Stormwater Management Report
The Gateway
220, 245, 265, & 270 Gateway Boulevard
South Windsor, Connecticut

Prepared by:

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21 Jeffrey Drive
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May 13, 2020
Revised to: July 8, 2020

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Introduction

Buckland East, LLC., is proposing a development at 190, 218, 240 & 274 Buckland Road, South Windsor, Connecticut (to be known as 220, 245, 265 & 270 Gateway Blvd). The properties are referenced on the Town of South Windsor Tax Assessors maps 27 & 38, Lots 8, 4, 5, & 9. The proposed development will include the construction of 89,280± sf of retail and office buildings. Associated site improvements will include but not be limited to new access driveways, parking areas for vehicles, sidewalks, landscaping, lighting, utilities, common access drive, and stormwater management BMP's.

The total combined tract area is 32.86 acres. 11.46 acres of the parcel is proposed to be disturbed during construction. For more information, please refer to the plans entitled "The Gateway ~ Site Plan ~ 220, 245, 265, & 270 Gateway Boulevard ~ South Windsor, CT" prepared by Design Professionals, Inc., and dated May 13, 2020, as amended.

Pre-Development Site Conditions

The existing surficial characteristics of the area to be developed can be primarily classified as farmland with woodland areas surrounding the outskirts. Review of the topography of the area indicated that the approximate center of the project site is located at a high point along Buckland Road. Offsite woodland areas along the northern property lines and farmlands onsite flow to the north and south due to this condition. The area draining to the south would discharge to the first pair of catch basins south of Cedar Avenue **(Design Point 1)**. The northerly draining area would discharge to the first pair of catch basins north of Cedar Avenue **(Design Point 2)**. A third design point was also identified for flow reaching an existing CB at M&R's existing drive to Buckland Road **(Design Point 3)**. Existing conditions watershed delineations are identified in the Existing Conditions Drainage Map located in **Appendix F**.

Based on Natural Resources Conservation Service (NRCS) Hydrologic Soil Group (HSG) mapping, soils types B, C, & C/ D are located on site. See **Appendix C** for The NRCS Soil Map & Data.

An evaluation was performed to quantify the peak rate of stormwater discharge offsite to all three design points. The Natural Resources Conservation Service's TR-55 Manual was followed in predicting the peak rates of runoff and volumes. HydroCAD computer modeling software was utilized.

Peak rates of stormwater runoff were evaluated for the 2-, 10-, 25-, 50- and 100-year storm events. For more information, please refer to the enclosed Pre-Development Drainage HydroCAD Report located in **Appendix A**.

Post-Development Site Conditions

The subject project proposes the construction of 89,280± sf of retail and office buildings. All runoff generated from the parking and landscaped areas will be collected in an underground

storm water catchment system and be conveyed to a multiple tiered pond system for water quality and detention.

The first of the three ponds proposed, is an underground detention system. All detained runoff will be treated in the isolator rows within this system, before flowing on to the downstream pond. The second and third ponds are both surface basins designed to be dry between storm events. The underground chamber system (UGC1) and first surface basin (P1P) are responsible for detaining the 2- & 10-yr storm events. The lower pond (P2P) will provide storage for larger events and will convey stormwater flows directly to the existing CB in Buckland Road (DP1) via a 36" RCP pipe.

The proposed location for the southern office building will intercept a portion of the sheet flow from the watershed upland of the approved pond for the Aldi Site at 205 Gateway Boulevard. Additional modifications to the ponds grading was also proposed to accommodate new walkways and common drives of the subject site. An analysis of the proposed impacts on the Aldi pond was done to evaluate the subject sites impact to the pond for the Aldi site. Analysis results are included in the next section of this report.

In the event of a storm larger than the 100-yr storm, an emergency outlet control structure is proposed to relieve peak flows. A standard Type C-L catch basin grate is proposed just above the 100-yr storm elevation to accomplish this. In addition to the emergency outlet grate, both surface ponds were designed with an additional 1.0' free board to provide additional storage volume for an emergency scenario.

See **Appendix B** for the Post Development Condition HydroCAD report. The Proposed Conditions Drainage Map for the site can be found in **Appendix F**.

Analysis of Results

The pre-development and post-development conditions were analyzed using HydroCAD consistent with National Resource Conservation Service (NRCS) hydrology methods. The discharge location **(Design Point #1)** was identified as a point of interest for assessing downstream effects. The following table contains the data generated from the HydroCAD software:

Reach		2 year	10 year	25 year	50 year	100 year
DP#1 – Existing Catch Basin in Buckland Road (South of Cedar Ave)	**Pre**	6.80	19.77	29.06	36.68	44.54
	Post	6.50	17.94	26.58	30.76	34.18
DP#2 – Existing Catch Basin in Buckland Road (North of Cedar Ave)	**Pre**	5.64	15.31	22.15	27.69	33.36
	Post	3.76	9.89	14.18	17.65	21.19
DP#3 – Existing Catch Basin in M&R Drive	**Pre**	0.26	0.51	0.67	0.79	0.92
	Post	0.17	0.28	0.36	0.41	0.47
Aldi Pond Outflow	**Pre (Previously Approved)**	3.38	7.28	10.09	10.46	11.41
	Post	3.21	6.46	9.12	10.22	11.11

As seen in the table above, the subject project will result in peak runoff rates in the proposed condition that are less than the peak runoff rates of the existing condition for 2-, 10-, 25- and 100-year design storms.

Storm Sewer Collection System

The proposed subsurface stormwater collection and conveyance system was designed to adequately convey proposed runoff under 10- year storm event conditions. The design of the storm sewers followed the guidelines set forth in the Connecticut Department of Transportation's Drainage Manual. It is estimated that during a 10-year storm event, all proposed subsurface culverts will convey storm runoff without resulting in any unacceptable flooding conditions. The computations are included as **Appendix D**.

Water Quality

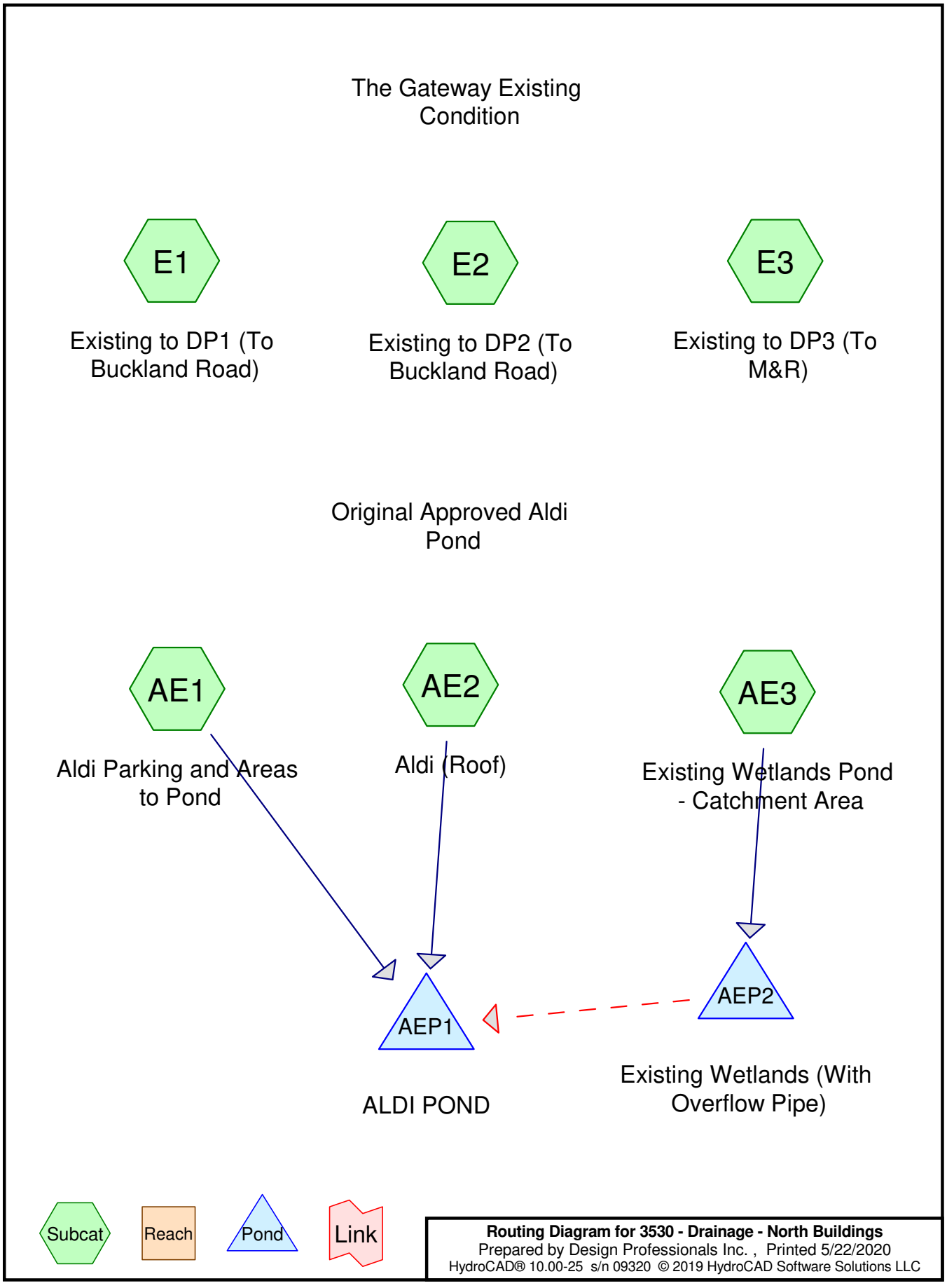
Cultec R-902HD isolation rows will be utilized to address water quality for all flows that will be detained in the multi-pond system. Based on the determined water quality flow and manufacturer specs for treated peak flow rates, the length of isolator rows provided will be more than adequate to treat the required water quality flow rate. Other flows from the site will be treated in an ADA

Barracuda S6 unit. See **Appendix E** for water quality flow calculations, and ADS Barracuda manufacturer's sizing.

Conclusion

The proposed stormwater management system as discussed herein and shown on the referenced plans is appropriate for the proposed development on the subject site and should not pose any detrimental impacts to the environment.

APPENDIX A
Watershed Computations
(Pre-Development Drainage HydroCAD Report)



Routing Diagram for 3530 - Drainage - North Buildings
Prepared by Design Professionals Inc. , Printed 5/22/2020

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 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

Subcatchment AE1: Aldi Parking and Areas Runoff Area=2.673 ac 35.35% Impervious Runoff Depth=1.61"
Tc=8.0 min CN=84 Runoff=4.69 cfs 15,595 cf

Subcatchment AE2: Aldi (Roof) Runoff Area=0.684 ac 88.30% Impervious Runoff Depth=2.56"
Tc=7.0 min CN=95 Runoff=1.87 cfs 6,349 cf

Subcatchment AE3: Existing Wetlands Runoff Area=14.784 ac 4.29% Impervious Runoff Depth=0.48"
Flow Length=1,685' Tc=16.6 min CN=63 Runoff=4.16 cfs 25,744 cf

Subcatchment E1: Existing to DP1 (To Runoff Area=727,394 sf 5.84% Impervious Runoff Depth=0.73"
Flow Length=2,111' Tc=32.0 min CN=69 Runoff=6.80 cfs 44,218 cf

Subcatchment E2: Existing to DP2 (To Runoff Area=462,141 sf 3.32% Impervious Runoff Depth=0.82"
Flow Length=1,161' Tc=25.1 min CN=71 Runoff=5.64 cfs 31,753 cf

Subcatchment E3: Existing to DP3 (To M&R) Runoff Area=8,338 sf 46.51% Impervious Runoff Depth=1.61"
Flow Length=146' Tc=17.5 min CN=84 Runoff=0.26 cfs 1,117 cf

Pond AEP1: ALDI POND Peak Elev=151.66' Storage=9,708 cf Inflow=6.53 cfs 21,944 cf
Outflow=3.38 cfs 21,943 cf

Pond AEP2: Existing Wetlands (With Peak Elev=169.30' Storage=1,329 cf Inflow=4.16 cfs 25,744 cf
Primary=4.14 cfs 24,719 cf Secondary=0.00 cfs 0 cf Outflow=4.14 cfs 24,719 cf

Total Runoff Area = 1,988,095 sf Runoff Volume = 124,775 cf Average Runoff Depth = 0.75"
92.11% Pervious = 1,831,322 sf 7.89% Impervious = 156,772 sf

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 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

Subcatchment AE1: Aldi Parking and Areas Runoff Area=2.673 ac 35.35% Impervious Runoff Depth=3.19"
Tc=8.0 min CN=84 Runoff=9.25 cfs 30,935 cf

Subcatchment AE2: Aldi (Roof) Runoff Area=0.684 ac 88.30% Impervious Runoff Depth=4.33"
Tc=7.0 min CN=95 Runoff=3.08 cfs 10,752 cf

Subcatchment AE3: Existing Wetlands Runoff Area=14.784 ac 4.29% Impervious Runoff Depth=1.45"
Flow Length=1,685' Tc=16.6 min CN=63 Runoff=16.83 cfs 77,933 cf

Subcatchment E1: Existing to DP1 (To Runoff Area=727,394 sf 5.84% Impervious Runoff Depth=1.89"
Flow Length=2,111' Tc=32.0 min CN=69 Runoff=19.77 cfs 114,698 cf

Subcatchment E2: Existing to DP2 (To Runoff Area=462,141 sf 3.32% Impervious Runoff Depth=2.05"
Flow Length=1,161' Tc=25.1 min CN=71 Runoff=15.31 cfs 78,899 cf

Subcatchment E3: Existing to DP3 (To M&R) Runoff Area=8,338 sf 46.51% Impervious Runoff Depth=3.19"
Flow Length=146' Tc=17.5 min CN=84 Runoff=0.51 cfs 2,215 cf

Pond AEP1: ALDI POND Peak Elev=152.16' Storage=13,140 cf Inflow=12.30 cfs 41,687 cf
Outflow=7.28 cfs 41,687 cf

Pond AEP2: Existing Wetlands (With Peak Elev=169.75' Storage=2,174 cf Inflow=16.83 cfs 77,933 cf
Primary=16.69 cfs 76,908 cf Secondary=0.00 cfs 0 cf Outflow=16.69 cfs 76,908 cf

Total Runoff Area = 1,988,095 sf Runoff Volume = 315,433 cf Average Runoff Depth = 1.90"
92.11% Pervious = 1,831,322 sf 7.89% Impervious = 156,772 sf

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 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

Subcatchment AE1: Aldi Parking and Areas Runoff Area=2.673 ac 35.35% Impervious Runoff Depth=4.22"
Tc=8.0 min CN=84 Runoff=12.15 cfs 40,991 cf

Subcatchment AE2: Aldi (Roof) Runoff Area=0.684 ac 88.30% Impervious Runoff Depth=5.44"
Tc=7.0 min CN=95 Runoff=3.82 cfs 13,510 cf

Subcatchment AE3: Existing Wetlands Runoff Area=14.784 ac 4.29% Impervious Runoff Depth=2.20"
Flow Length=1,685' Tc=16.6 min CN=63 Runoff=26.61 cfs 117,927 cf

Subcatchment E1: Existing to DP1 (To Runoff Area=727,394 sf 5.84% Impervious Runoff Depth=2.74"
Flow Length=2,111' Tc=32.0 min CN=69 Runoff=29.06 cfs 165,846 cf

Subcatchment E2: Existing to DP2 (To Runoff Area=462,141 sf 3.32% Impervious Runoff Depth=2.92"
Flow Length=1,161' Tc=25.1 min CN=71 Runoff=22.15 cfs 112,568 cf

Subcatchment E3: Existing to DP3 (To M&R) Runoff Area=8,338 sf 46.51% Impervious Runoff Depth=4.22"
Flow Length=146' Tc=17.5 min CN=84 Runoff=0.67 cfs 2,935 cf

Pond AEP1: ALDI POND Peak Elev=152.40' Storage=14,911 cf Inflow=15.94 cfs 54,502 cf
Outflow=10.09 cfs 54,501 cf

Pond AEP2: Existing Wetlands (With Peak Elev=170.14' Storage=3,370 cf Inflow=26.61 cfs 117,927 cf
Primary=25.24 cfs 116,902 cf Secondary=0.00 cfs 0 cf Outflow=25.24 cfs 116,902 cf

Total Runoff Area = 1,988,095 sf Runoff Volume = 453,777 cf Average Runoff Depth = 2.74"
92.11% Pervious = 1,831,322 sf 7.89% Impervious = 156,772 sf

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 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

Subcatchment AE1: Aldi Parking and Areas Runoff Area=2.673 ac 35.35% Impervious Runoff Depth=5.04"
Tc=8.0 min CN=84 Runoff=14.41 cfs 48,951 cf

Subcatchment AE2: Aldi (Roof) Runoff Area=0.684 ac 88.30% Impervious Runoff Depth=6.31"
Tc=7.0 min CN=95 Runoff=4.40 cfs 15,658 cf

Subcatchment AE3: Existing Wetlands Runoff Area=14.784 ac 4.29% Impervious Runoff Depth=2.83"
Flow Length=1,685' Tc=16.6 min CN=63 Runoff=34.82 cfs 151,674 cf

Subcatchment E1: Existing to DP1 (To Runoff Area=727,394 sf 5.84% Impervious Runoff Depth=3.43"
Flow Length=2,111' Tc=32.0 min CN=69 Runoff=36.68 cfs 208,042 cf

Subcatchment E2: Existing to DP2 (To Runoff Area=462,141 sf 3.32% Impervious Runoff Depth=3.64"
Flow Length=1,161' Tc=25.1 min CN=71 Runoff=27.69 cfs 140,160 cf

Subcatchment E3: Existing to DP3 (To M&R) Runoff Area=8,338 sf 46.51% Impervious Runoff Depth=5.04"
Flow Length=146' Tc=17.5 min CN=84 Runoff=0.79 cfs 3,505 cf

Pond AEP1: ALDI POND Peak Elev=152.66' Storage=16,912 cf Inflow=18.77 cfs 65,201 cf
Outflow=10.46 cfs 65,201 cf

Pond AEP2: Existing Wetlands (With Peak Elev=170.66' Storage=5,697 cf Inflow=34.82 cfs 151,674 cf
Primary=30.46 cfs 150,057 cf Secondary=1.54 cfs 592 cf Outflow=32.00 cfs 150,649 cf

Total Runoff Area = 1,988,095 sf Runoff Volume = 567,991 cf Average Runoff Depth = 3.43"
92.11% Pervious = 1,831,322 sf 7.89% Impervious = 156,772 sf

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 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

Subcatchment AE1: Aldi Parking and Areas Runoff Area=2.673 ac 35.35% Impervious Runoff Depth=5.87"
Tc=8.0 min CN=84 Runoff=16.66 cfs 57,002 cf

Subcatchment AE2: Aldi (Roof) Runoff Area=0.684 ac 88.30% Impervious Runoff Depth=7.17"
Tc=7.0 min CN=95 Runoff=4.97 cfs 17,808 cf

Subcatchment AE3: Existing Wetlands Runoff Area=14.784 ac 4.29% Impervious Runoff Depth=3.49"
Flow Length=1,685' Tc=16.6 min CN=63 Runoff=43.42 cfs 187,227 cf

Subcatchment E1: Existing to DP1 (To Runoff Area=727,394 sf 5.84% Impervious Runoff Depth=4.15"
Flow Length=2,111' Tc=32.0 min CN=69 Runoff=44.54 cfs 251,852 cf

Subcatchment E2: Existing to DP2 (To Runoff Area=462,141 sf 3.32% Impervious Runoff Depth=4.38"
Flow Length=1,161' Tc=25.1 min CN=71 Runoff=33.36 cfs 168,684 cf

Subcatchment E3: Existing to DP3 (To M&R) Runoff Area=8,338 sf 46.51% Impervious Runoff Depth=5.87"
Flow Length=146' Tc=17.5 min CN=84 Runoff=0.92 cfs 4,082 cf

Pond AEP1: ALDI POND Peak Elev=153.38' Storage=22,819 cf Inflow=21.59 cfs 80,231 cf
Outflow=11.41 cfs 80,231 cf

Pond AEP2: Existing Wetlands (With Peak Elev=170.96' Storage=7,428 cf Inflow=43.42 cfs 187,227 cf
Primary=33.05 cfs 180,781 cf Secondary=7.94 cfs 5,421 cf Outflow=40.99 cfs 186,202 cf

Total Runoff Area = 1,988,095 sf Runoff Volume = 686,656 cf Average Runoff Depth = 4.14"
92.11% Pervious = 1,831,322 sf 7.89% Impervious = 156,772 sf

Summary for Subcatchment AE1: Aldi Parking and Areas to Pond

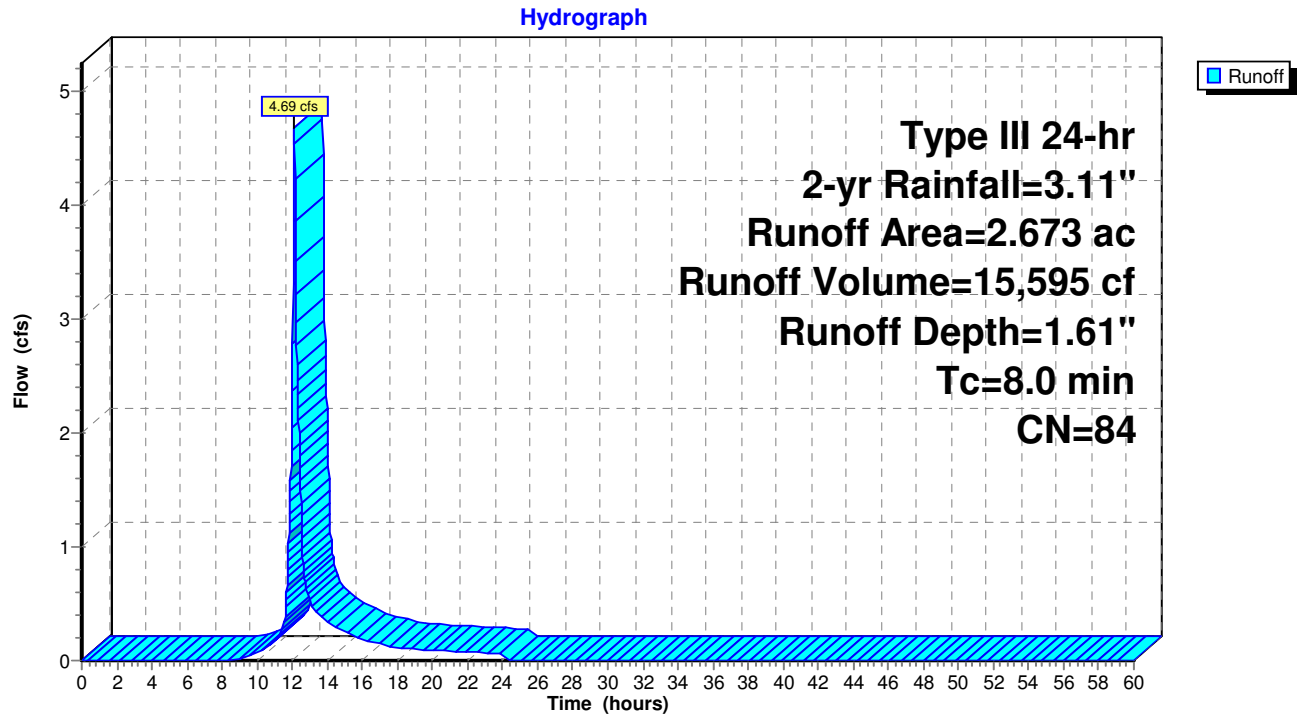
Runoff = 4.69 cfs @ 12.12 hrs, Volume= 15,595 cf, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	0.207	74	>75% Grass cover, Good, HSG C
*	1.197	77	>75% Grass cover, Good, HSG C/D
*	0.945	98	IMPERVIOUS
*	0.324	74	Woods, Good, HSG C/D
	2.673	84	Weighted Average
	1.728		64.65% Pervious Area
	0.945		35.35% Impervious Area

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

Subcatchment AE1: Aldi Parking and Areas to Pond



Summary for Subcatchment AE2: Aldi (Roof)

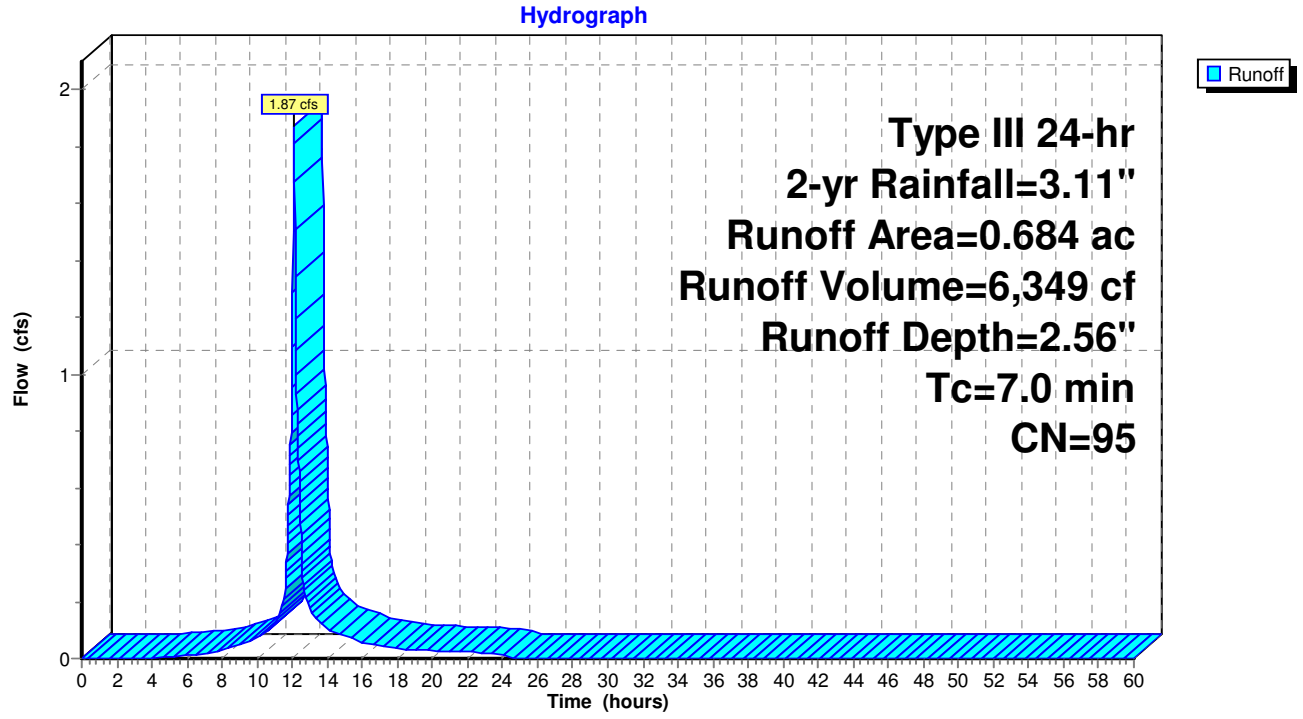
Runoff = 1.87 cfs @ 12.10 hrs, Volume= 6,349 cf, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	0.080	74	>75% Grass cover, Good, HSG C
*	0.604	98	IMPERVIOUS
	0.684	95	Weighted Average
	0.080		11.70% Pervious Area
	0.604		88.30% Impervious Area

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

Subcatchment AE2: Aldi (Roof)



Summary for Subcatchment AE3: Existing Wetlands Pond - Catchment Area

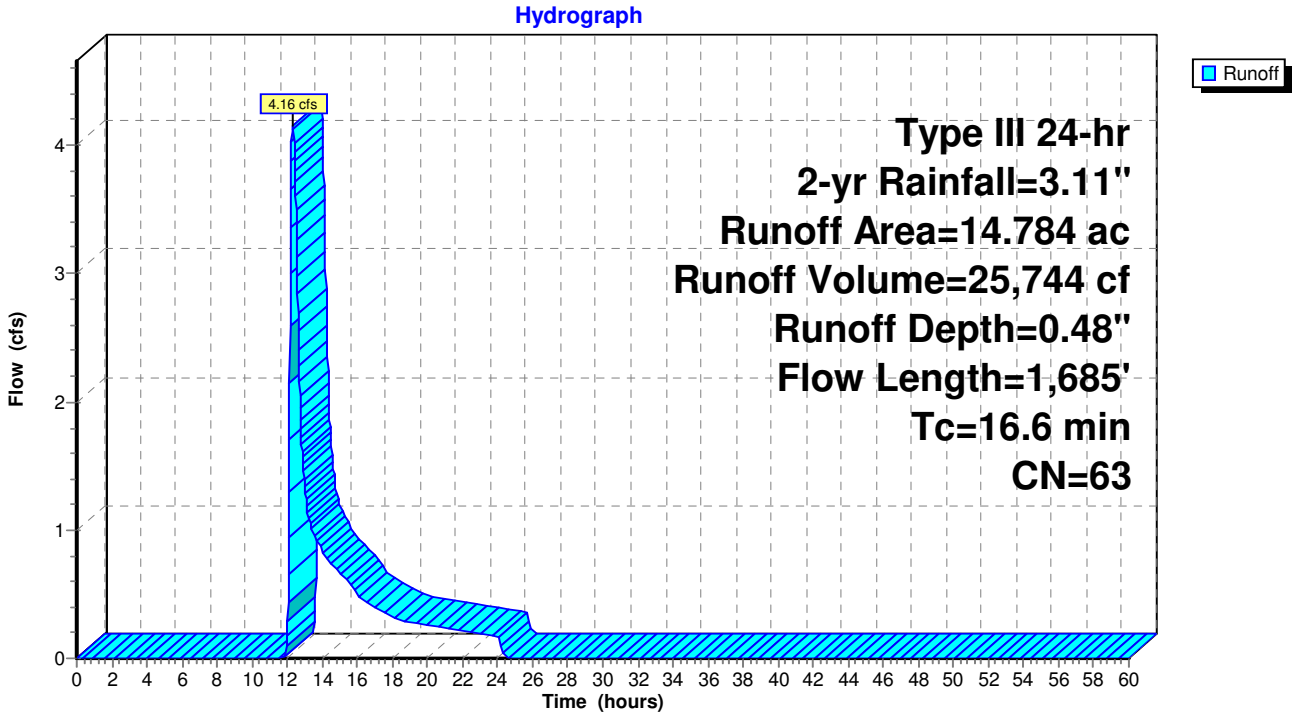
Runoff = 4.16 cfs @ 12.31 hrs, Volume= 25,744 cf, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	1.569	61	>75% Grass cover, Good, HSG B
	0.493	74	>75% Grass cover, Good, HSG C
*	1.529	77	>75% Grass cover, Good, HSG C/D
	8.016	55	Woods, Good, HSG B
	0.835	70	Woods, Good, HSG C
*	1.708	74	Woods, Good, HSG C/D
*	0.634	98	IMPERVIOUS
	14.784	63	Weighted Average
	14.150		95.71% Pervious Area
	0.634		4.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0300	0.20		**Sheet Flow, Grass Sheet Flow** Grass: Short n= 0.150 P2= 3.09"
1.3	153	0.0780	1.95		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
3.9	442	0.1440	1.90		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
2.9	990	0.0200	5.62	179.92	**Channel Flow, Ditch** Area= 32.0 sf Perim= 44.5' r= 0.72' n= 0.030 Earth, grassed & winding
16.6	1,685	Total			

Subcatchment AE3: Existing Wetlands Pond - Catchment Area



Summary for Subcatchment E1: Existing to DP1 (To Buckland Road)

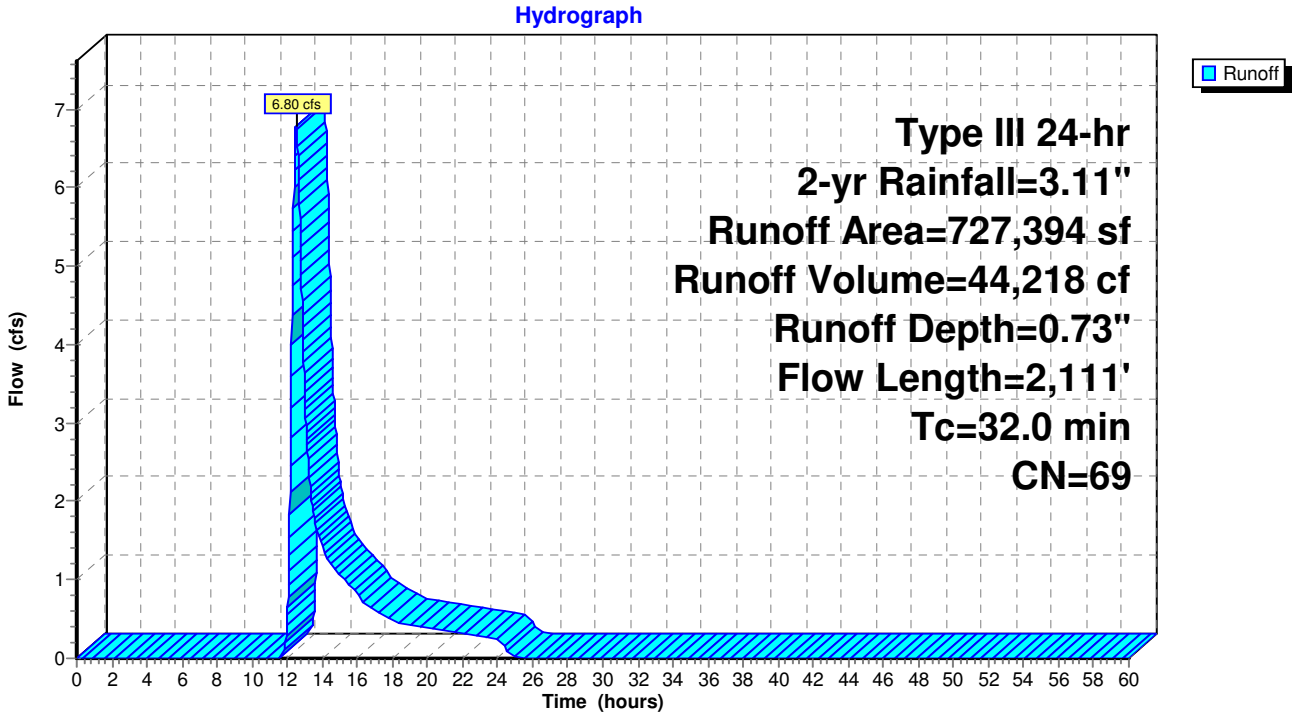
Runoff = 6.80 cfs @ 12.52 hrs, Volume= 44,218 cf, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
	141,926	55	Woods, Good, HSG B
	70,964	70	Woods, Good, HSG C
*	85,718	74	Woods, Good, HSG C/D
	113,244	61	>75% Grass cover, Good, HSG B
	23,060	74	>75% Grass cover, Good, HSG C
*	42,273	77	>75% Grass cover, Good, HSG C/D
	17,190	58	Meadow, non-grazed, HSG B
	68,742	71	Meadow, non-grazed, HSG C
*	121,819	75	Meadow, non-grazed, HSG C/D
*	42,458	98	IMPERVIOUS
	727,394	69	Weighted Average
	684,936		94.16% Pervious Area
	42,458		5.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0500	0.24		**Sheet Flow, Grass Sheet Flow** Grass: Short n= 0.150 P2= 3.09"
2.0	106	0.0310	0.88		**Shallow Concentrated Flow, Woodland SCF** Woodland Kv= 5.0 fps
1.3	100	0.0330	1.27		**Shallow Concentrated Flow, Grass SCF** Short Grass Pasture Kv= 7.0 fps
3.4	207	0.0400	1.00		**Shallow Concentrated Flow, Woodland SCF** Woodland Kv= 5.0 fps
1.5	260	0.0380	2.92		**Shallow Concentrated Flow, Grass SCF** Grassed Waterway Kv= 15.0 fps
4.8	473	0.1100	1.66		**Shallow Concentrated Flow, Woodland SCF** Woodland Kv= 5.0 fps
2.7	343	0.0550	2.11		**Shallow Concentrated Flow, Crops SCF** Cultivated Straight Rows Kv= 9.0 fps
8.8	420	0.0130	0.80		**Shallow Concentrated Flow, Grass SCF** Short Grass Pasture Kv= 7.0 fps
0.5	102	0.0280	3.40		**Shallow Concentrated Flow, Paved SCF** Paved Kv= 20.3 fps
32.0	2,111	Total			

Subcatchment E1: Existing to DP1 (To Buckland Road)



Summary for Subcatchment E2: Existing to DP2 (To Buckland Road)

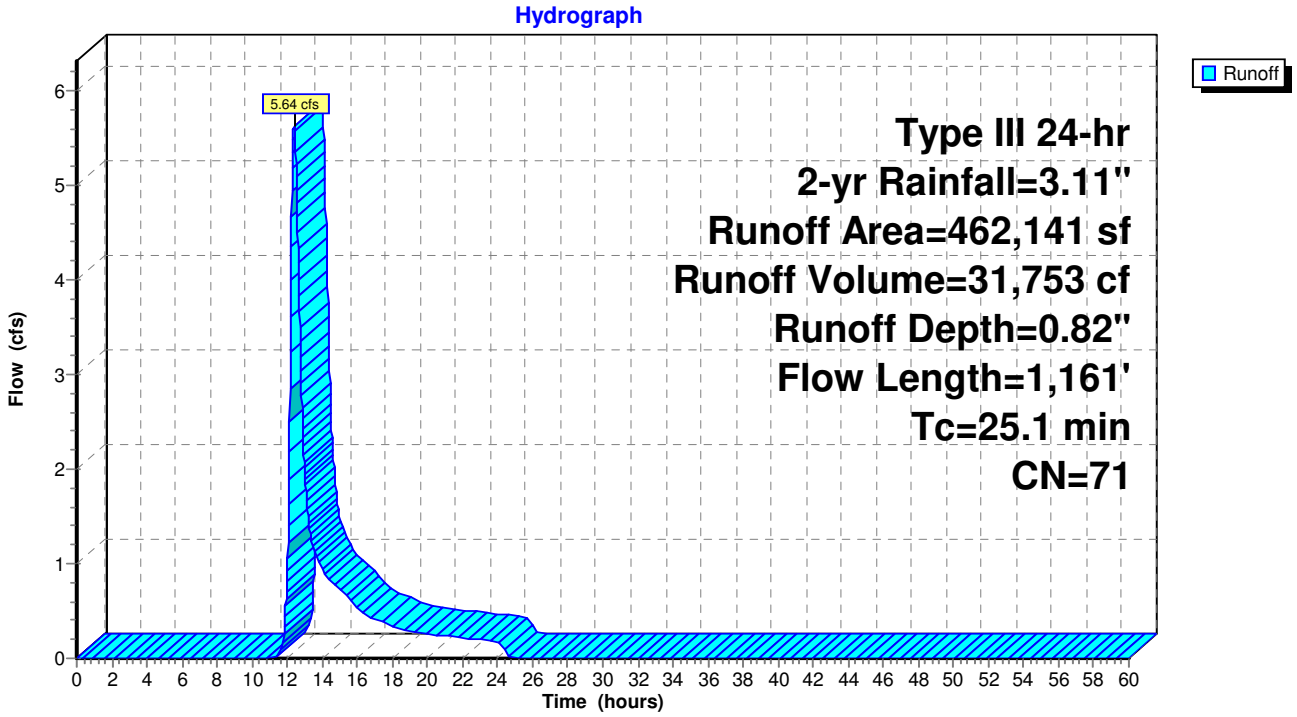
Runoff = 5.64 cfs @ 12.40 hrs, Volume= 31,753 cf, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
	14,845	70	Woods, Good, HSG C
	67,332	55	Woods, Good, HSG B
*	54,931	74	Woods, Good, HSG C/D
	22,620	74	>75% Grass cover, Good, HSG C
	21,550	61	>75% Grass cover, Good, HSG B
	15,332	58	Meadow, non-grazed, HSG B
	70,326	71	Meadow, non-grazed, HSG C
*	179,860	75	Meadow, non-grazed, HSG C/D
*	15,345	98	Imperv
	462,141	71	Weighted Average
	446,796		96.68% Pervious Area
	15,345		3.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0620	0.23		**Sheet Flow, Grass SF** Grass: Short n= 0.150 P2= 3.09"
8.0	50	0.0620	0.10		**Sheet Flow, Woodland SF** Woods: Light underbrush n= 0.400 P2= 3.09"
13.5	1,061	0.0690	1.31		**Shallow Concentrated Flow, Woodland SCF** Woodland Kv= 5.0 fps
25.1	1,161	Total			

Subcatchment E2: Existing to DP2 (To Buckland Road)



Summary for Subcatchment E3: Existing to DP3 (To M&R)

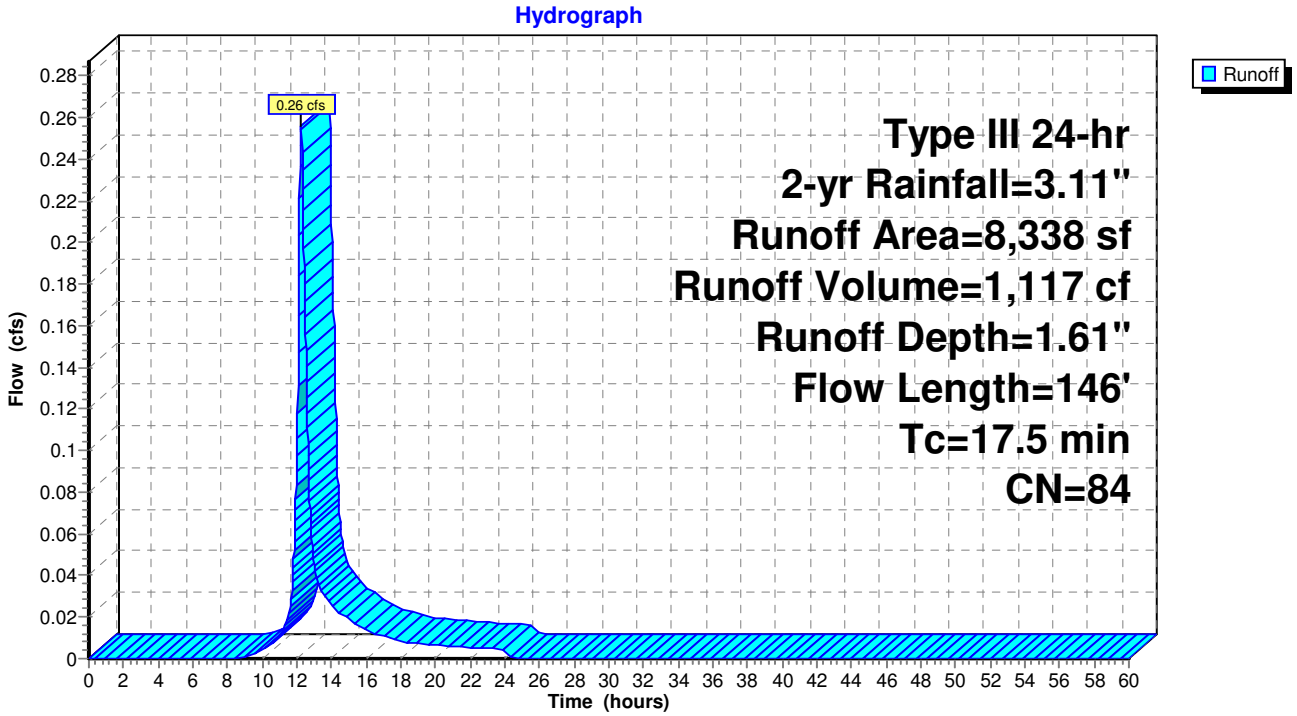
Runoff = 0.26 cfs @ 12.24 hrs, Volume= 1,117 cf, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
	4,460	71	Meadow, non-grazed, HSG C
*	3,878	98	IMPERVIOUS
	8,338	84	Weighted Average
	4,460		53.49% Pervious Area
	3,878		46.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.3	100	0.0130	0.10		**Sheet Flow, Meadow SF** Grass: Dense n= 0.240 P2= 3.09"
0.2	46	0.0600	3.94		**Shallow Concentrated Flow, Meadow SCF** Unpaved Kv= 16.1 fps
17.5	146	Total			

Subcatchment E3: Existing to DP3 (To M&R)



Summary for Pond AEP1: ALDI POND

Inflow Area = 146,231 sf, 46.14% Impervious, Inflow Depth = 1.80" for 2-yr event
Inflow = 6.53 cfs @ 12.11 hrs, Volume= 21,944 cf
Outflow = 3.38 cfs @ 12.29 hrs, Volume= 21,943 cf, Atten= 48%, Lag= 10.8 min
Primary = 3.38 cfs @ 12.29 hrs, Volume= 21,943 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Starting Elev= 151.00' Surf.Area= 6,004 sf Storage= 5,500 cf
Peak Elev= 151.66' @ 12.29 hrs Surf.Area= 6,691 sf Storage= 9,708 cf (4,209 cf above start)

Plug-Flow detention time= 168.6 min calculated for 16,444 cf (75% of inflow)
Center-of-Mass det. time= 28.8 min (847.1 - 818.3)

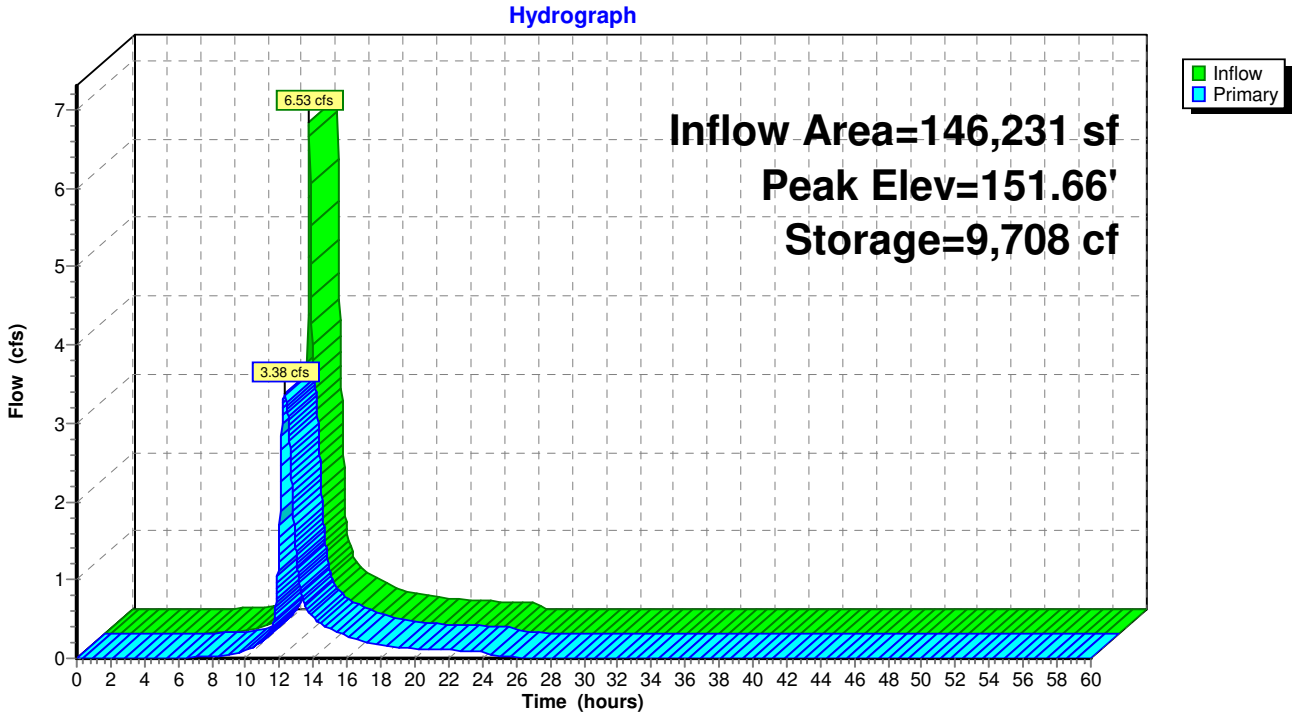
Volume	Invert	Avail.Storage	Storage Description
#1	150.00'	38,288 cf	**Pond (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
150.00	5,010	0	0	5,010
151.00	6,004	5,500	5,500	6,047
152.00	7,054	6,522	12,021	7,146
153.00	8,161	7,601	19,622	8,306
154.00	9,325	8,737	28,359	9,529
155.00	10,545	9,929	38,288	10,812

Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**18.0" Round Culvert** L= 300.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 147.36' S= 0.0088 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	151.00'	**36.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	151.75'	**36.0" W x 9.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=3.38 cfs @ 12.29 hrs HW=151.66' (Free Discharge)
└**1=Culvert** (Passes 3.38 cfs of 8.13 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 3.38 cfs @ 3.38 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Pond AEP1: ALDI POND



Summary for Pond AEP2: Existing Wetlands (With Overflow Pipe)

Inflow Area = 643,991 sf, 4.29% Impervious, Inflow Depth = 0.48" for 2-yr event
Inflow = 4.16 cfs @ 12.31 hrs, Volume= 25,744 cf
Outflow = 4.14 cfs @ 12.33 hrs, Volume= 24,719 cf, Atten= 0%, Lag= 1.3 min
Primary = 4.14 cfs @ 12.33 hrs, Volume= 24,719 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Peak Elev= 169.30' @ 12.33 hrs Surf.Area= 1,317 sf Storage= 1,329 cf

Plug-Flow detention time= 30.1 min calculated for 24,719 cf (96% of inflow)
Center-of-Mass det. time= 9.7 min (927.3 - 917.6)

Volume	Invert	Avail.Storage	Storage Description
#1	167.00'	17,482 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

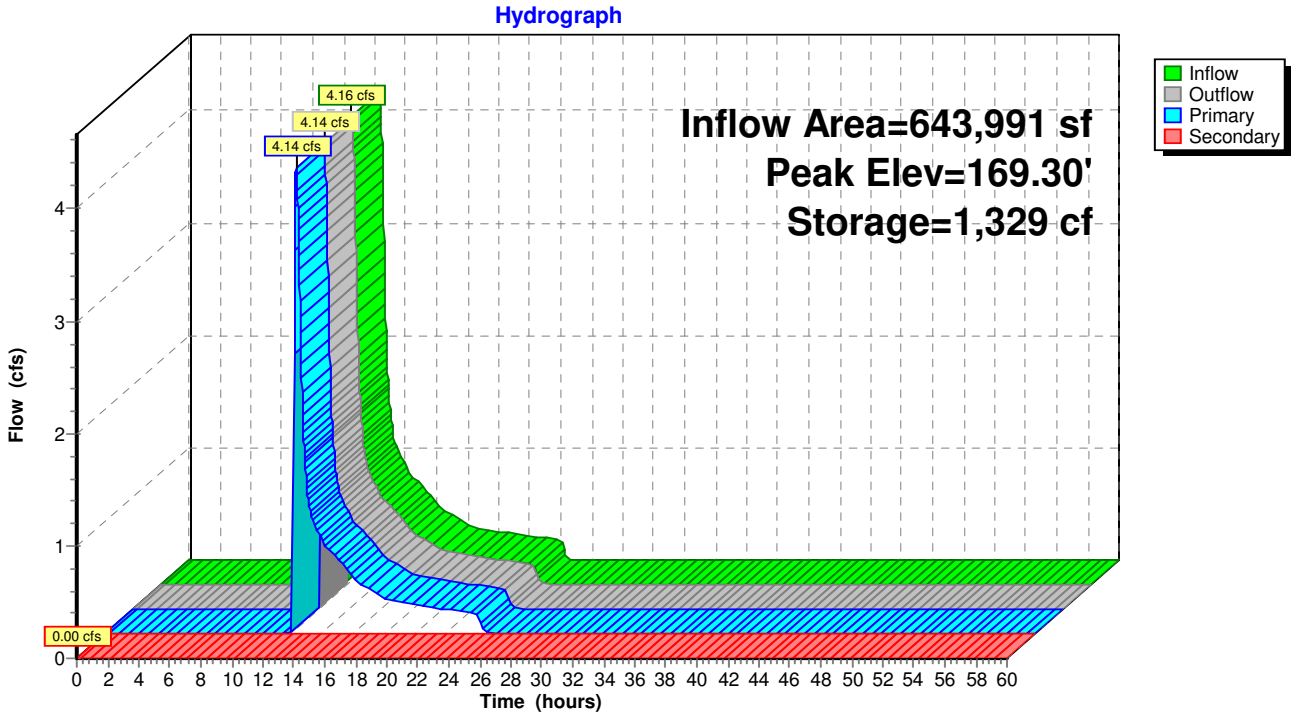
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
167.00	300	80.0	0	0	300
169.00	760	224.0	1,025	1,025	3,797
170.00	3,250	407.0	1,861	2,886	12,991
171.00	6,611	393.0	4,832	7,718	13,968
172.00	13,303	755.0	9,764	17,482	47,044

Device	Routing	Invert	Outlet Devices
#1	Secondary	170.50'	**10.0' 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
#2	Primary	165.00'	**30.0" Round Culvert** L= 96.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.00' / 163.00' S= 0.0208 '/' Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf
#3	Device 2	169.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

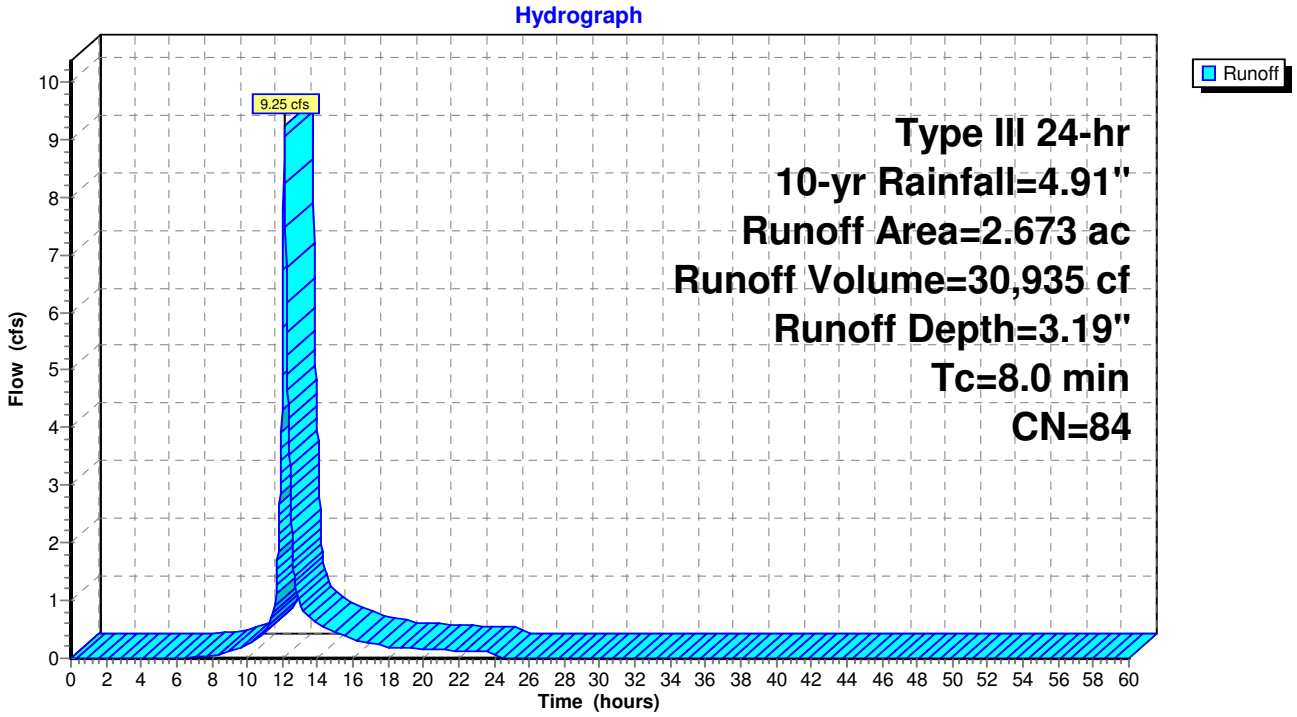
Primary OutFlow Max=4.14 cfs @ 12.33 hrs HW=169.30' (Free Discharge)
↑**2=Culvert** (Passes 4.14 cfs of 41.25 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 4.14 cfs @ 1.78 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=167.00' TW=151.00' (Dynamic Tailwater)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

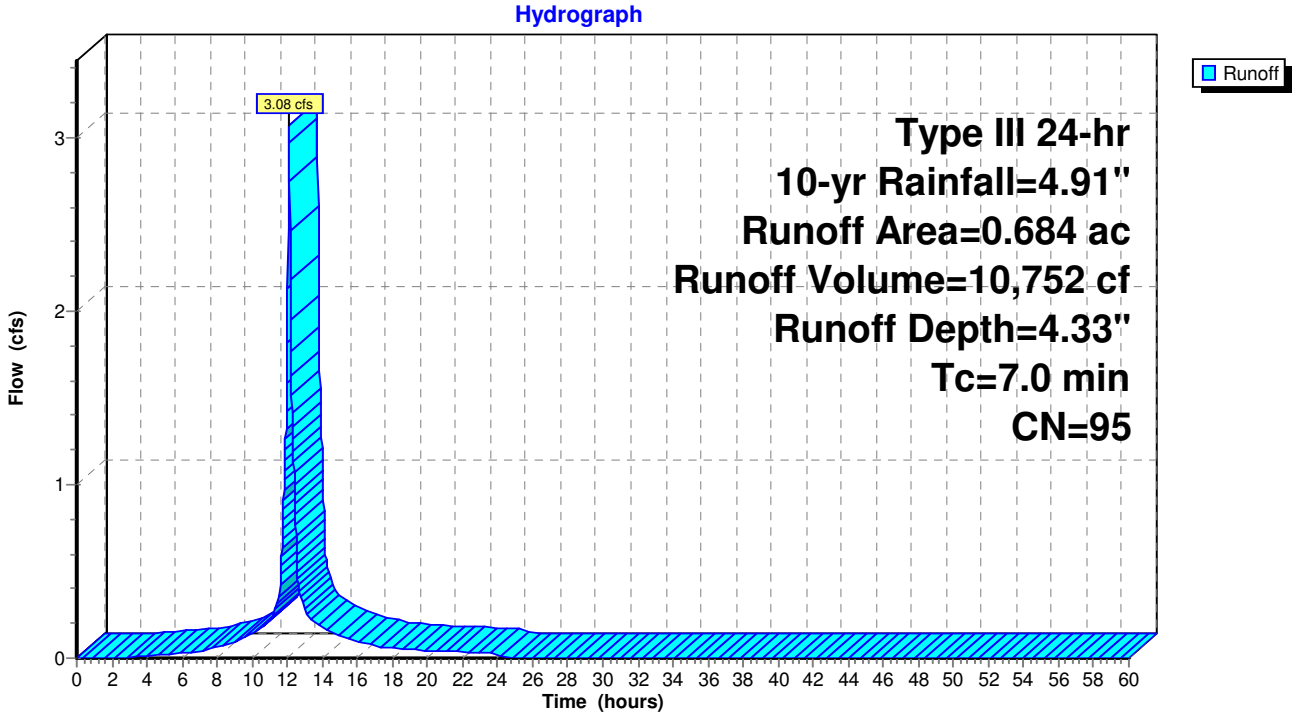
Pond AEP2: Existing Wetlands (With Overflow Pipe)



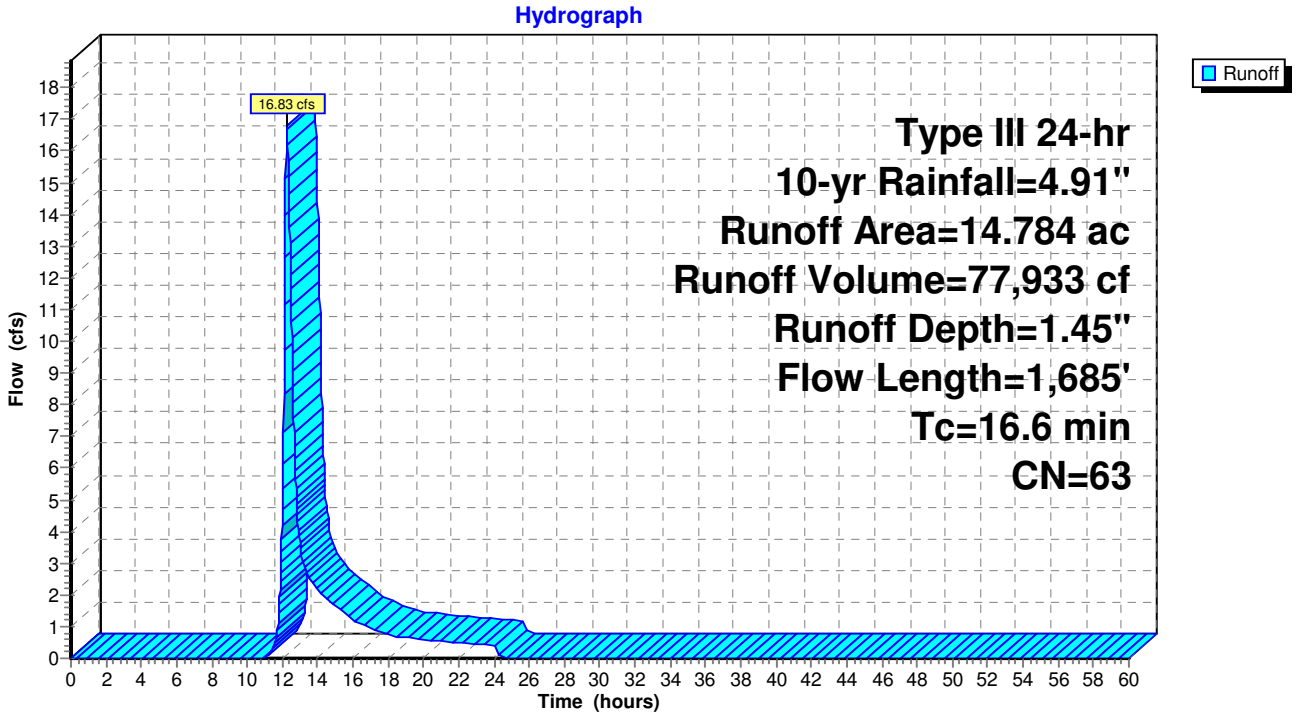
Subcatchment AE1: Aldi Parking and Areas to Pond



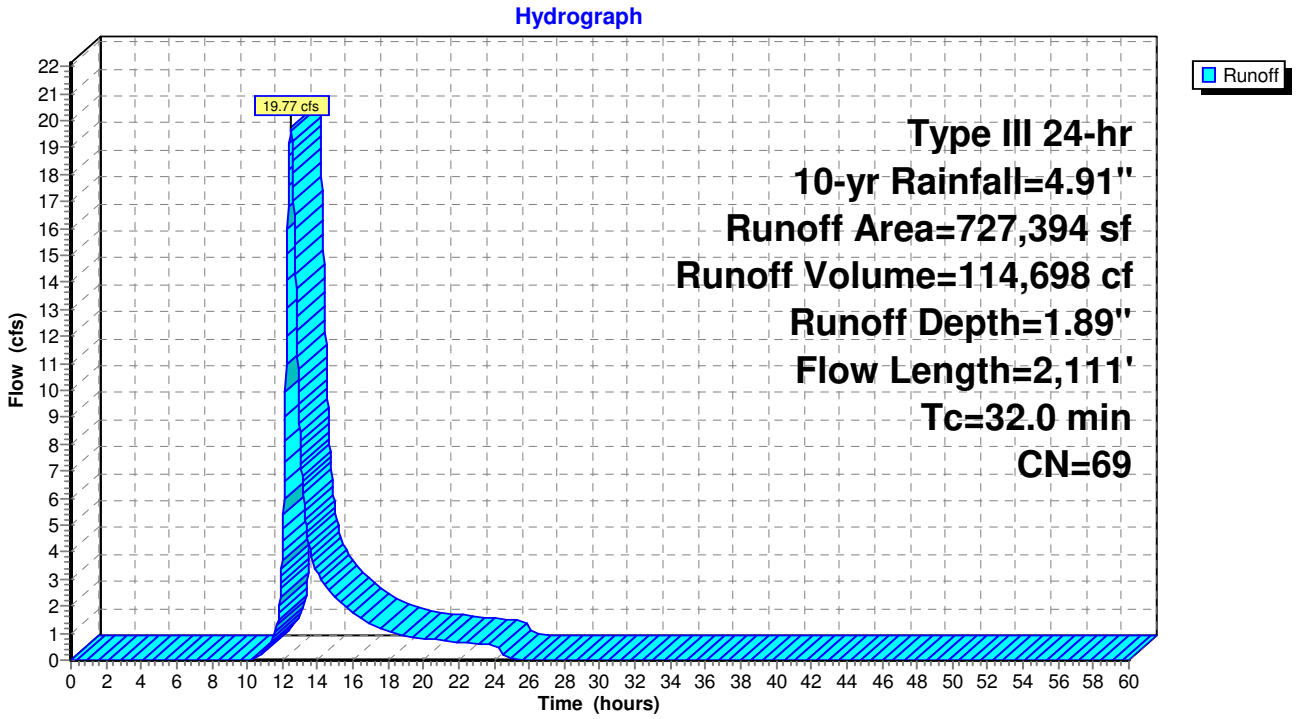
Subcatchment AE2: Aldi (Roof)



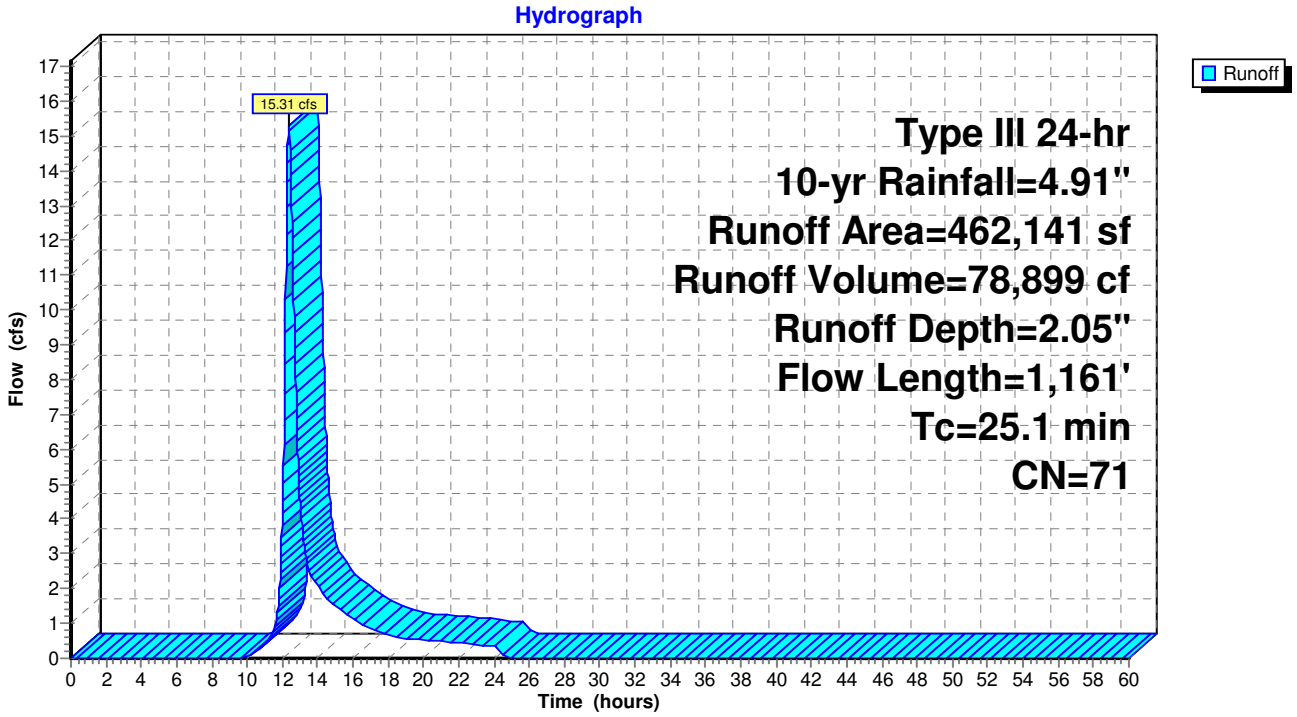
Subcatchment AE3: Existing Wetlands Pond - Catchment Area



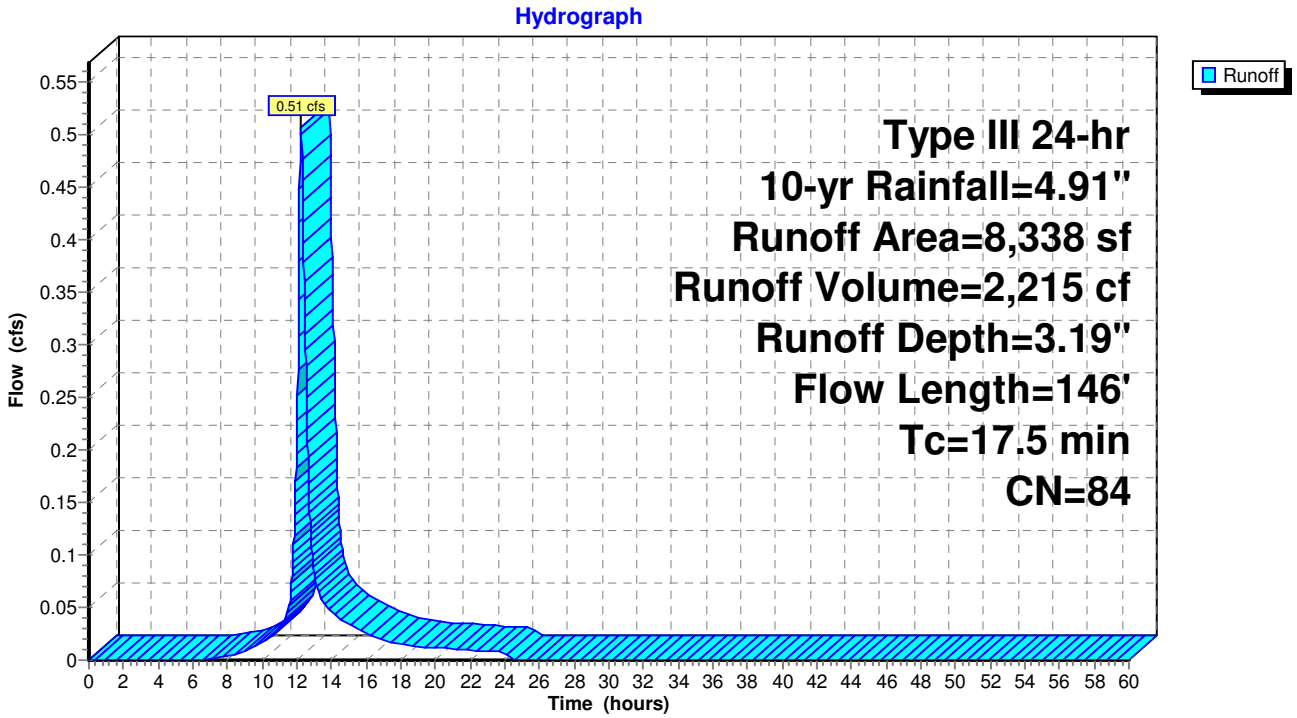
Subcatchment E1: Existing to DP1 (To Buckland Road)



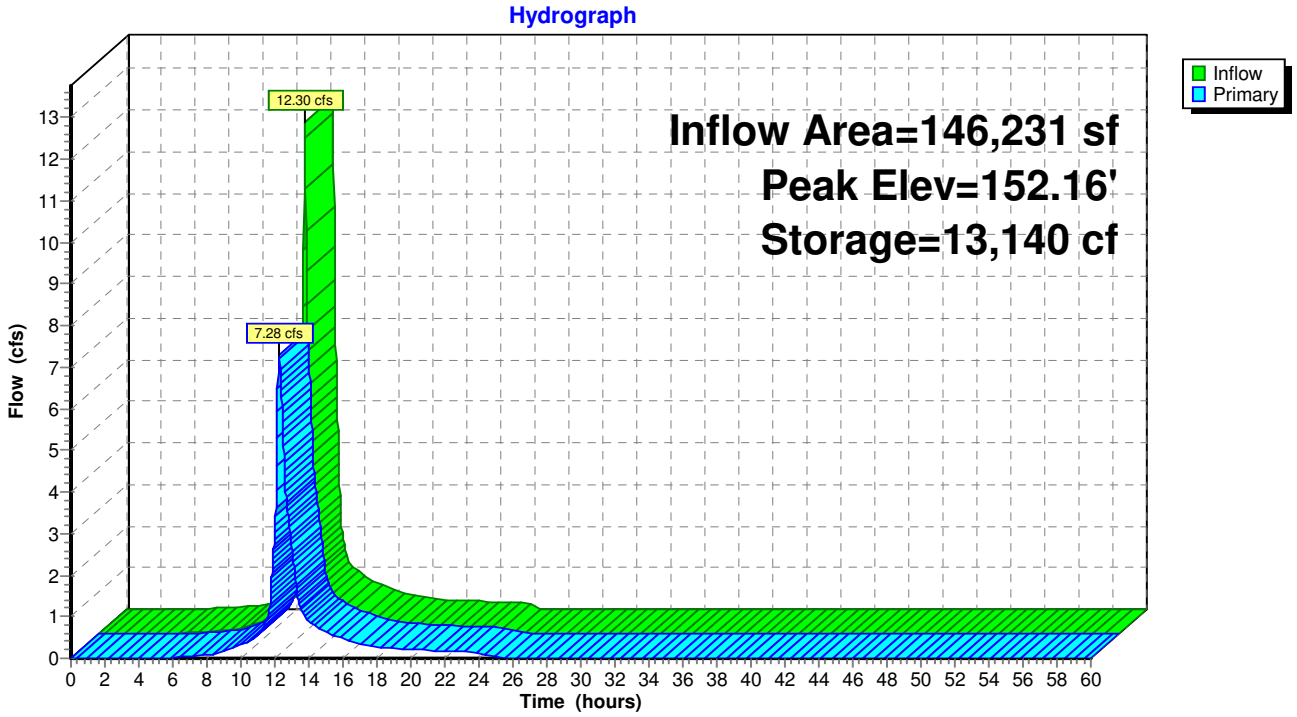
Subcatchment E2: Existing to DP2 (To Buckland Road)



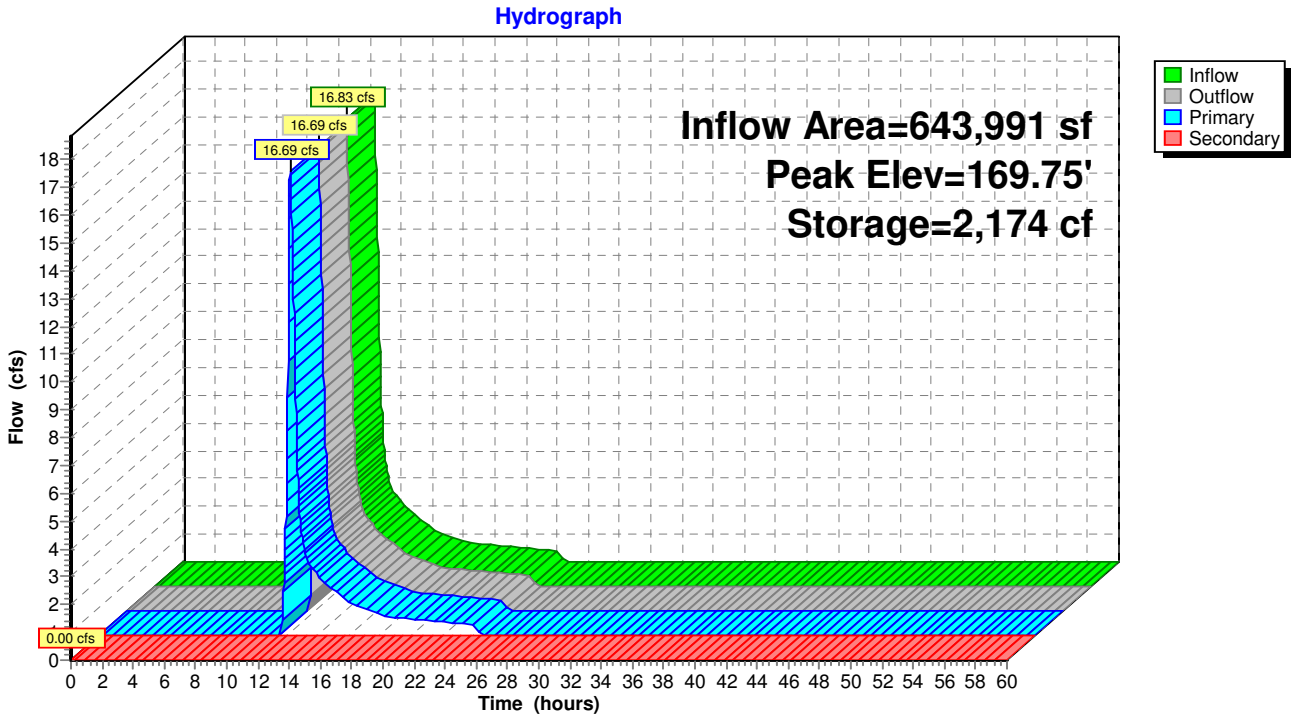
Subcatchment E3: Existing to DP3 (To M&R)



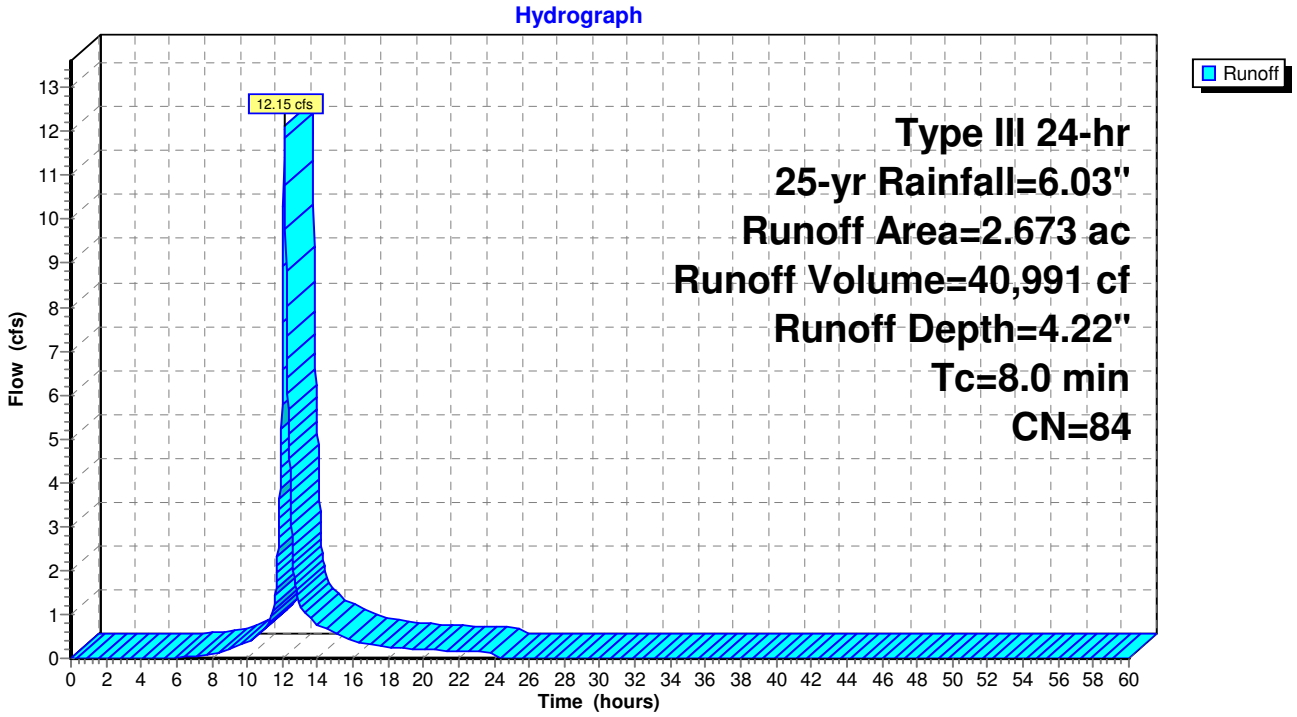
Pond AEP1: ALDI POND



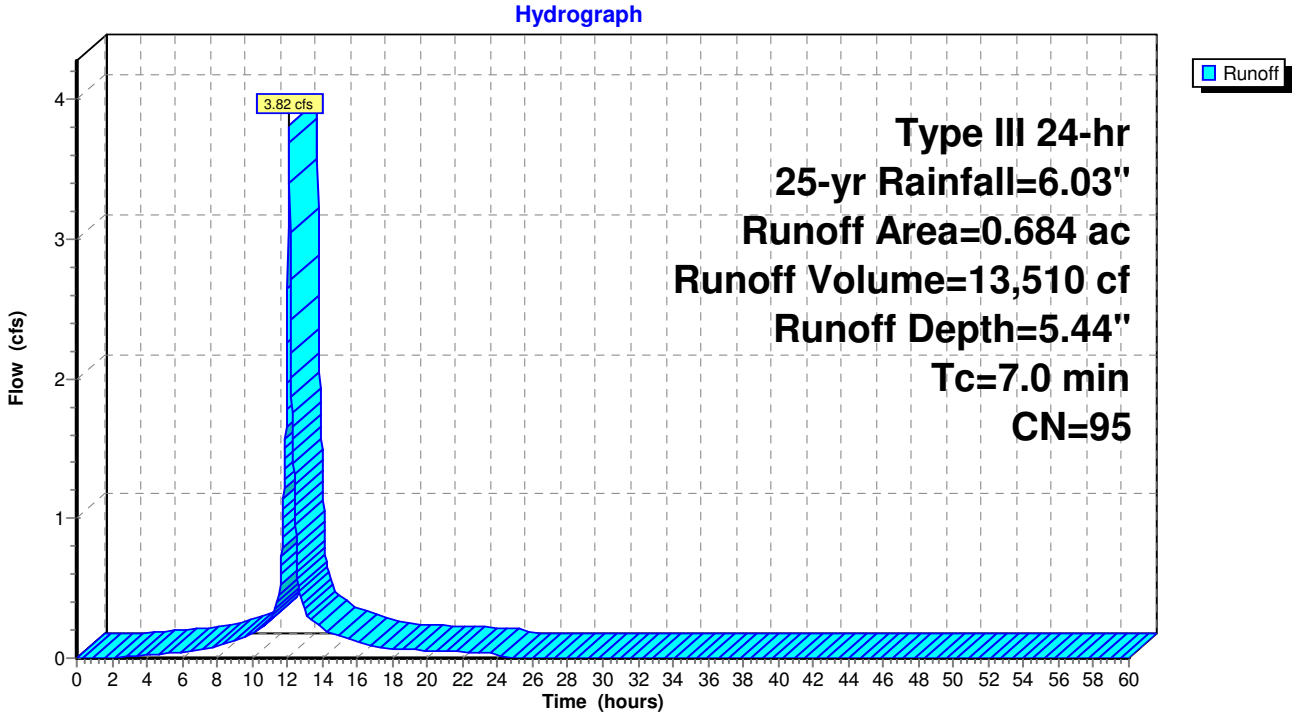
Pond AEP2: Existing Wetlands (With Overflow Pipe)



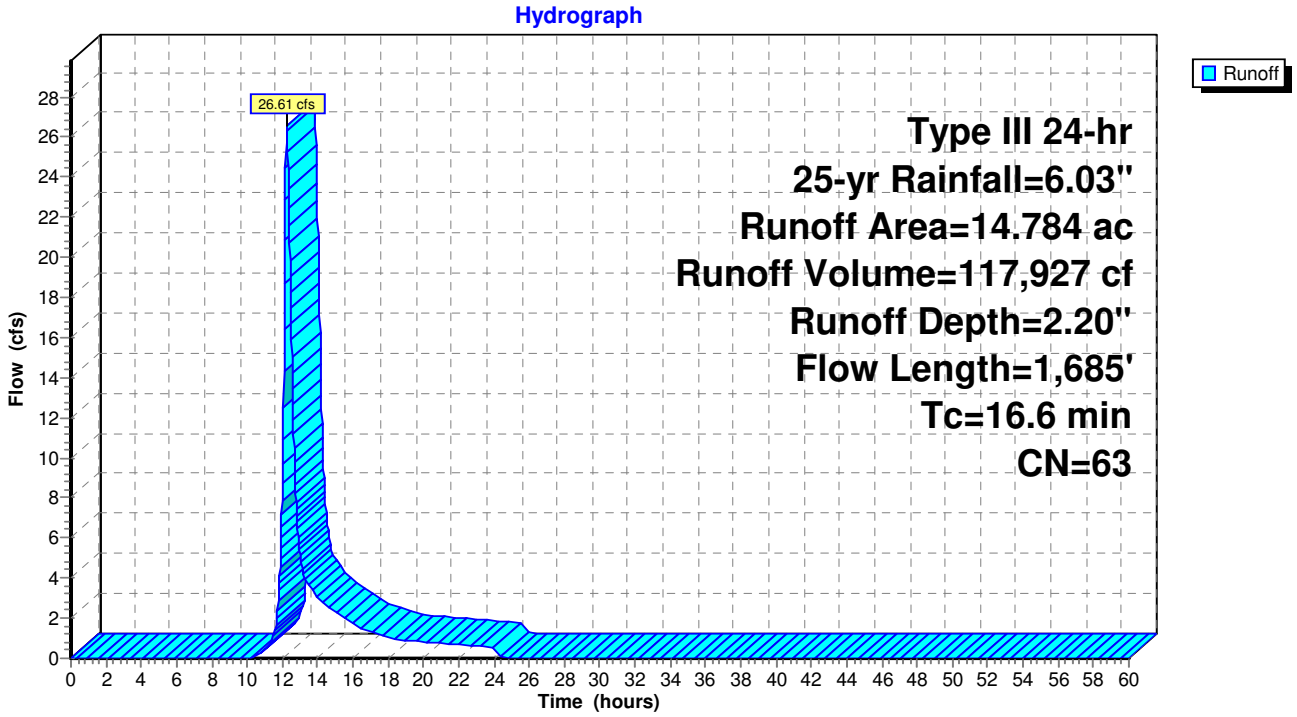
Subcatchment AE1: Aldi Parking and Areas to Pond



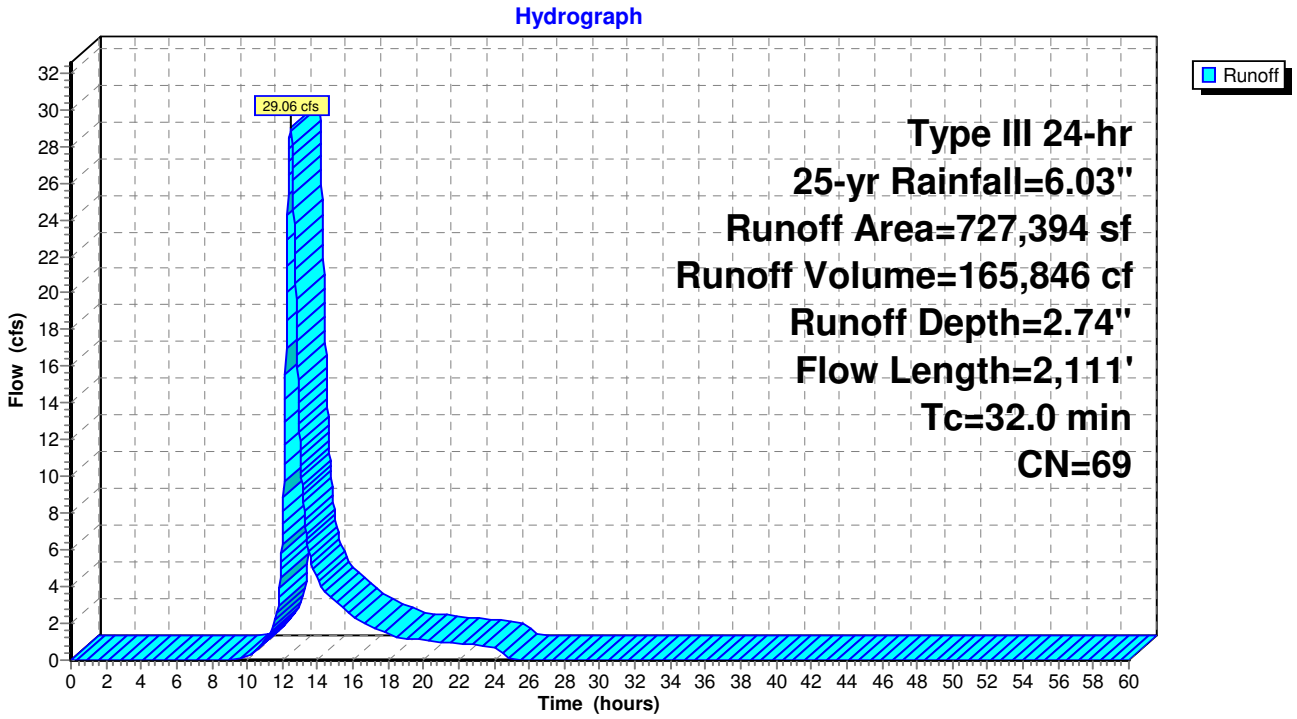
Subcatchment AE2: Aldi (Roof)



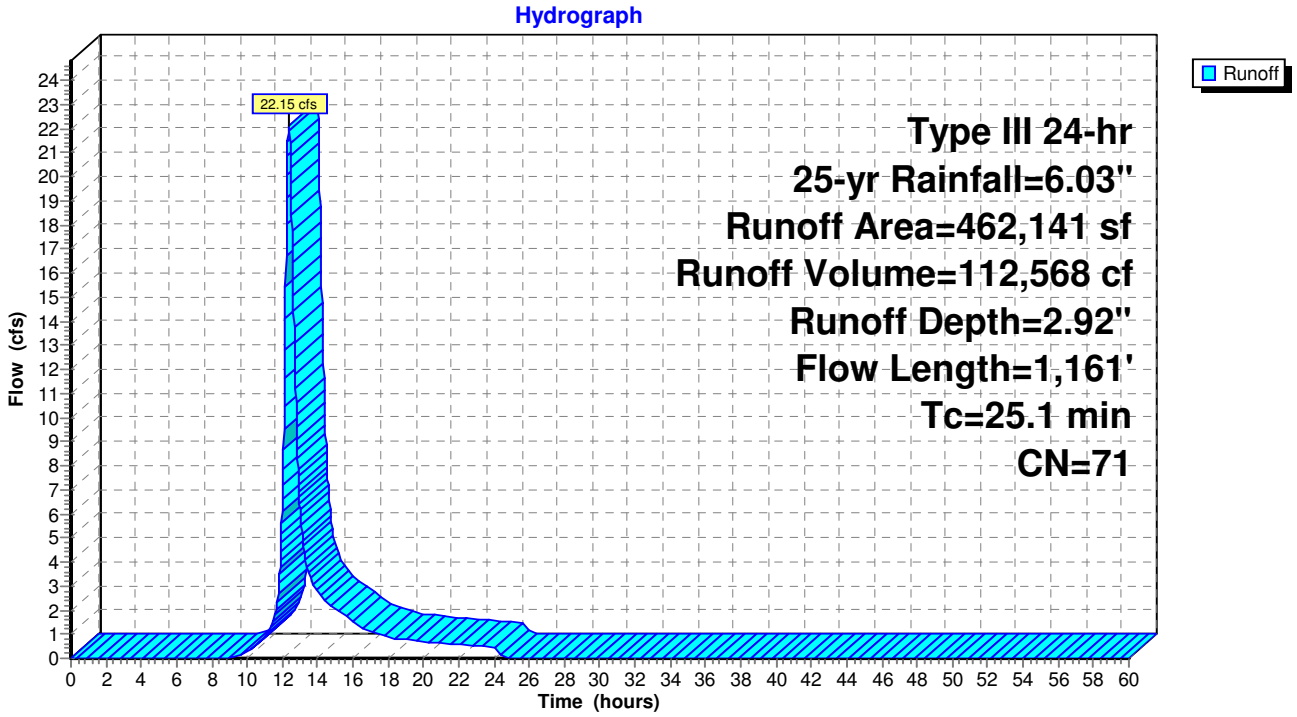
Subcatchment AE3: Existing Wetlands Pond - Catchment Area



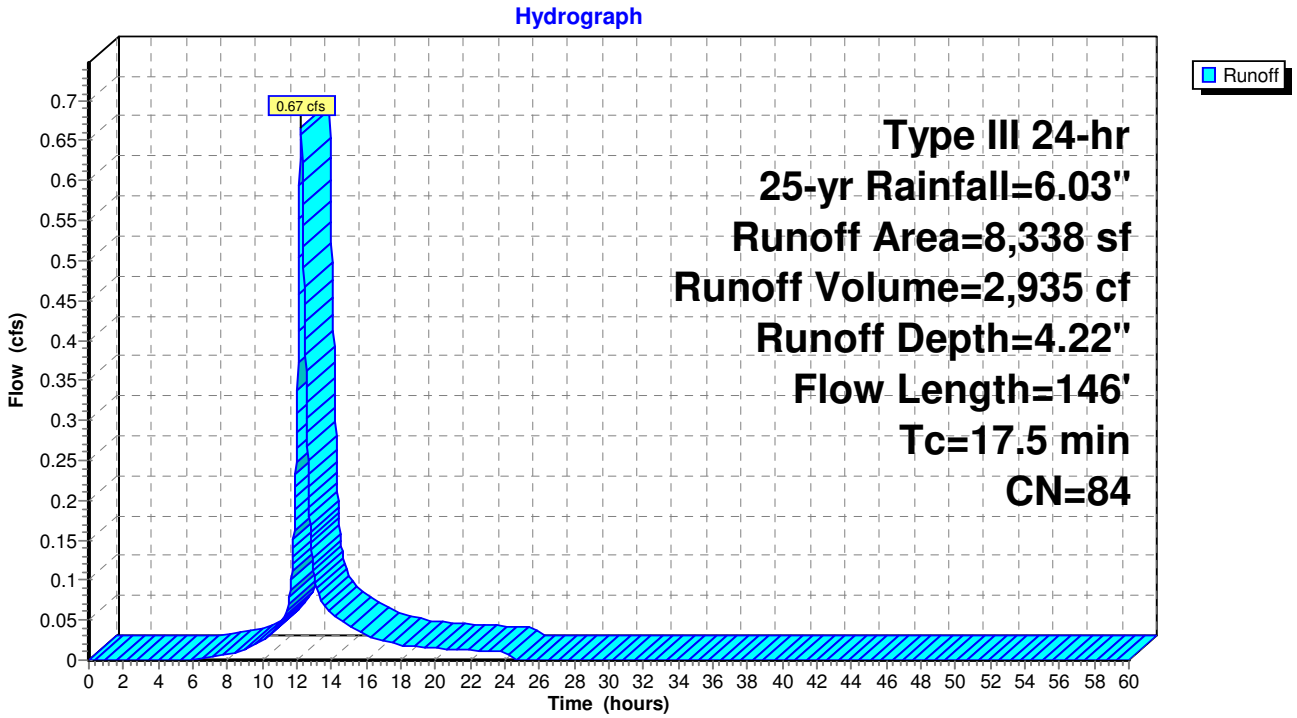
Subcatchment E1: Existing to DP1 (To Buckland Road)



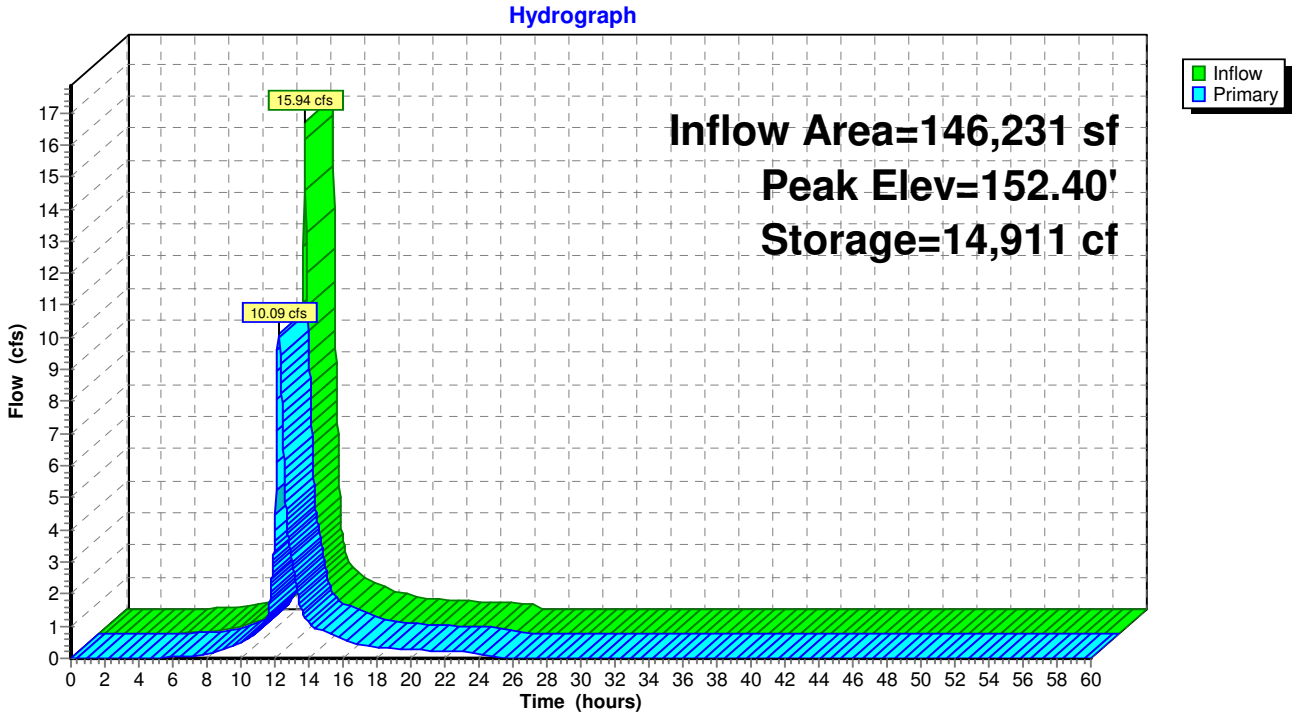
Subcatchment E2: Existing to DP2 (To Buckland Road)



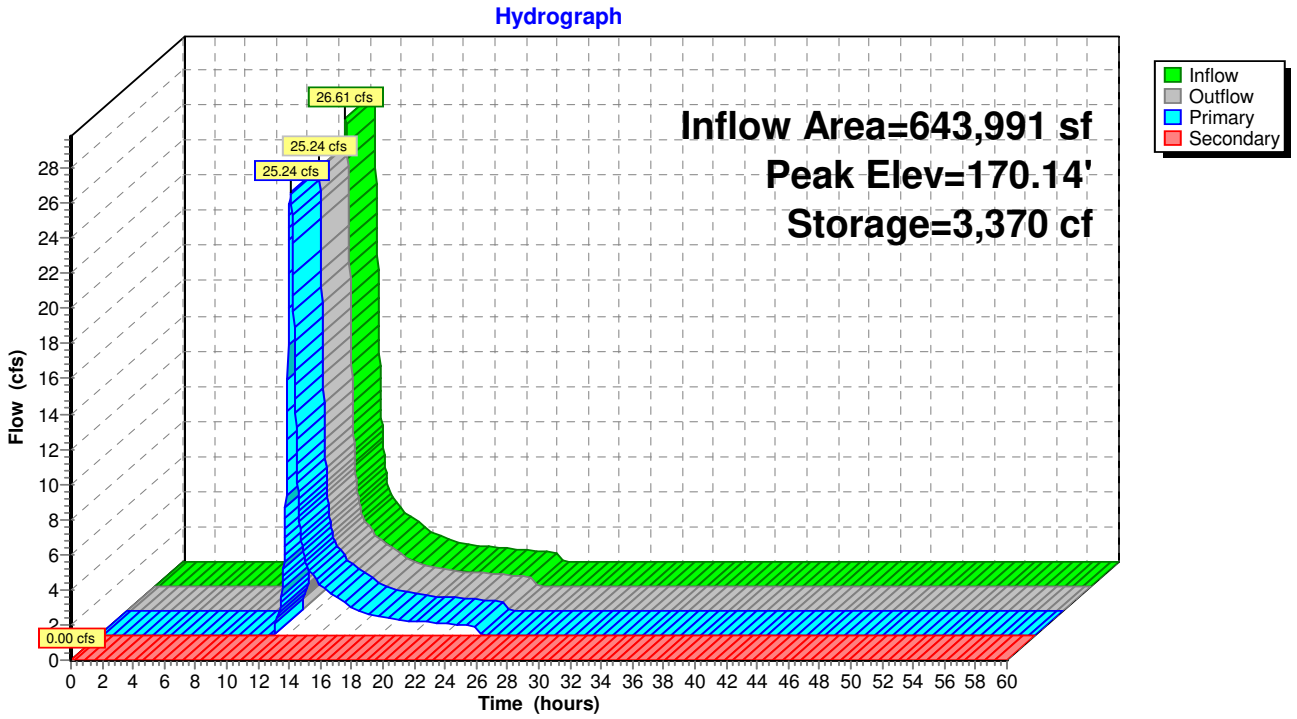
Subcatchment E3: Existing to DP3 (To M&R)



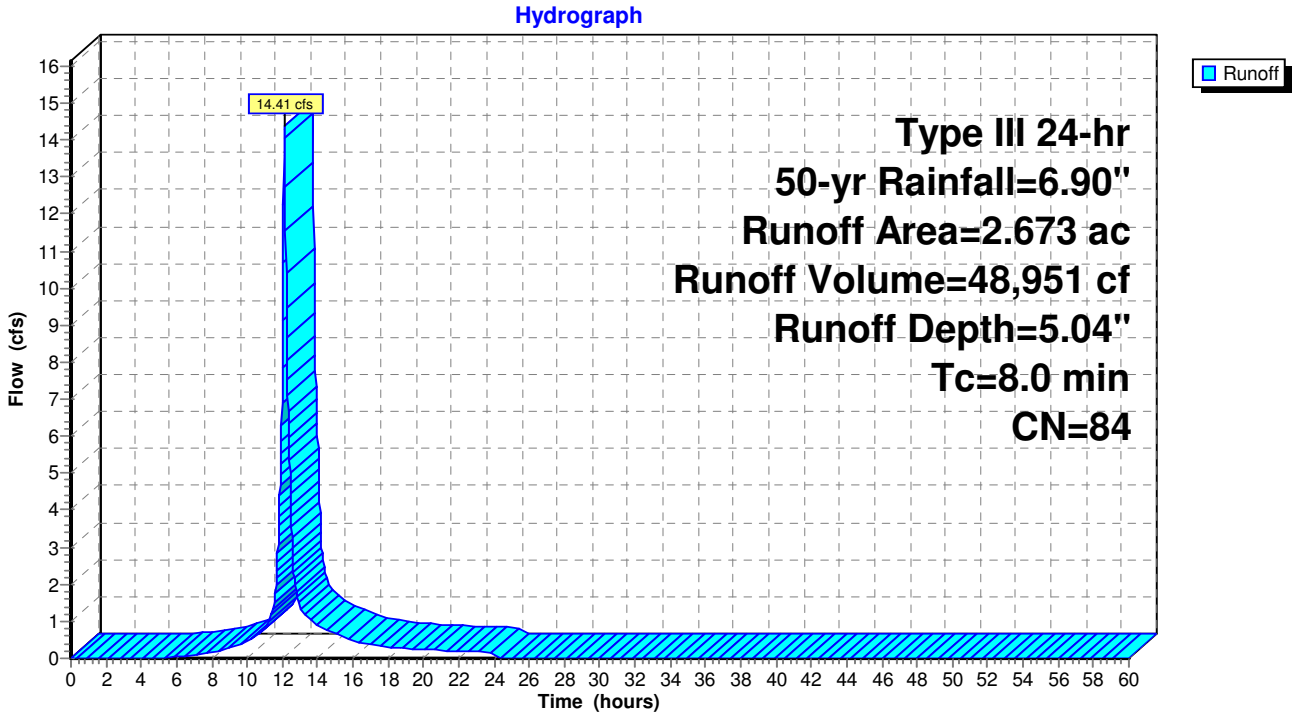
Pond AEP1: ALDI POND



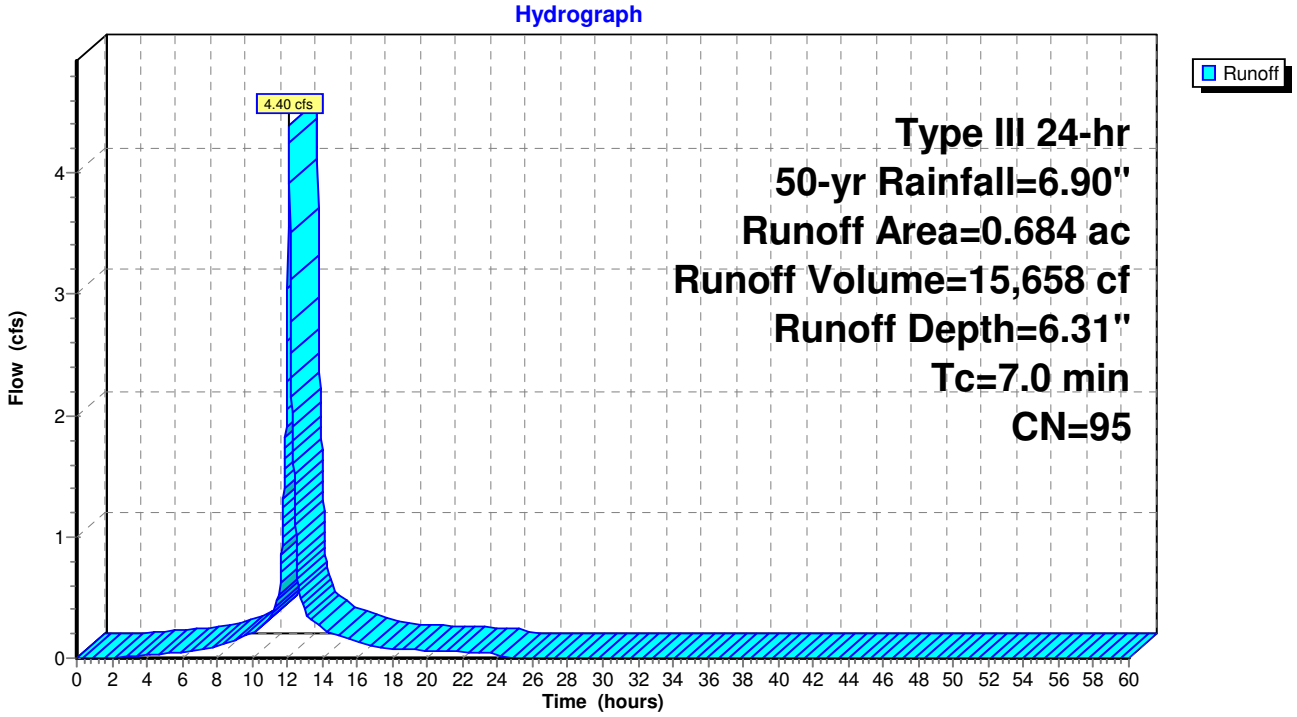
Pond AEP2: Existing Wetlands (With Overflow Pipe)



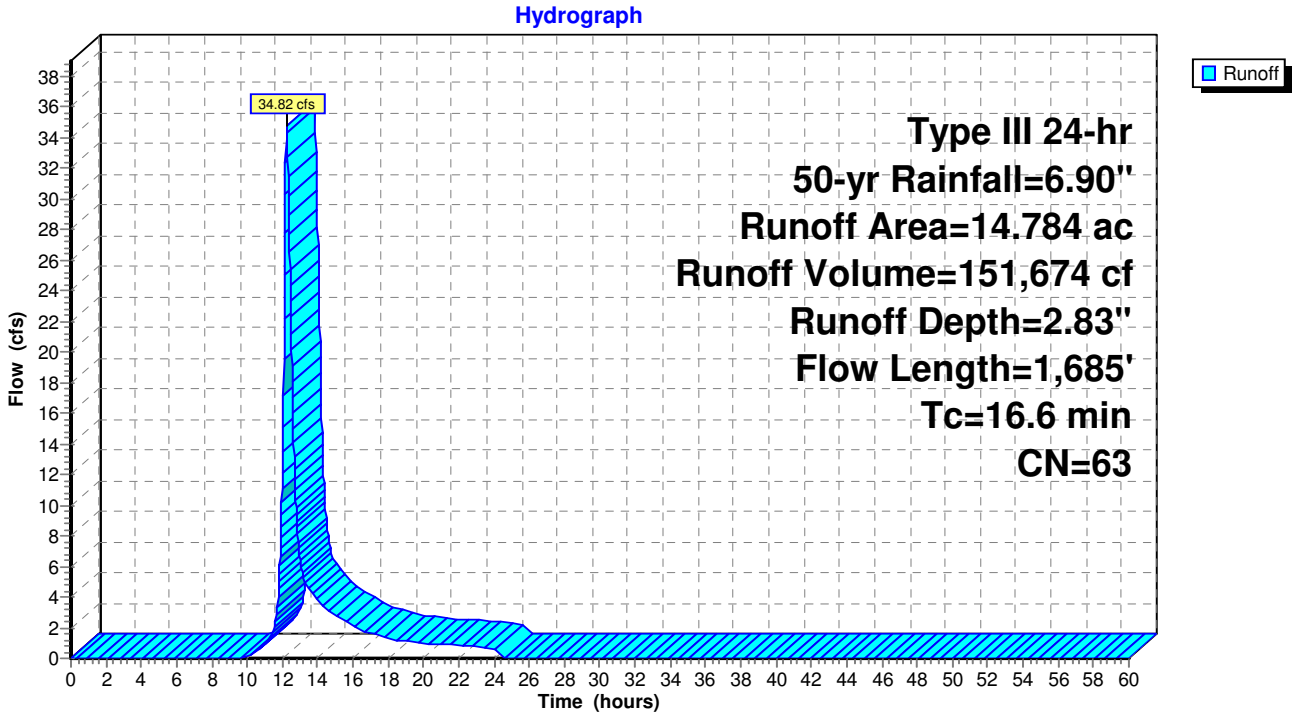
Subcatchment AE1: Aldi Parking and Areas to Pond



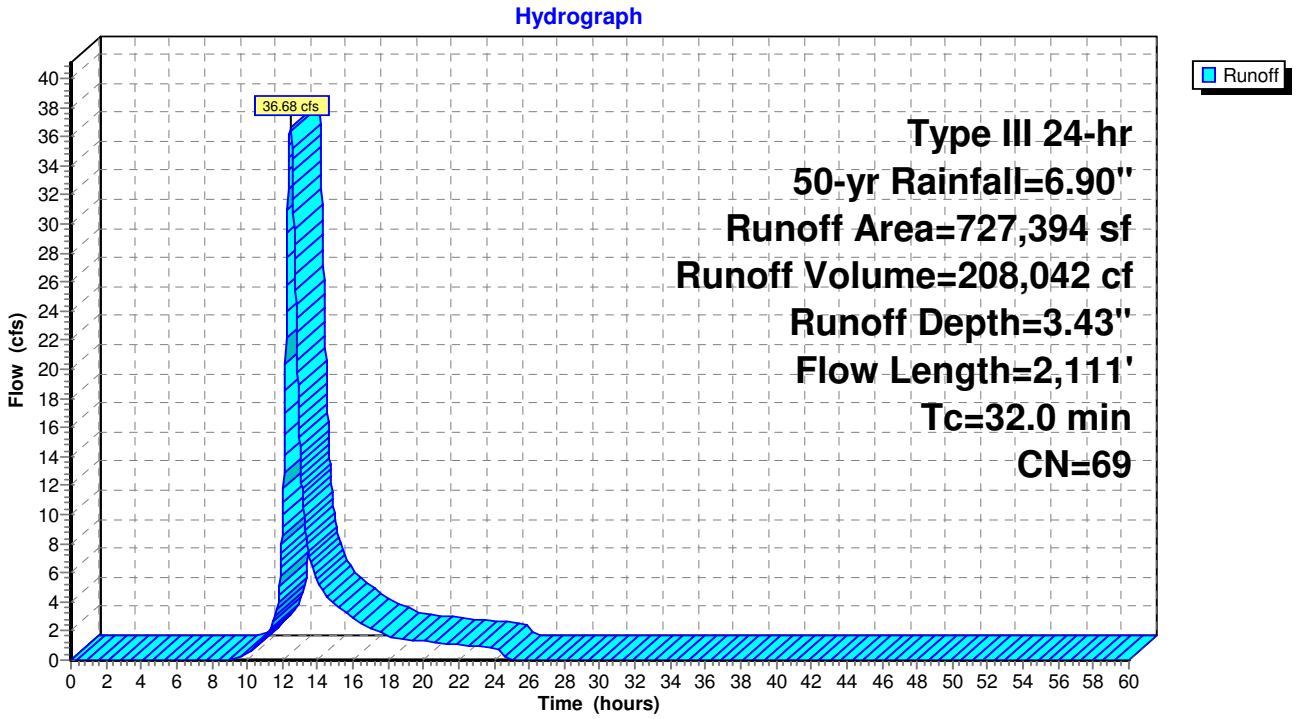
Subcatchment AE2: Aldi (Roof)



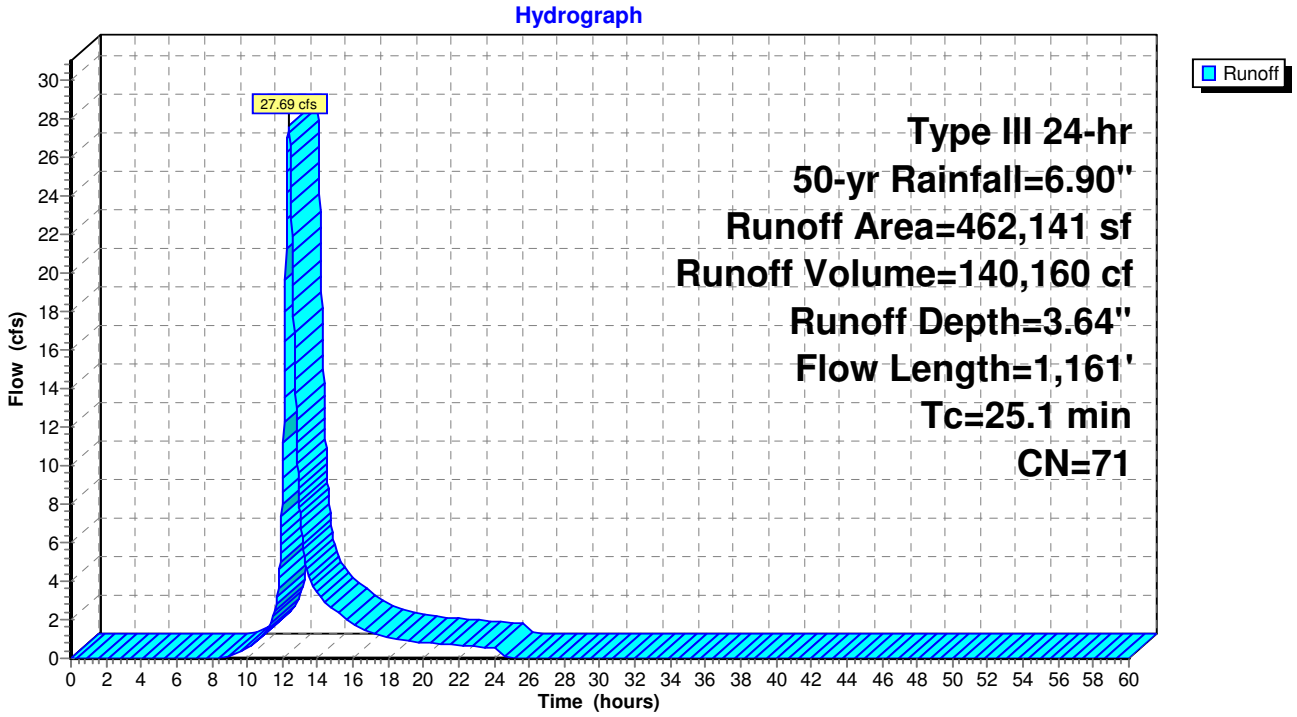
Subcatchment AE3: Existing Wetlands Pond - Catchment Area



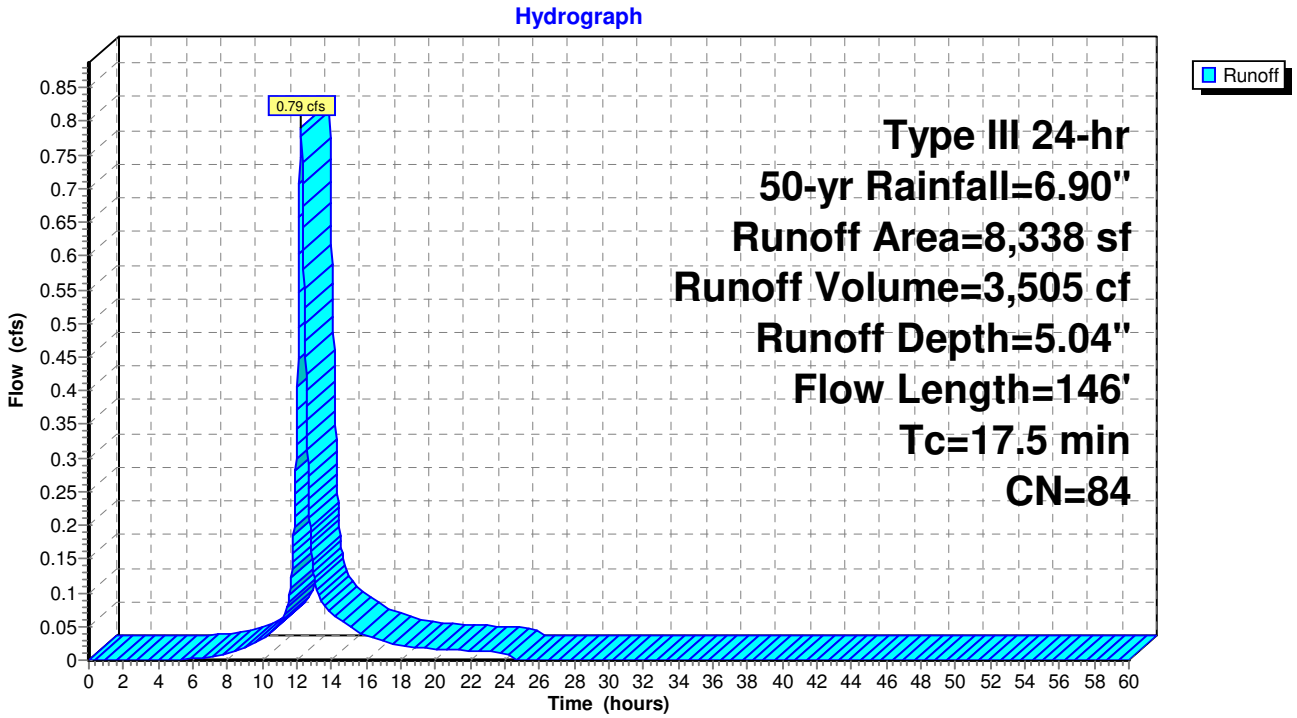
Subcatchment E1: Existing to DP1 (To Buckland Road)



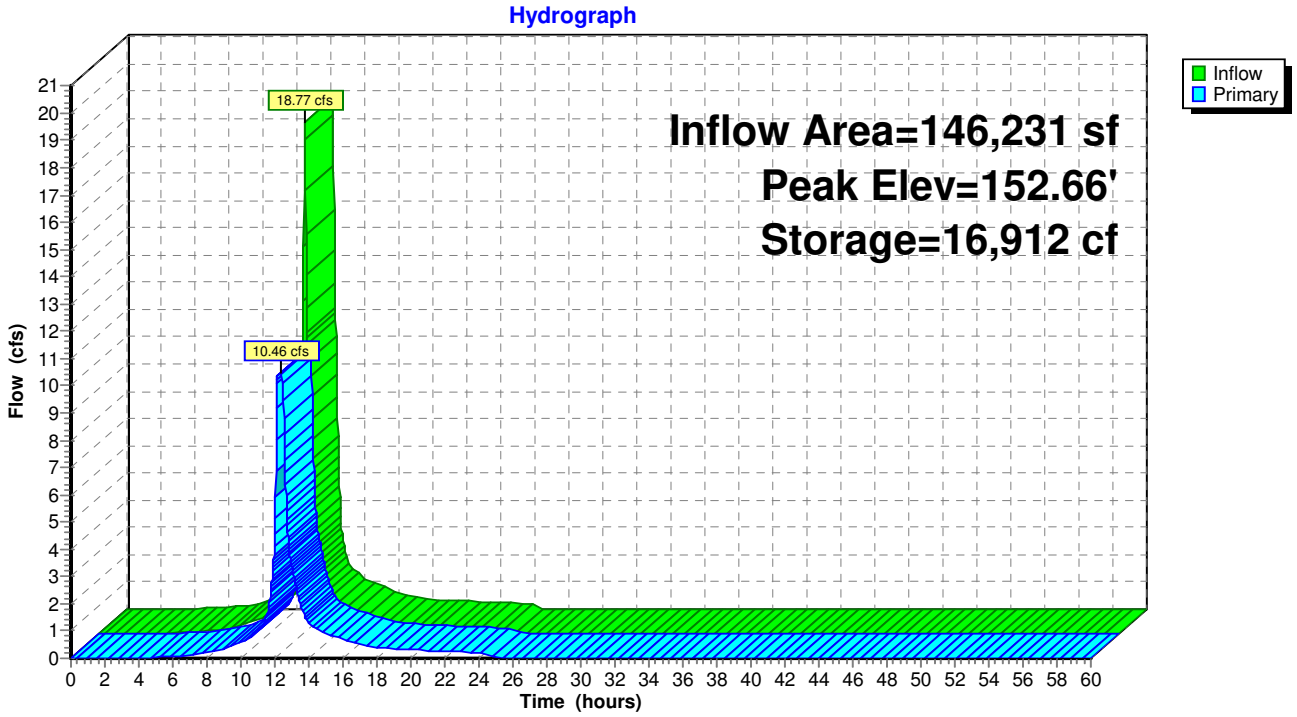
Subcatchment E2: Existing to DP2 (To Buckland Road)



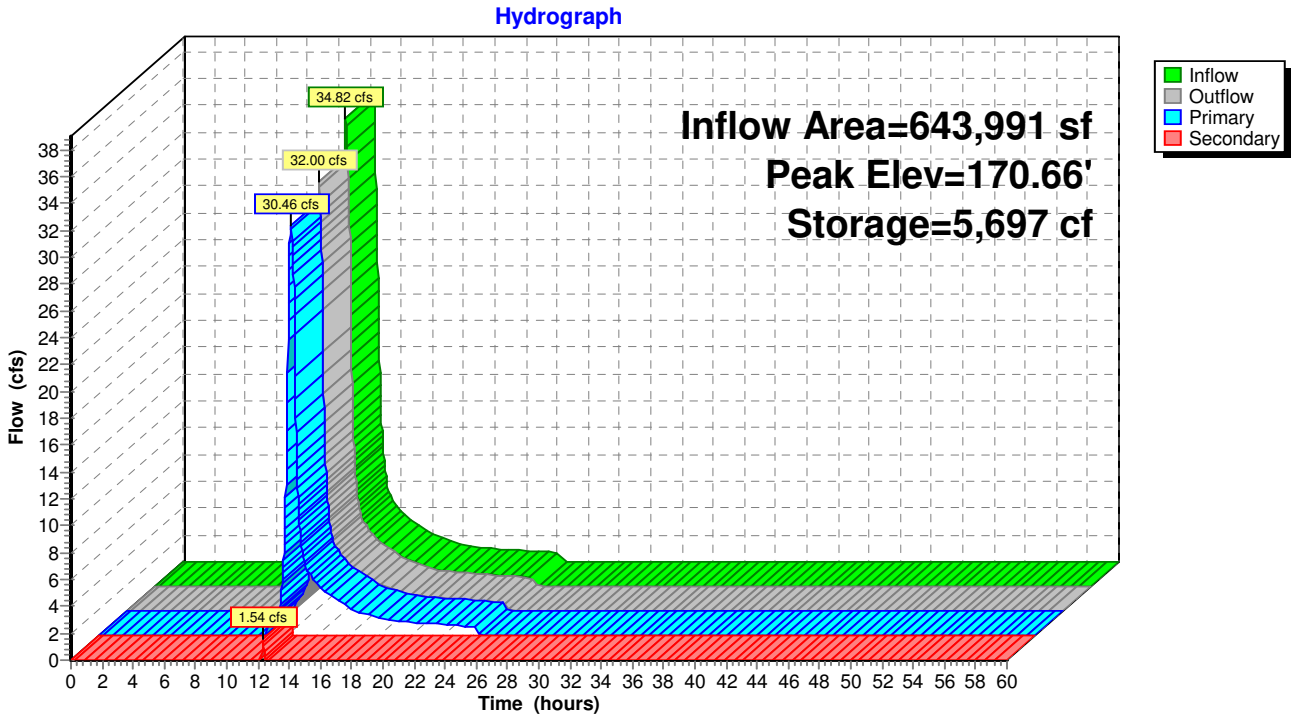
Subcatchment E3: Existing to DP3 (To M&R)



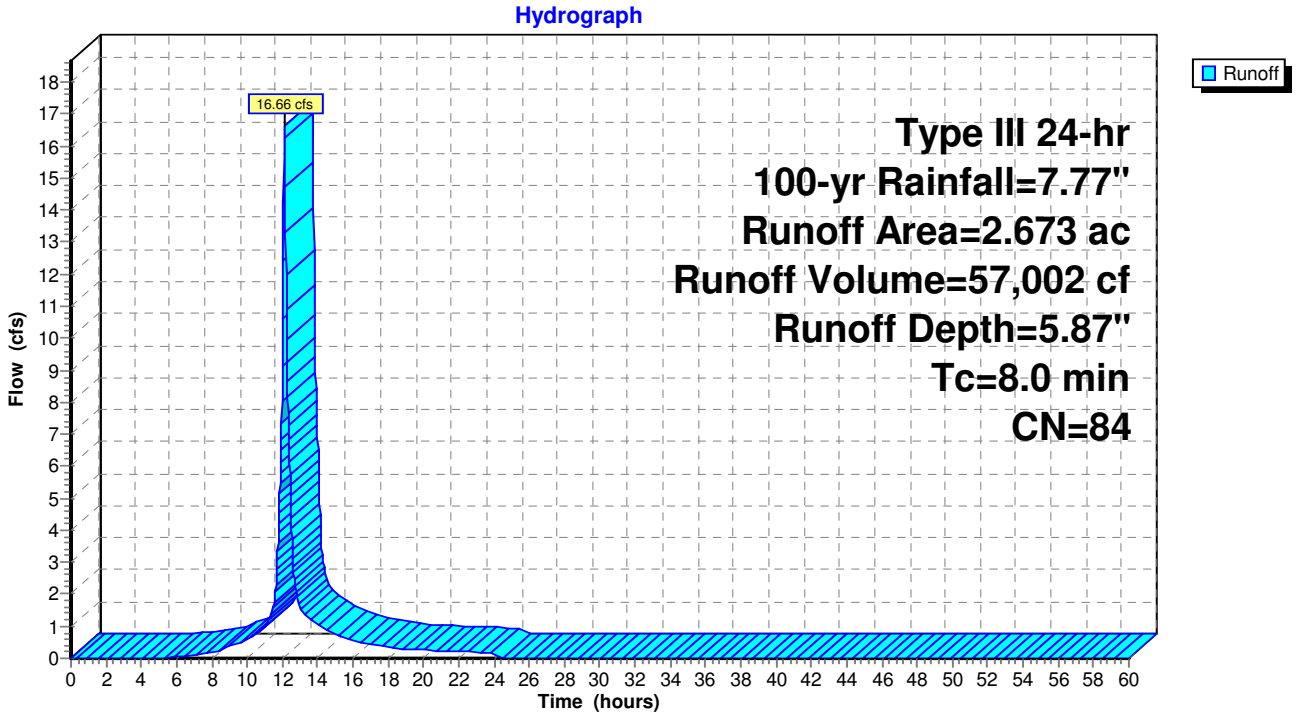
Pond AEP1: ALDI POND



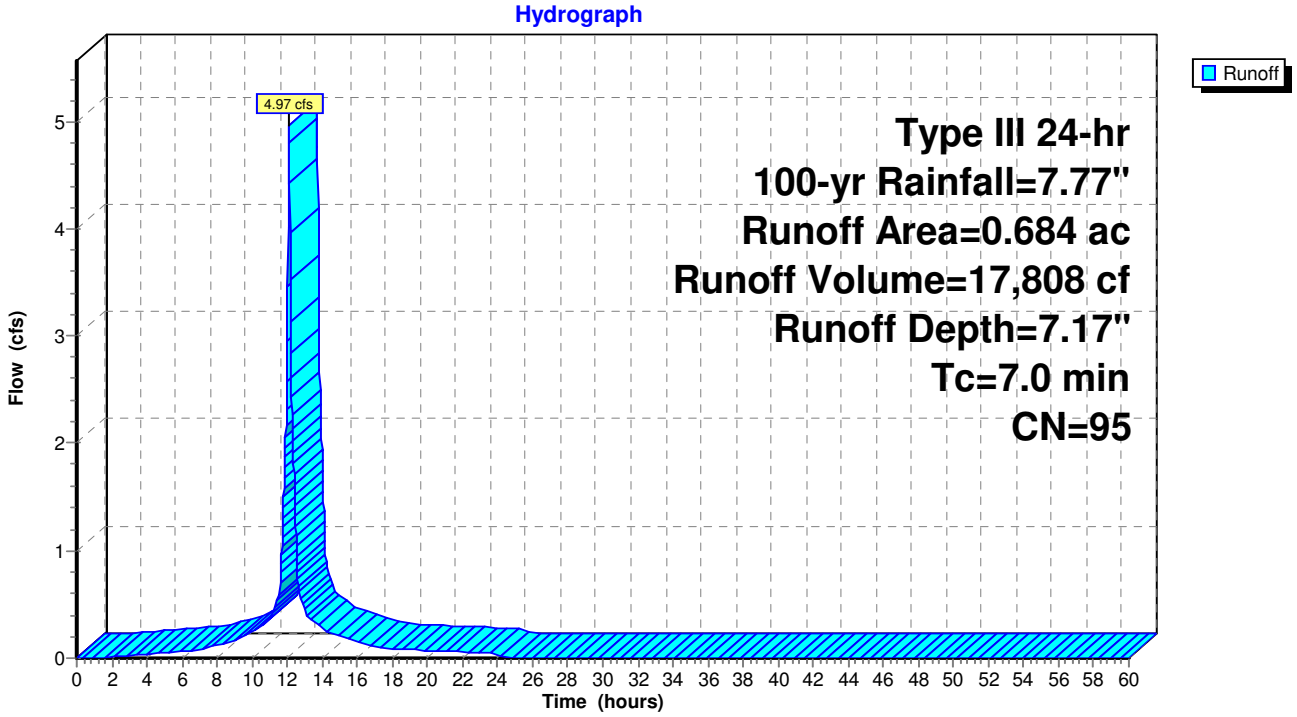
Pond AEP2: Existing Wetlands (With Overflow Pipe)



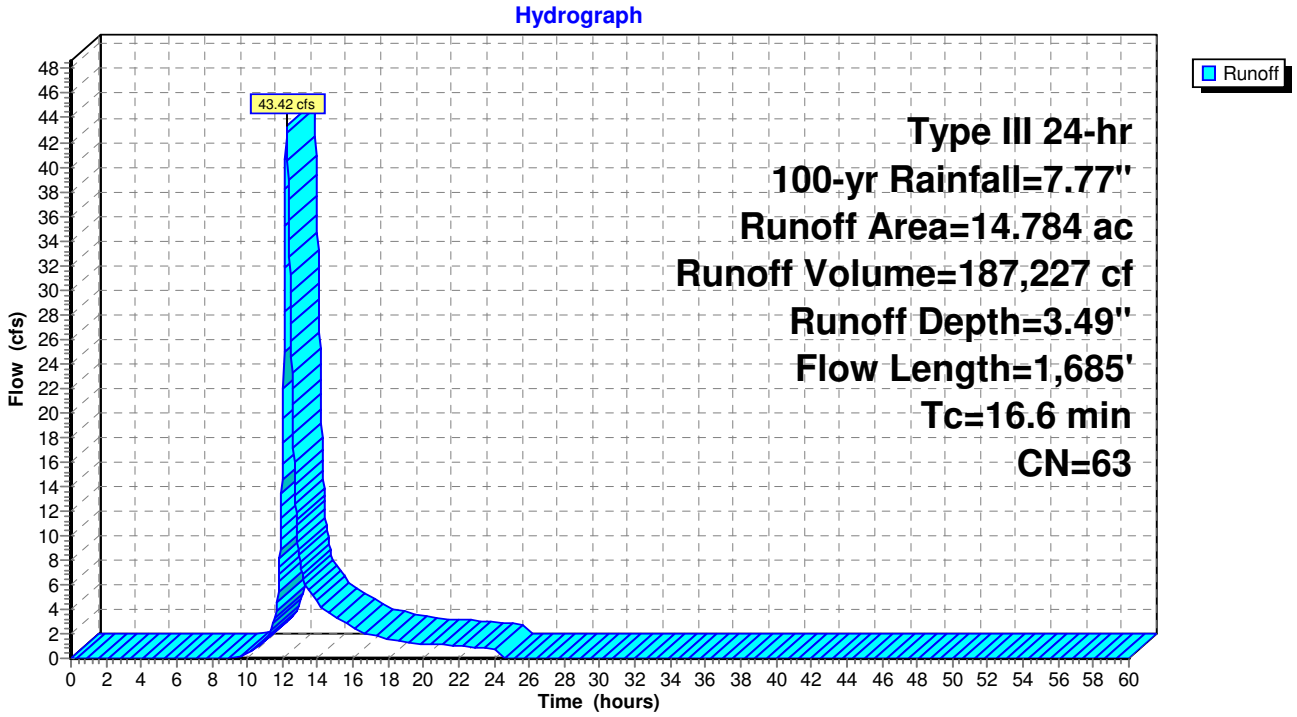
Subcatchment AE1: Aldi Parking and Areas to Pond



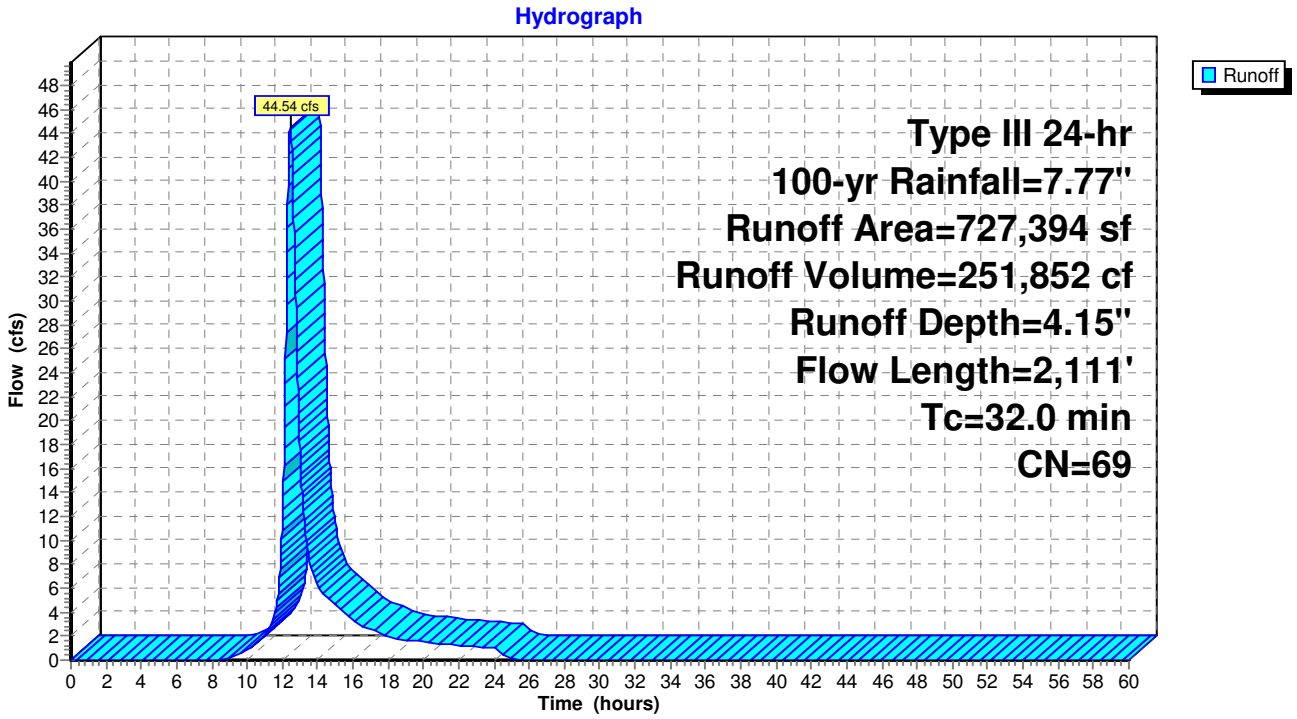
Subcatchment AE2: Aldi (Roof)



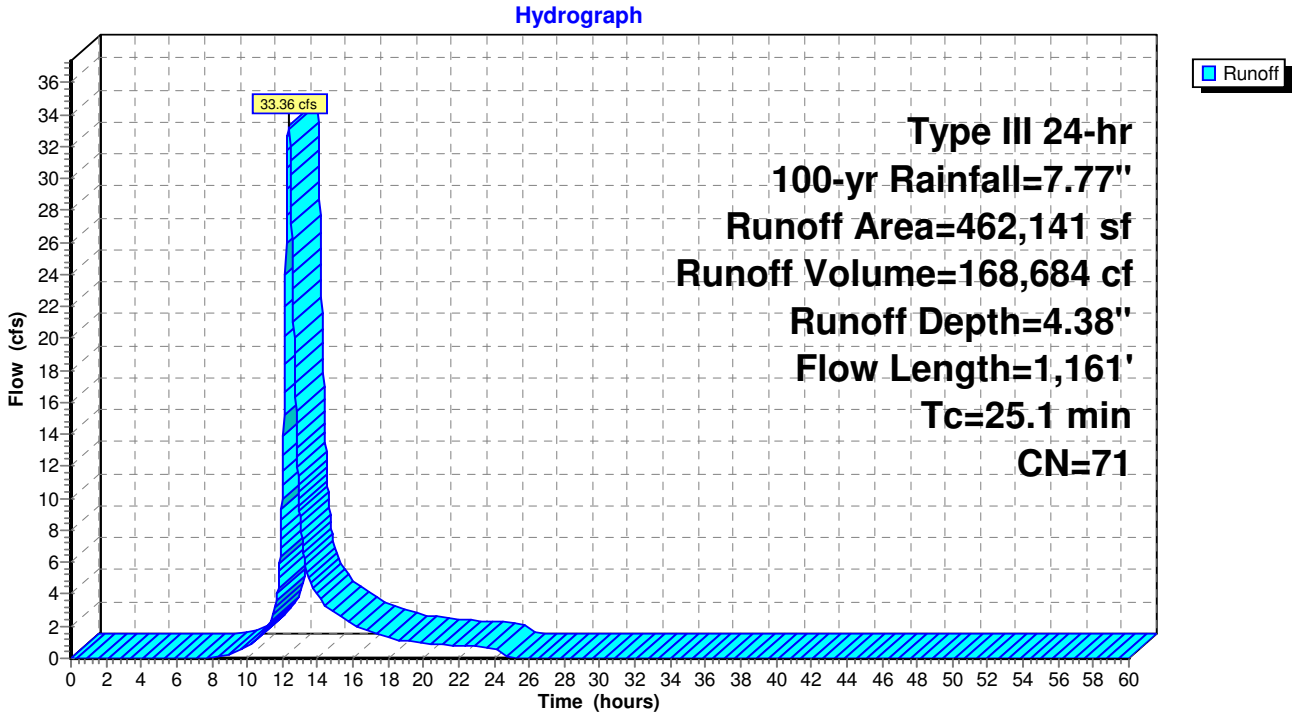
Subcatchment AE3: Existing Wetlands Pond - Catchment Area



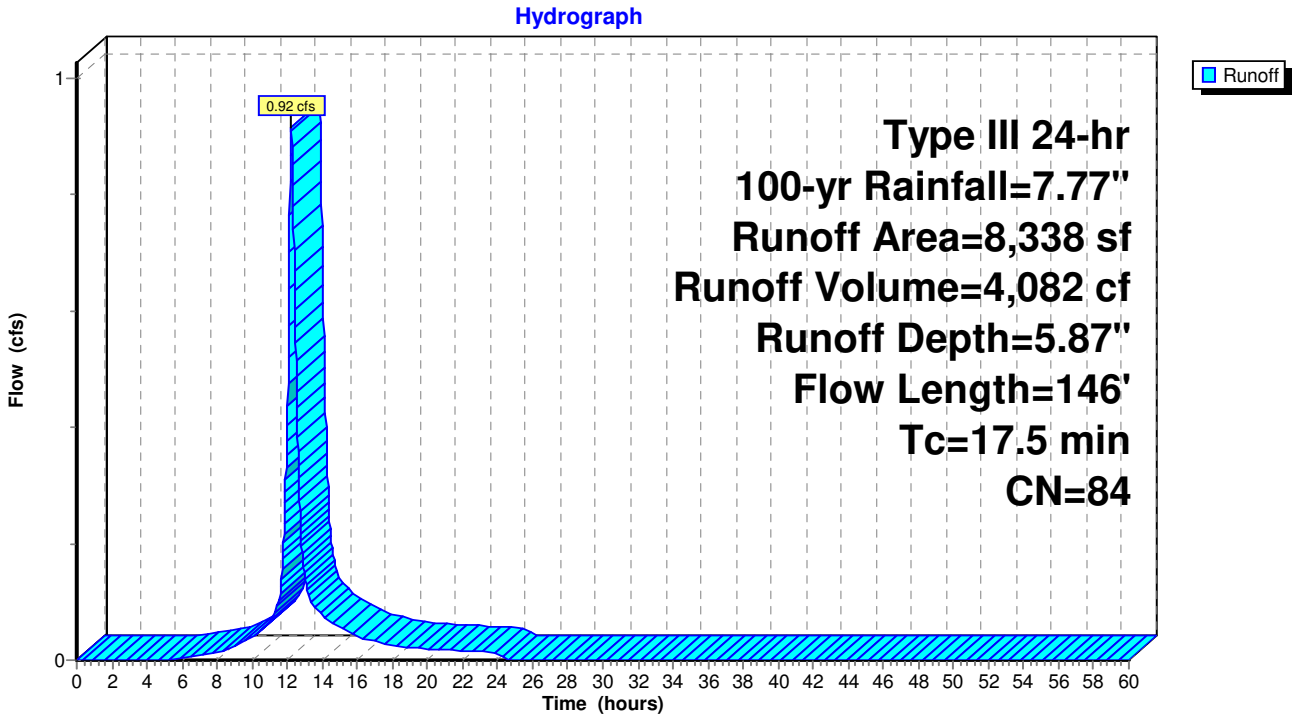
Subcatchment E1: Existing to DP1 (To Buckland Road)



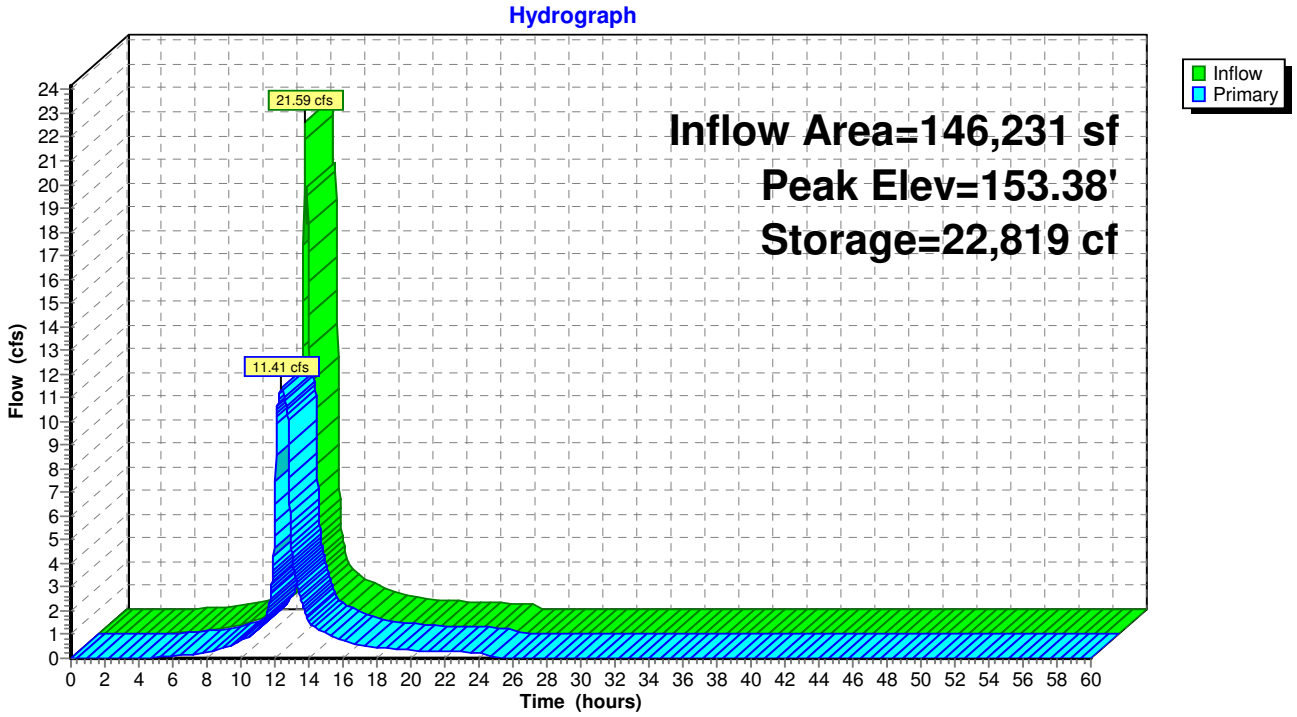
Subcatchment E2: Existing to DP2 (To Buckland Road)



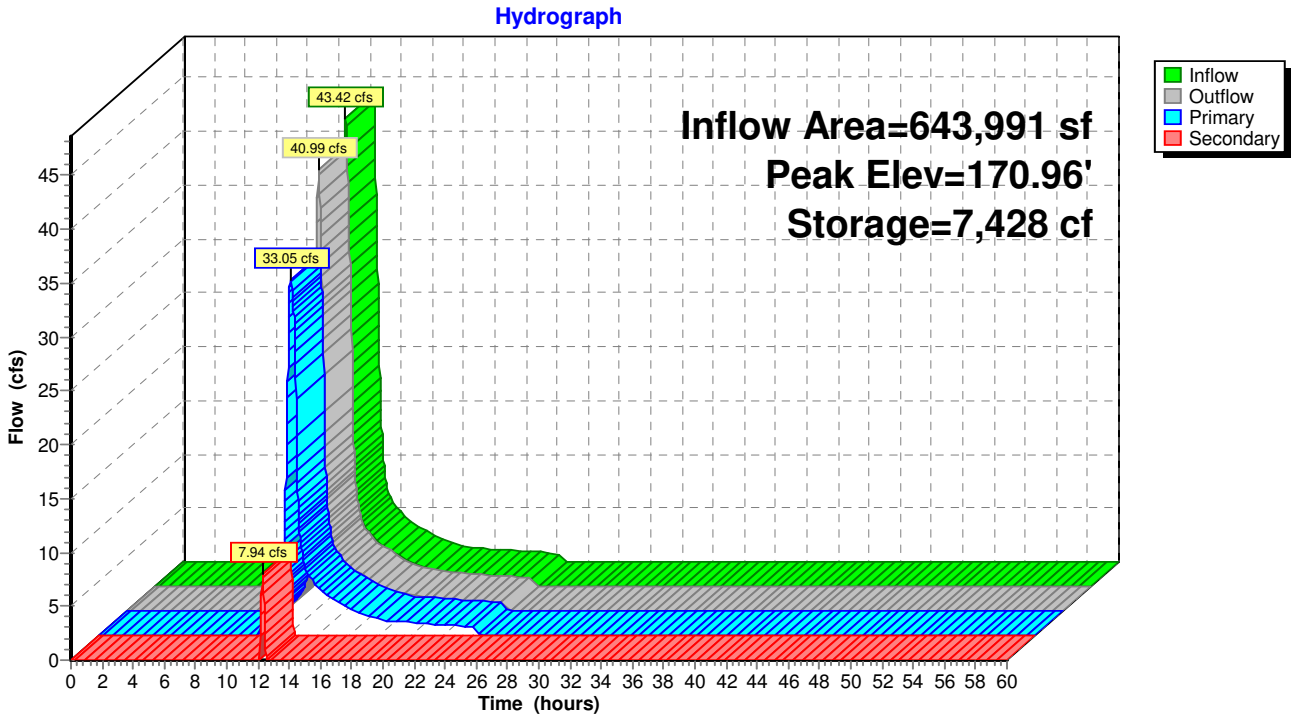
Subcatchment E3: Existing to DP3 (To M&R)



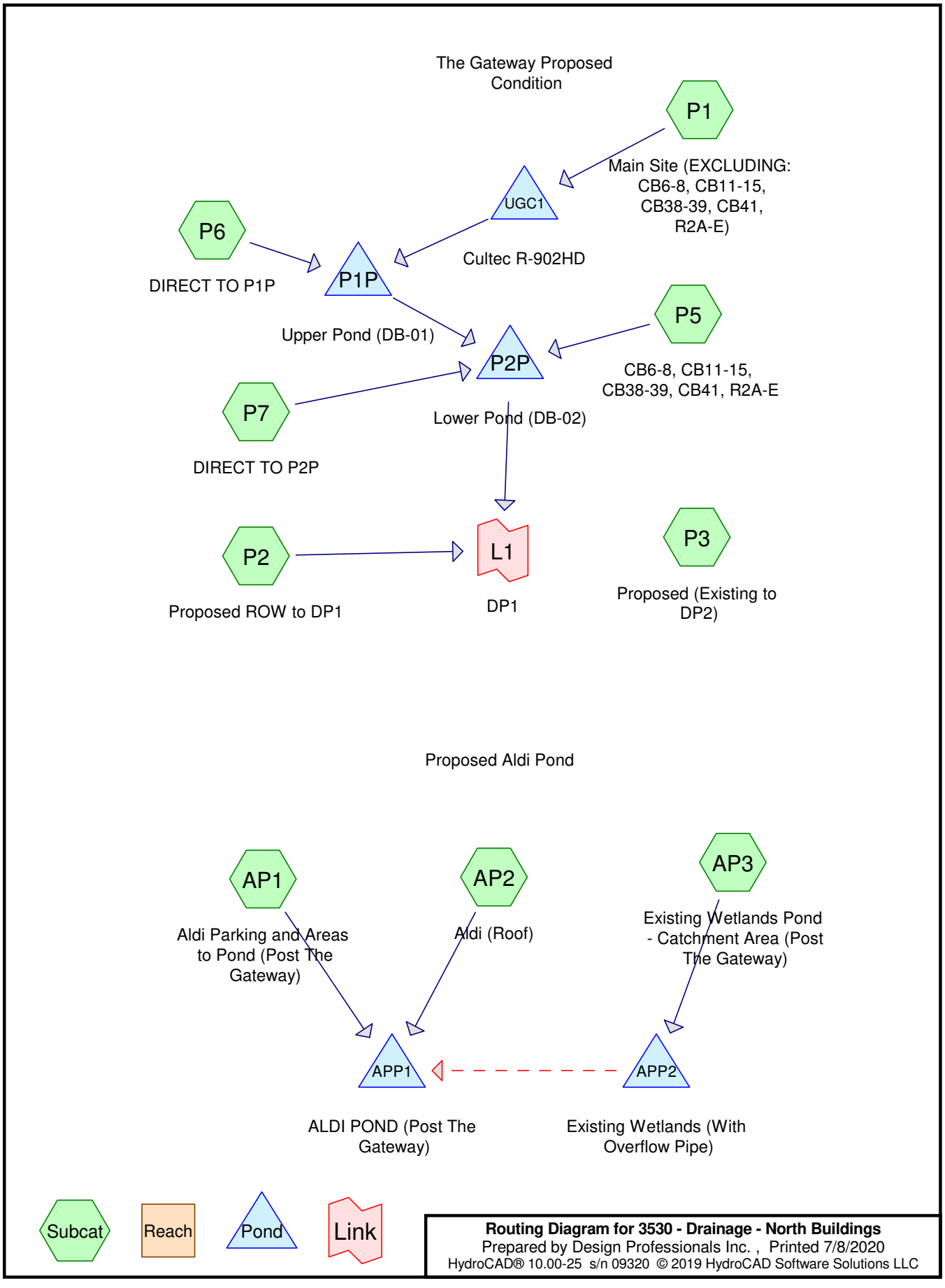
Pond AEP1: ALDI POND



Pond AEP2: Existing Wetlands (With Overflow Pipe)



APPENDIX B
Watershed Computations
(Post-Development Drainage HydroCAD Report)



Routing Diagram for 3530 - Drainage - North Buildings
Prepared by Design Professionals Inc. , Printed 7/8/2020

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 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

Subcatchment AP1: Aldi Parking and Areas Runoff Area=2.264 ac 41.74% Impervious Runoff Depth=1.68"
Tc=8.0 min CN=85 Runoff=4.16 cfs 13,816 cf

Subcatchment AP2: Aldi (Roof) Runoff Area=0.684 ac 88.30% Impervious Runoff Depth=2.56"
Tc=7.0 min CN=95 Runoff=1.87 cfs 6,349 cf

Subcatchment AP3: Existing Wetlands Runoff Area=14.790 ac 4.29% Impervious Runoff Depth=0.48"
Flow Length=1,685' Tc=16.6 min CN=63 Runoff=4.16 cfs 25,754 cf

Subcatchment P1: Main Site Runoff Area=784,591 sf 36.48% Impervious Runoff Depth=1.09"
Flow Length=1,865' Tc=26.0 min CN=76 Runoff=13.27 cfs 71,255 cf

Subcatchment P2: Proposed ROW to DP1 Runoff Area=19,637 sf 70.97% Impervious Runoff Depth=2.17"
Tc=6.0 min CN=91 Runoff=1.13 cfs 3,557 cf

Subcatchment P3: Proposed (Existing to Runoff Area=286,108 sf 4.77% Impervious Runoff Depth=0.87"
Flow Length=1,161' Tc=25.1 min CN=72 Runoff=3.76 cfs 20,846 cf

Subcatchment P5: CB6-8, CB11-15, Runoff Area=89,298 sf 88.29% Impervious Runoff Depth=2.56"
Tc=6.0 min CN=95 Runoff=5.81 cfs 19,027 cf

Subcatchment P6: DIRECT TO P1P Runoff Area=18,173 sf 0.00% Impervious Runoff Depth=0.98"
Tc=10.0 min CN=74 Runoff=0.39 cfs 1,482 cf

Subcatchment P7: DIRECT TO P2P Runoff Area=16,729 sf 0.00% Impervious Runoff Depth=0.98"
Tc=8.0 min CN=74 Runoff=0.39 cfs 1,364 cf

Pond APP1: ALDI POND (Post The Peak Elev=151.62' Storage=9,116 cf Inflow=6.01 cfs 20,164 cf
Outflow=3.21 cfs 20,164 cf

Pond APP2: Existing Wetlands (With Peak Elev=169.30' Storage=1,329 cf Inflow=4.16 cfs 25,754 cf
Primary=4.15 cfs 24,729 cf Secondary=0.00 cfs 0 cf Outflow=4.15 cfs 24,729 cf

Pond P1P: Upper Pond (DB-01) Peak Elev=149.47' Storage=3,010 cf Inflow=4.12 cfs 72,443 cf
Outflow=3.72 cfs 72,413 cf

Pond P2P: Lower Pond (DB-02) Peak Elev=146.94' Storage=1,624 cf Inflow=6.36 cfs 92,805 cf
Outflow=5.52 cfs 92,784 cf

Pond UGC1: Cultec R-902HD Peak Elev=150.15' Storage=26,777 cf Inflow=13.27 cfs 71,255 cf
Outflow=4.06 cfs 70,961 cf

Link L1: DP1 Inflow=6.50 cfs 96,341 cf
Primary=6.50 cfs 96,341 cf

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 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

Subcatchment AP1: Aldi Parking and Areas Runoff Area=2.264 ac 41.74% Impervious Runoff Depth=3.28"
Tc=8.0 min CN=85 Runoff=8.05 cfs 26,997 cf

Subcatchment AP2: Aldi (Roof) Runoff Area=0.684 ac 88.30% Impervious Runoff Depth=4.33"
Tc=7.0 min CN=95 Runoff=3.08 cfs 10,752 cf

Subcatchment AP3: Existing Wetlands Runoff Area=14.790 ac 4.29% Impervious Runoff Depth=1.45"
Flow Length=1,685' Tc=16.6 min CN=63 Runoff=16.83 cfs 77,964 cf

Subcatchment P1: Main Site Runoff Area=784,591 sf 36.48% Impervious Runoff Depth=2.46"
Flow Length=1,865' Tc=26.0 min CN=76 Runoff=31.19 cfs 160,943 cf

Subcatchment P2: Proposed ROW to DP1 Runoff Area=19,637 sf 70.97% Impervious Runoff Depth=3.89"
Tc=6.0 min CN=91 Runoff=1.97 cfs 6,373 cf

Subcatchment P3: Proposed (Existing to Runoff Area=286,108 sf 4.77% Impervious Runoff Depth=2.13"
Flow Length=1,161' Tc=25.1 min CN=72 Runoff=9.89 cfs 50,755 cf

Subcatchment P5: CB6-8, CB11-15, Runoff Area=89,298 sf 88.29% Impervious Runoff Depth=4.33"
Tc=6.0 min CN=95 Runoff=9.55 cfs 32,225 cf

Subcatchment P6: DIRECT TO P1P Runoff Area=18,173 sf 0.00% Impervious Runoff Depth=2.29"
Tc=10.0 min CN=74 Runoff=0.97 cfs 3,472 cf

Subcatchment P7: DIRECT TO P2P Runoff Area=16,729 sf 0.00% Impervious Runoff Depth=2.29"
Tc=8.0 min CN=74 Runoff=0.96 cfs 3,196 cf

Pond APP1: ALDI POND (Post The Peak Elev=152.08' Storage=12,237 cf Inflow=11.10 cfs 37,749 cf
Outflow=6.46 cfs 37,749 cf

Pond APP2: Existing Wetlands (With Peak Elev=169.75' Storage=2,175 cf Inflow=16.83 cfs 77,964 cf
Primary=16.70 cfs 76,939 cf Secondary=0.00 cfs 0 cf Outflow=16.70 cfs 76,939 cf

Pond P1P: Upper Pond (DB-01) Peak Elev=151.15' Storage=9,469 cf Inflow=18.57 cfs 164,106 cf
Outflow=16.82 cfs 164,075 cf

Pond P2P: Lower Pond (DB-02) Peak Elev=147.83' Storage=4,380 cf Inflow=18.02 cfs 199,495 cf
Outflow=17.73 cfs 199,474 cf

Pond UGC1: Cultec R-902HD Peak Elev=151.39' Storage=47,705 cf Inflow=31.19 cfs 160,943 cf
Outflow=18.18 cfs 160,634 cf

Link L1: DP1 Inflow=17.94 cfs 205,847 cf
Primary=17.94 cfs 205,847 cf

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 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

Subcatchment AP1: Aldi Parking and Areas Runoff Area=2.264 ac 41.74% Impervious Runoff Depth=4.33"
Tc=8.0 min CN=85 Runoff=10.51 cfs 35,592 cf

Subcatchment AP2: Aldi (Roof) Runoff Area=0.684 ac 88.30% Impervious Runoff Depth=5.44"
Tc=7.0 min CN=95 Runoff=3.82 cfs 13,510 cf

Subcatchment AP3: Existing Wetlands Runoff Area=14.790 ac 4.29% Impervious Runoff Depth=2.20"
Flow Length=1,685' Tc=16.6 min CN=63 Runoff=26.62 cfs 117,975 cf

Subcatchment P1: Main Site Runoff Area=784,591 sf 36.48% Impervious Runoff Depth=3.41"
Flow Length=1,865' Tc=26.0 min CN=76 Runoff=43.32 cfs 222,694 cf

Subcatchment P2: Proposed ROW to DP1 Runoff Area=19,637 sf 70.97% Impervious Runoff Depth=4.99"
Tc=6.0 min CN=91 Runoff=2.49 cfs 8,160 cf

Subcatchment P3: Proposed (Existing to Runoff Area=286,108 sf 4.77% Impervious Runoff Depth=3.02"
Flow Length=1,161' Tc=25.1 min CN=72 Runoff=14.18 cfs 71,951 cf

Subcatchment P5: CB6-8, CB11-15, Runoff Area=89,298 sf 88.29% Impervious Runoff Depth=5.44"
Tc=6.0 min CN=95 Runoff=11.86 cfs 40,492 cf

Subcatchment P6: DIRECT TO P1P Runoff Area=18,173 sf 0.00% Impervious Runoff Depth=3.21"
Tc=10.0 min CN=74 Runoff=1.37 cfs 4,861 cf

Subcatchment P7: DIRECT TO P2P Runoff Area=16,729 sf 0.00% Impervious Runoff Depth=3.21"
Tc=8.0 min CN=74 Runoff=1.35 cfs 4,475 cf

Pond APP1: ALDI POND (Post The Peak Elev=152.31' Storage=13,802 cf Inflow=14.30 cfs 49,103 cf
Outflow=9.12 cfs 49,102 cf

Pond APP2: Existing Wetlands (With Peak Elev=170.14' Storage=3,373 cf Inflow=26.62 cfs 117,975 cf
Primary=25.25 cfs 116,950 cf Secondary=0.00 cfs 0 cf Outflow=25.25 cfs 116,950 cf

Pond P1P: Upper Pond (DB-01) Peak Elev=151.92' Storage=13,525 cf Inflow=27.39 cfs 227,242 cf
Outflow=25.37 cfs 227,211 cf

Pond P2P: Lower Pond (DB-02) Peak Elev=148.48' Storage=7,175 cf Inflow=26.95 cfs 272,178 cf
Outflow=26.31 cfs 272,156 cf

Pond UGC1: Cultec R-902HD Peak Elev=152.13' Storage=59,051 cf Inflow=43.32 cfs 222,694 cf
Outflow=26.95 cfs 222,381 cf

Link L1: DP1 Inflow=26.58 cfs 280,316 cf
Primary=26.58 cfs 280,316 cf

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 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

Subcatchment AP1: Aldi Parking and Areas Runoff Area=2.264 ac 41.74% Impervious Runoff Depth=5.16"
Tc=8.0 min CN=85 Runoff=12.42 cfs 42,382 cf

Subcatchment AP2: Aldi (Roof) Runoff Area=0.684 ac 88.30% Impervious Runoff Depth=6.31"
Tc=7.0 min CN=95 Runoff=4.40 cfs 15,658 cf

Subcatchment AP3: Existing Wetlands Runoff Area=14.790 ac 4.29% Impervious Runoff Depth=2.83"
Flow Length=1,685' Tc=16.6 min CN=63 Runoff=34.83 cfs 151,736 cf

Subcatchment P1: Main Site Runoff Area=784,591 sf 36.48% Impervious Runoff Depth=4.17"
Flow Length=1,865' Tc=26.0 min CN=76 Runoff=52.99 cfs 272,544 cf

Subcatchment P2: Proposed ROW to DP1 Runoff Area=19,637 sf 70.97% Impervious Runoff Depth=5.84"
Tc=6.0 min CN=91 Runoff=2.89 cfs 9,557 cf

Subcatchment P3: Proposed (Existing to Runoff Area=286,108 sf 4.77% Impervious Runoff Depth=3.74"
Flow Length=1,161' Tc=25.1 min CN=72 Runoff=17.65 cfs 89,266 cf

Subcatchment P5: CB6-8, CB11-15, Runoff Area=89,298 sf 88.29% Impervious Runoff Depth=6.31"
Tc=6.0 min CN=95 Runoff=13.64 cfs 46,928 cf

Subcatchment P6: DIRECT TO P1P Runoff Area=18,173 sf 0.00% Impervious Runoff Depth=3.96"
Tc=10.0 min CN=74 Runoff=1.69 cfs 5,990 cf

Subcatchment P7: DIRECT TO P2P Runoff Area=16,729 sf 0.00% Impervious Runoff Depth=3.96"
Tc=8.0 min CN=74 Runoff=1.66 cfs 5,514 cf

Pond APP1: ALDI POND (Post The Peak Elev=152.49' Storage=15,126 cf Inflow=16.78 cfs 58,637 cf
Outflow=10.22 cfs 58,636 cf

Pond APP2: Existing Wetlands (With Peak Elev=170.66' Storage=5,700 cf Inflow=34.83 cfs 151,736 cf
Primary=30.47 cfs 150,114 cf Secondary=1.55 cfs 596 cf Outflow=32.02 cfs 150,711 cf

Pond P1P: Upper Pond (DB-01) Peak Elev=152.63' Storage=17,953 cf Inflow=34.69 cfs 278,218 cf
Outflow=30.45 cfs 278,186 cf

Pond P2P: Lower Pond (DB-02) Peak Elev=149.17' Storage=10,831 cf Inflow=32.30 cfs 330,628 cf
Outflow=30.47 cfs 330,605 cf

Pond UGC1: Cultec R-902HD Peak Elev=152.87' Storage=68,196 cf Inflow=52.99 cfs 272,544 cf
Outflow=34.03 cfs 272,228 cf

Link L1: DP1 Inflow=30.76 cfs 340,163 cf
Primary=30.76 cfs 340,163 cf

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 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

Subcatchment AP1: Aldi Parking and Areas Runoff Area=2.264 ac 41.74% Impervious Runoff Depth=5.99"
Tc=8.0 min CN=85 Runoff=14.32 cfs 49,240 cf

Subcatchment AP2: Aldi (Roof) Runoff Area=0.684 ac 88.30% Impervious Runoff Depth=7.17"
Tc=7.0 min CN=95 Runoff=4.97 cfs 17,808 cf

Subcatchment AP3: Existing Wetlands Runoff Area=14.790 ac 4.29% Impervious Runoff Depth=3.49"
Flow Length=1,685' Tc=16.6 min CN=63 Runoff=43.44 cfs 187,303 cf

Subcatchment P1: Main Site Runoff Area=784,591 sf 36.48% Impervious Runoff Depth=4.95"
Flow Length=1,865' Tc=26.0 min CN=76 Runoff=62.84 cfs 323,582 cf

Subcatchment P2: Proposed ROW to DP1 Runoff Area=19,637 sf 70.97% Impervious Runoff Depth=6.70"
Tc=6.0 min CN=91 Runoff=3.29 cfs 10,960 cf

Subcatchment P3: Proposed (Existing to Runoff Area=286,108 sf 4.77% Impervious Runoff Depth=4.49"
Flow Length=1,161' Tc=25.1 min CN=72 Runoff=21.19 cfs 107,129 cf

Subcatchment P5: CB6-8, CB11-15, Runoff Area=89,298 sf 88.29% Impervious Runoff Depth=7.17"
Tc=6.0 min CN=95 Runoff=15.42 cfs 53,372 cf

Subcatchment P6: DIRECT TO P1P Runoff Area=18,173 sf 0.00% Impervious Runoff Depth=4.72"
Tc=10.0 min CN=74 Runoff=2.01 cfs 7,149 cf

Subcatchment P7: DIRECT TO P2P Runoff Area=16,729 sf 0.00% Impervious Runoff Depth=4.72"
Tc=8.0 min CN=74 Runoff=1.98 cfs 6,581 cf

Pond APP1: ALDI POND (Post The Peak Elev=153.15' Storage=20,238 cf Inflow=19.26 cfs 72,482 cf
Outflow=11.11 cfs 72,482 cf

Pond APP2: Existing Wetlands (With Peak Elev=170.96' Storage=7,431 cf Inflow=43.44 cfs 187,303 cf
Primary=33.06 cfs 180,844 cf Secondary=7.95 cfs 5,434 cf Outflow=41.01 cfs 186,278 cf

Pond P1P: Upper Pond (DB-01) Peak Elev=153.48' Storage=24,198 cf Inflow=43.32 cfs 330,414 cf
Outflow=35.38 cfs 330,382 cf

Pond P2P: Lower Pond (DB-02) Peak Elev=150.13' Storage=17,238 cf Inflow=37.48 cfs 390,335 cf
Outflow=33.88 cfs 390,312 cf

Pond UGC1: Cultec R-902HD Peak Elev=153.81' Storage=76,262 cf Inflow=62.84 cfs 323,582 cf
Outflow=42.57 cfs 323,265 cf

Link L1: DP1 Inflow=34.18 cfs 401,272 cf
Primary=34.18 cfs 401,272 cf

Summary for Subcatchment AP1: Aldi Parking and Areas to Pond (Post The Gateway)

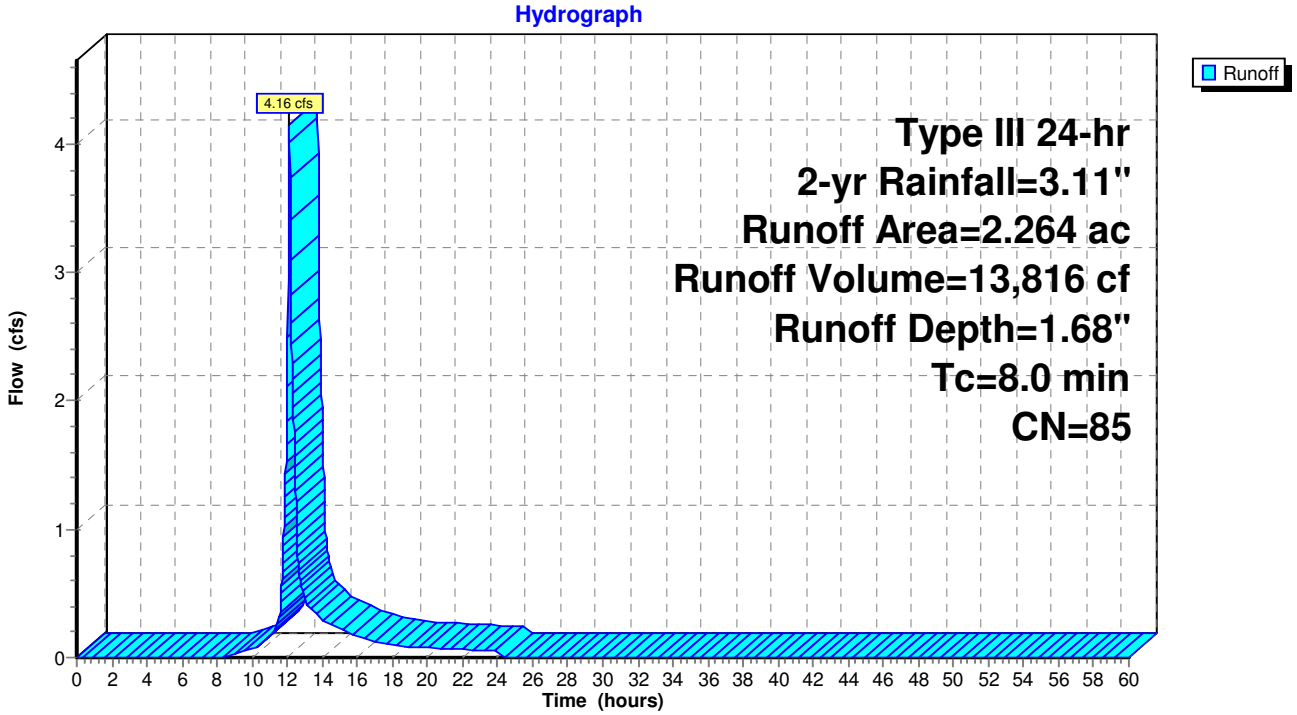
Runoff = 4.16 cfs @ 12.12 hrs, Volume= 13,816 cf, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	0.207	74	>75% Grass cover, Good, HSG C
*	1.112	77	>75% Grass cover, Good, HSG C/D
*	0.945	98	IMPERVIOUS
	2.264	85	Weighted Average
	1.319		58.26% Pervious Area
	0.945		41.74% Impervious Area

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

Subcatchment AP1: Aldi Parking and Areas to Pond (Post The Gateway)



Summary for Subcatchment AP2: Aldi (Roof)

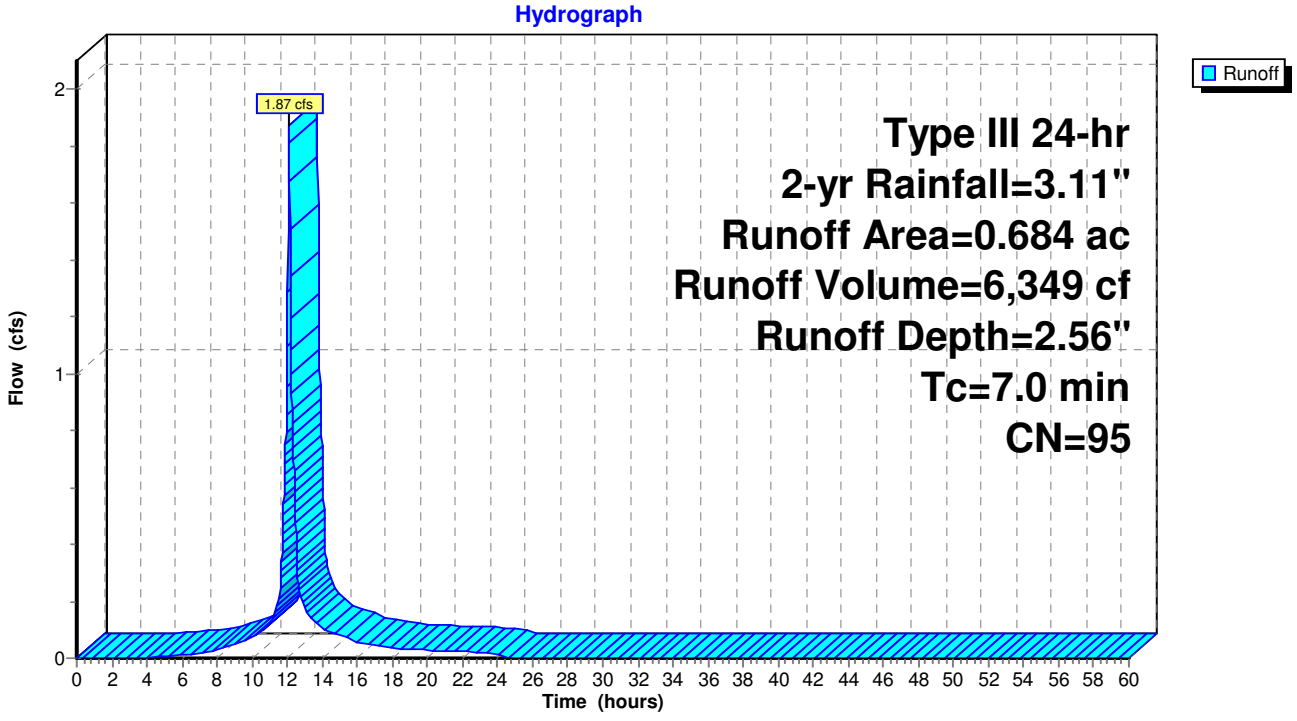
Runoff = 1.87 cfs @ 12.10 hrs, Volume= 6,349 cf, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	0.080	74	>75% Grass cover, Good, HSG C
*	0.604	98	IMPERVIOUS
	0.684	95	Weighted Average
	0.080		11.70% Pervious Area
	0.604		88.30% Impervious Area

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

Subcatchment AP2: Aldi (Roof)



Summary for Subcatchment AP3: Existing Wetlands Pond - Catchment Area (Post The Gateway)

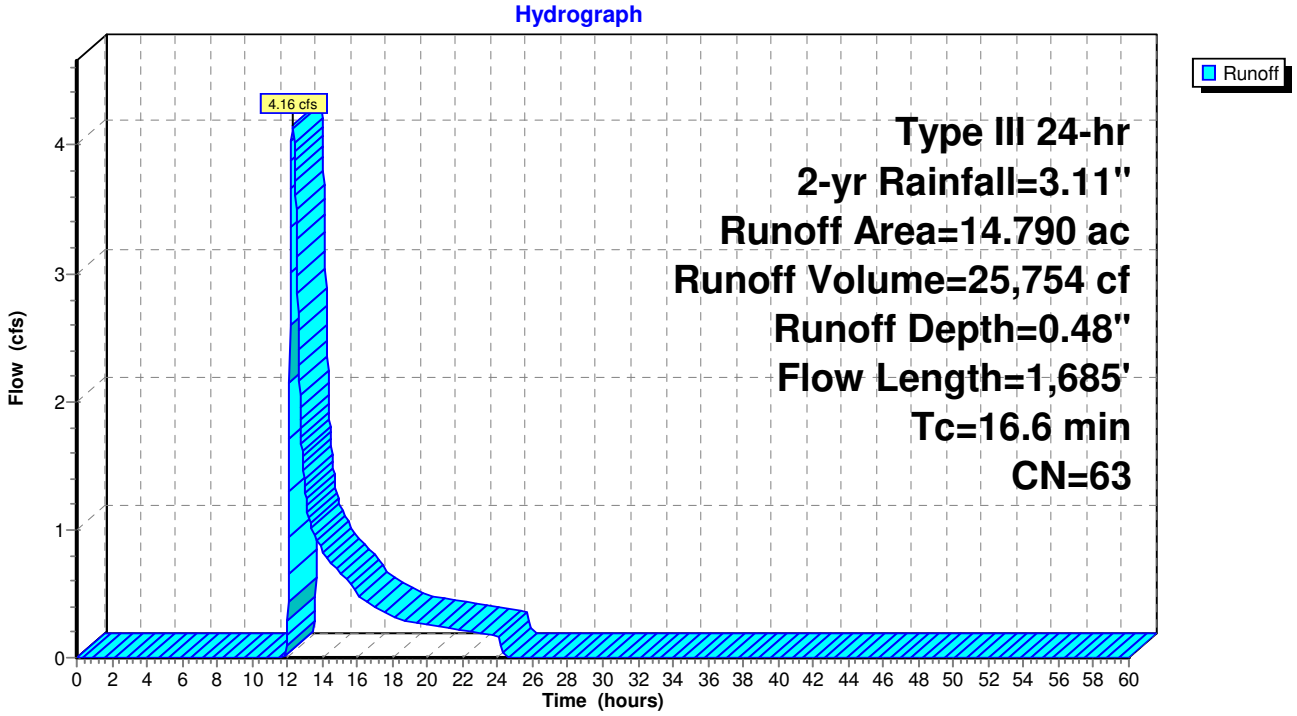
Runoff = 4.16 cfs @ 12.31 hrs, Volume= 25,754 cf, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	1.569	61	>75% Grass cover, Good, HSG B
	0.493	74	>75% Grass cover, Good, HSG C
*	1.529	77	>75% Grass cover, Good, HSG C/D
	8.016	55	Woods, Good, HSG B
	0.835	70	Woods, Good, HSG C
*	1.714	74	Woods, Good, HSG C/D
*	0.634	98	IMPERVIOUS
	14.790	63	Weighted Average
	14.156		95.71% Pervious Area
	0.634		4.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.0300	0.20		**Sheet Flow, Grass Sheet Flow** Grass: Short n= 0.150 P2= 3.09"
1.3	153	0.0780	1.95		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
3.9	442	0.1440	1.90		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
2.9	990	0.0200	5.62	179.92	**Channel Flow, Ditch** Area= 32.0 sf Perim= 44.5' r= 0.72' n= 0.030 Earth, grassed & winding
16.6	1,685	Total			

Subcatchment AP3: Existing Wetlands Pond - Catchment Area (Post The Gateway)



Summary for Subcatchment P1: Main Site (EXCLUDING: CB6-8, CB11-15, CB38-39, CB41, R2A-E)

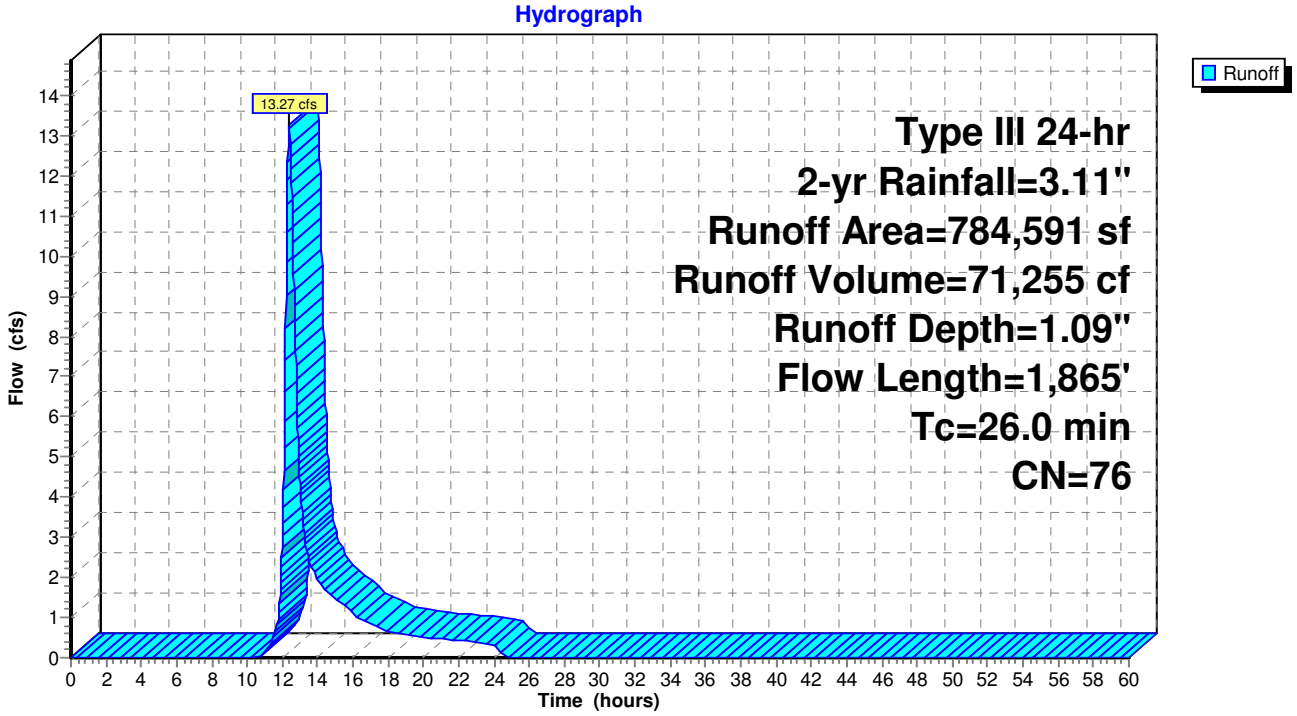
Runoff = 13.27 cfs @ 12.39 hrs, Volume= 71,255 cf, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
	166,617	55	Woods, Good, HSG B
	25,221	70	Woods, Good, HSG C
*	55,408	74	Woods, Good, HSG C/D
	133,206	61	>75% Grass cover, Good, HSG B
	31,043	74	>75% Grass cover, Good, HSG C
*	44,044	77	>75% Grass cover, Good, HSG C/D
	3,659	58	Meadow, non-grazed, HSG B
	35,240	71	Meadow, non-grazed, HSG C
*	3,964	75	Meadow, non-grazed, HSG C/D
*	286,189	98	IMPERVIOUS
	784,591	76	Weighted Average
	498,402		63.52% Pervious Area
	286,189		36.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0500	0.17		**Sheet Flow, Grass Sheet Flow** Grass: Dense n= 0.240 P2= 3.09"
2.0	106	0.0310	0.88		**Shallow Concentrated Flow, Wodland SCF** Woodland Kv= 5.0 fps
1.3	100	0.0330	1.27		**Shallow Concentrated Flow, Grass SCF** Short Grass Pasture Kv= 7.0 fps
3.5	208	0.0400	1.00		**Shallow Concentrated Flow, Woods SCF** Woodland Kv= 5.0 fps
3.2	260	0.0380	1.36		**Shallow Concentrated Flow, Grass SCF** Short Grass Pasture Kv= 7.0 fps
4.2	439	0.1200	1.73		**Shallow Concentrated Flow, Woodland SCF** Woodland Kv= 5.0 fps
0.4	72	0.1800	2.97		**Shallow Concentrated Flow, Grass SCF** Short Grass Pasture Kv= 7.0 fps
1.3	580	0.0100	7.20	22.62	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
26.0	1,865	Total			

Subcatchment P1: Main Site (EXCLUDING: CB6-8, CB11-15, CB38-39, CB41, R2A-E)



Summary for Subcatchment P2: Proposed ROW to DP1

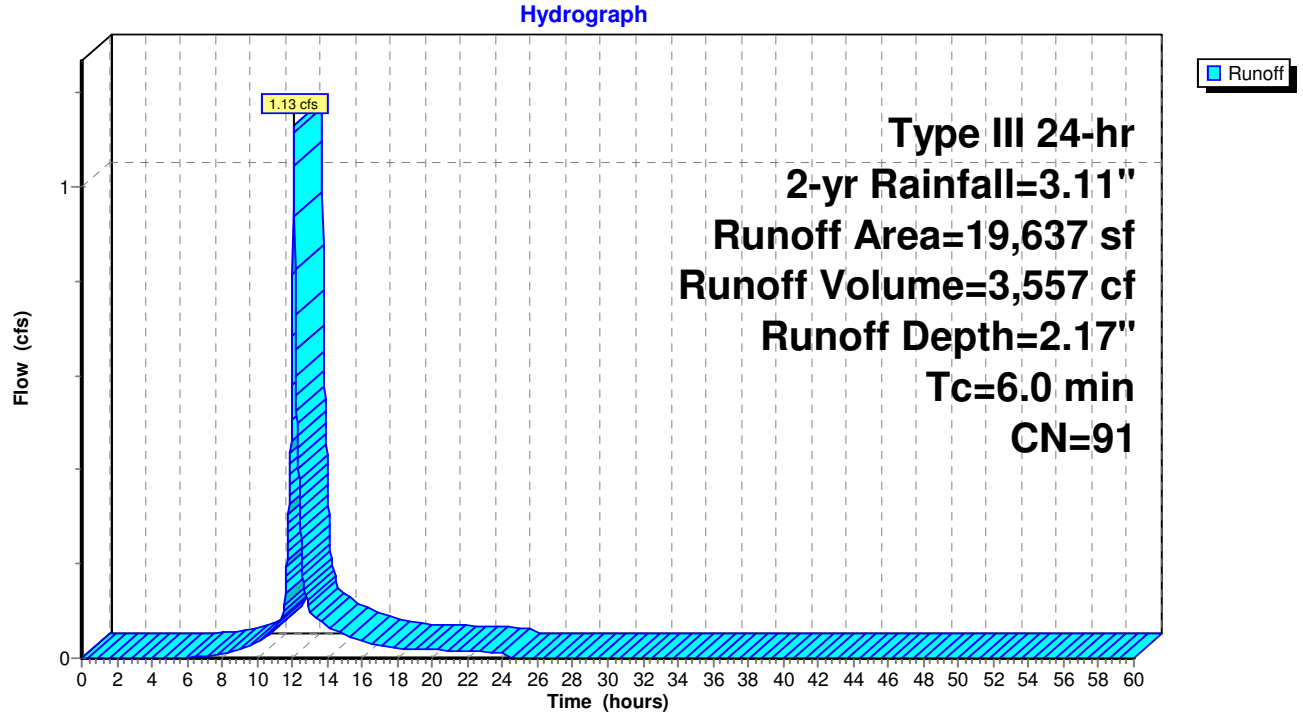
Runoff = 1.13 cfs @ 12.09 hrs, Volume= 3,557 cf, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	13,937	98	IMPERVIOUS
	5,700	74	>75% Grass cover, Good, HSG C
	19,637	91	Weighted Average
	5,700		29.03% Pervious Area
	13,937		70.97% Impervious Area

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

Subcatchment P2: Proposed ROW to DP1



Summary for Subcatchment P3: Proposed (Existing to DP2)

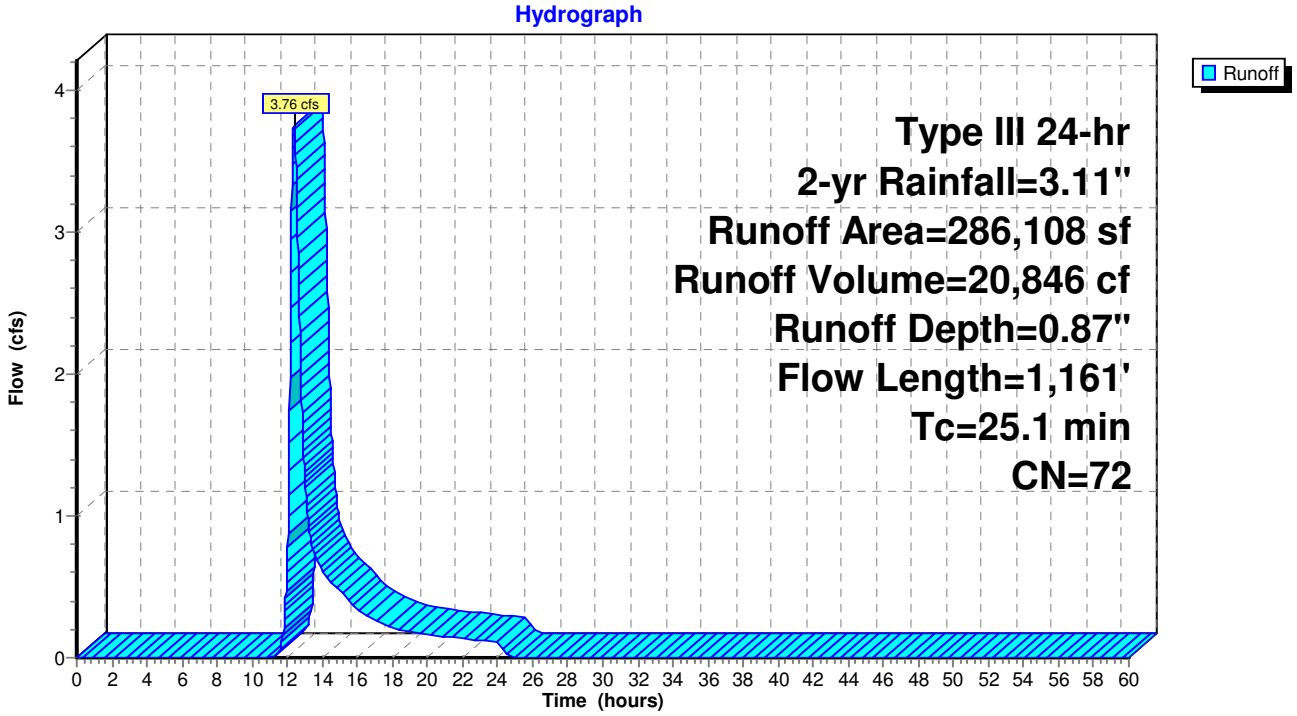
Runoff = 3.76 cfs @ 12.39 hrs, Volume= 20,846 cf, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
	7,880	70	Woods, Good, HSG C
	42,651	55	Woods, Good, HSG B
*	42,976	74	Woods, Good, HSG C/D
*	3,240	74	>75% Grass cover, Good, HSG C/D
	10,911	74	>75% Grass cover, Good, HSG C
	1,595	61	>75% Grass cover, Good, HSG B
	11,661	58	Meadow, non-grazed, HSG B
	30,530	71	Meadow, non-grazed, HSG C
*	121,021	75	Meadow, non-grazed, HSG C/D
*	13,643	98	Imperv
	286,108	72	Weighted Average
	272,465		95.23% Pervious Area
	13,643		4.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0620	0.23		**Sheet Flow, Grass SF** Grass: Short n= 0.150 P2= 3.09"
8.0	50	0.0620	0.10		**Sheet Flow, Woodland SF** Woods: Light underbrush n= 0.400 P2= 3.09"
13.5	1,061	0.0690	1.31		**Shallow Concentrated Flow, Woodland SCF** Woodland Kv= 5.0 fps
25.1	1,161	Total			

Subcatchment P3: Proposed (Existing to DP2)



Summary for Subcatchment P5: CB6-8, CB11-15, CB38-39, CB41, R2A-E

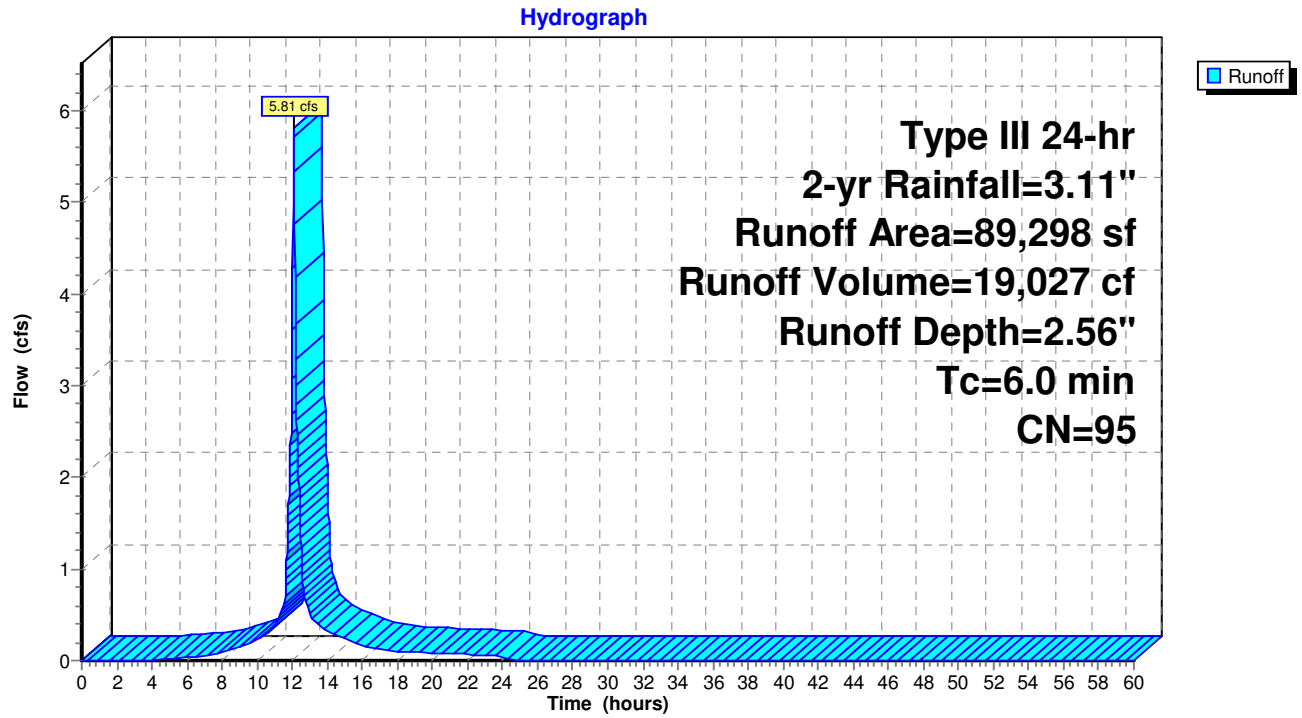
Runoff = 5.81 cfs @ 12.08 hrs, Volume= 19,027 cf, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
	1,742	74	>75% Grass cover, Good, HSG C
*	8,712	77	>75% Grass cover, Good, HSG C/D
*	78,844	98	IMPERVIOUS
	89,298	95	Weighted Average
	10,454		11.71% Pervious Area
	78,844		88.29% Impervious Area

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

Subcatchment P5: CB6-8, CB11-15, CB38-39, CB41, R2A-E



Summary for Subcatchment P6: DIRECT TO P1P

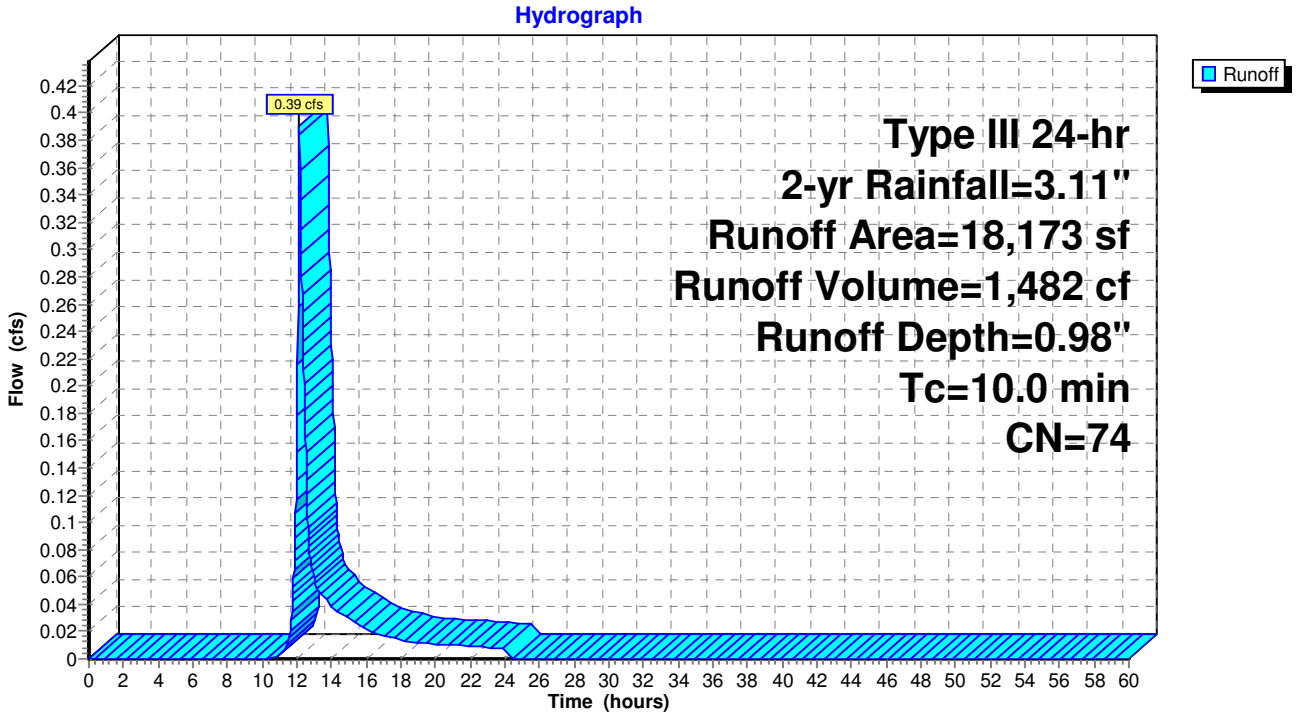
Runoff = 0.39 cfs @ 12.15 hrs, Volume= 1,482 cf, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

Area (sf)	CN	Description
18,173	74	>75% Grass cover, Good, HSG C
18,173		100.00% Pervious Area

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

Subcatchment P6: DIRECT TO P1P



Summary for Subcatchment P7: DIRECT TO P2P

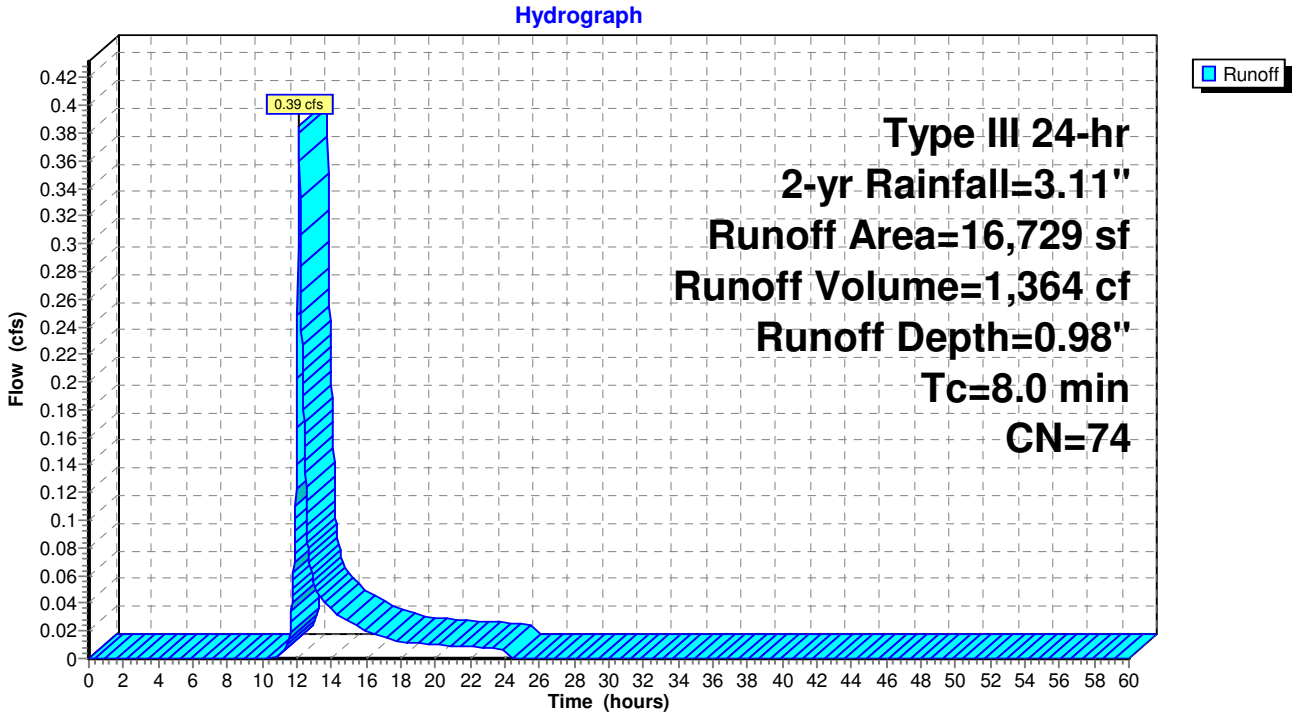
Runoff = 0.39 cfs @ 12.12 hrs, Volume= 1,364 cf, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
	15,514	74	>75% Grass cover, Good, HSG C
*	1,215	77	>75% Grass cover, Good, HSG C/D
	16,729	74	Weighted Average
	16,729		100.00% Pervious Area

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

Subcatchment P7: DIRECT TO P2P



Summary for Pond APP1: ALDI POND (Post The Gateway)

Inflow Area = 128,415 sf, 52.54% Impervious, Inflow Depth = 1.88" for 2-yr event
Inflow = 6.01 cfs @ 12.11 hrs, Volume= 20,164 cf
Outflow = 3.21 cfs @ 12.28 hrs, Volume= 20,164 cf, Atten= 47%, Lag= 10.0 min
Primary = 3.21 cfs @ 12.28 hrs, Volume= 20,164 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Starting Elev= 151.00' Surf.Area= 5,824 sf Storage= 5,335 cf
Peak Elev= 151.62' @ 12.28 hrs Surf.Area= 6,445 sf Storage= 9,116 cf (3,781 cf above start)

Plug-Flow detention time= 172.7 min calculated for 14,824 cf (74% of inflow)
Center-of-Mass det. time= 28.5 min (843.1 - 814.6)

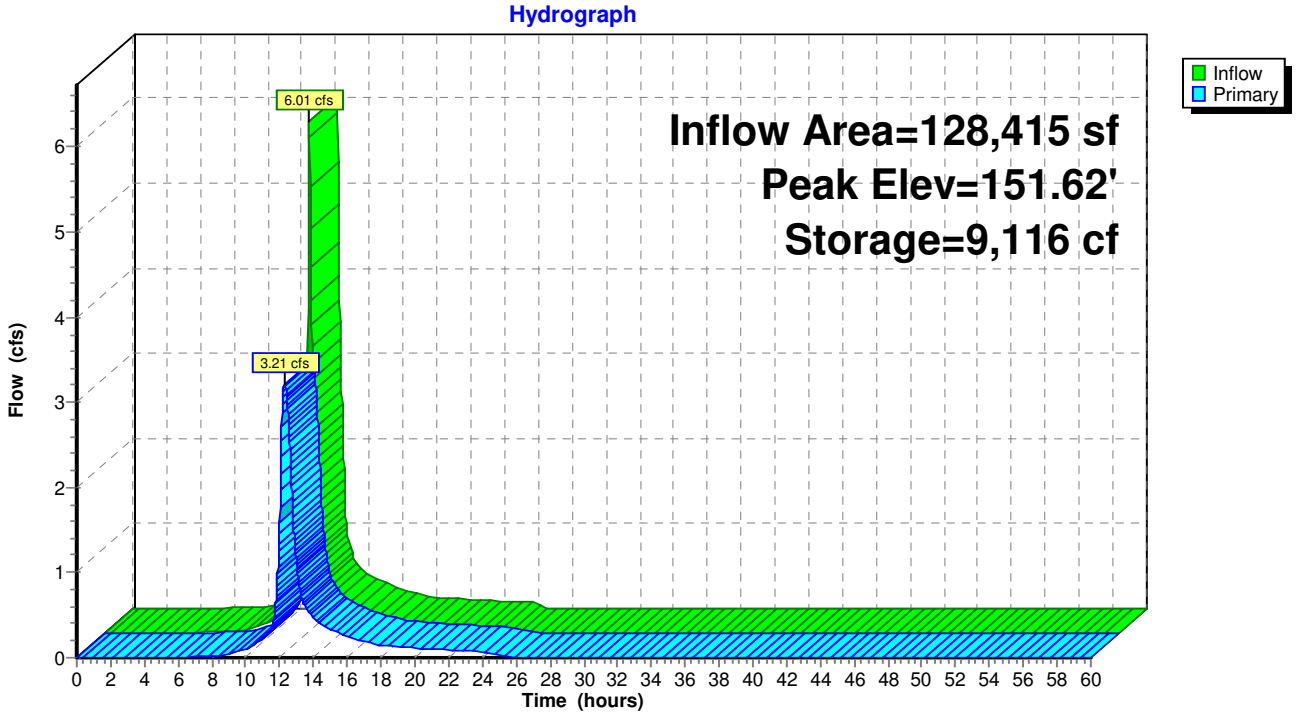
Volume	Invert	Avail.Storage	Storage Description
#1	150.00'	37,181 cf	**Pond (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
150.00	4,860	0	0	4,860
151.00	5,824	5,335	5,335	5,867
152.00	6,847	6,329	11,663	6,939
153.00	7,926	7,380	19,043	8,071
154.00	9,061	8,487	27,530	9,264
155.00	10,253	9,651	37,181	10,519

Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**18.0" Round Culvert** L= 300.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 147.36' S= 0.0088 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	151.00'	**36.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	151.75'	**36.0" W x 9.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=3.21 cfs @ 12.28 hrs HW=151.62' (Free Discharge)
└**1=Culvert** (Passes 3.21 cfs of 7.92 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 3.21 cfs @ 3.21 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Pond APP1: ALDI POND (Post The Gateway)



Summary for Pond APP2: Existing Wetlands (With Overflow Pipe)

Inflow Area = 644,252 sf, 4.29% Impervious, Inflow Depth = 0.48" for 2-yr event
Inflow = 4.16 cfs @ 12.31 hrs, Volume= 25,754 cf
Outflow = 4.15 cfs @ 12.33 hrs, Volume= 24,729 cf, Atten= 0%, Lag= 1.3 min
Primary = 4.15 cfs @ 12.33 hrs, Volume= 24,729 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Peak Elev= 169.30' @ 12.33 hrs Surf.Area= 1,317 sf Storage= 1,329 cf

Plug-Flow detention time= 30.2 min calculated for 24,729 cf (96% of inflow)
Center-of-Mass det. time= 9.7 min (927.3 - 917.6)

Volume	Invert	Avail.Storage	Storage Description
#1	167.00'	17,482 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

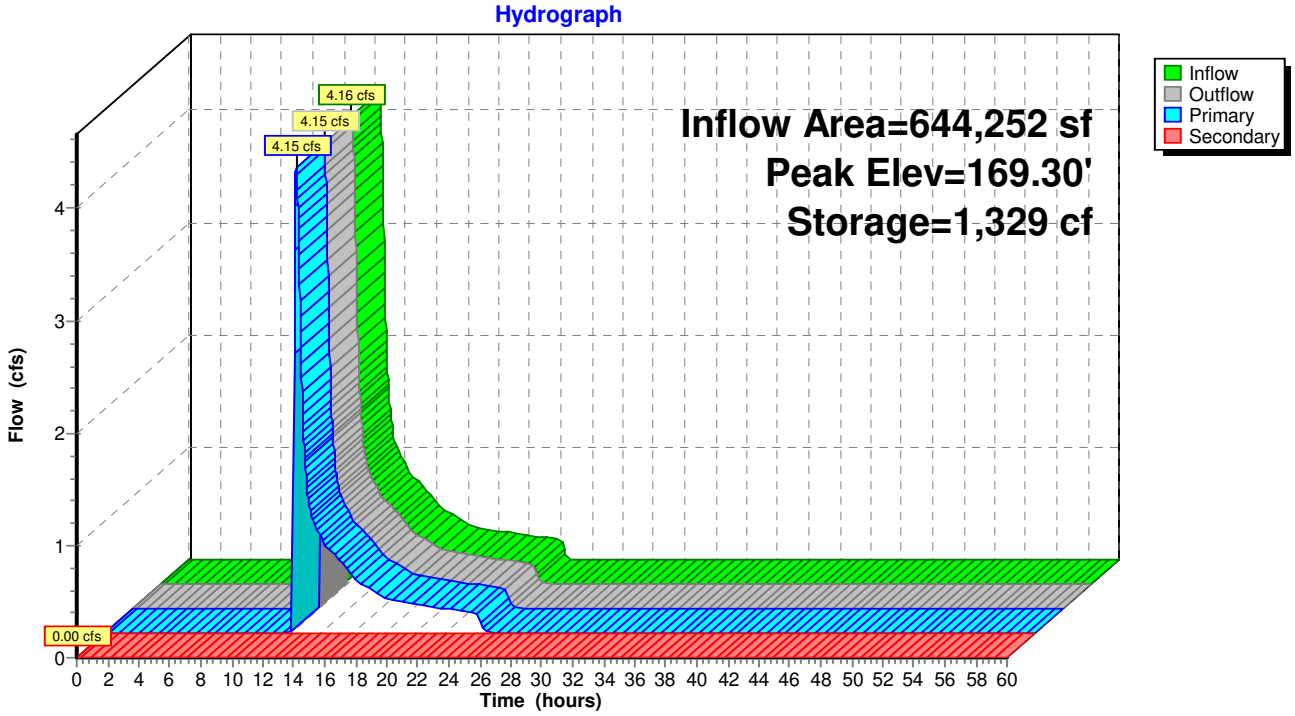
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
167.00	300	80.0	0	0	300
169.00	760	224.0	1,025	1,025	3,797
170.00	3,250	407.0	1,861	2,886	12,991
171.00	6,611	393.0	4,832	7,718	13,968
172.00	13,303	755.0	9,764	17,482	47,044

Device	Routing	Invert	Outlet Devices
#1	Secondary	170.50'	**10.0' 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
#2	Primary	165.00'	**30.0" Round Culvert** L= 96.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.00' / 163.00' S= 0.0208 '/' Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf
#3	Device 2	169.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.14 cfs @ 12.33 hrs HW=169.30' (Free Discharge)
└**2=Culvert** (Passes 4.14 cfs of 41.25 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 4.14 cfs @ 1.78 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=167.00' TW=151.00' (Dynamic Tailwater)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond APP2: Existing Wetlands (With Overflow Pipe)



Summary for Pond P1P: Upper Pond (DB-01)

Inflow Area = 802,764 sf, 35.65% Impervious, Inflow Depth > 1.08" for 2-yr event
Inflow = 4.12 cfs @ 12.99 hrs, Volume= 72,443 cf
Outflow = 3.72 cfs @ 13.37 hrs, Volume= 72,413 cf, Atten= 10%, Lag= 22.8 min
Primary = 3.72 cfs @ 13.37 hrs, Volume= 72,413 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Peak Elev= 149.47' @ 13.37 hrs Surf.Area= 2,861 sf Storage= 3,010 cf

Plug-Flow detention time= 14.8 min calculated for 72,413 cf (100% of inflow)
Center-of-Mass det. time= 13.8 min (1,084.5 - 1,070.7)

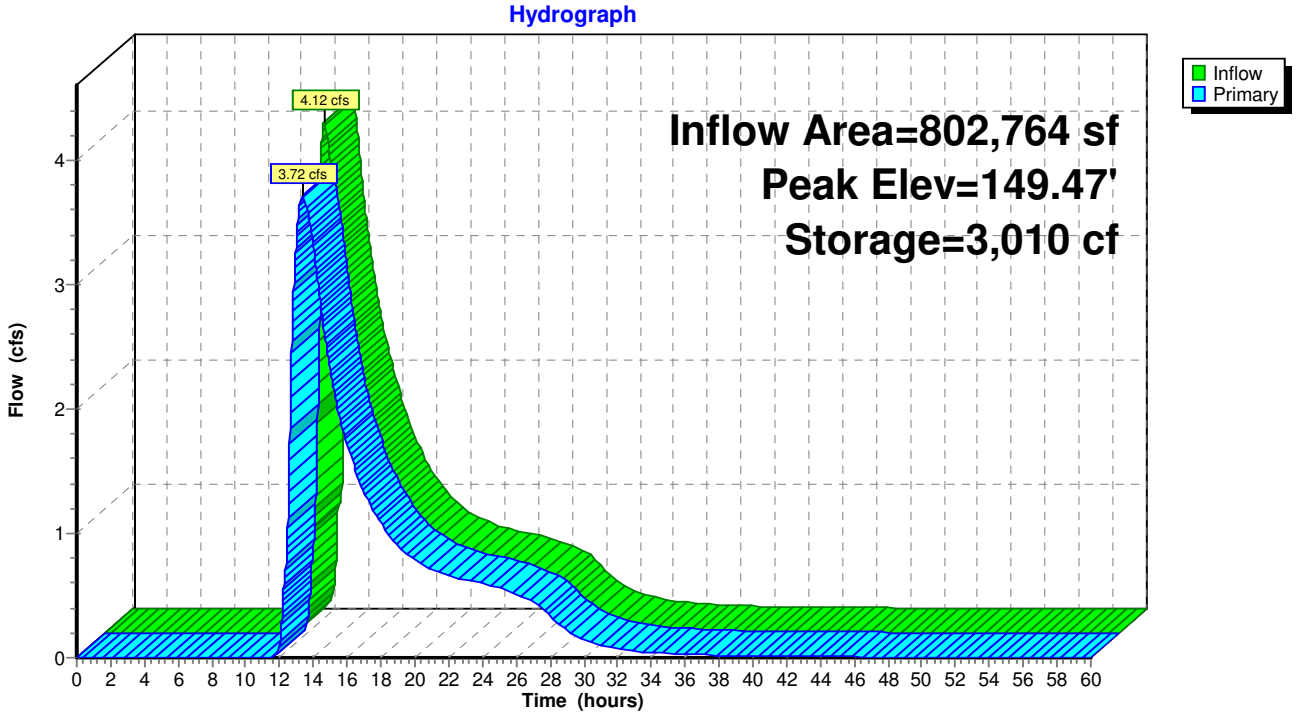
Volume	Invert	Avail.Storage	Storage Description
#1	148.00'	28,432 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
148.00	1,254	0	0
149.00	2,329	1,792	1,792
150.00	3,461	2,895	4,687
151.00	4,649	4,055	8,742
152.00	5,894	5,272	14,013
153.00	7,195	6,545	20,558
154.00	8,553	7,874	28,432

Device	Routing	Invert	Outlet Devices
#1	Primary	148.00'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 148.00' / 147.00' S= 0.0238 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Primary	150.00'	**18.0" Round Culvert X 2.00** L= 33.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 149.00' S= 0.0303 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=3.72 cfs @ 13.37 hrs HW=149.47' TW=146.81' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 3.72 cfs @ 4.74 fps)
└─**2=Culvert** (Controls 0.00 cfs)

Pond P1P: Upper Pond (DB-01)



Summary for Pond P2P: Lower Pond (DB-02)

Inflow Area = 908,791 sf, 40.17% Impervious, Inflow Depth > 1.23" for 2-yr event
Inflow = 6.36 cfs @ 12.09 hrs, Volume= 92,805 cf
Outflow = 5.52 cfs @ 12.14 hrs, Volume= 92,784 cf, Atten= 13%, Lag= 3.0 min
Primary = 5.52 cfs @ 12.14 hrs, Volume= 92,784 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Peak Elev= 146.94' @ 12.14 hrs Surf.Area= 2,400 sf Storage= 1,624 cf

Plug-Flow detention time= 8.5 min calculated for 92,784 cf (100% of inflow)
Center-of-Mass det. time= 7.9 min (1,027.2 - 1,019.3)

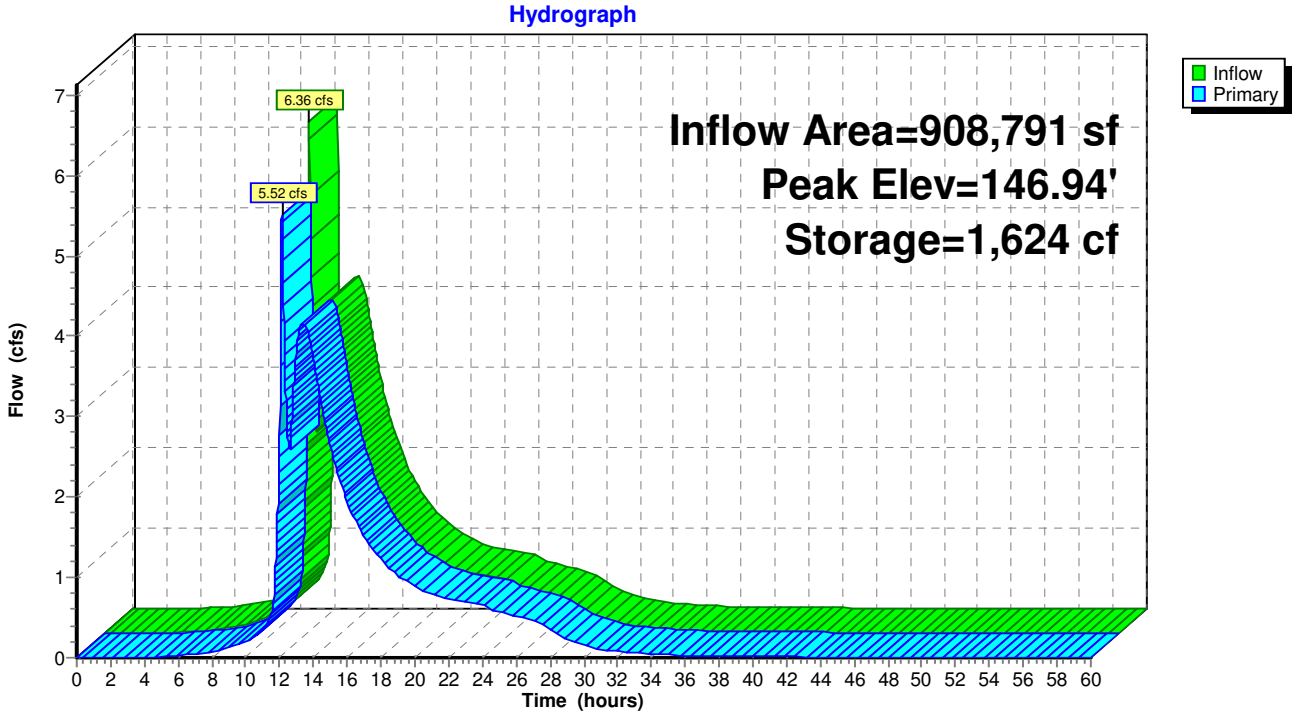
Volume	Invert	Avail.Storage	Storage Description
#1	146.00'	24,426 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
146.00	1,073	0	0
147.00	2,492	1,783	1,783
148.00	4,027	3,260	5,042
149.00	5,619	4,823	9,865
150.00	7,266	6,443	16,308
151.00	8,971	8,119	24,426

Device	Routing	Invert	Outlet Devices
#1	Primary	144.11'	**24.0" Round Culvert** L= 59.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 144.11' / 142.97' S= 0.0193 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	144.60'	**36.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 144.60' / 144.30' S= 0.0103 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#3	Device 2	146.00'	**30.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=5.52 cfs @ 12.14 hrs HW=146.93' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 5.52 cfs of 20.43 cfs potential flow)
↑**2=Culvert** (Passes 5.52 cfs of 24.89 cfs potential flow)
↑**3=Orifice/Grate** (Orifice Controls 5.52 cfs @ 3.29 fps)

Pond P2P: Lower Pond (DB-02)



Summary for Pond UGC1: Cultec R-902HD

Inflow Area = 784,591 sf, 36.48% Impervious, Inflow Depth = 1.09" for 2-yr event
Inflow = 13.27 cfs @ 12.39 hrs, Volume= 71,255 cf
Outflow = 4.06 cfs @ 13.00 hrs, Volume= 70,961 cf, Atten= 69%, Lag= 36.6 min
Primary = 4.06 cfs @ 13.00 hrs, Volume= 70,961 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Peak Elev= 150.15' @ 13.04 hrs Surf.Area= 21,110 sf Storage= 26,777 cf

Plug-Flow detention time= 201.6 min calculated for 70,961 cf (100% of inflow)
Center-of-Mass det. time= 199.2 min (1,075.0 - 875.8)

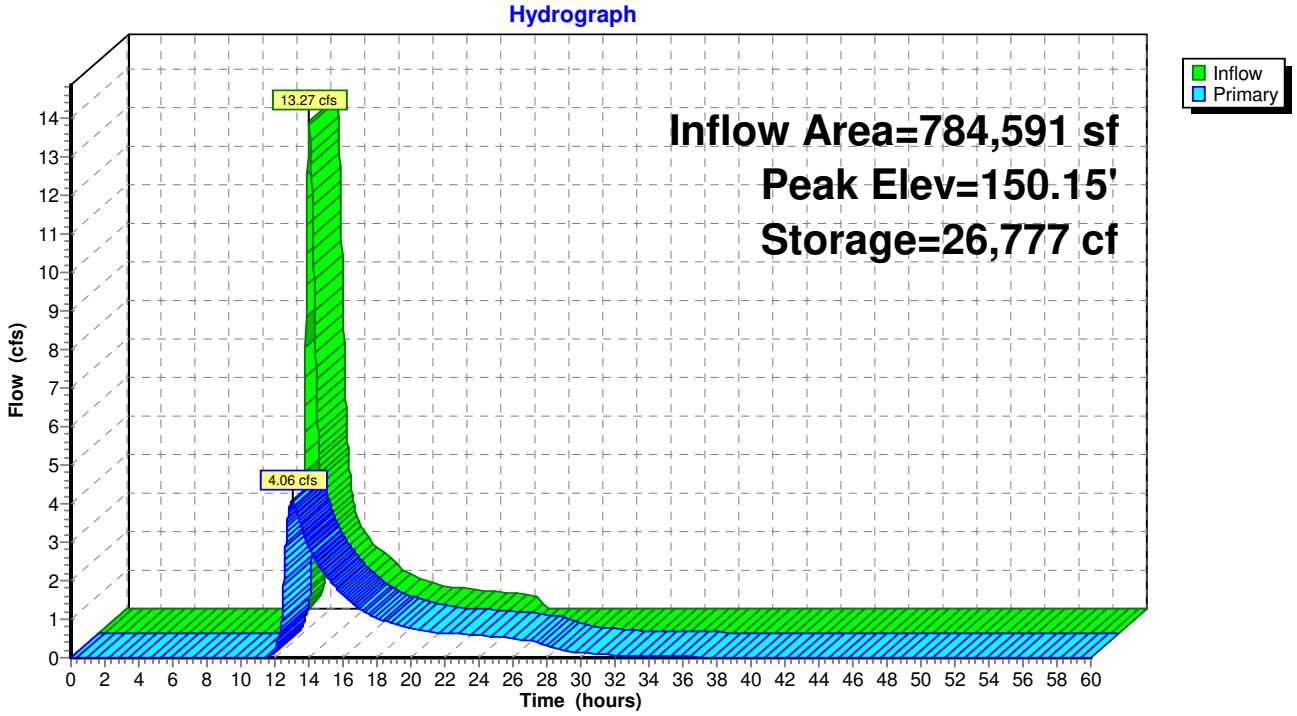
Volume	Invert	Avail.Storage	Storage Description
#1A	148.25'	29,021 cf	**363.75'W x 58.03'L x 5.75'H Field A** 121,380 cf Overall - 48,827 cf Embedded = 72,553 cf x 40.0% Voids
#2A	149.00'	48,827 cf	**Cultec R-902HD** x 750 Inside #1 Effective Size= 69.8"W x 48.0"H => 17.65 sf x 3.67'L = 64.7 cf Overall Size= 78.0"W x 48.0"H x 4.10'L with 0.44' Overlap 750 Chambers in 50 Rows Cap Storage= +2.8 cf x 2 x 50 rows = 276.0 cf
		77,848 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	148.25'	**6.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 148.25' / 148.00' S= 0.0056 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#2	Primary	149.25'	**24.0" Round Culvert** L= 43.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 149.25' / 149.00' S= 0.0058 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#3	Primary	150.37'	**24.0" Round Culvert X 3.00** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.37' / 150.00' S= 0.0093 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf

Primary OutFlow Max=4.05 cfs @ 13.00 hrs HW=150.15' TW=149.30' (Dynamic Tailwater)
- **1=Culvert** (Outlet Controls 0.64 cfs @ 3.28 fps)
- **2=Culvert** (Barrel Controls 3.40 cfs @ 3.66 fps)
- **3=Culvert** (Controls 0.00 cfs)

Pond UGC1: Cultec R-902HD

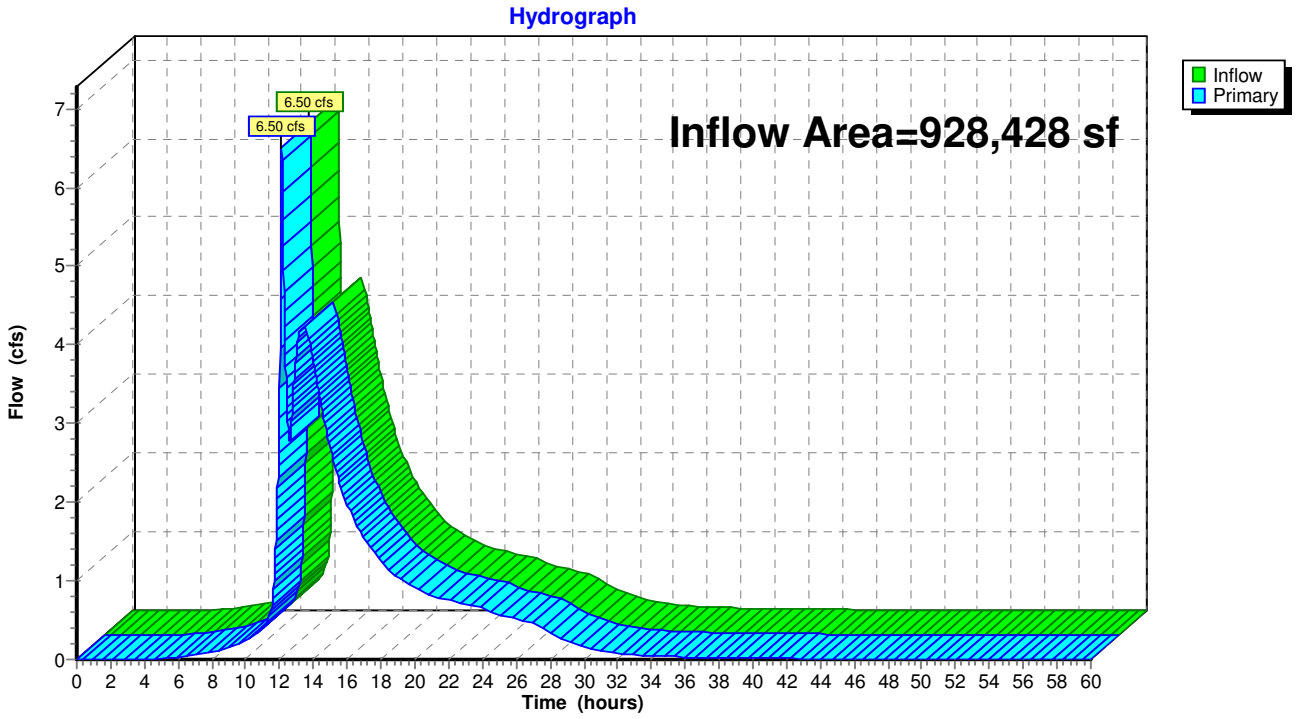


Summary for Link L1: DP1

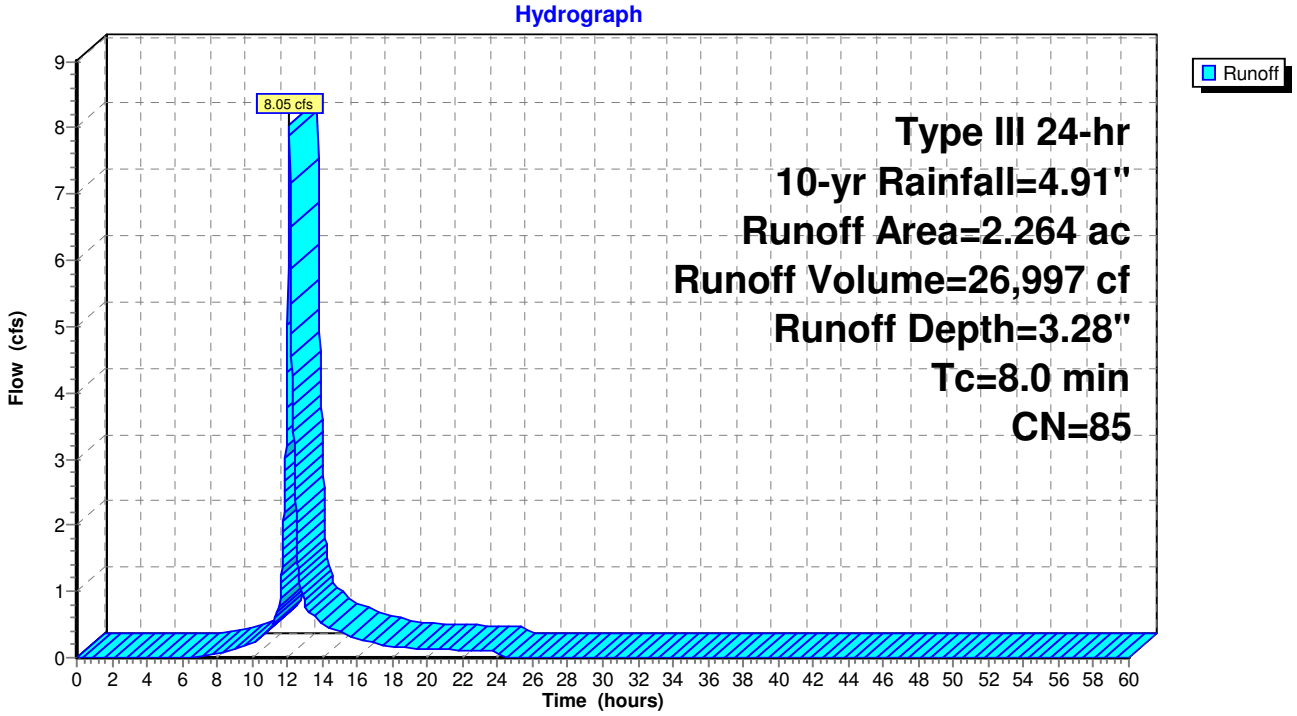
Inflow Area = 928,428 sf, 40.82% Impervious, Inflow Depth > 1.25" for 2-yr event
Inflow = 6.50 cfs @ 12.13 hrs, Volume= 96,341 cf
Primary = 6.50 cfs @ 12.13 hrs, Volume= 96,341 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

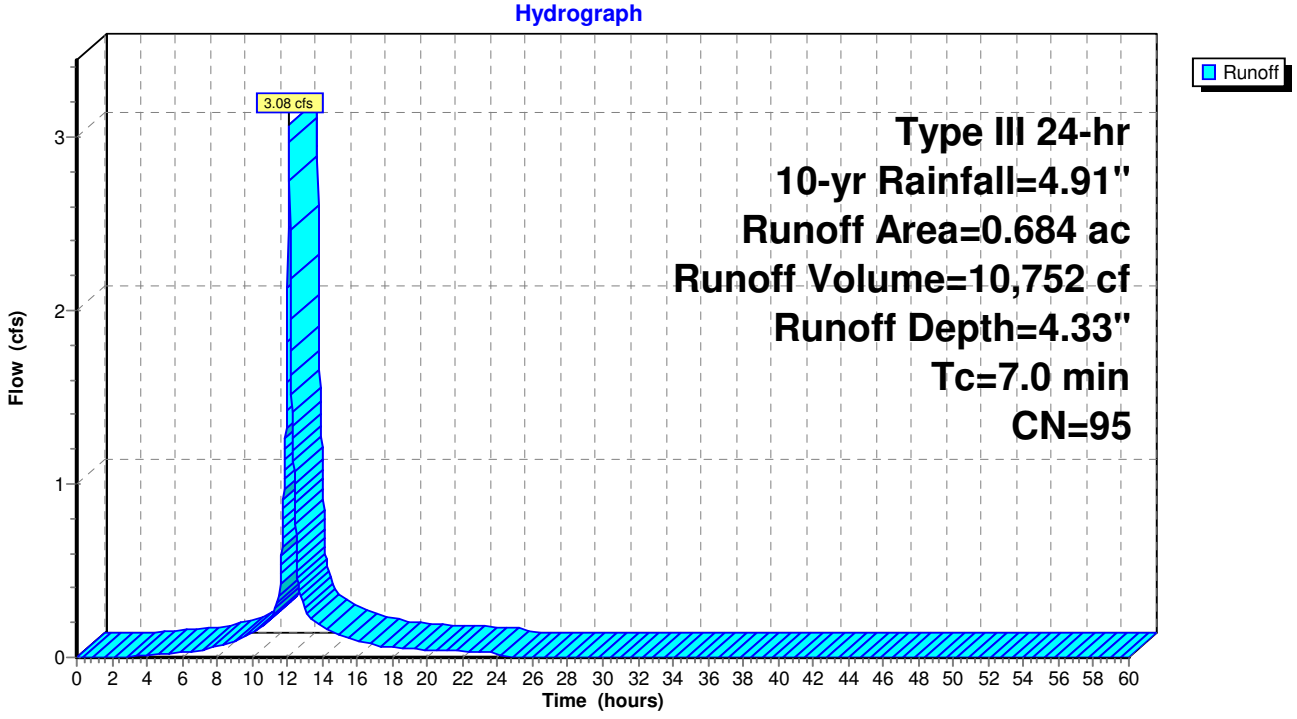
Link L1: DP1



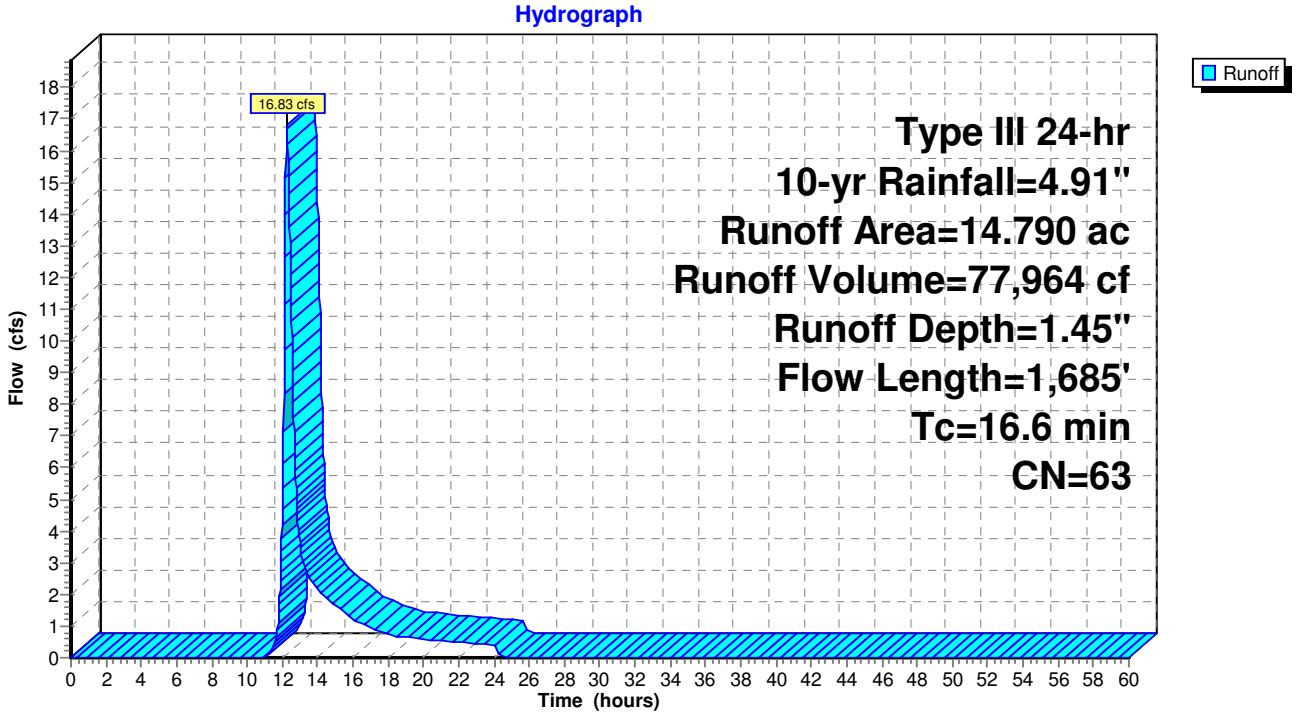
Subcatchment AP1: Aldi Parking and Areas to Pond (Post The Gateway)



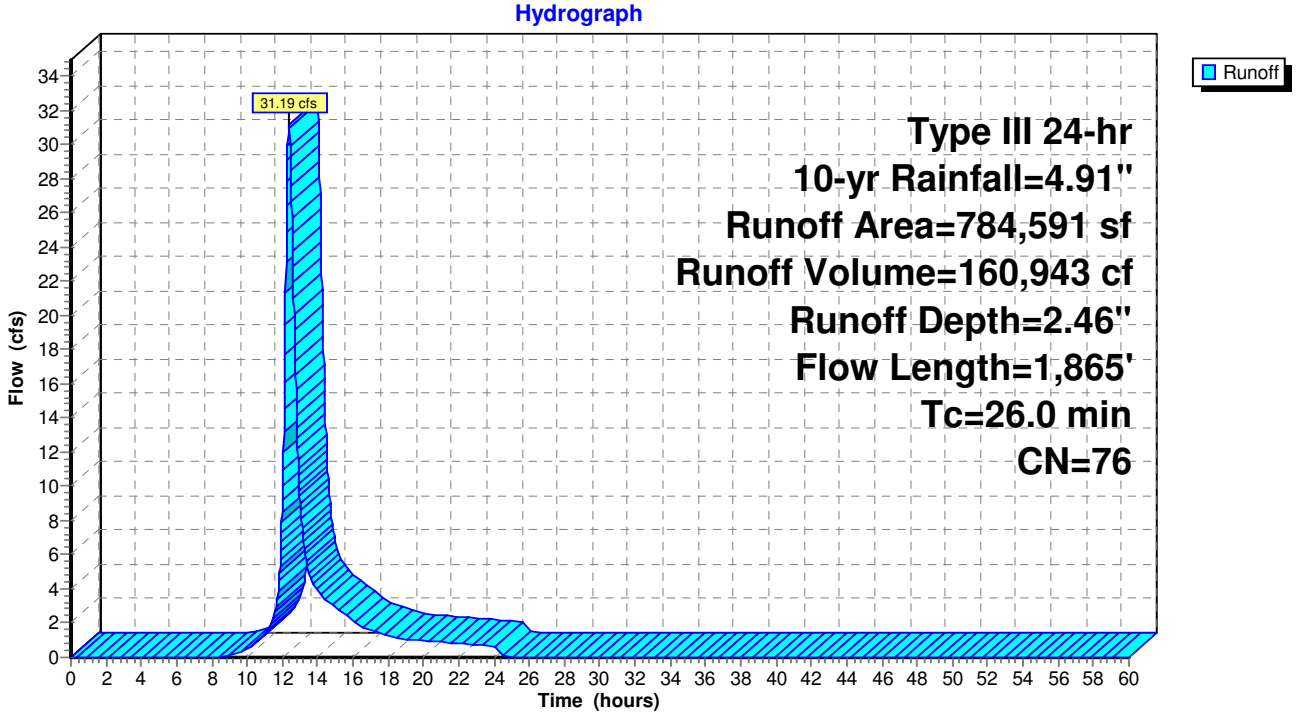
Subcatchment AP2: Aldi (Roof)



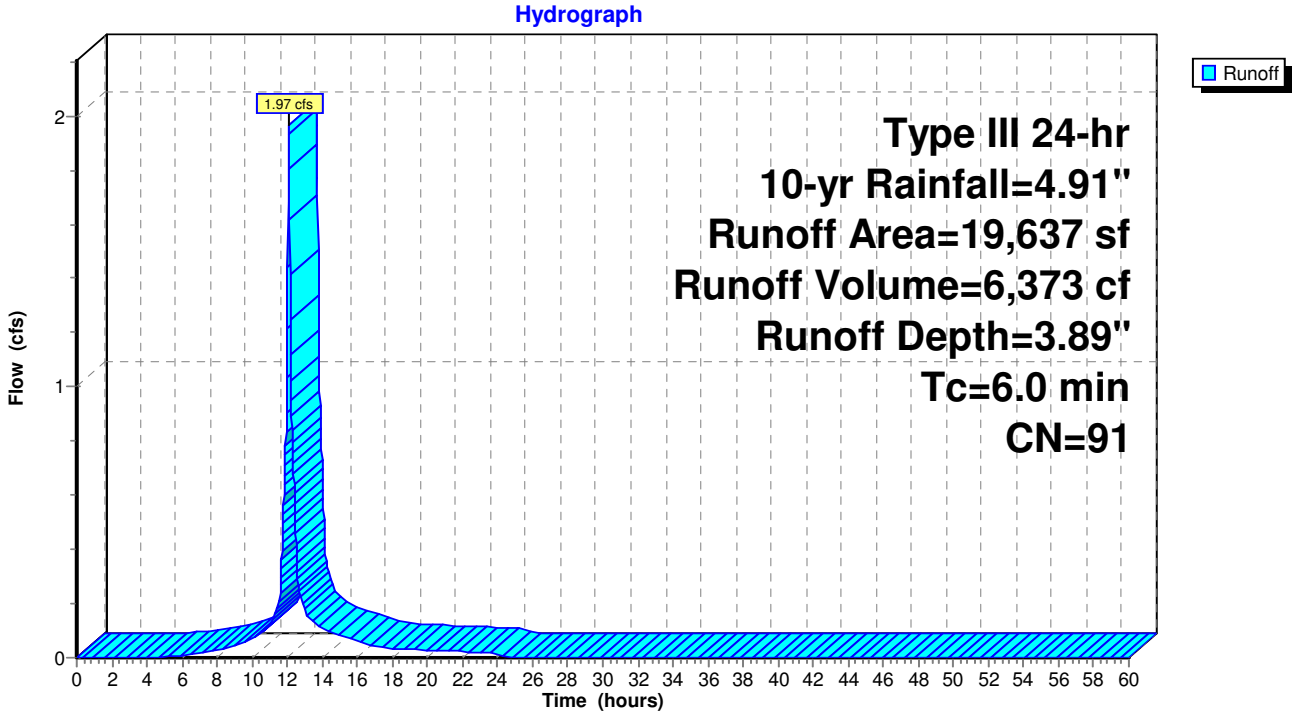
Subcatchment AP3: Existing Wetlands Pond - Catchment Area (Post The Gateway)



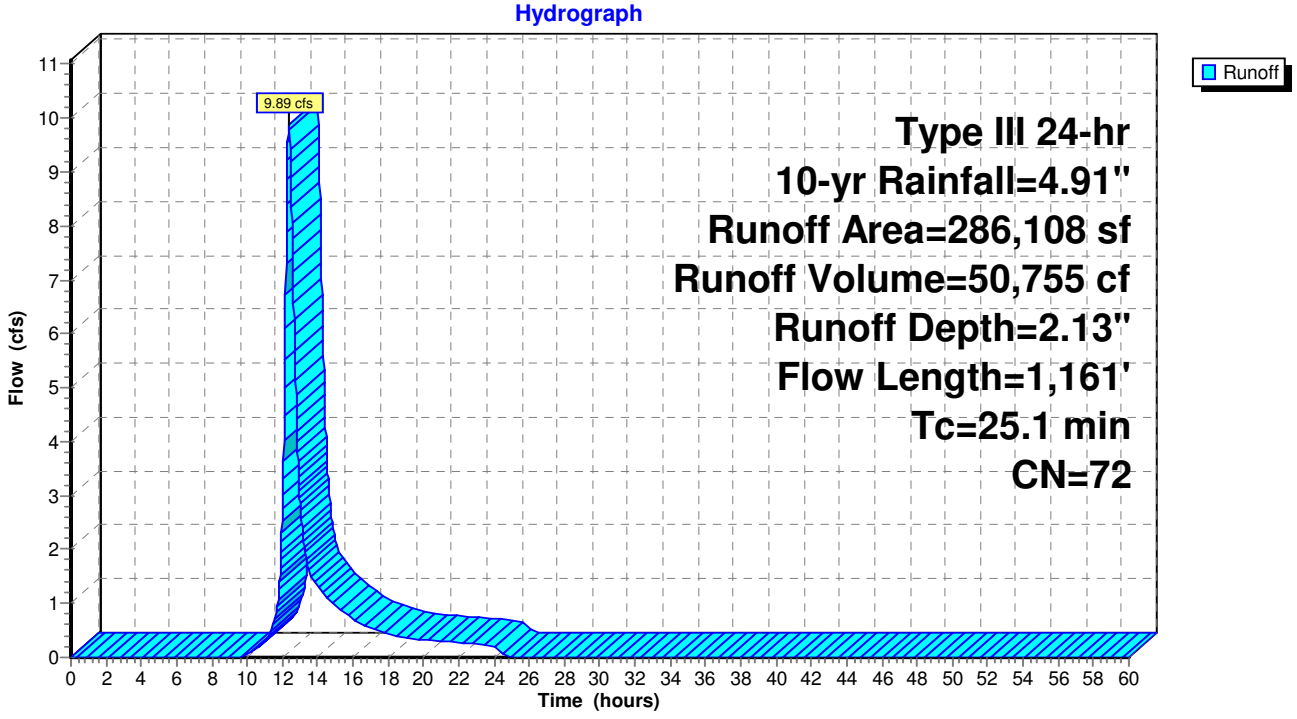
Subcatchment P1: Main Site (EXCLUDING: CB6-8, CB11-15, CB38-39, CB41, R2A-E)



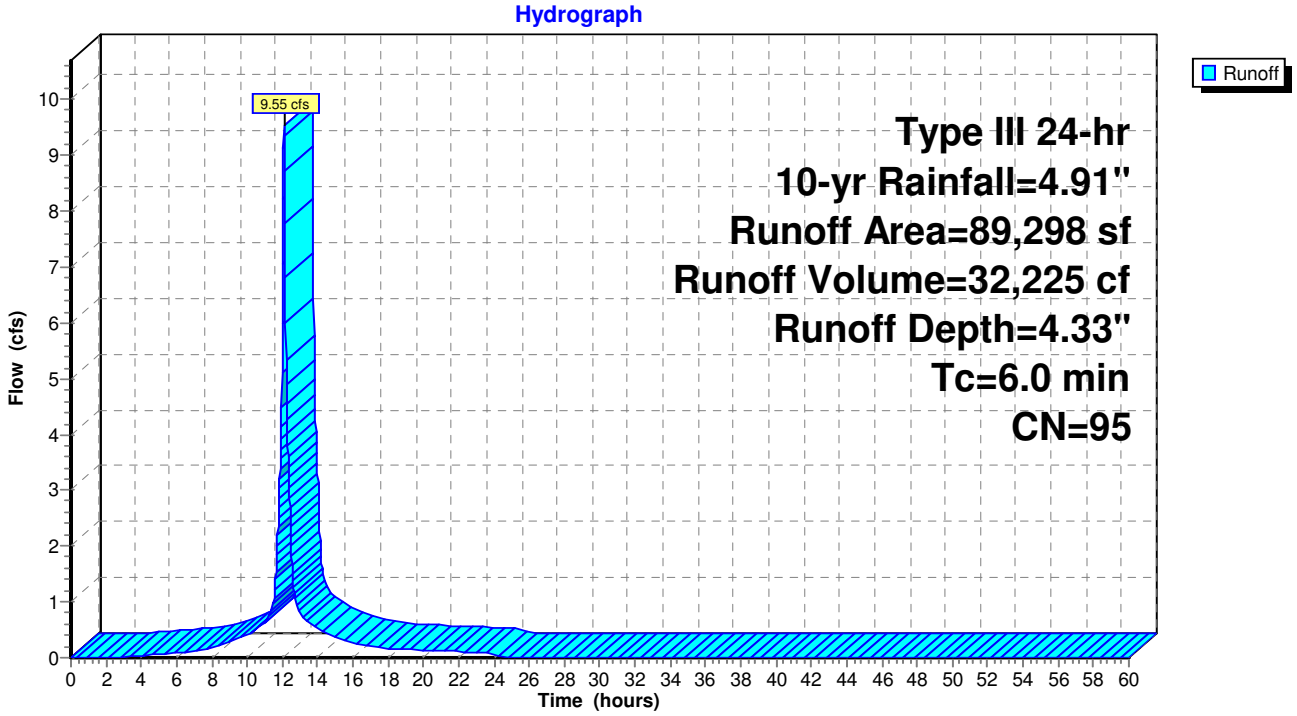
Subcatchment P2: Proposed ROW to DP1



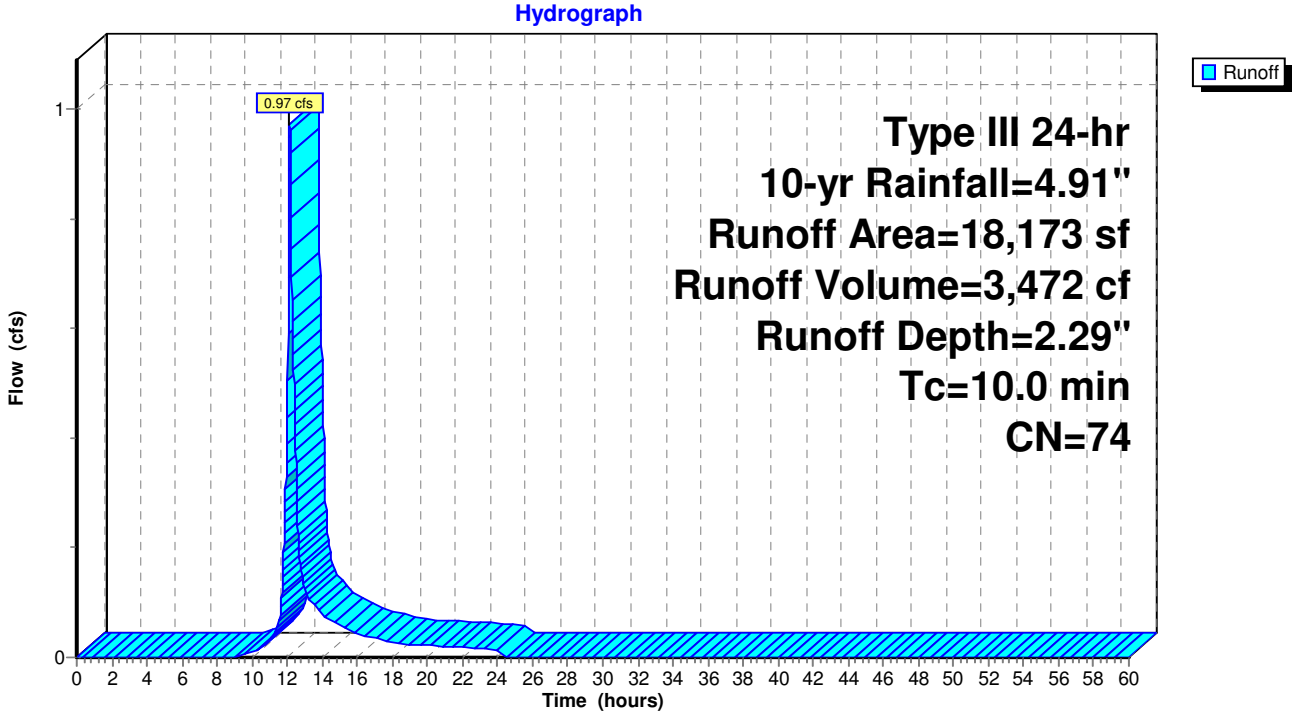
Subcatchment P3: Proposed (Existing to DP2)



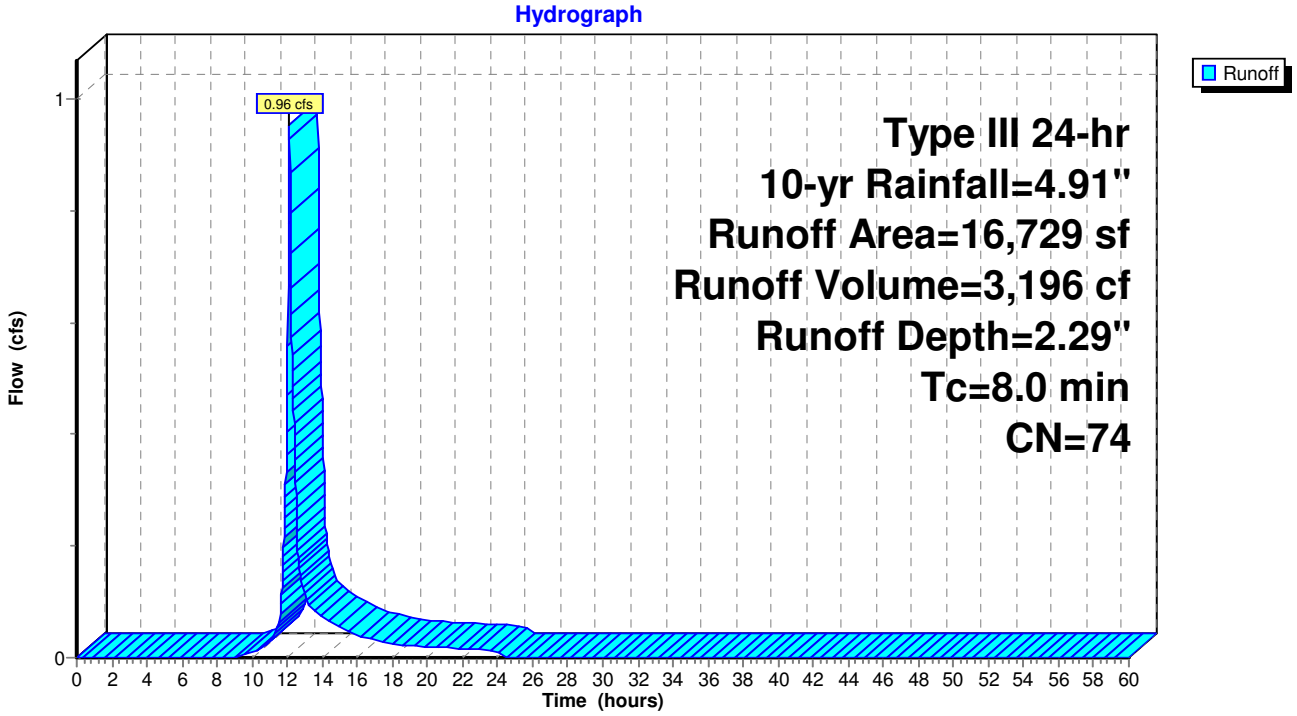
Subcatchment P5: CB6-8, CB11-15, CB38-39, CB41, R2A-E



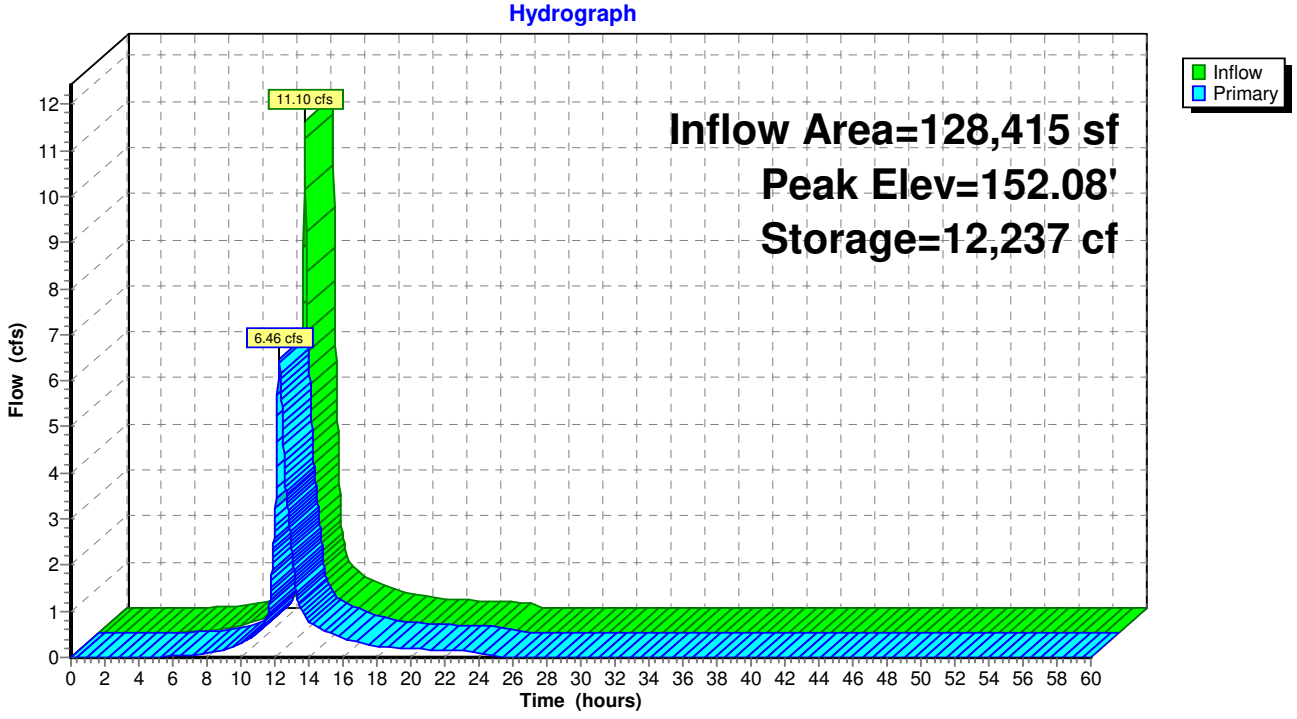
Subcatchment P6: DIRECT TO P1P



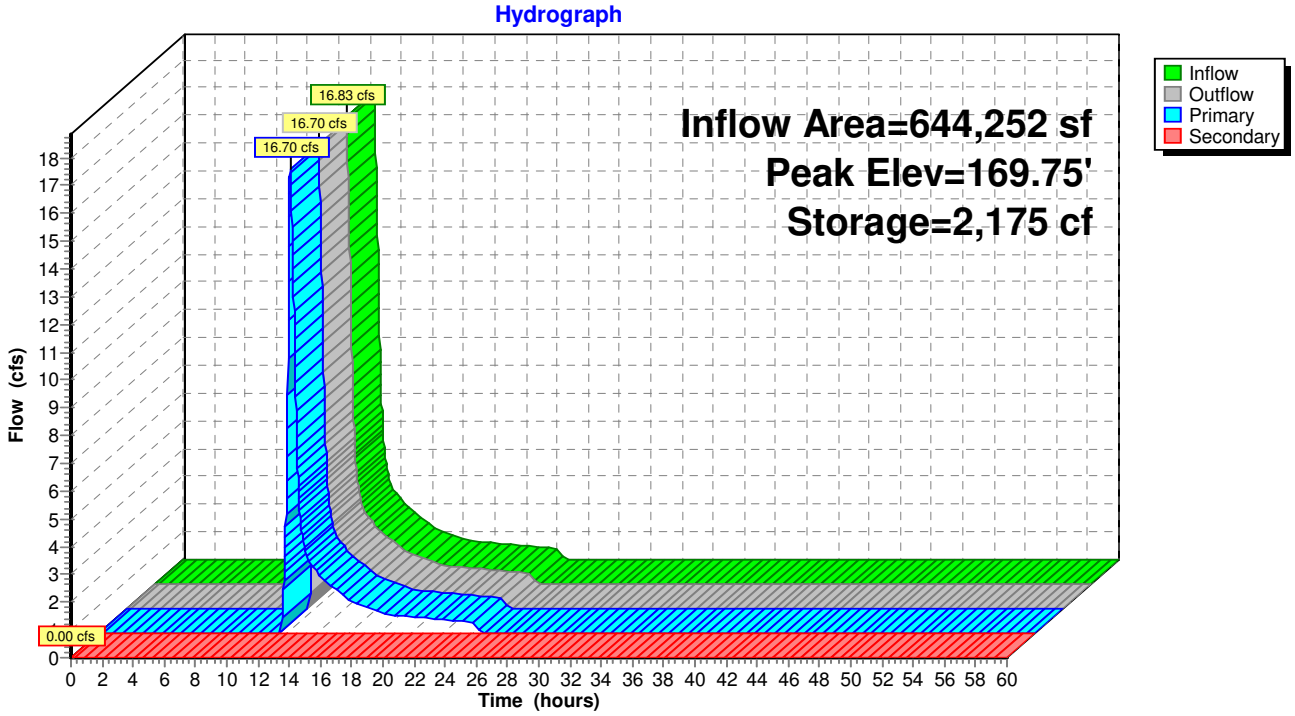
Subcatchment P7: DIRECT TO P2P



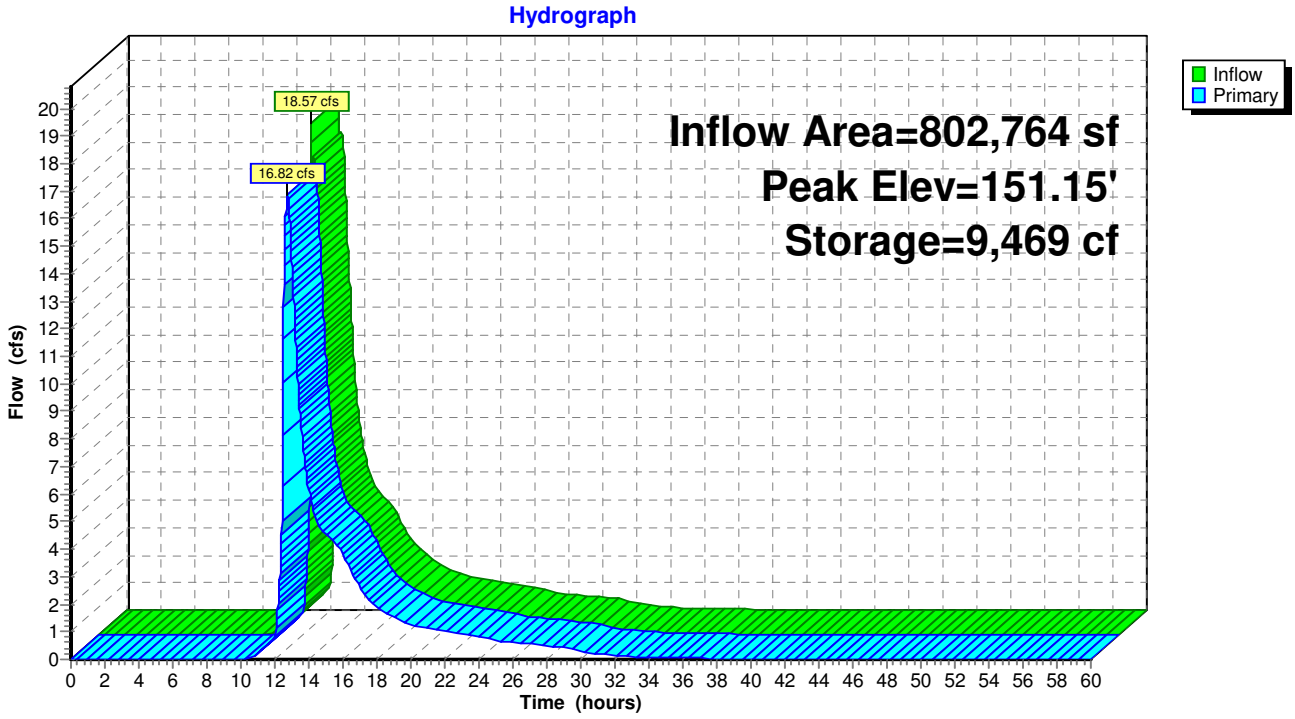
Pond APP1: ALDI POND (Post The Gateway)



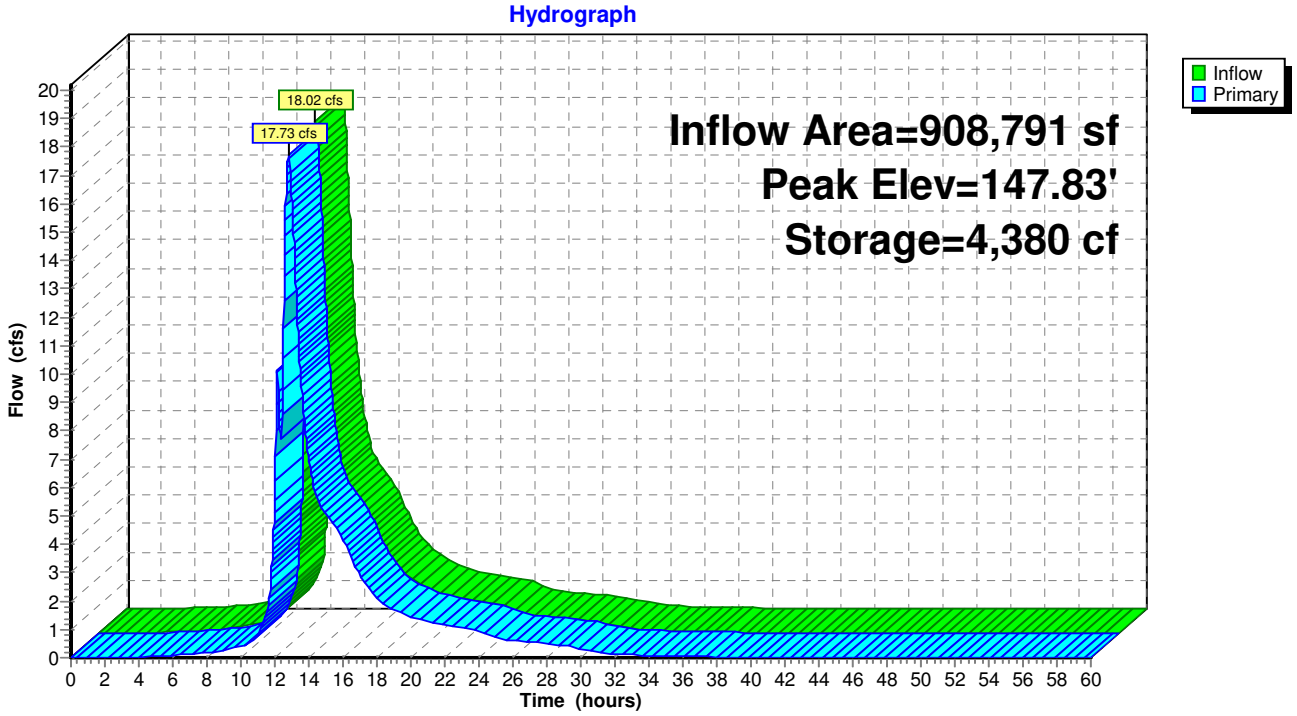
Pond APP2: Existing Wetlands (With Overflow Pipe)



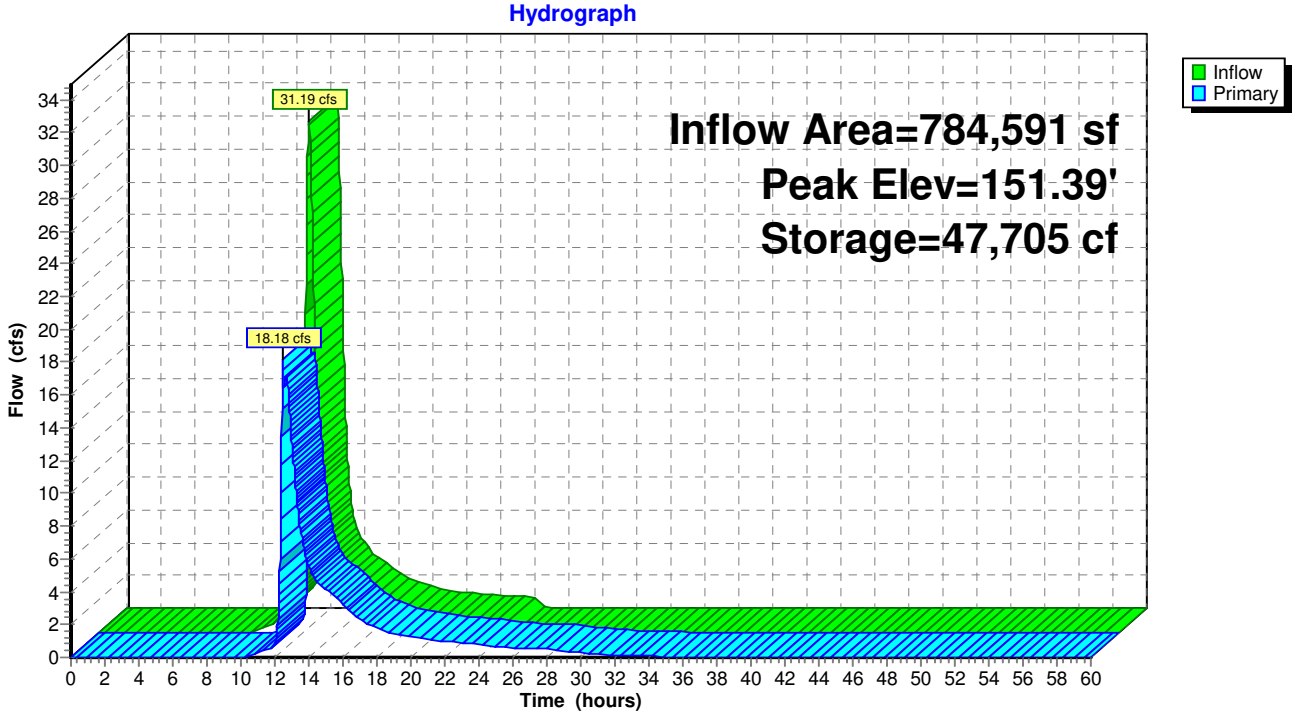
Pond P1P: Upper Pond (DB-01)



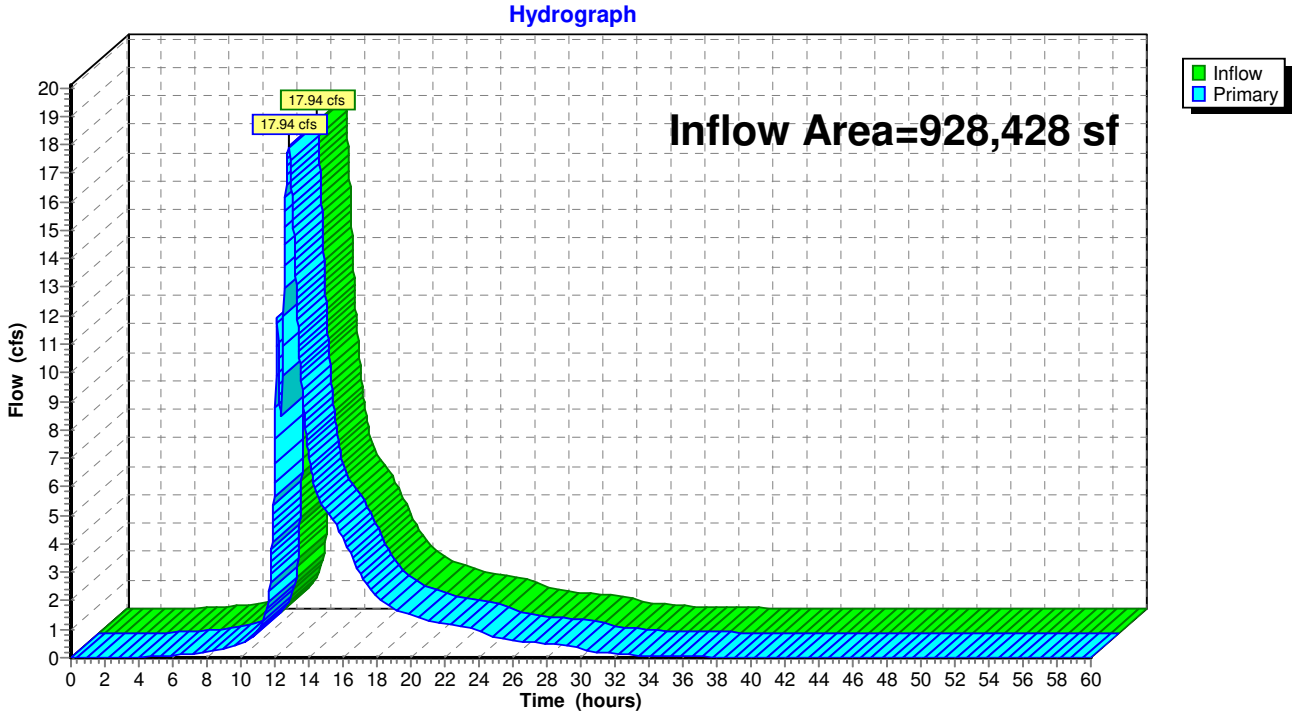
Pond P2P: Lower Pond (DB-02)



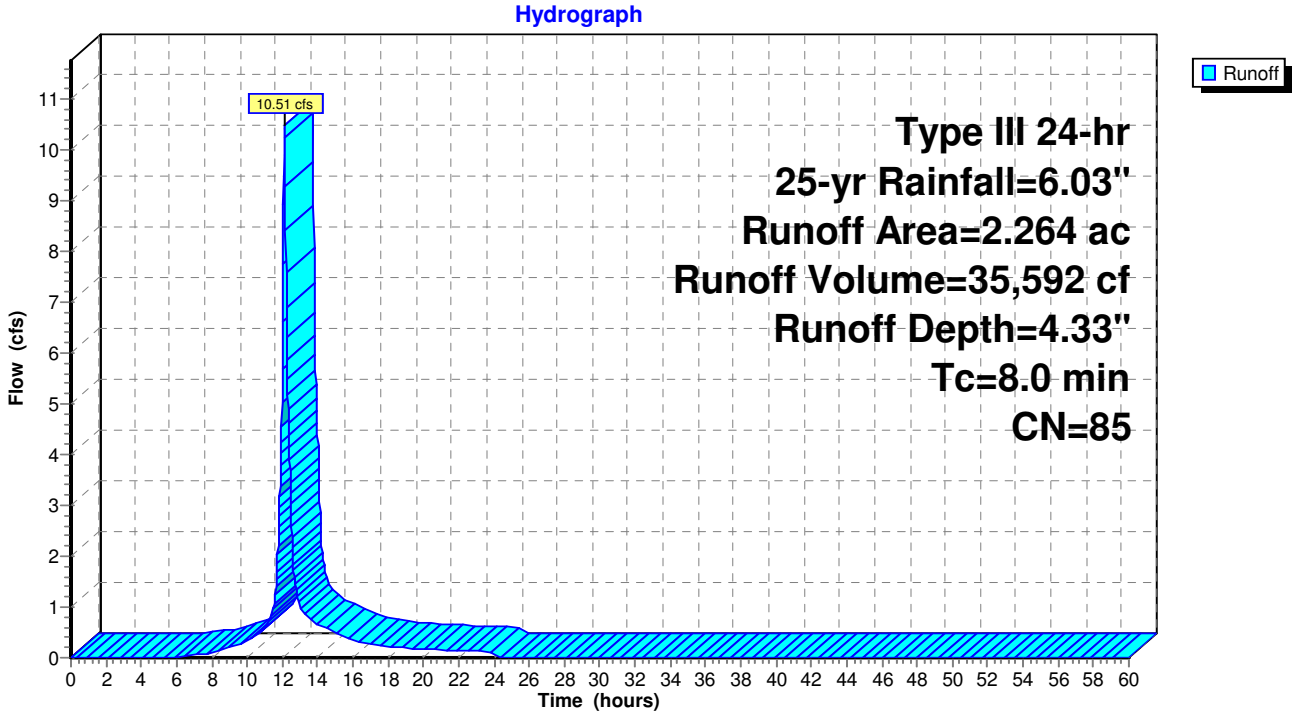
Pond UGC1: Cultec R-902HD



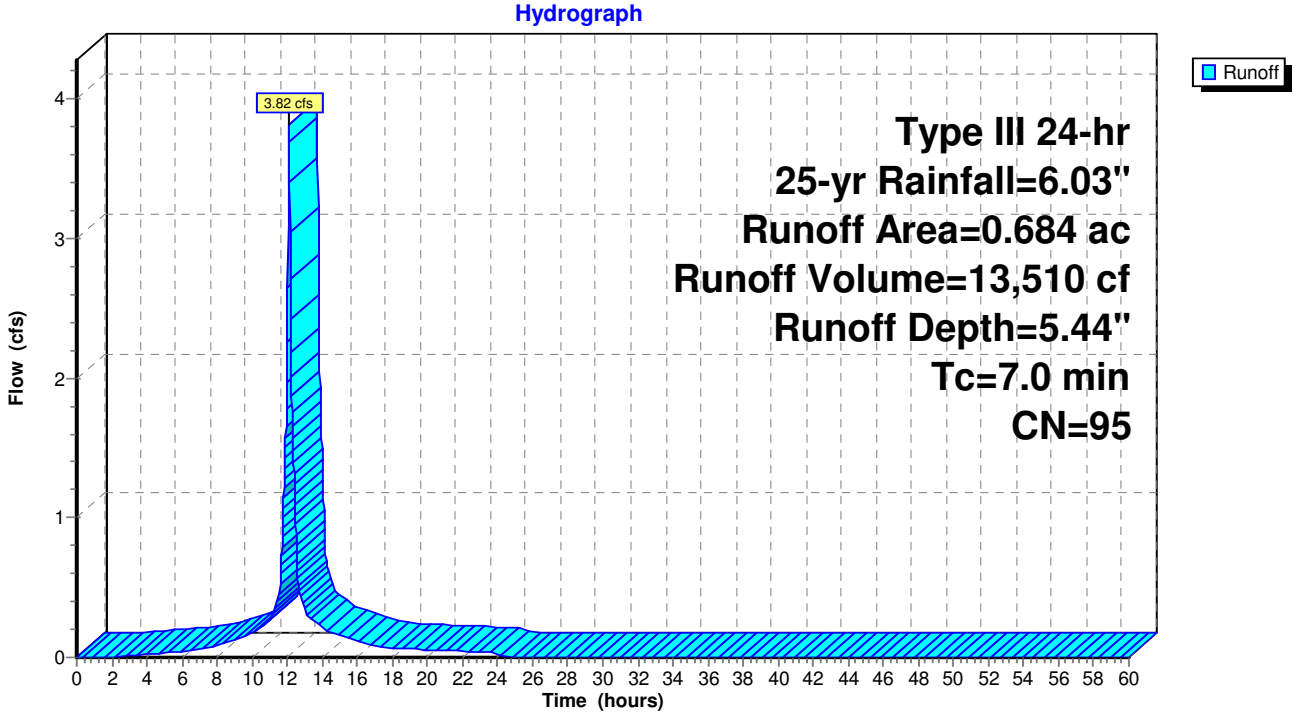
Link L1: DP1


Hydrograph
Inflow Area=928,428 sf
17.94 cfs
17.94 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60

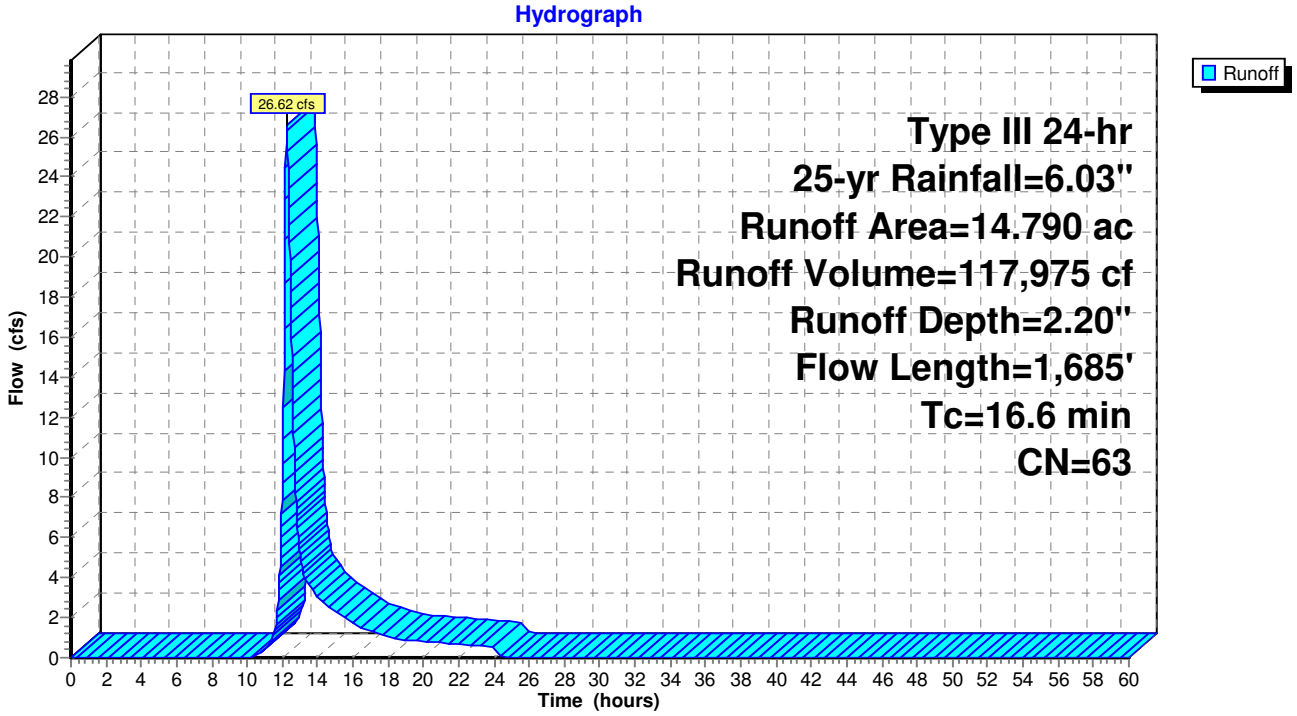
Subcatchment AP1: Aldi Parking and Areas to Pond (Post The Gateway)



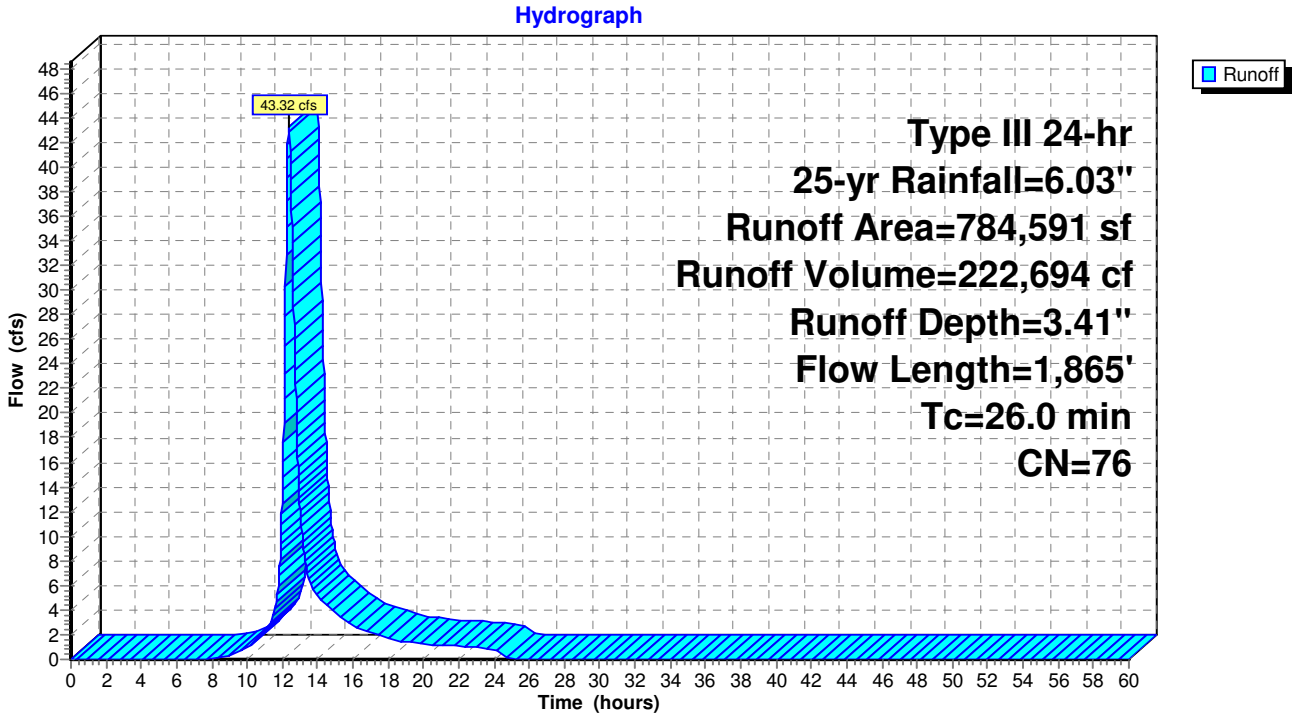
Subcatchment AP2: Aldi (Roof)



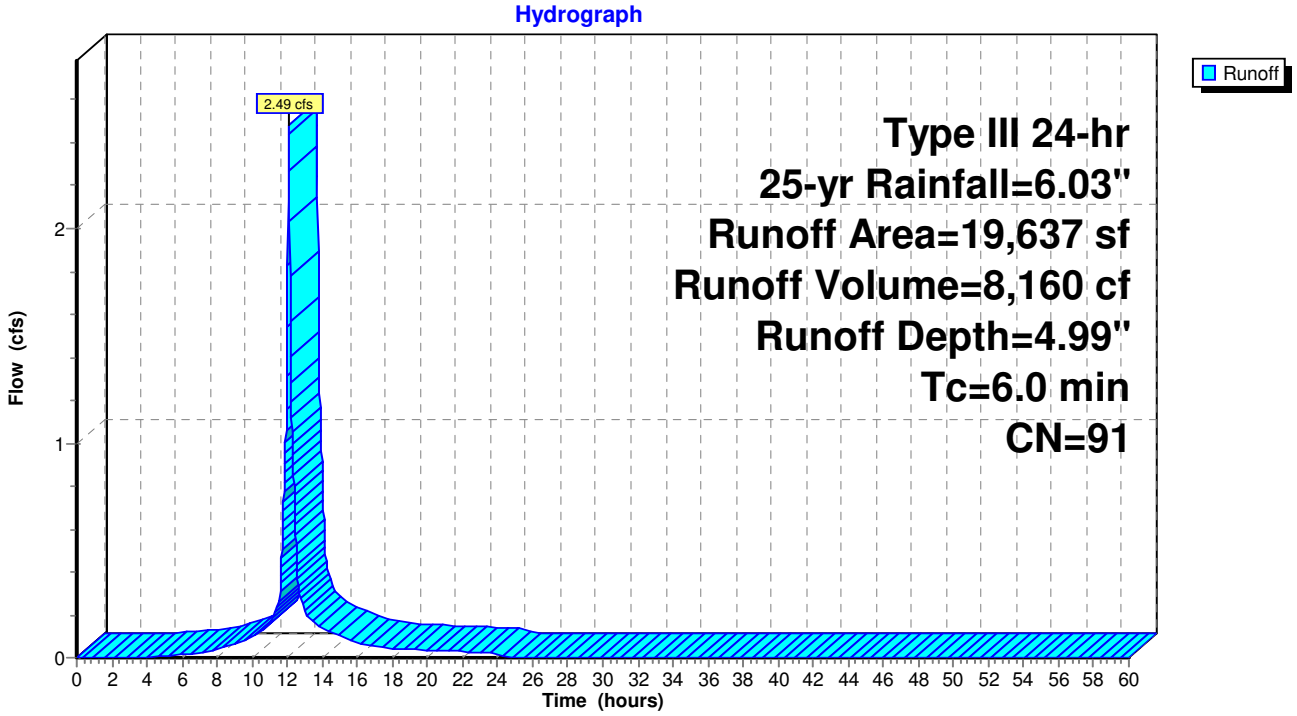
Subcatchment AP3: Existing Wetlands Pond - Catchment Area (Post The Gateway)



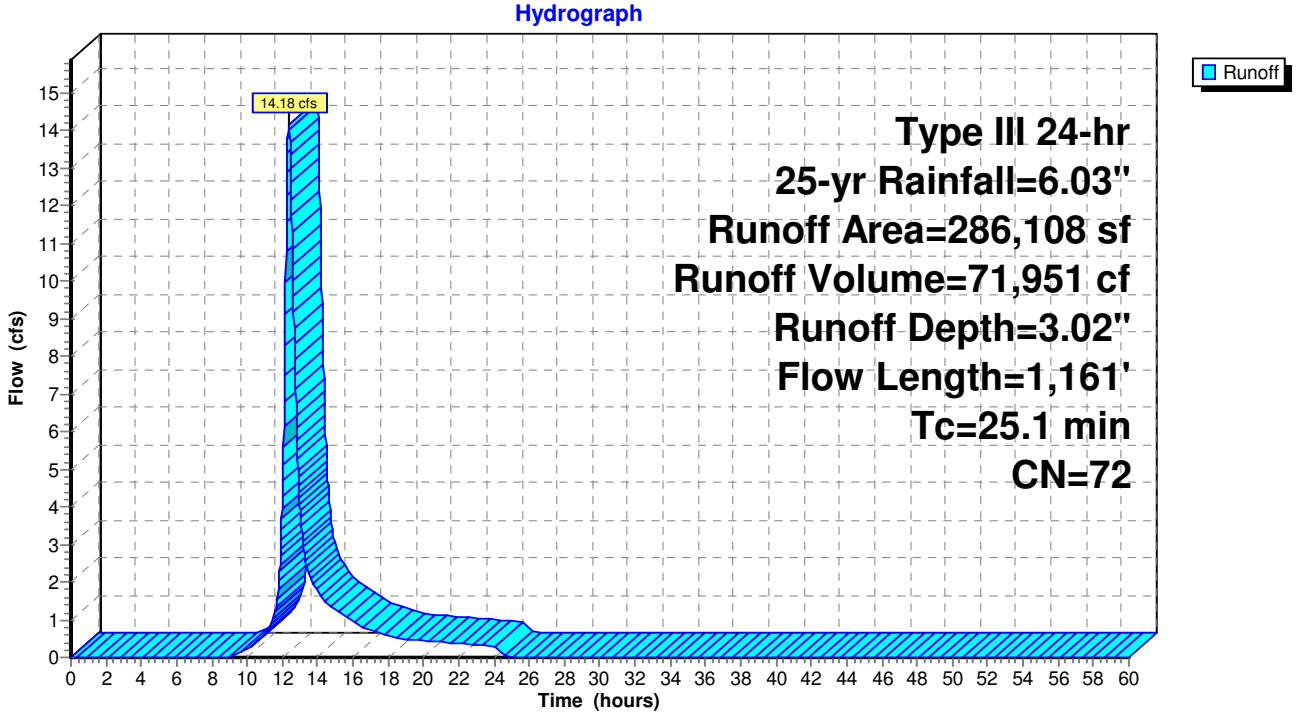
Subcatchment P1: Main Site (EXCLUDING: CB6-8, CB11-15, CB38-39, CB41, R2A-E)



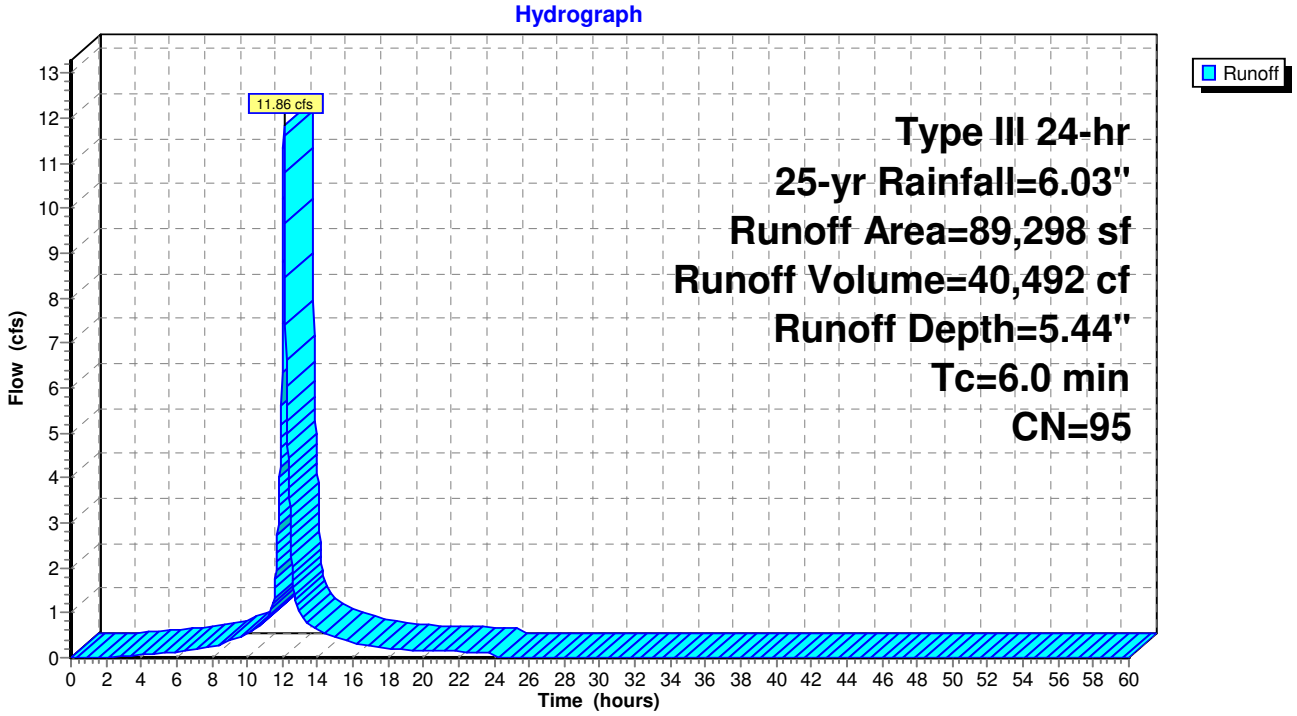
Subcatchment P2: Proposed ROW to DP1



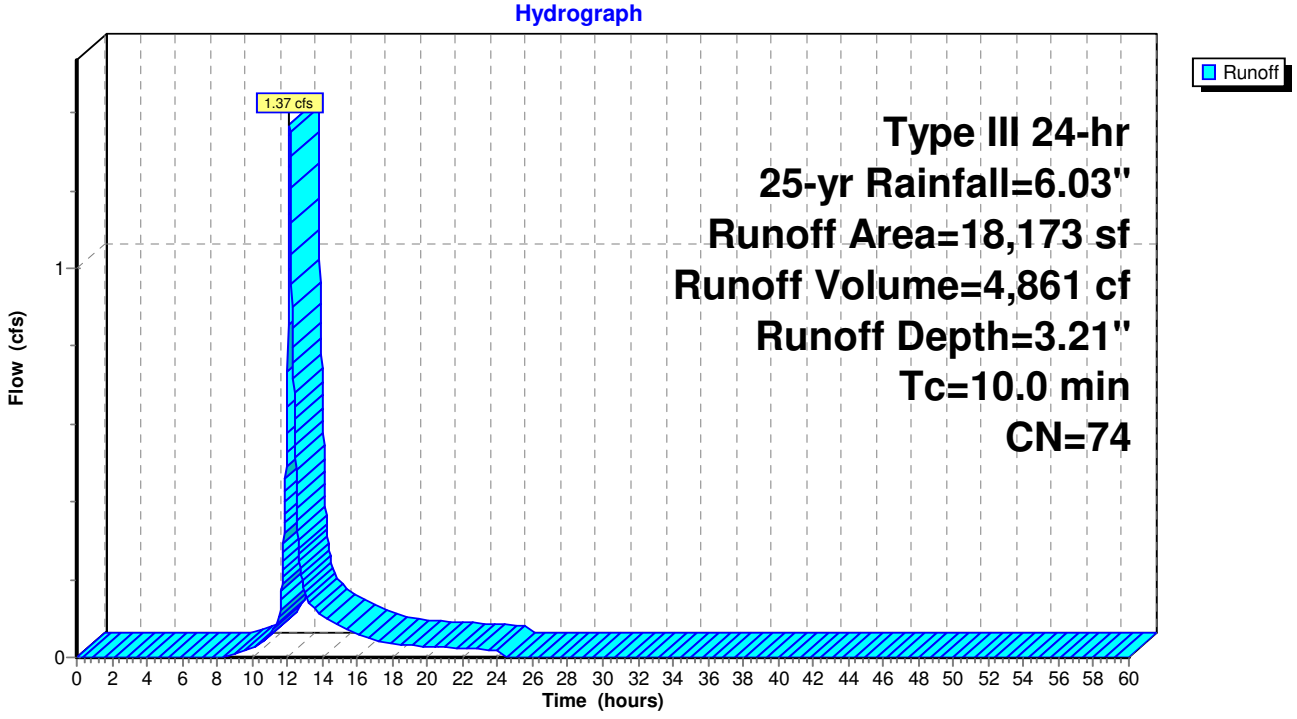
Subcatchment P3: Proposed (Existing to DP2)



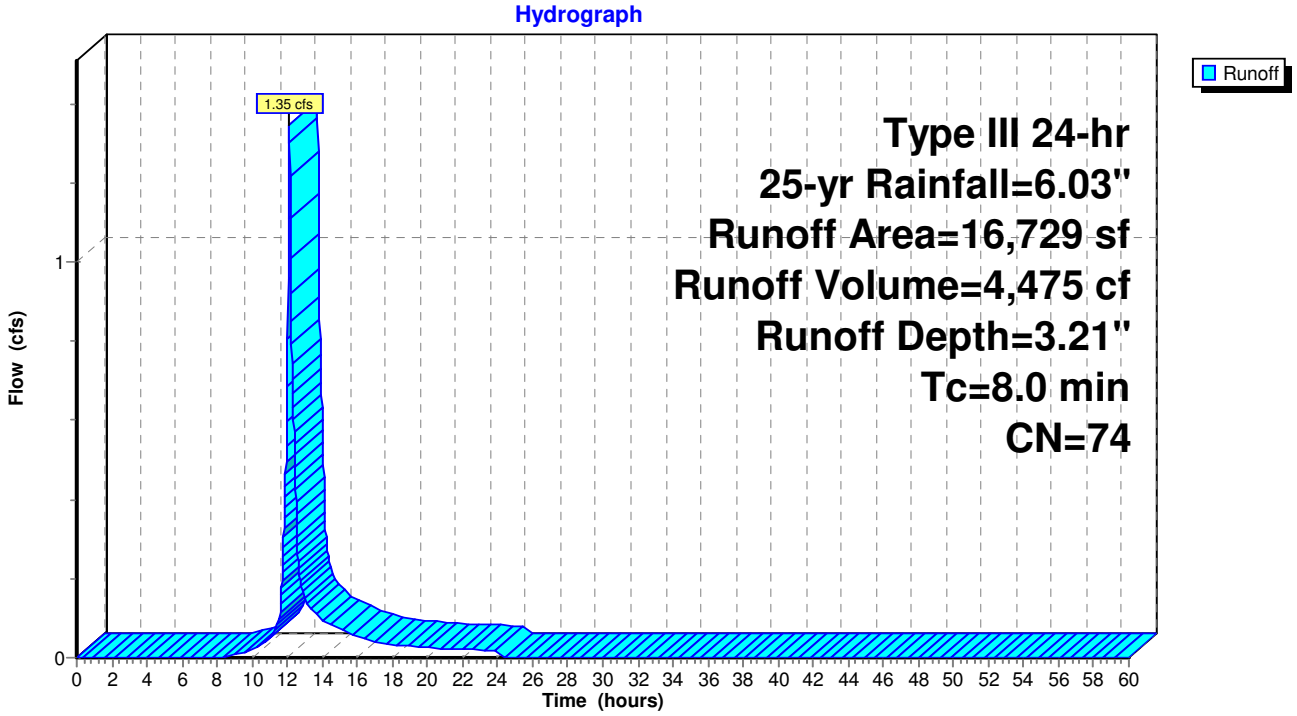
Subcatchment P5: CB6-8, CB11-15, CB38-39, CB41, R2A-E



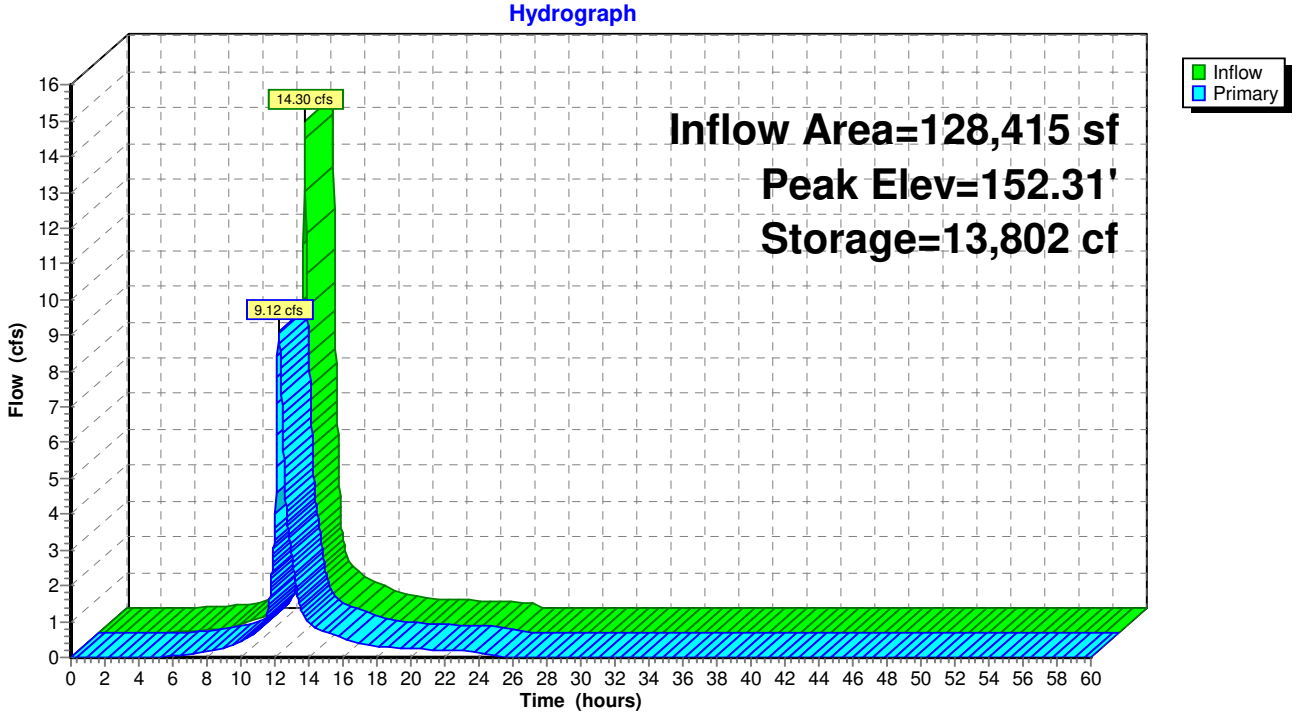
Subcatchment P6: DIRECT TO P1P



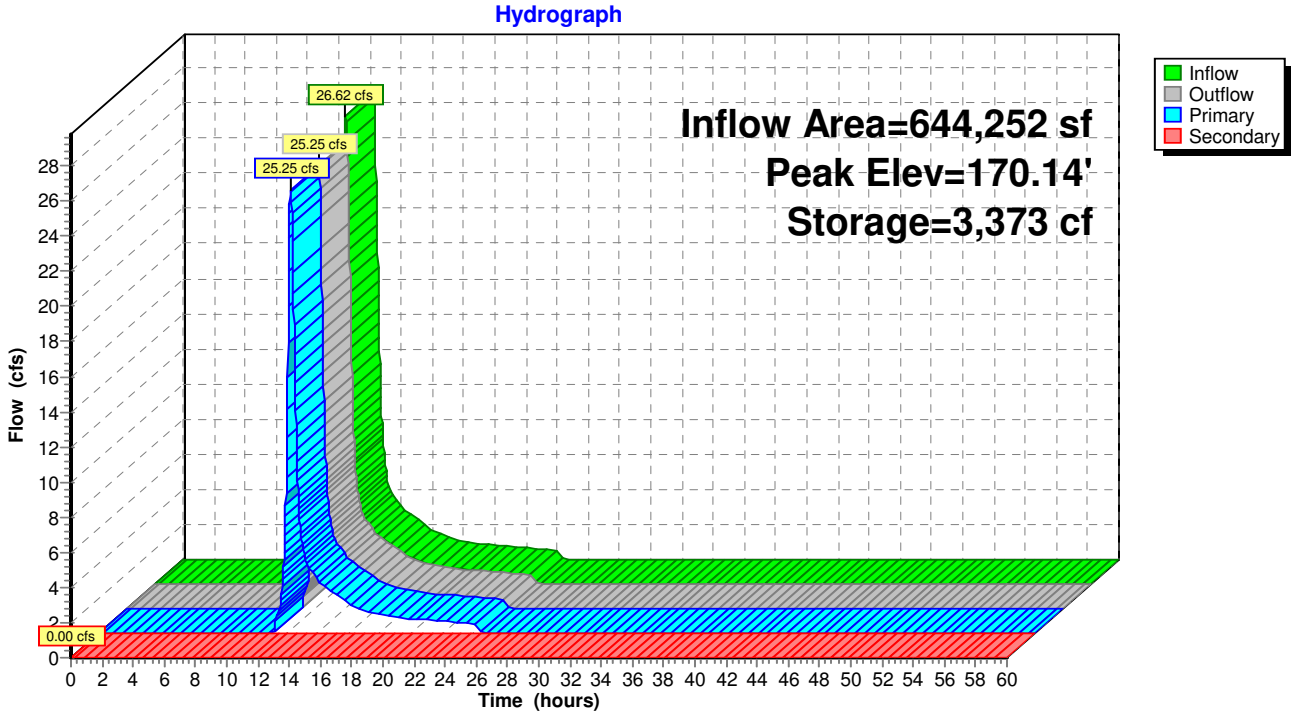
Subcatchment P7: DIRECT TO P2P



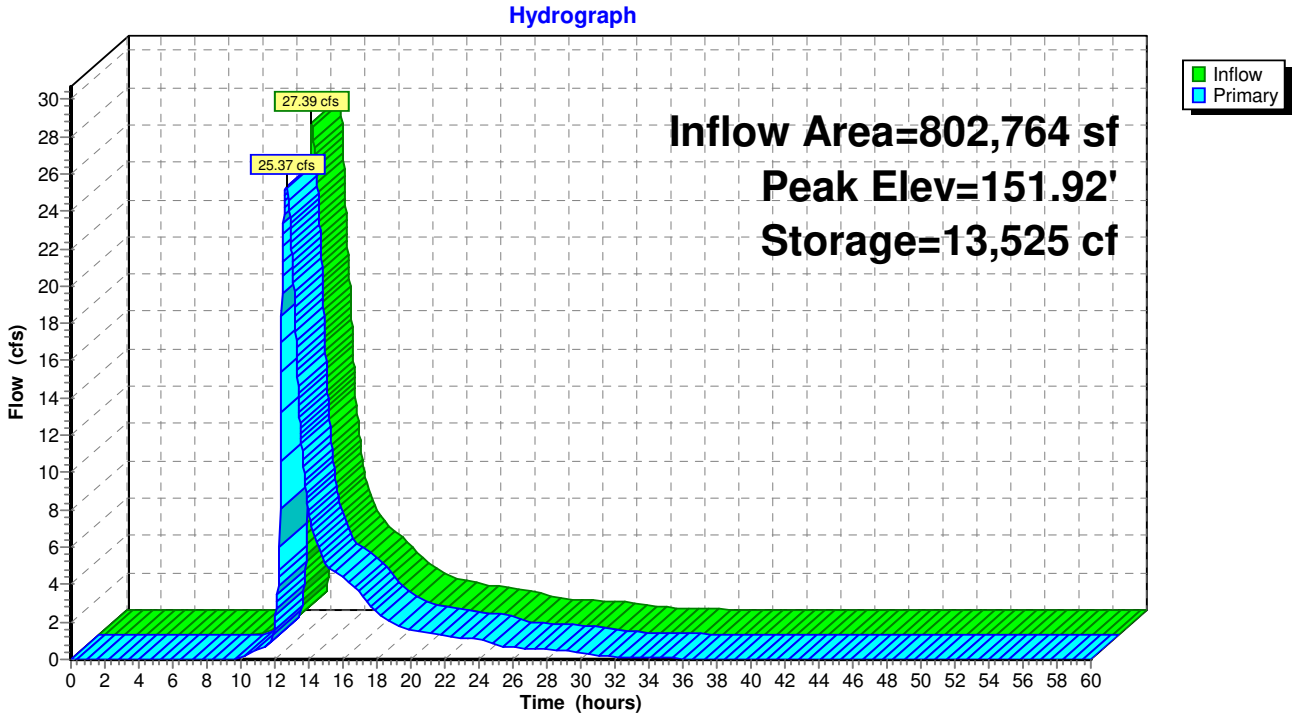
Pond APP1: ALDI POND (Post The Gateway)



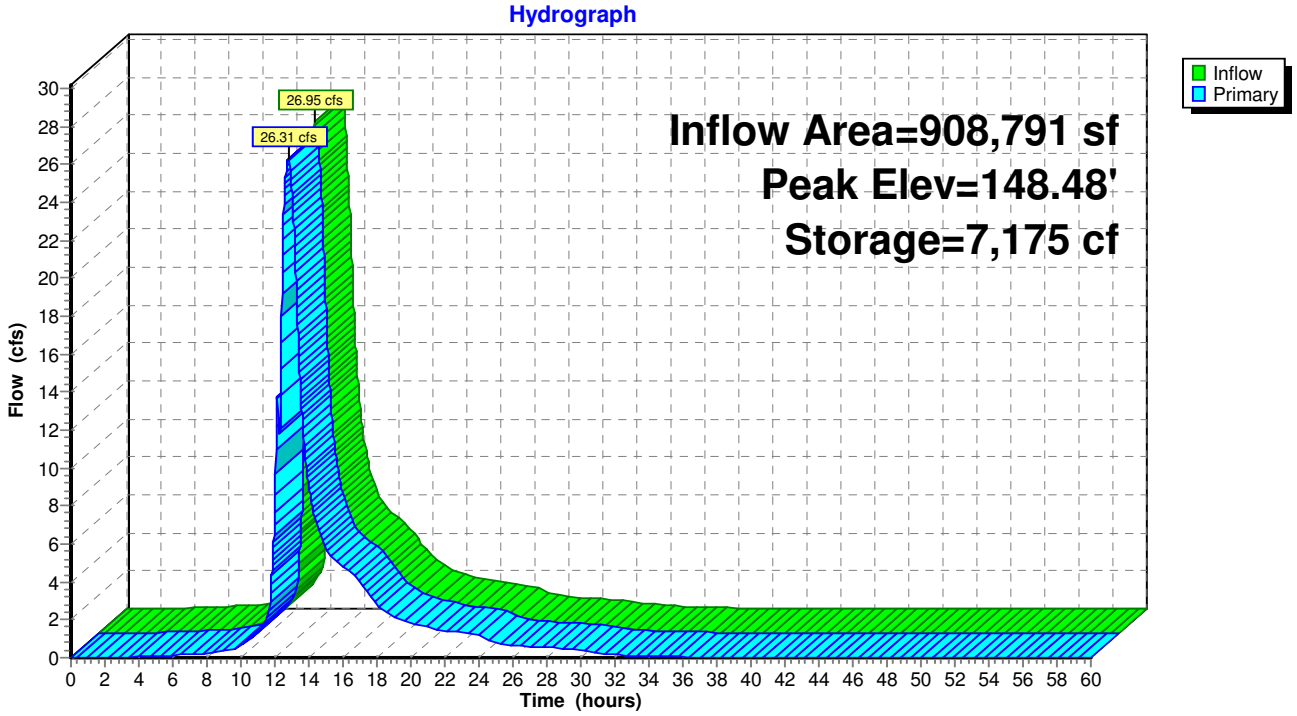
Pond APP2: Existing Wetlands (With Overflow Pipe)



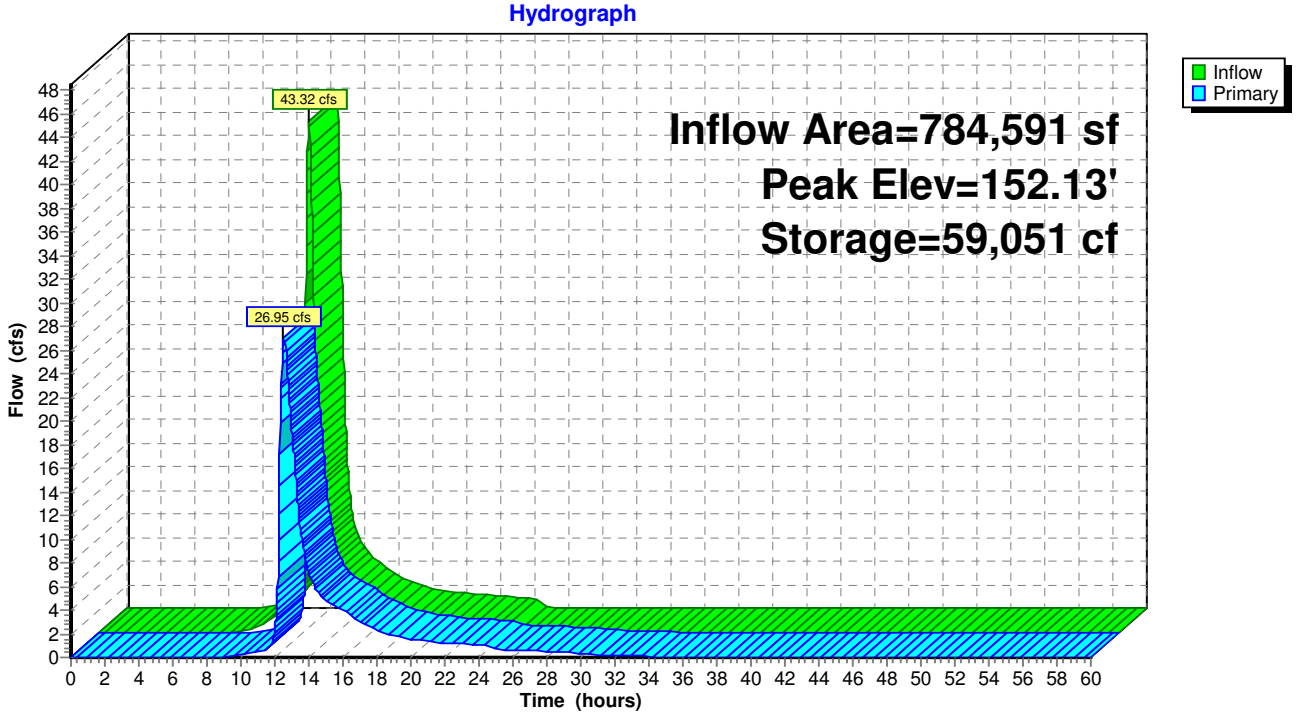
Pond P1P: Upper Pond (DB-01)



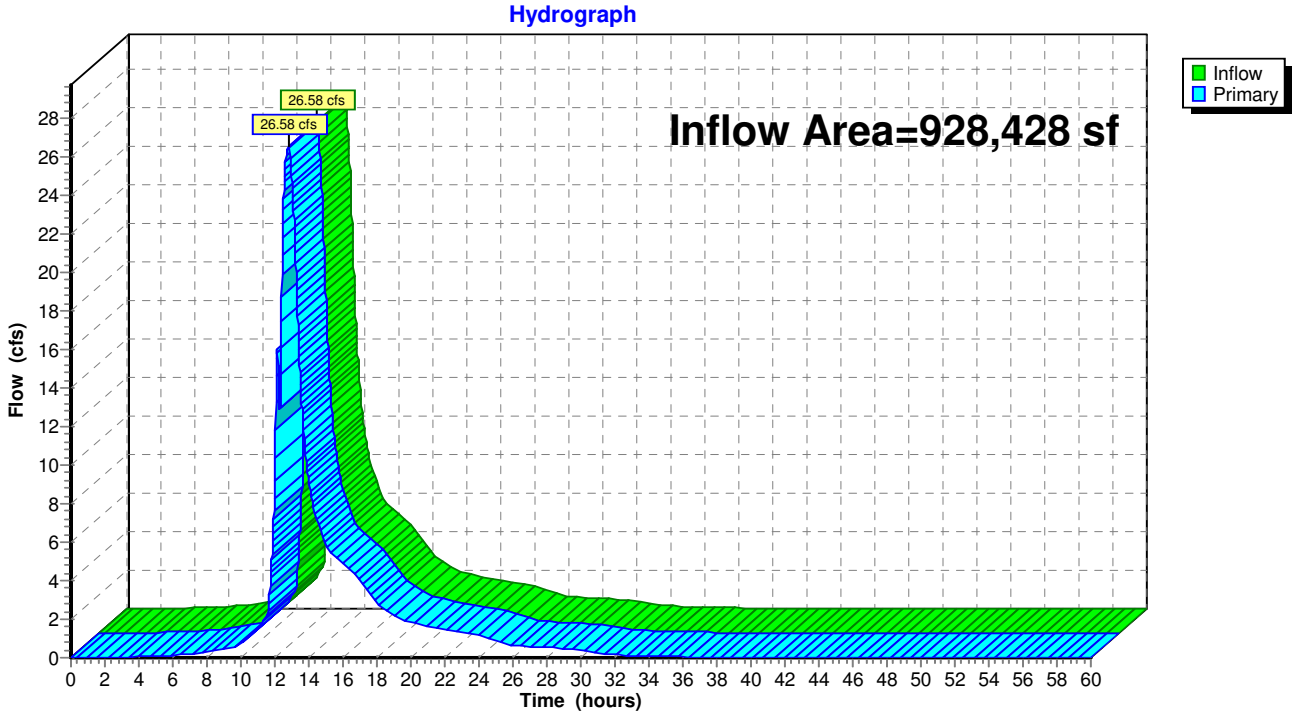
Pond P2P: Lower Pond (DB-02)



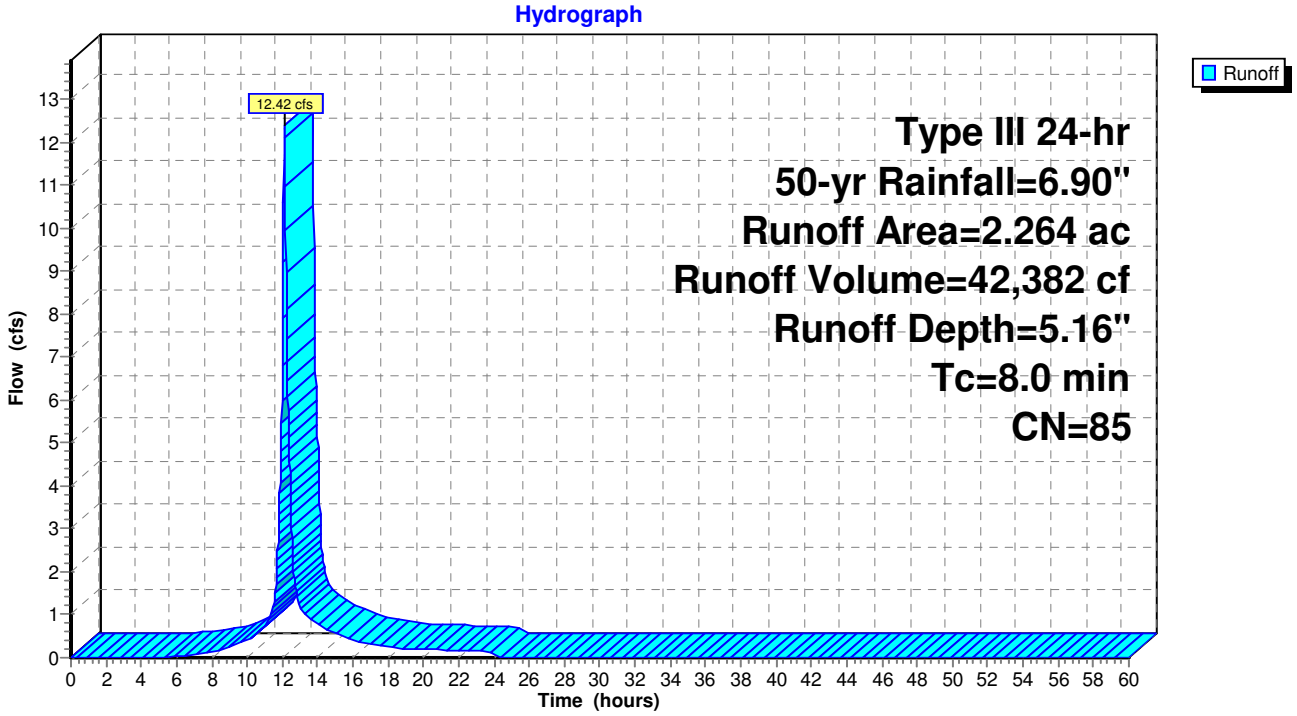
Pond UGC1: Cultec R-902HD



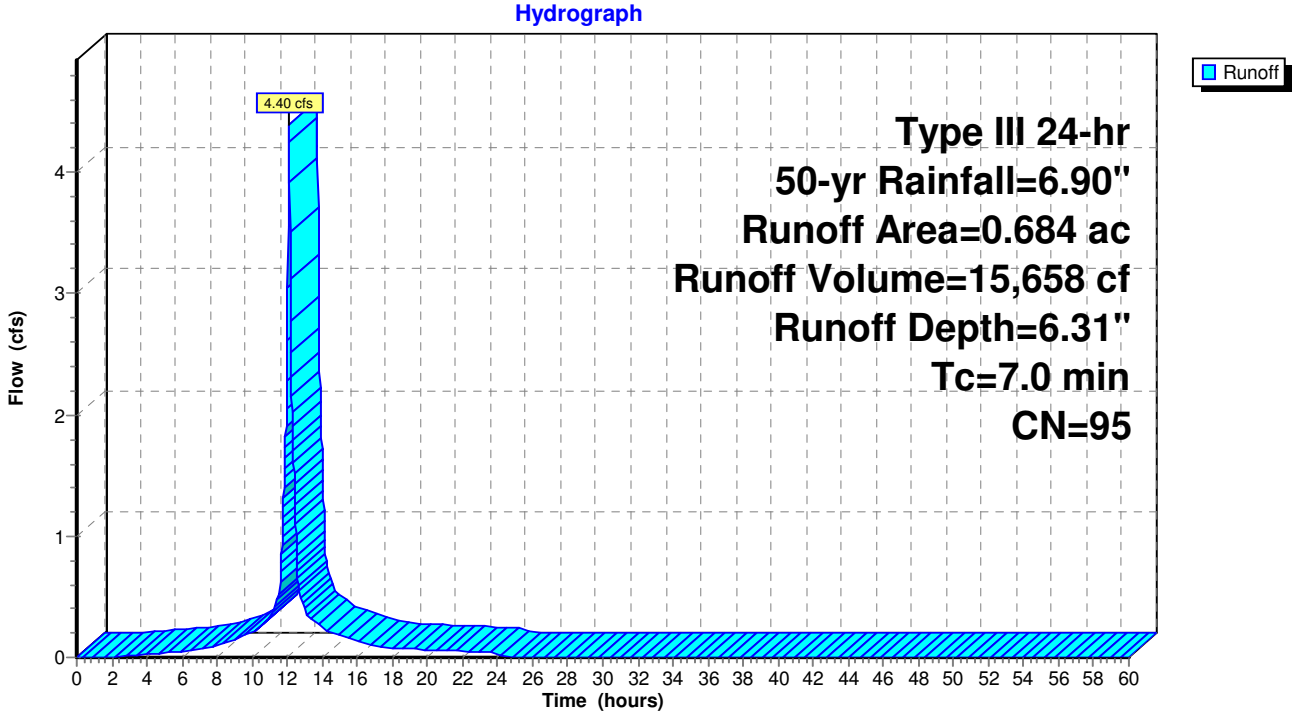
Link L1: DP1


Hydrograph
Inflow Area=928,428 sf
26.58 cfs
26.58 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60

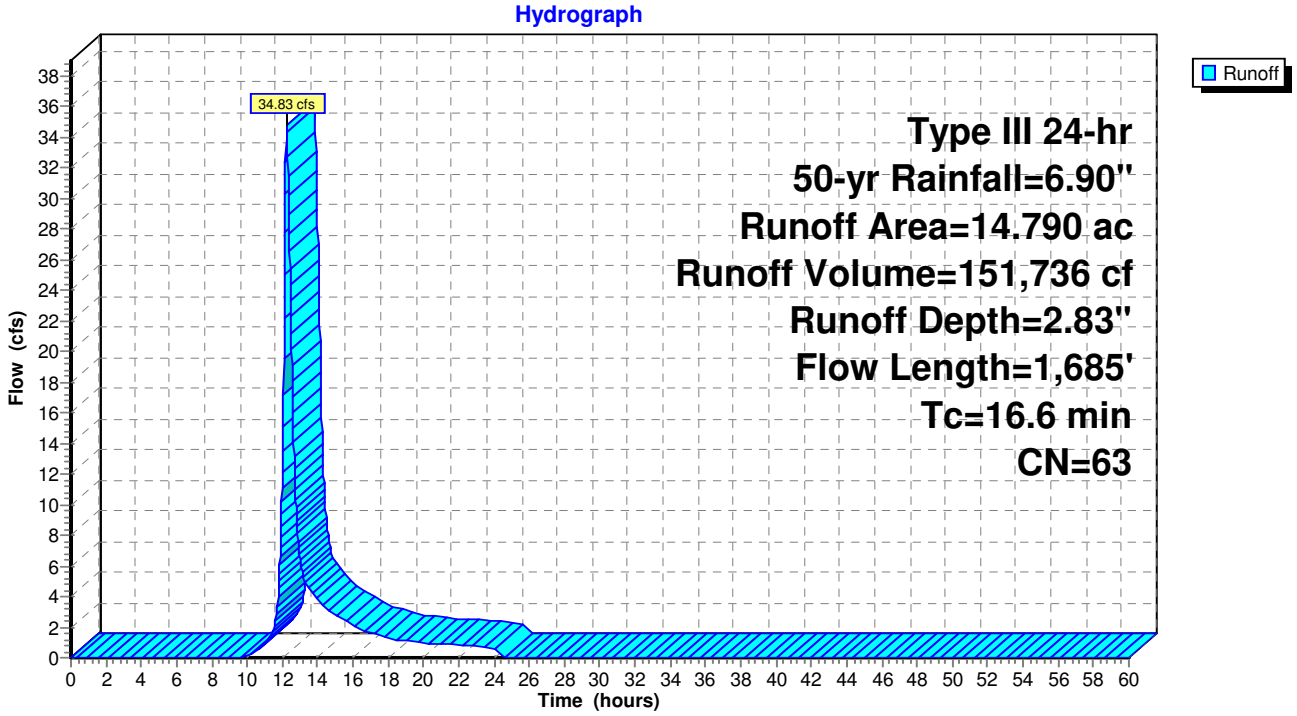
Subcatchment AP1: Aldi Parking and Areas to Pond (Post The Gateway)



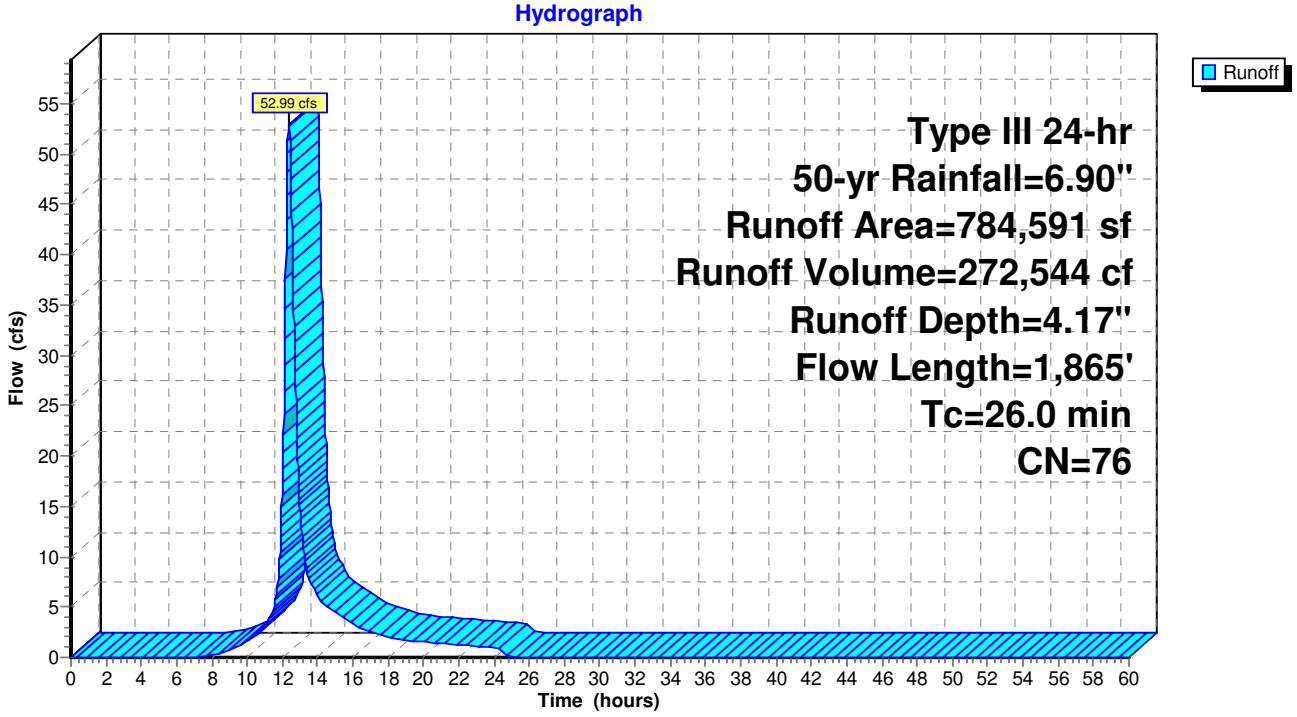
Subcatchment AP2: Aldi (Roof)



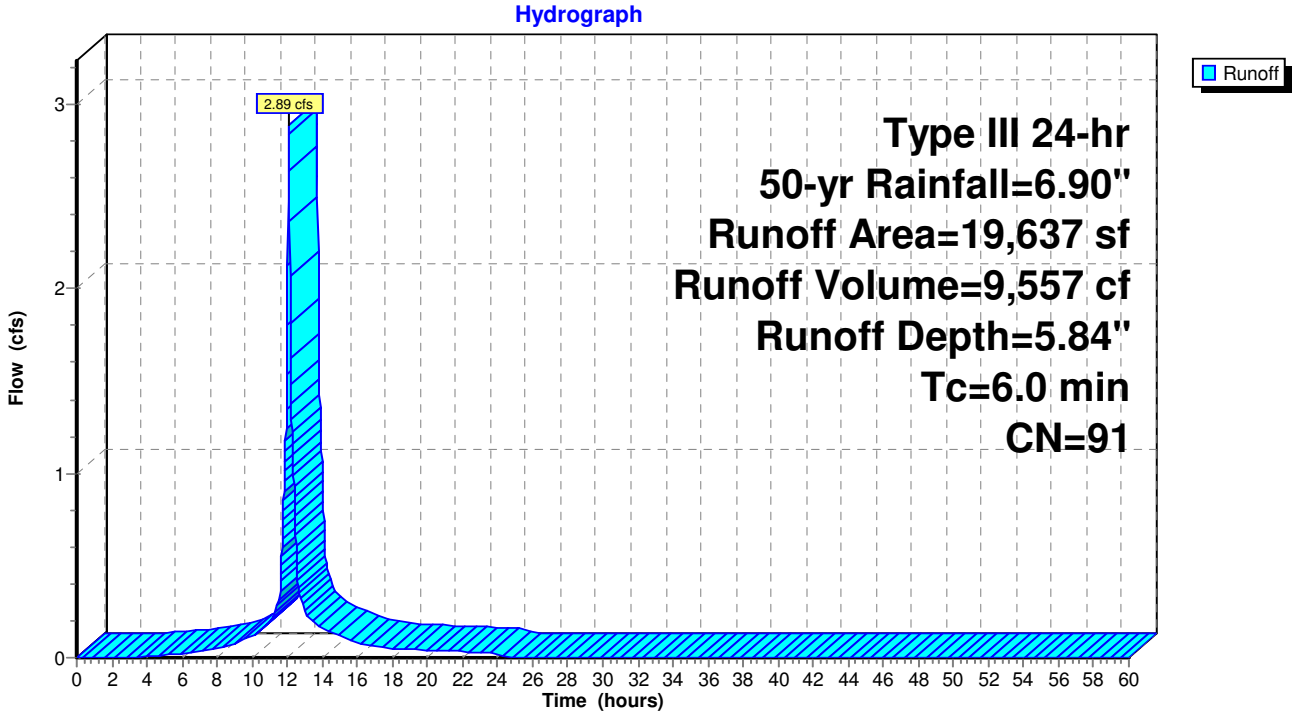
Subcatchment AP3: Existing Wetlands Pond - Catchment Area (Post The Gateway)



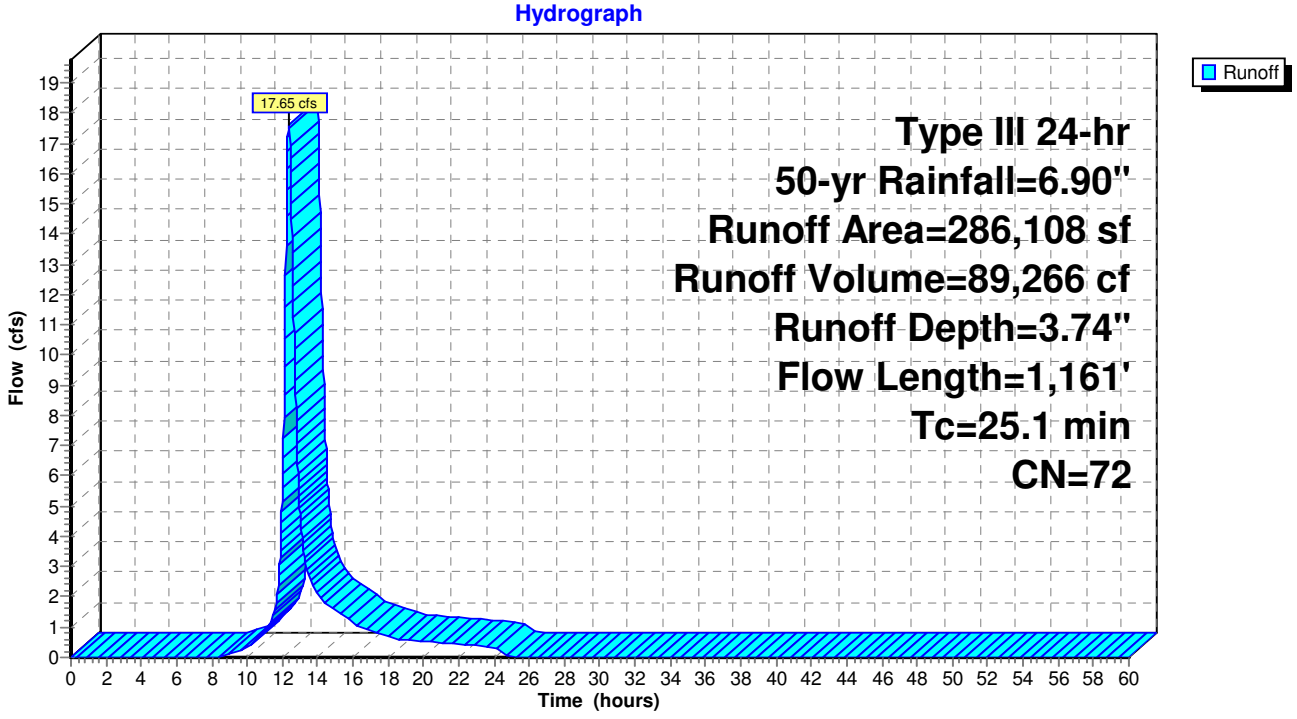
Subcatchment P1: Main Site (EXCLUDING: CB6-8, CB11-15, CB38-39, CB41, R2A-E)



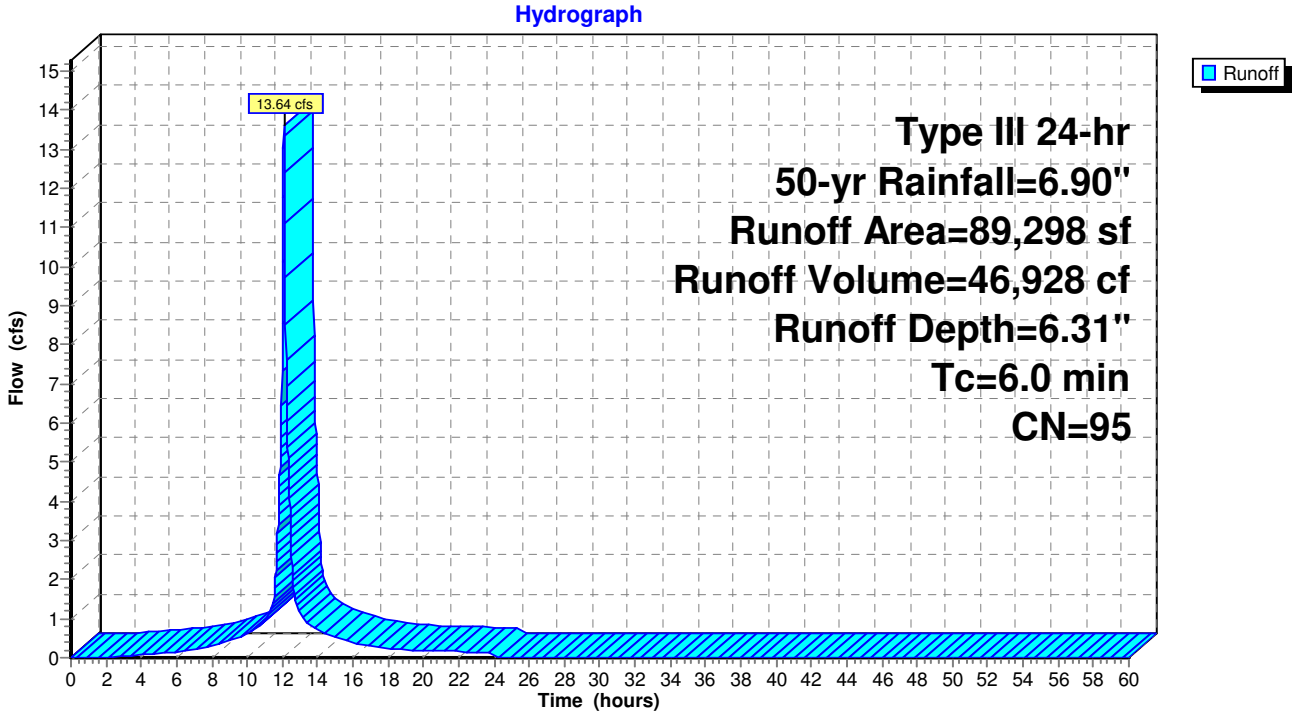
Subcatchment P2: Proposed ROW to DP1



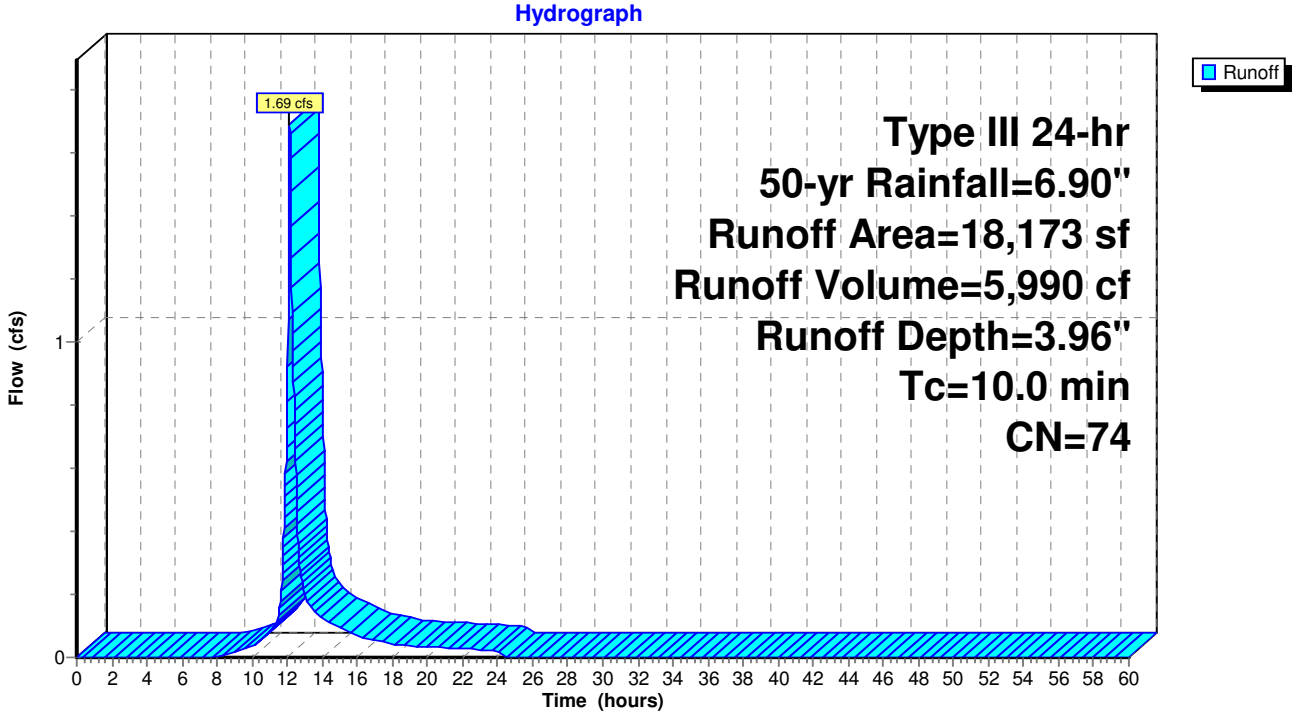
Subcatchment P3: Proposed (Existing to DP2)



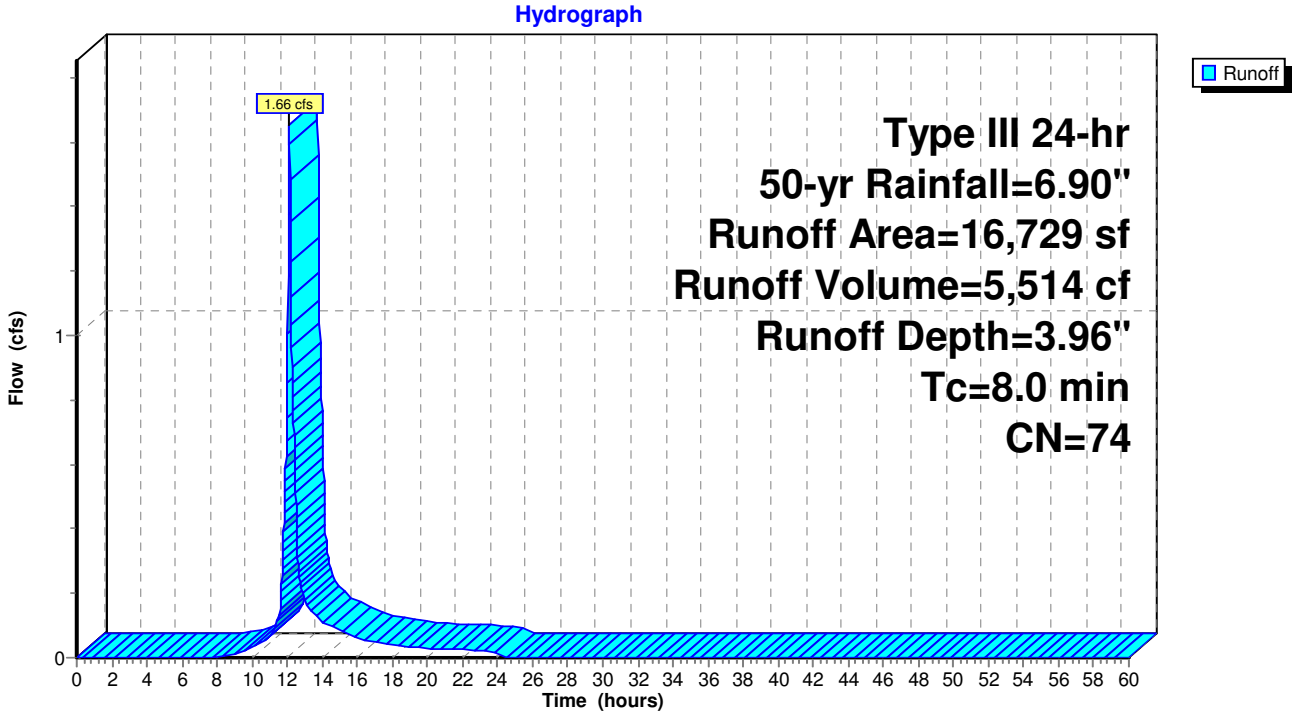
Subcatchment P5: CB6-8, CB11-15, CB38-39, CB41, R2A-E



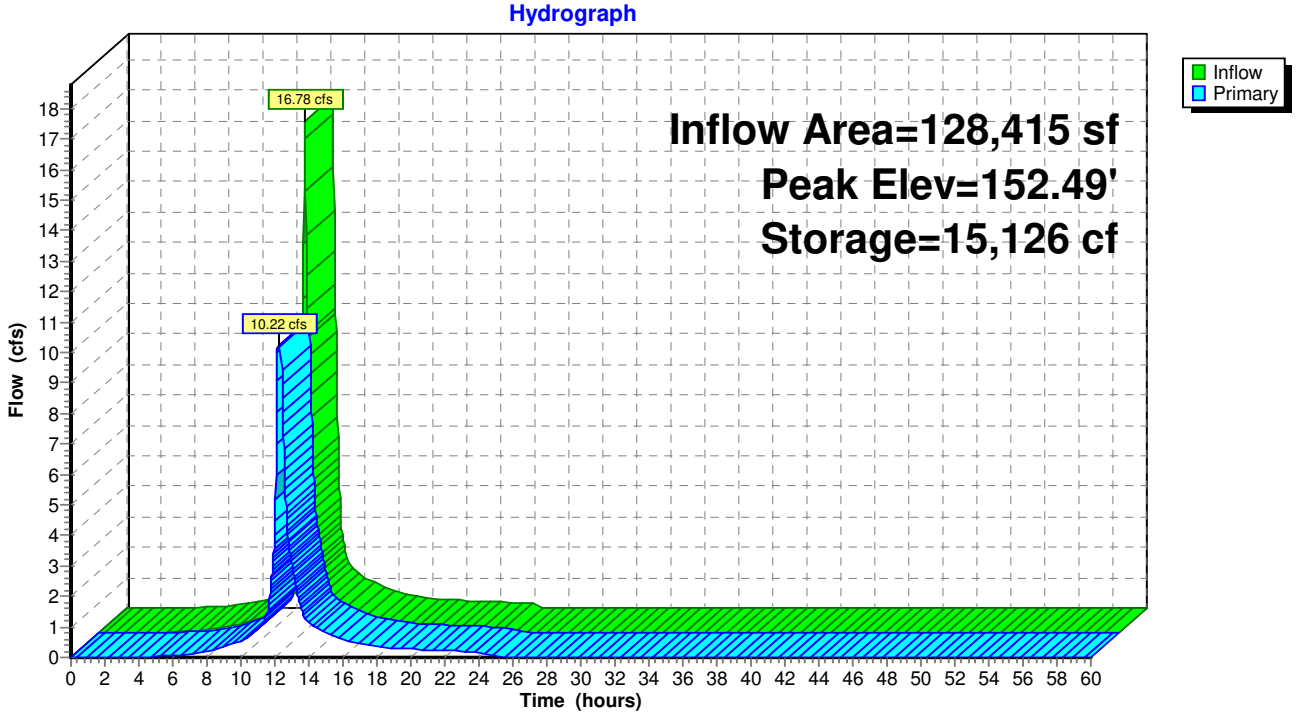
Subcatchment P6: DIRECT TO P1P



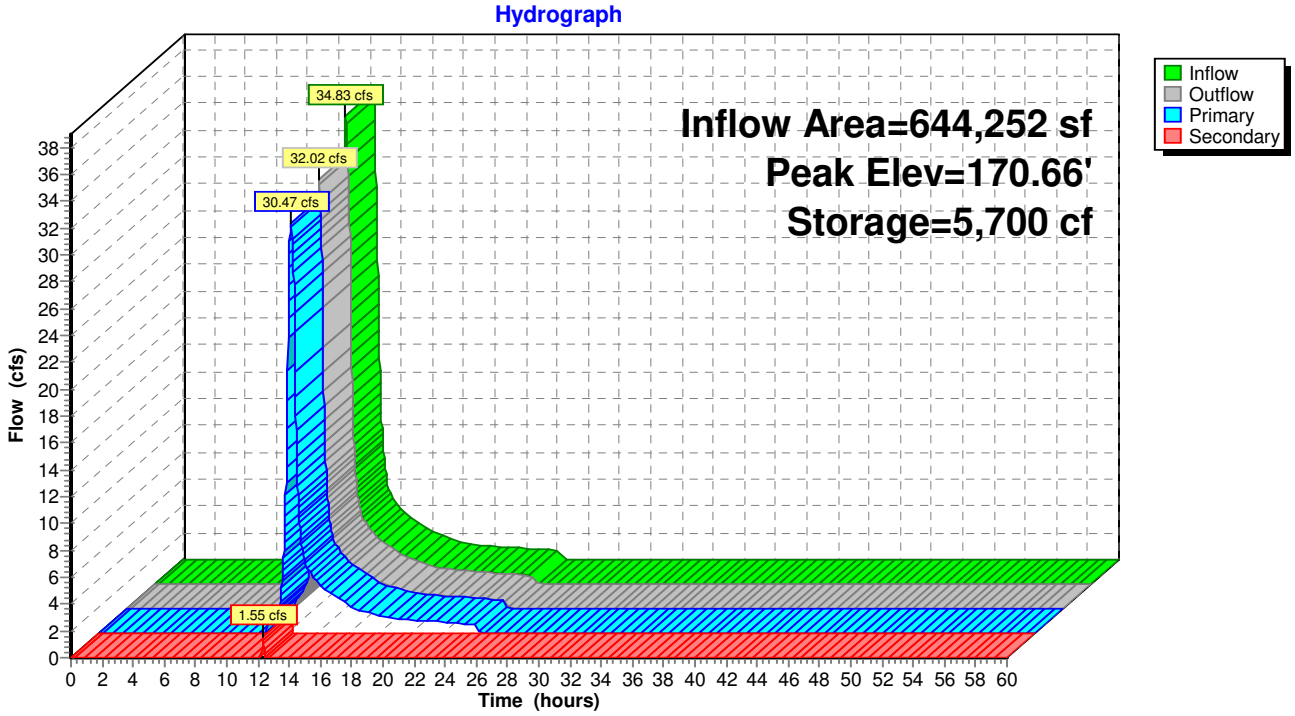
Subcatchment P7: DIRECT TO P2P



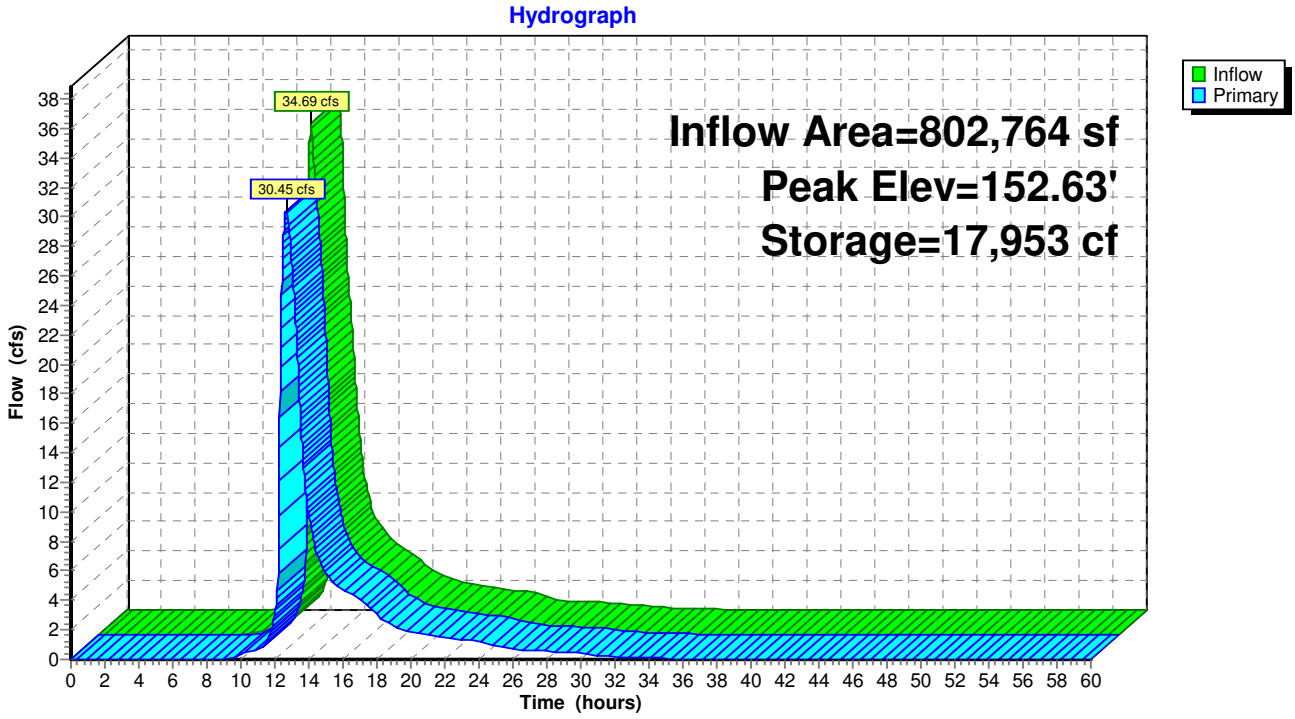
Pond APP1: ALDI POND (Post The Gateway)



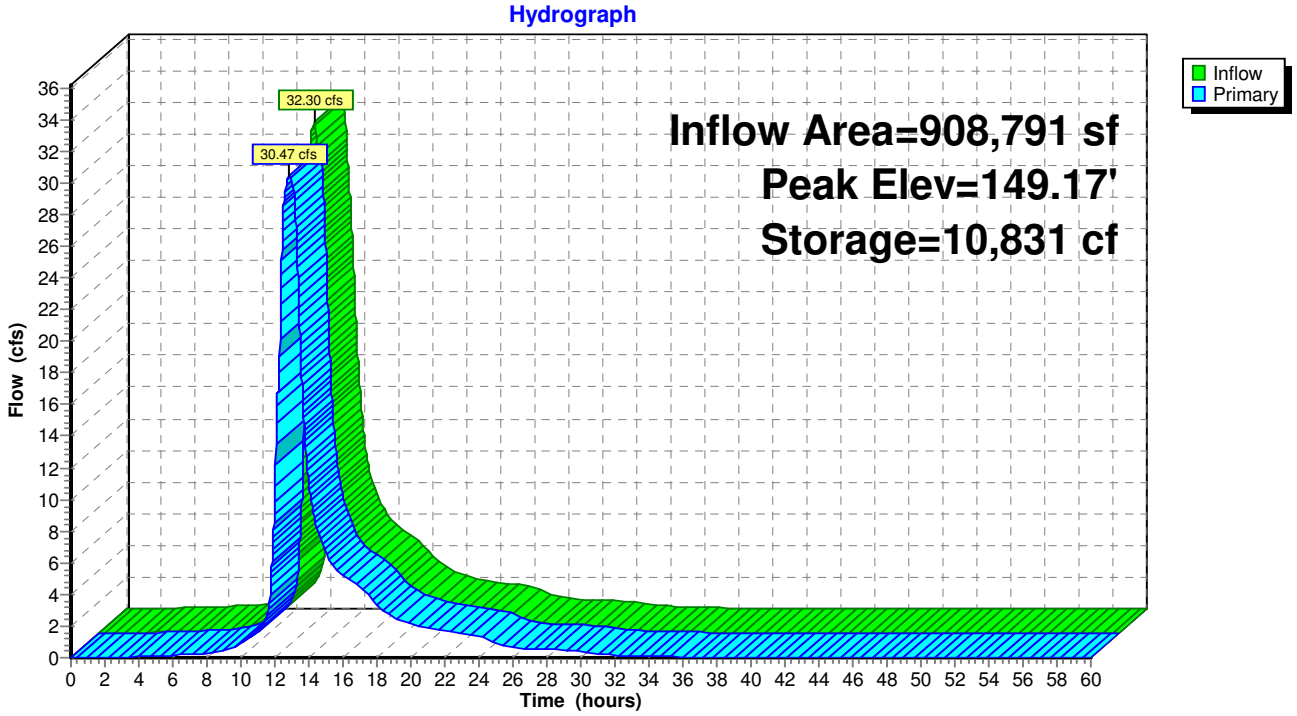
Pond APP2: Existing Wetlands (With Overflow Pipe)



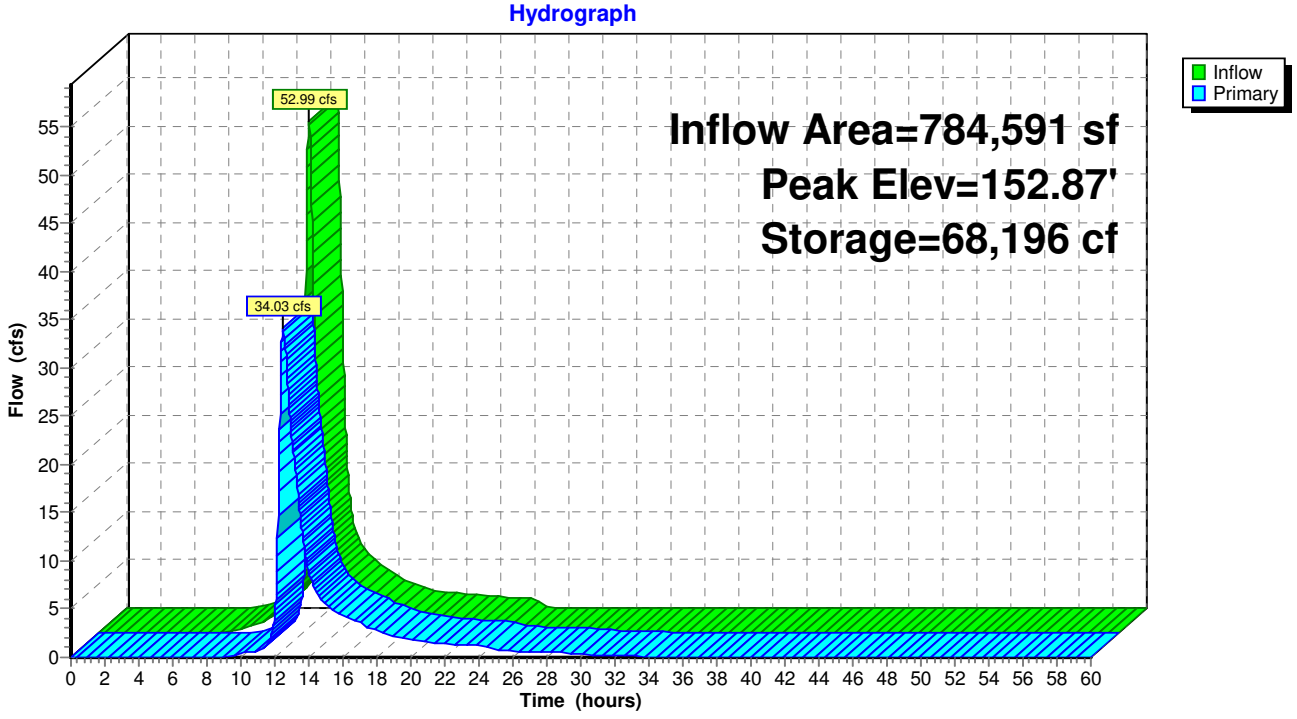
Pond P1P: Upper Pond (DB-01)



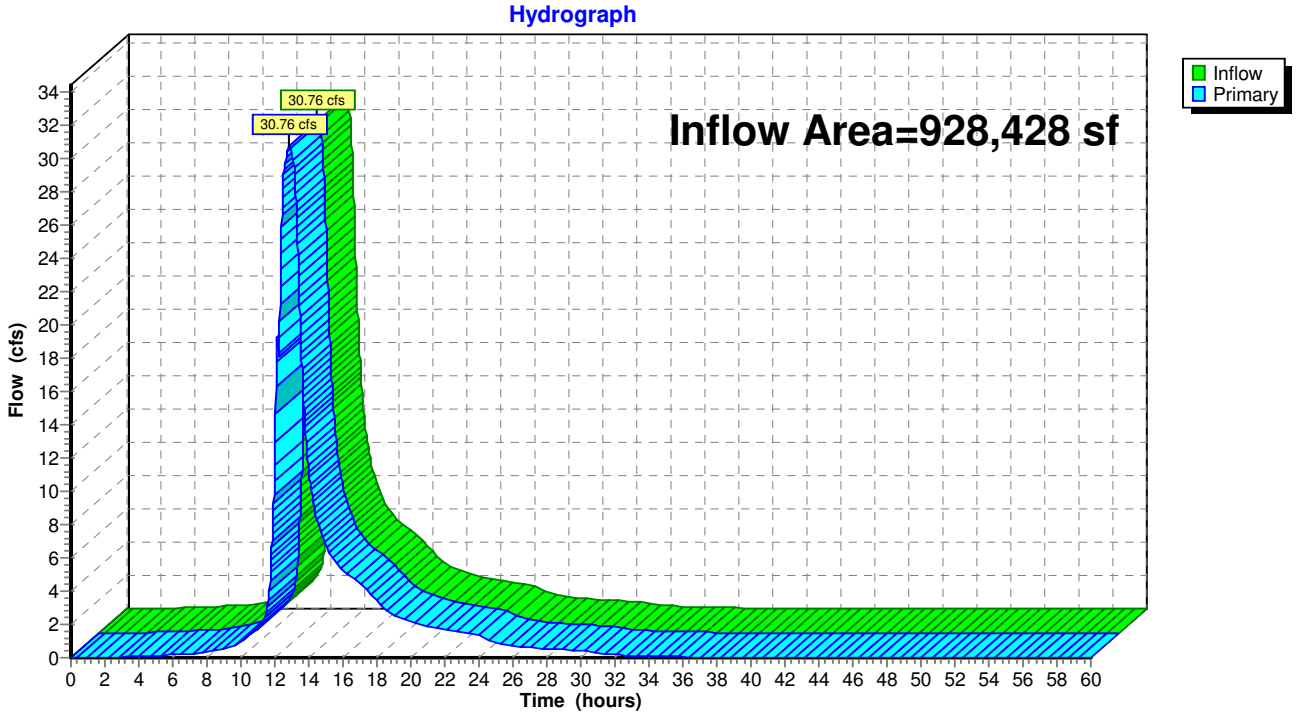
Pond P2P: Lower Pond (DB-02)



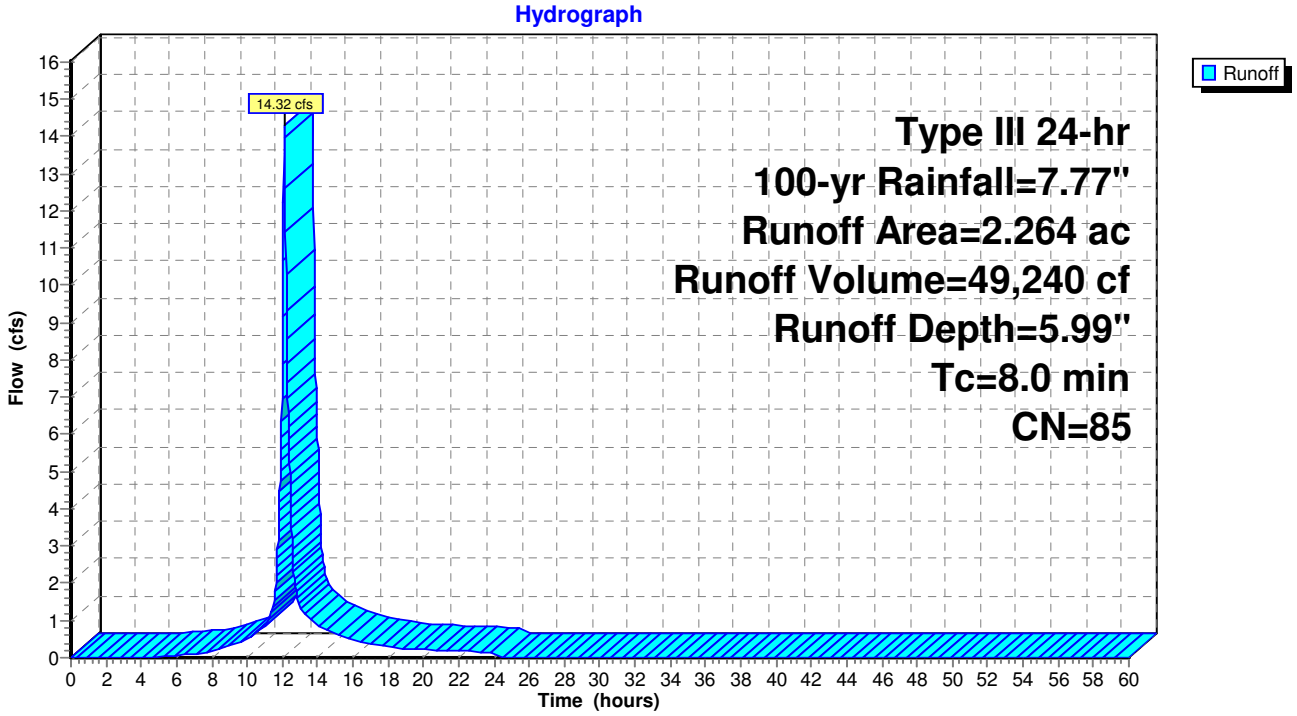
Pond UGC1: Cultec R-902HD



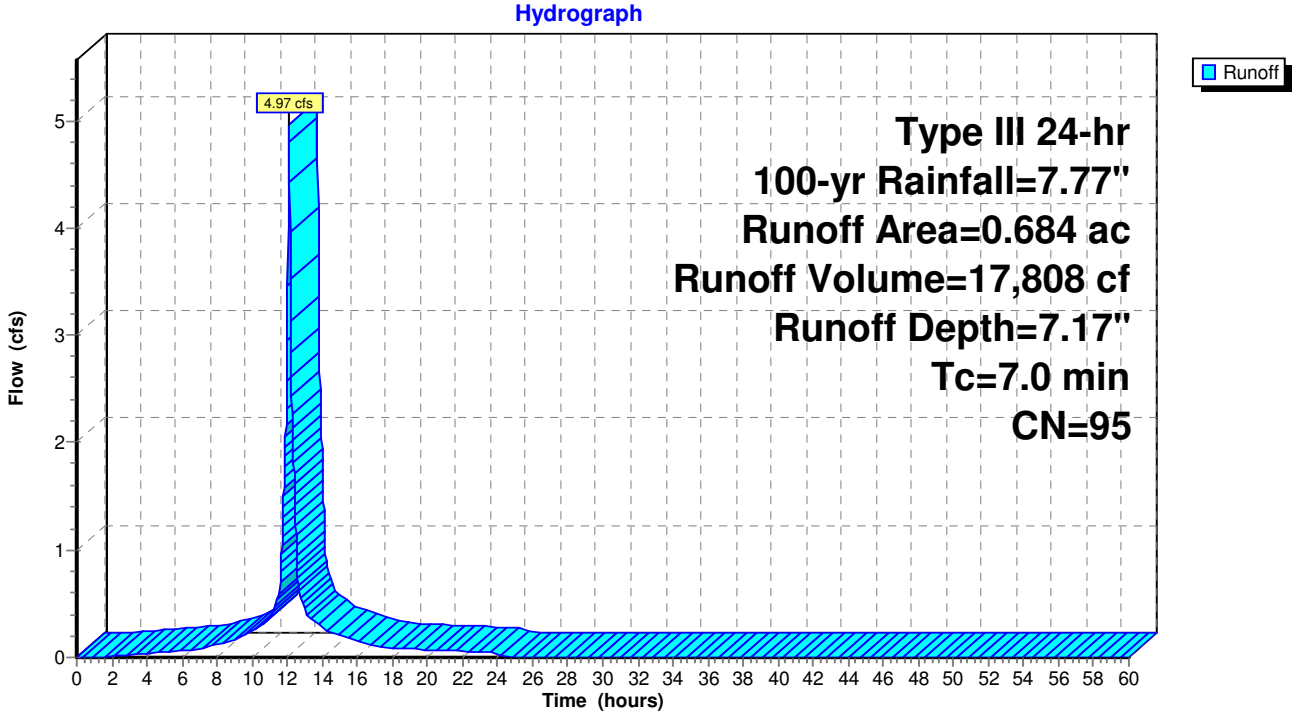
Link L1: DP1


Hydrograph
Inflow Area=928,428 sf
30.76 cfs
30.76 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34

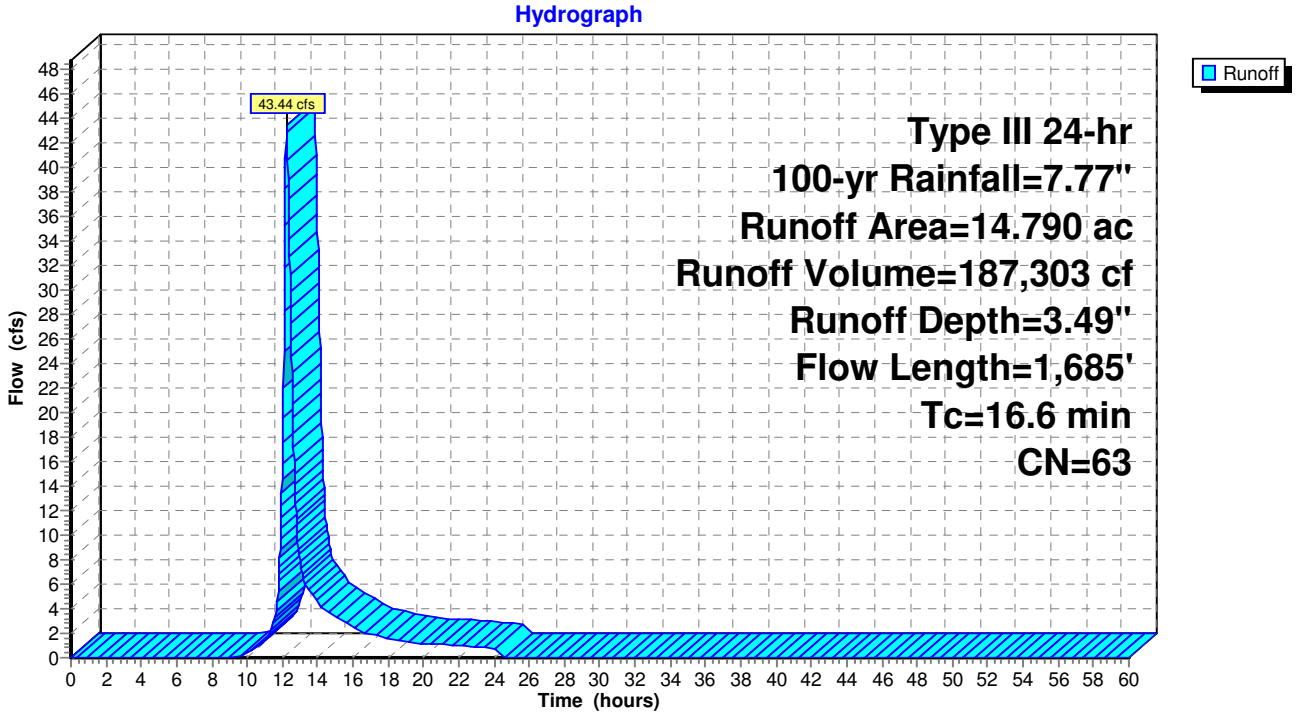
Subcatchment AP1: Aldi Parking and Areas to Pond (Post The Gateway)



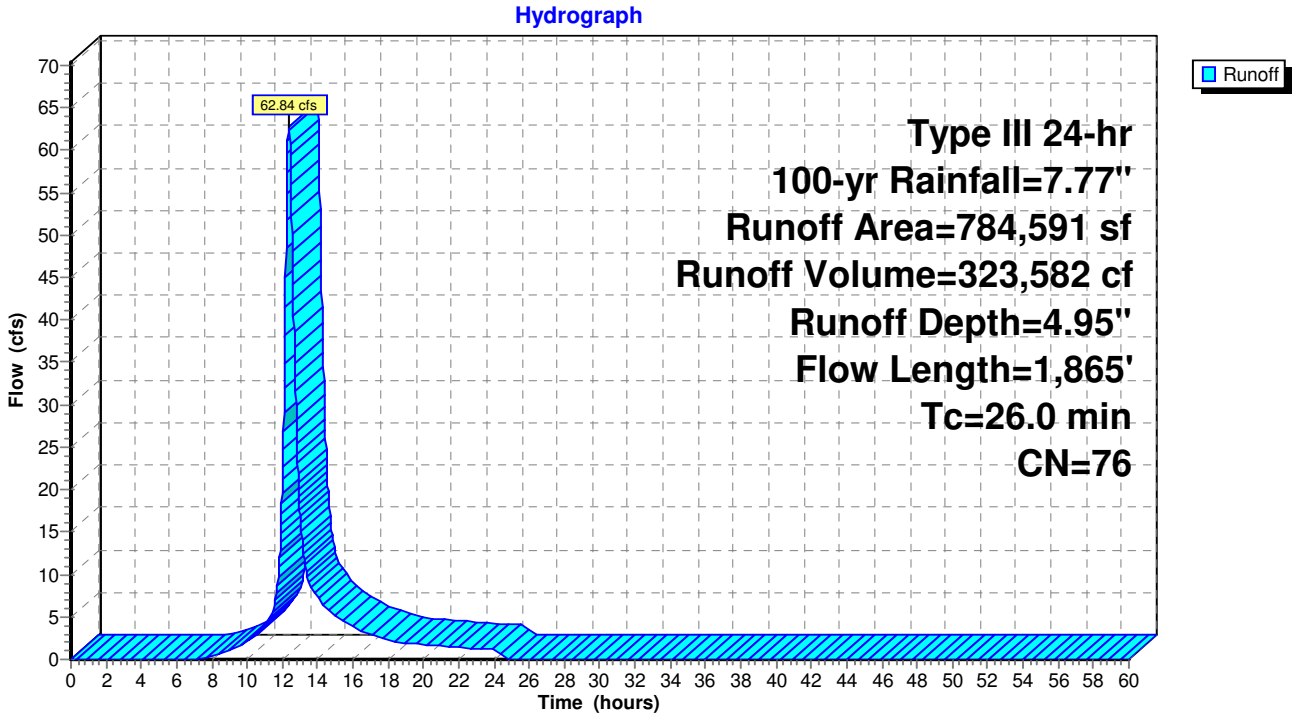
Subcatchment AP2: Aldi (Roof)



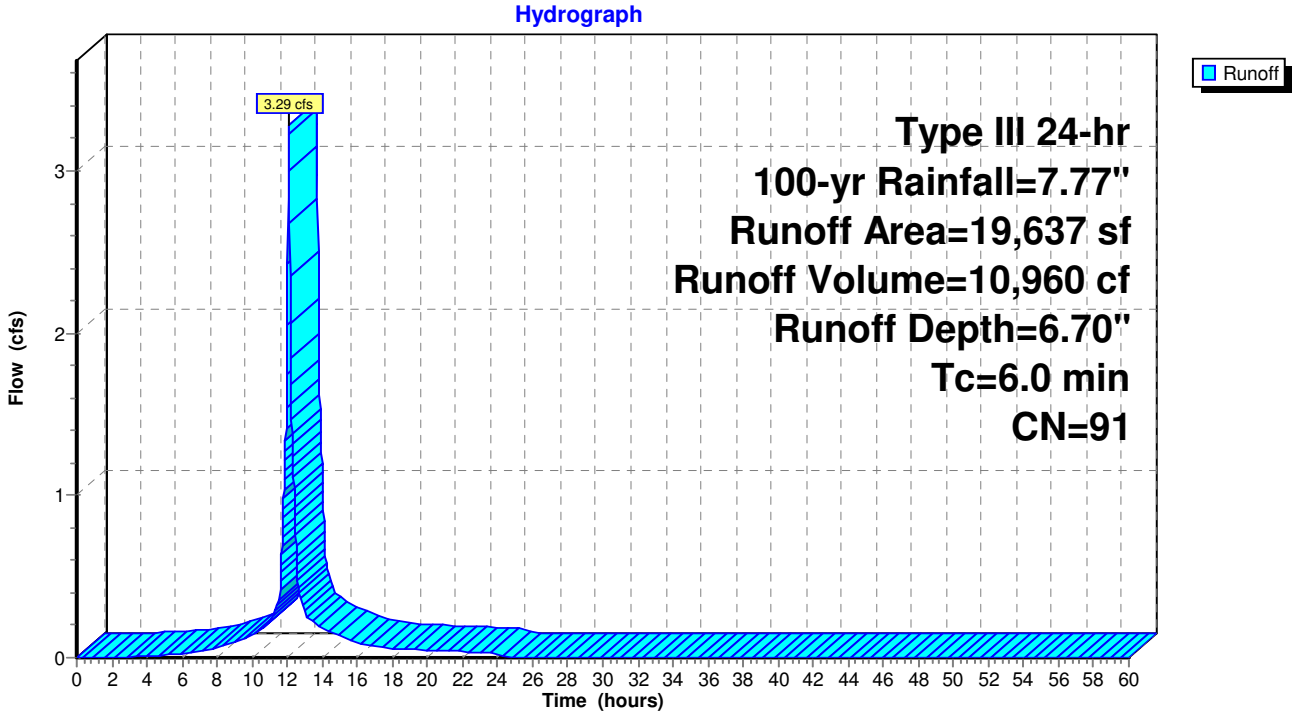
Subcatchment AP3: Existing Wetlands Pond - Catchment Area (Post The Gateway)



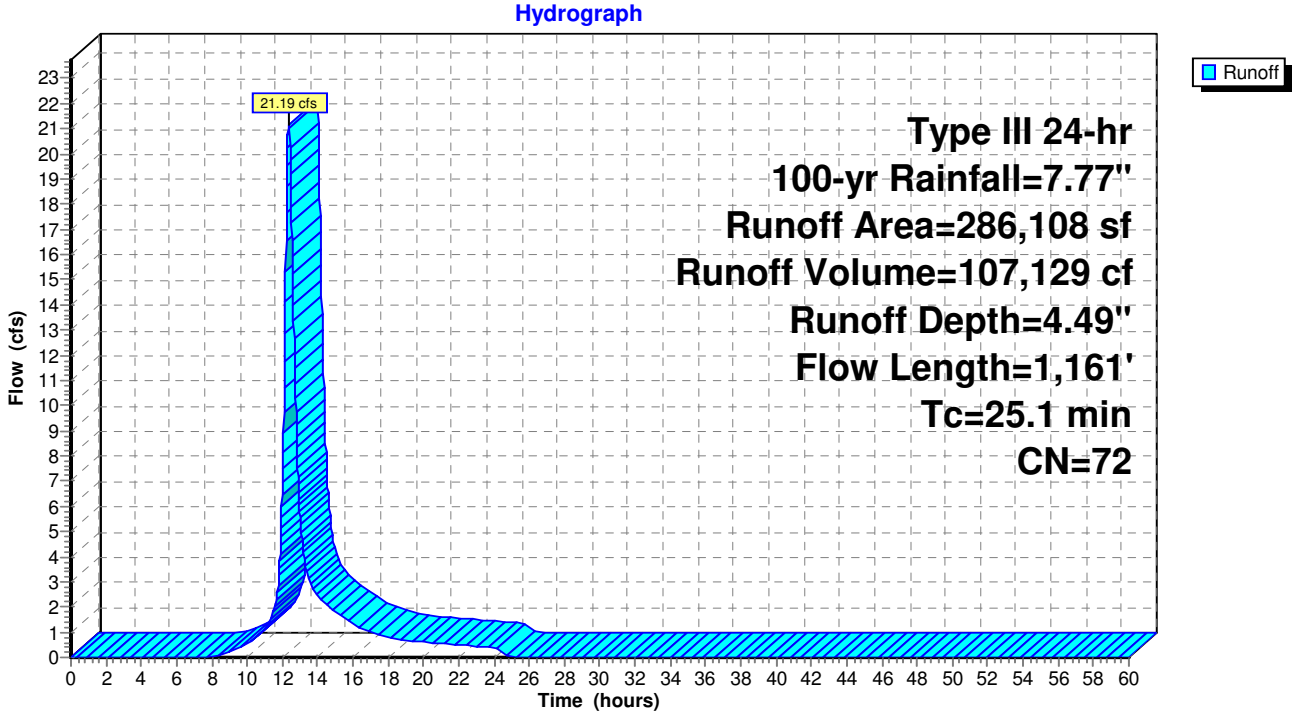
Subcatchment P1: Main Site (EXCLUDING: CB6-8, CB11-15, CB38-39, CB41, R2A-E)



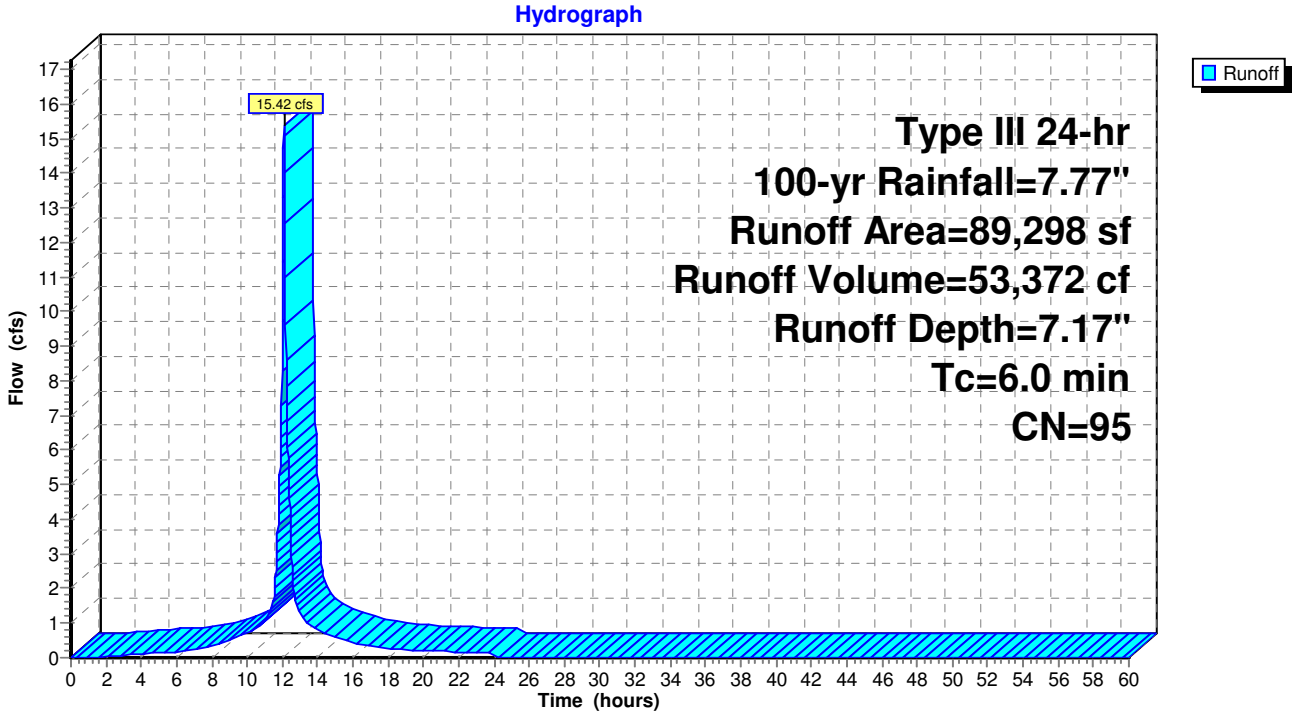
Subcatchment P2: Proposed ROW to DP1



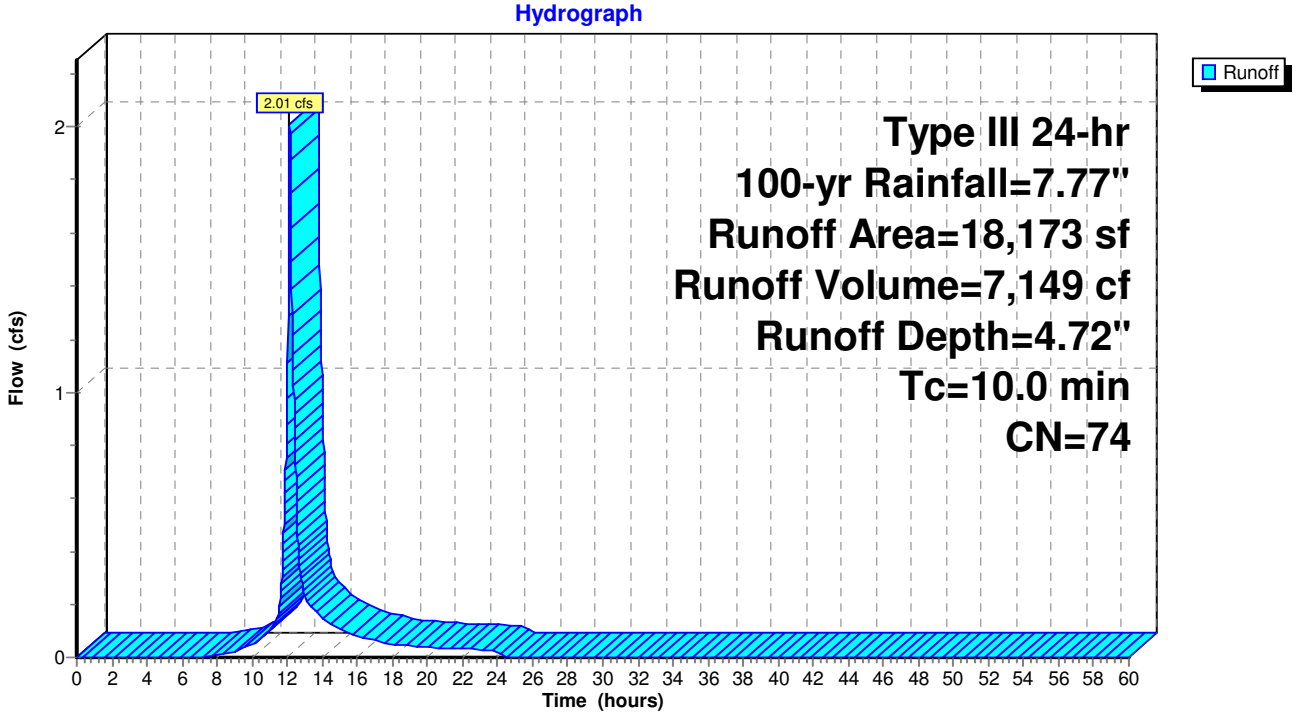
Subcatchment P3: Proposed (Existing to DP2)



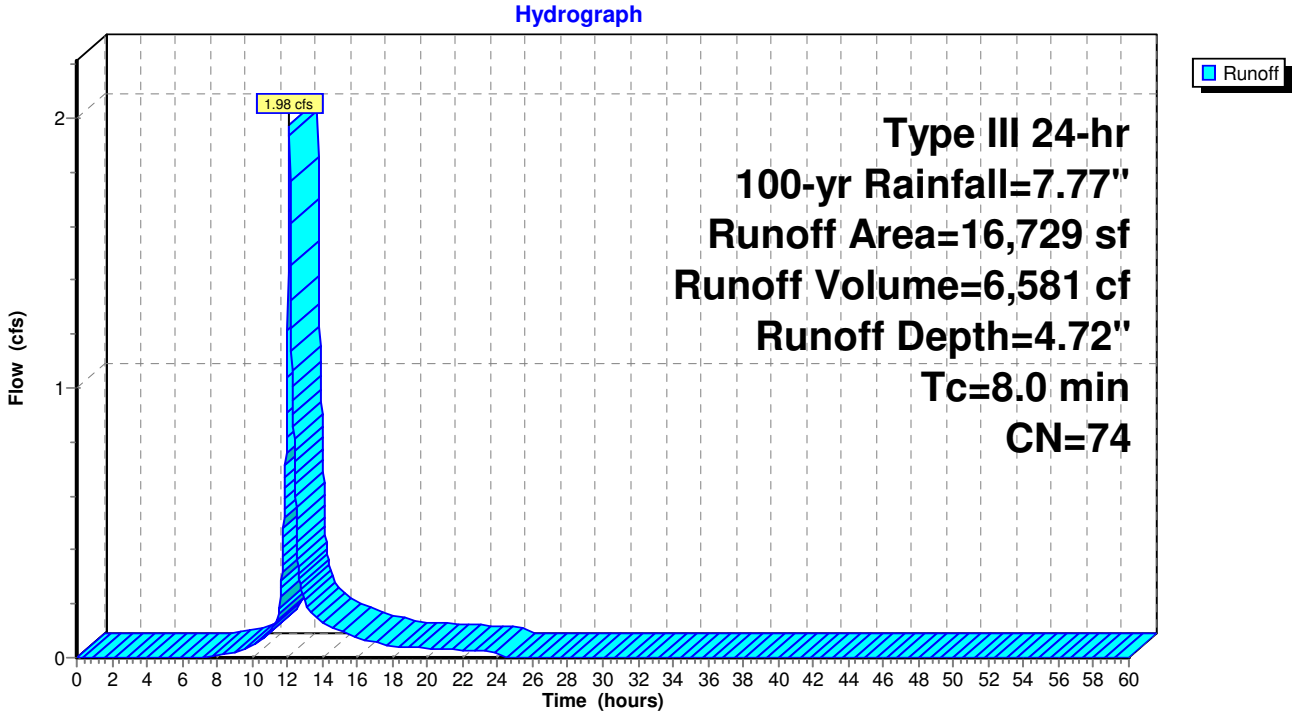
Subcatchment P5: CB6-8, CB11-15, CB38-39, CB41, R2A-E



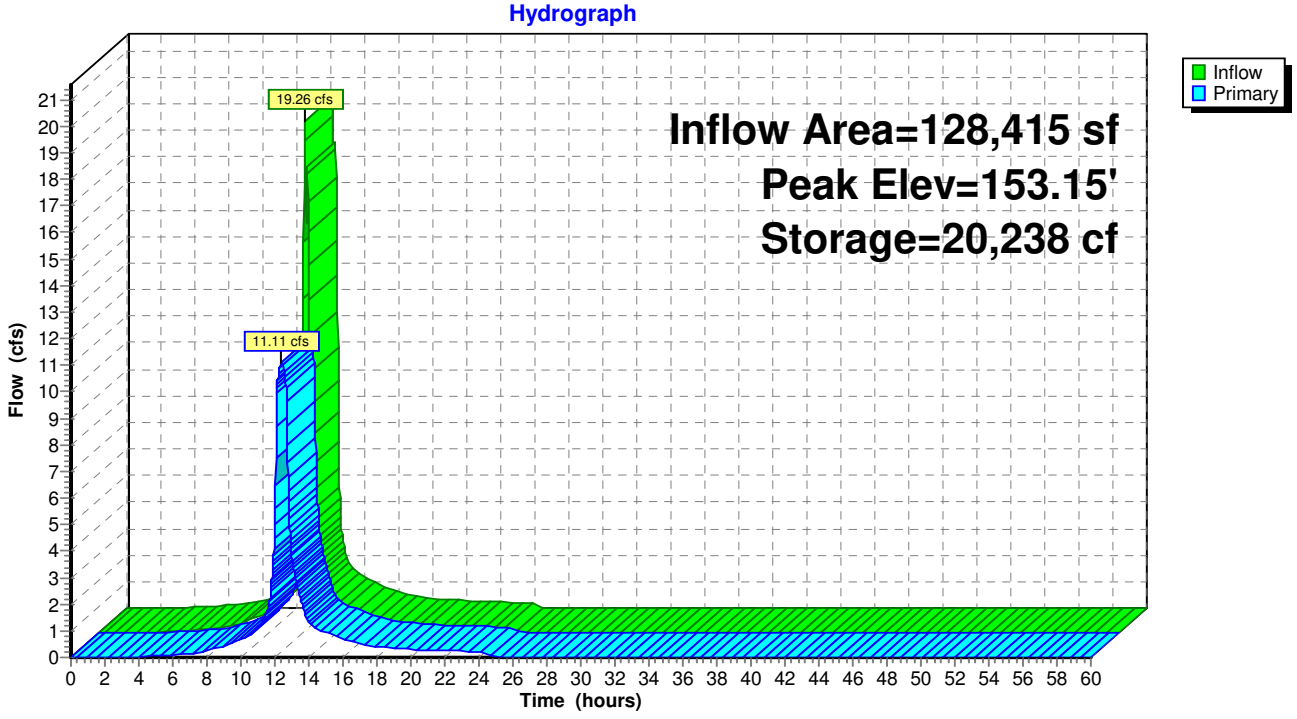
Subcatchment P6: DIRECT TO P1P



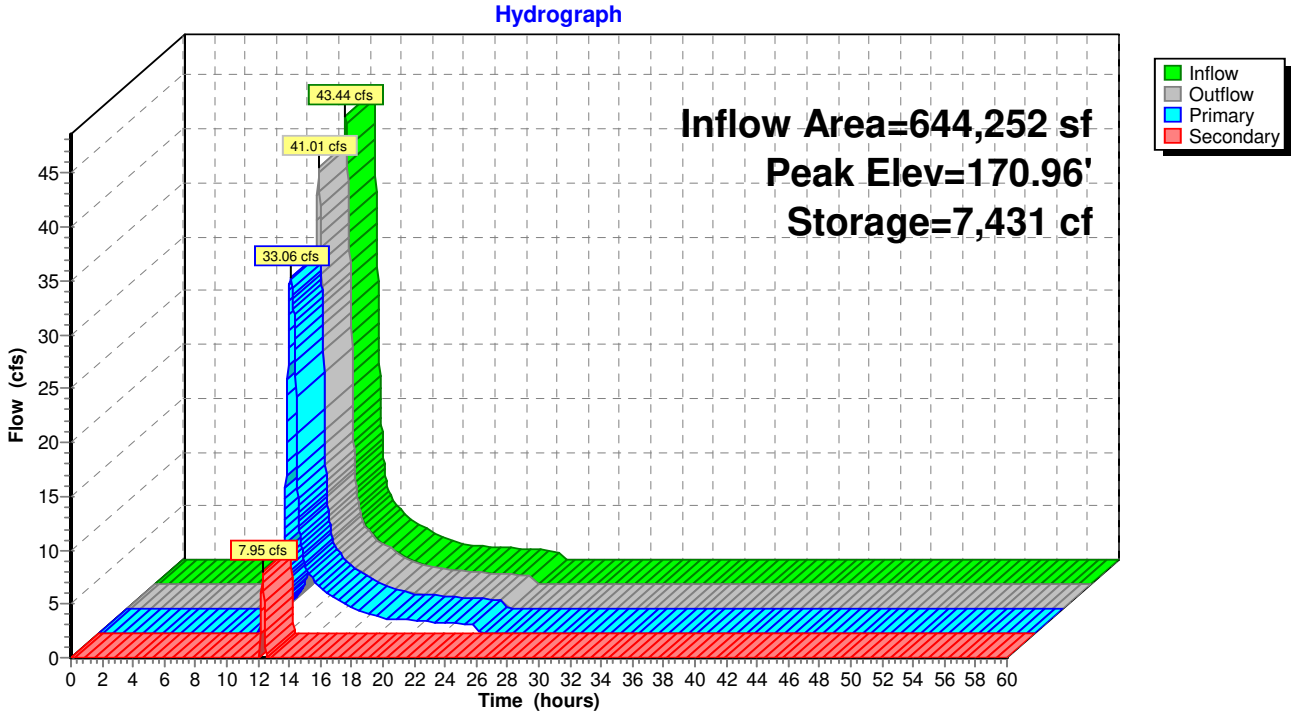
Subcatchment P7: DIRECT TO P2P



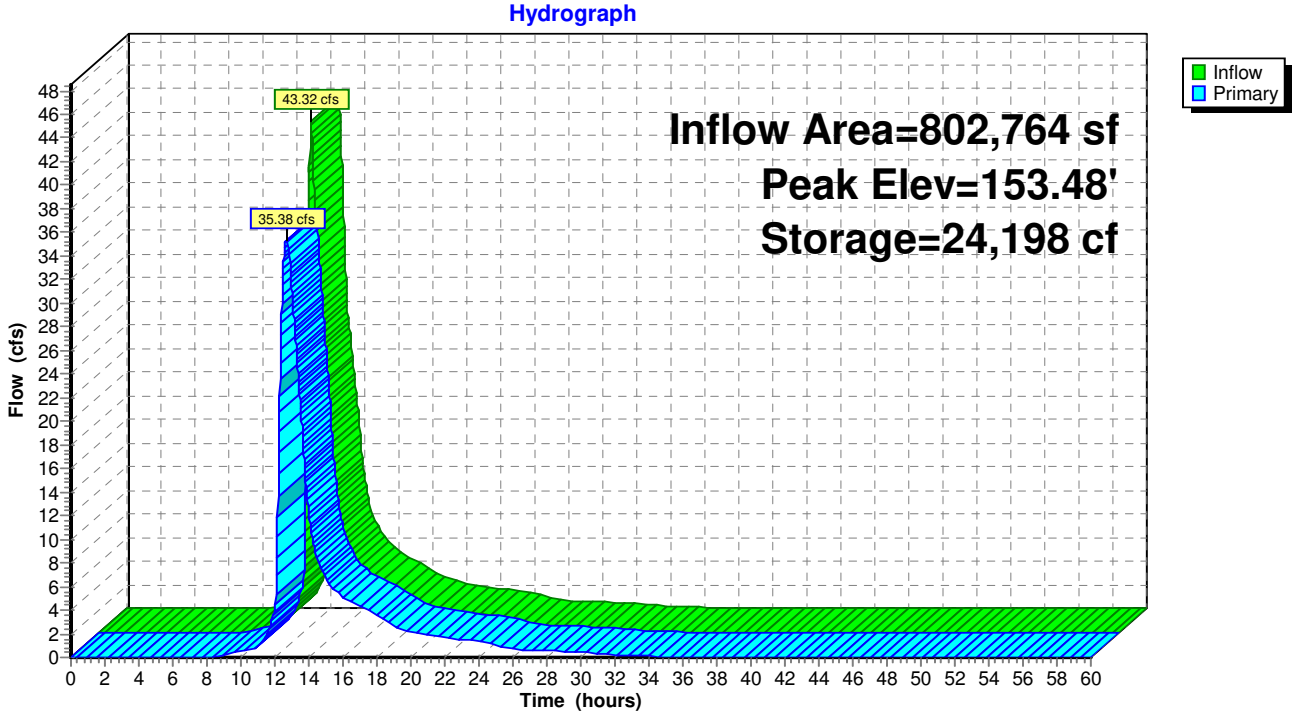
Pond APP1: ALDI POND (Post The Gateway)



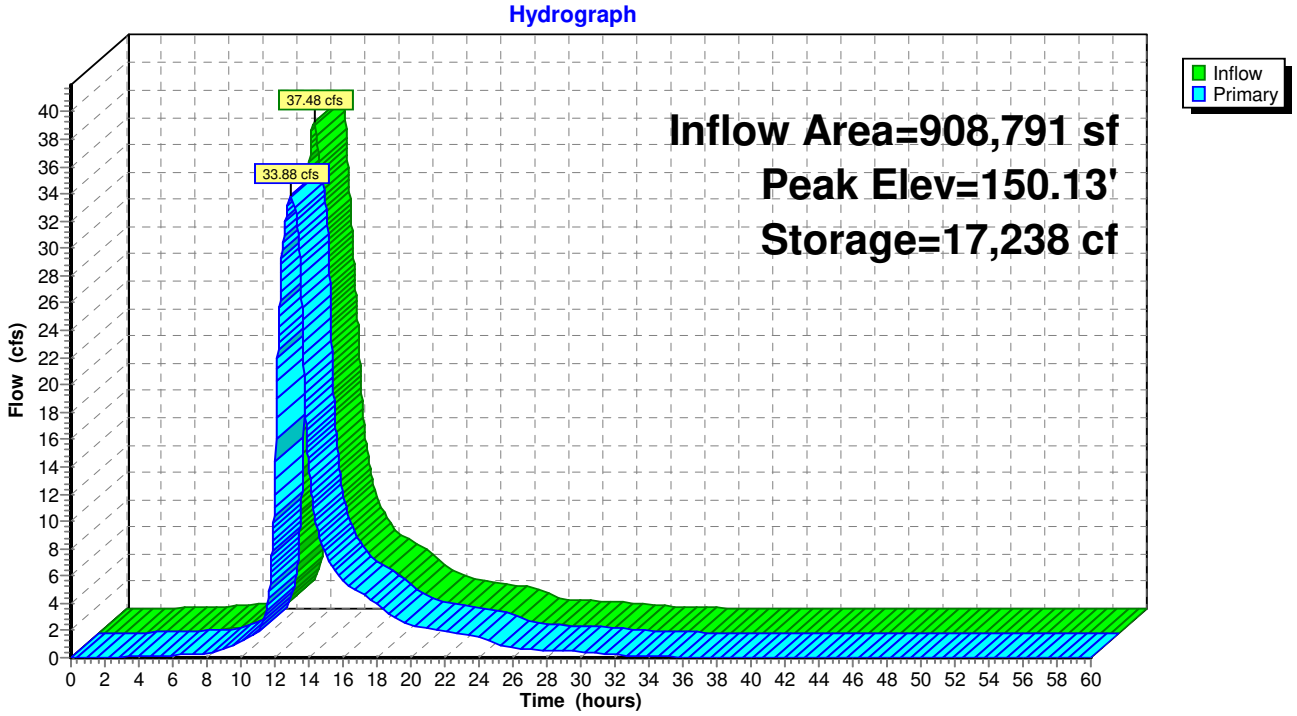
Pond APP2: Existing Wetlands (With Overflow Pipe)



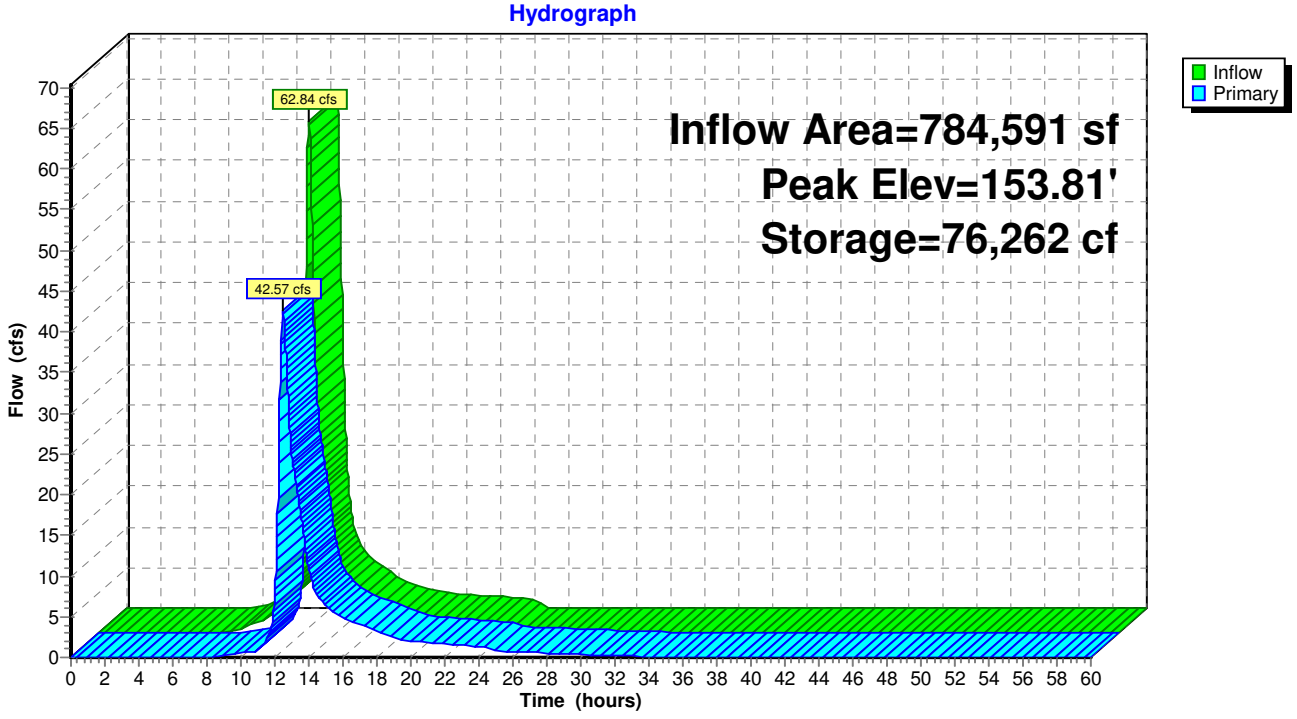
Pond P1P: Upper Pond (DB-01)



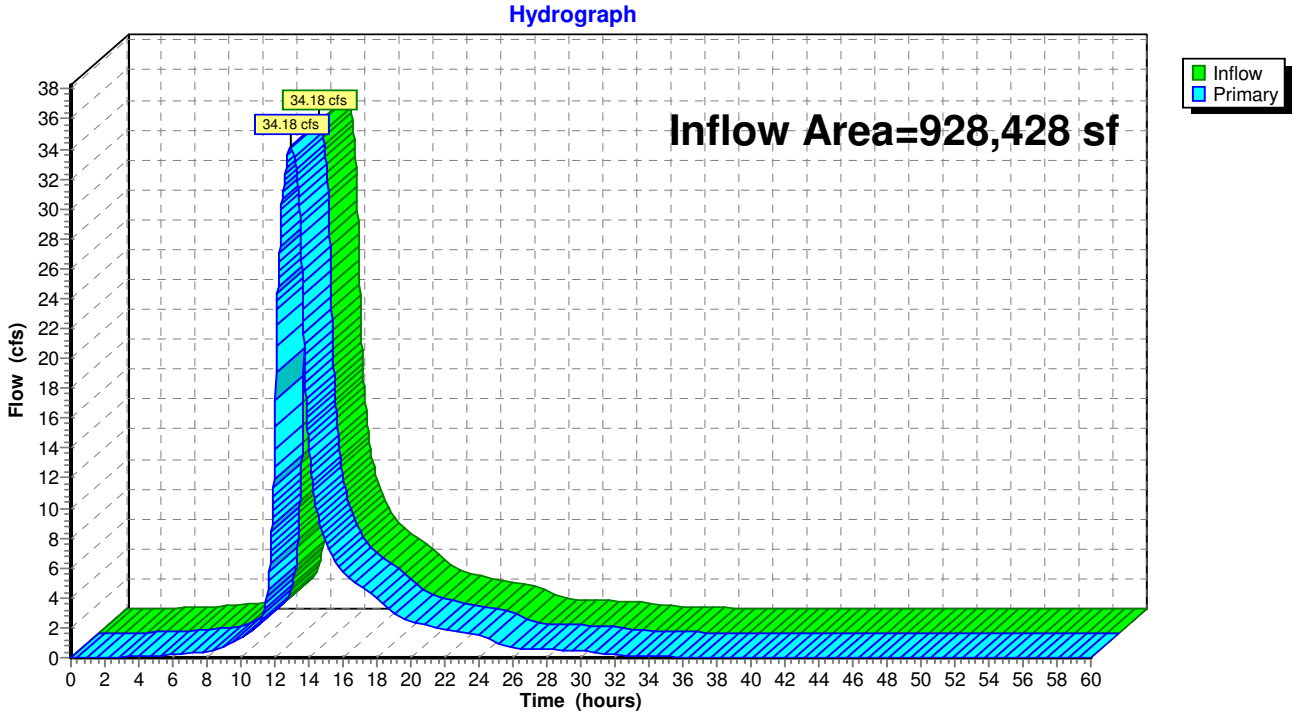
Pond P2P: Lower Pond (DB-02)



Pond UGC1: Cultec R-902HD



Link L1: DP1


Hydrograph
Inflow Area=928,428 sf
34.18 cfs
34.18 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38

Summary for Pond APP1: ALDI POND (Post The Gateway)

Inflow Area = 128,415 sf, 52.54% Impervious, Inflow Depth = 6.77" for 100-yr event
Inflow = 19.26 cfs @ 12.11 hrs, Volume= 72,482 cf
Outflow = 11.11 cfs @ 12.40 hrs, Volume= 72,482 cf, Atten= 42%, Lag= 17.7 min
Primary = 11.11 cfs @ 12.40 hrs, Volume= 72,482 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Starting Elev= 151.00' Surf.Area= 5,824 sf Storage= 5,335 cf
Peak Elev= 153.15' @ 12.40 hrs Surf.Area= 8,091 sf Storage= 20,238 cf (14,904 cf above start)

Plug-Flow detention time= 83.4 min calculated for 67,125 cf (93% of inflow)
Center-of-Mass det. time= 22.4 min (803.1 - 780.7)

Volume	Invert	Avail.Storage	Storage Description
#1	150.00'	37,181 cf	**Pond (Pyramidal)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
150.00	4,860	0	0	4,860
151.00	5,824	5,335	5,335	5,867
152.00	6,847	6,329	11,663	6,939
153.00	7,926	7,380	19,043	8,071
154.00	9,061	8,487	27,530	9,264
155.00	10,253	9,651	37,181	10,519

Device	Routing	Invert	Outlet Devices
#1	Primary	150.00'	**18.0" Round Culvert** L= 300.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 147.36' S= 0.0088 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	151.00'	**36.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	151.75'	**36.0" W x 9.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=11.11 cfs @ 12.40 hrs HW=153.15' (Free Discharge)
└**1=Culvert** (Barrel Controls 11.11 cfs @ 6.29 fps)
  ├**2=Orifice/Grate** (Passes < 6.78 cfs potential flow)
  └**3=Orifice/Grate** (Passes < 10.90 cfs potential flow)

Summary for Pond APP2: Existing Wetlands (With Overflow Pipe)

Inflow Area = 644,252 sf, 4.29% Impervious, Inflow Depth = 3.49" for 100-yr event
Inflow = 43.44 cfs @ 12.23 hrs, Volume= 187,303 cf
Outflow = 41.01 cfs @ 12.29 hrs, Volume= 186,278 cf, Atten= 6%, Lag= 3.6 min
Primary = 33.06 cfs @ 12.29 hrs, Volume= 180,844 cf
Secondary = 7.95 cfs @ 12.29 hrs, Volume= 5,434 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

Peak Elev= 170.96' @ 12.29 hrs Surf.Area= 6,439 sf Storage= 7,431 cf

Plug-Flow detention time= 6.3 min calculated for 186,278 cf (99% of inflow)
Center-of-Mass det. time= 3.0 min (853.9 - 850.9)

Volume	Invert	Avail.Storage	Storage Description
#1	167.00'	17,482 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
167.00	300	80.0	0	0	300
169.00	760	224.0	1,025	1,025	3,797
170.00	3,250	407.0	1,861	2,886	12,991
171.00	6,611	393.0	4,832	7,718	13,968
172.00	13,303	755.0	9,764	17,482	47,044

Device	Routing	Invert	Outlet Devices
#1	Secondary	170.50'	**10.0' 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
#2	Primary	165.00'	**30.0" Round Culvert** L= 96.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.00' / 163.00' S= 0.0208 '/' Cc= 0.900 n= 0.013 Concrete sewer w/manholes & inlets, Flow Area= 4.91 sf
#3	Device 2	169.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=33.04 cfs @ 12.29 hrs HW=170.95' (Free Discharge)
↑—**2=Culvert** (Passes 33.04 cfs of 51.27 cfs potential flow)
↑—**3=Orifice/Grate** (Orifice Controls 33.04 cfs @ 6.73 fps)

Secondary OutFlow Max=7.91 cfs @ 12.29 hrs HW=170.95' TW=152.98' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 7.91 cfs @ 1.74 fps)

Summary for Pond P1P: Upper Pond (DB-01)

Inflow Area = 802,764 sf, 35.65% Impervious, Inflow Depth = 4.94" for 100-yr event
Inflow = 43.32 cfs @ 12.47 hrs, Volume= 330,414 cf
Outflow = 35.38 cfs @ 12.69 hrs, Volume= 330,382 cf, Atten= 18%, Lag= 13.2 min
Primary = 35.38 cfs @ 12.69 hrs, Volume= 330,382 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Peak Elev= 153.48' @ 12.71 hrs Surf.Area= 7,852 sf Storage= 24,198 cf

Plug-Flow detention time= 12.3 min calculated for 330,382 cf (100% of inflow)
Center-of-Mass det. time= 12.1 min (930.6 - 918.5)

Volume	Invert	Avail.Storage	Storage Description
#1	148.00'	28,432 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
148.00	1,254	0	0
149.00	2,329	1,792	1,792
150.00	3,461	2,895	4,687
151.00	4,649	4,055	8,742
152.00	5,894	5,272	14,013
153.00	7,195	6,545	20,558
154.00	8,553	7,874	28,432

Device	Routing	Invert	Outlet Devices
#1	Primary	148.00'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 148.00' / 147.00' S= 0.0238 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Primary	150.00'	**18.0" Round Culvert X 2.00** L= 33.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.00' / 149.00' S= 0.0303 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=35.33 cfs @ 12.69 hrs HW=153.48' TW=149.78' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 7.22 cfs @ 9.19 fps)
└─**2=Culvert** (Inlet Controls 28.11 cfs @ 7.95 fps)

Summary for Pond P2P: Lower Pond (DB-02)

Inflow Area = 908,791 sf, 40.17% Impervious, Inflow Depth = 5.15" for 100-yr event
Inflow = 37.48 cfs @ 12.66 hrs, Volume= 390,335 cf
Outflow = 33.88 cfs @ 12.95 hrs, Volume= 390,312 cf, Atten= 10%, Lag= 17.4 min
Primary = 33.88 cfs @ 12.95 hrs, Volume= 390,312 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Peak Elev= 150.13' @ 12.95 hrs Surf.Area= 7,481 sf Storage= 17,238 cf

Plug-Flow detention time= 6.4 min calculated for 390,312 cf (100% of inflow)
Center-of-Mass det. time= 6.2 min (911.3 - 905.1)

Volume	Invert	Avail.Storage	Storage Description
#1	146.00'	24,426 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
146.00	1,073	0	0
147.00	2,492	1,783	1,783
148.00	4,027	3,260	5,042
149.00	5,619	4,823	9,865
150.00	7,266	6,443	16,308
151.00	8,971	8,119	24,426

Device	Routing	Invert	Outlet Devices
#1	Primary	144.11'	**24.0" Round Culvert** L= 59.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 144.11' / 142.97' S= 0.0193 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	144.60'	**36.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 144.60' / 144.30' S= 0.0103 '/' Cc= 0.900 n= 0.013, Flow Area= 7.07 sf
#3	Device 2	146.00'	**30.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=33.88 cfs @ 12.95 hrs HW=150.13' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 33.88 cfs @ 10.78 fps)
↑—**2=Culvert** (Passes 33.88 cfs of 68.29 cfs potential flow)
↑—**3=Orifice/Grate** (Passes 33.88 cfs of 40.08 cfs potential flow)

Summary for Pond UGC1: Cultec R-902HD

Inflow Area = 784,591 sf, 36.48% Impervious, Inflow Depth = 4.95" for 100-yr event
Inflow = 62.84 cfs @ 12.35 hrs, Volume= 323,582 cf
Outflow = 42.57 cfs @ 12.47 hrs, Volume= 323,265 cf, Atten= 32%, Lag= 7.2 min
Primary = 42.57 cfs @ 12.47 hrs, Volume= 323,265 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Peak Elev= 153.81' @ 12.69 hrs Surf.Area= 21,110 sf Storage= 76,262 cf

Plug-Flow detention time= 89.1 min calculated for 323,157 cf (100% of inflow)
Center-of-Mass det. time= 89.0 min (920.7 - 831.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	148.25'	29,021 cf	**363.75'W x 58.03'L x 5.75'H Field A** 121,380 cf Overall - 48,827 cf Embedded = 72,553 cf x 40.0% Voids
#2A	149.00'	48,827 cf	**Cultec R-902HD** x 750 Inside #1 Effective Size= 69.8"W x 48.0"H => 17.65 sf x 3.67'L = 64.7 cf Overall Size= 78.0"W x 48.0"H x 4.10'L with 0.44' Overlap 750 Chambers in 50 Rows Cap Storage= +2.8 cf x 2 x 50 rows = 276.0 cf
		77,848 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	148.25'	**6.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 148.25' / 148.00' S= 0.0056 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#2	Primary	149.25'	**24.0" Round Culvert** L= 43.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 149.25' / 149.00' S= 0.0058 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#3	Primary	150.37'	**24.0" Round Culvert X 3.00** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.37' / 150.00' S= 0.0093 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf

Primary OutFlow Max=36.80 cfs @ 12.47 hrs HW=153.20' TW=152.84' (Dynamic Tailwater)
- **1=Culvert** (Outlet Controls 0.42 cfs @ 2.15 fps)
- **2=Culvert** (Inlet Controls 9.09 cfs @ 2.89 fps)
- **3=Culvert** (Inlet Controls 27.28 cfs @ 2.89 fps)

APPENDIX C
NRCS Soil Map & Data

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for State of Connecticut

December 26, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

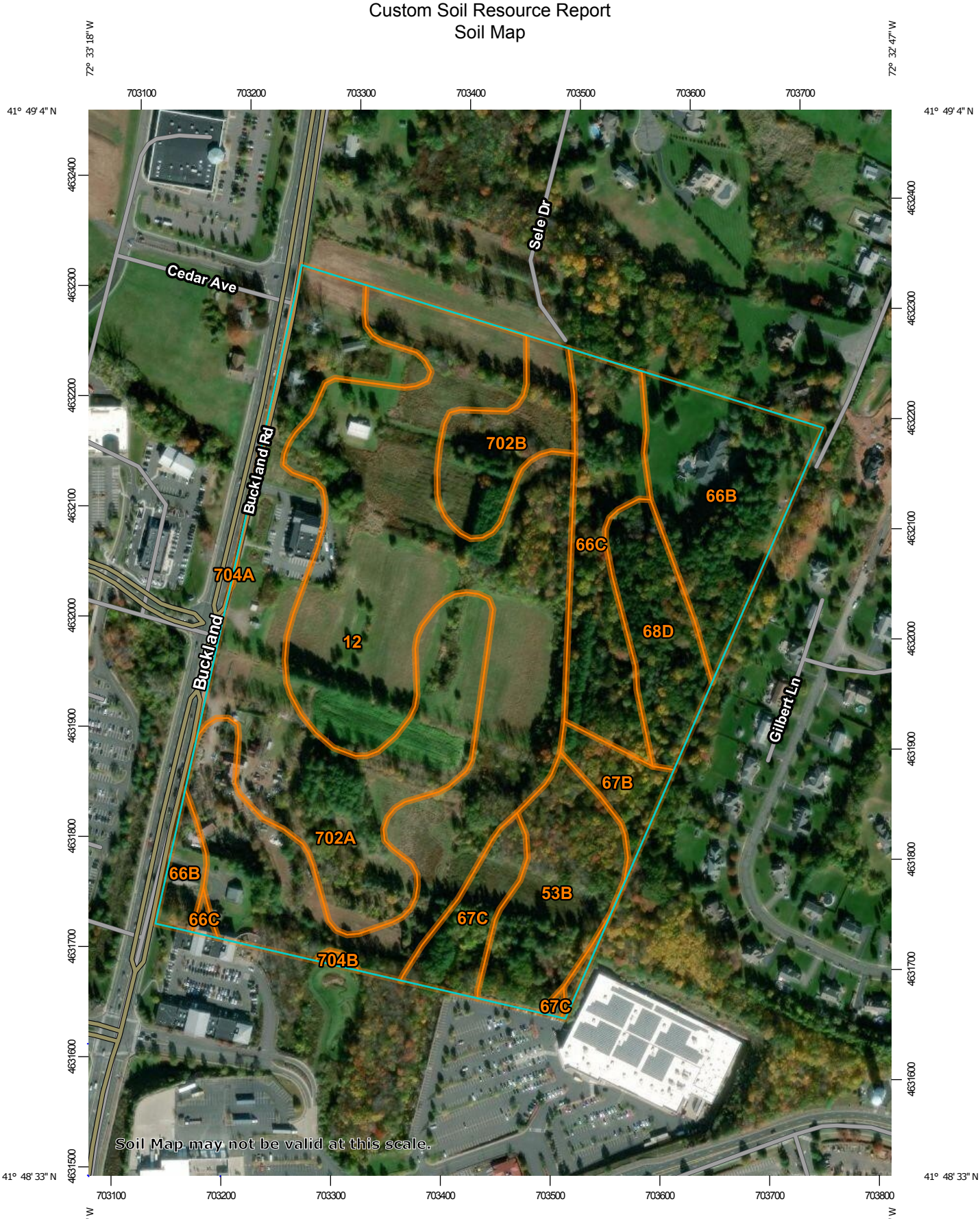
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:4,710 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 18, Dec 6, 2018

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

Date(s) aerial images were photographed: Aug 27, 2016—Oct 30, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Raypol silt loam	24.7	38.0%
53B	Wapping very fine sandy loam, 3 to 8 percent slopes	4.5	6.9%
66B	Narragansett silt loam, 2 to 8 percent slopes	6.8	10.5%
66C	Narragansett silt loam, 8 to 15 percent slopes	5.0	7.7%
67B	Narragansett silt loam, 3 to 8 percent slopes, very stony	1.5	2.3%
67C	Narragansett silt loam, 8 to 15 percent slopes, very stony	1.9	3.0%
68D	Narragansett silt loam, 15 to 25 percent slopes, extremely stony	3.2	5.0%
702A	Tisbury silt loam, 0 to 3 percent slopes	14.2	21.8%
702B	Tisbury silt loam, 3 to 8 percent slopes	3.0	4.6%
704A	Enfield silt loam, 0 to 3 percent slopes	0.0	0.0%
704B	Enfield silt loam, 3 to 8 percent slopes	0.1	0.1%
Totals for Area of Interest		**65.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called

noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can

be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

State of Connecticut

12—Raypol silt loam

Map Unit Setting

National map unit symbol: 9ljx
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Raypol

Setting

Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 8 inches: silt loam
Bg1 - 8 to 12 inches: very fine sandy loam
Bg2 - 12 to 20 inches: silt loam
Bw1 - 20 to 26 inches: silt loam
Bw2 - 26 to 29 inches: very fine sandy loam
2C1 - 29 to 52 inches: stratified very gravelly coarse sand to loamy fine sand
2C2 - 52 to 65 inches: stratified very gravelly coarse sand to loamy fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Haven
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Enfield
Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Ninigret
Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Tisbury
Percent of map unit: 2 percent
Landform: Outwash plains, terraces
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Walpole
Percent of map unit: 2 percent
Landform: Depressions on terraces, drainageways on terraces
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro
Percent of map unit: 2 percent
Landform: Depressions, drainageways, terraces
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Unnamed, loamy substratum
Percent of map unit: 1 percent

53B—Wapping very fine sandy loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 9lp7

Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Wapping

Setting

Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy eolian deposits over sandy and gravelly melt-out till derived from gneiss and/or schist and/or sandstone and shale

Typical profile

Ap - 0 to 11 inches: very fine sandy loam
Bw1 - 11 to 16 inches: very fine sandy loam
Bw2 - 16 to 20 inches: very fine sandy loam
2C1 - 20 to 28 inches: gravelly sandy loam
2C2 - 28 to 36 inches: gravelly loamy sand
2C3 - 36 to 80 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Narragansett

Percent of map unit: 5 percent
Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Leicester

Percent of map unit: 5 percent

Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Wilbraham

Percent of map unit: 3 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Menlo

Percent of map unit: 3 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Watchaug

Percent of map unit: 2 percent
Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Ludlow

Percent of map unit: 2 percent
Landform: Drumlins, hills
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

66B—Narragansett silt loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9lq3
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Narragansett

Setting

Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly melt-out till derived from gneiss and/or schist and/or sandstone and shale

Typical profile

Ap - 0 to 6 inches: silt loam
Bw1 - 6 to 15 inches: silt loam
Bw2 - 15 to 24 inches: silt loam
Bw3 - 24 to 28 inches: gravelly silt loam
2C - 28 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Broadbrook

Percent of map unit: 5 percent
Landform: Drumlins, hills, till plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Charlton

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Leicester

Percent of map unit: 3 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Unnamed, red parent material
Percent of map unit: 2 percent
Hydric soil rating: No

Canton
Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Wapping
Percent of map unit: 2 percent
Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Sutton
Percent of map unit: 1 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

66C—Narragansett silt loam, 8 to 15 percent slopes

Map Unit Setting
National map unit symbol: 9lq4
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Farmland of statewide importance

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

Description of Narragansett

Setting
Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly melt-out till derived from gneiss and/or schist and/or sandstone and shale

Typical profile
Ap - 0 to 6 inches: silt loam

Bw1 - 6 to 15 inches: silt loam
Bw2 - 15 to 24 inches: silt loam
Bw3 - 24 to 28 inches: gravelly silt loam
2C - 28 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Broadbrook

Percent of map unit: 5 percent
Landform: Drumlins, hills, till plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Canton

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 3 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Wapping

Percent of map unit: 3 percent
Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Sutton

Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Linear

Hydric soil rating: No

Leicester

Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

67B—Narragansett silt loam, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9lq5
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Narragansett

Setting

Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly melt-out till derived from gneiss and/or schist and/or sandstone and shale

Typical profile

Ap - 0 to 6 inches: silt loam
Bw1 - 6 to 15 inches: silt loam
Bw2 - 15 to 24 inches: silt loam
Bw3 - 24 to 28 inches: gravelly silt loam
2C - 28 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Charlton

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Broadbrook

Percent of map unit: 5 percent
Landform: Drumlins, hills, till plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Leicester

Percent of map unit: 3 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Unnamed, red parent material

Percent of map unit: 2 percent
Hydric soil rating: No

Canton

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Wapping

Percent of map unit: 2 percent
Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Sutton

Percent of map unit: 1 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

67C—Narragansett silt loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9lq6
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Narragansett

Setting

Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly melt-out till derived from gneiss and/or schist and/or sandstone and shale

Typical profile

Ap - 0 to 6 inches: silt loam
Bw1 - 6 to 15 inches: silt loam
Bw2 - 15 to 24 inches: silt loam
Bw3 - 24 to 28 inches: gravelly silt loam
2C - 28 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Broadbrook
Percent of map unit: 5 percent
Landform: Drumlins, hills, till plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Canton
Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton
Percent of map unit: 3 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Wapping
Percent of map unit: 3 percent
Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Sutton
Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Leicester
Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

68D—Narragansett silt loam, 15 to 25 percent slopes, extremely stony

Map Unit Setting
National map unit symbol: 9lq8
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F

Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Narragansett

Setting

Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly melt-out till derived from gneiss and/or schist and/or sandstone and shale

Typical profile

Ap - 0 to 6 inches: silt loam
Bw1 - 6 to 15 inches: silt loam
Bw2 - 15 to 24 inches: silt loam
Bw3 - 24 to 28 inches: gravelly silt loam
2C - 28 to 60 inches: very gravelly loamy coarse sand

Properties and qualities

Slope: 15 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Broadbrook

Percent of map unit: 5 percent
Landform: Drumlins, hills, till plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Charlton

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear

Hydric soil rating: No

Leicester

Percent of map unit: 3 percent
Landform: Depressions, drainageways
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Unnamed, red parent material

Percent of map unit: 2 percent
Hydric soil rating: No

Canton

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Wapping

Percent of map unit: 2 percent
Landform: Hills, till plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Sutton

Percent of map unit: 1 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

702A—Tisbury silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2y07g
Elevation: 0 to 1,260 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Tisbury

Setting

Landform: Valley trains, outwash plains, deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite, schist, and/or gneiss

Typical profile

Ap - 0 to 8 inches: silt loam
Bw1 - 8 to 18 inches: silt loam
Bw2 - 18 to 26 inches: silt loam
2C - 26 to 65 inches: extremely gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 24 to 36 inches to strongly contrasting textural stratification
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landform: Kames, eskers, moraines, outwash terraces, outwash plains
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest, side slope, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Agawam

Percent of map unit: 5 percent
Landform: Kames, moraines, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Ninigret

Percent of map unit: 3 percent
Landform: Outwash terraces, kames, moraines, outwash plains, kame terraces
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear, convex
Across-slope shape: Concave, convex
Hydric soil rating: No

Raypol

Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

702B—Tisbury silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2y07h
Elevation: 0 to 1,260 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Tisbury

Setting

Landform: Deltas, valley trains, outwash plains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite, schist, and/or gneiss

Typical profile

Ap - 0 to 8 inches: silt loam
Bw1 - 8 to 18 inches: silt loam
Bw2 - 18 to 26 inches: silt loam
2C - 26 to 65 inches: extremely gravelly sand

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: 24 to 36 inches to strongly contrasting textural stratification
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landform: Outwash plains, kames, eskers, moraines, outwash terraces
Landform position (two-dimensional): Backslope, footslope, shoulder, summit, toeslope
Landform position (three-dimensional): Side slope, crest, head slope, nose slope, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Agawam

Percent of map unit: 5 percent
Landform: Kames, moraines, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Backslope, shoulder, footslope, summit, toeslope
Landform position (three-dimensional): Side slope, crest, head slope, nose slope, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Ninigret

Percent of map unit: 3 percent
Landform: Moraines, outwash terraces, kames, outwash plains, kame terraces
Landform position (two-dimensional): Toeslope, footslope, backslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

Raypol

Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

704A—Enfield silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2y07p
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Enfield

Setting

Landform: Outwash terraces, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite, schist, and/or gneiss

Typical profile

Ap - 0 to 7 inches: silt loam
Bw1 - 7 to 15 inches: silt loam
Bw2 - 15 to 25 inches: silt loam
2C - 25 to 60 inches: stratified very gravelly coarse sand to loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 16 to 39 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Haven

Percent of map unit: 5 percent
Landform: Outwash terraces, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Tisbury

Percent of map unit: 5 percent
Landform: Outwash plains, deltas, valley trains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Agawam

Percent of map unit: 3 percent
Landform: Kames, moraines, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Raypol

Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

704B—Enfield silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2y07q
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Enfield

Setting

Landform: Outwash plains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite, schist, and/or gneiss

Typical profile

Ap - 0 to 7 inches: silt loam
Bw1 - 7 to 15 inches: silt loam
Bw2 - 15 to 25 inches: silt loam
2C - 25 to 60 inches: stratified very gravelly coarse sand to loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 16 to 39 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Haven

Percent of map unit: 5 percent
Landform: Outwash plains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Tisbury

Percent of map unit: 5 percent
Landform: Outwash plains, deltas, valley trains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Agawam

Percent of map unit: 3 percent
Landform: Kames, moraines, outwash terraces, outwash plains, kame terraces

Landform position (two-dimensional): Toeslope, summit, footslope, shoulder, backslope
Landform position (three-dimensional): Nose slope, head slope, crest, side slope, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Raypol

Percent of map unit: 2 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

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APPENDIX D
Storm Sewer Analysis Results

Subbasin Summary

Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
Sub-CB-01	0.13	0.8500	0.68	0.57	0.07	0.75	0 00:06:00
Sub-CB-02	0.27	0.7700	0.73	0.56	0.15	1.29	0 00:07:00
Sub-CB-03	0.24	0.6800	0.68	0.46	0.11	1.10	0 00:06:00
Sub-CB-04	0.32	0.8800	0.68	0.59	0.19	1.90	0 00:06:00
Sub-CB-05	0.38	0.8700	0.68	0.59	0.22	2.23	0 00:06:00
Sub-CB-06	0.38	0.8700	0.68	0.59	0.22	2.23	0 00:06:00
Sub-CB-07	0.33	0.8600	0.68	0.58	0.19	1.92	0 00:06:00
Sub-CB-08	0.14	0.8600	0.68	0.58	0.08	0.81	0 00:06:00
Sub-CB-09	0.31	0.8000	0.68	0.54	0.17	1.67	0 00:06:00
Sub-CB-10	0.30	0.8400	0.68	0.57	0.17	1.70	0 00:06:00
Sub-CB-11	0.11	0.7900	0.68	0.53	0.06	0.59	0 00:06:00
Sub-CB-12	0.03	0.7000	0.73	0.51	0.02	0.13	0 00:07:00
Sub-CB-13	0.18	0.7300	0.73	0.53	0.10	0.82	0 00:07:00
Sub-CB-14	0.04	0.6000	0.77	0.46	0.02	0.14	0 00:08:00
Sub-CB-15	0.14	0.8100	0.68	0.55	0.08	0.77	0 00:06:00
Sub-CB-16	0.03	0.9000	0.68	0.61	0.02	0.18	0 00:06:00
Sub-CB-17	0.11	0.7400	0.73	0.54	0.06	0.51	0 00:07:00
Sub-CB-18	0.34	0.8100	0.68	0.55	0.19	1.86	0 00:06:00
Sub-CB-19	0.31	0.8000	0.68	0.54	0.17	1.67	0 00:06:00
Sub-CB-20	0.14	0.7700	0.68	0.52	0.07	0.73	0 00:06:00
Sub-CB-21	0.05	0.9000	0.68	0.61	0.03	0.30	0 00:06:00
Sub-CB-22	0.16	0.8300	0.68	0.56	0.09	0.90	0 00:06:00
Sub-CB-23	0.38	0.7900	0.68	0.53	0.20	2.03	0 00:06:00
Sub-CB-24	0.14	0.7700	0.68	0.52	0.07	0.73	0 00:06:00
Sub-CB-25	0.05	0.9000	0.68	0.61	0.03	0.30	0 00:06:00
Sub-CB-26	0.08	0.9000	0.68	0.61	0.05	0.49	0 00:06:00
Sub-CB-27	0.13	0.7200	0.73	0.52	0.07	0.58	0 00:07:00
Sub-CB-28	0.21	0.8400	0.68	0.57	0.12	1.19	0 00:06:00
Sub-CB-29	0.21	0.8400	0.68	0.57	0.12	1.19	0 00:06:00
Sub-CB-30	0.10	0.7800	0.73	0.57	0.06	0.49	0 00:07:00
Sub-CB-31	0.06	0.9000	0.68	0.61	0.04	0.36	0 00:06:00
Sub-CB-32	0.11	0.6300	0.77	0.49	0.05	0.40	0 00:08:00
Sub-CB-33	0.03	0.9000	0.68	0.61	0.02	0.18	0 00:06:00
Sub-CB-34	0.06	0.7000	0.73	0.51	0.03	0.26	0 00:07:00
Sub-CB-35	0.36	0.7500	0.73	0.54	0.20	1.68	0 00:07:00
Sub-CB-36	0.12	0.7000	0.73	0.51	0.06	0.52	0 00:07:00
Sub-CB-37	0.09	0.8300	0.68	0.56	0.05	0.50	0 00:06:00
Sub-CB-38	0.06	0.6000	0.77	0.46	0.03	0.21	0 00:08:00
Sub-CB-39	0.13	0.7600	0.73	0.55	0.07	0.61	0 00:07:00
Sub-CB-40	0.09	0.9000	0.68	0.61	0.05	0.55	0 00:06:00
Sub-CB-41	0.01	0.9000	0.68	0.61	0.01	0.06	0 00:06:00
Sub-EXBD-01	0.45	0.7300	0.68	0.49	0.22	2.22	0 00:06:00
Sub-EXCB-02	0.37	0.7900	0.68	0.53	0.19	1.95	0 00:06:00
Sub-M-1A	0.13	0.9000	0.68	0.61	0.08	0.79	0 00:06:00
Sub-M-1B	0.33	0.9000	0.68	0.61	0.20	2.00	0 00:06:00
Sub-M-1C	0.12	0.9000	0.68	0.61	0.07	0.73	0 00:06:00
Sub-M-2A	0.13	0.9000	0.68	0.61	0.08	0.79	0 00:06:00
Sub-M-2B	0.33	0.9000	0.68	0.61	0.20	2.00	0 00:06:00
Sub-M-2C	0.12	0.9000	0.68	0.61	0.07	0.73	0 00:06:00
Sub-R-1A	0.09	0.9000	0.68	0.61	0.05	0.55	0 00:06:00
Sub-R-1B	0.10	0.9000	0.68	0.61	0.06	0.61	0 00:06:00
Sub-R-1C	0.06	0.9000	0.68	0.61	0.04	0.36	0 00:06:00
Sub-R-1D	0.10	0.9000	0.68	0.61	0.06	0.61	0 00:06:00
Sub-R-1E	0.09	0.9000	0.68	0.61	0.05	0.55	0 00:06:00
Sub-R-2A	0.09	0.9000	0.68	0.61	0.05	0.55	0 00:06:00
Sub-R-2B	0.10	0.9000	0.68	0.61	0.06	0.61	0 00:06:00
Sub-R-2C	0.06	0.9000	0.68	0.61	0.04	0.36	0 00:06:00
Sub-R-2D	0.10	0.9000	0.68	0.61	0.06	0.61	0 00:06:00
Sub-R-2E	0.09	0.9000	0.68	0.61	0.05	0.55	0 00:06:00
Sub-YD-01	0.05	0.4200	0.77	0.32	0.02	0.12	0 00:08:00
Sub-YD-02	0.07	0.3000	0.77	0.23	0.02	0.12	0 00:08:00
Sub-YD-03	0.23	0.2100	1.07	0.22	0.05	0.19	0 00:16:23
Sub-YD-04	1.51	0.2300	1.01	0.23	0.35	1.48	0 00:14:06
Sub-YD-05	0.49	0.2200	0.90	0.20	0.10	0.52	0 00:11:12
Sub-YD-06	4.58	0.3000	1.28	0.38	1.76	4.28	0 00:24:42
Sub-YD-07	1.82	0.2200	1.13	0.25	0.45	1.47	0 00:18:30
Sub-YD-08	0.57	0.2000	1.12	0.23	0.13	0.42	0 00:18:06
Sub-YD-09	1.72	0.1700	1.12	0.19	0.33	1.09	0 00:18:00
Sub-YD-10	0.01	0.3000	0.77	0.23	0.00	0.02	0 00:08:00
Sub-YD-11	0.05	0.3000	0.77	0.23	0.01	0.09	0 00:08:00
Sub-YD-12	0.05	0.7800	0.68	0.53	0.03	0.26	0 00:06:00
Sub-YD-13	0.04	0.7500	0.68	0.51	0.02	0.20	0 00:06:00
Sub-YD-14	0.01	0.3000	0.68	0.20	0.00	0.02	0 00:06:00

Link Summary

From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow Velocity	Peak Flow Depth	Total Time Surcharged
		(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)	(ft/sec)	(ft)	(min)
DMH-01	UGC-INLET-01	2.00	149.27	149.25	1.0000	36.000	0.0130	30.91	66.70	9.26	1.43	0.00
R2	CB-11	244.00	155.90	154.45	0.5900	12.000	0.0130	2.54	2.75	7.27	0.75	0.00
R1	YD-14	234.00	155.62	153.24	1.0200	12.000	0.0130	2.56	3.59	8.44	0.62	0.00
OCS	EXCB-01	29.00	144.60	144.30	1.0300	36.000	0.0130	19.32	67.84	8.27	1.10	0.00
EXCB-01	EXCB-02	58.00	143.72	142.97	1.2900	24.000	0.0130	19.31	25.72	8.99	1.29	0.00
EXCB-02	EXFE-01	15.00	142.97	142.78	1.2700	24.000	0.0130	19.31	25.46	8.91	1.30	0.00
CB-41(TYPEI)	CB-36	102.00	152.42	150.72	1.6700	15.000	0.0130	5.39	8.00	7.02	0.75	0.00
WQU-1	OCS	15.00	146.56	145.61	6.3300	30.000	0.0130	10.48	218.12	22.95	0.37	0.00
DMH-03	UGC-INLET-03	3.00	149.22	149.20	0.6700	15.000	0.0130	2.92	7.01	5.45	0.56	0.00
DMH-02	UGC-INLET-02	3.00	149.22	149.20	0.6700	15.000	0.0130	4.02	6.21	5.38	0.73	0.00
CB-24	CB-25	109.00	158.27	157.71	0.5100	24.000	0.0130	11.34	16.22	5.60	1.23	0.00
CB-03	CB-02	51.00	150.92	150.66	0.5100	12.000	0.0130	1.08	2.54	4.16	0.45	0.00
CB-31	CB-30	30.00	154.28	153.98	1.0000	18.000	0.0130	3.43	4.70	2.91	0.95	0.00
CB-30	CB-29	95.00	153.88	153.40	0.5100	18.000	0.0130	3.90	8.70	4.82	0.70	0.00
CB-29	DMH-04	44.00	153.30	153.07	0.5200	18.000	0.0130	4.82	9.07	5.22	0.78	0.00
DMH-04	CB-09	95.00	152.97	152.49	0.5100	18.000	0.0130	6.80	11.42	6.75	0.83	0.00
CB-09	YD-14	48.00	152.39	152.14	0.5200	30.000	0.0130	28.13	29.60	6.88	1.95	0.00
YD-14	YD-13	21.00	152.04	151.93	0.5200	36.000	0.0130	30.54	48.27	7.22	1.73	0.00
YD-13	YD-12	42.00	151.83	151.62	0.5000	36.000	0.0130	30.71	47.16	7.10	1.76	0.00
YD-12	DMH-01	53.00	151.52	151.25	0.5100	36.000	0.0130	30.91	47.61	7.17	1.76	0.00
CB-11	CB-41(TYPEI)	88.00	154.17	152.72	1.6500	15.000	0.0130	4.76	8.29	7.00	0.68	0.00
CB-10	CB-09	171.00	154.19	153.34	0.5000	15.000	0.0130	4.03	4.55	4.31	0.91	0.00
CB-13(TYPEI)	CB-12(TYPEI)	42.00	155.25	155.04	0.5000	12.000	0.0130	0.81	2.52	3.60	0.39	0.00
CB-12(TYPEI)	CB-11	36.00	154.94	154.45	1.3600	12.000	0.0130	1.70	4.16	5.04	0.45	0.00
CB-02	CB-01	41.00	150.56	150.35	0.5100	12.000	0.0130	2.25	2.55	3.69	0.73	0.00
CB-35	CB-34	7.00	155.99	155.96	0.4300	12.000	0.0130	2.29	2.48	3.58	0.76	0.00
CB-34	CB-33	33.00	155.86	155.54	0.9700	12.000	0.0130	2.54	3.54	4.92	0.63	0.00
CB-28	CB-27	7.00	157.29	156.94	5.0000	12.000	0.0130	1.19	14.13	10.94	0.20	0.00
CB-27	CB-26	21.00	156.84	156.73	0.5200	12.000	0.0130	1.68	3.62	4.53	0.48	0.00
CB-26	DMH-04	24.00	156.63	155.43	5.0000	12.000	0.0130	2.16	7.97	8.63	0.36	0.00
CB-37	CB-35	74.00	159.73	156.37	4.5400	12.000	0.0130	0.50	7.59	6.91	0.17	0.00
CB-23	CB-22	76.00	157.17	156.79	0.5000	24.000	0.0130	15.45	16.00	5.84	1.58	0.00
CB-22	CB-09	72.00	156.69	153.23	4.8100	24.000	0.0130	16.16	49.59	14.11	0.79	0.00
CB-18	CB-17	7.00	155.70	155.35	5.0000	12.000	0.0130	1.86	7.97	8.27	0.33	0.00
CB-17	CB-16	24.00	155.25	155.12	0.5400	12.000	0.0130	2.28	2.62	3.77	0.72	0.00
CB-16	CB-10	26.00	155.02	154.45	2.1900	12.000	0.0130	2.46	5.28	6.60	0.48	0.00
CB-15	CB-14	10.00	156.04	155.55	4.9000	12.000	0.0130	0.76	8.23	6.57	0.21	0.00
CB-14	CB-12(TYPEI)	33.00	155.45	155.29	0.4800	12.000	0.0130	0.86	2.48	2.88	0.41	0.00
CB-19	CB-21	68.00	159.92	159.58	0.5000	12.000	0.0130	2.18	2.52	3.66	0.72	0.00
CB-20	YD-07	26.00	161.25	160.95	1.1500	12.000	0.0130	0.72	3.83	4.07	0.29	0.00
CB-25	CB-23	68.00	157.61	157.27	0.5000	24.000	0.0130	13.83	16.00	5.75	1.44	0.00
YD-04	YD-05	101.00	160.44	159.93	0.5000	15.000	0.0130	3.51	4.59	4.15	0.82	0.00
CB-04	CB-05	100.00	152.19	151.68	0.5100	12.000	0.0130	1.86	2.54	5.40	0.63	0.00
YD-05	YD-06	89.00	159.83	159.38	0.5100	15.000	0.0130	4.46	4.59	4.31	0.99	0.00
YD-06	CB-24	26.00	158.51	158.13	1.4600	24.000	0.0130	10.75	21.73	6.90	0.99	0.00
YD-11	YD-10	53.00	161.18	160.91	0.5100	12.000	0.0130	0.09	2.54	2.22	0.12	0.00
YD-10	YD-09	54.00	160.81	160.53	0.5200	12.000	0.0130	0.79	2.57	2.90	0.38	0.00
YD-09	YD-08	101.00	160.43	159.92	0.5000	15.000	0.0130	3.09	4.59	4.05	0.75	0.00
YD-08	YD-07	89.00	159.82	159.38	0.4900	15.000	0.0130	3.96	4.54	4.21	0.90	0.00
YD-07	YD-06	132.00	159.28	158.61	0.5100	18.000	0.0130	5.12	7.48	4.60	0.91	0.00
YD-02	YD-03	52.00	161.18	160.91	0.5200	12.000	0.0130	0.12	2.57	2.39	0.15	0.00
YD-03	YD-04	54.00	160.81	160.54	0.5000	12.000	0.0130	0.93	2.52	2.98	0.42	0.00
CB-38	CB-35	38.00	157.36	156.09	3.3400	12.000	0.0130	0.21	6.51	4.05	0.12	0.00
CB-05	DMH-02	17.00	151.58	151.48	0.5900	15.000	0.0130	4.02	4.43	4.09	0.93	0.00
CB-33	CB-31	17.00	155.44	154.76	4.0000	12.000	0.0130	2.69	7.13	8.44	0.42	0.00
CB-01	DMH-03	18.00	150.25	150.15	0.5600	15.000	0.0130	2.92	4.81	4.11	0.70	0.00
CB-06	CB-07	100.00	152.19	151.68	0.5100	12.000	0.0130	2.18	2.50	5.52	0.72	0.00
CB-07	CB-36	130.00	151.31	150.65	0.5100	15.000	0.0130	3.99	4.74	4.42	0.88	0.00
CB-21	CB-25	55.00	159.48	159.20	0.5100	12.000	0.0130	2.46	2.54	3.74	0.79	0.00
CB-36	CB-08	31.00	150.55	149.87	2.1900	15.000	0.0130	9.80	11.80	10.75	0.87	0.00
CB-39(TYPEI)	CB-41(TYPEI)	16.00	152.60	152.52	0.5000	12.000	0.0130	0.61	1.69	2.14	0.41	0.00
CB-40	CB-19	29.00	160.46	160.02	1.5200	12.000	0.0130	0.54	4.39	4.21	0.24	0.00
CB-08	WQU-1	63.00	148.95	146.56	3.7900	30.000	0.0130	10.48	18.34	3.88	1.35	0.00
YD-01	CB-31	44.00	154.75	154.52	0.5200	12.000	0.0130	0.12	1.70	1.84	0.18	0.00
CB-32	CB-31	22.00	154.95	154.84	0.5000	12.000	0.0130	0.40	2.52	2.55	0.27	0.00

Junction Input

Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)
CB-01	150.22	154.40
CB-02	150.52	153.53
CB-03	150.89	153.09
CB-04	152.18	154.40
CB-05	151.57	154.40
CB-06	151.09	154.40
CB-07	151.70	153.90
CB-08	149.96	152.26
CB-09	152.39	156.77
CB-10	150.37	156.68
CB-11	151.99	156.68
CB-12(TYPEI)	151.72	157.67
CB-13(TYPEI)	155.20	157.37
CB-14	151.45	158.14
CB-15	156.08	160.90
CB-16	150.59	157.90
CB-17	150.83	157.50
CB-18	155.66	160.17
CB-19	159.92	162.23
CB-20	159.53	162.70
CB-21	159.48	163.66
CB-22	156.69	161.90
CB-23	157.17	162.23
CB-24	158.27	163.50
CB-25	157.61	163.66
CB-26	156.61	159.37
CB-27	156.95	159.37
CB-28	158.05	161.75
CB-29	153.94	156.84
CB-30	154.59	156.77
CB-31	154.65	157.09
CB-32	154.92	157.13
CB-33	155.38	157.70
CB-34	155.87	158.49
CB-35	155.99	160.37
CB-36	151.00	153.31
CB-37	159.67	163.11
CB-38	157.34	159.46
CB-39(TYPEI)	152.56	154.77
CB-40	160.46	162.73
CB-41(TYPEI)	152.56	155.29
DMH-01	149.27	157.30
DMH-02	151.50	157.50
DMH-03	150.10	156.10
DMH-04	153.61	157.86
EXCB-01	143.72	148.58
EXCB-02	142.97	148.12
OCS	144.60	150.62
R1	155.62	158.40
R2	155.90	158.40
WQU-1	149.85	155.85
YD-01	154.75	157.10
YD-02	161.18	163.50
YD-03	160.81	163.50
YD-04	160.44	163.00
YD-05	159.83	163.00
YD-06	158.51	163.30
YD-07	159.28	163.30
YD-08	159.82	163.00
YD-09	160.43	163.00
YD-10	160.81	163.50
YD-11	161.18	163.50
YD-12	151.52	158.00
YD-13	151.83	157.98
YD-14	152.04	157.41

Junction Results

Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Min Freeboard Attained	Time of Max HGL Occurrence
	(cfs)	(cfs)	(ft)	(ft)	(days hh:mm)
CB-01	2.92	0.75	151.08	3.32	0 00:07
CB-02	2.25	1.29	151.29	2.24	0 00:07
CB-03	1.10	1.10	151.38	1.71	0 00:06
CB-04	1.90	1.90	152.83	1.57	0 00:06
CB-05	4.02	2.23	152.51	1.89	0 00:06
CB-06	2.23	2.23	152.93	1.47	0 00:06
CB-07	4.03	1.91	152.59	1.31	0 00:06
CB-08	10.50	0.81	151.32	1.14	0 00:06
CB-09	28.13	1.67	154.34	2.43	0 00:07
CB-10	4.12	1.70	155.12	1.56	0 00:06
CB-11	4.76	0.59	155.21	1.47	0 00:06
CB-12(TYPEI)	1.70	0.13	155.70	1.97	0 00:06
CB-13(TYPEI)	0.82	0.82	155.64	1.73	0 00:07
CB-14	0.87	0.14	155.86	2.28	0 00:06
CB-15	0.77	0.77	156.29	4.61	0 00:06
CB-16	2.46	0.18	155.84	2.06	0 00:06
CB-17	2.29	0.51	155.97	1.53	0 00:06
CB-18	1.86	1.86	156.03	4.14	0 00:06
CB-19	2.21	1.67	160.65	1.58	0 00:06
CB-20	0.73	0.73	161.55	1.15	0 00:06
CB-21	2.48	0.30	160.30	3.36	0 00:06
CB-22	16.16	0.90	158.37	3.53	0 00:07
CB-23	15.47	2.03	158.75	3.48	0 00:07
CB-24	11.36	0.73	159.50	4.00	0 00:07
CB-25	13.84	0.30	159.99	3.67	0 00:06
CB-26	2.16	0.49	157.21	2.16	0 00:06
CB-27	1.69	0.58	157.43	1.94	0 00:06
CB-28	1.19	1.19	158.24	3.51	0 00:06
CB-29	4.82	1.19	154.72	2.12	0 00:07
CB-30	3.91	0.48	155.55	1.22	0 00:07
CB-31	3.44	0.36	155.60	1.49	0 00:07
CB-32	0.40	0.40	155.22	1.91	0 00:08
CB-33	2.69	0.18	156.17	1.53	0 00:07
CB-34	2.55	0.26	156.72	1.77	0 00:07
CB-35	2.29	1.68	156.75	3.62	0 00:07
CB-36	9.80	0.52	151.88	1.43	0 00:06
CB-37	0.50	0.50	159.91	3.20	0 00:06
CB-38	0.21	0.21	157.48	1.98	0 00:08
CB-39(TYPEI)	0.61	0.61	153.02	1.75	0 00:07
CB-40	0.55	0.55	160.70	2.03	0 00:06
CB-41(TYPEI)	5.40	0.06	153.40	1.89	0 00:06
DMH-01	30.91	0.00	153.01	4.29	0 00:07
DMH-02	4.02	0.00	152.43	5.07	0 00:06
DMH-03	2.92	0.00	150.85	5.25	0 00:06
DMH-04	6.80	0.00	155.79	2.08	0 00:06
EXCB-01	19.32	2.22	145.40	3.18	0 12:46
EXCB-02	19.31	1.95	144.27	3.85	0 12:46
OCS	19.32	19.32	145.98	4.64	0 00:07
R1	2.67	2.67	156.26	2.14	0 00:06
R2	2.67	2.67	156.70	1.70	0 00:06
WQU-1	10.48	0.00	151.21	4.65	0 00:07
YD-01	0.12	0.12	154.93	2.17	0 00:08
YD-02	0.12	0.12	161.33	2.17	0 00:08
YD-03	0.94	0.86	161.23	2.27	0 00:06
YD-04	3.54	2.63	161.26	1.74	0 00:06
YD-05	4.49	1.01	160.83	2.17	0 00:06
YD-06	10.75	4.28	160.37	2.93	0 00:06
YD-07	5.15	1.47	161.24	2.06	0 00:06
YD-08	3.98	0.93	160.73	2.27	0 00:06
YD-09	3.14	2.37	161.19	1.81	0 00:06
YD-10	0.80	0.74	161.19	2.31	0 00:06
YD-11	0.09	0.09	161.31	2.19	0 00:08
YD-12	30.92	0.26	153.38	4.62	0 00:07
YD-13	30.71	0.20	153.66	4.32	0 00:07
YD-14	30.54	0.02	154.09	3.32	0 00:07

Roadway & Gutter Input

SN	Element ID	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Gutter Depression (in)	Allowable Spread (ft)
1	CB-01	N/A	0.0260	0.0130	0.0260	12.00	0.0328	7.00
2	CB-02	N/A	0.0310	0.0130	0.0310	12.00	0.0328	7.00
3	CB-03	N/A	0.0310	0.0130	0.0310	12.00	0.0328	7.00
4	CB-04(TYPEII)	N/A	0.0200	0.0130	0.0200	12.00	0.0328	7.00
5	CB-05(TYPEII)	N/A	0.0200	0.0130	0.0200	12.00	0.0328	7.00
6	CB-06(TYPEII)	N/A	0.0200	0.0130	0.0200	12.00	0.0328	7.00
7	CB-07(TYPEII)	N/A	0.0200	0.0130	0.0200	12.00	0.0328	7.00
8	CB-08(TYPEI)	0.0500	0.0500	0.0130	0.0500	12.00	0.0328	7.00
9	CB-09	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
10	CB-10	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
11	CB-11	N/A	0.0200	0.0130	0.0200	12.00	0.0328	7.00
12	CB-12(TYPEI)	0.0240	0.0310	0.0130	0.0310	12.00	0.0328	7.00
13	CB-13(TYPEI)	0.0450	0.0310	0.0130	0.0310	12.00	0.0328	7.00
14	CB-14	N/A	0.0300	0.0130	0.0300	12.00	0.0328	7.00
15	CB-15	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
16	CB-16	0.0303	0.0310	0.0130	0.0303	12.00	0.0328	7.00
17	CB-17	N/A	0.0200	0.0130	0.0200	12.00	0.0328	7.00
18	CB-18	N/A	0.0300	0.0130	0.0300	12.00	0.0328	7.00
19	CB-19	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
20	CB-20	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
21	CB-21	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
22	CB-22	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
23	CB-23	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
24	CB-24	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
25	CB-25	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
26	CB-26	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
27	CB-27	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
28	CB-28	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
29	CB-29	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
30	CB-30	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
31	CB-31	N/A	0.0310	0.0130	0.0310	12.00	0.0328	7.00
32	CB-32	N/A	0.0310	0.0130	0.0310	12.00	0.0328	7.00
33	CB-33	0.0350	0.0310	0.0130	0.0310	12.00	0.0328	7.00
34	CB-34	N/A	0.0310	0.0130	0.0310	12.00	0.0328	7.00
35	CB-35	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
36	CB-36(TYPEI)	0.0300	0.0310	0.0130	0.0310	12.00	0.0328	7.00
37	CB-37	N/A	0.0250	0.0130	0.0250	12.00	0.0328	7.00
38	CB-38	0.0310	0.0500	0.0130	0.0500	12.00	0.0328	7.00
39	CB-39(TYPEI)	0.0200	0.0310	0.0130	0.0310	12.00	0.0328	7.00
40	CB-40	0.0150	0.0310	0.0130	0.0310	12.00	0.0328	7.00
41	CB-41(TYPEI)	0.0200	0.0310	0.0130	0.0310	12.00	0.0328	7.00
42	YD-01	N/A	0.1000	0.0250	0.1000	12.00	0.0328	7.00
43	YD-02	N/A	0.2000	0.0250	0.2000	12.00	0.0328	7.00
44	YD-03	N/A	0.2000	0.0250	0.2000	12.00	0.0328	7.00
45	YD-04	N/A	0.2000	0.0130	0.2000	12.00	0.0328	7.00
46	YD-05	N/A	0.2000	0.0250	0.2000	12.00	0.0328	7.00
47	YD-06	N/A	0.2000	0.0250	0.2000	12.00	0.0328	7.00
48	YD-07	N/A	0.2000	0.0250	0.2000	12.00	0.0328	7.00
49	YD-08	N/A	0.2000	0.0250	0.2000	12.00	0.0328	7.00
50	YD-09	N/A	0.2000	0.0250	0.2000	12.00	0.0328	7.00
51	YD-10	N/A	0.2000	0.0250	0.2000	12.00	0.0328	7.00
52	YD-11	N/A	0.2000	0.0250	0.2000	12.00	0.0328	7.00
53	YD-12	N/A	0.0150	0.0250	0.0150	12.00	0.0328	7.00
54	YD-13	N/A	0.0150	0.0250	0.0150	12.00	0.0328	7.00
55	YD-14	N/A	0.0250	0.0250	0.0250	12.00	0.0328	7.00

Inlet Results

SN	Element ID	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Max Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	CB-01	0.75	0.75	N/A	N/A	N/A	4.54	154.58	0.18	0 00:07	0.00	0.00
2	CB-02	1.29	1.29	N/A	N/A	N/A	6.00	153.80	0.27	0 00:07	0.00	0.00
3	CB-03	1.10	1.10	N/A	N/A	N/A	5.51	153.34	0.25	0 00:06	0.00	0.00
4	CB-04(TYPEII)	1.90	1.90	N/A	N/A	N/A	8.89	154.66	0.26	0 00:06	0.00	0.00
5	CB-05(TYPEII)	2.23	2.23	N/A	N/A	N/A	9.79	154.68	0.28	0 00:06	0.00	0.00
6	CB-06(TYPEII)	2.23	2.23	N/A	N/A	N/A	9.79	154.68	0.28	0 00:06	0.00	0.00
7	CB-07(TYPEII)	1.91	1.91	N/A	N/A	N/A	8.93	154.16	0.26	0 00:06	0.00	0.00
8	CB-08(TYPEI)	0.81	0.81	0.81	0.00	100.00	2.67	152.39	0.13	0 00:06	0.00	0.00
9	CB-09	1.67	1.67	N/A	N/A	N/A	8.51	157.07	0.30	0 00:07	0.00	0.00
10	CB-10	1.72	1.70	N/A	N/A	N/A	8.58	156.98	0.30	0 00:06	0.00	0.00
11	CB-11	0.59	0.59	N/A	N/A	N/A	4.49	156.82	0.14	0 00:06	0.00	0.00
12	CB-12(TYPEI)	0.13	0.13	0.13	0.00	100.00	0.88	157.70	0.03	0 00:06	0.00	0.00
13	CB-13(TYPEI)	0.82	0.82	0.81	0.00	99.79	3.54	157.48	0.11	0 00:07	0.00	0.00
14	CB-14	0.14	0.14	N/A	N/A	N/A	0.75	158.17	0.03	0 00:06	0.00	0.00
15	CB-15	0.77	0.77	N/A	N/A	N/A	4.82	161.08	0.18	0 00:06	0.00	0.00
16	CB-16	0.18	0.18	0.17	0.02	90.85	1.19	157.94	0.04	0 00:06	0.00	0.00
17	CB-17	0.51	0.51	N/A	N/A	N/A	3.87	157.62	0.12	0 00:06	0.00	0.00
18	CB-18	1.91	1.86	N/A	N/A	N/A	7.82	160.49	0.32	0 00:06	0.00	0.00
19	CB-19	1.67	1.67	N/A	N/A	N/A	8.44	162.52	0.29	0 00:06	0.00	0.00
20	CB-20	0.73	0.73	N/A	N/A	N/A	4.61	163.67	0.17	0 00:06	0.00	0.00
21	CB-21	0.30	0.30	N/A	N/A	N/A	1.91	163.73	0.07	0 00:06	0.00	0.00
22	CB-22	0.90	0.90	N/A	N/A	N/A	5.65	162.11	0.21	0 00:07	0.00	0.00
23	CB-23	2.03	2.03	N/A	N/A	N/A	9.55	162.55	0.32	0 00:07	0.00	0.00
24	CB-24	0.73	0.73	N/A	N/A	N/A	4.61	163.67	0.17	0 00:07	0.00	0.00
25	CB-25	0.30	0.30	N/A	N/A	N/A	1.91	163.73	0.07	0 00:06	0.00	0.00
26	CB-26	0.49	0.49	N/A	N/A	N/A	3.06	159.49	0.12	0 00:06	0.00	0.00
27	CB-27	0.58	0.58	N/A	N/A	N/A	3.66	159.51	0.14	0 00:06	0.00	0.00
28	CB-28	1.19	1.19	N/A	N/A	N/A	6.91	162.01	0.26	0 00:06	0.00	0.00
29	CB-29	1.19	1.19	N/A	N/A	N/A	6.91	157.10	0.26	0 00:07	0.00	0.00
30	CB-30	0.48	0.48	N/A	N/A	N/A	3.05	156.89	0.12	0 00:07	0.00	0.00
31	CB-31	0.38	0.36	N/A	N/A	N/A	1.99	157.18	0.09	0 00:07	0.00	0.00
32	CB-32	0.40	0.40	N/A	N/A	N/A	2.11	157.23	0.10	0 00:08	0.00	0.00
33	CB-33	0.18	0.18	0.17	0.02	91.73	1.15	157.74	0.04	0 00:07	0.00	0.00
34	CB-34	0.26	0.26	N/A	N/A	N/A	1.39	158.55	0.06	0 00:07	0.00	0.00
35	CB-35	1.68	1.68	N/A	N/A	N/A	8.46	160.66	0.29	0 00:07	0.00	0.00
36	CB-36(TYPEI)	0.52	0.52	0.52	0.00	99.93	3.27	153.41	0.10	0 00:06	0.00	0.00
37	CB-37	0.50	0.50	N/A	N/A	N/A	3.18	163.23	0.12	0 00:06	0.00	0.00
38	CB-38	0.21	0.21	0.20	0.00	97.63	1.04	159.51	0.05	0 00:08	0.00	0.00
39	CB-39(TYPEI)	0.61	0.61	0.61	0.00	99.38	3.70	154.88	0.11	0 00:07	0.00	0.00
40	CB-40	0.55	0.55	0.48	0.07	87.62	3.76	162.85	0.12	0 00:06	0.00	0.00
41	CB-41(TYPEI)	0.06	0.06	0.06	0.00	100.00	0.42	155.30	0.01	0 00:06	0.00	0.00
42	YD-01	0.12	0.12	N/A	N/A	N/A	0.29	157.14	0.04	0 00:08	0.00	0.00
43	YD-02	0.12	0.12	N/A	N/A	N/A	0.23	163.56	0.06	0 00:08	0.00	0.00
44	YD-03	0.86	0.86	N/A	N/A	N/A	1.64	163.89	0.39	0 00:06	0.00	0.00
45	YD-04	2.63	2.63	N/A	N/A	N/A	2.73	163.63	0.63	0 00:06	0.00	0.00
46	YD-05	1.01	1.01	N/A	N/A	N/A	1.89	163.46	0.46	0 00:06	0.00	0.00
47	YD-06	4.28	4.28	N/A	N/A	N/A	3.32	164.05	0.75	0 00:06	0.00	0.00
48	YD-07	1.47	1.47	N/A	N/A	N/A	2.12	163.81	0.51	0 00:06	0.00	0.00
49	YD-08	0.93	0.93	N/A	N/A	N/A	1.75	163.42	0.42	0 00:06	0.00	0.00
50	YD-09	2.37	2.37	N/A	N/A	N/A	2.56	163.59	0.59	0 00:06	0.00	0.00
51	YD-10	0.74	0.74	N/A	N/A	N/A	1.40	163.84	0.34	0 00:06	0.00	0.00
52	YD-11	0.09	0.09	N/A	N/A	N/A	0.16	163.54	0.04	0 00:08	0.00	0.00
53	YD-12	0.26	0.26	N/A	N/A	N/A	2.74	158.06	0.06	0 00:07	0.00	0.00
54	YD-13	0.20	0.20	N/A	N/A	N/A	2.11	158.03	0.05	0 00:07	0.00	0.00
55	YD-14	0.02	0.02	N/A	N/A	N/A	0.13	157.42	0.01	0 00:07	0.00	0.00

APPENDIX E
Water Quality Calculations

The Gateway -DPI No.3530
May 28, 2020

Water Quality Flow Calculations
Per 2004 Connecticut Stormwater Quality Manual
Per Appendix B page B-3:
Water Quality Flow (WQF) = (qu)(A)(Q), where:
qu = unit peak discharge (cfs/mi^2/inch) per Exhibit 4-III
A = drainage area (mi^2)
Q = runoff depth (in watershed inches)
= [Water Quality Volume (WQV) (in acre-feet)] x [12 inches/foot] / drainage area (acres)

Isolation Row 1 (CB-1, 2, &3)
To find Unit Peak Discharge qu with Exhibit 4-III, the following is needed:
Time of Concentration (Tc):
6 mins = 0.10 hours
Initial Abstraction (Ia) in inches / Design Precipitation (P) in inches:
Initial abstraction (Ia) from Table 4-I in Chapter 4 of TR-55 needs Curve Number (CN)
CN = 92
Ia = 0.174 inches
Design Precipitation (P) = 1" for water quality storms per Appendix B
Ia/P = 0.174
Unit Peak Discharge qu = 650 cfs/mi^2/inch

Drainage Area A = 27,878 sf = 0.64 acres = 0.001 mi^2

Runoff Depth Q = WQV (acre-feet) x 12 / drainage area (acres)

Water Quality Volume (WQV) = (1")(R)(A)/12, where:
R = volumetric runoff coefficient
= 0.05 + 0.009(I), where I = percent impervious cover = 75.0%
R = 0.05 + 0.009(I)
R = 0.05 + 0.009(75.0)
R = 0.725

A = drainage area in acres = 0.64 acres

WQV = (1")(R)(A)/12
WQV = (1")(0.725)(0.64 acres) / 12 in/ft
WQV = 0.039 acre-feet

Q = (WQV X 12 in/ft)/Drainage Area
Q = (0.039 acre-feet x 12 in/ft) / 0.64 acres
Q = 0.731 in

WQF = qu x A x Q
WQF = 650 cfs/mi^2/inch x 0.001 mi^2 x 0.733 in
WQF = **0.476 cfs required**

Proposed
As shown on the enclosed water quality per unit sizing report, the proposed Cultec Isolator chambers (utilizing **4 ~ R-902HD** chambers @ **0.133 cfs** treated flow rate per chamber) is rated for 80% TSS removal for the required **0.476 cfs** water quality flow. The current design plan proposes **14** isolator chambers for the subject area. See isolator row sizing chart included in the appendix.

Isolation Row 2 (CB-4 & 5)

To find Unit Peak Discharge qu with Exhibit 4-III, the following is needed:

Time of Concentration (Tc):

6 mins = 0.43 hours

Initial Abstraction (Ia) in inches / Design Precipitation (P) in inches:

Initial abstraction (Ia) from Table 4-I in Chapter 4 of TR-55 needs Curve Number (CN)

CN = 97

Ia = 0.062 inches

Design Precipitation (P) = 1" for water quality storms per Appendix B

Ia/P = 0.062

Unit Peak Discharge qu = 700 cfs/mi^2/inch

Drainage Area A = 30,492 sf = 0.70 acres = 0.0011 mi^2

Runoff Depth Q = WQV (acre-feet) x 12 / drainage area (acres)

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = volumetric runoff coefficient

= 0.05 + 0.009(I), where I = percent impervious cover = 95.71%

R = 0.05 + 0.009(I)

R = 0.05 + 0.009(95.71)

R = 0.911

A = drainage area in acres = 0.70 acres

WQV = (1")(R)(A)/12

WQV = (1")(0.911)(0.70 acres) / 12 in/ft

WQV = 0.053 acre-feet

Q = (WQV X 12 in/ft)/Drainage Area

Q = (0.053 acre-feet x 12 in/ft) / 0.70 acres

Q = 0.91 in

WQF = qu x A x Q

WQF = 700 cfs/mi^2/inch x 0.0011 mi^2 x 0.91 in

WQF = **0.70 cfs required**

Proposed

As shown on the enclosed water quality per unit sizing report, the proposed Cultec Isolator chambers (utilizing **6 ~ R-902HD** chambers @ **0.133 cfs** treated flow rate per chamber) is rated for 80% TSS removal for the required **0.70 cfs** water quality flow. The current design plan proposes **14** isolator chambers for the subject area. See isolator row sizing chart included in the appendix.

Isolation Row 3 (Main Site)

To find Unit Peak Discharge qu with Exhibit 4-III, the following is needed:

Time of Concentration (Tc):

26 mins = 0.43 hours

Initial Abstraction (Ia) in inches / Design Precipitation (P) in inches:

Initial abstraction (Ia) from Table 4-I in Chapter 4 of TR-55 needs Curve Number (CN)

CN = 75

Ia = 0.667 inches

Design Precipitation (P) = 1" for water quality storms per Appendix B

Ia/P = 0.667

Unit Peak Discharge qu = 280 cfs/mi^2/inch

Drainage Area A = 761,123 sf = 17.47 acres = 0.0273 mi^2

Runoff Depth Q = WQV (acre-feet) x 12 / drainage area (acres)

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = volumetric runoff coefficient

= 0.05 + 0.009(I), where I = percent impervious cover = 31.02%

R = 0.05 + 0.009(I)

R = 0.05 + 0.009(31.02)

R = 0.329

A = drainage area in acres = 17.47 acres

WQV = (1")(R)(A)/12

WQV = (1")(0.329)(17.47 acres) / 12 in/ft

WQV = 0.479 acre-feet

Q = (WQV X 12 in/ft)/Drainage Area

Q = (0.479 acre-feet x 12 in/ft) / 17.47 acres

Q = 0.33 in

WQF = qu x A x Q

WQF = 280 cfs/mi^2/inch x 0.0273 mi^2 x 0.33 in

WQF = **2.52 cfs required**

Proposed

As shown on the enclosed water quality per unit sizing report, the proposed Cultec Isolator chambers (utilizing **19 ~ R-902HD** chambers @ **0.133 cfs** treated flow rate per chamber) is rated for 80% TSS removal for the required **2.52 cfs** water quality flow. The current design plan proposes **20** isolator chambers for the subject area. See isolator row sizing chart included in the appendix.

Water Quality Unit 1 (P5)

To find Unit Peak Discharge qu with Exhibit 4-III, the following is needed:

Time of Concentration (Tc):

6 mins = 0.10 hours

Initial Abstraction (Ia) in inches / Design Precipitation (P) in inches:

Initial abstraction (Ia) from Table 4-I in Chapter 4 of TR-55 needs Curve Number (CN)

CN = 95

Ia = 0.105 inches

Design Precipitation (P) = 1" for water quality storms per Appendix B

Ia/P = 0.105

Unit Peak Discharge qu = 650 cfs/mi^2/inch

Drainage Area A = 89,298 sf = 2.05 acres = 0.003 mi^2

Runoff Depth Q = WQV (acre-feet) x 12 / drainage area (acres)

Water Quality Volume (WQV) = (1")(R)(A)/12, where:

R = volumetric runoff coefficient

= 0.05 + 0.009(I), where I = percent impervious cover = 88.29%

R = 0.05 + 0.009(I)

R = 0.05 + 0.009(88.29)

R = 0.845

A = drainage area in acres = 2.05 acres

WQV = (1")(R)(A)/12

WQV = (1")(0.845)(2.05 acres) / 12 in/ft

WQV = 0.144 acre-feet

Q = (WQV X 12 in/ft)/Drainage Area

Q = (0.144 acre-feet x 12 in/ft) / 2.05 acres

Q = 0.843 in

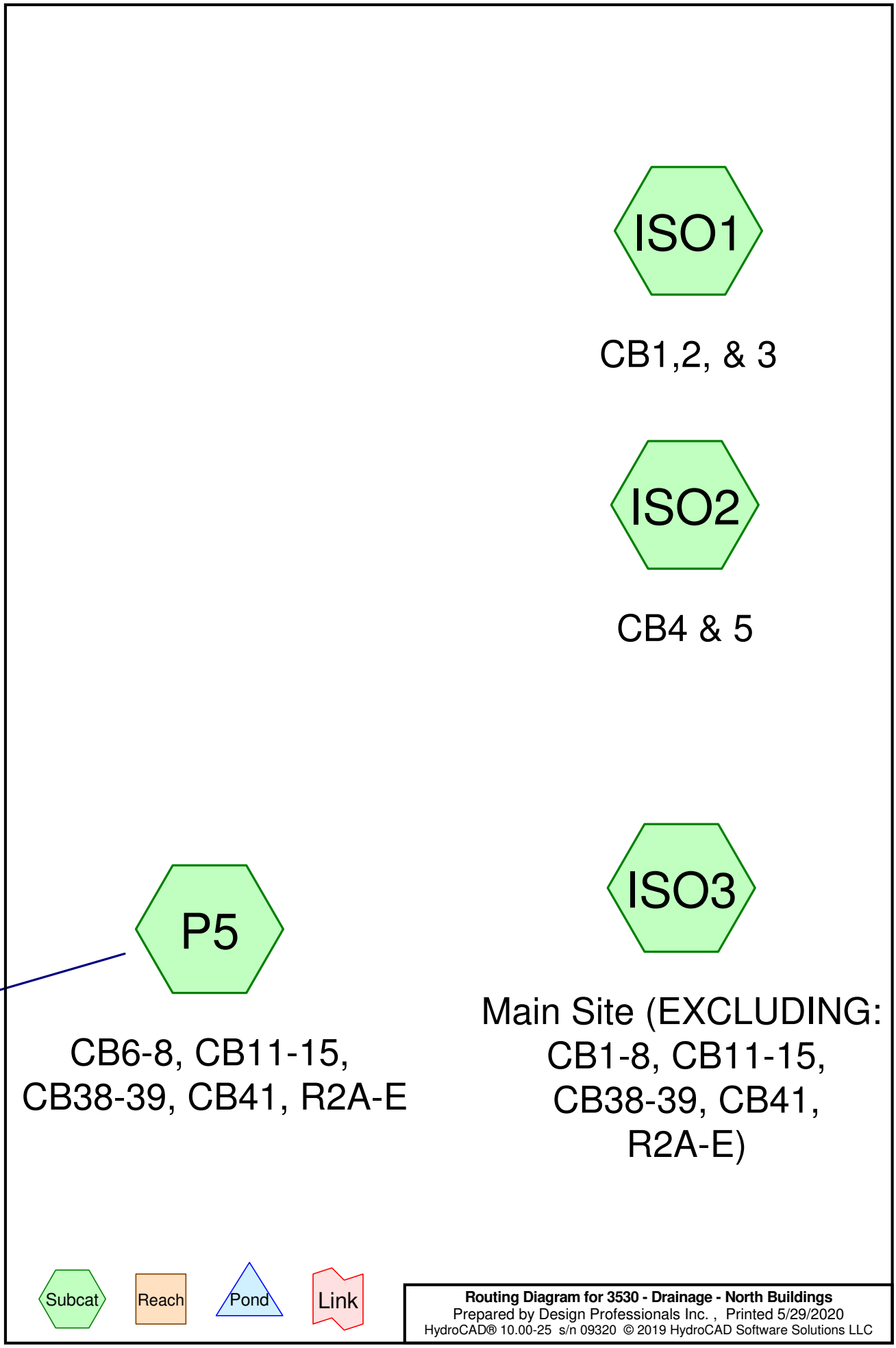
WQF = qu x A x Q

WQF = 650 cfs/mi^2/inch x 0.003 mi^2 x 0.843 in

WQF = **1.64 cfs required**

Proposed

As shown on the enclosed water quality unit sizing report, the proposed BaySaver Barracuda S6 is rated for 80% TSS removal for the required **1.64 cfs** water quality flow and Bypass the expected during 10.48cfs for during the 10 yr storm. See Barracuda sizing chart included in Appendix.



Routing Diagram for 3530 - Drainage - North Buildings
Prepared by Design Professionals Inc. , Printed 5/29/2020

Summary for Subcatchment ISO1: CB1,2, & 3

Runoff = 1.66 cfs @ 12.09 hrs, Volume= 5,263 cf, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	0.120	74	>75% Grass cover, Good, HSG C
*	0.040	77	>75% Grass cover, Good, HSG C/D
*	0.480	98	IMPERVIOUS
	0.640	92	Weighted Average
	0.160		25.00% Pervious Area
	0.480		75.00% Impervious Area

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

Summary for Subcatchment ISO2: CB4 & 5

Runoff = 2.08 cfs @ 12.08 hrs, Volume= 7,032 cf, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	0.020	74	>75% Grass cover, Good, HSG C
*	0.010	77	>75% Grass cover, Good, HSG C/D
*	0.670	98	IMPERVIOUS
	0.700	97	Weighted Average
	0.030		4.29% Pervious Area
	0.670		95.71% Impervious Area

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

Summary for Subcatchment ISO3: Main Site (EXCLUDING: CB1-8, CB11-15, CB38-39, CB41, R2A-E)

Runoff = 12.10 cfs @ 12.39 hrs, Volume= 65,548 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
	166,617	55	Woods, Good, HSG B
	25,221	70	Woods, Good, HSG C
*	55,408	74	Woods, Good, HSG C/D
	133,206	61	>75% Grass cover, Good, HSG B
	58,632	74	>75% Grass cover, Good, HSG C
*	43,081	77	>75% Grass cover, Good, HSG C/D
	3,659	58	Meadow, non-grazed, HSG B
	35,240	71	Meadow, non-grazed, HSG C
*	3,964	75	Meadow, non-grazed, HSG C/D
*	236,095	98	IMPERVIOUS
	761,123	75	Weighted Average
	525,028		68.98% Pervious Area
	236,095		31.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	100	0.0500	0.17		**Sheet Flow, Grass Sheet Flow** Grass: Dense n= 0.240 P2= 3.09"
2.0	106	0.0310	0.88		**Shallow Concentrated Flow, Wodland SCF** Woodland Kv= 5.0 fps
1.3	100	0.0330	1.27		**Shallow Concentrated Flow, Grass SCF** Short Grass Pasture Kv= 7.0 fps
3.5	208	0.0400	1.00		**Shallow Concentrated Flow, Woods SCF** Woodland Kv= 5.0 fps
3.2	260	0.0380	1.36		**Shallow Concentrated Flow, Grass SCF** Short Grass Pasture Kv= 7.0 fps
4.2	439	0.1200	1.73		**Shallow Concentrated Flow, Woodland SCF** Woodland Kv= 5.0 fps
0.4	72	0.1800	2.97		**Shallow Concentrated Flow, Grass SCF** Short Grass Pasture Kv= 7.0 fps
1.3	580	0.0100	7.20	22.62	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
26.0	1,865	Total			

Summary for Subcatchment P5: CB6-8, CB11-15, CB38-39, CB41, R2A-E

Runoff = 5.81 cfs @ 12.08 hrs, Volume= 19,027 cf, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (ac)	CN	Description
	0.040	74	>75% Grass cover, Good, HSG C
*	0.200	77	>75% Grass cover, Good, HSG C/D
*	1.810	98	IMPERVIOUS
	2.050	95	Weighted Average
	0.240		11.71% Pervious Area
	1.810		88.29% Impervious Area

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

CULTEC Separator Row Sizing Tables (Imperial)

Maine DEP / ADS Equivalent Sizing (OK 110 Particle Distribution)

	80% TSS Flow Rate (Maine DEP)	Chamber Width	Installed Chamber Length	Bottom Area	Treatment Rate / Chamber
CONTACTOR 100HD	2.5 gpm/sf	3.00'	7.5'	22.50 s.f.	0.125 cfs
RECHARGER 150XLHD	2.5 gpm/sf	2.75'	10.25'	28.18 s.f.	0.157 cfs
RECHARGER 180HD	2.5 gpm/sf	3.00'	6.33'	18.99 s.f.	0.106 cfs
RECHARGER 280HD	2.5 gpm/sf	3.91'	7.00'	27.37 s.f.	0.152 cfs
RECHARGER 330XLHD	2.5 gpm/sf	4.33'	7.00'	31.31 s.f.	0.174 cfs
RECHARGER 360HD	2.5 gpm/sf	5.00'	3.67'	18.35 s.f.	0.102 cfs
RECHARGER 902HD	2.5 gpm/sf	6.50'	3.67'	23.86 s.f.	0.133 cfs

ETV (ETV / NJDEP Particle Distribution)

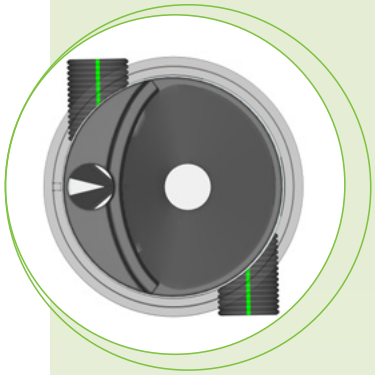
	80% TSS Flow Rate (ETV)	Chamber Width	Installed Chamber Length	Bottom Area	Treatment Rate / Chamber
CONTACTOR 100HD	1.0 gpm/sf	3.00'	7.5'	22.50 s.f.	0.050 cfs
RECHARGER 150XLHD	1.0 gpm/sf	2.75'	10.25'	28.18 s.f.	0.063 cfs
RECHARGER 180HD	1.0 gpm/sf	3.00'	6.33'	18.99 s.f.	0.042 cfs
RECHARGER 280HD	1.0 gpm/sf	3.91'	7.00'	27.37 s.f.	0.061 cfs
RECHARGER 330XLHD	1.0 gpm/sf	4.33'	7.00'	31.31 s.f.	0.070 cfs
RECHARGER 360HD	1.0 gpm/sf	5.00'	3.67'	18.35 s.f.	0.041 cfs
RECHARGER 902HD	1.0 gpm/sf	6.50'	3.67'	23.86 s.f.	0.053 cfs

BAYSAVER TECHNOLOGIES®

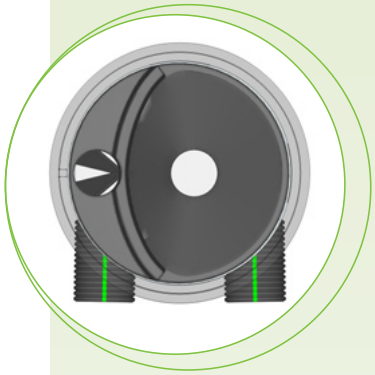
ADS®

Barracuda S4

The Barracuda S4 is a market-changing stormwater quality technology. This high performance vortex hydrodynamic separator is designed to remove total suspended solids in order to protect our precious receiving waters. The Barracuda is also an outstanding value that offers multiple pipe configurations, and quick installation.



Inline Configuration



Offline Configuration

FEATURES:

- Single manhole design
- No elevation loss between the inlet and outlet
- Flexible inlet/outlet positions (not just 180 degree orientation)
- Internal bypass for inline installation (where applicable)
- Revolutionary, patent pending “teeth” mitigate turbulence in the sump area to prevent resuspension of captured contaminants.

BENEFITS:

- Internal components are in stock for quick delivery.
- The S4 can be provided within a 48” ADS HP Manhole, to be factory fabricated and delivered complete to the jobsite.
- The S4 can also be installed in a standard 48” precast manhole. The Barracuda “teeth” apparatus is fabricated and designed for quick and easy field assembly.
- Designed for easy maintenance using a vacuum truck or similar equipment.
- Inspection and maintenance are performed from the surface with no confined space entry.

ADS Service: ADS representatives are committed to providing you with the answers to all your questions, including specifications, installation and more.

BARRACUDA S4 SPECIFICATION

MATERIALS AND DESIGN

- Concrete Structures: Designed for H-20 traffic loading and applicable soil loads or as otherwise determined by a Licensed Professional Engineer. The materials and structural design of the devices shall be per ASTM C857 and ASTM C858.
- 48" HP Manhole Structures: Made from an impact modified copolymer polypropylene meeting the material requirements of ASTM F2764. The eccentric cone reducer shall be manufactured from polyethylene material meeting ASTM D3350 cell class 213320C. Gaskets shall be made of material meeting the requirements of ASTM F477.
- Separator internals shall be substantially constructed of stainless steel, polyethylene or other thermoplastic material approved by the manufacturer.

PERFORMANCE

- The stormwater treatment unit shall be an inline unit capable of conveying 100% of the design peak flow. If peak flow rates exceed maximum hydraulic rate, the unit shall be installed offline.

- The Barracuda unit shall be designed to remove at least 80% of the suspended solids on an annual aggregate removal basis. Said removal shall be based on full-scale third party testing using OK-110 media gradation or equivalent and 300 mg/L influent concentration. Said full scale testing shall have included sediment capture based on actual total mass collected by the stormwater treatment unit.

  - OR -

  The Barracuda unit shall be designed to remove at least 50% of TSS using a media mix with d_{50}=75 micron and 200 mg/L influent concentration.

  - OR -

  The Barracuda unit shall be designed to remove at least 50% of TSS per current NJDEP/NJCAT HDS protocol .

- The stormwater treatment unit internals shall consist of (1) separator cone assembly, and (1) sump assembly which includes (4) legs with "teeth".

	Manhole Diameter	80% Removal OK-110	50% TSS per NJCAT	Max Hydraulic Rate
Barracuda S4	48"	1.08 CFS	1.25 CFS	6.25 CFS

INSTALLATION

Installation of the stormwater treatment unit(s) shall be performed per manufacturer's installation instructions. Such instructions can be obtained by calling Advanced Drainage Systems at (800) 821-6710 or by logging on to www.ads-pipe.com or www.baysaver.com.

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

BOGGS ENVIRONMENTAL CONSULTANTS

Middletown, MD & Morgantown, WV

Administrative Office:
200 W Main Street
Middletown, Maryland 21769

Office (301) 694-5687
Fax (301) 694-9799

BaySaver Technologies, LLC
1030 Deer Hollow Drive
Mount Airy, MD 21771
(301) 679-0640; dfigola@ads-pipe.com

November 1, 2017

ATTENTION: Daniel Figola, General Manager
REFERENCE: Third Party Review of Testing Procedures for Barracuda™ Separator at the Mid Atlantic Storm Water Research Center, 1207 Park Ridge Drive, Mount Airy, MD 21771

SUMMARY

Boggs Environmental Consultants, Inc. (BEC) was hired by Advanced Drainage Systems (ADS) in August of 2017, to serve as independent third-party oversight of the BaySaver Barracuda S4 Separator test unit for removal of sediment with equivalent particle size distribution to the industry standard OK-110. The BaySaver Barracuda S4 is a storm water treatment device with a Maximum Treatment Flow Rate (MTFR) of approximately 1.08 cubic feet per second (cfs) that removes suspended solids from storm water runoff, with an average removal efficiency of 80% at the MTFR and a feed concentration of 300 mg/L. The device is an insert that can be installed in either Polypropylene plastic pipe or concrete vault, and consists of a cone (vortex separator) and baffles ("teeth").

SCALED RESULTS

Testing flow rates ranged from 0.31 to 1.61 cfs, with a feed OK-110 concentration of 300 mg/L. Based upon New Jersey scaling methodology, the table below represents treatment and device information for the S4, S6, and S8 units.

Table 1: MTFR's and Sizing for BaySaver Barracuda Models

Model[1]	Man-hole Diam-eter[1] (ft)	OK110 80% TSS Maximum Treatment Flow Rate (cfs)	Treat-ment Area (ft^2)	Hydraulic Loading rate (gpm/ft^2)	Chamber Depth (ft)	Wet Volume (ft^3)	50% Maximum Sediment Storage[2] (ft^3)
Barracuda S4	4	1.08	12.57	38.6	6.83	75.4	10.47
Barracuda S6	6	2.43	28.27	38.6	6.83	169.7	23.56
Barracuda S8	8	4.32	50.27	38.6	11.03	512.7	41.89

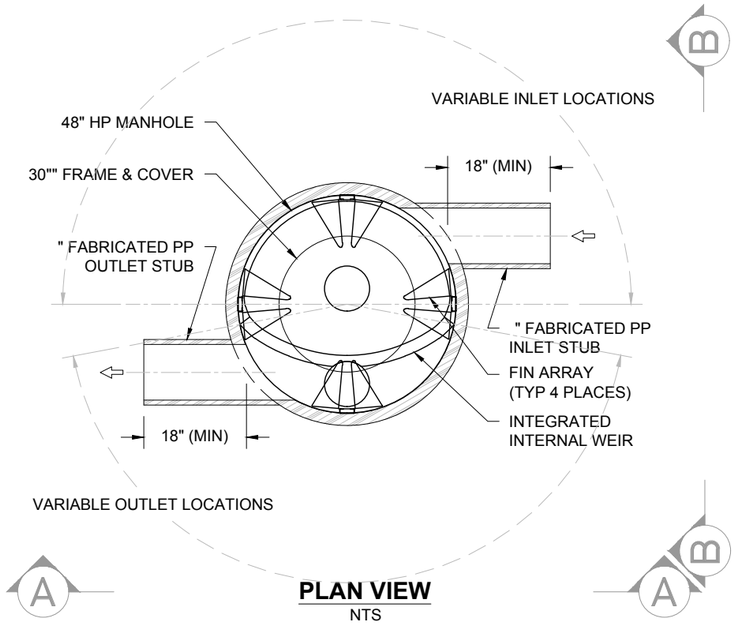
Notes:
1. In some areas, Barracuda units are available in additional diameters. Units not listed here are sized not to exceed 38.6 gpm/ft^2 of effective treatment during the peak water quality flow.
2. 50% Sediment Storage Capacity is equal to manhole diameter x 10 inches of sediment depth. Each Barracuda unit has a 20 inches deep sediment sump.

Should you have any questions, contact our office at your earliest convenience.

Sincerely,
BOGGS ENVIRONMENTAL CONSULTANTS, INC.

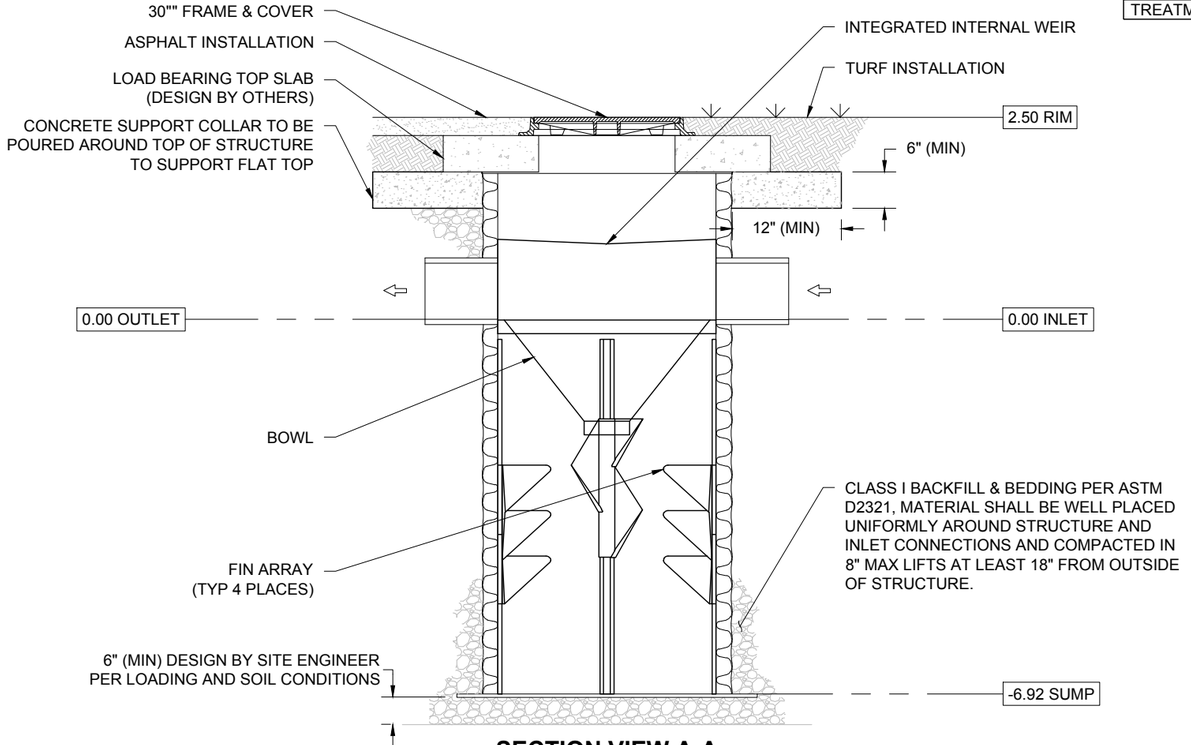
William R. Warfel
Principal Environmental Scientist

Robin J. Maliszewskyj
Chemical Engineer

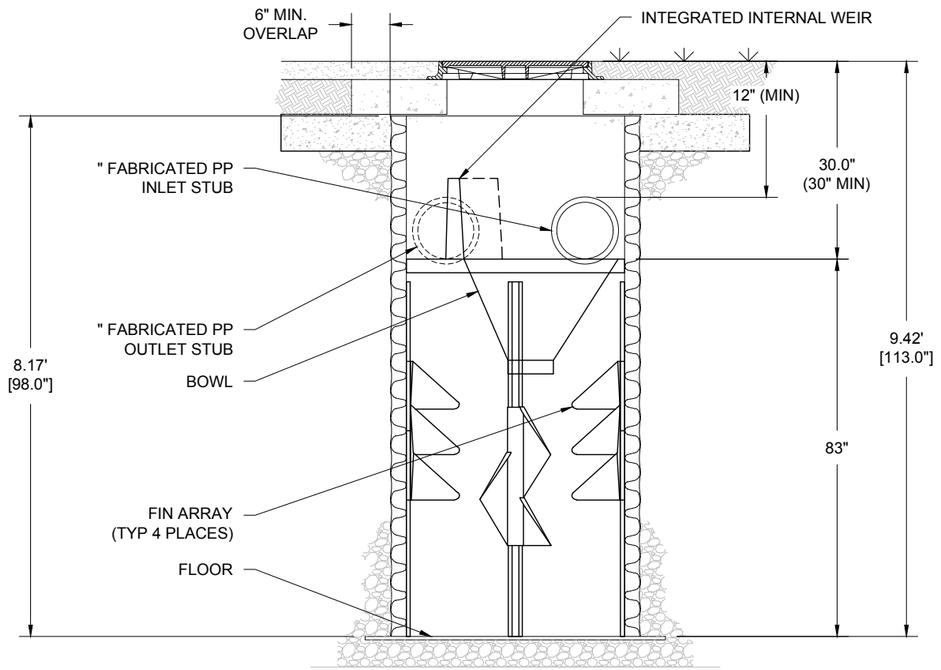


PLAN VIEW
NTS

BARRACUDA S4	
UNIT ID	BMP#1
PEAK FLOW RATE (CFS)	
TREATMENT FLOW RATE (CFS)	1.25 CFS



SECTION VIEW A-A
NTS



SECTION VIEW B-B
NTS

BARRACUDA S4 HP
STANDARD DETAIL

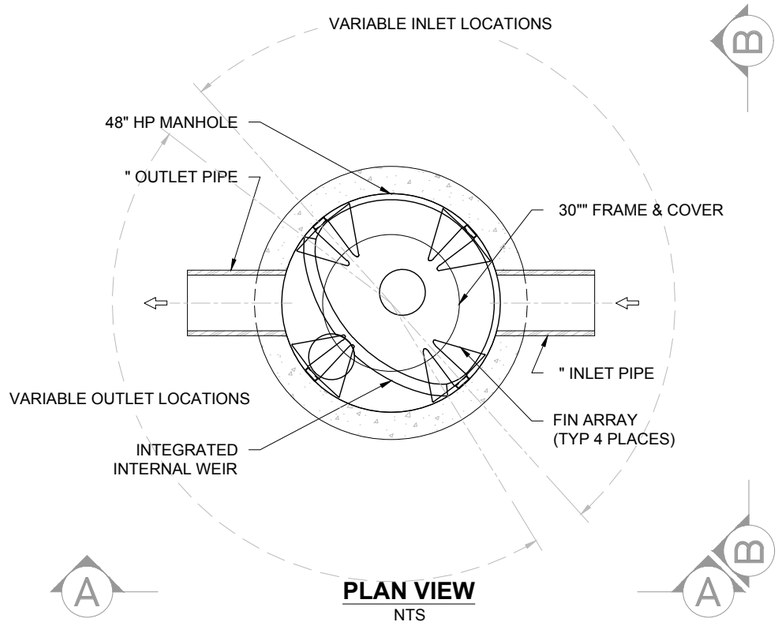
DATE: 10/20/17 DRAWN: EKH
PROJECT #: CHECKED: ----

REV	DWN	CKD	DESCRIPTION

1030 Deer Hollow Drive
Mount Airy, MD 21771
1-800-BAYSAVER
1-800-229-7283
barracuda

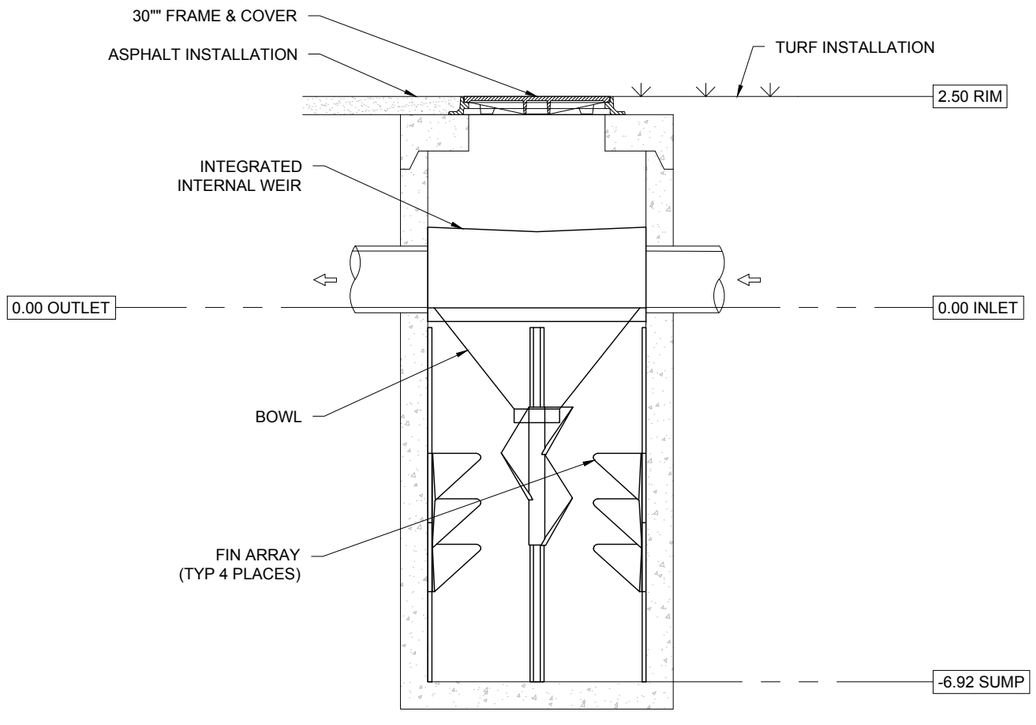
4640 TRUEMAN BLVD
HILLIARD, OH 43026
ADS® ADVANCED DRAINAGE SYSTEMS, INC.

NOT TO SCALE

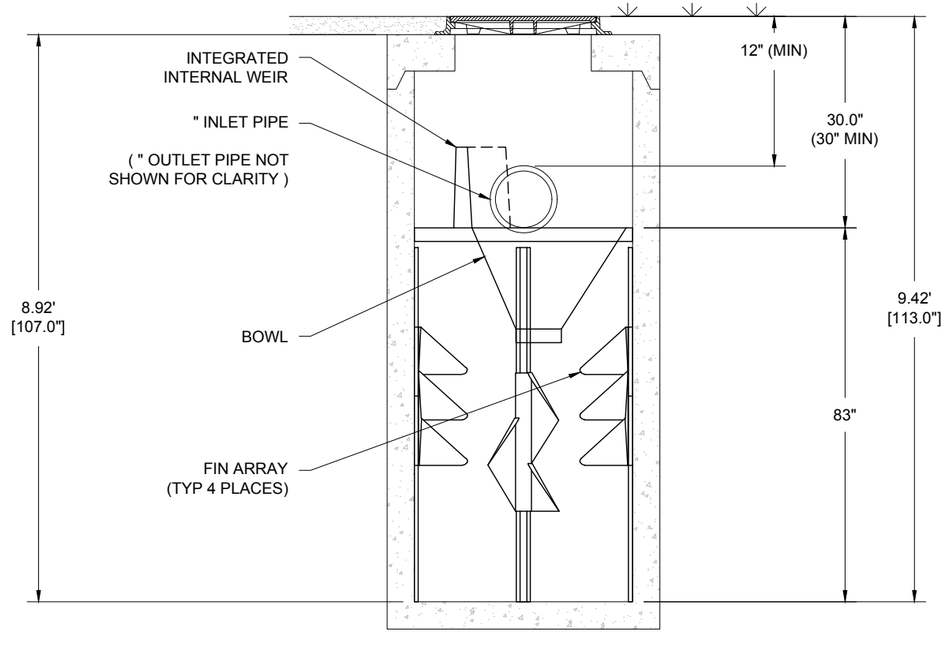


PLAN VIEW
NTS

BARRACUDA S4	
UNIT ID	BMP#1
PEAK FLOW RATE (CFS)	
TREATMENT FLOW RATE (CFS)	1.25 CFS



SECTION VIEW A-A
NTS



SECTION VIEW B-B
NTS

BARRACUDA S4
STANDARD DETAIL

DATE: 10/20/17
DRAWN: EKH
PROJECT #:
CHECKED: ----

REV	DWN	CKD	DESCRIPTION

1030 Deer Hollow Drive
Mount Airy, MD 21771
1-800-BAYSAVER
1-800-229-7283
barracuda

4640 TRUEMAN BLVD
HILLIARD, OH 43026
ADS
ADVANCED DRAINAGE SYSTEMS, INC.

NOT TO SCALE

Maintenance Guide

BaySaver Barracuda™

July 2017

One of the advantages of the BaySaver Barracuda is the ease of maintenance. Like any system that collects pollutants, the BaySaver Barracuda must be maintained for continued effectiveness. Maintenance is a simple procedure performed using a vacuum truck or similar equipment. The systems were designed to minimize the volume of water removed during routine maintenance, reducing disposal costs.

Contractors can access the pollutants stored in the manhole through the manhole cover. This allows them to gain vacuum hose access to the bottom of the manhole to remove sediment and trash. There is no confined space entry necessary for inspection or maintenance.

The entire maintenance procedure typically takes from 2 to 4 hours, depending on the size of the system, the captured material, and the capacity of the vacuum truck.

Local regulations may apply to the maintenance procedure. Safe and legal disposal of pollutants is the responsibility of the maintenance contractor. Maintenance should be performed only by a qualified contractor.

Inspection and Cleaning Cycle

Periodic inspection is needed to determine the need for and frequency of maintenance. You should begin inspecting as soon as construction is complete and thereafter on an annual basis. Typically, the system needs to be cleaned every 1-3 years.

Excessive oils, fuels or sediments may reduce the maintenance cycle. Periodic inspection is important.

Determining When to Clean

To determine the sediment depth, the maintenance contractor should lower a stadia rod into the manhole until it contacts the top of the captured sediment and mark that spot on the rod. Then push the probe through to the bottom of the sump and mark that spot to determine sediment depth.

Maintenance should occur when the sediment has reached the levels indicated in the Storage Capacity Chart.

BaySaver Barracuda Storage Capacities

Model	Manhole Diameter	Treatment Chamber Capacity	Standard Sediment Capacity (20" depth)	NJDEP Sediment Capacity (50% of standard depth)
S3	36"	212 gallons	0.44 cubic yards	0.22 cubic yards
S4	48"	564 gallons	0.78 cubic yards	0.39 cubic yards
S5	60"	881 gallons	1.21 cubic yards	0.61 cubic yards
S6	72"	1269 gallons	1.75 cubic yards	0.88 cubic yards
S8	96"	3835 gallons	3.10 cubic yards	1.55 cubic yards
S10	120"	7496 gallons	4.85 cubic yards	2.43 cubic yards

Maintenance Instructions

1. Remove the manhole cover to provide access to the pollutant storage. Pollutants are stored in the sump, below the bowl assembly visible from the surface. You'll access this area through the 10" diameter access cylinder.

2. Use a vacuum truck or other similar equipment to remove all water, debris, oils and sediment. See figure 1.
3. Use a high pressure hose to clean the manhole of all the remaining sediment and debris. Then, use the vacuum truck to remove the water.
4. Fill the cleaned manhole with water until the level reaches the invert of the outlet pipe.
5. Replace the manhole cover.
6. Dispose of the polluted water, oils, sediment and trash at an approved facility.
   - Local regulations prohibit the discharge of solid material into the sanitary system. Check with the local sewer authority for authority to discharge the liquid.
   - Some localities treat the pollutants as leachate. Check with local regulators about disposal requirements.
   - Additional local regulations may apply to the maintenance procedure.

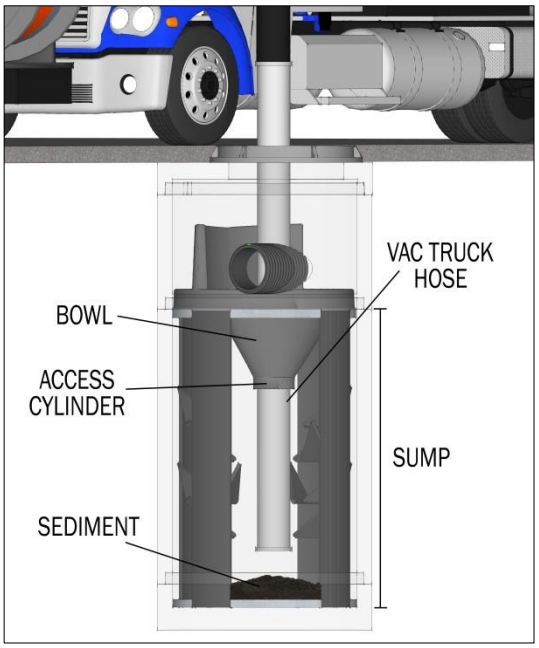
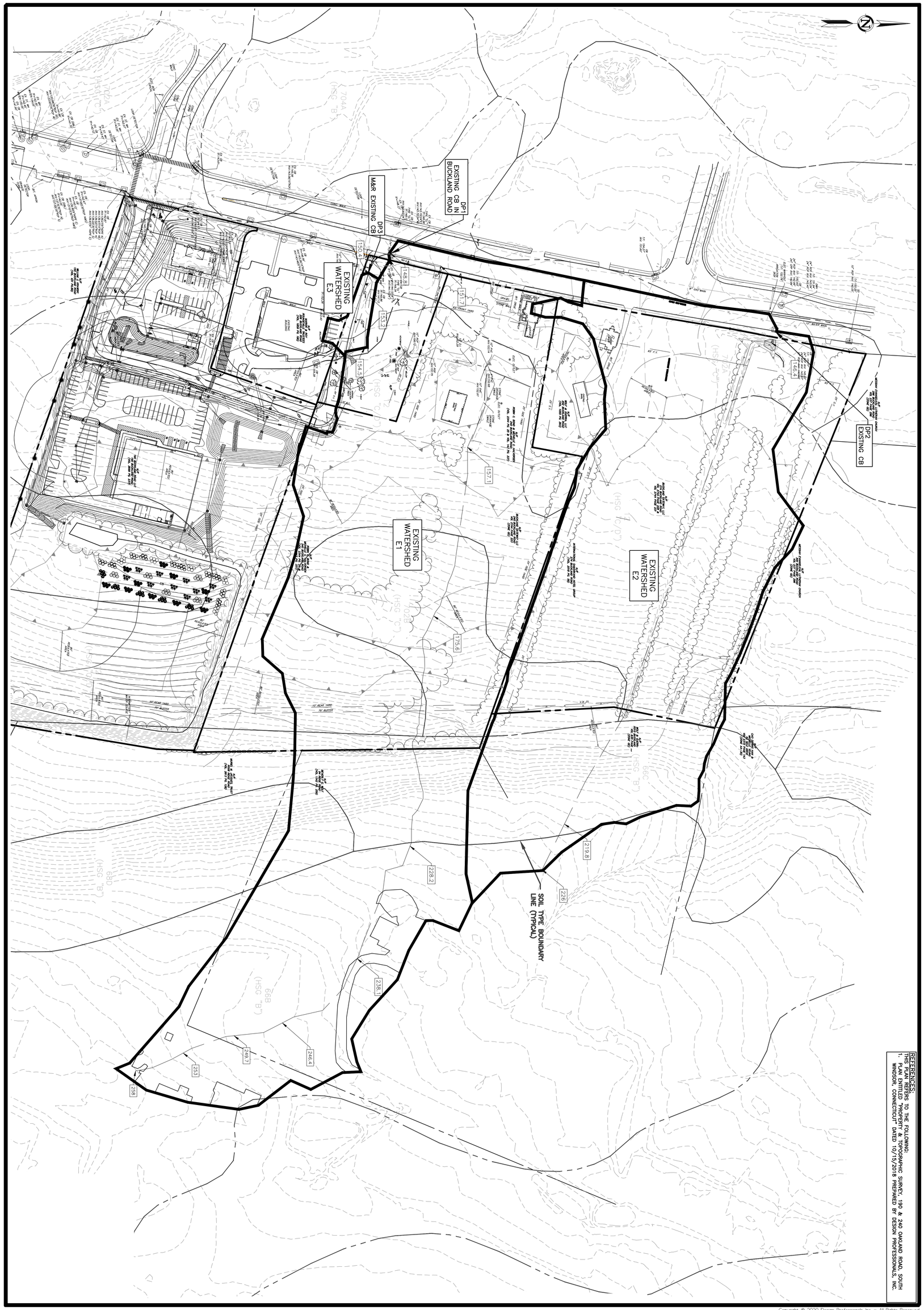


Figure 1

APPENDIX F
Drainage Area Maps



REFERENCES:
1. BOUNDARY INFORMATION IS TAKEN FROM A PLAN ENTITLED "PROPERTY & TOPOGRAPHIC SURVEY, 190 & 240 OAKLAND ROAD, SOUTH WINDSOR, CONNECTICUT" DATED 10/15/2018 PREPARED BY DESIGN PROFESSIONALS, INC.

SHEET C-DA1 SHEET 1 OF 2

EXISTING DRAINAGE AREA MAP

SCALE: 1" = 80' (0, 40', 80', 160')

NO.	DATE	REVISIONS	BY
1	5/22/20	UGC-1 AND STORM DRAINAGE LAYOUT UPDATES	DHJ

THE GATEWAY
SITE PLAN
220, 245, 265 & 270 GATEWAY BLVD.
SOUTH WINDSOR, CT
#15300190, #15300218, #15300240 & #15300274

PROJECT NO.: 3530.M
DATE: 5/13/2020
DESIGN BY: BPW
DRAWN BY: DHJ
CHECKED BY: BPW

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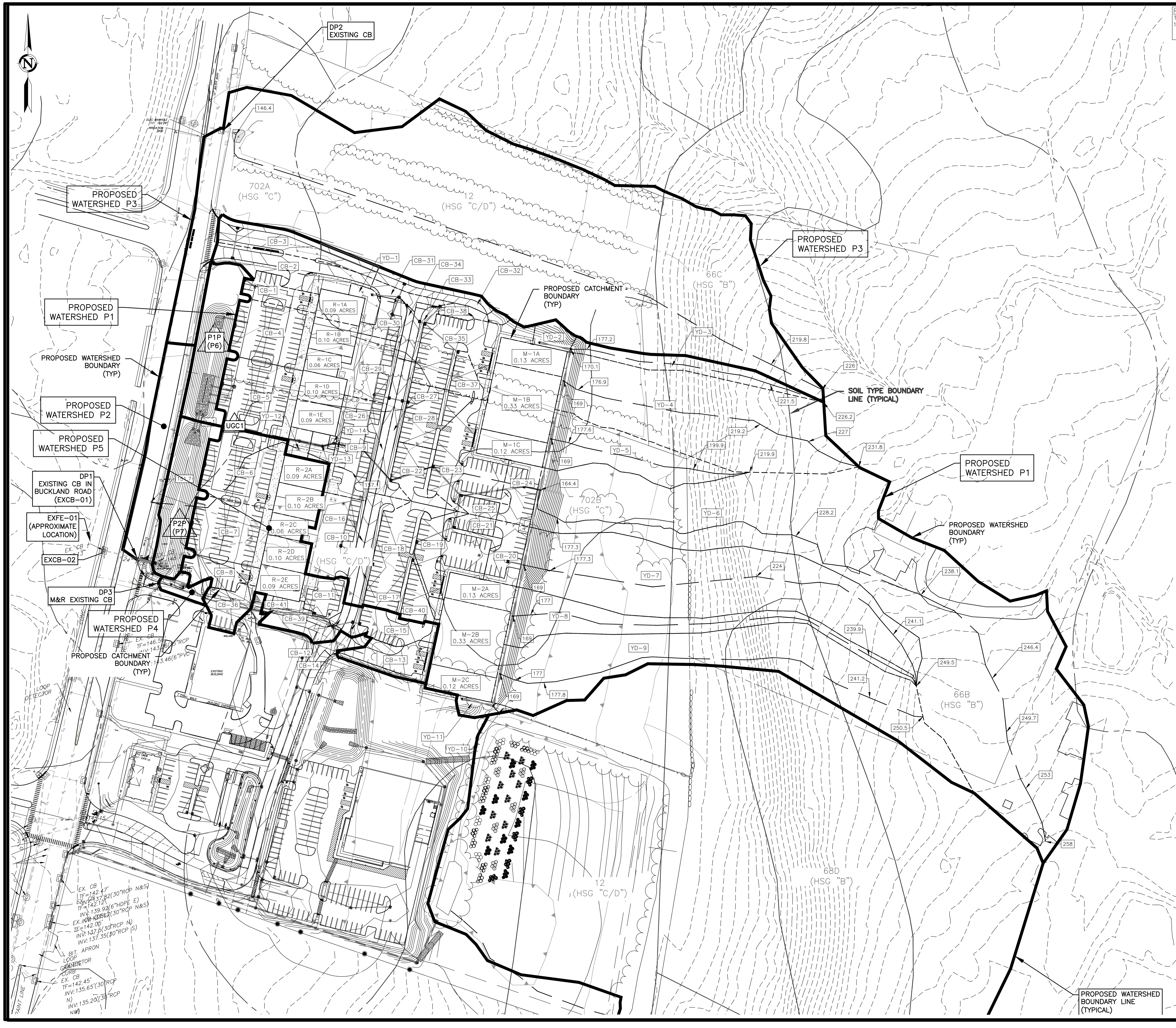

REFERENCES:

THIS PLAN REFERS TO THE FOLLOWING:

1. PLAN ENTITLED "PROPERTY & TOPOGRAPHIC SURVEY, 190 & 240 OAKLAND ROAD, SOUTH WINDSOR, CONNECTICUT" DATED 10/15/2018 PREPARED BY DESIGN PROFESSIONALS, INC.

CB#1	TOTAL AREA = 0.13 ACRES GRASS: 0.01 ACRES IMPERVIOUS: 0.12 ACRES C=0.85 Tc= 6 MINUTES	CB#30	TOTAL AREA = 0.10 ACRES GRASS: 0.02 ACRES IMPERVIOUS: 0.08 ACRES C=0.78 Tc= 7 MINUTES
CB#2	TOTAL AREA = 0.27 ACRES GRASS: 0.06 ACRES IMPERVIOUS: 0.21 ACRES C=0.77 Tc= 7 MINUTES	CB#31	TOTAL AREA = 0.06 ACRES IMPERVIOUS: 0.06 ACRES C=0.90 Tc= 6 MINUTES
CB#3	TOTAL AREA = 0.24 ACRES GRASS: 0.09 ACRES IMPERVIOUS: 0.15 ACRES C=0.68 Tc= 8 MINUTES	CB#32	TOTAL AREA = 0.11 ACRES GRASS: 0.05 ACRES IMPERVIOUS: 0.06 ACRES C=0.63 Tc= 8 MINUTES
CB#4	TOTAL AREA = 0.32 ACRES GRASS: 0.01 ACRES IMPERVIOUS: 0.31 ACRES C=0.88 Tc= 6 MINUTES	CB#33	TOTAL AREA = 0.03 ACRES IMPERVIOUS: 0.03 ACRES C=0.90 Tc= 6 MINUTES
CB#5	TOTAL AREA = 0.38 ACRES GRASS: 0.02 ACRES IMPERVIOUS: 0.36 ACRES C=0.87 Tc= 6 MINUTES	CB#34	TOTAL AREA = 0.06 ACRES GRASS: 0.02 ACRES IMPERVIOUS: 0.04 ACRES C=0.70 Tc= 7 MINUTES
CB#6	TOTAL AREA = 0.38 ACRES GRASS: 0.02 ACRES IMPERVIOUS: 0.36 ACRES C=0.87 Tc= 6 MINUTES	CB#35	TOTAL AREA = 0.36 ACRES GRASS: 0.09 ACRES IMPERVIOUS: 0.27 ACRES C=0.75 Tc= 7 MINUTES
CB#7	TOTAL AREA = 0.33 ACRES GRASS: 0.02 ACRES IMPERVIOUS: 0.31 ACRES C=0.86 Tc= 6 MINUTES	CB#36	TOTAL AREA = 0.12 ACRES GRASS: 0.04 ACRES IMPERVIOUS: 0.08 ACRES C=0.70 Tc= 7 MINUTES
CB#8	TOTAL AREA = 0.14 ACRES GRASS: 0.01 ACRES IMPERVIOUS: 0.13 ACRES C=0.86 Tc= 6 MINUTES	CB#37	TOTAL AREA = 0.09 ACRES GRASS: 0.01 ACRES IMPERVIOUS: 0.08 ACRES C=0.83 Tc= 6 MINUTES
CB#9	TOTAL AREA = 0.31 ACRES GRASS: 0.05 ACRES IMPERVIOUS: 0.26 ACRES C=0.80 Tc= 6 MINUTES	CB#38	TOTAL AREA = 0.06 ACRES GRASS: 0.03 ACRES IMPERVIOUS: 0.03 ACRES C=0.60 Tc= 8 MINUTES
CB#10	TOTAL AREA = 0.30 ACRES GRASS: 0.03 ACRES IMPERVIOUS: 0.27 ACRES C=0.84 Tc= 6 MINUTES	CB#39	TOTAL AREA = 0.13 ACRES GRASS: 0.03 ACRES IMPERVIOUS: 0.10 ACRES C=0.76 Tc= 7 MINUTES
CB#11	TOTAL AREA = 0.11 ACRES GRASS: 0.02 ACRES IMPERVIOUS: 0.09 ACRES C=0.79 Tc= 6 MINUTES	CB#40	TOTAL AREA = 0.09 ACRES IMPERVIOUS: 0.09 ACRES C=0.90 Tc= 6 MINUTES
CB#12	TOTAL AREA = 0.03 ACRES GRASS: 0.01 ACRES IMPERVIOUS: 0.02 ACRES C=0.70 Tc= 7 MINUTES	CB#41	TOTAL AREA = 0.01 ACRES IMPERVIOUS: 0.01 ACRES C=0.90 Tc= 6 MINUTES
CB#13	TOTAL AREA = 0.18 ACRES GRASS: 0.05 ACRES IMPERVIOUS: 0.13 ACRES C=0.73 Tc= 7 MINUTES	YD#1	TOTAL AREA = 0.05 ACRES GRASS: 0.04 ACRES IMPERVIOUS: 0.01 ACRES C=0.42 Tc= 8 MINUTES
CB#14	TOTAL AREA = 0.04 ACRES GRASS: 0.02 ACRES IMPERVIOUS: 0.02 ACRES C=0.60 Tc= 8 MINUTES	YD#2	TOTAL AREA = 0.07 ACRES GRASS: 0.07 ACRES C=0.30 Tc= 8 MINUTES
CB#15	TOTAL AREA = 0.14 ACRES GRASS: 0.02 ACRES IMPERVIOUS: 0.12 ACRES C=0.81 Tc= 6 MINUTES	YD#3	TOTAL AREA = 0.23 ACRES GRASS: 0.02 ACRES WOODS: 0.11 ACRES MEADOW: 0.10 ACRES C=0.21 Tc= 16.4 MINUTES
CB#16	TOTAL AREA = 0.03 ACRES IMPERVIOUS: 0.03 ACRES C=0.90 Tc= 6 MINUTES	YD#4	TOTAL AREA = 1.51 ACRES GRASS: 0.54 ACRES WOODS: 0.58 ACRES MEADOW: 0.39 ACRES C=0.23 Tc= 14.1 MINUTES
CB#17	TOTAL AREA = 0.11 ACRES GRASS: 0.03 ACRES IMPERVIOUS: 0.08 ACRES C=0.74 Tc= 7 MINUTES	YD#5	TOTAL AREA = 0.49 ACRES GRASS: 0.10 ACRES WOODS: 0.21 ACRES MEADOW: 0.18 ACRES C=0.22 Tc= 11.2 MINUTES
CB#18	TOTAL AREA = 0.34 ACRES GRASS: 0.05 ACRES IMPERVIOUS: 0.29 ACRES C=0.81 Tc= 6 MINUTES	YD#6	TOTAL AREA = 4.58 ACRES GRASS: 1.84 ACRES IMPERVIOUS: 0.50 ACRES WOODS: 1.91 ACRES MEADOW: 0.33 ACRES C=0.30 Tc= 24.7 MINUTES
CB#19	TOTAL AREA = 0.31 ACRES GRASS: 0.05 ACRES IMPERVIOUS: 0.26 ACRES C=0.80 Tc= 6 MINUTES	YD#7	TOTAL AREA = 1.82 ACRES GRASS: 0.88 ACRES WOODS: 0.94 ACRES C=0.22 Tc= 18.5 MINUTES
CB#20	TOTAL AREA = 0.14 ACRES GRASS: 0.03 ACRES IMPERVIOUS: 0.11 ACRES C=0.77 Tc= 6 MINUTES	YD#8	TOTAL AREA = 0.57 ACRES GRASS: 0.19 ACRES WOODS: 0.38 ACRES C=0.20 Tc= 18.1 MINUTES
CB#21	TOTAL AREA = 0.05 ACRES IMPERVIOUS: 0.05 ACRES C=0.90 Tc= 6 MINUTES	YD#9	TOTAL AREA = 1.72 ACRES GRASS: 0.18 ACRES WOODS: 1.54 ACRES C=0.17 Tc= 18 MINUTES
CB#22	TOTAL AREA = 0.16 ACRES GRASS: 0.02 ACRES IMPERVIOUS: 0.14 ACRES C=0.83 Tc= 6 MINUTES	YD#10	TOTAL AREA = 0.01 ACRES GRASS: 0.01 ACRES C=0.30 Tc= 8 MINUTES
CB#23	TOTAL AREA = 0.38 ACRES GRASS: 0.07 ACRES IMPERVIOUS: 0.31 ACRES C=0.79 Tc= 6 MINUTES	YD#11	TOTAL AREA = 0.05 ACRES GRASS: 0.05 ACRES C=0.30 Tc= 8 MINUTES
CB#24	TOTAL AREA = 0.14 ACRES GRASS: 0.03 ACRES IMPERVIOUS: 0.11 ACRES C=0.77 Tc= 6 MINUTES	YD#12	TOTAL AREA = 0.05 ACRES GRASS: 0.01 ACRES IMPERVIOUS: 0.04 ACRES C=0.78 Tc= 6 MINUTES
CB#25	TOTAL AREA = 0.05 ACRES IMPERVIOUS: 0.05 ACRES C=0.90 Tc= 6 MINUTES	YD#13	TOTAL AREA = 0.04 ACRES GRASS: 0.01 ACRES IMPERVIOUS: 0.03 ACRES C=0.75 Tc= 6 MINUTES
CB#26	TOTAL AREA = 0.08 ACRES IMPERVIOUS: 0.08 ACRES C=0.90 Tc= 6 MINUTES	YD#14	TOTAL AREA = 0.01 ACRES GRASS: 0.01 ACRES C=0.30 Tc= 6 MINUTES
CB#27	TOTAL AREA = 0.13 ACRES GRASS: 0.04 ACRES IMPERVIOUS: 0.09 ACRES C=0.72 Tc= 7 MINUTES		
CB#28	TOTAL AREA = 0.21 ACRES GRASS: 0.02 ACRES IMPERVIOUS: 0.19 ACRES C=0.84 Tc= 6 MINUTES		
CB#29	TOTAL AREA = 0.21 ACRES GRASS: 0.02 ACRES IMPERVIOUS: 0.19 ACRES C=0.84 Tc= 6 MINUTES		

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REVISIONS

NO.	DATE		BY
1	5/22/20	UGC-1 AND STORM DRAINAGE LAYOUT UPDATES	DHI
2	7/8/20	GRADING CHANGES AND TOWN COMMENTS	DHI

PROJECT NO. 3530.M
DATE: 5/4/2020
DESIGN BY: BPW
DRAWN BY: DHI
CHECKED BY: BPW

PROPOSED DRAINAGE AREA MAP

SCALE: 1" = 100'

SHEET

C-DA2

SHEET 2 OF 2