Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.31 cfs @ 12.01 hrs, Volume= 914 cf, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	2,252	98	Parking Lot & part of building
	2,252		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0325	1.68		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 0.81 cfs @ 12.02 hrs, Volume= 2,370 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	457	79	50-75% Grass cover, Fair, HSG C
*	5,522	98	Parking Lot
	5,979	97	Weighted Average
	457		7.64% Pervious Area
	5,522		92.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	92	0.0218	1.45		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.37 cfs @ 12.01 hrs, Volume= 1,022 cf, Depth= 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	730	79	50-75% Grass cover, Fair, HSG C
*	2,119	98	Parking Lot
	2,849	93	Weighted Average
	730		25.62% Pervious Area
	2,119		74.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	81	0.0277	1.56		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1D: Watershed 1D

Runoff = 0.11 cfs @ 12.01 hrs, Volume= 319 cf, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	786	98	
	786		100.00% Impervious Area

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

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 1.46 cfs @ 12.01 hrs, Volume= 4,254 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

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

Summary for Subcatchment 3: Watershed 3

Runoff = 2.90 cfs @ 12.02 hrs, Volume= 8,545 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	902	79	50-75% Grass cover, Fair, HSG C
*	20,655	98	Parking Lot & Buildings
	21,557	97	Weighted Average
	902		4.18% Pervious Area
	20,655		95.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	99	0.0141	1.24		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"
0.1	22	0.0318	3.62		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
1.4	121	Total			

Summary for Reach DP-1: Ex. Catch Basin

Inflow Area = 22,599 sf, 91.75% Impervious, Inflow Depth = 4.72" for 10-Year event
Inflow = 3.02 cfs @ 12.02 hrs, Volume= 8,881 cf
Outflow = 3.02 cfs @ 12.02 hrs, Volume= 8,881 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Ex. Catch Basin

Inflow Area = 21,557 sf, 95.82% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.89 cfs @ 12.02 hrs, Volume= 8,545 cf
Outflow = 2.89 cfs @ 12.02 hrs, Volume= 8,545 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

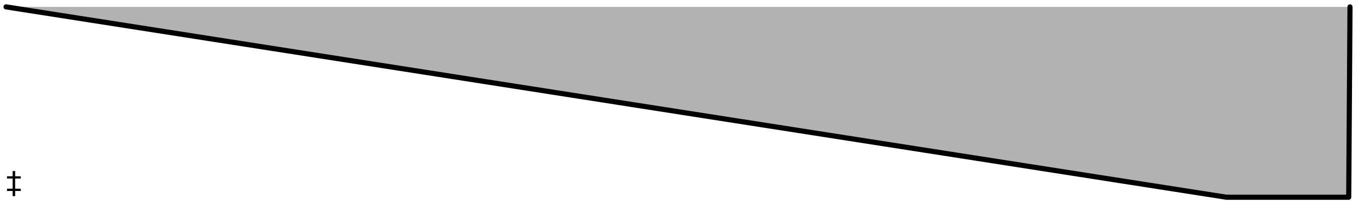
Summary for Reach R1: R1

Inflow Area = 21,557 sf, 95.82% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.90 cfs @ 12.02 hrs, Volume= 8,545 cf
Outflow = 2.89 cfs @ 12.02 hrs, Volume= 8,545 cf, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.26 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.20 fps, Avg. Travel Time= 0.6 min

Peak Storage= 36 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 0.10' Flow Area= 0.6 sf, Capacity= 1.77 cfs

1.00' x 0.10' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 100.0 0.1 '/' Top Width= 11.01'
Length= 41.0' Slope= 0.0324 '/'
Inlet Invert= 22.50', Outlet Invert= 21.17'



Summary for Pond 1P: Ex. Drain Inlet

Inflow Area = 5,979 sf, 92.36% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 0.81 cfs @ 12.02 hrs, Volume= 2,370 cf
Outflow = 0.81 cfs @ 12.02 hrs, Volume= 2,370 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.81 cfs @ 12.02 hrs, Volume= 2,370 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 23.65' @ 12.02 hrs
Flood Elev= 24.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.09'	**12.0" Round 12" HDPE** L= 65.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.09' / 22.26' S= 0.0127 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.77 cfs @ 12.02 hrs HW=23.64' TW=23.21' (Dynamic Tailwater)
↑—**1=12" HDPE** (Outlet Controls 0.77 cfs @ 2.52 fps)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area = 16,712 sf, 93.21% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.24 cfs @ 12.02 hrs, Volume= 6,625 cf
Outflow = 2.24 cfs @ 12.02 hrs, Volume= 6,625 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.24 cfs @ 12.02 hrs, Volume= 6,625 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 23.22' @ 12.02 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.24 cfs @ 12.02 hrs HW=23.22' TW=22.54' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 2.24 cfs @ 2.85 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area = 21,813 sf, 91.45% Impervious, Inflow Depth = 4.71" for 10-Year event
Inflow = 2.91 cfs @ 12.02 hrs, Volume= 8,562 cf
Outflow = 2.91 cfs @ 12.02 hrs, Volume= 8,562 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.91 cfs @ 12.02 hrs, Volume= 8,562 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 22.55' @ 12.02 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.85 cfs @ 12.02 hrs HW=22.53' TW=21.62' (Dynamic Tailwater)
└─**1=12" PVC** (Inlet Controls 2.85 cfs @ 3.63 fps)

Summary for Pond 4P: Ex. Manhole

Inflow Area = 22,599 sf, 91.75% Impervious, Inflow Depth = 4.72" for 10-Year event
Inflow = 3.02 cfs @ 12.02 hrs, Volume= 8,881 cf
Outflow = 3.02 cfs @ 12.02 hrs, Volume= 8,881 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.02 cfs @ 12.02 hrs, Volume= 8,881 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 21.19' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.02'	**15.0" Round Ex. 15" HDPE** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.02' / 19.97' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.01 cfs @ 12.02 hrs HW=21.19' TW=0.00' (Dynamic Tailwater)
└─**1=Ex. 15" HDPE** (Barrel Controls 3.01 cfs @ 3.28 fps)

Summary for Pond 6P: Ex. Drain Inlet

Inflow Area = 2,252 sf,100.00% Impervious, Inflow Depth = 4.87" for 10-Year event
Inflow = 0.31 cfs @ 12.01 hrs, Volume= 914 cf
Outflow = 0.31 cfs @ 12.01 hrs, Volume= 914 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.31 cfs @ 12.01 hrs, Volume= 914 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 22.55' @ 12.03 hrs
Flood Elev= 23.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.25'	**12.0" Round 12" PVC** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.25' / 20.79' S= 0.0102 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.01 hrs HW=22.34' TW=22.47' (Dynamic Tailwater)
└─**1=12" PVC** (Controls 0.00 cfs)

Summary for Pond AS-1: Ex. Hydrodynamic Separator

Inflow Area =	21,813 sf,	91.45% Impervious,	Inflow Depth = 4.71"	for 10-Year event	
Inflow =	2.91 cfs @	12.02 hrs,	Volume=	8,562 cf	
Outflow =	2.91 cfs @	12.02 hrs,	Volume=	8,562 cf,	Atten= 0%, Lag= 0.0 min
Primary =	2.91 cfs @	12.02 hrs,	Volume=	8,562 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 21.63' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.45'	**15.0" Round Ex. 15" RCP** L= 54.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.45' / 20.12' S= 0.0061 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.85 cfs @ 12.02 hrs HW=21.62' TW=21.19' (Dynamic Tailwater)
└─**1=Ex. 15" RCP** (Outlet Controls 2.85 cfs @ 3.10 fps)

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area =	10,733 sf,	93.69% Impervious,	Inflow Depth = 4.76"	for 10-Year event	
Inflow =	1.46 cfs @	12.01 hrs,	Volume=	4,254 cf	
Outflow =	1.43 cfs @	12.02 hrs,	Volume=	4,255 cf,	Atten= 2%, Lag= 0.5 min
Primary =	1.43 cfs @	12.02 hrs,	Volume=	4,255 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 27.84' @ 12.02 hrs Surf.Area= 677 sf Storage= 908 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 150.0 min (900.7 - 750.7)

Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,016 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	677	0	0
28.00	677	1,016	1,016

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 21.33' S= 0.0339 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.43 cfs @ 12.02 hrs HW=27.84' TW=23.22' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.43 cfs of 5.85 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 1.40 cfs @ 0.98 fps)
  └─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.39 cfs @ 12.01 hrs, Volume= 1,158 cf, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	2,252	98	Parking Lot & part of building
	2,252		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	85	0.0325	1.68		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 1.02 cfs @ 12.02 hrs, Volume= 3,016 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	457	79	50-75% Grass cover, Fair, HSG C
*	5,522	98	Parking Lot
	5,979	97	Weighted Average
	457		7.64% Pervious Area
	5,522		92.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	92	0.0218	1.45		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.47 cfs @ 12.01 hrs, Volume= 1,327 cf, Depth= 5.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	730	79	50-75% Grass cover, Fair, HSG C
*	2,119	98	Parking Lot
	2,849	93	Weighted Average
	730		25.62% Pervious Area
	2,119		74.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	81	0.0277	1.56		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1D: Watershed 1D

Runoff = 0.14 cfs @ 12.01 hrs, Volume= 404 cf, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	786	98	
	786		100.00% Impervious Area

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

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 1.84 cfs @ 12.01 hrs, Volume= 5,414 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

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

Summary for Subcatchment 3: Watershed 3

Runoff = 3.65 cfs @ 12.02 hrs, Volume= 10,874 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	902	79	50-75% Grass cover, Fair, HSG C
*	20,655	98	Parking Lot & Buildings
	21,557	97	Weighted Average
	902		4.18% Pervious Area
	20,655		95.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	99	0.0141	1.24		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"
0.1	22	0.0318	3.62		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
1.4	121	Total			

Summary for Reach DP-1: Ex. Catch Basin

Inflow Area = 22,599 sf, 91.75% Impervious, Inflow Depth = 6.01" for 25-Year event
Inflow = 3.81 cfs @ 12.02 hrs, Volume= 11,319 cf
Outflow = 3.81 cfs @ 12.02 hrs, Volume= 11,319 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Ex. Catch Basin

Inflow Area = 21,557 sf, 95.82% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 3.64 cfs @ 12.02 hrs, Volume= 10,874 cf
Outflow = 3.64 cfs @ 12.02 hrs, Volume= 10,874 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs

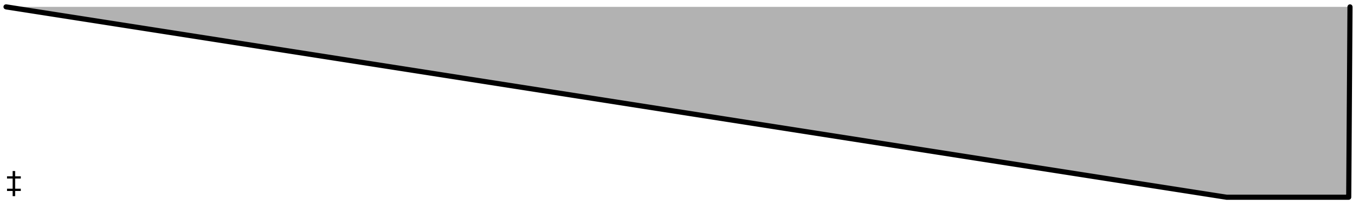
Summary for Reach R1: R1

Inflow Area = 21,557 sf, 95.82% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 3.65 cfs @ 12.02 hrs, Volume= 10,874 cf
Outflow = 3.64 cfs @ 12.02 hrs, Volume= 10,874 cf, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.38 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.28 fps, Avg. Travel Time= 0.5 min

Peak Storage= 44 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 0.10' Flow Area= 0.6 sf, Capacity= 1.77 cfs

1.00' x 0.10' deep channel, n= 0.013 Asphalt, smooth
Side Slope Z-value= 100.0 0.1 '/' Top Width= 11.01'
Length= 41.0' Slope= 0.0324 '/'
Inlet Invert= 22.50', Outlet Invert= 21.17'



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Summary for Pond 1P: Ex. Drain Inlet

Inflow Area = 5,979 sf, 92.36% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 1.02 cfs @ 12.02 hrs, Volume= 3,016 cf
Outflow = 1.02 cfs @ 12.02 hrs, Volume= 3,016 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.02 cfs @ 12.02 hrs, Volume= 3,016 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 24.38' @ 12.04 hrs
Flood Elev= 24.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.09'	**12.0" Round 12" HDPE** L= 65.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.09' / 22.26' S= 0.0127 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.02 hrs HW=23.93' TW=24.04' (Dynamic Tailwater)
└─**1=12" HDPE** (Controls 0.00 cfs)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area = 16,712 sf, 93.21% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 2.82 cfs @ 12.02 hrs, Volume= 8,430 cf
Outflow = 2.82 cfs @ 12.02 hrs, Volume= 8,430 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.82 cfs @ 12.02 hrs, Volume= 8,430 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 24.29' @ 12.03 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.53 cfs @ 12.02 hrs HW=24.16' TW=23.44' (Dynamic Tailwater)
└─**1=12" PVC** (Inlet Controls 2.53 cfs @ 3.22 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area = 21,813 sf, 91.45% Impervious, Inflow Depth = 6.00" for 25-Year event
Inflow = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf
Outflow = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 23.45' @ 12.02 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.56 cfs @ 12.02 hrs HW=23.40' TW=21.98' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 3.56 cfs @ 4.53 fps)

Summary for Pond 4P: Ex. Manhole

Inflow Area = 22,599 sf, 91.75% Impervious, Inflow Depth = 6.01" for 25-Year event
Inflow = 3.81 cfs @ 12.02 hrs, Volume= 11,319 cf
Outflow = 3.81 cfs @ 12.02 hrs, Volume= 11,319 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.81 cfs @ 12.02 hrs, Volume= 11,319 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 21.39' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.02'	**15.0" Round Ex. 15" HDPE** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.02' / 19.97' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.80 cfs @ 12.02 hrs HW=21.39' TW=0.00' (Dynamic Tailwater)
↑—**1=Ex. 15" HDPE** (Barrel Controls 3.80 cfs @ 3.52 fps)

Summary for Pond 6P: Ex. Drain Inlet

Inflow Area = 2,252 sf,100.00% Impervious, Inflow Depth = 6.17" for 25-Year event
Inflow = 0.39 cfs @ 12.01 hrs, Volume= 1,158 cf
Outflow = 0.39 cfs @ 12.01 hrs, Volume= 1,158 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.01 hrs, Volume= 1,158 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 23.47' @ 12.03 hrs
Flood Elev= 23.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.25'	**12.0" Round 12" PVC** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.25' / 20.79' S= 0.0102 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.01 hrs HW=23.04' TW=23.29' (Dynamic Tailwater)
└─**1=12" PVC** (Controls 0.00 cfs)

Summary for Pond AS-1: Ex. Hydrodynamic Separator

Inflow Area = 21,813 sf, 91.45% Impervious, Inflow Depth = 6.00" for 25-Year event
Inflow = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf
Outflow = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.68 cfs @ 12.02 hrs, Volume= 10,915 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 22.00' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.45'	**15.0" Round Ex. 15" RCP** L= 54.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.45' / 20.12' S= 0.0061 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.60 cfs @ 12.02 hrs HW=21.98' TW=21.39' (Dynamic Tailwater)
└─**1=Ex. 15" RCP** (Inlet Controls 3.60 cfs @ 2.93 fps)

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area = 10,733 sf, 93.69% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 1.84 cfs @ 12.01 hrs, Volume= 5,414 cf
Outflow = 1.81 cfs @ 12.02 hrs, Volume= 5,414 cf, Atten= 1%, Lag= 0.5 min
Primary = 1.81 cfs @ 12.02 hrs, Volume= 5,414 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 27.86' @ 12.02 hrs Surf.Area= 677 sf Storage= 918 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 133.3 min (879.6 - 746.3)

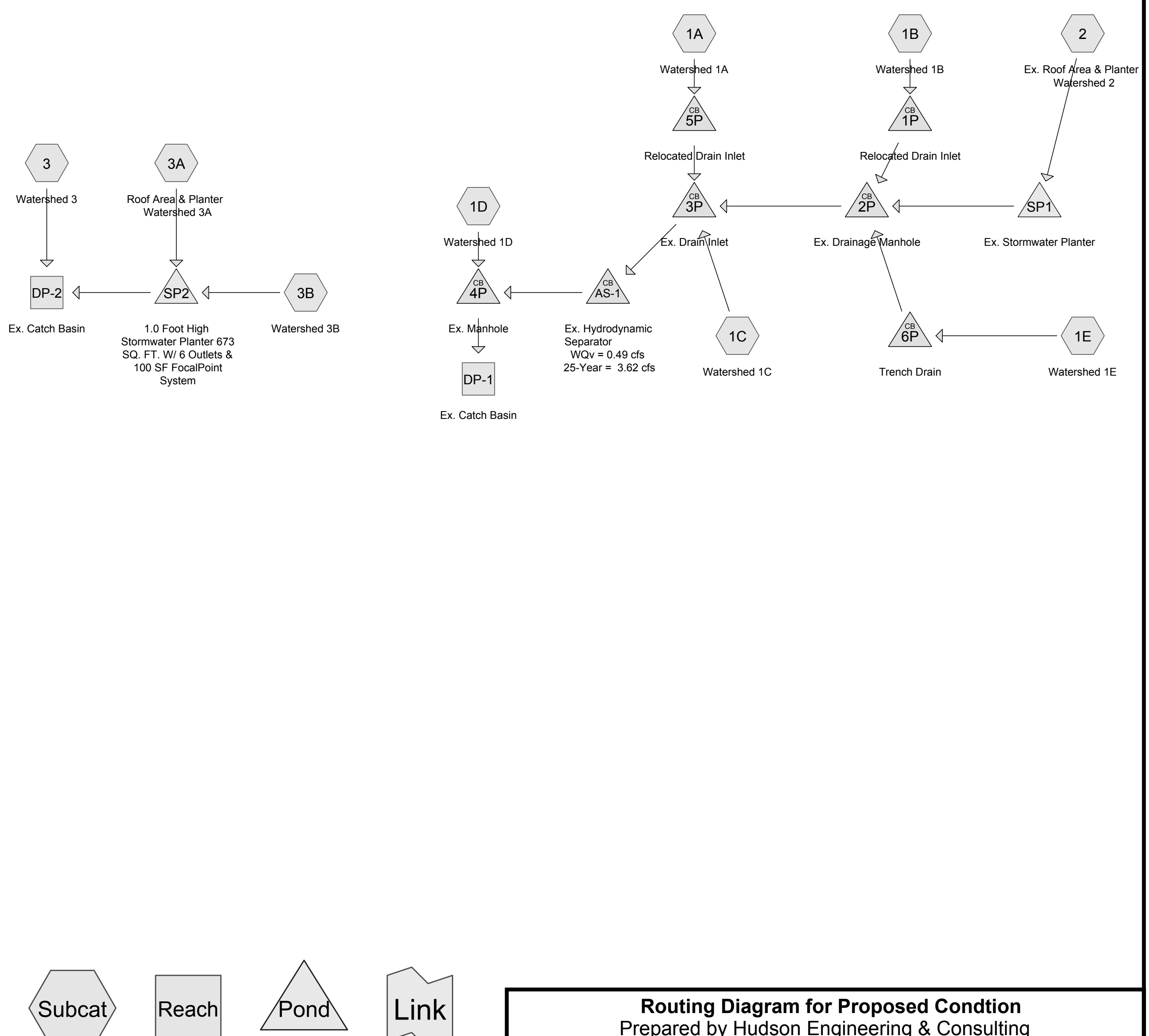
Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,016 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	677	0	0
28.00	677	1,016	1,016

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 21.33' S= 0.0339 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.80 cfs @ 12.02 hrs HW=27.86' TW=24.19' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.80 cfs of 5.72 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 1.77 cfs @ 1.06 fps)
  └─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

7.) Post-Developed Analysis of the 1-, 10-, and 25-year Extreme Storm Events



Routing Diagram for Proposed Condtion

Prepared by Hudson Engineering & Consulting

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Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.22 cfs @ 12.02 hrs, Volume= 634 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
*	2,893	98	Parking Lot
	2,893		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	96	0.0166	1.31		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 0.23 cfs @ 12.01 hrs, Volume= 646 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	71	74	>75% Grass cover, Good, HSG C
*	3,008	98	Parking Lot
	3,079	97	Weighted Average
	71		2.31% Pervious Area
	3,008		97.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	64	0.0225	1.37		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.24 cfs @ 12.01 hrs, Volume= 661 cf, Depth= 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	244	74	>75% Grass cover, Good, HSG C
*	3,039	98	Parking Lot
	3,283	96	Weighted Average
	244		7.43% Pervious Area
	3,039		92.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	57	0.0305	1.51		**Sheet Flow, A->B** Smooth surfaces n= 0.011 P2= 3.45"
0.3	53	0.0162	2.58		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
0.9	110	Total			

Summary for Subcatchment 1D: Watershed 1D

Runoff = 0.06 cfs @ 12.01 hrs, Volume= 172 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
*	786	98	building
	786		100.00% Impervious Area

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

Summary for Subcatchment 1E: Watershed 1E

Runoff = 0.11 cfs @ 12.01 hrs, Volume= 313 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	26	74	>75% Grass cover, Good, HSG C
*	1,402	98	Parking Lot
	1,428	98	Weighted Average
	26		1.82% Pervious Area
	1,402		98.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	42	0.0129	1.01		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 0.80 cfs @ 12.01 hrs, Volume= 2,254 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

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

Summary for Subcatchment 3: Watershed 3

Runoff = 0.07 cfs @ 12.02 hrs, Volume= 188 cf, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	1,655	74	>75% Grass cover, Good, HSG C
*	416	98	Sidewalks
	2,071	79	Weighted Average
	1,655		79.91% Pervious Area
	416		20.09% Impervious Area

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

Summary for Subcatchment 3A: Roof Area & Planter Watershed 3A

Runoff = 1.10 cfs @ 12.01 hrs, Volume= 3,098 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
*	14,082	98	Roof
*	673	79	Planter
	14,755	97	Weighted Average
	673		4.56% Pervious Area
	14,082		95.44% Impervious Area

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

Summary for Subcatchment 3B: Watershed 3B

Runoff = 0.38 cfs @ 12.01 hrs, Volume= 1,077 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.86"

	Area (sf)	CN	Description
	135	74	>75% Grass cover, Good, HSG C
*	4,993	98	Parking Lot & portion of ex. building
	5,128	97	Weighted Average
	135		2.63% Pervious Area
	4,993		97.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	74	0.0180	1.29		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Reach DP-1: Ex. Catch Basin

Inflow Area = 22,202 sf, 95.41% Impervious, Inflow Depth = 2.53" for 1-Year event
Inflow = 0.89 cfs @ 12.01 hrs, Volume= 4,680 cf
Outflow = 0.89 cfs @ 12.01 hrs, Volume= 4,680 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP-2: Ex. Catch Basin

Inflow Area = 21,954 sf, 88.78% Impervious, Inflow Depth = 2.39" for 1-Year event
Inflow = 1.48 cfs @ 12.03 hrs, Volume= 4,365 cf
Outflow = 1.48 cfs @ 12.03 hrs, Volume= 4,365 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1P: Relocated Drain Inlet

Inflow Area = 3,079 sf, 97.69% Impervious, Inflow Depth = 2.52" for 1-Year event
Inflow = 0.23 cfs @ 12.01 hrs, Volume= 646 cf
Outflow = 0.23 cfs @ 12.01 hrs, Volume= 646 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.23 cfs @ 12.01 hrs, Volume= 646 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.02' @ 12.01 hrs
Flood Elev= 25.05'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.75'	**12.0" Round 12" HDPE** L= 35.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.75' / 22.26' S= 0.0140 '/' Cc= 0.900

n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.23 cfs @ 12.01 hrs HW=23.01' TW=22.50' (Dynamic Tailwater)
↑—**1=12" HDPE** (Inlet Controls 0.23 cfs @ 1.38 fps)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area = 15,240 sf, 94.92% Impervious, Inflow Depth = 2.53" for 1-Year event
Inflow = 0.37 cfs @ 12.01 hrs, Volume= 3,213 cf
Outflow = 0.37 cfs @ 12.01 hrs, Volume= 3,213 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.37 cfs @ 12.01 hrs, Volume= 3,213 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.50' @ 12.01 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.37 cfs @ 12.01 hrs HW=22.50' TW=21.39' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 0.37 cfs @ 1.57 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area = 21,416 sf, 95.25% Impervious, Inflow Depth = 2.53" for 1-Year event
Inflow = 0.83 cfs @ 12.01 hrs, Volume= 4,508 cf
Outflow = 0.83 cfs @ 12.01 hrs, Volume= 4,508 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.83 cfs @ 12.01 hrs, Volume= 4,508 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.39' @ 12.01 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.82 cfs @ 12.01 hrs HW=21.39' TW=21.22' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 0.82 cfs @ 1.53 fps)

Summary for Pond 4P: Ex. Manhole

Inflow Area =	22,202 sf, 95.41% Impervious,	Inflow Depth = 2.53" for 1-Year event		
Inflow =	0.89 cfs @	12.01 hrs, Volume=	4,680 cf	
Outflow =	0.89 cfs @	12.01 hrs, Volume=	4,680 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.89 cfs @	12.01 hrs, Volume=	4,680 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 20.59' @ 12.01 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.02'	**15.0" Round Ex. 15" HDPE** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.02' / 19.97' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.88 cfs @ 12.01 hrs HW=20.59' TW=0.00' (Dynamic Tailwater)
↑—**1=Ex. 15" HDPE** (Barrel Controls 0.88 cfs @ 2.39 fps)

Summary for Pond 5P: Relocated Drain Inlet

Inflow Area =	2,893 sf,100.00% Impervious,	Inflow Depth = 2.63" for 1-Year event		
Inflow =	0.22 cfs @	12.02 hrs, Volume=	634 cf	
Outflow =	0.22 cfs @	12.02 hrs, Volume=	634 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.22 cfs @	12.02 hrs, Volume=	634 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.53' @ 12.02 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.20'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.20' / 20.79' S= 0.0121 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.22 cfs @ 12.02 hrs HW=21.52' TW=21.38' (Dynamic Tailwater)
↑—**1=12" HDPE** (Outlet Controls 0.22 cfs @ 1.47 fps)

Summary for Pond 6P: Trench Drain

Inflow Area =	1,428 sf, 98.18% Impervious,	Inflow Depth = 2.63" for 1-Year event		
Inflow =	0.11 cfs @	12.01 hrs, Volume=	313 cf	
Outflow =	0.11 cfs @	12.01 hrs, Volume=	313 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.11 cfs @	12.01 hrs, Volume=	313 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.53' @ 12.01 hrs
Flood Elev= 25.96'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.35'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.35' / 22.26' S= 0.0321 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.11 cfs @ 12.01 hrs HW=23.53' TW=22.50' (Dynamic Tailwater)
└─**1=12" HDPE** (Inlet Controls 0.11 cfs @ 1.14 fps)

Summary for Pond AS-1: Ex. Hydrodynamic Separator WQv = 0.49 cfs 25-Year = 3.62 cfs

Inflow Area = 21,416 sf, 95.25% Impervious, Inflow Depth = 2.53" for 1-Year event
Inflow = 0.83 cfs @ 12.01 hrs, Volume= 4,508 cf
Outflow = 0.83 cfs @ 12.01 hrs, Volume= 4,508 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.83 cfs @ 12.01 hrs, Volume= 4,508 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.23' @ 12.01 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**15.0" Round Ex. 15" RCP** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.12' S= 0.0119 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=0.82 cfs @ 12.01 hrs HW=21.22' TW=20.59' (Dynamic Tailwater)
└─**1=Ex. 15" RCP** (Inlet Controls 0.82 cfs @ 1.87 fps)

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area = 10,733 sf, 93.69% Impervious, Inflow Depth = 2.52" for 1-Year event
Inflow = 0.80 cfs @ 12.01 hrs, Volume= 2,254 cf
Outflow = 0.21 cfs @ 12.31 hrs, Volume= 2,254 cf, Atten= 74%, Lag= 17.7 min
Primary = 0.21 cfs @ 12.31 hrs, Volume= 2,254 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 27.77' @ 12.31 hrs Surf.Area= 669 sf Storage= 852 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 208.0 min (972.3 - 764.3)

Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,004 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	669	0	0
28.00	669	1,004	1,004

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 22.26' S= 0.0194 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.21 cfs @ 12.31 hrs HW=27.77' TW=22.46' (Dynamic Tailwater)
1=Culvert (Passes 0.21 cfs of 5.80 cfs potential flow)
2=Orifice/Grate (Weir Controls 0.18 cfs @ 0.50 fps)
3=Exfiltration (Exfiltration Controls 0.03 cfs)

mmary for Pond SP2: 1.0 Foot High Stormwater Planter 673 SQ. FT. W/ 6 Outlets & 100 SF FocalPoint Sy

Inflow Area = 19,883 sf, 95.94% Impervious, Inflow Depth = 2.52" for 1-Year event
Inflow = 1.48 cfs @ 12.01 hrs, Volume= 4,175 cf
Outflow = 1.41 cfs @ 12.03 hrs, Volume= 4,177 cf, Atten= 4%, Lag= 0.9 min
Primary = 1.41 cfs @ 12.03 hrs, Volume= 4,177 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.17' @ 12.03 hrs Surf.Area= 100 sf Storage= 445 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 6.3 min (770.6 - 764.3)

Volume	Invert	Avail.Storage	Storage Description
#1	19.33'	45 cf	**2.00'W x 50.00'L x 2.25'H FocalPoint** 225 cf Overall x 20.0% Voids
#2	21.58'	505 cf	**Stormwater Planter (Prismatic)** Listed below (Recalc) -Impervious
		550 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.58	673	0	0
22.08	673	337	337
22.33	673	168	505

Device	Routing	Invert	Outlet Devices
#1	Primary	19.00'	**12.0" Round Culvert** L= 19.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 18.77' S= 0.0121 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	19.33'	**100.000 in/hr Exfiltration over Surface area**
#3	Device 1	22.08'	**8.0" Horiz. Orifice/Grate X 6.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.41 cfs @ 12.03 hrs HW=22.17' TW=0.00' (Dynamic Tailwater)
1=Culvert (Passes 1.41 cfs of 4.88 cfs potential flow)
2=Exfiltration (Exfiltration Controls 0.23 cfs)
3=Orifice/Grate (Weir Controls 1.18 cfs @ 1.00 fps)

Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.39 cfs @ 12.02 hrs, Volume= 1,175 cf, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	2,893	98	Parking Lot
	2,893		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	96	0.0166	1.31		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 0.42 cfs @ 12.01 hrs, Volume= 1,220 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	71	74	>75% Grass cover, Good, HSG C
*	3,008	98	Parking Lot
	3,079	97	Weighted Average
	71		2.31% Pervious Area
	3,008		97.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	64	0.0225	1.37		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.44 cfs @ 12.01 hrs, Volume= 1,270 cf, Depth= 4.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	244	74	>75% Grass cover, Good, HSG C
*	3,039	98	Parking Lot
	3,283	96	Weighted Average
	244		7.43% Pervious Area
	3,039		92.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	57	0.0305	1.51		**Sheet Flow, A->B** Smooth surfaces n= 0.011 P2= 3.45"
0.3	53	0.0162	2.58		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
0.9	110	Total			

Summary for Subcatchment 1D: Watershed 1D

Runoff = 0.11 cfs @ 12.01 hrs, Volume= 319 cf, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	786	98	building
	786		100.00% Impervious Area

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

Summary for Subcatchment 1E: Watershed 1E

Runoff = 0.20 cfs @ 12.01 hrs, Volume= 580 cf, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	26	74	>75% Grass cover, Good, HSG C
*	1,402	98	Parking Lot
	1,428	98	Weighted Average
	26		1.82% Pervious Area
	1,402		98.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	42	0.0129	1.01		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 1.46 cfs @ 12.01 hrs, Volume= 4,254 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

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

Summary for Subcatchment 3: Watershed 3

Runoff = 0.19 cfs @ 12.02 hrs, Volume= 500 cf, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	1,655	74	>75% Grass cover, Good, HSG C
*	416	98	Sidewalks
	2,071	79	Weighted Average
	1,655		79.91% Pervious Area
	416		20.09% Impervious Area

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

Summary for Subcatchment 3A: Roof Area & Planter Watershed 3A

Runoff = 2.01 cfs @ 12.01 hrs, Volume= 5,849 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
*	14,082	98	Roof
*	673	79	Planter
	14,755	97	Weighted Average
	673		4.56% Pervious Area
	14,082		95.44% Impervious Area

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

Summary for Subcatchment 3B: Watershed 3B

Runoff = 0.70 cfs @ 12.01 hrs, Volume= 2,033 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.11"

	Area (sf)	CN	Description
	135	74	>75% Grass cover, Good, HSG C
*	4,993	98	Parking Lot & portion of ex. building
	5,128	97	Weighted Average
	135		2.63% Pervious Area
	4,993		97.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	74	0.0180	1.29		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Reach DP-1: Ex. Catch Basin

Inflow Area = 22,202 sf, 95.41% Impervious, Inflow Depth = 4.77" for 10-Year event
Inflow = 2.98 cfs @ 12.02 hrs, Volume= 8,819 cf
Outflow = 2.98 cfs @ 12.02 hrs, Volume= 8,819 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP-2: Ex. Catch Basin

Inflow Area = 21,954 sf, 88.78% Impervious, Inflow Depth = 4.58" for 10-Year event
Inflow = 2.85 cfs @ 12.02 hrs, Volume= 8,383 cf
Outflow = 2.85 cfs @ 12.02 hrs, Volume= 8,383 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1P: Relocated Drain Inlet

Inflow Area = 3,079 sf, 97.69% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 0.42 cfs @ 12.01 hrs, Volume= 1,220 cf
Outflow = 0.42 cfs @ 12.01 hrs, Volume= 1,220 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.42 cfs @ 12.01 hrs, Volume= 1,220 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.28' @ 12.02 hrs
Flood Elev= 25.05'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.75'	**12.0" Round 12" HDPE** L= 35.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.75' / 22.26' S= 0.0140 '/' Cc= 0.900

n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.01 hrs HW=23.27' TW=23.17' (Dynamic Tailwater)
↑—**1=12" HDPE** (Outlet Controls 0.39 cfs @ 1.39 fps)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area = 15,240 sf, 94.92% Impervious, Inflow Depth = 4.77" for 10-Year event
Inflow = 2.04 cfs @ 12.02 hrs, Volume= 6,055 cf
Outflow = 2.04 cfs @ 12.02 hrs, Volume= 6,055 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.04 cfs @ 12.02 hrs, Volume= 6,055 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.19' @ 12.02 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.03 cfs @ 12.02 hrs HW=23.18' TW=22.67' (Dynamic Tailwater)
↑—**1=12" PVC** (Outlet Controls 2.03 cfs @ 3.14 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area = 21,416 sf, 95.25% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf
Outflow = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.67' @ 12.02 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.86 cfs @ 12.02 hrs HW=22.66' TW=21.75' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 2.86 cfs @ 3.64 fps)

Summary for Pond 4P: Ex. Manhole

Inflow Area = 22,202 sf, 95.41% Impervious, Inflow Depth = 4.77" for 10-Year event
Inflow = 2.98 cfs @ 12.02 hrs, Volume= 8,819 cf
Outflow = 2.98 cfs @ 12.02 hrs, Volume= 8,819 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.98 cfs @ 12.02 hrs, Volume= 8,819 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.18' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.02'	**15.0" Round Ex. 15" HDPE** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.02' / 19.97' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.96 cfs @ 12.02 hrs HW=21.18' TW=0.00' (Dynamic Tailwater)
└─**1=Ex. 15" HDPE** (Barrel Controls 2.96 cfs @ 3.26 fps)

Summary for Pond 5P: Relocated Drain Inlet

Inflow Area = 2,893 sf,100.00% Impervious, Inflow Depth = 4.87" for 10-Year event
Inflow = 0.39 cfs @ 12.02 hrs, Volume= 1,175 cf
Outflow = 0.39 cfs @ 12.02 hrs, Volume= 1,175 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.02 hrs, Volume= 1,175 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.69' @ 12.02 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.20'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.20' / 20.79' S= 0.0121 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.02 hrs HW=22.68' TW=22.66' (Dynamic Tailwater)
└─**1=12" HDPE** (Inlet Controls 0.39 cfs @ 0.50 fps)

Summary for Pond 6P: Trench Drain

Inflow Area = 1,428 sf, 98.18% Impervious, Inflow Depth = 4.87" for 10-Year event
Inflow = 0.20 cfs @ 12.01 hrs, Volume= 580 cf
Outflow = 0.20 cfs @ 12.01 hrs, Volume= 580 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.20 cfs @ 12.01 hrs, Volume= 580 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.59' @ 12.01 hrs
Flood Elev= 25.96'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.35'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.35' / 22.26' S= 0.0321 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.20 cfs @ 12.01 hrs HW=23.59' TW=23.16' (Dynamic Tailwater)
└─**1=12" HDPE** (Inlet Controls 0.20 cfs @ 1.33 fps)

Summary for Pond AS-1: Ex. Hydrodynamic Separator WQv = 0.49 cfs 25-Year = 3.62 cfs

Inflow Area = 21,416 sf, 95.25% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf
Outflow = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.87 cfs @ 12.02 hrs, Volume= 8,500 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.75' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**15.0" Round Ex. 15" RCP** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.12' S= 0.0119 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=2.86 cfs @ 12.02 hrs HW=21.75' TW=21.18' (Dynamic Tailwater)
└─**1=Ex. 15" RCP** (Inlet Controls 2.86 cfs @ 2.70 fps)

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area = 10,733 sf, 93.69% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 1.46 cfs @ 12.01 hrs, Volume= 4,254 cf
Outflow = 1.43 cfs @ 12.02 hrs, Volume= 4,255 cf, Atten= 2%, Lag= 0.5 min
Primary = 1.43 cfs @ 12.02 hrs, Volume= 4,255 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 27.84' @ 12.02 hrs Surf.Area= 669 sf Storage= 897 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 149.2 min (899.8 - 750.7)

Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,004 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	669	0	0
28.00	669	1,004	1,004

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 22.26' S= 0.0194 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.43 cfs @ 12.02 hrs HW=27.84' TW=23.17' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.43 cfs of 5.85 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 1.40 cfs @ 0.98 fps)
  └─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

mmary for Pond SP2: 1.0 Foot High Stormwater Planter 673 SQ. FT. W/ 6 Outlets & 100 SF FocalPoint Sy

Inflow Area = 19,883 sf, 95.94% Impervious, Inflow Depth = 4.76" for 10-Year event
Inflow = 2.70 cfs @ 12.01 hrs, Volume= 7,881 cf
Outflow = 2.66 cfs @ 12.02 hrs, Volume= 7,883 cf, Atten= 2%, Lag= 0.5 min
Primary = 2.66 cfs @ 12.02 hrs, Volume= 7,883 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.23' @ 12.02 hrs Surf.Area= 100 sf Storage= 484 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 5.7 min (756.4 - 750.7)

Volume	Invert	Avail.Storage	Storage Description
#1	19.33'	45 cf	**2.00'W x 50.00'L x 2.25'H FocalPoint** 225 cf Overall x 20.0% Voids
#2	21.58'	505 cf	**Stormwater Planter (Prismatic)**Listed below (Recalc) -Impervious
		550 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.58	673	0	0
22.08	673	337	337
22.33	673	168	505

Device	Routing	Invert	Outlet Devices
#1	Primary	19.00'	**12.0" Round Culvert** L= 19.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 18.77' S= 0.0121 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	19.33'	**100.000 in/hr Exfiltration over Surface area**
#3	Device 1	22.08'	**8.0" Horiz. Orifice/Grate X 6.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.65 cfs @ 12.02 hrs HW=22.23' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.65 cfs of 4.93 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.23 cfs)
  └─**3=Orifice/Grate** (Weir Controls 2.42 cfs @ 1.27 fps)

Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.49 cfs @ 12.02 hrs, Volume= 1,488 cf, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	2,893	98	Parking Lot
	2,893		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	96	0.0166	1.31		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 0.53 cfs @ 12.01 hrs, Volume= 1,553 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	71	74	>75% Grass cover, Good, HSG C
*	3,008	98	Parking Lot
	3,079	97	Weighted Average
	71		2.31% Pervious Area
	3,008		97.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	64	0.0225	1.37		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.56 cfs @ 12.01 hrs, Volume= 1,624 cf, Depth= 5.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	244	74	>75% Grass cover, Good, HSG C
*	3,039	98	Parking Lot
	3,283	96	Weighted Average
	244		7.43% Pervious Area
	3,039		92.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	57	0.0305	1.51		**Sheet Flow, A->B** Smooth surfaces n= 0.011 P2= 3.45"
0.3	53	0.0162	2.58		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
0.9	110	Total			

Summary for Subcatchment 1D: Watershed 1D

Runoff = 0.14 cfs @ 12.01 hrs, Volume= 404 cf, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	786	98	building
	786		100.00% Impervious Area

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

Summary for Subcatchment 1E: Watershed 1E

Runoff = 0.25 cfs @ 12.01 hrs, Volume= 734 cf, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	26	74	>75% Grass cover, Good, HSG C
*	1,402	98	Parking Lot
	1,428	98	Weighted Average
	26		1.82% Pervious Area
	1,402		98.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	42	0.0129	1.01		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 1.84 cfs @ 12.01 hrs, Volume= 5,414 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

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

Summary for Subcatchment 3: Watershed 3

Runoff = 0.27 cfs @ 12.02 hrs, Volume= 699 cf, Depth= 4.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	1,655	74	>75% Grass cover, Good, HSG C
*	416	98	Sidewalks
	2,071	79	Weighted Average
	1,655		79.91% Pervious Area
	416		20.09% Impervious Area

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

Summary for Subcatchment 3A: Roof Area & Planter Watershed 3A

Runoff = 2.53 cfs @ 12.01 hrs, Volume= 7,443 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	14,082	98	Roof
*	673	79	Planter
	14,755	97	Weighted Average
	673		4.56% Pervious Area
	14,082		95.44% Impervious Area

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

Summary for Subcatchment 3B: Watershed 3B

Runoff = 0.88 cfs @ 12.01 hrs, Volume= 2,587 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
	135	74	>75% Grass cover, Good, HSG C
*	4,993	98	Parking Lot & portion of ex. building
	5,128	97	Weighted Average
	135		2.63% Pervious Area
	4,993		97.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	74	0.0180	1.29		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Reach DP-1: Ex. Catch Basin

Inflow Area = 22,202 sf, 95.41% Impervious, Inflow Depth = 6.06" for 25-Year event
Inflow = 3.75 cfs @ 12.02 hrs, Volume= 11,218 cf
Outflow = 3.75 cfs @ 12.02 hrs, Volume= 11,218 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP-2: Ex. Catch Basin

Inflow Area = 21,954 sf, 88.78% Impervious, Inflow Depth = 5.86" for 25-Year event
Inflow = 3.62 cfs @ 12.02 hrs, Volume= 10,730 cf
Outflow = 3.62 cfs @ 12.02 hrs, Volume= 10,730 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3

Summary for Pond 1P: Relocated Drain Inlet

Inflow Area = 3,079 sf, 97.69% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 0.53 cfs @ 12.01 hrs, Volume= 1,553 cf
Outflow = 0.53 cfs @ 12.01 hrs, Volume= 1,553 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.53 cfs @ 12.01 hrs, Volume= 1,553 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 24.20' @ 12.02 hrs
Flood Elev= 25.05'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.75'	**12.0" Round 12" HDPE** L= 35.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.75' / 22.26' S= 0.0140 '/' Cc= 0.900

n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.01 hrs HW=24.09' TW=24.11' (Dynamic Tailwater)
↑—**1=12" HDPE** (Controls 0.00 cfs)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area =	15,240 sf,	94.92% Impervious,	Inflow Depth = 6.06"	for 25-Year event
Inflow =	2.57 cfs @	12.02 hrs, Volume=	7,702 cf	
Outflow =	2.57 cfs @	12.02 hrs, Volume=	7,702 cf,	Atten= 0%, Lag= 0.0 min
Primary =	2.57 cfs @	12.02 hrs, Volume=	7,702 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 24.18' @ 12.02 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.55 cfs @ 12.02 hrs HW=24.16' TW=23.44' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 2.55 cfs @ 3.24 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area =	21,416 sf,	95.25% Impervious,	Inflow Depth = 6.06"	for 25-Year event
Inflow =	3.62 cfs @	12.02 hrs, Volume=	10,814 cf	
Outflow =	3.62 cfs @	12.02 hrs, Volume=	10,814 cf,	Atten= 0%, Lag= 0.0 min
Primary =	3.62 cfs @	12.02 hrs, Volume=	10,814 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.45' @ 12.02 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.60 cfs @ 12.02 hrs HW=23.43' TW=21.97' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 3.60 cfs @ 4.59 fps)

Summary for Pond 4P: Ex. Manhole

Inflow Area = 22,202 sf, 95.41% Impervious, Inflow Depth = 6.06" for 25-Year event
Inflow = 3.75 cfs @ 12.02 hrs, Volume= 11,218 cf
Outflow = 3.75 cfs @ 12.02 hrs, Volume= 11,218 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.75 cfs @ 12.02 hrs, Volume= 11,218 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.38' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.02'	**15.0" Round Ex. 15" HDPE** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.02' / 19.97' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.74 cfs @ 12.02 hrs HW=21.37' TW=0.00' (Dynamic Tailwater)
↑—**1=Ex. 15" HDPE** (Barrel Controls 3.74 cfs @ 3.50 fps)

Summary for Pond 5P: Relocated Drain Inlet

Inflow Area = 2,893 sf,100.00% Impervious, Inflow Depth = 6.17" for 25-Year event
Inflow = 0.49 cfs @ 12.02 hrs, Volume= 1,488 cf
Outflow = 0.49 cfs @ 12.02 hrs, Volume= 1,488 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.49 cfs @ 12.02 hrs, Volume= 1,488 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.47' @ 12.02 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.20'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.20' / 20.79' S= 0.0121 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.02 hrs HW=23.45' TW=23.43' (Dynamic Tailwater)
↑—**1=12" HDPE** (Inlet Controls 0.39 cfs @ 0.49 fps)

Summary for Pond 6P: Trench Drain

Inflow Area = 1,428 sf, 98.18% Impervious, Inflow Depth = 6.17" for 25-Year event
Inflow = 0.25 cfs @ 12.01 hrs, Volume= 734 cf
Outflow = 0.25 cfs @ 12.01 hrs, Volume= 734 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.25 cfs @ 12.01 hrs, Volume= 734 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 24.18' @ 12.02 hrs
Flood Elev= 25.96'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.35'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.35' / 22.26' S= 0.0321 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.01 hrs HW=24.05' TW=24.10' (Dynamic Tailwater)
└─**1=12" HDPE** (Controls 0.00 cfs)

Summary for Pond AS-1: Ex. Hydrodynamic Separator WQv = 0.49 cfs 25-Year = 3.62 cfs

Inflow Area = 21,416 sf, 95.25% Impervious, Inflow Depth = 6.06" for 25-Year event
Inflow = 3.62 cfs @ 12.02 hrs, Volume= 10,814 cf
Outflow = 3.62 cfs @ 12.02 hrs, Volume= 10,814 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.62 cfs @ 12.02 hrs, Volume= 10,814 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.98' @ 12.02 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**15.0" Round Ex. 15" RCP** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.12' S= 0.0119 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=3.60 cfs @ 12.02 hrs HW=21.97' TW=21.37' (Dynamic Tailwater)
└─**1=Ex. 15" RCP** (Inlet Controls 3.60 cfs @ 2.94 fps)

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area = 10,733 sf, 93.69% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 1.84 cfs @ 12.01 hrs, Volume= 5,414 cf
Outflow = 1.81 cfs @ 12.02 hrs, Volume= 5,414 cf, Atten= 1%, Lag= 0.5 min
Primary = 1.81 cfs @ 12.02 hrs, Volume= 5,414 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 27.86' @ 12.02 hrs Surf.Area= 669 sf Storage= 907 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 132.6 min (878.9 - 746.3)

Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,004 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	669	0	0
28.00	669	1,004	1,004

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 22.26' S= 0.0194 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=1.80 cfs @ 12.02 hrs HW=27.86' TW=24.14' (Dynamic Tailwater)
└1=**Culvert** (Passes 1.80 cfs of 5.75 cfs potential flow)
  ├2=**Orifice/Grate** (Weir Controls 1.77 cfs @ 1.06 fps)
  └3=**Exfiltration** (Exfiltration Controls 0.03 cfs)

mmary for Pond SP2: 1.0 Foot High Stormwater Planter 673 SQ. FT. W/ 6 Outlets & 100 SF FocalPoint Sy

Inflow Area = 19,883 sf, 95.94% Impervious, Inflow Depth = 6.05" for 25-Year event
Inflow = 3.40 cfs @ 12.01 hrs, Volume= 10,030 cf
Outflow = 3.36 cfs @ 12.02 hrs, Volume= 10,031 cf, Atten= 1%, Lag= 0.4 min
Primary = 3.36 cfs @ 12.02 hrs, Volume= 10,031 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.26' @ 12.02 hrs Surf.Area= 100 sf Storage= 502 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 5.8 min (752.1 - 746.3)

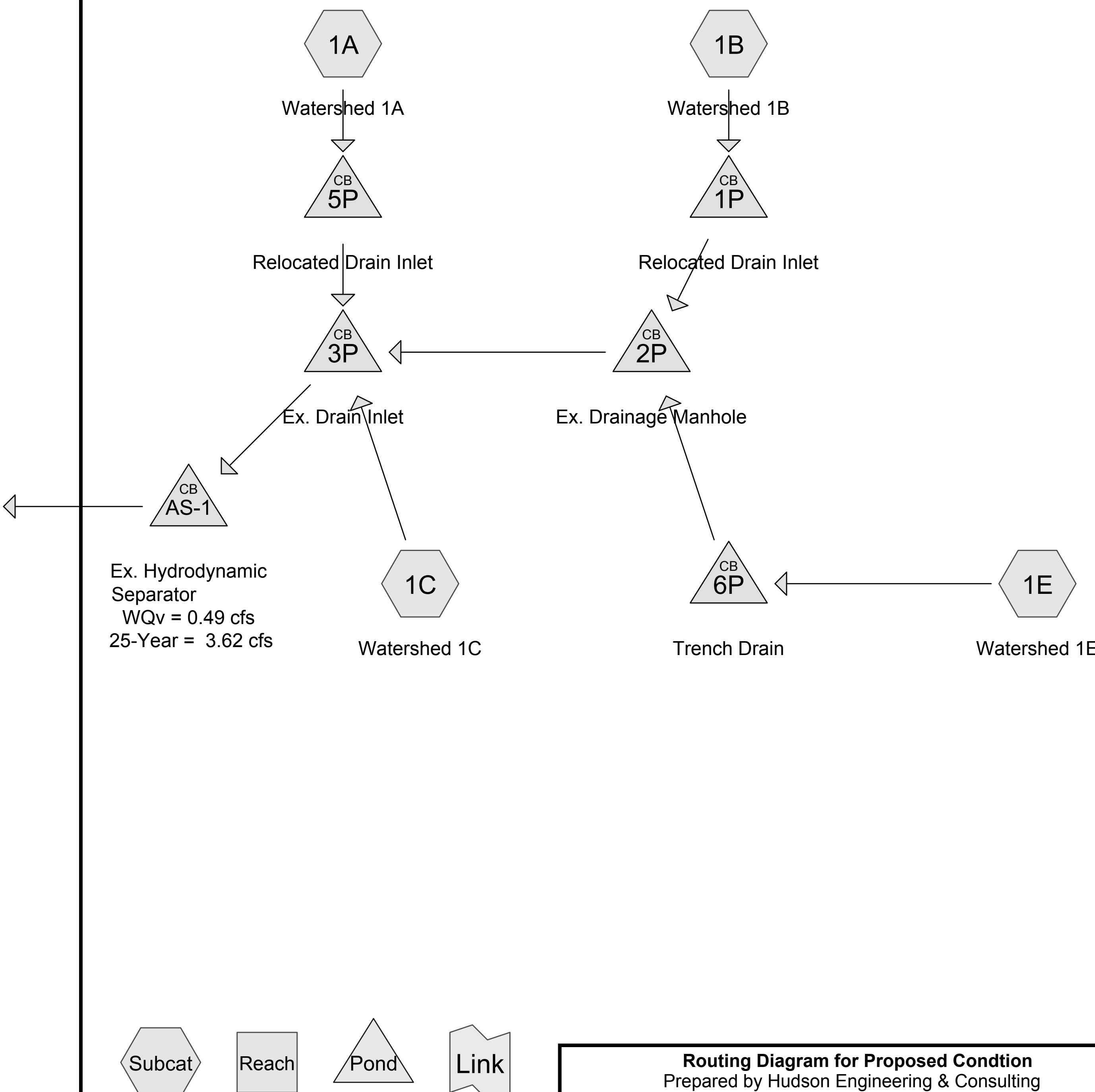
Volume	Invert	Avail.Storage	Storage Description
#1	19.33'	45 cf	**2.00'W x 50.00'L x 2.25'H FocalPoint** 225 cf Overall x 20.0% Voids
#2	21.58'	505 cf	**Stormwater Planter (Prismatic)**Listed below (Recalc) -Impervious
		550 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.58	673	0	0
22.08	673	337	337
22.33	673	168	505

Device	Routing	Invert	Outlet Devices
#1	Primary	19.00'	**12.0" Round Culvert** L= 19.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 18.77' S= 0.0121 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	19.33'	**100.000 in/hr Exfiltration over Surface area**
#3	Device 1	22.08'	**8.0" Horiz. Orifice/Grate X 6.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.35 cfs @ 12.02 hrs HW=22.26' TW=0.00' (Dynamic Tailwater)
└1=**Culvert** (Passes 3.35 cfs of 4.96 cfs potential flow)
  ├2=**Exfiltration** (Exfiltration Controls 0.23 cfs)
  └3=**Orifice/Grate** (Weir Controls 3.11 cfs @ 1.38 fps)

8). Water Quality Calculations



Routing Diagram for Proposed Condtion
Prepared by Hudson Engineering & Consulting

Summary for Subcatchment 1A: Watershed 1A

Runoff = 0.13 cfs @ 12.02 hrs, Volume= 363 cf, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
*	2,893	98	Parking Lot
	2,893		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	96	0.0166	1.31		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1B: Watershed 1B

Runoff = 0.13 cfs @ 12.01 hrs, Volume= 361 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
	71	74	>75% Grass cover, Good, HSG C
*	3,008	98	Parking Lot
	3,079	97	Weighted Average
	71		2.31% Pervious Area
	3,008		97.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	64	0.0225	1.37		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Subcatchment 1C: Watershed 1C

Runoff = 0.13 cfs @ 12.01 hrs, Volume= 360 cf, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
	244	74	>75% Grass cover, Good, HSG C
*	3,039	98	Parking Lot
	3,283	96	Weighted Average
	244		7.43% Pervious Area
	3,039		92.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	57	0.0305	1.51		**Sheet Flow, A->B** Smooth surfaces n= 0.011 P2= 3.45"
0.3	53	0.0162	2.58		**Shallow Concentrated Flow, B->C** Paved Kv= 20.3 fps
0.9	110	Total			

Summary for Subcatchment 1E: Watershed 1E

Runoff = 0.06 cfs @ 12.01 hrs, Volume= 179 cf, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
	26	74	>75% Grass cover, Good, HSG C
*	1,402	98	Parking Lot
	1,428	98	Weighted Average
	26		1.82% Pervious Area
	1,402		98.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	42	0.0129	1.01		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

Summary for Pond 1P: Relocated Drain Inlet

Inflow Area = 3,079 sf, 97.69% Impervious, Inflow Depth = 1.41" for WQv event
Inflow = 0.13 cfs @ 12.01 hrs, Volume= 361 cf
Outflow = 0.13 cfs @ 12.01 hrs, Volume= 361 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 12.01 hrs, Volume= 361 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.95' @ 12.01 hrs
Flood Elev= 25.05'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.75'	**12.0" Round 12" HDPE** L= 35.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.75' / 22.26' S= 0.0140 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 12.01 hrs HW=22.95' TW=22.40' (Dynamic Tailwater)
↑—**1=12" HDPE** (Inlet Controls 0.13 cfs @ 1.20 fps)

Summary for Pond 2P: Ex. Drainage Manhole

Inflow Area = 4,507 sf, 97.85% Impervious, Inflow Depth = 1.44" for WQv event
Inflow = 0.20 cfs @ 12.01 hrs, Volume= 540 cf
Outflow = 0.20 cfs @ 12.01 hrs, Volume= 540 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.20 cfs @ 12.01 hrs, Volume= 540 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.40' @ 12.01 hrs
Flood Elev= 26.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	22.16'	**12.0" Round 12" PVC** L= 101.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 22.16' / 20.74' S= 0.0140 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.20 cfs @ 12.01 hrs HW=22.40' TW=21.21' (Dynamic Tailwater)
↑—**1=12" PVC** (Inlet Controls 0.20 cfs @ 1.33 fps)

Summary for Pond 3P: Ex. Drain Inlet

Inflow Area = 10,683 sf, 96.81% Impervious, Inflow Depth = 1.42" for WQv event
Inflow = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf
Outflow = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.21' @ 12.01 hrs
Flood Elev= 23.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**12.0" Round 12" PVC** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.45' S= 0.0207 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.46 cfs @ 12.01 hrs HW=21.21' TW=21.09' (Dynamic Tailwater)
↑—**1=12" PVC** (Outlet Controls 0.46 cfs @ 1.84 fps)

Summary for Pond 5P: Relocated Drain Inlet

Inflow Area = 2,893 sf,100.00% Impervious, Inflow Depth = 1.51" for WQv event
Inflow = 0.13 cfs @ 12.02 hrs, Volume= 363 cf
Outflow = 0.13 cfs @ 12.02 hrs, Volume= 363 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 12.02 hrs, Volume= 363 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.42' @ 12.02 hrs
Flood Elev= 23.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	21.20'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 21.20' / 20.79' S= 0.0121 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 12.02 hrs HW=21.42' TW=21.21' (Dynamic Tailwater)
↑—**1=12" HDPE** (Outlet Controls 0.13 cfs @ 1.55 fps)

Summary for Pond 6P: Trench Drain

Inflow Area = 1,428 sf, 98.18% Impervious, Inflow Depth = 1.51" for WQv event
Inflow = 0.06 cfs @ 12.01 hrs, Volume= 179 cf
Outflow = 0.06 cfs @ 12.01 hrs, Volume= 179 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.06 cfs @ 12.01 hrs, Volume= 179 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 23.49' @ 12.01 hrs
Flood Elev= 25.96'

Device	Routing	Invert	Outlet Devices
#1	Primary	23.35'	**12.0" Round 12" HDPE** L= 34.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.35' / 22.26' S= 0.0321 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.06 cfs @ 12.01 hrs HW=23.49' TW=22.40' (Dynamic Tailwater)
↑—**1=12" HDPE** (Inlet Controls 0.06 cfs @ 0.99 fps)

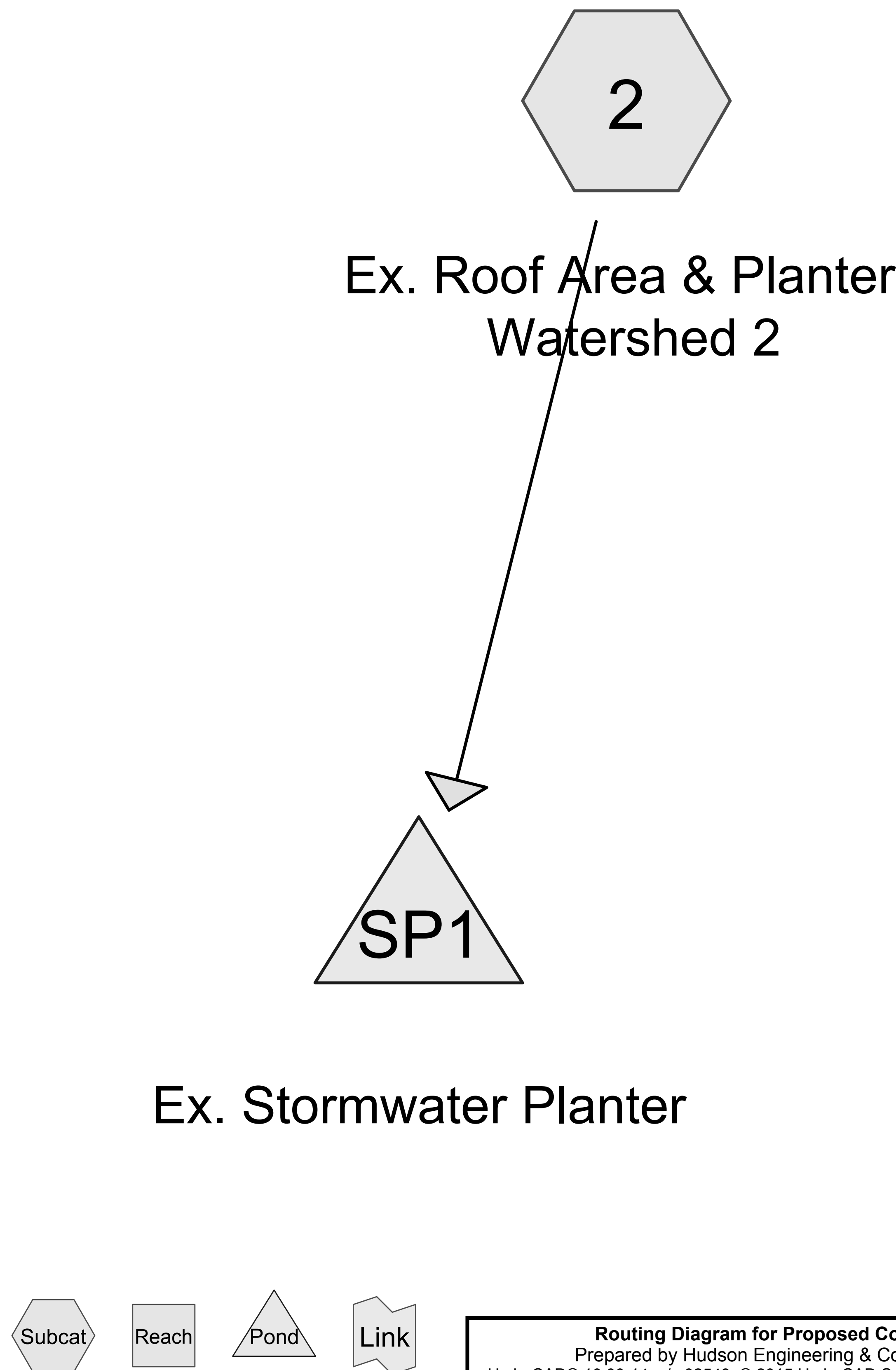
Summary for Pond AS-1: Ex. Hydrodynamic Separator WQv = 0.49 cfs 25-Year = 3.62 cfs

Inflow Area = 10,683 sf, 96.81% Impervious, Inflow Depth = 1.42" for WQv event
Inflow = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf
Outflow = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.46 cfs @ 12.01 hrs, Volume= 1,263 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 21.10' @ 12.01 hrs
Flood Elev= 24.12'

Device	Routing	Invert	Outlet Devices
#1	Primary	20.74'	**15.0" Round Ex. 15" RCP** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 20.74' / 20.12' S= 0.0119 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=0.46 cfs @ 12.01 hrs HW=21.09' TW=20.43' (Dynamic Tailwater)
↑—**1=Ex. 15" RCP** (Inlet Controls 0.46 cfs @ 1.60 fps)



Routing Diagram for Proposed Condtion
Prepared by Hudson Engineering & Consulting

Summary for Subcatchment 2: Ex. Roof Area & Planter Watershed 2

Runoff = 0.46 cfs @ 12.01 hrs, Volume= 1,259 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
*	10,056	98	Roof
*	677	79	Planter
	10,733	97	Weighted Average
	677		6.31% Pervious Area
	10,056		93.69% Impervious Area

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

Summary for Pond SP1: Ex. Stormwater Planter

Inflow Area = 10,733 sf, 93.69% Impervious, Inflow Depth = 1.41" for WQv event
Inflow = 0.46 cfs @ 12.01 hrs, Volume= 1,259 cf
Outflow = 0.03 cfs @ 11.57 hrs, Volume= 1,259 cf, Atten= 93%, Lag= 0.0 min
Primary = 0.03 cfs @ 11.57 hrs, Volume= 1,259 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 27.22' @ 12.99 hrs Surf.Area= 669 sf Storage= 482 cf

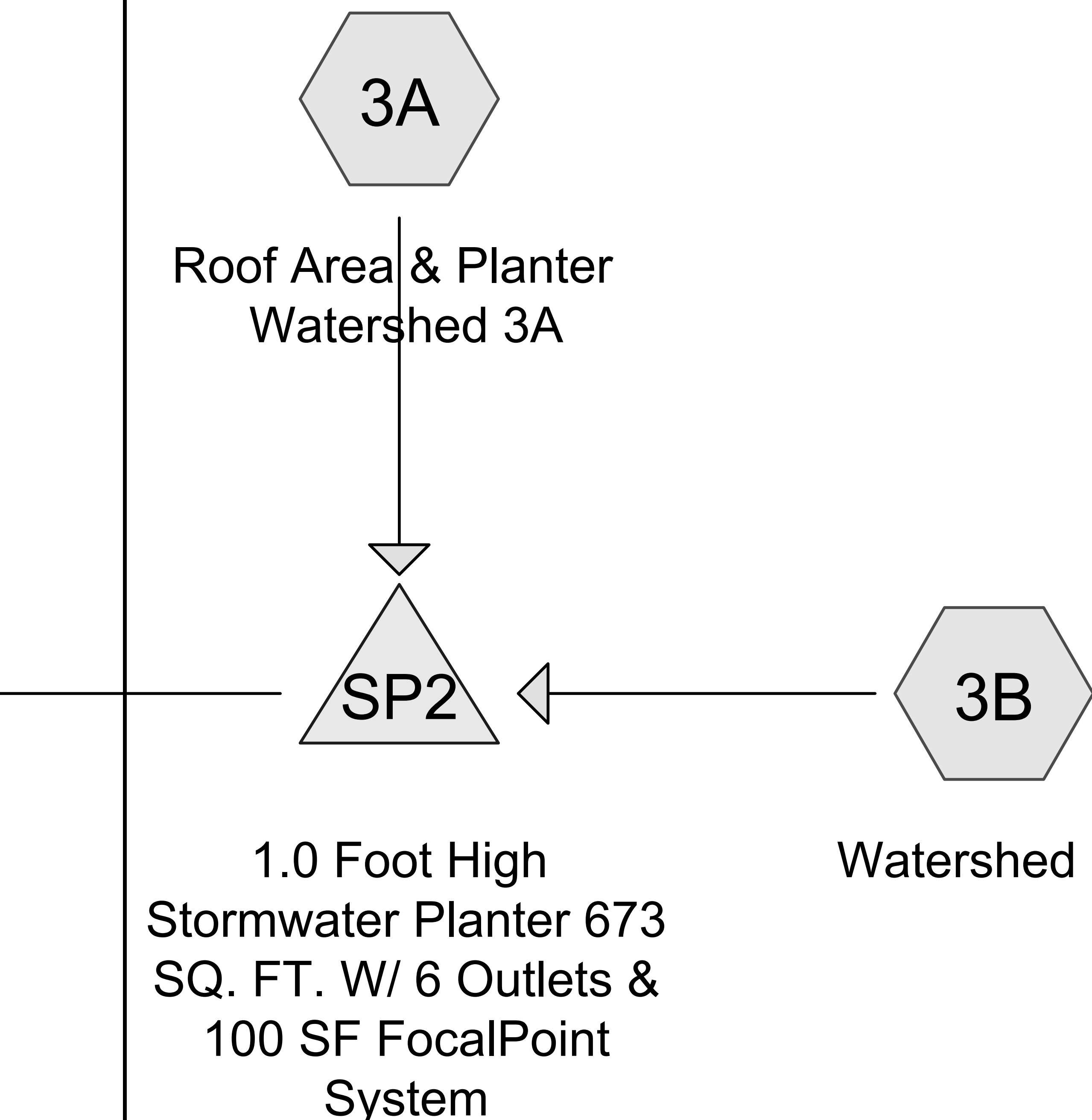
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 120.3 min (899.3 - 778.9)

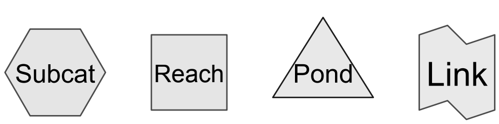
Volume	Invert	Avail.Storage	Storage Description
#1	26.50'	1,004 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.50	669	0	0
28.00	669	1,004	1,004

Device	Routing	Invert	Outlet Devices
#1	Primary	23.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 23.50' / 22.26' S= 0.0194 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	27.75'	**6.0" Horiz. Orifice/Grate X 10.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	26.50'	**2.000 in/hr Exfiltration over Surface area**

Primary OutFlow Max=0.03 cfs @ 11.57 hrs HW=26.52' (Free Discharge)
└─**1=Culvert** (Passes 0.03 cfs of 4.74 cfs potential flow)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Exfiltration** (Exfiltration Controls 0.03 cfs)





Routing Diagram for Proposed Condtion
Prepared by Hudson Engineering & Consulting
HydroCAD® 10.00-14 s/n 02549 © 2015 HydroCAD Software Solutions LLC

Summary for Subcatchment 3A: Roof Area & Planter Watershed 3A

Runoff = 0.63 cfs @ 12.01 hrs, Volume= 1,730 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
*	14,082	98	Roof
*	673	79	Planter
	14,755	97	Weighted Average
	673		4.56% Pervious Area
	14,082		95.44% Impervious Area

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

Summary for Subcatchment 3B: Watershed 3B

Runoff = 0.22 cfs @ 12.01 hrs, Volume= 601 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type III 24-hr WQv Rainfall=1.73"

	Area (sf)	CN	Description
	135	74	>75% Grass cover, Good, HSG C
*	4,993	98	Parking Lot & portion of ex. building
	5,128	97	Weighted Average
	135		2.63% Pervious Area
	4,993		97.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	74	0.0180	1.29		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.45"

mmary for Pond SP2: 1.0 Foot High Stormwater Planter 673 SQ. FT. W/ 6 Outlets & 100 SF FocalPoint Sy

Inflow Area = 19,883 sf, 95.94% Impervious, Inflow Depth = 1.41" for WQv event
Inflow = 0.85 cfs @ 12.01 hrs, Volume= 2,332 cf
Outflow = 0.23 cfs @ 11.78 hrs, Volume= 2,334 cf, Atten= 73%, Lag= 0.0 min
Primary = 0.23 cfs @ 11.78 hrs, Volume= 2,334 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 22.03' @ 12.30 hrs Surf.Area= 100 sf Storage= 347 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 6.4 min (785.4 - 778.9)

Volume	Invert	Avail.Storage	Storage Description
#1	19.33'	45 cf	**2.00'W x 50.00'L x 2.25'H FocalPoint** 225 cf Overall x 20.0% Voids
#2	21.58'	505 cf	**Stormwater Planter (Prismatic)**Listed below (Recalc) -Impervious
		550 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
21.58	673	0	0
22.08	673	337	337
22.33	673	168	505

Device	Routing	Invert	Outlet Devices
#1	Primary	19.00'	**12.0" Round Culvert** L= 19.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 18.77' S= 0.0121 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	19.33'	**100.000 in/hr Exfiltration over Surface area**
#3	Device 1	22.08'	**8.0" Horiz. Orifice/Grate X 6.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.23 cfs @ 11.78 hrs HW=19.37' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.23 cfs of 0.42 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.23 cfs)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

9.) AquaSwirl Sizing Chart & Spec Sheet

Aqua-Swirl®
Stormwater Treatment System

Inspection and Maintenance Manual

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March 2014

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Chattanooga, Tennessee 37343
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www.aquashieldinc.com

The highest priority of AquaShield™, Inc. (AquaShield™) is to protect waterways by providing stormwater treatment solutions to businesses across the world. These solutions have a reliable foundation based on over 20 years of water treatment experience.

Local regulators, engineers, and contractors have praised the AquaShield™ systems for their simple design and ease of installation. All the systems are fabricated from high performance, durable and lightweight materials. Contractors prefer the quick and simple installation of our structures that saves them money.

The patented line of AquaShield™ stormwater treatment products that provide high levels of stormwater treatment include the following:

- **Aqua-Swirl® Stormwater Treatment System:** hydrodynamic separator, which provides a highly effective means for the removal of sediment, floating debris and free-oil.

- **Aqua-Filter™ Stormwater Filtration System:** treatment train stormwater filtration system capable of removing gross contaminants, fine sediments, waterborne hydrocarbons, heavy metals and total phosphorous.

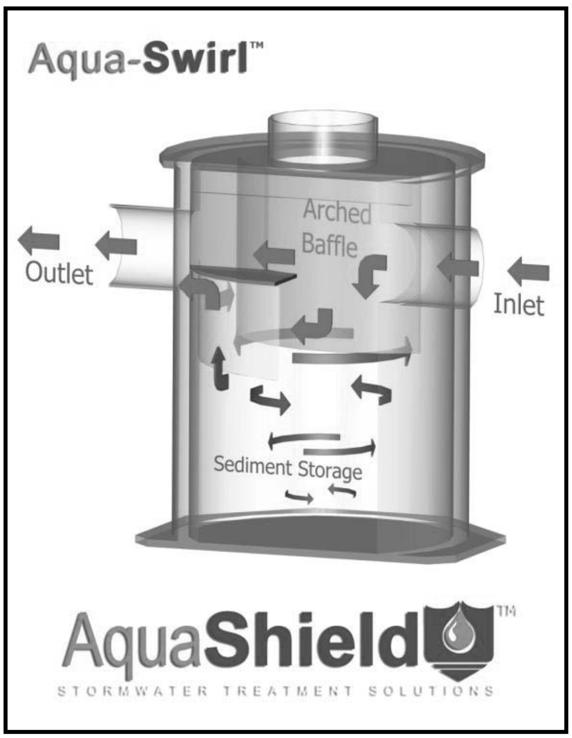
Aqua-Swirl® Stormwater Treatment System

Aqua-Filter™ Stormwater Filtration System

Aqua-Swirl® Stormwater Treatment System

The patented Aqua-Swirl® Stormwater Treatment System is a single chamber hydrodynamic separator which provides a highly effective means for the removal of sediment, free oil, and floating debris. Both treatment and storage are accomplished in the swirl chamber without the use of multiple or "blind" chambers. Independent laboratory and field performance verifications have shown that the Aqua-Swirl® achieves over 80% suspended solids removal efficiency on a net annual basis.

The Aqua-Swirl® is most commonly installed in an "off-line" configuration. Or, depending on local regulations, an "in-line" (on-line) conveyance flow diversion (CFD) system can be used. The CFD model allows simple installation by connecting directly to the existing storm conveyance pipe thereby providing full treatment of the "first flush," while the peak design storm is diverted and channeled through the main conveyance pipe.



The patented Aqua-Swirl® Stormwater Treatment System provides a highly effective means for the removal of sediment, floating debris, and free oil. Swirl technology, or vortex separation, is a proven form of treatment utilized in the stormwater industry to accelerate gravitational separation.

Floatable debris in the Aqua-Swirl®

Each Aqua-Swirl® is constructed of high performance, lightweight and durable materials including polymer coated steel (PCS), high density polyethylene (HDPE), or fiberglass reinforced polymer (FRP). These materials eliminate the need for heavy lifting equipment during installation.

System Operation

The treatment operation begins when stormwater enters the Aqua-Swirl® through a tangential inlet pipe that produces a circular (or vortex) flow pattern that causes contaminates to settle to the base of the unit. Since stormwater flow is intermittent by nature, the Aqua-Swirl® retains water between storm events providing both dynamic and quiescent settling of solids. The dynamic settling occurs during each storm event while the quiescent settling takes place between successive storms. A combination of gravitational and hydrodynamic drag forces encourages the solids to drop out of the flow and migrate to the center of the chamber where velocities are the lowest.

The treated flow then exits the Aqua-Swirl® behind the arched outer baffle. The top of the baffle is sealed across the treatment channel, thereby eliminating floatable pollutants from escaping the system. A vent pipe is extended up the riser to expose the backside of the baffle to atmospheric conditions, preventing a siphon from forming at the bottom of the baffle.

Custom Applications

The Aqua-Swirl® system can be modified to fit a variety of purposes in the field, and the angles for inlet and outlet lines can be modified to fit most applications. The photo below demonstrates the flexibility of Aqua-Swirl® installations using a “twin” configuration in order to double the water quality treatment capacity. Two Aqua-Swirl® units were placed side by side in order to treat a high volume of water while occupying a small amount of space.

Custom designed AS-9 Twin Aqua-Swirl®

Retrofit Applications

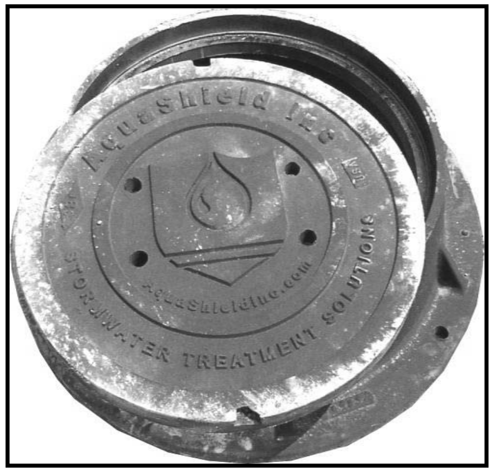
The Aqua-Swirl® system is designed so that it can easily be used for retrofit applications. With the invert of the inlet and outlet pipe at the same elevation, the Aqua-Swirl® can easily be connected directly to the existing storm conveyance drainage system. Furthermore, because of the lightweight nature and small footprint of the Aqua-Swirl®*,* existing infrastructure utilities (i.e., wires, poles, trees) would be unaffected by installation.

AquaShield™ Product System Maintenance

The long term performance of any stormwater treatment structure, including manufactured or land based systems, depends on a consistent maintenance plan. Inspection and maintenance functions are simple and easy for the AquaShield™ Stormwater Treatment Systems allowing all inspections to be performed from the surface.

It is important that a routine inspection and maintenance program be established for each unit based on: (a) the volume or load of the contaminants of concern, (b) the frequency of releases of contaminants at the facility or location, and (c) the nature of the area being drained.

In order to ensure that our systems are being maintained properly, AquaShield™ offers a maintenance solution to all of our customers. We will arrange to have maintenance performed.



Inspection

All AquaShield™ products can be inspected from the surface, eliminating the need to enter the systems to determine when cleanout should be performed. In most cases, AquaShield™ recommends a quarterly inspection for the first year of operation to develop an appropriate schedule of maintenance. Based on experience of the system's first year in operation, we recommend that the inspection schedule be revised to reflect the site-specific conditions encountered. Typically, the inspection schedule for subsequent years is reduced to semi-annual inspection.

Aqua-Swirl® Maintenance

The Aqua-Swirl® has been designed to minimize and simplify the inspection and maintenance process. The single chamber system can be inspected and maintained entirely from the surface thereby eliminating the need for confined space entry. Furthermore, the entire structure (specifically, the floor) is accessible for visual inspection from the surface. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any free-floating oil and floatable debris can be directly observed and maintained through the manhole access provided directly over the swirl chamber.

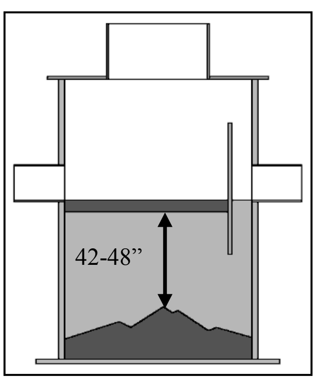
Aqua-Swirl® Inspection Procedure

To inspect the Aqua-Swirl®, a hook is needed to remove the manhole cover. AquaShield™ provides a customized manhole cover with our distinctive logo to make it easy for maintenance crews to locate the system in the field. We also provide a permanent metal information plate affixed inside the access riser which provides our contact information, the Aqua-Swirl® model size, and serial number.

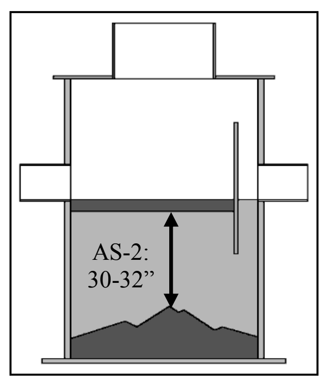
The only tools needed to inspect the Aqua-Swirl® system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating oil and debris can be observed directly from the surface. Sediment depths can easily be determined by lowering a measuring device to the top of the sediment pile and to the surface of the water.

Sediment inspection using a stadia rod in a single chamber

The maintenance trigger for Aqua-Swirl® Models AS-3 through AS-13 occurs when the sediment pile is within 42 to 48 inches of the standing water surface. For the Aqua-Swirl® Model AS-2, maintenance is needed when the top of the sediment pile is measured to be 30 to 32 inches below the standing water surface.



Maintenance trigger for Aqua-Swirl® Models AS-3 through AS-13 occurs when sediment pile is 42-48 inches below water surface.



Maintenance trigger for Aqua-Swirl® Model AS-2 occurs when sediment pile is 30 to 32 inches below water surface.

It should be noted that in order to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the *top* of the sediment pile. Keep in mind that the finer sediment at the top of the pile may offer less resistance to the measuring device than the larger particles which typically occur deeper within the sediment pile.

The Aqua-Swirl® design allows for the sediment to accumulate in a semi-conical fashion as illustrated above. That is, the depth to sediment as measured below the water surface may be less in the center of the swirl chamber; and likewise, may be greater at the edges of the swirl chamber.

Aqua-Swirl® Cleanout Procedure

Cleaning the Aqua-Swirl® is simple and quick. Free-floating oil and floatable debris can be observed and removed directly through the 30-inch service access riser provided. A vacuum truck is typically used to remove the accumulated sediment and debris. An advantage of the Aqua-Swirl® design is that the entire sediment storage area can be reached with a vacuum hose from the surface (reaching all the sides). Since there are no multiple or limited (hidden or "blind") chambers in the Aqua-Swirl®, there are no restrictions to impede on-site maintenance tasks.

Disposal of Recovered Materials

Disposal of recovered material is typically handled in the same fashion as catch basin cleanouts. AquaShield™ recommends that all maintenance activities be performed in accordance with appropriate health and safety practices for the tasks and equipment being used.

AquaShield™ also recommends that all materials removed from the Aqua-Swirl® and any external structures (e.g, bypass features) be handled and disposed in full accordance with any applicable local and state requirements.

Vacuum truck quickly cleans the Aqua-Swirl®
from a single chamber

Aqua-Swirl® Inspection and Maintenance Work Sheets on following pages

Aqua-Swirl® Inspection and Maintenance Manual
Work Sheets

SITE and OWNER INFORMATION

Site Name: ____________________

Site Location: ____________________

Date: ____________________ Time: ____________________

Inspector Name: ____________________

Inspector Company: ____________________ Phone #: ____________________

Owner Name: ____________________

Owner Address: ____________________

Owner Phone #: ____________________ Emergency Phone #: ____________________

INSPECTIONS

I. Floatable Debris and Oil

1. Remove manhole lid to expose liquid surface of the Aqua-Swirl®.
2. Remove floatable debris with basket or net if any present.
3. If oil is present, measure its depth. Clean liquids from system if one half (½) inch or more oil is present.

   Note: Water in Aqua-Swirl® can appear black and similar to oil due to the dark body of the surrounding structure. Oil may appear darker than water in the system and is usually accompanied by oil stained debris (e.g. Styrofoam, etc.). The depth of oil can be measured with an oil/water interface probe, a stadia rod with water finding paste, a coliwasa, or collect a representative sample with a jar attached to a rod.

II. Sediment Accumulation

1. Lower measuring device (e.g. stadia rod) into swirl chamber through service access provided until top of sediment pile is reached.
2. Record distance to top of sediment pile from top of standing water: ____________ inches
3. For Aqua-Swirl® Models AS-3 through AS-13, schedule cleaning if value in Step #2 is 48 to 42 inches or less.
4. For Aqua-Swirl® Model AS-2, schedule cleaning if value in Step #2 is 32 to 30 inches or less.

III. Diversion Structures (External Bypass Features)

If a diversion (external bypass) configuration is present, it should be inspected as follows:

1. Inspect weir or other bypass feature for structural decay or damage. Weirs are more susceptible to damage than off-set piping and should be checked to confirm that they are not crumbling (concrete or brick) or decaying (steel).
2. Inspect diversion structure and bypass piping for signs of structural damage or blockage from debris or sediment accumulation.
3. When feasible, measure elevations on diversion weir or piping to ensure it is consistent with site plan designs.
4. Inspect downstream (convergence) structure(s) for sign of blockage or structural failure as noted above.

CLEANING

Schedule cleaning with local vactor company or AquaShield™ to remove sediment, oil and other floatable pollutants. The captured material generally does not require special treatment or handling for disposal. Site-specific conditions or the presence of known contaminants may necessitate that appropriate actions be taken to clean and dispose of materials captured and retained by the Aqua-Swirl®. All cleaning activities should be performed in accordance with property health and safety procedures.

AquaShield™ always recommends that all materials removed from the Aqua-Swirl® during the maintenance process be handled and disposed in accordance with local and state environmental or other regulatory requirements.

MAINTENANCE SCHEDULE

I. During Construction

Inspect the Aqua-Swirl® every three (3) months and clean the system as needed. The Aqua-Swirl® should be inspected and cleaned at the end of construction regardless of whether it has reached its maintenance trigger.

II. First Year Post-Construction

Inspect the Aqua-Swirl® every three (3) months and clean the system as needed.

Inspect and clean the system once annually regardless of whether it has reached its sediment or floatable pollutant storage capacity.

III. Second and Subsequent Years Post-Construction

If the Aqua-Swirl® did not reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® reached full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once every six (6) months and cleaned as needed. The Aqua-Swirl® should be cleaned annually regardless of whether it reaches its sediment or floatable pollutant capacity.

IV. Bypass Structures

Bypass structures should be inspected whenever the Aqua-Swirl® is inspected. Maintenance should be performed on bypass structures as needed.

MAINTENANCE COMPANY INFORMATION

Company Name: ______________________________

Street Address: ______________________________

City: ____________________ State/Prov.:________ Zip/Postal Code: __________

Contact: ______________________________ Title: ____________________

Office Phone: ____________________ Cell Phone: ____________________

ACTIVITY LOG

Date of Cleaning: ____________________ (Next inspection should be 3 months from this data for first year).

Time of Cleaning: Start: ____________________ End: ____________________

Date of Next Inspection: ____________________

Floatable debris present: Yes No

Notes: ______________________________

____

____

Oil present: Yes No Oil depth (inches): ____________________

Measurement method and notes: ____________________

____

____

STRUCTURAL CONDITIONS and OBSERVATIONS

Structural damage: Yes No Where: ____________________

Structural wear: Yes No Where: ______________________________

Odors present: Yes No Describe: ______________________________

Clogging: Yes No Describe: ______________________________

Other Observations: ______________________________

____

____

NOTES

Additional Comments and/or Actions To Be Taken	Time Frame

ATTACHMENTS

- Attach site plan showing Aqua-Swirl® location.
- Attach detail drawing showing Aqua-Swirl® dimensions and model number.
- If a diversion configuration is used, attach details showing basic design and elevations (where feasible).

Aqua-Swirl®

TABULAR MAINTENANCE SCHEDULE

Date Construction Started: ______________________________

Date Construction Ended: ______________________________

During Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X*

* The Aqua-Swirl® should be cleaned **once a year** regardless of whether it has reached full pollutant storage capacity. In addition, the system should be cleaned at the **end of construction** regardless of whether it has reach full pollutant storage capacity.

First Year Post-Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X*

* The Aqua-Swirl® should be cleaned **once a year** regardless of whether it has reached full pollutant storage capacity.

Second and Subsequent Years Post-Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed												X*
Inspect Bypass, maintain as needed												X*
Clean System*												X*

* If the Aqua-Swirl® did **not** reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® **reached** full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once every six (6) months or more frequently if past history warrants, and cleaned as needed. The Aqua-Swirl® should be cleaned annually regardless of whether it reaches its full sediment or floatable pollutant capacity.

Aqua-Swirl™ Sizing Chart *(English)*

Aqua-Swirl™ Model	Swirl Chamber Diameter (ft.)	Maximum Stub-Out Pipe Outer Diameter (in.)		Water Quality Treatment Flow[2] (cfs)	Oil/Debris Storage Capacity (gal)	Sediment Storage Capacity (ft^3)
		On/Offline	CFD[1]			
AS-2	2.50	8	12	1.1	37	10
AS-3	3.25	10	16	1.8	110	20
AS-4	4.25	12	18	3.2	190	32
AS-5	5.00	12	24	4.4	270	45
AS-6	6.00	14	30	6.3	390	65
AS-7	7.00	16	36	8.6	540	90
AS-8	8.00	18	42	11.2	710	115
AS-9	9.00	20	48	14.2	910	145
AS-10	10.0	22	54	17.5	1130	180
AS-12	12.0	24	48	25.2	1698	270
AS-XX	Custom	--	--	>26	--	--

***Higher water quality treatment flow rates can be designed with multiple swirls.**

1) *The **Aqua-Swirl™ Conveyance Flow Diversion (CFD)** provides full treatment of the "first flush," while the peak design storm is diverted and channeled through the main conveyance pipe. Please refer to your local representative for more information.*

2) *Many regulatory agencies are establishing "water quality treatment flow rates" for their areas based on the initial movement of pollutants into the storm drainage system. The treatment flow rate of the Aqua-Swirl™ system is engineered to meet or exceed the local water quality treatment criteria. This **"water quality treatment flow rate"** typically represents approximately 90% to 95% of the total annual runoff volume.*

The design and orientation of the Aqua-Filter™ generally entails some degree of customization. For assistance in design and specific sizing using historical rainfall data, please refer to an AquaShield™ representative or visit our website at www.AquaShieldInc.com. CAD details and specifications are available upon request.

10.) FocalPoint Biofilter System

Designing with FocalPoint in New York

Utilizing a High Performance Modular Biofiltration System for New Development, Redevelopment and Retrofit Projects

The New York State Department of Environmental Conservation (NYS DEC) has approved the FocalPoint (High Performance Modular Biofiltration System) as a proprietary stormwater management practice for use on New Development, Redevelopment and Retrofit Projects.

SYSTEM OVERVIEW:

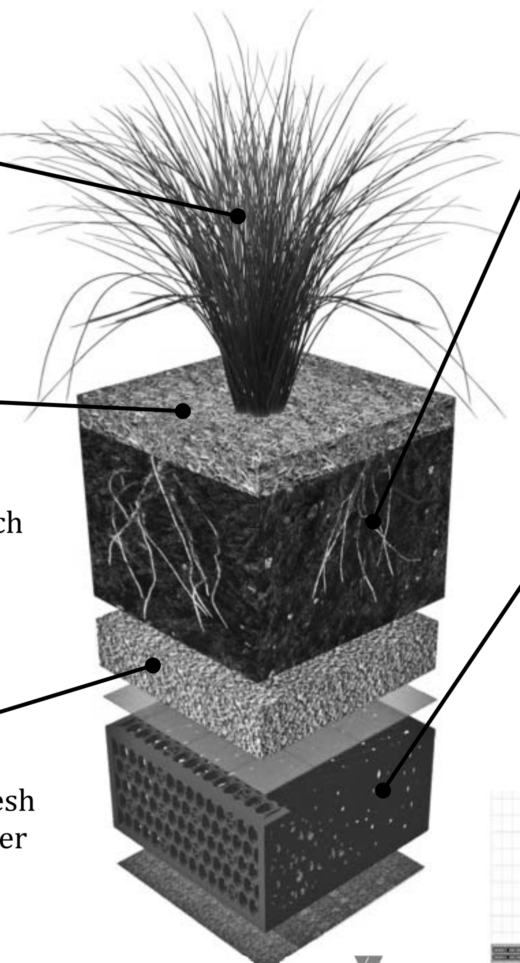
The FocalPoint is an ultra-efficient, modular biofiltration system that treats and drains large volumes of stormwater runoff in a small footprint to meet post construction stormwater treatment requirements. The system can be installed along the edge of a roadway behind curb line, in landscaped stormwater basins and be incorporated into an urban green infrastructure streetscape. As an innovative micro-scale practice, the FocalPoint overcomes many of the inherent challenges with traditional micro-bioretention and other similar BMPs – improving media quality control, reduction in space needed and reduced maintenance footprint, and elimination of clog-prone geotextiles.

SYSTEM COMPONENTS:

Vegetated System:
Plants process pollutants removed from run-off and root system maintains drainage and aeration of media.

3" Layer of Shredded Hardwood Mulch:
Pre-treatment mechanism. Removal and Replacement of Mulch Represents the Bulk of System Maintenance!

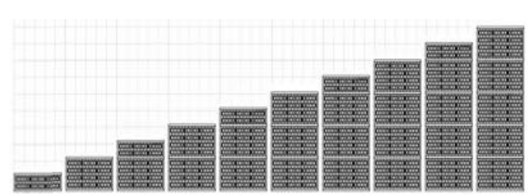
6" Bridging Stone & Separation Layer:
Clog-Proof Clean Stone & Micro-Mesh Replace Traditional Geotextile Layer
No geotextile = no clogging



18" High Performance Media:
Flows at 100" Per Hour / 200 ft per day
Resistant to Clogging

3rd Party Field and Lab Test Verified for 91% TSS, 66% P and 48% N

High Performance Underdrain:
9.45" Modular Tank, or "Flat Pipe" w/95% Open Surface Collects Water Efficiently. Expand into Modular Tanks for Larger Storage Needs.

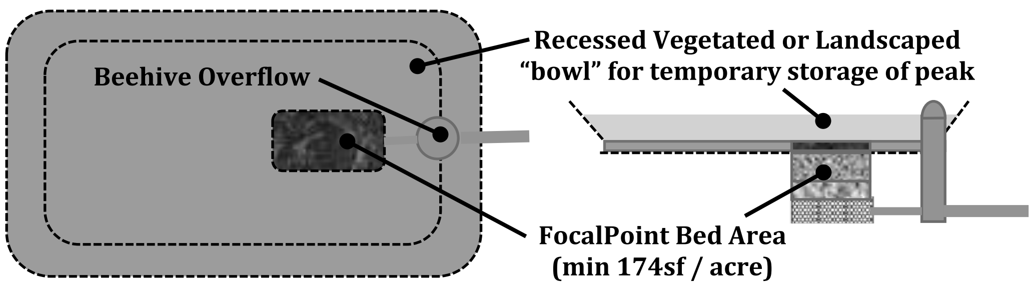


FocalPoint
BIOFILTRATION SYSTEMS

SIZING SUMMARY:

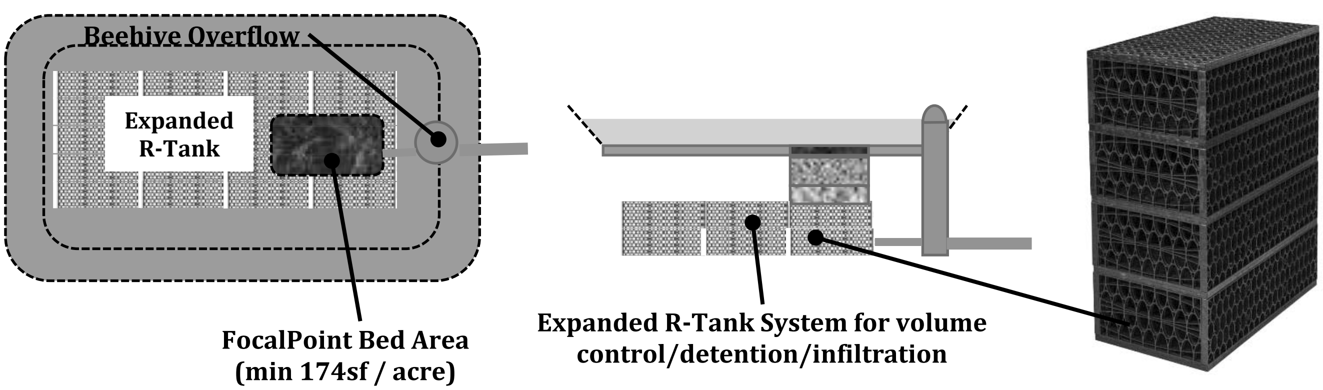
Water Quality (WQ) Treatment Only projects:

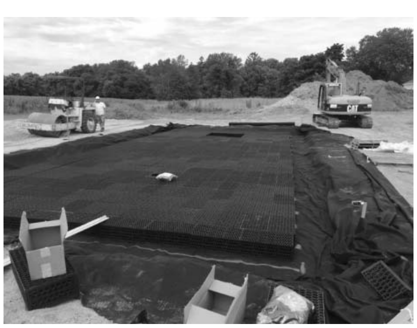
- The surface area of the FocalPoint media bed must be a minimum of **174 square feet per 1 acre of impervious area**
- The system must also be modelled in HydroCAD (or similar TR-55 modelling software) to demonstrate that the entire volume of a Type II or Type III (depending on region) 24 hr storm is treated prior to activation of the bypass/overflow (typically set at 6-12" above the mulch surface). Note: a 1.20 to 1.50 inch rainfall event typically generates 1.0 inches of runoff depending on watershed characteristics

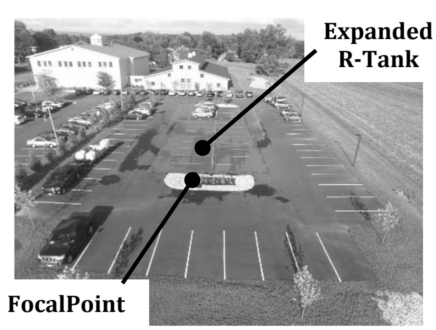


Managing Larger Storms (with expanded infiltration or detention):

The R-Tank modular underdrain at the bottom of the FocalPoint gives the designer the opportunity to satisfy both WQv, Channel Protection, Recharge and Detention for controlled release of major storm events all within one system. The R-Tank can be expanded both vertically and horizontally to meet the volume/storage goals to ensure runoff is not only treated by the FocalPoint but also achieves post development peak flowrate control. The benefit to designers is that the R-Tank portion of the system can be built under parking areas (H-20, HS-25 load rated) to improve site surface utilization.







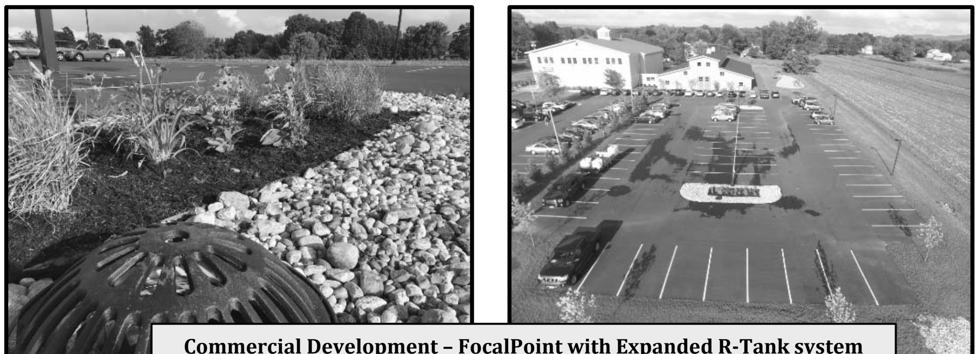
FocalPoint
BIOFILTRATION SYSTEMS

Site Development Project Examples:

Housing Development – FocalPoint with Expanded R-Tank system (Portland, ME)

Grant Funded WQ Project – FocalPoint (Ogunquit, ME)

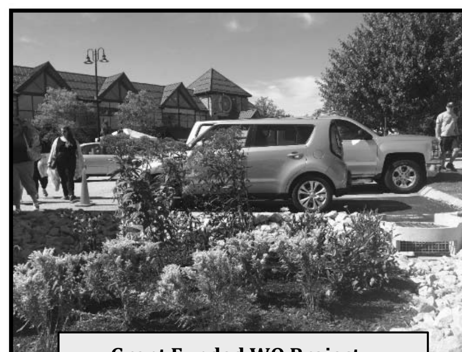
Site Development Project – FocalPoint (Portland, ME)



Commercial Development – FocalPoint with Expanded R-Tank system (Hadley, MA)

Urban Streetscape Project FocalPoint

Sports Facility – FocalPoint (Washington D.C.)



Grant Funded WQ Project – FocalPoint (Kittery, ME)

Urban Streetscape Installation FocalPoint

Premixed, certified FocalPoint Materials/Components

Site Development Project – FocalPoint with Expanded R-Tank – Newington NH

ACCESSORY ITEMS TO CONSIDER:

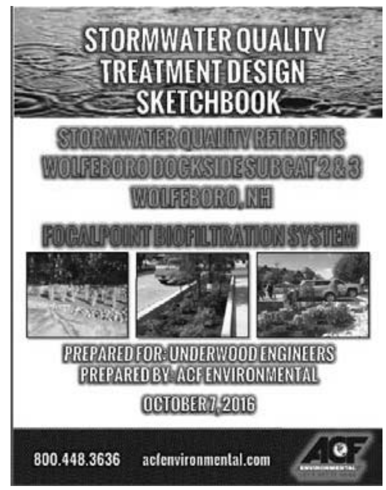
Rain Guardian Turret/Foxhole Curbline precast pretreatment unit for collection of sediment and energy dissipation.



ACF Beehive Overflow Filter Domed riser with geotextile insert for collection of gross solids during major storm events.


DESIGN SUPPORT:

ACF and Fabco's in house engineering support team provide site specific technical support to engineers, designers, landscape architects and contractors. ACF realizes that engineers today are working on several projects at one time and are always working against low engineering design budgets. The intent of our technical support is to not only provide you with product information but to work alongside you and develop solutions to your site development design challenges.



We offer site specific design computations and conceptual layout support at no charge which we typically bind up with all relevant attachments in a design "Sketchbook" - a helpful tool that ultimately brings value and saves you time and associated cost as you work through incorporating this innovative solution into your design plans.

CONTACT ACF ENVIRONMENTAL:

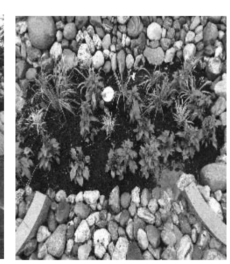
Bill Stoecker bill@energysmartsolutionsinc.com

BMP Specialist - Fabco Industries *(800) 559 2450*

Robert J Woodman – P.E., C.P.E.S.C rwoodman@acfenv.com

Senior Stormwater Engineer – ACF Environmental




ACF ENVIRONMENTAL
LET'S GET IT DONE

FocalPoint

BIOFILTRATION SYSTEMS

HIGH PERFORMANCE MODULAR BIOFILTRATION SYSTEM (HPMBS)

Operations & Maintenance

ACF ENVIRONMENTAL

Customer Focused, Environmentally Committed

GENERAL DESCRIPTION

The following general specifications describe the general operations and maintenance requirements for the FocalPoint® High Performance Modular Biofiltration System (HPMBS). The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, modular, constructed in place system designed to treat contaminated runoff.

Stormwater enters the FocalPoint® HPMBS, is filtered by the High Flow Biofiltration Media and passes through to the underdrain/storage system where the treated water is detained, retained or infiltrated to sub-soils, prior to discharge to the storm sewer system of any remaining flow.

Higher flows bypass the FocalPoint® HPMBS via a downstream inlet or other overflow conveyance. Maintenance is a simple, inexpensive and safe operation that does not require confined space entry, pumping or vacuum equipment, or specialized tools. Properly trained landscape personnel can effectively maintain FocalPoint® HPMBS by following instructions in this manual.

BASIC OPERATIONS

FocalPoint® is a modular, high performance biofiltration system that often works in tandem with other integrated management practices (IMP). Contaminated stormwater runoff enters the biofiltration bed through a conveyance swale, planter box, or directly through a curb cut or false inlet. Energy is dissipated by a rock or vegetative dissipation device and is absorbed by a 3-inch layer of aged, double shredded hardwood mulch, with fines removed, (when specified) on the surface of the biofiltration media.

As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the biofiltration media where the finer particles are removed and numerous chemical reactions take place to immobilize and capture pollutants in the soil media.

The cleansed water passes into the underdrain/storage system and remaining flows are directed to a storm sewer system or other appropriate discharge point. Once the pollutants are in the soil, bacteria begin to break down and metabolize the materials and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a variety of very complex biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

DESIGN AND INSTALLATION

Each project presents different scopes for the use of FocalPoint® HPMBS. To ensure the safe and specified function of this stormwater BMP, Convergent Water Technologies and/or its Value Added Resellers (VAR) review each application before supply. Information and design assistance is available to the design engineer during the planning process. Correct FocalPoint® sizing is essential to optimum performance. The engineer shall submit calculations for approval by the local jurisdiction when required. The contractor and/or VAR is responsible for the correct installation of FocalPoint® HPMBS units as described in approved plans. A comprehensive installation manual is available at www.convergentwater.com.

MAINTENANCE

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons for maintenance include:

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the lifespan of your FocalPoint® HPMBS.
- Avoid costly repairs.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the FocalPoint® HPMBS is required to continue effective pollutant removal from stormwater runoff before any discharge into downstream waters. This procedure will also extend the longevity of the living biofiltration system. The unit will recycle and accumulate pollutants within the biomass, but may also subjected to other materials entering the surface of the system. This may include trash, silt and leaves etc. which will be contained above the mulch and/or biofiltration media layer. Too much silt may inhibit the FocalPoint's® HPMBS flow rate, which is a primary reason for system maintenance. Removal of accumulated silt/sediment and/or replacement of the mulch layer (when specified), is an important activity that prevents over accumulation of such silt/sediment.

When to Maintain?

Convergent Water Technologies and/or its VAR includes a 1-year maintenance plan with each system purchased. Annual included maintenance consists of two (2) scheduled maintenance visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as when the site is appropriately stabilized, the unit is installed and activated (by VAR), i.e., when mulch (if specified) and plantings are added.

Activation should be avoided until the site is fully stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands. The fall visit helps the system by removing excessive leaf litter.

A first inspection to determine if maintenance is necessary should be performed at least twice annually after storm events of greater than (1) one inch total depth (subject to regional climate). Please refer to the maintenance checklist for specific conditions that indicate if maintenance is necessary.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required. Regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the VAR/Maintenance contractor and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the VAR/Maintenance contractor of any damage to the plant(s), which constitute(s) an integral part of the biofiltration technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance of the FocalPoint® HPMBS to the VAR/Maintenance contractor (i.e. no pruning or fertilizing).

EXCLUSION OF SERVICES

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant(s) in the FocalPoint® HPMBS.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the VAR/Maintenance contractor maintenance contract. Should a major contamination event occur, the Owner must block off the outlet pipe of the FocalPoint® (where the cleaned runoff drains to, such as drop-inlet) and block off the point where water enters of the FocalPoint® HPMBS. The VAR/Maintenance contractor should be informed immediately.

MAINTENANCE VISIT SUMMARY

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of FocalPoint® HPMBS and surrounding area

2. Removal of debris, trash and mulch

3. Mulch replacement

4. Plant health evaluation (including measurements) and pruning or replacement as necessary

5. Clean area around FocalPoint® HPMBS

6. Complete paperwork, including date stamped photos of the tasks listed above.

MAINTENANCE TOOLS, SAFETY EQUIPMENT AND SUPPLIES

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes.

Inspection of FocalPoint® HPMBS and surrounding area

Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

- Standing Water yes | no
- Is Bypass Inlet Clear? yes | no
- Damage to HPMBS System to Overflow conveyance yes | no

Removal of Silt / Sediment / Clay

Dig out silt (if any) and mulch and remove trash & foreign items.

- Silt / Clay Found? yes | no
- Cups / Bags Found? yes | no
- Leaves? yes | no
- Volume of material removed _______ (volume or weight)

Removal of debris, trash and mulch

After removal of mulch and debris, measure distance from the top of the FocalPoint® HPMBS engineered media soil to the flow line elevation of the adjacent overflow conveyance. If this distance is greater than that specified on the plans (typ. 6" - 12"), add media (not top soil or other) to recharge to the distance specified.

- Distance to media surface to flow line of overflow conveyance (inches) ____________
- # of Buckets of Media Added _________

Mulch Replacement

Most maintenance visits require only replacement mulch (if utilized) which must be, aged, double shredded hardwood mulch with fines removed. For smaller projects, one cubic foot of mulch will cover four square feet of biofiltration bed, and for larger projects, one cubic yard of mulch will cover 108 square feet of biofiltration bed. Some visits may require additional FocalPoint® HPMBS engineered soil media available from the VAR/Contractor.

- Add double shredded, aged hardwood mulch which has been screened to remove fines, evenly across the entire biofiltration media bed to a depth of 3".
- Clean accumulated sediment from energy dissipation system at the inlet to the FocalPoint® HPMBS to allow for entry of trash during a storm event.

Plant health evaluation and pruning or replacement as necessary

Examine the plant's health and replace if dead or dying.
Prune as necessary to encourage growth in the correct directions

- Height above Grate (feet) _______
- Width at Widest point (feet) _______
- Health alive | dead
- Damage to Plant yes | no

Clean area around FocalPoint® HPMBS

- Clean area around unit and remove all refuse to be disposed of appropriately.

Complete paperwork

- Deliver Maintenance Report and photographs as appropriate.
- Some jurisdictions may require submission of maintenance reports in accordance with approvals.
- It is the responsibility of the Owner to comply with local regulations.

FocalPoint

BIOFILTRATION SYSTEM

FocalPoint Warranty

Seller warrants goods sold hereunder against defects in materials and workmanship only, for a period of (1) year from date the Seller activates the system into service. Seller makes no other warranties, express or implied.

Seller's liability hereunder shall be conditioned upon the Buyer's installation, maintenance, and service of the goods in strict compliance with the written instructions and specifications provided by the Seller. Any deviation from Seller's instructions and specifications or any abuse or neglect shall void warranties.

In the event of any claim upon Seller's warranty, the burden shall be upon the Buyer to prove strict compliance with all instructions and specifications provided by the Seller.

Seller's liability hereunder shall be limited only to the cost or replacement of the goods. Buyer agrees that Seller shall not be liable for any consequential losses arising from the purchase, installation, and/or use of the goods.

Maintenance Checklist

Element	Problem	What To Check	Should Exist	Action
Inlet	Excessive sediment or trash accumulation	Accumulation of sediment or trash impair free flow of water into FocalPoint	Inlet free of obstructions allowing free flow into FocalPoint System	Sediments or trash should be removed
Mulch Cover	Trash and floatable debris accumulation	Excessive trash or debris accumulation.	Minimal trash or other debris on mulch cover	Trash and debris should be removed and mulch cover raked level. Ensure that bark nugget
Mulch Cover	Ponding of water on mulch cover	Ponding in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils	Stormwater should drain freely and evenly over mulch cover.	Contact VAR for advice.
Plants	Plants not growing, or in poor condition	Soil/mulch too wet, evidence of spill. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact VAR for advice.
Plants	Plant growth excessive	Plants should be appropriate to the species and location of FocalPoint		Trim/prune plants in accordance with typical landscaping and

R-TANK

STORMWATER DETENTION SYSTEM®

LD HD SD UD XD

ACF ENVIRONMENTAL

LET'S GET IT DONE®

More Stormwater Less Space

STORMWATER MANAGEMENT

Is your stormwater detention system taking up too much space? Bring it down to size with the R-Tank System, the most efficient and versatile underground stormwater storage system available today. Whether you need to reduce your system footprint to resolve a utility conflict or free up space for a future expansion, R-Tank will give you the smallest footprint, provide more options for vehicular loading and cover depths, and deliver more installation versatility than any other system around.

The R-Tank System includes five different module configurations, providing system height options from 2” to over 7’ tall. And it delivers support for HS-20 and HS-25 traffic with cover depths from 6” all the way up to over 16’. Whether you’re designing a project at the beach with minimal depth over the water table, or a deep system in the hills, R-Tank has you covered.

With an unlimited array of system footprints and configurations, R-Tank solves tough stormwater problems by perfectly adapting to the needs of your site. Give R-Tank a shot on your next project, and prepare to be impressed.

BENEFITS

High Capacity
- 95% void internal area

Strength
- Easily supports traffic loading from parking lots and roads
- Module options for HS-20 and HS-25 rating with cover depths from 6 inches to 16 feet

Design & Construction Versatility
- Combine modules into any shape to efficiently use space
- Vary height from 2 inches to 7 feet

Increased Infiltration and Exfiltration
- Outer shell is 90% open
- Increases groundwater recharge, reducing post-construction discharge volumes

Easy to Transport
- Can be supplied unassembled for reduced delivery costs

Lightweight and Quick to Install
- Installed by hand; no cranes required
- Reduces site access delays

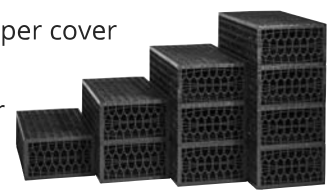
Recycled Content
- Manufactured with recycled polypropylene

R-TANK®

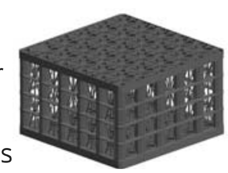
R-TANK® LD
- Light Duty module (30 psi)
- Ideal for applications in green space
- Not rated for vehicular traffic
- 12" Minimum cover, 36" maximum cover
- Four internal plates

R-TANK® HD
- Heavy Duty module (33.4 psi)
- Standard module for HS-20 traffic applications
- 20" Minimum cover, 84" Maximum cover
- Five internal plates

R-TANK® SD
- Super Duty module (42.9 psi)
- Higher safety factors for shallow traffic applications and deeper cover
- 18" Minimum cover, 120" Maximum cover
- Five internal plates



R-TANK UD
- Ultra Duty module (134.2 psi)
- Traffic loads with 12" of cover
- Available from 14" – 66" tall
- Ideal for high water table sites

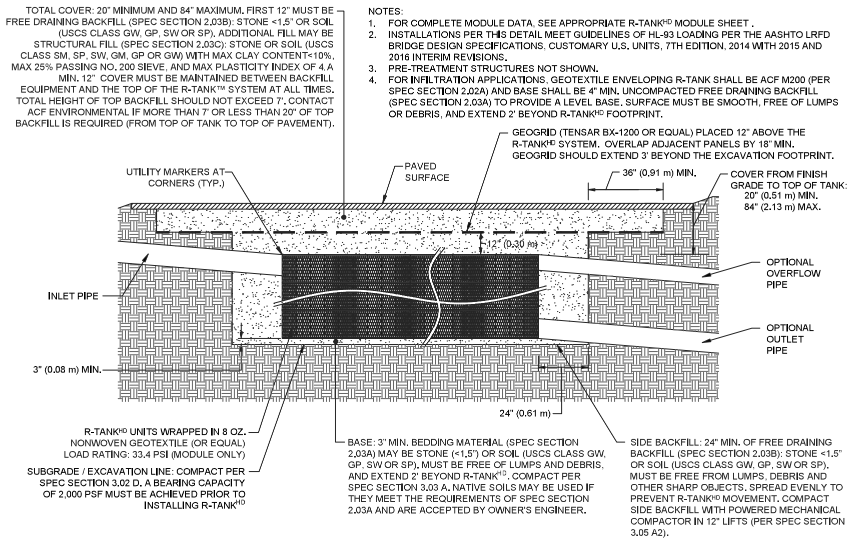


R-TANK® XD
- Extreme Duty module (320 psi)
- Traffic loads with 6" cover
- 16.5' maximum cover
- Available from 2" - 10' tall
- 90% void

DESIGN CONSIDERATIONS

Many factors will influence the design of the R-Tank® system. While this list is not intended to be all-inclusive, several design considerations are worth highlighting:

1. PRE-TREATMENT
2. BACKFILL MATERIALS
3. RUNOFF REDUCTION
4. WATER TABLE
5. CONSTRUCTION LOADS
6. LATERAL LOADS
7. R-TANK® MODULES
8. LOAD MODELING



1. PRE-TREATMENT

Removing pollutants from runoff before they enter an underground detention system is the only smart way to design & build a system. The best way to do that is with the Trash Guard Plus® (see page 6), but many other ways exist. Be sure the system you select will remove:

- Heavy Sediments
- Gross Pollutants (trash)
- Biodegradable Debris

2. BACKFILL MATERIALS

Backfill materials should be stone (smaller than 1.5" in diameter) or soil (GW, GP SW or SP as classified by the Unified Soil Classification System). Material must be free from lumps, debris and any sharp objects that could cut the geotextile. See the R-Tank® narrative specification section 2.03 for additional information.

3. RUNOFF REDUCTION

Most designs incorporate an outlet to drain the system at a controlled rate and/or an overflow to prevent flooding in extreme events. But be sure to take advantage of any infiltration you can achieve on the site. Consider raising the invert of your outlet or creating a sump to capture and infiltrate the water quality volume whenever possible.

4. WATER TABLE

While installing the R-Tank® below the water table is manageable, designers must be able to create a stable base and account for the system's ability to drain this water out or limit its ability to enter the system. If a liner is used to prevent ground water from entering the system, measures must be taken to prevent the system from floating.

5. CONSTRUCTION LOADS

Construction loads are often the heaviest loads the system will see throughout its life. Care must be taken during backfilling and compaction using the proper equipment (see specification section 3.05), and post-installation construction traffic should be routed around the system (Installation Guide step 12).

6. LATERAL LOADS

As systems get deeper, the loads acting on the sides of the tank increase. While vertical loads often control the design, be sure to consider lateral loading, as well.

7. R-TANK MODULES

Be sure to select the right module for your application. See the information on page 3 for more details on which module is the best fit. Also refer to the specifications for each module on the back of this brochure, or call us for assistance.

8. LOAD MODELING

A safety factor of 1.75 or higher is required when designing an R-Tank System using the AASHTO LRFD Bridge Design Specifications. Be sure to run your own loading model with all requirements specific to your site. Several example models can be found in our Tech Note on loading capabilities, and minimum cover requirements for various loads can be found in the spec on the back of this brochure.

LOW IMPACT DESIGN AND GREEN INFRASTRUCTURE

As much of the nation's Gray Infrastructure continues to decay, new concepts for a better way to rebuild it are emerging through Green Infrastructure (GI) and Low Impact Development (LID). This type of reconstruction moves beyond traditional systems that do ONE THING very well to systems that accomplish MULTIPLE objectives simultaneously. ACF has several technologies that dovetail with the goals of LID and GI that can play a significant role in the redevelopment process.

SPACE EFFICIENT SUBSURFACE STORAGE

R-TANK®

Pipe and stone are used in traditional systems to move and store runoff.
R-Tank does the same job, but with several additional benefits.

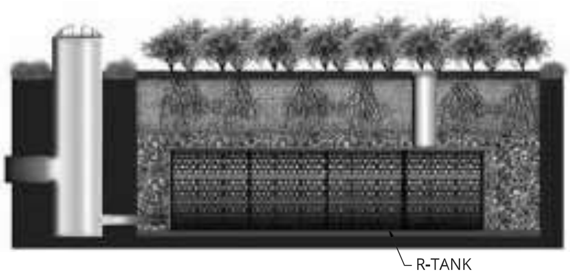
- Stores and moves runoff
- Open system encourages infiltration
- Stores 138% more water than stone
- Easily handles traffic loads beneath sidewalks and streets
- Ships flat to reduce site disturbance
- Moves water slowly, increasing time of concentration
- Fully accessible for maintenance
- Maximizes storage potential of GI practices like bioretention, street tree pits, etc.

VEGETATED/ BIOLOGICAL TREATMENT SYSTEM

FOCALPOINT

Traditional landscaping adds aesthetic value to projects, but has more potential. Many developers turn to bioretention, but are forced to surrender massive land areas and dedicate significant future funds to maintenance. FocalPoint reduces the space requirements and maintenance costs of bioretention by up to 90% while providing all the water purification benefits.

- Adds aesthetic value to properties
- Cleans runoff to improve water quality
- Reduces space requirements and maintenance costs of traditional bioretention systems
- Encourages infiltration to reduce volume of water discharged
- Pair with R-Tank® to maximize water storage and transport

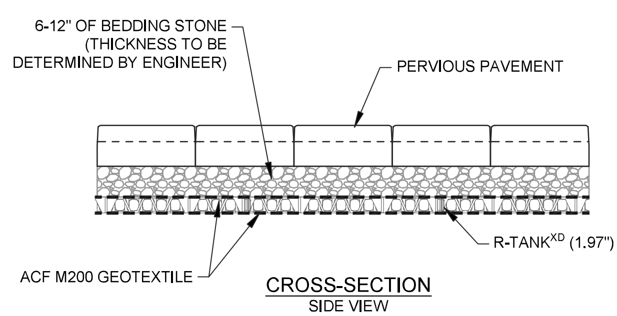


RUNOFF REDUCTION TECHNIQUES

PERMEABLE PAVEMENTS

Traditional pavements move vehicles efficiently, but are easily damaged by stormwater. ACF specializes in pervious pavements that handle traffic easily while providing surface infiltration rates 10 times higher than traditional pervious pavements. High surface infiltration rates reduce the expense of long-term maintenance and the headaches that go with it.

- Handles all vehicular loads
- Drains ten times faster than competing pervious pavements
- Reduces long-term maintenance costs
- Encourages infiltration
- Pair with R-Tank® to maximize water storage and transport



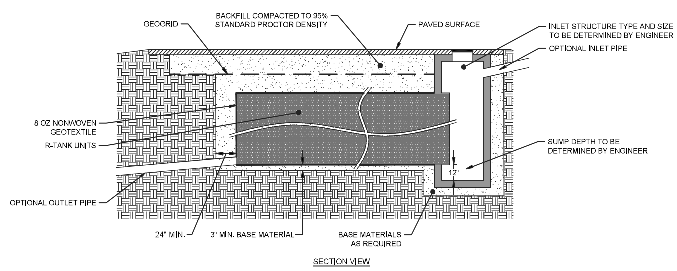
MAINTENANCE

Designing an R-Tank System with longevity and maintenance in mind is a simple three-step process:

1. PREVENT

Keep debris and sediment out of the system by pre-treating runoff with the Trash Guard Plus® unit (see below). For a more centralized approach, you could consider having the R-Tank units penetrate the connecting structure, which allows the use of the R-Tank® as its own trash screen. This works best with a structure that includes a sump (see drawing to right).

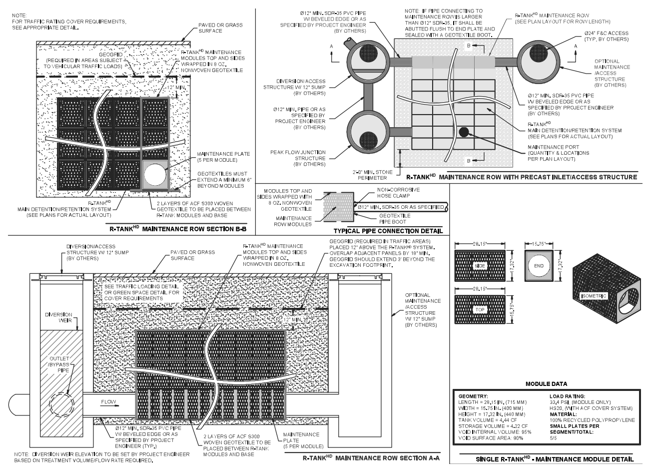
INLET CONNECTION



2. ISOLATE

Trap solid pollutants inside the maintenance row (see drawing to right) where they can be easily removed, using the Maintenance Modules (available in LD, HD, and UD only). These modules are wrapped in geotextile to retain solids and are fully accessible by conventional jet-vac systems to remove captured pollutants.

MAINTENANCE ROW



3. PROTECT

Ensure a long system life by including maintenance ports to remove any pollutants that evade the pre-treatment system and maintenance row. Maintenance ports should be specified within 10' of inlet and outlet connections, and roughly 50' on center (see detail on page 7).

MAINTENANCE PREVENTION

TRASH GUARD PLUS ®

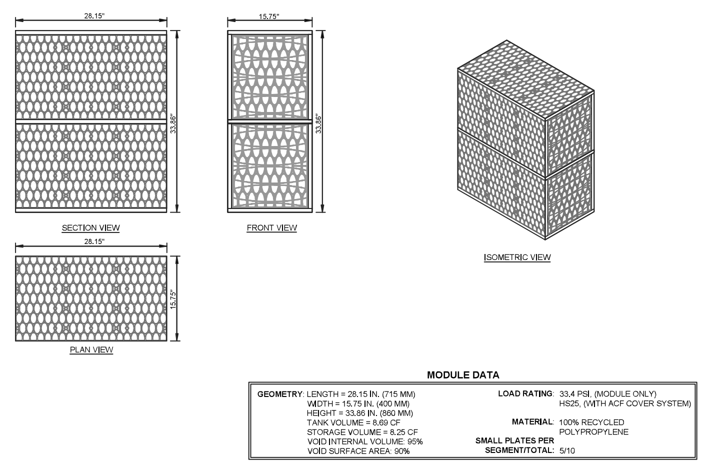
Trash Guard Plus® is a patented stormwater pretreatment device that captures debris, sediment and floatables. Easy to install and maintain, it is a fraction of the cost of other pretreatment devices.

Benefits of Trash Guard Plus®

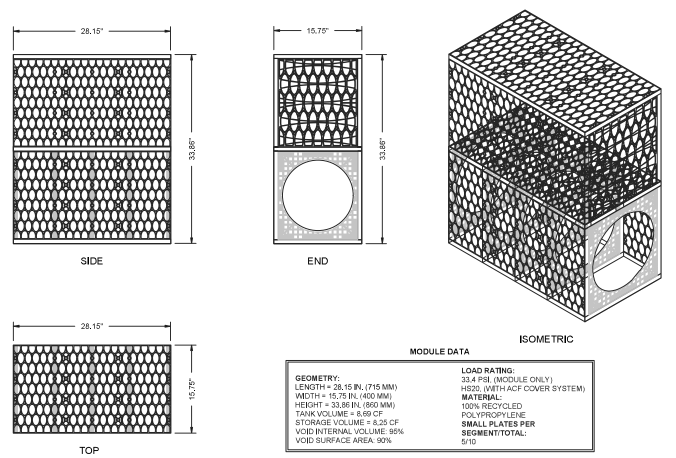
- Simple retrofit to existing catch basins
- Installs without heavy equipment
- Quick and easy assembly
- Adjusts to irregular catch basin bottoms and/or walls
- Eliminates eyesore stormwater trash at public parks, beaches, and waterways
- Removes harmful nutrients and regulated metals

CAD DRAWINGS

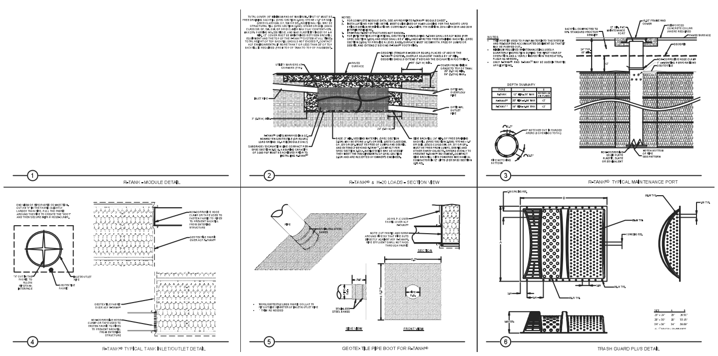
Module Drawing - Double



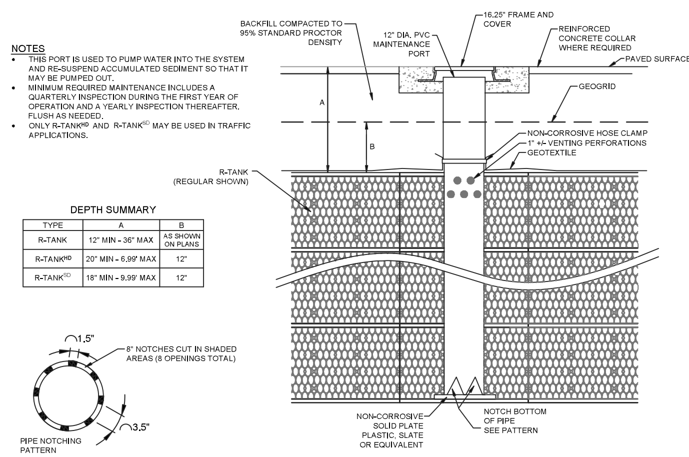
Maintenance Module - Double



Composite Details



Maintenance Port



Selecting the Right R-Tank Module

	Module				
Cover Depth* (Inches)	LD	HD	SD	UD	XD
Minimum 6"	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	HS-20
12"	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	HS-20**	HS-20
14"	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	HS-20	HS-20
18"	Green Space - No Traffic	Green Space - No Traffic	HS-20	HS-20	HS-20
20"	Green Space - No Traffic	HS-20	HS-20	HS-20	HS-20
24"	Green Space - No Traffic	HS-20	HS-20	HS-20	HS-20
36"	Green Space - No Traffic	HS-20	HS-20	HS-20	HS-20
48"	-	HS-20	HS-20	HS-20	HS-20
60"	-	HS-20	HS-20	HS-20	HS-20
72"	-	HS-20	HS-20	-	HS-20
84"	-	-	HS-20	-	HS-20
120"	-	-	HS-20	-	HS-20
160"	-	-	-	-	HS-20
Maximum 200"	-	-	-	-	HS-20

HS-20 designation based on AASHTO LRFD Bridge Design Specification for Single Lane Traffic

* *Cover depth is measured from the top of the module to the finished grade or top of pavement.*

** *The UD module requires STONE backfill (not soils) on the sides at this depth.*

R-TANK LD / R-TANK HD

Dimensions & Capacity

Module (Segments)	Width (inch)	Length (inch)	Height (in/ft)	Volume (cf)	Capacity (cf)	Weight* (lbs)
Mini	15.75	28.15	9.45"/0.79'	2.42	2.30	10.1/10.9
Single(1)	15.75	28.15	17.32"/1.44'	4.44	4.22	15.7/17.3
Single + Mini(1.5)	15.75	28.15	25.98"/2.17'	6.67	6.33	23.6/25.9
Double (2)	15.75	28.15	33.86"/2.82'	8.69	8.25	29.1/32.3
Double + Mini(2.5)	15.75	28.15	42.52"/3.54'	10.91	10.36	37.0/41.0
Triple (3)	15.75	28.15	50.39"/4.20'	12.93	12.28	42.5/47.4
Triple + Mini(3.5)	15.75	28.15	59.06"/4.92'	15.15	14.39	50.4/56.0
Quad(4)	15.75	28.15	66.93"/5.58'	17.17	16.31	55.9/62.4
Quad + Mini(4.5)	15.75	28.15	75.59"/6.30'	19.39	18.42	63.8/71.0
Pent(5)	15.75	28.15	83.46"/6.96'	21.41	20.34	69.3/77.4

*Weights shown are for LD/HD modules.

R-TANK SD

Dimensions & Capacity

Module (Segments)	Width (inch)	Length (inch)	Height (in/ft)	Volume (cf)	Capacity (cf)	Weight (lbs)
Single (1)	15.75	28.15	9.45"/0.79'	2.42	2.30	10.95
Double (2)	15.75	28.15	18.12"/1.51'	4.64	4.41	19.58
Triple (3)	15.75	28.15	26.79"/2.23'	6.86	6.52	28.21
Quad (4)	15.75	28.15	35.46"/2.96'	9.08	8.63	36.84
Pent (5)	15.75	28.15	44.13"/3.68'	11.30	10.74	45.47
Hex (6)	15.75	28.15	52.80"/4.40'	13.52	12.84	54.10
Septa (7)	15.75	28.15	61.47"/5.12'	15.74	14.95	62.73
Octo (8)	15.75	28.15	70.14"/5.85'	17.96	17.06	71.36
Nono (9)	15.75	28.15	78.81"/6.57'	20.18	19.17	79.99
Decka (10)	15.75	28.15	87.48"/7.29'	22.40	21.28	88.62

R-TANK UD

Dimensions & Capacity

Module (Segments)	Width (inch)	Length (inch)	Height (in/ft)	Volume (cf)	Capacity (cf)	Weight (lbs)
Single (1)	23.62	23.62	14.17"/1.18'	4.57	4.35	21.2
Double (2)	23.62	23.62	27.17"/2.26'	8.77	8.33	39.0
Triple (3)	23.62	23.62	40.16"/ 3.35'	12.97	12.32	56.8
Quad (4)	23.62	23.62	53.15"/4.43'	17.16	16.30	74.6
Pent (5)	23.62	23.62	66.14"/5.5'	21.35	20.29	92.4

R-TANK XD

Dimensions & Capacity

Module (Segments)	Width (inch)	Length (inch)	Height (inch)	Volume (cf)	Capacity (cf)	Weight (lbs)
Single (1)	19.68	23.62	1.97	0.53	0.48	4
Double (2)	19.68	23.62	3.94	1.06	0.95	8
Triple (3)	19.68	23.62	5.91	1.59	1.43	12
Quad (4)	19.68	23.62	7.87	2.12	1.91	16
Pent (5)	19.68	23.62	9.84	2.65	2.38	20

Note: XD modules may be stacked up to 10' tall (60 layers).

Specifications

Item	Description	LD	HD	SD	UD	XD
Void Area	Volume available for water storage	95%	95%	95%	95%	90%
Surface Area Void	% of exterior available for infiltration	90%	90%	90%	90%	90%
Compressive Strength	ASTM D2412 / ASTM F2418	30.0 psi	33.4	42.9 psi	134.2 psi	240.2 psi
Unit Weight	Weight of plastic/cubic foot of tank	3.29 lbs/cf	3.62 lbs/cf	3.96 lbs/cf	4.33 lbs/cf	7.55 lbs/cf
Rib Thickness	Thickness of load-bearing members	0.18 inches	0.18 inches	0.18 inches	-	-
Service Temperature	Safe temperature range for use	-14 - 167° F	-14 - 167° F	-14 - 167° F	-14 - 167° F	-14 - 167° F
Recycled Content	Use of recycle polypropylene	100%	100%	100%	100%	100%
Minimum Cover	Cover required for HS-20 loading	Not Traffic Rated	20"	18"	12"-14"	6"
Minimum Cover	Cover required for HS-25 loading	Not Traffic Rated	24"	18"	15"-17"	6"
Maximum Cover	Maximum allowable cover depth	3.0'	6.99'	9.99'	5.0'	16.7'

3 2018

FOCALPOINT

HIGH PERFORMANCE MODULAR BIOFILTRATION SYSTEM

NYS DEC DESIGN WORKSHEET/CHECKLIST

The New York State Department of Environmental Conservation (NYS DEC) has approved the FocalPoint (High Performance Modular Biofiltration System) as a proprietary stormwater management practice for use on New Development, Redevelopment and Retrofit Projects.

1. **FocalPoint Bed Area (min 174 square feet per acre of impervious area (e.g. 0.2 acres = 35 sf))**

- Tributary Impervious area = 0.44 ac. (A)
- Tributary Pervious area = 0.018 ac. (B)
- Min FocalPoint bed area req'd = (((A) x 1.0) + ((B) x 0.4)) * 174 = 77.8 sf.
- FocalPoint Bed Area provided * = 100 sf.
- Dimensions of Proposed FocalPoint = 2 ft x 50 ft

* see criteria 2. to determine if minimum size is appropriate.

2. **A Type II 24hr rainfall event that generates the WQ volume shall be modelled to demonstrate the entire storm volume is treated prior to activation of the overflow (typically set at 6-12" above the mulch) (Note: a 1.2 to 1.3" rainfall event usually generates 1 inch of runoff)** contact ACF for a sample HydroCAD node.

- Water Quality Volume Goal (WQv) = 2332 cubic feet
- Type II 24hr Rainfall Depth to generate WQv = 1.73 inches
- Temporary storage depth provided = 6" inches (typ 6" to 12")
- Temporary storage volume provided at above depth = 336.5 cubic feet.
- Peak ponding depth from Type II 24hr storm event = 5.5" inches

3. **Size Harco Domed Overflow Riser**

- Domed Overflow Riser:
  - Rim Elev of Overflow Riser: = ____________ (typ 6-12" above mulch surface)
  - Overflow Riser Diameter = ____________ (12, 15, 18, 24 or 30" dia)
  - 6" invert in Elev from FocalPoint = ____________ (typ 3 ft below mulch surface)
  - ___" invert out Elev = ____________
- Or other (spillway/weir etc) ☐

4. **RRv, Channel Protection and Flood Control/Peak flow attenuation of major storms**

- The treated flow and bypass flow can be routed to a detention system either an open pond, or a subsurface system such as an expanded R-Tank system (contact ACF for additional information on designing expanded R-Tank systems)

5. **The Design shall be reviewed by the manufacturer's representative prior to submission and installation will be overseen by the manufacturer's representative.**

- The Design has been reviewed by ACF Environmental ☐
- Engineer will coordinate installation inspection with ACF ☐

Contact ACF Environmental at 1800 448 3636 with any questions
or contact Rob Woodman – Senior Stormwater Engineer at rwoodman@acfenv.com

11.) Stormwater Management Construction Checklists