

November 19, 2025

Revision 1: 12-22-25

To: Massachusetts Association of Conservation Commissions
10 Juniper Road
Belmont, MA 02478
T. 617-489-3930

Subject: Derby Academy - Drainage Memo

Location: 56 Burditt Ave, Hingham, MA 02043



Civil • Survey • Structural • Environmental • Design
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Broad Perspective, Exact Execution.

Drainage Memo

This drainage memo has been prepared in reference to the proposed air handler for Derby Academy located at 56 Burditt Ave, Hingham MA. The purpose of this memorandum is to document existing and proposed drainage conditions within the project area and satisfy stormwater requirements as applicable.

In the existing condition, the project area is comprised of maintained lawn and a paved walkway immediately northeast of the existing Derby Academy Gymnasium. Runoff from this area flows overland past moderate slopes north to Broad Cove. The project area has been conglomerated into a single watershed consistent with the terminus flow patterns of the subwatershed. According to the USDA web soil survey accessed October 6th 2025, soils in the general area are classified as a gravelly fine sandy loam with a depth to water table at 80 inches below original grade and infiltration rate of 5.95 in/hr. The soils shall be verified onsite and a soil evaluation and perk test are pending. Based on FEMA FIRMette accessed September 3rd, 2025, the project is not located within a flood zone. See the attached plans and FIRMette attachment.

Under proposed conditions, the air handler on top of a concrete pad, associated maintenance access on all sides of the air handler and the retaining wall make up the first subwatershed. The remainder of the site retains its maintained lawn pervious coverage and is designated in separate subwatersheds. Within the elevated air handler pad site is a crushed stone bed with perforated subdrain to collect runoff from the impervious areas of the subwatershed. This crushed stone bed is designed to provide pretreatment and discharge to a system of Cultec Infiltrators. The infiltration system is designed to store and infiltrate the flow to the system with an overflow upstream the system to provide relief during larger sized storm events. This overflow outlet has been designed to ensure no hydrostatic pressure builds up behind the proposed retaining wall. The infiltration system has been properly sized to ensure proposed conditions satisfy the water quality treatment requirement of Massachusetts Stormwater Handbook Standard 1.

The Massachusetts Stormwater Handbook, specifically Volume 1 Standard 2, states that the post-development peak discharge rates being equal or lesser than pre-development rates may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04. Since the site discharges directly to Broad Cove, this standard has been considered waived for the design of this project. Even though the standard is waived and the peak flows are required to be reduced, as seen below, the runoff volume is reduced in all storm events and there is only a minor increase in the peak flows.

Design Point 1L - Overland Flow			
Peak Flow Rate (cfs)			
Design Storm	Existing	Proposed	Change
WQ Storm (1")	0.00	0.00	0.00
1 - Year	0.00	0.00	0.00
2 - Year	0.01	0.00	-0.01
10 - Year	0.08	0.06	-0.02
25 - Year	0.14	0.18	0.04
100 - Year	0.25	0.27	0.02
Peak Volume (cf)			
Design Storm	Existing	Proposed	Change
WQ Storm (1")	0	0	0
1 - Year	40	0	-40
2 - Year	87	0	-87
10 - Year	307	58	-249
25 - Year	487	184	-303
100 - Year	807	402	-405

Standard 3 – groundwater recharge, has been satisfied based on the water quality calculations of the proposed infiltration best management practice (BMP) as found attached. The crushed stone bed providing pretreatment to the infiltration system is best classified as an infiltration trench. A Total Suspended Solids (TSS) removal calc can be found attached displaying compliance with Standard 4.

The site, the rear facing façade of a primary educational facility, does not qualify as a land use with higher potential pollutant loads (LUHPPL) and thus Standard 5 is not applicable. Broad Cove does not contain any critical resource as defined under Standard 6 and so is not applicable to this project. The nature of the proposed project is an expansion of previously developed land. As such, this site classifies as a redevelopment project. As described herewithin, the applicable standards have been meet or exceeded conforming to the requirements of Standard 7 – Redevelopment.

Erosion and sediment control measures have been developed for this project and are included in the construction drawings as attached. These plans show the proposed locations for erosion control devices. The following supplemental provisions are also a part of this plan. Erosion and sedimentation control measures which are proposed to be implemented during construction and include the installation of silt socks and silt fencing which has the bottom 6 inches buried in the ground. All exposed construction areas will be stabilized upon completion in order to minimize the time that these areas are not stabilized. With the full impact of the measures presented on the Erosion and Sedimentation Control Plans, Standard 8 will be satisfied.

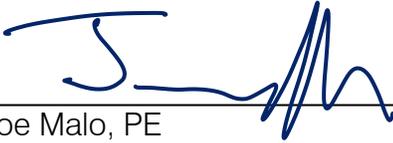
A Long Term Operation and Maintenance Plan (O&M Plan) has been attached to satisfy the requirements set forth in Standard 9. Likewise, an illicit discharge statement has been included to satisfy Standard 10.

A hydrological analysis has been conducted to determine the infiltrator size required to provide water quality volume for the new impervious the project provides. The subwatersheds as described above was entered into HydroCAD Version 10.20-5c to calculate the post-runoff rates and size an appropriate system. The required water quality volume is 208 cubic foot of runoff as calculated in the attached water quality volume spreadsheet. The infiltration system has been designed to treat 210 cubic feet of runoff, satisfying this requirement. The pre and post HydroCAD analysis can be found attached to this memorandum.

In summary, the proposed condition yields a net increase in impervious area which is designed to be treated by the crushed stone bed with pipe conveyance and Cultec infiltration system as deigned in the attached supporting documentation. The design and configuration of the gravel trench subdrain and stormwater infiltration practices provide a defined path for runoff treatment and management.

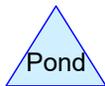
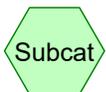
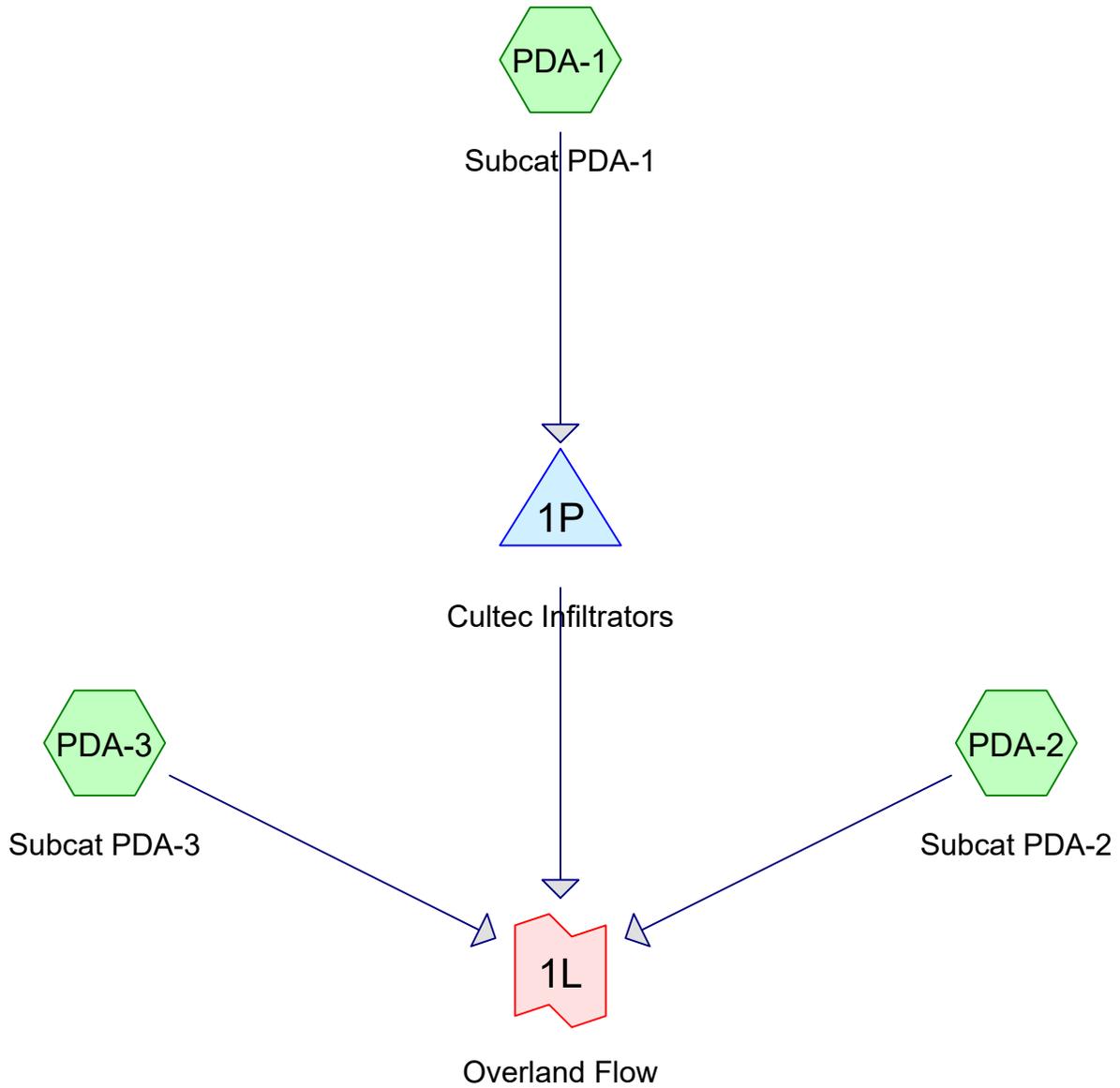
Should you have any questions or comments, please do not hesitate to reach out to my office (401.683.6630) or email me at ebuzzi@nei-cds.com

Sincerely,



Joe Malo, PE
VP (Narragansett Engineering Inc)





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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC	P2 (inches)
1	WQv	Type III 24-hr		Default	24.00	1	1.20	2	3.40
2	1-Year	Type III 24-hr		Default	24.00	1	2.79	2	3.40
3	2-Year	Type III 24-hr		Default	24.00	1	3.40	2	3.40
4	10-Year	Type III 24-hr		Default	24.00	1	5.24	2	3.40
5	25-Year	Type III 24-hr		Default	24.00	1	6.39	2	3.40
6	100-Year	Type III 24-hr		Default	24.00	1	8.16	2	3.40

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
860	39	>75% Grass cover, Good, HSG A (PDA-1, PDA-2, PDA-3)
2,492	98	Paved parking, HSG A (PDA-1, PDA-2)
3,351	83	TOTAL AREA

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Type III 24-hr WQv Rainfall=1.20", P2=3.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PDA-1: Subcat PDA-1 Runoff Area=2,736 sf 91.05% Impervious Runoff Depth>0.61"
Tc=6.0 min CN=93 Runoff=0.04 cfs 139 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=462 sf 0.03% Impervious Runoff Depth=0.00"
Tc=0.0 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment PDA-3: Subcat PDA-3 Runoff Area=153 sf 0.00% Impervious Runoff Depth=0.00"
Tc=0.0 min CN=39 Runoff=0.00 cfs 0 cf

Pond 1P: Cultec Infiltrators Peak Elev=9.54' Storage=4 cf Inflow=0.04 cfs 139 cf
Discarded=0.04 cfs 139 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 139 cf

Link 1L: Overland Flow Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 3,351 sf Runoff Volume = 139 cf Average Runoff Depth = 0.50"
25.65% Pervious = 860 sf 74.35% Impervious = 2,492 sf

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Type III 24-hr WQv Rainfall=1.20", P2=3.40"

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Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 139 cf, Depth> 0.61"
Routed to Pond 1P : Cultec Infiltrators

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Rainfall=1.20", P2=3.40"

Area (sf)	CN	Description
245	39	>75% Grass cover, Good, HSG A
2,492	98	Paved parking, HSG A
2,736	93	Weighted Average
245		8.95% Pervious Area
2,492		91.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Rainfall=1.20", P2=3.40"

Area (sf)	CN	Description
462	39	>75% Grass cover, Good, HSG A
0	98	Paved parking, HSG A
462	39	Weighted Average
462		99.97% Pervious Area
0		0.03% Impervious Area

Summary for Subcatchment PDA-3: Subcat PDA-3

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr WQv Rainfall=1.20", P2=3.40"

Area (sf)	CN	Description
153	39	>75% Grass cover, Good, HSG A
153		100.00% Pervious Area

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Type III 24-hr WQv Rainfall=1.20", P2=3.40"

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Summary for Pond 1P: Cultec Infiltrators

Inflow Area = 2,736 sf, 91.05% Impervious, Inflow Depth > 0.61" for WQv event
 Inflow = 0.04 cfs @ 12.09 hrs, Volume= 139 cf
 Outflow = 0.04 cfs @ 12.12 hrs, Volume= 139 cf, Atten= 5%, Lag= 1.5 min
 Discarded = 0.04 cfs @ 12.12 hrs, Volume= 139 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 1L : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 9.54' @ 12.12 hrs Surf.Area= 325 sf Storage= 4 cf

Plug-Flow detention time= 1.6 min calculated for 139 cf (100% of inflow)
 Center-of-Mass det. time= 1.4 min (832.8 - 831.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	331 cf	37.50'W x 8.67'L x 4.00'H Field A 1,300 cf Overall - 297 cf Embedded = 1,003 cf x 33.0% Voids
#2A	10.00'	297 cf	Cultec R-360HD x 6 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 6 Chambers in 6 Rows Cap Storage= 6.5 cf x 2 x 6 rows = 77.5 cf
		628 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	13.50'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	9.50'	5.950 in/hr Exfiltration over Surface area
#2	Primary	11.00'	4.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.12 hrs HW=9.54' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.50' (Free Discharge)

↑**2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Link 1L: Overland Flow

Inflow Area = 3,351 sf, 74.35% Impervious, Inflow Depth = 0.00" for WQv event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

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Type III 24-hr 1-Year Rainfall=2.79", P2=3.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PDA-1: Subcat PDA-1 Runoff Area=2,736 sf 91.05% Impervious Runoff Depth>2.05"
Tc=6.0 min CN=93 Runoff=0.14 cfs 468 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=462 sf 0.03% Impervious Runoff Depth=0.00"
Tc=0.0 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment PDA-3: Subcat PDA-3 Runoff Area=153 sf 0.00% Impervious Runoff Depth=0.00"
Tc=0.0 min CN=39 Runoff=0.00 cfs 0 cf

Pond 1P: Cultec Infiltrators Peak Elev=10.14' Storage=80 cf Inflow=0.14 cfs 468 cf
Discarded=0.04 cfs 468 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 468 cf

Link 1L: Overland Flow Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 3,351 sf Runoff Volume = 468 cf Average Runoff Depth = 1.68"
25.65% Pervious = 860 sf 74.35% Impervious = 2,492 sf

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Type III 24-hr 1-Year Rainfall=2.79", P2=3.40"

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Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 0.14 cfs @ 12.09 hrs, Volume= 468 cf, Depth> 2.05"
Routed to Pond 1P : Cultec Infiltrators

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.79", P2=3.40"

Area (sf)	CN	Description
245	39	>75% Grass cover, Good, HSG A
2,492	98	Paved parking, HSG A
2,736	93	Weighted Average
245		8.95% Pervious Area
2,492		91.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.79", P2=3.40"

Area (sf)	CN	Description
462	39	>75% Grass cover, Good, HSG A
0	98	Paved parking, HSG A
462	39	Weighted Average
462		99.97% Pervious Area
0		0.03% Impervious Area

Summary for Subcatchment PDA-3: Subcat PDA-3

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.79", P2=3.40"

Area (sf)	CN	Description
153	39	>75% Grass cover, Good, HSG A
153		100.00% Pervious Area

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Type III 24-hr 1-Year Rainfall=2.79", P2=3.40"

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Summary for Pond 1P: Cultec Infiltrators

Inflow Area = 2,736 sf, 91.05% Impervious, Inflow Depth > 2.05" for 1-Year event
 Inflow = 0.14 cfs @ 12.09 hrs, Volume= 468 cf
 Outflow = 0.04 cfs @ 11.90 hrs, Volume= 468 cf, Atten= 69%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 11.90 hrs, Volume= 468 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 1L : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 10.14' @ 12.41 hrs Surf.Area= 325 sf Storage= 80 cf

Plug-Flow detention time= 9.2 min calculated for 468 cf (100% of inflow)
 Center-of-Mass det. time= 9.0 min (806.0 - 797.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	331 cf	37.50'W x 8.67'L x 4.00'H Field A 1,300 cf Overall - 297 cf Embedded = 1,003 cf x 33.0% Voids
#2A	10.00'	297 cf	Cultec R-360HD x 6 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 6 Chambers in 6 Rows Cap Storage= 6.5 cf x 2 x 6 rows = 77.5 cf
		628 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	13.50'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	9.50'	5.950 in/hr Exfiltration over Surface area
#2	Primary	11.00'	4.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 11.90 hrs HW=9.55' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.50' (Free Discharge)

↑**2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Link 1L: Overland Flow

Inflow Area = 3,351 sf, 74.35% Impervious, Inflow Depth = 0.00" for 1-Year event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

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Type III 24-hr 2-Year Rainfall=3.40", P2=3.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PDA-1: Subcat PDA-1 Runoff Area=2,736 sf 91.05% Impervious Runoff Depth>2.64"
Tc=6.0 min CN=93 Runoff=0.18 cfs 601 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=462 sf 0.03% Impervious Runoff Depth>0.00"
Tc=0.0 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment PDA-3: Subcat PDA-3 Runoff Area=153 sf 0.00% Impervious Runoff Depth>0.00"
Tc=0.0 min CN=39 Runoff=0.00 cfs 0 cf

Pond 1P: Cultec Infiltrators Peak Elev=10.38' Storage=130 cf Inflow=0.18 cfs 601 cf
Discarded=0.04 cfs 601 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 601 cf

Link 1L: Overland Flow Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 3,351 sf Runoff Volume = 601 cf Average Runoff Depth = 2.15"
25.65% Pervious = 860 sf 74.35% Impervious = 2,492 sf

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Type III 24-hr 2-Year Rainfall=3.40", P2=3.40"

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Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 601 cf, Depth> 2.64"
Routed to Pond 1P : Cultec Infiltrators

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40", P2=3.40"

Area (sf)	CN	Description
245	39	>75% Grass cover, Good, HSG A
2,492	98	Paved parking, HSG A
2,736	93	Weighted Average
245		8.95% Pervious Area
2,492		91.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 0.00 cfs @ 23.34 hrs, Volume= 0 cf, Depth> 0.00"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40", P2=3.40"

Area (sf)	CN	Description
462	39	>75% Grass cover, Good, HSG A
0	98	Paved parking, HSG A
462	39	Weighted Average
462		99.97% Pervious Area
0		0.03% Impervious Area

Summary for Subcatchment PDA-3: Subcat PDA-3

Runoff = 0.00 cfs @ 23.34 hrs, Volume= 0 cf, Depth> 0.00"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40", P2=3.40"

Area (sf)	CN	Description
153	39	>75% Grass cover, Good, HSG A
153		100.00% Pervious Area

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Type III 24-hr 2-Year Rainfall=3.40", P2=3.40"

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Summary for Pond 1P: Cultec Infiltrators

Inflow Area = 2,736 sf, 91.05% Impervious, Inflow Depth > 2.64" for 2-Year event
 Inflow = 0.18 cfs @ 12.09 hrs, Volume= 601 cf
 Outflow = 0.04 cfs @ 11.80 hrs, Volume= 601 cf, Atten= 76%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 11.80 hrs, Volume= 601 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 1L : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 10.38' @ 12.47 hrs Surf.Area= 325 sf Storage= 130 cf

Plug-Flow detention time= 15.3 min calculated for 601 cf (100% of inflow)
 Center-of-Mass det. time= 15.1 min (805.2 - 790.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	331 cf	37.50'W x 8.67'L x 4.00'H Field A 1,300 cf Overall - 297 cf Embedded = 1,003 cf x 33.0% Voids
#2A	10.00'	297 cf	Cultec R-360HD x 6 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 6 Chambers in 6 Rows Cap Storage= 6.5 cf x 2 x 6 rows = 77.5 cf
		628 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	13.50'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	9.50'	5.950 in/hr Exfiltration over Surface area
#2	Primary	11.00'	4.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 11.80 hrs HW=9.55' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.50' (Free Discharge)
 ↑**2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Link 1L: Overland Flow

Inflow Area = 3,351 sf, 74.35% Impervious, Inflow Depth > 0.00" for 2-Year event
 Inflow = 0.00 cfs @ 23.34 hrs, Volume= 0 cf
 Primary = 0.00 cfs @ 23.34 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

25.0126 Proposed

Type III 24-hr 10-Year Rainfall=5.24", P2=3.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PDA-1: Subcat PDA-1 Runoff Area=2,736 sf 91.05% Impervious Runoff Depth>4.43"
Tc=6.0 min CN=93 Runoff=0.30 cfs 1,010 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=462 sf 0.03% Impervious Runoff Depth>0.25"
Tc=0.0 min CN=39 Runoff=0.00 cfs 10 cf

Subcatchment PDA-3: Subcat PDA-3 Runoff Area=153 sf 0.00% Impervious Runoff Depth>0.25"
Tc=0.0 min CN=39 Runoff=0.00 cfs 3 cf

Pond 1P: Cultec Infiltrators Peak Elev=11.07' Storage=261 cf Inflow=0.30 cfs 1,010 cf
Discarded=0.04 cfs 965 cf Primary=0.06 cfs 45 cf Outflow=0.10 cfs 1,010 cf

Link 1L: Overland Flow Inflow=0.06 cfs 58 cf
Primary=0.06 cfs 58 cf

Total Runoff Area = 3,351 sf Runoff Volume = 1,023 cf Average Runoff Depth = 3.66"
25.65% Pervious = 860 sf 74.35% Impervious = 2,492 sf

25.0126 Proposed

Type III 24-hr 10-Year Rainfall=5.24", P2=3.40"

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Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 0.30 cfs @ 12.09 hrs, Volume= 1,010 cf, Depth> 4.43"
Routed to Pond 1P : Cultec Infiltrators

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.24", P2=3.40"

Area (sf)	CN	Description
245	39	>75% Grass cover, Good, HSG A
2,492	98	Paved parking, HSG A
2,736	93	Weighted Average
245		8.95% Pervious Area
2,492		91.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 0.00 cfs @ 12.34 hrs, Volume= 10 cf, Depth> 0.25"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.24", P2=3.40"

Area (sf)	CN	Description
462	39	>75% Grass cover, Good, HSG A
0	98	Paved parking, HSG A
462	39	Weighted Average
462		99.97% Pervious Area
0		0.03% Impervious Area

Summary for Subcatchment PDA-3: Subcat PDA-3

Runoff = 0.00 cfs @ 12.34 hrs, Volume= 3 cf, Depth> 0.25"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.24", P2=3.40"

Area (sf)	CN	Description
153	39	>75% Grass cover, Good, HSG A
153		100.00% Pervious Area

25.0126 Proposed

Type III 24-hr 10-Year Rainfall=5.24", P2=3.40"

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Summary for Pond 1P: Cultec Infiltrators

Inflow Area = 2,736 sf, 91.05% Impervious, Inflow Depth > 4.43" for 10-Year event
 Inflow = 0.30 cfs @ 12.09 hrs, Volume= 1,010 cf
 Outflow = 0.10 cfs @ 12.37 hrs, Volume= 1,010 cf, Atten= 65%, Lag= 17.2 min
 Discarded = 0.04 cfs @ 11.65 hrs, Volume= 965 cf
 Primary = 0.06 cfs @ 12.37 hrs, Volume= 45 cf
 Routed to Link 1L : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 11.07' @ 12.37 hrs Surf.Area= 325 sf Storage= 261 cf

Plug-Flow detention time= 32.0 min calculated for 1,008 cf (100% of inflow)
 Center-of-Mass det. time= 31.8 min (808.2 - 776.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	331 cf	37.50'W x 8.67'L x 4.00'H Field A 1,300 cf Overall - 297 cf Embedded = 1,003 cf x 33.0% Voids
#2A	10.00'	297 cf	Cultec R-360HD x 6 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 6 Chambers in 6 Rows Cap Storage= 6.5 cf x 2 x 6 rows = 77.5 cf
		628 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	13.50'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	9.50'	5.950 in/hr Exfiltration over Surface area
#2	Primary	11.00'	4.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 11.65 hrs HW=9.54' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.06 cfs @ 12.37 hrs HW=11.06' (Free Discharge)
 ↑**2=Orifice/Grate** (Weir Controls 0.06 cfs @ 0.83 fps)

Summary for Link 1L: Overland Flow

Inflow Area = 3,351 sf, 74.35% Impervious, Inflow Depth > 0.21" for 10-Year event
 Inflow = 0.06 cfs @ 12.37 hrs, Volume= 58 cf
 Primary = 0.06 cfs @ 12.37 hrs, Volume= 58 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

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Type III 24-hr 25-Year Rainfall=6.39", P2=3.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PDA-1: Subcat PDA-1 Runoff Area=2,736 sf 91.05% Impervious Runoff Depth>5.56"
Tc=6.0 min CN=93 Runoff=0.37 cfs 1,269 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=462 sf 0.03% Impervious Runoff Depth>0.56"
Tc=0.0 min CN=39 Runoff=0.00 cfs 22 cf

Subcatchment PDA-3: Subcat PDA-3 Runoff Area=153 sf 0.00% Impervious Runoff Depth>0.56"
Tc=0.0 min CN=39 Runoff=0.00 cfs 7 cf

Pond 1P: Cultec Infiltrators Peak Elev=11.16' Storage=278 cf Inflow=0.37 cfs 1,269 cf
Discarded=0.04 cfs 1,113 cf Primary=0.18 cfs 156 cf Outflow=0.22 cfs 1,269 cf

Link 1L: Overland Flow Inflow=0.18 cfs 184 cf
Primary=0.18 cfs 184 cf

Total Runoff Area = 3,351 sf Runoff Volume = 1,298 cf Average Runoff Depth = 4.65"
25.65% Pervious = 860 sf 74.35% Impervious = 2,492 sf

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Type III 24-hr 25-Year Rainfall=6.39", P2=3.40"

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Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 0.37 cfs @ 12.09 hrs, Volume= 1,269 cf, Depth> 5.56"
Routed to Pond 1P : Cultec Infiltrators

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.39", P2=3.40"

Area (sf)	CN	Description
245	39	>75% Grass cover, Good, HSG A
2,492	98	Paved parking, HSG A
2,736	93	Weighted Average
245		8.95% Pervious Area
2,492		91.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 0.00 cfs @ 12.22 hrs, Volume= 22 cf, Depth> 0.56"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.39", P2=3.40"

Area (sf)	CN	Description
462	39	>75% Grass cover, Good, HSG A
0	98	Paved parking, HSG A
462	39	Weighted Average
462		99.97% Pervious Area
0		0.03% Impervious Area

Summary for Subcatchment PDA-3: Subcat PDA-3

Runoff = 0.00 cfs @ 12.22 hrs, Volume= 7 cf, Depth> 0.56"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.39", P2=3.40"

Area (sf)	CN	Description
153	39	>75% Grass cover, Good, HSG A
153		100.00% Pervious Area

25.0126 Proposed

Type III 24-hr 25-Year Rainfall=6.39", P2=3.40"

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Summary for Pond 1P: Cultec Infiltrators

Inflow Area = 2,736 sf, 91.05% Impervious, Inflow Depth > 5.56" for 25-Year event
 Inflow = 0.37 cfs @ 12.09 hrs, Volume= 1,269 cf
 Outflow = 0.22 cfs @ 12.22 hrs, Volume= 1,269 cf, Atten= 40%, Lag= 8.1 min
 Discarded = 0.04 cfs @ 11.60 hrs, Volume= 1,113 cf
 Primary = 0.18 cfs @ 12.22 hrs, Volume= 156 cf
 Routed to Link 1L : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 11.16' @ 12.22 hrs Surf.Area= 325 sf Storage= 278 cf

Plug-Flow detention time= 30.0 min calculated for 1,269 cf (100% of inflow)
 Center-of-Mass det. time= 29.8 min (800.6 - 770.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	331 cf	37.50'W x 8.67'L x 4.00'H Field A 1,300 cf Overall - 297 cf Embedded = 1,003 cf x 33.0% Voids
#2A	10.00'	297 cf	Cultec R-360HD x 6 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 6 Chambers in 6 Rows Cap Storage= 6.5 cf x 2 x 6 rows = 77.5 cf
		628 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	13.50'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	9.50'	5.950 in/hr Exfiltration over Surface area
#2	Primary	11.00'	4.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 11.60 hrs HW=9.54' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)**Primary OutFlow** Max=0.16 cfs @ 12.22 hrs HW=11.15' (Free Discharge)↑**2=Orifice/Grate** (Orifice Controls 0.16 cfs @ 1.84 fps)**Summary for Link 1L: Overland Flow**

Inflow Area = 3,351 sf, 74.35% Impervious, Inflow Depth > 0.66" for 25-Year event
 Inflow = 0.18 cfs @ 12.22 hrs, Volume= 184 cf
 Primary = 0.18 cfs @ 12.22 hrs, Volume= 184 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

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Type III 24-hr 100-Year Rainfall=8.16", P2=3.40"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PDA-1: Subcat PDA-1 Runoff Area=2,736 sf 91.05% Impervious Runoff Depth>7.32"
Tc=6.0 min CN=93 Runoff=0.48 cfs 1,668 cf

Subcatchment PDA-2: Subcat PDA-2 Runoff Area=462 sf 0.03% Impervious Runoff Depth>1.22"
Tc=0.0 min CN=39 Runoff=0.01 cfs 47 cf

Subcatchment PDA-3: Subcat PDA-3 Runoff Area=153 sf 0.00% Impervious Runoff Depth>1.22"
Tc=0.0 min CN=39 Runoff=0.00 cfs 16 cf

Pond 1P: Cultec Infiltrators Peak Elev=11.39' Storage=320 cf Inflow=0.48 cfs 1,668 cf
Discarded=0.04 cfs 1,329 cf Primary=0.26 cfs 339 cf Outflow=0.31 cfs 1,668 cf

Link 1L: Overland Flow Inflow=0.27 cfs 402 cf
Primary=0.27 cfs 402 cf

Total Runoff Area = 3,351 sf Runoff Volume = 1,731 cf Average Runoff Depth = 6.20"
25.65% Pervious = 860 sf 74.35% Impervious = 2,492 sf

25.0126 Proposed

Type III 24-hr 100-Year Rainfall=8.16", P2=3.40"

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Summary for Subcatchment PDA-1: Subcat PDA-1

Runoff = 0.48 cfs @ 12.09 hrs, Volume= 1,668 cf, Depth> 7.32"
Routed to Pond 1P : Cultec Infiltrators

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16", P2=3.40"

Area (sf)	CN	Description
245	39	>75% Grass cover, Good, HSG A
2,492	98	Paved parking, HSG A
2,736	93	Weighted Average
245		8.95% Pervious Area
2,492		91.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Direct (Less than 6 mins)

Summary for Subcatchment PDA-2: Subcat PDA-2

Runoff = 0.01 cfs @ 12.03 hrs, Volume= 47 cf, Depth> 1.22"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16", P2=3.40"

Area (sf)	CN	Description
462	39	>75% Grass cover, Good, HSG A
0	98	Paved parking, HSG A
462	39	Weighted Average
462		99.97% Pervious Area
0		0.03% Impervious Area

Summary for Subcatchment PDA-3: Subcat PDA-3

Runoff = 0.00 cfs @ 12.03 hrs, Volume= 16 cf, Depth> 1.22"
Routed to Link 1L : Overland Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16", P2=3.40"

Area (sf)	CN	Description
153	39	>75% Grass cover, Good, HSG A
153		100.00% Pervious Area

25.0126 Proposed

Type III 24-hr 100-Year Rainfall=8.16", P2=3.40"

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Summary for Pond 1P: Cultec Infiltrators

Inflow Area = 2,736 sf, 91.05% Impervious, Inflow Depth > 7.32" for 100-Year event
 Inflow = 0.48 cfs @ 12.09 hrs, Volume= 1,668 cf
 Outflow = 0.31 cfs @ 12.19 hrs, Volume= 1,668 cf, Atten= 36%, Lag= 6.3 min
 Discarded = 0.04 cfs @ 11.35 hrs, Volume= 1,329 cf
 Primary = 0.26 cfs @ 12.19 hrs, Volume= 339 cf
 Routed to Link 1L : Overland Flow

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 11.39' @ 12.19 hrs Surf.Area= 325 sf Storage= 320 cf

Plug-Flow detention time= 28.4 min calculated for 1,665 cf (100% of inflow)
 Center-of-Mass det. time= 28.1 min (792.6 - 764.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	331 cf	37.50'W x 8.67'L x 4.00'H Field A 1,300 cf Overall - 297 cf Embedded = 1,003 cf x 33.0% Voids
#2A	10.00'	297 cf	Cultec R-360HD x 6 Inside #1 Effective Size= 54.9"W x 36.0"H => 9.99 sf x 3.67'L = 36.6 cf Overall Size= 60.0"W x 36.0"H x 4.17'L with 0.50' Overlap 6 Chambers in 6 Rows Cap Storage= 6.5 cf x 2 x 6 rows = 77.5 cf
		628 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	13.50'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	9.50'	5.950 in/hr Exfiltration over Surface area
#2	Primary	11.00'	4.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 11.35 hrs HW=9.54' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.26 cfs @ 12.19 hrs HW=11.38' (Free Discharge)
 ↳ **2=Orifice/Grate** (Orifice Controls 0.26 cfs @ 2.98 fps)

Summary for Link 1L: Overland Flow

Inflow Area = 3,351 sf, 74.35% Impervious, Inflow Depth > 1.44" for 100-Year event
 Inflow = 0.27 cfs @ 12.19 hrs, Volume= 402 cf
 Primary = 0.27 cfs @ 12.19 hrs, Volume= 402 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs