

July 29, 2019  
*Revised August 12, 2020*

Van Cleef Engineering Associates  
755 Memorial Parkway  
Suite 110  
Phillipsburg, NJ 08865

Attn: Mr. Stanley Schrek, PE, AIA, PP, CME, LEED AP

**RE: Ingerman Development Company, LLC  
Proposed Birchwood at Phillipsburg  
Block 1901, Lot 13  
220 Stockton Street  
Town of Phillipsburg  
Warren County, NJ  
DEC #2362-99-010**

Dear Mr. Schrek,

As discussed, please accept this Drainage Statement and attached stormwater calculations regarding the existing and proposed conditions per the Preliminary Site Plan Application Checklist. The above-referenced application proposes a 3-story Senior Adult Housing Facility containing 67 apartment units which results in approximately 2.13 Ac of disturbance. Additional proposed site improvements include new utilities, on-site stormwater conveyance system, landscaping and lighting.

The Stormwater Management rules (N.J.A.C. 7:8) set forth the required components of regional and municipal stormwater management plans, and establish the stormwater management design and performance standards for new (proposed) development. The design and performance standards for new development include groundwater recharge, runoff quantity controls, and water quality controls. To determine whether a new (proposed) development requires compliance with the Stormwater Management rules, the applicant shall prove conformance with the above noted three (3) criteria:

Groundwater Recharge:

The groundwater recharge standards at N.J.A.C. 7:8-5.4(a)2 apply for “major development”, that is, if either the 0.25-acre or 1-acre threshold is exceeded.

Runoff Quantity:

The runoff quantity standards at N.J.A.C. 7:8-5.4(a)3 apply for “major development”, that is, if either the 0.25-acre or 1-acre threshold is exceeded; however, where a municipality zoning ordinance specifies more conservative design requirements the proposed development must follow same. The Town of Phillipsburg Zoning Ordinance section §535-3.A states “the rate and velocity from the site following completion of the planned development shall not exceed that which occurred in previous undisturbed ground cover.” As such, calculations for water quantity must considered existing conditions for the site as undisturbed grass area.

Water Quality:

The water quality standards at N.J.A.C. 7:8-5.5 apply only if there is a net increase of 0.25 acres or more of impervious surface on-site.

“Major development” is defined as new development that will ultimately result in the disturbance of one or more acres of land, or increase impervious surfaces by one-quarter acre (or 10,890 square feet) or more. Although this project disturbs  $\pm 2$  acres, a net reduction in  $\pm 8,060$  SF (0.19 acres) of impervious coverage is proposed. By providing a reduction in impervious coverage, runoff quality will improve and groundwater recharge will be improved compared to existing conditions. As such, the project either complies or is exempt from the water quality and groundwater recharge standards noted above. However, the site must be designed to meet the Town of Phillipsburg water quantity requirements as noted above.

Under existing conditions, stormwater generated from the majority of the site flows overland to the southwest onto the neighboring railroad right-of-way and ultimately into the existing drainage system within the Stockton Street right-of-way. Under proposed conditions, stormwater runoff will be collected via either roof leaders or a series of on-site inlets and conveyed into the proposed underground detention basin. The underground basin consists of 4' diameter HDPE pipe and provides a maximum storage volume of 6,052 cuft. Stormwater will be detained and released at a controlled rate to the existing drainage system within the Stockton Street right-of-way, improving existing drainage conditions. The following is a comparison of the pre- and post- development runoff rates:

<b>Runoff Rates (CFS) – §535.3(A)</b>				
<b>Design Storm</b>	<b>Existing Runoff - Current Condition (cfs)</b>	<b>Existing Runoff - Undisturbed Grass (cfs)</b>	<b>Allowable Runoff (cfs)</b>	<b>Proposed Runoff (cfs)</b>
2-year	4.28	2.66	2.66	2.50
10-year	6.57	4.96	4.96	4.90
100-year	10.94	9.49	9.49	9.44

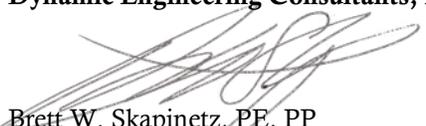
Per the above, the stormwater management system has been designed to not exceed the previous undisturbed ground cover runoff rates for the 2, 10 and 100-year design storms thus meeting the stormwater management design standards of the Town of Phillipsburg.

Please refer to the appendix for additional design analysis and information.

We trust that the above Drainage Statement addresses any concerns the township professionals may have regarding the proposed application. Please review the enclosed information and feel free to contact our office with any questions or comments.

Sincerely,

**Dynamic Engineering Consultants, PC**

  
Brett W. Skapinetz, PE, PP  
New Jersey License No: 41985

## **APPENDIX**

## **RUNOFF CURVE NUMBER (CN) CALCULATIONS**



# DYNAMIC ENGINEERING

## EXISTING DRAINAGE AREA SUMMARY AND AVERAGE CURVE NUMBER(CN) CALCULATIONS

Project: Ingerman Phillipsburg  
 Job #: 2362-99-010  
 Location: Phillipsburg, NJ

Computed By: ZZ  
 Checked By: JW  
 Date: 8/4/2020

Drainage Area	Impervious Area (acre)	Curve Number (CN) Used	HSG D - Open Space Area	Curve Number (CN) Used	HSG D - Wooded Area (acre)	Curve Number (CN) Used	Avg. Perv. Curve Number	Total Pervious Area (acres)	Total Area (acres)	TC (Min.)
EX DA-1	0.00	98	2.07	80	0.00	77	80	2.07	2.07	10
<b>Total</b>	<b>0.00</b>		<b>2.07</b>		<b>0.00</b>			<b>2.07</b>	<b>2.07</b>	

Per County Soil Survey -	HSG	D	Udorthents-Urban Land Complex
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Description	Runoff Curve Number (CN) (HSG D)
Impervious Surface	98
Open Space (lawn) (good)	80
Woods (good)	77



# DYNAMIC ENGINEERING

## PROPOSED DRAINAGE AREA SUMMARY AND AVERAGE CURVE NUMBER(CN) CALCULATIONS

Project: Ingerman Phillipsburg                      Computed By: ZZ  
 Job #: 2362-99-010                                      Checked By: JW  
 Location: Phillipsburg, NJ                              Date: 8/4/2020

Drainage Area	Impervious Area (acre)	Curve Number (CN) Used	HSG D - Open Space Area	Curve Number (CN) Used	HSG D - Wooded Area (acre)	Curve Number (CN) Used	Avg. Perv. Curve Number	Total Pervious Area (acres)	Total Area (acres)	TC (Min.)
PR DA-1	1.35	98	0.72	80	0.00	77	80	0.72	2.07	10
<b>Total</b>	<b>1.35</b>		<b>0.72</b>		<b>0.00</b>			<b>0.72</b>	<b>2.07</b>	

Per County Soil Survey -	HSG	D	Udorthents-Urban Land Complex
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Description	Runoff Curve Number (CN) (HSG D)
Impervious Surface	98
Open Space (lawn) (good)	80
Woods (good)	77

**EXISTING & PROPOSED 2-, 10-, 100-YEAR STORM  
HYDROGRAPHS & SUMMARY TABLE**

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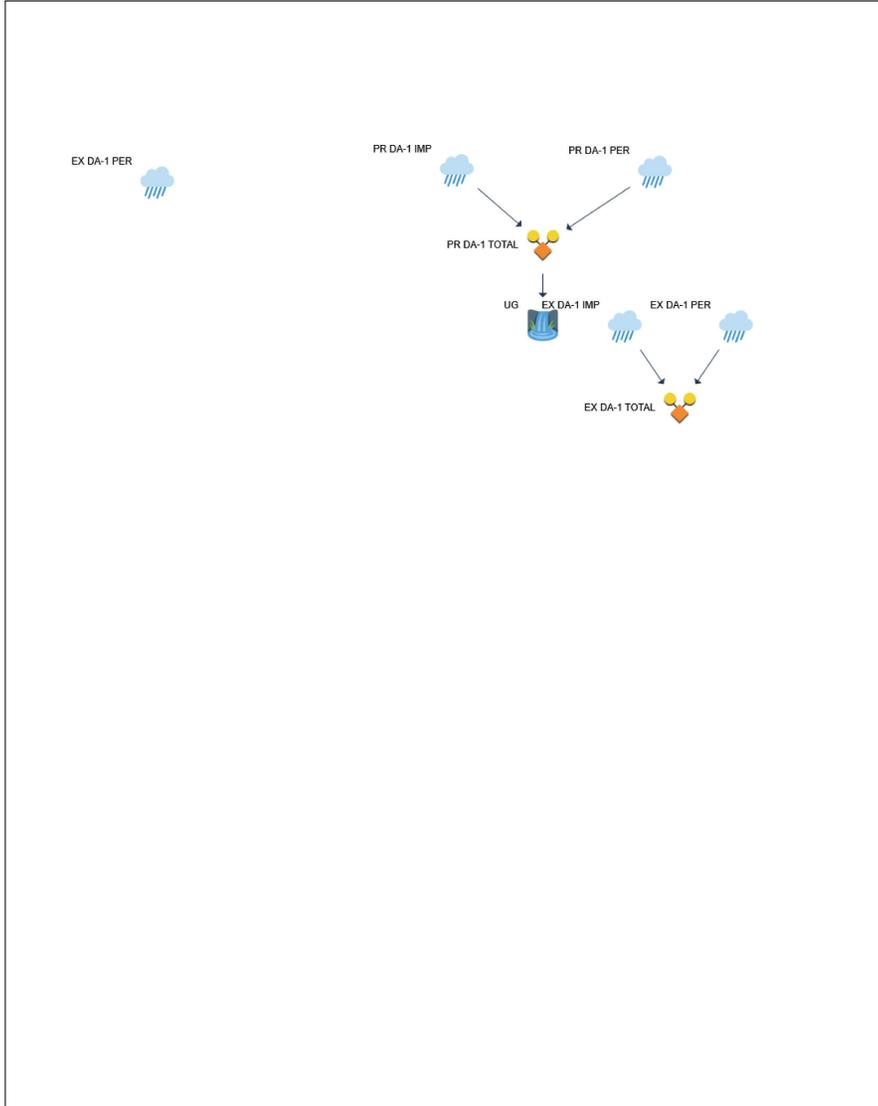
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# Basin Model

Hydrology Studio v 3.0.0.16

Project Name: 2020-06-30 2,10,100

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# Hydrograph by Return Period

Hydrology Studio v 3.0.0.16

Project Name: 2020-06-30 2,10,100

08-13-2020

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Outflow (cfs)							
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
1	NRCS Runoff	EX DA-1 IMP		3.598			5.301			8.509
2	NRCS Runoff	EX DA-1 PER		0.682			1.269			2.431
3	Junction	EX DA-1 TOTAL		4.280			6.570			10.94
5	NRCS Runoff	EX DA-1 PER		2.664			4.956			9.493
7	NRCS Runoff	PR DA-1 IMP		3.175			4.678			7.508
8	NRCS Runoff	PR DA-1 PER		0.927			1.724			3.302
9	Junction	PR DA-1 TOTAL		4.101			6.401			10.81
10	Pond Route	UG		2.500			4.898			9.439

# Hydrograph 2-yr Summary

Project Name: 2020-06-30 2,10,100

Hydrology Studio v 3.0.0.16

08-13-2020

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	EX DA-1 IMP	3.598	12.17	16,177	----		
2	NRCS Runoff	EX DA-1 PER	0.682	12.17	2,724	----		
3	Junction	EX DA-1 TOTAL	4.280	12.17	18,902	1, 2		
5	NRCS Runoff	EX DA-1 PER	2.664	12.17	10,640	----		
7	NRCS Runoff	PR DA-1 IMP	3.175	12.17	14,274	----		
8	NRCS Runoff	PR DA-1 PER	0.927	12.17	3,701	----		
9	Junction	PR DA-1 TOTAL	4.101	12.17	17,975	7, 8		
10	Pond Route	UG	2.500	12.33	17,974	9	273.84	2,964

# Hydrograph Report

Project Name: 2020-06-30 2,10,100

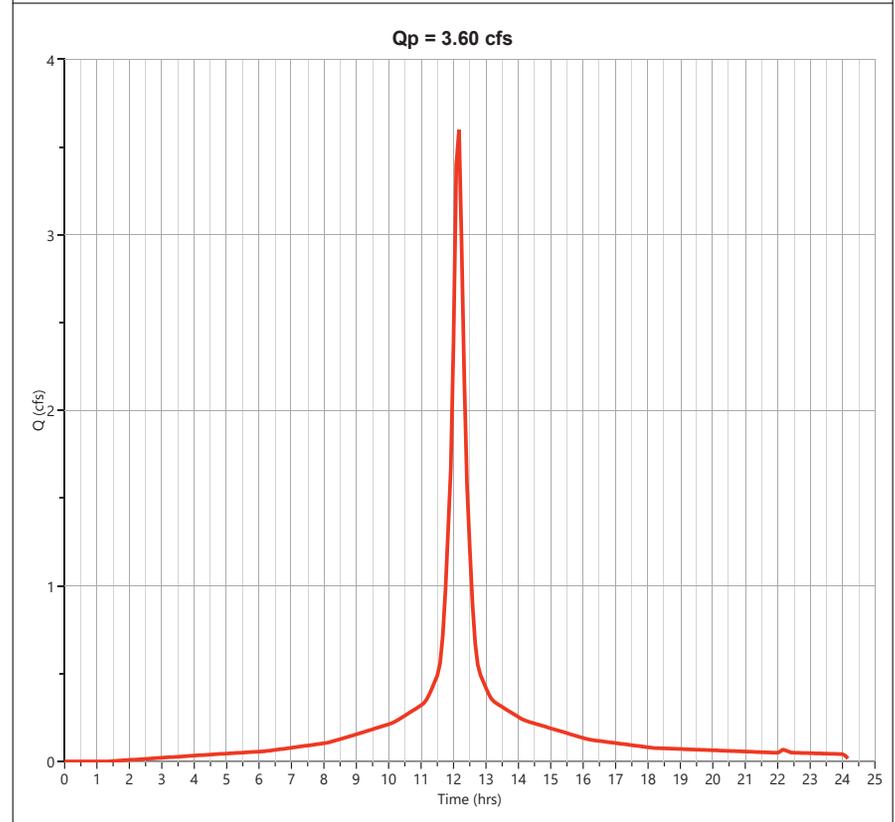
Hydrology Studio v 3.0.0.16

08-13-2020

## EX DA-1 IMP

## Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.598 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 16,177 cuft
Drainage Area	= 1.53 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.34 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



# Hydrograph Report

Project Name: 2020-06-30 2,10,100

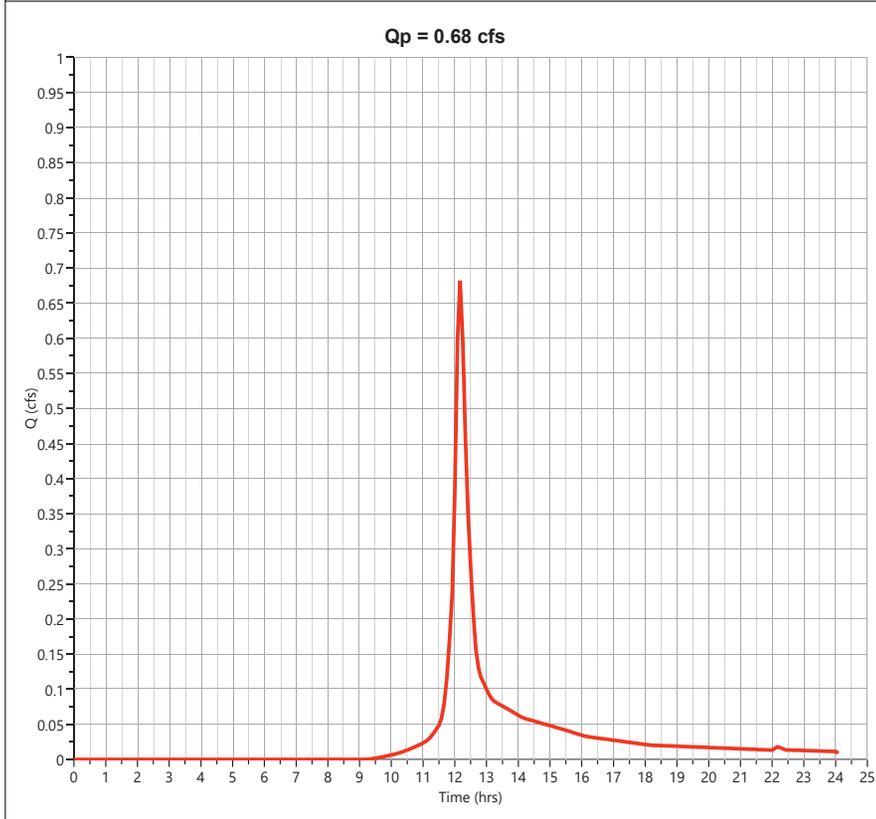
Hydrology Studio v 3.0.0.16

08-13-2020

## EX DA-1 PER

## Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.682 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 2,724 cuft
Drainage Area	= 0.53 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.34 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



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# Hydrograph Report

Project Name: 2020-06-30 2,10,100

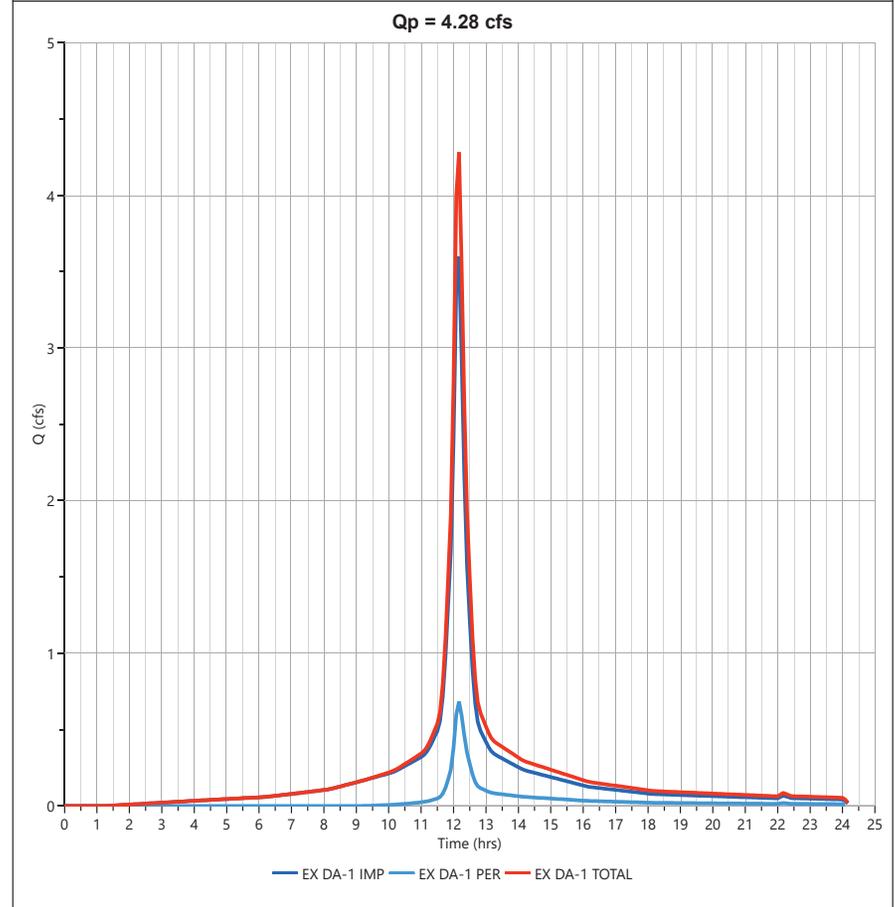
Hydrology Studio v 3.0.0.16

08-13-2020

## EX DA-1 TOTAL

## Hyd. No. 3

Hydrograph Type	= Junction	Peak Flow	= 4.280 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 18,902 cuft
Inflow Hydrographs	= 1, 2	Total Contrib. Area	= 2.06 ac



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# Hydrograph Report

Project Name: 2020-06-30 2,10,100

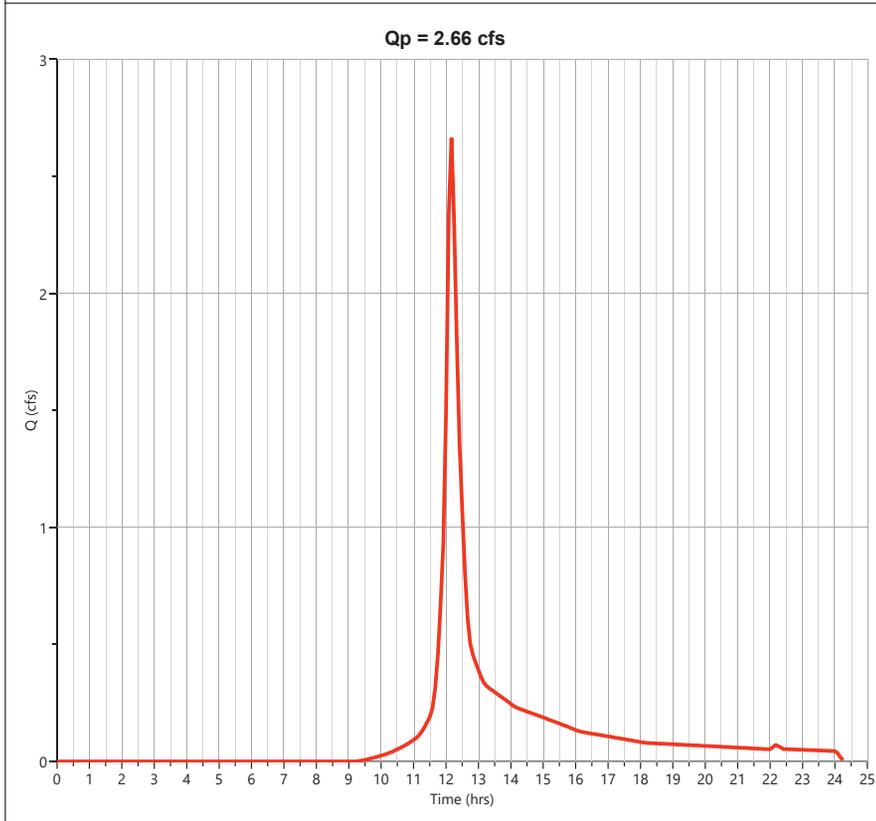
Hydrology Studio v 3.0.0.16

08-13-2020

## EX DA-1 PER

## Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.664 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 10,640 cuft
Drainage Area	= 2.07 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.34 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



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# Hydrograph Report

Project Name: 2020-06-30 2,10,100

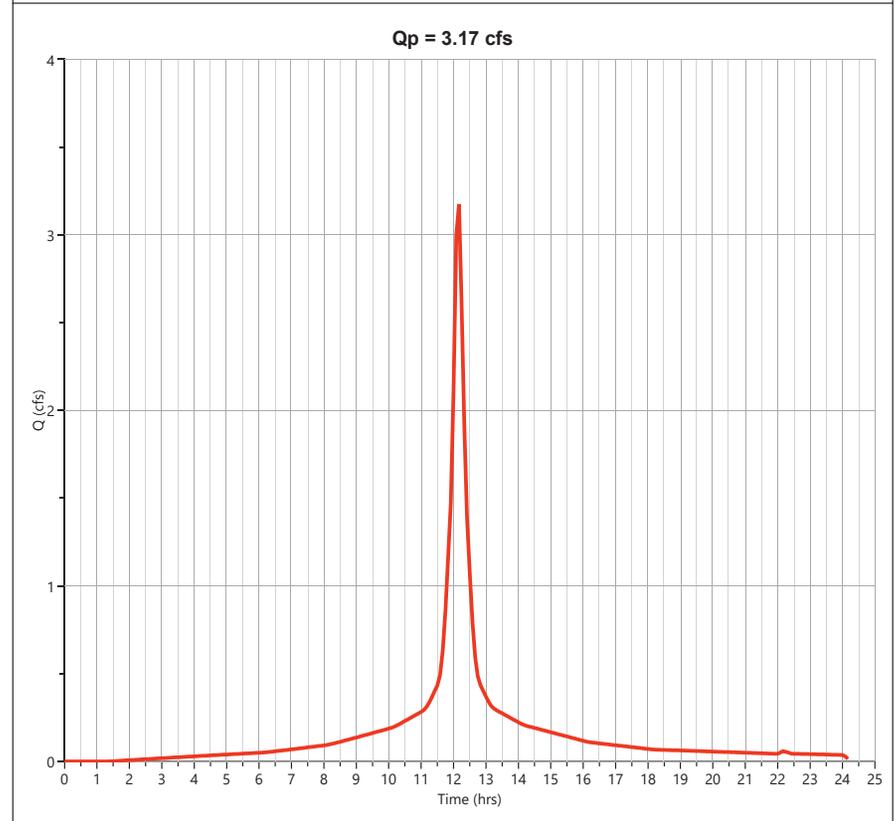
Hydrology Studio v 3.0.0.16

08-13-2020

## PR DA-1 IMP

## Hyd. No. 7

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.175 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 14,274 cuft
Drainage Area	= 1.35 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.34 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



8

# Hydrograph Report

Project Name: 2020-06-30 2,10,100

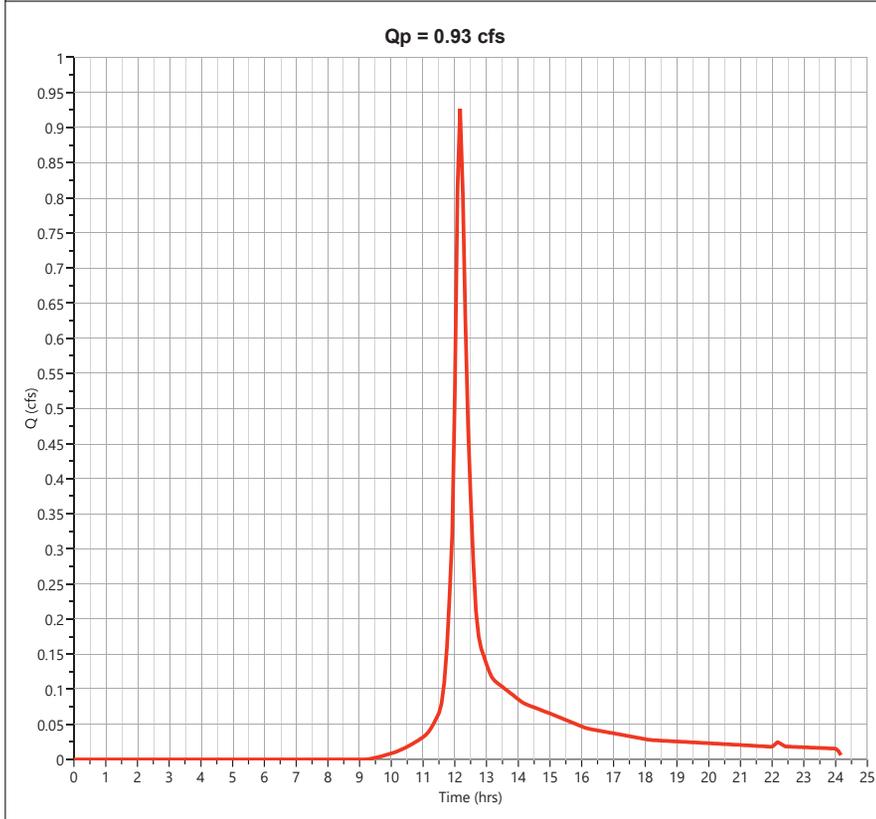
Hydrology Studio v 3.0.0.16

08-13-2020

## PR DA-1 PER

## Hyd. No. 8

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.927 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Runoff Volume	= 3,701 cuft
Drainage Area	= 0.72 ac	Curve Number	= 80
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.34 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



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# Hydrograph Report

Project Name: 2020-06-30 2,10,100

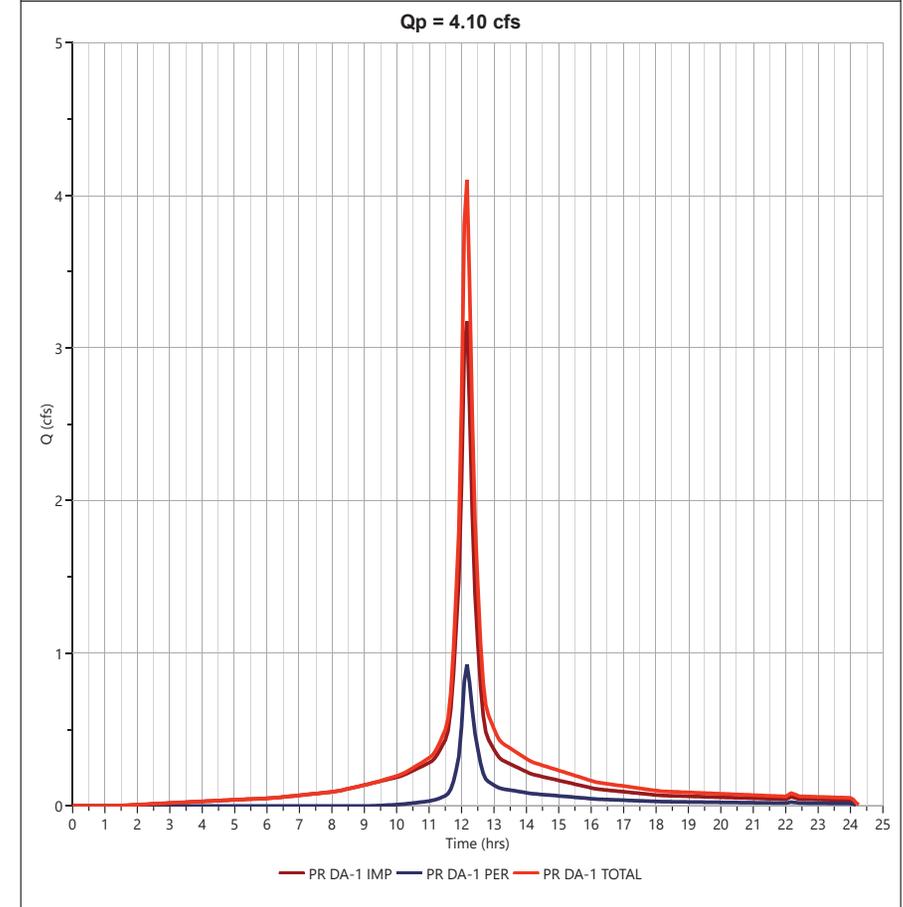
Hydrology Studio v 3.0.0.16

08-13-2020

## PR DA-1 TOTAL

## Hyd. No. 9

Hydrograph Type	= Junction	Peak Flow	= 4.101 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.17 hrs
Time Interval	= 5 min	Hydrograph Volume	= 17,975 cuft
Inflow Hydrographs	= 7, 8	Total Contrib. Area	= 2.07 ac



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# Hydrograph Report

Project Name: 2020-06-30 2,10,100

Hydrology Studio v 3.0.0.16

08-13-2020

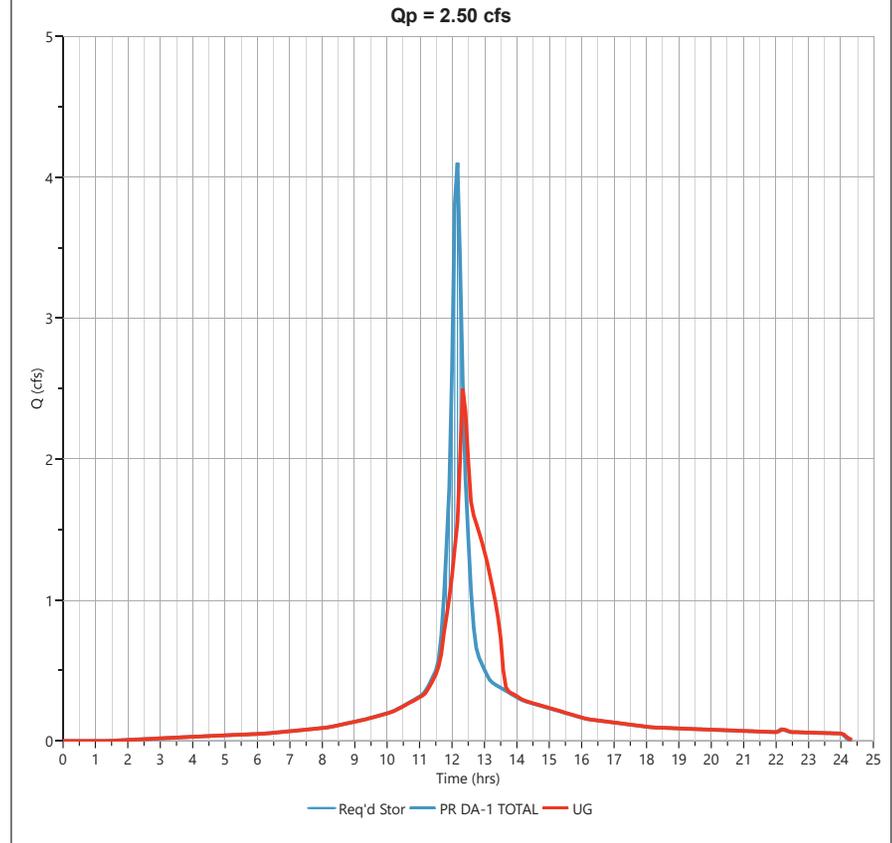
## UG

## Hyd. No. 10

Hydrograph Type	= Pond Route	Peak Flow	= 2.500 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.33 hrs
Time Interval	= 5 min	Hydrograph Volume	= 17,974 cuft
Inflow Hydrograph	= 9 - PR DA-1 TOTAL	Max. Elevation	= 273.84 ft
Pond Name	= 2020-07-24 OVERSIZE PIPE	Max. Storage	= 2,964 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 10 min



# Pond Report

Project Name: 2020-06-30 2,10,100

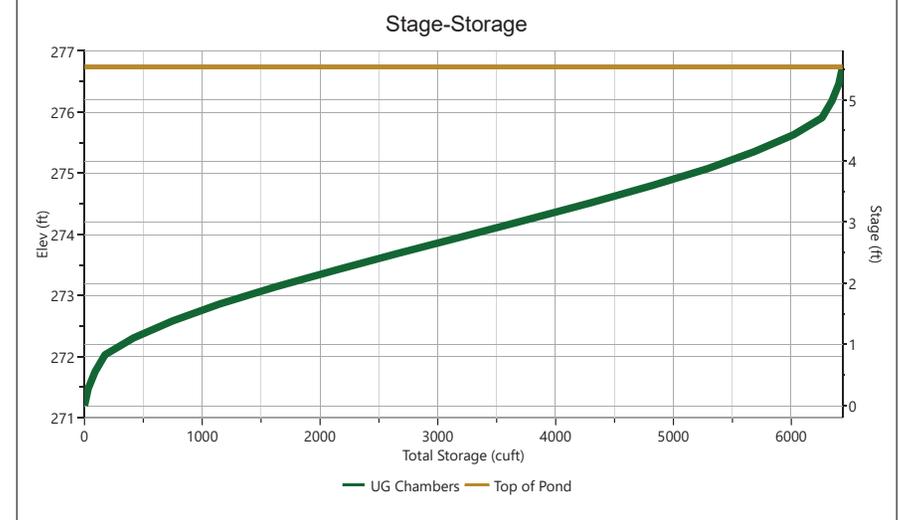
Hydrology Studio v 3.0.0.16

08-13-2020

## 2020-07-24 OVERSIZE PIPE

## Stage-Storage

Underground Chambers			Stage / Storage Table				
Description	Input		Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Invert Elev Down, ft	271.20		0.00	271.20	n/a	0.000	0.000
Chamber Rise, ft	4.00		0.28	271.48	n/a	32.5	32.5
Chamber Shape	Circular		0.55	271.75	n/a	57.3	89.8
Chamber Span, ft	4.00		0.83	272.03	n/a	85.6	175
Barrel Length, ft	512.00		1.11	272.31	n/a	242	417
No. Barrels	1		1.38	272.58	n/a	332	749
Barrel Slope, %	0.30		1.66	272.86	n/a	397	1,146
Headers, y/n	No		1.94	273.14	n/a	471	1,617
Stone Encasement, y/n	No		2.21	273.41	n/a	512	2,129
Encasement Bottom Elevation, ft	0.00		2.49	273.69	n/a	538	2,667
Encasement Width per Chamber, ft	0.00		2.77	273.97	n/a	551	3,218
Encasement Depth, ft	0.00		3.04	274.24	n/a	551	3,769
Encasement Voids, %	40.00		3.32	274.52	n/a	538	4,307
			3.60	274.80	n/a	513	4,820
			3.88	275.08	n/a	470	5,290
			4.15	275.35	n/a	397	5,687
			4.43	275.63	n/a	331	6,019
			4.71	275.91	n/a	241	6,260
			4.98	276.18	n/a	85.4	6,346
			5.26	276.46	n/a	57.3	6,403
			5.54	276.74	n/a	32.4	6,435



# Pond Report

Project Name: 2020-06-30 2,10,100

Hydrology Studio v 3.0.0.16

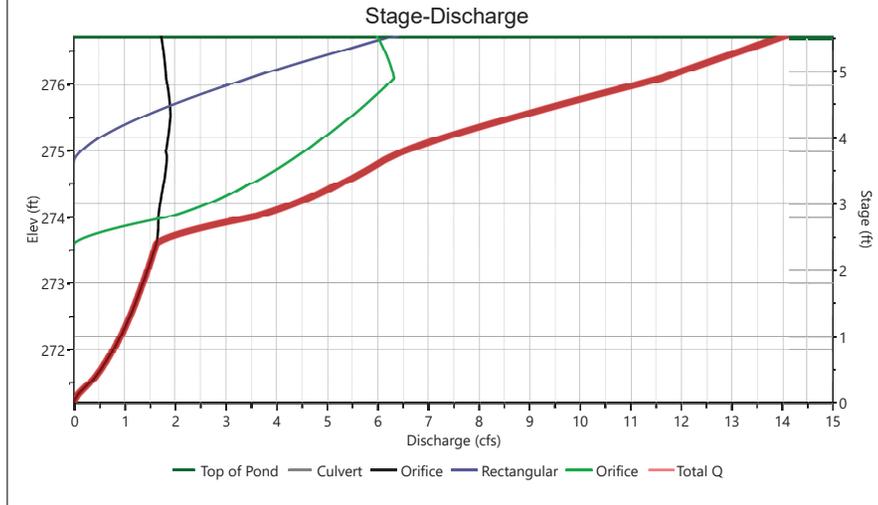
08-13-2020

## 2020-07-24 OVERSIZE PIPE

### Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1*	2*	3	
Rise, in	18	3	5		Hole Diameter, in
Span, in	18	12	25		No. holes
No. Barrels	1	1	1		Invert Elevation, ft
Invert Elevation, ft	271.20	271.20	273.60		Height, ft
Orifice Coefficient, Co	0.60	0.60	0.60		Orifice Coefficient, Co
Length, ft	18				
Barrel Slope, %	2				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1*	2	3	
Shape / Type		Rectangular			Exfiltration, in/hr
Crest Elevation, ft		274.85			
Crest Length, ft		.75			
Angle, deg					
Weir Coefficient, Cw		3.3			

\*Routes through Culvert.



# Pond Report

Project Name: 2020-06-30 2,10,100

Hydrology Studio v 3.0.0.16

08-13-2020

## 2020-07-24 OVERSIZE PIPE

### Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	271.20	0.000	0.000	0.000	0.000			0.000						0.000
0.28	271.48	32.5	0.274 ic	0.274	0.000			0.000						0.274
0.55	271.75	89.8	0.571 ic	0.571	0.000			0.000						0.571
0.83	272.03	175	0.800 ic	0.800	0.000			0.000						0.800
1.11	272.31	417	0.982 ic	0.982	0.000			0.000						0.982
1.38	272.58	749	1.148 ic	1.148	0.000			0.000						1.148
1.66	272.86	1,146	1.293 ic	1.293	0.000			0.000						1.293
1.94	273.14	1,617	1.427 ic	1.427	0.000			0.000						1.427
2.21	273.41	2,129	1.548 ic	1.548	0.000			0.000						1.548
2.49	273.69	2,667	1.844 ic	1.649	0.195			0.000						1.844
2.77	273.97	3,218	3.253 ic	1.670	1.584			0.000						3.253
3.04	274.24	3,769	4.472 ic	1.710	2.761			0.000						4.472
3.32	274.52	4,307	5.306 ic	1.776	3.530			0.000						5.306
3.60	274.80	4,820	5.985 oc	1.826	4.159			0.000						5.985
3.88	275.08	5,290	6.805 oc	1.836	4.704			0.265						6.805
4.15	275.35	5,687	7.958 oc	1.885	5.193			0.880						7.958
4.43	275.63	6,019	9.243 ic	1.903	5.639			1.701						9.243
4.71	275.91	6,260	10.60 ic	1.866	6.053			2.684						10.60
4.98	276.18	6,346	11.92 ic	1.814	6.297			3.807						11.92
5.26	276.46	6,403	12.99 ic	1.776	6.166			5.052						12.99
5.54	276.74	6,435	14.10 ic	1.719	5.969			6.411						14.10

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

# Pond Report

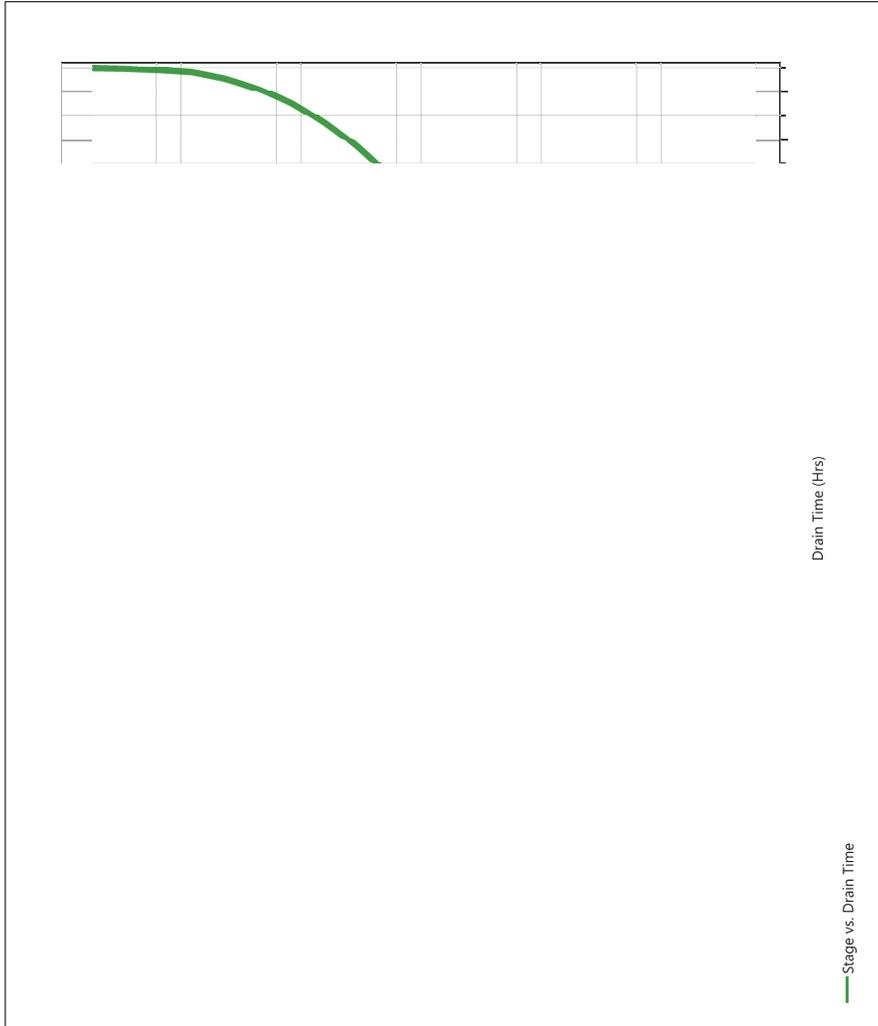
Project Name: 2020-06-30 2,10,100

Hydrology Studio v 3.0.0.16

08-13-2020

## 2020-07-24 OVERSIZE PIPE

## Pond Drawdown



ERROR: undefined  
OFFENDING COMMAND: '~

STACK:

**INLET AREA CALCULATIONS AND STORMWATER  
COLLECTION SYSTEM CALCULATIONS (PIPE SIZING)**



## Stormwater Collection System Calculations

Project: Ingerman Phillipsburg  
 Job #: 2362-99-010  
 Location: 220 Stockton Street, Town of Phillipsburg, NJ  
 Design Storm: 100-year storm

Computed By: ZAH  
 Checked By: ZZ  
 Date: 8/12/2020

**NOTES:**

- 1) Design method used is Rational Method, unless otherwise noted.
- 2) Refer to Weighted Runoff Coefficient table for calculation of incremental areas and C values

PIPE SECTION		SUBCATCHMENT AREA	INCREMENTAL		CUMULATIVE	TIME OF CONCENTRATION			I	PEAK RUNOFF		PIPING INPUT			PIPING DATA		
FROM	TO	Area (Acres)	"C"	A x C Ac	A x C (acres)	Tc to Inlet (min)	Tc in Pipe (min.)	Final Tc (min)	(In/Hr)	Q to Inlet (CFS)	Q cum. for Pipe (CFS)	Dia. (In)	Length (Ft)	Man. "n"	Slope (ft/ft)	Pipe Capacity (cfs)	Pipe Velocity (fps)
OCS-101	MH-33	1.40	0.99	1.39	1.39	10.00	0.04	10.00	6.80	9.45	9.45	18	18.0	0.013	0.0200	14.85	8.41
MH-33	MH-100	0.00	0.99	0.00	1.39	10.00	0.17	10.04	6.80	0.00	9.45	18	86.0	0.013	0.0200	14.85	8.41
MH-100	Ex Inlet Road	0.00	0.99	0.00	1.39	10.00	0.04	10.21	6.80	0.00	9.45	18	18.0	0.013	0.0200	14.85	8.41

## **EXISTING 18" RCP CAPACITY ANALYSIS**

Manning's Equation

**Design Parameters:**

Pipe Diameter, $D$ .....	18 in
Pipe Material .....	RCP
Slope, $s$ .....	10.00 %
Flow Depth, $y$ .....	FULL

**Calculations:**

Cross-Sectional Area, $A = D^2/8 [\theta - \sin(\theta)] =$ .....	1.77 ft <sup>2</sup>
Manning's Coefficient, $n$ .....	0.013
Hydraulic Radius, $R$ .....	0.38 ft
Angle, $\theta =$ .....	6.28 radians
Wetted Perimeter, $P = \theta D/2$ .....	4.71 ft
Flow Depth, $y$ .....	1.50 ft
Flow Top Width, $T = 2[y(D-y)]^{1/2}$ .....	0.00 ft
Gravity Constant, $g$ .....	32.174 ft/s <sup>2</sup>
Froude Number, $F$ .....	0.00
	<b>Subcritical Flow</b>

**Flow & Velocity:**

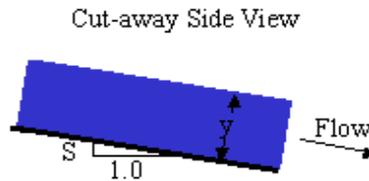
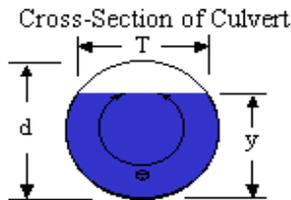
Flow,  $Q_o = \frac{1.486 \cdot R^{2/3} s^{1/2} A}{n}$  .....

**33.22 cfs**  
**21.47 MGD**

**Prop. 25-yr Flow to Existing Pipe** **6.94 cfs**

Velocity,  $V = Q/A$  .....

**18.80 fps**



$$Q = VA \quad V = \frac{k}{n} R^{2/3} s^{1/2} \quad R = \frac{A}{P} \quad A = \frac{d^2}{8} (\theta - \sin(\theta))$$

$$P = \frac{\theta d}{2} \quad y = \frac{d}{2} \left[ 1 - \cos\left(\frac{\theta}{2}\right) \right] \quad T = 2\sqrt{y(d-y)} \quad F = V \sqrt{\frac{T}{gA \cos(\tan^{-1} S)}}$$

## **SOIL VELOCITY CALCULATION BY RATIONAL METHOD**

Allowable Velocities Over Soils Calculation by Rational Method

$$Q = CiA$$

Where:

C for lawn areas within Hydrologic Soil Group D = 0.65

i for 100 year storm = 8.25

A of rear steep slopes are = 0.25 ac

$$Q = (0.65)(8.25)(0.25)$$

$$Q = 1.34 \text{ cfs}$$

The undetained stormwater associated with in southern side of the site is spread along the entire property line therefore it is not considered concentrated flow. As the area is not channel flow, to be conservative the maximum 0.5' water depth for shallow concentrated flow has been utilized for design purposes.

$$V = Q/A$$

Where

$$Q = 1.82 \text{ cfs}$$

A = Length of rear property line (483.41') x depth of flow (0.5') = 241.71 sqft

$$V = \frac{1.34}{241.71}$$

$$V = 0.006 \text{ fps}$$

Per Websoil Survey, on-site soils consist of Udaub – Udorthents-Urban land complex, 0 to 8 percent slopes which has a texture of sandy loam. Per the table 12-1 allowable velocities for various soils of the NJ Standards for Soil Erosion and Sediment Control Manual, the proposed flow is far less than the maximum 2.5 permitted therefore no adverse impacts to on-site or adjacent proper soils are anticipated.

TABLE 12-1 ALLOWABLE VELOCITIES FOR VARIOUS SOILS

SOIL TEXTURE	ALLOWABLE VELOCITY (ft./sec.)
Sand	1.8
Sandy loam	2.5
Silt loam (also high lime clay), loam	3.0
Sandy clay loam	3.5
Clay loam	4.0
Clay, fine gravel, graded loam to gravel	5.0
Cobbles	5.5
Shale (non-weathered)	6.0

## **DRAINAGE MAPS**

