

August 30, 2023

Franklin Planning Board  
355 East Central Street  
Franklin, MA 02038

Re: Special Permit Application  
Lots 1R & 2R Uncas Avenue Extension  
Franklin, MA  
Applicant: J. Walsh Corporation

Dear Board Members,

The applicant, J. Walsh Corporation, has filed a Special Permit Application to construct three (3) family dwellings on Lots 1R and 2R, Uncas Avenue Extension. The existing subdivision is Zoned Single Family IV and was approved with the intent to construct two (2) family dwellings. The existing project site has been partially completed with water, sewer, drainage system, rough site grading and roadway constructed to binder coarse.

The Town of Franklin recently voted to allow three (3) family dwellings in Single Family IV zone with a special permit from the Planning Board.

Our firm has reviewed the originally approved Stormwater design for the subdivision and the new proposed project with three (3) family dwelling units. The stormwater system consists of catch basin, manholes and a retention basin to mitigate the increase in stormwater rate and volume of runoff. We have prepared a conceptual plan for the entire project depicting 3-unit buildings on all nine (9) lots.

The approved stormwater design was used to provide a comparison of the proposed 3-unit building layout. The drainage basin was constructed along with the roadway and utilities. The as-built conditions of the drainage basin were used to analyze the proposed 3-unit building design. The study includes the ability of the drainage basin to mitigate the stormwater flow and provide water quality pretreatment for the impervious area.

We have provided the hydro-cad results for the approved stormwater report and the proposed conditions with the as-built drainage basin conditions. The approved project design is represented by Subcatchment 30 and Pond 31P. The proposed conditions are shown as Subcatchment 31 and Pond 32P.

The following is a comparison of the peak rates, volumes, and flood elevations within the drainage basin. (See attached hydro-cad summaries)

	Approved Conditions		Proposed 3-Family Units	
	Peak Inflow Pond 31P (c.f.s.)	Peak Flood Elevation (feet)	Peak Inflow Pond 32P (c.f.s.)	Peak Flood Elevation (feet)
3.2"-2 year	9.27	279.9	8.77	280.2
4.8"-10 year	19.00	281.5	18.30	281.6
6.1"-50 year	27.42	282.5	26.68	282.5
7.0"-100 year	33.37	283.0	32.60	283.1

The calculations conclude that the drainage basin as constructed will provide sufficient mitigation for the proposed three (3) family dwellings units. The berm elevation was constructed as proposed to elevation 284.5 feet, thus providing a minimum of one foot freeboard.

Water quality calculations were performed to demonstrate that the basin as constructed will provide adequate pretreatment for the proposed impervious area. (See attached Water Quality Volume Calculations). In summary, the stormwater drainage basin will provide adequate water quality treatment for the impervious area.

Please let us know if you have any questions or need additional information.

Thank you for your cooperation in this matter.

Yours truly,  
GLM Engineering Consultants Inc.

Robert S. Truax, P.E.

## Stormwater Water Quality Volume Calculations

### **Project:**

Uncas Avenue Extension  
Franklin, MA  
October 25, 2023

### **Impervious Areas\*:**

#### **Project Site Total Impervious:**

Roof:	30,408 sf
Roads/Sidewalk:	35,017 sf
Driveways:	<u>19,502 s.f</u>
Total:	84,927 sf

#### **Project Site Paved Impervious:**

Roads/Sidewalk:	35,017 sf
Driveways:	<u>19,502 s.f</u>
Total:	54,519 sf

Water Quality Volume (WQV): Based on 1.0 inch rainfall

WQV = Impervious Pavement x 1.0 inch

WQV= 54,519 s.f. x 1.0 = 4,543 cu.ft.

### **Storage Volume Provided:**

Basin Volume below outlet elevation (Outlet El=280.0):

Storage Volume = 9,619 cu.ft. > 4,543 cu.ft. **O.K.**

Drawdown time = Volume/(K\*Bottom Area)

Volume = 1157 cf

K = 8.27 in/hr = 0.69 ft/hr

Bottom Area (Bot EL.=278.5) = 2,495 sf

Drawdown time = 9619 cu.ft. / (0.69 ft/hr x 2,495 sf)

Drawdown time = 5.6 hr < 72 hr **ok**

## **Stormwater Calculations**

### **Project:**

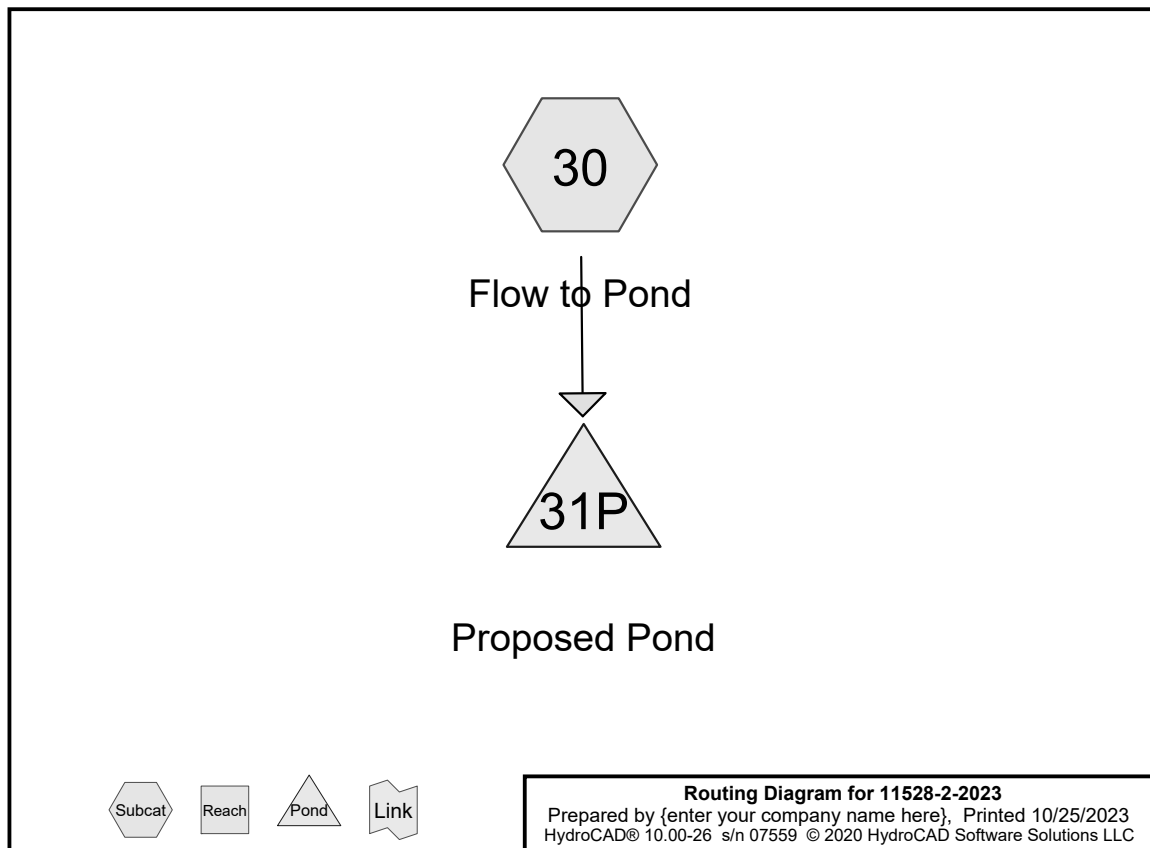
Uncas Avenue Extension  
Franklin, MA  
October 25, 2023

### **Approved Conditions:**

Subcatchment 30  
Pond 31P

### **Proposed Conditions:**

Subcatchment 31  
Pond 32P



# 11528-2-2023

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Type III 24-hr 2 yr - 3.2" Rainfall=3.20"

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## Summary for Subcatchment 30: Flow to Pond

Runoff = 9.27 cfs @ 12.34 hrs, Volume= 1.065 af, Depth> 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 yr - 3.2" Rainfall=3.20"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
* 9,460	98	Exist. pave - C
* 21,890	98	Proposed drives - C
* 25,557	98	Proposed roads & walks
* 45,286	98	Proposed units & decks - C
131,583	74	>75% Grass cover, Good, HSG C
144,279	70	Woods, Good, HSG C
* 8,980	98	Ledge
439,474	78	Weighted Average
328,301		74.70% Pervious Area
111,173		25.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b> Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b> Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12"RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
23.2	875	Total			

**Summary for Pond 31P: Proposed Pond**

Inflow Area = 10.089 ac, 25.30% Impervious, Inflow Depth > 1.27" for 2 yr - 3.2" event  
 Inflow = 9.27 cfs @ 12.34 hrs, Volume= 1.065 af  
 Outflow = 3.50 cfs @ 12.83 hrs, Volume= 1.031 af, Atten= 62%, Lag= 29.7 min  
 Discarded = 3.50 cfs @ 12.83 hrs, Volume= 1.031 af  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 279.93' @ 12.83 hrs Surf.Area= 7,515 sf Storage= 13,863 cf

Plug-Flow detention time= 58.9 min calculated for 1.031 af (97% of inflow)  
 Center-of-Mass det. time= 41.6 min ( 903.5 - 861.9 )

Volume	Invert	Avail.Storage	Storage Description		
#1	273.00'	74,097 cf	<b>Custom Stage Data (Irregular)</b> Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	348	116.0	0	0	348
274.00	348	116.0	348	348	464
275.00	348	116.0	348	696	580
276.00	348	116.0	348	1,044	696
277.00	348	116.0	348	1,392	812
278.00	3,709	312.0	1,731	3,123	7,491
280.00	7,651	487.0	11,125	14,248	18,647
282.00	12,840	660.0	20,268	34,516	34,479
282.10	15,780	665.0	1,428	35,945	35,010
283.00	19,820	680.0	15,986	51,930	36,726
284.00	24,600	690.0	22,167	74,097	38,014

Device	Routing	Invert	Outlet Devices
#1	Primary	278.00'	<b>18.0" Round Culvert</b> L= 22.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 278.00' / 277.12' S= 0.0400 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	280.00'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=3.49 cfs @ 12.83 hrs HW=279.93' (Free Discharge)  
 3=Exfiltration (Exfiltration Controls 3.49 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=273.00' (Free Discharge)  
 1=Culvert ( Controls 0.00 cfs)  
 2=Orifice/Grate ( Controls 0.00 cfs)

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Type III 24-hr 10 yr - 4.8" Rainfall=4.80"

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**Summary for Subcatchment 30: Flow to Pond**

Runoff = 19.00 cfs @ 12.32 hrs, Volume= 2.128 af, Depth> 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10 yr - 4.8" Rainfall=4.80"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
* 9,460	98	Exist. pave - C
* 21,890	98	Proposed drives - C
* 25,557	98	Proposed roads & walks
* 45,286	98	Proposed units & decks - C
131,583	74	>75% Grass cover, Good, HSG C
144,279	70	Woods, Good, HSG C
* 8,980	98	Ledge
439,474	78	Weighted Average
328,301		74.70% Pervious Area
111,173		25.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b> Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b> Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12"RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
23.2	875	Total			

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Type III 24-hr 10 yr - 4.8" Rainfall=4.80"

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**Summary for Pond 31P: Proposed Pond**

Inflow Area = 10.089 ac, 25.30% Impervious, Inflow Depth > 2.53" for 10 yr - 4.8" event  
 Inflow = 19.00 cfs @ 12.32 hrs, Volume= 2.128 af  
 Outflow = 7.68 cfs @ 12.77 hrs, Volume= 2.089 af, Atten= 60%, Lag= 27.0 min  
 Discarded = 5.79 cfs @ 12.77 hrs, Volume= 1.934 af  
 Primary = 1.90 cfs @ 12.77 hrs, Volume= 0.155 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 281.46' @ 12.77 hrs Surf.Area= 11,449 sf Storage= 29,081 cf

Plug-Flow detention time= 59.9 min calculated for 2.085 af (98% of inflow)  
 Center-of-Mass det. time= 49.5 min ( 891.6 - 842.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	273.00'	74,097 cf	<b>Custom Stage Data (Irregular)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	348	116.0	0	0	348
274.00	348	116.0	348	348	464
275.00	348	116.0	348	696	580
276.00	348	116.0	348	1,044	696
277.00	348	116.0	348	1,392	812
278.00	3,709	312.0	1,731	3,123	7,491
280.00	7,651	487.0	11,125	14,248	18,647
282.00	12,840	660.0	20,268	34,516	34,479
282.10	15,780	665.0	1,428	35,945	35,010
283.00	19,820	680.0	15,986	51,930	36,726
284.00	24,600	690.0	22,167	74,097	38,014

Device	Routing	Invert	Outlet Devices
#1	Primary	278.00'	<b>18.0" Round Culvert</b> L= 22.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 278.00' / 277.12' S= 0.0400 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	280.00'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

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Type III 24-hr 10 yr - 4.8" Rainfall=4.80"

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**Discarded OutFlow** Max=5.78 cfs @ 12.77 hrs HW=281.46' (Free Discharge)↑ **3=Exfiltration** (Exfiltration Controls 5.78 cfs)**Primary OutFlow** Max=1.89 cfs @ 12.77 hrs HW=281.46' (Free Discharge)↑ **1=Culvert** (Passes 1.89 cfs of 17.51 cfs potential flow)↑ **2=Orifice/Grate** (Orifice Controls 1.89 cfs @ 3.88 fps)

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Type III 24-hr 50 yr - 6.1" Rainfall=6.10"

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**Summary for Subcatchment 30: Flow to Pond**

Runoff = 27.42 cfs @ 12.32 hrs, Volume= 3.070 af, Depth&gt; 3.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Type III 24-hr 50 yr - 6.1" Rainfall=6.10"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
* 9,460	98	Exist. pave - C
* 21,890	98	Proposed drives - C
* 25,557	98	Proposed roads & walks
* 45,286	98	Proposed units & decks - C
131,583	74	>75% Grass cover, Good, HSG C
144,279	70	Woods, Good, HSG C
* 8,980	98	Ledge
439,474	78	Weighted Average
328,301		74.70% Pervious Area
111,173		25.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b>
					Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b>
					Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12"RCP</b>
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b>
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013
23.2	875	Total			



**Summary for Pond 31P: Proposed Pond**

Inflow Area = 10.089 ac, 25.30% Impervious, Inflow Depth > 3.65" for 50 yr - 6.1" event  
 Inflow = 27.42 cfs @ 12.32 hrs, Volume= 3.070 af  
 Outflow = 10.92 cfs @ 12.77 hrs, Volume= 3.027 af, Atten= 60%, Lag= 27.0 min  
 Discarded = 6.83 cfs @ 12.77 hrs, Volume= 2.586 af  
 Primary = 4.10 cfs @ 12.77 hrs, Volume= 0.441 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 282.45' @ 12.77 hrs Surf.Area= 17,338 sf Storage= 42,108 cf

Plug-Flow detention time= 59.2 min calculated for 3.027 af (99% of inflow)  
 Center-of-Mass det. time= 51.0 min ( 882.7 - 831.7 )

Volume	Invert	Avail.Storage	Storage Description		
#1	273.00'	74,097 cf	<b>Custom Stage Data (Irregular)</b> Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	348	116.0	0	0	348
274.00	348	116.0	348	348	464
275.00	348	116.0	348	696	580
276.00	348	116.0	348	1,044	696
277.00	348	116.0	348	1,392	812
278.00	3,709	312.0	1,731	3,123	7,491
280.00	7,651	487.0	11,125	14,248	18,647
282.00	12,840	660.0	20,268	34,516	34,479
282.10	15,780	665.0	1,428	35,945	35,010
283.00	19,820	680.0	15,986	51,930	36,726
284.00	24,600	690.0	22,167	74,097	38,014

Device	Routing	Invert	Outlet Devices
#1	Primary	278.00'	<b>18.0" Round Culvert</b> L= 22.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 278.00' / 277.12' S= 0.0400 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	280.00'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=6.83 cfs @ 12.77 hrs HW=282.45' (Free Discharge)  
 3=Exfiltration (Exfiltration Controls 6.83 cfs)

**Primary OutFlow** Max=4.09 cfs @ 12.77 hrs HW=282.45' (Free Discharge)  
 1=Culvert (Passes 4.09 cfs of 20.45 cfs potential flow)  
 2=Orifice/Grate (Orifice Controls 4.09 cfs @ 5.02 fps)

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Type III 24-hr 100 yr 7.0" Rainfall=7.00"

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**Summary for Subcatchment 30: Flow to Pond**

Runoff = 33.37 cfs @ 12.32 hrs, Volume= 3.747 af, Depth> 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100 yr 7.0" Rainfall=7.00"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
9,460	98	Exist. pave - C
21,890	98	Proposed drives - C
25,557	98	Proposed roads & walks
45,286	98	Proposed units & decks - C
131,583	74	>75% Grass cover, Good, HSG C
144,279	70	Woods, Good, HSG C
8,980	98	Ledge
439,474	78	Weighted Average
328,301		74.70% Pervious Area
111,173		25.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b> Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b> Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12"RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
23.2	875	Total			

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Type III 24-hr 100 yr 7.0" Rainfall=7.00"

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**Summary for Pond 31P: Proposed Pond**

Inflow Area = 10.089 ac, 25.30% Impervious, Inflow Depth > 4.46" for 100 yr 7.0" event  
 Inflow = 33.37 cfs @ 12.32 hrs, Volume= 3.747 af  
 Outflow = 12.68 cfs @ 12.78 hrs, Volume= 3.701 af, Atten= 62%, Lag= 27.8 min  
 Discarded = 7.04 cfs @ 12.78 hrs, Volume= 2.996 af  
 Primary = 5.64 cfs @ 12.78 hrs, Volume= 0.705 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 283.03' @ 12.78 hrs Surf.Area= 19,961 sf Storage= 52,586 cf

Plug-Flow detention time= 60.5 min calculated for 3.701 af (99% of inflow)  
 Center-of-Mass det. time= 53.2 min ( 879.4 - 826.1 )

Volume	Invert	Avail.Storage	Storage	Description
#1	273.00'	74,097 cf		<b>Custom Stage Data (Irregular)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	348	116.0	0	0	348
274.00	348	116.0	348	348	464
275.00	348	116.0	348	696	580
276.00	348	116.0	348	1,044	696
277.00	348	116.0	348	1,392	812
278.00	3,709	312.0	1,731	3,123	7,491
280.00	7,651	487.0	11,125	14,248	18,647
282.00	12,840	660.0	20,268	34,516	34,479
282.10	15,780	665.0	1,428	35,945	35,010
283.00	19,820	680.0	15,986	51,930	36,726
284.00	24,600	690.0	22,167	74,097	38,014

Device	Routing	Invert	Outlet Devices
#1	Primary	278.00'	<b>18.0" Round Culvert</b> L= 22.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 278.00' / 277.12' S= 0.0400 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	280.00'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

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Type III 24-hr 100 yr 7.0" Rainfall=7.00"

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**Discarded OutFlow** Max=7.04 cfs @ 12.78 hrs HW=283.03' (Free Discharge)↳ **3=Exfiltration** (Exfiltration Controls 7.04 cfs)**Primary OutFlow** Max=5.64 cfs @ 12.78 hrs HW=283.03' (Free Discharge)↳ **1=Culvert** (Passes 5.64 cfs of 22.00 cfs potential flow)↳ **2=Orifice/Grate** (Orifice Controls 5.64 cfs @ 5.59 fps)

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Type III 24-hr 100 yr 8.57" Rainfall=8.57"

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**Summary for Subcatchment 30: Flow to Pond**

Runoff = 43.86 cfs @ 12.31 hrs, Volume= 4.958 af, Depth&gt; 5.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 yr 8.57" Rainfall=8.57"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
* 9,460	98	Exist. pave - C
* 21,890	98	Proposed drives - C
* 25,557	98	Proposed roads & walks
* 45,286	98	Proposed units & decks - C
131,583	74	>75% Grass cover, Good, HSG C
144,279	70	Woods, Good, HSG C
* 8,980	98	Ledge
439,474	78	Weighted Average
328,301		74.70% Pervious Area
111,173		25.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b> Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b> Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12"RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
23.2	875	Total			

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Type III 24-hr 100 yr 8.57" Rainfall=8.57"

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**Summary for Pond 31P: Proposed Pond**

Inflow Area = 10.089 ac, 25.30% Impervious, Inflow Depth > 5.90" for 100 yr 8.57" event  
 Inflow = 43.86 cfs @ 12.31 hrs, Volume= 4.958 af  
 Outflow = 15.54 cfs @ 12.80 hrs, Volume= 4.907 af, Atten= 65%, Lag= 29.1 min  
 Discarded = 7.26 cfs @ 12.80 hrs, Volume= 3.646 af  
 Primary = 8.29 cfs @ 12.80 hrs, Volume= 1.262 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 283.91' @ 12.80 hrs Surf.Area= 24,191 sf Storage= 72,202 cf

Plug-Flow detention time= 63.8 min calculated for 4.907 af (99% of inflow)  
 Center-of-Mass det. time= 57.7 min ( 876.0 - 818.3 )

Volume	Invert	Avail.Storage	Storage Description		
#1	273.00'	74,097 cf	<b>Custom Stage Data (Irregular)</b> Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	348	116.0	0	0	348
274.00	348	116.0	348	348	464
275.00	348	116.0	348	696	580
276.00	348	116.0	348	1,044	696
277.00	348	116.0	348	1,392	812
278.00	3,709	312.0	1,731	3,123	7,491
280.00	7,651	487.0	11,125	14,248	18,647
282.00	12,840	660.0	20,268	34,516	34,479
282.10	15,780	665.0	1,428	35,945	35,010
283.00	19,820	680.0	15,986	51,930	36,726
284.00	24,600	690.0	22,167	74,097	38,014

Device	Routing	Invert	Outlet Devices
#1	Primary	278.00'	<b>18.0" Round Culvert</b> L= 22.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 278.00' / 277.12' S= 0.0400 '/ Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	280.00'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

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Type III 24-hr 100 yr 8.57" Rainfall=8.57"

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**Discarded OutFlow** Max=7.26 cfs @ 12.80 hrs HW=283.91' (Free Discharge)  
 3=Exfiltration (Exfiltration Controls 7.26 cfs)

**Primary OutFlow** Max=8.29 cfs @ 12.80 hrs HW=283.91' (Free Discharge)  
 1=Culvert (Passes 8.29 cfs of 24.17 cfs potential flow)  
 2=Orifice/Grate (Orifice Controls 8.29 cfs @ 6.35 fps)

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Type III 24-hr Custom Rainfall=8.57"

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**Summary for Subcatchment 30: Flow to Pond**

Runoff = 43.86 cfs @ 12.31 hrs, Volume= 4.958 af, Depth> 5.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type III 24-hr Custom Rainfall=8.57"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
* 9,460	98	Exist. pave - C
* 21,890	98	Proposed drives - C
* 25,557	98	Proposed roads & walks
* 45,286	98	Proposed units & decks - C
131,583	74	>75% Grass cover, Good, HSG C
144,279	70	Woods, Good, HSG C
* 8,980	98	Ledge
439,474	78	Weighted Average
328,301		74.70% Pervious Area
111,173		25.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b> Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b> Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12"RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
23.2	875	Total			

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Type III 24-hr Custom Rainfall=8.57"

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**Summary for Pond 31P: Proposed Pond**

Inflow Area = 10.089 ac, 25.30% Impervious, Inflow Depth > 5.90" for Custom event  
 Inflow = 43.86 cfs @ 12.31 hrs, Volume= 4.958 af  
 Outflow = 15.54 cfs @ 12.80 hrs, Volume= 4.907 af, Atten= 65%, Lag= 29.1 min  
 Discarded = 7.26 cfs @ 12.80 hrs, Volume= 3.646 af  
 Primary = 8.29 cfs @ 12.80 hrs, Volume= 1.262 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 283.91' @ 12.80 hrs Surf.Area= 24,191 sf Storage= 72,202 cf

Plug-Flow detention time= 63.8 min calculated for 4.907 af (99% of inflow)  
 Center-of-Mass det. time= 57.7 min ( 876.0 - 818.3 )

Volume	Invert	Avail.Storage	Storage	Description
#1	273.00'	74,097 cf		<b>Custom Stage Data (Irregular)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	348	116.0	0	0	348
274.00	348	116.0	348	348	464
275.00	348	116.0	348	696	580
276.00	348	116.0	348	1,044	696
277.00	348	116.0	348	1,392	812
278.00	3,709	312.0	1,731	3,123	7,491
280.00	7,651	487.0	11,125	14,248	18,647
282.00	12,840	660.0	20,268	34,516	34,479
282.10	15,780	665.0	1,428	35,945	35,010
283.00	19,820	680.0	15,986	51,930	36,726
284.00	24,600	690.0	22,167	74,097	38,014

Device	Routing	Invert	Outlet Devices
#1	Primary	278.00'	<b>18.0" Round Culvert</b> L= 22.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 278.00' / 277.12' S= 0.0400 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	280.00'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

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*Type III 24-hr Custom Rainfall=8.57"*

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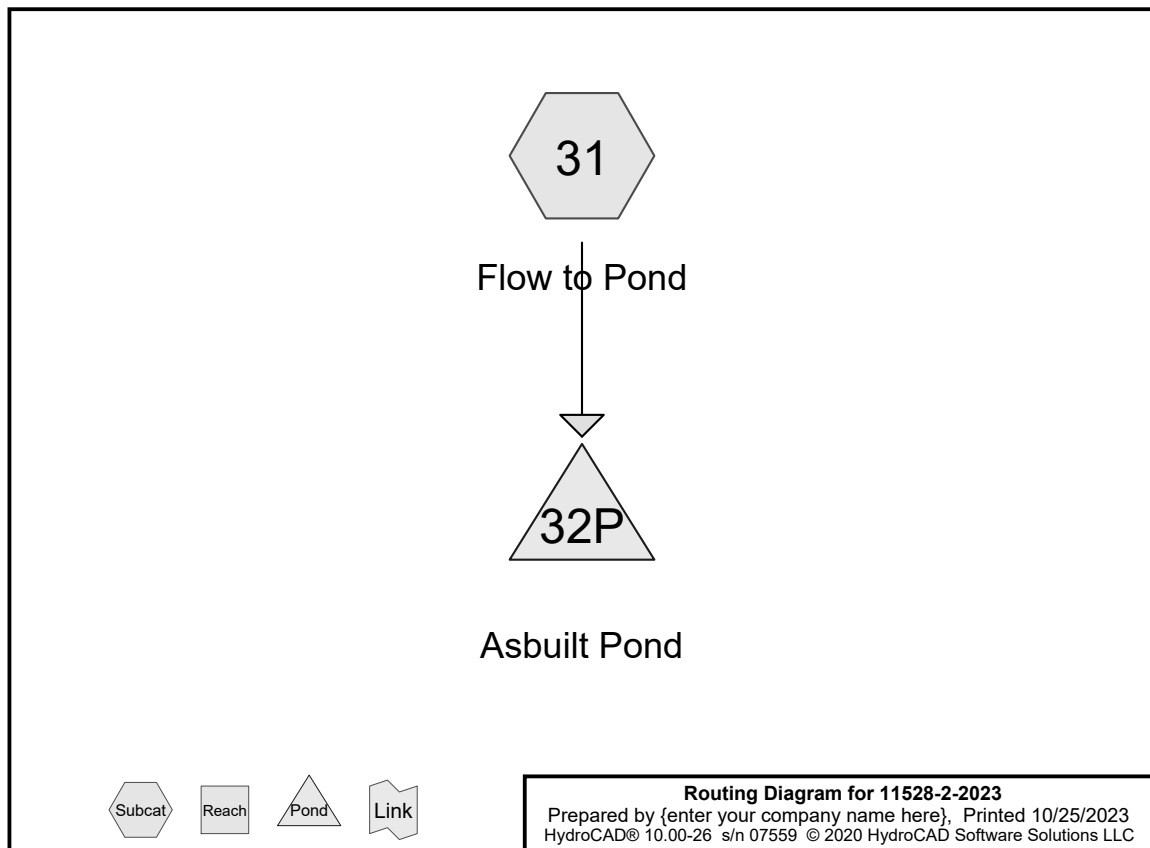
**Discarded OutFlow** Max=7.26 cfs @ 12.80 hrs HW=283.91' (Free Discharge)

↑**3=Exfiltration** (Exfiltration Controls 7.26 cfs)

**Primary OutFlow** Max=8.29 cfs @ 12.80 hrs HW=283.91' (Free Discharge)

↑**1=Culvert** (Passes 8.29 cfs of 24.17 cfs potential flow)

↑**2=Orifice/Grate** (Orifice Controls 8.29 cfs @ 6.35 fps)



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Type III 24-hr 2 yr - 3.2" Rainfall=3.20"

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#### Summary for Subcatchment 31: Flow to Pond

Runoff = 8.77 cfs @ 12.34 hrs, Volume= 1.013 af, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 2 yr - 3.2" Rainfall=3.20"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
* 9,460	98	Exist. pave - C
* 19,502	98	Proposed drives - C
* 25,557	98	Proposed roads & walks
* 30,408	98	Proposed Roofs - C
137,230	74	>75% Grass cover, Good, HSG C
155,898	70	Woods, Good, HSG C
* 8,980	98	Ledge
439,474	77	Weighted Average
345,567		78.63% Pervious Area
93,907		21.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b> Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b> Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12"RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
23.2	875	Total			

**Summary for Pond 32P: Asbuilt Pond**

Inflow Area = 10.089 ac, 21.37% Impervious, Inflow Depth > 1.21" for 2 yr - 3.2" event  
 Inflow = 8.77 cfs @ 12.34 hrs, Volume= 1.013 af  
 Outflow = 3.78 cfs @ 12.79 hrs, Volume= 1.003 af, Atten= 57%, Lag= 26.7 min  
 Discarded = 3.59 cfs @ 12.79 hrs, Volume= 0.994 af  
 Primary = 0.19 cfs @ 12.79 hrs, Volume= 0.009 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 280.22' @ 12.79 hrs Surf.Area= 7,917 sf Storage= 11,830 cf

Plug-Flow detention time= 46.0 min calculated for 1.003 af (99% of inflow)  
 Center-of-Mass det. time= 40.5 min ( 905.6 - 865.1 )

Volume	Invert	Avail.Storage	Storage Description		
#1	273.00'	73,184 cf	<b>Custom Stage Data (Irregular)</b> Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	348	0.0	0	0	348
274.00	312	116.0	330	330	1,420
275.00	312	116.0	312	642	1,536
276.00	312	116.0	312	954	1,652
277.00	312	116.0	312	1,266	1,768
278.00	860	237.0	563	1,829	5,172
278.50	2,495	265.0	803	2,632	6,297
280.00	7,230	450.0	6,986	9,619	16,837
282.00	13,590	650.0	20,488	30,107	34,379
283.00	16,900	678.0	15,215	45,322	37,411
284.00	19,100	697.0	17,989	63,311	39,601
284.50	20,400	709.0	9,873	73,184	40,989

Device	Routing	Invert	Outlet Devices
#1	Primary	278.00'	<b>18.0" Round Culvert</b> L= 22.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 278.00' / 277.12' S= 0.0400 ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	279.90'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=3.58 cfs @ 12.79 hrs HW=280.22' (Free Discharge)  
 3=Exfiltration (Exfiltration Controls 3.58 cfs)

**Primary OutFlow** Max=0.19 cfs @ 12.79 hrs HW=280.22' (Free Discharge)  
 1=Culvert (Passes 0.19 cfs of 12.87 cfs potential flow)  
 2=Orifice/Grate (Orifice Controls 0.19 cfs @ 1.80 fps)



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Type III 24-hr 10 yr - 4.8" Rainfall=4.80"

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**Summary for Subcatchment 31: Flow to Pond**

Runoff = 18.30 cfs @ 12.33 hrs, Volume= 2.056 af, Depth> 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10 yr - 4.8" Rainfall=4.80"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
* 9,460	98	Exist. pave - C
* 19,502	98	Proposed drives - C
* 25,557	98	Proposed roads & walks
* 30,408	98	Proposed Roofs - C
137,230	74	>75% Grass cover, Good, HSG C
155,898	70	Woods, Good, HSG C
* 8,980	98	Ledge
439,474	77	Weighted Average
345,567		78.63% Pervious Area
93,907		21.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b> Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b> Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12"RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
23.2	875	Total			

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Type III 24-hr 10 yr - 4.8" Rainfall=4.80"

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**Summary for Pond 32P: Asbuilt Pond**

Inflow Area = 10.089 ac, 21.37% Impervious, Inflow Depth > 2.45" for 10 yr - 4.8" event  
 Inflow = 18.30 cfs @ 12.33 hrs, Volume= 2.056 af  
 Outflow = 8.19 cfs @ 12.74 hrs, Volume= 2.026 af, Atten= 55%, Lag= 25.0 min  
 Discarded = 5.87 cfs @ 12.74 hrs, Volume= 1.820 af  
 Primary = 2.32 cfs @ 12.74 hrs, Volume= 0.206 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 281.57' @ 12.74 hrs Surf.Area= 12,237 sf Storage= 25,747 cf

Plug-Flow detention time= 48.1 min calculated for 2.026 af (99% of inflow)  
 Center-of-Mass det. time= 39.8 min ( 884.5 - 844.7 )

Volume	Invert	Avail.Storage	Storage	Description
#1	273.00'	73,184 cf		<b>Custom Stage Data (Irregular)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	348	0.0	0	0	348
274.00	312	116.0	330	330	1,420
275.00	312	116.0	312	642	1,536
276.00	312	116.0	312	954	1,652
277.00	312	116.0	312	1,266	1,768
278.00	860	237.0	563	1,829	5,172
278.50	2,495	265.0	803	2,632	6,297
280.00	7,230	450.0	6,986	9,619	16,837
282.00	13,590	650.0	20,488	30,107	34,379
283.00	16,900	678.0	15,215	45,322	37,411
284.00	19,100	697.0	17,989	63,311	39,601
284.50	20,400	709.0	9,873	73,184	40,989

Device	Routing	Invert	Outlet Devices
#1	Primary	278.00'	<b>18.0" Round Culvert</b> L= 22.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 278.00' / 277.12' S= 0.0400 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	279.90'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

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Type III 24-hr 10 yr - 4.8" Rainfall=4.80"

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**Discarded OutFlow** Max=5.86 cfs @ 12.74 hrs HW=281.57' (Free Discharge)↑ **3=Exfiltration** (Exfiltration Controls 5.86 cfs)**Primary OutFlow** Max=2.32 cfs @ 12.74 hrs HW=281.57' (Free Discharge)↑ **1=Culvert** (Passes 2.32 cfs of 17.87 cfs potential flow)↑ **2=Orifice/Grate** (Orifice Controls 2.32 cfs @ 4.15 fps)

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Type III 24-hr 50 yr - 6.1" Rainfall=6.10"

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**Summary for Subcatchment 31: Flow to Pond**

Runoff = 26.68 cfs @ 12.32 hrs, Volume= 2.985 af, Depth&gt; 3.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Type III 24-hr 50 yr - 6.1" Rainfall=6.10"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
* 9,460	98	Exist. pave - C
* 19,502	98	Proposed drives - C
* 25,557	98	Proposed roads & walks
* 30,408	98	Proposed Roofs - C
137,230	74	>75% Grass cover, Good, HSG C
155,898	70	Woods, Good, HSG C
* 8,980	98	Ledge
439,474	77	Weighted Average
345,567		78.63% Pervious Area
93,907		21.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b>
					Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b>
					Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12"RCP</b>
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b>
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013
23.2	875	Total			

**Summary for Pond 32P: Asbuilt Pond**

Inflow Area = 10.089 ac, 21.37% Impervious, Inflow Depth > 3.55" for 50 yr - 6.1" event  
 Inflow = 26.68 cfs @ 12.32 hrs, Volume= 2.985 af  
 Outflow = 11.46 cfs @ 12.74 hrs, Volume= 2.953 af, Atten= 57%, Lag= 25.5 min  
 Discarded = 6.89 cfs @ 12.74 hrs, Volume= 2.452 af  
 Primary = 4.57 cfs @ 12.74 hrs, Volume= 0.501 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 282.53' @ 12.74 hrs Surf.Area= 15,354 sf Storage= 38,217 cf

Plug-Flow detention time= 48.7 min calculated for 2.947 af (99% of inflow)  
 Center-of-Mass det. time= 42.4 min ( 876.5 - 834.1 )

Volume	Invert	Avail.Storage	Storage Description		
#1	273.00'	73,184 cf	<b>Custom Stage Data (Irregular)</b> Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	348	0.0	0	0	348
274.00	312	116.0	330	330	1,420
275.00	312	116.0	312	642	1,536
276.00	312	116.0	312	954	1,652
277.00	312	116.0	312	1,266	1,768
278.00	860	237.0	563	1,829	5,172
278.50	2,495	265.0	803	2,632	6,297
280.00	7,230	450.0	6,986	9,619	16,837
282.00	13,590	650.0	20,488	30,107	34,379
283.00	16,900	678.0	15,215	45,322	37,411
284.00	19,100	697.0	17,989	63,311	39,601
284.50	20,400	709.0	9,873	73,184	40,989

Device	Routing	Invert	Outlet Devices
#1	Primary	278.00'	<b>18.0" Round Culvert</b> L= 22.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 278.00' / 277.12' S= 0.0400 ' / Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	279.90'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=6.89 cfs @ 12.74 hrs HW=282.53' (Free Discharge)  
 3=Exfiltration (Exfiltration Controls 6.89 cfs)

**Primary OutFlow** Max=4.57 cfs @ 12.74 hrs HW=282.53' (Free Discharge)  
 1=Culvert (Passes 4.57 cfs of 20.68 cfs potential flow)  
 2=Orifice/Grate (Orifice Controls 4.57 cfs @ 5.21 fps)

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Type III 24-hr 100 yr 7.0" Rainfall=7.00"

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**Summary for Subcatchment 31: Flow to Pond**

Runoff = 32.60 cfs @ 12.32 hrs, Volume= 3.655 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100 yr 7.0" Rainfall=7.00"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
* 9,460	98	Exist. pave - C
* 19,502	98	Proposed drives - C
* 25,557	98	Proposed roads & walks
* 30,408	98	Proposed Roofs - C
137,230	74	>75% Grass cover, Good, HSG C
155,898	70	Woods, Good, HSG C
* 8,980	98	Ledge
439,474	77	Weighted Average
345,567		78.63% Pervious Area
93,907		21.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b> Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b> Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
23.2	875	Total			

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Type III 24-hr 100 yr 7.0" Rainfall=7.00"

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**Summary for Pond 32P: Asbuilt Pond**

Inflow Area = 10.089 ac, 21.37% Impervious, Inflow Depth > 4.35" for 100 yr 7.0" event  
 Inflow = 32.60 cfs @ 12.32 hrs, Volume= 3.655 af  
 Outflow = 13.48 cfs @ 12.75 hrs, Volume= 3.621 af, Atten= 59%, Lag= 26.1 min  
 Discarded = 7.22 cfs @ 12.75 hrs, Volume= 2.853 af  
 Primary = 6.26 cfs @ 12.75 hrs, Volume= 0.768 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 283.15' @ 12.75 hrs Surf.Area= 17,219 sf Storage= 47,931 cf

Plug-Flow detention time= 50.2 min calculated for 3.614 af (99% of inflow)  
 Center-of-Mass det. time= 44.6 min ( 873.1 - 828.4 )

Volume	Invert	Avail.Storage	Storage	Description
#1	273.00'	73,184 cf		<b>Custom Stage Data (Irregular)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	348	0.0	0	0	348
274.00	312	116.0	330	330	1,420
275.00	312	116.0	312	642	1,536
276.00	312	116.0	312	954	1,652
277.00	312	116.0	312	1,266	1,768
278.00	860	237.0	563	1,829	5,172
278.50	2,495	265.0	803	2,632	6,297
280.00	7,230	450.0	6,986	9,619	16,837
282.00	13,590	650.0	20,488	30,107	34,379
283.00	16,900	678.0	15,215	45,322	37,411
284.00	19,100	697.0	17,989	63,311	39,601
284.50	20,400	709.0	9,873	73,184	40,989

Device	Routing	Invert	Outlet Devices
#1	Primary	278.00'	<b>18.0" Round Culvert</b> L= 22.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 278.00' / 277.12' S= 0.0400 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	279.90'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

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Type III 24-hr 100 yr 7.0" Rainfall=7.00"

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**Discarded OutFlow** Max=7.22 cfs @ 12.75 hrs HW=283.14' (Free Discharge)↳ **3=Exfiltration** (Exfiltration Controls 7.22 cfs)**Primary OutFlow** Max=6.25 cfs @ 12.75 hrs HW=283.14' (Free Discharge)↳ **1=Culvert** (Passes 6.25 cfs of 22.30 cfs potential flow)↳ **2=Orifice/Grate** (Orifice Controls 6.25 cfs @ 5.78 fps)

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Type III 24-hr 100 yr 8.57" Rainfall=8.57"

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**Summary for Subcatchment 31: Flow to Pond**

Runoff = 43.06 cfs @ 12.31 hrs, Volume= 4.857 af, Depth&gt; 5.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 yr 8.57" Rainfall=8.57"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
* 9,460	98	Exist. pave - C
* 19,502	98	Proposed drives - C
* 25,557	98	Proposed roads & walks
* 30,408	98	Proposed Roofs - C
137,230	74	>75% Grass cover, Good, HSG C
155,898	70	Woods, Good, HSG C
* 8,980	98	Ledge
439,474	77	Weighted Average
345,567		78.63% Pervious Area
93,907		21.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b> Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b> Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12"RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
23.2	875	Total			

**Summary for Pond 32P: Asbuilt Pond**

Inflow Area = 10.089 ac, 21.37% Impervious, Inflow Depth > 5.78" for 100 yr 8.57" event  
 Inflow = 43.06 cfs @ 12.31 hrs, Volume= 4.857 af  
 Outflow = 16.84 cfs @ 12.76 hrs, Volume= 4.820 af, Atten= 61%, Lag= 27.0 min  
 Discarded = 7.65 cfs @ 12.76 hrs, Volume= 3.500 af  
 Primary = 9.19 cfs @ 12.76 hrs, Volume= 1.319 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 284.13' @ 12.76 hrs Surf.Area= 19,437 sf Storage= 65,873 cf

Plug-Flow detention time= 53.1 min calculated for 4.820 af (99% of inflow)  
 Center-of-Mass det. time= 48.5 min ( 869.0 - 820.5 )

Volume	Invert	Avail.Storage	Storage Description		
#1	273.00'	73,184 cf	<b>Custom Stage Data (Irregular)</b> Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	348	0.0	0	0	348
274.00	312	116.0	330	330	1,420
275.00	312	116.0	312	642	1,536
276.00	312	116.0	312	954	1,652
277.00	312	116.0	312	1,266	1,768
278.00	860	237.0	563	1,829	5,172
278.50	2,495	265.0	803	2,632	6,297
280.00	7,230	450.0	6,986	9,619	16,837
282.00	13,590	650.0	20,488	30,107	34,379
283.00	16,900	678.0	15,215	45,322	37,411
284.00	19,100	697.0	17,989	63,311	39,601
284.50	20,400	709.0	9,873	73,184	40,989

Device	Routing	Invert	Outlet Devices
#1	Primary	278.00'	<b>18.0" Round Culvert</b> L= 22.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 278.00' / 277.12' S= 0.0400 ' / Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	279.90'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

**Discarded OutFlow** Max=7.65 cfs @ 12.76 hrs HW=284.13' (Free Discharge)  
 3=Exfiltration (Exfiltration Controls 7.65 cfs)

**Primary OutFlow** Max=9.18 cfs @ 12.76 hrs HW=284.13' (Free Discharge)  
 1=Culvert (Passes 9.18 cfs of 24.66 cfs potential flow)  
 2=Orifice/Grate (Orifice Controls 9.18 cfs @ 6.89 fps)

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Type III 24-hr Custom Rainfall=8.57"

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**Summary for Subcatchment 31: Flow to Pond**

Runoff = 43.06 cfs @ 12.31 hrs, Volume= 4.857 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Type III 24-hr Custom Rainfall=8.57"

Area (sf)	CN	Description
23,351	61	>75% Grass cover, Good, HSG B
29,088	74	Exist. >75% Grass cover, Good, HSG C
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* 8,980	98	Ledge
439,474	77	Weighted Average
345,567		78.63% Pervious Area
93,907		21.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		<b>Sheet Flow, 30-1</b> Woods: Light underbrush n= 0.400 P2= 3.20"
5.1	150	0.0050	0.49		<b>Shallow Concentrated Flow, 30-2</b> Short Grass Pasture Kv= 7.0 fps
1.2	325	0.0100	4.54	3.56	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
0.6	350	0.0400	9.07	7.13	<b>Pipe Channel, 12" RCP</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
23.2	875	Total			

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Type III 24-hr Custom Rainfall=8.57"

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**Summary for Pond 32P: Asbuilt Pond**

Inflow Area = 10.089 ac, 21.37% Impervious, Inflow Depth > 5.78" for Custom event  
 Inflow = 43.06 cfs @ 12.31 hrs, Volume= 4.857 af  
 Outflow = 16.84 cfs @ 12.76 hrs, Volume= 4.820 af, Atten= 61%, Lag= 27.0 min  
 Discarded = 7.65 cfs @ 12.76 hrs, Volume= 3.500 af  
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Volume	Invert	Avail.Storage	Storage Description			
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275.00	312	116.0	312	642	1,536	
276.00	312	116.0	312	954	1,652	
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280.00	7,230	450.0	6,986	9,619	16,837	
282.00	13,590	650.0	20,488	30,107	34,379	
283.00	16,900	678.0	15,215	45,322	37,411	
284.00	19,100	697.0	17,989	63,311	39,601	
284.50	20,400	709.0	9,873	73,184	40,989	

Device	Routing	Invert	Outlet Devices
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#2	Device 1	279.90'	<b>4.0" W x 48.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Discarded	273.00'	<b>8.270 in/hr Exfiltration over Wetted area</b>

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*Type III 24-hr Custom Rainfall=8.57"*

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**Discarded OutFlow** Max=7.65 cfs @ 12.76 hrs HW=284.13' (Free Discharge)

↑**3=Exfiltration** (Exfiltration Controls 7.65 cfs)

**Primary OutFlow** Max=9.18 cfs @ 12.76 hrs HW=284.13' (Free Discharge)

↑**1=Culvert** (Passes 9.18 cfs of 24.66 cfs potential flow)

↑**2=Orifice/Gate** (Orifice Controls 9.18 cfs @ 6.89 fps)