Hydrologic & Hydraulic Narrative
To analyze the impact of the Residential Subdivision of
Lots 37 & 38, Block 1303
Located in
The Village of South Orange Township, Essex County, New Jersey
December 10, 2020
Revised; January 14, 2021

David E. Fantina, NJPE #32395
15 Sunset Drive
Bernardsville, NJ 07924

Description of the January 2021 Revisions:

This report has been revised in compliance with the December 30, 2020 letter from Eric L. Keller, PE, PP, LEED AP, the Village of South Orange Township Planning Board Consulting Engineer, and the applicant's appearance before the planning board on January 6, 2021. Specifically, this revision includes the following:

1. The existing gravel areas on the property are no longer considered to be impervious.
2. Hydrograph input data and stage-storage-discharge data relative to the drywells have been provided.
3. The overall calculations are more extensive in comparing existing & proposed situations.
4. Time to drain calculations have been added to the calculations.
5. The area to be considered in this analysis is the entire area slated for disturbance as well as the on-site area that drains into this area.

Methodology & Assumptions:

The following methodology & assumptions are employed in this analysis:

1. The area being considered includes all of the area on-site that will be disturbed and all on-site areas that drain onto this area. This is shown on the accompanying drainage maps.
2. The runoff is calculated using the Modified Rational Method. Runoff coefficients (c values) are based on the RSISD table. Where the RSIS table does not include a c value for a particular combination of soil type and land use, then a value has been extrapolated from other values in the table.
3. The 2 year, 10 year, and 100 year storms are analyzed. A variety of storm durations are analyzed to determine the critical storm durations that cause (i) the peak runoff from the site and (ii) the most storage within the drywell. Only the hydrographs associated with the critical storm duration that causes the maximum outflow from the site is included in the appendix.
4. All hydrographs are calculated using the "Hydrology Studio" software package.
5. The geometry of the drywells are shown on Sheet 4 of the Minor Subdivision Development Plans prepared by this office.
6. The NRCS web soil survey indicates that both drywells will be installed within soils designated as DunB (Dunellen sandy loam, 3-8% slopes). This soil is described as having a depth to water table of more than 80" and the layer from 42" to 70" deep is classified as "loamy sand". According to the soil textural triangle, loamy sand has a permeability of K-4 or 6-20 inches per hour. Using the midpoint of this range (i.e. 13 inches per hour) and dividing by 2 to account for siltation over time yields a final permeability value of 6.5 inches per hour. Therefore the exfiltration rate through the bottom of the drywell is 22'X14' X 6.5 in/hr X 1/12 X 1/3600 = 0.046 CFS. This value is used solely for the determination the "drain time of the drywells. No credit is taken during the routings for exfiltration.

Summary:

Storm Frequency (Years)	Existing Peak Q (CFS)	Proposed peak Q (CFS)
2	1.39	0.84
10	1.77	1.08
100	2.36	1.42

The table above shows that there will be a significant decrease in the peak runoff from the site during all design storms.

Time of concentration calculations:

Sheet Flow: $T_{t1}=0.007(nL)^{0.8}/P_2^{0.5}S^{0.4}=$
L=50', n=0.4 (woods), P_2=3.4", s=0.12
T_{t1}=0.097 hrs = 5.8 minutes
Travel time 2
Length=165', slope=14%, unpaved (v=6 FPSS, per TR-55)
L=165/6=27.5 seconds = 0.45 minutes
Total = 6.2 minutes (Use 6 min)

Determination of Weighted C Values:

Existing Conditions:

Land Use	Soil Type	c	Area (acres)	C X Area
Woods	C	0.45	0.05	0.00225
Gravel	A	0.57	0.07	0.0399
Impervious	A	0.99	0.10	0.099
Woods	A	0.17	0.14	0.0238
Lawn	A	0.19	0.59	0.1121
Total	----	----	0.95	0.27705

Weighted C= 0.27705/0.95=0.29

Proposed Undetained Area:

Land Use	Soil Type	c	Area (acres)	C X Area
Woods	C	0.45	0.05	0.00225
Impervious	A	0.99	0.01	0.0099
Woods	A	0.17	0.14	0.0238
Lawn	A	0.19	0.59	0.1121
Total	----	----	0.70	0.1683

Weighted C= 0.1683/0.79=0.21

Determination of Drain Time:

Lot 37 Drywell: Maximum 100 year storage achieved in the drywell is 425 CF (during storms with durations of 36 and 42 minutes).
Drain time = 425 CF/0.046CFS = 924 seconds =0.26 hours

Lot 38 Drywell: Maximum 100 year storage achieved in the drywell is 454 CF (during storm with duration of 36 minutes).
Drain time = 454 CF/0.046CFS = 987 seconds =0.27 hours

Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

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	Rational	Existing	1.392	0.10	627	----		
2	Rational	To Lot 38	0.450	0.10	203	----		
3	Pond Route	Lot 38	0.000	0.00	0.000	2	98.29	203
4	Rational	To Lot 37	0.350	0.10	158	----		
5	Pond Route	Lot 37	0.000	0.00	0.000	4	98.97	158
6	Rational	Undet	0.839	0.10	377	----		
7	Junction	Drywell total	0.000	0.00	0.000	3, 5		
8	Junction	Total	0.839	0.10	377	6, 7		
9	Rational	To Lot 38 12	0.353	0.20	317	----		
10	Pond Route	Lot 38 12	0.000	0.00	0.000	9	99.15	317
11	Rational	To Lot 37 12	0.274	0.20	247	----		
12	Pond Route	Lot 37 12	0.000	0.00	0.000	11	99.62	247
13	Junction	Drywell 12	0.000	0.00	0.000	10, 12		
14	Rational	Undet 12	0.657	0.20	591	----		
15	Junction	Total 12	0.657	0.20	591	13, 14		
16	Rational	Lot 38 18	0.290	0.30	391	----		
17	Pond Route	Lot 38 18	0.022	0.72	15.0	16	99.67	386
18	Rational	To Lot 37 18	0.225	0.30	304	----		
19	Pond Route	Lot 37 18	0.000	0.00	0.000	18	100.06	304
20	Rational	Undet 18	0.540	0.30	729	----		
21	Junction	Drywell 18	0.022	0.72	15.0	17, 19		
22	Junction	Total 18	0.540	0.30	744	20, 21		
23	Rational	To 38 24	0.246	0.40	443	----		
24	Pond Route	Lot 38 24	0.075	0.82	66.6	23	99.77	398
25	Rational	To Lot 37 24	0.191	0.40	345	----		
26	Pond Route	Lot 37 24	0.000	0.00	0.000	25	100.36	345
27	Rational	Undet 24	0.458	0.40	825	----		
28	Junction	Drywell 24	0.075	0.82	66.6	24, 26		
29	Junction	Total 24	0.458	0.40	891	27, 28		
30	Rational	To 38 30	0.214	0.50	481	----		
31	Pond Route	Lot 38 30	0.090	0.93	105	30	99.79	401
32	Rational	To Lot 37 30	0.166	0.50	374	----		
33	Pond Route	Lot 37 30	0.003	1.23	3.55	32	100.58	373
34	Rational	Undet 30	0.398	0.50	896	----		
35	Junction	Drywell 30	0.090	0.93	108	31, 33		
36	Junction	Total 30	0.398	0.50	1,004	34, 35		

Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

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)
37	Rational	To Lot 38 36	0.189	0.60	510	----		
38	Pond Route	Lot 38 36	0.093	1.05	134	37	99.80	402
39	Rational	To Lot 37 36	0.147	0.60	397	----		
40	Pond Route	Lot 37 36	0.021	1.37	26.3	39	100.67	385
41	Rational	Undet 36	0.352	0.60	950	----		
42	Junction	Drywell 36	0.093	1.05	160	38, 40		
43	Junction	Total 36	0.352	0.60	1,111	41, 42		
44	Rational	To Lot 38 42	0.169	0.70	534	----		
45	Pond Route	Lot 38 42	0.092	1.18	157	44	99.79	402
46	Rational	To lot 37 42	0.132	0.70	415	----		
47	Pond Route	Lot 37 42	0.032	1.50	44.4	46	100.69	388
48	Rational	Undet 42	0.315	0.70	994	----		
49	Junction	Drywell 42	0.092	1.18	202	45, 47		
50	Junction	Total 42	0.315	0.70	1,195	48, 49		

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Existing

Hyd. No. 1

Hydrograph Type	= Rational	Peak Flow	= 1.392 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 627 cuft
Drainage Area	= 0.95 ac	Runoff Coeff.	= 0.29
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 5.05 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.696								
4	0.928								
5	1.160								
6	**1.392**								
7	1.238								
8	1.083								
9	0.928								
10	0.774								
11	0.619								
12	0.464								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

To Lot 38

Hyd. No. 2

Hydrograph Type	= Rational	Peak Flow	= 0.450 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 203 cuft
Drainage Area	= 0.09 ac	Runoff Coeff.	= 0.99
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 5.05 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.225								
4	0.300								
5	0.375								
6	**0.450**								
7	0.400								
8	0.350								
9	0.300								
10	0.250								
11	0.200								
12	0.150								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 38

Hyd. No. 3

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 1 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 2 - To Lot 38	Max. Elevation	= 98.29 ft
Pond Name	= Lot 38	Max. Storage	= 203 cuft

Pond Routing by Storage Indication Method

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
0.02	0.000								
...end	...end								

Printed values > 35% of Qpeak. nth-point print interval = 1

Pond Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

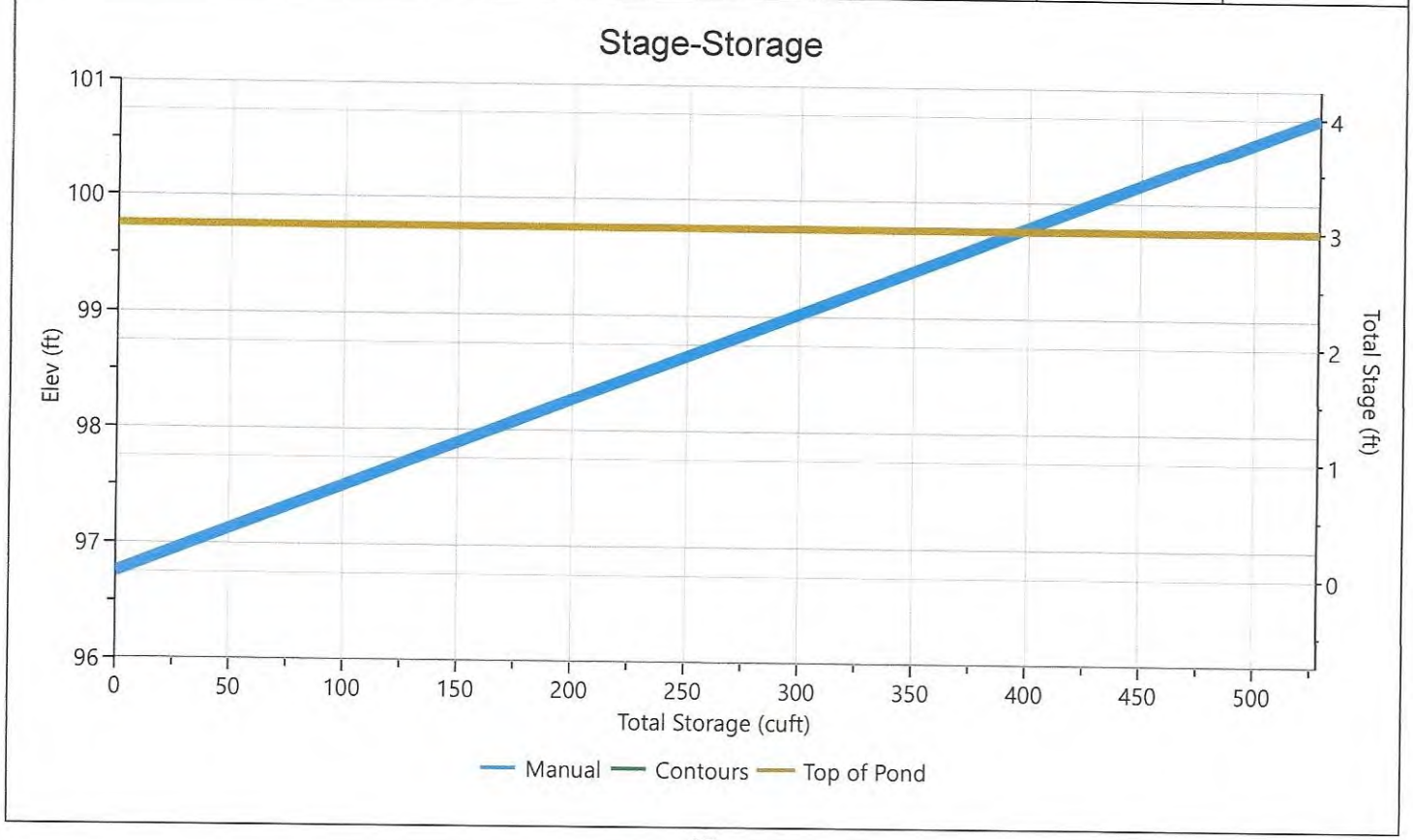
Lot 38

Stage-Storage

User Defined Storage	
Description	Input
Bottom Elevation, ft	96.75

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	96.75	n/a	0.000	0.000
1.00	97.75	n/a	132	132
2.00	98.75	n/a	132	264
2.83	99.58	n/a	110	374
3.00	99.75	n/a	22.0	396
4.00	100.75	n/a	132	528



Pond Report

Project Name:

Hydrology Studio v 3.0.0.17

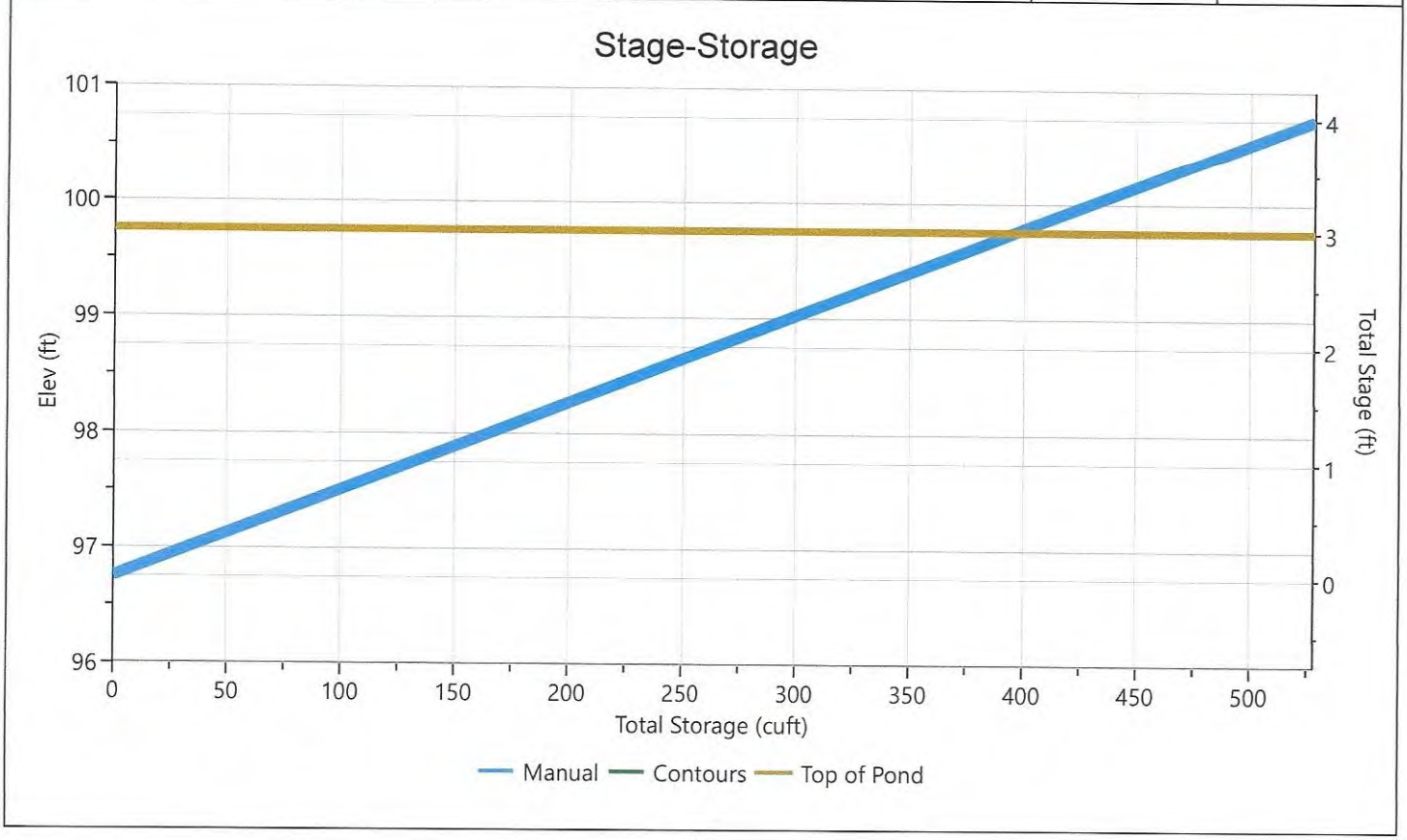
01-14-2021

Lot 38

Stage-Storage

User Defined Contours	
Description	Input
Bottom Elevation, ft	98.00
Voids (%)	100.00
Volume Calc	Conic

Stage / Storage Table				
Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	98.00	0	0.000	0.000



Pond Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 38

Stage-Discharge

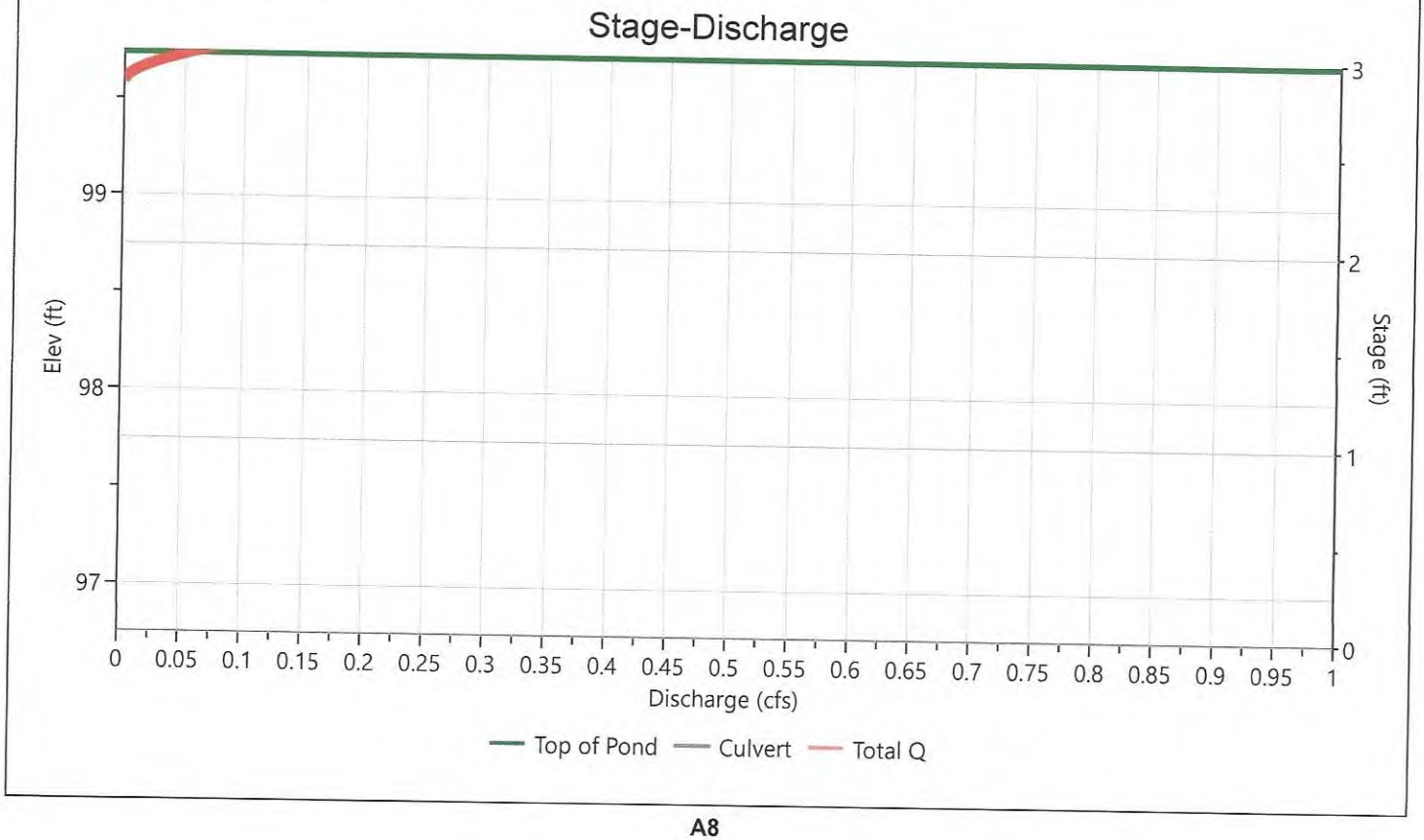
Culvert / Orifices	Culvert	Orifices		
		1	2	3
Rise, in	4			
Span, in	4			
No. Barrels	1			
Invert Elevation, ft	99.58			
Orifice Coefficient, Co	0.60			
Length, ft	13			
Barrel Slope, %	1			
N-Value, n	0.013			

Weirs	Riser*	Weirs		
		1	2	3
Shape / Type				
Crest Elevation, ft				
Crest Length, ft				
Angle, deg				
Weir Coefficient, Cw				

Perforated Riser	
Hole Diameter, in	
No. holes	
Invert Elevation, ft	
Height, ft	
Orifice Coefficient, Co	

Ancillary	
Exfiltration, in/hr	6.50**

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 38

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	96.75	0.000	0.000									0.000		0.000
1.00	97.75	132	0.000									0.000		0.000
2.00	98.75	264	0.000									0.000		0.000
2.83	99.58	374	0.000									0.000		0.000
3.00	99.75	396	0.063 ic									0.000		0.063
4.00	98.00	528	0.000									0.000		0.000
5.00	0.00	528	0.000									0.000		0.000
6.00	0.00	528	0.000									0.000		0.000
7.00	0.00	528	0.000									0.000		0.000

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

Pond Report

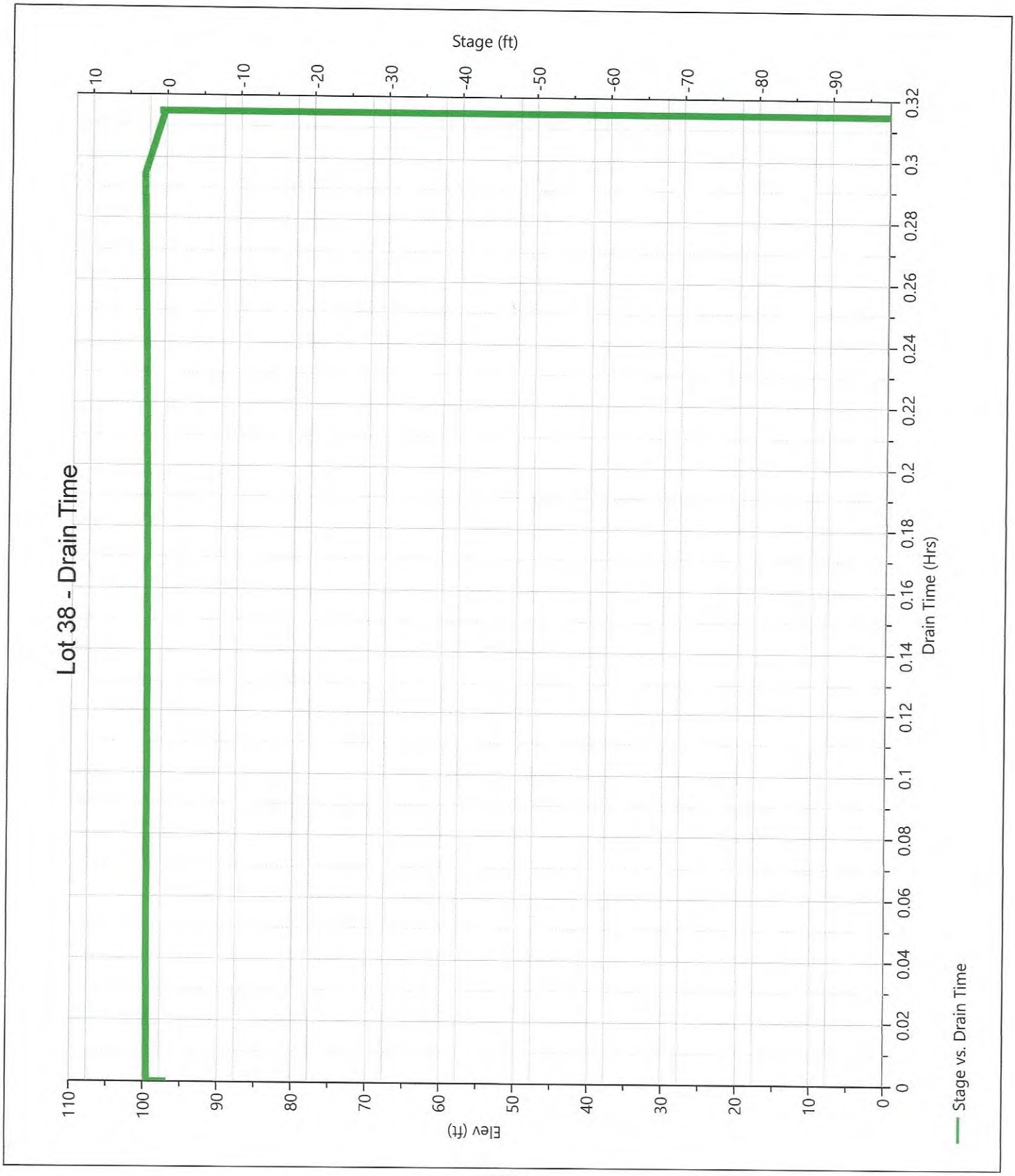
Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 38

Pond Drawdown



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

To Lot 37

Hyd. No. 4

Hydrograph Type	= Rational	Peak Flow	= 0.350 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 158 cuft
Drainage Area	= 0.07 ac	Runoff Coeff.	= 0.99
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 5.05 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.175								
4	0.234								
5	0.292								
6	**0.350**								
7	0.311								
8	0.272								
9	0.234								
10	0.195								
11	0.156								
12	0.117								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 37

Hyd. No. 5

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 1 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 4 - To Lot 37	Max. Elevation	= 98.97 ft
Pond Name	= Lot 37 Drywell	Max. Storage	= 158 cuft

Pond Routing by Storage Indication Method

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
0.02	0.000								
...end	...end								

Printed values > 35% of Qpeak. nth-point print interval = 1

Pond Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

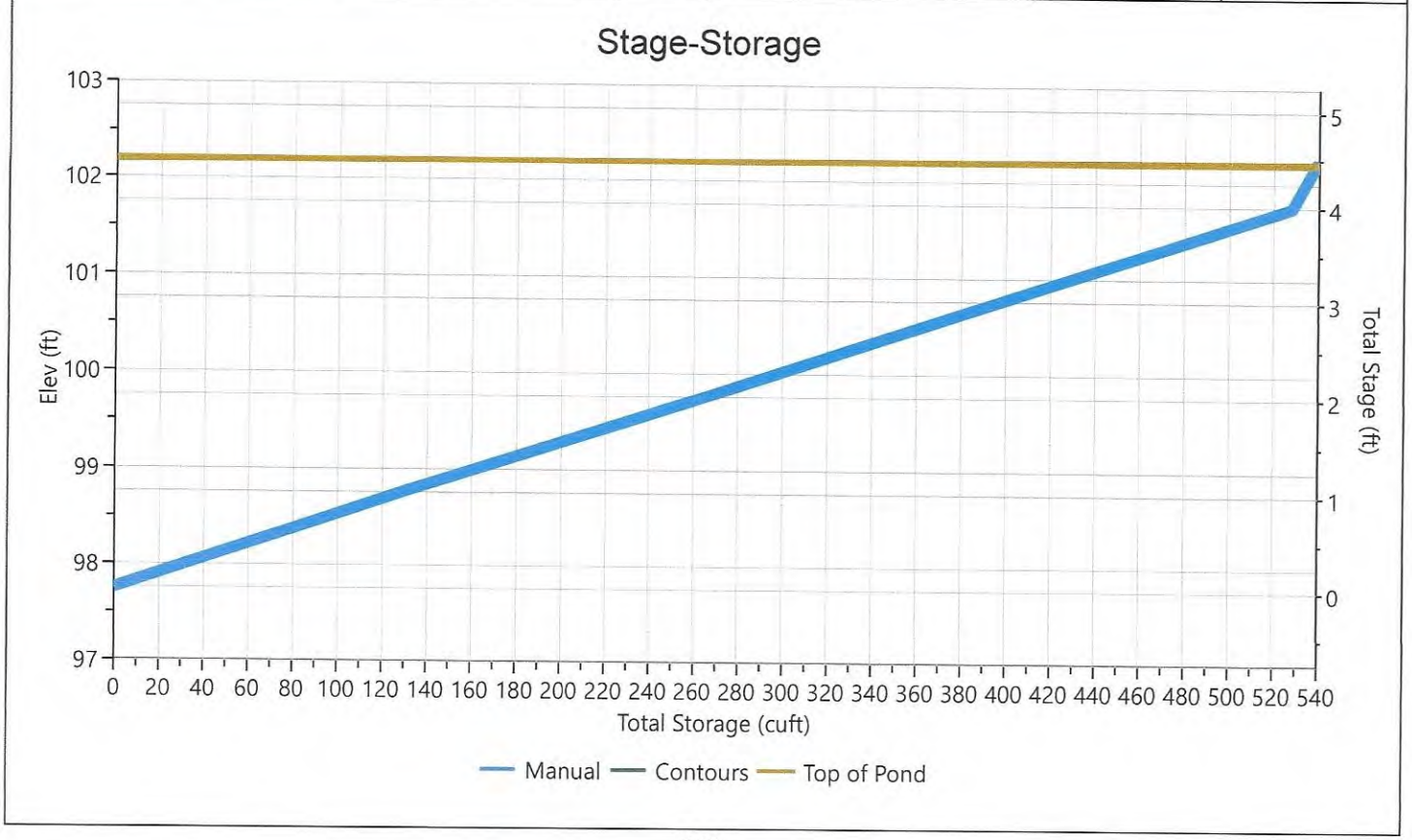
Lot 37 Drywell

Stage-Storage

User Defined Storage	
Description	Input
Bottom Elevation, ft	97.75

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	97.75	n/a	0.000	0.000
1.00	98.75	n/a	128	128
2.00	99.75	n/a	136	264
3.00	100.75	n/a	132	396
4.00	101.75	n/a	132	528
4.50	102.25	n/a	12.0	540



Pond Report

Project Name:

Hydrology Studio v 3.0.0.17

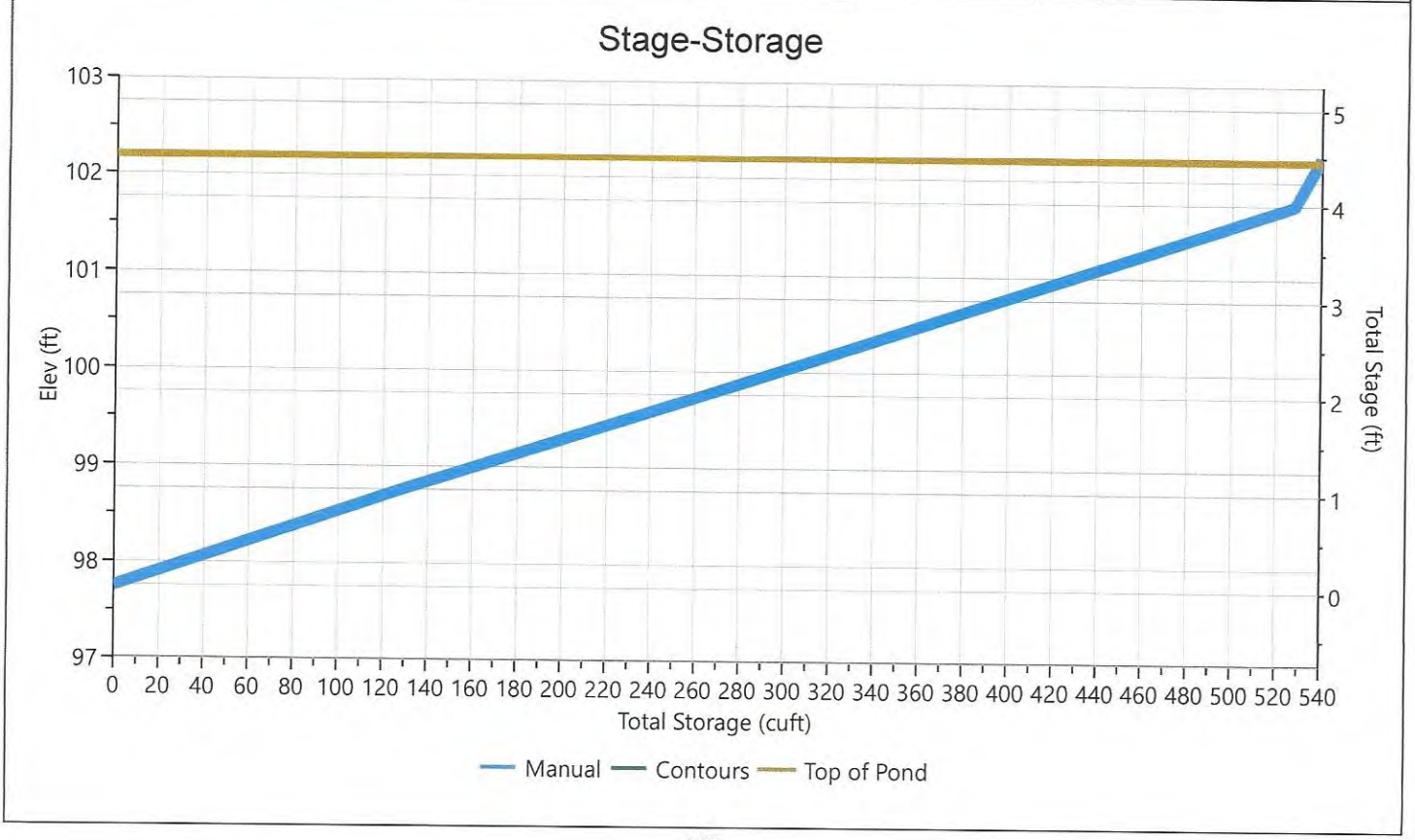
01-14-2021

Lot 37 Drywell

Stage-Storage

User Defined Contours	
Description	Input
Bottom Elevation, ft	98.00
Voids (%)	100.00
Volume Calc	None

Stage / Storage Table				
Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	98.00	0	0.000	0.000



Pond Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 37 Drywell

Stage-Discharge

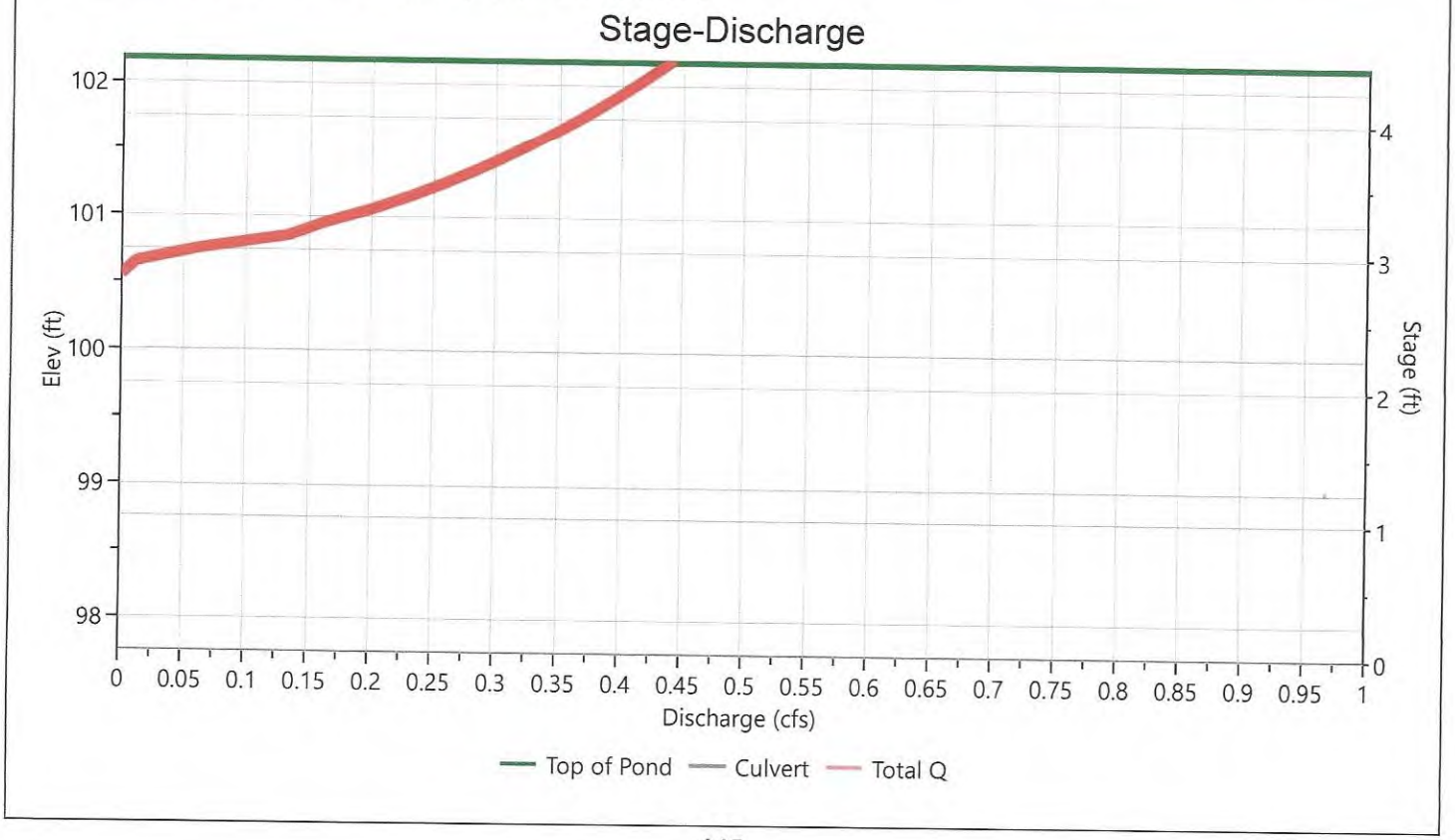
Culvert / Orifices	Culvert	Orifices		
		1	2	3
Rise, in	4			
Span, in	4			
No. Barrels	1			
Invert Elevation, ft	100.58			
Orifice Coefficient, Co	0.60			
Length, ft	16			
Barrel Slope, %	1			
N-Value, n	0.013			

Weirs	Riser*	Weirs		
		1	2	3
Shape / Type				
Crest Elevation, ft				
Crest Length, ft				
Angle, deg				
Weir Coefficient, Cw				

Perforated Riser	
Hole Diameter, in	
No. holes	
Invert Elevation, ft	
Height, ft	
Orifice Coefficient, Co	

Ancillary	
Exfiltration, in/hr	6.50**

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 37 Drywell

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	97.75	0.000	0.000									0.000		0.000
1.00	98.75	128	0.000									0.000		0.000
2.00	99.75	264	0.000									0.000		0.000
3.00	100.75	396	0.063 ic									0.000		0.063
4.00	101.75	528	0.367 oc									0.000		0.367
4.50	98.00	540	0.000									0.000		0.000

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

Pond Report

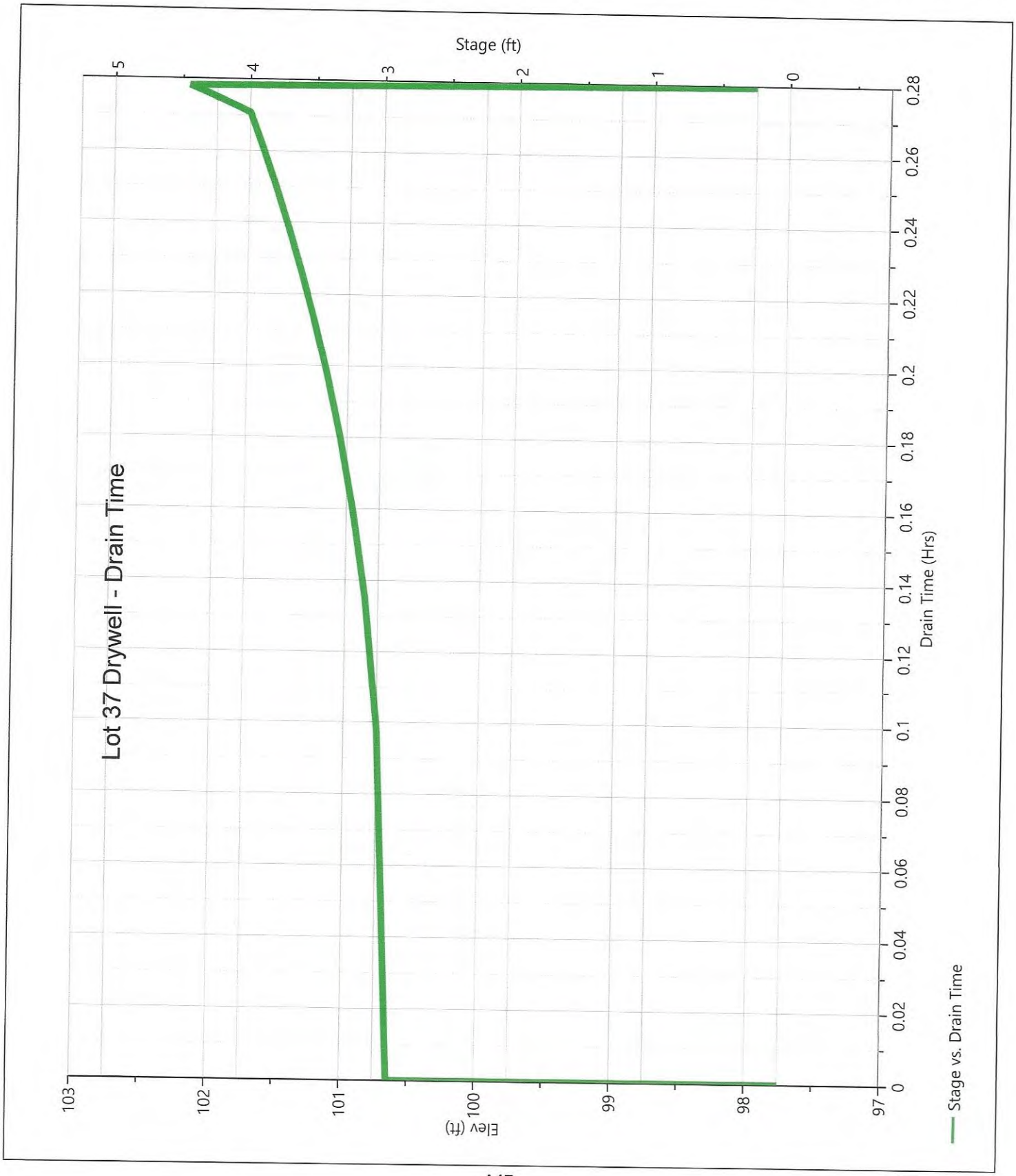
Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 37 Drywell

Pond Drawdown



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Undet

Hyd. No. 6

Hydrograph Type	= Rational	Peak Flow	= 0.839 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 377 cuft
Drainage Area	= 0.79 ac	Runoff Coeff.	= 0.21
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 5.05 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.419								
4	0.559								
5	0.699								
6	**0.839**								
7	0.745								
8	0.652								
9	0.559								
10	0.466								
11	0.373								
12	0.280								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Drywell total

Hyd. No. 7

Hydrograph Type	= Junction	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 1 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrographs	= 3, 5	Total Contrib. Area	= 0.0 ac

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
0.02	0.000								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Total

Hyd. No. 8

Hydrograph Type	= Junction	Peak Flow	= 0.839 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 377 cuft
Inflow Hydrographs	= 6, 7	Total Contrib. Area	= 0.79 ac

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.419								
4	0.559								
5	0.699								
6	**0.839**								
7	0.745								
8	0.652								
9	0.559								
10	0.466								
11	0.373								
12	0.280								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

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	Rational	Existing	1.788	0.10	804	----		
2	Rational	To Lot 38	0.578	0.10	260	----		
3	Pond Route	Lot 38	0.000	0.00	0.000	2	98.72	260
4	Rational	To Lot 37	0.450	0.10	202	----		
5	Pond Route	Lot 37	0.000	0.00	0.000	4	99.30	202
6	Rational	Undet	1.076	0.10	484	----		
7	Junction	Drywell total	0.000	0.00	0.000	3, 5		
8	Junction	Total	1.076	0.10	484	6, 7		
9	Rational	To Lot 38 12	0.457	0.20	412	----		
10	Pond Route	Lot 38 12	0.065	0.45	35.3	9	99.76	396
11	Rational	To Lot 37 12	0.356	0.20	320	----		
12	Pond Route	Lot 37 12	0.000	0.00	0.000	11	100.18	320
13	Junction	Drywell 12	0.065	0.45	35.3	10, 12		
14	Rational	Undet 12	0.852	0.20	767	----		
15	Junction	Total 12	0.852	0.20	802	13, 14		
16	Rational	Lot 38 18	0.380	0.30	513	----		
17	Pond Route	Lot 38 18	0.148	0.57	136	16	99.91	417
18	Rational	To Lot 37 18	0.295	0.30	399	----		
19	Pond Route	Lot 37 18	0.034	0.70	28.0	18	100.69	389
20	Rational	Undet 18	0.707	0.30	955	----		
21	Junction	Drywell 18	0.153	0.65	164	17, 19		
22	Junction	Total 18	0.707	0.30	1,119	20, 21		
23	Rational	To 38 24	0.325	0.40	586	----		
24	Pond Route	Lot 38 24	0.165	0.70	209	23	99.97	424
25	Rational	To Lot 37 24	0.253	0.40	456	----		
26	Pond Route	Lot 37 24	0.085	0.80	84.9	25	100.78	400
27	Rational	Undet 24	0.606	0.40	1,091	----		
28	Junction	Drywell 24	0.235	0.78	294	24, 26		
29	Junction	Total 24	0.606	0.40	1,385	27, 28		
30	Rational	To 38 30	0.285	0.50	642	----		
31	Pond Route	Lot 38 30	0.168	0.80	265	30	99.97	425
32	Rational	To Lot 37 30	0.222	0.50	499	----		
33	Pond Route	Lot 37 30	0.101	0.92	128	32	100.80	403
34	Rational	Undet 30	0.531	0.50	1,194	----		
35	Junction	Drywell 30	0.258	0.88	393	31, 33		
36	Junction	Total 30	0.535	0.83	1,588	34, 35		

Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

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)
37	Rational	To Lot 38 36	0.254	0.60	686	----		
38	Pond Route	Lot 38 36	0.164	0.92	309	37	99.96	424
39	Rational	To Lot 37 36	0.198	0.60	534	----		
40	Pond Route	Lot 37 36	0.105	1.02	163	39	100.81	404
41	Rational	Undet 36	0.473	0.60	1,277	----		
42	Junction	Drywell 36	0.261	1.00	472	38, 40		
43	Junction	Total 36	0.539	0.95	1,749	41, 42		
44	Rational	To Lot 38 42	0.229	0.70	722	----		
45	Pond Route	Lot 38 42	0.158	1.03	346	44	99.95	422
46	Rational	To lot 37 42	0.178	0.70	562	----		
47	Pond Route	Lot 37 42	0.105	1.13	191	46	100.81	404
48	Rational	Undet 42	0.427	0.70	1,345	----		
49	Junction	Drywell 42	0.256	1.12	537	45, 47		
50	Junction	Total 42	0.526	1.07	1,882	48, 49		

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Existing

Hyd. No. 1

Hydrograph Type	= Rational	Peak Flow	= 1.788 cfs
Storm Frequency	= 10-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 804 cuft
Drainage Area	= 0.95 ac	Runoff Coeff.	= 0.29
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 6.49 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.894								
4	1.192								
5	1.490								
6	**1.788**								
7	1.589								
8	1.390								
9	1.192								
10	0.993								
11	0.795								
12	0.596								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

To Lot 38

Hyd. No. 2

Hydrograph Type	= Rational	Peak Flow	= 0.578 cfs
Storm Frequency	= 10-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 260 cuft
Drainage Area	= 0.09 ac	Runoff Coeff.	= 0.99
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 6.49 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.289								
4	0.385								
5	0.482								
6	**0.578**								
7	0.514								
8	0.450								
9	0.385								
10	0.321								
11	0.257								
12	0.193								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 38

Hyd. No. 3

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 0.00 hrs
Time Interval	= 1 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 2 - To Lot 38	Max. Elevation	= 98.72 ft
Pond Name	= Lot 38	Max. Storage	= 260 cuft

Pond Routing by Storage Indication Method

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
0.02	0.000								
...end	...end								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

To Lot 37

Hyd. No. 4

Hydrograph Type	= Rational	Peak Flow	= 0.450 cfs
Storm Frequency	= 10-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 202 cuft
Drainage Area	= 0.07 ac	Runoff Coeff.	= 0.99
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 6.49 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.225								
4	0.300								
5	0.375								
6	**0.450**								
7	0.400								
8	0.350								
9	0.300								
10	0.250								
11	0.200								
12	0.150								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 37

Hyd. No. 5

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 0.00 hrs
Time Interval	= 1 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 4 - To Lot 37	Max. Elevation	= 99.30 ft
Pond Name	= Lot 37 Drywell	Max. Storage	= 202 cuft

Pond Routing by Storage Indication Method

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
0.02	0.000								
...end	...end								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Undet

Hyd. No. 6

Hydrograph Type	= Rational	Peak Flow	= 1.076 cfs
Storm Frequency	= 10-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 484 cuft
Drainage Area	= 0.79 ac	Runoff Coeff.	= 0.21
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 6.49 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.538								
4	0.718								
5	0.897								
6	**1.076**								
7	0.957								
8	0.837								
9	0.718								
10	0.598								
11	0.478								
12	0.359								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Drywell total

Hyd. No. 7

Hydrograph Type	= Junction	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 0.00 hrs
Time Interval	= 1 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrographs	= 3, 5	Total Contrib. Area	= 0.0 ac

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
0.02	0.000								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Total

Hyd. No. 8

Hydrograph Type	= Junction	Peak Flow	= 1.076 cfs
Storm Frequency	= 10-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 484 cuft
Inflow Hydrographs	= 6, 7	Total Contrib. Area	= 0.79 ac

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.538								
4	0.718								
5	0.897								
6	**1.076**								
7	0.957								
8	0.837								
9	0.718								
10	0.598								
11	0.478								
12	0.359								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph 100-yr Summary

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

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	Rational	Existing	2.358	0.10	1,061	----		
2	Rational	To Lot 38	0.762	0.10	343	----		
3	Pond Route	Lot 38	0.000	0.00	0.000	2	99.35	343
4	Rational	To Lot 37	0.593	0.10	267	----		
5	Pond Route	Lot 37	0.000	0.00	0.000	4	99.77	267
6	Rational	Undet	1.420	0.10	639	----		
7	Junction	Drywell total	0.000	0.00	0.000	3, 5		
8	Junction	Total	1.420	0.10	639	6, 7		
9	Rational	To Lot 38 12	0.565	0.20	509	----		
10	Pond Route	Lot 38 12	0.182	0.40	132	9	100.01	430
11	Rational	To Lot 37 12	0.439	0.20	396	----		
12	Pond Route	Lot 37 12	0.035	0.48	24.9	11	100.70	389
13	Junction	Drywell 12	0.190	0.45	157	10, 12		
14	Rational	Undet 12	1.052	0.20	947	----		
15	Junction	Total 12	1.052	0.20	1,104	13, 14		
16	Rational	Lot 38 18	0.468	0.30	632	----		
17	Pond Route	Lot 38 18	0.233	0.53	255	16	100.14	448
18	Rational	To Lot 37 18	0.364	0.30	491	----		
19	Pond Route	Lot 37 18	0.138	0.58	121	18	100.86	411
20	Rational	Undet 18	0.871	0.30	1,176	----		
21	Junction	Drywell 18	0.365	0.55	376	17, 19		
22	Junction	Total 18	0.871	0.30	1,552	20, 21		
23	Rational	To 38 24	0.407	0.40	733	----		
24	Pond Route	Lot 38 24	0.246	0.63	357	23	100.19	453
25	Rational	To Lot 37 24	0.317	0.40	570	----		
26	Pond Route	Lot 37 24	0.158	0.70	200	25	100.93	420
27	Rational	Undet 24	0.759	0.40	1,365	----		
28	Junction	Drywell 24	0.399	0.67	557	24, 26		
29	Junction	Total 24	0.869	0.60	1,922	27, 28		
30	Rational	To 38 30	0.365	0.50	822	----		
31	Pond Route	Lot 38 30	0.249	0.73	445	30	100.19	455
32	Rational	To Lot 37 30	0.284	0.50	639	----		
33	Pond Route	Lot 37 30	0.167	0.82	269	32	100.96	424
34	Rational	Undet 30	0.680	0.50	1,530	----		
35	Junction	Drywell 30	0.411	0.78	714	31, 33		
36	Junction	Total 30	0.885	0.70	2,244	34, 35		

Hydrograph 100-yr Summary

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

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)
37	Rational	To Lot 38 36	0.334	0.60	901	----		
38	Pond Route	Lot 38 36	0.247	0.83	525	37	100.19	454
39	Rational	To Lot 37 36	0.260	0.60	701	----		
40	Pond Route	Lot 37 36	0.170	0.92	330	39	100.97	425
41	Rational	Undet 36	0.622	0.60	1,678	----		
42	Junction	Drywell 36	0.413	0.88	855	38, 40		
43	Junction	Total 36	0.879	0.78	2,533	41, 42		
44	Rational	To Lot 38 42	0.309	0.70	974	----		
45	Pond Route	Lot 38 42	0.243	0.92	597	44	100.18	452
46	Rational	To lot 37 42	0.240	0.70	757	----		
47	Pond Route	Lot 37 42	0.171	1.00	387	46	100.97	425
48	Rational	Undet 42	0.576	0.70	1,813	----		
49	Junction	Drywell 42	0.410	0.97	984	45, 47		
50	Junction	Total 42	0.865	0.88	2,797	48, 49		

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Existing

Hyd. No. 1

Hydrograph Type	= Rational	Peak Flow	= 2.358 cfs
Storm Frequency	= 100-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 1,061 cuft
Drainage Area	= 0.95 ac	Runoff Coeff.	= 0.29
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 8.56 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	1.179								
4	1.572								
5	1.965								
6	**2.358**								
7	2.096								
8	1.834								
9	1.572								
10	1.310								
11	1.048								
12	0.786								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

To Lot 38

Hyd. No. 2

Hydrograph Type	= Rational	Peak Flow	= 0.762 cfs
Storm Frequency	= 100-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 343 cuft
Drainage Area	= 0.09 ac	Runoff Coeff.	= 0.99
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 8.56 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.381								
4	0.508								
5	0.635								
6	**0.762**								
7	0.678								
8	0.593								
9	0.508								
10	0.424								
11	0.339								
12	0.254								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 38

Hyd. No. 3

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 0.00 hrs
Time Interval	= 1 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 2 - To Lot 38	Max. Elevation	= 99.35 ft
Pond Name	= Lot 38	Max. Storage	= 343 cuft

Pond Routing by Storage Indication Method

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
0.02	0.000								
...end	...end								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

To Lot 37

Hyd. No. 4

Hydrograph Type	= Rational	Peak Flow	= 0.593 cfs
Storm Frequency	= 100-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 267 cuft
Drainage Area	= 0.07 ac	Runoff Coeff.	= 0.99
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 8.56 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.297								
4	0.395								
5	0.494								
6	**0.593**								
7	0.527								
8	0.461								
9	0.395								
10	0.329								
11	0.264								
12	0.198								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Lot 37

Hyd. No. 5

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 0.00 hrs
Time Interval	= 1 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 4 - To Lot 37	Max. Elevation	= 99.77 ft
Pond Name	= Lot 37 Drywell	Max. Storage	= 267 cuft

Pond Routing by Storage Indication Method

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
0.02	0.000								
...end	...end								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Undet

Hyd. No. 6

Hydrograph Type	= Rational	Peak Flow	= 1.420 cfs
Storm Frequency	= 100-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Runoff Volume	= 639 cuft
Drainage Area	= 0.79 ac	Runoff Coeff.	= 0.21
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
IDF Curve	= NJRSIS.idf	Intensity	= 8.56 in/hr
Freq. Corr. Factor	= 1.00	Asc/Rec Limb Factors	= 1/1.5

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.710								
4	0.946								
5	1.183								
6	**1.420**								
7	1.262								
8	1.104								
9	0.946								
10	0.789								
11	0.631								
12	0.473								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Drywell total

Hyd. No. 7

Hydrograph Type	= Junction	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 0.00 hrs
Time Interval	= 1 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrographs	= 3, 5	Total Contrib. Area	= 0.0 ac

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
0.02	0.000								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.17

01-14-2021

Total

Hyd. No. 8

Hydrograph Type	= Junction	Peak Flow	= 1.420 cfs
Storm Frequency	= 100-yr	Time to Peak	= 0.10 hrs
Time Interval	= 1 min	Hydrograph Volume	= 639 cuft
Inflow Hydrographs	= 6, 7	Total Contrib. Area	= 0.79 ac

Hydrograph Discharge Table

Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)	Time (min)	Outflow (cfs)
3	0.710								
4	0.946								
5	1.183								
6	**1.420**								
7	1.262								
8	1.104								
9	0.946								
10	0.789								
11	0.631								
12	0.473								
...end	*...end*								

Printed values > 35% of Qpeak. nth-point print interval = 1