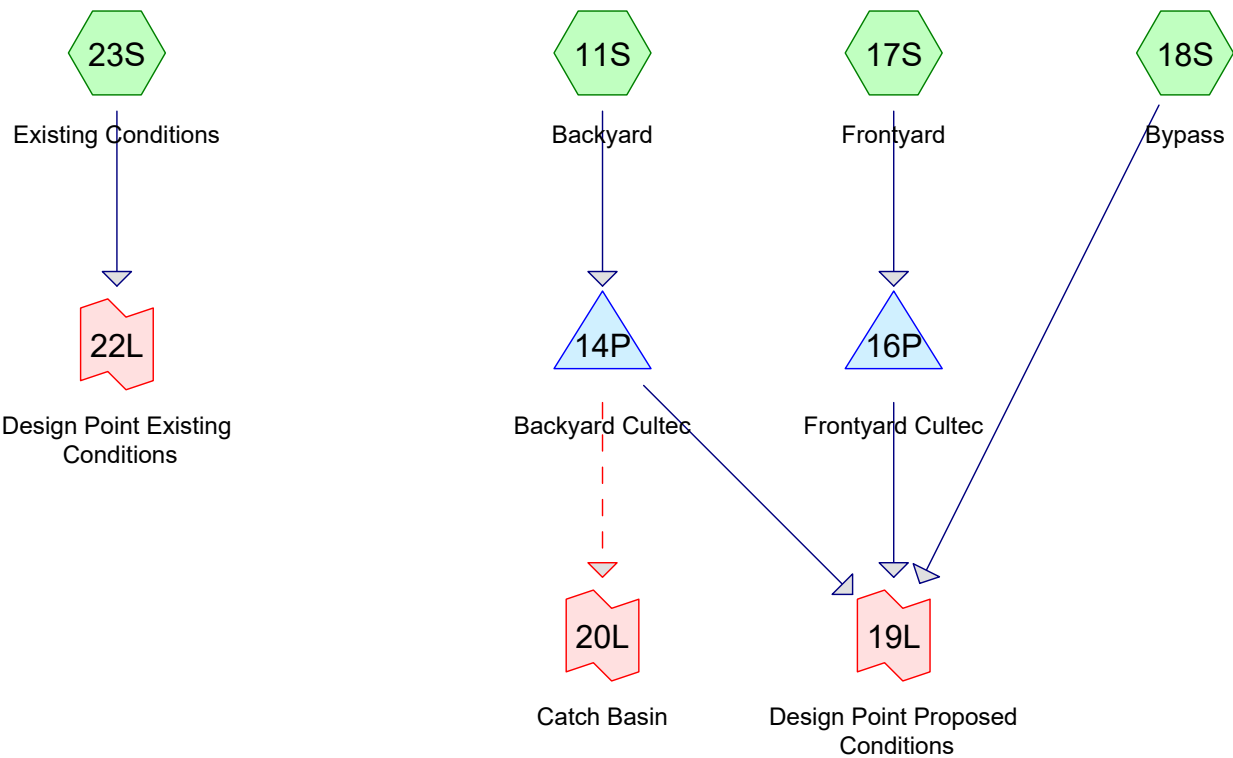
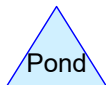


Subcat



Reach



Pond



Link

Routing Diagram for 51 Beechdale Road Drainage - Cultec - with pump
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51 Beechdale Road Drainage - Cultec - with pump

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Page 2

Project Notes

Rainfall events imported from "Pipe sizing.hcp"

51 Beechdale Road Drainage - Cultec - with pump

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Page 3

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.921	61	Soil B Grass (11S, 17S, 18S)
0.079	98	Soil B Impervious (11S, 17S)
4.000	70	Soil B Residential (23S)
2.000	60	Soil B Wooded (23S)
12.000	64	TOTAL AREA

51 Beechdale Road Drainage - Cultec - with pump

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Page 4

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
12.000	Other	11S, 17S, 18S, 23S
12.000		TOTAL AREA

51 Beechdale Road Drainage - Cultec - with pump

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Page 5

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	5.921	5.921	Soil B Grass	11S, 17S, 18S
0.000	0.000	0.000	0.000	0.079	0.079	Soil B Impervious	11S, 17S
0.000	0.000	0.000	0.000	4.000	4.000	Soil B Residential	23S
0.000	0.000	0.000	0.000	2.000	2.000	Soil B Wooded	23S
0.000	0.000	0.000	0.000	12.000	12.000	TOTAL AREA	

51 Beechdale Road Drainage - Cultec - with pump Type III 24-hr 100-Year Rainfall=9.28"

Prepared by James J. Hahn Engineering, P.C.

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Page 6

Time span=5.00-40.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment11S: Backyard Runoff Area=0.177 ac 26.55% Impervious Runoff Depth=5.71"
Tc=6.0 min CN=71 Runoff=1.16 cfs 0.084 af

Subcatchment17S: Frontyard Runoff Area=0.202 ac 15.84% Impervious Runoff Depth=5.20"
Tc=6.0 min CN=67 Runoff=1.21 cfs 0.088 af

Subcatchment18S: Bypass Runoff Area=5.621 ac 0.00% Impervious Runoff Depth=4.45"
Tc=6.0 min CN=61 Runoff=28.65 cfs 2.083 af

Subcatchment23S: Existing Conditions Runoff Area=6.000 ac 0.00% Impervious Runoff Depth=5.20"
Flow Length=500' Tc=6.6 min CN=67 Runoff=35.35 cfs 2.602 af

Pond 14P: Backyard Cultec Peak Elev=438.75' Storage=0.032 af Inflow=1.16 cfs 0.084 af
Discarded=0.06 cfs 0.057 af Primary=0.00 cfs 0.000 af Secondary=0.88 cfs 0.028 af Outflow=0.94 cfs 0.084 af

Pond 16P: Frontyard Cultec Peak Elev=442.18' Storage=0.017 af Inflow=1.21 cfs 0.088 af
Discarded=0.06 cfs 0.046 af Primary=1.19 cfs 0.041 af Outflow=1.24 cfs 0.088 af

Link 19L: Design Point Proposed Conditions Inflow=28.96 cfs 2.124 af
Primary=28.96 cfs 2.124 af

Link 20L: Catch Basin Inflow=0.88 cfs 0.028 af
Primary=0.88 cfs 0.028 af

Link 22L: Design Point Existing Conditions Inflow=35.35 cfs 2.602 af
Primary=35.35 cfs 2.602 af

Total Runoff Area = 12.000 ac Runoff Volume = 4.857 af Average Runoff Depth = 4.86"
99.34% Pervious = 11.921 ac 0.66% Impervious = 0.079 ac

Summary for Subcatchment 11S: Backyard

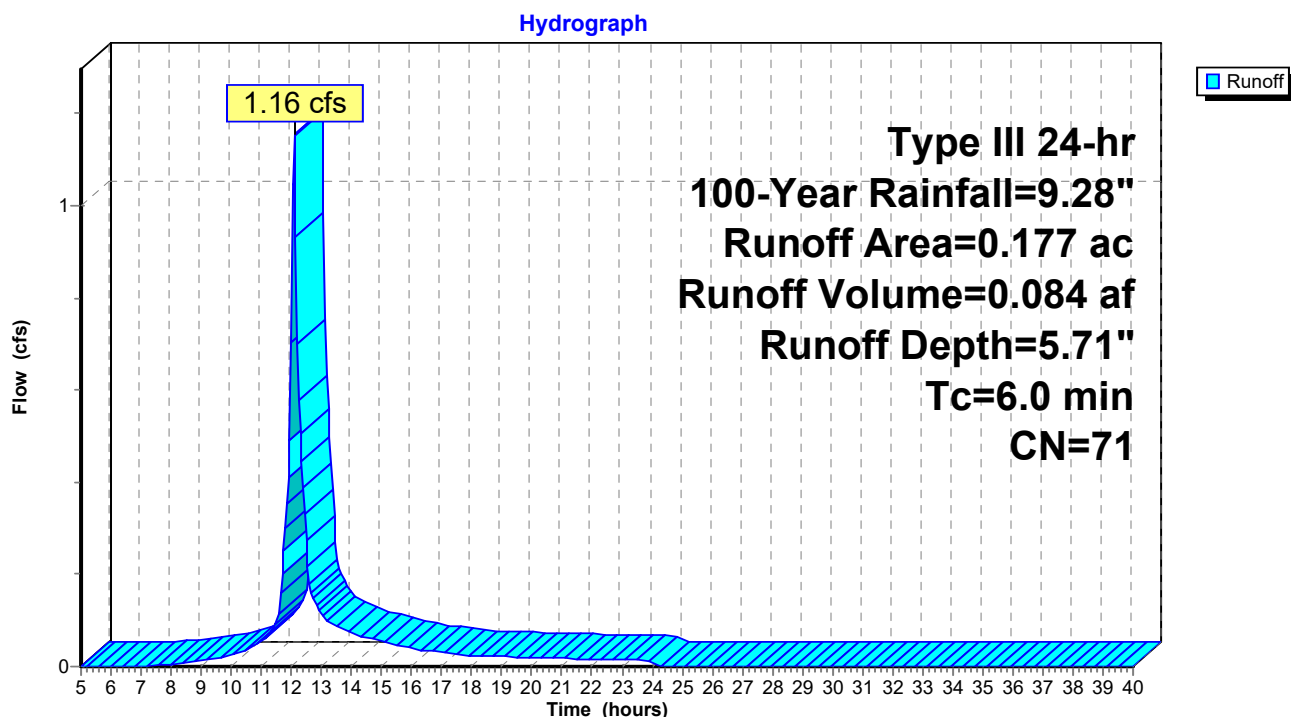
Runoff = 1.16 cfs @ 12.09 hrs, Volume= 0.084 af, Depth= 5.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
* 0.130	61	Soil B Grass
* 0.047	98	Soil B Impervious
0.177	71	Weighted Average
0.130		73.45% Pervious Area
0.047		26.55% Impervious Area

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

Subcatchment 11S: Backyard



Summary for Subcatchment 17S: Frontyard

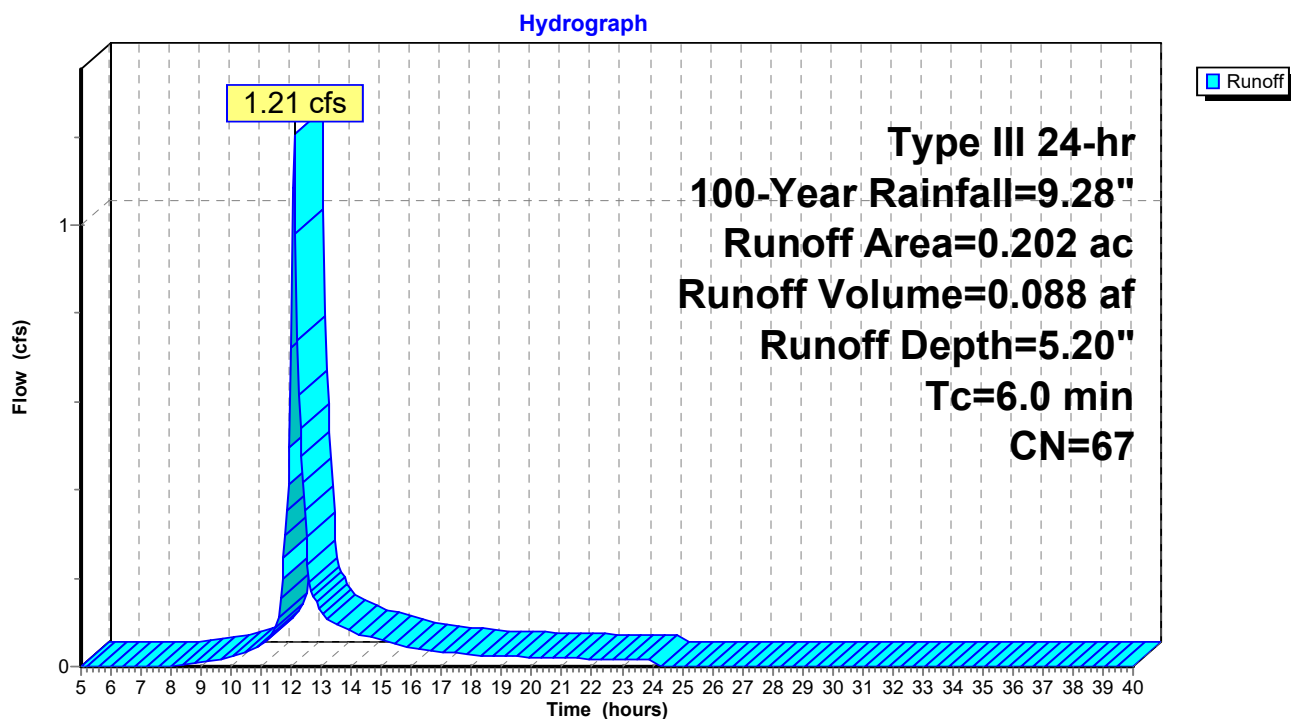
Runoff = 1.21 cfs @ 12.09 hrs, Volume= 0.088 af, Depth= 5.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
* 0.032	98	Soil B Impervious
* 0.170	61	Soil B Grass
0.202	67	Weighted Average
0.170		84.16% Pervious Area
0.032		15.84% Impervious Area

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

Subcatchment 17S: Frontyard



Summary for Subcatchment 18S: Bypass

Runoff = 28.65 cfs @ 12.09 hrs, Volume= 2.083 af, Depth= 4.45"

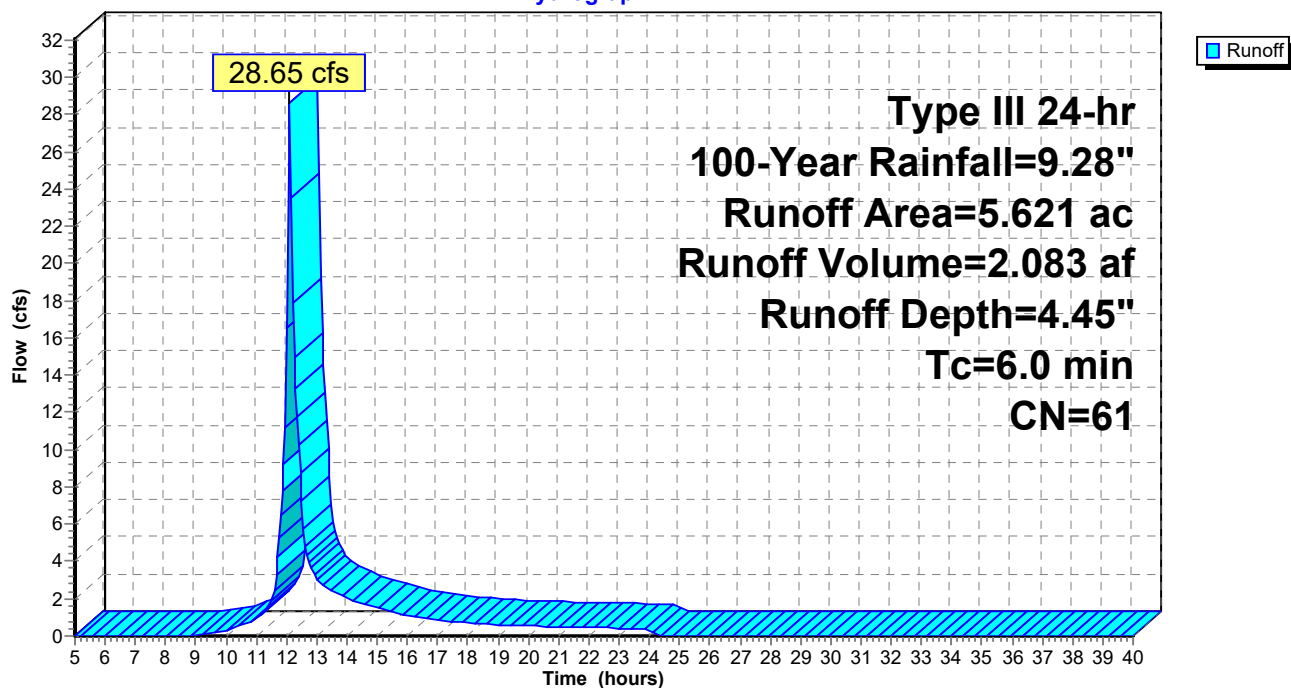
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
* 5.621	61	Soil B Grass
5.621		100.00% Pervious Area

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

Subcatchment 18S: Bypass

Hydrograph



Summary for Subcatchment 23S: Existing Conditions

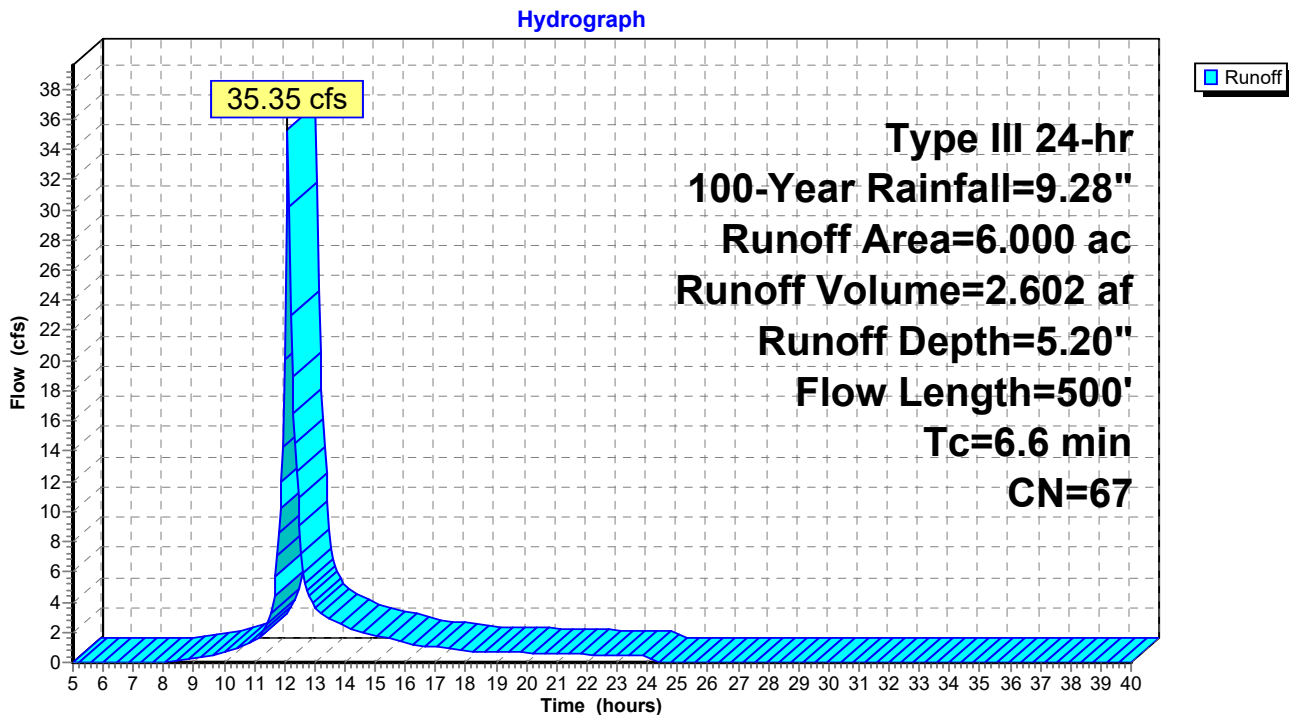
Runoff = 35.35 cfs @ 12.10 hrs, Volume= 2.602 af, Depth= 5.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=9.28"

Area (ac)	CN	Description
* 2.000	60	Soil B Wooded
* 4.000	70	Soil B Residential
6.000	67	Weighted Average
6.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	100	0.0800	0.31		Sheet Flow, Segment 1 Grass: Short n= 0.150 P2= 3.50"
0.4	100	0.0600	3.94		Shallow Concentrated Flow, Segment 2 Unpaved Kv= 16.1 fps
0.8	300	0.0130	6.27	18.80	Channel Flow, Segment 3 Area= 3.0 sf Perim= 9.0' r= 0.33' n= 0.013
6.6	500	Total			

Subcatchment 23S: Existing Conditions



51 Beechdale Road Drainage - Cultec - with pump Type III 24-hr 100-Year Rainfall=9.28"

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Page 11

Summary for Pond 14P: Backyard Cultec

Inflow Area = 0.177 ac, 26.55% Impervious, Inflow Depth = 5.71" for 100-Year event
 Inflow = 1.16 cfs @ 12.09 hrs, Volume= 0.084 af
 Outflow = 0.94 cfs @ 12.45 hrs, Volume= 0.084 af, Atten= 18%, Lag= 21.5 min
 Discarded = 0.06 cfs @ 11.20 hrs, Volume= 0.057 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Secondary = 0.88 cfs @ 12.45 hrs, Volume= 0.028 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
 Peak Elev= 438.75' @ 12.40 hrs Surf.Area= 0.017 ac Storage= 0.032 af

Plug-Flow detention time= 64.8 min calculated for 0.084 af (100% of inflow)
 Center-of-Mass det. time= 64.7 min (881.1 - 816.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	436.00'	0.015 af	11.17'W x 66.50'L x 3.54'H Field A 0.060 af Overall - 0.022 af Embedded = 0.038 af x 40.0% Voids
#2A	436.50'	0.022 af	Cultec R-330XLHD x 18 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		0.037 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices (Turned on 1 times)
#1	Discarded	436.00'	3.500 in/hr Exfiltration over Surface area Phase-In= 0.04'
#2	Secondary	438.75'	Pump Discharges@440.00' Turns Off<437.00' Flow (gpm)= 100.0 160.0 210.0 265.0 310.0 350.0 400.0 Head (feet)= 45.00 40.00 35.00 30.00 25.00 20.00 0.00
#3	Primary	438.90'	6.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.06 cfs @ 11.20 hrs HW=436.04' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.06 cfs)**Primary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=436.00' TW=0.00' (Dynamic Tailwater)↑**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)**Secondary OutFlow** Max=0.88 cfs @ 12.45 hrs HW=438.63' TW=438.00' (Dynamic Tailwater)↑**2=Pump** (Pump Controls 0.88 cfs)

Pond 14P: Backyard Cultec - Chamber Wizard Field A

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

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

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

Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

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

9 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 64.50' Row Length +12.0" End Stone x 2 =
66.50' Base Length

2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width

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

18 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 961.2 cf Chamber Storage

2,630.0 cf Field - 961.2 cf Chambers = 1,668.8 cf Stone x 40.0% Voids = 667.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,628.7 cf = 0.037 af

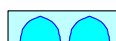
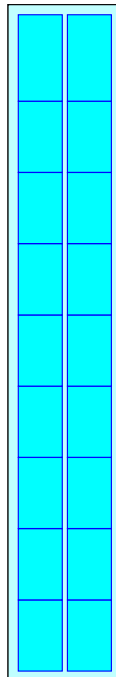
Overall Storage Efficiency = 61.9%

Overall System Size = 66.50' x 11.17' x 3.54'

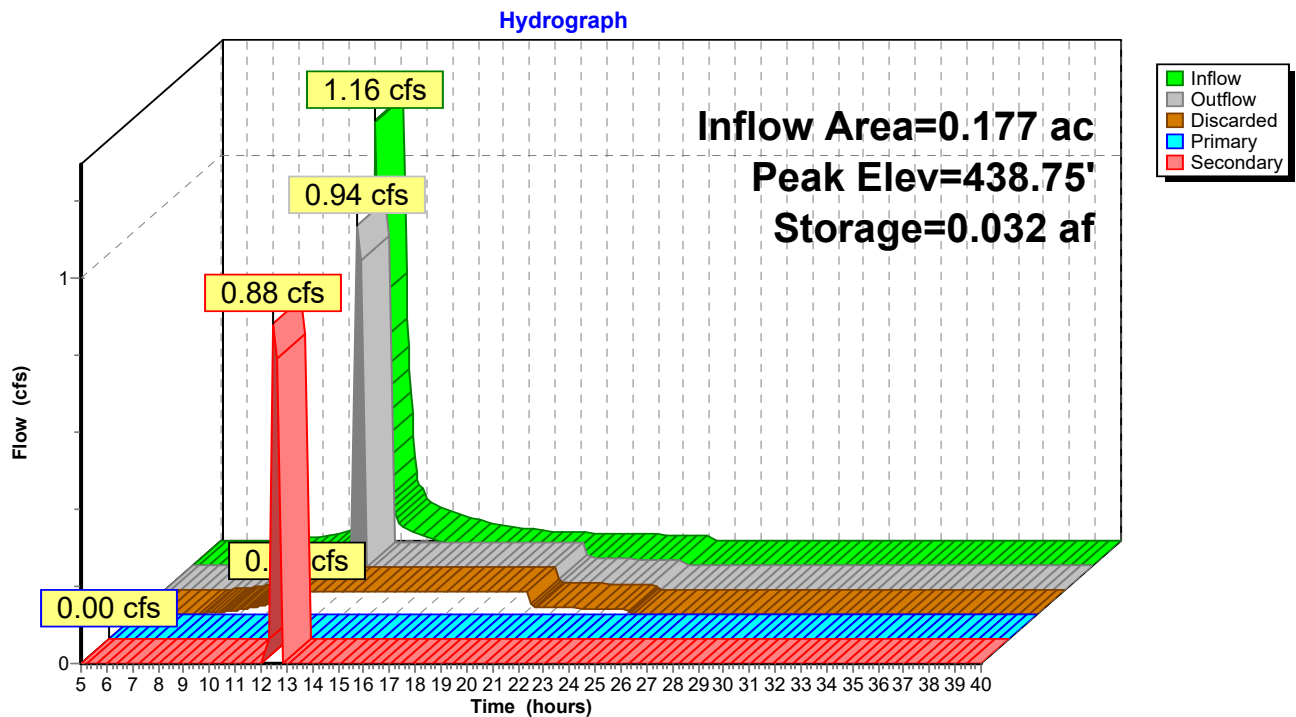
18 Chambers

97.4 cy Field

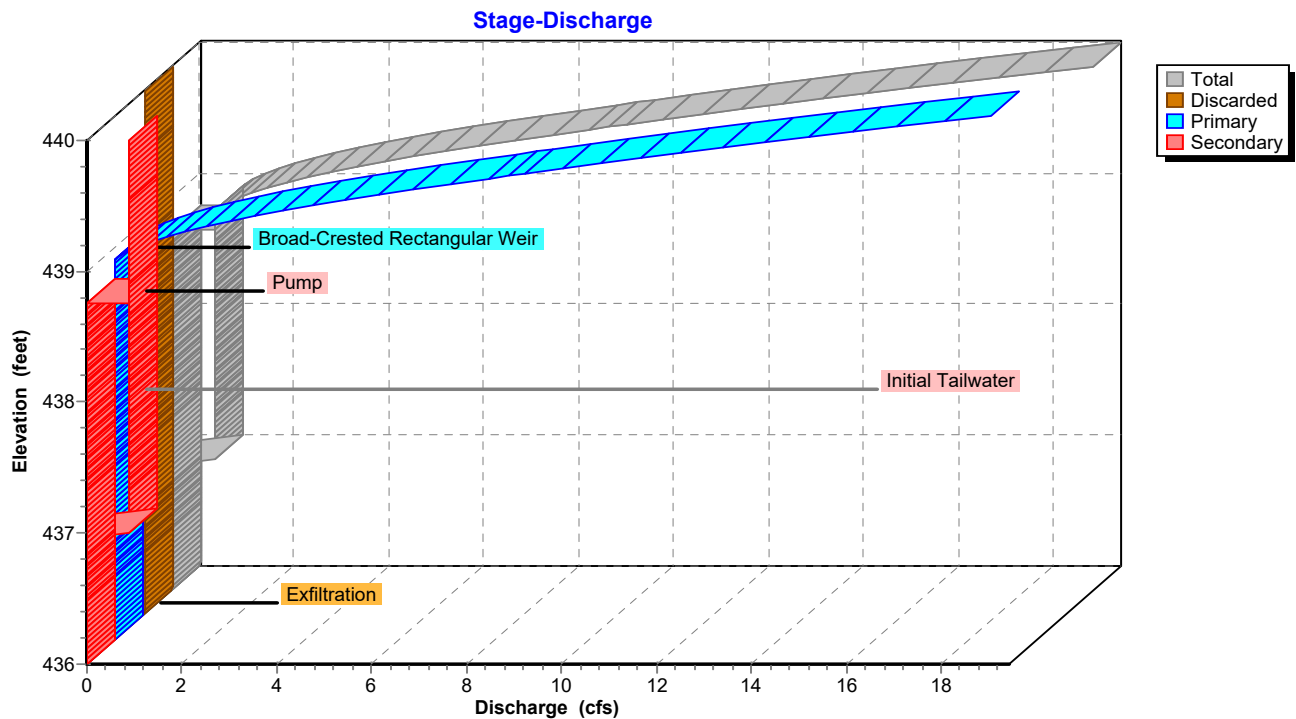
61.8 cy Stone



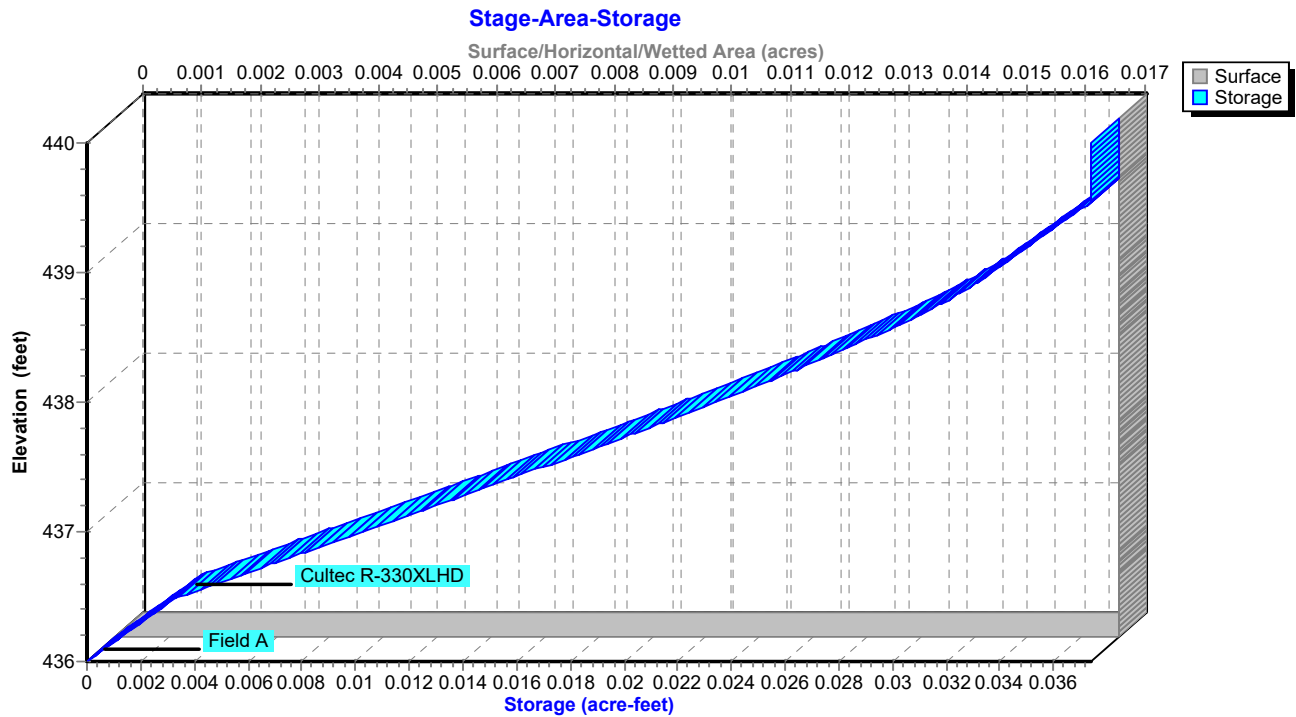
Pond 14P: Backyard Cultec



Pond 14P: Backyard Cultec



Pond 14P: Backyard Cultec



Summary for Pond 16P: Frontyard Cultec

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.202 ac, 15.84% Impervious, Inflow Depth = 5.20" for 100-Year event
 Inflow = 1.21 cfs @ 12.09 hrs, Volume= 0.088 af
 Outflow = 1.24 cfs @ 12.16 hrs, Volume= 0.088 af, Atten= 0%, Lag= 3.9 min
 Discarded = 0.06 cfs @ 11.30 hrs, Volume= 0.046 af
 Primary = 1.19 cfs @ 12.16 hrs, Volume= 0.041 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
 Peak Elev= 442.18' @ 12.16 hrs Surf.Area= 0.016 ac Storage= 0.017 af

Plug-Flow detention time= 29.9 min calculated for 0.087 af (100% of inflow)
 Center-of-Mass det. time= 29.8 min (854.2 - 824.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	440.50'	0.012 af	21.00'W x 33.00'L x 2.54'H Field A 0.040 af Overall - 0.011 af Embedded = 0.029 af x 40.0% Voids
#2A	441.00'	0.011 af	Cultec R-150 x 24 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 7.50'L = 19.9 cf Overall Size= 33.0"W x 18.5"H x 8.50'L with 1.00' Overlap Row Length Adjustment= +1.00' x 2.65 sf x 6 rows
		0.023 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	440.50'	3.500 in/hr Exfiltration over Surface area above 436.50' Excluded Surface area = 0.000 ac Phase-In= 0.01'
#2	Primary	441.00'	2.0" W x 2.0" H Vert. Orifice/Grate C= 0.600
#3	Primary	442.00'	6.0' long x 4.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.06 cfs @ 11.30 hrs HW=440.53' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=1.11 cfs @ 12.16 hrs HW=442.17' TW=0.00' (Dynamic Tailwater)

↑ **2=Orifice/Grate** (Orifice Controls 0.14 cfs @ 5.01 fps)

↑ **3=Broad-Crested Rectangular Weir** (Weir Controls 0.97 cfs @ 0.97 fps)

Pond 16P: Frontyard Cultec - Chamber Wizard Field A

Chamber Model = Cultec R-150 (Cultec Recharger® 150HD - DISCONTINUED, Not for new designs)

Effective Size= 29.8"W x 18.0"H => 2.65 sf x 7.50'L = 19.9 cf

Overall Size= 33.0"W x 18.5"H x 8.50'L with 1.00' Overlap

Row Length Adjustment= +1.00' x 2.65 sf x 6 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

4 Chambers/Row x 7.50' Long +1.00' Row Adjustment = 31.00' Row Length +12.0" End Stone x 2 =
33.00' Base Length

6 Rows x 33.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 21.00' Base Width

6.0" Base + 18.5" Chamber Height + 6.0" Cover = 2.54' Field Height

24 Chambers x 19.9 cf +1.00' Row Adjustment x 2.65 sf x 6 Rows = 492.7 cf Chamber Storage

1,761.4 cf Field - 492.7 cf Chambers = 1,268.7 cf Stone x 40.0% Voids = 507.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,000.2 cf = 0.023 af

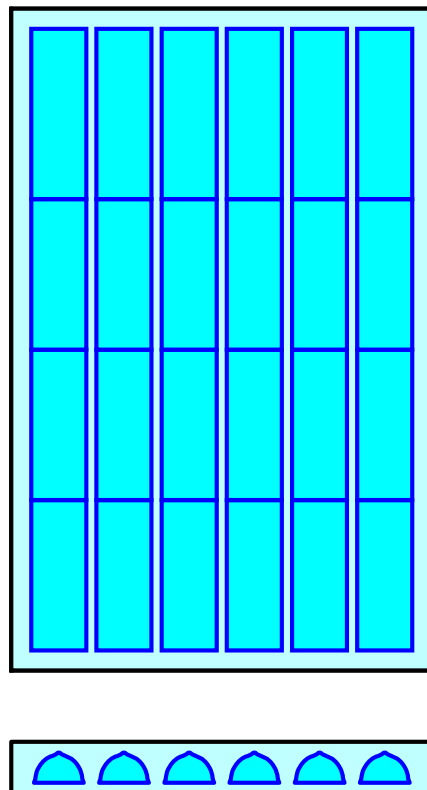
Overall Storage Efficiency = 56.8%

Overall System Size = 33.00' x 21.00' x 2.54'

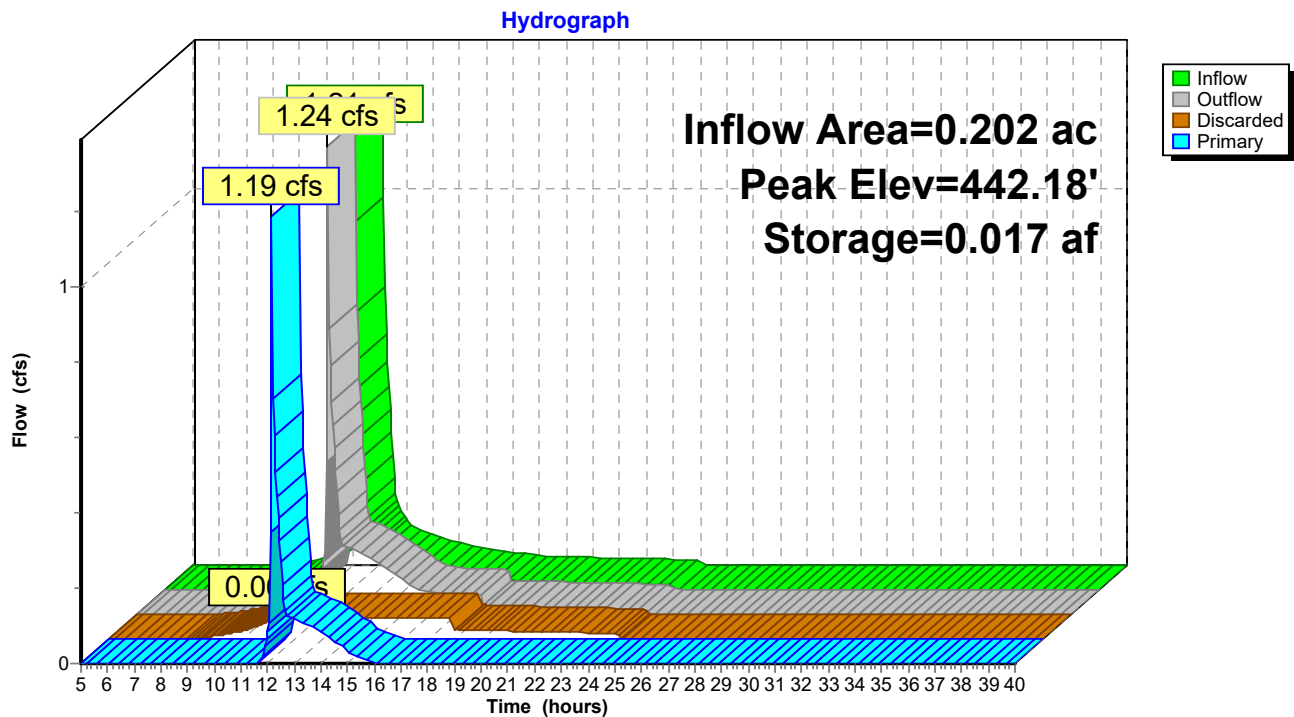
24 Chambers

65.2 cy Field

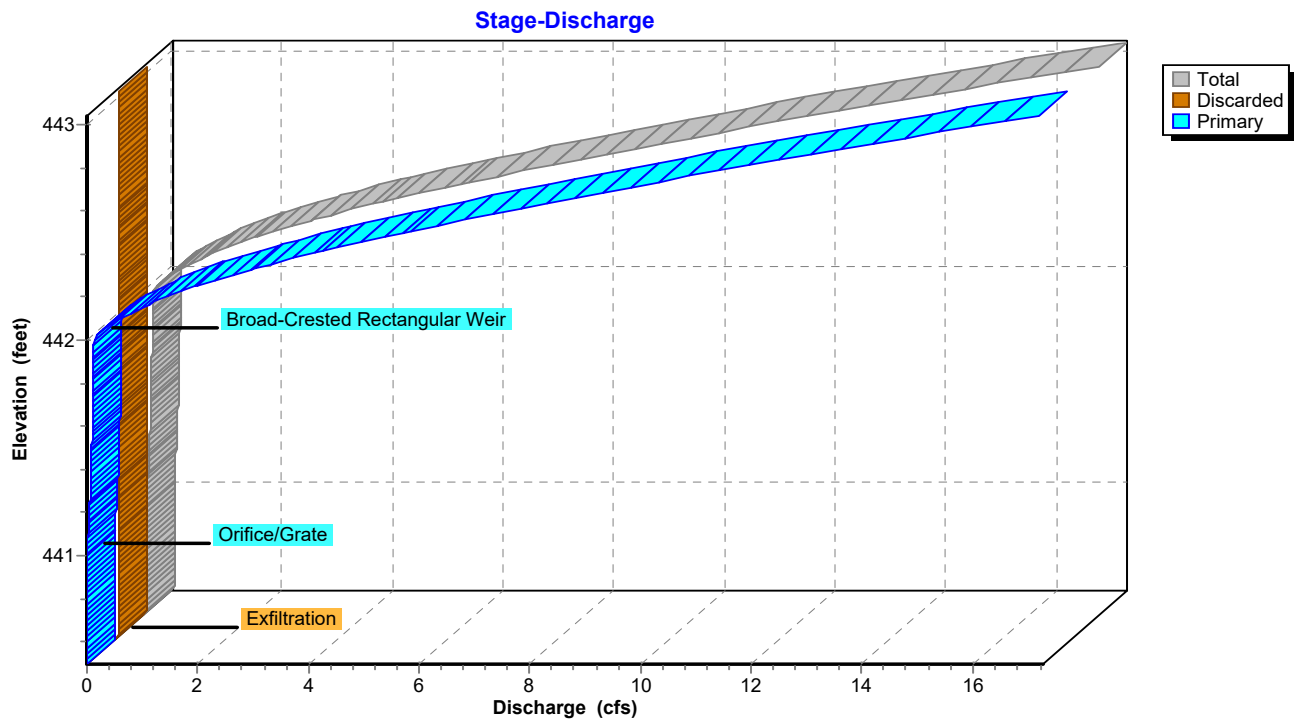
47.0 cy Stone



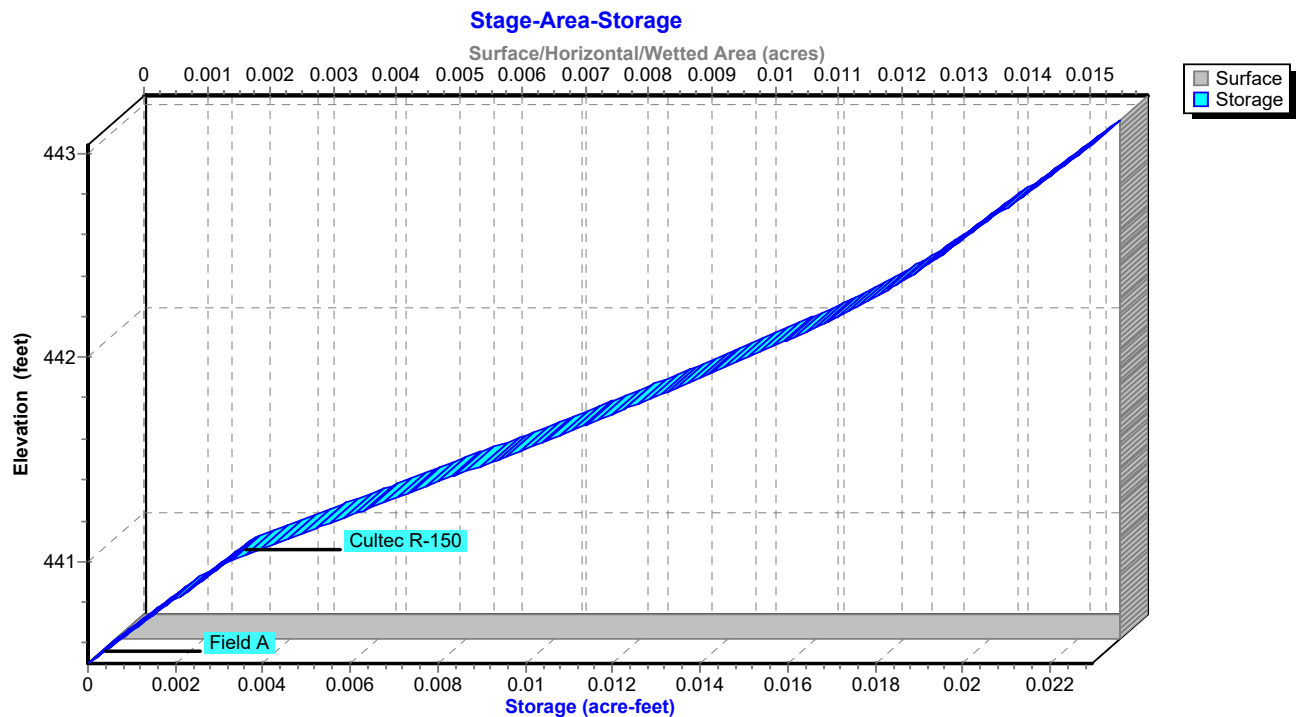
Pond 16P: Frontyard Cultec



Pond 16P: Frontyard Cultec



Pond 16P: Frontyard Cultec

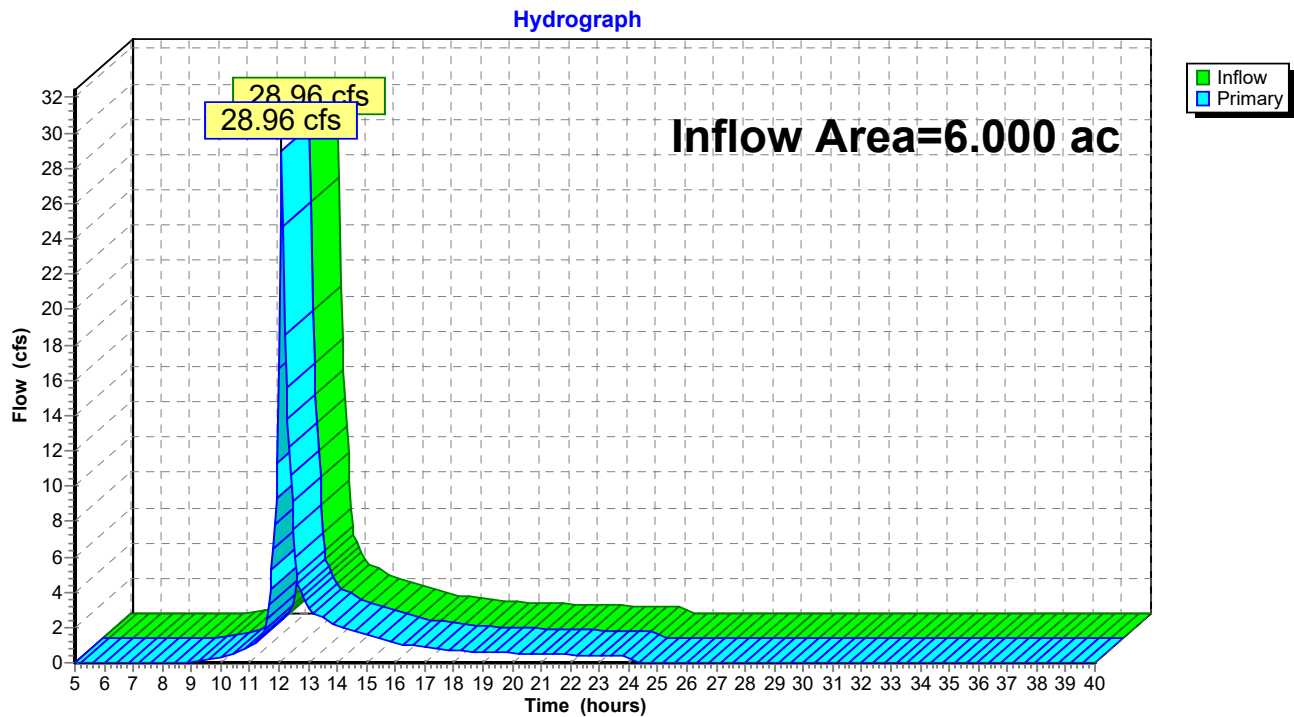


Summary for Link 19L: Design Point Proposed Conditions

Inflow Area = 6.000 ac, 1.32% Impervious, Inflow Depth = 4.25" for 100-Year event
Inflow = 28.96 cfs @ 12.10 hrs, Volume= 2.124 af
Primary = 28.96 cfs @ 12.10 hrs, Volume= 2.124 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs

Link 19L: Design Point Proposed Conditions



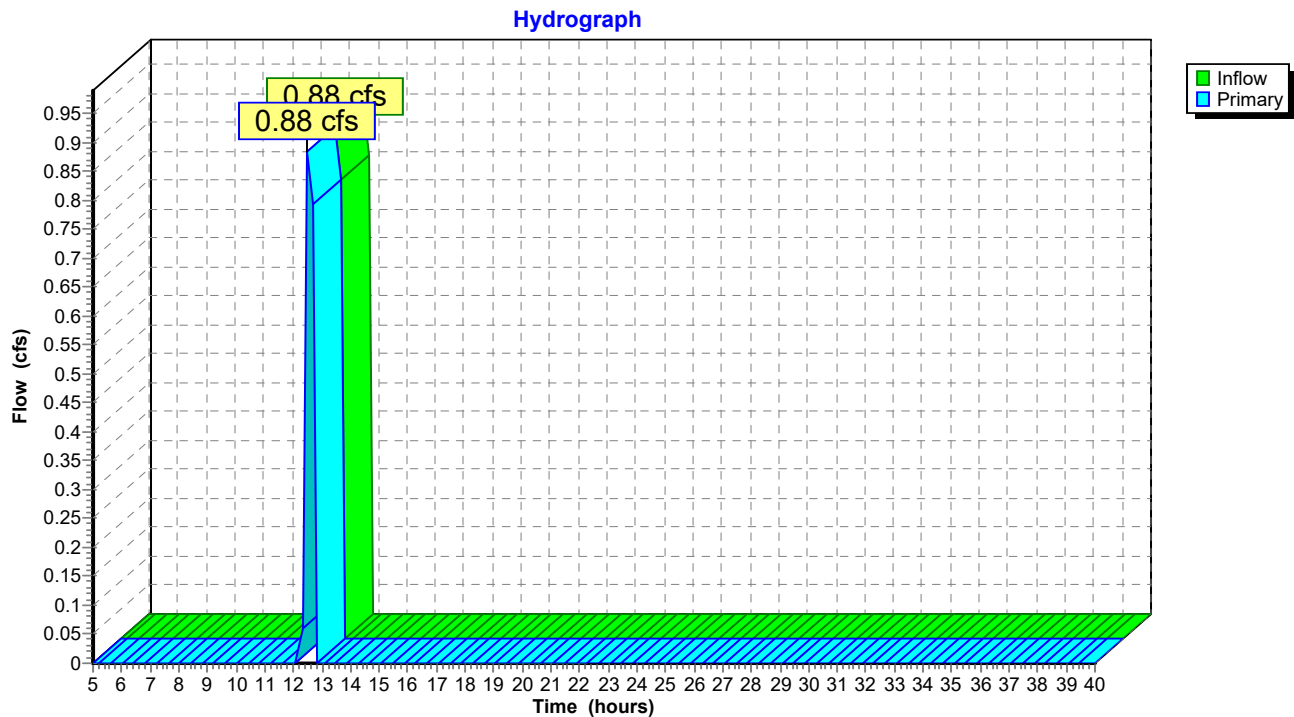
Summary for Link 20L: Catch Basin

Inflow = 0.88 cfs @ 12.45 hrs, Volume= 0.028 af
Primary = 0.88 cfs @ 12.45 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs

Fixed water surface Elevation= 438.00'

Link 20L: Catch Basin



Summary for Link 22L: Design Point Existing Conditions

Inflow Area = 6.000 ac, 0.00% Impervious, Inflow Depth = 5.20" for 100-Year event
Inflow = 35.35 cfs @ 12.10 hrs, Volume= 2.602 af
Primary = 35.35 cfs @ 12.10 hrs, Volume= 2.602 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs

Link 22L: Design Point Existing Conditions

