

DRAINAGE REPORT

PROPOSED COMMERCIAL BUILDING PHILLIPS ROAD NEW BEDFORD, MA

Prepared For:

PANAGAKOS DEVELOPMENT

Prepared By:

**SITEC, INC. - CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
DARTMOUTH, MA**

CEC Project 304-118

**MARCH 26, 2021
REVISED: JUNE 15, 2021**



SITEC
Part of Civil & Environmental Consultants, Inc.



The Phillips Road site is a 1.9-acre parcel of land situated in New Bedford, on the west side of Phillips Road. The project site will consist of a 3500 square foot commercial building, along with associated parking facilities, utilities and drainage improvements.

EXISTING CONDITIONS

The project site currently is a wooded vacant lot. The topography of the site is fairly consistent, generally sloping from east to west. Stormwater runoff generated on site flows to the west to a bordering vegetated wetland system.

A review of the soils survey map of Bristol County prepared by the U.S.D.A. Natural Resources Conservation Service indicates that the following soil classifications exist within the area of the site being developed:

- 242A Hinckley Loamy Sand
- 260A Sudbury fine Sandy Loam

The Hinckley soil series is a Hydrologic Group A soil that is found over eastern portion of the proposed site development. The Sudbury soil series is a Hydrologic Group B soil found on the western portion of the proposed site development.

For the purpose of these calculations a single design point will be analyzed for the existing conditions. Design Point No. 1 (DP-1) is the edge of the bordering vegetated wetland. Existing condition runoff hydrographs for the 2, 10, and 100-year storm events have been computed using the SCS TR20 methodology and the results as measured at each design point are summarized below:

<u>Storm Frequency</u>	Design Point No. 1
	<u>Peak Rate of Runoff</u>
2 yr.	0.1 CFS
10 yr.	0.6 CFS
100 yr.	2.2 CFS

DEVELOPED CONDITIONS

The applicant is proposing the construction of a 3500 commercial building with associated parking facility, utilities, and drainage improvements. There will be 31 parking spaces added to the property with three access points off of an existing access road.

The improvements being proposed as part of this development will add impervious surfaces to the project site. As a result of these improvements, without proper site design the development of this project would result in an increase in the rate of runoff from the project site. The flow of runoff through the watershed will follow the same general pattern as existing conditions. The majority of the site (PC-1) will drain to an onsite water treatment unit that will overflow into a subsurface detention/recharge system. The overflow from this system will be directed to the east side of the site, matching the existing conditions flow path. A small portion of the site (PC-2) will by-pass the drainage systems and the runoff will be directed to the bordering vegetated wetland that borders the site in the east.

The developed condition runoff hydrographs for the 2-, 10-, and 100-year storm events as measured at the design point have been computed using the SCS TR20 methodology and are summarized below:

Design Point No. 1	
<u>Storm Frequency</u>	<u>Peak Rate of Runoff</u>
2 yr.	0.1 CFS
10 yr.	0.6 CFS
100 yr.	2.1 CFS

STORMWATER STANDARD NO. 2 – PEAK RATE MITIGATION

The comparison of the pre- and post-development runoff rates summarized below illustrates the proper mitigation of post-development stormwater runoff.

Design Point No. 1

<u>Storm Frequency</u>	<u>Existing Conditions</u>	<u>Developed Conditions</u>
	<u>Peak Rate of Runoff</u>	<u>Peak Rate Runoff</u>
2 yr.	0.1 CFS	0.1 CFS
10 yr.	0.6 CFS	0.6 CFS
100 yr.	2.2 CFS	2.1 CFS

STORMWATER STANDARD NO. 3 - GROUNDWATER RECHARGE

Groundwater recharge will take place in the proposed infiltration system consisting of 35 Cultec 330XLHD units. Supporting calculations are included within the Hydrocad drainage report attached.

STORMWATER STANDARD NO. 4 - WATER QUALITY VOLUME

Total Suspended Solid Removal:

The proposed development will result in an increase of impervious area being added to the project site. Therefore, the TSS removal calculation for each watershed is as follows:

Design Point No. 1 (TSS Removal = 86%)

<u>BMP</u>	<u>TSS Removal Rate</u>	<u>Starting TSS Load</u>	<u>Amount Removed</u>	<u>Remaining Load</u>
Stormceptor	0.86	1.00	0.86	0.14

Water Quality Volume:

The required water quality volume has been converted to a water quality flow rate per the Massachusetts standard method for proprietary stormwater treatment practices. The calculations for the Stormceptor unit are attached to this report.

STORMWATER STANDARD NO. 5 – Land with Higher Potential Pollutant Loads

Does not apply to this project.

STORMWATER STANDARD NO. 6 – CRITICAL AREAS

Does not apply to this project.

STORMWATER STANDARD NO. 7 – REDEVELOPMENT PROJECTS

Does not apply to this project.

STORMWATER STANDARD NO. 8 – Construction Impact Control Plan

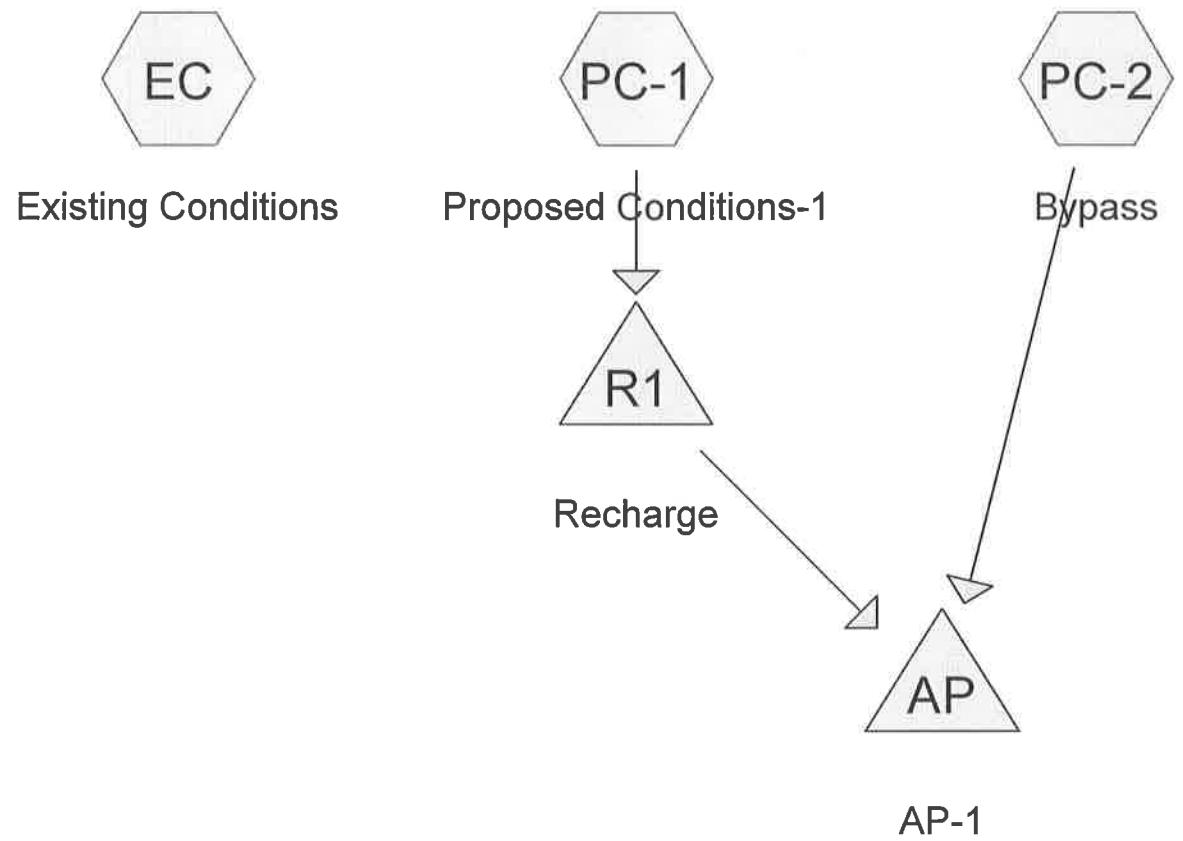
See the Erosion and Sediment Control Plan on Sheet 9 of 9 of the plan set.

STORMWATER STANDARD NO. 9 – OPERATION AND MAINTENANCE PLAN

Refer to the Operation and Maintenance Plan on Sheet 9 of 9 of the plan set.

STORMWATER STANDARD NO. 10 – ILLICIT DISCHARGES

There are no existing or proposed illicit discharges located on the site.



Routing Diagram for Panagakos-Phillips-Rd-current-rev
Prepared by CEC, Inc., Printed 6/29/2021
HydroCAD® 10.10-3a s/n 07492 © 2020 HydroCAD Software Solutions LLC

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points x 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EC: Existing Conditions Runoff Area=1.420 ac 0.00% Impervious Runoff Depth=0.17"
Flow Length=146' Tc=7.8 min CN=50 Runoff=0.06 cfs 0.020 af**Subcatchment PC-1: Proposed** Runoff Area=0.590 ac 66.10% Impervious Runoff Depth=1.70"
Tc=6.0 min CN=82 Runoff=1.15 cfs 0.084 af**Subcatchment PC-2: Bypass** Runoff Area=0.830 ac 6.02% Impervious Runoff Depth=0.31"
Flow Length=110' Tc=7.8 min CN=55 Runoff=0.12 cfs 0.022 af**Pond AP: AP-1** Inflow=0.12 cfs 0.022 af
Primary=0.12 cfs 0.022 af**Pond R1: Recharge** Peak Elev=89.51' Storage=0.019 af Inflow=1.15 cfs 0.084 af
Discarded=0.26 cfs 0.084 af Primary=0.00 cfs 0.000 af Outflow=0.26 cfs 0.084 af**Total Runoff Area = 2.840 ac Runoff Volume = 0.126 af Average Runoff Depth = 0.53"**
84.51% Pervious = 2.400 ac 15.49% Impervious = 0.440 ac

Summary for Subcatchment EC: Existing Conditions

Runoff = 0.06 cfs @ 12.45 hrs, Volume= 0.020 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-YR. STORM Rainfall=3.40"

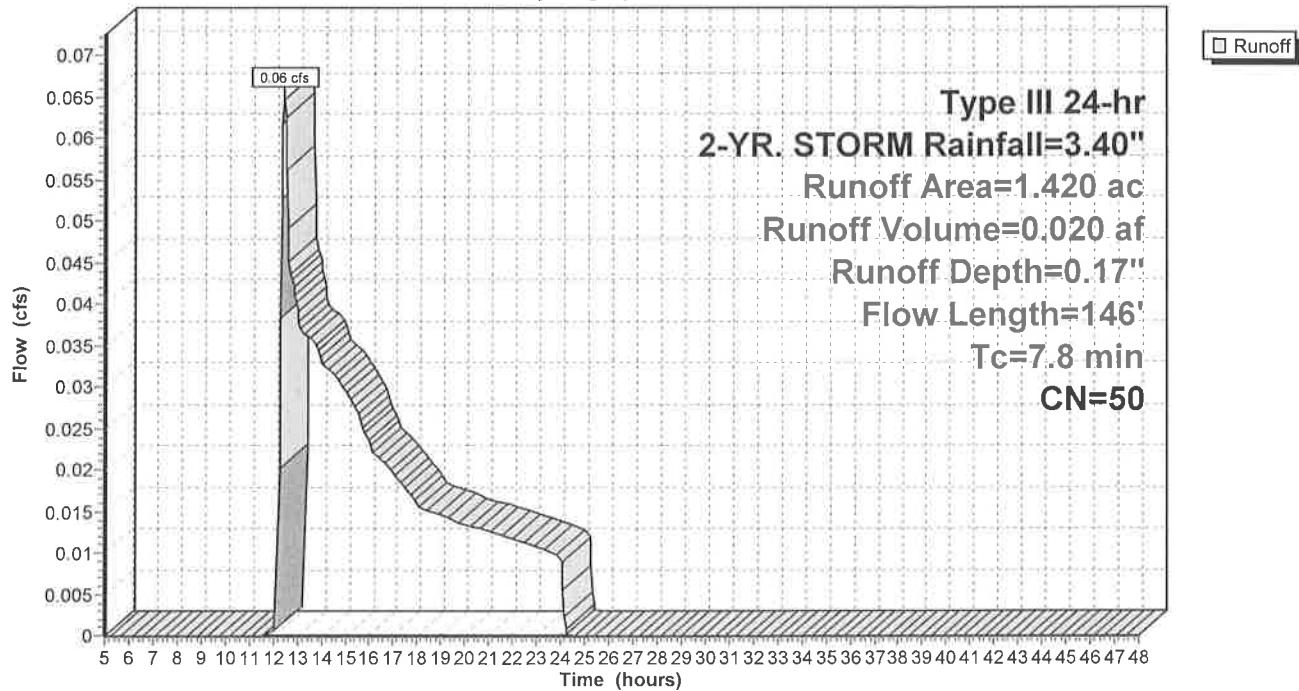
Area (ac)	CN	Description
0.600	36	Woods, Fair, HSG A
0.820	60	Woods, Fair, HSG B

1.420	50	Weighted Average
1.420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1080	0.14		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	96	0.0360	0.95		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
7.8	146				Total

Subcatchment EC: Existing Conditions

Hydrograph



Summary for Subcatchment PC-1: Proposed Conditions-1

Runoff = 1.15 cfs @ 12.09 hrs, Volume= 0.084 af, Depth= 1.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR. STORM Rainfall=3.40"

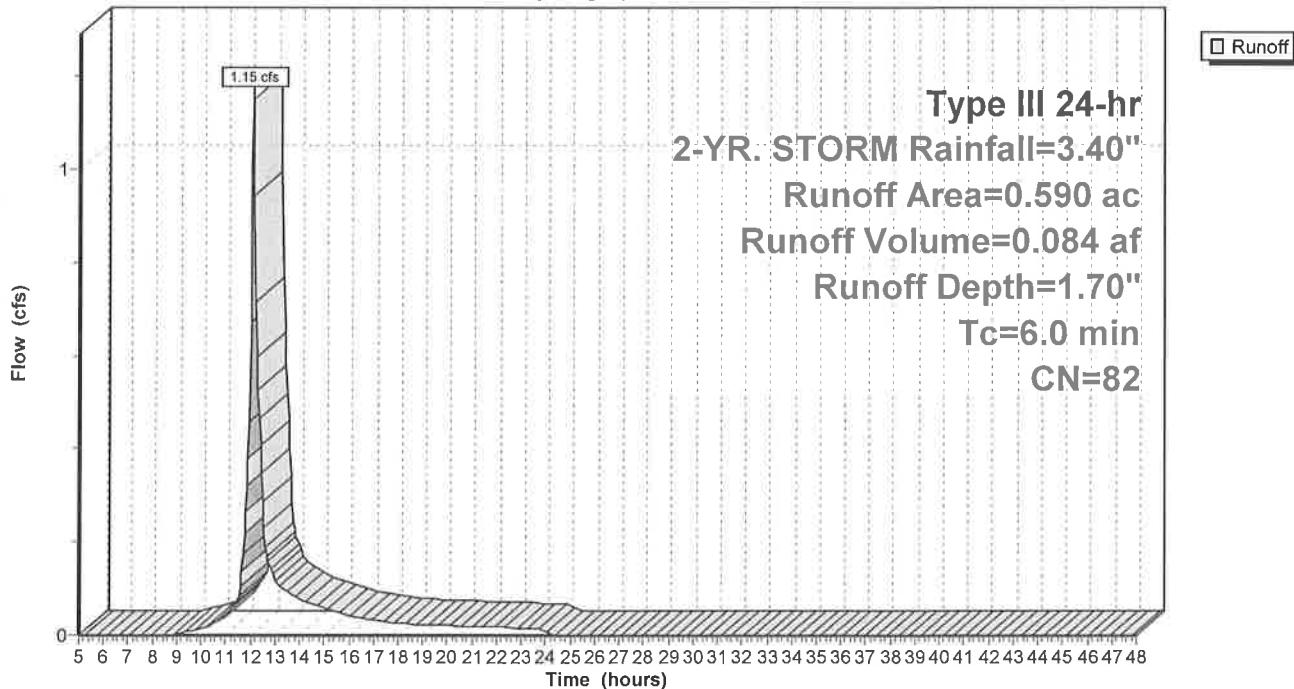
Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.110	61	>75% Grass cover, Good, HSG B
0.180	98	Paved parking, HSG A
0.210	98	Paved parking, HSG B

0.590	82	Weighted Average
0.200		33.90% Pervious Area
0.390		66.10% Impervious Area

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

Subcatchment PC-1: Proposed Conditions-1

Hydrograph



Summary for Subcatchment PC-2: Bypass

Runoff = 0.12 cfs @ 12.32 hrs, Volume= 0.022 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR. STORM Rainfall=3.40"

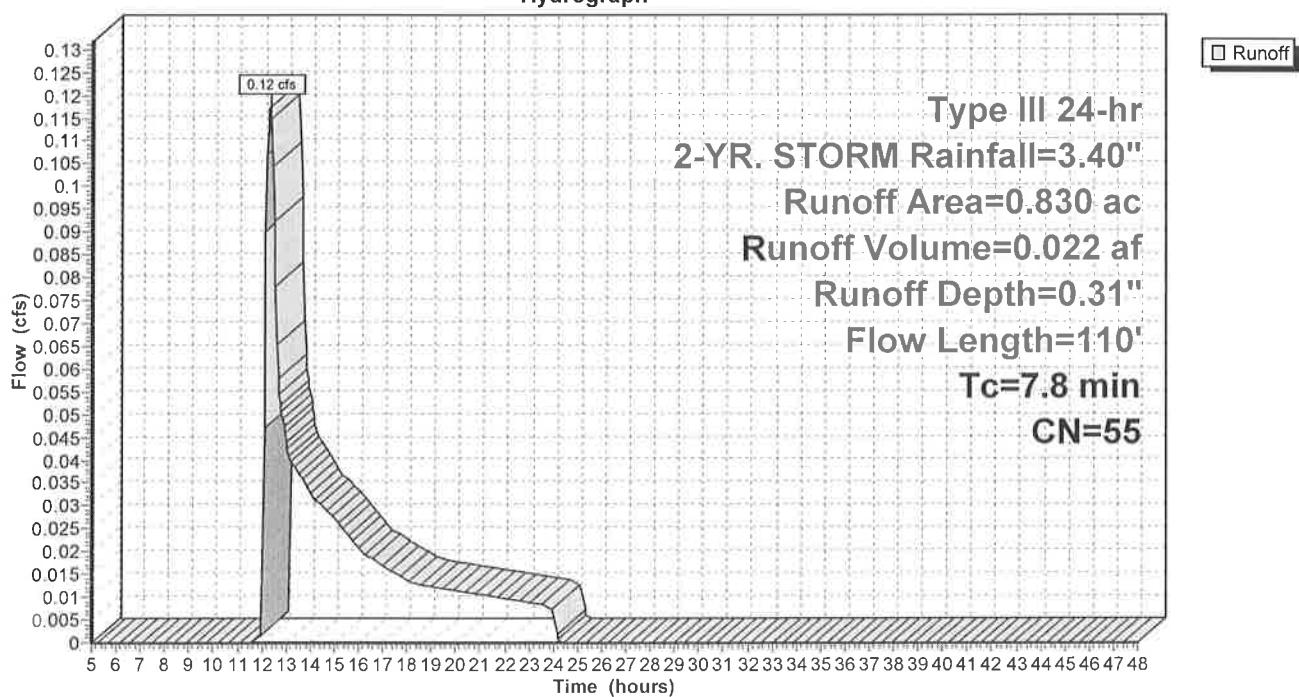
Area (ac)	CN	Description
0.220	36	Woods, Fair, HSG A
0.510	60	Woods, Fair, HSG B
0.050	98	Paved parking, HSG A
0.050	39	>75% Grass cover, Good, HSG A

0.830	55	Weighted Average
0.780		93.98% Pervious Area
0.050		6.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0740	0.12		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	60	0.0920	1.52		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
7.8	110			Total	

Subcatchment PC-2: Bypass

Hydrograph



Summary for Pond AP: AP-1

Inflow Area = 1.420 ac, 30.99% Impervious, Inflow Depth = 0.18" for 2-YR. STORM event

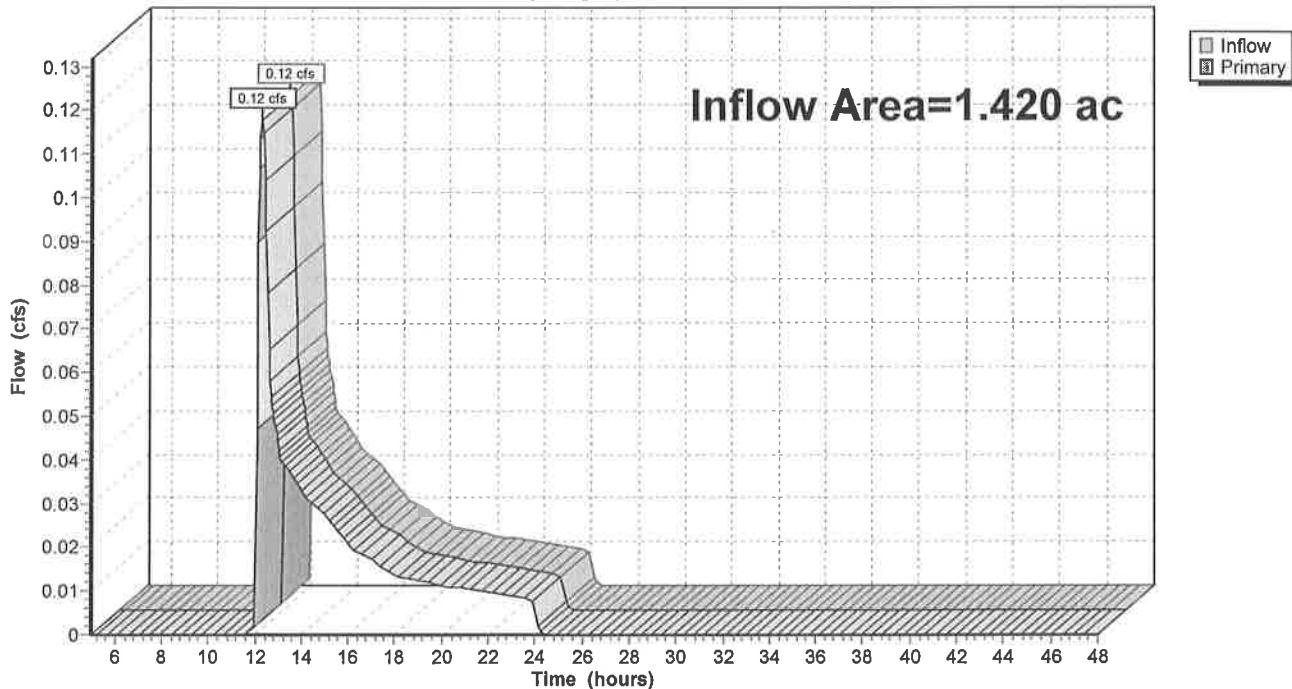
Inflow = 0.12 cfs @ 12.32 hrs, Volume= 0.022 af

Primary = 0.12 cfs @ 12.32 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2

Pond AP: AP-1

Hydrograph



Summary for Pond R1: Recharge

Inflow Area = 0.590 ac, 66.10% Impervious, Inflow Depth = 1.70" for 2-YR. STORM event
 Inflow = 1.15 cfs @ 12.09 hrs, Volume= 0.084 af
 Outflow = 0.26 cfs @ 11.90 hrs, Volume= 0.084 af, Atten= 78%, Lag= 0.0 min
 Discarded = 0.26 cfs @ 11.90 hrs, Volume= 0.084 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 89.51' @ 12.53 hrs Surf.Area= 0.031 ac Storage= 0.019 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 18.4 min (851.8 - 833.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.50'	0.027 af	25.67'W x 52.50'L x 3.54'H Field A 0.110 af Overall - 0.043 af Embedded = 0.066 af x 40.0% Voids
#2A	89.00'	0.043 af	Cultec R-330XLHD x 35 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
0.070 af			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices	
#1	Discarded	88.50'	8.270 in/hr Exfiltration over Surface area	Phase-In= 0.01'
#2	Primary	91.00'	8.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.00' / 90.90' S= 0.0033 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf	

Discarded OutFlow Max=0.26 cfs @ 11.90 hrs HW=88.55' (Free Discharge)
 ↗1=Exfiltration (Exfiltration Controls 0.26 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=88.50' TW=0.00' (Dynamic Tailwater)
 ↗2=Culvert (Controls 0.00 cfs)

Pond R1: Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50'
Base Length

5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

35 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 1,881.4 cf Chamber Storage

4,772.4 cf Field - 1,881.4 cf Chambers = 2,891.0 cf Stone x 40.0% Voids = 1,156.4 cf Stone Storage

Chamber Storage + Stone Storage = 3,037.8 cf = 0.070 af

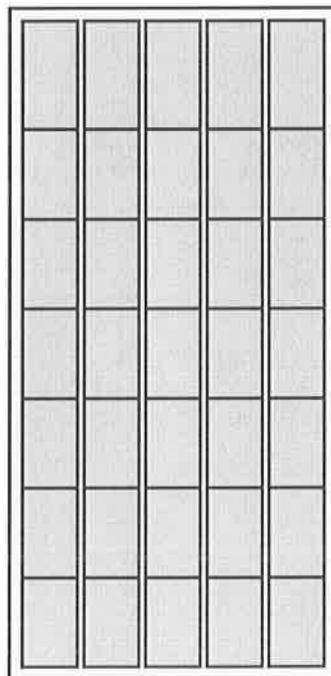
Overall Storage Efficiency = 63.7%

Overall System Size = 52.50' x 25.67' x 3.54'

35 Chambers

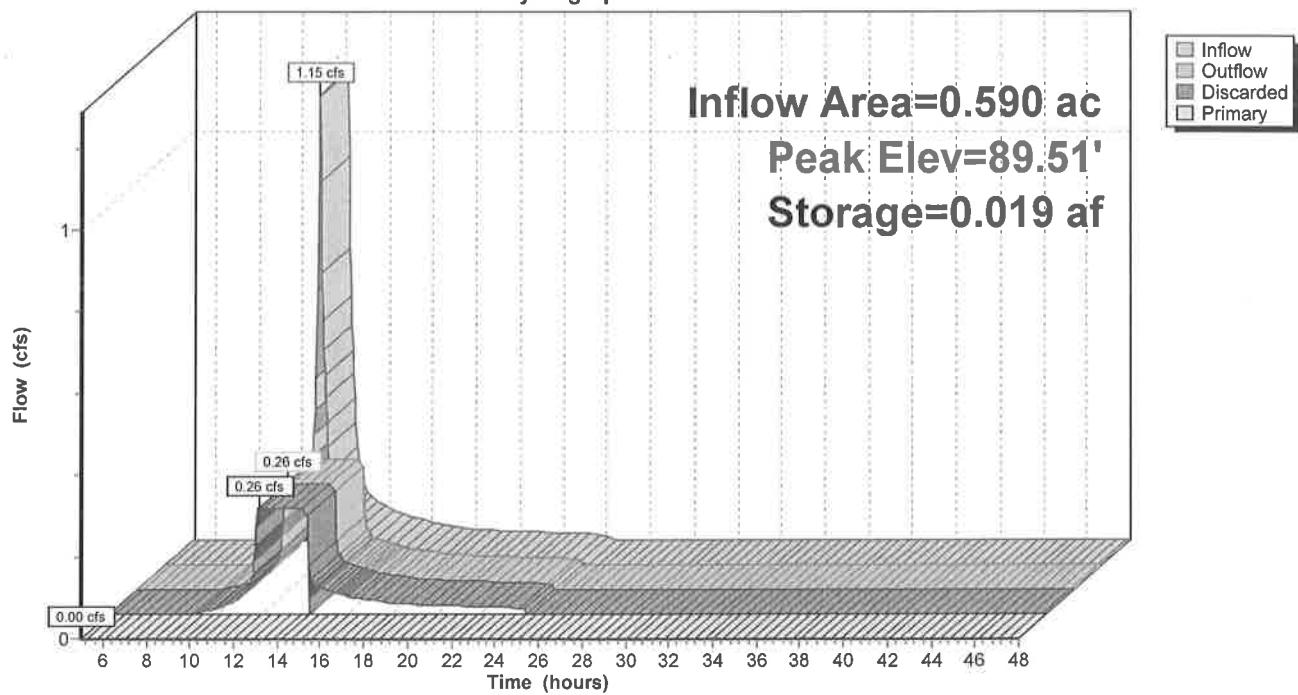
176.8 cy Field

107.1 cy Stone



Pond R1: Recharge

Hydrograph



Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EC: Existing Conditions Runoff Area=1.420 ac 0.00% Impervious Runoff Depth=0.61"
Flow Length=146' Tc=7.8 min CN=50 Runoff=0.55 cfs 0.072 af

Subcatchment PC-1: Proposed Runoff Area=0.590 ac 66.10% Impervious Runoff Depth=2.90"
Tc=6.0 min CN=82 Runoff=1.96 cfs 0.143 af

Subcatchment PC-2: Bypass Runoff Area=0.830 ac 6.02% Impervious Runoff Depth=0.88"
Flow Length=110' Tc=7.8 min CN=55 Runoff=0.61 cfs 0.061 af

Pond AP: AP-1 Inflow=0.61 cfs 0.061 af
Primary=0.61 cfs 0.061 af

Pond R1: Recharge Peak Elev=90.60' Storage=0.046 af Inflow=1.96 cfs 0.143 af
Discarded=0.26 cfs 0.143 af Primary=0.00 cfs 0.000 af Outflow=0.26 cfs 0.143 af

Total Runoff Area = 2.840 ac Runoff Volume = 0.276 af Average Runoff Depth = 1.17"
84.51% Pervious = 2.400 ac 15.49% Impervious = 0.440 ac

Summary for Subcatchment EC: Existing Conditions

Runoff = 0.55 cfs @ 12.17 hrs, Volume= 0.072 af, Depth= 0.61"

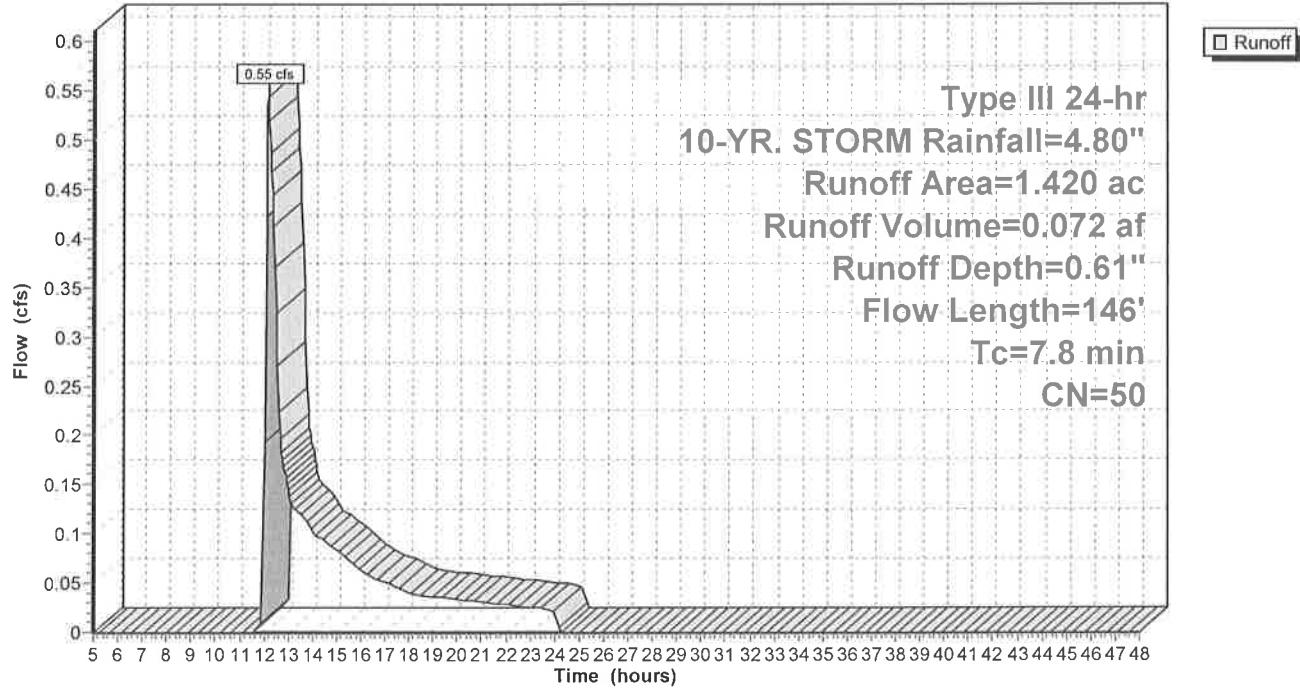
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR. STORM Rainfall=4.80"

Area (ac)	CN	Description
0.600	36	Woods, Fair, HSG A
0.820	60	Woods, Fair, HSG B
1.420	50	Weighted Average
1.420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1080	0.14		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	96	0.0360	0.95		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
7.8	146				Total

Subcatchment EC: Existing Conditions

Hydrograph



Summary for Subcatchment PC-1: Proposed Conditions-1

Runoff = 1.96 cfs @ 12.09 hrs, Volume= 0.143 af, Depth= 2.90"

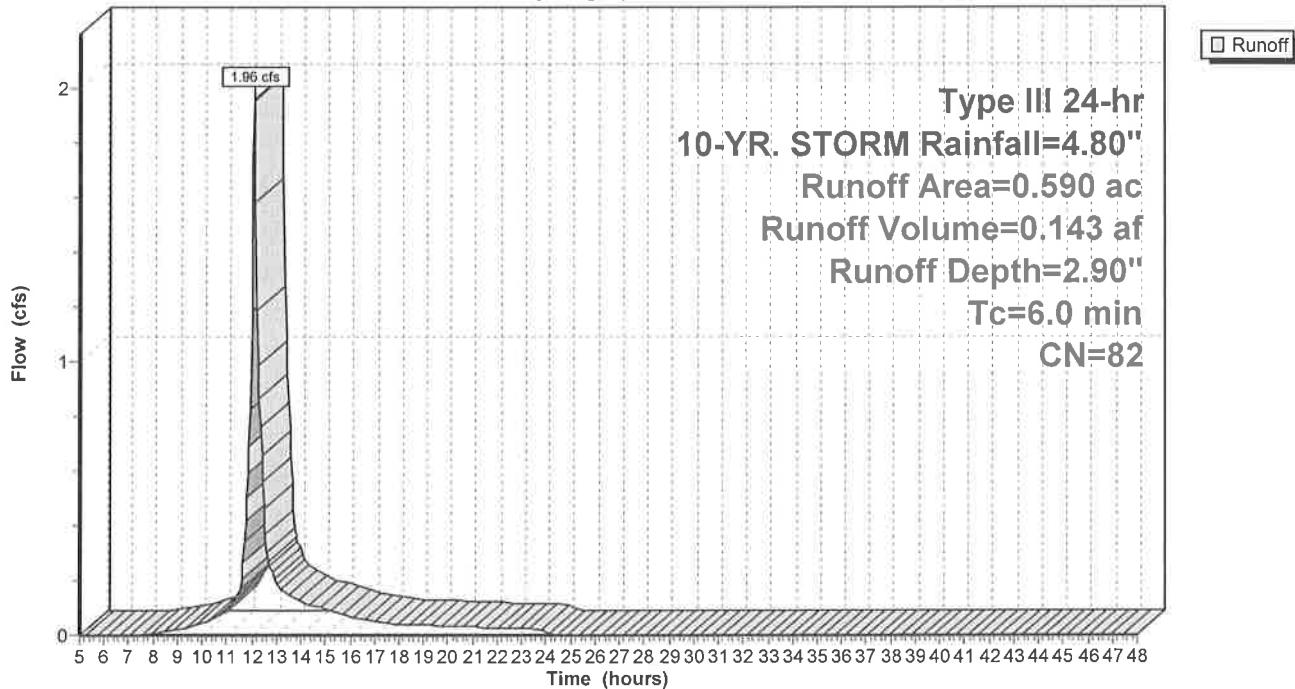
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-YR. STORM Rainfall=4.80"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.110	61	>75% Grass cover, Good, HSG B
0.180	98	Paved parking, HSG A
0.210	98	Paved parking, HSG B
0.590	82	Weighted Average
0.200		33.90% Pervious Area
0.390		66.10% Impervious Area

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

Subcatchment PC-1: Proposed Conditions-1

Hydrograph



Summary for Subcatchment PC-2: Bypass

Runoff = 0.61 cfs @ 12.14 hrs, Volume= 0.061 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-YR. STORM Rainfall=4.80"

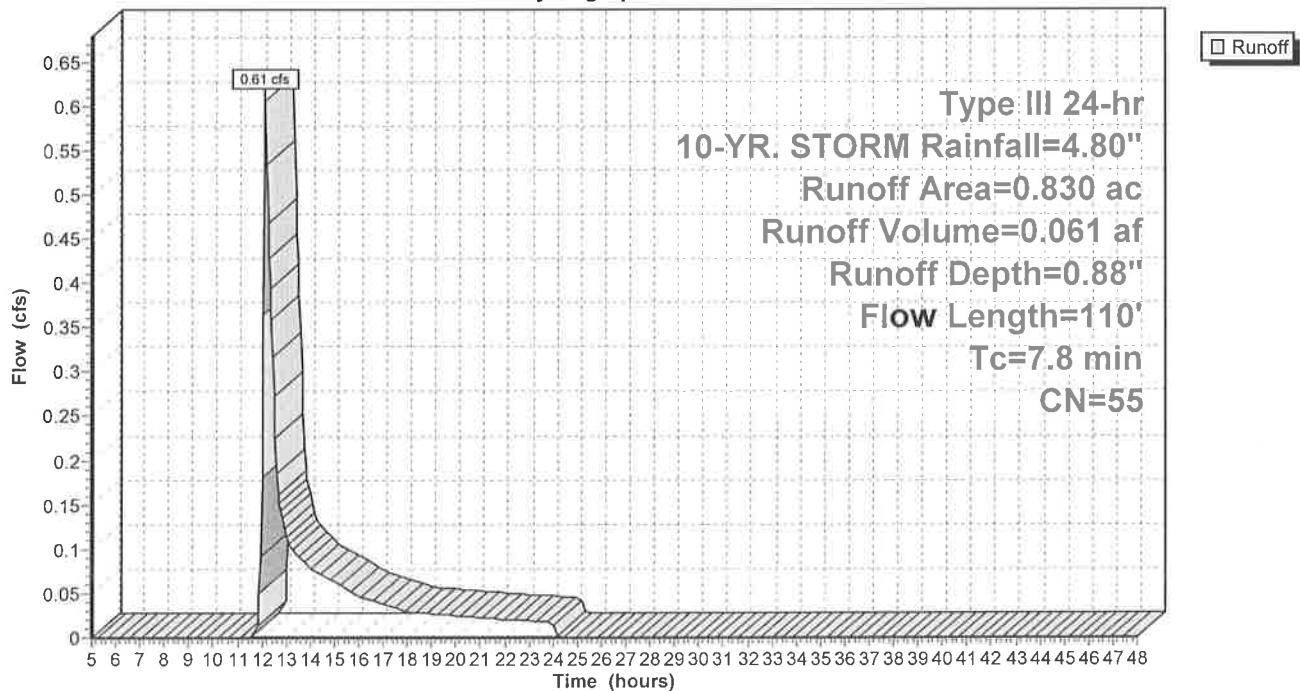
Area (ac)	CN	Description
0.220	36	Woods, Fair, HSG A
0.510	60	Woods, Fair, HSG B
0.050	98	Paved parking, HSG A
0.050	39	>75% Grass cover, Good, HSG A

0.830	55	Weighted Average
0.780		93.98% Pervious Area
0.050		6.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0740	0.12		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	60	0.0920	1.52		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
7.8	110	Total			

Subcatchment PC-2: Bypass

Hydrograph



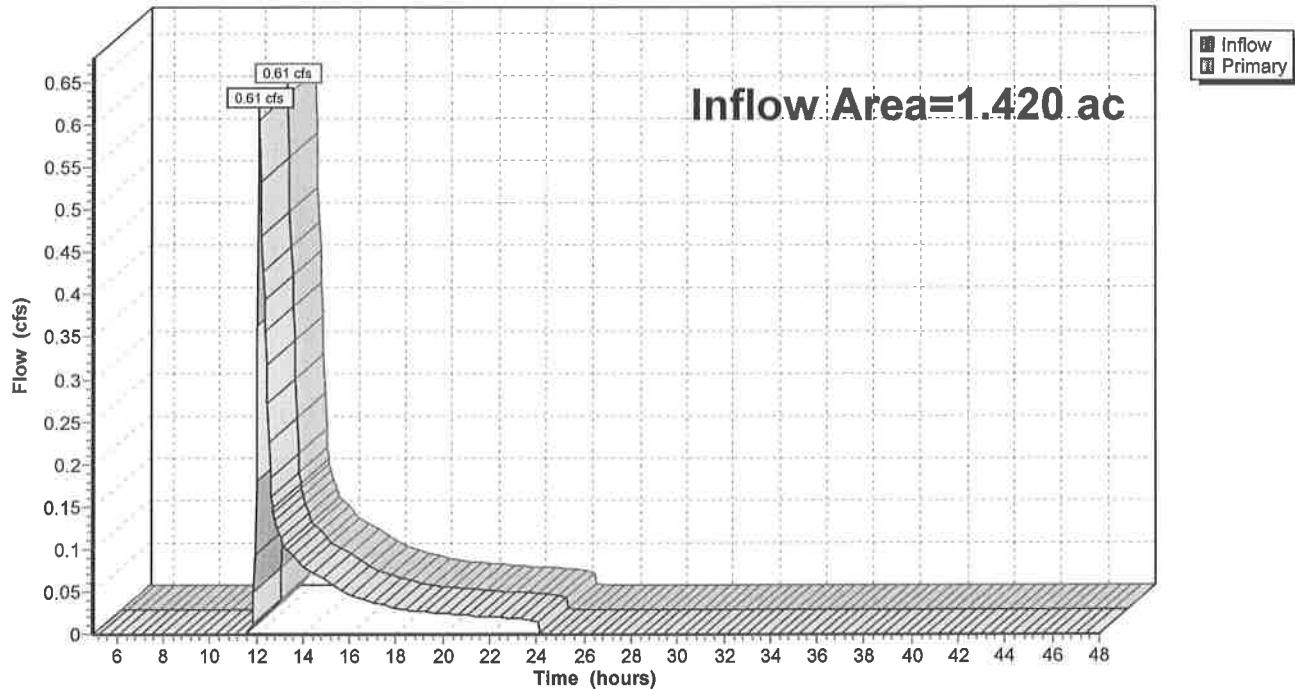
Summary for Pond AP: AP-1

Inflow Area = 1.420 ac, 30.99% Impervious, Inflow Depth = 0.52" for 10-YR. STORM event
Inflow = 0.61 cfs @ 12.14 hrs, Volume= 0.061 af
Primary = 0.61 cfs @ 12.14 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2

Pond AP: AP-1

Hydrograph



Summary for Pond R1: Recharge

Inflow Area = 0.590 ac, 66.10% Impervious, Inflow Depth = 2.90" for 10-YR. STORM event
 Inflow = 1.96 cfs @ 12.09 hrs, Volume= 0.143 af
 Outflow = 0.26 cfs @ 11.75 hrs, Volume= 0.143 af, Atten= 87%, Lag= 0.0 min
 Discarded = 0.26 cfs @ 11.75 hrs, Volume= 0.143 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 90.60' @ 12.70 hrs Surf.Area= 0.031 ac Storage= 0.046 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 55.6 min (873.6 - 818.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.50'	0.027 af	25.67'W x 52.50'L x 3.54'H Field A 0.110 af Overall - 0.043 af Embedded = 0.066 af x 40.0% Voids
#2A	89.00'	0.043 af	Cultec R-330XLHD x 35 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
0.070 af			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices	
#1	Discarded	88.50'	8.270 in/hr Exfiltration over Surface area	Phase-In= 0.01'
#2	Primary	91.00'	8.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.00' / 90.90' S= 0.0033 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf	

Discarded OutFlow Max=0.26 cfs @ 11.75 hrs HW=88.57' (Free Discharge)
 ↑ 1=Exfiltration (Exfiltration Controls 0.26 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=88.50' TW=0.00' (Dynamic Tailwater)
 ↑ 2=Culvert (Controls 0.00 cfs)

Pond R1: Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50'
Base Length

5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

35 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 1,881.4 cf Chamber Storage

4,772.4 cf Field - 1,881.4 cf Chambers = 2,891.0 cf Stone x 40.0% Voids = 1,156.4 cf Stone Storage

Chamber Storage + Stone Storage = 3,037.8 cf = 0.070 af

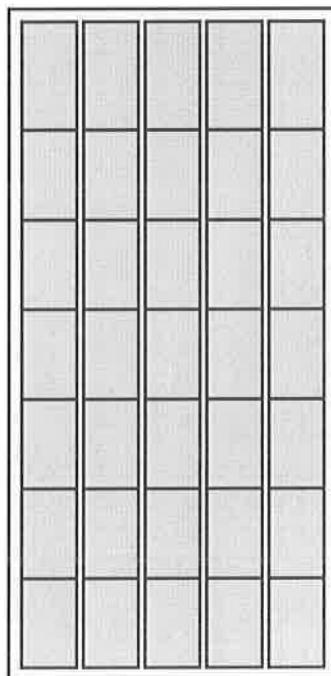
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Overall System Size = 52.50' x 25.67' x 3.54'

35 Chambers

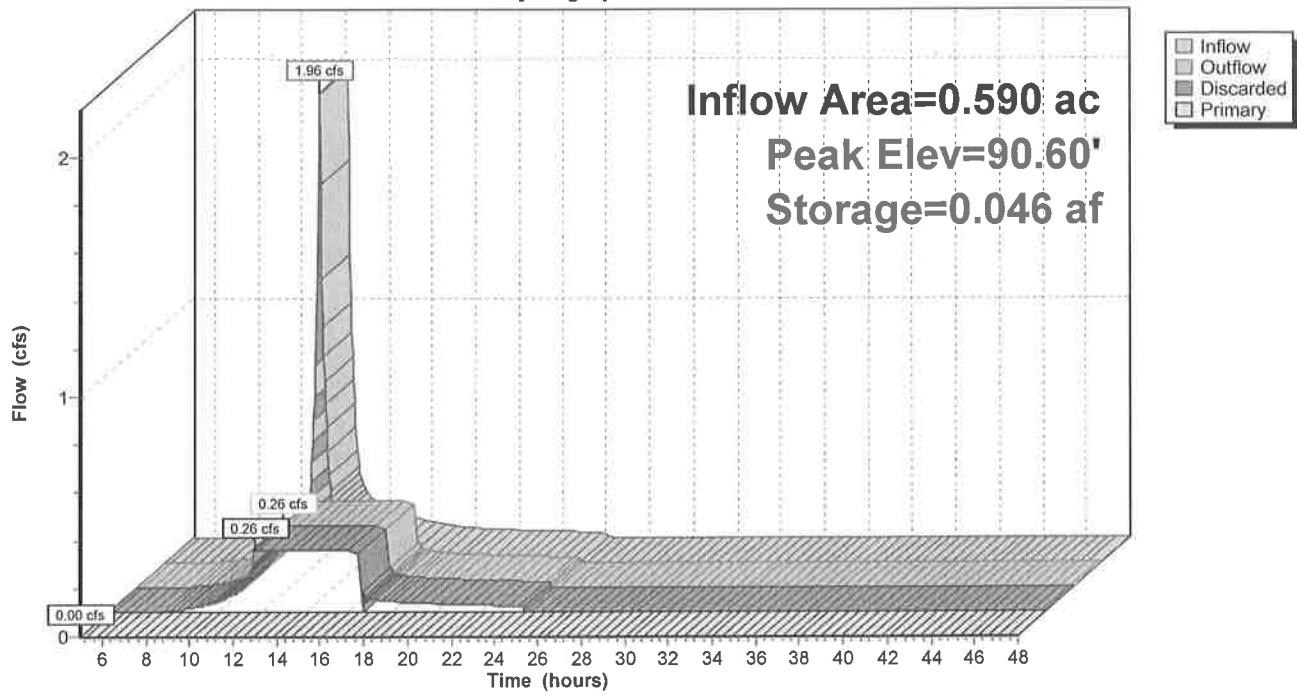
176.8 cy Field

107.1 cy Stone



Pond R1: Recharge

Hydrograph



Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EC: Existing Conditions Runoff Area=1.420 ac 0.00% Impervious Runoff Depth=1.67"
Flow Length=146' Tc=7.8 min CN=50 Runoff=2.20 cfs 0.197 af

Subcatchment PC-1: Proposed Runoff Area=0.590 ac 66.10% Impervious Runoff Depth=4.92"
Tc=6.0 min CN=82 Runoff=3.27 cfs 0.242 af

Subcatchment PC-2: Bypass Runoff Area=0.830 ac 6.02% Impervious Runoff Depth=2.12"
Flow Length=110' Tc=7.8 min CN=55 Runoff=1.78 cfs 0.147 af

Pond AP: AP-1 Inflow=2.09 cfs 0.187 af
Primary=2.09 cfs 0.187 af

Pond R1: Recharge Peak Elev=91.95' Storage=0.069 af Inflow=3.27 cfs 0.242 af
Discarded=0.26 cfs 0.202 af Primary=0.99 cfs 0.040 af Outflow=1.24 cfs 0.242 af

Total Runoff Area = 2.840 ac Runoff Volume = 0.586 af Average Runoff Depth = 2.48"
84.51% Pervious = 2.400 ac 15.49% Impervious = 0.440 ac

Summary for Subcatchment EC: Existing Conditions

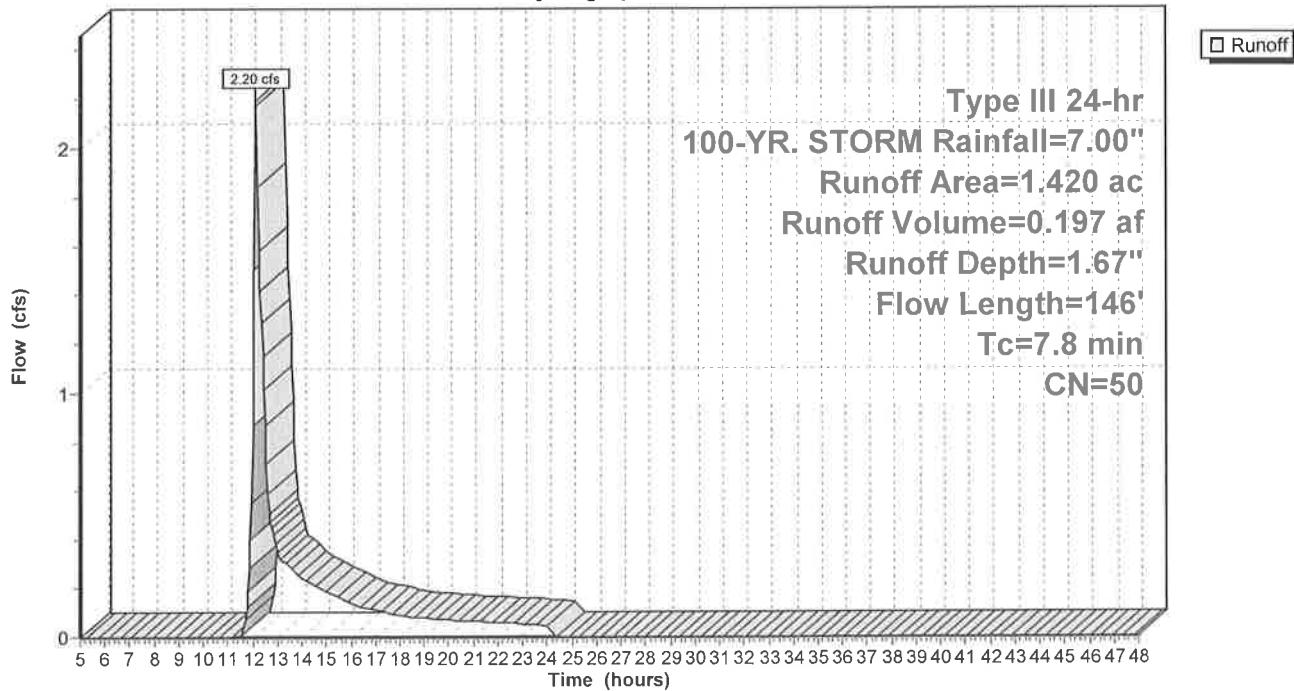
Runoff = 2.20 cfs @ 12.13 hrs, Volume= 0.197 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR. STORM Rainfall=7.00"

Area (ac)	CN	Description			
0.600	36	Woods, Fair, HSG A			
0.820	60	Woods, Fair, HSG B			
1.420	50	Weighted Average			
1.420		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1080	0.14		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	96	0.0360	0.95		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
7.8	146				Total

Subcatchment EC: Existing Conditions

Hydrograph



Summary for Subcatchment PC-1: Proposed Conditions-1

Runoff = 3.27 cfs @ 12.09 hrs, Volume= 0.242 af, Depth= 4.92"

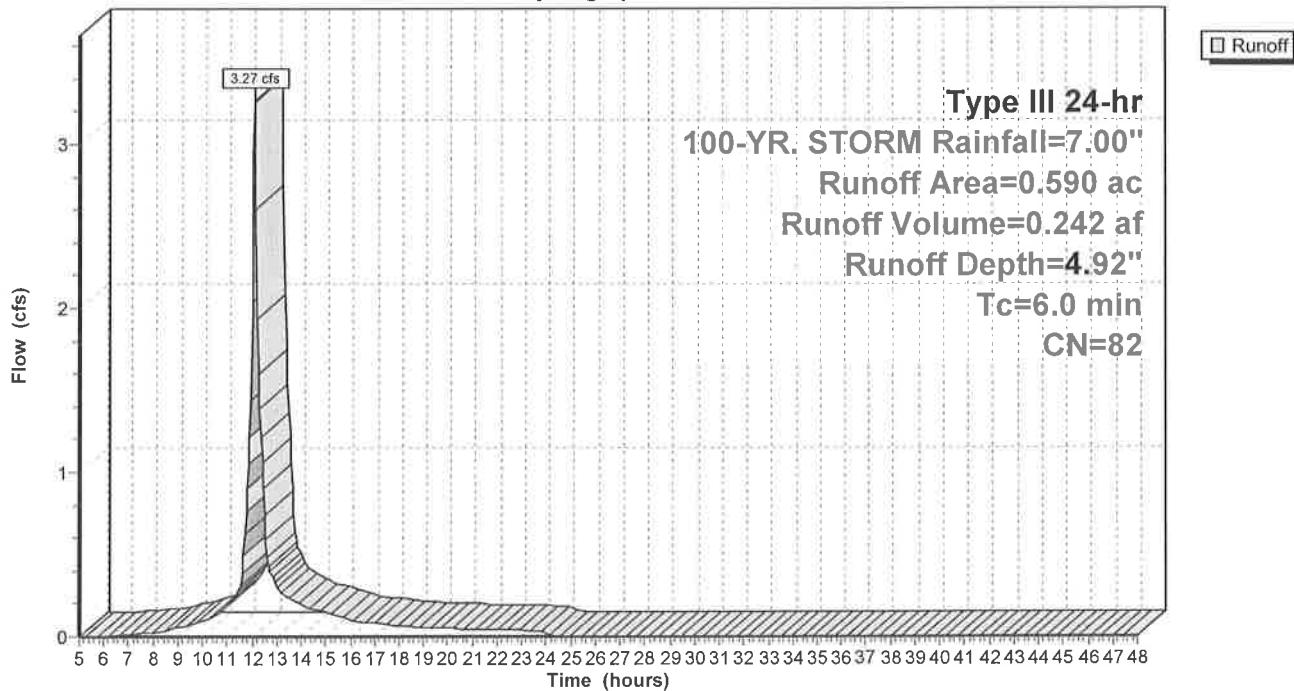
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR. STORM Rainfall=7.00"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.110	61	>75% Grass cover, Good, HSG B
0.180	98	Paved parking, HSG A
0.210	98	Paved parking, HSG B
0.590	82	Weighted Average
0.200		33.90% Pervious Area
0.390		66.10% Impervious Area

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

Subcatchment PC-1: Proposed Conditions-1

Hydrograph



Summary for Subcatchment PC-2: Bypass

Runoff = 1.78 cfs @ 12.12 hrs, Volume= 0.147 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-YR. STORM Rainfall=7.00"

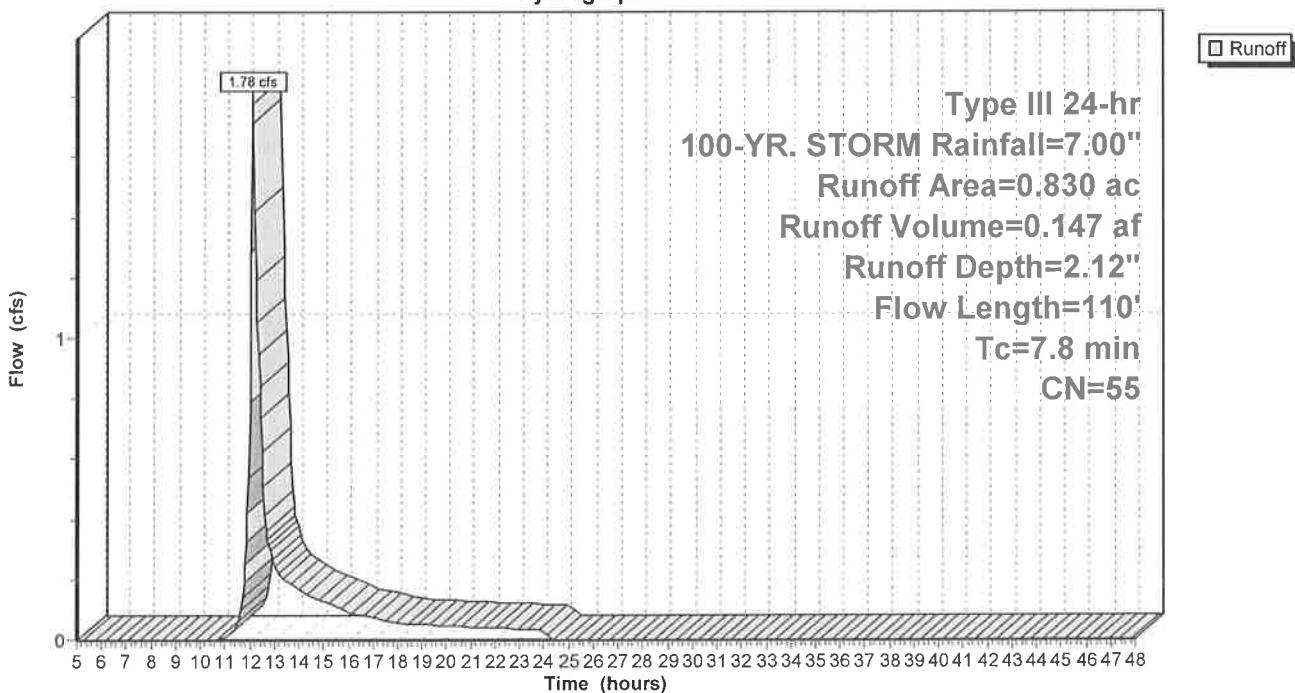
Area (ac)	CN	Description
0.220	36	Woods, Fair, HSG A
0.510	60	Woods, Fair, HSG B
0.050	98	Paved parking, HSG A
0.050	39	>75% Grass cover, Good, HSG A

0.830	55	Weighted Average
0.780		93.98% Pervious Area
0.050		6.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0740	0.12		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	60	0.0920	1.52		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
7.8	110			Total	

Subcatchment PC-2: Bypass

Hydrograph



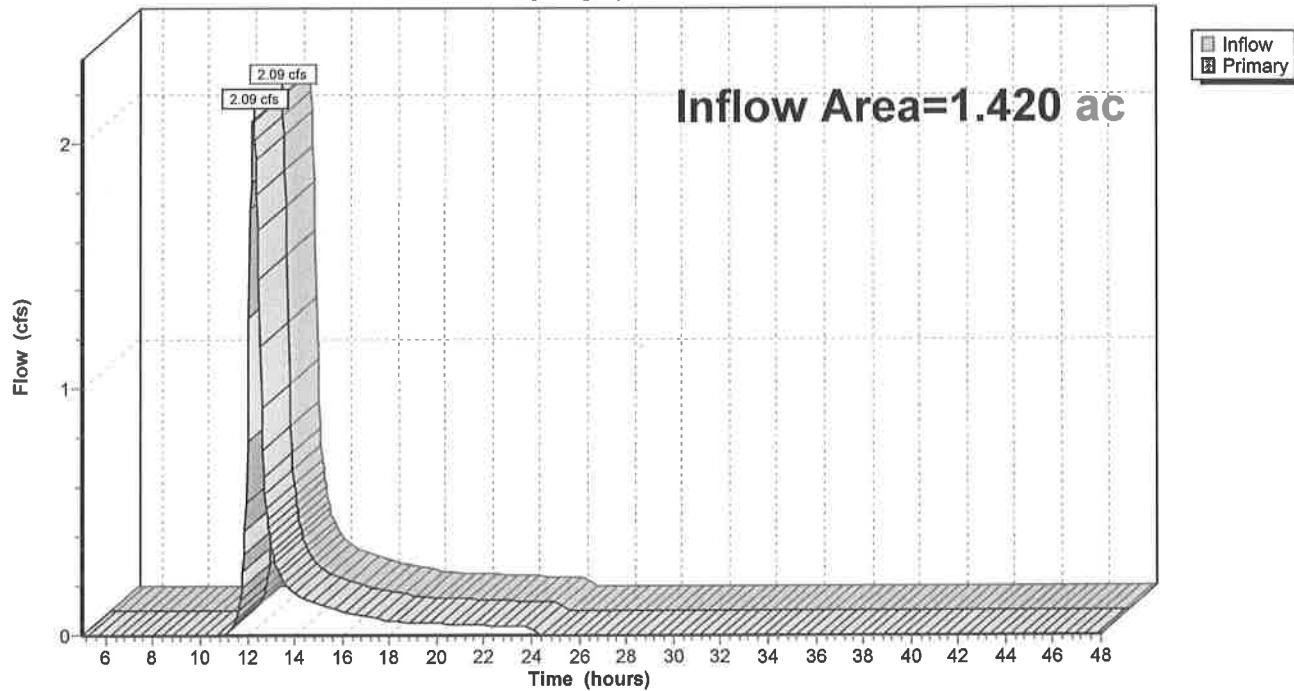
Summary for Pond AP: AP-1

Inflow Area = 1.420 ac, 30.99% Impervious, Inflow Depth = 1.58" for 100-YR. STORM event
Inflow = 2.09 cfs @ 12.26 hrs, Volume= 0.187 af
Primary = 2.09 cfs @ 12.26 hrs, Volume= 0.187 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2

Pond AP: AP-1

Hydrograph



Summary for Pond R1: Recharge

Inflow Area = 0.590 ac, 66.10% Impervious, Inflow Depth = 4.92" for 100-YR. STORM event
 Inflow = 3.27 cfs @ 12.09 hrs, Volume= 0.242 af
 Outflow = 1.24 cfs @ 12.35 hrs, Volume= 0.242 af, Atten= 62%, Lag= 15.5 min
 Discarded = 0.26 cfs @ 11.55 hrs, Volume= 0.202 af
 Primary = 0.99 cfs @ 12.35 hrs, Volume= 0.040 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 91.95' @ 12.35 hrs Surf.Area= 0.031 ac Storage= 0.069 af

Plug-Flow detention time= 65.2 min calculated for 0.241 af (100% of inflow)
 Center-of-Mass det. time= 65.1 min (868.1 - 803.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.50'	0.027 af	25.67'W x 52.50'L x 3.54'H Field A 0.110 af Overall - 0.043 af Embedded = 0.066 af x 40.0% Voids
#2A	89.00'	0.043 af	Cultec R-330XLHD x 35 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
0.070 af			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices	
#1	Discarded	88.50'	8.270 in/hr Exfiltration over Surface area	Phase-In= 0.01'
#2	Primary	91.00'	8.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.00' / 90.90' S= 0.0033 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf	

Discarded OutFlow Max=0.26 cfs @ 11.55 hrs HW=88.55' (Free Discharge)
 ↑ 1=Exfiltration (Exfiltration Controls 0.26 cfs)

Primary OutFlow Max=0.99 cfs @ 12.35 hrs HW=91.95' TW=0.00' (Dynamic Tailwater)
 ↑ 2=Culvert (Barrel Controls 0.99 cfs @ 2.82 fps)

Pond R1: Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50'
Base Length

5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

35 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 1,881.4 cf Chamber Storage

4,772.4 cf Field - 1,881.4 cf Chambers = 2,891.0 cf Stone x 40.0% Voids = 1,156.4 cf Stone Storage

Chamber Storage + Stone Storage = 3,037.8 cf = 0.070 af

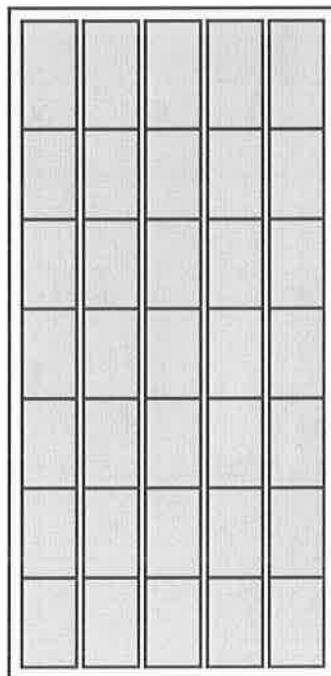
Overall Storage Efficiency = 63.7%

Overall System Size = 52.50' x 25.67' x 3.54'

35 Chambers

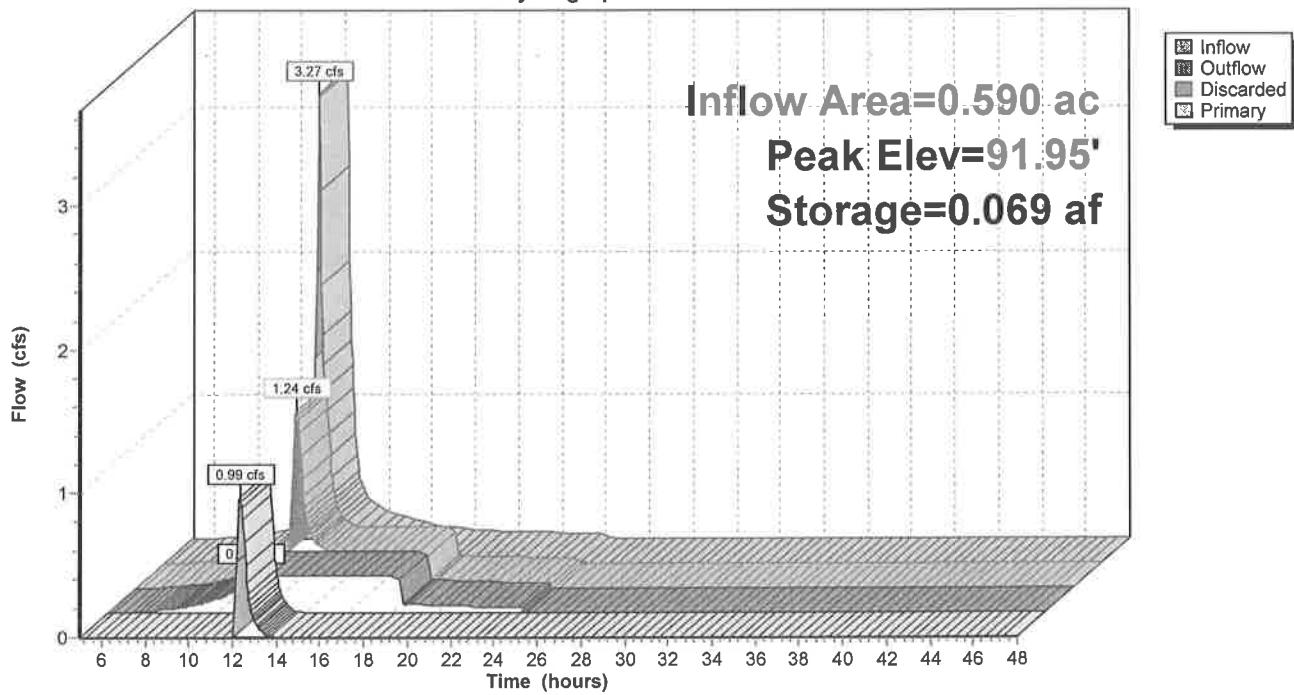
176.8 cy Field

107.1 cy Stone



Pond R1: Recharge

Hydrograph



Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EC: Existing Conditions Runoff Area=1.420 ac 0.00% Impervious Runoff Depth=0.20"
Flow Length=146' Tc=7.8 min CN=50 Runoff=0.08 cfs 0.023 af

Subcatchment PC-1: Proposed Runoff Area=0.590 ac 66.10% Impervious Runoff Depth=1.78"
Tc=6.0 min CN=82 Runoff=1.21 cfs 0.088 af

Subcatchment PC-2: Bypass Runoff Area=0.830 ac 6.02% Impervious Runoff Depth=0.35"
Flow Length=110' Tc=7.8 min CN=55 Runoff=0.14 cfs 0.024 af

Pond AP: AP-1 Inflow=0.14 cfs 0.024 af
Primary=0.14 cfs 0.024 af

Pond R1: Recharge Peak Elev=89.58' Storage=0.021 af Inflow=1.21 cfs 0.088 af
Discarded=0.26 cfs 0.088 af Primary=0.00 cfs 0.000 af Outflow=0.26 cfs 0.088 af

Total Runoff Area = 2.840 ac Runoff Volume = 0.135 af Average Runoff Depth = 0.57"
84.51% Pervious = 2.400 ac 15.49% Impervious = 0.440 ac

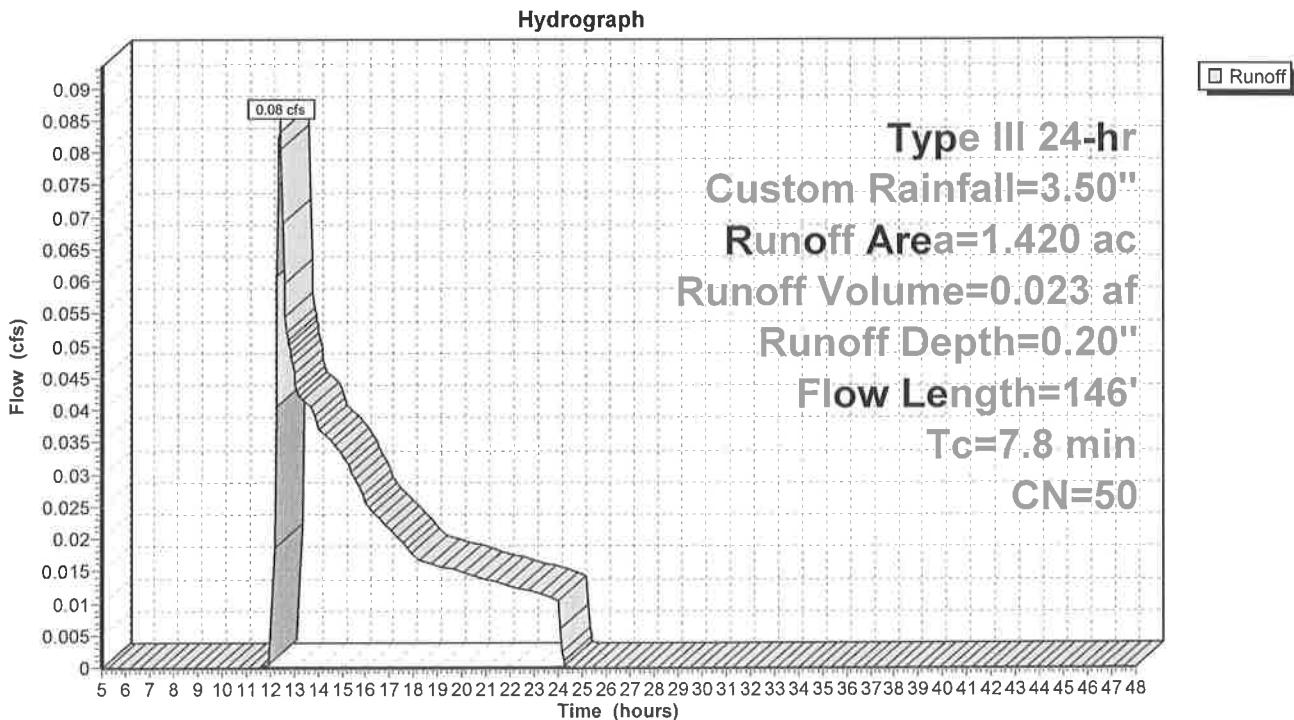
Summary for Subcatchment EC: Existing Conditions

Runoff = 0.08 cfs @ 12.43 hrs, Volume= 0.023 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Custom Rainfall=3.50"

Area (ac)	CN	Description			
0.600	36	Woods, Fair, HSG A			
0.820	60	Woods, Fair, HSG B			
1.420	50	Weighted Average			
1.420		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1080	0.14		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
1.7	96	0.0360	0.95		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
7.8	146				Total

Subcatchment EC: Existing Conditions



Summary for Subcatchment PC-1: Proposed Conditions-1

Runoff = 1.21 cfs @ 12.09 hrs, Volume= 0.088 af, Depth= 1.78"

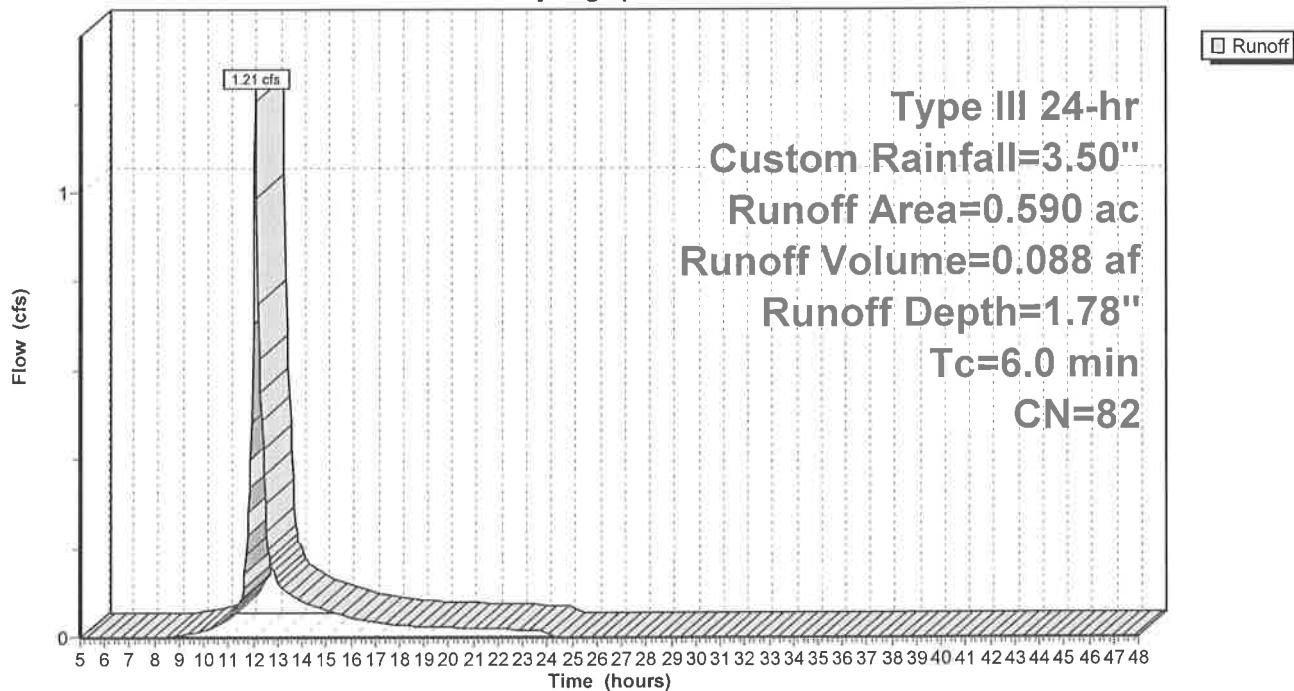
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Custom Rainfall=3.50"

Area (ac)	CN	Description
0.090	39	>75% Grass cover, Good, HSG A
0.110	61	>75% Grass cover, Good, HSG B
0.180	98	Paved parking, HSG A
0.210	98	Paved parking, HSG B
0.590	82	Weighted Average
0.200		33.90% Pervious Area
0.390		66.10% Impervious Area

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

Subcatchment PC-1: Proposed Conditions-1

Hydrograph



Summary for Subcatchment PC-2: Bypass

Runoff = 0.14 cfs @ 12.30 hrs, Volume= 0.024 af, Depth= 0.35"

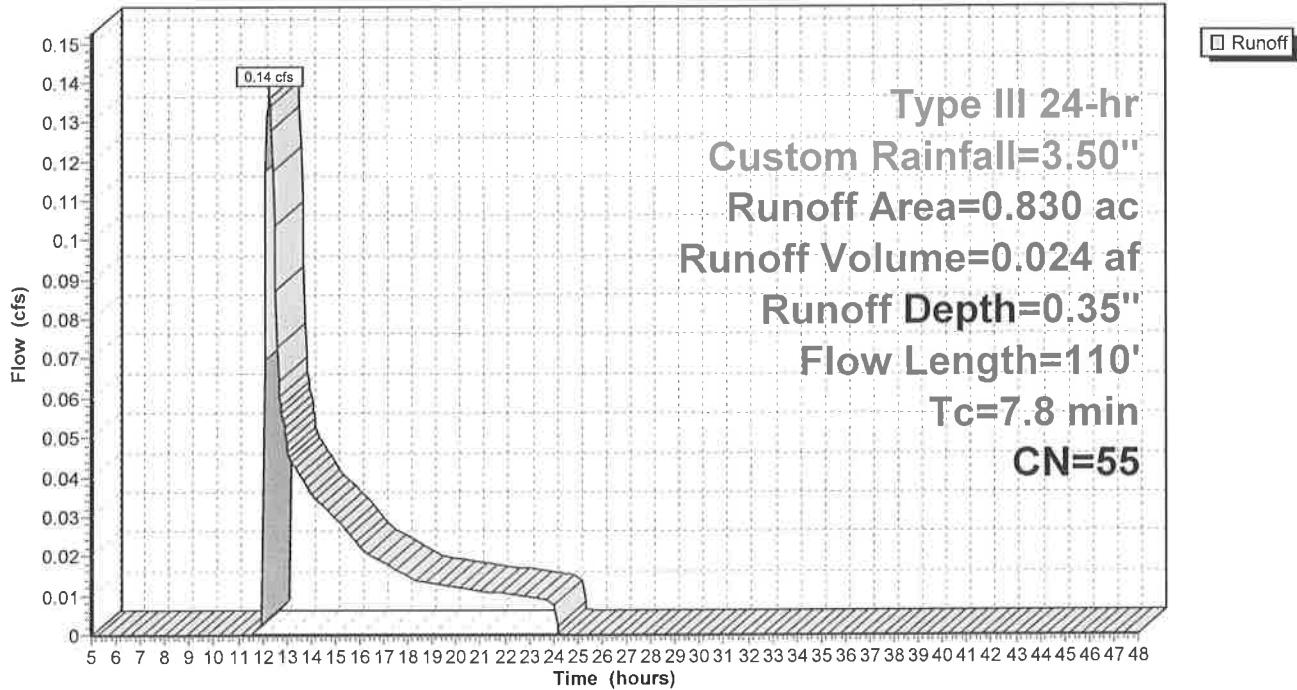
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Custom Rainfall=3.50"

Area (ac)	CN	Description
0.220	36	Woods, Fair, HSG A
0.510	60	Woods, Fair, HSG B
0.050	98	Paved parking, HSG A
0.050	39	>75% Grass cover, Good, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0740	0.12		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	60	0.0920	1.52		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
7.8	110			Total	

Subcatchment PC-2: Bypass

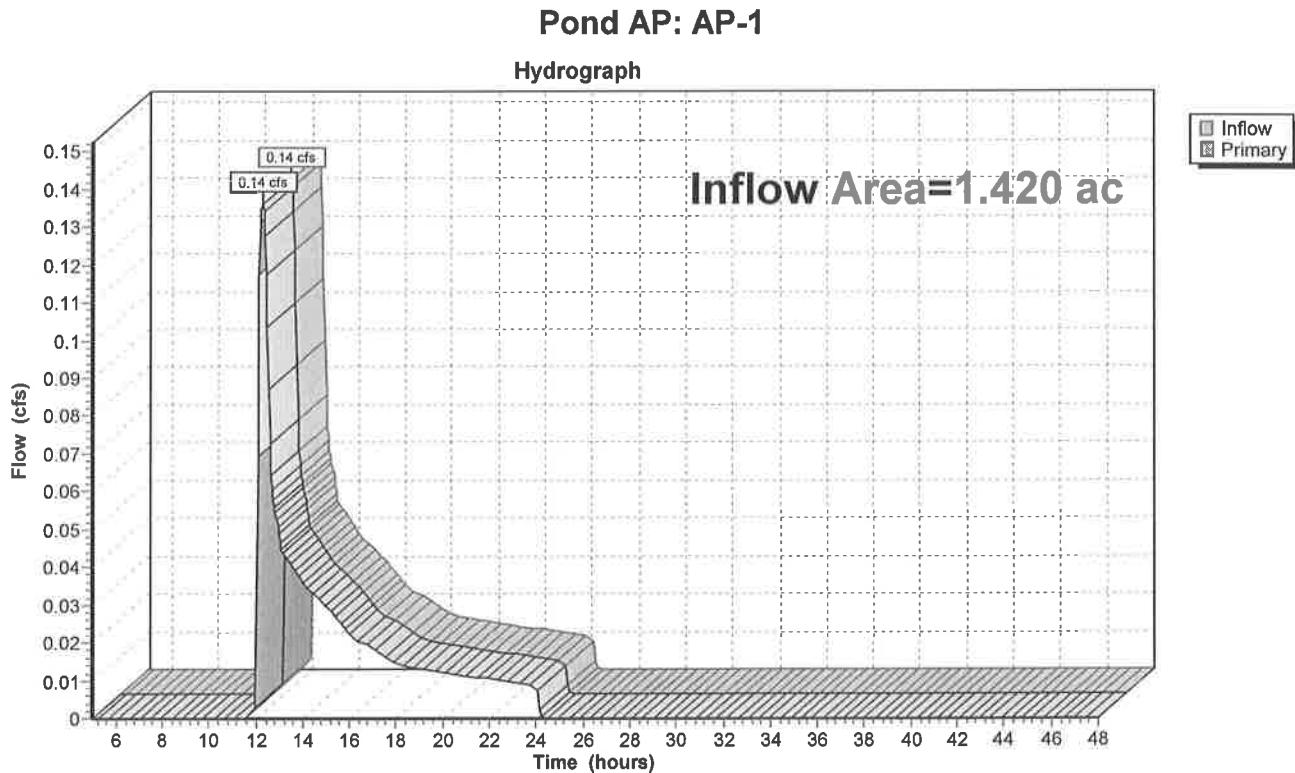
Hydrograph



Summary for Pond AP: AP-1

Inflow Area = 1.420 ac, 30.99% Impervious, Inflow Depth = 0.20" for Custom event
Inflow = 0.14 cfs @ 12.30 hrs, Volume= 0.024 af
Primary = 0.14 cfs @ 12.30 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2



Summary for Pond R1: Recharge

Inflow Area = 0.590 ac, 66.10% Impervious, Inflow Depth = 1.78" for Custom event
 Inflow = 1.21 cfs @ 12.09 hrs, Volume= 0.088 af
 Outflow = 0.26 cfs @ 11.90 hrs, Volume= 0.088 af, Atten= 79%, Lag= 0.0 min
 Discarded = 0.26 cfs @ 11.90 hrs, Volume= 0.088 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 89.58' @ 12.54 hrs Surf.Area= 0.031 ac Storage= 0.021 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 20.5 min (852.5 - 832.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.50'	0.027 af	25.67'W x 52.50'L x 3.54'H Field A 0.110 af Overall - 0.043 af Embedded = 0.066 af x 40.0% Voids
#2A	89.00'	0.043 af	Cultec R-330XLHD x 35 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
0.070 af Total Available Storage			

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices	
#1	Discarded	88.50'	8.270 in/hr Exfiltration over Surface area	Phase-In= 0.01'
#2	Primary	91.00'	8.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.00' / 90.90' S= 0.0033 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf	

Discarded OutFlow Max=0.26 cfs @ 11.90 hrs HW=88.57' (Free Discharge)
 ↑ 1=Exfiltration (Exfiltration Controls 0.26 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=88.50' TW=0.00' (Dynamic Tailwater)
 ↑ 2=Culvert (Controls 0.00 cfs)

Pond R1: Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50'
Base Length

5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width

6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

35 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 1,881.4 cf Chamber Storage

4,772.4 cf Field - 1,881.4 cf Chambers = 2,891.0 cf Stone x 40.0% Voids = 1,156.4 cf Stone Storage

Chamber Storage + Stone Storage = 3,037.8 cf = 0.070 af

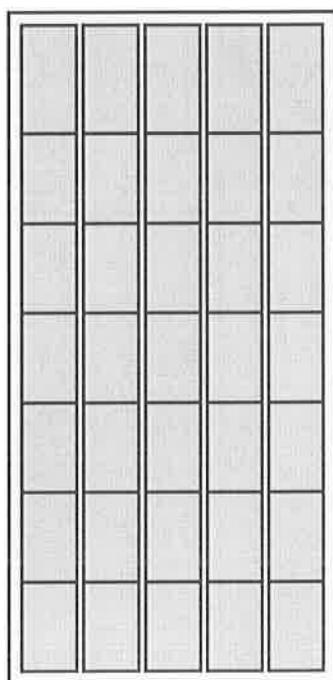
Overall Storage Efficiency = 63.7%

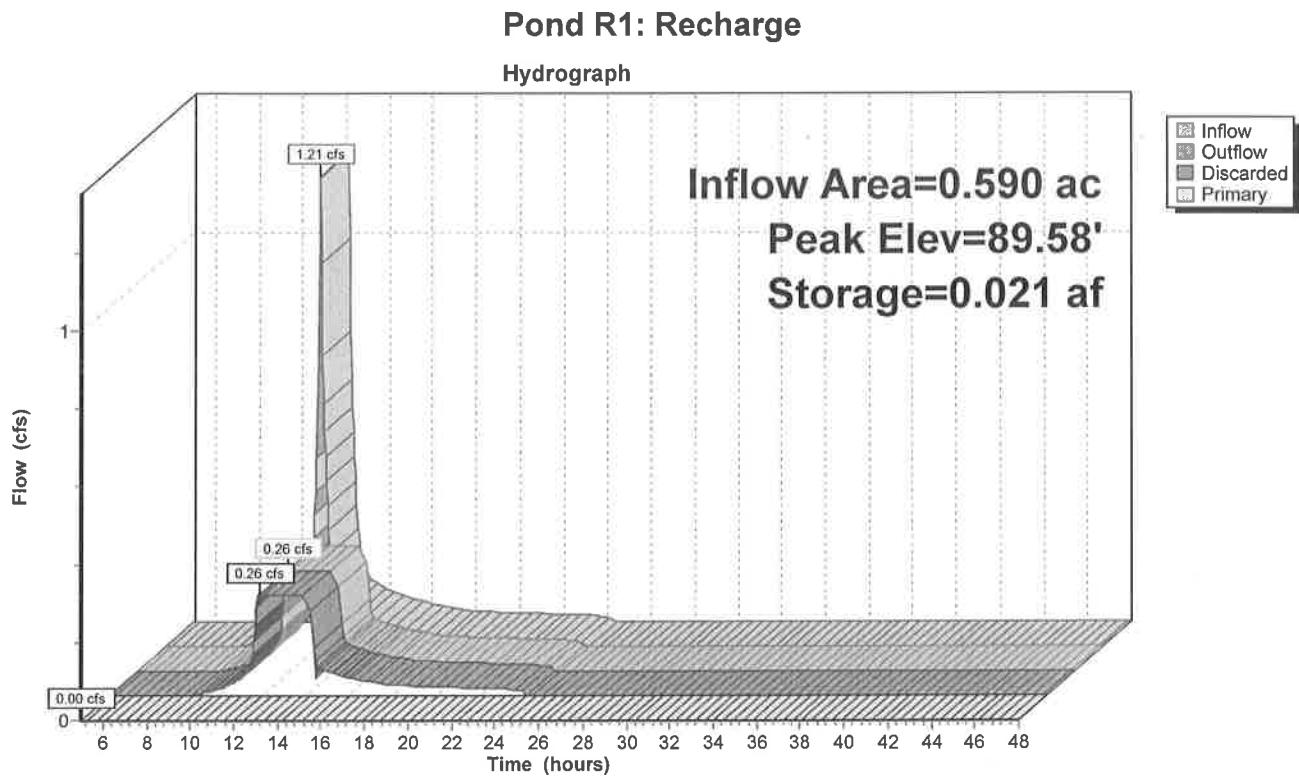
Overall System Size = 52.50' x 25.67' x 3.54'

35 Chambers

176.8 cy Field

107.1 cy Stone





Hydrograph for Pond R1: Recharge

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
5.00	0.00	0.000	88.50	0.00	0.00	0.00
6.00	0.00	0.000	88.50	0.00	0.00	0.00
7.00	0.01	0.000	88.50	0.01	0.01	0.00
8.00	0.03	0.000	88.50	0.03	0.03	0.00
9.00	0.06	0.000	88.50	0.06	0.06	0.00
10.00	0.10	0.000	88.50	0.10	0.10	0.00
11.00	0.18	0.000	88.51	0.18	0.18	0.00
12.00	2.04	0.024	89.70	0.26	0.26	0.00
13.00	0.31	0.059	91.25	0.38	0.26	0.12
14.00	0.19	0.055	91.01	0.26	0.26	0.00
15.00	0.15	0.048	90.66	0.26	0.26	0.00
16.00	0.10	0.037	90.20	0.26	0.26	0.00
17.00	0.08	0.023	89.65	0.26	0.26	0.00
18.00	0.06	0.008	89.06	0.26	0.26	0.00
19.00	0.06	0.000	88.50	0.06	0.06	0.00
20.00	0.05	0.000	88.50	0.05	0.05	0.00
21.00	0.05	0.000	88.50	0.05	0.05	0.00
22.00	0.04	0.000	88.50	0.04	0.04	0.00
23.00	0.04	0.000	88.50	0.04	0.04	0.00
24.00	0.03	0.000	88.50	0.03	0.03	0.00
25.00	0.00	0.000	88.50	0.00	0.00	0.00
26.00	0.00	0.000	88.50	0.00	0.00	0.00
27.00	0.00	0.000	88.50	0.00	0.00	0.00
28.00	0.00	0.000	88.50	0.00	0.00	0.00
29.00	0.00	0.000	88.50	0.00	0.00	0.00
30.00	0.00	0.000	88.50	0.00	0.00	0.00
31.00	0.00	0.000	88.50	0.00	0.00	0.00
32.00	0.00	0.000	88.50	0.00	0.00	0.00
33.00	0.00	0.000	88.50	0.00	0.00	0.00
34.00	0.00	0.000	88.50	0.00	0.00	0.00
35.00	0.00	0.000	88.50	0.00	0.00	0.00
36.00	0.00	0.000	88.50	0.00	0.00	0.00
37.00	0.00	0.000	88.50	0.00	0.00	0.00
38.00	0.00	0.000	88.50	0.00	0.00	0.00
39.00	0.00	0.000	88.50	0.00	0.00	0.00
40.00	0.00	0.000	88.50	0.00	0.00	0.00
41.00	0.00	0.000	88.50	0.00	0.00	0.00
42.00	0.00	0.000	88.50	0.00	0.00	0.00
43.00	0.00	0.000	88.50	0.00	0.00	0.00
44.00	0.00	0.000	88.50	0.00	0.00	0.00
45.00	0.00	0.000	88.50	0.00	0.00	0.00
46.00	0.00	0.000	88.50	0.00	0.00	0.00
47.00	0.00	0.000	88.50	0.00	0.00	0.00
48.00	0.00	0.000	88.50	0.00	0.00	0.00

Soil Map—Bristol County, Massachusetts, Southern Part



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

12/16/2020
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)	<input type="checkbox"/> Area of Interest (AOI)		Spoil Area
Soils	<input type="checkbox"/> Soil Map Unit Polygons		Stony Spot
	<input type="checkbox"/> Soil Map Unit Lines		Very Stony Spot
	<input type="checkbox"/> Soil Map Unit Points		Wet Spot
Special Point Features			Other
			Special Line Features
			Water Features
			Streams and Canals
			Transportation
			Rails
			Interstate Highways
			US Routes
			Major Roads
			Local Roads
			Background
			Aerial Photography
			Mine or Quarry
			Miscellaneous Water
			Perennial Water
			Rock Outcrop
			Saline Spot
			Sandy Spot
			Severely Eroded Spot
			Sinkhole
			Slide or Slip
			Sodic Spot

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Bristol County, Massachusetts, Southern Part
Survey Area Data: Version 14, Jun 9, 2020

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

Date(s) aerial images were photographed: Dec 31, 2009—Jul 3, 2017

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
39A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	2.6	9.1%
242A	Hinckley loamy sand, 0 to 3 percent slopes	4.9	17.1%
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	8.2	28.4%
602	Urban land	7.5	26.3%
656	Udorthents - Urban land complex	5.4	18.9%
Totals for Area of Interest		28.7	100.0%

Bristol County, Massachusetts, Southern Part

242A—Hinckley loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svm7
Elevation: 0 to 1,420 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Hinckley

Setting

Landform: Outwash deltas, kame terraces, outwash plains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear, concave
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent

Landform: Outwash deltas, kame terraces, outwash terraces

Landform position (three-dimensional): Tread

Down-slope shape: Convex, linear, concave

Across-slope shape: Convex, linear, concave

Hydric soil rating: No

Windsor

Percent of map unit: 5 percent

Landform: Outwash terraces, kame terraces, outwash deltas

Landform position (three-dimensional): Tread

Down-slope shape: Concave, linear, convex

Across-slope shape: Linear, convex, concave

Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent

Landform: Outwash deltas, kame terraces, outwash terraces

Landform position (three-dimensional): Tread

Down-slope shape: Convex, concave, linear

Across-slope shape: Convex, linear, concave

Hydric soil rating: No

Data Source Information

Soil Survey Area: Bristol County, Massachusetts, Southern Part

Survey Area Data: Version 14, Jun 9, 2020

Bristol County, Massachusetts, Southern Part

260A—Sudbury fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: v5rh
Elevation: 0 to 2,100 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sudbury and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sudbury

Setting

Landform: Outwash plains
Landform position (two-dimensional): Foothslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Friable coarse-loamy eolian deposits over loose sandy glaciofluvial deposits derived from granite and gneiss

Typical profile

H1 - 0 to 4 inches: fine sandy loam
H2 - 4 to 18 inches: fine sandy loam
H3 - 18 to 28 inches: gravelly coarse sandy loam
H4 - 28 to 60 inches: gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Deerfield

Percent of map unit: 5 percent
Hydric soil rating: No

Walpole

Percent of map unit: 5 percent
Landform: Terraces
Hydric soil rating: Yes

Merrimac

Percent of map unit: 5 percent
Hydric soil rating: No

Ninigret

Percent of map unit: 5 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Bristol County, Massachusetts, Southern Part
Survey Area Data: Version 14, Jun 9, 2020

Bristol County, Massachusetts, Southern Part

39A—Scarboro mucky fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svky
Elevation: 0 to 1,320 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Scarboro and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scarboro

Setting

Landform: Depressions, outwash terraces, outwash deltas, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from schist and/or sandy glaciofluvial deposits derived from gneiss and/or sandy glaciofluvial deposits derived from granite

Typical profile

Oe - 0 to 3 inches: mucky peat
A - 3 to 11 inches: mucky fine sandy loam
Cg1 - 11 to 21 inches: sand
Cg2 - 21 to 65 inches: gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: A/D

Ecological site: F144AY031MA - Very Wet Outwash

Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 10 percent

Landform: Bogs, swamps

Landform position (three-dimensional): Dip

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Walpole

Percent of map unit: 5 percent

Landform: Outwash plains, depressions, outwash terraces, depressions, deltas

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread, dip, talus

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Wareham

Percent of map unit: 5 percent

Landform: Depressions

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Bristol County, Massachusetts, Southern Part

Survey Area Data: Version 14, Jun 9, 2020

Required Recharge Calculations

Required:

$$(0.23 \text{ acres} * 0.05 \text{ ft}) + (0.21 \text{ Acres} * 0.03 \text{ ft}) = 0.018 \text{ Acre Feet Required}$$

Provided:

Per attached Hydrocad Report:

0.084 Acre-feet is provided during the 2-year storm event

0.084 Acre-feet > 0.018 Acre-feet, so okay

**WATER QUALITY FLOWRATE CALCULATION
PHILLIPS ROAD, NEW BEDFORD
STORMCEPTOR IN Catch Basins #1**

Purpose: Calculate the first flush runoff flowrate/Water Quality Flowrate (WQF) over the given site area entering the proposed water quality inlet. In this case, the Water Quality Volume (WQV) to be analyzed is the runoff produced by the first inch (1") of rainfall.

Reference: USDA NRCS TR-55 Manual

Given:

A	= Watershed Area = 0.59-acres [0.39-acres impervious] = 0.002 square miles
I	= Percentage of Impervious Cover = 0.39/0.59 = 66
t _c	= 6 minutes = 0.10 hours
P	= Design Precipitation = 1.0"

Procedure: The WQF is calculated using the WQV. This WQV, converted to watershed inches, is substituted for the runoff depth (Q) in the NRCS TR-55 Graphical Peak Discharge Method.

1. Read the Unit Peak Discharge (q_u) from Figure 4.

From Figure 2, $q_u = 774 \text{ csm/in}$ (for a $t_c=0.10$ hours and an $I_a/P = 0.034$)

2. Compute the WQF from the following equation:

$$\text{WQF} = q_u * A * \text{WQV}$$

Where:

WQF	= Water Quality Flowrate (cfs)
q_u	= Unit Peak Discharge (cfs/mi ² /inch)
A	= Drainage Area (mi ²)
WQV	= Water Quality Volume (watershed inches)

$$\text{WQF} = 774 * 0.002 * 1 = 1.54 \text{ cfs}$$

Use a Stormceptor STC450i or approved equal

Brief Stormceptor Sizing Report - Phillips Road

Project Information & Location			
Project Name	Phillips Road	Project Number	38992
City	New Bedford	State/ Province	Massachusetts
Country	United States of America	Date	3/23/2021
Designer Information		EOR Information (optional)	
Name	Daniel Gioiosa	Name	
Company	Sitec, Inc.	Company	
Phone #	508-998-2125	Phone #	
Email	dgioiosa@sitec-engineering.com	Email	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Phillips Road
Target TSS Removal (%)	80
TSS Removal (%) Provided	86
Recommended Stormceptor Model	STC 450i

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	% TSS Removal Provided
STC 450i	86
STC 900	91
STC 1200	91
STC 1800	91
STC 2400	93
STC 3600	94
STC 4800	95
STC 6000	95
STC 7200	96
STC 11000	98
STC 13000	98
STC 16000	98

Sizing Details			
Drainage Area		Water Quality Objective	
Total Area (acres)	0.59	TSS Removal (%)	80.0
Imperviousness %	66.0	Runoff Volume Capture (%)	
Rainfall			Oil Spill Capture Volume (Gal)
Station Name	BLUE HILL	Peak Conveyed Flow Rate (CFS)	3.27
State/Province	Massachusetts	Water Quality Flow Rate (CFS)	1.54
Station ID #	0736	Up Stream Storage	
Years of Records	58	Storage (ac-ft)	Discharge (cfs)
Latitude	42°12'44"N	0.000	0.000
Longitude	71°6'53"W	Up Stream Flow Diversion	
		Max. Flow to Stormceptor (cfs)	

Particle Size Distribution (PSD) The selected PSD defines TSS removal		
Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
<https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX>

Figure 4: for First 1-inch Runoff, Table of qu values for I_a/P Curve = 0.034, listed by T_c , for Type III Storm Distribution

T_c (Hours)	qu (csm/in)	T_c (Hours)	qu (csm/in)	T_c (Hours)	qu (csm/in)
0.01	835	2.7	197	7.1	95
0.03	835	2.8	192	7.2	94
0.05	831	2.9	187	7.3	93
0.067	814	3	183	7.4	92
0.083	795	3.1	179	7.5	91
0.1	774	3.2	175	7.6	90
0.116	755	3.3	171	7.7	89
0.133	736	3.4	168	7.8	88
0.15	717	3.5	164	7.9	87
0.167	700	3.6	161	8	86
0.183	685	3.7	158	8.1	85
0.2	669	3.8	155	8.2	84
0.217	654	3.9	152	8.3	84
0.233	641	4	149	8.4	83
0.25	628	4.1	146	8.5	82
0.3	593	4.2	144	8.6	81
0.333	572	4.3	141	8.7	80
0.35	563	4.4	139	8.8	79
0.4	536	4.5	137	8.9	79
0.416	528	4.6	134	9	78
0.5	491	4.7	132	9.1	77
0.583	460	4.8	130	9.2	76
0.6	454	4.9	128	9.3	76
0.667	433	5	126	9.4	75
0.7	424	5.1	124	9.5	74
0.8	398	5.2	122	9.6	74
0.9	376	5.3	120	9.7	73
1	356	5.4	119	9.8	72
1.1	339	5.5	117	9.9	72
1.2	323	5.6	115	10	71
1.3	309	5.7	114		
1.4	296	5.8	112		
1.5	285	5.9	111		
1.6	274	6	109		
1.7	264	6.1	108		
1.8	255	6.2	106		
1.9	247	6.3	105		
2	239	6.4	104		
2.1	232	6.5	102		
2.2	225	6.6	101		
2.3	219	6.7	100		
2.4	213	6.8	99		
2.5	207	6.9	98		
2.6	202	7	96		



CULTEC Recharger® 330XLHD Stormwater Chamber

The Recharger® 330XLHD is a 30.5" (775 mm) tall, high capacity chamber. Typically when using this model, fewer chambers are required resulting in less labor and a smaller installation area. The Recharger® 330XLHD has the side portal internal manifold feature. HVLV® FC-24 Feed Connectors are inserted into the side portals to create the internal manifold.

Size (L x W x H)	8.5' x 52" x 30.5"
	2.59 m x 1321 mm x 775 mm
Installed Length	7'
	2.13 m
Length Adjustment per Run	1.50' 0.46 m
Chamber Storage	7.46 ft³/ft 0.69 m³/m 52.21 ft³/unit 1.48 m³/unit
Min. Installed Storage	11.32 ft³/ft 1.05 m³/m 79.26 ft³/unit 2.24 m³/unit
Min. Area Required	33.83 ft² 3.14 m²
Chamber Weight	73.0 lbs 33.11 kg
Shipping	30 chambers/skid 2,335 lbs/skid 10 skids/48' flatbed
Min. Center-to-Center Spacing	4.83' 1.47 m
Max. Allowable Cover	12' 3.66 m
Max. Inlet Opening in End Wall	24" HDPE, PVC 600 mm HDPE, PVC
Max. Allowable O.D. in Side Portal	10" HDPE, 12" PVC 250 mm HDPE, 300 mm PVC
Compatible Feed Connector	HVLV FC-24 Feed Connector

Calculations are based on Installed chamber length.

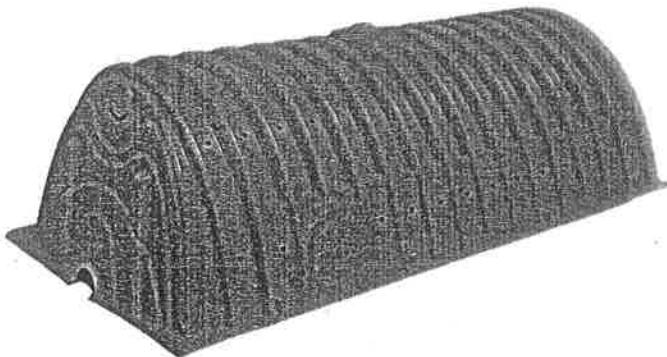
All above values are nominal.

Min. Installed storage includes 6" (152 mm) stone base, 6" (152 mm) stone above crown of chamber and typical stone surround at 58" (1473 mm) center-to-center spacing.

	Stone Foundation Depth		
	6"	12"	18"
	152 mm	305 mm	457 mm
Chamber and Stone Storage Per Chamber	79.26 ft³ 2.24 m³	86.03 ft³ 2.44 m³	92.79 ft³ 2.63 m³
Min. Effective Depth	3.54' 1.08 m	4.04' 1.23 m	4.54' 1.38 m
Stone Required Per Chamber	2.50 yd³ 1.91 m³	3.13 yd³ 2.39 m³	3.76 yd³ 2.87 m³

Calculations are based on installed chamber length.

Includes 6" (305 mm) stone above crown of chamber and typical stone surround at 58" (1473 mm) center-to-center spacing and stone foundation as listed in table.
Stone void calculated at 40%.



Recharger® 330XLHD Bare Chamber Storage Volumes

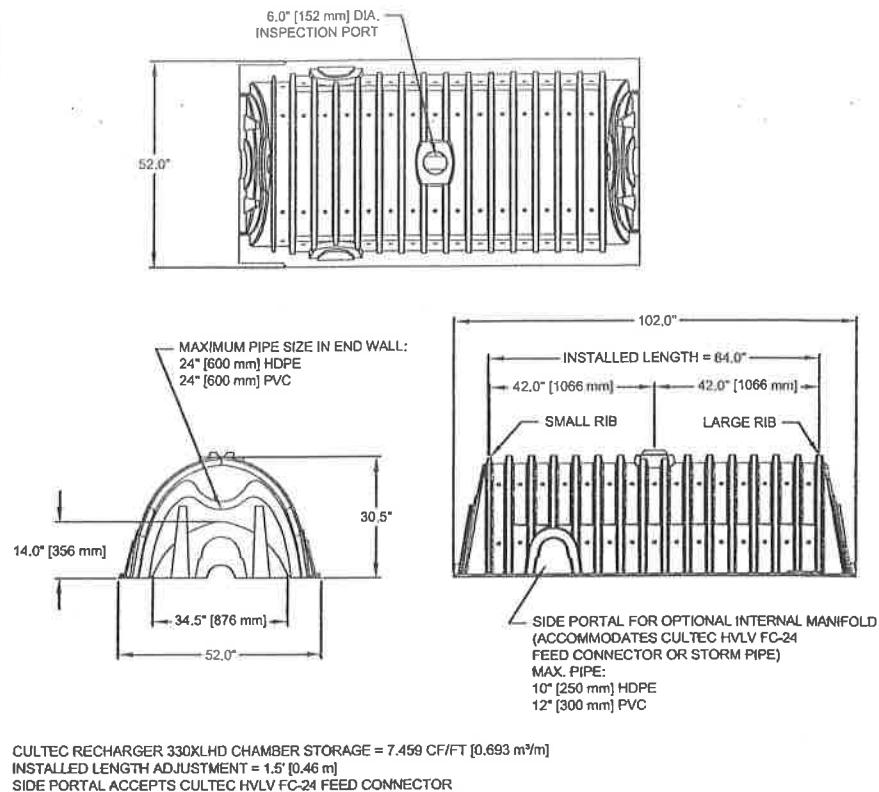
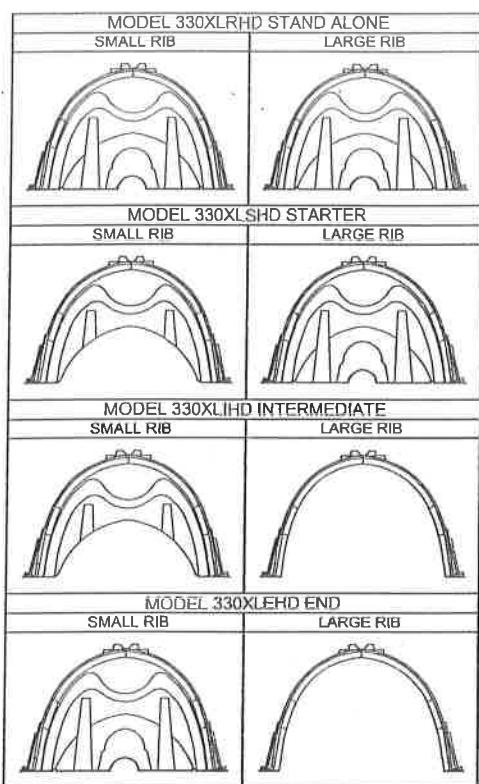
Elevation in. mm	Incremental Storage Volume			Cumulative Storage		
	ft³/ft m³/m	m²/m	ft³ m³	m² ft²	m³ ft³	m³ ft³
30.5 775	0.000	0.000	0.000	0.000	52.213	1.479
30 762	0.019	0.002	0.133	0.004	52.213	1.479
29	0.051	0.005	0.357	0.010	52.080	1.475
28	0.084	0.008	0.588	0.017	51.723	1.465
27	0.124	0.012	0.868	0.025	51.135	1.448
26	0.150	0.014	1.05	0.030	50.267	1.424
25	0.173	0.016	1.211	0.034	49.217	1.394
24	0.191	0.018	1.337	0.038	48.006	1.360
23	0.207	0.019	1.449	0.041	46.669	1.322
22	0.221	0.021	1.547	0.044	45.220	1.281
21	0.233	0.022	1.631	0.046	43.673	1.237
20	0.244	0.023	1.708	0.048	42.042	1.191
19	0.254	0.024	1.778	0.050	40.334	1.142
18	0.264	0.025	1.848	0.052	38.556	1.092
17	0.271	0.025	1.897	0.054	36.708	1.040
16	0.283	0.026	1.981	0.056	34.811	0.986
15	0.294	0.027	2.058	0.058	32.830	0.930
14	0.296	0.027	2.072	0.059	30.772	0.871
13	0.299	0.028	2.093	0.059	28.700	0.813
12	0.301	0.028	2.107	0.060	26.607	0.754
11	0.303	0.028	2.121	0.060	24.500	0.694
10	0.304	0.028	2.128	0.060	22.379	0.634
9	0.306	0.028	2.142	0.061	20.251	0.574
8	0.313	0.029	2.191	0.062	18.109	0.513
7	0.321	0.030	2.247	0.064	15.918	0.451
6	0.322	0.030	2.254	0.064	13.671	0.387
5	0.323	0.030	2.261	0.064	11.417	0.323
4	0.324	0.030	2.268	0.064	9.156	0.259
3	0.325	0.030	2.275	0.064	6.888	0.195
2	0.327	0.030	2.289	0.065	4.613	0.131
1	0.332	0.031	2.324	0.066	2.324	0.066
Total	7.459	0.693	52.213	1.479	52.213	1.479

Calculations are based on installed chamber length.

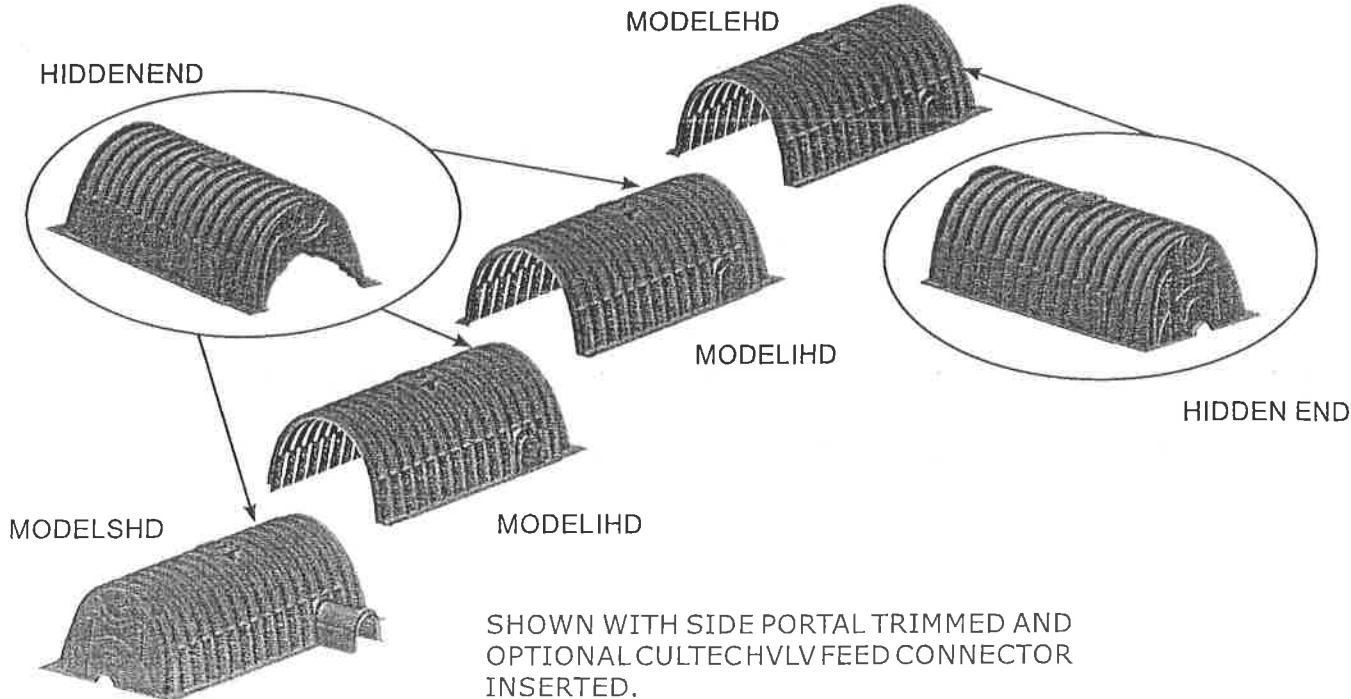
Visit <http://cultec.com/downloads/> for Product Downloads and CAD details.

CULTEC Recharger® 330XLHD Stormwater Chamber

Three View Drawing



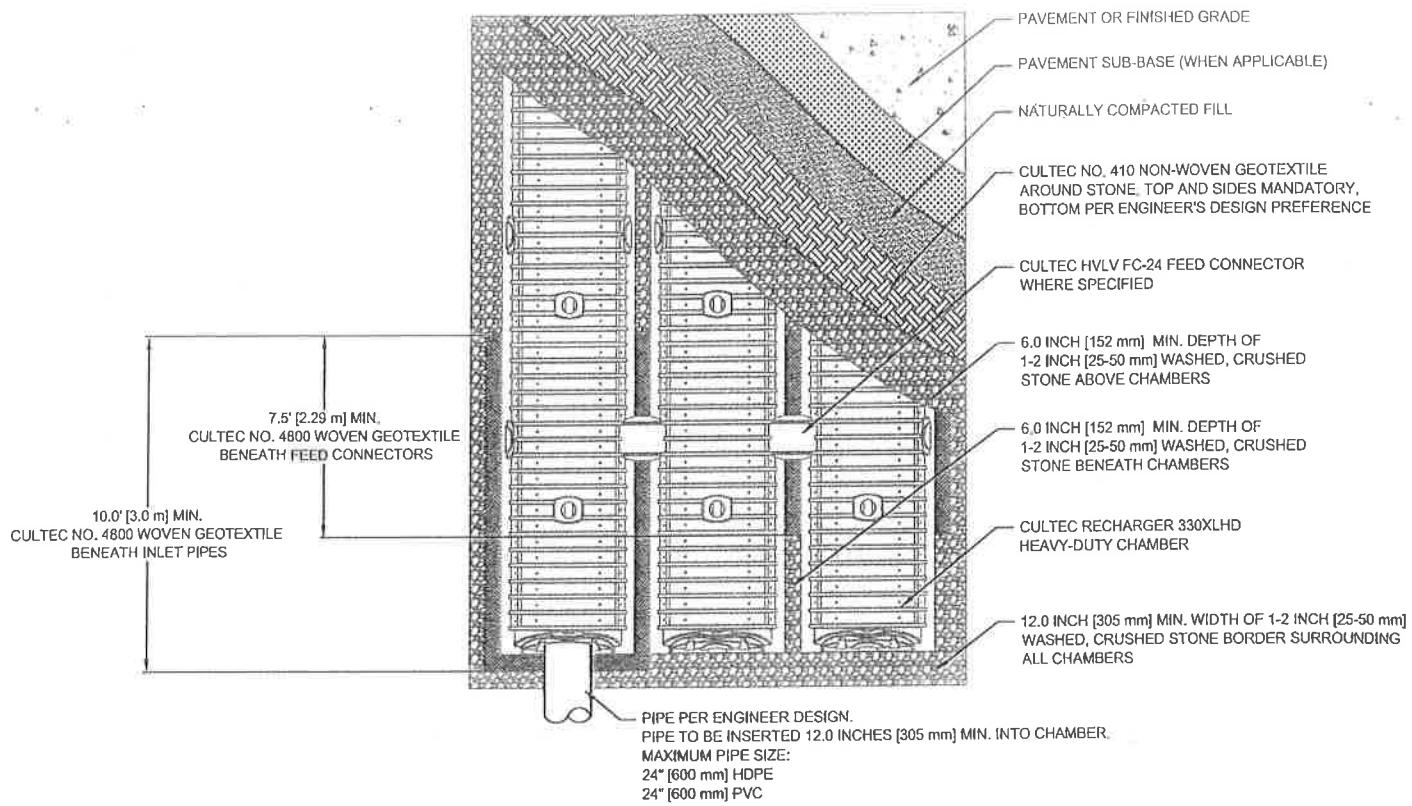
Typical Interlock Installation



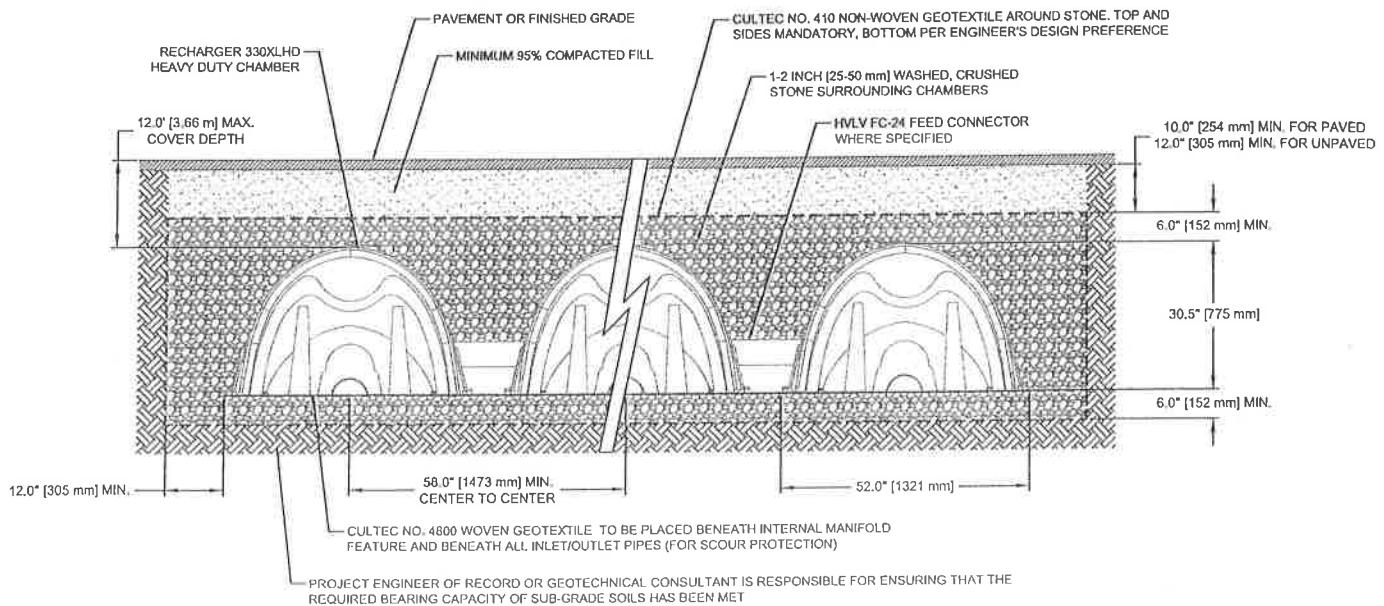


CULTEC Recharger® 330XLHD Stormwater Chamber

Plan View Drawing



Typical Cross Section for Traffic Application



CULTEC Recharger® 330XLHD Stormwater Chamber

CULTEC Recharger® 330XLHD Specifications

GENERAL

CULTEC Recharger® 330XLHD chambers are designed for underground stormwater management. The chambers may be used for retention, recharging, detention or controlling the flow of on-site stormwater runoff.

CHAMBER PARAMETERS

1. The chambers shall be manufactured in the U.S.A. by CULTEC, Inc. of Brookfield, CT (cultec.com, 203-775-4416).
2. The chamber shall be vacuum thermoformed of polyethylene with a black interior and blue exterior.
3. The chamber shall be arched in shape.
4. The chamber shall be open-bottomed.
5. The chamber shall be joined using an interlocking overlapping rib method. Connections must be fully shouldered overlapping ribs, having no separate couplings or separate end walls.
6. The nominal chamber dimensions of the CULTEC Recharger® 330XLHD shall be 30.5 inches (775 mm) tall, 52 inches (1321 mm) wide and 8.5 feet (2.59 m) long. The installed length of a joined Recharger® 330XLHD shall be 7 feet (2.13 m).
7. Maximum inlet opening on the chamber end wall is 24 inches (600 mm) HDPE, PVC.
8. The chamber shall have two side portals to accept CULTEC HVLV® FC-24 Feed Connectors to create an internal manifold. Maximum allowable O.D. in the side portal is 10 inches (250 mm) HDPE and 12 inches (300 mm) PVC.
9. The nominal chamber dimensions of the CULTEC HVLV® FC-24 Feed Connector shall be 12 inches (305 mm) tall, 16 inches (406 mm) wide and 24.2 inches (614 mm) long.
10. The nominal storage volume of the Recharger® 330XLHD chamber shall be 7.459 ft³ / ft (0.693 m³ / m) - without stone. The nominal storage volume of a single Recharger® 330XLRHD Stand Alone unit shall be 63.40 ft³ (1.80 m³) - without stone. The nominal storage volume of a joined Recharger® 330XLIHD Intermediate unit shall be 52.213 ft³ (1.478 m³) - without stone. The nominal storage volume of the length adjustment amount per run shall be 11.19 ft³ (1.04 m³) - without stone.
11. The nominal storage volume of the HVLV® FC-24 Feed Connector shall be 0.913 ft³ / ft (0.026 m³ / m) - without stone.
12. The Recharger® 330XLHD chamber shall have fifty-six discharge holes bored into the sidewalls of the unit's core to promote lateral conveyance of water.
13. The Recharger® 330XLHD chamber shall have 16 corrugations.
14. The end wall of the chamber, when present, shall be an integral part of the continuously formed unit. Separate end plates cannot be used with this unit.
15. The Recharger® 330XLRHD Stand Alone unit must be formed as a whole chamber having two fully formed integral end walls and having no separate end plates or separate end walls.
16. The Recharger® 330XLSHD Starter unit must be formed as a whole chamber having one fully formed integral end wall and one partially formed integral end wall with a lower transfer opening of 14 inches (356 mm) high x 34.5 inches (876 mm) wide.
17. The Recharger® 330XLIHD Intermediate unit must be formed as a whole chamber having one fully open end wall and one partially formed integral end wall with a lower transfer opening of 14 inches (356 mm) high x 34.5 inches (876 mm) wide.
18. The Recharger® 330XLEHD End unit must be formed as a whole chamber having one fully formed integral end wall and one fully open end wall and having no separate end plates or end walls.
19. The HVLV® FC-24 Feed Connector must be formed as a whole chamber having two open end walls and having no separate end plates or separate end walls. The unit shall fit into the side portals of the Recharger® 330XLHD and act as cross feed connections.
20. Chambers must have horizontal stiffening flex reduction steps between the ribs.
21. The chamber shall have a raised integral cap at the top of the arch in the center of each unit to be used as an optional inspection port or clean-out.
22. The units may be trimmed to custom lengths by cutting back to any corrugation on the large rib end.
23. The chamber shall be manufactured in an ISO 9001:2015 certified facility.
24. The chamber shall be designed and manufactured to meet the material and structural requirements of IAPMO PS 63-2019, including resistance to AASHTO H-10 and H-20 highway live loads, when installed in accordance with CULTEC's installation instructions.
25. The chamber shall be designed and manufactured in accordance with the specifications of NSAI Irish Agreement Board Certificate for Cultec Attenuation and Infiltration.
26. Maximum allowable cover over the top of the chamber shall be 12' (3.66 m).
27. The chamber shall be designed to withstand traffic loads when installed according to CULTEC's recommended installation instructions.

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations.
 2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
 3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
 4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
 5. Total TSS Removal = Sum All Values in Column D

Location: PHILLIPS ROAD - PANAGAKOS DEVELOPMENT T

Project:
Prepared By:
Date:

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

COMMERCIAL BUILDING – PHILLIPS ROAD

ILLICIT DISCHARGE COMPLIANCE STATEMENT

Description of Illicit Discharges

Illicit discharges are discharges to the stormwater management system that are not entirely composed of stormwater. Illicit discharges include (but are not limited to) wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease.

Illicit Discharge Prevention

The project, as designed, does not provide for any illicit connections to the proposed stormwater management system. As part of the long-term pollution prevention plan that will be on file at the City and with the Owners, illicit connections to the stormwater management system will be strictly prohibited. Any contractors performing work at the site will be notified of the prohibition of any illicit connections to the stormwater management system.

Training for Staff

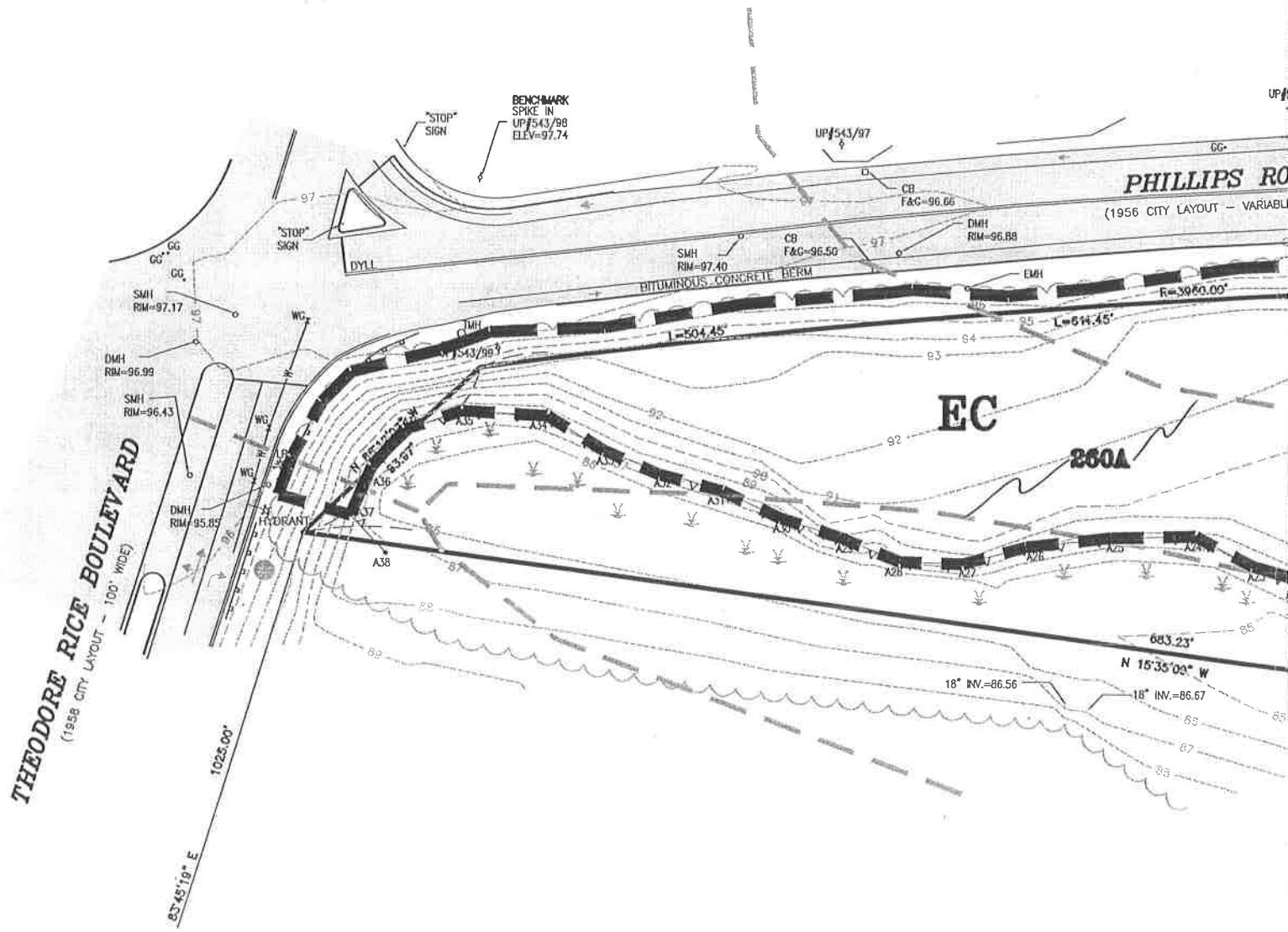
The property owner/managers responsible for the maintenance of the stormwater management system will be properly trained as required to detect any unauthorized illicit discharges to the stormwater management system and eliminate them as soon as possible. It is anticipated that staff will be performing routine maintenance on the stormwater management system and at this time would be able to detect any unauthorized illicit discharges.

Site Map

Refer to Proposed Site Development Plans prepared for Panagakos Development by SITEC Engineering for locations and information on the proposed stormwater management system associated with this project.

Certification

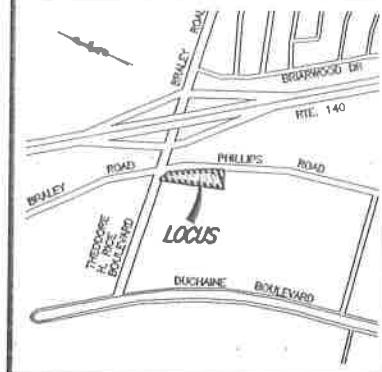
As the design plans show, there are no provisions for illicit discharges to the stormwater management system being proposed. Additionally, there are no proposed connections between any stormwater and wastewater management systems. Illicit discharges will be prohibited to the new stormwater management system associated with the proposed project and the property owners have been notified to not allow any unauthorized illicit discharges.





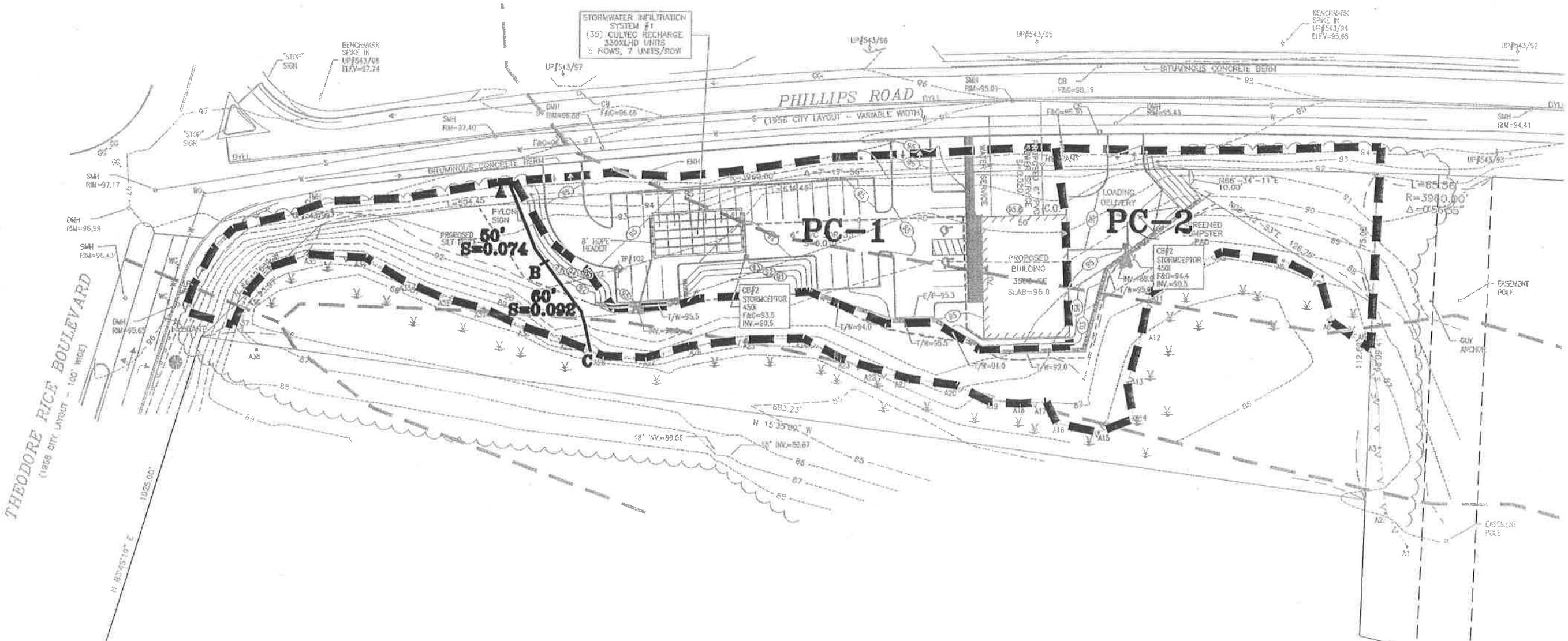
LEGEND

<u>S4</u>	PROPERTY LINE
<u>EXISTING CONTOUR</u>	
<u>GUARDRAIL</u>	
<u>OVERHEAD WIRES</u>	
<u>GAS MAIN</u>	
<u>WATER MAIN</u>	
<u>SEWER LINE</u>	
<u>DRAINAGE LINE</u>	
<u>CATCH BASIN</u>	
<u>DRIVE MANHOLE</u>	
<u>SEWER MANHOLE</u>	
<u>HYDRANT</u>	
<u>WATER GATE VALVE</u>	
<u>GATE VALVE</u>	
<u>GAS SERVICE</u>	
<u>LIGHT POLE</u>	
<u>UTILITY POLE</u>	
<u>MONITORING WELL</u>	
<u>TREE LINE</u>	
<u>ELECTRICAL MANHOLE</u>	
<u>EDGE OF BORDERING VEGETATED WETLANDS</u>	
<u>DOUBLE YELLOW LANE LINE</u>	
<u>PROPOSED CONTOUR</u>	
<u>PROPOSED SPOT GRADE</u>	
<u>PROPOSED CATCH BASIN</u>	
<u>PROPOSED ROOF DRAIN</u>	



LOCUS MAP

SCALE: 1"=1,000'



Project ASSESSOR'S MAP 136 - LOT 468 PHILLIPS ROAD NEW BEDFORD, MASSACHUSETTS		Area 1"=30' Date MARCH 26, 2021 Drawn: KJ	Revised No. Date	Approved By Chkd. by
Client PANAGAKOS DEVELOPMENT		Effect SDG Approved SDG	Effect SDG Approved SDG	Approved By Chkd. by
		Stamp Date 2024-03-26	Stamp Date 2024-03-26	Stamp Date 2024-03-26
PROPOSED CONDITIONS DRAINAGE PLAN				
 SITE C Project of C&E Environmental Consultants, Inc. 449 Perin Corner Ave., Dartmouth, MA 02747 P.O. Box 1275 P.C. 02748-1275 www.cenrc.com				