STORMWATER MANAGEMENT REPORT

prepared for

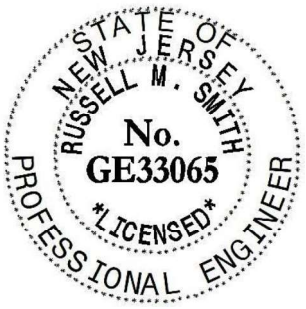
Nexus Spruce Street Apartments
Preliminary and Final Site Plan
Township of Lawrence
Mercer County, New Jersey

Lot 39 in Block 701

November 18, 2021

Prepared by
Hopewell Valley Engineering, P.C.
P.O. Box 710
Pennington, NJ 08534

HVE Project No. 1107537C



Russell M. Smith, P.E.
New Jersey License No. 33065

Digitally signed by
Russell M Smith
Date: 2021.11.23
11:11:11 -05'00'

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Project Description and Methodology

The applicant proposes to improve the existing developed site into 129 one (1), two (2), and three (3) bedroom apartments in five (5) three (3) story buildings. A 3,600 SF Community Building is also proposed. The site will be served by a boulevard-style driveway that connects to Spruce Street. Parking will be provided around the buildings in paved lots with perpendicular and parallel parking spaces. A total of 246 parking spaces are proposed.

The soil survey identifies that the existing soils are Udorthents, 0% to 8% slopes and Elkton Silt Loam, 0% to 2% slopes. These soils are classified as Hydrologic Soil Group D and C/D respectively. We will use HSG "D" for the calculations.

A. Hydrologic Soil Condition
   - Use "Good" condition for all pervious areas

B. Design Storms
   - 1 yr. Water Quality (NJDEP design storm)
   - 2 yr. storm, Region C, 24 hour (Allowable Discharge = 50% of pre-developed flow)
   - 10 yr. storm, Region C, 24 hour (Allowable Discharge = 75% of pre-developed flow)
   - 100 yr. storm, Region C, 24 hour (Allowable Discharge = 80% of pre-developed flow)

The stormwater plan for the project will incorporate the "green infrastructure" measure of Filterra Bioretention Systems to provide water quality treatment. This configuration was modeled using the Bentley Pond Pack program. A combination extended detention basin and infiltration basin (Green Infrastructure) will be used to provide quantity control. Soil testing completed in the area of the basin showed permeability rates in loamy sand layers of 2 to 4.5 in/hr. A seasonal high water table was found at elevation 71. Soil testing results are included in Appendix A of this report.

The proposed project will not create an annual recharge deficit per GSR-32 calculation and, therefore, groundwater recharge measures are not required.

The existing and developed Drainage Area Plans are included in Appendix B of this report.

SITE AERIAL IMAGE

REFERENCE:
NEW JERSEY 2015 HIGH RESOLUTION ORTHOPHOTOGRAPHY, https://njgin.state.nj.us/ ACCESSED 07/01/20

HOPEWELL VALLEY ENGINEERING, PC
ENGINEERS, PLANNERS & LAND SURVEYORS
1600 Reed Road, Suite A
Pennington, NJ 08534-5002
Tel.: 609-745-5800
Fax: 609-745-5807
www.hopewellvalleyengineering.com

Date:	05/07/20
Scale:	1"=200'
Job No:	1106672A
Drawing:	AM01672A

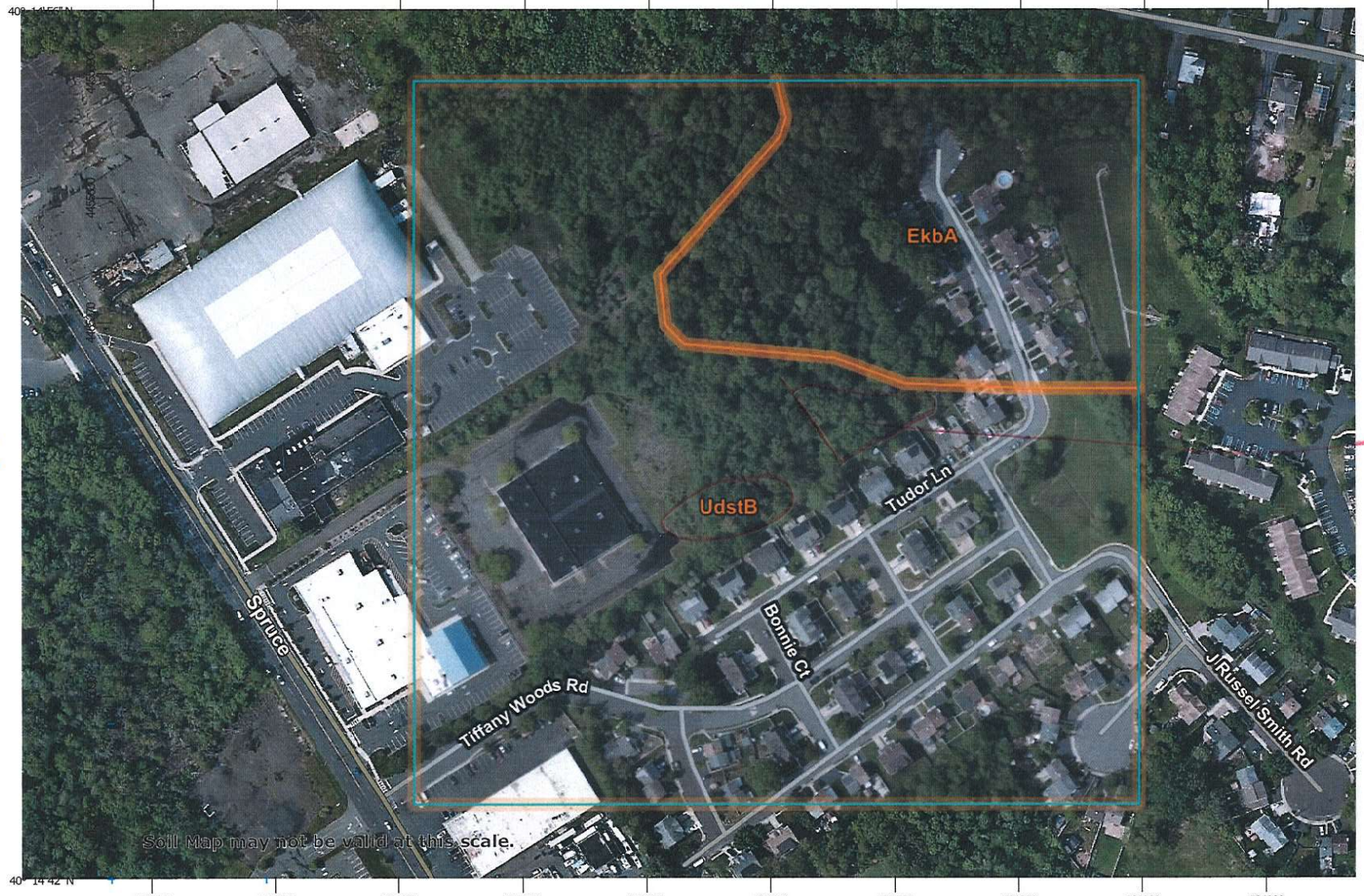
SITE AERIAL IMAGE

FOR

SPRUCE STREET APARTMENTS
LOT 39 BLOCK 70

SITUATE IN

LAWRENCE TOWNSHIP, MERCER COUNTY, NEW JERSEY



74° 45' 18" W
74° 44' 51" W
40° 14' 56" N
40° 14' 42" N
520840 520900 520960 521020 521080 521140 521200 521260 521320 521380 521440
4455390 4455330 4455270 4455210 4455150 4455090 4455030

STORM BASIN

Map Scale: 1:2,950 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Mercer County, New Jersey
Survey Area Data: Version 16, Jun 1, 2020

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

Date(s) aerial images were photographed: May 2, 2019—Jul 9, 2019

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

Mercer County, New Jersey

UdstB—Udorthents, stratified substratum, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 4jq2
Elevation: 30 to 1,500 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, stratified substratum, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Stratified Substratum

Setting

Landform: Low hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy lateral spread deposits over gravelly lateral spread deposits

Typical profile

A - 0 to 10 inches: sand
C - 10 to 72 inches: gravelly coarse sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Urban land

Percent of map unit: 5 percent
Landform: Low hills
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: Unranked

Data Source Information

Soil Survey Area: Mercer County, New Jersey
Survey Area Data: Version 16, Jun 1, 2020

Mercer County, New Jersey

EkbA—Elkton silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 4jmh
Elevation: 0 to 200 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Farmland of statewide importance, if drained

Map Unit Composition

Elkton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Elkton

Setting

Landform: Marine terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty eolian deposits over loamy alluvium and/or loamy marine deposits

Typical profile

Ap - 0 to 6 inches: silt loam
BAg - 6 to 10 inches: silty clay
Btg - 10 to 25 inches: clay
Cg - 25 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Fallsington

Percent of map unit: 5 percent
Landform: Flats, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Woodstown

Percent of map unit: 5 percent
Landform: Flats, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Keyport

Percent of map unit: 5 percent
Landform: Depressions, flats
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Mercer County, New Jersey
Survey Area Data: Version 16, Jun 1, 2020

Routing Summary Sheet

Determine Allowable Basin Outflow

Existing Drainage Areas

	A + B = Total Existing	Allowable Discharge
2 YEAR Storm	12 cfs + 0.8 cfs = 12.8 cfs	12.8 cfs x 50% = 6.4 cfs
10 YEAR Storm	22.3 cfs + 1.5 cfs = 23.8 cfs	23.8 cfs x 75% = 17.9 cfs
100 YEAR Storm	42.7 cfs + 3 cfs = 45.7 cfs	45.7 cfs x 80% = 36.6 cfs

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Proposed Basin Outflow with Infiltration plus Undetained Areas A & B

2 YEAR Storm	=	5.13 cfs	vs.	6.4 cfs allowable
10 YEAR Storm	=	16.06 cfs	vs.	17.9 cfs allowable
100 YEAR Storm	=	36.15 cfs	vs.	36.6 cfs allowable

Proposed Basin Outflow without Infiltration plus Undetained Areas A & B

2 YEAR Storm	=	6.01 cfs	vs.	6.4 cfs allowable
10 YEAR Storm	=	17.34 cfs	vs.	17.9 cfs allowable
100 YEAR Storm	=	36.41 cfs	vs.	36.6 cfs allowable

ROUTING SUMMARY SHEET

Existing and Proposed Flow to POA C

	Existing	Proposed
2 YEAR Storm	1.28 cfs	0.74 cfs
10 YEAR Storm	2.0 cfs	0.93 cfs
100 YEAR Storm	3.38 cfs	1.43 cfs

EXISTING POA A, B & C
FLOW CALCULATIONS

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open Space- Good condition; grass c	80	.740			80.00
Woods-Good Condition	77	3.740			77.00
Impervious-Roof/Parking	98	1.820			98.00
COMPOSITE AREA & WEIGHTED CN --->		6.300			83.42 (83)

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Shallow

Hydraulic Length 180.00 ft
Slope .004000 ft/ft
Paved

Avg.Velocity 1.29 ft/sec

Segment #1 Time: .0389 hrs

Segment #2: Tc: TR-55 Sheet

Mannings n .2400
Hydraulic Length 20.00 ft
2yr, 24hr P 3.3000 in
Slope .020000 ft/ft

Avg.Velocity .09 ft/sec

Segment #2 Time: .0646 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length 560.00 ft
Slope .022000 ft/ft
Unpaved

Avg.Velocity 2.39 ft/sec

Segment #3 Time: .0650 hrs

==========
Total Tc: .1685 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

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

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

Tc = (Lf / V) / (3600sec/hr)

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

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1.9999 hrs Rain Depth = 1.2500 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - NJDEP Water Qual
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA A 1
Tc = .1685 hrs
Drainage Area = 6.300 acres Runoff CN= 83

==========
Computational Time Increment = .02247 hrs
Computed Peak Time = 1.1684 hrs
Computed Peak Flow = 3.77 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 1.1500 hrs
Peak Flow, Interpolated Output = 3.67 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:EXIST TO POA A
CN = 83
Area = 6.300 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

.2445 in
.128 ac-ft

HYG Volume... .128 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16852 hrs (ID: EXIST TO POA A)
Computational Incr, Tm = .02247 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 42.36 cfs
Unit peak time Tp = .11235 hrs
Unit receding limb, Tr = .44938 hrs
Total unit time, Tb = .56173 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA A 2
Tc = .1685 hrs
Drainage Area = 6.300 acres Runoff CN= 83

==========
Computational Time Increment = .02247 hrs
Computed Peak Time = 12.1559 hrs
Computed Peak Flow = 12.02 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 11.93 cfs
==========

DRAINAGE AREA

ID:EXIST TO POA A
CN = 83
Area = 6.300 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

1.6916 in
.888 ac-ft

HYG Volume... .888 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16852 hrs (ID: EXIST TO POA A)
Computational Incr, Tm = .02247 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 42.36 cfs
Unit peak time Tp = .11235 hrs
Unit receding limb, Tr = .44938 hrs
Total unit time, Tb = .56173 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA A 10
Tc = .1685 hrs
Drainage Area = 6.300 acres Runoff CN= 83

==========
Computational Time Increment = .02247 hrs
Computed Peak Time = 12.1559 hrs
Computed Peak Flow = 22.30 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 22.18 cfs
==========

DRAINAGE AREA

ID:EXIST TO POA A
CN = 83
Area = 6.300 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

3.1741 in
1.666 ac-ft

HYG Volume... 1.666 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16852 hrs (ID: EXIST TO POA A)
Computational Incr, Tm = .02247 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 42.36 cfs
Unit peak time Tp = .11235 hrs
Unit receding limb, Tr = .44938 hrs
Total unit time, Tb = .56173 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA A 100
Tc = .1685 hrs
Drainage Area = 6.300 acres Runoff CN= 83

==========
Computational Time Increment = .02247 hrs
Computed Peak Time = 12.1559 hrs
Computed Peak Flow = 42.66 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 42.48 cfs
==========

DRAINAGE AREA

ID:EXIST TO POA A
CN = 83
Area = 6.300 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

6.2643 in
3.289 ac-ft

HYG Volume... 3.289 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16852 hrs (ID: EXIST TO POA A)
Computational Incr, Tm = .02247 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 42.36 cfs
Unit peak time Tp = .11235 hrs
Unit receding limb, Tr = .44938 hrs
Total unit time, Tb = .56173 hrs

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Woods- Good condition	77	.190			77.00
Open Space-Good condition	80	.240			80.00
COMPOSITE AREA & WEIGHTED CN --->		.430			78.67 (79)

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400	
Hydraulic Length	70.00	ft
2yr, 24hr P	3.3000	in
Slope	.043000	ft/ft

Avg.Velocity .15 ft/sec

Segment #1 Time: .1296 hrs

==========
Total Tc: .1296 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1.9999 hrs Rain Depth = 1.2500 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - NJDEP Water Qual
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA B 1
Tc = .1296 hrs
Drainage Area = .430 acres Runoff CN= 79

==========

Computational Time Increment	=	.01728 hrs
Computed Peak Time	=	1.1580 hrs
Computed Peak Flow	=	.16 cfs
Time Increment for HYG File	=	.0500 hrs
Peak Time, Interpolated Output	=	1.1500 hrs
Peak Flow, Interpolated Output	=	.16 cfs

==========

DRAINAGE AREA

ID:EXIST TO POA B
CN = 79
Area = .430 acres
S = 2.6582 in
0.2S = .5316 in

Cumulative Runoff

.1528 in
.005 ac-ft

HYG Volume... .005 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12963 hrs (ID: EXIST TO POA B)
Computational Incr, Tm = .01728 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	3.76 cfs
Unit peak time	Tp =	.08642 hrs
Unit receding limb,	Tr =	.34568 hrs
Total unit time,	Tb =	.43210 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA B 2
Tc = .1296 hrs
Drainage Area = .430 acres Runoff CN= 79

==========
Computational Time Increment = .01728 hrs
Computed Peak Time = 12.1333 hrs
Computed Peak Flow = .75 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = .73 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:EXIST TO POA B
CN = 79
Area = .430 acres
S = 2.6582 in
0.2S = .5316 in

Cumulative Runoff

1.4123 in
.051 ac-ft

HYG Volume... .051 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12963 hrs (ID: EXIST TO POA B)
Computational Incr, Tm = .01728 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.76 cfs
Unit peak time Tp = .08642 hrs
Unit receding limb, Tr = .34568 hrs
Total unit time, Tb = .43210 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA B 10
Tc = .1296 hrs
Drainage Area = .430 acres Runoff CN= 79

==========
Computational Time Increment = .01728 hrs
Computed Peak Time = 12.1333 hrs
Computed Peak Flow = 1.49 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 1.45 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:EXIST TO POA B
CN = 79
Area = .430 acres
S = 2.6582 in
0.2S = .5316 in

Cumulative Runoff

2.8017 in
.100 ac-ft

HYG Volume... .100 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12963 hrs (ID: EXIST TO POA B)
Computational Incr, Tm = .01728 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.76 cfs
Unit peak time Tp = .08642 hrs
Unit receding limb, Tr = .34568 hrs
Total unit time, Tb = .43210 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA B 100
Tc = .1296 hrs
Drainage Area = .430 acres Runoff CN= 79

==========
Computational Time Increment = .01728 hrs
Computed Peak Time = 12.1333 hrs
Computed Peak Flow = 2.99 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 2.90 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:EXIST TO POA B
CN = 79
Area = .430 acres
S = 2.6582 in
0.2S = .5316 in

Cumulative Runoff

5.7878 in
.207 ac-ft

HYG Volume... .207 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12963 hrs (ID: EXIST TO POA B)
Computational Incr, Tm = .01728 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.76 cfs
Unit peak time Tp = .08642 hrs
Unit receding limb, Tr = .34568 hrs
Total unit time, Tb = .43210 hrs

File.... F:\1107537A\1107537C\Design\Existing Flow to POA C.ppw

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	Impervious Adjustment %UC	Adjusted CN
Open Space- Good condition; grass c	80	.070			80.00
Impervious-Pavement	98	.340			98.00
COMPOSITE AREA & WEIGHTED CN --->		.410			94.93 (95)

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Shallow

Hydraulic Length	355.00	ft
Slope	.009000	ft/ft
Paved		
Avg.Velocity	1.93	ft/sec

Segment #1 Time: .0511 hrs

Segment #2: Tc: TR-55 Sheet

Mannings n	.2400	
Hydraulic Length	25.00	ft
2yr, 24hr P	3.3000	in
Slope	.020000	ft/ft
Avg.Velocity	.09	ft/sec

Segment #2 Time: .0773 hrs

Segment #3: Tc: TR-55 Channel

Flow Area	.6100	sq.ft
Wetted Perimeter	1.96	ft
Hydraulic Radius	.31	ft
Slope	.032000	ft/ft
Mannings n	.0130	
Hydraulic Length	65.00	ft
Avg.Velocity	9.42	ft/sec

Segment #3 Time: .0019 hrs

==========
Total Tc: .1303 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

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

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

Tc = (Lf / V) / (3600sec/hr)

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

==== SCS Channel Flow ==

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

Tc = (Lf / V) / (3600sec/hr)

Where: R = Hydraulic radius
Aq = Flow area, sq.ft.
Wp = Wetted perimeter, ft
V = Velocity, ft/sec
Sf = Slope, ft/ft
n = Mannings n
Tc = Time of concentration, hrs
Lf = Flow length, ft

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1.9999 hrs Rain Depth = 1.2500 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - NJDEP Water Qual
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA C 1
Tc = .1303 hrs
Drainage Area = .410 acres Runoff CN= 95

==========
Computational Time Increment = .01737 hrs
Computed Peak Time = 1.1120 hrs
Computed Peak Flow = .92 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 1.1000 hrs
Peak Flow, Interpolated Output = .91 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:EXIST TO POA C
CN = 95
Area = .410 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

.7842 in
.027 ac-ft

HYG Volume... .027 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .13031 hrs (ID: EXIST TO POA C)
Computational Incr, Tm = .01737 hrs - 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.56 cfs
Unit peak time Tp = .08687 hrs
Unit receding limb, Tr = .34749 hrs
Total unit time, Tb = .43437 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA C 2
Tc = .1303 hrs
Drainage Area = .410 acres Runoff CN= 95

==========
Computational Time Increment = .01737 hrs
Computed Peak Time = 12.1275 hrs
Computed Peak Flow = 1.28 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 1.23 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:EXIST TO POA C
CN = 95
Area = .410 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

2.7429 in
.094 ac-ft

HYG Volume... .094 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .13031 hrs (ID: EXIST TO POA C)
Computational Incr, Tm = .01737 hrs - 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.56 cfs
Unit peak time Tp = .08687 hrs
Unit receding limb, Tr = .34749 hrs
Total unit time, Tb = .43437 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA C 10
Tc = .1303 hrs
Drainage Area = .410 acres Runoff CN= 95

==========
Computational Time Increment = .01737 hrs
Computed Peak Time = 12.1275 hrs
Computed Peak Flow = 2.00 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 1.92 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:EXIST TO POA C
CN = 95
Area = .410 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

4.4195 in
.151 ac-ft

HYG Volume... .151 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .13031 hrs (ID: EXIST TO POA C)
Computational Incr, Tm = .01737 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.56 cfs
Unit peak time Tp = .08687 hrs
Unit receding limb, Tr = .34749 hrs
Total unit time, Tb = .43437 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Existing.HYG - EXIST TO POA C 100
Tc = .1303 hrs
Drainage Area = .410 acres Runoff CN= 95

Computational Time Increment = .01737 hrs
Computed Peak Time = 12.1275 hrs
Computed Peak Flow = 3.38 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1500 hrs
Peak Flow, Interpolated Output = 3.25 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%

==========

DRAINAGE AREA

ID:EXIST TO POA C
CN = 95
Area = .410 acres
S = .5263 in
0.2S = .1053 in

Cumulative Runoff

7.7002 in
.263 ac-ft

HYG Volume... .263 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .13031 hrs (ID: EXIST TO POA C)
Computational Incr, Tm = .01737 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.56 cfs
Unit peak time Tp = .08687 hrs
Unit receding limb, Tr = .34749 hrs
Total unit time, Tb = .43437 hrs

PROPOSED BASIN AND POA C
FLOW CALCULATIONS

FLOW TO BASIN POA A & POA B

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious-Building/Pavement/Walks/	98	4.280			98.00
Open Space + 50% Basin	80	1.070			80.00
COMPOSITE AREA & WEIGHTED CN --->		5.350			94.40 (94)

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0240
Hydraulic Length	55.00 ft
2yr, 24hr P	3.3000 in
Slope	.020000 ft/ft
Avg.Velocity	.66 ft/sec

Segment #1 Time: .0230 hrs

Segment #2: Tc: TR-55 Channel

Flow Area	.6100 sq.ft
Wetted Perimeter	1.96 ft
Hydraulic Radius	.31 ft
Slope	.010000 ft/ft
Mannings n	.0130
Hydraulic Length	245.00 ft
Avg.Velocity	5.26 ft/sec

Segment #2 Time: .0129 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	240.00 ft
Slope	.010000 ft/ft
Paved	
Avg.Velocity	2.03 ft/sec

Segment #3 Time: .0328 hrs

==========
Total Tc: .0687 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

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

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

Tc = (Lf / V) / (3600sec/hr)

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

==== SCS Channel Flow ==

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

Tc = (Lf / V) / (3600sec/hr)

Where: R = Hydraulic radius
Aq = Flow area, sq.ft.
Wp = Wetted perimeter, ft
V = Velocity, ft/sec
Sf = Slope, ft/ft
n = Mannings n
Tc = Time of concentration, hrs
Lf = Flow length, ft

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1.9999 hrs Rain Depth = 1.2500 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - NJDEP Water Qual
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - DEVELOPED 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = 5.350 acres Runoff CN= 94

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 1.1000 hrs
Computed Peak Flow = 12.19 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 1.1000 hrs
Peak Flow, Interpolated Output = 12.19 cfs
==========

DRAINAGE AREA

ID:DEVELOPED
CN = 94
Area = 5.350 acres
S = .6383 in
0.2S = .1277 in

Cumulative Runoff

.7154 in
13894 cu.ft

HYG Volume... 13908 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: DEVELOPED)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 72.74 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3100 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - DEVELOPED 2
Tc (Min. Tc) = .0833 hrs
Drainage Area = 5.350 acres Runoff CN= 94

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1106 hrs
Computed Peak Flow = 18.13 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 17.93 cfs
==========

DRAINAGE AREA

ID:DEVELOPED
CN = 94
Area = 5.350 acres
S = .6383 in
0.2S = .1277 in

Cumulative Runoff

2.6507 in
51478 cu.ft

HYG Volume... 51476 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: DEVELOPED)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 72.74 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0100 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - DEVELOPED 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = 5.350 acres Runoff CN= 94

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1106 hrs
Computed Peak Flow = 28.59 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 28.31 cfs
==========

DRAINAGE AREA

ID:DEVELOPED
CN = 94
Area = 5.350 acres
S = .6383 in
0.2S = .1277 in

Cumulative Runoff

4.3178 in
83855 cu.ft

HYG Volume... 83853 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: DEVELOPED)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 72.74 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3300 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - DEVELOPED 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = 5.350 acres Runoff CN= 94

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1106 hrs
Computed Peak Flow = 48.72 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 48.28 cfs
==========

DRAINAGE AREA

ID:DEVELOPED
CN = 94
Area = 5.350 acres
S = .6383 in
0.2S = .1277 in

Cumulative Runoff

7.6101 in
147793 cu.ft

HYG Volume... 147791 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: DEVELOPED)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 72.74 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

UNDETAINED FLOW TO POA A

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Woods-Good condition	77	1.090			77.00
COMPOSITE AREA & WEIGHTED CN --->		1.090			77.00 (77)

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.4000
Hydraulic Length	150.00 ft
2yr, 24hr P	3.3000 in
Slope	.043000 ft/ft
Avg.Velocity	.12 ft/sec

Segment #1 Time: .3589 hrs

Total Tc: .3589 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1.9999 hrs Rain Depth = 1.2500 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - NJDEP Water Qual
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - UNDET A 1
Tc = .3589 hrs
Drainage Area = 1.090 acres Runoff CN= 77

==========
Computational Time Increment = .04785 hrs
Computed Peak Time = 1.3878 hrs
Computed Peak Flow = .18 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 1.3500 hrs
Peak Flow, Interpolated Output = .18 cfs
==========

DRAINAGE AREA

ID:UNDET A
CN = 77
Area = 1.090 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff

.1170 in
463 cu.ft

HYG Volume... 462 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .35890 hrs (ID: UNDET A)
Computational Incr, Tm = .04785 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.44 cfs
Unit peak time Tp = .23927 hrs
Unit receding limb, Tr = .95707 hrs
Total unit time, Tb = 1.19634 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3100 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - UNDET A 2
Tc = .3589 hrs
Drainage Area = 1.090 acres Runoff CN= 77

==========
Computational Time Increment = .04785 hrs
Computed Peak Time = 12.2984 hrs
Computed Peak Flow = 1.12 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.3000 hrs
Peak Flow, Interpolated Output = 1.12 cfs
==========

DRAINAGE AREA

ID:UNDET A
CN = 77
Area = 1.090 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff

1.2910 in
5108 cu.ft

HYG Volume... 5112 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .35890 hrs (ID: UNDET A)
Computational Incr, Tm = .04785 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.44 cfs
Unit peak time Tp = .23927 hrs
Unit receding limb, Tr = .95707 hrs
Total unit time, Tb = 1.19634 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0100 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - UNDET A 10
Tc = .3589 hrs
Drainage Area = 1.090 acres Runoff CN= 77

==========
Computational Time Increment = .04785 hrs
Computed Peak Time = 12.2505 hrs
Computed Peak Flow = 2.34 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2500 hrs
Peak Flow, Interpolated Output = 2.34 cfs
==========

DRAINAGE AREA

ID:UNDET A
CN = 77
Area = 1.090 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff

2.6314 in
10411 cu.ft

HYG Volume... 10419 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .35890 hrs (ID: UNDET A)
Computational Incr, Tm = .04785 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.44 cfs
Unit peak time Tp = .23927 hrs
Unit receding limb, Tr = .95707 hrs
Total unit time, Tb = 1.19634 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3300 in
Rain Dir - F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - UNDET A 100
Tc = .3589 hrs
Drainage Area = 1.090 acres Runoff CN= 77

==========
Computational Time Increment = .04785 hrs
Computed Peak Time = 12.2505 hrs
Computed Peak Flow = 4.93 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.2500 hrs
Peak Flow, Interpolated Output = 4.92 cfs
==========

DRAINAGE AREA

ID:UNDET A
CN = 77
Area = 1.090 acres
S = 2.9870 in
0.2S = .5974 in

Cumulative Runoff

5.5779 in
22070 cu.ft

HYG Volume... 22087 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .35890 hrs (ID: UNDET A)
Computational Incr, Tm = .04785 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 3.44 cfs
Unit peak time Tp = .23927 hrs
Unit receding limb, Tr = .95707 hrs
Total unit time, Tb = 1.19634 hrs

UNDETAINED FLOW TO POA B

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open Space-Good Condition	80	.380			80.00
COMPOSITE AREA & WEIGHTED CN --->		.380			80.00 (80)

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400	
Hydraulic Length	25.00	ft
2yr, 24hr P	3.3000	in
Slope	.080000	ft/ft

Avg.Velocity .16 ft/sec

Segment #1 Time: .0444 hrs

==========
Total Tc: .0444 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1.9999 hrs Rain Depth = 1.2500 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - NJDEP Water Qual
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - UNDET B 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .380 acres Runoff CN= 80

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 1.1111 hrs
Computed Peak Flow = .20 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 1.1000 hrs
Peak Flow, Interpolated Output = .19 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:UNDET B
CN = 80
Area = .380 acres
S = 2.5000 in
0.2S = .5000 in

Cumulative Runoff

.1731 in
239 cu.ft

HYG Volume... 239 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: UNDET B)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.17 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3100 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - UNDET B 2
Tc (Min. Tc) = .0833 hrs
Drainage Area = .380 acres Runoff CN= 80

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1106 hrs
Computed Peak Flow = .78 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = .76 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:UNDET B
CN = 80
Area = .380 acres
S = 2.5000 in
0.2S = .5000 in

Cumulative Runoff

1.4870 in
2051 cu.ft

HYG Volume... 2051 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: UNDET B)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.17 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0100 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - UNDET B 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .380 acres Runoff CN= 80

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1106 hrs
Computed Peak Flow = 1.51 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 1.48 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:UNDET B
CN = 80
Area = .380 acres
S = 2.5000 in
0.2S = .5000 in

Cumulative Runoff

2.9016 in
4002 cu.ft

HYG Volume... 4002 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: UNDET B)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.17 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3300 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Develope.HYG - UNDET B 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .380 acres Runoff CN= 80

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1106 hrs
Computed Peak Flow = 2.99 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 2.95 cfs
==========

DRAINAGE AREA

ID:UNDET B
CN = 80
Area = .380 acres
S = 2.5000 in
0.2S = .5000 in

Cumulative Runoff

5.9350 in
8187 cu.ft

HYG Volume... 8186 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: UNDET B)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 5.17 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

BASIN VOLUME/INFILTRATION AREA

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	Volume (cu.ft)	Volume Sum (cu.ft)	Stormtech 136 Chambers	Total (cu.ft)
78.50	-----	0	0	0	0	0	0
79.00	-----	6410	6410	1068	1068	919	1987
80.00	-----	7989	21555	7185	8253	4,791	13,044
81.00	-----	10350	27432	9144	17397	8,114	25,511
82.00	-----	12870	34761	11587	28985	10,186	39,171
83.00	-----	15840	42988	14329	43314	11,105	54,419

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Project:

Chamber Model -	SC-740	
Units -	Imperial	Click Here for Metric
Number of chambers -	136	
Voids in the stone (porosity) -	40	%
Base of STONE Elevation -	78.50	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	6	in
Area of system -	4597	sf

Include Perimeter Stone in Calculations

Min. Area - 4597 sf min. area

8 rows w/17 chambers each

StormTech SC-740 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)
48	0.00	0.00	153.23	153.23	11104.79	82.50
47	0.00	0.00	153.23	153.23	10951.56	82.42
46	0.00	0.00	153.23	153.23	10798.32	82.33
45	0.00	0.00	153.23	153.23	10645.09	82.25
44	0.00	0.00	153.23	153.23	10491.86	82.17
43	0.00	0.00	153.23	153.23	10338.62	82.08
42	0.00	0.00	153.23	153.23	10185.39	82.00
41	0.00	0.00	153.23	153.23	10032.16	81.92
40	0.00	0.00	153.23	153.23	9878.92	81.83
39	0.00	0.00	153.23	153.23	9725.69	81.75
38	0.00	0.00	153.23	153.23	9572.46	81.67
37	0.00	0.00	153.23	153.23	9419.22	81.58
36	0.05	7.48	150.24	157.72	9265.99	81.50
35	0.16	22.16	144.37	166.53	9108.27	81.42
34	0.28	38.34	137.90	176.24	8941.74	81.33
33	0.60	82.14	120.38	202.52	8765.50	81.25
32	0.80	109.03	109.62	218.65	8562.98	81.17
31	0.95	129.29	101.52	230.81	8344.33	81.08
30	1.07	146.13	94.78	240.91	8113.52	81.00
29	1.18	160.55	89.01	249.56	7872.61	80.92
28	1.27	172.13	84.38	256.51	7623.05	80.83
27	1.36	184.28	79.52	263.80	7366.54	80.75
26	1.45	197.76	74.13	271.89	7102.73	80.67
25	1.52	207.36	70.29	277.65	6830.85	80.58
24	1.58	215.20	67.15	282.35	6553.20	80.50
23	1.64	223.35	63.89	287.24	6270.84	80.42
22	1.70	231.13	60.78	291.91	5983.60	80.33
21	1.75	238.40	57.87	296.27	5691.69	80.25
20	1.80	245.18	55.16	300.34	5395.41	80.17
19	1.85	252.28	52.32	304.60	5095.07	80.08
18	1.89	257.46	50.25	307.71	4790.47	80.00
17	1.93	263.02	48.02	311.05	4482.76	79.92
16	1.97	268.60	45.79	314.39	4171.71	79.83
15	2.01	273.35	43.89	317.24	3857.32	79.75
14	2.04	278.12	41.99	320.10	3540.08	79.67
13	2.07	282.19	40.36	322.55	3219.97	79.58
12	2.10	286.27	38.73	324.99	2897.42	79.50
11	2.13	289.92	37.26	327.19	2572.43	79.42
10	2.15	292.92	36.06	328.99	2245.24	79.33
9	2.18	296.08	34.80	330.88	1916.25	79.25
8	2.20	298.98	33.64	332.62	1585.37	79.17
7	2.21	300.20	33.15	333.35	1252.75	79.08
6	0.00	0.00	153.23	153.23	919.40	79.00
5	0.00	0.00	153.23	153.23	766.17	78.92
4	0.00	0.00	153.23	153.23	612.93	78.83
3	0.00	0.00	153.23	153.23	459.70	78.75
2	0.00	0.00	153.23	153.23	306.47	78.67
1	0.00	0.00	153.23	153.23	153.23	78.58
					0	78.5

BASIN OUTFLOW STRUCTURES WITH INFILTRATION

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 78.50 ft
Increment = .10 ft
Max. Elev.= 83.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	2A	--->	TW	78.500	83.000
Orifice-Circular	1A	--->	TW	79.000	83.000
Weir-Rectangular	2C	--->	TW	80.200	83.000
Weir-Rectangular	1C	--->	TW	80.200	83.000
Weir-Rectangular	2B	--->	TW	81.000	83.000
Weir-Rectangular	1B	--->	TW	81.000	83.000

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = 2A
Structure Type = Orifice-Circular

# of Openings	=	1
Invert Elev.	=	78.50 ft
Diameter	=	.2500 ft
Orifice Coeff.	=	.600

Structure ID = 1A
Structure Type = Orifice-Circular

# of Openings	=	1
Invert Elev.	=	79.00 ft
Diameter	=	.2500 ft
Orifice Coeff.	=	.600

Structure ID = 2C
Structure Type = Weir-Rectangular

# of Openings	=	1
Crest Elev.	=	80.20 ft
Weir Length	=	1.35 ft
Weir Coeff.	=	3.330000

Weir TW effects (Use adjustment equation)

OUTLET STRUCTURE INPUT DATA

Structure ID = 1C
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 80.20 ft
Weir Length = 1.35 ft
Weir Coeff. = 3.330000

Weir TW effects (Use adjustment equation)

Structure ID = 2B
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 81.00 ft
Weir Length = 1.75 ft
Weir Coeff. = 3.330000

Weir TW effects (Use adjustment equation)

Structure ID = 1B
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 81.00 ft
Weir Length = 1.75 ft
Weir Coeff. = 3.330000

Weir TW effects (Use adjustment equation)

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

CALCULATE INFILTRATION RATE

Infiltration Area (Sand Bed) = 6,410 SF

Permeability Rate = 2 in/hr./2 (Safety Factor)

= 1 in./hr. (1 ft./12 in.)(1 hr./60 min.)(1 min./60 sec.)

= 0.000023 ft./sec.

Rate = (6,410 SF)(0.000023 ft./sec.)

= 0.15 cfs

BASIN OUTFLOW STRUCTURES WITHOUT INFILTRATION

- Assume No Infiltration

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 78.50 ft
Increment = .10 ft
Max. Elev.= 83.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	2A	--->	TW	78.500	83.000
Orifice-Circular	1A	--->	TW	79.000	83.000
Weir-Rectangular	2C	--->	TW	80.200	83.000
Weir-Rectangular	1C	--->	TW	80.200	83.000
Weir-Rectangular	2B	--->	TW	81.000	83.000
Weir-Rectangular	1B	--->	TW	81.000	83.000

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = 2A
Structure Type = Orifice-Circular

# of Openings	=	1
Invert Elev.	=	78.50 ft
Diameter	=	.2500 ft
Orifice Coeff.	=	.600

Structure ID = 1A
Structure Type = Orifice-Circular

# of Openings	=	1
Invert Elev.	=	79.00 ft
Diameter	=	.2500 ft
Orifice Coeff.	=	.600

Structure ID = 2C
Structure Type = Weir-Rectangular

# of Openings	=	1
Crest Elev.	=	80.20 ft
Weir Length	=	1.35 ft
Weir Coeff.	=	3.330000

Weir TW effects (Use adjustment equation)

OUTLET STRUCTURE INPUT DATA

Structure ID = 1C
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 80.20 ft
Weir Length = 1.35 ft
Weir Coeff. = 3.330000

Weir TW effects (Use adjustment equation)

Structure ID = 2B
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 81.00 ft
Weir Length = 1.75 ft
Weir Coeff. = 3.330000

Weir TW effects (Use adjustment equation)

Structure ID = 1B
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 81.00 ft
Weir Length = 1.75 ft
Weir Coeff. = 3.330000

Weir TW effects (Use adjustment equation)

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

STORM SUMMARY & BASIN ROUTINGS WITH INFILTRATION

MASTER DESIGN STORM SUMMARY

Network Storm Collection: TR55

Return Event	Total Depth in	Rainfall Type	RNF ID
2	3.3100	Synthetic Curve	Region C 24hr
10	5.0100	Synthetic Curve	Region C 24hr
100	8.3300	Synthetic Curve	Region C 24hr
1	1.2500	Time-Depth Curve	NJDEP Water Qual

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
BAS+136 CHAMBIN	POND	2	51477		12.1000	17.93		
BAS+136 CHAMBIN	POND	10	83854		12.1000	28.31		
BAS+136 CHAMBIN	POND	100	147792		12.1000	48.28		
BAS+136 CHAMBIN	POND	1	14288		1.1000	12.19		
BAS+136 CHAMBOUT	POND	2	38882		12.4000	3.91	80.74	22235
BAS+136 CHAMBOUT	POND	10	69257		12.2000	13.15	81.39	30887
BAS+136 CHAMBOUT	POND	100	131116		12.2000	30.09	82.12	41050
BAS+136 CHAMBOUT	POND	1	8972		1.8000	.48	79.91	12020
DEVELOPED	AREA	2	51477		12.1000	17.93		
DEVELOPED	AREA	10	83854		12.1000	28.31		
DEVELOPED	AREA	100	147792		12.1000	48.28		
DEVELOPED	AREA	1	14288		1.1000	12.19		

Basin Outflow

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
*OUTFALL	JCT	2	46042		12.3000	5.13		
*OUTFALL	JCT	10	83677		12.2000	16.06		
*OUTFALL	JCT	100	161388		12.2000	36.15		
*OUTFALL	JCT	1	9676		1.4000	.68		
UNDET A	AREA	2	5112		12.3000	1.12		
UNDET A	AREA	10	10420		12.3000	2.31		
UNDET A	AREA	100	22088		12.3000	4.82		
UNDET A	AREA	1	462		1.4000	.18		
UNDET B	AREA	2	2051		12.1000	.76		
UNDET B	AREA	10	4002		12.1000	1.48		
UNDET B	AREA	100	8186		12.1000	2.95		
UNDET B	AREA	1	243		1.1000	.19		

Total Flow @ POA A

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107537A\1107537C\Design\
Inflow HYG file = work_pad.hyg - BAS+136 CHAMBIN 1
Outflow HYG file = work_pad.hyg - BAS+136 CHAMBOUT 1

Pond Node Data = BAS+136 CHAMB
Pond Volume Data = BAS+136 CHAMB
Pond Outlet Data = Outlet 1

Infiltration = .15 cfs

INITIAL CONDITIONS

Starting WS Elev	=	78.50 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	12.19 cfs	at	1.1000 hrs
Peak Outflow	=	.48 cfs	at	1.8000 hrs
Peak Infiltration	=	.15 cfs	at	.9000 hrs
Peak Elevation	=	79.91 ft		
Peak Storage	=	12020 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	14288
- Infiltration	=	5309
- HYG Vol OUT	=	8972
- Retained Vol	=	7
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107537A\1107537C\Design\
Inflow HYG file = work_pad.hyg - BAS+136 CHAMBIN 2
Outflow HYG file = work_pad.hyg - BAS+136 CHAMBOUT 2

Pond Node Data = BAS+136 CHAMB
Pond Volume Data = BAS+136 CHAMB
Pond Outlet Data = Outlet 1

Infiltration = .15 cfs

INITIAL CONDITIONS

Starting WS Elev	=	78.50 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	17.93 cfs	at	12.1000 hrs
Peak Outflow	=	3.91 cfs	at	12.4000 hrs
Peak Infiltration	=	.15 cfs	at	8.0000 hrs
Peak Elevation	=	80.74 ft		
Peak Storage	=	22235 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	51477
- Infiltration	=	12589
- HYG Vol OUT	=	38882
- Retained Vol	=	6
Unrouted Vol	=	0 cu.ft (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107537A\1107537C\Design\
Inflow HYG file = work_pad.hyg - BAS+136 CHAMBIN 10
Outflow HYG file = work_pad.hyg - BAS+136 CHAMBOUT 10

Pond Node Data = BAS+136 CHAMB
Pond Volume Data = BAS+136 CHAMB
Pond Outlet Data = Outlet 1

Infiltration = .15 cfs

INITIAL CONDITIONS

Starting WS Elev	=	78.50 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	28.31 cfs	at	12.1000 hrs
Peak Outflow	=	13.15 cfs	at	12.2000 hrs
Peak Infiltration	=	.15 cfs	at	5.8000 hrs
Peak Elevation	=	81.39 ft		
Peak Storage	=	30887 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	83854
- Infiltration	=	14591
- HYG Vol OUT	=	69257
- Retained Vol	=	7
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107537A\1107537C\Design\
Inflow HYG file = work_pad.hyg - BAS+136 CHAMBIN 100
Outflow HYG file = work_pad.hyg - BAS+136 CHAMBOUT 100

Pond Node Data = BAS+136 CHAMB
Pond Volume Data = BAS+136 CHAMB
Pond Outlet Data = Outlet 1

Infiltration = .15 cfs

INITIAL CONDITIONS

Starting WS Elev	=	78.50 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	48.28 cfs	at	12.1000 hrs
Peak Outflow	=	30.09 cfs	at	12.2000 hrs
Peak Infiltration	=	.15 cfs	at	3.3000 hrs
Peak Elevation	=	82.12 ft		
Peak Storage	=	41050 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	147792
- Infiltration	=	16670
- HYG Vol OUT	=	131116
- Retained Vol	=	6
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

STORM SUMMARY & BASIN ROUTINGS WITHOUT INFILTRATION

MASTER DESIGN STORM SUMMARY

Network Storm Collection: TR55

Return Event	Total Depth in	Rainfall Type	RNF ID
2	3.3100	Synthetic Curve	Region C 24hr
10	5.0100	Synthetic Curve	Region C 24hr
100	8.3300	Synthetic Curve	Region C 24hr
1	1.2500	Time-Depth Curve	NJDEP Water Qual

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
BAS+136 CHAMBIN	POND	2	51477		12.1000	17.93		
BAS+136 CHAMBIN	POND	10	83854		12.1000	28.31		
BAS+136 CHAMBIN	POND	100	147792		12.1000	48.28		
BAS+136 CHAMBIN	POND	1	14288		1.1000	12.19		
BAS+136 CHAMBOUT	POND	2	51402		12.3000	4.64	80.82	23256
BAS+136 CHAMBOUT	POND	10	83778		12.2000	14.43	81.45	31714
BAS+136 CHAMBOUT	POND	100	147716		12.2000	30.35	82.13	41208
BAS+136 CHAMBOUT	POND	1	14213		1.8000	.49	79.96	12583
DEVELOPED	AREA	2	51477		12.1000	17.93		
DEVELOPED	AREA	10	83854		12.1000	28.31		
DEVELOPED	AREA	100	147792		12.1000	48.28		
DEVELOPED	AREA	1	14288		1.1000	12.19		

Basin Outflow

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
*OUTFALL	JCT	2	58564		12.3000	6.01		
*OUTFALL	JCT	10	98200		12.2000	17.34		
*OUTFALL	JCT	100	177990		12.2000	36.41		
*OUTFALL	JCT	1	14918		1.4000	.69		
UNDET A	AREA	2	5112		12.3000	1.12		
UNDET A	AREA	10	10420		12.3000	2.31		
UNDET A	AREA	100	22088		12.3000	4.82		
UNDET A	AREA	1	462		1.4000	.18		
UNDET B	AREA	2	2051		12.1000	.76		
UNDET B	AREA	10	4002		12.1000	1.48		
UNDET B	AREA	100	8186		12.1000	2.95		
UNDET B	AREA	1	243		1.1000	.19		

Total Flow @ POA A

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107537A\1107537C\Design\
Inflow HYG file = work_pad.hyg - BAS+136 CHAMBIN 1
Outflow HYG file = work_pad.hyg - BAS+136 CHAMBOUT 1

Pond Node Data = BAS+136 CHAMB
Pond Volume Data = BAS+136 CHAMB
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	78.50 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	12.19 cfs	at	1.1000 hrs
Peak Outflow	=	.49 cfs	at	1.8000 hrs
Peak Elevation	=	79.96 ft		
Peak Storage	=	12583 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	14288
- Infiltration	=	0
- HYG Vol OUT	=	14213
- Retained Vol	=	75
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107537A\1107537C\Design\
Inflow HYG file = work_pad.hyg - BAS+136 CHAMBIN 2
Outflow HYG file = work_pad.hyg - BAS+136 CHAMBOUT 2

Pond Node Data = BAS+136 CHAMB
Pond Volume Data = BAS+136 CHAMB
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	78.50 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	17.93 cfs	at	12.1000 hrs
Peak Outflow	=	4.64 cfs	at	12.3000 hrs
Peak Elevation	=	80.82 ft		
Peak Storage	=	23256 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	51477
- Infiltration	=	0
- HYG Vol OUT	=	51402
- Retained Vol	=	75
Unrouted Vol	=	0 cu.ft (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107537A\1107537C\Design\
Inflow HYG file = work_pad.hyg - BAS+136 CHAMBIN 10
Outflow HYG file = work_pad.hyg - BAS+136 CHAMBOUT 10

Pond Node Data = BAS+136 CHAMB
Pond Volume Data = BAS+136 CHAMB
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	78.50 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	28.31 cfs	at	12.1000 hrs
Peak Outflow	=	14.43 cfs	at	12.2000 hrs
Peak Elevation	=	81.45 ft		
Peak Storage	=	31714 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	83854
- Infiltration	=	0
- HYG Vol OUT	=	83778
- Retained Vol	=	76
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107537A\1107537C\Design\
Inflow HYG file = work_pad.hyg - BAS+136 CHAMBIN 100
Outflow HYG file = work_pad.hyg - BAS+136 CHAMBOUT 100

Pond Node Data = BAS+136 CHAMB
Pond Volume Data = BAS+136 CHAMB
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	78.50 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	48.28 cfs	at	12.1000 hrs
Peak Outflow	=	30.35 cfs	at	12.2000 hrs
Peak Elevation	=	82.13 ft		
Peak Storage	=	41208 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	147792
- Infiltration	-	0
- HYG Vol OUT	=	147716
- Retained Vol	=	76
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

PROPOSED FLOW TO
POA C

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Open Space- Good condition; grass c	80	.020			80.00
Impervious-Pavement	98	.260			98.00
COMPOSITE AREA & WEIGHTED CN --->		.280			96.71 (97)

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Shallow

Hydraulic Length	270.00 ft
Slope	.015000 ft/ft
Paved	
Avg.Velocity	2.49 ft/sec

Segment #1 Time: .0301 hrs

Segment #2: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	25.00 ft
2yr, 24hr P	3.3000 in
Slope	.016000 ft/ft
Avg.Velocity	.08 ft/sec

Segment #2 Time: .0845 hrs

Segment #3: Tc: TR-55 Channel

Flow Area	.6100 sq.ft
Wetted Perimeter	1.96 ft
Hydraulic Radius	.31 ft
Slope	.010000 ft/ft
Mannings n	.0130
Hydraulic Length	85.00 ft
Avg.Velocity	5.26 ft/sec

Segment #3 Time: .0045 hrs

==========
Total Tc: .1191 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

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

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

Tc = (Lf / V) / (3600sec/hr)

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

==== SCS Channel Flow ==

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

Tc = (Lf / V) / (3600sec/hr)

Where: R = Hydraulic radius
Aq = Flow area, sq.ft.
Wp = Wetted perimeter, ft
V = Velocity, ft/sec
Sf = Slope, ft/ft
n = Mannings n
Tc = Time of concentration, hrs
Lf = Flow length, ft

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1.9999 hrs Rain Depth = 1.2500 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - NJDEP Water Qual
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Proposed.HYG - PROP TO POA C 1
Tc = .1191 hrs
Drainage Area = .280 acres Runoff CN= 97

==========
Computational Time Increment = .01588 hrs
Computed Peak Time = 1.1114 hrs
Computed Peak Flow = .74 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 1.1000 hrs
Peak Flow, Interpolated Output = .74 cfs
==========

DRAINAGE AREA

ID:PROP TO POA C
CN = 97
Area = .280 acres
S = .3093 in
0.2S = .0619 in

Cumulative Runoff

.9427 in
.022 ac-ft

HYG Volume... .022 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .11908 hrs (ID: PROP TO POA C)
Computational Incr, Tm = .01588 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.66 cfs
Unit peak time Tp = .07939 hrs
Unit receding limb, Tr = .31755 hrs
Total unit time, Tb = .39694 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Proposed.HYG - PROP TO POA C 2
Tc = .1191 hrs
Drainage Area = .280 acres Runoff CN= 97

==========
Computational Time Increment = .01588 hrs
Computed Peak Time = 12.1305 hrs
Computed Peak Flow = .93 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = .88 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:PROP TO POA C
CN = 97
Area = .280 acres
S = .3093 in
0.2S = .0619 in

Cumulative Runoff

2.9558 in
.069 ac-ft

HYG Volume... .069 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .11908 hrs (ID: PROP TO POA C)
Computational Incr, Tm = .01588 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.66 cfs
Unit peak time Tp = .07939 hrs
Unit receding limb, Tr = .31755 hrs
Total unit time, Tb = .39694 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Proposed.HYG - PROP TO POA C 10
Tc = .1191 hrs
Drainage Area = .280 acres Runoff CN= 97

==========
Computational Time Increment = .01588 hrs
Computed Peak Time = 12.1305 hrs
Computed Peak Flow = 1.43 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 1.36 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:PROP TO POA C
CN = 97
Area = .280 acres
S = .3093 in
0.2S = .0619 in

Cumulative Runoff

4.6471 in
.108 ac-ft

HYG Volume... .108 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .11908 hrs (ID: PROP TO POA C)
Computational Incr, Tm = .01588 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.66 cfs
Unit peak time Tp = .07939 hrs
Unit receding limb, Tr = .31755 hrs
Total unit time, Tb = .39694 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3000 in
Rain Dir = F:\1107537A\1107537C\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107537A\1107537C\Design\
HYG File - ID = Proposed.HYG - PROP TO POA C 100
Tc = .1191 hrs
Drainage Area = .280 acres Runoff CN= 97

==========
Computational Time Increment = .01588 hrs
Computed Peak Time = 12.1305 hrs
Computed Peak Flow = 2.39 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 2.28 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:PROP TO POA C
CN = 97
Area = .280 acres
S = .3093 in
0.2S = .0619 in

Cumulative Runoff

7.9401 in
.185 ac-ft

HYG Volume... .185 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .11908 hrs (ID: PROP TO POA C)
Computational Incr, Tm = .01588 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 2.66 cfs
Unit peak time Tp = .07939 hrs
Unit receding limb, Tr = .31755 hrs
Total unit time, Tb = .39694 hrs

GROUNDWATER RECHARGE CALCULATIONS

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:	Nexus Apartment Site Plan
Description:	Calc Annual Recharge Deficit
Analysis Date:	09/08/21

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.69	Open space	Udorthents	0.0	-
2	2.84	Woods	Elkton	0.0	-
3	2.16	Impervious areas	Udorthents	0.0	-
4					
5					
6					
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	5.7			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				0.0	-

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	4.54	Impervious areas	Udorthents	0.0	-
2	1.15	Open space	Udorthents	0.0	-
3					
4					
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	5.7			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				0.0	-
				Total Impervious Area (sq.ft)	197,762

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	
Post-Development Annual Recharge Deficit=	*0*	(cubic feet)

Recharge Efficiency Parameters Calculations (area averages)

RWC=	0.00	(in)	DRWC= 0.00	(in)
ERWC =	0.00	(in)	EDRWC= 0.00	(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.

L6

WATER QUALITY CALCULATIONS

WATER QUALITY CALCULATIONS

Water quality treatment (80% TSS removal) is provided for the parking lot run-off by eleven (11) Filterra HC units as manufactured by Contech Engineered Solutions. These units were sized based on the attached drainage area plan and sizing table from the manufacturer and the DEP approval letter (dated 2/12/21) confirming the 80% TSS removal rates.

The extended detention basin has a maximum detention time of 7 hours. This does not provide any additional TSS removal per the NJDEP BMP manual per Chapter 11.2 – see attached calculations.

FILTERRA DRAINAGE AREA PLAN

FLM: INSERT ONE (1) PLAN POCKET IN PLACE OF THIS SHEET

CONTECH ENGINEERED SOLUTIONS

filterra®

Filterra HC Standard Flow Based Sizing

Sizing Basis:

The sizing for the Filterra HC system under NJDEP regulations is based on the methodolgy outlined in Chapter 5 of the NJDEP BMP Manual. The NRCS Runoff Equation in the handbook is utilized to determine a water quality flow rate for the drainage area in question. To validate the sizing, the following parameters were assumed:

Sample Parameters:

Design Storm =	1.25" in 2 hrs	(As outlined in the NJDEP SWM Handbook)
Filterra HC Media Flow Rate =	300"/hr	
Site Drainage Area =	0.319 ac	
Percent Impervious =	100%	
Time of Concentration =	10 min	
Allowable Ponding in Filterra HC =	9"	
Filterra HC Model Size Analyzed =	13x7	(Treats 0.632 cfs at 300"/hr)

Design Summary:

Using the NRCS Method, the required treatment flow rate for this drainage area is 0.82 cfs. Utilizing the HydroCAD Software, a matching hydrograph can be derived (Figure 1).

This storm can then be routed through an appropriately sized Filterra HC unit, for this example, a 13x7. Because the Filterra HC system can provide up to 9" of ponding, some flow attentuation is possible and the Filterra HC system is able to accommodate a portion of the water quality volume in the head space and release it at the system's design flow rate. The hydrograph in Figure 2 illustrates this concept. In this example, the 69 cf stored represents the upper portion of the hydrograph between 0.63 cfs and 0.82 cfs.

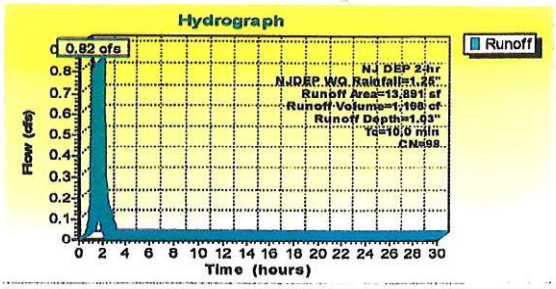


Figure 1. Inflow rate during the 1.25" in 2 hrs, NJDEP WQ Storm event.

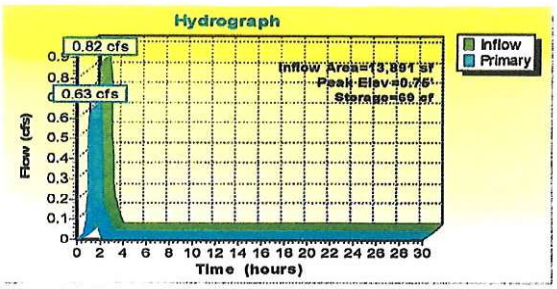


Figure 2. Inflow rate during the WQ Storm Event compared with the Filterra outflow rate, accounting for 9" ponding within the unit.

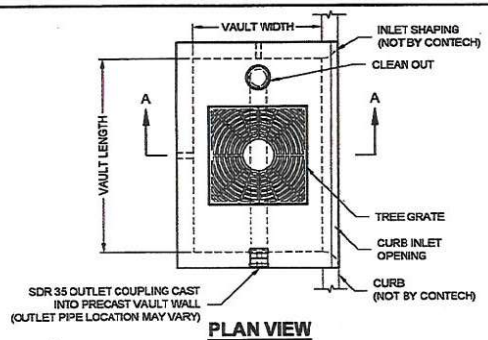
This approach is scalable and can be completed for all Filterra HC sizes. Table 1 identifies the allowable impervious drainage area to each Filterra HC unit based on this methodology. Addtionally, for drainage areas that are not fully impervious, a new table can be generated based on site specific constraints. Please contact your Contech Representative for more information.

Table 1. Filterra HC Sizing based on the New Jersey BMP Manual.

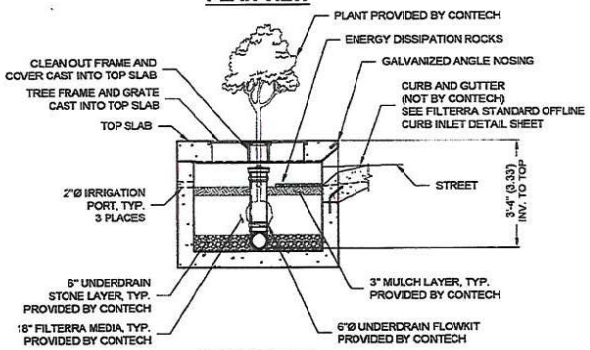
System Size	Treatment Flow Rate at 300"/hr	Allowable Impervious Drainage Area w/ 9" of Ponding (CN=98)	Outlet Pipe Size
(ft)	(cfs)	(ac)	(in)
4x4	0.111	0.056	6" SDR-35 PVC
4x6 / 6x4	0.167	0.084	6" SDR-35 PVC
4.5x7.83 / 7.83x4.5	0.245	0.123	6" SDR-35 PVC
6x6	0.25	0.126	6" SDR-35 PVC
6x8 / 8x6	0.333	0.168	6" SDR-35 PVC
6x10 / 10x6	0.417	0.210	6" SDR-35 PVC
6x12 / 12x6	0.500	0.252	6" SDR-35 PVC
7x13 / 13x7	0.632	0.319	6" SDR-35 PVC
14x8	0.778	0.392	6" SDR-35 PVC
16x8	0.889	0.449	6" SDR-35 PVC
18x8	1.000	0.505	6" SDR-35 PVC
20x8	1.111	0.561	6" SDR-35 PVC
22x8	1.222	0.617	6" SDR-35 PVC

Notes:

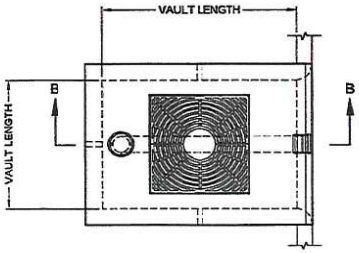
1. Boxes are standard depth from rim to outlet: 3.33' for Standard Offline
2. Vault sizes 8x14 and larger available on case-by-case basis. Please contact Contech for individual project design assistance.
3. A standard PVC pipe coupling is cast into the wall for easy connection to discharge piping
4. Dimensions shown are internal.
5. Contact Contech for site specific sizing or other box configurations.



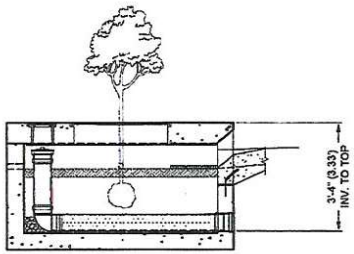
PLAN VIEW



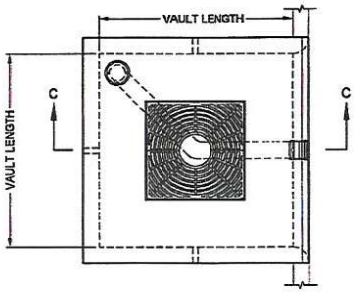
SECTION A-A



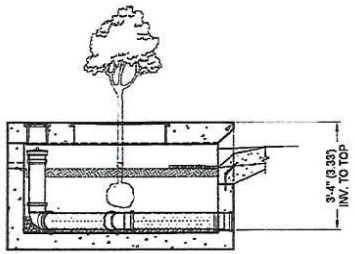
PLAN VIEW



SECTION B-B



PLAN VIEW



SECTION C-C

FT-HC LONG SIDE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (L x W)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0604-HC	N/A CA	6 x 4	6 x 4	6" SDR 35	(1) 3' x 3'
FT06504-HC	CA ONLY	6.5 x 4	6.5 x 4 .	6" SDR 35	(1) 3' x 3'
FT078045-HC	DE, MD, NJ, PA, VA, WV ONLY	7.83 x 4.5	7.83 x 4.5	6" SDR 35	(1) 3' x 3'
FT0804-HC	N/A DE, MD, NJ, PA, VA, WV	8 x 4	8 x 4	6" SDR 35	(1) 3' x 3'
FT0806-HC	ALL	8 x 6	8 x 6	6" SDR 35	(1) 4' x 4'
FT1006-HC	ALL	10 x 6	10 x 6	6" SDR 35	(1) 4' x 4'
FT1206-HC	ALL	12 x 6	12 x 6	6" SDR 35	(2) 4' x 4'
FT1307-HC	ALL	13 x 7	13 x 7	6" SDR 35	(2) 4' x 4'
FT1408-HC	CALL CONTECH	14 x 8	14 x 8	6" SDR 35	(2) 4' x 4'
FT1509-HC	CALL CONTECH	15 x 9	15 x 9	6" SDR 35	(2) 4' x 4'
FT1608-HC	CALL CONTECH	16 x 8	16 x 8	6" SDR 35	(2) 4' x 4'
FT1808-HC	CALL CONTECH	18 x 8	18 x 8	6" SDR 35	(2) 4' x 4'
FT2008-HC	CALL CONTECH	20 x 8	20 x 8	6" SDR 35	(3) 4' x 4'
FT2208-HC	CALL CONTECH	22 x 8	22 x 8	6" SDR 35	(3) 4' x 4'

N/A = NOT AVAILABLE

FT-HC SHORT SIDE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0406-HC	N/A CA	4 x 6	4 x 6	6" SDR 35	(1) 3' x 3'
FT04065-HC	CA ONLY	4 x 6.5	4 x 6.5	6" SDR 35	(1) 3' x 3'
FT0408-HC	N/A DE, MD, NJ, PA, VA, WV	4 x 8	4 x 8	6" SDR 35	(1) 3' x 3'
FT045078-HC	DE, MD, NJ, PA, VA, WV ONLY	4.5 x 7.83	4.5 x 7.83	6" SDR 35	(1) 3' x 3'
FT0608-HC	ALL	6 x 8	6 x 8	6" SDR 35	(1) 4' x 4'
FT0610-HC	ALL	6 x 10	6 x 10	6" SDR 35	(1) 4' x 4'
FT0812-HC	ALL	6 x 12	6 x 12	6" SDR 35	(2) 4' x 4'
FT0713-HC	ALL	7 x 13	7 x 13	6" SDR 35	(2) 4' x 4'

N/A = NOT AVAILABLE

FT-HC SQUARE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0404-HC	ALL	4 x 4	4 x 4	6" SDR 35	(1) 3' x 3'
FT0606-HC	ALL	6 x 6	6 x 6	6" SDR 35	(1) 3' x 3'

N/A = NOT AVAILABLE

INTERNAL PIPE CONFIGURATION MAY VARY DEPENDING UPON OUTLET LOCATION.

filterra
CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

FILTERRA HC OFFLINE (FT-HC)
CONFIGURATION DETAIL

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State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER QUALITY
Bureau of Stormwater Permitting
401 East State Street
P.O. Box 420 Mail Code 401-02B
Trenton, NJ 08625-0420
Tel. (609) 633-7021 • Fax (609) 777-0432
www.nj.gov/dep/dwq/bnpc_home.htm

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Acting Commissioner

February 12, 2021

Derek M. Berg
Director – Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Lab Certification
Filterra® HC Bioretention System
Off-line Installation Approved

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the Filterra® HC Bioretention System (Filterra® HC.)

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated January 2021) for this device is published online at http://www.njcat.org/uploads/newDocs/NJCATFilterraTechnologyVerificationReportFinal._.pdf.

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The NJDEP certifies the use of the Filterra® HC stormwater treatment unit by Contech Engineered Solutions LLC at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 3.12 gpm/ft^2 of effective filtration treatment area.

2. The Filterra® HC stormwater treatment unit shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 7 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Filterra® HC. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at https://www.conteches.com/Portals/0/Documents/Maintenance%20Guides/Filterra%20HC%20OM%20Packet.pdf for any changes to the maintenance requirements.

6. For an MTD to be considered "green infrastructure" (GI) in accordance with the March 2, 2020 amendments to the Stormwater Management rules at N.J.A.C. 7:8, the MTD must meet the GI definition noted at amended N.J.A.C. 7:8-1.2. Specifically, the MTD shall (1) treat stormwater runoff through infiltration into subsoil; and/or (2) treat stormwater runoff through filtration by vegetation or soil; or (3) store stormwater runoff for reuse.

   The Filterra® HC filters stormwater runoff through an engineered biofiltration soil media and, thus, meets the definition of GI. Filterra® HC can be configured with or without a precast vault. Installations that will not include a precast vault will additionally need to comply the NJDEP Stormwater BMP Manual conditions regarding separation from the seasonal high water table and, if infiltration is proposed as an outlet, minimum vertical saturated hydraulic conductivity of the subsoil. Installations without a precast vault that do not rely on infiltration are required to maintain at least a one-foot separation from the seasonal high water table measured from the lowest point of the system. Installations without a precast vault that utilize infiltration are required to have the most hydraulically restrictive soil layer below the MTD meet the minimum tested vertical saturated hydraulic conductivity of one inch per hour and have at least two feet of separation from the seasonal high water table measured from the lowest point of the system.

7. Sizing Requirement:

The example below demonstrates the sizing procedure for the Filterra® HC:

Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using the Filterra® HC. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

The selection of the appropriate model of Filterra® HC is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the Filterra® HC in this example is 0.25 acres. Included in Table 1 below, all of the Filterra® HC models are designed with a maximum allowable drainage area greater than 0.25 acres. Specifically, the Filterra® HC with a 4'x4' media bay and a maximum allowable drainage area of 0.40 acres would be the smallest model able to treat runoff without exceeding the maximum allowable drainage area.

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was based on the following:

time of concentration = 10 minutes
i = 3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
c = 0.99 (runoff coefficient for impervious)
$Q = ciA = 0.99 \times 3.2 \times 0.25 = 0.79$ cfs

Given the site runoff is 0.79 cfs and based on the MTFR's listed in Table 1 below, the Filterra® HC with a 16'x8' media bay and an MTFR of 0.889 cfs would be the smallest model that could be used to treat the impervious area without exceeding the MTFR. If using more than one unit for treating runoff, the units should be configured such that the flowrate to each unit does not exceed the design MTFR for each unit and ensuring the entire 0.25 acre area is treated.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system models is noted below:

Table 1. Filterra® HC MTFRs and Maximum Allowable Drainage Areas

	Available Filterra® Media Bay Sizes (feet)	Effective Filtration Treatment Area (ft^2)	Treatment Flow Rate (cfs)	Maximum Allowable Drainage Area (ac)
Standard Configuration Filterra and Filterra Bioscape Vaults	4x4	16	0.111	0.40
	4x6 or 6x4	24	0.167	0.60
	4.5x7.83 or 7.83x4.5 (Nominal 4x8/8x4)	35.24	0.245	0.89
	6x6	36	0.250	0.91
	6x8 or 8x6	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	6x12 or 12x6	72	0.500	1.81
	7x13 or 13x7	91	0.632	2.29
	14x8	112	0.778	2.82
	16x8	128	0.889	3.22
	18x8	144	1.000	3.62
	20x8	160	1.111	4.03
	22x8	176	1.222	4.43
Peak Diversion Filterra Vaults	4x4	16	0.111	0.40
	4.5x5.83 (Nominal 4x6)	26.24	0.182	0.66
	6x4	24	0.167	0.60
	6x6	36	0.250	0.91
	6x8	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	7x10	70	0.486	1.76
	8x10.5	84	0.583	2.11
	8x12.5	100	0.694	2.52
	Custom and/or Filterra Bioscape	Media Area in ft^2	0.00694 * (Media Area in ft^2)	0.0252 * (Media Area in ft^2)

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact me at (609) 633-7021.

Sincerely,

Gabriel Mahon

Gabriel Mahon, Chief
Bureau of Stormwater Permitting

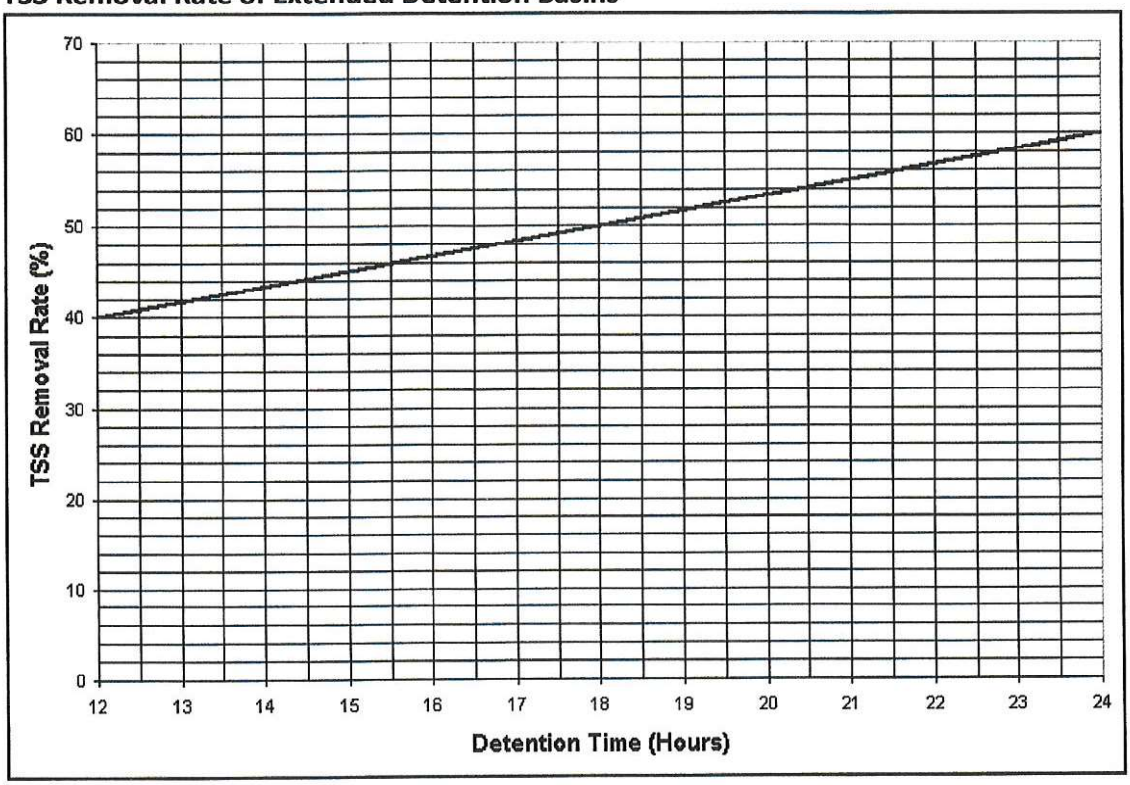
Attachment: Maintenance Plan
cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP – Water & Land Management
Nancy Kempel, NJDEP– BSTP
Keith Stampfel, NJDEP – DLRP
Dennis Contois, NJDEP – DLRP

TSS Removal Rates for Extended Detention Basins

Extended detention basins are designed to provide treatment of runoff volume generated by the Water Quality Design Storm (WQDS). Techniques to compute this volume are discussed in *Chapter 5: Stormwater Management Quantity and Quality Standards and Computations.*

The TSS removal rate for an extended detention basin is based on the basin's detention time. The detention time begins when the maximum storage volume is achieved and ends when only 10% of the maximum volume remains. The chart below shows the TSS removal rate for a given detention time. As previously stated, for the purposes of TSS removal rate calculations, the minimum detention time is 12 hours, and the maximum detention time is 24 hours. Systems with detention times in excess of 24 hours will still only be credited with a 60% TSS removal rate. **Extrapolation beyond the minimum and maximum detention times of 12 and 24 hours, respectively, is not allowed.**

TSS Removal Rate of Extended Detention Basins



To determine the TSS removal rate for an extended detention basin, either the chart above or the following equation may be used:

$$\% \text{ TSS Removal Rate} = 40 + \left\{20\ x\ \left[\frac{t-12}{12}\right]\right\}$$

where t is the time of detention in hours and $12 \leq t \leq 24$.

The example located on the following page illustrates how to use the chart to determine the TSS removal rate provided.

TIME vs. VOLUME (cu.ft)

Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
.5000	0	1	29	140	512
1.0000	2186	5684	8711	10023	10649
1.5000	11095	11462	11752	11967	12020
2.0000	11969	11841	11631	11410	11190
2.5000	10972	10756	10541	10328	10118
3.0000	9908	9701	9496	9292	9090
3.5000	8890	8692	8496	8301	8109
4.0000	7918	7730	7543	7358	7175
4.5000	6994	6815	6638	6463	6290
5.0000	6119	5950	5784	5619	5457
5.5000	5297	5139	4984	4832	4683
6.0000	4537	4393	4252	4114	3978
6.5000	3845	3714	3586	3460	3336
7.0000	3214	3095	2977	2861	2746
7.5000	2632	2520	2408	2298	2189
8.0000	2081	1975	1870	1767	1666
8.5000	1567	1470	1375	1283	1192
9.0000	1104	1020	939	860	785
9.5000	713	643	576	511	448
10.0000	389	334	288	247	213
10.5000	183	158	136	117	100
11.0000	86	74	64	55	47
11.5000	41	35	30	26	22
12.0000	19	17	14	12	11
12.5000	9	8	7		

Peak @ 1.9 hrs

≈ 10% peak volume @ 8.9 hrs

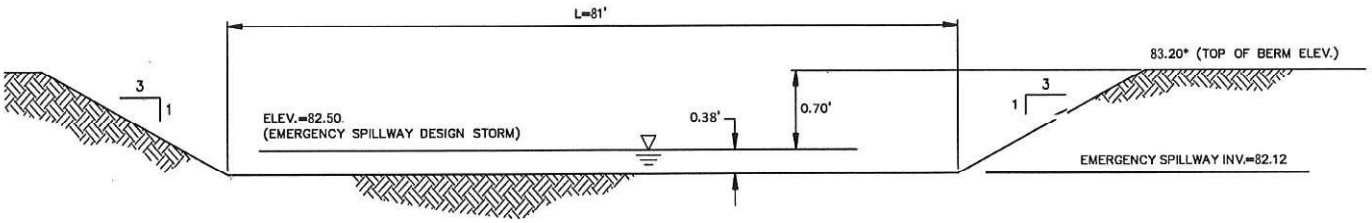
7 hrs detention time

< 12 hrs for basin to provide TSS removal

EMERGENCY SPILLWAY

DESIGN

Emergency SpillwayCalculations



EMERGENCY SPILLWAY SECTION

NO SCALE

*1.08' of freeboard to 100 year storm elevation in basin.

DESIGN FOR PEAK

100 YEAR STORM INFLOW TO BASIN

Q= 48.3 CFS

C= 2.56 (for 10' wide broad crested weirs taken from Brater & King)

Q=CLH^3/2

Find L when H = 0.38 ft

L= Q/C * (H)^3/2 L = [48.3 cfs / (2.56) x (0.38 ft) ^ 3/2 = 80.50 ft use 81'

Check velocity through emergency spillway

V=Q/A

V= 48.3 cfs / (81 ft x 0.38 ft) = 1.6 fps

1.6 fps ≤3.0 fps (allow. vel. for silt loam)

Therefore, grass lined emergency spillway will be stable

STORM SEWER AND CONDUIT OUTLET PROTECTION CALCULATIONS

DRAINAGE COMPUTATION SHEET
Rational Method

Hopewell Valley Engineering, P.C.
1600 Reed Road, Suite A
Pennington, NJ 08534

Sheet 1 of 3

PROJECT: Spruce St Apartments
JOB #: 11075376
MUNICIPALITY: Lawrence Township

STORM FREQUENCY: 100 YR
PIPE n = 0.012 (HDPE)

CALC BY: RMS
DATE: Sept, 2021

FROM STRUCTURE NUMBER	TO STRUCTURE NUMBER	INCREMENTS OF AREA - ACRES (A)	COEFFICIENT OF RUNOFF C	EQUIVALENT AREA (C*A) (100% ACRES)	TOTAL AREA (ΣCA) (100 ACRES) INLET / PIPE	TIME OF CONCENTRATION (MIN) INLET / PIPE	INTENSITY (IN. PER HR.) (I) INLET / PIPE	FLOW VOLUME (CFS) (Q=CIA) INLET / PIPE	TYPE STRUCTURE	DIAMETER OF PIPE (IN.)	SLOPE %	CAPACITY OF SEWER (CFS)	FULL VELOCITY (FT. PER SEC.)	ACTUAL VELOCITY (FT. PER . SEC.)	LENGTH OF PIPE (FT.)	TIME OF FLOW	REMARKS
3A	3	0.47	.94	0.44	0.44	6.0	9.1	4	A Inlet	15	0.5	4.95	4.03	4.5	84	.3	Includes Roof Drain Connection From Bldg 4 & 5
3	2	0.55	.75	0.41	0.41 / 0.85	6.0 / 6.3	9.1 / 9.0	3.7 / 7.65	B Inlet	18	0.5	8.05	4.55	5.2	206	0.7	
2	WW 1	0.43	.88	0.38	.38 / 1.23	6.0 / 7.0	9.1 / 8.9	3.5 / 10.9	B Inlet	18	1.0	11.4	6.4	7.3	30		Basin Outfall
13	12A	0.15	0.3	0.05	.05 / .05	6 / 6	9.1 / 9.1	0.46 / 0.46	A Inlet	15	0.25	3.5	2.9	2.0	101	0.9	
12A	12	—	—	—	— / —	— / —	— / —	— / 0.46	Storm MH	15	0.25	3.5	2.9	2.0	20	0.2	
12	11	0.31	.86	0.27	0.27 / 0.32	6 / 7.1	9.1 / 8.9	2.5 / 2.8	E Inlet	15	0.25	3.5	2.9	3.2	236	1.1	

DRAINAGE COMPUTATION SHEET
Rational Method

Hopewell Valley Engineering, P.C.
1600 Reed Road, Suite A
Pennington, NJ 08534

Sheet 2 of 3

PROJECT: Spruce St Apartments
JOB #: 11075376
MUNICIPALITY: Lawrence Township
STORM FREQUENCY: 100 YR
PIPE n = 0.012 (HDPE)
CALC BY: RMS
DATE: Sept, 2021

FROM STRUCTURE NUMBER	TO STRUCTURE NUMBER	INCREMENTS OF AREA - ACRES (A)	COEFFICIENT OF RUNOFF C	EQUIVALENT AREA (C*A) (100% ACRES)	TOTAL AREA (ΣCA) (100 ACRES)	TIME OF CONCENTRATION (MIN)	INTENSITY (IN. PER HR.) (I)	FLOW VOLUME (CFS) (Q=CIA)	TYPE STRUCTURE	DIAMETER OF PIPE (IN.)	SLOPE %	CAPACITY OF SEWER (CFS)	FULL VELOCITY (FT. PER SEC.)	ACTUAL VELOCITY (FT. PER . SEC.)	LENGTH OF PIPE (FT.)	TIME OF FLOW	REMARKS
					INLET / PIPE	INLET / PIPE	INLET / PIPE	INLET / PIPE									
11	MH 10	0.34	.95	.32	.32 / .67	6 / 7.4	9.1 / 8.8	2.9 / 5.9	E Inlet	15	0.75	6.06	4.9	5.6	211	0.6	
15A	15	0.47	.94	0.44	0.44	6	9.1	4.0	A Inlet	15	0.5	4.95	4.03	4.5	56	0.2	Includes Roof Areas from Bldgs 1 & 2
15	14	0.31	.97	0.3	0.3 / 0.74	6 / 6.2	9.1 / 9.1	2.7 / 6.7	B INLET	15	1.0	7.0	5.7	6.5	205	0.5	
14	MH 10	0.27	.95	0.26	0.26 / 1.0	6 / 6.7	9.1 / 8.9	2.4 / 8.9	E Inlet	18	0.6	8.9	5.0	5.8	76	0.2	
MH 10	9	1.62	.95	1.67	1.67	8.0	8.7	14.5	MH	24	0.5	17.3	5.5	6	25	0.1	
9	MH 7	0.77	.95	0.73	0.73 / 2.4	6 / 8.1	9.1 / 8.6	6.6 / 20.6	E Inlet	24	0.7	20.7	6.5	7.5	90		MH #7 is on the header pipe for the basin. WW #5 is located on this header @ 79.0

Hll

DRAINAGE COMPUTATION SHEET

Rational Method

Hopewell Valley Engineering, P.C.
1600 Reed Road, Suite A
Pennington, NJ 08534

Sheet 3 of 3

PROJECT: Spruce St Apartments
JOB #: 1107537C
MUNICIPALITY: Lawrence Township

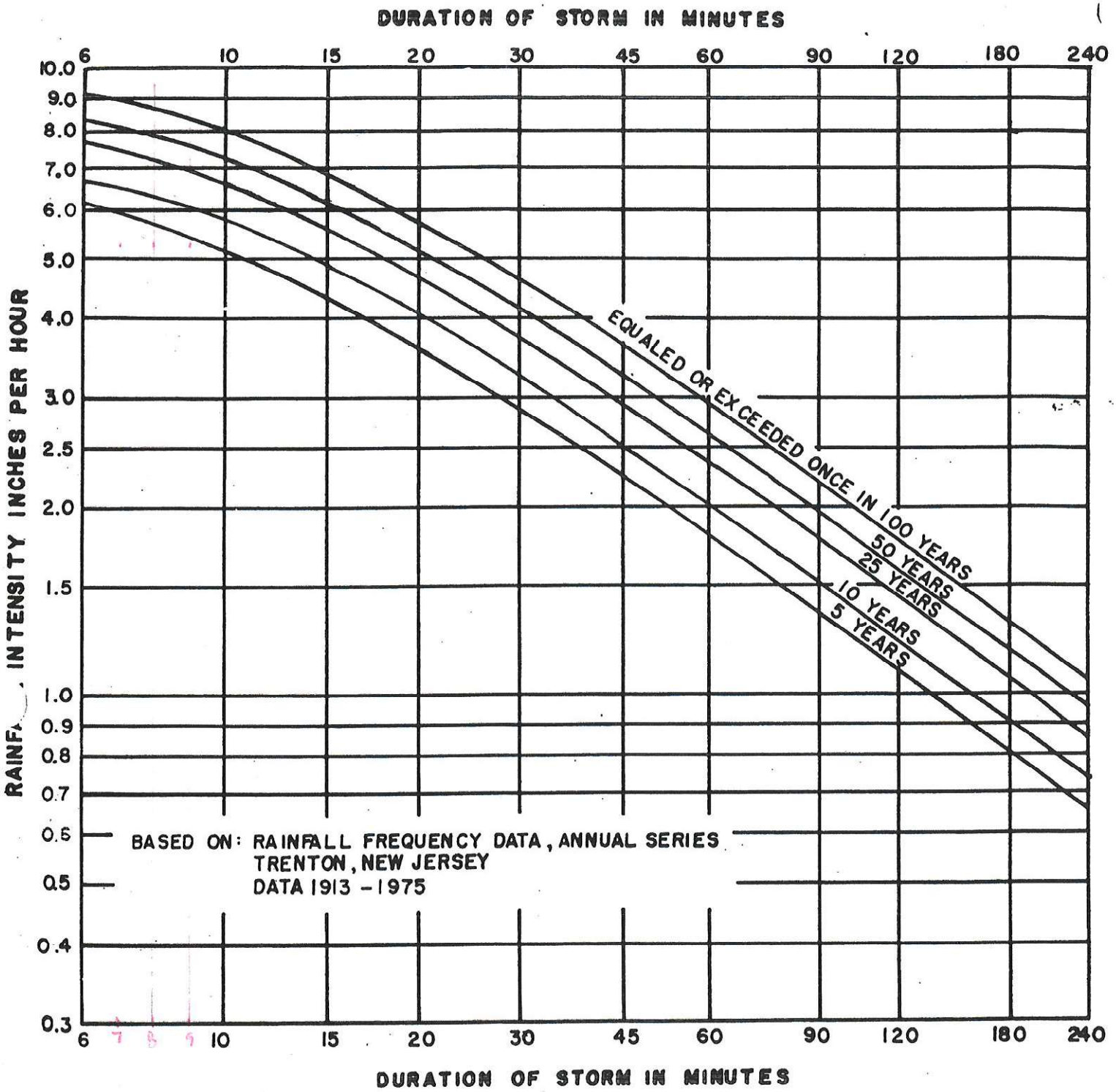
STORM FREQUENCY: 100 YR
PIPE n = 0.012 (HDPE)

CALC BY: RMS
DATE: Sept, 2021

FROM STRUCTURE NUMBER	TO STRUCTURE NUMBER	INCREMENTS OF AREA - ACRES (A)	COEFFICIENT OF RUNOFF C	EQUIVALENT AREA (C*A) (100% ACRES)	TOTAL AREA (ΣCA) (100 ACRES)	TIME OF CONCENTRATION (MIN)	INTENSITY (IN. PER HR.) (I)	FLOW VOLUME (CFS) (Q=CIA)	TYPE STRUCTURE	DIAMETER OF PIPE (IN.)	SLOPE %	CAPACITY OF SEWER (CFS)	FULL VELOCITY (FT. PER SEC.)	ACTUAL VELOCITY (FT. PER . SEC.)	LENGTH OF PIPE (FT.)	TIME OF FLOW	REMARKS
					INLET / PIPE	INLET / PIPE	INLET / PIPE	INLET / PIPE									
18	17	0.24	0.94	0.22	0.22 / 0.22	6 / 6	9.1 / 9.1	2 / 2	B INLET	15	0.5	4.95	4.03	3.8	41	.2	
17	MH 16	0.04	1.0	0.04	0.04 / 0.26	6 / 6.2	9.1 / 9.1	.36 / 2.4	B Inlet	15	0.5	4.95	4.03	4	25		MH 16 will connect to exist 15" RCP to Spruce St drainage system

115

FIG. 3.1-2(B-1)-RAINFALL INTENSITY CURVES



STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
FLOOD PLAIN MANAGEMENT 1976

FIG 2.1-2(B-1) RAINFALL INTENSITY CURVES

HDPE Storm Pipe

ADS N-12® ST IB PIPE (ASTM F2648) SPECIFICATION

Scope

This specification describes 4- through 60-inch (100 to 1500 mm) ADS N-12 ST IB pipe (per ASTM F2648) for use in gravity-flow land drainage applications.

Pipe Requirements

ADS N-12 ST IB pipe (per ASTM F2648) shall have a smooth interior and annular exterior corrugations.

- 4- through 60-inch (100 to 1500 mm) pipe shall meet ASTM F2648.
- Manning's "n" value for use in design shall be 0.012.

Joint Performance

Pipe shall be joined using a bell & spigot joint meeting ASTM F2648. The joint shall be soil-tight and gaskets for diameters 12- through 60-inch, shall meet the requirements of ASTM F477. For diameters 4- through 10-inch, the joint shall be soil-tight using an engaging dimple connection. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

Fittings

Fittings shall conform to ASTM F2306. Bell and spigot connections shall utilize a welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of ASTM F2306.

Material Properties

Material for pipe production shall be an engineered compound of virgin and recycled high density polyethylene conforming with the minimum requirements of cell classification 424420C (ESCR Test Condition B) for 4- through 10-inch (100 to 250 mm) diameters, and 435420C (ESCR Test Condition B) for 12- through 60-inch (300 to 1500 mm) diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The design engineer shall verify compatibility with overall system including structural, hydraulic, material, and installation requirements for a given application.

Installation

Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with the exception that minimum cover in trafficked areas for 4- through 48-inch (100 to 1200 mm) diameters shall be one foot. (0.3 m) and for 60-inch (1500 mm) diameter the minimum cover shall be 2 ft. (0.6 m) in single run applications. Backfill for minimum cover situations shall consist of Class 1 (compacted) or Class 2 (minimum 90% SPD) material. Maximum fill heights depend on embedment material and compaction level; please refer to Technical Note 2.02. Contact your local ADS representative or visit our website at www.ads-pipe.com for a copy of the latest installation guidelines.

Pipe Dimensions

	Nominal Diameter, in (mm)												
Pipe I.D. in (mm)	4 (100)	6 (150)	8 (200)	10 (250)	12 (300)	15 (375)	18 (450)	24 (600)	30 (750)	36 (900)	42 (1050)	48 (1200)	60 (1500)
Pipe O.D.* in (mm)	4.8 (122)	6.9 (175)	9.1 (231)	11.4 (290)	14.5 (368)	18 (457)	22 (559)	28 (711)	36 (914)	42 (1067)	48 (1219)	54 (1372)	67 (1702)

*Pipe O.D. values are provided for reference purposes only, values stated for 12 through 60-inch are ±1 inch. Contact a sales representative for exact values
**All diameters available with or without perforations.

TABLE 1106.2
SIZE OF VERTICAL CONDUCTORS AND LEADERS

DIAMETER OF LEADER (Inches)[a]	HORIZONTALLY PROJECTED ROOF AREA (square feet) Rainfall rate (inches per hour)											
	1	2	3	4	5	6	7	8	9	10	11	12
2	2,880	1,440	960	720	575	480	410	360	320	290	260	240
3	8,800	4,400	2,930	2,200	1,760	1,470	1,260	1,100	980	880	800	730
4	18,400	9,200	6,130	4,600	3,680	3,070	2,630	2,300	2,045	1,840	1,675	1,530
5	34,600	17,300	11,530	8,650	6,920	5,765	4,945	4,325	3,845	3,460	3,145	2,880
6	54,000	27,000	17,995	13,500	10,800	9,000	7,715	6,750	6,000	5,400	4,910	4,500
8	116,000	58,000	38,660	29,000	23,200	19,315	16,570	14,500	12,890	11,600	10,545	9,660

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m^2.

[a] Sizes indicated are the diameter of circular piping. This table is applicable to piping of other shapes provided the cross-sectional shape fully encloses a circle of the diameter indicated in this table.

TABLE 1106.3
SIZE OF HORIZONTAL STORM DRAINAGE PIPING

SIZE OF HORIZONTAL PIPING (Inches)	HORIZONTALLY PROJECTED ROOF AREA (square feet) Rainfall rate (inches per hour)					
	1	2	3	4	5	6
$\frac{1}{8}$ unit vertical in 12 units horizontal (1-percent slope)						
3	3,288	1,644	1,096	822	657	548
4	7,520	3,760	2,506	1,800	1,504	1,253
5	13,360	6,680	4,453	3,340	2,672	2,227
6	21,400	10,700	7,133	5,350	4,280	3,566
8	46,000	23,000	15,330	11,500	9,200	7,600
10	82,800	41,400	27,600	20,700	16,580	13,800
12	133,200	66,600	44,400	33,300	26,650	22,200
15	218,000	109,000	72,800	59,500	47,600	39,650
$\frac{1}{4}$ unit vertical in 12 units horizontal (2-percent slope)						
3	4,640	2,320	1,546	1,160	928	773
4	10,600	5,300	3,533	2,650	2,120	1,766
5	18,880	9,440	6,293	4,720	3,776	3,146
6	30,200	15,100	10,066	7,550	6,040	5,033
8	65,200	32,600	21,733	16,300	13,040	10,866
10	116,800	58,400	38,950	29,200	23,350	19,450
12	188,000	94,000	62,600	47,000	37,600	31,350
15	336,000	168,000	112,000	84,000	67,250	56,000
$\frac{1}{2}$ unit vertical in 12 units horizontal (4-percent slope)						
3	6,576	3,288	2,295	1,644	1,310	1,096
4	15,040	7,520	5,010	3,760	3,010	2,500
5	26,720	13,360	8,900	6,680	5,320	4,450
6	42,800	21,400	13,700	10,700	8,580	7,140
8	92,000	46,000	30,650	23,000	18,400	15,320
10	171,600	85,800	55,200	41,400	33,150	27,600
12	266,400	133,200	88,800	66,600	53,200	44,400
15	476,000	238,000	158,800	119,000	95,300	79,250

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m^2.

Big Roof Area = 9,267 SF

APPENDIX B

RATES OF RAINFALL FOR VARIOUS CITIES

Rainfall rates, in inches per hour, are based on a storm of one-hour duration and a 100-year return period. The rainfall rates shown in the appendix are derived from Figure 1106.1.

Alabama:
- Birmingham 3.8
- Huntsville 3.6
- Mobile 4.6
- Montgomery 4.2

Alaska:
- Fairbanks 1.0
- Juneau 0.6

Arizona:
- Flagstaff 2.4
- Nogales 3.1
- Phoenix 2.5
- Yuma 1.6

Arkansas:
- Fort Smith 3.6
- Little Rock 3.7
- Texarkana 3.8

California:
- Barstow 1.4
- Crescent City 1.5
- Fresno 1.1
- Los Angeles 2.1
- Needles 1.6
- Placerville 1.5
- San Fernando 2.3
- San Francisco 1.5
- Yreka 1.4

Colorado:
- Craig 1.5
- Denver 2.4
- Durango 1.8
- Grand Junction 1.7
- Lamar 3.0
- Pueblo 2.5

Connecticut:
- Hartford 2.7
- New Haven 2.8
- Putnam 2.6

Delaware:
- Georgetown 3.0
- Wilmington 3.1

District of Columbia:
- Washington 3.2

Florida:
- Jacksonville 4.3
- Key West 4.3
- Miami 4.7
- Pensacola 4.6
- Tampa 4.5

Georgia:
- Atlanta 3.7
- Dalton 3.4
- Macon 3.9
- Savannah 4.3
- Thomasville 4.3

Hawaii:
- Hilo 6.2
- Honolulu 3.0
- Wailuku 3.0

Idaho:
- Boise 0.9
- Lewiston 1.1
- Pocatello 1.2

Illinois:
- Cairo 3.3
- Chicago 3.0
- Peoria 3.3
- Rockford 3.2
- Springfield 3.3

Indiana:
- Evansville 3.2
- Fort Wayne 2.9
- Indianapolis 3.1

Iowa:
- Davenport 3.3
- Des Moines 3.4
- Dubuque 3.3
- Sioux City 3.6

Kansas:
- Atwood 3.3
- Dodge City 3.3
- Topeka 3.7
- Wichita 3.7

Kentucky:
- Ashland 3.0
- Lexington 3.1
- Louisville 3.2
- Middlesboro 3.2
- Paducah 3.3

Louisiana:
- Alexandria 4.2
- Lake Providence 4.0
- New Orleans 4.8
- Shreveport 3.9

Maine:
- Bangor 2.2
- Houlton 2.1
- Portland 2.4

Maryland:
- Baltimore 3.2
- Hagerstown 2.8
- Oakland 2.7
- Salisbury 3.1

Massachusetts:
- Boston 2.5
- Pittsfield 2.8
- Worcester 2.7

Michigan:
- Alpena 2.5
- Detroit 2.7
- Grand Rapids 2.6
- Lansing 2.8
- Marquette 2.4
- Sault Ste. Marie 2.2

Minnesota:
- Duluth 2.8
- Grand Marais 2.3
- Minneapolis 3.1
- Moorhead 3.2
- Worthington 3.5

Mississippi:
- Biloxi 4.7
- Columbus 3.9
- Corinth 3.6
- Natchez 4.4
- Vicksburg 4.1

Missouri:
- Columbia 3.2
- Kansas City 3.6
- Springfield 3.4
- St. Louis 3.2

Montana:
- Ekalaka 2.5
- Havre 1.6
- Helena 1.5
- Kalispell 1.2
- Missoula 1.3

Nebraska:
- North Platte 3.3
- Omaha 3.8
- Scottsbluff 3.1
- Valentine 3.2

Nevada:
- Elko 1.0
- Ely 1.1
- Las Vegas 1.4
- Reno 1.1

New Hampshire:
- Berlin 2.5
- Concord 2.5
- Keene 2.4

New Jersey:
- Atlantic City 2.9
- Newark 3.1
- Trenton 3.1

New Mexico:
- Albuquerque 2.0
- Hobbs 3.0
- Raton 2.5
- Roswell 2.6
- Silver City 1.9

New York:
- Albany 2.5
- Binghamton 2.3
- Buffalo 2.3
- Kingston 2.7
- New York 3.0
- Rochester 2.2

North Carolina:
- Asheville 4.1
- Charlotte 3.7
- Greensboro 3.4
- Wilmington 4.2

North Dakota:
- Bismarck 2.8
- Devils Lake 2.9
- Fargo 3.1
- Williston 2.6

Ohio:
- Cincinnati 2.9
- Cleveland 2.6
- Columbus 2.8
- Toledo 2.8

Oklahoma:
- Altus 3.7
- Boise City 3.3
- Durant 3.8
- Oklahoma City 3.8

Oregon:
- Baker 0.9
- Coos Bay 1.5
- Eugene 1.3
- Portland 1.2

Pennsylvania:
- Erie 2.6
- Harrisburg 2.8
- Philadelphia 3.1
- Pittsburgh 2.6
- Scranton 2.7

CONDUIT OUTLET PROTECTION CALCULATIONS

PROPOSED 18" HDPE WW #1 INTO DETENTION/INFILTRATION BASIN (FROM B INLET #2)

Q_{100} = 10.5 CFS (18" RCP) q_{100} = 10.5/1.5 = 7.0 CFS/FT
$D_o = W_o$ = 18" = 1.5'
Use 2 Year Storm T_w = 80.74 – 79.0 = 1.74'

$La = 3\ (q/D_o^{0.5}) = 3\ (7/1.5^{0.5}) = 17.1'$ use 18.0'

$W_a = 3W_o + 0.4La = 3(1.5) + (0.4)(18) = 11.7'$ use 12.0'

$W' = 3D_o = 3(1.5) = 3.75$ use 4.0'

$D_{50} = (0.02/T_w)q^{1.33} = (0.02/1.74)7.0^{1.33} = 0.15'$ use 4" MIN, 8" THICK W/ FILTER FABRIC

PROPOSED 24" HDPE WW #5 INTO DETENTION/INFILTRATION BASIN (FROM E INLET #9)

Q_{100} = 19.7 CFS (24" RCP) q_{100} = 19.7/2 = 9.85 CFS/FT
$D_o = W_o$ = 24" = 2.0'
Use 2 Year Storm T_w = 80.74 – 79.0 = 1.74'

$La = 3\ (q/D_o^{0.5}) = 3\ (9.85/2.0^{0.5}) = 6.9'$ use 7.0'

$W_a = 3W_o + 0.4La = 3(2.0) + (0.4)(7.0) = 8.8'$ use 9.0'

$W' = 3D_o = 3(2.0) = 6$ use 6.0'

$D_{50} = (0.02/T_w)q^{1.33} = (0.02/1.74)9.85^{1.33} = 0.24'$ use 4" MIN, 8" THICK W/ FILTER FABRIC

TWO (2) 24" HDPE DISCHARGE FROM DETENTION/INFILTRATION BASIN

$Q_{100} = 15.05$ CFS $\qquad q_{100} = 15.05/2 = 7.52$ CFS/FT
$D_o = W_o = 15" = 1.25'$
$T_w = 0.2\ D_o = 0.4'$

$La = 1.8\ (q/D_o^{0.5}) + 7\ D_o = (7.52/2^{0.5}) + 7\ (2) = 19.3'$ use 20.0'

$W_a = 3W_o + La = 3(2) + 20 = 26'$ use 26.0'

$W' = 3D_o = 3(2) = 6.0'$ use 6.0'

$D_{50} = (0.02/T_w)q^{1.33} + 25\% = (0.02/0.4)7.52^{1.33} = 0.28'$ use 4" MIN, 8" THICK W/ FILTER FABRIC

∴ Use this at both basin outlet wingwalls

Appendix A

Stormwater Soil Test Results

NOTE: The attached soil test locations are shown on select Site Plan drawings

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 2b Soil Log and Interpretation

1. Log Number SL 812-1 Method: ☑Profile Pit ☐Boring Elev 89.4
2. Soil Log: Date Recorded: August 12, 2021

Depth (Inches) Top - Bottom	Munsell Color Name and Symbol; Estimated Textural Class; Estimated Volume % Coarse Fragment, If Present; Structure; Moist or Dry Consistence; Mottling Abundance, Size and Contrast, If Present
0-3"	Topsoil.
3-60"	7.5YR8/4 Pink Silt Loam; subangular blocky, friable; <10% gravel; few, fine, faint mottling (10YR7/1 Light Gray) at 53"; no seepage.
60-144"	7.5YR7/6 Reddish Yellow Sandy Loam; subangular blocky, friable; 10% gravel; no mottling; no seepage.
>144"	Machine Refusal.

2a. If mottling give reason for mottling: Regional Water Table

3. Ground Water Observations:
   ☐Seepage - Indicate Depth: _____
   ☐Pit/Boring Flooded Depth after _____ hours = _____

4. Soil Limiting Zones:
   ☐Fractured Rock Substratum - Depth to Top: _____
   ☐Massive Rock Substratum - Depth to Top: _____
   ☐Excessively Coarse Horizon - Depth Top to Bottom: _____
   ☐Excessively Coarse Substratum - Depth to Top: _____
   ☐Hydraulically Restrictive Horizon - Depth Top to Bottom: _____
   ☐Hydraulically Restrictive Substratum - Depth to Top: _____
   ☐Perched Zone of Saturation - Depth Top to Bottom: _____
   ☑Regional Zone of Saturation - Depth to Top: 53"

5. Soil Suitability Classification: IIWr

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Soil Evaluator Jade Cook Date 09-01-2021

Signature of Professional Engineer Date 09-01-2021

Seal

N.J. License No. 33806
Theodore H. Bayer, PE
Bayer-Risse Engineering, Inc.

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 2b Soil Log and Interpretation

1. Log Number SL 812-2 Method: ☑Profile Pit ☐Boring Elev 88.9
2. Soil Log: Date Recorded: August 12, 2021

Depth (Inches) Top - Bottom	Munsell Color Name and Symbol; Estimated Textural Class; Estimated Volume % Coarse Fragment, If Present; Structure; Moist or Dry Consistence; Mottling Abundance, Size and Contrast, If Present
0-5"	Topsoil.
5-78"	7.5YR8/4 Pink Silt Loam; subangular blocky, friable; <5% gravel; no mottling; no seepage.
78-144"	7.5YR7/6 Reddish Yellow Sandy Loam; subangular blocky, friable; 10% gravel; no mottling; no seepage.
>144"	Machine Refusal.

2a. If mottling give reason for mottling: _____

3. Ground Water Observations:
   ☐Seepage - Indicate Depth: _____
   ☐Pit/Boring Flooded Depth after _____ hours = _____

4. Soil Limiting Zones:
   ☐Fractured Rock Substratum - Depth to Top: _____
   ☐Massive Rock Substratum - Depth to Top: _____
   ☐Excessively Coarse Horizon - Depth Top to Bottom: _____
   ☐Excessively Coarse Substratum - Depth to Top: _____
   ☐Hydraulically Restrictive Horizon - Depth Top to Bottom: _____
   ☐Hydraulically Restrictive Substratum - Depth to Top: _____
   ☐Perched Zone of Saturation - Depth Top to Bottom: _____
   ☐Regional Zone of Saturation - Depth to Top: _____

5. Soil Suitability Classification: I

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Soil Evaluator Jade Cooke Date 09-01-2021

Signature of Professional Engineer _____ Date 09-01-2021

Seal

N.J. License No. 33806
Theodore H. Bayer, PE
Bayer-Risse Engineering, Inc.

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 2b Soil Log and Interpretation

1. Log Number SL 812-3 Method: ☑Profile Pit ☐Boring Elev 79.0

2. Soil Log: Date Recorded: August 12, 2021

Depth (Inches) Top - Bottom	Munsell Color Name and Symbol; Estimated Textural Class; Estimated Volume % Coarse Fragment, If Present; Structure; Moist or Dry Consistence; Mottling Abundance, Size and Contrast, If Present
0-2"	Topsoil with fine/medium roots.
2-96"	7.5YR8/4 Pink Silt Loam; subangular blocky, friable; <5% gravel; no mottling; no seepage.
96-116"	7.5YR7/6 Reddish Yellow Loamy Sand; subangular blocky, friable; 10% gravel; no mottling; slight seepage at 96".
>116"	Stop Test.

2a. If mottling give reason for mottling: _____

3. Ground Water Observations:
☑Seepage - Indicate Depth: 96"
☐Pit/Boring Flooded Depth after ____ hours = ____

4. Soil Limiting Zones:
☐Fractured Rock Substratum - Depth to Top: ____
☐Massive Rock Substratum - Depth to Top: ____
☐Excessively Coarse Horizon - Depth Top to Bottom: ____
☐Excessively Coarse Substratum - Depth to Top: ____
☐Hydraulically Restrictive Horizon - Depth Top to Bottom: ____
☐Hydraulically Restrictive Substratum - Depth to Top: ____
☐Perched Zone of Saturation - Depth Top to Bottom: ____
☑Regional Zone of Saturation - Depth to Top: 96"

5. Soil Suitability Classification: I

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Soil Evaluator Jade Cook Date 09-01-2021

Signature of Professional Engineer _____ Date 09-01-2021

Seal

N.J. License No. 33806
Theodore H. Bayer, PE
Bayer-Risse Engineering, Inc.

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 2b Soil Log and Interpretation

1. Log Number SL 812-4 Method: ☑Profile Pit ☐Boring Elev 81.4

2. Soil Log: Date Recorded: August 12, 2021

Depth (Inches) Top - Bottom	Munsell Color Name and Symbol; Estimated Textural Class; Estimated Volume % Coarse Fragment, If Present; Structure; Moist or Dry Consistence; Mottling Abundance, Size and Contrast, If Present
0-6"	Topsoil with fine/medium roots.
6-60"	7.5YR8/4 Pink Silt Loam; subangular blocky, friable; 10% gravel; no mottling; no seepage.
60-96"	7.5YR7/6 Reddish Yellow Loamy Sand; subangular blocky, friable; 10-20% gravel; no mottling; no seepage.
96-150"	7.5YR8/2 Pinkish White Loamy Sand; subangular blocky, friable; 10-20% gravel; no mottling, no seepage.
>150"	Machine Limit.

Tube Permeameter TP 13A performed at 72" (K= 0.8 in/hr)
Tube Permeameter TP 13B performed at 72" (K= 0.7 in/hr)
Tube Permeameter TP 14A performed at 120" (K= 2.1 in/hr)
Tube Permeameter TP 14B performed at 120" (K= 1.9 in/hr)

2a. If mottling give reason for mottling: _____

3. Ground Water Observations:
☐Seepage - Indicate Depth: _____
☐Pit/Boring Flooded Depth after _____ hours = _____

4. Soil Limiting Zones:
☐Fractured Rock Substratum - Depth to Top: _____
☐Massive Rock Substratum - Depth to Top: _____
☐Excessively Coarse Horizon - Depth Top to Bottom: _____
☐Excessively Coarse Substratum - Depth to Top: _____
☐Hydraulically Restrictive Horizon - Depth Top to Bottom: _____
☐Hydraulically Restrictive Substratum - Depth to Top: _____
☐Perched Zone of Saturation - Depth Top to Bottom: _____
☐Regional Zone of Saturation - Depth to Top: _____

5. Soil Suitability Classification: I

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Soil Evaluator _____ Date 09-01-2021

Signature of Professional Engineer _____ Date 09-01-2021

Seal

N.J. License No. 33806
Theodore H. Bayer, PE
Bayer-Risse Engineering, Inc.

STATE OF NEW JERSEY THEODORE H BAYER No. GE33806 *LICENSED* PROFESSIONAL ENGINEER

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 2b Soil Log and Interpretation

1. Log Number **SL 812-5** Method: ☑Profile Pit ☐Boring Elev 82.9

2. Soil Log: Date Recorded: **August 12, 2021**

Depth (Inches) Top - Bottom	Munsell Color Name and Symbol; Estimated Textural Class; Estimated Volume % Coarse Fragment, If Present; Structure; Moist or Dry Consistence; Mottling Abundance, Size and Contrast, If Present
0-5"	**Topsoil with fine/medium roots.**
5-54"	**7.5YR8/4 Pink Silt Loam; subangular blocky, friable; <5% gravel; no mottling; no seepage.**
54-150"	**7.5YR7/6 Reddish Yellow Loamy Sand; subangular blocky, friable; 10% gravel; no mottling; no seepage.**
>150"	**Machine Limit.**

Tube Permeameter TP 15A performed at 96" (K= 4.5 in/hr)
Tube Permeameter TP 15B performed at 96" (K= 4.2 in/hr)

2a. If mottling give reason for mottling: _____

3. Ground Water Observations:
☐Seepage - Indicate Depth: _____
☐Pit/Boring Flooded Depth after _____ hours = _____

4. Soil Limiting Zones:
☐Fractured Rock Substratum - Depth to Top: _____
☐Massive Rock Substratum - Depth to Top: _____
☐Excessively Coarse Horizon - Depth Top to Bottom: _____
☐Excessively Coarse Substratum - Depth to Top: _____
☐Hydraulically Restrictive Horizon - Depth Top to Bottom: _____
☐Hydraulically Restrictive Substratum - Depth to Top: _____
☐Perched Zone of Saturation - Depth Top to Bottom: _____
☐Regional Zone of Saturation - Depth to Top: _____

5. Soil Suitability Classification: I

6. I hereby certify that the information furnished on Form 2b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Soil Evaluator Jodi Cook Date 09-01-2021

Signature of Professional Engineer _____ Date 09-01-2021

Seal

N.J. License No. 33806
Theodore H. Bayer, PE
Bayer-Risse Engineering, Inc.

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 3a. Soil Permeability Data

Assign a number for each test and a letter for each test replicate. Show test data and calculations on Form 3b, 3c, 3d, 3e, 3f, or 3g. Use one sheet for each separate test or test replicate.

1. Summary of Data - Enter data for each test replicate on a separate line.

Type of Test	Test (Number)	Replicate (Letter)	Depth (Inches)	Result*
Tube Permeameter	TP 13	A	72"	K=0.8 in/hr
Tube Permeameter	TP 13	B	72"	K=0.7 in/hr
Tube Permeameter	TP 14	A	120"	K=2.1 in/hr
Tube Permeameter	TP 14	B	120"	K=1.9 in/hr
Tube Permeameter	TP 15	A	96"	K=4.5 in/hr
Tube Permeameter	TP 15	B	96"	K=4.2 in/hr

*For tube permeameter, pit bailing, and piezometer tests, report results in inches per hour. For Soil permeability class rating, give soil permeability class number. For percolation test report result in minutes per inch. For basin flooding test report result as positive if basin drains completely within 24 hours of second filling, negative otherwise.

2. Design Permeability/Percolation Rate: Specify Test Number: ____
   ☐Average of Test Replicates ☐Single Replicate
   ☐Slowest Replicate

3. Type of Limiting Zone Identified Test Number

4. Attachments (Check items included):
   ☑Form 3b - Tube Permeameter Test Data - Number of Sheets: 6
   ☐Form 3c - Soil Permeability Class Rating Test Data - Number of Sheets: ____
   ☐Form 3d - Percolation Test Data - Number of Sheets: ____
   ☐Form 3e - Piezometer Test Data - Number of Sheets: ____
   ☐Form 3f - Pit Bailing Test Data - Number of Sheets: ____
   ☐Form 3g - Basin Flooding Test Data - Number of Sheets: ____

5. I hereby certify that the information furnished on Form 3a of this application (and the attachments thereto) is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____ Date 09-01-2021

Signature of Professional Engineer _____ Date 09-01-2021

Seal

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 3b. Tube Permeameter Test Data:

I. Test Number: TP 13 Replicate (Letter): A Date Tested: 8/12/21

II. Material Tested: ☐Fill ☑Test in Native Soil - Indicate Depth: 72"

III. Sample: ☑Undisturbed ☐Disturbed

IV. Sample Dimensions: Inside Radius of Sample Tube, R, in cm.: 2.54

Length of Sample, L, in inches: 3.625

V. Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample - Wt. of Empty Tube), grams: _____
Sample Volume (L × 2.54 cm./inch × 3.14R^2), cc.: _____
Bulk Density (Sample Wt./Sample Volume), grams/cc.: _____

VI. Standpipe Used: ☐No ☑Yes - Indicate Internal Radius, cm.: 0.635

VII. Height of Water Level Above Rim of Test Basin, in inches:

At the beginning of each test interval, , H_1: 10
At the end of each test interval, , H_2: 8

VIII. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval T_1	Time, End of Test Interval T_2	Length of Test Interval T (minutes)
0:00:00	0:03:45	3.75
0:00:00	0:03:48	3.80
0:00:00	0:03:48	3.80

IX. Calculation of Permeability:

K (in/hr) = 60 min/hr × r^2/R^2 × L(in)/T(min) × ln(H_1/H_2)
K (in/hr) = 60 min/hr × 0.635^2/2.54^2 × 3.625/3.80 × ln(10/8)=0.8 in/hr

X. Defects in the Sample (Check appropriate items):

☑None ☐Cracks ☐Worm Channels ☐Root Channels
☐Soil/Tube Contact ☐Large Gravel ☐Large Roots
☐Dry Soil ☐Smearing ☐Compaction
☐Other - Specify: _____.

XI. I hereby certify that the information furnished on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____ Date 09-01-2021

Signature of Professional Engineer _____ Date 09-01-2021

Seal

N.J. License No. 33806
Theodore H. Bayer, PE
Bayer-Risse Engineering, Inc.

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 3b. Tube Permeameter Test Data:

I. Test Number: **TP 13** Replicate (Letter): **B** Date Tested: **8/12/21**

II. Material Tested: ☐Fill ☑Test in Native Soil - Indicate Depth: **72"**

III. Sample: ☑Undisturbed ☐Disturbed

IV. Sample Dimensions: Inside Radius of Sample Tube, R, in cm.: **2.54**

Length of Sample, L, in inches: **3.5**

V. Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample - Wt. of Empty Tube), grams: _____
Sample Volume (L × 2.54 cm./inch × 3.14R^2), cc.: _____
Bulk Density (Sample Wt./Sample Volume), grams/cc.: _____

VI. Standpipe Used: ☐No ☑Yes - Indicate Internal Radius, cm.: **0.635**

VII. Height of Water Level Above Rim of Test Basin, in inches:

At the beginning of each test interval, , H_1: **10**
At the end of each test interval, , H_2: **8**

VIII. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval T_1	Time, End of Test Interval T_2	Length of Test Interval T (minutes)
0:00:00	**0:04:05**	**4.08**
0:00:00	**0:04:08**	**4.13**
0:00:00	**0:04:08**	**4.13**

IX. Calculation of Permeability:

K (in/hr) = 60 min/hr × r^2/R^2 × L(in)/T(min) × ln(H_1/H_2)
K (in/hr) = 60 min/hr × **$0.635^2/2.54^2$** × **3.5/4.13** × ln(**10/8**)=**0.7 in/hr**

X. Defects in the Sample (Check appropriate items):

☑None ☐Cracks ☐Worm Channels ☐Root Channels
☐Soil/Tube Contact ☐Large Gravel ☐Large Roots
☐Dry Soil ☐Smearing ☐Compaction
☐Other - Specify: _____.

XI. I hereby certify that the information furnished on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____ Date 09-01-2021

Signature of Professional Engineer _____ Date 09-01-2021

Seal

N.J. License No. 33806
Theodore H. Bayer, PE
Bayer-Risse Engineering, Inc.

STATE OF NEW JERSEY THEODORE H BAYER No. GE33806 *LICENSED* PROFESSIONAL ENGINEER

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 3b. Tube Permeameter Test Data:

I. Test Number: TP 14 Replicate (Letter): A Date Tested: 8/12/21

II. Material Tested: ☐Fill ☑Test in Native Soil - Indicate Depth: 120"

III. Sample: ☑Undisturbed ☐Disturbed

IV. Sample Dimensions: Inside Radius of Sample Tube, R, in cm.: 2.54

Length of Sample, L, in inches: 4.125

V. Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample - Wt. of Empty Tube), grams: ____
Sample Volume (L × 2.54 cm./inch × 3.14R^2), cc.: ____
Bulk Density (Sample Wt./Sample Volume), grams/cc.: ____

VI. Standpipe Used: ☐No ☑Yes - Indicate Internal Radius, cm.: 0.635

VII. Height of Water Level Above Rim of Test Basin, in inches:

At the beginning of each test interval, , H_1: 10
At the end of each test interval, , H_2: 8

VIII. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval T_1	Time, End of Test Interval T_2	Length of Test Interval T (minutes)
0:00:00	0:01:37	1.62
0:00:00	0:01:36	1.60
0:00:00	0:01:37	1.62

IX. Calculation of Permeability:

K (in/hr) = 60 min/hr × r^2/R^2 × L(in)/T(min) × ln(H_1/H_2)
K (in/hr) = 60 min/hr × $0.635^2/2.54^2$ × 4.125/1.62 × ln(10/8)=2.1 in/hr

X. Defects in the Sample (Check appropriate items):

☑None ☐Cracks ☐Worm Channels ☐Root Channels
☐Soil/Tube Contact ☐Large Gravel ☐Large Roots
☐Dry Soil ☐Smearing ☐Compaction
☐Other - Specify: ____.

XI. I hereby certify that the information furnished on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____ Date 09-01-2021

Signature of Professional Engineer _____ Date 09-01-2021

Seal

N.J. License No. 33806
Theodore H. Bayer, PE
Bayer-Risse Engineering, Inc.

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 3b. Tube Permeameter Test Data:

I. Test Number: **TP 14** Replicate (Letter): **B** Date Tested: **8/12/21**

II. Material Tested: ☐Fill ☑Test in Native Soil - Indicate Depth: **120"**

III. Sample: ☑Undisturbed ☐Disturbed

IV. Sample Dimensions: Inside Radius of Sample Tube, R, in cm.: **2.54**

Length of Sample, L, in inches: **4.85**

V. Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample - Wt. of Empty Tube), grams: ____
Sample Volume (L × 2.54 cm./inch × 3.14R^2), cc.: ____
Bulk Density (Sample Wt./Sample Volume), grams/cc.: ____

VI. Standpipe Used: ☐No ☑Yes - Indicate Internal Radius, cm.: **0.635**

VII. Height of Water Level Above Rim of Test Basin, in inches:

At the beginning of each test interval, , H_1: **10**
At the end of each test interval, , H_2: **8**

VIII. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval T_1	Time, End of Test Interval T_2	Length of Test Interval T (minutes)
0:00:00	0:02:05	2.08
0:00:00	0:02:08	2.13
0:00:00	0:02:09	2.15

IX. Calculation of Permeability:

K (in/hr) = 60 min/hr × r^2/R^2 × L(in)/T(min) × ln(H_1/H_2)
K (in/hr) = 60 min/hr × **$0.635^2/2.54^2$** × **4.85/2.15** × ln(**10/8**)=**1.9 in/hr**

X. Defects in the Sample (Check appropriate items):

☑None ☐Cracks ☐Worm Channels ☐Root Channels
☐Soil/Tube Contact ☐Large Gravel ☐Large Roots
☐Dry Soil ☐Smearing ☐Compaction
☐Other - Specify: ____.

XI. I hereby certify that the information furnished on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator Jodi Cook Date 09-01-2021

Signature of Professional Engineer Date 09-01-2021

Seal

N.J. License No. 33806
Theodore H. Bayer, PE
Bayer-Risse Engineering, Inc.

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 3b. Tube Permeameter Test Data:

I. Test Number: **TP 15** Replicate (Letter): **A** Date Tested: **8/12/21**

II. Material Tested: ☐Fill ☑Test in Native Soil - Indicate Depth: **96"**

III. Sample: ☑Undisturbed ☐Disturbed

IV. Sample Dimensions: Inside Radius of Sample Tube, R, in cm.: **2.54**

Length of Sample, L, in inches: **4.25**

V. Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample - Wt. of Empty Tube), grams: _____
Sample Volume (L × 2.54 cm./inch × 3.14R^2), cc.: _____
Bulk Density (Sample Wt./Sample Volume), grams/cc.: _____

VI. Standpipe Used: ☐No ☑Yes - Indicate Internal Radius, cm.: **0.635**

VI. Height of Water Level Above Rim of Test Basin, in inches:

At the beginning of each test interval, , H_1: **10**
At the end of each test interval, , H_2: **8**

VIII. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval T_1	Time, End of Test Interval T_2	Length of Test Interval T (minutes)
0:00:00	0:00:49	0.82
0:00:00	0:00:48	0.80
0:00:00	0:00:47	0.78

IX. Calculation of Permeability:

K (in/hr) = 60 min/hr × r^2/R^2 × L(in)/T(min) × ln(H_1/H_2)
K (in/hr) = 60 min/hr × **$0.635^2/2.54^2$** × **4.25/.78** × ln(**10/8**)=**4.5 in/hr**

X. Defects in the Sample (Check appropriate items):

☑None ☐Cracks ☐Worm Channels ☐Root Channels
☐Soil/Tube Contact ☐Large Gravel ☐Large Roots
☐Dry Soil ☐Smearing ☐Compaction
☐Other - Specify: _____.

XI. I hereby certify that the information furnished on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____ Date 09-01-2021

Signature of Professional Engineer _____ Date 09-01-2021

Seal

N.J. License No. 33806
Theodore H. Bayer, PE
Bayer-Risse Engineering, Inc.

STATE OF NEW JERSEY THEODORE H BAYER No. GE33806 *LICENSED* PROFESSIONAL ENGINEER

STORMWATER PERMEABILITY TEST

LAWRENCE TOWNSHIP / MERCER COUNTY **Block** 701 **Lot** 39

Form 3b. Tube Permeameter Test Data:

I. Test Number: **TP 15** Replicate (Letter): **B** Date Tested: **8/12/21**

II. Material Tested: ☐Fill ☑Test in Native Soil - Indicate Depth: **96"**

III. Sample: ☑Undisturbed ☐Disturbed

IV. Sample Dimensions: Inside Radius of Sample Tube, R, in cm.: **2.54**

Length of Sample, L, in inches: **4.75**

V. Bulk Density Determination (Disturbed Samples Only):

Sample Weight (Wt. Tube Containing Sample - Wt. of Empty Tube), grams: _____
Sample Volume (L × 2.54 cm./inch × 3.14R^2), cc.: _____
Bulk Density (Sample Wt./Sample Volume), grams/cc.: _____

VI. Standpipe Used: ☐No ☑Yes - Indicate Internal Radius, cm.: **0.635**

VI. Height of Water Level Above Rim of Test Basin, in inches:

At the beginning of each test interval, , H_1: **10**
At the end of each test interval, , H_2: **8**

VIII. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval T_1	Time, End of Test Interval T_2	Length of Test Interval T (minutes)
0:00:00	**0:00:55**	**0.92**
0:00:00	**0:00:57**	**0.95**
0:00:00	**0:00:57**	**0.95**

IX. Calculation of Permeability:

K (in/hr) = 60 min/hr × r^2/R^2 × L(in)/T(min) × ln(H_1/H_2)
K (in/hr) = 60 min/hr × **0.635²/2.54²** × **4.75/.95** × ln(**10/8**)=**4.2 in/hr**

X. Defects in the Sample (Check appropriate items):

☑None ☐Cracks ☐Worm Channels ☐Root Channels
☐Soil/Tube Contact ☐Large Gravel ☐Large Roots
☐Dry Soil ☐Smearing ☐Compaction
☐Other - Specify: _____.

XI. I hereby certify that the information furnished on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

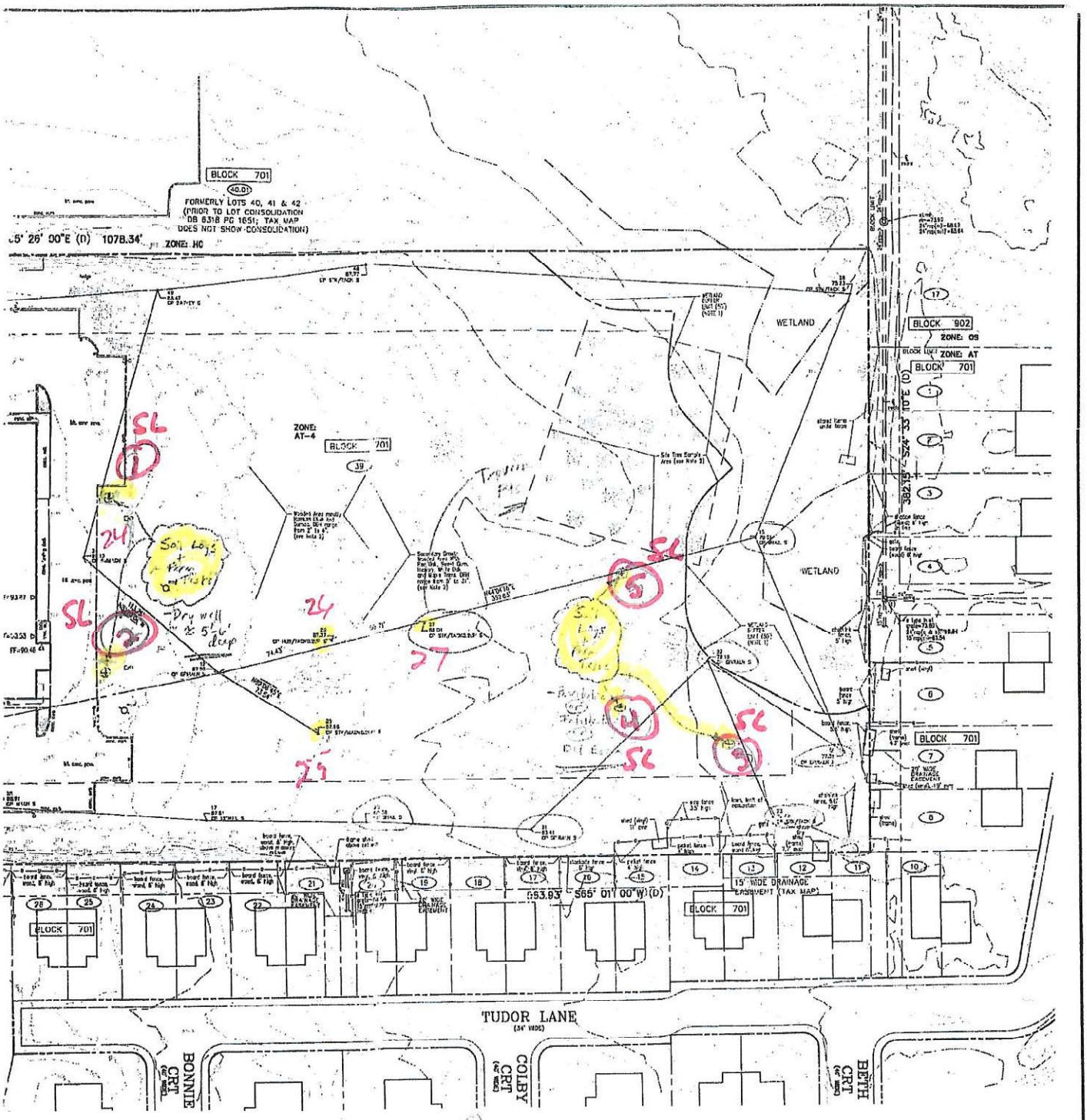
Signature of Site Evaluator _____ Date 09-01-2021

Signature of Professional Engineer _____ Date 09-01-2021

Seal

N.J. License No. 33806
Theodore H. Bayer, PE
Bayer-Risse Engineering, Inc.

STATE OF NEW JERSEY THEODORE H BAYER No. GE33806 *LICENSED* PROFESSIONAL ENGINEER



ZONING REQUIREMENTS APARTMENT AND TOWNHOUSE 4 (AT-4) DISTRICT (THE FOLLOWING IS A PARTIAL LIST)		
	REQUIRED	EXISTING
MIN. LOT AREA (AC)	7	7.1714
MIN. BUILDABLE AREA (WITHIN SETBACKS) (AC)	4	4.4528
MIN. FRONTAGE (FT)	40	40
BUILDING SETBACK FROM TRACT PERIMETER (FT)	50	100.6
PARKING SETBACK FROM TRACT PERIMETER (FT)	25	28.2
BUILDING TO BUILDING SETBACKS		
FRONT OR BACK SETBACK (FT)	50	N/A
SIDE (FT)	20	N/A
FROM PARKING (FT)	5	N/A
MAX. BUILDING HEIGHT (FT/STORIES)	45/3	20/1
MAX. BUILDING LENGTH, LONG AXIS (FT)	240	174

2,385 SQ. FT. (7.1714
. SETBACKS AND

RENCE TOWNSHIP ZONING
OUSE 4 RESIDENTIAL
QUIREMENTS ARE LISTED
HE TWP. ORDINANCE FOR

D TO THE NORTH
BASED ON GPS

RIBED IN THE FOLLOWING
RECORDED IN DEED
ED BOOK 2080 PAGES

AL FLOOD HAZARD) AS
RM). MERCER COUNTY,
COMMUNITIES- EWING
F: LAWRENCE, TWP. OF
NO. 345325.
0207F WITH AN

NO.	DATE	DESCRIPTION OF REVISION	BY	CHK'D

HOPEWELL VALLEY ENGINEERING, PC
ENGINEERS, PLANNERS & LAND SURVEYORS
1600 Reed Road, Suite A
Pennington, NJ 08534-5002
Tel: 609-745-5800
Fax: 609-745-5807
www.hopewellvalleyengineering.com

DATE	06/18/21
SCALE	1" = 40'
DRAWN	ALS
CHECKED	ALS
JOB NO.	1107537C
FILE NO.	102
DWG	D101537C

BOUNDARY & TOPOGRAPHIC SURVEY
FOR
1052 SPRUCE STREET PARTNERS, LLC
BLOCK 701 LOT 39
SITUATE IN
LAWRENCE TOWNSHIP MERCER COUNTY NEW JERSEY

STATE OF NEW JERSEY
ALLAN L. SAMPSON
No. GS29356
LICENSED PROFESSIONAL LAND SURVEYOR

ALLAN L. SAMPSON
N.J. PROF. LAND SURVEYOR No. 29356

Sheet 1 of 1

FIELD SHEET - Locations Approximate

Appendix B

Existing and Developed
Drainage Area Plan

FLM: INSERT TWO (2) PLAN POCKETS IN PLACE OF THIS SHEET