Stormwater Management Report

Gratuity Brook Farm Estates
Definitive Subdivision

63 Gratuity Road
Groton, MA

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Project Narrative

The site known as 63 Gratuity Road, Groton, MA is approximately 52.8 acres and consists mostly of woodland, with a small portion of the property being cleared near Gratuity Road. The lot is shown on the Town of Groton Tax Map 216 as Parcel 47 and is located entirely in the Residential/Agricultural Zoning District.

The proposed project involves the construction of a 22 unit (12 duplex buildings) residential development which will be accessed from two dead end roads, along with associated grading, utility installation, and stormwater management system. The stormwater management system for the proposed development has been designed in accordance with the DEP Stormwater Management Policy to the maximum extent practicable. The combination of Best Management Practices (BMPs) provided would achieve the required removal of total suspended solids/phosphorus as required by the DEP Storm Water Management Policy and the local Stormwater Management Regulations.

The development would incorporate a combination of open and closed drainage systems designed to handle runoff that would be generated by the proposed development. The drainage system would collect runoff which has been designed to treat the runoff for the 2-year, 10-year, 25-year, and 100-year storm events. The proposed grading would be in such a manner as to not increase the post development peak rate of runoff to the adjacent properties.

1.1 TOPOGRAPHY, GEOLOGY AND SOILS

The property lies on the east side of the Nashua River, bounded by Gratuity Road to the north, Jenkins Road to the south, residential properties to the east, and Hazel Grove Park and fairgrounds to the west. The property is bisected by an intermittent stream which flows east to west towards Nashua River. The topography of the site consists of gently sloping grades that generally slope north from land south of the stream, and south from land north of the stream. The high point north of the stream is found near Gratuity Road, at the location of a razed dwelling at an elevation of approximately 216', and at southeast corner adjacent to Jenkins Road at elevation 215'. The lowest point found is at the intermittent stream, at elevation 208' (top of stream bank).

Vegetation onsite is primarily wooded throughout the site with a mix of deciduous and coniferous trees. Some cleared grassy areas and pavement exist at disturbed arounds that surround the location of the razed dwelling.

The property is bisected by an intermittent stream, with several small areas bordering vegetated wetlands adjacent to the stream. The wetlands were flagged by Creative Land & Water Engineering, LLC. and field located by S. J. Mullaney Engineering, Inc. and confirmed in and

Order of Resource Area Delineation by the Town of Groton Conservation Commission on November 12, 2019 (MassDEP File Number 169-1190). An extension permit was issued by the Groton Conservation Commission for the ORAD on January 23, 2024.

The Natural Resources Conservation Service (NRCS) Soil survey of Middlesex County, Massachusetts has mapped the soils on the project site. The soil consists of Hinckley Loamy Sand, Winsor loamy sand, and Deerfield loamy sand. Soil testing performed on the site confirms the mapping of the soils, with well drained sandy soils found throughout all test holes performed.

2.0 Standard 1: No New Untreated Discharges

The MA Stormwater Handbook requires that the project demonstrates that there are no new untreated discharges and that new discharges will not cause erosion or scour downstream wetlands. The proposed project will not result in any new untreated discharges. New erosion and sediment control devices will be put in place to ensure there will be no erosion or scour to downstream properties or wetlands.

3.0 Standard 2: Peak Rate Attenuation

Standard 2 requires that peak rates of flow be attenuated for the proposed condition. A full hydrologic analysis of the pre-development and post-development conditions was completed. A more detailed explanation of the existing and proposed peak rates of runoff is included below. The following section outlines the procedure for determining the peak rates for the existing condition as well as the methods for attenuating the peak flows in the proposed condition.

3.1 EXISTING CONDITIONS

There are two drainage areas that discharge to different points around the project site or to the wetlands within the site (see Figure 2 – Pre-Development Drainage Map). The following assumptions were made for the purpose of this hydrologic analysis:

- Whenever possible, the property line, flagged wetland line, and/or an arbitrary line, outside the limit of proposed work was delineated as the watershed boundary.

Brief descriptions of each contributing area are below (see Table 1 for area acreage for each drainage area):

3.1.1 Existing Drainage Areas

Existing Drainage Area EX-1 (A&B) consists of wooded areas both south (EX-1A) and north (EX-1B) of the intermittent stream at the center of the property, as well as a portion of the grass and pavement near the razed dwelling at Gratuity Road. The drainage area slopes towards the intermittent stream (DP-1). Runoff from this area flows overland and is undetained and untreated. The discharge point is designated as DP-1 on the existing HydroCAD analysis and accompanying drainage map.

Existing Drainage Area EX-2 consists of a portion of the remaining grass area and pavement at the razed dwelling near Gratuity Road. The area slopes towards Gratuity Road. Runoff from this area is undetained and untreated. The discharge point is designated as DP-2 on the existing HydroCAD analysis and accompanying drainage map.

3.1.2 Existing Drainage Area Summary

The following table (Table 1) summarizes the existing drainage areas, including the pertinent information used for hydrologic analysis:

Table 1 – Existing Conditions Drainage Area Characteristics Summary

Drainage Area	**Area** (Acres)	**Weighted Curve Number**	***Tc** (min)
EX-1A	30.7	30	104.9
EX-1B	20.8	35	43.9
EX-2	0.5	71	6.3

*The minimum time of concentration used was 5.0 minutes.

3.1.3 Peak Discharge Runoff Rates

The existing peak flow rates of stormwater runoff, tributary to the design point, were calculated for the 2-, 10-, 25-, and 100-year storm events. Results are presented in Table 3.

3.2 PROPOSED CONDITIONS

As stated previously, the proposed project includes the construction of fourteen (14) duplex dwellings and two dead end roads. The proposed development will include clearing of vegetation, grading around the proposed buildings and driveways, and the construction of stormwater management BMP's. Stormwater controls are also proposed to attenuate peak rates and promote infiltration of runoff and are described in further detail in the following sections.

The development will include a Homeowner's Association (HOA) which will be responsible for the maintenance of all drainage systems. The annual maintenance cost is estimated to be $6,000.

3.2.1 Proposed Drainage Areas

Proposed Drainage Areas PR-1A-B consists of undisturbed woodland aeras and graded areas not captured by stormwater BMP's. Runoff flows overland undetained to the intermittent stream designated as DP-1. The discharge point is designated as DP-1 on the proposed HydroCAD analysis and accompanying drainage map.

Proposed Drainage Areas PR-1C-f consists of the majority of impervious areas and graded lawn areas. Runoff flows overland to several infiltration basins which have been designed to detain and infiltrate up to the 100-year storm. Infiltration overflow weirs direct flows towards DP-1. The discharge point is designated as DP-1 on the proposed HydroCAD analysis and accompanying drainage map.

Proposed Drainage Areas PR-1G-H consists of mostly undisturbed woodland and a portion of graded lawn areas. Runoff flows overland to several depressions that will be created by the proposed grading. Minor ponding is only anticipated in larger design storms.

Proposed Drainage Area PR-2 consists of a portion of the proposed roadway and graded lawn. Runoff from impervious areas will flow overland undetained to Gratuity Road. The discharge point is designated as DP-2 on the proposed HydroCAD analysis and accompanying drainage map.

3.2.2 Proposed Drainage Area Summary

The following table (Table 2) summarizes the proposed drainage areas, including the pertinent information used for hydrologic analysis:

Table 2 – Proposed Conditions Drainage Area Characteristics Summary

Drainage Area	**Area** (Acres)	**Weighted Curve Number**	***Tc** (min)
PR-1A	21.7	32	104.9
PR-1B	17.2	33	43.9
PR-1C	0.7	80	5.0
PR-1D	2.4	81	5.0
PR-1E	1.0	79	5.0
PR-1F	1.8	82	5.0
PR-1G	3.0	40	24.8
PR-1H	2.5	41	24.8
PR-2	0.4	72	5.0

*The minimum time of concentration used was 5.0 minutes.

3.2.3 Peak Discharge Runoff Rates

The peak flows were calculated for the 2-, 10-, 25-, and 100-year storm events under proposed conditions. The following table (Tables 3) represents a comparison between existing and proposed conditions of the peak rates of runoff from the project area to the discharge points.

Table 3 – Summary of Peak Flows

Discharge Point		2-Year Storm (3.01")	10-Year Storm (4.44")	10-Year Storm (5.55")	100-Year Storm (7.80")
		Rate (cfs)	Rate (cfs)	Rate (cfs)	Rate (cfs)
DP-1	Existing	0.0	0.1	0.4	4.7
	Proposed	0.0	0.1	0.4	3.2
DP-2	Existing	0.3	0.9	2.0	2.3
	Proposed	0.3	0.7	1.1	1.9

3.2.4 Peak Discharge Volumes

The runoff volumes were calculated for the 2-, 10-, 25-, and 100-year storm events under proposed conditions. The following table (Tables 4) represents a comparison between existing and proposed conditions of the volume of runoff from the project area to the discharge points.

Table 3 – Summary of Runoff Volumes

Discharge Point		2-Year Storm (3.01")	10-Year Storm (4.44")	10-Year Storm (5.55")	100-Year Storm (7.80")
		Volume (Cubic-Feet)	Volume (Cubic-Feet)	Volume (Cubic-Feet)	Volume (Cubic-Feet)
DP-1	Existing	0	975	9,792	75,466
	Proposed	0	69	7,285	59,196
DP-2	Existing	1,162	2,631	3,917	6,914
	Proposed	1,110	2,463	3,673	6,365

3.3 METHODOLOGY AND DESIGN CRITERIA

3.3.1 Hydrologic Model Description

The drainage analysis was performed using the Soil Conservation Service (SCS) TR-55 and TR-20 methodologies and the computer program HydroCAD 10.00 by HydroCAD Software Solutions, LLC.

3.3.2 Design Storms

The analysis was performed on the 2-, 10-, 25-, and 100-year frequency rainfall events. The events were based on the 24-hour type-III duration storm.

3.3.3 Time of Concentration

The 'time of concentration' (T_c) for each watershed was determined by finding the time necessary for runoff to travel from the most hydraulically distant point in the watershed to the point of concentration. The travel path was drawn based on the topography and the time was calculated using the TR-55 Method and HydroCAD. A minimum T_c of 5.0 minutes was used.

3.3.4 Curve Numbers

Curve numbers were developed for each of the different use categories and hydrologic soil group types within each sub-area. The curve numbers were based on the SCS TR-55 methodology and are included in the HydroCAD input and output found in the Attachments.

3.3.5 Rainfall Depth

Rainfall depths were acquired from NRCC Extreme Precipitation Tables for Groton, Massachusetts. Rainfall events for the 2-, 10-, 25-, and 100-year storms were analyzed.

The following rainfall depths for Groton, Middlesex County, Massachusetts were used in the calculations:

Storm Event	**Rainfall Depth**
2-Year	3.01 inches
10-Year	4.44 inches
25-Year	5.55 inches
100-Year	7.80 inches

4.0 Standard 3: Recharge

Standard 3 requires that three computations or demonstrations be fulfilled in order to satisfy the stormwater recharge requirements, as follows:

- Impervious Area
- Required Recharge Volume
- Bottom Area Sizing for Infiltration Structures

These calculations are included in Appendix A.

4.1 IMPERVIOUS AREA AND REQUIRED RECHARGE VOLUME

The first and second calculation for required recharge volume are based on the underlying soil types for the site and the amount of impervious area covering that soil type at the post-development site.

The proposed drainage design provides infiltration into the ground using the *Static* method for a specific volume based on the impervious areas over specific hydrologic soil groups. The required recharge calculations are calculated for the entire project area. The recharge calculations include the required recharge based on the post-development impervious coverage contributing to the infiltration basin and soil type.

The required recharge volume equals a depth of runoff corresponding to the soil type times the impervious areas covering that soil type at the post-development site. The Natural Resources Conservation Service (NRCS) Soil survey of Middlesex County, Massachusetts has mapped the soils on the project site.

4.2 DRAWDOWN WITHIN 72 HOURS

The formula for calculating drawdown time for the infiltration basin is displayed below:

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ \ Area)}$$

Where:
Rv = Storage Volume
K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate (see Table 2.3.3). For "Dynamic Field" Method, use 50% of the in-situ saturated hydraulic conductivity.
Bottom Area = Bottom Area of Recharge Structure

Calculations for drawdown time have been provided in Appendix A.

5.0 Standard 4: Water Quality

Standard 4 requires that all stormwater management systems be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). The MA Stormwater Handbook states that 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. Structural stormwater best management practices are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and

c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

5.1 WATER QUALITY TREATMENT VOLUME

The project site is not located in an area of higher pollutant loading, therefore, a "Water Quality Depth" of 0.5" was used when computing the required water quality treatment volume. The calculation for determining the water quality treatment volume is as follows:

V_{WQ} = (D_{WQ}/12 inches/foot) * (A_{IMP})

V_{WQ} = Required Water Quality Volume (in cubic feet)
D_{WQ} = Water Quality Depth: 0.5"
A_{IMP} = Impervious Area (in square feet)

Calculations showing the required and provided water quality volume are included in Appendix A of this report.

5.2 TSS REMOVAL COMPUTATIONS

As required, a minimum of 80% TSS removal be achieved in the proposed condition. Appendix A contains calculations for TSS removal. Pre-treatment includes the use of two treatment trains: deep sump catch basins discharging to infiltration basins with sediment forebays; and proprietary separator structures discharging to infiltration basins with sediment forebays.

6.0 Standard 5: Land Uses with Higher Potential Pollutant Loads

For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

The proposed project not considered a Land Use with Higher Potential Pollutant Loads (LUHPPL) and therefore Standard 5 does not apply.

7.0 Standard 6: Critical Areas

The project site is not considered a Critical Area and therefore Standard 6 is not applicable to this project.

8.0 Standard 7: Redevelopment

A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

There is an increase of impervious area on the site and therefor this project is not considered a redevelopment project. Standard 7 is not applicable to the proposed project.

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

Construction period pollution prevention and erosion and sedimentation control measures will be implemented at the project site to control construction related impacts during construction and land disturbance activities. The general contractor for the project will be responsible for implementation of the construction period controls.

The project will disturb more than one acre of land during the construction process and will therefore require a NPDES Construction General Permit issued by the Environmental Protection Agency. As a result, a stormwater pollution prevention plan (SWPPP) will be required. The SWPPP document will satisfy the requirements of the Construction General Permit and the construction period erosion, sedimentation and pollution prevention plan requirements outlined in Standard 8 of the Massachusetts Stormwater Handbook.

Without proper erosion and sediment control measures, grading and filling may cause erosion and sedimentation, resulting in temporarily increased turbidity and suspended solid loads. Runoff from construction sites may also transport sediment to downstream watercourses, where sediment deposition and accumulation will occur as flow velocities decrease.

Erosion and sedimentation controls will be employed to prevent the erosion and transport of sediment into resource areas during the earthwork and construction phases of the project. Erosion and sedimentation control measures will be installed prior to site excavation or disturbance and will be maintained throughout the construction period.

Below is a description of some of the erosion and sediment control measures that will be employed at the project and that will be included in the SWPPP.

Silt Fence and Straw Wattles

Prior to any ground disturbance, a professional engineer or land surveyor will certify that a barrier of reinforced silt fence and straw wattles is in place at the down gradient limit of work in accordance with the site plan. The barrier will be placed to trap sediment transported by runoff before it reaches the drainage system or leaves the construction site. The silt fence is a semi-permeable barrier made of a synthetic porous fabric. When necessary, additional silt fence barriers will be installed immediately down gradient of erosion-prone areas, such as the base of steep exposed slopes, throughout the construction phase of the project. The barriers will be entrenched into the substrate to prevent underflow.

The erosion control barriers will be inspected weekly and after every storm event. Any sediment that collects behind the barriers will be removed and will be either reused at the site or disposed of at a suitable offsite location. Any damaged sections of silt fence or wattles will be repaired or replaced. The underside of the straw wattles will be kept in close contact with the earth and

reset as necessary. Straw wattles and silt fences will be maintained and cleaned until slopes have healthy stands of grass.

Dust Control

Fugitive dust from large areas of unstabilized soil can be a problem during construction. On dry and windy days when dust generation is a concern, a water truck will traverse the site and spray water as necessary to prevent dust from forming.

9.1 MATERIAL MANAGEMENT PRACTICES

The following material management practices will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff. These include good housekeeping practices and guidelines for the handling of hazardous products. The following good housekeeping practices will be followed on-site during the construction period:

- An effort will be made to store only enough product required to do the job.
- All materials stored on-site will be stored in a neat, orderly manner in their appropriate containers, and (if possible) under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used before disposing of the container.
- Manufacturer's recommendations for proper use and disposal will be followed.
- The site superintendent will inspect the storage area daily to ensure proper use and disposal of materials on-site.

Hazardous Products:

These practices will be used to reduce the risks associated with hazardous materials. Material Safety Data Sheets (MSDS) for each substance with hazardous properties that is used on the job site will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is used and another copy of each MSDS will be maintained in the SWPPP file at the job site construction trailer office. Hazardous fuels or other potential contaminants shall not be stored on site. Each employee who must handle a substance with hazardous properties will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product they are using, particularly regarding spill control techniques.

- Products will be kept in original containers unless they are not re-sealable
- Original labels and material safety data will be retained; they contain important product information

- If surplus product must be disposed of, manufacturer's or local and State recommended methods for proper disposal will be followed

Hazardous Waste

All hazardous waste material will be disposed of by the Contractor in the manner specified by local, state, and/or federal regulations and by the manufacturer of such products. Site personnel will be instructed in these practices by the job site superintendent, who will also be responsible for seeing that these practices are followed.

Solid and Construction Wastes

All waste materials will be collected and stored in accordance with state and federal law in an appropriately covered container and/or securely lidded metal dumpster.

All trash and construction debris from the site will be transported off site. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedures for waste disposal.

Sanitary Wastes

All sanitary waste will be collected from the portable units as required to maintain proper operation and sanitary conditions of these units. All maintenance work on portable sanitation units shall be performed by a licensed portable facility provider in complete compliance with local and state regulations.

All sanitary waste units will be located in an area where the likelihood of the unit contributing to storm water discharges is negligible. If required, additional BMPs must be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges.

9.2 PRODUCT SPECIFIC PRACTICES

The following product-specific practices will be followed on-site. Recommendations are provided for petroleum products, fertilizers, solvents, paints, and other hazardous substances.

Petroleum Products

All on-site vehicles will be monitored for leaks and will receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers that are clearly labeled. Any asphalt substances used on-site will be applied according to manufacturer's recommendations.

Solvents, Paints, and other Hazardous Substances

All containers will be tightly sealed and stored when not required for use. Excess materials will not be discharged to the storm sewer system, but will be properly disposed of according to

manufacturer's instructions or state and local regulations. No storage will occur within 100 feet of a resource area.

9.3 SPILL CONTROL/NOTIFICATION PRACTICES

In addition to the good housekeeping and material management practices discussed above, the following practices will be followed for spill control, notification and cleanup.

- Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be informed of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area on-site. Equipment and materials will include, but will not be limited to: Shovels, wheel barrows, brooms, dust pans, mops, rags, gloves, goggles, kitty litter or Speedi-Dry, sand, sawdust, and plastic and metal trash containers specifically designated for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well-ventilated and personnel will wear protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material in excess of reportable quantities, as established in the Massachusetts Contingency Plan (MCP), will be reported to the Massachusetts Department of Environmental Protection Division of Hazardous Waste [(617) 292-5851 or (978) 661-7679].
- The construction superintendent responsible for the daily operations will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel to receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of the responsible spill personnel will be posted in the material storage area and in the on-site office trailer.

10.0 Standard 9: Operation and Maintenance Plan

The goal of the operation and maintenance plan is to protect resources in the region that may be affected by the activities at the site. Water quality treatment measures and the implementation of Best Management Practices (BMP's) for structural controls will result in the treatment of site stormwater.

The stormwater management system will be a portion of the area leased by the applicant. They will be responsible for operation and maintenance. The estimated operation and maintenance budget is expected to be about $2,000.

10.1 NON-STRUCTURAL POLLUTANT CONTROLS

The proposed stormwater management system is designed to protect the runoff water quality through the removal of sediment and pollutants. Non-structural pollutant controls used to separate and capture stormwater pollutants are described below.

Deicing Chemicals

The use of any deicing chemicals will be used sparingly and will follow the manufacturer's recommendations for application.

Fertilizer

Slow-release organic fertilizers will be used in the landscaped areas to limit the amount of nutrients that could enter downstream resource areas. Fertilizer use will be reduced once proposed landscaping is established.

Street Sweeping

Street dirt accumulates on roads and parking lots and runs off in response to precipitation. Street sweeping will occur on the project site as necessary with a minimum frequency of twice per year to control sediment, dust, and sand. Sweeping will be scheduled primarily in the spring and fall.

10.2 STRUCTURAL POLLUTANT CONTROLS

The proposed stormwater management system is designed to protect runoff water quality through the removal of sediment and pollutants. Structural pollutant controls used to separate and capture stormwater pollutants are described below.

VEGETATED AREAS MAINTENANCE

Although not a structural component of the drainage system, the maintenance of vegetated areas may affect the functioning of stormwater management practices. This includes the health/density of vegetative cover and activities such as the application and disposal of lawn and garden care products, disposal of leaves and yard trimmings.

DEEP SUMP CATCH BASIN

Purpose: The stormwater management system includes the use of deep sump catch basins to enhance total suspended solids removal. The proper function of these items is crucial to providing adequate groundwater recharge and flood control.

Minimum required maintenance: The maintenance of the individual catch basins affects how well the stormwater management system performs and helps with longevity. Inspect or clean deep sump basins at least four times per year and at the end of the foliage and snow removal seasons. Sediments must also be removed four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

CONTECH CDS HYDRODYNAMIC SEPARATOR

Purpose: The stormwater management system includes Contech CDS systems which are hydrodynamic separators used to remove pollutants from stormwater runoff, including suspended solids and free oils. It is important that continued maintenance of this infrastructure is performed to ensure that it will continue to function as designed.

Minimum required maintenance: Inspection should be performed at least twice per year, though the frequency of maintenance may need to be increased or reduced based on local conditions. Maintenance shall be performed when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated.

RAIN GUARDIAN TURRET PRETREATMENT STRUCTURE

Purpose: The stormwater management system includes the use of proprietary pretreatment structures to enhance total suspended solids removal. It is important that continued maintenance of this infrastructure is performed to ensure that it will continue to function as designed.

Minimum required maintenance: Regular maintenance is essential. Inspect or clean drain separator structures similar to catch basins, at least four times per year. Sediments must be removed whenever the depth of deposits is greater than or equal to one half the depth from bottom of sump to outlet elevation. Sediment to be removed from collection chamber with shovels or with hydro-vac, and drop in filters to be cleaned with broom or hose.

DRAIN PIPES AND OVERFLOW WEIRS

Purpose: The stormwater management system includes the use of drainpipes and an overflow weir to convey stormwater. It is important that continued maintenance of this infrastructure is performed to ensure that it will continue to function as designed.

Minimum required maintenance: Regular maintenance is essential. Inspect or clean drain pipes/overflow pipe similar to catch basins, at least four times per year. Sediments must be removed whenever the depth of deposits is greater than or equal to one half the depth of the pipe. Clean trash racks, inlet and outlet structures similarly.

SEDIMENT FOREBAY

Purpose: The stormwater management system includes sediment forebays which are excavated pits and/or bermed areas. They are designed to slow incoming stormwater runoff allowing for the settlement of suspended solids. The maintenance of the system is critical as they do not function properly with sediment buildup.
Minimum required maintenance: Visual inspection of the sediment forebay shall occur monthly and cleaned out at least four (4) times per year. Mow grass on a regular/seasonal basis removing clippings and accumulated sediment from the surface.

Check for signs of rilling and gullying and repair as necessary. Replace any damaged vegetation immediately.

INFILTRATION BASIN

Purpose: The stormwater management system includes an infiltration basin to provide water quality treatment and recharge, as well as attenuate peak flows. The proposed infiltration basin has been designed to allow adequate separation to groundwater. The maintenance of the system is critical as they are prone to clogging and failure.

Minimum required maintenance: Visual inspection of the infiltration trench will occur twice per year and after every major storm during the first 3 months of operation. Remove any debris that might clog the system. If water is observed and it is at least 72 hours after a rain event, the system will be cleaned to remove any built-up sediment.

A major storm event is defined as a storm that is equal to or greater than the 2-year, 24-hour storm (generally 3.1 inches in a 24-hour period).

Important items to check during the inspection include:

- Signs of differential settlement,
- Cracking,
- Erosion,
- Leakage in the embankments
- Tree growth on the embankments
- Condition of riprap,
- Sediment accumulation and the health of the turf.

At least twice a year, mow the buffer area, side slopes, and basin bottom. Remove grass clippings and accumulated organic matter to prevent an impervious organic mat from forming.

Remove trash and debris at the same time. Use deep tilling to break up clogged surfaces and revegetate immediately.

Remove sediment from the basin as necessary when the floor of the basin is thoroughly dry. Use light equipment to remove the top layer to not compact the underlying soil. Deeply till the remaining soil and revegetate as soon as possible.

References

Massachusetts Department of Environmental Protection (MassDEP) Stormwater Handbook, Volume 2, Chapter 2, Structural BMP Specifications for Massachusetts Stormwater Handbook, revised and updated February 2008.

11.0 Standard 10: Prohibition of Illicit Discharges

Standard 10 of the Massachusetts Stormwater Handbook prohibits illicit discharges to stormwater management systems. As stated in the handbook, "The stormwater management system is the system for conveying, treating, and infiltrating stormwater on-site, including stormwater best management practices and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater."

Proponents of projects within Wetlands jurisdiction must demonstrate compliance with this requirement by submitting to the issuing authority an Illicit Discharge Compliance Statement verifying that no illicit discharges exist on the site and by including in the pollution prevention plan measures to prevent illicit discharges to the stormwater management system. An Illicit Discharge Compliance Statement for the project follows:

Illicit Discharge Compliance Statement

Per the requirements of Standard 10 of the Massachusetts Stormwater Management Standards it shall be stated that No Illicit Discharges exist on the project site located at 63 Gratuity Road in Groton, Massachusetts.

Name

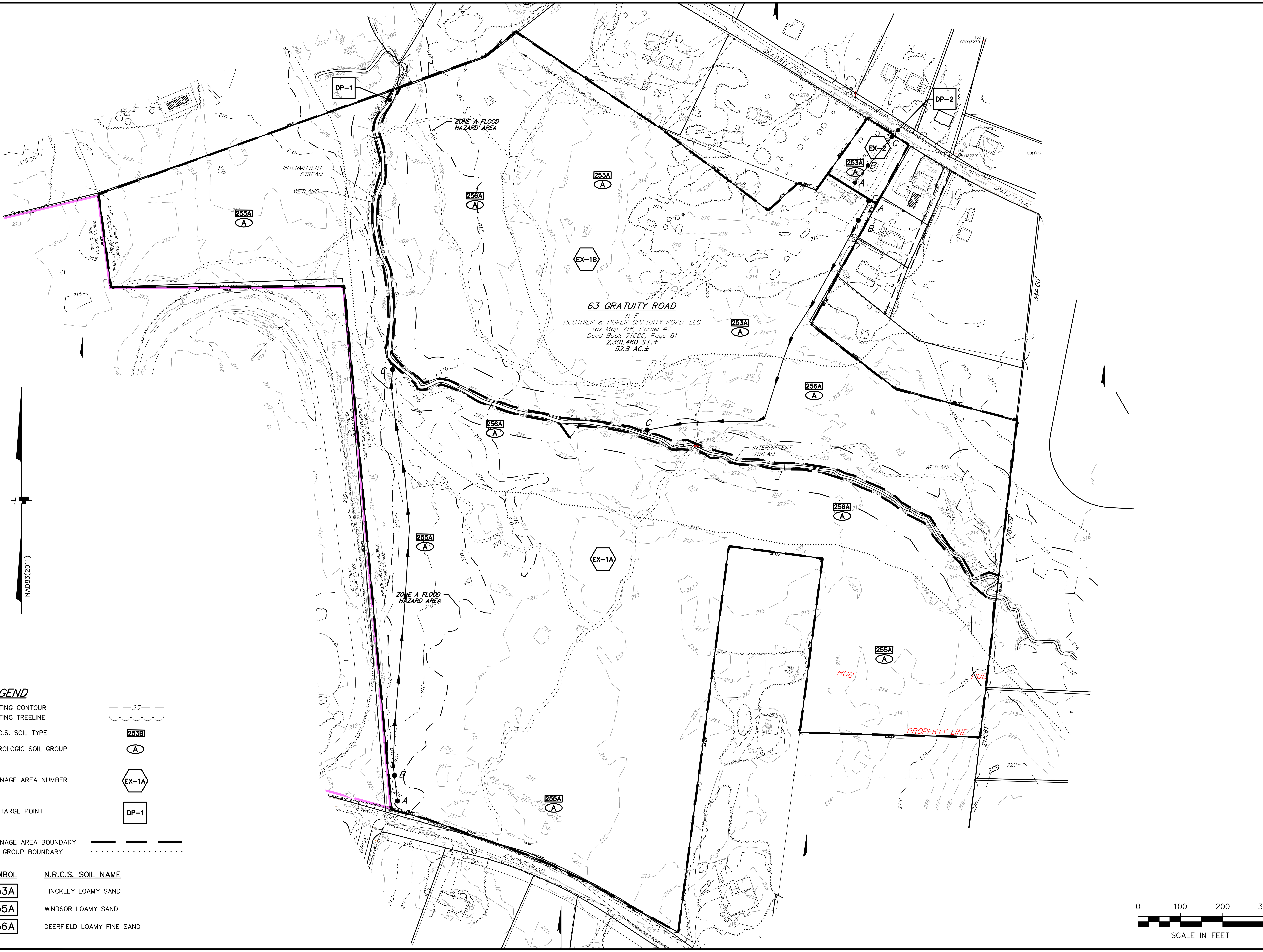
1/15/25
Date

APPENDIX A. CALCULATIONS

Existing Conditions (HydroCAD)
Proposed Conditions (HydroCAD)
Recharge Volume Calculations (Part I and II)
Water Quality Treatment Volume Calculations
TSS Calculations
Sediment Forebay Sizing Calculations
Pipe Calculations
Groundwater Mounding Analysis

LandTech Consultants

Existing Conditions (HydroCAD)



LEGEND

EXISTING CONTOUR	
EXISTING TREELINE	
N.R.C.S. SOIL TYPE	253B
HYDROLOGIC SOIL GROUP	A
DRAINAGE AREA NUMBER	EX-1A
DISCHARGE POINT	DP-1
DRAINAGE AREA BOUNDARY	
SOIL GROUP BOUNDARY	

SYMBOL	N.R.C.S. SOIL NAME
253A	HINCKLEY LOAMY SAND
255A	WINDSOR LOAMY SAND
256A	DEERFIELD LOAMY FINE SAND

DATE	REVISION	BY
12/10/24	PEER REVIEW COMMENTS	MJS
1/13/25	UPDATE FLOODPLAIN & PB/PEER REVIEW COMMENTS	MJS

COMMONWEALTH OF MASSACHUSETTS
MATTHEW A. WATERMAN
CIVIL
No. 45666
REGISTERED PROFESSIONAL ENGINEER

PREPARED FOR:
ROUTHIER & ROPER
GRATUITY ROAD, LLC
256 AYER ROAD
LITTLETON, MA 01460

DESIGN	DRAFT	CHECK
MJS	MJS	MAW

GRATUITY BROOK FARM ESTATES PRE-DEVELOPMENT MAP

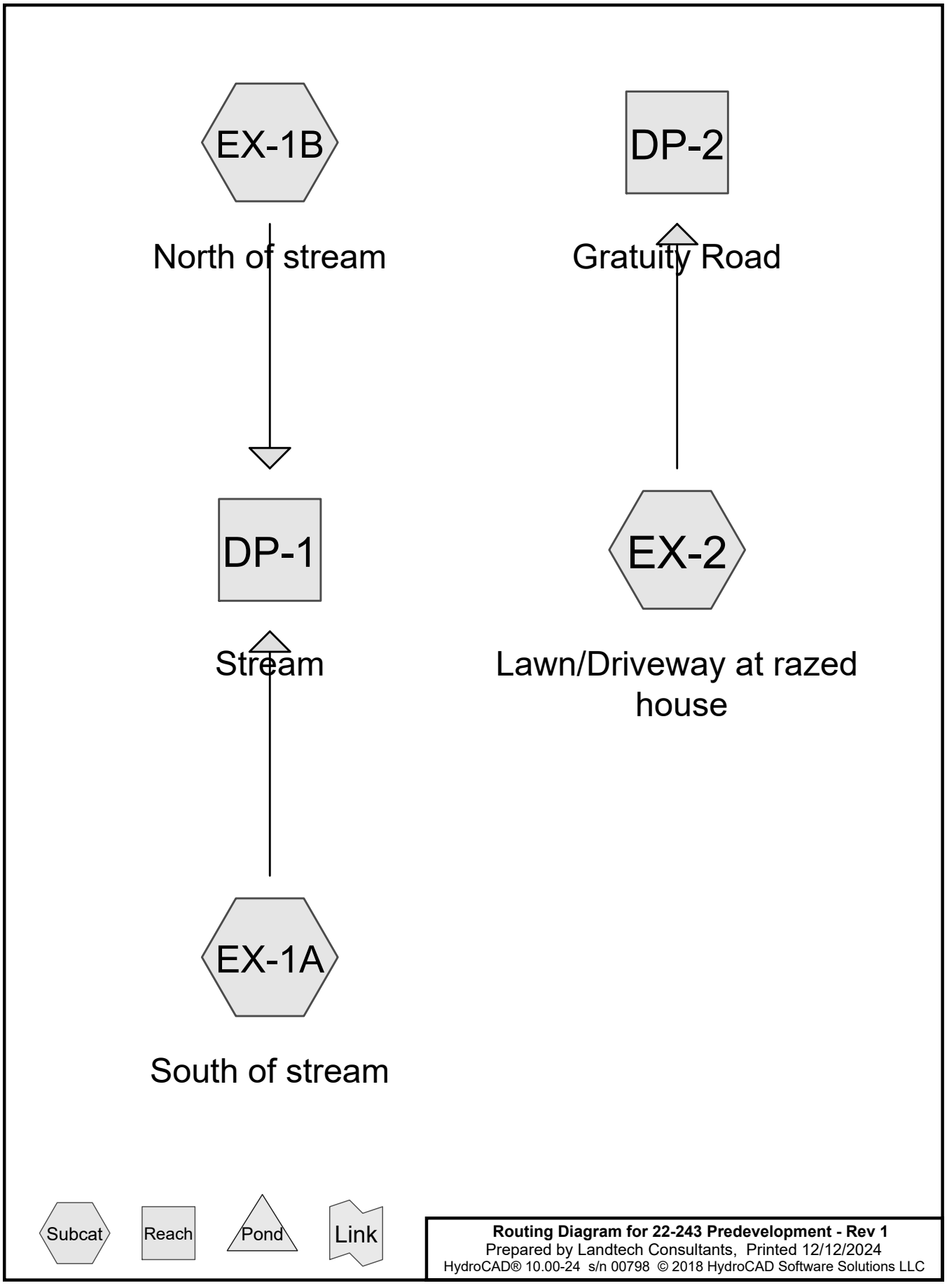
63 GRATUITY ROAD
GROTON, MA

SCALE: 1"= 100'

AUGUST 12, 2024

LandTech Consultants
515 Groton Road • Westford, MA 01886 • (978) 692-6100 • www.landtechinc.com

JOB NO. 22-243
DWG. NO. 11142
SHEET PRE



Routing Diagram for 22-243 Predevelopment - Rev 1
Prepared by Landtech Consultants, Printed 12/12/2024

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
129,569	68	<50% Grass cover, Poor, HSG A (EX-1B, EX-2)
9,402	98	Paved parking, HSG A (EX-1B, EX-2)
2,125,132	30	Woods, Good, HSG A (EX-1A, EX-1B)
2,264,103	**32**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
2,264,103	HSG A	EX-1A, EX-1B, EX-2
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
2,264,103		**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	Subc Num
129,569	0	0	0	0	129,569	<50% Grass cover, Poor	
9,402	0	0	0	0	9,402	Paved parking	
2,125,132	0	0	0	0	2,125,132	Woods, Good	
2,264,103	**0**	**0**	**0**	**0**	**2,264,103**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 EX-1A: South of stream Runoff Area=1,335,882 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,035' Slope=0.0020 '/' Tc=104.9 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment EX-1B: North of stream Runoff Area=908,040 sf 0.78% Impervious Runoff Depth=0.00"
Flow Length=860' Tc=43.9 min CN=35 Runoff=0.00 cfs 0 cf

Subcatchment EX-2: Lawn/Driveway at Runoff Area=20,181 sf 11.48% Impervious Runoff Depth>0.69"
Flow Length=160' Tc=6.3 min CN=71 Runoff=0.36 cfs 1,162 cf

Reach DP-1: Stream Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach DP-2: Gratuity Road Inflow=0.36 cfs 1,162 cf
Outflow=0.36 cfs 1,162 cf

Total Runoff Area = 2,264,103 sf Runoff Volume = 1,162 cf Average Runoff Depth = 0.01"
99.58% Pervious = 2,254,701 sf 0.42% Impervious = 9,402 sf

Summary for Subcatchment EX-1A: South of stream

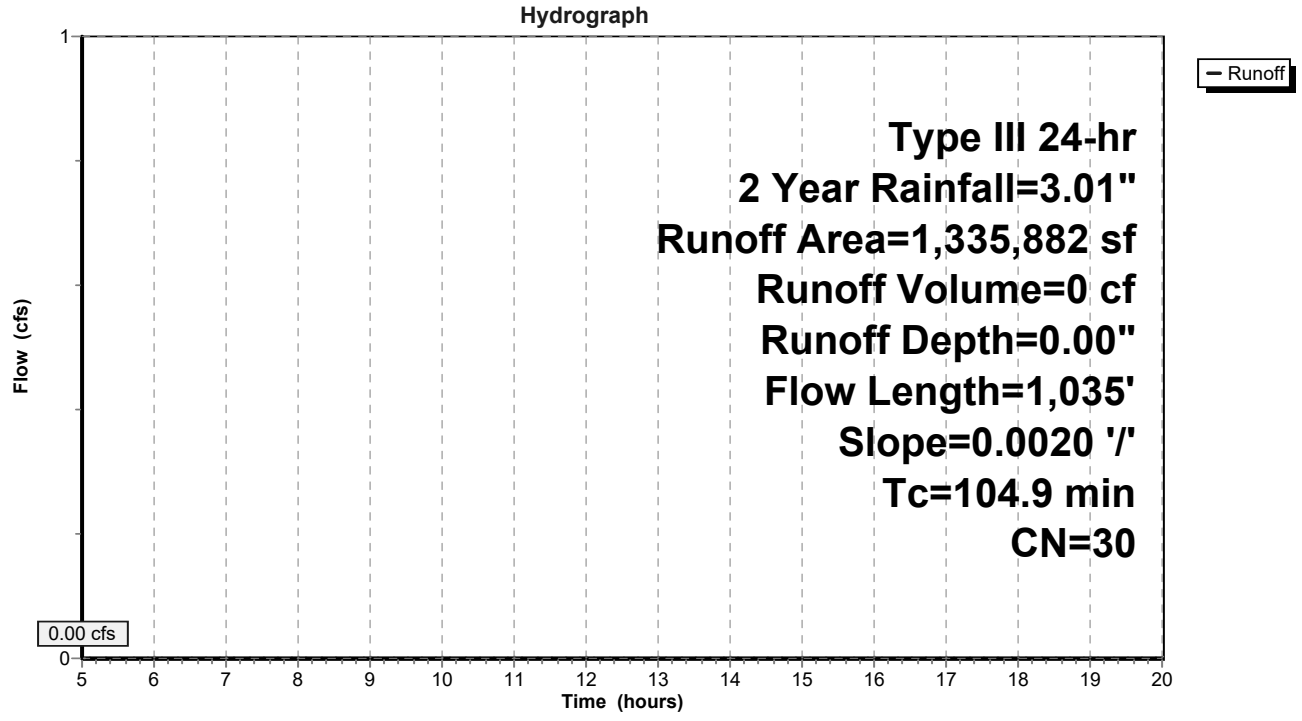
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,335,882	30	Woods, Good, HSG A
1,335,882		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	50	0.0020	0.03		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
73.4	985	0.0020	0.22		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
104.9	1,035	Total			

Subcatchment EX-1A: South of stream



Summary for Subcatchment EX-1B: North of stream

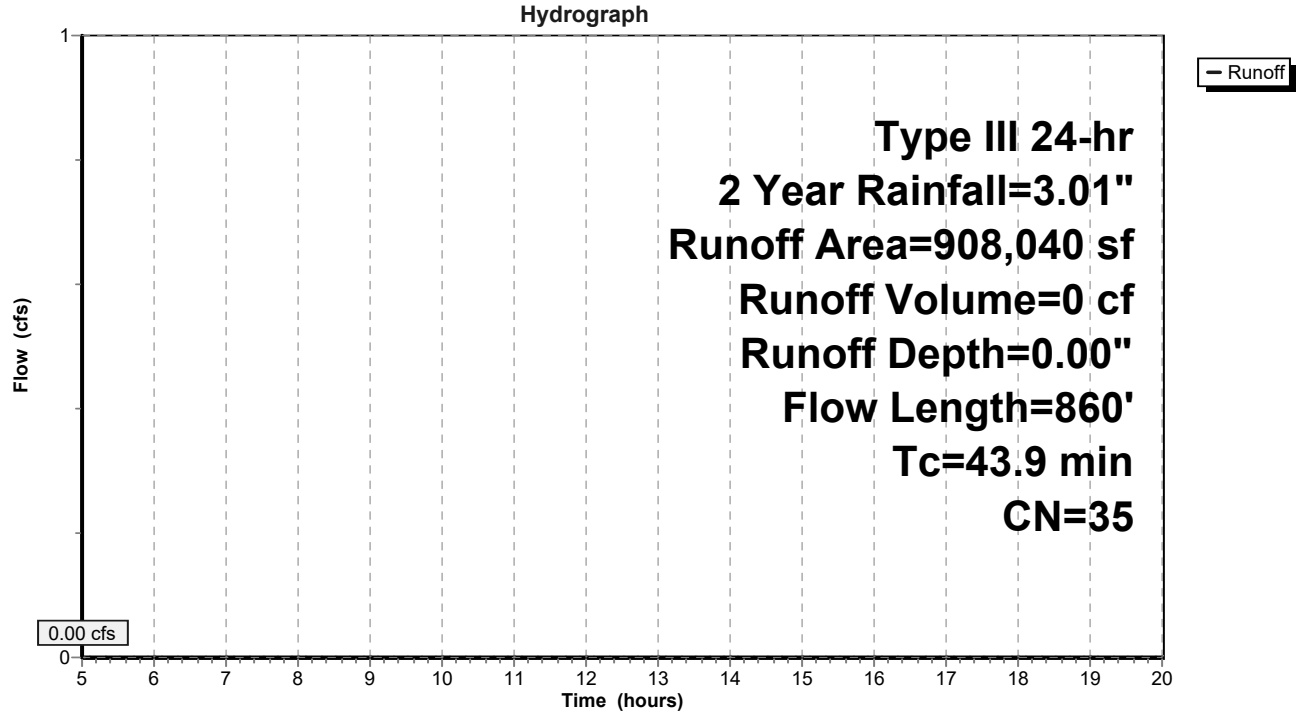
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
789,250	30	Woods, Good, HSG A
111,705	68	<50% Grass cover, Poor, HSG A
7,085	98	Paved parking, HSG A
908,040	35	Weighted Average
900,955		99.22% Pervious Area
7,085		0.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
38.2	810	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
43.9	860	Total			

Subcatchment EX-1B: North of stream



Summary for Subcatchment EX-2: Lawn/Driveway at razed house

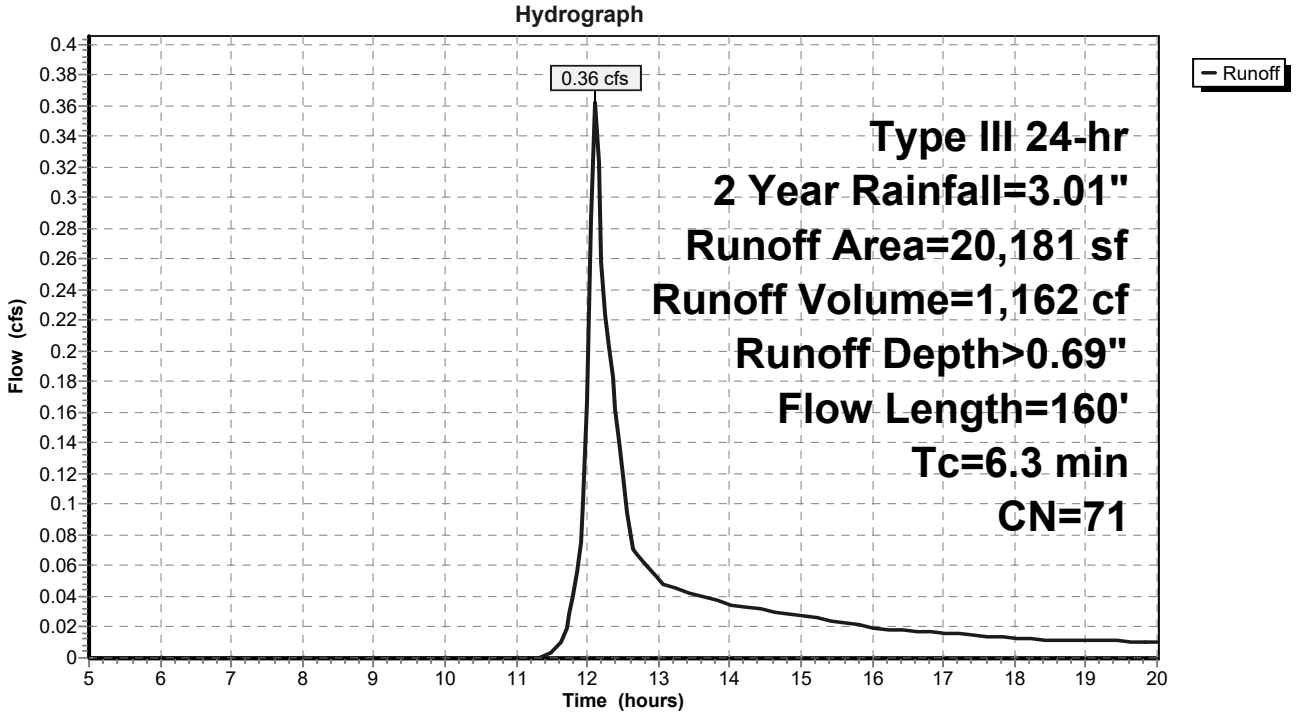
Runoff = 0.36 cfs @ 12.11 hrs, Volume= 1,162 cf, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
17,864	68	<50% Grass cover, Poor, HSG A
2,317	98	Paved parking, HSG A
20,181	71	Weighted Average
17,864		88.52% Pervious Area
2,317		11.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
2.6	110	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
6.3	160	Total			

Subcatchment EX-2: Lawn/Driveway at razed house

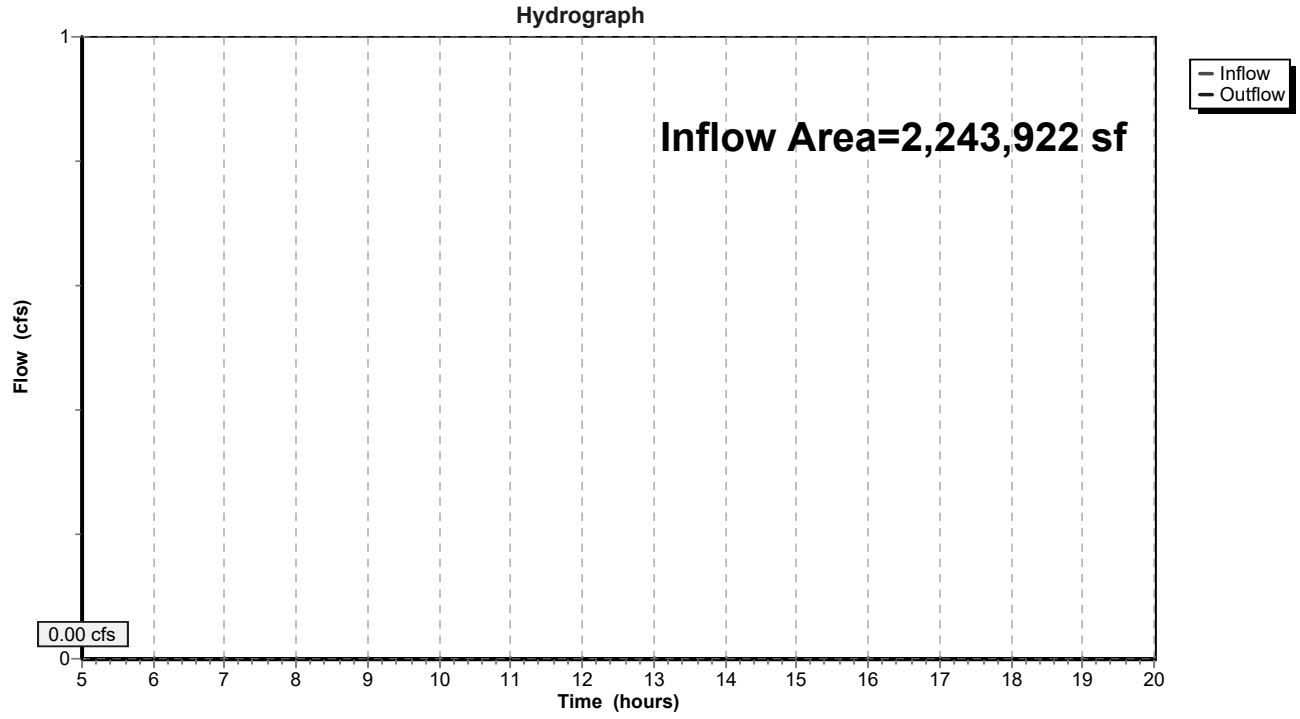


Summary for Reach DP-1: Stream

Inflow Area = 2,243,922 sf, 0.32% Impervious, Inflow Depth = 0.00" for 2 Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-1: Stream

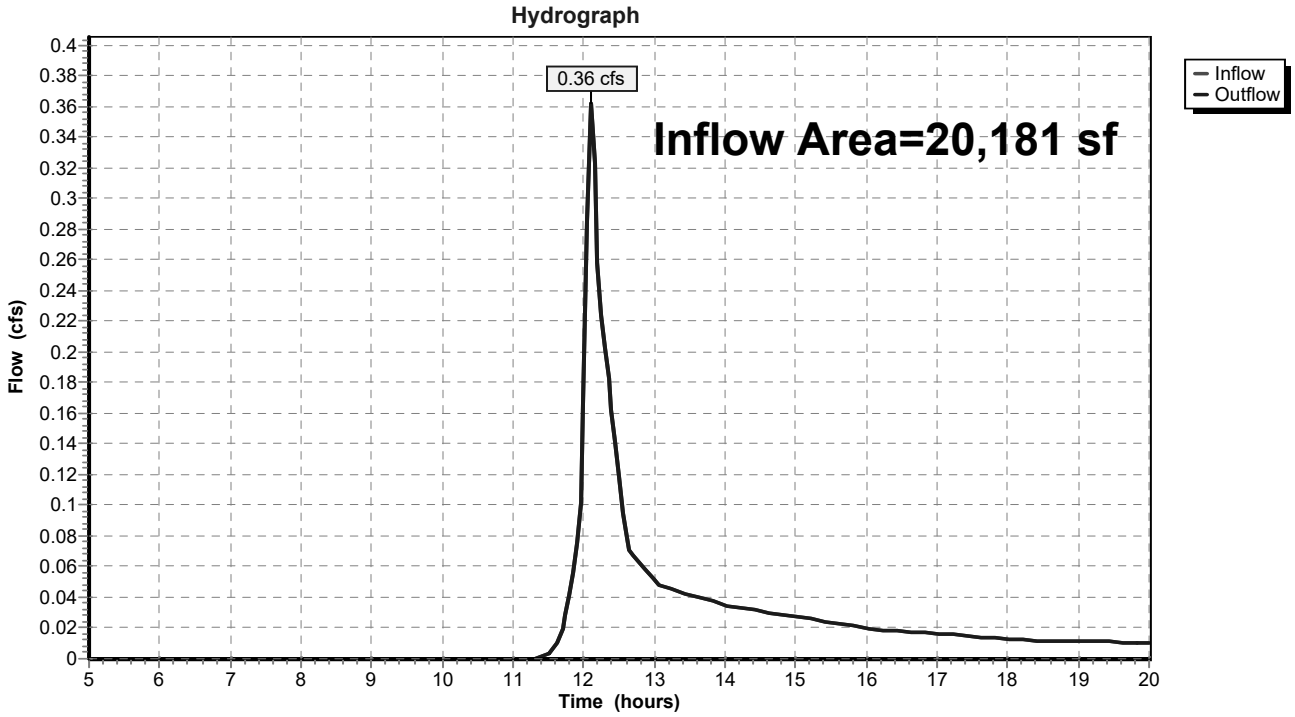


Summary for Reach DP-2: Gratuity Road

Inflow Area = 20,181 sf, 11.48% Impervious, Inflow Depth > 0.69" for 2 Year event
Inflow = 0.36 cfs @ 12.11 hrs, Volume= 1,162 cf
Outflow = 0.36 cfs @ 12.11 hrs, Volume= 1,162 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Gratuity Road



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 EX-1A: South of stream Runoff Area=1,335,882 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,035' Slope=0.0020 '/' Tc=104.9 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment EX-1B: North of stream Runoff Area=908,040 sf 0.78% Impervious Runoff Depth>0.01"
Flow Length=860' Tc=43.9 min CN=35 Runoff=0.07 cfs 975 cf

Subcatchment EX-2: Lawn/Driveway at Runoff Area=20,181 sf 11.48% Impervious Runoff Depth>1.56"
Flow Length=160' Tc=6.3 min CN=71 Runoff=0.88 cfs 2,631 cf

Reach DP-1: Stream Inflow=0.07 cfs 975 cf
Outflow=0.07 cfs 975 cf

Reach DP-2: Gratuity Road Inflow=0.88 cfs 2,631 cf
Outflow=0.88 cfs 2,631 cf

Total Runoff Area = 2,264,103 sf Runoff Volume = 3,606 cf Average Runoff Depth = 0.02"
99.58% Pervious = 2,254,701 sf 0.42% Impervious = 9,402 sf

Summary for Subcatchment EX-1A: South of stream

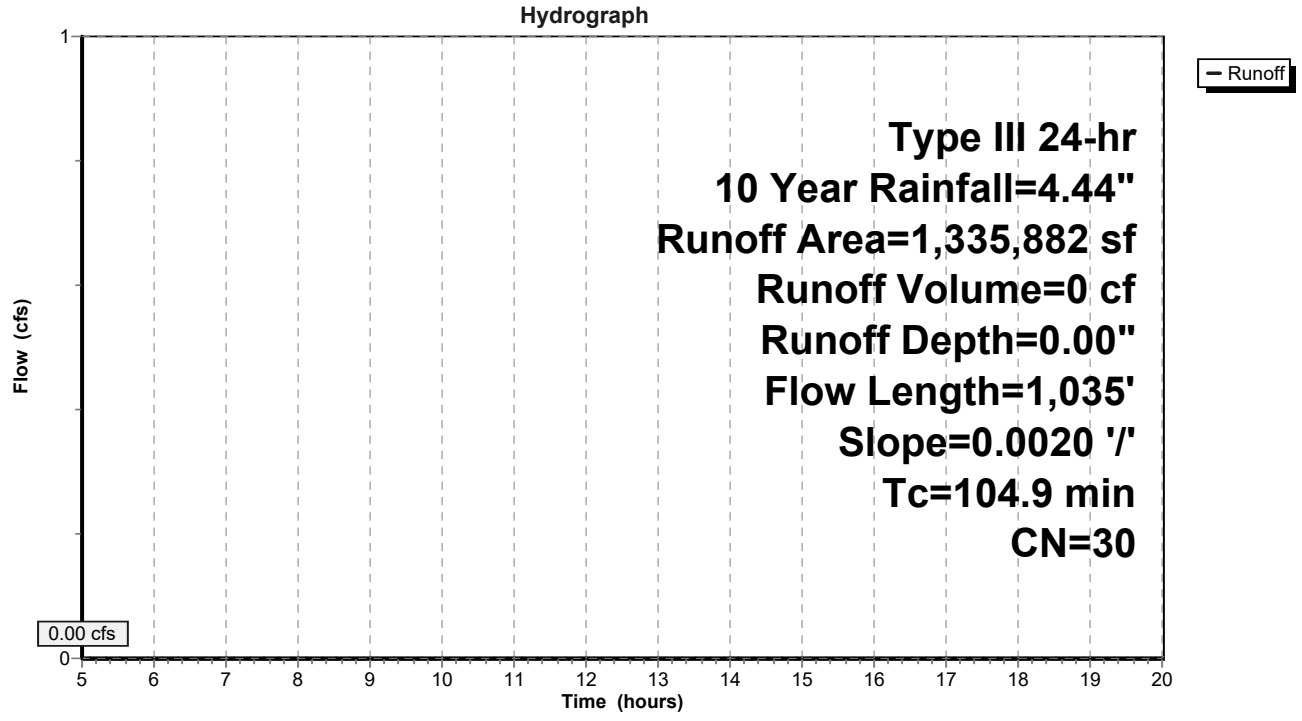
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,335,882	30	Woods, Good, HSG A
1,335,882		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	50	0.0020	0.03		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
73.4	985	0.0020	0.22		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
104.9	1,035	Total			

Subcatchment EX-1A: South of stream



Summary for Subcatchment EX-1B: North of stream

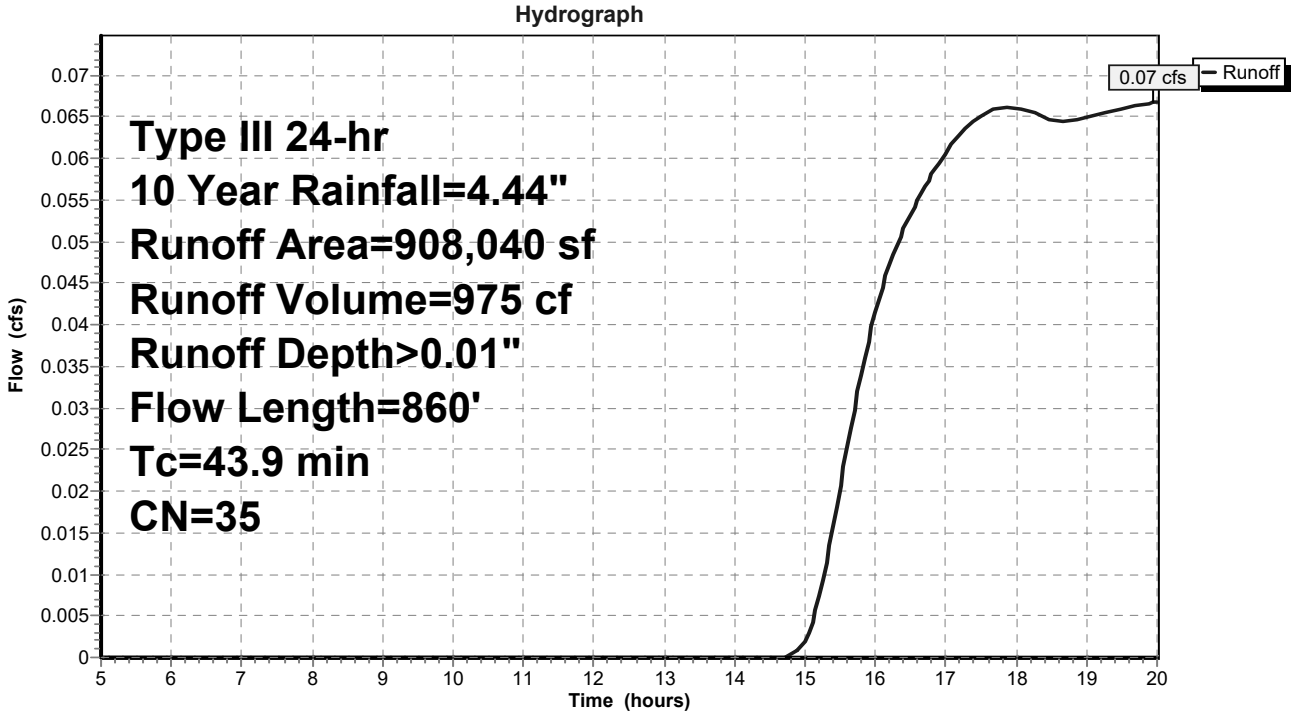
Runoff = 0.07 cfs @ 19.95 hrs, Volume= 975 cf, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
789,250	30	Woods, Good, HSG A
111,705	68	<50% Grass cover, Poor, HSG A
7,085	98	Paved parking, HSG A
908,040	35	Weighted Average
900,955		99.22% Pervious Area
7,085		0.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
38.2	810	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
43.9	860	Total			

Subcatchment EX-1B: North of stream



Summary for Subcatchment EX-2: Lawn/Driveway at razed house

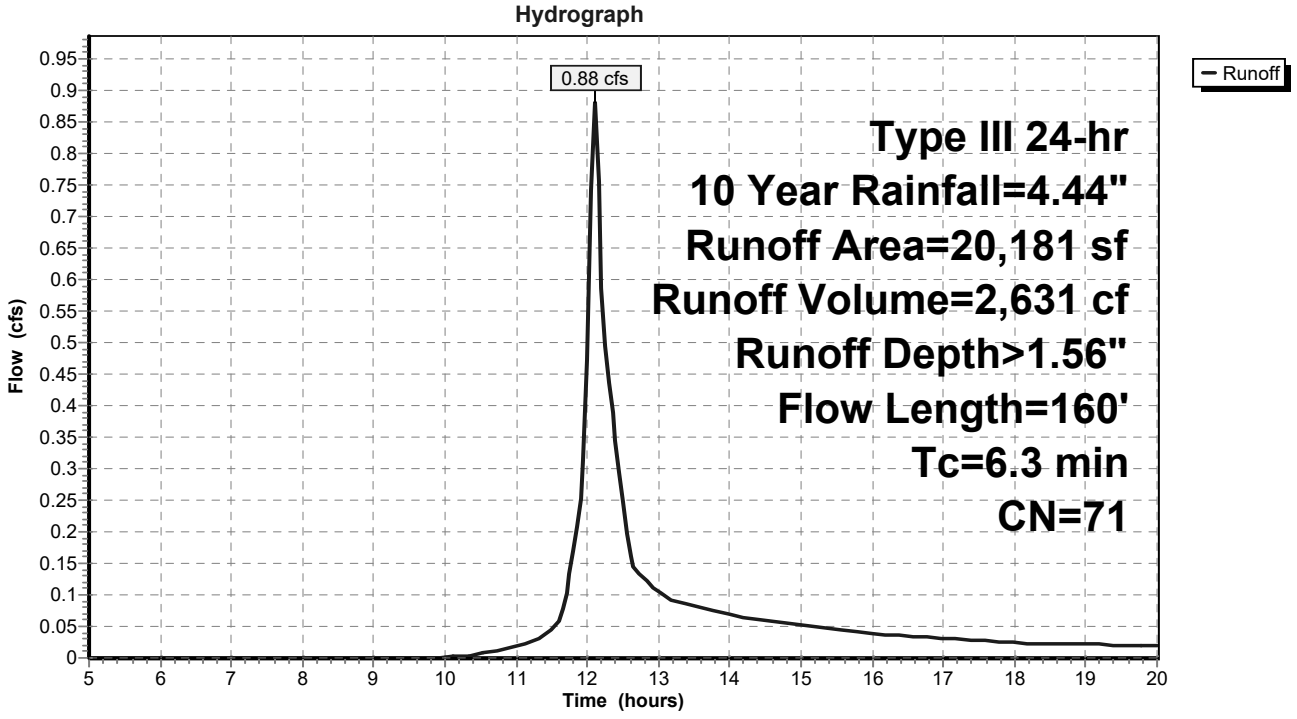
Runoff = 0.88 cfs @ 12.10 hrs, Volume= 2,631 cf, Depth> 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
17,864	68	<50% Grass cover, Poor, HSG A
2,317	98	Paved parking, HSG A
20,181	71	Weighted Average
17,864		88.52% Pervious Area
2,317		11.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
2.6	110	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
6.3	160	Total			

Subcatchment EX-2: Lawn/Driveway at razed house

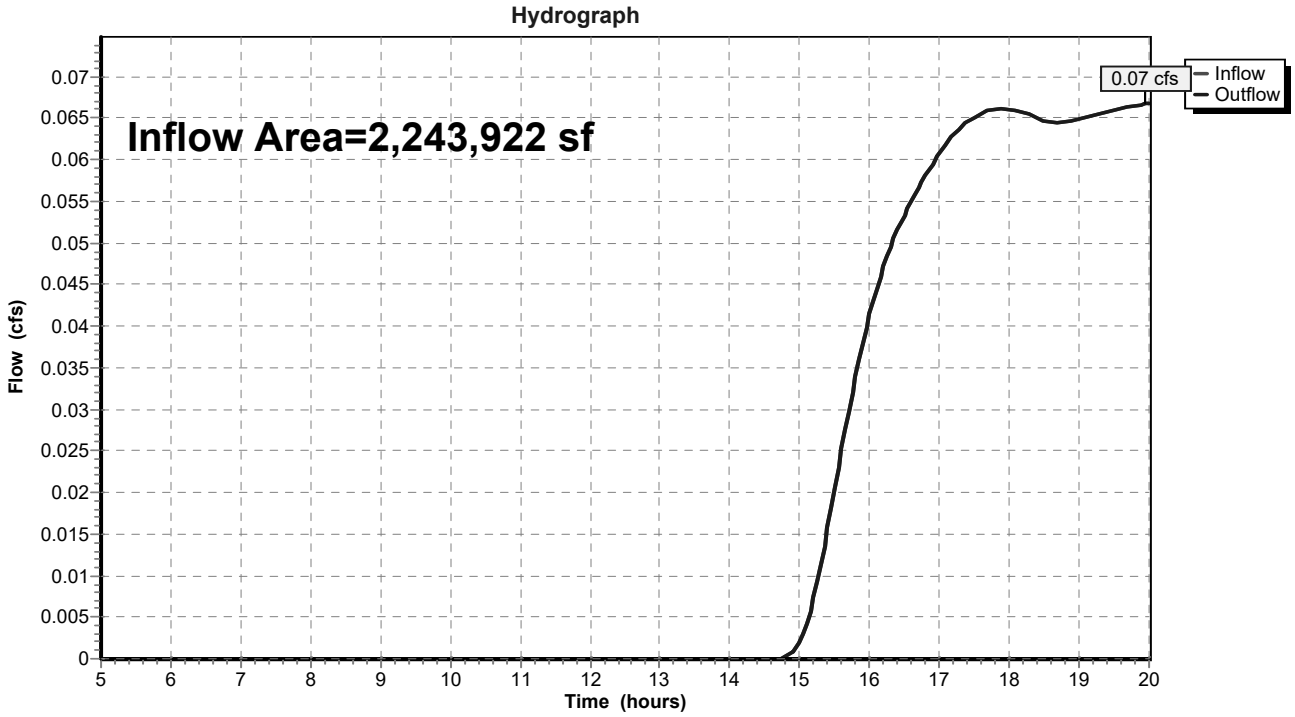


Summary for Reach DP-1: Stream

Inflow Area = 2,243,922 sf, 0.32% Impervious, Inflow Depth > 0.01" for 10 Year event
Inflow = 0.07 cfs @ 19.95 hrs, Volume= 975 cf
Outflow = 0.07 cfs @ 19.95 hrs, Volume= 975 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-1: Stream

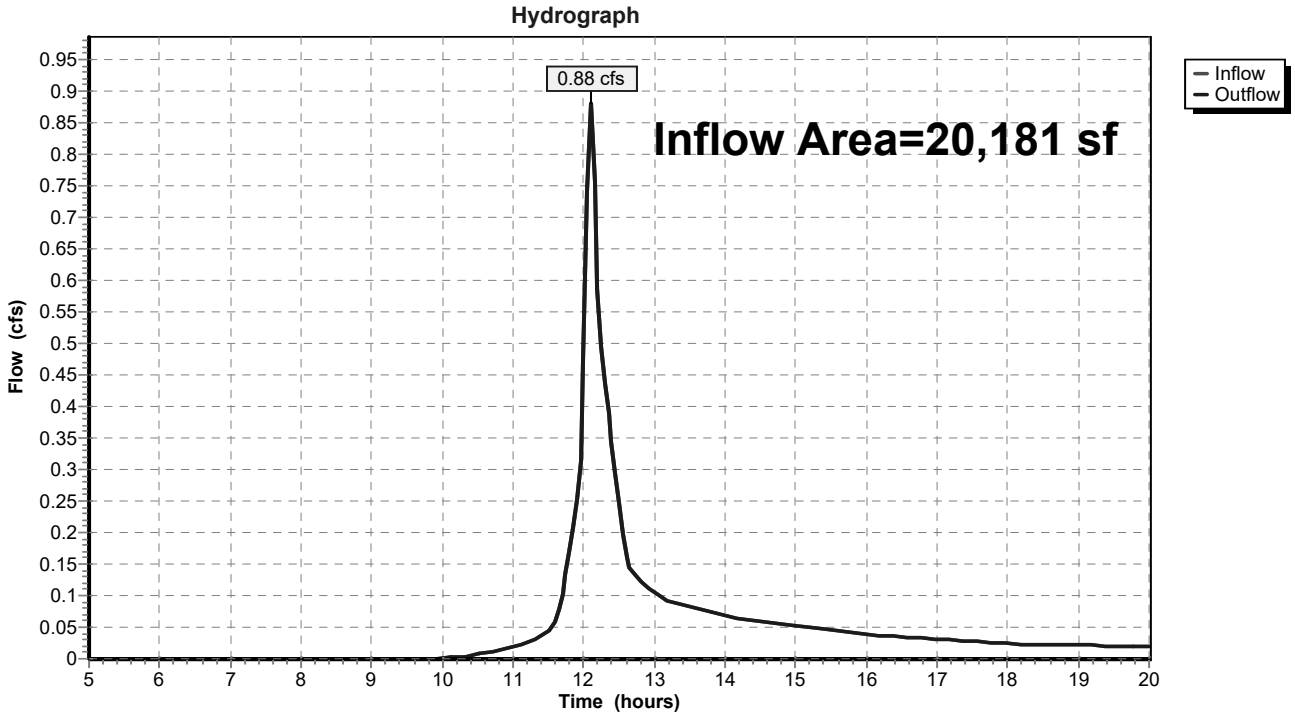


Summary for Reach DP-2: Gratuity Road

Inflow Area = 20,181 sf, 11.48% Impervious, Inflow Depth > 1.56" for 10 Year event
Inflow = 0.88 cfs @ 12.10 hrs, Volume= 2,631 cf
Outflow = 0.88 cfs @ 12.10 hrs, Volume= 2,631 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Gratuity Road



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 EX-1A: South of stream Runoff Area=1,335,882 sf 0.00% Impervious Runoff Depth>0.01"
Flow Length=1,035' Slope=0.0020 '/' Tc=104.9 min CN=30 Runoff=0.11 cfs 1,105 cf

Subcatchment EX-1B: North of stream Runoff Area=908,040 sf 0.78% Impervious Runoff Depth>0.11"
Flow Length=860' Tc=43.9 min CN=35 Runoff=0.41 cfs 8,687 cf

Subcatchment EX-2: Lawn/Driveway at Runoff Area=20,181 sf 11.48% Impervious Runoff Depth>2.33"
Flow Length=160' Tc=6.3 min CN=71 Runoff=2.03 cfs 3,917 cf

Reach DP-1: Stream Inflow=0.41 cfs 9,792 cf
Outflow=0.41 cfs 9,792 cf

Reach DP-2: Gratuity Road Inflow=2.03 cfs 3,917 cf
Outflow=2.03 cfs 3,917 cf

Total Runoff Area = 2,264,103 sf Runoff Volume = 13,709 cf Average Runoff Depth = 0.07"
99.58% Pervious = 2,254,701 sf 0.42% Impervious = 9,402 sf

Summary for Subcatchment EX-1A: South of stream

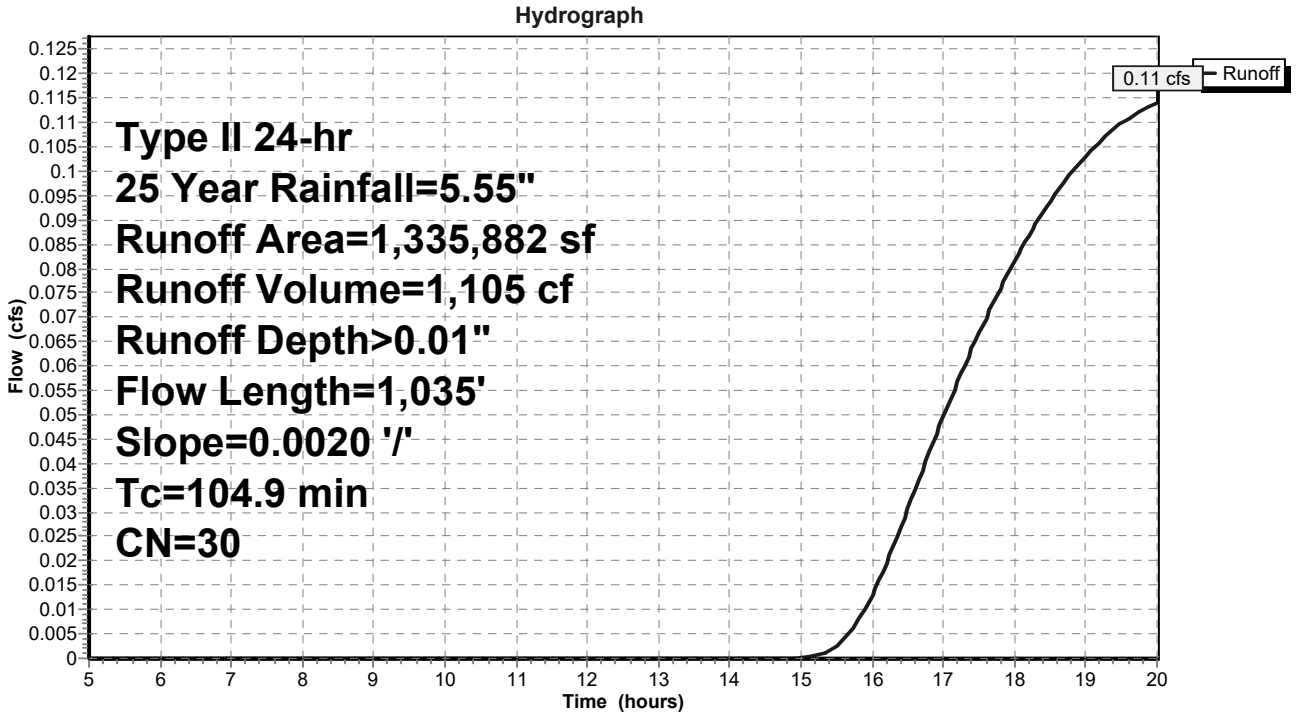
Runoff = 0.11 cfs @ 20.00 hrs, Volume= 1,105 cf, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,335,882	30	Woods, Good, HSG A
1,335,882		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	50	0.0020	0.03		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
73.4	985	0.0020	0.22		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
104.9	1,035	Total			

Subcatchment EX-1A: South of stream



Summary for Subcatchment EX-1B: North of stream

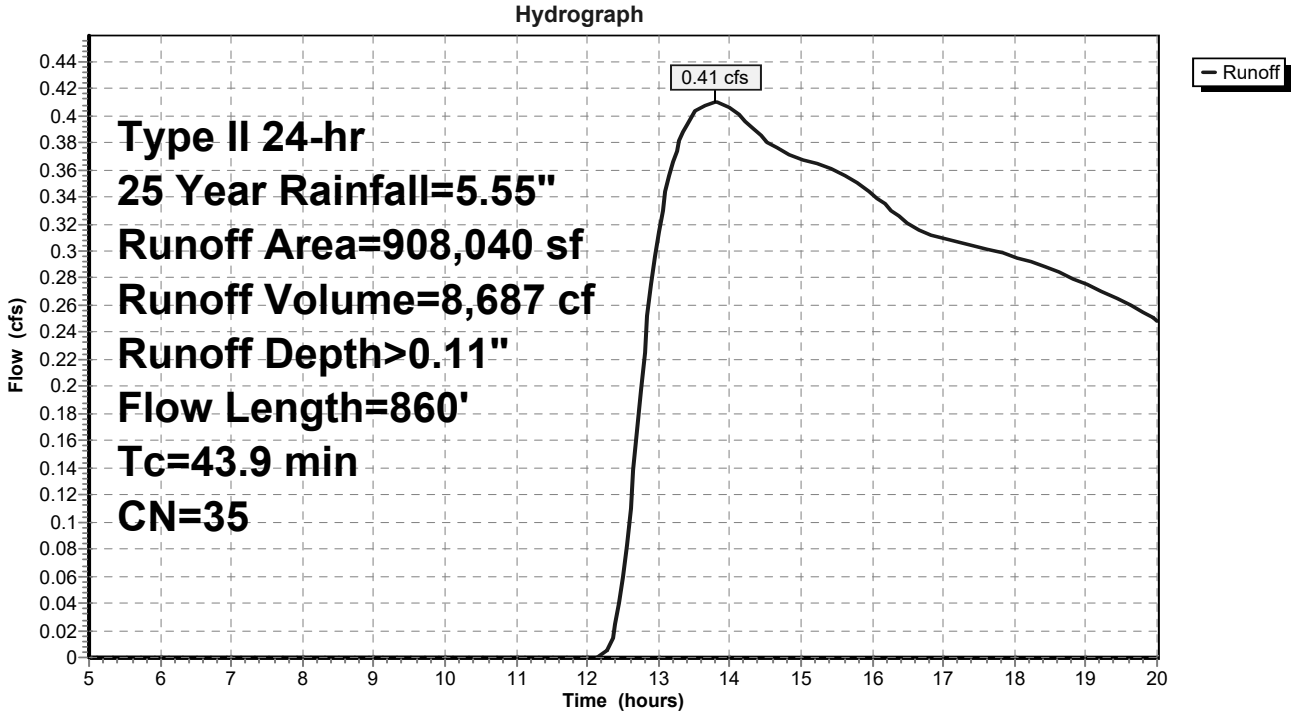
Runoff = 0.41 cfs @ 13.79 hrs, Volume= 8,687 cf, Depth> 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
789,250	30	Woods, Good, HSG A
111,705	68	<50% Grass cover, Poor, HSG A
7,085	98	Paved parking, HSG A
908,040	35	Weighted Average
900,955		99.22% Pervious Area
7,085		0.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
38.2	810	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
43.9	860	Total			

Subcatchment EX-1B: North of stream



Summary for Subcatchment EX-2: Lawn/Driveway at razed house

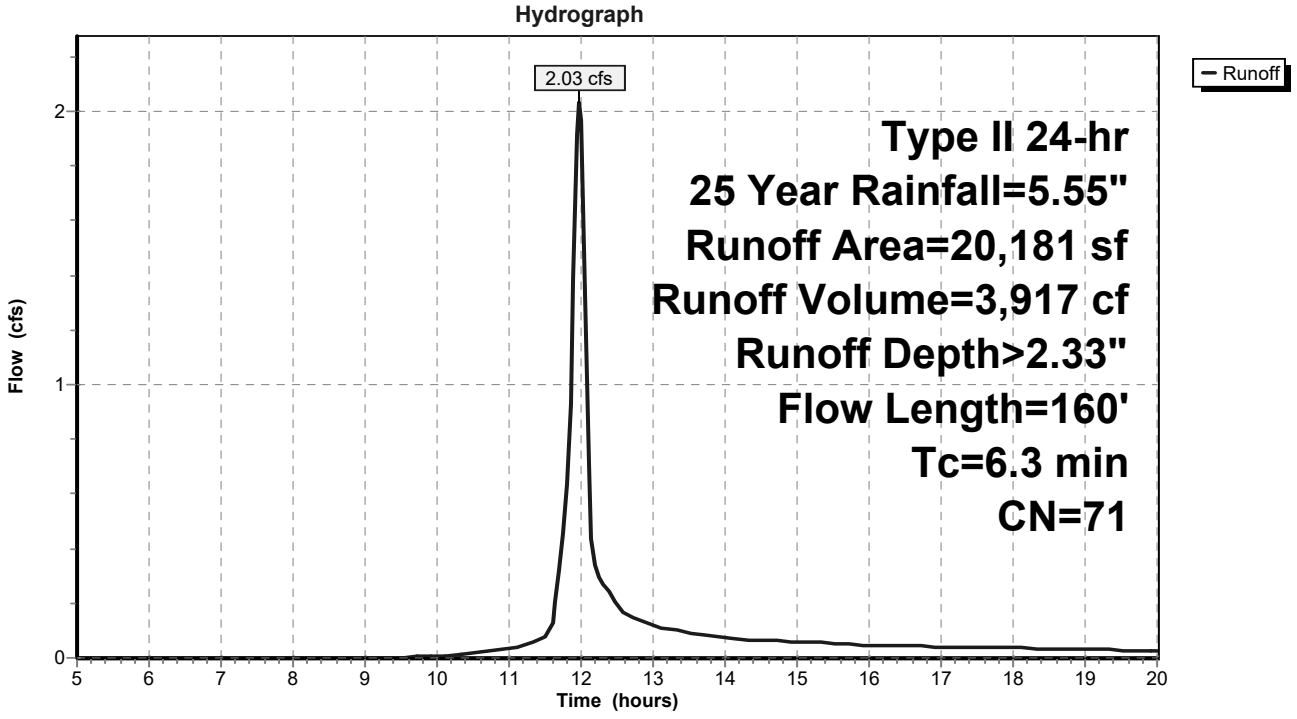
Runoff = 2.03 cfs @ 11.98 hrs, Volume= 3,917 cf, Depth> 2.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
17,864	68	<50% Grass cover, Poor, HSG A
2,317	98	Paved parking, HSG A
20,181	71	Weighted Average
17,864		88.52% Pervious Area
2,317		11.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
2.6	110	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
6.3	160	Total			

Subcatchment EX-2: Lawn/Driveway at razed house

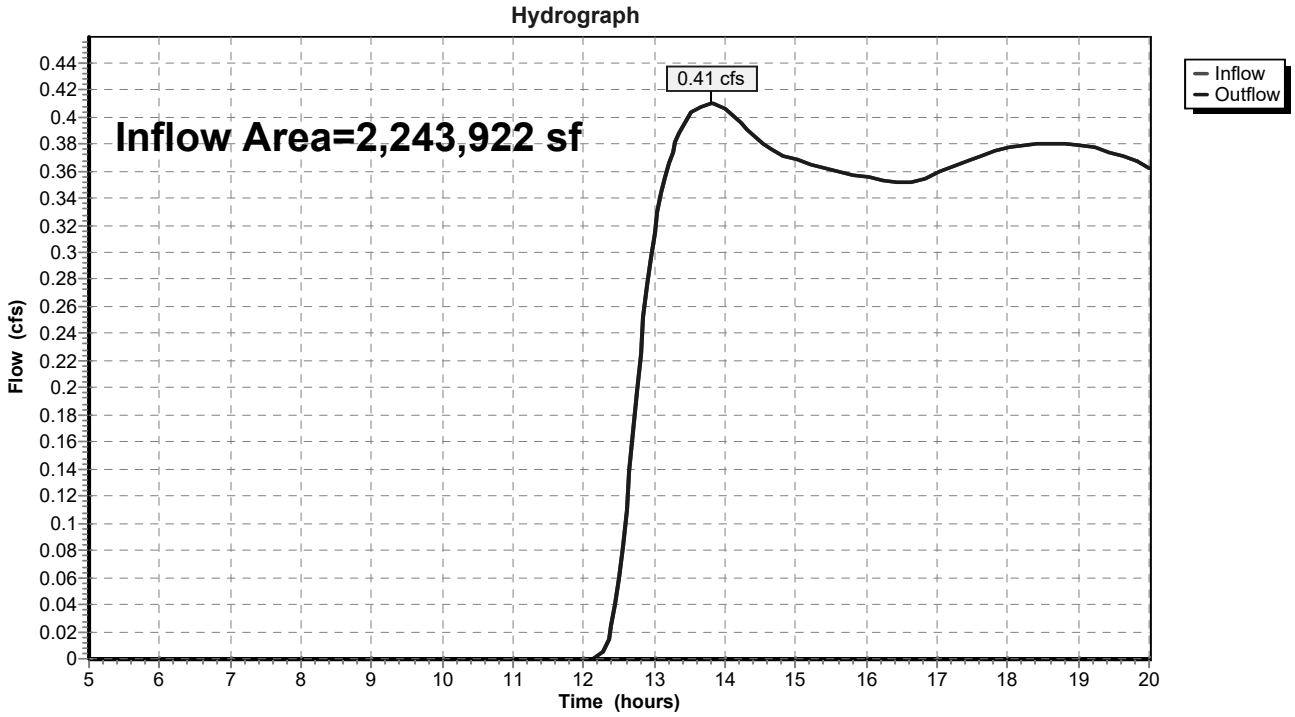


Summary for Reach DP-1: Stream

Inflow Area = 2,243,922 sf, 0.32% Impervious, Inflow Depth > 0.05" for 25 Year event
Inflow = 0.41 cfs @ 13.79 hrs, Volume= 9,792 cf
Outflow = 0.41 cfs @ 13.79 hrs, Volume= 9,792 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-1: Stream

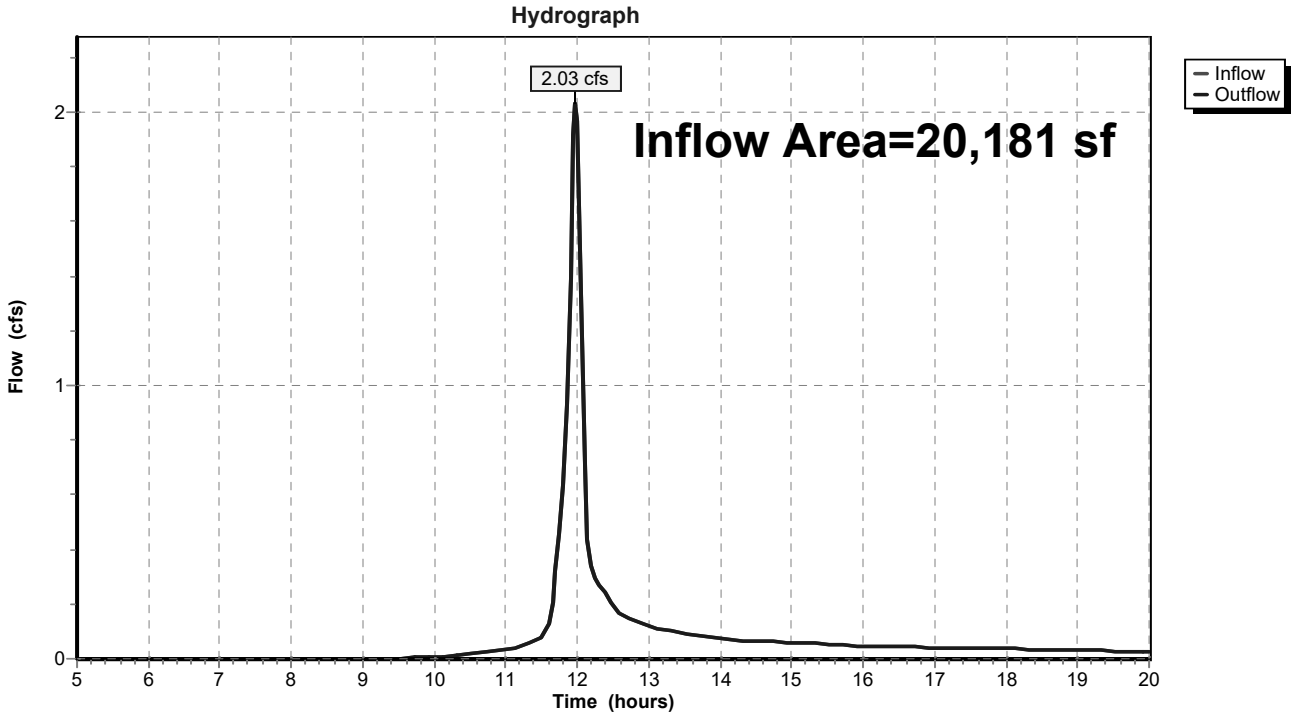


Summary for Reach DP-2: Gratuity Road

Inflow Area = 20,181 sf, 11.48% Impervious, Inflow Depth > 2.33" for 25 Year event
Inflow = 2.03 cfs @ 11.98 hrs, Volume= 3,917 cf
Outflow = 2.03 cfs @ 11.98 hrs, Volume= 3,917 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Gratuity Road



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 EX-1A: South of stream Runoff Area=1,335,882 sf 0.00% Impervious Runoff Depth>0.26"
Flow Length=1,035' Slope=0.0020 '/' Tc=104.9 min CN=30 Runoff=1.55 cfs 29,368 cf

Subcatchment EX-1B: North of stream Runoff Area=908,040 sf 0.78% Impervious Runoff Depth>0.61"
Flow Length=860' Tc=43.9 min CN=35 Runoff=4.51 cfs 46,078 cf

Subcatchment EX-2: Lawn/Driveway at Runoff Area=20,181 sf 11.48% Impervious Runoff Depth>4.11"
Flow Length=160' Tc=6.3 min CN=71 Runoff=2.33 cfs 6,914 cf

Reach DP-1: Stream Inflow=4.67 cfs 75,446 cf
Outflow=4.67 cfs 75,446 cf

Reach DP-2: Gratuity Road Inflow=2.33 cfs 6,914 cf
Outflow=2.33 cfs 6,914 cf

Total Runoff Area = 2,264,103 sf Runoff Volume = 82,360 cf Average Runoff Depth = 0.44"
99.58% Pervious = 2,254,701 sf 0.42% Impervious = 9,402 sf

Summary for Subcatchment EX-1A: South of stream

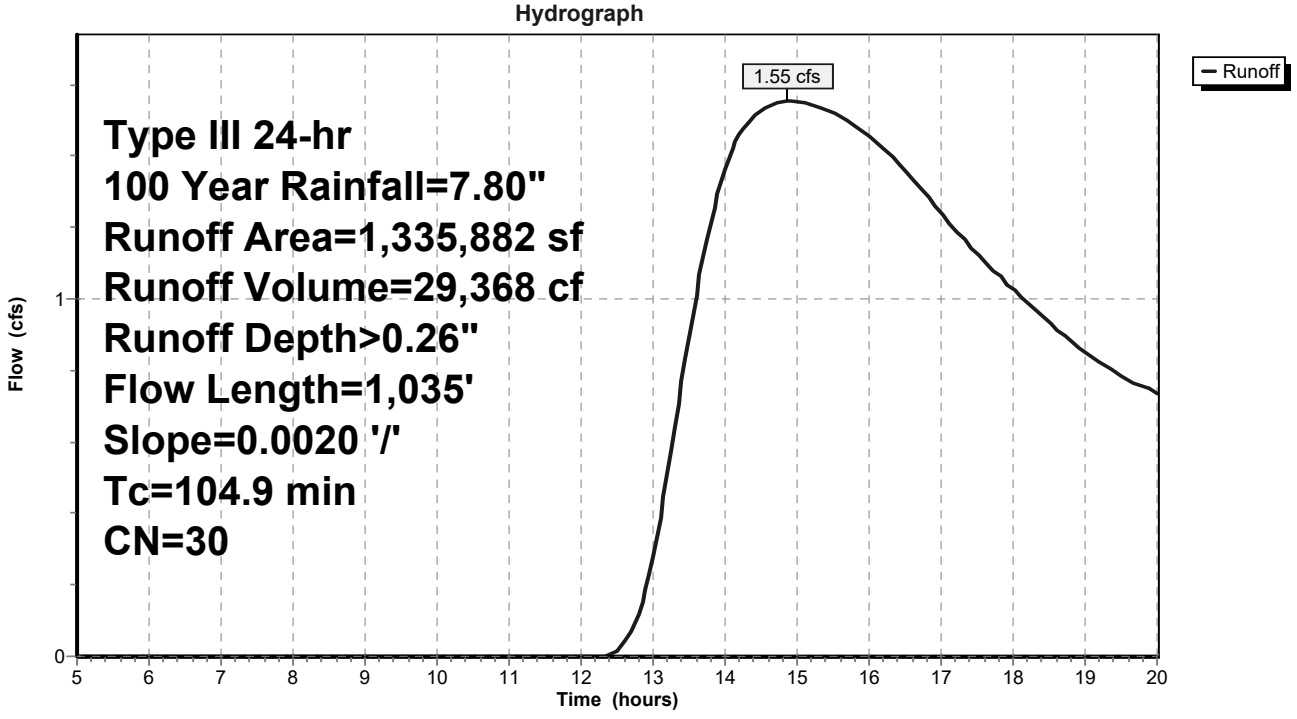
Runoff = 1.55 cfs @ 14.85 hrs, Volume= 29,368 cf, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,335,882	30	Woods, Good, HSG A
1,335,882		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	50	0.0020	0.03		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
73.4	985	0.0020	0.22		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
104.9	1,035	Total			

Subcatchment EX-1A: South of stream



Summary for Subcatchment EX-1B: North of stream

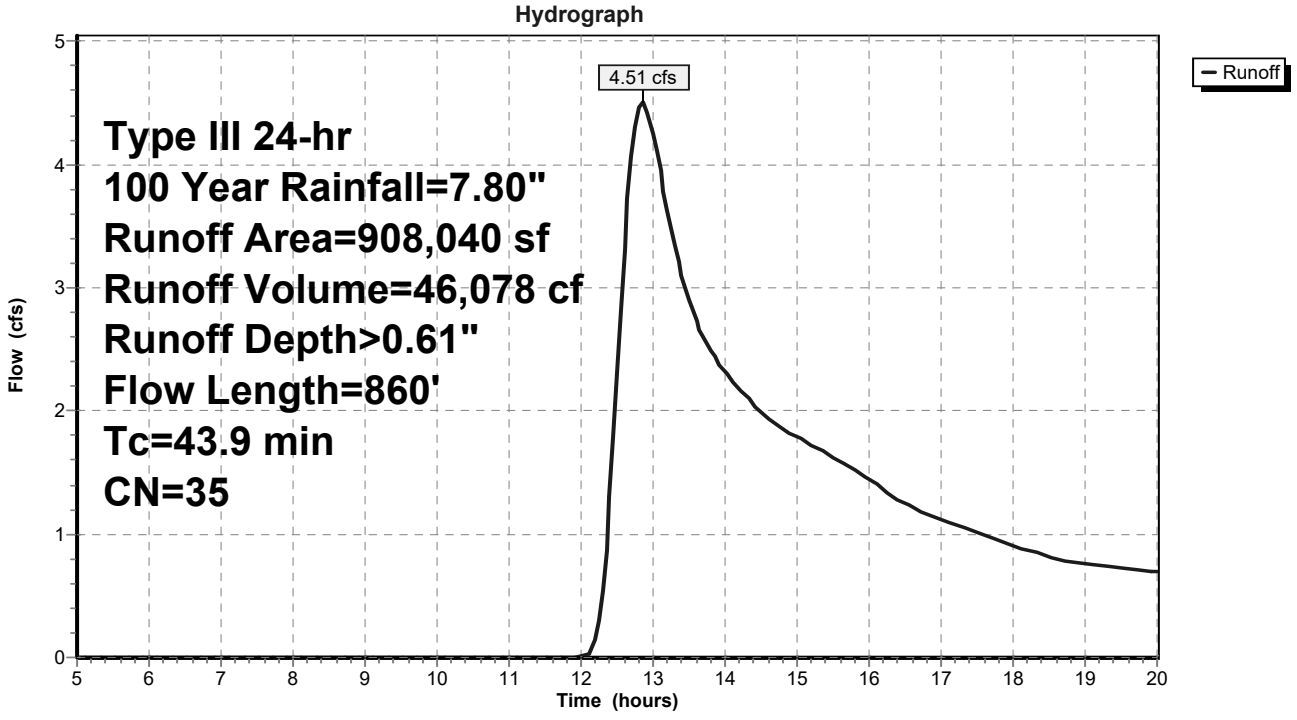
Runoff = 4.51 cfs @ 12.85 hrs, Volume= 46,078 cf, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
789,250	30	Woods, Good, HSG A
111,705	68	<50% Grass cover, Poor, HSG A
7,085	98	Paved parking, HSG A
908,040	35	Weighted Average
900,955		99.22% Pervious Area
7,085		0.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
38.2	810	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
43.9	860	Total			

Subcatchment EX-1B: North of stream



Summary for Subcatchment EX-2: Lawn/Driveway at razed house

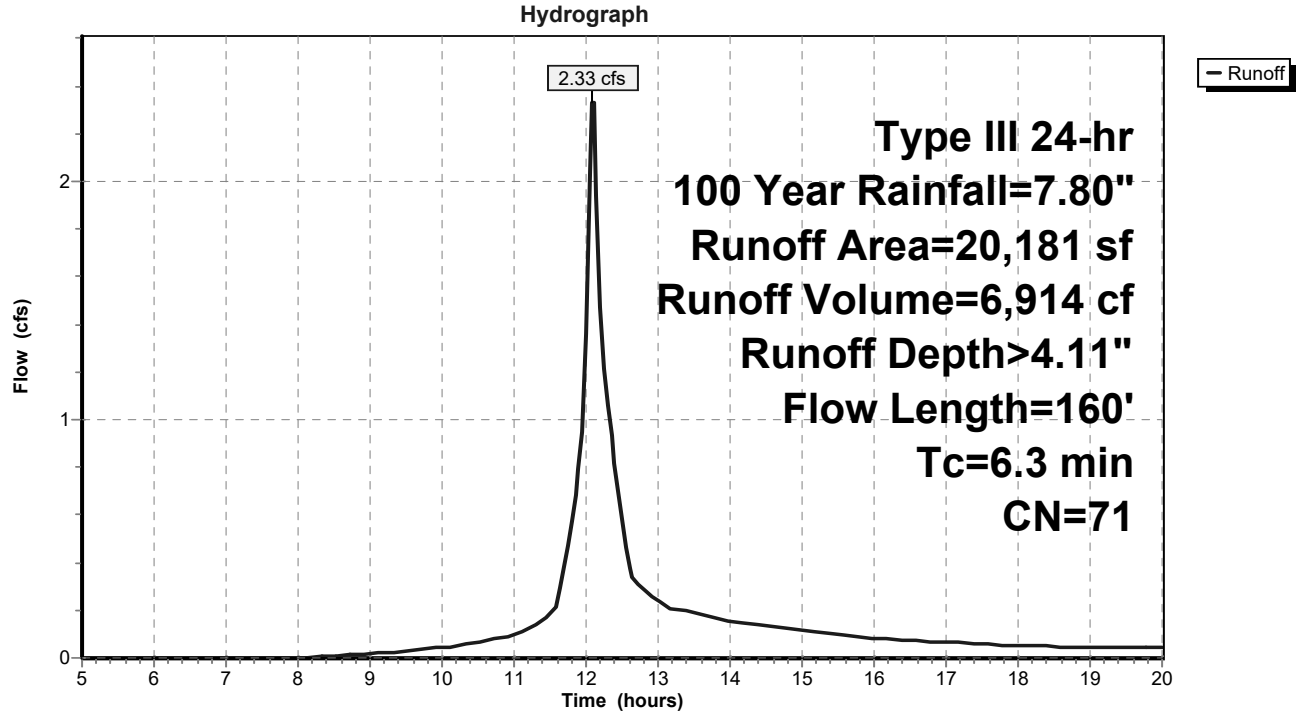
Runoff = 2.33 cfs @ 12.10 hrs, Volume= 6,914 cf, Depth> 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
17,864	68	<50% Grass cover, Poor, HSG A
2,317	98	Paved parking, HSG A
20,181	71	Weighted Average
17,864		88.52% Pervious Area
2,317		11.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0600	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
2.6	110	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
6.3	160	Total			

Subcatchment EX-2: Lawn/Driveway at razed house

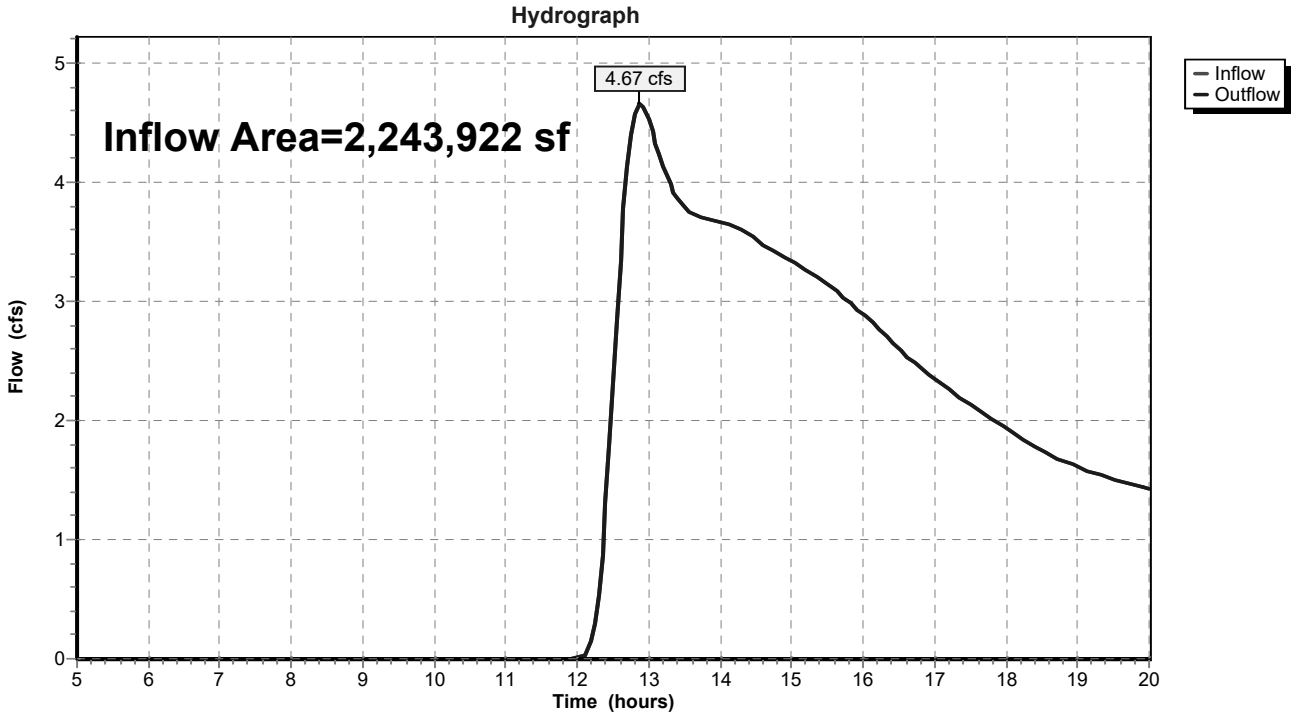


Summary for Reach DP-1: Stream

Inflow Area = 2,243,922 sf, 0.32% Impervious, Inflow Depth > 0.40" for 100 Year event
Inflow = 4.67 cfs @ 12.87 hrs, Volume= 75,446 cf
Outflow = 4.67 cfs @ 12.87 hrs, Volume= 75,446 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-1: Stream

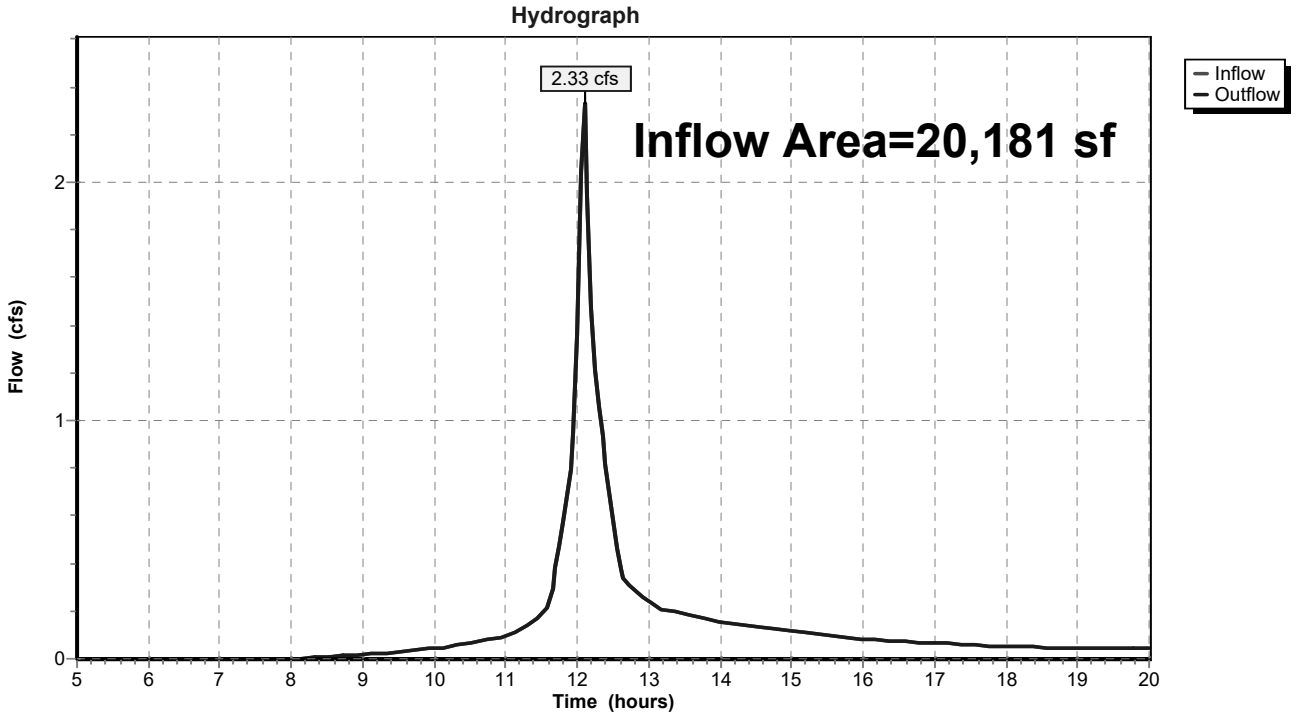


Summary for Reach DP-2: Gratuity Road

Inflow Area = 20,181 sf, 11.48% Impervious, Inflow Depth > 4.11" for 100 Year event
Inflow = 2.33 cfs @ 12.10 hrs, Volume= 6,914 cf
Outflow = 2.33 cfs @ 12.10 hrs, Volume= 6,914 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach DP-2: Gratuity Road



LandTech Consultants

Proposed Conditions (HydroCAD)

LEGEND

EXISTING CONTOUR — 25
EXISTING TREELINE
N.R.C.S. SOIL TYPE — 253B
HYDROLOGIC SOIL GROUP — A
DRAINAGE AREA NUMBER — PR-1A
DISCHARGE POINT — DP-1
DRAINAGE AREA BOUNDARY
SOIL GROUP BOUNDARY

SYMBOL	N.R.C.S. SOIL NAME
253A	HINCKLEY LOAMY SAND
255A	WINDSOR LOAMY SAND
256A	DEERFIELD LOAMY FINE SAND

DATE	REVISION	BY
12/10/24	PEER REVIEW COMMENTS	MJS
1/13/25	UPDATE FLOODPLAIN & PB/PEER REVIEW COMMENTS	MJS

COMMONWEALTH OF MASSACHUSETTS — MATTHEW A. WATERMAN — CIVIL — REGISTERED PROFESSIONAL ENGINEER

PREPARED FOR:
ROUTHIER & ROPER
GRATUITY ROAD, LLC
256 AYER ROAD
LITTLETON, MA 01460

DESIGN	DRAFT	CHECK
MJS	MJS	MAW

GRATUITY BROOK FARM ESTATES
POST-DEVELOPMENT MAP

63 GRATUITY ROAD
GROTON, MA

SCALE: 1"= 100'
AUGUST 12, 2024

LandTech Consultants
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JOB NO. 22-243
DWG. NO. 11142
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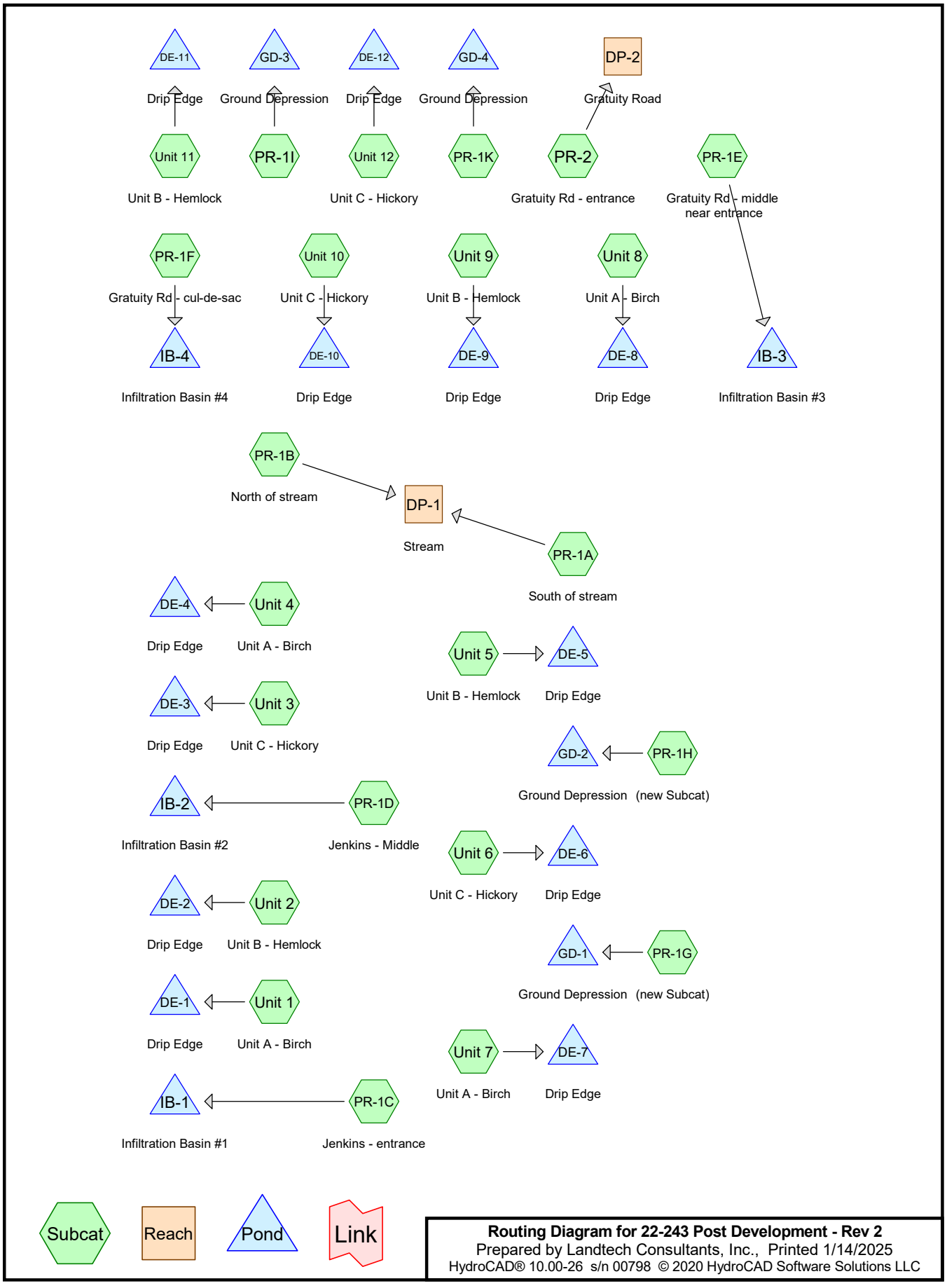


Routing Diagram for 22-243 Post Development - Rev 2
Prepared by Landtech Consultants, Inc., Printed 1/14/2025

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
359,253	68	<50% Grass cover, Poor, HSG A (PR-1A, PR-1B, PR-1C, PR-1D, PR-1E, PR-1F, PR-1G, PR-1H, PR-1I, PR-1K, PR-2)
44,590	30	Meadow, non-grazed, HSG A (PR-1B, PR-1K)
1,947	98	Paved parking, HSG A (PR-1A)
89,974	98	Paved roads w/curbs & sewers, HSG A (PR-1C, PR-1D, PR-1E, PR-1F, PR-2)
44,000	98	Roofs, HSG A (PR-1C, PR-1D, PR-1E, PR-1F, Unit 1, Unit 10, Unit 11, Unit 12, Unit 2, Unit 3, Unit 4, Unit 5, Unit 6, Unit 7, Unit 8, Unit 9)
1,724,339	30	Woods, Good, HSG A (PR-1A, PR-1B, PR-1G, PR-1H, PR-1I)
2,264,103	**40**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
2,264,103	HSG A	PR-1A, PR-1B, PR-1C, PR-1D, PR-1E, PR-1F, PR-1G, PR-1H, PR-1I, PR-1K, PR-2, Unit 1, Unit 10, Unit 11, Unit 12, Unit 2, Unit 3, Unit 4, Unit 5, Unit 6, Unit 7, Unit 8, Unit 9
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
2,264,103		**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
359,253	0	0	0	0	359,253	<50% Grass cover, Poor
44,590	0	0	0	0	44,590	Meadow, non-grazed
1,947	0	0	0	0	1,947	Paved parking
89,974	0	0	0	0	89,974	Paved roads w/curbs & sewers
44,000	0	0	0	0	44,000	Roofs
1,724,339	0	0	0	0	1,724,339	Woods, Good
2,264,103	**0**	**0**	**0**	**0**	**2,264,103**	**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 PR-1A: South of stream Runoff Area=947,061 sf 0.21% Impervious Runoff Depth=0.00"
Flow Length=1,035' Slope=0.0020 '/' Tc=104.9 min CN=32 Runoff=0.00 cfs 0 cf

Subcatchment PR-1B: North of stream Runoff Area=747,420 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=860' Tc=43.9 min CN=33 Runoff=0.00 cfs 0 cf

Subcatchment PR-1C: Jenkins - entrance Runoff Area=32,617 sf 41.40% Impervious Runoff Depth>1.16"
Tc=5.0 min CN=80 Runoff=1.09 cfs 3,152 cf

Subcatchment PR-1D: Jenkins - Middle Runoff Area=104,358 sf 41.83% Impervious Runoff Depth>1.22"
Tc=5.0 min CN=81 Runoff=3.68 cfs 10,617 cf

Subcatchment PR-1E: Gratuity Rd - middle Runoff Area=45,685 sf 37.54% Impervious Runoff Depth>1.10"
Tc=5.0 min CN=79 Runoff=1.45 cfs 4,189 cf

Subcatchment PR-1F: Gratuity Rd - Runoff Area=77,252 sf 45.33% Impervious Runoff Depth>1.28"
Tc=5.0 min CN=82 Runoff=2.87 cfs 8,266 cf

Subcatchment PR-1G: (new Subcat) Runoff Area=131,193 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=300' Slope=0.0100 '/' Tc=24.8 min CN=40 Runoff=0.00 cfs 0 cf

Subcatchment PR-1H: (new Subcat) Runoff Area=107,768 sf 0.00% Impervious Runoff Depth>0.00"
Flow Length=300' Slope=0.0100 '/' Tc=24.8 min CN=41 Runoff=0.00 cfs 0 cf

Subcatchment PR-1I: Runoff Area=13,678 sf 0.00% Impervious Runoff Depth>0.14"
Tc=5.0 min CN=54 Runoff=0.02 cfs 162 cf

Subcatchment PR-1K: Runoff Area=16,989 sf 0.00% Impervious Runoff Depth>0.00"
Tc=5.0 min CN=43 Runoff=0.00 cfs 5 cf

Subcatchment PR-2: Gratuity Rd - entrance Runoff Area=18,114 sf 14.80% Impervious Runoff Depth>0.74"
Flow Length=148' Slope=0.0100 '/' Tc=9.8 min CN=72 Runoff=0.31 cfs 1,110 cf

Subcatchment Unit 1: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.12 cfs 387 cf

Subcatchment Unit 10: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.13 cfs 402 cf

Subcatchment Unit 11: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.12 cfs 401 cf

Subcatchment Unit 12: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.13 cfs 402 cf

Subcatchment Unit 2: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.12 cfs 401 cf

Subcatchment Unit 3: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.13 cfs 402 cf

Subcatchment Unit 4: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.12 cfs 387 cf

Subcatchment Unit 5: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.12 cfs 401 cf

Subcatchment Unit 6: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.13 cfs 402 cf

Subcatchment Unit 7: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.12 cfs 387 cf

Subcatchment Unit 8: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.12 cfs 387 cf

Subcatchment Unit 9: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>2.60"
Tc=5.0 min CN=98 Runoff=0.12 cfs 401 cf

Reach DP-1: Stream Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach DP-2: Gratuity Road Inflow=0.31 cfs 1,110 cf
Outflow=0.31 cfs 1,110 cf

Pond DE-1: Drip Edge Peak Elev=0.13' Storage=0.000 af Inflow=0.12 cfs 387 cf
Discarded=0.07 cfs 387 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 387 cf

Pond DE-10: Drip Edge Peak Elev=0.15' Storage=0.001 af Inflow=0.13 cfs 402 cf
Discarded=0.07 cfs 402 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 402 cf

Pond DE-11: Drip Edge Peak Elev=0.19' Storage=0.001 af Inflow=0.12 cfs 401 cf
Discarded=0.07 cfs 401 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 401 cf

Pond DE-12: Drip Edge Peak Elev=0.15' Storage=0.001 af Inflow=0.13 cfs 402 cf
Discarded=0.07 cfs 402 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 402 cf

Pond DE-2: Drip Edge Peak Elev=0.24' Storage=0.001 af Inflow=0.12 cfs 401 cf
Discarded=0.06 cfs 401 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 401 cf

Pond DE-3: Drip Edge Peak Elev=0.21' Storage=0.001 af Inflow=0.13 cfs 402 cf
Discarded=0.07 cfs 402 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 402 cf

Pond DE-4: Drip Edge Peak Elev=0.28' Storage=0.001 af Inflow=0.12 cfs 387 cf
Discarded=0.06 cfs 387 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 387 cf

Pond DE-5: Drip Edge Peak Elev=0.19' Storage=0.001 af Inflow=0.12 cfs 401 cf
Discarded=0.07 cfs 401 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 401 cf

Pond DE-6: Drip Edge Peak Elev=0.15' Storage=0.001 af Inflow=0.13 cfs 402 cf
Discarded=0.07 cfs 402 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 402 cf

Pond DE-7: Drip Edge Peak Elev=0.22' Storage=0.001 af Inflow=0.12 cfs 387 cf
Discarded=0.06 cfs 387 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 387 cf

Pond DE-8: Drip Edge Peak Elev=0.13' Storage=0.000 af Inflow=0.12 cfs 387 cf
Discarded=0.07 cfs 387 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 387 cf

Pond DE-9: Drip Edge Peak Elev=0.29' Storage=0.001 af Inflow=0.12 cfs 401 cf
Discarded=0.06 cfs 401 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 401 cf

Pond GD-1: Ground Depression Peak Elev=211.60' Storage=0 cf Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Pond GD-2: Ground Depression Peak Elev=210.60' Storage=0 cf Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Pond GD-3: Ground Depression Peak Elev=213.60' Storage=1 cf Inflow=0.02 cfs 162 cf
Outflow=0.02 cfs 162 cf

Pond GD-4: Ground Depression Peak Elev=213.60' Storage=0 cf Inflow=0.00 cfs 5 cf
Outflow=0.00 cfs 5 cf

Pond IB-1: Infiltration Basin #1 Peak Elev=211.03' Storage=139 cf Inflow=1.09 cfs 3,152 cf
Discarded=0.86 cfs 3,150 cf Primary=0.00 cfs 0 cf Outflow=0.86 cfs 3,150 cf

Pond IB-2: Infiltration Basin #2 Peak Elev=212.18' Storage=1,464 cf Inflow=3.68 cfs 10,617 cf
Discarded=1.55 cfs 10,606 cf Primary=0.00 cfs 0 cf Outflow=1.55 cfs 10,606 cf

Pond IB-3: Infiltration Basin #3 Peak Elev=213.52' Storage=160 cf Inflow=1.45 cfs 4,189 cf
Discarded=1.26 cfs 4,186 cf Primary=0.00 cfs 0 cf Outflow=1.26 cfs 4,186 cf

Pond IB-4: Infiltration Basin #4 Peak Elev=211.64' Storage=962 cf Inflow=2.87 cfs 8,266 cf
Discarded=1.34 cfs 8,259 cf Primary=0.00 cfs 0 cf Outflow=1.34 cfs 8,259 cf

Total Runoff Area = 2,264,103 sf Runoff Volume = 32,261 cf Average Runoff Depth = 0.17"
94.00% Pervious = 2,128,182 sf 6.00% Impervious = 135,921 sf

Summary for Subcatchment PR-1A: South of stream

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
897,676	30	Woods, Good, HSG A
47,438	68	<50% Grass cover, Poor, HSG A
1,947	98	Paved parking, HSG A
947,061	32	Weighted Average
945,114		99.79% Pervious Area
1,947		0.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	50	0.0020	0.03		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
73.4	985	0.0020	0.22		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
104.9	1,035	Total			

Summary for Subcatchment PR-1B: North of stream

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
646,242	30	Woods, Good, HSG A
67,899	68	<50% Grass cover, Poor, HSG A
33,279	30	Meadow, non-grazed, HSG A
747,420	33	Weighted Average
747,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
38.2	810	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
43.9	860	Total			

Summary for Subcatchment PR-1C: Jenkins - entrance

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

Runoff = 1.09 cfs @ 12.08 hrs, Volume= 3,152 cf, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
9,869	98	Paved roads w/curbs & sewers, HSG A
19,113	68	<50% Grass cover, Poor, HSG A
3,635	98	Roofs, HSG A
32,617	80	Weighted Average
19,113		58.60% Pervious Area
13,504		41.40% Impervious Area

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

Summary for Subcatchment PR-1D: Jenkins - Middle

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

Runoff = 3.68 cfs @ 12.08 hrs, Volume= 10,617 cf, Depth> 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
34,458	98	Paved roads w/curbs & sewers, HSG A
60,702	68	<50% Grass cover, Poor, HSG A
9,198	98	Roofs, HSG A
104,358	81	Weighted Average
60,702		58.17% Pervious Area
43,656		41.83% Impervious Area

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

Summary for Subcatchment PR-1E: Gratuity Rd - middle near entrance

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

Runoff = 1.45 cfs @ 12.08 hrs, Volume= 4,189 cf, Depth> 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
15,364	98	Paved roads w/curbs & sewers, HSG A
28,536	68	<50% Grass cover, Poor, HSG A
1,785	98	Roofs, HSG A
45,685	79	Weighted Average
28,536		62.46% Pervious Area
17,149		37.54% Impervious Area

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

Summary for Subcatchment PR-1F: Gratuity Rd - cul-de-sac

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

Runoff = 2.87 cfs @ 12.08 hrs, Volume= 8,266 cf, Depth> 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
27,603	98	Paved roads w/curbs & sewers, HSG A
42,235	68	<50% Grass cover, Poor, HSG A
7,414	98	Roofs, HSG A
77,252	82	Weighted Average
42,235		54.67% Pervious Area
35,017		45.33% Impervious Area

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

Summary for Subcatchment PR-1G: (new Subcat)

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
33,650	68	<50% Grass cover, Poor, HSG A
97,543	30	Woods, Good, HSG A
131,193	40	Weighted Average
131,193		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
8.3	250	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	300	Total			

Summary for Subcatchment PR-1H: (new Subcat)

[73] Warning: Peak may fall outside time span

Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0 cf, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
29,892	68	<50% Grass cover, Poor, HSG A
77,876	30	Woods, Good, HSG A
107,768	41	Weighted Average
107,768		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
8.3	250	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	300	Total			

Summary for Subcatchment PR-1I:

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

Runoff = 0.02 cfs @ 12.38 hrs, Volume= 162 cf, Depth> 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
8,676	68	<50% Grass cover, Poor, HSG A
5,002	30	Woods, Good, HSG A
13,678	54	Weighted Average
13,678		100.00% Pervious Area

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

Summary for Subcatchment PR-1K:

[49] Hint: Tc<2dt may require smaller dt
[73] Warning: Peak may fall outside time span

Runoff = 0.00 cfs @ 20.00 hrs, Volume= 5 cf, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
5,678	68	<50% Grass cover, Poor, HSG A
11,311	30	Meadow, non-grazed, HSG A
16,989	43	Weighted Average
16,989		100.00% Pervious Area

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

Summary for Subcatchment PR-2: Gratuity Rd - entrance

Runoff = 0.31 cfs @ 12.16 hrs, Volume= 1,110 cf, Depth> 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
2,680	98	Paved roads w/curbs & sewers, HSG A
15,434	68	<50% Grass cover, Poor, HSG A
18,114	72	Weighted Average
15,434		85.20% Pervious Area
2,680		14.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.3	98	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	148	Total			

Summary for Subcatchment Unit 1: Unit A - Birch

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

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 387 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 10: Unit C - Hickory

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

Runoff = 0.13 cfs @ 12.07 hrs, Volume= 402 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 11: Unit B - Hemlock

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

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 401 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 12: Unit C - Hickory

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

Runoff = 0.13 cfs @ 12.07 hrs, Volume= 402 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 2: Unit B - Hemlock

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

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 401 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 3: Unit C - Hickory

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

Runoff = 0.13 cfs @ 12.07 hrs, Volume= 402 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 4: Unit A - Birch

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

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 387 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 5: Unit B - Hemlock

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

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 401 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 6: Unit C - Hickory

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

Runoff = 0.13 cfs @ 12.07 hrs, Volume= 402 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 7: Unit A - Birch

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

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 387 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 8: Unit A - Birch

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

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 387 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 9: Unit B - Hemlock

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

Runoff = 0.12 cfs @ 12.07 hrs, Volume= 401 cf, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.01"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Reach DP-1: Stream

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

Inflow Area = 1,694,481 sf, 0.11% Impervious, Inflow Depth = 0.00" for 2 Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: Gratuity Road

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

Inflow Area = 18,114 sf, 14.80% Impervious, Inflow Depth > 0.74" for 2 Year event
Inflow = 0.31 cfs @ 12.16 hrs, Volume= 1,110 cf
Outflow = 0.31 cfs @ 12.16 hrs, Volume= 1,110 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond DE-1: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,785 sf,100.00% Impervious, Inflow Depth > 2.60" for 2 Year event
Inflow = 0.12 cfs @ 12.07 hrs, Volume= 387 cf
Outflow = 0.07 cfs @ 12.00 hrs, Volume= 387 cf, Atten= 38%, Lag= 0.0 min
Discarded = 0.07 cfs @ 12.00 hrs, Volume= 387 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.13' @ 12.17 hrs Surf.Area= 0.009 ac Storage= 0.000 af

Plug-Flow detention time= 1.3 min calculated for 387 cf (100% of inflow)
Center-of-Mass det. time= 1.2 min (739.6 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 12.00 hrs HW=0.02' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-10: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area =	1,857 sf,100.00% Impervious,	Inflow Depth >	2.60"	for	2 Year event
Inflow =	0.13 cfs @	12.07 hrs,	Volume=	402 cf	
Outflow =	0.07 cfs @	12.00 hrs,	Volume=	402 cf,	Atten= 40%, Lag= 0.0 min
Discarded =	0.07 cfs @	12.00 hrs,	Volume=	402 cf	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.15' @ 12.18 hrs Surf.Area= 0.009 ac Storage= 0.001 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.3 min (739.8 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 12.00 hrs HW=0.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-11: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area =	1,850 sf,	100.00% Impervious,	Inflow Depth >	2.60"	for 2 Year event
Inflow =	0.12 cfs @	12.07 hrs,	Volume=	401 cf	
Outflow =	0.07 cfs @	12.00 hrs,	Volume=	401 cf,	Atten= 45%, Lag= 0.0 min
Discarded =	0.07 cfs @	12.00 hrs,	Volume=	401 cf	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.19' @ 12.19 hrs Surf.Area= 0.008 ac Storage= 0.001 af

Plug-Flow detention time= 1.8 min calculated for 401 cf (100% of inflow)
Center-of-Mass det. time= 1.6 min (740.1 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 120.00'L x 2.00'H Prismatoid** 0.017 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 12.00 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-12: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,857 sf,100.00% Impervious, Inflow Depth > 2.60" for 2 Year event
Inflow = 0.13 cfs @ 12.07 hrs, Volume= 402 cf
Outflow = 0.07 cfs @ 12.00 hrs, Volume= 402 cf, Atten= 40%, Lag= 0.0 min
Discarded = 0.07 cfs @ 12.00 hrs, Volume= 402 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.15' @ 12.18 hrs Surf.Area= 0.009 ac Storage= 0.001 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.3 min (739.8 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 12.00 hrs HW=0.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-2: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,850 sf,100.00% Impervious, Inflow Depth > 2.60" for 2 Year event
Inflow = 0.12 cfs @ 12.07 hrs, Volume= 401 cf
Outflow = 0.06 cfs @ 12.00 hrs, Volume= 401 cf, Atten= 49%, Lag= 0.0 min
Discarded = 0.06 cfs @ 12.00 hrs, Volume= 401 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.24' @ 12.21 hrs Surf.Area= 0.008 ac Storage= 0.001 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 2.1 min (740.5 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 110.00'L x 2.00'H Prismatoid** 0.015 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 12.00 hrs HW=0.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-3: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area =	1,857 sf,100.00% Impervious,	Inflow Depth >	2.60"	for 2 Year event	
Inflow =	0.13 cfs @	12.07 hrs, Volume=	402 cf		
Outflow =	0.07 cfs @	12.00 hrs, Volume=	402 cf,	Atten= 47%,	Lag= 0.0 min
Discarded =	0.07 cfs @	12.00 hrs, Volume=	402 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.21' @ 12.20 hrs Surf.Area= 0.008 ac Storage= 0.001 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.9 min (740.3 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 115.00'L x 2.00'H Prismatoid**
			0.016 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 12.00 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-4: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,785 sf,100.00% Impervious, Inflow Depth > 2.60" for 2 Year event
Inflow = 0.12 cfs @ 12.07 hrs, Volume= 387 cf
Outflow = 0.06 cfs @ 12.00 hrs, Volume= 387 cf, Atten= 52%, Lag= 0.0 min
Discarded = 0.06 cfs @ 12.00 hrs, Volume= 387 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.28' @ 12.22 hrs Surf.Area= 0.007 ac Storage= 0.001 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 2.4 min (740.9 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 100.00'L x 2.00'H Prismatoid** 0.014 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 12.00 hrs HW=0.04' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-5: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,850 sf,100.00% Impervious, Inflow Depth > 2.60" for 2 Year event
Inflow = 0.12 cfs @ 12.07 hrs, Volume= 401 cf
Outflow = 0.07 cfs @ 12.00 hrs, Volume= 401 cf, Atten= 45%, Lag= 0.0 min
Discarded = 0.07 cfs @ 12.00 hrs, Volume= 401 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.19' @ 12.19 hrs Surf.Area= 0.008 ac Storage= 0.001 af

Plug-Flow detention time= 1.8 min calculated for 401 cf (100% of inflow)
Center-of-Mass det. time= 1.6 min (740.1 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 120.00'L x 2.00'H Prismatoid** 0.017 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 12.00 hrs HW=0.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-6: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area =	1,857 sf,100.00% Impervious,	Inflow Depth >	2.60"	for 2 Year event	
Inflow =	0.13 cfs @	12.07 hrs, Volume=	402 cf		
Outflow =	0.07 cfs @	12.00 hrs, Volume=	402 cf,	Atten= 40%,	Lag= 0.0 min
Discarded =	0.07 cfs @	12.00 hrs, Volume=	402 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.15' @ 12.18 hrs Surf.Area= 0.009 ac Storage= 0.001 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.3 min (739.8 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 12.00 hrs HW=0.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-7: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area =	1,785 sf,100.00% Impervious,	Inflow Depth >	2.60"	for 2 Year event	
Inflow =	0.12 cfs @	12.07 hrs,	Volume=	387 cf	
Outflow =	0.06 cfs @	12.00 hrs,	Volume=	387 cf,	Atten= 47%, Lag= 0.0 min
Discarded =	0.06 cfs @	12.00 hrs,	Volume=	387 cf	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.22' @ 12.20 hrs Surf.Area= 0.008 ac Storage= 0.001 af

Plug-Flow detention time= 2.0 min calculated for 387 cf (100% of inflow)
Center-of-Mass det. time= 1.9 min (740.3 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 110.00'L x 2.00'H Prismatoid** 0.015 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 12.00 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-8: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,785 sf,100.00% Impervious, Inflow Depth > 2.60" for 2 Year event
Inflow = 0.12 cfs @ 12.07 hrs, Volume= 387 cf
Outflow = 0.07 cfs @ 12.00 hrs, Volume= 387 cf, Atten= 38%, Lag= 0.0 min
Discarded = 0.07 cfs @ 12.00 hrs, Volume= 387 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.13' @ 12.17 hrs Surf.Area= 0.009 ac Storage= 0.000 af

Plug-Flow detention time= 1.3 min calculated for 387 cf (100% of inflow)
Center-of-Mass det. time= 1.2 min (739.6 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 12.00 hrs HW=0.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-9: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,850 sf,100.00% Impervious, Inflow Depth > 2.60" for 2 Year event
Inflow = 0.12 cfs @ 12.07 hrs, Volume= 401 cf
Outflow = 0.06 cfs @ 12.00 hrs, Volume= 401 cf, Atten= 53%, Lag= 0.0 min
Discarded = 0.06 cfs @ 12.00 hrs, Volume= 401 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.29' @ 12.22 hrs Surf.Area= 0.007 ac Storage= 0.001 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 2.5 min (741.0 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 102.00'L x 2.00'H Prismatoid** 0.014 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 12.00 hrs HW=0.04' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond GD-1: Ground Depression

Inflow Area = 131,193 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2 Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 211.60' @ 5.00 hrs Surf.Area= 1,514 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	211.60'	2,903 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.60	1,514	0	0
212.00	13,000	2,903	2,903

Device	Routing	Invert	Outlet Devices
#1	Discarded	211.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=211.60' (Free Discharge)
↑—**1=Exfiltration** (Passes 0.00 cfs of 0.29 cfs potential flow)

Summary for Pond GD-2: Ground Depression

Inflow Area = 107,768 sf, 0.00% Impervious, Inflow Depth > 0.00" for 2 Year event
Inflow = 0.00 cfs @ 20.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 20.00 hrs, Volume= 0 cf, Atten= 32%, Lag= 0.0 min
Discarded = 0.00 cfs @ 20.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 210.60' @ 20.00 hrs Surf.Area= 550 sf Storage= 0 cf

Plug-Flow detention time= 0.5 min calculated for 0 cf (68% of inflow)
Center-of-Mass det. time= 0.0 min (1,199.9 - 1,199.9)

Volume	Invert	Avail.Storage	Storage Description
#1	210.60'	3,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
210.60	550	0	0
211.00	2,998	710	710
211.50	8,352	2,838	3,547

Device	Routing	Invert	Outlet Devices
#1	Discarded	210.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.11 cfs @ 20.00 hrs HW=210.60' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.11 cfs)

Summary for Pond GD-3: Ground Depression

Inflow Area = 13,678 sf, 0.00% Impervious, Inflow Depth > 0.14" for 2 Year event
Inflow = 0.02 cfs @ 12.38 hrs, Volume= 162 cf
Outflow = 0.02 cfs @ 12.39 hrs, Volume= 162 cf, Atten= 0%, Lag= 0.8 min
Discarded = 0.02 cfs @ 12.39 hrs, Volume= 162 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 213.60' @ 12.39 hrs Surf.Area= 357 sf Storage= 1 cf

Plug-Flow detention time= 0.8 min calculated for 162 cf (100% of inflow)
Center-of-Mass det. time= 0.5 min (904.9 - 904.4)

Volume	Invert	Avail.Storage	Storage Description
#1	213.60'	919 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.60	355	0	0
214.00	660	203	203
214.50	2,205	716	919

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.07 cfs @ 12.39 hrs HW=213.60' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Summary for Pond GD-4: Ground Depression

Inflow Area = 16,989 sf, 0.00% Impervious, Inflow Depth > 0.00" for 2 Year event
Inflow = 0.00 cfs @ 20.00 hrs, Volume= 5 cf
Outflow = 0.00 cfs @ 20.00 hrs, Volume= 5 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 20.00 hrs, Volume= 5 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 213.60' @ 20.00 hrs Surf.Area= 550 sf Storage= 0 cf

Plug-Flow detention time= 0.3 min calculated for 5 cf (99% of inflow)
Center-of-Mass det. time= 0.1 min (1,102.1 - 1,101.9)

Volume	Invert	Avail.Storage	Storage Description
#1	213.60'	363 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.60	550	0	0
214.00	1,263	363	363

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.11 cfs @ 20.00 hrs HW=213.60' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Summary for Pond IB-1: Infiltration Basin #1

Inflow Area = 32,617 sf, 41.40% Impervious, Inflow Depth > 1.16" for 2 Year event
Inflow = 1.09 cfs @ 12.08 hrs, Volume= 3,152 cf
Outflow = 0.86 cfs @ 12.14 hrs, Volume= 3,150 cf, Atten= 21%, Lag= 3.7 min
Discarded = 0.86 cfs @ 12.14 hrs, Volume= 3,150 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 211.03' @ 12.14 hrs Surf.Area= 4,510 sf Storage= 139 cf

Plug-Flow detention time= 1.8 min calculated for 3,150 cf (100% of inflow)
Center-of-Mass det. time= 1.6 min (806.9 - 805.4)

Volume	Invert	Avail.Storage	Storage Description
#1	211.00'	11,236 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.00	4,480	0	0
212.00	5,436	4,958	4,958
213.00	7,119	6,278	11,236

Device	Routing	Invert	Outlet Devices
#1	Primary	212.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	211.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.86 cfs @ 12.14 hrs HW=211.03' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.86 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=211.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond IB-2: Infiltration Basin #2

Inflow Area = 104,358 sf, 41.83% Impervious, Inflow Depth > 1.22" for 2 Year event
Inflow = 3.68 cfs @ 12.08 hrs, Volume= 10,617 cf
Outflow = 1.55 cfs @ 12.32 hrs, Volume= 10,606 cf, Atten= 58%, Lag= 14.4 min
Discarded = 1.55 cfs @ 12.32 hrs, Volume= 10,606 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 212.18' @ 12.32 hrs Surf.Area= 8,108 sf Storage= 1,464 cf

Plug-Flow detention time= 6.2 min calculated for 10,606 cf (100% of inflow)
Center-of-Mass det. time= 5.8 min (808.6 - 802.8)

Volume	Invert	Avail.Storage	Storage Description
#1	212.00'	28,939 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
212.00	7,901	0	0
213.00	9,033	8,467	8,467
214.00	10,222	9,628	18,095
215.00	11,467	10,845	28,939

Device	Routing	Invert	Outlet Devices
#1	Discarded	212.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	214.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.55 cfs @ 12.32 hrs HW=212.18' (Free Discharge)
1=Exfiltration (Exfiltration Controls 1.55 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=212.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond IB-3: Infiltration Basin #3

Inflow Area = 45,685 sf, 37.54% Impervious, Inflow Depth > 1.10" for 2 Year event
Inflow = 1.45 cfs @ 12.08 hrs, Volume= 4,189 cf
Outflow = 1.26 cfs @ 12.13 hrs, Volume= 4,186 cf, Atten= 13%, Lag= 2.5 min
Discarded = 1.26 cfs @ 12.13 hrs, Volume= 4,186 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 213.52' @ 12.13 hrs Surf.Area= 6,520 sf Storage= 160 cf

Plug-Flow detention time= 1.8 min calculated for 4,172 cf (100% of inflow)
Center-of-Mass det. time= 1.5 min (809.4 - 807.9)

Volume	Invert	Avail.Storage	Storage Description
#1	213.50'	15,681 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.50	6,490	0	0
214.00	7,094	3,396	3,396
214.50	7,710	3,701	7,097
215.00	8,343	4,013	11,110
215.50	9,940	4,571	15,681

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	214.50'	**5.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=1.25 cfs @ 12.13 hrs HW=213.52' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 1.25 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=213.50' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond IB-4: Infiltration Basin #4

Inflow Area = 77,252 sf, 45.33% Impervious, Inflow Depth > 1.28" for 2 Year event
Inflow = 2.87 cfs @ 12.08 hrs, Volume= 8,266 cf
Outflow = 1.34 cfs @ 12.27 hrs, Volume= 8,259 cf, Atten= 53%, Lag= 11.5 min
Discarded = 1.34 cfs @ 12.27 hrs, Volume= 8,259 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 211.64' @ 12.27 hrs Surf.Area= 7,004 sf Storage= 962 cf

Plug-Flow detention time= 4.7 min calculated for 8,232 cf (100% of inflow)

Center-of-Mass det. time= 4.3 min (804.5 - 800.2)

Volume	Invert	Avail.Storage	Storage Description
#1	211.50'	21,638 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.50	6,864	0	0
212.00	7,370	3,559	3,559
213.00	9,144	8,257	11,816
214.00	10,501	9,823	21,638

Device	Routing	Invert	Outlet Devices
#1	Discarded	211.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	213.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.34 cfs @ 12.27 hrs HW=211.64' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.34 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=211.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 PR-1A: South of stream Runoff Area=947,061 sf 0.21% Impervious Runoff Depth=0.00"
Flow Length=1,035' Slope=0.0020 '/' Tc=104.9 min CN=32 Runoff=0.00 cfs 0 cf

Subcatchment PR-1B: North of stream Runoff Area=747,420 sf 0.00% Impervious Runoff Depth>0.00"
Flow Length=860' Tc=43.9 min CN=33 Runoff=0.02 cfs 69 cf

Subcatchment PR-1C: Jenkins - entrance Runoff Area=32,617 sf 41.40% Impervious Runoff Depth>2.25"
Tc=5.0 min CN=80 Runoff=2.12 cfs 6,107 cf

Subcatchment PR-1D: Jenkins - Middle Runoff Area=104,358 sf 41.83% Impervious Runoff Depth>2.33"
Tc=5.0 min CN=81 Runoff=7.02 cfs 20,262 cf

Subcatchment PR-1E: Gratuity Rd - middle Runoff Area=45,685 sf 37.54% Impervious Runoff Depth>2.17"
Tc=5.0 min CN=79 Runoff=2.86 cfs 8,242 cf

Subcatchment PR-1F: Gratuity Rd - Runoff Area=77,252 sf 45.33% Impervious Runoff Depth>2.41"
Tc=5.0 min CN=82 Runoff=5.37 cfs 15,545 cf

Subcatchment PR-1G: (new Subcat) Runoff Area=131,193 sf 0.00% Impervious Runoff Depth>0.09"
Flow Length=300' Slope=0.0100 '/' Tc=24.8 min CN=40 Runoff=0.05 cfs 1,016 cf

Subcatchment PR-1H: (new Subcat) Runoff Area=107,768 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=300' Slope=0.0100 '/' Tc=24.8 min CN=41 Runoff=0.05 cfs 1,040 cf

Subcatchment PR-1I: Runoff Area=13,678 sf 0.00% Impervious Runoff Depth>0.58"
Tc=5.0 min CN=54 Runoff=0.17 cfs 666 cf

Subcatchment PR-1K: Runoff Area=16,989 sf 0.00% Impervious Runoff Depth>0.17"
Tc=5.0 min CN=43 Runoff=0.02 cfs 242 cf

Subcatchment PR-2: Gratuity Rd - entrance Runoff Area=18,114 sf 14.80% Impervious Runoff Depth>1.63"
Flow Length=148' Slope=0.0100 '/' Tc=9.8 min CN=72 Runoff=0.74 cfs 2,463 cf

Subcatchment Unit 1: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.18 cfs 581 cf

Subcatchment Unit 10: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.19 cfs 605 cf

Subcatchment Unit 11: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.19 cfs 603 cf

Subcatchment Unit 12: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.19 cfs 605 cf

Subcatchment Unit 2: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.19 cfs 603 cf

Subcatchment Unit 3: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.19 cfs 605 cf

Subcatchment Unit 4: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.18 cfs 581 cf

Subcatchment Unit 5: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.19 cfs 603 cf

Subcatchment Unit 6: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.19 cfs 605 cf

Subcatchment Unit 7: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.18 cfs 581 cf

Subcatchment Unit 8: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.18 cfs 581 cf

Subcatchment Unit 9: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>3.91"
Tc=5.0 min CN=98 Runoff=0.19 cfs 603 cf

Reach DP-1: Stream Inflow=0.02 cfs 69 cf
Outflow=0.02 cfs 69 cf

Reach DP-2: Gratuity Road Inflow=0.74 cfs 2,463 cf
Outflow=0.74 cfs 2,463 cf

Pond DE-1: Drip Edge Peak Elev=0.39' Storage=0.001 af Inflow=0.18 cfs 581 cf
Discarded=0.07 cfs 581 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 581 cf

Pond DE-10: Drip Edge Peak Elev=0.43' Storage=0.002 af Inflow=0.19 cfs 605 cf
Discarded=0.07 cfs 605 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 605 cf

Pond DE-11: Drip Edge Peak Elev=0.52' Storage=0.002 af Inflow=0.19 cfs 603 cf
Discarded=0.07 cfs 602 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 602 cf

Pond DE-12: Drip Edge Peak Elev=0.43' Storage=0.002 af Inflow=0.19 cfs 605 cf
Discarded=0.07 cfs 605 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 605 cf

Pond DE-2: Drip Edge Peak Elev=0.64' Storage=0.002 af Inflow=0.19 cfs 603 cf
Discarded=0.06 cfs 602 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 602 cf

Pond DE-3: Drip Edge Peak Elev=0.58' Storage=0.002 af Inflow=0.19 cfs 605 cf
Discarded=0.07 cfs 605 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 605 cf

Pond DE-4: Drip Edge Peak Elev=0.73' Storage=0.002 af Inflow=0.18 cfs 581 cf
Discarded=0.06 cfs 581 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 581 cf

Pond DE-5: Drip Edge Peak Elev=0.52' Storage=0.002 af Inflow=0.19 cfs 603 cf
Discarded=0.07 cfs 602 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 602 cf

Pond DE-6: Drip Edge Peak Elev=0.43' Storage=0.002 af Inflow=0.19 cfs 605 cf
Discarded=0.07 cfs 605 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 605 cf

Pond DE-7: Drip Edge Peak Elev=0.59' Storage=0.002 af Inflow=0.18 cfs 581 cf
Discarded=0.06 cfs 581 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 581 cf

Pond DE-8: Drip Edge Peak Elev=0.39' Storage=0.001 af Inflow=0.18 cfs 581 cf
Discarded=0.07 cfs 581 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 581 cf

Pond DE-9: Drip Edge Peak Elev=0.76' Storage=0.002 af Inflow=0.19 cfs 603 cf
Discarded=0.06 cfs 602 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 602 cf

Pond GD-1: Ground Depression Peak Elev=211.60' Storage=1 cf Inflow=0.05 cfs 1,016 cf
Outflow=0.05 cfs 1,015 cf

Pond GD-2: Ground Depression Peak Elev=210.60' Storage=2 cf Inflow=0.05 cfs 1,040 cf
Outflow=0.05 cfs 1,039 cf

Pond GD-3: Ground Depression Peak Elev=213.75' Storage=61 cf Inflow=0.17 cfs 666 cf
Outflow=0.09 cfs 666 cf

Pond GD-4: Ground Depression Peak Elev=213.60' Storage=0 cf Inflow=0.02 cfs 242 cf
Outflow=0.02 cfs 242 cf

Pond IB-1: Infiltration Basin #1 Peak Elev=211.18' Storage=802 cf Inflow=2.12 cfs 6,107 cf
Discarded=0.89 cfs 6,103 cf Primary=0.00 cfs 0 cf Outflow=0.89 cfs 6,103 cf

Pond IB-2: Infiltration Basin #2 Peak Elev=212.62' Storage=5,132 cf Inflow=7.02 cfs 20,262 cf
Discarded=1.65 cfs 20,243 cf Primary=0.00 cfs 0 cf Outflow=1.65 cfs 20,243 cf

Pond IB-3: Infiltration Basin #3 Peak Elev=213.65' Storage=996 cf Inflow=2.86 cfs 8,242 cf
Discarded=1.28 cfs 8,237 cf Primary=0.00 cfs 0 cf Outflow=1.28 cfs 8,237 cf

Pond IB-4: Infiltration Basin #4 Peak Elev=212.00' Storage=3,541 cf Inflow=5.37 cfs 15,545 cf
Discarded=1.41 cfs 15,533 cf Primary=0.00 cfs 0 cf Outflow=1.41 cfs 15,533 cf

Total Runoff Area = 2,264,103 sf Runoff Volume = 62,807 cf Average Runoff Depth = 0.33"
94.00% Pervious = 2,128,182 sf 6.00% Impervious = 135,921 sf

Summary for Subcatchment PR-1A: South of stream

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
897,676	30	Woods, Good, HSG A
47,438	68	<50% Grass cover, Poor, HSG A
1,947	98	Paved parking, HSG A
947,061	32	Weighted Average
945,114		99.79% Pervious Area
1,947		0.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	50	0.0020	0.03		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
73.4	985	0.0020	0.22		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
104.9	1,035	Total			

Summary for Subcatchment PR-1B: North of stream

[73] Warning: Peak may fall outside time span

Runoff = 0.02 cfs @ 20.00 hrs, Volume= 69 cf, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
646,242	30	Woods, Good, HSG A
67,899	68	<50% Grass cover, Poor, HSG A
33,279	30	Meadow, non-grazed, HSG A
747,420	33	Weighted Average
747,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
38.2	810	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
43.9	860	Total			

Summary for Subcatchment PR-1C: Jenkins - entrance

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

Runoff = 2.12 cfs @ 12.08 hrs, Volume= 6,107 cf, Depth> 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
9,869	98	Paved roads w/curbs & sewers, HSG A
19,113	68	<50% Grass cover, Poor, HSG A
3,635	98	Roofs, HSG A
32,617	80	Weighted Average
19,113		58.60% Pervious Area
13,504		41.40% Impervious Area

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

Summary for Subcatchment PR-1D: Jenkins - Middle

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

Runoff = 7.02 cfs @ 12.08 hrs, Volume= 20,262 cf, Depth> 2.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
34,458	98	Paved roads w/curbs & sewers, HSG A
60,702	68	<50% Grass cover, Poor, HSG A
9,198	98	Roofs, HSG A
104,358	81	Weighted Average
60,702		58.17% Pervious Area
43,656		41.83% Impervious Area

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

Summary for Subcatchment PR-1E: Gratuity Rd - middle near entrance

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

Runoff = 2.86 cfs @ 12.08 hrs, Volume= 8,242 cf, Depth> 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
15,364	98	Paved roads w/curbs & sewers, HSG A
28,536	68	<50% Grass cover, Poor, HSG A
1,785	98	Roofs, HSG A
45,685	79	Weighted Average
28,536		62.46% Pervious Area
17,149		37.54% Impervious Area

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

Summary for Subcatchment PR-1F: Gratuity Rd - cul-de-sac

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

Runoff = 5.37 cfs @ 12.08 hrs, Volume= 15,545 cf, Depth> 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
27,603	98	Paved roads w/curbs & sewers, HSG A
42,235	68	<50% Grass cover, Poor, HSG A
7,414	98	Roofs, HSG A
77,252	82	Weighted Average
42,235		54.67% Pervious Area
35,017		45.33% Impervious Area

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

Summary for Subcatchment PR-1G: (new Subcat)

Runoff = 0.05 cfs @ 14.81 hrs, Volume= 1,016 cf, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
33,650	68	<50% Grass cover, Poor, HSG A
97,543	30	Woods, Good, HSG A
131,193	40	Weighted Average
131,193		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
8.3	250	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	300	Total			

Summary for Subcatchment PR-1H: (new Subcat)

Runoff = 0.05 cfs @ 13.93 hrs, Volume= 1,040 cf, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
29,892	68	<50% Grass cover, Poor, HSG A
77,876	30	Woods, Good, HSG A
107,768	41	Weighted Average
107,768		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
8.3	250	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	300	Total			

Summary for Subcatchment PR-1I:

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

Runoff = 0.17 cfs @ 12.11 hrs, Volume= 666 cf, Depth> 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
8,676	68	<50% Grass cover, Poor, HSG A
5,002	30	Woods, Good, HSG A
13,678	54	Weighted Average
13,678		100.00% Pervious Area

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

Summary for Subcatchment PR-1K:

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

Runoff = 0.02 cfs @ 12.42 hrs, Volume= 242 cf, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
5,678	68	<50% Grass cover, Poor, HSG A
11,311	30	Meadow, non-grazed, HSG A
16,989	43	Weighted Average
16,989		100.00% Pervious Area

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

Summary for Subcatchment PR-2: Gratuity Rd - entrance

Runoff = 0.74 cfs @ 12.15 hrs, Volume= 2,463 cf, Depth> 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
2,680	98	Paved roads w/curbs & sewers, HSG A
15,434	68	<50% Grass cover, Poor, HSG A
18,114	72	Weighted Average
15,434		85.20% Pervious Area
2,680		14.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.3	98	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	148	Total			

Summary for Subcatchment Unit 1: Unit A - Birch

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

Runoff = 0.18 cfs @ 12.07 hrs, Volume= 581 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 10: Unit C - Hickory

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

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 605 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 11: Unit B - Hemlock

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

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 603 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 12: Unit C - Hickory

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

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 605 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 2: Unit B - Hemlock

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

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 603 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 3: Unit C - Hickory

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

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 605 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 4: Unit A - Birch

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

Runoff = 0.18 cfs @ 12.07 hrs, Volume= 581 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 5: Unit B - Hemlock

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

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 603 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 6: Unit C - Hickory

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

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 605 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 7: Unit A - Birch

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

Runoff = 0.18 cfs @ 12.07 hrs, Volume= 581 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 8: Unit A - Birch

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

Runoff = 0.18 cfs @ 12.07 hrs, Volume= 581 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 9: Unit B - Hemlock

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

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 603 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.44"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Reach DP-1: Stream

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

Inflow Area = 1,694,481 sf, 0.11% Impervious, Inflow Depth > 0.00" for 10 Year event
Inflow = 0.02 cfs @ 20.00 hrs, Volume= 69 cf
Outflow = 0.02 cfs @ 20.00 hrs, Volume= 69 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: Gratuity Road

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

Inflow Area = 18,114 sf, 14.80% Impervious, Inflow Depth > 1.63" for 10 Year event
Inflow = 0.74 cfs @ 12.15 hrs, Volume= 2,463 cf
Outflow = 0.74 cfs @ 12.15 hrs, Volume= 2,463 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond DE-1: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,785 sf,100.00% Impervious, Inflow Depth > 3.91" for 10 Year event
Inflow = 0.18 cfs @ 12.07 hrs, Volume= 581 cf
Outflow = 0.07 cfs @ 11.95 hrs, Volume= 581 cf, Atten= 58%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.95 hrs, Volume= 581 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.39' @ 12.26 hrs Surf.Area= 0.009 ac Storage= 0.001 af

Plug-Flow detention time= 3.6 min calculated for 579 cf (100% of inflow)
Center-of-Mass det. time= 3.5 min (738.6 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88

2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.95 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-10: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area =	1,857 sf,100.00% Impervious,	Inflow Depth >	3.91"	for	10 Year event
Inflow =	0.19 cfs @	12.07 hrs, Volume=	605 cf		
Outflow =	0.07 cfs @	11.95 hrs, Volume=	605 cf,	Atten= 60%,	Lag= 0.0 min
Discarded =	0.07 cfs @	11.95 hrs, Volume=	605 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.43' @ 12.27 hrs Surf.Area= 0.009 ac Storage= 0.002 af

Plug-Flow detention time= 4.0 min calculated for 603 cf (100% of inflow)
Center-of-Mass det. time= 3.8 min (739.0 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.95 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-11: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,850 sf,100.00% Impervious, Inflow Depth > 3.91" for 10 Year event
Inflow = 0.19 cfs @ 12.07 hrs, Volume= 603 cf
Outflow = 0.07 cfs @ 11.90 hrs, Volume= 602 cf, Atten= 63%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.90 hrs, Volume= 602 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.52' @ 12.30 hrs Surf.Area= 0.008 ac Storage= 0.002 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.7 min (739.8 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 120.00'L x 2.00'H Prismatoid** 0.017 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.90 hrs HW=0.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-12: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,857 sf,100.00% Impervious, Inflow Depth > 3.91" for 10 Year event
Inflow = 0.19 cfs @ 12.07 hrs, Volume= 605 cf
Outflow = 0.07 cfs @ 11.95 hrs, Volume= 605 cf, Atten= 60%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.95 hrs, Volume= 605 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.43' @ 12.27 hrs Surf.Area= 0.009 ac Storage= 0.002 af

Plug-Flow detention time= 4.0 min calculated for 603 cf (100% of inflow)
Center-of-Mass det. time= 3.8 min (739.0 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.95 hrs HW=0.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-2: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area =	1,850 sf,100.00% Impervious,	Inflow Depth >	3.91"	for	10 Year event
Inflow =	0.19 cfs @	12.07 hrs, Volume=	603 cf		
Outflow =	0.06 cfs @	11.85 hrs, Volume=	602 cf,	Atten= 66%,	Lag= 0.0 min
Discarded =	0.06 cfs @	11.85 hrs, Volume=	602 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.64' @ 12.33 hrs Surf.Area= 0.008 ac Storage= 0.002 af

Plug-Flow detention time= 6.1 min calculated for 600 cf (100% of inflow)
Center-of-Mass det. time= 5.9 min (741.0 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 110.00'L x 2.00'H Prismatoid**
			0.015 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.85 hrs HW=0.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-3: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area =	1,857 sf,	100.00% Impervious,	Inflow Depth >	3.91"	for 10 Year event
Inflow =	0.19 cfs @	12.07 hrs,	Volume=	605 cf	
Outflow =	0.07 cfs @	11.90 hrs,	Volume=	605 cf,	Atten= 65%, Lag= 0.0 min
Discarded =	0.07 cfs @	11.90 hrs,	Volume=	605 cf	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.58' @ 12.32 hrs Surf.Area= 0.008 ac Storage= 0.002 af

Plug-Flow detention time= 5.5 min calculated for 603 cf (100% of inflow)
Center-of-Mass det. time= 5.3 min (740.4 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 115.00'L x 2.00'H Prismatoid** 0.016 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.90 hrs HW=0.03' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-4: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,785 sf,	100.00% Impervious,	Inflow Depth >	3.91"	for 10 Year event
Inflow =	0.18 cfs @	12.07 hrs,	Volume=	581 cf	
Outflow =	0.06 cfs @	11.85 hrs,	Volume=	581 cf,	Atten= 68%, Lag= 0.0 min
Discarded =	0.06 cfs @	11.85 hrs,	Volume=	581 cf	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.73' @ 12.36 hrs Surf.Area= 0.007 ac Storage= 0.002 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 6.9 min (742.0 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 100.00'L x 2.00'H Prismatoid** 0.014 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.85 hrs HW=0.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-5: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area =	1,850 sf,100.00% Impervious,	Inflow Depth >	3.91"	for 10 Year event	
Inflow =	0.19 cfs @	12.07 hrs, Volume=	603 cf		
Outflow =	0.07 cfs @	11.90 hrs, Volume=	602 cf,	Atten= 63%,	Lag= 0.0 min
Discarded =	0.07 cfs @	11.90 hrs, Volume=	602 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.52' @ 12.30 hrs Surf.Area= 0.008 ac Storage= 0.002 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.7 min (739.8 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 120.00'L x 2.00'H Prismatoid** 0.017 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.90 hrs HW=0.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-6: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area =	1,857 sf,	100.00% Impervious,	Inflow Depth >	3.91"	for 10 Year event
Inflow =	0.19 cfs @	12.07 hrs,	Volume=	605 cf	
Outflow =	0.07 cfs @	11.95 hrs,	Volume=	605 cf,	Atten= 60%, Lag= 0.0 min
Discarded =	0.07 cfs @	11.95 hrs,	Volume=	605 cf	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.43' @ 12.27 hrs Surf.Area= 0.009 ac Storage= 0.002 af

Plug-Flow detention time= 4.0 min calculated for 603 cf (100% of inflow)
Center-of-Mass det. time= 3.8 min (739.0 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.95 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-7: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,785 sf,100.00% Impervious, Inflow Depth > 3.91" for 10 Year event
Inflow = 0.18 cfs @ 12.07 hrs, Volume= 581 cf
Outflow = 0.06 cfs @ 11.90 hrs, Volume= 581 cf, Atten= 65%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.90 hrs, Volume= 581 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.59' @ 12.32 hrs Surf.Area= 0.008 ac Storage= 0.002 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 5.3 min (740.5 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 110.00'L x 2.00'H Prismatoid** 0.015 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.90 hrs HW=0.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-8: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,785 sf,100.00% Impervious, Inflow Depth > 3.91" for 10 Year event
Inflow = 0.18 cfs @ 12.07 hrs, Volume= 581 cf
Outflow = 0.07 cfs @ 11.95 hrs, Volume= 581 cf, Atten= 58%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.95 hrs, Volume= 581 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.39' @ 12.26 hrs Surf.Area= 0.009 ac Storage= 0.001 af

Plug-Flow detention time= 3.6 min calculated for 579 cf (100% of inflow)
Center-of-Mass det. time= 3.5 min (738.6 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.95 hrs HW=0.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-9: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,850 sf,100.00% Impervious,	Inflow Depth >	3.91"	for	10 Year event
Inflow =	0.19 cfs @ 12.07 hrs,	Volume=	603 cf		
Outflow =	0.06 cfs @ 11.85 hrs,	Volume=	602 cf,	Atten= 68%,	Lag= 0.0 min
Discarded =	0.06 cfs @ 11.85 hrs,	Volume=	602 cf		
Primary =	0.00 cfs @ 5.00 hrs,	Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.76' @ 12.36 hrs Surf.Area= 0.007 ac Storage= 0.002 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 7.1 min (742.3 - 735.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 102.00'L x 2.00'H Prismatoid**
			0.014 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.85 hrs HW=0.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond GD-1: Ground Depression

Inflow Area = 131,193 sf, 0.00% Impervious, Inflow Depth > 0.09" for 10 Year event
Inflow = 0.05 cfs @ 14.81 hrs, Volume= 1,016 cf
Outflow = 0.05 cfs @ 14.81 hrs, Volume= 1,015 cf, Atten= 0%, Lag= 0.3 min
Discarded = 0.05 cfs @ 14.81 hrs, Volume= 1,015 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 211.60' @ 14.81 hrs Surf.Area= 1,533 sf Storage= 1 cf

Plug-Flow detention time= 0.3 min calculated for 1,015 cf (100% of inflow)
Center-of-Mass det. time= 0.2 min (962.7 - 962.4)

Volume	Invert	Avail.Storage	Storage Description
#1	211.60'	2,903 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.60	1,514	0	0
212.00	13,000	2,903	2,903

Device	Routing	Invert	Outlet Devices
#1	Discarded	211.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.29 cfs @ 14.81 hrs HW=211.60' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Summary for Pond GD-2: Ground Depression

Inflow Area = 107,768 sf, 0.00% Impervious, Inflow Depth > 0.12" for 10 Year event
Inflow = 0.05 cfs @ 13.93 hrs, Volume= 1,040 cf
Outflow = 0.05 cfs @ 13.95 hrs, Volume= 1,039 cf, Atten= 0%, Lag= 0.7 min
Discarded = 0.05 cfs @ 13.95 hrs, Volume= 1,039 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 210.60' @ 13.95 hrs Surf.Area= 575 sf Storage= 2 cf

Plug-Flow detention time= 0.7 min calculated for 1,039 cf (100% of inflow)
Center-of-Mass det. time= 0.5 min (950.0 - 949.5)

Volume	Invert	Avail.Storage	Storage Description
#1	210.60'	3,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
210.60	550	0	0
211.00	2,998	710	710
211.50	8,352	2,838	3,547

Device	Routing	Invert	Outlet Devices
#1	Discarded	210.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.11 cfs @ 13.95 hrs HW=210.60' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.11 cfs)

Summary for Pond GD-3: Ground Depression

Inflow Area = 13,678 sf, 0.00% Impervious, Inflow Depth > 0.58" for 10 Year event
Inflow = 0.17 cfs @ 12.11 hrs, Volume= 666 cf
Outflow = 0.09 cfs @ 12.41 hrs, Volume= 666 cf, Atten= 47%, Lag= 18.1 min
Discarded = 0.09 cfs @ 12.41 hrs, Volume= 666 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 213.75' @ 12.41 hrs Surf.Area= 469 sf Storage= 61 cf

Plug-Flow detention time= 3.6 min calculated for 666 cf (100% of inflow)
Center-of-Mass det. time= 3.4 min (855.9 - 852.5)

Volume	Invert	Avail.Storage	Storage Description
#1	213.60'	919 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.60	355	0	0
214.00	660	203	203
214.50	2,205	716	919

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 12.41 hrs HW=213.75' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.09 cfs)

Summary for Pond GD-4: Ground Depression

Inflow Area = 16,989 sf, 0.00% Impervious, Inflow Depth > 0.17" for 10 Year event
Inflow = 0.02 cfs @ 12.42 hrs, Volume= 242 cf
Outflow = 0.02 cfs @ 12.42 hrs, Volume= 242 cf, Atten= 0%, Lag= 0.3 min
Discarded = 0.02 cfs @ 12.42 hrs, Volume= 242 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 213.60' @ 12.42 hrs Surf.Area= 551 sf Storage= 0 cf

Plug-Flow detention time= 0.3 min calculated for 242 cf (100% of inflow)
Center-of-Mass det. time= 0.2 min (916.3 - 916.1)

Volume	Invert	Avail.Storage	Storage Description
#1	213.60'	363 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.60	550	0	0
214.00	1,263	363	363

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.11 cfs @ 12.42 hrs HW=213.60' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.11 cfs)

Summary for Pond IB-1: Infiltration Basin #1

Inflow Area = 32,617 sf, 41.40% Impervious, Inflow Depth > 2.25" for 10 Year event
Inflow = 2.12 cfs @ 12.08 hrs, Volume= 6,107 cf
Outflow = 0.89 cfs @ 12.30 hrs, Volume= 6,103 cf, Atten= 58%, Lag= 13.5 min
Discarded = 0.89 cfs @ 12.30 hrs, Volume= 6,103 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 211.18' @ 12.30 hrs Surf.Area= 4,648 sf Storage= 802 cf

Plug-Flow detention time= 5.3 min calculated for 6,103 cf (100% of inflow)
Center-of-Mass det. time= 5.1 min (795.5 - 790.5)

Volume	Invert	Avail.Storage	Storage Description
#1	211.00'	11,236 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.00	4,480	0	0
212.00	5,436	4,958	4,958
213.00	7,119	6,278	11,236

Device	Routing	Invert	Outlet Devices
#1	Primary	212.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	211.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.89 cfs @ 12.30 hrs HW=211.18' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.89 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=211.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond IB-2: Infiltration Basin #2

Inflow Area = 104,358 sf, 41.83% Impervious, Inflow Depth > 2.33" for 10 Year event
Inflow = 7.02 cfs @ 12.08 hrs, Volume= 20,262 cf
Outflow = 1.65 cfs @ 12.49 hrs, Volume= 20,243 cf, Atten= 77%, Lag= 24.6 min
Discarded = 1.65 cfs @ 12.49 hrs, Volume= 20,243 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 212.62' @ 12.49 hrs Surf.Area= 8,605 sf Storage= 5,132 cf

Plug-Flow detention time= 20.0 min calculated for 20,243 cf (100% of inflow)
Center-of-Mass det. time= 19.6 min (807.8 - 788.2)

Volume	Invert	Avail.Storage	Storage Description
#1	212.00'	28,939 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
212.00	7,901	0	0
213.00	9,033	8,467	8,467
214.00	10,222	9,628	18,095
215.00	11,467	10,845	28,939

Device	Routing	Invert	Outlet Devices
#1	Discarded	212.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	214.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.65 cfs @ 12.49 hrs HW=212.62' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.65 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=212.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond IB-3: Infiltration Basin #3

Inflow Area = 45,685 sf, 37.54% Impervious, Inflow Depth > 2.17" for 10 Year event
Inflow = 2.86 cfs @ 12.08 hrs, Volume= 8,242 cf
Outflow = 1.28 cfs @ 12.28 hrs, Volume= 8,237 cf, Atten= 55%, Lag= 12.1 min
Discarded = 1.28 cfs @ 12.28 hrs, Volume= 8,237 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 213.65' @ 12.28 hrs Surf.Area= 6,673 sf Storage= 996 cf

Plug-Flow detention time= 4.7 min calculated for 8,210 cf (100% of inflow)
Center-of-Mass det. time= 4.4 min (797.1 - 792.7)

Volume	Invert	Avail.Storage	Storage Description
#1	213.50'	15,681 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.50	6,490	0	0
214.00	7,094	3,396	3,396
214.50	7,710	3,701	7,097
215.00	8,343	4,013	11,110
215.50	9,940	4,571	15,681

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	214.50'	**5.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=1.28 cfs @ 12.28 hrs HW=213.65' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.28 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=213.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond IB-4: Infiltration Basin #4

Inflow Area = 77,252 sf, 45.33% Impervious, Inflow Depth > 2.41" for 10 Year event
Inflow = 5.37 cfs @ 12.08 hrs, Volume= 15,545 cf
Outflow = 1.41 cfs @ 12.46 hrs, Volume= 15,533 cf, Atten= 74%, Lag= 22.8 min
Discarded = 1.41 cfs @ 12.46 hrs, Volume= 15,533 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 212.00' @ 12.46 hrs Surf.Area= 7,368 sf Storage= 3,541 cf

Plug-Flow detention time= 15.3 min calculated for 15,533 cf (100% of inflow)
Center-of-Mass det. time= 15.0 min (800.8 - 785.8)

Volume	Invert	Avail.Storage	Storage Description
#1	211.50'	21,638 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.50	6,864	0	0
212.00	7,370	3,559	3,559
213.00	9,144	8,257	11,816
214.00	10,501	9,823	21,638

Device	Routing	Invert	Outlet Devices
#1	Discarded	211.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	213.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.41 cfs @ 12.46 hrs HW=212.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.41 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=211.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 PR-1A: South of stream Runoff Area=947,061 sf 0.21% Impervious Runoff Depth>0.04"
Flow Length=1,035' Slope=0.0020 '/' Tc=104.9 min CN=32 Runoff=0.19 cfs 3,102 cf

Subcatchment PR-1B: North of stream Runoff Area=747,420 sf 0.00% Impervious Runoff Depth>0.07"
Flow Length=860' Tc=43.9 min CN=33 Runoff=0.23 cfs 4,182 cf

Subcatchment PR-1C: Jenkins - entrance Runoff Area=32,617 sf 41.40% Impervious Runoff Depth>3.16"
Tc=5.0 min CN=80 Runoff=2.96 cfs 8,597 cf

Subcatchment PR-1D: Jenkins - Middle Runoff Area=104,358 sf 41.83% Impervious Runoff Depth>3.26"
Tc=5.0 min CN=81 Runoff=9.72 cfs 28,339 cf

Subcatchment PR-1E: Gratuity Rd - middle Runoff Area=45,685 sf 37.54% Impervious Runoff Depth>3.07"
Tc=5.0 min CN=79 Runoff=4.03 cfs 11,681 cf

Subcatchment PR-1F: Gratuity Rd - Runoff Area=77,252 sf 45.33% Impervious Runoff Depth>3.36"
Tc=5.0 min CN=82 Runoff=7.43 cfs 21,602 cf

Subcatchment PR-1G: (new Subcat) Runoff Area=131,193 sf 0.00% Impervious Runoff Depth>0.30"
Flow Length=300' Slope=0.0100 '/' Tc=24.8 min CN=40 Runoff=0.31 cfs 3,302 cf

Subcatchment PR-1H: (new Subcat) Runoff Area=107,768 sf 0.00% Impervious Runoff Depth>0.34"
Flow Length=300' Slope=0.0100 '/' Tc=24.8 min CN=41 Runoff=0.32 cfs 3,097 cf

Subcatchment PR-1I: Runoff Area=13,678 sf 0.00% Impervious Runoff Depth>1.07"
Tc=5.0 min CN=54 Runoff=0.37 cfs 1,221 cf

Subcatchment PR-1K: Runoff Area=16,989 sf 0.00% Impervious Runoff Depth>0.44"
Tc=5.0 min CN=43 Runoff=0.09 cfs 628 cf

Subcatchment PR-2: Gratuity Rd - entrance Runoff Area=18,114 sf 14.80% Impervious Runoff Depth>2.43"
Flow Length=148' Slope=0.0100 '/' Tc=9.8 min CN=72 Runoff=1.11 cfs 3,673 cf

Subcatchment Unit 1: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.22 cfs 732 cf

Subcatchment Unit 10: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.23 cfs 761 cf

Subcatchment Unit 11: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.23 cfs 758 cf

Subcatchment Unit 12: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.23 cfs 761 cf

Subcatchment Unit 2: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.23 cfs 758 cf

Subcatchment Unit 3: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.23 cfs 761 cf

Subcatchment Unit 4: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.22 cfs 732 cf

Subcatchment Unit 5: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.23 cfs 758 cf

Subcatchment Unit 6: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.23 cfs 761 cf

Subcatchment Unit 7: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.22 cfs 732 cf

Subcatchment Unit 8: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.22 cfs 732 cf

Subcatchment Unit 9: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>4.92"
Tc=5.0 min CN=98 Runoff=0.23 cfs 758 cf

Reach DP-1: Stream Inflow=0.39 cfs 7,285 cf
Outflow=0.39 cfs 7,285 cf

Reach DP-2: Gratuity Road Inflow=1.11 cfs 3,673 cf
Outflow=1.11 cfs 3,673 cf

Pond DE-1: Drip Edge Peak Elev=0.68' Storage=0.002 af Inflow=0.22 cfs 732 cf
Discarded=0.07 cfs 732 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 732 cf

Pond DE-10: Drip Edge Peak Elev=0.74' Storage=0.003 af Inflow=0.23 cfs 761 cf
Discarded=0.07 cfs 761 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 761 cf

Pond DE-11: Drip Edge Peak Elev=0.88' Storage=0.003 af Inflow=0.23 cfs 758 cf
Discarded=0.07 cfs 758 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 758 cf

Pond DE-12: Drip Edge Peak Elev=0.74' Storage=0.003 af Inflow=0.23 cfs 761 cf
Discarded=0.07 cfs 761 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 761 cf

Pond DE-2: Drip Edge Peak Elev=1.05' Storage=0.003 af Inflow=0.23 cfs 758 cf
Discarded=0.06 cfs 758 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 758 cf

Pond DE-3: Drip Edge Peak Elev=0.97' Storage=0.003 af Inflow=0.23 cfs 761 cf
Discarded=0.07 cfs 761 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 761 cf

Pond DE-4: Drip Edge Peak Elev=1.19' Storage=0.003 af Inflow=0.22 cfs 732 cf
Discarded=0.06 cfs 732 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 732 cf

Pond DE-5: Drip Edge Peak Elev=0.88' Storage=0.003 af Inflow=0.23 cfs 758 cf
Discarded=0.07 cfs 758 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 758 cf

Pond DE-6: Drip Edge Peak Elev=0.74' Storage=0.003 af Inflow=0.23 cfs 761 cf
Discarded=0.07 cfs 761 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 761 cf

Pond DE-7: Drip Edge Peak Elev=0.98' Storage=0.003 af Inflow=0.22 cfs 732 cf
Discarded=0.06 cfs 732 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 732 cf

Pond DE-8: Drip Edge Peak Elev=0.68' Storage=0.002 af Inflow=0.22 cfs 732 cf
Discarded=0.07 cfs 732 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 732 cf

Pond DE-9: Drip Edge Peak Elev=1.23' Storage=0.003 af Inflow=0.23 cfs 758 cf
Discarded=0.06 cfs 758 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 758 cf

Pond GD-1: Ground Depression Peak Elev=211.60' Storage=6 cf Inflow=0.31 cfs 3,302 cf
Outflow=0.31 cfs 3,301 cf

Pond GD-2: Ground Depression Peak Elev=210.73' Storage=129 cf Inflow=0.32 cfs 3,097 cf
Outflow=0.26 cfs 3,095 cf

Pond GD-3: Ground Depression Peak Elev=214.03' Storage=224 cf Inflow=0.37 cfs 1,221 cf
Outflow=0.14 cfs 1,221 cf

Pond GD-4: Ground Depression Peak Elev=213.60' Storage=2 cf Inflow=0.09 cfs 628 cf
Outflow=0.09 cfs 628 cf

Pond IB-1: Infiltration Basin #1 Peak Elev=211.35' Storage=1,631 cf Inflow=2.96 cfs 8,597 cf
Discarded=0.92 cfs 8,592 cf Primary=0.00 cfs 0 cf Outflow=0.92 cfs 8,592 cf

Pond IB-2: Infiltration Basin #2 Peak Elev=213.02' Storage=8,680 cf Inflow=9.72 cfs 28,339 cf
Discarded=1.73 cfs 28,314 cf Primary=0.00 cfs 0 cf Outflow=1.73 cfs 28,314 cf

Pond IB-3: Infiltration Basin #3 Peak Elev=213.81' Storage=2,100 cf Inflow=4.03 cfs 11,681 cf
Discarded=1.32 cfs 11,674 cf Primary=0.00 cfs 0 cf Outflow=1.32 cfs 11,674 cf

Pond IB-4: Infiltration Basin #4 Peak Elev=212.33' Storage=6,059 cf Inflow=7.43 cfs 21,602 cf
Discarded=1.52 cfs 21,587 cf Primary=0.00 cfs 0 cf Outflow=1.52 cfs 21,587 cf

Total Runoff Area = 2,264,103 sf Runoff Volume = 98,430 cf Average Runoff Depth = 0.52"
94.00% Pervious = 2,128,182 sf 6.00% Impervious = 135,921 sf

Summary for Subcatchment PR-1A: South of stream

Runoff = 0.19 cfs @ 17.35 hrs, Volume= 3,102 cf, Depth> 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
897,676	30	Woods, Good, HSG A
47,438	68	<50% Grass cover, Poor, HSG A
1,947	98	Paved parking, HSG A
947,061	32	Weighted Average
945,114		99.79% Pervious Area
1,947		0.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	50	0.0020	0.03		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
73.4	985	0.0020	0.22		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
104.9	1,035	Total			

Summary for Subcatchment PR-1B: North of stream

Runoff = 0.23 cfs @ 15.64 hrs, Volume= 4,182 cf, Depth> 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
646,242	30	Woods, Good, HSG A
67,899	68	<50% Grass cover, Poor, HSG A
33,279	30	Meadow, non-grazed, HSG A
747,420	33	Weighted Average
747,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
38.2	810	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
43.9	860	Total			

Summary for Subcatchment PR-1C: Jenkins - entrance

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

Runoff = 2.96 cfs @ 12.08 hrs, Volume= 8,597 cf, Depth> 3.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
9,869	98	Paved roads w/curbs & sewers, HSG A
19,113	68	<50% Grass cover, Poor, HSG A
3,635	98	Roofs, HSG A
32,617	80	Weighted Average
19,113		58.60% Pervious Area
13,504		41.40% Impervious Area

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

Summary for Subcatchment PR-1D: Jenkins - Middle

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

Runoff = 9.72 cfs @ 12.08 hrs, Volume= 28,339 cf, Depth> 3.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
34,458	98	Paved roads w/curbs & sewers, HSG A
60,702	68	<50% Grass cover, Poor, HSG A
9,198	98	Roofs, HSG A
104,358	81	Weighted Average
60,702		58.17% Pervious Area
43,656		41.83% Impervious Area

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

Summary for Subcatchment PR-1E: Gratuity Rd - middle near entrance

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

Runoff = 4.03 cfs @ 12.08 hrs, Volume= 11,681 cf, Depth> 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
15,364	98	Paved roads w/curbs & sewers, HSG A
28,536	68	<50% Grass cover, Poor, HSG A
1,785	98	Roofs, HSG A
45,685	79	Weighted Average
28,536		62.46% Pervious Area
17,149		37.54% Impervious Area

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

Summary for Subcatchment PR-1F: Gratuity Rd - cul-de-sac

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

Runoff = 7.43 cfs @ 12.07 hrs, Volume= 21,602 cf, Depth> 3.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
27,603	98	Paved roads w/curbs & sewers, HSG A
42,235	68	<50% Grass cover, Poor, HSG A
7,414	98	Roofs, HSG A
77,252	82	Weighted Average
42,235		54.67% Pervious Area
35,017		45.33% Impervious Area

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

Summary for Subcatchment PR-1G: (new Subcat)

Runoff = 0.31 cfs @ 12.65 hrs, Volume= 3,302 cf, Depth> 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
33,650	68	<50% Grass cover, Poor, HSG A
97,543	30	Woods, Good, HSG A
131,193	40	Weighted Average
131,193		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
8.3	250	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	300	Total			

Summary for Subcatchment PR-1H: (new Subcat)

Runoff = 0.32 cfs @ 12.62 hrs, Volume= 3,097 cf, Depth> 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
29,892	68	<50% Grass cover, Poor, HSG A
77,876	30	Woods, Good, HSG A
107,768	41	Weighted Average
107,768		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
8.3	250	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	300	Total			

Summary for Subcatchment PR-1I:

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

Runoff = 0.37 cfs @ 12.10 hrs, Volume= 1,221 cf, Depth> 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
8,676	68	<50% Grass cover, Poor, HSG A
5,002	30	Woods, Good, HSG A
13,678	54	Weighted Average
13,678		100.00% Pervious Area

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

Summary for Subcatchment PR-1K:

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

Runoff = 0.09 cfs @ 12.27 hrs, Volume= 628 cf, Depth> 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
5,678	68	<50% Grass cover, Poor, HSG A
11,311	30	Meadow, non-grazed, HSG A
16,989	43	Weighted Average
16,989		100.00% Pervious Area

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

Summary for Subcatchment PR-2: Gratuity Rd - entrance

Runoff = 1.11 cfs @ 12.14 hrs, Volume= 3,673 cf, Depth> 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
2,680	98	Paved roads w/curbs & sewers, HSG A
15,434	68	<50% Grass cover, Poor, HSG A
18,114	72	Weighted Average
15,434		85.20% Pervious Area
2,680		14.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.3	98	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	148	Total			

Summary for Subcatchment Unit 1: Unit A - Birch

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

Runoff = 0.22 cfs @ 12.07 hrs, Volume= 732 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 10: Unit C - Hickory

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

Runoff = 0.23 cfs @ 12.07 hrs, Volume= 761 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 11: Unit B - Hemlock

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

Runoff = 0.23 cfs @ 12.07 hrs, Volume= 758 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 12: Unit C - Hickory

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

Runoff = 0.23 cfs @ 12.07 hrs, Volume= 761 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 2: Unit B - Hemlock

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

Runoff = 0.23 cfs @ 12.07 hrs, Volume= 758 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 3: Unit C - Hickory

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

Runoff = 0.23 cfs @ 12.07 hrs, Volume= 761 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 4: Unit A - Birch

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

Runoff = 0.22 cfs @ 12.07 hrs, Volume= 732 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 5: Unit B - Hemlock

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

Runoff = 0.23 cfs @ 12.07 hrs, Volume= 758 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 6: Unit C - Hickory

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

Runoff = 0.23 cfs @ 12.07 hrs, Volume= 761 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 7: Unit A - Birch

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

Runoff = 0.22 cfs @ 12.07 hrs, Volume= 732 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 8: Unit A - Birch

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

Runoff = 0.22 cfs @ 12.07 hrs, Volume= 732 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 9: Unit B - Hemlock

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

Runoff = 0.23 cfs @ 12.07 hrs, Volume= 758 cf, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=5.55"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Reach DP-1: Stream

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

Inflow Area = 1,694,481 sf, 0.11% Impervious, Inflow Depth > 0.05" for 25 Year event
Inflow = 0.39 cfs @ 16.45 hrs, Volume= 7,285 cf
Outflow = 0.39 cfs @ 16.45 hrs, Volume= 7,285 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: Gratuity Road

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

Inflow Area = 18,114 sf, 14.80% Impervious, Inflow Depth > 2.43" for 25 Year event
Inflow = 1.11 cfs @ 12.14 hrs, Volume= 3,673 cf
Outflow = 1.11 cfs @ 12.14 hrs, Volume= 3,673 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond DE-1: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,785 sf,100.00% Impervious, Inflow Depth > 4.92" for 25 Year event
Inflow = 0.22 cfs @ 12.07 hrs, Volume= 732 cf
Outflow = 0.07 cfs @ 11.85 hrs, Volume= 732 cf, Atten= 67%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.85 hrs, Volume= 732 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.68' @ 12.34 hrs Surf.Area= 0.009 ac Storage= 0.002 af

Plug-Flow detention time= 6.4 min calculated for 732 cf (100% of inflow)
Center-of-Mass det. time= 6.2 min (740.0 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88

2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.85 hrs HW=0.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-10: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,857 sf,100.00% Impervious,	Inflow Depth >	4.92"	for 25 Year event	
Inflow =	0.23 cfs @	12.07 hrs, Volume=	761 cf		
Outflow =	0.07 cfs @	11.85 hrs, Volume=	761 cf,	Atten= 68%,	Lag= 0.0 min
Discarded =	0.07 cfs @	11.85 hrs, Volume=	761 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.74' @ 12.36 hrs Surf.Area= 0.009 ac Storage= 0.003 af

Plug-Flow detention time= 7.1 min calculated for 761 cf (100% of inflow)
Center-of-Mass det. time= 6.9 min (740.7 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.85 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-11: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,850 sf,100.00% Impervious, Inflow Depth > 4.92" for 25 Year event
Inflow = 0.23 cfs @ 12.07 hrs, Volume= 758 cf
Outflow = 0.07 cfs @ 11.80 hrs, Volume= 758 cf, Atten= 70%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.80 hrs, Volume= 758 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.88' @ 12.38 hrs Surf.Area= 0.008 ac Storage= 0.003 af

Plug-Flow detention time= 8.5 min calculated for 756 cf (100% of inflow)
Center-of-Mass det. time= 8.3 min (742.1 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 120.00'L x 2.00'H Prismatoid** 0.017 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.80 hrs HW=0.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-12: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 1,857 sf,100.00% Impervious, Inflow Depth > 4.92" for 25 Year event
Inflow = 0.23 cfs @ 12.07 hrs, Volume= 761 cf
Outflow = 0.07 cfs @ 11.85 hrs, Volume= 761 cf, Atten= 68%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.85 hrs, Volume= 761 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.74' @ 12.36 hrs Surf.Area= 0.009 ac Storage= 0.003 af

Plug-Flow detention time= 7.1 min calculated for 761 cf (100% of inflow)
Center-of-Mass det. time= 6.9 min (740.7 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.85 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-2: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,850 sf,100.00% Impervious,	Inflow Depth >	4.92"	for 25 Year event	
Inflow =	0.23 cfs @	12.07 hrs, Volume=	758 cf		
Outflow =	0.06 cfs @	11.80 hrs, Volume=	758 cf,	Atten= 73%,	Lag= 0.0 min
Discarded =	0.06 cfs @	11.80 hrs, Volume=	758 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.05' @ 12.41 hrs Surf.Area= 0.008 ac Storage= 0.003 af

Plug-Flow detention time= 10.4 min calculated for 756 cf (100% of inflow)
Center-of-Mass det. time= 10.3 min (744.1 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 110.00'L x 2.00'H Prismatoid** 0.015 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.80 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-3: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,857 sf,100.00% Impervious,	Inflow Depth >	4.92"	for 25 Year event	
Inflow =	0.23 cfs @	12.07 hrs, Volume=	761 cf		
Outflow =	0.07 cfs @	11.80 hrs, Volume=	761 cf,	Atten= 72%,	Lag= 0.0 min
Discarded =	0.07 cfs @	11.80 hrs, Volume=	761 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.97' @ 12.40 hrs Surf.Area= 0.008 ac Storage= 0.003 af

Plug-Flow detention time= 9.5 min calculated for 759 cf (100% of inflow)
Center-of-Mass det. time= 9.3 min (743.1 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 115.00'L x 2.00'H Prismatoid** 0.016 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.80 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-4: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 1,785 sf,100.00% Impervious, Inflow Depth > 4.92" for 25 Year event
Inflow = 0.22 cfs @ 12.07 hrs, Volume= 732 cf
Outflow = 0.06 cfs @ 11.75 hrs, Volume= 732 cf, Atten= 74%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.75 hrs, Volume= 732 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.19' @ 12.43 hrs Surf.Area= 0.007 ac Storage= 0.003 af

Plug-Flow detention time= 12.0 min calculated for 732 cf (100% of inflow)
Center-of-Mass det. time= 11.8 min (745.6 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 100.00'L x 2.00'H Prismatoid** 0.014 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.75 hrs HW=0.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-5: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,850 sf,100.00% Impervious, Inflow Depth > 4.92" for 25 Year event
Inflow = 0.23 cfs @ 12.07 hrs, Volume= 758 cf
Outflow = 0.07 cfs @ 11.80 hrs, Volume= 758 cf, Atten= 70%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.80 hrs, Volume= 758 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.88' @ 12.38 hrs Surf.Area= 0.008 ac Storage= 0.003 af

Plug-Flow detention time= 8.5 min calculated for 756 cf (100% of inflow)
Center-of-Mass det. time= 8.3 min (742.1 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 120.00'L x 2.00'H Prismatoid** 0.017 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.80 hrs HW=0.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-6: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,857 sf,100.00% Impervious,	Inflow Depth >	4.92"	for 25 Year event	
Inflow =	0.23 cfs @	12.07 hrs, Volume=	761 cf		
Outflow =	0.07 cfs @	11.85 hrs, Volume=	761 cf,	Atten= 68%,	Lag= 0.0 min
Discarded =	0.07 cfs @	11.85 hrs, Volume=	761 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.74' @ 12.36 hrs Surf.Area= 0.009 ac Storage= 0.003 af

Plug-Flow detention time= 7.1 min calculated for 761 cf (100% of inflow)
Center-of-Mass det. time= 6.9 min (740.7 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid**
			0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50
			Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.85 hrs HW=0.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-7: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,785 sf,	100.00% Impervious,	Inflow Depth >	4.92"	for 25 Year event
Inflow =	0.22 cfs @	12.07 hrs,	Volume=	732 cf	
Outflow =	0.06 cfs @	11.80 hrs,	Volume=	732 cf,	Atten= 72%, Lag= 0.0 min
Discarded =	0.06 cfs @	11.80 hrs,	Volume=	732 cf	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.98' @ 12.40 hrs Surf.Area= 0.008 ac Storage= 0.003 af

Plug-Flow detention time= 9.6 min calculated for 732 cf (100% of inflow)
Center-of-Mass det. time= 9.4 min (743.2 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 110.00'L x 2.00'H Prismatoid** 0.015 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.80 hrs HW=0.03' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-8: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area =	1,785 sf,	100.00% Impervious,	Inflow Depth >	4.92"	for 25 Year event
Inflow =	0.22 cfs @	12.07 hrs,	Volume=	732 cf	
Outflow =	0.07 cfs @	11.85 hrs,	Volume=	732 cf,	Atten= 67%, Lag= 0.0 min
Discarded =	0.07 cfs @	11.85 hrs,	Volume=	732 cf	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.68' @ 12.34 hrs Surf.Area= 0.009 ac Storage= 0.002 af

Plug-Flow detention time= 6.4 min calculated for 732 cf (100% of inflow)

Center-of-Mass det. time= 6.2 min (740.0 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.85 hrs HW=0.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-9: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,850 sf,	100.00% Impervious,	Inflow Depth >	4.92"	for 25 Year event
Inflow =	0.23 cfs @	12.07 hrs, Volume=	758 cf		
Outflow =	0.06 cfs @	11.75 hrs, Volume=	758 cf,	Atten= 75%,	Lag= 0.0 min
Discarded =	0.06 cfs @	11.75 hrs, Volume=	758 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.23' @ 12.43 hrs Surf.Area= 0.007 ac Storage= 0.003 af

Plug-Flow detention time= 12.4 min calculated for 758 cf (100% of inflow)
Center-of-Mass det. time= 12.3 min (746.1 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 102.00'L x 2.00'H Prismatoid** 0.014 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.75 hrs HW=0.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond GD-1: Ground Depression

Inflow Area = 131,193 sf, 0.00% Impervious, Inflow Depth > 0.30" for 25 Year event
Inflow = 0.31 cfs @ 12.65 hrs, Volume= 3,302 cf
Outflow = 0.31 cfs @ 12.65 hrs, Volume= 3,301 cf, Atten= 0%, Lag= 0.3 min
Discarded = 0.31 cfs @ 12.65 hrs, Volume= 3,301 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 211.60' @ 12.65 hrs Surf.Area= 1,628 sf Storage= 6 cf

Plug-Flow detention time= 0.3 min calculated for 3,290 cf (100% of inflow)
Center-of-Mass det. time= 0.2 min (908.6 - 908.3)

Volume	Invert	Avail.Storage	Storage Description
#1	211.60'	2,903 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.60	1,514	0	0
212.00	13,000	2,903	2,903

Device	Routing	Invert	Outlet Devices
#1	Discarded	211.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.31 cfs @ 12.65 hrs HW=211.60' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.31 cfs)

Summary for Pond GD-2: Ground Depression

Inflow Area = 107,768 sf, 0.00% Impervious, Inflow Depth > 0.34" for 25 Year event
Inflow = 0.32 cfs @ 12.62 hrs, Volume= 3,097 cf
Outflow = 0.26 cfs @ 12.84 hrs, Volume= 3,095 cf, Atten= 19%, Lag= 13.3 min
Discarded = 0.26 cfs @ 12.84 hrs, Volume= 3,095 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 210.73' @ 12.84 hrs Surf.Area= 1,373 sf Storage= 129 cf

Plug-Flow detention time= 3.0 min calculated for 3,085 cf (100% of inflow)
Center-of-Mass det. time= 2.8 min (904.2 - 901.4)

Volume	Invert	Avail.Storage	Storage Description
#1	210.60'	3,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
210.60	550	0	0
211.00	2,998	710	710
211.50	8,352	2,838	3,547

Device	Routing	Invert	Outlet Devices
#1	Discarded	210.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.26 cfs @ 12.84 hrs HW=210.73' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.26 cfs)

Summary for Pond GD-3: Ground Depression

Inflow Area = 13,678 sf, 0.00% Impervious, Inflow Depth > 1.07" for 25 Year event
Inflow = 0.37 cfs @ 12.10 hrs, Volume= 1,221 cf
Outflow = 0.14 cfs @ 12.45 hrs, Volume= 1,221 cf, Atten= 62%, Lag= 21.1 min
Discarded = 0.14 cfs @ 12.45 hrs, Volume= 1,221 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 214.03' @ 12.45 hrs Surf.Area= 750 sf Storage= 224 cf

Plug-Flow detention time= 11.3 min calculated for 1,221 cf (100% of inflow)
Center-of-Mass det. time= 11.1 min (846.8 - 835.7)

Volume	Invert	Avail.Storage	Storage Description
#1	213.60'	919 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.60	355	0	0
214.00	660	203	203
214.50	2,205	716	919

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.14 cfs @ 12.45 hrs HW=214.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.14 cfs)

Summary for Pond GD-4: Ground Depression

Inflow Area = 16,989 sf, 0.00% Impervious, Inflow Depth > 0.44" for 25 Year event
Inflow = 0.09 cfs @ 12.27 hrs, Volume= 628 cf
Outflow = 0.09 cfs @ 12.27 hrs, Volume= 628 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.09 cfs @ 12.27 hrs, Volume= 628 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 213.60' @ 12.27 hrs Surf.Area= 556 sf Storage= 2 cf

Plug-Flow detention time= 0.3 min calculated for 626 cf (100% of inflow)

Center-of-Mass det. time= 0.3 min (876.6 - 876.3)

Volume	Invert	Avail.Storage	Storage Description
#1	213.60'	363 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.60	550	0	0
214.00	1,263	363	363

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.11 cfs @ 12.27 hrs HW=213.60' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.11 cfs)

Summary for Pond IB-1: Infiltration Basin #1

Inflow Area = 32,617 sf, 41.40% Impervious, Inflow Depth > 3.16" for 25 Year event
Inflow = 2.96 cfs @ 12.08 hrs, Volume= 8,597 cf
Outflow = 0.92 cfs @ 12.40 hrs, Volume= 8,592 cf, Atten= 69%, Lag= 19.6 min
Discarded = 0.92 cfs @ 12.40 hrs, Volume= 8,592 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 211.35' @ 12.40 hrs Surf.Area= 4,815 sf Storage= 1,631 cf

Plug-Flow detention time= 10.2 min calculated for 8,563 cf (100% of inflow)
Center-of-Mass det. time= 9.9 min (792.5 - 782.6)

Volume	Invert	Avail.Storage	Storage Description
#1	211.00'	11,236 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.00	4,480	0	0
212.00	5,436	4,958	4,958
213.00	7,119	6,278	11,236

Device	Routing	Invert	Outlet Devices
#1	Primary	212.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	211.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.92 cfs @ 12.40 hrs HW=211.35' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.92 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=211.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond IB-2: Infiltration Basin #2

Inflow Area = 104,358 sf, 41.83% Impervious, Inflow Depth > 3.26" for 25 Year event
Inflow = 9.72 cfs @ 12.08 hrs, Volume= 28,339 cf
Outflow = 1.73 cfs @ 12.54 hrs, Volume= 28,314 cf, Atten= 82%, Lag= 28.0 min
Discarded = 1.73 cfs @ 12.54 hrs, Volume= 28,314 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 213.02' @ 12.54 hrs Surf.Area= 9,061 sf Storage= 8,680 cf

Plug-Flow detention time= 35.4 min calculated for 28,314 cf (100% of inflow)
Center-of-Mass det. time= 35.0 min (815.4 - 780.4)

Volume	Invert	Avail.Storage	Storage Description
#1	212.00'	28,939 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
212.00	7,901	0	0
213.00	9,033	8,467	8,467
214.00	10,222	9,628	18,095
215.00	11,467	10,845	28,939

Device	Routing	Invert	Outlet Devices
#1	Discarded	212.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	214.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.73 cfs @ 12.54 hrs HW=213.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.73 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=212.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond IB-3: Infiltration Basin #3

Inflow Area = 45,685 sf, 37.54% Impervious, Inflow Depth > 3.07" for 25 Year event
Inflow = 4.03 cfs @ 12.08 hrs, Volume= 11,681 cf
Outflow = 1.32 cfs @ 12.39 hrs, Volume= 11,674 cf, Atten= 67%, Lag= 18.8 min
Discarded = 1.32 cfs @ 12.39 hrs, Volume= 11,674 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 213.81' @ 12.39 hrs Surf.Area= 6,870 sf Storage= 2,100 cf

Plug-Flow detention time= 9.2 min calculated for 11,635 cf (100% of inflow)
Center-of-Mass det. time= 8.9 min (793.6 - 784.7)

Volume	Invert	Avail.Storage	Storage Description
#1	213.50'	15,681 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.50	6,490	0	0
214.00	7,094	3,396	3,396
214.50	7,710	3,701	7,097
215.00	8,343	4,013	11,110
215.50	9,940	4,571	15,681

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	214.50'	**5.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=1.32 cfs @ 12.39 hrs HW=213.81' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.32 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=213.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond IB-4: Infiltration Basin #4

Inflow Area = 77,252 sf, 45.33% Impervious, Inflow Depth > 3.36" for 25 Year event
Inflow = 7.43 cfs @ 12.07 hrs, Volume= 21,602 cf
Outflow = 1.52 cfs @ 12.51 hrs, Volume= 21,587 cf, Atten= 80%, Lag= 26.0 min
Discarded = 1.52 cfs @ 12.51 hrs, Volume= 21,587 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 212.33' @ 12.51 hrs Surf.Area= 7,949 sf Storage= 6,059 cf

Plug-Flow detention time= 26.7 min calculated for 21,587 cf (100% of inflow)
Center-of-Mass det. time= 26.4 min (804.5 - 778.1)

Volume	Invert	Avail.Storage	Storage Description
#1	211.50'	21,638 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.50	6,864	0	0
212.00	7,370	3,559	3,559
213.00	9,144	8,257	11,816
214.00	10,501	9,823	21,638

Device	Routing	Invert	Outlet Devices
#1	Discarded	211.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	213.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.52 cfs @ 12.51 hrs HW=212.33' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.52 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=211.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 PR-1A: South of stream Runoff Area=947,061 sf 0.21% Impervious Runoff Depth>0.38"
Flow Length=1,035' Slope=0.0020 '/' Tc=104.9 min CN=32 Runoff=1.71 cfs 29,893 cf

Subcatchment PR-1B: North of stream Runoff Area=747,420 sf 0.00% Impervious Runoff Depth>0.47"
Flow Length=860' Tc=43.9 min CN=33 Runoff=2.42 cfs 29,303 cf

Subcatchment PR-1C: Jenkins - entrance Runoff Area=32,617 sf 41.40% Impervious Runoff Depth>5.12"
Tc=5.0 min CN=80 Runoff=4.73 cfs 13,917 cf

Subcatchment PR-1D: Jenkins - Middle Runoff Area=104,358 sf 41.83% Impervious Runoff Depth>5.23"
Tc=5.0 min CN=81 Runoff=15.41 cfs 45,516 cf

Subcatchment PR-1E: Gratuity Rd - middle Runoff Area=45,685 sf 37.54% Impervious Runoff Depth>5.01"
Tc=5.0 min CN=79 Runoff=6.50 cfs 19,060 cf

Subcatchment PR-1F: Gratuity Rd - Runoff Area=77,252 sf 45.33% Impervious Runoff Depth>5.35"
Tc=5.0 min CN=82 Runoff=11.60 cfs 34,429 cf

Subcatchment PR-1G: (new Subcat) Runoff Area=131,193 sf 0.00% Impervious Runoff Depth>1.01"
Flow Length=300' Slope=0.0100 '/' Tc=24.8 min CN=40 Runoff=1.77 cfs 11,031 cf

Subcatchment PR-1H: (new Subcat) Runoff Area=107,768 sf 0.00% Impervious Runoff Depth>1.09"
Flow Length=300' Slope=0.0100 '/' Tc=24.8 min CN=41 Runoff=1.63 cfs 9,814 cf

Subcatchment PR-1I: Runoff Area=13,678 sf 0.00% Impervious Runoff Depth>2.32"
Tc=5.0 min CN=54 Runoff=0.89 cfs 2,645 cf

Subcatchment PR-1K: Runoff Area=16,989 sf 0.00% Impervious Runoff Depth>1.28"
Tc=5.0 min CN=43 Runoff=0.52 cfs 1,812 cf

Subcatchment PR-2: Gratuity Rd - entrance Runoff Area=18,114 sf 14.80% Impervious Runoff Depth>4.22"
Flow Length=148' Slope=0.0100 '/' Tc=9.8 min CN=72 Runoff=1.91 cfs 6,365 cf

Subcatchment Unit 1: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.32 cfs 1,036 cf

Subcatchment Unit 10: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.33 cfs 1,078 cf

Subcatchment Unit 11: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.33 cfs 1,074 cf

Subcatchment Unit 12: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.33 cfs 1,078 cf

Subcatchment Unit 2: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.33 cfs 1,074 cf

Subcatchment Unit 3: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.33 cfs 1,078 cf

Subcatchment Unit 4: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.32 cfs 1,036 cf

Subcatchment Unit 5: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.33 cfs 1,074 cf

Subcatchment Unit 6: Unit C - Hickory Runoff Area=1,857 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.33 cfs 1,078 cf

Subcatchment Unit 7: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.32 cfs 1,036 cf

Subcatchment Unit 8: Unit A - Birch Runoff Area=1,785 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.32 cfs 1,036 cf

Subcatchment Unit 9: Unit B - Hemlock Runoff Area=1,850 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=0.33 cfs 1,074 cf

Reach DP-1: Stream Inflow=3.22 cfs 59,196 cf
Outflow=3.22 cfs 59,196 cf

Reach DP-2: Gratuity Road Inflow=1.91 cfs 6,365 cf
Outflow=1.91 cfs 6,365 cf

Pond DE-1: Drip Edge Peak Elev=1.39' Storage=0.005 af Inflow=0.32 cfs 1,036 cf
Discarded=0.07 cfs 1,036 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 1,036 cf

Pond DE-10: Drip Edge Peak Elev=1.50' Storage=0.005 af Inflow=0.33 cfs 1,078 cf
Discarded=0.07 cfs 1,077 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 1,077 cf

Pond DE-11: Drip Edge Peak Elev=1.72' Storage=0.006 af Inflow=0.33 cfs 1,074 cf
Discarded=0.07 cfs 1,073 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 1,073 cf

Pond DE-12: Drip Edge Peak Elev=1.50' Storage=0.005 af Inflow=0.33 cfs 1,078 cf
Discarded=0.07 cfs 1,077 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 1,077 cf

Pond DE-2: Drip Edge Peak Elev=2.00' Storage=0.006 af Inflow=0.33 cfs 1,074 cf
Discarded=0.06 cfs 1,072 cf Primary=0.01 cfs 1 cf Outflow=0.07 cfs 1,073 cf

Pond DE-3: Drip Edge Peak Elev=1.87' Storage=0.006 af Inflow=0.33 cfs 1,078 cf
Discarded=0.07 cfs 1,077 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 1,077 cf

Pond DE-4: Drip Edge Peak Elev=2.00' Storage=0.006 af Inflow=0.32 cfs 1,036 cf
Discarded=0.06 cfs 1,008 cf Primary=0.07 cfs 28 cf Outflow=0.13 cfs 1,036 cf

Pond DE-5: Drip Edge Peak Elev=1.72' Storage=0.006 af Inflow=0.33 cfs 1,074 cf
Discarded=0.07 cfs 1,073 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 1,073 cf

Pond DE-6: Drip Edge Peak Elev=1.50' Storage=0.005 af Inflow=0.33 cfs 1,078 cf
Discarded=0.07 cfs 1,077 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 1,077 cf

Pond DE-7: Drip Edge Peak Elev=1.88' Storage=0.006 af Inflow=0.32 cfs 1,036 cf
Discarded=0.06 cfs 1,036 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 1,036 cf

Pond DE-8: Drip Edge Peak Elev=1.39' Storage=0.005 af Inflow=0.32 cfs 1,036 cf
Discarded=0.07 cfs 1,036 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 1,036 cf

Pond DE-9: Drip Edge Peak Elev=2.00' Storage=0.006 af Inflow=0.33 cfs 1,074 cf
Discarded=0.06 cfs 1,040 cf Primary=0.11 cfs 34 cf Outflow=0.16 cfs 1,073 cf

Pond GD-1: Ground Depression Peak Elev=211.80' Storage=872 cf Inflow=1.77 cfs 11,031 cf
Outflow=1.39 cfs 11,028 cf

Pond GD-2: Ground Depression Peak Elev=211.20' Storage=1,516 cf Inflow=1.63 cfs 9,814 cf
Outflow=0.98 cfs 9,809 cf

Pond GD-3: Ground Depression Peak Elev=214.34' Storage=607 cf Inflow=0.89 cfs 2,645 cf
Outflow=0.33 cfs 2,644 cf

Pond GD-4: Ground Depression Peak Elev=213.93' Storage=276 cf Inflow=0.52 cfs 1,812 cf
Outflow=0.22 cfs 1,811 cf

Pond IB-1: Infiltration Basin #1 Peak Elev=211.77' Storage=3,754 cf Inflow=4.73 cfs 13,917 cf
Discarded=1.00 cfs 13,909 cf Primary=0.00 cfs 0 cf Outflow=1.00 cfs 13,909 cf

Pond IB-2: Infiltration Basin #2 Peak Elev=213.85' Storage=16,558 cf Inflow=15.41 cfs 45,516 cf
Discarded=1.92 cfs 45,480 cf Primary=0.00 cfs 0 cf Outflow=1.92 cfs 45,480 cf

Pond IB-3: Infiltration Basin #3 Peak Elev=214.22' Storage=5,023 cf Inflow=6.50 cfs 19,060 cf
Discarded=1.41 cfs 19,050 cf Primary=0.00 cfs 0 cf Outflow=1.41 cfs 19,050 cf

Pond IB-4: Infiltration Basin #4 Peak Elev=212.98' Storage=11,623 cf Inflow=11.60 cfs 34,429 cf
Discarded=1.74 cfs 34,406 cf Primary=0.00 cfs 0 cf Outflow=1.74 cfs 34,406 cf

Total Runoff Area = 2,264,103 sf Runoff Volume = 216,532 cf Average Runoff Depth = 1.15"
94.00% Pervious = 2,128,182 sf 6.00% Impervious = 135,921 sf

Summary for Subcatchment PR-1A: South of stream

Runoff = 1.71 cfs @ 14.13 hrs, Volume= 29,893 cf, Depth> 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
897,676	30	Woods, Good, HSG A
47,438	68	<50% Grass cover, Poor, HSG A
1,947	98	Paved parking, HSG A
947,061	32	Weighted Average
945,114		99.79% Pervious Area
1,947		0.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.5	50	0.0020	0.03		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
73.4	985	0.0020	0.22		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
104.9	1,035	Total			

Summary for Subcatchment PR-1B: North of stream

Runoff = 2.42 cfs @ 12.93 hrs, Volume= 29,303 cf, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
646,242	30	Woods, Good, HSG A
67,899	68	<50% Grass cover, Poor, HSG A
33,279	30	Meadow, non-grazed, HSG A
747,420	33	Weighted Average
747,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
38.2	810	0.0050	0.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
43.9	860	Total			

Summary for Subcatchment PR-1C: Jenkins - entrance

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

Runoff = 4.73 cfs @ 12.07 hrs, Volume= 13,917 cf, Depth> 5.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
9,869	98	Paved roads w/curbs & sewers, HSG A
19,113	68	<50% Grass cover, Poor, HSG A
3,635	98	Roofs, HSG A
32,617	80	Weighted Average
19,113		58.60% Pervious Area
13,504		41.40% Impervious Area

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

Summary for Subcatchment PR-1D: Jenkins - Middle

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

Runoff = 15.41 cfs @ 12.07 hrs, Volume= 45,516 cf, Depth> 5.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
34,458	98	Paved roads w/curbs & sewers, HSG A
60,702	68	<50% Grass cover, Poor, HSG A
9,198	98	Roofs, HSG A
104,358	81	Weighted Average
60,702		58.17% Pervious Area
43,656		41.83% Impervious Area

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

Summary for Subcatchment PR-1E: Gratuity Rd - middle near entrance

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

Runoff = 6.50 cfs @ 12.07 hrs, Volume= 19,060 cf, Depth> 5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
15,364	98	Paved roads w/curbs & sewers, HSG A
28,536	68	<50% Grass cover, Poor, HSG A
1,785	98	Roofs, HSG A
45,685	79	Weighted Average
28,536		62.46% Pervious Area
17,149		37.54% Impervious Area

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

Summary for Subcatchment PR-1F: Gratuity Rd - cul-de-sac

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

Runoff = 11.60 cfs @ 12.07 hrs, Volume= 34,429 cf, Depth> 5.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
27,603	98	Paved roads w/curbs & sewers, HSG A
42,235	68	<50% Grass cover, Poor, HSG A
7,414	98	Roofs, HSG A
77,252	82	Weighted Average
42,235		54.67% Pervious Area
35,017		45.33% Impervious Area

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

Summary for Subcatchment PR-1G: (new Subcat)

Runoff = 1.77 cfs @ 12.47 hrs, Volume= 11,031 cf, Depth> 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
33,650	68	<50% Grass cover, Poor, HSG A
97,543	30	Woods, Good, HSG A
131,193	40	Weighted Average
131,193		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
8.3	250	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	300	Total			

Summary for Subcatchment PR-1H: (new Subcat)

Runoff = 1.63 cfs @ 12.46 hrs, Volume= 9,814 cf, Depth> 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
29,892	68	<50% Grass cover, Poor, HSG A
77,876	30	Woods, Good, HSG A
107,768	41	Weighted Average
107,768		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
8.3	250	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	300	Total			

Summary for Subcatchment PR-1I:

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

Runoff = 0.89 cfs @ 12.09 hrs, Volume= 2,645 cf, Depth> 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
8,676	68	<50% Grass cover, Poor, HSG A
5,002	30	Woods, Good, HSG A
13,678	54	Weighted Average
13,678		100.00% Pervious Area

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

Summary for Subcatchment PR-1K:

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

Runoff = 0.52 cfs @ 12.10 hrs, Volume= 1,812 cf, Depth> 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
5,678	68	<50% Grass cover, Poor, HSG A
11,311	30	Meadow, non-grazed, HSG A
16,989	43	Weighted Average
16,989		100.00% Pervious Area

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

Summary for Subcatchment PR-2: Gratuity Rd - entrance

Runoff = 1.91 cfs @ 12.14 hrs, Volume= 6,365 cf, Depth> 4.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
2,680	98	Paved roads w/curbs & sewers, HSG A
15,434	68	<50% Grass cover, Poor, HSG A
18,114	72	Weighted Average
15,434		85.20% Pervious Area
2,680		14.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.3	98	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.8	148	Total			

Summary for Subcatchment Unit 1: Unit A - Birch

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

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 1,036 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 10: Unit C - Hickory

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

Runoff = 0.33 cfs @ 12.07 hrs, Volume= 1,078 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 11: Unit B - Hemlock

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

Runoff = 0.33 cfs @ 12.07 hrs, Volume= 1,074 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 12: Unit C - Hickory

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

Runoff = 0.33 cfs @ 12.07 hrs, Volume= 1,078 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 2: Unit B - Hemlock

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

Runoff = 0.33 cfs @ 12.07 hrs, Volume= 1,074 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 3: Unit C - Hickory

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

Runoff = 0.33 cfs @ 12.07 hrs, Volume= 1,078 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 4: Unit A - Birch

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

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 1,036 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 5: Unit B - Hemlock

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

Runoff = 0.33 cfs @ 12.07 hrs, Volume= 1,074 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Subcatchment Unit 6: Unit C - Hickory

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

Runoff = 0.33 cfs @ 12.07 hrs, Volume= 1,078 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,857	98	Roofs, HSG A
1,857		100.00% Impervious Area

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

Summary for Subcatchment Unit 7: Unit A - Birch

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

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 1,036 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 8: Unit A - Birch

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

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 1,036 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,785	98	Roofs, HSG A
1,785		100.00% Impervious Area

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

Summary for Subcatchment Unit 9: Unit B - Hemlock

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

Runoff = 0.33 cfs @ 12.07 hrs, Volume= 1,074 cf, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.80"

Area (sf)	CN	Description
1,850	98	Roofs, HSG A
1,850		100.00% Impervious Area

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

Summary for Reach DP-1: Stream

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

Inflow Area = 1,694,481 sf, 0.11% Impervious, Inflow Depth > 0.42" for 100 Year event
Inflow = 3.22 cfs @ 13.91 hrs, Volume= 59,196 cf
Outflow = 3.22 cfs @ 13.91 hrs, Volume= 59,196 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: Gratuity Road

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

Inflow Area = 18,114 sf, 14.80% Impervious, Inflow Depth > 4.22" for 100 Year event
Inflow = 1.91 cfs @ 12.14 hrs, Volume= 6,365 cf
Outflow = 1.91 cfs @ 12.14 hrs, Volume= 6,365 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond DE-1: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 1,785 sf,100.00% Impervious, Inflow Depth > 6.96" for 100 Year event
Inflow = 0.32 cfs @ 12.07 hrs, Volume= 1,036 cf
Outflow = 0.07 cfs @ 11.75 hrs, Volume= 1,036 cf, Atten= 76%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.75 hrs, Volume= 1,036 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.39' @ 12.45 hrs Surf.Area= 0.009 ac Storage= 0.005 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.2 min (746.6 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50

Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.75 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-10: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,857 sf,	100.00% Impervious,	Inflow Depth >	6.96"	for 100 Year event
Inflow =	0.33 cfs @	12.07 hrs,	Volume=	1,078 cf	
Outflow =	0.07 cfs @	11.75 hrs,	Volume=	1,077 cf,	Atten= 77%, Lag= 0.0 min
Discarded =	0.07 cfs @	11.75 hrs,	Volume=	1,077 cf	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.50' @ 12.46 hrs Surf.Area= 0.009 ac Storage= 0.005 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 15.5 min (747.9 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.75 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-11: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,850 sf,100.00% Impervious,	Inflow Depth >	6.96"	for	100 Year event
Inflow =	0.33 cfs @	12.07 hrs, Volume=	1,074 cf		
Outflow =	0.07 cfs @	11.70 hrs, Volume=	1,073 cf,	Atten= 79%,	Lag= 0.0 min
Discarded =	0.07 cfs @	11.70 hrs, Volume=	1,073 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.72' @ 12.48 hrs Surf.Area= 0.008 ac Storage= 0.006 af

Plug-Flow detention time= 18.5 min calculated for 1,070 cf (100% of inflow)
Center-of-Mass det. time= 18.3 min (750.7 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 120.00'L x 2.00'H Prismatoid** 0.017 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.70 hrs HW=0.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-12: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,857 sf,100.00% Impervious,	Inflow Depth >	6.96"	for	100 Year event
Inflow =	0.33 cfs @	12.07 hrs, Volume=	1,078 cf		
Outflow =	0.07 cfs @	11.75 hrs, Volume=	1,077 cf,	Atten= 77%,	Lag= 0.0 min
Discarded =	0.07 cfs @	11.75 hrs, Volume=	1,077 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 1.50' @ 12.46 hrs Surf.Area= 0.009 ac Storage= 0.005 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 15.5 min (747.9 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.75 hrs HW=0.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-2: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,850 sf,100.00% Impervious,	Inflow Depth >	6.96"	for	100 Year event
Inflow =	0.33 cfs @	12.07 hrs, Volume=	1,074 cf		
Outflow =	0.07 cfs @	12.50 hrs, Volume=	1,073 cf,	Atten= 79%,	Lag= 25.8 min
Discarded =	0.06 cfs @	11.70 hrs, Volume=	1,072 cf		
Primary =	0.01 cfs @	12.50 hrs, Volume=	1 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.00' @ 12.49 hrs Surf.Area= 0.008 ac Storage= 0.006 af

Plug-Flow detention time= 22.1 min calculated for 1,073 cf (100% of inflow)
Center-of-Mass det. time= 22.0 min (754.4 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 110.00'L x 2.00'H Prismatoid** 0.015 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88

2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.70 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 12.50 hrs HW=2.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.00 cfs @ 0.04 fps)

Summary for Pond DE-3: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,857 sf,	100.00% Impervious,	Inflow Depth >	6.96"	for 100 Year event
Inflow =	0.33 cfs @	12.07 hrs, Volume=	1,078 cf		
Outflow =	0.07 cfs @	11.70 hrs, Volume=	1,077 cf,	Atten= 80%,	Lag= 0.0 min
Discarded =	0.07 cfs @	11.70 hrs, Volume=	1,077 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.87' @ 12.49 hrs Surf.Area= 0.008 ac Storage= 0.006 af

Plug-Flow detention time= 20.5 min calculated for 1,074 cf (100% of inflow)
Center-of-Mass det. time= 20.2 min (752.7 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 115.00'L x 2.00'H Prismatoid** 0.016 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.70 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-4: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage

Inflow Area = 1,785 sf,100.00% Impervious, Inflow Depth > 6.96" for 100 Year event
Inflow = 0.32 cfs @ 12.07 hrs, Volume= 1,036 cf
Outflow = 0.13 cfs @ 12.34 hrs, Volume= 1,036 cf, Atten= 60%, Lag= 16.3 min
Discarded = 0.06 cfs @ 11.70 hrs, Volume= 1,008 cf
Primary = 0.07 cfs @ 12.34 hrs, Volume= 28 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.00' @ 12.35 hrs Surf.Area= 0.007 ac Storage= 0.006 af

Plug-Flow detention time= 21.7 min calculated for 1,036 cf (100% of inflow)
Center-of-Mass det. time= 21.6 min (754.0 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 100.00'L x 2.00'H Prismatoid** 0.014 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.70 hrs HW=0.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.02 cfs @ 12.34 hrs HW=2.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.13 fps)

Summary for Pond DE-5: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 1,850 sf,100.00% Impervious, Inflow Depth > 6.96" for 100 Year event
Inflow = 0.33 cfs @ 12.07 hrs, Volume= 1,074 cf
Outflow = 0.07 cfs @ 11.70 hrs, Volume= 1,073 cf, Atten= 79%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.70 hrs, Volume= 1,073 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.72' @ 12.48 hrs Surf.Area= 0.008 ac Storage= 0.006 af

Plug-Flow detention time= 18.5 min calculated for 1,070 cf (100% of inflow)
Center-of-Mass det. time= 18.3 min (750.7 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 120.00'L x 2.00'H Prismatoid** 0.017 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.70 hrs HW=0.02' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-6: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,857 sf,100.00% Impervious,	Inflow Depth >	6.96"	for	100 Year event
Inflow =	0.33 cfs @	12.07 hrs, Volume=	1,078 cf		
Outflow =	0.07 cfs @	11.75 hrs, Volume=	1,077 cf,	Atten= 77%,	Lag= 0.0 min
Discarded =	0.07 cfs @	11.75 hrs, Volume=	1,077 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.50' @ 12.46 hrs Surf.Area= 0.009 ac Storage= 0.005 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 15.5 min (747.9 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.75 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-7: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area =	1,785 sf,100.00% Impervious,	Inflow Depth >	6.96"	for	100 Year event
Inflow =	0.32 cfs @	12.07 hrs, Volume=	1,036 cf		
Outflow =	0.06 cfs @	11.70 hrs, Volume=	1,036 cf,	Atten= 80%,	Lag= 0.0 min
Discarded =	0.06 cfs @	11.70 hrs, Volume=	1,036 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.88' @ 12.49 hrs Surf.Area= 0.008 ac Storage= 0.006 af

Plug-Flow detention time= 20.7 min calculated for 1,032 cf (100% of inflow)
Center-of-Mass det. time= 20.5 min (752.9 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 110.00'L x 2.00'H Prismatoid** 0.015 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.70 hrs HW=0.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond DE-8: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 1,785 sf,100.00% Impervious, Inflow Depth > 6.96" for 100 Year event
Inflow = 0.32 cfs @ 12.07 hrs, Volume= 1,036 cf
Outflow = 0.07 cfs @ 11.75 hrs, Volume= 1,036 cf, Atten= 76%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.75 hrs, Volume= 1,036 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.39' @ 12.45 hrs Surf.Area= 0.009 ac Storage= 0.005 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.2 min (746.6 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.007 af	**3.00'W x 130.00'L x 2.00'H Prismatoid** 0.018 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.07 cfs @ 11.75 hrs HW=0.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DE-9: Drip Edge

[82] Warning: Early inflow requires earlier time span
[92] Warning: Device #2 is above defined storage
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 1,850 sf,100.00% Impervious, Inflow Depth > 6.96" for 100 Year event
Inflow = 0.33 cfs @ 12.07 hrs, Volume= 1,074 cf
Outflow = 0.16 cfs @ 12.30 hrs, Volume= 1,073 cf, Atten= 50%, Lag= 13.8 min
Discarded = 0.06 cfs @ 11.70 hrs, Volume= 1,040 cf
Primary = 0.11 cfs @ 12.30 hrs, Volume= 34 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.00' @ 12.30 hrs Surf.Area= 0.007 ac Storage= 0.006 af

Plug-Flow detention time= 21.8 min calculated for 1,073 cf (100% of inflow)
Center-of-Mass det. time= 21.7 min (754.1 - 732.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.006 af	**3.00'W x 102.00'L x 2.00'H Prismatoid** 0.014 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	2.00'	**72.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.06 cfs @ 11.70 hrs HW=0.03' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.05 cfs @ 12.30 hrs HW=2.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.16 fps)

Summary for Pond GD-1: Ground Depression

Inflow Area = 131,193 sf, 0.00% Impervious, Inflow Depth > 1.01" for 100 Year event
Inflow = 1.77 cfs @ 12.47 hrs, Volume= 11,031 cf
Outflow = 1.39 cfs @ 12.70 hrs, Volume= 11,028 cf, Atten= 22%, Lag= 13.9 min
Discarded = 1.39 cfs @ 12.70 hrs, Volume= 11,028 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 211.80' @ 12.70 hrs Surf.Area= 7,237 sf Storage= 872 cf

Plug-Flow detention time= 4.2 min calculated for 10,991 cf (100% of inflow)
Center-of-Mass det. time= 4.1 min (870.8 - 866.7)

Volume	Invert	Avail.Storage	Storage Description
#1	211.60'	2,903 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.60	1,514	0	0
212.00	13,000	2,903	2,903

Device	Routing	Invert	Outlet Devices
#1	Discarded	211.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.39 cfs @ 12.70 hrs HW=211.80' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.39 cfs)

Summary for Pond GD-2: Ground Depression

Inflow Area = 107,768 sf, 0.00% Impervious, Inflow Depth > 1.09" for 100 Year event
Inflow = 1.63 cfs @ 12.46 hrs, Volume= 9,814 cf
Outflow = 0.98 cfs @ 12.82 hrs, Volume= 9,809 cf, Atten= 40%, Lag= 21.6 min
Discarded = 0.98 cfs @ 12.82 hrs, Volume= 9,809 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 211.20' @ 12.82 hrs Surf.Area= 5,125 sf Storage= 1,516 cf

Plug-Flow detention time= 15.5 min calculated for 9,809 cf (100% of inflow)
Center-of-Mass det. time= 15.3 min (878.5 - 863.2)

Volume	Invert	Avail.Storage	Storage Description
#1	210.60'	3,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
210.60	550	0	0
211.00	2,998	710	710
211.50	8,352	2,838	3,547

Device	Routing	Invert	Outlet Devices
#1	Discarded	210.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.98 cfs @ 12.82 hrs HW=211.20' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.98 cfs)

Summary for Pond GD-3: Ground Depression

Inflow Area = 13,678 sf, 0.00% Impervious, Inflow Depth > 2.32" for 100 Year event
Inflow = 0.89 cfs @ 12.09 hrs, Volume= 2,645 cf
Outflow = 0.33 cfs @ 12.41 hrs, Volume= 2,644 cf, Atten= 63%, Lag= 19.4 min
Discarded = 0.33 cfs @ 12.41 hrs, Volume= 2,644 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 214.34' @ 12.41 hrs Surf.Area= 1,712 sf Storage= 607 cf

Plug-Flow detention time= 18.5 min calculated for 2,636 cf (100% of inflow)
Center-of-Mass det. time= 18.3 min (835.6 - 817.3)

Volume	Invert	Avail.Storage	Storage Description
#1	213.60'	919 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.60	355	0	0
214.00	660	203	203
214.50	2,205	716	919

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.33 cfs @ 12.41 hrs HW=214.34' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.33 cfs)

Summary for Pond GD-4: Ground Depression

Inflow Area = 16,989 sf, 0.00% Impervious, Inflow Depth > 1.28" for 100 Year event
Inflow = 0.52 cfs @ 12.10 hrs, Volume= 1,812 cf
Outflow = 0.22 cfs @ 12.45 hrs, Volume= 1,811 cf, Atten= 58%, Lag= 20.8 min
Discarded = 0.22 cfs @ 12.45 hrs, Volume= 1,811 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 213.93' @ 12.45 hrs Surf.Area= 1,133 sf Storage= 276 cf

Plug-Flow detention time= 7.8 min calculated for 1,811 cf (100% of inflow)
Center-of-Mass det. time= 7.7 min (850.4 - 842.7)

Volume	Invert	Avail.Storage	Storage Description
#1	213.60'	363 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.60	550	0	0
214.00	1,263	363	363

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.60'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.22 cfs @ 12.45 hrs HW=213.93' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.22 cfs)

Summary for Pond IB-1: Infiltration Basin #1

Inflow Area = 32,617 sf, 41.40% Impervious, Inflow Depth > 5.12" for 100 Year event
Inflow = 4.73 cfs @ 12.07 hrs, Volume= 13,917 cf
Outflow = 1.00 cfs @ 12.50 hrs, Volume= 13,909 cf, Atten= 79%, Lag= 25.3 min
Discarded = 1.00 cfs @ 12.50 hrs, Volume= 13,909 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 211.77' @ 12.50 hrs Surf.Area= 5,220 sf Storage= 3,754 cf

Plug-Flow detention time= 23.9 min calculated for 13,909 cf (100% of inflow)
Center-of-Mass det. time= 23.7 min (794.9 - 771.2)

Volume	Invert	Avail.Storage	Storage Description
#1	211.00'	11,236 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.00	4,480	0	0
212.00	5,436	4,958	4,958
213.00	7,119	6,278	11,236

Device	Routing	Invert	Outlet Devices
#1	Primary	212.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	211.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.00 cfs @ 12.50 hrs HW=211.77' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 1.00 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=211.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond IB-2: Infiltration Basin #2

Inflow Area = 104,358 sf, 41.83% Impervious, Inflow Depth > 5.23" for 100 Year event
Inflow = 15.41 cfs @ 12.07 hrs, Volume= 45,516 cf
Outflow = 1.92 cfs @ 12.66 hrs, Volume= 45,480 cf, Atten= 88%, Lag= 35.1 min
Discarded = 1.92 cfs @ 12.66 hrs, Volume= 45,480 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 213.85' @ 12.66 hrs Surf.Area= 10,042 sf Storage= 16,558 cf

Plug-Flow detention time= 70.3 min calculated for 45,329 cf (100% of inflow)
Center-of-Mass det. time= 69.7 min (838.8 - 769.1)

Volume	Invert	Avail.Storage	Storage Description
#1	212.00'	28,939 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
212.00	7,901	0	0
213.00	9,033	8,467	8,467
214.00	10,222	9,628	18,095
215.00	11,467	10,845	28,939

Device	Routing	Invert	Outlet Devices
#1	Discarded	212.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	214.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.92 cfs @ 12.66 hrs HW=213.85' (Free Discharge)
1=Exfiltration (Exfiltration Controls 1.92 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=212.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond IB-3: Infiltration Basin #3

Inflow Area = 45,685 sf, 37.54% Impervious, Inflow Depth > 5.01" for 100 Year event
Inflow = 6.50 cfs @ 12.07 hrs, Volume= 19,060 cf
Outflow = 1.41 cfs @ 12.49 hrs, Volume= 19,050 cf, Atten= 78%, Lag= 25.0 min
Discarded = 1.41 cfs @ 12.49 hrs, Volume= 19,050 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 214.22' @ 12.49 hrs Surf.Area= 7,371 sf Storage= 5,023 cf

Plug-Flow detention time= 22.4 min calculated for 18,987 cf (100% of inflow)
Center-of-Mass det. time= 22.1 min (795.3 - 773.2)

Volume	Invert	Avail.Storage	Storage Description
#1	213.50'	15,681 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
213.50	6,490	0	0
214.00	7,094	3,396	3,396
214.50	7,710	3,701	7,097
215.00	8,343	4,013	11,110
215.50	9,940	4,571	15,681

Device	Routing	Invert	Outlet Devices
#1	Discarded	213.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	214.50'	**5.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=1.41 cfs @ 12.49 hrs HW=214.22' (Free Discharge)
1=Exfiltration (Exfiltration Controls 1.41 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=213.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond IB-4: Infiltration Basin #4

Inflow Area = 77,252 sf, 45.33% Impervious, Inflow Depth > 5.35" for 100 Year event
Inflow = 11.60 cfs @ 12.07 hrs, Volume= 34,429 cf
Outflow = 1.74 cfs @ 12.57 hrs, Volume= 34,406 cf, Atten= 85%, Lag= 29.8 min
Discarded = 1.74 cfs @ 12.57 hrs, Volume= 34,406 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 212.98' @ 12.57 hrs Surf.Area= 9,107 sf Storage= 11,623 cf

Plug-Flow detention time= 51.3 min calculated for 34,406 cf (100% of inflow)
Center-of-Mass det. time= 51.0 min (818.0 - 767.0)

Volume	Invert	Avail.Storage	Storage Description
#1	211.50'	21,638 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.50	6,864	0	0
212.00	7,370	3,559	3,559
213.00	9,144	8,257	11,816
214.00	10,501	9,823	21,638

Device	Routing	Invert	Outlet Devices
#1	Discarded	211.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	213.00'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.74 cfs @ 12.57 hrs HW=212.98' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.74 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=211.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Recharge Volume Calculations (Part I and II)

Project:	*Gratuity Brook Farm Estates*
Location:	*63 Grauity Road, Groton, MA*
Calculated By:	*MJS*
Checked By:	*MAW*
Date:	*7/1/2024*
Revised:	*1/8/2025*

RECHARGE VOLUME CALCULATIONS, PART I

Recharge Area Design

Objective: Size an infiltration basin that will approximate the annual recharge from the existing conditions

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol.3, Ch.1)

Design Criteria: The required recharge volume equals a depth of runoff corresponding to the soil type times the impervious areas covering that soil type at the post-development site. The soils are defined by the National Resources Conservation Service (NRCS) Soil Survey of Middlesex County of Massachusetts as type "A".

Based on the Site Hydrologic Soil Group:

Hydrologic Soil Group	Soil Texture	Target Depth Factor (F)	
A	Sand	0.60	inches
B	Loam	0.35	inches
C	Silty Loam	0.25	inches
D	Clay	0.10	inches

Recharge Volume Required:

Total increase in Impervious Area (sf)	Impervious Area to Recharge BMP (sf)	Adjustment Factor	Target Depth (in)	Adjusted Volume Required (cf)*
139,628	109,326	1.277	0.60	8,916

Recharge Volume Provided:

	Proposed Impervious Area (Sq. Ft.)	Volume Required (Cu. Ft.)	Volume Provided* (Cu. Ft.)	
Infiltration Basin #1	13,504	675	4,958	**(standard is met)**
Infiltration Basin #2	43,656	2,183	18,095	**(standard is met)**
Infiltration Basin #3	17,149	857	7,097	**(standard is met)**
Infiltration Basin #4	35,017	1,751	11,816	**(standard is met)**

*-Volume provided at overflow weir elevation.

Project:	*Gratuity Brook Farm Estates*
Location:	*63 Grauity Road, Groton, MA*
Calculated By:	*MJS*
Checked By:	*MAW*
Date:	*7/1/2024*
Revised:	*1/8/2025*

RECHARGE VOLUME CALCULATIONS, PART II

Drawdown Calculations

Objective: Size an infiltration basin that will approximate the annual recharge from the existing conditions

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 3, Ch. 1)

Design Criteria: The required recharge volume equals a depth of runoff corresponding to the soil type times the impervious areas covering that soil type at the post-development site.

Based on the Site Hydrologic Soil Group:

Hydrologic Soil Group	Soil Texture	Target Depth Factor (F)	
A	Sand	0.60	inches
B	Loam	0.35	inches
C	Silty Loam	0.25	inches
D	Clay	0.10	inches

Required Drawdown Time: Maximum of 72 Hours using the following equation:

$$\text{Drawdown Time} = \frac{R_v}{(K x A_{Bot})}$$

R_v = Required Recharge Volume
K = the Permeability Rate
A_{Bot} = Bottom area of Infiltration basin

Infiltration Basin #1

Bottom Area	4840	sf
Depth	2	ft
% Voids	100%	
Volume provided	4958	cf (HydroCAD)

R_v	K	A_{Bot}	Drawdown Time
cf	in/hr	sf	Hours
4,958	8.27	4,840	1.49

1.49 hours is less than 72 hours (standard is met)

Infiltration Basin #2

Bottom Area	7901	sf
Depth	3	ft
% Voids	100%	
Volume provided	18095	cf (HydroCAD)

R_v	K	A_{Bot}	Drawdown Time
cf	in/hr	sf	Hours
18,095	8.27	7,901	3.32

3.32 hours is less than 72 hours (standard is met)

Infiltration Basin #3

Bottom Area	6490	sf
Depth	2	ft
% Voids	100%	
Volume provided	7097	cf (HydroCAD)

R_v	K	A_{Bot}	Drawdown Time
cf	in/hr	sf	Hours
7,097	8.27	6,490	1.59

1.59 hours is less than 72 hours (standard is met)

Infiltration Basin #4

Bottom Area	6864	sf
Depth	3	ft
% Voids	100%	
Volume provided	11816	cf (HydroCAD)

R_v	K	A_{Bot}	Drawdown Time
cf	in/hr	sf	Hours
11,816	8.27	6,864	2.50

2.50 hours is less than 72 hours (standard is met)

Water Quality Treatment Volume Calculations

Project:	*63 Gratuity Road*
Location:	*Groton, MA*
Calculated By:	*MJS*
Checked By:	*MAW*
Date:	*7/1/2024*
Revised:	*1/8/2025*

WATER QUALITY VOLUME CALCULATIONS

Objective: To determine the required Water Quality Volume (WQV) for adequte stormwater treatment

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 3, Ch. 1)

Design Criteria: Volume to be treated = 1.0" x Post Development Impervious Area
(Project is not classified as an area of Higher Potential Pollutant Loading)

Volume to be Treated & Volume Provided:

	Proposed Impervious Area (Sq. Ft.)	Volume Required to be Treated (Cu. Ft.)	Water Quality Volume Provided* (Cu. Ft.)	
Infiltration Basin #1	13,504	1,125	4,958	**Standard is met**
Infiltration Basin #2	43,656	3,638	18,095	**Standard is met**
Infiltration Basin #3	17,149	1,429	7,097	**Standard is met**
Infiltration Basin #4	35,017	2,918	11,816	**Standard is met**

* - Volume provided below basin outlet elevations.

TSS Calculations

Project:	*Gratuity Brook Farm Estates*
Location:	*63 Gratuity Road, Groton, MA*
Calculated By:	*MJS*
Checked By:	*MAW*
Date:	*1/8/2025*
Revised Date:	*-*

TOTAL SUSPENDED SOLIDS (TSS) REMOVAL WORKSHEET

Legend: = TSS Removal Rate Prior to Treatment

Treatment Train 1: **Infiltration Basins 1, 2, 3**

	A BMP	B TSS Removal Rate	C Starting TSS Load	D Amount Removed (BxC)	E Remaining Load (C-D)	F TSS Removal Rate
PRETREATMENT	Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75	25%
PRETREATMENT	Stormceptor	0.75	0.75	0.56	0.19	81%
PRETREATMENT	Sediment Forebay	0.25	0.19	0.05	0.14	86%

Project:	*Gratuity Brook Farm Estates*
Location:	*63 Gratuity Road, Groton, MA*
Calculated By:	*MJS*
Checked By:	*MAW*
Date:	*8/9/2024*
Revised Date:	*1/8/2025*

TOTAL SUSPENDED SOLIDS (TSS) REMOVAL WORKSHEET

Legend: = TSS Removal Rate Prior to Treatment

Treatment Train: **Pretreatment for Infiltration Basin #4**

	A	B	C	D	E	F
	BMP	TSS Removal Rate	Starting TSS Load	Amount Removed (BxC)	Remaining Load (C-D)	TSS Removal Rate
PRETREATMENT	Stormceptor	0.75	1.00	0.75	0.25	75%
PRETREATMENT	Sediment Forebay	0.25	0.25	0.06	0.19	81%

Sediment Forebay Sizing

Project:	*63 Gratuity Road*
Location:	*Groton, MA*
Calculated By:	*MJS*
Checked By:	*MAW*
Date:	*7/1/2024*
Revised:	*1/6/2025*

SEDIMENT FOREBAY SIZING CALCULATIONS

Objective: To determine the required Sediment Forebay volume for adequte pretreatment of water quality volume and annual sediment loading.

Methodology: MA Department of Environmental Protection (DEP) Stormwater Management (Vol. 2, Ch. 2)

Design Criteria: 1. Sediment Forebay Volume = 0.1" Runoff per Acre of Post Development Impervious Area
2. Annual sediment loading (CF/year) = Area to be sanded (ac.) x 500 lb/ac.-storm / 90 lb/ft3 x 10 storm/year

Volume to be Treated:

	Proposed Impervious Area (Sq. Ft.)	Required Sediment Forebay Volume (WQV) (Cu. Ft.)	Required Sediment Forebay Volume (ASL) (Cu. Ft.)	Provided Sediment Forebay Volume (Cu. Ft.)
Infiltration Basin #1	13,504	113	17	350
Infiltration Basin #2	43,656	364	56	1,338
Infiltration Basin #3	17,149	143	22	389
Infiltration Basin #4	35,017	292	45	341

Pipe Calculations

Pipe Calculations

Rainfall Data from US Department of Agriculture, Urban Hydrology for Small Watersheds - Technical Release 55

25 YEAR Design Rainfall Intensity (in/hr) =	*5.5*
Minimum Velocity: 25-yr Storm (fps) =	*2.5*
100 YEAR Design Rainfall Intensity (in/hr) =	*7.8*
Minimum Velocity: 100y-r Storm (fps) =	*15.0*

Pipe Types	***Manning's Coefficient***
Plastic	*0.009*
Steel	*0.012*
Concrete	*0.013*

PIPE NETWORK 1	***LOCATION***		***DRAINAGE AREA***			***PIPE INFORMATION***						***PIPE FLOW***					***DESIGN FLOW***						***FLOW PARAMETERS***				***100 YEAR STORM***		
												Actual Flow		***Full Flow***			***25 YEAR Storm***			***100 YEAR Storm***			***25 YEAR Storm***		***100 YEAR Storm***			***CB***	***PONDING***
Description	*From*	*To*	*Area Ac*	*Runoff Coeff., C*	*C * A*	*Invert In, Elv.*	*Invert Out, Elv.*	*Length (Feet)*	*Slope Ft./Ft.*	*Pipe Dia. (inches)*	*Pipe Material*	*Minimum (25-yr)*	*Maximum (100-yr)*	*Capacity (Cfs)*	*Sufficient Flow?*	*Velocity (fps)*	*Depth (Ft.)*	*Velocity (Fps.)*	*Satisfy Min. Vel.?*	*Depth (Ft.)*	*Velocity (Fps.)*	*Satisfy Max. Vel.?*	*q/Qfull 25 YEAR*	*Hydraulic Radius, 25 yr*	*q/Qfull 25 YEAR*	*Hydraulic Radius, 100 yr*	***PIPE % FULL***	***OPENING (SQ.IN.)***	***OVER CB (IN)***
INDIVIDUAL SYSTEMS (CATCH BASINS)																													
Pipe 1	DCB-1	DMH-1	1.14	0.61	0.70	213.35	213.15	10	0.0200	15	RCP	3.9	5.5	9.1	YES	7.4	0.57	7.1	YES	0.70	7.7	YES	0.43	0.29	0.60	0.33	57	498	3.0
Pipe 2	CB-2	DMH-1	0.68	0.66	0.45	213.35	213.15	10	0.0200	15	RCP	2.5	3.5	9.1	YES	7.4	0.44	6.3	YES	0.53	6.9	YES	0.27	0.24	0.38	0.28	41	498	1.2
Pipe 3	CB-3	DMH-2	0.37	0.55	0.20	212.30	212.10	10	0.0200	12	RCP	1.1	1.6	5.0	YES	6.4	0.32	5.2	YES	0.39	5.7	YES	0.22	0.18	0.32	0.21	36	498	0.3
Pipe 4	CB-4	DMH-2	0.37	0.55	0.20	212.30	212.10	10	0.0200	12	RCP	1.1	1.6	5.0	YES	6.4	0.32	5.2	YES	0.39	5.7	YES	0.22	0.18	0.32	0.21	36	498	0.3
Pipe 5	CB-5	DMH-3	0.52	0.53	0.28	214.60	214.50	8	0.0125	12	RCP	1.5	2.2	4.0	YES	5.1	0.43	4.7	YES	0.53	5.2	YES	0.38	0.22	0.55	0.26	54	498	0.5
Pipe 6	CB-6	DMH-3	0.52	0.53	0.28	214.60	214.50	8	0.0125	12	RCP	1.5	2.2	4.0	YES	5.1	0.43	4.7	YES	0.53	5.2	YES	0.38	0.22	0.55	0.26	54	498	0.5
Pipe 7	CB-7	DMH-4	0.89	0.57	0.51	212.50	211.70	80	0.0100	15	RCP	2.8	4.0	6.5	YES	5.3	0.57	5.0	YES	0.71	5.6	YES	0.43	0.29	0.62	0.34	59	498	1.6
Pipe 8	CB-8	DMH-4	0.89	0.57	0.51	212.50	211.70	60	0.0133	12	RCP	2.8	4.0	4.1	YES	5.2	0.60	5.7	YES	0.80	5.9	YES	0.68	0.28	0.98	0.30	86	498	1.6
COMBINED SYSTEMS																													
Pipe 9	DMH-1	CDS			1.15	213.05	212.90	15	0.0100	18	RCP	6.3	9.0	10.5	YES	5.9	0.84	6.2	YES	1.07	6.7	YES	0.60	0.40	0.86	0.45	76		
Pipe 10	DMH-2	CDS			0.40	212.00	211.90	10	0.0100	12	RCP	2.2	3.1	3.6	YES	4.6	0.56	4.8	YES	0.71	5.1	YES	0.61	0.27	0.86	0.30	76		
Pipe 11	DMH-3	CDS			0.56	214.50	214.40	20	0.0050	15	RCP	3.1	4.4	4.6	YES	3.7	0.75	4.0	YES	0.98	4.3	YES	0.67	0.35	0.96	0.38	84		

Groundwater Mounding Analysis

LandTech Consultants
Engineering/Design/Surveying/Permitting
515 Groton Road, — Westford, MA 01886
Ph: (978) 692–6100 — landtechinc.com

Project:	*Gratuity Brook Farm Estates*
Location:	*63 Gratuity Road, Groton, MA*
Calculated By:	*MJS*
Checked By:	*MAW*
Date:	*12/10/2024*
Revised:	*1/8/2025*

Infiltration Basin #1

Bottom of bed elevation (Bot. of Stone)	211.00	ft
Estimated seasonal high water table	208.90	ft
Clearance Provided	2.10	ft
Maximum Groundwater Mounding	0.6	ft.

GROUNDWATER MOUNDING ANALYSIS USING HANTUSH EQUATION

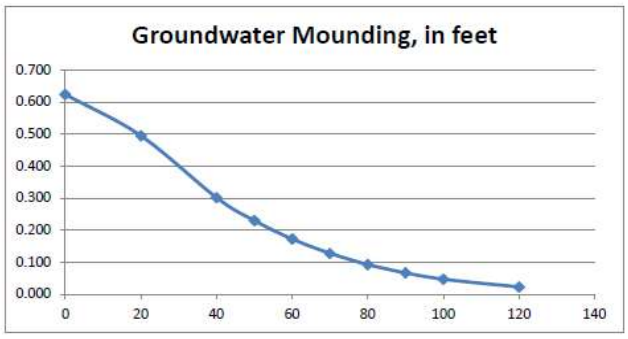
Input Values

			inch/hour	feet/day	
0.5000	R	Recharge (infiltration) rate (feet/day)	0.67	1.33	
0.260	Sy	Specific yield, Sy (dimensionless, between 0 and 1)			
55.00	K	Horizontal hydraulic conductivity, Kh (feet/day)*	2.00	4.00	
18.000	x	1/2 length of basin (x direction, in feet)			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).
65.000	y	1/2 width of basin (y direction, in feet)	hours	days	
1.000	t	duration of infiltration period (days)	36	1.50	
10.000	hi(0)	initial thickness of saturated zone (feet)			

10.624	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
0.624	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.624	0
0.495	20
0.301	40
0.230	50
0.173	60
0.128	70
0.093	80
0.067	90
0.047	100
0.023	120

Re-Calculate Now



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Calculated By:	*MJS*
Checked By:	*MAW*
Date:	*12/10/2024*
Revised:	*1/8/2025*

Infiltration Basin #2

Bottom of bed elevation (Bot. of Stone)	212.00	ft
Estimated seasonal high water table	209.80	ft
Clearance Provided	2.20	ft
Maximum Groundwater Mounding	1.6	ft.

GROUNDWATER MOUNDING ANALYSIS USING HANTUSH EQUATION

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

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 permeabilit (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

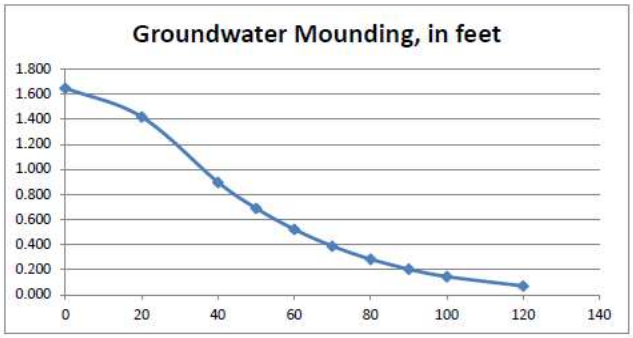
Input Values

1.0500	*R*	Recharge (infiltration) rate (feet/day)
0.260	Sy	Specific yield, Sy (dimensionless, between 0 and 1)
55.00	K	Horizontal hydraulic conductivity, Kh (feet/day)*
25.000	x	1/2 length of basin (x direction, in feet)
65.000	y	1/2 width of basin (y direction, in feet)
1.000	t	duration of infiltration period (days)
10.000	hi(0)	initial thickness of saturated zone (feet)

11.647	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
1.647	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.647	0
1.419	20
0.897	40
0.690	50
0.522	60
0.389	70
0.285	80
0.205	90
0.146	100
0.070	120

Re-Calculate Now



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Project:	*Gratuity Brook Farm Estates*
Location:	*63 Gratuity Road, Groton, MA*
Calculated By:	*MJS*
Checked By:	*MAW*
Date:	*12/10/2024*
Revised:	*1/8/2025*

Infiltration Basin #3

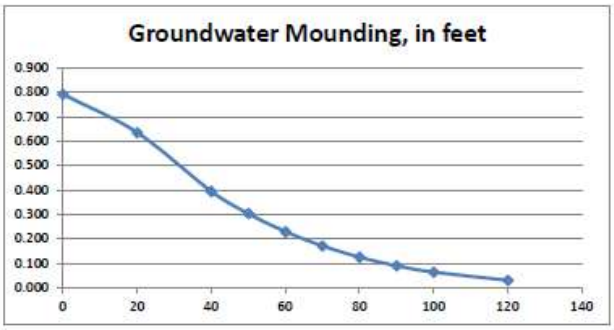
Bottom of bed elevation (Bot. of Stone)	213.50	ft
Estimated seasonal high water table	211.40	ft
Clearance Provided	2.10	ft
Maximum Groundwater Mounding	0.8	ft.

GROUNDWATER MOUNDING ANALYSIS USING HANTUSH EQUATION

Input Values			inch/hour	feet/day	
0.6000	R	Recharge (infiltration) rate (feet/day)	0.67	1.33	
0.260	Sy	Specific yield, Sy (dimensionless, between 0 and 1)			
55.00	K	Horizontal hydraulic conductivity, Kh (feet/day)*	2.00	4.00	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).
18.000	x	1/2 length of basin (x direction, in feet)			
83.000	y	1/2 width of basin (y direction, in feet)	hours	days	
1.000	t	duration of infiltration period (days)	36	1.50	
10.000	hi(0)	initial thickness of saturated zone (feet)			
10.792	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)			
0.792	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)			

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.792	0
0.635	20
0.395	40
0.304	50
0.230	60
0.171	70
0.125	80
0.090	90
0.064	100
0.031	120

Re-Calculate Now



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Project:	*Gratuity Brook Farm Estates*
Location:	*63 Gratuity Road, Groton, MA*
Calculated By:	*MJS*
Checked By:	*MAW*
Date:	*12/10/2024*
Revised:	*1/8/2025*

Infiltration Basin #4

Bottom of bed elevation (Bot. of Stone)	211.50	ft
Estimated seasonal high water table	208.80	ft
Clearance Provided	2.70	ft
Maximum Groundwater Mounding	1.8	ft.

GROUNDWATER MOUNDING ANALYSIS USING HANTUSH EQUATION

Input Values

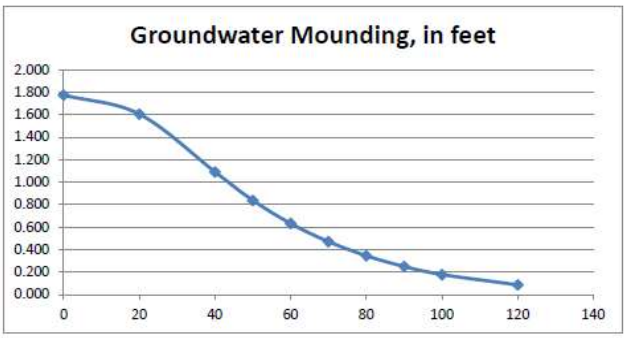
			inch/hour	feet/day	
1.0000	R	Recharge (infiltration) rate (feet/day)	0.67	1.33	
0.260	Sy	Specific yield, Sy (dimensionless, between 0 and 1)			
55.00	K	Horizontal hydraulic conductivity, Kh (feet/day)*	2.00	4.00	
34.000	x	1/2 length of basin (x direction, in feet)			
52.000	y	1/2 width of basin (y direction, in feet)			
			hours	days	
1.000	t	duration of infiltration period (days)	36	1.50	
10.000	hi(0)	initial thickness of saturated zone (feet)			

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).

11.778	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
1.778	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.778	0
1.608	20
1.093	40
0.840	50
0.635	60
0.473	70
0.347	80
0.251	90
0.179	100
0.087	120

Re-Calculate Now



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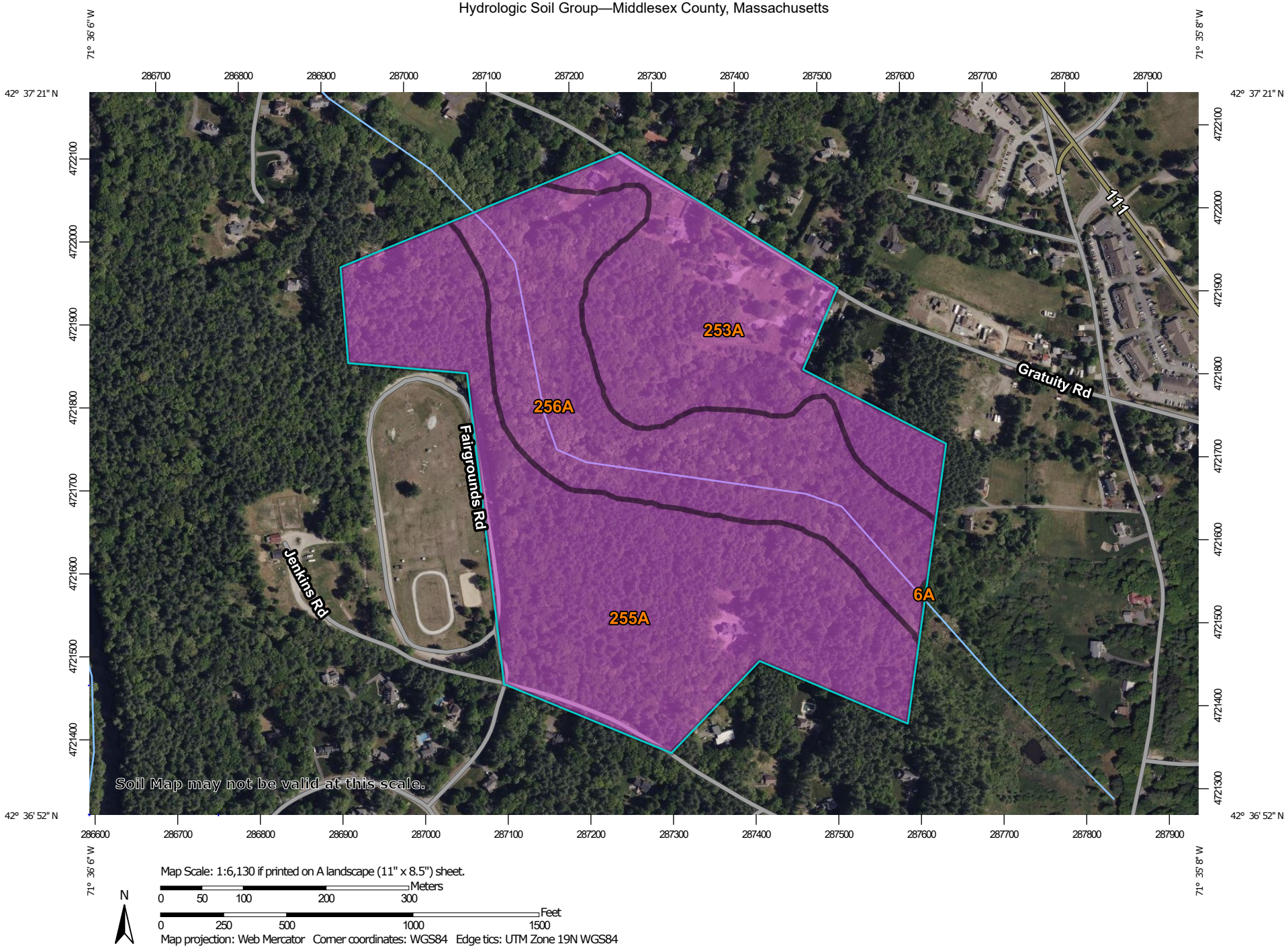
APPENDIX B. SOIL INFORMATION

NRCS Soils Report (from NRCS Website)



Map Scale: 1:6,130 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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: Middlesex County, Massachusetts
Survey Area Data: Version 22, Sep 9, 2022

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

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

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	A/D	0.0	0.0%
253A	Hinckley loamy sand, 0 to 3 percent slopes	A	19.0	23.8%
255A	Windsor loamy sand, 0 to 3 percent slopes	A	36.0	45.3%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	24.6	30.9%
Totals for Area of Interest			**79.6**	**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

Deep Observation Hole Logs

DEEP OBSERVATION HOLE LOGS

DATE:	May 10, 2024	**JOB NO:**	22-243
LOCATION:	63 Gratuity Road Groton, MA	**PREPARED FOR:**	Routhier & Roper Gratuity Road, LLC
ATTENDEES:	Matthew Stangle, LandTech	**APPROVING AUTHORITY:**	Unofficial (Stormwater)

Number	Depth (inches)	Soil Horizon	Soil Color	Soil Description
TH-101	0-12	A	10Y/R 3/2	Sandy Loam
	12-16	B	10Y/R 6/8	Loamy Sand
	16-72	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	Water @ 52”	ESHWT @ 42”	
TH-102	0-8	A	10Y/R 3/2	Sandy Loam
	8-18	B	10Y/R 6/8	Loamy Sand
	18-60	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	Water @ 48”	ESHWT @ 40”	
TH-103	0-8	A	10Y/R 3/2	Sandy Loam
	8-16	B	10Y/R 6/8	Loamy Sand
	16-66	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	Water @ 52”	ESHWT @ 36”	
TH-104	0-8	A	10Y/R 3/2	Sandy Loam
	8-16	B	10Y/R 6/8	Loamy Sand
	16-60	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	Water @ 36”	ESHWT @ 32”	

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Number	Depth (inches)	Soil Horizon	Soil Color	Soil Description
TH-105	0-12	A	10Y/R 3/2	Sandy Loam
	12-16	B	10Y/R 6/8	Loamy Sand
	16-48	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	Water @ 32”	ESHWT @ 20”	
TH-106	0-12	A	10Y/R 3/2	Sandy Loam
	12-18	B	10Y/R 6/8	Loamy Sand
	18-48	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	Water @ 36”	ESHWT @ 24”	
TH-107	0-8	A	10Y/R 3/2	Sandy Loam
	8-16	B	10Y/R 6/8	Loamy Sand
	16-54	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	Water @ 32”	ESHWT @ 20”	

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DEEP OBSERVATION HOLE LOGS

DATE: December 10, 2024 **JOB NO:** 22-243

LOCATION: 63 Gratuity Road, Groton, MA **PREPARED FOR:** Routhier & Roper Gratuity Road, LLC

ATTENDEES: Matthew Stangle, LandTech **APPROVING AUTHORITY:** Unofficial (Stormwater)

Number	Depth (inches)	Soil Horizon	Soil Color	Soil Description
TH-201	0-8	A	10Y/R 3/2	Sandy Loam
	8-18	B	10Y/R 6/8	Loamy Sand
	18-72	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	No Water	ESHWT @ 36”	
TH-202	0-12	A	10Y/R 3/2	Sandy Loam
	12-18	B	10Y/R 6/8	Loamy Sand
	18-90	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	Water @ 72”	ESHWT @ 42”	
TH-203	0-12	A	10Y/R 3/2	Sandy Loam
	12-24	B	10Y/R 6/8	Loamy Sand
	24-80	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	No Water	ESHWT @ 24”	
TH-204	0-12	A	10Y/R 3/2	Sandy Loam
	12-24	B	10Y/R 6/8	Loamy Sand
	24-78	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	No Water	ESHWT @ 20”	

Number	Depth (inches)	Soil Horizon	Soil Color	Soil Description
TH-205	0-12	A	10Y/R 3/2	Sandy Loam
	12-20	B	10Y/R 6/8	Loamy Sand
	20-72	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	No Water	ESHWT @ 20”	

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DEEP OBSERVATION HOLE LOGS

DATE:	January 22, 2025	**JOB NO:**	22-243
LOCATION:	63 Gratuity Road Groton, MA	**PREPARED FOR:**	Routhier & Roper Gratuity Road, LLC
ATTENDEES:	Matthew Stangle, LandTech	**APPROVING AUTHORITY:**	Unofficial (Stormwater)

Number	Depth (inches)	Soil Horizon	Soil Color	Soil Description
TH-206	0-12	A	10Y/R 3/2	Sandy Loam
	12-21	B	10Y/R 6/8	Loamy Sand
	21-84	C	2.5Y5/2	Medium-Course Sand
Notes:	No Refusal	Weep @ 60”	Water @ 64”	ESHWT @ 24”
TH-207	0-8	A	10Y/R 3/2	Sandy Loam
	8-18	B	10Y/R 6/8	Loamy Sand
	18-78	C	2.5Y5/2	Medium Sand
Notes:	No Refusal	Weep/Water @ 66”	ESHWT @ 24”	
TH-208	0-12	A	10Y/R 3/2	Sandy Loam
	12-18	B	10Y/R 6/8	Loamy Sand
	24-72	C	2.5Y5/2	Medium Sand
Notes:	No Refusal	Water @ 72”	ESHWT @ 21”	

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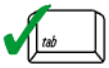
APPENDIX C. DEP STORMWATER MANAGEMENT CHECKLIST

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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[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.

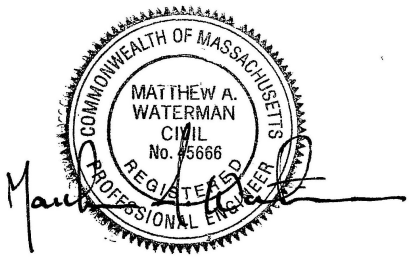
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



8/12/2024

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.

APPENDIX D. OPERATION AND MAINTENANCE LOG

Inspections for Year: _____

NOTE: See Standard 9 Operations and Maintenance of the Stormwater Management Report for additional details.

Best Management Practice	Action	Date Completed	Comments	Completed By	Action	Date Completed	Comments	Completed By
Deep Sump Catch Basins - Inspect or clean deep sump basins at least four times per year and at the end of the foliage and snow removal seasons. Sediments must also be removed four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Clean				Clean			
	Clean				Clean			
Sediment Forebay Visually inspect monthly during first year of operation, after which visually inspect every 3 months at a minimum. Clean when average depth of sediment exceeds three inches. Mow grasses when exceeding 6 inches and replace vegetation damaged during cleaning.	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Clean				Clean			
	Clean				Clean			

Best Management Practice	Action	Date Completed	Comments	Completed By	Action	Date Completed	Comments	Completed By
Pretreatment Structures (Turret) – Inspect or clean drain separator structures similar to catch basins, at least four times per year. Sediments must be removed whenever the depth of deposits is greater than or equal to one half the depth from bottom of sump to outlet elevation. Sediment to be removed from collection chamber with shovels or with hydro-vac, and drop in filters to be cleaned with broom or hose.	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Clean				Clean			
	Clean				Clean			
Infiltration Basin – Visual inspection for proper functioning will occur after every major storm during the first three months of operation and twice a year thereafter. Visual inspection and preventative maintenance will occur at least twice per year, and after every time drainage discharges through emergency spillways. Mow the buffer area, side slopes, and basin bottom; remove trash and debris; remove grass clippings and accumulated organic matter twice per year.	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Clean				Clean			
	Clean				Clean			

Best Management Practice	Action	Date Completed	Comments	Completed By	Action	Date Completed	Comments	Completed By
Contech CDS separator – Inspection should be performed at least twice per year, though the frequency of maintenance may need to be increased or reduced based on local conditions. Maintenance shall be performed when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated.	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Inspect				Inspect			
	Clean				Clean			
	Clean				Clean			