume= 0.119 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 250.46' @ 12.38 hrs Surf.Area= 5,141 sf Storage= 947 cf

Plug-Flow detention time= 14.6 min calculated for 0.119 af (100% of inflow)
Center-of-Mass det. time= 14.3 min (791.9 - 777.6)

Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	4,113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 10,282 cf Overall x 40.0% Voids

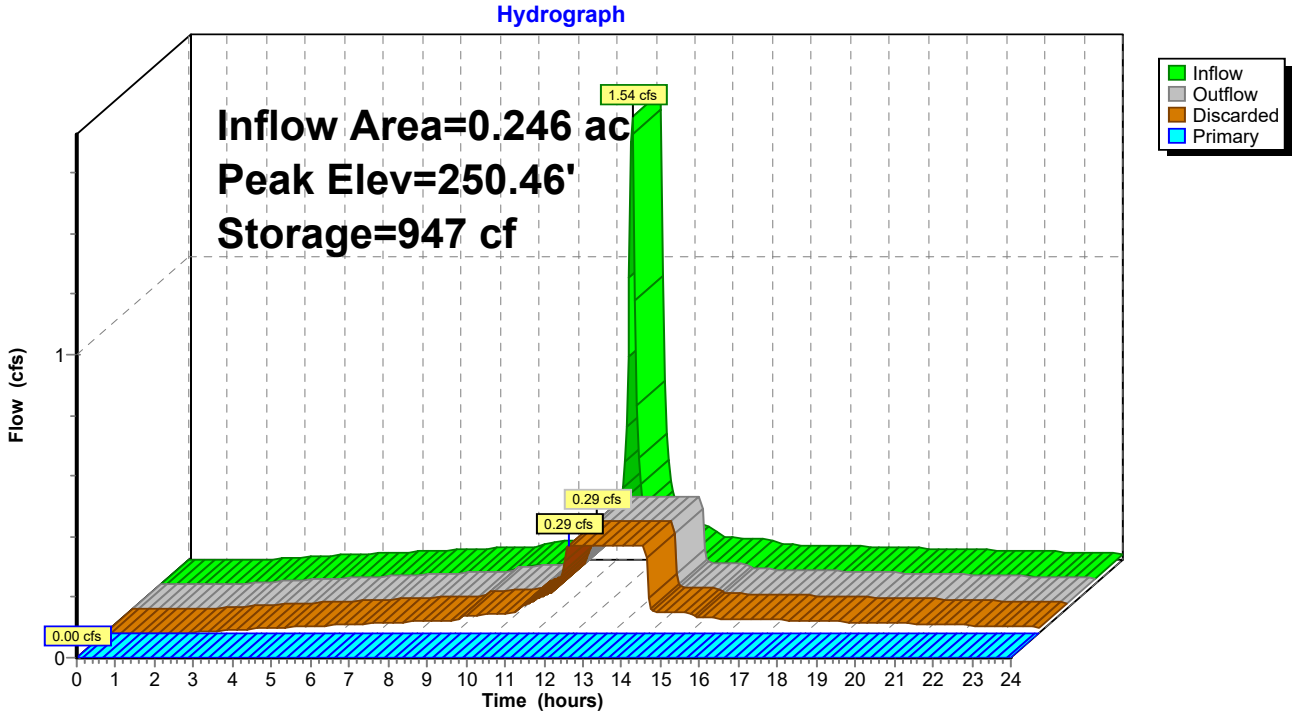
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
250.00	5,141	0	0
251.00	5,141	5,141	5,141
252.00	5,141	5,141	10,282

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	252.00'	**5,141.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.29 cfs @ 11.90 hrs HW=250.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=250.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: Storage under Pervious Pavement



Summary for Pond P2: Bioswale

Inflow Area = 4.866 ac, 7.99% Impervious, Inflow Depth > 1.86" for 50-Year event
Inflow = 4.28 cfs @ 12.56 hrs, Volume= 0.753 af
Outflow = 3.34 cfs @ 12.79 hrs, Volume= 0.641 af, Atten= 22%, Lag= 13.9 min
Discarded = 0.32 cfs @ 12.79 hrs, Volume= 0.290 af
Primary = 3.02 cfs @ 12.79 hrs, Volume= 0.351 af
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 250.92' @ 12.79 hrs Surf.Area= 5,797 sf Storage= 6,194 cf

Plug-Flow detention time= 106.7 min calculated for 0.640 af (85% of inflow)
Center-of-Mass det. time= 40.9 min (975.6 - 934.7)

Volume	Invert	Avail.Storage	Storage Description
#1	249.00'	14,297 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

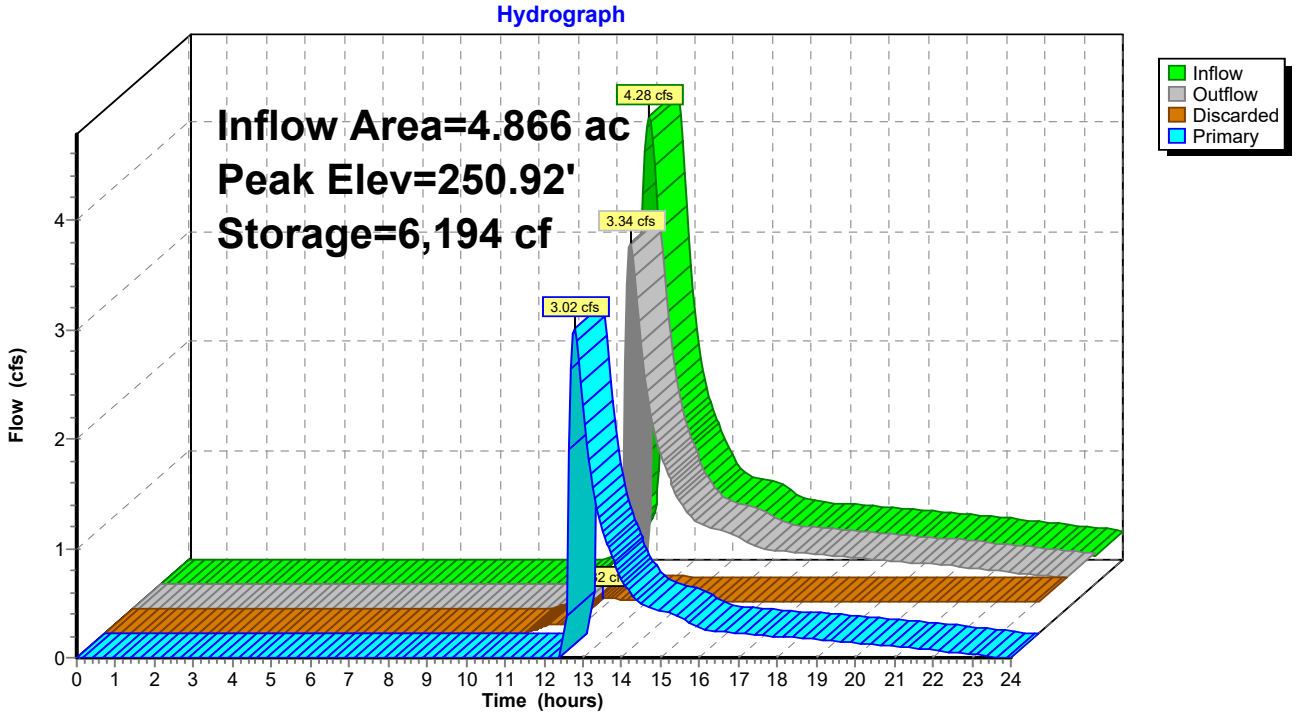
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
249.00	1,215	0	0
250.00	3,038	2,127	2,127
251.00	6,035	4,537	6,663
251.50	7,500	3,384	10,047
252.00	9,500	4,250	14,297

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	250.68'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.32 cfs @ 12.79 hrs HW=250.92' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.32 cfs)

Primary OutFlow Max=3.00 cfs @ 12.79 hrs HW=250.92' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 3.00 cfs @ 1.25 fps)

Pond P2: Bioswale



Summary for Subcatchment A1-PR: A1-PR

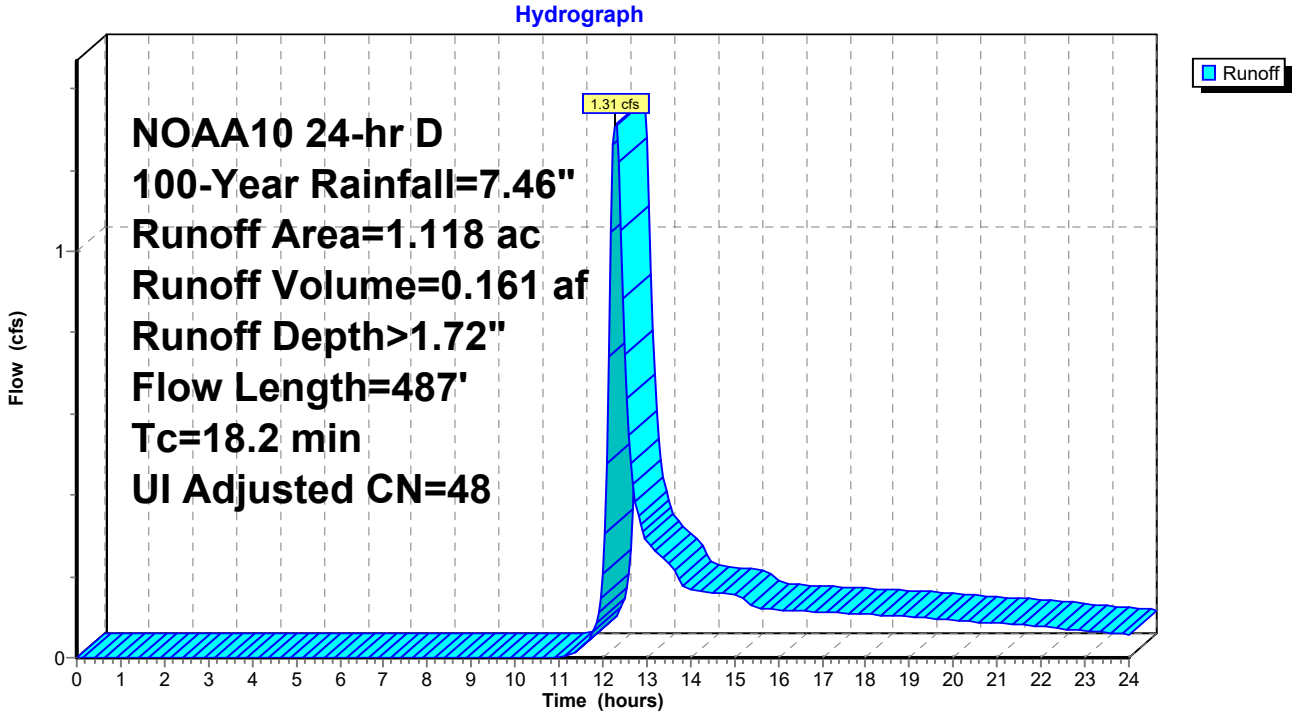
Runoff = 1.31 cfs @ 12.29 hrs, Volume= 0.161 af, Depth> 1.72"
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=7.46"

Area (ac)	CN	Adj	Description
0.556	39		>75% Grass cover, Good, HSG A
0.066	30		Woods, Good, HSG A
0.404	55		Woods, Good, HSG B
0.029	98		Unconnected pavement, HSG A
0.063	98		Roofs, HSG A
1.118	49	48	Weighted Average, UI Adjusted
1.026			91.77% Pervious Area
0.092			8.23% Impervious Area
0.029			31.52% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0600	0.06		**Sheet Flow, Woodland** Woods: Dense underbrush n= 0.800 P2= 3.20"
2.3	250	0.1300	1.80		**Shallow Concentrated Flow, Woodland Steep** Woodland Kv= 5.0 fps
2.1	187	0.0100	1.50		**Shallow Concentrated Flow, Grassed swale** Grassed Waterway Kv= 15.0 fps
18.2	487	Total			

Subcatchment A1-PR: A1-PR



Summary for Subcatchment A2-PR: A2-PR

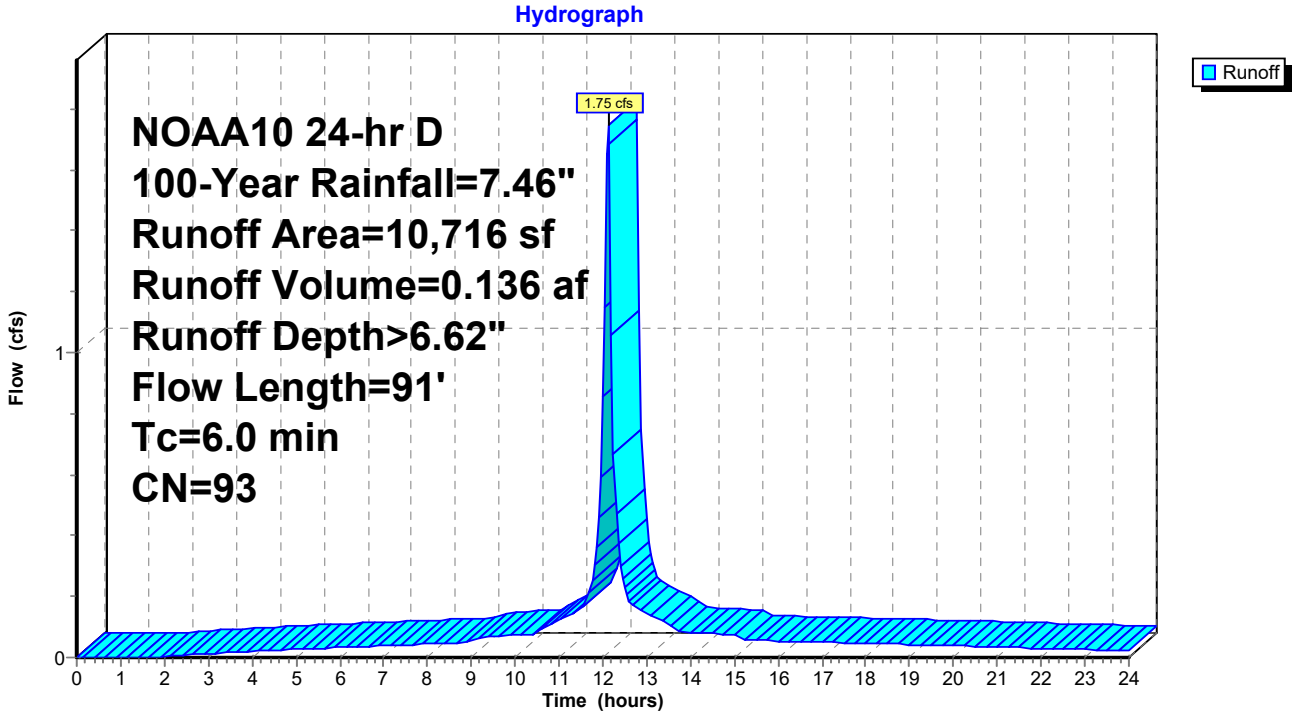
Runoff = 1.75 cfs @ 12.13 hrs, Volume= 0.136 af, Depth> 6.62"
Routed to Pond P1 : Storage under Pervious Pavement

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=7.46"

Area (sf)	CN	Description
4,704	98	Roofs, HSG A
5,141	98	Unconnected pavement, HSG A
871	39	>75% Grass cover, Good, HSG A
10,716	93	Weighted Average
871		8.13% Pervious Area
9,845		91.87% Impervious Area
5,141		52.22% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	91		0.25		**Direct Entry, Roofs and Gutters**

Subcatchment A2-PR: A2-PR



Summary for Subcatchment A3-PR: A3-PR

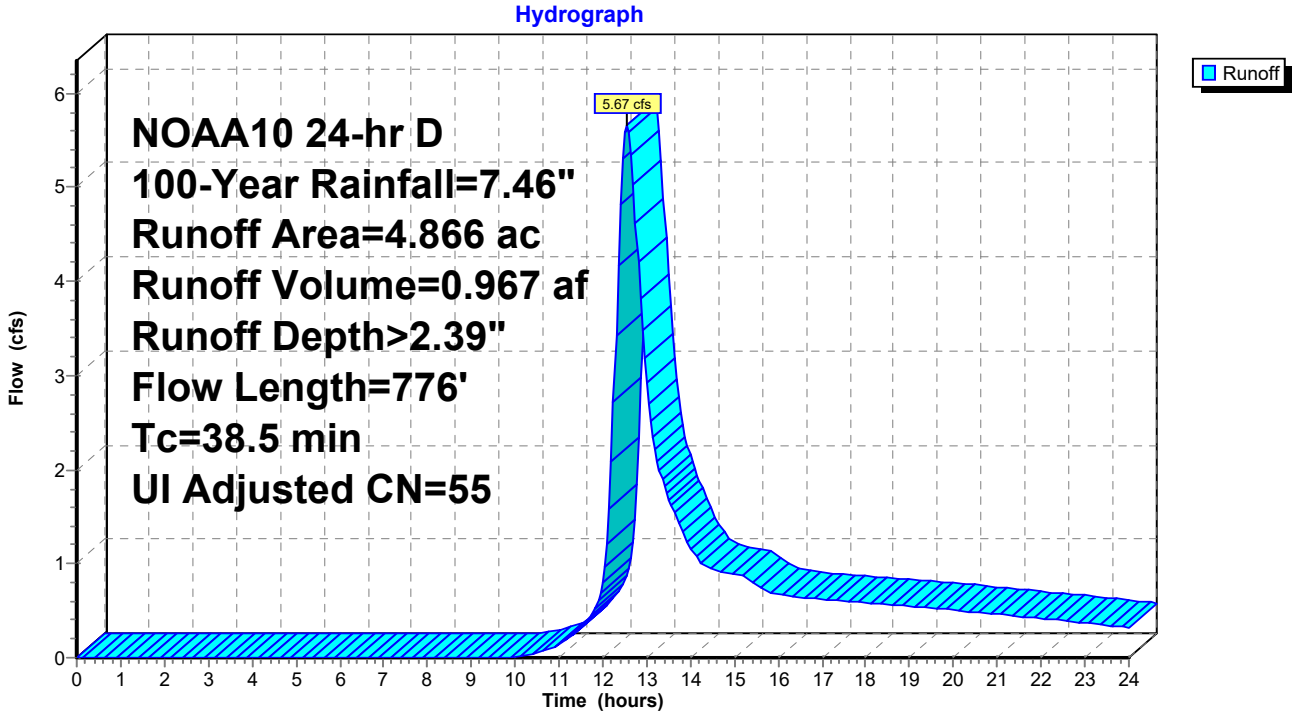
Runoff = 5.67 cfs @ 12.55 hrs, Volume= 0.967 af, Depth> 2.39"
Routed to Pond P2 : Bioswale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=7.46"

Area (ac)	CN	Adj	Description
0.853	39		>75% Grass cover, Good, HSG A
0.022	30		Woods, Good, HSG A
0.363	98		Roofs, HSG A
3.552	55		Woods, Good, HSG B
0.050	61		>75% Grass cover, Good, HSG B
0.026	98		Unconnected pavement, HSG A
4.866	56	55	Weighted Average, UI Adjusted
4.477			92.01% Pervious Area
0.389			7.99% Impervious Area
0.026			6.68% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.3	50	0.0100	0.03		**Sheet Flow, Woodland** Woods: Dense underbrush n= 0.800 P2= 3.20"
2.6	283	0.1270	1.78		**Shallow Concentrated Flow, Woodland** Woodland Kv= 5.0 fps
0.0	10	0.3300	8.62		**Shallow Concentrated Flow, Grassed 3:1** Grassed Waterway Kv= 15.0 fps
7.6	433	0.0040	0.95		**Shallow Concentrated Flow, Detention Pond and swale** Grassed Waterway Kv= 15.0 fps
38.5	776	Total			

Subcatchment A3-PR: A3-PR

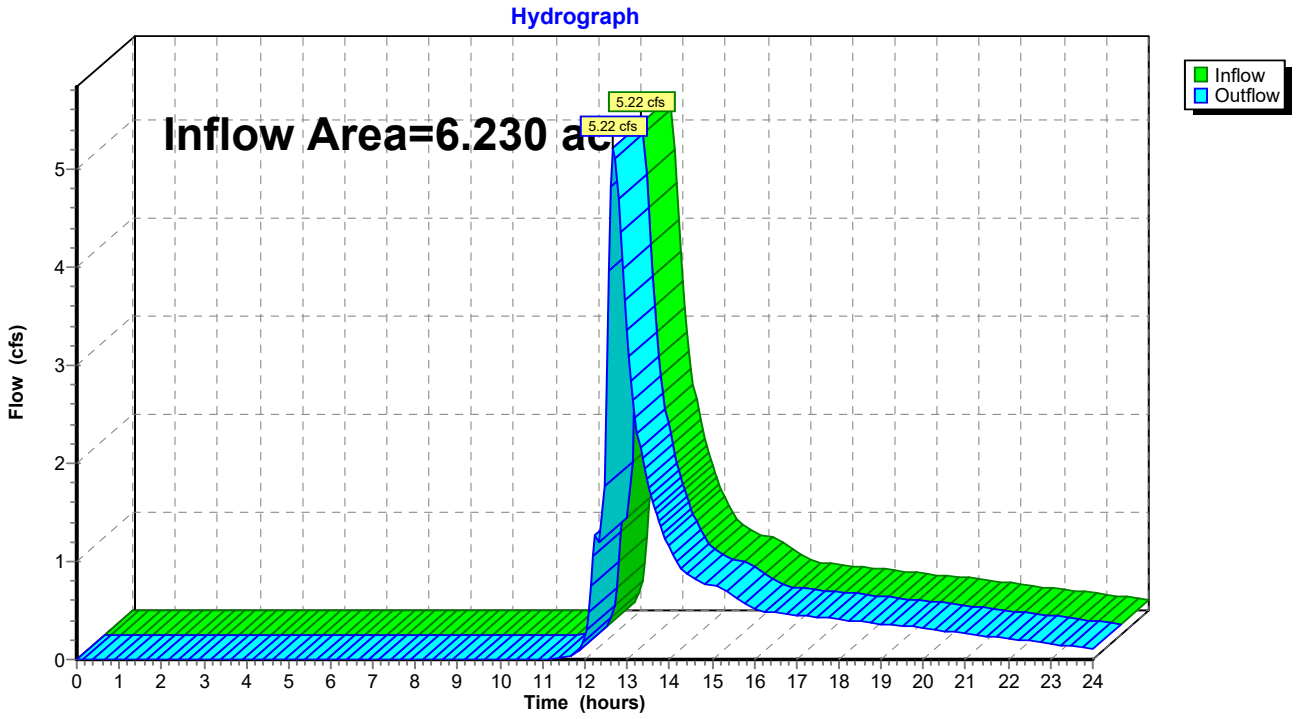


Summary for Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM

Inflow Area = 6.230 ac, 11.35% Impervious, Inflow Depth > 1.38" for 100-Year event
Inflow = 5.22 cfs @ 12.68 hrs, Volume= 0.715 af
Outflow = 5.22 cfs @ 12.68 hrs, Volume= 0.715 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach DP-A: ADAMS CIRCLE - MUNICIPAL SYSTEM



Summary for Pond P1: Storage under Pervious Pavement

Inflow Area = 0.246 ac, 91.87% Impervious, Inflow Depth > 6.62" for 100-Year event
Inflow = 1.75 cfs @ 12.13 hrs, Volume= 0.136 af
Outflow = 0.29 cfs @ 11.85 hrs, Volume= 0.136 af, Atten= 84%, Lag= 0.0 min
Discarded = 0.29 cfs @ 11.85 hrs, Volume= 0.136 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 250.56' @ 12.42 hrs Surf.Area= 5,141 sf Storage= 1,155 cf

Plug-Flow detention time= 18.4 min calculated for 0.136 af (100% of inflow)
Center-of-Mass det. time= 18.0 min (791.6 - 773.6)

Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	4,113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 10,282 cf Overall x 40.0% Voids

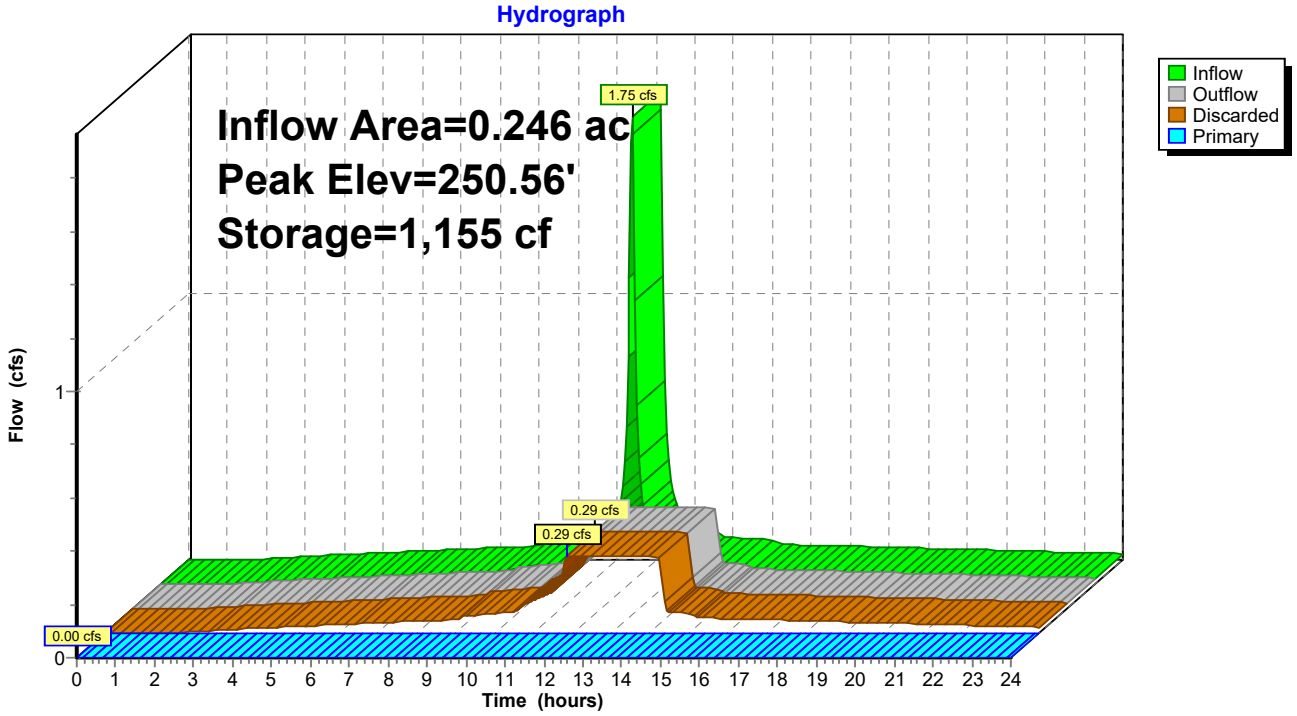
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
250.00	5,141	0	0
251.00	5,141	5,141	5,141
252.00	5,141	5,141	10,282

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	252.00'	**5,141.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.29 cfs @ 11.85 hrs HW=250.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=250.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: Storage under Pervious Pavement



Summary for Pond P2: Bioswale

Inflow Area = 4.866 ac, 7.99% Impervious, Inflow Depth > 2.39" for 100-Year event
Inflow = 5.67 cfs @ 12.55 hrs, Volume= 0.967 af
Outflow = 5.12 cfs @ 12.69 hrs, Volume= 0.854 af, Atten= 10%, Lag= 8.5 min
Discarded = 0.34 cfs @ 12.69 hrs, Volume= 0.300 af
Primary = 4.78 cfs @ 12.69 hrs, Volume= 0.554 af
Routed to Reach DP-A : ADAMS CIRCLE - MUNICIPAL SYSTEM

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 251.00' @ 12.69 hrs Surf.Area= 6,049 sf Storage= 6,691 cf

Plug-Flow detention time= 85.6 min calculated for 0.852 af (88% of inflow)
Center-of-Mass det. time= 31.7 min (956.5 - 924.8)

Volume	Invert	Avail.Storage	Storage Description
#1	249.00'	14,297 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

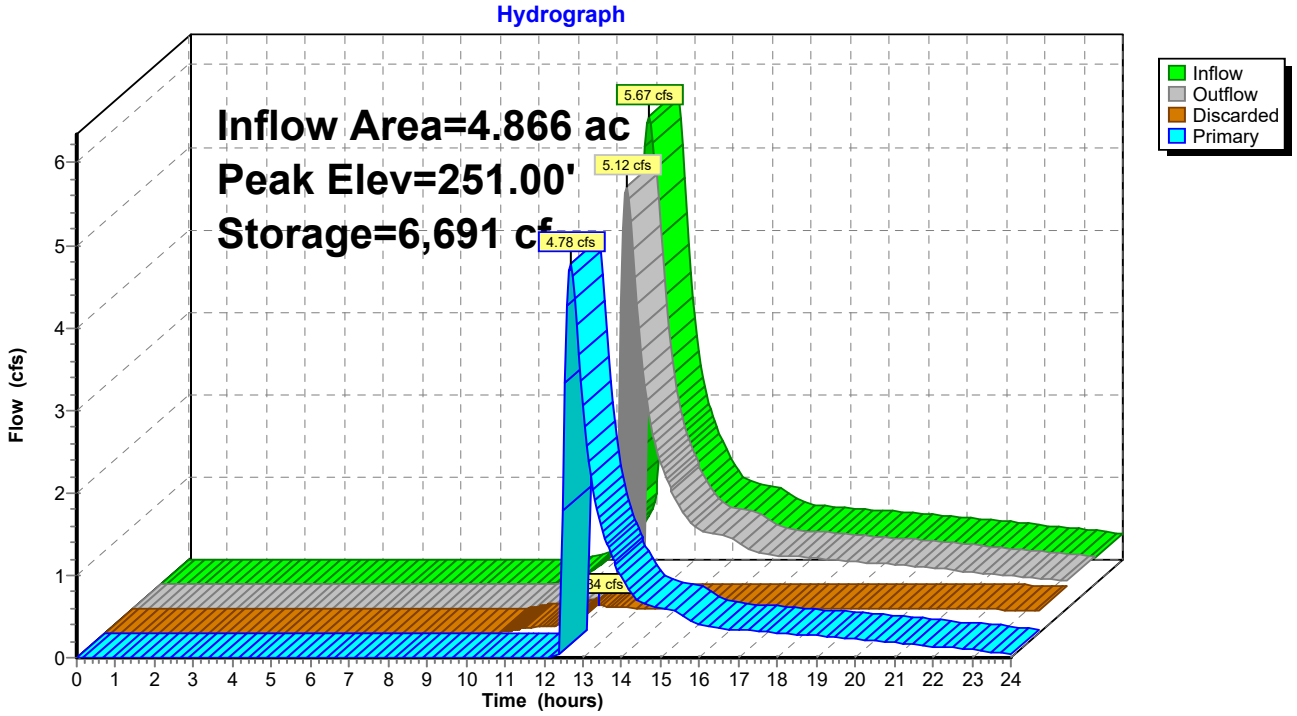
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
249.00	1,215	0	0
250.00	3,038	2,127	2,127
251.00	6,035	4,537	6,663
251.50	7,500	3,384	10,047
252.00	9,500	4,250	14,297

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	250.68'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

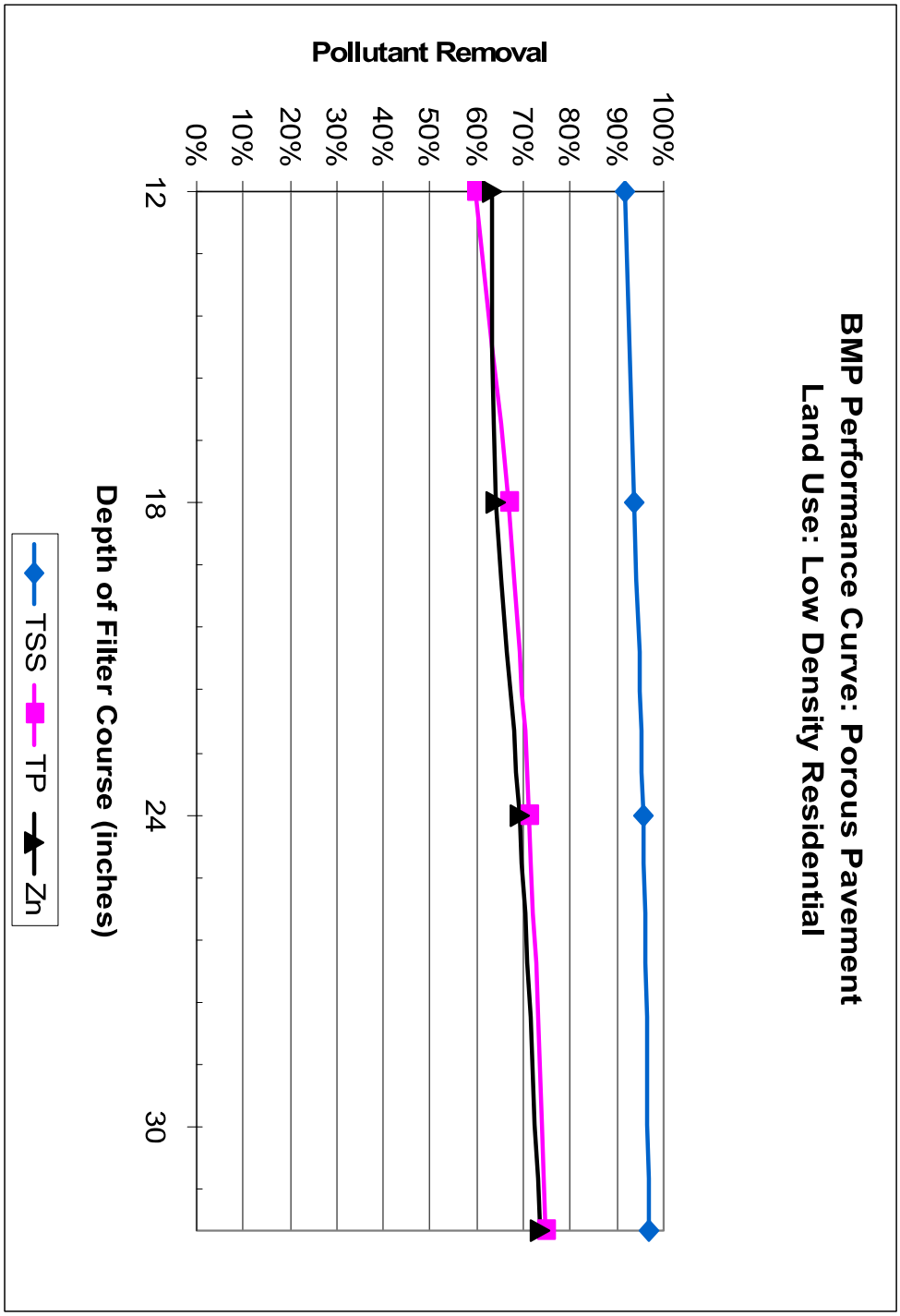
Discarded OutFlow Max=0.34 cfs @ 12.69 hrs HW=251.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=4.76 cfs @ 12.69 hrs HW=251.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 4.76 cfs @ 1.47 fps)

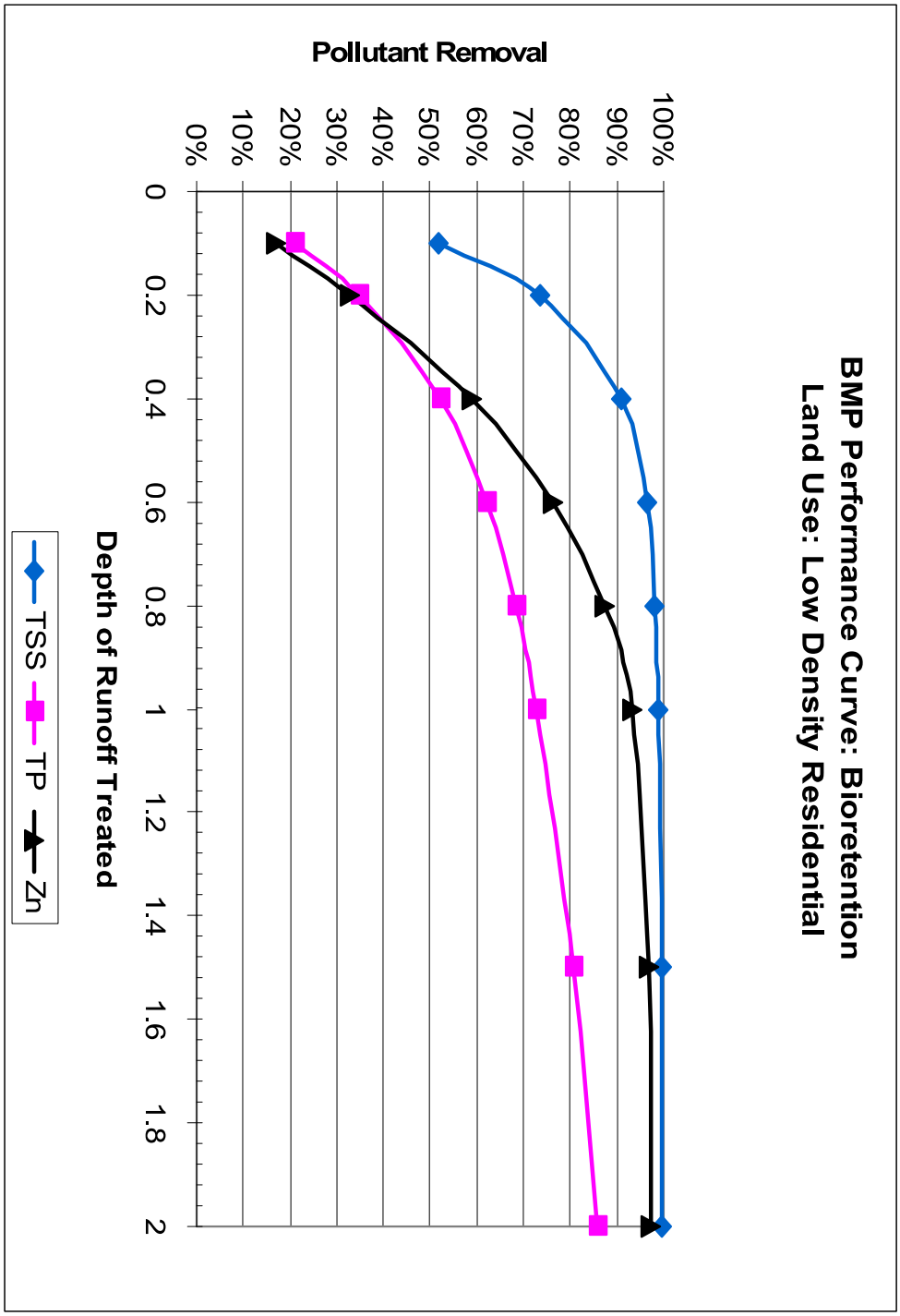
Pond P2: Bioswale



TSS Calculations



Source: "Stormwater Best Management Practices (BMP) Performance Analysis" prepared by Tetra Tech, Inc., prepared for United Stated Environmental Protection Agency - Region 1, dated last revised March 2010.



Source: "Stormwater Best Management Practices (BMP) Performance Analysis" prepared by Tetra Tech, Inc., prepared for United Stated Environmental Protection Agency - Region 1, dated last revised March 2010.

Water Quality Calculations

Water Quality Volume Calculations

Project Name:	Multi-family Development	Date:	9/15/2025
Project Location:	25 Adams Circle, Devens, MA	Calculated By:	MKB
Project Number:	348-019	Checked By:	BP

Stormwater BMP: Bioswale (P-2) Description: Proposed Bioswale

Total Drainage Area:	211,963	sq ft
	4.87	ac
Total Impervious Area:	16,945	sq ft
	0.39	ac

** Roof Areas are considred clean and are generally not subject to WQV calculation, however per the request of the Peer Reviewer, calculations have been revised to include roof areas.*

Runoff Depth to be Treated: 1.0 inches

Required Water Quality Volume:	**1,412**	**cf**
	0.032	ac ft

Provided Water Quality Volume:	**4,885**	**cf**
	0.112	ac ft

Stormwater BMP: Porous Pavement (P-1) Description: Proposed Porous Pavement Driveways

Total Drainage Area:	10,716	sq ft
	0.25	ac
Total Impervious Area:	9,845	sq ft
	0.23	ac

** Roof Areas are considred clean and are generally not subject to WQV calculation, however per the request of the Peer Reviewer, calculations have been revised to include roof areas.*

Runoff Depth to be Treated: 1.0 inches

Required Water Quality Volume:	**820**	**cf**
	0.019	ac ft

Provided Water Quality Volume:	**4,113**	**cf**
	0.094	ac ft

Groundwater Recharge Calculations

Groundwater Recharge Calculations

Project Name: Multi-family Development
Project Location: 25 Adams Circle, Devens, MA
Project Number: 348-019

Date: 7/30/2025
Calculated By: MKB
Checked By: BP

Existing Conditions Impervious Area

Hydrologic Soil Group	Area (sq ft)	Area (acres)	Recharge Depth (in)	Volume (cu ft)
A	0	0.00	0.60	0.0
B	0	0.00	0.35	0.0
C	0	0.00	0.25	0.0
D	0	0.00	0.10	0.0
TOTAL	**0**	**0.00**		**0**

Proposed Conditions Impervious Area

Hydrologic Soil Group	Area (sq ft)	Area (acres)	Recharge Depth (in)	Volume (cu ft)
A	30,797	0.71	0.60	1,539.9
B	0	0.00	0.35	0.0
C	0	0.00	0.25	0.0
D	0	0.00	0.10	0.0
TOTAL	**30,797**	**0.71**		**1,540**

Net Required Recharge Volume: 1,540 cu ft

Provided Recharge Volume

Pond P2	4,885	cf	*Bioswale*
Pond P1	4,113	cf	*Porous Pavement*
TOTAL	8,998	cf	

Total Provided Recharge Volume: 8,998 cu ft

Groundwater Recharge Calculations

Project Name: Multi-family Development
Project Location: 25 Adams Circle, Devens, MA
Project Number: 348-019

Date: 9/15/2025
Calculated By: MKB
Checked By: BP

Provided Recharge Volume

Stormwater BMP: Pond P2

Description: Bioswale

Bottom of Rain Garden Elevation:	250.00	ft	
Lowest Outlet Elevation:	250.68	ft	
***** Volume Provided:**	**0.11**	**ac ft**	
	4,885	**cu ft**	*** (See attached HydroCAD output)

Stormwater BMP: Pond P1

Description: Porous Pavement

***** Volume Provided:**	**0.09**	**ac ft**	
	4,113	**cu ft**	*** (See attached HydroCAD output)

Total Provided Recharge Volume:	**8,998**	**cu ft**

72-hour Drawdown Calculation

Bioswale (Pond P-2)

Provided Recharge Volume:	4,885	cu ft	
Saturated Hydraulic Conductivity:	2.41	in / hr	Per NRCS Web Soil Survey
Bottom Area:	3,038	sq ft	
Drawdown Time:	**8.0**	**hours**	

Porous Pavement (Pond P-1)

Provided Recharge Volume:	4,113	cu ft	
Saturated Hydraulic Conductivity:	2.41	in / hr	Per NRCS Web Soil Survey
Bottom Area:	5,141	sq ft	
Drawdown Time:	**4.0**	**hours**	

Stage-Area-Storage for Pond P2: Bioswale (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
250.04	3,158	2,250
250.05	3,188	2,282
250.06	3,218	2,314
250.07	3,248	2,347
250.08	3,278	2,379
250.09	3,308	2,412
250.10	3,338	2,445
250.11	3,368	2,479
250.12	3,398	2,513
250.13	3,428	2,547
250.14	3,458	2,581
250.15	3,488	2,616
250.16	3,518	2,651
250.17	3,547	2,686
250.18	3,577	2,722
250.19	3,607	2,758
250.20	3,637	2,794
250.21	3,667	2,831
250.22	3,697	2,867
250.23	3,727	2,905
250.24	3,757	2,942
250.25	3,787	2,980
250.26	3,817	3,018
250.27	3,847	3,056
250.28	3,877	3,095
250.29	3,907	3,134
250.30	3,937	3,173
250.31	3,967	3,212
250.32	3,997	3,252
250.33	4,027	3,292
250.34	4,057	3,333
250.35	4,087	3,373
250.36	4,117	3,414
250.37	4,147	3,456
250.38	4,177	3,497
250.39	4,207	3,539
250.40	4,237	3,581
250.41	4,267	3,624
250.42	4,297	3,667
250.43	4,327	3,710
250.44	4,357	3,753
250.45	4,387	3,797
250.46	4,417	3,841
250.47	4,447	3,885
250.48	4,477	3,930
250.49	4,507	3,975
250.50	4,537	4,020
250.51	4,566	4,066
250.52	4,596	4,111
250.53	4,626	4,158
250.54	4,656	4,204
250.55	4,686	4,251
250.56	4,716	4,298
250.57	4,746	4,345
250.58	4,776	4,393
250.59	4,806	4,441
250.60	4,836	4,489
250.61	4,866	4,537
250.62	4,896	4,586
250.63	4,926	4,635
250.64	4,956	4,685
250.65	4,986	4,734
250.66	5,016	4,784
250.67	5,046	4,835
250.68	5,076	4,885
250.69	5,106	4,936
250.70	5,136	4,987
250.71	5,166	5,039
250.72	5,196	5,091
250.73	5,226	5,143
250.74	5,256	5,195
250.75	5,286	5,248
250.76	5,316	5,301
250.77	5,346	5,354
250.78	5,376	5,408
250.79	5,406	5,462
250.80	5,436	5,516
250.81	5,466	5,570
250.82	5,496	5,625
250.83	5,526	5,680
250.84	5,555	5,736
250.85	5,585	5,791
250.86	5,615	5,847
250.87	5,645	5,904
250.88	5,675	5,960
250.89	5,705	6,017
250.90	5,735	6,074
250.91	5,765	6,132
250.92	5,795	6,190
250.93	5,825	6,248
250.94	5,855	6,306
250.95	5,885	6,365
250.96	5,915	6,424
250.97	5,945	6,483
250.98	5,975	6,543
250.99	6,005	6,603
251.00	6,035	6,663
251.01	6,064	6,723
251.02	6,094	6,784
251.03	6,123	6,845
251.04	6,152	6,907
251.05	6,182	6,968
251.06	6,211	7,030
251.07	6,240	7,093

Elevation of lowest outlet = 250.68
Provided Recharge Volume = 4,885 CF

Stage-Area-Storage for Pond P1: Storage under Pervious Pavement

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
250.00	**5,141**	0
250.02	5,141	41
250.04	5,141	82
250.06	5,141	123
250.08	5,141	165
250.10	5,141	206
250.12	5,141	247
250.14	5,141	288
250.16	5,141	329
250.18	5,141	370
250.20	5,141	411
250.22	5,141	452
250.24	5,141	494
250.26	5,141	535
250.28	5,141	576
250.30	5,141	617
250.32	5,141	658
250.34	5,141	699
250.36	5,141	740
250.38	5,141	781
250.40	5,141	823
250.42	5,141	864
250.44	5,141	905
250.46	5,141	946
250.48	5,141	987
250.50	5,141	1,028
250.52	5,141	1,069
250.54	5,141	1,110
250.56	5,141	1,152
250.58	5,141	1,193
250.60	5,141	1,234
250.62	5,141	1,275
250.64	5,141	1,316
250.66	5,141	1,357
250.68	5,141	1,398
250.70	5,141	1,439
250.72	5,141	1,481
250.74	5,141	1,522
250.76	5,141	1,563
250.78	5,141	1,604
250.80	5,141	1,645
250.82	5,141	1,686
250.84	5,141	1,727
250.86	5,141	1,769
250.88	5,141	1,810
250.90	5,141	1,851
250.92	5,141	1,892
250.94	5,141	1,933
250.96	5,141	1,974
250.98	5,141	2,015
251.00	5,141	2,056
251.02	5,141	2,098
251.04	5,141	2,139
251.06	5,141	2,180
251.08	5,141	2,221
251.10	5,141	2,262
251.12	5,141	2,303
251.14	5,141	2,344
251.16	5,141	2,385
251.18	5,141	2,427
251.20	5,141	2,468
251.22	5,141	2,509
251.24	5,141	2,550
251.26	5,141	2,591
251.28	5,141	2,632
251.30	5,141	2,673
251.32	5,141	2,714
251.34	5,141	2,756
251.36	5,141	2,797
251.38	5,141	2,838
251.40	5,141	2,879
251.42	5,141	2,920
251.44	5,141	2,961
251.46	5,141	3,002
251.48	5,141	3,043
251.50	5,141	3,085
251.52	5,141	3,126
251.54	5,141	3,167
251.56	5,141	3,208
251.58	5,141	3,249
251.60	5,141	3,290
251.62	5,141	3,331
251.64	5,141	3,372
251.66	5,141	3,414
251.68	5,141	3,455
251.70	5,141	3,496
251.72	5,141	3,537
251.74	5,141	3,578
251.76	5,141	3,619
251.78	5,141	3,660
251.80	5,141	3,702
251.82	5,141	3,743
251.84	5,141	3,784
251.86	5,141	3,825
251.88	5,141	3,866
251.90	5,141	3,907
251.92	5,141	3,948
251.94	5,141	3,989
251.96	5,141	4,031
251.98	5,141	4,072
252.00	5,141	**4,113**

Provided Recharge Volume = 4,113 CF

APPENDIX D

Illicit Discharge Statement

Illicit Discharge Statement

ILLICIT DISCHARGE COMPLIANCE STATEMENT

I VERIFY THAT NO ILLICIT DISCHARGES EXIST FROM THE PROPOSED MULTI-FAMILY DEVELOPMENT AT 25 ADAMS CIRCLE, MASSACHUSETTS. THROUGH THE IMPLEMENTATION OF THE *CONSTRUCTION PERIOD POLLUTION PREVENTION AND SEDIMENTATION AND EROSION CONTROL PLAN* AS WELL AS THE *OPERATION AND MAINTENANCE PLAN*, MEASURES ARE SET FORTH TO PREVENT ILLICIT DISCHARGES FROM ENTERING THE STORMWATER MANAGEMENT DRAINAGE SYSTEM.

SIGNATURE	**PRINT NAME**	**DATE**

TITLE	**COMPANY**

SIGNATURE	**PRINT NAME**	**DATE**

TITLE	**COMPANY**

NOTE: THIS CERTIFICATION MUST BE SIGNED BEFORE STORMWATER IS CONVEYED TO THE PROPOSED STORMWATER DRAINAGE SYSTEM IN ACCORDANCE WITH STANDARD 10 OF THE MASSACHUSETTS STORMWATER MANAGEMENT STANDARDS.