

Final Drainage Report for

**Specialty Storage  
Solutions - Phase One  
1050 N. Hurricane Road**

Dated: May 9, 2019



Calculations Prepared By:

**PROJECTS plus**

2650 Fairview Place, Suite W  
Greenwood, Indiana 46142

LAND PLANNING • ENGINEERING • SURVEYING • PROJECT MANAGEMENT

Certified By:

 5/9/19  
Jeffery K. Smith, P.E. 19419

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## TECHNICAL INFORMATION DATA

### Summary of Site Drainage Conditions:

This project, "Specialty Storage Solutions- Phase One" is located on Lot No. 2 of the "Bastin Logan Subdivision" at 1050 North Hurricane Road, in the City of Franklin, Johnson County, Indiana. The site is located within the 'B' soil classifications per the Soil Survey Maps for Johnson County. The site is currently an undeveloped lot that is comprised of two dirt stockpiles and grass areas.

The proposed site improvements consist of one 6,600 sq. ft. storage building, and one 4,500 sq. ft. storage building. The proposed improvements will also include concrete and asphalt parking, temporary stone drives, concrete sidewalks and private infrastructure utilities (storm pipe and water main).

The project site was included in a prior industrial development known as "Bastin Logan Water Services, Inc." and the site and drainage review was approved under City of Franklin review (PC 2018-13). As part of the site improvements for the overall project a dry detention pond was installed south of the project site in the common area of the "Bastin Logan Subdivision". The stormwater runoff will be routed through the existing dry detention pond in the common area with the outlet controlled by a pond control structure. The outflow from the pond then releases to an existing 60" CMP pipe along the south property line of the subdivision. The proposed improvements on Lot No. 2 are located in the Onsite Post-Basin '1' watershed, a summary of the drainage runoff and the dry detention pond are as follows:

#### Onsite Post-Basin '1':

A = 10.39 acres                      CN = 84  
Q<sub>2</sub> = 4.54 cfs, Q<sub>10</sub> = 12.48 cfs, Q<sub>100</sub> = 25.67 cfs  
Total to Dry Detention Pond #1  
Q<sub>2</sub> = 6.58 cfs, Q<sub>10</sub> = 17.89 cfs, Q<sub>100</sub> = 36.57 cfs  
Dry Detention Pond #1:  
N.P. = 724.00, T.O.B. = 731.00, Storage = 191,688 Cu. Ft.  
100-yr elev. = 728.09  
Detention Outflow:  
Q<sub>2</sub> = 2.04 cfs, Q<sub>10</sub> = 2.72 cfs, Q<sub>100</sub> = 11.49 cfs

### Water Quality:

The water quality treatment for the project site is provided by an existing downstream dry detention pond and a pond control structure. This system was designed in accordance with the City of Franklin Subdivision Control Ordinance, Section 6.19, for water quality design. The water quality detention pond was designed for Option #1; detain 20% of the 0.5" direct runoff for 24 hours past the peak.

### **Engineering Methodology:**

The calculations contained herein have been prepared in compliance with the City of Franklin Subdivision Control Ordinance. The detention facilities were designed using HYDRAFLOW Hydrograph Routing Module. A storm hydrograph is developed using the “SCS Curve Number Method” for each watershed and routed through a user defined detention basin and outlet structure configuration. Water surface elevations and outlet rates are determined by the storage indication method which uses a stage/storage/discharge relationship and inflow hydrograph to set the inflow minus the outflow equal to the change in storage. The post-developed drainage basins and basin characteristics for each pond are shown on the “Post-Development Drainage Map”.

The storm sewer system was designed using the HYDRAFLOW Storm Sewer Module. Discharge rates for each inlet were calculated using the “Rational Method” and input into the HYDRAFLOW Storm Sewer Module to calculate the velocity, capacity, hydraulic grade line, gutter and inlet spreads for each storm sewer system. A weighted coefficient was computed for all storm basins in accordance with Chapter 6.19 of the City of Franklin General Drainage Standards. Individual times of concentration were calculated using Manning Equation. The storm sewer system is sized for a 10-year storm runoff event with no surcharging.

### **Stormwater Pollution Prevention:**

The land disturbing activities will be greater than 1 acre, so a Rule 5 submittal is required. A Stormwater Pollution Prevention Plan (SWPPP) with an activities schedule will be submitted as part of the construction plans. Standard maintenance schedules and details will be included. All swales and pond banks will be mulch-seeded and have an erosion control blanket installed. All drainage easements will be mulch-seeded and the rights-of-way will be temporary seeded. A perimeter filter fence will be installed where needed as well as at all ditch inlets.

Map Unit Legend			
Johnson County, Indiana (IN081)			
Johnson County, Indiana (IN081)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	8.3	19.0%
MnB2	Miami silt loam, 2 to 6 percent slopes, eroded	0.0	0.0%
ObaA	Ockley loam, 0 to 2 percent slopes	21.2	48.5%
Re	Rensselaer silty clay loam	14.2	32.5%
<b>Totals for Area of Interest</b>		<b>43.8</b>	<b>100.0%</b>



Hours	Minutes	Return Period - Rainfall Intensity (in/hr)					
		2	5	10	25	50	100
0.08	5	4.75	6.14	6.99	8.08	8.83	9.69
0.17	10	3.63	4.75	5.48	6.40	7.07	7.77
0.25	15	2.97	3.92	4.55	5.34	5.94	6.53
0.5	30	1.98	2.64	3.09	3.65	4.10	4.50
1	60	1.25	1.67	1.96	2.31	2.62	2.88
2	120	0.76	1.02	1.20	1.40	1.59	1.75
3	180	0.56	0.75	0.88	1.03	1.17	1.29
6	360	0.33	0.44	0.52	0.60	0.68	0.75
12	720	0.20	0.26	0.30	0.35	0.39	0.43
24	1440	0.11	0.15	0.17	0.20	0.22	0.25

Hours	Minutes	Return Period - Rainfall Depth (in)					
		2	5	10	25	50	100
0.08	5	0.40	0.51	0.58	0.67	0.74	0.81
0.17	10	0.61	0.79	0.91	1.07	1.18	1.30
0.25	15	0.74	0.98	1.14	1.34	1.49	1.63
0.5	30	0.99	1.32	1.55	1.83	2.05	2.25
1	60	1.25	1.67	1.96	2.31	2.62	2.88
2	120	1.52	2.04	2.40	2.80	3.18	3.50
3	180	1.68	2.25	2.64	3.09	3.51	3.87
6	360	1.98	2.64	3.12	3.60	4.08	4.50
12	720	2.40	3.12	3.60	4.20	4.68	5.16
24	1440	2.64	3.60	4.08	4.80	5.28	6.00

TABLE 202-02: IDF and IDD Tables for Indianapolis, IN



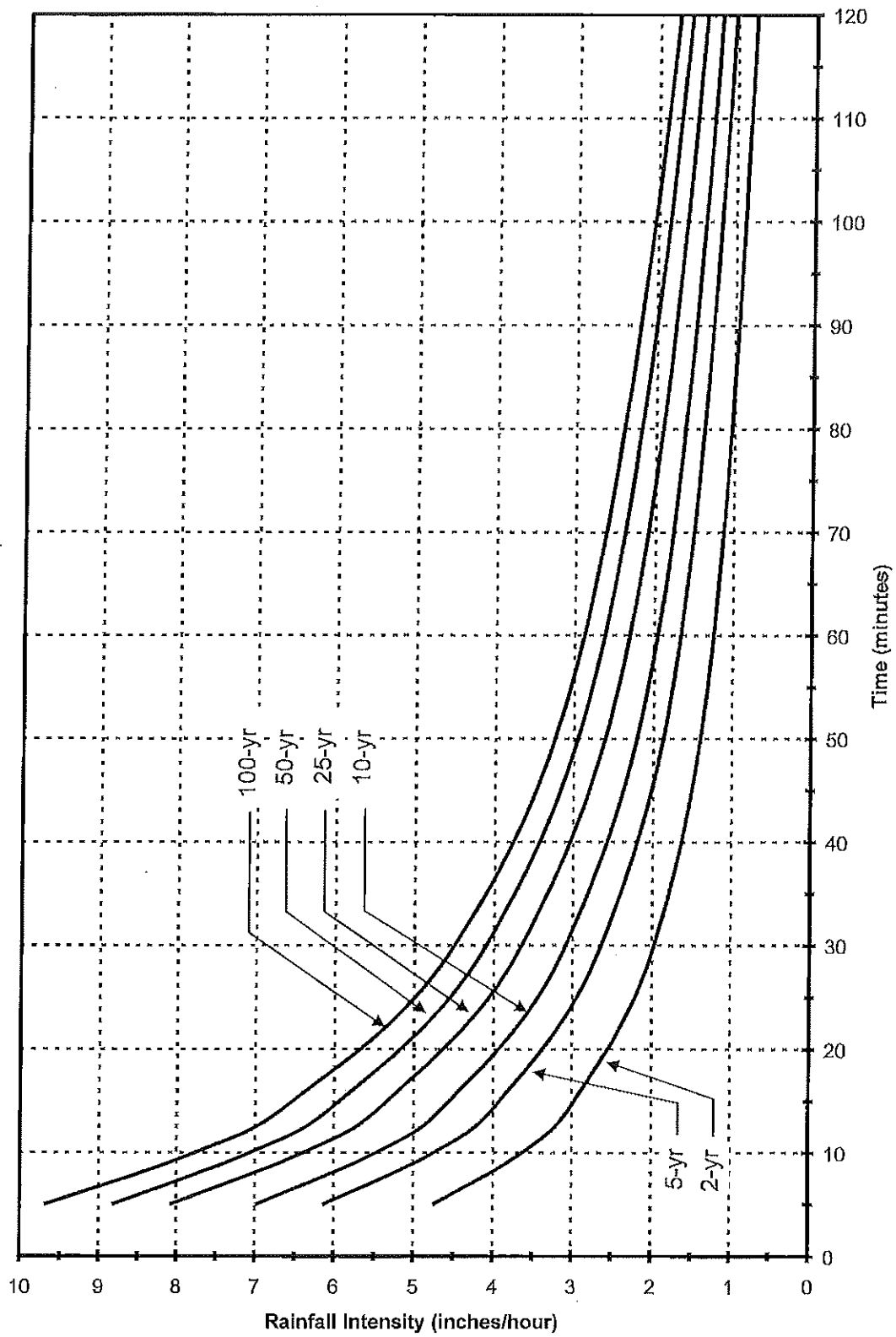


FIGURE 202-01: Indianapolis IDF Curve

Surface Description	n
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated Soils:	
Residue cover $\leq 20\%$	0.06
Residue cover $> 20\%$	0.17
Grass:	
Short grass prairie	0.15
Dense grasses	0.24
Bermuda grass	0.41
Range (natural)	0.13
Woods:	
Light underbrush	0.40
Dense underbrush	0.80

**TABLE 203-01: Roughness coefficients (Manning's n) for sheet flow**



<u>TYPE OF SURFACE</u>	<u>RUNOFF COEFFICIENT</u> ®
<u>Non-Urban Areas</u>	
Bare earth	0.55
Steep grassed areas (slope 2:1)	0.60
Turf meadows	0.25
Forested areas	0.20
Cultivated fields	0.30
<u>Urban Areas</u>	
All watertight roof surfaces	0.90
Pavement	0.85
Gravel	0.85
Impervious soils (heavy)	0.55
Impervious soils (with turf)	0.45
Slightly pervious soil	0.25
Slightly pervious soil (with turf)	0.20
Moderately pervious soil	0.15
Moderately pervious soil (with turf)	0.10
Business, Commercial & Industrial	0.85
Apartments & Townhouses	0.70
Schools & Churches	0.55
Single Family Lots < 10,000 SF	0.45
Lots < 12,000 SF	0.45
Lots < 17,000 SF	0.40
Lots > ½ acre	0.35
Park, Cemetery or Unimproved Area	0.30

**TABLE 204-01: Runoff Coefficients® for Use in the Rational Method**

[Absence of an entry indicates the feature is not a concern. The symbol < means less than; > means greater than]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	
Brookston: Br	B/D	Frequent	Brief	Dec-May	Fr 0-1.0	Apparent	Dec-May	High.
Crosby: CrA	C	None			1.0-3.0	Apparent	Jan-Apr	High.
<sup>1</sup> CrB2: Crosby part	C	None			1.0-3.0	Apparent	Jan-Apr	High.
Miami part	B	None			>6.0			Moderate.
Eel: Ee	C	Frequent	Brief	Oct-Jun	3.0-6.0	Apparent	Jan-Apr	High.
Fox: FoA, FoB2, <sup>1</sup> FxC2	B	None			>6.0			Moderate.
Genesee: Ge	B	Frequent	Brief	Oct-Jun	>6.0			Moderate.
Hennepin: HeF	B	None			>6.0			Moderate.
Martinsville: MgA, MgB2	B	None			>6.0			Moderate.
Miami: MmA, MmB2, MmC2, <sup>1</sup> MxO2, MxEZ	B	None			>6.0			Moderate.
Ockley: OeA, OeB2	B	None			>6.0			Moderate.
Rensselaer: Re	B/D	None			0-1.0	Apparent	Dec-May	High.
Shoals: Sh	C	Frequent	Brief	Oct-Jun	1.0-3.0	Apparent	Jan-Apr	High.
Sleeth: Sk	C	None			1.0-3.0	Apparent	Jan-Apr	High.
Sloan: Sn	B/D	Frequent	Long	Oct-Jun	0-0.5	Apparent	Nov-Jun	High.
Urban land: <sup>1</sup> Ub	B/D	Frequent	Brief	Dec-May	0-1.0	Apparent	Dec-May	High.
Brookston part	B/D	Frequent	Brief	Dec-May	0-1.0	Apparent	Dec-May	High.
<sup>1</sup> Uc Crosby part	C	None			1.0-3.0	Apparent	Jan-Apr	High.
<sup>1</sup> UFA Fox part	B	None			>6.0			Moderate.
<sup>1</sup> U/C Fox part	B	None			>6.0			Moderate.
<sup>1</sup> Ug Genesee part	B	Frequent	Brief	Oct-Jun	>6.0			Moderate.
<sup>1</sup> Umb Miami part	B	None			>6.0			Moderate.
<sup>1</sup> UmC Miami part	B	None			>6.0			Moderate.
<sup>1</sup> Uw Westland part	B/D	Frequent	Brief	Dec-May	0-1.0	Apparent	Dec-May	High.
Westland: We	B/D	Frequent	Brief	Dec-May	0-1.0	Apparent	Dec-May	High.
Whitaker: Wh	C	None			1.0-3.0	Apparent	Jan-Apr	High.

<sup>1</sup> This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 205-01: Soil and Water Features for Marion County, Indiana  
(SOURCE: NRCS, Soil Survey of Marion county, Indiana, 1991)

Cover Description	Curve Numbers for Hydrologic Soil Groups				
Cover Type and Hydrologic Condition	Average Percent <sup>2</sup> Impervious Area	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) <sup>2</sup>		68	79	86	89
Poor condition (grass cover < 50%)		49	69	79	84
Fair condition (grass cover 50% to 75%)		39	61	74	80
Good condition (grass cover > 75%)					
Impervious Areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and Roads:					
Paved; curbs and storm drains (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Urban Districts:					
Commercial and Business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential Districts by Average Lot Size:					
0.125 acre or less (townhouses)	65	77	85	90	92
0.25 acre	38	61	75	83	87
0.33 acre	30	57	72	81	86
0.50 acre	25	54	70	80	85
1.00 acre	20	51	68	79	84
2.00 acre	12	46	65	77	82
Developing Urban Areas					
Newly graded areas (pervious area only, no vegetation)		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in <u>Table 205-04</u> ).					

<sup>1</sup> Average runoff condition, and  $I_a = 0.2S$

<sup>2</sup> The average percent impervious area shown was used to develop the composite CNs. Other assumptions are as follows: Impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. If the impervious area is not connected, the NRCS method has an adjustment to reduce the effect.

<sup>3</sup> CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space cover type.

**TABLE 205-02: Runoff Curve Numbers for Urban Areas**  
(SOURCE: 210-VI-TR-55, Second Ed., June 1986)

Cover Description	Curve Numbers for Hydrologic Soil Groups			
Cover Type and Hydrologic Condition	A	B	C	D
Cultivated Land (Row Crops)	72	81	88	91
With conservation treatment	62	71	78	81
Without conservation treatment				
Pasture or Range Land	68	79	86	89
Poor condition	39	61	74	80
Good condition				
Meadow	30	58	71	78
Good condition				
Wood or Forest Land	45	66	77	83
Thin stand, poor cover, no mulch	25	55	70	77
Good cover				

**TABLE 205-03: Runoff Curve Numbers for Undeveloped Areas**  
(SOURCE: 210-VI-TR-55, Second Ed., June 1986)

Cover Description	Curve Numbers for Hydrologic Soil Groups			
Cover Type and Hydrologic Condition	A	B	C	D
Pasture, grassland or range with continuous forage for grazing.				
Poor	68	79	86	89
Fair	49	69	79	84
Good	39	61	74	80
Meadow with continuous grass, protected from grazing and generally mowed for hay.	30	58	71	78
Brush/brush-weed-grass mixture with brush being the major element.				
Poor	48	67	77	83
Fair	35	56	70	77
Good	30	48	65	73
Woods and grass combination (orchard or tree farm).				
Poor	57	73	82	86
Fair	43	65	76	82
Good	32	58	72	79
Woods				
Poor	45	66	77	83
Fair	36	60	73	79
Good	30	55	70	77
Farmsteads	59	74	82	86

**TABLE 205-04: Runoff Curve Numbers for Agricultural Lands**  
(SOURCE: 210-VI-TR-55, Second Ed., June 1986)

**Post-Developed Drainage Conditions**

**Approved from Bastin Logan Water  
Services, Inc.**

**1010 N. Hurricane Road**

**Drainage review under City of Franklin  
review (PC 2018-13)**

DATED: 3/20/18

### ALLOWABLE RELEASE RATE CALCULATIONS

ALLOWABLE RELEASE PNT #1

PRE-DEV. ONSITE BASIN	PRE-DEV. OffSITE BASIN	Q10p = 0.5 Q10e :	<b>6.07</b>	cfs
'1'	'2'	Q100p = Q10e =	<b>14.18</b>	cfs

Q100p = Q10e = **14.18** cfs

Time	2 YR	10 YR.	100 YR.	2 YR	10 YR.	100 YR.	10p	100p
1 hr.	0.65	3.28	9.36	2.05	5.42	10.90	6.07	14.18
2 hr.	0.80	3.72	9.38	1.88	4.75	9.15	5.40	12.87
3 hr.	0.85	3.42	8.48	1.63	3.83	7.45	4.48	10.87
6 hr.	0.75	2.80	6.14	1.17	2.73	5.51	3.38	8.31
12 hr.	1.04	2.80	5.54	1.16	2.15	3.56	2.80	6.36
24 hr.	1.01	2.45	4.62	0.87	1.58	2.54	2.23	4.99

# Runoff curve number (CN) and Time of Concentration (TC) Calculations

Project: BASTIN LOGAN

By: JPH

Date: 3/20/18

Circle one:

Present

Developed

Onsite Basin 1

## Runoff curve number (CN)

Soil Name and Hydrologic Group	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/	Area (in acres)	Product of CN x area
Re-ObAa - "B"	Urban Disticts (Industrial) (60% impervious coverage)	84	10.39	872.8
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
Totals=			10.39	872.76

CN (weighted) =  $\frac{\text{Total Product}}{\text{Total Area}}$

CN (weighted) =  $\frac{872.8}{10.4}$

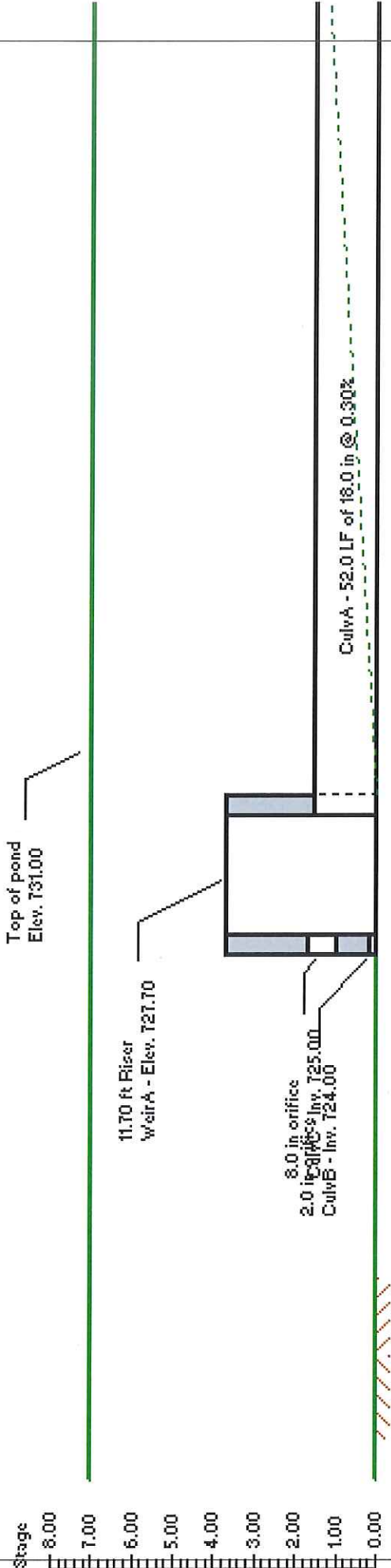
CN (weighted) = **84.0**  
US CN = **84**

## Time of Concentration

Sheet Flow	T.C. = $\frac{0.01}{2.64^{0.50}} \times \left( \frac{0.17}{0.008^{0.40}} \times 60 \right)^{0.80} =$						11 Minutes
Shallow Concentrated	Paved:	T.C. =	20.3	x	$0.02^{0.5} =$	2.88 ft/sec	1 Minutes
					$=$	130 feet	
	Unpaved:	T.C. =	16.1	x	$0.005^{0.5} =$	1.14 ft/sec	0 Minutes
					$=$	1.14 ft/sec	
Channel Flow	X-sec	1.77	Mann 'N'	0.013	2.52 ft/sec	=	4 Minutes
	Wet Per.	4.71		Flow Length	552 feet		
	Hyd. R. =	0.38					
	Chan. Slope	0.0018					
Minimum T/C = 5 Minutes						T/c Total=	16 Minutes



Dry Detention



Section  
NTS

Schematic only. Not for construction.

# Pond Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:44 AM

## Pond No. 1 - Dry Detention

### Pond Data

Pond storage is based on known contour areas. Average end area method used.

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	724.00	00	0	0
1.00	725.00	1,877	939	939
2.00	726.00	8,821	5,349	6,288
3.00	727.00	25,017	16,919	23,207
4.00	728.00	39,432	32,225	55,431
5.00	729.00	43,379	41,406	96,837
6.00	730.00	47,382	45,381	142,217
7.00	731.00	51,560	49,471	191,688

### Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise (in)	= 18.00	2.00	8.00	0.00
Span (in)	= 18.00	2.00	8.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 724.00	724.00	725.00	0.00
Length (ft)	= 52.00	0.50	0.50	0.00
Slope (%)	= 0.30	0.50	0.50	0.00
N-Value	= .011	.011	.013	.000
Orif. Coeff.	= 0.60	0.60	0.60	0.00
Multi-Stage	= n/a	Yes	Yes	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.70	0.00	0.00	0.00
Crest El. (ft)	= 727.70	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.

### Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	724.00	0.00	0.00	0.00	---	0.00	---	---	---	---	0.00
1.00	939	725.00	0.10	0.10	0.00	---	0.00	---	---	---	---	0.10
2.00	6,288	726.00	1.53	0.12	1.37	---	0.00	---	---	---	---	1.49
3.00	23,207	727.00	2.36	0.15	2.17	---	0.00	---	---	---	---	2.32
4.00	55,431	728.00	8.81	0.14	2.27	---	6.40	---	---	---	---	8.81
5.00	96,837	729.00	17.46	0.02	0.32	---	17.12	---	---	---	---	17.46
6.00	142,217	730.00	19.48	0.01	0.16	---	19.28	---	---	---	---	19.46
7.00	191,688	731.00	21.26	0.01	0.11	---	21.13	---	---	---	---	21.25

**PROJECT NAME: BASTIN LOGAN**

**Emergency spillway calculation Pond**

Peak 100 Yr. Inflow = 36.57 c.f.s.

$$1.25 \times 36.57 \text{ c.f.s.} = 45.7$$

Weir Equation:

$$Q = C L H^{3/2}$$

Where Q = outflow

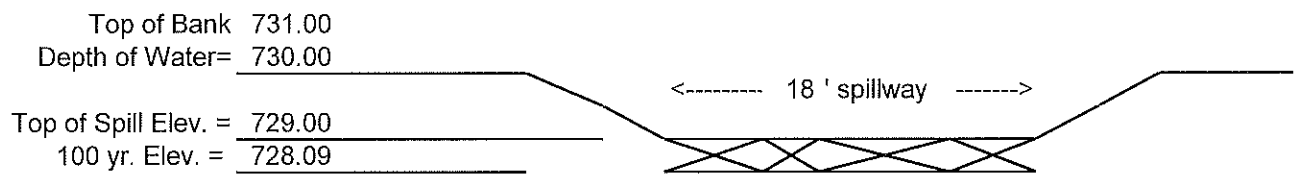
L = length of weir

C = discharge coefficient

H = hydraulic head over weir

$$45.713 \text{ c.f.s.} = 2.6 (L)^{3/2}$$

$$L = 17.58'$$



# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	2.05	1	31	4,751	----	-----	-----	Pre Offsite 2 - 1 hr.
2	SCS Runoff	1.88	1	39	7,299	----	-----	-----	Pre Offsite 2 - 2 hr.
3	SCS Runoff	1.63	1	51	8,952	----	-----	-----	Pre Offsite 2 - 3 hr.
4	SCS Runoff	1.17	1	91	12,269	----	-----	-----	Pre Offsite 2 - 6 hr.
5	SCS Runoff	1.16	1	325	17,280	----	-----	-----	Pre Offsite 2 - 12 hr.
6	SCS Runoff	0.87	1	936	20,292	----	-----	-----	Pre Offsite 2 - 24 hr.
7	SCS Runoff	4.54	1	30	10,378	----	-----	-----	Post Onsite 1 - 1 hr.
8	SCS Runoff	4.18	1	39	16,276	----	-----	-----	Post Onsite 1 - 2 hr.
9	SCS Runoff	3.65	1	51	20,110	----	-----	-----	Post Onsite 1 - 3 hr.
10	SCS Runoff	2.66	1	92	27,866	----	-----	-----	Post Onsite 1 - 6 hr.
11	SCS Runoff	2.69	1	325	39,674	----	-----	-----	Post Onsite 1 - 12 hr.
12	SCS Runoff	2.03	1	936	46,803	----	-----	-----	Post Onsite 1 - 24 hr.
13	Combine	6.58	1	30	15,129	1, 7,	-----	-----	Total to Pond - 1 hr.
14	Combine	6.06	1	39	23,575	2, 8,	-----	-----	Total to Pond - 2 hr.
15	Combine	5.28	1	51	29,062	3, 9,	-----	-----	Total to Pond - 3 hr.
16	Combine	3.83	1	92	40,135	4, 10,	-----	-----	Total to Pond - 6 hr.
17	Combine	3.85	1	325	56,954	5, 11,	-----	-----	Total to Pond - 12 hr.
18	Combine	2.90	1	936	67,095	6, 12,	-----	-----	Total to Pond - 24 hr.
19	Reservoir	1.73	1	71	15,123	13	726.24	10,375	Thru Pond - 1 hr.
20	Reservoir	1.87	1	116	23,569	14	726.40	13,120	Thru Pond - 2 hr.
21	Reservoir	1.89	1	160	29,056	15	726.42	13,405	Thru Pond - 3 hr.
22	Reservoir	1.88	1	184	40,129	16	726.41	13,281	Thru Pond - 6 hr.
23	Reservoir	2.04	1	438	56,948	17	726.61	16,614	Thru Pond - 12 hr.
24	Reservoir	1.89	1	1018	67,089	18	726.42	13,477	Thru Pond - 24 hr.
17022post.gpw					Return Period: 2 Year			Wednesday, May 9 2018, 8:44 AM	

# Hydrograph Report

Hydraflow Hydrographs by Intellisolve

Wednesday, May 9 2018, 8:44 AM

## Hyd. No. 7

Post Onsite 1 - 1 hr.

Hydrograph type = SCS Runoff  
Storm frequency = 2 yrs  
Drainage area = 10.39 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 1.25 in  
Storm duration = 1 hrs

Peak discharge = 4.54 cfs  
Time interval = 1 min  
Curve number = 84  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 16.0 min  
Distribution = Huff-1st  
Shape factor = 484

Hydrograph Volume = 10,378 cuft

( Printed values >= 50% of Qp.)

## Hydrograph Discharge Table

Time -- Outflow (hrs      cfs)	Time -- Outflow (hrs      cfs)
0.32      2.50	0.88      2.54
0.33      2.83	0.90      2.52
0.35      3.14	0.92      2.48
0.37      3.43	0.93      2.44
0.38      3.68	0.95      2.40
0.40      3.90	0.97      2.35
0.42      4.08	0.98      2.31
0.43      4.23	
0.45      4.36	
0.47      4.45	...End
0.48      4.51	
0.50      4.54 <<	
0.52      4.52	
0.53      4.48	
0.55      4.41	
0.57      4.32	
0.58      4.20	
0.60      4.06	
0.62      3.90	
0.63      3.75	
0.65      3.59	
0.67      3.43	
0.68      3.29	
0.70      3.17	
0.72      3.06	
0.73      2.96	
0.75      2.88	
0.77      2.81	
0.78      2.75	
0.80      2.70	
0.82      2.65	
0.83      2.62	
0.85      2.60	
0.87      2.57	

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:45 AM

## Hyd. No. 12

Post Onsite 1 - 24 hr.

Hydrograph type = SCS Runoff  
Storm frequency = 2 yrs  
Drainage area = 10.39 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 2.64 in  
Storm duration = 24 hrs

Peak discharge = 2.03 cfs  
Time interval = 1 min  
Curve number = 84  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 16.0 min  
Distribution = Huff-3rd  
Shape factor = 484

Hydrograph Volume = 46,803 cuft

( Printed values >= 50% of Qp.)

## Hydrograph Discharge Table

Time -- Outflow (hrs cfs)	Time -- Outflow (hrs cfs)	Time -- Outflow (hrs cfs)	Time -- Outflow (hrs cfs)
13.35 1.02	13.92 1.55	14.48 1.69	15.05 1.93
13.37 1.07	13.93 1.55	14.50 1.70	15.07 1.93
13.38 1.11	13.95 1.56	14.52 1.71	15.08 1.94
13.40 1.16	13.97 1.56	14.53 1.72	15.10 1.94
13.42 1.19	13.98 1.56	14.55 1.73	15.12 1.94
13.43 1.23	14.00 1.57	14.57 1.74	15.13 1.95
13.45 1.27	14.02 1.57	14.58 1.76	15.15 1.95
13.47 1.30	14.03 1.57	14.60 1.77	15.17 1.95
13.48 1.33	14.05 1.58	14.62 1.78	15.18 1.96
13.50 1.35	14.07 1.58	14.63 1.79	15.20 1.96
13.52 1.38	14.08 1.59	14.65 1.81	15.22 1.96
13.53 1.40	14.10 1.59	14.67 1.82	15.23 1.97
13.55 1.42	14.12 1.59	14.68 1.83	15.25 1.97
13.57 1.44	14.13 1.60	14.70 1.83	15.27 1.97
13.58 1.45	14.15 1.60	14.72 1.84	15.28 1.98
13.60 1.46	14.17 1.60	14.73 1.85	15.30 1.98
13.62 1.47	14.18 1.61	14.75 1.86	15.32 1.98
13.63 1.48	14.20 1.61	14.77 1.86	15.33 1.98
13.65 1.48	14.22 1.62	14.78 1.87	15.35 1.99
13.67 1.49	14.23 1.62	14.80 1.88	15.37 1.99
13.68 1.49	14.25 1.62	14.82 1.88	15.38 1.99
13.70 1.50	14.27 1.63	14.83 1.89	15.40 2.00
13.72 1.50	14.28 1.63	14.85 1.89	15.42 2.00
13.73 1.50	14.30 1.63	14.87 1.89	15.43 2.00
13.75 1.51	14.32 1.64	14.88 1.90	15.45 2.01
13.77 1.51	14.33 1.64	14.90 1.90	15.47 2.01
13.78 1.52	14.35 1.64	14.92 1.90	15.48 2.01
13.80 1.52	14.37 1.65	14.93 1.91	15.50 2.01
13.82 1.52	14.38 1.65	14.95 1.91	15.52 2.02
13.83 1.53	14.40 1.65	14.97 1.91	15.53 2.02
13.85 1.53	14.42 1.66	14.98 1.92	15.55 2.02
13.87 1.54	14.43 1.66	15.00 1.92	15.57 2.03
13.88 1.54	14.45 1.67	15.02 1.92	15.58 2.03
13.90 1.54	14.47 1.68	15.03 1.93	15.60 2.03 <<

Continues on next page...

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:45 AM

## Hyd. No. 13

Total to Pond - 1 hr.

Hydrograph type = Combine  
Storm frequency = 2 yrs  
Inflow hyds. = 1, 7

Peak discharge = 6.58 cfs  
Time interval = 1 min

Hydrograph Volume = 15,129 cuft

( Printed values >= 75% of Qp. )

## Hydrograph Discharge Table

Time (hrs)	Hyd. 1 + (cfs)	Hyd. 7 + (cfs)	Outflow (cfs)
0.37	1.52	3.43	4.94
0.38	1.63	3.68	5.31
0.40	1.73	3.90	5.63
0.42	1.82	4.08	5.89
0.43	1.89	4.23	6.12
0.45	1.95	4.36	6.30
0.47	1.99	4.45	6.44
0.48	2.02	4.51	6.53
0.50	2.04	4.54 <<	6.58 <<
0.52	2.05 <<	4.52	6.57
0.53	2.04	4.48	6.52
0.55	2.01	4.41	6.43
0.57	1.98	4.32	6.30
0.58	1.93	4.20	6.13
0.60	1.88	4.06	5.94
0.62	1.82	3.90	5.72
0.63	1.75	3.75	5.50
0.65	1.68	3.59	5.27
0.67	1.61	3.43	5.04

...End



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:45 AM

## Hyd. No. 23

Thru Pond - 12 hr.

Hydrograph type = Reservoir  
Storm frequency = 2 yrs  
Inflow hyd. No. = 17  
Max. Elevation = 726.61 ft

Peak discharge = 2.04 cfs  
Time interval = 1 min  
Reservoir name = Dry Detention  
Max. Storage = 16,614 cuft

Storage Indication method used.

Outflow hydrograph volume = 56,948 cuft

(Printed values >= 75% of Qp.)

## Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
4.70	3.41	726.04	1.56	0.12	1.41	-----	-----	-----	-----	-----	-----	1.53
4.72	3.43	726.04	1.56	0.12	1.41	-----	-----	-----	-----	-----	-----	1.54
4.73	3.45	726.05	1.57	0.12	1.42	-----	-----	-----	-----	-----	-----	1.55
4.75	3.47	726.06	1.57	0.12	1.43	-----	-----	-----	-----	-----	-----	1.55
4.77	3.50	726.06	1.58	0.12	1.43	-----	-----	-----	-----	-----	-----	1.56
4.78	3.52	726.07	1.58	0.13	1.44	-----	-----	-----	-----	-----	-----	1.57
4.80	3.54	726.08	1.59	0.13	1.45	-----	-----	-----	-----	-----	-----	1.57
4.82	3.56	726.08	1.60	0.13	1.46	-----	-----	-----	-----	-----	-----	1.58
4.83	3.58	726.09	1.60	0.13	1.46	-----	-----	-----	-----	-----	-----	1.59
4.85	3.60	726.10	1.61	0.13	1.47	-----	-----	-----	-----	-----	-----	1.60
4.87	3.61	726.11	1.61	0.13	1.48	-----	-----	-----	-----	-----	-----	1.60
4.88	3.62	726.11	1.62	0.13	1.48	-----	-----	-----	-----	-----	-----	1.61
4.90	3.62	726.12	1.63	0.13	1.49	-----	-----	-----	-----	-----	-----	1.62
4.92	3.63	726.13	1.64	0.13	1.50	-----	-----	-----	-----	-----	-----	1.62
4.93	3.63	726.13	1.65	0.13	1.50	-----	-----	-----	-----	-----	-----	1.63
4.95	3.63	726.14	1.66	0.13	1.51	-----	-----	-----	-----	-----	-----	1.64
4.97	3.63	726.15	1.67	0.13	1.52	-----	-----	-----	-----	-----	-----	1.64
4.98	3.63	726.15	1.68	0.13	1.52	-----	-----	-----	-----	-----	-----	1.65
5.00	3.62	726.16	1.69	0.13	1.53	-----	-----	-----	-----	-----	-----	1.66
5.02	3.62	726.17	1.69	0.13	1.54	-----	-----	-----	-----	-----	-----	1.66
5.03	3.62	726.18	1.70	0.13	1.54	-----	-----	-----	-----	-----	-----	1.67
5.05	3.62	726.18	1.71	0.13	1.55	-----	-----	-----	-----	-----	-----	1.68
5.07	3.62	726.19	1.72	0.13	1.55	-----	-----	-----	-----	-----	-----	1.68
5.08	3.63	726.20	1.73	0.13	1.56	-----	-----	-----	-----	-----	-----	1.69
5.10	3.63	726.20	1.74	0.13	1.57	-----	-----	-----	-----	-----	-----	1.70
5.12	3.64	726.21	1.74	0.13	1.57	-----	-----	-----	-----	-----	-----	1.70
5.13	3.64	726.22	1.75	0.13	1.58	-----	-----	-----	-----	-----	-----	1.71
5.15	3.65	726.22	1.75	0.13	1.59	-----	-----	-----	-----	-----	-----	1.72
5.17	3.66	726.23	1.76	0.13	1.59	-----	-----	-----	-----	-----	-----	1.72
5.18	3.67	726.24	1.76	0.13	1.60	-----	-----	-----	-----	-----	-----	1.73
5.20	3.68	726.24	1.77	0.13	1.60	-----	-----	-----	-----	-----	-----	1.73
5.22	3.69	726.25	1.78	0.13	1.61	-----	-----	-----	-----	-----	-----	1.74
5.23	3.70	726.26	1.78	0.13	1.62	-----	-----	-----	-----	-----	-----	1.75
5.25	3.72	726.27	1.79	0.13	1.62	-----	-----	-----	-----	-----	-----	1.75
5.27	3.73	726.27	1.79	0.13	1.63	-----	-----	-----	-----	-----	-----	1.76
5.28	3.75	726.28	1.80	0.13	1.63	-----	-----	-----	-----	-----	-----	1.77
5.30	3.76	726.29	1.80	0.13	1.64	-----	-----	-----	-----	-----	-----	1.77
5.32	3.78	726.29	1.81	0.13	1.65	-----	-----	-----	-----	-----	-----	1.78

Continues on next page...

Thru Pond - 12 hr.

## Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
5.33	3.79	726.30	1.82	0.13	1.65	----	----	----	----	----	----	1.78
5.35	3.81	726.31	1.82	0.13	1.66	----	----	----	----	----	----	1.79
5.37	3.82	726.31	1.83	0.13	1.66	----	----	----	----	----	----	1.80
5.38	3.83	726.32	1.83	0.13	1.67	----	----	----	----	----	----	1.80
5.40	3.85	726.33	1.84	0.13	1.68	----	----	----	----	----	----	1.81
5.42	3.85 <<	726.34	1.85	0.13	1.68	----	----	----	----	----	----	1.82
5.43	3.85	726.34	1.85	0.13	1.69	----	----	----	----	----	----	1.82
5.45	3.84	726.35	1.86	0.13	1.69	----	----	----	----	----	----	1.83
5.47	3.82	726.36	1.86	0.13	1.70	----	----	----	----	----	----	1.83
5.48	3.80	726.36	1.87	0.13	1.71	----	----	----	----	----	----	1.84
5.50	3.77	726.37	1.88	0.13	1.71	----	----	----	----	----	----	1.85
5.52	3.72	726.38	1.88	0.13	1.72	----	----	----	----	----	----	1.85
5.53	3.67	726.38	1.89	0.13	1.72	----	----	----	----	----	----	1.86
5.55	3.62	726.39	1.89	0.14	1.73	----	----	----	----	----	----	1.86
5.57	3.55	726.40	1.90	0.14	1.73	----	----	----	----	----	----	1.87
5.58	3.48	726.40	1.90	0.14	1.74	----	----	----	----	----	----	1.87
5.60	3.42	726.41	1.91	0.14	1.74	----	----	----	----	----	----	1.88
5.62	3.36	726.41	1.91	0.14	1.75	----	----	----	----	----	----	1.88
5.63	3.31	726.42	1.92	0.14	1.75	----	----	----	----	----	----	1.89
5.65	3.26	726.42	1.92	0.14	1.75	----	----	----	----	----	----	1.89
5.67	3.22	726.43	1.92	0.14	1.76	----	----	----	----	----	----	1.90
5.68	3.18	726.43	1.93	0.14	1.76	----	----	----	----	----	----	1.90
5.70	3.14	726.44	1.93	0.14	1.77	----	----	----	----	----	----	1.90
5.72	3.11	726.44	1.94	0.14	1.77	----	----	----	----	----	----	1.91
5.73	3.08	726.45	1.94	0.14	1.77	----	----	----	----	----	----	1.91
5.75	3.06	726.45	1.94	0.14	1.78	----	----	----	----	----	----	1.91
5.77	3.04	726.45	1.95	0.14	1.78	----	----	----	----	----	----	1.92
5.78	3.03	726.46	1.95	0.14	1.78	----	----	----	----	----	----	1.92
5.80	3.02	726.46	1.95	0.14	1.79	----	----	----	----	----	----	1.92
5.82	3.01	726.47	1.96	0.14	1.79	----	----	----	----	----	----	1.93
5.83	3.01	726.47	1.96	0.14	1.79	----	----	----	----	----	----	1.93
5.85	3.01	726.47	1.96	0.14	1.79	----	----	----	----	----	----	1.93
5.87	3.02	726.48	1.97	0.14	1.80	----	----	----	----	----	----	1.94
5.88	3.02	726.48	1.97	0.14	1.80	----	----	----	----	----	----	1.94
5.90	3.03	726.49	1.97	0.14	1.80	----	----	----	----	----	----	1.94
5.92	3.04	726.49	1.98	0.14	1.81	----	----	----	----	----	----	1.95
5.93	3.04	726.49	1.98	0.14	1.81	----	----	----	----	----	----	1.95
5.95	3.05	726.50	1.98	0.14	1.81	----	----	----	----	----	----	1.95
5.97	3.05	726.50	1.98	0.14	1.82	----	----	----	----	----	----	1.95
5.98	3.06	726.51	1.99	0.14	1.82	----	----	----	----	----	----	1.96
6.00	3.07	726.51	1.99	0.14	1.82	----	----	----	----	----	----	1.96
6.02	3.07	726.51	1.99	0.14	1.83	----	----	----	----	----	----	1.96
6.03	3.06	726.52	2.00	0.14	1.83	----	----	----	----	----	----	1.97
6.05	3.05	726.52	2.00	0.14	1.83	----	----	----	----	----	----	1.97
6.07	3.03	726.52	2.00	0.14	1.83	----	----	----	----	----	----	1.97
6.08	3.01	726.53	2.01	0.14	1.84	----	----	----	----	----	----	1.98
6.10	2.98	726.53	2.01	0.14	1.84	----	----	----	----	----	----	1.98
6.12	2.95	726.54	2.01	0.14	1.84	----	----	----	----	----	----	1.98
6.13	2.91	726.54	2.02	0.14	1.84	----	----	----	----	----	----	1.98
6.15	2.87	726.54	2.02	0.14	1.85	----	----	----	----	----	----	1.99
6.17	2.82	726.54	2.02	0.14	1.85	----	----	----	----	----	----	1.99

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# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	5.42	1	28	12,026	----	-----	-----	Pre Offsite 2 - 1 hr.
2	SCS Runoff	4.75	1	35	17,272	----	-----	-----	Pre Offsite 2 - 2 hr.
3	SCS Runoff	3.83	1	46	20,288	----	-----	-----	Pre Offsite 2 - 3 hr.
4	SCS Runoff	2.73	1	46	26,557	----	-----	-----	Pre Offsite 2 - 6 hr.
5	SCS Runoff	2.15	1	325	33,068	----	-----	-----	Pre Offsite 2 - 12 hr.
6	SCS Runoff	1.58	1	936	39,759	----	-----	-----	Pre Offsite 2 - 24 hr.
7	SCS Runoff	12.48	1	27	27,293	----	-----	-----	Post Onsite 1 - 1 hr.
8	SCS Runoff	10.87	1	34	39,674	----	-----	-----	Post Onsite 1 - 2 hr.
9	SCS Runoff	8.84	1	46	46,803	----	-----	-----	Post Onsite 1 - 3 hr.
10	SCS Runoff	6.15	1	45	61,693	----	-----	-----	Post Onsite 1 - 6 hr.
11	SCS Runoff	5.07	1	325	77,229	----	-----	-----	Post Onsite 1 - 12 hr.
12	SCS Runoff	3.77	1	936	93,242	----	-----	-----	Post Onsite 1 - 24 hr.
13	Combine	17.89	1	27	39,319	1, 7,	-----	-----	Total to Pond - 1 hr.
14	Combine	15.61	1	35	56,945	2, 8,	-----	-----	Total to Pond - 2 hr.
15	Combine	12.67	1	46	67,090	3, 9,	-----	-----	Total to Pond - 3 hr.
16	Combine	8.88	1	45	88,250	4, 10,	-----	-----	Total to Pond - 6 hr.
17	Combine	7.22	1	325	110,297	5, 11,	-----	-----	Total to Pond - 12 hr.
18	Combine	5.35	1	936	133,002	6, 12,	-----	-----	Total to Pond - 24 hr.
19	Reservoir	2.49	1	73	39,313	13	727.25	31,274	Thru Pond - 1 hr.
20	Reservoir	2.66	1	130	56,939	14	727.54	40,505	Thru Pond - 2 hr.
21	Reservoir	2.69	1	168	67,084	15	727.59	42,235	Thru Pond - 3 hr.
22	Reservoir	2.69	1	198	88,243	16	727.58	41,789	Thru Pond - 6 hr.
23	Reservoir	2.75	1	477	110,290	17	727.69	45,545	Thru Pond - 12 hr.
24	Reservoir	2.62	1	1032	132,995	18	727.46	38,130	Thru Pond - 24 hr.
17022post.gpw					Return Period: 10 Year			Wednesday, May 9 2018, 8:44 AM	

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:44 AM

## Hyd. No. 7

Post Onsite 1 - 1 hr.

Hydrograph type = SCS Runoff  
Storm frequency = 10 yrs  
Drainage area = 10.39 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 1.96 in  
Storm duration = 1 hrs

Peak discharge = 12.48 cfs  
Time interval = 1 min  
Curve number = 84  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 16.0 min  
Distribution = Huff-1st  
Shape factor = 484

Hydrograph Volume = 27,293 cuft

( Printed values >= 50% of Qp.)

## Hydrograph Discharge Table

Time -- Outflow  
(hrs cfs)

0.27	6.88
0.28	7.81
0.30	8.70
0.32	9.51
0.33	10.24
0.35	10.88
0.37	11.40
0.38	11.83
0.40	12.14
0.42	12.33
0.43	12.44
0.45	12.48 <<
0.47	12.42
0.48	12.28
0.50	12.06
0.52	11.75
0.53	11.38
0.55	11.00
0.57	10.60
0.58	10.16
0.60	9.71
0.62	9.24
0.63	8.78
0.65	8.34
0.67	7.92
0.68	7.54
0.70	7.21
0.72	6.92
0.73	6.66
0.75	6.44
0.77	6.24

...End

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:45 AM

## Hyd. No. 12

Post Onsite 1 - 24 hr.

Hydrograph type = SCS Runoff  
Storm frequency = 10 yrs  
Drainage area = 10.39 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 4.08 in  
Storm duration = 24 hrs

Peak discharge = 3.77 cfs  
Time interval = 1 min  
Curve number = 84  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 16.0 min  
Distribution = Huff-3rd  
Shape factor = 484

Hydrograph Volume = 93,242 cuft

( Printed values >= 50% of Qp.)

## Hydrograph Discharge Table

Time -- Outflow (hrs cfs)	Time -- Outflow (hrs cfs)	Time -- Outflow (hrs cfs)	Time -- Outflow (hrs cfs)
13.30 1.89	13.87 3.08	14.43 3.24	15.00 3.64
13.32 1.96	13.88 3.09	14.45 3.25	15.02 3.64
13.33 2.03	13.90 3.09	14.47 3.26	15.03 3.65
13.35 2.12	13.92 3.10	14.48 3.27	15.05 3.65
13.37 2.21	13.93 3.10	14.50 3.29	15.07 3.65
13.38 2.30	13.95 3.11	14.52 3.31	15.08 3.66
13.40 2.39	13.97 3.11	14.53 3.33	15.10 3.66
13.42 2.46	13.98 3.12	14.55 3.35	15.12 3.67
13.43 2.54	14.00 3.12	14.57 3.37	15.13 3.67
13.45 2.61	14.02 3.12	14.58 3.40	15.15 3.67
13.47 2.67	14.03 3.13	14.60 3.42	15.17 3.68
13.48 2.73	14.05 3.13	14.62 3.44	15.18 3.68
13.50 2.78	14.07 3.14	14.63 3.46	15.20 3.68
13.52 2.83	14.08 3.14	14.65 3.48	15.22 3.69
13.53 2.87	14.10 3.15	14.67 3.49	15.23 3.69
13.55 2.91	14.12 3.15	14.68 3.51	15.25 3.69
13.57 2.94	14.13 3.16	14.70 3.52	15.27 3.70
13.58 2.97	14.15 3.16	14.72 3.54	15.28 3.70
13.60 2.99	14.17 3.16	14.73 3.55	15.30 3.71
13.62 3.00	14.18 3.17	14.75 3.56	15.32 3.71
13.63 3.01	14.20 3.17	14.77 3.57	15.33 3.71
13.65 3.02	14.22 3.18	14.78 3.58	15.35 3.72
13.67 3.02	14.23 3.18	14.80 3.59	15.37 3.72
13.68 3.03	14.25 3.19	14.82 3.59	15.38 3.72
13.70 3.03	14.27 3.19	14.83 3.60	15.40 3.73
13.72 3.04	14.28 3.19	14.85 3.60	15.42 3.73
13.73 3.04	14.30 3.20	14.87 3.61	15.43 3.73
13.75 3.05	14.32 3.20	14.88 3.61	15.45 3.74
13.77 3.05	14.33 3.21	14.90 3.62	15.47 3.74
13.78 3.06	14.35 3.21	14.92 3.62	15.48 3.74
13.80 3.06	14.37 3.21	14.93 3.62	15.50 3.75
13.82 3.07	14.38 3.22	14.95 3.63	15.52 3.75
13.83 3.07	14.40 3.22	14.97 3.63	15.53 3.75
13.85 3.08	14.42 3.23	14.98 3.64	15.55 3.76

Continues on next page...

## Hydrograph Discharge Table

Time -- Outflow (hrs cfs)	Time -- Outflow (hrs cfs)
15.57 3.76	16.42 2.68
15.58 3.76	16.43 2.68
15.60 3.77 <<	16.45 2.68
15.62 3.76	16.47 2.69
15.63 3.75	16.48 2.69
15.65 3.72	16.50 2.69
15.67 3.69	16.52 2.69
15.68 3.65	16.53 2.69
15.70 3.60	16.55 2.69
15.72 3.54	16.57 2.69
15.73 3.48	16.58 2.69
15.75 3.40	16.60 2.70
15.77 3.32	16.62 2.70
15.78 3.24	16.63 2.70
15.80 3.16	16.65 2.70
15.82 3.09	16.67 2.70
15.83 3.03	16.68 2.70
15.85 2.97	16.70 2.70
15.87 2.92	16.72 2.70
15.88 2.87	16.73 2.70
15.90 2.82	16.75 2.71
15.92 2.78	16.77 2.71
15.93 2.75	16.78 2.71
15.95 2.72	16.80 2.71
15.97 2.70	16.82 2.70
15.98 2.68	16.83 2.69
16.00 2.66	16.85 2.67
16.02 2.66	16.87 2.65
16.03 2.65	16.88 2.61
16.05 2.65	16.90 2.58
16.07 2.65	16.92 2.53
16.08 2.66	16.93 2.48
16.10 2.66	16.95 2.42
16.12 2.66	16.97 2.35
16.13 2.66	16.98 2.29
16.15 2.66	17.00 2.23
16.17 2.66	17.02 2.17
16.18 2.66	17.03 2.12
16.20 2.67	17.05 2.08
16.22 2.67	17.07 2.03
16.23 2.67	17.08 2.00
16.25 2.67	17.10 1.96
16.27 2.67	17.12 1.93
16.28 2.67	17.13 1.90
16.30 2.67	
16.32 2.67	
16.33 2.68	...End
16.35 2.68	
16.37 2.68	
16.38 2.68	
16.40 2.68	

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:45 AM

## Hyd. No. 13

Total to Pond - 1 hr.

Hydrograph type = Combine  
Storm frequency = 10 yrs  
Inflow hyds. = 1, 7

Peak discharge = 17.89 cfs  
Time interval = 1 min

Hydrograph Volume = 39,319 cuft

( Printed values >= 75% of Qp.)

## Hydrograph Discharge Table

Time (hrs)	Hyd. 1 + (cfs)	Hyd. 7 + (cfs)	Outflow (cfs)
0.32	3.95	9.51	13.46
0.33	4.27	10.24	14.51
0.35	4.56	10.88	15.44
0.37	4.81	11.40	16.21
0.38	5.01	11.83	16.84
0.40	5.17	12.14	17.31
0.42	5.29	12.33	17.62
0.43	5.37	12.44	17.81
0.45	5.41	12.48 <<	17.89 <<
0.47	5.42 <<	12.42	17.84
0.48	5.39	12.28	17.67
0.50	5.33	12.06	17.39
0.52	5.23	11.75	16.98
0.53	5.10	11.38	16.48
0.55	4.94	11.00	15.95
0.57	4.77	10.60	15.36
0.58	4.59	10.16	14.76
0.60	4.41	9.71	14.12
0.62	4.21	9.24	13.45

...End



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:45 AM

## Hyd. No. 23

Thru Pond - 12 hr.

Hydrograph type = Reservoir  
Storm frequency = 10 yrs  
Inflow hyd. No. = 17  
Max. Elevation = 727.69 ft

Peak discharge = 2.75 cfs  
Time interval = 1 min  
Reservoir name = Dry Detention  
Max. Storage = 45,545 cuft

Storage Indication method used.

Outflow hydrograph volume = 110,290 cuft

( Printed values >= 75% of Qp.)

## Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
4.67	6.84	726.65	2.09	0.14	1.93	----	----	----	----	----	----	2.07
4.68	6.87	726.67	2.10	0.14	1.94	----	----	----	----	----	----	2.09
4.70	6.90	726.69	2.10	0.14	1.95	----	----	----	----	----	----	2.10
4.72	6.93	726.70	2.11	0.14	1.97	----	----	----	----	----	----	2.11
4.73	6.96	726.72	2.13	0.15	1.98	----	----	----	----	----	----	2.12
4.75	6.99	726.74	2.14	0.15	1.99	----	----	----	----	----	----	2.14
4.77	7.02	726.75	2.15	0.15	2.00	----	----	----	----	----	----	2.15
4.78	7.05	726.77	2.17	0.15	2.01	----	----	----	----	----	----	2.16
4.80	7.08	726.79	2.18	0.15	2.03	----	----	----	----	----	----	2.17
4.82	7.10	726.81	2.20	0.15	2.04	----	----	----	----	----	----	2.19
4.83	7.12	726.82	2.21	0.15	2.05	----	----	----	----	----	----	2.20
4.85	7.13	726.84	2.23	0.15	2.06	----	----	----	----	----	----	2.21
4.87	7.14	726.86	2.24	0.15	2.07	----	----	----	----	----	----	2.22
4.88	7.15	726.88	2.25	0.15	2.09	----	----	----	----	----	----	2.24
4.90	7.15	726.89	2.27	0.15	2.10	----	----	----	----	----	----	2.25
4.92	7.14	726.91	2.28	0.15	2.11	----	----	----	----	----	----	2.26
4.93	7.13	726.93	2.30	0.15	2.12	----	----	----	----	----	----	2.27
4.95	7.12	726.94	2.31	0.15	2.13	----	----	----	----	----	----	2.28
4.97	7.10	726.96	2.33	0.15	2.14	----	----	----	----	----	----	2.30
4.98	7.08	726.98	2.34	0.15	2.16	----	----	----	----	----	----	2.31
5.00	7.06	727.00	2.35	0.15	2.17	----	----	----	----	----	----	2.32
5.02	7.04	727.01	2.36	0.15	2.17	----	----	----	----	----	----	2.33
5.03	7.03	727.02	2.36	0.15	2.18	----	----	----	----	----	----	2.33
5.05	7.02	727.02	2.37	0.15	2.19	----	----	----	----	----	----	2.34
5.07	7.01	727.03	2.37	0.15	2.19	----	----	----	----	----	----	2.35
5.08	7.00	727.04	2.37	0.15	2.20	----	----	----	----	----	----	2.35
5.10	7.00	727.05	2.38	0.15	2.20	----	----	----	----	----	----	2.36
5.12	7.00	727.06	2.38	0.16	2.21	----	----	----	----	----	----	2.36
5.13	7.00	727.07	2.38	0.16	2.21	----	----	----	----	----	----	2.37
5.15	7.00	727.08	2.39	0.16	2.22	----	----	----	----	----	----	2.37
5.17	7.01	727.08	2.39	0.16	2.22	----	----	----	----	----	----	2.38
5.18	7.01	727.09	2.39	0.16	2.23	----	----	----	----	----	----	2.39
5.20	7.02	727.10	2.40	0.16	2.23	----	----	----	----	----	----	2.39
5.22	7.03	727.11	2.41	0.16	2.24	----	----	----	----	----	----	2.40
5.23	7.05	727.12	2.41	0.16	2.25	----	----	----	----	----	----	2.40
5.25	7.06	727.13	2.42	0.16	2.25	----	----	----	----	----	----	2.41
5.27	7.08	727.14	2.43	0.16	2.26	----	----	----	----	----	----	2.41
5.28	7.10	727.15	2.43	0.16	2.26	----	----	----	----	----	----	2.42

Continues on next page...

**Hydrograph Discharge Table**

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
5.30	7.12	727.15	2.44	0.16	2.27	-----	-----	-----	-----	-----	-----	2.43
5.32	7.13	727.16	2.45	0.16	2.27	-----	-----	-----	-----	-----	-----	2.43
5.33	7.15	727.17	2.45	0.16	2.28	-----	-----	-----	-----	-----	-----	2.44
5.35	7.17	727.18	2.46	0.16	2.28	-----	-----	-----	-----	-----	-----	2.44
5.37	7.18	727.19	2.47	0.16	2.29	-----	-----	-----	-----	-----	-----	2.45
5.38	7.20	727.20	2.48	0.16	2.29	-----	-----	-----	-----	-----	-----	2.45
5.40	7.22	727.21	2.48	0.16	2.30	-----	-----	-----	-----	-----	-----	2.46
5.42	7.22 <<	727.22	2.49	0.16	2.31	-----	-----	-----	-----	-----	-----	2.47
5.43	7.21	727.22	2.50	0.16	2.31	-----	-----	-----	-----	-----	-----	2.47
5.45	7.18	727.23	2.50	0.16	2.32	-----	-----	-----	-----	-----	-----	2.48
5.47	7.14	727.24	2.51	0.16	2.32	-----	-----	-----	-----	-----	-----	2.48
5.48	7.08	727.25	2.52	0.16	2.33	-----	-----	-----	-----	-----	-----	2.49
5.50	7.01	727.26	2.52	0.16	2.33	-----	-----	-----	-----	-----	-----	2.49
5.52	6.92	727.27	2.53	0.16	2.34	-----	-----	-----	-----	-----	-----	2.50
5.53	6.82	727.28	2.54	0.16	2.34	-----	-----	-----	-----	-----	-----	2.50
5.55	6.71	727.28	2.54	0.16	2.35	-----	-----	-----	-----	-----	-----	2.51
5.57	6.58	727.29	2.55	0.16	2.35	-----	-----	-----	-----	-----	-----	2.51
5.58	6.45	727.30	2.56	0.16	2.36	-----	-----	-----	-----	-----	-----	2.52
5.60	6.33	727.31	2.56	0.16	2.36	-----	-----	-----	-----	-----	-----	2.52
5.62	6.22	727.31	2.56	0.16	2.36	-----	-----	-----	-----	-----	-----	2.53
5.63	6.11	727.32	2.56	0.16	2.37	-----	-----	-----	-----	-----	-----	2.53
5.65	6.02	727.33	2.57	0.16	2.37	-----	-----	-----	-----	-----	-----	2.53
5.67	5.93	727.33	2.57	0.16	2.38	-----	-----	-----	-----	-----	-----	2.54
5.68	5.85	727.34	2.57	0.16	2.38	-----	-----	-----	-----	-----	-----	2.54
5.70	5.78	727.34	2.57	0.16	2.38	-----	-----	-----	-----	-----	-----	2.55
5.72	5.71	727.35	2.58	0.16	2.39	-----	-----	-----	-----	-----	-----	2.55
5.73	5.66	727.36	2.58	0.16	2.39	-----	-----	-----	-----	-----	-----	2.55
5.75	5.61	727.36	2.58	0.16	2.39	-----	-----	-----	-----	-----	-----	2.56
5.77	5.57	727.37	2.58	0.16	2.40	-----	-----	-----	-----	-----	-----	2.56
5.78	5.54	727.37	2.59	0.16	2.40	-----	-----	-----	-----	-----	-----	2.56
5.80	5.52	727.38	2.59	0.16	2.40	-----	-----	-----	-----	-----	-----	2.57
5.82	5.50	727.38	2.59	0.16	2.41	-----	-----	-----	-----	-----	-----	2.57
5.83	5.50	727.39	2.59	0.16	2.41	-----	-----	-----	-----	-----	-----	2.57
5.85	5.50	727.40	2.59	0.16	2.41	-----	-----	-----	-----	-----	-----	2.58
5.87	5.50	727.40	2.60	0.16	2.42	-----	-----	-----	-----	-----	-----	2.58
5.88	5.51	727.41	2.60	0.17	2.42	-----	-----	-----	-----	-----	-----	2.58
5.90	5.52	727.41	2.60	0.17	2.42	-----	-----	-----	-----	-----	-----	2.59
5.92	5.52	727.42	2.61	0.17	2.43	-----	-----	-----	-----	-----	-----	2.59
5.93	5.53	727.42	2.61	0.17	2.43	-----	-----	-----	-----	-----	-----	2.59
5.95	5.54	727.43	2.62	0.17	2.43	-----	-----	-----	-----	-----	-----	2.60
5.97	5.54	727.43	2.62	0.17	2.44	-----	-----	-----	-----	-----	-----	2.60
5.98	5.55	727.44	2.63	0.17	2.44	-----	-----	-----	-----	-----	-----	2.60
6.00	5.56	727.44	2.63	0.17	2.44	-----	-----	-----	-----	-----	-----	2.61
6.02	5.55	727.45	2.63	0.17	2.44	-----	-----	-----	-----	-----	-----	2.61
6.03	5.54	727.46	2.64	0.17	2.45	-----	-----	-----	-----	-----	-----	2.61
6.05	5.52	727.46	2.64	0.17	2.45	-----	-----	-----	-----	-----	-----	2.62
6.07	5.48	727.47	2.65	0.17	2.45	-----	-----	-----	-----	-----	-----	2.62
6.08	5.44	727.47	2.65	0.17	2.46	-----	-----	-----	-----	-----	-----	2.62
6.10	5.39	727.48	2.65	0.17	2.46	-----	-----	-----	-----	-----	-----	2.63
6.12	5.32	727.48	2.66	0.17	2.46	-----	-----	-----	-----	-----	-----	2.63
6.13	5.25	727.49	2.66	0.17	2.47	-----	-----	-----	-----	-----	-----	2.63

*Continues on next page...*

# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	10.90	1	26	23,370	----	-----	-----	Pre Offsite 2 - 1 hr.
2	SCS Runoff	9.15	1	32	31,691	----	-----	-----	Pre Offsite 2 - 2 hr.
3	SCS Runoff	7.45	1	36	36,812	----	-----	-----	Pre Offsite 2 - 3 hr.
4	SCS Runoff	5.51	1	44	45,727	----	-----	-----	Pre Offsite 2 - 6 hr.
5	SCS Runoff	3.56	1	292	55,271	----	-----	-----	Pre Offsite 2 - 12 hr.
6	SCS Runoff	2.54	1	936	67,630	----	-----	-----	Pre Offsite 2 - 24 hr.
7	SCS Runoff	25.67	1	25	54,041	----	-----	-----	Post Onsite 1 - 1 hr.
8	SCS Runoff	21.32	1	31	73,947	----	-----	-----	Post Onsite 1 - 2 hr.
9	SCS Runoff	17.22	1	34	86,166	----	-----	-----	Post Onsite 1 - 3 hr.
10	SCS Runoff	12.80	1	43	107,550	----	-----	-----	Post Onsite 1 - 6 hr.
11	SCS Runoff	8.43	1	291	130,489	----	-----	-----	Post Onsite 1 - 12 hr.
12	SCS Runoff	6.10	1	936	160,253	----	-----	-----	Post Onsite 1 - 24 hr.
13	Combine	36.57	1	25	77,411	1, 7,	-----	-----	Total to Pond - 1 hr.
14	Combine	30.46	1	32	105,638	2, 8,	-----	-----	Total to Pond - 2 hr.
15	Combine	24.66	1	35	122,978	3, 9,	-----	-----	Total to Pond - 3 hr.
16	Combine	18.30	1	43	153,278	4, 10,	-----	-----	Total to Pond - 6 hr.
17	Combine	11.99	1	292	185,760	5, 11,	-----	-----	Total to Pond - 12 hr.
18	Combine	8.64	1	936	227,883	6, 12,	-----	-----	Total to Pond - 24 hr.
19	Reservoir	10.03	1	64	77,405	13	728.04	57,094	Thru Pond - 1 hr.
20	Reservoir	11.49	1	72	105,632	14	728.09	59,089	Thru Pond - 2 hr.
21	Reservoir	11.67	1	90	122,971	15	728.09	59,330	Thru Pond - 3 hr.
22	Reservoir	9.98	1	122	153,271	16	728.04	57,026	Thru Pond - 6 hr.
23	Reservoir	9.82	1	338	185,754	17	728.03	56,812	Thru Pond - 12 hr.
24	Reservoir	8.23	1	942	227,876	18	727.98	54,746	Thru Pond - 24 hr.
17022post.gpw					Return Period: 100 Year		Wednesday, May 9 2018, 8:44 AM		

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:44 AM

## Hyd. No. 7

Post Onsite 1 - 1 hr.

Hydrograph type	=	SCS Runoff	Peak discharge	=	25.67 cfs
Storm frequency	=	100 yrs	Time interval	=	1 min
Drainage area	=	10.39 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	16.0 min
Total precip.	=	2.88 in	Distribution	=	Huff-1st
Storm duration	=	1 hrs	Shape factor	=	484

Hydrograph Volume = 54,041 cuft

( Printed values >= 50% of Qp.)

## Hydrograph Discharge Table

Time -- Outflow  
(hrs        cfs)

0.23	13.53
0.25	15.63
0.27	17.47
0.28	19.18
0.30	20.74
0.32	22.09
0.33	23.26
0.35	24.21
0.37	24.92
0.38	25.40
0.40	25.66
0.42	25.67 <<
0.43	25.53
0.45	25.24
0.47	24.75
0.48	24.12
0.50	23.33
0.52	22.43
0.53	21.51
0.55	20.62
0.57	19.70
0.58	18.76
0.60	17.82
0.62	16.86
0.63	15.95
0.65	15.08
0.67	14.25
0.68	13.52
0.70	12.89

...End

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:45 AM

## Hyd. No. 12

Post Onsite 1 - 24 hr.

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Drainage area = 10.39 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 6.00 in  
Storm duration = 24 hrs

Peak discharge = 6.10 cfs  
Time interval = 1 min  
Curve number = 84  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 16.0 min  
Distribution = Huff-3rd  
Shape factor = 484

Hydrograph Volume = 160,253 cuft

(Printed values >= 50% of Qp.)

## Hydrograph Discharge Table

Time -- Outflow (hrs cfs)	Time -- Outflow (hrs cfs)	Time -- Outflow (hrs cfs)	Time -- Outflow (hrs cfs)
13.27 3.10	13.83 5.22	14.40 5.37	14.97 5.96
13.28 3.18	13.85 5.22	14.42 5.38	14.98 5.97
13.30 3.28	13.87 5.23	14.43 5.39	15.00 5.97
13.32 3.39	13.88 5.23	14.45 5.40	15.02 5.98
13.33 3.52	13.90 5.24	14.47 5.42	15.03 5.98
13.35 3.66	13.92 5.24	14.48 5.44	15.05 5.98
13.37 3.82	13.93 5.25	14.50 5.47	15.07 5.99
13.38 3.97	13.95 5.25	14.52 5.49	15.08 5.99
13.40 4.11	13.97 5.26	14.53 5.53	15.10 5.99
13.42 4.25	13.98 5.26	14.55 5.56	15.12 6.00
13.43 4.37	14.00 5.27	14.57 5.60	15.13 6.00
13.45 4.49	14.02 5.27	14.58 5.63	15.15 6.01
13.47 4.59	14.03 5.28	14.60 5.67	15.17 6.01
13.48 4.69	14.05 5.28	14.62 5.70	15.18 6.01
13.50 4.78	14.07 5.28	14.63 5.73	15.20 6.02
13.52 4.86	14.08 5.29	14.65 5.76	15.22 6.02
13.53 4.93	14.10 5.29	14.67 5.78	15.23 6.02
13.55 4.99	14.12 5.30	14.68 5.81	15.25 6.03
13.57 5.04	14.13 5.30	14.70 5.83	15.27 6.03
13.58 5.08	14.15 5.31	14.72 5.85	15.28 6.03
13.60 5.11	14.17 5.31	14.73 5.87	15.30 6.04
13.62 5.14	14.18 5.32	14.75 5.88	15.32 6.04
13.63 5.15	14.20 5.32	14.77 5.90	15.33 6.04
13.65 5.16	14.22 5.33	14.78 5.91	15.35 6.05
13.67 5.16	14.23 5.33	14.80 5.92	15.37 6.05
13.68 5.17	14.25 5.33	14.82 5.93	15.38 6.05
13.70 5.17	14.27 5.34	14.83 5.93	15.40 6.06
13.72 5.18	14.28 5.34	14.85 5.94	15.42 6.06
13.73 5.18	14.30 5.35	14.87 5.94	15.43 6.06
13.75 5.19	14.32 5.35	14.88 5.94	15.45 6.07
13.77 5.20	14.33 5.36	14.90 5.95	15.47 6.07
13.78 5.20	14.35 5.36	14.92 5.95	15.48 6.07
13.80 5.21	14.37 5.36	14.93 5.96	15.50 6.08
13.82 5.21	14.38 5.37	14.95 5.96	15.52 6.08

Continues on next page...

## Hydrograph Discharge Table

Time -- Outflow (hrs cfs)	Time -- Outflow (hrs cfs)
15.53	6.08
15.55	6.09
15.57	6.09
15.58	6.09
15.60	6.10 <<
15.62	6.08
15.63	6.06
15.65	6.02
15.67	5.97
15.68	5.90
15.70	5.82
15.72	5.72
15.73	5.62
15.75	5.49
15.77	5.36
15.78	5.23
15.80	5.10
15.82	4.99
15.83	4.89
15.85	4.79
15.87	4.70
15.88	4.62
15.90	4.55
15.92	4.48
15.93	4.43
15.95	4.38
15.97	4.34
15.98	4.31
16.00	4.29
16.02	4.27
16.03	4.26
16.05	4.27
16.07	4.27
16.08	4.27
16.10	4.27
16.12	4.27
16.13	4.27
16.15	4.27
16.17	4.27
16.18	4.28
16.20	4.28
16.22	4.28
16.23	4.28
16.25	4.28
16.27	4.28
16.28	4.28
16.30	4.28
16.32	4.29
16.33	4.29
16.35	4.29
16.37	4.29

...End

# Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:45 AM

## Hyd. No. 13

Total to Pond - 1 hr.

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Inflow hyds. = 1, 7

Peak discharge = 36.57 cfs  
Time interval = 1 min

Hydrograph Volume = 77,411 cuft

(Printed values >= 75% of Qp.)

## Hydrograph Discharge Table

Time (hrs)	Hyd. 1 + (cfs)	Hyd. 7 + (cfs)	Outflow (cfs)
0.30	8.43	20.74	29.17
0.32	9.03	22.09	31.12
0.33	9.55	23.26	32.81
0.35	10.00	24.21	34.21
0.37	10.36	24.92	35.27
0.38	10.62	25.40	36.02
0.40	10.80	25.66	36.46
0.42	10.90	25.67 <<	36.57 <<
0.43	10.90 <<	25.53	36.43
0.45	10.85	25.24	36.09
0.47	10.73	24.75	35.48
0.48	10.53	24.12	34.65
0.50	10.29	23.33	33.62
0.52	9.97	22.43	32.40
0.53	9.59	21.51	31.10
0.55	9.19	20.62	29.81
0.57	8.79	19.70	28.49

...End



# Hydrograph Report

Hydraflow Hydrographs by Intelisolve

Wednesday, May 9 2018, 8:45 AM

## Hyd. No. 20

Thru Pond - 2 hr.

Hydrograph type = Reservoir  
Storm frequency = 100 yrs  
Inflow hyd. No. = 14  
Max. Elevation = 728.09 ft

Peak discharge = 11.49 cfs  
Time interval = 1 min  
Reservoir name = Dry Detention  
Max. Storage = 59,089 cuft

Storage Indication method used.

Outflow hydrograph volume = 105,632 cuft

## Hydrograph Discharge Table

(Printed values >= 75% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
0.95	17.83	728.00	8.80	0.14	2.27	----	6.39	----	----	----	----	8.80
0.97	17.48	728.01	9.18	0.14	2.22	----	6.83	----	----	----	----	9.18
0.98	17.13	728.02	9.53	0.14	2.17	----	7.22	----	----	----	----	9.53
1.00	16.78	728.03	9.85	0.13	2.13	----	7.59	----	----	----	----	9.85
1.02	16.40	728.04	10.14	0.13	2.09	----	7.92	----	----	----	----	10.14
1.03	16.00	728.05	10.40	0.13	2.06	----	8.21	----	----	----	----	10.40
1.05	15.56	728.06	10.63	0.13	2.03	----	8.48	----	----	----	----	10.63
1.07	15.08	728.07	10.83	0.13	2.00	----	8.71	----	----	----	----	10.83
1.08	14.59	728.07	11.01	0.12	1.98	----	8.90	----	----	----	----	11.01
1.10	14.11	728.08	11.15	0.12	1.96	----	9.07	----	----	----	----	11.15
1.12	13.63	728.08	11.27	0.12	1.95	----	9.20	----	----	----	----	11.27
1.13	13.15	728.08	11.36	0.12	1.93	----	9.30	----	----	----	----	11.36
1.15	12.67	728.09	11.43	0.12	1.93	----	9.38	----	----	----	----	11.42
1.17	12.18	728.09	11.47	0.12	1.92	----	9.43	----	----	----	----	11.47
1.18	11.72	728.09 <<	11.49	0.12	1.92	----	9.45	----	----	----	----	11.49
1.20	11.29	728.09 <<	11.49	0.12	1.92	----	9.45	----	----	----	----	11.49 <<
1.22	10.90	728.09	11.47	0.12	1.92	----	9.43	----	----	----	----	11.47
1.23	10.54	728.09	11.44	0.12	1.92	----	9.40	----	----	----	----	11.44
1.25	10.21	728.09	11.40	0.12	1.93	----	9.34	----	----	----	----	11.39
1.27	9.92	728.08	11.34	0.12	1.94	----	9.28	----	----	----	----	11.34
1.28	9.67	728.08	11.27	0.12	1.95	----	9.20	----	----	----	----	11.27
1.30	9.44	728.08	11.20	0.12	1.96	----	9.12	----	----	----	----	11.20
1.32	9.26	728.08	11.12	0.12	1.97	----	9.03	----	----	----	----	11.12
1.33	9.11	728.07	11.03	0.12	1.98	----	8.93	----	----	----	----	11.03
1.35	8.99	728.07	10.95	0.12	1.99	----	8.84	----	----	----	----	10.95
1.37	8.90	728.07	10.86	0.12	2.00	----	8.74	----	----	----	----	10.86
1.38	8.82	728.06	10.78	0.13	2.01	----	8.64	----	----	----	----	10.78
1.40	8.77	728.06	10.69	0.13	2.02	----	8.54	----	----	----	----	10.69
1.42	8.73	728.06	10.61	0.13	2.03	----	8.45	----	----	----	----	10.61
1.43	8.72	728.06	10.53	0.13	2.04	----	8.36	----	----	----	----	10.53
1.45	8.71	728.05	10.45	0.13	2.05	----	8.27	----	----	----	----	10.45
1.47	8.72	728.05	10.37	0.13	2.06	----	8.18	----	----	----	----	10.37
1.48	8.73	728.05	10.30	0.13	2.07	----	8.10	----	----	----	----	10.30
1.50	8.74	728.05	10.24	0.13	2.08	----	8.03	----	----	----	----	10.24
1.52	8.75	728.04	10.17	0.13	2.09	----	7.95	----	----	----	----	10.17
1.53	8.75	728.04	10.11	0.13	2.10	----	7.88	----	----	----	----	10.11
1.55	8.76	728.04	10.05	0.13	2.10	----	7.82	----	----	----	----	10.05
1.57	8.77	728.04	10.00	0.13	2.11	----	7.75	----	----	----	----	10.00

Continues on next page...

# **Storm Sewer Calculations**

## Specialty Concrete Self Storage

## Storm Sewer Calculations

STR. #	Weighted "C" Factor =	Ac.	(%)	Coefficient	
607		Roof	0.23	12.4	x 0.90 = 0.11
		Pavement	0.79	42.7	x 0.85 = 0.36
		Lawn/Grass/Woods	0.20	10.8	x 0.20 = 0.02
Area = Acres				Weighted 'C'	0.50
1.85 Acres					

"T/c" =

$$1. \text{ Sheet Flow } T.C. = \frac{0.007}{2.64^{0.50}} \times \left( \frac{0.24}{0.01^{0.40}} \times 46 \right)^{0.80} = 11.14 \text{ Minutes}$$

2. Shallow Concentrated

$$\begin{aligned} \text{Unpaved: } T.C. &= 16.135 \times 0.005^{0.5} = 1.14 \text{ ft/sec} \\ &= \frac{641 \text{ feet}}{1.14 \text{ ft/sec}} = 9.36 \text{ Minutes} \\ \text{Paved: } T.C. &= 20.328 \times 0.006^{0.5} = 1.57 \text{ ft/sec} \\ &= \frac{0 \text{ feet}}{1.57 \text{ ft/sec}} = 0.00 \text{ Minutes} \end{aligned}$$

T/c Total= 20.5 Minutes

Min. 5.00 Minutes

STR. #	Weighted "C" Factor =	Ac.	(%)	Coefficient	
609		Roof	0.10	26.3	x 0.90 = 0.24
		Pavement	0.18	47.4	x 0.85 = 0.40
		Lawn/Grass/Woods	0.10	26.3	x 0.20 = 0.05
Area = Acres				Weighted 'C'	0.69
0.38 Acres					

"T/c" =

$$1. \text{ Sheet Flow } T.C. = \frac{0.007}{2.64^{0.50}} \times \left( \frac{0.24}{0.01^{0.40}} \times 20 \right)^{0.80} = 5.72 \text{ Minutes}$$

2. Shallow Concentrated

$$\begin{aligned} \text{Unpaved: } T.C. &= 16.135 \times 0.001^{0.5} = 0.51 \text{ ft/sec} \\ &= \frac{0 \text{ feet}}{0.51 \text{ ft/sec}} = 0.00 \text{ Minutes} \\ \text{Paved: } T.C. &= 20.328 \times 0.006^{0.5} = 1.57 \text{ ft/sec} \\ &= \frac{40 \text{ feet}}{1.57 \text{ ft/sec}} = 0.42 \text{ Minutes} \end{aligned}$$

T/c Total= 6.1 Minutes

Min. 5.00 Minutes

STR. #	Weighted "C" Factor =	Ac.	(%)	Coefficient	
610		Roof	0.07	21.9	x 0.90 = 0.20
		Pavement	0.16	50.0	x 0.85 = 0.43
		Lawn/Grass/Woods	0.09	28.1	x 0.20 = 0.06
Area = Acres				Weighted 'C'	0.68
0.32 Acres					

"T/c" =

$$1. \text{ Sheet Flow } T.C. = \frac{0.007}{2.64^{0.50}} \times \left( \frac{0.24}{0.01^{0.40}} \times 20 \right)^{0.80} = 5.72 \text{ Minutes}$$

2. Shallow Concentrated

$$\begin{aligned} \text{Unpaved: } T.C. &= 16.135 \times 0.001^{0.5} = 0.51 \text{ ft/sec} \\ &= \frac{0 \text{ feet}}{0.51 \text{ ft/sec}} = 0.00 \text{ Minutes} \\ \text{Paved: } T.C. &= 20.328 \times 0.006^{0.5} = 1.57 \text{ ft/sec} \\ &= \frac{43 \text{ feet}}{1.57 \text{ ft/sec}} = 0.46 \text{ Minutes} \end{aligned}$$

T/c Total= 6.2 Minutes

Min. 5.00 Minutes

# Specialty Concrete Self Storage

# Storm Sewer Calculations

STR. #	Weighted "C" Factor =	Ac.	(%)	Coefficient	
611		Roof	0.07	21.2	x 0.90 = 0.19
		Pavement	0.15	45.5	x 0.85 = 0.39
		Lawn/Grass/Woods	0.20	60.6	x 0.20 = 0.12
Area = Acres		Weighted 'C'			0.70
0.33 Acres					

"T/c" =

$$1. \text{ Sheet Flow } T.C. = \frac{0.007}{2.64^{0.50}} \times \left( \frac{0.24}{0.01^{0.40}} \times 20 \right)^{0.80} = 5.72 \text{ Minutes}$$

2. Shallow Concentrated

$$\text{Unpaved: } T.C. = 16.135 \times 0.005^{0.5} = 1.14 \text{ ft/sec} = 0 \text{ feet} = 0.00 \text{ Minutes}$$

$$\text{Paved: } T.C. = 20.328 \times 0.006^{0.5} = 1.57 \text{ ft/sec} = 42 \text{ feet} = 0.44 \text{ Minutes}$$

$$T/c \text{ Total} = 6.2 \text{ Minutes}$$

$$\text{Min. } 5.00 \text{ Minutes}$$

STR. #	Weighted "C" Factor =	Ac.	(%)	Coefficient	
612	Roof	0.03	9.4	x 0.90 =	0.08
	Pavement	0.14	43.8	x 0.85 =	0.37
	Lawn/Grass/Woods	0.15	46.9	x 0.20 =	0.09
Area = Acres				Weighted 'C'	0.55
0.32 Acres					

"T/c" =

$$1. \text{ Sheet Flow } T.C. = \frac{0.007}{2.64^{0.50}} \times \left( \frac{0.24}{0.01^{0.40}} \times 20 \right)^{0.80} = 5.72 \text{ Minutes}$$

2. Shallow Concentrated

$$\text{Unpaved: } T.C. = 16.135 \times 0.001^{0.5} = 0.51 \text{ ft/sec} = 0 \text{ feet} = 0.00 \text{ Minutes}$$

$$\text{Paved: } T.C. = 20.328 \times 0.006^{0.5} = 1.57 \text{ ft/sec} = 90 \text{ feet} = 0.95 \text{ Minutes}$$

$$T/c \text{ Total} = 6.7 \text{ Minutes}$$

$$\text{Min. } 5.00 \text{ Minutes}$$

STR. #	Weighted "C" Factor =	Roof	Ac.	(%)	Coefficient	
613			0.04	6.2	x 0.90 =	0.06
		Pavement	0.34	52.3	x 0.85 =	0.44
		Lawn/Grass/Woods	0.27	41.5	x 0.20 =	0.08
Area = Acres					Weighted 'C'	0.58
0.65 Acres						

"T/c" =

$$1. \text{ Sheet Flow } T.C. = \frac{0.007}{2.64^{0.50}} \times \left( \frac{0.24}{0.01^{0.40}} \times 70 \right)^{0.80} = 15.58 \text{ Minutes}$$

2. Shallow Concentrated

$$\text{Unpaved: } T.C. = 16.135 \times 0.014^{0.5} = 1.91 \text{ ft/sec} = 125 \text{ feet} = 1.09 \text{ Minutes}$$

$$\text{Paved: } T.C. = 20.328 \times 0.006^{0.5} = 1.57 \text{ ft/sec} = 0 \text{ feet} = 0.00 \text{ Minutes}$$

$$T/c \text{ Total} = 16.7 \text{ Minutes}$$

$$\text{Min. } 5.00 \text{ Minutes}$$

## Specialty Concrete Self Storage

## Storm Sewer Calculations

STR. #	Weighted "C" Factor =	Ac.	(%)	Coefficient	
615		Roof	0.00	0.0	x 0.90 = 0.00
		Pavement	0.21	50.0	x 0.85 = 0.43
		Lawn/Grass/Woods	0.20	47.6	x 0.20 = 0.10
Area = Acres				Weighted 'C'	0.52
0.42 Acres					

"T/c" =

$$1. \text{ Sheet Flow } T.C. = \frac{0.007}{2.64^{0.50}} \times \left( \frac{0.24}{0.005^{0.40}} \times 13 \right)^{0.80} = 5.35 \text{ Minutes}$$

2. Shallow Concentrated

$$\text{Unpaved: } T.C. = 16.135 \times 0.005^{0.5} = 1.14 \text{ ft/sec}$$

$$= \frac{115 \text{ feet}}{1.14 \text{ ft/sec}} = 1.68 \text{ Minutes}$$

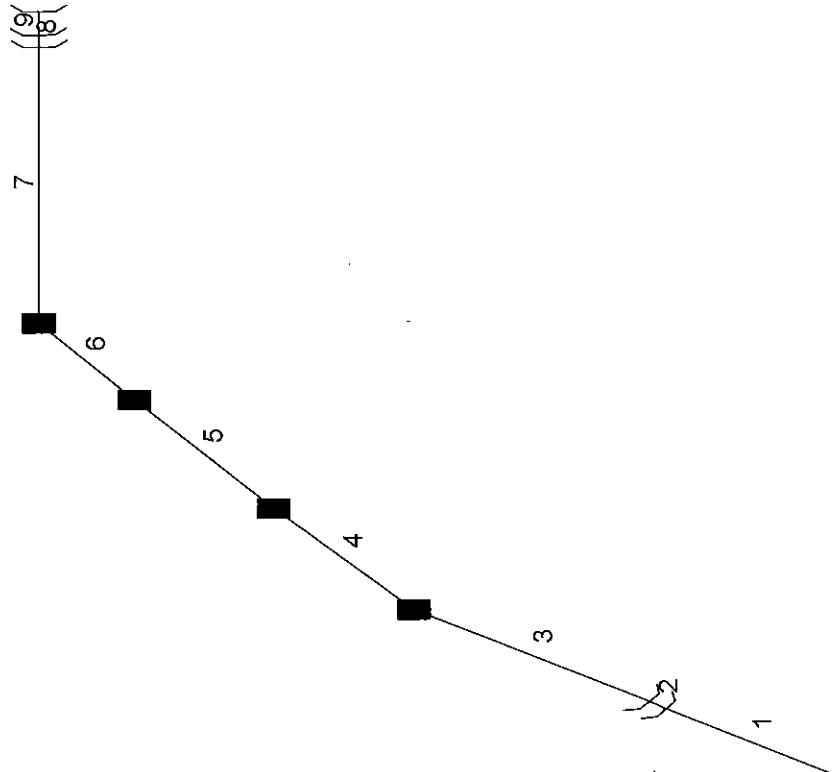
$$\text{Paved: } T.C. = 20.328 \times 0.006^{0.5} = 1.57 \text{ ft/sec}$$

$$= \frac{0 \text{ feet}}{1.57 \text{ ft/sec}} = 0.00 \text{ Minutes}$$

$$T/c \text{ Total} = 7.0 \text{ Minutes}$$

$$\text{Min. } 5.00 \text{ Minutes}$$

Hydraflow Plan View



Project file: 18009 607-615 Storm Design.stm	IDF file: MARION.IDF	No. Lines: 9	05-01-2019
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## Page 1

NOTES: c = circular; e = elliptical; b = box; Return period = 10 Yrs.; \* Indicates surcharge condition.

## Page 1

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	88.0	1.85	4.27	0.50	0.93	2.41	21.0	21.2	3.8	9.11	18.83	5.33	24	0.69	727.23	726.62	728.30	727.69	730.00	0.00	607
2	1	9.0	0.00	2.42	0.00	0.00	1.48	0.0	21.2	3.8	5.62	6.01	4.35	21	0.14	727.51	727.50	728.50	728.37	730.00	730.00	608
3	2	120.0	0.38	2.42	0.69	0.26	1.48	6.0	20.4	3.9	5.74	6.00	3.62	21	0.14	727.69	727.51	728.93	728.50	731.30	730.00	609
4	3	95.0	0.32	2.04	0.68	0.22	1.22	6.0	19.8	3.9	4.80	5.14	3.11	18	0.24	727.91	727.69	729.12	728.93	731.30	731.30	610
5	4	99.0	0.33	1.72	0.70	0.23	1.00	6.0	19.1	4.0	4.03	4.41	2.67	18	0.18	728.09	727.91	729.27	729.12	731.45	731.30	611
6	5	69.0	0.32	1.39	0.55	0.18	0.77	7.0	18.6	4.1	3.14	3.26	2.64	15	0.25	728.26	728.09	729.41	729.27	732.20	731.45	612
7	6	200.0	0.65	1.07	0.58	0.38	0.60	17.0	17.0	4.3	2.54	3.54	2.50	15	0.30	728.86	728.26	729.72	729.41	732.50	732.20	613
8	7	9.0	0.00	0.42	0.00	0.00	0.22	0.0	7.2	6.2	1.36	4.40	2.09	12	1.53	729.00	728.86	729.71	729.72	731.50	732.50	614
9	8	17.0	0.42	0.42	0.52	0.22	0.22	7.0	7.0	6.3	1.37	2.89	2.52	12	0.66	729.11	729.00	729.72	729.71	731.00	731.50	615
Total number of lines: 9																						
Project File: 18009 607-615 Storm Design.stm										IDF File: MARION.IDF										Run Date: 05-01-2019		
NOTES: Intensity = 57.92 / (Inlet time + 9.10) ^ 0.80; Return period = 10 Yrs. ; Initial tailwater elevation = 727.69 (ft)																						



**Specialty Concrete Self Storage**  
**INLET DEPTH CALCULATION**

**INLET #      609      Neenah R-      3405      Casting**  
Discharge Rate (Qi) = 1.73 c.f.s.  
Perimeter of Grate Opening (P) = 7.9 ft.  
Area of Grate Opening (Ai) = 1.5 sq. ft.

Grate acting as weir (depths less than 0.3 ft.):

$$Q_i = 3.0P[(d)^{1.5}]$$

Grate acting as orifice (depths greater than 0.4 ft.):

$$Q_i = 4.89(A_i)[(d)^{0.5}]$$

Weir flow depth = 0.17 ft.  
Orifice flow depth = 0.06 ft.  
Allowable Depth = 0.50 ft.

CHECKED

OK

OK

**INLET #      610      Neenah R-      3405      Casting**  
Discharge Rate (Qi) = 1.44 c.f.s.  
Perimeter of Grate Opening (P) = 7.9 ft.  
Area of Grate Opening (Ai) = 1.5 sq. ft.

Grate acting as weir (depths less than 0.3 ft.):

$$Q_i = 3.0P[(d)^{1.5}]$$

Grate acting as orifice (depths greater than 0.4 ft.):

$$Q_i = 4.89(A_i)[(d)^{0.5}]$$

Weir flow depth = 0.15 ft.  
Orifice flow depth = 0.04 ft.  
Allowable Depth = 0.50 ft.

CHECKED

OK

OK

**INLET #      611      Neenah R-      3405      Casting**  
Discharge Rate (Qi) = 1.53 c.f.s.  
Perimeter of Grate Opening (P) = 7.9 ft.  
Area of Grate Opening (Ai) = 1.5 sq. ft.

Grate acting as weir (depths less than 0.3 ft.):

$$Q_i = 3.0P[(d)^{1.5}]$$

Grate acting as orifice (depths greater than 0.4 ft.):

$$Q_i = 4.89(A_i)[(d)^{0.5}]$$

Weir flow depth = 0.16 ft.  
Orifice flow depth = 0.04 ft.  
Allowable Depth = 0.50 ft.

CHECKED

OK

OK

**Specialty Concrete Self Storage**  
**INLET DEPTH CALCULATION**

**INLET #      612      Neenah R-      3405      Casting**  
Discharge Rate (Qi) = 1.11 c.f.s.  
Perimeter of Grate Opening (P) = 7.9 ft.  
Area of Grate Opening (Ai) = 1.5 sq. ft.

Grate acting as weir (depths less than 0.3 ft.):

$$Q_i = 3.0P[(d)^{1.5}]$$

Grate acting as orifice (depths greater than 0.4 ft.):

$$Q_i = 4.89(A_i)[(d)^{0.5}]$$

Weir flow depth = 0.13 ft.  
Orifice flow depth = 0.02 ft.  
Allowable Depth = 0.50 ft.

**CHECKED**

**OK**

**OK**

# **Watershed Basin Maps**



