STORMWATER POLLUTION PREVENTION PLAN REPORT FOR WILLIAM BUTLER SUBDIVISION

2 Hillcrest Drive
Town of Ossining
Westchester County, New York

April, 2017

Submitted To:

The Town of Ossining

This report, in conjunction with the project plans, makes up the complete Stormwater Pollution Prevention Plan.

Prepared by:

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Stormwater Pollution Prevention Plan Report (SWPPP)

NARRATIVE REPORT (SWPPP)

PROJECT DESCRIPTION

The subject property is located at 2 Hillcrest Drive in the Town of Ossining and consists of ±2.7 acres of land; NYS Route 100 is located immediately to the east. The subject property is partially developed with a residence, asphalt driveway, asphalt basketball court, and other ancillary accessory structures; the remains of a stone foundation is located to the east of the residence and extends over the easterly property line.

The topography varies and slopes away from the residence to the south and east, with a steeper band of slopes (in excess of 35%) located immediately east of the residence and basketball court; gentler slopes are located to the rear (south) of the residence. The developed portion of the property adjacent to the residence is mainly lawn, with pine, hemlock, maple and oak trees flanking the easterly and westerly perimeters; open woodlands are located in the northeastern portion of the property. The undeveloped portion of the property located to the south and east of the residence and basketball court is dominated by invasive shrubs and vines.

The proposed action is to subdivide the lot into two (2) parcels. One parcel will include all the existing site improvements mentioned above. The vacant parcel is proposed to be developed with a single-family residence, asphalt driveway, individual septic system and stormwater improvements.

Throughout the construction process, strict adherence to the erosion control plan will be maintained to ensure that all sediment is contained within the site in a controlled manner and that the untimely or unnecessary removal of existing vegetation is prevented. The implementation of the project will involve disturbance to approximately 0.8 acre of land. The project will occur in a single phase, anticipated to commence in Summer, 2017.

This report and associated plans have been prepared in accordance with New York State Department of Environmental Conservation SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 and follows the guidelines set forth by the Town of Ossining stormwater management requirements provided in Town Code Chapter 168 "Stormwater Management and Erosion Control".

STORMWATER MITIGATION

The project site will be developed into a single-family house. With the typical appurtenances, including a single-family residence, asphalt driveway, individual septic system and stormwater improvements. The stormwater runoff generated by the driveway will be collected in a series of drain inlets. The collection system will be conveyed by 12" diameter HDPE pipes. The roof runoff will be collected into the roof leader system. Both the driveway and roof runoff will be collected and pretreated in a deep sump drain inlet equipped with a hooded outlet.

The infiltration system will consist of Cultec 330XL infiltration chambers. These chambers were selected based on the deep soil testing that was performed by this office. The system will be sized to mitigate the increase in stormwater runoff generated by the 25-year design storm from the increase in impervious cover. Storms greater than the 25-year event will overflow to a protected outlet.

The collection system was also modeled in HydroCad. As shown, it is capable of safely conveying the 25-year storm event.

The infiltration system also has the ability to treat the Water Quality Volume (WQv). The WQv for this project location is defined as the 90th percentile rainfall event. The supporting calculation to determine the WQv of 0.0178 a.f. can be found in Appendix D. As shown in Appendix D, the system can completely store and treat 0.026 a.f. without taking credit for infiltration. This is greater than 100% of the WQv.

Based on the level of stormwater treatment proposed, there are no negative impacts anticipated for any downstream properties or wetlands.

EROSION AND SEDIMENT CONTROL PLAN

All proposed soil erosion and sediment control practices have been designed in accordance with the following publications:

- New York Standards and Specifications for Erosion and Sediment Control, latest edition
- New York State Department of Environmental Conservation (NYSDEC) SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-15-002)
- Town Code of Ossining Chapter 168 "Stormwater Management and Erosion Control"

The primary aim of the soil erosion and sediment control plan is to reduce soil erosion from areas stripped of vegetation during construction and to prevent silt from reaching the drainage structures, wetland systems, watercourses, waterbodies and downstream properties. As outlined in the construction sequencing notes below and on the Grading, Drainage and Utility Plan, the Sediment and Erosion Control Plan is an integral component of the construction phasing and project sequencing and will be implemented to control sediment and re-establish vegetation as soon as practicable. The plan will be implemented prior to the commencement of any earthmoving activities and will be maintained through the duration of the project.

The proposed soil erosion and sediment control devices include the planned erosion control practices outlined below. Maintenance procedures for each erosion control practice are also provided herein. The owner or operator must ensure that all erosion and sediment control practices identified herein are maintained in effective operating condition at all times.

- **STABILIZED CONSTRUCTION ENTRANCE**

  A stabilized construction entrance shall be installed at the project entrance as indicated on the plans. The purpose of the stabilized construction entrance is to prevent vehicles leaving the site from tracking sediment, mud or any other construction-related materials from the site onto Hillcrest Drive.

  Maintenance/Inspection

  Stabilized construction entrance shall be inspected a minimum of once every seven (7) calendar days. The Contractor shall maintain the construction entrance in a manner which prevents or significantly reduces the tracking of sediment/soil onto Hillcrest Drive. The Contractor shall inspect the construction entrance daily and after each rain event for displacement or loss of aggregate. The Contractor shall top-dress the construction entrance when displacement/loss of aggregate occurs, or if the aggregate becomes clogged or silted to the extent that the entrance can no longer perform its intended function. The Contractor shall inspect the vicinity of the construction entrance several times a day and immediately remove any sediment dropped or washed onto Hillcrest Drive.

- **SILT FENCE**

  Silt fence (geotextile filter cloth) shall be placed in locations depicted on the approved plans. The purpose of the silt fence is to reduce the velocity of sediment-laden stormwater from small drainage areas and to intercept the transported sediment load. In general, silt fence shall be used at the down-gradient perimeter of disturbed areas, toe of slopes or intermediately within slopes where obvious channel concentration of stormwater is not present. Silt fence shall always be installed parallel to the contours in order to prevent concentrated flows from developing along the silt fence.

  Maintenance/Inspection

  Silt fencing shall be inspected a minimum of once every seven (7) calendar days. Inspections shall include ensuring that the fence material is tightly secured to the wood posts. In addition, overlapping filter fabric shall be secure and the fabric shall be maintained a minimum of six (6) inches below grade. In the event that any "bulges" develop in the fence, that section of fence shall be replaced immediately with a new fence section. Any visible sediment build-up against the fence shall be removed immediately and deposited on-site a minimum of 100 feet outside of any regulated wetland area, watercourse or waterbody.

- **TREE PROTECTION**

All significant trees to be preserved and located within the limits of disturbance and on the perimeter of the disturbance limits shall be protected from harm by erecting a three (3) feet high (minimum) snow fence surrounding the tree. Snow fence should extend to the drip-line of the tree to be preserved. Trees designated to be protected/saved are illustrated on the construction drawings and will be identified in the field prior to construction.

Maintenance/Inspection

The snow fence shall remain at the drip-line of the tree to be preserved. The snow fence shall be inspected a minimum of once every seven (7) calendar days. Any damaged portions of the fence shall be repaired or replaced. Care shall also be taken to ensure that no construction equipment is driven or parked within the drip-line of the tree to be preserved.

- **SOIL/MATERIAL STOCKPILING**

All soil/material stripped from the construction area during grubbing and grading shall be stockpiled within the vicinity of the locations illustrated on the approved plans, or in practical locations on-site.

Maintenance/Inspection

All stockpiles shall be inspected a minimum of once every seven (7) calendar days for signs of erosion or problems with seed establishment. Soil stockpiles shall be protected from erosion by vegetating the stockpile with a rapidly-germinating grass seed and surrounded with silt fence. If the project is ongoing during the non-growing season, the stockpiles shall be protected with a tarpaulin covering the entire stockpile.

- **SURFACE STABILIZATION**

All disturbed areas will be protected from erosion with the use of vegetative measures (e.g., grass seed mix, sod), hydromulch, hay or erosion control blankets.

Erosion control barriers consisting of silt fencing shall be placed around exposed areas during construction. Any areas stripped of vegetation during construction will be vegetated and/or mulched immediately to prevent erosion of the exposed soils. In areas where significant erosion potential exists (steep slopes) and/or where specifically directed, Curlex Excelsior erosion control blankets (manufactured by American Excelsior or approved equal) shall be installed.

Materials that may be used for mulching include straw, hay, salt hay, wood fiber, synthetic soil stabilizers, mulch netting, erosion control blankets or sod. A permanent vegetative cover will be established upon completion of construction of those areas which have been brought to finish grade and to remain undisturbed.

- **GENERAL LAND GRADING**

  The applicant/developer or their representatives shall be on-site at all times when construction or grading activity takes place and shall inspect and document the effectiveness of all sediment and erosion control practices.

  The intent of the erosion controls is to control all disturbed areas, such that soils are protected from erosion by temporary methods and, ultimately, by permanent vegetation.

- **DUST CONTROL**

  Where vegetative or mulch cover is not practical in disturbed areas of the site, dust shall be controlled by the use of water sprinkling. The surface shall be sprayed until wet. Dust control shall continue until such time as the entire site is adequately stabilized with permanent vegetative cover.

- **POLLUTION PREVENTION MEASURES FOR CONSTRUCTION RELATED ACTIVITIES**

  Pollution prevention practices for preventing litter, construction chemicals (if applicable) and construction debris from becoming a pollutant source in stormwater discharge include daily pickup of construction debris, inspection, and physical controls such as silt fencing. Inspections will also be conducted to ensure that dust control measures are utilized as necessary. During construction, maintenance, construction and waste materials will be stored within suitable areas/dumpsters, as appropriate, to minimize the exposure of the materials to stormwater and spill prevention. All maintenance and construction waste will be disposed of in a safe manner in accordance with all applicable regulations.

GENERAL CONSTRUCTION SEQUENCING

Outlined below is a brief listing of the construction sequencing for the project.

Prior to any interior site activity, the owner, contractor, owner's engineer and Town Engineer shall hold a pre-construction meeting.

Final stabilization as defined by the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activities GP-0-15-002 is the establishment of a uniform perennial vegetative cover with a density of eighty (80) percent over the pervious surface once all soil disturbance activities have ceased. Cover can be vegetative (e.g., grass, trees, seed and mulch, shrubs or turf) or non-vegetative (e.g., geotextiles, rip-rap or gabions, pavement, roofs, etc.).

The applicant shall notify the Town of Ossining enforcement official at least 48 hours before any of the following as required by the Stormwater Management Officer:

- Start of construction.
- Installation of sediment and erosion control measures.
- Completion of site clearing.
- Completion of rough grading.
- Completion of final grading.
- Close of the construction season.
- Completion of final landscaping.
- Successful establishment of landscaping in public areas.

Construction Sequencing:

- Owner/operator to obtain all necessary permits/approvals.
- Owner/operator to conduct a pre-construction meeting.
- Install stabilized construction entrance.
- Install silt fence and tree protection in locations as indicated on the plan.
- Initiate driveway modifications.
- Rough grade driveway.
- Commence house reconstruction.
- Stockpile excavated soil in soil stockpile locations to reclaim for further use (i.e., landscaping).
- Install underground infiltration system.
- Provide dust control during construction as necessary.
- Final grade driveway.
- Install driveway pavement.

- Re-vegetate all disturbed areas.
- Final stabilize all disturbed areas.
- Remove silt fence and all erosion control parameters upon site's final stabilization.

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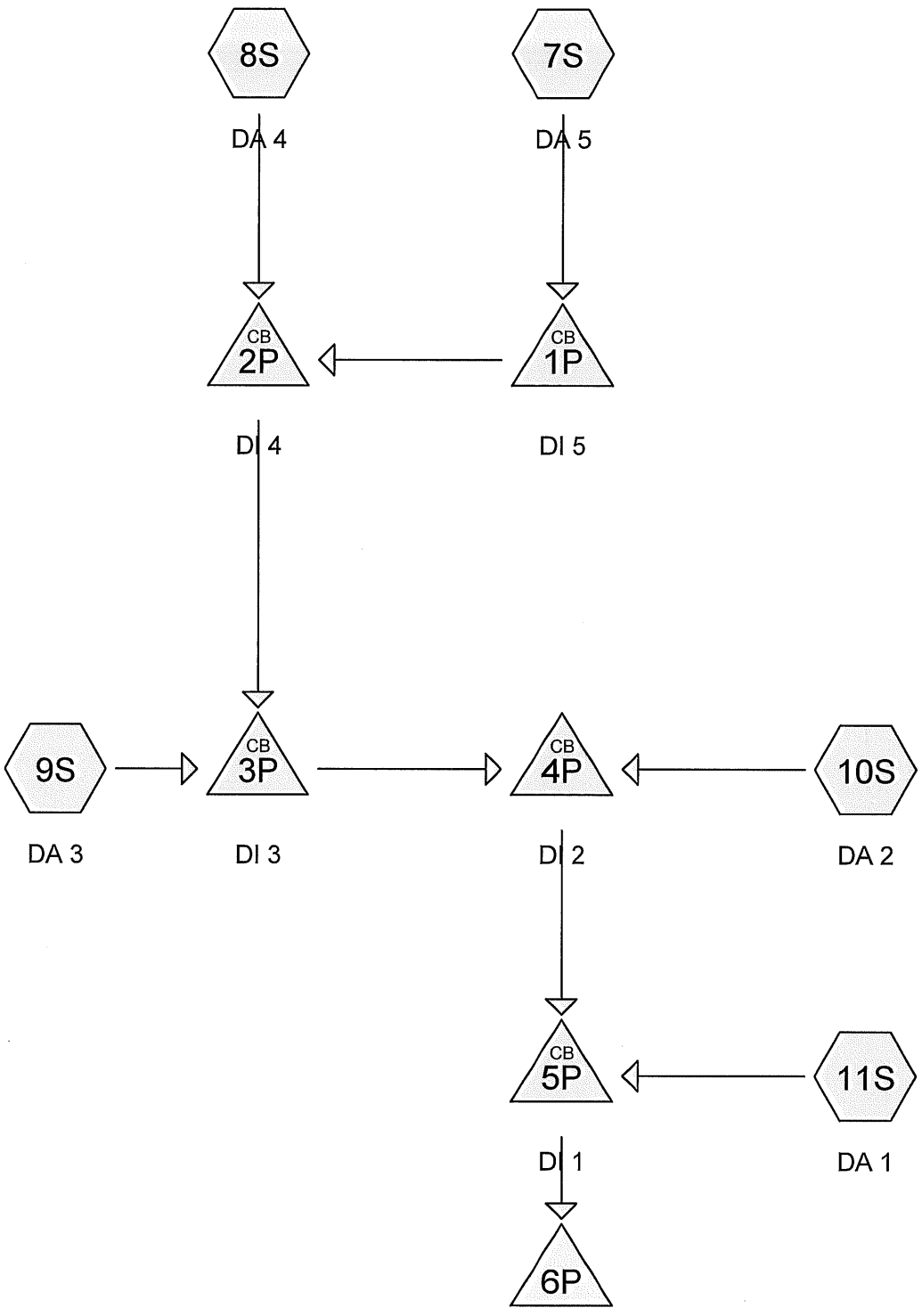
APPENDIX A
STORMWATER MITIGATION CALCULATIONS



Subcat Reach Pond Link

Routing Diagram for Butler Subdivision

Prepared by Kellard Sessions Consulting, P.C., Printed 4/6/2017

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.153	61	>75% Grass cover, Good, HSG B (7S, 8S, 11S)
0.154	98	Paved parking, HSG B (7S, 8S, 9S, 10S, 11S)
0.161	60	Woods, Fair, HSG B (11S)

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	329.30	318.70	78.0	0.1359	0.013	12.0	0.0	0.0
2	2P	321.90	307.30	55.0	0.2655	0.013	12.0	0.0	0.0
3	3P	307.30	304.30	70.0	0.0429	0.013	12.0	0.0	0.0
4	4P	304.30	300.80	85.0	0.0412	0.013	12.0	0.0	0.0
5	5P	296.80	287.00	45.0	0.2178	0.013	12.0	0.0	0.0

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 7S: DA 5 Runoff Area=1,348 sf 91.02% Impervious Runoff Depth=5.41"
Tc=5.0 min CN=95 Runoff=0.18 cfs 0.014 af

Subcatchment 8S: DA 4 Runoff Area=2,556 sf 34.66% Impervious Runoff Depth=3.18"
Tc=5.0 min CN=74 Runoff=0.22 cfs 0.016 af

Subcatchment 9S: DA 3 Runoff Area=1,009 sf 100.00% Impervious Runoff Depth=5.76"
Tc=5.0 min CN=98 Runoff=0.14 cfs 0.011 af

Subcatchment 10S: DA 2 Runoff Area=1,425 sf 100.00% Impervious Runoff Depth=5.76"
Tc=5.0 min CN=98 Runoff=0.19 cfs 0.016 af

Subcatchment 11S: DA 1 Runoff Area=14,066 sf 15.41% Impervious Runoff Depth=2.44"
Tc=0.0 min CN=66 Runoff=1.04 cfs 0.066 af

Pond 1P: DI 5 Peak Elev=329.53' Inflow=0.18 cfs 0.014 af
12.0" Round Culvert n=0.013 L=78.0' S=0.1359 '/' Outflow=0.18 cfs 0.014 af

Pond 2P: DI 4 Peak Elev=322.26' Inflow=0.40 cfs 0.030 af
12.0" Round Culvert n=0.013 L=55.0' S=0.2655 '/' Outflow=0.40 cfs 0.030 af

Pond 3P: DI 3 Peak Elev=307.72' Inflow=0.54 cfs 0.041 af
12.0" Round Culvert n=0.013 L=70.0' S=0.0429 '/' Outflow=0.54 cfs 0.041 af

Pond 4P: DI 2 Peak Elev=304.79' Inflow=0.73 cfs 0.056 af
12.0" Round Culvert n=0.013 L=85.0' S=0.0412 '/' Outflow=0.73 cfs 0.056 af

Pond 5P: DI 1 Peak Elev=297.59' Inflow=1.59 cfs 0.122 af
12.0" Round Culvert n=0.013 L=45.0' S=0.2178 '/' Outflow=1.59 cfs 0.122 af

Pond 6P: INFILTRATION Peak Elev=284.27' Storage=0.005 af Inflow=1.59 cfs 0.122 af
Outflow=1.05 cfs 0.122 af

Summary for Subcatchment 7S: DA 5

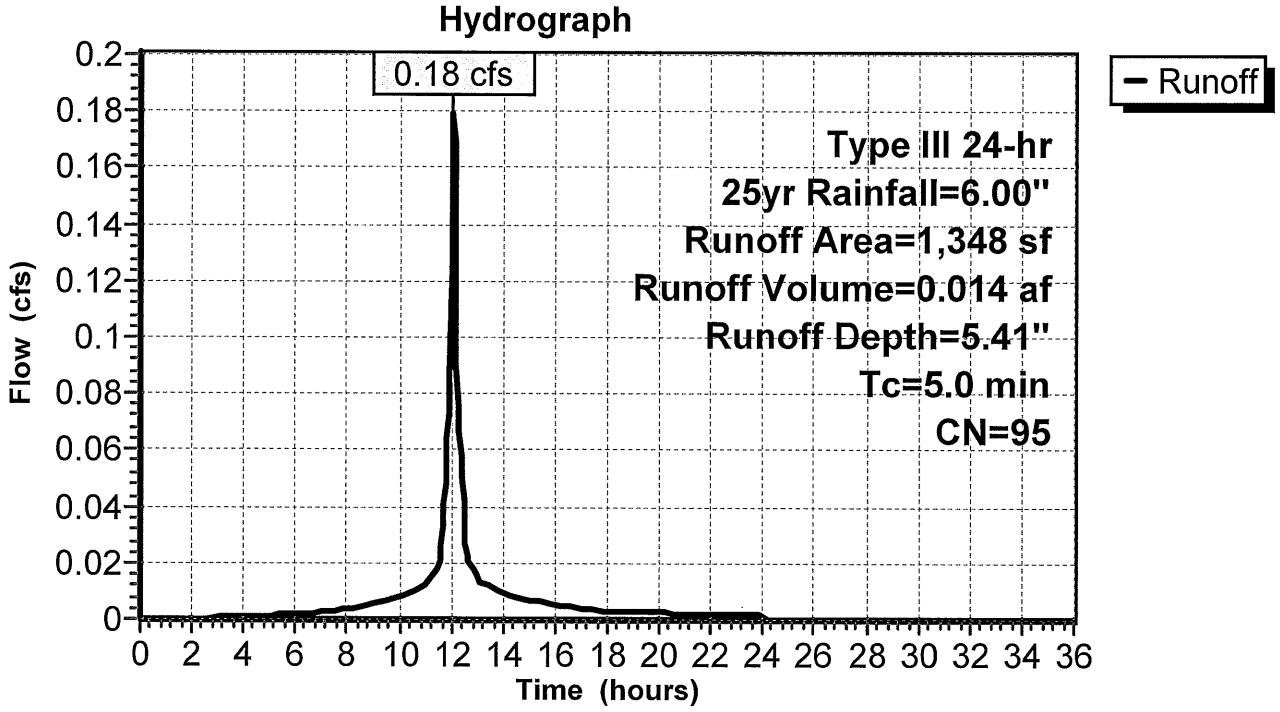
Runoff = 0.18 cfs @ 12.07 hrs, Volume= 0.014 af, Depth= 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.00"

Area (sf)	CN	Description
1,227	98	Paved parking, HSG B
121	61	>75% Grass cover, Good, HSG B
1,348	95	Weighted Average
121		8.98% Pervious Area
1,227		91.02% Impervious Area

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

Subcatchment 7S: DA 5



Summary for Subcatchment 8S: DA 4

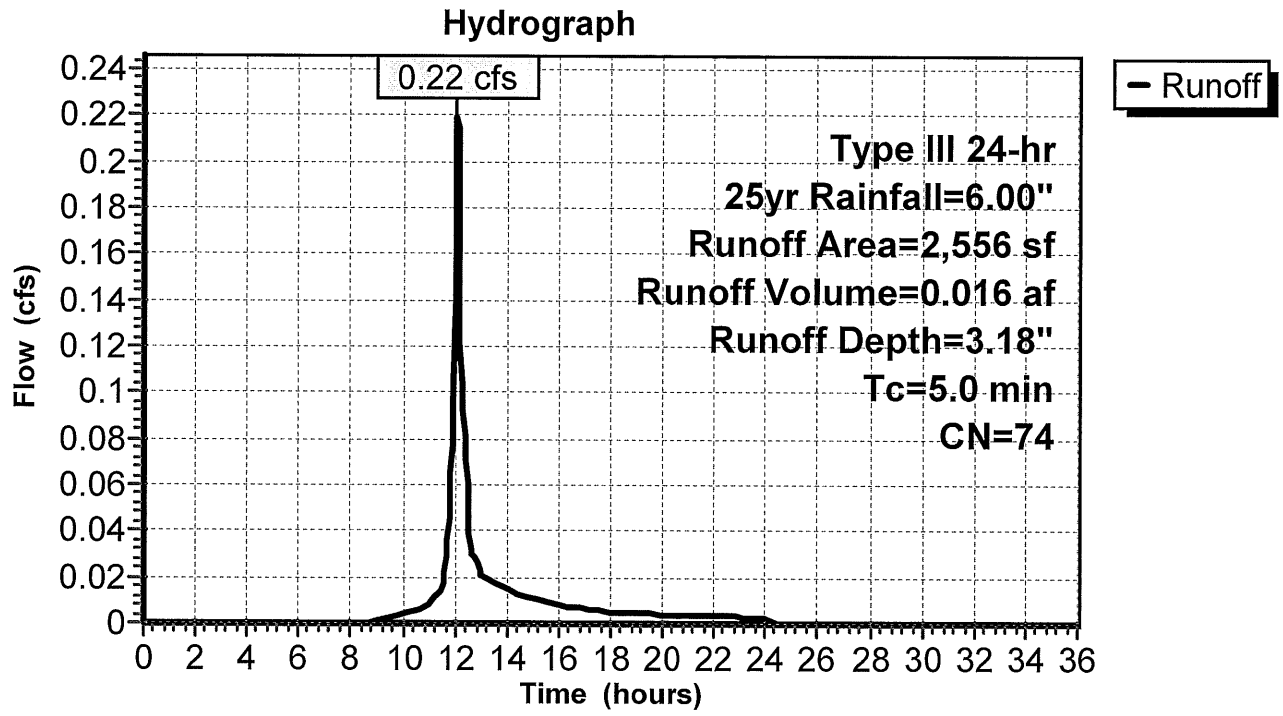
Runoff = 0.22 cfs @ 12.08 hrs, Volume= 0.016 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.00"

Area (sf)	CN	Description
1,670	61	>75% Grass cover, Good, HSG B
886	98	Paved parking, HSG B
2,556	74	Weighted Average
1,670		65.34% Pervious Area
886		34.66% Impervious Area

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

Subcatchment 8S: DA 4



Summary for Subcatchment 9S: DA 3

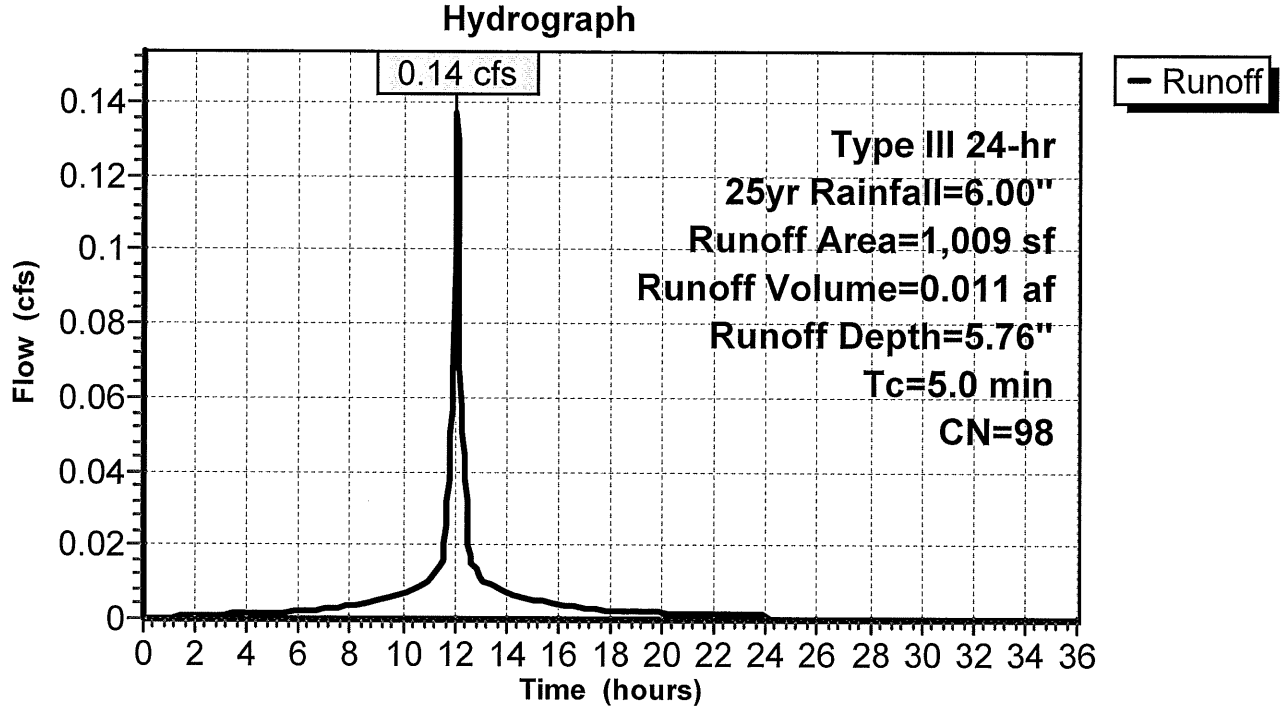
Runoff = 0.14 cfs @ 12.07 hrs, Volume= 0.011 af, Depth= 5.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.00"

Area (sf)	CN	Description
1,009	98	Paved parking, HSG B
1,009		100.00% Impervious Area

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

Subcatchment 9S: DA 3



Summary for Subcatchment 10S: DA 2

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 0.016 af, Depth= 5.76"

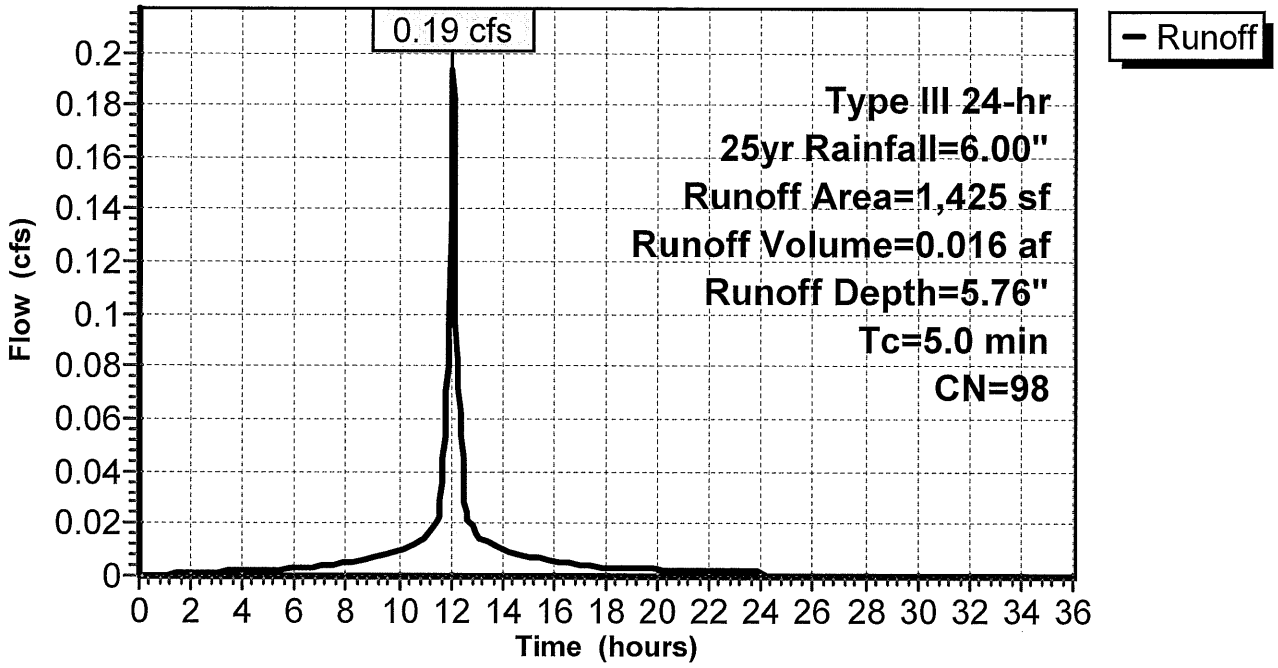
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.00"

Area (sf)	CN	Description
1,425	98	Paved parking, HSG B
1,425		100.00% Impervious Area

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

Subcatchment 10S: DA 2

Hydrograph



Summary for Subcatchment 11S: DA 1

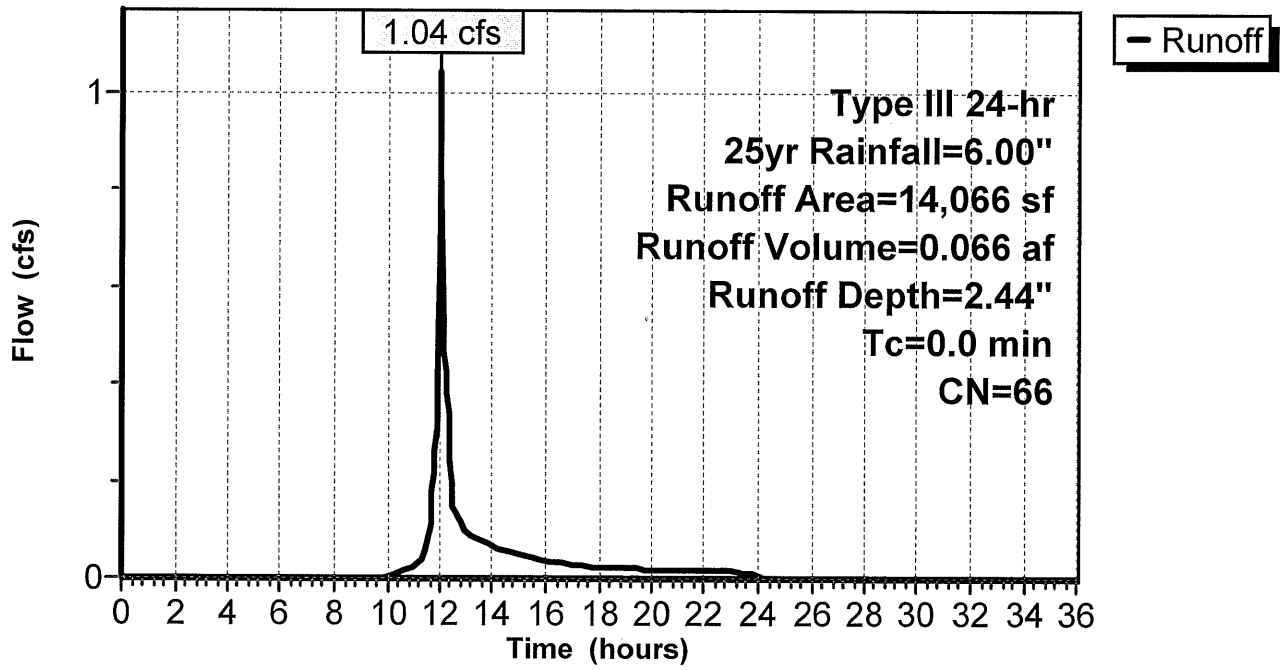
Runoff = 1.04 cfs @ 12.01 hrs, Volume= 0.066 af, Depth= 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.00"

Area (sf)	CN	Description
2,167	98	Paved parking, HSG B
4,892	61	>75% Grass cover, Good, HSG B
7,007	60	Woods, Fair, HSG B
14,066	66	Weighted Average
11,899		84.59% Pervious Area
2,167		15.41% Impervious Area

Subcatchment 11S: DA 1

Hydrograph



Summary for Pond 1P: DI 5

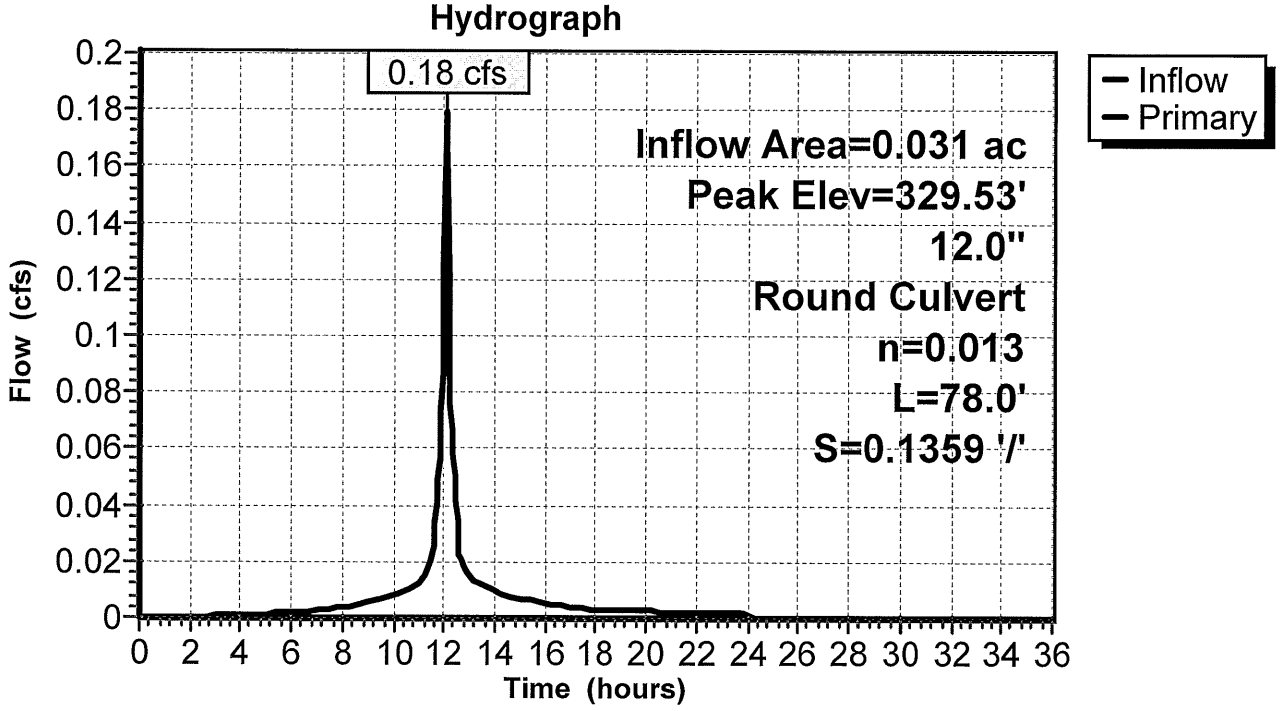
Inflow Area = 0.031 ac, 91.02% Impervious, Inflow Depth = 5.41" for 25yr event
Inflow = 0.18 cfs @ 12.07 hrs, Volume= 0.014 af
Outflow = 0.18 cfs @ 12.07 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min
Primary = 0.18 cfs @ 12.07 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 329.53' @ 12.07 hrs
Flood Elev= 332.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	329.30'	**12.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 329.30' / 318.70' S= 0.1359 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.17 cfs @ 12.07 hrs HW=329.53' (Free Discharge)
1=Culvert (Inlet Controls 0.17 cfs @ 1.28 fps)

Pond 1P: DI 5



Summary for Pond 2P: DI 4

Inflow Area = 0.090 ac, 54.12% Impervious, Inflow Depth = 3.95" for 25yr event
Inflow = 0.40 cfs @ 12.07 hrs, Volume= 0.030 af
Outflow = 0.40 cfs @ 12.07 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.07 hrs, Volume= 0.030 af

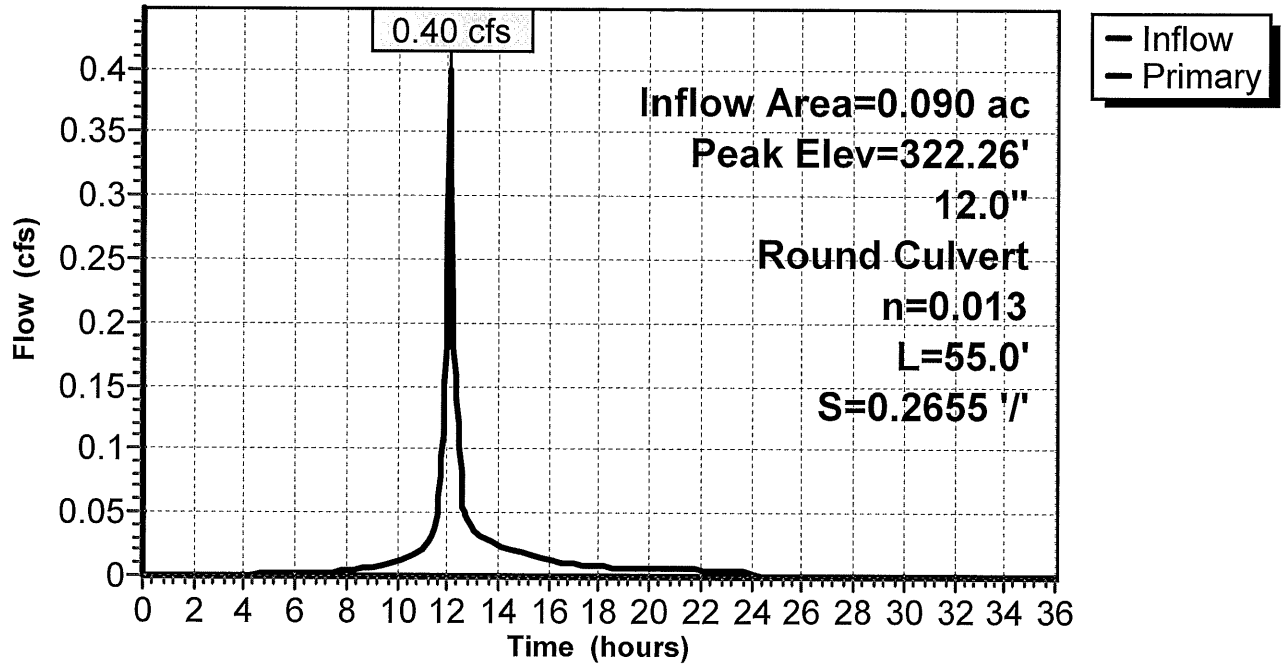
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 322.26' @ 12.07 hrs
Flood Elev= 321.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	321.90'	**12.0" Round Culvert** L= 55.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 321.90' / 307.30' S= 0.2655 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.38 cfs @ 12.07 hrs HW=322.25' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.38 cfs @ 1.58 fps)

Pond 2P: DI 4

Hydrograph



Summary for Pond 3P: DI 3

Inflow Area = 0.113 ac, 63.55% Impervious, Inflow Depth = 4.33" for 25yr event
Inflow = 0.54 cfs @ 12.07 hrs, Volume= 0.041 af
Outflow = 0.54 cfs @ 12.07 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
Primary = 0.54 cfs @ 12.07 hrs, Volume= 0.041 af

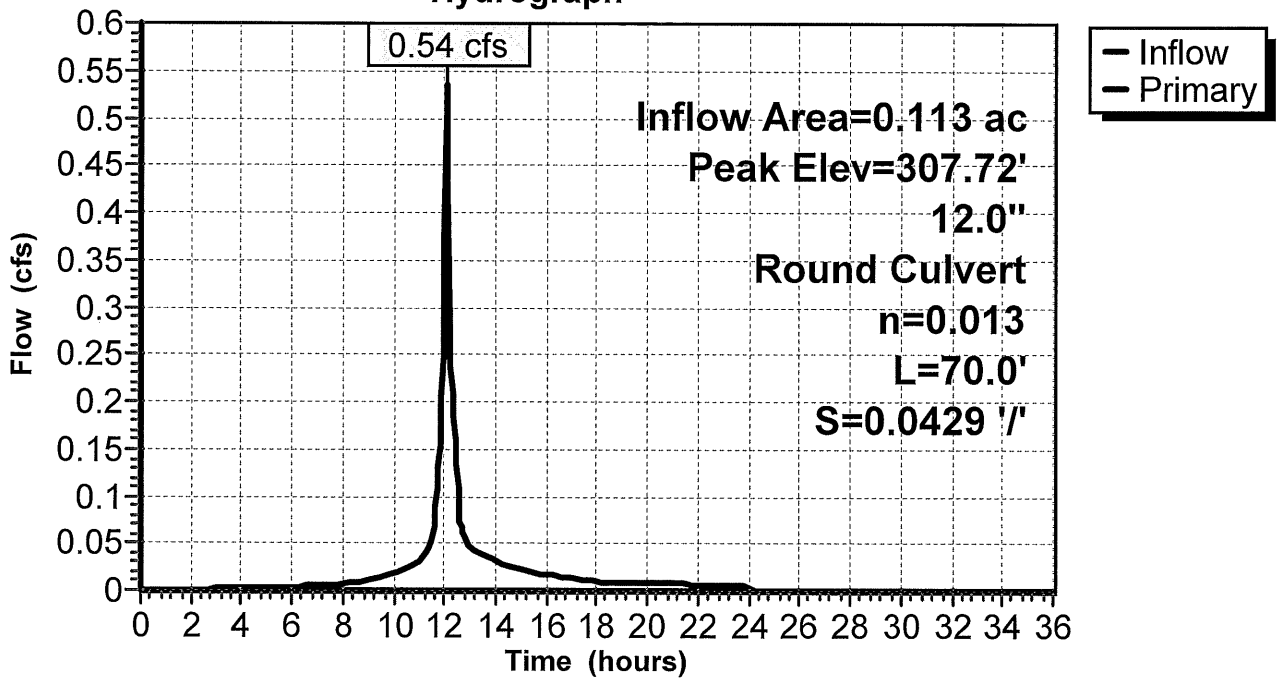
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 307.72' @ 12.07 hrs
Flood Elev= 310.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	307.30'	**12.0" Round Culvert** L= 70.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.30' / 304.30' S= 0.0429 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.52 cfs @ 12.07 hrs HW=307.71' (Free Discharge)
1=Culvert (Inlet Controls 0.52 cfs @ 1.72 fps)

Pond 3P: DI 3

Hydrograph



Summary for Pond 4P: DI 2

Inflow Area = 0.146 ac, 71.74% Impervious, Inflow Depth = 4.65" for 25yr event
Inflow = 0.73 cfs @ 12.07 hrs, Volume= 0.056 af
Outflow = 0.73 cfs @ 12.07 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min
Primary = 0.73 cfs @ 12.07 hrs, Volume= 0.056 af

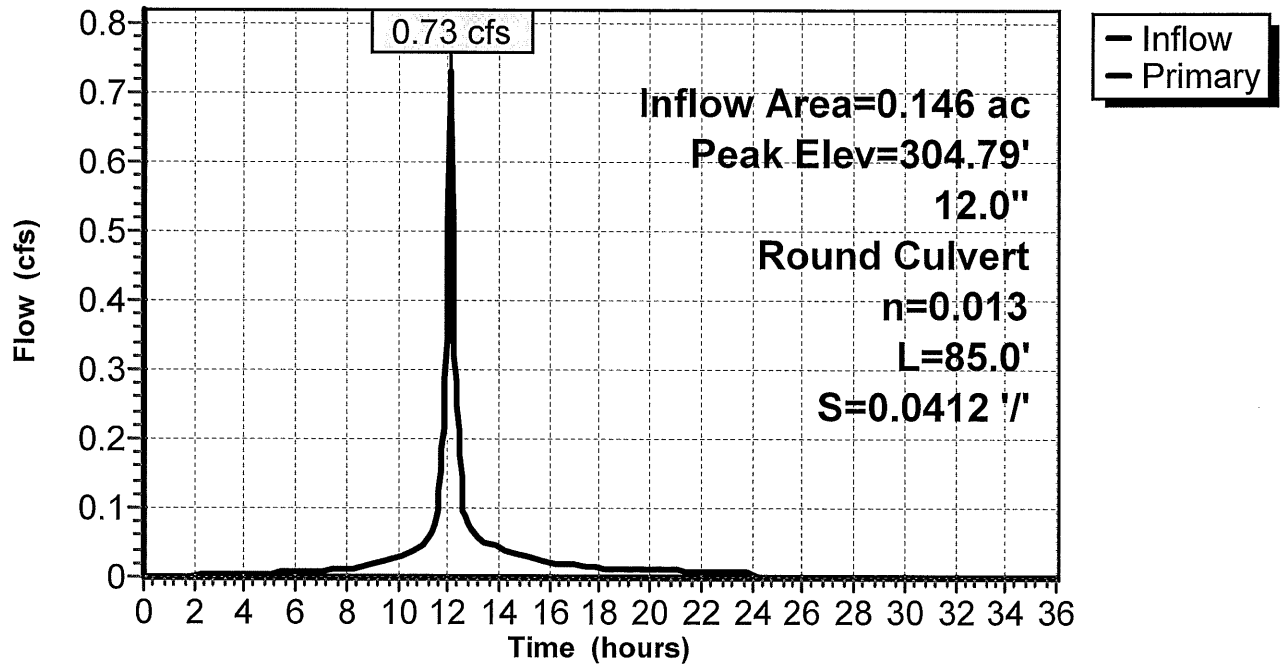
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 304.79' @ 12.07 hrs
Flood Elev= 307.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	304.30'	**12.0" Round Culvert** L= 85.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 304.30' / 300.80' S= 0.0412 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.70 cfs @ 12.07 hrs HW=304.78' (Free Discharge)
1=Culvert (Inlet Controls 0.70 cfs @ 1.87 fps)

Pond 4P: DI 2

Hydrograph



Summary for Pond 5P: DI 1

Inflow Area = 0.468 ac, 32.91% Impervious, Inflow Depth = 3.13" for 25yr event
Inflow = 1.59 cfs @ 12.03 hrs, Volume= 0.122 af
Outflow = 1.59 cfs @ 12.03 hrs, Volume= 0.122 af, Atten= 0%, Lag= 0.0 min
Primary = 1.59 cfs @ 12.03 hrs, Volume= 0.122 af

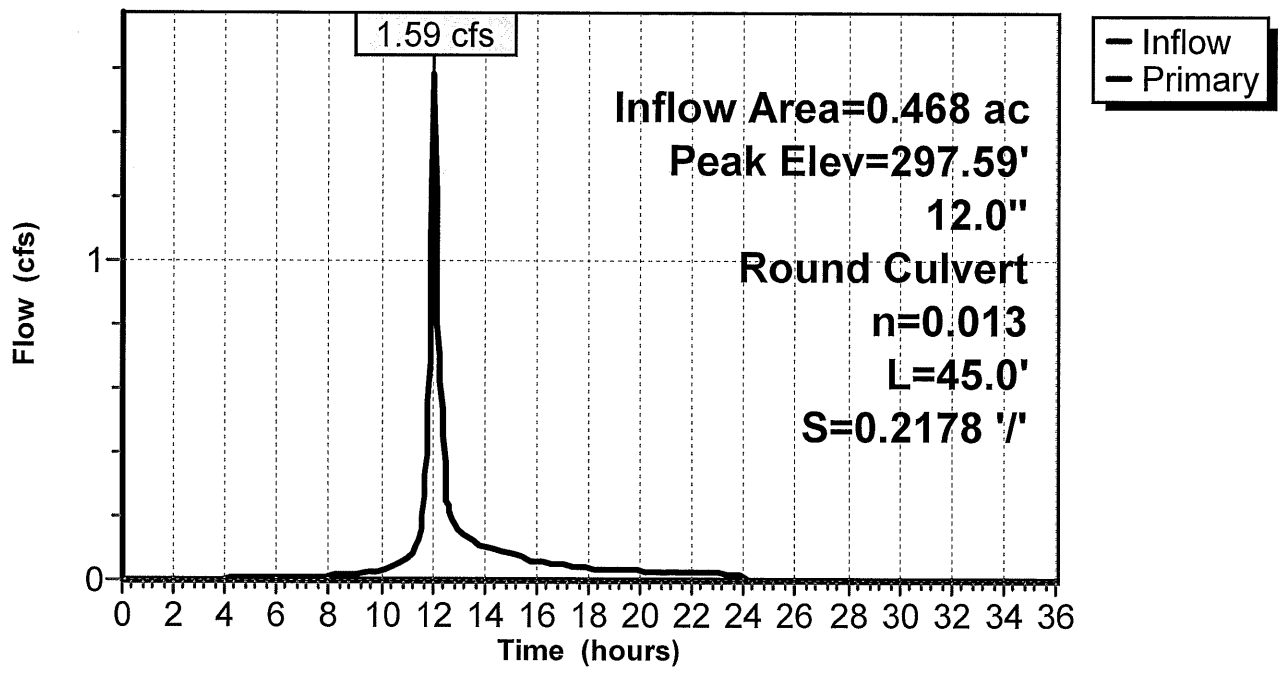
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 297.59' @ 12.03 hrs
Flood Elev= 304.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	296.80'	**12.0" Round Culvert** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 296.80' / 287.00' S= 0.2178 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.55 cfs @ 12.03 hrs HW=297.58' (Free Discharge)
↑**1=Culvert** (Inlet Controls 1.55 cfs @ 2.37 fps)

Pond 5P: DI 1

Hydrograph



Summary for Pond 6P: INFILTRATION

Inflow Area = 0.468 ac, 32.91% Impervious, Inflow Depth = 3.13" for 25yr event
Inflow = 1.59 cfs @ 12.03 hrs, Volume= 0.122 af
Outflow = 1.05 cfs @ 12.00 hrs, Volume= 0.122 af, Atten= 34%, Lag= 0.0 min
Discarded = 1.05 cfs @ 12.00 hrs, Volume= 0.122 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 284.27' @ 12.14 hrs Surf.Area= 0.012 ac Storage= 0.005 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.6 min (810.4 - 809.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	283.50'	0.010 af	**20.83'W x 24.50'L x 3.54'H Field A** 0.041 af Overall - 0.015 af Embedded = 0.026 af x 40.0% Voids
#2A	284.00'	0.015 af	**Cultec R-330XLHD** x 12 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 4 rows
		0.026 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.50'	**89.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.05 cfs @ 12.00 hrs HW=283.76' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 1.05 cfs)

Pond 6P: INFILTRATION - 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 4 rows

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

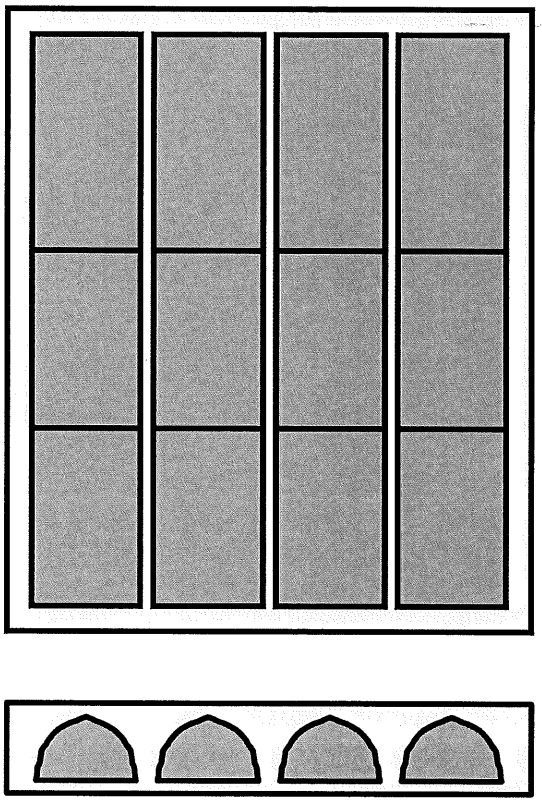
3 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 22.50' Row Length +12.0" End Stone x 2 = 24.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 670.6 cf Chamber Storage

1,807.7 cf Field - 670.6 cf Chambers = 1,137.1 cf Stone x 40.0% Voids = 454.9 cf Stone Storage

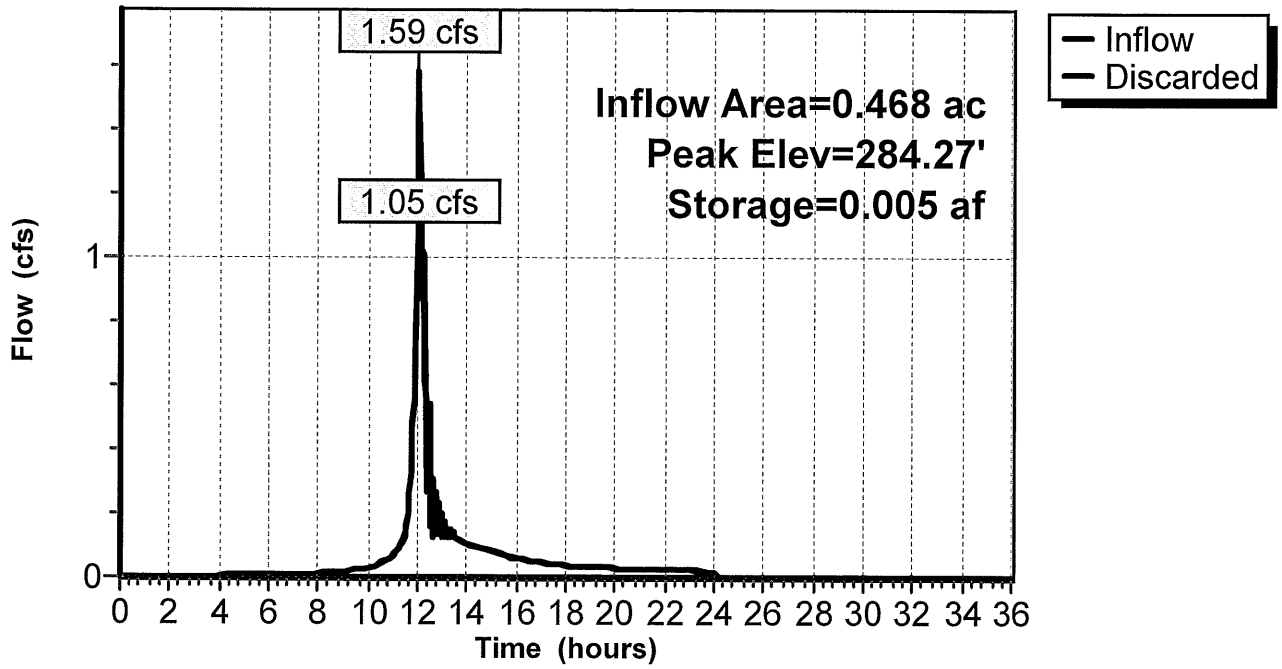
Chamber Storage + Stone Storage = 1,125.4 cf = 0.026 af
Overall Storage Efficiency = 62.3%
Overall System Size = 24.50' x 20.83' x 3.54'

12 Chambers
67.0 cy Field
42.1 cy Stone



Pond 6P: INFILTRATION

Hydrograph



APPENDIX B
SOIL TESTING RESULTS

KELLARD SESSIONS
CONSULTING, P.C.

DESIGN DATA SHEET - STORM WATER SYSTEM

OWNER_____ ADDRESS _____

PROPERTY LOCATION: 2 Hillcrest Dr. Briarcliff Manor SEC._____BLK._____ LOT._____

MUNICIPALITY: _____ NYCDEP: JOINT REVIEW _____ DELEGATED _____

WATERSHED _____

SOIL PERCOLATION TEST DATA REQUIRED TO BE SUBMITTED WITH APPLICATION

PRESOAK DATE: _____ RUN DATE: 3/22/17

HOLE#		CLOCK TIME			PERCOLATION			
					DEPTH TO WATER FROM GROUND SURFACES			
HOLE NUMBER	RUN NO.	START	STOP	ELAPSE TIME MIN.	START INCHES	STOP INCHES	WATER LEVEL DROP IN INCHES	SOIL RATE MIN./IN DROP
1	1	1:18	1:27	9	15.5	19.5	4	2.25
	2	1:28	1:45	17	17	20.5	3.5	4.86
	3	1:47	2:05	18	19	22	3	6
	4							
	5							
2	1	1:20	1:34	14	21	24	3	4.67
	2	1:35	1:56	21	22	25	3	7
	3	1:57	2:17	20	23	26	3	6.67
	4							
	5							
3	1	2:12	2:50	38	17	20	3	12.67
	2	2:51	3:21	30	17	19	2	15
	3							
	4							
	5							

PERC TEST DONE BY: _____

NOTES:

1. TESTS TO BE REPEATED AT SAME DEPTH UNTIL APPROXIMATELY EQUAL SOIL RATES ARE OBTAINED AT EACH PERCOLATION TEST HOLE. ALL DATA TO BE SUBMITTED FOR REVIEW.

2. DEPTH MEASUREMENTS TO BE MADE FROM TOP OF HOLE. DO NOT REPORT INCREMENTS OF LESS THAN ONE INCH.

KELLARD SESSIONS
CONSULTING, P.C.

DESIGN DATA SHEET - STORM WATER SYSTEM

OWNER_____ ADDRESS _____

PROPERTY LOCATION: 2 Hillcrest Dr. Briarcliff Manor SEC._____BLK._____ LOT._____

MUNICIPALITY: _____ NYCDEP: JOINT REVIEW _____ DELEGATED _____

WATERSHED _____

SOIL PERCOLATION TEST DATA REQUIRED TO BE SUBMITTED WITH APPLICATION

PRESOAK DATE: _____ RUN DATE: 3/22/17

HOLE#		CLOCK TIME			PERCOLATION			
					DEPTH TO WATER FROM GROUND SURFACES			
HOLE NUMBER	RUN NO.	START	STOP	ELAPSE TIME MIN.	START INCHES	STOP INCHES	WATER LEVEL DROP IN INCHES	SOIL RATE MIN./IN DROP
4	1	2:30	2:33	3	20	23	3	1
	2	2:34	2:39	5	18	21	3	1.67
	3	2:41	2:46	5	18	21.5	3.5	1.43
	4	2:47	2:53	6	18	21	3	2
	5							
	1							
	2							
	3							
	4							
	5							
	1							
	2							
	3							
	4							
	5							

PERC TEST DONE BY: _____

NOTES:

1. TESTS TO BE REPEATED AT SAME DEPTH UNTIL APPROXIMATELY EQUAL SOIL RATES ARE OBTAINED AT EACH PERCOLATION TEST HOLE. ALL DATA TO BE SUBMITTED FOR REVIEW.

2. DEPTH MEASUREMENTS TO BE MADE FROM TOP OF HOLE. DO NOT REPORT INCREMENTS OF LESS THAN ONE INCH.

TEST PIT DATA REQUIRED TO BE SUBMITTED WITH APPLICATION

DESCRIPTION OF SOILS ENCOUNTERED IN TEST HOLES

DEPTH	HOLE NO. 1	HOLE NO. 2	HOLE NO. 3	HOLE NO. 4
G.L.	Top Soil	Top Soil	Top Soil	Top Soil
6"	8	8	6	6
12"	silty loam	silty sands	silty sands	silty sands
18"		18		
24"	24		24	24
30"	silty clay loam			tight compact gray / tan silty loam
36"		silty w/ cobbles	gray / tan silty loam tight compact	
42"				
48"	50 ledge			
54"				
60"				60 ledge
66"			66 ledge	
72"				
78"		78 ledge		
84"				
90"				
96"				

WAS GROUNDWATER ENCOUNTERED? YES / NO

INDICATE LEVEL AT WHICH GROUND WATER IS ENCOUNTERED _____ FT. / IN.

INDICATED LEVEL FOR WHICH WATER LEVEL RISES AFTER BEING ENCOUNTERED _____ FT. / IN.

DEEP TEST MADE BY: _____ DATE OF DEEP TESTS 3/22/17

SOIL RATE USED _____ MIN. / 1" DROP: S.D. USABLE AREA PROVIDED

INFILTRATION SYSTEM PROV. BY _____ UNITS OTHER _____

DESIGN PROFESSIONAL NAME _____ SIGNATURE _____

ADDRESS _____

_____ SEAL

TEST PIT DATA REQUIRED TO BE SUBMITTED WITH APPLICATION

DESCRIPTION OF SOILS ENCOUNTERED IN TEST HOLES

DEPTH	HOLE NO. 5	HOLE NO. 6	HOLE NO. 7	HOLE NO. 8
G.L.	↓ Top Soil	↓ Top Soil	↓ Top Soil	
6"	6	6	6	
12"	sandy loam	sandy loam	tight compact	
18"	↓	↓	sandy silts	
24"	20	20		
30"		grey silty		
36"	grey silty	sands w/		36/40 ledge
42"	sands w/	cobbles and	↓	
48"	cobbles and	boulders	48	
54"	boulders	56 water seep	med fine	
60"			sands	
66"	↓		63	
72"	72 ledge		ledge slopes	
78"		↓	↓	
84"		84	84	
90"				
96"				

WAS GROUNDWATER ENCOUNTERED? YES / NO

INDICATE LEVEL AT WHICH GROUND WATER IS ENCOUNTERED _____ FT. / IN.

INDICATED LEVEL FOR WHICH WATER LEVEL RISES AFTER BEING ENCOUNTERED _____ FT. / IN.

DEEP TEST MADE BY: _____ DATE OF DEEP TESTS 3/22/17

SOIL RATE USED _____ MIN. / 1" DROP: S.D. USABLE AREA PROVIDED

INFILTRATION SYSTEM PROV. BY _____ UNITS OTHER _____

DESIGN PROFESSIONAL NAME _____ SIGNATURE _____

ADDRESS _____

_____ SEAL

TEST PIT DATA REQUIRED TO BE SUBMITTED WITH APPLICATION

DESCRIPTION OF SOILS ENCOUNTERED IN TEST HOLES

DEPTH	HOLE NO. 9	HOLE NO. 10	HOLE NO. 11	HOLE NO. 12
G.L.	Top Soil	Top Soil		
6"	6	6	Top Soil	Top Soil
12"	sandy loam	sandy loam		12
18"			18	sandy loam
24"		24		24
30"			sandy loam	
36"	36			
42"		fine sands	42	grey fine ~~sands~~
48"	mix sands			
54"	+ gravel			to med sands
60"	(bankrun)		grey / Brown	No ledge
66"		70 ledge	mix sands	No water
72"			No ledge	
78"			No water	
84"				
90"				
96"	96			
			102	108

WAS GROUNDWATER ENCOUNTERED? YES / NO

INDICATE LEVEL AT WHICH GROUND WATER IS ENCOUNTERED _____ FT. / IN.

INDICATED LEVEL FOR WHICH WATER LEVEL RISES AFTER BEING ENCOUNTERED _____ FT. / IN.

DEEP TEST MADE BY: _____ DATE OF DEEP TESTS 3/22/17

SOIL RATE USED _____ MIN. / 1" DROP: S.D. USABLE AREA PROVIDED

INFILTRATION SYSTEM PROV. BY _____ UNITS OTHER _____

DESIGN PROFESSIONAL NAME _____ SIGNATURE _____

ADDRESS _____

_____ SEAL

TEST PIT DATA REQUIRED TO BE SUBMITTED WITH APPLICATION

DESCRIPTION OF SOILS ENCOUNTERED IN TEST HOLES

DEPTH	HOLE NO. 13	HOLE NO. 14	HOLE NO. 15	HOLE NO. 16
G.L.		Top Soil	Top Soil	Top Soil
6"			6	6
12"			sandy loam	sandy loam
18"				
24"		28	24	20
30"	30 water seep	silty loam clay		
36"				
42"		40 water seep		fine sands
48"			med fine	w/ silts
54"			sands	w/ stones
60"			w/ stones	
66"				
72"				
78"				
84"				84
90"				
96"			96	

WAS GROUNDWATER ENCOUNTERED? YES / NO

INDICATE LEVEL AT WHICH GROUND WATER IS ENCOUNTERED _____ FT. / IN.

INDICATED LEVEL FOR WHICH WATER LEVEL RISES AFTER BEING ENCOUNTERED _____ FT. / IN.

DEEP TEST MADE BY: _____ DATE OF DEEP TESTS 3/22/17

SOIL RATE USED _____ MIN. / 1" DROP: S.D. USABLE AREA PROVIDED

INFILTRATION SYSTEM PROV. BY _____ UNITS OTHER _____

DESIGN PROFESSIONAL NAME _____ SIGNATURE _____

ADDRESS _____

_____ SEAL

TEST PIT DATA REQUIRED TO BE SUBMITTED WITH APPLICATION

DESCRIPTION OF SOILS ENCOUNTERED IN TEST HOLES

DEPTH	HOLE NO. 17	HOLE NO. _____	HOLE NO. _____	HOLE NO. _____
G.L.	Top Soil			
6"	6			
12"	sandy loam			
18"				
24"	24			
30"				
36"	med fine			
42"	sands w/ stones			
48"	+ boulders			
54"	+ broken rocks			
60"				
66"				
72"				
78"				
84"				
90"	92 ledge			
96"				

WAS GROUNDWATER ENCOUNTERED? YES / NO

INDICATE LEVEL AT WHICH GROUND WATER IS ENCOUNTERED _____ FT. / IN.

INDICATED LEVEL FOR WHICH WATER LEVEL RISES AFTER BEING ENCOUNTERED _____ FT. / IN.

DEEP TEST MADE BY: _____ DATE OF DEEP TESTS 3/22/17

SOIL RATE USED _____ MIN. / 1" DROP: S.D. USABLE AREA PROVIDED

INFILTRATION SYSTEM PROV. BY _____ UNITS OTHER _____

DESIGN PROFESSIONAL NAME _____ SIGNATURE _____

ADDRESS _____

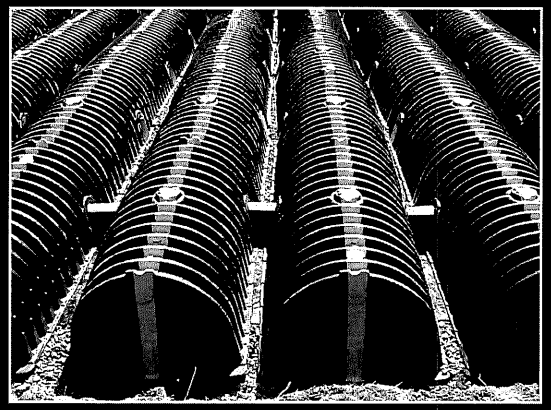
_____ SEAL

APPENDIX C
CULTEC INFILTRATION CHAMBER LITERATURE

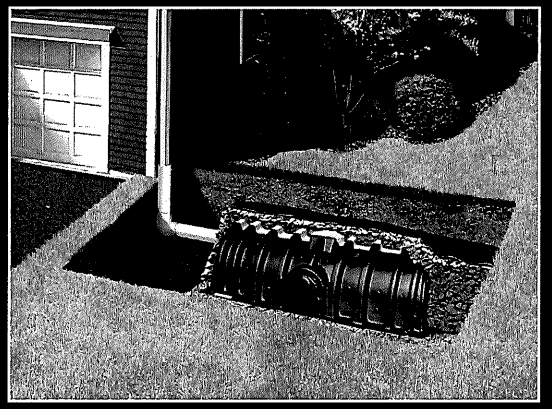
WE HAVE SOLUTIONS

Commercial Drainage

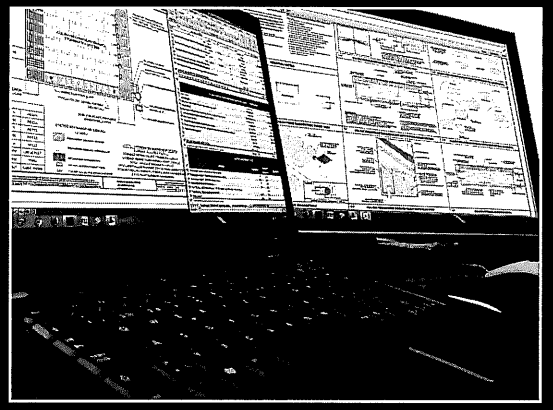
Residential Drainage



Internal Manifold



Drywell Applications

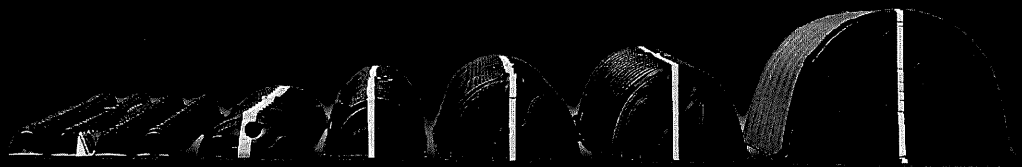


Free Design Assistance

Contactor® & Recharger®

Plastic Chambers for Stormwater Management

Since 1986



The Founder of Plastic Chamber Technology

HydroCAD®
Stormwater Modeling
Supported Product

CULTEC®

Contactor® & Recharger®

Plastic Chambers for Stormwater Management *Since 1986*

The first stormwater chambers manufactured with installations dating back over 30 years.

- Chamber systems are the least expensive and most efficient underground storage option.
- Most extensive product line in the industry.
- Internal manifold saves $$$.
- Earn up to 22 LEED Credits.
- Maximized storage capabiltiy in minimized area.
- Corrugated arch design for structural integrity.
- Less downtime during handling and placement.
- Minimized shipping costs and stockpile area requirements.
- Sizes to accommodate extremely low-profile depth constraints and high-volume demands.

From Design to Installation, our client services are unmatched.

- Exceptional custom design services performed by stormwater chamber specialists.
- Most experienced project managers in the industry.
- In stock and ready to ship worldwide.
- Hands-on field services.
- Included in popular hydrology software.
- Free HydroCAD® CULTEC Edition available.
- Complimentary project-specific calculations and drawings.
- Single point of contact ensures your project goes smoothly from Start to Finish.

From single residential dry well applications to huge commercial developments, we've got you covered.

The Founder of Plastic Chamber Technology

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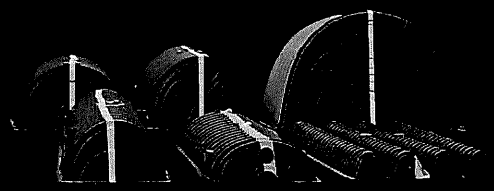
CULG087 08-16

Contactor® & Recharger®

Plastic Chambers for Stormwater Management *Since 1986*

		Contactor Field Drain C-4	Contactor EZ-24	Contactor 100	Contactor 100HD	Recharger 150XLHD	Recharger 280HD	Recharger 330XLHD	Recharger 902HD
Length	feet	8.5	8.5	8	8	11	8	8.5	4.10
	meters	2.59	2.59	2.44	2.44	3.35	2.44	2.59	1.25
Installed Length	feet	8	8	7.4	7.5	10.25	7	7	3.67
	meters	2.44	2.44	2.26	2.29	3.12	2.13	2.13	1.12
Length Adjustment	feet	0.50	0.50	0.60	0.50	0.75	1.00	1.50	0.44
	meters	0.15	0.15	0.18	0.15	0.23	0.30	0.46	0.13
Width	inches	48	16	36	36	33	47	52	78
	mm	1219	406	914	914	838	1194	1321	1981
Height	inches	8.5	12	12.5	12.5	18.5	26.5	30.5	48
	mm	216	305	318	318	470	673	775	1219
Bare Chamber Storage	ft^3/ft	1.692	0.819	1.961	1.866	2.65	6.079	7.459	17.660
	gal/ft	12.66	6.13	14.67	13.96	19.82	45.48	55.80	132.11
	m^3/m	0.16	0.08	0.18	0.17	0.25	0.56	0.69	1.64
	l/m	157.18	76.08	182.17	173.35	246.18	564.73	692.93	1640.59
Bare Chamber Storage per Unit for Intermediate Unit	ft^3	13.54	6.55	14.51	14.00	27.16	42.55	52.21	64.75
	gallons	101	49	109	105	203	318	391	484
	m^3	0.38	0.19	0.41	0.40	0.77	1.21	1.48	1.83
	liters	383.28	185.52	410.90	396.28	769.12	1204.91	1478.44	1833.53
Bare Chamber Storage per Unit for Stand Alone Unit	ft^3	14.38	6.96	15.69	14.93	29.15	48.63	63.40	70.27
	gallons	108	52	117	112	218	364	474	526
	m^3	0.41	0.20	0.44	0.42	0.83	1.38	1.80	1.99
	liters	407.23	197.12	444.21	422.70	825.40	1377.04	1795.25	1989.77
Min. Installed Storage per Unit for Intermediate Unit	ft^3	29.99	14.06	28.85	28.81	50.17	64.46	79.26	99.99
	gallons	224	105	216	216	375	482	593	748
	m^3	0.85	0.40	0.82	0.82	1.42	1.83	2.24	2.83
	liters	849.14	398.25	816.94	815.88	1420.46	1825.21	2244.25	2831.38
Min. Installed Storage per Unit for Stand Alone Unit	ft^3	31.86	14.94	31.19	30.73	53.84	73.67	96.24	120.54
	gallons	238	112	233	230	403	551	720	902
	m^3	0.90	0.42	0.88	0.87	1.52	2.09	2.73	3.41
	liters	902.21	423.14	883.18	870.27	1524.39	2085.96	2725.16	3413.03

Price per Unit
Date of Quote:_____
Prices are good for _____ days



The Recharger 902HD only comes in only one model type and requires a separate end plate. The Intermediate model for the Recharger 902HD in this case means a model which has an installed length of 3.67' (1.12 m) located in the middle of a row. A stand alone model for the Recharger 902HD is a single chamber with two end plates. All other models as stand alone units shall be called Model R.

The Founder of Plastic Chamber Technology

CULTEC®

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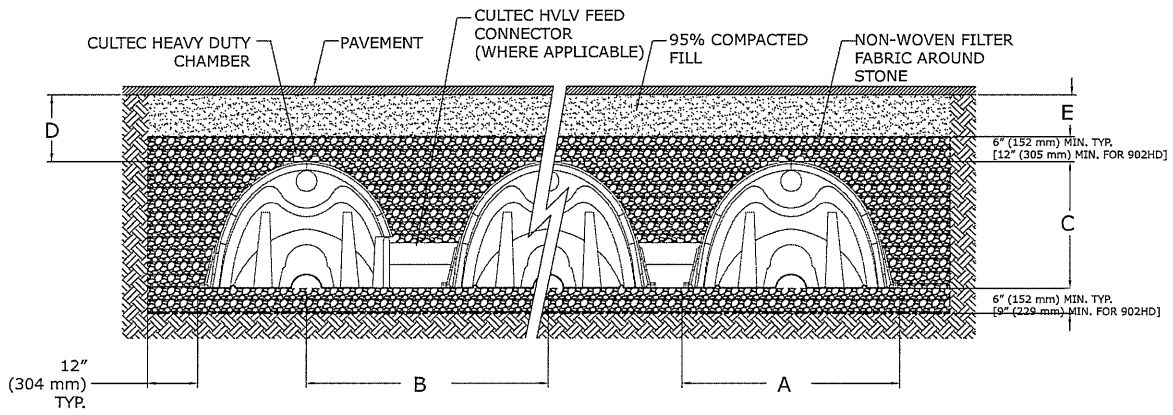
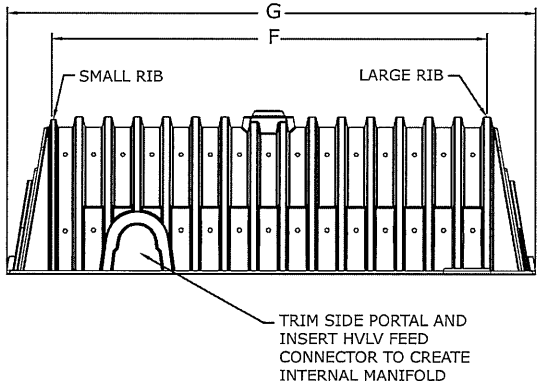
Contactor® & Recharger®

Plastic Chambers for Stormwater Management *Since 1986*





Model	A Chamber Width	B Typical Center-to-Center Spacing	C Chamber Height	D Min. Depth (Paved)	D Max. Depth	E Min. Depth (Paved)	F Installed Chamber Length	G Overall Chamber Length	Bare Chamber Volume	Min. Installed Storage		Min. Stone Required per Chamber
CULTEC Contactor 100HD	36″	40″	12.5″	14″	12′	8″	7.5′	8′	1.87 ft³/ft	3.84 ft³/ft	28.81 ft³/unit	1.37 yd³
	914 mm	1016 mm	318 mm	356 mm	3.66 m	203 mm	2.29 m	2.44 m	0.17 m³/m	0.36 m³/m	0.82 m³/unit	1.05 m³
CULTEC Recharger 150XLHD	33″	39″	18.5″	14″	12′	8″	10.25′	11′	2.65 ft³/ft	4.89 ft³/ft	50.17 ft³/unit	2.13 yd³
	838 mm	991 mm	470 mm	356 mm	3.66 m	203 mm	3.12 m	3.35 m	0.25 m³/m	0.45 m³/m	1.42 m³/unit	1.63 m³
CULTEC Recharger 280HD	47″	52″	26.5″	14″	12′	8″	7′	8′	6.08 ft³/ft	9.21 ft³/ft	64.46 ft³/unit	2.03 yd³
	1194 mm	1321 mm	673 mm	356 mm	3.66 m	203 mm	2.13 m	2.44 m	0.56 m³/m	0.86 m³/m	1.83 m³/unit	1.55 m³
CULTEC Recharger 330XLHD	52″	58″	30.5″	16″	12′	10″	7′	8.5′	7.46 ft³/ft	11.32 ft³/ft	79.26 ft³/unit	2.50 yd³
	1321 mm	1473 mm	775 mm	406 mm	3.66 m	254 mm	2.13 m	2.59 m	0.69 m³/m	1.05 m³/m	2.24 m³/unit	1.91 m³
CULTEC Recharger 902HD	78″	87″	48″	24″	8.3′	12″	3.67′	4.10′	17.66 ft³/ft	27.27 ft³/ft	100 ft³/unit	3.26 yd³
	1981 mm	2210 mm	1219 mm	610 mm	2.53 m	305 mm	1.12 m	1.25 m	1.64 m³/m	2.53 m³/m	2.83 m³/unit	2.49 m³

Calculations are based on installed chamber length.
Most calculations assume a 6″ (152 mm) stone base, 6″ (152 mm) stone above and typical center-to-center spacing.
Recharger 902HD assumes 9″ (229 mm) stone base, 12″ (305 mm) stone above and typical center-to-center spacing.
Other models available. Contact CULTEC for more information.

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APPENDIX D
WATER QUALITY VOLUME SIZING CALCULATIONS

NYSDEC Water Quality Volume (WQv) Calculation

PROJECT: Butler Subdivision
BMP Location: Infiltration Area #1

Enter Total Watershed Area:	*0.47*	***Acres***
Enter Impervious Area:	*0.155*	***Acres***
% Impervious is:	*32.91*	
Enter Value of P:	*1.3*	***Inches***

Rv = 0.05 + (0.009 x I)

RV = (or min. 0.2)	*0.3462*	

WQv = P x Rv x A / 12

WQv =	*0.0176*	***Acre-Feet***
	768	***Cubic Feet***