STORM WATER CALCUATIONS

FOR

BRELIE GEAR

Corporate Drive
Waukesha, Wisconsin

January 15, 2019

PREPARED BY:

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CJE Job No.: 1841

Storm water / sewer Areas

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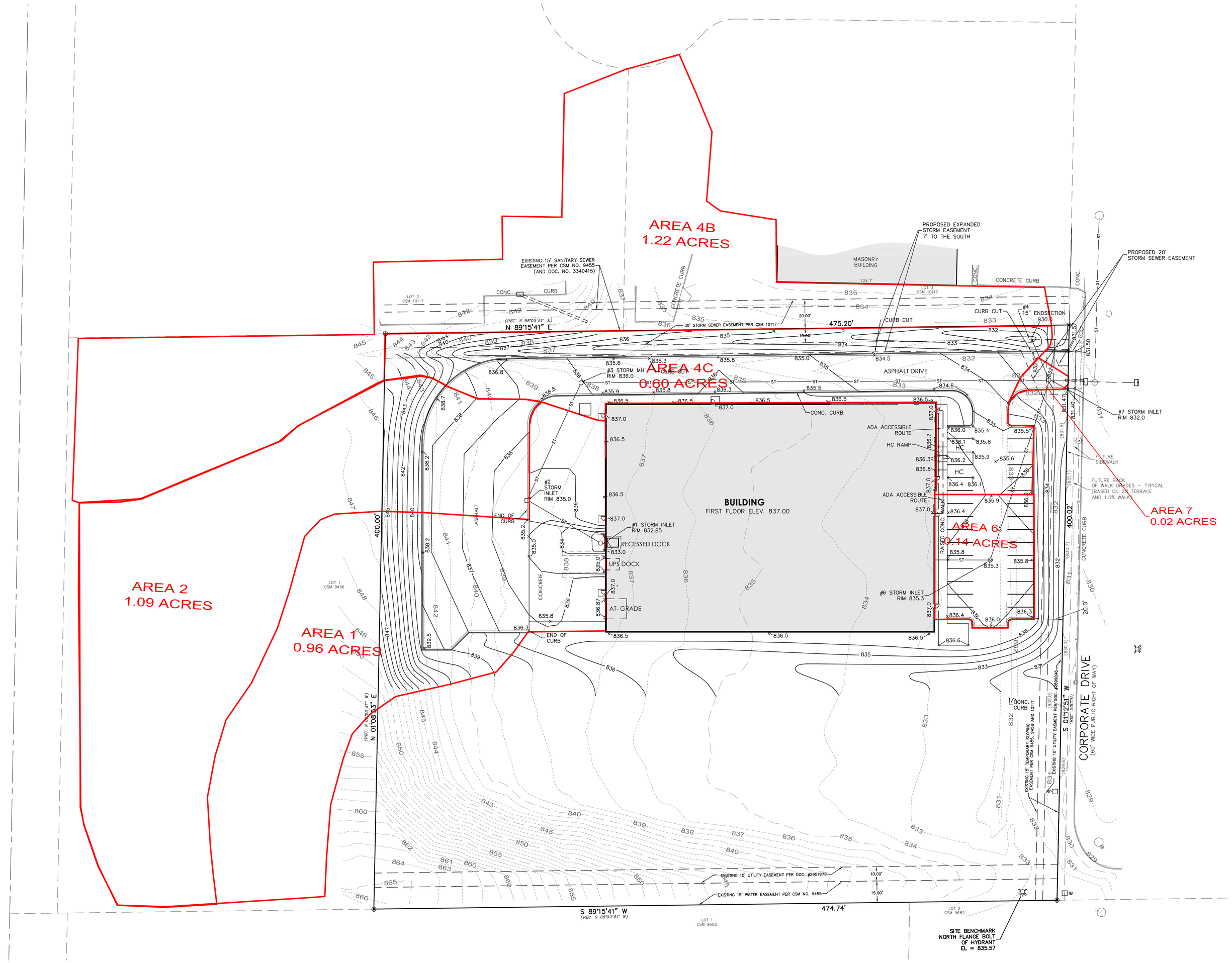
BRELIE GEAR

CORPORATE ROAD WAUKESHA, WI



CJE NO.: 1841R3
JANUARY 15, 2019

LEGEND

841	EXISTING CONTOUR
835	PROPOSED CONTOUR
x 836.5	PROPOSED ELEVATION
ST	EXISTING STORM SEWER
ST	PROPOSED STORM SEWER
	PROPOSED SILT FENCE

NOTES:

1. GRADES ALONG THE CURB OR RAISED WALK ARE AT THE BOTTOM OF CURB OR WALK.
2. DISTURBED AREA = 120,000 S.F. (2.75 ACRES)
3. STORM WATER MANAGEMENT IS PROVIDED BY A REGIONAL OFF SITE STORM WATER POND.
4. CURRENT CITY STANDARD SPECIFICATIONS SHALL BE FOLLOWED FOR ALL WORK IN THE PUBLIC RIGHT OF WAY.

SITE AREAS:

PROPERTY AREA = 189,885 S.F. (4.359 ACRES)
BUILDING FOOTPRINT = 36,546 S.F.
PAVEMENT = 38,006 S.F.
TOTAL IMPERVIOUS AREA = 74,552 S.F. (1.711 ACRES)
GREEN SPACE = 115,333 (2.648 ACRES) 60.7%

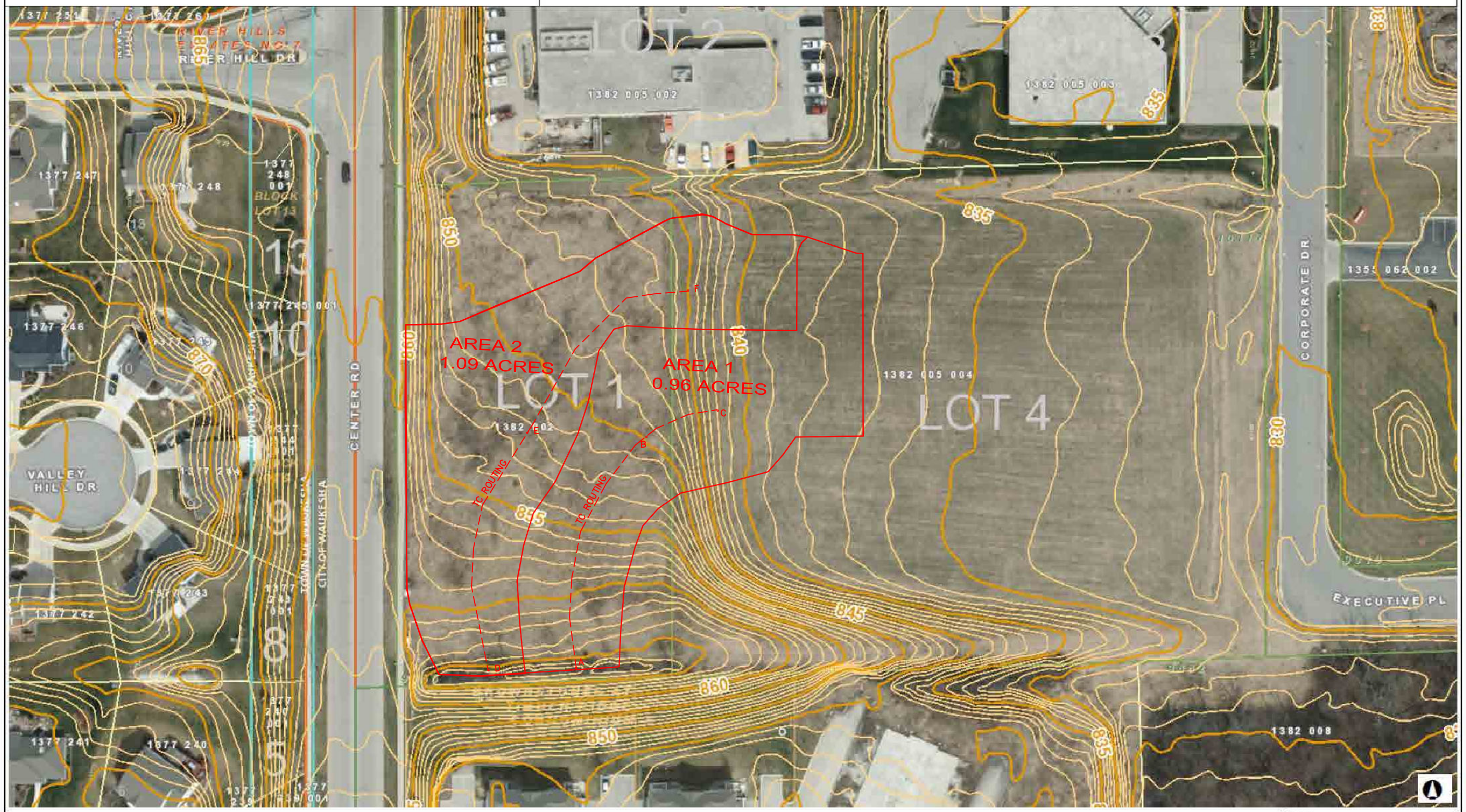
GRAPHIC SCALE
30 0 15 30 60
1 inch = 30 ft

STORM SEWER AREAS

WAUKESHA COUNTY
LEADING THE WAY

LAND INFORMATION SYSTEMS DIVISION

Waukesha County GIS Map



0 70.64 Feet

Printed: 11/28/2018

Notes

WAUKESHA COUNTY
LEADING THE WAY

LAND INFORMATION SYSTEMS DIVISION

Waukesha County GIS Map

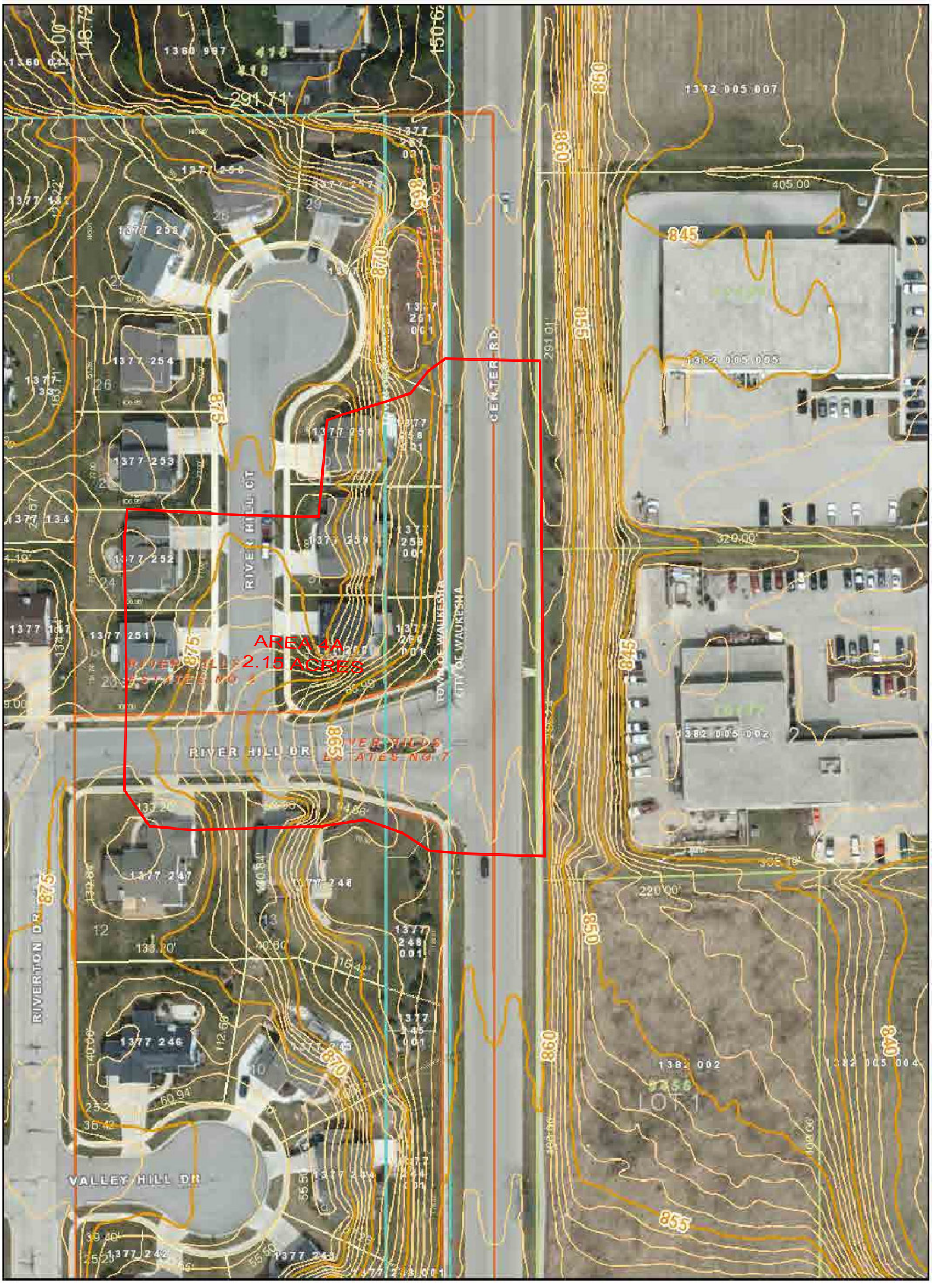
0 70.64 Feet

Printed: 11/28/2018

Notes

LAND INFORMATION SYSTEMS DIVISION

Waukesha County GIS Map



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Notes:

Printed: 1/15/2019

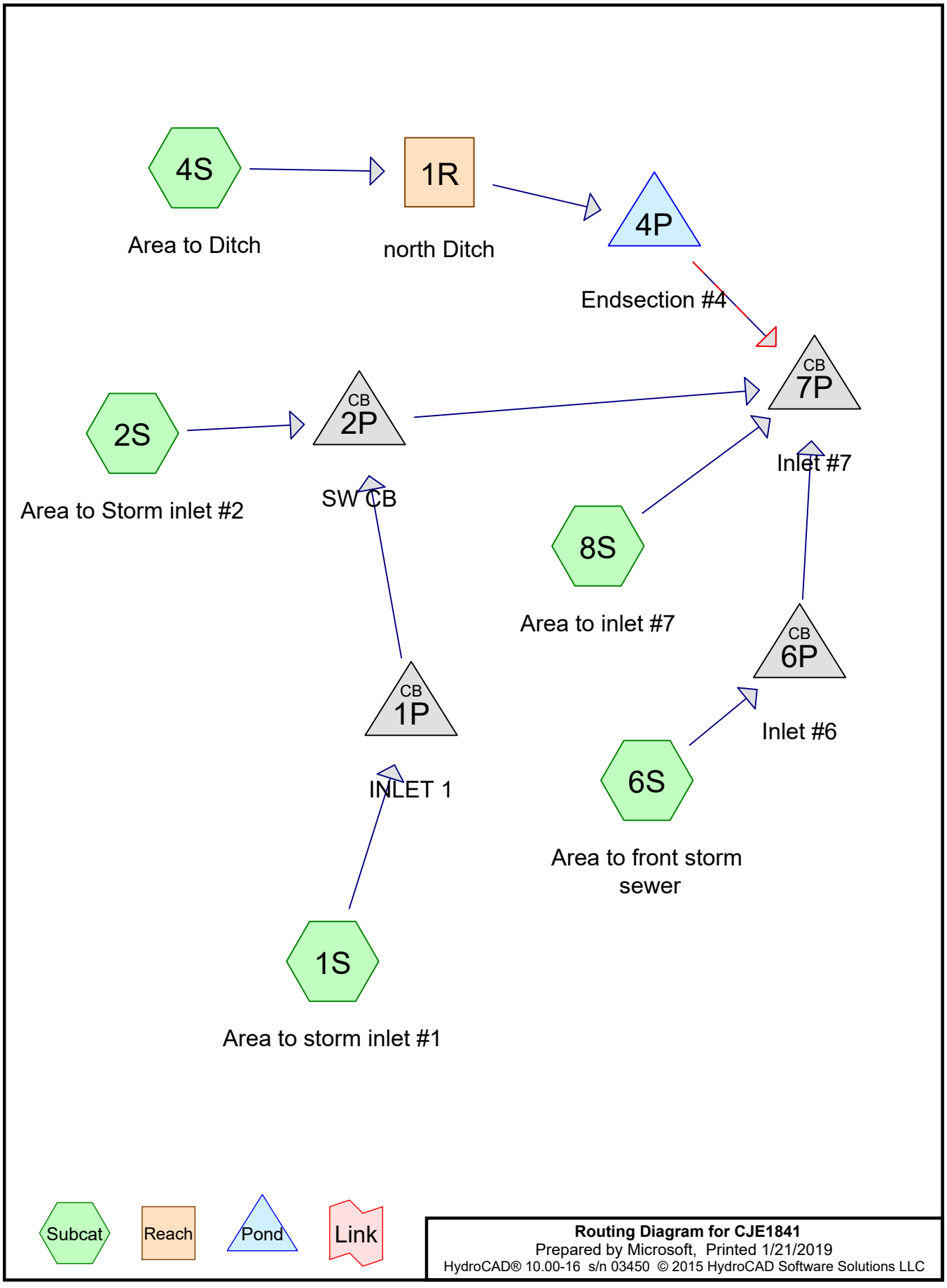
Storm water Calculations

Sewer has been sized for the 10-year design storm event

Project Name Brelie Gear **Project Location** Waukesha, WI **Date** 01/15/19

CJE Job No. CJE1841 **Designed By** CAJ **Checked By** _____ **Sheet** 1 **of** 1

Location of Sewer			Drainage Area			Rainfall and Runoff Data					Total Runoff	Design Computations							Time of Flow in Sewer		Remarks		
			a	A	C	Ca	Σ Ca			I	Q												
In	From	To	Individual Area in Acres	Accumulated Area in Acres	Individual Impervious Coefficient	Individual Ca	Accumulated Ca	Rainfall Frequency Curve Used (years)	Initial Time of Concentration (min.)	Rainfall Intensity in. per hr. = I	Total Runoff Cu. Ft. per Sec. CIA=Q	Length of Sewer (ft)	Inside Size of Sewer (in)	Necessary Drop in Length Given (ft)	Actual Drop in Length Given (ft)	Mannings Roughness Coefficient	Parts Full for Actual Drop	Velocity ftt. per sec. for Actual Drop	Time of Flow in Section (min.)	Total Elapsed Time at End of Section (min.)	Invert (In)	Invert (Out)	Slope
	1	2	0.96	0.96	0.4	0.38	0.38	10	10.0	5.14	1.98	54	12	0.12	0.17	0.011	0.70	3.37	0.3	10.3	830.4	830.23	0.00315
	2	3	1.09	2.05	0.4	0.44	0.82	10	10.3	5.09	4.17	96	15	0.29	0.30	0.011	0.80	3.96	0.4	10.7	830.2	829.90	0.00313
	3	7		2.05	0.4		0.82	10	10.7	5.02	4.11	320	15	0.92	0.96	0.011	0.81	3.88	1.4	12.1	829.86	828.90	0.00300
	4	7	3.97	3.97	0.5	1.99	1.99	10	10.0	5.14	10.21	33	18	0.22	1.10	0.011	0.47	12.45	0.0	10.0	830	828.90	0.03333
	5	6	0.84	0.84	0.9	0.76	0.76	10	10.0	5.14	3.89	38	12	0.32	0.50	0.011	0.68	6.84	0.1	10.1	831.75	831.25	0.01316
	6	7	0.14	0.98	0.8	0.11	0.87	10	10.1	5.13	4.45	133	12	2.06	2.10	0.013	0.81	6.49	0.3	10.4	831	828.90	0.01579
	7	8	0.02	7.02	0.8	0.02	3.69	10	12.1	4.78	17.64	23	18	0.65	0.67	0.013	0.81	11.56	0.0	12.1	828.85	828.18	0.02913



Routing Diagram for CJE1841
Prepared by Microsoft, Printed 1/21/2019

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Area to storm inlet #1 Runoff Area=0.960 ac 26.04% Impervious Runoff Depth>1.20"
Flow Length=300' Tc=10.8 min CN=71 Runoff=1.76 cfs 0.096 af

Subcatchment 2S: Area to Storm inlet #2 Runoff Area=1.090 ac 11.93% Impervious Runoff Depth>0.86"
Flow Length=385' Tc=12.3 min CN=65 Runoff=1.28 cfs 0.078 af

Subcatchment 4S: Area to Ditch Runoff Area=3.970 ac 45.34% Impervious Runoff Depth>1.66"
Tc=10.0 min CN=78 Runoff=10.46 cfs 0.548 af

Subcatchment 6S: Area to front storm Runoff Area=0.980 ac 100.00% Impervious Runoff Depth>3.44"
Tc=5.0 min CN=98 Runoff=5.53 cfs 0.281 af

Subcatchment 8S: Area to inlet #7 Runoff Area=0.020 ac 100.00% Impervious Runoff Depth>3.44"
Tc=5.0 min CN=98 Runoff=0.11 cfs 0.006 af

Reach 1R: north Ditch Avg. Flow Depth=0.60' Max Vel=4.26 fps Inflow=10.46 cfs 0.548 af
n=0.022 L=350.0' S=0.0143 '/' Capacity=153.56 cfs Outflow=9.97 cfs 0.546 af

Pond 1P: INLET 1 Peak Elev=831.29' Inflow=1.76 cfs 0.096 af
12.0" Round Culvert n=0.011 L=54.0' S=0.0031 '/' Outflow=1.76 cfs 0.096 af

Pond 2P: SW CB Peak Elev=831.32' Inflow=3.02 cfs 0.174 af
15.0" Round Culvert n=0.013 L=86.0' S=0.0035 '/' Outflow=3.02 cfs 0.174 af

Pond 4P: Endsection #4 Peak Elev=831.98' Storage=483 cf Inflow=9.97 cfs 0.546 af
Primary=9.42 cfs 0.546 af Secondary=0.00 cfs 0.000 af Outflow=9.42 cfs 0.546 af

Pond 6P: Inlet #6 Peak Elev=835.24' Inflow=5.53 cfs 0.281 af
12.0" Round Culvert n=0.013 L=133.0' S=0.0083 '/' Outflow=5.53 cfs 0.281 af

Pond 7P: Inlet #7 Peak Elev=832.63' Inflow=14.83 cfs 1.007 af
18.0" Round Culvert n=0.013 L=23.0' S=0.0291 '/' Outflow=14.83 cfs 1.007 af

Total Runoff Area = 7.020 ac Runoff Volume = 1.008 af Average Runoff Depth = 1.72"
54.70% Pervious = 3.840 ac 45.30% Impervious = 3.180 ac

Summary for Subcatchment 1S: Area to storm inlet #1

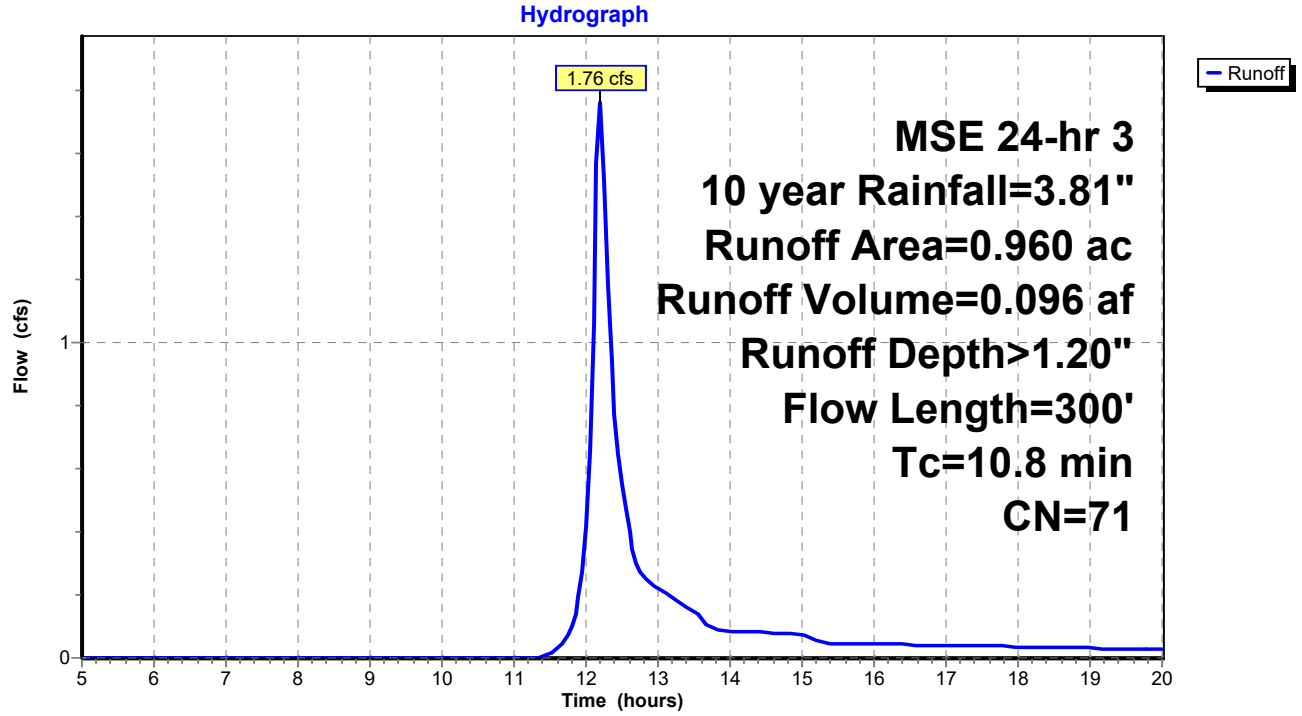
Runoff = 1.76 cfs @ 12.20 hrs, Volume= 0.096 af, Depth> 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10 year Rainfall=3.81"

	Area (ac)	CN	Description
*	0.250	98	Impervious Area, HSG C
	0.710	61	>75% Grass cover, Good, HSG B
	0.960	71	Weighted Average
	0.710		73.96% Pervious Area
	0.250		26.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	200	0.0850	0.32		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 2.70"
0.4	100	0.0800	4.55		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
10.8	300	Total			

Subcatchment 1S: Area to storm inlet #1



Summary for Subcatchment 2S: Area to Storm inlet #2

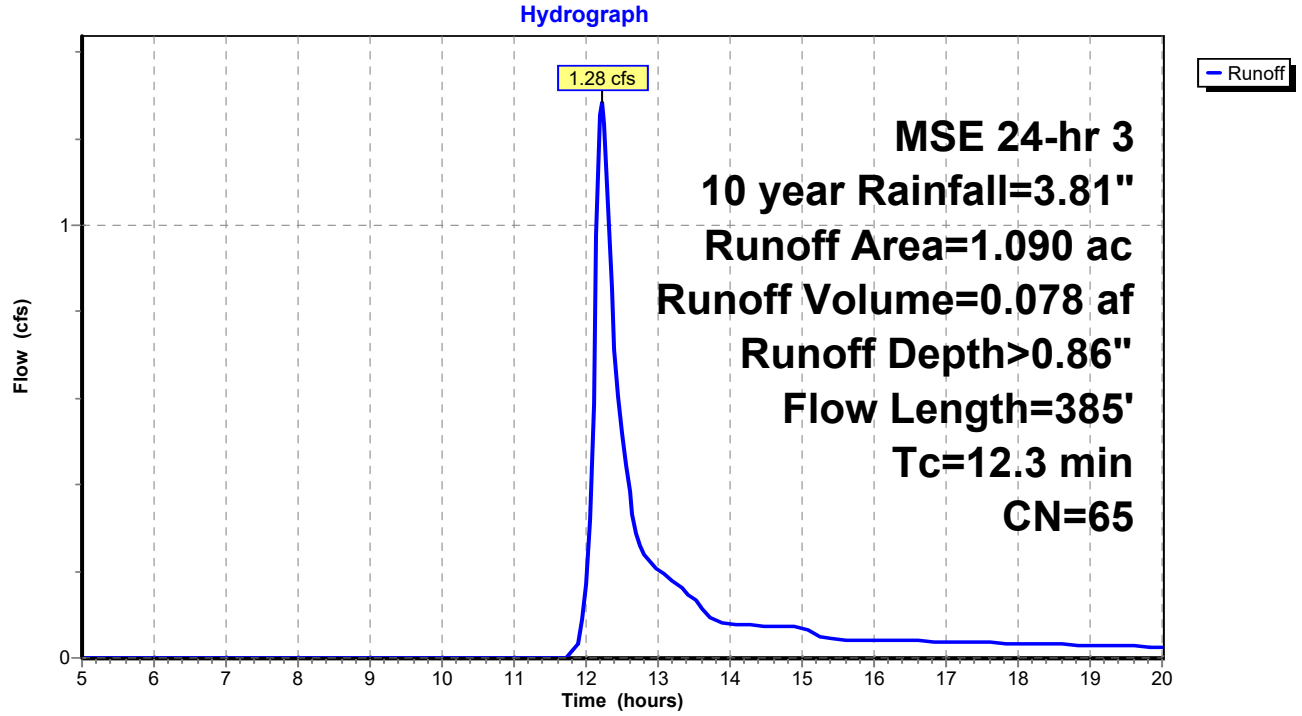
Runoff = 1.28 cfs @ 12.22 hrs, Volume= 0.078 af, Depth> 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10 year Rainfall=3.81"

	Area (ac)	CN	Description
*	0.130	98	Impervious Area
	0.960	61	>75% Grass cover, Good, HSG B
	1.090	65	Weighted Average
	0.960		88.07% Pervious Area
	0.130		11.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	200	0.0700	0.30		**Sheet Flow, D-E** Grass: Short n= 0.150 P2= 2.70"
1.0	185	0.0400	3.22		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
12.3	385	Total			

Subcatchment 2S: Area to Storm inlet #2



Summary for Subcatchment 4S: Area to Ditch

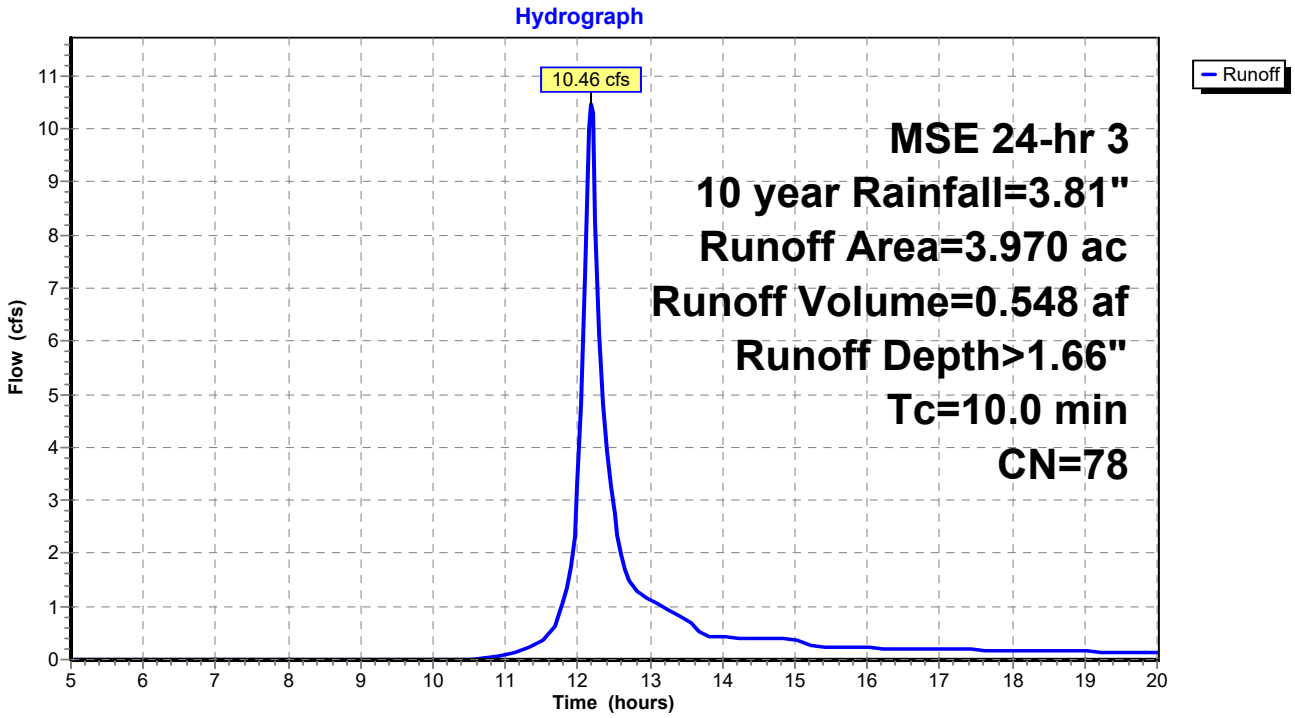
Runoff = 10.46 cfs @ 12.18 hrs, Volume= 0.548 af, Depth> 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10 year Rainfall=3.81"

Area (ac)	CN	Description
1.800	98	Paved roads w/curbs & sewers, HSG B
2.170	61	>75% Grass cover, Good, HSG B
3.970	78	Weighted Average
2.170		54.66% Pervious Area
1.800		45.34% Impervious Area

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

Subcatchment 4S: Area to Ditch



Summary for Subcatchment 6S: Area to front storm sewer

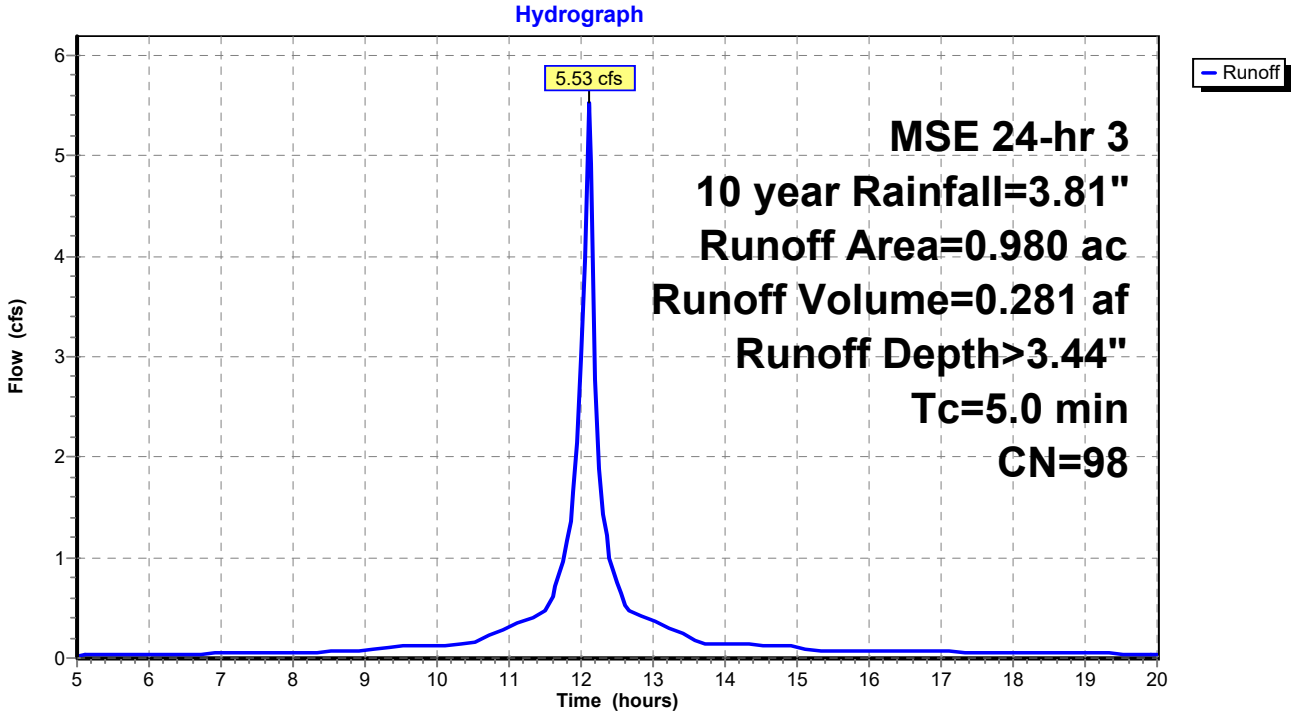
Runoff = 5.53 cfs @ 12.11 hrs, Volume= 0.281 af, Depth> 3.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10 year Rainfall=3.81"

Area (ac)	CN	Description
0.840	98	Roofs, HSG B
0.140	98	Paved parking, HSG B
0.980	98	Weighted Average
0.980		100.00% Impervious Area

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

Subcatchment 6S: Area to front storm sewer



Summary for Subcatchment 8S: Area to inlet #7

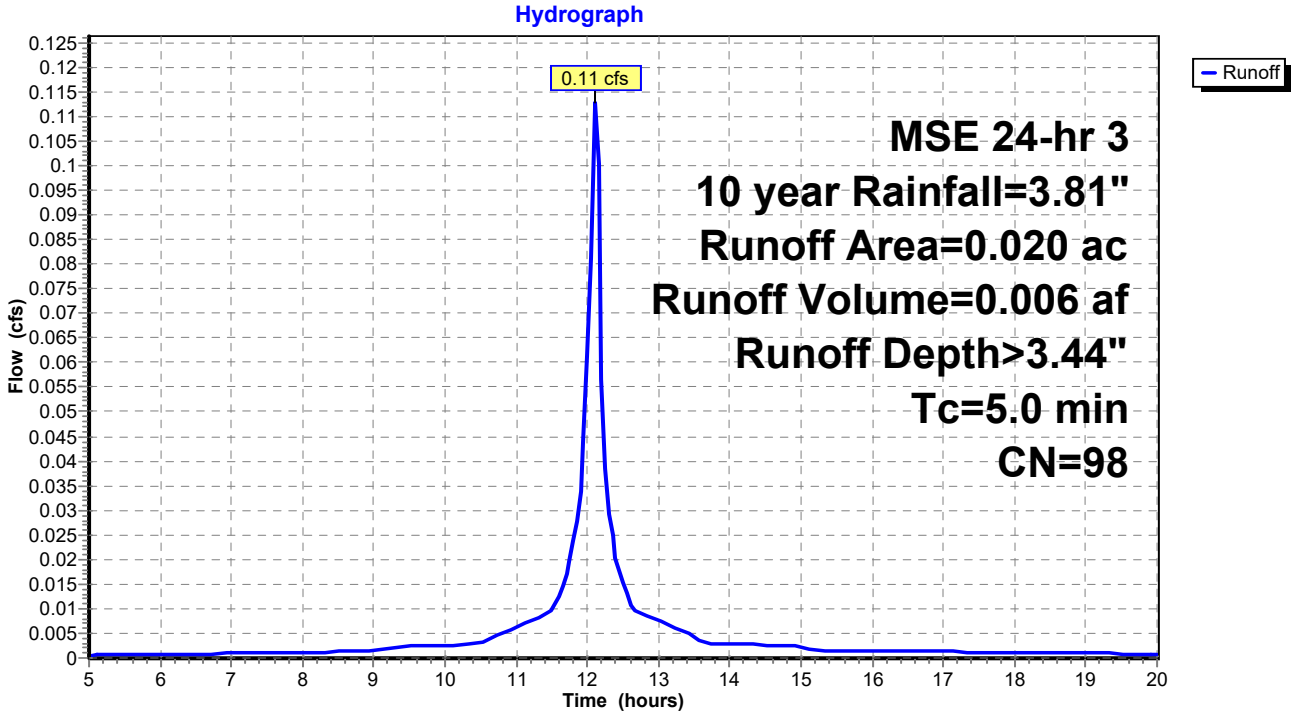
Runoff = 0.11 cfs @ 12.11 hrs, Volume= 0.006 af, Depth> 3.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10 year Rainfall=3.81"

Area (ac)	CN	Description
0.020	98	Paved parking, HSG B
0.020		100.00% Impervious Area

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

Subcatchment 8S: Area to inlet #7



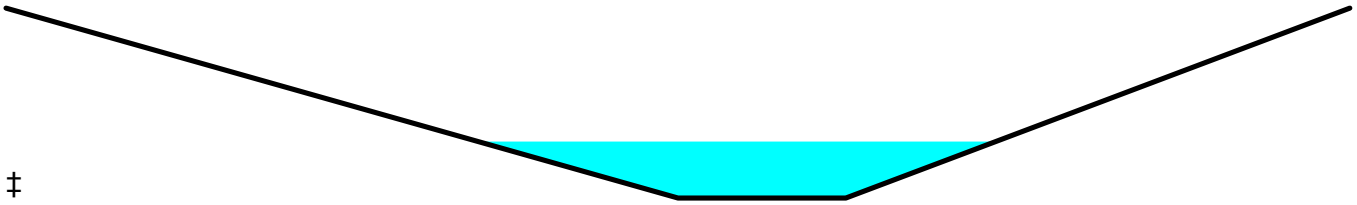
Summary for Reach 1R: north Ditch

Inflow Area = 3.970 ac, 45.34% Impervious, Inflow Depth > 1.66" for 10 year event
Inflow = 10.46 cfs @ 12.18 hrs, Volume= 0.548 af
Outflow = 9.97 cfs @ 12.22 hrs, Volume= 0.546 af, Atten= 5%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.26 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.55 fps, Avg. Travel Time= 3.8 min

Peak Storage= 851 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 153.56 cfs

Custom cross-section, Length= 350.0' Slope= 0.0143 '/'
Constant n= 0.022 Earth, clean & straight
Inlet Invert= 836.00', Outlet Invert= 831.00'



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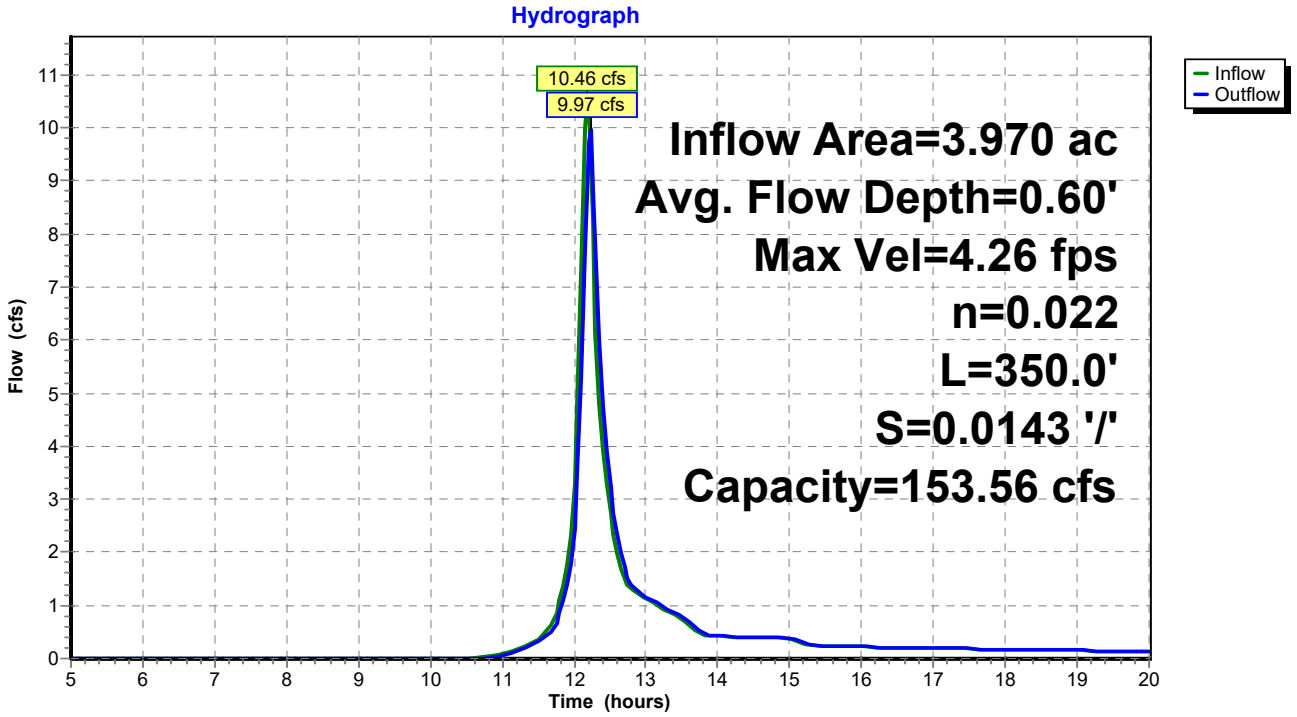
Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	2.00	0.00
8.00	0.00	2.00
10.00	0.00	2.00
16.00	2.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	2.0	0	0.00
2.00	18.0	16.6	6,300	153.56

Reach 1R: north Ditch



Summary for Pond 1P: INLET 1

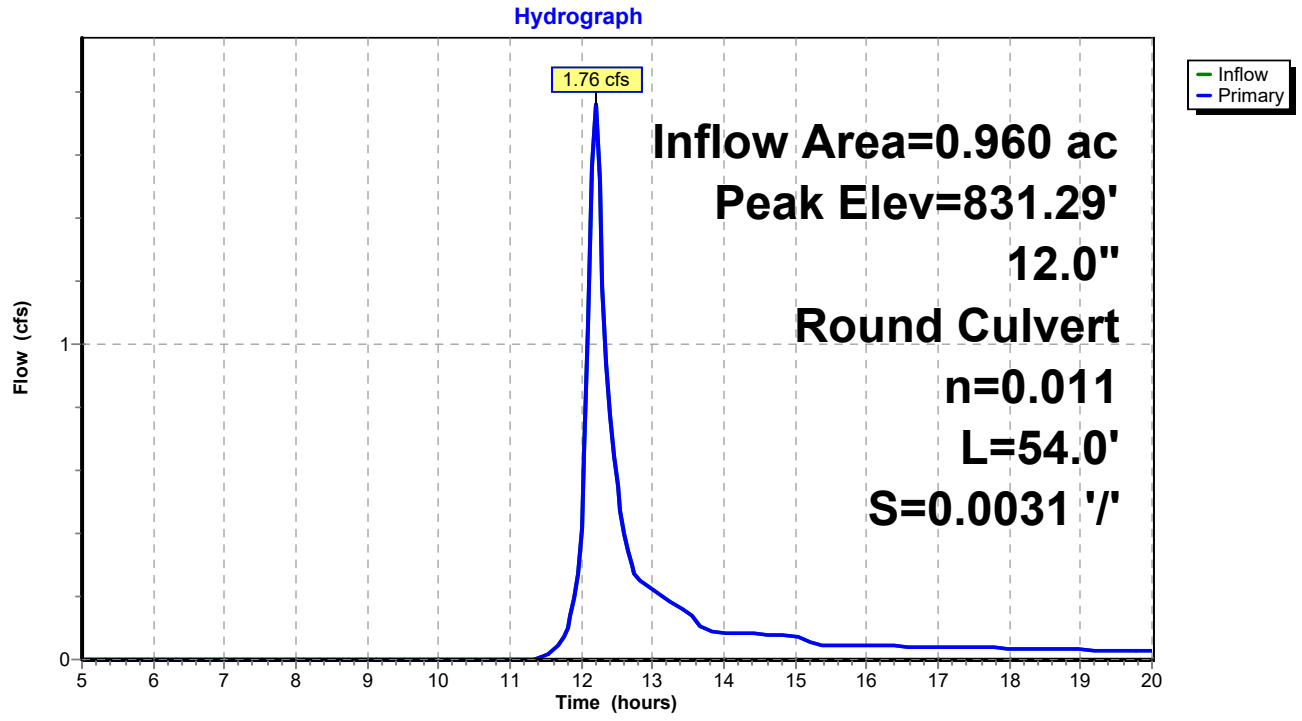
Inflow Area = 0.960 ac, 26.04% Impervious, Inflow Depth > 1.20" for 10 year event
Inflow = 1.76 cfs @ 12.20 hrs, Volume= 0.096 af
Outflow = 1.76 cfs @ 12.20 hrs, Volume= 0.096 af, Atten= 0%, Lag= 0.0 min
Primary = 1.76 cfs @ 12.20 hrs, Volume= 0.096 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 831.29' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	830.40'	**12.0" Round Culvert** L= 54.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 830.40' / 830.23' S= 0.0031 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.75 cfs @ 12.20 hrs HW=831.28' (Free Discharge)
1=Culvert (Barrel Controls 1.75 cfs @ 3.17 fps)

Pond 1P: INLET 1



Summary for Pond 2P: SW CB

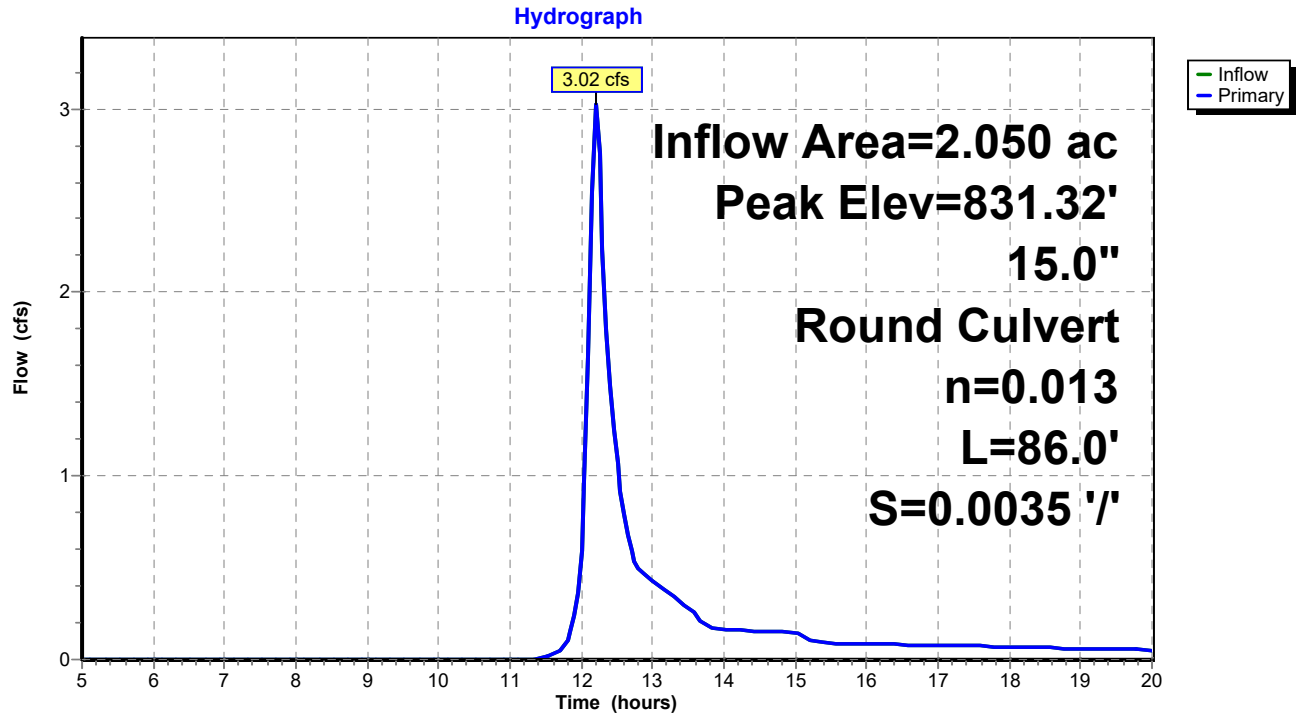
Inflow Area = 2.050 ac, 18.54% Impervious, Inflow Depth > 1.02" for 10 year event
Inflow = 3.02 cfs @ 12.21 hrs, Volume= 0.174 af
Outflow = 3.02 cfs @ 12.21 hrs, Volume= 0.174 af, Atten= 0%, Lag= 0.0 min
Primary = 3.02 cfs @ 12.21 hrs, Volume= 0.174 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 831.32' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	830.20'	**15.0" Round Culvert** L= 86.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 830.20' / 829.90' S= 0.0035 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.98 cfs @ 12.21 hrs HW=831.31' (Free Discharge)
1=Culvert (Barrel Controls 2.98 cfs @ 3.44 fps)

Pond 2P: SW CB



Summary for Pond 4P: Endsection #4

Inflow Area = 3.970 ac, 45.34% Impervious, Inflow Depth > 1.65" for 10 year event
Inflow = 9.97 cfs @ 12.22 hrs, Volume= 0.546 af
Outflow = 9.42 cfs @ 12.26 hrs, Volume= 0.546 af, Atten= 5%, Lag= 2.1 min
Primary = 9.42 cfs @ 12.26 hrs, Volume= 0.546 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= 831.98' @ 12.26 hrs Surf.Area= 687 sf Storage= 483 cf

Plug-Flow detention time= 0.4 min calculated for 0.546 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (795.5 - 795.2)

Volume	Invert	Avail.Storage	Storage Description
#1	830.00'	1,835 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

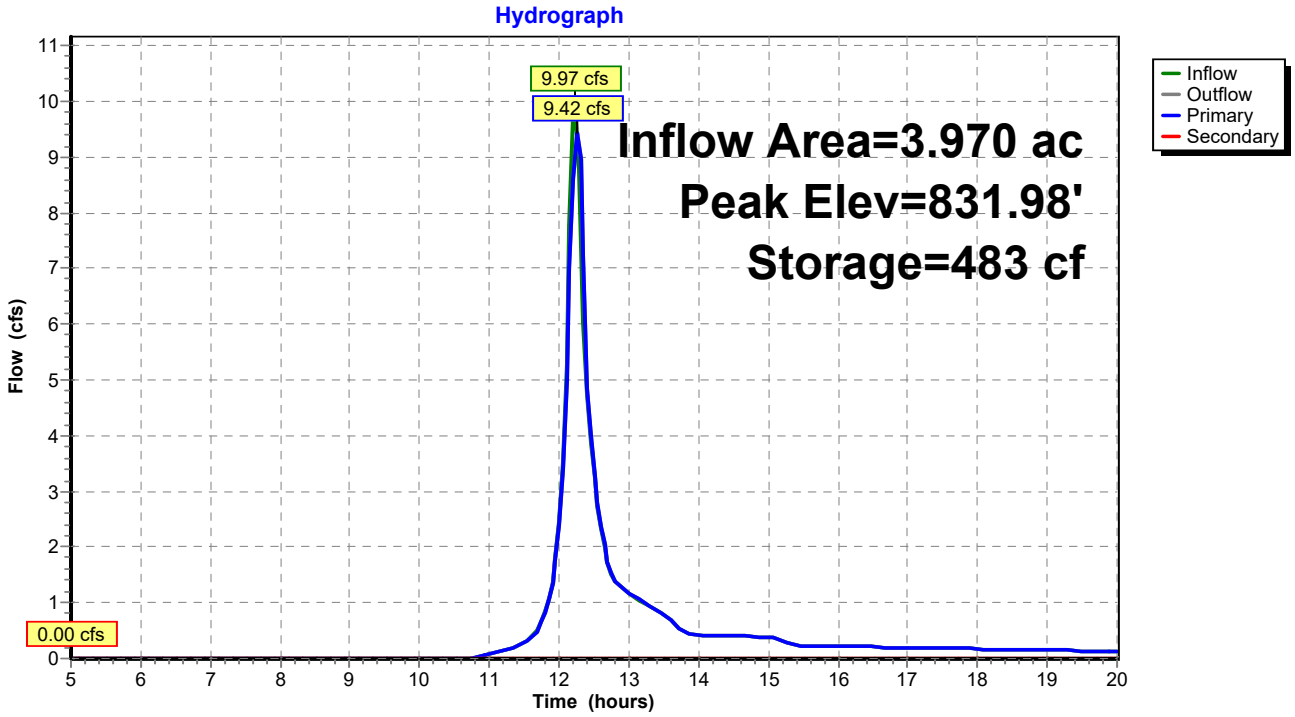
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
830.00	0	0	0
831.00	150	75	75
832.00	700	425	500
832.30	1,200	285	785
833.00	1,800	1,050	1,835

Device	Routing	Invert	Outlet Devices
#1	Primary	830.00'	**18.0" Round Culvert** L= 33.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 830.00' / 828.90' S= 0.0333 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Secondary	832.30'	**3.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=9.35 cfs @ 12.26 hrs HW=831.96' (Free Discharge)
1=Culvert (Inlet Controls 9.35 cfs @ 5.29 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=830.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 4P: Endsection #4



Summary for Pond 6P: Inlet #6

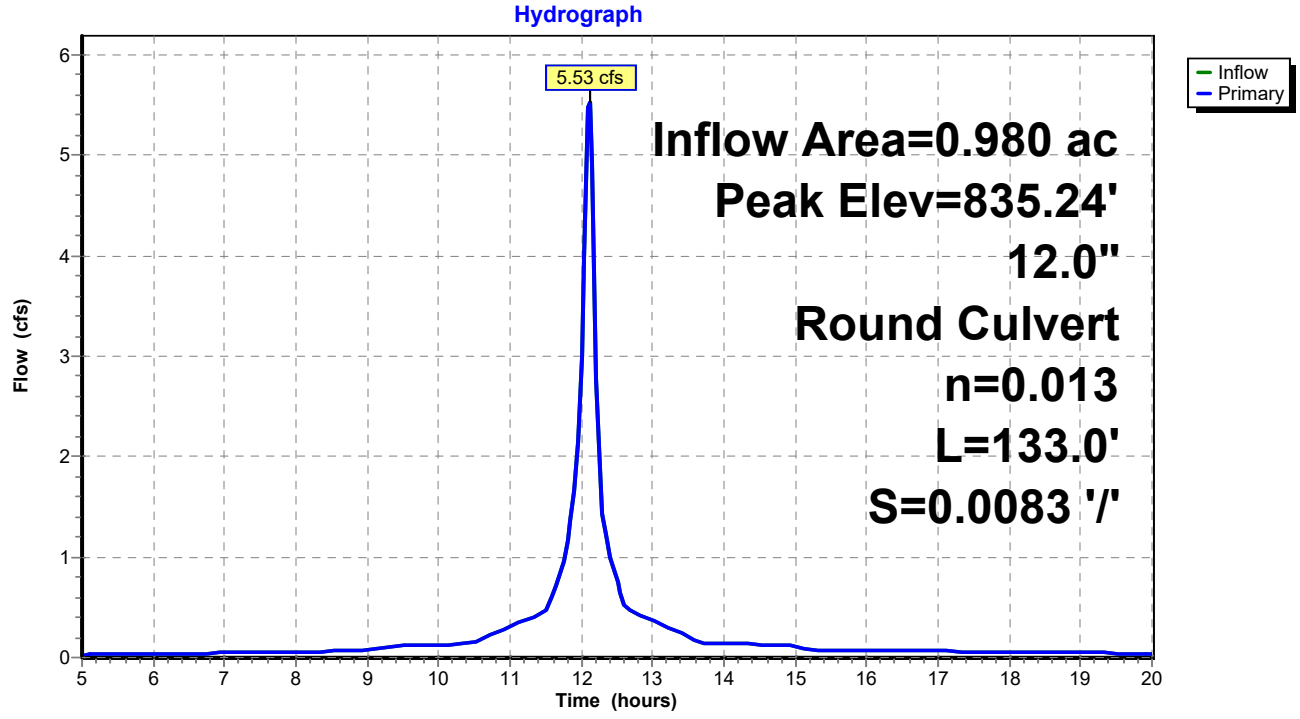
Inflow Area = 0.980 ac,100.00% Impervious, Inflow Depth > 3.44" for 10 year event
Inflow = 5.53 cfs @ 12.11 hrs, Volume= 0.281 af
Outflow = 5.53 cfs @ 12.11 hrs, Volume= 0.281 af, Atten= 0%, Lag= 0.0 min
Primary = 5.53 cfs @ 12.11 hrs, Volume= 0.281 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 835.24' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	831.00'	**12.0" Round Culvert** L= 133.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 831.00' / 829.90' S= 0.0083 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=5.35 cfs @ 12.11 hrs HW=834.99' (Free Discharge)
1=Culvert (Barrel Controls 5.35 cfs @ 6.81 fps)

Pond 6P: Inlet #6



Summary for Pond 7P: Inlet #7

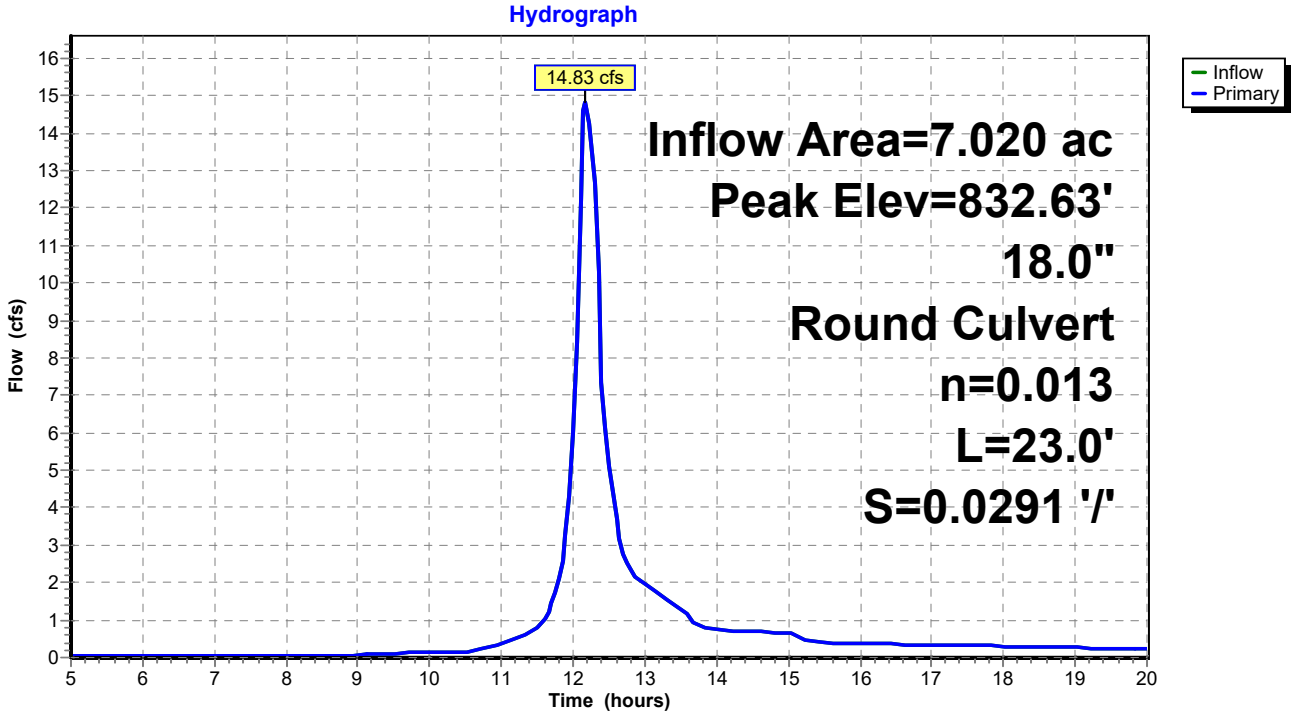
Inflow Area = 7.020 ac, 45.30% Impervious, Inflow Depth > 1.72" for 10 year event
Inflow = 14.83 cfs @ 12.17 hrs, Volume= 1.007 af
Outflow = 14.83 cfs @ 12.17 hrs, Volume= 1.007 af, Atten= 0%, Lag= 0.0 min
Primary = 14.83 cfs @ 12.17 hrs, Volume= 1.007 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 832.63' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	828.85'	**18.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 828.85' / 828.18' S= 0.0291 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

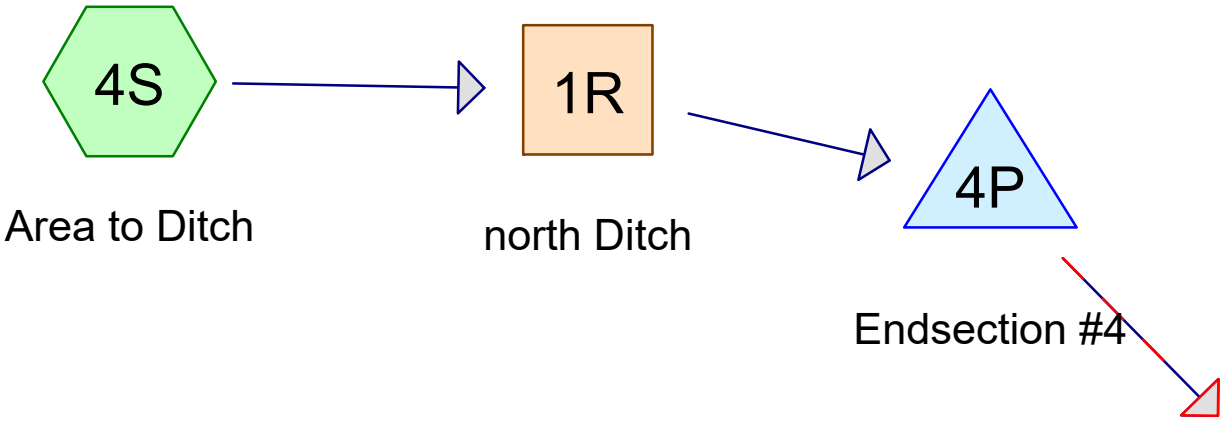
Primary OutFlow Max=14.52 cfs @ 12.17 hrs HW=832.51' (Free Discharge)
1=Culvert (Inlet Controls 14.52 cfs @ 8.22 fps)

Pond 7P: Inlet #7



Drainage Ditch Calculations

Analyzed for 10–year, 25-year and 100-year design events



Subcat Reach Pond Link

Routing Diagram for CJE1841
Prepared by Microsoft, Printed 1/15/2019

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 4S: Area to Ditch Runoff Area=3.970 ac 45.34% Impervious Runoff Depth>1.66"
Tc=10.0 min CN=78 Runoff=10.46 cfs 0.548 af

Reach 1R: north Ditch Avg. Flow Depth=0.60' Max Vel=4.26 fps Inflow=10.46 cfs 0.548 af
n=0.022 L=350.0' S=0.0143 '/' Capacity=153.56 cfs Outflow=9.97 cfs 0.546 af

Pond 4P: Endsection #4 Peak Elev=831.98' Storage=483 cf Inflow=9.97 cfs 0.546 af
Primary=9.42 cfs 0.546 af Secondary=0.00 cfs 0.000 af Outflow=9.42 cfs 0.546 af

Total Runoff Area = 3.970 ac Runoff Volume = 0.548 af Average Runoff Depth = 1.66"
54.66% Pervious = 2.170 ac 45.34% Impervious = 1.800 ac

Summary for Subcatchment 4S: Area to Ditch

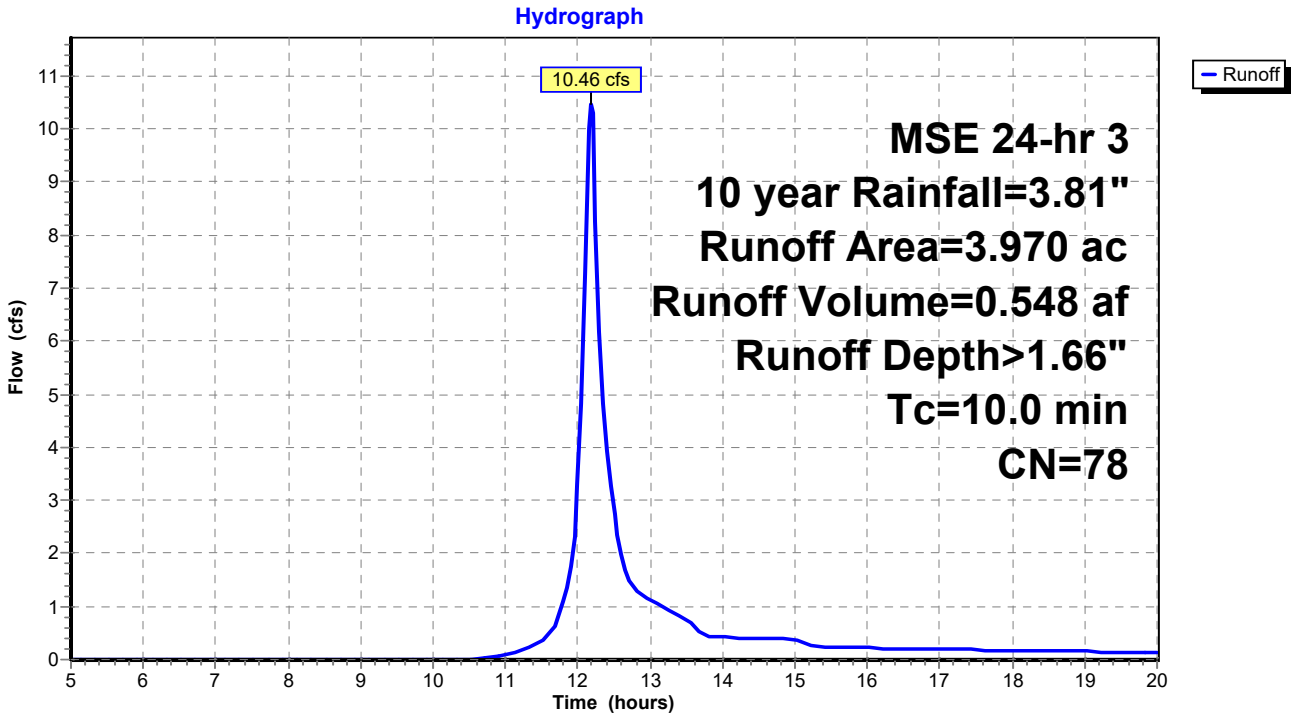
Runoff = 10.46 cfs @ 12.18 hrs, Volume= 0.548 af, Depth> 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10 year Rainfall=3.81"

Area (ac)	CN	Description
1.800	98	Paved roads w/curbs & sewers, HSG B
2.170	61	>75% Grass cover, Good, HSG B
3.970	78	Weighted Average
2.170		54.66% Pervious Area
1.800		45.34% Impervious Area

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

Subcatchment 4S: Area to Ditch



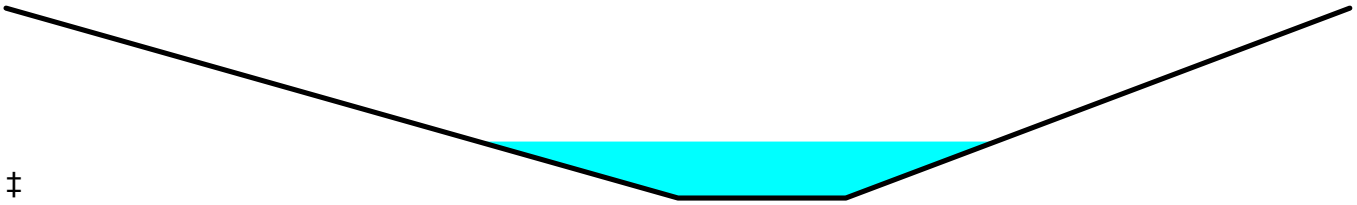
Summary for Reach 1R: north Ditch

Inflow Area = 3.970 ac, 45.34% Impervious, Inflow Depth > 1.66" for 10 year event
Inflow = 10.46 cfs @ 12.18 hrs, Volume= 0.548 af
Outflow = 9.97 cfs @ 12.22 hrs, Volume= 0.546 af, Atten= 5%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.26 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.55 fps, Avg. Travel Time= 3.8 min

Peak Storage= 851 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 153.56 cfs

Custom cross-section, Length= 350.0' Slope= 0.0143 '/'
Constant n= 0.022 Earth, clean & straight
Inlet Invert= 836.00', Outlet Invert= 831.00'

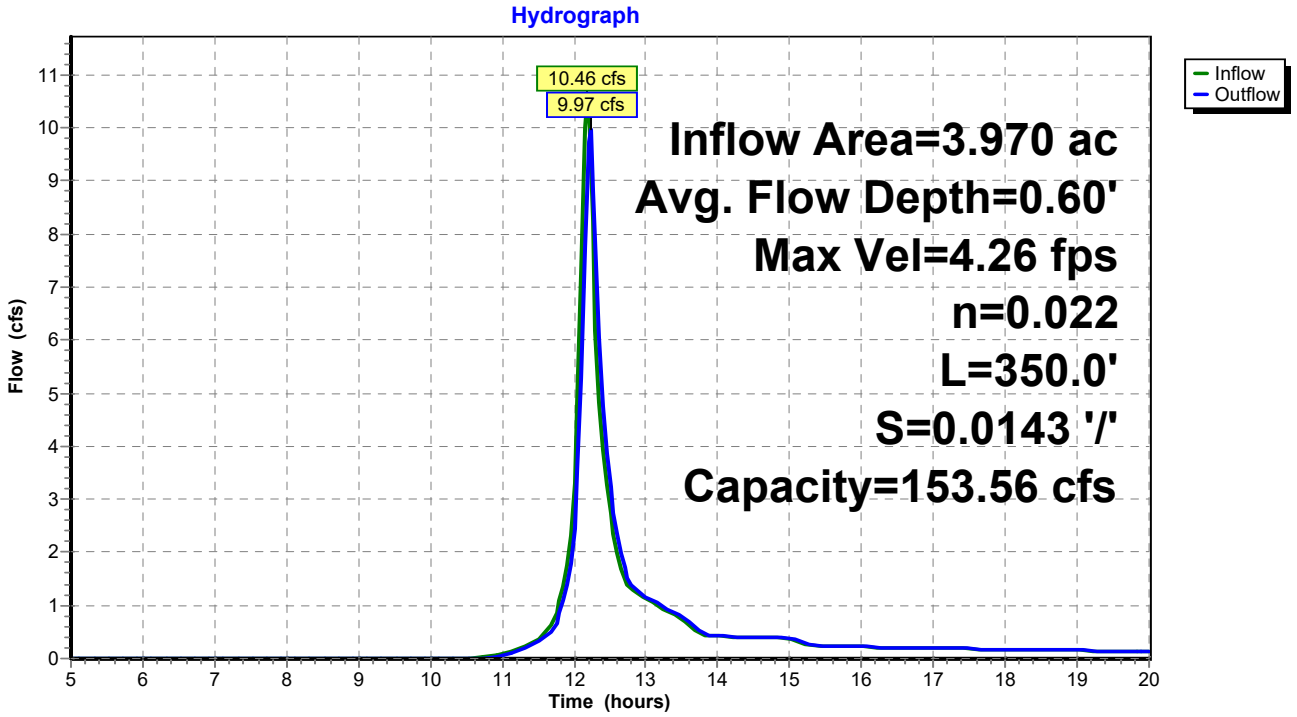


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	2.00	0.00
8.00	0.00	2.00
10.00	0.00	2.00
16.00	2.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	2.0	0	0.00
2.00	18.0	16.6	6,300	153.56

Reach 1R: north Ditch



Summary for Pond 4P: Endsection #4

Inflow Area = 3.970 ac, 45.34% Impervious, Inflow Depth > 1.65" for 10 year event
Inflow = 9.97 cfs @ 12.22 hrs, Volume= 0.546 af
Outflow = 9.42 cfs @ 12.26 hrs, Volume= 0.546 af, Atten= 5%, Lag= 2.1 min
Primary = 9.42 cfs @ 12.26 hrs, Volume= 0.546 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= 831.98' @ 12.26 hrs Surf.Area= 687 sf Storage= 483 cf

Plug-Flow detention time= 0.4 min calculated for 0.546 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (795.5 - 795.2)

Volume	Invert	Avail.Storage	Storage Description
#1	830.00'	1,835 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

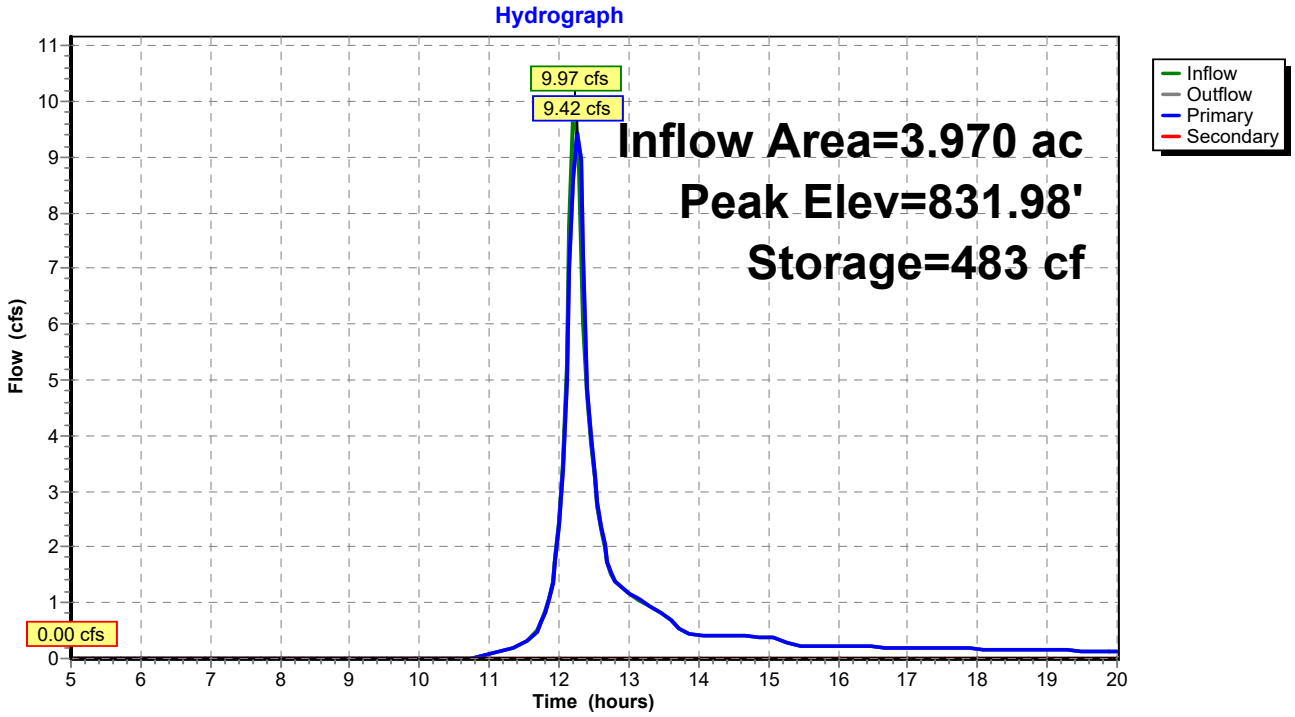
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
830.00	0	0	0
831.00	150	75	75
832.00	700	425	500
832.30	1,200	285	785
833.00	1,800	1,050	1,835

Device	Routing	Invert	Outlet Devices
#1	Primary	830.00'	**18.0" Round Culvert** L= 33.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 830.00' / 828.90' S= 0.0333 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Secondary	832.30'	**3.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=9.35 cfs @ 12.26 hrs HW=831.96' (Free Discharge)
1=Culvert (Inlet Controls 9.35 cfs @ 5.29 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=830.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 4P: Endsection #4



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 4S: Area to Ditch Runoff Area=3.970 ac 45.34% Impervious Runoff Depth>2.32"
Tc=10.0 min CN=78 Runoff=14.62 cfs 0.767 af

Reach 1R: north Ditch Avg. Flow Depth=0.70' Max Vel=4.66 fps Inflow=14.62 cfs 0.767 af
n=0.022 L=350.0' S=0.0143 '/' Capacity=153.56 cfs Outflow=14.00 cfs 0.766 af

Pond 4P: Endsection #4 Peak Elev=832.61' Storage=1,204 cf Inflow=14.00 cfs 0.766 af
Primary=11.62 cfs 0.757 af Secondary=1.26 cfs 0.009 af Outflow=12.87 cfs 0.766 af

Total Runoff Area = 3.970 ac Runoff Volume = 0.767 af Average Runoff Depth = 2.32"
54.66% Pervious = 2.170 ac 45.34% Impervious = 1.800 ac

Summary for Subcatchment 4S: Area to Ditch

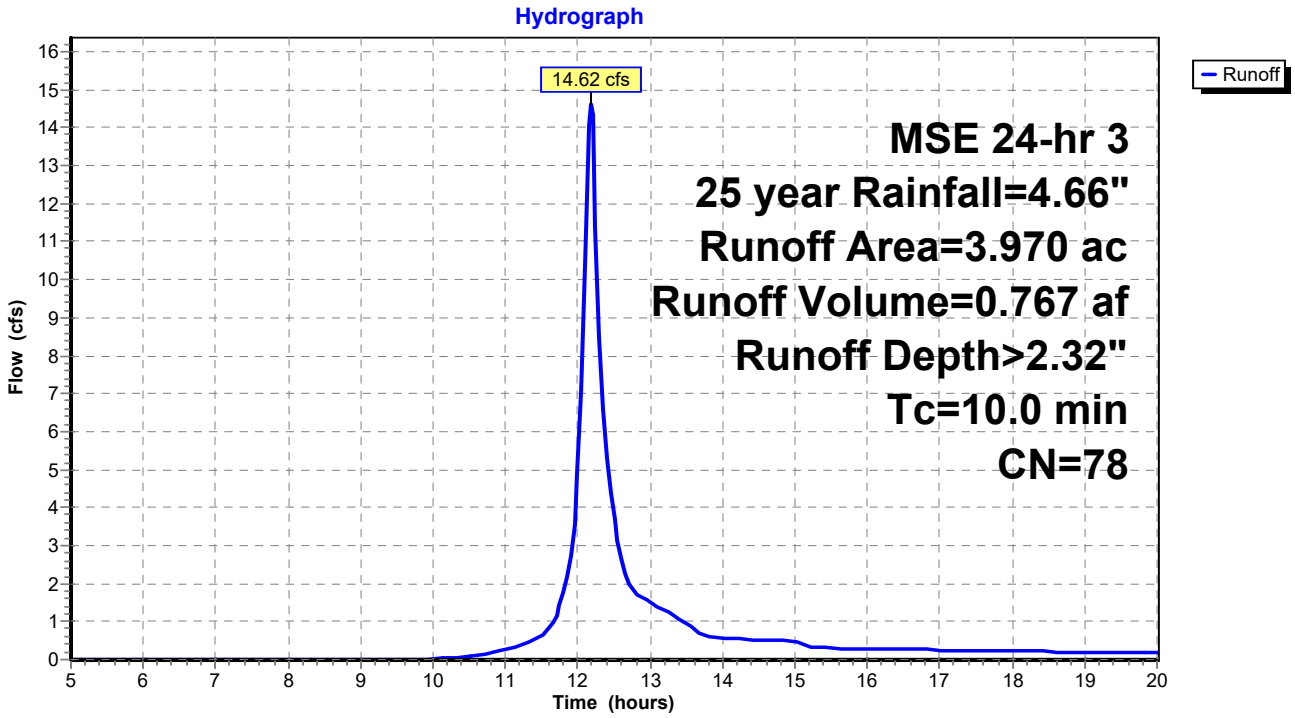
Runoff = 14.62 cfs @ 12.18 hrs, Volume= 0.767 af, Depth> 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 25 year Rainfall=4.66"

Area (ac)	CN	Description
1.800	98	Paved roads w/curbs & sewers, HSG B
2.170	61	>75% Grass cover, Good, HSG B
3.970	78	Weighted Average
2.170		54.66% Pervious Area
1.800		45.34% Impervious Area

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

Subcatchment 4S: Area to Ditch



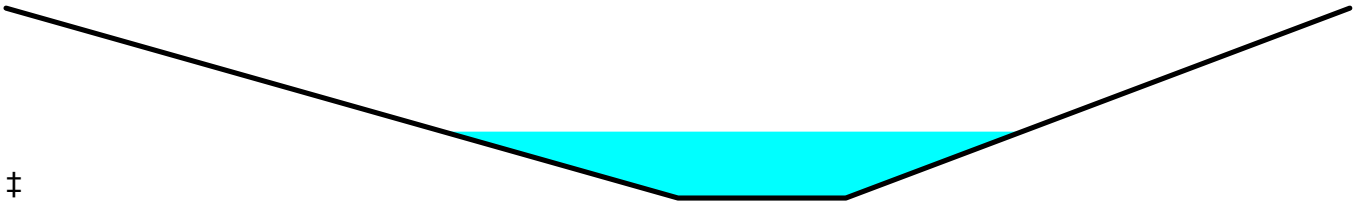
Summary for Reach 1R: north Ditch

Inflow Area = 3.970 ac, 45.34% Impervious, Inflow Depth > 2.32" for 25 year event
Inflow = 14.62 cfs @ 12.18 hrs, Volume= 0.767 af
Outflow = 14.00 cfs @ 12.22 hrs, Volume= 0.766 af, Atten= 4%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.66 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.66 fps, Avg. Travel Time= 3.5 min

Peak Storage= 1,090 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 153.56 cfs

Custom cross-section, Length= 350.0' Slope= 0.0143 '/'
Constant n= 0.022 Earth, clean & straight
Inlet Invert= 836.00', Outlet Invert= 831.00'

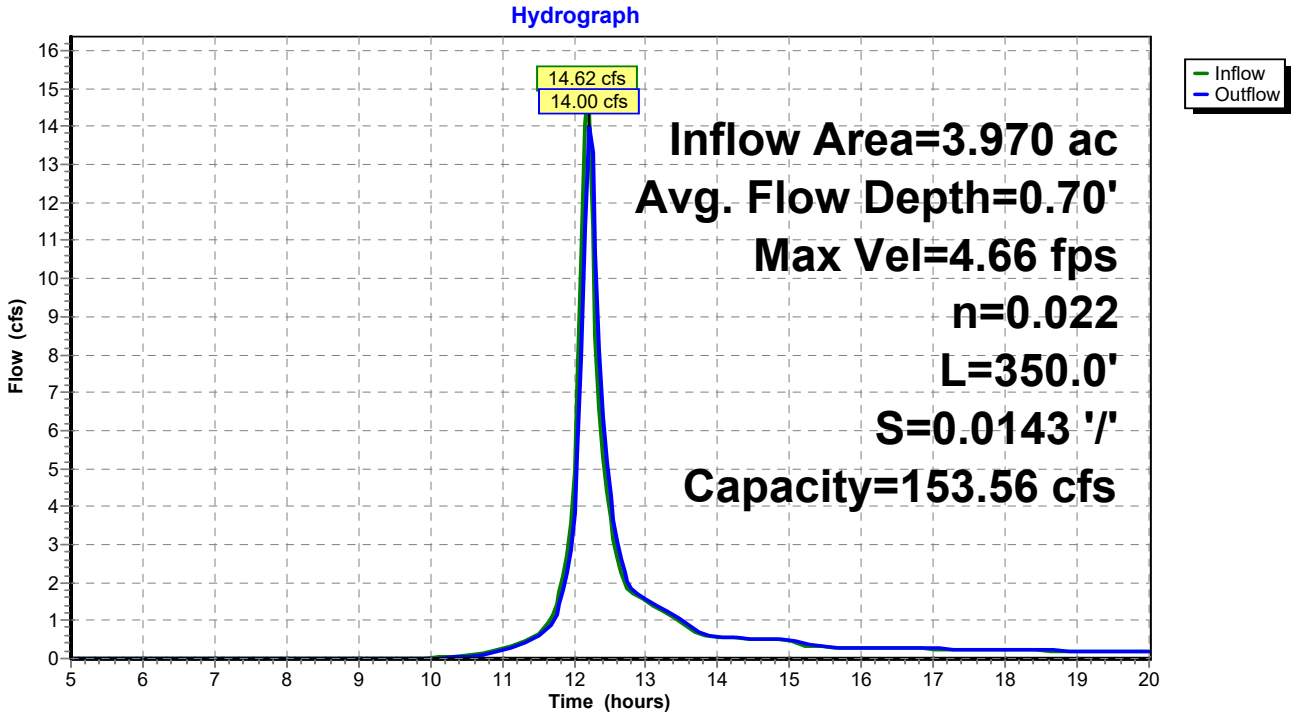


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	2.00	0.00
8.00	0.00	2.00
10.00	0.00	2.00
16.00	2.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	2.0	0	0.00
2.00	18.0	16.6	6,300	153.56

Reach 1R: north Ditch



Summary for Pond 4P: Endsection #4

Inflow Area = 3.970 ac, 45.34% Impervious, Inflow Depth > 2.32" for 25 year event
Inflow = 14.00 cfs @ 12.22 hrs, Volume= 0.766 af
Outflow = 12.87 cfs @ 12.26 hrs, Volume= 0.766 af, Atten= 8%, Lag= 2.8 min
Primary = 11.62 cfs @ 12.26 hrs, Volume= 0.757 af
Secondary = 1.26 cfs @ 12.26 hrs, Volume= 0.009 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 832.61' @ 12.26 hrs Surf.Area= 1,469 sf Storage= 1,204 cf

Plug-Flow detention time= 0.6 min calculated for 0.763 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (790.0 - 789.5)

Volume	Invert	Avail.Storage	Storage Description
#1	830.00'	1,835 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

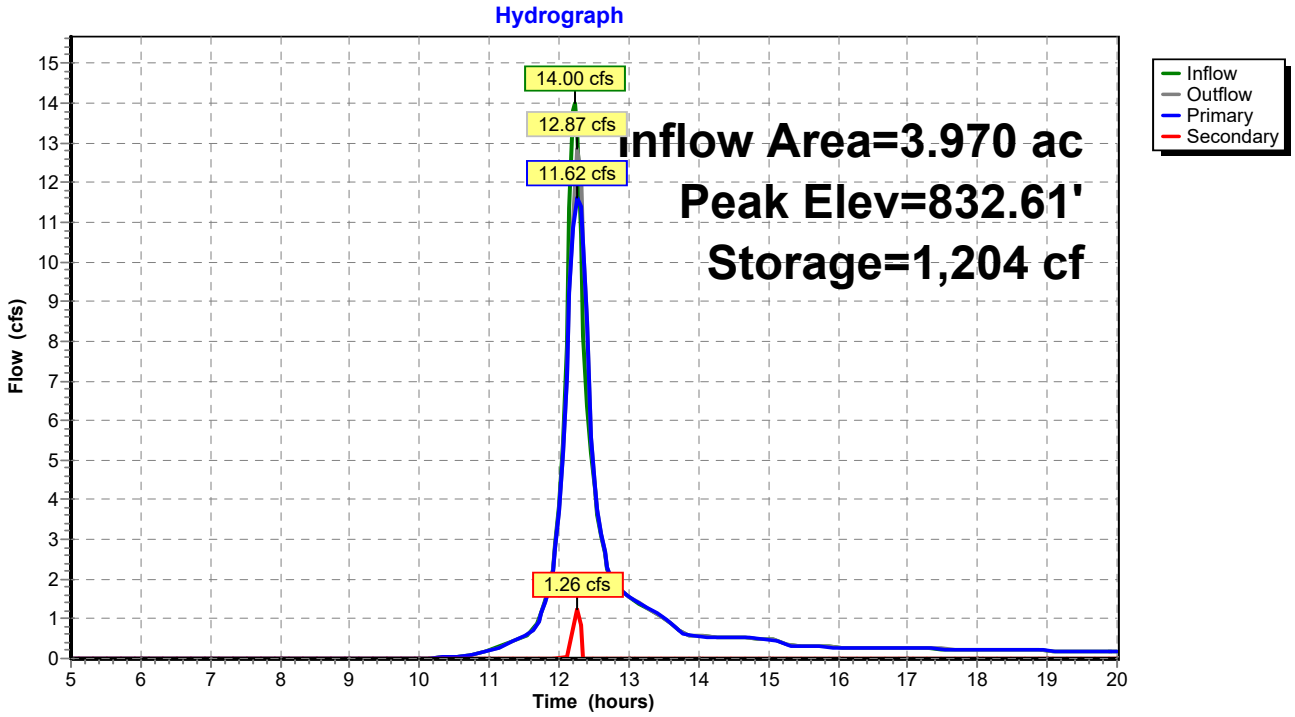
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
830.00	0	0	0
831.00	150	75	75
832.00	700	425	500
832.30	1,200	285	785
833.00	1,800	1,050	1,835

Device	Routing	Invert	Outlet Devices
#1	Primary	830.00'	**18.0" Round Culvert** L= 33.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 830.00' / 828.90' S= 0.0333 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Secondary	832.30'	**3.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=11.53 cfs @ 12.26 hrs HW=832.59' (Free Discharge)
1=Culvert (Inlet Controls 11.53 cfs @ 6.52 fps)

Secondary OutFlow Max=1.12 cfs @ 12.26 hrs HW=832.59' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 1.12 cfs @ 1.30 fps)

Pond 4P: Endsection #4



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 4S: Area to Ditch Runoff Area=3.970 ac 45.34% Impervious Runoff Depth>3.59"
Tc=10.0 min CN=78 Runoff=22.35 cfs 1.187 af

Reach 1R: north Ditch Avg. Flow Depth=0.85' Max Vel=5.21 fps Inflow=22.35 cfs 1.187 af
n=0.022 L=350.0' S=0.0143 '/' Capacity=153.56 cfs Outflow=21.54 cfs 1.185 af

Pond 4P: Endsection #4 Peak Elev=833.30' Storage=1,835 cf Inflow=21.54 cfs 1.185 af
Primary=13.60 cfs 1.091 af Secondary=8.04 cfs 0.095 af Outflow=21.64 cfs 1.185 af

Total Runoff Area = 3.970 ac Runoff Volume = 1.187 af Average Runoff Depth = 3.59"
54.66% Pervious = 2.170 ac 45.34% Impervious = 1.800 ac

Summary for Subcatchment 4S: Area to Ditch

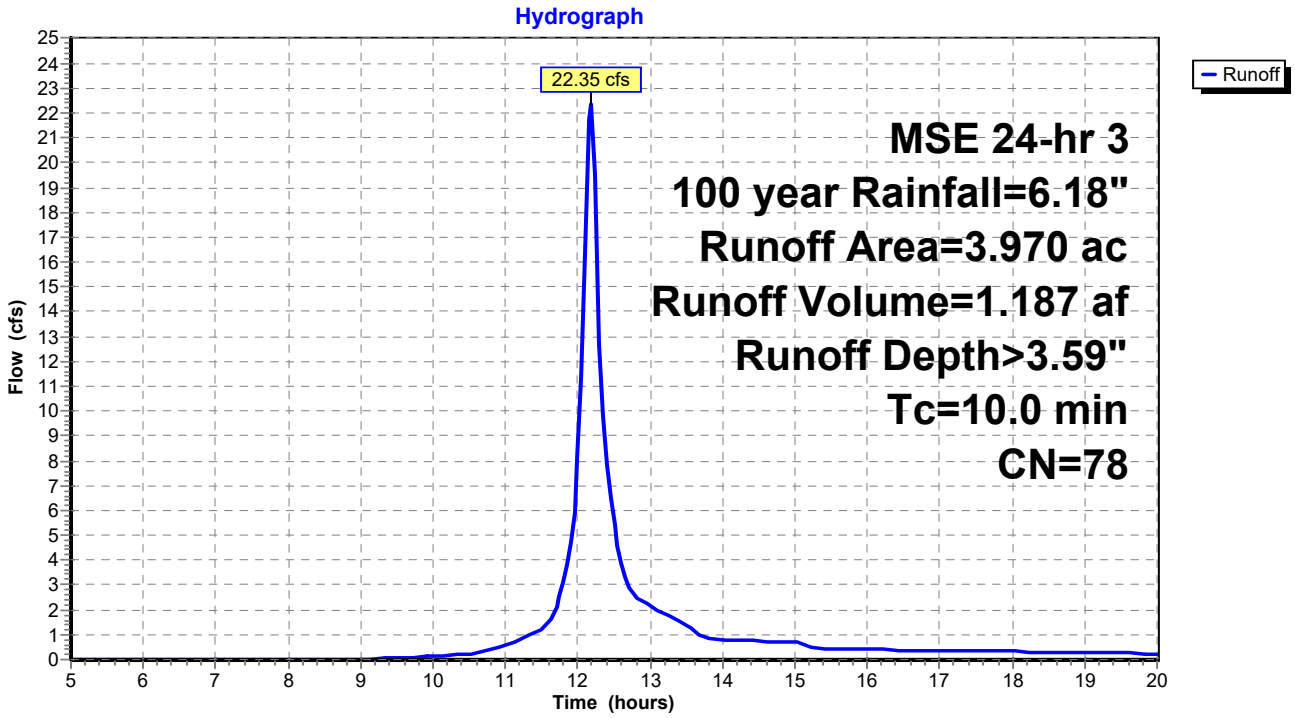
Runoff = 22.35 cfs @ 12.18 hrs, Volume= 1.187 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100 year Rainfall=6.18"

Area (ac)	CN	Description
1.800	98	Paved roads w/curbs & sewers, HSG B
2.170	61	>75% Grass cover, Good, HSG B
3.970	78	Weighted Average
2.170		54.66% Pervious Area
1.800		45.34% Impervious Area

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

Subcatchment 4S: Area to Ditch



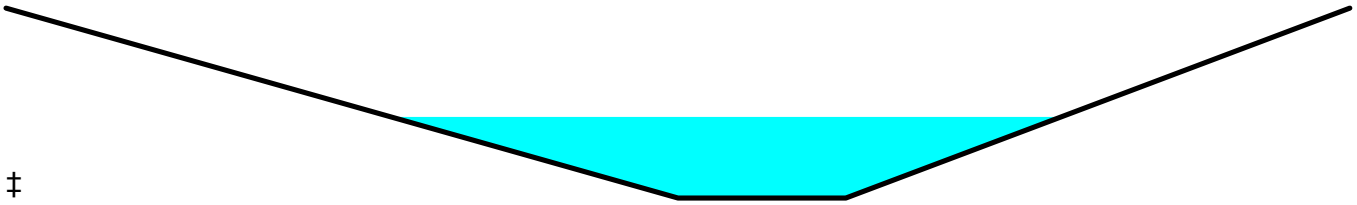
Summary for Reach 1R: north Ditch

Inflow Area = 3.970 ac, 45.34% Impervious, Inflow Depth > 3.59" for 100 year event
Inflow = 22.35 cfs @ 12.18 hrs, Volume= 1.187 af
Outflow = 21.54 cfs @ 12.21 hrs, Volume= 1.185 af, Atten= 4%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.21 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.81 fps, Avg. Travel Time= 3.2 min

Peak Storage= 1,494 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 153.56 cfs

Custom cross-section, Length= 350.0' Slope= 0.0143 '/'
Constant n= 0.022 Earth, clean & straight
Inlet Invert= 836.00', Outlet Invert= 831.00'

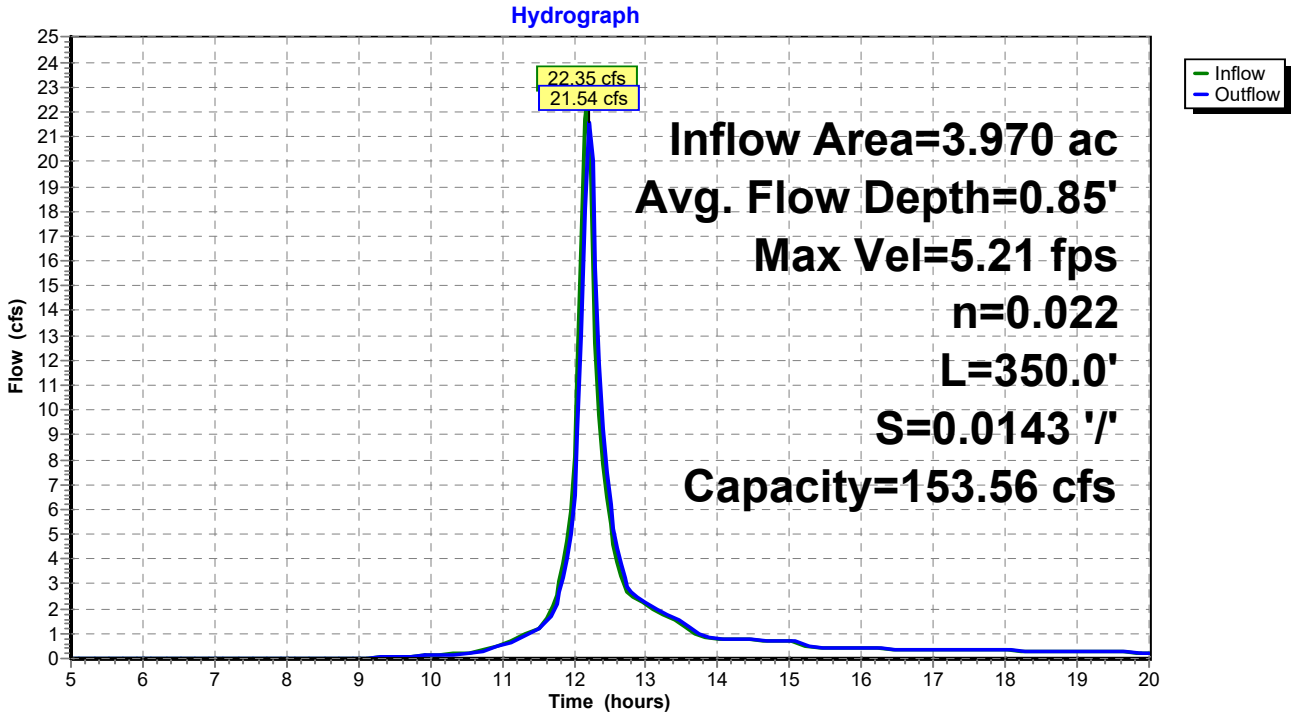


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	2.00	0.00
8.00	0.00	2.00
10.00	0.00	2.00
16.00	2.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	2.0	0	0.00
2.00	18.0	16.6	6,300	153.56

Reach 1R: north Ditch



Summary for Pond 4P: Endsection #4

Inflow Area = 3.970 ac, 45.34% Impervious, Inflow Depth > 3.58" for 100 year event
Inflow = 21.54 cfs @ 12.21 hrs, Volume= 1.185 af
Outflow = 21.64 cfs @ 12.23 hrs, Volume= 1.185 af, Atten= 0%, Lag= 1.5 min
Primary = 13.60 cfs @ 12.23 hrs, Volume= 1.091 af
Secondary = 8.04 cfs @ 12.23 hrs, Volume= 0.095 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 833.30' @ 12.23 hrs Surf.Area= 1,800 sf Storage= 1,835 cf

Plug-Flow detention time= 0.8 min calculated for 1.185 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (782.8 - 782.1)

Volume	Invert	Avail.Storage	Storage Description
#1	830.00'	1,835 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
830.00	0	0	0
831.00	150	75	75
832.00	700	425	500
832.30	1,200	285	785
833.00	1,800	1,050	1,835

Device	Routing	Invert	Outlet Devices
#1	Primary	830.00'	**18.0" Round Culvert** L= 33.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 830.00' / 828.90' S= 0.0333 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Secondary	832.30'	**3.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=13.46 cfs @ 12.23 hrs HW=833.25' (Free Discharge)
1=Culvert (Inlet Controls 13.46 cfs @ 7.62 fps)

Secondary OutFlow Max=7.51 cfs @ 12.23 hrs HW=833.26' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 7.51 cfs @ 2.62 fps)

Pond 4P: Endsection #4