



**Kabil Associates**

*Engineers Architects Planners*

5900 Sharon Woods Blvd Suite B

Columbus, Ohio 43229

614-899-6707

Received By:

Grove City Development

Date: 02/22/2022

# EXISTING CHURCH BUILDING ADDITION

BEAUTIFUL SAVIOR EVANGELICAL LUTHERAN CHURCH  
2213 WHITE ROAD  
GROVE CITY, OH 43123

STORM WATER MANAGEMENT REPORT  
October 28, 2021



*Shashikant Savla*

Shashikant Savla

38864

No.

10/28/2021

Date



## ***Kabil Associates***

*Engineers Architects Planners*

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### **NARRATIVE SUMMARY:**

The project consists of a 9,500 Sf building expansion to an existing church and education center. The building expansion includes areas that were previously used for parking and open grass area. The existing parking area is proposed to be adjusted and expanded to maintain the existing number of parking spaces.

The property contains an existing private storm sewer and storm water detention area that will be adjusted and resized accordingly to the proposed site condition as part of the proposed construction plan. The existing detention system is made up of a small depression that receives overland flow from the adjacent area and drains via a 12" pipe into an existing detention basin. The existing detention basin receives piped flow from the western half of the property along with roof drains from the building. The existing detention basin drains into a rock lined swale that drains to an existing storm sewer.

The proposed storm water management system expands the existing depression into a forebay for the existing detention basin that provides the required post construction storm water quality volume and quality release control structure on the existing 12" pipe draining to the existing detention basin. The pipe flow to the existing basin is rerouted to the proposed forebay by a proposed pipe and an orifice plate placed on the outlet pipe at existing structure G. The proposed system layout provides water quality storage and release in the proposed forebay and maintains the existing detention basin for water quantity control.

### **SITE DATA:**

Property Area:	4.12 Acres
Existing Impervious Area:	1.41 Acres
Existing Percent Impervious:	34%
Disturbed Area:	0.98 Acres
Proposed Impervious Area:	1.69 Acres
Proposed Percent Impervious:	41%

### **CRITICAL STORM:**

Existing 1 year storm event runoff:	0.176 af
Proposed 1 year storm event runoff:	0.205 af
Percent Increase:	16%
Critical Storm:	2-year storm event

### **EXISTING TRIBUTARY AREA:**

1. Existing storm sewer along White Road:	0.29 Acres
2. Existing storm sewer along west property line:	0.57 Acres
3. Existing onsite structure H:	0.88 Acres
4. Existing detention basin:	2.38 Acres

Areas 1 and 2 are not disturbed by the proposed construction. Existing drainage and sewer will remain the same. The proposed site reroutes 0.16 acres from area 3 to area 4.

### **PROPOSED TRIBUTARY AREA:**

3. Existing onsite structure H:	0.72 Acres
4. Proposed detention basin:	2.54 Acres



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### PROPOSED DETENTION BASIN RELEASE:

STORM	Existing Runoff	Proposed Runoff	Allowable Release	Detention Basin Site Release Structure		
	Q (cfs)	Q (CFS)	MAX Q (cfs)	Q (cfs)	ELEV (ft)	VOL (CF)
1	2.72	2.91	2.72	0.65	792.91	73
2	3.76	4.01	2.72	1.67	793.2	310
5	5.35	5.7	5.35	2.72	793.52	1106
10	6.71	7.16	6.71	3.19	793.71	1831
25	8.68	9.27	8.68	3.63	793.92	2759
50	10.36	11.06	10.36	3.9	794.07	3490
100	12.17	12.99	12.17	4.15	794.2	4228

### POST CONSTRUCTION WATER QUALITY:

The proposed site plan reconstructs the existing forebay and provides a water quality release device designed and sized to draw down the water quality volume over 48 hours. The water quality volume was calculated using the entire site area (4.12 Acres).

$$WQv = Rv * P * A / 12 = 0.419 * 0.90 * (4.12) / 12 = 0.129 \text{ af}$$

The project is a redevelopment project so the WQv is 20% of the calculated (0.026 af) plus 20% for sedimentation = 0.30 af (1,354 CF). The proposed forebay provides the required storage volume at an elevation of 794.50 feet.



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CRITICAL STORM HYDROGRAPHS:

**Site**

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EXISTING 4.12 AC SITE  
Type II 24-hr 1 YEAR Rainfall=1.88"

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Page 1

**Summary for Subcatchment 2S: Existing Site**

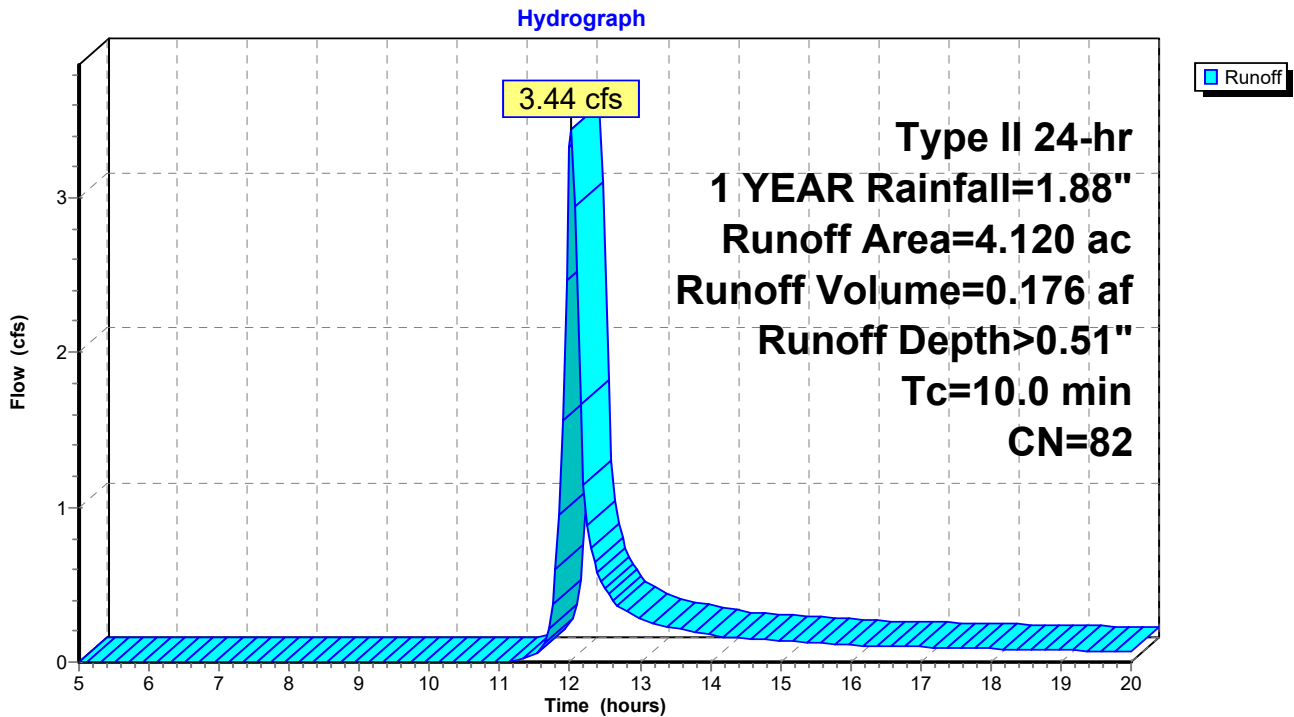
Runoff = 3.44 cfs @ 12.03 hrs, Volume= 0.176 af, Depth> 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1 YEAR Rainfall=1.88"

Area (ac)	CN	Description
1.410	98	Paved parking, HSG C
2.710	74	>75% Grass cover, Good, HSG C
4.120	82	Weighted Average
2.710		65.78% Pervious Area
1.410		34.22% Impervious Area

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

**Subcatchment 2S: Existing Site**



**Site**

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PROPOSED 4.12 AC SITE  
Type II 24-hr 1 YEAR Rainfall=1.88"

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Page 1

**Summary for Subcatchment 1P: Proposed Site**

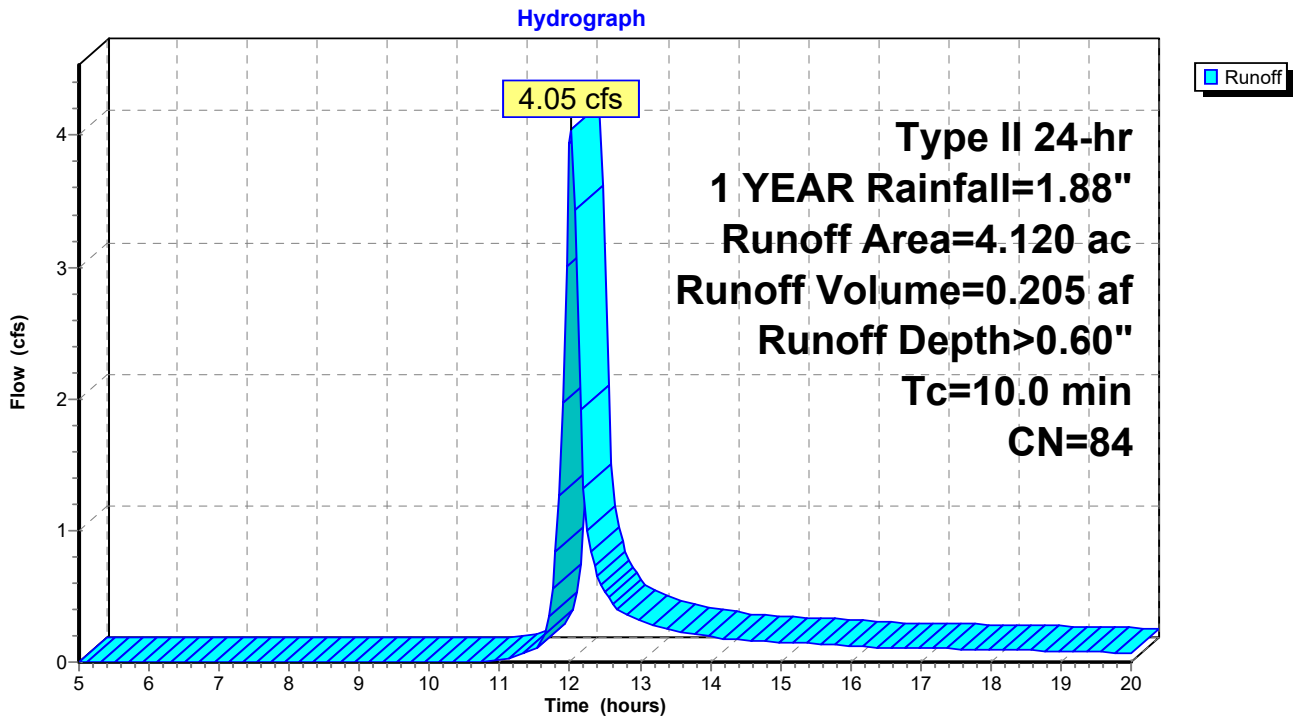
Runoff = 4.05 cfs @ 12.02 hrs, Volume= 0.205 af, Depth> 0.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1 YEAR Rainfall=1.88"

Area (ac)	CN	Description
1.690	98	Paved parking, HSG C
2.430	74	>75% Grass cover, Good, HSG C
4.120	84	Weighted Average
2.430		58.98% Pervious Area
1.690		41.02% Impervious Area

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

**Subcatchment 1P: Proposed Site**





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EXISTING TRIBUTARY HYDROGRAPHS

# Basin

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EXISTING TRIBUTARY AREA  
Type II 24-hr 1 YEAR Rainfall=1.88"

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Page 1

## Summary for Subcatchment 1E: Existing

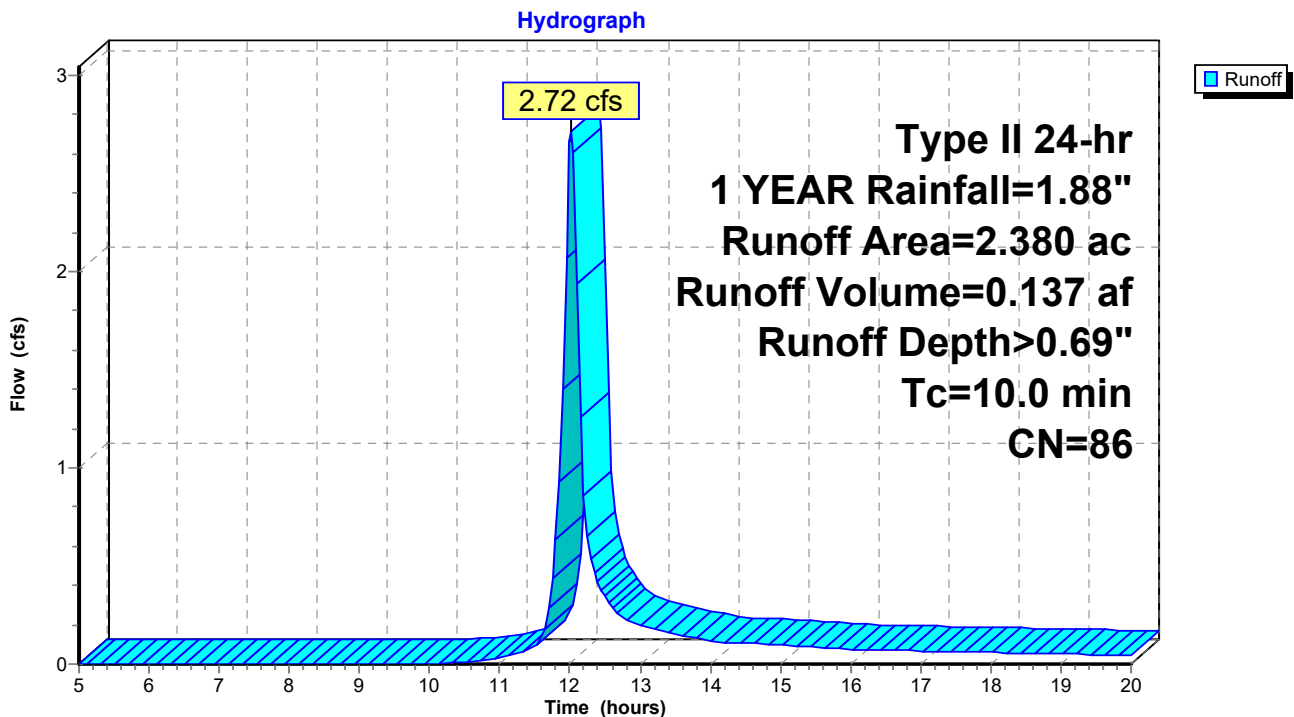
Runoff = 2.72 cfs @ 12.02 hrs, Volume= 0.137 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1 YEAR Rainfall=1.88"

Area (ac)	CN	Description
0.930	98	Paved parking, HSG C
1.450	79	50-75% Grass cover, Fair, HSG C
2.380	86	Weighted Average
1.450		60.92% Pervious Area
0.930		39.08% Impervious Area

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

## Subcatchment 1E: Existing





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EXISTING TRIBUTARY AREA  
Type II 24-hr 2 YEAR Rainfall=2.25"

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**Summary for Subcatchment 1E: Existing**

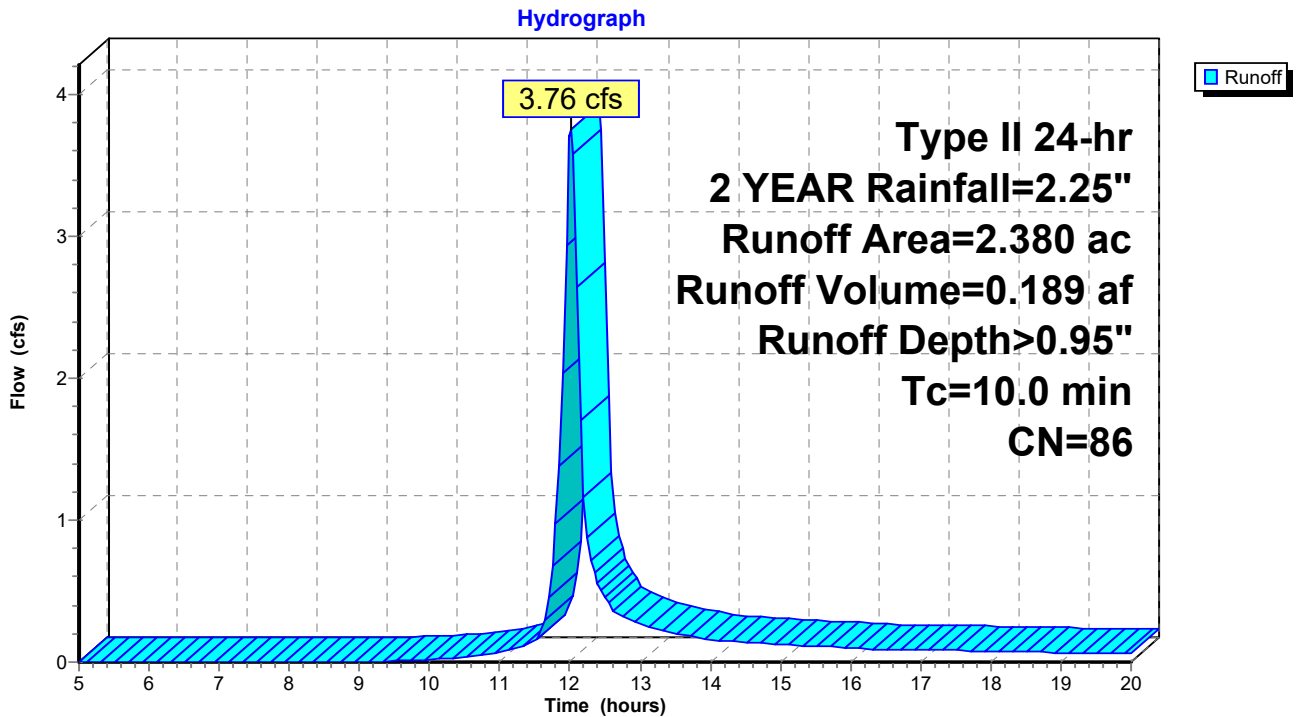
Runoff = 3.76 cfs @ 12.02 hrs, Volume= 0.189 af, Depth> 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2 YEAR Rainfall=2.25"

Area (ac)	CN	Description
0.930	98	Paved parking, HSG C
1.450	79	50-75% Grass cover, Fair, HSG C
2.380	86	Weighted Average
1.450		60.92% Pervious Area
0.930		39.08% Impervious Area

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

**Subcatchment 1E: Existing**



# Basin

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EXISTING TRIBUTARY AREA  
Type II 24-hr 5 YEAR Rainfall=2.79"

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Page 3

## Summary for Subcatchment 1E: Existing

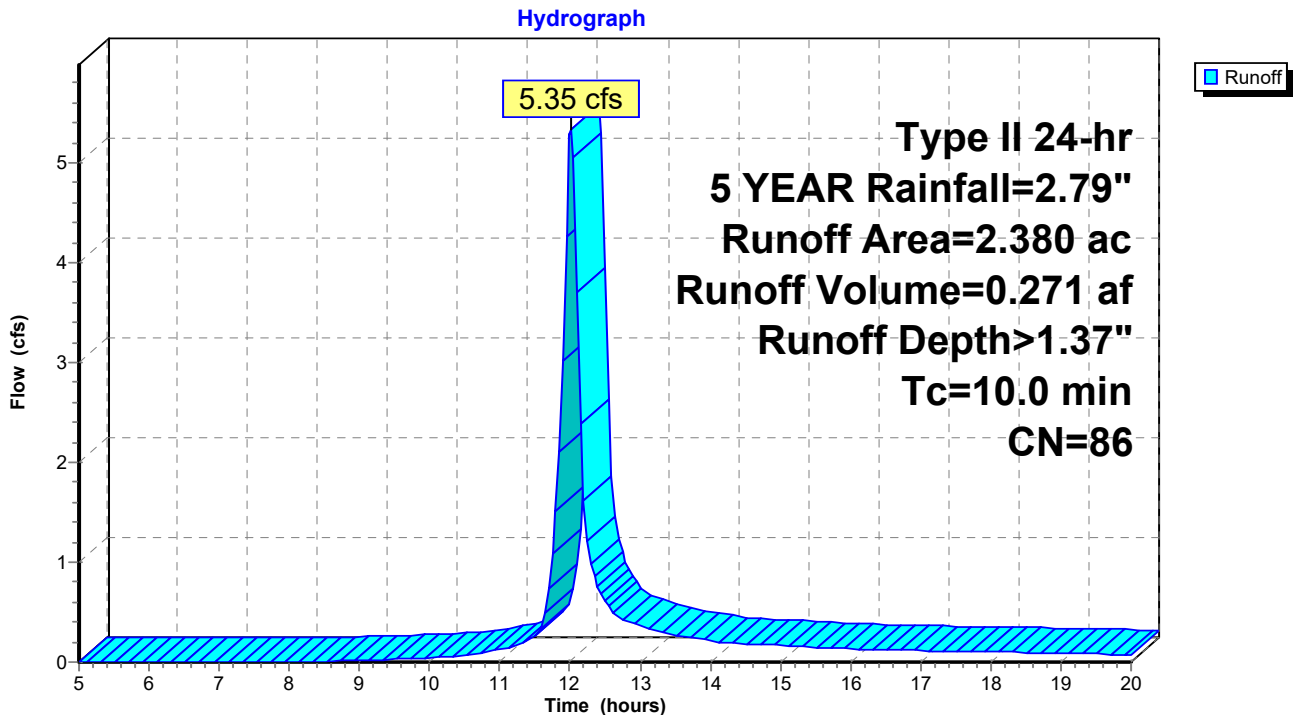
Runoff = 5.35 cfs @ 12.02 hrs, Volume= 0.271 af, Depth> 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 5 YEAR Rainfall=2.79"

Area (ac)	CN	Description
0.930	98	Paved parking, HSG C
1.450	79	50-75% Grass cover, Fair, HSG C
2.380	86	Weighted Average
1.450		60.92% Pervious Area
0.930		39.08% Impervious Area

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

## Subcatchment 1E: Existing



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EXISTING TRIBUTARY AREA  
Type II 24-hr 10 YEAR Rainfall=3.24"

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Page 4

**Summary for Subcatchment 1E: Existing**

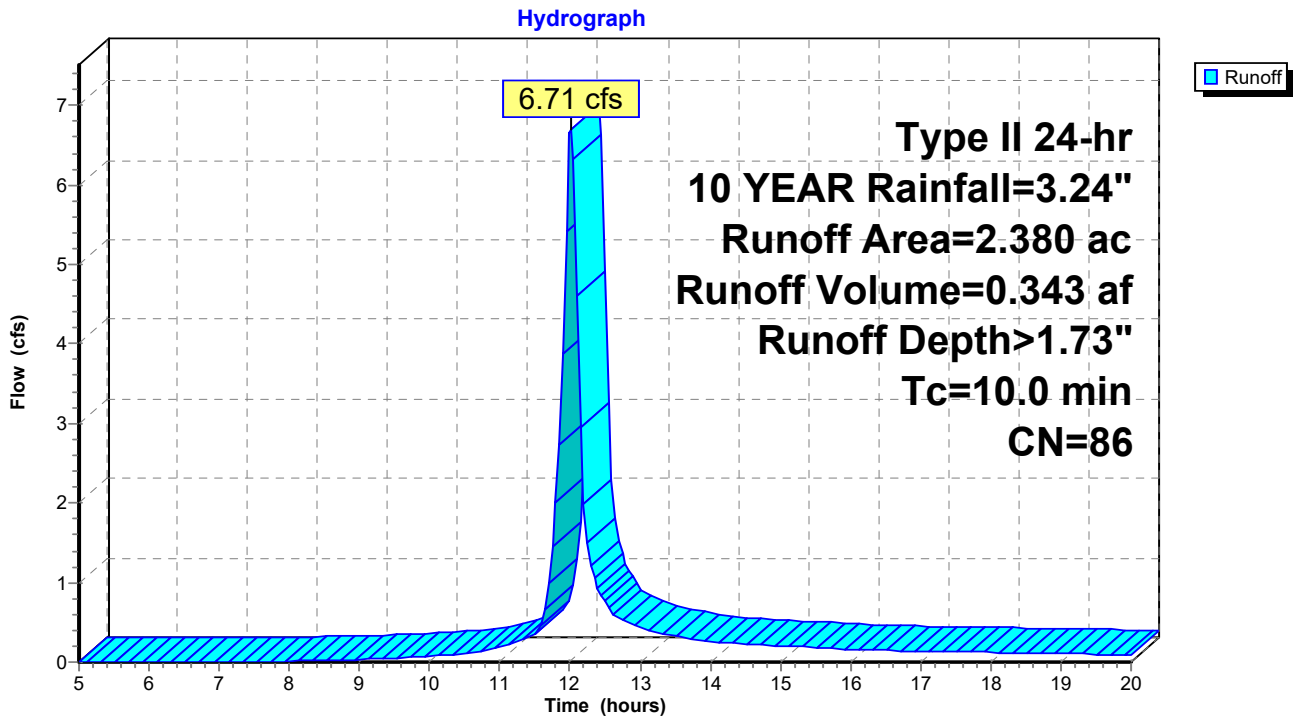
Runoff = 6.71 cfs @ 12.01 hrs, Volume= 0.343 af, Depth> 1.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10 YEAR Rainfall=3.24"

Area (ac)	CN	Description
0.930	98	Paved parking, HSG C
1.450	79	50-75% Grass cover, Fair, HSG C
2.380	86	Weighted Average
1.450		60.92% Pervious Area
0.930		39.08% Impervious Area

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

**Subcatchment 1E: Existing**



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EXISTING TRIBUTARY AREA  
Type II 24-hr 25 YEAR Rainfall=3.88"

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Page 5

**Summary for Subcatchment 1E: Existing**

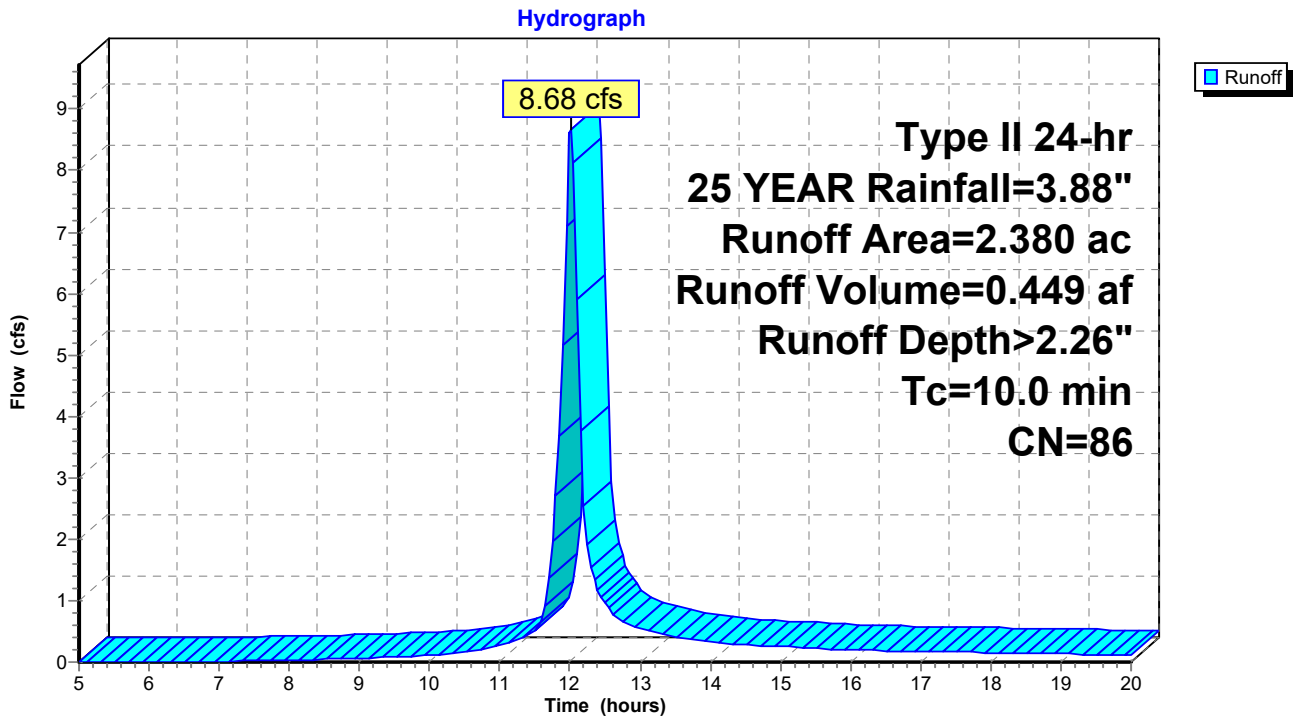
Runoff = 8.68 cfs @ 12.01 hrs, Volume= 0.449 af, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25 YEAR Rainfall=3.88"

Area (ac)	CN	Description
0.930	98	Paved parking, HSG C
1.450	79	50-75% Grass cover, Fair, HSG C
2.380	86	Weighted Average
1.450		60.92% Pervious Area
0.930		39.08% Impervious Area

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

**Subcatchment 1E: Existing**



# Basin

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EXISTING TRIBUTARY AREA  
Type II 24-hr 50 YEAR Rainfall=4.42"

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Page 6

## Summary for Subcatchment 1E: Existing

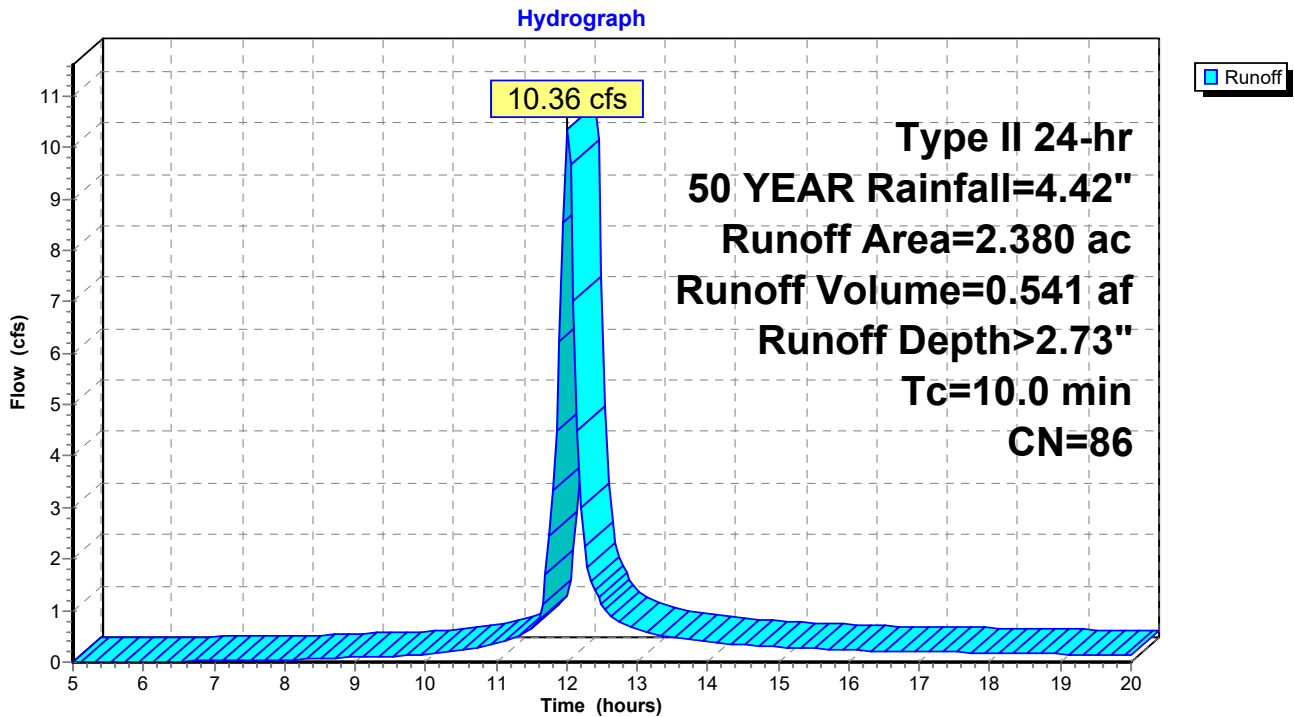
Runoff = 10.36 cfs @ 12.01 hrs, Volume= 0.541 af, Depth> 2.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50 YEAR Rainfall=4.42"

Area (ac)	CN	Description
0.930	98	Paved parking, HSG C
1.450	79	50-75% Grass cover, Fair, HSG C
2.380	86	Weighted Average
1.450		60.92% Pervious Area
0.930		39.08% Impervious Area

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

## Subcatchment 1E: Existing



# Basin

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EXISTING TRIBUTARY AREA  
Type II 24-hr 100 YEAR Rainfall=5.00"

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Page 7

## Summary for Subcatchment 1E: Existing

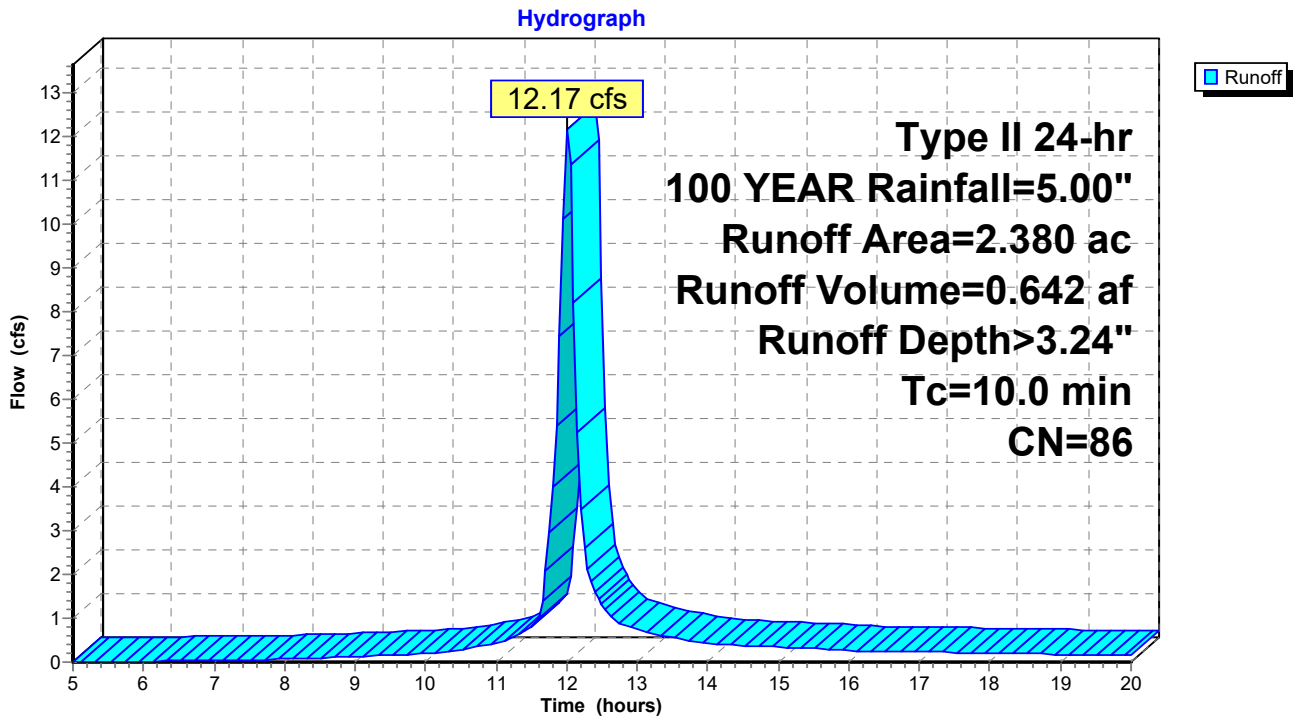
Runoff = 12.17 cfs @ 12.01 hrs, Volume= 0.642 af, Depth> 3.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100 YEAR Rainfall=5.00"

Area (ac)	CN	Description
0.930	98	Paved parking, HSG C
1.450	79	50-75% Grass cover, Fair, HSG C
2.380	86	Weighted Average
1.450		60.92% Pervious Area
0.930		39.08% Impervious Area

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

## Subcatchment 1E: Existing





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PROPOSED TRIBUTARY HYDROGRAPH

# Basin

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PROPOSED TRIBUTARY AREA  
Type II 24-hr 1 YEAR Rainfall=1.88"

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Page 1

## Summary for Subcatchment 1P: Proposed

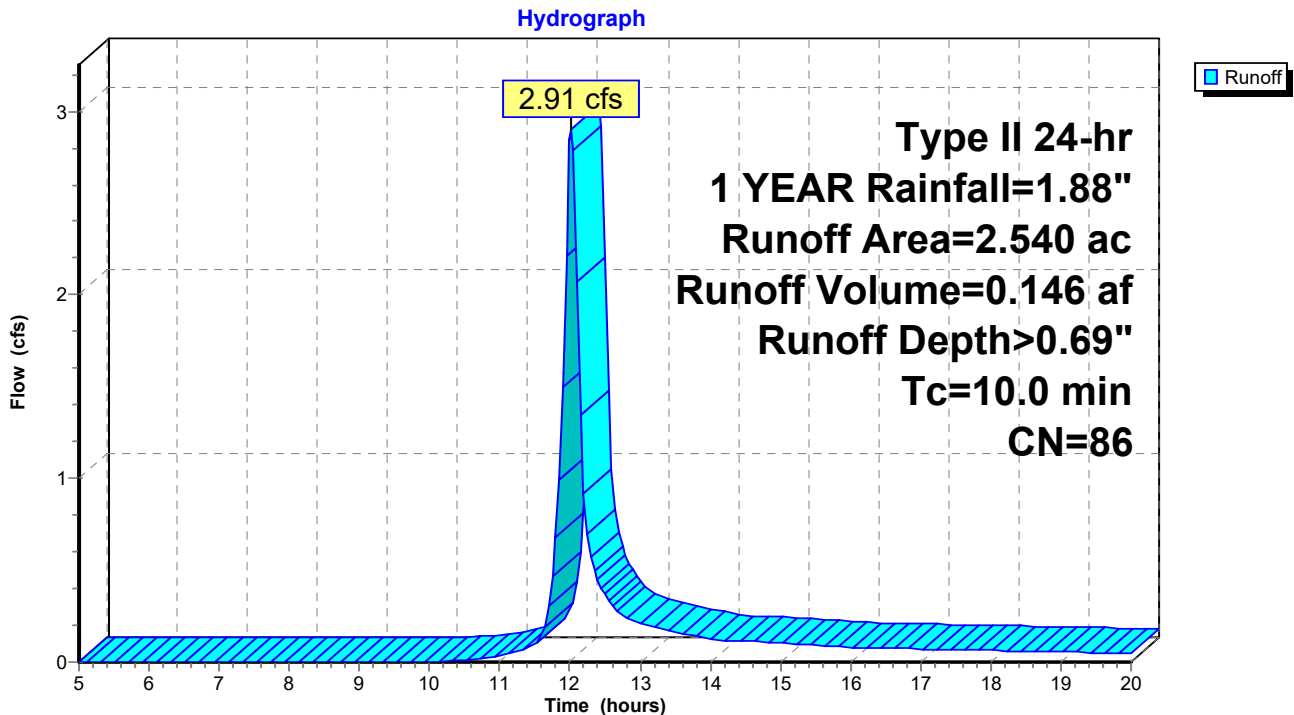
Runoff = 2.91 cfs @ 12.02 hrs, Volume= 0.146 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1 YEAR Rainfall=1.88"

Area (ac)	CN	Description
1.270	98	Paved parking, HSG C
1.270	74	>75% Grass cover, Good, HSG C
2.540	86	Weighted Average
1.270		50.00% Pervious Area
1.270		50.00% Impervious Area

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

## Subcatchment 1P: Proposed





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PROPOSED TRIBUTARY AREA  
Type II 24-hr 2 YEAR Rainfall=2.25"

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Page 2

**Summary for Subcatchment 1P: Proposed**

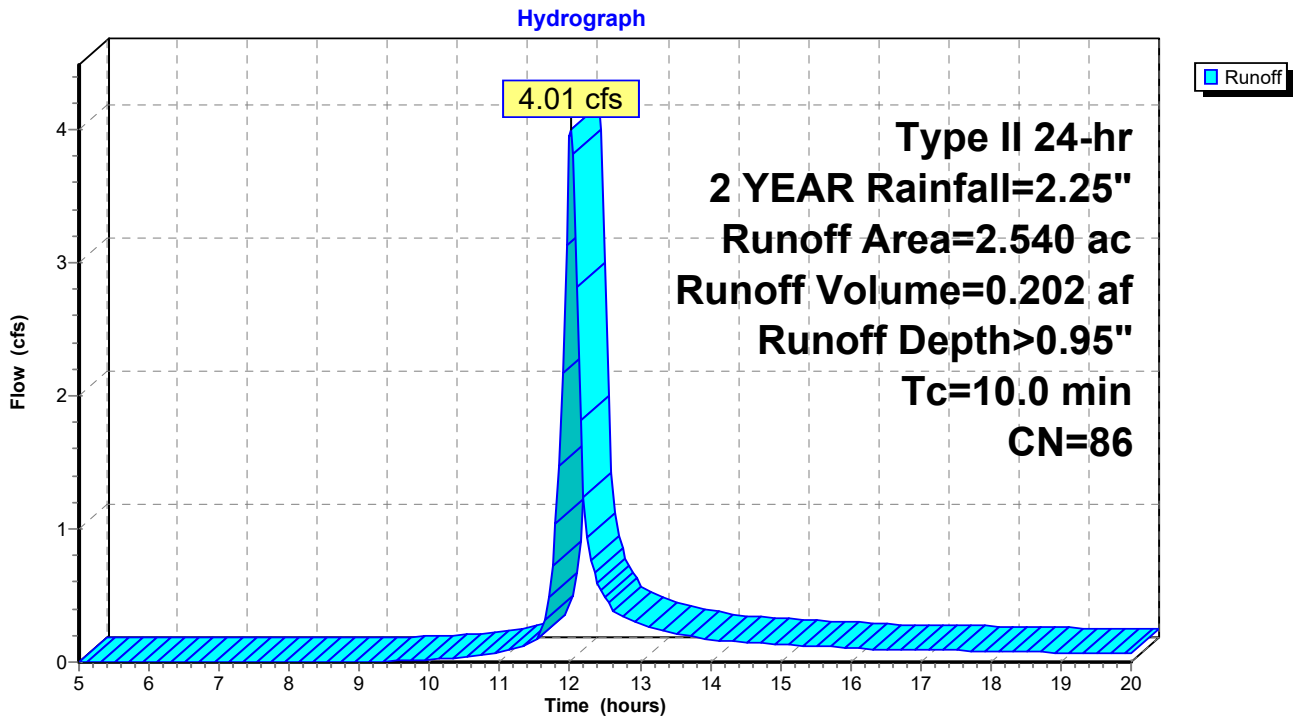
Runoff = 4.01 cfs @ 12.02 hrs, Volume= 0.202 af, Depth> 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2 YEAR Rainfall=2.25"

Area (ac)	CN	Description
1.270	98	Paved parking, HSG C
1.270	74	>75% Grass cover, Good, HSG C
2.540	86	Weighted Average
1.270		50.00% Pervious Area
1.270		50.00% Impervious Area

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

**Subcatchment 1P: Proposed**



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PROPOSED TRIBUTARY AREA  
Type II 24-hr 5 YEAR Rainfall=2.79"

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Page 3

**Summary for Subcatchment 1P: Proposed**

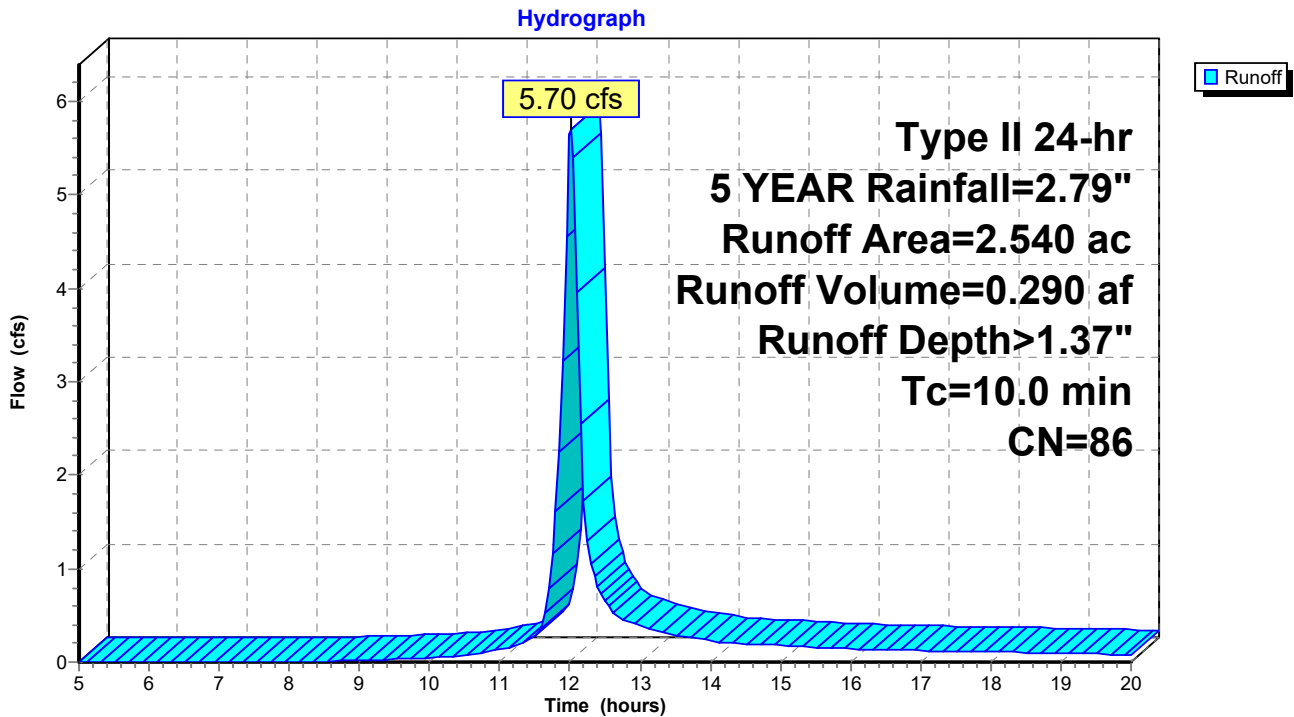
Runoff = 5.70 cfs @ 12.02 hrs, Volume= 0.290 af, Depth> 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 5 YEAR Rainfall=2.79"

Area (ac)	CN	Description
1.270	98	Paved parking, HSG C
1.270	74	>75% Grass cover, Good, HSG C
2.540	86	Weighted Average
1.270		50.00% Pervious Area
1.270		50.00% Impervious Area

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

**Subcatchment 1P: Proposed**



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PROPOSED TRIBUTARY AREA  
Type II 24-hr 10 YEAR Rainfall=3.24"

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Page 4

**Summary for Subcatchment 1P: Proposed**

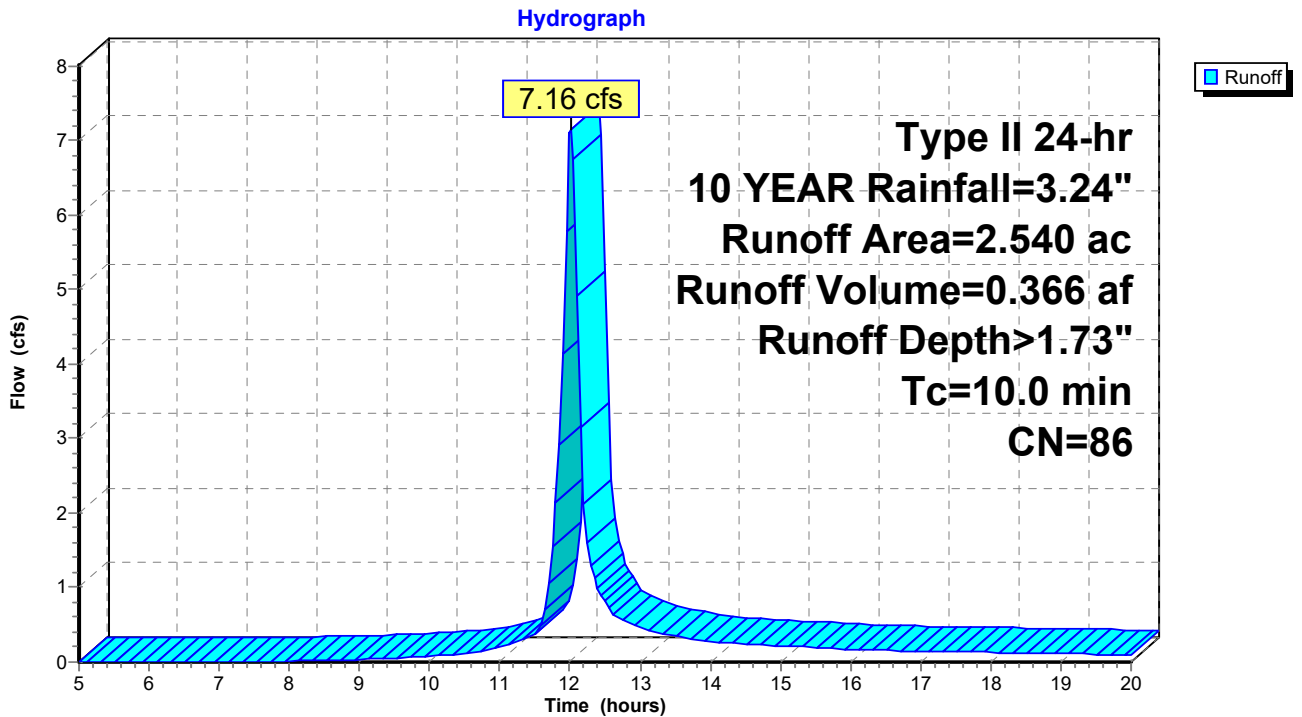
Runoff = 7.16 cfs @ 12.01 hrs, Volume= 0.366 af, Depth> 1.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10 YEAR Rainfall=3.24"

Area (ac)	CN	Description
1.270	98	Paved parking, HSG C
1.270	74	>75% Grass cover, Good, HSG C
2.540	86	Weighted Average
1.270		50.00% Pervious Area
1.270		50.00% Impervious Area

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

**Subcatchment 1P: Proposed**



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PROPOSED TRIBUTARY AREA  
Type II 24-hr 25 YEAR Rainfall=3.88"

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Page 5

**Summary for Subcatchment 1P: Proposed**

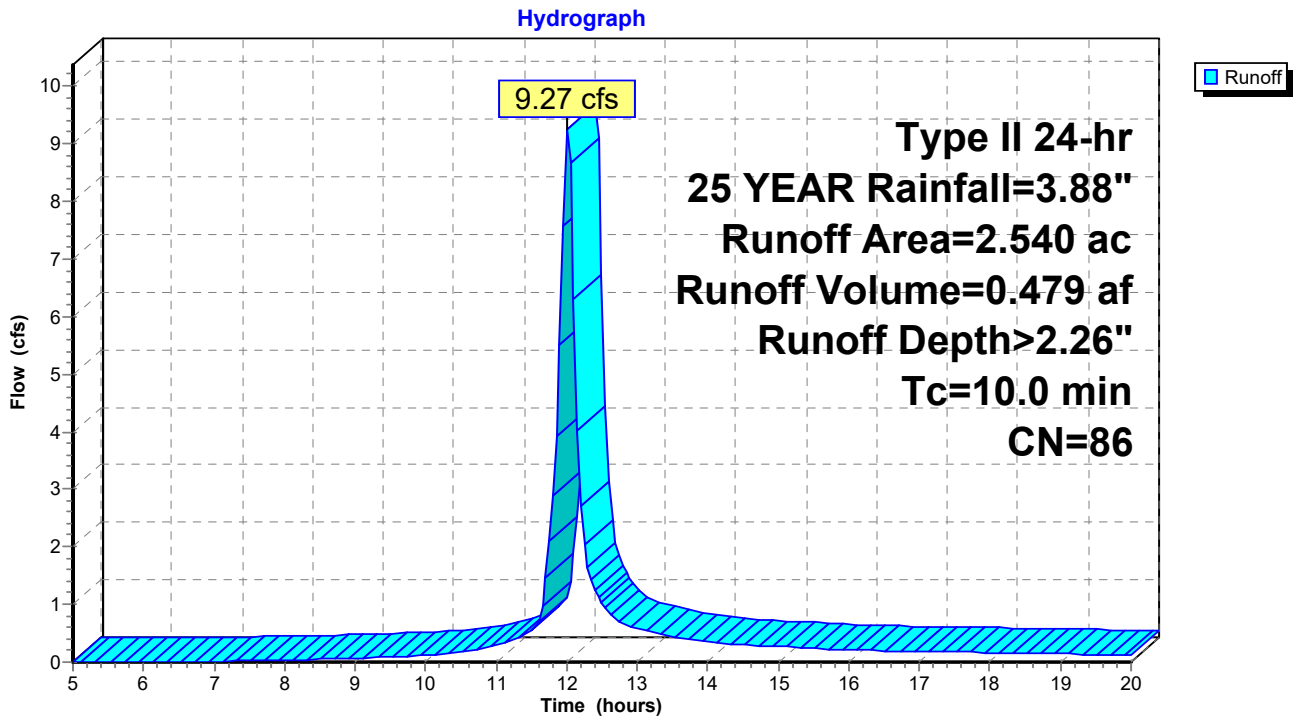
Runoff = 9.27 cfs @ 12.01 hrs, Volume= 0.479 af, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25 YEAR Rainfall=3.88"

Area (ac)	CN	Description
1.270	98	Paved parking, HSG C
1.270	74	>75% Grass cover, Good, HSG C
2.540	86	Weighted Average
1.270		50.00% Pervious Area
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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

**Subcatchment 1P: Proposed**



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PROPOSED TRIBUTARY AREA  
Type II 24-hr 50 YEAR Rainfall=4.42"

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**Summary for Subcatchment 1P: Proposed**

Runoff = 11.06 cfs @ 12.01 hrs, Volume= 0.578 af, Depth> 2.73"

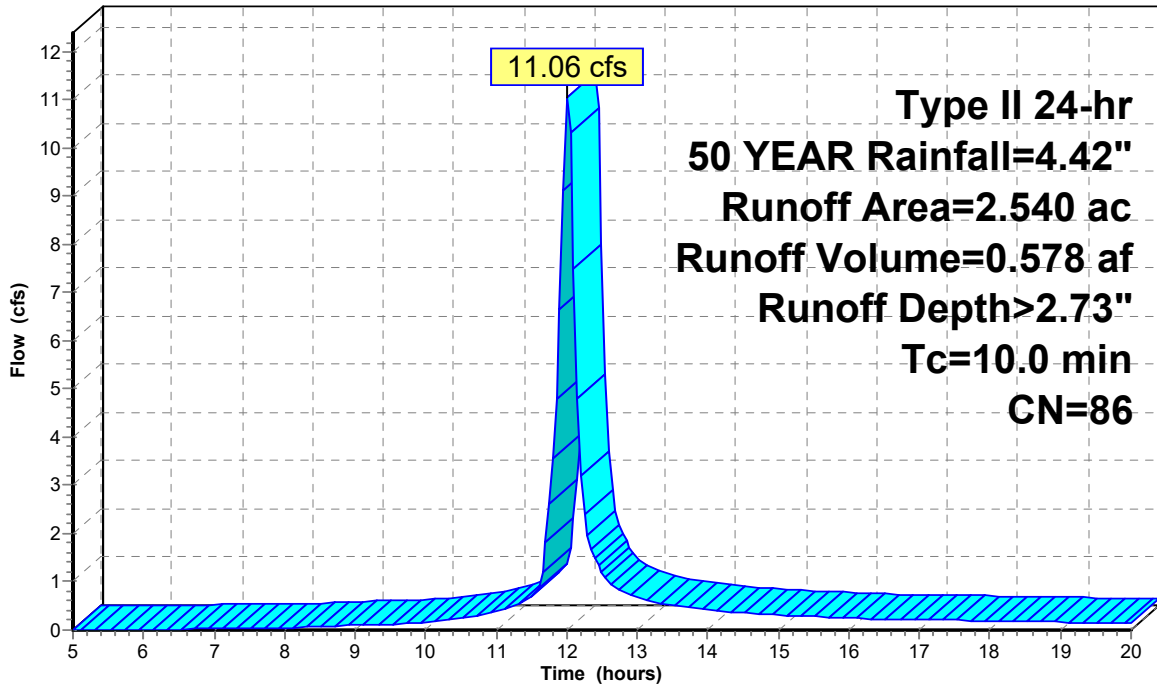
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50 YEAR Rainfall=4.42"

Area (ac)	CN	Description
1.270	98	Paved parking, HSG C
1.270	74	>75% Grass cover, Good, HSG C
2.540	86	Weighted Average
1.270		50.00% Pervious Area
1.270		50.00% Impervious Area

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

**Subcatchment 1P: Proposed**

Hydrograph



Runoff

**Basin**

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PROPOSED TRIBUTARY AREA  
Type II 24-hr 100 YEAR Rainfall=5.00"

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Page 7

**Summary for Subcatchment 1P: Proposed**

Runoff = 12.99 cfs @ 12.01 hrs, Volume= 0.685 af, Depth> 3.24"

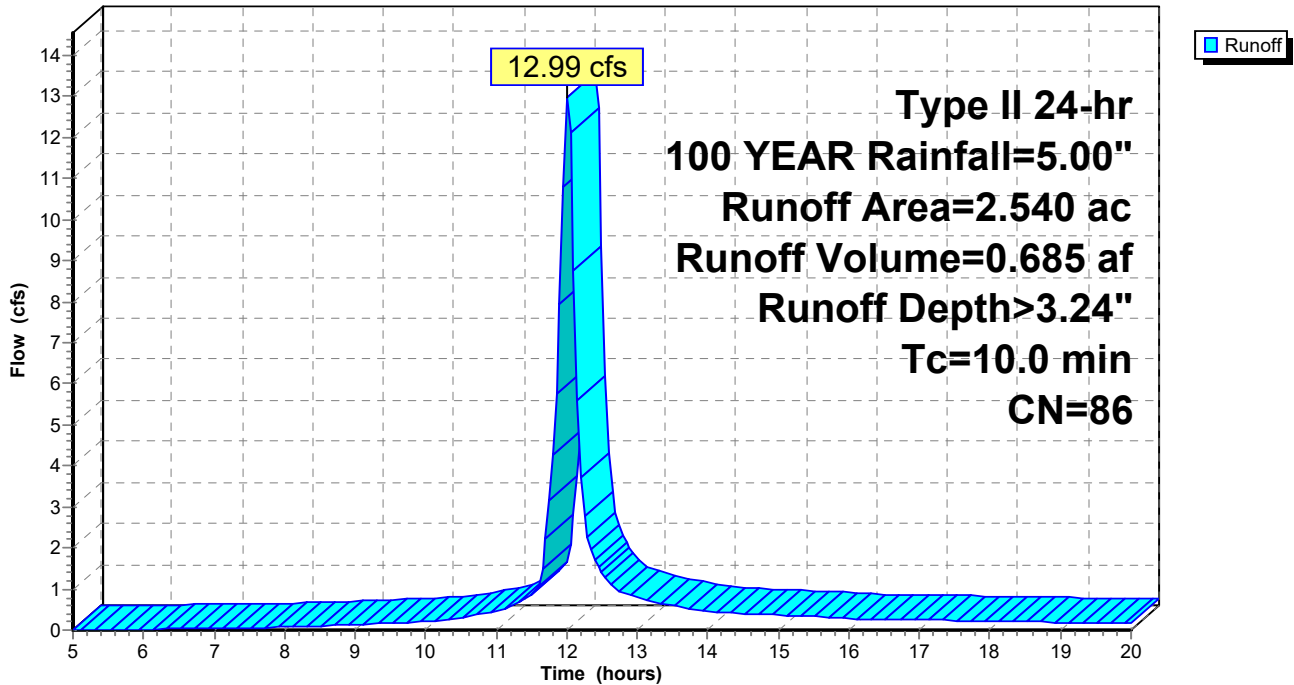
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100 YEAR Rainfall=5.00"

Area (ac)	CN	Description
1.270	98	Paved parking, HSG C
1.270	74	>75% Grass cover, Good, HSG C
2.540	86	Weighted Average
1.270		50.00% Pervious Area
1.270		50.00% Impervious Area

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

**Subcatchment 1P: Proposed**

Hydrograph





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DETENSION BASIN FOREBAY HYDROGRAPHS

**Basin**

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**Summary for Pond 2P: Proposed**

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 0.69" for 1 YEAR event  
 Inflow = 2.91 cfs @ 12.02 hrs, Volume= 0.146 af  
 Outflow = 0.67 cfs @ 12.27 hrs, Volume= 0.088 af, Atten= 77%, Lag= 14.9 min  
 Primary = 0.67 cfs @ 12.27 hrs, Volume= 0.088 af  
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 794.66' @ 12.27 hrs Surf.Area= 3,254 sf Storage= 2,952 cf

Plug-Flow detention time= 146.5 min calculated for 0.088 af (60% of inflow)  
 Center-of-Mass det. time= 67.7 min ( 869.5 - 801.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	793.00'	11,373 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
793.00	204	0	0
794.00	2,134	1,169	1,169
795.00	3,826	2,980	4,149
796.00	5,081	4,454	8,603
796.50	6,000	2,770	11,373

Device	Routing	Invert	Outlet Devices
#1	Device 2	795.50'	<b>36.0" x 36.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	793.48'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600
#3	Secondary	796.20'	<b>15.0' long x 18.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#4	Device 2	794.50'	<b>3.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 0.5' Crest Height
#5	Device 2	793.75'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600
#6	Device 2	793.88'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600

**Primary OutFlow** Max=0.66 cfs @ 12.27 hrs HW=794.66' (Free Discharge)  
 ↑ **2=Orifice/Grate** (Passes 0.66 cfs of 3.12 cfs potential flow)  
 ↑ **1=Orifice/Grate** ( Controls 0.00 cfs)  
 ↑ **4=Sharp-Crested Rectangular Weir** (Weir Controls 0.65 cfs @ 1.36 fps)  
 ↑ **5=Orifice/Grate** (Orifice Controls 0.00 cfs @ 4.57 fps)  
 ↑ **6=Orifice/Grate** (Orifice Controls 0.00 cfs @ 4.23 fps)

**Secondary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=793.00' (Free Discharge)  
 ↑ **3=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)



**Basin**

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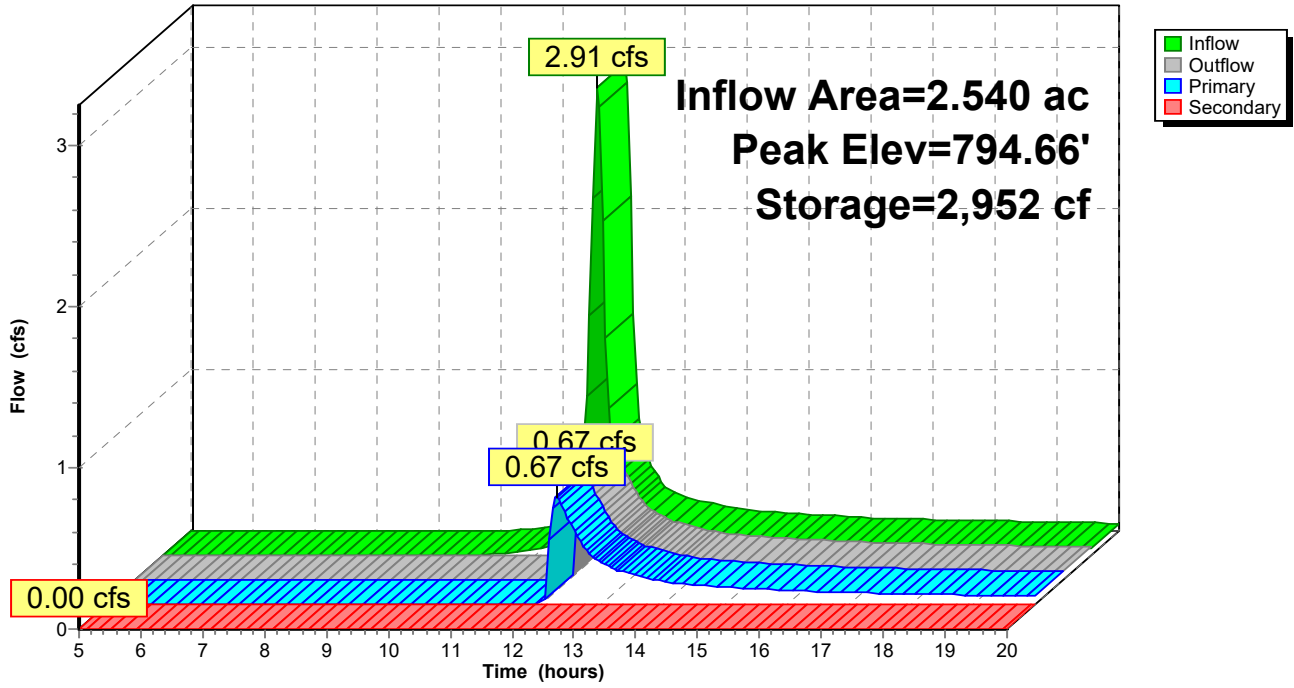
PROPOSED BASIN FOREBAY  
Type II 24-hr 1 YEAR Rainfall=1.88"

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Page 2

**Pond 2P: Proposed**

Hydrograph



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**Summary for Pond 2P: Proposed**

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 0.95" for 2 YEAR event  
 Inflow = 4.01 cfs @ 12.02 hrs, Volume= 0.202 af  
 Outflow = 1.98 cfs @ 12.15 hrs, Volume= 0.144 af, Atten= 51%, Lag= 8.0 min  
 Primary = 1.98 cfs @ 12.15 hrs, Volume= 0.144 af  
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 794.83' @ 12.15 hrs Surf.Area= 3,539 sf Storage= 3,525 cf

Plug-Flow detention time= 113.0 min calculated for 0.143 af (71% of inflow)  
 Center-of-Mass det. time= 45.5 min ( 840.6 - 795.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	793.00'	11,373 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
793.00	204	0	0
794.00	2,134	1,169	1,169
795.00	3,826	2,980	4,149
796.00	5,081	4,454	8,603
796.50	6,000	2,770	11,373

Device	Routing	Invert	Outlet Devices
#1	Device 2	795.50'	<b>36.0" x 36.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	793.48'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600
#3	Secondary	796.20'	<b>15.0' long x 18.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#4	Device 2	794.50'	<b>3.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 0.5' Crest Height
#5	Device 2	793.75'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600
#6	Device 2	793.88'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600

**Primary OutFlow** Max=1.97 cfs @ 12.15 hrs HW=794.83' (Free Discharge)  
 ↑ **2=Orifice/Grate** (Passes 1.97 cfs of 3.49 cfs potential flow)  
 ↑ **1=Orifice/Grate** ( Controls 0.00 cfs)  
 ↑ **4=Sharp-Crested Rectangular Weir** (Weir Controls 1.96 cfs @ 2.03 fps)  
 ↑ **5=Orifice/Grate** (Orifice Controls 0.00 cfs @ 4.98 fps)  
 ↑ **6=Orifice/Grate** (Orifice Controls 0.00 cfs @ 4.67 fps)

**Secondary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=793.00' (Free Discharge)  
 ↑ **3=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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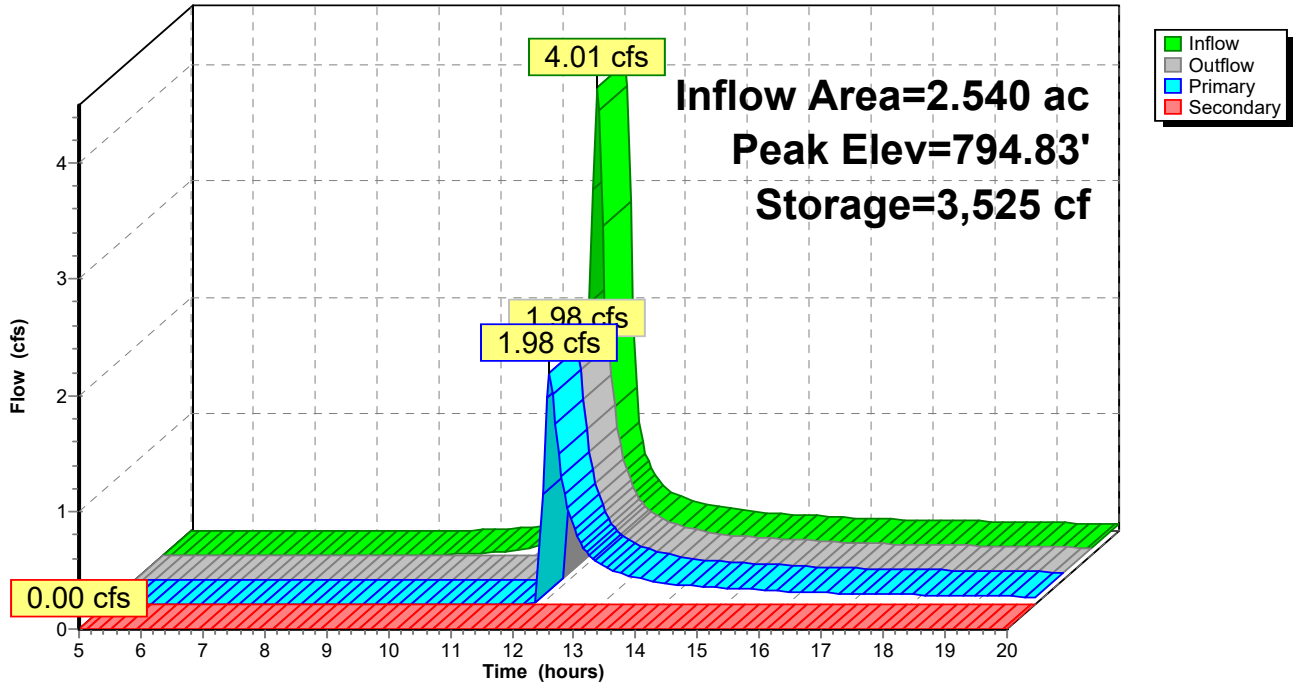
PROPOSED BASIN FOREBAY  
Type II 24-hr 2 YEAR Rainfall=2.25"

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Page 4

**Pond 2P: Proposed**

Hydrograph



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Page 5

**Summary for Pond 2P: Proposed**

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 1.37" for 5 YEAR event  
 Inflow = 5.70 cfs @ 12.02 hrs, Volume= 0.290 af  
 Outflow = 3.88 cfs @ 12.11 hrs, Volume= 0.231 af, Atten= 32%, Lag= 5.8 min  
 Primary = 3.88 cfs @ 12.11 hrs, Volume= 0.231 af  
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 795.03' @ 12.11 hrs Surf.Area= 3,864 sf Storage= 4,266 cf

Plug-Flow detention time= 88.7 min calculated for 0.231 af (80% of inflow)  
 Center-of-Mass det. time= 33.1 min ( 820.5 - 787.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	793.00'	11,373 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
793.00	204	0	0
794.00	2,134	1,169	1,169
795.00	3,826	2,980	4,149
796.00	5,081	4,454	8,603
796.50	6,000	2,770	11,373

Device	Routing	Invert	Outlet Devices
#1	Device 2	795.50'	<b>36.0" x 36.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	793.48'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600
#3	Secondary	796.20'	<b>15.0' long x 18.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#4	Device 2	794.50'	<b>3.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 0.5' Crest Height
#5	Device 2	793.75'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600
#6	Device 2	793.88'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600

**Primary OutFlow** Max=3.86 cfs @ 12.11 hrs HW=795.02' (Free Discharge)

- ↑ **2=Orifice/Grate** (Orifice Controls 3.86 cfs @ 4.92 fps)
- ↑ **1=Orifice/Grate** ( Controls 0.00 cfs)
- ↑ **4=Sharp-Crested Rectangular Weir** (Passes < 4.04 cfs potential flow)
- ↑ **5=Orifice/Grate** (Passes < 0.00 cfs potential flow)
- ↑ **6=Orifice/Grate** (Passes < 0.00 cfs potential flow)

**Secondary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=793.00' (Free Discharge)

- ↑ **3=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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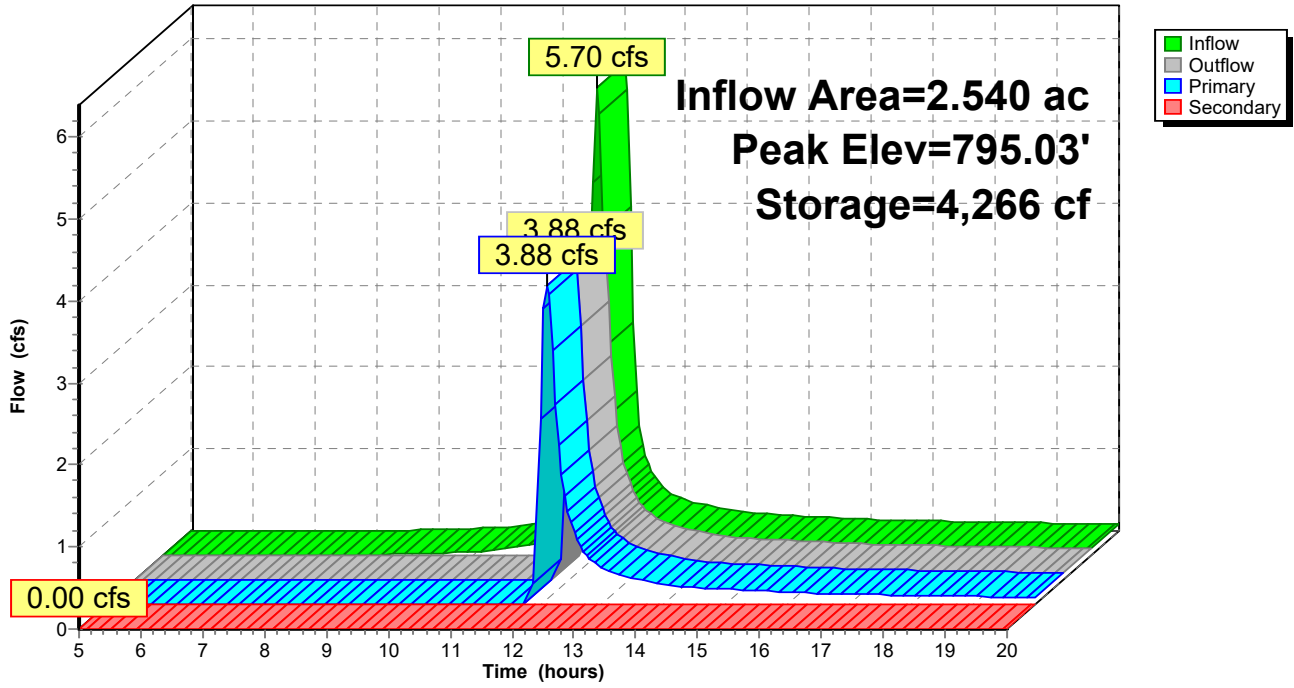
PROPOSED BASIN FOREBAY  
Type II 24-hr 5 YEAR Rainfall=2.79"

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Page 6

**Pond 2P: Proposed**

Hydrograph



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Page 7

**Summary for Pond 2P: Proposed**

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 1.73" for 10 YEAR event  
 Inflow = 7.16 cfs @ 12.01 hrs, Volume= 0.366 af  
 Outflow = 4.26 cfs @ 12.12 hrs, Volume= 0.307 af, Atten= 40%, Lag= 6.3 min  
 Primary = 4.26 cfs @ 12.12 hrs, Volume= 0.307 af  
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 795.25' @ 12.12 hrs Surf.Area= 4,142 sf Storage= 5,151 cf

Plug-Flow detention time= 76.6 min calculated for 0.306 af (84% of inflow)  
 Center-of-Mass det. time= 29.5 min ( 811.9 - 782.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	793.00'	11,373 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
793.00	204	0	0
794.00	2,134	1,169	1,169
795.00	3,826	2,980	4,149
796.00	5,081	4,454	8,603
796.50	6,000	2,770	11,373

Device	Routing	Invert	Outlet Devices
#1	Device 2	795.50'	<b>36.0" x 36.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	793.48'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600
#3	Secondary	796.20'	<b>15.0' long x 18.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#4	Device 2	794.50'	<b>3.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 0.5' Crest Height
#5	Device 2	793.75'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600
#6	Device 2	793.88'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600

**Primary OutFlow** Max=4.25 cfs @ 12.12 hrs HW=795.24' (Free Discharge)

- ↑ **2=Orifice/Grate** (Orifice Controls 4.25 cfs @ 5.41 fps)
- ↑ **1=Orifice/Grate** ( Controls 0.00 cfs)
- ↑ **4=Sharp-Crested Rectangular Weir** (Passes < 7.04 cfs potential flow)
- ↑ **5=Orifice/Grate** (Passes < 0.01 cfs potential flow)
- ↑ **6=Orifice/Grate** (Passes < 0.00 cfs potential flow)

**Secondary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=793.00' (Free Discharge)

- ↑ **3=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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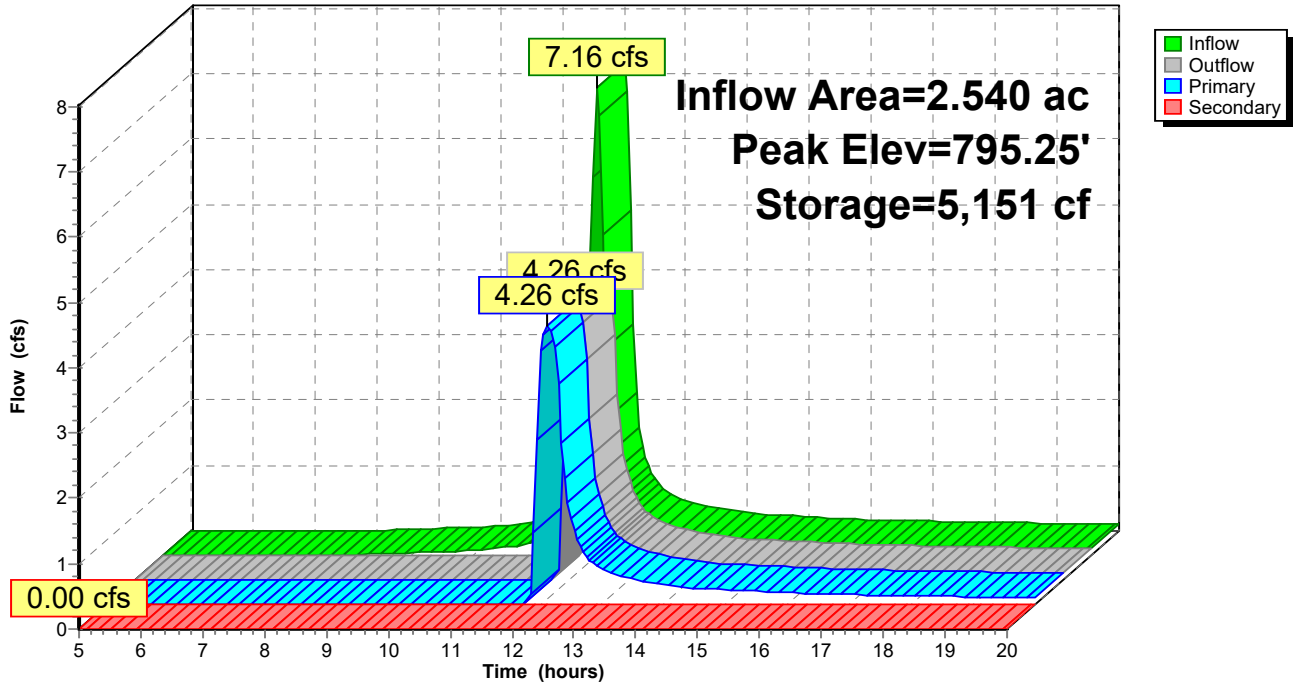
PROPOSED BASIN FOREBAY  
Type II 24-hr 10 YEAR Rainfall=3.24"

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Page 8

**Pond 2P: Proposed**

Hydrograph



# Basin

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PROPOSED BASIN FOREBAY  
Type II 24-hr 25 YEAR Rainfall=3.88"

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Page 9

## Summary for Pond 2P: Proposed

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 2.26" for 25 YEAR event  
 Inflow = 9.27 cfs @ 12.01 hrs, Volume= 0.479 af  
 Outflow = 4.79 cfs @ 12.14 hrs, Volume= 0.420 af, Atten= 48%, Lag= 7.4 min  
 Primary = 4.79 cfs @ 12.14 hrs, Volume= 0.420 af  
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 795.59' @ 12.14 hrs Surf.Area= 4,563 sf Storage= 6,611 cf

Plug-Flow detention time= 67.3 min calculated for 0.418 af (87% of inflow)  
 Center-of-Mass det. time= 28.3 min ( 804.6 - 776.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	793.00'	11,373 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
793.00	204	0	0
794.00	2,134	1,169	1,169
795.00	3,826	2,980	4,149
796.00	5,081	4,454	8,603
796.50	6,000	2,770	11,373

Device	Routing	Invert	Outlet Devices
#1	Device 2	795.50'	<b>36.0" x 36.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	793.48'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600
#3	Secondary	796.20'	<b>15.0' long x 18.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#4	Device 2	794.50'	<b>3.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 0.5' Crest Height
#5	Device 2	793.75'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600
#6	Device 2	793.88'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600

**Primary OutFlow** Max=4.78 cfs @ 12.14 hrs HW=795.58' (Free Discharge)

- ↑ **2=Orifice/Grate** (Orifice Controls 4.78 cfs @ 6.09 fps)
  - ↑ **1=Orifice/Grate** (Passes < 0.88 cfs potential flow)
  - ↑ **4=Sharp-Crested Rectangular Weir** (Passes < 12.91 cfs potential flow)
  - ↑ **5=Orifice/Grate** (Passes < 0.01 cfs potential flow)
  - ↑ **6=Orifice/Grate** (Passes < 0.01 cfs potential flow)

**Secondary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=793.00' (Free Discharge)

- ↑ **3=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)



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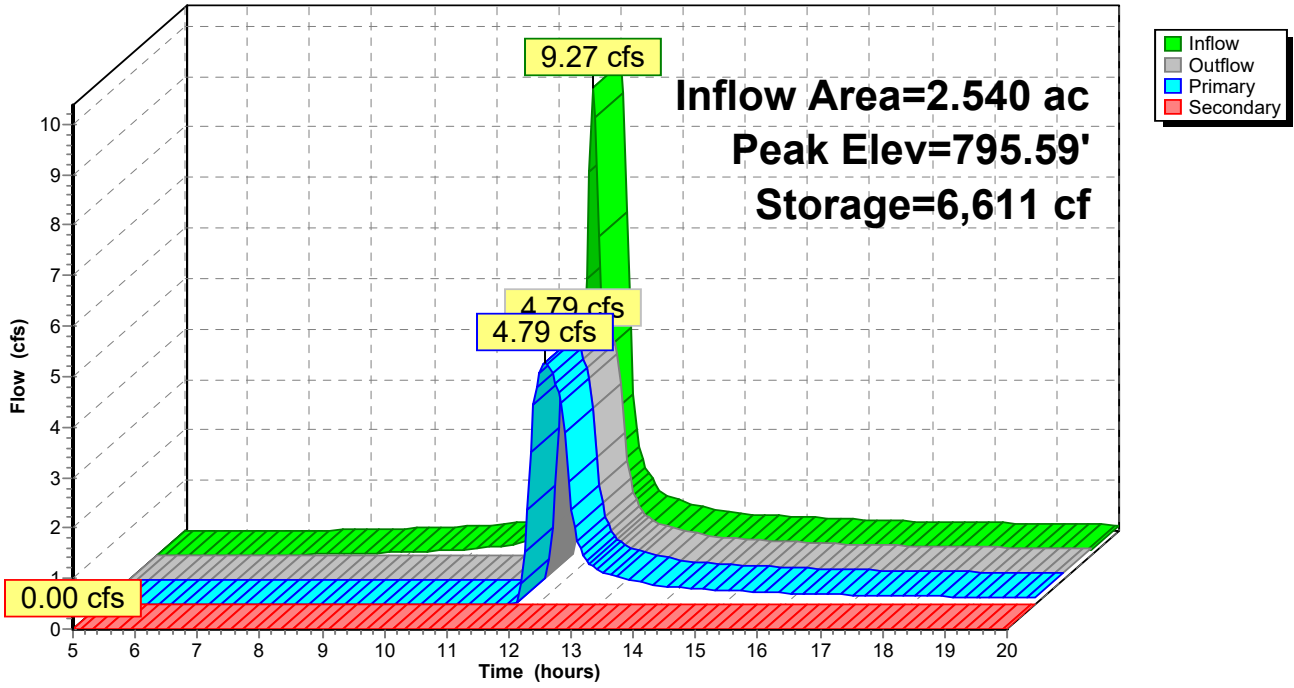
PROPOSED BASIN FOREBAY  
Type II 24-hr 25 YEAR Rainfall=3.88"

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Page 10

**Pond 2P: Proposed**

Hydrograph



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Page 11

**Summary for Pond 2P: Proposed**

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 2.73" for 50 YEAR event  
 Inflow = 11.06 cfs @ 12.01 hrs, Volume= 0.578 af  
 Outflow = 5.19 cfs @ 12.15 hrs, Volume= 0.517 af, Atten= 53%, Lag= 8.1 min  
 Primary = 5.19 cfs @ 12.15 hrs, Volume= 0.517 af  
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 795.86' @ 12.15 hrs Surf.Area= 4,908 sf Storage= 7,913 cf

Plug-Flow detention time= 62.5 min calculated for 0.516 af (89% of inflow)  
 Center-of-Mass det. time= 28.4 min ( 800.5 - 772.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	793.00'	11,373 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
793.00	204	0	0
794.00	2,134	1,169	1,169
795.00	3,826	2,980	4,149
796.00	5,081	4,454	8,603
796.50	6,000	2,770	11,373

Device	Routing	Invert	Outlet Devices
#1	Device 2	795.50'	<b>36.0" x 36.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	793.48'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600
#3	Secondary	796.20'	<b>15.0' long x 18.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#4	Device 2	794.50'	<b>3.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 0.5' Crest Height
#5	Device 2	793.75'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600
#6	Device 2	793.88'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600

**Primary OutFlow** Max=5.19 cfs @ 12.15 hrs HW=795.86' (Free Discharge)

- ↑ **2=Orifice/Grate** (Orifice Controls 5.19 cfs @ 6.60 fps)
  - ↑ **1=Orifice/Grate** (Passes < 8.48 cfs potential flow)
  - ↑ **4=Sharp-Crested Rectangular Weir** (Passes < 18.86 cfs potential flow)
  - ↑ **5=Orifice/Grate** (Passes < 0.01 cfs potential flow)
  - ↑ **6=Orifice/Grate** (Passes < 0.01 cfs potential flow)

**Secondary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=793.00' (Free Discharge)

- ↑ **3=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

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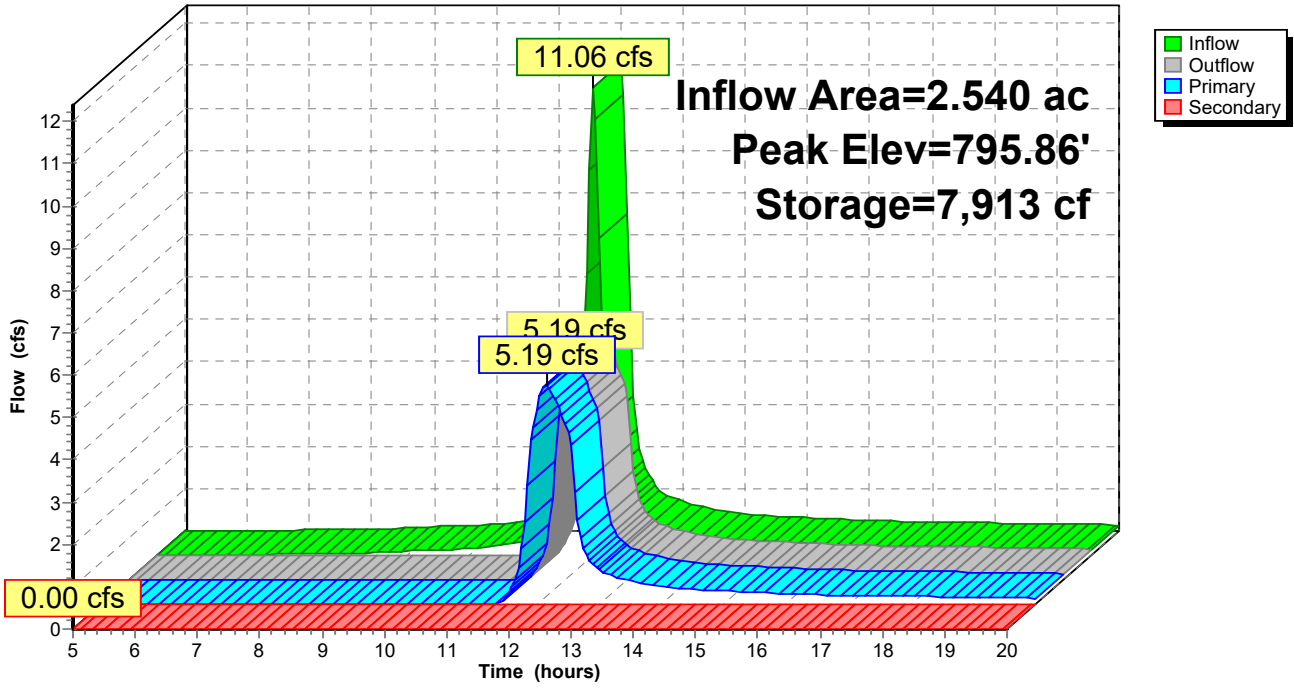
PROPOSED BASIN FOREBAY  
Type II 24-hr 50 YEAR Rainfall=4.42"

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Page 12

**Pond 2P: Proposed**

Hydrograph



**Basin**

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Page 13

**Summary for Pond 2P: Proposed**

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 3.24" for 100 YEAR event  
 Inflow = 12.99 cfs @ 12.01 hrs, Volume= 0.685 af  
 Outflow = 5.57 cfs @ 12.16 hrs, Volume= 0.624 af, Atten= 57%, Lag= 8.8 min  
 Primary = 5.57 cfs @ 12.16 hrs, Volume= 0.624 af  
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 796.15' @ 12.16 hrs Surf.Area= 5,358 sf Storage= 9,390 cf

Plug-Flow detention time= 59.0 min calculated for 0.622 af (91% of inflow)  
 Center-of-Mass det. time= 28.9 min ( 797.0 - 768.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	793.00'	11,373 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
793.00	204	0	0
794.00	2,134	1,169	1,169
795.00	3,826	2,980	4,149
796.00	5,081	4,454	8,603
796.50	6,000	2,770	11,373

Device	Routing	Invert	Outlet Devices
#1	Device 2	795.50'	<b>36.0" x 36.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#2	Primary	793.48'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600
#3	Secondary	796.20'	<b>15.0' long x 18.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#4	Device 2	794.50'	<b>3.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s) 0.5' Crest Height
#5	Device 2	793.75'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600
#6	Device 2	793.88'	<b>0.2" Vert. Orifice/Grate X 4.00</b> C= 0.600

**Primary OutFlow** Max=5.57 cfs @ 12.16 hrs HW=796.15' (Free Discharge)

- ↑ **2=Orifice/Grate** (Orifice Controls 5.57 cfs @ 7.09 fps)
- ↑ **1=Orifice/Grate** (Passes < 20.35 cfs potential flow)
- ↑ **4=Sharp-Crested Rectangular Weir** (Passes < 25.86 cfs potential flow)
- ↑ **5=Orifice/Grate** (Passes < 0.01 cfs potential flow)
- ↑ **6=Orifice/Grate** (Passes < 0.01 cfs potential flow)

**Secondary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=793.00' (Free Discharge)

- ↑ **3=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Basin**

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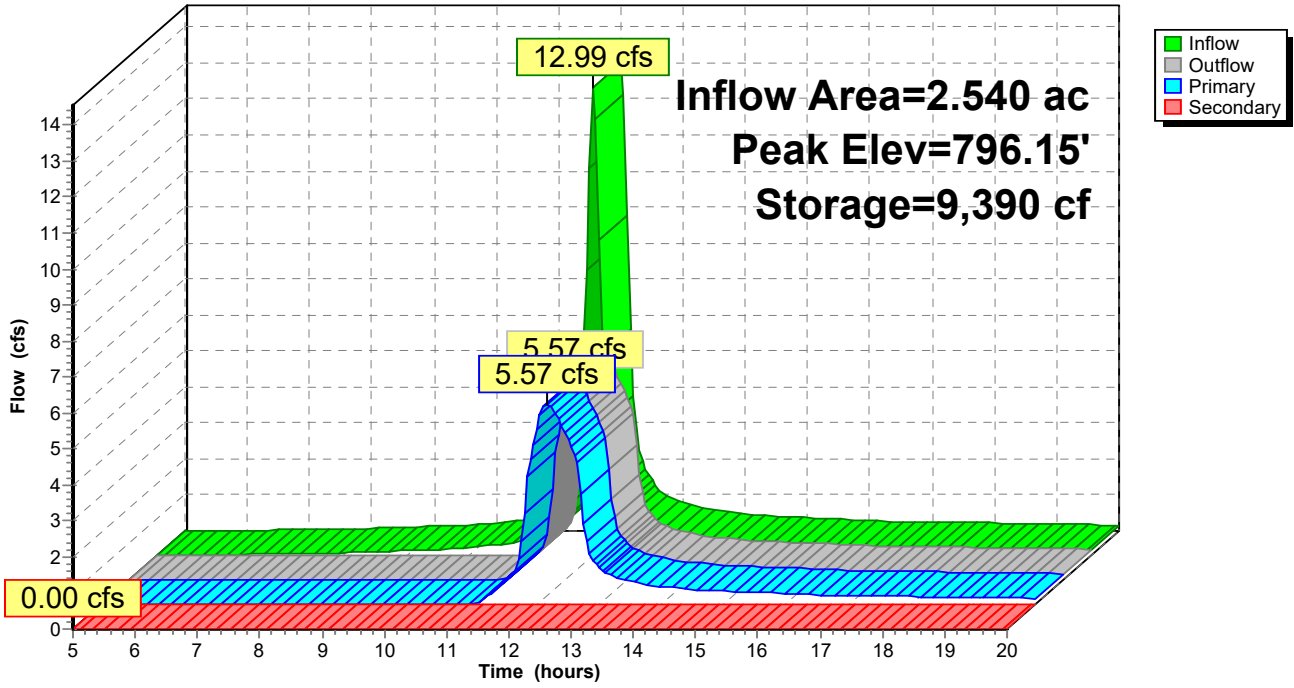
PROPOSED BASIN FOREBAY  
Type II 24-hr 100 YEAR Rainfall=5.00"

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Page 14

**Pond 2P: Proposed**

Hydrograph





## *Kabil Associates*

---

*Engineers Architects Planners*

5900 Sharon Woods Blvd Suite B

Columbus, Ohio 43229

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DETENTION BASIN HYDROGRAPHS

**Basin**

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Page 1

**Summary for Pond 3E: EX**

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 0.42" for 1 YEAR event  
 Inflow = 0.67 cfs @ 12.27 hrs, Volume= 0.088 af  
 Outflow = 0.65 cfs @ 12.31 hrs, Volume= 0.088 af, Atten= 2%, Lag= 2.7 min  
 Primary = 0.65 cfs @ 12.31 hrs, Volume= 0.088 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 792.91' @ 12.31 hrs Surf.Area= 357 sf Storage= 73 cf

Plug-Flow detention time= 1.7 min calculated for 0.088 af (100% of inflow)  
 Center-of-Mass det. time= 1.3 min ( 870.8 - 869.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	792.50'	28,890 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.50	1	0	0
793.00	438	110	110
793.50	3,315	938	1,048
794.00	5,098	2,103	3,151
794.50	6,056	2,789	5,940
795.00	7,087	3,286	9,226
795.50	8,250	3,834	13,060
796.00	9,555	4,451	17,511
796.50	11,241	5,199	22,710
797.00	13,480	6,180	28,890

Device	Routing	Invert	Outlet Devices
#1	Primary	792.50'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.65 cfs @ 12.31 hrs HW=792.91' (Free Discharge)

↑**1=Orifice/Grate** (Orifice Controls 0.65 cfs @ 2.17 fps)

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EXISTING DETENTION BASIN OUTLET

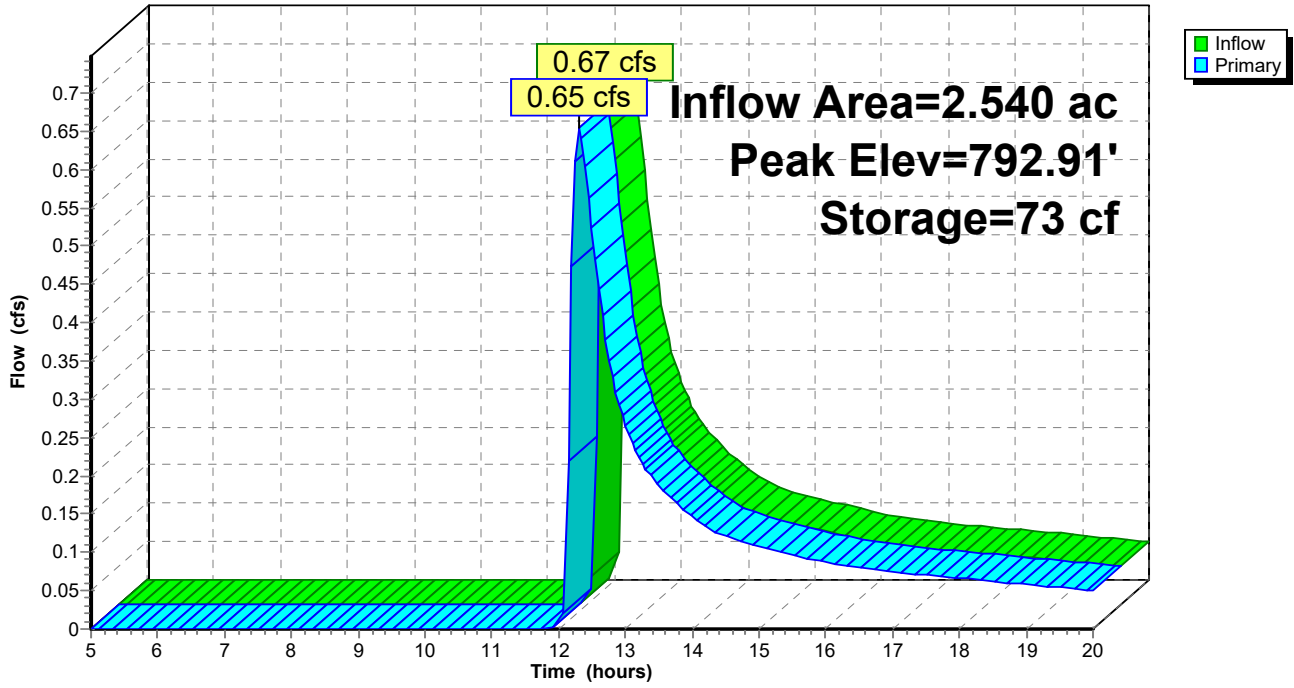
Type II 24-hr 1 YEAR Rainfall=1.88"

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Page 2

**Pond 3E: EX**

Hydrograph





**Basin**

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Page 3

**Summary for Pond 3E: EX**

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 0.68" for 2 YEAR event  
 Inflow = 1.98 cfs @ 12.15 hrs, Volume= 0.144 af  
 Outflow = 1.67 cfs @ 12.23 hrs, Volume= 0.144 af, Atten= 16%, Lag= 4.6 min  
 Primary = 1.67 cfs @ 12.23 hrs, Volume= 0.144 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 793.20' @ 12.23 hrs Surf.Area= 1,582 sf Storage= 310 cf

Plug-Flow detention time= 2.0 min calculated for 0.144 af (100% of inflow)  
 Center-of-Mass det. time= 1.7 min ( 842.2 - 840.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	792.50'	28,890 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.50	1	0	0
793.00	438	110	110
793.50	3,315	938	1,048
794.00	5,098	2,103	3,151
794.50	6,056	2,789	5,940
795.00	7,087	3,286	9,226
795.50	8,250	3,834	13,060
796.00	9,555	4,451	17,511
796.50	11,241	5,199	22,710
797.00	13,480	6,180	28,890

Device	Routing	Invert	Outlet Devices
#1	Primary	792.50'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=1.66 cfs @ 12.23 hrs HW=793.20' (Free Discharge)

↑**1=Orifice/Grate** (Orifice Controls 1.66 cfs @ 2.84 fps)

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EXISTING DETENTION BASIN OUTLET

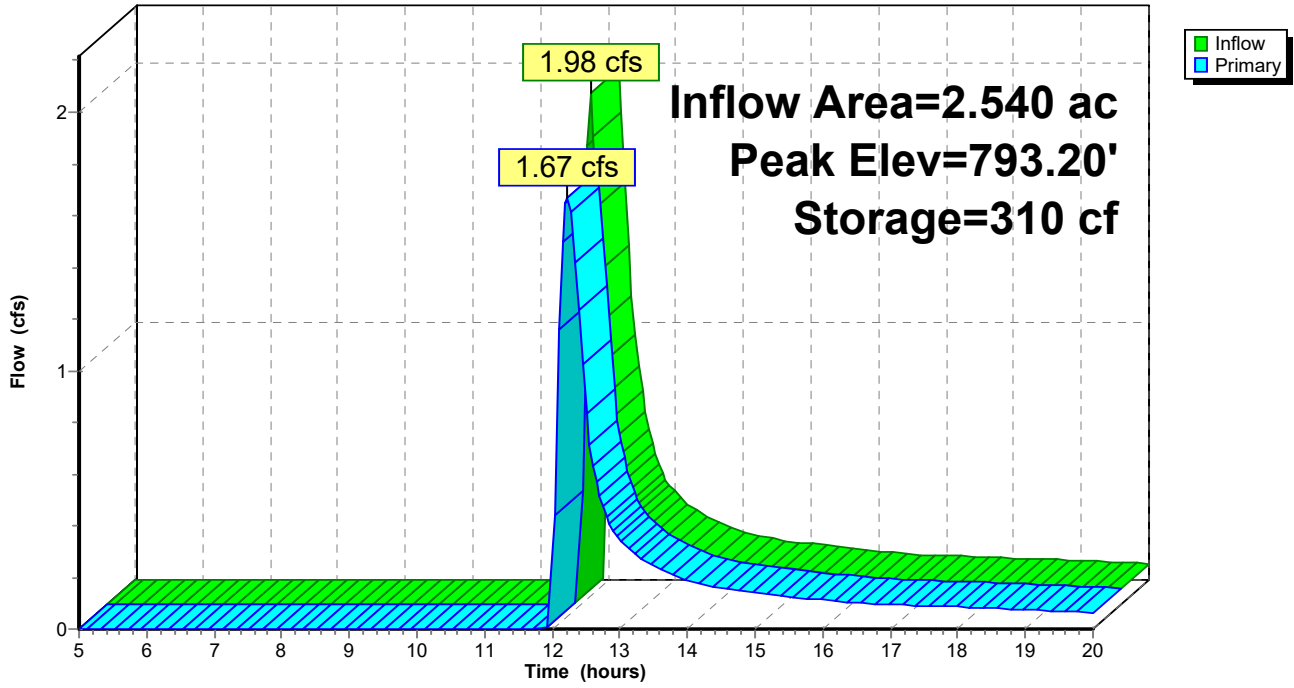
Type II 24-hr 2 YEAR Rainfall=2.25"

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Page 4

**Pond 3E: EX**

Hydrograph



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Page 5

**Summary for Pond 3E: EX**

[79] Warning: Submerged Pond 2P Primary device # 2 by 0.04'

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 1.09" for 5 YEAR event  
 Inflow = 3.88 cfs @ 12.11 hrs, Volume= 0.231 af  
 Outflow = 2.72 cfs @ 12.23 hrs, Volume= 0.231 af, Atten= 30%, Lag= 7.1 min  
 Primary = 2.72 cfs @ 12.23 hrs, Volume= 0.231 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 793.52' @ 12.23 hrs Surf.Area= 3,377 sf Storage= 1,106 cf

Plug-Flow detention time= 3.4 min calculated for 0.230 af (100% of inflow)  
 Center-of-Mass det. time= 3.0 min ( 823.5 - 820.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	792.50'	28,890 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.50	1	0	0
793.00	438	110	110
793.50	3,315	938	1,048
794.00	5,098	2,103	3,151
794.50	6,056	2,789	5,940
795.00	7,087	3,286	9,226
795.50	8,250	3,834	13,060
796.00	9,555	4,451	17,511
796.50	11,241	5,199	22,710
797.00	13,480	6,180	28,890

Device	Routing	Invert	Outlet Devices
#1	Primary	792.50'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=2.71 cfs @ 12.23 hrs HW=793.51' (Free Discharge)

↑1=Orifice/Grate (Orifice Controls 2.71 cfs @ 3.45 fps)

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EXISTING DETENTION BASIN OUTLET

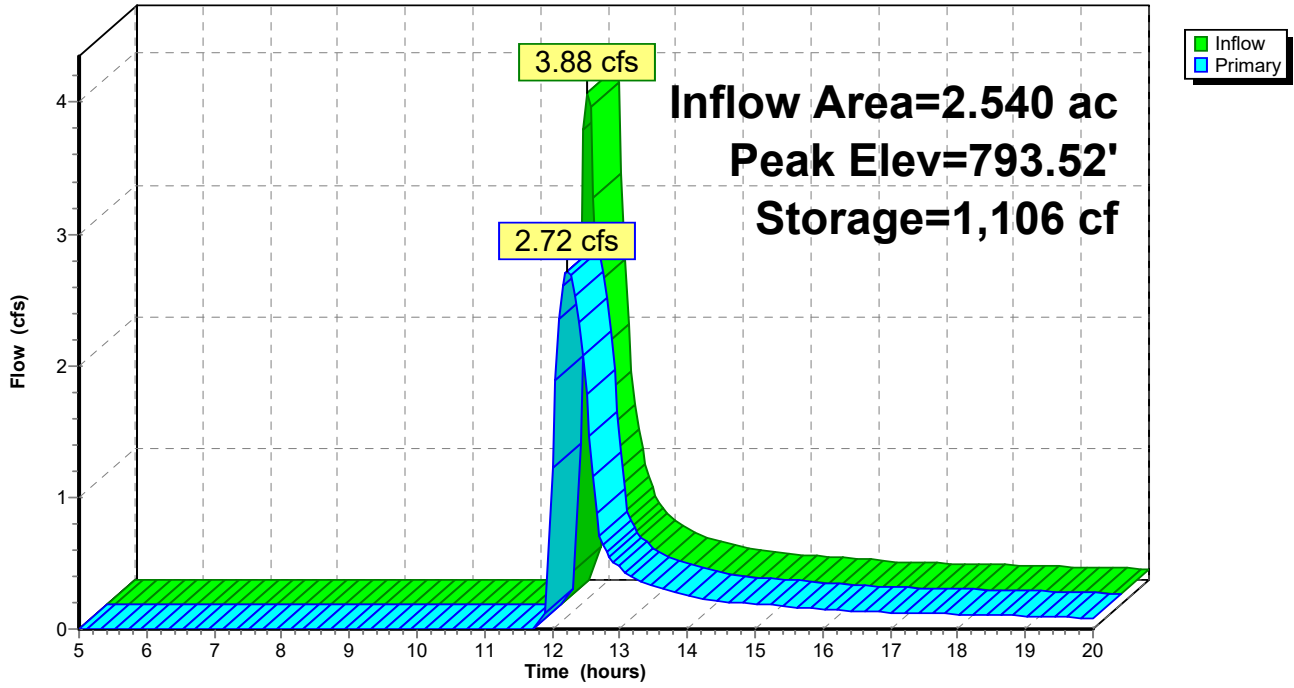
Type II 24-hr 5 YEAR Rainfall=2.79"

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Page 6

**Pond 3E: EX**

Hydrograph



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Page 7

**Summary for Pond 3E: EX**

[79] Warning: Submerged Pond 2P Primary device # 2 by 0.23'

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 1.45" for 10 YEAR event  
 Inflow = 4.26 cfs @ 12.12 hrs, Volume= 0.307 af  
 Outflow = 3.19 cfs @ 12.31 hrs, Volume= 0.307 af, Atten= 25%, Lag= 11.3 min  
 Primary = 3.19 cfs @ 12.31 hrs, Volume= 0.307 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 793.71' @ 12.31 hrs Surf.Area= 4,071 sf Storage= 1,831 cf

Plug-Flow detention time= 4.7 min calculated for 0.306 af (100% of inflow)  
 Center-of-Mass det. time= 4.4 min ( 816.2 - 811.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	792.50'	28,890 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.50	1	0	0
793.00	438	110	110
793.50	3,315	938	1,048
794.00	5,098	2,103	3,151
794.50	6,056	2,789	5,940
795.00	7,087	3,286	9,226
795.50	8,250	3,834	13,060
796.00	9,555	4,451	17,511
796.50	11,241	5,199	22,710
797.00	13,480	6,180	28,890

Device	Routing	Invert	Outlet Devices
#1	Primary	792.50'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=3.19 cfs @ 12.31 hrs HW=793.71' (Free Discharge)

↑**1=Orifice/Grate** (Orifice Controls 3.19 cfs @ 4.06 fps)

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EXISTING DETENTION BASIN OUTLET

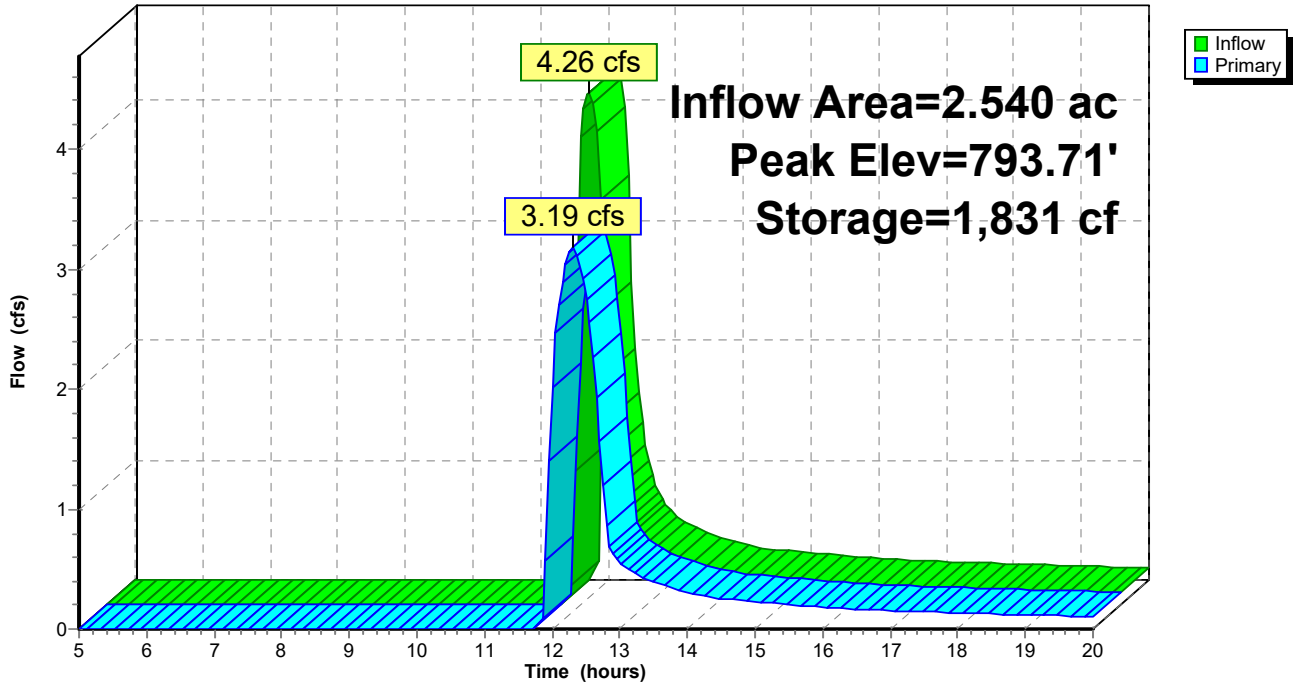
Type II 24-hr 10 YEAR Rainfall=3.24"

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**Pond 3E: EX**

Hydrograph



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Page 9

**Summary for Pond 3E: EX**

[79] Warning: Submerged Pond 2P Primary device # 2 by 0.44'

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 1.98" for 25 YEAR event  
 Inflow = 4.79 cfs @ 12.14 hrs, Volume= 0.420 af  
 Outflow = 3.63 cfs @ 12.43 hrs, Volume= 0.419 af, Atten= 24%, Lag= 17.6 min  
 Primary = 3.63 cfs @ 12.43 hrs, Volume= 0.419 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 793.92' @ 12.43 hrs Surf.Area= 4,816 sf Storage= 2,759 cf

Plug-Flow detention time= 6.4 min calculated for 0.418 af (100% of inflow)  
 Center-of-Mass det. time= 6.1 min ( 810.7 - 804.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	792.50'	28,890 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.50	1	0	0
793.00	438	110	110
793.50	3,315	938	1,048
794.00	5,098	2,103	3,151
794.50	6,056	2,789	5,940
795.00	7,087	3,286	9,226
795.50	8,250	3,834	13,060
796.00	9,555	4,451	17,511
796.50	11,241	5,199	22,710
797.00	13,480	6,180	28,890

Device	Routing	Invert	Outlet Devices
#1	Primary	792.50'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=3.62 cfs @ 12.43 hrs HW=793.92' (Free Discharge)

↑**1=Orifice/Grate** (Orifice Controls 3.62 cfs @ 4.61 fps)

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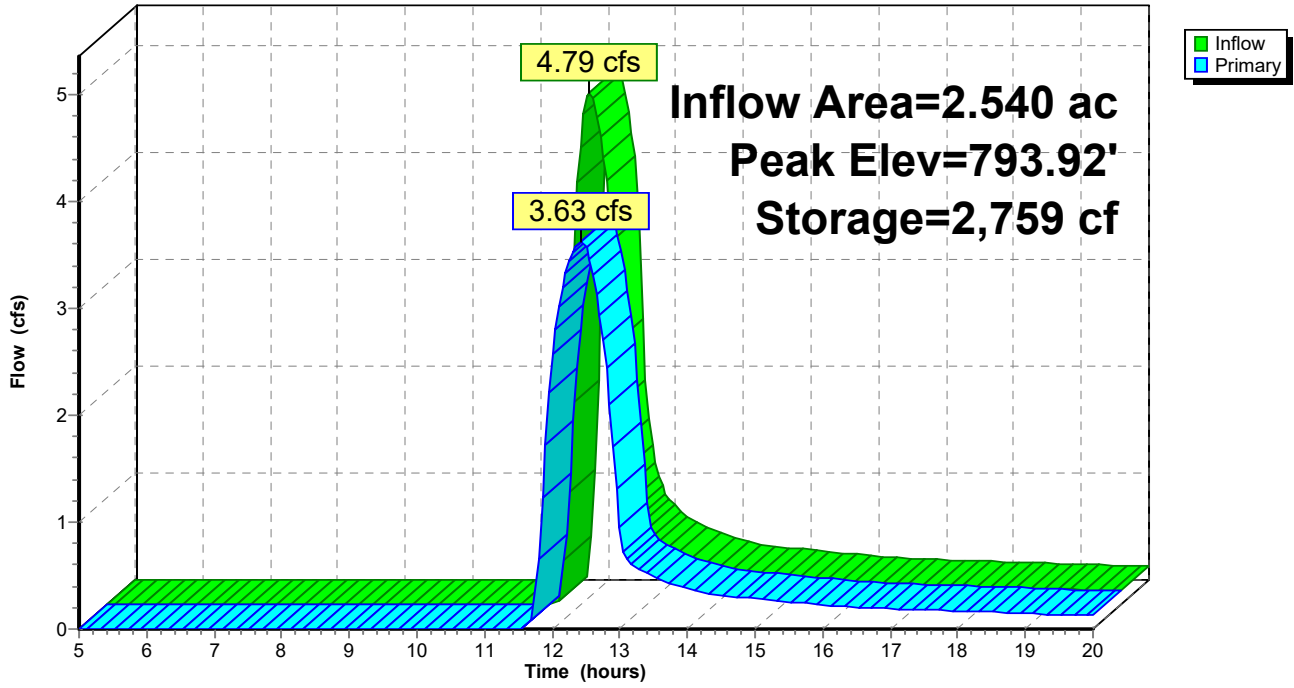
EXISTING DETENTION BASIN OUTLET  
Type II 24-hr 25 YEAR Rainfall=3.88"

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Page 10

**Pond 3E: EX**

Hydrograph





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Page 11

**Summary for Pond 3E: EX**

[79] Warning: Submerged Pond 2P Primary device # 2 by 0.58'

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 2.44" for 50 YEAR event  
 Inflow = 5.19 cfs @ 12.15 hrs, Volume= 0.517 af  
 Outflow = 3.90 cfs @ 12.53 hrs, Volume= 0.517 af, Atten= 25%, Lag= 22.8 min  
 Primary = 3.90 cfs @ 12.53 hrs, Volume= 0.517 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 794.07' @ 12.53 hrs Surf.Area= 5,224 sf Storage= 3,490 cf

Plug-Flow detention time= 7.6 min calculated for 0.517 af (100% of inflow)  
 Center-of-Mass det. time= 7.4 min ( 807.8 - 800.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	792.50'	28,890 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.50	1	0	0
793.00	438	110	110
793.50	3,315	938	1,048
794.00	5,098	2,103	3,151
794.50	6,056	2,789	5,940
795.00	7,087	3,286	9,226
795.50	8,250	3,834	13,060
796.00	9,555	4,451	17,511
796.50	11,241	5,199	22,710
797.00	13,480	6,180	28,890

Device	Routing	Invert	Outlet Devices
#1	Primary	792.50'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=3.90 cfs @ 12.53 hrs HW=794.06' (Free Discharge)

↑**1=Orifice/Grate** (Orifice Controls 3.90 cfs @ 4.96 fps)

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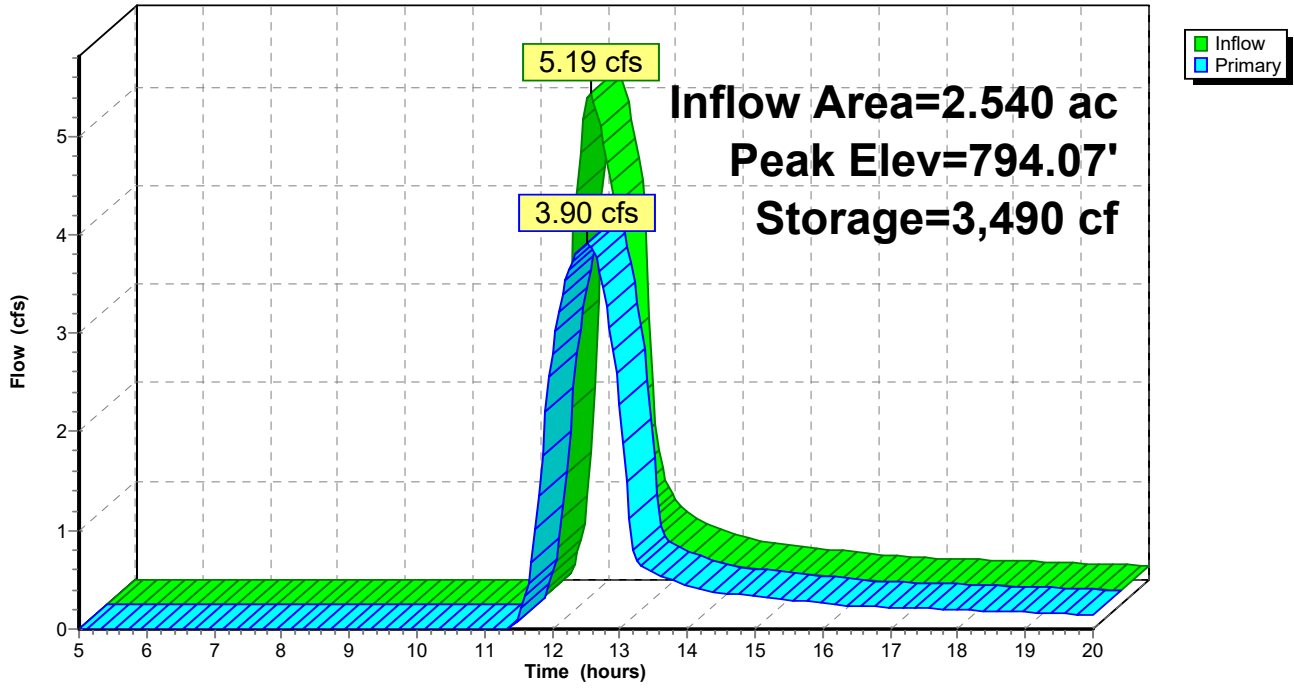
EXISTING DETENTION BASIN OUTLET  
Type II 24-hr 50 YEAR Rainfall=4.42"

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Page 12

**Pond 3E: EX**

Hydrograph



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**Summary for Pond 3E: EX**

[79] Warning: Submerged Pond 2P Primary device # 2 by 0.72'

Inflow Area = 2.540 ac, 50.00% Impervious, Inflow Depth > 2.95" for 100 YEAR event  
 Inflow = 5.57 cfs @ 12.16 hrs, Volume= 0.624 af  
 Outflow = 4.15 cfs @ 12.60 hrs, Volume= 0.624 af, Atten= 26%, Lag= 26.7 min  
 Primary = 4.15 cfs @ 12.60 hrs, Volume= 0.624 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 794.20' @ 12.60 hrs Surf.Area= 5,488 sf Storage= 4,228 cf

Plug-Flow detention time= 8.8 min calculated for 0.624 af (100% of inflow)  
 Center-of-Mass det. time= 8.5 min ( 805.5 - 797.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	792.50'	28,890 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
792.50	1	0	0
793.00	438	110	110
793.50	3,315	938	1,048
794.00	5,098	2,103	3,151
794.50	6,056	2,789	5,940
795.00	7,087	3,286	9,226
795.50	8,250	3,834	13,060
796.00	9,555	4,451	17,511
796.50	11,241	5,199	22,710
797.00	13,480	6,180	28,890

Device	Routing	Invert	Outlet Devices
#1	Primary	792.50'	<b>12.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=4.15 cfs @ 12.60 hrs HW=794.20' (Free Discharge)

↑**1=Orifice/Grate** (Orifice Controls 4.15 cfs @ 5.28 fps)

**Basin**

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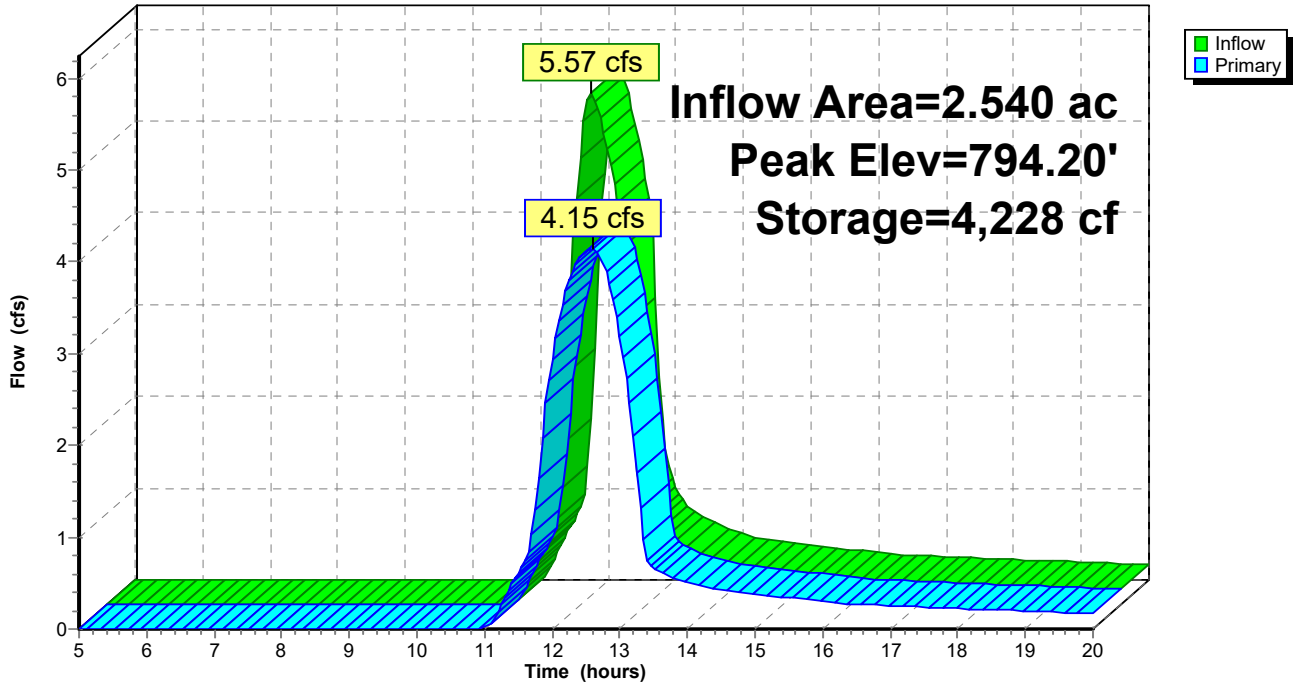
EXISTING DETENTION BASIN OUTLET  
Type II 24-hr 100 YEAR Rainfall=5.00"

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Page 14

**Pond 3E: EX**

Hydrograph





***Kabil Associates***

*Engineers Architects Planners*

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Columbus, Ohio 43229

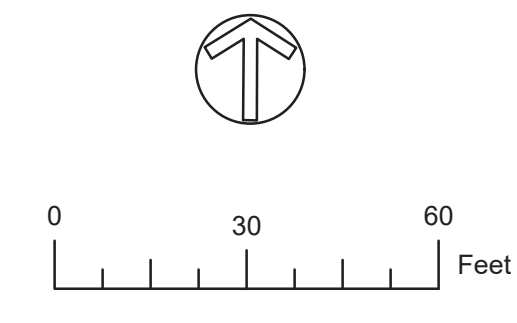
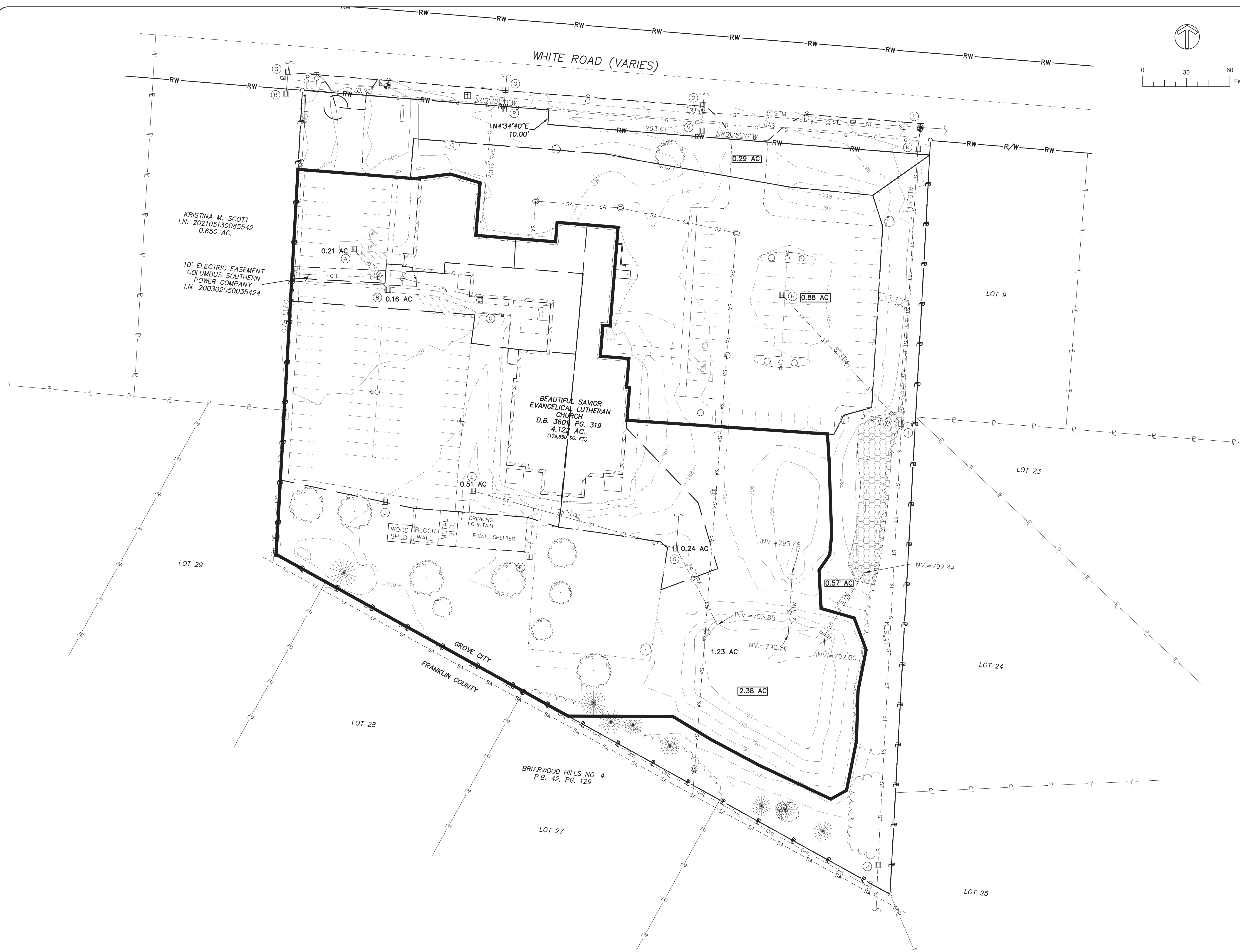
614-899-6707

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PIPE DESIGN







KRISTINA M. SCOTT  
I.N. 20210513008542  
0.650 AC.

10' ELECTRIC EASEMENT  
COLUMBUS SOUTHERN  
POWER COMPANY  
I.N. 200302050035424

BEAUTIFUL SAVIOR  
EVANGELICAL LUTHERAN  
CHURCH  
D.B. 3801, PG. 319  
4.122 AC.  
(179,550 SQ. FT.)

BRIARWOOD HILLS NO. 4  
P.B. 42, PG. 129

EXISTING TRIBUTARY MAP

**RESEARCH**

ROBERT. E. EUANS, ARCHITECTS, INC.  
2057 Honeytree Loop North Columbus, Ohio 43229  
(614) 882-3657 research@remail.com

**BEAUTIFUL SAVIOR LUTHERAN CHURCH  
ALTERATIONS AND ADDITION  
2213 WHITE ROAD, GROVE CITY, OHIO**

CAD FILE NAME:

REVISIONS:

PROJECT NUMBER: 2131  
DATE: OCTOBER 20, 2021

SHEET NUMBER  
**T-EX**





KRISTINA M. SCOTT  
I.N. 202105130085542  
0.650 AC.

10' ELECTRIC EASEMENT  
COLUMBUS SOUTHERN  
POWER COMPANY  
I.N. 200302050035424

BEAUTIFUL SAVIOR  
EVANGELICAL LUTHERAN  
CHURCH  
D.B. 3601, PG. 319  
4.122 AC.  
(179,599 SQ. FT.)

LOT 28

BRIARWOOD HILLS NO. 4  
P.B. 42, PG. 129

LOT 27

LOT 9

LOT 23

LOT 24

LOT 25

PROPOSED TRIBUTARY MAP

ROBERT E. EVANS, ARCHITECTS, INC.  
2057 Honeytree Loop North Columbus, Ohio 43229  
(614) 882-3657 rearchinc@gmail.com

BEAUTIFUL SAVIOR LUTHERAN CHURCH  
ALTERATIONS AND ADDITION  
2213 WHITE ROAD, GROVE CITY, OHIO

CAD FILE NAME:

REVISIONS:

PROJECT NUMBER: 2131  
DATE: OCTOBER 20, 2021

SHEET NUMBER  
T-PR