Stormwater Report

Recreational Marijuana Retail Establishment

420 State Route 2A

Lot 37-9

Prepared for:

Tempest Inc.
160 South Royalston Road
Royalston, MA 01368

Prepared by:

Stoddard Engineering
1863 Old Keene Road
Athol, MA 01331

Table of Contents

Figures

1.0 Introduction:

On behalf of Tempest, INC., Stoddard Engineering has prepared this stormwater system analysis in accordance with the Town of Phillipston, Massachusetts Zoning By-Law and the Massachusetts DEP's Stormwater Management Standards for the proposed Recreational Marijuana Establishment.

The proposed development is located in the northwest section of Phillipston on State Route 2A, North of the State Route 2 Overpass, south of Baldwin Hill Road. The subject property consists of 20± acres. Bordering vegetated wetlands are located along the northern section of the property, along with a perennial stream flowing through the wetland area. Caron Environmental Consulting, LLC conducted the stream analysis and wetlands delineation.

A 4,000 sqft Recreational Marijuana Retail Establishment (RMRE) is proposed to occupy 0.50± acres of the subject site. The project is to be accessed via State Route 2A by a proposed 30' wide bituminous concrete driveway. The project is proposed to have 38 traditional 10' X 20' parking stalls and two (2) ADA/AAB accessible parking stalls. The parking lots are proposed to have 24' travel lanes to accommodate vehicles in both directions.

The purpose of this stormwater analysis is to compare the pre-development conditions to the post development conditions resulting from the change in surface cover. The proposed stormwater management system for this development includes a combination of both flood control and water quality elements. The system within the development includes a closed storm system made up of catch basins, storm conveyance pipe and drain manholes, stormwater swales, and a stormwater basin. The stormwater basin discharges to the existing wetlands through an outlet control structure.

2.0 Existing Conditions:

The RMRE is proposed to be located 84'± from State Route 2A's right of way. The location is on the lower portion of a hill that slopes north west to the low point at the perennial stream. The objective of the project is to minimize the impacts to the existing landscapes, while making the site usable for a retail establishment.

The Natural Resources Conservation Services (NRCS) Soil Survey for the site classifies underlying soils as follows:

Berkshire – Marlow Association – 901E Class B/C

Oe	0 - 2"	slightly decomposed plant material
A	2 - 4"	fine sandy loam
E	4 - 5"	fine sandy loam
Bs1	5 - 7"	fine sandy loam
Bs2	7 – 13"	fine sandy loam
Bs3	13 - 21"	fine sandy loam
BC1	21 - 28"	fine sandy loam
BC2	28 – 33"	fine sandy loam
C	33 – 65"	fine sandy loam

Pillbury – Peacham Association – 917B Class C/D

A	0 -4”	gravely fine sandy loam
Bg	4 - 14”	gravely fine sandy loam
Bw	14 -24”	gravely fine sandy loam
Cd	24 -65”	gravely fine sandy loam

3.0 Stormwater Modeling Methodology:

The enclosed hydrologic calculations utilize the runoff estimating techniques developed by the USDA Soil Conservation Services (SCS). “HydroCAD” developed by Applied Microcomputer Systems, Stoddard Engineering has calculated stormwater hydrographs, which provide the peak rates of runoff for the Site. The drainage software program “HydroCAD” calculates runoff hydrographs using the same basic methodology as the TR-20 program entitled “Computer Programs for Project Formulations Hydrology, Technical Release Number 20” developed by SCS.

The total site area was subdivided into multiple sub-watersheds for both the existing conditions and the proposed conditions. For each sub-watershed a series of hydrologic parameters were estimated and entered into the HydroCAD program.

For this application of HydroCAD the times of concentration (Tc) were computed by using the “CN/Lag” which calculates the Tc utilizing land use and slope in conjunction with other land use variables. The Tc for a specific sub-watershed represents the time required for a droplet of water to travel from the most hydraulically distant point of the sub-watershed to the design point. It is computed by summing the times it takes the water to travel through the different components of the sub-watershed drainage system.

As a result of the urbanization of an area (i.e., increase of impervious area), the time of concentration will be decreased since velocity of overland flow will be increased. As the time of concentration is decreased for a sub-watershed, the peak flow rate will be increased for that particular sub-watershed.

4.0 Pre-Development:

As mentioned previously, the proposed development is located in the northwest section of Phillipston on State Route 2A, North of the State Route 2 Overpass, south of Baldwin Hill Road. The subject property consists of 20± acres. Bordering vegetated wetlands are located along the northern section of the property, along with a perennial stream flowing through the wetland area.

For the purpose of this analysis, the Site was analyzed as three watersheds. The watersheds are tributary to existing catch basins along State Route 2A (Design Point #1, Design Point #2) and to an existing 48” RCP Culvert (Design Point #3), which in turn were used to compare the pre-development and post-development rates of runoff. The sub-catchment areas area shown on the attached plan labeled “predevelopment watershed Delineation” (Plan W-1)

5.0 Post-Development:

A 4,000 sqft Recreational Marijuana Retail Establishment (RMRE) is proposed to occupy 0.50± acres of the subject site. The project is to be accessed via State Route 2A by a proposed 30' wide bituminous concrete driveway. (Refer to Plan W-2 for the proposed improvements and sub-watersheds)

Surface runoff from the proposed Impervious areas along with additional pervious areas within the development is directed to a stormwater basin in the northwestern portion of the project site. The development utilizes a sediment forebay and stormwater basin to hold and treat the stormwater, prior to release at a controlled rate.

The proposed stormwater basin has been designed to promote the removal of nitrites-nitrates and phosphorous, which are significant nutrient loading factors, and to promote the recharge of the groundwater supply. The side slopes and bottoms of the basins and swales will be loamed and seeded to establish vegetation.

The runoff from the storm events will remain in the basins, interact with the plantings within the basins and gradually infiltrate through the basin's bottom. The combination of plant interaction and infiltration will serve to remove sediment and nutrients from the runoff.

The proposed parking lot will include a series of 4' sump precast concrete catchbasin's connected to the infiltration basin utilizing 12" High-Density Polyethylene (HDPE) stormwater pipe. The catchbasin's will utilize a trash/gas traps to prevent any unwanted material from migrating to the infiltration basin.

The stormwater basin's design also includes an overflow spillway that provides 1-foot of freeboard above the 100-year storm event elevation within the basin. The purpose of the spillway is to provide a safe discharge point for any combination of conditions that leads to a greater volume of water within the basin than the 100-year design event.

In addition to the providing groundwater infiltration and water quality enhancement, the proposed stormwater basins also mitigate the increase in peak rates of runoff due to the change in the land surface. As the hydrographs are hydraulically routed through the basins their peak rates are attenuated due to the available storage.

Given the need to maintain the infiltration capacity at the basins, the basins were designed for ease of maintenance, stability, and aesthetic values. The side slopes of the basins are graded to allow for access of light construction equipment for cleaning purposes when silt and organics accumulate within the basin. Given the objective of minimizing water quality impacts, and on-going System and Site Maintenance Program has been developed as part of the Stormwater Maintenance Program presented in Section 8.0.

6.0 Conclusions:

The proposed stormwater management system achieves the series of design objectives and criteria for the project, specifically meeting or exceeding the requirements of the Massachusetts DEP Stormwater Management Standards outlined below.

7.0 Massachusetts Stormwater Management Standards:

Standard 1: No Untreated Discharges

The project does not include any new untreated discharges. The drainage system has one (1) outfall locations with the stormwater being treated and peak attenuation occurring prior to discharge.

Standard 2: Peak Rate

The stormwater management system for this project has been designed such that the post-development peak rates of run-off are consistent or less than pre-development run-off rates.

Table 1.0 – Peak Flow Rate Comparison

	25-YR EVENT (CFS)		50-YR EVENT (CFS)		100-YR EVENT (CFS)	
	PRE	**POST**	PRE	**POST**	PRE	**POST**
DP#1	2.37	**2.37**	3.60	**3.60**	5.21	**5.21**
DP#2	2.52	**0.74**	3.84	**1.00**	5.58	**1.31**
DP#3	8.75	**8.12**	13.64	**12.66**	20.07	**18.63**

Standard 3: Stormwater Recharge

Stormwater management systems must be designed such that the loss of annual recharge to groundwater shall be eliminated or minimized through infiltration measures. This standard requires that the stormwater management system be designed to infiltrate the required recharge volume as calculated per the Massachusetts Stormwater Handbook.

The "Static" Method was used to determine the required storage volume needed:

$$Rv = F \times \text{impervious area}$$

Rv = *Required Recharge Volume*, expressed in Ft^3, cubic yards, or acre-feet
F = Target Depth Factor associated with each Hydrologic Soil Group
Impervious Area = pavement, rooftop, and sidewalk area on site

$Rv = (0.6\text{-in}/12) \times 22{,}145\ Ft^3$

Rv = 1,107.25 Ft^3

The Infiltration basins should have a draw down rate of no more than 72 hours.

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

Where:
Rv = Storage Volume
K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate of 1.02 inches/hour based on NRCS (HSG – B)
Bottom Area = Bottom Area of Recharge Structure

$$\boldsymbol{Time_{drawdown} = \frac{Rv}{(1.02\ in./hr)(\frac{1ft}{12in})(1200)}}$$

$Time_{drawdown}$ = 10.9 hours

10.9 hours < 72 hours so result is satisfactory for design purposes

Standard 4: Water Quality (TSS Removal Rates)

V_{WQ} = (D_{WQ}/12 inches/foot) * (A_{IMP} * 43,560 square feet/acre)

V_{WQ} = *Required Water Quality Volume* (in cubic feet)

D_{WQ} = 1-inch for discharges near or to other areas.

A_{IMP} = Impervious Area (in acres)

V_{WQ} = (*0.6 in /*12 inches/foot) * (*0.508* * 43,560 square feet/acre)

V_{WQ} = 1106.42 Ft^3

Volume Provided in the Infiltration Basin = 12,490 Ft^3

Required Recharge Volume is based on 0.6 inches and Required Water Quality Volume is based on 0.6", the Required Water Quality Volume is the Target Volume used for design.

Forebay Sizing:

V = 0.1"/12 X A_{IMP}
V = 0.1"/12 X 22,145 = 184.54 Ft^3

Forebay Volume Provided = 448 Ft^3

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

Spreadsheet calculation of TSS removal demonstrates the >80% TSS removal is achieved. TSS removal calculations are included in Appendix 2.

See Standard 9 for information regarding Long Term Pollution Prevention Plan.

Standard 5: Land Use with Higher Potential Pollution Loads

The project does not contain Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

Standard 6: Critical Areas (Zone II Discharges)

This project is not within a Zone II and does not require review by the Natural Heritage and Endangered Species Program, this Standard is not applicable.

Standard 7: Redevelopment and Other Projects Subject to the Standards only to the maximum extent Practicable

This project is New Development; therefore, this Standard is not applicable.

Standard 8: Erosion and Sedimentation Control Plan

Erosion control measures are shown on the attached plans, and includes the installation of silt fencing, staked wattles, and the remediation of disturbed areas.

This project includes the disturbance of more than one acre of land so a NPDES General Construction Permit is required. This permit will include the preparation of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP will be prepared prior to the start of construction.

Standard 9: Operations and Maintenance Plan

Refer to Section 8.0 for the Stormwater Operation and Maintenance Program for the proposed project.

Standard 10: Illicit Discharges to the Stormwater Management System

There are no known illicit discharges into the Town of Phillipston's drainage system.

8.0 Stormwater Operation and Maintenance Program

This project is proposed to be A 4,000 sqft Recreational Marijuana Retail Establishment (RMRE) is proposed to occupy 0.50± acres of the subject site. The project is to be accessed via State Route 2A by a proposed 30' wide bituminous concrete driveway. The project is proposed to have 38 traditional

10’ X 20’ parking stalls and two (2) ADA/AAB accessible parking stalls. The parking lots are proposed to have 24’ travel lanes to accommodate vehicles in both directions.

As presented within the description of the proposed stormwater management system, several management practices have been instituted to collect, mitigate, and treat stormwater runoff from the proposed development. These include the following:

- Deep Sump Catch basins with trash/gas hoods.
- Retention of stormwater, within the proposed stormwater basin to facilitate recharge of the groundwater system and balancing of pre/post development flows.
- Construction of stormwater basin with associated outlets to mitigate pre and post peak development plows for all storm events (i.e. 2, 10, 25, and 100-year storm events.)

All of the above items reflect mitigation measures to improve and maintain stormwater quality that will flow as groundwater to the existing wetland system. In order to assure proper operation of the stormwater facilities in the future, it is necessary for a stormwater maintenance program be instituted and followed.

The property owner of the stormwater system described herein will be responsible for the required maintenance and operation. The proposed maintenance procedures and scheduling is as follows:

8.1 Stormwater System Maintenance

The Stormwater basin is the primary element of the site’s stormwater management program. Final treatment and infiltration of stormwater normally occurs within this mitigation structure. At a minimum; at 6 month intervals, the bottom of the basin requires inspection and removal of sediment if, during the inspection, an accumulation of 2” of more of sediment is found at several locations within the basin. In addition, routine inspections are required after each major storm event of 1” of rainfall or more. Additionally, the operation of the drainage system should be observed at least once every six months during a major storm event to evaluate its performance and note any deficiencies that may occur. Included within this report are sample inspection forms that should be completed to maintain proper records of necessary observations and required maintenance.

Inspection of stormwater basin’s outlets is required. Accumulated debris, etc., is to be removed from the vicinity of the outflow. The stormwater basin’s emergency spillways shall be inspected on a regular basis. If there is evidence that an overflow event has occurred, the rip rap on the slope shall be examined to determine if repairs are required following the overflow event.

Due to the design of the interior slopes of the basins to accommodate construction equipment, it is anticipated that the slope erosion should be minimal after the vegetation is established. If erosion of the slopes occurs, loam shall be replaced and standard methods used to re-establish proper vegetation cover. Fescues and reed canary grass seed mixtures, which are rapid growing and low maintenance, are recommended. Hay mulch or other suitable stabilizing techniques shall be utilized during the reseeding process.

On a bi-yearly basis the side slopes of the basins will be mowed. The condition of the turf, the status of controlled tree growth, and evidence of differential settlement will be evaluated and if needed, corrective action will be taken. The outside toe of slope should be evaluated for evidence of ponding or leakage through the embankment. If evidence of leakage is apparent, an engineer will need to be engaged to evaluate the stability of the embankment and furnish recommendations regarding the structure.

Inspection of the catch basins is required to ensure the stormwater management system functions as designed. At a minimum, annual inspections of the catch basins should be conducted. The level of sediment in the bottom of the basin should be noted. The sediment/debris should be removed if it has accumulated to a level greater than 50% of the sump. The catch basin outlet is equipped with a trash/gas hood that is designed to prevent floatables from leaving the basin and contaminating the downstream receiving waters. This hood should be inspected to ensure it is still secured properly.

8.2 Stormwater Maintenance Data Sheet

An operation and maintenance log should be maintained for the last three years. This should include inspections, repairs, replacement, and disposal. For disposal, the log shall indicate the type of material and the disposal location.

9.0 General Construction Sequence

1. Prior to construction, the contractor shall file for a Stormwater Pollution Prevention Plan (SWPPP) for acceptance under the EPA's Massachusetts General Construction Activity Permit.
2. Contractor shall furnish and install all erosion controls including silt fence, haybales, straw wattles (as required on approved plans). Note that the perimeter erosion controls shown on the plan set does not relieve the contractor of construction period erosion control measures needed to assure adequate stormwater treatment. Interior sediment pond and run-off controls will be required to meet SWPPP standards.
3. The access driveway shall be installed to the width and grades shown on the plan set. This entrance shall be maintained throughout construction to assure safe and adequate travel.
4. The infiltration basin shall be installed as shown on the approved plans. These areas may be used as temporary sediment basins during construction maintaining 1' of vertical separation from the proposed finish grade and as long as they are properly cleaned upon completion.
5. The drainage infrastructure shall be installed in accordance with the approved plan.
6. The telecommunication and electrical infrastructure shall be installed in coordination with the appropriate agencies.
7. Install and finish grade parking lot, place bituminous concrete binder mix.
8. Raise all utilities to finish grade.
9. Install bituminous concrete berm and place finish course of bituminous concrete.
10. Place loam and seed to establish vegetation on all disturbed areas.

10.0 Stormwater System Maintenance Construction Phase

Best Management Practices (BMP) for erosion and sedimentation control are staked straw bales, filter fences, wattles, hydro seeding, and phased development. Although not all of these methods are utilized for this project, it should be noted that these are not designed to handle high concentrations of sediments typically found in construction runoff. High sediment losses are not anticipated on this project, but it is imperative that the BMP's on this site be maintained.

Pre-Construction

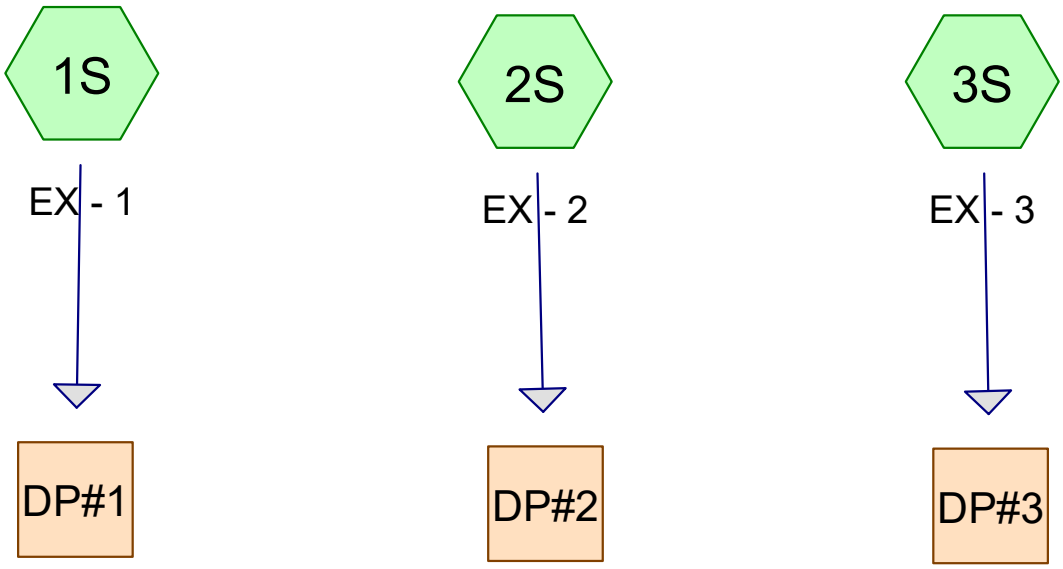
A. The contractor shall have a stockpile of materials required to control erosion onsite to be used to supplement or repair erosion control devices. These materials shall include, but are not limited to straw bales, silt fence, wattles, and crushed stone.
B. The contractor is responsible for erosion control on site and shall utilize erosion control measures where needed, regardless of whether the measures are specified on the plan or in the order of conditions.

Construction Phase

A. All excavated materials shall be stockpiled, separating topsoil from other materials. The topsoil shall be kept for future use on the site. Erosion control shall be utilized along the down slope side of the piles and side slopes shall not exceed 2:1.
B. If intense rainfall is anticipated the installation of supplemental straw bale dikes, silt fences, or wattles shall be considered.
C. Unsuitable excavated material shall be removed from the site as soon as practicable.
D. Construction entrance shall be installed as shown on the approved plan.

Ongoing Site Work

A. Inspect all sediment and erosion control measures on a weekly basis, prior to, and after significant storm events (0.25 inches or greater).
B. Sediment shall be removed from sediment barriers if buildup exceeds ½ the height of the barrier.
C. Damaged or deteriorated barriers shall be repaired immediately after the defect is identified.
D. The underside of the straw bales and wattles shall be kept in close contact with exposed earth. Reset as necessary.
E. Remove vegetative and non-vegetative debris from basins. Inspect emergency overflow rip rap and remove debris as necessary.
F. In general, the are shall be kept neat and litter free, to the maximum extent practicable. Trash, shipping materials, and other disposable materials shall be contained and prevented from becoming windblown litter. The site supervisor shall ensure all debris is either removed or properly contained prior to leaving the site on a daily basis.
G. Erosion control elements shall remain in place until all disturbed areas are stabilized. After removal of erosion control elements, regrade, and stabilize disturbed areas under barriers, as necessary.
H. No pesticides or herbicides are to be used on the site.



Subcat Reach Pond Link

Routing Diagram for Pre-Condition
Prepared by Hewlett-Packard Company, Printed 6/11/2020

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 4347 MA Worcester Worcester County Central

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.160	98	Paved roads w/curbs & sewers, HSG B (1S, 2S, 3S)
14.690	55	Woods, Good, HSG B (1S, 2S, 3S)
14.850	**55**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
14.850	HSG B	1S, 2S, 3S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
14.850		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.160	0.000	0.000	0.000	0.160	Paved roads w/curbs & sewers	1S, 2S, 3S
0.000	14.690	0.000	0.000	0.000	14.690	Woods, Good	1S, 2S, 3S
0.000	**14.850**	**0.000**	**0.000**	**0.000**	**14.850**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 1S: EX - 1 Runoff Area=1.840 ac 3.26% Impervious Runoff Depth=1.53"
Flow Length=657' Slope=0.1800 '/' Tc=10.3 min CN=56 Runoff=2.37 cfs 0.234 af

Subcatchment 2S: EX - 2 Runoff Area=2.130 ac 2.35% Impervious Runoff Depth=1.53"
Flow Length=802' Slope=0.1600 '/' Tc=12.8 min CN=56 Runoff=2.52 cfs 0.271 af

Subcatchment 3S: EX - 3 Runoff Area=10.880 ac 0.46% Impervious Runoff Depth=1.45"
Flow Length=1,404' Slope=0.1100 '/' Tc=24.7 min CN=55 Runoff=8.75 cfs 1.314 af

Reach DP#1: Inflow=2.37 cfs 0.234 af
Outflow=2.37 cfs 0.234 af

Reach DP#2: Inflow=2.52 cfs 0.271 af
Outflow=2.52 cfs 0.271 af

Reach DP#3: Inflow=8.75 cfs 1.314 af
Outflow=8.75 cfs 1.314 af

Total Runoff Area = 14.850 ac Runoff Volume = 1.819 af Average Runoff Depth = 1.47"
98.92% Pervious = 14.690 ac 1.08% Impervious = 0.160 ac

Summary for Subcatchment 1S: EX - 1

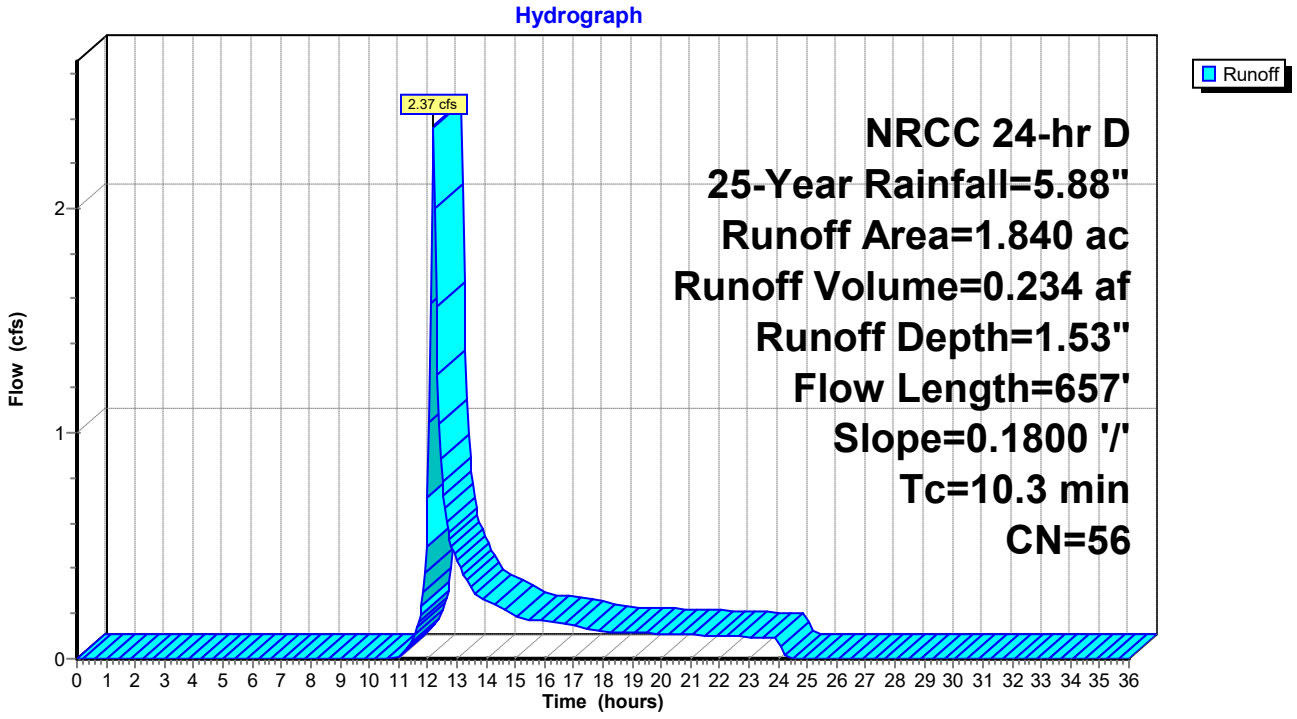
Runoff = 2.37 cfs @ 12.19 hrs, Volume= 0.234 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (ac)	CN	Description
1.780	55	Woods, Good, HSG B
0.060	98	Paved roads w/curbs & sewers, HSG B
1.840	56	Weighted Average
1.780		96.74% Pervious Area
0.060		3.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	657	0.1800	1.07		**Lag/CN Method,**

Subcatchment 1S: EX - 1



Summary for Subcatchment 2S: EX - 2

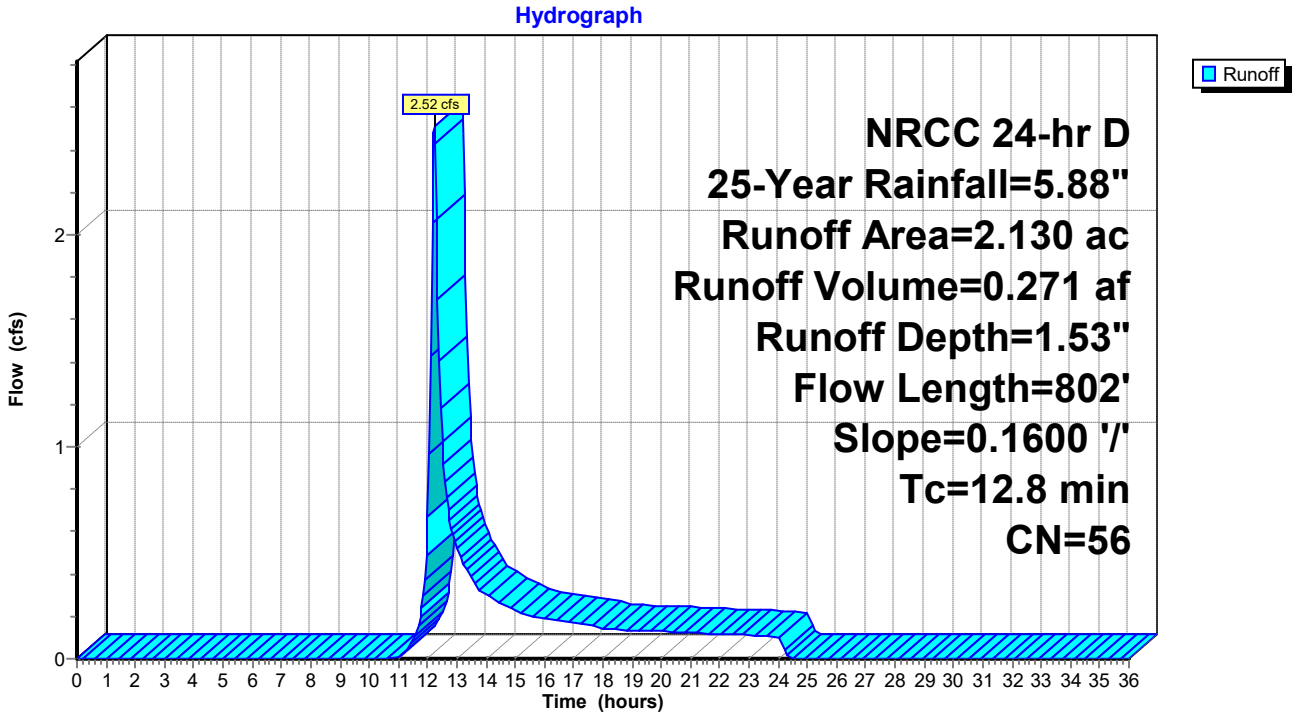
Runoff = 2.52 cfs @ 12.22 hrs, Volume= 0.271 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (ac)	CN	Description
2.080	55	Woods, Good, HSG B
0.050	98	Paved roads w/curbs & sewers, HSG B
2.130	56	Weighted Average
2.080		97.65% Pervious Area
0.050		2.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	802	0.1600	1.05		**Lag/CN Method,**

Subcatchment 2S: EX - 2



Summary for Subcatchment 3S: EX - 3

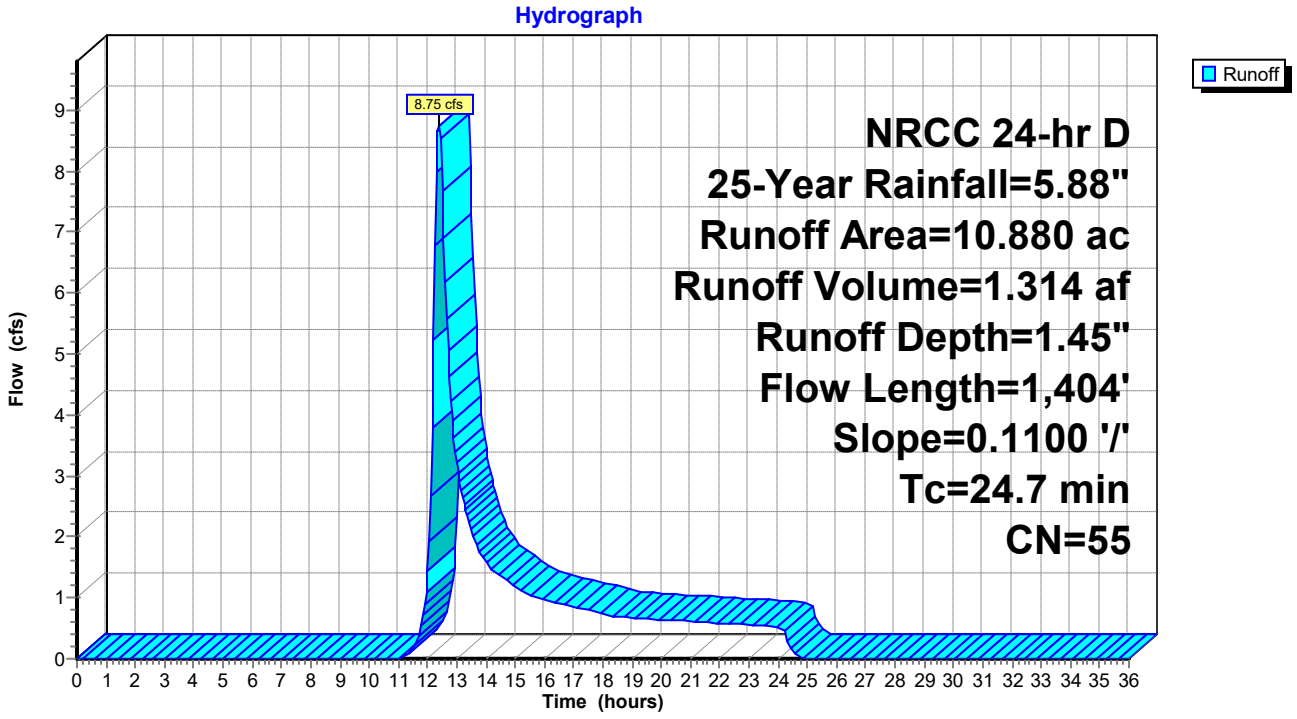
Runoff = 8.75 cfs @ 12.38 hrs, Volume= 1.314 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (ac)	CN	Description
10.830	55	Woods, Good, HSG B
0.050	98	Paved roads w/curbs & sewers, HSG B
10.880	55	Weighted Average
10.830		99.54% Pervious Area
0.050		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.7	1,404	0.1100	0.95		**Lag/CN Method,**

Subcatchment 3S: EX - 3



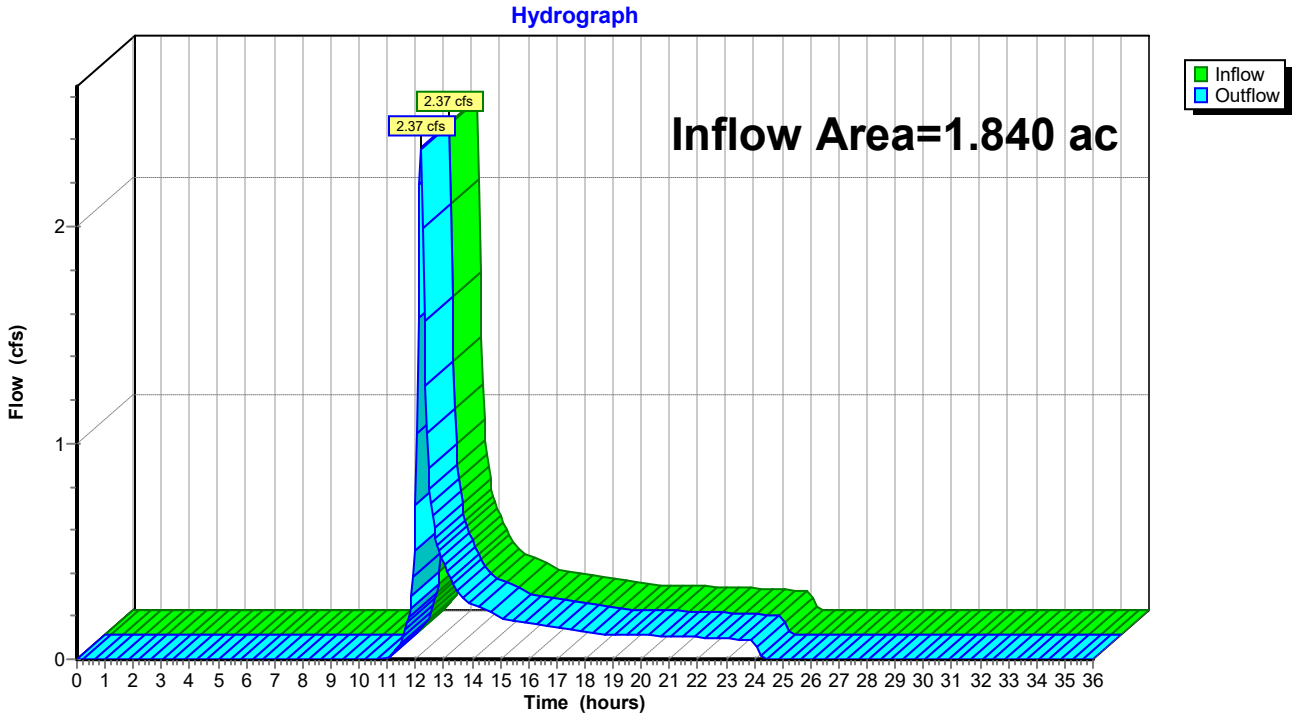
Summary for Reach DP#1:

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

Inflow Area = 1.840 ac, 3.26% Impervious, Inflow Depth = 1.53" for 25-Year event
Inflow = 2.37 cfs @ 12.19 hrs, Volume= 0.234 af
Outflow = 2.37 cfs @ 12.19 hrs, Volume= 0.234 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP#1:



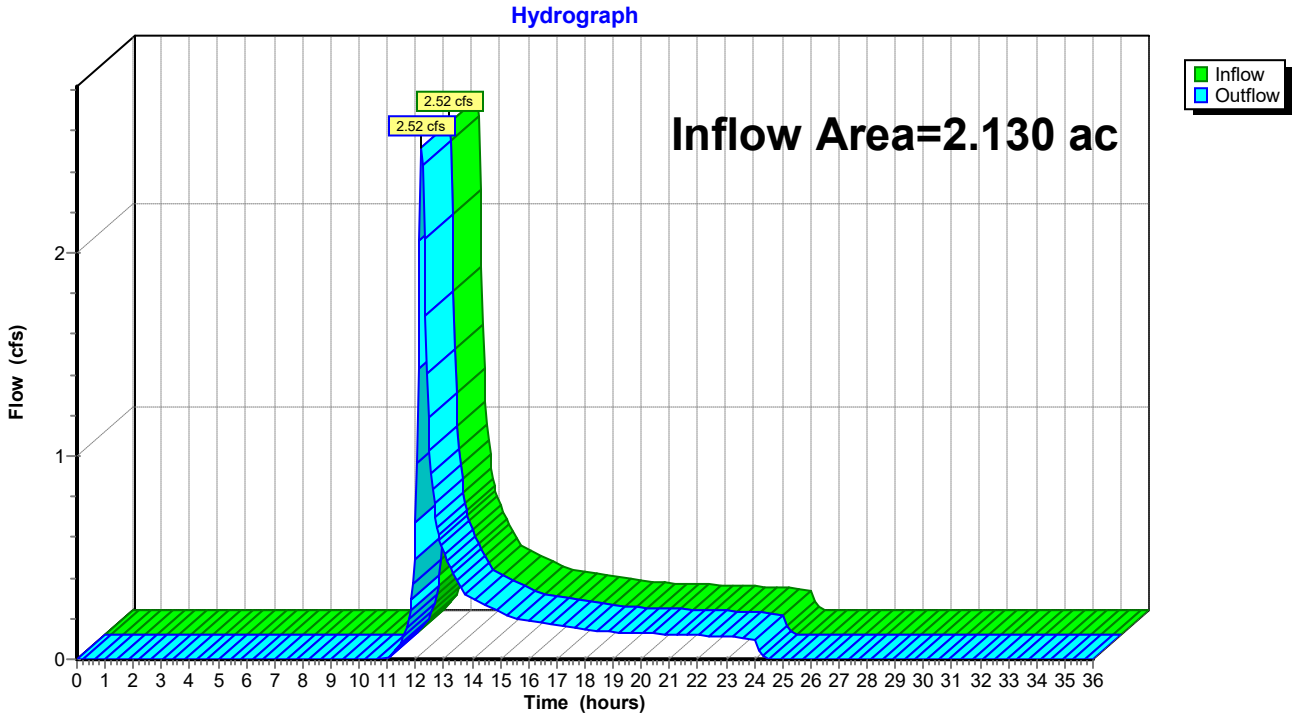
Summary for Reach DP#2:

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

Inflow Area = 2.130 ac, 2.35% Impervious, Inflow Depth = 1.53" for 25-Year event
Inflow = 2.52 cfs @ 12.22 hrs, Volume= 0.271 af
Outflow = 2.52 cfs @ 12.22 hrs, Volume= 0.271 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP#2:



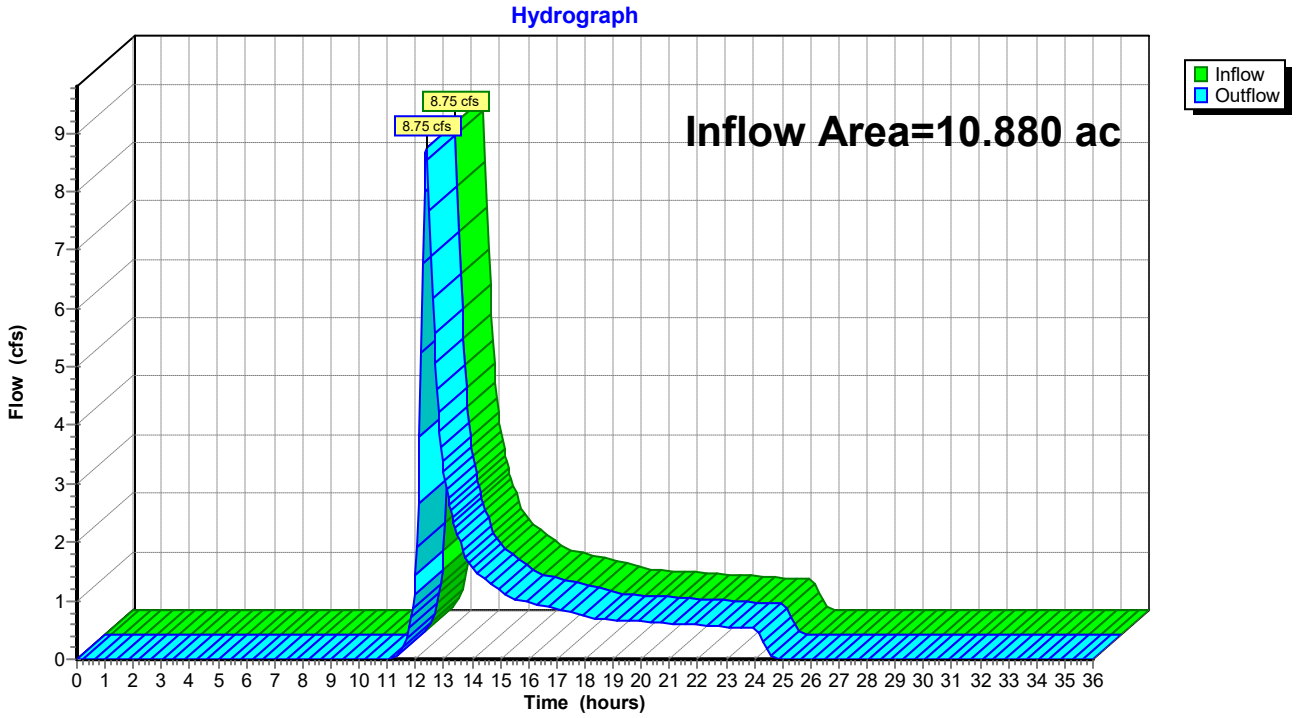
Summary for Reach DP#3:

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

Inflow Area = 10.880 ac, 0.46% Impervious, Inflow Depth = 1.45" for 25-Year event
Inflow = 8.75 cfs @ 12.38 hrs, Volume= 1.314 af
Outflow = 8.75 cfs @ 12.38 hrs, Volume= 1.314 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP#3:



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 1S: EX - 1 Runoff Area=1.840 ac 3.26% Impervious Runoff Depth=2.22"
Flow Length=657' Slope=0.1800 '/' Tc=10.3 min CN=56 Runoff=3.60 cfs 0.340 af

Subcatchment 2S: EX - 2 Runoff Area=2.130 ac 2.35% Impervious Runoff Depth=2.22"
Flow Length=802' Slope=0.1600 '/' Tc=12.8 min CN=56 Runoff=3.84 cfs 0.394 af

Subcatchment 3S: EX - 3 Runoff Area=10.880 ac 0.46% Impervious Runoff Depth=2.12"
Flow Length=1,404' Slope=0.1100 '/' Tc=24.7 min CN=55 Runoff=13.64 cfs 1.926 af

Reach DP#1: Inflow=3.60 cfs 0.340 af
Outflow=3.60 cfs 0.340 af

Reach DP#2: Inflow=3.84 cfs 0.394 af
Outflow=3.84 cfs 0.394 af

Reach DP#3: Inflow=13.64 cfs 1.926 af
Outflow=13.64 cfs 1.926 af

Total Runoff Area = 14.850 ac Runoff Volume = 2.659 af Average Runoff Depth = 2.15"
98.92% Pervious = 14.690 ac 1.08% Impervious = 0.160 ac

Summary for Subcatchment 1S: EX - 1

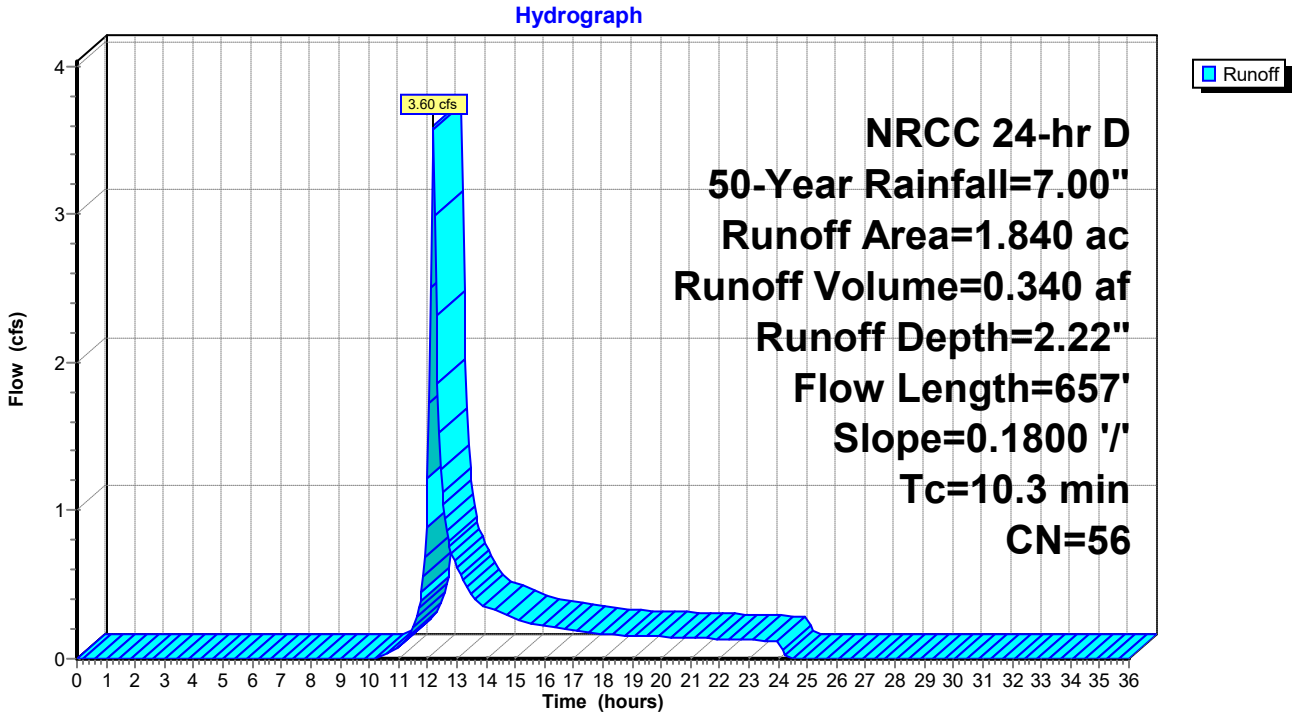
Runoff = 3.60 cfs @ 12.19 hrs, Volume= 0.340 af, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 50-Year Rainfall=7.00"

Area (ac)	CN	Description
1.780	55	Woods, Good, HSG B
0.060	98	Paved roads w/curbs & sewers, HSG B
1.840	56	Weighted Average
1.780		96.74% Pervious Area
0.060		3.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	657	0.1800	1.07		**Lag/CN Method,**

Subcatchment 1S: EX - 1



Summary for Subcatchment 2S: EX - 2

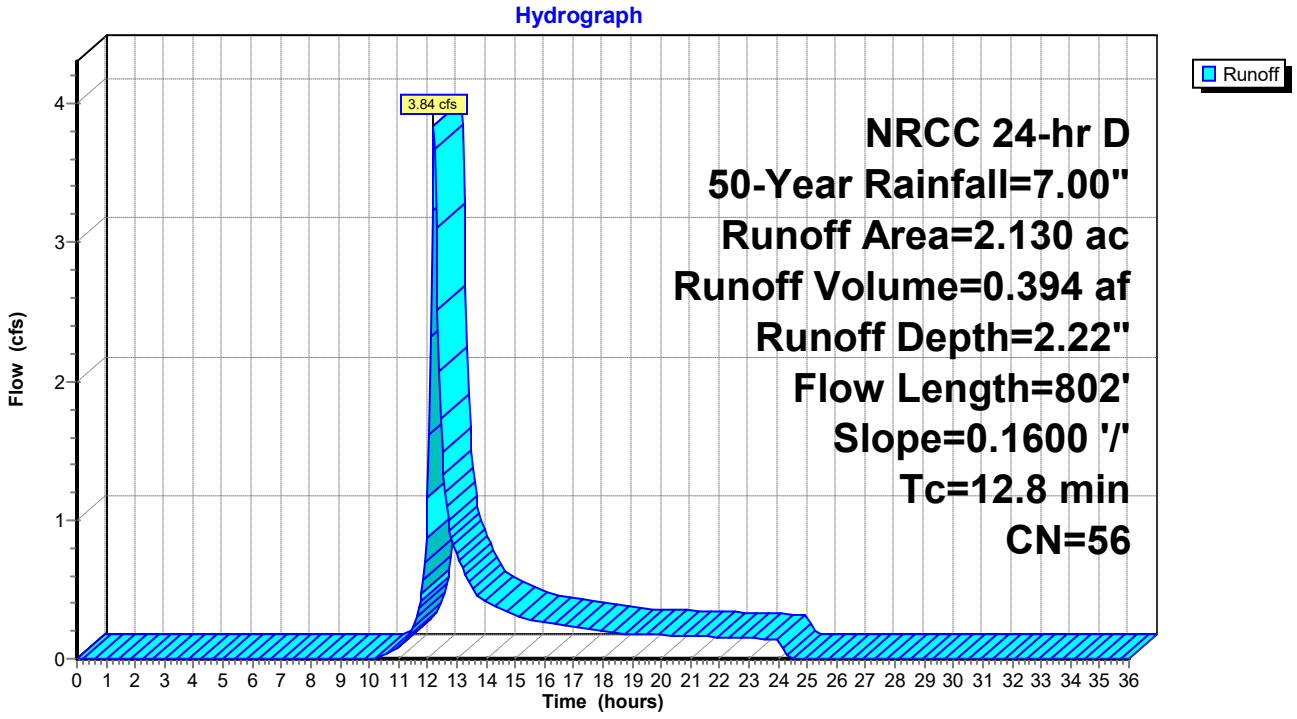
Runoff = 3.84 cfs @ 12.22 hrs, Volume= 0.394 af, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 50-Year Rainfall=7.00"

Area (ac)	CN	Description
2.080	55	Woods, Good, HSG B
0.050	98	Paved roads w/curbs & sewers, HSG B
2.130	56	Weighted Average
2.080		97.65% Pervious Area
0.050		2.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	802	0.1600	1.05		**Lag/CN Method,**

Subcatchment 2S: EX - 2



Summary for Subcatchment 3S: EX - 3

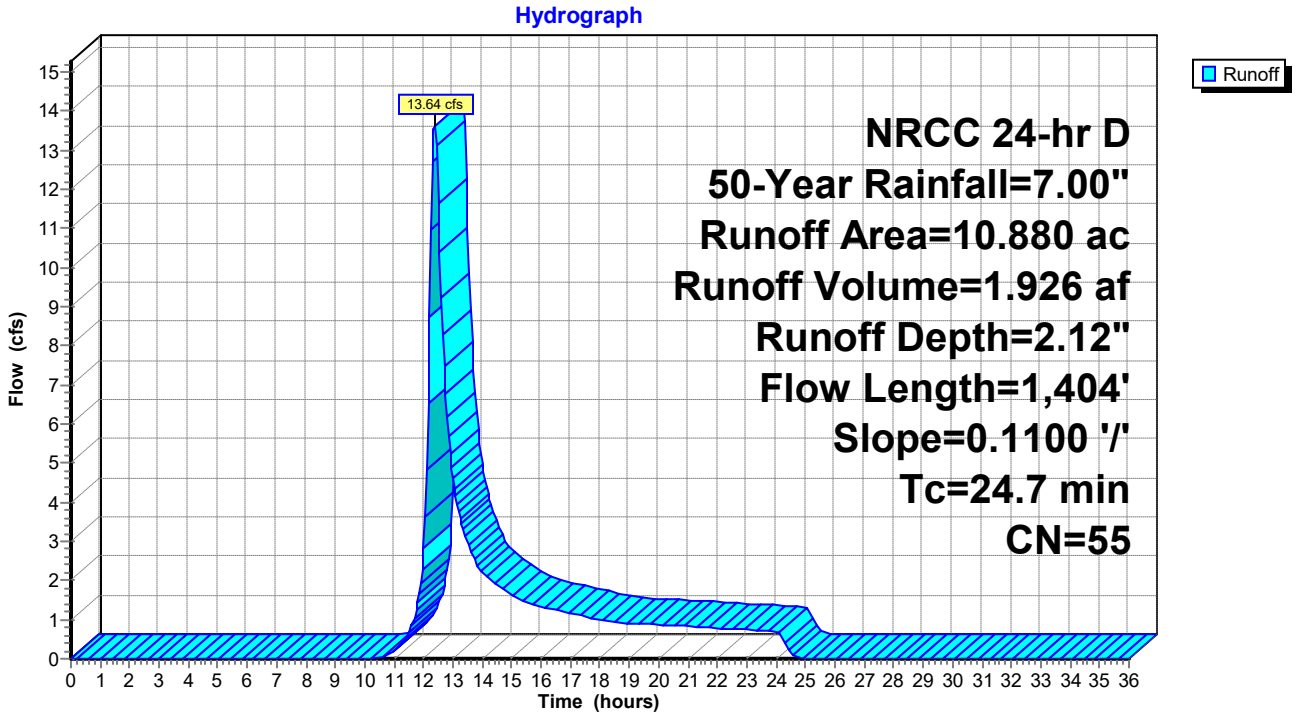
Runoff = 13.64 cfs @ 12.37 hrs, Volume= 1.926 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 50-Year Rainfall=7.00"

Area (ac)	CN	Description
10.830	55	Woods, Good, HSG B
0.050	98	Paved roads w/curbs & sewers, HSG B
10.880	55	Weighted Average
10.830		99.54% Pervious Area
0.050		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.7	1,404	0.1100	0.95		**Lag/CN Method,**

Subcatchment 3S: EX - 3



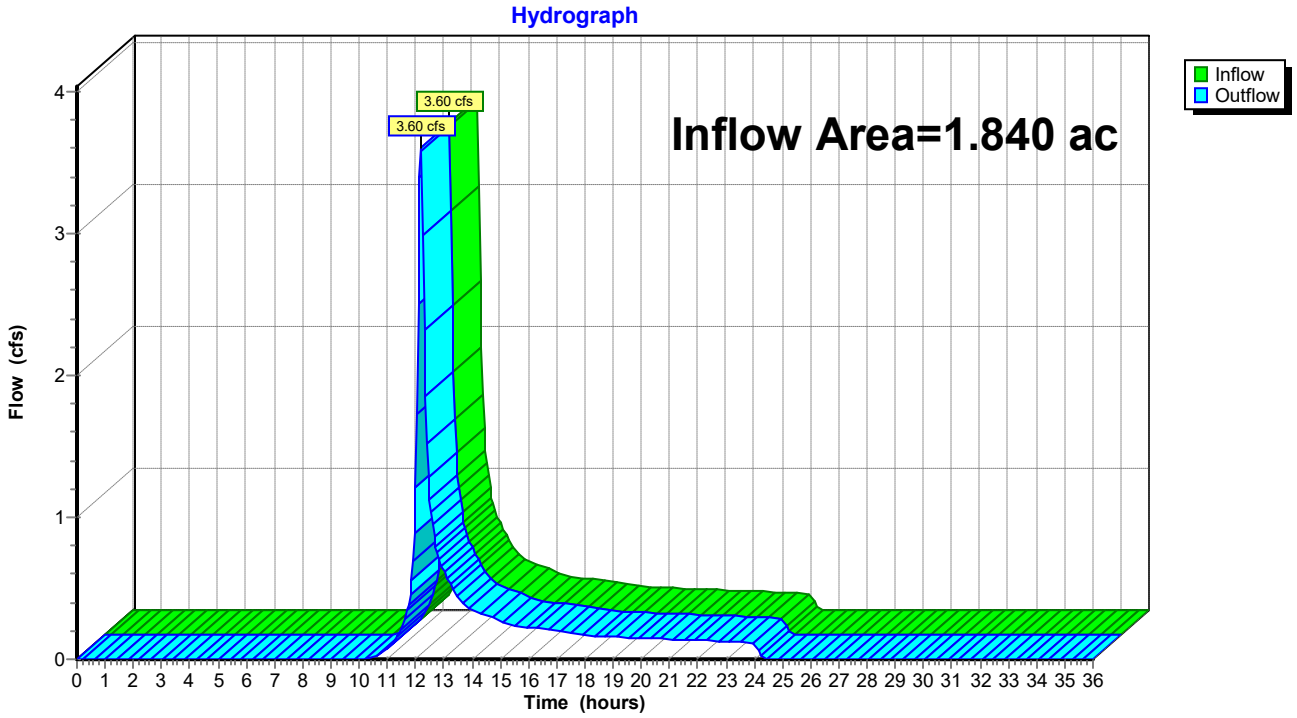
Summary for Reach DP#1:

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

Inflow Area = 1.840 ac, 3.26% Impervious, Inflow Depth = 2.22" for 50-Year event
Inflow = 3.60 cfs @ 12.19 hrs, Volume= 0.340 af
Outflow = 3.60 cfs @ 12.19 hrs, Volume= 0.340 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP#1:



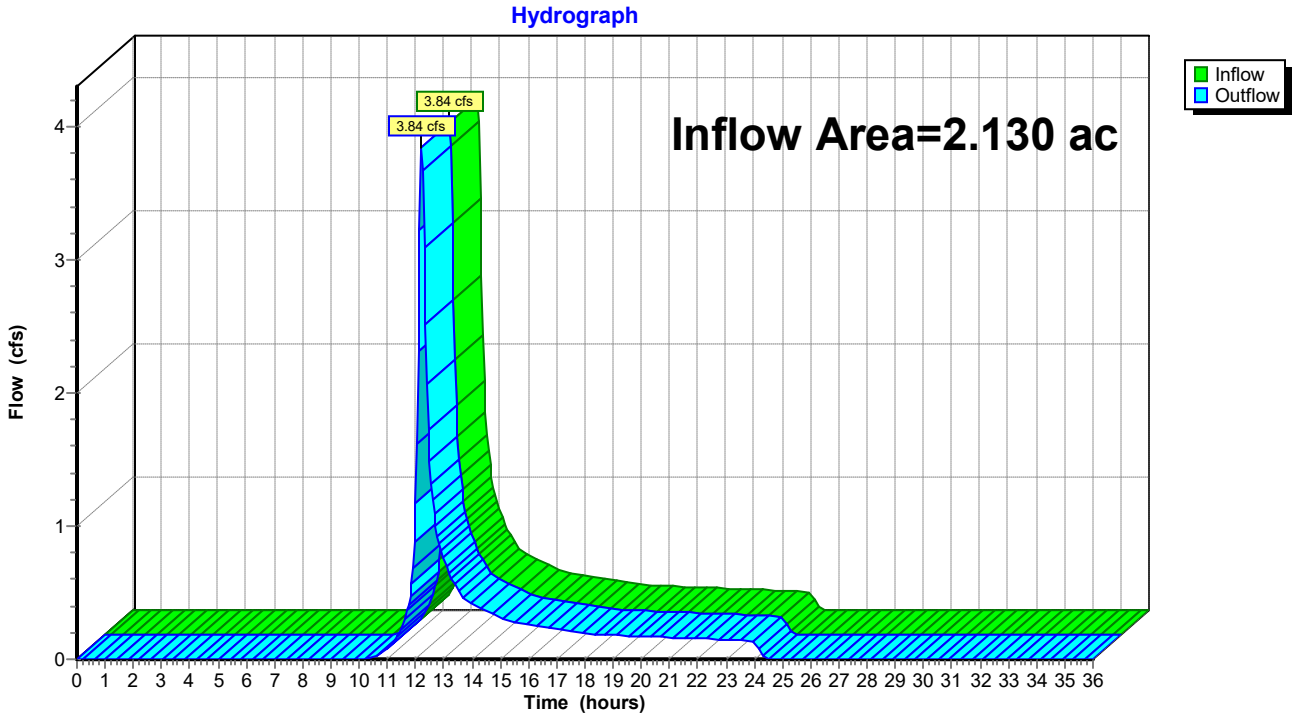
Summary for Reach DP#2:

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

Inflow Area = 2.130 ac, 2.35% Impervious, Inflow Depth = 2.22" for 50-Year event
Inflow = 3.84 cfs @ 12.22 hrs, Volume= 0.394 af
Outflow = 3.84 cfs @ 12.22 hrs, Volume= 0.394 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP#2:



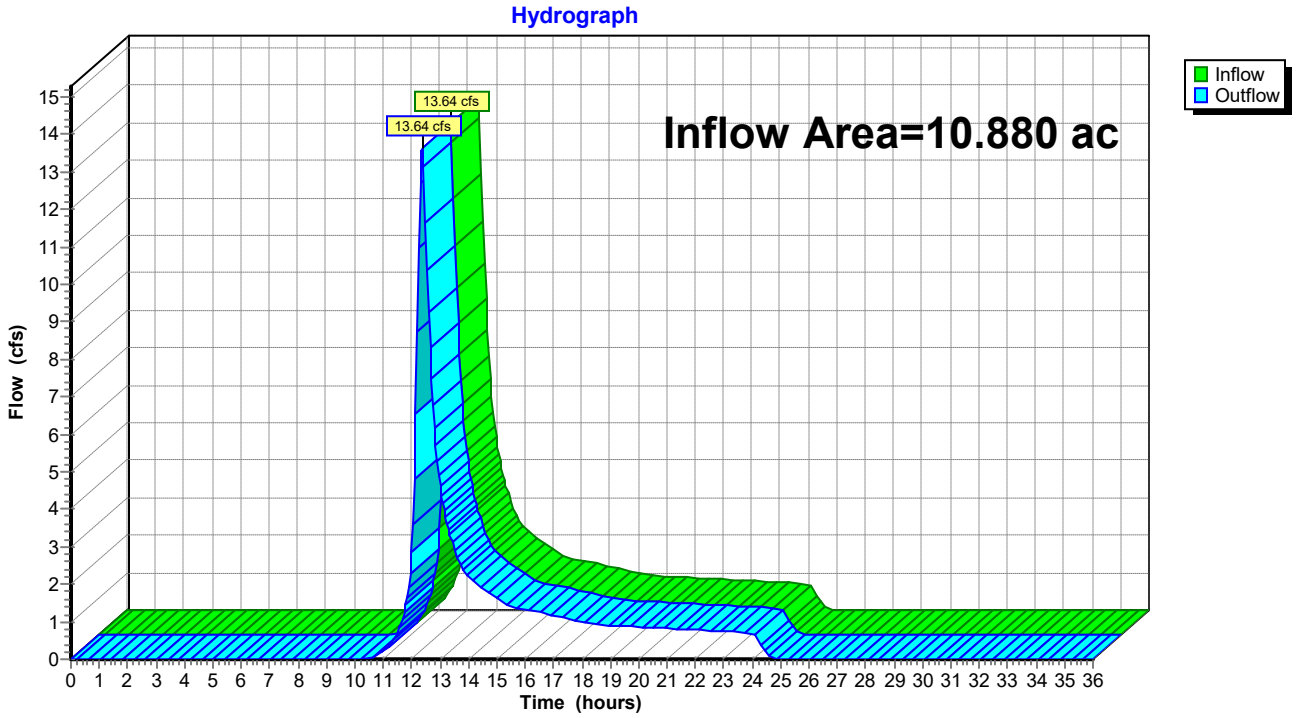
Summary for Reach DP#3:

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

Inflow Area = 10.880 ac, 0.46% Impervious, Inflow Depth = 2.12" for 50-Year event
Inflow = 13.64 cfs @ 12.37 hrs, Volume= 1.926 af
Outflow = 13.64 cfs @ 12.37 hrs, Volume= 1.926 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP#3:



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 1S: EX - 1 Runoff Area=1.840 ac 3.26% Impervious Runoff Depth=3.13"
Flow Length=657' Slope=0.1800 '/' Tc=10.3 min CN=56 Runoff=5.21 cfs 0.480 af

Subcatchment 2S: EX - 2 Runoff Area=2.130 ac 2.35% Impervious Runoff Depth=3.13"
Flow Length=802' Slope=0.1600 '/' Tc=12.8 min CN=56 Runoff=5.58 cfs 0.556 af

Subcatchment 3S: EX - 3 Runoff Area=10.880 ac 0.46% Impervious Runoff Depth=3.02"
Flow Length=1,404' Slope=0.1100 '/' Tc=24.7 min CN=55 Runoff=20.07 cfs 2.737 af

Reach DP#1: Inflow=5.21 cfs 0.480 af
Outflow=5.21 cfs 0.480 af

Reach DP#2: Inflow=5.58 cfs 0.556 af
Outflow=5.58 cfs 0.556 af

Reach DP#3: Inflow=20.07 cfs 2.737 af
Outflow=20.07 cfs 2.737 af

Total Runoff Area = 14.850 ac Runoff Volume = 3.774 af Average Runoff Depth = 3.05"
98.92% Pervious = 14.690 ac 1.08% Impervious = 0.160 ac

Summary for Subcatchment 1S: EX - 1

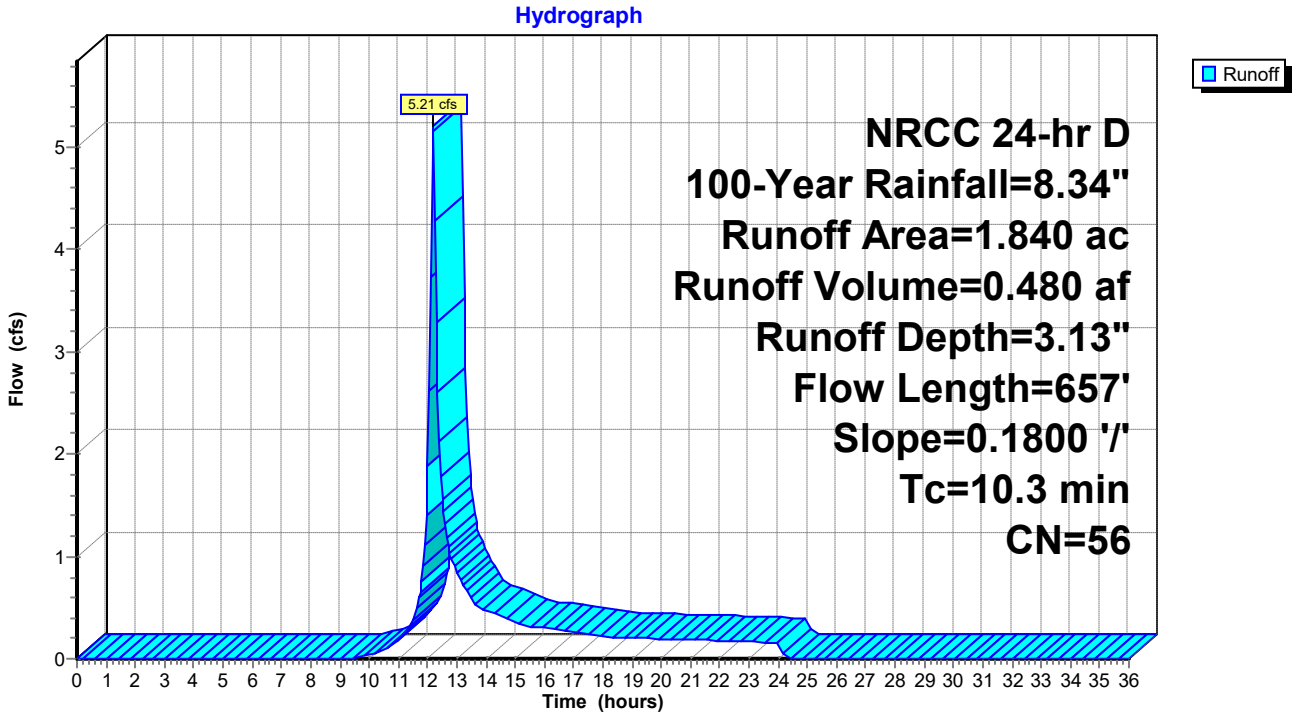
Runoff = 5.21 cfs @ 12.18 hrs, Volume= 0.480 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (ac)	CN	Description
1.780	55	Woods, Good, HSG B
0.060	98	Paved roads w/curbs & sewers, HSG B
1.840	56	Weighted Average
1.780		96.74% Pervious Area
0.060		3.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	657	0.1800	1.07		**Lag/CN Method,**

Subcatchment 1S: EX - 1



Summary for Subcatchment 2S: EX - 2

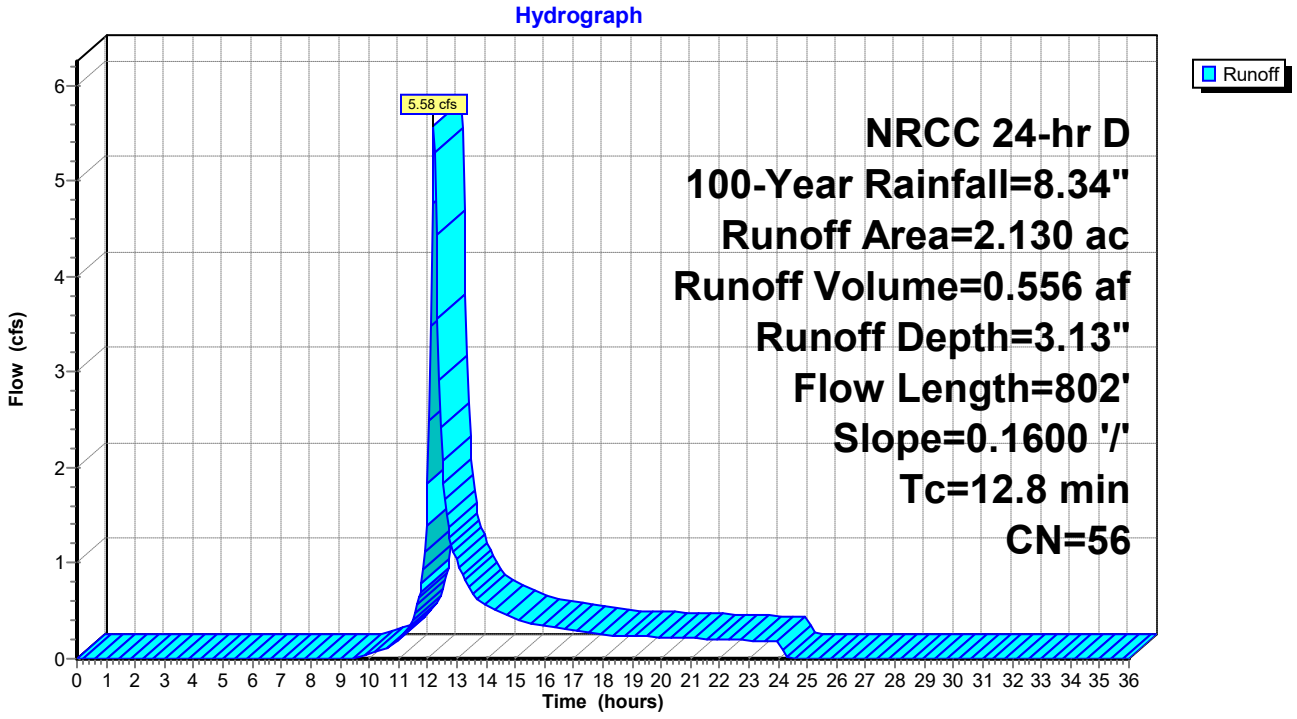
Runoff = 5.58 cfs @ 12.21 hrs, Volume= 0.556 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (ac)	CN	Description
2.080	55	Woods, Good, HSG B
0.050	98	Paved roads w/curbs & sewers, HSG B
2.130	56	Weighted Average
2.080		97.65% Pervious Area
0.050		2.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	802	0.1600	1.05		**Lag/CN Method,**

Subcatchment 2S: EX - 2



Summary for Subcatchment 3S: EX - 3

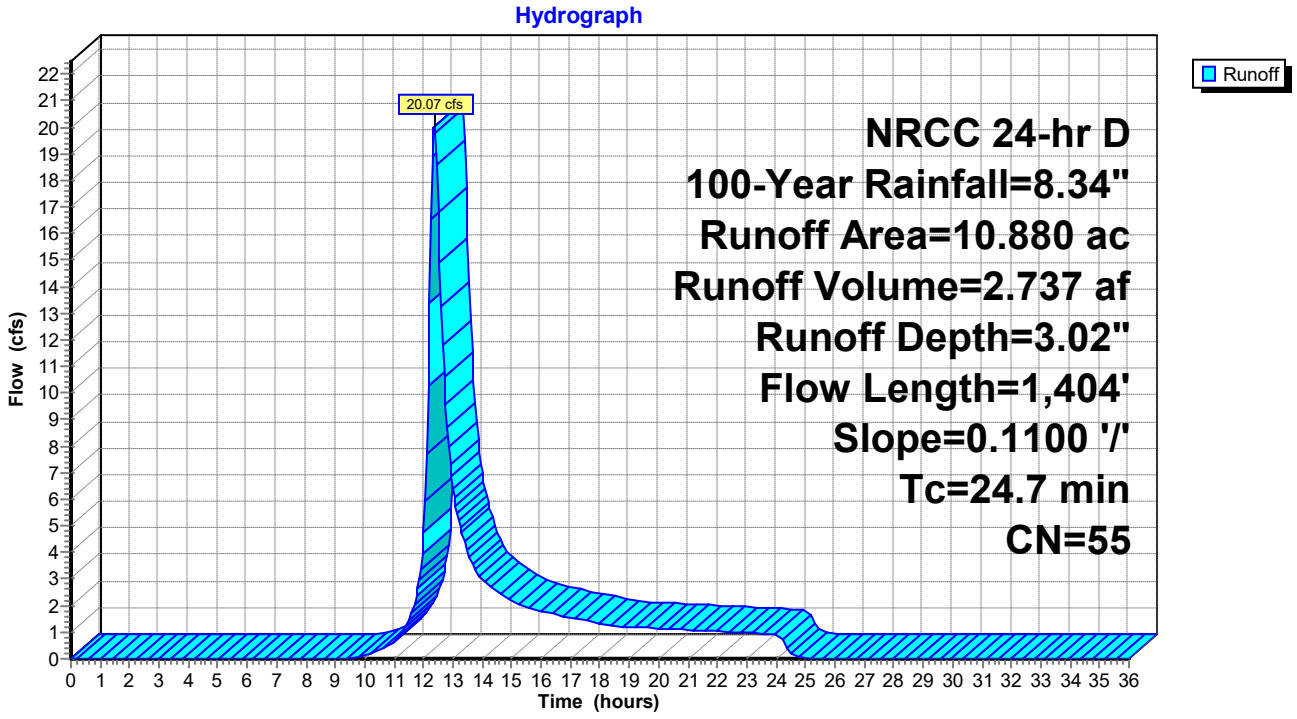
Runoff = 20.07 cfs @ 12.37 hrs, Volume= 2.737 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (ac)	CN	Description
10.830	55	Woods, Good, HSG B
0.050	98	Paved roads w/curbs & sewers, HSG B
10.880	55	Weighted Average
10.830		99.54% Pervious Area
0.050		0.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.7	1,404	0.1100	0.95		**Lag/CN Method,**

Subcatchment 3S: EX - 3



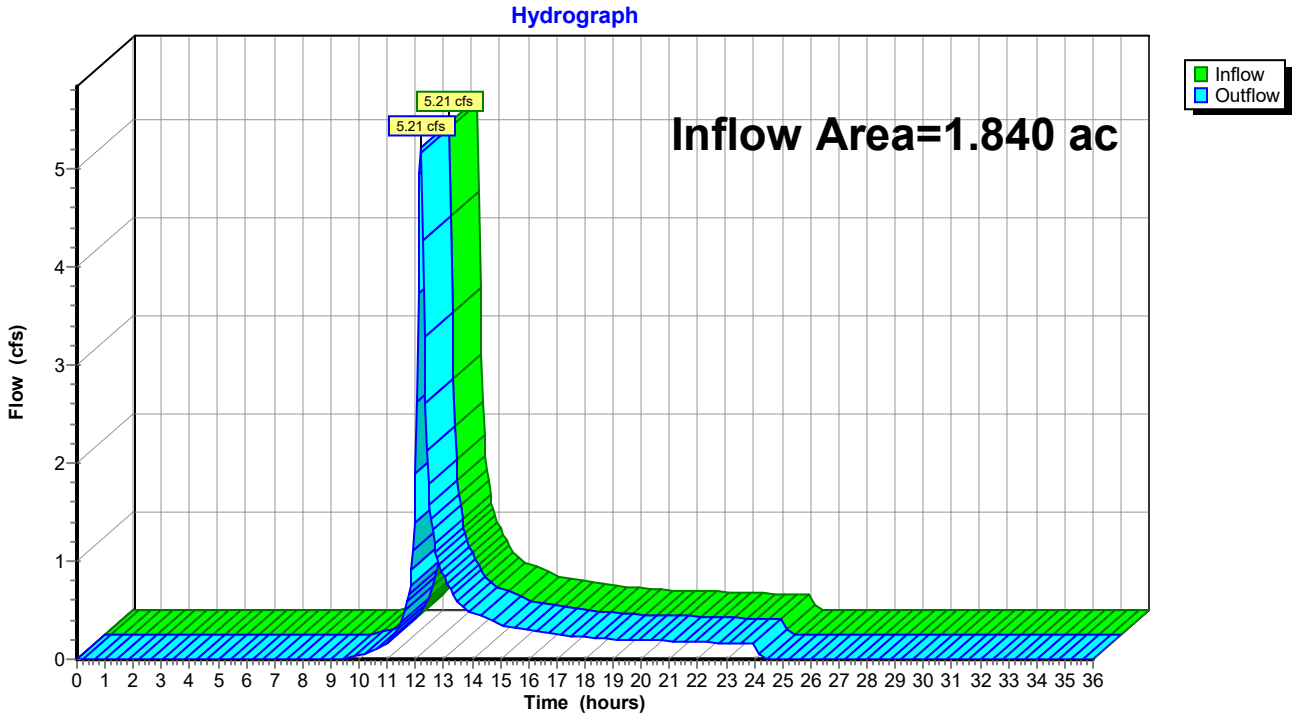
Summary for Reach DP#1:

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

Inflow Area = 1.840 ac, 3.26% Impervious, Inflow Depth = 3.13" for 100-Year event
Inflow = 5.21 cfs @ 12.18 hrs, Volume= 0.480 af
Outflow = 5.21 cfs @ 12.18 hrs, Volume= 0.480 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP#1:



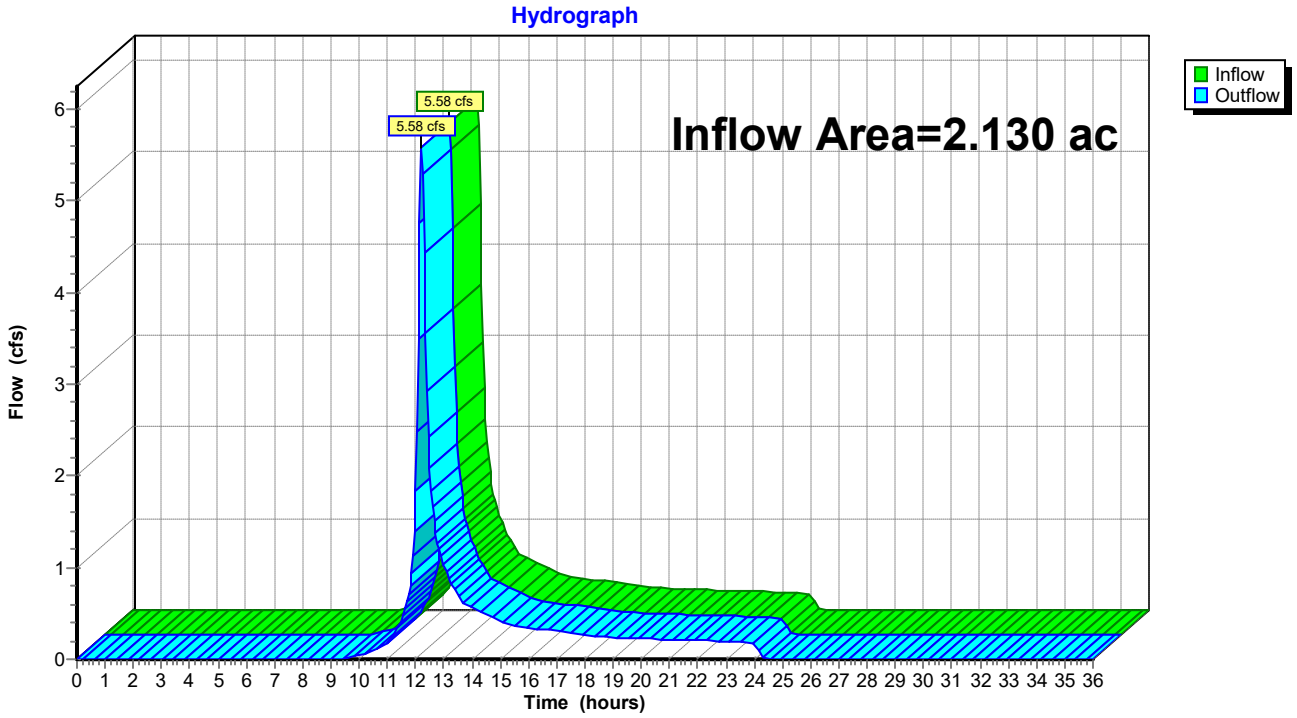
Summary for Reach DP#2:

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

Inflow Area = 2.130 ac, 2.35% Impervious, Inflow Depth = 3.13" for 100-Year event
Inflow = 5.58 cfs @ 12.21 hrs, Volume= 0.556 af
Outflow = 5.58 cfs @ 12.21 hrs, Volume= 0.556 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP#2:



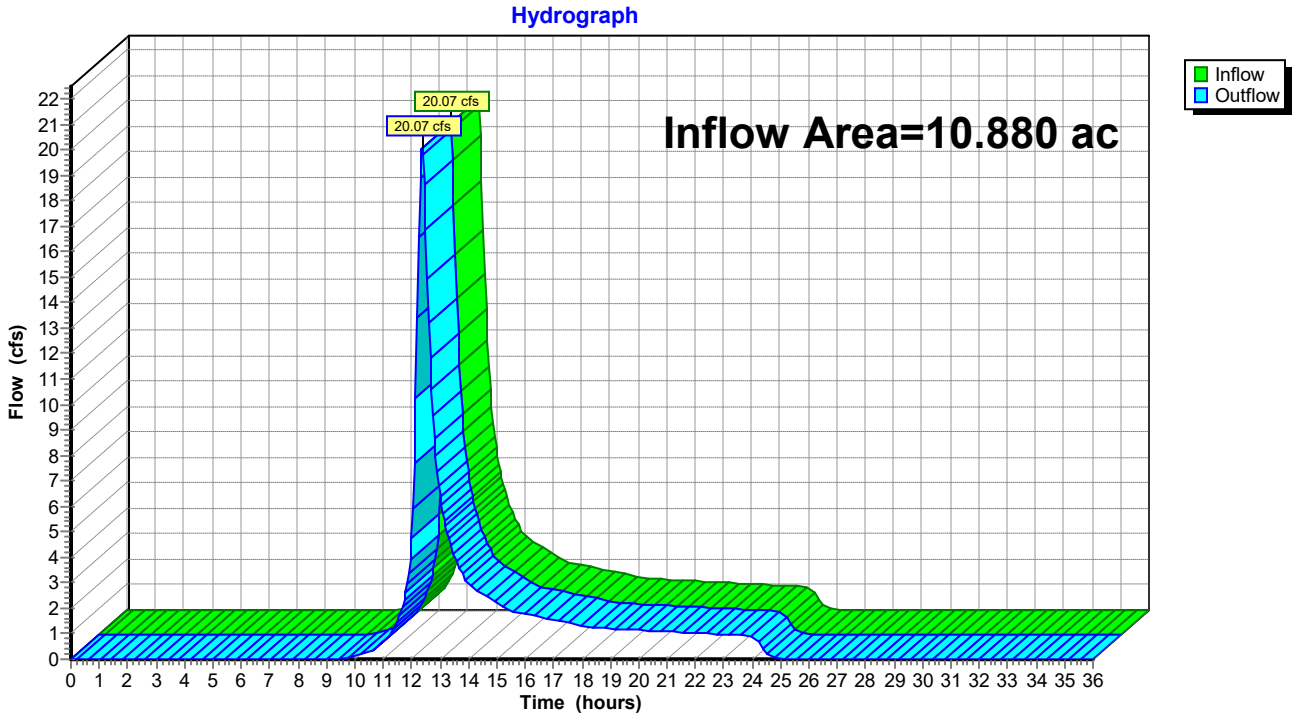
Summary for Reach DP#3:

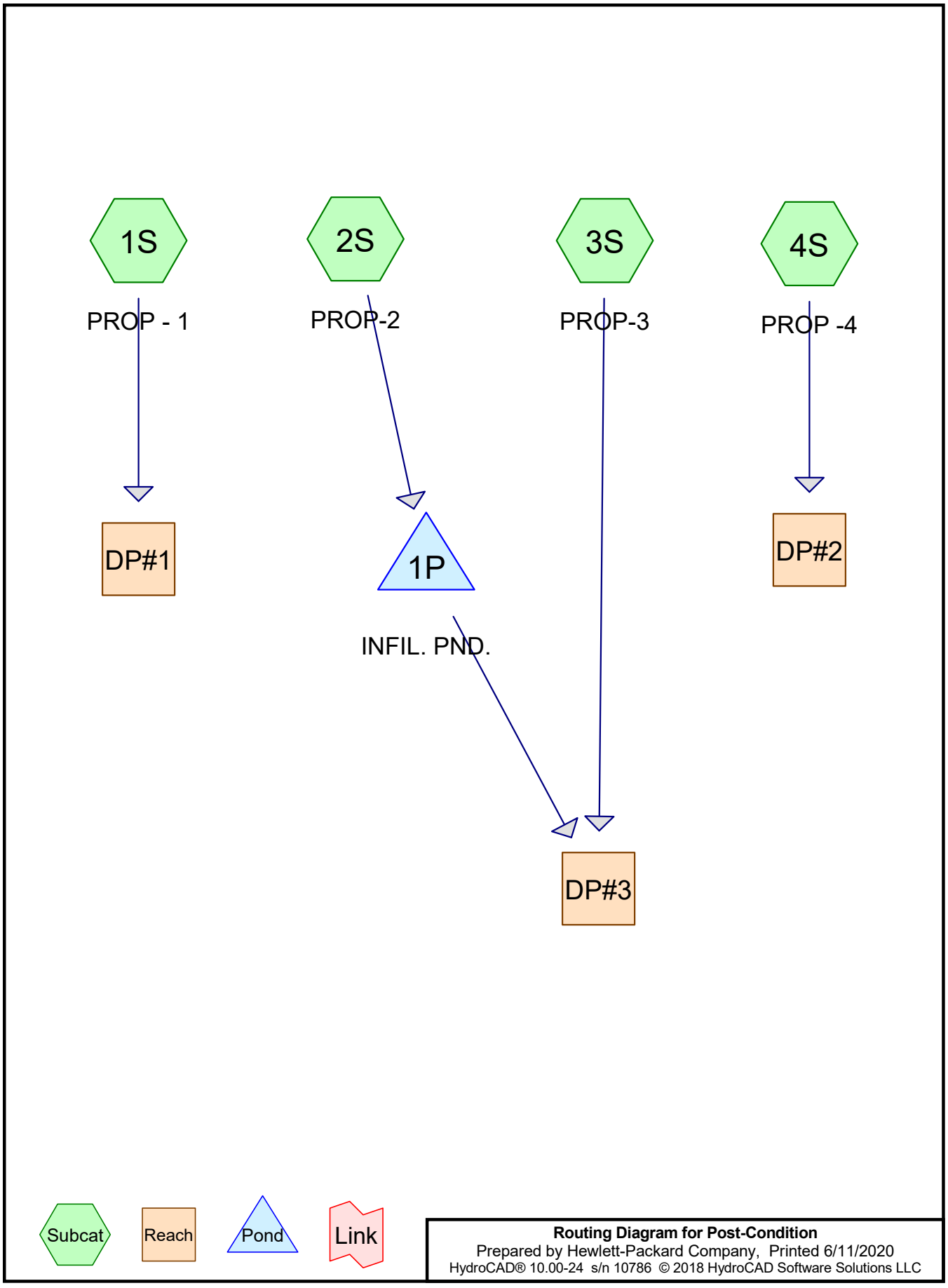
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10.880 ac, 0.46% Impervious, Inflow Depth = 3.02" for 100-Year event
Inflow = 20.07 cfs @ 12.37 hrs, Volume= 2.737 af
Outflow = 20.07 cfs @ 12.37 hrs, Volume= 2.737 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP#3:





Routing Diagram for Post-Condition
Prepared by Hewlett-Packard Company, Printed 6/11/2020

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 4347 MA Worcester Worcester County Central

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.207	61	>75% Grass cover, Good, HSG B (4S)
0.163	98	Paved roads w/curbs & sewers, HSG B (1S, 3S, 4S)
0.510	98	Unconnected roofs, HSG B (2S)
11.840	55	Woods, Good, HSG B (1S, 3S)
2.160	58	Woods/grass comb., Good, HSG B (2S)
14.880	**57**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
14.880	HSG B	1S, 2S, 3S, 4S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
14.880		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.207	0.000	0.000	0.000	0.207	>75% Grass cover, Good	4S
0.000	0.163	0.000	0.000	0.000	0.163	Paved roads w/curbs & sewers	1S, 3S, 4S
0.000	0.510	0.000	0.000	0.000	0.510	Unconnected roofs	2S
0.000	11.840	0.000	0.000	0.000	11.840	Woods, Good	1S, 3S
0.000	2.160	0.000	0.000	0.000	2.160	Woods/grass comb., Good	2S
0.000	**14.880**	**0.000**	**0.000**	**0.000**	**14.880**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	1,096.00	1,095.92	8.0	0.0100	0.013	6.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 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 1S: PROP - 1 Runoff Area=1.840 ac 3.26% Impervious Runoff Depth=1.53"
Flow Length=657' Slope=0.1800 '/' Tc=10.3 min CN=56 Runoff=2.37 cfs 0.234 af

Subcatchment 2S: PROP-2 Runoff Area=2.670 ac 19.10% Impervious Runoff Depth=2.01"
Flow Length=777' Slope=0.1600 '/' Tc=9.6 min UI Adjusted CN=62 Runoff=4.91 cfs 0.447 af

Subcatchment 3S: PROP-3 Runoff Area=10.110 ac 0.49% Impervious Runoff Depth=1.45"
Flow Length=1,404' Slope=0.1090 '/' Tc=24.8 min CN=55 Runoff=8.12 cfs 1.221 af

Subcatchment 4S: PROP -4 Runoff Area=0.260 ac 20.38% Impervious Runoff Depth=2.62"
Flow Length=310' Slope=0.1050 '/' Tc=5.3 min CN=69 Runoff=0.74 cfs 0.057 af

Reach DP#1: Inflow=2.37 cfs 0.234 af
Outflow=2.37 cfs 0.234 af

Reach DP#2: Inflow=0.74 cfs 0.057 af
Outflow=0.74 cfs 0.057 af

Reach DP#3: Inflow=8.12 cfs 1.221 af
Outflow=8.12 cfs 1.221 af

Pond 1P: INFIL. PND. Peak Elev=1,095.91' Storage=0.447 af Inflow=4.91 cfs 0.447 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 14.880 ac Runoff Volume = 1.959 af Average Runoff Depth = 1.58"
95.48% Pervious = 14.207 ac 4.52% Impervious = 0.673 ac

Summary for Subcatchment 1S: PROP - 1

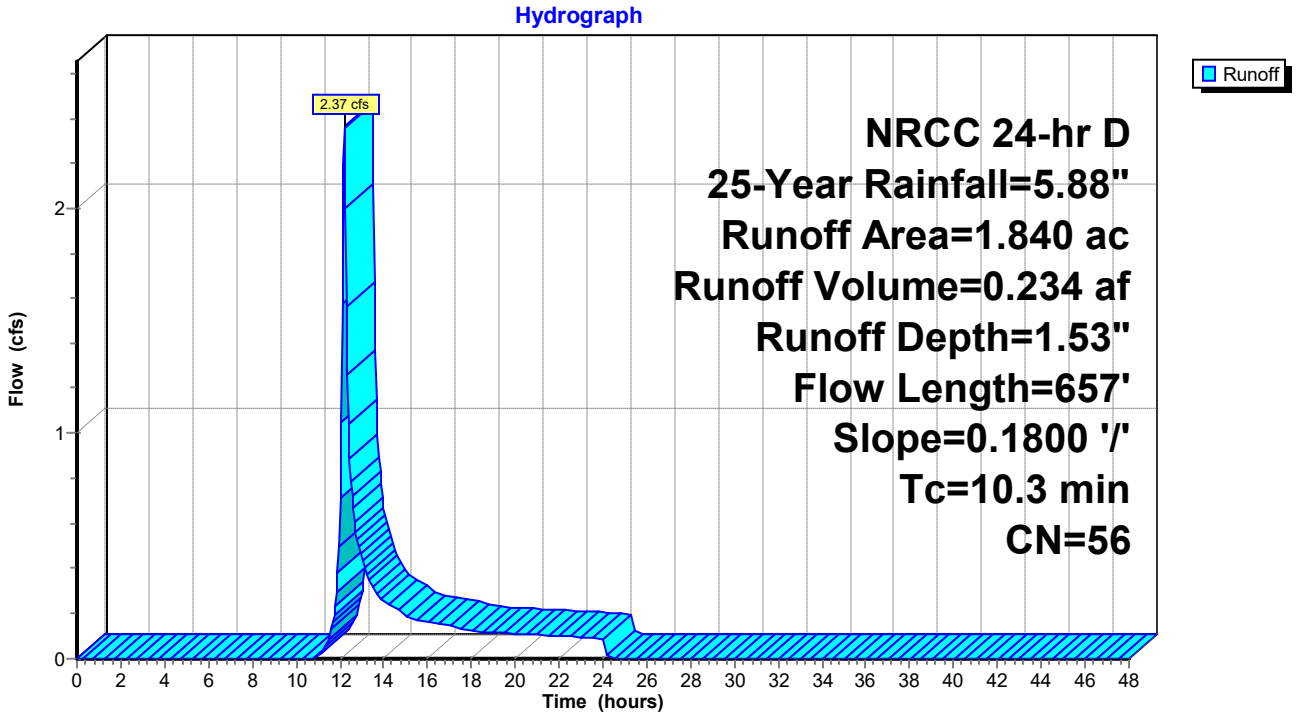
Runoff = 2.37 cfs @ 12.19 hrs, Volume= 0.234 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (ac)	CN	Description
1.780	55	Woods, Good, HSG B
0.060	98	Paved roads w/curbs & sewers, HSG B
1.840	56	Weighted Average
1.780		96.74% Pervious Area
0.060		3.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	657	0.1800	1.07		**Lag/CN Method,**

Subcatchment 1S: PROP - 1



Summary for Subcatchment 2S: PROP-2

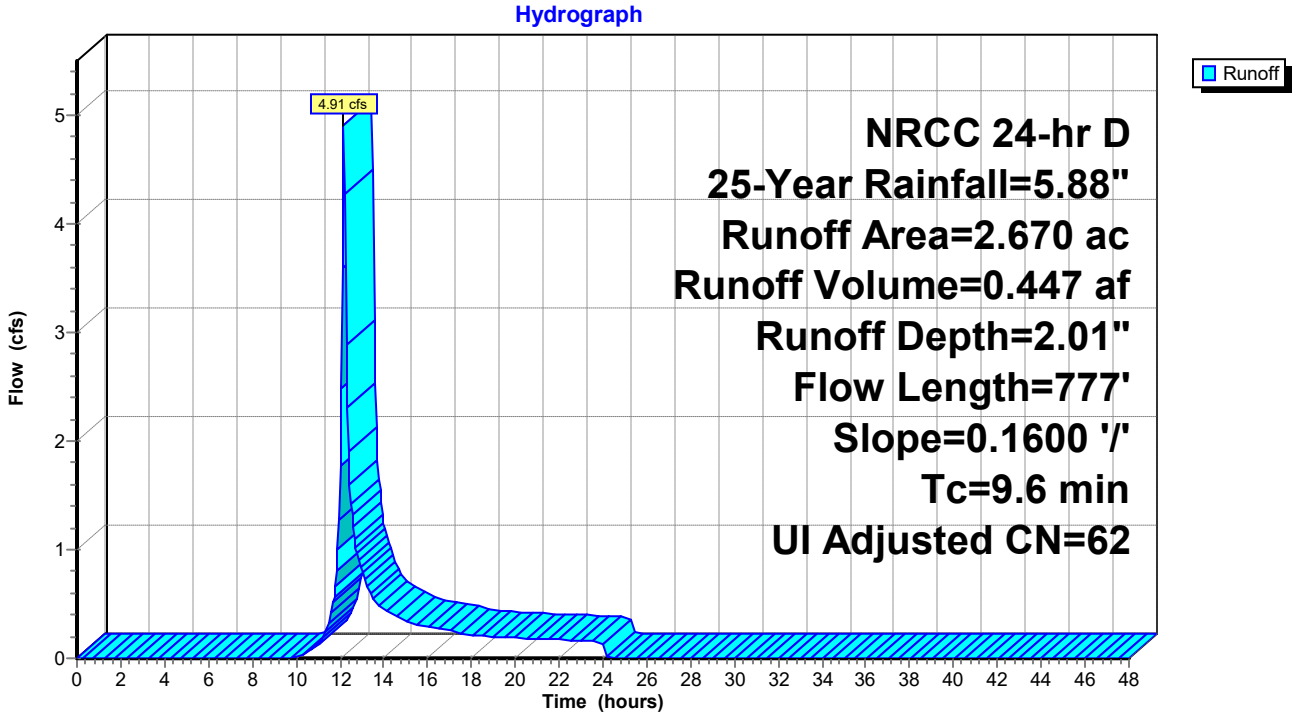
Runoff = 4.91 cfs @ 12.17 hrs, Volume= 0.447 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (ac)	CN	Adj	Description
2.160	58		Woods/grass comb., Good, HSG B
0.510	98		Unconnected roofs, HSG B
2.670	66	62	Weighted Average, UI Adjusted
2.160			80.90% Pervious Area
0.510			19.10% Impervious Area
0.510			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	777	0.1600	1.34		**Lag/CN Method,**

Subcatchment 2S: PROP-2



Summary for Subcatchment 3S: PROP-3

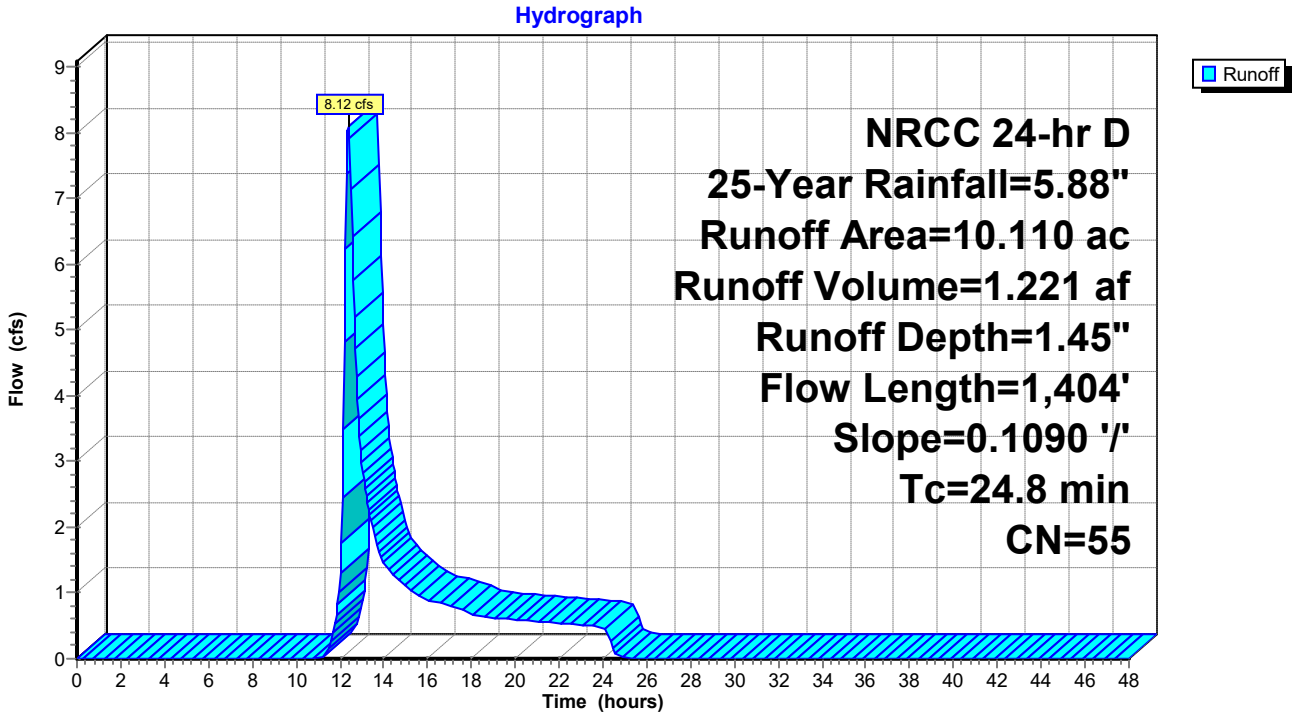
Runoff = 8.12 cfs @ 12.38 hrs, Volume= 1.221 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (ac)	CN	Description
0.050	98	Paved roads w/curbs & sewers, HSG B
10.060	55	Woods, Good, HSG B
10.110	55	Weighted Average
10.060		99.51% Pervious Area
0.050		0.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.8	1,404	0.1090	0.94		**Lag/CN Method,**

Subcatchment 3S: PROP-3



Summary for Subcatchment 4S: PROP -4

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

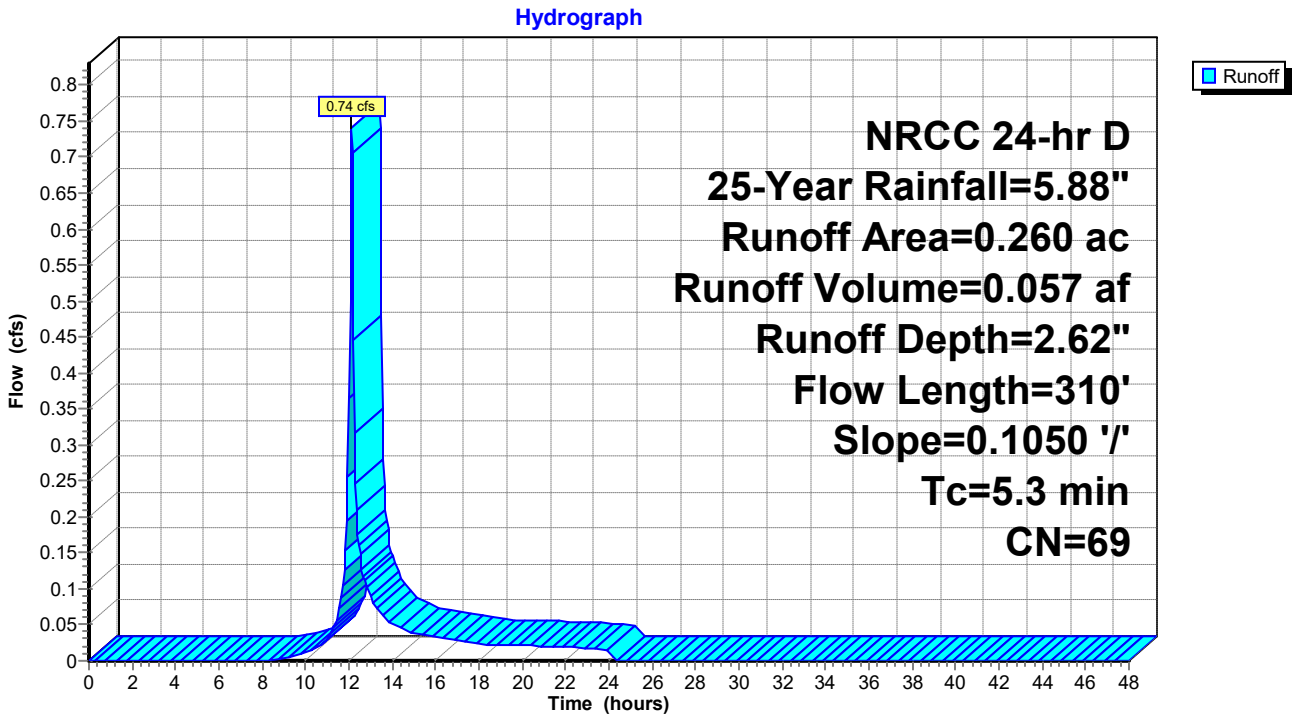
Runoff = 0.74 cfs @ 12.12 hrs, Volume= 0.057 af, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (ac)	CN	Description
0.207	61	>75% Grass cover, Good, HSG B
0.053	98	Paved roads w/curbs & sewers, HSG B
0.260	69	Weighted Average
0.207		79.62% Pervious Area
0.053		20.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	310	0.1050	0.98		**Lag/CN Method,**

Subcatchment 4S: PROP -4



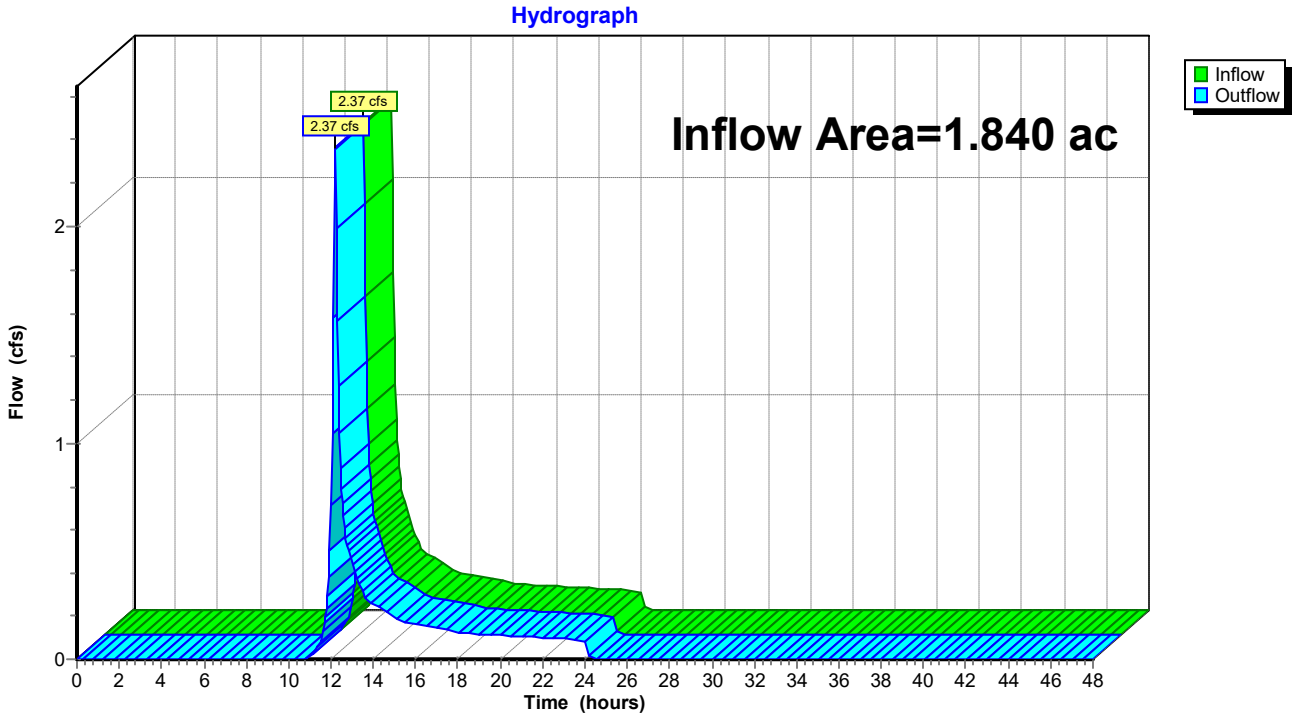
Summary for Reach DP#1:

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

Inflow Area = 1.840 ac, 3.26% Impervious, Inflow Depth = 1.53" for 25-Year event
Inflow = 2.37 cfs @ 12.19 hrs, Volume= 0.234 af
Outflow = 2.37 cfs @ 12.19 hrs, Volume= 0.234 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP#1:



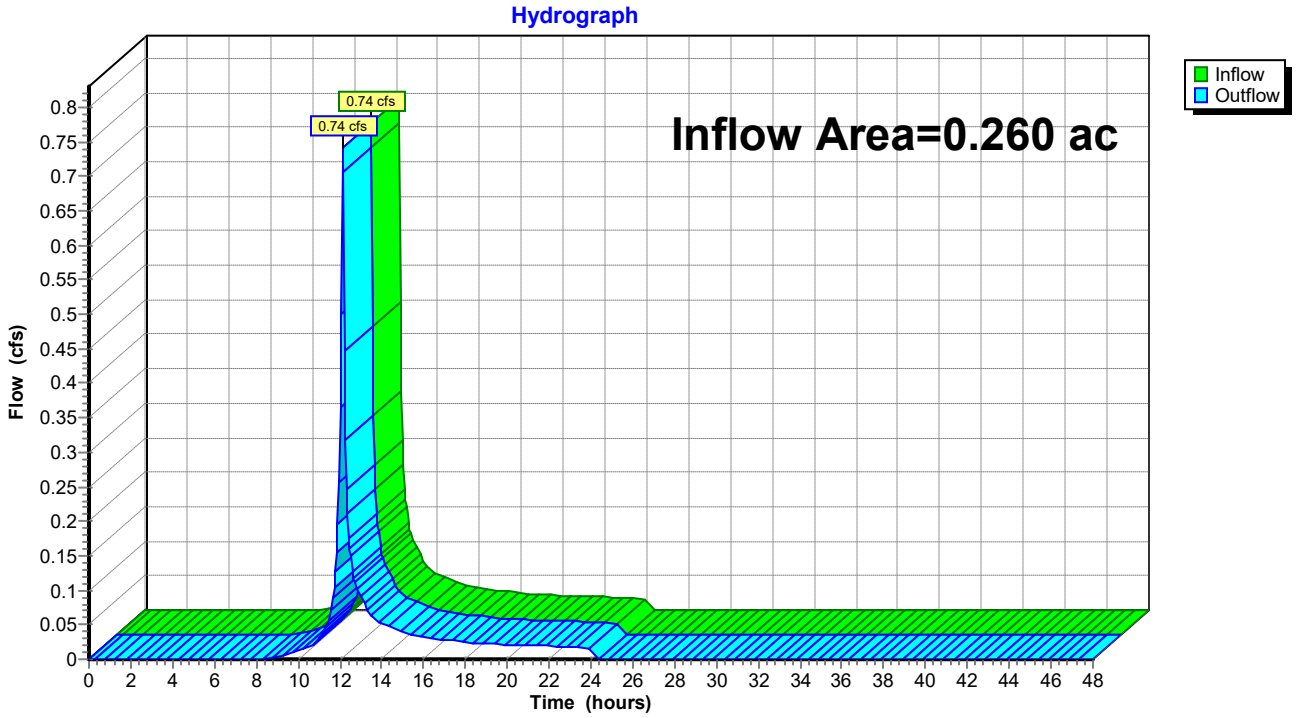
Summary for Reach DP#2:

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

Inflow Area = 0.260 ac, 20.38% Impervious, Inflow Depth = 2.62" for 25-Year event
Inflow = 0.74 cfs @ 12.12 hrs, Volume= 0.057 af
Outflow = 0.74 cfs @ 12.12 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP#2:



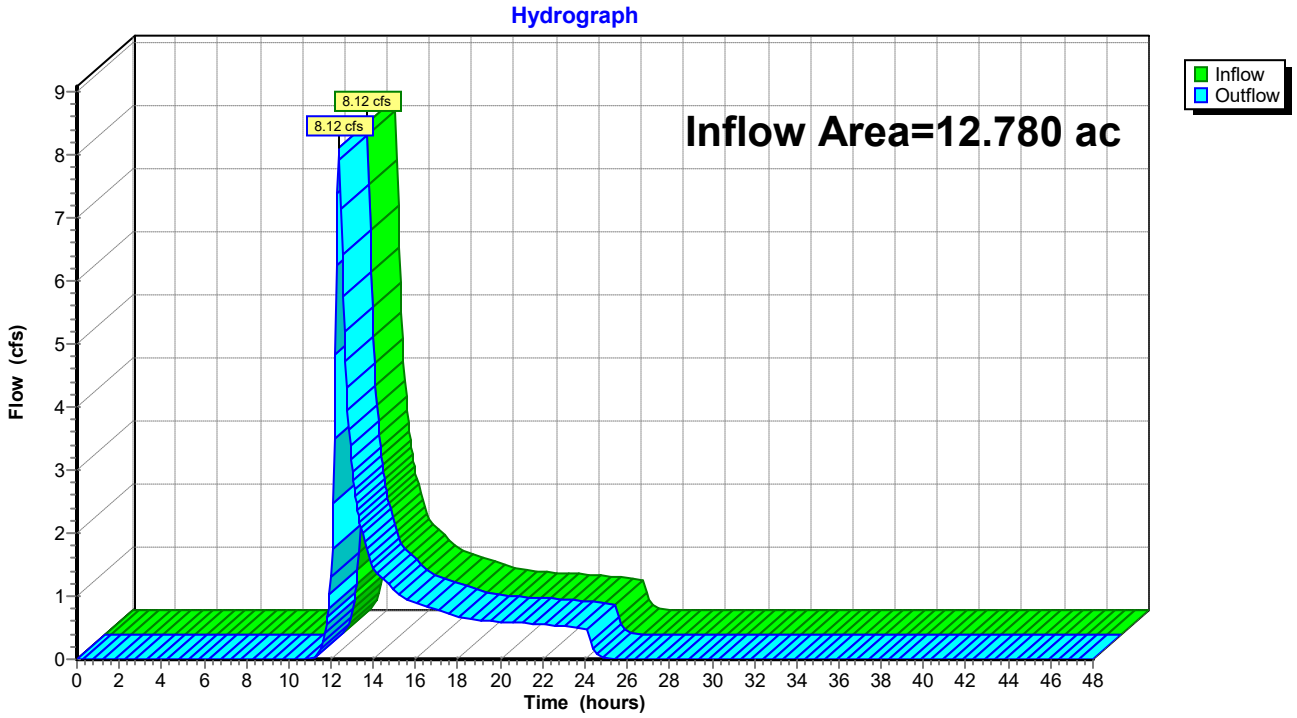
Summary for Reach DP#3:

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

Inflow Area = 12.780 ac, 4.38% Impervious, Inflow Depth = 1.15" for 25-Year event
Inflow = 8.12 cfs @ 12.38 hrs, Volume= 1.221 af
Outflow = 8.12 cfs @ 12.38 hrs, Volume= 1.221 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP#3:



Summary for Pond 1P: INFIL. PND.

Inflow Area = 2.670 ac, 19.10% Impervious, Inflow Depth = 2.01" for 25-Year event
Inflow = 4.91 cfs @ 12.17 hrs, Volume= 0.447 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,095.91' @ 24.60 hrs Surf.Area= 0.000 ac Storage= 0.447 af

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

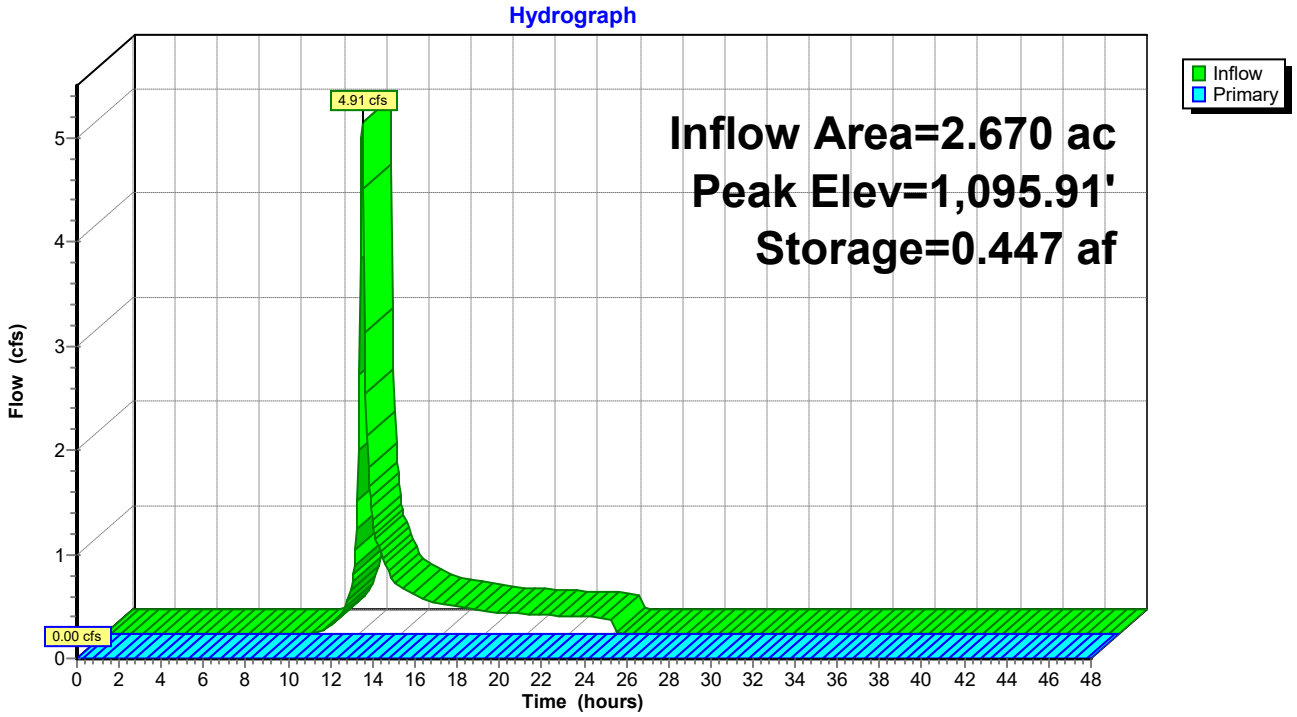
Volume	Invert	Avail.Storage	Storage Description
#1	1,094.00'	0.622 af	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,094.00	0.000	0.000
1,095.00	0.036	0.036
1,096.00	0.450	0.486
1,098.00	0.063	0.549
1,099.00	0.073	0.622

Device	Routing	Invert	Outlet Devices
#1	Primary	1,096.00'	**6.0" Round Culvert** L= 8.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1,096.00' / 1,095.92' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Primary	1,098.50'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,094.00' (Free Discharge)
1=Culvert (Controls 0.00 cfs)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: INFIL. PND.



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 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 1S: PROP - 1 Runoff Area=1.840 ac 3.26% Impervious Runoff Depth=2.22"
Flow Length=657' Slope=0.1800 '/' Tc=10.3 min CN=56 Runoff=3.60 cfs 0.340 af

Subcatchment 2S: PROP-2 Runoff Area=2.670 ac 19.10% Impervious Runoff Depth=2.80"
Flow Length=777' Slope=0.1600 '/' Tc=9.6 min UI Adjusted CN=62 Runoff=6.99 cfs 0.623 af

Subcatchment 3S: PROP-3 Runoff Area=10.110 ac 0.49% Impervious Runoff Depth=2.12"
Flow Length=1,404' Slope=0.1090 '/' Tc=24.8 min CN=55 Runoff=12.66 cfs 1.789 af

Subcatchment 4S: PROP -4 Runoff Area=0.260 ac 20.38% Impervious Runoff Depth=3.51"
Flow Length=310' Slope=0.1050 '/' Tc=5.3 min CN=69 Runoff=1.00 cfs 0.076 af

Reach DP#1: Inflow=3.60 cfs 0.340 af
Outflow=3.60 cfs 0.340 af

Reach DP#2: Inflow=1.00 cfs 0.076 af
Outflow=1.00 cfs 0.076 af

Reach DP#3: Inflow=12.66 cfs 1.927 af
Outflow=12.66 cfs 1.927 af

Pond 1P: INFIL. PND. Peak Elev=1,096.39' Storage=0.498 af Inflow=6.99 cfs 0.623 af
Outflow=0.26 cfs 0.137 af

Total Runoff Area = 14.880 ac Runoff Volume = 2.829 af Average Runoff Depth = 2.28"
95.48% Pervious = 14.207 ac 4.52% Impervious = 0.673 ac

Summary for Subcatchment 1S: PROP - 1

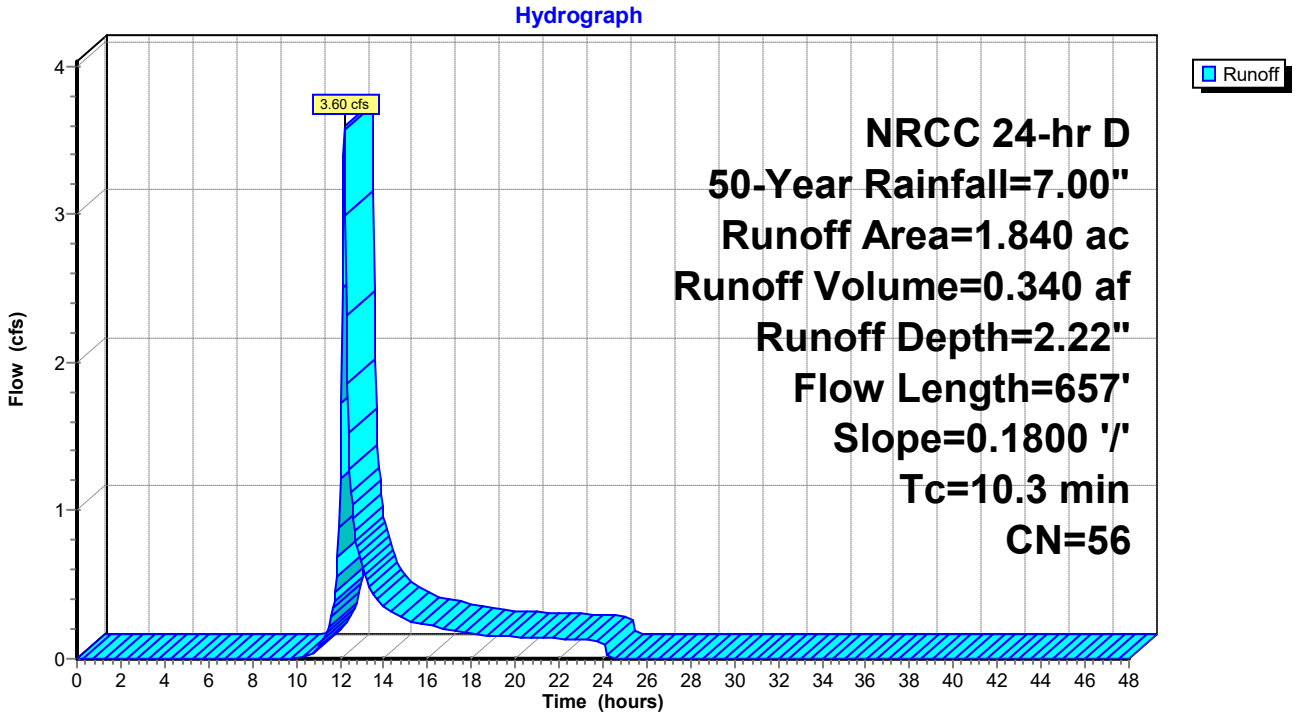
Runoff = 3.60 cfs @ 12.19 hrs, Volume= 0.340 af, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 50-Year Rainfall=7.00"

Area (ac)	CN	Description
1.780	55	Woods, Good, HSG B
0.060	98	Paved roads w/curbs & sewers, HSG B
1.840	56	Weighted Average
1.780		96.74% Pervious Area
0.060		3.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	657	0.1800	1.07		**Lag/CN Method,**

Subcatchment 1S: PROP - 1



Summary for Subcatchment 2S: PROP-2

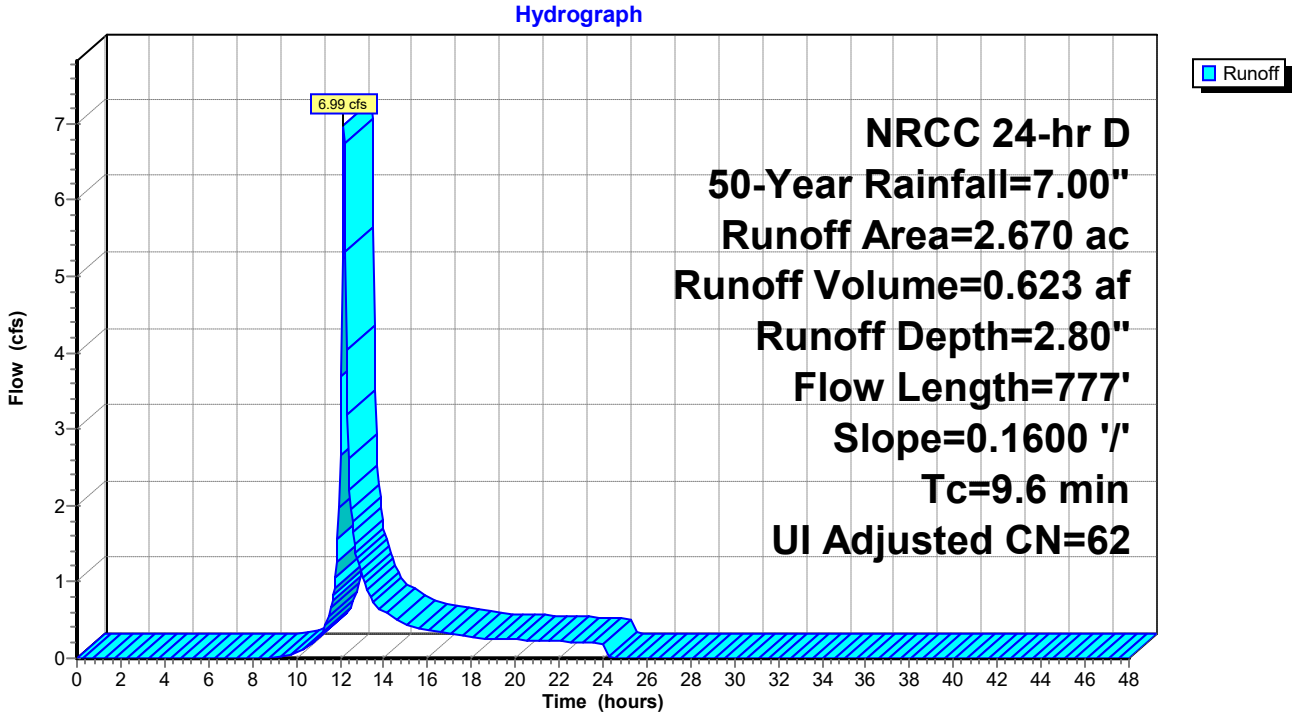
Runoff = 6.99 cfs @ 12.17 hrs, Volume= 0.623 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 50-Year Rainfall=7.00"

Area (ac)	CN	Adj	Description
2.160	58		Woods/grass comb., Good, HSG B
0.510	98		Unconnected roofs, HSG B
2.670	66	62	Weighted Average, UI Adjusted
2.160			80.90% Pervious Area
0.510			19.10% Impervious Area
0.510			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	777	0.1600	1.34		**Lag/CN Method,**

Subcatchment 2S: PROP-2



Summary for Subcatchment 3S: PROP-3

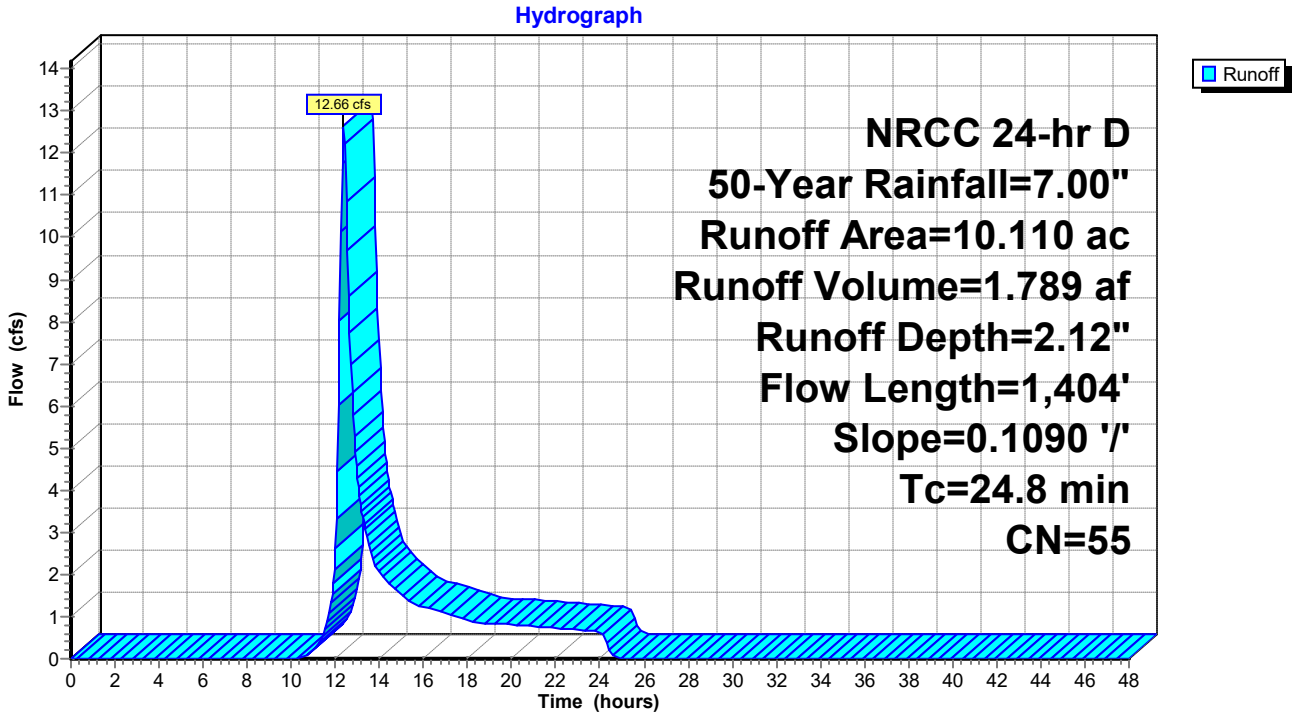
Runoff = 12.66 cfs @ 12.37 hrs, Volume= 1.789 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 50-Year Rainfall=7.00"

Area (ac)	CN	Description
0.050	98	Paved roads w/curbs & sewers, HSG B
10.060	55	Woods, Good, HSG B
10.110	55	Weighted Average
10.060		99.51% Pervious Area
0.050		0.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.8	1,404	0.1090	0.94		**Lag/CN Method,**

Subcatchment 3S: PROP-3



Summary for Subcatchment 4S: PROP -4

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

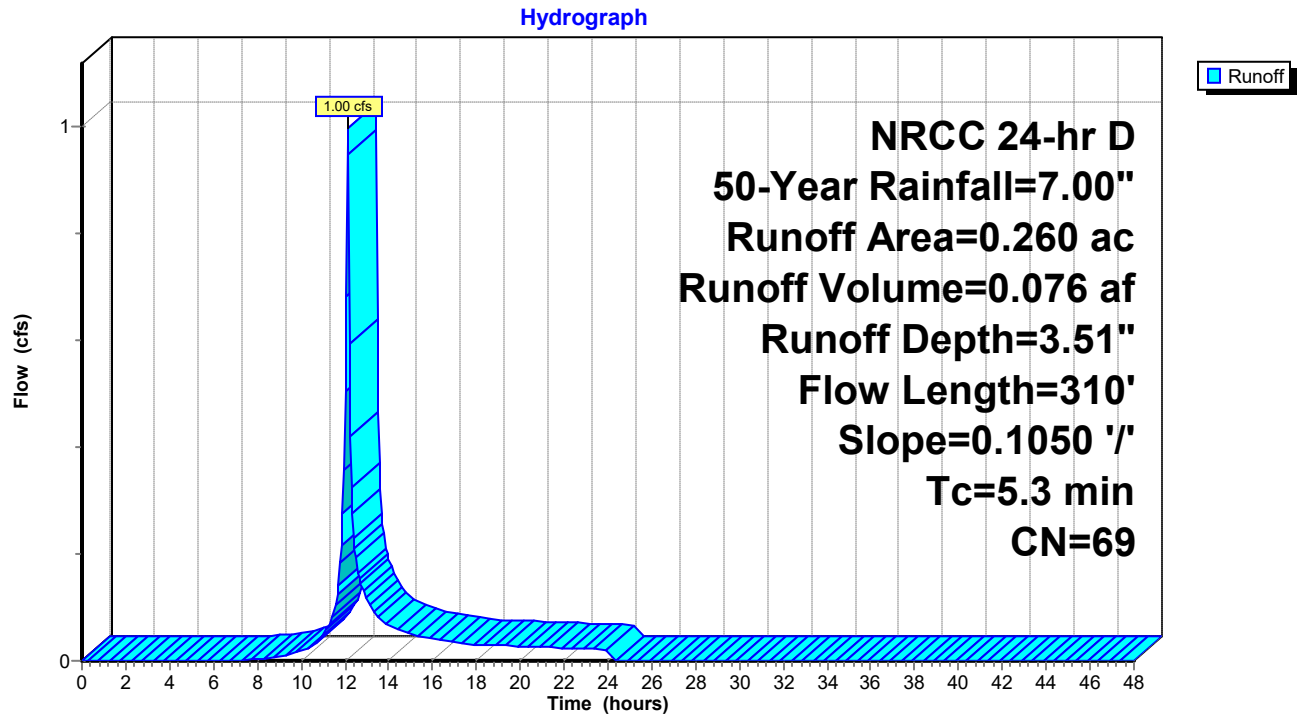
Runoff = 1.00 cfs @ 12.12 hrs, Volume= 0.076 af, Depth= 3.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 50-Year Rainfall=7.00"

Area (ac)	CN	Description
0.207	61	>75% Grass cover, Good, HSG B
0.053	98	Paved roads w/curbs & sewers, HSG B
0.260	69	Weighted Average
0.207		79.62% Pervious Area
0.053		20.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	310	0.1050	0.98		**Lag/CN Method,**

Subcatchment 4S: PROP -4



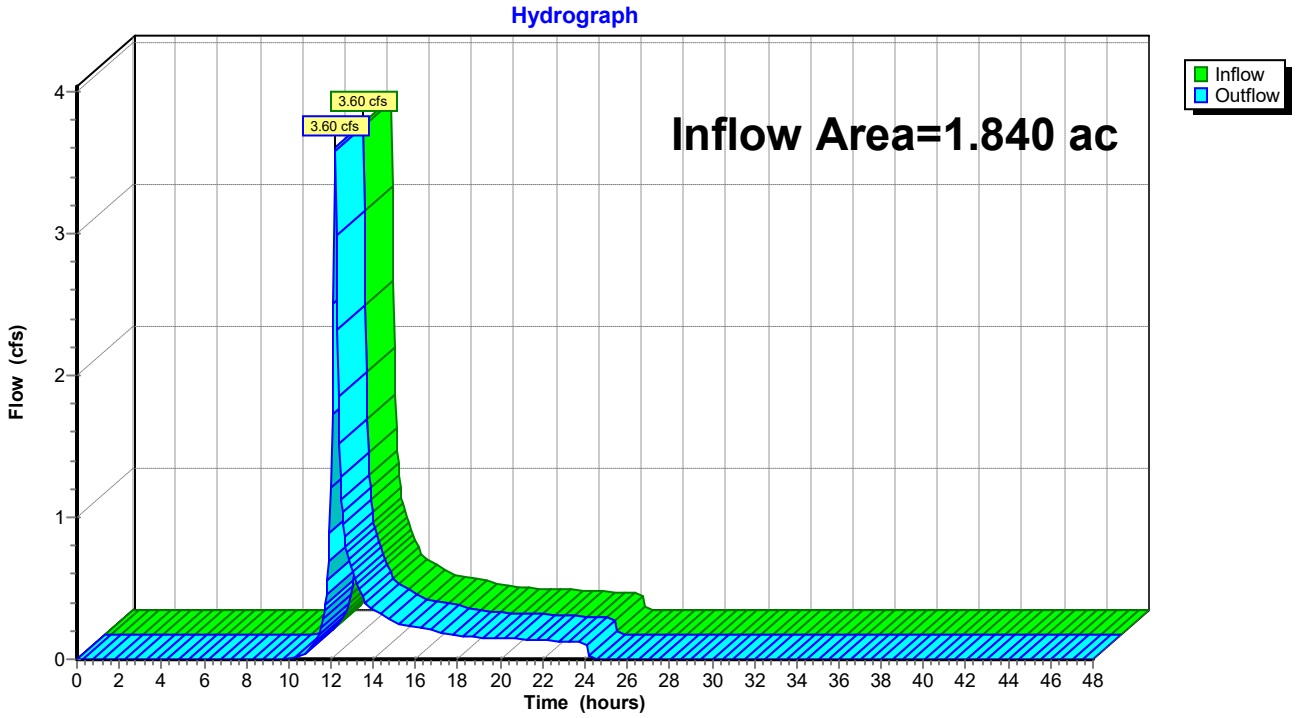
Summary for Reach DP#1:

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

Inflow Area = 1.840 ac, 3.26% Impervious, Inflow Depth = 2.22" for 50-Year event
Inflow = 3.60 cfs @ 12.19 hrs, Volume= 0.340 af
Outflow = 3.60 cfs @ 12.19 hrs, Volume= 0.340 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP#1:



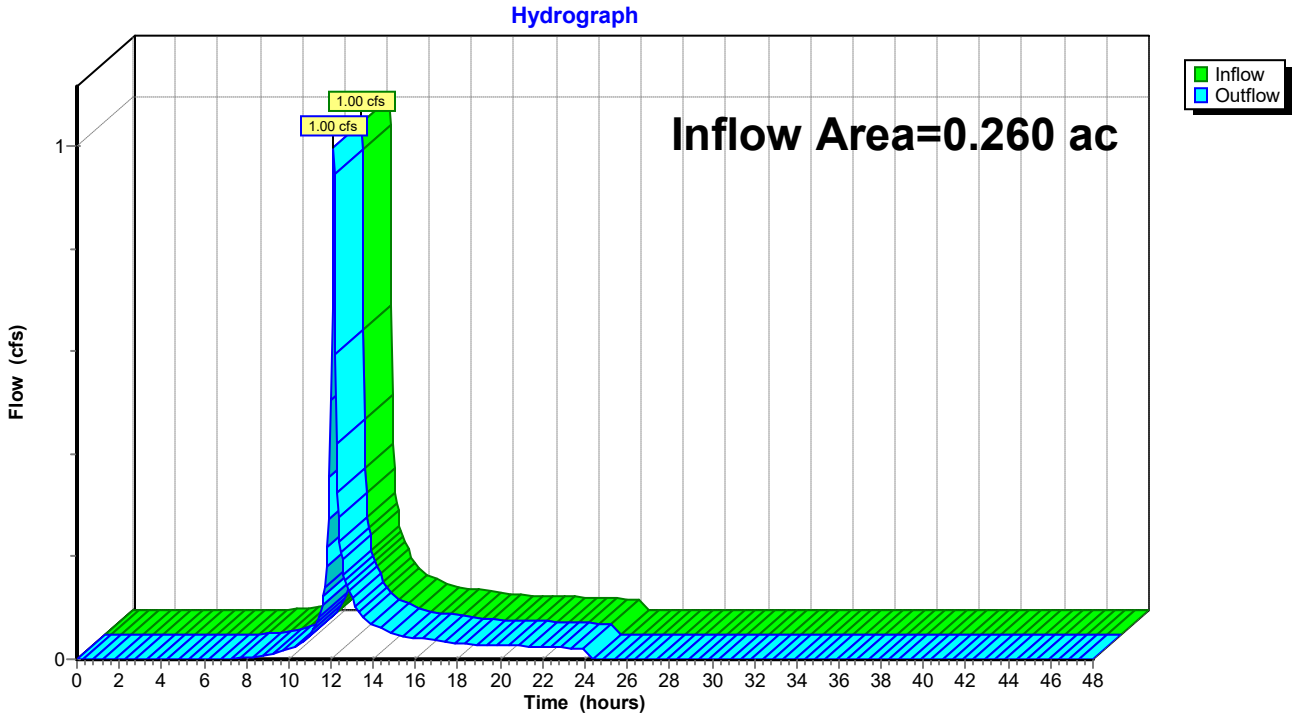
Summary for Reach DP#2:

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

Inflow Area = 0.260 ac, 20.38% Impervious, Inflow Depth = 3.51" for 50-Year event
Inflow = 1.00 cfs @ 12.12 hrs, Volume= 0.076 af
Outflow = 1.00 cfs @ 12.12 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP#2:



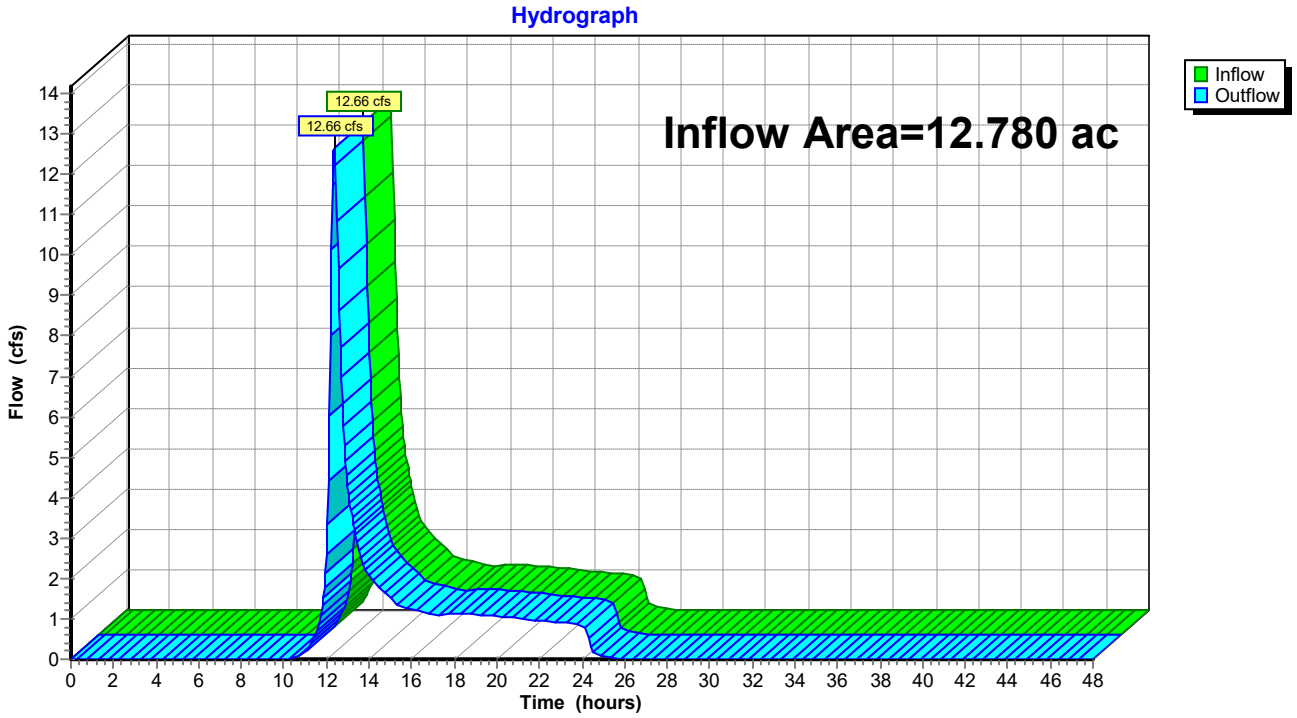
Summary for Reach DP#3:

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

Inflow Area = 12.780 ac, 4.38% Impervious, Inflow Depth = 1.81" for 50-Year event
Inflow = 12.66 cfs @ 12.37 hrs, Volume= 1.927 af
Outflow = 12.66 cfs @ 12.37 hrs, Volume= 1.927 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP#3:



Summary for Pond 1P: INFIL. PND.

Inflow Area = 2.670 ac, 19.10% Impervious, Inflow Depth = 2.80" for 50-Year event
Inflow = 6.99 cfs @ 12.17 hrs, Volume= 0.623 af
Outflow = 0.26 cfs @ 18.90 hrs, Volume= 0.137 af, Atten= 96%, Lag= 403.7 min
Primary = 0.26 cfs @ 18.90 hrs, Volume= 0.137 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,096.39' @ 18.90 hrs Surf.Area= 0.000 ac Storage= 0.498 af

Plug-Flow detention time= 564.6 min calculated for 0.137 af (22% of inflow)
Center-of-Mass det. time= 386.1 min (1,267.6 - 881.5)

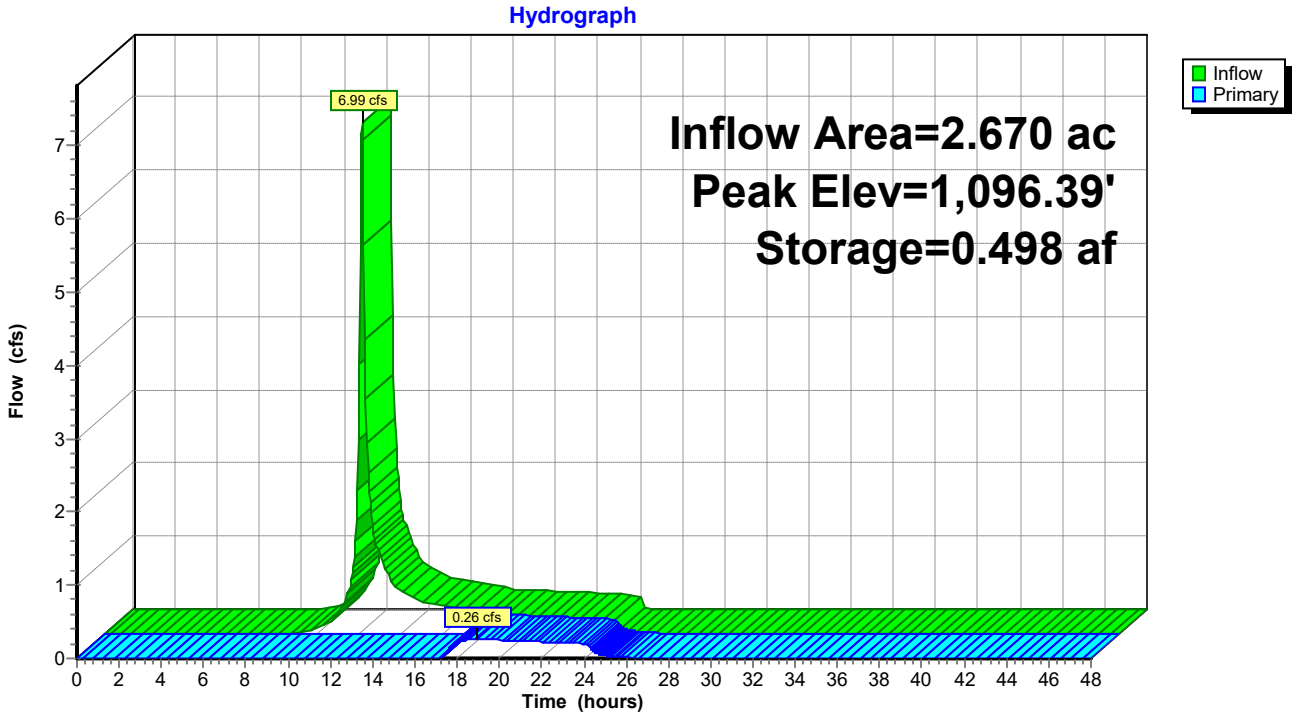
Volume	Invert	Avail.Storage	Storage Description
#1	1,094.00'	0.622 af	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,094.00	0.000	0.000
1,095.00	0.036	0.036
1,096.00	0.450	0.486
1,098.00	0.063	0.549
1,099.00	0.073	0.622

Device	Routing	Invert	Outlet Devices
#1	Primary	1,096.00'	**6.0" Round Culvert** L= 8.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1,096.00' / 1,095.92' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Primary	1,098.50'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.26 cfs @ 18.90 hrs HW=1,096.39' (Free Discharge)
1=Culvert (Barrel Controls 0.26 cfs @ 2.16 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: INFIL. PND.



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 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 1S: PROP - 1 Runoff Area=1.840 ac 3.26% Impervious Runoff Depth=3.13"
Flow Length=657' Slope=0.1800 '/' Tc=10.3 min CN=56 Runoff=5.21 cfs 0.480 af

Subcatchment 2S: PROP-2 Runoff Area=2.670 ac 19.10% Impervious Runoff Depth=3.82"
Flow Length=777' Slope=0.1600 '/' Tc=9.6 min UI Adjusted CN=62 Runoff=9.62 cfs 0.850 af

Subcatchment 3S: PROP-3 Runoff Area=10.110 ac 0.49% Impervious Runoff Depth=3.02"
Flow Length=1,404' Slope=0.1090 '/' Tc=24.8 min CN=55 Runoff=18.63 cfs 2.543 af

Subcatchment 4S: PROP -4 Runoff Area=0.260 ac 20.38% Impervious Runoff Depth=4.64"
Flow Length=310' Slope=0.1050 '/' Tc=5.3 min CN=69 Runoff=1.31 cfs 0.101 af

Reach DP#1: Inflow=5.21 cfs 0.480 af
Outflow=5.21 cfs 0.480 af

Reach DP#2: Inflow=1.31 cfs 0.101 af
Outflow=1.31 cfs 0.101 af

Reach DP#3: Inflow=18.63 cfs 2.908 af
Outflow=18.63 cfs 2.908 af

Pond 1P: INFIL. PND. Peak Elev=1,096.99' Storage=0.517 af Inflow=9.62 cfs 0.850 af
Outflow=0.64 cfs 0.364 af

Total Runoff Area = 14.880 ac Runoff Volume = 3.975 af Average Runoff Depth = 3.21"
95.48% Pervious = 14.207 ac 4.52% Impervious = 0.673 ac

Summary for Subcatchment 1S: PROP - 1

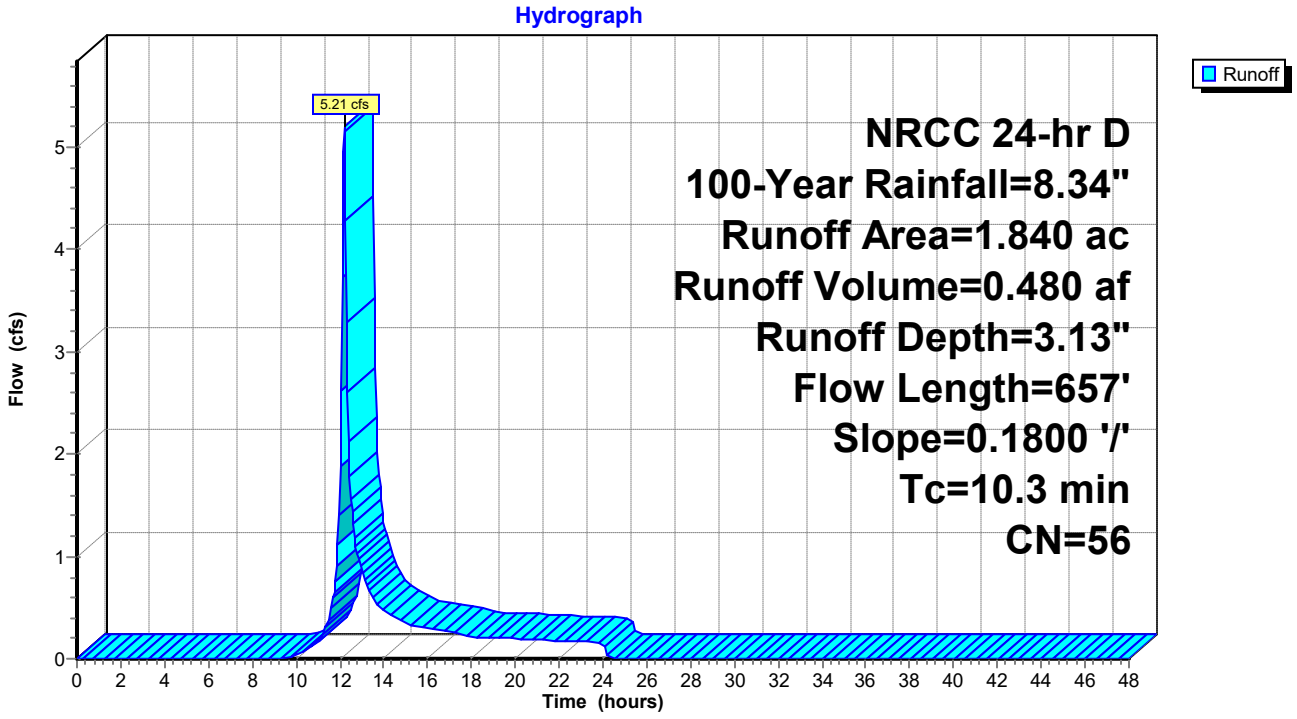
Runoff = 5.21 cfs @ 12.18 hrs, Volume= 0.480 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (ac)	CN	Description
1.780	55	Woods, Good, HSG B
0.060	98	Paved roads w/curbs & sewers, HSG B
1.840	56	Weighted Average
1.780		96.74% Pervious Area
0.060		3.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	657	0.1800	1.07		**Lag/CN Method,**

Subcatchment 1S: PROP - 1



Summary for Subcatchment 2S: PROP-2

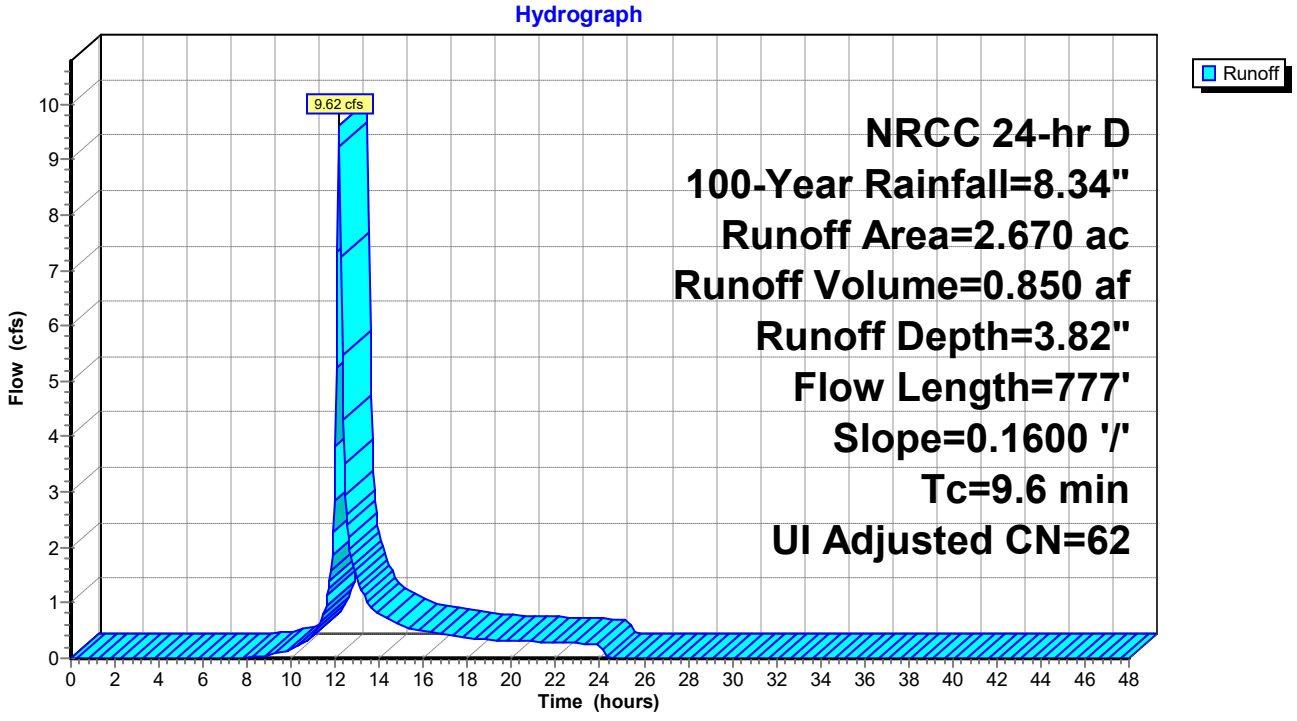
Runoff = 9.62 cfs @ 12.17 hrs, Volume= 0.850 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (ac)	CN	Adj	Description
2.160	58		Woods/grass comb., Good, HSG B
0.510	98		Unconnected roofs, HSG B
2.670	66	62	Weighted Average, UI Adjusted
2.160			80.90% Pervious Area
0.510			19.10% Impervious Area
0.510			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	777	0.1600	1.34		**Lag/CN Method,**

Subcatchment 2S: PROP-2



Summary for Subcatchment 3S: PROP-3

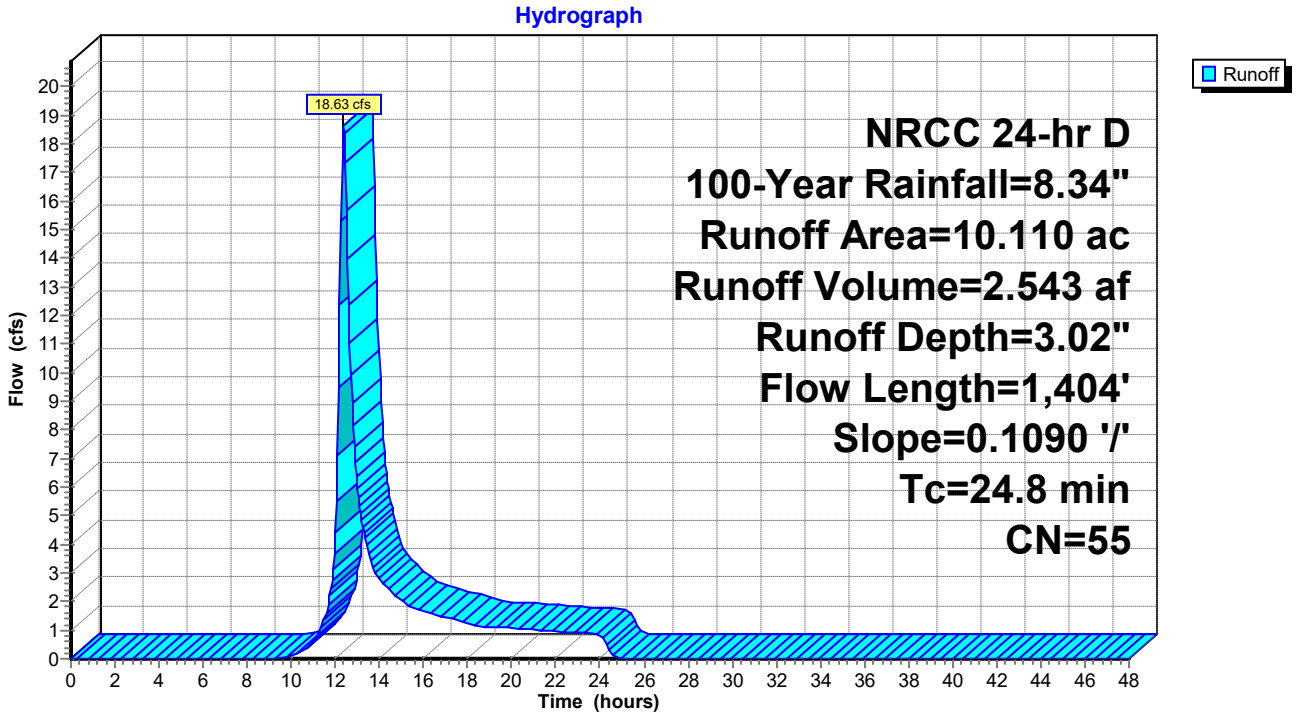
Runoff = 18.63 cfs @ 12.37 hrs, Volume= 2.543 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (ac)	CN	Description
0.050	98	Paved roads w/curbs & sewers, HSG B
10.060	55	Woods, Good, HSG B
10.110	55	Weighted Average
10.060		99.51% Pervious Area
0.050		0.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.8	1,404	0.1090	0.94		**Lag/CN Method,**

Subcatchment 3S: PROP-3



Summary for Subcatchment 4S: PROP -4

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

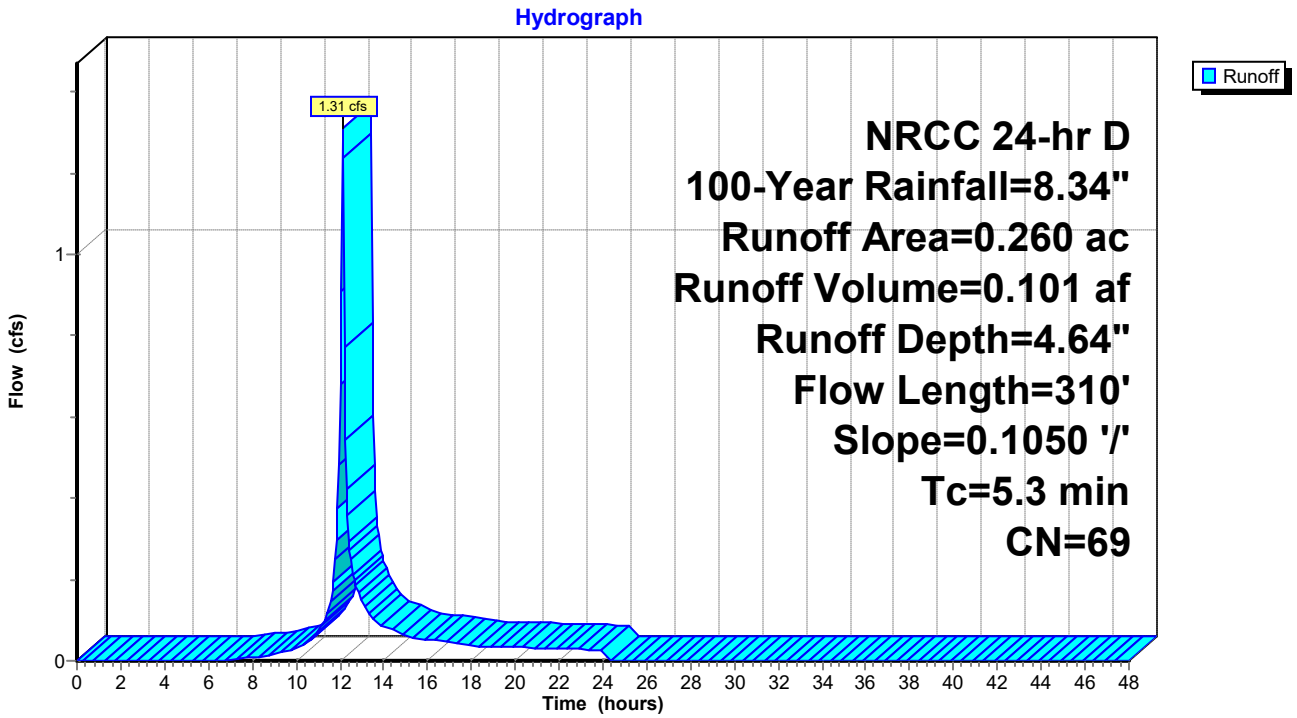
Runoff = 1.31 cfs @ 12.12 hrs, Volume= 0.101 af, Depth= 4.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (ac)	CN	Description
0.207	61	>75% Grass cover, Good, HSG B
0.053	98	Paved roads w/curbs & sewers, HSG B
0.260	69	Weighted Average
0.207		79.62% Pervious Area
0.053		20.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	310	0.1050	0.98		**Lag/CN Method,**

Subcatchment 4S: PROP -4



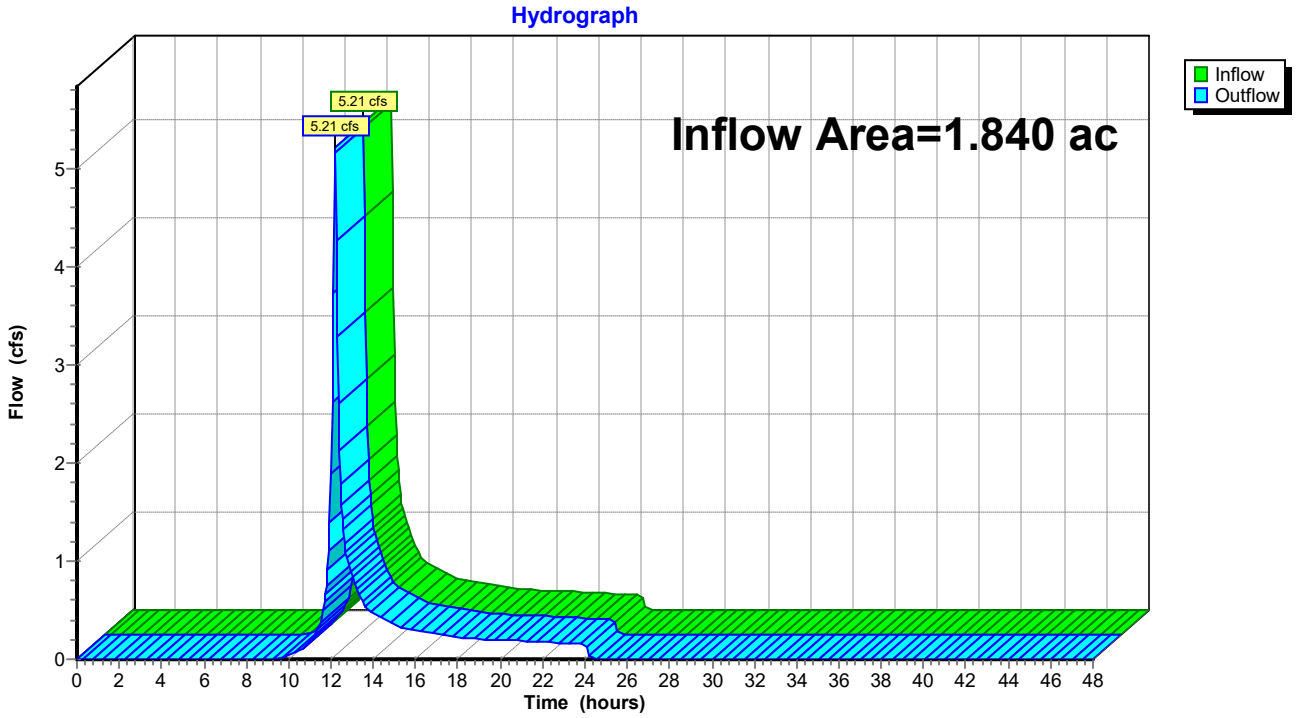
Summary for Reach DP#1:

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

Inflow Area = 1.840 ac, 3.26% Impervious, Inflow Depth = 3.13" for 100-Year event
Inflow = 5.21 cfs @ 12.18 hrs, Volume= 0.480 af
Outflow = 5.21 cfs @ 12.18 hrs, Volume= 0.480 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP#1:



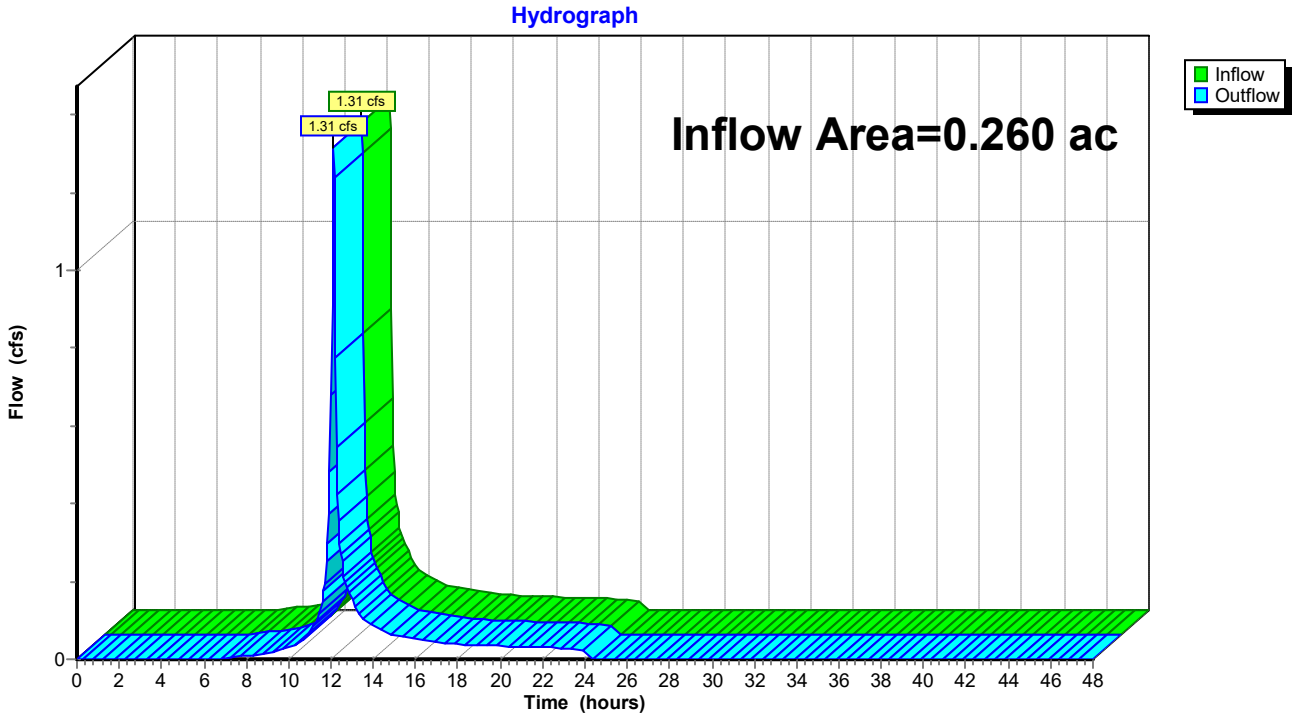
Summary for Reach DP#2:

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

Inflow Area = 0.260 ac, 20.38% Impervious, Inflow Depth = 4.64" for 100-Year event
Inflow = 1.31 cfs @ 12.12 hrs, Volume= 0.101 af
Outflow = 1.31 cfs @ 12.12 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP#2:



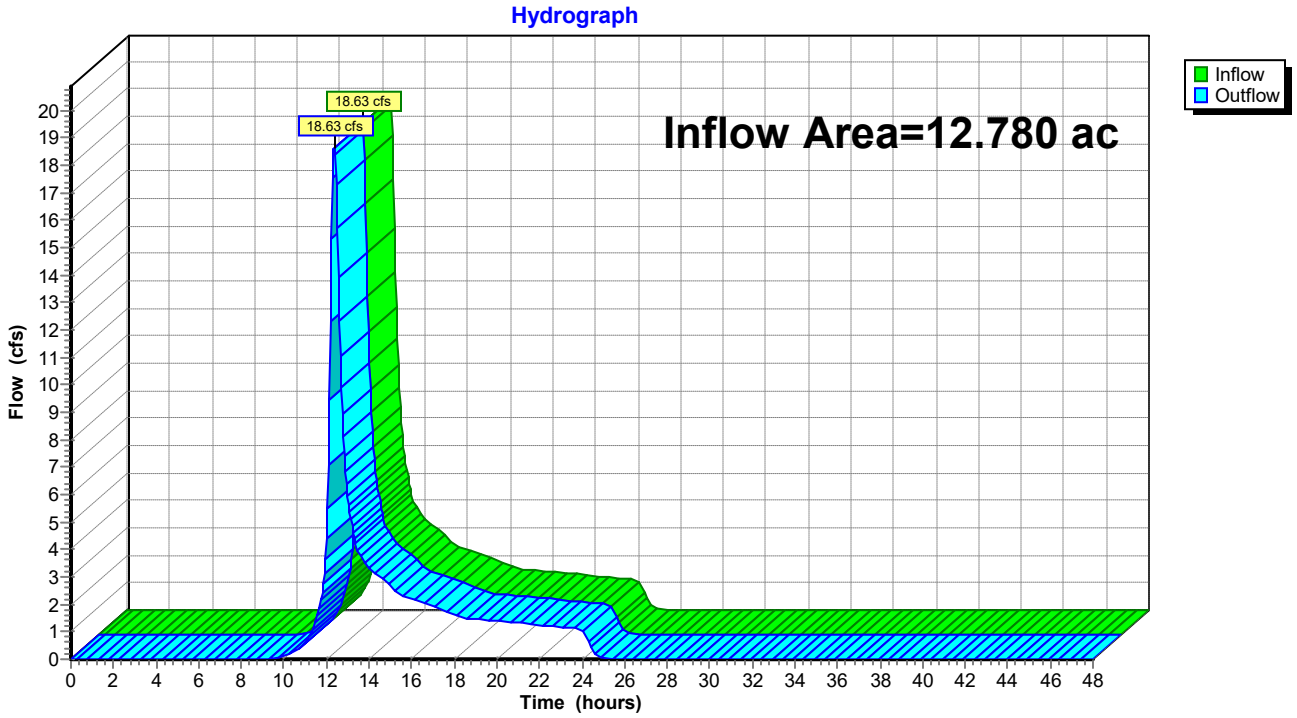
Summary for Reach DP#3:

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

Inflow Area = 12.780 ac, 4.38% Impervious, Inflow Depth = 2.73" for 100-Year event
Inflow = 18.63 cfs @ 12.37 hrs, Volume= 2.908 af
Outflow = 18.63 cfs @ 12.37 hrs, Volume= 2.908 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP#3:



Summary for Pond 1P: INFIL. PND.

Inflow Area = 2.670 ac, 19.10% Impervious, Inflow Depth = 3.82" for 100-Year event
Inflow = 9.62 cfs @ 12.17 hrs, Volume= 0.850 af
Outflow = 0.64 cfs @ 14.71 hrs, Volume= 0.364 af, Atten= 93%, Lag= 152.4 min
Primary = 0.64 cfs @ 14.71 hrs, Volume= 0.364 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 1,096.99' @ 14.71 hrs Surf.Area= 0.000 ac Storage= 0.517 af

Plug-Flow detention time= 379.9 min calculated for 0.364 af (43% of inflow)
Center-of-Mass det. time= 224.0 min (1,093.9 - 869.9)

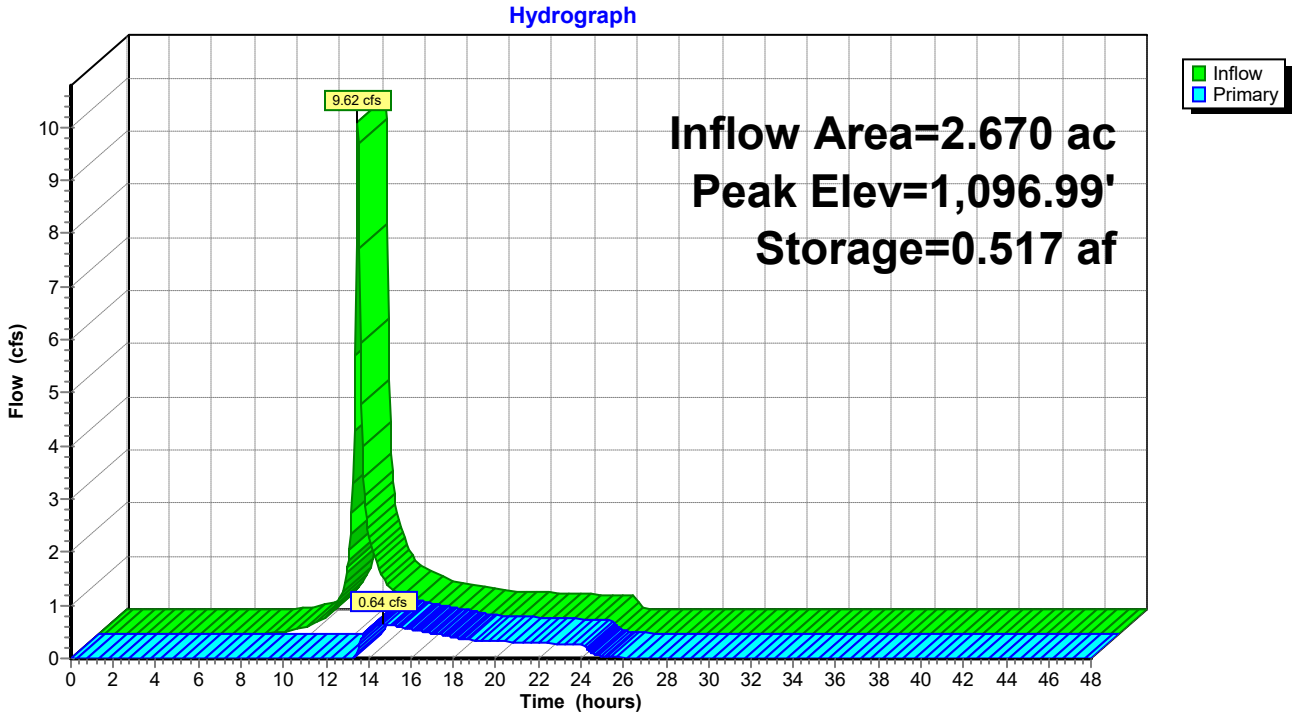
Volume	Invert	Avail.Storage	Storage Description
#1	1,094.00'	0.622 af	**Custom Stage Data** Listed below

Elevation (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,094.00	0.000	0.000
1,095.00	0.036	0.036
1,096.00	0.450	0.486
1,098.00	0.063	0.549
1,099.00	0.073	0.622

Device	Routing	Invert	Outlet Devices
#1	Primary	1,096.00'	**6.0" Round Culvert** L= 8.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1,096.00' / 1,095.92' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Primary	1,098.50'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.64 cfs @ 14.71 hrs HW=1,096.99' (Free Discharge)
1=Culvert (Inlet Controls 0.64 cfs @ 3.28 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: INFIL. PND.



INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

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

Location: #420 Rt. 2A

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 10%	**0.10**	**1.00**	**0.10**	**0.90**
Deep Sump and Hooded Catch Basin	**0.25**	**0.90**	**0.23**	**0.68**
Sediment Forebay	**0.25**	**0.68**	**0.17**	**0.51**
Infiltration Basin	**0.80**	**0.51**	**0.41**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**

Total TSS Removal = **90%**

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

Project: **RMRE Rt. 2A/Baldwin Hill Road**

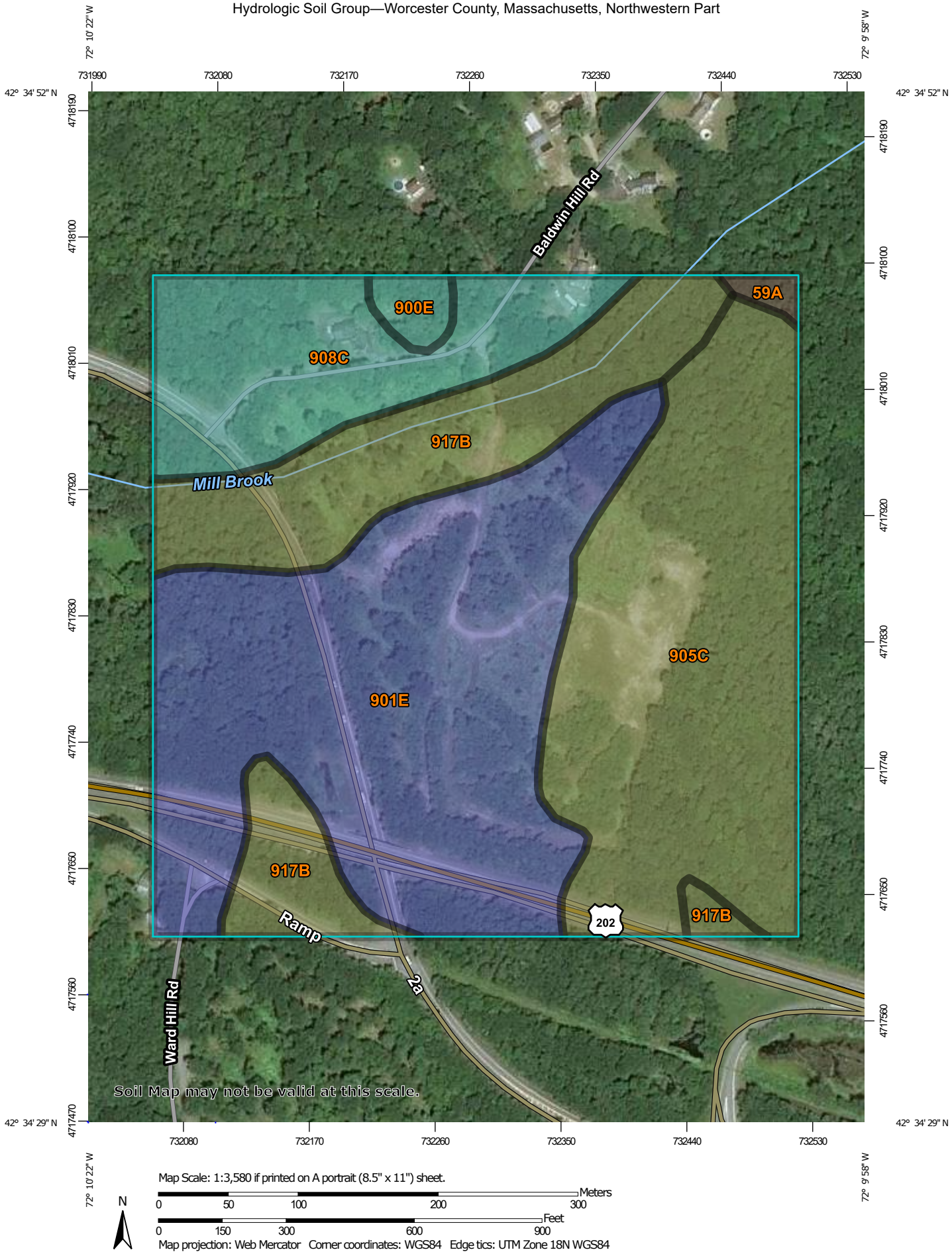
Prepared By: **Stoddard Engineering**

Date: **6/8/2020**

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

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

1. From MassDEP Stormwater Handbook Vol. 1



Map Scale: 1:3,580 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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: Worcester County, Massachusetts, Northwestern Part
Survey Area Data: Version 13, Sep 12, 2019

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

Date(s) aerial images were photographed: May 18, 2019—Jul 9, 2019

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
59A	Bucksport and Wonsqueak mucks, 0 to 2 percent slopes	B/D	0.3	0.6%
900E	Becket-Monadnock association, 15 to 45 percent slopes, extremely stony	C	0.6	1.2%
901E	Berkshire-Marlow association, 15 to 45 percent slopes, extremely stony	B	20.0	37.1%
905C	Peru-Marlow association, 3 to 15 percent slopes, extremely stony	C/D	15.9	29.5%
908C	Becket-Skerry association, 0 to 15 percent slopes, extremely stony	C	7.4	13.8%
917B	Pillsbury-Peacham association, 0 to 8 percent slopes, extremely stony	C/D	9.7	17.9%
Totals for Area of Interest			**54.0**	**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

Worcester County, Massachusetts, Northwestern Part

901E—Berkshire-Marlow association, 15 to 45 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wlnm
Elevation: 750 to 2,070 feet
Mean annual precipitation: 31 to 95 inches
Mean annual air temperature: 27 to 52 degrees F
Frost-free period: 90 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Berkshire, extremely stony, and similar soils: 55 percent
Marlow, extremely stony, and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Berkshire, Extremely Stony

Setting

Landform: Mountains, hills
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Mountainflank, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy supraglacial meltout till derived from phyllite and/or granite and gneiss and/or mica schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 4 inches: fine sandy loam
E - 4 to 5 inches: fine sandy loam
Bs1 - 5 to 7 inches: fine sandy loam
Bs2 - 7 to 13 inches: fine sandy loam
Bs3 - 13 to 21 inches: fine sandy loam
BC1 - 21 to 28 inches: fine sandy loam
BC2 - 28 to 33 inches: fine sandy loam
C - 33 to 65 inches: fine sandy loam

Properties and qualities

Slope: 15 to 45 percent
Percent of area covered with surface fragments: 6.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Marlow, Extremely Stony

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainflank, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy lodgment till derived from mica schist and/or granite and/or phyllite

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
E - 5 to 8 inches: fine sandy loam
Bs1 - 8 to 15 inches: fine sandy loam
Bs2 - 15 to 19 inches: fine sandy loam
BC - 19 to 33 inches: gravelly fine sandy loam
Cd - 33 to 65 inches: fine sandy loam

Properties and qualities

Slope: 15 to 45 percent
Percent of area covered with surface fragments: 6.0 percent
Depth to restrictive feature: 20 to 41 inches to densic material
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.42 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Lyman, extremely stony

Percent of map unit: 9 percent

Landform: Mountains, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Mountainflank, side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Peru, extremely stony

Percent of map unit: 4 percent
Landform: Mountains, hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Mountainflank, nose slope, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Pillsbury, extremely stony

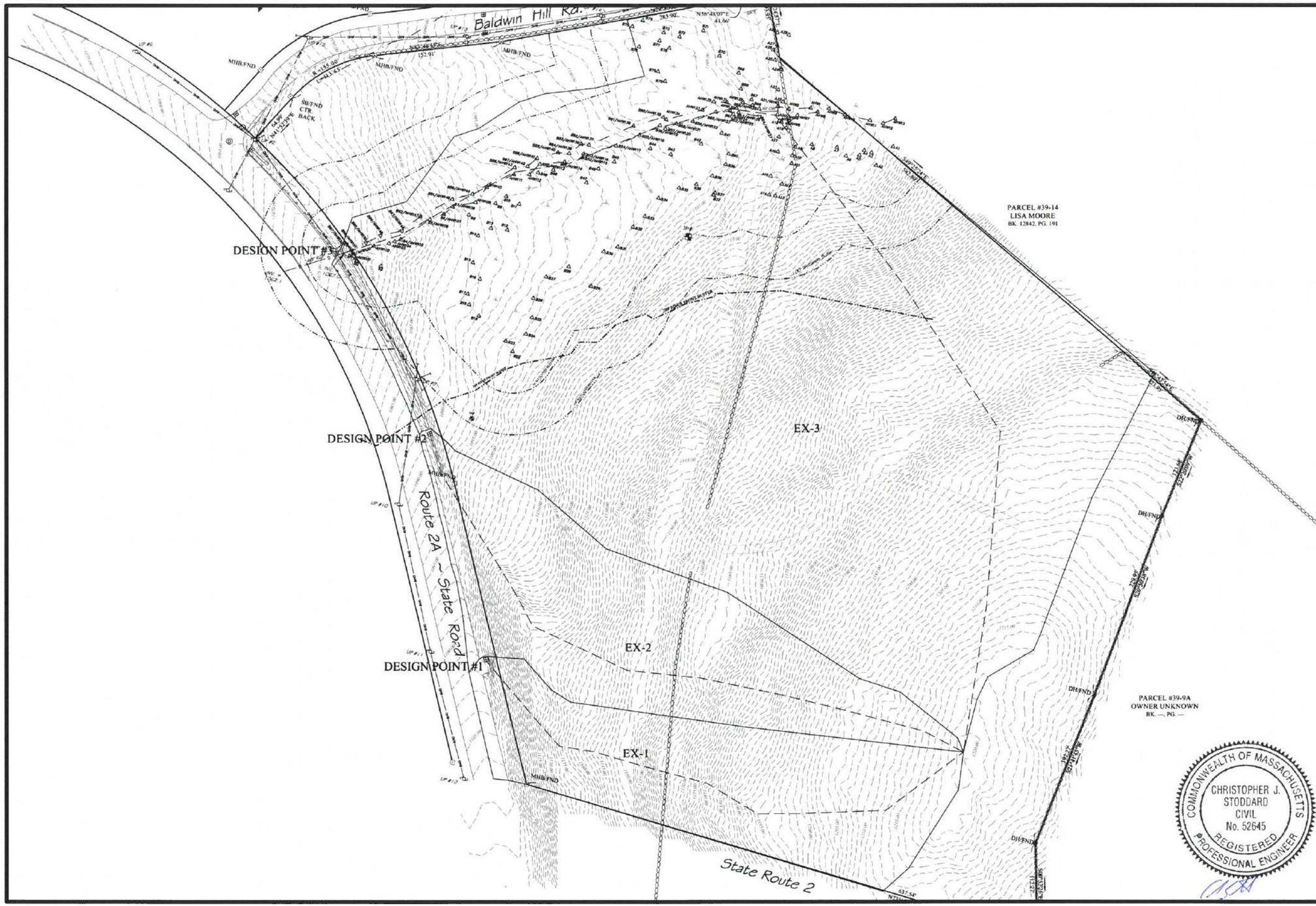
Percent of map unit: 1 percent
Landform: Hills, mountains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Mountainflank, side slope, nose slope, interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Peacham, extremely stony

Percent of map unit: 1 percent
Landform: Hills, mountains
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Mountainflank, interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Worcester County, Massachusetts, Northwestern Part
Survey Area Data: Version 13, Sep 12, 2019



Project:

TEMPEST INC.
RMRE SITE PLAN
420 STATE ROUTE 2A
PHILLIPSTON, MA

STODDARD ENGINEERING
163 OLD KEENE ROAD
ATHOL, MASSACHUSETTS 01331
978.790.9731

Rev No	Revision Note	Date	By	Checked

Drawing:

PRE-DEVELOPMENT
WATERSHED
DELINEATION

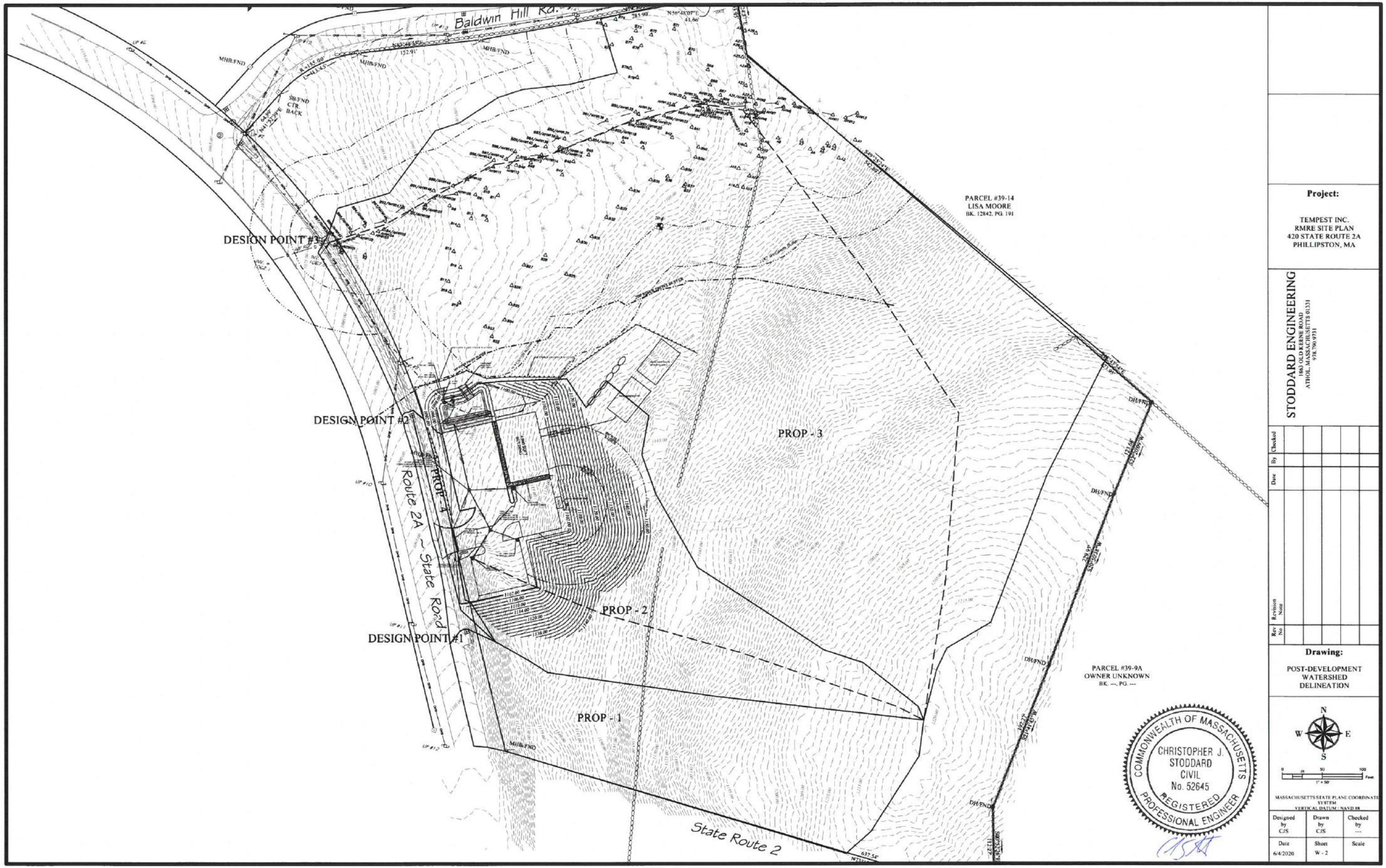
N
W E
S

0 25 50 100 Feet
1" = 50'

MASSACHUSETTS STATE PLANE COORDINATE SYSTEM
VERTICAL DATUM - NAVD 88

Designed by	Drawn by	Checked by
CJS	CJS	---
Date	Sheet	Scale
6/4/2020	W-1	

COMMONWEALTH OF MASSACHUSETTS
CHRISTOPHER J. STODDARD
CIVIL
No. 52645
REGISTERED PROFESSIONAL ENGINEER



Project:

TEMPEST INC.
RMRE SITE PLAN
420 STATE ROUTE 2A
PHILLIPSTON, MA

STODDARD ENGINEERING
180 OLD KEENE ROAD
ATHOL, MASSACHUSETTS 01331
978.790.9731

Rev No	Revision Note	Date	By	Checked

Drawing:

POST-DEVELOPMENT
WATERSHED
DELINEATION

N
W E
S

0 25 50 100 Feet
1" = 50'

MASSACHUSETTS STATE PLANE COORDINATE SYSTEM
VERTICAL DATUM - NAVD 88

Designed by	Drawn by	Checked by
CJS	CJS	---
Date	Sheet	Scale
6/4/2020	W - 2	

COMMONWEALTH OF MASSACHUSETTS
CHRISTOPHER J. STODDARD
CIVIL
No. 52645
REGISTERED PROFESSIONAL ENGINEER

Stormwater Operations and Maintenance Program

1.0 Site Details

Project Name: Recreational Marijuana Retail Establishment

Project Location: 420 State Route 2A

Operator Name and Address: Tempest Inc.
160 South Royalston Road
Phillipston, MA 01368

References:

Site Plan: Site Plan set titled "Tempest, INC. Recreational Marijuana Retail Establishment Site Plan" dated June 4, 2020 (or as amended), prepared by Stoddard Engineering.

Stormwater Report: Report titled "Stormwater Report – "Recreational Marijuana Retail Establishment Site Plan" dated June 4, 2020 (or as amended), Prepared by Stoddard Engineering

2.0 Stormwater Operation and Maintenance Program

This project is proposed to be A 4,000 sqft Recreational Marijuana Retail Establishment (RMRE) is proposed to occupy 0.50± acres of the subject site. The project is to be accessed via State Route 2A by a proposed 30' wide bituminous concrete driveway. The project is proposed to have 38 traditional 10' X 20' parking stalls and two (2) ADA/AAB accessible parking stalls. The parking lots are proposed to have 24' travel lanes to accommodate vehicles in both directions.

As presented within the description of the proposed stormwater management system, several management practices have been instituted to collect, mitigate, and treat stormwater runoff from the proposed development. These include the following:

- Deep Sump Catch basins with trash/gas hoods.
- Retention of stormwater, within the proposed stormwater basin to facilitate recharge of the groundwater system and balancing of pre/post development flows.
- Construction of stormwater basin with associated outlets to mitigate pre and post peak development plows for all storm events (i.e. 2, 10, 25, and 100-year storm events.)

All of the above items reflect mitigation measures to improve and maintain stormwater quality that will flow as groundwater to the existing wetland system. In order to assure proper operation of the stormwater facilities in the future, it is necessary for a stormwater maintenance program be instituted and followed.

The property owner of the stormwater system described herein will be responsible for the required maintenance and operation. The proposed maintenance procedures and scheduling is as follows:

2.1 Stormwater System Maintenance

The Stormwater basin is the primary element of the site's stormwater management program. Final treatment and infiltration of stormwater normally occurs within this mitigation structure. At a minimum; at 6 month intervals, the bottom of the basin requires inspection and removal of sediment if, during the inspection, an accumulation of 2" of more of sediment is found at several locations within the basin. In addition, routine inspections are required after each major storm event of 1" of rainfall or more. Additionally, the operation of the drainage system should be observed at least once every six months during a major storm event to evaluate its performance and note any deficiencies that may occur. Included within this report are sample inspection forms that should be completed to maintain proper records of necessary observations and required maintenance.

Inspection of stormwater basin's outlets is required. Accumulated debris, etc., is to be removed from the vicinity of the outflow. The stormwater basin's emergency spillways shall be inspected on a regular basis. If there is evidence that an overflow event has occurred, the rip rap on the slope shall be examined to determine if repairs are required following the overflow event.

Due to the design of the interior slopes of the basins to accommodate construction equipment, it is anticipated that the slope erosion should be minimal after the vegetation is established. If erosion of the slopes occurs, loam shall be replaced and standard methods used to re-establish proper vegetation cover. Fescues and reed canary grass seed mixtures, which are rapid growing and low maintenance, are recommended. Hay mulch or other suitable stabilizing techniques shall be utilized during the reseeding process.

On a bi-yearly basis the side slopes of the basins will be mowed. The condition of the turf, the status of controlled tree growth, and evidence of differential settlement will be evaluated and if needed, corrective action will be taken. The outside toe of slope should be evaluated for evidence of ponding or leakage through the embankment. If evidence of leakage is apparent, an engineer will need to be engaged to evaluate the stability of the embankment and furnish recommendations regarding the structure.

Inspection of the catch basins is required to ensure the stormwater management system functions as designed. At a minimum, annual inspections of the catch basins should be conducted. The level of sediment in the bottom of the basin should be noted. The sediment/debris should be removed if it has accumulated to a level greater than 50% of the sump. The catch basin outlet is equipped with a trash/gas hood that is designed to prevent floatables from leaving the basin and contaminating the downstream receiving waters. This hood should be inspected to ensure it is still secured properly.

2.2 Stormwater Maintenance Data Sheet

An operation and maintenance log should be maintained for the last three years. This should include inspections, repairs, replacement, and disposal. For disposal, the log shall indicate the type of material and the disposal location.

STORMWATER POLLUTION MAINTENANCE PLAN
INSPECTON AND MAINTENANCE FORM
(To be completed at 6 Month Intervals)

STORMWATER BASIN:

BASIN ID#	DEPTH OF SEDIMENT IN BASIN	CONDITION OF BASIN SIDE SLOPES	ANY EVIDENCE OF OVERTOPPING OF EMBANKMENT?	CONDITION OF OUTFALL FROM BASIN

MAINTENANCE REQUIRED FOR STORMWATER BASIN:

_____

_____

_____

_____

_____

_____

_____

_____

_____

TO BE PERFORMED BY:_____ON OR BEFORE:_____

INSPECTED BY:_____DATE:_____

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

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

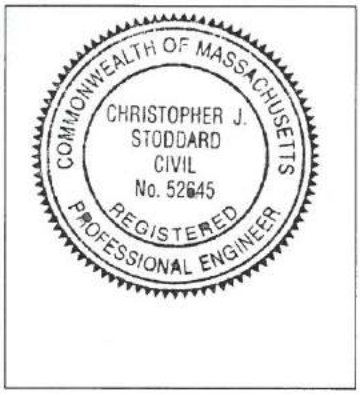
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



6-17-2020
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): Infiltration Basin

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.

Illicit Discharge Compliance Statement

Tempest, INC.
RMRE Site Plan

Date: June 12, 2020

This statement is provided in accordance with the provisions of Massachusetts Stormwater Management Standards (Standards), Standard 10 and of the Massachusetts Stormwater Handbook.

The site drainage patterns have been designed such that no known or anticipated illicit discharges are present at the site. The facility's Operation & Maintenance Plan is designed to prevent non-stormwater discharge to on-site stormwater BMP's. Any illicit discharges identified during or after construction will be immediately disconnected in accordance with the Standards.

Signed:_____
Chris Stoddard, P.E.