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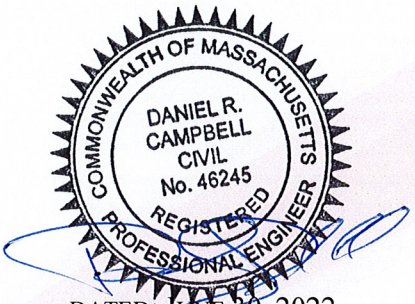
STORMWATER REPORT

FOR

704 WASHINGTON STREET
FRANKLIN, MA



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Prepared By:

Level Design Group, L.L.C.

249 South Street, Unit 1

Plainville, MA 02762

Applicant:

Amego Inc.

33 Perry Street

Attleboro, MA 02703

508.455.6200

Property Owner:

Lawrence P. Benedetto

213 Chestnut St.

Franklin, MA 02038

LDG Project No.: 2013.00

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HYDROLOGIC SUMMARY

METHODOLOGY

The HydroCAD computer program (Hydro CAD) was used to model the existing and proposed hydrology of the site and design a stormwater management system. HydroCAD generates flood hydrographs dependent upon the type of land use, vegetation, soil types, land slope, watershed areas and rainfall data. HydroCAD also takes into account the antecedent moisture condition of the soil. The peak rate of runoff and volume of runoff are projected for the input storm frequency events (design storms).

Rainfall data was obtained from the Northeast Regional Climate Center and are based on Extreme Precipitation Events for the 2-, 10-, 25- and 100-year return periods for Franklin, Massachusetts. A 24-hour type III rainfall distribution was used in the HydroCAD analysis as prescribed for New England by the Northeast Regional Climate Center. A copy of the precipitation table is included herein.

PRE-DEVELOPMENT CONDITIONS

The existing site is located at 704 Washington Street between Stanford Road and Jefferson Road in Franklin, MA. The existing site contains a single-family one-story dwelling, a barn, and a shed. The lot is developed and contains existing structures, driveway, landscaping, & utilities, including an on-site septic system.

The existing topography generally slopes south towards the rear of the site to the south directing a majority of the overland flow to an off-site wetland. The northwestern corner of the site around the existing dwelling slopes north directing runoff onto Washington Street. The land cover is mostly lawn area at the front of the site around the existing buildings. The remaining area along the perimeter and rear is lightly wooded with dense underbrush.

Test pits were dug on-site in the areas of the proposed detention basin to verify the groundwater elevation. Groundwater depth in the area of the detention basin varies between approximately 4-feet to 6-feet below the surface. The soil logs of the test pits are attached.

The on-site soils as classified by the Soil Survey for Middlesex County Massachusetts are:

71B – Ridgebury fine sandy loam; 3 to 8 percent slopes; Hydrologic Soil Group (HSG) D
254B – Merrimac fine sandy loam; 3 to 8 percent slopes; Hydrologic Soil Group (HSG) A
422B – Canton fine sandy loam; 3 to 8 percent slopes; Hydrologic Soil Group (HSG) B

See the attached SCS soils documentation herein for additional soil details

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POST-DEVELOPMENT CONDITIONS

The Applicant is proposing to Demolish the existing buildings and construct 2 new Group homes each proposed to accommodate 5 people. The project will also include the construction of a new paved driveway and parking area between the new buildings as well as installation of new utilities and associated grading. A new stormwater management system will be installed for the site.

A new fully compliant stormwater management system has been designed to mitigate the impacts of the proposed site redevelopment. Runoff from the impervious areas and building rooftops will be directed to bioretention basins via overland flow. The bioretention basins will provide the required infiltration volume as well as attenuate peak rates of runoff.

A fully compliant stormwater management system for the entire site addressing compliance with the 10 MADEP Stormwater Standards will be part of the site redevelopment. Site improvements have been made to the maximum extent practicable in accordance with MADEP Stormwater Regulations.

STANDARD 1: Untreated Discharges

Stormwater Management Standard 1 requires that, "No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth".

This standard is met by the proposed redevelopment not creating any new non-treated stormwater discharges and improving an existing residential site with no existing stormwater management system. All surface runoff from proposed impervious areas, with the exception of a portion of the proposed building roof and a portion of the proposed driveway, is collected and directed to a bioretention basin and treated for suspended solids removal. All discharges are designed to be placed in areas which mimic existing drainage flow patterns.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 1.

Full compliance with Standard 1 is required for new outfalls.

- What BMPs are proposed to ensure that all new discharges associated with the discharge are adequately treated? Bioretention Basin
- What BMPs are proposed to ensure that no new discharges cause erosion in wetlands or waters of the Commonwealth? Bioretention Basin includes a rip rap spillway designed to prevent erosion.
- Will the proposed discharge comply with all applicable requirements of the Massachusetts Clean Waters Act and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00? yes

Existing outfalls shall be brought into compliance with Standard 1 to the maximum extent practicable.

- Are there any existing discharges associated with the redevelopment project for which new treatment could be provided? No existing outfalls
- If so, the proponent shall specify the stormwater BMP retrofit measures that have been considered to ensure that the discharges are adequately treated and indicate the reasons for adopting or rejecting those measures. (See Section entitled "Retrofit of Existing BMPs".) N/A
- What BMPs have been considered to prevent erosion from existing stormwater discharges? N/A

STANDARD 2: Peak Rate Control and Flood Prevention

Stormwater Management Standard 2 requires that, "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 land subject to coastal storm flowage."

This standard is met by the proposed redevelopment mitigating the post-development peak discharge rates at the designated control points for all design storm events. This is accomplished by directing stormwater flow to bioretention basins. Below is a description of the design points used in the hydrologic analysis and a summary of pre- and post- development discharge rates. The proposed development will reduce the peak rate of runoff at all the design points and provide ample groundwater recharge.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 2.

Compliance to the Maximum Extent Practicable:

- Does the redevelopment design meet Standard 2, comparing post-development to pre-development conditions? Yes
- If not, the applicant shall document an analysis of alternative approaches for meeting the Standard. (See Menu of Strategies to Reduce Runoff and Peak Flows and/or Increase Recharge Menu included at the end of this chapter.) N/A

Improvement of existing conditions:

- Does the project reduce the volume and/or rate of runoff to less than current estimated conditions? Has the applicant considered all the alternatives for reducing the volume and/or rate of runoff from the site? (See Menu.) Yes
- Is the project located within a watershed subject to damage by flooding during the 2-year or 10-year 24-hour storm event? If so, does the project design provide for attenuation of the 2-year and 10-year 24-hour storm event to less than current estimated conditions? Have measures been implemented to reduce the volume of runoff from the site resulting from the 2 year or 10 year 24 hour storm event? (See Menu.) N/A
- Is the project located adjacent to a water body or watercourse subject to adverse impacts from flooding during the 100-year 24-hour storm event? If so, are portions of the site available to increase flood storage adjacent to existing Bordering Land Subject to Flooding (BLSF)? N/A
- Have measures been implemented to attenuate peak rates of discharge during the 100-year 24-hour storm event to less than the peak rates under current estimated conditions? Have measures been implemented to reduce the volume of runoff from the site resulting from the 100-year 24-hour storm event? (See Menu.) Yes

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SUMMARY OF PEAK STORMWATER RUNOFF (CFS)

Two design points were utilized to analyze the runoff characteristics of the site. Design Point (DP-1) is flow from the site to the existing drainage on Washington Street. Design Point DP-2 is a wetland located off-site to the south. The pre- and post- development peak discharge rates for all analyzed design storms is summarized in the following table:

Design Point – DP-1		
Storm	Pre-Dev. Flow	Post-Dev. Flow
2-yr	0.01 cfs	0.00 cfs
10-yr	0.24 cfs	0.02 cfs
25-yr	0.48 cfs	0.08 cfs
100-yr	0.91 cfs	0.21 cfs
Design Point – DP-2		
Year Storm	Pre-Dev. Flow	Post-Dev. Flow
2-yr	0.01 cfs	0.00 cfs
10-yr	0.54 cfs	0.15 cfs
25-yr	1.52 cfs	0.66 cfs
100-yr	3.52 cfs	3.23 cfs

The net peak discharge is for DP-2 is controlled by the bioretention basins and does not increase flows off site for any of the evaluated design storms. The net peak discharge is for DP-1 is un-controlled and flows off-site overland as occurs in existing conditions. There is a reduction in total area and impervious area based on the proposed development and does not increase flows off site for any of the evaluated design storms from existing conditions.

STANDARD 3: Recharge to Groundwater

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

This standard is fulfilled by sizing the bioretention basins to accommodate all new impervious surfaces and rooftops. The system is designed to fully infiltrate to the maximum extent practicable based on all new impervious areas being mapped as a HSG A. The redevelopment of the site is a significant improvement to the existing conditions which contains no treated stormwater infiltration. All existing site infiltration occurs through the pervious surfaces consisting of vegetated wooded and/or grass ground cover. Below is a detailed calculation demonstrating full compliance with the recharge to groundwater requirements.

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GROUND WATER RECHARGE

The on-site soils of the areas contributing to the proposed infiltration system as classified by the Soil Survey for Middlesex County Massachusetts are 254B – Merrimac fine sandy loam 3 to 8 percent slopes with a hydrologic soil group classification of HSG A. On-site soil textures vary from Loamy Sand to Sand based on test pits performed by Level Design Group, LLC. Based on test pit data and the HSA "A" soil classification, an infiltration rate of 2.41 inches per hour was used per the Rawls Rates for the soils identified in the test pits (MADEP Stormwater Handbook Volume 3, Chapter 1, Page 22).

The total post-development impervious area including the proposed building rooftop totals 22,263 SF
The required recharge was calculated using the Simple Dynamic Method as follows:

Simple Dynamic Method Calculations for all proposed infiltration practices:

Required Recharge Volume:
Rv = (F) x (Impervious Area)
Rv = (HSG A) x (impervious area)

F = 0.60 (HSG A)
Impervious Area = 22,263 SF
Rv = (0.60) x (22,263 SF) x (1 ft./12 in.)
= 1,114 CF

Franklin Stormwater Regulations:
Rv = (1 in.) x (impervious area)
Rv = (1 in.) x (22,263 SF) x (1 ft./12 in.)
= 1,856 CF

Recharge Volume Provided:
Bioretention Basin-1:
Lowest Outlet Invert = 293.45 (Stone Weir)
Volume at El. 293.45 = 1,659 CF → HydroCAD Report

Bioretention Basin-2:
Lowest Outlet Invert = 293.60 (24" Drain Basin)
Volume at El. 293.60 = 370 CF → HydroCAD Report

1,659 CF + 370 CF = 2,029 CF

2,029 CF > 1,856 CF

The recharge volume requirement 1,856 CF is exceeded with a total volume of 2,029 CF of storage provided below the lowest outlets of the infiltration systems.

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Drawdown Calculations

$Time_{drawdown}$ = Rv / (K) x (Bottom Area)
Rv = Required recharge volume
K = Saturated Conductivity Rate
Bottom Area = Bottom area of recharge structure

Bioretention Basin-1:
Bottom Area = 4,367 SF
K = 2.41 in./hr.
$Time_{drawdown}$ = 1,659 CF / (2.41 in./hr.) x (4,367 SF) x (1 ft./ 12 in.)
= 1.89 hours

Bioretention Basin-2:
Bottom Area = 198 SF
K = 2.41 in./hr.
$Time_{drawdown}$ = 370 CF / (2.41 in./hr.) x (198 SF) x (1 ft./ 12 in.)
= 9.30 hours

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 3.

Compliance to the Maximum Extent Practicable:

- Does the redevelopment design meet Standard 3, comparing post-development to pre-development conditions? Yes
- If not, the applicant shall document an analysis of alternative approaches for meeting the Standard? N/A
- What soil types are present on the site? Is the site is comprised solely of C and D soils and bedrock at the land surface? A, B, and D soils on site
- Does the project include sites where recharge is proposed at or adjacent to an area classified as contaminated, sites where contamination has been capped in place, sites that have an Activity and Use Limitation (AUL) that precludes inducing runoff to the groundwater, pursuant to MGL Chapter 21E and the Massachusetts Contingency Plan 310 CMR 40.0000; sites that are the location of a solid waste landfill as defined in 310 CMR 19.000; or sites where groundwater from the recharge location flows directly toward a solid waste landfill or 21E site?[1] N/A
- Is the stormwater runoff from a land use with a higher potential pollutant load? N/A
- Is the discharge to the ground located within the Zone II or Interim Wellhead Protection Area of a public water supply? Zone II
- Does the site have an infiltration rate greater than 2.4 inches per hour? Yes

Improvements to Existing Conditions:

- Does the project increase the required recharge volume over existing (developed) conditions? If so, can the project be redesigned to reduce the required recharge volume by decreasing impervious surfaces (make building higher, put parking under the building, narrower roads, sidewalks on only one side of street, etc.) or using low impact development techniques such as porous pavement? Fully Compliant with Standard 3, N/A

[1] A mounding analysis is needed if a site falls within this category. See Volume 3.

- Is the project located within a basin or sub-basin that has been categorized as under high or medium stress by the Massachusetts Water Resources Commission, or where there is other evidence that there are rivers and streams experiencing low flow problems? If so, have measures been considered to replace the natural recharge lost as a result of the prior development? (See Menu.) N/A
- Has the applicant evaluated measures for reducing site runoff? (See Menu.) Fully complies

STANDARD 4: 80% TSS Removal

Stormwater Management Standard 4 requires that, "Stormwater management systems must be designed to remove 80% of the average annual post-construction of Total Suspended Solids (TSS). This standard is met when:

a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan and thereafter are implemented and maintained;
b. Stormwater BMPs are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook and;
c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook"

This standard is met by collecting all surface runoff form all paved areas in bioretention basins. Pretreatment is provided by either a Sediment Forebay for Bioretention Basin-1 and a Vegetated Filter Strip for Bioretention Basin-2.

Water Quality Calculations:

The volume of stormwater runoff to be treated for water quality is calculated as the total of one-inch times the total post-development impervious area being directed to each individual water quality BMP. The water quality volume calculation is detailed below.

Water Quality Volume Required:

V_{wq} = (D_{wq}) x (Impervious Area)
D_{wq} = Water Quality Depth

Treatment Train-1 (Sediment Forebay to Bioretention Basin-1)

Water Quality Pre-Treatment Volume Required:
D_{wq} = 0.1 in. (Sediment Forebay)
Contributing Impervious area = 18,011 SF
V_{wq} = (0.1 in.) x (18,011 SF) x (1 ft./12 in.)
= 151 CF

Water Quality Pre-Treatment Volume Provided:

Sediment Forebay
Lowest Outlet Invert = 293.50 (Stone Gabion)
Volume at El. 293.50 = 213 CF → HydroCAD Report

213 CF > 151 CF

Water Quality Treatment Volume Required:
D_{wq} = 1.0 in.
Contributing Impervious area = 18,011 SF
V_{wq} = (1.0 in.) x (18,011 SF) x (1 ft./12 in.)
= 1,501 CF

Water Quality Treatment Volume Provided:

Bioretention Basin-1
Lowest Outlet Invert = 293.45 (Stone Weir)
Volume at El. 293.45 = 1,659 CF → HydroCAD Report

1,659 CF > 1,501 CF

Treatment Train-2 (Vegetated Filter Strip to Bioretention Basin-2)

Water Quality Treatment Volume Required:
D_{wq} = 1.0 in.
Contributing Impervious area = 3,766 SF
V_{wq} = (1.0 in.) x (3,766 SF) x (1 ft./12 in.)
= 314 CF

Water Quality Treatment Volume Provided:

Bioretention Basin-2
Lowest Outlet Invert = 293.60 (24" Drain Basin)
Volume at El. 293.60 = 370 CF → HydroCAD Report

370 CF > 314 CF

To achieve the required 80% TSS removal, new stormwater BMP's will be installed. Two Bioretention Basins are proposed. The Bioretention Basins will collect runoff from all impervious areas within Drainage Areas P-2a and P-2c and provide the maximum level or stormwater treatment practicable. A Sediment Forebay is proposed which provides pretreatment for runoff to Bioretention Basin-1. Runoff to Bioretention Basin-2 receives pretreatment via a vegetated filter strip. MADEP TSS Removal Sheets are included herein which show 90% TSS removal by the Bioretention Basin meeting the requirements for pretreatment and total treatment.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 4.

Full compliance for any component that is not a redevelopment
Full compliance with the long-term pollution plan requirement for new developments and redevelopments.

- Has the proponent developed a long-term pollution plan that fully meets the requirements of Standard 4? A Long Term Pollution Prevention Plan is provided
- Does the pollution prevention plan include the following source control measures?
    - Street sweeping - yes
    - Proper management of snow, salt, sand and other deicing chemicals – yes
    - Proper management of fertilizers, herbicides and pesticides - yes
    - Stabilization of existing eroding surfaces - yes

Compliance to the Maximum Extent Practicable for the other requirements:

- Does the redevelopment design provide for treatment of all runoff from existing (as well as new) impervious areas to achieve 80% TSS removal? If 80% TSS removal is not achieved, has the stormwater management system been designed to remove TSS to the maximum extent practicable? 80% TSS removal achieved
- Have the proposed stormwater BMPs been properly sized to capture the prescribed runoff volume?
    - One inch rule applies for discharge
        - within a Zone II or Interim Wellhead Protection Area, - Yes Zone II
        - near or to another critical area,
        - from a land use with a higher potential pollutant load
        - to the ground where the infiltration rate is greater than 2.4 inches per hour
- Has adequate pretreatment been proposed?
    - 44% TSS Removal Pretreatment Requirement applies if:
        - Stormwater runoff is from a land use with a higher potential pollutant load
        - Stormwater is discharged - Yes, 44% TSS removal achieved (Zone II and rapid infiltration)
            - To the ground within the Zone II or Interim Wellhead Protection Area of a Public Water Supply
            - To the ground with an infiltration rate greater than 2.4 inches per hour
            - Near or to an Outstanding Resource Water, Special Resource Water, Cold-Water Fishery, Shellfish Growing Area, or Bathing Beach.

- If the stormwater BMPs do not meet all the requirements set forth above, the applicant shall document an analysis of alternative approaches for meeting the these requirements. (See Section on Retrofitting Existing BMPs (the "Retrofit Section"). N/A

Improvements to Existing Conditions:

- Have measures been provided to achieve at least partial compliance with the TSS removal standard? Fully complies
- Have any of the best management practices in the Retrofit Section been considered? N/A
- Have any of the following pollution prevention measures been considered? Operation & Maintenance and Long Term Pollution Prevention Plans have been prepared for the site in accordance with Massachusetts Stormwater regulations and are included in the Stormwater Report
    - Reduction or elimination of winter sanding, where safe and prudent to do so
    - Tighter controls over the application of fertilizers, herbicides, and pesticides
    - Landscaping that reduces the need for fertilizer, herbicides and pesticides
    - High frequency sweeping of paved surfaces using vacuum sweepers
    - Improved catch basin cleaning
    - Waterfowl control programs

Are there any discharges (new or existing) to impaired waters? If so, see TMDL section. N/A

STANDARD 5: Higher Potential Pollutant Loads

Stormwater Management Standard 5 requires that, "For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts

Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific stormwater BMPs determined by the Department to be suitable for such use as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 2,§26-53, and the regulations promulgated thereunder at 314 CMF 3.00, 314 CMR 4.00 and 314 CMR 5.00."

The proposed use in not considered a use that would generate Higher Potential Pollutant Loads.

Redevelopment: The project use is not considered a use that would generate Higher Potential Pollutant Loads.

STANDARD 6: Critical Areas

Stormwater Management Standard 6 requires that Stormwater discharge to a Zone II Interim Wellhead Protection Area of a public water supply and stormwater discharges near any other critical area require the use of specific source control and pollution prevention measures and the specific stormwater best management practices determined by the Department to be suitable for managing discharges to such area, as provided in the Massachusetts Stormwater Handbook. A discharge near a critical area, if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters or Special Resource Waters shall be set back from the receiving water and receive the highest and best practical method of treatment. A "stormwater discharge," as defined in 314 CMR 3.04(2)(a)1. or (b), to an Outstanding Resource Waters or Special Resource Waters shall comply with 314 CMF 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A area prohibited unless essential to the operation of the public water supply."

The development site is located with a Zone II Interim Wellhead Protection Area / Groundwater Protection District of Franklin. A Special Permit from the Town of Franklin Zoning Board of Appeals is required to permit the proposed use within the Groundwater Protection District.

The proposed stormwater management system design follows the guidelines detailed in the Massachusetts Stormwater Handbook, Volume 1, Standard 6, Stormwater Discharges within Zone Is, Zone IIs and Interim Wellhead Protection Areas. The system provides pretreatment measures which include a Bioretention Basin utilized for stormwater collection within the impervious areas to treat flow prior to being discharged an on-site bioretention basin. All runoff to infiltration BMP's will be treated to remove a minimum of 44% of TSS prior to infiltration.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 6.

If applicable, compliance to the Maximum Extent Practicable with the pretreatment and treatment requirements of Standard 6:

- Does the redevelopment project utilize the pretreatment, treatment and infiltration BMPs approved for discharges near or to critical areas? Yes - Bioretention Basin

- If the redevelopment project does not comply with Standard 6, the applicant shall document an analysis of alternative measures for meeting Standard 6. (See Section on Specific Redevelopment Projects.) Fully complies with Standard 6

Improvements to Existing Conditions:

- Have measures to protect critical areas been considered, including additional pollution prevention measures and structural and non-structural BMPs? Infiltrating Bioretention Basins have been designed with adequate pretreatment (sediment forebay/vegetated filter strip) and provide greater than 44% TSS removal for pretreatment.

Other Requirements

- Does the discharge comply with the Massachusetts Clean Waters Act, 314 CMR 3.00, 314 CMR 4.00, and 314 CMR 5.00? Yes

STANDARD 7: Redevelopment and Other Projects Subject to the Standards only to the Maximum Extent Practicable

The definition of a Redevelopment Project under the definition provided in the MADEP Stormwater Handbook for Standard 7 is listed below:

> "Development rehabilitation, expansion and phased projected on previously developed sites, provided that redevelopment results in no next increase in impervious area."

The proposed development redevelopment as classified by Standard 7. A net increase of impervious cover is proposed located in the front of the parcel which currently contains mostly grassed areas with wooded area along the perimeter. The proposed project will provide a new stormwater management system to mitigate the existing and proposed impervious areas collecting and treating 98% of the total post-development impervious cover. The 2% of impervious cover which is not treated is from roof area which does not require treatment or from the front portion of the proposed driveway. The existing driveway currently drains untreated to the Washington Street Drainage System. Compliance with the Stormwater Management Standards is detailed in the Stormwater Management Report.

STANDARD 8: Erosion and Sediment Control

Stormwater Management Standard 8 requires that, "A plan to control construction-related impacts, including erosion sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan), must be developed and implemented."

This standard is met through the type and style of construction. The existing driveway will, to the extent possible, remain intact until the proposed driveway is to be graded and paved. This will provide a pad for wheel cleaning prior to the vehicle exit on Washington Street. The site is self-contained with abutting properties draining overland to the rear of the subject property. Thereby there will be no additional erosion from this property to abutting properties. With careful construction the project will limit erosion potential through the development itself and no additional structural measures, passive or active, are proposed. A Construction Period Pollution and Erosion & Sedimentation Control Plan has also been prepared and is included as part of the Stormwater Report.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 8.

All redevelopment projects shall fully comply with Standard 8.

- Has the proponent submitted a construction period erosion, sedimentation and pollution prevention plan that meets the requirements of Standard 8?
  A draft Stormwater Pollution Prevention Plan has been previously submitted with the stormwater report and will be finalized prior to the start of construction.

STANDARD 9: Operation and Maintenance

Stormwater Management Standard 9 requires that, "A long-term operation and maintenance plan must be developed and implemented to ensure that stormwater management systems function as designed".

This standard is fully met with development and implementation of an Operation and Maintenance Plan is included in Stormwater Management Report.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 9.

All redevelopment projects shall fully comply with Standard 9.

- Has the proponent submitted a long-term Operation and Maintenance plan that meets the requirements of Standard 9?
  O&M included in Stormwater Report

STANDARD 10: Illicit Discharges

Stormwater Management Standard 10 requires that, "All illicit discharges to the stormwater management system are prohibited".

This standard is fully met with development and implementation of a Long-Term Pollution Prevention which is included in the Stormwater Management Report. An Illicit Discharge statement has been prepared and is included herein.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 10.

All redevelopment projects shall fully comply with Standard 10.

- Are there any known or suspected illicit discharges to the stormwater management system at the redevelopment project site? No
- Has an illicit connection detection program been implemented using visual screening, dye or smoke testing? No
- Have an Illicit Discharge Compliance Statement and associated site map been submitted verifying that there are no illicit discharges to the stormwater management system at the site? Yes

Improvements to Existing Conditions:

- Once all illicit discharges are removed, has the proponent implemented any measures to prevent additional illicit discharges? N/A

CONCLUSION

The proposed redevelopment of this parcel will be a significant improvement to the area and to the resource area on and adjacent to the site. The proposed redevelopment meets or exceeds the current MADEP Stormwater Management Standards and Guidelines and provides a stormwater management system that will maintain water quality while attenuating peak rates of runoff at the control points. This was achieved by using infiltration and pretreatment BMPs and directing the stormwater runoff to bioretention basins which attenuate peak flows while maximizing groundwater recharge and providing a high level of TSS removal. An Operation and Maintenance Plan for post-construction maintenance of the Stormwater Management System has been developed and is included with this report.

MADEP Stormwater Report Checklist

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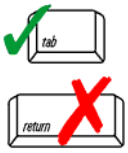
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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

Signature and Date

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ 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.

Aerial Photograph (MAGIS)

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

704 Washington Street

Franklin, MA

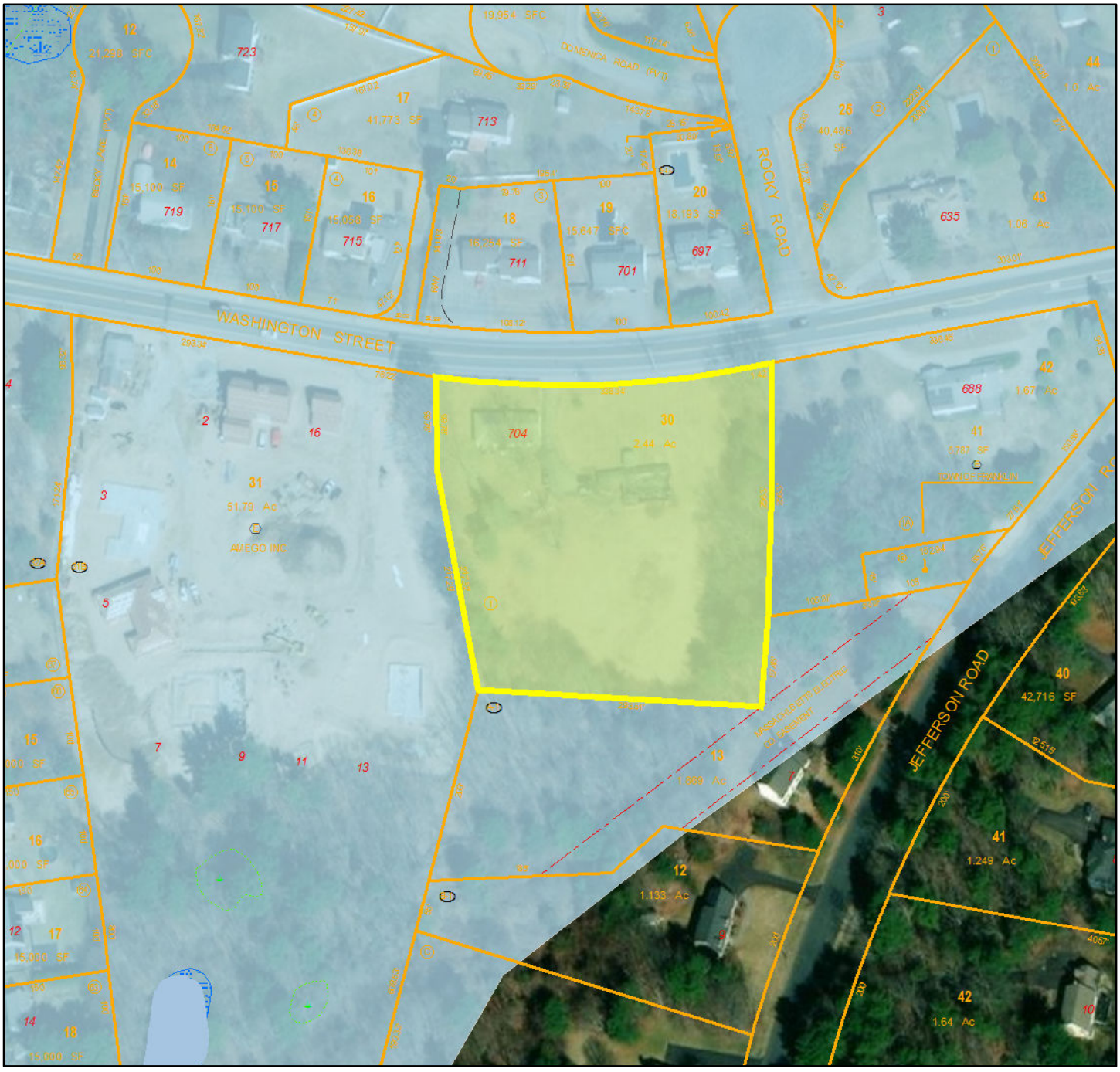
July 1, 2022

1 inch = 150 Feet

0 150 300 450

CAI Technologies
Precision Mapping. Geospatial Solutions.

www.cai-tech.com



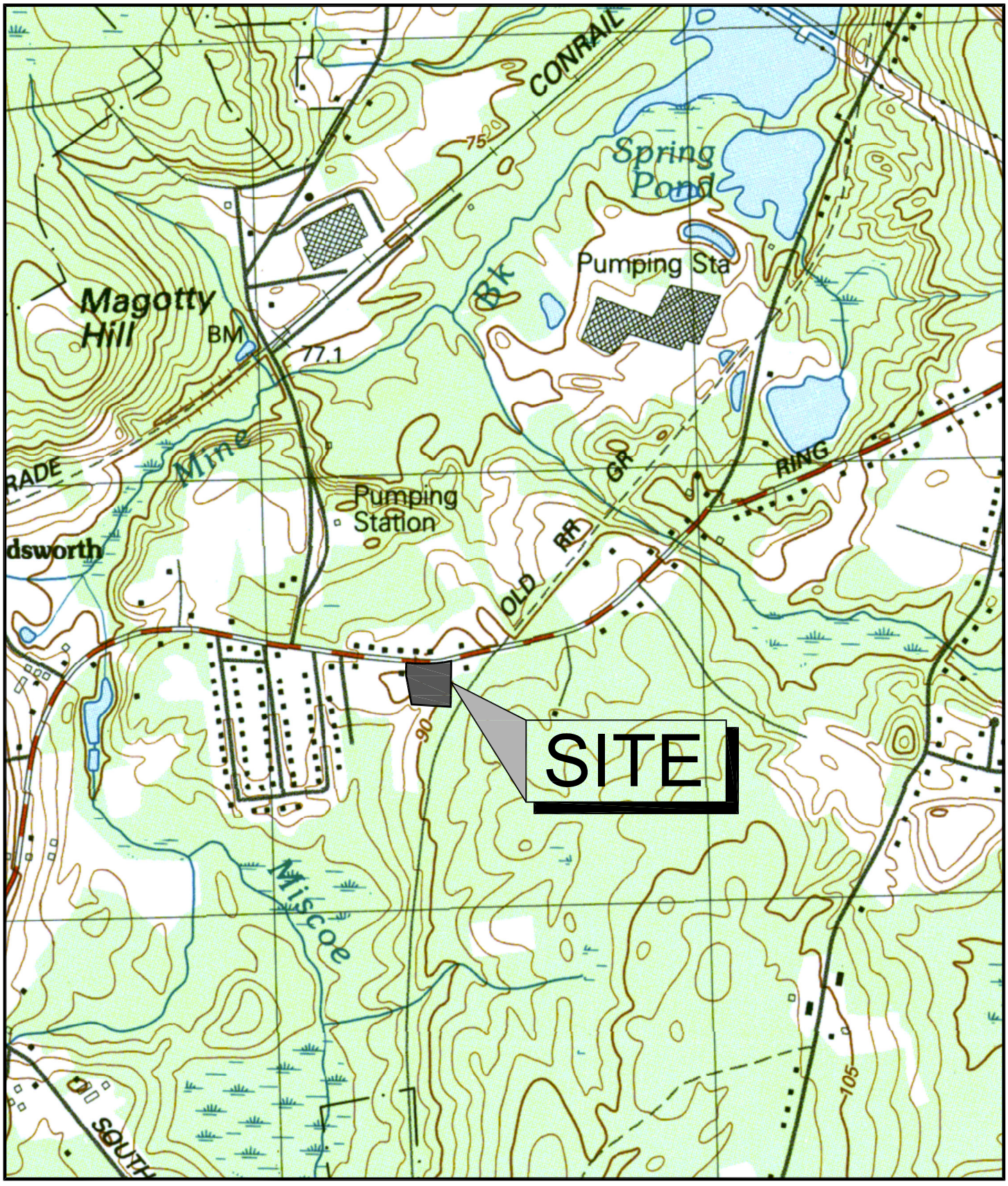
TownPoly
Private Road
Property Line
Public Road
Wetland
Right of Way
Utility
Wet Areas
Water-poly
Swamp
Zone II

This information is believed to be correct but is subject to change and is not warrantied.

LEVEL
DESIGN GROUP

USGS Topographic Map (MAGIS)

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM



USGS LOCUS MAP

LEVEL DESIGN GROUP
CIVIL ENGINEERS AND LAND SURVEYORS
249 SOUTH STREET, UNIT 1
PLAINVILLE, MA 02762
508.695.2221 (F) 508.695.2219
WWW.LEVELDG.COM

704 WASHINGTON STREET
FRANKLIN, MA

PROJ NO.: 2013.00
SCALE: 1" = 1,000'

LEVEL
DESIGN GROUP

On-Site Soils Documentation

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

Project No: 2013.00 **Soil Evaluator** Sean Barry E.I.T. SE# 14412

Project: 704 Washington St. Franklin, MA **Temp** 52F Cloudy

Date of Testing 4/26/22

Test Hole No.: DP-1 Ground Elevation at Hole =292.60'

Time: 12:18 PM Groundwater Elevation =287.27'

Depth (inches)	Horizon	Color	Texture	Redox Depth	Redox Color	Comments
0-32	Fill					
32-43	Fill					
43-87	Fill			64"		
87-118	C1	2.5Y 4/3	LFS			10-20% gravel

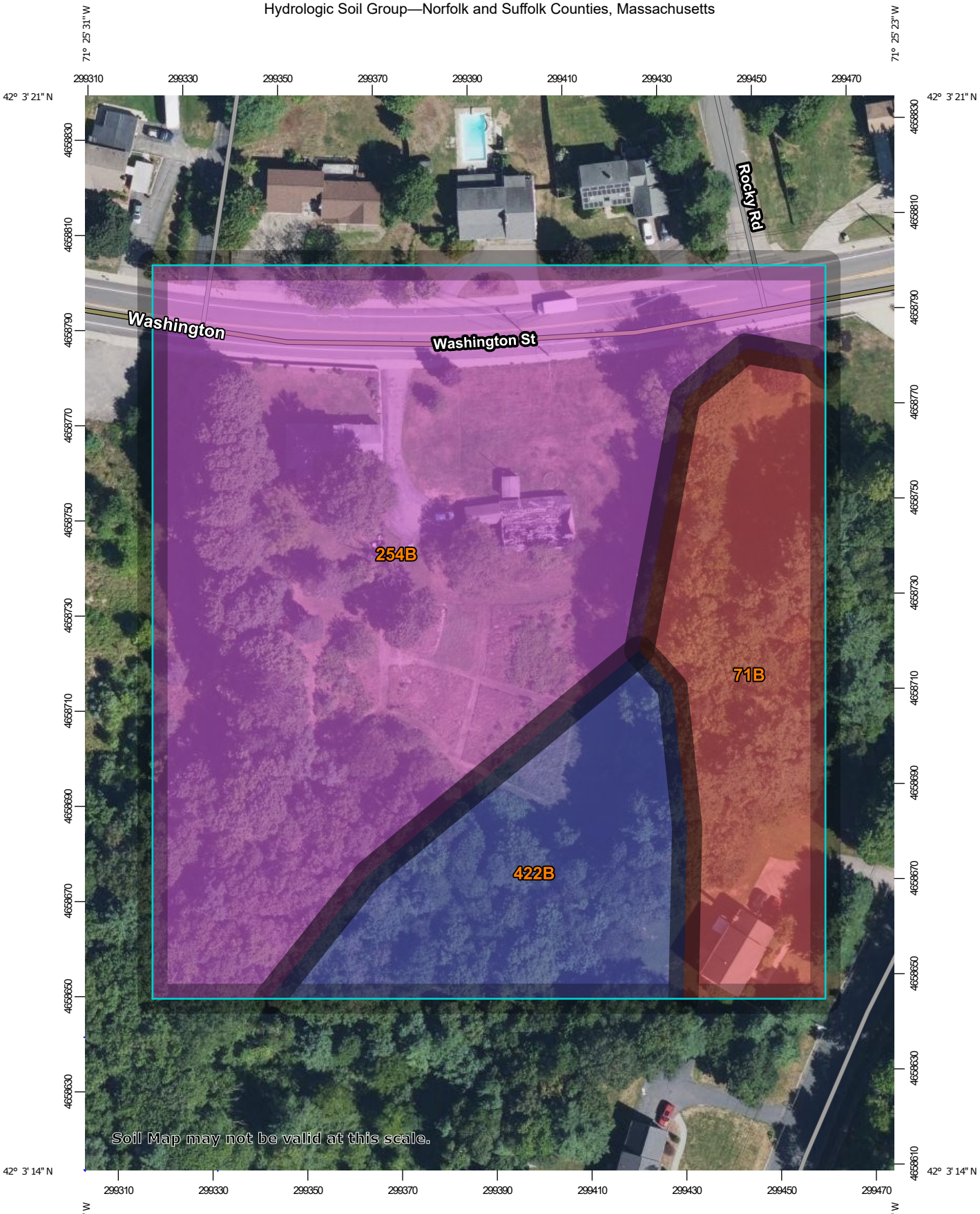
Weeping Observed	none
Standing Water Observed	none
Redox Observed	64"

Test Hole No.: DP-2 Ground Elevation at Hole =292.80'

Time: 12:24 PM Groundwater Elevation =288.55'

Depth (inches)	Horizon	Color	Texture	Redox Depth	Redox Color	Comments
0-22	A	10YR 3/2	FSL			
22-38	Bw	10YR 5/4	FSL			
38-58	C1	10YR 5/6	Gravelly Sand	51"		
58-85	C2	10YR 5/6	M.-C. Sand			
85-121	C2	2.5Y 6/2	F. Sand			compact

Weeping Observed	none
Standing Water Observed	none
Redox Observed	51"



Map Scale: 1:1,100 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

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 Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

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 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 17, Sep 3, 2021

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

Date(s) aerial images were photographed: Aug 31, 2020—Oct 22, 2020

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	D	1.1	19.6%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	3.4	63.4%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B	0.9	17.1%
Totals for Area of Interest			**5.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

MADEP TSS Removal Calculation Sheets

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Bioretention Areas

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Bioretention Area	**0.90**	**1.00**	**0.90**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**

Total TSS Removal = **90%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **704 Washington Street**

Prepared By: **APH**

Date: **11/15/2022**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

LEVEL
DESIGN GROUP

Illicit Discharge Statement

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

Illicit Discharge Statement

Under the Massachusetts Wetlands Protection Act – Stormwater Management Standards
For
704 WASHINGTON STREET
FRANKLIN, MA

All illicit discharges to the Stormwater Management System are prohibited. The Stormwater Management System is the system for conveying, treating, and infiltrating stormwater. Illicit discharges to Stormwater Management Systems are discharges that are not entirely comprised of stormwater, but do not include discharges from the following activities or facilities:

- Firefighting
- Water Line Flushing
- Potable Water Sources
- Landscape Irrigation
- Potable Water Sources
- Uncontaminated Groundwater
- Air-conditioning Condensation
- Dechlorinated Water from Swimming Pools
- Water used for street washing
- Water used for clean residential buildings without detergents
- Foundation Drains

The site will be operated and maintained in accordance with the Operation and Maintenance Plan dated June 30, 2022 and revised November 21, 2022 prepared by Level Design Group, LLC.

I, Anthony Marchese Amezo ***(Applicant)*** do hereby agree to comply with requirements set forth within the Illicit Discharge Statement and will not knowingly discharge illicit materials to the stormwater management system once it is brought online **upon** completion of construction.

Signature: _____ Date: 11/28/22

Groundwater Mounding Calculations

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

Gilbert Street Warehouse
Mansfield, MA

Bioretention Basin
Mounding Analysis

Level Design Group, LLC
249 South Street
Plainville, MA 02762

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.2134	*R*	**Recharge (infiltration) rate (feet/day)**
0.200	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
48.20	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
60.000	x	**1/2 length of basin (x direction, in feet)**
16.000	y	**1/2 width of basin (y direction, in feet)**
3.000	t	**duration of infiltration period (days)**
10.000	hi(0)	**initial thickness of saturated zone (feet)**

10.421	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.421	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Conversion Table

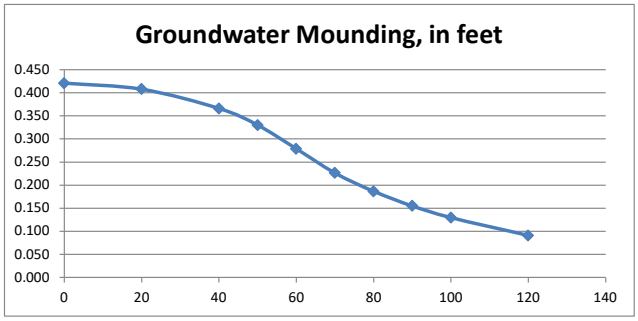
inch/hour	feet/day
0.67	1.33
2.00	4.00

hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.421	0
0.408	20
0.366	40
0.330	50
0.279	60
0.226	70
0.186	80
0.155	90
0.130	100
0.091	120

Re-Calculate Now

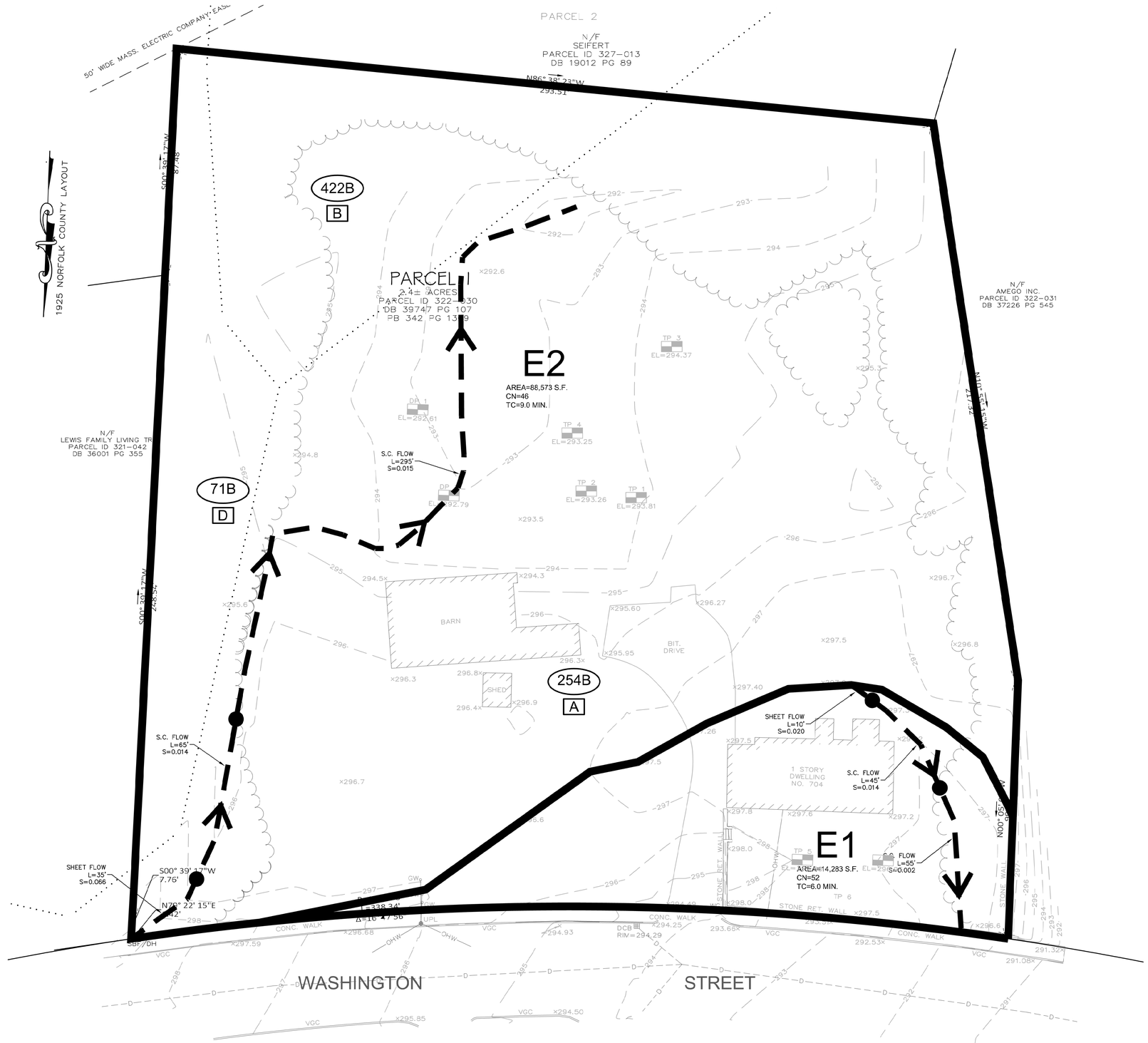


Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Existing Drainage Plan & HydroCAD Diagram

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM



WATERSHED LEGEND

XXXX — SOIL TYPE

X — HYDROLOGIC SOIL GROUP

SOILS

71B	RIDGEBURY FINE SANDY LOAM
254B	MERRIMAC FINE SANDY LOAM
422B	CANTON FINE SANDY LOAM

NO	DATE	REVISIONS
1	8-31-22	REVISED LAYOUT
2	10-31-22	REVISED LAYOUT
3	11-21-22	REVIEW COMMENTS

SEAL

DATE :	JUNE 21, 2022
DRAWN :	APH / DRC
SCALE :	H - 1" = 20', V - 1"=4'

PRE-CONSTRUCTION WATERSHED MAP

MAP SHEET 322, PARCEL 030
704 WASHINGTON STREET
FRANKLIN, MASSACHUSETTS

LEVEL ONE DESIGN GROUP
CIVIL ENGINEERING / LAND SURVEYING
249 SOUTH STREET
UNIT 1
PLAINVILLE, MA 02762
TEL. (508) 695-2221 FAX. (508) 695-2219

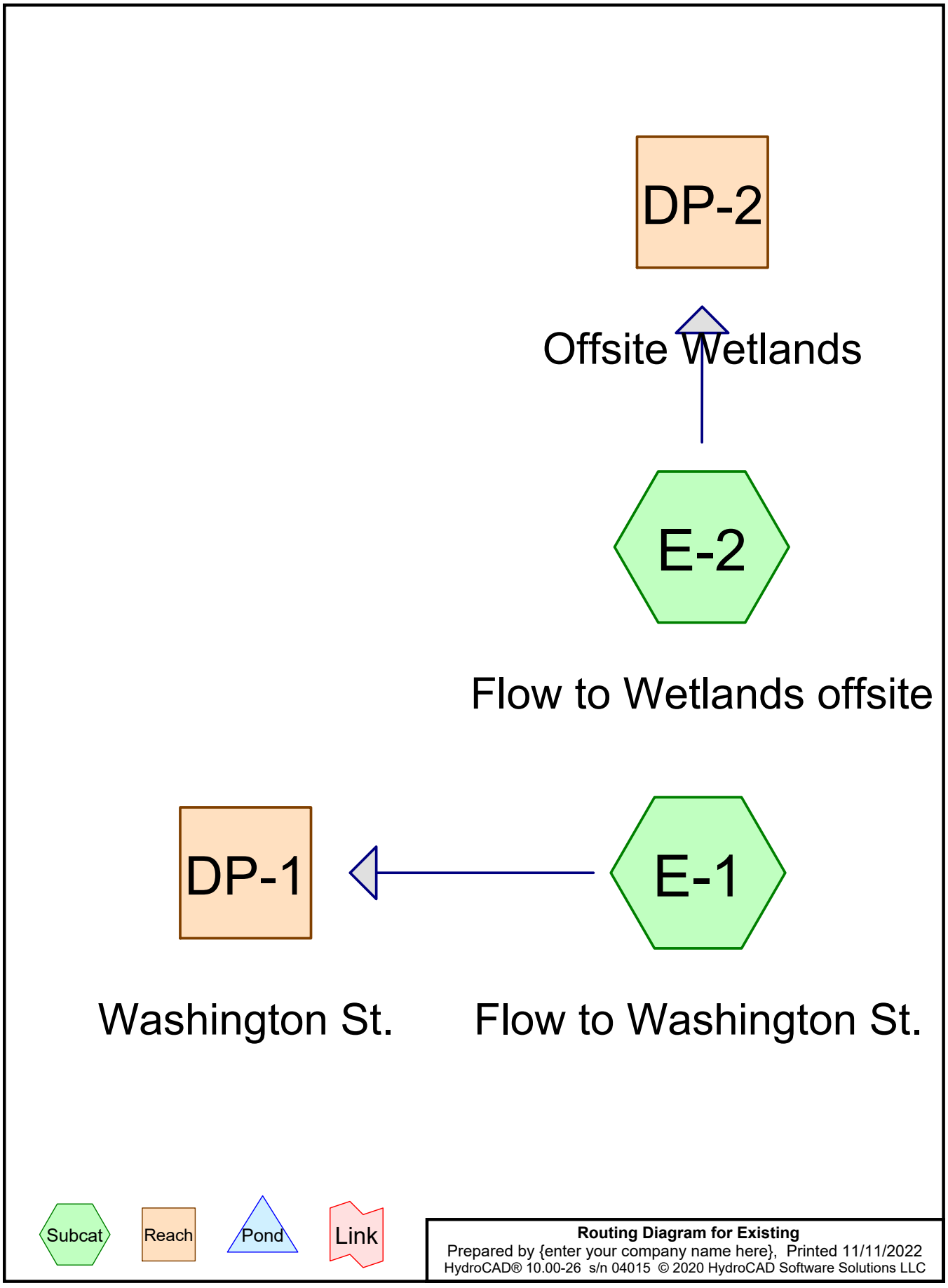
EXISTING DRAINAGE

D-1.0

SHEET 1 OF 2

0' 5' 10' 20'

2013.00


DP-2
Offsite Wetlands
E-2
Flow to Wetlands offsite
DP-1
E-1
Washington St.
Flow to Washington St.
Subcat
Reach
Pond
Link
Routing Diagram for Existing
Prepared by {enter your company name here}, Printed 11/11/2022
HydroCAD® 10.00-26 s/n 04015 © 2020 HydroCAD Software Solutions LLC

HydroCAD Analysis

Existing Conditions – 2 Year Storm

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
56,395	39	>75% Grass cover, Good, HSG A (E-1, E-2)
4,987	61	>75% Grass cover, Good, HSG B (E-2)
7,102	98	Paved parking (E-1, E-2)
18,995	30	Woods, Good, HSG A (E-1, E-2)
7,197	55	Woods, Good, HSG B (E-2)
8,180	77	Woods, Good, HSG D (E-2)
102,856	**47**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
75,390	HSG A	E-1, E-2
12,184	HSG B	E-2
0	HSG C	
8,180	HSG D	E-2
7,102	Other	E-1, E-2
102,856		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
56,395	4,987	0	0	0	61,382	>75% Grass cover, Good	E-1, E-2
0	0	0	0	7,102	7,102	Paved parking	E-1, E-2
18,995	7,197	0	8,180	0	34,372	Woods, Good	E-1, E-2
75,390	**12,184**	**0**	**8,180**	**7,102**	**102,856**	**TOTAL AREA**	

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Flow to Washington St. Runoff Area=14,283 sf 23.13% Impervious Runoff Depth=0.14"
Flow Length=110' Tc=6.0 min CN=52 Runoff=0.01 cfs 165 cf

Subcatchment E-2: Flow to Wetlands offsite Runoff Area=88,573 sf 4.29% Impervious Runoff Depth=0.04"
Flow Length=395' Tc=9.0 min CN=46 Runoff=0.01 cfs 293 cf

Reach DP-1: Washington St. Inflow=0.01 cfs 165 cf
Outflow=0.01 cfs 165 cf

Reach DP-2: Offsite Wetlands Inflow=0.01 cfs 293 cf
Outflow=0.01 cfs 293 cf

Total Runoff Area = 102,856 sf Runoff Volume = 458 cf Average Runoff Depth = 0.05"
93.10% Pervious = 95,754 sf 6.90% Impervious = 7,102 sf

Summary for Subcatchment E-1: Flow to Washington St.

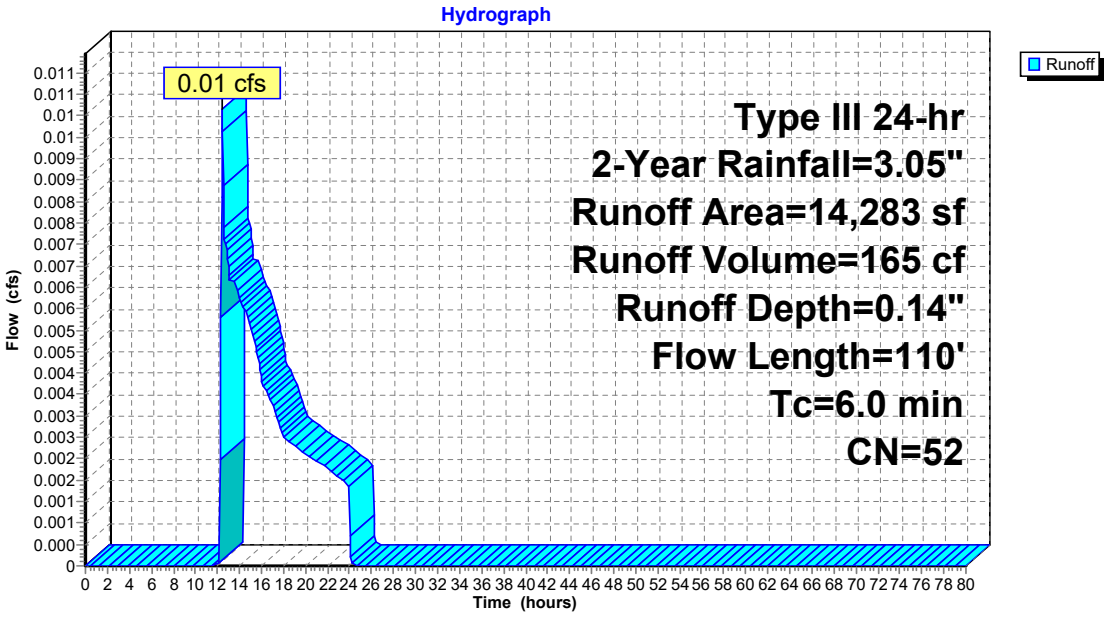
Runoff = 0.01 cfs @ 12.45 hrs, Volume= 165 cf, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

	Area (sf)	CN	Description
*	3,303	98	Paved parking
	1,527	30	Woods, Good, HSG A
	9,453	39	>75% Grass cover, Good, HSG A
	14,283	52	Weighted Average
	10,980		76.87% Pervious Area
	3,303		23.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	10	0.0200	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.05"
0.4	45	0.0140	1.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.0	55	0.0002	0.23		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	110	Total			

Subcatchment E-1: Flow to Washington St.



Summary for Subcatchment E-2: Flow to Wetlands offsite

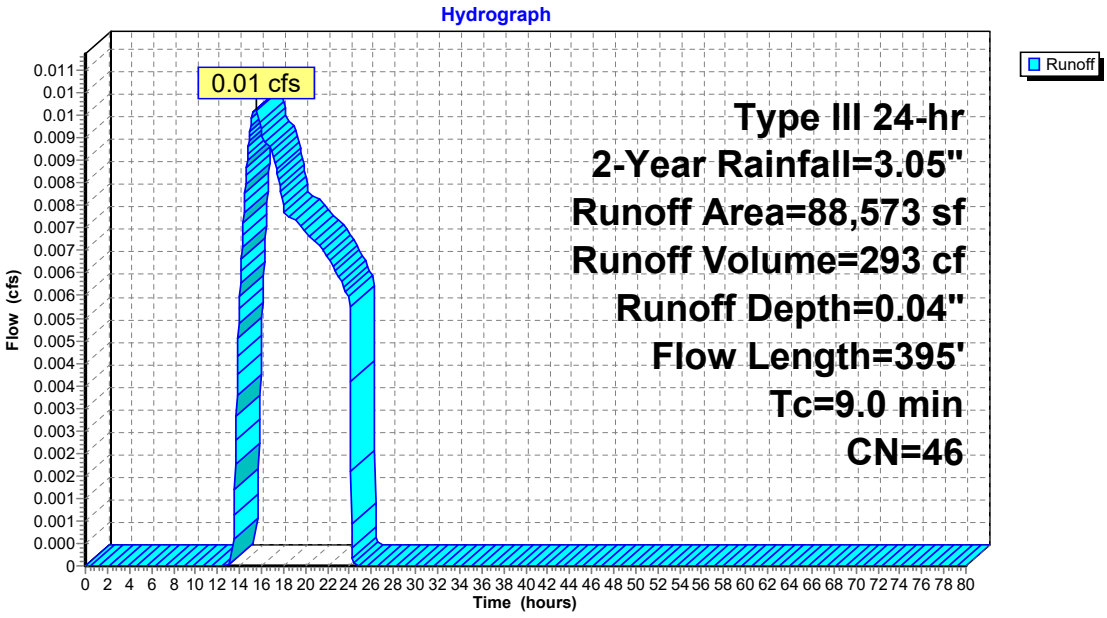
Runoff = 0.01 cfs @ 15.46 hrs, Volume= 293 cf, Depth= 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

	Area (sf)	CN	Description
*	3,799	98	Paved parking
	17,468	30	Woods, Good, HSG A
	7,197	55	Woods, Good, HSG B
	8,180	77	Woods, Good, HSG D
	46,942	39	>75% Grass cover, Good, HSG A
	4,987	61	>75% Grass cover, Good, HSG B
	88,573	46	Weighted Average
	84,774		95.71% Pervious Area
	3,799		4.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	35	0.0660	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.05"
0.6	65	0.0140	1.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	295	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	395	Total			

Subcatchment E-2: Flow to Wetlands offsite



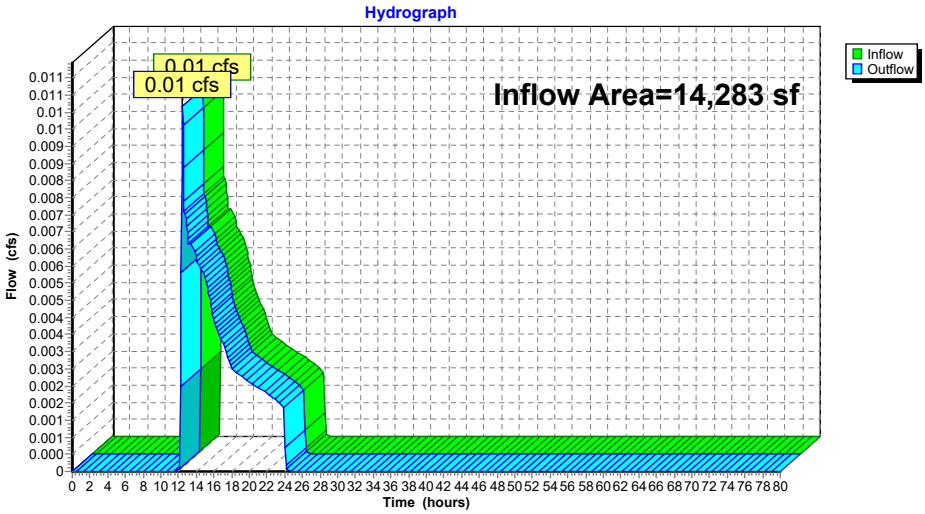
Summary for Reach DP-1: Washington St.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14,283 sf, 23.13% Impervious, Inflow Depth = 0.14" for 2-Year event
Inflow = 0.01 cfs @ 12.45 hrs, Volume= 165 cf
Outflow = 0.01 cfs @ 12.45 hrs, Volume= 165 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Washington St.



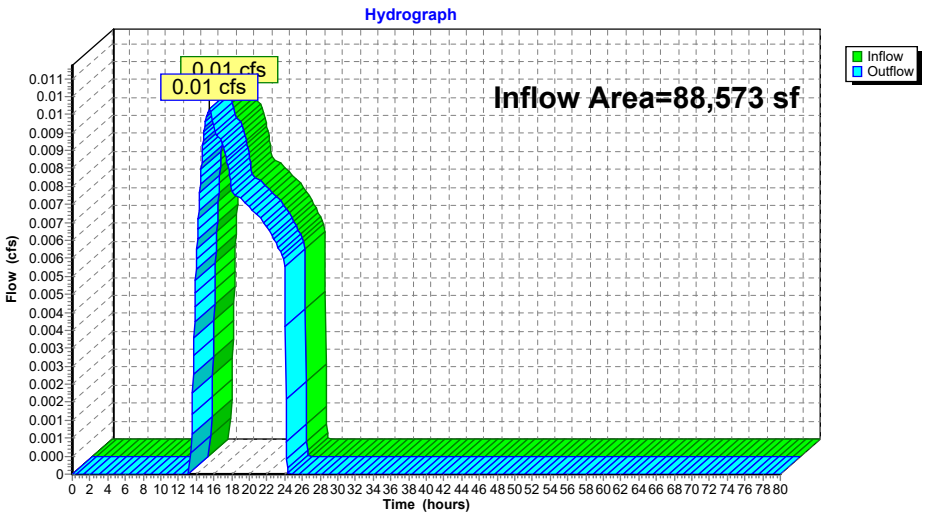
Summary for Reach DP-2: Offsite Wetlands

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 88,573 sf, 4.29% Impervious, Inflow Depth = 0.04" for 2-Year event
Inflow = 0.01 cfs @ 15.46 hrs, Volume= 293 cf
Outflow = 0.01 cfs @ 15.46 hrs, Volume= 293 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Offsite Wetlands



HydroCAD Analysis

Existing Conditions – 10 Year Storm

LEVEL DESIGN GROUP

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
56,395	39	>75% Grass cover, Good, HSG A (E-1, E-2)
4,987	61	>75% Grass cover, Good, HSG B (E-2)
7,102	98	Paved parking (E-1, E-2)
18,995	30	Woods, Good, HSG A (E-1, E-2)
7,197	55	Woods, Good, HSG B (E-2)
8,180	77	Woods, Good, HSG D (E-2)
102,856	**47**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
75,390	HSG A	E-1, E-2
12,184	HSG B	E-2
0	HSG C	
8,180	HSG D	E-2
7,102	Other	E-1, E-2
102,856		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
56,395	4,987	0	0	0	61,382	>75% Grass cover, Good	E-1, E-2
0	0	0	0	7,102	7,102	Paved parking	E-1, E-2
18,995	7,197	0	8,180	0	34,372	Woods, Good	E-1, E-2
75,390	**12,184**	**0**	**8,180**	**7,102**	**102,856**	**TOTAL AREA**	

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Flow to Washington St. Runoff Area=14,283 sf 23.13% Impervious Runoff Depth=0.87"
Flow Length=110' Tc=6.0 min CN=52 Runoff=0.24 cfs 1,036 cf

Subcatchment E-2: Flow to Wetlands offsite Runoff Area=88,573 sf 4.29% Impervious Runoff Depth=0.54"
Flow Length=395' Tc=9.0 min CN=46 Runoff=0.54 cfs 3,986 cf

Reach DP-1: Washington St. Inflow=0.24 cfs 1,036 cf
Outflow=0.24 cfs 1,036 cf

Reach DP-2: Offsite Wetlands Inflow=0.54 cfs 3,986 cf
Outflow=0.54 cfs 3,986 cf

Total Runoff Area = 102,856 sf Runoff Volume = 5,022 cf Average Runoff Depth = 0.59"
93.10% Pervious = 95,754 sf 6.90% Impervious = 7,102 sf

Summary for Subcatchment E-1: Flow to Washington St.

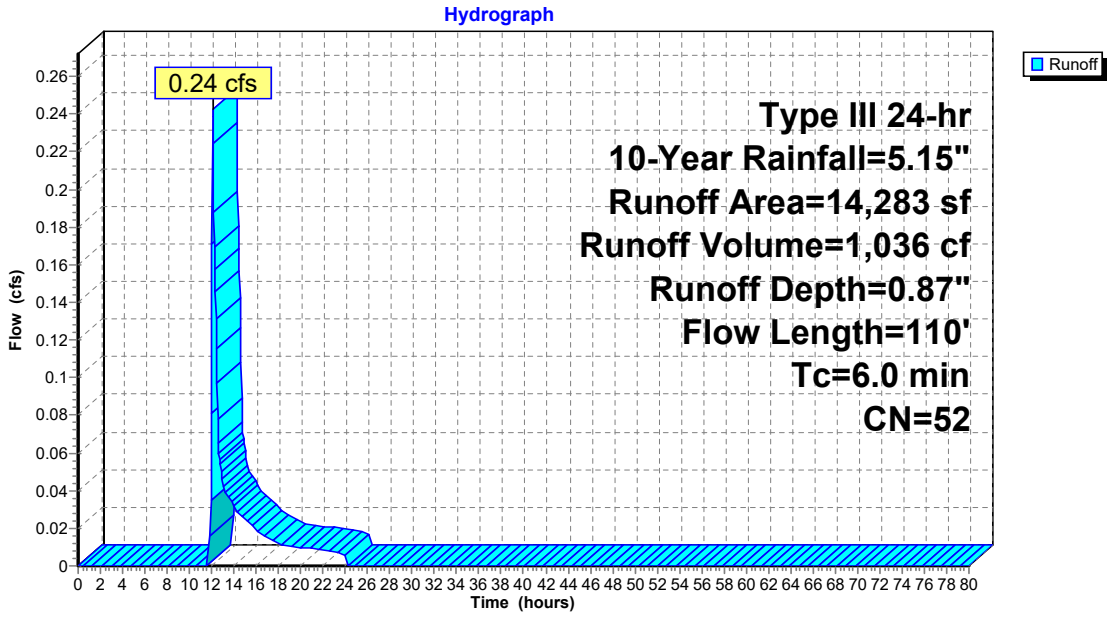
Runoff = 0.24 cfs @ 12.12 hrs, Volume= 1,036 cf, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

	Area (sf)	CN	Description
*	3,303	98	Paved parking
	1,527	30	Woods, Good, HSG A
	9,453	39	>75% Grass cover, Good, HSG A
	14,283	52	Weighted Average
	10,980		76.87% Pervious Area
	3,303		23.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	10	0.0200	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.05"
0.4	45	0.0140	1.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.0	55	0.0002	0.23		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	110	Total			

Subcatchment E-1: Flow to Washington St.



Summary for Subcatchment E-2: Flow to Wetlands offsite

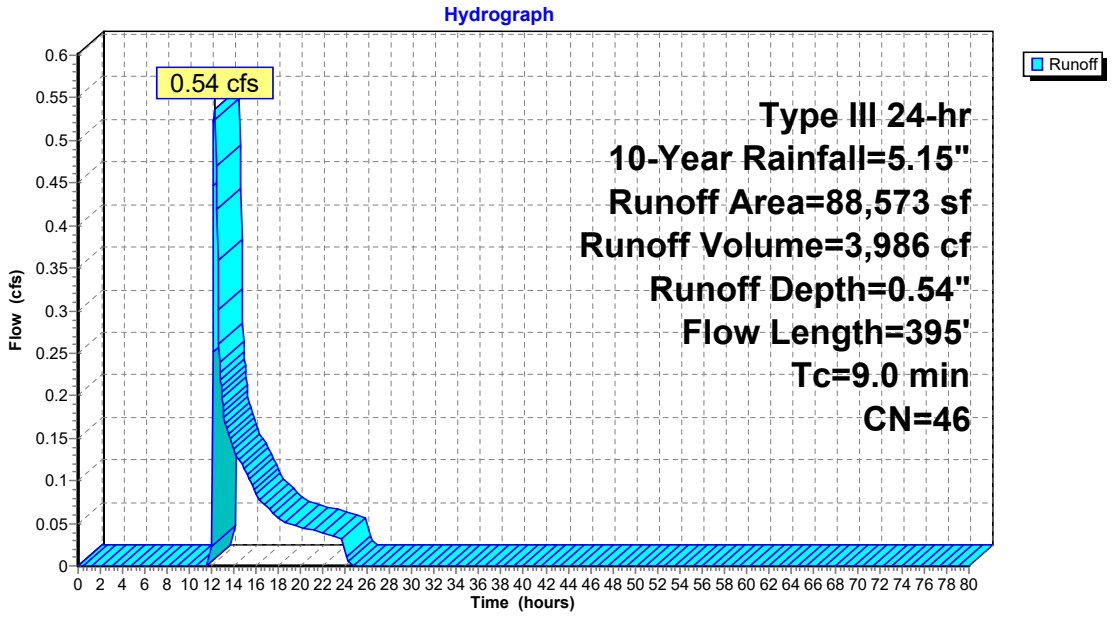
Runoff = 0.54 cfs @ 12.29 hrs, Volume= 3,986 cf, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

	Area (sf)	CN	Description
*	3,799	98	Paved parking
	17,468	30	Woods, Good, HSG A
	7,197	55	Woods, Good, HSG B
	8,180	77	Woods, Good, HSG D
	46,942	39	>75% Grass cover, Good, HSG A
	4,987	61	>75% Grass cover, Good, HSG B
	88,573	46	Weighted Average
	84,774		95.71% Pervious Area
	3,799		4.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	35	0.0660	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.05"
0.6	65	0.0140	1.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	295	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	395	Total			

Subcatchment E-2: Flow to Wetlands offsite



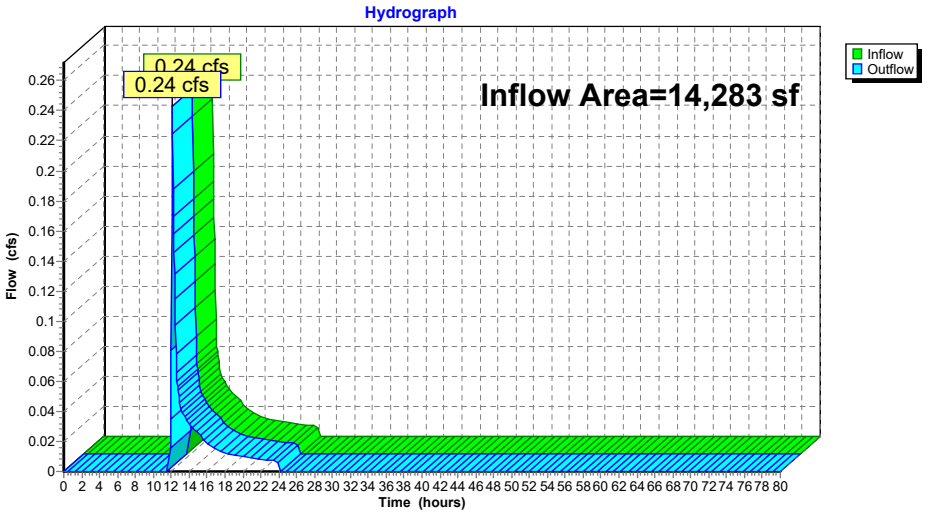
Summary for Reach DP-1: Washington St.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14,283 sf, 23.13% Impervious, Inflow Depth = 0.87" for 10-Year event
Inflow = 0.24 cfs @ 12.12 hrs, Volume= 1,036 cf
Outflow = 0.24 cfs @ 12.12 hrs, Volume= 1,036 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Washington St.



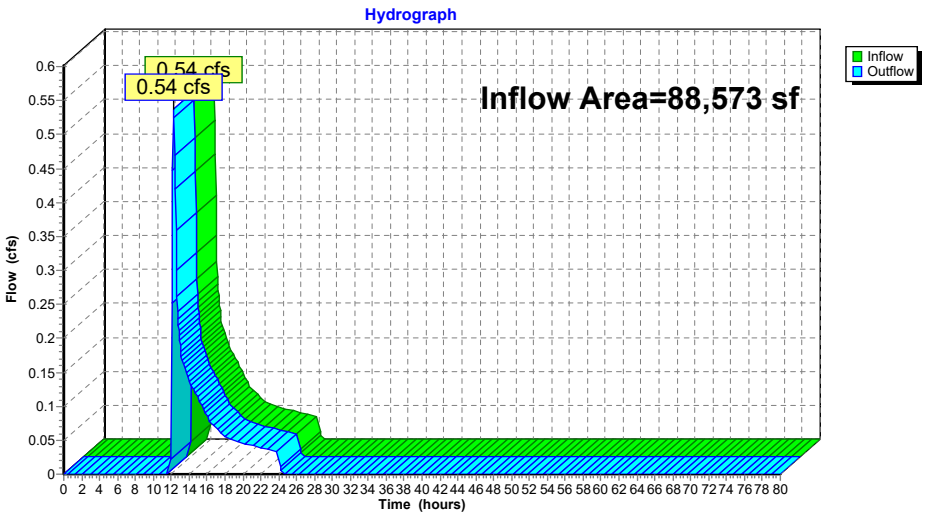
Summary for Reach DP-2: Offsite Wetlands

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 88,573 sf, 4.29% Impervious, Inflow Depth = 0.54" for 10-Year event
Inflow = 0.54 cfs @ 12.29 hrs, Volume= 3,986 cf
Outflow = 0.54 cfs @ 12.29 hrs, Volume= 3,986 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Offsite Wetlands



HydroCAD Analysis

Existing Conditions - 25 Year Storm

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
56,395	39	>75% Grass cover, Good, HSG A (E-1, E-2)
4,987	61	>75% Grass cover, Good, HSG B (E-2)
7,102	98	Paved parking (E-1, E-2)
18,995	30	Woods, Good, HSG A (E-1, E-2)
7,197	55	Woods, Good, HSG B (E-2)
8,180	77	Woods, Good, HSG D (E-2)
102,856	**47**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
75,390	HSG A	E-1, E-2
12,184	HSG B	E-2
0	HSG C	
8,180	HSG D	E-2
7,102	Other	E-1, E-2
102,856		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
56,395	4,987	0	0	0	61,382	>75% Grass cover, Good	E-1, E-2
0	0	0	0	7,102	7,102	Paved parking	E-1, E-2
18,995	7,197	0	8,180	0	34,372	Woods, Good	E-1, E-2
75,390	**12,184**	**0**	**8,180**	**7,102**	**102,856**	**TOTAL AREA**	

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Flow to Washington St. Runoff Area=14,283 sf 23.13% Impervious Runoff Depth=1.48"
Flow Length=110' Tc=6.0 min CN=52 Runoff=0.48 cfs 1,758 cf

Subcatchment E-2: Flow to Wetlands offsite Runoff Area=88,573 sf 4.29% Impervious Runoff Depth=1.02"
Flow Length=395' Tc=9.0 min CN=46 Runoff=1.52 cfs 7,511 cf

Reach DP-1: Washington St. Inflow=0.48 cfs 1,758 cf
Outflow=0.48 cfs 1,758 cf

Reach DP-2: Offsite Wetlands Inflow=1.52 cfs 7,511 cf
Outflow=1.52 cfs 7,511 cf

Total Runoff Area = 102,856 sf Runoff Volume = 9,268 cf Average Runoff Depth = 1.08"
93.10% Pervious = 95,754 sf 6.90% Impervious = 7,102 sf

Summary for Subcatchment E-1: Flow to Washington St.

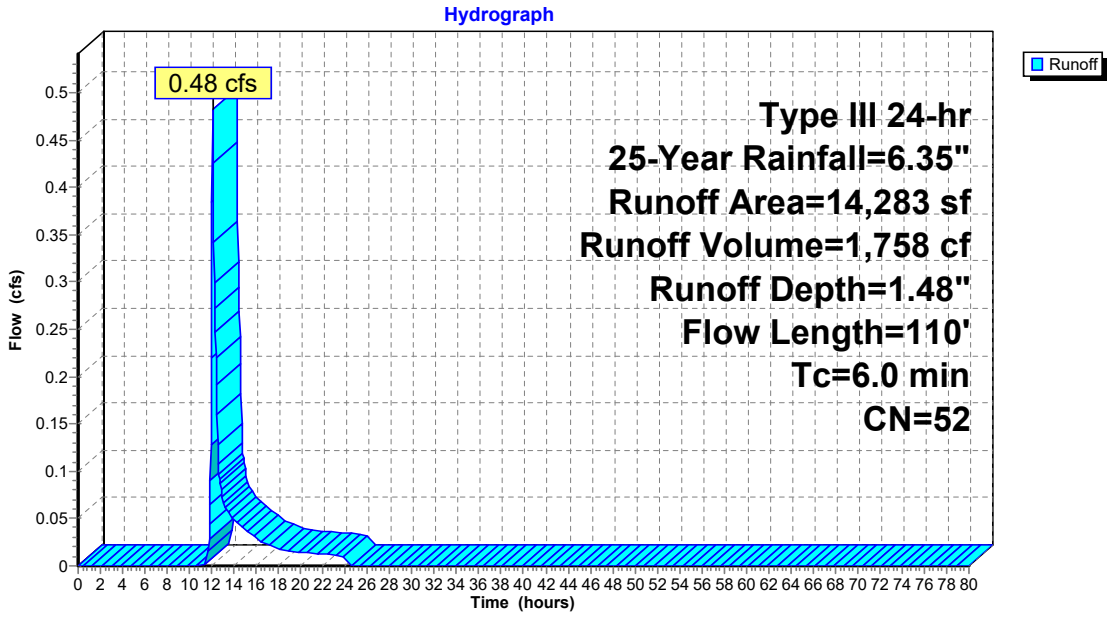
Runoff = 0.48 cfs @ 12.11 hrs, Volume= 1,758 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

	Area (sf)	CN	Description
*	3,303	98	Paved parking
	1,527	30	Woods, Good, HSG A
	9,453	39	>75% Grass cover, Good, HSG A
	14,283	52	Weighted Average
	10,980		76.87% Pervious Area
	3,303		23.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	10	0.0200	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.05"
0.4	45	0.0140	1.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.0	55	0.0002	0.23		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	110	Total			

Subcatchment E-1: Flow to Washington St.



Summary for Subcatchment E-2: Flow to Wetlands offsite

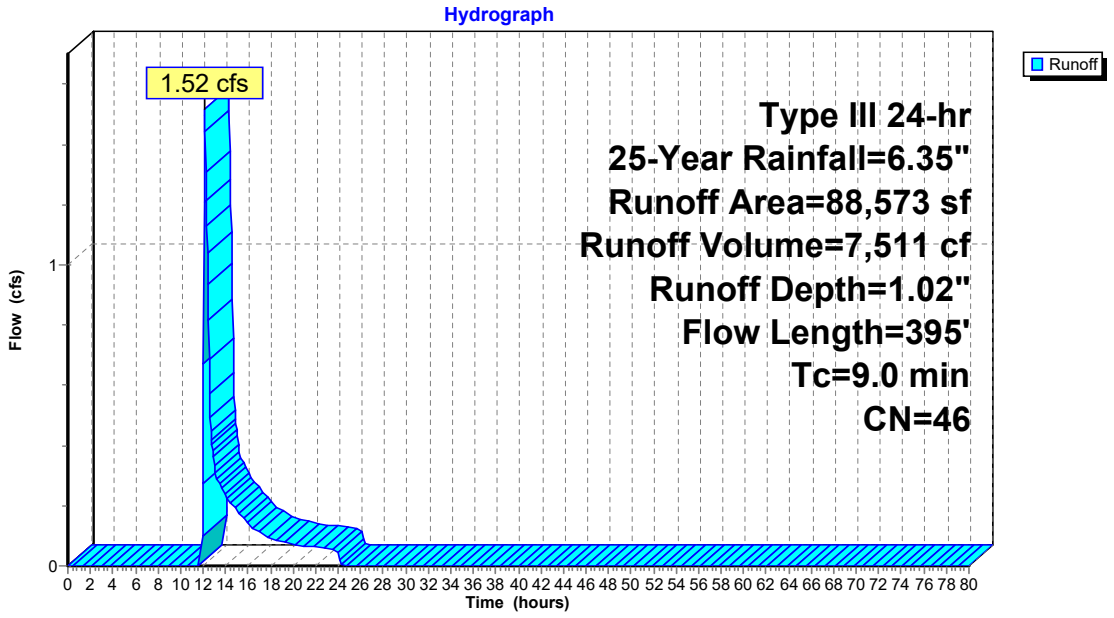
Runoff = 1.52 cfs @ 12.17 hrs, Volume= 7,511 cf, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

	Area (sf)	CN	Description
*	3,799	98	Paved parking
	17,468	30	Woods, Good, HSG A
	7,197	55	Woods, Good, HSG B
	8,180	77	Woods, Good, HSG D
	46,942	39	>75% Grass cover, Good, HSG A
	4,987	61	>75% Grass cover, Good, HSG B
	88,573	46	Weighted Average
	84,774		95.71% Pervious Area
	3,799		4.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	35	0.0660	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.05"
0.6	65	0.0140	1.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	295	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	395	Total			

Subcatchment E-2: Flow to Wetlands offsite



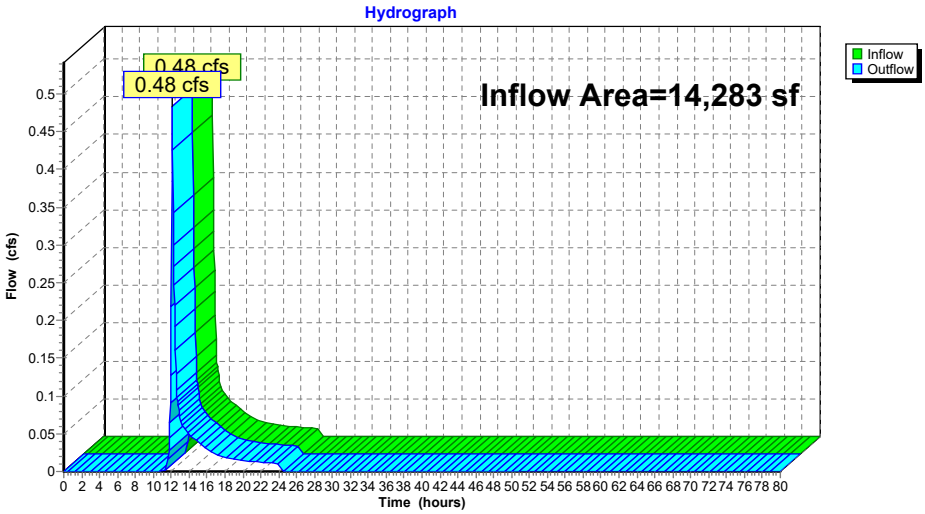
Summary for Reach DP-1: Washington St.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14,283 sf, 23.13% Impervious, Inflow Depth = 1.48" for 25-Year event
Inflow = 0.48 cfs @ 12.11 hrs, Volume= 1,758 cf
Outflow = 0.48 cfs @ 12.11 hrs, Volume= 1,758 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Washington St.



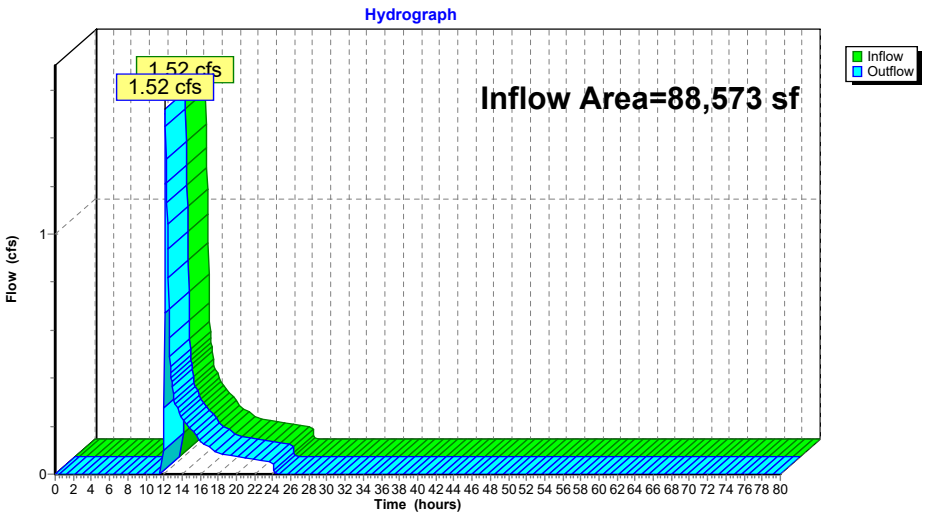
Summary for Reach DP-2: Offsite Wetlands

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 88,573 sf, 4.29% Impervious, Inflow Depth = 1.02" for 25-Year event
Inflow = 1.52 cfs @ 12.17 hrs, Volume= 7,511 cf
Outflow = 1.52 cfs @ 12.17 hrs, Volume= 7,511 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Offsite Wetlands



HydroCAD Analysis

Existing Conditions - 100 Year Storm

LEVEL DESIGN GROUP

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
56,395	39	>75% Grass cover, Good, HSG A (E-1, E-2)
4,987	61	>75% Grass cover, Good, HSG B (E-2)
7,102	98	Paved parking (E-1, E-2)
18,995	30	Woods, Good, HSG A (E-1, E-2)
7,197	55	Woods, Good, HSG B (E-2)
8,180	77	Woods, Good, HSG D (E-2)
102,856	**47**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
75,390	HSG A	E-1, E-2
12,184	HSG B	E-2
0	HSG C	
8,180	HSG D	E-2
7,102	Other	E-1, E-2
102,856		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
56,395	4,987	0	0	0	61,382	>75% Grass cover, Good	E-1, E-2
0	0	0	0	7,102	7,102	Paved parking	E-1, E-2
18,995	7,197	0	8,180	0	34,372	Woods, Good	E-1, E-2
75,390	**12,184**	**0**	**8,180**	**7,102**	**102,856**	**TOTAL AREA**	

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Flow to Washington St. Runoff Area=14,283 sf 23.13% Impervious Runoff Depth=2.56"
Flow Length=110' Tc=6.0 min CN=52 Runoff=0.91 cfs 3,052 cf

Subcatchment E-2: Flow to Wetlands offsite Runoff Area=88,573 sf 4.29% Impervious Runoff Depth=1.92"
Flow Length=395' Tc=9.0 min CN=46 Runoff=3.52 cfs 14,207 cf

Reach DP-1: Washington St. Inflow=0.91 cfs 3,052 cf
Outflow=0.91 cfs 3,052 cf

Reach DP-2: Offsite Wetlands Inflow=3.52 cfs 14,207 cf
Outflow=3.52 cfs 14,207 cf

Total Runoff Area = 102,856 sf Runoff Volume = 17,259 cf Average Runoff Depth = 2.01"
93.10% Pervious = 95,754 sf 6.90% Impervious = 7,102 sf

Summary for Subcatchment E-1: Flow to Washington St.

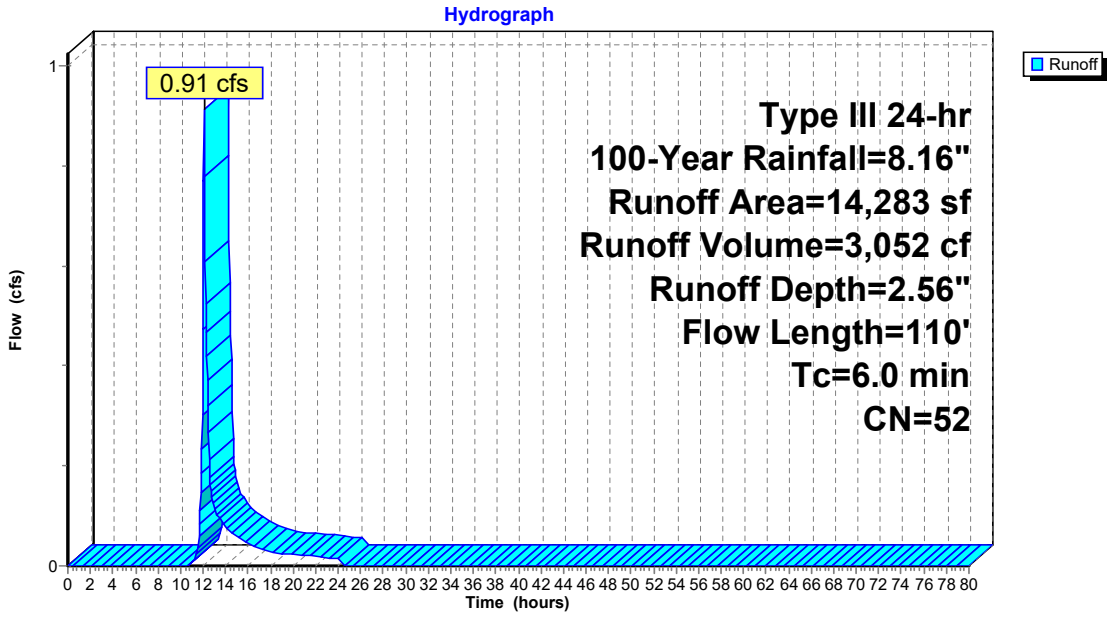
Runoff = 0.91 cfs @ 12.10 hrs, Volume= 3,052 cf, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

	Area (sf)	CN	Description
*	3,303	98	Paved parking
	1,527	30	Woods, Good, HSG A
	9,453	39	>75% Grass cover, Good, HSG A
	14,283	52	Weighted Average
	10,980		76.87% Pervious Area
	3,303		23.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	10	0.0200	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.05"
0.4	45	0.0140	1.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.0	55	0.0002	0.23		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	110	Total			

Subcatchment E-1: Flow to Washington St.



Summary for Subcatchment E-2: Flow to Wetlands offsite

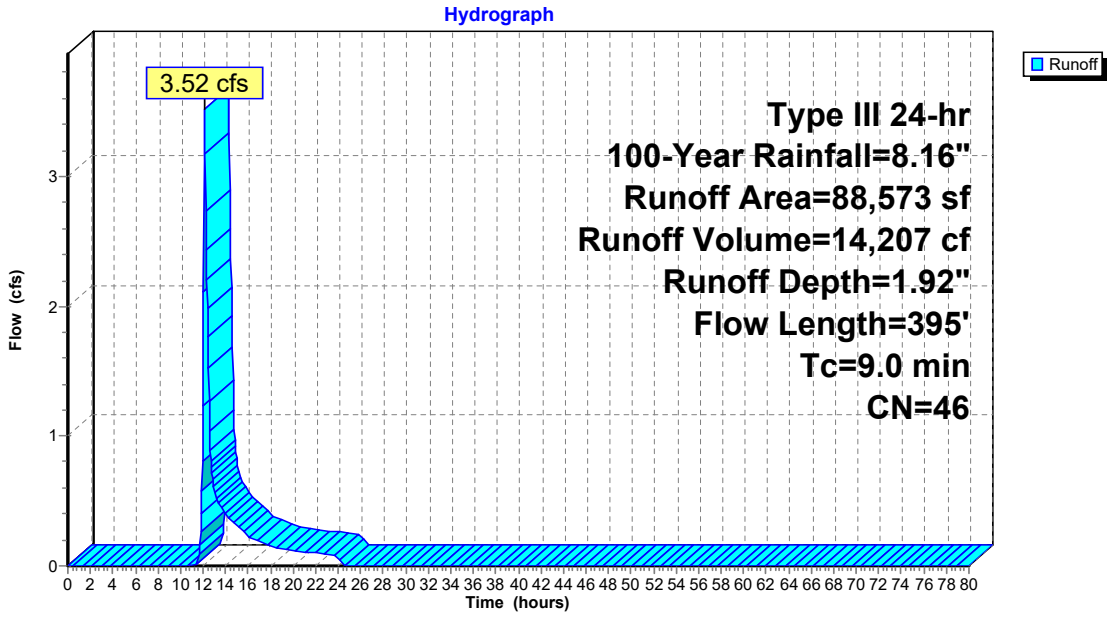
Runoff = 3.52 cfs @ 12.15 hrs, Volume= 14,207 cf, Depth= 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

	Area (sf)	CN	Description
*	3,799	98	Paved parking
	17,468	30	Woods, Good, HSG A
	7,197	55	Woods, Good, HSG B
	8,180	77	Woods, Good, HSG D
	46,942	39	>75% Grass cover, Good, HSG A
	4,987	61	>75% Grass cover, Good, HSG B
	88,573	46	Weighted Average
	84,774		95.71% Pervious Area
	3,799		4.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	35	0.0660	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.05"
0.6	65	0.0140	1.90		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.5	295	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	395	Total			

Subcatchment E-2: Flow to Wetlands offsite



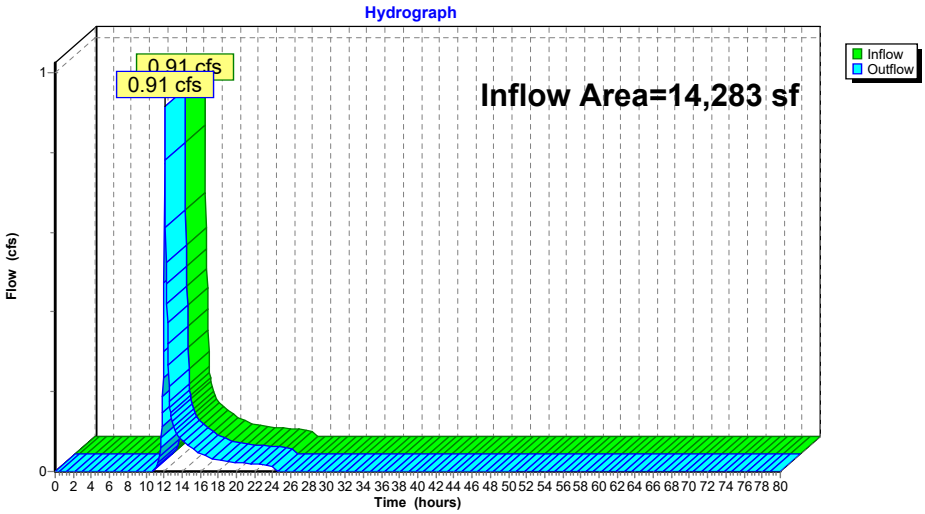
Summary for Reach DP-1: Washington St.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14,283 sf, 23.13% Impervious, Inflow Depth = 2.56" for 100-Year event
Inflow = 0.91 cfs @ 12.10 hrs, Volume= 3,052 cf
Outflow = 0.91 cfs @ 12.10 hrs, Volume= 3,052 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Washington St.



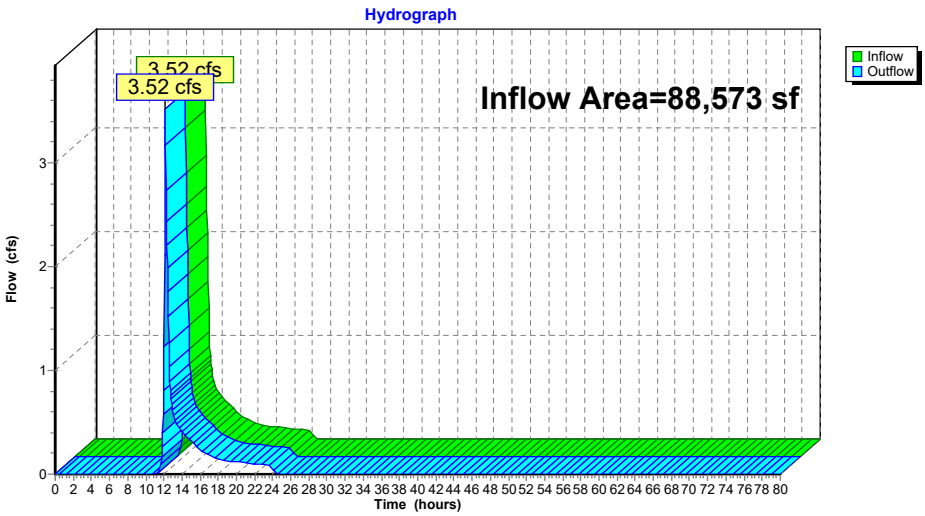
Summary for Reach DP-2: Offsite Wetlands

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 88,573 sf, 4.29% Impervious, Inflow Depth = 1.92" for 100-Year event
Inflow = 3.52 cfs @ 12.15 hrs, Volume= 14,207 cf
Outflow = 3.52 cfs @ 12.15 hrs, Volume= 14,207 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Offsite Wetlands



LEVEL
DESIGN GROUP

Proposed Drainage Plan & HydroCAD Diagram

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
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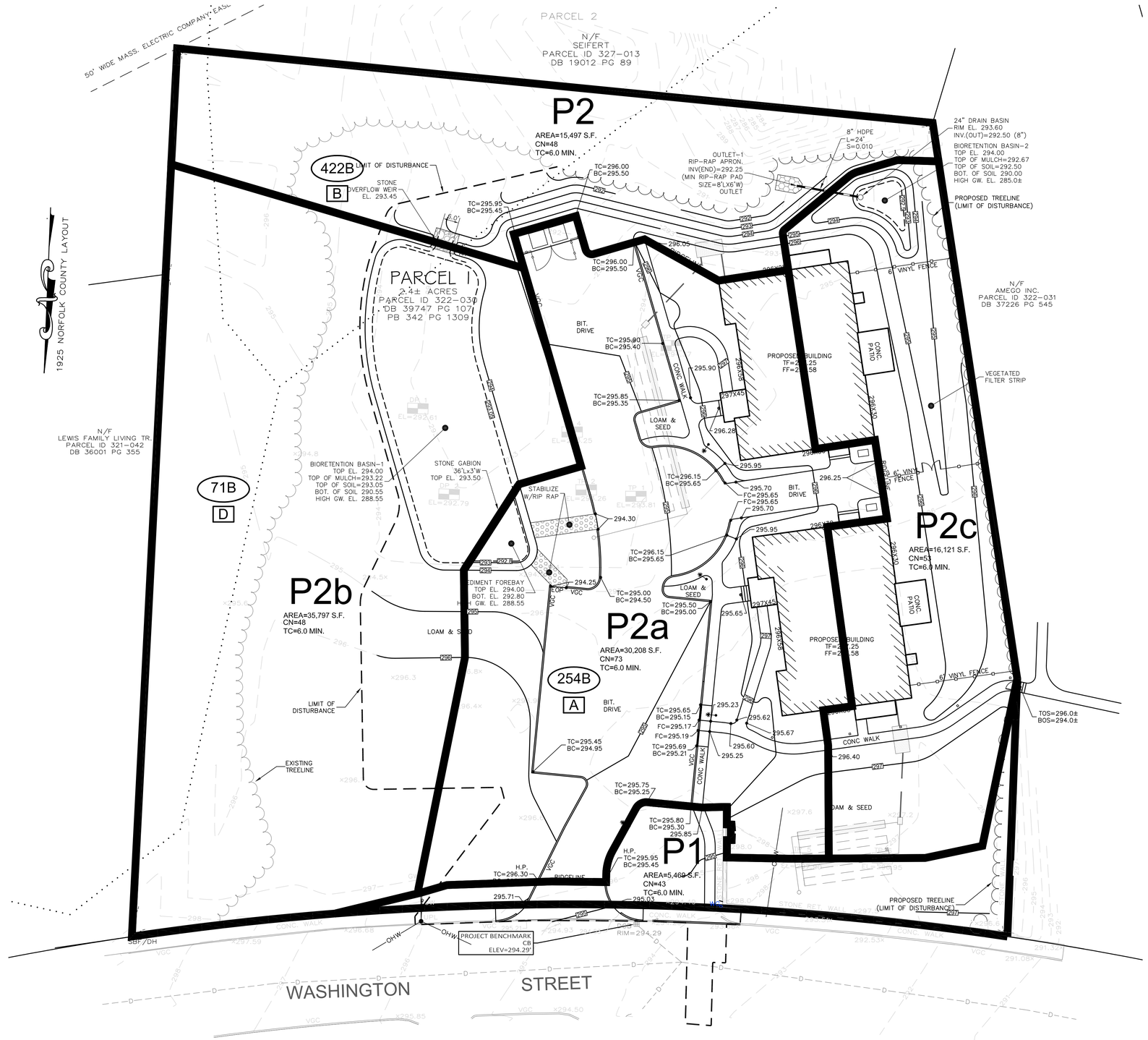


WATERSHED LEGEND

XXXX — SOIL TYPE

X — HYDROLOGIC SOIL GROUP

SOILS

71B	RIDGEBURY FINE SANDY LOAM
254B	MERRIMAC FINE SANDY LOAM
422B	CANTON FINE SANDY LOAM

NO	DATE	REVISIONS
1	8-31-22	REVISED LAYOUT
2	10-31-22	REVISED LAYOUT
3	11-21-22	REVIEW COMMENTS
4	1-4-23	REVIEW COMMENTS
5	2-09-23	REVIEW COMMENTS

SEAL

DATE :	JUNE 21, 2022
DRAWN :	APH / DRC
SCALE :	H - 1" = 20', V - 1"=4'

POST-CONSTRUCTION WATERSHED MAP

MAP SHEET 322, PARCEL 030
704 WASHINGTON STREET
FRANKLIN, MASSACHUSETTS

LEVEL DESIGN GROUP
CIVIL ENGINEERING / LAND SURVEYING
249 SOUTH STREET
UNIT 1
PLAINVILLE, MA 02762
TEL. (508) 695-2221 FAX. (508) 695-2219

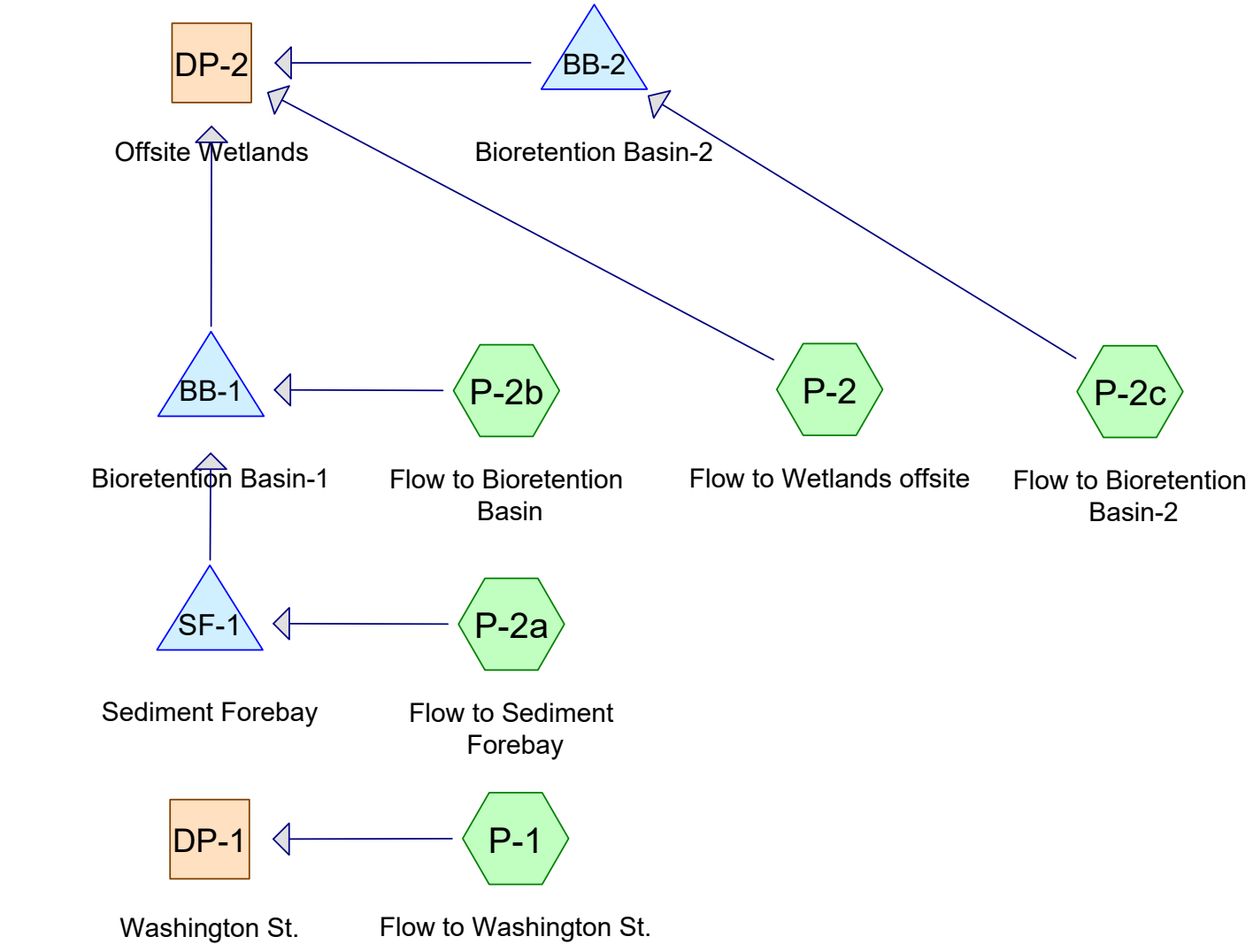
PROPOSED DRAINAGE

D-2.0

SHEET 2 OF 2

0' 5' 10' 20'

2013.00



Routing Diagram for Proposed-2

Prepared by {enter your company name here}, Printed 2/3/2023

HydroCAD Analysis

Proposed Conditions - 2 Year Storm

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
52,826	39	>75% Grass cover, Good, HSG A (P-1, P-2, P-2a, P-2b, P-2c)
4,987	61	>75% Grass cover, Good, HSG B (P-2, P-2b)
14,687	98	Paved parking (P-1, P-2a)
7,576	98	Roofs (P-2a, P-2c)
7,405	30	Woods, Good, HSG A (P-1, P-2, P-2b, P-2c)
7,196	55	Woods, Good, HSG B (P-2, P-2b)
8,179	77	Woods, Good, HSG D (P-2, P-2b)
102,856	**56**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
60,231	HSG A	P-1, P-2, P-2a, P-2b, P-2c
12,183	HSG B	P-2, P-2b
0	HSG C	
8,179	HSG D	P-2, P-2b
22,263	Other	P-1, P-2a, P-2c
102,856		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
52,826	4,987	0	0	0	57,813	>75% Grass cover, Good	P-1, P-2, P-2a, P-2b, P-2c
0	0	0	0	14,687	14,687	Paved parking	P-1, P-2a
0	0	0	0	7,576	7,576	Roofs	P-2a, P-2c
7,405	7,196	0	8,179	0	22,780	Woods, Good	P-1, P-2, P-2b, P-2c
60,231	**12,183**	**0**	**8,179**	**22,263**	**102,856**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	BB-2	292.50	292.25	24.0	0.0104	0.013	8.0	0.0	0.0

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Flow to Washington St. Runoff Area=5,469 sf 8.89% Impervious Runoff Depth=0.02"
Tc=6.0 min CN=44 Runoff=0.00 cfs 9 cf

Subcatchment P-2: Flow to Wetlands offsite Runoff Area=15,497 sf 0.00% Impervious Runoff Depth=0.07"
Tc=6.0 min CN=48 Runoff=0.00 cfs 86 cf

Subcatchment P-2a: Flow to Sediment Forebay Runoff Area=30,208 sf 59.62% Impervious Runoff Depth=0.94"
Tc=6.0 min CN=74 Runoff=0.71 cfs 2,367 cf

Subcatchment P-2b: Flow to Bioretention Basin Runoff Area=35,561 sf 0.00% Impervious Runoff Depth=0.07"
Tc=6.0 min CN=48 Runoff=0.01 cfs 197 cf

Subcatchment P-2c: Flow to Bioretention Basin-2 Runoff Area=16,121 sf 23.36% Impervious Runoff Depth=0.16"
Tc=6.0 min CN=53 Runoff=0.02 cfs 216 cf

Reach DP-1: Washington St. Inflow=0.00 cfs 9 cf
Outflow=0.00 cfs 9 cf

Reach DP-2: Offsite Wetlands Inflow=0.00 cfs 86 cf
Outflow=0.00 cfs 86 cf

Pond BB-1: Bioretention Basin-1 Peak Elev=293.04' Storage=0 cf Inflow=0.70 cfs 2,348 cf
Discarded=0.70 cfs 2,348 cf Primary=0.00 cfs 0 cf Outflow=0.70 cfs 2,348 cf

Pond BB-2: Bioretention Basin-2 Peak Elev=290.51' Storage=0 cf Inflow=0.02 cfs 216 cf
Discarded=0.02 cfs 216 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 216 cf

Pond SF-1: Sediment Forebay Peak Elev=293.53' Storage=225 cf Inflow=0.71 cfs 2,367 cf
Outflow=0.70 cfs 2,151 cf

Total Runoff Area = 102,856 sf Runoff Volume = 2,874 cf Average Runoff Depth = 0.34"
78.36% Pervious = 80,593 sf 21.64% Impervious = 22,263 sf

Summary for Subcatchment P-1: Flow to Washington St.

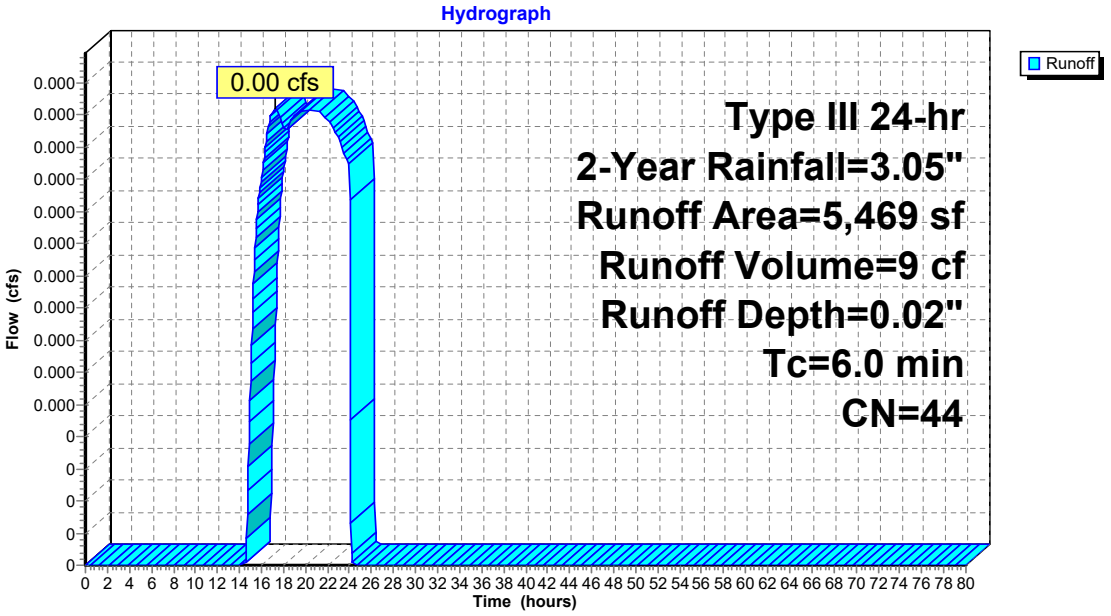
Runoff = 0.00 cfs @ 17.27 hrs, Volume= 9 cf, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

	Area (sf)	CN	Description
*	486	98	Paved parking
	385	30	Woods, Good, HSG A
	4,598	39	>75% Grass cover, Good, HSG A
	5,469	44	Weighted Average
	4,983		91.11% Pervious Area
	486		8.89% Impervious Area

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

Subcatchment P-1: Flow to Washington St.



Summary for Subcatchment P-2: Flow to Wetlands offsite

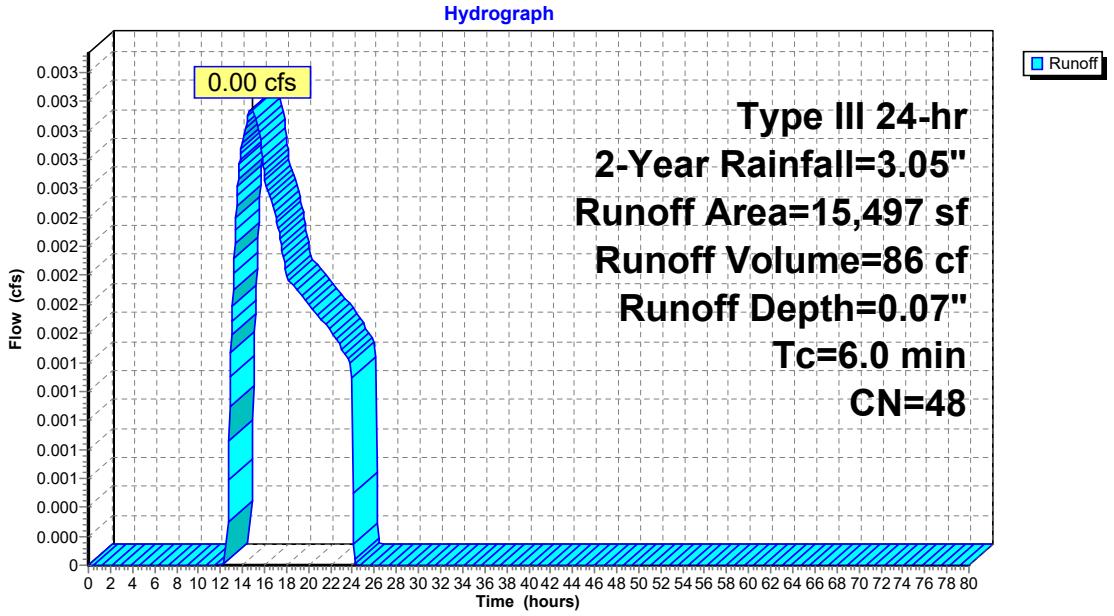
Runoff = 0.00 cfs @ 14.84 hrs, Volume= 86 cf, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
3,259	30	Woods, Good, HSG A
4,678	55	Woods, Good, HSG B
646	77	Woods, Good, HSG D
3,454	39	>75% Grass cover, Good, HSG A
3,460	61	>75% Grass cover, Good, HSG B
15,497	48	Weighted Average
15,497		100.00% Pervious Area

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

Subcatchment P-2: Flow to Wetlands offsite



Summary for Subcatchment P-2a: Flow to Sediment Forebay

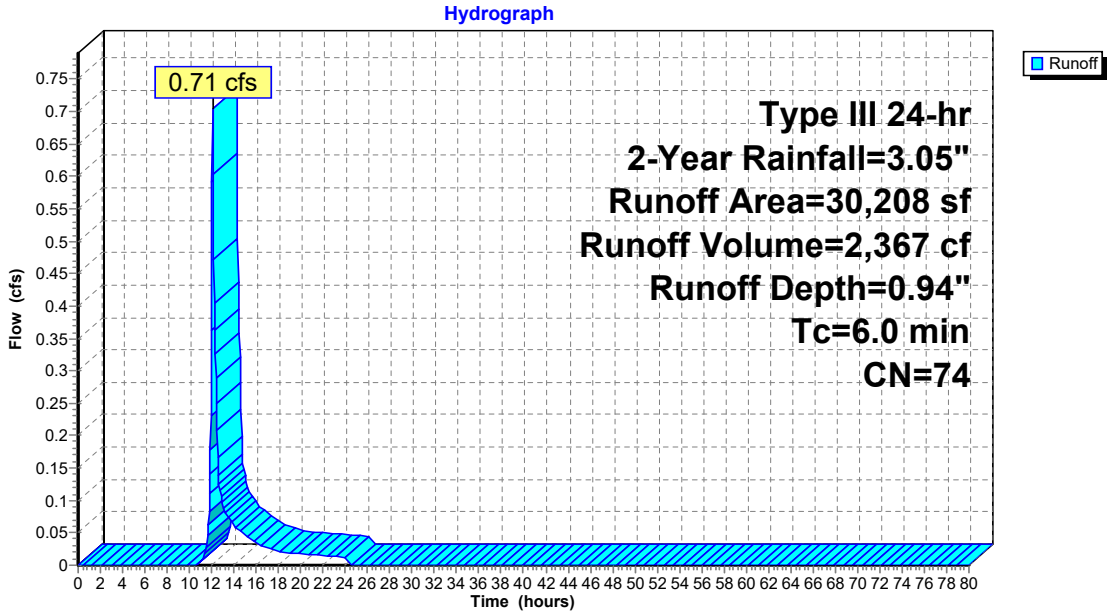
Runoff = 0.71 cfs @ 12.10 hrs, Volume= 2,367 cf, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

	Area (sf)	CN	Description
*	3,810	98	Roofs
*	14,201	98	Paved parking
	12,197	39	>75% Grass cover, Good, HSG A
	30,208	74	Weighted Average
	12,197		40.38% Pervious Area
	18,011		59.62% Impervious Area

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

Subcatchment P-2a: Flow to Sediment Forebay



Summary for Subcatchment P-2b: Flow to Bioretention Basin

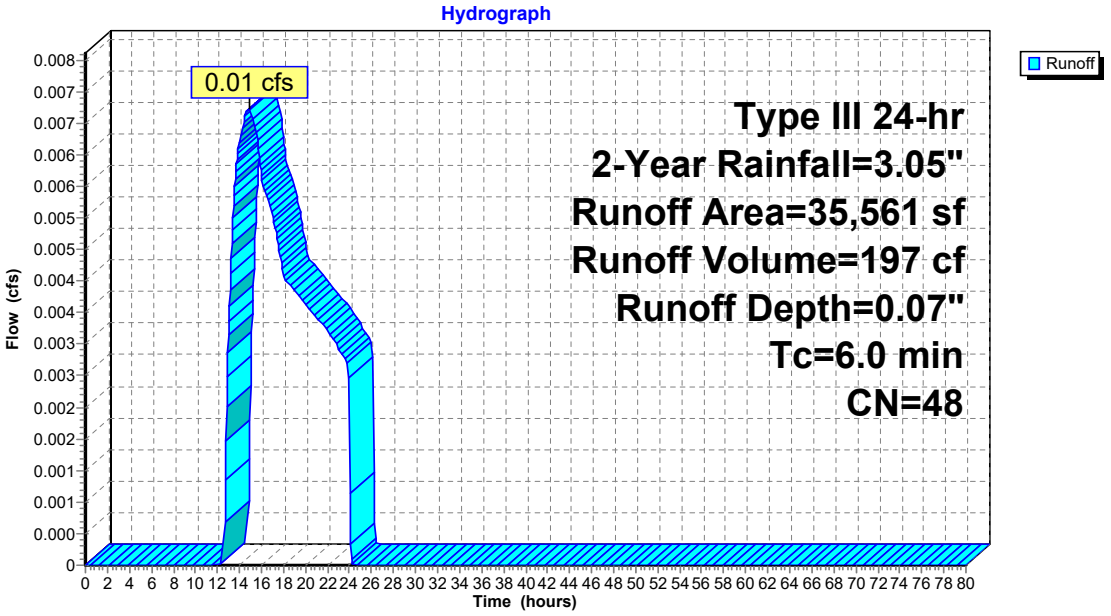
Runoff = 0.01 cfs @ 14.84 hrs, Volume= 197 cf, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
3,606	30	Woods, Good, HSG A
2,518	55	Woods, Good, HSG B
7,533	77	Woods, Good, HSG D
20,377	39	>75% Grass cover, Good, HSG A
1,527	61	>75% Grass cover, Good, HSG B
35,561	48	Weighted Average
35,561		100.00% Pervious Area

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

Subcatchment P-2b: Flow to Bioretention Basin



Summary for Subcatchment P-2c: Flow to Bioretention Basin-2

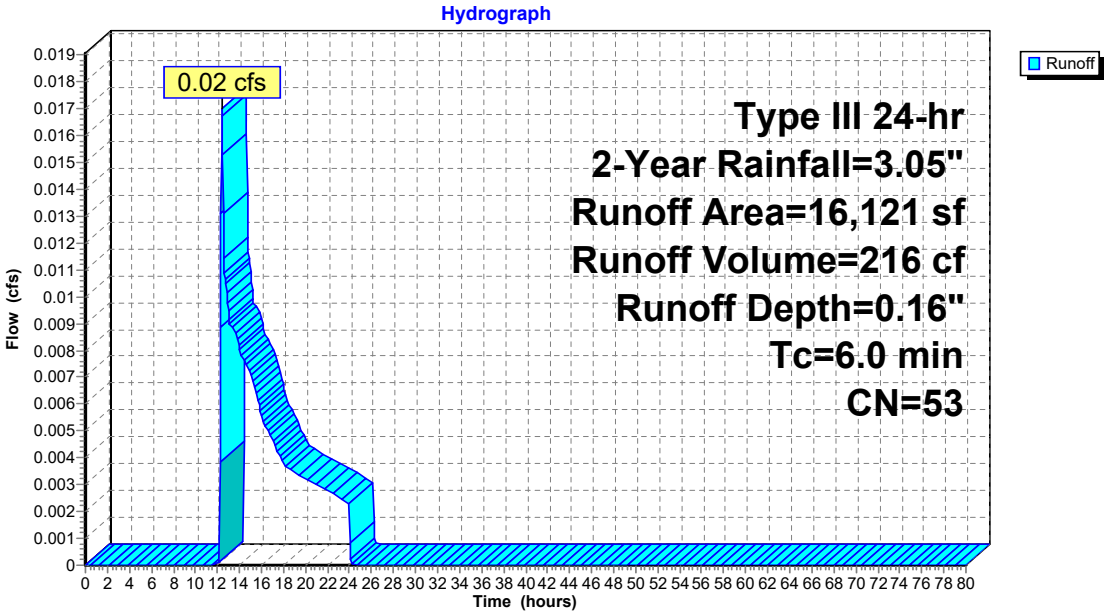
Runoff = 0.02 cfs @ 12.42 hrs, Volume= 216 cf, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

	Area (sf)	CN	Description
*	3,766	98	Roofs
	155	30	Woods, Good, HSG A
	12,200	39	>75% Grass cover, Good, HSG A
	16,121	53	Weighted Average
	12,355		76.64% Pervious Area
	3,766		23.36% Impervious Area

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

Subcatchment P-2c: Flow to Bioretention Basin-2



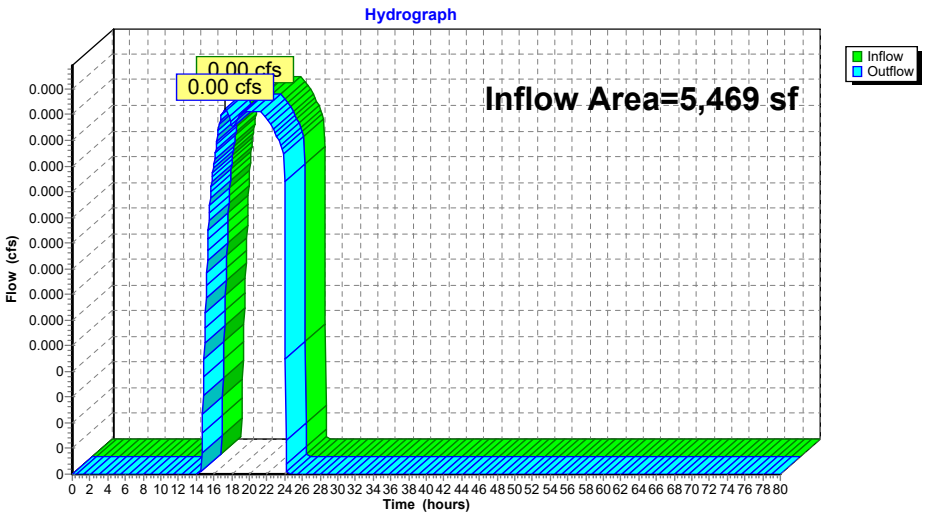
Summary for Reach DP-1: Washington St.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,469 sf, 8.89% Impervious, Inflow Depth = 0.02" for 2-Year event
Inflow = 0.00 cfs @ 17.27 hrs, Volume= 9 cf
Outflow = 0.00 cfs @ 17.27 hrs, Volume= 9 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Washington St.



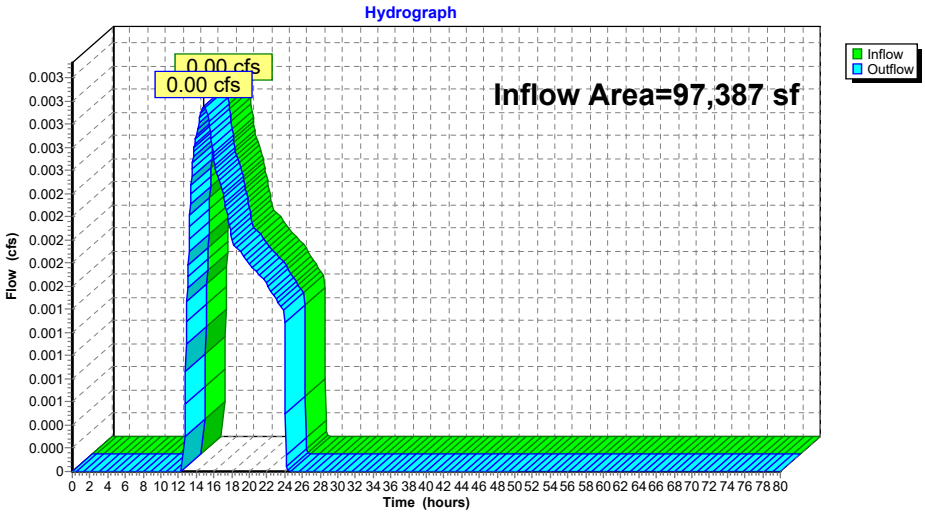
Summary for Reach DP-2: Offsite Wetlands

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 97,387 sf, 22.36% Impervious, Inflow Depth = 0.01" for 2-Year event
Inflow = 0.00 cfs @ 14.84 hrs, Volume= 86 cf
Outflow = 0.00 cfs @ 14.84 hrs, Volume= 86 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Offsite Wetlands



Summary for Pond BB-1: Bioretention Basin-1

Inflow Area = 65,769 sf, 27.39% Impervious, Inflow Depth = 0.43" for 2-Year event
Inflow = 0.70 cfs @ 12.10 hrs, Volume= 2,348 cf
Outflow = 0.70 cfs @ 12.10 hrs, Volume= 2,348 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.70 cfs @ 12.10 hrs, Volume= 2,348 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 293.04' @ 12.10 hrs Surf.Area= 4,367 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (896.8 - 896.8)

Volume	Invert	Avail.Storage	Storage Description
#1	290.55'	0 cf	**Soil Media (Irregular)** Listed below (Recalc) 10,918 cf Overall x 0.0% Voids
#2	293.05'	603 cf	**Mulch (Irregular)** Listed below (Recalc) 754 cf Overall x 80.0% Voids
#3	293.22'	3,754 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
		4,357 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
290.55	4,367	295.2	0	0	4,367
293.05	4,367	295.2	10,918	10,918	5,105

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.05	4,367	295.2	0	0	4,367
293.22	4,499	297.9	754	754	4,504

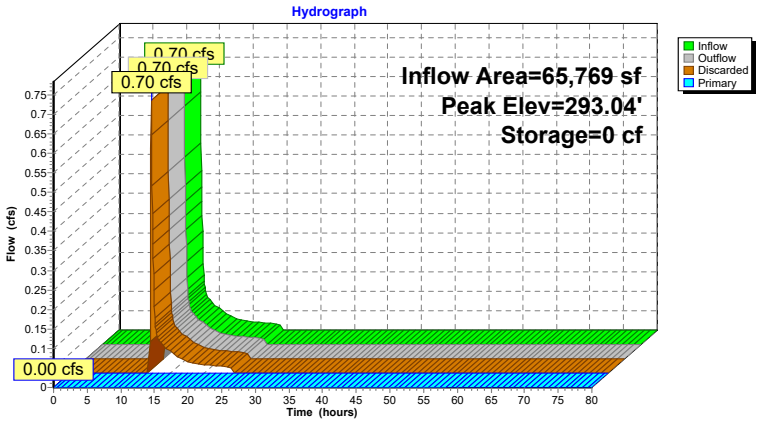
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.22	4,499	297.9	0	0	4,499
294.00	5,134	310.7	3,754	3,754	5,163

Device	Routing	Invert	Outlet Devices
#1	Discarded	290.55'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 288.55'
#2	Primary	293.45'	**6.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.55 cfs @ 12.10 hrs HW=293.04' (Free Discharge)
└**1=Exfiltration** (Controls 0.55 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=290.55' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BB-1: Bioretention Basin-1



Summary for Pond BB-2: Bioretention Basin-2

Inflow Area = 16,121 sf, 23.36% Impervious, Inflow Depth = 0.16" for 2-Year event
Inflow = 0.02 cfs @ 12.42 hrs, Volume= 216 cf
Outflow = 0.02 cfs @ 12.42 hrs, Volume= 216 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.02 cfs @ 12.42 hrs, Volume= 216 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 290.51' @ 12.42 hrs Surf.Area= 198 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: no plugs found)
Center-of-Mass det. time= 0.0 min (987.0 - 987.0)

Volume	Invert	Avail.Storage	Storage Description
#1	290.00'	0 cf	**Soil Media (Irregular)** Listed below (Recalc) 495 cf Overall x 0.0% Voids
#2	292.50'	29 cf	**Mulch (Irregular)** Listed below (Recalc) 36 cf Overall x 80.0% Voids
#3	292.67'	587 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
		616 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
290.00	198	61.0	0	0	198
292.50	198	61.0	495	495	351

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.50	198	61.0	0	0	198
292.67	230	64.0	36	36	230

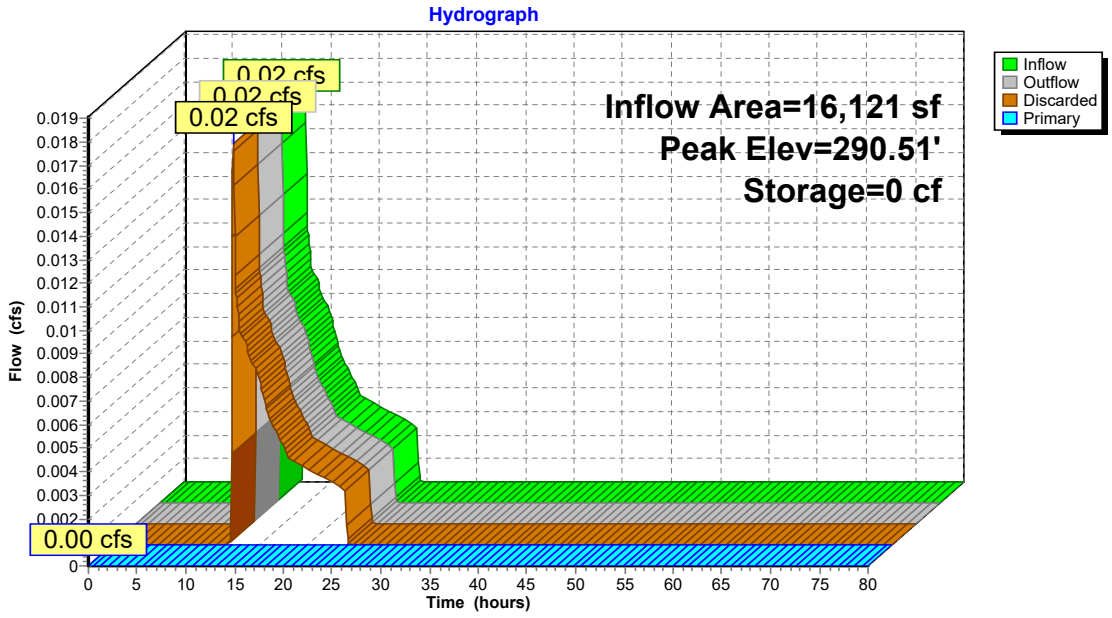
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.67	230	64.0	0	0	230
293.00	317	82.0	90	90	441
294.00	703	125.0	497	587	1,156

Device	Routing	Invert	Outlet Devices
#1	Primary	292.50'	**8.0" Round Culvert** L= 24.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 292.50' / 292.25' S= 0.0104 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Device 1	293.60'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	290.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 289.05'

Discarded OutFlow Max=0.02 cfs @ 12.42 hrs HW=290.50' (Free Discharge)
└**3=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=290.00' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond BB-2: Bioretention Basin-2



Summary for Pond SF-1: Sediment Forebay

Inflow Area = 30,208 sf, 59.62% Impervious, Inflow Depth = 0.94" for 2-Year event
Inflow = 0.71 cfs @ 12.10 hrs, Volume= 2,367 cf
Outflow = 0.70 cfs @ 12.10 hrs, Volume= 2,151 cf, Atten= 1%, Lag= 0.2 min
Primary = 0.70 cfs @ 12.10 hrs, Volume= 2,151 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 293.53' @ 12.10 hrs Surf.Area= 359 sf Storage= 225 cf

Plug-Flow detention time= 61.0 min calculated for 2,150 cf (91% of inflow)
Center-of-Mass det. time= 16.2 min (881.4 - 865.2)

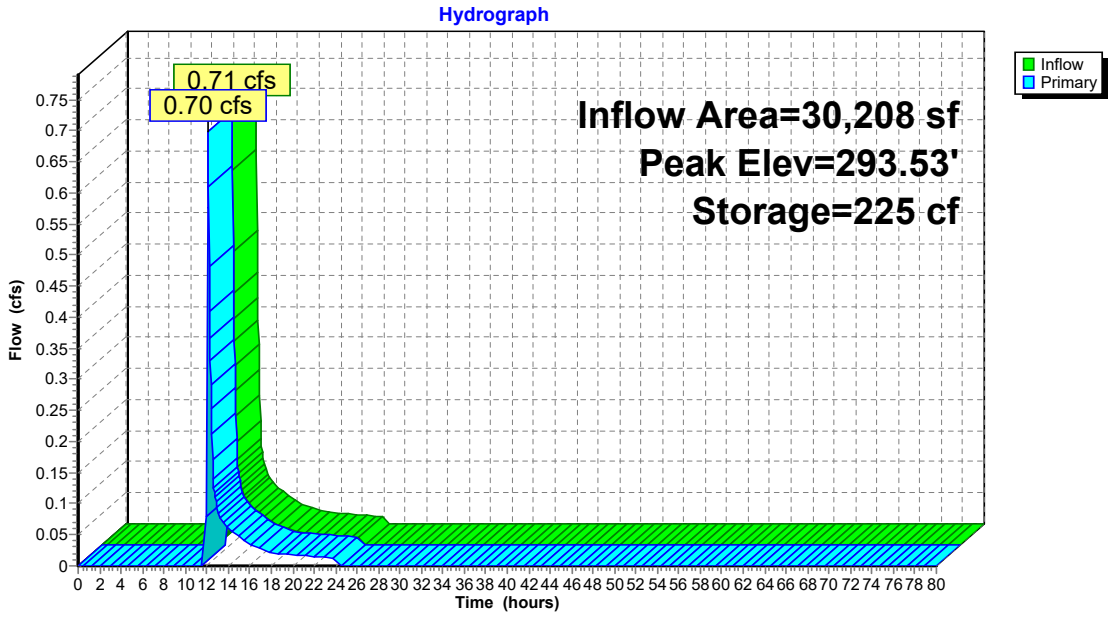
Volume	Invert	Avail.Storage	Storage Description
#1	292.80'	410 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.80	256	72.0	0	0	256
293.00	283	75.0	54	54	294
294.00	434	93.0	356	410	549

Device	Routing	Invert	Outlet Devices
#1	Primary	293.50'	**36.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.69 cfs @ 12.10 hrs HW=293.53' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.69 cfs @ 0.59 fps)

Pond SF-1: Sediment Forebay



HydroCAD Analysis

Proposed Conditions - 10 Year Storm

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
52,826	39	>75% Grass cover, Good, HSG A (P-1, P-2, P-2a, P-2b, P-2c)
4,987	61	>75% Grass cover, Good, HSG B (P-2, P-2b)
14,687	98	Paved parking (P-1, P-2a)
7,576	98	Roofs (P-2a, P-2c)
7,405	30	Woods, Good, HSG A (P-1, P-2, P-2b, P-2c)
7,196	55	Woods, Good, HSG B (P-2, P-2b)
8,179	77	Woods, Good, HSG D (P-2, P-2b)
102,856	**56**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
60,231	HSG A	P-1, P-2, P-2a, P-2b, P-2c
12,183	HSG B	P-2, P-2b
0	HSG C	
8,179	HSG D	P-2, P-2b
22,263	Other	P-1, P-2a, P-2c
102,856		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
52,826	4,987	0	0	0	57,813	>75% Grass cover, Good	P-1, P-2, P-2a, P-2b, P-2c
0	0	0	0	14,687	14,687	Paved parking	P-1, P-2a
0	0	0	0	7,576	7,576	Roofs	P-2a, P-2c
7,405	7,196	0	8,179	0	22,780	Woods, Good	P-1, P-2, P-2b, P-2c
60,231	**12,183**	**0**	**8,179**	**22,263**	**102,856**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	BB-2	292.50	292.25	24.0	0.0104	0.013	8.0	0.0	0.0

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Flow to Washington St. Runoff Area=5,469 sf 8.89% Impervious Runoff Depth=0.44"
Tc=6.0 min CN=44 Runoff=0.02 cfs 202 cf

Subcatchment P-2: Flow to Wetlands offsite Runoff Area=15,497 sf 0.00% Impervious Runoff Depth=0.64"
Tc=6.0 min CN=48 Runoff=0.15 cfs 832 cf

Subcatchment P-2a: Flow to Sediment Forebay Runoff Area=30,208 sf 59.62% Impervious Runoff Depth=2.48"
Tc=6.0 min CN=74 Runoff=1.98 cfs 6,254 cf

Subcatchment P-2b: Flow to Bioretention Basin Runoff Area=35,561 sf 0.00% Impervious Runoff Depth=0.64"
Tc=6.0 min CN=48 Runoff=0.34 cfs 1,909 cf

Subcatchment P-2c: Flow to Bioretention Basin-2 Runoff Area=16,121 sf 23.36% Impervious Runoff Depth=0.93"
Tc=6.0 min CN=53 Runoff=0.31 cfs 1,251 cf

Reach DP-1: Washington St. Inflow=0.02 cfs 202 cf
Outflow=0.02 cfs 202 cf

Reach DP-2: Offsite Wetlands Inflow=0.15 cfs 832 cf
Outflow=0.15 cfs 832 cf

Pond BB-1: Bioretention Basin-1 Peak Elev=293.27' Storage=842 cf Inflow=2.28 cfs 7,948 cf
Discarded=1.09 cfs 11,846 cf Primary=0.00 cfs 0 cf Outflow=1.09 cfs 11,846 cf

Pond BB-2: Bioretention Basin-2 Peak Elev=293.30' Storage=228 cf Inflow=0.31 cfs 1,251 cf
Discarded=0.09 cfs 1,251 cf Primary=0.00 cfs 0 cf Outflow=0.09 cfs 1,251 cf

Pond SF-1: Sediment Forebay Peak Elev=293.57' Storage=236 cf Inflow=1.98 cfs 6,254 cf
Outflow=1.96 cfs 6,039 cf

Total Runoff Area = 102,856 sf Runoff Volume = 10,448 cf Average Runoff Depth = 1.22"
78.36% Pervious = 80,593 sf 21.64% Impervious = 22,263 sf

Summary for Subcatchment P-1: Flow to Washington St.

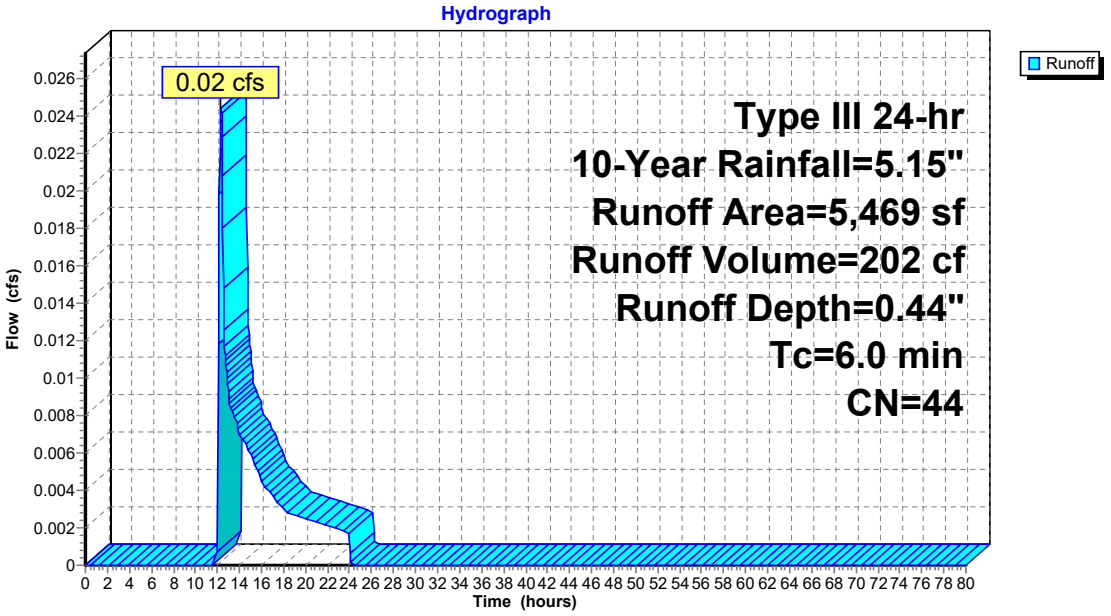
Runoff = 0.02 cfs @ 12.31 hrs, Volume= 202 cf, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

	Area (sf)	CN	Description
*	486	98	Paved parking
	385	30	Woods, Good, HSG A
	4,598	39	>75% Grass cover, Good, HSG A
	5,469	44	Weighted Average
	4,983		91.11% Pervious Area
	486		8.89% Impervious Area

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

Subcatchment P-1: Flow to Washington St.



Summary for Subcatchment P-2: Flow to Wetlands offsite

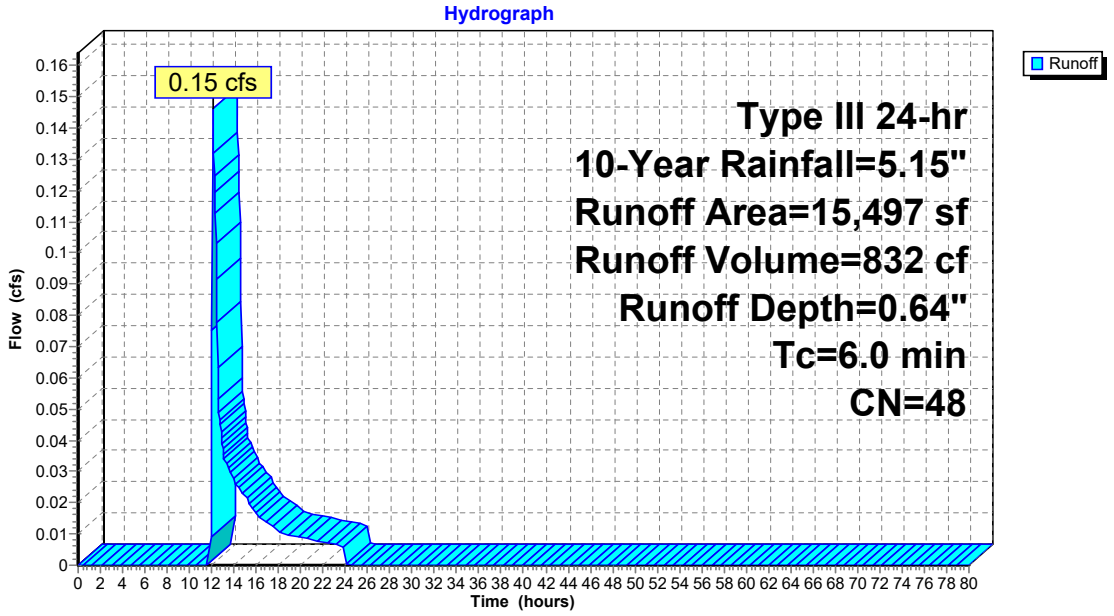
Runoff = 0.15 cfs @ 12.14 hrs, Volume= 832 cf, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
3,259	30	Woods, Good, HSG A
4,678	55	Woods, Good, HSG B
646	77	Woods, Good, HSG D
3,454	39	>75% Grass cover, Good, HSG A
3,460	61	>75% Grass cover, Good, HSG B
15,497	48	Weighted Average
15,497		100.00% Pervious Area

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

Subcatchment P-2: Flow to Wetlands offsite



Summary for Subcatchment P-2a: Flow to Sediment Forebay

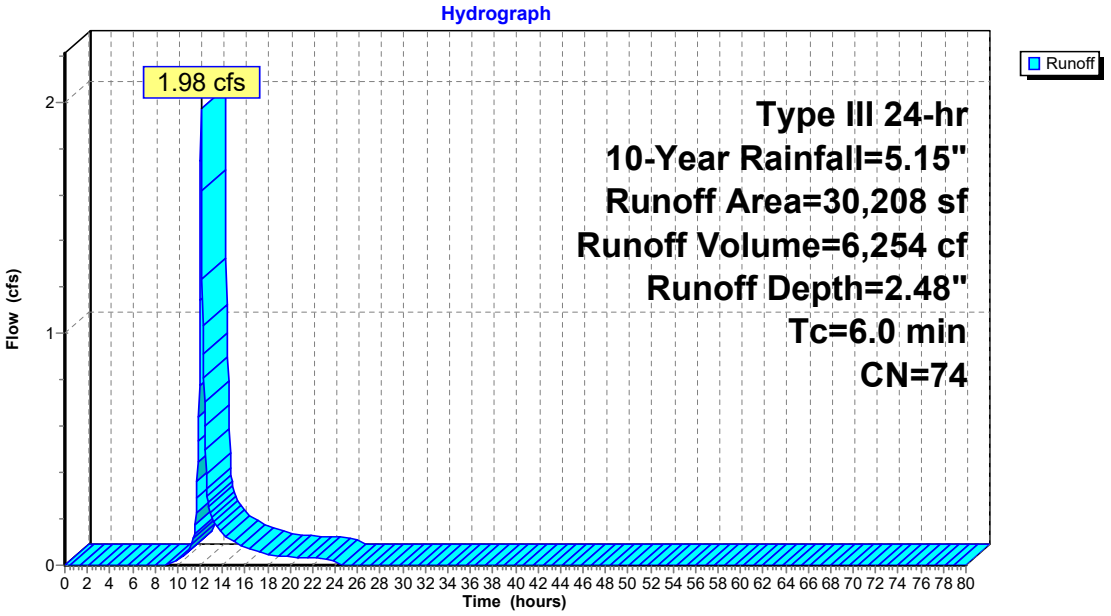
Runoff = 1.98 cfs @ 12.09 hrs, Volume= 6,254 cf, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

	Area (sf)	CN	Description
*	3,810	98	Roofs
*	14,201	98	Paved parking
	12,197	39	>75% Grass cover, Good, HSG A
	30,208	74	Weighted Average
	12,197		40.38% Pervious Area
	18,011		59.62% Impervious Area

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

Subcatchment P-2a: Flow to Sediment Forebay



Summary for Subcatchment P-2b: Flow to Bioretention Basin

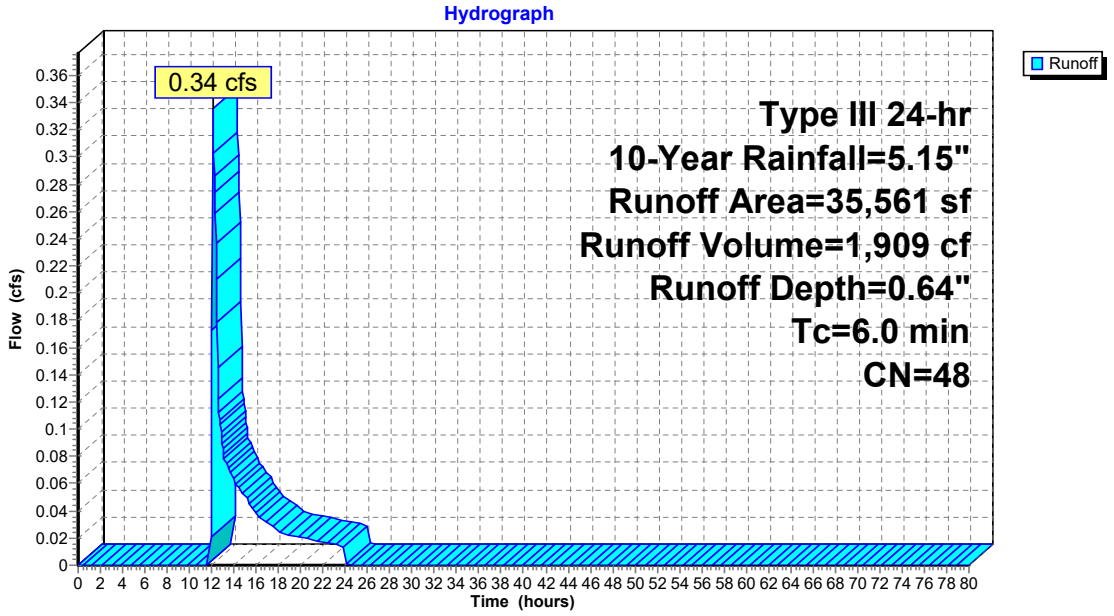
Runoff = 0.34 cfs @ 12.14 hrs, Volume= 1,909 cf, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
3,606	30	Woods, Good, HSG A
2,518	55	Woods, Good, HSG B
7,533	77	Woods, Good, HSG D
20,377	39	>75% Grass cover, Good, HSG A
1,527	61	>75% Grass cover, Good, HSG B
35,561	48	Weighted Average
35,561		100.00% Pervious Area

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

Subcatchment P-2b: Flow to Bioretention Basin



Summary for Subcatchment P-2c: Flow to Bioretention Basin-2

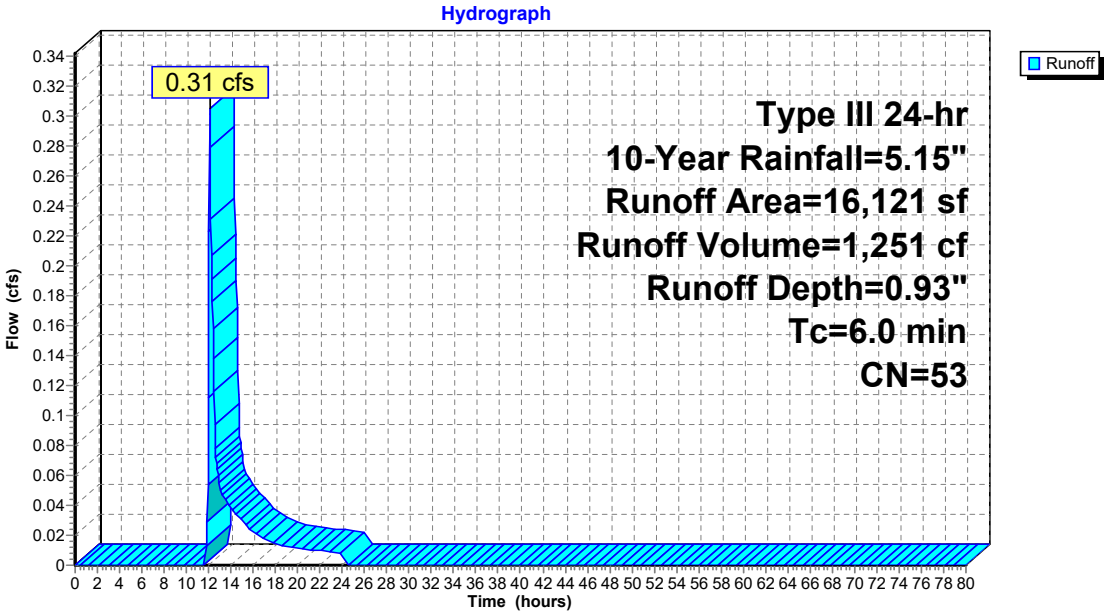
Runoff = 0.31 cfs @ 12.11 hrs, Volume= 1,251 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

	Area (sf)	CN	Description
*	3,766	98	Roofs
	155	30	Woods, Good, HSG A
	12,200	39	>75% Grass cover, Good, HSG A
	16,121	53	Weighted Average
	12,355		76.64% Pervious Area
	3,766		23.36% Impervious Area

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

Subcatchment P-2c: Flow to Bioretention Basin-2



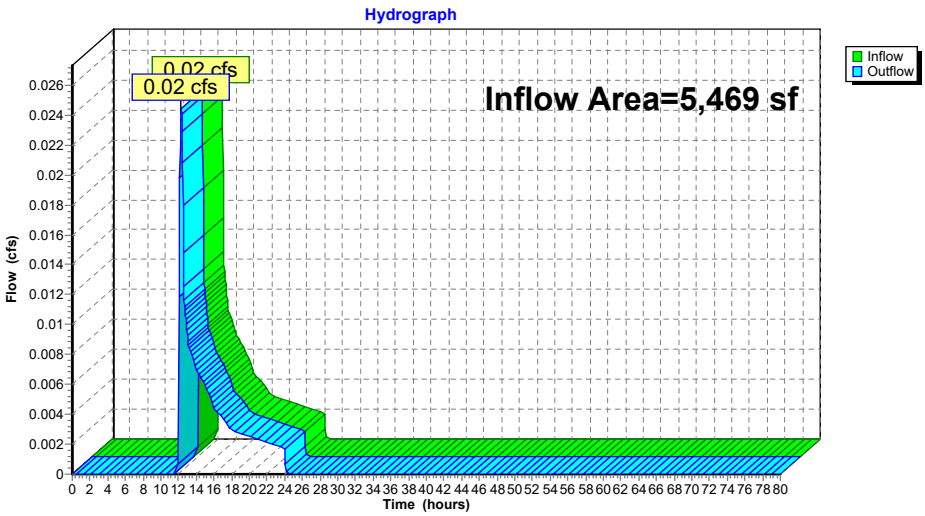
Summary for Reach DP-1: Washington St.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,469 sf, 8.89% Impervious, Inflow Depth = 0.44" for 10-Year event
Inflow = 0.02 cfs @ 12.31 hrs, Volume= 202 cf
Outflow = 0.02 cfs @ 12.31 hrs, Volume= 202 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Washington St.



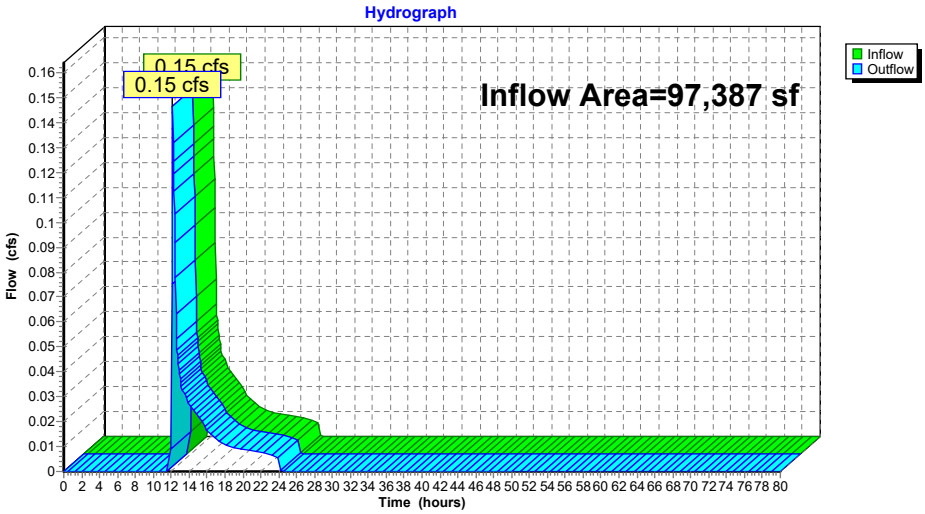
Summary for Reach DP-2: Offsite Wetlands

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 97,387 sf, 22.36% Impervious, Inflow Depth = 0.10" for 10-Year event
Inflow = 0.15 cfs @ 12.14 hrs, Volume= 832 cf
Outflow = 0.15 cfs @ 12.14 hrs, Volume= 832 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Offsite Wetlands



Summary for Pond BB-1: Bioretention Basin-1

Inflow Area = 65,769 sf, 27.39% Impervious, Inflow Depth = 1.45" for 10-Year event
Inflow = 2.28 cfs @ 12.10 hrs, Volume= 7,948 cf
Outflow = 1.09 cfs @ 12.34 hrs, Volume= 11,846 cf, Atten= 52%, Lag= 14.3 min
Discarded = 1.09 cfs @ 12.34 hrs, Volume= 11,846 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 293.27' @ 12.34 hrs Surf.Area= 13,407 sf Storage= 842 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 47.5 min (910.0 - 862.5)

Volume	Invert	Avail.Storage	Storage Description
#1	290.55'	0 cf	**Soil Media (Irregular)** Listed below (Recalc) 10,918 cf Overall x 0.0% Voids
#2	293.05'	603 cf	**Mulch (Irregular)** Listed below (Recalc) 754 cf Overall x 80.0% Voids
#3	293.22'	3,754 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
		4,357 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
290.55	4,367	295.2	0	0	4,367
293.05	4,367	295.2	10,918	10,918	5,105

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.05	4,367	295.2	0	0	4,367
293.22	4,499	297.9	754	754	4,504

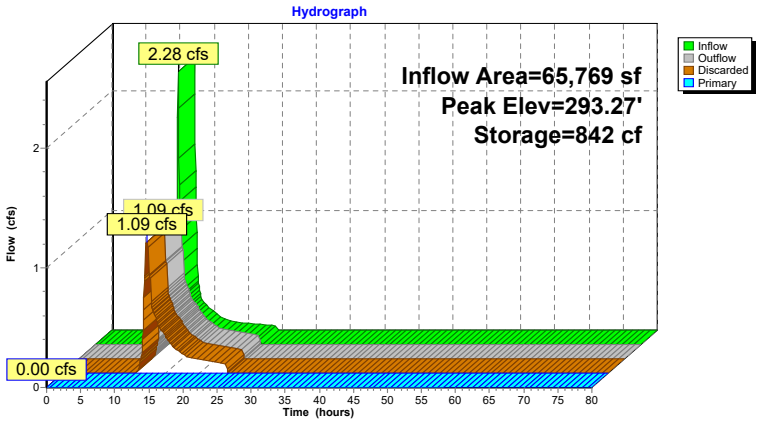
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.22	4,499	297.9	0	0	4,499
294.00	5,134	310.7	3,754	3,754	5,163

Device	Routing	Invert	Outlet Devices
#1	Discarded	290.55'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 288.55'
#2	Primary	293.45'	**6.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=1.09 cfs @ 12.34 hrs HW=293.27' (Free Discharge)
└**1=Exfiltration** (Controls 1.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=290.55' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BB-1: Bioretention Basin-1



Summary for Pond BB-2: Bioretention Basin-2

Inflow Area = 16,121 sf, 23.36% Impervious, Inflow Depth = 0.93" for 10-Year event
Inflow = 0.31 cfs @ 12.11 hrs, Volume= 1,251 cf
Outflow = 0.09 cfs @ 12.56 hrs, Volume= 1,251 cf, Atten= 70%, Lag= 26.9 min
Discarded = 0.09 cfs @ 12.56 hrs, Volume= 1,251 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 293.30' @ 12.56 hrs Surf.Area= 844 sf Storage= 228 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 15.7 min (913.4 - 897.7)

Volume	Invert	Avail.Storage	Storage Description
#1	290.00'	0 cf	**Soil Media (Irregular)** Listed below (Recalc) 495 cf Overall x 0.0% Voids
#2	292.50'	29 cf	**Mulch (Irregular)** Listed below (Recalc) 36 cf Overall x 80.0% Voids
#3	292.67'	587 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
		616 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
290.00	198	61.0	0	0	198
292.50	198	61.0	495	495	351

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.50	198	61.0	0	0	198
292.67	230	64.0	36	36	230

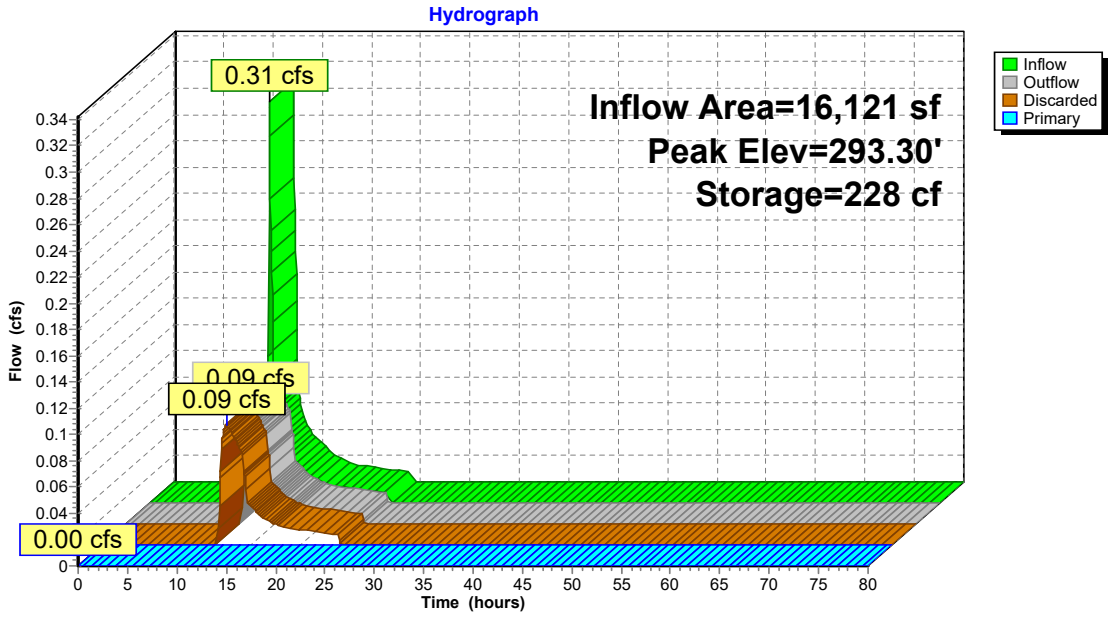
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.67	230	64.0	0	0	230
293.00	317	82.0	90	90	441
294.00	703	125.0	497	587	1,156

Device	Routing	Invert	Outlet Devices
#1	Primary	292.50'	**8.0" Round Culvert** L= 24.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 292.50' / 292.25' S= 0.0104 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Device 1	293.60'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	290.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 289.05'

Discarded OutFlow Max=0.09 cfs @ 12.56 hrs HW=293.30' (Free Discharge)
└**3=Exfiltration** (Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=290.00' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond BB-2: Bioretention Basin-2



Summary for Pond SF-1: Sediment Forebay

Inflow Area = 30,208 sf, 59.62% Impervious, Inflow Depth = 2.48" for 10-Year event
Inflow = 1.98 cfs @ 12.09 hrs, Volume= 6,254 cf
Outflow = 1.96 cfs @ 12.10 hrs, Volume= 6,039 cf, Atten= 1%, Lag= 0.1 min
Primary = 1.96 cfs @ 12.10 hrs, Volume= 6,039 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 293.57' @ 12.10 hrs Surf.Area= 364 sf Storage= 236 cf

Plug-Flow detention time= 27.0 min calculated for 6,035 cf (97% of inflow)
Center-of-Mass det. time= 7.8 min (843.8 - 836.0)

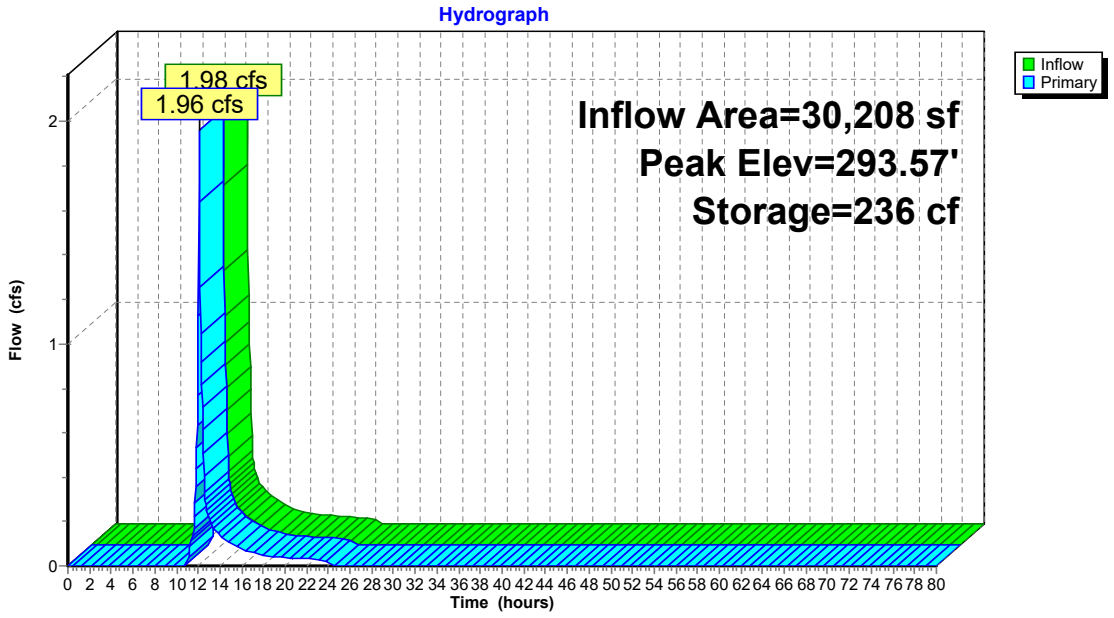
Volume	Invert	Avail.Storage	Storage Description
#1	292.80'	410 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.80	256	72.0	0	0	256
293.00	283	75.0	54	54	294
294.00	434	93.0	356	410	549

Device	Routing	Invert	Outlet Devices
#1	Primary	293.50'	**36.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.94 cfs @ 12.10 hrs HW=293.56' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 1.94 cfs @ 0.83 fps)

Pond SF-1: Sediment Forebay



HydroCAD Analysis

Proposed Conditions - 25 Year Storm

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
52,826	39	>75% Grass cover, Good, HSG A (P-1, P-2, P-2a, P-2b, P-2c)
4,987	61	>75% Grass cover, Good, HSG B (P-2, P-2b)
14,687	98	Paved parking (P-1, P-2a)
7,576	98	Roofs (P-2a, P-2c)
7,405	30	Woods, Good, HSG A (P-1, P-2, P-2b, P-2c)
7,196	55	Woods, Good, HSG B (P-2, P-2b)
8,179	77	Woods, Good, HSG D (P-2, P-2b)
102,856	**56**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
60,231	HSG A	P-1, P-2, P-2a, P-2b, P-2c
12,183	HSG B	P-2, P-2b
0	HSG C	
8,179	HSG D	P-2, P-2b
22,263	Other	P-1, P-2a, P-2c
102,856		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
52,826	4,987	0	0	0	57,813	>75% Grass cover, Good	P-1, P-2, P-2a, P-2b, P-2c
0	0	0	0	14,687	14,687	Paved parking	P-1, P-2a
0	0	0	0	7,576	7,576	Roofs	P-2a, P-2c
7,405	7,196	0	8,179	0	22,780	Woods, Good	P-1, P-2, P-2b, P-2c
60,231	**12,183**	**0**	**8,179**	**22,263**	**102,856**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	BB-2	292.50	292.25	24.0	0.0104	0.013	8.0	0.0	0.0

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Flow to Washington St. Runoff Area=5,469 sf 8.89% Impervious Runoff Depth=0.88"
Tc=6.0 min CN=44 Runoff=0.08 cfs 399 cf

Subcatchment P-2: Flow to Wetlands offsite Runoff Area=15,497 sf 0.00% Impervious Runoff Depth=1.17"
Tc=6.0 min CN=48 Runoff=0.37 cfs 1,505 cf

Subcatchment P-2a: Flow to Sediment Forebay Runoff Area=30,208 sf 59.62% Impervious Runoff Depth=3.48"
Tc=6.0 min CN=74 Runoff=2.78 cfs 8,764 cf

Subcatchment P-2b: Flow to Bioretention Basin Runoff Area=35,561 sf 0.00% Impervious Runoff Depth=1.17"
Tc=6.0 min CN=48 Runoff=0.85 cfs 3,454 cf

Subcatchment P-2c: Flow to Bioretention Basin-2 Runoff Area=16,121 sf 23.36% Impervious Runoff Depth=1.56"
Tc=6.0 min CN=53 Runoff=0.59 cfs 2,093 cf

Reach DP-1: Washington St. Inflow=0.08 cfs 399 cf
Outflow=0.08 cfs 399 cf

Reach DP-2: Offsite Wetlands Inflow=0.66 cfs 1,950 cf
Outflow=0.66 cfs 1,950 cf

Pond BB-1: Bioretention Basin-1 Peak Elev=293.52' Storage=1,989 cf Inflow=3.60 cfs 12,006 cf
Discarded=1.16 cfs 6,971 cf Primary=0.26 cfs 250 cf Outflow=1.42 cfs 7,220 cf

Pond BB-2: Bioretention Basin-2 Peak Elev=293.65' Storage=397 cf Inflow=0.59 cfs 2,093 cf
Discarded=0.11 cfs 2,362 cf Primary=0.22 cfs 196 cf Outflow=0.33 cfs 2,558 cf

Pond SF-1: Sediment Forebay Peak Elev=293.58' Storage=242 cf Inflow=2.78 cfs 8,764 cf
Outflow=2.76 cfs 8,552 cf

Total Runoff Area = 102,856 sf Runoff Volume = 16,214 cf Average Runoff Depth = 1.89"
78.36% Pervious = 80,593 sf 21.64% Impervious = 22,263 sf

Summary for Subcatchment P-1: Flow to Washington St.

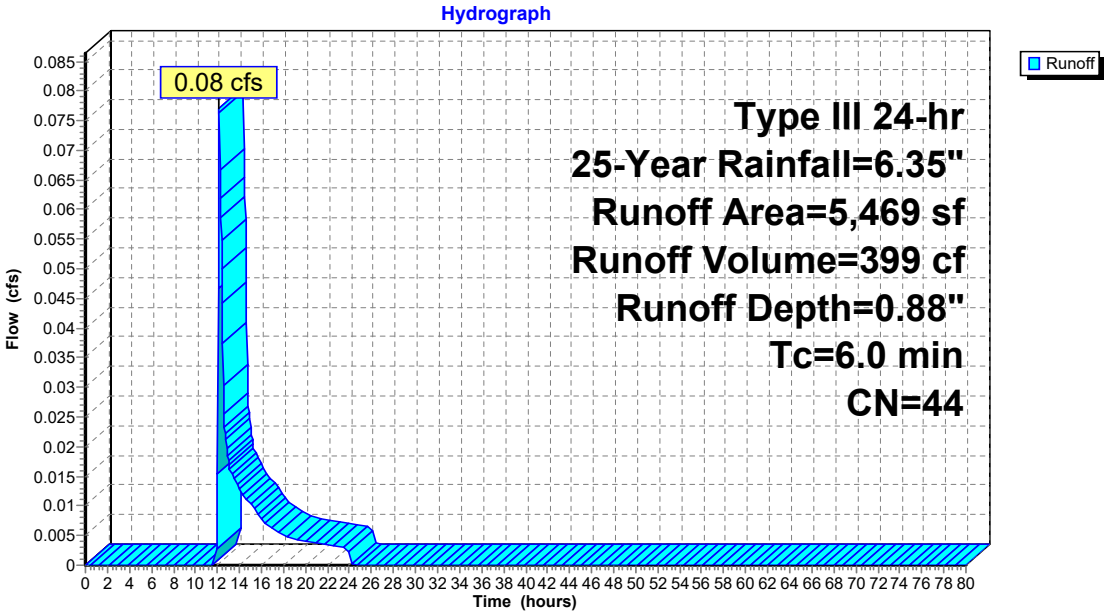
Runoff = 0.08 cfs @ 12.13 hrs, Volume= 399 cf, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

	Area (sf)	CN	Description
*	486	98	Paved parking
	385	30	Woods, Good, HSG A
	4,598	39	>75% Grass cover, Good, HSG A
	5,469	44	Weighted Average
	4,983		91.11% Pervious Area
	486		8.89% Impervious Area

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

Subcatchment P-1: Flow to Washington St.



Summary for Subcatchment P-2: Flow to Wetlands offsite

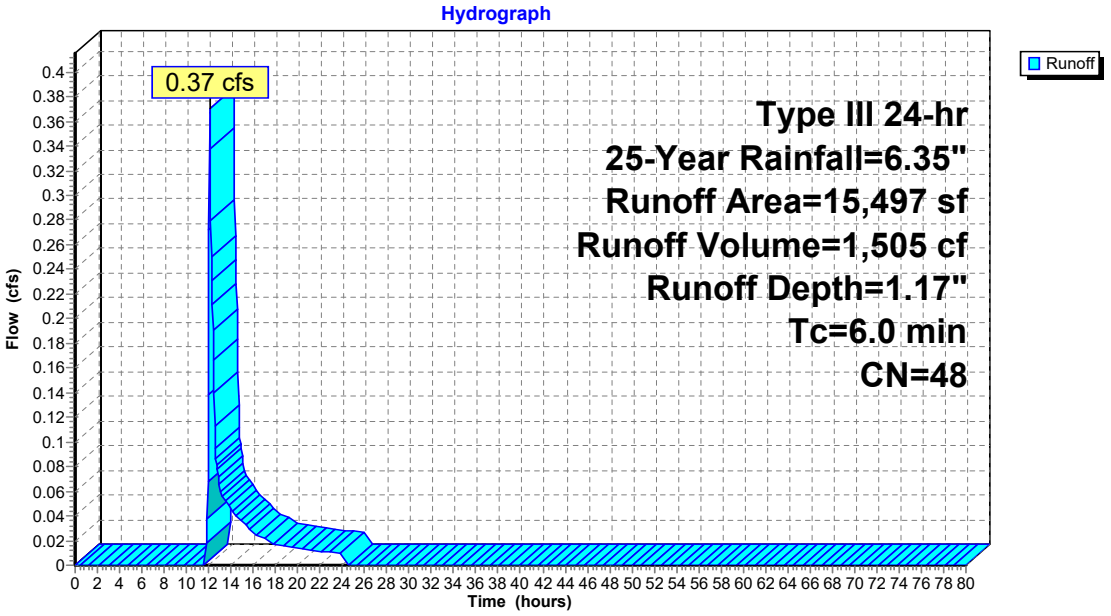
Runoff = 0.37 cfs @ 12.11 hrs, Volume= 1,505 cf, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
3,259	30	Woods, Good, HSG A
4,678	55	Woods, Good, HSG B
646	77	Woods, Good, HSG D
3,454	39	>75% Grass cover, Good, HSG A
3,460	61	>75% Grass cover, Good, HSG B
15,497	48	Weighted Average
15,497		100.00% Pervious Area

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

Subcatchment P-2: Flow to Wetlands offsite



Summary for Subcatchment P-2a: Flow to Sediment Forebay

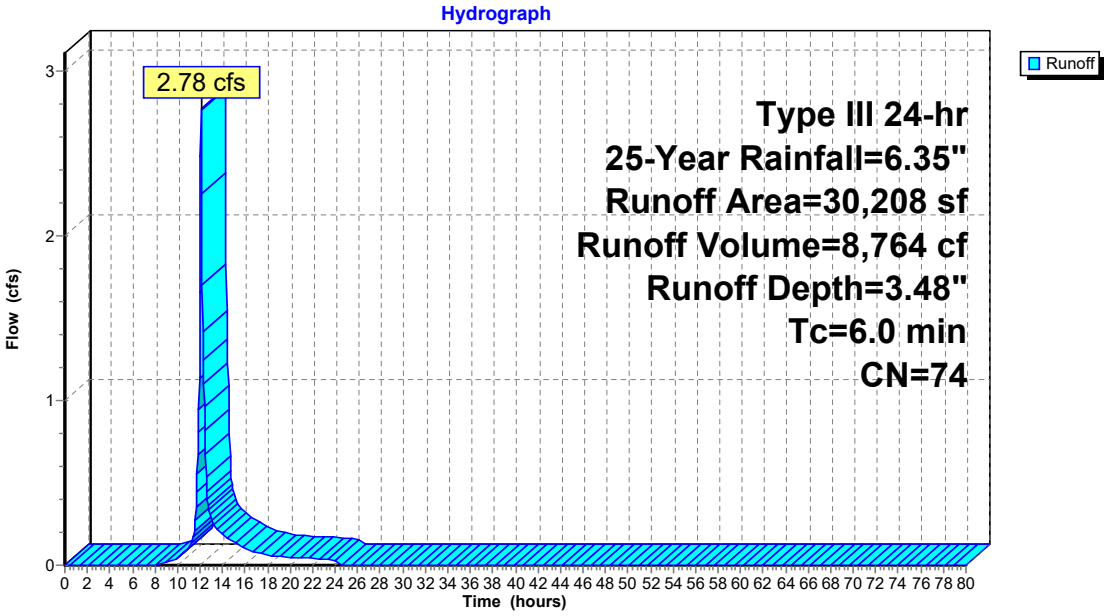
Runoff = 2.78 cfs @ 12.09 hrs, Volume= 8,764 cf, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

	Area (sf)	CN	Description
*	3,810	98	Roofs
*	14,201	98	Paved parking
	12,197	39	>75% Grass cover, Good, HSG A
	30,208	74	Weighted Average
	12,197		40.38% Pervious Area
	18,011		59.62% Impervious Area

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

Subcatchment P-2a: Flow to Sediment Forebay



Summary for Subcatchment P-2b: Flow to Bioretention Basin

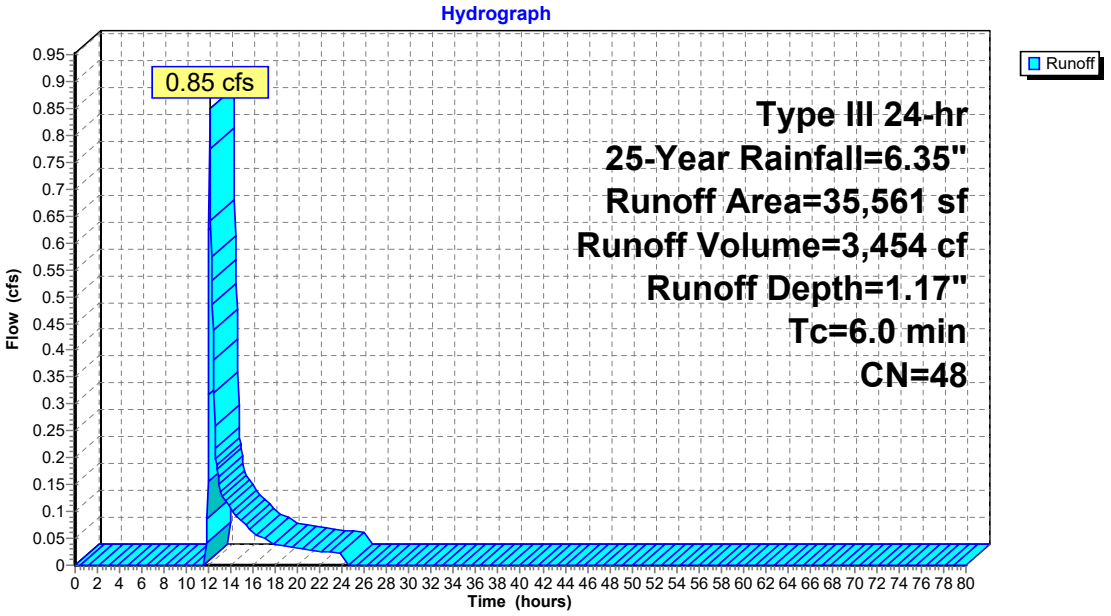
Runoff = 0.85 cfs @ 12.11 hrs, Volume= 3,454 cf, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
3,606	30	Woods, Good, HSG A
2,518	55	Woods, Good, HSG B
7,533	77	Woods, Good, HSG D
20,377	39	>75% Grass cover, Good, HSG A
1,527	61	>75% Grass cover, Good, HSG B
35,561	48	Weighted Average
35,561		100.00% Pervious Area

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

Subcatchment P-2b: Flow to Bioretention Basin



Summary for Subcatchment P-2c: Flow to Bioretention Basin-2

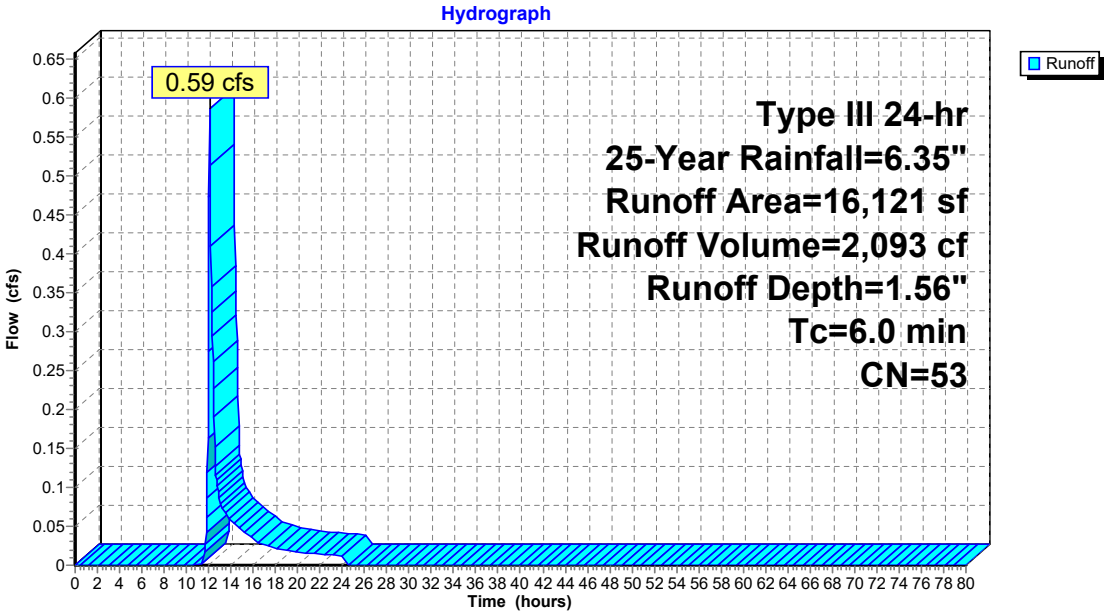
Runoff = 0.59 cfs @ 12.11 hrs, Volume= 2,093 cf, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

	Area (sf)	CN	Description
*	3,766	98	Roofs
	155	30	Woods, Good, HSG A
	12,200	39	>75% Grass cover, Good, HSG A
	16,121	53	Weighted Average
	12,355		76.64% Pervious Area
	3,766		23.36% Impervious Area

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

Subcatchment P-2c: Flow to Bioretention Basin-2



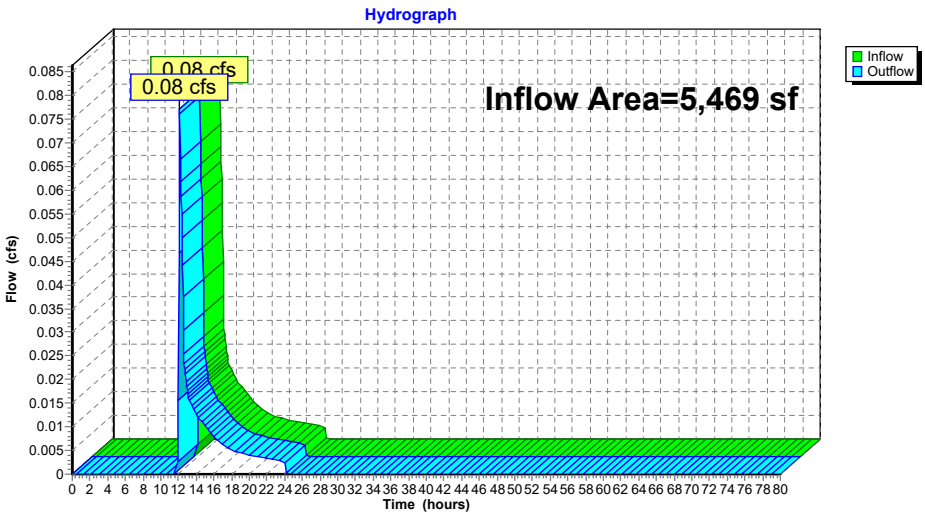
Summary for Reach DP-1: Washington St.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,469 sf, 8.89% Impervious, Inflow Depth = 0.88" for 25-Year event
Inflow = 0.08 cfs @ 12.13 hrs, Volume= 399 cf
Outflow = 0.08 cfs @ 12.13 hrs, Volume= 399 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Washington St.



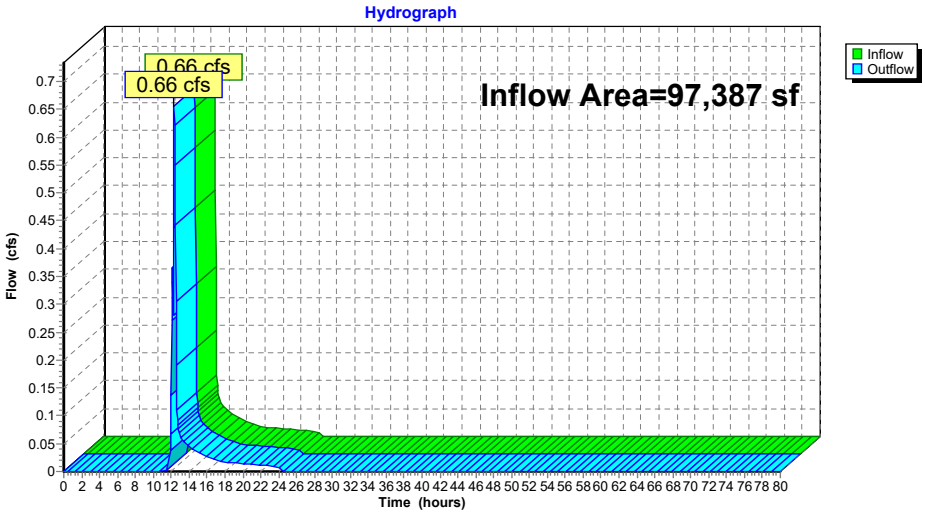
Summary for Reach DP-2: Offsite Wetlands

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 97,387 sf, 22.36% Impervious, Inflow Depth = 0.24" for 25-Year event
Inflow = 0.66 cfs @ 12.35 hrs, Volume= 1,950 cf
Outflow = 0.66 cfs @ 12.35 hrs, Volume= 1,950 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Offsite Wetlands



Summary for Pond BB-1: Bioretention Basin-1

[79] Warning: Submerged Pond SF-1 Primary device # 1 by 0.02'

Inflow Area = 65,769 sf, 27.39% Impervious, Inflow Depth = 2.19" for 25-Year event
Inflow = 3.60 cfs @ 12.10 hrs, Volume= 12,006 cf
Outflow = 1.42 cfs @ 12.40 hrs, Volume= 7,220 cf, Atten= 60%, Lag= 17.8 min
Discarded = 1.16 cfs @ 12.40 hrs, Volume= 6,971 cf
Primary = 0.26 cfs @ 12.40 hrs, Volume= 250 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 293.52' @ 12.40 hrs Surf.Area= 13,604 sf Storage= 1,989 cf

Plug-Flow detention time= 14.4 min calculated for 7,216 cf (60% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	290.55'	0 cf	**Soil Media (Irregular)** Listed below (Recalc) 10,918 cf Overall x 0.0% Voids
#2	293.05'	603 cf	**Mulch (Irregular)** Listed below (Recalc) 754 cf Overall x 80.0% Voids
#3	293.22'	3,754 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
		4,357 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
290.55	4,367	295.2	0	0	4,367
293.05	4,367	295.2	10,918	10,918	5,105

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.05	4,367	295.2	0	0	4,367
293.22	4,499	297.9	754	754	4,504

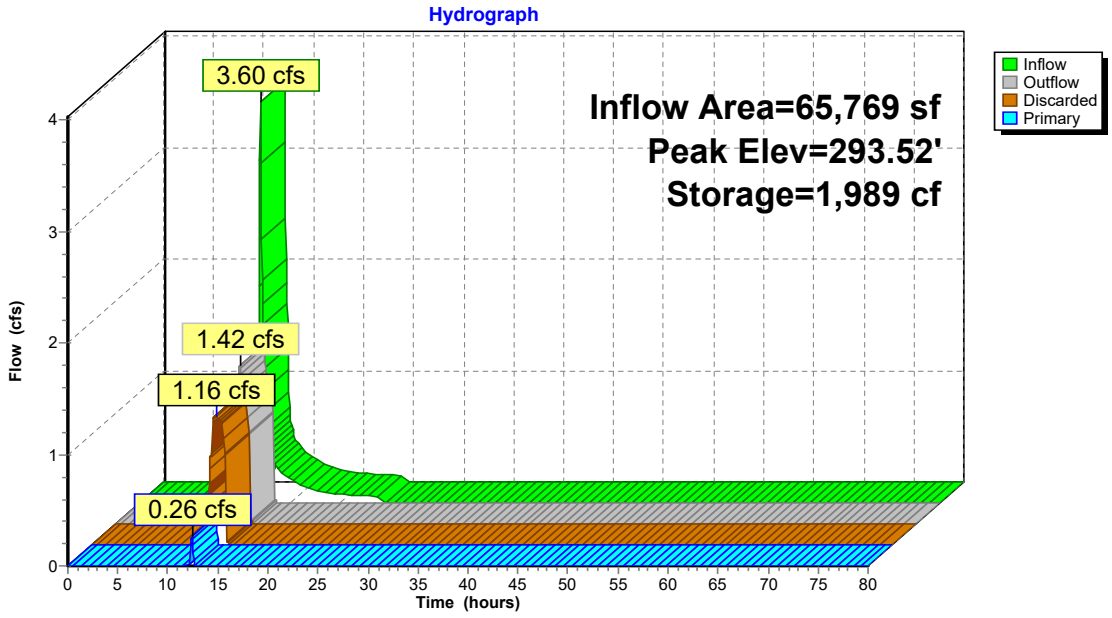
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.22	4,499	297.9	0	0	4,499
294.00	5,134	310.7	3,754	3,754	5,163

Device	Routing	Invert	Outlet Devices
#1	Discarded	290.55'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 288.55'
#2	Primary	293.45'	**6.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=1.16 cfs @ 12.40 hrs HW=293.52' (Free Discharge)
└**1=Exfiltration** (Controls 1.16 cfs)

Primary OutFlow Max=0.26 cfs @ 12.40 hrs HW=293.52' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.26 cfs @ 0.62 fps)

Pond BB-1: Bioretention Basin-1



Summary for Pond BB-2: Bioretention Basin-2

Inflow Area = 16,121 sf, 23.36% Impervious, Inflow Depth = 1.56" for 25-Year event
Inflow = 0.59 cfs @ 12.11 hrs, Volume= 2,093 cf
Outflow = 0.33 cfs @ 12.32 hrs, Volume= 2,558 cf, Atten= 44%, Lag= 12.8 min
Discarded = 0.11 cfs @ 12.32 hrs, Volume= 2,362 cf
Primary = 0.22 cfs @ 12.32 hrs, Volume= 196 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 293.65' @ 12.32 hrs Surf.Area= 978 sf Storage= 397 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 77.1 min (956.1 - 879.0)

Volume	Invert	Avail.Storage	Storage Description
#1	290.00'	0 cf	**Soil Media (Irregular)** Listed below (Recalc) 495 cf Overall x 0.0% Voids
#2	292.50'	29 cf	**Mulch (Irregular)** Listed below (Recalc) 36 cf Overall x 80.0% Voids
#3	292.67'	587 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
		616 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
290.00	198	61.0	0	0	198
292.50	198	61.0	495	495	351

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.50	198	61.0	0	0	198
292.67	230	64.0	36	36	230

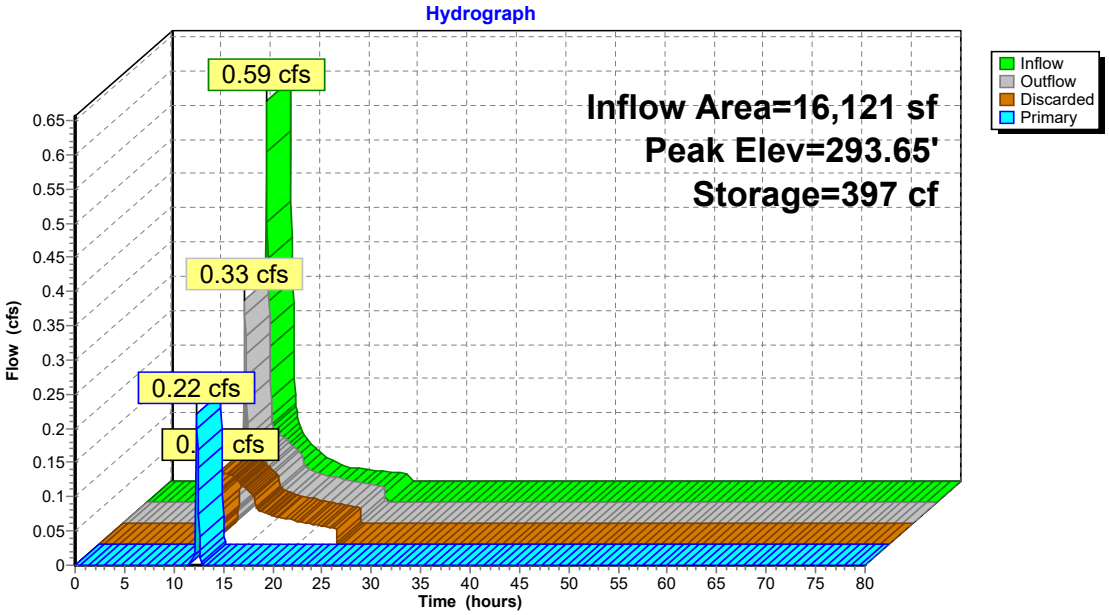
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.67	230	64.0	0	0	230
293.00	317	82.0	90	90	441
294.00	703	125.0	497	587	1,156

Device	Routing	Invert	Outlet Devices
#1	Primary	292.50'	**8.0" Round Culvert** L= 24.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 292.50' / 292.25' S= 0.0104 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Device 1	293.60'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	290.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 289.05'

Discarded OutFlow Max=0.11 cfs @ 12.32 hrs HW=293.65' (Free Discharge)
└─**3=Exfiltration** (Controls 0.11 cfs)

Primary OutFlow Max=0.20 cfs @ 12.32 hrs HW=293.65' (Free Discharge)
└─**1=Culvert** (Passes 0.20 cfs of 1.43 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 0.20 cfs @ 0.70 fps)

Pond BB-2: Bioretention Basin-2



Summary for Pond SF-1: Sediment Forebay

Inflow Area = 30,208 sf, 59.62% Impervious, Inflow Depth = 3.48" for 25-Year event
Inflow = 2.78 cfs @ 12.09 hrs, Volume= 8,764 cf
Outflow = 2.76 cfs @ 12.09 hrs, Volume= 8,552 cf, Atten= 1%, Lag= 0.1 min
Primary = 2.76 cfs @ 12.09 hrs, Volume= 8,552 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 293.58' @ 12.09 hrs Surf.Area= 367 sf Storage= 242 cf

Plug-Flow detention time= 20.4 min calculated for 8,547 cf (98% of inflow)
Center-of-Mass det. time= 6.4 min (832.7 - 826.2)

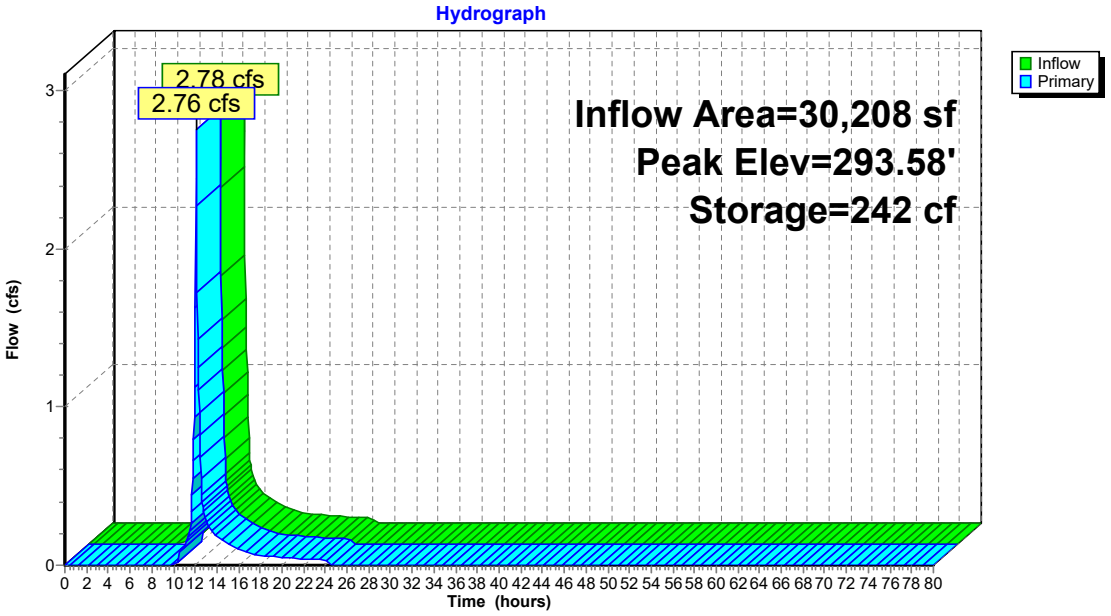
Volume	Invert	Avail.Storage	Storage Description
#1	292.80'	410 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.80	256	72.0	0	0	256
293.00	283	75.0	54	54	294
294.00	434	93.0	356	410	549

Device	Routing	Invert	Outlet Devices
#1	Primary	293.50'	**36.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.72 cfs @ 12.09 hrs HW=293.58' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 2.72 cfs @ 0.93 fps)

Pond SF-1: Sediment Forebay



HydroCAD Analysis

Proposed Conditions - 100 Year Storm

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
TEL508 695 2221 FAX508 695 2219 CONTACT@LEVELDG.COM LEVELDG.COM

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
52,826	39	>75% Grass cover, Good, HSG A (P-1, P-2, P-2a, P-2b, P-2c)
4,987	61	>75% Grass cover, Good, HSG B (P-2, P-2b)
14,687	98	Paved parking (P-1, P-2a)
7,576	98	Roofs (P-2a, P-2c)
7,405	30	Woods, Good, HSG A (P-1, P-2, P-2b, P-2c)
7,196	55	Woods, Good, HSG B (P-2, P-2b)
8,179	77	Woods, Good, HSG D (P-2, P-2b)
102,856	**56**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
60,231	HSG A	P-1, P-2, P-2a, P-2b, P-2c
12,183	HSG B	P-2, P-2b
0	HSG C	
8,179	HSG D	P-2, P-2b
22,263	Other	P-1, P-2a, P-2c
102,856		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
52,826	4,987	0	0	0	57,813	>75% Grass cover, Good	P-1, P-2, P-2a, P-2b, P-2c
0	0	0	0	14,687	14,687	Paved parking	P-1, P-2a
0	0	0	0	7,576	7,576	Roofs	P-2a, P-2c
7,405	7,196	0	8,179	0	22,780	Woods, Good	P-1, P-2, P-2b, P-2c
60,231	**12,183**	**0**	**8,179**	**22,263**	**102,856**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	BB-2	292.50	292.25	24.0	0.0104	0.013	8.0	0.0	0.0

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Flow to Washington St. Runoff Area=5,469 sf 8.89% Impervious Runoff Depth=1.72"
Tc=6.0 min CN=44 Runoff=0.21 cfs 783 cf

Subcatchment P-2: Flow to Wetlands offsite Runoff Area=15,497 sf 0.00% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=48 Runoff=0.79 cfs 2,757 cf

Subcatchment P-2a: Flow to Sediment Forebay Runoff Area=30,208 sf 59.62% Impervious Runoff Depth=5.07"
Tc=6.0 min CN=74 Runoff=4.02 cfs 12,760 cf

Subcatchment P-2b: Flow to Bioretention Basin Runoff Area=35,561 sf 0.00% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=48 Runoff=1.81 cfs 6,326 cf

Subcatchment P-2c: Flow to Bioretention Basin-2 Runoff Area=16,121 sf 23.36% Impervious Runoff Depth=2.67"
Tc=6.0 min CN=53 Runoff=1.08 cfs 3,592 cf

Reach DP-1: Washington St. Inflow=0.21 cfs 783 cf
Outflow=0.21 cfs 783 cf

Reach DP-2: Offsite Wetlands Inflow=3.23 cfs 6,629 cf
Outflow=3.23 cfs 6,629 cf

Pond BB-1: Bioretention Basin-1 Peak Elev=293.72' Storage=2,974 cf Inflow=5.80 cfs 18,875 cf
Discarded=1.22 cfs 13,934 cf Primary=2.07 cfs 2,874 cf Outflow=3.29 cfs 16,808 cf

Pond BB-2: Bioretention Basin-2 Peak Elev=293.72' Storage=437 cf Inflow=1.08 cfs 3,592 cf
Discarded=0.11 cfs 2,580 cf Primary=0.86 cfs 999 cf Outflow=0.97 cfs 3,578 cf

Pond SF-1: Sediment Forebay Peak Elev=293.61' Storage=251 cf Inflow=4.02 cfs 12,760 cf
Outflow=4.00 cfs 12,549 cf

Total Runoff Area = 102,856 sf Runoff Volume = 26,218 cf Average Runoff Depth = 3.06"
78.36% Pervious = 80,593 sf 21.64% Impervious = 22,263 sf

Summary for Subcatchment P-1: Flow to Washington St.

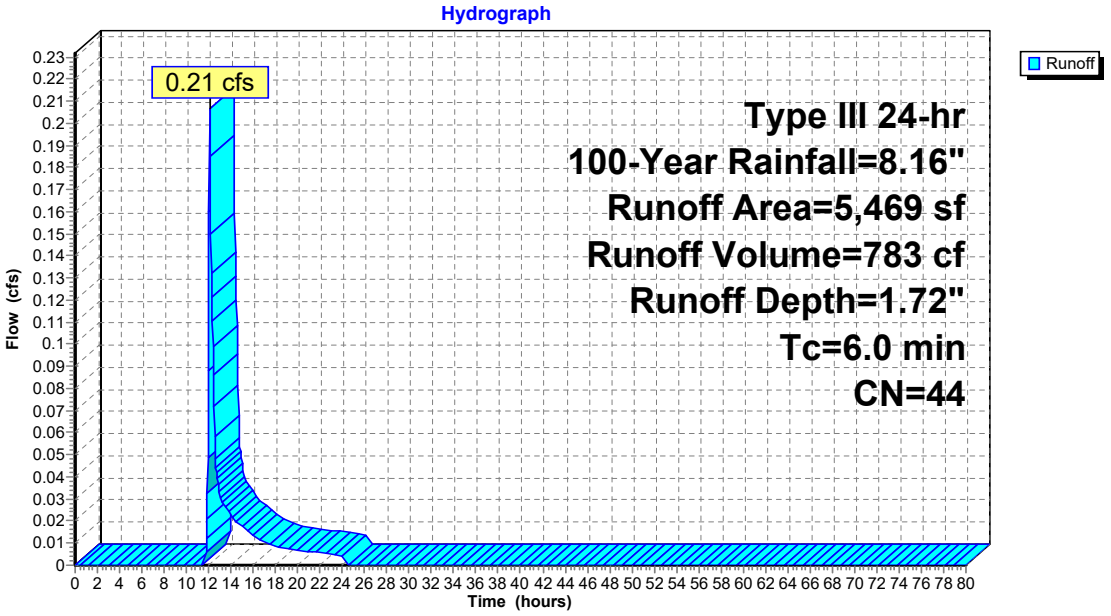
Runoff = 0.21 cfs @ 12.11 hrs, Volume= 783 cf, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

	Area (sf)	CN	Description
*	486	98	Paved parking
	385	30	Woods, Good, HSG A
	4,598	39	>75% Grass cover, Good, HSG A
	5,469	44	Weighted Average
	4,983		91.11% Pervious Area
	486		8.89% Impervious Area

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

Subcatchment P-1: Flow to Washington St.



Summary for Subcatchment P-2: Flow to Wetlands offsite

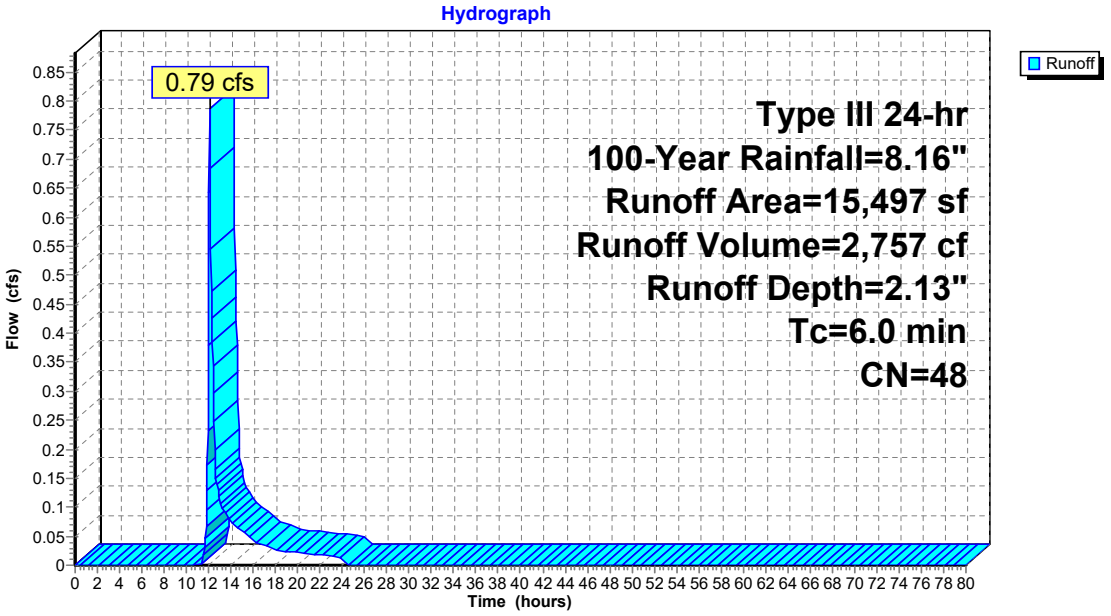
Runoff = 0.79 cfs @ 12.10 hrs, Volume= 2,757 cf, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
3,259	30	Woods, Good, HSG A
4,678	55	Woods, Good, HSG B
646	77	Woods, Good, HSG D
3,454	39	>75% Grass cover, Good, HSG A
3,460	61	>75% Grass cover, Good, HSG B
15,497	48	Weighted Average
15,497		100.00% Pervious Area

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

Subcatchment P-2: Flow to Wetlands offsite



Summary for Subcatchment P-2a: Flow to Sediment Forebay

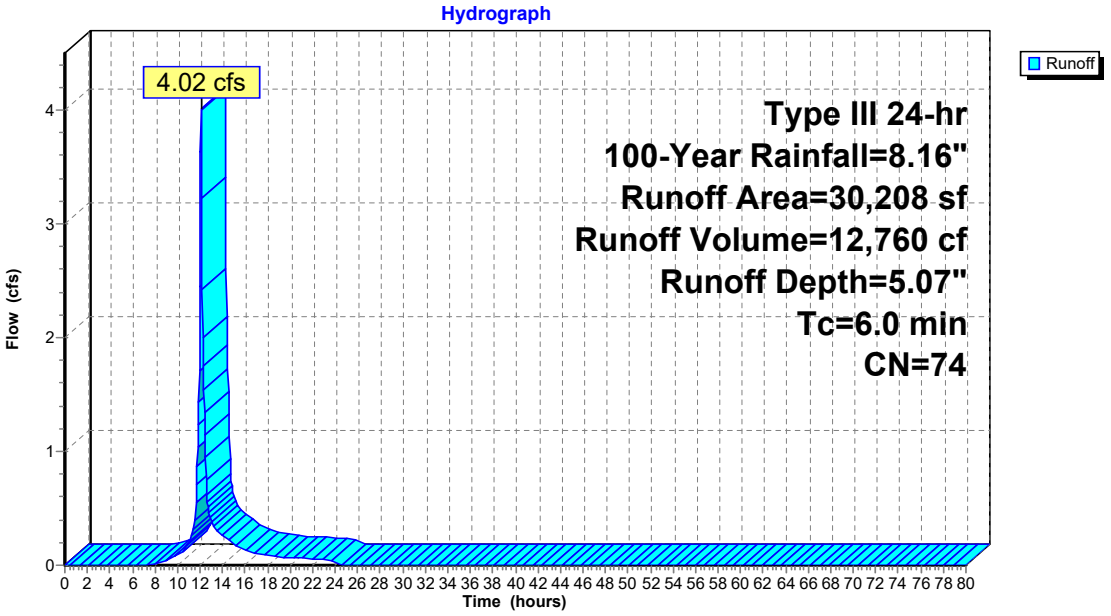
Runoff = 4.02 cfs @ 12.09 hrs, Volume= 12,760 cf, Depth= 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

	Area (sf)	CN	Description
*	3,810	98	Roofs
*	14,201	98	Paved parking
	12,197	39	>75% Grass cover, Good, HSG A
	30,208	74	Weighted Average
	12,197		40.38% Pervious Area
	18,011		59.62% Impervious Area

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

Subcatchment P-2a: Flow to Sediment Forebay



Summary for Subcatchment P-2b: Flow to Bioretention Basin

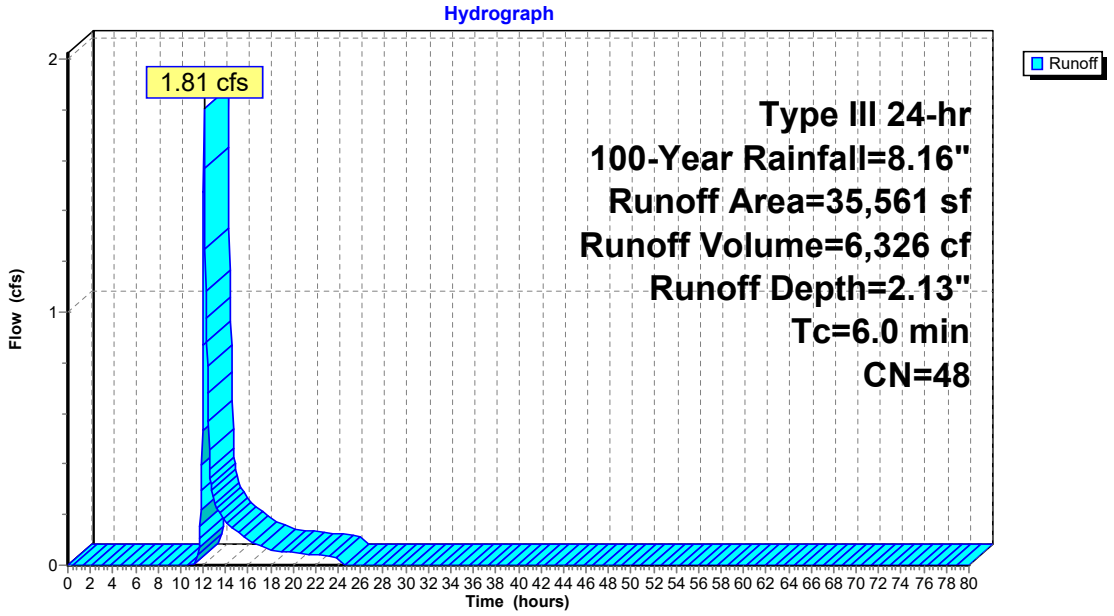
Runoff = 1.81 cfs @ 12.10 hrs, Volume= 6,326 cf, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
3,606	30	Woods, Good, HSG A
2,518	55	Woods, Good, HSG B
7,533	77	Woods, Good, HSG D
20,377	39	>75% Grass cover, Good, HSG A
1,527	61	>75% Grass cover, Good, HSG B
35,561	48	Weighted Average
35,561		100.00% Pervious Area

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

Subcatchment P-2b: Flow to Bioretention Basin



Summary for Subcatchment P-2c: Flow to Bioretention Basin-2

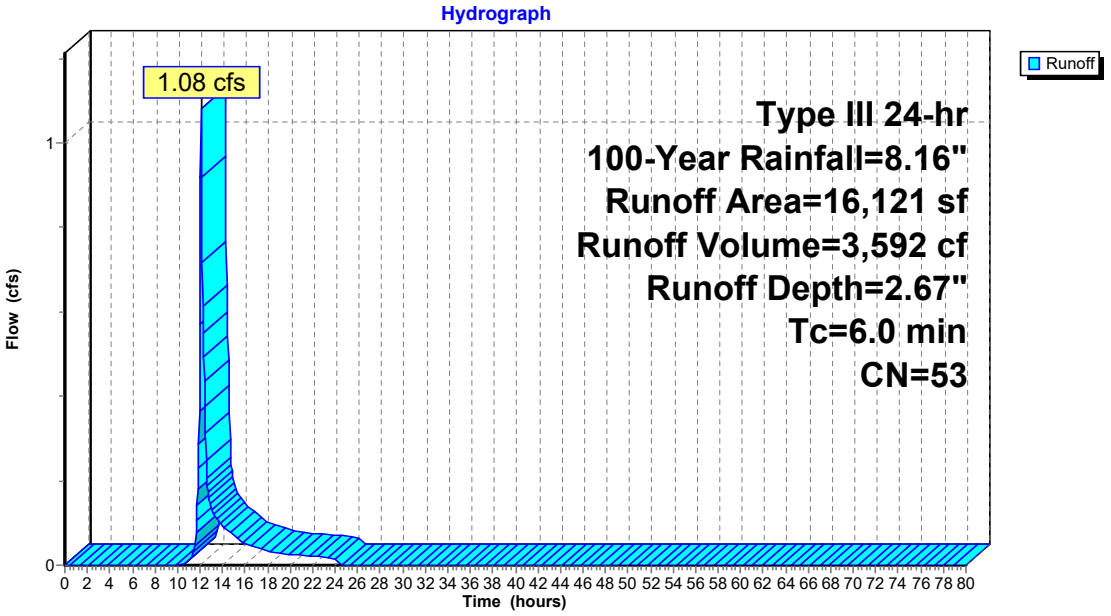
Runoff = 1.08 cfs @ 12.10 hrs, Volume= 3,592 cf, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

	Area (sf)	CN	Description
*	3,766	98	Roofs
	155	30	Woods, Good, HSG A
	12,200	39	>75% Grass cover, Good, HSG A
	16,121	53	Weighted Average
	12,355		76.64% Pervious Area
	3,766		23.36% Impervious Area

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

Subcatchment P-2c: Flow to Bioretention Basin-2



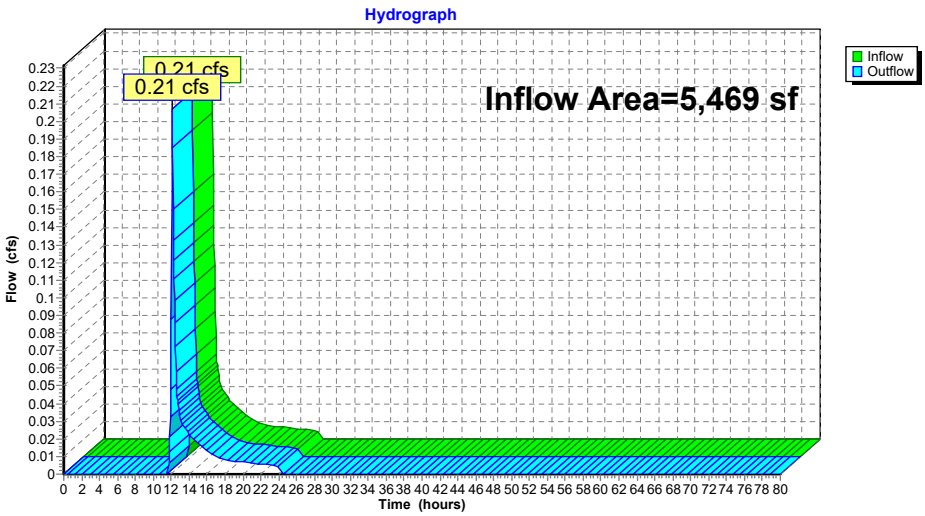
Summary for Reach DP-1: Washington St.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,469 sf, 8.89% Impervious, Inflow Depth = 1.72" for 100-Year event
Inflow = 0.21 cfs @ 12.11 hrs, Volume= 783 cf
Outflow = 0.21 cfs @ 12.11 hrs, Volume= 783 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Washington St.



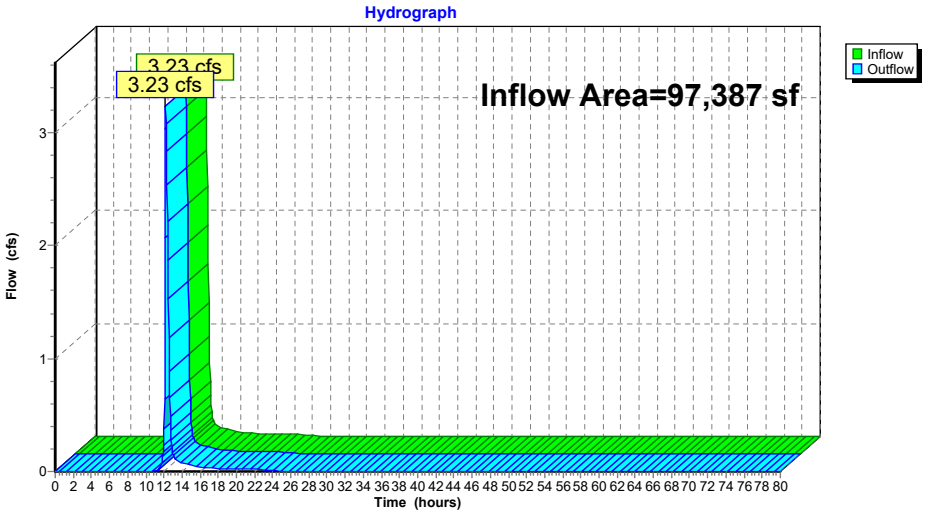
Summary for Reach DP-2: Offsite Wetlands

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 97,387 sf, 22.36% Impervious, Inflow Depth = 0.82" for 100-Year event
Inflow = 3.23 cfs @ 12.20 hrs, Volume= 6,629 cf
Outflow = 3.23 cfs @ 12.20 hrs, Volume= 6,629 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Offsite Wetlands



Summary for Pond BB-1: Bioretention Basin-1

[81] Warning: Exceeded Pond SF-1 by 0.16' @ 12.25 hrs

Inflow Area = 65,769 sf, 27.39% Impervious, Inflow Depth = 3.44" for 100-Year event
Inflow = 5.80 cfs @ 12.10 hrs, Volume= 18,875 cf
Outflow = 3.29 cfs @ 12.24 hrs, Volume= 16,808 cf, Atten= 43%, Lag= 8.6 min
Discarded = 1.22 cfs @ 12.24 hrs, Volume= 13,934 cf
Primary = 2.07 cfs @ 12.24 hrs, Volume= 2,874 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 293.72' @ 12.24 hrs Surf.Area= 13,771 sf Storage= 2,974 cf

Plug-Flow detention time= 26.2 min calculated for 16,798 cf (89% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	290.55'	0 cf	**Soil Media (Irregular)** Listed below (Recalc) 10,918 cf Overall x 0.0% Voids
#2	293.05'	603 cf	**Mulch (Irregular)** Listed below (Recalc) 754 cf Overall x 80.0% Voids
#3	293.22'	3,754 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
		4,357 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
290.55	4,367	295.2	0	0	4,367
293.05	4,367	295.2	10,918	10,918	5,105

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.05	4,367	295.2	0	0	4,367
293.22	4,499	297.9	754	754	4,504

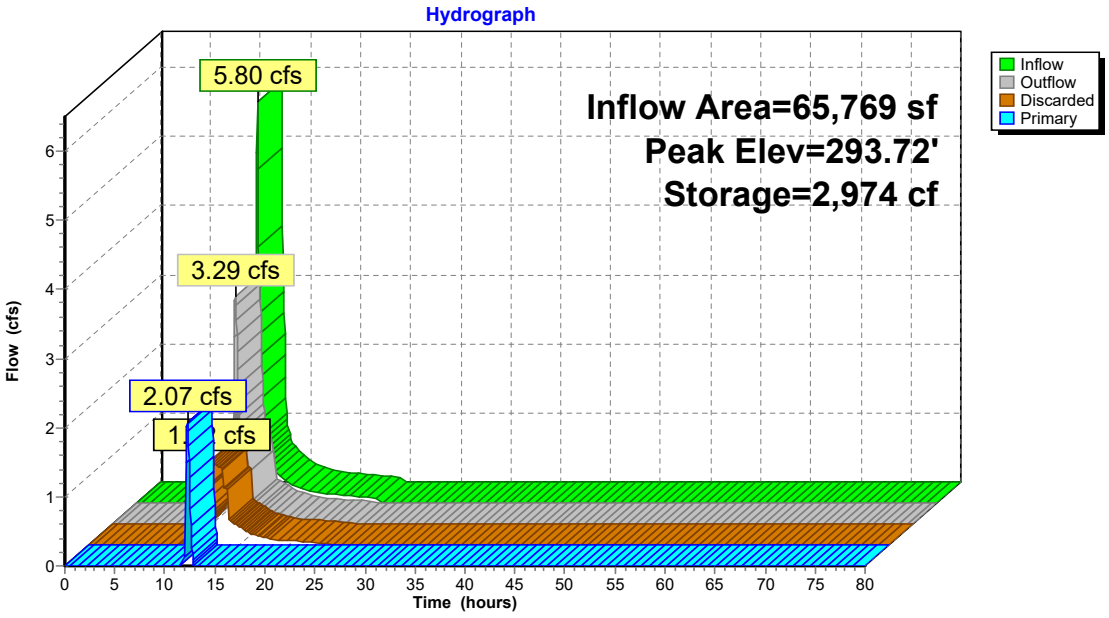
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
293.22	4,499	297.9	0	0	4,499
294.00	5,134	310.7	3,754	3,754	5,163

Device	Routing	Invert	Outlet Devices
#1	Discarded	290.55'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 288.55'
#2	Primary	293.45'	**6.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=1.22 cfs @ 12.24 hrs HW=293.72' (Free Discharge)
└**1=Exfiltration** (Controls 1.22 cfs)

Primary OutFlow Max=2.06 cfs @ 12.24 hrs HW=293.72' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.06 cfs @ 1.25 fps)

Pond BB-1: Bioretention Basin-1



Summary for Pond BB-2: Bioretention Basin-2

Inflow Area = 16,121 sf, 23.36% Impervious, Inflow Depth = 2.67" for 100-Year event
Inflow = 1.08 cfs @ 12.10 hrs, Volume= 3,592 cf
Outflow = 0.97 cfs @ 12.14 hrs, Volume= 3,578 cf, Atten= 11%, Lag= 2.3 min
Discarded = 0.11 cfs @ 12.14 hrs, Volume= 2,580 cf
Primary = 0.86 cfs @ 12.14 hrs, Volume= 999 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 293.72' @ 12.14 hrs Surf.Area= 1,008 sf Storage= 437 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 22.3 min (883.8 - 861.4)

Volume	Invert	Avail.Storage	Storage Description
#1	290.00'	0 cf	**Soil Media (Irregular)** Listed below (Recalc) 495 cf Overall x 0.0% Voids
#2	292.50'	29 cf	**Mulch (Irregular)** Listed below (Recalc) 36 cf Overall x 80.0% Voids
#3	292.67'	587 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)
		616 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
290.00	198	61.0	0	0	198
292.50	198	61.0	495	495	351

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.50	198	61.0	0	0	198
292.67	230	64.0	36	36	230

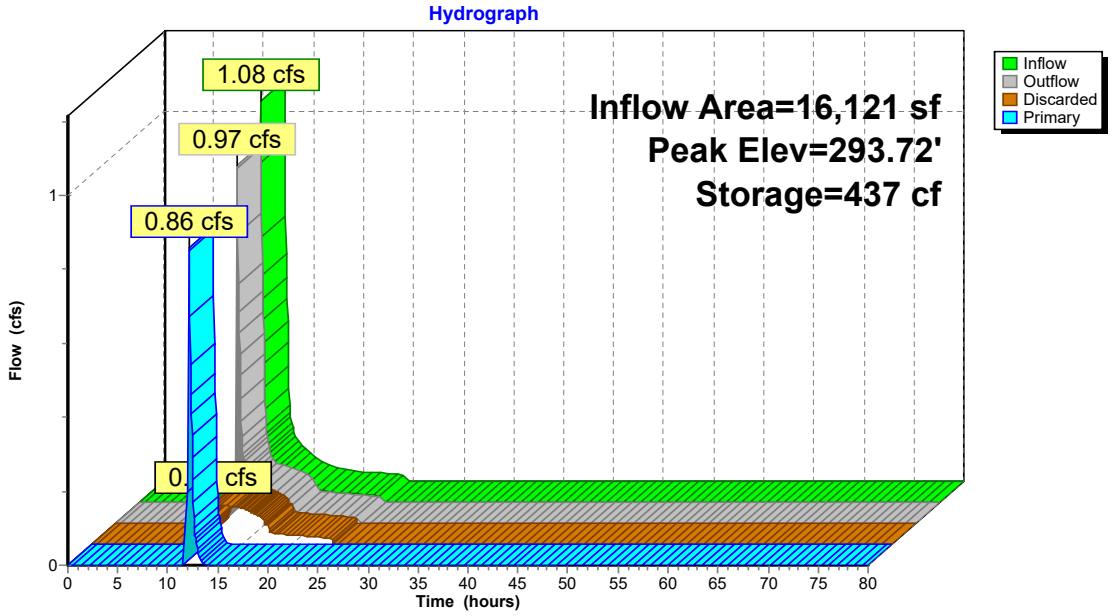
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.67	230	64.0	0	0	230
293.00	317	82.0	90	90	441
294.00	703	125.0	497	587	1,156

Device	Routing	Invert	Outlet Devices
#1	Primary	292.50'	**8.0" Round Culvert** L= 24.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 292.50' / 292.25' S= 0.0104 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Device 1	293.60'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	290.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 289.05'

Discarded OutFlow Max=0.11 cfs @ 12.14 hrs HW=293.72' (Free Discharge)
└─**3=Exfiltration** (Controls 0.11 cfs)

Primary OutFlow Max=0.83 cfs @ 12.14 hrs HW=293.72' (Free Discharge)
└─**1=Culvert** (Passes 0.83 cfs of 1.50 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 0.83 cfs @ 1.12 fps)

Pond BB-2: Bioretention Basin-2



Summary for Pond SF-1: Sediment Forebay

Inflow Area = 30,208 sf, 59.62% Impervious, Inflow Depth = 5.07" for 100-Year event
Inflow = 4.02 cfs @ 12.09 hrs, Volume= 12,760 cf
Outflow = 4.00 cfs @ 12.09 hrs, Volume= 12,549 cf, Atten= 0%, Lag= 0.1 min
Primary = 4.00 cfs @ 12.09 hrs, Volume= 12,549 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 293.61' @ 12.09 hrs Surf.Area= 371 sf Storage= 251 cf

Plug-Flow detention time= 15.2 min calculated for 12,541 cf (98% of inflow)
Center-of-Mass det. time= 5.3 min (820.8 - 815.5)

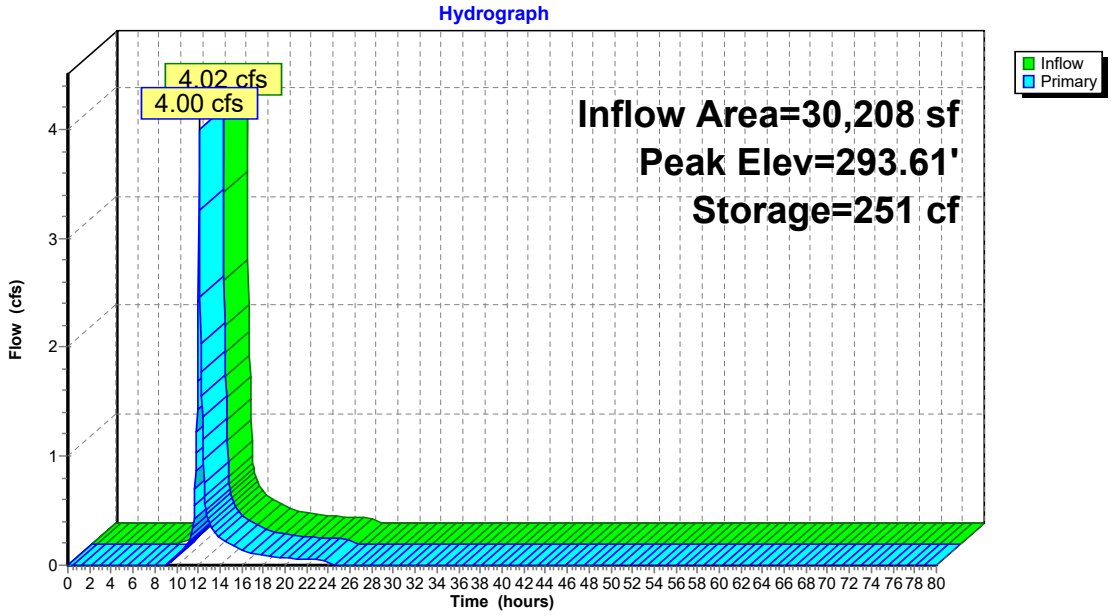
Volume	Invert	Avail.Storage	Storage Description
#1	292.80'	410 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
292.80	256	72.0	0	0	256
293.00	283	75.0	54	54	294
294.00	434	93.0	356	410	549

Device	Routing	Invert	Outlet Devices
#1	Primary	293.50'	**36.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=3.93 cfs @ 12.09 hrs HW=293.60' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 3.93 cfs @ 1.05 fps)

Pond SF-1: Sediment Forebay



LEVEL
DESIGN GROUP

Operation and Maintenance Plan

249 SOUTH STREET UNIT 1 PLAINVILLE MA 02762
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OPERATION AND MAINTENANCE PLAN

FOR

704 WASHINGTON STREET
FRANKLIN, MA

DATED: JUNE 30, 2022
REVISED: NOVEMBER 21, 2022
REVISED: DECEMBER 19, 2022

Prepared By:
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Prepared For:
Amego Inc.
33 Perry Street
Attleboro, MA 02703

LDG Project No.:
2013.00

The proposed Stormwater Management System is designed to function properly provided that routine maintenance is performed. It is the responsibility during construction and until purchase of the units and turnover of the project to a Home Owners Association to be formed, that the Owner and Developer, Amego Inc., shall be responsible for the long-term maintenance and to provide the required maintenance outlined in this plan for the site infiltration systems as well as the remainder of the on-site storm drainage system.

Upon completion of construction and the formation of the Home Owners Association, maintenance of driveways and the stormwater appurtenances required to ensure that sedimentation and pollution is controlled and that storm water detention and infiltration capacity is sustained are the on-going responsibility of the Home Owners Association. To ensure the proper functioning of these facilities the following maintenance practices will be used:

DRIVEWAYS AND PARKING AREAS

Spring Maintenance
Driveways and Parking Areas are to be swept monthly to remove sand which has accumulated. Sand shall be removed from the site and legally disposed of.

Summer & Fall Maintenance
Leaves and debris which accumulates within the Driveways and Parking Areas during the summer and fall shall be collected and legally disposed of.

Winter Maintenance & Snow Removal
Snow removal within Driveways and Parking Area shall be stockpiled in the designated Snow Stockpile Areas outside of the traveled driveways. These areas should be located within or adjacent to the parking surface and should drain to the stormwater management system. Under no circumstances shall snow be directed onto abutting parcels or into the on-site resource areas (wetlands, wetland buffer zone, and riverfront areas).

Estimated Yearly Cost $1,000.00 (not including cost for snow plowing)

GUTTERS AND DOWNSPOUTS

Summer & Fall Maintenance
Leaves and debris which accumulates within the gutters during the summer and fall shall be collected and legally disposed of. Excessive water shall not be introduced to clean the gutters and the downspouts, and materials shall be collected so as not to clog the subsurface basin.

Estimated Yearly Cost $150.00

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BIORETENTION BASIN

Spring Maintenance
The bioretention basin requires monthly inspections for accumulations of settled of solids. If these materials have accumulated to a point where removal is necessary this shall be completed immediately. If during monthly inspections a condition as detailed has not occurred the sediment shall be removed from the forebay three to four times a year and legally disposed of. Accumulated trash and debris shall also be removed and legally disposed of during the monthly inspections.

During the initial growing season, the bioretention basin shall be inspected to ensure that vegetation has become adequately established and will be reseeded and mulched, as necessary.

At least twice during the growing season the upper-stage, side slopes, and all other grass areas shall be mowed with mower blades set to no lower than 3-inches. If riling or gullying is observed these areas shall be raked out and reseeded.
Estimated Yearly Cost $500.00

SEDIMENT FOREBAY

Spring Maintenance
The sediment forebay requires monthly inspections for accumulations of settled of solids. If these materials have accumulated to a point where removal is necessary this shall be completed immediately. If during monthly inspections a condition as detailed has not occurred the sediment shall be removed from the forebay three to four times a year and legally disposed of. Accumulated trash and debris shall also be removed and legally disposed of during the monthly inspections.

During the initial growing season, the infiltration basin shall be inspected to ensure that vegetation has become adequately established and will be reseeded, as necessary.

At least twice during the growing season the upper-stage, side slopes, and all other grass areas shall be mowed with mower blades set to no lower than 3-inches. If riling or gullying is observed these areas shall be raked out and reseeded.
Estimated Yearly Cost $500.00

PUBLIC SAFETY FEATURES

Many of the Public Safety Features of the Stormwater Management System are incorporated into its design. The Infiltration basin was designed to minimize its depth to 2-feet deep. This combined with sediment forebay being approximately 1-foot deep provide for a safe and effective system.

Despite all the well-designed safety features within the Stormwater Management System all components of the system must be properly maintained to be effective. All maintenance procedures detailed above must be done on schedule and documented. Standing or stagnant water provides

mosquito-breeding habitat and increases the potential for disease transmission. The basin is designed to fully infiltrate within 72 hours after a storm even which will prevent standing water from becoming a safety hazard. Routine monitoring for and management of mosquito-breeding conditions by qualified maintenance staff is required during the peak breading season between April and September ensure that unforeseen conditions do not develop.

While risks can be mitigated through proper design and maintenance, it is impossible to entirely eliminate risk. Therefore, education regarding stormwater management facilities and their inherent risks is valuable and should be a part of every community's activities. Employees and tenants of the Facility shall be given an overview of the Stormwater System and which areas to avoid. Public participation also increases the level of maintenance as community members can notify staff if a component of the stormwater system is not functioning properly.

The O&M shall be recorded with the Home Owners Agreement or other approving maintenance agreement to properly notify future owners of maintenance requirements.

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LEVEL
DESIGN GROUP

STORMWATER MANAGEMENT OPREATOIN AND MAINTENANCE LOG

It is the responsibility of the owner and developer, Amego Inc., to provide the maintenance of the Stormwater Management System Maintenance in accordance with the Town of Franklin Stormwater Management Standards until such time as an entity is created for overall site management at which time the agreement will spell out responsibility with appropriate contact information for all parties. The log form below is a template and shall be reproduced as needed. Copies of all log forms shall be kept on file for a minimum of three years from the date of inspection.

Name of Inspector:
Date and Time of Inspection:
Weather Conditions:

Stormwater BMP	Observations	Action Required

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Long Term Pollution Prevention Plan

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LONG TERM POLLUTION PREVENTION PLAN

FOR

704 WASHINGTON STREET
FRANKLIN, MA

DATED: JUNE 30, 2022

Prepared By:

Level Design Group, L.L.C.
249 South Street, Unit 1
Plainville, MA 02762

Prepared For:

Amego Inc.
33 Perry Street
Attleboro, MA 02703

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GOOD HOUSEKEEPING PRACTICES

It is the responsibility of the developer, Amego Inc., to provide for maintenance of the parking areas and the storm drainage system until the site is turned over to the condominium association which will be created prior to the sale of any units. The Owner shall utilize good housekeeping practices as outlined in the Operation and Maintenance Plan required for the maintenance of the Stormwater Management System.

PROVISIONS FOR STORAGE OF MATERIALS AND WASTE PRODUCTS INSIDE OR UNDER COVER

The storage of hazardous materials and waste is prohibited from being stored outdoor at the site. Any hazardous materials shall be stored under cover.

VEHICLE WASHING CONTROLS

Outdoor vehicle washing is allowed only for occupants of the condominium development for non-commercial vehicles owned by the residents of the units. No commercial vehicle washing operations is allowed in this area.

REQUIREMENTS FOR ROUTINE INSPECTION AND MAINTENANCE OF STORMWATER BMPS

The Owner / Operator shall keep a Maintenance Log Sheets of scheduled tasks outlined Operation and Maintenance Plan.

SPILL PREVENTION AND RESPONSE PLANS

The risk of significant spills requiring action at this site is limited and will most likely be associated with motor vehicle use or maintenance. In the event of a significant spill contact:

> Massachusetts Department of Environmental Protection 24-hour emergency response notification line – (888) 304-1133

PROVISIONS FOR MAINTENANCE OF LAWNS, GARDENS, AND OTHER LANDSCAPED AREAS

The use of chemical fertilizers shall not be used on-site. If chemical fertilizers are required to be used, the fertilizers must be worked into the soil to prevent washouts and stormwater contamination of fertilizers.

REQUIREMENTS FOR STORAGE AND USE OF FERTILIZERS, HERBICIDES, AND PESTICIDES

If fertilizers, herbicides, and pesticides are to be used and stored on site they are to be stored in their original containers and keep in a dry, safe area where children do not have access to.

PROVISIONS SOLID WASTE MANAGEMENT

Solid waste and recycling is to be disposed in designated areas in enclosed dumpsters and receptacles with covers and hauled by private certified waste management service operators. Solid waste management systems shall be inspected and maintained in accordance with state, local, and federal solid waste management regulations.

EMERGENCY AND REGULATORY CONTACTS

Franklin Fire Department:	911 / (508) 528-2323
Franklin Police Department:	911 / (508) 528-1212
Massachusetts Department of Environmental Protection – Central Regional Office:	(508) 792-7650
United State Environmental Protection Agency:	(617) 918-1111

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NPDES Stormwater Pollution Prevention Plan
(DRAFT – Under separate cover)

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