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Division of Pennoni

ENGINEERING REPORT

Princeton Pike Parking Lot Expansion
Bristol-Myers Squibb
Block 5001, Lot 1.01
Lawrence Township
Mercer County, New Jersey

Prepared For:
Bristol-Myers Squibb Company
Route 206 and Province Line Road
P.O. Box 4000
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BRMYS23006
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1.0 INTRODUCTION

This report has been prepared as a supplement to the report entitled, "Engineering Report, Princeton Pike Project - Bristol Myers Squibb, Block 5001, Lots 1,2,3 and 11" by Van Note-Harvey Associates (VNHA), dated April 21, 2014, and will discuss how the stormwater management is provided for a proposed 244 space parking expansion at the Bristol-Myers Squibb (BMS) corporate building in Lawrence Township, Mercer County, New Jersey.

The overall corporate building site contains four (4) office buildings connected by a common atrium and associated surface parking lot, a daycare facility and associated surface parking lot, pedestrian paths as well as a porous path that connects to the existing Lawrence-Hopewell Trail and undeveloped cultivated agricultural fields. The area proposed for development is located on the undeveloped cultivated agricultural fields.

2.0 PROJECT DESCRIPTION

Existing Conditions

The property can be found on the United States Geological Survey (USGS) 7.5- minute topographic quadrangle for Princeton, New Jersey. A copy of the USGS map is provided as Figure 1. The project is situated on Block 5001, Lot 1.01 in the Township of Lawrence, County of Mercer, New Jersey as shown on the Township of Lawrence Tax Map (Figure 2). The Project is bounded by Princeton Pike to the east, Interstate 95 to the south, Franklin Corner Road to the west, and Lewisville Road to the north.

The existing watershed area for this analysis is one (1) sub area (See Dwg. CS9001, Appendix H). The sub area is part of drainage area Exist-DA-2 Undisturbed, as indicated within the previous design report by VNHA. Therefore, is referred as EX-DA-2 under existing conditions. The sub area drains to A "point of interest" (POI 1), to Analysis Point 2 which is located at the pipe at the existing wetlands that discharges below Interstate 95.

Existing Drainage Area 2 (EX-DA-2) consists of undeveloped cultivated agricultural fields, and stormwater collection and water quality treatment facilities installed during construction of the on-site loop road. The water quality swales and associated underdrains will remain and be reconfigured. The existing 24-inch HDPE, which drains the wooded area located northwest of the site, will be rerouted along the westerly project limits a discharge point in the southwesterly corner of the site. The runoff from EX-DA-2 flows in a southernly direction towards Analysis Point 2. Pre-developed calculations were analyzed for the portion of the site being developed to Point of Interest 1 (POI 1).

Proposed Conditions

As the proposed improvements will disturb more than one (1) acre of land and increase impervious surface by more than 0.25 acres., the Project is deemed as a "Major Development". Thus, the project triggers the stormwater management regulatory requirements.

The proposed watershed area for this analysis is divided into two (2) sub areas; DA-2 and DA-2 Bypass Pervious (See Dwg. CS9002). The post-developed calculations were analyzed to a “point of interest” (POI 1) as the predeveloped analysis, to Analysis Point 2, (See Post-Developed Hydrographs, Appendix B). The post-developed calculations were analyzed for the portion of the site being developed.

Proposed Drainage Area 2 (DA2) consists of runoff from the proposed porous pavement parking area, and grass areas. An underground chamber and stone storage detention system will be constructed below a portion of the porous pavement parking lot areas remaining while other areas of porous pavement will have an underground “conveyance system” that will consist of 8” of stone below the porous pavement that will direct runoff into the areas with underground storage.

The proposed porous asphalt section consists of a surface course (3” thickness), a choker course (1” thickness), and underground chamber and stone storage detention system (varying in thickness). Rainwater is infiltrated through the surface course where the goal is to control stormwater at the source, reduce runoff and improve water quality by filtering pollutants primarily in the porous pavement surface structure. Runoff is reduced by temporarily detaining stormwater within underground storage chambers and stone storage bed, allowing infiltration back into the ground and controlling outflow by an outlet structure. The surface of porous pavement captures pollutants present in stormwater runoff (including heavy metals, suspended solids, nutrients, car oils/fluids [hydrocarbons], etc.) which get “stuck” on the porous pavement surface within the pores of the porous pavement/choker course. These pollutants and oils are biodegraded into simpler chemical components by naturally occurring microorganisms and then released into the atmosphere.

Proposed Drainage Area 2 Bypass Pervious consists of runoff from the grass areas that bypass the porous pavement and underground stone storage detention system and the existing paved areas draining to the water quality swales adjacent to the loop road. The water quality swales will be regraded to retain and infiltrate the WQ storm runoff volume draining to each area.

Table 1 below summarizes the pre- vs. post-developed impervious areas onsite.

Table 1 - Project Area Comparison

	Impervious Area (acre)	Motor Vehicle Surface Area (acre)	Pervious Area (acre)
Pre-Developed	0.03	0.00	2.99
Post-Developed	0.04	2.10	0.88
Increase	**+0.01**	**+2.10**	**-2.11**

3.0 SOIL DATA

The site soils consist of Matapeake loam (MbpB), 2 to 5 percent slopes, Mattapex and Bertie loams (MBYB), 0 to 5 percent slopes, and Othello silt loams, (SacBO), 0 to 2 percent slopes as depicted on the United States Department of Agriculture, (USDA) Web Soil Survey of Mercer County, New Jersey (Figure 3). The assigned hydrologic soil group is Type "B" and "C" soils, respectively.

4.0 WATERSHED DATA

Based on a review of FEMA Flood Insurance Rate Maps, and NJ GeoWeb, we have made the following determinations near the project limits:

FEMA FIRM panel number 34021C0137F (effective 7/20/2016) indicates the immediate project area is not located within a FEMA flood hazard zone. Wetlands with a 50' transition area are located onsite south of the proposed project area.

5.0 REQUIREMENTS FOR STORMWATER MANAGEMENT

As required by N.J.A.C. 7:8-1.6, all "major development" shall comply with the requirements of N.J.A.C. 7:8 Stormwater Management Rules. A "Major development" means an individual "development," as well as multiple developments that individually or collectively result in:

1. The disturbance of one or more acres of land since February 2, 2004;

2. The creation of one-quarter acre or more of "regulated impervious surface" since February 2, 2004;

3. The creation of one-quarter acre or more of "regulated motor vehicle surface" since March 2, 2021; or

4. A combination of 2 and 3 above that totals an area of one-quarter acre or more. The same surface shall not be counted twice when determining if the combination area equals one-quarter acre or more.

Major development includes all developments that are part of a common plan of development, or sale (for example, phased residential development) that collectively or individually meet one or more of paragraphs 1, 2, 3, or 4 above. Projects undertaken by any government agency that otherwise meet the definition of "major development", but which do not require approval under the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq., are also considered "major development."

The stormwater management rules at N.J.A.C. 7:8 apply to the project site, as the site meets the definition for a major development based on the following:

1. The disturbance of one or more acres of land since February 2, 2004. **The project will disturb more than one acre of land.**

2. One-quarter acre or more of "regulated impervious surface" has been created on the site since February 2, 2004**. The project will create more than one-quarter acre of "regulated impervious surface".**

3. The creation of one-quarter acre or more of "regulated motor vehicle surface" since March 2, 2021. **The project will create more than one-quarter acre of "regulated motor vehicle surface".**

In addition to the requirements of N.J.A.C. 7:8; Stormwater Management Rules, the project has been designed in accordance with the Delaware and Raritan Canal Commission rules at N.J.A.C 7:45, Subchapter 8 – Stormwater Runoff and Water Quality Impact Review and the Lawrence Township stormwater ordinance Section 522, Drainage and Stormwater Management last amended July 2021.

6.0 TECHNIQUES OF ANALYSIS

In accordance with the stormwater runoff calculation methodology at N.J.A.C. 7:8-5.6, the quantity (volume and rate) of stormwater runoff for pre- and post-developed conditions is calculated based on the USDA NRCS methodology as described in NRCS National Engineering Handbook, Part 630.

Pre- and post-developed times of concentration (Tc) are determined using the hydraulically longest flow path. Curve numbers (CN) for the drainage areas are based on the hydrologic soil group and land use. The developed area is made up of Type A and B soils, and therefore the following CN values were utilized:

Type B soils – Row Crops (Assumed meadow) 55; Open Space 61 and Impervious 98
Type C soils – Row Crops (Assumed meadow) 71; Open Space 74 and Impervious 98

The impervious areas were calculated as separate subareas to generate hydrographs without weighted CNs as outlined in the CMP N.J.A.C. 7:50-6.84(a) 6.i (2) and the BMP manual chapter 5.

Note, any porous areas of conveyance are considered as impervious and have been assigned a CN of 98.

Using the drainage areas, the Tc's and CNs as input data, *Pond Pack Connect Edition,* a hydrologic/hydraulic software program by Bentley, was utilized to generate the runoff rates and volumes.

7.0 KEY HYDROLOGIC PRINCIPALS

A 24-hour, NOAA _C (Region C) storm distribution was utilized with the following precipitation depths, within Mercer County for each storm analyzed (reference Appendix G).

Storm Event	Current	Projected (year 2100)
2 year	3.34 inches	3.8 inches
10 year	5.11 inches	5.9 inches
100 year	8.67 inches	11.3 inches

Note: Precipitation change factors in accordance with NJ BMP Manual, Chapter 5, Table 5-5 and Table 5-6, have been applied.

8.0 DESIGN CRITERIA

GREEN INFRASTRUCTURE:

To satisfy the groundwater recharge, runoff quality and runoff quantity the project design must utilize green infrastructure BMP's (GI BMP) as identified in Table 5-1 at N.J.A.C. 7:8-5.2 (f) or an alternative stormwater management measure approved in accordance with N.J.A.C. 7:8-5.2(g). The following green infrastructure BMP from Table 5-1 at N.J.A.C. 7:8-5.2 (b) has been incorporated into the project design:

1. Pervious Paving Systems – Porous pavement is provided as part of the project design. **Permeable pavement with underground chambers and stone storage bed is provided as part of the project design.**

Nonstructural measures employed in the engineering of this site include.

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion of sediment loss.
   - **Construction of the project will comply with the Soil Erosion and Sediment Control Act, NJSA 4:24-39 et seq. and implementing rules.**

2. Minimize impervious surfaces.
    - **Porous asphalt to limit impervious surfaces;**
3. Maximize the protection of natural drainage features and vegetation.
    - **Natural drainage features are protected by the adjacent wetland buffer. Encroachment areas are not proposed within the buffer.**
4. Minimize the decrease in the pre-construction time of concentration.
    - **Runoff from the site will be routed through porous pavement minimizing the decrease in the time of concentration to the point of interest within the watershed.**
5. Minimize land disturbance including clearing and grading.
    - **Although the site design requires regarding of the project area due to the existing topography, land disturbance has been minimized to the extent practical.**
6. Minimize soil compaction.
    - **Light construction equipment will be utilized to minimize soil compaction within the proposed basin areas.**
7. Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.
    - **The landscaping has been designed to encourage retention of stormwater and minimize the need for pesticides and fertilizers.**

GROUNDWATER RECHARGE:

Pursuant to the N.J.A.C. 7:8-5.4 (b) groundwater recharge requirements apply if there is either a 0.25 acre increase in impervious area or 1 acre of disturbance. The project disturbs more than 1 acre and increases motor vehicle surfaces by more than 0.25 acres. Therefore, one of the following requirements shall be met to satisfy the standards for groundwater recharge: (1) 100 percent of the site's average annual pre-developed groundwater recharge volume shall be maintained after development; (2) 100 percent of the difference between the site's pre- and post-developed 2-year runoff volumes shall be infiltrated.

- BMP Area (ABMP) stone storage area (sq.ft)
- BMP effective depth (dBMP) (in.)
- Upper Level of BMP (dBMPu) (in.) (porous pavement)
- Depth of lower surface of BMP (dEXC) = 12" for subsurface recharge BMP (ref. Figure 6-4, Chapter 6, NJ BMP Manual, Appendix G).

To meet the groundwater recharge requirement, 100 percent of the site's average annual pre-developed groundwater recharge volume shall be maintained after development. The water will be infiltrated within the green infrastructure BMP (porous pavement with stone storage bed).

Average annual recharge volume deficit is 66,859 cf
Total annual recharge provided within stone storage bed = 66,859 cf

Utilizing Underground System Stone Storage Bed as the recharge location.

BMP Area (ABMP) stone area = 29,104 SF
Upper Level of BMP (dBMPu) = 4.0" (surface)
Depth to Lower Level (dEXC) = 12"
BMP effective depth (dBMP) = 3.8" (Solved for dBMP)
Annual BMP Recharge = 66,859 cf

The spreadsheet was solved for the effective depth (dBMP) to provide the required post-developed recharge deficit (Vdef) within each BMP area. The spreadsheet is included within Appendix E.

RUNOFF QUALITY:

Pursuant to N.J.A.C. 7:8-5.2 (f), the green infrastructure BMP's can be utilized to satisfy the requirements of N.J.A.C. 7:8-5.5 for stormwater runoff quality. Stormwater Management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm by 80 percent of the anticipated load from the developed site. The increase in motor vehicle surface, must be treated for 80% TSS reductions.

The water quality standards will apply as the net increase of motor vehicle surface exceeds the limit for a maximum net increase of 0.25 acres for the site.

The water quality (WQ) design storm is 1.25 inches of rainfall in 2-hours. In accordance with N.J.A.C. 7:8-5.5, Table 5-4, a one-minute water quality design storm rainfall distribution was utilized for the calculations. Bentley's Pondpack Connect Edition was used to perform the calculations.

The water quality storm volume and volume infiltrated is summarized in Table 2 below.

Table 2 – WQ Storm Volume and Volume Infiltrated

Infiltration Area	Motor Vehicle Impervious Runoff Volume (cf)	Motor Vehicle Impervious Volume Retained & Infiltrated (cf)
Porous Pavement	8,107	8,107

RUNOFF QUANTITY:

Post-construction runoff hydrographs for the 2, 10 and 100-year have been analyzed as part of the stormwater management design. Pursuant to N.J.A.C. 7:8-5.6(b) one of the following peak runoff requirements must be met: (1) demonstrate that the post development hydrograph is

less than the pre-development hydrograph at all points during 2, 10 and 100 year storm events; (2) demonstrate that the there is no increase in peak runoff rates of stormwater leaving the site for the 2, 10 and 100 year storm events and that the increased volume or change in timing will not increase flood damage at or downstream of the site; or (3) reduce the post-development peak discharge for the 2, 10, and 100-year storm events to release 50%, 75% and 80%, respectively as a result of the proposed development.

The proposed stormwater management system design has been revised to reduce the post-development peak discharge for the 2, 10, and 100-year storm events to release 50%, 75% and 80% for developed areas. (option 3 above) See Appendices A & B for pre- and post-construction hydrographs.

Table 3 below provides a comparison of the Pre-Developed and Post-Developed peak runoff rate for the current rainfall precipitation depth for the portion of the site being developed to Analysis Point 2.

Table 3 – Pre-Developed Flow vs. Post-Developed Flow to Analysis Point 2 (Current year)

Storm (Year)	Pre-Developed Runoff Rate (cfs)	Allowable % of Pre-Developed Peak Flow	Allowable Post-Developed Runoff Rate (cfs)	Post-Developed Routed Runoff Rate (cfs)	Runoff Rate Increase from Pre-Developed (cfs)	Proposed % Reduced*
2	1.60	50	0.80	0.70	-0.90	56.3
10	4.40	75	3.30	2.30	-2.10	47.8
100	11.5	80	9.20	8.70	-2.80	22.7

Table 4 below provides a comparison of the Pre-Developed and Post-Developed peak runoff rate for the projected rainfall precipitation depth for the portion of the site being developed to Analysis Point 2.

Table 4 – Pre-Developed Flow vs. Post-Developed Flow to Analysis Point 2 (Projected year 2100)

Storm (Year)	Pre-Developed Runoff Rate (cfs)	Allowable % of Pre-Developed Peak Flow	Allowable Post-Developed Runoff Rate (cfs)	Post-Developed Routed Runoff Rate (cfs)	Runoff Rate Increase from Pre-Developed (cfs)	Proposed % Reduced*
2	2.30	50	1.15	1.10	-1.20	52.2
10	6.00	75	4.50	3.60	-2.40	40.0
100	18.00	80	14.40	14.00	-4.00	22.3

9.0 STORMWATER MANAGEMENT

Stormwater management measures are designed so that the post-construction for the peak runoff rates for the 2, 10 and 100-year storm events are 50, 75 and 80 percent, respectively of the pre-construction peak runoff rates. Bentley's Pondpack Connect Edition was used to perform the calculations. Pre- and post-developed drainage area delineations can be found on Sheets CS-9001 and CS-9002 in Appendix H.

Underground Infiltration/Extended Detention Basin

Underground chamber and stone storage detention system will be constructed below a portion of the porous pavement parking lot area while other areas of porous pavement will have an underground "conveyance system" that will consist of stone below the porous pavement that will direct runoff into the areas with underground stone storage.

The underground detention system beneath the porous pavement will consist of a chamber system with stone storage, utilizing 40% void ratio, to provide temporary storage of stormwater runoff and promote infiltration. Cleanouts have been provided within each underground storage area for observation and access to the system for any required maintenance. An outlet structure discharges stormwater runoff collected from the system to the on-site storm sewer system. The outlet structure parameters are as follows:

1st Stage Orifice= 6" diameter; Invert=93.50 ft.
2nd Stage Weir= 1' wide weir; Invert=94.00 ft.
Outlet Pipe=24" HDPE; Invert=93.50 ft.
Grate Elevation at Outlet Structure =97.0 ft

Table 5 below provides summary of the basin inflow rates, outflow rates, storage volumes and elevations for the current rainfall and Table 6 provides summary of the basin inflow rates, outflow rates, storage volumes and elevations for the projected rainfall.

Table 5 (Current Rainfall)
Storage Chamber and Porous Pavement Stone Bed

Storm (year)	Peak Inflow (cfs)	Peak Outflow Routed (cfs)	Storage Volume (cf)	Peak Elevations (ft)
2	8.30	0.70	16,707	94.07
10	12.80	2.20	24,036	94.50
100	24.10	7.90	35,687	95.46

Table 6 (Projected Rainfall)
Storage Chambers and Porous Pavement Stone Bed

Storm (year)	Peak Inflow (cfs)	Peak Outflow Routed (cfs)	Storage Volume (cf)	Peak Elevations (ft)
2	9.50	0.90	18,644	94.18
10	15.2	3.00	26,348	94.67
100	30.9	11.7	41,566	95.97

10.0 GROUNDWATER MOUNDING

A groundwater mounding (GWM) analysis has been performed to determine the height and range of groundwater mounding beneath the stormwater infiltration facility .

The U.S. Geological Survey (USGS), in coordination with N.J. Department of Environmental Protection developed a report entitled “Simulation of Groundwater Mounding Beneath Hypothetical Stormwater Infiltration Basins”, this report outlines the method utilized for analysis of groundwater mounding.

As spreadsheet was then developed by USGS to solve the Hantush equation, referred to as the Hantush Spreadsheet, which calculates the maximum height of the mounding formed and assumes all groundwater flow is horizontal above an infinite aquifer.

The maximum height of mounding occurs when the entire volume of runoff has been infiltrated into the subsoil through the bottom of the stone storage bed. Duration of the infiltration in accordance with NJ BMP Manual, Groundwater Table Hydraulic Assessment Guide for Infiltration BMP’s, Chapter 13, for each facility is calculated below:

Duration of Infiltration Period, t = $\frac{\text{volume of runoff to be infiltrated (cf)*}}{\text{Infiltration area (sf) x recharge rate (ft/day)}}$

* Volume to first outflow structure

Recharge Rate Porous Pavement Underground Basin = 2.3 in/hr x 0.50 x 24 hr =
27.6 in/day/12 in. = 2.3 ft day

Porous Pavement Underground Basin (1), t = $\frac{5{,}820 \text{ cf}}{29{,}104 \text{ sf x } 2.3 \text{ (ft/day)}}$ = 0.087 days / 2.09 hrs.

Note: The underground stone storage detention system will infiltrate in less than 72 hours. Utilizing the Hantush method and minimum input model parameters in accordance with NJ BMP Manual, Groundwater Table Hydraulic Assessment Guide for Infiltration BMP's, Chapter 13, the maximum height and range of the groundwater mound was calculated (Refer to the Appendix E for Hantush GWM spreadsheet). Note that the Hantush method is uses conservative values for the horizontal hydraulic conductivity (Kh) in the calculations.
Limiting Kh to 5x the recharge rate results.

A higher Kh would result in a flatter curve, less mounding height, and a greater horizontal distance with hydraulic conductive zone effects further out.

Table 7 below summarizes the calculated groundwater mounding, ESHW elevation and bottom of basin elevations.

Table 7
Groundwater Mounding Results Summary

Basin	Time (Hrs.)	GWM (ft) by Hantush Spreadsheet	ESHW (Elev.)	GWM (Elev.)	Bottom of Stone (Elev.)
Porous Pavement Stone Bed	2.09	1.33	84.7*	90.66	93.00

***** Estimated seasonal high water not encountered. Perched water encountered at elev. 92.7, soils within subsurface basin area to be excavated and replaced to elev. 91.00.

Based on Table 7 above, the mounding at the analyzed within the area of underground basin does not reach the bottom elevation of the stone.

11.0 STORM SEWER DESIGN

Storm sewer design consists of Type "B" and "E" inlets, manholes, and HDPE storm pipes. All proposed conveyance systems have been sized to accommodate the 25-year storm event (Appendix F). Rainfall intensities are based on NOAA data for Township of Lawrence, NJ (Appendix G).

12.0 SOIL EROSION AND SEDIMENT CONTROL

The project will comply with the minimum design and performance standards for erosion control established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules. Anticipated BMP's to be included in the Soil Erosion and Sediment Control Plan will include, structural and non-structural soil erosion BMP's to be implemented during construction, including: minimizing the area of disturbance, placement of silt fencing around the limit of disturbance, temporary soil stockpiles surrounded with silt fencing, temporary vegetative cover standards, inlet filter covers over all existing and proposed stormwater inlets, and an anti-tracking stabilized construction entrance (see Dwg. CS8001). The project will be submitted to the Mercer County Soil Conservation District for certification of a Soil Erosion and Sediment Control Plan prior to commencement of construction.

13.0 CONCLUSION

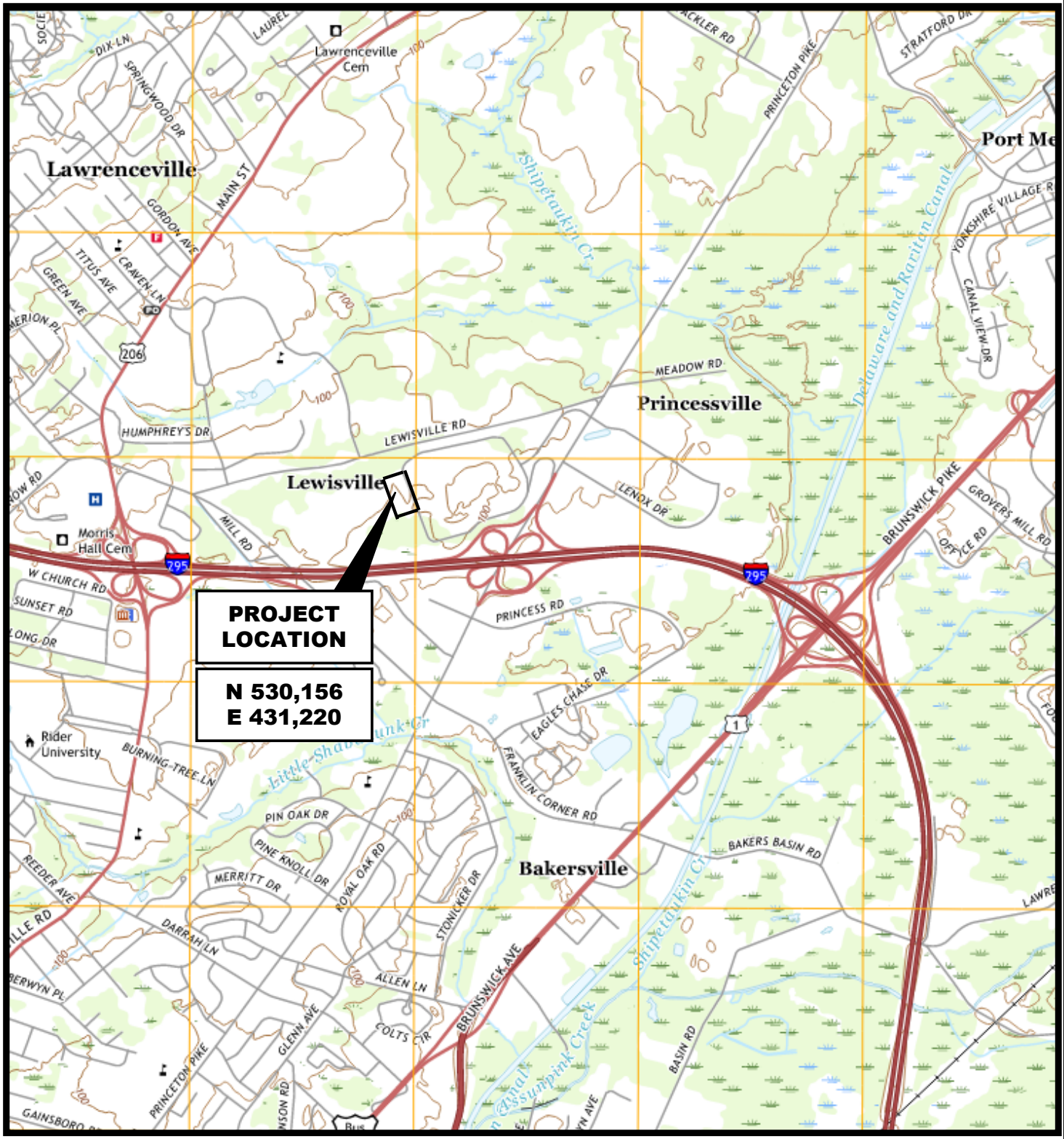
Pursuant to N.J.A.C. 7:8-5, the proposed stormwater management system has been designed such that:

- Post-construction for the peak runoff rates for the 2, 10 and 100-year storm events are no greater than 50, 75 and 80 percent, respectively of the pre-construction peak runoff rates for developed areas.

- The site has been designed to provide TSS removal for the motor vehicle surface area at a rate of 80% utilizing porous pavement.

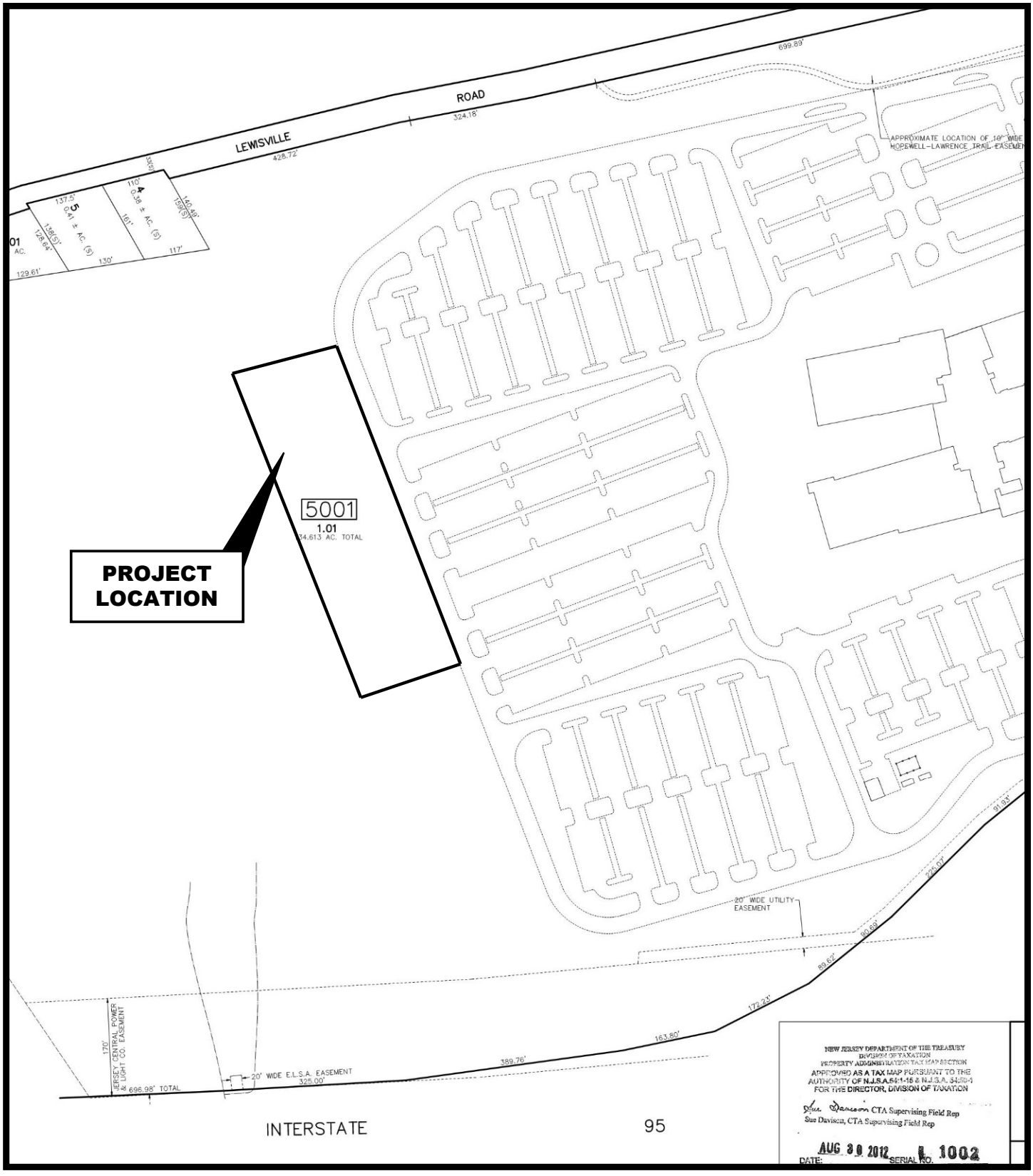
- Groundwater recharge has been met by infiltrating 100 percent of the site's average annual pre-developed groundwater recharge volume after development. The water will be infiltrated within underground detention area of the porous pavement.

Exhibits



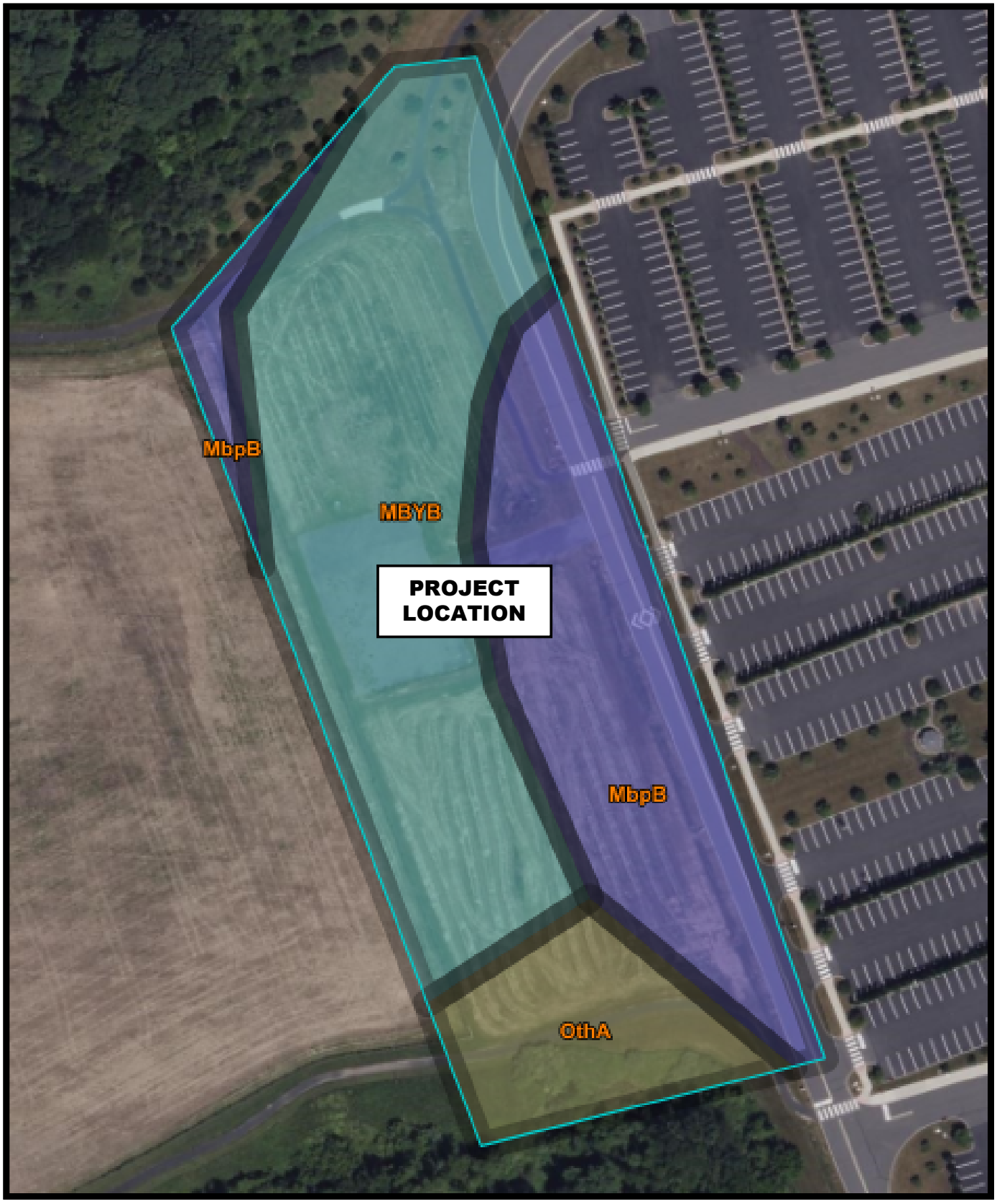
USGS Quadrangle, Princeton, NJ

vanote-harvey division of pennoni		PRINCETON PIKE BRISTOL MYERS SQUIBB BLOCK 5001, LOT 1.01 LAWRENCE TOWNSHIP, MERCER COUNTY NEW JERSEY
Job No. BRMYS23006	Scale: 1"=2,000'	Figure 1 – Location Map



Lawrence Township Tax Map, Plate 50.1

van note-harvey division of pennoni		PRINCETON PIKE BRISTOL MYERS SQUIBB BLOCK 5001, LOT 1.01 LAWRENCE TOWNSHIP, MERCER COUNTY NEW JERSEY
Job No. BRMYS23006	Scale: NTS	Figure 2 – Tax Map



NRCS WebSoil Survey, Mercer County, NJ

vhh van note-harvey division of pennoni		PRINCETON PIKE BRISTOL MYERS SQUIBB BLOCK 5001, LOT 1.01 LAWRENCE TOWNSHIP, MERCER COUNTY NEW JERSEY
Job No. BRMYS23006	Scale: NTS	Figure 3 – Soils Map

Appendix A

Current Rainfall

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Pre Dev Current Rainfall

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
EX-DA-2-DISTURBED	2yr Current NOAA C	2	7,534.000	12.300	1.5
EX-DA-2-DISTURBED	10yr Current NOAA C	10	19,569.000	12.300	4.3
EX-DA-2-DISTURBED	100yr Current NOAA C	100	49,431.000	12.200	11.3
EX-DA-2 IMPERVIOUS	2yr Current NOAA C	2	334.000	12.200	0.1
EX-DA-2 IMPERVIOUS	10yr Current NOAA C	10	531.000	12.200	0.1
EX-DA-2 IMPERVIOUS	100yr Current NOAA C	100	917.000	12.200	0.2

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
EX-DA-2	2yr Current NOAA C	2	7,868.000	12.300	1.6
EX-DA-2	10yr Current NOAA C	10	20,099.000	12.300	4.4
EX-DA-2	100yr Current NOAA C	100	50,348.000	12.200	11.5

CN Area Collection - EX-DA-2-DISTURBED (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
ROW CROP - ASSUMED MEADOW [C]	71.000	1.940	0.000	0.000
ROW CROP - ASSUMED MEADOW [B]	55.000	0.810	0.000	0.000
GRASS (C)	74.000	0.030	0.000	0.000
GRASS (B)	61.000	0.210	0.000	0.000

CN Area Collection - EX-DA-2 IMPERVIOUS (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
Impervious	98.000	0.030	0.000	0.000

Pre Dev Current Rainfall

Subsection: Time of Concentration Calculations
Label: EX-DA-2 IMPERVIOUS
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.024 ft/ft
2 Year 24 Hour Depth	3.3 in
Average Velocity	0.13 ft/s
Segment Time of Concentration	0.218 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	174.00 ft
Is Paved?	False
Slope	0.025 ft/ft
Average Velocity	2.55 ft/s
Segment Time of Concentration	0.019 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	412.00 ft
Is Paved?	False
Slope	0.008 ft/ft
Average Velocity	1.44 ft/s
Segment Time of Concentration	0.079 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.316 hours

Pre Dev Current Rainfall

Subsection: Time of Concentration Calculations
Label: EX-DA-2 IMPERVIOUS
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Pre Dev Current Rainfall

Subsection: Time of Concentration Calculations
Label: EX-DA-2-DISTURBED
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.024 ft/ft
2 Year 24 Hour Depth	3.3 in
Average Velocity	0.13 ft/s
Segment Time of Concentration	0.218 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	174.00 ft
Is Paved?	False
Slope	0.025 ft/ft
Average Velocity	2.55 ft/s
Segment Time of Concentration	0.019 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	412.00 ft
Is Paved?	False
Slope	0.008 ft/ft
Average Velocity	1.44 ft/s
Segment Time of Concentration	0.079 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.316 hours

Pre Dev Current Rainfall

Subsection: Time of Concentration Calculations
Label: EX-DA-2-DISTURBED
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Storm Event	2yr current
Return Event	2 years
Duration	72.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.316 hours
Area (User Defined)	0.030 acres

Computational Time Increment	0.042 hours
Time to Peak (Computed)	12.218 hours
Flow (Peak, Computed)	0.1 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.200 hours
Flow (Peak Interpolated Output)	0.1 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.1 in
Runoff Volume (Pervious)	334.010 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	334.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.316 hours
Computational Time Increment	0.042 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

SCS Unit Hydrograph Parameters	
Unit peak, qp	0.1 ft³/s
Unit peak time, Tp	0.211 hours
Unit receding limb, Tr	0.843 hours
Total unit time, Tb	1.053 hours

Pre Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2 IMPERVIOUS
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

Storm Event	10yr current
Return Event	10 years
Duration	72.000 hours
Depth	5.1 in
Time of Concentration (Composite)	0.316 hours
Area (User Defined)	0.030 acres

Computational Time Increment	0.042 hours
Time to Peak (Computed)	12.218 hours
Flow (Peak, Computed)	0.1 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.200 hours
Flow (Peak Interpolated Output)	0.1 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.9 in
Runoff Volume (Pervious)	530.670 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	531.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.316 hours
Computational Time Increment	0.042 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2 IMPERVIOUS
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	0.1 ft³/s
Unit peak time, Tp	0.211 hours
Unit receding limb, Tr	0.843 hours
Total unit time, Tb	1.053 hours

Storm Event	100yr current
Return Event	100 years
Duration	72.000 hours
Depth	8.7 in
Time of Concentration (Composite)	0.316 hours
Area (User Defined)	0.030 acres

Computational Time Increment	0.042 hours
Time to Peak (Computed)	12.218 hours
Flow (Peak, Computed)	0.2 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.200 hours
Flow (Peak Interpolated Output)	0.2 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.4 in
Runoff Volume (Pervious)	916.919 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	917.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.316 hours
Computational Time Increment	0.042 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2 IMPERVIOUS
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	0.1 ft³/s
Unit peak time, Tp	0.211 hours
Unit receding limb, Tr	0.843 hours
Total unit time, Tb	1.053 hours

Pre Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2-DISTURBED
Scenario: 2yr Current NOAA C

Return Event: 2 years
Storm Event: 2yr current

Storm Event	2yr current
Return Event	2 years
Duration	72.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.316 hours
Area (User Defined)	2.990 acres

Computational Time Increment	0.042 hours
Time to Peak (Computed)	12.260 hours
Flow (Peak, Computed)	1.5 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.300 hours
Flow (Peak Interpolated Output)	1.5 ft³/s

Drainage Area	
SCS CN (Composite)	66.000
Area (User Defined)	2.990 acres
Maximum Retention (Pervious)	5.2 in
Maximum Retention (Pervious, 20 percent)	1.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.7 in
Runoff Volume (Pervious)	7,534.217 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	7,534.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.316 hours
Computational Time Increment	0.042 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2-DISTURBED
Scenario: 2yr Current NOAA C

Return Event: 2 years
Storm Event: 2yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	10.7 ft³/s
Unit peak time, Tp	0.211 hours
Unit receding limb, Tr	0.843 hours
Total unit time, Tb	1.053 hours

Pre Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2-DISTURBED
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

Storm Event	10yr current
Return Event	10 years
Duration	72.000 hours
Depth	5.1 in
Time of Concentration (Composite)	0.316 hours
Area (User Defined)	2.990 acres

Computational Time Increment	0.042 hours
Time to Peak (Computed)	12.260 hours
Flow (Peak, Computed)	4.5 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.300 hours
Flow (Peak Interpolated Output)	4.3 ft³/s

Drainage Area	
SCS CN (Composite)	66.000
Area (User Defined)	2.990 acres
Maximum Retention (Pervious)	5.2 in
Maximum Retention (Pervious, 20 percent)	1.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.8 in
Runoff Volume (Pervious)	19,569.282 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	19,569.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.316 hours
Computational Time Increment	0.042 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2-DISTURBED
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	10.7 ft³/s
Unit peak time, Tp	0.211 hours
Unit receding limb, Tr	0.843 hours
Total unit time, Tb	1.053 hours

Pre Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2-DISTURBED
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Storm Event	100yr current
Return Event	100 years
Duration	72.000 hours
Depth	8.7 in
Time of Concentration (Composite)	0.316 hours
Area (User Defined)	2.990 acres

Computational Time Increment	0.042 hours
Time to Peak (Computed)	12.260 hours
Flow (Peak, Computed)	11.7 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.200 hours
Flow (Peak Interpolated Output)	11.3 ft³/s

Drainage Area	
SCS CN (Composite)	66.000
Area (User Defined)	2.990 acres
Maximum Retention (Pervious)	5.2 in
Maximum Retention (Pervious, 20 percent)	1.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.6 in
Runoff Volume (Pervious)	49,433.385 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	49,431.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.316 hours
Computational Time Increment	0.042 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2-DISTURBED
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	10.7 ft³/s
Unit peak time, Tp	0.211 hours
Unit receding limb, Tr	0.843 hours
Total unit time, Tb	1.053 hours

Pre Dev Current Rainfall

Subsection: Addition Summary
Label: EX-DA-2
Scenario: 2yr Current NOAA C

Return Event: 2 years
Storm Event: 2yr current

Summary for Hydrograph Addition at 'EX-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-DA-2 IMPERVIOUS
<Catchment to Outflow Node>	EX-DA-2-DISTURBED

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EX-DA-2 IMPERVIOUS	333.988	12.200	0.1
Flow (From)	EX-DA-2-DISTURBED	7,534.364	12.300	1.5
Flow (In)	EX-DA-2	7,868.352	12.300	1.6

Pre Dev Current Rainfall

Subsection: Addition Summary
Label: EX-DA-2
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

Summary for Hydrograph Addition at 'EX-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-DA-2 IMPERVIOUS
<Catchment to Outflow Node>	EX-DA-2-DISTURBED

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EX-DA-2 IMPERVIOUS	530.636	12.200	0.1
Flow (From)	EX-DA-2-DISTURBED	19,568.745	12.300	4.3
Flow (In)	EX-DA-2	20,099.381	12.300	4.4

Pre Dev Current Rainfall

Subsection: Addition Summary
Label: EX-DA-2
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Summary for Hydrograph Addition at 'EX-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-DA-2 IMPERVIOUS
<Catchment to Outflow Node>	EX-DA-2-DISTURBED

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EX-DA-2 IMPERVIOUS	916.861	12.200	0.2
Flow (From)	EX-DA-2-DISTURBED	49,430.745	12.200	11.3
Flow (In)	EX-DA-2	50,347.606	12.200	11.5

Projected Rainfall

Table of Contents

Pre Dev Projected Rainfall

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
EX-DA-2-UNDISTURBED	2yr Projected NOAA C	2	10,699.000	12.300	2.3
EX-DA-2-UNDISTURBED	10yr Projected NOAA C	10	25,284.000	12.200	5.8
EX-DA-2-UNDISTURBED	100yr Projected NOAA C	100	74,224.000	12.200	17.7
EX-DA-2 IMPERVIOUS	2yr Projected NOAA C	2	392.000	12.200	0.1
EX-DA-2 IMPERVIOUS	10yr Projected NOAA C	10	611.000	12.200	0.1
EX-DA-2 IMPERVIOUS	100yr Projected NOAA C	100	1,204.000	12.200	0.2

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
EX-DA-2	2yr Projected NOAA C	2	11,091.000	12.300	2.3
EX-DA-2	10yr Projected NOAA C	10	25,895.000	12.200	6.0
EX-DA-2	100yr Projected NOAA C	100	75,429.000	12.200	18.0

CN Area Collection - EX-DA-2-DISTURBED (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
ROW CROP - ASSUMED MEADOW [C]	71.000	1.940	0.000	0.000
ROW CROP - ASSUMED MEADOW [B]	55.000	0.810	0.000	0.000
GRASS (C)	74.000	0.030	0.000	0.000
GRASS (B)	61.000	0.210	0.000	0.000

CN Area Collection - EX-DA-2 IMPERVIOUS (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
Impervious	98.000	0.030	0.000	0.000

Pre Dev Projected Rainfall

Subsection: Time of Concentration Calculations
Label: EX-DA-2 IMPERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.024 ft/ft
2 Year 24 Hour Depth	3.8 in
Average Velocity	0.14 ft/s
Segment Time of Concentration	0.202 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	174.00 ft
Is Paved?	False
Slope	0.025 ft/ft
Average Velocity	2.55 ft/s
Segment Time of Concentration	0.019 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	412.00 ft
Is Paved?	False
Slope	0.008 ft/ft
Average Velocity	1.44 ft/s
Segment Time of Concentration	0.079 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.300 hours

Pre Dev Projected Rainfall

Subsection: Time of Concentration Calculations
Label: EX-DA-2 IMPERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

==== SCS Channel Flow

Tc =
R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc =
Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Pre Dev Projected Rainfall

Subsection: Time of Concentration Calculations
Label: EX-DA-2-UNDISTURBED
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.024 ft/ft
2 Year 24 Hour Depth	3.8 in
Average Velocity	0.14 ft/s
Segment Time of Concentration	0.202 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	174.00 ft
Is Paved?	False
Slope	0.025 ft/ft
Average Velocity	2.55 ft/s
Segment Time of Concentration	0.019 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	412.00 ft
Is Paved?	False
Slope	0.008 ft/ft
Average Velocity	1.46 ft/s
Segment Time of Concentration	0.078 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.299 hours

Pre Dev Projected Rainfall

Subsection: Time of Concentration Calculations
Label: EX-DA-2-UNDISTURBED
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Pre Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2 IMPERVIOUS
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

Storm Event	2yr Projected
Return Event	2 years
Duration	72.000 hours
Depth	3.8 in
Time of Concentration (Composite)	0.300 hours
Area (User Defined)	0.030 acres

Computational Time Increment	0.040 hours
Time to Peak (Computed)	12.215 hours
Flow (Peak, Computed)	0.1 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.200 hours
Flow (Peak Interpolated Output)	0.1 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.6 in
Runoff Volume (Pervious)	391.553 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	392.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.300 hours
Computational Time Increment	0.040 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2 IMPERVIOUS
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	0.1 ft³/s
Unit peak time, Tp	0.200 hours
Unit receding limb, Tr	0.801 hours
Total unit time, Tb	1.001 hours

Pre Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2 IMPERVIOUS
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

Storm Event	10yr Projected
Return Event	10 years
Duration	72.000 hours
Depth	5.9 in
Time of Concentration (Composite)	0.300 hours
Area (User Defined)	0.030 acres

Computational Time Increment	0.040 hours
Time to Peak (Computed)	12.215 hours
Flow (Peak, Computed)	0.1 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.200 hours
Flow (Peak Interpolated Output)	0.1 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.6 in
Runoff Volume (Pervious)	611.150 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	611.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.300 hours
Computational Time Increment	0.040 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2 IMPERVIOUS
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	0.1 ft³/s
Unit peak time, Tp	0.200 hours
Unit receding limb, Tr	0.801 hours
Total unit time, Tb	1.001 hours

Pre Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2 IMPERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Storm Event	100yr Projected
Return Event	100 years
Duration	72.000 hours
Depth	11.3 in
Time of Concentration (Composite)	0.300 hours
Area (User Defined)	0.030 acres

Computational Time Increment	0.040 hours
Time to Peak (Computed)	12.215 hours
Flow (Peak, Computed)	0.3 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.200 hours
Flow (Peak Interpolated Output)	0.2 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	0.030 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	11.1 in
Runoff Volume (Pervious)	1,204.296 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,204.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.300 hours
Computational Time Increment	0.040 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Pre Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: EX-DA-2 IMPERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	0.1 ft³/s
Unit peak time, Tp	0.200 hours
Unit receding limb, Tr	0.801 hours
Total unit time, Tb	1.001 hours

Pre Dev Projected Rainfall

Subsection: Addition Summary
Label: EX-DA-2
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

Summary for Hydrograph Addition at 'EX-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-DA-2 IMPERVIOUS
<Catchment to Outflow Node>	EX-DA-2-UNDISTURBED

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EX-DA-2 IMPERVIOUS	391.530	12.200	0.1
Flow (From)	EX-DA-2-UNDISTURBED	10,699.107	12.300	2.3
Flow (In)	EX-DA-2	11,090.637	12.300	2.3

Pre Dev Projected Rainfall

Subsection: Addition Summary
Label: EX-DA-2
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

Summary for Hydrograph Addition at 'EX-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-DA-2 IMPERVIOUS
<Catchment to Outflow Node>	EX-DA-2-UNDISTURBED

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EX-DA-2 IMPERVIOUS	611.113	12.200	0.1
Flow (From)	EX-DA-2-UNDISTURBED	25,283.937	12.200	5.8
Flow (In)	EX-DA-2	25,895.050	12.200	6.0

Pre Dev Projected Rainfall

Subsection: Addition Summary
Label: EX-DA-2
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Summary for Hydrograph Addition at 'EX-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	EX-DA-2 IMPERVIOUS
<Catchment to Outflow Node>	EX-DA-2-UNDISTURBED

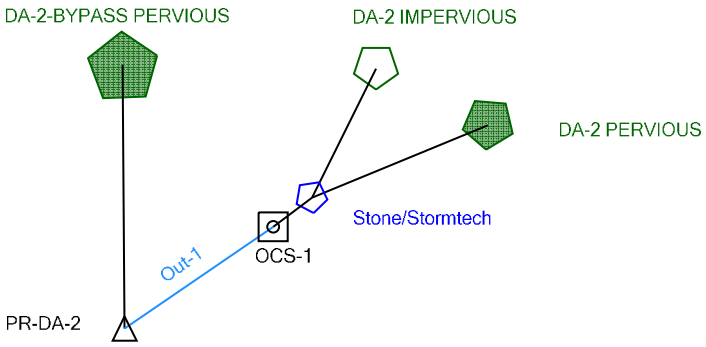
Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	EX-DA-2 IMPERVIOUS	1,204.225	12.200	0.2
Flow (From)	EX-DA-2-UNDISTURBED	74,224.398	12.200	17.7
Flow (In)	EX-DA-2	75,428.623	12.200	18.0

Appendix B

Current Rainfall

POST DEVELOPED



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Post Dev Current Rainfall

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
DA-2-BYPASS PERVIOUS	2yr Current NOAA C	2	568.000	12.300	0.1
DA-2-BYPASS PERVIOUS	10yr Current NOAA C	10	1,499.000	12.300	0.3
DA-2-BYPASS PERVIOUS	100yr Current NOAA C	100	3,914.000	12.200	0.9
DA-2 IMPERVIOUS	2yr Current NOAA C	2	24,134.000	12.100	7.7
DA-2 IMPERVIOUS	10yr Current NOAA C	10	37,852.000	12.100	11.9
DA-2 IMPERVIOUS	100yr Current NOAA C	100	65,403.000	12.100	20.3
DA-2 DISTURBED	2yr Current NOAA C	2	1,634.000	12.100	0.5
DA-2 DISTURBED	10yr Current NOAA C	10	4,122.000	12.100	1.5
DA-2 DISTURBED	100yr Current NOAA C	100	10,414.000	12.100	3.8

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PR-DA-2	2yr Current NOAA C	2	20,471.000	13.000	0.7
PR-DA-2	10yr Current NOAA C	10	37,600.000	12.400	2.3
PR-DA-2	100yr Current NOAA C	100	73,849.000	12.300	8.7

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
Stone/Storm tech (IN)	2yr Current NOAA C	2	25,769.000	12.100	8.3	(N/A)	(N/A)
Stone/Storm tech (OUT)	2yr Current NOAA C	2	19,903.000	13.100	0.7	94.07	16,707.000
Stone/Storm tech (IN)	10yr Current NOAA C	10	41,974.000	12.100	13.4	(N/A)	(N/A)
Stone/Storm tech (OUT)	10yr Current NOAA C	10	36,101.000	12.600	2.2	94.50	24,036.000
Stone/Storm tech (IN)	100yr Current NOAA C	100	75,817.000	12.100	24.1	(N/A)	(N/A)
Stone/Storm tech (OUT)	100yr Current NOAA C	100	69,934.000	12.300	7.9	95.46	35,687.000

CN Area Collection - DA-2-BYPASS PERVIOUS (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
GRASS (C)	74.000	0.050	0.000	0.000
GRASS (B)	61.000	0.200	0.000	0.000

CN Area Collection - DA-2 IMPERVIOUS (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
IMPERVIOUS VEHICULAR	98.000	2.100	0.000	0.000
IMPERVIOUS NON-VEHICULAR	98.000	0.040	0.000	0.000

CN Area Collection - DA-2 DISTURBED (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
GRASS (B)	61.000	0.410	0.000	0.000
GRASS (C)	74.000	0.220	0.000	0.000

Post Dev Current Rainfall

Subsection: Time of Concentration Calculations
Label: DA-2 DISTURBED
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.016 ft/ft
2 Year 24 Hour Depth	3.3 in
Average Velocity	1.28 ft/s
Segment Time of Concentration	0.022 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	112.00 ft
Is Paved?	True
Slope	0.016 ft/ft
Average Velocity	2.57 ft/s
Segment Time of Concentration	0.012 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	352.00 ft
Is Paved?	True
Slope	0.009 ft/ft
Average Velocity	1.93 ft/s
Segment Time of Concentration	0.051 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.085 hours

Post Dev Current Rainfall

Subsection: Time of Concentration Calculations
Label: DA-2 DISTURBED
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Post Dev Current Rainfall

Subsection: Time of Concentration Calculations
Label: DA-2 IMPERVIOUS
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.016 ft/ft
2 Year 24 Hour Depth	3.3 in
Average Velocity	1.28 ft/s
Segment Time of Concentration	0.022 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	112.00 ft
Is Paved?	True
Slope	0.016 ft/ft
Average Velocity	2.57 ft/s
Segment Time of Concentration	0.012 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	352.00 ft
Is Paved?	True
Slope	0.009 ft/ft
Average Velocity	1.93 ft/s
Segment Time of Concentration	0.051 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.085 hours

Post Dev Current Rainfall

Subsection: Time of Concentration Calculations
Label: DA-2 IMPERVIOUS
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Post Dev Current Rainfall

Subsection: Time of Concentration Calculations
Label: DA-2-BYPASS PERVIOUS
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.024 ft/ft
2 Year 24 Hour Depth	3.3 in
Average Velocity	0.13 ft/s
Segment Time of Concentration	0.218 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	174.00 ft
Is Paved?	False
Slope	0.025 ft/ft
Average Velocity	2.55 ft/s
Segment Time of Concentration	0.019 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	412.00 ft
Is Paved?	False
Slope	0.008 ft/ft
Average Velocity	1.46 ft/s
Segment Time of Concentration	0.078 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.315 hours

Post Dev Current Rainfall

Subsection: Time of Concentration Calculations
Label: DA-2-BYPASS PERVIOUS
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 DISTURBED
Scenario: 2yr Current NOAA C

Return Event: 2 years
Storm Event: 2yr current

Storm Event	2yr current
Return Event	2 years
Duration	72.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.085 hours
Area (User Defined)	0.630 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.118 hours
Flow (Peak, Computed)	0.6 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.5 ft³/s

Drainage Area	
SCS CN (Composite)	66.000
Area (User Defined)	0.630 acres
Maximum Retention (Pervious)	5.2 in
Maximum Retention (Pervious, 20 percent)	1.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.7 in
Runoff Volume (Pervious)	1,635.113 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,634.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.085 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 DISTURBED
Scenario: 2yr Current NOAA C

Return Event: 2 years
Storm Event: 2yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	8.4 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.225 hours
Total unit time, Tb	0.282 hours

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 DISTURBED
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

Storm Event	10yr current
Return Event	10 years
Duration	72.000 hours
Depth	5.1 in
Time of Concentration (Composite)	0.085 hours
Area (User Defined)	0.630 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.118 hours
Flow (Peak, Computed)	1.5 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	1.5 ft³/s

Drainage Area	
SCS CN (Composite)	66.000
Area (User Defined)	0.630 acres
Maximum Retention (Pervious)	5.2 in
Maximum Retention (Pervious, 20 percent)	1.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.8 in
Runoff Volume (Pervious)	4,123.293 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	4,122.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.085 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 DISTURBED
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	8.4 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.225 hours
Total unit time, Tb	0.282 hours

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 DISTURBED
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Storm Event	100yr current
Return Event	100 years
Duration	72.000 hours
Depth	8.7 in
Time of Concentration (Composite)	0.085 hours
Area (User Defined)	0.630 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.118 hours
Flow (Peak, Computed)	3.9 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	3.8 ft³/s

Drainage Area	
SCS CN (Composite)	66.000
Area (User Defined)	0.630 acres
Maximum Retention (Pervious)	5.2 in
Maximum Retention (Pervious, 20 percent)	1.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.6 in
Runoff Volume (Pervious)	10,415.730 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	10,414.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.085 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 DISTURBED
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	8.4 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.225 hours
Total unit time, Tb	0.282 hours

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 2yr Current NOAA C

Return Event: 2 years
Storm Event: 2yr current

Storm Event	2yr current
Return Event	2 years
Duration	72.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.085 hours
Area (User Defined)	2.140 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.107 hours
Flow (Peak, Computed)	7.8 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	7.7 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.140 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.1 in
Runoff Volume (Pervious)	24,135.724 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	24,134.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.085 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 2yr Current NOAA C

Return Event: 2 years
Storm Event: 2yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	28.7 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.225 hours
Total unit time, Tb	0.282 hours

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

Storm Event	10yr current
Return Event	10 years
Duration	72.000 hours
Depth	5.1 in
Time of Concentration (Composite)	0.085 hours
Area (User Defined)	2.140 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.107 hours
Flow (Peak, Computed)	12.0 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	11.9 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.140 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.9 in
Runoff Volume (Pervious)	37,854.440 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	37,852.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.085 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	28.7 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.225 hours
Total unit time, Tb	0.282 hours

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Storm Event	100yr current
Return Event	100 years
Duration	72.000 hours
Depth	8.7 in
Time of Concentration (Composite)	0.085 hours
Area (User Defined)	2.140 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.107 hours
Flow (Peak, Computed)	20.5 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	20.3 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.140 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	8.4 in
Runoff Volume (Pervious)	65,406.865 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	65,403.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.085 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	28.7 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.225 hours
Total unit time, Tb	0.282 hours

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 2yr Current NOAA C

Return Event: 2 years
Storm Event: 2yr current

Storm Event	2yr current
Return Event	2 years
Duration	72.000 hours
Depth	3.3 in
Time of Concentration (Composite)	0.315 hours
Area (User Defined)	0.250 acres

Computational Time Increment	0.042 hours
Time to Peak (Computed)	12.264 hours
Flow (Peak, Computed)	0.1 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.300 hours
Flow (Peak Interpolated Output)	0.1 ft³/s

Drainage Area	
SCS CN (Composite)	64.000
Area (User Defined)	0.250 acres
Maximum Retention (Pervious)	5.6 in
Maximum Retention (Pervious, 20 percent)	1.1 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.6 in
Runoff Volume (Pervious)	567.908 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	568.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.315 hours
Computational Time Increment	0.042 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 2yr Current NOAA C

Return Event: 2 years
Storm Event: 2yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	0.9 ft³/s
Unit peak time, Tp	0.210 hours
Unit receding limb, Tr	0.840 hours
Total unit time, Tb	1.050 hours

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

Storm Event	10yr current
Return Event	10 years
Duration	72.000 hours
Depth	5.1 in
Time of Concentration (Composite)	0.315 hours
Area (User Defined)	0.250 acres

Computational Time Increment	0.042 hours
Time to Peak (Computed)	12.264 hours
Flow (Peak, Computed)	0.3 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.300 hours
Flow (Peak Interpolated Output)	0.3 ft³/s

Drainage Area	
SCS CN (Composite)	64.000
Area (User Defined)	0.250 acres
Maximum Retention (Pervious)	5.6 in
Maximum Retention (Pervious, 20 percent)	1.1 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.7 in
Runoff Volume (Pervious)	1,499.615 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,499.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.315 hours
Computational Time Increment	0.042 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	0.9 ft³/s
Unit peak time, Tp	0.210 hours
Unit receding limb, Tr	0.840 hours
Total unit time, Tb	1.050 hours

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Storm Event	100yr current
Return Event	100 years
Duration	72.000 hours
Depth	8.7 in
Time of Concentration (Composite)	0.315 hours
Area (User Defined)	0.250 acres

Computational Time Increment	0.042 hours
Time to Peak (Computed)	12.222 hours
Flow (Peak, Computed)	0.9 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.200 hours
Flow (Peak Interpolated Output)	0.9 ft³/s

Drainage Area	
SCS CN (Composite)	64.000
Area (User Defined)	0.250 acres
Maximum Retention (Pervious)	5.6 in
Maximum Retention (Pervious, 20 percent)	1.1 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	4.3 in
Runoff Volume (Pervious)	3,915.230 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,914.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.315 hours
Computational Time Increment	0.042 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Current Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

SCS Unit Hydrograph Parameters	
Unit peak, qp	0.9 ft³/s
Unit peak time, Tp	0.210 hours
Unit receding limb, Tr	0.840 hours
Total unit time, Tb	1.050 hours

Post Dev Current Rainfall

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 2yr Current NOAA C

Return Event: 2 years
Storm Event: 2yr current

Summary for Hydrograph Addition at 'PR-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DA-2-BYPASS PERVIOUS	567.805	12.300	0.1
Flow (From)	Out-1	19,902.914	13.100	0.7
Flow (In)	PR-DA-2	20,470.718	13.000	0.7

Post Dev Current Rainfall

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

Summary for Hydrograph Addition at 'PR-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DA-2-BYPASS PERVIOUS	1,499.296	12.300	0.3
Flow (From)	Out-1	36,101.037	12.600	2.2
Flow (In)	PR-DA-2	37,600.333	12.400	2.3

Post Dev Current Rainfall

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Summary for Hydrograph Addition at 'PR-DA-2'

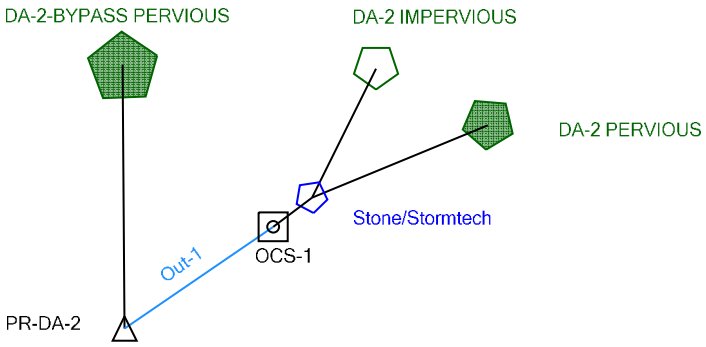
Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	DA-2-BYPASS PERVIOUS	3,914.369	12.200	0.9
Flow (From)	Out-1	69,934.369	12.300	7.9
Flow (In)	PR-DA-2	73,848.738	12.300	8.7

Projected Rainfall

POST DEVELOPED



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Post Dev Projected Rainfall

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
DA-2-BYPASS PERVIOUS	2yr Projected NOAA C	2	1,230.000	12.300	0.2
DA-2-BYPASS PERVIOUS	10yr Projected NOAA C	10	3,084.000	12.200	0.7
DA-2-BYPASS PERVIOUS	100yr Projected NOAA C	100	9,537.000	12.200	2.3
DA-2 IMPERVIOUS	2yr Projected NOAA C	2	27,931.000	12.100	8.9
DA-2 IMPERVIOUS	10yr Projected NOAA C	10	43,595.000	12.100	13.7
DA-2 IMPERVIOUS	100yr Projected NOAA C	100	85,906.000	12.100	26.5
DA-2 PERVIOUS	2yr Projected NOAA C	2	1,777.000	12.100	0.6
DA-2 PERVIOUS	10yr Projected NOAA C	10	4,124.000	12.100	1.5
DA-2 PERVIOUS	100yr Projected NOAA C	100	11,911.000	12.100	4.4

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PR-DA-2	2yr Projected NOAA C	2	25,070.000	12.600	1.1
PR-DA-2	10yr Projected NOAA C	10	44,928.000	12.300	3.6
PR-DA-2	100yr Projected NOAA C	100	101,467.000	12.200	14.0

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
Stone/Storm tech (IN)	2yr Projected NOAA C	2	29,708.000	12.100	9.5	(N/A)	(N/A)
Stone/Storm tech (OUT)	2yr Projected NOAA C	2	23,840.000	12.900	0.9	94.18	18,644.000
Stone/Storm tech (IN)	10yr Projected NOAA C	10	47,719.000	12.100	15.2	(N/A)	(N/A)
Stone/Storm tech (OUT)	10yr Projected NOAA C	10	41,844.000	12.500	3.0	94.67	26,348.000

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
Stone/Storm tech (IN)	100yr Projected NOAA C	100	97,817.000	12.100	30.9	(N/A)	(N/A)
Stone/Storm tech (OUT)	100yr Projected NOAA C	100	91,930.000	12.300	11.7	95.97	41,566.000

CN Area Collection - DA-2-BYPASS PERVIOUS (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
GRASS (C)	74.000	0.050	0.000	0.000
GRASS (B)	61.000	0.200	0.000	0.000

CN Area Collection - DA-2 IMPERVIOUS (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
IMPERVIOUS VEHICULAR	98.000	2.100	0.000	0.000
IMPERVIOUS NON-VEHICULAR	98.000	0.040	0.000	0.000

CN Area Collection - DA-2 DISTURBED (Catchment)

Description	CN	Area (acres)	Percent Connected Impervious Area (%)	Percent Unconnected Impervious Area (%)
GRASS (B)	61.000	0.410	0.000	0.000
GRASS (C)	74.000	0.220	0.000	0.000

Subsection: Time of Concentration Calculations
Label: DA-2 IMPERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.016 ft/ft
2 Year 24 Hour Depth	3.8 in
Average Velocity	1.38 ft/s
Segment Time of Concentration	0.020 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	112.00 ft
Is Paved?	True
Slope	0.016 ft/ft
Average Velocity	2.57 ft/s
Segment Time of Concentration	0.012 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	352.00 ft
Is Paved?	True
Slope	0.009 ft/ft
Average Velocity	1.93 ft/s
Segment Time of Concentration	0.051 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

Post Dev Projected Rainfall

Subsection: Time of Concentration Calculations
Label: DA-2 IMPERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Post Dev Projected Rainfall

Subsection: Time of Concentration Calculations
Label: DA-2 PERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.016 ft/ft
2 Year 24 Hour Depth	3.8 in
Average Velocity	1.38 ft/s
Segment Time of Concentration	0.020 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	112.00 ft
Is Paved?	True
Slope	0.016 ft/ft
Average Velocity	2.57 ft/s
Segment Time of Concentration	0.012 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	352.00 ft
Is Paved?	True
Slope	0.009 ft/ft
Average Velocity	1.93 ft/s
Segment Time of Concentration	0.051 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.083 hours

Post Dev Projected Rainfall

Subsection: Time of Concentration Calculations
Label: DA-2 PERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Post Dev Projected Rainfall

Subsection: Time of Concentration Calculations
Label: DA-2-BYPASS PERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.240
Slope	0.024 ft/ft
2 Year 24 Hour Depth	3.8 in
Average Velocity	0.14 ft/s
Segment Time of Concentration	0.202 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	174.00 ft
Is Paved?	False
Slope	0.025 ft/ft
Average Velocity	2.55 ft/s
Segment Time of Concentration	0.019 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	412.00 ft
Is Paved?	False
Slope	0.008 ft/ft
Average Velocity	1.46 ft/s
Segment Time of Concentration	0.078 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.299 hours

Post Dev Projected Rainfall

Subsection: Time of Concentration Calculations
Label: DA-2-BYPASS PERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

Storm Event	2yr Projected
Return Event	2 years
Duration	72.000 hours
Depth	3.8 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	2.140 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.106 hours
Flow (Peak, Computed)	9.0 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	8.9 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.140 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	3.6 in
Runoff Volume (Pervious)	27,930.804 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	27,931.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	29.1 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

Storm Event	10yr Projected
Return Event	10 years
Duration	72.000 hours
Depth	5.9 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	2.140 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.106 hours
Flow (Peak, Computed)	13.8 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	13.7 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.140 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	5.6 in
Runoff Volume (Pervious)	43,595.358 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	43,595.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	29.1 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Storm Event	100yr Projected
Return Event	100 years
Duration	72.000 hours
Depth	11.3 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	2.140 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.106 hours
Flow (Peak, Computed)	26.8 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	26.5 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.140 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	11.1 in
Runoff Volume (Pervious)	85,906.467 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	85,906.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	29.1 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 PERVIOUS
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

Storm Event	2yr Projected
Return Event	2 years
Duration	72.000 hours
Depth	3.8 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	0.470 acres
Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.117 hours
Flow (Peak, Computed)	0.6 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	0.6 ft³/s

Drainage Area	
SCS CN (Composite)	67.000
Area (User Defined)	0.470 acres
Maximum Retention (Pervious)	4.9 in
Maximum Retention (Pervious, 20 percent)	1.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	1,777.086 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,777.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 PERVIOUS
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	6.4 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 PERVIOUS
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

Storm Event	10yr Projected
Return Event	10 years
Duration	72.000 hours
Depth	5.9 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	0.470 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.117 hours
Flow (Peak, Computed)	1.6 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	1.5 ft³/s

Drainage Area	
SCS CN (Composite)	67.000
Area (User Defined)	0.470 acres
Maximum Retention (Pervious)	4.9 in
Maximum Retention (Pervious, 20 percent)	1.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.4 in
Runoff Volume (Pervious)	4,124.401 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	4,124.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 PERVIOUS
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	6.4 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 PERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Storm Event	100yr Projected
Return Event	100 years
Duration	72.000 hours
Depth	11.3 in
Time of Concentration (Composite)	0.083 hours
Area (User Defined)	0.470 acres

Computational Time Increment	0.011 hours
Time to Peak (Computed)	12.117 hours
Flow (Peak, Computed)	4.4 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	4.4 ft³/s

Drainage Area	
SCS CN (Composite)	67.000
Area (User Defined)	0.470 acres
Maximum Retention (Pervious)	4.9 in
Maximum Retention (Pervious, 20 percent)	1.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	7.0 in
Runoff Volume (Pervious)	11,910.862 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	11,911.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.083 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2 PERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	6.4 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.222 hours
Total unit time, Tb	0.278 hours

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

Storm Event	2yr Projected
Return Event	2 years
Duration	72.000 hours
Depth	3.8 in
Time of Concentration (Composite)	0.299 hours
Area (User Defined)	0.410 acres
Computational Time Increment	0.040 hours
Time to Peak (Computed)	12.255 hours
Flow (Peak, Computed)	0.3 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.300 hours
Flow (Peak Interpolated Output)	0.2 ft³/s

Drainage Area	
SCS CN (Composite)	63.000
Area (User Defined)	0.410 acres
Maximum Retention (Pervious)	5.9 in
Maximum Retention (Pervious, 20 percent)	1.2 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	0.8 in
Runoff Volume (Pervious)	1,230.499 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,230.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.299 hours
Computational Time Increment	0.040 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	1.6 ft³/s
Unit peak time, Tp	0.200 hours
Unit receding limb, Tr	0.798 hours
Total unit time, Tb	0.998 hours

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

Storm Event	10yr Projected
Return Event	10 years
Duration	72.000 hours
Depth	5.9 in
Time of Concentration (Composite)	0.299 hours
Area (User Defined)	0.410 acres

Computational Time Increment	0.040 hours
Time to Peak (Computed)	12.255 hours
Flow (Peak, Computed)	0.7 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.200 hours
Flow (Peak Interpolated Output)	0.7 ft³/s

Drainage Area	
SCS CN (Composite)	63.000
Area (User Defined)	0.410 acres
Maximum Retention (Pervious)	5.9 in
Maximum Retention (Pervious, 20 percent)	1.2 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	2.1 in
Runoff Volume (Pervious)	3,084.184 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,084.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.299 hours
Computational Time Increment	0.040 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	1.6 ft³/s
Unit peak time, Tp	0.200 hours
Unit receding limb, Tr	0.798 hours
Total unit time, Tb	0.998 hours

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Storm Event	100yr Projected
Return Event	100 years
Duration	72.000 hours
Depth	11.3 in
Time of Concentration (Composite)	0.299 hours
Area (User Defined)	0.410 acres

Computational Time Increment	0.040 hours
Time to Peak (Computed)	12.215 hours
Flow (Peak, Computed)	2.3 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	12.200 hours
Flow (Peak Interpolated Output)	2.3 ft³/s

Drainage Area	
SCS CN (Composite)	63.000
Area (User Defined)	0.410 acres
Maximum Retention (Pervious)	5.9 in
Maximum Retention (Pervious, 20 percent)	1.2 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	6.4 in
Runoff Volume (Pervious)	9,537.569 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	9,537.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.299 hours
Computational Time Increment	0.040 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Post Dev Projected Rainfall

Subsection: Unit Hydrograph Summary
Label: DA-2-BYPASS PERVIOUS
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

SCS Unit Hydrograph Parameters	
Unit peak, qp	1.6 ft³/s
Unit peak time, Tp	0.200 hours
Unit receding limb, Tr	0.798 hours
Total unit time, Tb	0.998 hours

Post Dev Projected Rainfall

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

Summary for Hydrograph Addition at 'PR-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DA-2-BYPASS PERVIOUS	1,230.452	12.300	0.2
Flow (From)	Out-1	23,839.888	12.900	0.9
Flow (In)	PR-DA-2	25,070.340	12.600	1.1

Post Dev Projected Rainfall

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

Summary for Hydrograph Addition at 'PR-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DA-2-BYPASS PERVIOUS	3,084.019	12.200	0.7
Flow (From)	Out-1	41,844.398	12.500	3.0
Flow (In)	PR-DA-2	44,928.416	12.300	3.6

Post Dev Projected Rainfall

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Summary for Hydrograph Addition at 'PR-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

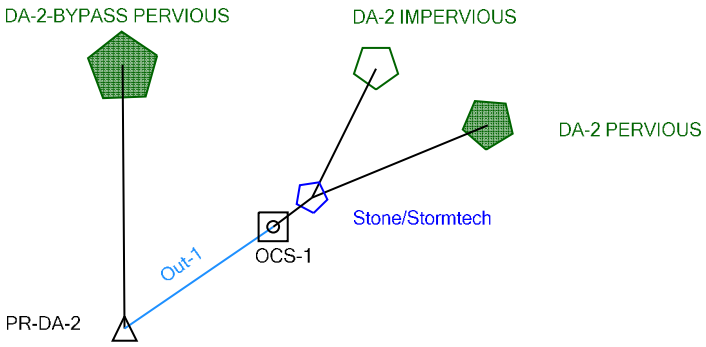
Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DA-2-BYPASS PERVIOUS	9,536.965	12.200	2.3
Flow (From)	Out-1	91,930.256	12.300	11.7
Flow (In)	PR-DA-2	101,467.221	12.200	14.0

Appendix C

Current Rainfall

POST DEVELOPED



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Post Dev Current Rainfall Basin Routings

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
DA-2-BYPASS PERVIOUS	2yr Current NOAA C	2	568.000	12.300	0.1
DA-2-BYPASS PERVIOUS	10yr Current NOAA C	10	1,499.000	12.300	0.3
DA-2-BYPASS PERVIOUS	100yr Current NOAA C	100	3,914.000	12.200	0.9
DA-2 IMPERVIOUS	2yr Current NOAA C	2	24,134.000	12.100	7.7
DA-2 IMPERVIOUS	10yr Current NOAA C	10	37,852.000	12.100	11.9
DA-2 IMPERVIOUS	100yr Current NOAA C	100	65,403.000	12.100	20.3
DA-2 DISTURBED	2yr Current NOAA C	2	1,634.000	12.100	0.5
DA-2 DISTURBED	10yr Current NOAA C	10	4,122.000	12.100	1.5
DA-2 DISTURBED	100yr Current NOAA C	100	10,414.000	12.100	3.8

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PR-DA-2	2yr Current NOAA C	2	20,471.000	13.000	0.7
PR-DA-2	10yr Current NOAA C	10	37,600.000	12.400	2.3
PR-DA-2	100yr Current NOAA C	100	73,849.000	12.300	8.7

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
Stone/Stormtech (IN)	2yr Current NOAA C	2	25,769.000	12.100	8.3	(N/A)	(N/A)
Stone/Stormtech (OUT)	2yr Current NOAA C	2	19,903.000	13.100	0.7	94.07	16,707.000
Stone/Stormtech (IN)	10yr Current NOAA C	10	41,974.000	12.100	13.4	(N/A)	(N/A)
Stone/Stormtech (OUT)	10yr Current NOAA C	10	36,101.000	12.600	2.2	94.50	24,036.000
Stone/Stormtech (IN)	100yr Current NOAA C	100	75,817.000	12.100	24.1	(N/A)	(N/A)
Stone/Stormtech (OUT)	100yr Current NOAA C	100	69,934.000	12.300	7.9	95.46	35,687.000

Post Dev Current Rainfall Basin Routings

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 2yr Current NOAA C

Return Event: 2 years
Storm Event: 2yr current

Summary for Hydrograph Addition at 'PR-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DA-2-BYPASS PERVIOUS	567.805	12.300	0.1
Flow (From)	Out-1	19,902.914	13.100	0.7
Flow (In)	PR-DA-2	20,470.718	13.000	0.7

Post Dev Current Rainfall Basin Routings

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

Summary for Hydrograph Addition at 'PR-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DA-2-BYPASS PERVIOUS	1,499.296	12.300	0.3
Flow (From)	Out-1	36,101.037	12.600	2.2
Flow (In)	PR-DA-2	37,600.333	12.400	2.3

Post Dev Current Rainfall Basin Routings

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Summary for Hydrograph Addition at 'PR-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DA-2-BYPASS PERVIOUS	3,914.369	12.200	0.9
Flow (From)	Out-1	69,934.369	12.300	7.9
Flow (In)	PR-DA-2	73,848.738	12.300	8.7

Post Dev Current Rainfall Basin Routings

Subsection: Elevation vs. Volume Curve
Label: Stone/Stormtech
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Elevation-Volume

Pond Elevation (ft)	Pond Volume (ft³)
93.00	0.000
93.08	970.130
93.25	2,910.400
93.50	5,820.800
93.75	10,736.790
94.00	15,466.660
94.25	19,933.900
94.50	24,014.450
94.75	27,385.330
95.00	30,323.780
95.25	33,234.180
95.50	36,144.580
95.75	39,054.980
96.00	41,965.380

Post Dev Current Rainfall Basin Routings

Subsection: Outlet Input Data
Label: POROUS-1 Add
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Requested Pond Water Surface Elevations	
Minimum (Headwater)	93.00 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	96.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 2	Forward	TW	93.50	96.00
Rectangular Weir	Weir - 1	Forward	TW	94.00	96.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Post Dev Current Rainfall Basin Routings

Subsection: Outlet Input Data
Label: POROUS-1 Add
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Structure ID: Weir - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	94.00 ft
Weir Length	1.25 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	93.50 ft
Orifice Diameter	6.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Post Dev Current Rainfall Basin Routings

Subsection: Individual Outlet Curves
Label: POROUS-1 Add
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
93.00	0.0	(N/A)	0.00
93.25	0.0	(N/A)	0.00
93.50	0.0	(N/A)	0.00
93.75	0.0	(N/A)	0.00
94.00	0.0	(N/A)	0.00
94.25	0.5	(N/A)	0.00
94.50	1.3	(N/A)	0.00
94.75	2.4	(N/A)	0.00
95.00	3.8	(N/A)	0.00
95.25	5.2	(N/A)	0.00
95.50	6.9	(N/A)	0.00
95.75	8.7	(N/A)	0.00
96.00	10.6	(N/A)	0.00

Computation Messages
HW & TW below Inv.El.=94.000
HW & TW below Inv.El.=94.000
HW & TW below Inv.El.=94.000
HW & TW below Inv.El.=94.000
H=.00; Htw=.00; Qfree=.00;
H=.25; Htw=.00; Qfree=.47;
H=.50; Htw=.00; Qfree=1.33;
H=.75; Htw=.00; Qfree=2.44;
H=1.00; Htw=.00; Qfree=3.75;
H=1.25; Htw=.00; Qfree=5.24;
H=1.50; Htw=.00; Qfree=6.89;
H=1.75; Htw=.00; Qfree=8.68;

Post Dev Current Rainfall Basin Routings

Subsection: Individual Outlet Curves
Label: POROUS-1 Add
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
H=2.00; Htw=.00; Qfree=10.61;

Post Dev Current Rainfall Basin Routings

Subsection: Individual Outlet Curves
Label: POROUS-1 Add
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
93.00	0.0	(N/A)	0.00
93.25	0.0	(N/A)	0.00
93.50	0.0	(N/A)	0.00
93.75	0.1	(N/A)	0.00
94.00	0.5	(N/A)	0.00
94.25	0.7	(N/A)	0.00
94.50	0.8	(N/A)	0.00
94.75	0.9	(N/A)	0.00
95.00	1.1	(N/A)	0.00
95.25	1.2	(N/A)	0.00
95.50	1.3	(N/A)	0.00
95.75	1.3	(N/A)	0.00
96.00	1.4	(N/A)	0.00

Computation Messages
HW & TW below invert
HW & TW below invert
Upstream HW & DNstream TW < Inv.El
CRIT.DEPTH CONTROL Vh= .067ft Dcr= .183ft
CRIT.DEPTH Hev= .00ft
H =.25
H =.50
H =.75
H =1.00
H =1.25
H =1.50
H =1.75
H =2.00
H =2.25

Post Dev Current Rainfall Basin Routings

Subsection: Composite Rating Curve
Label: POROUS-1 Add
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
93.00	0.0	(N/A)	0.00
93.25	0.0	(N/A)	0.00
93.50	0.0	(N/A)	0.00
93.75	0.1	(N/A)	0.00
94.00	0.5	(N/A)	0.00
94.25	1.1	(N/A)	0.00
94.50	2.1	(N/A)	0.00
94.75	3.4	(N/A)	0.00
95.00	4.8	(N/A)	0.00
95.25	6.4	(N/A)	0.00
95.50	8.1	(N/A)	0.00
95.75	10.0	(N/A)	0.00
96.00	12.0	(N/A)	0.00

Contributing Structures
None Contributing
None Contributing
None Contributing
Orifice - 2
Orifice - 2 + Weir - 1
Orifice - 2 + Weir - 1
Orifice - 2 + Weir - 1
Orifice - 2 + Weir - 1
Orifice - 2 + Weir - 1
Orifice - 2 + Weir - 1
Orifice - 2 + Weir - 1
Orifice - 2 + Weir - 1
Orifice - 2 + Weir - 1

Post Dev Current Rainfall Basin Routings

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 100 years
Label: Stone/Stormtech Storm Event: 100yr current
Scenario: 100yr Current NOAA C

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	93.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0 ft³/s
Flow (Initial Infiltration)	0.0 ft³/s
Flow (Initial, Total)	0.0 ft³/s
Time Increment	0.100 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
93.00	0.0	0.000	0.000	0.0	0.0	0.0
93.25	0.0	2,910.400	0.000	0.0	0.0	16.2
93.50	0.0	5,820.800	0.000	0.0	0.0	32.3
93.75	0.1	10,736.790	0.000	0.0	0.1	59.8
94.00	0.5	15,466.660	0.000	0.0	0.5	86.4
94.25	1.1	19,933.900	0.000	0.0	1.1	111.9
94.50	2.1	24,014.450	0.000	0.0	2.1	135.6
94.75	3.4	27,385.330	0.000	0.0	3.4	155.5
95.00	4.8	30,323.780	0.000	0.0	4.8	173.3
95.25	6.4	33,234.180	0.000	0.0	6.4	191.0
95.50	8.1	36,144.580	0.000	0.0	8.1	208.9
95.75	10.0	39,054.980	0.000	0.0	10.0	227.0
96.00	12.0	41,965.380	0.000	0.0	12.0	245.2

Post Dev Current Rainfall Basin Routings

Subsection: Level Pool Pond Routing Summary Return Event: 2 years
Label: Stone/Stormtech (IN) Storm Event: 2yr current
Scenario: 2yr Current NOAA C

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	93.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0 ft³/s
Flow (Initial Infiltration)	0.0 ft³/s
Flow (Initial, Total)	0.0 ft³/s
Time Increment	0.100 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	8.3 ft³/s	Time to Peak (Flow, In)	12.100 hours
Flow (Peak Outlet)	0.7 ft³/s	Time to Peak (Flow, Outlet)	13.100 hours

Elevation (Water Surface, Peak)	94.07 ft
Volume (Peak)	16,707.448 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	25,769.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	19,903.000 ft³
Volume (Retained)	5,866.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.000 %

Post Dev Current Rainfall Basin Routings

Subsection: Level Pool Pond Routing Summary
Label: Stone/Stormtech (IN)
Scenario: 10yr Current NOAA C

Return Event: 10 years
Storm Event: 10yr current

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	93.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0 ft³/s
Flow (Initial Infiltration)	0.0 ft³/s
Flow (Initial, Total)	0.0 ft³/s
Time Increment	0.100 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	13.4 ft³/s	Time to Peak (Flow, In)	12.100 hours
Flow (Peak Outlet)	2.2 ft³/s	Time to Peak (Flow, Outlet)	12.600 hours

Elevation (Water Surface, Peak)	94.50 ft
Volume (Peak)	24,036.133 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	41,974.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	36,101.000 ft³
Volume (Retained)	5,873.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.000 %

Post Dev Current Rainfall Basin Routings

Subsection: Level Pool Pond Routing Summary
Label: Stone/Stormtech (IN)
Scenario: 100yr Current NOAA C

Return Event: 100 years
Storm Event: 100yr current

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	93.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0 ft³/s
Flow (Initial Infiltration)	0.0 ft³/s
Flow (Initial, Total)	0.0 ft³/s
Time Increment	0.100 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	24.1 ft³/s	Time to Peak (Flow, In)	12.100 hours
Flow (Peak Outlet)	7.9 ft³/s	Time to Peak (Flow, Outlet)	12.300 hours

Elevation (Water Surface, Peak)	95.46 ft
Volume (Peak)	35,687.372 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	75,817.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	69,934.000 ft³
Volume (Retained)	5,883.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.000 %

Project: **BMS Princeton Pike - Conceptual StormTech Layout**

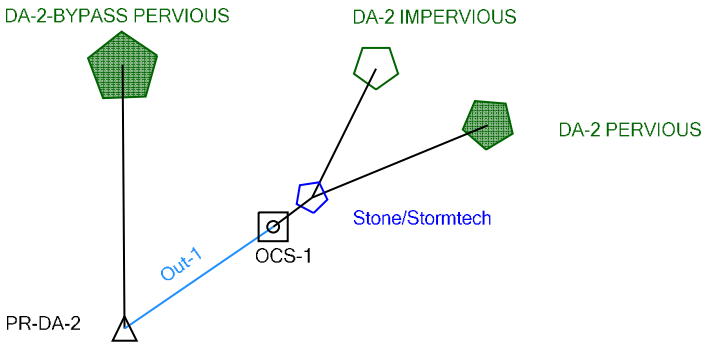
Chamber Model -	SC-310	
Units -	Imperial	
	-	
Number of Chambers -	795	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	93.00	ft
Amount of Stone Above Chambers -	14	in
Amount of Stone Below Chambers -	6	in
Area of system -	29104	sf Min. Area - 18859 sf min. area

StormTech SC-310 Cumulative Storage Volumes

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Total Chamber *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch & St *(cubic feet)*	Cumulative Chamber *(cubic feet)*	Elevation *(feet)*
36	0.00	0.00	970.13	970.13	41965.38	96.00
35	0.00	0.00	970.13	970.13	40995.24	95.92
34	0.00	0.00	970.13	970.13	40025.11	95.83
33	0.00	0.00	970.13	970.13	39054.98	95.75
32	0.00	0.00	970.13	970.13	38084.84	95.67
31	0.00	0.00	970.13	970.13	37114.71	95.58
30	0.00	0.00	970.13	970.13	36144.58	95.50
29	0.00	0.00	970.13	970.13	35174.44	95.42
28	0.00	0.00	970.13	970.13	34204.31	95.33
27	0.00	0.00	970.13	970.13	33234.18	95.25
26	0.00	0.00	970.13	970.13	32264.04	95.17
25	0.00	0.00	970.13	970.13	31293.91	95.08
24	0.00	0.00	970.13	970.13	30323.78	95.00
23	0.00	0.00	970.13	970.13	29353.64	94.92
22	0.06	46.75	951.43	998.18	28383.51	94.83
21	0.15	123.00	920.93	1043.93	27385.33	94.75
20	0.27	211.36	885.59	1096.95	26341.40	94.67
19	0.54	433.11	796.89	1230.00	25244.45	94.58
18	0.70	559.71	746.25	1305.96	24014.45	94.50
17	0.82	655.50	707.93	1363.43	22708.49	94.42
16	0.92	735.02	676.12	1411.15	21345.05	94.33
15	1.01	806.92	647.36	1454.29	19933.90	94.25
14	1.09	870.17	622.07	1492.24	18479.62	94.17
13	1.15	917.65	603.07	1520.73	16987.38	94.08
12	1.21	965.88	583.78	1549.66	15466.66	94.00
11	1.27	1013.53	564.72	1578.25	13917.00	93.92
10	1.32	1053.03	548.92	1601.95	12338.75	93.83
9	1.36	1085.16	536.07	1621.23	10736.79	93.75
8	1.40	1116.97	523.34	1640.32	9115.56	93.67
7	1.43	1140.52	513.92	1654.45	7475.25	93.58
6	0.00	0.00	970.13	970.13	5820.80	93.50
5	0.00	0.00	970.13	970.13	4850.67	93.42
4	0.00	0.00	970.13	970.13	3880.53	93.33
3	0.00	0.00	970.13	970.13	2910.40	93.25
2	0.00	0.00	970.13	970.13	1940.27	93.17
1	0.00	0.00	970.13	970.13	970.13	93.08

Projected Rainfall

POST DEVELOPED



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Post Dev Projected Rainfall Basin Routings

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
DA-2-BYPASS PERVIOUS	2yr Projected NOAA C	2	1,230.000	12.300	0.2
DA-2-BYPASS PERVIOUS	10yr Projected NOAA C	10	3,084.000	12.200	0.7
DA-2-BYPASS PERVIOUS	100yr Projected NOAA C	100	9,537.000	12.200	2.3
DA-2 IMPERVIOUS	2yr Projected NOAA C	2	27,931.000	12.100	8.9
DA-2 IMPERVIOUS	10yr Projected NOAA C	10	43,595.000	12.100	13.7
DA-2 IMPERVIOUS	100yr Projected NOAA C	100	85,906.000	12.100	26.5
DA-2 PERVIOUS	2yr Projected NOAA C	2	1,777.000	12.100	0.6
DA-2 PERVIOUS	10yr Projected NOAA C	10	4,124.000	12.100	1.5
DA-2 PERVIOUS	100yr Projected NOAA C	100	11,911.000	12.100	4.4

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
PR-DA-2	2yr Projected NOAA C	2	25,070.000	12.600	1.1
PR-DA-2	10yr Projected NOAA C	10	44,928.000	12.300	3.6
PR-DA-2	100yr Projected NOAA C	100	101,467.000	12.200	14.0

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
Stone/Stormtech (IN)	2yr Projected NOAA C	2	29,708.000	12.100	9.5	(N/A)	(N/A)
Stone/Stormtech (OUT)	2yr Projected NOAA C	2	23,840.000	12.900	0.9	94.18	18,644.000
Stone/Stormtech (IN)	10yr Projected NOAA C	10	47,719.000	12.100	15.2	(N/A)	(N/A)
Stone/Stormtech (OUT)	10yr Projected NOAA C	10	41,844.000	12.500	3.0	94.67	26,348.000

Post Dev Projected Rainfall Basin Routings

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
Stone/Storm tech (IN)	100yr Projected NOAA C	100	97,817.000	12.100	30.9	(N/A)	(N/A)
Stone/Storm tech (OUT)	100yr Projected NOAA C	100	91,930.000	12.300	11.7	95.97	41,566.000

Post Dev Projected Rainfall Basin Routings

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

Summary for Hydrograph Addition at 'PR-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DA-2-BYPASS PERVIOUS	1,230.452	12.300	0.2
Flow (From)	Out-1	23,839.888	12.900	0.9
Flow (In)	PR-DA-2	25,070.340	12.600	1.1

Post Dev Projected Rainfall Basin Routings

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

Summary for Hydrograph Addition at 'PR-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DA-2-BYPASS PERVIOUS	3,084.019	12.200	0.7
Flow (From)	Out-1	41,844.398	12.500	3.0
Flow (In)	PR-DA-2	44,928.416	12.300	3.6

Post Dev Projected Rainfall Basin Routings

Subsection: Addition Summary
Label: PR-DA-2
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Summary for Hydrograph Addition at 'PR-DA-2'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DA-2-BYPASS PERVIOUS
Out-1	Stone/Stormtech

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DA-2-BYPASS PERVIOUS	9,536.965	12.200	2.3
Flow (From)	Out-1	91,930.256	12.300	11.7
Flow (In)	PR-DA-2	101,467.221	12.200	14.0

Post Dev Projected Rainfall Basin Routings

Subsection: Elevation vs. Volume Curve
Label: Stone/Stormtech
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Elevation-Volume

Pond Elevation (ft)	Pond Volume (ft³)
93.00	0.000
93.08	970.130
93.25	2,910.400
93.50	5,820.800
93.75	10,736.790
94.00	15,466.660
94.25	19,933.900
94.50	24,014.450
94.75	27,385.330
95.00	30,323.780
95.25	33,234.180
95.50	36,144.580
95.75	39,054.980
96.00	41,965.380

Post Dev Projected Rainfall Basin Routings

Subsection: Outlet Input Data
Label: POROUS 1 Add
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Requested Pond Water Surface Elevations	
Minimum (Headwater)	93.00 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	96.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 2	Forward	TW	93.50	96.00
Rectangular Weir	w - 1	Forward	TW	94.00	96.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Post Dev Projected Rainfall Basin Routings

Subsection: Outlet Input Data
Label: POROUS 1 Add
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Structure ID: w - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	94.00 ft
Weir Length	1.25 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	93.50 ft
Orifice Diameter	6.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Post Dev Projected Rainfall Basin Routings

Subsection: Individual Outlet Curves
Label: POROUS 1 Add
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = w - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
93.00	0.0	(N/A)	0.00
93.25	0.0	(N/A)	0.00
93.50	0.0	(N/A)	0.00
93.75	0.0	(N/A)	0.00
94.00	0.0	(N/A)	0.00
94.25	0.5	(N/A)	0.00
94.50	1.3	(N/A)	0.00
94.75	2.4	(N/A)	0.00
95.00	3.8	(N/A)	0.00
95.25	5.2	(N/A)	0.00
95.50	6.9	(N/A)	0.00
95.75	8.7	(N/A)	0.00
96.00	10.6	(N/A)	0.00

Computation Messages
HW & TW below Inv.El.=94.000
HW & TW below Inv.El.=94.000
HW & TW below Inv.El.=94.000
HW & TW below Inv.El.=94.000
H=.00; Htw=.00; Qfree=.00;
H=.25; Htw=.00; Qfree=.47;
H=.50; Htw=.00; Qfree=1.33;
H=.75; Htw=.00; Qfree=2.44;
H=1.00; Htw=.00; Qfree=3.75;
H=1.25; Htw=.00; Qfree=5.24;
H=1.50; Htw=.00; Qfree=6.89;
H=1.75; Htw=.00; Qfree=8.68;

Post Dev Projected Rainfall Basin Routings

Subsection: Individual Outlet Curves
Label: POROUS 1 Add
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = w - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Computation Messages
H=2.00; Htw=.00;
Qfree=10.61;

Post Dev Projected Rainfall Basin Routings

Subsection: Individual Outlet Curves
Label: POROUS 1 Add
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
93.00	0.0	(N/A)	0.00
93.25	0.0	(N/A)	0.00
93.50	0.0	(N/A)	0.00
93.75	0.1	(N/A)	0.00
94.00	0.5	(N/A)	0.00
94.25	0.7	(N/A)	0.00
94.50	0.8	(N/A)	0.00
94.75	0.9	(N/A)	0.00
95.00	1.1	(N/A)	0.00
95.25	1.2	(N/A)	0.00
95.50	1.3	(N/A)	0.00
95.75	1.3	(N/A)	0.00
96.00	1.4	(N/A)	0.00

Computation Messages
HW & TW below invert
HW & TW below invert
Upstream HW & DNstream TW < Inv.El
CRIT.DEPTH CONTROL
Vh= .067ft Dcr= .183ft
CRIT.DEPTH Hev= .00ft
H =.25
H =.50
H =.75
H =1.00
H =1.25
H =1.50
H =1.75
H =2.00
H =2.25

Post Dev Projected Rainfall Basin Routings

Subsection: Composite Rating Curve
Label: POROUS 1 Add
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
93.00	0.0	(N/A)	0.00
93.25	0.0	(N/A)	0.00
93.50	0.0	(N/A)	0.00
93.75	0.1	(N/A)	0.00
94.00	0.5	(N/A)	0.00
94.25	1.1	(N/A)	0.00
94.50	2.1	(N/A)	0.00
94.75	3.4	(N/A)	0.00
95.00	4.8	(N/A)	0.00
95.25	6.4	(N/A)	0.00
95.50	8.1	(N/A)	0.00
95.75	10.0	(N/A)	0.00
96.00	12.0	(N/A)	0.00

Contributing Structures
None Contributing
None Contributing
None Contributing
Orifice - 2
Orifice - 2 + w - 1
Orifice - 2 + w - 1
Orifice - 2 + w - 1
Orifice - 2 + w - 1
Orifice - 2 + w - 1
Orifice - 2 + w - 1
Orifice - 2 + w - 1
Orifice - 2 + w - 1
Orifice - 2 + w - 1

Post Dev Projected Rainfall Basin Routings

Subsection: Elevation-Volume-Flow Table (Pond)
Label: Stone/Stormtech
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	93.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0 ft³/s
Flow (Initial Infiltration)	0.0 ft³/s
Flow (Initial, Total)	0.0 ft³/s
Time Increment	0.100 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
93.00	0.0	0.000	0.000	0.0	0.0	0.0
93.25	0.0	2,910.400	0.000	0.0	0.0	16.2
93.50	0.0	5,820.800	0.000	0.0	0.0	32.3
93.75	0.1	10,736.790	0.000	0.0	0.1	59.8
94.00	0.5	15,466.660	0.000	0.0	0.5	86.4
94.25	1.1	19,933.900	0.000	0.0	1.1	111.9
94.50	2.1	24,014.450	0.000	0.0	2.1	135.6
94.75	3.4	27,385.330	0.000	0.0	3.4	155.5
95.00	4.8	30,323.780	0.000	0.0	4.8	173.3
95.25	6.4	33,234.180	0.000	0.0	6.4	191.0
95.50	8.1	36,144.580	0.000	0.0	8.1	208.9
95.75	10.0	39,054.980	0.000	0.0	10.0	227.0
96.00	12.0	41,965.380	0.000	0.0	12.0	245.2

Post Dev Projected Rainfall Basin Routings

Subsection: Level Pool Pond Routing Summary
Label: Stone/Stormtech (IN)
Scenario: 2yr Projected NOAA C

Return Event: 2 years
Storm Event: 2yr Projected

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	93.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0 ft³/s
Flow (Initial Infiltration)	0.0 ft³/s
Flow (Initial, Total)	0.0 ft³/s
Time Increment	0.100 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	9.5 ft³/s	Time to Peak (Flow, In)	12.100 hours
Flow (Peak Outlet)	0.9 ft³/s	Time to Peak (Flow, Outlet)	12.900 hours

Elevation (Water Surface, Peak)	94.18 ft
Volume (Peak)	18,643.643 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	29,708.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	23,840.000 ft³
Volume (Retained)	5,868.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.000 %

Post Dev Projected Rainfall Basin Routings

Subsection: Level Pool Pond Routing Summary
Label: Stone/Stormtech (IN)
Scenario: 10yr Projected NOAA C

Return Event: 10 years
Storm Event: 10yr Projected

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	93.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0 ft³/s
Flow (Initial Infiltration)	0.0 ft³/s
Flow (Initial, Total)	0.0 ft³/s
Time Increment	0.100 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	15.2 ft³/s	Time to Peak (Flow, In)	12.100 hours
Flow (Peak Outlet)	3.0 ft³/s	Time to Peak (Flow, Outlet)	12.500 hours

Elevation (Water Surface, Peak)	94.67 ft
Volume (Peak)	26,348.427 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	47,719.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	41,844.000 ft³
Volume (Retained)	5,875.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.000 %

Post Dev Projected Rainfall Basin Routings

Subsection: Level Pool Pond Routing Summary
Label: Stone/Stormtech (IN)
Scenario: 100yr Projected NOAA C

Return Event: 100 years
Storm Event: 100yr Projected

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	93.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0 ft³/s
Flow (Initial Infiltration)	0.0 ft³/s
Flow (Initial, Total)	0.0 ft³/s
Time Increment	0.100 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	30.9 ft³/s	Time to Peak (Flow, In)	12.100 hours
Flow (Peak Outlet)	11.7 ft³/s	Time to Peak (Flow, Outlet)	12.300 hours

Elevation (Water Surface, Peak)	95.97 ft
Volume (Peak)	41,566.332 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	97,817.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	91,930.000 ft³
Volume (Retained)	5,887.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.000 %

Project: **BMS Princeton Pike - Conceptual StormTech Layout**

Chamber Model -	SC-310	
Units -	Imperial	
	-	
Number of Chambers -	795	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	93.00	ft
Amount of Stone Above Chambers -	14	in
Amount of Stone Below Chambers -	6	in
Area of system -	29104	sf Min. Area - 18859 sf min. area

StormTech SC-310 Cumulative Storage Volumes

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Total Chamber *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch & St *(cubic feet)*	Cumulative Chamber *(cubic feet)*	Elevation *(feet)*
36	0.00	0.00	970.13	970.13	41965.38	96.00
35	0.00	0.00	970.13	970.13	40995.24	95.92
34	0.00	0.00	970.13	970.13	40025.11	95.83
33	0.00	0.00	970.13	970.13	39054.98	95.75
32	0.00	0.00	970.13	970.13	38084.84	95.67
31	0.00	0.00	970.13	970.13	37114.71	95.58
30	0.00	0.00	970.13	970.13	36144.58	95.50
29	0.00	0.00	970.13	970.13	35174.44	95.42
28	0.00	0.00	970.13	970.13	34204.31	95.33
27	0.00	0.00	970.13	970.13	33234.18	95.25
26	0.00	0.00	970.13	970.13	32264.04	95.17
25	0.00	0.00	970.13	970.13	31293.91	95.08
24	0.00	0.00	970.13	970.13	30323.78	95.00
23	0.00	0.00	970.13	970.13	29353.64	94.92
22	0.06	46.75	951.43	998.18	28383.51	94.83
21	0.15	123.00	920.93	1043.93	27385.33	94.75
20	0.27	211.36	885.59	1096.95	26341.40	94.67
19	0.54	433.11	796.89	1230.00	25244.45	94.58
18	0.70	559.71	746.25	1305.96	24014.45	94.50
17	0.82	655.50	707.93	1363.43	22708.49	94.42
16	0.92	735.02	676.12	1411.15	21345.05	94.33
15	1.01	806.92	647.36	1454.29	19933.90	94.25
14	1.09	870.17	622.07	1492.24	18479.62	94.17
13	1.15	917.65	603.07	1520.73	16987.38	94.08
12	1.21	965.88	583.78	1549.66	15466.66	94.00
11	1.27	1013.53	564.72	1578.25	13917.00	93.92
10	1.32	1053.03	548.92	1601.95	12338.75	93.83
9	1.36	1085.16	536.07	1621.23	10736.79	93.75
8	1.40	1116.97	523.34	1640.32	9115.56	93.67
7	1.43	1140.52	513.92	1654.45	7475.25	93.58
6	0.00	0.00	970.13	970.13	5820.80	93.50
5	0.00	0.00	970.13	970.13	4850.67	93.42
4	0.00	0.00	970.13	970.13	3880.53	93.33
3	0.00	0.00	970.13	970.13	2910.40	93.25
2	0.00	0.00	970.13	970.13	1940.27	93.17
1	0.00	0.00	970.13	970.13	970.13	93.08

Appendix D

Table of Contents

Water Quality

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
DA-2 IMPERVIOUS	MERCER:NJWQ	1	8,093.000	1.100	6.2

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
UG STONE (IN)	MERCER:NJWQ	1	8,093.000	1.100	6.2	(N/A)	(N/A)
UG STONE (OUT)	MERCER:NJWQ	1	0.000	0.000	0.0	93.26	8,093.000

Time of Concentration Results

Segment #1: TR-55 Sheet Flow	
Hydraulic Length	100.00 ft
Manning's n	0.011
Slope	0.016 ft/ft
2 Year 24 Hour Depth	3.3 in
Average Velocity	1.28 ft/s
Segment Time of Concentration	0.022 hours

Segment #2: TR-55 Shallow Concentrated Flow	
Hydraulic Length	112.00 ft
Is Paved?	True
Slope	0.016 ft/ft
Average Velocity	2.57 ft/s
Segment Time of Concentration	0.012 hours

Segment #3: TR-55 Shallow Concentrated Flow	
Hydraulic Length	352.00 ft
Is Paved?	True
Slope	0.009 ft/ft
Average Velocity	1.93 ft/s
Segment Time of Concentration	0.051 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.085 hours

Water Quality

Subsection: Time of Concentration Calculations
Label: DA-2 IMPERVIOUS
Scenario: MERCER:NJWQ

Return Event: 1 years
Storm Event: wq

==== SCS Channel Flow

Tc = R = Qa / Wp
V = (1.49 * (R**(2/3)) * (Sf**-0.5)) / n

(Lf / V) / 3600

Where:
R= Hydraulic radius
Aq= Flow area, square feet
Wp= Wetted perimeter, feet
V= Velocity, ft/sec
Sf= Slope, ft/ft
n= Manning's n
Tc= Time of concentration, hours
Lf= Flow length, feet

==== SCS TR-55 Shallow Concentration Flow

Tc = Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved Surface:
V = 20.3282 * (Sf**0.5)

(Lf / V) / 3600

Where:
V= Velocity, ft/sec
Sf= Slope, ft/ft
Tc= Time of concentration, hours
Lf= Flow length, feet

Water Quality

Subsection: Runoff CN-Area
Label: DA-2 IMPERVIOUS
Scenario: MERCER:NJWQ

Return Event: 1 years
Storm Event: wq

Runoff Curve Number Data

Soil/Surface Description	CN	Area (acres)	C (%)	UC (%)	Adjusted CN
IMPERVIOUS VEHICULAR	98.000	2.100	0.000	0.000	98.000
COMPOSITE AREA & WEIGHTED CN --->	(N/A)	2.100	(N/A)	(N/A)	98.000

Water Quality

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: MERCER:NJWQ

Return Event: 1 years
Storm Event: wq

Storm Event	wq
Return Event	1 years
Duration	72.000 hours
Depth	1.3 in
Time of Concentration (Composite)	0.085 hours
Area (User Defined)	2.100 acres
Computational Time Increment	0.011 hours
Time to Peak (Computed)	1.093 hours
Flow (Peak, Computed)	6.3 ft³/s
Output Increment	0.100 hours
Time to Flow (Peak Interpolated Output)	1.100 hours
Flow (Peak Interpolated Output)	6.2 ft³/s

Drainage Area	
SCS CN (Composite)	98.000
Area (User Defined)	2.100 acres
Maximum Retention (Pervious)	0.2 in
Maximum Retention (Pervious, 20 percent)	0.0 in

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	1.0 in
Runoff Volume (Pervious)	7,886.545 ft³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	8,093.000 ft³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.085 hours
Computational Time Increment	0.011 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670

Water Quality

Subsection: Unit Hydrograph Summary
Label: DA-2 IMPERVIOUS
Scenario: MERCER:NJWQ

Return Event: 1 years
Storm Event: wq

SCS Unit Hydrograph Parameters	
Unit peak, qp	28.1 ft³/s
Unit peak time, Tp	0.056 hours
Unit receding limb, Tr	0.225 hours
Total unit time, Tb	0.282 hours

Water Quality

Subsection: Elevation-Area Volume Curve
Label: UG STONE
Scenario: MERCER:NJWQ

Return Event: 1 years
Storm Event: wq

Elevation (ft)	Planimeter (ft²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ft³)	Volume (Total) (ft³)
93.00	0.0	0.710	0.000	0.000	0.000
93.25	0.0	0.710	2.130	7,732.000	7,732.000
93.50	0.0	0.710	2.130	7,732.000	15,464.000
93.75	0.0	0.710	2.130	7,732.000	23,196.000
94.00	0.0	0.710	2.130	7,732.000	30,928.000
94.25	0.0	0.710	2.130	7,732.000	38,660.000

Water Quality

Subsection: Elevation-Volume-Flow Table (Pond)
Label: UG STONE
Scenario: MERCER:NJWQ

Return Event: 1 years
Storm Event: wq

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	93.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0 ft³/s
Flow (Initial Infiltration)	0.0 ft³/s
Flow (Initial, Total)	0.0 ft³/s
Time Increment	0.100 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
93.00	0.0	0.000	0.710	0.0	0.0	0.0
93.25	0.0	7,731.900	0.710	0.0	0.0	43.0
93.50	0.0	15,463.800	0.710	0.0	0.0	85.9
93.75	0.0	23,195.700	0.710	0.0	0.0	128.9
94.00	0.0	30,927.600	0.710	0.0	0.0	171.8
94.25	0.0	38,659.500	0.710	0.0	0.0	214.8

Water Quality

Subsection: Level Pool Pond Routing Summary
Label: UG STONE (IN)
Scenario: MERCER:NJWQ

Return Event: 1 years
Storm Event: wq

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	93.00 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.0 ft³/s
Flow (Initial Infiltration)	0.0 ft³/s
Flow (Initial, Total)	0.0 ft³/s
Time Increment	0.100 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	6.2 ft³/s	Time to Peak (Flow, In)	1.100 hours
Flow (Peak Outlet)	0.0 ft³/s	Time to Peak (Flow, Outlet)	0.000 hours

Elevation (Water Surface, Peak)	93.26 ft
Volume (Peak)	8,092.766 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	8,093.000 ft³
Volume (Total Infiltration)	0.000 ft³
Volume (Total Outlet Outflow)	0.000 ft³
Volume (Retained)	8,093.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.000 %

Appendix E

March 5, 2024

BRMYS23006

Bristol Myers Squibb
3401 Princeton Pike
Lawrence Township, NJ
Attn: Andrew Frankgakis

RE: Infiltration Testing Summary Report
Bristol Myers Squibb - Princeton Pike Campus
Parking Lot Expansion Project
3401 Princeton Pike
Lawrence Township, NJ

Pennoni is pleased to submit this report summarizing the infiltration tests performed as part of the above referenced project in Lawrence Township, New Jersey. The purpose of the study was to determine the soil profile, depth to groundwater and seasonal high-water table (SHWT), the presence of potential confining soil strata, and to estimate the infiltration rates in the general areas of potential Stormwater Management (SWM) facilities.

FIELD WORK

On February 29, 2024, ten test pits were excavated to depths varying between 10 and 11 ft below the ground surface (bgs), using a rubber tire backhoe. Testing locations were selected and established in the field by Pennoni personnel. Approximate testing locations are presented on the Test Location Plan, Drawing TL-1. The test pits were performed to determine soil strata and the depth to groundwater and SHWT, prior to infiltration testing (described below). Following the conclusion of the excavations and testing, the test pits were backfilled with the excavated soil in 10 to 12 in. lifts and tamped with the excavator bucket.

Our M. Arkan, PE directed the field work, and our T. Hall, EIT observed the test pits and performed the infiltration testing. The test pit and infiltration logs are attached.

SUBSURFACE STRATIGRAPHY

The test pits disclosed a surficial topsoil layer varying from approximately 10 to 14 in. thick. Test Pit TP-6 encountered a Possible Fill layer approximately 6 ft thick. The underlying subsoils have been grouped into three principal strata based on their engineering properties and our interpretation of their origin. Table 1 presents the strata descriptions.

Table 1: Soil Stratum Descriptions

STRATUM	THICKNESS (FT)	DESCRIPTION
PF	6.0	POSSIBLE FILL: Brown to gray SILT and fine to coarse GRAVEL, little fine to medium to coarse Sand, trace Cobbles and Boulders
1	2.0 – 3.0	Brown to gray SILT and fine to medium to coarse SAND, with varying amounts of fine to coarse Gravel
2	--	Reddish to purplish brown fine to medium SAND and SILT, with varying amounts of gravel to cobble size Shale Fragments, trace gray Clay pockets
Notes: Stratum PF only encountered in TP-6.		

Observations for groundwater were made during and shortly after the completion of the test pit excavations. Perched water (not indicative of the groundwater table, GWT) was encountered in Test Pits TP-5, TP-6, and TP-10 at depths varying between 1.5 and 4 ft bgs (Elev. 92.7 to Elev. 97.5). These observations are for the time and locations noted and may not be indicative of seasonal or daily fluctuations. Seasonal variations on the order of several feet should be anticipated. No evidence of the SHWT was observed from mottling and redoximorphic features during testing.

INFILTRATION TESTING SUMMARY

Pennoni performed a total of six single ring infiltration tests, within TP-7 through TP-10. A pre-soak was performed prior to testing, where the single rings were filled with approximately 3 in. of water and allowed to drain completely. In pre-soaks where the water level dropped less than 1 in. after 60 minutes, the pre-soak was ended. The rings were refilled and the time to drop 1 in. measured until stabilized infiltration rates were observed (two testing measurements of time within 0.5 second). The following table presents a summary of the field results for the infiltration tests performed.

Table 2: Testing Results

Test # / Test Location	Ground Surface Elev.	Limiting Zone	Testing Depth, ft (Elev.)	Tested Stratum	Field Infiltration Rate (in/hr)	Converted Hydraulic Conductivity (in/hr)
INF-1 / TP-7	95.7	NE	3.0 (92.7)	2	4.62	1.58
INF-2 / TP-8	95.5	NE	3.0 (92.5)	2	2.68	0.92
INF-3A / TP-9	95.8	NE	3.0 (92.8)	1	0.75	Less than 1.00
INF-3B / TP-9			4.0 (91.8)	2	8.57	2.93
INF-4A / TP-10	94.7	NE	2.0 (92.7)	1	0.50	Less than 1.00
INF-4B / TP-10			3.0 (91.7)	2	2.30	0.79

NE – Not Encountered

Field infiltration rates in Stratum 2 were observed to vary from 2.3 to 8.6 in/hr. Rates in Stratum 1 were observed to be less than 1.0 in/hr and are not recommended for infiltration.

The bottom of the proposed SWM facility is currently at Elev. 93.0. Generally, Stratum 1 was encountered at this elevation in the test pits. Due to the low permeability of Stratum 1, performing a soil exchange to the depth of Stratum 2 soils (3 to 4 ft bgs) may be more suitable due to Stratum 2's greater permeability.

LIMITATIONS

This work has been performed in accordance with generally accepted professional practice in the field of geotechnical engineering. Our conclusions and recommendations are based on the data revealed by this exploration. We are not responsible for any conclusions or opinions drawn from the data included herein, other than those specifically stated, nor are the recommendations presented in this report intended for direct use as construction specifications. This report is intended for use with regard to the specific project described herein; any changes in loads, structures, or locations should be brought to our attention so that we may determine how they may affect our conclusions. An attempt has been made to provide for normal contingencies, but the possibility remains that unexpected conditions may be present which we are not aware of. If additional or contradictory data are revealed in the future, we should be notified so that modifications to this report can be made, if necessary. If we do not review relevant construction documents and witness the relevant construction operations, then we cannot be responsible for any problems that may result from misinterpretation or misunderstanding of this report or failure to comply with our recommendations.

We trust that the information presented in this report is what you require at this time and we thank you for the opportunity to assist you with this project. If you have any questions, or if you need any further assistance with this project, please contact this office at your earliest convenience.

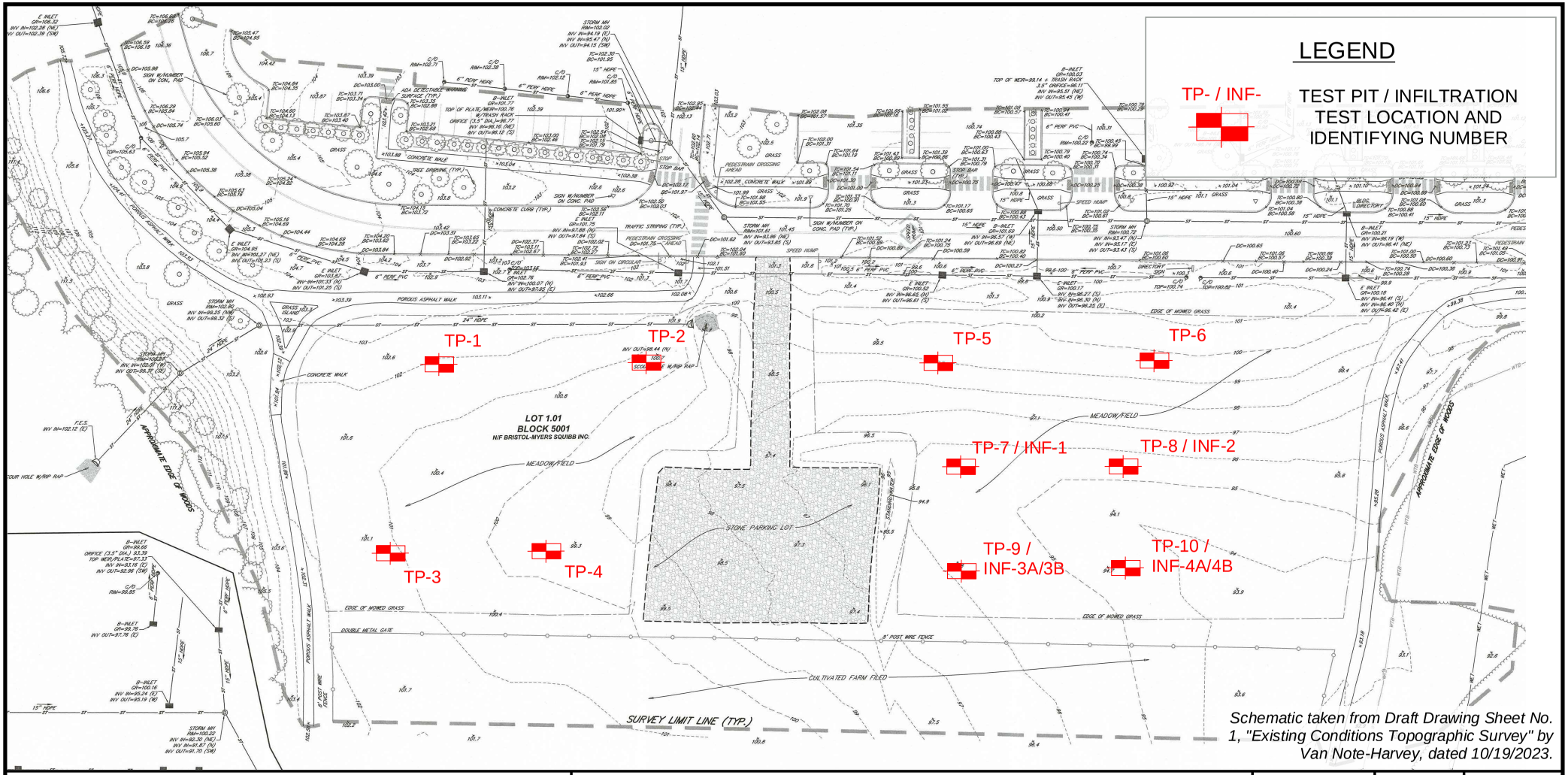
Respectfully,

PENNONI ASSOCIATES INC.

Tristan Hall, EIT
Graduate Geotechnical Engineer

Murat Arkan, PE
Senior Geotechnical Engineer

Enclosures: Test Location Plan (TL-1)
Test Pit Logs (TP-1 through TP-10)
Infiltration Testing Logs (INF-1 through INF-4B)



Schematic taken from Draft Drawing Sheet No. 1, "Existing Conditions Topographic Survey" by Van Note-Harvey, dated 10/19/2023.

PENNONI ASSOCIATES INC.
515 Grove Street, Suite 1B
Haddon Heights, NJ 08035
T 856.547.0505 **F** 856.547.9174

DRAWN BY:	SCALE:	DATE:
TH	NTS	03/05/2024
CHECKED BY:	FIGURE No.	
MA	TL-1	
PROJECT No:		
BRMYS23006		

TEST LOCATION PLAN - 3401 Princeton Pike, Lawrence Twp, NJ

TEST PIT LOG

Test Pit TP-1
PAGE 1 OF 1

CLIENT Bristol Myers Squibb
PROJECT NAME Parking Lot Expansion
PROJECT NUMBER BRMYS23006-100-04
PROJECT LOCATION 3401 Princeton Pike, Lawrence Township, NJ
DATE STARTED 3/1/24 **COMPLETED** 3/1/24
GROUND ELEVATION 102.0'
EXCAVATION CONTRACTOR Ambient Group, LLC
WATER ENCOUNTERED:
EXCAVATION METHOD Rubber Tire Backhoe
DURING EXCAVATION Not Encountered
OPERATOR / HELPER M. Ritorto
AT END OF EXCAVATION Not Encountered
LOGGED BY T. Hall **CHECKED BY** M. Arkan
AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0.0				Depth Elev.	
			T	12" TOPSOIL	
				1.0 101.0	
			1	Gray to brown SILT, some F/M/C Sand, little F/C Gravel	
2.5					
				4.0 98.0	
			2	Reddish brown SILT, little F/M/C Sand	
5.0					
7.5				Reddish brown SILT, little F/M/C Sand, trace gray Clay pockets (stiff to hard)	
10.0				10.0 92.0	
				Test Pit terminated at 10.0 feet.	

NOTES:

TEST PIT LOG

Test Pit TP-2
PAGE 1 OF 1

CLIENT Bristol Myers Squibb
PROJECT NAME Parking Lot Expansion
PROJECT NUMBER BRMYS23006-100-04
PROJECT LOCATION 3401 Princeton Pike, Lawrence Township, NJ
DATE STARTED 3/1/24 **COMPLETED** 3/1/24
GROUND ELEVATION 100.5'
EXCAVATION CONTRACTOR Ambient Group, LLC
WATER ENCOUNTERED:
EXCAVATION METHOD Rubber Tire Backhoe
DURING EXCAVATION Not Encountered
OPERATOR / HELPER M. Ritorto
AT END OF EXCAVATION Not Encountered
LOGGED BY T. Hall **CHECKED BY** M. Arkan
AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0.0				Depth Elev.	
			T	12" TOPSOIL	
				1.0 99.5	
			1	Brown SILT, some F/C Gravel, little F/M/C Sand	
2.5				Grayish brown SILT and F/M/C SAND, little F/C Gravel (slightly cemented, stiff)	Moist
				4.0 96.5	
			2	Brown F/M/C SAND, some Silt, little F/C Gravel	
5.0					
				Reddish brown F/M/C SAND, little Silt	
7.5					
				Reddish brown F/M/C SAND, some gravel size Shale Fragments, little Silt	
10.0				10.0 90.5	
				Test Pit terminated at 10.0 feet.	

NOTES:

TEST PIT LOG

Test Pit TP-3
PAGE 1 OF 1

CLIENT Bristol Myers Squibb
PROJECT NAME Parking Lot Expansion
PROJECT NUMBER BRMYS23006-100-04
PROJECT LOCATION 3401 Princeton Pike, Lawrence Township, NJ
DATE STARTED 3/1/24 **COMPLETED** 3/1/24
GROUND ELEVATION 101.1'
EXCAVATION CONTRACTOR Ambient Group, LLC
WATER ENCOUNTERED:
EXCAVATION METHOD Rubber Tire Backhoe
DURING EXCAVATION Not Encountered
OPERATOR / HELPER M. Ritorto
AT END OF EXCAVATION Not Encountered
LOGGED BY T. Hall **CHECKED BY** M. Arkan
AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0.0				Depth Elev.	
			T	12" TOPSOIL	
				1.0 100.1	
			1	Brown SILT, some F/C Gravel, little F/M/C Sand	
2.5					
				4.0 97.1	
			2	Reddish brown SILT, little F/M/C Sand	
5.0					
7.5					
10.0				10.0 91.1	
				Test Pit terminated at 10.0 feet.	

NOTES:

TEST PIT LOG

Test Pit TP-4
PAGE 1 OF 1

CLIENT Bristol Myers Squibb
PROJECT NAME Parking Lot Expansion
PROJECT NUMBER BRMYS23006-100-04
PROJECT LOCATION 3401 Princeton Pike, Lawrence Township, NJ
DATE STARTED 3/1/24 **COMPLETED** 3/1/24
GROUND ELEVATION 99.5'
EXCAVATION CONTRACTOR Ambient Group, LLC
WATER ENCOUNTERED:
EXCAVATION METHOD Rubber Tire Backhoe
DURING EXCAVATION Not Encountered
OPERATOR / HELPER M. Ritorto
AT END OF EXCAVATION Not Encountered
LOGGED BY T. Hall **CHECKED BY** M. Arkan
AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0.0				Depth Elev.	
			T	12" TOPSOIL	
				1.0 98.5	
			1	Brown SILT and F/M/C SAND, little fine Gravel	
2.5					
				3.5 96.0	
			2	Reddish brown SILT, little F/M/C Sand	
5.0					
7.5					
10.0				10.0 89.5	
				Test Pit terminated at 10.0 feet.	

NOTES:

TEST PIT LOG

Test Pit TP-5
PAGE 1 OF 1

CLIENT Bristol Myers Squibb
PROJECT NAME Parking Lot Expansion
PROJECT NUMBER BRMYS23006-100-04
PROJECT LOCATION 3401 Princeton Pike, Lawrence Township, NJ
DATE STARTED 3/1/24 **COMPLETED** 3/1/24
GROUND ELEVATION 99.0'
EXCAVATION CONTRACTOR Ambient Group, LLC
WATER ENCOUNTERED:
EXCAVATION METHOD Rubber Tire Backhoe
DURING EXCAVATION Not Encountered
OPERATOR / HELPER M. Ritorto
AT END OF EXCAVATION 1.5' / Elev 97.5' Perched Seepage
LOGGED BY T. Hall **CHECKED BY** M. Arkan
AFTER EXCAVATION 1.5' / Elev 97.5' Perched Seepage

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0.0				Depth / Elev.	
			T	12" TOPSOIL	
				1.0 / 98.0	
			1	Brown SILT and F/M/C SAND	Seepage
2.5					
				4.0 / 95.0	
			2	Reddish brown F/M/C SAND, little Silt	
5.0					
7.5					
10.0				10.0 / 89.0	

NOTES:

Test Pit terminated at 10.0 feet.

TEST PIT LOG

Test Pit TP-6
PAGE 1 OF 1

CLIENT Bristol Myers Squibb
PROJECT NAME Parking Lot Expansion
PROJECT NUMBER BRMYS23006-100-04
PROJECT LOCATION 3401 Princeton Pike, Lawrence Township, NJ
DATE STARTED 3/1/24 **COMPLETED** 3/1/24
GROUND ELEVATION 99.7'
EXCAVATION CONTRACTOR Ambient Group, LLC
WATER ENCOUNTERED:
EXCAVATION METHOD Rubber Tire Backhoe
DURING EXCAVATION Not Encountered
OPERATOR / HELPER M. Ritorto
AT END OF EXCAVATION 4.0' / Elev 95.7' Perched Seepage
LOGGED BY T. Hall **CHECKED BY** M. Arkan
AFTER EXCAVATION 4.0' / Elev 95.7' Perched Seepage

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0.0				Depth / Elev.	
			T	12" TOPSOIL	
				1.0 / 98.7	
				POSSIBLE FILL: Brown SILT, some F/C Gravel, little F/M/C Sand	
2.5					
				4.0 / 95.7	
			PF	POSSIBLE FILL: Brown to gray SILT and C/F GRAVEL, trace Cobbles and Boulders	Trace Seepage
5.0					
				7.0 / 92.7	
				Brown F/M/C SAND, little Silt	
7.5					
			2		
10.0				10.0 / 89.7	

NOTES:

Test Pit terminated at 10.0 feet.

TEST PIT LOG

Test Pit TP-7
PAGE 1 OF 1

CLIENT Bristol Myers Squibb
PROJECT NAME Parking Lot Expansion
PROJECT NUMBER BRMYS23006-100-04
PROJECT LOCATION 3401 Princeton Pike, Lawrence Township, NJ
DATE STARTED 3/1/24 **COMPLETED** 3/1/24
GROUND ELEVATION 95.7'
EXCAVATION CONTRACTOR Ambient Group, LLC
WATER ENCOUNTERED:
EXCAVATION METHOD Rubber Tire Backhoe
DURING EXCAVATION Not Encountered
OPERATOR / HELPER M. Ritorto
AT END OF EXCAVATION Not Encountered
LOGGED BY T. Hall **CHECKED BY** M. Arkan
AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0.0				Depth Elev.	
			T	10" TOPSOIL	
				0.8 94.9	
			1	Brown SILT and F/M/C SAND, some F/C Gravel	
2.5					
				3.0 92.7	
			2	Reddish to purplish brown F/M/C SAND, some C/F gravel size Rock Fragments	
5.0					
				Reddish to purplish brown SHALE COBBLES and gravel size ROCK FRAGMENTS, some F/M/C Sand, little Silt	
7.5					
10.0					
				11.0 84.7	
				Test Pit terminated at 11.0 feet.	

NOTES:

Test Pit TP-8
PAGE 1 OF 1

TEST PIT LOG

CLIENT Bristol Myers Squibb
PROJECT NAME Parking Lot Expansion
PROJECT NUMBER BRMYS23006-100-04
PROJECT LOCATION 3401 Princeton Pike, Lawrence Township, NJ
DATE STARTED 3/1/24 **COMPLETED** 3/1/24
GROUND ELEVATION 95.5'
EXCAVATION CONTRACTOR Ambient Group, LLC
WATER ENCOUNTERED:
EXCAVATION METHOD Rubber Tire Backhoe
DURING EXCAVATION Not Encountered
OPERATOR / HELPER M. Ritorto
AT END OF EXCAVATION Not Encountered
LOGGED BY T. Hall **CHECKED BY** M. Arkan
AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0.0				Depth Elev.	
			T	12" TOPSOIL	
				1.0 94.5	
			1	Brown SILT and F/M/C SAND, trace fine Gravel	
2.5				3.0 92.5	
				Reddish brown F/M/C SAND, little Silt	
5.0					
			2		
7.5				Reddish brown F/M/C SAND, some Shale Cobbles and gravel size Rock Fragments, litle Silt	
10.0					
				11.0 84.5	
				Test Pit terminated at 11.0 feet.	

NOTES:

TEST PIT LOG

Test Pit TP-9
PAGE 1 OF 1

CLIENT Bristol Myers Squibb
PROJECT NAME Parking Lot Expansion
PROJECT NUMBER BRMYS23006-100-04
PROJECT LOCATION 3401 Princeton Pike, Lawrence Township, NJ
DATE STARTED 3/1/24 **COMPLETED** 3/1/24
GROUND ELEVATION 95.8'
EXCAVATION CONTRACTOR Ambient Group, LLC
WATER ENCOUNTERED:
EXCAVATION METHOD Rubber Tire Backhoe
DURING EXCAVATION Not Encountered
OPERATOR / HELPER M. Ritorto
AT END OF EXCAVATION Not Encountered
LOGGED BY T. Hall **CHECKED BY** M. Arkan
AFTER EXCAVATION Not Encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0.0				Depth Elev.	
			T	14" TOPSOIL	
				1.2 94.6	
			1	Brown SILT and F/M/C SAND	
2.5				Brown SILT and F/M/C SAND, trace fine Gravel	
				4.0 91.8	
5.0			2	Reddish to purplish brown F/M/C SAND, some Silt, little C/F Gravel (little gravel size cemented Sand and Silt fragments)	
7.5				Reddish to purplish brown F/M/C SAND, some Shale Cobbles and gravel size Rock Fragments, litle Silt	
10.0				11.0 84.8	
				Test Pit terminated at 11.0 feet.	

NOTES:

TEST PIT LOG

Test Pit TP-10
PAGE 1 OF 1

CLIENT Bristol Myers Squibb
PROJECT NAME Parking Lot Expansion
PROJECT NUMBER BRMYS23006-100-04
PROJECT LOCATION 3401 Princeton Pike, Lawrence Township, NJ
DATE STARTED 3/1/24 **COMPLETED** 3/1/24
GROUND ELEVATION 94.7'
EXCAVATION CONTRACTOR Ambient Group, LLC
WATER ENCOUNTERED:
EXCAVATION METHOD Rubber Tire Backhoe
DURING EXCAVATION Not Encountered
OPERATOR / HELPER M. Ritorto
AT END OF EXCAVATION 2.0' / Elev 92.7' Perched Seepage
LOGGED BY T. Hall **CHECKED BY** M. Arkan
AFTER EXCAVATION 2.0' / Elev 92.7' Perched Seepage

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	STRATA	DESCRIPTION	REMARKS
0.0				Depth / Elev.	
			T	12" TOPSOIL	
				1.0 / 93.7	
			1	Brown SILT, little F/M/C Sand, little F/C Gravel	
2.5				Brown SILT, little F/M/C Sand (cemented, very stiff/hard)	Perched Seeoage
				3.0 / 91.7	
			2	Reddish brown F/M SAND and SILT	
5.0				Reddish brown F/M SAND and SILT (with pockets of white F/M Sand and Clay)	
7.5				Reddish brown F/M/C SAND, some gravel size Shale Fragments, litle Silt	
10.0				10.0 / 84.7	
				Test Pit terminated at 10.0 feet.	

NOTES:

Infiltration Test Number: INF-1

Project: Parking Lot Expansion	Project Number: BRMYS23006	Date: 02/29/2024
Location: 3401 Princeton Pike, Lawrence Twp, NJ	Test Location: TP-7	Testing Depth (ft): 3.0
Test Performed By: T. Hall	Ring Seating Depth (in): 4	Ring Diameter (in): 6
Ground Surface Elev. 95.7		Testing Elev. 92.7
Test Soil Strata: Loamy Sand		
Limiting Zones: Not Encountered		

Trial #	Initial Water Height (in.)	Final Water Height (in.)	ΔHeight (in.)	ΔTime (min)	Infiltration Rate (in/hr)	Converted Hydraulic Conductivity (in/hr)
Pre Soak	3.00	0.00	3.00	30.00	6.00	2.05
1	3.00	2.00	1.00	11.00	5.45	1.87
2	3.00	2.00	1.00	13.00	4.62	1.58
3	3.00	2.00	1.00	13.05	4.60	1.57
4	3.00	2.00	1.00	13.00	4.62	1.58
5						
6						
7						
8						
9						
10						
				Hydraulic Conductivity (in/hr)		1.58

Infiltration Test Number: INF-2

Project: Parking Lot Expansion	Project Number: BRMYS23006	Date: 02/29/2024
Location: 3401 Princeton Pike, Lawrence Twp, NJ	Test Location: TP-8	Testing Depth (ft): 3.0
Test Performed By: T. Hall	Ring Seating Depth (in): 4	Ring Diameter (in): 6
Ground Surface Elev. 95.5		Testing Elev. 92.5
Test Soil Strata: Loamy Sand		
Limiting Zones: Not Encountered		

Trial #	Initial Water Height (in.)	Final Water Height (in.)	ΔHeight (in.)	ΔTime (min)	Infiltration Rate (in/hr)	Converted Hydraulic Conductivity (in/hr)
Pre Soak	3.00	0.00	3.00	42.00	4.29	1.47
1	3.00	2.00	1.00	21.50	2.79	0.96
2	3.00	2.00	1.00	22.50	2.67	0.91
3	3.00	2.00	1.00	22.33	2.69	0.92
4	3.00	2.00	1.00	22.42	2.68	0.92
5						
6						
7						
8						
9						
10						
				Hydraulic Conductivity (in/hr)		0.92

Infiltration Test Number: INF-3A

Project: Parking Lot Expansion	Project Number: BRMYS23006	Date: 02/29/2024
Location: 3401 Princeton Pike, Lawrence Twp, NJ	Test Location: TP-9	Testing Depth (ft): 3.0
Test Performed By: T. Hall	Ring Seating Depth (in): 4	Ring Diameter (in): 6
Ground Surface Elev. 95.8		Testing Elev. 92.8
Test Soil Strata: Silt Loam		
Limiting Zones: Not Encountered		

Trial #	Initial Water Height (in.)	Final Water Height (in.)	ΔHeight (in.)	ΔTime (min)	Infiltration Rate (in/hr)	Converted Hydraulic Conductivity (in/hr)
Pre Soak	3.00	1.75	1.25	60.00	1.25	0.43
1	3.00	2.25	0.75	60.00	0.75	0.26
2						
3						
4						
5						
6						
7						
8						
9						
10						
				Hydraulic Conductivity (in/hr)		< 1.00

Infiltration Test Number: INF-3B

Project: Parking Lot Expansion	Project Number: BRMYS23006	Date: 02/29/2024
Location: 3401 Princeton Pike, Lawrence Twp, NJ	Test Location: TP-9	Testing Depth (ft): 4.0
Test Performed By: T. Hall	Ring Seating Depth (in): 4	Ring Diameter (in): 6
Ground Surface Elev. 95.8		Testing Elev. 91.8
Test Soil Strata: Loamy Sand		
Limiting Zones: Not Encountered		

Trial #	Initial Water Height (in.)	Final Water Height (in.)	ΔHeight (in.)	ΔTime (min)	Infiltration Rate (in/hr)	Converted Hydraulic Conductivity (in/hr)
Pre Soak	3.00	0.00	3.00	15.00	12.00	4.11
1	3.00	2.00	1.00	6.00	10.00	3.42
2	3.00	2.00	1.00	6.17	9.73	3.33
3	3.00	2.00	1.00	6.25	9.60	3.29
4	3.00	2.00	1.00	7.00	8.57	2.93
5	3.00	2.00	1.00	7.00	8.57	2.93
6						
7						
8						
9						
10						
				Hydraulic Conductivity (in/hr)		2.93

Infiltration Test Number: INF-4A

Project: Parking Lot Expansion	Project Number: BRMYS23006	Date: 02/29/2024
Location: 3401 Princeton Pike, Lawrence Twp, NJ	Test Location: TP-10	Testing Depth (ft): 2.0
Test Performed By: T. Hall	Ring Seating Depth (in): 4	Ring Diameter (in): 6
Ground Surface Elev. 94.7		Testing Elev. 92.7
Test Soil Strata: Silt Loam		
Limiting Zones: Not Encountered		

Trial #	Initial Water Height (in.)	Final Water Height (in.)	ΔHeight (in.)	ΔTime (min)	Infiltration Rate (in/hr)	Converted Hydraulic Conductivity (in/hr)
Pre Soak	3.00	2.13	0.88	60.00	0.88	0.30
1	3.00	2.50	0.50	60.00	0.50	0.17
2						
3						
4						
5						
6						
7						
8						
9						
10						
				Hydraulic Conductivity (in/hr)		< 1.00

Infiltration Test Number: INF-4B

Project: Parking Lot Expansion	Project Number: BRMYS23006	Date: 02/29/2024
Location: 3401 Princeton Pike, Lawrence Twp, NJ	Test Location: TP-10	Testing Depth (ft): 3.0
Test Performed By: T. Hall	Ring Seating Depth (in): 4	Ring Diameter (in): 6
Ground Surface Elev. 94.7		Testing Elev. 91.7
Test Soil Strata: Loamy Sand		
Limiting Zones: Not Encountered		

Trial #	Initial Water Height (in.)	Final Water Height (in.)	ΔHeight (in.)	ΔTime (min)	Infiltration Rate (in/hr)	Converted Hydraulic Conductivity (in/hr)
Pre Soak	3.00	0.00	3.00	51.00	3.53	1.21
1	3.00	2.00	1.00	23.25	2.58	0.88
2	3.00	2.00	1.00	26.00	2.31	0.79
3	3.00	2.00	1.00	26.03	2.30	0.79
4	3.00	2.00	1.00	26.08	2.30	0.79
5						
6						
7						
8						
9						
10						
				Hydraulic Conductivity (in/hr)		0.79

New Jersey Groundwater Recharge Spreadsheet Version 2.0 November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
MERCER CO., LAWRENCE TWP	44.9	1.43

Project Name:	**Princeton Pike Parking Expan.**
Description:	**Block 5001, Lot 1.01**
Analysis Date:	**01/04/24**

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.94	Row Crop	Matapeake	11.1	78,356
2	0.57	Row Crop	Mattapex	7.9	16,363
3	0.21	Open space	Matapeake	12.9	9,850
4	0.03	Open space	Mattapex	10.4	1,137
5	0.24	Row Crop	Othello	0.0	-
6	0.03	Impervious areas	Nixonton	0.0	-
7					
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	3.0			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				9.6	105,706

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.61	Open space	Matapeake	12.9	28,613
2	0.27	Open space	Mattapex	10.4	10,234
3	2.14	Impervious areas	Nixonton	0.0	-
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	3.0			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				3.5	38,847

Annual Recharge Requirements Calculation ↓			
% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	93,218
Post-Development Annual Recharge Deficit=	***66,859***	(cubic feet)	

Recharge Efficiency Parameters Calculations (area averages)

RWC=	#N/A	(in)	DRWC=	#N/A	(in)
ERWC =	#N/A	(in)	EDRWC=	#N/A	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Project Name	Description	Analysis Date	BMP or LID Type
brm	Block 5001, Lot 1.01	01/04/24	Porous asphalt

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	29104.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	3.8	in
Upper level of the BMP surface (negative if above ground)	dBMPu	4.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	12.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	1	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	2.23	in
ERWC Modified to consider dEXC	EDRWC	1.78	in
Empty Portion of RWC under Infilt. BMP	RERWC	1.57	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	1.19	in
Inches of Rainfall to capture	Pdesign	1.41	in
Recharge Provided Avg. over Imp. Area		8.6	in
Runoff Captured Avg. over imp. Area		31.6	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.31	unitless
BMP Volume	VBMP	9,204	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK
BMP Location---> OK

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	66,859	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	93,218	sq.ft
Root Zone Water Capacity	RWC	7.82	in
RWC Modified to consider dEXC	DRWC	6.26	in
Climatic Factor	C-factor	1.43	no units
Average Annual P	Pavg	44.9	in
Recharge Requirement over Imp. Area	dr	8.6	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		66,859	cu.ft
Avg BMP Recharge Efficiency		27.2%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.7%	%
%Runoff Infiltrated		90.6%	%
%Runoff Recharged		24.7%	%
%Rainfall Recharged		19.2%	%

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

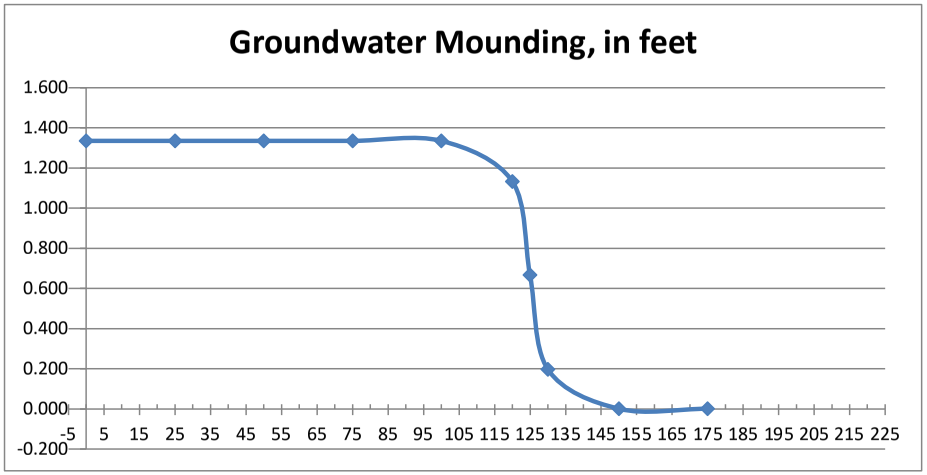
Input Values

1.15	*R*	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
2.30	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
125.000	x	1/2 length of basin (x direction, in feet)
56.000	y	1/2 width of basin (y direction, in feet)
2.09	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

11.335	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
1.335	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.335	0
1.335	25
1.335	50
1.335	75
1.335	100
1.132	120
0.668	125
0.197	130
0.000	150
0.000	175

Re-Calculate Now



Disclaimer

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

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project:	BMS Princeton Pike
Date:	Rev 2/15/2024
User:	BM
Notes:	Study area based on full site (not based on drainage area map).
	Rev to include additional parking area

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 = 134.6 **Acres**

B. Specify by Percent the Various Planning Areas Located within the Development Site:

State Plan Planning Area:	PA-1	PA-2	PA-3	PA-4	PA-4B	PA-5	Total % Area
Percent of Each Planning Area within Site:		100.0%					100.0%

Note: See User's Guide for Equivalent Zones within Designated Centers and the NJ Meadowlands, Pinelands, and Highlands Districts

Step 2 - Describe Existing or Pre-Developed Site Conditions

A. Specify Existing Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers		0.5	0.5	5.4	6.4	17
2	Lawn and Open Space		14.4			14.4	35
3	Brush and Shrub		55.9	2.0	0.3	58.2	155
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop		29.2	4.3	0.4	33.9	64
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous		14.8	4.1	0.7	19.6	62
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious		2.1			2.1	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0
	HSG Subtotals (Acres):	0.0	116.9	10.9	6.8	**Total Area:**	134.6
	HSG Subtotals (%):	0.0%	86.8%	8.1%	5.1%	**Total % Area:**	100.0%

Points Subtotal: **334**

Total Existing Site Points: **334**

Step 3 - Describe Proposed or Post-Developed Site Conditions

A. Specify Proposed Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals		Points
		HSG A	HSG B	HSG C	HSG D			
1	Wetlands and Undisturbed Stream Buffers		0.5	0.5	5.4	6.4		17
2	Lawn and Open Space		39.8			39.8		98
3	Brush and Shrub		11.8	1.7	0.3	13.8		36
4	Meadow, Pasture, Grassland, or Range					0.0		0
5	Row Crop		21.3	2.6	0.4	24.3		46
6	Small Grain and Legumes					0.0		0
7	Woods - Indigenous		8.2	4.1	0.6	12.9		39
8	Woods - Planted					0.0		0
9	Woods and Grass Combination					0.0		0
10	Ponds, Lakes, and Other Open Water					0.0		0
11	Gravel and Dirt					0.0		0
12	Porous and Permeable Paving		16.0	1.0		17.0		41
13	Directly Connected Impervious		17.3	1.0		18.3		0
14	Unconnected Impervious with Small D/S Pervious		2.0		0.1	2.1		2
15	Unconnected Impervious with Large D/S Pervious					0.0		0
	HSG Subtotals (Acres):	0.0	116.9	10.9	6.8		**Total Area:**	134.6
	HSG Subtotals (%):	0.0%	86.8%	8.1%	5.1%		**Total % Area:**	100.0%
							Points Subtotal:	**278**

B. Compare Proposed Impervious Coverage with Maximum Allowable Impervious Coverage:

Total Directly Connected Impervious Coverage =	14%	% of Site
Total Unconnected Impervious Coverage with Small D/S Pervious =	2%	% of Site
Total Unconnected Impervious Coverage with Large D/S Pervious =	0%	% of Site
Total Site Impervious Coverage =	15%	% of Site
Effective Site Impervious Coverage =	15%	% of Site
Specify Source of Maximum Allowable Impervious Coverage:	Table	(None or Table)
Allowable Site Impervious Cover from Maximum Impervious Cover Table:	72%	

Note: See Maximum Impervious Cover Table Worksheet for Details

Points Subtotal: 50

C. Compare Proposed Site Disturbance with Maximum Allowable Site Disturbance:

Total Proposed Site Disturbance =		% of Site
Maximum Allowable Site Disturbance by Municipal Ordinance =		% of Site

Points Subtotal: 0

D. Describe Proposed Runoff Conveyance System:

Total Length of Runoff Conveyance System =	100	Feet
Length of Vegetated Runoff Conveyance System =	0	Feet
% of Total Runoff Conveyance System That is Vegetated =	0%	

Points Subtotal: 0

E. Residential Lot Clustering:

Percent of Total Site Area that will be Clustered =		% of Site
Minimum Standard Lot Size as Per Zoning (Note: 1/2 Acre or Greater) =		Acres
Maximum Proposed Cluster Lot Size (Note:1/4 Acre or Less) =		Acres
Percent of Clustered Portion of Site to be Preserved as Vegetated Open Space =		% of Clustered Site Portion

Points Subtotal: 0

F. Will the Following be Utilized to Minimize Soil Compaction?

Proposed Lawn Areas will be Graded with Lightweight Construction Equipment:	No	(Yes or No)
Percent of Proposed Lawn Areas to be Graded with Such Equipment:		% of Lawn Areas

Points Subtotal: 0

G. Are Any of the Following Stormwater Management Standards Met Using Only Nonstructural Strategies and Measures?

Groundwater Recharge Standards (NJAC 7:8-5.4-a-2):	No	(Yes or No)
Stormwater Runoff Quality Standards (NJAC 7:8-5.5):	No	(Yes or No)
Stormwater Runoff Quantity Standards (NJAC 7:8-5.4-a-3):	No	(Yes or No)

Points Subtotal: 0

Note: If the Answers to All Three Questions at G Above are "Yes", Adequate Nonstructural Measures have been Utilized.

Total Proposed Site Points: 328

Ratio of Proposed to Existing Site Points: 98%

Required Site Points Ratio: 95%

Nonstructural Point System Results: Proposed Nonstructural Measures are Adequate

Appendix F

24" Basin Outflow Pipe(projected flow)

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.012
Channel Slope	0.003 ft/ft
Normal Depth	12.7 in
Diameter	24.0 in

Results	
Discharge	7.26 cfs
Flow Area	1.7 ft²
Wetted Perimeter	3.3 ft
Hydraulic Radius	6.2 in
Top Width	2.00 ft
Critical Depth	11.5 in
Percent Full	52.9 %
Critical Slope	0.004 ft/ft
Velocity	4.30 ft/s
Velocity Head	0.29 ft
Specific Energy	1.35 ft
Froude Number	0.825
Maximum Discharge	14.20 cfs
Discharge Full	13.20 cfs
Slope Full	0.001 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	12.7 in
Critical Depth	11.5 in
Channel Slope	0.003 ft/ft
Critical Slope	0.004 ft/ft

24" dia Bypass 25yr projected

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.012
Channel Slope	0.008 ft/ft
Normal Depth	10.0 in
Diameter	24.0 in

Results	
Discharge	7.96 cfs
Flow Area	1.2 ft²
Wetted Perimeter	2.8 ft
Hydraulic Radius	5.3 in
Top Width	1.97 ft
Critical Depth	12.0 in
Percent Full	41.7 %
Critical Slope	0.004 ft/ft
Velocity	6.42 ft/s
Velocity Head	0.64 ft
Specific Energy	1.47 ft
Froude Number	1.428
Maximum Discharge	23.58 cfs
Discharge Full	21.92 cfs
Slope Full	0.001 ft/ft
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	41.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	10.0 in
Critical Depth	12.0 in
Channel Slope	0.008 ft/ft
Critical Slope	0.004 ft/ft

NEW JERSEY SOIL EROSION & SEDIMENT CONTROL STANDARDS

FOR

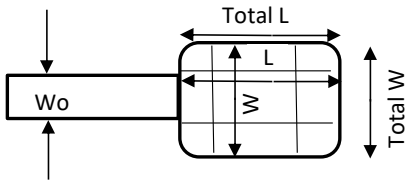
CONDUIT OUTLET PROTECTION - SCOUR HOLE

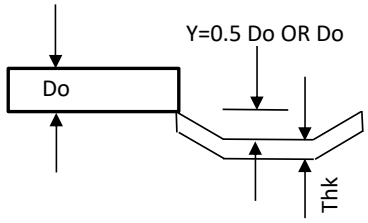
PROJECT: Prinecton Pike Parking Lot Expansion

Date: 2/14/2024
Rev:
Page:
By:

Structure: FES-2
25 Year Storm

DESIGN CRITERIA:		
Design Storm (Max. Pipe Discharge)	25	yr
Flow Rate, Q=	6.60	CFS
Culvert Horiz Dim.=	2.00	Ft
Tailwater Depth=	1.00	*Ft
Filter Fabric Used?	y	(Y/N)
D(50) min.	3	in
SCOUR HOLE DIMENSIONS:		
Culvert Vert Dim. (Do)	2.00	Ft
Depth of Hole (Y)	1.00	Ft
Length of Bottom (L)	6.00	Ft
Width of Bottom (W)	4.00	Ft
Total Length of Scour Hole	12.00	Ft
Total Width of Scour Hole	10.00	Ft
D(50) calc.	0	in
D(50) to be used	3	in
Thickness (Thk.)	6	in





NOTE: * Tailwater was calculated at 0.50 x pipe diameter

NEW JERSEY SOIL EROSION & SEDIMENT CONTROL STANDARDS

FOR

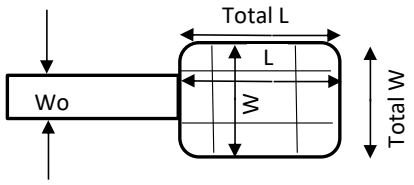
CONDUIT OUTLET PROTECTION - SCOUR HOLE

PROJECT: Prinecton Pike Parking Lot Expansion

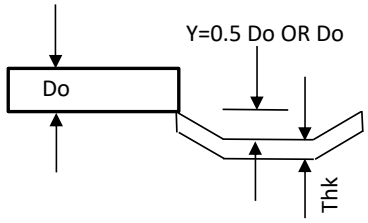
Date: 2/14/2024
Rev:
Page:
By:

Structure: FES-1
100 Year Storm

DESIGN CRITERIA:		
Design Storm (Basin Outflow)	100	yr
Flow Rate, Q=	11.70	CFS
Culvert Horiz Dim.=	2.00	Ft
Tailwater Depth=	1.00	*Ft
Filter Fabric Used?	y	(Y/N)
D(50) min.	3	in



SCOUR HOLE DIMENSIONS:		
Culvert Vert Dim. (Do)	2.00	Ft
Depth of Hole (Y)	1.00	Ft
Length of Bottom (L)	6.00	Ft
Width of Bottom (W)	4.00	Ft
Total Length of Scour Hole	12.00	Ft
Total Width of Scour Hole	10.00	Ft
D(50) calc.	1	in
D(50) to be used	3	in
Thickness (Thk.)	6	in



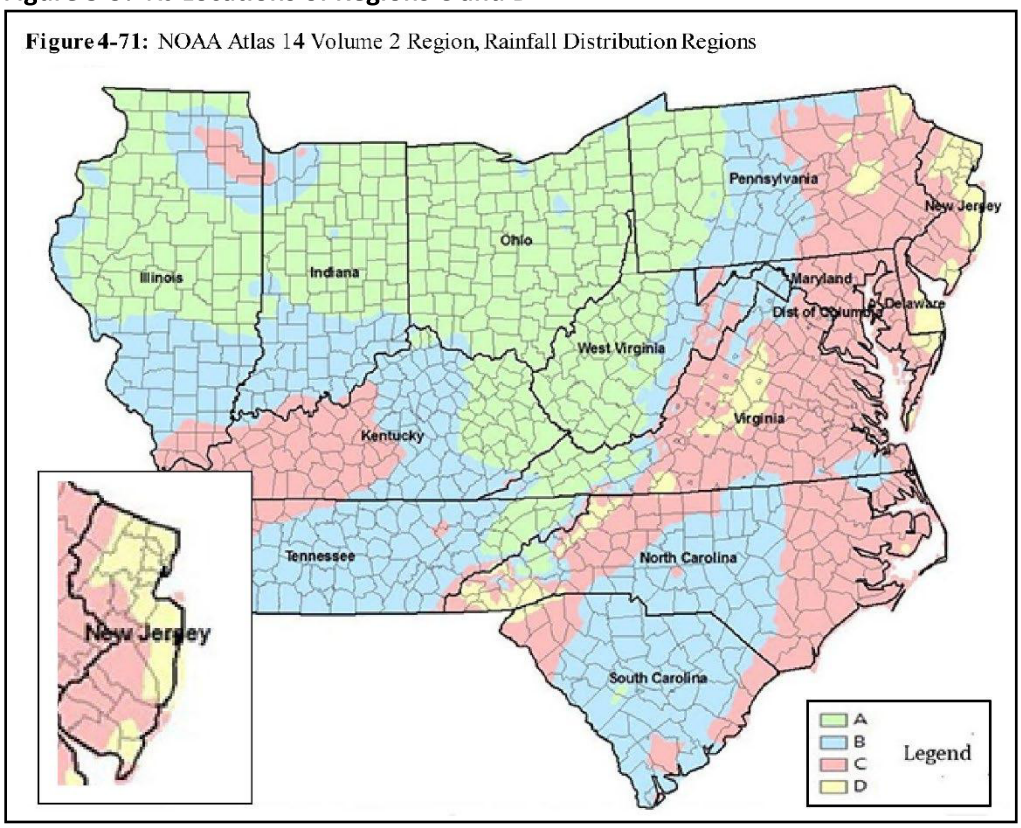
NOTE: * Tailwater was calculated at 0.50 x pipe diameter

Appendix G

It should be noted that the extents of Regions C and D were updated in the *NEH* published August 2019, as shown in Figure 5-9. This figure is a reprint of Figure 4-71 in Chapter 4 of the *NEH* and is found online at the link below:

https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=43924.wba.

Figure 5-9: NJ Locations of Regions C and D



The updated extents of Regions C and D shown in Figure 5-9, and either shaded in orange or yellow, indicate that both Rainfall Distribution Regions C and D may not follow the county boundaries as stated in the NEW JERSEY BULLETIN NO. NJ210-12-1. If a project is near a rainfall distribution region boundary, it might be difficult to identify the respective rainfall distribution region from Figure 5-9. In such a case, the designer is encouraged to contact the Department to help determine the appropriate distribution.

6. **Rainfall Depth for the Stormwater Runoff Water Quality Design Storm**: For stormwater runoff quality control, N.J.A.C. 7:8-5.5 requires using 1.25 inches of rain falling nonuniformly in a 2-hour storm event, which is also known as the Water Quality Design Storm (WQDS).

7. **Rainfall Distribution for the NJDEP Water Quality Design Storm:** During its duration, precipitation falls in a nonlinear pattern as depicted in N.J.A.C. 7:8-5.5(a) and in Table 5-2, provided below. This rainfall pattern or distribution is based on Trenton, New Jersey, rainfall data collected between 1913 and 1975 and contains intermediate rainfall intensities that have the same probability or recurrence interval as the storm's total rainfall and duration. As such, for times of concentration up to two hours, the NJDEP WQDS can be used to compute runoff volumes, peak rates and hydrographs of equal

ii. N.J.A.C. 7:8-5.7(c)2 and N.J.A.C. 7:8-5.7(d)2 both allow an alternative to calculating the current and projected rainfall precipitation depths by using separate rainfall totals for each county. The 24-hour county rainfall amount provided by NRCS is duplicated here and can be found online at:

https://www.nrcs.usda.gov/sites/default/files/2022-09/NJ%2024%20Hour%20Rainfall%20Data.pdf.

Table 5-1: County-Specific, New Jersey 24-Hour Rainfall Frequency Data

NEW JERSEY 24 HOUR RAINFALL FREQUENCY DATA

Rainfall amounts in Inches

County	1 year	2 year	5 year	10 year	25 year	50 year	100 year
Atlantic	2.72	3.31	4.30	5.16	6.46	7.61	8.90
Bergen	2.75	3.34	4.27	5.07	6.28	7.32	8.47
Burlington	2.77	3.36	4.34	5.18	6.45	7.56	8.81
Camden	2.73	3.31	4.25	5.06	6.28	7.34	8.52
Cape May	2.67	3.25	4.22	5.07	6.34	7.47	8.73
Cumberland	2.69	3.27	4.25	5.09	6.37	7.49	8.76
Essex	2.85	3.44	4.40	5.22	6.44	7.49	8.66
Gloucester	2.71	3.29	4.24	5.05	6.29	7.36	8.55
Hudson	2.73	3.31	4.23	5.02	6.19	7.20	8.31
Hunterdon	2.80	3.38	4.26	5.00	6.09	7.02	8.03
Mercer	2.74	3.31	4.23	5.01	6.19	7.20	8.33
Middlesex	2.76	3.35	4.30	5.12	6.36	7.43	8.63
Monmouth	2.79	3.38	4.38	5.23	6.53	7.66	8.94
Morris	2.94	3.54	4.47	5.24	6.37	7.32	8.35
Ocean	2.81	3.42	4.45	5.33	6.68	7.87	9.20
Passaic	2.87	3.47	4.42	5.23	6.43	7.47	8.62
Salem	2.69	3.26	4.20	5.00	6.22	7.28	8.45
Somerset	2.76	3.34	4.25	5.01	6.15	7.13	8.21
Sussex	2.68	3.22	4.02	4.70	5.72	6.60	7.58
Union	2.80	3.39	4.35	5.17	6.42	7.49	8.69
Warren	2.78	3.34	4.18	4.89	5.93	6.83	7.82

Notes: The average point rainfall amounts listed above were developed from data contained in NOAA Atlas 14 Volume 2.

Point rainfall estimates for specific locations may be obtained from the Precipitation Frequency Data Server located at http://www.nws.noaa.gov/ohd/hdsc/

For most hydrologic design procedures, the rainfall amounts listed above may be rounded to the nearest tenth of an inch.

b. N.J.A.C.7:8-5.7(c) requires the precipitation depths of the current 2-, 10- and 100-year storm events be determined by multiplying the NOAA rainfall data with the current precipitation adjustment factors in Table 5-5 at N.J.A.C.7:8-5.7(c)2. N.J.A.C.7:8-5.7(d) requires the precipitation depths of the projected 2-, 10- and 100-year storm events be determined by multiplying the NOAA rainfall data with the future precipitation change factors in Table 5-6 at N.J.A.C.7:8-5.7(d). Table 5-5 and Table 5-6 from the Rules are reproduced below.

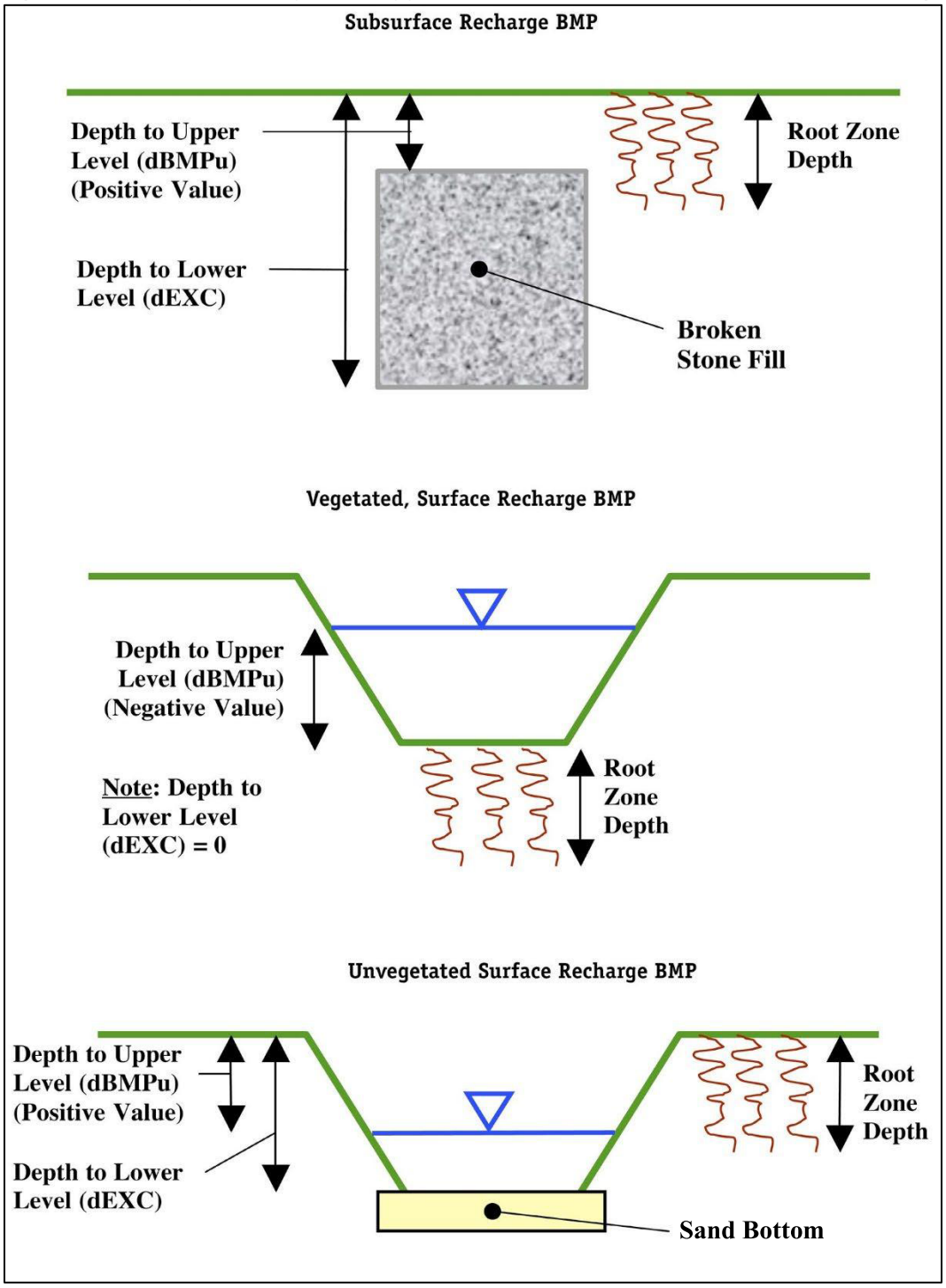
Current Precipitation Adjustment Factors at N.J.A.C. 7:8-5.7(c) as Table 5-5

County	Current Precipitation Adjustment Factors		
	2-year Design Storm	10-year Design Storm	100-year Design Storm
Atlantic	1.01	1.02	1.03
Bergen	1.01	1.03	1.06
Burlington	0.99	1.01	1.04
Camden	1.03	1.04	1.05
Cape May	1.03	1.03	1.04
Cumberland	1.03	1.03	1.01
Essex	1.01	1.03	1.06
Gloucester	1.05	1.06	1.06
Hudson	1.03	1.05	1.09
Hunterdon	1.02	1.05	1.13
Mercer	1.01	1.02	1.04
Middlesex	1.00	1.01	1.03
Monmouth	1.00	1.01	1.02
Morris	1.01	1.03	1.06
Ocean	1.00	1.01	1.03
Passaic	1.00	1.02	1.05
Salem	1.02	1.03	1.03
Somerset	1.00	1.03	1.09
Sussex	1.03	1.04	1.07
Union	1.01	1.03	1.06
Warren	1.02	1.07	1.15

Future Precipitation Change Factors at N.J.A.C. 7:8-5.7(d) as Table 5-6

County	Future Precipitation Change Factors		
	2-year Design Storm	10-year Design Storm	100-year Design Storm
Atlantic	1.22	1.24	1.39
Bergen	1.20	1.23	1.37
Burlington	1.17	1.18	1.32
Camden	1.18	1.22	1.39
Cape May	1.21	1.24	1.32
Cumberland	1.20	1.21	1.39
Essex	1.19	1.22	1.33
Gloucester	1.19	1.23	1.41
Hudson	1.19	1.19	1.23
Hunterdon	1.19	1.23	1.42
Mercer	1.16	1.17	1.36
Middlesex	1.19	1.21	1.33
Monmouth	1.19	1.19	1.26
Morris	1.23	1.28	1.46
Ocean	1.18	1.19	1.24
Passaic	1.21	1.27	1.50
Salem	1.20	1.23	1.32
Somerset	1.19	1.24	1.48
Sussex	1.24	1.29	1.50
Union	1.20	1.23	1.35
Warren	1.20	1.25	1.37

Figure 6-4: Examples of Depths to Upper (dBMPu) and Lower (dEXC) Levels of Recharge BMP



In using the BMP Calculations worksheet, it is important to note that, by default, the NJGRS takes the values from the Annual Recharge worksheet for the Post-Development Recharge Deficit Volume (Cell K24) and the Total Impervious Area (Cell M23) and specifies them as initial values on the BMP Calculations worksheet for the Post-Development Deficit Recharge (variable Vdef in Cell C14) and Post-Development Impervious Area (variable Aimp in Cell C15). This allows solution of the site's total recharge deficit by a

Appendix H