CHAMBLEE LAKE

ZEBULON, NORTH CAROLINA

EROSION CONTROL
CALCULATION REPORT

PROJECT NUMBER:	**DRH22004**
DESIGNED BY:	**BENJAMIN KINTNER**
CHECKED BY:	**KATIE ANDERSON, PE**
DATE:	**27 FEBRUARY, 2024**

NORTH CAROLINA
PROFESSIONAL
SEAL
054022
ENGINEER
KATHERINE E. ANDERSON

Digitally signed by Katherine E Anderson
Date: 2024.02.26 18:07:52-05'00'

MCADAMS
621 HILLSBOROUGH ST, SUITE 500
RALEIGH, NORTH CAROLINA 27603
NC LIC. # C-0293

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SECTION I

1.0 PROJECT DESCRIPTION

The site of the proposed single-family and multi-family residential development is located on Chamblee Road in Zebulon, North Carolina. The proposed residential development includes approximately 355 dwelling units on approximately 136 acres. It is a mix of single-family and townhomes built on the site. The development also includes offsite road improvements and utility improvements along Chamblee Road.

2.0 EROSION AND SEDIMENT CONTROL MEASURES

All vegetative practices and erosion and sediment control features shall be designed, constructed and maintained to control runoff resulting from the 2 and 10 year frequency storms. Supporting design calculations are attached. Plan-view drawings with details are also provided.

2.1 Temporary Gravel Construction Entrance/Exit

A construction entrance will be needed to clean the tires of vehicles and equipment during wet conditions. There is a high potential for tracking mud and sediment onto adjacent local streets.

2.2 Silt Fence

Sediment fences will be provided down gradient of the proposed site grading at the locations shown on the drawings. The sediment fences will act as a filter for sediment laden runoff sheet flowing from slopes or small areas that cannot be directed to a temporary sediment trap. Silt Fence Outlets will be placed at any low points along the Silt Fence to allow collected runoff to pass through without overwhelming the fencing.

2.3 Storm Drain Inlet Protection

Storm sewer inlets will need to be protected to prevent sediment-laden runoff from clogging the storm pipes during construction. Inlet protection should be used on each inlet until upland areas are stabilized.

2.4 Temporary Diversions

Diversion ditches/berms will be constructed at the locations shown on the drawings. The ditches/berms are to divert sediment-laden water to appropriate traps or suitable outlet.

2.5 Skimmer Sediment Basin

Temporary sediment traps will be constructed at the locations shown on the drawings. Temporary diversion ditches will direct sediment-laden water to the traps. The sediment traps will be maintained during the course of construction until stabilization is reached. The Sediment Traps for this project are designed to be drained within 3 days after a rain event with the use of a Skimmer device.

3.0 VEGETATIVE STABILIZATION

Vegetative cover shall be re-established within 14 calendar days after completion of the activity. Temporary and permanent seeding specifications are attached.

4.0 MAINTENANCE

Sediment fences shall be inspected at least once a week and after each rainfall. Repairs shall be made immediately. Sediment deposits shall be removed as needed to provide adequate storage volume for the next rainfall event, and to reduce pressure on the fence. Fencing materials and sediment deposits shall be removed, and the area brought to grade following stabilization of up-gradient disturbed areas.

5.0 EROSION CONTROL CALCULATION METHODOLOGY

- For the Skimmer Sediment Basins, a drainage area was measured as well as assigning disturbed surface percentage. From this disturbed percentage, a rational c factor was calculated. This data was used for basin sizing.
- The basins were sized using a series of electronic spreadsheets developed to size the basin according to Wake County criteria and to also route the 2 and 10 storm events through the proposed basin to check the spillway device for integrity during these storm events.
- The "Skimmer" water drawdown devices were sized by the method described in "A Manual for Designing, Installing and Maintaining Skimmer Sediment Basins" by J. W. Faircloth & Son.
- The various inlet types are shown on the stormwater detail sheet, within the plan set. Headwalls are used at discharge points. Structures are used at inlet points. Velocity dissipators are provided at discharge points to prevent erosion and scour in these areas. The dissipators have been sized using the NYDOT method.

LIST OF APPENDICES

- SKIMMER SEDIMENT BASIN CALCULATIONS
- DRAINAGE AREA MAPS
- SLOPE DRAIN AND DIVERSION DITCH CALCULATIONS

Skimmer Sediment Basin Calculations

SCM-A
SKIMMER BASIN WITH RISER DESIGN

CHAMBLEE LAKE
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Skimmer Basin Sizing
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Graphed Data for the 10-year storm
Routing for the 25-year storm
Graphed Data for the 25-year storm

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH-22004	Calculated By:	BJK
Sediment Trap ID	SCM-A		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	4.59 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	4.59 ac.	0.25
Undisturbed grassy area	0.00 ac.	0.00 ac.	0.35
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	4.59 ac.	4.59 ac.	
Composite Rational 'c'	0.45	0.25	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	493	feet
Height of watershed =	21	feet
Calculated t(c) =	3.1	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.0	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for Raleigh, NC

Return Period	g	h	Intensity	
2	132	18	5.74	in/hr
10	195	22	7.22	in/hr
25	232	23	8.29	in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff	
2-year storm	5.74 in/hr	11.9 cfs	6.59	cfs
10-year storm	7.22 in/hr	14.9 cfs	8.29	cfs
25-year storm	8.29 in/hr	17.1 cfs	9.51	cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	3,600	cubic feet per disturbed acre
Required sediment trap surface area	435	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	287
Bottom width =	74
Sediment depth =	4.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Permanent Riser =	4.0
Side slopes =	3.0 H:1V
Spillway length =	16
Height of berm =	6
Top of trap length =	323
Top of trap width =	110
Bottom elevation =	314

Sediment Trap Data

	Required	Provided	
Sediment storage volume =	16524 cu. ft.	102880 cu. ft.	
Sediment surface area =	6490 sq. ft.	30480 sq. ft.	
Sediment storage depth =	3.5 ft. (max.)	4	Decrease storage depth
Trap bottom length to width ratio =	2.0L:1W (min)	3.9L:1W	
Spillway length =	10.0 ft. (min)	16	
10-Year flow depth over spillway =	0.50 ft. (max)	-1.94 ft	
Freeboard at 10-Year discharge =	1.00 ft. (min)	3.94 ft	

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU 1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Required for Sediment Basin = 16,524 cubic feet

24 HOURS	Best Option =	1 - 4 inch Skimmers with a 3.6 inch orifice	
2 DAYS	Best Option =	1 - 3 inch Skimmers with a 2.8 inch orifice	
3 DAYS	Best Option =	1 - 2.5 inch Skimmers with a 2.3 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2.5 inch Skimmers with a 2 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

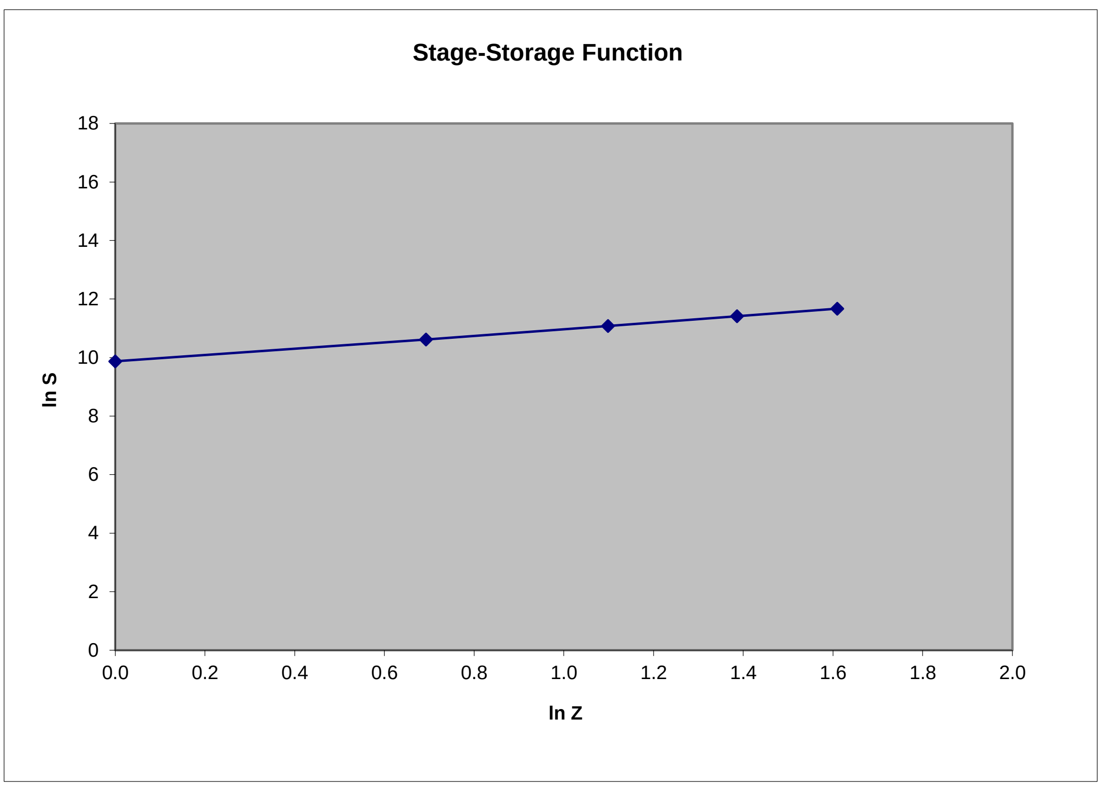
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
314	18271		0	0			
315	20539	19405	19405	1	9.8733	0.0000	1.01
316	22562	21550.5	40955.5	2	10.6202	0.6931	1.97
317	24641	23601.5	64557	3	11.0753	1.0986	2.97
318	26776	25708.5	90265.5	4	11.4105	1.3863	4.01
319	26968	26872	117137.5	5	11.6711	1.6094	5.06

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.12 and **K_s =** 19172



HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	4.59	ac	**Use Kirpich Equation:**	
Disturbed Area =	4.59	ac	**Tc =**	5.0 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	493	ft	**i_1 =**	5.74 in/hr
Vertical Fall =	21	ft	**i_{10} =**	7.22 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	8.29 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	11.9 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	14.9 cfs
h =	23		**Q_{25} =**	17.1 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	29.4	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	39.1	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	42.0	**minutes**

McADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	315.43 ft
		Rise =	1.43 ft
Freeboard =	4.57 ft	**Peak Outflow =**	0.07 cfs

INPUT

Hydrograph Results:

Qp = 11.85 cfs
Tp = 29.4 min
dT = 1.0 min

Stage-Storage Results:

Ks = 19172
b = 1.12
Z_0 = 314.0 ft (inv)

Initial Water Level:

Z_i = 314.00 ft

Weir:

N = 1
L = 16 ft
Cw = 3.00
Zcr = 318.00 ft

Top of Dam: 320.00 ft

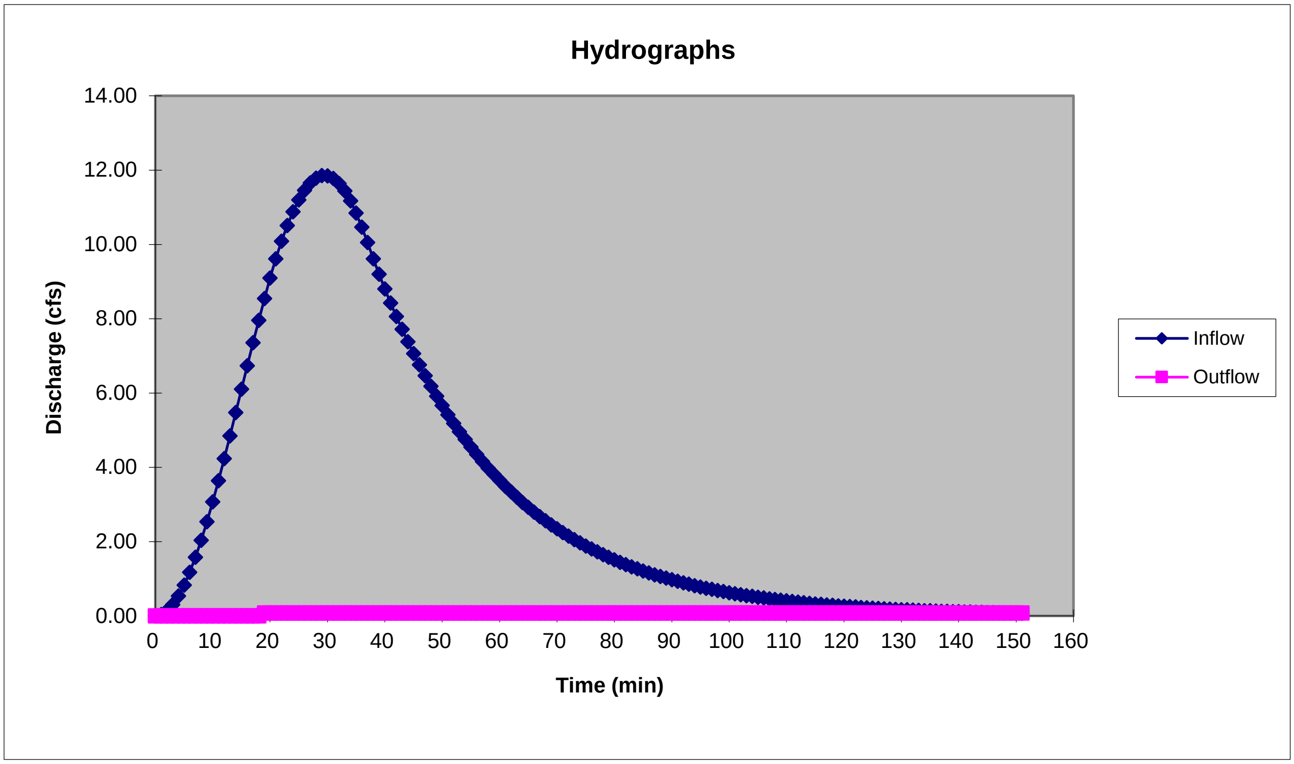
Skimmer Orifice:

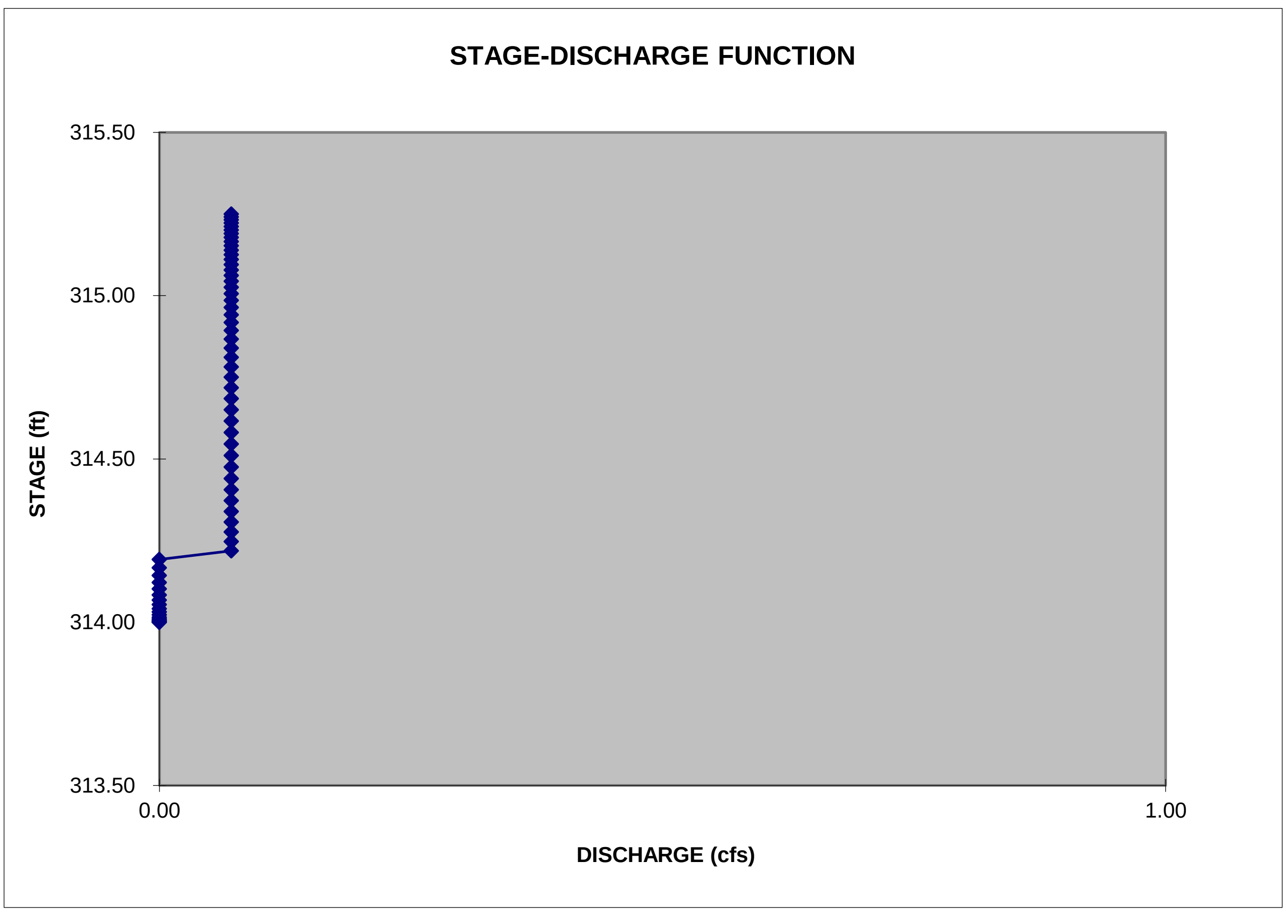
Number = 1.00 Ea
Diameter = 2.50 Inches
Head = 2.35 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	314.00	0.0	0.0	0.0		
1	0	0.00	314.00	0.0	0.0	0.00		
2	0	2.02	314.00	0.0	0.0	0.00		
3	0	10.08	314.00	0.0	0.0	0.00		
4	1	28.14	314.00	0.0	0.0	0.00		
5	1	60.03	314.01	0.0	0.0	0.00		
6	1	109.43	314.01	0.0	0.0	0.00		
7	2	179.82	314.02	0.0	0.0	0.00		
8	2	274.45	314.02	0.0	0.0	0.00		
9	3	396.28	314.03	0.0	0.0	0.00		
10	3	547.97	314.04	0.0	0.0	0.00		
11	4	731.84	314.05	0.0	0.0	0.00		
12	4	949.85	314.07	0.0	0.0	0.00		
13	5	1203.55	314.08	0.0	0.0	0.00		
14	5	1494.11	314.10	0.0	0.0	0.00		
15	6	1822.26	314.12	0.0	0.0	0.00		
16	7	2188.32	314.14	0.0	0.0	0.00		
17	7	2592.17	314.17	0.0	0.0	0.00		
18	8	3033.26	314.19	0.0	0.0	0.00		
19	9	3510.62	314.22	0.1	0.0	0.07		
20	9	4018.58	314.25	0.1	0.0	0.07		
21	10	4559.65	314.28	0.1	0.0	0.07		
22	10	5131.66	314.31	0.1	0.0	0.07		
23	11	5732.11	314.34	0.1	0.0	0.07		
24	11	6358.17	314.37	0.1	0.0	0.07		
25	11	7006.71	314.41	0.1	0.0	0.07		
26	11	7674.35	314.44	0.1	0.0	0.07		
27	12	8357.51	314.48	0.1	0.0	0.07		
28	12	9052.40	314.51	0.1	0.0	0.07		
29	12	9755.12	314.55	0.1	0.0	0.07		
30	12	10461.68	314.58	0.1	0.0	0.07		
31	12	11168.03	314.62	0.1	0.0	0.07		
32	12	11870.14	314.65	0.1	0.0	0.07		
33	11	12564.03	314.68	0.1	0.0	0.07		
34	11	13245.79	314.72	0.1	0.0	0.07		
35	11	13911.68	314.75	0.1	0.0	0.07		
36	10	14558.11	314.78	0.1	0.0	0.07		
37	10	15181.73	314.81	0.1	0.0	0.07		
38	10	15780.26	314.84	0.1	0.0	0.07		
39	9	16352.76	314.87	0.1	0.0	0.07		
40	9	16900.35	314.89	0.1	0.0	0.07		

GRAPHED DATA FOR 2 YEAR STORM





ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

Peak Stage =	316.06 ft
Rise =	2.06 ft
Freeboard =	3.94 ft
Peak Outflow =	0.07 cfs

INPUT

Hydrograph Results:

Qp =	14.92	cfs
Tp =	39.1	min
dT =	1.0	min

Stage-Storage Results:

Ks =	19172	
b =	1.12	
Z_0 =	314.0	ft (inv)

Initial Water Level:

Z_i =	314.00	ft

Weir:

N =	1	
L =	16	ft
Cw =	3.00	
Zcr =	318.00	ft

Top of Dam: 320.00 ft

Skimmer Orifice:

Number =	1	Ea
Diameter =	2.50	Inches
Head =	2.35	inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	314.00	0.0	0.0	0.0		
1	0	0.00	314.00	0.0	0.0	0.00		
2	0	1.44	314.00	0.0	0.0	0.00		
3	0	7.20	314.00	0.0	0.0	0.00		
4	0	20.12	314.00	0.0	0.0	0.00		
5	1	43.00	314.00	0.0	0.0	0.00		
6	1	78.58	314.01	0.0	0.0	0.00		
7	1	129.51	314.01	0.0	0.0	0.00		
8	1	198.35	314.02	0.0	0.0	0.00		
9	2	287.54	314.02	0.0	0.0	0.00		
10	2	399.38	314.03	0.0	0.0	0.00		
11	3	536.04	314.04	0.0	0.0	0.00		
12	3	699.53	314.05	0.0	0.0	0.00		
13	4	891.66	314.06	0.0	0.0	0.00		
14	4	1114.09	314.08	0.0	0.0	0.00		
15	5	1368.27	314.09	0.0	0.0	0.00		
16	5	1655.45	314.11	0.0	0.0	0.00		
17	6	1976.65	314.13	0.0	0.0	0.00		
18	7	2332.69	314.15	0.0	0.0	0.00		
19	7	2724.15	314.17	0.0	0.0	0.00		
20	8	3151.41	314.20	0.0	0.0	0.00		
21	8	3614.60	314.22	0.1	0.0	0.07		
22	9	4109.31	314.25	0.1	0.0	0.07		
23	9	4639.52	314.28	0.1	0.0	0.07		
24	10	5204.65	314.31	0.1	0.0	0.07		
25	11	5803.93	314.34	0.1	0.0	0.07		
26	11	6436.34	314.38	0.1	0.0	0.07		
27	12	7100.68	314.41	0.1	0.0	0.07		
28	12	7795.51	314.45	0.1	0.0	0.07		
29	13	8519.21	314.48	0.1	0.0	0.07		
30	13	9269.98	314.52	0.1	0.0	0.07		
31	13	10045.83	314.56	0.1	0.0	0.07		
32	14	10844.63	314.60	0.1	0.0	0.07		
33	14	11664.07	314.64	0.1	0.0	0.07		
34	14	12501.75	314.68	0.1	0.0	0.07		
35	15	13355.11	314.72	0.1	0.0	0.07		
36	15	14221.51	314.77	0.1	0.0	0.07		
37	15	15098.24	314.81	0.1	0.0	0.07		
38	15	15982.48	314.85	0.1	0.0	0.07		
39	15	16871.41	314.89	0.1	0.0	0.07		
40	15	17762.15	314.93	0.1	0.0	0.07		
41	15	18651.82	314.98	0.1	0.0	0.07		
42	15	19537.54	315.02	0.1	0.0	0.07		
43	15	20416.46	315.06	0.1	0.0	0.07		
44	14	21285.78	315.10	0.1	0.0	0.07		
45	14	22142.75	315.14	0.1	0.0	0.07		
46	14	22984.69	315.18	0.1	0.0	0.07		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time	Inflow	Storage	Stage	Outflow	Weir	Skimmer		
T	I	S	Z	O	Flow	Flow		
min	cfs	cu-ft	ft	cfs	cfs	cfs		
47	13	23809.06	315.21	0.1	0.0	0.07		
48	13	24613.38	315.25	0.1	0.0	0.07		
49	10	25395.33	315.29	0.1	0.0	0.07		
50	10	25997.07	315.31	0.1	0.0	0.07		
51	9	26579.01	315.34	0.1	0.0	0.07		
52	9	27141.79	315.37	0.1	0.0	0.07		
53	9	27686.04	315.39	0.1	0.0	0.07		
54	9	28212.37	315.41	0.1	0.0	0.07		
55	8	28721.35	315.44	0.1	0.0	0.07		
56	8	29213.57	315.46	0.1	0.0	0.07		
57	8	29689.55	315.48	0.1	0.0	0.07		
58	7	30149.85	315.50	0.1	0.0	0.07		
59	7	30594.96	315.52	0.1	0.0	0.07		
60	7	31025.39	315.54	0.1	0.0	0.07		
61	7	31441.61	315.56	0.1	0.0	0.07		
62	7	31844.09	315.58	0.1	0.0	0.07		
63	6	32233.28	315.59	0.1	0.0	0.07		
64	6	32609.61	315.61	0.1	0.0	0.07		
65	6	32973.50	315.63	0.1	0.0	0.07		
66	6	33325.36	315.64	0.1	0.0	0.07		
67	6	33665.58	315.66	0.1	0.0	0.07		
68	5	33994.54	315.67	0.1	0.0	0.07		
69	5	34312.62	315.68	0.1	0.0	0.07		
70	5	34620.16	315.70	0.1	0.0	0.07		
71	5	34917.51	315.71	0.1	0.0	0.07		
72	5	35205.00	315.72	0.1	0.0	0.07		
73	5	35482.96	315.74	0.1	0.0	0.07		
74	4	35751.70	315.75	0.1	0.0	0.07		
75	4	36011.51	315.76	0.1	0.0	0.07		
76	4	36262.69	315.77	0.1	0.0	0.07		
77	4	36505.53	315.78	0.1	0.0	0.07		
78	4	36740.29	315.79	0.1	0.0	0.07		
79	4	36967.24	315.80	0.1	0.0	0.07		
80	4	37186.63	315.81	0.1	0.0	0.07		
81	3	37398.71	315.82	0.1	0.0	0.07		
82	3	37603.72	315.83	0.1	0.0	0.07		
83	3	37801.90	315.84	0.1	0.0	0.07		
84	3	37993.45	315.85	0.1	0.0	0.07		
85	3	38178.61	315.85	0.1	0.0	0.07		
86	3	38357.58	315.86	0.1	0.0	0.07		
87	3	38530.55	315.87	0.1	0.0	0.07		
88	3	38697.74	315.88	0.1	0.0	0.07		
89	3	38859.32	315.88	0.1	0.0	0.07		
90	3	39015.48	315.89	0.1	0.0	0.07		
91	3	39166.40	315.90	0.1	0.0	0.07		
92	2	39312.25	315.90	0.1	0.0	0.07		
93	2	39453.19	315.91	0.1	0.0	0.07		
94	2	39589.39	315.91	0.1	0.0	0.07		
95	2	39720.99	315.92	0.1	0.0	0.07		
96	2	39848.15	315.93	0.1	0.0	0.07		
97	2	39971.02	315.93	0.1	0.0	0.07		
98	2	40089.74	315.94	0.1	0.0	0.07		
99	2	40204.43	315.94	0.1	0.0	0.07		
100	2	40315.23	315.95	0.1	0.0	0.07		
101	2	40422.28	315.95	0.1	0.0	0.07		
102	2	40525.69	315.96	0.1	0.0	0.07		
103	2	40625.57	315.96	0.1	0.0	0.07		
104	2	40722.06	315.96	0.1	0.0	0.07		
105	2	40815.25	315.97	0.1	0.0	0.07		
106	2	40905.25	315.97	0.1	0.0	0.07		
107	1	40992.18	315.98	0.1	0.0	0.07		
108	1	41076.12	315.98	0.1	0.0	0.07		
109	1	41157.18	315.98	0.1	0.0	0.07		
110	1	41235.45	315.99	0.1	0.0	0.07		
111	1	41311.03	315.99	0.1	0.0	0.07		
112	1	41383.99	315.99	0.1	0.0	0.07		
113	1	41454.43	316.00	0.1	0.0	0.07		
114	1	41522.43	316.00	0.1	0.0	0.07		
115	1	41588.06	316.00	0.1	0.0	0.07		
116	1	41651.41	316.00	0.1	0.0	0.07		
117	1	41712.55	316.01	0.1	0.0	0.07		
118	1	41771.56	316.01	0.1	0.0	0.07		
119	1	41828.49	316.01	0.1	0.0	0.07		
120	1	41883.42	316.01	0.1	0.0	0.07		
121	1	41936.42	316.02	0.1	0.0	0.07		
122	1	41987.55	316.02	0.1	0.0	0.07		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
123	1	42036.87	316.02	0.1	0.0	0.07		
124	1	42084.43	316.02	0.1	0.0	0.07		
125	1	42130.30	316.02	0.1	0.0	0.07		
126	1	42174.53	316.03	0.1	0.0	0.07		
127	1	42217.18	316.03	0.1	0.0	0.07		
128	1	42258.29	316.03	0.1	0.0	0.07		
129	1	42297.92	316.03	0.1	0.0	0.07		
130	1	42336.11	316.03	0.1	0.0	0.07		
131	1	42372.92	316.03	0.1	0.0	0.07		
132	1	42408.38	316.04	0.1	0.0	0.07		
133	1	42442.54	316.04	0.1	0.0	0.07		
134	1	42475.45	316.04	0.1	0.0	0.07		
135	1	42507.14	316.04	0.1	0.0	0.07		
136	1	42537.66	316.04	0.1	0.0	0.07		
137	1	42567.04	316.04	0.1	0.0	0.07		
138	1	42595.31	316.04	0.1	0.0	0.07		
139	1	42622.53	316.05	0.1	0.0	0.07		
140	0	42648.71	316.05	0.1	0.0	0.07		
141	0	42673.90	316.05	0.1	0.0	0.07		
142	0	42698.13	316.05	0.1	0.0	0.07		
143	0	42721.43	316.05	0.1	0.0	0.07		
144	0	42743.82	316.05	0.1	0.0	0.07		
145	0	42765.34	316.05	0.1	0.0	0.07		
146	0	42786.02	316.05	0.1	0.0	0.07		
147	0	42805.88	316.05	0.1	0.0	0.07		
148	0	42824.95	316.05	0.1	0.0	0.07		
149	0	42843.26	316.06	0.1	0.0	0.07		
150	0	42860.84	316.06	0.1	0.0	0.07		
151	0	42877.69	**316.06**	0.1	0.0	0.07		

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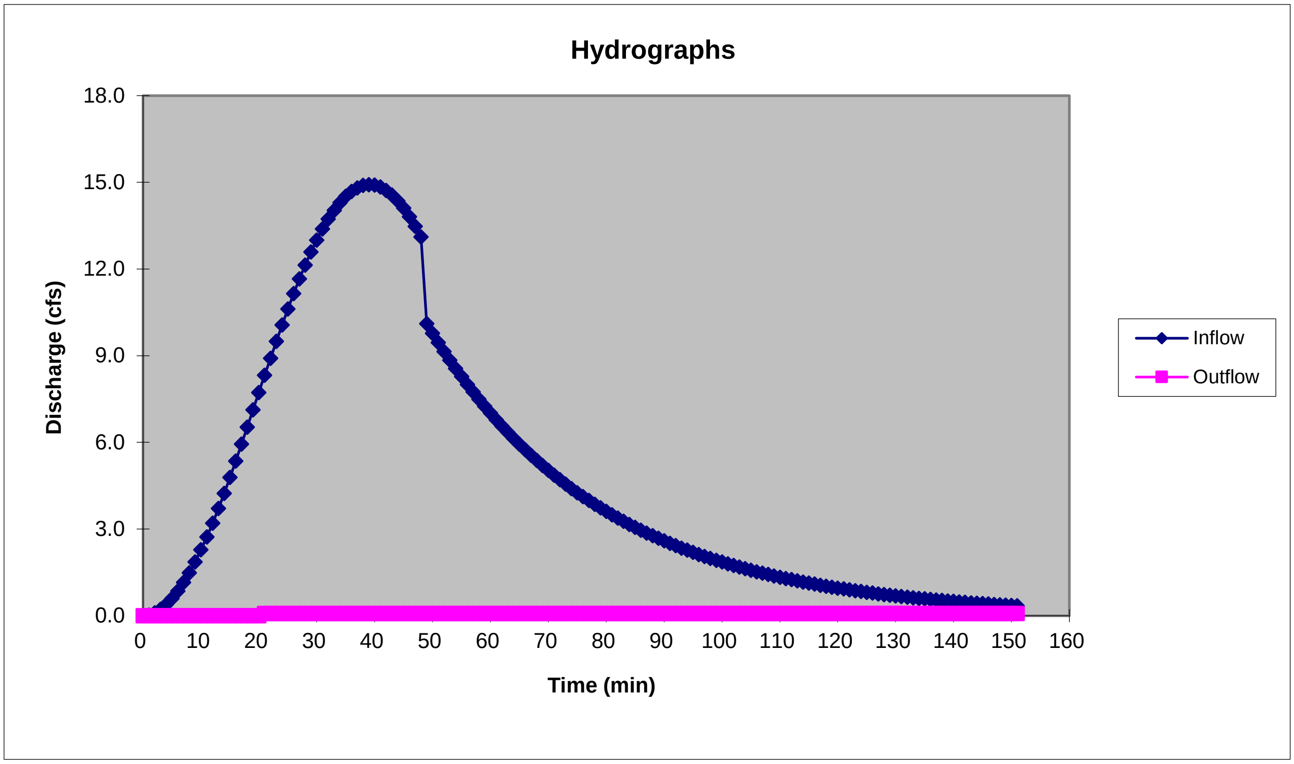
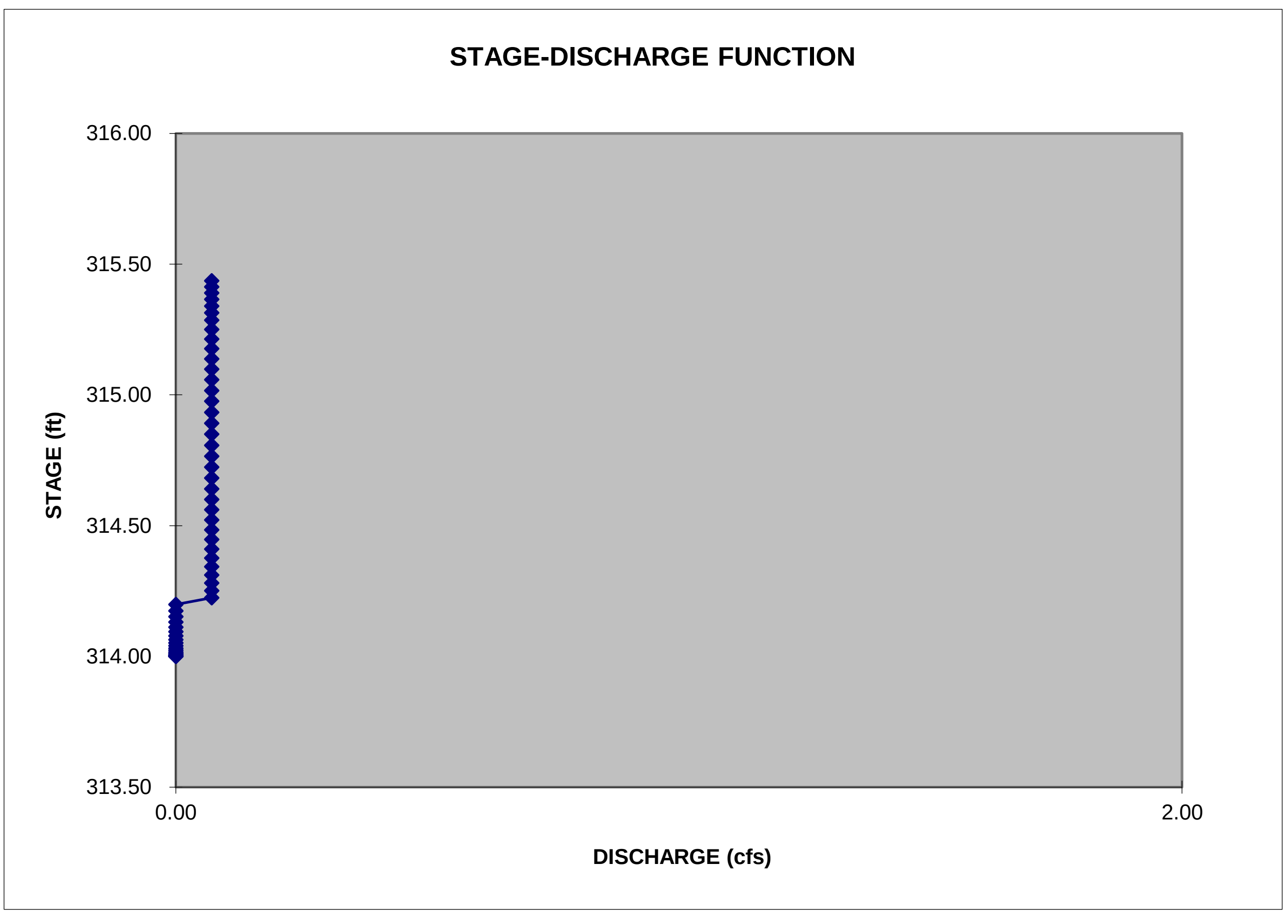
GRAPHED DATA FOR 10 YEAR STORM





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ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	316.22 ft
		Rise =	2.22 ft
Freeboard =	3.78 ft	Peak Outflow =	0.07 cfs

INPUT

Hydrograph Results:

Qp =	17.11	cfs
Tp =	39.1	min
dT =	1.0	min

Stage-Storage Results:

Ks =	19172	
b =	1.12	
Z_0 =	314.0	ft (inv)

Initial Water Level:

Z_i =	314.00	ft

Weir:

N =	1	
L =	16	ft
Cw =	3.00	
Zcr =	318.00	ft

Top of Dam: 320.00 ft

Skimmer Orifice:

Number =	1.00	Ea
Diameter =	2.50	Inches
Head =	2.35	inches

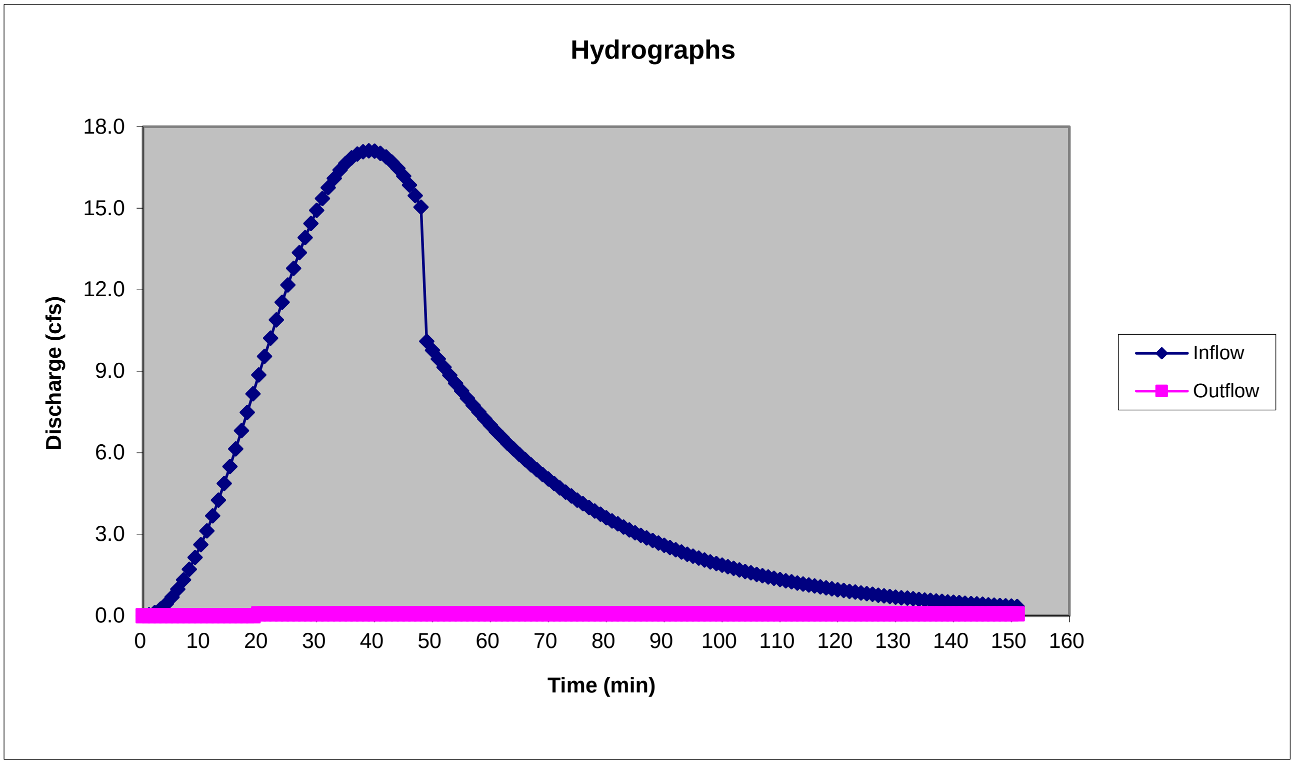
OUTPUT

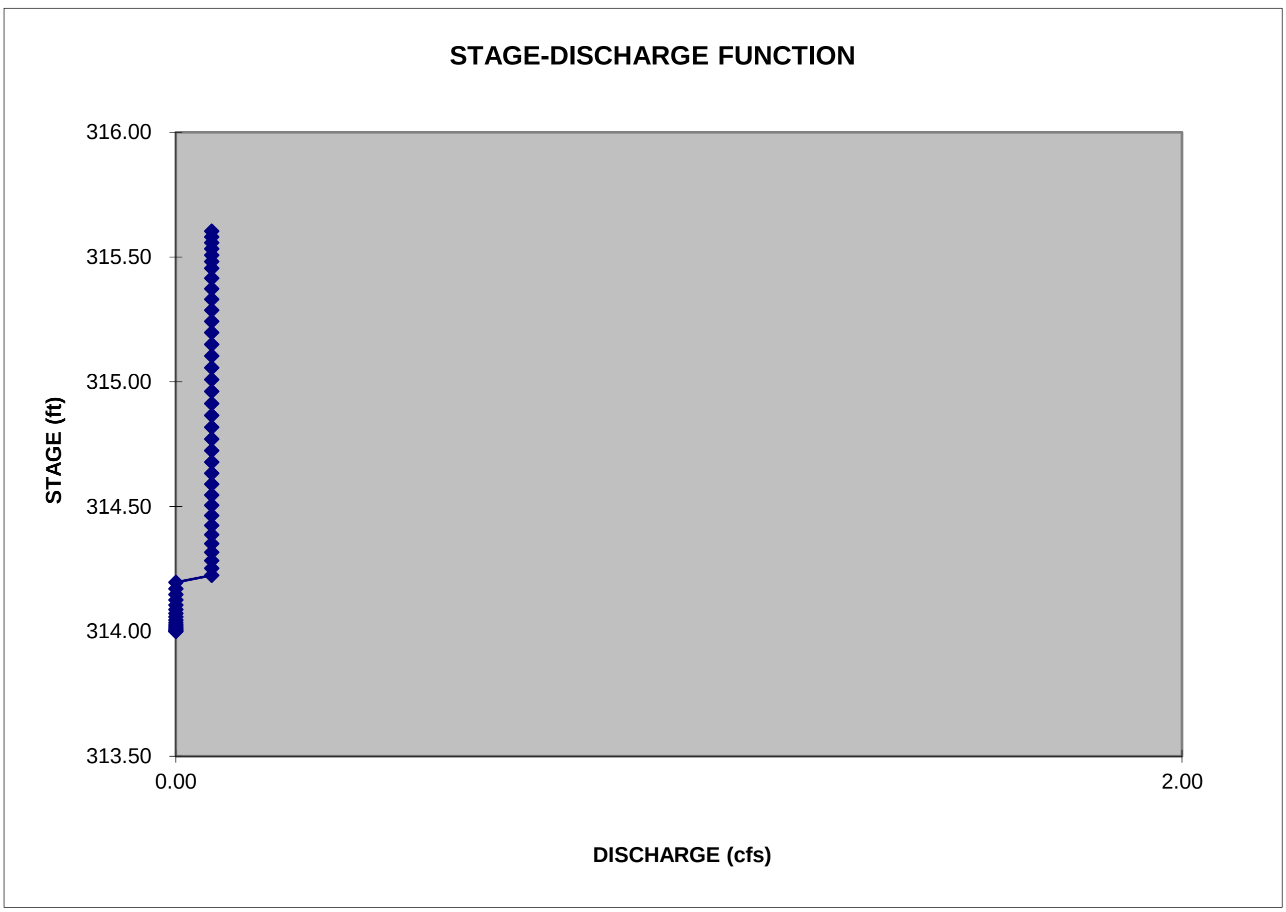
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	314.00	0.0	0.0	0.0		
1	0	0.00	314.00	0.0	0.0	0.00		
2	0	1.65	314.00	0.0	0.0	0.00		
3	0	8.26	314.00	0.0	0.0	0.00		
4	0	23.08	314.00	0.0	0.0	0.00		
5	1	49.33	314.00	0.0	0.0	0.00		
6	1	90.15	314.01	0.0	0.0	0.00		
7	1	148.58	314.01	0.0	0.0	0.00		
8	2	227.56	314.02	0.0	0.0	0.00		
9	2	329.88	314.03	0.0	0.0	0.00		
10	3	458.19	314.04	0.0	0.0	0.00		
11	3	614.98	314.05	0.0	0.0	0.00		
12	4	802.53	314.06	0.0	0.0	0.00		
13	4	1022.96	314.07	0.0	0.0	0.00		
14	5	1278.15	314.09	0.0	0.0	0.00		
15	5	1569.76	314.11	0.0	0.0	0.00		
16	6	1899.22	314.13	0.0	0.0	0.00		
17	7	2267.71	314.15	0.0	0.0	0.00		
18	7	2676.18	314.17	0.0	0.0	0.00		
19	8	3125.29	314.20	0.0	0.0	0.00		
20	9	3615.47	314.22	0.1	0.0	0.07		
21	10	4142.57	314.25	0.1	0.0	0.07		
22	10	4710.77	314.28	0.1	0.0	0.07		
23	11	5319.68	314.32	0.1	0.0	0.07		
24	12	5968.66	314.35	0.1	0.0	0.07		
25	12	6656.81	314.39	0.1	0.0	0.07		
26	13	7382.98	314.43	0.1	0.0	0.07		
27	13	8145.77	314.46	0.1	0.0	0.07		
28	14	8943.55	314.51	0.1	0.0	0.07		
29	14	9774.45	314.55	0.1	0.0	0.07		
30	15	10636.40	314.59	0.1	0.0	0.07		
31	15	11527.13	314.63	0.1	0.0	0.07		
32	16	12444.18	314.68	0.1	0.0	0.07		
33	16	13384.93	314.72	0.1	0.0	0.07		
34	16	14346.58	314.77	0.1	0.0	0.07		
35	17	15326.23	314.82	0.1	0.0	0.07		
36	17	16320.85	314.87	0.1	0.0	0.07		
37	17	17327.30	314.91	0.1	0.0	0.07		
38	17	18342.39	314.96	0.1	0.0	0.07		
39	17	19362.85	315.01	0.1	0.0	0.07		
40	17	20385.38	315.06	0.1	0.0	0.07		
41	17	21406.69	315.10	0.1	0.0	0.07		
42	17	22423.47	315.15	0.1	0.0	0.07		
43	17	23432.44	315.20	0.1	0.0	0.07		
44	16	24430.40	315.24	0.1	0.0	0.07		
45	16	25414.19	315.29	0.1	0.0	0.07		
46	16	26380.74	315.33	0.1	0.0	0.07		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time	Inflow	Storage	Stage	Outflow	Weir	Skimmer		
T	I	S	Z	O	Flow	Flow		
min	cfs	cu-ft	ft	cfs	cfs	cfs		
47	15	27327.13	315.37	0.1	0.0	0.07		
48	15	28250.52	315.42	0.1	0.0	0.07		
49	10	29148.25	315.46	0.1	0.0	0.07		
50	10	29749.99	315.48	0.1	0.0	0.07		
51	9	30331.93	315.51	0.1	0.0	0.07		
52	9	30894.71	315.53	0.1	0.0	0.07		
53	9	31438.96	315.56	0.1	0.0	0.07		
54	9	31965.28	315.58	0.1	0.0	0.07		
55	8	32474.27	315.60	0.1	0.0	0.07		
56	8	32966.48	315.63	0.1	0.0	0.07		
57	8	33442.47	315.65	0.1	0.0	0.07		
58	7	33902.76	315.67	0.1	0.0	0.07		
59	7	34347.88	315.69	0.1	0.0	0.07		
60	7	34778.30	315.70	0.1	0.0	0.07		
61	7	35194.52	315.72	0.1	0.0	0.07		
62	7	35597.00	315.74	0.1	0.0	0.07		
63	6	35986.19	315.76	0.1	0.0	0.07		
64	6	36362.52	315.77	0.1	0.0	0.07		
65	6	36726.41	315.79	0.1	0.0	0.07		
66	6	37078.27	315.81	0.1	0.0	0.07		
67	6	37418.50	315.82	0.1	0.0	0.07		
68	5	37747.46	315.83	0.1	0.0	0.07		
69	5	38065.53	315.85	0.1	0.0	0.07		
70	5	38373.08	315.86	0.1	0.0	0.07		
71	5	38670.43	315.87	0.1	0.0	0.07		
72	5	38957.92	315.89	0.1	0.0	0.07		
73	5	39235.88	315.90	0.1	0.0	0.07		
74	4	39504.61	315.91	0.1	0.0	0.07		
75	4	39764.43	315.92	0.1	0.0	0.07		
76	4	40015.61	315.93	0.1	0.0	0.07		
77	4	40258.45	315.94	0.1	0.0	0.07		
78	4	40493.21	315.95	0.1	0.0	0.07		
79	4	40720.15	315.96	0.1	0.0	0.07		
80	4	40939.55	315.97	0.1	0.0	0.07		
81	3	41151.63	315.98	0.1	0.0	0.07		
82	3	41356.64	315.99	0.1	0.0	0.07		
83	3	41554.81	316.00	0.1	0.0	0.07		
84	3	41746.37	316.01	0.1	0.0	0.07		
85	3	41931.53	316.02	0.1	0.0	0.07		
86	3	42110.49	316.02	0.1	0.0	0.07		
87	3	42283.47	316.03	0.1	0.0	0.07		
88	3	42450.66	316.04	0.1	0.0	0.07		
89	3	42612.24	316.05	0.1	0.0	0.07		
90	3	42768.40	316.05	0.1	0.0	0.07		
91	3	42919.32	316.06	0.1	0.0	0.07		
92	2	43065.17	316.06	0.1	0.0	0.07		
93	2	43206.11	316.07	0.1	0.0	0.07		
94	2	43342.30	316.08	0.1	0.0	0.07		
95	2	43473.91	316.08	0.1	0.0	0.07		
96	2	43601.07	316.09	0.1	0.0	0.07		
97	2	43723.94	316.09	0.1	0.0	0.07		
98	2	43842.65	316.10	0.1	0.0	0.07		
99	2	43957.35	316.10	0.1	0.0	0.07		
100	2	44068.15	316.11	0.1	0.0	0.07		
101	2	44175.20	316.11	0.1	0.0	0.07		
102	2	44278.60	316.12	0.1	0.0	0.07		
103	2	44378.49	316.12	0.1	0.0	0.07		
104	2	44474.97	316.13	0.1	0.0	0.07		
105	2	44568.16	316.13	0.1	0.0	0.07		
106	2	44658.17	316.13	0.1	0.0	0.07		
107	1	44745.09	316.14	0.1	0.0	0.07		
108	1	44829.04	316.14	0.1	0.0	0.07		
109	1	44910.10	316.14	0.1	0.0	0.07		
110	1	44988.37	316.15	0.1	0.0	0.07		
111	1	45063.94	316.15	0.1	0.0	0.07		
112	1	45136.91	316.15	0.1	0.0	0.07		
113	1	45207.35	316.16	0.1	0.0	0.07		
114	1	45275.34	316.16	0.1	0.0	0.07		
115	1	45340.98	316.16	0.1	0.0	0.07		
116	1	45404.33	316.16	0.1	0.0	0.07		
117	1	45465.47	316.17	0.1	0.0	0.07		
118	1	45524.47	316.17	0.1	0.0	0.07		
119	1	45581.41	316.17	0.1	0.0	0.07		
120	1	45636.34	316.17	0.1	0.0	0.07		
121	1	45689.34	316.18	0.1	0.0	0.07		
122	1	45740.47	316.18	0.1	0.0	0.07		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	45789.78	316.18	0.1	0.0	0.07		
124	1	45837.35	316.18	0.1	0.0	0.07		
125	1	45883.22	316.19	0.1	0.0	0.07		
126	1	45927.45	316.19	0.1	0.0	0.07		
127	1	45970.09	316.19	0.1	0.0	0.07		
128	1	46011.20	316.19	0.1	0.0	0.07		
129	1	46050.83	316.19	0.1	0.0	0.07		
130	1	46089.03	316.19	0.1	0.0	0.07		
131	1	46125.83	316.20	0.1	0.0	0.07		
132	1	46161.29	316.20	0.1	0.0	0.07		
133	1	46195.46	316.20	0.1	0.0	0.07		
134	1	46228.36	316.20	0.1	0.0	0.07		
135	1	46260.06	316.20	0.1	0.0	0.07		
136	1	46290.57	316.20	0.1	0.0	0.07		
137	1	46319.95	316.20	0.1	0.0	0.07		
138	1	46348.23	316.21	0.1	0.0	0.07		
139	1	46375.45	316.21	0.1	0.0	0.07		
140	0	46401.63	316.21	0.1	0.0	0.07		
141	0	46426.82	316.21	0.1	0.0	0.07		
142	0	46451.05	316.21	0.1	0.0	0.07		
143	0	46474.34	316.21	0.1	0.0	0.07		
144	0	46496.73	316.21	0.1	0.0	0.07		
145	0	46518.26	316.21	0.1	0.0	0.07		
146	0	46538.93	316.21	0.1	0.0	0.07		
147	0	46558.80	316.21	0.1	0.0	0.07		
148	0	46577.87	316.21	0.1	0.0	0.07		
149	0	46596.18	316.22	0.1	0.0	0.07		
150	0	46613.75	316.22	0.1	0.0	0.07		
151	0	46630.61	**316.22**	0.1	0.0	0.07		

GRAPHED DATA FOR 25 YEAR STORM





SCM-B
SKIMMER BASIN WITH RISER DESIGN

CHAMBLEE LAKE
ZEBULON
DRH-22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm
Routing for the 25-year storm
Graphed Data for the 25-year storm

MCADAMS
SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH-22004	Calculated By:	BJK
Sediment Trap ID	SCM-B		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	12.24 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	0.50 ac.	0.25
Undisturbed grassy area	0.00 ac.	11.74 ac.	0.35
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	12.24 ac.	12.24 ac.	
Composite Rational 'c'	0.45	0.35	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	1476	feet
Height of watershed =	29	feet
Calculated t(c) =	9.8	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	9.8	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for Raleigh, NC

Return Period	g	h	Intensity
2	132	18	4.75 in/hr
10	195	22	6.14 in/hr
25	232	23	7.08 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	4.75 in/hr	26.2 cfs	20.12 cfs
10-year storm	6.14 in/hr	33.8 cfs	25.98 cfs
25-year storm	7.08 in/hr	39.0 cfs	29.97 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	3,600	cubic feet per disturbed acre
Required sediment trap surface area	435	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	245
Bottom width =	90
Sediment depth =	4.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Permanent Riser =	4.0
Side slopes =	3.0 H:1V
Spillway length =	24
Height of berm =	6
Top of trap length =	281
Top of trap width =	126
Bottom elevation =	310

Sediment Trap Data

	Required	Provided	
Sediment storage volume =	44064 cu. ft.	104970 cu. ft.	
Sediment surface area =	14700 sq. ft.	30670 sq. ft.	
Sediment storage depth =	3.5 ft. (max.)	4	Decrease storage depth
Trap bottom length to width ratio =	2.0L:1W (min)	2.7L:1W	
Spillway length =	10.0 ft. (min)	24	
10-Year flow depth over spillway =	0.50 ft. (max)	0.02 ft	
Freeboard at 10-Year discharge =	1.00 ft. (min)	1.98 ft	

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU 1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Required for Sediment Basin = 44,064 cubic feet

24 HOURS	Best Option =	1 - 6 inch Skimmers with a 5.6 inch orifice	
2 DAYS	Best Option =	1 - 5 inch Skimmers with a 4.1 inch orifice	
3 DAYS	Best Option =	1 - 4 inch Skimmers with a 3.4 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 4 inch Skimmers with a 3 inch orifice	

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STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

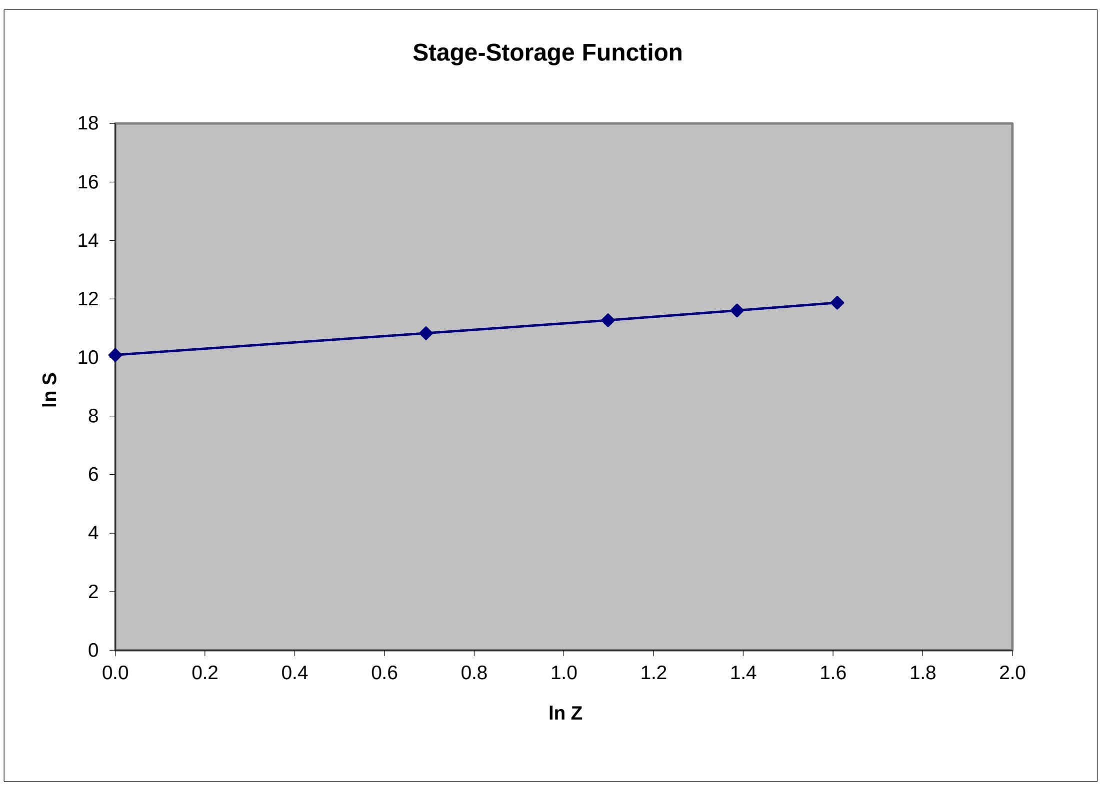
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6 Y	7 X	8
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
310	22976		0	0			
311	25208	24092	24092	1	10.0896	0.0000	1.01
312	27506	26357	50449	2	10.8287	0.6931	1.97
313	29870	28688	79137	3	11.2789	1.0986	2.96
314	32301	31085.5	110222.5	4	11.6103	1.3863	4.00
315	34797	33549	143771.5	5	11.8760	1.6094	5.08

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.11 and **K_s =** 23773



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HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	12.24	ac	**Use Kirpich Equation:**	
Disturbed Area =	12.24	ac	**Tc =**	9.8 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	1476	ft	**i_1 =**	4.75 in/hr
Vertical Fall =	29	ft	**i_{10} =**	6.14 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	7.08 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	26.2 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	33.8 cfs
h =	23		**Q_{25} =**	39.0 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	35.6	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	46.0	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	49.1	**minutes**

MCADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**312.84** ft
		Rise =	**2.84** ft
Freeboard =	**3.16** ft	**Peak Outflow =**	**0.22** cfs

INPUT

Hydrograph Results:

Qp = 26.18 cfs
Tp = 35.6 min
dT = 1.0 min

Stage-Storage Results:

Ks = 23773
b = 1.11
Z_0 = 310.0 ft (inv)

Initial Water Level:

Z_i = 310.00 ft

Weir:

N = 1
L = 24 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

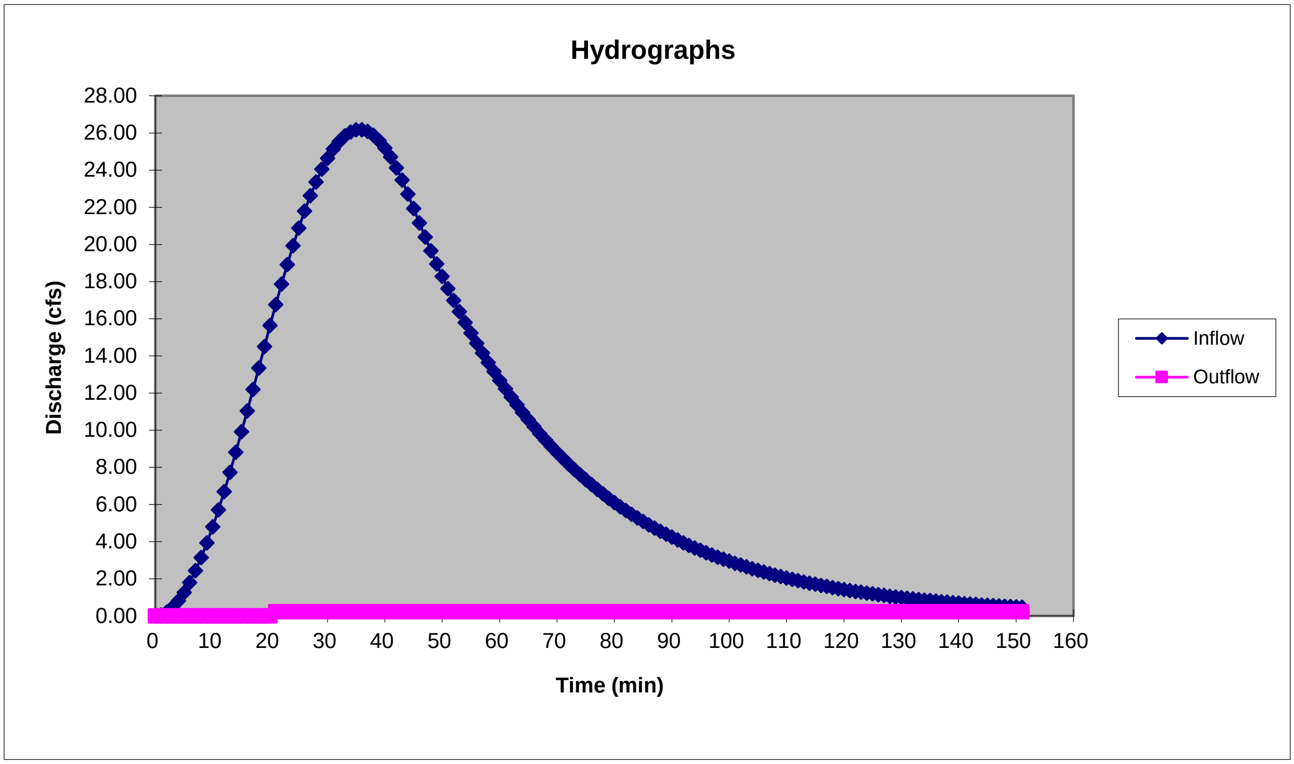
Skimmer Orifice:

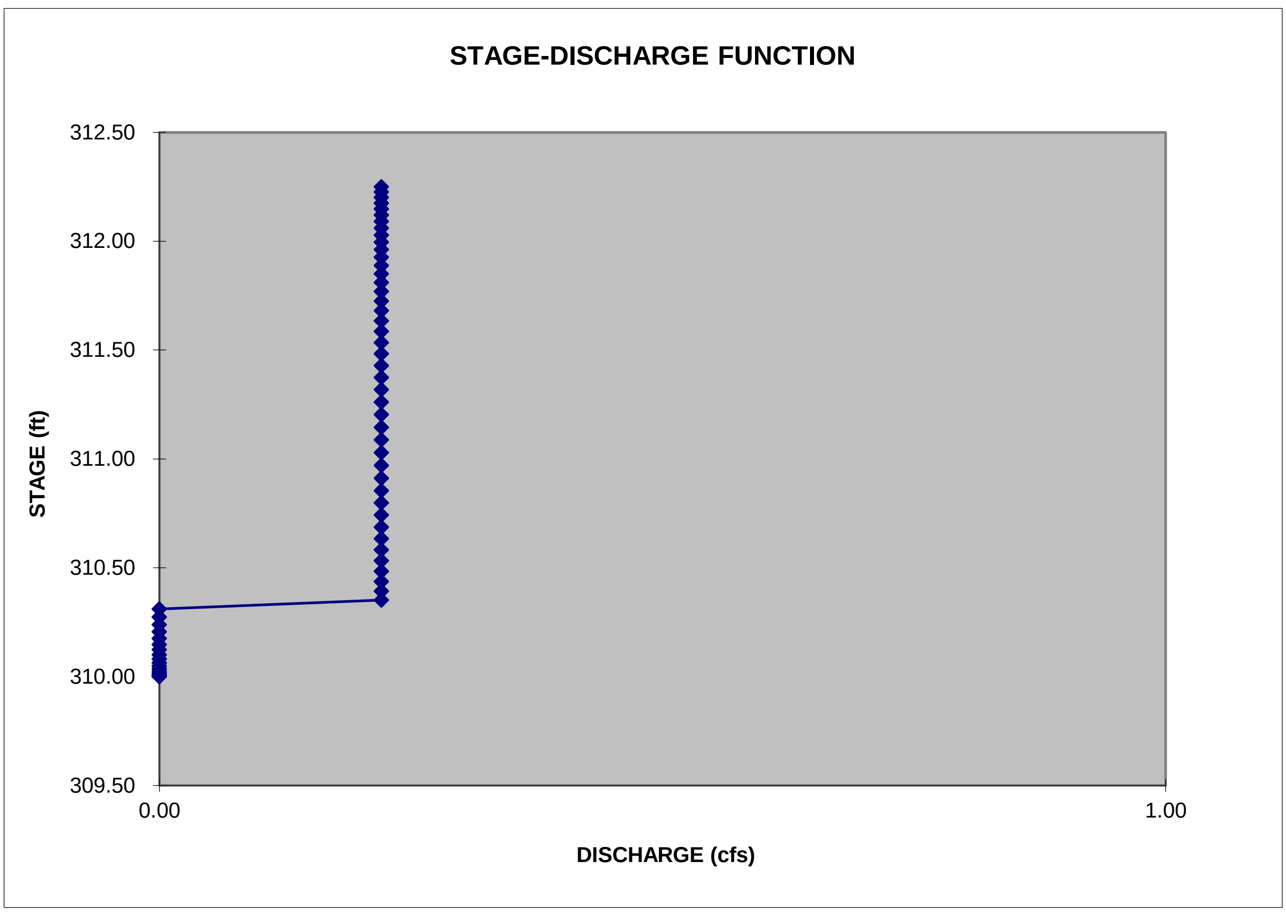
Number = 1.00 Ea
Diameter = 4.00 Inches
Head = 3.42 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	3.06	310.00	0.0	0.0	0.00		
3	0	15.29	310.00	0.0	0.0	0.00		
4	1	42.71	310.00	0.0	0.0	0.00		
5	1	91.23	310.01	0.0	0.0	0.00		
6	2	166.60	310.01	0.0	0.0	0.00		
7	2	274.36	310.02	0.0	0.0	0.00		
8	3	419.79	310.03	0.0	0.0	0.00		
9	4	607.89	310.04	0.0	0.0	0.00		
10	5	843.30	310.05	0.0	0.0	0.00		
11	6	1130.32	310.06	0.0	0.0	0.00		
12	7	1472.84	310.08	0.0	0.0	0.00		
13	8	1874.31	310.10	0.0	0.0	0.00		
14	9	2337.72	310.12	0.0	0.0	0.00		
15	10	2865.58	310.15	0.0	0.0	0.00		
16	11	3459.91	310.18	0.0	0.0	0.00		
17	12	4122.18	310.21	0.0	0.0	0.00		
18	13	4853.37	310.24	0.0	0.0	0.00		
19	14	5653.89	310.27	0.0	0.0	0.00		
20	16	6523.62	310.31	0.0	0.0	0.00		
21	17	7461.91	310.35	0.2	0.0	0.22		
22	18	8454.34	310.39	0.2	0.0	0.22		
23	19	9512.41	310.44	0.2	0.0	0.22		
24	20	10633.89	310.48	0.2	0.0	0.22		
25	21	11816.06	310.53	0.2	0.0	0.22		
26	22	13055.73	310.58	0.2	0.0	0.22		
27	23	14349.24	310.63	0.2	0.0	0.22		
28	23	15692.53	310.69	0.2	0.0	0.22		
29	24	17081.15	310.74	0.2	0.0	0.22		
30	25	18510.28	310.80	0.2	0.0	0.22		
31	25	19974.80	310.85	0.2	0.0	0.22		
32	26	21469.32	310.91	0.2	0.0	0.22		
33	26	22988.19	310.97	0.2	0.0	0.22		
34	26	24525.59	311.03	0.2	0.0	0.22		
35	26	26075.57	311.09	0.2	0.0	0.22		
36	26	27632.03	311.15	0.2	0.0	0.22		
37	26	29188.89	311.20	0.2	0.0	0.22		
38	26	30740.00	311.26	0.2	0.0	0.22		
39	26	32279.29	311.32	0.2	0.0	0.22		
40	25	33800.79	311.37	0.2	0.0	0.22		

GRAPHED DATA FOR 2 YEAR STORM





MCADAMS

ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	314.02 ft
		Rise =	4.02 ft
Freeboard =	1.98 ft	Peak Outflow =	0.50 cfs

INPUT

Hydrograph Results:

Qp = 33.80 cfs
Tp = 46.0 min
dT = 1.0 min

Stage-Storage Results:

Ks = 23773
b = 1.11
Z_0 = 310.0 ft (inv)

Initial Water Level:

Z_i = 310.00 ft

Weir:

N = 1
L = 24 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number = 1 Ea
Diameter = 4.00 Inches
Head = 3.42 inches

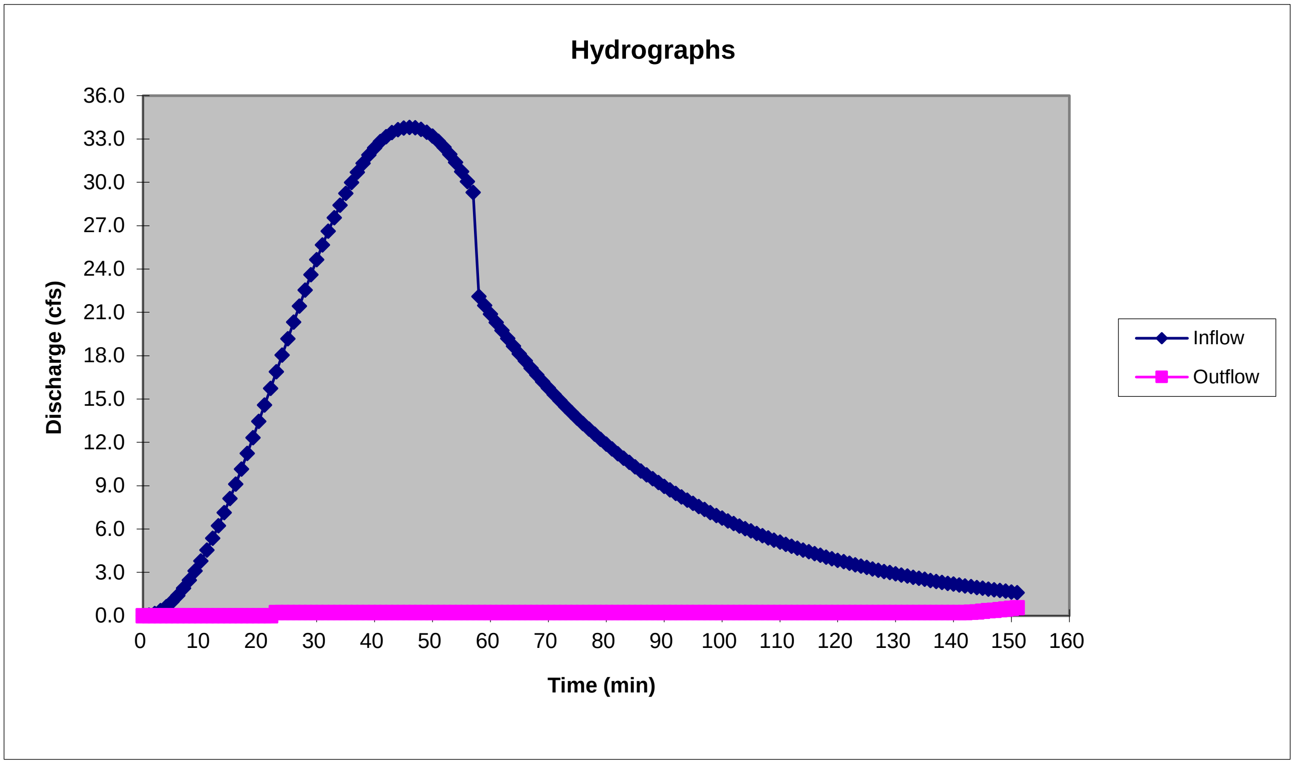
OUTPUT

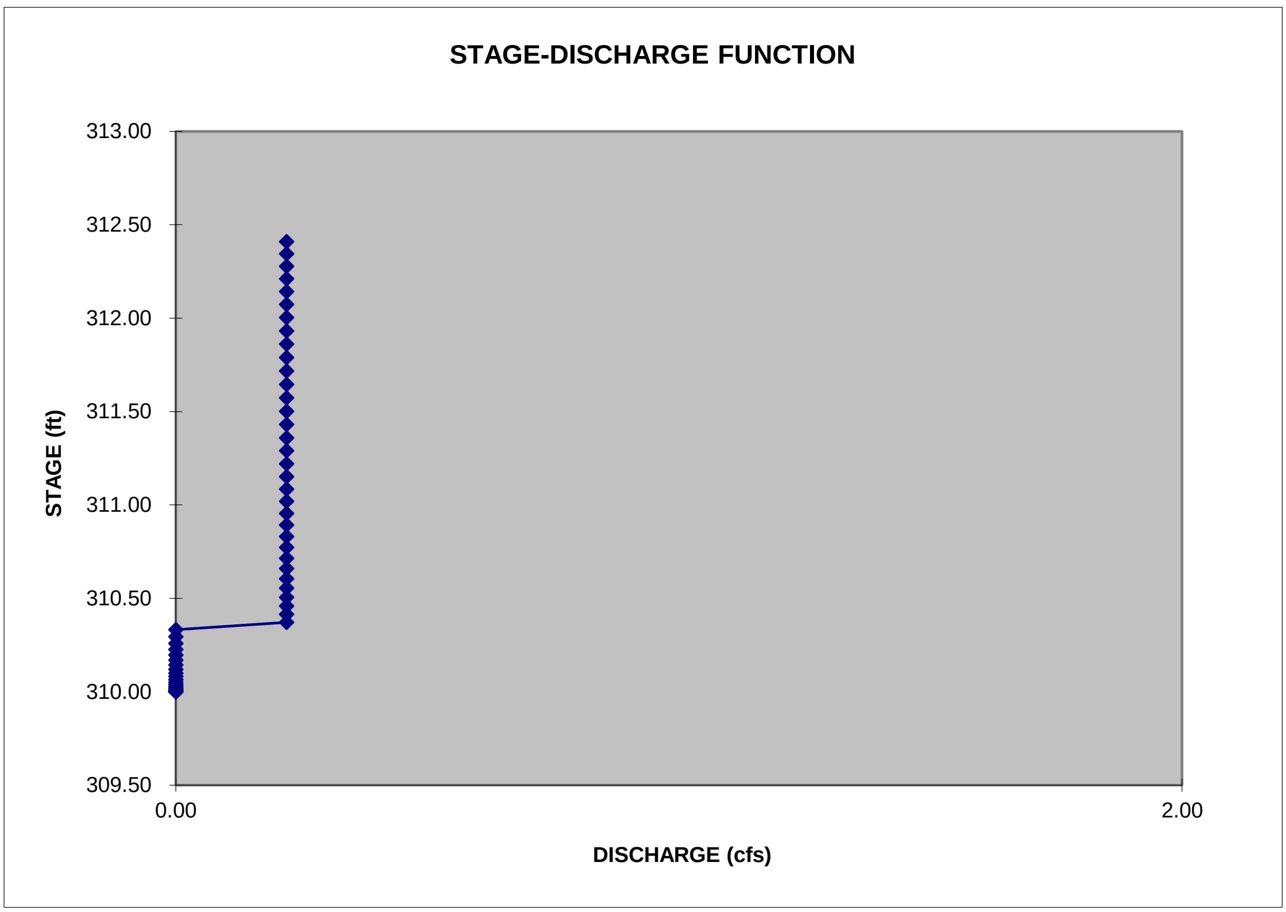
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	2.36	310.00	0.0	0.0	0.00		
3	0	11.79	310.00	0.0	0.0	0.00		
4	1	32.95	310.00	0.0	0.0	0.00		
5	1	70.48	310.01	0.0	0.0	0.00		
6	1	128.92	310.01	0.0	0.0	0.00		
7	2	212.71	310.01	0.0	0.0	0.00		
8	2	326.18	310.02	0.0	0.0	0.00		
9	3	473.52	310.03	0.0	0.0	0.00		
10	4	658.77	310.04	0.0	0.0	0.00		
11	5	885.78	310.05	0.0	0.0	0.00		
12	5	1158.22	310.07	0.0	0.0	0.00		
13	6	1479.53	310.08	0.0	0.0	0.00		
14	7	1852.94	310.10	0.0	0.0	0.00		
15	8	2281.43	310.12	0.0	0.0	0.00		
16	9	2767.72	310.14	0.0	0.0	0.00		
17	10	3314.28	310.17	0.0	0.0	0.00		
18	11	3923.27	310.20	0.0	0.0	0.00		
19	12	4596.58	310.23	0.0	0.0	0.00		
20	13	5335.80	310.26	0.0	0.0	0.00		
21	15	6142.21	310.29	0.0	0.0	0.00		
22	16	7016.77	310.33	0.0	0.0	0.00		
23	17	7960.13	310.37	0.2	0.0	0.22		
24	18	8959.39	310.41	0.2	0.0	0.22		
25	19	10027.79	310.46	0.2	0.0	0.22		
26	20	11165.02	310.51	0.2	0.0	0.22		
27	21	12370.43	310.55	0.2	0.0	0.22		
28	23	13643.09	310.61	0.2	0.0	0.22		
29	24	14981.72	310.66	0.2	0.0	0.22		
30	25	16384.74	310.71	0.2	0.0	0.22		
31	26	17850.30	310.77	0.2	0.0	0.22		
32	27	19376.23	310.83	0.2	0.0	0.22		
33	28	20960.09	310.89	0.2	0.0	0.22		
34	28	22599.15	310.96	0.2	0.0	0.22		
35	29	24290.46	311.02	0.2	0.0	0.22		
36	30	26030.80	311.09	0.2	0.0	0.22		
37	31	27816.73	311.15	0.2	0.0	0.22		
38	31	29644.60	311.22	0.2	0.0	0.22		
39	32	31510.55	311.29	0.2	0.0	0.22		
40	32	33410.57	311.36	0.2	0.0	0.22		
41	33	35340.47	311.43	0.2	0.0	0.22		
42	33	37295.92	311.50	0.2	0.0	0.22		
43	33	39272.49	311.57	0.2	0.0	0.22		
44	34	41265.63	311.65	0.2	0.0	0.22		
45	34	43270.74	311.72	0.2	0.0	0.22		
46	34	45283.13	311.79	0.2	0.0	0.22		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	34	47298.09	311.86	0.2	0.0	0.22		
48	34	49310.92	311.93	0.2	0.0	0.22		
49	33	51316.90	312.00	0.2	0.0	0.22		
50	33	53311.35	312.07	0.2	0.0	0.22		
51	33	55289.65	312.14	0.2	0.0	0.22		
52	32	57247.26	312.21	0.2	0.0	0.22		
53	32	59179.72	312.28	0.2	0.0	0.22		
54	31	61082.69	312.34	0.2	0.0	0.22		
55	31	62951.99	312.41	0.2	0.0	0.22		
56	30	64783.56	312.47	0.2	0.0	0.22		
57	29	66573.54	312.53	0.2	0.0	0.22		
58	22	68318.27	312.59	0.2	0.0	0.22		
59	21	69630.69	312.64	0.2	0.0	0.22		
60	21	70906.20	312.68	0.2	0.0	0.22		
61	20	72145.84	312.72	0.2	0.0	0.22		
62	20	73350.60	312.77	0.2	0.0	0.22		
63	19	74521.45	312.81	0.2	0.0	0.22		
64	19	75659.34	312.84	0.2	0.0	0.22		
65	18	76765.19	312.88	0.2	0.0	0.22		
66	18	77839.89	312.92	0.2	0.0	0.22		
67	17	78884.30	312.95	0.2	0.0	0.22		
68	17	79899.27	312.99	0.2	0.0	0.22		
69	16	80885.61	313.02	0.2	0.0	0.22		
70	16	81844.13	313.05	0.2	0.0	0.22		
71	15	82775.60	313.08	0.2	0.0	0.22		
72	15	83680.77	313.12	0.2	0.0	0.22		
73	14	84560.38	313.14	0.2	0.0	0.22		
74	14	85415.13	313.17	0.2	0.0	0.22		
75	14	86245.72	313.20	0.2	0.0	0.22		
76	13	87052.82	313.23	0.2	0.0	0.22		
77	13	87837.08	313.25	0.2	0.0	0.22		
78	13	88599.14	313.28	0.2	0.0	0.22		
79	12	89339.62	313.30	0.2	0.0	0.22		
80	12	90059.12	313.33	0.2	0.0	0.22		
81	12	90758.22	313.35	0.2	0.0	0.22		
82	11	91437.49	313.37	0.2	0.0	0.22		
83	11	92097.49	313.40	0.2	0.0	0.22		
84	11	92738.74	313.42	0.2	0.0	0.22		
85	10	93361.78	313.44	0.2	0.0	0.22		
86	10	93967.10	313.46	0.2	0.0	0.22		
87	10	94555.20	313.48	0.2	0.0	0.22		
88	9	95126.56	313.50	0.2	0.0	0.22		
89	9	95681.65	313.52	0.2	0.0	0.22		
90	9	96220.92	313.53	0.2	0.0	0.22		
91	9	96744.81	313.55	0.2	0.0	0.22		
92	8	97253.75	313.57	0.2	0.0	0.22		
93	8	97748.15	313.58	0.2	0.0	0.22		
94	8	98228.42	313.60	0.2	0.0	0.22		
95	8	98694.95	313.62	0.2	0.0	0.22		
96	8	99148.13	313.63	0.2	0.0	0.22		
97	7	99588.32	313.65	0.2	0.0	0.22		
98	7	100015.89	313.66	0.2	0.0	0.22		
99	7	100431.19	313.67	0.2	0.0	0.22		
100	7	100834.56	313.69	0.2	0.0	0.22		
101	7	101226.34	313.70	0.2	0.0	0.22		
102	6	101606.84	313.71	0.2	0.0	0.22		
103	6	101976.37	313.72	0.2	0.0	0.22		
104	6	102335.26	313.74	0.2	0.0	0.22		
105	6	102683.78	313.75	0.2	0.0	0.22		
106	6	103022.24	313.76	0.2	0.0	0.22		
107	6	103350.90	313.77	0.2	0.0	0.22		
108	5	103670.05	313.78	0.2	0.0	0.22		
109	5	103979.94	313.79	0.2	0.0	0.22		
110	5	104280.84	313.80	0.2	0.0	0.22		
111	5	104573.00	313.81	0.2	0.0	0.22		
112	5	104856.65	313.82	0.2	0.0	0.22		
113	5	105132.04	313.83	0.2	0.0	0.22		
114	5	105399.39	313.84	0.2	0.0	0.22		
115	4	105658.94	313.85	0.2	0.0	0.22		
116	4	105910.89	313.85	0.2	0.0	0.22		
117	4	106155.46	313.86	0.2	0.0	0.22		
118	4	106392.85	313.87	0.2	0.0	0.22		
119	4	106623.26	313.88	0.2	0.0	0.22		
120	4	106846.90	313.88	0.2	0.0	0.22		
121	4	107063.93	313.89	0.2	0.0	0.22		
122	4	107274.56	313.90	0.2	0.0	0.22		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	4	107478.96	313.91	0.2	0.0	0.22		
124	3	107677.30	313.91	0.2	0.0	0.22		
125	3	107869.75	313.92	0.2	0.0	0.22		
126	3	108056.47	313.92	0.2	0.0	0.22		
127	3	108237.63	313.93	0.2	0.0	0.22		
128	3	108413.38	313.94	0.2	0.0	0.22		
129	3	108583.86	313.94	0.2	0.0	0.22		
130	3	108749.23	313.95	0.2	0.0	0.22		
131	3	108909.63	313.95	0.2	0.0	0.22		
132	3	109065.20	313.96	0.2	0.0	0.22		
133	3	109216.07	313.96	0.2	0.0	0.22		
134	3	109362.37	313.97	0.2	0.0	0.22		
135	3	109504.22	313.97	0.2	0.0	0.22		
136	2	109641.76	313.98	0.2	0.0	0.22		
137	2	109775.11	313.98	0.2	0.0	0.22		
138	2	109904.37	313.98	0.2	0.0	0.22		
139	2	110029.67	313.99	0.2	0.0	0.22		
140	2	110151.11	313.99	0.2	0.0	0.22		
141	2	110268.80	314.00	0.2	0.0	0.22		
142	2	110382.85	314.00	0.2	0.0	0.22		
143	2	110493.31	314.00	0.2	0.0	0.22		
144	2	110599.23	314.01	0.3	0.0	0.22		
145	2	110700.10	314.01	0.3	0.1	0.22		
146	2	110795.66	314.01	0.3	0.1	0.22		
147	2	110885.80	314.02	0.4	0.2	0.22		
148	2	110970.49	314.02	0.4	0.2	0.22		
149	2	111049.76	314.02	0.5	0.2	0.22		
150	2	111123.69	314.02	0.5	0.3	0.22		
151	2	111192.39	**314.03**	0.5	0.3	0.22		

GRAPHED DATA FOR 10 YEAR STORM





ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**314.13 ft**
		Rise =	**4.13 ft**
Freeboard =	**1.87 ft**	**Peak Outflow =**	**3.77 cfs**

INPUT

Hydrograph Results:

Qp = 38.99 cfs
Tp = 46.0 min
dT = 1.0 min

Stage-Storage Results:

Ks = 23773
b = 1.11
Z_0 = 310.0 ft (inv)

Initial Water Level:

Z_i = 310.00 ft

Weir:

N = 1
L = 24 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number = 1.00 Ea
Diameter = 4.00 Inches
Head = 3.42 inches

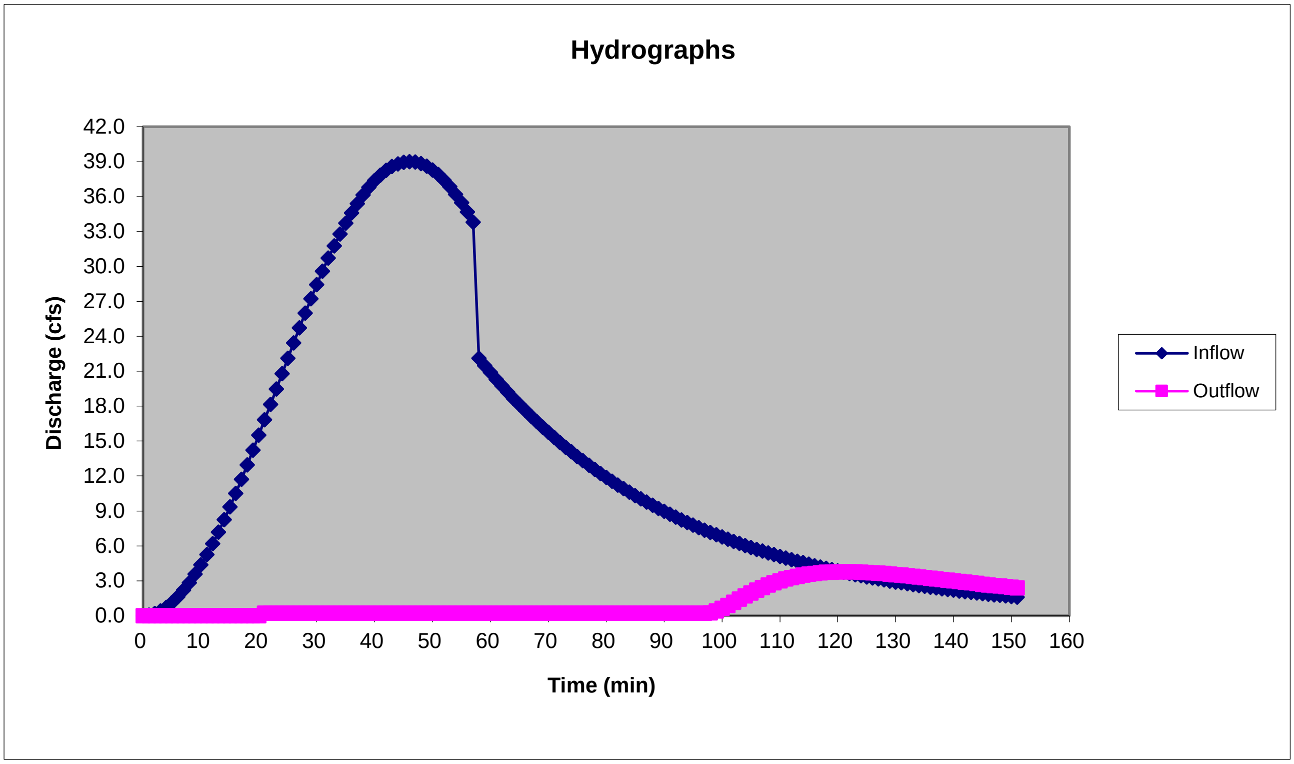
OUTPUT

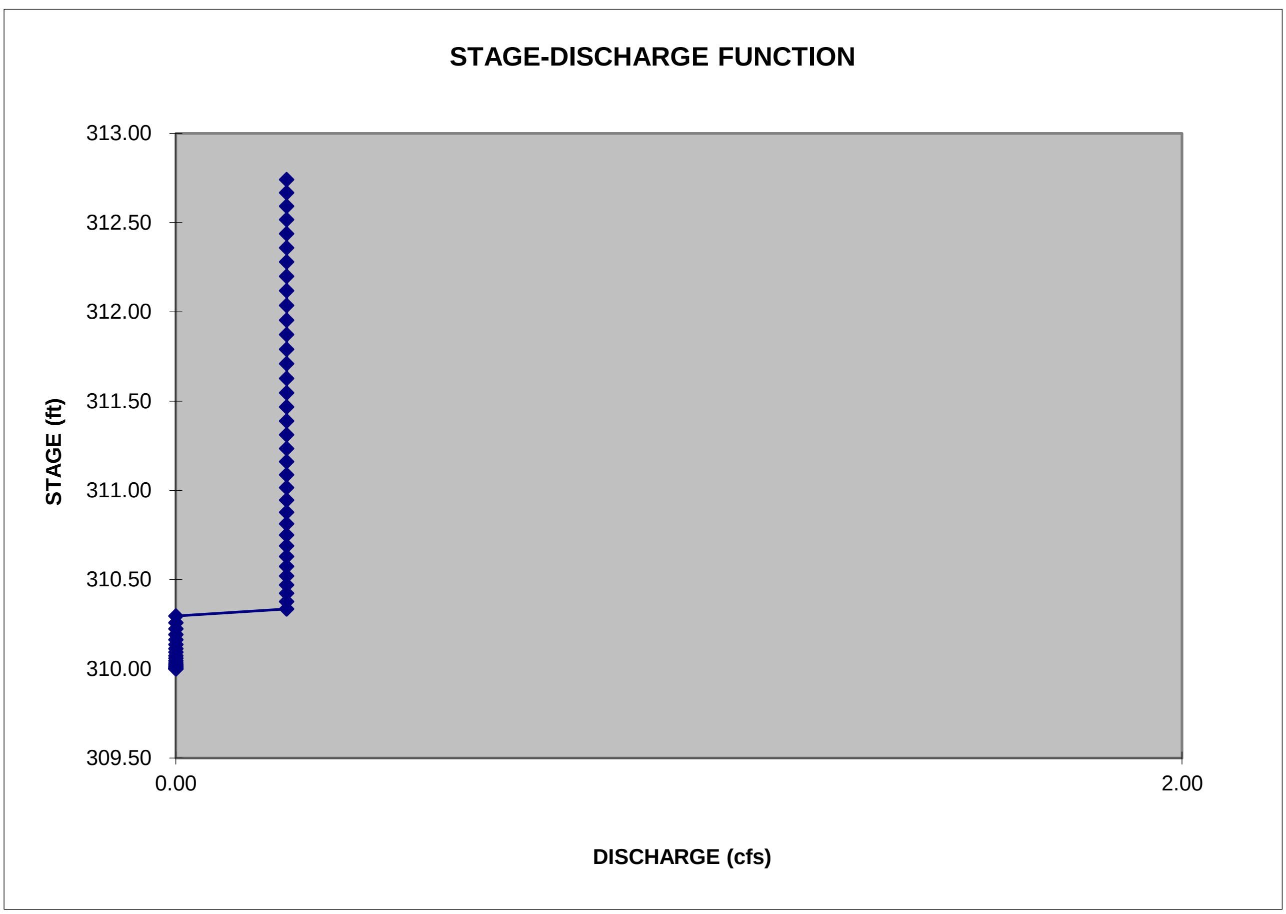
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	2.72	310.00	0.0	0.0	0.00		
3	0	13.59	310.00	0.0	0.0	0.00		
4	1	38.01	310.00	0.0	0.0	0.00		
5	1	81.30	310.01	0.0	0.0	0.00		
6	2	148.70	310.01	0.0	0.0	0.00		
7	2	245.35	310.02	0.0	0.0	0.00		
8	3	376.23	310.02	0.0	0.0	0.00		
9	4	546.18	310.03	0.0	0.0	0.00		
10	4	759.85	310.04	0.0	0.0	0.00		
11	5	1021.70	310.06	0.0	0.0	0.00		
12	6	1335.94	310.07	0.0	0.0	0.00		
13	7	1706.55	310.09	0.0	0.0	0.00		
14	8	2137.25	310.11	0.0	0.0	0.00		
15	9	2631.49	310.14	0.0	0.0	0.00		
16	11	3192.40	310.16	0.0	0.0	0.00		
17	12	3822.82	310.19	0.0	0.0	0.00		
18	13	4525.26	310.22	0.0	0.0	0.00		
19	14	5301.89	310.26	0.0	0.0	0.00		
20	16	6154.54	310.30	0.0	0.0	0.00		
21	17	7084.68	310.34	0.2	0.0	0.22		
22	18	8080.20	310.38	0.2	0.0	0.22		
23	19	9155.09	310.42	0.2	0.0	0.22		
24	21	10309.71	310.47	0.2	0.0	0.22		
25	22	11544.08	310.52	0.2	0.0	0.22		
26	23	12857.83	310.57	0.2	0.0	0.22		
27	25	14250.24	310.63	0.2	0.0	0.22		
28	26	15720.20	310.69	0.2	0.0	0.22		
29	27	17266.26	310.75	0.2	0.0	0.22		
30	28	18886.60	310.81	0.2	0.0	0.22		
31	30	20579.07	310.88	0.2	0.0	0.22		
32	31	22341.17	310.95	0.2	0.0	0.22		
33	32	24170.08	311.02	0.2	0.0	0.22		
34	33	26062.68	311.09	0.2	0.0	0.22		
35	34	28015.53	311.16	0.2	0.0	0.22		
36	35	30024.95	311.23	0.2	0.0	0.22		
37	35	32086.94	311.31	0.2	0.0	0.22		
38	36	34197.31	311.39	0.2	0.0	0.22		
39	37	36351.61	311.47	0.2	0.0	0.22		
40	37	38545.20	311.55	0.2	0.0	0.22		
41	38	40773.25	311.63	0.2	0.0	0.22		
42	38	43030.79	311.71	0.2	0.0	0.22		
43	39	45312.68	311.79	0.2	0.0	0.22		
44	39	47613.68	311.87	0.2	0.0	0.22		
45	39	49928.48	311.95	0.2	0.0	0.22		
46	39	52251.68	312.04	0.2	0.0	0.22		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	39	54577.86	312.12	0.2	0.0	0.22		
48	39	56901.57	312.20	0.2	0.0	0.22		
49	39	59217.38	312.28	0.2	0.0	0.22		
50	38	61519.89	312.36	0.2	0.0	0.22		
51	38	63803.78	312.44	0.2	0.0	0.22		
52	37	66063.80	312.52	0.2	0.0	0.22		
53	37	68294.81	312.59	0.2	0.0	0.22		
54	36	70491.81	312.67	0.2	0.0	0.22		
55	35	72649.96	312.74	0.2	0.0	0.22		
56	35	74764.60	312.81	0.2	0.0	0.22		
57	34	76831.27	312.88	0.2	0.0	0.22		
58	22	78845.75	312.95	0.2	0.0	0.22		
59	21	80158.16	313.00	0.2	0.0	0.22		
60	21	81433.67	313.04	0.2	0.0	0.22		
61	20	82673.31	313.08	0.2	0.0	0.22		
62	20	83878.07	313.12	0.2	0.0	0.22		
63	19	85048.93	313.16	0.2	0.0	0.22		
64	19	86186.82	313.20	0.2	0.0	0.22		
65	18	87292.67	313.24	0.2	0.0	0.22		
66	18	88367.36	313.27	0.2	0.0	0.22		
67	17	89411.78	313.31	0.2	0.0	0.22		
68	17	90426.74	313.34	0.2	0.0	0.22		
69	16	91413.09	313.37	0.2	0.0	0.22		
70	16	92371.61	313.41	0.2	0.0	0.22		
71	15	93303.08	313.44	0.2	0.0	0.22		
72	15	94208.25	313.47	0.2	0.0	0.22		
73	14	95087.86	313.50	0.2	0.0	0.22		
74	14	95942.61	313.52	0.2	0.0	0.22		
75	14	96773.20	313.55	0.2	0.0	0.22		
76	13	97580.29	313.58	0.2	0.0	0.22		
77	13	98364.56	313.61	0.2	0.0	0.22		
78	13	99126.62	313.63	0.2	0.0	0.22		
79	12	99867.10	313.65	0.2	0.0	0.22		
80	12	100586.60	313.68	0.2	0.0	0.22		
81	12	101285.70	313.70	0.2	0.0	0.22		
82	11	101964.97	313.72	0.2	0.0	0.22		
83	11	102624.96	313.75	0.2	0.0	0.22		
84	11	103266.22	313.77	0.2	0.0	0.22		
85	10	103889.25	313.79	0.2	0.0	0.22		
86	10	104494.57	313.81	0.2	0.0	0.22		
87	10	105082.68	313.83	0.2	0.0	0.22		
88	9	105654.04	313.85	0.2	0.0	0.22		
89	9	106209.13	313.86	0.2	0.0	0.22		
90	9	106748.40	313.88	0.2	0.0	0.22		
91	9	107272.29	313.90	0.2	0.0	0.22		
92	8	107781.23	313.92	0.2	0.0	0.22		
93	8	108275.63	313.93	0.2	0.0	0.22		
94	8	108755.90	313.95	0.2	0.0	0.22		
95	8	109222.43	313.96	0.2	0.0	0.22		
96	8	109675.60	313.98	0.2	0.0	0.22		
97	7	110115.80	313.99	0.2	0.0	0.22		
98	7	110543.37	314.01	0.3	0.0	0.22		
99	7	110956.79	314.02	0.4	0.2	0.22		
100	7	111348.61	314.03	0.6	0.4	0.22		
101	7	111715.57	314.04	0.9	0.7	0.22		
102	6	112056.10	314.06	1.2	0.9	0.22		
103	6	112369.60	314.07	1.4	1.2	0.22		
104	6	112656.16	314.07	1.7	1.5	0.22		
105	6	112916.30	314.08	2.0	1.7	0.22		
106	6	113150.89	314.09	2.2	2.0	0.22		
107	6	113361.04	314.10	2.4	2.2	0.22		
108	5	113548.01	314.10	2.6	2.4	0.22		
109	5	113713.18	314.11	2.8	2.6	0.22		
110	5	113857.94	314.11	3.0	2.8	0.22		
111	5	113983.74	314.12	3.1	2.9	0.22		
112	5	114091.97	314.12	3.3	3.1	0.22		
113	5	114184.01	314.12	3.4	3.2	0.22		
114	5	114261.19	314.13	3.5	3.3	0.22		
115	4	114324.77	314.13	3.6	3.3	0.22		
116	4	114375.95	314.13	3.6	3.4	0.22		
117	4	114415.84	314.13	3.7	3.5	0.22		
118	4	114445.50	314.13	3.7	3.5	0.22		
119	4	114465.89	314.13	3.7	3.5	0.22		
120	4	114477.94	314.13	3.8	3.5	0.22		
121	4	114482.45	**314.13**	3.8	3.5	0.22		
122	4	114480.21	314.13	3.8	3.5	0.22		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	4	114471.90	314.13	3.8	3.5	0.22		
124	3	114458.19	314.13	3.7	3.5	0.22		
125	3	114439.64	314.13	3.7	3.5	0.22		
126	3	114416.80	314.13	3.7	3.5	0.22		
127	3	114390.15	314.13	3.6	3.4	0.22		
128	3	114360.13	314.13	3.6	3.4	0.22		
129	3	114327.15	314.13	3.6	3.3	0.22		
130	3	114291.57	314.13	3.5	3.3	0.22		
131	3	114253.71	314.13	3.5	3.3	0.22		
132	3	114213.87	314.13	3.4	3.2	0.22		
133	3	114172.34	314.12	3.4	3.2	0.22		
134	3	114129.33	314.12	3.3	3.1	0.22		
135	3	114085.08	314.12	3.3	3.0	0.22		
136	2	114039.78	314.12	3.2	3.0	0.22		
137	2	113993.62	314.12	3.2	2.9	0.22		
138	2	113946.74	314.12	3.1	2.9	0.22		
139	2	113899.29	314.12	3.0	2.8	0.22		
140	2	113851.41	314.11	3.0	2.8	0.22		
141	2	113803.21	314.11	2.9	2.7	0.22		
142	2	113754.78	314.11	2.9	2.7	0.22		
143	2	113706.24	314.11	2.8	2.6	0.22		
144	2	113657.65	314.11	2.8	2.5	0.22		
145	2	113609.09	314.11	2.7	2.5	0.22		
146	2	113560.63	314.10	2.6	2.4	0.22		
147	2	113512.33	314.10	2.6	2.4	0.22		
148	2	113464.24	314.10	2.5	2.3	0.22		
149	2	113416.41	314.10	2.5	2.3	0.22		
150	2	113368.88	314.10	2.4	2.2	0.22		
151	2	113321.68	314.10	2.4	2.2	0.22		

GRAPHED DATA FOR 25 YEAR STORM





SCM C
SKIMMER BASIN WITH TEMP RISER DESIGN

CHAMBLEE LAKE
ZEBULON, NC
DRH22004

Skimmer Basin Sizing
Riser-Barrel Design
Stage-Storage Function
Hydrograph Formulation
Anti-Bouyancy Calculations
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm
Routing for the 25-year storm
Graphed Data for the 25-year storm

McADAMS

RISER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Sediment Basin ID	SCM C		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	7.93 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	7.93 ac.	0.25
Undisturbed grassy area	0.00 ac.	0.00 ac.	0.35
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	7.93 ac.	7.93 ac.	
Composite Rational 'c'	0.45	0.25	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	847	feet
Height of watershed =	8	feet
Calculated t(c) =	8.4	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	8.4	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Time of Concentration

IDF curves for Raleigh, NC

Return Period	B	D	Intensity
2	132	18	4.99 in/hr
10	195	22	6.40 in/hr
25	232	23	7.38 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	4.99 in/hr	17.8 cfs	9.89 cfs
10-year storm	6.40 in/hr	22.9 cfs	12.70 cfs
25-year storm	7.38 in/hr	26.3 cfs	14.62 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	1,800	cubic feet per disturbed acre
Required sediment trap surface area	325	square feet per 1 cfs of Q
Design Return Period	10	

Sediment Trap Dimensions

Bottom length =	410
Bottom width =	85
Sediment depth =	1.0
Freeboard (from sediment depth) =	3.0
Depth to crest of emergency spillway =	4.0
Side slopes =	3.0 H:1V
Riser Diameter (in) =	36
Emergency Spillway length =	20
Height of berm =	4.0
Top of trap length =	434
Top of trap width =	109
Bottom Elevation =	312

Sediment Trap Data

	Required	Provided
Sediment storage volume =	14274 cu. ft.	36340 cu. ft.
Sediment surface area =	7430 sq. ft.	37860 sq. ft.
Sediment storage depth =	3.5 ft. (max.)	1
Trap bottom length to width ratio =	2.0L:1W (min)	4.8L:1W
Emergency Spillway length =	10.0 ft. (min)	20
10-Year flow depth over spillway =	0.50 ft. (max)	-2.61 ft
Freeboard at 10-Year discharge =	1.00 ft. (min)	2.61 ft
10-Year flow depth over riser =	1.50 ft. (max)	0.39 ft

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU 1999,
Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Provided for Sediment Basin = 14,274 cubic feet

24 HOURS	Best Option =	1 - 4 inch Skimmers with a 3.4 inch orifice	
2 DAYS	Best Option =	1 - 3 inch Skimmers with a 2.6 inch orifice	
3 DAYS	Best Option =	1 - 2.5 inch Skimmers with a 2.2 inch orifice	<<== USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.8 inch orifice	

RISER - BARREL DESIGN

DESIGN PRINCIPAL AND EMERGENCY SPILLWAY

Determine minimum principal spillway outflow
Minimum outflow = 0.2 cfs per acre

Drainage area =	7.93	acres
Minimum outflow =	1.6	cfs
Principal spillway elevation =	313.00	
Emergency spillway elevation =	316.00	

SIZE RISER/BARREL

Constant TW elevation =	311.00	feet	*Typically i
Riser diameter =	36	inches	
Barrel diameter =	24	inches	
Barrel Manning's n =	0.013		*CMP=0.0
Riser crest elevation =	313.00	feet	
Barrel invert in elevation =	311.50	feet	
Barrel invert out =	311.00	feet	
Barrel length =	50	feet	
Barrel slope =	0.0100	ft/ft	

Basin WSEL (feet)	Riser as orifice* (cfs)	Riser as weir** (cfs)	Barrel TW conditions (cfs)	Barrel HW condition (cfs)	Primary spillway outflow (cfs)	Action ?
316.00	59.0	161.6	38.6	28.3	28.3	OK

* $$= 0.6 * \pi * \left(\frac{\frac{RiserDiameter}{2}}{12}\right)^{2} * \sqrt{2 * g * h}$$

** $$= 3.3. * \pi * \frac{RiserDiameter}{12} * (h)^{\frac{3}{2}}$$

nvert out of barrel, unless tailwater can be calculated

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

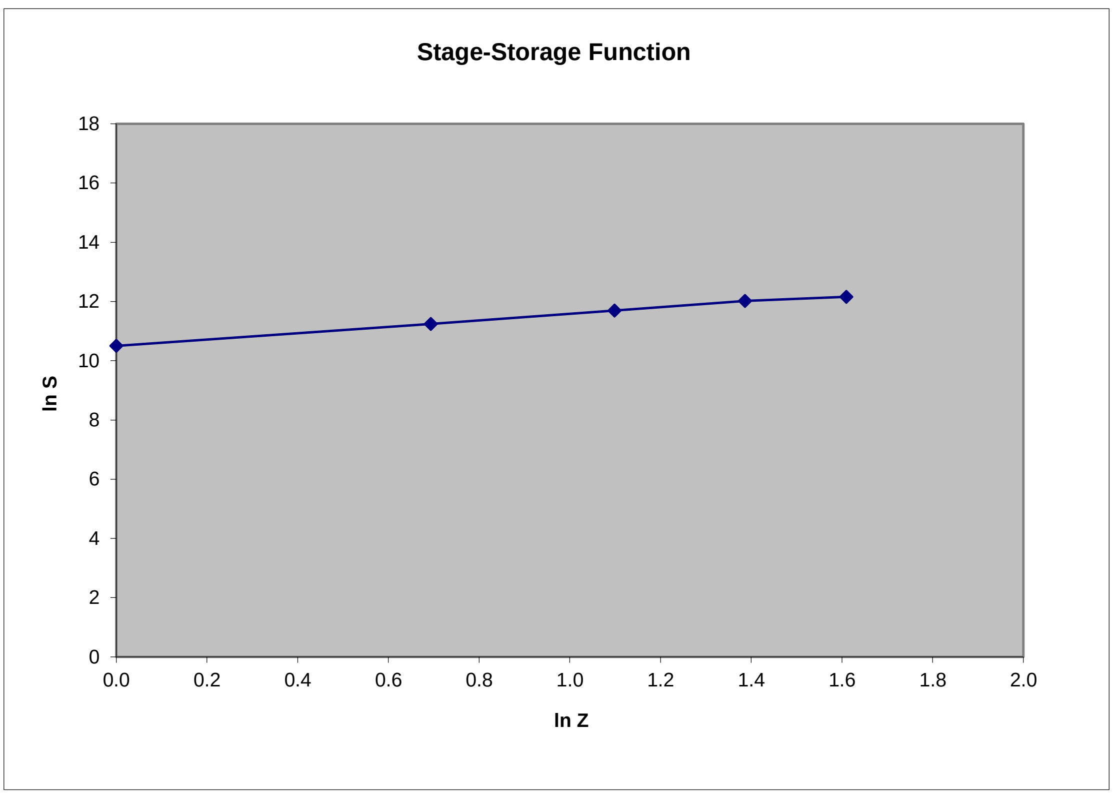
AVERAGE - END CALCULATIONS

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
312	34632		0	0			
313	38069	36351	36350.5	1	10.5010	0.0000	0.99
314	41563	39816	76166.5	2	11.2407	0.6931	1.99
315	45114	43338.5	119505	3	11.6911	1.0986	3.06
316	48721	46917.5	166422.5	4	12.0223	1.3863	4.18
317	0	24360.5	190783	5	12.1589	1.6094	4.76

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.06 and **K_s =** 36749



ANTI - FLOTATION CALCULATION DESIGN SHEET

CHAMBLEE LAKE

CMP RISER

Riser Diameter =	36	inches
Riser Height =	1.00	feet
Length of barrel exposed from berm section =	7	feet
Diameter of barrel =	24	inches
Volume displaced by riser =	7.07	CF
Volume displaced by barrel =	21.99	CF
Total Volume Displaced by System =	29.06	CF
Total Water Wt. Displaced by System =	1813.33	LBS.

Design of concrete anti-flotation block

Safety factor for use =	1.10	
Unit weight for concrete =	142.00	PCF
Unit Weight for water =	62.40	PCF
Buoyant wt. concrete (w/ safety factor applied) =	72.36	PCF
With Safety Factor, conc. must weigh (buoyant wt.) =	1994.66	LBS.
Volume of Concrete Required =	27.56	CF

Enter size wanted for conrete block ==>

Width =	6.00	feet
Length =	6.00	feet
Thickness =	9.00	inches
Volume of concrete provided =	27.00	CF

Check validity of anti-flotation design

Total volume of water displaced =	56.06	CF
Total volume of concrete present =	27.00	CF
Total weight of water displaced =	3,498	LBS.
Total weight of concrete present =	4,050	LBS.
Safety Factor w/ design as above =	1.16	

Therefore, for anti-flotation, use a concrete block:

Width =	6.00	**feet**
Length =	6.00	**feet**
Thickness =	9.00	**inches**

This block shall be integrally attached to the riser unit. The barrel shall attach to the riser with a watertight joint.

HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	7.93	ac	**Use Kirpich Equation:**	
Disturbed Area =	7.93	ac	**Tc =**	8.4 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	847	ft	**i_1 =**	4.99 in/hr
Vertical Fall =	8	ft	**i_{10} =**	6.40 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	7.38 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	17.8 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	22.9 cfs
h =	23		**Q_{25} =**	26.3 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	33.9	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	44.1	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	47.1	**minutes**

McADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	313.18 ft
		Rise =	1.18 ft
Freeboard =	2.82 ft	Peak Outflow =	2.23 cfs

INPUT

Hydrograph Results:

Qp =	17.81	cfs
Tp =	33.9	min
dT =	1.0	min

Stage-Storage Results:

Ks =	36749	
b =	1.06	
Z_0 =	312.0	ft (inv)

Initial Water Level:

Z_i =	312.00	ft

Weir:

N =	1	
L =	20	ft
Cw =	3.00	
Zcr =	316.00	ft

Riser:

N =	1	
D =	36	in
Cw =	3.00	
Zcr =	313.00	ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number =	1.00	Ea
Diameter =	2.50	Inches
Head =	2.18	inches

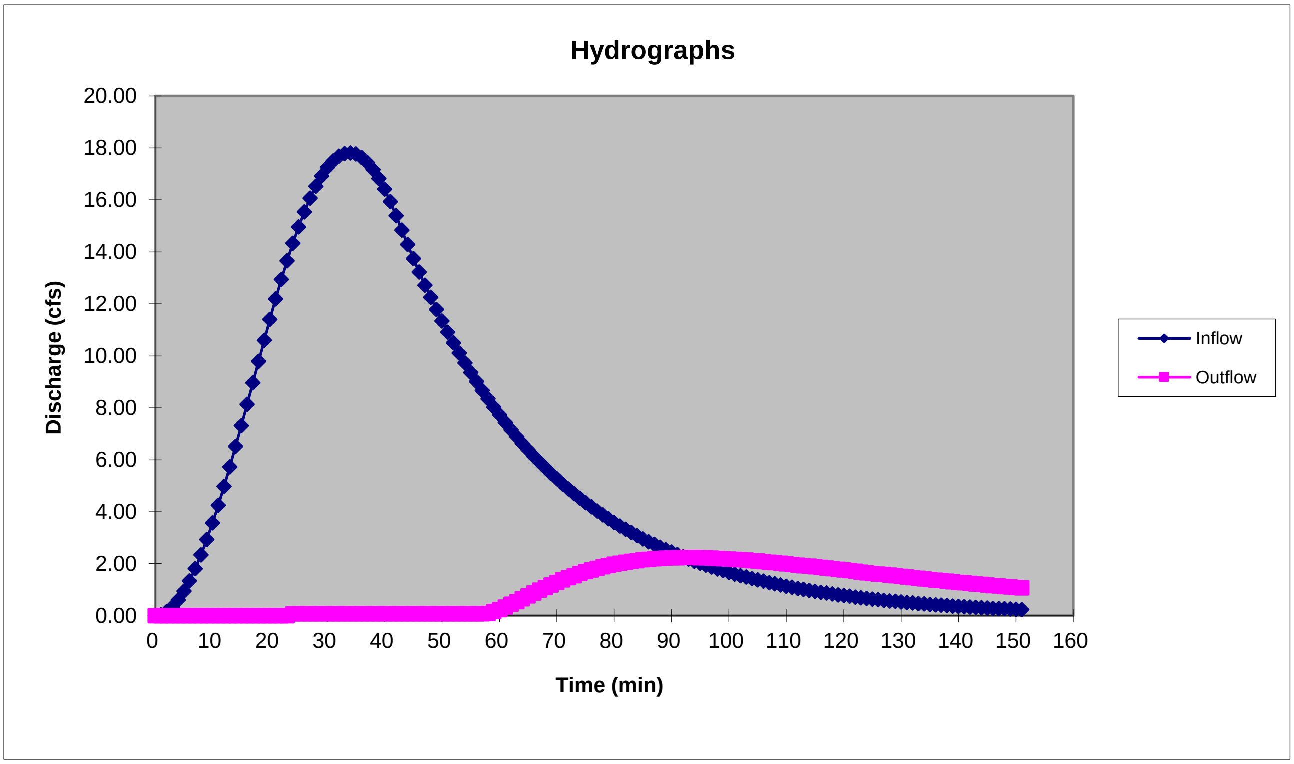
OUTPUT

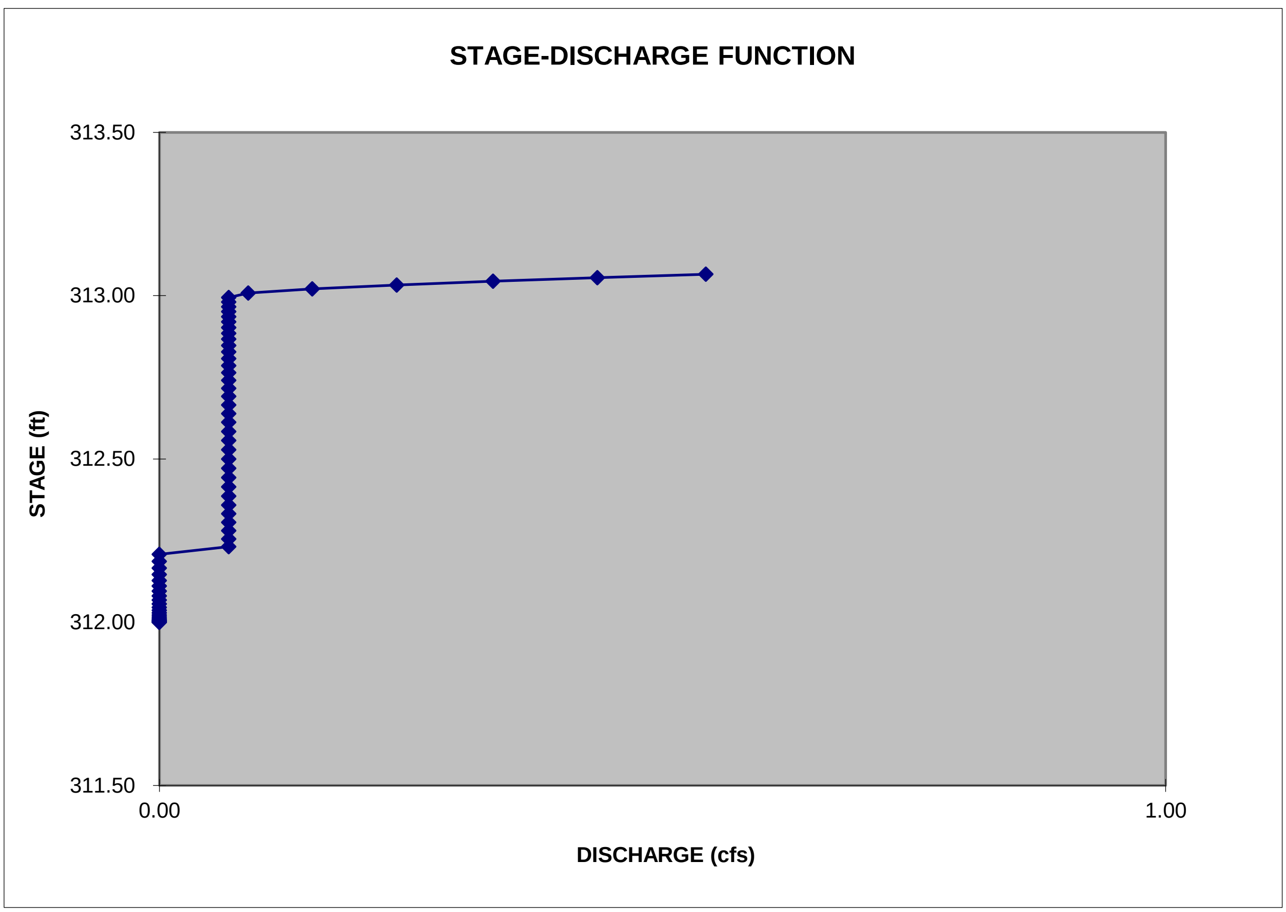
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8 Riser Flow cfs	9
0	0	0.00	312.00	0.0	0.0	0.0	0.0	
1	0	0.00	312.00	0.0	0.0	0.00	0.0	
2	0	2.30	312.00	0.0	0.0	0.00	0.0	
3	0	11.47	312.00	0.0	0.0	0.00	0.0	
4	1	32.02	312.00	0.0	0.0	0.00	0.0	
5	1	68.38	312.00	0.0	0.0	0.00	0.0	
6	1	124.83	312.00	0.0	0.0	0.00	0.0	
7	2	205.48	312.01	0.0	0.0	0.00	0.0	
8	2	314.22	312.01	0.0	0.0	0.00	0.0	
9	3	454.72	312.02	0.0	0.0	0.00	0.0	
10	4	630.36	312.02	0.0	0.0	0.00	0.0	
11	4	844.23	312.03	0.0	0.0	0.00	0.0	
12	5	1099.07	312.04	0.0	0.0	0.00	0.0	
13	6	1397.31	312.05	0.0	0.0	0.00	0.0	
14	7	1740.96	312.06	0.0	0.0	0.00	0.0	
15	7	2131.66	312.07	0.0	0.0	0.00	0.0	
16	8	2570.65	312.08	0.0	0.0	0.00	0.0	
17	9	3058.75	312.09	0.0	0.0	0.00	0.0	
18	10	3596.35	312.11	0.0	0.0	0.00	0.0	
19	11	4183.44	312.13	0.0	0.0	0.00	0.0	
20	11	4819.54	312.15	0.0	0.0	0.00	0.0	
21	12	5503.79	312.17	0.0	0.0	0.00	0.0	
22	13	6234.90	312.19	0.0	0.0	0.00	0.0	
23	14	7011.17	312.21	0.0	0.0	0.00	0.0	
24	14	7830.53	312.23	0.1	0.0	0.07	0.0	
25	15	8686.39	312.26	0.1	0.0	0.07	0.0	
26	16	9580.08	312.28	0.1	0.0	0.07	0.0	
27	16	10508.48	312.31	0.1	0.0	0.07	0.0	
28	17	11468.15	312.33	0.1	0.0	0.07	0.0	
29	17	12455.42	312.36	0.1	0.0	0.07	0.0	
30	17	13466.34	312.39	0.1	0.0	0.07	0.0	
31	17	14496.78	312.41	0.1	0.0	0.07	0.0	
32	18	15542.45	312.44	0.1	0.0	0.07	0.0	
33	18	16598.90	312.47	0.1	0.0	0.07	0.0	
34	18	17661.61	312.50	0.1	0.0	0.07	0.0	
35	18	18726.00	312.53	0.1	0.0	0.07	0.0	
36	18	19787.48	312.56	0.1	0.0	0.07	0.0	
37	17	20841.48	312.58	0.1	0.0	0.07	0.0	
38	17	21883.50	312.61	0.1	0.0	0.07	0.0	
39	17	22909.12	312.64	0.1	0.0	0.07	0.0	
40	16	23914.10	312.67	0.1	0.0	0.07	0.0	
41	16	24894.35	312.69	0.1	0.0	0.07	0.0	
42	15	25845.99	312.72	0.1	0.0	0.07	0.0	
43	15	26765.41	312.74	0.1	0.0	0.07	0.0	
44	14	27651.37	312.76	0.1	0.0	0.07	0.0	
45	14	28503.81	312.79	0.1	0.0	0.07	0.0	

OUTPUT								
1	2	3	4	5	6	7	8	9
Time	Inflow	Storage	Stage	Outflow	Weir	Skimmer	Riser	
T	I	S	Z	O	Flow	Flow	Flow	
min	cfs	cu-ft	ft	cfs	cfs	cfs	cfs	
46	13	29323.99	312.81	0.1	0.0	0.07	0.0	
47	13	30113.12	312.83	0.1	0.0	0.07	0.0	
48	12	30872.39	312.85	0.1	0.0	0.07	0.0	
49	12	31602.90	312.87	0.1	0.0	0.07	0.0	
50	11	32305.75	312.89	0.1	0.0	0.07	0.0	
51	11	32981.98	312.90	0.1	0.0	0.07	0.0	
52	11	33632.58	312.92	0.1	0.0	0.07	0.0	
53	10	34258.53	312.94	0.1	0.0	0.07	0.0	
54	10	34860.75	312.95	0.1	0.0	0.07	0.0	
55	9	35440.13	312.97	0.1	0.0	0.07	0.0	
56	9	35997.54	312.98	0.1	0.0	0.07	0.0	
57	9	36533.80	312.99	0.1	0.0	0.07	0.0	
58	8	37049.71	313.01	0.1	0.0	0.07	0.0	
59	8	37544.88	313.02	0.2	0.0	0.07	0.1	
60	8	38017.38	313.03	0.2	0.0	0.07	0.2	
61	7	38466.72	313.04	0.3	0.0	0.07	0.3	
62	7	38892.84	313.06	0.4	0.0	0.07	0.4	
63	7	39295.95	313.07	0.5	0.0	0.07	0.5	
64	7	39676.42	313.08	0.7	0.0	0.07	0.6	
65	6	40034.75	313.08	0.8	0.0	0.07	0.7	
66	6	40371.49	313.09	0.9	0.0	0.07	0.8	
67	6	40687.28	313.10	1.0	0.0	0.07	0.9	
68	6	40982.78	313.11	1.1	0.0	0.07	1.0	
69	5	41258.70	313.12	1.2	0.0	0.07	1.1	
70	5	41515.75	313.12	1.3	0.0	0.07	1.2	
71	5	41754.66	313.13	1.4	0.0	0.07	1.3	
72	5	41976.16	313.13	1.5	0.0	0.07	1.4	
73	5	42180.99	313.14	1.5	0.0	0.07	1.5	
74	5	42369.88	313.14	1.6	0.0	0.07	1.5	
75	4	42543.54	313.15	1.7	0.0	0.07	1.6	
76	4	42702.67	313.15	1.8	0.0	0.07	1.7	
77	4	42847.97	313.16	1.8	0.0	0.07	1.8	
78	4	42980.11	313.16	1.9	0.0	0.07	1.8	
79	4	43099.74	313.16	1.9	0.0	0.07	1.9	
80	4	43207.50	313.17	2.0	0.0	0.07	1.9	
81	3	43304.00	313.17	2.0	0.0	0.07	2.0	
82	3	43389.83	313.17	2.1	0.0	0.07	2.0	
83	3	43465.58	313.17	2.1	0.0	0.07	2.0	
84	3	43531.79	313.17	2.1	0.0	0.07	2.1	
85	3	43588.98	313.18	2.1	0.0	0.07	2.1	
86	3	43637.68	313.18	2.2	0.0	0.07	2.1	
87	3	43678.36	313.18	2.2	0.0	0.07	2.1	
88	3	43711.49	313.18	2.2	0.0	0.07	2.1	
89	3	43737.53	313.18	2.2	0.0	0.07	2.1	
90	2	43756.89	313.18	2.2	0.0	0.07	2.2	
91	2	43769.98	313.18	2.2	0.0	0.07	2.2	
92	2	43777.20	313.18	2.2	0.0	0.07	2.2	
93	2	43778.91	**313.18**	2.2	0.0	0.07	2.2	
94	2	43775.46	313.18	2.2	0.0	0.07	2.2	
95	2	43767.18	313.18	2.2	0.0	0.07	2.2	
96	2	43754.41	313.18	2.2	0.0	0.07	2.2	
97	2	43737.43	313.18	2.2	0.0	0.07	2.1	
98	2	43716.53	313.18	2.2	0.0	0.07	2.1	
99	2	43692.00	313.18	2.2	0.0	0.07	2.1	
100	2	43664.07	313.18	2.2	0.0	0.07	2.1	
101	2	43633.01	313.18	2.2	0.0	0.07	2.1	
102	2	43599.04	313.18	2.2	0.0	0.07	2.1	
103	1	43562.37	313.17	2.1	0.0	0.07	2.1	
104	1	43523.23	313.17	2.1	0.0	0.07	2.0	
105	1	43481.79	313.17	2.1	0.0	0.07	2.0	
106	1	43438.25	313.17	2.1	0.0	0.07	2.0	
107	1	43392.79	313.17	2.1	0.0	0.07	2.0	
108	1	43345.56	313.17	2.0	0.0	0.07	2.0	
109	1	43296.72	313.17	2.0	0.0	0.07	1.9	
110	1	43246.43	313.17	2.0	0.0	0.07	1.9	
111	1	43194.81	313.17	2.0	0.0	0.07	1.9	
112	1	43142.00	313.16	1.9	0.0	0.07	1.9	
113	1	43088.11	313.16	1.9	0.0	0.07	1.9	
114	1	43033.27	313.16	1.9	0.0	0.07	1.8	

MCADAMS

GRAPHED DATA FOR 2 YEAR STORM





McADAMS

ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	313.39 ft
		Rise =	1.39 ft
Freeboard =	2.61 ft	Peak Outflow =	7.07 cfs

INPUT

Hydrograph Results:

Qp =	22.85	cfs
Tp =	44.1	min
dT =	1.0	min

Stage-Storage Results:

Ks =	36749	
b =	1.06	
Z_0 =	312.0	ft (inv)

Initial Water Level:

Z_i =	312.00	ft

Weir:

N =	1	
L =	20	ft
Cw =	3.00	
Zcr =	316.00	ft

Riser:

N =	1	
D =	36	in
Cw =	3.00	
Zcr =	313.00	ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number =	1	Ea
Diameter =	2.50	Inches
Head =	2.18	inches

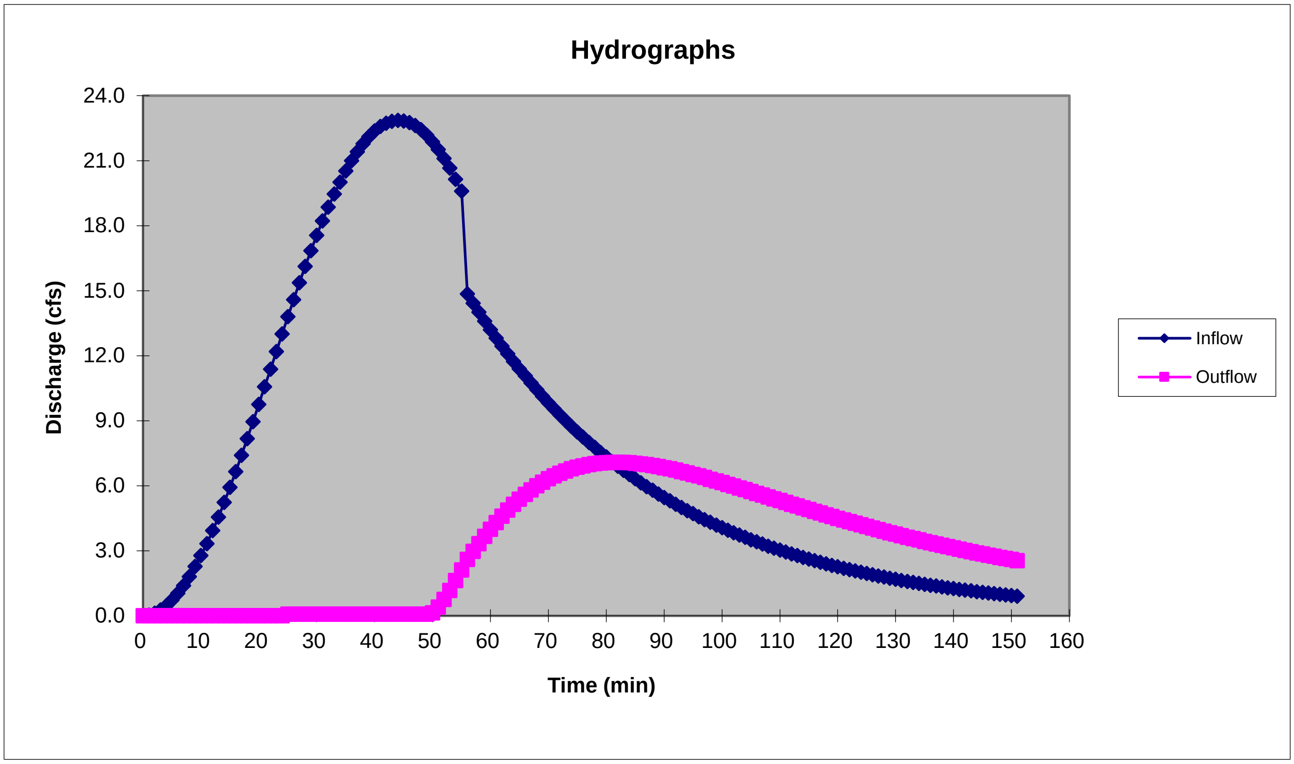
OUTPUT

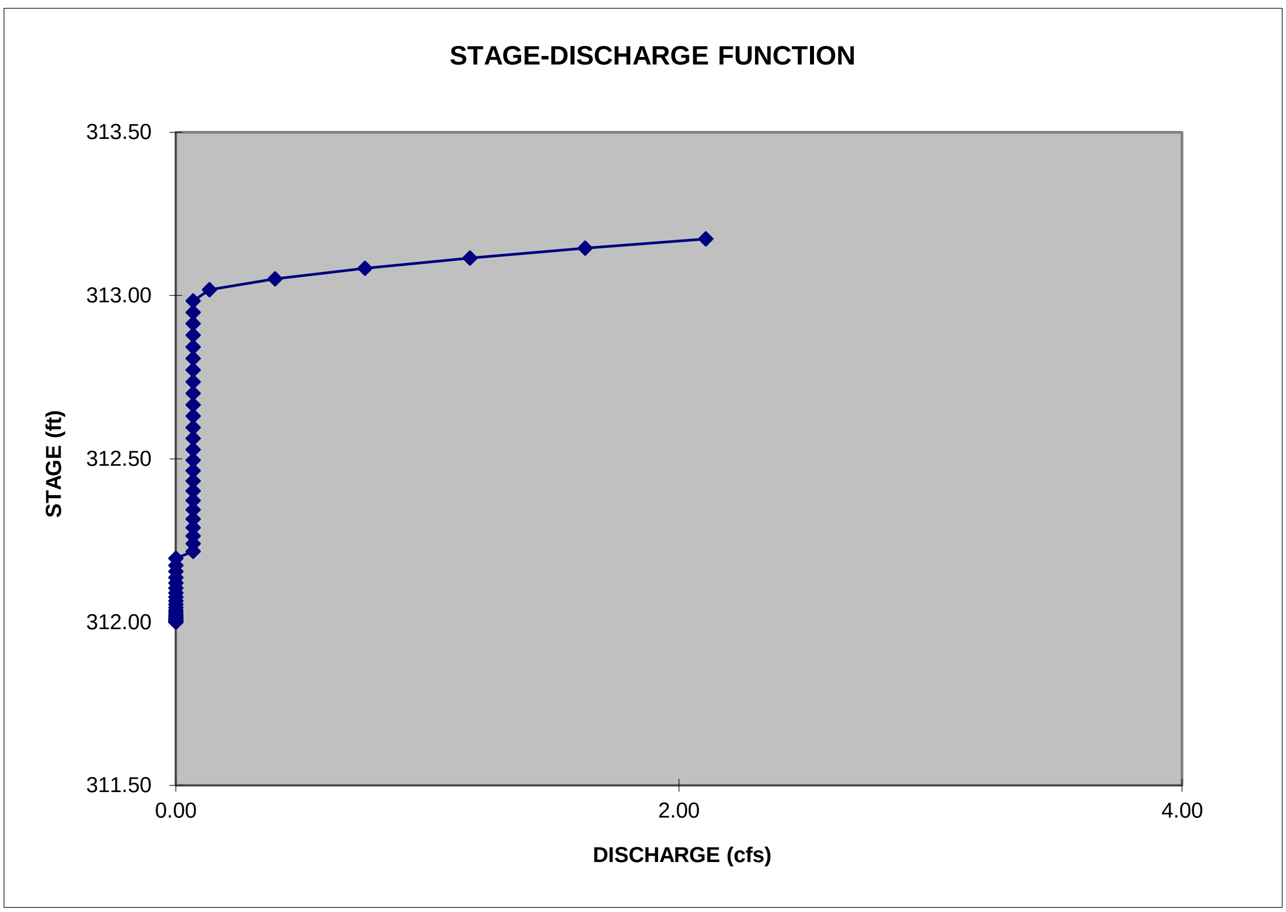
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8 Riser Flow cfs	9
0	0	0.00	312.00	0.0	0.0	0.0	0.0	
1	0	0.00	312.00	0.0	0.0	0.00	0.0	
2	0	1.74	312.00	0.0	0.0	0.00	0.0	
3	0	8.68	312.00	0.0	0.0	0.00	0.0	
4	0	24.25	312.00	0.0	0.0	0.00	0.0	
5	1	51.87	312.00	0.0	0.0	0.00	0.0	
6	1	94.85	312.00	0.0	0.0	0.00	0.0	
7	1	156.46	312.01	0.0	0.0	0.00	0.0	
8	2	239.85	312.01	0.0	0.0	0.00	0.0	
9	2	348.08	312.01	0.0	0.0	0.00	0.0	
10	3	484.07	312.02	0.0	0.0	0.00	0.0	
11	3	650.61	312.02	0.0	0.0	0.00	0.0	
12	4	850.32	312.03	0.0	0.0	0.00	0.0	
13	5	1085.67	312.04	0.0	0.0	0.00	0.0	
14	5	1358.95	312.04	0.0	0.0	0.00	0.0	
15	6	1672.23	312.05	0.0	0.0	0.00	0.0	
16	7	2027.40	312.06	0.0	0.0	0.00	0.0	
17	7	2426.15	312.08	0.0	0.0	0.00	0.0	
18	8	2869.92	312.09	0.0	0.0	0.00	0.0	
19	9	3359.93	312.10	0.0	0.0	0.00	0.0	
20	10	3897.19	312.12	0.0	0.0	0.00	0.0	
21	11	4482.43	312.14	0.0	0.0	0.00	0.0	
22	11	5116.18	312.15	0.0	0.0	0.00	0.0	
23	12	5798.68	312.17	0.0	0.0	0.00	0.0	
24	13	6529.97	312.19	0.0	0.0	0.00	0.0	
25	14	7309.79	312.22	0.1	0.0	0.07	0.0	
26	15	8133.56	312.24	0.1	0.0	0.07	0.0	
27	15	9004.67	312.26	0.1	0.0	0.07	0.0	
28	16	9922.17	312.29	0.1	0.0	0.07	0.0	
29	17	10884.86	312.32	0.1	0.0	0.07	0.0	
30	18	11891.31	312.34	0.1	0.0	0.07	0.0	
31	18	12939.88	312.37	0.1	0.0	0.07	0.0	
32	19	14028.71	312.40	0.1	0.0	0.07	0.0	
33	19	15155.74	312.43	0.1	0.0	0.07	0.0	
34	20	16318.71	312.46	0.1	0.0	0.07	0.0	
35	21	17515.17	312.50	0.1	0.0	0.07	0.0	
36	21	18742.52	312.53	0.1	0.0	0.07	0.0	
37	21	19997.99	312.56	0.1	0.0	0.07	0.0	
38	22	21278.68	312.60	0.1	0.0	0.07	0.0	
39	22	22581.55	312.63	0.1	0.0	0.07	0.0	
40	22	23903.45	312.67	0.1	0.0	0.07	0.0	
41	23	25241.14	312.70	0.1	0.0	0.07	0.0	
42	23	26591.28	312.74	0.1	0.0	0.07	0.0	
43	23	27950.50	312.77	0.1	0.0	0.07	0.0	
44	23	29315.35	312.81	0.1	0.0	0.07	0.0	
45	23	30682.39	312.84	0.1	0.0	0.07	0.0	
46	23	32048.12	312.88	0.1	0.0	0.07	0.0	

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs	Riser Flow cfs	
47	23	33409.10	312.91	0.1	0.0	0.07	0.0	
48	22	34761.86	312.95	0.1	0.0	0.07	0.0	
49	22	36103.02	312.98	0.1	0.0	0.07	0.0	
50	22	37429.23	313.02	0.1	0.0	0.07	0.1	
51	22	38733.29	313.05	0.4	0.0	0.07	0.3	
52	21	40000.31	313.08	0.8	0.0	0.07	0.7	
53	21	41221.44	313.11	1.2	0.0	0.07	1.1	
54	20	42390.11	313.14	1.6	0.0	0.07	1.6	
55	20	43501.15	313.17	2.1	0.0	0.07	2.0	
56	15	44550.53	313.20	2.6	0.0	0.07	2.5	
57	14	45285.47	313.22	3.0	0.0	0.07	2.9	
58	14	45972.73	313.24	3.3	0.0	0.07	3.2	
59	14	46613.63	313.25	3.7	0.0	0.07	3.6	
60	13	47209.61	313.27	4.0	0.0	0.07	3.9	
61	13	47762.24	313.28	4.3	0.0	0.07	4.2	
62	12	48273.14	313.29	4.6	0.0	0.07	4.5	
63	12	48743.98	313.31	4.9	0.0	0.07	4.8	
64	12	49176.46	313.32	5.1	0.0	0.07	5.1	
65	11	49572.29	313.33	5.4	0.0	0.07	5.3	
66	11	49933.17	313.34	5.6	0.0	0.07	5.5	
67	11	50260.78	313.35	5.8	0.0	0.07	5.7	
68	10	50556.78	313.35	6.0	0.0	0.07	5.9	
69	10	50822.80	313.36	6.2	0.0	0.07	6.1	
70	10	51060.43	313.37	6.3	0.0	0.07	6.2	
71	10	51271.20	313.37	6.5	0.0	0.07	6.4	
72	9	51456.61	313.38	6.6	0.0	0.07	6.5	
73	9	51618.09	313.38	6.7	0.0	0.07	6.6	
74	9	51757.04	313.38	6.8	0.0	0.07	6.7	
75	8	51874.79	313.39	6.9	0.0	0.07	6.8	
76	8	51972.62	313.39	6.9	0.0	0.07	6.8	
77	8	52051.75	313.39	7.0	0.0	0.07	6.9	
78	8	52113.36	313.39	7.0	0.0	0.07	6.9	
79	8	52158.55	313.39	7.0	0.0	0.07	7.0	
80	7	52188.40	313.39	7.1	0.0	0.07	7.0	
81	7	52203.90	313.39	7.1	0.0	0.07	7.0	
82	7	52206.03	**313.39**	7.1	0.0	0.07	7.0	
83	7	52195.68	313.39	7.1	0.0	0.07	7.0	
84	7	52173.74	313.39	7.1	0.0	0.07	7.0	
85	6	52141.00	313.39	7.0	0.0	0.07	7.0	
86	6	52098.26	313.39	7.0	0.0	0.07	6.9	
87	6	52046.23	313.39	7.0	0.0	0.07	6.9	
88	6	51985.61	313.39	6.9	0.0	0.07	6.9	
89	6	51917.05	313.39	6.9	0.0	0.07	6.8	
90	5	51841.17	313.39	6.8	0.0	0.07	6.8	
91	5	51758.54	313.38	6.8	0.0	0.07	6.7	
92	5	51669.71	313.38	6.7	0.0	0.07	6.6	
93	5	51575.20	313.38	6.7	0.0	0.07	6.6	
94	5	51475.48	313.38	6.6	0.0	0.07	6.5	
95	5	51371.02	313.37	6.5	0.0	0.07	6.5	
96	5	51262.23	313.37	6.4	0.0	0.07	6.4	
97	4	51149.52	313.37	6.4	0.0	0.07	6.3	
98	4	51033.27	313.36	6.3	0.0	0.07	6.2	
99	4	50913.82	313.36	6.2	0.0	0.07	6.2	
100	4	50791.51	313.36	6.1	0.0	0.07	6.1	
101	4	50666.65	313.36	6.1	0.0	0.07	6.0	
102	4	50539.52	313.35	6.0	0.0	0.07	5.9	
103	4	50410.40	313.35	5.9	0.0	0.07	5.8	
104	4	50279.54	313.35	5.8	0.0	0.07	5.7	
105	4	50147.19	313.34	5.7	0.0	0.07	5.7	
106	3	50013.55	313.34	5.6	0.0	0.07	5.6	
107	3	49878.84	313.34	5.6	0.0	0.07	5.5	
108	3	49743.24	313.33	5.5	0.0	0.07	5.4	
109	3	49606.95	313.33	5.4	0.0	0.07	5.3	
110	3	49470.13	313.33	5.3	0.0	0.07	5.2	
111	3	49332.93	313.32	5.2	0.0	0.07	5.2	
112	3	49195.50	313.32	5.1	0.0	0.07	5.1	
113	3	49057.97	313.31	5.1	0.0	0.07	5.0	
114	3	48920.47	313.31	5.0	0.0	0.07	4.9	
115	3	48783.12	313.31	4.9	0.0	0.07	4.8	
116	3	48646.02	313.30	4.8	0.0	0.07	4.7	

MCADAMS

GRAPHED DATA FOR 10 YEAR STORM





SCM-D
SKIMMER BASIN WITH RISER DESIGN

CHAMBLEE LAKE
ZEBULON
DRH-22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm
Routing for the 25-year storm
Graphed Data for the 25-year storm

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH-22004	Calculated By:	BJK
Sediment Trap ID	SCM-D		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	1.33 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	0.53 ac.	0.25
Undisturbed grassy area	0.00 ac.	0.80 ac.	0.35
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	1.33 ac.	1.33 ac.	
Composite Rational 'c'	0.45	0.31	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	284	feet
Height of watershed =	8	feet
Calculated t(c) =	2.4	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.0	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for Raleigh, NC

Return Period	g	h	Intensity
2	132	18	5.74 in/hr
10	195	22	7.22 in/hr
25	232	23	8.29 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	5.74 in/hr	3.4 cfs	2.37 cfs
10-year storm	7.22 in/hr	4.3 cfs	2.98 cfs
25-year storm	8.29 in/hr	5.0 cfs	3.42 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	3,600	cubic feet per disturbed acre
Required sediment trap surface area	435	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	95
Bottom width =	75
Sediment depth =	4.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Permanent Riser =	4.0
Side slopes =	3.0 H:1V
Spillway length =	16
Height of berm =	6
Top of trap length =	131
Top of trap width =	111
Bottom elevation =	310

Sediment Trap Data

	Required	Provided	
Sediment storage volume =	4788 cu. ft.	37420 cu. ft.	
Sediment surface area =	1880 sq. ft.	11780 sq. ft.	
Sediment storage depth =	3.5 ft. (max.)	4	Decrease storage depth
Trap bottom length to width ratio =	2.0L:1W (min)	1.3L:1W	Ratio too low
Spillway length =	10.0 ft. (min)	16	
10-Year flow depth over spillway =	0.50 ft. (max)	-2.59 ft	
Freeboard at 10-Year discharge =	1.00 ft. (min)	4.59 ft	

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU 1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Required for Sediment Basin = 4,788 cubic feet

24 HOURS	Best Option =	1 - 2.5 inch Skimmers with a 2.2 inch orifice	
2 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.6 inch orifice	
3 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.3 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.2 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

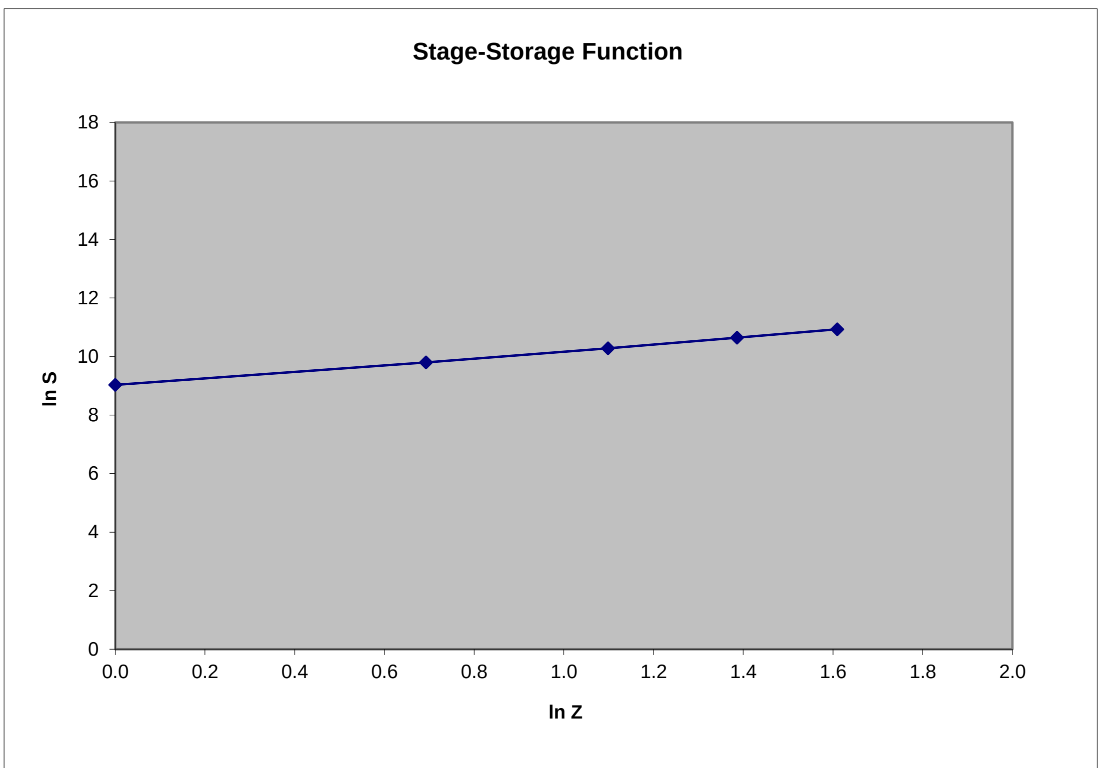
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6 Y	7 X	8
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
310	7708		0	0			
311	9026	8367	8367	1	9.0321	0.0000	1.02
312	10410	9718	18085	2	9.8028	0.6931	1.96
313	11861	11135.5	29220.5	3	10.2826	1.0986	2.94
314	13378	12619.5	41840	4	10.6416	1.3863	3.99
315	14961	14169.5	56009.5	5	10.9333	1.6094	5.12

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.18 and **K_s =** 8192



McADAMS

HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	1.33	ac	**Use Kirpich Equation:**	
Disturbed Area =	1.33	ac	**Tc =**	5.0 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	284	ft	**i_1 =**	5.74 in/hr
Vertical Fall =	8	ft	**i_{10} =**	7.22 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	8.29 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	3.4 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	4.3 cfs
h =	23		**Q_{25} =**	5.0 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	29.4	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	39.1	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	42.0	**minutes**

McADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	311.00 ft
		Rise =	1.00 ft
Freeboard =	5.00 ft	Peak Outflow =	0.03 cfs

INPUT

Hydrograph Results:

Qp = 3.43 cfs
Tp = 29.4 min
dT = 1.0 min

Stage-Storage Results:

Ks = 8192
b = 1.18
Z_0 = 310.0 ft (inv)

Initial Water Level:

Z_i = 310.00 ft

Weir:

N = 1
L = 16 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

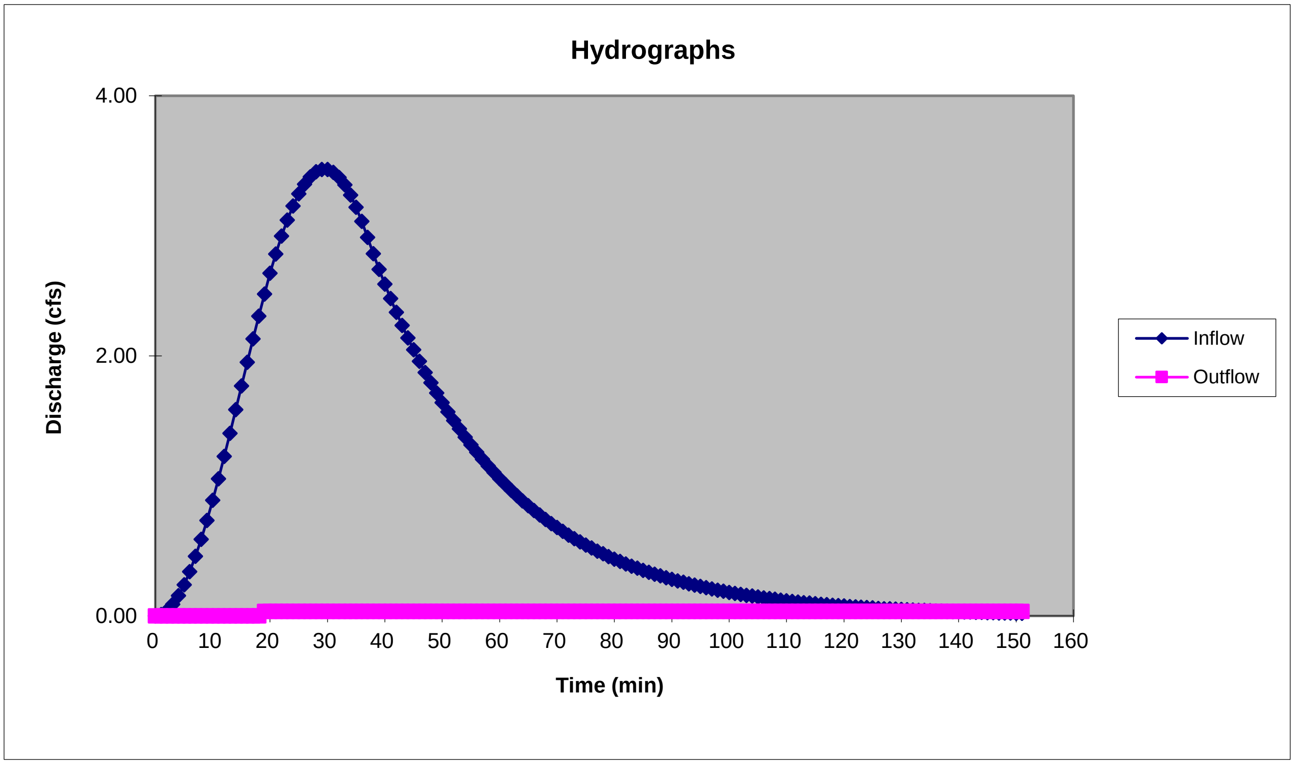
Skimmer Orifice:

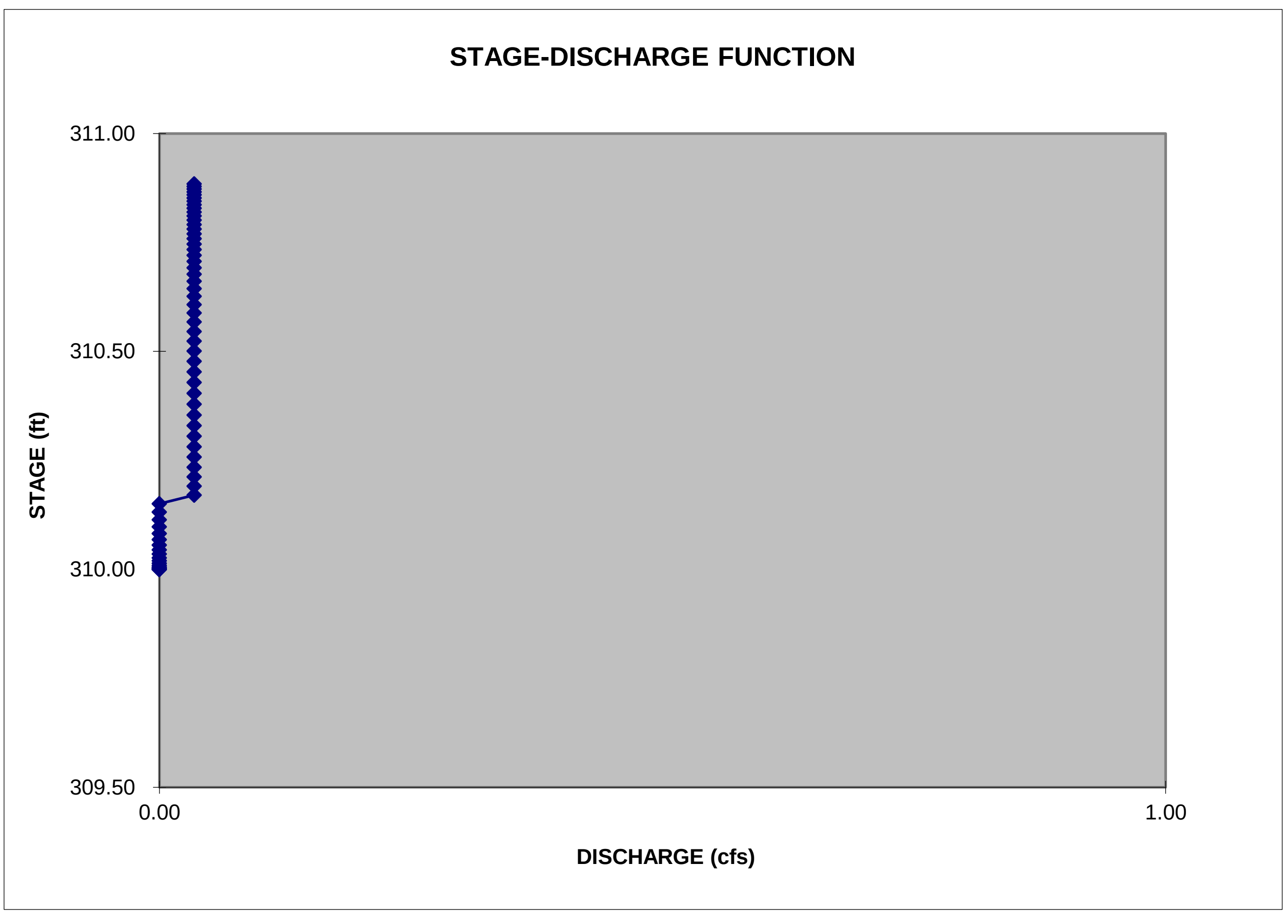
Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 1.35 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	0.59	310.00	0.0	0.0	0.00		
3	0	2.92	310.00	0.0	0.0	0.00		
4	0	8.15	310.00	0.0	0.0	0.00		
5	0	17.39	310.01	0.0	0.0	0.00		
6	0	31.71	310.01	0.0	0.0	0.00		
7	0	52.10	310.01	0.0	0.0	0.00		
8	1	79.52	310.02	0.0	0.0	0.00		
9	1	114.83	310.03	0.0	0.0	0.00		
10	1	158.78	310.04	0.0	0.0	0.00		
11	1	212.06	310.04	0.0	0.0	0.00		
12	1	275.23	310.06	0.0	0.0	0.00		
13	1	348.74	310.07	0.0	0.0	0.00		
14	2	432.93	310.08	0.0	0.0	0.00		
15	2	528.02	310.10	0.0	0.0	0.00		
16	2	634.09	310.11	0.0	0.0	0.00		
17	2	751.11	310.13	0.0	0.0	0.00		
18	2	878.92	310.15	0.0	0.0	0.00		
19	2	1017.24	310.17	0.0	0.0	0.03		
20	3	1163.59	310.19	0.0	0.0	0.03		
21	3	1319.54	310.21	0.0	0.0	0.03		
22	3	1484.45	310.23	0.0	0.0	0.03		
23	3	1657.60	310.26	0.0	0.0	0.03		
24	3	1838.18	310.28	0.0	0.0	0.03		
25	3	2025.27	310.31	0.0	0.0	0.03		
26	3	2217.89	310.33	0.0	0.0	0.03		
27	3	2415.01	310.35	0.0	0.0	0.03		
28	3	2615.53	310.38	0.0	0.0	0.03		
29	3	2818.31	310.40	0.0	0.0	0.03		
30	3	3022.21	310.43	0.0	0.0	0.03		
31	3	3226.05	310.45	0.0	0.0	0.03		
32	3	3428.66	310.48	0.0	0.0	0.03		
33	3	3628.89	310.50	0.0	0.0	0.03		
34	3	3825.60	310.52	0.0	0.0	0.03		
35	3	4017.72	310.55	0.0	0.0	0.03		
36	3	4204.20	310.57	0.0	0.0	0.03		
37	3	4384.06	310.59	0.0	0.0	0.03		
38	3	4556.66	310.61	0.0	0.0	0.03		
39	3	4721.71	310.63	0.0	0.0	0.03		
40	3	4879.55	310.64	0.0	0.0	0.03		

GRAPHED DATA FOR 2 YEAR STORM





McADAMS

ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**311.41 ft**
		Rise =	**1.41 ft**
Freeboard =	**4.59 ft**	**Peak Outflow =**	**0.03 cfs**

INPUT

Hydrograph Results:

- Qp = 4.32 cfs
- Tp = 39.1 min
- dT = 1.0 min

Stage-Storage Results:

- Ks = 8192
- b = 1.18
- Z_0 = 310.0 ft (inv)

Initial Water Level:

- Z_i = 310.00 ft

Weir:

- N = 1
- L = 16 ft
- Cw = 3.00
- Zcr = 314.00 ft

Top of Dam: 316.00 ft

Skimmer Orifice:

- Number = 1 Ea
- Diameter = 2.00 Inches
- Head = 1.35 inches

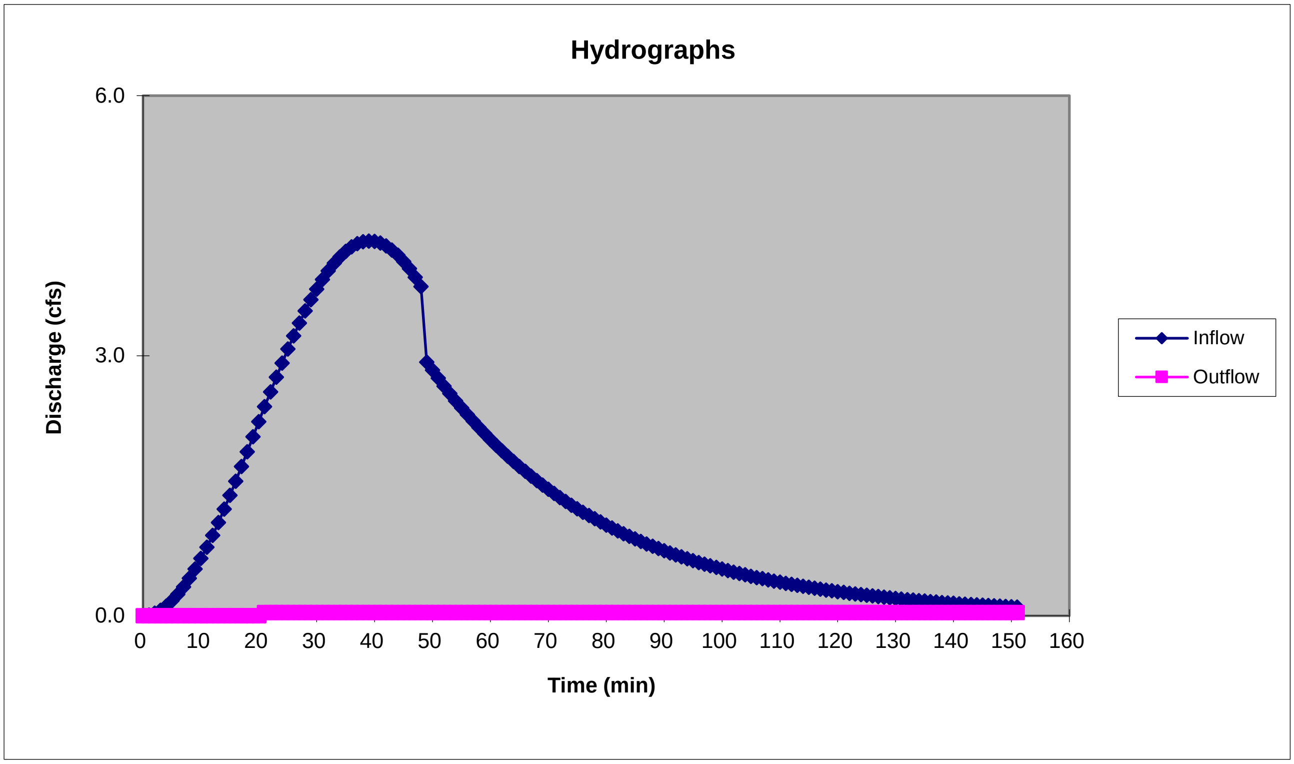
OUTPUT

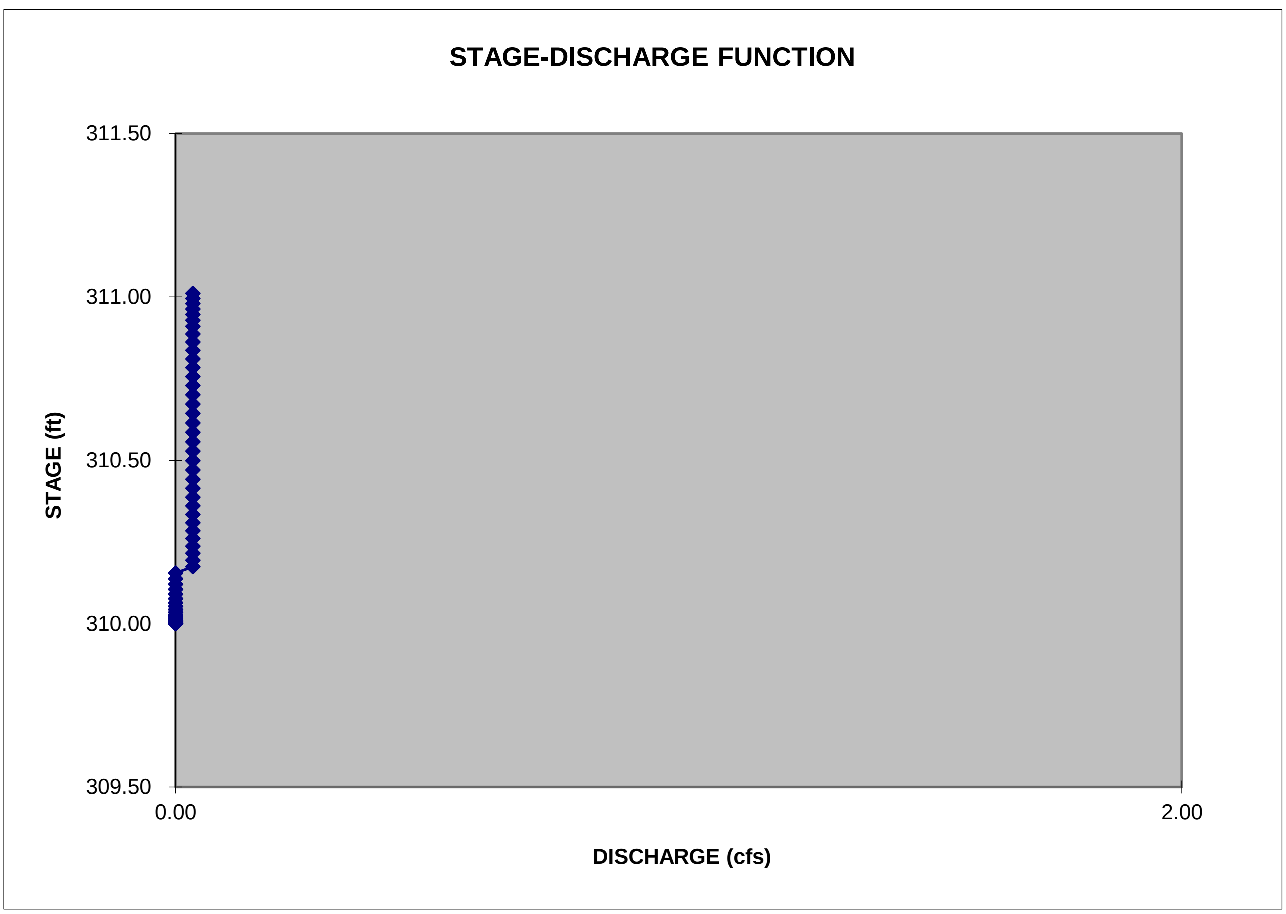
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	0.42	310.00	0.0	0.0	0.00		
3	0	2.09	310.00	0.0	0.0	0.00		
4	0	5.83	310.00	0.0	0.0	0.00		
5	0	12.46	310.00	0.0	0.0	0.00		
6	0	22.77	310.01	0.0	0.0	0.00		
7	0	37.53	310.01	0.0	0.0	0.00		
8	0	57.47	310.01	0.0	0.0	0.00		
9	1	83.32	310.02	0.0	0.0	0.00		
10	1	115.72	310.03	0.0	0.0	0.00		
11	1	155.32	310.03	0.0	0.0	0.00		
12	1	202.69	310.04	0.0	0.0	0.00		
13	1	258.37	310.05	0.0	0.0	0.00		
14	1	322.82	310.06	0.0	0.0	0.00		
15	1	396.47	310.08	0.0	0.0	0.00		
16	2	479.68	310.09	0.0	0.0	0.00		
17	2	572.75	310.10	0.0	0.0	0.00		
18	2	675.92	310.12	0.0	0.0	0.00		
19	2	789.35	310.14	0.0	0.0	0.00		
20	2	913.16	310.16	0.0	0.0	0.00		
21	2	1047.37	310.17	0.0	0.0	0.03		
22	3	1189.88	310.19	0.0	0.0	0.03		
23	3	1342.68	310.22	0.0	0.0	0.03		
24	3	1505.60	310.24	0.0	0.0	0.03		
25	3	1678.42	310.26	0.0	0.0	0.03		
26	3	1860.83	310.28	0.0	0.0	0.03		
27	3	2052.49	310.31	0.0	0.0	0.03		
28	4	2253.00	310.33	0.0	0.0	0.03		
29	4	2461.86	310.36	0.0	0.0	0.03		
30	4	2678.57	310.39	0.0	0.0	0.03		
31	4	2902.55	310.41	0.0	0.0	0.03		
32	4	3133.18	310.44	0.0	0.0	0.03		
33	4	3369.79	310.47	0.0	0.0	0.03		
34	4	3611.68	310.50	0.0	0.0	0.03		
35	4	3858.11	310.53	0.0	0.0	0.03		
36	4	4108.33	310.56	0.0	0.0	0.03		
37	4	4361.54	310.59	0.0	0.0	0.03		
38	4	4616.92	310.61	0.0	0.0	0.03		
39	4	4873.67	310.64	0.0	0.0	0.03		
40	4	5130.93	310.67	0.0	0.0	0.03		
41	4	5387.89	310.70	0.0	0.0	0.03		
42	4	5643.70	310.73	0.0	0.0	0.03		
43	4	5897.55	310.76	0.0	0.0	0.03		
44	4	6148.61	310.78	0.0	0.0	0.03		
45	4	6396.09	310.81	0.0	0.0	0.03		
46	4	6639.22	310.84	0.0	0.0	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	4	6877.25	310.86	0.0	0.0	0.03		
48	4	7109.48	310.89	0.0	0.0	0.03		
49	3	7335.23	310.91	0.0	0.0	0.03		
50	3	7508.75	310.93	0.0	0.0	0.03		
51	3	7676.54	310.95	0.0	0.0	0.03		
52	3	7838.78	310.96	0.0	0.0	0.03		
53	3	7995.65	310.98	0.0	0.0	0.03		
54	2	8147.33	311.00	0.0	0.0	0.03		
55	2	8293.98	311.01	0.0	0.0	0.03		
56	2	8435.77	311.03	0.0	0.0	0.03		
57	2	8572.86	311.04	0.0	0.0	0.03		
58	2	8705.40	311.05	0.0	0.0	0.03		
59	2	8833.54	311.07	0.0	0.0	0.03		
60	2	8957.43	311.08	0.0	0.0	0.03		
61	2	9077.20	311.09	0.0	0.0	0.03		
62	2	9192.99	311.10	0.0	0.0	0.03		
63	2	9304.92	311.11	0.0	0.0	0.03		
64	2	9413.14	311.13	0.0	0.0	0.03		
65	2	9517.74	311.14	0.0	0.0	0.03		
66	2	9618.87	311.15	0.0	0.0	0.03		
67	2	9716.62	311.16	0.0	0.0	0.03		
68	2	9811.10	311.17	0.0	0.0	0.03		
69	2	9902.44	311.17	0.0	0.0	0.03		
70	1	9990.72	311.18	0.0	0.0	0.03		
71	1	10076.04	311.19	0.0	0.0	0.03		
72	1	10158.51	311.20	0.0	0.0	0.03		
73	1	10238.22	311.21	0.0	0.0	0.03		
74	1	10315.26	311.22	0.0	0.0	0.03		
75	1	10389.71	311.22	0.0	0.0	0.03		
76	1	10461.66	311.23	0.0	0.0	0.03		
77	1	10531.19	311.24	0.0	0.0	0.03		
78	1	10598.38	311.24	0.0	0.0	0.03		
79	1	10663.31	311.25	0.0	0.0	0.03		
80	1	10726.04	311.26	0.0	0.0	0.03		
81	1	10786.66	311.26	0.0	0.0	0.03		
82	1	10845.23	311.27	0.0	0.0	0.03		
83	1	10901.82	311.27	0.0	0.0	0.03		
84	1	10956.50	311.28	0.0	0.0	0.03		
85	1	11009.31	311.29	0.0	0.0	0.03		
86	1	11060.34	311.29	0.0	0.0	0.03		
87	1	11109.63	311.30	0.0	0.0	0.03		
88	1	11157.24	311.30	0.0	0.0	0.03		
89	1	11203.22	311.30	0.0	0.0	0.03		
90	1	11247.64	311.31	0.0	0.0	0.03		
91	1	11290.54	311.31	0.0	0.0	0.03		
92	1	11331.96	311.32	0.0	0.0	0.03		
93	1	11371.97	311.32	0.0	0.0	0.03		
94	1	11410.60	311.32	0.0	0.0	0.03		
95	1	11447.90	311.33	0.0	0.0	0.03		
96	1	11483.91	311.33	0.0	0.0	0.03		
97	1	11518.68	311.34	0.0	0.0	0.03		
98	1	11552.25	311.34	0.0	0.0	0.03		
99	1	11584.65	311.34	0.0	0.0	0.03		
100	1	11615.92	311.35	0.0	0.0	0.03		
101	1	11646.11	311.35	0.0	0.0	0.03		
102	1	11675.24	311.35	0.0	0.0	0.03		
103	0	11703.35	311.35	0.0	0.0	0.03		
104	0	11730.47	311.36	0.0	0.0	0.03		
105	0	11756.64	311.36	0.0	0.0	0.03		
106	0	11781.89	311.36	0.0	0.0	0.03		
107	0	11806.24	311.36	0.0	0.0	0.03		
108	0	11829.73	311.37	0.0	0.0	0.03		
109	0	11852.38	311.37	0.0	0.0	0.03		
110	0	11874.23	311.37	0.0	0.0	0.03		
111	0	11895.30	311.37	0.0	0.0	0.03		
112	0	11915.60	311.37	0.0	0.0	0.03		
113	0	11935.18	311.38	0.0	0.0	0.03		
114	0	11954.05	311.38	0.0	0.0	0.03		
115	0	11972.24	311.38	0.0	0.0	0.03		
116	0	11989.76	311.38	0.0	0.0	0.03		
117	0	12006.64	311.38	0.0	0.0	0.03		
118	0	12022.91	311.39	0.0	0.0	0.03		
119	0	12038.57	311.39	0.0	0.0	0.03		
120	0	12053.65	311.39	0.0	0.0	0.03		
121	0	12068.18	311.39	0.0	0.0	0.03		
122	0	12082.16	311.39	0.0	0.0	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	0	12095.62	311.39	0.0	0.0	0.03		
124	0	12108.56	311.39	0.0	0.0	0.03		
125	0	12121.02	311.39	0.0	0.0	0.03		
126	0	12133.01	311.40	0.0	0.0	0.03		
127	0	12144.53	311.40	0.0	0.0	0.03		
128	0	12155.61	311.40	0.0	0.0	0.03		
129	0	12166.26	311.40	0.0	0.0	0.03		
130	0	12176.49	311.40	0.0	0.0	0.03		
131	0	12186.32	311.40	0.0	0.0	0.03		
132	0	12195.76	311.40	0.0	0.0	0.03		
133	0	12204.83	311.40	0.0	0.0	0.03		
134	0	12213.53	311.40	0.0	0.0	0.03		
135	0	12221.88	311.40	0.0	0.0	0.03		
136	0	12229.89	311.41	0.0	0.0	0.03		
137	0	12237.57	311.41	0.0	0.0	0.03		
138	0	12244.93	311.41	0.0	0.0	0.03		
139	0	12251.98	311.41	0.0	0.0	0.03		
140	0	12258.74	311.41	0.0	0.0	0.03		
141	0	12265.20	311.41	0.0	0.0	0.03		
142	0	12271.39	311.41	0.0	0.0	0.03		
143	0	12277.31	311.41	0.0	0.0	0.03		
144	0	12282.96	311.41	0.0	0.0	0.03		
145	0	12288.36	311.41	0.0	0.0	0.03		
146	0	12293.52	311.41	0.0	0.0	0.03		
147	0	12298.45	311.41	0.0	0.0	0.03		
148	0	12303.14	311.41	0.0	0.0	0.03		
149	0	12307.61	311.41	0.0	0.0	0.03		
150	0	12311.87	311.41	0.0	0.0	0.03		
151	0	12315.92	**311.41**	0.0	0.0	0.03		

GRAPHED DATA FOR 10 YEAR STORM





McADAMS

ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	311.52 ft
		Rise =	1.52 ft
Freeboard =	4.48 ft	Peak Outflow =	0.03 cfs

INPUT

Hydrograph Results:

Qp = 4.96 cfs
Tp = 39.1 min
dT = 1.0 min

Stage-Storage Results:

Ks = 8192
b = 1.18
Z_0 = 310.0 ft (inv)

Initial Water Level:

Z_i = 310.00 ft

Weir:

N = 1
L = 16 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 1.35 inches

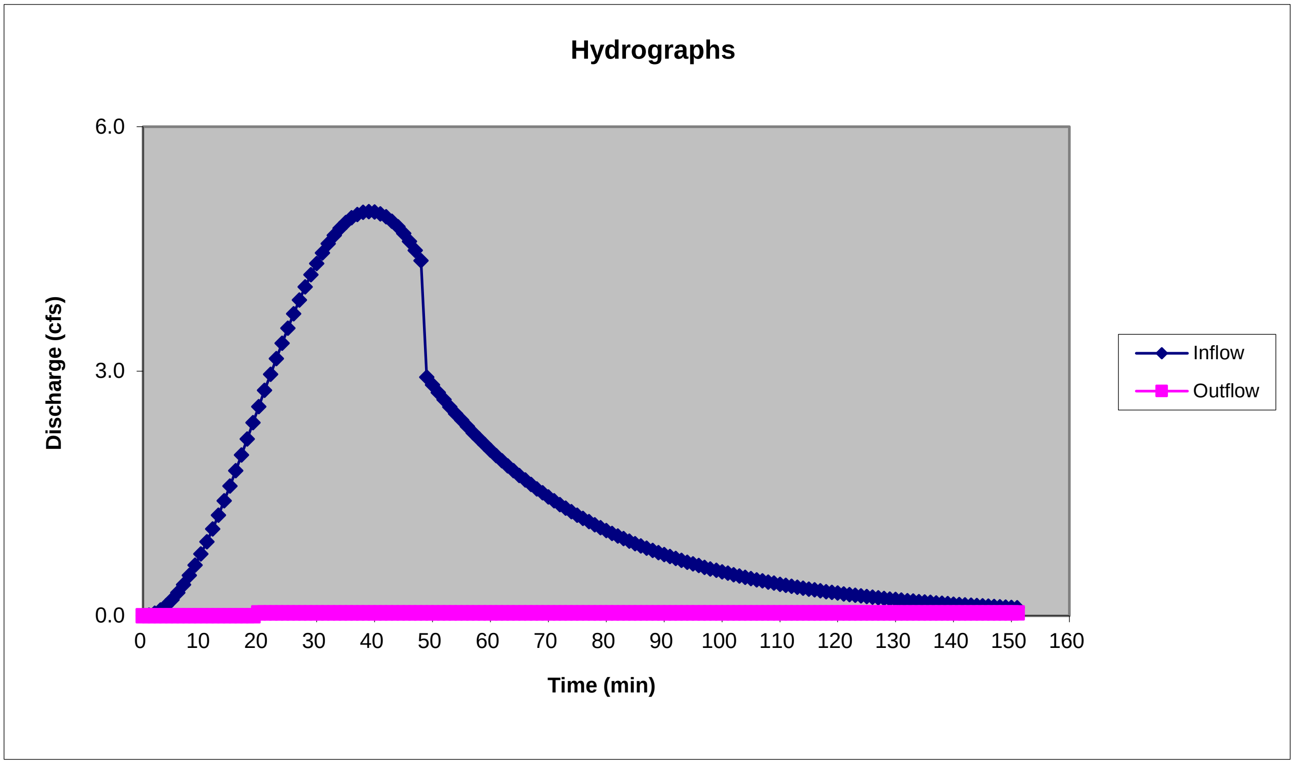
OUTPUT

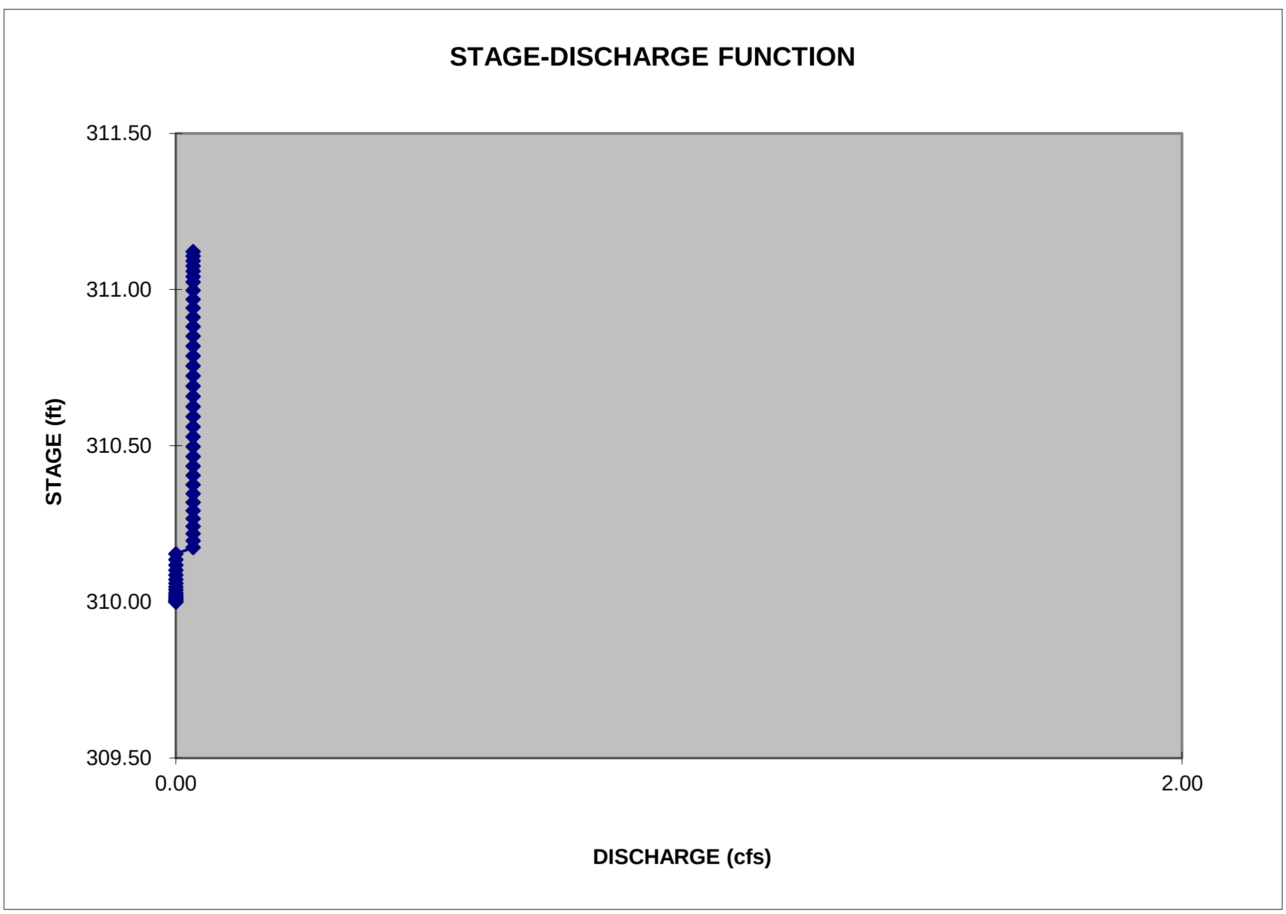
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	0.48	310.00	0.0	0.0	0.00		
3	0	2.39	310.00	0.0	0.0	0.00		
4	0	6.69	310.00	0.0	0.0	0.00		
5	0	14.29	310.00	0.0	0.0	0.00		
6	0	26.12	310.01	0.0	0.0	0.00		
7	0	43.05	310.01	0.0	0.0	0.00		
8	0	65.94	310.02	0.0	0.0	0.00		
9	1	95.59	310.02	0.0	0.0	0.00		
10	1	132.77	310.03	0.0	0.0	0.00		
11	1	178.20	310.04	0.0	0.0	0.00		
12	1	232.54	310.05	0.0	0.0	0.00		
13	1	296.41	310.06	0.0	0.0	0.00		
14	1	370.36	310.07	0.0	0.0	0.00		
15	2	454.85	310.09	0.0	0.0	0.00		
16	2	550.32	310.10	0.0	0.0	0.00		
17	2	657.09	310.12	0.0	0.0	0.00		
18	2	775.45	310.14	0.0	0.0	0.00		
19	2	905.59	310.15	0.0	0.0	0.00		
20	3	1047.62	310.17	0.0	0.0	0.03		
21	3	1199.52	310.20	0.0	0.0	0.03		
22	3	1363.33	310.22	0.0	0.0	0.03		
23	3	1538.93	310.24	0.0	0.0	0.03		
24	3	1726.15	310.27	0.0	0.0	0.03		
25	4	1924.71	310.29	0.0	0.0	0.03		
26	4	2134.30	310.32	0.0	0.0	0.03		
27	4	2354.49	310.35	0.0	0.0	0.03		
28	4	2584.82	310.38	0.0	0.0	0.03		
29	4	2824.75	310.40	0.0	0.0	0.03		
30	4	3073.67	310.43	0.0	0.0	0.03		
31	4	3330.94	310.47	0.0	0.0	0.03		
32	5	3595.83	310.50	0.0	0.0	0.03		
33	5	3867.59	310.53	0.0	0.0	0.03		
34	5	4145.40	310.56	0.0	0.0	0.03		
35	5	4428.43	310.59	0.0	0.0	0.03		
36	5	4715.80	310.63	0.0	0.0	0.03		
37	5	5006.60	310.66	0.0	0.0	0.03		
38	5	5299.90	310.69	0.0	0.0	0.03		
39	5	5594.75	310.72	0.0	0.0	0.03		
40	5	5890.21	310.76	0.0	0.0	0.03		
41	5	6185.31	310.79	0.0	0.0	0.03		
42	5	6479.10	310.82	0.0	0.0	0.03		
43	5	6770.63	310.85	0.0	0.0	0.03		
44	5	7058.96	310.88	0.0	0.0	0.03		
45	5	7343.19	310.91	0.0	0.0	0.03		
46	5	7622.43	310.94	0.0	0.0	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	4	7895.82	310.97	0.0	0.0	0.03		
48	4	8162.55	311.00	0.0	0.0	0.03		
49	3	8421.84	311.02	0.0	0.0	0.03		
50	3	8595.37	311.04	0.0	0.0	0.03		
51	3	8763.16	311.06	0.0	0.0	0.03		
52	3	8925.39	311.08	0.0	0.0	0.03		
53	3	9082.26	311.09	0.0	0.0	0.03		
54	2	9233.94	311.11	0.0	0.0	0.03		
55	2	9380.59	311.12	0.0	0.0	0.03		
56	2	9522.38	311.14	0.0	0.0	0.03		
57	2	9659.47	311.15	0.0	0.0	0.03		
58	2	9792.01	311.16	0.0	0.0	0.03		
59	2	9920.15	311.18	0.0	0.0	0.03		
60	2	10044.04	311.19	0.0	0.0	0.03		
61	2	10163.81	311.20	0.0	0.0	0.03		
62	2	10279.60	311.21	0.0	0.0	0.03		
63	2	10391.54	311.22	0.0	0.0	0.03		
64	2	10499.75	311.23	0.0	0.0	0.03		
65	2	10604.36	311.25	0.0	0.0	0.03		
66	2	10705.48	311.26	0.0	0.0	0.03		
67	2	10803.23	311.26	0.0	0.0	0.03		
68	2	10897.72	311.27	0.0	0.0	0.03		
69	2	10989.05	311.28	0.0	0.0	0.03		
70	1	11077.33	311.29	0.0	0.0	0.03		
71	1	11162.66	311.30	0.0	0.0	0.03		
72	1	11245.13	311.31	0.0	0.0	0.03		
73	1	11324.83	311.32	0.0	0.0	0.03		
74	1	11401.87	311.32	0.0	0.0	0.03		
75	1	11476.32	311.33	0.0	0.0	0.03		
76	1	11548.27	311.34	0.0	0.0	0.03		
77	1	11617.80	311.35	0.0	0.0	0.03		
78	1	11684.99	311.35	0.0	0.0	0.03		
79	1	11749.92	311.36	0.0	0.0	0.03		
80	1	11812.66	311.36	0.0	0.0	0.03		
81	1	11873.28	311.37	0.0	0.0	0.03		
82	1	11931.85	311.38	0.0	0.0	0.03		
83	1	11988.44	311.38	0.0	0.0	0.03		
84	1	12043.11	311.39	0.0	0.0	0.03		
85	1	12095.93	311.39	0.0	0.0	0.03		
86	1	12146.95	311.40	0.0	0.0	0.03		
87	1	12196.24	311.40	0.0	0.0	0.03		
88	1	12243.85	311.41	0.0	0.0	0.03		
89	1	12289.84	311.41	0.0	0.0	0.03		
90	1	12334.25	311.42	0.0	0.0	0.03		
91	1	12377.15	311.42	0.0	0.0	0.03		
92	1	12418.58	311.42	0.0	0.0	0.03		
93	1	12458.58	311.43	0.0	0.0	0.03		
94	1	12497.21	311.43	0.0	0.0	0.03		
95	1	12534.51	311.43	0.0	0.0	0.03		
96	1	12570.53	311.44	0.0	0.0	0.03		
97	1	12605.30	311.44	0.0	0.0	0.03		
98	1	12638.86	311.45	0.0	0.0	0.03		
99	1	12671.26	311.45	0.0	0.0	0.03		
100	1	12702.54	311.45	0.0	0.0	0.03		
101	1	12732.72	311.45	0.0	0.0	0.03		
102	1	12761.85	311.46	0.0	0.0	0.03		
103	0	12789.96	311.46	0.0	0.0	0.03		
104	0	12817.08	311.46	0.0	0.0	0.03		
105	0	12843.25	311.46	0.0	0.0	0.03		
106	0	12868.50	311.47	0.0	0.0	0.03		
107	0	12892.85	311.47	0.0	0.0	0.03		
108	0	12916.34	311.47	0.0	0.0	0.03		
109	0	12939.00	311.47	0.0	0.0	0.03		
110	0	12960.84	311.48	0.0	0.0	0.03		
111	0	12981.91	311.48	0.0	0.0	0.03		
112	0	13002.22	311.48	0.0	0.0	0.03		
113	0	13021.79	311.48	0.0	0.0	0.03		
114	0	13040.66	311.48	0.0	0.0	0.03		
115	0	13058.85	311.49	0.0	0.0	0.03		
116	0	13076.37	311.49	0.0	0.0	0.03		
117	0	13093.26	311.49	0.0	0.0	0.03		
118	0	13109.52	311.49	0.0	0.0	0.03		
119	0	13125.18	311.49	0.0	0.0	0.03		
120	0	13140.27	311.49	0.0	0.0	0.03		
121	0	13154.79	311.50	0.0	0.0	0.03		
122	0	13168.77	311.50	0.0	0.0	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	0	13182.23	311.50	0.0	0.0	0.03		
124	0	13195.18	311.50	0.0	0.0	0.03		
125	0	13207.64	311.50	0.0	0.0	0.03		
126	0	13219.62	311.50	0.0	0.0	0.03		
127	0	13231.14	311.50	0.0	0.0	0.03		
128	0	13242.22	311.50	0.0	0.0	0.03		
129	0	13252.87	311.50	0.0	0.0	0.03		
130	0	13263.10	311.51	0.0	0.0	0.03		
131	0	13272.94	311.51	0.0	0.0	0.03		
132	0	13282.38	311.51	0.0	0.0	0.03		
133	0	13291.44	311.51	0.0	0.0	0.03		
134	0	13300.15	311.51	0.0	0.0	0.03		
135	0	13308.50	311.51	0.0	0.0	0.03		
136	0	13316.50	311.51	0.0	0.0	0.03		
137	0	13324.18	311.51	0.0	0.0	0.03		
138	0	13331.54	311.51	0.0	0.0	0.03		
139	0	13338.60	311.51	0.0	0.0	0.03		
140	0	13345.35	311.51	0.0	0.0	0.03		
141	0	13351.82	311.51	0.0	0.0	0.03		
142	0	13358.00	311.51	0.0	0.0	0.03		
143	0	13363.92	311.52	0.0	0.0	0.03		
144	0	13369.58	311.52	0.0	0.0	0.03		
145	0	13374.98	311.52	0.0	0.0	0.03		
146	0	13380.14	311.52	0.0	0.0	0.03		
147	0	13385.06	311.52	0.0	0.0	0.03		
148	0	13389.75	311.52	0.0	0.0	0.03		
149	0	13394.22	311.52	0.0	0.0	0.03		
150	0	13398.48	311.52	0.0	0.0	0.03		
151	0	13402.53	**311.52**	0.0	0.0	0.03		

GRAPHED DATA FOR 25 YEAR STORM





SCM-E
SKIMMER BASIN WITH RISER DESIGN

CHAMBLEE LAKE
ZEBULON
DRH-22004

MCADAMS

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH-22004	Calculated By:	BJK
Sediment Trap ID	SCM-E		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	9.51 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	4.75 ac.	0.25
Undisturbed grassy area	0.00 ac.	4.76 ac.	0.35
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	9.51 ac.	9.51 ac.	
Composite Rational 'c'	0.45	0.30	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	1063	feet
Height of watershed =	39	feet
Calculated t(c) =	6.0	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	6.0	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for: Raleigh, NC

Return Period	g	h	Intensity	
2	132	18	5.51	in/hr
10	195	22	6.97	in/hr
25	232	23	8.01	in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff	
2-year storm	5.51 in/hr	23.6 cfs	15.71	cfs
10-year storm	6.97 in/hr	29.8 cfs	19.89	cfs
25-year storm	8.01 in/hr	34.3 cfs	22.85	cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	3,600	cubic feet per disturbed acre
Required sediment trap surface area	435	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	190
Bottom width =	94
Sediment depth =	4.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Permanent Riser =	4.0
Side slopes =	3.0 H:1V
Spillway length =	20
Height of berm =	6
Top of trap length =	226
Top of trap width =	130
Bottom elevation =	276

Sediment Trap Data

	Required	Provided	
Sediment storage volume =	34236 cu. ft.	85790 cu. ft.	
Sediment surface area =	12980 sq. ft.	25250 sq. ft.	
Sediment storage depth =	3.5 ft. (max.)	4	Decrease storage depth
Trap bottom length to width ratio =	2.0L:1W (min)	2.0L:1W	
Spillway length =	10.0 ft. (min)	20	
10-Year flow depth over spillway =	0.50 ft. (max)	0.06 ft	
Freeboard at 10-Year discharge =	1.00 ft. (min)	1.94 ft	

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU
1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Required for Sediment Basin = 34,236 cubic feet

24 HOURS	Best Option =	2 - 4 inch Skimmers with a 3.7 inch orifice	
2 DAYS	Best Option =	1 - 4 inch Skimmers with a 3.7 inch orifice	
3 DAYS	Best Option =	1 - 4 inch Skimmers with a 3 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 3 inch Skimmers with a 2.8 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

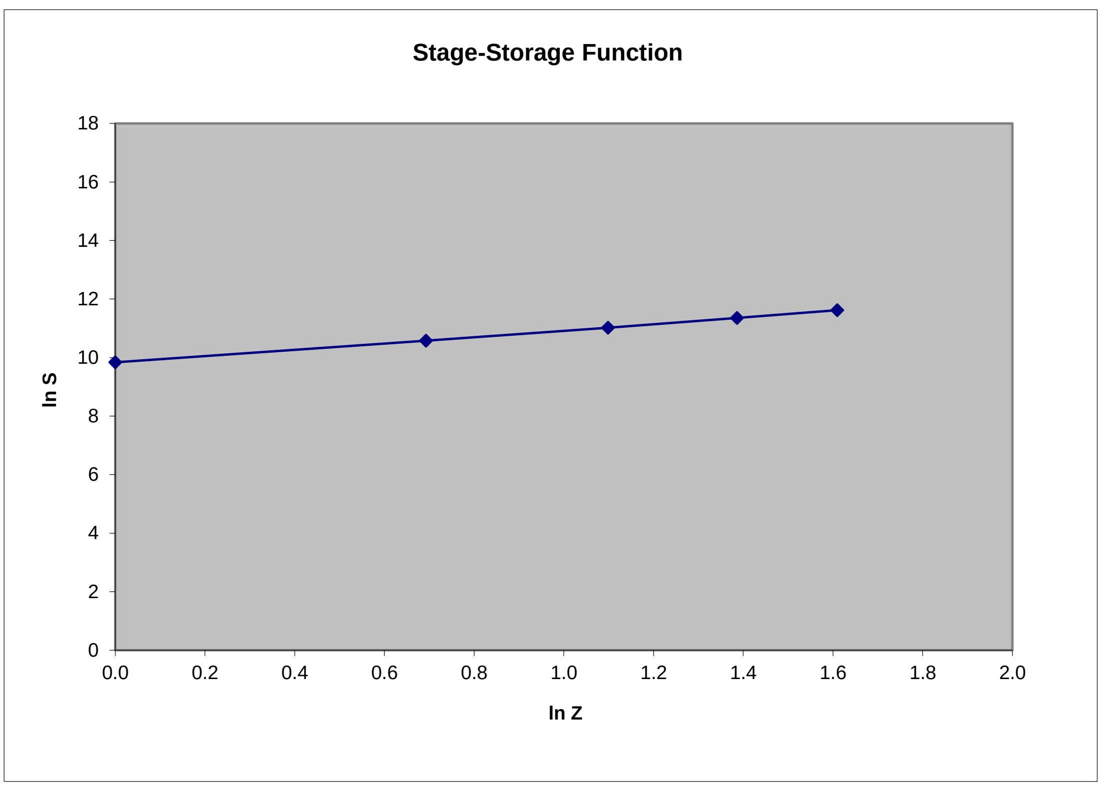
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
276	17888		0	0			
277	19563	18726	18725.5	1	9.8376	0.0000	1.01
278	21295	20429	39154.5	2	10.5753	0.6931	1.97
279	23083	22189	61343.5	3	11.0242	1.0986	2.96
280	24928	24005.5	85349	4	11.3545	1.3863	4.00
281	26829	25878.5	111227.5	5	11.6193	1.6094	5.08

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.10 and **K_s =** 18482



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HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	9.51	ac	**Use Kirpich Equation:**	
Disturbed Area =	9.51	ac	**Tc =**	6.0 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	1063	ft	i_1 =	5.51 in/hr
Vertical Fall =	39	ft	i_{10} =	6.97 in/hr
For 1 yr Storm, g =	132		i_{25} =	8.01 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		Q_2 =	23.6 cfs
For 25 yr Storm, g =	232		Q_{10} =	29.8 cfs
h =	23		Q_{25} =	34.3 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	30.7	**minutes**
P_{n6} =	3.9	in (10 Year Storm)	**Q* =**	2.92	**in**
			T_{p10} =	40.5	**minutes**
P_{n6} =	4.6	in (25 Year Storm)	**Q* =**	3.59	**in**
			T_{p25} =	43.4	**minutes**

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ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	278.84 ft
		Rise =	2.84 ft
Freeboard =	3.16 ft	Peak Outflow =	0.21 cfs

INPUT

Hydrograph Results:

Qp = 23.57 cfs
Tp = 30.7 min
dT = 1.0 min

Stage-Storage Results:

Ks = 18482
b = 1.10
Z_0 = 276.0 ft (inv)

Initial Water Level:

Z_i = 276.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 280.00 ft

Top of Dam: 282.00 ft

Skimmer Orifice:

Number = 1.00 Ea
Diameter = 4.00 Inches
Head = 3.01 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	276.00	0.0	0.0	0.0		
1	0	0.00	276.00	0.0	0.0	0.00		
2	0	3.70	276.00	0.0	0.0	0.00		
3	1	18.47	276.00	0.0	0.0	0.00		
4	1	51.55	276.00	0.0	0.0	0.00		
5	2	109.99	276.01	0.0	0.0	0.00		
6	2	200.60	276.02	0.0	0.0	0.00		
7	3	329.82	276.03	0.0	0.0	0.00		
8	4	503.70	276.04	0.0	0.0	0.00		
9	5	727.82	276.05	0.0	0.0	0.00		
10	6	1007.25	276.07	0.0	0.0	0.00		
11	7	1346.45	276.09	0.0	0.0	0.00		
12	8	1749.28	276.12	0.0	0.0	0.00		
13	9	2218.93	276.15	0.0	0.0	0.00		
14	10	2757.87	276.18	0.0	0.0	0.00		
15	11	3367.87	276.21	0.0	0.0	0.00		
16	13	4049.94	276.25	0.0	0.0	0.00		
17	14	4804.35	276.30	0.0	0.0	0.00		
18	15	5630.60	276.34	0.2	0.0	0.21		
19	16	6515.02	276.39	0.2	0.0	0.21		
20	17	7468.05	276.44	0.2	0.0	0.21		
21	18	8486.97	276.49	0.2	0.0	0.21		
22	19	9568.40	276.55	0.2	0.0	0.21		
23	20	10708.28	276.61	0.2	0.0	0.21		
24	21	11901.96	276.67	0.2	0.0	0.21		
25	22	13144.20	276.73	0.2	0.0	0.21		
26	22	14429.27	276.80	0.2	0.0	0.21		
27	23	15751.00	276.87	0.2	0.0	0.21		
28	23	17102.82	276.93	0.2	0.0	0.21		
29	23	18477.84	277.00	0.2	0.0	0.21		
30	24	19868.95	277.07	0.2	0.0	0.21		
31	24	21268.85	277.14	0.2	0.0	0.21		
32	23	22670.15	277.20	0.2	0.0	0.21		
33	23	24065.47	277.27	0.2	0.0	0.21		
34	23	25447.45	277.34	0.2	0.0	0.21		
35	22	26808.91	277.40	0.2	0.0	0.21		
36	22	28142.87	277.46	0.2	0.0	0.21		
37	21	29442.63	277.52	0.2	0.0	0.21		
38	20	30701.86	277.58	0.2	0.0	0.21		
39	20	31914.64	277.64	0.2	0.0	0.21		
40	19	33078.49	277.69	0.2	0.0	0.21		

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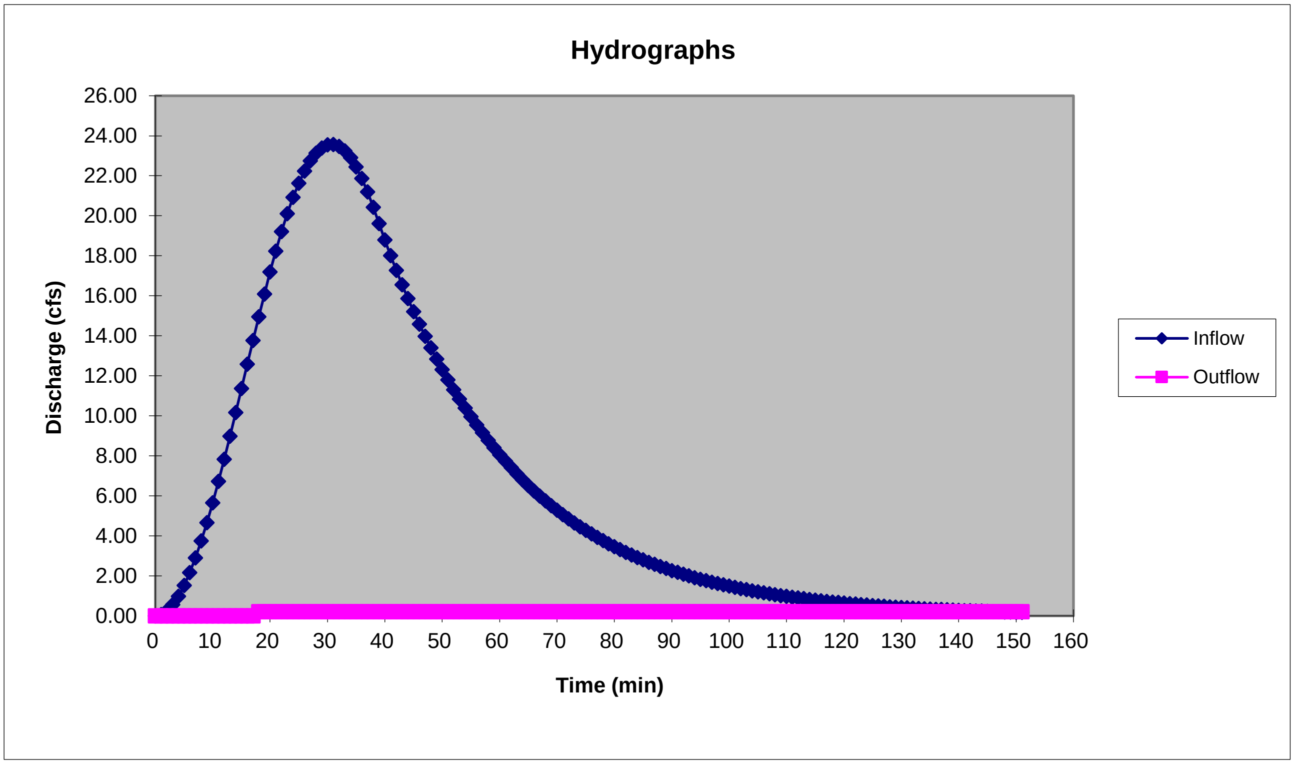
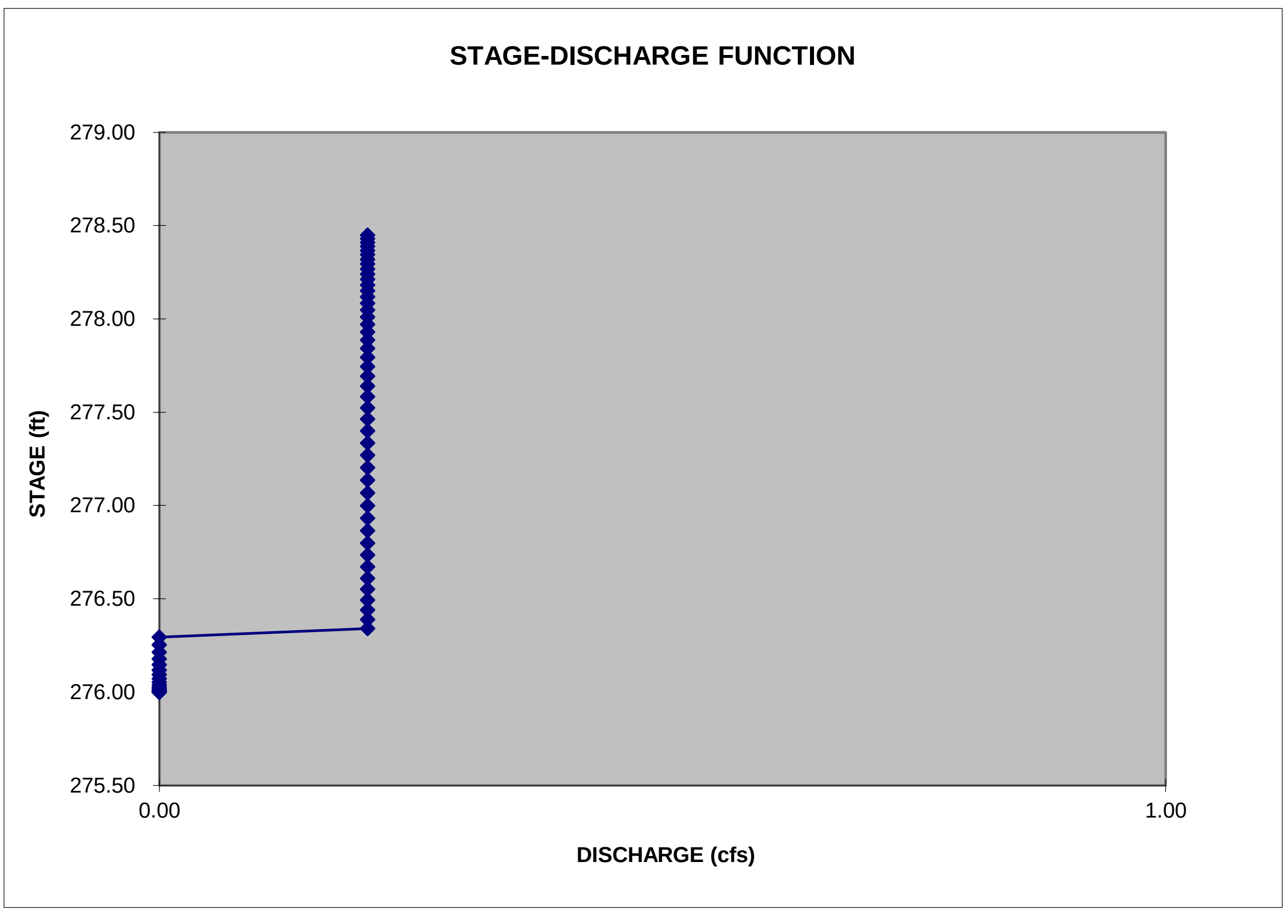
GRAPHED DATA FOR 2 YEAR STORM





ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

Peak Stage =	280.06 ft
Rise =	4.06 ft
Freeboard =	1.94 ft
Peak Outflow =	1.05 cfs

INPUT

Hydrograph Results:

Qp =	29.84	cfs
Tp =	40.5	min
dT =	1.0	min

Stage-Storage Results:

Ks =	18482	
b =	1.10	
Z_0 =	276.0	ft (inv)

Initial Water Level:

Z_i =	276.00	ft

Weir:

N =	1	
L =	20	ft
Cw =	3.00	
Zcr =	280.00	ft

Top of Dam: 282.00 ft

Skimmer Orifice:

Number =	1	Ea
Diameter =	4.00	Inches
Head =	3.01	inches

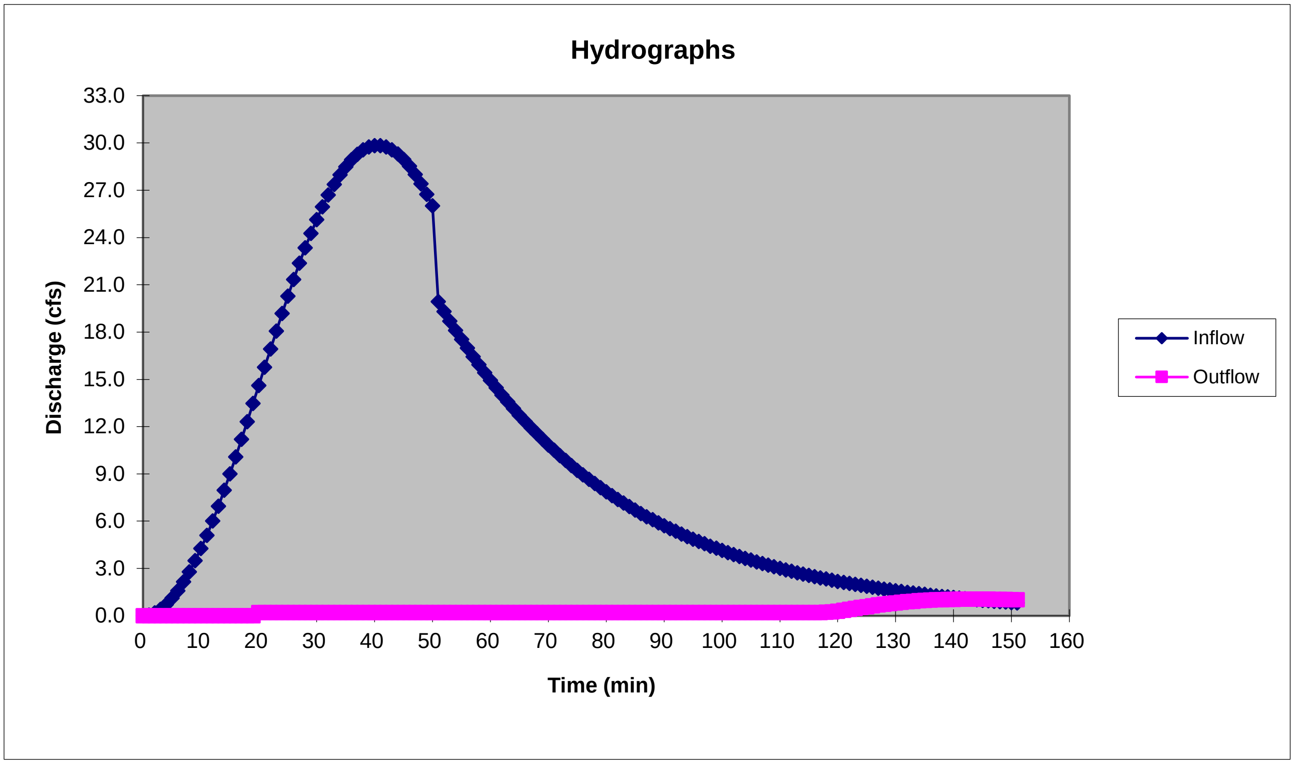
OUTPUT

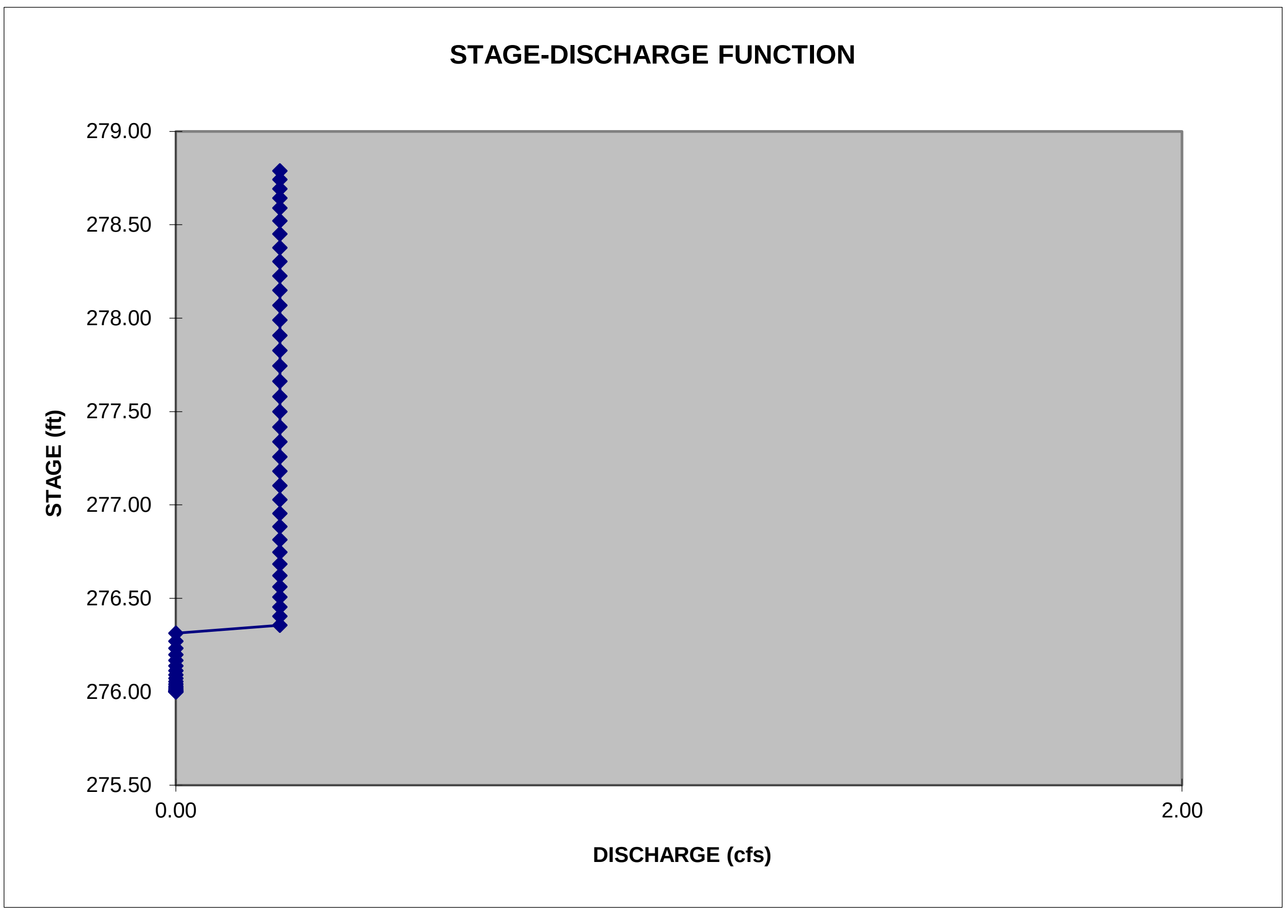
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	276.00	0.0	0.0	0.0		
1	0	0.00	276.00	0.0	0.0	0.00		
2	0	2.69	276.00	0.0	0.0	0.00		
3	0	13.42	276.00	0.0	0.0	0.00		
4	1	37.51	276.00	0.0	0.0	0.00		
5	1	80.19	276.01	0.0	0.0	0.00		
6	2	146.57	276.01	0.0	0.0	0.00		
7	2	241.63	276.02	0.0	0.0	0.00		
8	3	370.18	276.03	0.0	0.0	0.00		
9	3	536.81	276.04	0.0	0.0	0.00		
10	4	745.91	276.05	0.0	0.0	0.00		
11	5	1001.59	276.07	0.0	0.0	0.00		
12	6	1307.69	276.09	0.0	0.0	0.00		
13	7	1667.75	276.11	0.0	0.0	0.00		
14	8	2084.98	276.14	0.0	0.0	0.00		
15	9	2562.25	276.17	0.0	0.0	0.00		
16	10	3102.07	276.20	0.0	0.0	0.00		
17	11	3706.57	276.23	0.0	0.0	0.00		
18	12	4377.50	276.27	0.0	0.0	0.00		
19	13	5116.20	276.31	0.0	0.0	0.00		
20	15	5923.61	276.36	0.2	0.0	0.21		
21	16	6787.85	276.40	0.2	0.0	0.21		
22	17	7721.43	276.45	0.2	0.0	0.21		
23	18	8724.06	276.51	0.2	0.0	0.21		
24	19	9795.01	276.56	0.2	0.0	0.21		
25	20	10933.15	276.62	0.2	0.0	0.21		
26	21	12136.96	276.68	0.2	0.0	0.21		
27	22	13404.50	276.75	0.2	0.0	0.21		
28	23	14733.46	276.81	0.2	0.0	0.21		
29	24	16121.16	276.88	0.2	0.0	0.21		
30	25	17564.57	276.95	0.2	0.0	0.21		
31	26	19060.32	277.03	0.2	0.0	0.21		
32	27	20604.73	277.10	0.2	0.0	0.21		
33	27	22193.83	277.18	0.2	0.0	0.21		
34	28	23823.38	277.26	0.2	0.0	0.21		
35	28	25488.88	277.34	0.2	0.0	0.21		
36	29	27185.65	277.42	0.2	0.0	0.21		
37	29	28908.79	277.50	0.2	0.0	0.21		
38	30	30653.26	277.58	0.2	0.0	0.21		
39	30	32413.88	277.66	0.2	0.0	0.21		
40	30	34185.38	277.75	0.2	0.0	0.21		
41	30	35962.42	277.83	0.2	0.0	0.21		
42	30	37739.63	277.91	0.2	0.0	0.21		
43	30	39511.65	277.99	0.2	0.0	0.21		
44	29	41273.13	278.07	0.2	0.0	0.21		
45	29	43018.79	278.15	0.2	0.0	0.21		
46	29	44743.45	278.23	0.2	0.0	0.21		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
47	28	46442.06	278.30	0.2	0.0	0.21		
48	27	48109.72	278.38	0.2	0.0	0.21		
49	27	49741.72	278.45	0.2	0.0	0.21		
50	26	51333.55	278.52	0.2	0.0	0.21		
51	20	52880.95	278.59	0.2	0.0	0.21		
52	19	54064.09	278.64	0.2	0.0	0.21		
53	19	55209.50	278.69	0.2	0.0	0.21		
54	18	56318.35	278.74	0.2	0.0	0.21		
55	18	57391.82	278.79	0.2	0.0	0.21		
56	17	58431.01	278.84	0.2	0.0	0.21		
57	16	59437.00	278.88	0.2	0.0	0.21		
58	16	60410.85	278.92	0.2	0.0	0.21		
59	15	61353.57	278.96	0.2	0.0	0.21		
60	15	62266.14	279.00	0.2	0.0	0.21		
61	14	63149.51	279.04	0.2	0.0	0.21		
62	14	64004.61	279.08	0.2	0.0	0.21		
63	14	64832.32	279.11	0.2	0.0	0.21		
64	13	65633.52	279.15	0.2	0.0	0.21		
65	13	66409.04	279.18	0.2	0.0	0.21		
66	12	67159.68	279.22	0.2	0.0	0.21		
67	12	67886.24	279.25	0.2	0.0	0.21		
68	12	68589.47	279.28	0.2	0.0	0.21		
69	11	69270.12	279.31	0.2	0.0	0.21		
70	11	69928.88	279.34	0.2	0.0	0.21		
71	10	70566.47	279.36	0.2	0.0	0.21		
72	10	71183.53	279.39	0.2	0.0	0.21		
73	10	71780.73	279.42	0.2	0.0	0.21		
74	10	72358.68	279.44	0.2	0.0	0.21		
75	9	72918.00	279.46	0.2	0.0	0.21		
76	9	73459.27	279.49	0.2	0.0	0.21		
77	9	73983.07	279.51	0.2	0.0	0.21		
78	8	74489.93	279.53	0.2	0.0	0.21		
79	8	74980.41	279.55	0.2	0.0	0.21		
80	8	75455.02	279.57	0.2	0.0	0.21		
81	8	75914.25	279.59	0.2	0.0	0.21		
82	7	76358.59	279.61	0.2	0.0	0.21		
83	7	76788.52	279.63	0.2	0.0	0.21		
84	7	77204.49	279.65	0.2	0.0	0.21		
85	7	77606.93	279.67	0.2	0.0	0.21		
86	6	77996.28	279.68	0.2	0.0	0.21		
87	6	78372.94	279.70	0.2	0.0	0.21		
88	6	78737.33	279.71	0.2	0.0	0.21		
89	6	79089.82	279.73	0.2	0.0	0.21		
90	6	79430.79	279.74	0.2	0.0	0.21		
91	6	79760.61	279.76	0.2	0.0	0.21		
92	5	80079.63	279.77	0.2	0.0	0.21		
93	5	80388.18	279.78	0.2	0.0	0.21		
94	5	80686.60	279.80	0.2	0.0	0.21		
95	5	80975.21	279.81	0.2	0.0	0.21		
96	5	81254.32	279.82	0.2	0.0	0.21		
97	5	81524.23	279.83	0.2	0.0	0.21		
98	4	81785.22	279.84	0.2	0.0	0.21		
99	4	82037.59	279.85	0.2	0.0	0.21		
100	4	82281.60	279.86	0.2	0.0	0.21		
101	4	82517.51	279.87	0.2	0.0	0.21		
102	4	82745.59	279.88	0.2	0.0	0.21		
103	4	82966.07	279.89	0.2	0.0	0.21		
104	4	83179.20	279.90	0.2	0.0	0.21		
105	4	83385.21	279.91	0.2	0.0	0.21		
106	3	83584.33	279.92	0.2	0.0	0.21		
107	3	83776.77	279.93	0.2	0.0	0.21		
108	3	83962.75	279.94	0.2	0.0	0.21		
109	3	84142.46	279.94	0.2	0.0	0.21		
110	3	84316.11	279.95	0.2	0.0	0.21		
111	3	84483.88	279.96	0.2	0.0	0.21		
112	3	84645.97	279.97	0.2	0.0	0.21		
113	3	84802.55	279.97	0.2	0.0	0.21		
114	3	84953.79	279.98	0.2	0.0	0.21		
115	3	85099.87	279.98	0.2	0.0	0.21		
116	2	85240.94	279.99	0.2	0.0	0.21		
117	2	85377.17	280.00	0.2	0.0	0.21		
118	2	85508.71	280.00	0.2	0.0	0.21		
119	2	85635.40	280.01	0.2	0.0	0.21		
120	2	85755.74	280.01	0.3	0.1	0.21		
121	2	85869.10	280.02	0.3	0.1	0.21		
122	2	85975.17	280.02	0.4	0.2	0.21		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	2	86073.87	280.03	0.5	0.2	0.21		
124	2	86165.22	280.03	0.5	0.3	0.21		
125	2	86249.34	280.03	0.6	0.4	0.21		
126	2	86326.41	280.04	0.6	0.4	0.21		
127	2	86396.67	280.04	0.7	0.5	0.21		
128	2	86460.40	280.04	0.7	0.5	0.21		
129	2	86517.88	280.04	0.8	0.6	0.21		
130	2	86569.43	280.05	0.8	0.6	0.21		
131	2	86615.37	280.05	0.9	0.6	0.21		
132	1	86656.01	280.05	0.9	0.7	0.21		
133	1	86691.69	280.05	0.9	0.7	0.21		
134	1	86722.71	280.05	0.9	0.7	0.21		
135	1	86749.39	280.05	1.0	0.8	0.21		
136	1	86772.01	280.06	1.0	0.8	0.21		
137	1	86790.87	280.06	1.0	0.8	0.21		
138	1	86806.25	280.06	1.0	0.8	0.21		
139	1	86818.39	280.06	1.0	0.8	0.21		
140	1	86827.56	280.06	1.0	0.8	0.21		
141	1	86833.98	280.06	1.0	0.8	0.21		
142	1	86837.87	280.06	1.0	0.8	0.21		
143	1	86839.45	**280.06**	1.1	0.8	0.21		
144	1	86838.90	280.06	1.1	0.8	0.21		
145	1	86836.40	280.06	1.0	0.8	0.21		
146	1	86832.14	280.06	1.0	0.8	0.21		
147	1	86826.25	280.06	1.0	0.8	0.21		
148	1	86818.90	280.06	1.0	0.8	0.21		
149	1	86810.21	280.06	1.0	0.8	0.21		
150	1	86800.32	280.06	1.0	0.8	0.21		
151	1	86789.34	280.06	1.0	0.8	0.21		

GRAPHED DATA FOR 10 YEAR STORM





McADAMS

ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	280.14 ft
		Rise =	4.14 ft
Freeboard =	1.86 ft	Peak Outflow =	3.50 cfs

INPUT

Hydrograph Results:

Qp = 34.27 cfs

Tp = 40.5 min

dT = 1.0 min

Stage-Storage Results:

Ks = 18482

b = 1.10

Z_0 = 276.0 ft (inv)

Initial Water Level:

Z_i = 276.00 ft

Weir:

N = 1

L = 20 ft

Cw = 3.00

Zcr = 280.00 ft

Top of Dam: 282.00 ft

Skimmer Orifice:

Number = 1.00 Ea

Diameter = 4.00 Inches

Head = 3.01 inches

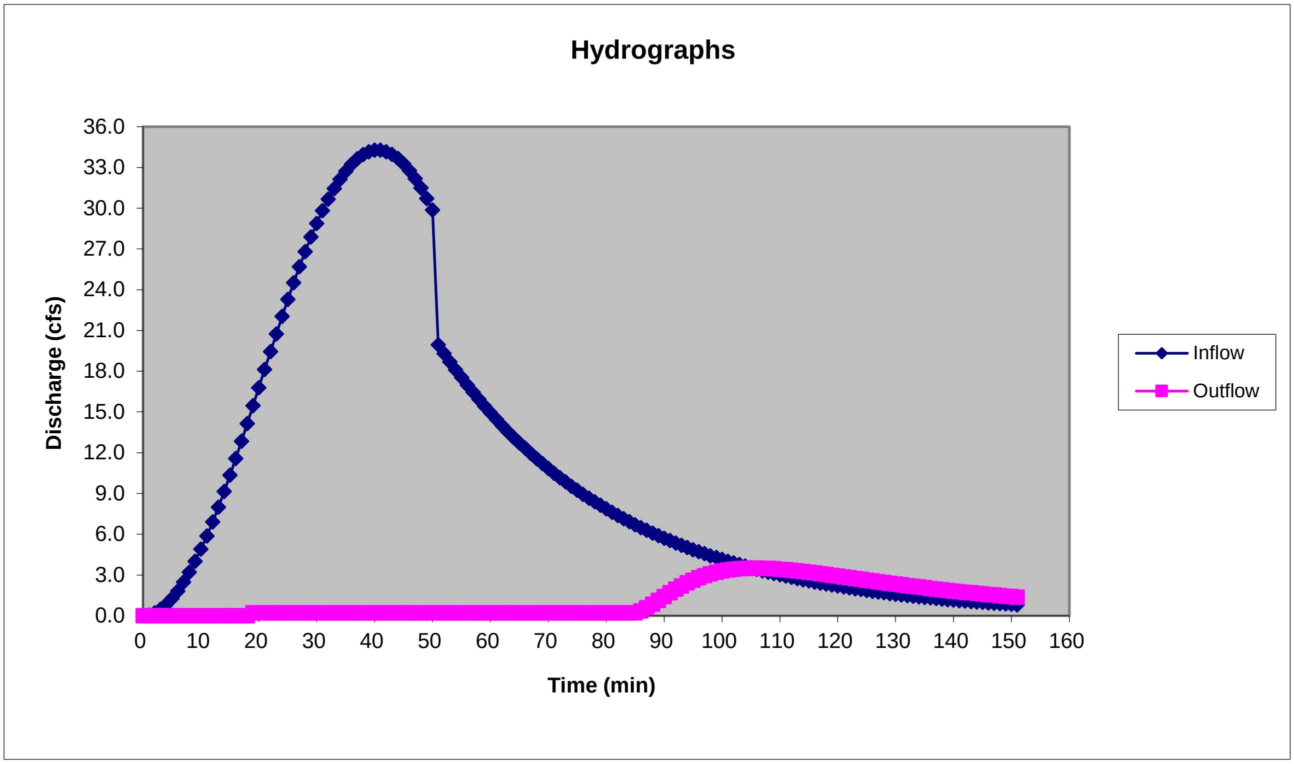
OUTPUT

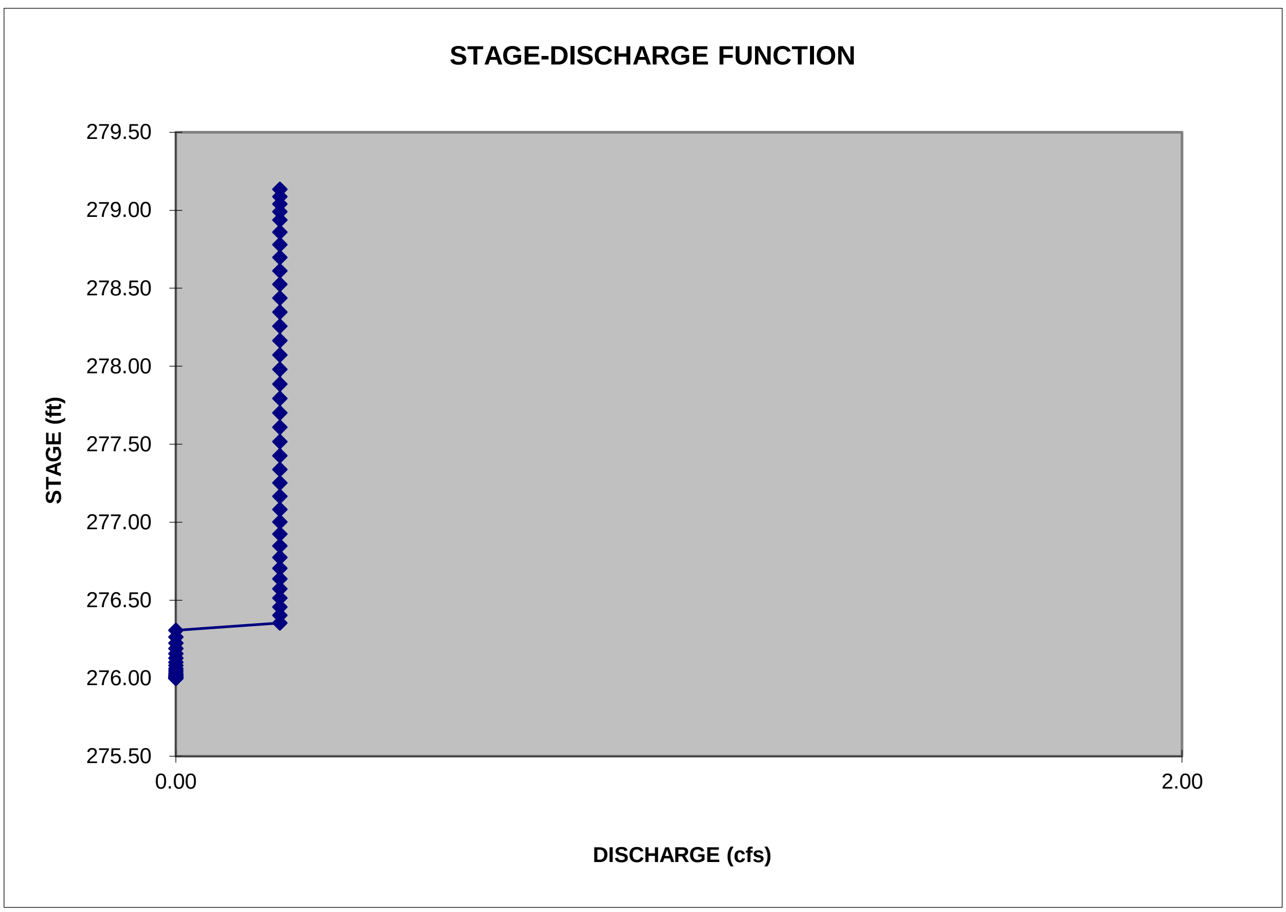
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	276.00	0.0	0.0	0.0		
1	0	0.00	276.00	0.0	0.0	0.00		
2	0	3.09	276.00	0.0	0.0	0.00		
3	0	15.42	276.00	0.0	0.0	0.00		
4	1	43.09	276.00	0.0	0.0	0.00		
5	1	92.11	276.01	0.0	0.0	0.00		
6	2	168.36	276.01	0.0	0.0	0.00		
7	2	277.55	276.02	0.0	0.0	0.00		
8	3	425.21	276.03	0.0	0.0	0.00		
9	4	616.62	276.05	0.0	0.0	0.00		
10	5	856.81	276.06	0.0	0.0	0.00		
11	6	1150.50	276.08	0.0	0.0	0.00		
12	7	1502.11	276.10	0.0	0.0	0.00		
13	8	1915.70	276.13	0.0	0.0	0.00		
14	9	2394.96	276.16	0.0	0.0	0.00		
15	10	2943.19	276.19	0.0	0.0	0.00		
16	12	3563.26	276.23	0.0	0.0	0.00		
17	13	4257.64	276.26	0.0	0.0	0.00		
18	14	5028.32	276.31	0.0	0.0	0.00		
19	15	5876.84	276.35	0.2	0.0	0.21		
20	17	6791.88	276.40	0.2	0.0	0.21		
21	18	7786.44	276.46	0.2	0.0	0.21		
22	19	8860.67	276.51	0.2	0.0	0.21		
23	21	10014.21	276.57	0.2	0.0	0.21		
24	22	11246.23	276.64	0.2	0.0	0.21		
25	23	12555.44	276.70	0.2	0.0	0.21		
26	25	13940.06	276.77	0.2	0.0	0.21		
27	26	15397.90	276.85	0.2	0.0	0.21		
28	27	16926.28	276.92	0.2	0.0	0.21		
29	28	18522.15	277.00	0.2	0.0	0.21		
30	29	20182.00	277.08	0.2	0.0	0.21		
31	30	21901.98	277.17	0.2	0.0	0.21		
32	31	23677.85	277.25	0.2	0.0	0.21		
33	31	25505.05	277.34	0.2	0.0	0.21		
34	32	27378.72	277.43	0.2	0.0	0.21		
35	33	29293.69	277.52	0.2	0.0	0.21		
36	33	31244.57	277.61	0.2	0.0	0.21		
37	34	33225.74	277.70	0.2	0.0	0.21		
38	34	35231.41	277.79	0.2	0.0	0.21		
39	34	37255.63	277.89	0.2	0.0	0.21		
40	34	39292.35	277.98	0.2	0.0	0.21		
41	34	41335.44	278.07	0.2	0.0	0.21		
42	34	43378.73	278.16	0.2	0.0	0.21		
43	34	45416.04	278.26	0.2	0.0	0.21		
44	34	47441.25	278.35	0.2	0.0	0.21		
45	33	49448.29	278.44	0.2	0.0	0.21		
46	33	51431.21	278.53	0.2	0.0	0.21		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	32	53384.21	278.61	0.2	0.0	0.21		
48	31	55301.66	278.70	0.2	0.0	0.21		
49	31	57178.13	278.78	0.2	0.0	0.21		
50	30	59008.47	278.86	0.2	0.0	0.21		
51	20	60787.78	278.94	0.2	0.0	0.21		
52	19	61970.92	278.99	0.2	0.0	0.21		
53	19	63116.32	279.04	0.2	0.0	0.21		
54	18	64225.18	279.09	0.2	0.0	0.21		
55	18	65298.64	279.14	0.2	0.0	0.21		
56	17	66337.83	279.18	0.2	0.0	0.21		
57	16	67343.83	279.22	0.2	0.0	0.21		
58	16	68317.68	279.27	0.2	0.0	0.21		
59	15	69260.39	279.31	0.2	0.0	0.21		
60	15	70172.96	279.35	0.2	0.0	0.21		
61	14	71056.34	279.38	0.2	0.0	0.21		
62	14	71911.44	279.42	0.2	0.0	0.21		
63	14	72739.15	279.46	0.2	0.0	0.21		
64	13	73540.35	279.49	0.2	0.0	0.21		
65	13	74315.86	279.52	0.2	0.0	0.21		
66	12	75066.51	279.56	0.2	0.0	0.21		
67	12	75793.07	279.59	0.2	0.0	0.21		
68	12	76496.30	279.62	0.2	0.0	0.21		
69	11	77176.94	279.65	0.2	0.0	0.21		
70	11	77835.71	279.68	0.2	0.0	0.21		
71	10	78473.29	279.70	0.2	0.0	0.21		
72	10	79090.36	279.73	0.2	0.0	0.21		
73	10	79687.55	279.75	0.2	0.0	0.21		
74	10	80265.51	279.78	0.2	0.0	0.21		
75	9	80824.83	279.80	0.2	0.0	0.21		
76	9	81366.10	279.83	0.2	0.0	0.21		
77	9	81889.89	279.85	0.2	0.0	0.21		
78	8	82396.76	279.87	0.2	0.0	0.21		
79	8	82887.24	279.89	0.2	0.0	0.21		
80	8	83361.84	279.91	0.2	0.0	0.21		
81	8	83821.08	279.93	0.2	0.0	0.21		
82	7	84265.42	279.95	0.2	0.0	0.21		
83	7	84695.35	279.97	0.2	0.0	0.21		
84	7	85111.31	279.99	0.2	0.0	0.21		
85	7	85513.76	280.00	0.2	0.0	0.21		
86	6	85902.74	280.02	0.4	0.2	0.21		
87	6	86270.25	280.03	0.6	0.4	0.21		
88	6	86611.87	280.05	0.9	0.6	0.21		
89	6	86925.73	280.06	1.1	0.9	0.21		
90	6	87211.21	280.07	1.4	1.2	0.21		
91	6	87468.54	280.08	1.7	1.5	0.21		
92	5	87698.51	280.09	2.0	1.7	0.21		
93	5	87902.30	280.10	2.2	2.0	0.21		
94	5	88081.32	280.11	2.4	2.2	0.21		
95	5	88237.17	280.12	2.6	2.4	0.21		
96	5	88371.51	280.12	2.8	2.6	0.21		
97	5	88486.03	280.13	3.0	2.7	0.21		
98	4	88582.38	280.13	3.1	2.9	0.21		
99	4	88662.18	280.14	3.2	3.0	0.21		
100	4	88726.97	280.14	3.3	3.1	0.21		
101	4	88778.20	280.14	3.4	3.2	0.21		
102	4	88817.24	280.14	3.4	3.2	0.21		
103	4	88845.35	280.14	3.5	3.2	0.21		
104	4	88863.68	280.14	3.5	3.3	0.21		
105	4	88873.31	280.14	3.5	3.3	0.21		
106	3	88875.22	**280.14**	3.5	3.3	0.21		
107	3	88870.28	280.14	3.5	3.3	0.21		
108	3	88859.31	280.14	3.5	3.3	0.21		
109	3	88843.02	280.14	3.5	3.2	0.21		
110	3	88822.07	280.14	3.4	3.2	0.21		
111	3	88797.05	280.14	3.4	3.2	0.21		
112	3	88768.49	280.14	3.3	3.1	0.21		
113	3	88736.86	280.14	3.3	3.1	0.21		
114	3	88702.59	280.14	3.3	3.0	0.21		
115	3	88666.05	280.14	3.2	3.0	0.21		
116	2	88627.58	280.13	3.1	2.9	0.21		
117	2	88587.49	280.13	3.1	2.9	0.21		
118	2	88546.04	280.13	3.0	2.8	0.21		
119	2	88503.47	280.13	3.0	2.8	0.21		
120	2	88459.99	280.13	2.9	2.7	0.21		
121	2	88415.80	280.12	2.9	2.6	0.21		
122	2	88371.05	280.12	2.8	2.6	0.21		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	2	88325.90	280.12	2.7	2.5	0.21		
124	2	88280.48	280.12	2.7	2.5	0.21		
125	2	88234.90	280.12	2.6	2.4	0.21		
126	2	88189.27	280.12	2.6	2.4	0.21		
127	2	88143.67	280.11	2.5	2.3	0.21		
128	2	88098.19	280.11	2.4	2.2	0.21		
129	2	88052.89	280.11	2.4	2.2	0.21		
130	2	88007.83	280.11	2.3	2.1	0.21		
131	2	87963.06	280.11	2.3	2.1	0.21		
132	1	87918.64	280.10	2.2	2.0	0.21		
133	1	87874.61	280.10	2.2	2.0	0.21		
134	1	87830.99	280.10	2.1	1.9	0.21		
135	1	87787.81	280.10	2.1	1.9	0.21		
136	1	87745.11	280.10	2.0	1.8	0.21		
137	1	87702.89	280.09	2.0	1.8	0.21		
138	1	87661.19	280.09	1.9	1.7	0.21		
139	1	87620.01	280.09	1.9	1.7	0.21		
140	1	87579.37	280.09	1.8	1.6	0.21		
141	1	87539.28	280.09	1.8	1.6	0.21		
142	1	87499.74	280.09	1.7	1.5	0.21		
143	1	87460.75	280.08	1.7	1.5	0.21		
144	1	87422.33	280.08	1.6	1.4	0.21		
145	1	87384.48	280.08	1.6	1.4	0.21		
146	1	87347.19	280.08	1.6	1.4	0.21		
147	1	87310.47	280.08	1.5	1.3	0.21		
148	1	87274.31	280.08	1.5	1.3	0.21		
149	1	87238.71	280.08	1.4	1.2	0.21		
150	1	87203.67	280.07	1.4	1.2	0.21		
151	1	87169.19	280.07	1.4	1.2	0.21		

GRAPHED DATA FOR 25 YEAR STORM





SCM-F
SKIMMER BASIN WITH RISER DESIGN

CHAMBLEE LAKE
ZEBULON
DRH-22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm
Routing for the 25-year storm
Graphed Data for the 25-year storm

SKIMMER BASIN SIZING

McADAMS

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH-22004	Calculated By:	BJK
Sediment Trap ID	SCM-F		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	8.31 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	4.99 ac.	0.25
Undisturbed grassy area	0.00 ac.	3.32 ac.	0.35
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	8.31 ac.	8.31 ac.	
Composite Rational 'c'	0.45	0.29	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	731	feet
Height of watershed =	22	feet
Calculated t(c) =	4.8	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.0	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for Raleigh, NC

Return Period	g	h	Intensity
2	132	18	5.74 in/hr
10	195	22	7.22 in/hr
25	232	23	8.29 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	5.74 in/hr	21.5 cfs	13.83 cfs
10-year storm	7.22 in/hr	27.0 cfs	17.40 cfs
25-year storm	8.29 in/hr	31.0 cfs	19.96 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	3,600	cubic feet per disturbed acre
Required sediment trap surface area	435	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	304
Bottom width =	58
Sediment depth =	4.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Permanent Riser =	4.0
Side slopes =	3.0 H:1V
Spillway length =	16
Height of berm =	6
Top of trap length =	340
Top of trap width =	94
Bottom elevation =	299

Sediment Trap Data

	Required	Provided	
Sediment storage volume =	29916 cu. ft.	88410 cu. ft.	
Sediment surface area =	11750 sq. ft.	26900 sq. ft.	
Sediment storage depth =	3.5 ft. (max.)	4	Decrease storage depth
Trap bottom length to width ratio =	2.0L:1W (min)	5.2L:1W	
Spillway length =	10.0 ft. (min)	16	
10-Year flow depth over spillway =	0.50 ft. (max)	-0.44 ft	
Freeboard at 10-Year discharge =	1.00 ft. (min)	2.44 ft	

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU
1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Required for Sediment Basin = 29,916 cubic feet

24 HOURS	Best Option =	1 - 5 inch Skimmers with a 4.8 inch orifice	
2 DAYS	Best Option =	1 - 4 inch Skimmers with a 3.4 inch orifice	
3 DAYS	Best Option =	1 - 4 inch Skimmers with a 2.8 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 3 inch Skimmers with a 2.6 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

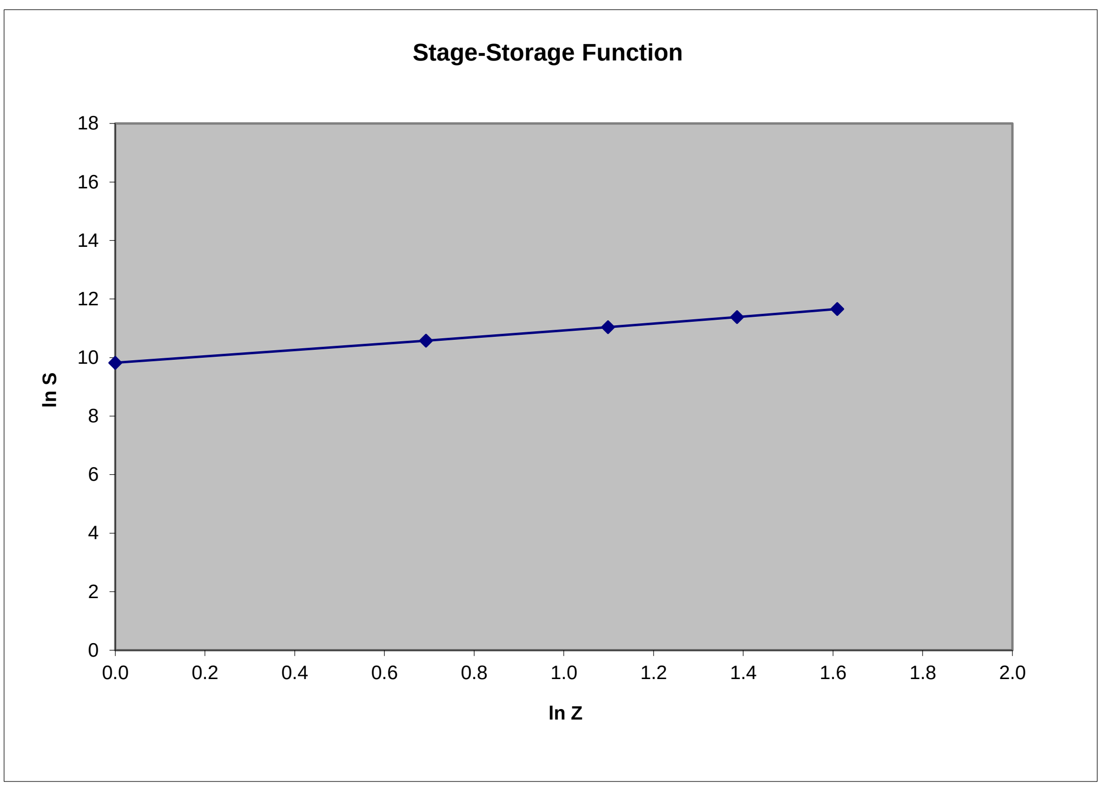
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
299	17190		0	0			
300	19733	18462	18461.5	1	9.8234	0.0000	1.01
301	21982	20857.5	39319	2	10.5795	0.6931	1.97
302	24287	23134.5	62453.5	3	11.0422	1.0986	2.96
303	26650	25468.5	87922	4	11.3842	1.3863	3.99
304	29068	27859	115781	5	11.6595	1.6094	5.09

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.14 and **K_s =** 18182



HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	8.31	ac	**Use Kirpich Equation:**	
Disturbed Area =	8.31	ac	**Tc =**	5.0 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	731	ft	**i_1 =**	5.74 in/hr
Vertical Fall =	22	ft	**i_{10} =**	7.22 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	8.29 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	21.5 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	27.0 cfs
h =	23		**Q_{25} =**	31.0 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	29.4	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	39.1	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	42.0	**minutes**

McADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	301.48 ft
		Rise =	2.48 ft
Freeboard =	3.52 ft	Peak Outflow =	0.20 cfs

INPUT

Hydrograph Results:

Qp =	21.46	cfs
Tp =	29.4	min
dT =	1.0	min

Stage-Storage Results:

Ks =	18182	
b =	1.14	
Z_0 =	299.0	ft (inv)

Initial Water Level:

Z_i =	299.00	ft

Weir:

N =	1	
L =	16	ft
Cw =	3.00	
Zcr =	303.00	ft

Top of Dam: 305.00 ft

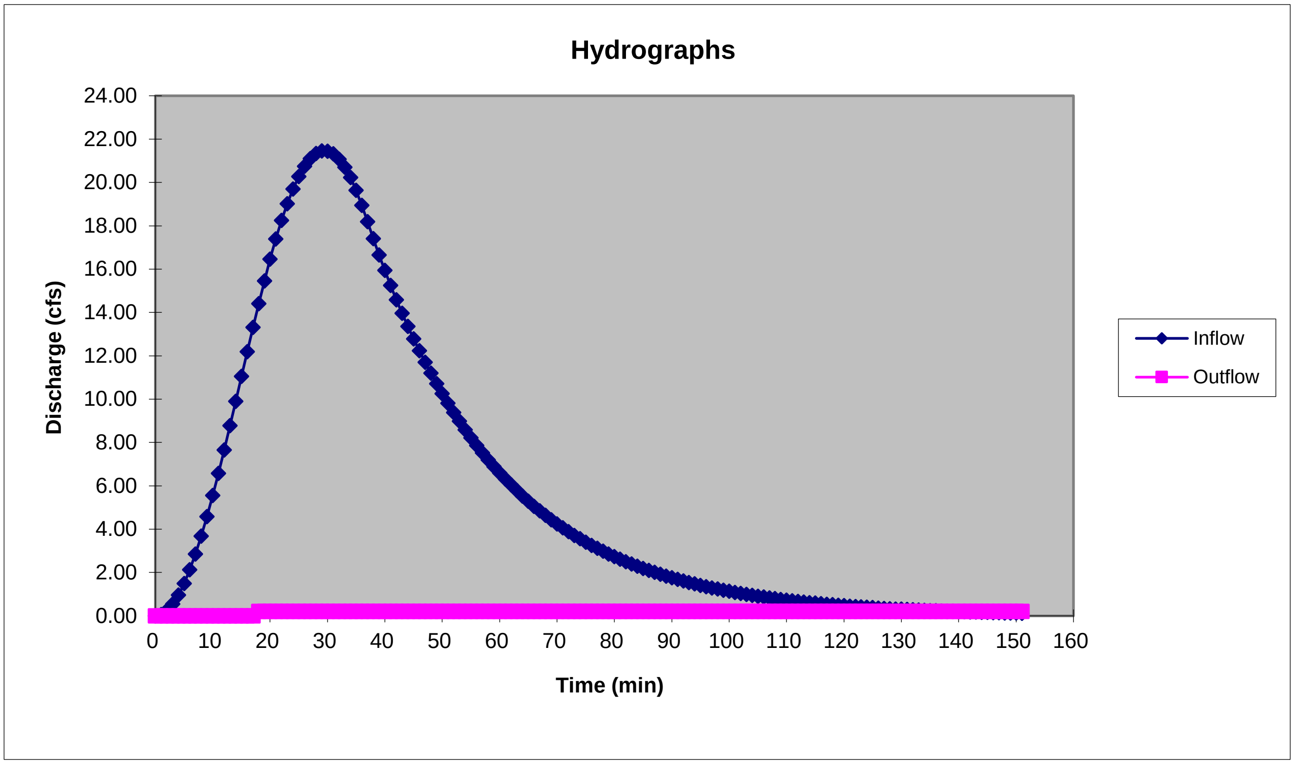
Skimmer Orifice:

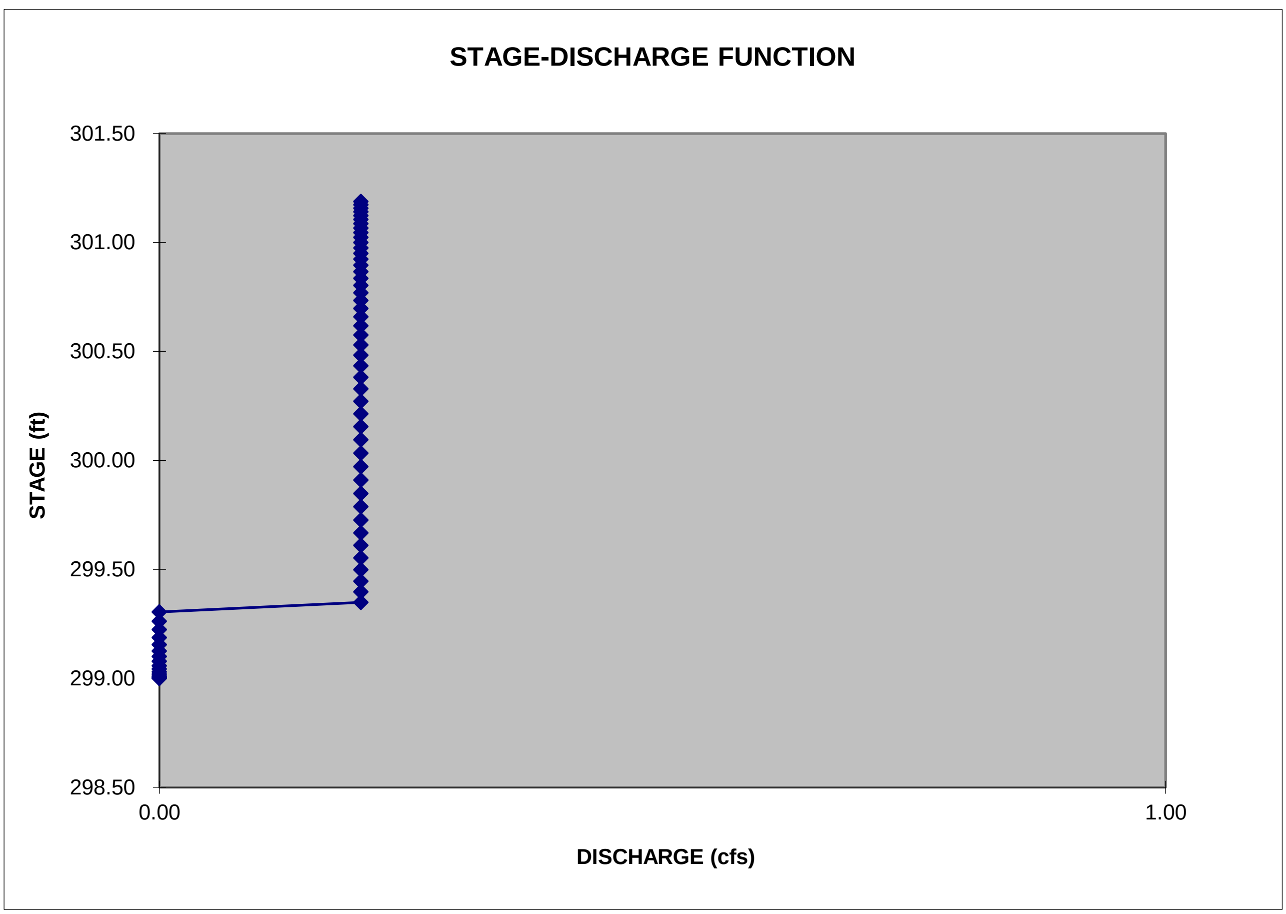
Number =	1.00	Ea
Diameter =	4.00	Inches
Head =	2.82	inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	299.00	0.0	0.0	0.0		
1	0	0.00	299.00	0.0	0.0	0.00		
2	0	3.66	299.00	0.0	0.0	0.00		
3	1	18.26	299.00	0.0	0.0	0.00		
4	1	50.95	299.01	0.0	0.0	0.00		
5	1	108.68	299.01	0.0	0.0	0.00		
6	2	198.11	299.02	0.0	0.0	0.00		
7	3	325.56	299.03	0.0	0.0	0.00		
8	4	496.88	299.04	0.0	0.0	0.00		
9	5	717.45	299.06	0.0	0.0	0.00		
10	6	992.08	299.08	0.0	0.0	0.00		
11	7	1324.97	299.10	0.0	0.0	0.00		
12	8	1719.66	299.13	0.0	0.0	0.00		
13	9	2178.97	299.15	0.0	0.0	0.00		
14	10	2705.02	299.19	0.0	0.0	0.00		
15	11	3299.12	299.22	0.0	0.0	0.00		
16	12	3961.86	299.26	0.0	0.0	0.00		
17	13	4693.01	299.30	0.0	0.0	0.00		
18	14	5491.59	299.35	0.2	0.0	0.20		
19	15	6343.82	299.40	0.2	0.0	0.20		
20	16	7259.21	299.45	0.2	0.0	0.20		
21	17	8234.53	299.50	0.2	0.0	0.20		
22	18	9265.89	299.55	0.2	0.0	0.20		
23	19	10348.73	299.61	0.2	0.0	0.20		
24	20	11477.93	299.67	0.2	0.0	0.20		
25	20	12647.83	299.73	0.2	0.0	0.20		
26	21	13852.33	299.79	0.2	0.0	0.20		
27	21	15084.90	299.85	0.2	0.0	0.20		
28	21	16338.71	299.91	0.2	0.0	0.20		
29	21	17606.71	299.97	0.2	0.0	0.20		
30	21	18881.65	300.03	0.2	0.0	0.20		
31	21	20156.22	300.09	0.2	0.0	0.20		
32	21	21423.11	300.16	0.2	0.0	0.20		
33	21	22675.11	300.21	0.2	0.0	0.20		
34	20	23905.17	300.27	0.2	0.0	0.20		
35	20	25106.47	300.33	0.2	0.0	0.20		
36	19	26272.56	300.38	0.2	0.0	0.20		
37	18	27397.35	300.43	0.2	0.0	0.20		
38	17	28476.71	300.48	0.2	0.0	0.20		
39	17	29508.94	300.53	0.2	0.0	0.20		
40	16	30496.08	300.58	0.2	0.0	0.20		

GRAPHED DATA FOR 2 YEAR STORM





ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	302.56 ft
		Rise =	3.56 ft
Freeboard =	2.44 ft	Peak Outflow =	0.20 cfs

INPUT

Hydrograph Results:

Qp = 27.01 cfs
Tp = 39.1 min
dT = 1.0 min

Stage-Storage Results:

Ks = 18182
b = 1.14
Z_0 = 299.0 ft (inv)

Initial Water Level:

Z_i = 299.00 ft

Weir:

N = 1
L = 16 ft
Cw = 3.00
Zcr = 303.00 ft

Top of Dam: 305.00 ft

Skimmer Orifice:

Number = 1 Ea
Diameter = 4.00 Inches
Head = 2.82 inches

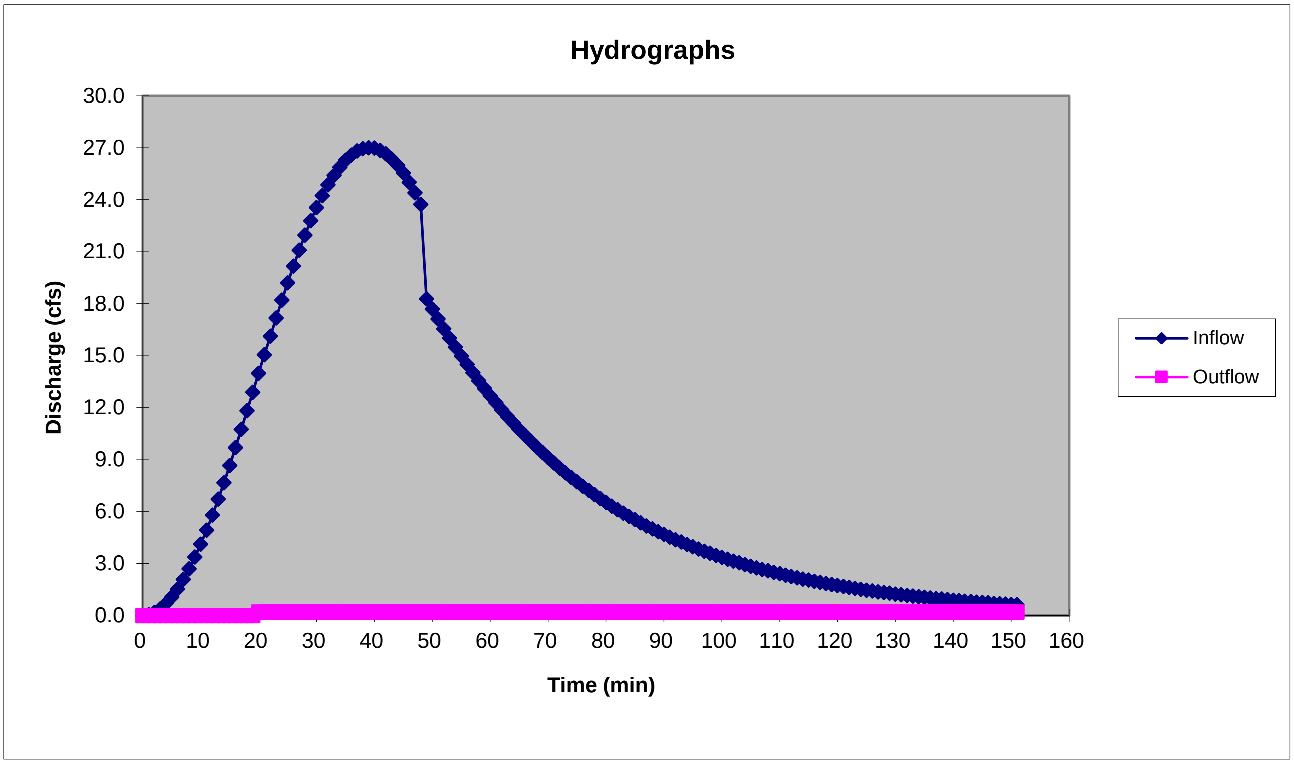
OUTPUT

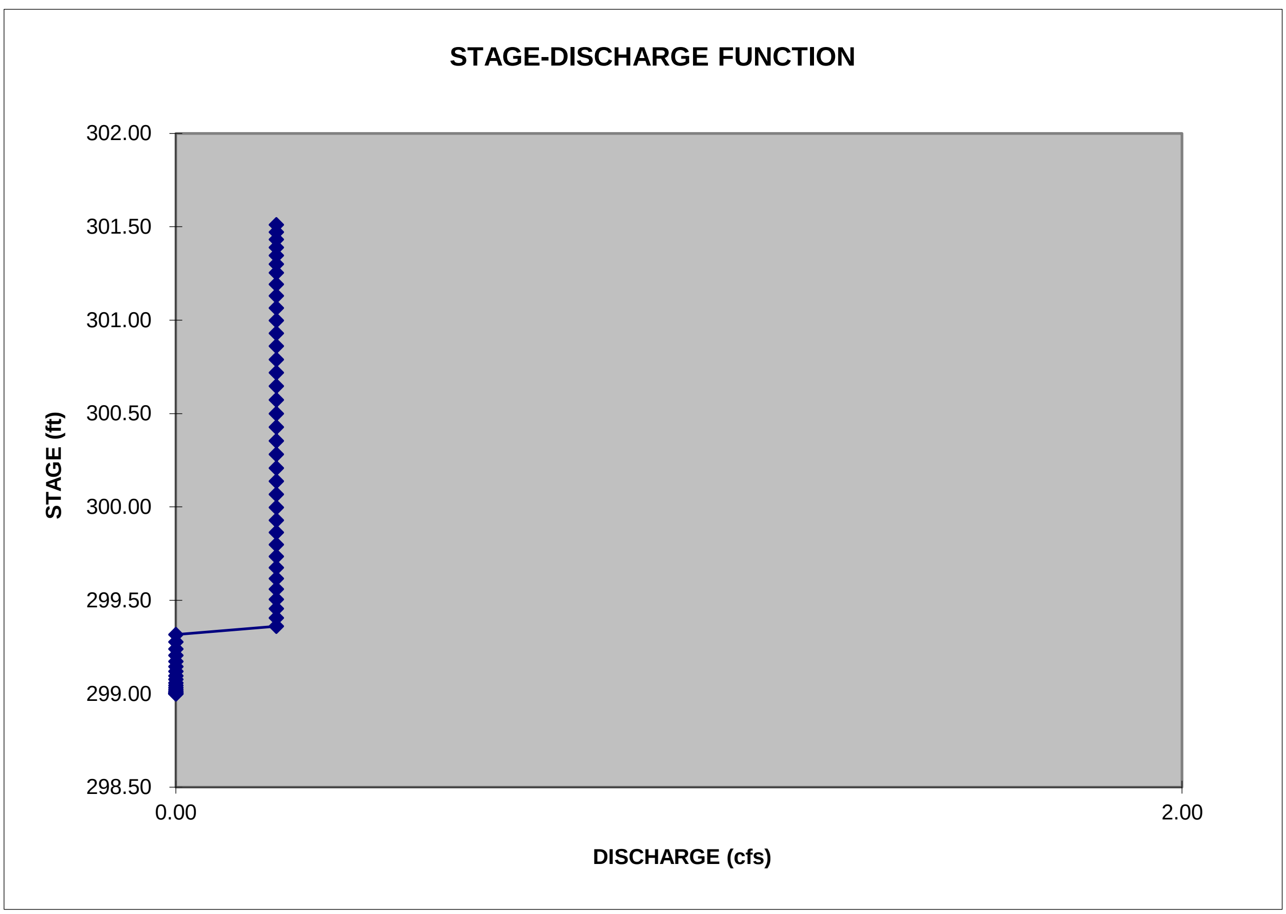
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	299.00	0.0	0.0	0.0		
1	0	0.00	299.00	0.0	0.0	0.00		
2	0	2.61	299.00	0.0	0.0	0.00		
3	0	13.03	299.00	0.0	0.0	0.00		
4	1	36.42	299.00	0.0	0.0	0.00		
5	1	77.85	299.01	0.0	0.0	0.00		
6	2	142.27	299.01	0.0	0.0	0.00		
7	2	234.48	299.02	0.0	0.0	0.00		
8	3	359.11	299.03	0.0	0.0	0.00		
9	3	520.58	299.04	0.0	0.0	0.00		
10	4	723.06	299.06	0.0	0.0	0.00		
11	5	970.48	299.08	0.0	0.0	0.00		
12	6	1266.46	299.10	0.0	0.0	0.00		
13	7	1614.32	299.12	0.0	0.0	0.00		
14	8	2017.02	299.14	0.0	0.0	0.00		
15	9	2477.20	299.17	0.0	0.0	0.00		
16	10	2997.12	299.21	0.0	0.0	0.00		
17	11	3578.63	299.24	0.0	0.0	0.00		
18	12	4223.23	299.28	0.0	0.0	0.00		
19	13	4931.97	299.32	0.0	0.0	0.00		
20	14	5705.50	299.36	0.2	0.0	0.20		
21	15	6532.06	299.41	0.2	0.0	0.20		
22	16	7423.48	299.46	0.2	0.0	0.20		
23	17	8379.14	299.51	0.2	0.0	0.20		
24	18	9398.04	299.56	0.2	0.0	0.20		
25	19	10478.75	299.62	0.2	0.0	0.20		
26	20	11619.46	299.67	0.2	0.0	0.20		
27	21	12817.96	299.74	0.2	0.0	0.20		
28	22	14071.67	299.80	0.2	0.0	0.20		
29	23	15377.65	299.86	0.2	0.0	0.20		
30	24	16732.63	299.93	0.2	0.0	0.20		
31	24	18133.03	300.00	0.2	0.0	0.20		
32	25	19574.96	300.07	0.2	0.0	0.20		
33	25	21054.29	300.14	0.2	0.0	0.20		
34	26	22566.61	300.21	0.2	0.0	0.20		
35	26	24107.33	300.28	0.2	0.0	0.20		
36	27	25671.67	300.35	0.2	0.0	0.20		
37	27	27254.69	300.43	0.2	0.0	0.20		
38	27	28851.33	300.50	0.2	0.0	0.20		
39	27	30456.44	300.57	0.2	0.0	0.20		
40	27	32064.84	300.65	0.2	0.0	0.20		
41	27	33671.30	300.72	0.2	0.0	0.20		
42	27	35270.61	300.79	0.2	0.0	0.20		
43	26	36857.61	300.86	0.2	0.0	0.20		
44	26	38427.22	300.93	0.2	0.0	0.20		
45	26	39974.46	301.00	0.2	0.0	0.20		
46	25	41494.52	301.06	0.2	0.0	0.20		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	24	42982.75	301.13	0.2	0.0	0.20		
48	24	44434.69	301.19	0.2	0.0	0.20		
49	18	45846.13	301.25	0.2	0.0	0.20		
50	18	46931.31	301.30	0.2	0.0	0.20		
51	17	47980.63	301.35	0.2	0.0	0.20		
52	17	48995.27	301.39	0.2	0.0	0.20		
53	16	49976.36	301.43	0.2	0.0	0.20		
54	15	50925.00	301.47	0.2	0.0	0.20		
55	15	51842.24	301.51	0.2	0.0	0.20		
56	14	52729.12	301.55	0.2	0.0	0.20		
57	14	53586.63	301.59	0.2	0.0	0.20		
58	14	54415.72	301.62	0.2	0.0	0.20		
59	13	55217.32	301.65	0.2	0.0	0.20		
60	13	55992.34	301.69	0.2	0.0	0.20		
61	12	56741.64	301.72	0.2	0.0	0.20		
62	12	57466.06	301.75	0.2	0.0	0.20		
63	11	58166.42	301.78	0.2	0.0	0.20		
64	11	58843.50	301.81	0.2	0.0	0.20		
65	11	59498.06	301.83	0.2	0.0	0.20		
66	10	60130.83	301.86	0.2	0.0	0.20		
67	10	60742.54	301.89	0.2	0.0	0.20		
68	10	61333.87	301.91	0.2	0.0	0.20		
69	9	61905.47	301.93	0.2	0.0	0.20		
70	9	62458.01	301.96	0.2	0.0	0.20		
71	9	62992.10	301.98	0.2	0.0	0.20		
72	9	63508.35	302.00	0.2	0.0	0.20		
73	8	64007.33	302.02	0.2	0.0	0.20		
74	8	64489.61	302.04	0.2	0.0	0.20		
75	8	64955.74	302.06	0.2	0.0	0.20		
76	7	65406.25	302.08	0.2	0.0	0.20		
77	7	65841.64	302.10	0.2	0.0	0.20		
78	7	66262.41	302.12	0.2	0.0	0.20		
79	7	66669.04	302.13	0.2	0.0	0.20		
80	7	67061.99	302.15	0.2	0.0	0.20		
81	6	67441.70	302.16	0.2	0.0	0.20		
82	6	67808.62	302.18	0.2	0.0	0.20		
83	6	68163.15	302.19	0.2	0.0	0.20		
84	6	68505.70	302.21	0.2	0.0	0.20		
85	6	68836.67	302.22	0.2	0.0	0.20		
86	5	69156.43	302.23	0.2	0.0	0.20		
87	5	69465.35	302.25	0.2	0.0	0.20		
88	5	69763.78	302.26	0.2	0.0	0.20		
89	5	70052.07	302.27	0.2	0.0	0.20		
90	5	70330.54	302.28	0.2	0.0	0.20		
91	5	70599.52	302.29	0.2	0.0	0.20		
92	4	70859.32	302.30	0.2	0.0	0.20		
93	4	71110.23	302.32	0.2	0.0	0.20		
94	4	71352.56	302.33	0.2	0.0	0.20		
95	4	71586.57	302.33	0.2	0.0	0.20		
96	4	71812.55	302.34	0.2	0.0	0.20		
97	4	72030.74	302.35	0.2	0.0	0.20		
98	4	72241.42	302.36	0.2	0.0	0.20		
99	3	72444.81	302.37	0.2	0.0	0.20		
100	3	72641.17	302.38	0.2	0.0	0.20		
101	3	72830.72	302.39	0.2	0.0	0.20		
102	3	73013.68	302.39	0.2	0.0	0.20		
103	3	73190.27	302.40	0.2	0.0	0.20		
104	3	73360.70	302.41	0.2	0.0	0.20		
105	3	73525.17	302.41	0.2	0.0	0.20		
106	3	73683.87	302.42	0.2	0.0	0.20		
107	3	73836.99	302.43	0.2	0.0	0.20		
108	3	73984.71	302.43	0.2	0.0	0.20		
109	2	74127.22	302.44	0.2	0.0	0.20		
110	2	74264.67	302.44	0.2	0.0	0.20		
111	2	74397.25	302.45	0.2	0.0	0.20		
112	2	74525.09	302.45	0.2	0.0	0.20		
113	2	74648.37	302.46	0.2	0.0	0.20		
114	2	74767.23	302.46	0.2	0.0	0.20		
115	2	74881.80	302.47	0.2	0.0	0.20		
116	2	74992.25	302.47	0.2	0.0	0.20		
117	2	75098.69	302.48	0.2	0.0	0.20		
118	2	75201.26	302.48	0.2	0.0	0.20		
119	2	75300.08	302.49	0.2	0.0	0.20		
120	2	75395.29	302.49	0.2	0.0	0.20		
121	2	75486.99	302.49	0.2	0.0	0.20		
122	2	75575.30	302.50	0.2	0.0	0.20		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
123	2	75660.33	302.50	0.2	0.0	0.20		
124	2	75742.20	302.50	0.2	0.0	0.20		
125	1	75820.99	302.51	0.2	0.0	0.20		
126	1	75896.82	302.51	0.2	0.0	0.20		
127	1	75969.77	302.51	0.2	0.0	0.20		
128	1	76039.96	302.52	0.2	0.0	0.20		
129	1	76107.45	302.52	0.2	0.0	0.20		
130	1	76172.35	302.52	0.2	0.0	0.20		
131	1	76234.73	302.52	0.2	0.0	0.20		
132	1	76294.68	302.53	0.2	0.0	0.20		
133	1	76352.28	302.53	0.2	0.0	0.20		
134	1	76407.61	302.53	0.2	0.0	0.20		
135	1	76460.73	302.53	0.2	0.0	0.20		
136	1	76511.73	302.54	0.2	0.0	0.20		
137	1	76560.67	302.54	0.2	0.0	0.20		
138	1	76607.62	302.54	0.2	0.0	0.20		
139	1	76652.64	302.54	0.2	0.0	0.20		
140	1	76695.79	302.54	0.2	0.0	0.20		
141	1	76737.15	302.54	0.2	0.0	0.20		
142	1	76776.76	302.55	0.2	0.0	0.20		
143	1	76814.68	302.55	0.2	0.0	0.20		
144	1	76850.97	302.55	0.2	0.0	0.20		
145	1	76885.68	302.55	0.2	0.0	0.20		
146	1	76918.87	302.55	0.2	0.0	0.20		
147	1	76950.58	302.55	0.2	0.0	0.20		
148	1	76980.86	302.55	0.2	0.0	0.20		
149	1	77009.76	302.56	0.2	0.0	0.20		
150	1	77037.32	302.56	0.2	0.0	0.20		
151	1	77063.59	**302.56**	0.2	0.0	0.20		

GRAPHED DATA FOR 10 YEAR STORM





McADAMS

ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**302.83** ft
		Rise =	**3.83** ft
Freeboard =	**2.17** ft	**Peak Outflow =**	**0.20** cfs

INPUT

Hydrograph Results:

Qp = 30.98 cfs
Tp = 39.1 min
dT = 1.0 min

Stage-Storage Results:

Ks = 18182
b = 1.14
Z_0 = 299.0 ft (inv)

Initial Water Level:

Z_i = 299.00 ft

Weir:

N = 1
L = 16 ft
Cw = 3.00
Zcr = 303.00 ft

Top of Dam: 305.00 ft

Skimmer Orifice:

Number = 1.00 Ea
Diameter = 4.00 Inches
Head = 2.82 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	299.00	0.0	0.0	0.0		
1	0	0.00	299.00	0.0	0.0	0.00		
2	0	2.99	299.00	0.0	0.0	0.00		
3	0	14.95	299.00	0.0	0.0	0.00		
4	1	41.79	299.00	0.0	0.0	0.00		
5	1	89.31	299.01	0.0	0.0	0.00		
6	2	163.21	299.02	0.0	0.0	0.00		
7	2	269.00	299.02	0.0	0.0	0.00		
8	3	411.99	299.04	0.0	0.0	0.00		
9	4	597.23	299.05	0.0	0.0	0.00		
10	5	829.54	299.07	0.0	0.0	0.00		
11	6	1113.39	299.09	0.0	0.0	0.00		
12	7	1452.95	299.11	0.0	0.0	0.00		
13	8	1852.03	299.13	0.0	0.0	0.00		
14	9	2314.03	299.16	0.0	0.0	0.00		
15	10	2841.98	299.20	0.0	0.0	0.00		
16	11	3438.45	299.23	0.0	0.0	0.00		
17	12	4105.60	299.27	0.0	0.0	0.00		
18	14	4845.11	299.31	0.0	0.0	0.00		
19	15	5658.21	299.36	0.2	0.0	0.20		
20	16	6533.64	299.41	0.2	0.0	0.20		
21	17	7483.69	299.46	0.2	0.0	0.20		
22	19	8508.13	299.51	0.2	0.0	0.20		
23	20	9606.29	299.57	0.2	0.0	0.20		
24	21	10776.99	299.63	0.2	0.0	0.20		
25	22	12018.61	299.70	0.2	0.0	0.20		
26	23	13329.06	299.76	0.2	0.0	0.20		
27	24	14705.81	299.83	0.2	0.0	0.20		
28	25	16145.90	299.90	0.2	0.0	0.20		
29	26	17645.95	299.97	0.2	0.0	0.20		
30	27	19202.23	300.05	0.2	0.0	0.20		
31	28	20810.61	300.13	0.2	0.0	0.20		
32	29	22466.64	300.20	0.2	0.0	0.20		
33	29	24165.57	300.28	0.2	0.0	0.20		
34	30	25902.35	300.36	0.2	0.0	0.20		
35	30	27671.72	300.45	0.2	0.0	0.20		
36	30	29468.18	300.53	0.2	0.0	0.20		
37	31	31286.07	300.61	0.2	0.0	0.20		
38	31	33119.58	300.69	0.2	0.0	0.20		
39	31	34962.83	300.78	0.2	0.0	0.20		
40	31	36809.84	300.86	0.2	0.0	0.20		
41	31	38654.62	300.94	0.2	0.0	0.20		
42	31	40491.20	301.02	0.2	0.0	0.20		
43	30	42313.66	301.10	0.2	0.0	0.20		
44	30	44116.16	301.18	0.2	0.0	0.20		
45	29	45893.02	301.26	0.2	0.0	0.20		
46	29	47638.68	301.33	0.2	0.0	0.20		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	28	49347.81	301.40	0.2	0.0	0.20		
48	27	51015.32	301.48	0.2	0.0	0.20		
49	18	52636.37	301.55	0.2	0.0	0.20		
50	18	53721.55	301.59	0.2	0.0	0.20		
51	17	54770.87	301.64	0.2	0.0	0.20		
52	17	55785.51	301.68	0.2	0.0	0.20		
53	16	56766.60	301.72	0.2	0.0	0.20		
54	15	57715.24	301.76	0.2	0.0	0.20		
55	15	58632.49	301.80	0.2	0.0	0.20		
56	14	59519.37	301.84	0.2	0.0	0.20		
57	14	60376.87	301.87	0.2	0.0	0.20		
58	14	61205.96	301.91	0.2	0.0	0.20		
59	13	62007.57	301.94	0.2	0.0	0.20		
60	13	62782.59	301.97	0.2	0.0	0.20		
61	12	63531.89	302.00	0.2	0.0	0.20		
62	12	64256.31	302.03	0.2	0.0	0.20		
63	11	64956.66	302.06	0.2	0.0	0.20		
64	11	65633.74	302.09	0.2	0.0	0.20		
65	11	66288.30	302.12	0.2	0.0	0.20		
66	10	66921.08	302.14	0.2	0.0	0.20		
67	10	67532.78	302.17	0.2	0.0	0.20		
68	10	68124.11	302.19	0.2	0.0	0.20		
69	9	68695.72	302.22	0.2	0.0	0.20		
70	9	69248.26	302.24	0.2	0.0	0.20		
71	9	69782.35	302.26	0.2	0.0	0.20		
72	9	70298.59	302.28	0.2	0.0	0.20		
73	8	70797.57	302.30	0.2	0.0	0.20		
74	8	71279.85	302.32	0.2	0.0	0.20		
75	8	71745.98	302.34	0.2	0.0	0.20		
76	7	72196.49	302.36	0.2	0.0	0.20		
77	7	72631.88	302.38	0.2	0.0	0.20		
78	7	73052.65	302.39	0.2	0.0	0.20		
79	7	73459.28	302.41	0.2	0.0	0.20		
80	7	73852.23	302.43	0.2	0.0	0.20		
81	6	74231.95	302.44	0.2	0.0	0.20		
82	6	74598.86	302.46	0.2	0.0	0.20		
83	6	74953.39	302.47	0.2	0.0	0.20		
84	6	75295.95	302.49	0.2	0.0	0.20		
85	6	75626.91	302.50	0.2	0.0	0.20		
86	5	75946.67	302.51	0.2	0.0	0.20		
87	5	76255.59	302.53	0.2	0.0	0.20		
88	5	76554.02	302.54	0.2	0.0	0.20		
89	5	76842.31	302.55	0.2	0.0	0.20		
90	5	77120.78	302.56	0.2	0.0	0.20		
91	5	77389.76	302.57	0.2	0.0	0.20		
92	4	77649.56	302.58	0.2	0.0	0.20		
93	4	77900.48	302.59	0.2	0.0	0.20		
94	4	78142.80	302.60	0.2	0.0	0.20		
95	4	78376.82	302.61	0.2	0.0	0.20		
96	4	78602.79	302.62	0.2	0.0	0.20		
97	4	78820.99	302.63	0.2	0.0	0.20		
98	4	79031.66	302.64	0.2	0.0	0.20		
99	3	79235.06	302.65	0.2	0.0	0.20		
100	3	79431.42	302.65	0.2	0.0	0.20		
101	3	79620.96	302.66	0.2	0.0	0.20		
102	3	79803.93	302.67	0.2	0.0	0.20		
103	3	79980.52	302.68	0.2	0.0	0.20		
104	3	80150.95	302.68	0.2	0.0	0.20		
105	3	80315.41	302.69	0.2	0.0	0.20		
106	3	80474.11	302.70	0.2	0.0	0.20		
107	3	80627.23	302.70	0.2	0.0	0.20		
108	3	80774.96	302.71	0.2	0.0	0.20		
109	2	80917.46	302.71	0.2	0.0	0.20		
110	2	81054.92	302.72	0.2	0.0	0.20		
111	2	81187.49	302.72	0.2	0.0	0.20		
112	2	81315.34	302.73	0.2	0.0	0.20		
113	2	81438.61	302.73	0.2	0.0	0.20		
114	2	81557.47	302.74	0.2	0.0	0.20		
115	2	81672.05	302.74	0.2	0.0	0.20		
116	2	81782.49	302.75	0.2	0.0	0.20		
117	2	81888.93	302.75	0.2	0.0	0.20		
118	2	81991.50	302.76	0.2	0.0	0.20		
119	2	82090.33	302.76	0.2	0.0	0.20		
120	2	82185.53	302.76	0.2	0.0	0.20		
121	2	82277.23	302.77	0.2	0.0	0.20		
122	2	82365.55	302.77	0.2	0.0	0.20		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
123	2	82450.58	302.78	0.2	0.0	0.20		
124	2	82532.44	302.78	0.2	0.0	0.20		
125	1	82611.23	302.78	0.2	0.0	0.20		
126	1	82687.06	302.78	0.2	0.0	0.20		
127	1	82760.02	302.79	0.2	0.0	0.20		
128	1	82830.20	302.79	0.2	0.0	0.20		
129	1	82897.69	302.79	0.2	0.0	0.20		
130	1	82962.59	302.80	0.2	0.0	0.20		
131	1	83024.97	302.80	0.2	0.0	0.20		
132	1	83084.93	302.80	0.2	0.0	0.20		
133	1	83142.53	302.80	0.2	0.0	0.20		
134	1	83197.85	302.81	0.2	0.0	0.20		
135	1	83250.98	302.81	0.2	0.0	0.20		
136	1	83301.98	302.81	0.2	0.0	0.20		
137	1	83350.91	302.81	0.2	0.0	0.20		
138	1	83397.86	302.81	0.2	0.0	0.20		
139	1	83442.88	302.82	0.2	0.0	0.20		
140	1	83486.04	302.82	0.2	0.0	0.20		
141	1	83527.39	302.82	0.2	0.0	0.20		
142	1	83567.00	302.82	0.2	0.0	0.20		
143	1	83604.92	302.82	0.2	0.0	0.20		
144	1	83641.21	302.82	0.2	0.0	0.20		
145	1	83675.93	302.82	0.2	0.0	0.20		
146	1	83709.11	302.83	0.2	0.0	0.20		
147	1	83740.82	302.83	0.2	0.0	0.20		
148	1	83771.10	302.83	0.2	0.0	0.20		
149	1	83800.00	302.83	0.2	0.0	0.20		
150	1	83827.56	302.83	0.2	0.0	0.20		
151	1	83853.83	**302.83**	0.2	0.0	0.20		

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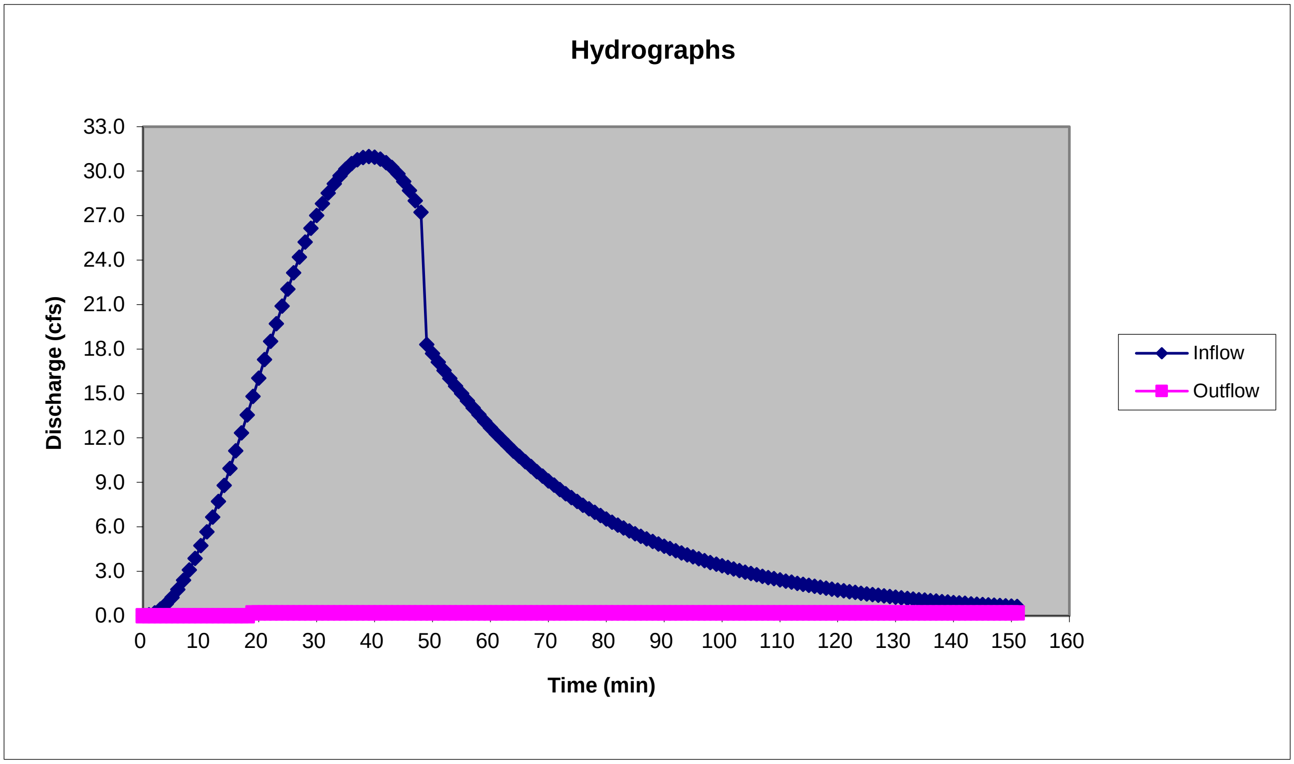
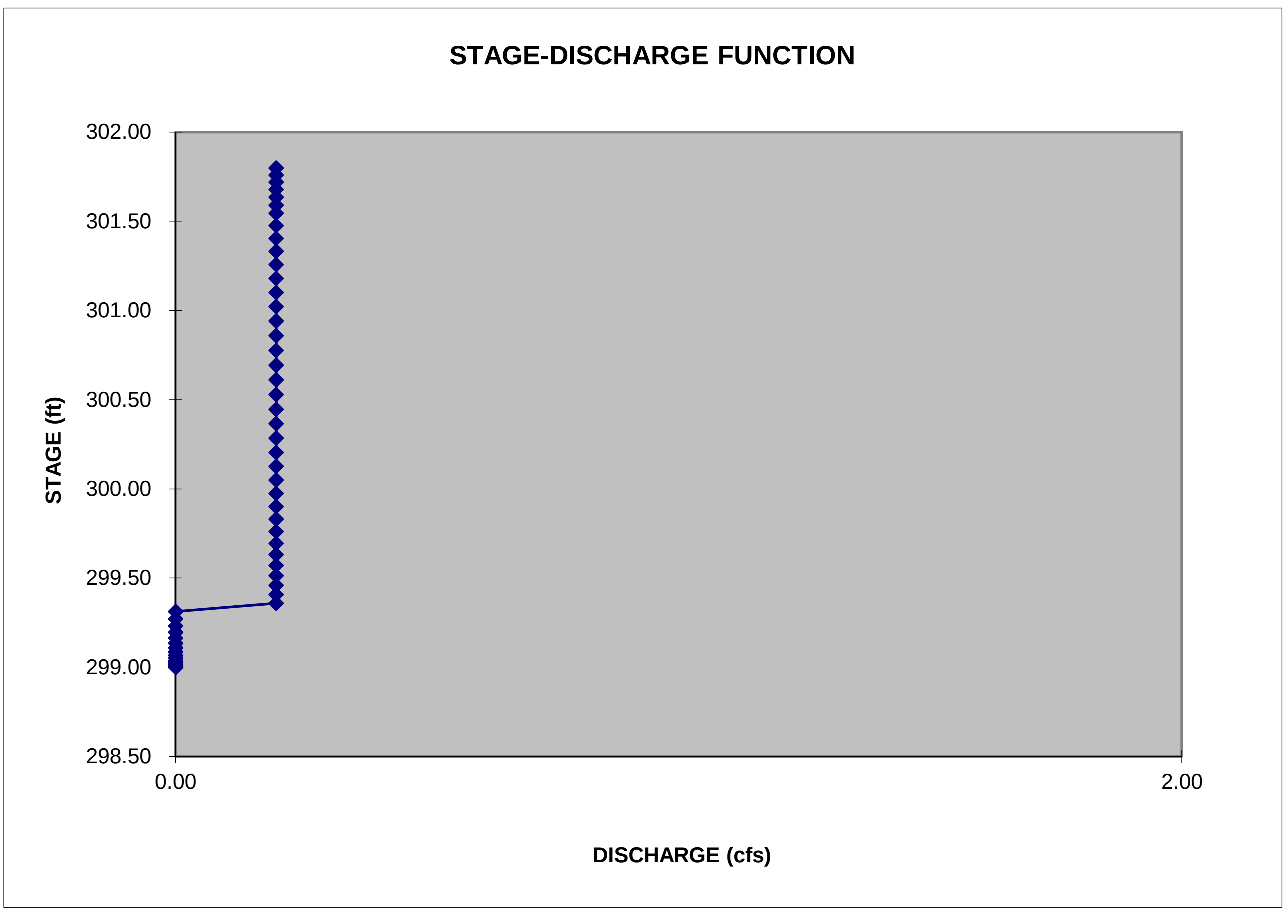
GRAPHED DATA FOR 25 YEAR STORM





SCM-G
SKIMMER BASIN WITH RISER DESIGN

CHAMBLEE LAKE
ZEBULON
DRH-22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm
Routing for the 25-year storm
Graphed Data for the 25-year storm

McADAMS

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH-22004	Calculated By:	BJK
Sediment Trap ID	SCM-G		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	5.76 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	5.76 ac.	0.25
Undisturbed grassy area	0.00 ac.	0.00 ac.	0.35
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	5.76 ac.	5.76 ac.	
Composite Rational 'c'	0.45	0.25	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	845	feet
Height of watershed =	21	feet
Calculated t(c) =	5.8	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.8	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for: Raleigh, NC

Return Period	g	h	Intensity
2	132	18	5.54 in/hr
10	195	22	7.01 in/hr
25	232	23	8.05 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	5.54 in/hr	14.4 cfs	7.98 cfs
10-year storm	7.01 in/hr	18.2 cfs	10.10 cfs
25-year storm	8.05 in/hr	20.9 cfs	11.60 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	3,600	cubic feet per disturbed acre
Required sediment trap surface area	435	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	160
Bottom width =	80
Sediment depth =	4.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Permanent Riser =	4.0
Side slopes =	3.0 H:1V
Spillway length =	16
Height of berm =	6
Top of trap length =	196
Top of trap width =	116
Bottom elevation =	302

Sediment Trap Data

	Required	Provided	
Sediment storage volume =	20736 cu. ft.	63460 cu. ft.	
Sediment surface area =	7910 sq. ft.	19140 sq. ft.	
Sediment storage depth =	3.5 ft. (max.)	4	Decrease storage depth
Trap bottom length to width ratio =	2.0L:1W (min)	2.0L:1W	
Spillway length =	10.0 ft. (min)	16	
10-Year flow depth over spillway =	0.50 ft. (max)	-0.07 ft	
Freeboard at 10-Year discharge =	1.00 ft. (min)	2.07 ft	

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU 1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Required for Sediment Basin = 20,736 cubic feet

24 HOURS	Best Option =	1 - 5 inch Skimmers with a 4 inch orifice	
2 DAYS	Best Option =	1 - 4 inch Skimmers with a 2.9 inch orifice	
3 DAYS	Best Option =	1 - 3 inch Skimmers with a 2.5 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2.5 inch Skimmers with a 2.3 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

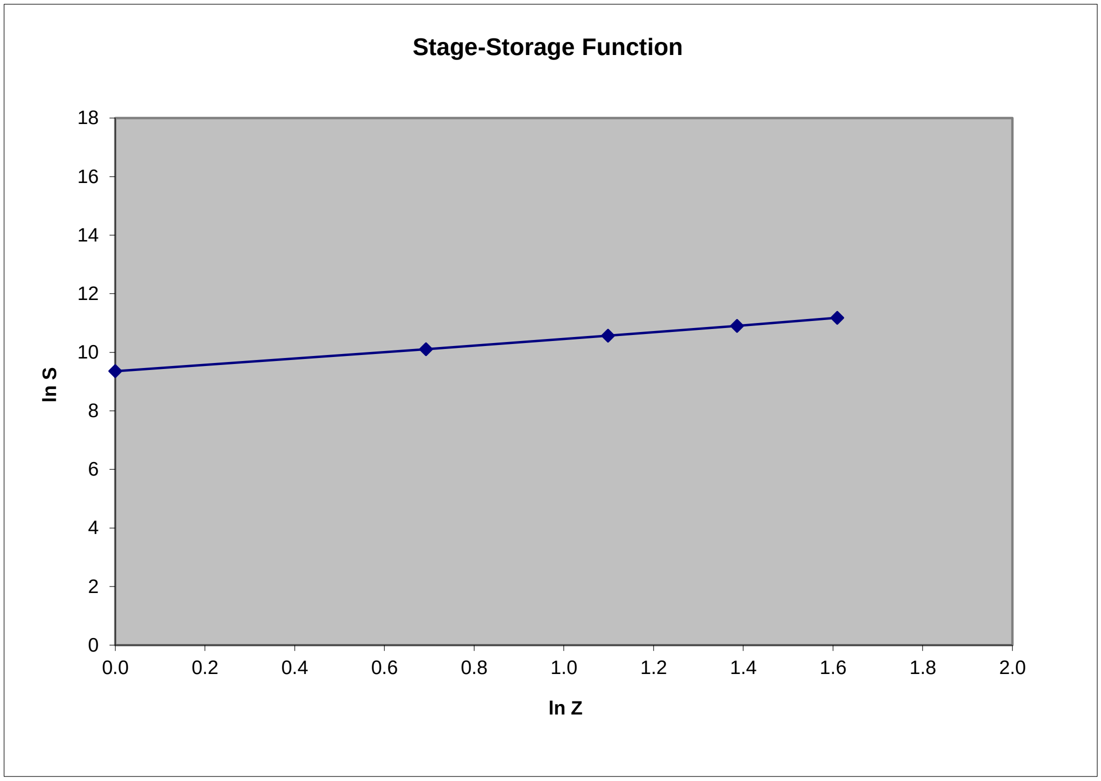
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
302	10884		0	0			
303	12195	11540	11539.5	1	9.3535	0.0000	1.01
304	13563	12879	24418.5	2	10.1031	0.6931	1.97
305	14987	14275	38693.5	3	10.5634	1.0986	2.95
306	16468	15727.5	54421	4	10.9045	1.3863	3.99
307	18005	17236.5	71657.5	5	11.1797	1.6094	5.09

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.13 and **K_s =** 11354



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HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT				OUTPUT	
Drainage Area, DA =	5.76	ac		**Use Kirpich Equation:**	
Disturbed Area =	5.76	ac		**Tc =**	5.8 min
Undisturbed Woods =	0.00	ac			
Undisturbed Grass =	0.00	ac		**Use Malcom Method:**	
Hydraulic Length =	845	ft		**i_1 =**	5.54 in/hr
Vertical Fall =	21	ft		**i_{10} =**	7.01 in/hr
For 1 yr Storm, g =	132			**i_{25} =**	8.05 in/hr
h =	18				
For 10 yr Storm, g =	195			**Use Rational Method:**	
h =	22			**Q_2 =**	14.4 cfs
For 25 yr Storm, g =	232			**Q_{10} =**	18.2 cfs
h =	23			**Q_{25} =**	20.9 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	30.5	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	40.3	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	43.2	**minutes**

McADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	304.75 ft
		Rise =	2.75 ft
Freeboard =	3.25 ft	Peak Outflow =	0.11 cfs

INPUT

Hydrograph Results:

Qp = 14.37 cfs
Tp = 30.5 min
dT = 1.0 min

Stage-Storage Results:

Ks = 11354
b = 1.13
Z_0 = 302.0 ft (inv)

Initial Water Level:

Z_i = 302.00 ft

Weir:

N = 1
L = 16 ft
Cw = 3.00
Zcr = 306.00 ft

Top of Dam: 308.00 ft

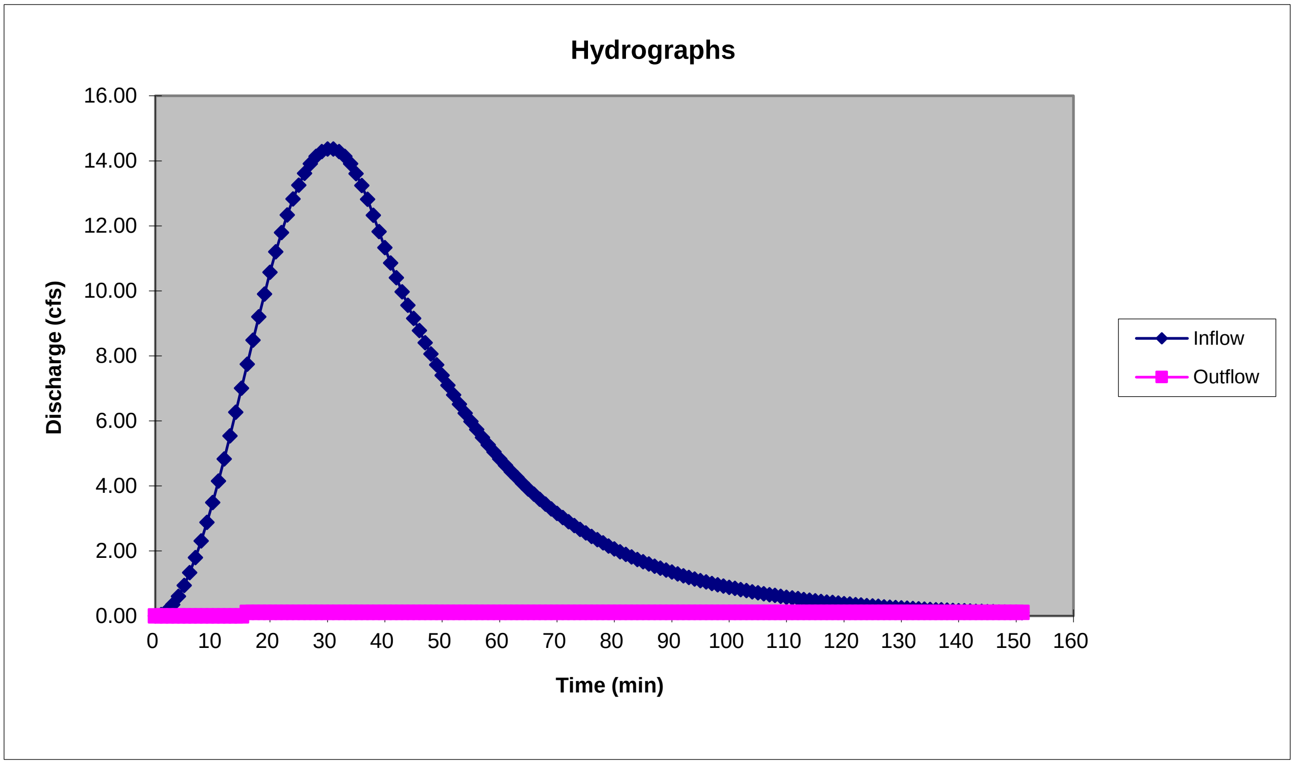
Skimmer Orifice:

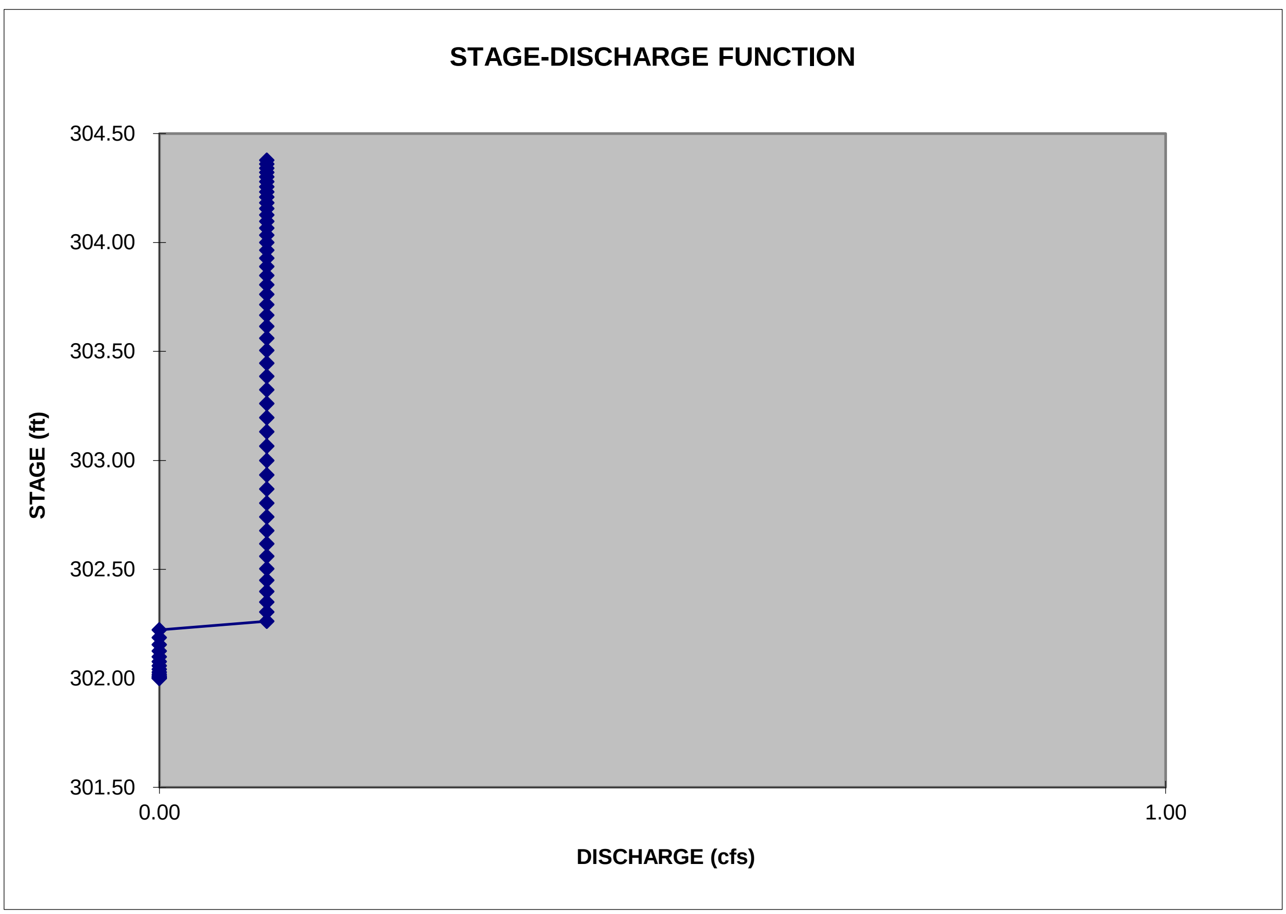
Number = 1.00 Ea
Diameter = 3.00 Inches
Head = 2.52 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	302.00	0.0	0.0	0.0		
1	0	0.00	302.00	0.0	0.0	0.00		
2	0	2.29	302.00	0.0	0.0	0.00		
3	0	11.41	302.00	0.0	0.0	0.00		
4	1	31.84	302.01	0.0	0.0	0.00		
5	1	67.94	302.01	0.0	0.0	0.00		
6	1	123.90	302.02	0.0	0.0	0.00		
7	2	203.70	302.03	0.0	0.0	0.00		
8	2	311.06	302.04	0.0	0.0	0.00		
9	3	449.41	302.06	0.0	0.0	0.00		
10	3	621.87	302.08	0.0	0.0	0.00		
11	4	831.18	302.10	0.0	0.0	0.00		
12	5	1079.69	302.13	0.0	0.0	0.00		
13	6	1369.33	302.15	0.0	0.0	0.00		
14	6	1701.60	302.19	0.0	0.0	0.00		
15	7	2077.57	302.22	0.0	0.0	0.00		
16	8	2497.80	302.26	0.1	0.0	0.11		
17	8	2956.02	302.30	0.1	0.0	0.11		
18	9	3458.26	302.35	0.1	0.0	0.11		
19	10	4003.72	302.40	0.1	0.0	0.11		
20	11	4591.09	302.45	0.1	0.0	0.11		
21	11	5218.67	302.50	0.1	0.0	0.11		
22	12	5884.29	302.56	0.1	0.0	0.11		
23	12	6585.40	302.62	0.1	0.0	0.11		
24	13	7319.07	302.68	0.1	0.0	0.11		
25	13	8082.01	302.74	0.1	0.0	0.11		
26	14	8870.65	302.80	0.1	0.0	0.11		
27	14	9681.12	302.87	0.1	0.0	0.11		
28	14	10509.32	302.93	0.1	0.0	0.11		
29	14	11350.98	303.00	0.1	0.0	0.11		
30	14	12201.68	303.07	0.1	0.0	0.11		
31	14	13056.88	303.13	0.1	0.0	0.11		
32	14	13912.04	303.20	0.1	0.0	0.11		
33	14	14762.57	303.26	0.1	0.0	0.11		
34	14	15603.97	303.32	0.1	0.0	0.11		
35	14	16431.80	303.39	0.1	0.0	0.11		
36	13	17241.80	303.45	0.1	0.0	0.11		
37	13	18029.88	303.50	0.1	0.0	0.11		
38	12	18792.18	303.56	0.1	0.0	0.11		
39	12	19525.12	303.61	0.1	0.0	0.11		
40	11	20228.09	303.67	0.1	0.0	0.11		

GRAPHED DATA FOR 2 YEAR STORM





ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS					
			Peak Stage =	305.93	ft
			Rise =	3.93	ft
Freeboard =	2.07	ft	Peak Outflow =	0.11	cfs

INPUT

Hydrograph Results:

Qp =	18.17	cfs
Tp =	40.3	min
dT =	1.0	min

Stage-Storage Results:

Ks =	11354	
b =	1.13	
Z_0 =	302.0	ft (inv)

Initial Water Level:

Z_i =	302.00	ft

Weir:

N =	1	
L =	16	ft
Cw =	3.00	
Zcr =	306.00	ft

Top of Dam: 308.00 ft

Skimmer Orifice:

Number =	1	Ea
Diameter =	3.00	Inches
Head =	2.52	inches

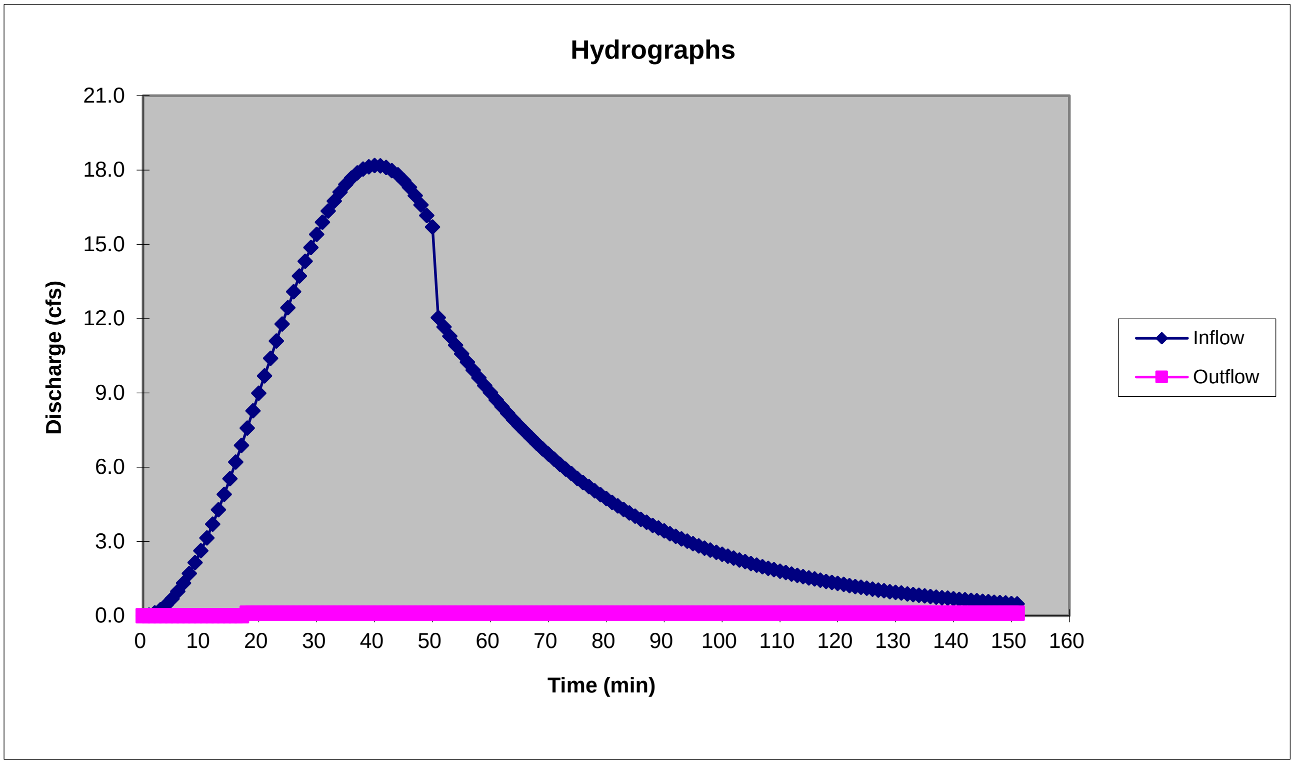
OUTPUT

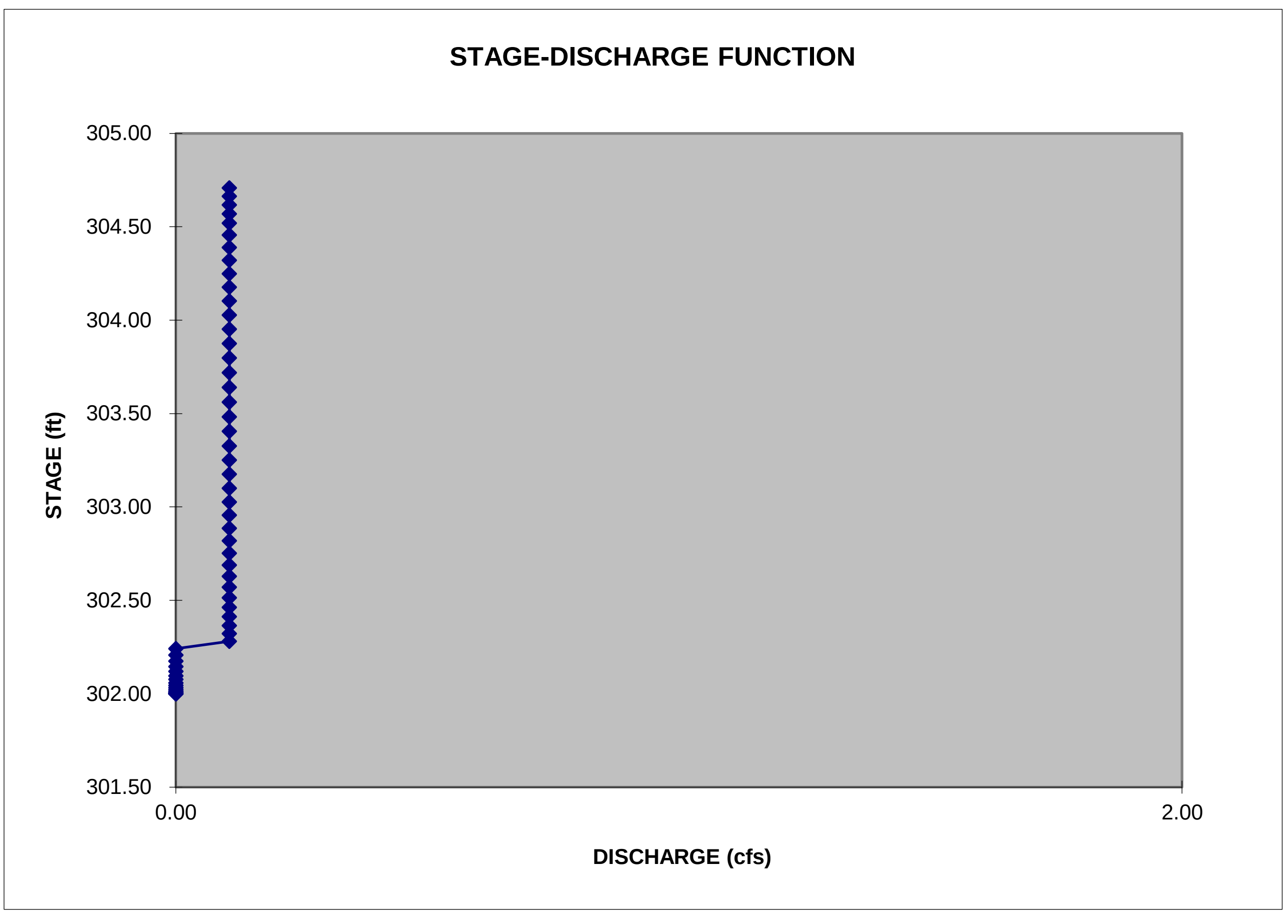
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	302.00	0.0	0.0	0.0		
1	0	0.00	302.00	0.0	0.0	0.00		
2	0	1.66	302.00	0.0	0.0	0.00		
3	0	8.27	302.00	0.0	0.0	0.00		
4	0	23.11	302.00	0.0	0.0	0.00		
5	1	49.39	302.01	0.0	0.0	0.00		
6	1	90.28	302.01	0.0	0.0	0.00		
7	1	148.83	302.02	0.0	0.0	0.00		
8	2	228.00	302.03	0.0	0.0	0.00		
9	2	330.61	302.04	0.0	0.0	0.00		
10	3	459.37	302.06	0.0	0.0	0.00		
11	3	616.78	302.08	0.0	0.0	0.00		
12	4	805.22	302.10	0.0	0.0	0.00		
13	4	1026.84	302.12	0.0	0.0	0.00		
14	5	1283.62	302.15	0.0	0.0	0.00		
15	6	1577.30	302.17	0.0	0.0	0.00		
16	6	1909.41	302.21	0.0	0.0	0.00		
17	7	2281.24	302.24	0.0	0.0	0.00		
18	8	2693.86	302.28	0.1	0.0	0.11		
19	8	3141.66	302.32	0.1	0.0	0.11		
20	9	3631.60	302.37	0.1	0.0	0.11		
21	10	4163.97	302.41	0.1	0.0	0.11		
22	10	4738.82	302.46	0.1	0.0	0.11		
23	11	5355.92	302.51	0.1	0.0	0.11		
24	12	6014.80	302.57	0.1	0.0	0.11		
25	12	6714.72	302.63	0.1	0.0	0.11		
26	13	7454.72	302.69	0.1	0.0	0.11		
27	14	8233.57	302.75	0.1	0.0	0.11		
28	14	9049.81	302.82	0.1	0.0	0.11		
29	15	9901.76	302.89	0.1	0.0	0.11		
30	15	10787.51	302.96	0.1	0.0	0.11		
31	16	11704.96	303.03	0.1	0.0	0.11		
32	16	12651.81	303.10	0.1	0.0	0.11		
33	17	13625.58	303.17	0.1	0.0	0.11		
34	17	14623.63	303.25	0.1	0.0	0.11		
35	17	15643.18	303.33	0.1	0.0	0.11		
36	18	16681.29	303.40	0.1	0.0	0.11		
37	18	17734.95	303.48	0.1	0.0	0.11		
38	18	18801.02	303.56	0.1	0.0	0.11		
39	18	19876.30	303.64	0.1	0.0	0.11		
40	18	20957.54	303.72	0.1	0.0	0.11		
41	18	22041.44	303.80	0.1	0.0	0.11		
42	18	23124.68	303.87	0.1	0.0	0.11		
43	18	24203.97	303.95	0.1	0.0	0.11		
44	18	25276.02	304.03	0.1	0.0	0.11		
45	18	26337.60	304.10	0.1	0.0	0.11		
46	17	27385.52	304.18	0.1	0.0	0.11		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	17	28416.71	304.25	0.1	0.0	0.11		
48	17	29428.16	304.32	0.1	0.0	0.11		
49	16	30417.00	304.39	0.1	0.0	0.11		
50	16	31380.52	304.46	0.1	0.0	0.11		
51	12	32316.11	304.52	0.1	0.0	0.11		
52	12	33031.91	304.57	0.1	0.0	0.11		
53	11	33724.79	304.62	0.1	0.0	0.11		
54	11	34395.47	304.66	0.1	0.0	0.11		
55	11	35044.66	304.71	0.1	0.0	0.11		
56	10	35673.04	304.75	0.1	0.0	0.11		
57	10	36281.27	304.79	0.1	0.0	0.11		
58	10	36869.99	304.83	0.1	0.0	0.11		
59	9	37439.83	304.87	0.1	0.0	0.11		
60	9	37991.37	304.91	0.1	0.0	0.11		
61	9	38525.21	304.94	0.1	0.0	0.11		
62	8	39041.90	304.98	0.1	0.0	0.11		
63	8	39541.98	305.01	0.1	0.0	0.11		
64	8	40026.00	305.04	0.1	0.0	0.11		
65	8	40494.44	305.08	0.1	0.0	0.11		
66	7	40947.81	305.11	0.1	0.0	0.11		
67	7	41386.59	305.14	0.1	0.0	0.11		
68	7	41811.24	305.16	0.1	0.0	0.11		
69	7	42222.21	305.19	0.1	0.0	0.11		
70	7	42619.93	305.22	0.1	0.0	0.11		
71	6	43004.82	305.24	0.1	0.0	0.11		
72	6	43377.30	305.27	0.1	0.0	0.11		
73	6	43737.75	305.29	0.1	0.0	0.11		
74	6	44086.55	305.32	0.1	0.0	0.11		
75	6	44424.08	305.34	0.1	0.0	0.11		
76	5	44750.70	305.36	0.1	0.0	0.11		
77	5	45066.74	305.38	0.1	0.0	0.11		
78	5	45372.55	305.40	0.1	0.0	0.11		
79	5	45668.45	305.42	0.1	0.0	0.11		
80	5	45954.76	305.44	0.1	0.0	0.11		
81	5	46231.78	305.46	0.1	0.0	0.11		
82	4	46499.79	305.48	0.1	0.0	0.11		
83	4	46759.10	305.49	0.1	0.0	0.11		
84	4	47009.98	305.51	0.1	0.0	0.11		
85	4	47252.69	305.53	0.1	0.0	0.11		
86	4	47487.49	305.54	0.1	0.0	0.11		
87	4	47714.64	305.56	0.1	0.0	0.11		
88	4	47934.38	305.57	0.1	0.0	0.11		
89	4	48146.94	305.58	0.1	0.0	0.11		
90	3	48352.54	305.60	0.1	0.0	0.11		
91	3	48551.42	305.61	0.1	0.0	0.11		
92	3	48743.79	305.62	0.1	0.0	0.11		
93	3	48929.84	305.64	0.1	0.0	0.11		
94	3	49109.79	305.65	0.1	0.0	0.11		
95	3	49283.82	305.66	0.1	0.0	0.11		
96	3	49452.12	305.67	0.1	0.0	0.11		
97	3	49614.88	305.68	0.1	0.0	0.11		
98	3	49772.27	305.69	0.1	0.0	0.11		
99	3	49924.47	305.70	0.1	0.0	0.11		
100	2	50071.63	305.71	0.1	0.0	0.11		
101	2	50213.91	305.72	0.1	0.0	0.11		
102	2	50351.48	305.73	0.1	0.0	0.11		
103	2	50484.47	305.74	0.1	0.0	0.11		
104	2	50613.04	305.75	0.1	0.0	0.11		
105	2	50737.33	305.75	0.1	0.0	0.11		
106	2	50857.47	305.76	0.1	0.0	0.11		
107	2	50973.60	305.77	0.1	0.0	0.11		
108	2	51085.83	305.78	0.1	0.0	0.11		
109	2	51194.30	305.78	0.1	0.0	0.11		
110	2	51299.13	305.79	0.1	0.0	0.11		
111	2	51400.42	305.80	0.1	0.0	0.11		
112	2	51498.29	305.80	0.1	0.0	0.11		
113	2	51592.86	305.81	0.1	0.0	0.11		
114	2	51684.22	305.82	0.1	0.0	0.11		
115	2	51772.48	305.82	0.1	0.0	0.11		
116	1	51857.74	305.83	0.1	0.0	0.11		
117	1	51940.08	305.83	0.1	0.0	0.11		
118	1	52019.61	305.84	0.1	0.0	0.11		
119	1	52096.41	305.84	0.1	0.0	0.11		
120	1	52170.57	305.85	0.1	0.0	0.11		
121	1	52242.18	305.85	0.1	0.0	0.11		
122	1	52311.30	305.86	0.1	0.0	0.11		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	52378.04	305.86	0.1	0.0	0.11		
124	1	52442.45	305.87	0.1	0.0	0.11		
125	1	52504.61	305.87	0.1	0.0	0.11		
126	1	52564.59	305.87	0.1	0.0	0.11		
127	1	52622.47	305.88	0.1	0.0	0.11		
128	1	52678.31	305.88	0.1	0.0	0.11		
129	1	52732.18	305.88	0.1	0.0	0.11		
130	1	52784.13	305.89	0.1	0.0	0.11		
131	1	52834.23	305.89	0.1	0.0	0.11		
132	1	52882.54	305.89	0.1	0.0	0.11		
133	1	52929.11	305.90	0.1	0.0	0.11		
134	1	52973.99	305.90	0.1	0.0	0.11		
135	1	53017.26	305.90	0.1	0.0	0.11		
136	1	53058.94	305.91	0.1	0.0	0.11		
137	1	53099.10	305.91	0.1	0.0	0.11		
138	1	53137.78	305.91	0.1	0.0	0.11		
139	1	53175.03	305.91	0.1	0.0	0.11		
140	1	53210.90	305.92	0.1	0.0	0.11		
141	1	53245.42	305.92	0.1	0.0	0.11		
142	1	53278.65	305.92	0.1	0.0	0.11		
143	1	53310.61	305.92	0.1	0.0	0.11		
144	1	53341.37	305.92	0.1	0.0	0.11		
145	1	53370.94	305.93	0.1	0.0	0.11		
146	1	53399.37	305.93	0.1	0.0	0.11		
147	1	53426.69	305.93	0.1	0.0	0.11		
148	1	53452.94	305.93	0.1	0.0	0.11		
149	1	53478.16	305.93	0.1	0.0	0.11		
150	0	53502.38	305.93	0.1	0.0	0.11		
151	0	53525.62	**305.94**	0.1	0.0	0.11		

GRAPHED DATA FOR 10 YEAR STORM





MCADAMS

ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**306.09 ft**
		Rise =	**4.09 ft**
Freeboard =	**1.91 ft**	**Peak Outflow =**	**1.38 cfs**

INPUT

Hydrograph Results:

Qp = 20.87 cfs
Tp = 40.3 min
dT = 1.0 min

Stage-Storage Results:

Ks = 11354
b = 1.13
Z_0 = 302.0 ft (inv)

Initial Water Level:

Z_i = 302.00 ft

Weir:

N = 1
L = 16 ft
Cw = 3.00
Zcr = 306.00 ft

Top of Dam: 308.00 ft

Skimmer Orifice:

Number = 1.00 Ea
Diameter = 3.00 Inches
Head = 2.52 inches

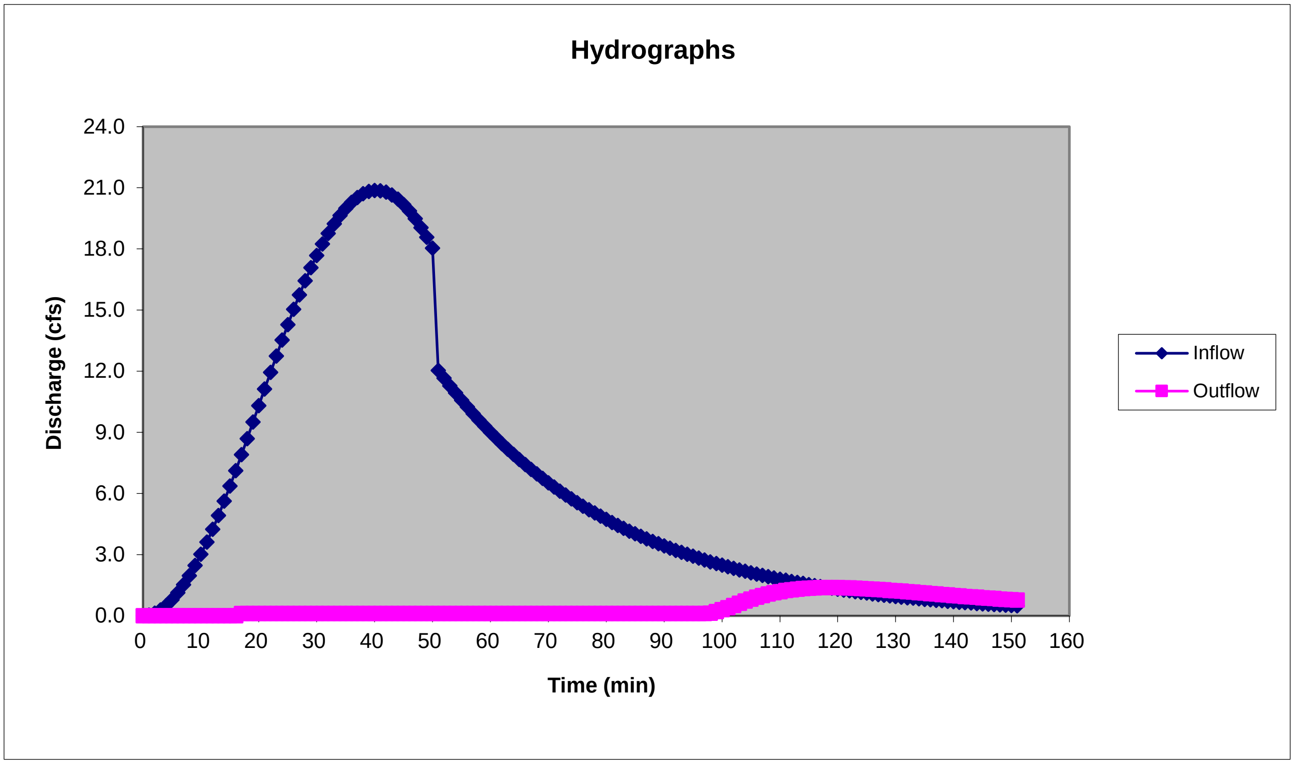
OUTPUT

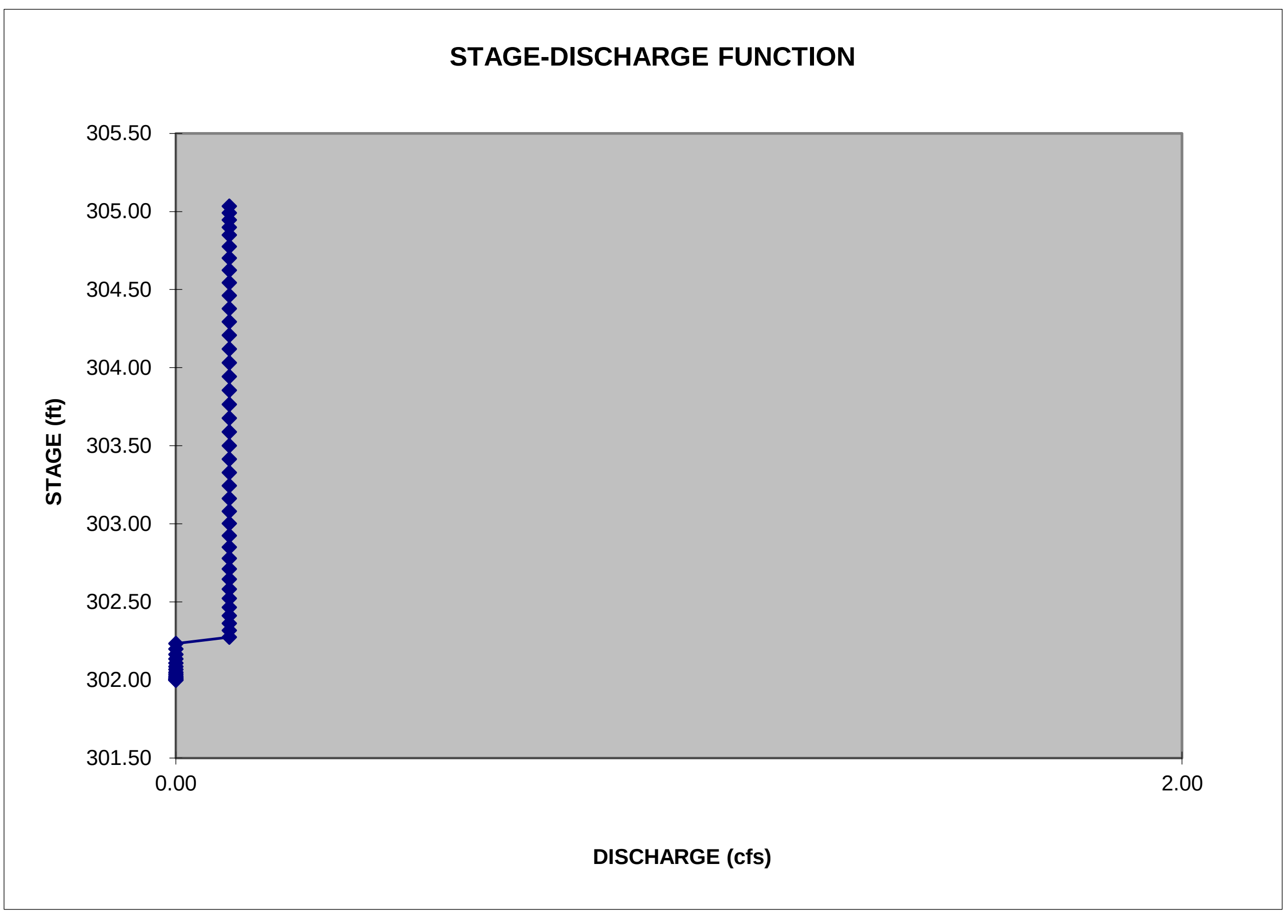
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	302.00	0.0	0.0	0.0		
1	0	0.00	302.00	0.0	0.0	0.00		
2	0	1.90	302.00	0.0	0.0	0.00		
3	0	9.49	302.00	0.0	0.0	0.00		
4	1	26.54	302.00	0.0	0.0	0.00		
5	1	56.73	302.01	0.0	0.0	0.00		
6	1	103.68	302.02	0.0	0.0	0.00		
7	2	170.93	302.02	0.0	0.0	0.00		
8	2	261.85	302.04	0.0	0.0	0.00		
9	2	379.69	302.05	0.0	0.0	0.00		
10	3	527.56	302.07	0.0	0.0	0.00		
11	4	708.34	302.09	0.0	0.0	0.00		
12	4	924.75	302.11	0.0	0.0	0.00		
13	5	1179.28	302.14	0.0	0.0	0.00		
14	6	1474.17	302.16	0.0	0.0	0.00		
15	6	1811.45	302.20	0.0	0.0	0.00		
16	7	2192.86	302.23	0.0	0.0	0.00		
17	8	2619.89	302.27	0.1	0.0	0.11		
18	9	3087.36	302.32	0.1	0.0	0.11		
19	10	3602.59	302.36	0.1	0.0	0.11		
20	10	4166.21	302.41	0.1	0.0	0.11		
21	11	4778.56	302.47	0.1	0.0	0.11		
22	12	5439.69	302.52	0.1	0.0	0.11		
23	13	6149.35	302.58	0.1	0.0	0.11		
24	14	6906.99	302.64	0.1	0.0	0.11		
25	14	7711.77	302.71	0.1	0.0	0.11		
26	15	8562.57	302.78	0.1	0.0	0.11		
27	16	9457.98	302.85	0.1	0.0	0.11		
28	16	10396.34	302.93	0.1	0.0	0.11		
29	17	11375.71	303.00	0.1	0.0	0.11		
30	18	12393.90	303.08	0.1	0.0	0.11		
31	18	13448.49	303.16	0.1	0.0	0.11		
32	19	14536.85	303.24	0.1	0.0	0.11		
33	19	15656.13	303.33	0.1	0.0	0.11		
34	20	16803.29	303.41	0.1	0.0	0.11		
35	20	17975.13	303.50	0.1	0.0	0.11		
36	20	19168.31	303.59	0.1	0.0	0.11		
37	21	20379.33	303.68	0.1	0.0	0.11		
38	21	21604.60	303.77	0.1	0.0	0.11		
39	21	22840.46	303.85	0.1	0.0	0.11		
40	21	24083.15	303.94	0.1	0.0	0.11		
41	21	25328.90	304.03	0.1	0.0	0.11		
42	21	26573.90	304.12	0.1	0.0	0.11		
43	21	27814.36	304.21	0.1	0.0	0.11		
44	20	29046.51	304.29	0.1	0.0	0.11		
45	20	30266.62	304.38	0.1	0.0	0.11		
46	20	31471.06	304.46	0.1	0.0	0.11		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time	Inflow	Storage	Stage	Outflow	Weir	Skimmer		
T	I	S	Z	O	Flow	Flow		
min	cfs	cu-ft	ft	cfs	cfs	cfs		
47	19	32656.27	304.54	0.1	0.0	0.11		
48	19	33818.82	304.62	0.1	0.0	0.11		
49	19	34955.41	304.70	0.1	0.0	0.11		
50	18	36062.90	304.78	0.1	0.0	0.11		
51	12	37138.34	304.85	0.1	0.0	0.11		
52	12	37854.13	304.90	0.1	0.0	0.11		
53	11	38547.01	304.95	0.1	0.0	0.11		
54	11	39217.69	304.99	0.1	0.0	0.11		
55	11	39866.88	305.03	0.1	0.0	0.11		
56	10	40495.26	305.08	0.1	0.0	0.11		
57	10	41103.49	305.12	0.1	0.0	0.11		
58	10	41692.22	305.16	0.1	0.0	0.11		
59	9	42262.05	305.19	0.1	0.0	0.11		
60	9	42813.60	305.23	0.1	0.0	0.11		
61	9	43347.43	305.27	0.1	0.0	0.11		
62	8	43864.12	305.30	0.1	0.0	0.11		
63	8	44364.21	305.33	0.1	0.0	0.11		
64	8	44848.22	305.37	0.1	0.0	0.11		
65	8	45316.66	305.40	0.1	0.0	0.11		
66	7	45770.04	305.43	0.1	0.0	0.11		
67	7	46208.82	305.46	0.1	0.0	0.11		
68	7	46633.47	305.48	0.1	0.0	0.11		
69	7	47044.43	305.51	0.1	0.0	0.11		
70	7	47442.15	305.54	0.1	0.0	0.11		
71	6	47827.05	305.56	0.1	0.0	0.11		
72	6	48199.52	305.59	0.1	0.0	0.11		
73	6	48559.97	305.61	0.1	0.0	0.11		
74	6	48908.78	305.63	0.1	0.0	0.11		
75	6	49246.31	305.66	0.1	0.0	0.11		
76	5	49572.92	305.68	0.1	0.0	0.11		
77	5	49888.97	305.70	0.1	0.0	0.11		
78	5	50194.78	305.72	0.1	0.0	0.11		
79	5	50490.68	305.74	0.1	0.0	0.11		
80	5	50776.98	305.76	0.1	0.0	0.11		
81	5	51054.00	305.78	0.1	0.0	0.11		
82	4	51322.02	305.79	0.1	0.0	0.11		
83	4	51581.33	305.81	0.1	0.0	0.11		
84	4	51832.20	305.83	0.1	0.0	0.11		
85	4	52074.91	305.84	0.1	0.0	0.11		
86	4	52309.72	305.86	0.1	0.0	0.11		
87	4	52536.87	305.87	0.1	0.0	0.11		
88	4	52756.60	305.89	0.1	0.0	0.11		
89	4	52969.16	305.90	0.1	0.0	0.11		
90	3	53174.77	305.91	0.1	0.0	0.11		
91	3	53373.65	305.93	0.1	0.0	0.11		
92	3	53566.01	305.94	0.1	0.0	0.11		
93	3	53752.06	305.95	0.1	0.0	0.11		
94	3	53932.01	305.96	0.1	0.0	0.11		
95	3	54106.04	305.97	0.1	0.0	0.11		
96	3	54274.35	305.98	0.1	0.0	0.11		
97	3	54437.11	306.00	0.1	0.0	0.11		
98	3	54594.50	306.01	0.1	0.0	0.11		
99	3	54745.46	306.02	0.2	0.1	0.11		
100	2	54887.09	306.02	0.3	0.2	0.11		
101	2	55018.24	306.03	0.4	0.3	0.11		
102	2	55138.44	306.04	0.5	0.4	0.11		
103	2	55247.61	306.05	0.6	0.5	0.11		
104	2	55345.91	306.05	0.7	0.6	0.11		
105	2	55433.71	306.06	0.8	0.7	0.11		
106	2	55511.49	306.07	0.9	0.8	0.11		
107	2	55579.82	306.07	1.0	0.9	0.11		
108	2	55639.31	306.07	1.1	1.0	0.11		
109	2	55690.59	306.08	1.1	1.0	0.11		
110	2	55734.30	306.08	1.2	1.1	0.11		
111	2	55771.06	306.08	1.2	1.1	0.11		
112	2	55801.49	306.08	1.3	1.2	0.11		
113	2	55826.17	306.09	1.3	1.2	0.11		
114	2	55845.63	306.09	1.3	1.2	0.11		
115	2	55860.40	306.09	1.4	1.2	0.11		
116	1	55870.94	306.09	1.4	1.3	0.11		
117	1	55877.70	306.09	1.4	1.3	0.11		
118	1	55881.08	306.09	1.4	1.3	0.11		
119	1	55881.46	**306.09**	1.4	1.3	0.11		
120	1	55879.16	306.09	1.4	1.3	0.11		
121	1	55874.50	306.09	1.4	1.3	0.11		
122	1	55867.74	306.09	1.4	1.3	0.11		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	55859.16	306.09	1.4	1.2	0.11		
124	1	55848.96	306.09	1.3	1.2	0.11		
125	1	55837.35	306.09	1.3	1.2	0.11		
126	1	55824.53	306.09	1.3	1.2	0.11		
127	1	55810.64	306.08	1.3	1.2	0.11		
128	1	55795.85	306.08	1.3	1.2	0.11		
129	1	55780.28	306.08	1.2	1.1	0.11		
130	1	55764.04	306.08	1.2	1.1	0.11		
131	1	55747.26	306.08	1.2	1.1	0.11		
132	1	55730.01	306.08	1.2	1.1	0.11		
133	1	55712.39	306.08	1.2	1.0	0.11		
134	1	55694.47	306.08	1.1	1.0	0.11		
135	1	55676.32	306.08	1.1	1.0	0.11		
136	1	55657.99	306.07	1.1	1.0	0.11		
137	1	55639.54	306.07	1.1	1.0	0.11		
138	1	55621.01	306.07	1.0	0.9	0.11		
139	1	55602.45	306.07	1.0	0.9	0.11		
140	1	55583.89	306.07	1.0	0.9	0.11		
141	1	55565.36	306.07	1.0	0.9	0.11		
142	1	55546.90	306.07	0.9	0.8	0.11		
143	1	55528.53	306.07	0.9	0.8	0.11		
144	1	55510.26	306.06	0.9	0.8	0.11		
145	1	55492.13	306.06	0.9	0.8	0.11		
146	1	55474.14	306.06	0.9	0.8	0.11		
147	1	55456.30	306.06	0.8	0.7	0.11		
148	1	55438.64	306.06	0.8	0.7	0.11		
149	1	55421.17	306.06	0.8	0.7	0.11		
150	0	55403.88	306.06	0.8	0.7	0.11		
151	0	55386.79	306.06	0.8	0.7	0.11		

GRAPHED DATA FOR 25 YEAR STORM





SCM-H
SKIMMER BASIN WITH RISER DESIGN

CHAMBLEE LAKE
ZEBULON
DRH-22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm
Routing for the 25-year storm
Graphed Data for the 25-year storm

McADAMS

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH-22004	Calculated By:	BJK
Sediment Trap ID	SCM-H		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	2.66 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	2.00 ac.	0.25
Undisturbed grassy area	0.00 ac.	0.66 ac.	0.35
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	2.66 ac.	2.66 ac.	
Composite Rational 'c'	0.45	0.27	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	605	feet
Height of watershed =	9	feet
Calculated t(c) =	5.5	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.5	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for: Raleigh, NC

Return Period	g	h	Intensity	
2	132	18	5.62	in/hr
10	195	22	7.10	in/hr
25	232	23	8.15	in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff	
2-year storm	5.62 in/hr	6.7 cfs	4.11	cfs
10-year storm	7.10 in/hr	8.5 cfs	5.19	cfs
25-year storm	8.15 in/hr	9.8 cfs	5.96	cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	3,600	cubic feet per disturbed acre
Required sediment trap surface area	435	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	215
Bottom width =	65
Sediment depth =	3.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Permanent Riser =	3.0
Side slopes =	3.0 H:1V
Spillway length =	16
Height of berm =	5
Top of trap length =	245
Top of trap width =	95
Bottom elevation =	311

Sediment Trap Data

	Required	Provided
Sediment storage volume =	9576 cu. ft.	49760 cu. ft.
Sediment surface area =	3700 sq. ft.	19340 sq. ft.
Sediment storage depth =	3.5 ft. (max.)	3
Trap bottom length to width ratio =	2.0L:1W (min)	3.3L:1W
Spillway length =	10.0 ft. (min)	16
10-Year flow depth over spillway =	0.50 ft. (max)	-1.37 ft
Freeboard at 10-Year discharge =	1.00 ft. (min)	3.37 ft

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU 1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Required for Sediment Basin = 9,576 cubic feet

24 HOURS	Best Option =	1 - 3 inch Skimmers with a 3 inch orifice	
2 DAYS	Best Option =	1 - 2.5 inch Skimmers with a 2.2 inch orifice	
3 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.9 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.6 inch orifice	

MCADAMS

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

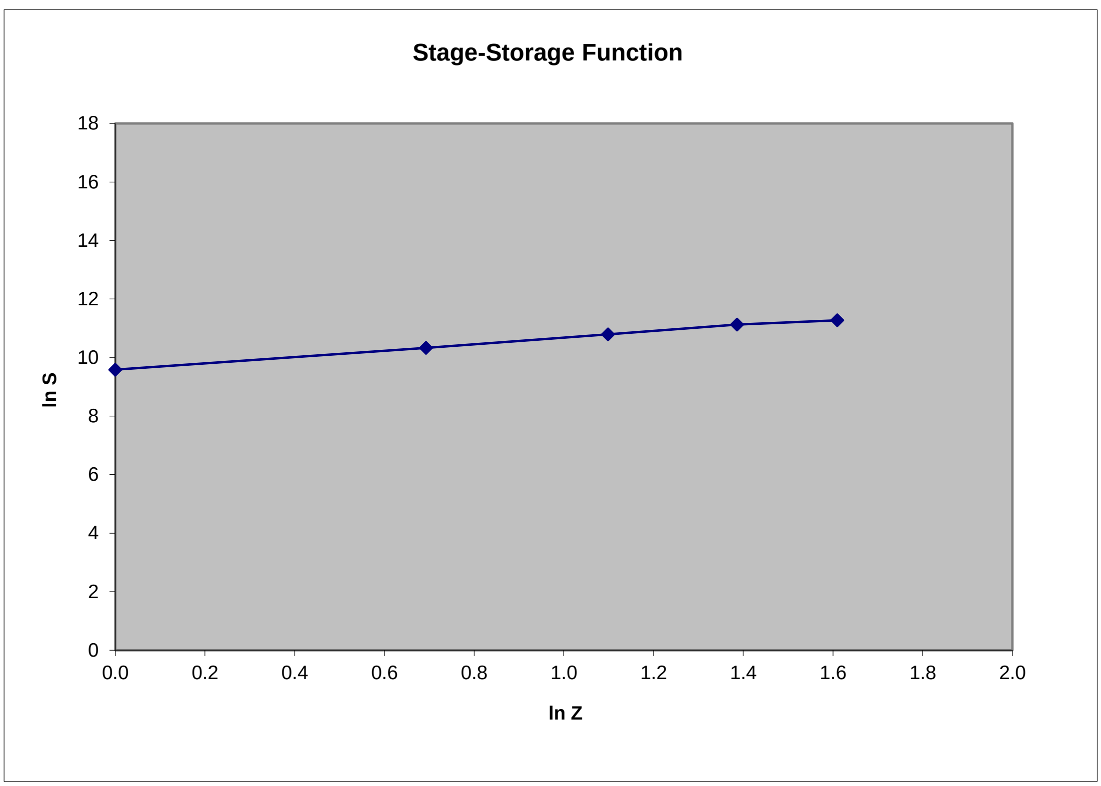
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6 Y	7 X	8
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
311	13780		0	0			
312	15377	14579	14578.5	1	9.5873	0.0000	0.99
313	17037	16207	30785.5	2	10.3348	0.6931	1.99
314	18760	17898.5	48684	3	10.7931	1.0986	3.05
315	20545	19652.5	68336.5	4	11.1322	1.3863	4.18
316	0	10272.5	78609	5	11.2722	1.6094	4.77

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.07 and **K_s =** 14713



McADAMS

HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	2.66	ac	**Use Kirpich Equation:**	
Disturbed Area =	2.66	ac	**Tc =**	5.5 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	605	ft	**i_1 =**	5.62 in/hr
Vertical Fall =	9	ft	**i_{10} =**	7.10 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	8.15 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	6.7 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	8.5 cfs
h =	23		**Q_{25} =**	9.8 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	30.1	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	39.8	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	42.7	**minutes**

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	312.12 ft
		Rise =	1.12 ft
Freeboard =	3.88 ft	Peak Outflow =	0.04 cfs

INPUT

Hydrograph Results:

Qp = 6.73 cfs

Tp = 30.1 min

dT = 1.0 min

Stage-Storage Results:

Ks = 14713

b = 1.07

Z_0 = 311.0 ft (inv)

Initial Water Level:

Z_i = 311.00 ft

Weir:

N = 1

L = 16 ft

Cw = 3.00

Zcr = 314.00 ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number = 1.00 Ea

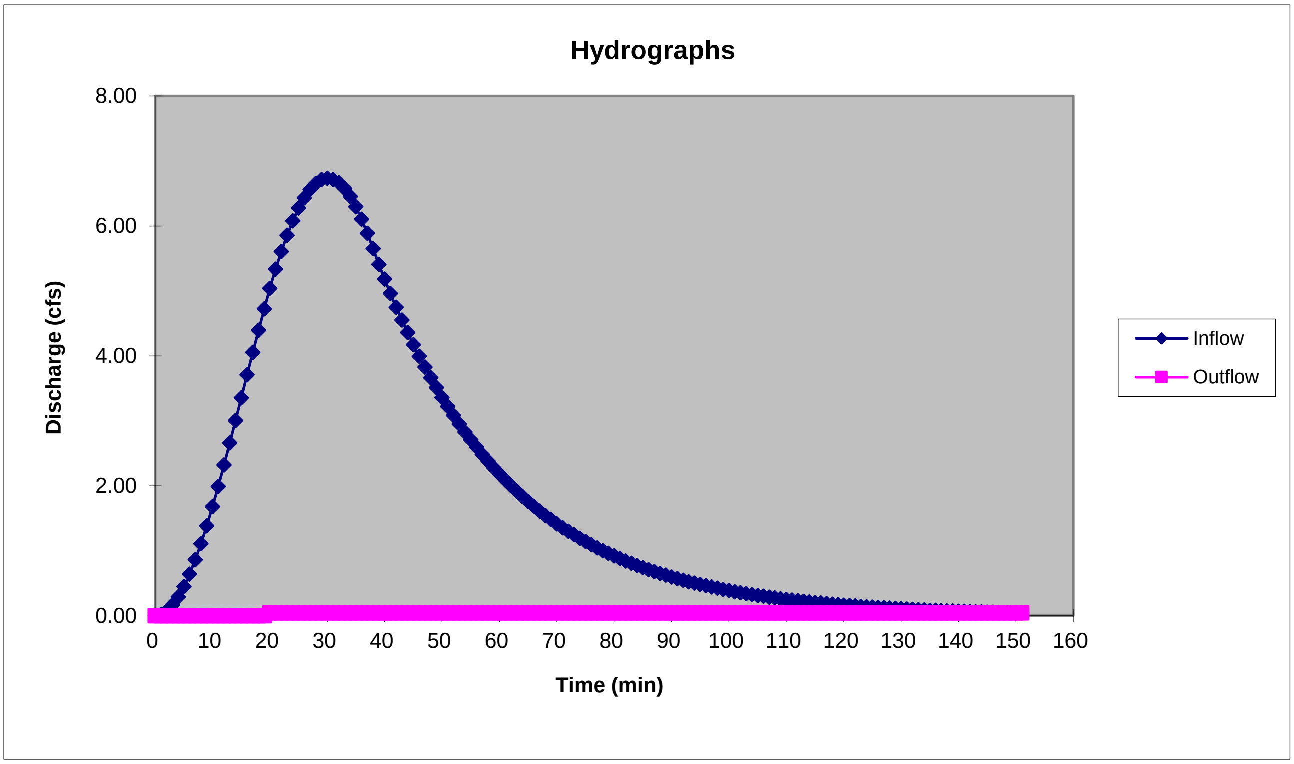
Diameter = 2.00 Inches

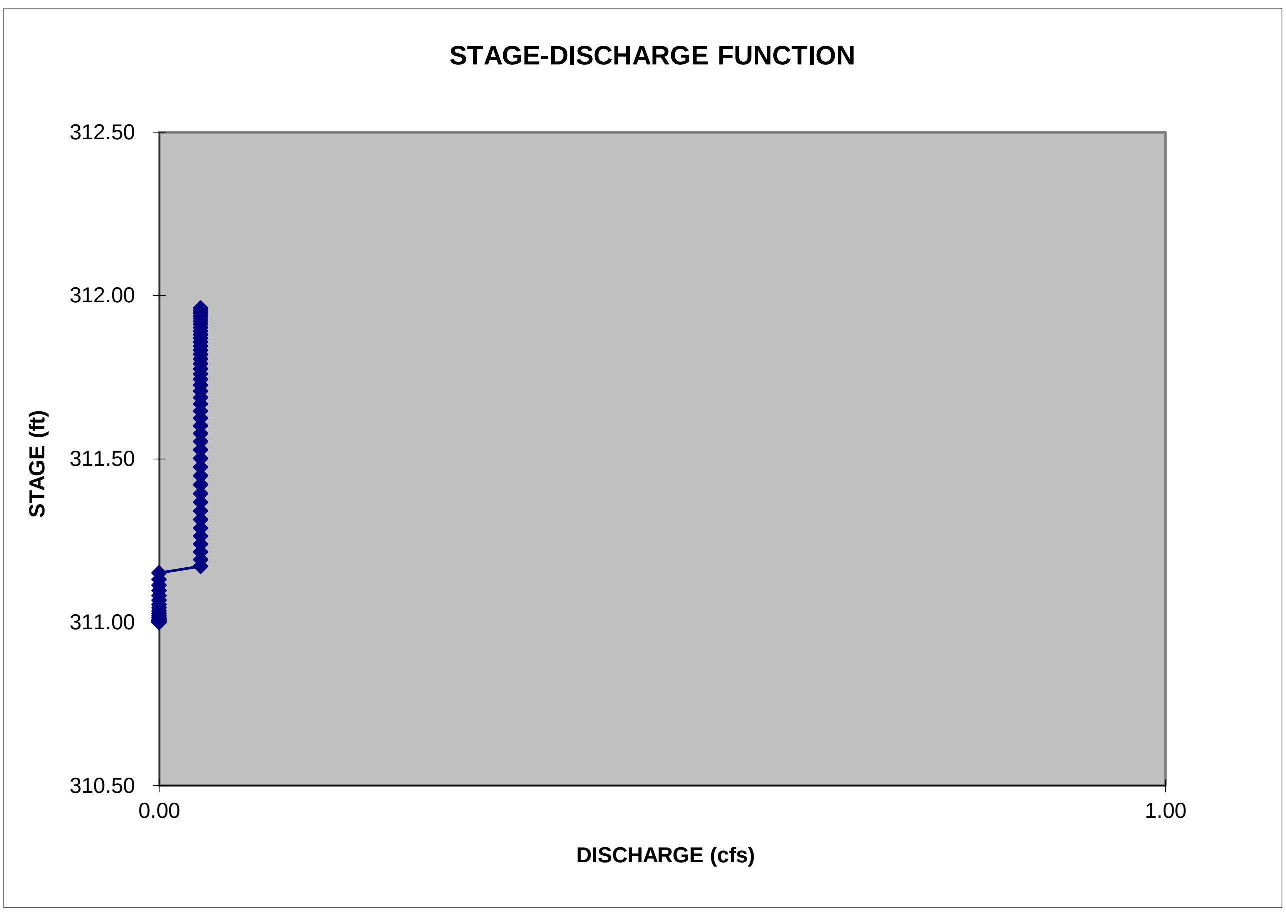
Head = 1.90 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	311.00	0.0	0.0	0.0		
1	0	0.00	311.00	0.0	0.0	0.00		
2	0	1.10	311.00	0.0	0.0	0.00		
3	0	5.50	311.00	0.0	0.0	0.00		
4	0	15.34	311.00	0.0	0.0	0.00		
5	0	32.74	311.00	0.0	0.0	0.00		
6	1	59.69	311.01	0.0	0.0	0.00		
7	1	98.11	311.01	0.0	0.0	0.00		
8	1	149.79	311.01	0.0	0.0	0.00		
9	1	216.36	311.02	0.0	0.0	0.00		
10	2	299.31	311.03	0.0	0.0	0.00		
11	2	399.92	311.03	0.0	0.0	0.00		
12	2	519.31	311.04	0.0	0.0	0.00		
13	3	658.38	311.06	0.0	0.0	0.00		
14	3	817.82	311.07	0.0	0.0	0.00		
15	3	998.08	311.08	0.0	0.0	0.00		
16	4	1199.40	311.10	0.0	0.0	0.00		
17	4	1421.80	311.11	0.0	0.0	0.00		
18	4	1665.04	311.13	0.0	0.0	0.00		
19	5	1928.68	311.15	0.0	0.0	0.00		
20	5	2212.04	311.17	0.0	0.0	0.04		
21	5	2511.76	311.19	0.0	0.0	0.04		
22	6	2829.23	311.22	0.0	0.0	0.04		
23	6	3163.14	311.24	0.0	0.0	0.04		
24	6	3512.04	311.26	0.0	0.0	0.04		
25	6	3874.30	311.29	0.0	0.0	0.04		
26	6	4248.13	311.31	0.0	0.0	0.04		
27	7	4631.63	311.34	0.0	0.0	0.04		
28	7	5022.80	311.37	0.0	0.0	0.04		
29	7	5419.53	311.39	0.0	0.0	0.04		
30	7	5819.69	311.42	0.0	0.0	0.04		
31	7	6221.07	311.45	0.0	0.0	0.04		
32	7	6621.48	311.48	0.0	0.0	0.04		
33	7	7018.72	311.50	0.0	0.0	0.04		
34	6	7410.63	311.53	0.0	0.0	0.04		
35	6	7795.11	311.55	0.0	0.0	0.04		
36	6	8170.14	311.58	0.0	0.0	0.04		
37	6	8533.81	311.60	0.0	0.0	0.04		
38	6	8884.33	311.62	0.0	0.0	0.04		
39	5	9220.65	311.65	0.0	0.0	0.04		
40	5	9542.64	311.67	0.0	0.0	0.04		

GRAPHED DATA FOR 2 YEAR STORM





MCADAMS

ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

Peak Stage =	312.63	ft
Rise =	1.63	ft
Peak Outflow =	0.04	cfs
Freeboard =	3.37	ft

INPUT

Hydrograph Results:

Qp =	8.50	cfs
Tp =	39.8	min
dT =	1.0	min

Stage-Storage Results:

Ks =	14713	
b =	1.07	
Z_0 =	311.0	ft (inv)

Initial Water Level:

Z_i =	311.00	ft

Weir:

N =	1	
L =	16	ft
Cw =	3.00	
Zcr =	314.00	ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number =	1	Ea
Diameter =	2.00	Inches
Head =	1.90	inches

OUTPUT

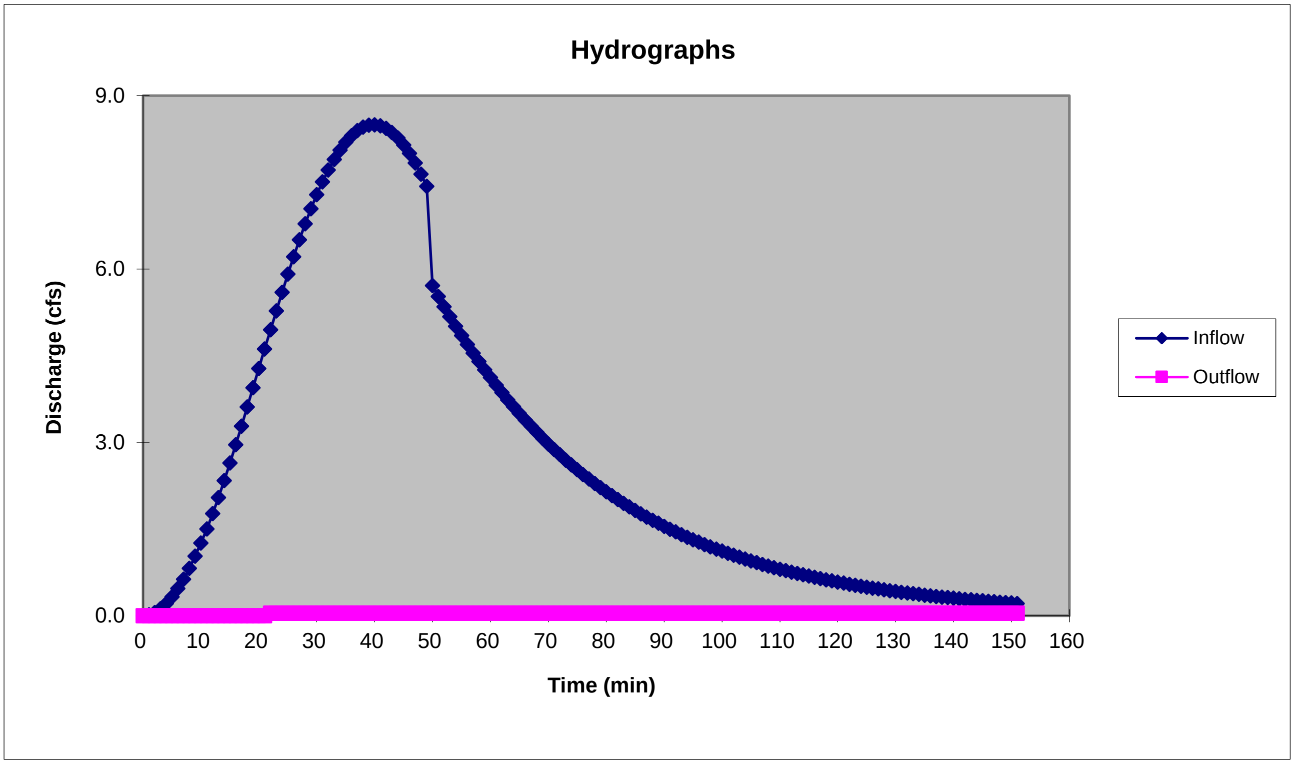
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	311.00	0.0	0.0	0.0		
1	0	0.00	311.00	0.0	0.0	0.00		
2	0	0.79	311.00	0.0	0.0	0.00		
3	0	3.96	311.00	0.0	0.0	0.00		
4	0	11.07	311.00	0.0	0.0	0.00		
5	0	23.66	311.00	0.0	0.0	0.00		
6	0	43.23	311.00	0.0	0.0	0.00		
7	1	71.27	311.01	0.0	0.0	0.00		
8	1	109.16	311.01	0.0	0.0	0.00		
9	1	158.28	311.01	0.0	0.0	0.00		
10	1	219.88	311.02	0.0	0.0	0.00		
11	2	295.19	311.03	0.0	0.0	0.00		
12	2	385.31	311.03	0.0	0.0	0.00		
13	2	491.28	311.04	0.0	0.0	0.00		
14	2	614.00	311.05	0.0	0.0	0.00		
15	3	754.32	311.06	0.0	0.0	0.00		
16	3	912.95	311.07	0.0	0.0	0.00		
17	3	1090.47	311.09	0.0	0.0	0.00		
18	4	1287.37	311.10	0.0	0.0	0.00		
19	4	1504.02	311.12	0.0	0.0	0.00		
20	4	1740.65	311.14	0.0	0.0	0.00		
21	5	1997.38	311.16	0.0	0.0	0.00		
22	5	2274.18	311.18	0.0	0.0	0.04		
23	5	2568.47	311.20	0.0	0.0	0.04		
24	6	2882.44	311.22	0.0	0.0	0.04		
25	6	3215.71	311.24	0.0	0.0	0.04		
26	6	3567.79	311.27	0.0	0.0	0.04		
27	7	3938.04	311.29	0.0	0.0	0.04		
28	7	4325.74	311.32	0.0	0.0	0.04		
29	7	4730.05	311.35	0.0	0.0	0.04		
30	7	5150.01	311.38	0.0	0.0	0.04		
31	8	5584.59	311.41	0.0	0.0	0.04		
32	8	6032.65	311.44	0.0	0.0	0.04		
33	8	6492.98	311.47	0.0	0.0	0.04		
34	8	6964.28	311.50	0.0	0.0	0.04		
35	8	7445.19	311.53	0.0	0.0	0.04		
36	8	7934.29	311.56	0.0	0.0	0.04		
37	8	8430.10	311.60	0.0	0.0	0.04		
38	8	8931.11	311.63	0.0	0.0	0.04		
39	8	9435.77	311.66	0.0	0.0	0.04		
40	8	9942.52	311.69	0.0	0.0	0.04		
41	8	10449.77	311.73	0.0	0.0	0.04		
42	8	10955.94	311.76	0.0	0.0	0.04		
43	8	11459.44	311.79	0.0	0.0	0.04		
44	8	11958.71	311.82	0.0	0.0	0.04		
45	8	12452.22	311.86	0.0	0.0	0.04		
46	8	12938.47	311.89	0.0	0.0	0.04		

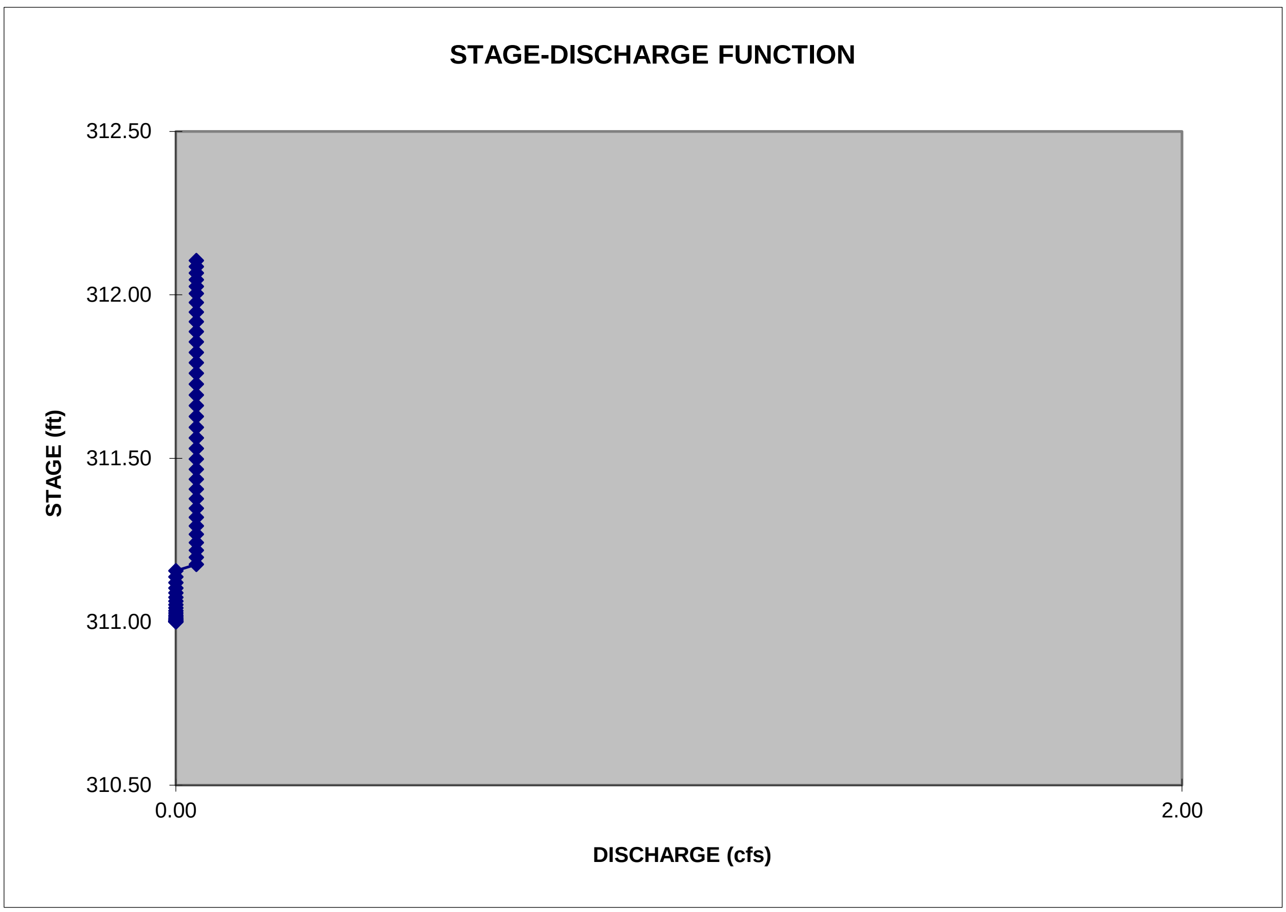
OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	8	13416.01	311.92	0.0	0.0	0.04		
48	8	13883.42	311.95	0.0	0.0	0.04		
49	7	14339.38	311.98	0.0	0.0	0.04		
50	6	14782.61	312.00	0.0	0.0	0.04		
51	6	15122.69	312.03	0.0	0.0	0.04		
52	5	15451.77	312.05	0.0	0.0	0.04		
53	5	15770.19	312.07	0.0	0.0	0.04		
54	5	16078.31	312.09	0.0	0.0	0.04		
55	5	16376.45	312.10	0.0	0.0	0.04		
56	5	16664.94	312.12	0.0	0.0	0.04		
57	5	16944.08	312.14	0.0	0.0	0.04		
58	4	17214.17	312.16	0.0	0.0	0.04		
59	4	17475.51	312.17	0.0	0.0	0.04		
60	4	17728.37	312.19	0.0	0.0	0.04		
61	4	17973.03	312.21	0.0	0.0	0.04		
62	4	18209.76	312.22	0.0	0.0	0.04		
63	4	18438.79	312.23	0.0	0.0	0.04		
64	4	18660.40	312.25	0.0	0.0	0.04		
65	3	18874.80	312.26	0.0	0.0	0.04		
66	3	19082.24	312.27	0.0	0.0	0.04		
67	3	19282.93	312.29	0.0	0.0	0.04		
68	3	19477.10	312.30	0.0	0.0	0.04		
69	3	19664.96	312.31	0.0	0.0	0.04		
70	3	19846.69	312.32	0.0	0.0	0.04		
71	3	20022.52	312.33	0.0	0.0	0.04		
72	3	20192.61	312.34	0.0	0.0	0.04		
73	3	20357.16	312.35	0.0	0.0	0.04		
74	3	20516.35	312.36	0.0	0.0	0.04		
75	3	20670.34	312.37	0.0	0.0	0.04		
76	2	20819.31	312.38	0.0	0.0	0.04		
77	2	20963.41	312.39	0.0	0.0	0.04		
78	2	21102.80	312.40	0.0	0.0	0.04		
79	2	21237.64	312.41	0.0	0.0	0.04		
80	2	21368.07	312.42	0.0	0.0	0.04		
81	2	21494.22	312.42	0.0	0.0	0.04		
82	2	21616.25	312.43	0.0	0.0	0.04		
83	2	21734.28	312.44	0.0	0.0	0.04		
84	2	21848.43	312.45	0.0	0.0	0.04		
85	2	21958.84	312.45	0.0	0.0	0.04		
86	2	22065.63	312.46	0.0	0.0	0.04		
87	2	22168.90	312.47	0.0	0.0	0.04		
88	2	22268.78	312.47	0.0	0.0	0.04		
89	2	22365.37	312.48	0.0	0.0	0.04		
90	2	22458.78	312.48	0.0	0.0	0.04		
91	1	22549.10	312.49	0.0	0.0	0.04		
92	1	22636.45	312.49	0.0	0.0	0.04		
93	1	22720.91	312.50	0.0	0.0	0.04		
94	1	22802.58	312.50	0.0	0.0	0.04		
95	1	22881.55	312.51	0.0	0.0	0.04		
96	1	22957.90	312.51	0.0	0.0	0.04		
97	1	23031.72	312.52	0.0	0.0	0.04		
98	1	23103.09	312.52	0.0	0.0	0.04		
99	1	23172.08	312.53	0.0	0.0	0.04		
100	1	23238.78	312.53	0.0	0.0	0.04		
101	1	23303.26	312.54	0.0	0.0	0.04		
102	1	23365.59	312.54	0.0	0.0	0.04		
103	1	23425.84	312.54	0.0	0.0	0.04		
104	1	23484.07	312.55	0.0	0.0	0.04		
105	1	23540.35	312.55	0.0	0.0	0.04		
106	1	23594.75	312.55	0.0	0.0	0.04		
107	1	23647.32	312.56	0.0	0.0	0.04		
108	1	23698.12	312.56	0.0	0.0	0.04		
109	1	23747.21	312.56	0.0	0.0	0.04		
110	1	23794.64	312.57	0.0	0.0	0.04		
111	1	23840.47	312.57	0.0	0.0	0.04		
112	1	23884.75	312.57	0.0	0.0	0.04		
113	1	23927.53	312.57	0.0	0.0	0.04		
114	1	23968.85	312.58	0.0	0.0	0.04		
115	1	24008.77	312.58	0.0	0.0	0.04		
116	1	24047.32	312.58	0.0	0.0	0.04		
117	1	24084.56	312.58	0.0	0.0	0.04		
118	1	24120.52	312.59	0.0	0.0	0.04		
119	1	24155.25	312.59	0.0	0.0	0.04		
120	1	24188.79	312.59	0.0	0.0	0.04		
121	1	24221.16	312.59	0.0	0.0	0.04		
122	1	24252.42	312.59	0.0	0.0	0.04		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
123	1	24282.59	312.60	0.0	0.0	0.04		
124	1	24311.72	312.60	0.0	0.0	0.04		
125	0	24339.83	312.60	0.0	0.0	0.04		
126	0	24366.96	312.60	0.0	0.0	0.04		
127	0	24393.13	312.60	0.0	0.0	0.04		
128	0	24418.39	312.60	0.0	0.0	0.04		
129	0	24442.76	312.60	0.0	0.0	0.04		
130	0	24466.26	312.61	0.0	0.0	0.04		
131	0	24488.93	312.61	0.0	0.0	0.04		
132	0	24510.80	312.61	0.0	0.0	0.04		
133	0	24531.88	312.61	0.0	0.0	0.04		
134	0	24552.20	312.61	0.0	0.0	0.04		
135	0	24571.80	312.61	0.0	0.0	0.04		
136	0	24590.68	312.61	0.0	0.0	0.04		
137	0	24608.88	312.62	0.0	0.0	0.04		
138	0	24626.41	312.62	0.0	0.0	0.04		
139	0	24643.30	312.62	0.0	0.0	0.04		
140	0	24659.57	312.62	0.0	0.0	0.04		
141	0	24675.24	312.62	0.0	0.0	0.04		
142	0	24690.33	312.62	0.0	0.0	0.04		
143	0	24704.85	312.62	0.0	0.0	0.04		
144	0	24718.83	312.62	0.0	0.0	0.04		
145	0	24732.27	312.62	0.0	0.0	0.04		
146	0	24745.21	312.62	0.0	0.0	0.04		
147	0	24757.65	312.62	0.0	0.0	0.04		
148	0	24769.61	312.62	0.0	0.0	0.04		
149	0	24781.11	312.63	0.0	0.0	0.04		
150	0	24792.16	312.63	0.0	0.0	0.04		
151	0	24802.78	**312.63**	0.0	0.0	0.04		

MCADAMS

GRAPHED DATA FOR 10 YEAR STORM





ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

Peak Stage =	312.76 ft
Rise =	1.76 ft
Freeboard =	3.24 ft
Peak Outflow =	0.04 cfs

INPUT

Hydrograph Results:

Qp = 9.75 cfs
Tp = 39.8 min
dT = 1.0 min

Stage-Storage Results:

Ks = 14713
b = 1.07
Z_0 = 311.0 ft (inv)

Initial Water Level:

Z_i = 311.00 ft

Weir:

N = 1
L = 16 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 1.90 inches

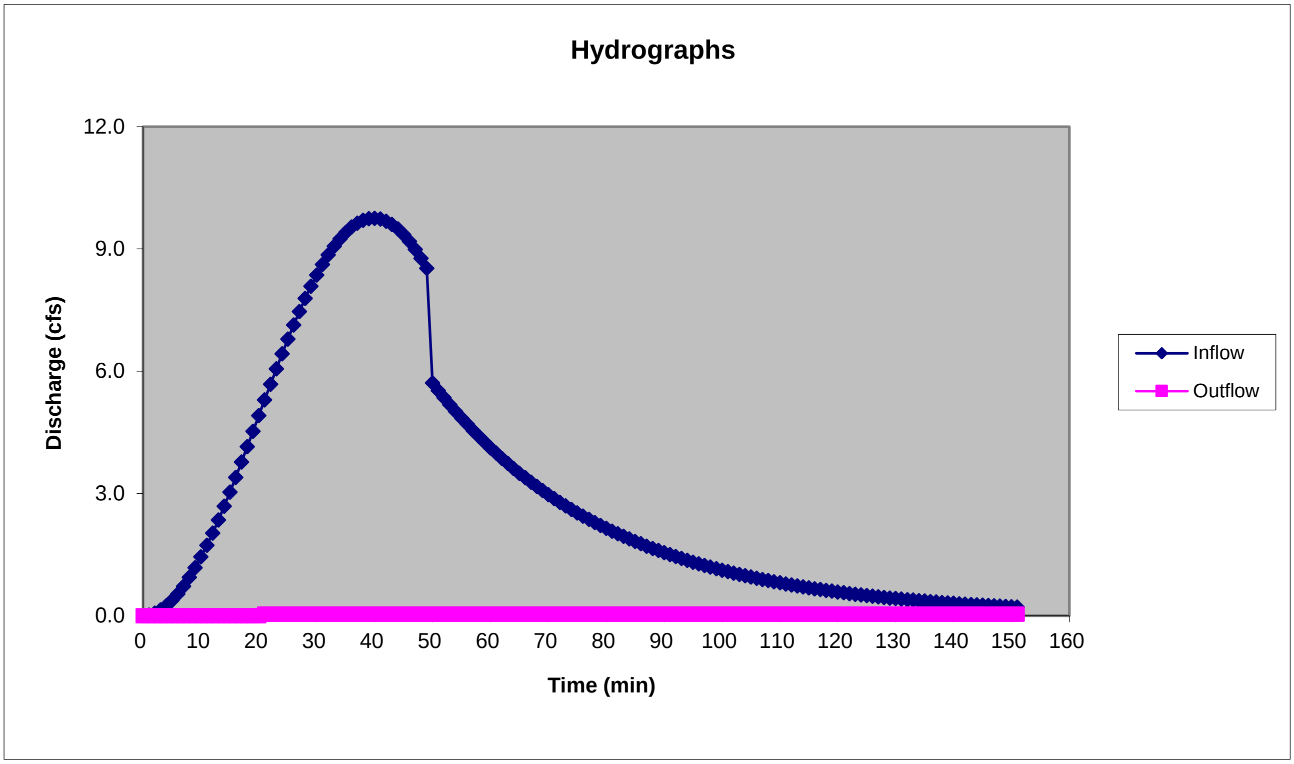
OUTPUT

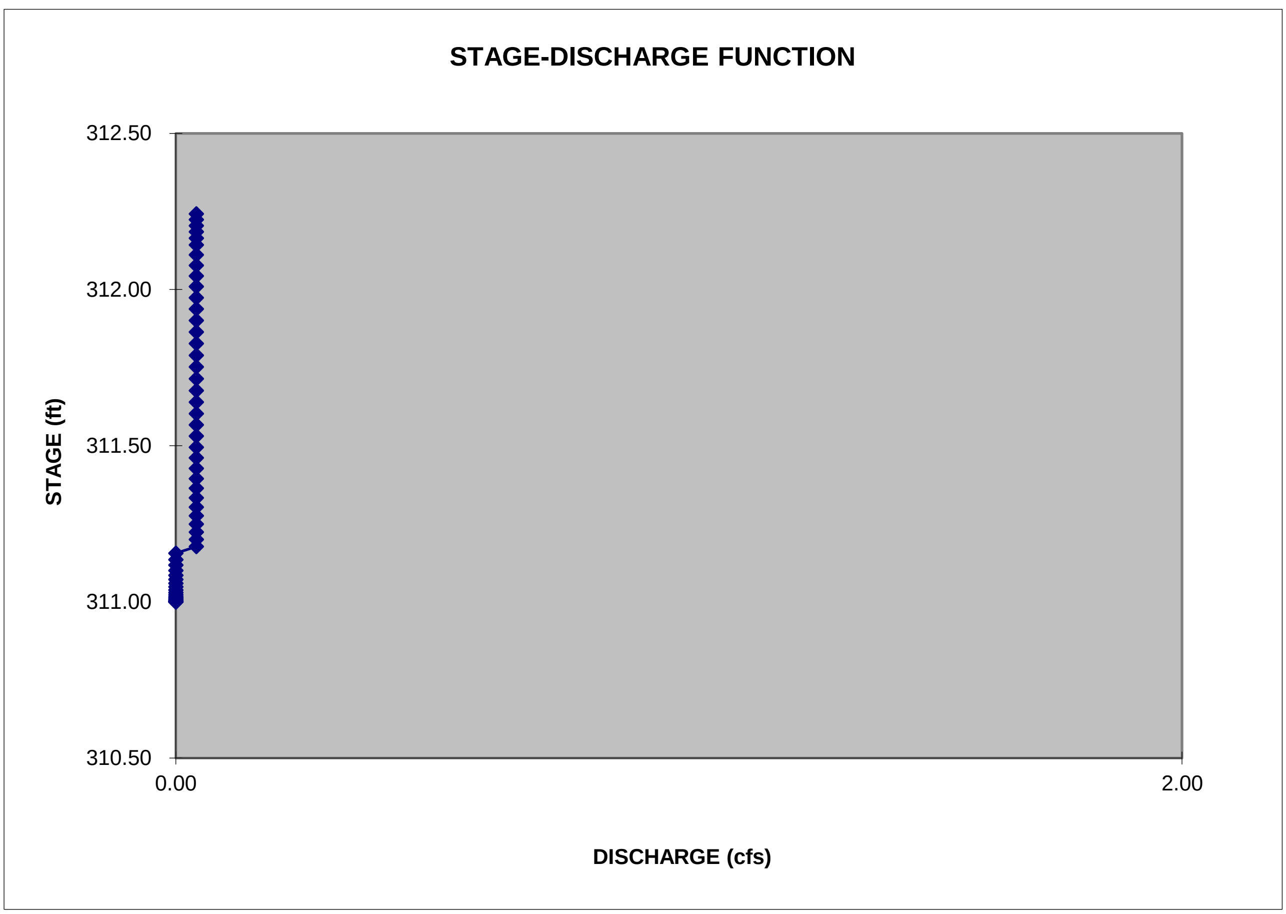
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	311.00	0.0	0.0	0.0		
1	0	0.00	311.00	0.0	0.0	0.00		
2	0	0.91	311.00	0.0	0.0	0.00		
3	0	4.55	311.00	0.0	0.0	0.00		
4	0	12.70	311.00	0.0	0.0	0.00		
5	0	27.16	311.00	0.0	0.0	0.00		
6	1	49.63	311.00	0.0	0.0	0.00		
7	1	81.81	311.01	0.0	0.0	0.00		
8	1	125.32	311.01	0.0	0.0	0.00		
9	1	181.70	311.02	0.0	0.0	0.00		
10	1	252.42	311.02	0.0	0.0	0.00		
11	2	338.87	311.03	0.0	0.0	0.00		
12	2	442.32	311.04	0.0	0.0	0.00		
13	2	563.96	311.05	0.0	0.0	0.00		
14	3	704.85	311.06	0.0	0.0	0.00		
15	3	865.93	311.07	0.0	0.0	0.00		
16	3	1048.03	311.09	0.0	0.0	0.00		
17	4	1251.81	311.10	0.0	0.0	0.00		
18	4	1477.85	311.12	0.0	0.0	0.00		
19	5	1726.56	311.14	0.0	0.0	0.00		
20	5	1998.20	311.16	0.0	0.0	0.00		
21	5	2292.91	311.18	0.0	0.0	0.04		
22	6	2608.20	311.20	0.0	0.0	0.04		
23	6	2946.40	311.22	0.0	0.0	0.04		
24	6	3307.19	311.25	0.0	0.0	0.04		
25	7	3690.14	311.28	0.0	0.0	0.04		
26	7	4094.67	311.30	0.0	0.0	0.04		
27	7	4520.08	311.33	0.0	0.0	0.04		
28	8	4965.51	311.36	0.0	0.0	0.04		
29	8	5430.00	311.39	0.0	0.0	0.04		
30	8	5912.46	311.43	0.0	0.0	0.04		
31	9	6411.71	311.46	0.0	0.0	0.04		
32	9	6926.43	311.50	0.0	0.0	0.04		
33	9	7455.23	311.53	0.0	0.0	0.04		
34	9	7996.63	311.57	0.0	0.0	0.04		
35	9	8549.06	311.60	0.0	0.0	0.04		
36	10	9110.89	311.64	0.0	0.0	0.04		
37	10	9680.43	311.68	0.0	0.0	0.04		
38	10	10255.94	311.71	0.0	0.0	0.04		
39	10	10835.64	311.75	0.0	0.0	0.04		
40	10	11417.73	311.79	0.0	0.0	0.04		
41	10	12000.40	311.83	0.0	0.0	0.04		
42	10	12581.82	311.86	0.0	0.0	0.04		
43	10	13160.18	311.90	0.0	0.0	0.04		
44	9	13733.70	311.94	0.0	0.0	0.04		
45	9	14300.59	311.97	0.0	0.0	0.04		
46	9	14859.15	312.01	0.0	0.0	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	9	15407.71	312.04	0.0	0.0	0.04		
48	9	15944.64	312.08	0.0	0.0	0.04		
49	9	16468.43	312.11	0.0	0.0	0.04		
50	6	16977.61	312.14	0.0	0.0	0.04		
51	6	17317.69	312.16	0.0	0.0	0.04		
52	5	17646.77	312.18	0.0	0.0	0.04		
53	5	17965.19	312.20	0.0	0.0	0.04		
54	5	18273.31	312.22	0.0	0.0	0.04		
55	5	18571.45	312.24	0.0	0.0	0.04		
56	5	18859.94	312.26	0.0	0.0	0.04		
57	5	19139.08	312.28	0.0	0.0	0.04		
58	4	19409.17	312.29	0.0	0.0	0.04		
59	4	19670.51	312.31	0.0	0.0	0.04		
60	4	19923.37	312.33	0.0	0.0	0.04		
61	4	20168.03	312.34	0.0	0.0	0.04		
62	4	20404.75	312.36	0.0	0.0	0.04		
63	4	20633.79	312.37	0.0	0.0	0.04		
64	4	20855.40	312.38	0.0	0.0	0.04		
65	3	21069.80	312.40	0.0	0.0	0.04		
66	3	21277.24	312.41	0.0	0.0	0.04		
67	3	21477.93	312.42	0.0	0.0	0.04		
68	3	21672.10	312.43	0.0	0.0	0.04		
69	3	21859.96	312.45	0.0	0.0	0.04		
70	3	22041.69	312.46	0.0	0.0	0.04		
71	3	22217.52	312.47	0.0	0.0	0.04		
72	3	22387.61	312.48	0.0	0.0	0.04		
73	3	22552.16	312.49	0.0	0.0	0.04		
74	3	22711.35	312.50	0.0	0.0	0.04		
75	3	22865.34	312.51	0.0	0.0	0.04		
76	2	23014.31	312.52	0.0	0.0	0.04		
77	2	23158.41	312.53	0.0	0.0	0.04		
78	2	23297.80	312.53	0.0	0.0	0.04		
79	2	23432.64	312.54	0.0	0.0	0.04		
80	2	23563.07	312.55	0.0	0.0	0.04		
81	2	23689.22	312.56	0.0	0.0	0.04		
82	2	23811.25	312.57	0.0	0.0	0.04		
83	2	23929.28	312.57	0.0	0.0	0.04		
84	2	24043.43	312.58	0.0	0.0	0.04		
85	2	24153.84	312.59	0.0	0.0	0.04		
86	2	24260.63	312.59	0.0	0.0	0.04		
87	2	24363.90	312.60	0.0	0.0	0.04		
88	2	24463.78	312.61	0.0	0.0	0.04		
89	2	24560.37	312.61	0.0	0.0	0.04		
90	2	24653.77	312.62	0.0	0.0	0.04		
91	1	24744.10	312.62	0.0	0.0	0.04		
92	1	24831.45	312.63	0.0	0.0	0.04		
93	1	24915.91	312.63	0.0	0.0	0.04		
94	1	24997.58	312.64	0.0	0.0	0.04		
95	1	25076.55	312.64	0.0	0.0	0.04		
96	1	25152.90	312.65	0.0	0.0	0.04		
97	1	25226.72	312.65	0.0	0.0	0.04		
98	1	25298.09	312.66	0.0	0.0	0.04		
99	1	25367.08	312.66	0.0	0.0	0.04		
100	1	25433.78	312.67	0.0	0.0	0.04		
101	1	25498.26	312.67	0.0	0.0	0.04		
102	1	25560.59	312.67	0.0	0.0	0.04		
103	1	25620.84	312.68	0.0	0.0	0.04		
104	1	25679.07	312.68	0.0	0.0	0.04		
105	1	25735.35	312.68	0.0	0.0	0.04		
106	1	25789.75	312.69	0.0	0.0	0.04		
107	1	25842.32	312.69	0.0	0.0	0.04		
108	1	25893.12	312.69	0.0	0.0	0.04		
109	1	25942.21	312.70	0.0	0.0	0.04		
110	1	25989.64	312.70	0.0	0.0	0.04		
111	1	26035.47	312.70	0.0	0.0	0.04		
112	1	26079.75	312.70	0.0	0.0	0.04		
113	1	26122.53	312.71	0.0	0.0	0.04		
114	1	26163.85	312.71	0.0	0.0	0.04		
115	1	26203.77	312.71	0.0	0.0	0.04		
116	1	26242.32	312.71	0.0	0.0	0.04		
117	1	26279.56	312.72	0.0	0.0	0.04		
118	1	26315.52	312.72	0.0	0.0	0.04		
119	1	26350.25	312.72	0.0	0.0	0.04		
120	1	26383.78	312.72	0.0	0.0	0.04		
121	1	26416.16	312.73	0.0	0.0	0.04		
122	1	26447.42	312.73	0.0	0.0	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	26477.59	312.73	0.0	0.0	0.04		
124	1	26506.72	312.73	0.0	0.0	0.04		
125	0	26534.83	312.73	0.0	0.0	0.04		
126	0	26561.96	312.73	0.0	0.0	0.04		
127	0	26588.13	312.74	0.0	0.0	0.04		
128	0	26613.39	312.74	0.0	0.0	0.04		
129	0	26637.76	312.74	0.0	0.0	0.04		
130	0	26661.26	312.74	0.0	0.0	0.04		
131	0	26683.93	312.74	0.0	0.0	0.04		
132	0	26705.80	312.74	0.0	0.0	0.04		
133	0	26726.88	312.74	0.0	0.0	0.04		
134	0	26747.20	312.75	0.0	0.0	0.04		
135	0	26766.80	312.75	0.0	0.0	0.04		
136	0	26785.68	312.75	0.0	0.0	0.04		
137	0	26803.88	312.75	0.0	0.0	0.04		
138	0	26821.41	312.75	0.0	0.0	0.04		
139	0	26838.30	312.75	0.0	0.0	0.04		
140	0	26854.57	312.75	0.0	0.0	0.04		
141	0	26870.24	312.75	0.0	0.0	0.04		
142	0	26885.33	312.75	0.0	0.0	0.04		
143	0	26899.85	312.75	0.0	0.0	0.04		
144	0	26913.82	312.76	0.0	0.0	0.04		
145	0	26927.27	312.76	0.0	0.0	0.04		
146	0	26940.21	312.76	0.0	0.0	0.04		
147	0	26952.65	312.76	0.0	0.0	0.04		
148	0	26964.61	312.76	0.0	0.0	0.04		
149	0	26976.11	312.76	0.0	0.0	0.04		
150	0	26987.16	312.76	0.0	0.0	0.04		
151	0	26997.78	**312.76**	0.0	0.0	0.04		

GRAPHED DATA FOR 25 YEAR STORM





SCM-I
SKIMMER BASIN WITH RISER DESIGN

CHAMBLEE LAKE
ZEBULON
DRH-22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm
Routing for the 25-year storm
Graphed Data for the 25-year storm

McADAMS

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH-22004	Calculated By:	BJK
Sediment Trap ID	SCM-I		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	5.46 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	3.28 ac.	0.25
Undisturbed grassy area	0.00 ac.	2.18 ac.	0.35
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	5.46 ac.	5.46 ac.	
Composite Rational 'c'	0.45	0.29	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	1047	feet
Height of watershed =	19	feet
Calculated t(c) =	7.7	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	7.7	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for: Raleigh, NC

Return Period	g	h	Intensity
2	132	18	5.13 in/hr
10	195	22	6.56 in/hr
25	232	23	7.55 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	5.13 in/hr	12.6 cfs	8.12 cfs
10-year storm	6.56 in/hr	16.1 cfs	10.38 cfs
25-year storm	7.55 in/hr	18.5 cfs	11.95 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	3,600	cubic feet per disturbed acre
Required sediment trap surface area	435	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	163
Bottom width =	68
Sediment depth =	2.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Permanent Riser =	2.0
Side slopes =	3.0 H:1V
Spillway length =	20
Height of berm =	4
Top of trap length =	187
Top of trap width =	92
Bottom elevation =	310

Sediment Trap Data

	Required	Provided
Sediment storage volume =	19656 cu. ft.	25030 cu. ft.
Sediment surface area =	7010 sq. ft.	14000 sq. ft.
Sediment storage depth =	3.5 ft. (max.)	2
Trap bottom length to width ratio =	2.0L:1W (min)	2.4L:1W
Spillway length =	10.0 ft. (min)	20
10-Year flow depth over spillway =	0.50 ft. (max)	0.38 ft
Freeboard at 10-Year discharge =	1.00 ft. (min)	1.62 ft

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU 1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Required for Sediment Basin = 19,656 cubic feet

24 HOURS	Best Option =	1 - 4 inch Skimmers with a 4 inch orifice	
2 DAYS	Best Option =	1 - 4 inch Skimmers with a 2.8 inch orifice	
3 DAYS	Best Option =	1 - 3 inch Skimmers with a 2.5 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2.5 inch Skimmers with a 2.2 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

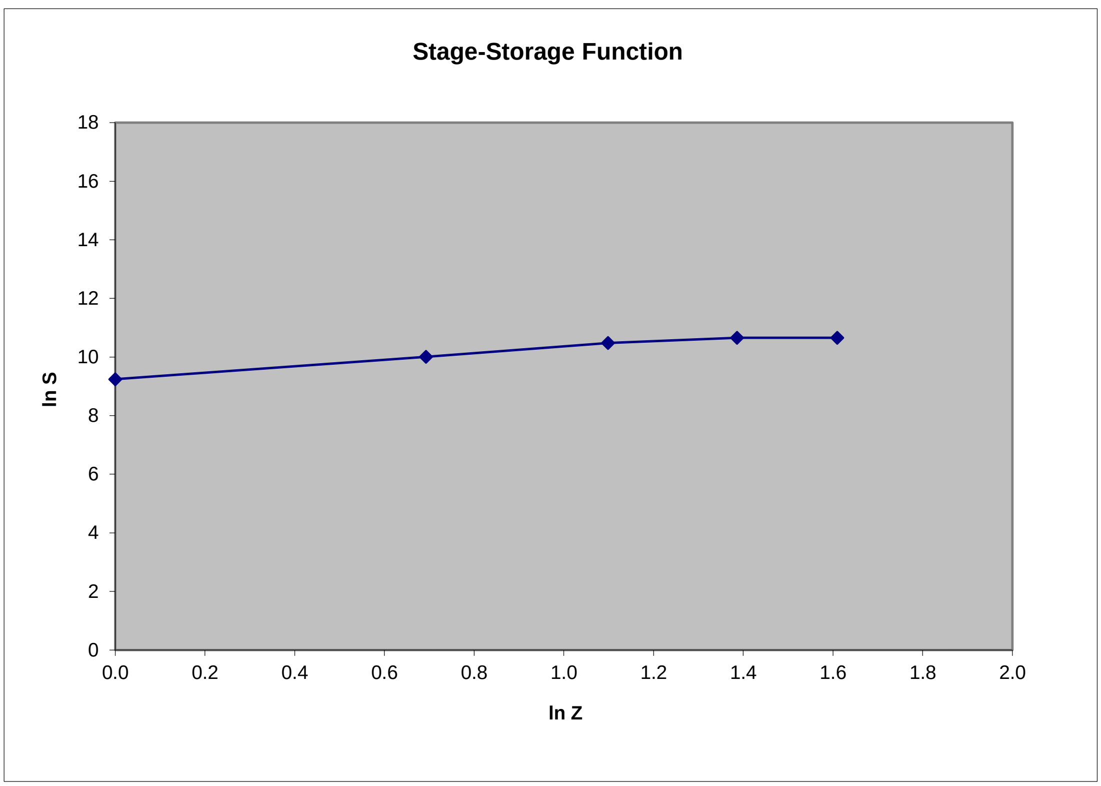
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
310	9626		0	0			
311	11047	10337	10336.5	1	9.2434	0.0000	0.92
312	12540	11793.5	22130	2	10.0047	0.6931	2.09
313	14103	13321.5	35451.5	3	10.4759	1.0986	3.48
314	0	7051.5	42503	4	10.6573	1.3863	4.23
315	0	0	42503	5	10.6573	1.6094	4.23

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 0.93 and **K_s =** 11140



McADAMS

HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	5.46	ac	**Use Kirpich Equation:**	
Disturbed Area =	5.46	ac	**Tc =**	7.7 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	1047	ft	**i_1 =**	5.13 in/hr
Vertical Fall =	19	ft	**i_{10} =**	6.56 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	7.55 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	12.6 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	16.1 cfs
h =	23		**Q_{25} =**	18.5 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	33.0	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	43.1	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	46.1	**minutes**

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**312.21** ft
		Rise =	**2.21** ft
Freeboard =	**1.79** ft	**Peak Outflow =**	**6.02** cfs

INPUT

Hydrograph Results:

Qp = 12.60 cfs
Tp = 33.0 min
dT = 1.0 min

Stage-Storage Results:

Ks = 11140
b = 0.93
Z_0 = 310.0 ft (inv)

Initial Water Level:

Z_i = 310.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 312.00 ft

Top of Dam: 314.00 ft

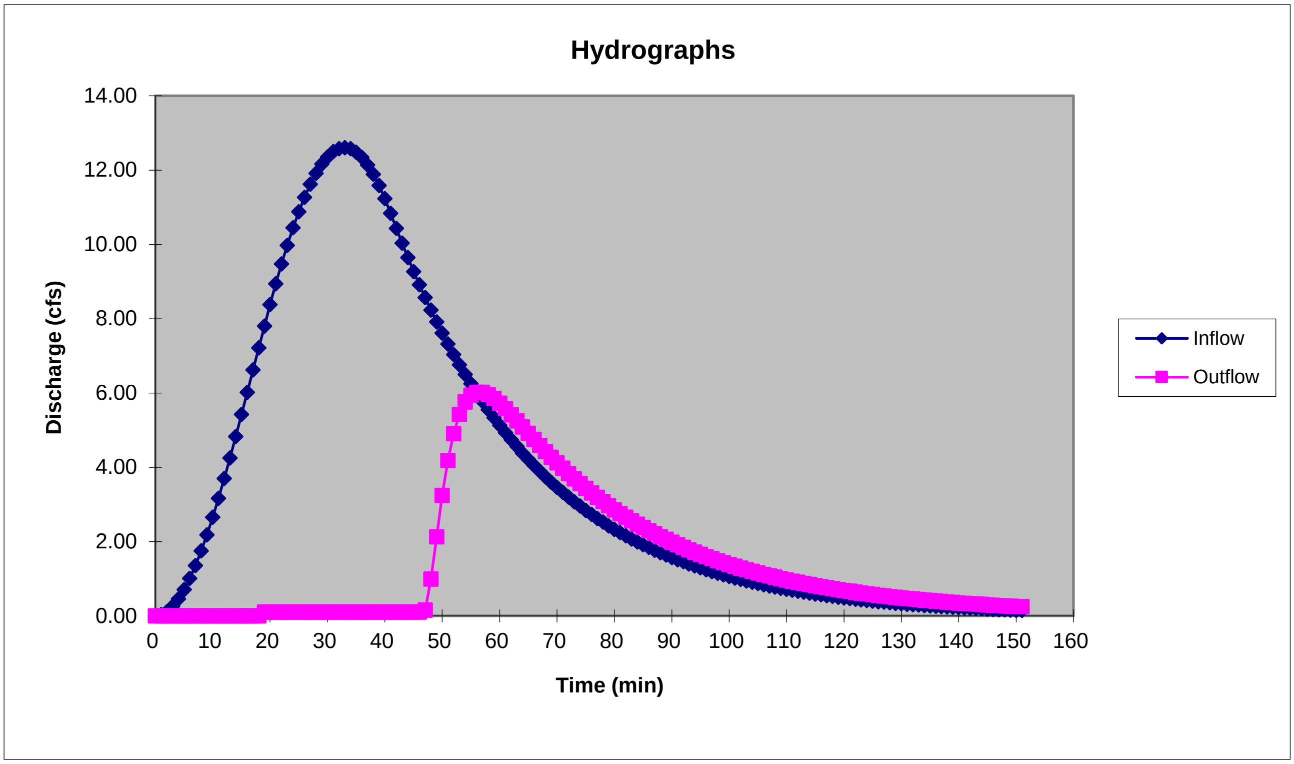
Skimmer Orifice:

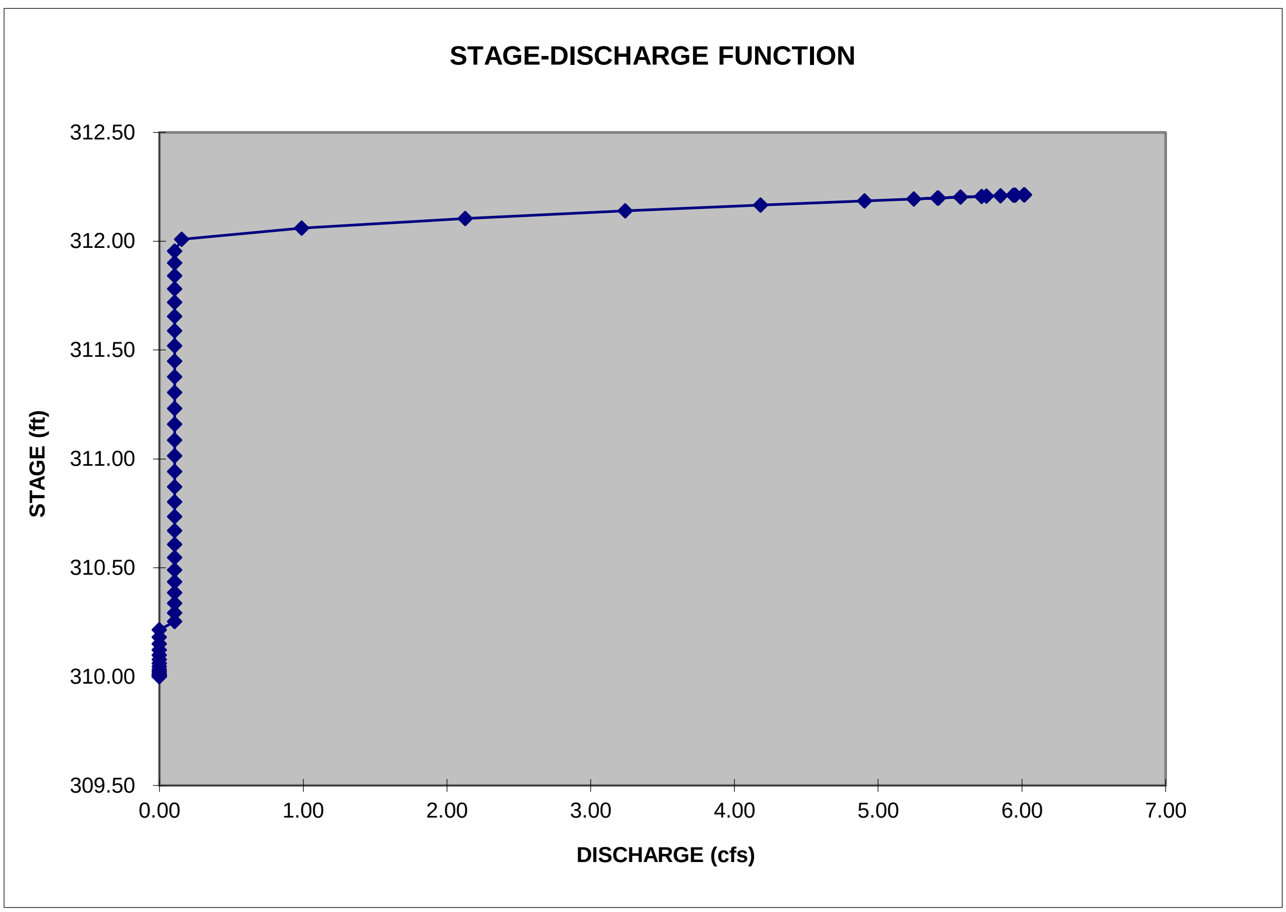
Number = 1.00 Ea
Diameter = 3.00 Inches
Head = 2.46 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	1.72	310.00	0.0	0.0	0.00		
3	0	8.57	310.00	0.0	0.0	0.00		
4	0	23.93	310.00	0.0	0.0	0.00		
5	1	51.08	310.00	0.0	0.0	0.00		
6	1	93.23	310.01	0.0	0.0	0.00		
7	1	153.41	310.01	0.0	0.0	0.00		
8	2	234.52	310.02	0.0	0.0	0.00		
9	2	339.25	310.02	0.0	0.0	0.00		
10	3	470.08	310.03	0.0	0.0	0.00		
11	3	629.27	310.05	0.0	0.0	0.00		
12	4	818.79	310.06	0.0	0.0	0.00		
13	4	1040.36	310.08	0.0	0.0	0.00		
14	5	1295.40	310.10	0.0	0.0	0.00		
15	5	1585.03	310.12	0.0	0.0	0.00		
16	6	1910.06	310.15	0.0	0.0	0.00		
17	7	2270.95	310.18	0.0	0.0	0.00		
18	7	2667.88	310.21	0.0	0.0	0.00		
19	8	3100.66	310.25	0.1	0.0	0.11		
20	8	3562.49	310.29	0.1	0.0	0.11		
21	9	4058.87	310.34	0.1	0.0	0.11		
22	9	4588.65	310.38	0.1	0.0	0.11		
23	10	5150.42	310.44	0.1	0.0	0.11		
24	10	5742.43	310.49	0.1	0.0	0.11		
25	11	6362.69	310.55	0.1	0.0	0.11		
26	11	7008.94	310.61	0.1	0.0	0.11		
27	12	7678.70	310.67	0.1	0.0	0.11		
28	12	8369.24	310.74	0.1	0.0	0.11		
29	12	9077.69	310.80	0.1	0.0	0.11		
30	12	9800.97	310.87	0.1	0.0	0.11		
31	12	10535.90	310.94	0.1	0.0	0.11		
32	13	11279.18	311.01	0.1	0.0	0.11		
33	13	12027.43	311.09	0.1	0.0	0.11		
34	13	12777.24	311.16	0.1	0.0	0.11		
35	12	13525.17	311.23	0.1	0.0	0.11		
36	12	14267.80	311.31	0.1	0.0	0.11		
37	12	15001.77	311.38	0.1	0.0	0.11		
38	12	15723.79	311.45	0.1	0.0	0.11		
39	12	16430.68	311.52	0.1	0.0	0.11		
40	11	17119.38	311.59	0.1	0.0	0.11		

GRAPHED DATA FOR 2 YEAR STORM





ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**312.38 ft**
		Rise =	**2.38 ft**
Freeboard =	**1.62 ft**	**Peak Outflow =**	**14.16 cfs**

INPUT

Hydrograph Results:

Qp = 16.11 cfs
Tp = 43.1 min
dT = 1.0 min

Stage-Storage Results:

Ks = 11140
b = 0.93
Z_0 = 310.0 ft (inv)

Initial Water Level:

Z_i = 310.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 312.00 ft

Top of Dam: 314.00 ft

Skimmer Orifice:

Number = 1 Ea
Diameter = 3.00 Inches
Head = 2.46 inches

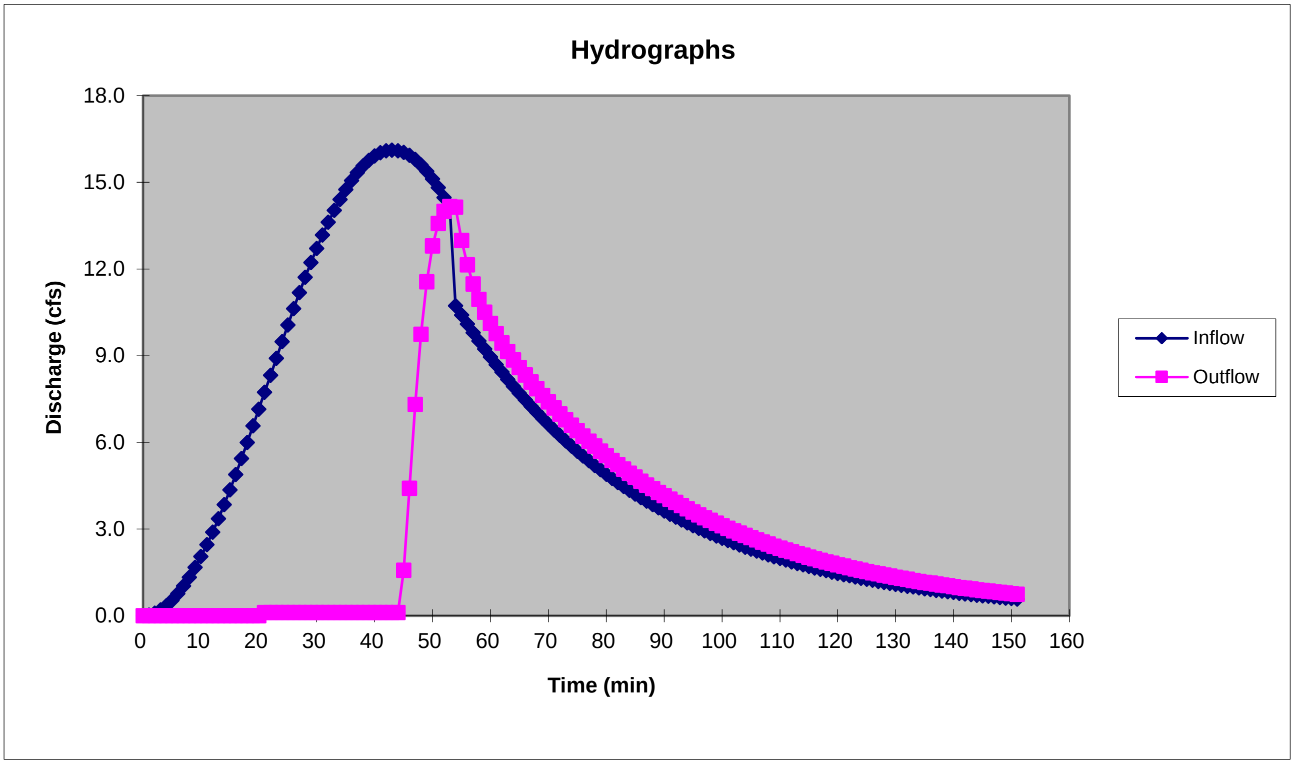
OUTPUT

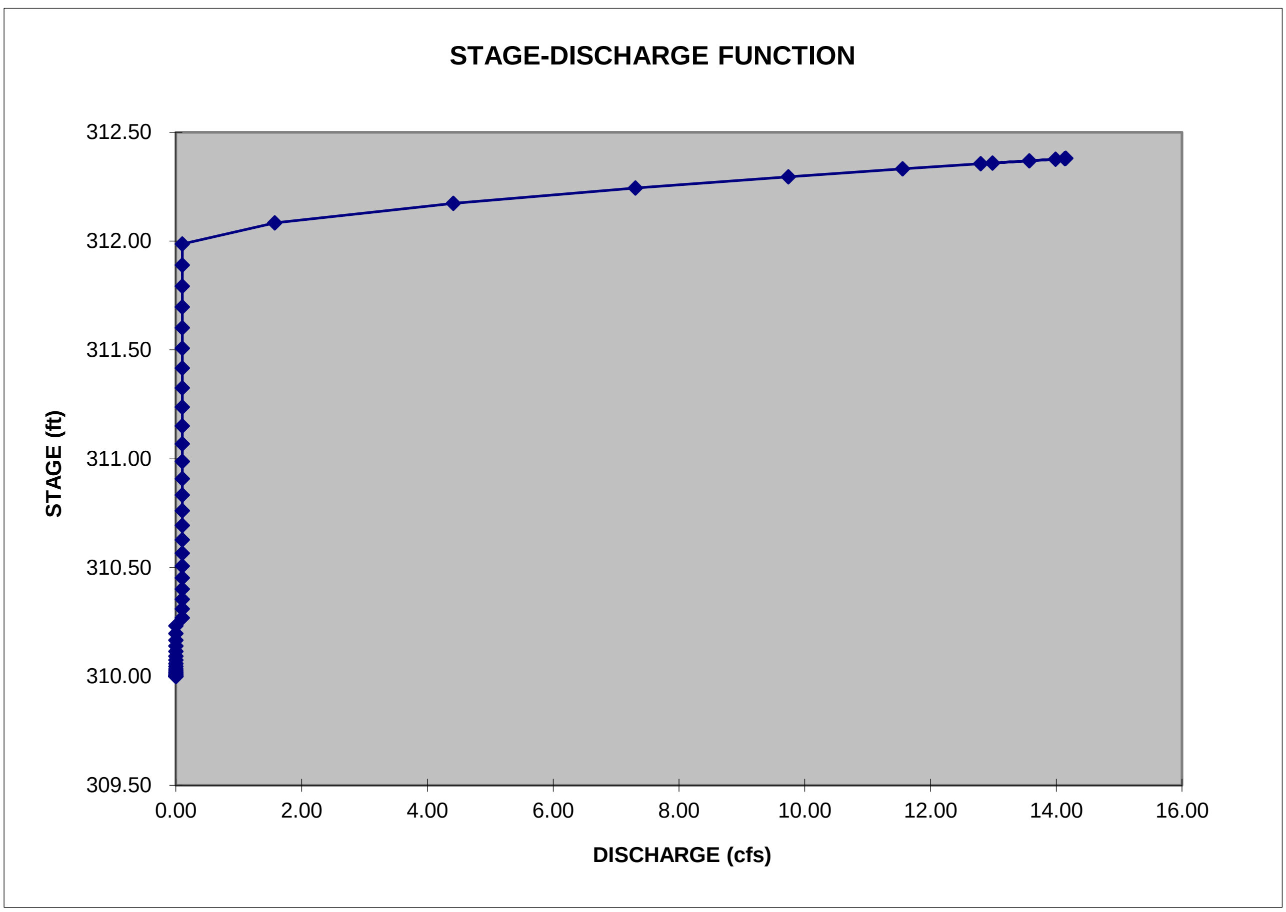
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	1.28	310.00	0.0	0.0	0.00		
3	0	6.41	310.00	0.0	0.0	0.00		
4	0	17.93	310.00	0.0	0.0	0.00		
5	1	38.33	310.00	0.0	0.0	0.00		
6	1	70.09	310.00	0.0	0.0	0.00		
7	1	115.60	310.01	0.0	0.0	0.00		
8	1	177.19	310.01	0.0	0.0	0.00		
9	2	257.09	310.02	0.0	0.0	0.00		
10	2	357.46	310.02	0.0	0.0	0.00		
11	2	480.32	310.03	0.0	0.0	0.00		
12	3	627.59	310.05	0.0	0.0	0.00		
13	3	801.06	310.06	0.0	0.0	0.00		
14	4	1002.37	310.07	0.0	0.0	0.00		
15	4	1233.02	310.09	0.0	0.0	0.00		
16	5	1494.36	310.12	0.0	0.0	0.00		
17	5	1787.55	310.14	0.0	0.0	0.00		
18	6	2113.63	310.17	0.0	0.0	0.00		
19	7	2473.41	310.20	0.0	0.0	0.00		
20	7	2867.55	310.23	0.0	0.0	0.00		
21	8	3296.54	310.27	0.1	0.0	0.11		
22	8	3754.35	310.31	0.1	0.0	0.11		
23	9	4247.38	310.35	0.1	0.0	0.11		
24	9	4775.56	310.40	0.1	0.0	0.11		
25	10	5338.62	310.45	0.1	0.0	0.11		
26	11	5936.10	310.51	0.1	0.0	0.11		
27	11	6567.35	310.57	0.1	0.0	0.11		
28	12	7231.56	310.63	0.1	0.0	0.11		
29	12	7927.73	310.69	0.1	0.0	0.11		
30	13	8654.71	310.76	0.1	0.0	0.11		
31	13	9411.16	310.83	0.1	0.0	0.11		
32	14	10195.60	310.91	0.1	0.0	0.11		
33	14	11006.39	310.99	0.1	0.0	0.11		
34	14	11841.77	311.07	0.1	0.0	0.11		
35	15	12699.82	311.15	0.1	0.0	0.11		
36	15	13578.53	311.24	0.1	0.0	0.11		
37	15	14475.77	311.33	0.1	0.0	0.11		
38	16	15389.29	311.42	0.1	0.0	0.11		
39	16	16316.78	311.51	0.1	0.0	0.11		
40	16	17255.85	311.60	0.1	0.0	0.11		
41	16	18204.05	311.70	0.1	0.0	0.11		
42	16	19158.86	311.79	0.1	0.0	0.11		
43	16	20117.76	311.89	0.1	0.0	0.11		
44	16	21078.18	311.99	0.1	0.0	0.11		
45	16	22037.56	312.08	1.6	1.5	0.11		
46	16	22905.28	312.17	4.4	4.3	0.11		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time	Inflow	Storage	Stage	Outflow	Weir	Skimmer		
T	I	S	Z	O	Flow	Flow		
min	cfs	cu-ft	ft	cfs	cfs	cfs		
47	16	23596.46	312.24	7.3	7.2	0.11		
48	16	24105.15	312.30	9.7	9.6	0.11		
49	15	24456.72	312.33	11.6	11.5	0.11		
50	15	24685.74	312.36	12.8	12.7	0.11		
51	15	24824.52	312.37	13.6	13.5	0.11		
52	14	24898.85	312.38	14.0	13.9	0.11		
53	14	24927.73	**312.38**	14.2	14.1	0.11		
54	11	24924.44	312.38	14.1	14.0	0.11		
55	10	24719.79	312.36	13.0	12.9	0.11		
56	10	24564.99	312.34	12.1	12.0	0.11		
57	10	24442.46	312.33	11.5	11.4	0.11		
58	10	24341.31	312.32	11.0	10.8	0.11		
59	9	24254.64	312.31	10.5	10.4	0.11		
60	9	24177.97	312.30	10.1	10.0	0.11		
61	9	24108.37	312.30	9.8	9.7	0.11		
62	8	24043.89	312.29	9.4	9.3	0.11		
63	8	23983.24	312.28	9.1	9.0	0.11		
64	8	23925.51	312.28	8.9	8.8	0.11		
65	8	23870.11	312.27	8.6	8.5	0.11		
66	7	23816.61	312.27	8.3	8.2	0.11		
67	7	23764.73	312.26	8.1	8.0	0.11		
68	7	23714.25	312.26	7.9	7.7	0.11		
69	7	23665.03	312.25	7.6	7.5	0.11		
70	7	23616.95	312.25	7.4	7.3	0.11		
71	6	23569.94	312.24	7.2	7.1	0.11		
72	6	23523.94	312.24	7.0	6.9	0.11		
73	6	23478.90	312.23	6.8	6.7	0.11		
74	6	23434.77	312.23	6.6	6.5	0.11		
75	6	23391.53	312.22	6.4	6.3	0.11		
76	6	23349.15	312.22	6.2	6.1	0.11		
77	5	23307.60	312.21	6.0	5.9	0.11		
78	5	23266.87	312.21	5.9	5.8	0.11		
79	5	23226.93	312.21	5.7	5.6	0.11		
80	5	23187.76	312.20	5.5	5.4	0.11		
81	5	23149.35	312.20	5.4	5.3	0.11		
82	5	23111.68	312.19	5.2	5.1	0.11		
83	4	23074.74	312.19	5.1	5.0	0.11		
84	4	23038.51	312.19	4.9	4.8	0.11		
85	4	23002.98	312.18	4.8	4.7	0.11		
86	4	22968.13	312.18	4.7	4.5	0.11		
87	4	22933.95	312.18	4.5	4.4	0.11		
88	4	22900.42	312.17	4.4	4.3	0.11		
89	4	22867.54	312.17	4.3	4.2	0.11		
90	4	22835.29	312.17	4.1	4.0	0.11		
91	4	22803.65	312.16	4.0	3.9	0.11		
92	3	22772.63	312.16	3.9	3.8	0.11		
93	3	22742.19	312.16	3.8	3.7	0.11		
94	3	22712.34	312.15	3.7	3.6	0.11		
95	3	22683.05	312.15	3.6	3.5	0.11		
96	3	22654.33	312.15	3.5	3.4	0.11		
97	3	22626.15	312.14	3.4	3.3	0.11		
98	3	22598.52	312.14	3.3	3.2	0.11		
99	3	22571.40	312.14	3.2	3.1	0.11		
100	3	22544.81	312.14	3.1	3.0	0.11		
101	3	22518.72	312.13	3.0	2.9	0.11		
102	3	22493.13	312.13	2.9	2.8	0.11		
103	2	22468.03	312.13	2.9	2.8	0.11		
104	2	22443.40	312.13	2.8	2.7	0.11		
105	2	22419.24	312.12	2.7	2.6	0.11		
106	2	22395.54	312.12	2.6	2.5	0.11		
107	2	22372.29	312.12	2.5	2.4	0.11		
108	2	22349.48	312.12	2.5	2.4	0.11		
109	2	22327.10	312.11	2.4	2.3	0.11		
110	2	22305.15	312.11	2.3	2.2	0.11		
111	2	22283.61	312.11	2.3	2.2	0.11		
112	2	22262.47	312.11	2.2	2.1	0.11		
113	2	22241.74	312.11	2.1	2.0	0.11		
114	2	22221.40	312.10	2.1	2.0	0.11		
115	2	22201.44	312.10	2.0	1.9	0.11		
116	2	22181.86	312.10	2.0	1.9	0.11		
117	2	22162.65	312.10	1.9	1.8	0.11		
118	2	22143.79	312.10	1.9	1.8	0.11		
119	2	22125.29	312.09	1.8	1.7	0.11		
120	1	22107.14	312.09	1.8	1.7	0.11		
121	1	22089.33	312.09	1.7	1.6	0.11		
122	1	22071.86	312.09	1.7	1.6	0.11		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	22054.71	312.09	1.6	1.5	0.11		
124	1	22037.88	312.08	1.6	1.5	0.11		
125	1	22021.36	312.08	1.5	1.4	0.11		
126	1	22005.16	312.08	1.5	1.4	0.11		
127	1	21989.25	312.08	1.4	1.3	0.11		
128	1	21973.64	312.08	1.4	1.3	0.11		
129	1	21958.32	312.08	1.4	1.3	0.11		
130	1	21943.29	312.07	1.3	1.2	0.11		
131	1	21928.53	312.07	1.3	1.2	0.11		
132	1	21914.05	312.07	1.3	1.2	0.11		
133	1	21899.83	312.07	1.2	1.1	0.11		
134	1	21885.88	312.07	1.2	1.1	0.11		
135	1	21872.19	312.07	1.2	1.1	0.11		
136	1	21858.74	312.07	1.1	1.0	0.11		
137	1	21845.55	312.06	1.1	1.0	0.11		
138	1	21832.59	312.06	1.1	1.0	0.11		
139	1	21819.88	312.06	1.0	0.9	0.11		
140	1	21807.39	312.06	1.0	0.9	0.11		
141	1	21795.14	312.06	1.0	0.9	0.11		
142	1	21783.11	312.06	1.0	0.8	0.11		
143	1	21771.29	312.06	0.9	0.8	0.11		
144	1	21759.69	312.06	0.9	0.8	0.11		
145	1	21748.31	312.05	0.9	0.8	0.11		
146	1	21737.12	312.05	0.9	0.7	0.11		
147	1	21726.14	312.05	0.8	0.7	0.11		
148	1	21715.36	312.05	0.8	0.7	0.11		
149	1	21704.77	312.05	0.8	0.7	0.11		
150	1	21694.37	312.05	0.8	0.7	0.11		
151	1	21684.16	312.05	0.7	0.6	0.11		

GRAPHED DATA FOR 10 YEAR STORM





ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS					
			Peak Stage =	312.43	ft
			Rise =	2.43	ft
Freeboard =	1.57	ft	Peak Outflow =	17.30	cfs

INPUT

Hydrograph Results:			Weir:			Top of Dam:	314.00	ft
Qp =	18.55	cfs	N =	1				
Tp =	43.1	min	L =	20	ft	Skimmer Orifice:		
dT =	1.0	min	Cw =	3.00		Number =	1.00	Ea
Stage-Storage Results:			Zcr =	312.00	ft	Diameter =	3.00	Inches
Ks =	11140					Head =	2.46	inches
b =	0.93							
Z_0 =	310.0	ft (inv)						
Initial Water Level:								
Z_i =	310.00	ft						

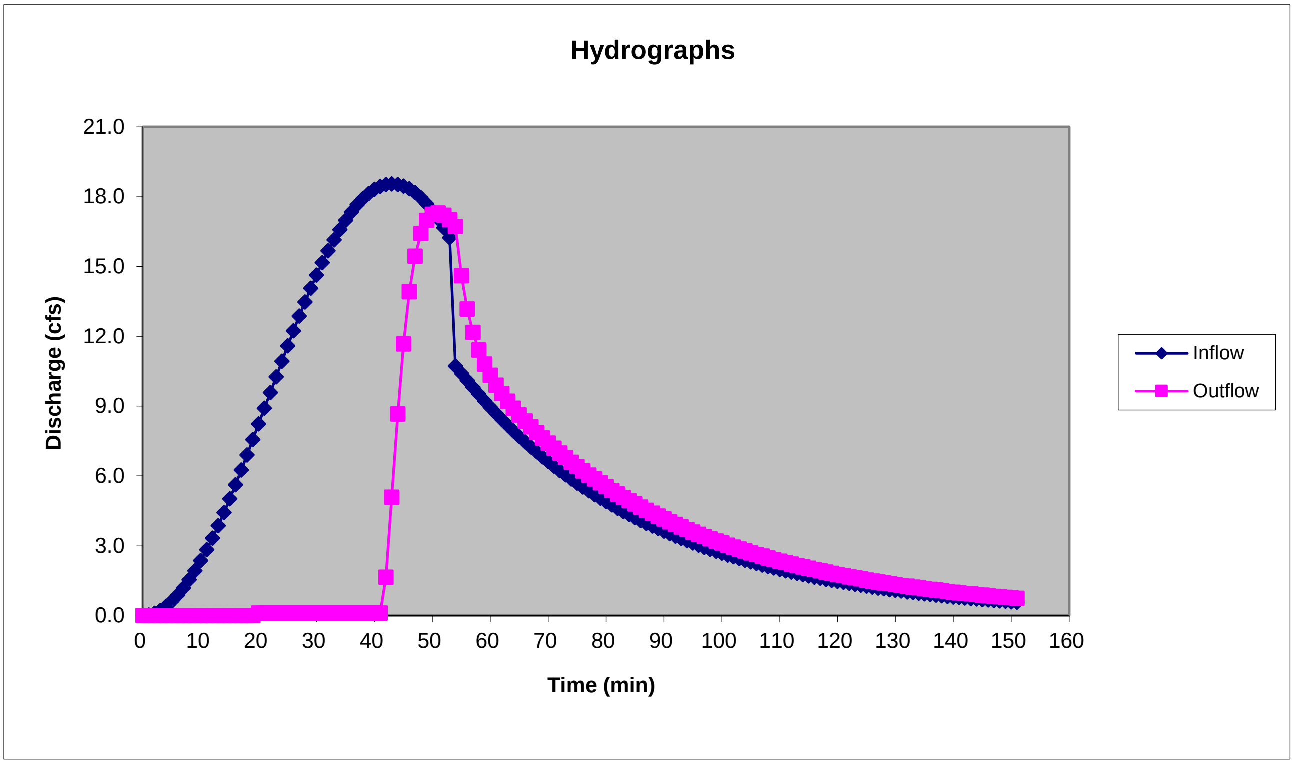
OUTPUT

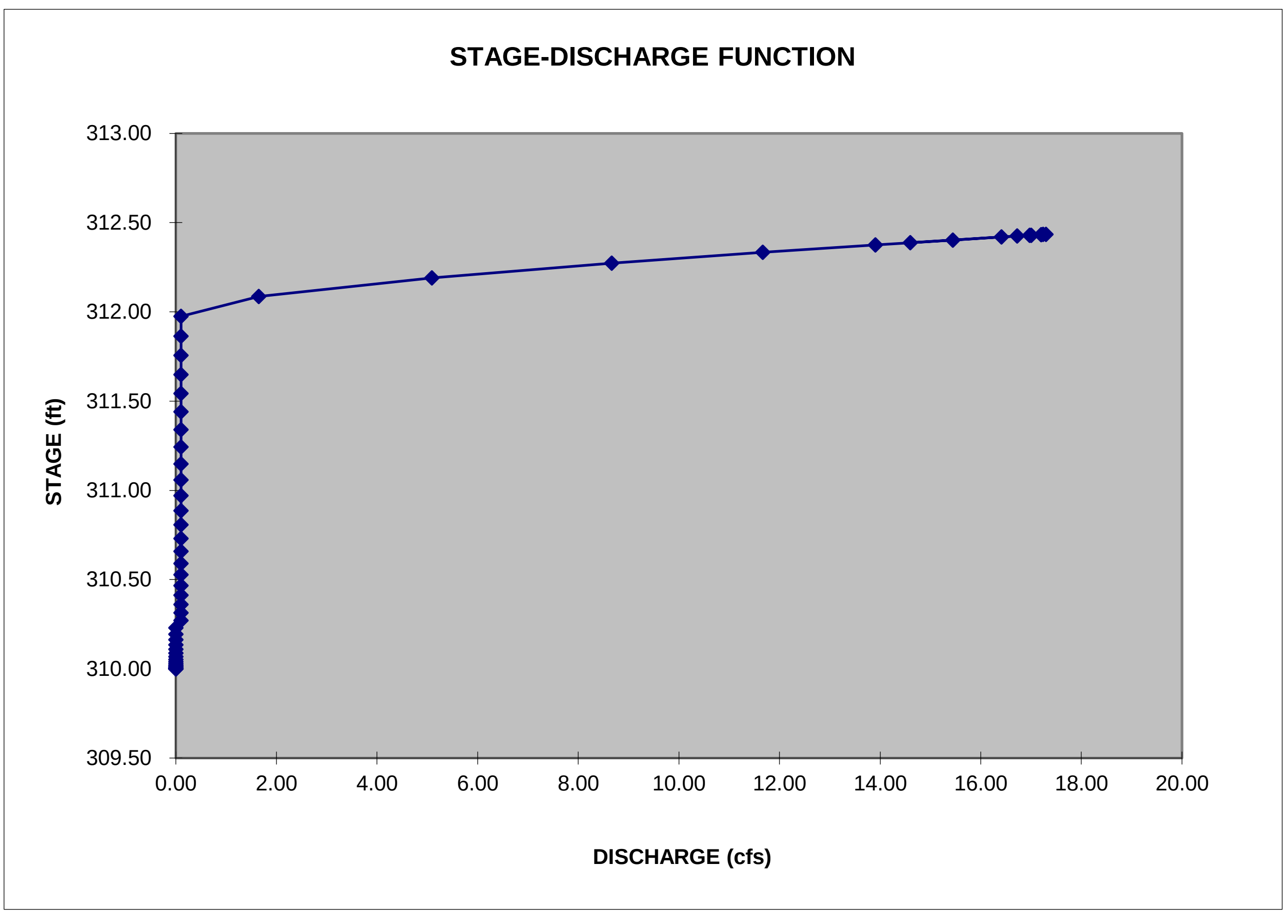
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	1.48	310.00	0.0	0.0	0.00		
3	0	7.38	310.00	0.0	0.0	0.00		
4	0	20.63	310.00	0.0	0.0	0.00		
5	1	44.12	310.00	0.0	0.0	0.00		
6	1	80.68	310.00	0.0	0.0	0.00		
7	1	133.06	310.01	0.0	0.0	0.00		
8	2	203.95	310.01	0.0	0.0	0.00		
9	2	295.92	310.02	0.0	0.0	0.00		
10	2	411.45	310.03	0.0	0.0	0.00		
11	3	552.86	310.04	0.0	0.0	0.00		
12	3	722.38	310.05	0.0	0.0	0.00		
13	4	922.05	310.07	0.0	0.0	0.00		
14	4	1153.76	310.09	0.0	0.0	0.00		
15	5	1419.25	310.11	0.0	0.0	0.00		
16	6	1720.06	310.13	0.0	0.0	0.00		
17	6	2057.54	310.16	0.0	0.0	0.00		
18	7	2432.86	310.19	0.0	0.0	0.00		
19	8	2846.98	310.23	0.0	0.0	0.00		
20	8	3300.66	310.27	0.1	0.0	0.11		
21	9	3788.12	310.31	0.1	0.0	0.11		
22	10	4316.03	310.36	0.1	0.0	0.11		
23	10	4884.48	310.41	0.1	0.0	0.11		
24	11	5493.39	310.47	0.1	0.0	0.11		
25	12	6142.44	310.53	0.1	0.0	0.11		
26	12	6831.11	310.59	0.1	0.0	0.11		
27	13	7558.66	310.66	0.1	0.0	0.11		
28	13	8324.14	310.73	0.1	0.0	0.11		
29	14	9126.41	310.81	0.1	0.0	0.11		
30	15	9964.14	310.89	0.1	0.0	0.11		
31	15	10835.79	310.97	0.1	0.0	0.11		
32	16	11739.66	311.06	0.1	0.0	0.11		
33	16	12673.87	311.15	0.1	0.0	0.11		
34	17	13636.37	311.24	0.1	0.0	0.11		
35	17	14624.97	311.34	0.1	0.0	0.11		
36	17	15637.35	311.44	0.1	0.0	0.11		
37	18	16671.05	311.54	0.1	0.0	0.11		
38	18	17723.50	311.65	0.1	0.0	0.11		
39	18	18792.03	311.76	0.1	0.0	0.11		
40	18	19873.89	311.86	0.1	0.0	0.11		
41	18	20966.24	311.98	0.1	0.0	0.11		
42	19	22066.22	312.09	1.6	1.5	0.11		
43	19	23078.24	312.19	5.1	5.0	0.11		
44	19	23885.58	312.27	8.7	8.6	0.11		
45	18	24477.32	312.33	11.7	11.6	0.11		
46	18	24884.54	312.38	13.9	13.8	0.11		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	18	25150.22	312.40	15.4	15.3	0.11		
48	18	25313.94	312.42	16.4	16.3	0.11		
49	18	25406.53	312.43	17.0	16.9	0.11		
50	17	25450.03	312.43	17.2	17.1	0.11		
51	17	25459.39	**312.43**	17.3	17.2	0.11		
52	17	25444.47	312.43	17.2	17.1	0.11		
53	16	25411.69	312.43	17.0	16.9	0.11		
54	11	25365.19	312.42	16.7	16.6	0.11		
55	10	25005.32	312.39	14.6	14.5	0.11		
56	10	24753.74	312.36	13.2	13.1	0.11		
57	10	24569.08	312.34	12.2	12.1	0.11		
58	10	24427.22	312.33	11.4	11.3	0.11		
59	9	24313.45	312.32	10.8	10.7	0.11		
60	9	24218.53	312.31	10.3	10.2	0.11		
61	9	24136.53	312.30	9.9	9.8	0.11		
62	8	24063.55	312.29	9.5	9.4	0.11		
63	8	23997.03	312.28	9.2	9.1	0.11		
64	8	23935.24	312.28	8.9	8.8	0.11		
65	8	23877.00	312.27	8.6	8.5	0.11		
66	7	23821.52	312.27	8.4	8.3	0.11		
67	7	23768.23	312.26	8.1	8.0	0.11		
68	7	23716.76	312.26	7.9	7.8	0.11		
69	7	23666.84	312.25	7.6	7.5	0.11		
70	7	23618.26	312.25	7.4	7.3	0.11		
71	6	23570.90	312.24	7.2	7.1	0.11		
72	6	23524.64	312.24	7.0	6.9	0.11		
73	6	23479.41	312.23	6.8	6.7	0.11		
74	6	23435.15	312.23	6.6	6.5	0.11		
75	6	23391.81	312.22	6.4	6.3	0.11		
76	6	23349.35	312.22	6.2	6.1	0.11		
77	5	23307.75	312.21	6.0	5.9	0.11		
78	5	23266.98	312.21	5.9	5.8	0.11		
79	5	23227.01	312.21	5.7	5.6	0.11		
80	5	23187.82	312.20	5.5	5.4	0.11		
81	5	23149.40	312.20	5.4	5.3	0.11		
82	5	23111.72	312.19	5.2	5.1	0.11		
83	4	23074.77	312.19	5.1	5.0	0.11		
84	4	23038.53	312.19	4.9	4.8	0.11		
85	4	23003.00	312.18	4.8	4.7	0.11		
86	4	22968.14	312.18	4.7	4.5	0.11		
87	4	22933.96	312.18	4.5	4.4	0.11		
88	4	22900.43	312.17	4.4	4.3	0.11		
89	4	22867.55	312.17	4.3	4.2	0.11		
90	4	22835.29	312.17	4.1	4.0	0.11		
91	4	22803.66	312.16	4.0	3.9	0.11		
92	3	22772.63	312.16	3.9	3.8	0.11		
93	3	22742.19	312.16	3.8	3.7	0.11		
94	3	22712.34	312.15	3.7	3.6	0.11		
95	3	22683.05	312.15	3.6	3.5	0.11		
96	3	22654.33	312.15	3.5	3.4	0.11		
97	3	22626.15	312.14	3.4	3.3	0.11		
98	3	22598.52	312.14	3.3	3.2	0.11		
99	3	22571.41	312.14	3.2	3.1	0.11		
100	3	22544.81	312.14	3.1	3.0	0.11		
101	3	22518.72	312.13	3.0	2.9	0.11		
102	3	22493.13	312.13	2.9	2.8	0.11		
103	2	22468.03	312.13	2.9	2.8	0.11		
104	2	22443.40	312.13	2.8	2.7	0.11		
105	2	22419.24	312.12	2.7	2.6	0.11		
106	2	22395.54	312.12	2.6	2.5	0.11		
107	2	22372.29	312.12	2.5	2.4	0.11		
108	2	22349.48	312.12	2.5	2.4	0.11		
109	2	22327.10	312.11	2.4	2.3	0.11		
110	2	22305.15	312.11	2.3	2.2	0.11		
111	2	22283.61	312.11	2.3	2.2	0.11		
112	2	22262.47	312.11	2.2	2.1	0.11		
113	2	22241.74	312.11	2.1	2.0	0.11		
114	2	22221.40	312.10	2.1	2.0	0.11		
115	2	22201.44	312.10	2.0	1.9	0.11		
116	2	22181.86	312.10	2.0	1.9	0.11		
117	2	22162.65	312.10	1.9	1.8	0.11		
118	2	22143.79	312.10	1.9	1.8	0.11		
119	2	22125.29	312.09	1.8	1.7	0.11		
120	1	22107.14	312.09	1.8	1.7	0.11		
121	1	22089.33	312.09	1.7	1.6	0.11		
122	1	22071.86	312.09	1.7	1.6	0.11		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	22054.71	312.09	1.6	1.5	0.11		
124	1	22037.88	312.08	1.6	1.5	0.11		
125	1	22021.36	312.08	1.5	1.4	0.11		
126	1	22005.16	312.08	1.5	1.4	0.11		
127	1	21989.25	312.08	1.4	1.3	0.11		
128	1	21973.64	312.08	1.4	1.3	0.11		
129	1	21958.32	312.08	1.4	1.3	0.11		
130	1	21943.29	312.07	1.3	1.2	0.11		
131	1	21928.53	312.07	1.3	1.2	0.11		
132	1	21914.05	312.07	1.3	1.2	0.11		
133	1	21899.83	312.07	1.2	1.1	0.11		
134	1	21885.88	312.07	1.2	1.1	0.11		
135	1	21872.19	312.07	1.2	1.1	0.11		
136	1	21858.74	312.07	1.1	1.0	0.11		
137	1	21845.55	312.06	1.1	1.0	0.11		
138	1	21832.59	312.06	1.1	1.0	0.11		
139	1	21819.88	312.06	1.0	0.9	0.11		
140	1	21807.39	312.06	1.0	0.9	0.11		
141	1	21795.14	312.06	1.0	0.9	0.11		
142	1	21783.11	312.06	1.0	0.8	0.11		
143	1	21771.29	312.06	0.9	0.8	0.11		
144	1	21759.69	312.06	0.9	0.8	0.11		
145	1	21748.31	312.05	0.9	0.8	0.11		
146	1	21737.12	312.05	0.9	0.7	0.11		
147	1	21726.14	312.05	0.8	0.7	0.11		
148	1	21715.36	312.05	0.8	0.7	0.11		
149	1	21704.77	312.05	0.8	0.7	0.11		
150	1	21694.37	312.05	0.8	0.7	0.11		
151	1	21684.16	312.05	0.7	0.6	0.11		

GRAPHED DATA FOR 25 YEAR STORM





SCM-J
SKIMMER BASIN WITH RISER DESIGN

CHAMBLEE LAKE
ZEBULON
DRH-22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm
Routing for the 25-year storm
Graphed Data for the 25-year storm

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH-22004	Calculated By:	BJK
Sediment Trap ID	SCM-J		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	3.11 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	3.11 ac.	0.25
Undisturbed grassy area	0.00 ac.	0.00 ac.	0.35
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	3.11 ac.	3.11 ac.	
Composite Rational 'c'	0.45	0.25	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	756	feet
Height of watershed =	6	feet
Calculated t(c) =	8.3	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	8.3	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for Raleigh, NC

Return Period	g	h	Intensity
2	132	18	5.02 in/hr
10	195	22	6.44 in/hr
25	232	23	7.42 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	5.02 in/hr	7.0 cfs	3.91 cfs
10-year storm	6.44 in/hr	9.0 cfs	5.01 cfs
25-year storm	7.42 in/hr	10.4 cfs	5.77 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	3,600	cubic feet per disturbed acre
Required sediment trap surface area	435	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	161
Bottom width =	86
Sediment depth =	4.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Permanent Riser =	4.0
Side slopes =	3.0 H:1V
Spillway length =	16
Height of berm =	6
Top of trap length =	197
Top of trap width =	122
Bottom elevation =	313

Sediment Trap Data

	Required	Provided	
Sediment storage volume =	11196 cu. ft.	67980 cu. ft.	
Sediment surface area =	3920 sq. ft.	20350 sq. ft.	
Sediment storage depth =	3.5 ft. (max.)	4	Decrease storage depth
Trap bottom length to width ratio =	2.0L:1W (min)	1.9L:1W	Ratio too low
Spillway length =	10.0 ft. (min)	16	
10-Year flow depth over spillway =	0.50 ft. (max)	-1.81 ft	
Freeboard at 10-Year discharge =	1.00 ft. (min)	3.81 ft	

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU 1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Required for Sediment Basin = 11,196 cubic feet

24 HOURS	Best Option =	1 - 4 inch Skimmers with a 3 inch orifice	
2 DAYS	Best Option =	1 - 2.5 inch Skimmers with a 2.4 inch orifice	
3 DAYS	Best Option =	1 - 2.5 inch Skimmers with a 1.9 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.8 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

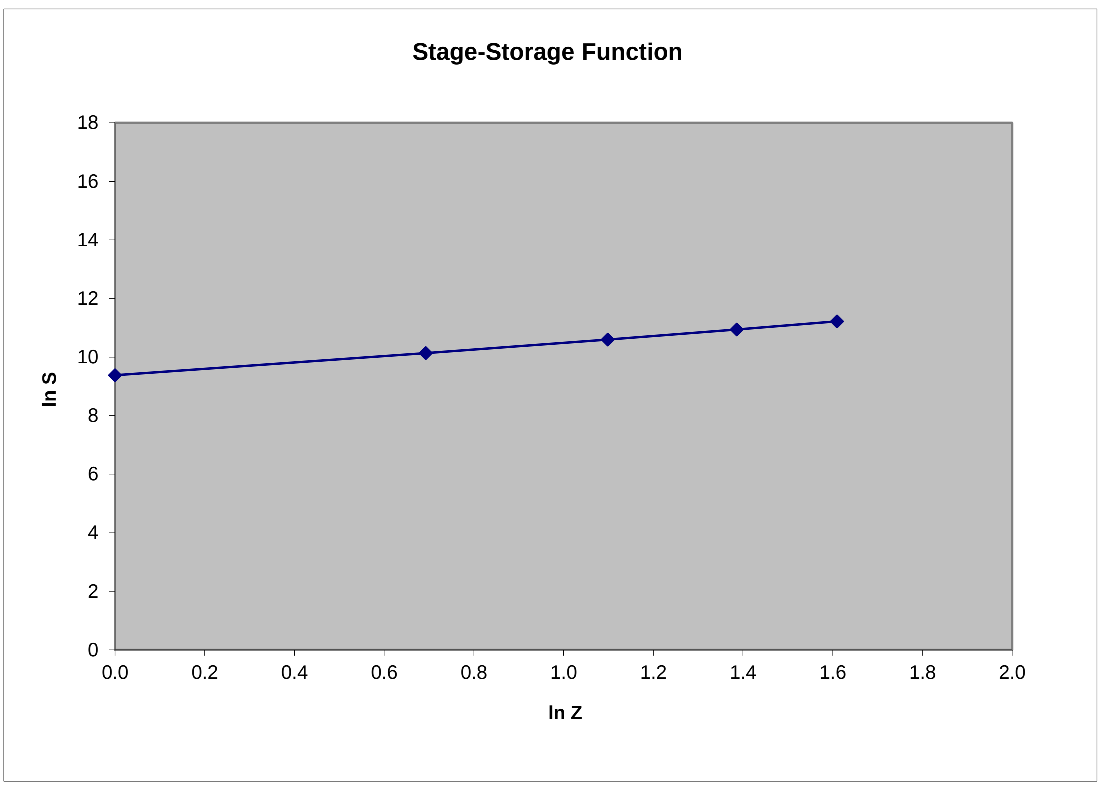
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
313	11119		0	0			
314	12557	11838	11838	1	9.3791	0.0000	1.02
315	14061	13309	25147	2	10.1325	0.6931	1.97
316	15632	14846.5	39993.5	3	10.5965	1.0986	2.95
317	17269	16450.5	56444	4	10.9410	1.3863	3.99
318	18972	18120.5	74564.5	5	11.2194	1.6094	5.10

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.14 and **K_s =** 11636



HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	3.11	ac	**Use Kirpich Equation:**	
Disturbed Area =	3.11	ac	**Tc =**	8.3 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	756	ft	**i_1 =**	5.02 in/hr
Vertical Fall =	6	ft	**i_{10} =**	6.44 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	7.42 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	7.0 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	9.0 cfs
h =	23		**Q_{25} =**	10.4 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	33.6	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	43.9	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	46.9	**minutes**

MCADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	314.55 ft
		Rise =	1.55 ft
Freeboard =	4.45 ft	Peak Outflow =	0.06 cfs

INPUT

Hydrograph Results:

Qp =	7.03	cfs
Tp =	33.6	min
dT =	1.0	min

Stage-Storage Results:

Ks =	11636	
b =	1.14	
Z_0 =	313.0	ft (inv)

Initial Water Level:

Z_i =	313.00	ft

Weir:

N =	1	
L =	16	ft
Cw =	3.00	
Zcr =	317.00	ft

Top of Dam: 319.00 ft

Skimmer Orifice:

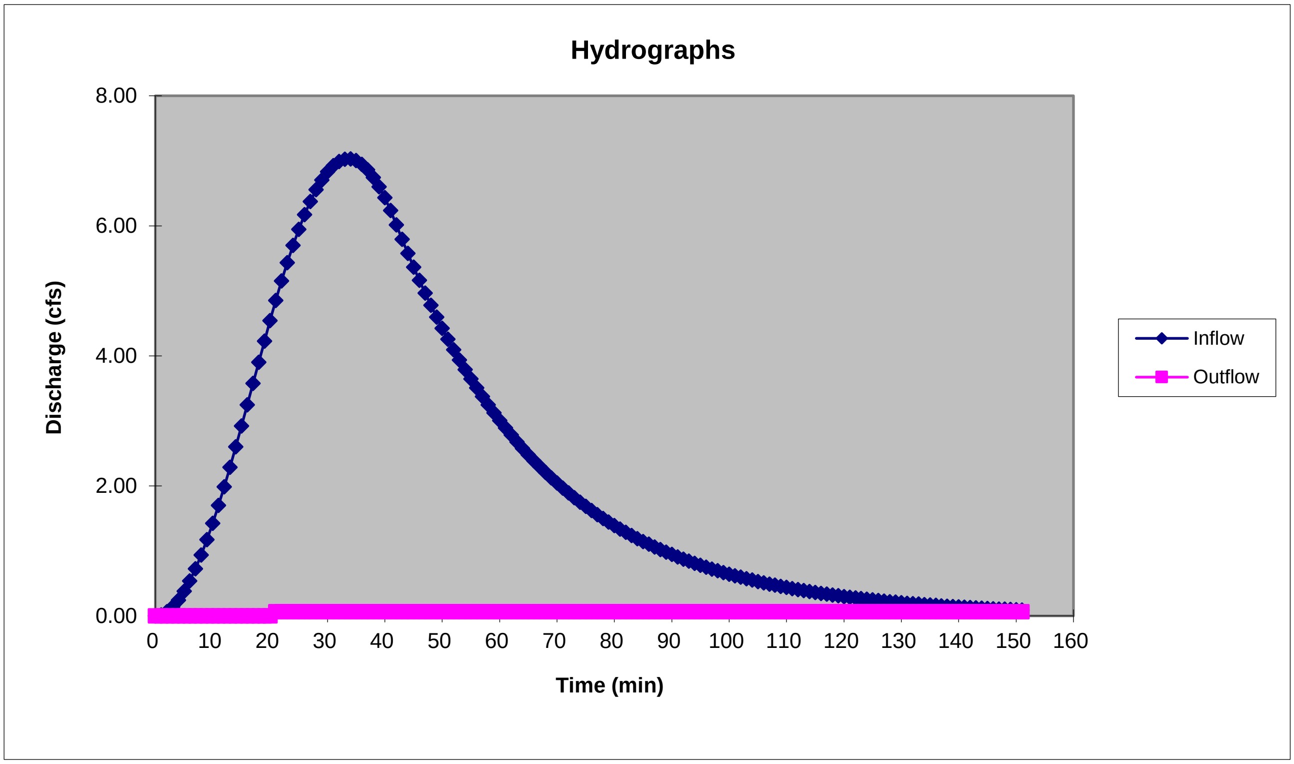
Number =	1.00	Ea
Diameter =	2.50	Inches
Head =	1.93	inches

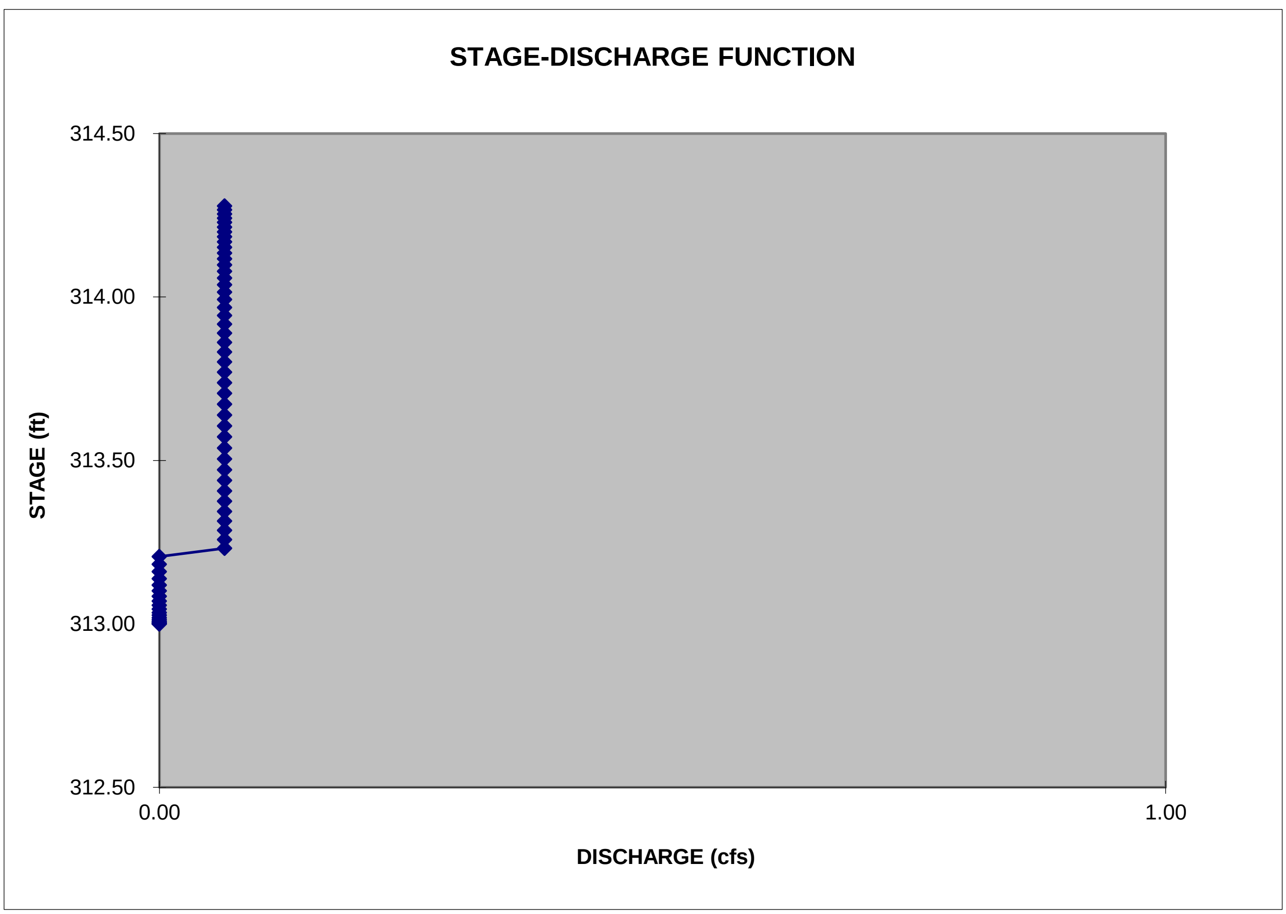
OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	313.00	0.0	0.0	0.0		
1	0	0.00	313.00	0.0	0.0	0.00		
2	0	0.92	313.00	0.0	0.0	0.00		
3	0	4.59	313.00	0.0	0.0	0.00		
4	0	12.81	313.00	0.0	0.0	0.00		
5	0	27.35	313.00	0.0	0.0	0.00		
6	1	49.91	313.01	0.0	0.0	0.00		
7	1	82.15	313.01	0.0	0.0	0.00		
8	1	125.62	313.02	0.0	0.0	0.00		
9	1	181.77	313.03	0.0	0.0	0.00		
10	1	251.96	313.03	0.0	0.0	0.00		
11	2	337.41	313.04	0.0	0.0	0.00		
12	2	439.21	313.06	0.0	0.0	0.00		
13	2	558.31	313.07	0.0	0.0	0.00		
14	3	695.52	313.08	0.0	0.0	0.00		
15	3	851.47	313.10	0.0	0.0	0.00		
16	3	1026.65	313.12	0.0	0.0	0.00		
17	4	1221.36	313.14	0.0	0.0	0.00		
18	4	1435.75	313.16	0.0	0.0	0.00		
19	4	1669.78	313.18	0.0	0.0	0.00		
20	5	1923.26	313.21	0.0	0.0	0.00		
21	5	2195.81	313.23	0.1	0.0	0.06		
22	5	2483.01	313.26	0.1	0.0	0.06		
23	5	2788.04	313.29	0.1	0.0	0.06		
24	6	3110.07	313.31	0.1	0.0	0.06		
25	6	3448.07	313.34	0.1	0.0	0.06		
26	6	3800.91	313.37	0.1	0.0	0.06		
27	6	4167.33	313.41	0.1	0.0	0.06		
28	7	4545.93	313.44	0.1	0.0	0.06		
29	7	4935.21	313.47	0.1	0.0	0.06		
30	7	5333.59	313.50	0.1	0.0	0.06		
31	7	5739.41	313.54	0.1	0.0	0.06		
32	7	6150.93	313.57	0.1	0.0	0.06		
33	7	6566.36	313.61	0.1	0.0	0.06		
34	7	6983.90	313.64	0.1	0.0	0.06		
35	7	7401.70	313.67	0.1	0.0	0.06		
36	7	7817.94	313.71	0.1	0.0	0.06		
37	7	8230.79	313.74	0.1	0.0	0.06		
38	7	8638.45	313.77	0.1	0.0	0.06		
39	7	9039.19	313.80	0.1	0.0	0.06		
40	6	9431.30	313.83	0.1	0.0	0.06		

McADAMS

GRAPHED DATA FOR 2 YEAR STORM





McADAMS

ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	315.19 ft
		Rise =	2.19 ft
Freeboard =	3.81 ft	Peak Outflow =	0.06 cfs

INPUT

Hydrograph Results:

Qp =	9.01	cfs
Tp =	43.9	min
dT =	1.0	min

Stage-Storage Results:

Ks =	11636	
b =	1.14	
Z_0 =	313.0	ft (inv)

Initial Water Level:

Z_i =	313.00	ft

Weir:

N =	1	
L =	16	ft
Cw =	3.00	
Zcr =	317.00	ft

Top of Dam: 319.00 ft

Skimmer Orifice:

Number =	1	Ea
Diameter =	2.50	Inches
Head =	1.93	inches

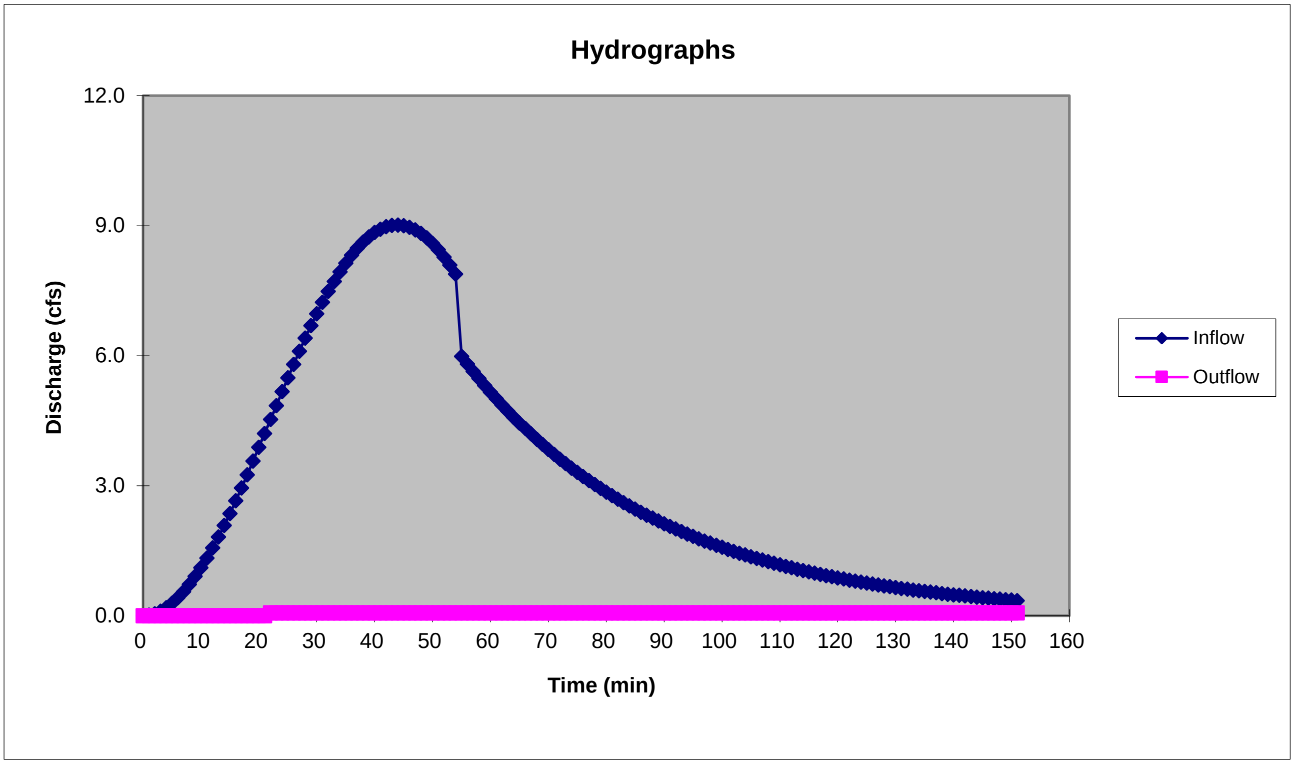
OUTPUT

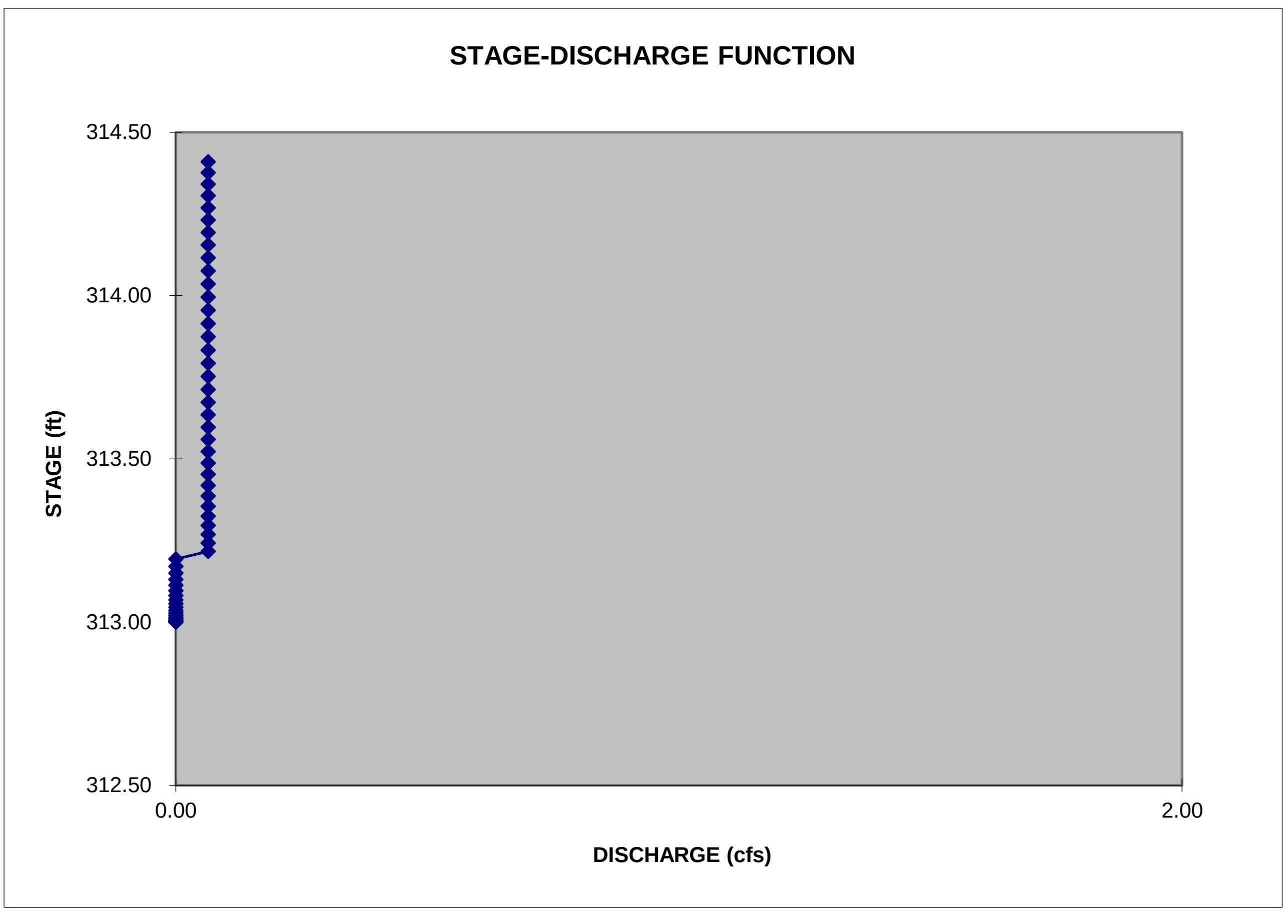
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	313.00	0.0	0.0	0.0		
1	0	0.00	313.00	0.0	0.0	0.00		
2	0	0.69	313.00	0.0	0.0	0.00		
3	0	3.46	313.00	0.0	0.0	0.00		
4	0	9.67	313.00	0.0	0.0	0.00		
5	0	20.69	313.00	0.0	0.0	0.00		
6	0	37.83	313.01	0.0	0.0	0.00		
7	1	62.40	313.01	0.0	0.0	0.00		
8	1	95.66	313.01	0.0	0.0	0.00		
9	1	138.81	313.02	0.0	0.0	0.00		
10	1	193.04	313.03	0.0	0.0	0.00		
11	1	259.44	313.04	0.0	0.0	0.00		
12	2	339.05	313.05	0.0	0.0	0.00		
13	2	432.87	313.06	0.0	0.0	0.00		
14	2	541.78	313.07	0.0	0.0	0.00		
15	2	666.63	313.08	0.0	0.0	0.00		
16	3	808.15	313.10	0.0	0.0	0.00		
17	3	967.00	313.11	0.0	0.0	0.00		
18	3	1143.76	313.13	0.0	0.0	0.00		
19	4	1338.91	313.15	0.0	0.0	0.00		
20	4	1552.83	313.17	0.0	0.0	0.00		
21	4	1785.82	313.19	0.0	0.0	0.00		
22	5	2038.05	313.22	0.1	0.0	0.06		
23	5	2305.75	313.24	0.1	0.0	0.06		
24	5	2592.78	313.27	0.1	0.0	0.06		
25	5	2899.06	313.30	0.1	0.0	0.06		
26	6	3224.36	313.32	0.1	0.0	0.06		
27	6	3568.39	313.35	0.1	0.0	0.06		
28	6	3930.76	313.39	0.1	0.0	0.06		
29	7	4310.97	313.42	0.1	0.0	0.06		
30	7	4708.44	313.45	0.1	0.0	0.06		
31	7	5122.49	313.49	0.1	0.0	0.06		
32	7	5552.38	313.52	0.1	0.0	0.06		
33	8	5997.27	313.56	0.1	0.0	0.06		
34	8	6456.23	313.60	0.1	0.0	0.06		
35	8	6928.29	313.63	0.1	0.0	0.06		
36	8	7412.40	313.67	0.1	0.0	0.06		
37	8	7907.43	313.71	0.1	0.0	0.06		
38	9	8412.21	313.75	0.1	0.0	0.06		
39	9	8925.53	313.79	0.1	0.0	0.06		
40	9	9446.13	313.83	0.1	0.0	0.06		
41	9	9972.69	313.87	0.1	0.0	0.06		
42	9	10503.88	313.91	0.1	0.0	0.06		
43	9	11038.36	313.95	0.1	0.0	0.06		
44	9	11574.74	314.00	0.1	0.0	0.06		
45	9	12111.64	314.04	0.1	0.0	0.06		
46	9	12647.69	314.08	0.1	0.0	0.06		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	9	13181.49	314.12	0.1	0.0	0.06		
48	9	13711.68	314.15	0.1	0.0	0.06		
49	9	14236.90	314.19	0.1	0.0	0.06		
50	9	14755.84	314.23	0.1	0.0	0.06		
51	8	15267.19	314.27	0.1	0.0	0.06		
52	8	15769.71	314.31	0.1	0.0	0.06		
53	8	16262.18	314.34	0.1	0.0	0.06		
54	8	16743.44	314.38	0.1	0.0	0.06		
55	6	17212.40	314.41	0.1	0.0	0.06		
56	6	17567.37	314.44	0.1	0.0	0.06		
57	6	17911.85	314.46	0.1	0.0	0.06		
58	5	18246.17	314.48	0.1	0.0	0.06		
59	5	18570.61	314.51	0.1	0.0	0.06		
60	5	18885.47	314.53	0.1	0.0	0.06		
61	5	19191.03	314.55	0.1	0.0	0.06		
62	5	19487.55	314.57	0.1	0.0	0.06		
63	5	19775.30	314.59	0.1	0.0	0.06		
64	5	20054.53	314.61	0.1	0.0	0.06		
65	4	20325.50	314.63	0.1	0.0	0.06		
66	4	20588.45	314.65	0.1	0.0	0.06		
67	4	20843.61	314.67	0.1	0.0	0.06		
68	4	21091.20	314.68	0.1	0.0	0.06		
69	4	21331.46	314.70	0.1	0.0	0.06		
70	4	21564.58	314.72	0.1	0.0	0.06		
71	4	21790.79	314.73	0.1	0.0	0.06		
72	4	22010.28	314.75	0.1	0.0	0.06		
73	4	22223.25	314.76	0.1	0.0	0.06		
74	3	22429.89	314.78	0.1	0.0	0.06		
75	3	22630.38	314.79	0.1	0.0	0.06		
76	3	22824.91	314.81	0.1	0.0	0.06		
77	3	23013.64	314.82	0.1	0.0	0.06		
78	3	23196.75	314.83	0.1	0.0	0.06		
79	3	23374.40	314.84	0.1	0.0	0.06		
80	3	23546.75	314.86	0.1	0.0	0.06		
81	3	23713.96	314.87	0.1	0.0	0.06		
82	3	23876.17	314.88	0.1	0.0	0.06		
83	3	24033.53	314.89	0.1	0.0	0.06		
84	3	24186.19	314.90	0.1	0.0	0.06		
85	2	24334.28	314.91	0.1	0.0	0.06		
86	2	24477.92	314.92	0.1	0.0	0.06		
87	2	24617.27	314.93	0.1	0.0	0.06		
88	2	24752.43	314.94	0.1	0.0	0.06		
89	2	24883.53	314.95	0.1	0.0	0.06		
90	2	25010.69	314.96	0.1	0.0	0.06		
91	2	25134.02	314.96	0.1	0.0	0.06		
92	2	25253.65	314.97	0.1	0.0	0.06		
93	2	25369.66	314.98	0.1	0.0	0.06		
94	2	25482.18	314.99	0.1	0.0	0.06		
95	2	25591.29	315.00	0.1	0.0	0.06		
96	2	25697.11	315.00	0.1	0.0	0.06		
97	2	25799.73	315.01	0.1	0.0	0.06		
98	2	25899.23	315.02	0.1	0.0	0.06		
99	2	25995.72	315.02	0.1	0.0	0.06		
100	2	26089.28	315.03	0.1	0.0	0.06		
101	2	26179.99	315.04	0.1	0.0	0.06		
102	1	26267.94	315.04	0.1	0.0	0.06		
103	1	26353.21	315.05	0.1	0.0	0.06		
104	1	26435.88	315.05	0.1	0.0	0.06		
105	1	26516.02	315.06	0.1	0.0	0.06		
106	1	26593.70	315.06	0.1	0.0	0.06		
107	1	26669.01	315.07	0.1	0.0	0.06		
108	1	26742.00	315.07	0.1	0.0	0.06		
109	1	26812.75	315.08	0.1	0.0	0.06		
110	1	26881.32	315.08	0.1	0.0	0.06		
111	1	26947.78	315.09	0.1	0.0	0.06		
112	1	27012.18	315.09	0.1	0.0	0.06		
113	1	27074.59	315.10	0.1	0.0	0.06		
114	1	27135.06	315.10	0.1	0.0	0.06		
115	1	27193.66	315.11	0.1	0.0	0.06		
116	1	27250.43	315.11	0.1	0.0	0.06		
117	1	27305.43	315.11	0.1	0.0	0.06		
118	1	27358.71	315.12	0.1	0.0	0.06		
119	1	27410.32	315.12	0.1	0.0	0.06		
120	1	27460.31	315.12	0.1	0.0	0.06		
121	1	27508.73	315.13	0.1	0.0	0.06		
122	1	27555.62	315.13	0.1	0.0	0.06		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	27601.03	315.13	0.1	0.0	0.06		
124	1	27645.00	315.14	0.1	0.0	0.06		
125	1	27687.57	315.14	0.1	0.0	0.06		
126	1	27728.78	315.14	0.1	0.0	0.06		
127	1	27768.68	315.14	0.1	0.0	0.06		
128	1	27807.31	315.15	0.1	0.0	0.06		
129	1	27844.69	315.15	0.1	0.0	0.06		
130	1	27880.86	315.15	0.1	0.0	0.06		
131	1	27915.87	315.15	0.1	0.0	0.06		
132	1	27949.74	315.16	0.1	0.0	0.06		
133	1	27982.51	315.16	0.1	0.0	0.06		
134	1	28014.20	315.16	0.1	0.0	0.06		
135	1	28044.86	315.16	0.1	0.0	0.06		
136	1	28074.51	315.16	0.1	0.0	0.06		
137	1	28103.18	315.17	0.1	0.0	0.06		
138	1	28130.91	315.17	0.1	0.0	0.06		
139	0	28157.70	315.17	0.1	0.0	0.06		
140	0	28183.61	315.17	0.1	0.0	0.06		
141	0	28208.64	315.17	0.1	0.0	0.06		
142	0	28232.83	315.18	0.1	0.0	0.06		
143	0	28256.20	315.18	0.1	0.0	0.06		
144	0	28278.77	315.18	0.1	0.0	0.06		
145	0	28300.57	315.18	0.1	0.0	0.06		
146	0	28321.62	315.18	0.1	0.0	0.06		
147	0	28341.94	315.18	0.1	0.0	0.06		
148	0	28361.56	315.18	0.1	0.0	0.06		
149	0	28380.49	315.19	0.1	0.0	0.06		
150	0	28398.75	315.19	0.1	0.0	0.06		
151	0	28416.37	**315.19**	0.1	0.0	0.06		

GRAPHED DATA FOR 10 YEAR STORM





McADAMS

ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	315.36 ft
		Rise =	2.36 ft
Freeboard =	3.64 ft	Peak Outflow =	0.06 cfs

INPUT

Hydrograph Results:

Qp = 10.38 cfs
Tp = 43.9 min
dT = 1.0 min

Stage-Storage Results:

Ks = 11636
b = 1.14
Z_0 = 313.0 ft (inv)

Initial Water Level:

Z_i = 313.00 ft

Weir:

N = 1
L = 16 ft
Cw = 3.00
Zcr = 317.00 ft

Top of Dam: 319.00 ft

Skimmer Orifice:

Number = 1.00 Ea
Diameter = 2.50 Inches
Head = 1.93 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	313.00	0.0	0.0	0.0		
1	0	0.00	313.00	0.0	0.0	0.00		
2	0	0.80	313.00	0.0	0.0	0.00		
3	0	3.99	313.00	0.0	0.0	0.00		
4	0	11.14	313.00	0.0	0.0	0.00		
5	0	23.83	313.00	0.0	0.0	0.00		
6	0	43.57	313.01	0.0	0.0	0.00		
7	1	71.87	313.01	0.0	0.0	0.00		
8	1	110.17	313.02	0.0	0.0	0.00		
9	1	159.87	313.02	0.0	0.0	0.00		
10	1	222.32	313.03	0.0	0.0	0.00		
11	2	298.79	313.04	0.0	0.0	0.00		
12	2	390.49	313.05	0.0	0.0	0.00		
13	2	498.54	313.06	0.0	0.0	0.00		
14	2	623.97	313.08	0.0	0.0	0.00		
15	3	767.76	313.09	0.0	0.0	0.00		
16	3	930.75	313.11	0.0	0.0	0.00		
17	3	1113.70	313.13	0.0	0.0	0.00		
18	4	1317.28	313.15	0.0	0.0	0.00		
19	4	1542.03	313.17	0.0	0.0	0.00		
20	4	1788.41	313.19	0.0	0.0	0.00		
21	5	2056.73	313.22	0.1	0.0	0.06		
22	5	2343.35	313.25	0.1	0.0	0.06		
23	6	2652.24	313.27	0.1	0.0	0.06		
24	6	2983.41	313.30	0.1	0.0	0.06		
25	6	3336.74	313.33	0.1	0.0	0.06		
26	7	3711.98	313.37	0.1	0.0	0.06		
27	7	4108.80	313.40	0.1	0.0	0.06		
28	7	4526.73	313.44	0.1	0.0	0.06		
29	8	4965.20	313.47	0.1	0.0	0.06		
30	8	5423.56	313.51	0.1	0.0	0.06		
31	8	5901.02	313.55	0.1	0.0	0.06		
32	9	6396.72	313.59	0.1	0.0	0.06		
33	9	6909.68	313.63	0.1	0.0	0.06		
34	9	7438.87	313.68	0.1	0.0	0.06		
35	9	7983.13	313.72	0.1	0.0	0.06		
36	10	8541.27	313.76	0.1	0.0	0.06		
37	10	9111.98	313.81	0.1	0.0	0.06		
38	10	9693.94	313.85	0.1	0.0	0.06		
39	10	10285.72	313.90	0.1	0.0	0.06		
40	10	10885.88	313.94	0.1	0.0	0.06		
41	10	11492.91	313.99	0.1	0.0	0.06		
42	10	12105.28	314.04	0.1	0.0	0.06		
43	10	12721.43	314.08	0.1	0.0	0.06		
44	10	13339.77	314.13	0.1	0.0	0.06		
45	10	13958.72	314.17	0.1	0.0	0.06		
46	10	14576.68	314.22	0.1	0.0	0.06		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	10	15192.05	314.26	0.1	0.0	0.06		
48	10	15803.26	314.31	0.1	0.0	0.06		
49	10	16408.75	314.35	0.1	0.0	0.06		
50	10	17007.00	314.39	0.1	0.0	0.06		
51	10	17596.52	314.44	0.1	0.0	0.06		
52	10	18175.86	314.48	0.1	0.0	0.06		
53	9	18743.63	314.52	0.1	0.0	0.06		
54	9	19298.50	314.56	0.1	0.0	0.06		
55	6	19839.19	314.60	0.1	0.0	0.06		
56	6	20194.15	314.62	0.1	0.0	0.06		
57	6	20538.64	314.65	0.1	0.0	0.06		
58	5	20872.96	314.67	0.1	0.0	0.06		
59	5	21197.40	314.69	0.1	0.0	0.06		
60	5	21512.26	314.71	0.1	0.0	0.06		
61	5	21817.81	314.74	0.1	0.0	0.06		
62	5	22114.33	314.76	0.1	0.0	0.06		
63	5	22402.08	314.78	0.1	0.0	0.06		
64	5	22681.32	314.80	0.1	0.0	0.06		
65	4	22952.29	314.81	0.1	0.0	0.06		
66	4	23215.24	314.83	0.1	0.0	0.06		
67	4	23470.40	314.85	0.1	0.0	0.06		
68	4	23717.99	314.87	0.1	0.0	0.06		
69	4	23958.24	314.88	0.1	0.0	0.06		
70	4	24191.37	314.90	0.1	0.0	0.06		
71	4	24417.58	314.92	0.1	0.0	0.06		
72	4	24637.07	314.93	0.1	0.0	0.06		
73	4	24850.04	314.95	0.1	0.0	0.06		
74	3	25056.67	314.96	0.1	0.0	0.06		
75	3	25257.17	314.97	0.1	0.0	0.06		
76	3	25451.69	314.99	0.1	0.0	0.06		
77	3	25640.43	315.00	0.1	0.0	0.06		
78	3	25823.54	315.01	0.1	0.0	0.06		
79	3	26001.19	315.02	0.1	0.0	0.06		
80	3	26173.54	315.04	0.1	0.0	0.06		
81	3	26340.75	315.05	0.1	0.0	0.06		
82	3	26502.96	315.06	0.1	0.0	0.06		
83	3	26660.32	315.07	0.1	0.0	0.06		
84	3	26812.98	315.08	0.1	0.0	0.06		
85	2	26961.06	315.09	0.1	0.0	0.06		
86	2	27104.71	315.10	0.1	0.0	0.06		
87	2	27244.05	315.11	0.1	0.0	0.06		
88	2	27379.21	315.12	0.1	0.0	0.06		
89	2	27510.32	315.13	0.1	0.0	0.06		
90	2	27637.48	315.14	0.1	0.0	0.06		
91	2	27760.81	315.14	0.1	0.0	0.06		
92	2	27880.43	315.15	0.1	0.0	0.06		
93	2	27996.45	315.16	0.1	0.0	0.06		
94	2	28108.96	315.17	0.1	0.0	0.06		
95	2	28218.08	315.17	0.1	0.0	0.06		
96	2	28323.90	315.18	0.1	0.0	0.06		
97	2	28426.51	315.19	0.1	0.0	0.06		
98	2	28526.02	315.20	0.1	0.0	0.06		
99	2	28622.51	315.20	0.1	0.0	0.06		
100	2	28716.06	315.21	0.1	0.0	0.06		
101	2	28806.78	315.21	0.1	0.0	0.06		
102	1	28894.73	315.22	0.1	0.0	0.06		
103	1	28980.00	315.23	0.1	0.0	0.06		
104	1	29062.66	315.23	0.1	0.0	0.06		
105	1	29142.80	315.24	0.1	0.0	0.06		
106	1	29220.49	315.24	0.1	0.0	0.06		
107	1	29295.80	315.25	0.1	0.0	0.06		
108	1	29368.79	315.25	0.1	0.0	0.06		
109	1	29439.54	315.26	0.1	0.0	0.06		
110	1	29508.11	315.26	0.1	0.0	0.06		
111	1	29574.57	315.27	0.1	0.0	0.06		
112	1	29638.97	315.27	0.1	0.0	0.06		
113	1	29701.38	315.27	0.1	0.0	0.06		
114	1	29761.85	315.28	0.1	0.0	0.06		
115	1	29820.44	315.28	0.1	0.0	0.06		
116	1	29877.21	315.29	0.1	0.0	0.06		
117	1	29932.21	315.29	0.1	0.0	0.06		
118	1	29985.49	315.29	0.1	0.0	0.06		
119	1	30037.10	315.30	0.1	0.0	0.06		
120	1	30087.10	315.30	0.1	0.0	0.06		
121	1	30135.51	315.30	0.1	0.0	0.06		
122	1	30182.40	315.31	0.1	0.0	0.06		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time	Inflow	Storage	Stage	Outflow	Weir	Skimmer		
T	I	S	Z	O	Flow	Flow		
min	cfs	cu-ft	ft	cfs	cfs	cfs		
123	1	30227.81	315.31	0.1	0.0	0.06		
124	1	30271.78	315.31	0.1	0.0	0.06		
125	1	30314.36	315.32	0.1	0.0	0.06		
126	1	30355.57	315.32	0.1	0.0	0.06		
127	1	30395.47	315.32	0.1	0.0	0.06		
128	1	30434.09	315.32	0.1	0.0	0.06		
129	1	30471.47	315.33	0.1	0.0	0.06		
130	1	30507.65	315.33	0.1	0.0	0.06		
131	1	30542.65	315.33	0.1	0.0	0.06		
132	1	30576.52	315.33	0.1	0.0	0.06		
133	1	30609.29	315.34	0.1	0.0	0.06		
134	1	30640.99	315.34	0.1	0.0	0.06		
135	1	30671.65	315.34	0.1	0.0	0.06		
136	1	30701.30	315.34	0.1	0.0	0.06		
137	1	30729.97	315.34	0.1	0.0	0.06		
138	1	30757.69	315.35	0.1	0.0	0.06		
139	0	30784.49	315.35	0.1	0.0	0.06		
140	0	30810.39	315.35	0.1	0.0	0.06		
141	0	30835.43	315.35	0.1	0.0	0.06		
142	0	30859.61	315.35	0.1	0.0	0.06		
143	0	30882.98	315.35	0.1	0.0	0.06		
144	0	30905.56	315.36	0.1	0.0	0.06		
145	0	30927.36	315.36	0.1	0.0	0.06		
146	0	30948.41	315.36	0.1	0.0	0.06		
147	0	30968.73	315.36	0.1	0.0	0.06		
148	0	30988.35	315.36	0.1	0.0	0.06		
149	0	31007.28	315.36	0.1	0.0	0.06		
150	0	31025.54	315.36	0.1	0.0	0.06		
151	0	31043.16	**315.36**	0.1	0.0	0.06		

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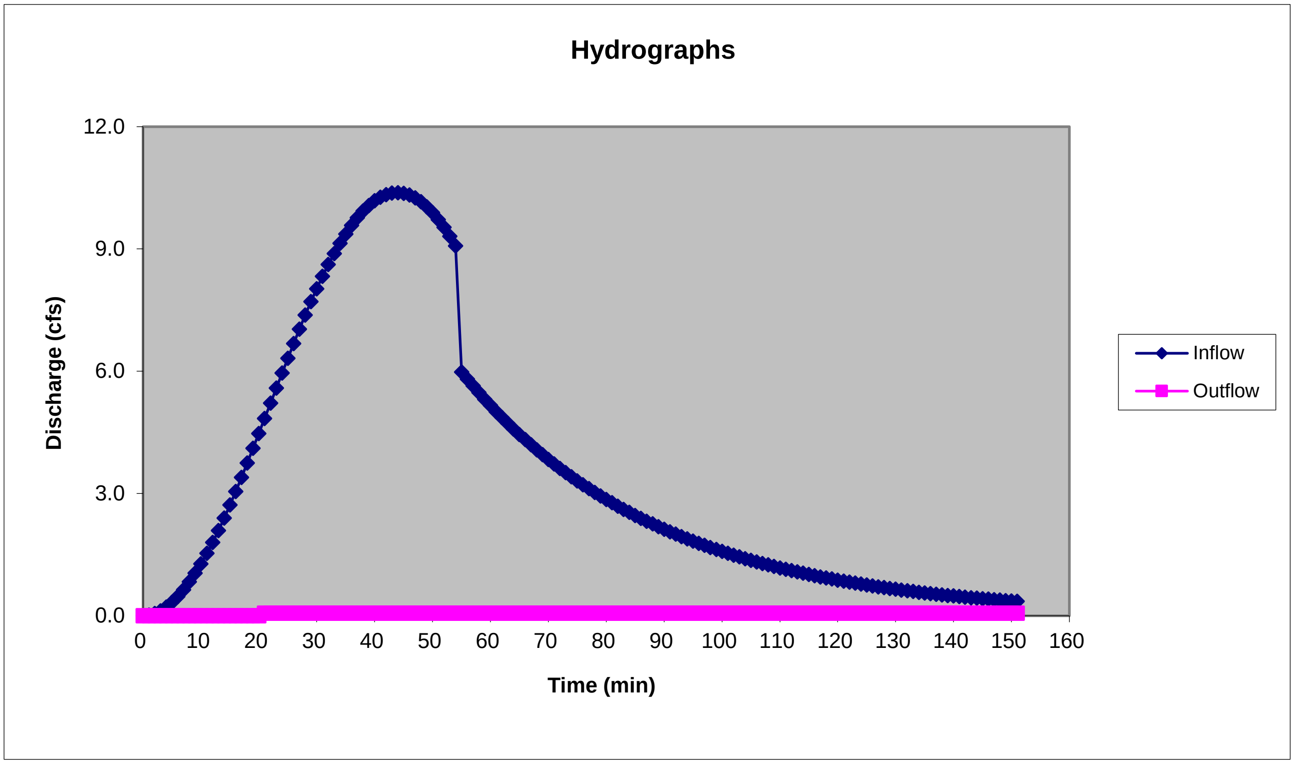
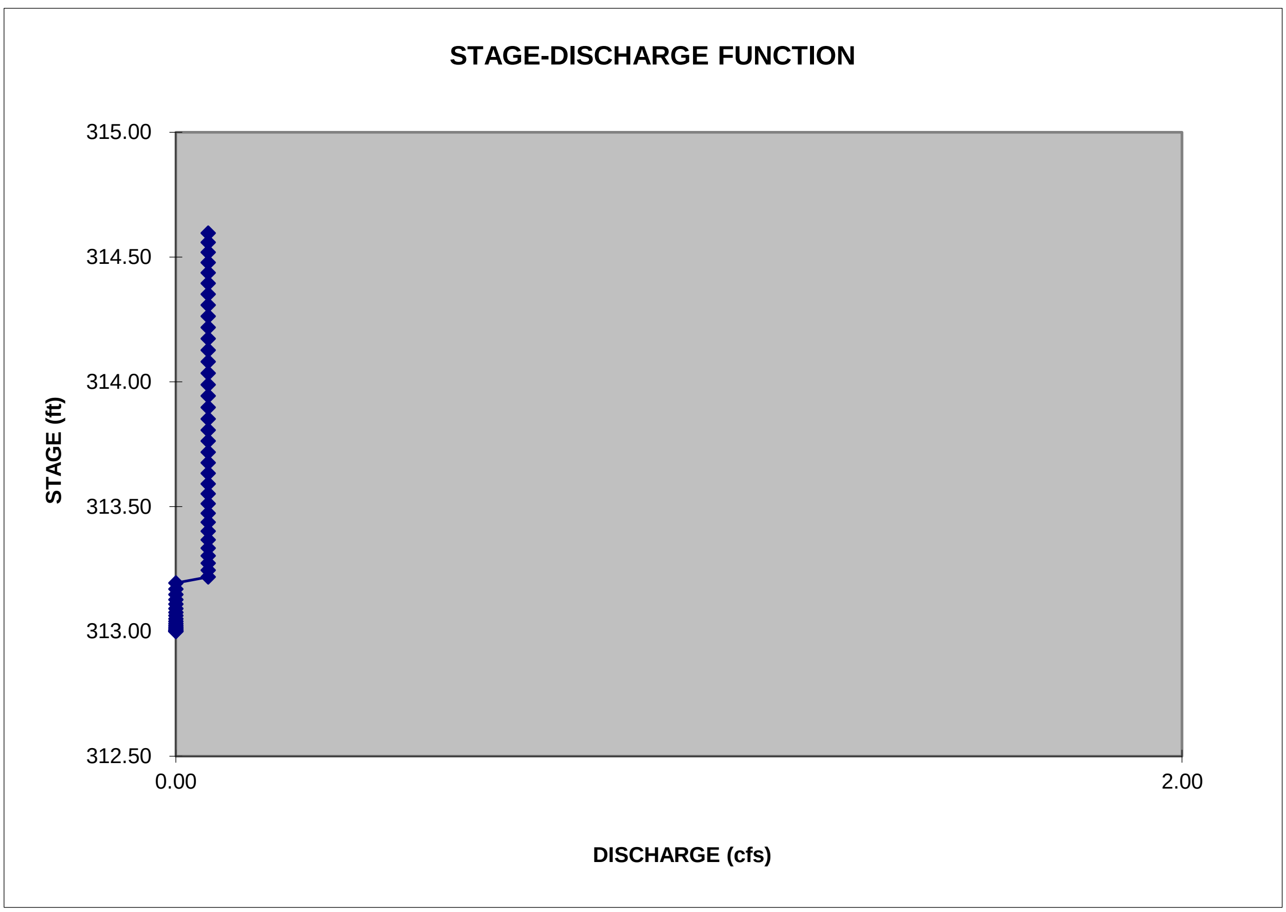
GRAPHED DATA FOR 25 YEAR STORM





ST-1
SKIMMER BASIN
DESIGN

CHAMBLEE LAKE
ZEBULON, NC
DRH22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm

MCADAMS

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Sediment Trap ID	ST-1		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	1.76 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	1.76 ac.	0.35
Undisturbed grassy area	0.00 ac.	0.00 ac.	0.25
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	1.76 ac.	1.76 ac.	
Composite Rational 'c'	0.45	0.35	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	309	feet
Height of watershed =	6	feet
Calculated t(c) =	2.9	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.0	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for: Raleigh, NC

Return Period	B	D	Intensity
2	132	18	5.74 in/hr
10	195	22	7.22 in/hr
25	232	23	8.29 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	5.74 in/hr	4.5 cfs	3.54 cfs
10-year storm	7.22 in/hr	5.7 cfs	4.45 cfs
25-year storm	8.29 in/hr	6.6 cfs	5.10 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	1,800	cubic feet per disturbed acre
Required sediment trap surface area	325	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	80
Bottom width =	40
Sediment depth =	2.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Emergency Spillway =	2.0
Side slopes =	3.0 H:1V
Emergency Spillway length =	10
Height of berm =	4
Top of trap length =	104
Top of trap width =	64
Bottom elevation =	310

Sediment Trap Data

	Required	Provided
Sediment storage volume =	3168 cu. ft.	7930 cu. ft.
Sediment surface area =	1860 sq. ft.	4780 sq. ft.
Sediment storage depth =	3.5 ft. (max.)	2
Trap bottom length to width ratio =	2.0L:1W (min)	2.0L:1W
Spillway length =	10.0 ft. (min)	10
10-Year flow depth over spillway =	0.50 ft. (max)	-1.12 ft
Freeboard at 10-Year discharge =	1.00 ft. (min)	3.12 ft

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU
1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Provided for Sediment Basin = 3,168 cubic feet

24 HOURS	Best Option =	1 - 2 inch Skimmers with a 1.9 inch orifice	
2 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.3 inch orifice	
3 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.1 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 0.8 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

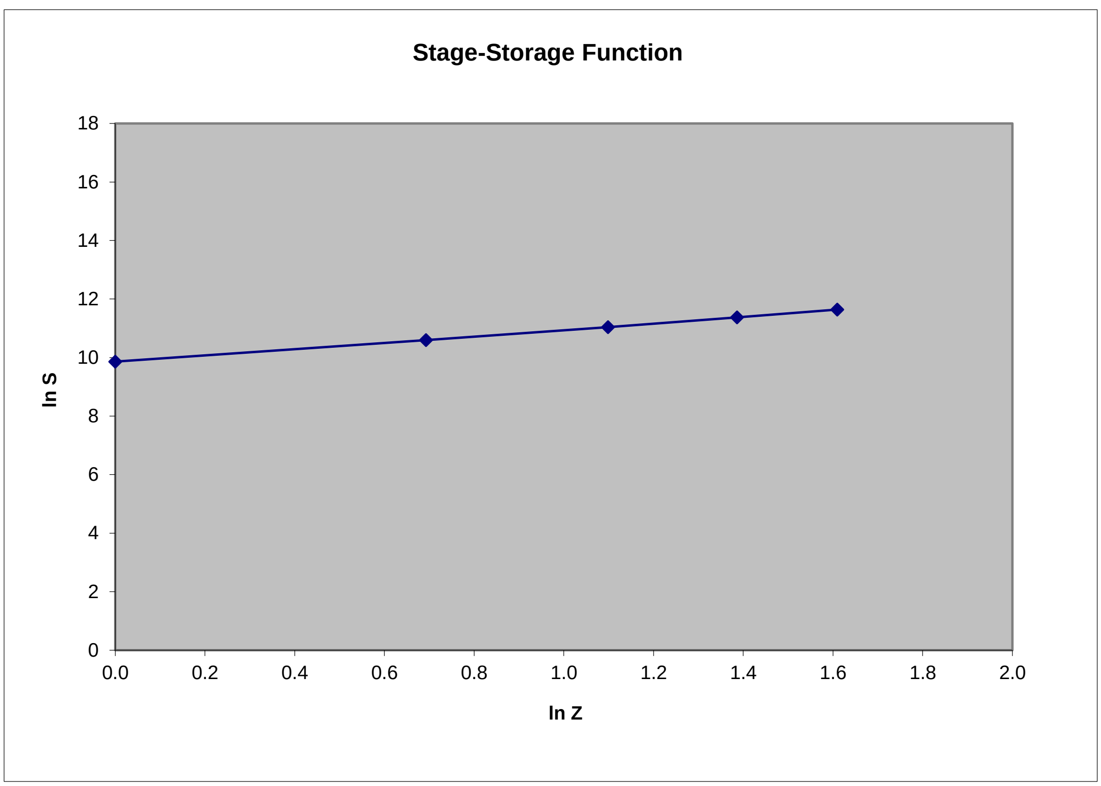
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
310	18395		0	0			
311	19981	19188	19188	1	9.8620	0.0000	1.01
312	21475	20728	39916	2	10.5945	0.6931	1.97
313	22972	22223.5	62139.5	3	11.0371	1.0986	2.95
314	26299	24635.5	86775	4	11.3711	1.3863	3.99
315	27427	26863	113638	5	11.6408	1.6094	5.10

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.10 and **K_s =** 18897



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HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	1.76	ac	**Use Kirpich Equation:**	
Disturbed Area =	1.76	ac	**Tc =**	5.0 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	309	ft	**i_1 =**	5.74 in/hr
Vertical Fall =	6	ft	**i_{10} =**	7.22 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	8.29 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	4.5 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	5.7 cfs
h =	23		**Q_{25} =**	6.6 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	29.4	**minutes**
P_{n6} =	3.9	in (10 Year Storm)	**Q* =**	2.92	**in**
			T_{p10} =	39.1	**minutes**
P_{n6} =	4.6	in (25 Year Storm)	**Q* =**	3.59	**in**
			T_{p25} =	42.0	**minutes**

McADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**310.61** ft
		Rise =	**0.61** ft
Freeboard =	**3.39** ft	**Peak Outflow =**	**0.03** cfs

INPUT

Hydrograph Results:

Qp =	4.55	cfs
Tp =	29.4	min
dT =	1.0	min

Stage-Storage Results:

Ks =	18897	
b =	1.10	
Z_0 =	310.0	ft (inv)

Initial Water Level:

Z_i =	310.00	ft

Weir:

N =	1	
L =	10	ft
Cw =	3.00	
Zcr =	312.00	ft

Top of Dam: 314.00 ft

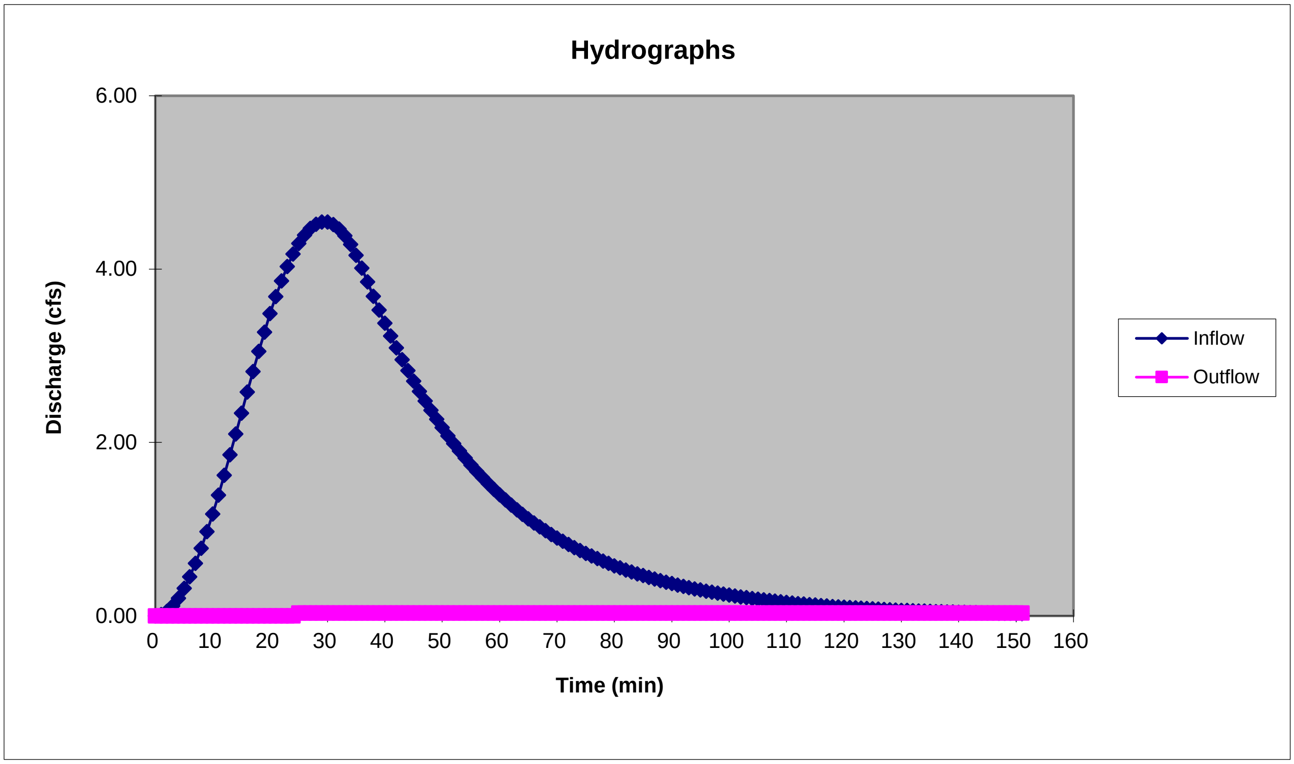
Skimmer Orifice:

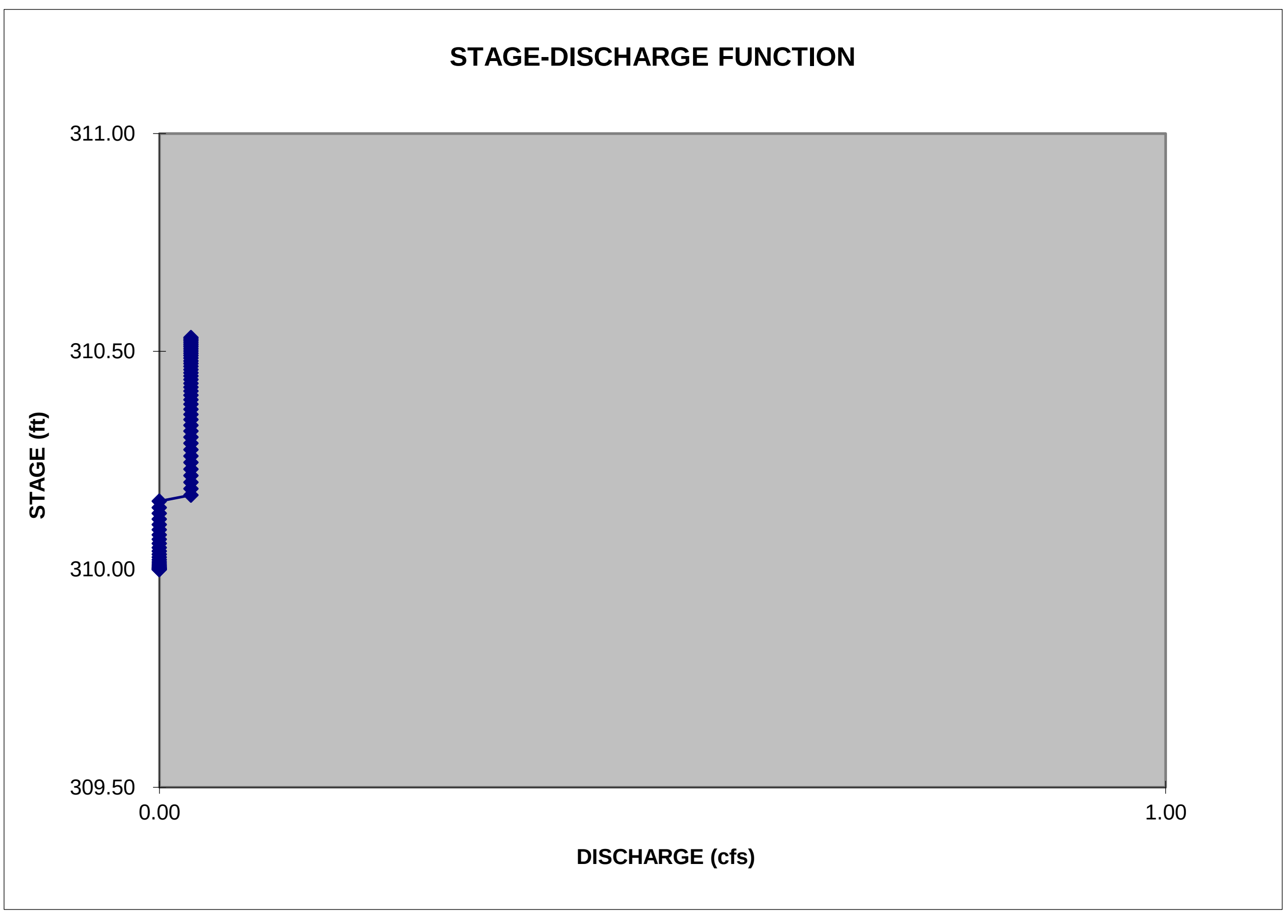
Number =	1.00	Ea
Diameter =	2.00	Inches
Head =	1.09	inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	0.78	310.00	0.0	0.0	0.00		
3	0	3.87	310.00	0.0	0.0	0.00		
4	0	10.79	310.00	0.0	0.0	0.00		
5	0	23.02	310.00	0.0	0.0	0.00		
6	0	41.96	310.00	0.0	0.0	0.00		
7	1	68.95	310.01	0.0	0.0	0.00		
8	1	105.23	310.01	0.0	0.0	0.00		
9	1	151.95	310.01	0.0	0.0	0.00		
10	1	210.12	310.02	0.0	0.0	0.00		
11	1	280.62	310.02	0.0	0.0	0.00		
12	2	364.21	310.03	0.0	0.0	0.00		
13	2	461.49	310.03	0.0	0.0	0.00		
14	2	572.90	310.04	0.0	0.0	0.00		
15	2	698.73	310.05	0.0	0.0	0.00		
16	3	839.09	310.06	0.0	0.0	0.00		
17	3	993.95	310.07	0.0	0.0	0.00		
18	3	1163.08	310.08	0.0	0.0	0.00		
19	3	1346.12	310.09	0.0	0.0	0.00		
20	3	1542.54	310.10	0.0	0.0	0.00		
21	4	1751.65	310.12	0.0	0.0	0.00		
22	4	1972.62	310.13	0.0	0.0	0.00		
23	4	2204.51	310.14	0.0	0.0	0.00		
24	4	2446.21	310.16	0.0	0.0	0.00		
25	4	2696.53	310.17	0.0	0.0	0.03		
26	4	2952.30	310.19	0.0	0.0	0.03		
27	4	3214.02	310.20	0.0	0.0	0.03		
28	5	3480.25	310.22	0.0	0.0	0.03		
29	5	3749.47	310.23	0.0	0.0	0.03		
30	5	4020.17	310.25	0.0	0.0	0.03		
31	5	4290.78	310.26	0.0	0.0	0.03		
32	4	4559.77	310.27	0.0	0.0	0.03		
33	4	4825.61	310.29	0.0	0.0	0.03		
34	4	5086.80	310.30	0.0	0.0	0.03		
35	4	5341.90	310.32	0.0	0.0	0.03		
36	4	5589.54	310.33	0.0	0.0	0.03		
37	4	5828.44	310.34	0.0	0.0	0.03		
38	4	6057.71	310.36	0.0	0.0	0.03		
39	4	6277.00	310.37	0.0	0.0	0.03		
40	3	6486.74	310.38	0.0	0.0	0.03		

GRAPHED DATA FOR 2 YEAR STORM





MCADAMS

ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

Peak Stage =	310.88 ft
Rise =	0.88 ft
Freeboard =	3.12 ft
Peak Outflow =	0.03 cfs

INPUT

Hydrograph Results:

Qp =	5.72	cfs
Tp =	39.1	min
dT =	1.0	min

Stage-Storage Results:

Ks =	18897	
b =	1.10	
Z_0 =	310.0	ft (inv)

Initial Water Level:

Z_i =	310.00	ft

Weir:

N =	1	
L =	10	ft
Cw =	3.00	
Zcr =	312.00	ft

Top of Dam: 314.00 ft

Skimmer Orifice:

Number =	1	Ea
Diameter =	2.00	Inches
Head =	1.09	inches

OUTPUT

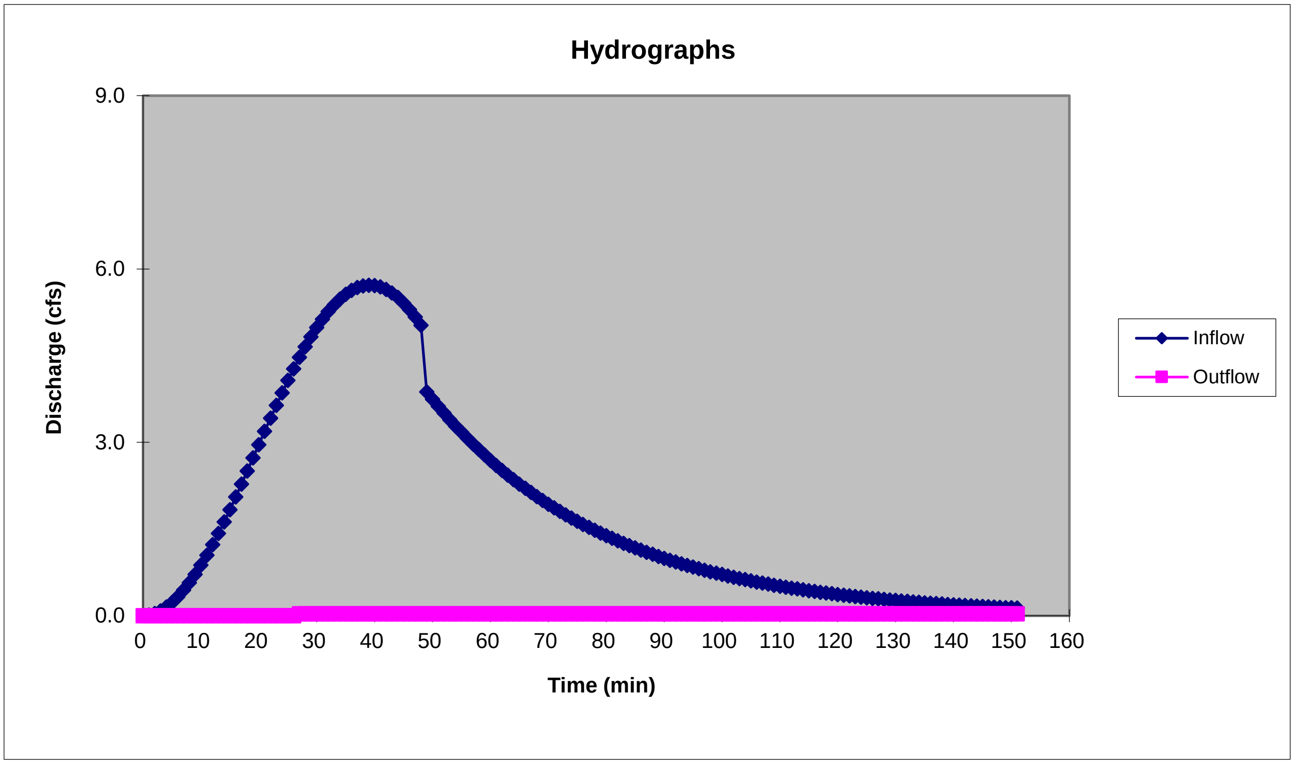
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	0.55	310.00	0.0	0.0	0.00		
3	0	2.76	310.00	0.0	0.0	0.00		
4	0	7.71	310.00	0.0	0.0	0.00		
5	0	16.49	310.00	0.0	0.0	0.00		
6	0	30.13	310.00	0.0	0.0	0.00		
7	0	49.66	310.00	0.0	0.0	0.00		
8	1	76.06	310.01	0.0	0.0	0.00		
9	1	110.25	310.01	0.0	0.0	0.00		
10	1	153.14	310.01	0.0	0.0	0.00		
11	1	205.54	310.02	0.0	0.0	0.00		
12	1	268.23	310.02	0.0	0.0	0.00		
13	1	341.90	310.03	0.0	0.0	0.00		
14	2	427.19	310.03	0.0	0.0	0.00		
15	2	524.65	310.04	0.0	0.0	0.00		
16	2	634.77	310.05	0.0	0.0	0.00		
17	2	757.93	310.05	0.0	0.0	0.00		
18	3	894.45	310.06	0.0	0.0	0.00		
19	3	1044.56	310.07	0.0	0.0	0.00		
20	3	1208.39	310.08	0.0	0.0	0.00		
21	3	1385.99	310.09	0.0	0.0	0.00		
22	3	1577.33	310.10	0.0	0.0	0.00		
23	4	1782.27	310.12	0.0	0.0	0.00		
24	4	2000.61	310.13	0.0	0.0	0.00		
25	4	2232.04	310.14	0.0	0.0	0.00		
26	4	2476.18	310.16	0.0	0.0	0.00		
27	4	2732.56	310.17	0.0	0.0	0.03		
28	5	2998.76	310.19	0.0	0.0	0.03		
29	5	3276.03	310.20	0.0	0.0	0.03		
30	5	3563.68	310.22	0.0	0.0	0.03		
31	5	3860.94	310.24	0.0	0.0	0.03		
32	5	4167.01	310.25	0.0	0.0	0.03		
33	5	4480.99	310.27	0.0	0.0	0.03		
34	5	4801.96	310.29	0.0	0.0	0.03		
35	6	5128.95	310.31	0.0	0.0	0.03		
36	6	5460.93	310.32	0.0	0.0	0.03		
37	6	5796.88	310.34	0.0	0.0	0.03		
38	6	6135.71	310.36	0.0	0.0	0.03		
39	6	6476.33	310.38	0.0	0.0	0.03		
40	6	6817.65	310.40	0.0	0.0	0.03		
41	6	7158.56	310.41	0.0	0.0	0.03		
42	6	7497.95	310.43	0.0	0.0	0.03		
43	6	7834.74	310.45	0.0	0.0	0.03		
44	6	8167.85	310.47	0.0	0.0	0.03		
45	5	8496.21	310.48	0.0	0.0	0.03		
46	5	8818.82	310.50	0.0	0.0	0.03		

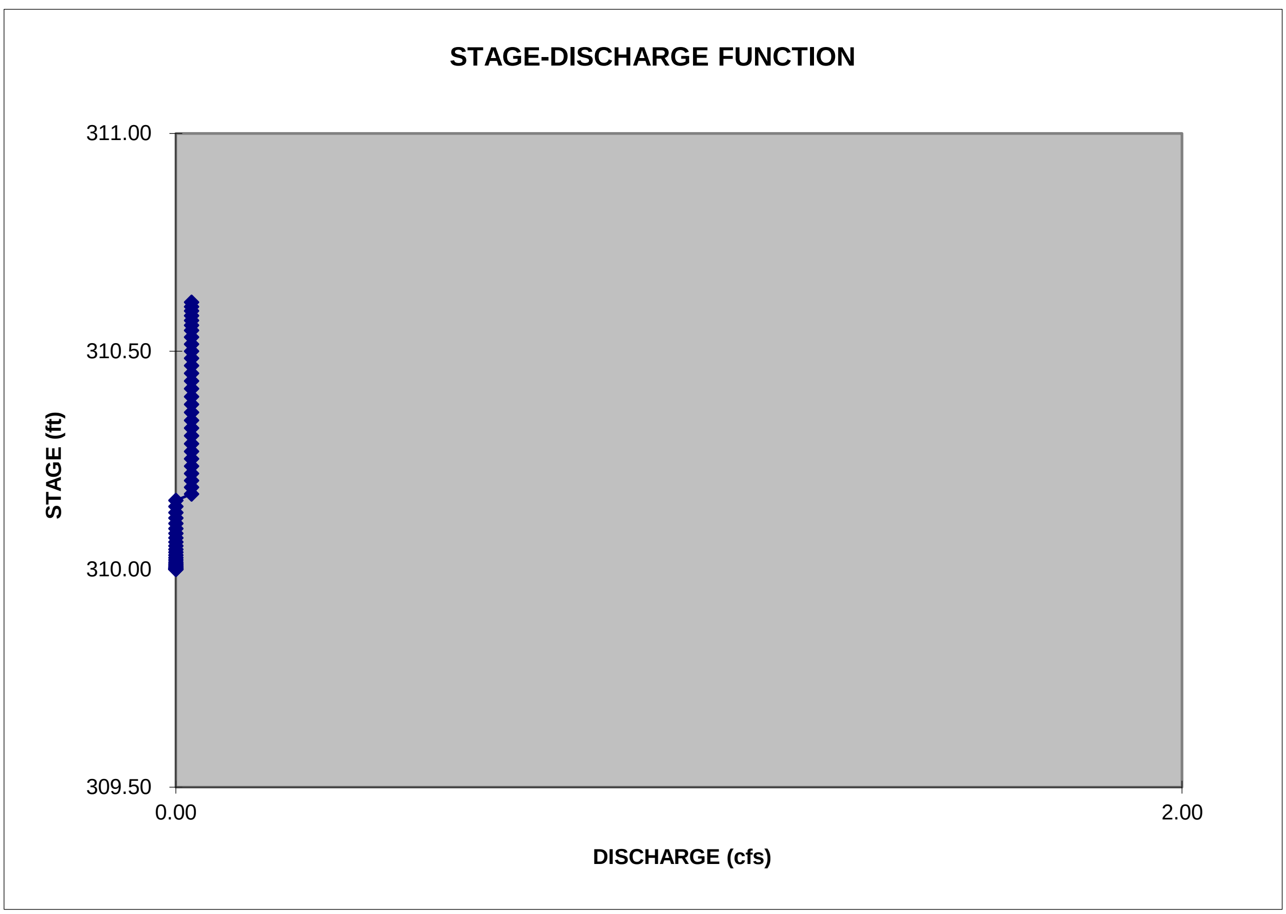
OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	5	9134.69	310.52	0.0	0.0	0.03		
48	5	9442.87	310.53	0.0	0.0	0.03		
49	4	9742.48	310.55	0.0	0.0	0.03		
50	4	9972.98	310.56	0.0	0.0	0.03		
51	4	10195.90	310.57	0.0	0.0	0.03		
52	4	10411.46	310.58	0.0	0.0	0.03		
53	3	10619.92	310.59	0.0	0.0	0.03		
54	3	10821.51	310.60	0.0	0.0	0.03		
55	3	11016.45	310.61	0.0	0.0	0.03		
56	3	11204.95	310.62	0.0	0.0	0.03		
57	3	11387.24	310.63	0.0	0.0	0.03		
58	3	11563.51	310.64	0.0	0.0	0.03		
59	3	11733.95	310.65	0.0	0.0	0.03		
60	3	11898.77	310.66	0.0	0.0	0.03		
61	3	12058.14	310.66	0.0	0.0	0.03		
62	3	12212.24	310.67	0.0	0.0	0.03		
63	2	12361.24	310.68	0.0	0.0	0.03		
64	2	12505.31	310.69	0.0	0.0	0.03		
65	2	12644.62	310.69	0.0	0.0	0.03		
66	2	12779.31	310.70	0.0	0.0	0.03		
67	2	12909.53	310.71	0.0	0.0	0.03		
68	2	13035.44	310.71	0.0	0.0	0.03		
69	2	13157.18	310.72	0.0	0.0	0.03		
70	2	13274.87	310.73	0.0	0.0	0.03		
71	2	13388.66	310.73	0.0	0.0	0.03		
72	2	13498.67	310.74	0.0	0.0	0.03		
73	2	13605.02	310.74	0.0	0.0	0.03		
74	2	13707.84	310.75	0.0	0.0	0.03		
75	2	13807.24	310.75	0.0	0.0	0.03		
76	2	13903.32	310.76	0.0	0.0	0.03		
77	2	13996.21	310.76	0.0	0.0	0.03		
78	1	14085.99	310.77	0.0	0.0	0.03		
79	1	14172.79	310.77	0.0	0.0	0.03		
80	1	14256.68	310.77	0.0	0.0	0.03		
81	1	14337.78	310.78	0.0	0.0	0.03		
82	1	14416.16	310.78	0.0	0.0	0.03		
83	1	14491.92	310.79	0.0	0.0	0.03		
84	1	14565.14	310.79	0.0	0.0	0.03		
85	1	14635.91	310.79	0.0	0.0	0.03		
86	1	14704.30	310.80	0.0	0.0	0.03		
87	1	14770.40	310.80	0.0	0.0	0.03		
88	1	14834.28	310.80	0.0	0.0	0.03		
89	1	14896.01	310.81	0.0	0.0	0.03		
90	1	14955.66	310.81	0.0	0.0	0.03		
91	1	15013.30	310.81	0.0	0.0	0.03		
92	1	15069.00	310.81	0.0	0.0	0.03		
93	1	15122.81	310.82	0.0	0.0	0.03		
94	1	15174.81	310.82	0.0	0.0	0.03		
95	1	15225.04	310.82	0.0	0.0	0.03		
96	1	15273.57	310.82	0.0	0.0	0.03		
97	1	15320.46	310.83	0.0	0.0	0.03		
98	1	15365.75	310.83	0.0	0.0	0.03		
99	1	15409.50	310.83	0.0	0.0	0.03		
100	1	15451.76	310.83	0.0	0.0	0.03		
101	1	15492.57	310.83	0.0	0.0	0.03		
102	1	15532.00	310.84	0.0	0.0	0.03		
103	1	15570.07	310.84	0.0	0.0	0.03		
104	1	15606.84	310.84	0.0	0.0	0.03		
105	1	15642.34	310.84	0.0	0.0	0.03		
106	1	15676.63	310.84	0.0	0.0	0.03		
107	1	15709.73	310.85	0.0	0.0	0.03		
108	1	15741.69	310.85	0.0	0.0	0.03		
109	1	15772.54	310.85	0.0	0.0	0.03		
110	1	15802.32	310.85	0.0	0.0	0.03		
111	0	15831.07	310.85	0.0	0.0	0.03		
112	0	15858.82	310.85	0.0	0.0	0.03		
113	0	15885.60	310.85	0.0	0.0	0.03		
114	0	15911.45	310.86	0.0	0.0	0.03		
115	0	15936.39	310.86	0.0	0.0	0.03		
116	0	15960.45	310.86	0.0	0.0	0.03		
117	0	15983.67	310.86	0.0	0.0	0.03		
118	0	16006.06	310.86	0.0	0.0	0.03		
119	0	16027.67	310.86	0.0	0.0	0.03		
120	0	16048.50	310.86	0.0	0.0	0.03		
121	0	16068.59	310.86	0.0	0.0	0.03		
122	0	16087.97	310.86	0.0	0.0	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time	Inflow	Storage	Stage	Outflow	Weir	Skimmer		
T	I	S	Z	O	Flow	Flow		
min	cfs	cu-ft	ft	cfs	cfs	cfs		
123	0	16106.65	310.86	0.0	0.0	0.03		
124	0	16124.66	310.87	0.0	0.0	0.03		
125	0	16142.02	310.87	0.0	0.0	0.03		
126	0	16158.75	310.87	0.0	0.0	0.03		
127	0	16174.88	310.87	0.0	0.0	0.03		
128	0	16190.41	310.87	0.0	0.0	0.03		
129	0	16205.38	310.87	0.0	0.0	0.03		
130	0	16219.80	310.87	0.0	0.0	0.03		
131	0	16233.68	310.87	0.0	0.0	0.03		
132	0	16247.05	310.87	0.0	0.0	0.03		
133	0	16259.92	310.87	0.0	0.0	0.03		
134	0	16272.31	310.87	0.0	0.0	0.03		
135	0	16284.24	310.87	0.0	0.0	0.03		
136	0	16295.71	310.87	0.0	0.0	0.03		
137	0	16306.74	310.87	0.0	0.0	0.03		
138	0	16317.36	310.88	0.0	0.0	0.03		
139	0	16327.57	310.88	0.0	0.0	0.03		
140	0	16337.38	310.88	0.0	0.0	0.03		
141	0	16346.81	310.88	0.0	0.0	0.03		
142	0	16355.87	310.88	0.0	0.0	0.03		
143	0	16364.57	310.88	0.0	0.0	0.03		
144	0	16372.93	310.88	0.0	0.0	0.03		
145	0	16380.96	310.88	0.0	0.0	0.03		
146	0	16388.66	310.88	0.0	0.0	0.03		
147	0	16396.05	310.88	0.0	0.0	0.03		
148	0	16403.13	310.88	0.0	0.0	0.03		
149	0	16409.92	310.88	0.0	0.0	0.03		
150	0	16416.43	310.88	0.0	0.0	0.03		
151	0	16422.67	**310.88**	0.0	0.0	0.03		

McADAMS

GRAPHED DATA FOR 10 YEAR STORM





ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS					
			Peak Stage =	310.95	ft
			Rise =	0.95	ft
Freeboard =	3.05	ft	Peak Outflow =	0.03	cfs

INPUT

Hydrograph Results:

Qp =	6.56	cfs
Tp =	39.1	min
dT =	1.0	min

Stage-Storage Results:

Ks =	18897	
b =	1.10	
Z_0 =	310.0	ft (inv)

Initial Water Level:

Z_i =	310.00	ft

Weir:

N =	1	
L =	10	ft
Cw =	3.00	
Zcr =	312.00	ft

Top of Dam: 314.00 ft

Skimmer Orifice:

Number =	1.00	Ea
Diameter =	2.00	Inches
Head =	1.09	inches

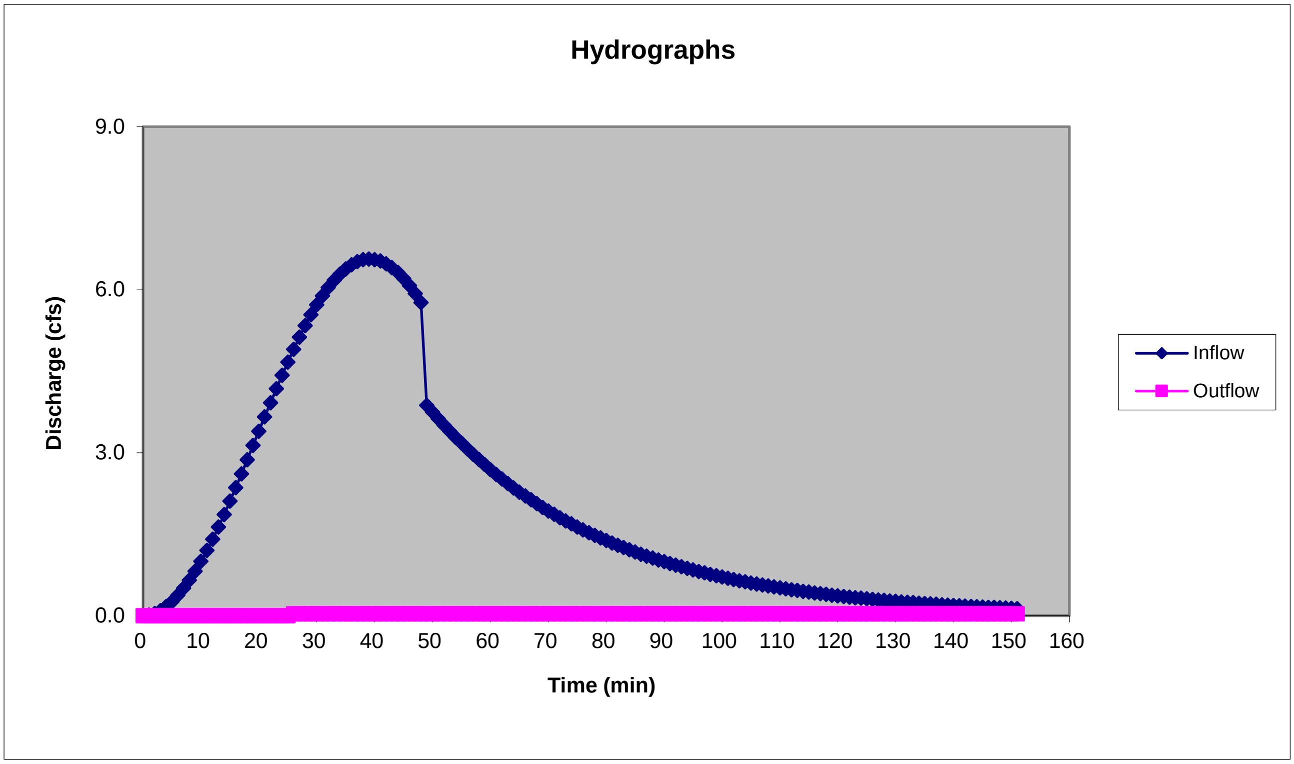
OUTPUT

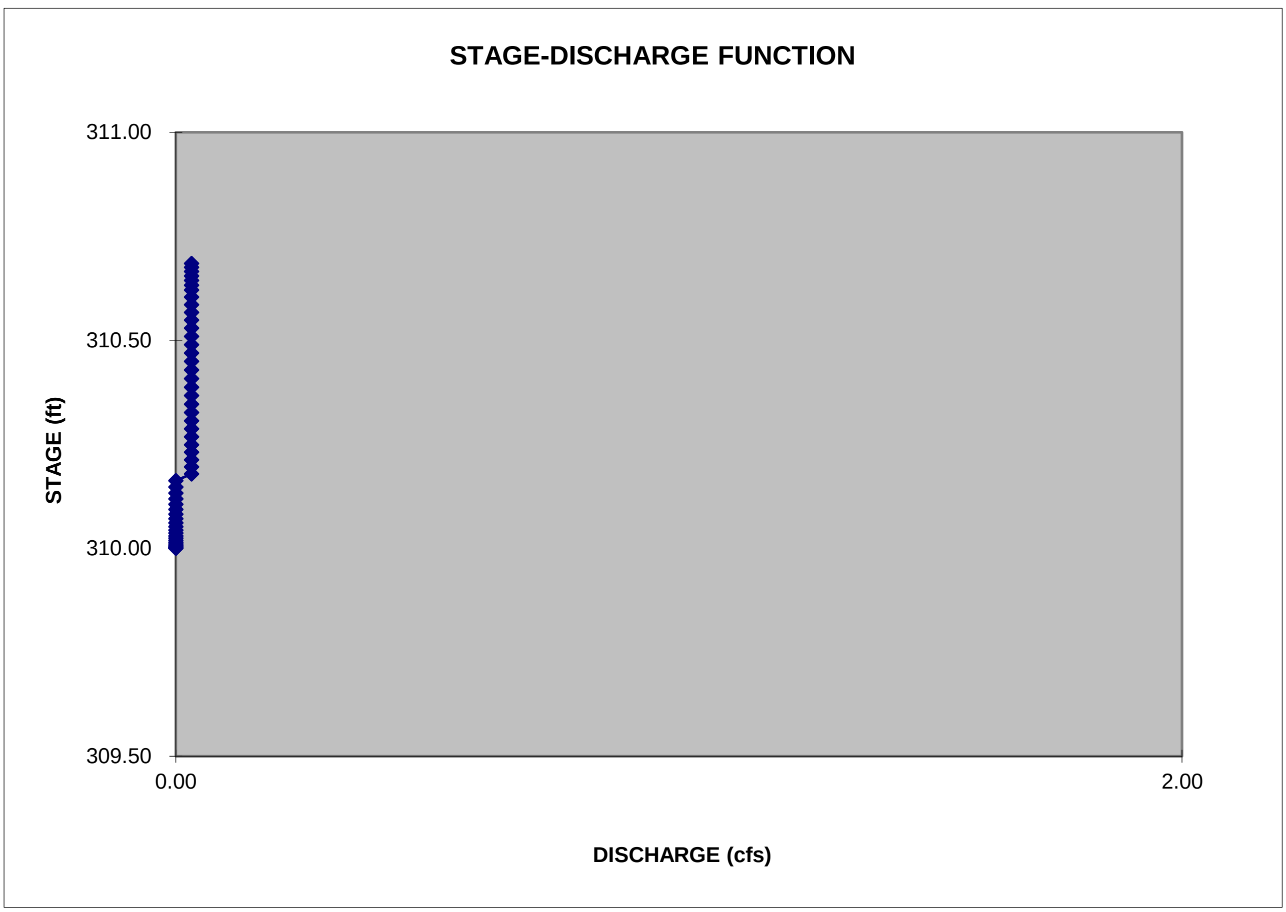
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	310.00	0.0	0.0	0.0		
1	0	0.00	310.00	0.0	0.0	0.00		
2	0	0.63	310.00	0.0	0.0	0.00		
3	0	3.17	310.00	0.0	0.0	0.00		
4	0	8.85	310.00	0.0	0.0	0.00		
5	0	18.92	310.00	0.0	0.0	0.00		
6	0	34.57	310.00	0.0	0.0	0.00		
7	1	56.97	310.01	0.0	0.0	0.00		
8	1	87.26	310.01	0.0	0.0	0.00		
9	1	126.49	310.01	0.0	0.0	0.00		
10	1	175.69	310.01	0.0	0.0	0.00		
11	1	235.81	310.02	0.0	0.0	0.00		
12	1	307.73	310.02	0.0	0.0	0.00		
13	2	392.25	310.03	0.0	0.0	0.00		
14	2	490.10	310.04	0.0	0.0	0.00		
15	2	601.91	310.04	0.0	0.0	0.00		
16	2	728.24	310.05	0.0	0.0	0.00		
17	3	869.54	310.06	0.0	0.0	0.00		
18	3	1026.16	310.07	0.0	0.0	0.00		
19	3	1198.37	310.08	0.0	0.0	0.00		
20	3	1386.32	310.09	0.0	0.0	0.00		
21	4	1590.08	310.11	0.0	0.0	0.00		
22	4	1809.59	310.12	0.0	0.0	0.00		
23	4	2044.72	310.13	0.0	0.0	0.00		
24	4	2295.21	310.15	0.0	0.0	0.00		
25	5	2560.72	310.16	0.0	0.0	0.00		
26	5	2840.81	310.18	0.0	0.0	0.03		
27	5	3133.06	310.20	0.0	0.0	0.03		
28	5	3438.74	310.21	0.0	0.0	0.03		
29	6	3757.11	310.23	0.0	0.0	0.03		
30	6	4087.39	310.25	0.0	0.0	0.03		
31	6	4428.71	310.27	0.0	0.0	0.03		
32	6	4780.12	310.29	0.0	0.0	0.03		
33	6	5140.61	310.31	0.0	0.0	0.03		
34	6	5509.12	310.33	0.0	0.0	0.03		
35	6	5884.53	310.35	0.0	0.0	0.03		
36	6	6265.68	310.37	0.0	0.0	0.03		
37	7	6651.37	310.39	0.0	0.0	0.03		
38	7	7040.37	310.41	0.0	0.0	0.03		
39	7	7431.42	310.43	0.0	0.0	0.03		
40	7	7823.28	310.45	0.0	0.0	0.03		
41	7	8214.66	310.47	0.0	0.0	0.03		
42	6	8604.31	310.49	0.0	0.0	0.03		
43	6	8990.97	310.51	0.0	0.0	0.03		
44	6	9373.40	310.53	0.0	0.0	0.03		
45	6	9750.39	310.55	0.0	0.0	0.03		
46	6	10120.79	310.57	0.0	0.0	0.03		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
47	6	10483.44	310.59	0.0	0.0	0.03		
48	6	10837.28	310.60	0.0	0.0	0.03		
49	4	11181.28	310.62	0.0	0.0	0.03		
50	4	11411.78	310.63	0.0	0.0	0.03		
51	4	11634.69	310.64	0.0	0.0	0.03		
52	4	11850.26	310.65	0.0	0.0	0.03		
53	3	12058.72	310.67	0.0	0.0	0.03		
54	3	12260.31	310.68	0.0	0.0	0.03		
55	3	12455.25	310.68	0.0	0.0	0.03		
56	3	12643.75	310.69	0.0	0.0	0.03		
57	3	12826.04	310.70	0.0	0.0	0.03		
58	3	13002.31	310.71	0.0	0.0	0.03		
59	3	13172.75	310.72	0.0	0.0	0.03		
60	3	13337.57	310.73	0.0	0.0	0.03		
61	3	13496.94	310.74	0.0	0.0	0.03		
62	3	13651.04	310.74	0.0	0.0	0.03		
63	2	13800.04	310.75	0.0	0.0	0.03		
64	2	13944.11	310.76	0.0	0.0	0.03		
65	2	14083.41	310.77	0.0	0.0	0.03		
66	2	14218.10	310.77	0.0	0.0	0.03		
67	2	14348.33	310.78	0.0	0.0	0.03		
68	2	14474.24	310.78	0.0	0.0	0.03		
69	2	14595.98	310.79	0.0	0.0	0.03		
70	2	14713.67	310.80	0.0	0.0	0.03		
71	2	14827.46	310.80	0.0	0.0	0.03		
72	2	14937.47	310.81	0.0	0.0	0.03		
73	2	15043.82	310.81	0.0	0.0	0.03		
74	2	15146.64	310.82	0.0	0.0	0.03		
75	2	15246.03	310.82	0.0	0.0	0.03		
76	2	15342.12	310.83	0.0	0.0	0.03		
77	2	15435.00	310.83	0.0	0.0	0.03		
78	1	15524.79	310.84	0.0	0.0	0.03		
79	1	15611.59	310.84	0.0	0.0	0.03		
80	1	15695.48	310.84	0.0	0.0	0.03		
81	1	15776.58	310.85	0.0	0.0	0.03		
82	1	15854.96	310.85	0.0	0.0	0.03		
83	1	15930.72	310.86	0.0	0.0	0.03		
84	1	16003.94	310.86	0.0	0.0	0.03		
85	1	16074.71	310.86	0.0	0.0	0.03		
86	1	16143.10	310.87	0.0	0.0	0.03		
87	1	16209.20	310.87	0.0	0.0	0.03		
88	1	16273.08	310.87	0.0	0.0	0.03		
89	1	16334.81	310.88	0.0	0.0	0.03		
90	1	16394.46	310.88	0.0	0.0	0.03		
91	1	16452.10	310.88	0.0	0.0	0.03		
92	1	16507.79	310.88	0.0	0.0	0.03		
93	1	16561.61	310.89	0.0	0.0	0.03		
94	1	16613.60	310.89	0.0	0.0	0.03		
95	1	16663.84	310.89	0.0	0.0	0.03		
96	1	16712.37	310.89	0.0	0.0	0.03		
97	1	16759.25	310.90	0.0	0.0	0.03		
98	1	16804.55	310.90	0.0	0.0	0.03		
99	1	16848.30	310.90	0.0	0.0	0.03		
100	1	16890.56	310.90	0.0	0.0	0.03		
101	1	16931.37	310.91	0.0	0.0	0.03		
102	1	16970.79	310.91	0.0	0.0	0.03		
103	1	17008.87	310.91	0.0	0.0	0.03		
104	1	17045.64	310.91	0.0	0.0	0.03		
105	1	17081.14	310.91	0.0	0.0	0.03		
106	1	17115.42	310.91	0.0	0.0	0.03		
107	1	17148.53	310.92	0.0	0.0	0.03		
108	1	17180.48	310.92	0.0	0.0	0.03		
109	1	17211.34	310.92	0.0	0.0	0.03		
110	1	17241.12	310.92	0.0	0.0	0.03		
111	0	17269.87	310.92	0.0	0.0	0.03		
112	0	17297.62	310.92	0.0	0.0	0.03		
113	0	17324.40	310.92	0.0	0.0	0.03		
114	0	17350.25	310.93	0.0	0.0	0.03		
115	0	17375.19	310.93	0.0	0.0	0.03		
116	0	17399.25	310.93	0.0	0.0	0.03		
117	0	17422.47	310.93	0.0	0.0	0.03		
118	0	17444.86	310.93	0.0	0.0	0.03		
119	0	17466.46	310.93	0.0	0.0	0.03		
120	0	17487.30	310.93	0.0	0.0	0.03		
121	0	17507.39	310.93	0.0	0.0	0.03		
122	0	17526.77	310.93	0.0	0.0	0.03		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
123	0	17545.45	310.93	0.0	0.0	0.03		
124	0	17563.46	310.94	0.0	0.0	0.03		
125	0	17580.82	310.94	0.0	0.0	0.03		
126	0	17597.55	310.94	0.0	0.0	0.03		
127	0	17613.68	310.94	0.0	0.0	0.03		
128	0	17629.21	310.94	0.0	0.0	0.03		
129	0	17644.18	310.94	0.0	0.0	0.03		
130	0	17658.59	310.94	0.0	0.0	0.03		
131	0	17672.48	310.94	0.0	0.0	0.03		
132	0	17685.85	310.94	0.0	0.0	0.03		
133	0	17698.72	310.94	0.0	0.0	0.03		
134	0	17711.11	310.94	0.0	0.0	0.03		
135	0	17723.03	310.94	0.0	0.0	0.03		
136	0	17734.51	310.94	0.0	0.0	0.03		
137	0	17745.54	310.94	0.0	0.0	0.03		
138	0	17756.16	310.95	0.0	0.0	0.03		
139	0	17766.37	310.95	0.0	0.0	0.03		
140	0	17776.18	310.95	0.0	0.0	0.03		
141	0	17785.61	310.95	0.0	0.0	0.03		
142	0	17794.67	310.95	0.0	0.0	0.03		
143	0	17803.37	310.95	0.0	0.0	0.03		
144	0	17811.73	310.95	0.0	0.0	0.03		
145	0	17819.76	310.95	0.0	0.0	0.03		
146	0	17827.46	310.95	0.0	0.0	0.03		
147	0	17834.84	310.95	0.0	0.0	0.03		
148	0	17841.93	310.95	0.0	0.0	0.03		
149	0	17848.72	310.95	0.0	0.0	0.03		
150	0	17855.23	310.95	0.0	0.0	0.03		
151	0	17861.47	**310.95**	0.0	0.0	0.03		

GRAPHED DATA FOR 25 YEAR STORM





MCADAMS

ST-2
SKIMMER BASIN
DESIGN

CHAMBLEE LAKE
ZEBULON, NC
DRH22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm

MCADAMS

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Sediment Trap ID	ST-2		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	3.67 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	3.67 ac.	0.35
Undisturbed grassy area	0.00 ac.	0.00 ac.	0.25
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	3.67 ac.	3.67 ac.	
Composite Rational 'c'	0.45	0.35	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	662	feet
Height of watershed =	11	feet
Calculated t(c) =	5.6	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.6	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for: Raleigh, NC

Return Period	B	D	Intensity
2	132	18	5.59 in/hr
10	195	22	7.06 in/hr
25	232	23	8.11 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	5.59 in/hr	9.2 cfs	7.18 cfs
10-year storm	7.06 in/hr	11.7 cfs	9.07 cfs
25-year storm	8.11 in/hr	13.4 cfs	10.41 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	1,800	cubic feet per disturbed acre
Required sediment trap surface area	325	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	80
Bottom width =	40
Sediment depth =	2.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Emergency Spillway =	2.0
Side slopes =	3.0 H:1V
Emergency Spillway length =	20
Height of berm =	4
Top of trap length =	104
Top of trap width =	64
Bottom elevation =	308

Sediment Trap Data

	Required	Provided
Sediment storage volume =	6606 cu. ft.	7930 cu. ft.
Sediment surface area =	3790 sq. ft.	4780 sq. ft.
Sediment storage depth =	3.5 ft. (max.)	2
Trap bottom length to width ratio =	2.0L:1W (min)	2.0L:1W
Spillway length =	10.0 ft. (min)	20
10-Year flow depth over spillway =	0.50 ft. (max)	0.33 ft
Freeboard at 10-Year discharge =	1.00 ft. (min)	1.67 ft

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU
1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Provided for Sediment Basin = 6,606 cubic feet

24 HOURS	Best Option =	1 - 3 inch Skimmers with a 2.5 inch orifice	
2 DAYS	Best Option =	1 - 2.5 inch Skimmers with a 1.9 inch orifice	
3 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.6 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.2 inch orifice	

McADAMS

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

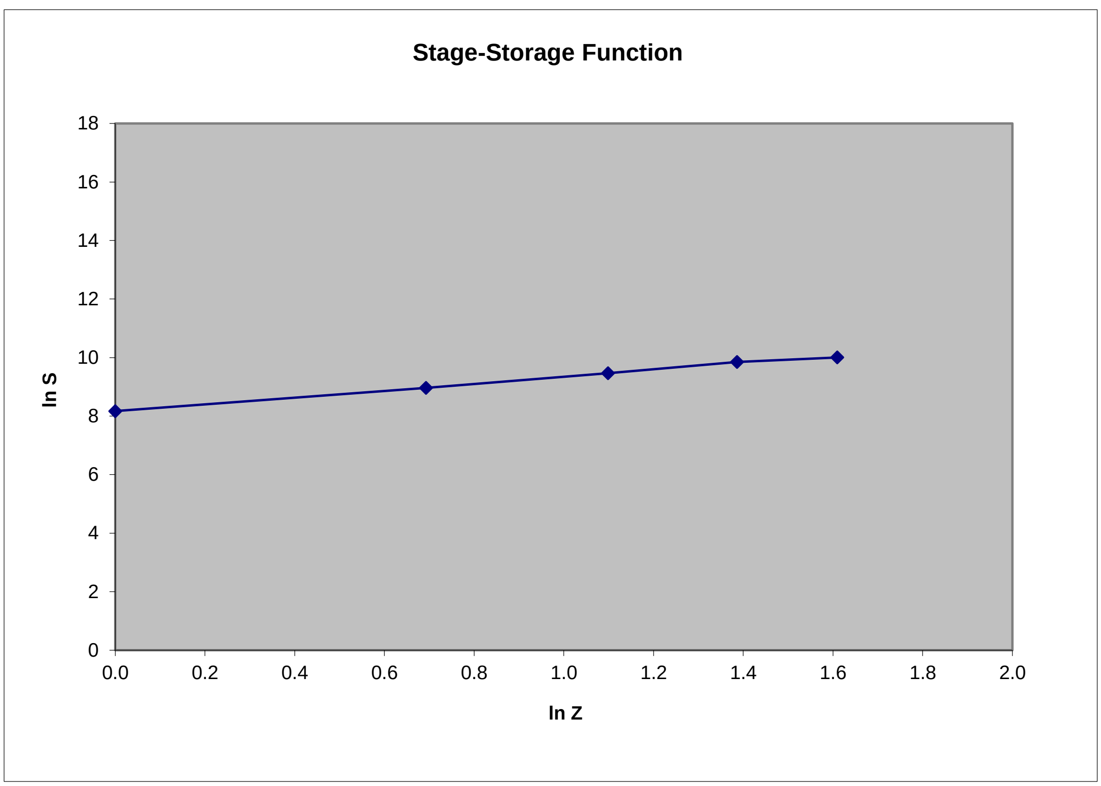
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
308	3179		0	0			
309	3901	3540	3540	1	8.1719	0.0000	1.00
310	4680	4290.5	7830.5	2	8.9658	0.6931	1.97
311	5516	5098	12928.5	3	9.4672	1.0986	3.03
312	6408	5962	18890.5	4	9.8464	1.3863	4.19
313	0	3204	22094.5	5	10.0031	1.6094	4.80

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.17 and **K_s =** 3547



McADAMS

HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	3.67	ac	**Use Kirpich Equation:**	
Disturbed Area =	3.67	ac	**Tc =**	5.6 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	662	ft	**i_1 =**	5.59 in/hr
Vertical Fall =	11	ft	**i_{10} =**	7.06 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	8.11 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	9.2 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	11.7 cfs
h =	23		**Q_{25} =**	13.4 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	30.2	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	40.0	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	42.9	**minutes**

McADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	310.27 ft
		Rise =	2.27 ft
Freeboard =	1.73 ft	**Peak Outflow =**	8.67 cfs

INPUT

Hydrograph Results:

Qp = 9.23 cfs
Tp = 30.2 min
dT = 1.0 min

Stage-Storage Results:

Ks = 3547
b = 1.17
Z_0 = 308.0 ft (inv)

Initial Water Level:

Z_i = 308.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 310.00 ft

Top of Dam: 312.00 ft

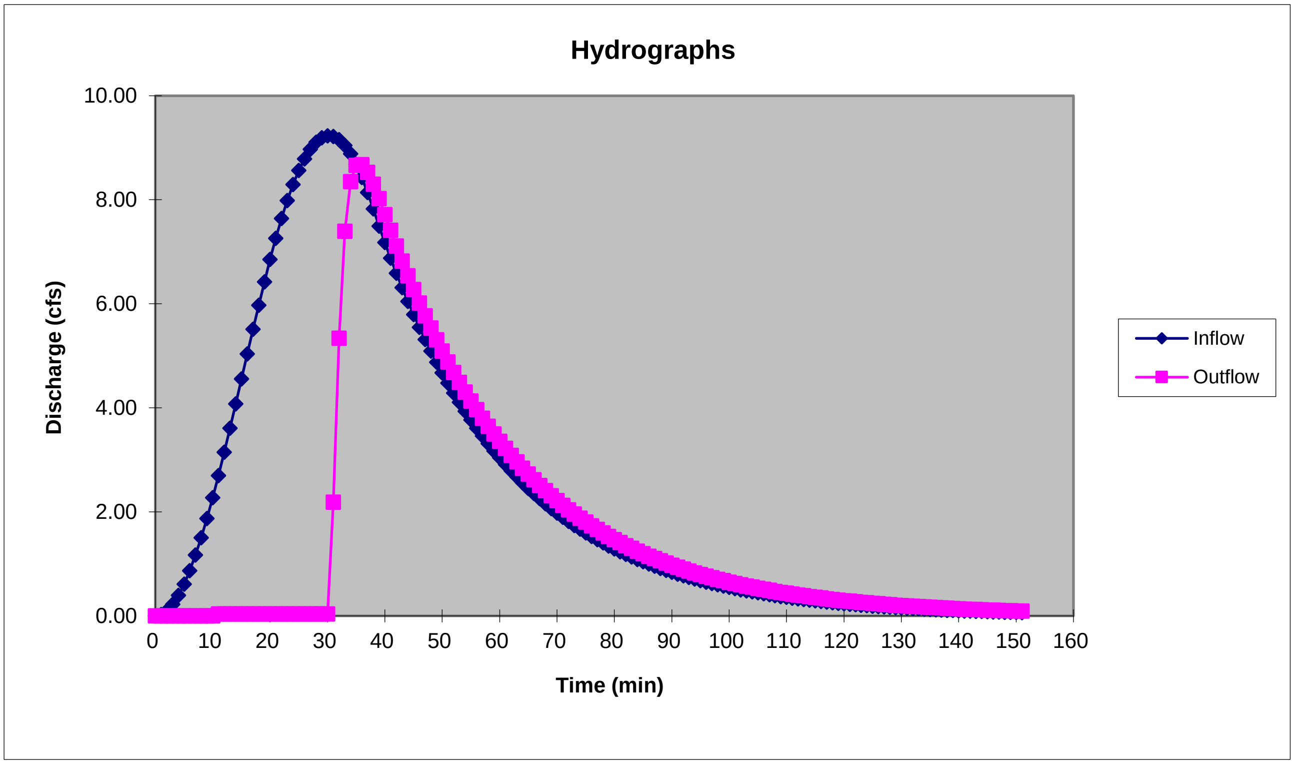
Skimmer Orifice:

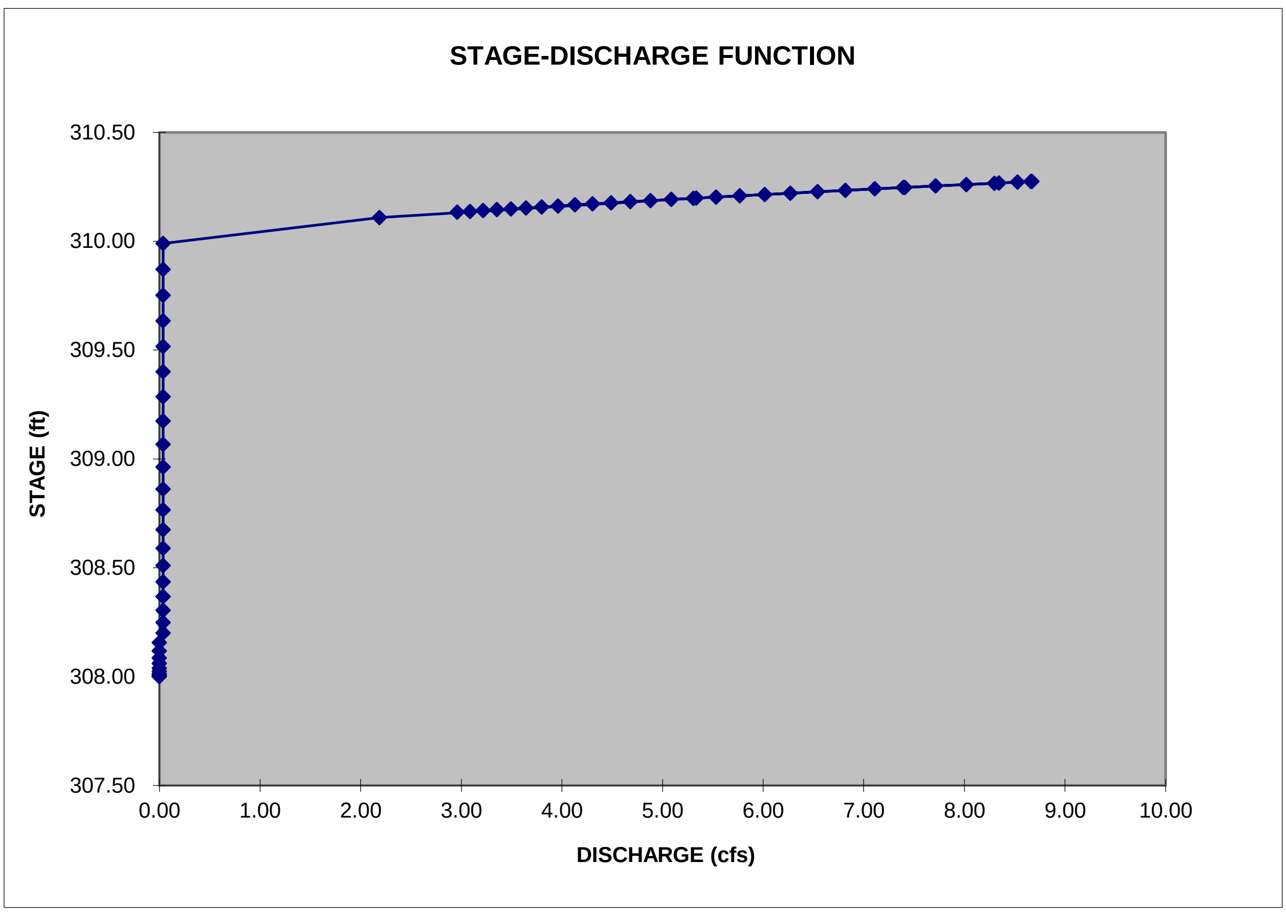
Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 1.58 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	308.00	0.0	0.0	0.0		
1	0	0.00	308.00	0.0	0.0	0.00		
2	0	1.49	308.00	0.0	0.0	0.00		
3	0	7.44	308.01	0.0	0.0	0.00		
4	0	20.78	308.01	0.0	0.0	0.00		
5	1	44.33	308.02	0.0	0.0	0.00		
6	1	80.83	308.04	0.0	0.0	0.00		
7	1	132.87	308.06	0.0	0.0	0.00		
8	2	202.87	308.09	0.0	0.0	0.00		
9	2	293.07	308.12	0.0	0.0	0.00		
10	2	405.47	308.16	0.0	0.0	0.00		
11	3	541.85	308.20	0.0	0.0	0.04		
12	3	701.47	308.25	0.0	0.0	0.04		
13	4	887.82	308.31	0.0	0.0	0.04		
14	4	1101.86	308.37	0.0	0.0	0.04		
15	5	1344.22	308.44	0.0	0.0	0.04		
16	5	1615.27	308.51	0.0	0.0	0.04		
17	6	1915.04	308.59	0.0	0.0	0.04		
18	6	2243.26	308.68	0.0	0.0	0.04		
19	6	2599.34	308.77	0.0	0.0	0.04		
20	7	2982.42	308.86	0.0	0.0	0.04		
21	7	3391.33	308.96	0.0	0.0	0.04		
22	8	3824.61	309.07	0.0	0.0	0.04		
23	8	4280.55	309.17	0.0	0.0	0.04		
24	8	4757.21	309.29	0.0	0.0	0.04		
25	9	5252.40	309.40	0.0	0.0	0.04		
26	9	5763.74	309.52	0.0	0.0	0.04		
27	9	6288.69	309.63	0.0	0.0	0.04		
28	9	6824.55	309.75	0.0	0.0	0.04		
29	9	7368.49	309.87	0.0	0.0	0.04		
30	9	7917.62	309.99	0.0	0.0	0.04		
31	9	8468.98	310.11	2.2	2.1	0.04		
32	9	8890.68	310.20	5.3	5.3	0.04		
33	9	9119.61	310.25	7.4	7.4	0.04		
34	9	9218.57	310.27	8.3	8.3	0.04		
35	9	9250.83	310.27	8.7	8.6	0.04		
36	8	9251.68	310.27	8.7	8.6	0.04		
37	8	9237.11	310.27	8.5	8.5	0.04		
38	8	9213.83	310.27	8.3	8.3	0.04		
39	7	9185.26	310.26	8.0	8.0	0.04		
40	7	9153.66	310.25	7.7	7.7	0.04		

GRAPHED DATA FOR 2 YEAR STORM





MCADAMS

ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	310.33 ft
		Rise =	2.33 ft
Freeboard =	1.67 ft	Peak Outflow =	11.64 cfs

INPUT

Hydrograph Results:

Qp = 11.66 cfs
Tp = 40.0 min
dT = 1.0 min

Stage-Storage Results:

Ks = 3547
b = 1.17
Z_0 = 308.0 ft (inv)

Initial Water Level:

Z_i = 308.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 310.00 ft

Top of Dam: 312.00 ft

Skimmer Orifice:

Number = 1 Ea
Diameter = 2.00 Inches
Head = 1.58 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	308.00	0.0	0.0	0.0		
1	0	0.00	308.00	0.0	0.0	0.00		
2	0	1.08	308.00	0.0	0.0	0.00		
3	0	5.38	308.00	0.0	0.0	0.00		
4	0	15.03	308.01	0.0	0.0	0.00		
5	0	32.12	308.02	0.0	0.0	0.00		
6	1	58.70	308.03	0.0	0.0	0.00		
7	1	96.76	308.05	0.0	0.0	0.00		
8	1	148.23	308.07	0.0	0.0	0.00		
9	1	214.93	308.09	0.0	0.0	0.00		
10	2	298.60	308.12	0.0	0.0	0.00		
11	2	400.90	308.15	0.0	0.0	0.00		
12	2	523.33	308.19	0.0	0.0	0.04		
13	3	665.05	308.24	0.0	0.0	0.04		
14	3	829.58	308.29	0.0	0.0	0.04		
15	4	1018.04	308.34	0.0	0.0	0.04		
16	4	1231.41	308.40	0.0	0.0	0.04		
17	4	1470.51	308.47	0.0	0.0	0.04		
18	5	1736.02	308.54	0.0	0.0	0.04		
19	5	2028.44	308.62	0.0	0.0	0.04		
20	6	2348.11	308.70	0.0	0.0	0.04		
21	6	2695.20	308.79	0.0	0.0	0.04		
22	7	3069.71	308.88	0.0	0.0	0.04		
23	7	3471.47	308.98	0.0	0.0	0.04		
24	8	3900.16	309.08	0.0	0.0	0.04		
25	8	4355.27	309.19	0.0	0.0	0.04		
26	8	4836.14	309.30	0.0	0.0	0.04		
27	9	5341.94	309.42	0.0	0.0	0.04		
28	9	5871.72	309.54	0.0	0.0	0.04		
29	10	6424.33	309.66	0.0	0.0	0.04		
30	10	6998.52	309.79	0.0	0.0	0.04		
31	10	7592.90	309.92	0.0	0.0	0.04		
32	11	8205.94	310.05	0.8	0.7	0.04		
33	11	8792.86	310.18	4.5	4.5	0.04		
34	11	9168.85	310.26	7.9	7.8	0.04		
35	11	9358.25	310.30	9.8	9.7	0.04		
36	11	9445.78	310.32	10.7	10.6	0.04		
37	11	9487.88	310.32	11.1	11.1	0.04		
38	12	9510.47	310.33	11.4	11.3	0.04		
39	12	9523.85	310.33	11.5	11.5	0.04		
40	12	9531.79	310.33	11.6	11.6	0.04		
41	12	9535.69	310.33	11.6	11.6	0.04		
42	12	9536.02	**310.33**	11.6	11.6	0.04		
43	12	9532.98	310.33	11.6	11.6	0.04		
44	11	9526.65	310.33	11.5	11.5	0.04		
45	11	9517.08	310.33	11.4	11.4	0.04		
46	11	9504.32	310.33	11.3	11.3	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	11	9488.44	310.32	11.1	11.1	0.04		
48	11	9469.50	310.32	10.9	10.9	0.04		
49	10	9447.57	310.32	10.7	10.6	0.04		
50	10	9422.75	310.31	10.4	10.4	0.04		
51	8	9395.12	310.30	10.1	10.1	0.04		
52	7	9245.72	310.27	8.6	8.6	0.04		
53	7	9172.96	310.26	7.9	7.9	0.04		
54	7	9128.72	310.25	7.5	7.4	0.04		
55	7	9096.12	310.24	7.2	7.1	0.04		
56	6	9068.64	310.24	6.9	6.9	0.04		
57	6	9043.61	310.23	6.7	6.6	0.04		
58	6	9019.92	310.23	6.5	6.4	0.04		
59	6	8997.09	310.22	6.3	6.2	0.04		
60	6	8974.91	310.22	6.1	6.0	0.04		
61	6	8953.28	310.21	5.9	5.8	0.04		
62	5	8932.14	310.21	5.7	5.7	0.04		
63	5	8911.47	310.20	5.5	5.5	0.04		
64	5	8891.25	310.20	5.3	5.3	0.04		
65	5	8871.46	310.19	5.2	5.1	0.04		
66	5	8852.10	310.19	5.0	5.0	0.04		
67	5	8833.16	310.19	4.9	4.8	0.04		
68	4	8814.63	310.18	4.7	4.7	0.04		
69	4	8796.49	310.18	4.6	4.5	0.04		
70	4	8778.73	310.17	4.4	4.4	0.04		
71	4	8761.36	310.17	4.3	4.2	0.04		
72	4	8744.36	310.17	4.1	4.1	0.04		
73	4	8727.73	310.16	4.0	4.0	0.04		
74	4	8711.45	310.16	3.9	3.8	0.04		
75	4	8695.51	310.16	3.8	3.7	0.04		
76	3	8679.92	310.15	3.6	3.6	0.04		
77	3	8664.66	310.15	3.5	3.5	0.04		
78	3	8649.72	310.15	3.4	3.4	0.04		
79	3	8635.10	310.14	3.3	3.3	0.04		
80	3	8620.79	310.14	3.2	3.2	0.04		
81	3	8606.79	310.14	3.1	3.1	0.04		
82	3	8593.09	310.14	3.0	3.0	0.04		
83	3	8579.67	310.13	2.9	2.9	0.04		
84	3	8566.55	310.13	2.8	2.8	0.04		
85	3	8553.70	310.13	2.7	2.7	0.04		
86	2	8541.12	310.12	2.7	2.6	0.04		
87	2	8528.81	310.12	2.6	2.5	0.04		
88	2	8516.76	310.12	2.5	2.5	0.04		
89	2	8504.97	310.12	2.4	2.4	0.04		
90	2	8493.42	310.11	2.3	2.3	0.04		
91	2	8482.13	310.11	2.3	2.2	0.04		
92	2	8471.07	310.11	2.2	2.2	0.04		
93	2	8460.24	310.11	2.1	2.1	0.04		
94	2	8449.64	310.10	2.1	2.0	0.04		
95	2	8439.27	310.10	2.0	2.0	0.04		
96	2	8429.11	310.10	1.9	1.9	0.04		
97	2	8419.17	310.10	1.9	1.8	0.04		
98	2	8409.44	310.10	1.8	1.8	0.04		
99	2	8399.91	310.09	1.8	1.7	0.04		
100	2	8390.59	310.09	1.7	1.7	0.04		
101	2	8381.46	310.09	1.7	1.6	0.04		
102	1	8372.52	310.09	1.6	1.6	0.04		
103	1	8363.77	310.09	1.6	1.5	0.04		
104	1	8355.21	310.08	1.5	1.5	0.04		
105	1	8346.82	310.08	1.5	1.4	0.04		
106	1	8338.61	310.08	1.4	1.4	0.04		
107	1	8330.57	310.08	1.4	1.3	0.04		
108	1	8322.70	310.08	1.3	1.3	0.04		
109	1	8315.00	310.08	1.3	1.3	0.04		
110	1	8307.46	310.07	1.2	1.2	0.04		
111	1	8300.07	310.07	1.2	1.2	0.04		
112	1	8292.84	310.07	1.2	1.1	0.04		
113	1	8285.76	310.07	1.1	1.1	0.04		
114	1	8278.83	310.07	1.1	1.1	0.04		
115	1	8272.04	310.07	1.1	1.0	0.04		
116	1	8265.39	310.07	1.0	1.0	0.04		
117	1	8258.88	310.06	1.0	1.0	0.04		
118	1	8252.51	310.06	1.0	0.9	0.04		
119	1	8246.27	310.06	0.9	0.9	0.04		
120	1	8240.15	310.06	0.9	0.9	0.04		
121	1	8234.17	310.06	0.9	0.8	0.04		
122	1	8228.31	310.06	0.9	0.8	0.04		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
123	1	8222.57	310.06	0.8	0.8	0.04		
124	1	8216.95	310.05	0.8	0.8	0.04		
125	1	8211.44	310.05	0.8	0.7	0.04		
126	1	8206.05	310.05	0.8	0.7	0.04		
127	1	8200.77	310.05	0.7	0.7	0.04		
128	1	8195.60	310.05	0.7	0.7	0.04		
129	1	8190.53	310.05	0.7	0.7	0.04		
130	1	8185.57	310.05	0.7	0.6	0.04		
131	1	8180.71	310.05	0.6	0.6	0.04		
132	1	8175.95	310.05	0.6	0.6	0.04		
133	1	8171.29	310.04	0.6	0.6	0.04		
134	1	8166.73	310.04	0.6	0.6	0.04		
135	0	8162.25	310.04	0.6	0.5	0.04		
136	0	8157.87	310.04	0.6	0.5	0.04		
137	0	8153.58	310.04	0.5	0.5	0.04		
138	0	8149.37	310.04	0.5	0.5	0.04		
139	0	8145.25	310.04	0.5	0.5	0.04		
140	0	8141.22	310.04	0.5	0.5	0.04		
141	0	8137.26	310.04	0.5	0.4	0.04		
142	0	8133.39	310.04	0.5	0.4	0.04		
143	0	8129.59	310.04	0.4	0.4	0.04		
144	0	8125.87	310.04	0.4	0.4	0.04		
145	0	8122.22	310.03	0.4	0.4	0.04		
146	0	8118.65	310.03	0.4	0.4	0.04		
147	0	8115.15	310.03	0.4	0.4	0.04		
148	0	8111.72	310.03	0.4	0.3	0.04		
149	0	8108.36	310.03	0.4	0.3	0.04		
150	0	8105.07	310.03	0.4	0.3	0.04		
151	0	8101.84	310.03	0.3	0.3	0.04		

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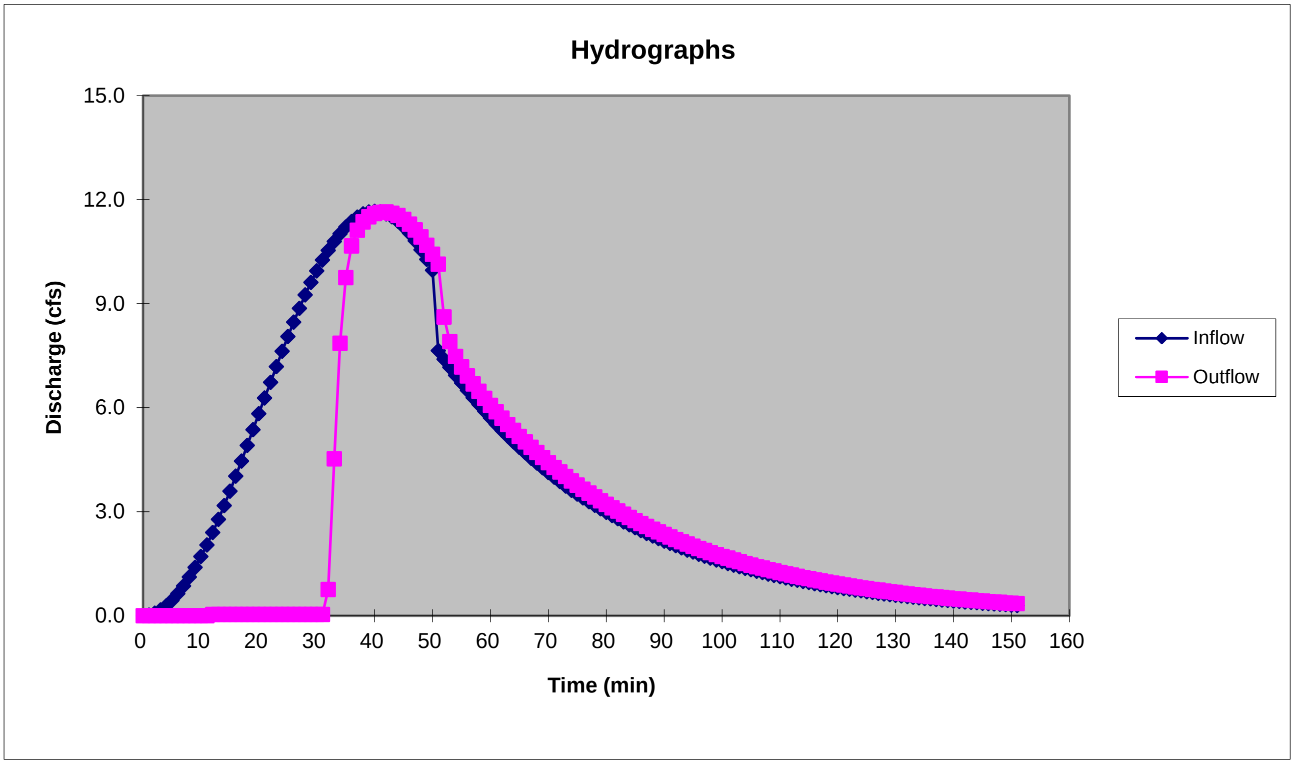
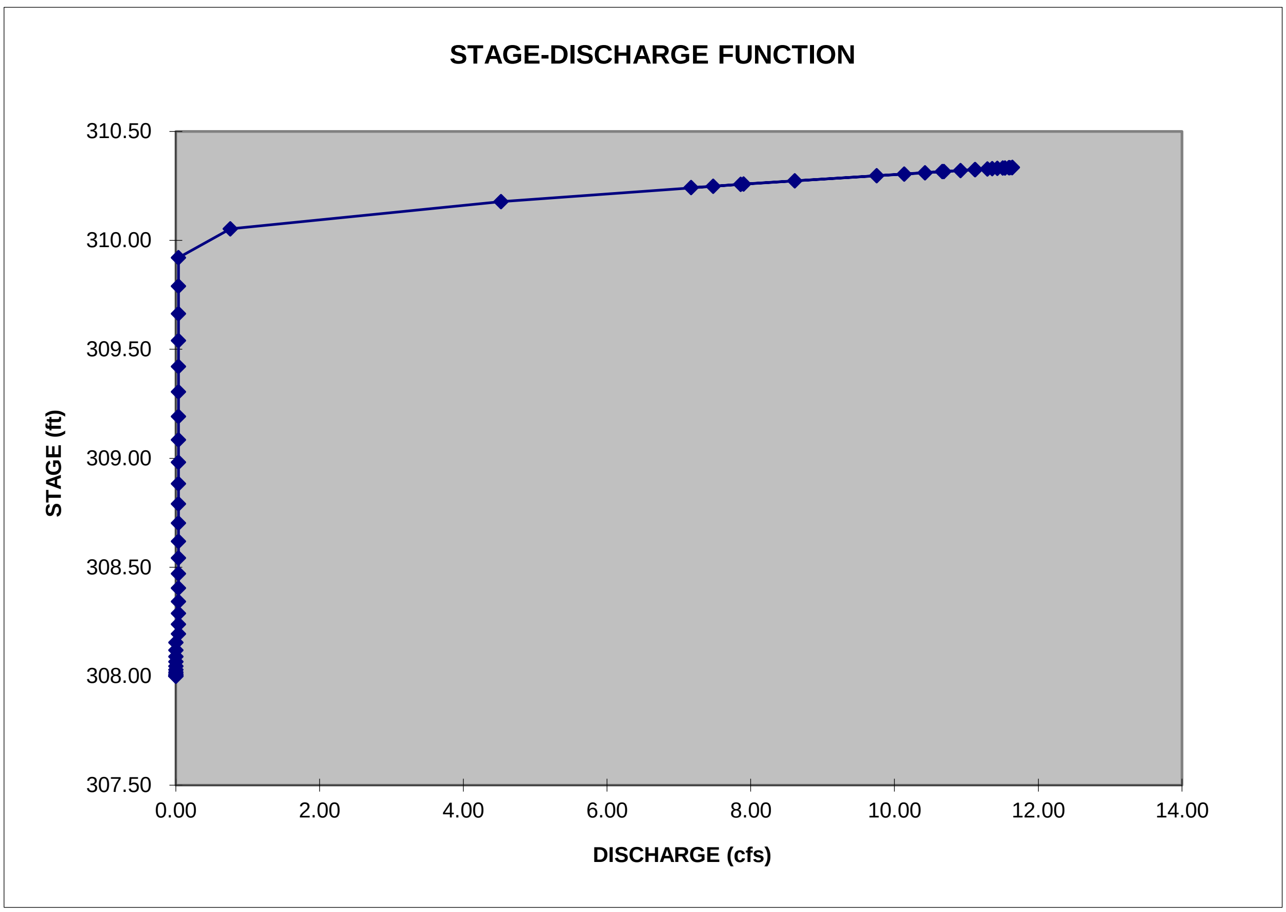
GRAPHED DATA FOR 10 YEAR STORM





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ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	310.37 ft
		Rise =	2.37 ft
Freeboard =	1.63 ft	Peak Outflow =	13.37 cfs

INPUT

Hydrograph Results:

Qp = 13.39 cfs
Tp = 40.0 min
dT = 1.0 min

Stage-Storage Results:

Ks = 3547
b = 1.17
Z_0 = 308.0 ft (inv)

Initial Water Level:

Z_i = 308.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 310.00 ft

Top of Dam: 312.00 ft

Skimmer Orifice:

Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 1.58 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	308.00	0.0	0.0	0.0		
1	0	0.00	308.00	0.0	0.0	0.00		
2	0	1.24	308.00	0.0	0.0	0.00		
3	0	6.17	308.00	0.0	0.0	0.00		
4	0	17.25	308.01	0.0	0.0	0.00		
5	1	36.88	308.02	0.0	0.0	0.00		
6	1	67.40	308.03	0.0	0.0	0.00		
7	1	111.10	308.05	0.0	0.0	0.00		
8	1	170.19	308.07	0.0	0.0	0.00		
9	2	246.77	308.10	0.0	0.0	0.00		
10	2	342.85	308.13	0.0	0.0	0.00		
11	2	460.30	308.17	0.0	0.0	0.04		
12	3	598.62	308.22	0.0	0.0	0.04		
13	3	761.68	308.27	0.0	0.0	0.04		
14	4	950.92	308.32	0.0	0.0	0.04		
15	4	1167.64	308.39	0.0	0.0	0.04		
16	5	1412.96	308.45	0.0	0.0	0.04		
17	5	1687.83	308.53	0.0	0.0	0.04		
18	6	1993.01	308.61	0.0	0.0	0.04		
19	6	2329.10	308.70	0.0	0.0	0.04		
20	7	2696.46	308.79	0.0	0.0	0.04		
21	7	3095.32	308.89	0.0	0.0	0.04		
22	8	3525.65	308.99	0.0	0.0	0.04		
23	8	3987.28	309.11	0.0	0.0	0.04		
24	9	4479.82	309.22	0.0	0.0	0.04		
25	9	5002.70	309.34	0.0	0.0	0.04		
26	10	5555.16	309.47	0.0	0.0	0.04		
27	10	6136.25	309.60	0.0	0.0	0.04		
28	11	6744.85	309.73	0.0	0.0	0.04		
29	11	7379.68	309.87	0.0	0.0	0.04		
30	11	8039.29	310.02	0.2	0.1	0.04		
31	12	8714.38	310.16	3.9	3.9	0.04		
32	12	9186.24	310.26	8.0	8.0	0.04		
33	12	9430.51	310.31	10.5	10.5	0.04		
34	13	9543.72	310.34	11.7	11.7	0.04		
35	13	9599.31	310.35	12.3	12.3	0.04		
36	13	9631.34	310.35	12.7	12.7	0.04		
37	13	9652.86	310.36	12.9	12.9	0.04		
38	13	9668.47	310.36	13.1	13.1	0.04		
39	13	9679.69	310.36	13.2	13.2	0.04		
40	13	9687.04	310.37	13.3	13.3	0.04		
41	13	9690.68	310.37	13.4	13.3	0.04		
42	13	9690.67	310.37	13.4	13.3	0.04		
43	13	9687.04	310.37	13.3	13.3	0.04		
44	13	9679.83	310.36	13.2	13.2	0.04		
45	13	9669.07	310.36	13.1	13.1	0.04		
46	13	9654.82	310.36	13.0	12.9	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	12	9637.14	310.36	12.8	12.7	0.04		
48	12	9616.10	310.35	12.5	12.5	0.04		
49	12	9591.78	310.35	12.3	12.2	0.04		
50	11	9564.28	310.34	11.9	11.9	0.04		
51	8	9533.70	310.33	11.6	11.6	0.04		
52	7	9295.48	310.28	9.1	9.1	0.04		
53	7	9192.84	310.26	8.1	8.1	0.04		
54	7	9137.05	310.25	7.6	7.5	0.04		
55	7	9099.70	310.24	7.2	7.2	0.04		
56	6	9070.21	310.24	6.9	6.9	0.04		
57	6	9044.31	310.23	6.7	6.7	0.04		
58	6	9020.24	310.23	6.5	6.4	0.04		
59	6	8997.24	310.22	6.3	6.2	0.04		
60	6	8974.98	310.22	6.1	6.0	0.04		
61	6	8953.31	310.21	5.9	5.8	0.04		
62	5	8932.15	310.21	5.7	5.7	0.04		
63	5	8911.47	310.20	5.5	5.5	0.04		
64	5	8891.25	310.20	5.3	5.3	0.04		
65	5	8871.46	310.19	5.2	5.1	0.04		
66	5	8852.10	310.19	5.0	5.0	0.04		
67	5	8833.16	310.19	4.9	4.8	0.04		
68	4	8814.63	310.18	4.7	4.7	0.04		
69	4	8796.49	310.18	4.6	4.5	0.04		
70	4	8778.73	310.17	4.4	4.4	0.04		
71	4	8761.36	310.17	4.3	4.2	0.04		
72	4	8744.36	310.17	4.1	4.1	0.04		
73	4	8727.73	310.16	4.0	4.0	0.04		
74	4	8711.45	310.16	3.9	3.8	0.04		
75	4	8695.51	310.16	3.8	3.7	0.04		
76	3	8679.92	310.15	3.6	3.6	0.04		
77	3	8664.66	310.15	3.5	3.5	0.04		
78	3	8649.72	310.15	3.4	3.4	0.04		
79	3	8635.10	310.14	3.3	3.3	0.04		
80	3	8620.79	310.14	3.2	3.2	0.04		
81	3	8606.79	310.14	3.1	3.1	0.04		
82	3	8593.09	310.14	3.0	3.0	0.04		
83	3	8579.67	310.13	2.9	2.9	0.04		
84	3	8566.55	310.13	2.8	2.8	0.04		
85	3	8553.70	310.13	2.7	2.7	0.04		
86	2	8541.12	310.12	2.7	2.6	0.04		
87	2	8528.81	310.12	2.6	2.5	0.04		
88	2	8516.76	310.12	2.5	2.5	0.04		
89	2	8504.97	310.12	2.4	2.4	0.04		
90	2	8493.42	310.11	2.3	2.3	0.04		
91	2	8482.13	310.11	2.3	2.2	0.04		
92	2	8471.07	310.11	2.2	2.2	0.04		
93	2	8460.24	310.11	2.1	2.1	0.04		
94	2	8449.64	310.10	2.1	2.0	0.04		
95	2	8439.27	310.10	2.0	2.0	0.04		
96	2	8429.11	310.10	1.9	1.9	0.04		
97	2	8419.17	310.10	1.9	1.8	0.04		
98	2	8409.44	310.10	1.8	1.8	0.04		
99	2	8399.91	310.09	1.8	1.7	0.04		
100	2	8390.59	310.09	1.7	1.7	0.04		
101	2	8381.46	310.09	1.7	1.6	0.04		
102	1	8372.52	310.09	1.6	1.6	0.04		
103	1	8363.77	310.09	1.6	1.5	0.04		
104	1	8355.21	310.08	1.5	1.5	0.04		
105	1	8346.82	310.08	1.5	1.4	0.04		
106	1	8338.61	310.08	1.4	1.4	0.04		
107	1	8330.57	310.08	1.4	1.3	0.04		
108	1	8322.70	310.08	1.3	1.3	0.04		
109	1	8315.00	310.08	1.3	1.3	0.04		
110	1	8307.46	310.07	1.2	1.2	0.04		
111	1	8300.07	310.07	1.2	1.2	0.04		
112	1	8292.84	310.07	1.2	1.1	0.04		
113	1	8285.76	310.07	1.1	1.1	0.04		
114	1	8278.83	310.07	1.1	1.1	0.04		
115	1	8272.04	310.07	1.1	1.0	0.04		
116	1	8265.39	310.07	1.0	1.0	0.04		
117	1	8258.88	310.06	1.0	1.0	0.04		
118	1	8252.51	310.06	1.0	0.9	0.04		
119	1	8246.27	310.06	0.9	0.9	0.04		
120	1	8240.15	310.06	0.9	0.9	0.04		
121	1	8234.17	310.06	0.9	0.8	0.04		
122	1	8228.31	310.06	0.9	0.8	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	8222.57	310.06	0.8	0.8	0.04		
124	1	8216.95	310.05	0.8	0.8	0.04		
125	1	8211.44	310.05	0.8	0.7	0.04		
126	1	8206.05	310.05	0.8	0.7	0.04		
127	1	8200.77	310.05	0.7	0.7	0.04		
128	1	8195.60	310.05	0.7	0.7	0.04		
129	1	8190.53	310.05	0.7	0.7	0.04		
130	1	8185.57	310.05	0.7	0.6	0.04		
131	1	8180.71	310.05	0.6	0.6	0.04		
132	1	8175.95	310.05	0.6	0.6	0.04		
133	1	8171.29	310.04	0.6	0.6	0.04		
134	1	8166.73	310.04	0.6	0.6	0.04		
135	0	8162.25	310.04	0.6	0.5	0.04		
136	0	8157.87	310.04	0.6	0.5	0.04		
137	0	8153.58	310.04	0.5	0.5	0.04		
138	0	8149.37	310.04	0.5	0.5	0.04		
139	0	8145.25	310.04	0.5	0.5	0.04		
140	0	8141.22	310.04	0.5	0.5	0.04		
141	0	8137.26	310.04	0.5	0.4	0.04		
142	0	8133.39	310.04	0.5	0.4	0.04		
143	0	8129.59	310.04	0.4	0.4	0.04		
144	0	8125.87	310.04	0.4	0.4	0.04		
145	0	8122.22	310.03	0.4	0.4	0.04		
146	0	8118.65	310.03	0.4	0.4	0.04		
147	0	8115.15	310.03	0.4	0.4	0.04		
148	0	8111.72	310.03	0.4	0.3	0.04		
149	0	8108.36	310.03	0.4	0.3	0.04		
150	0	8105.07	310.03	0.4	0.3	0.04		
151	0	8101.84	310.03	0.3	0.3	0.04		

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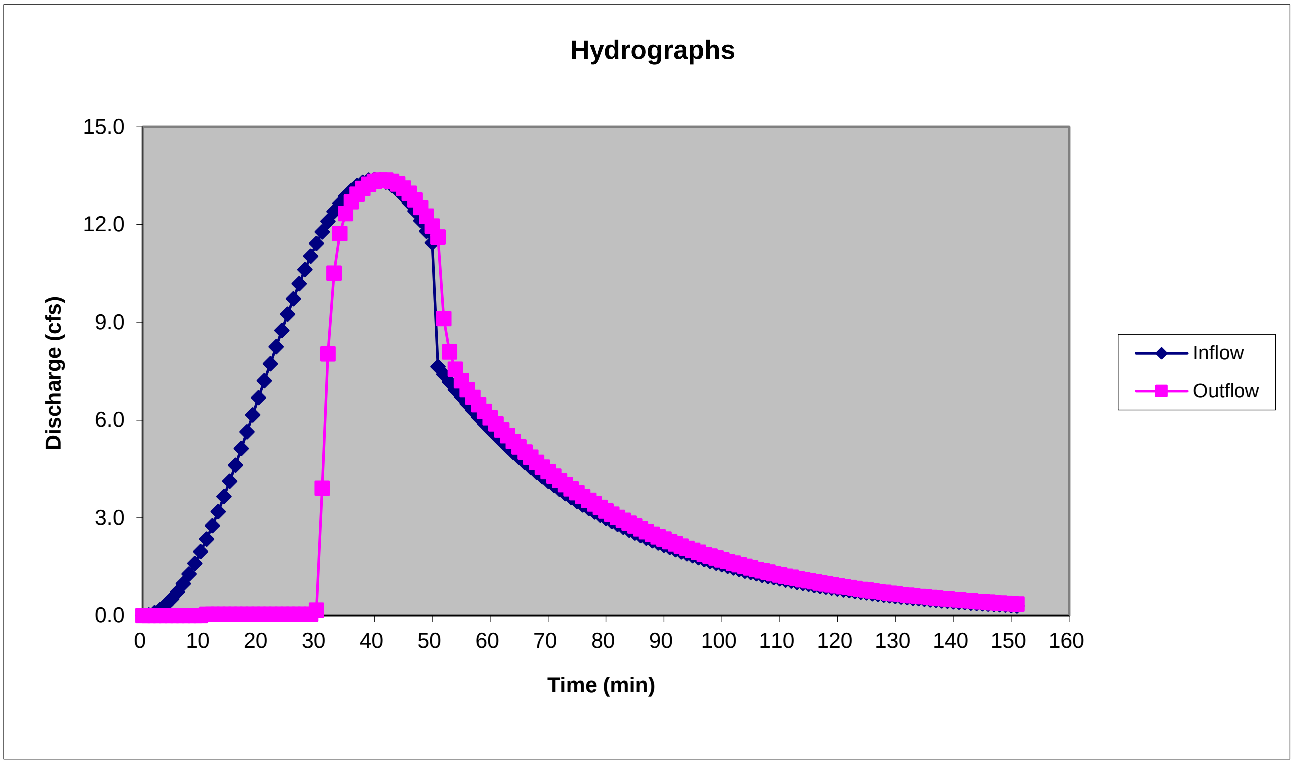
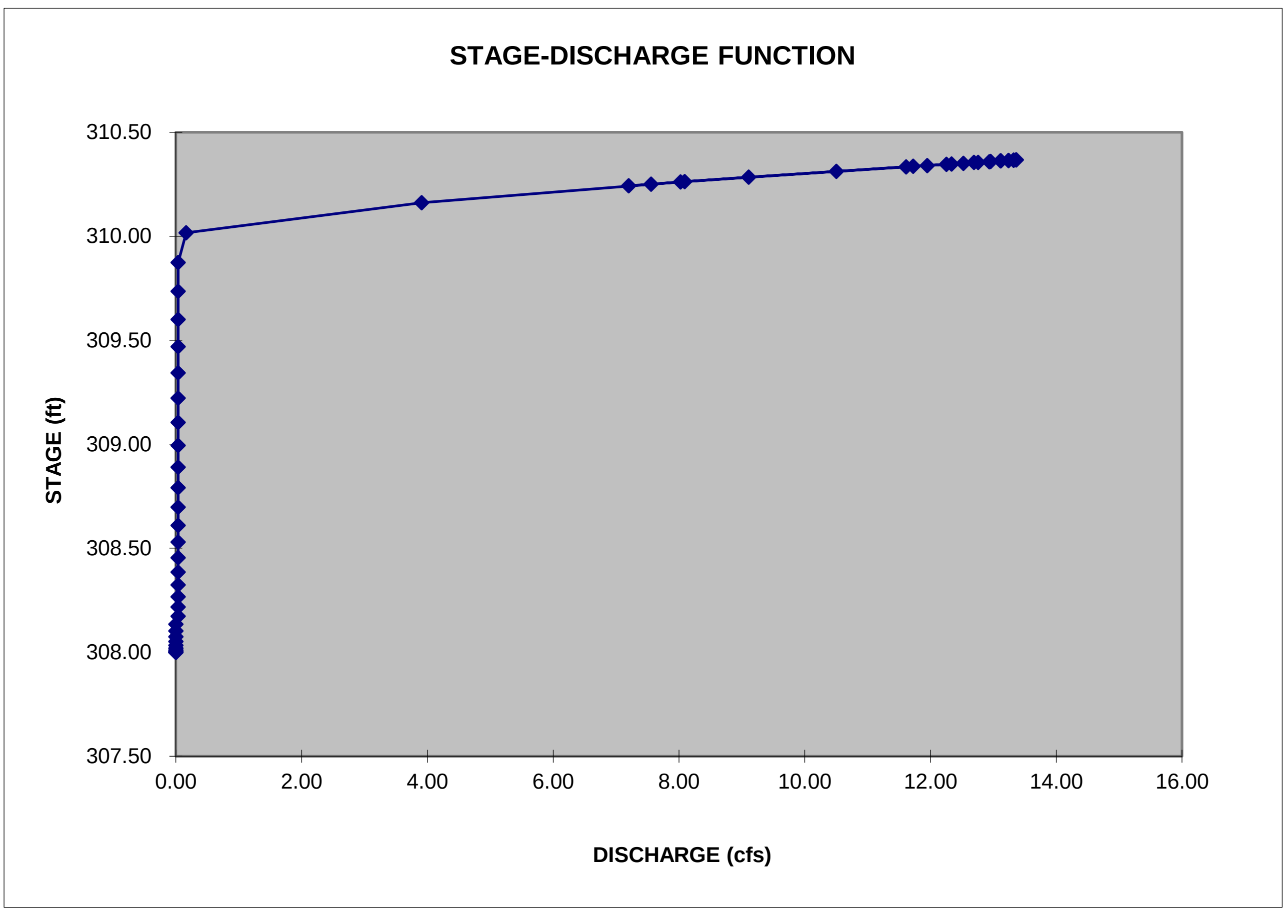
GRAPHED DATA FOR 25 YEAR STORM





McADAMS

ST-3
SKIMMER BASIN
DESIGN

CHAMBLEE LAKE
ZEBULON, NC
DRH22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm

McADAMS

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Sediment Trap ID	ST-3		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	3.59 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	0.00 ac.	0.35
Undisturbed grassy area	0.00 ac.	3.59 ac.	0.25
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	3.59 ac.	3.59 ac.	
Composite Rational 'c'	0.45	0.25	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	661	feet
Height of watershed =	10	feet
Calculated t(c) =	5.8	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.8	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for Raleigh, NC

Return Period	B	D	Intensity
2	132	18	5.54 in/hr
10	195	22	7.01 in/hr
25	232	23	8.05 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	5.54 in/hr	9.0 cfs	4.97 cfs
10-year storm	7.01 in/hr	11.3 cfs	6.29 cfs
25-year storm	8.05 in/hr	13.0 cfs	7.22 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	1,800	cubic feet per disturbed acre
Required sediment trap surface area	325	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	100
Bottom width =	50
Sediment depth =	2.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Emergency Spillway =	2.0
Side slopes =	3.0 H:1V
Emergency Spillway length =	20
Height of berm =	4
Top of trap length =	124
Top of trap width =	74
Bottom elevation =	312

Sediment Trap Data

	Required	Provided
Sediment storage volume =	6462 cu. ft.	11890 cu. ft.
Sediment surface area =	3680 sq. ft.	6940 sq. ft.
Sediment storage depth =	3.5 ft. (max.)	2
Trap bottom length to width ratio =	2.0L:1W (min)	2.0L:1W
Spillway length =	10.0 ft. (min)	20
10-Year flow depth over spillway =	0.50 ft. (max)	0.32 ft
Freeboard at 10-Year discharge =	1.00 ft. (min)	1.68 ft

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU
1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Provided for Sediment Basin = 6,462 cubic feet

24 HOURS	Best Option =	1 - 3 inch Skimmers with a 2.4 inch orifice	
2 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.9 inch orifice	
3 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.6 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.2 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

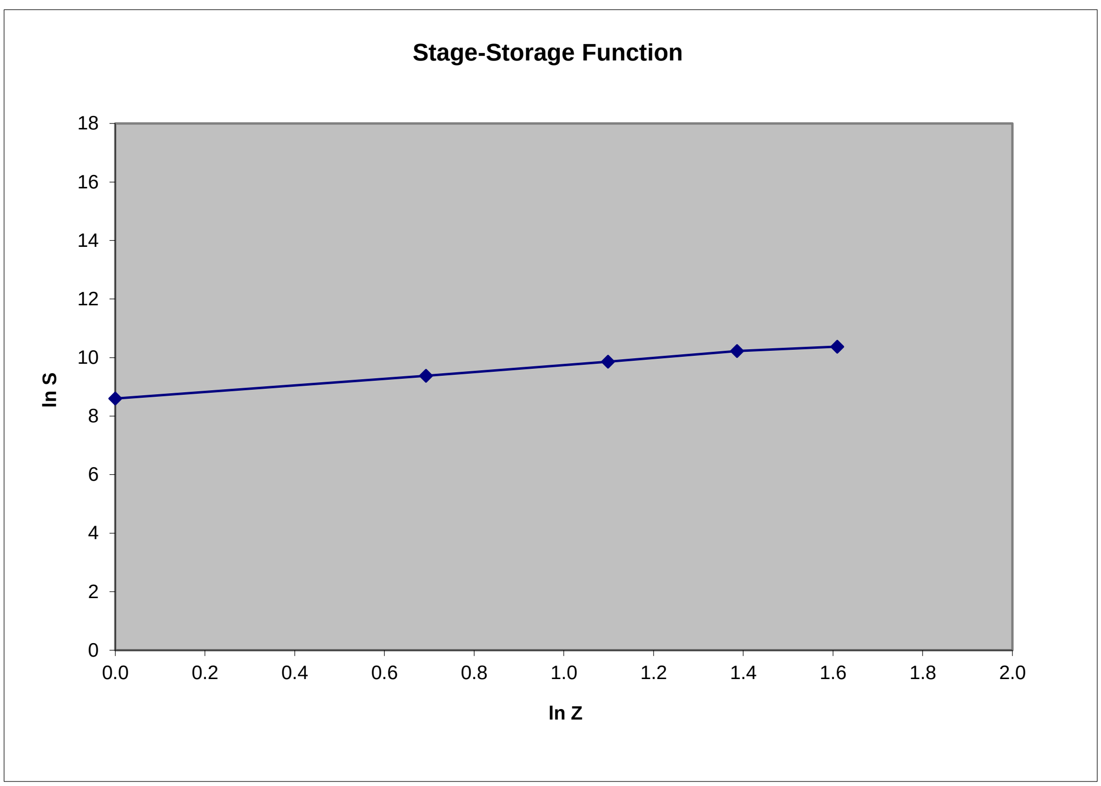
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
312	4979		0	0			
313	5881	5430	5430	1	8.5997	0.0000	1.00
314	6840	6360.5	11790.5	2	9.3750	0.6931	1.98
315	7856	7348	19138.5	3	9.8595	1.0986	3.04
316	8928	8392	27530.5	4	10.2230	1.3863	4.19
317	0	4464	31994.5	5	10.3733	1.6094	4.79

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.13 and K_s = 5455



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HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	3.59	ac	**Use Kirpich Equation:**	
Disturbed Area =	3.59	ac	**Tc =**	5.8 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	661	ft	**i_1 =**	5.54 in/hr
Vertical Fall =	10	ft	**i_{10} =**	7.01 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	8.05 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	9.0 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	11.3 cfs
h =	23		**Q_{25} =**	13.0 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	30.5	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	40.3	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	43.2	**minutes**

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**314.21** ft
		Rise =	**2.21** ft
Freeboard =	**1.79** ft	**Peak Outflow =**	**5.68** cfs

INPUT

Hydrograph Results:

Qp = 8.95 cfs
Tp = 30.5 min
dT = 1.0 min

Stage-Storage Results:

Ks = 5455
b = 1.13
Z_0 = 312.0 ft (inv)

Initial Water Level:

Z_i = 312.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

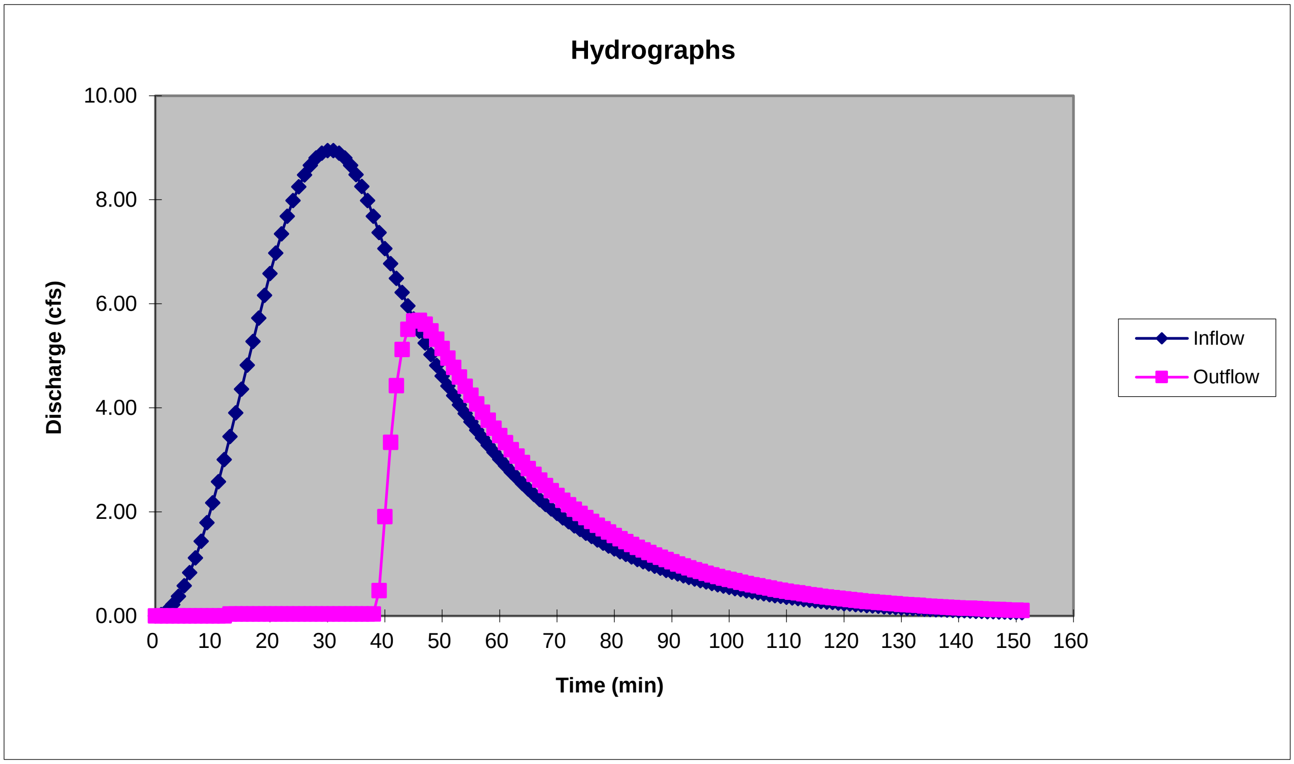
Skimmer Orifice:

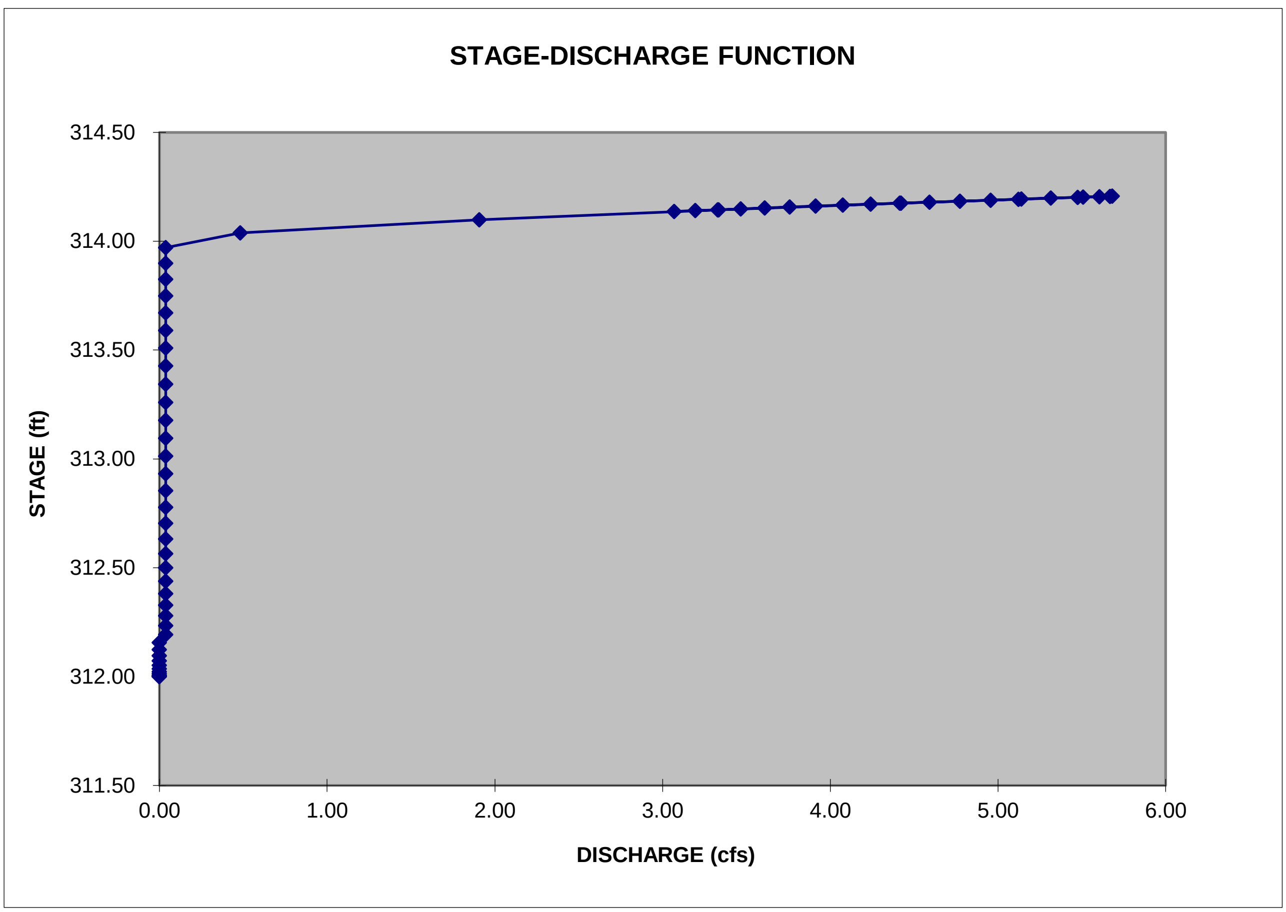
Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 1.56 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	312.00	0.0	0.0	0.0		
1	0	0.00	312.00	0.0	0.0	0.00		
2	0	1.42	312.00	0.0	0.0	0.00		
3	0	7.10	312.00	0.0	0.0	0.00		
4	0	19.82	312.01	0.0	0.0	0.00		
5	1	42.28	312.01	0.0	0.0	0.00		
6	1	77.11	312.02	0.0	0.0	0.00		
7	1	126.77	312.04	0.0	0.0	0.00		
8	1	193.59	312.05	0.0	0.0	0.00		
9	2	279.70	312.07	0.0	0.0	0.00		
10	2	387.04	312.10	0.0	0.0	0.00		
11	3	517.32	312.12	0.0	0.0	0.00		
12	3	671.99	312.16	0.0	0.0	0.00		
13	3	852.27	312.19	0.0	0.0	0.04		
14	4	1056.86	312.23	0.0	0.0	0.04		
15	4	1288.65	312.28	0.0	0.0	0.04		
16	5	1547.99	312.33	0.0	0.0	0.04		
17	5	1834.98	312.38	0.0	0.0	0.04		
18	6	2149.38	312.44	0.0	0.0	0.04		
19	6	2490.69	312.50	0.0	0.0	0.04		
20	7	2858.11	312.56	0.0	0.0	0.04		
21	7	3250.57	312.63	0.0	0.0	0.04		
22	7	3666.74	312.70	0.0	0.0	0.04		
23	8	4105.02	312.78	0.0	0.0	0.04		
24	8	4563.60	312.85	0.0	0.0	0.04		
25	8	5040.43	312.93	0.0	0.0	0.04		
26	8	5533.29	313.01	0.0	0.0	0.04		
27	9	6039.76	313.09	0.0	0.0	0.04		
28	9	6557.32	313.18	0.0	0.0	0.04		
29	9	7083.29	313.26	0.0	0.0	0.04		
30	9	7614.93	313.34	0.0	0.0	0.04		
31	9	8149.41	313.43	0.0	0.0	0.04		
32	9	8683.91	313.51	0.0	0.0	0.04		
33	9	9215.57	313.59	0.0	0.0	0.04		
34	9	9741.59	313.67	0.0	0.0	0.04		
35	8	10259.21	313.75	0.0	0.0	0.04		
36	8	10765.76	313.83	0.0	0.0	0.04		
37	8	11258.71	313.90	0.0	0.0	0.04		
38	8	11735.65	313.97	0.0	0.0	0.04		
39	7	12194.35	314.04	0.5	0.4	0.04		
40	7	12607.68	314.10	1.9	1.9	0.04		

GRAPHED DATA FOR 2 YEAR STORM





ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

Peak Stage =	314.32 ft
Rise =	2.32 ft
Freeboard =	1.68 ft
Peak Outflow =	10.77 cfs

INPUT

Hydrograph Results:

Qp =	11.32	cfs
Tp =	40.3	min
dT =	1.0	min

Stage-Storage Results:

Ks =	5455	
b =	1.13	
Z_0 =	312.0	ft (inv)

Initial Water Level:

Z_i =	312.00	ft

Weir:

N =	1	
L =	20	ft
Cw =	3.00	
Zcr =	314.00	ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number =	1	Ea
Diameter =	2.00	Inches
Head =	1.56	inches

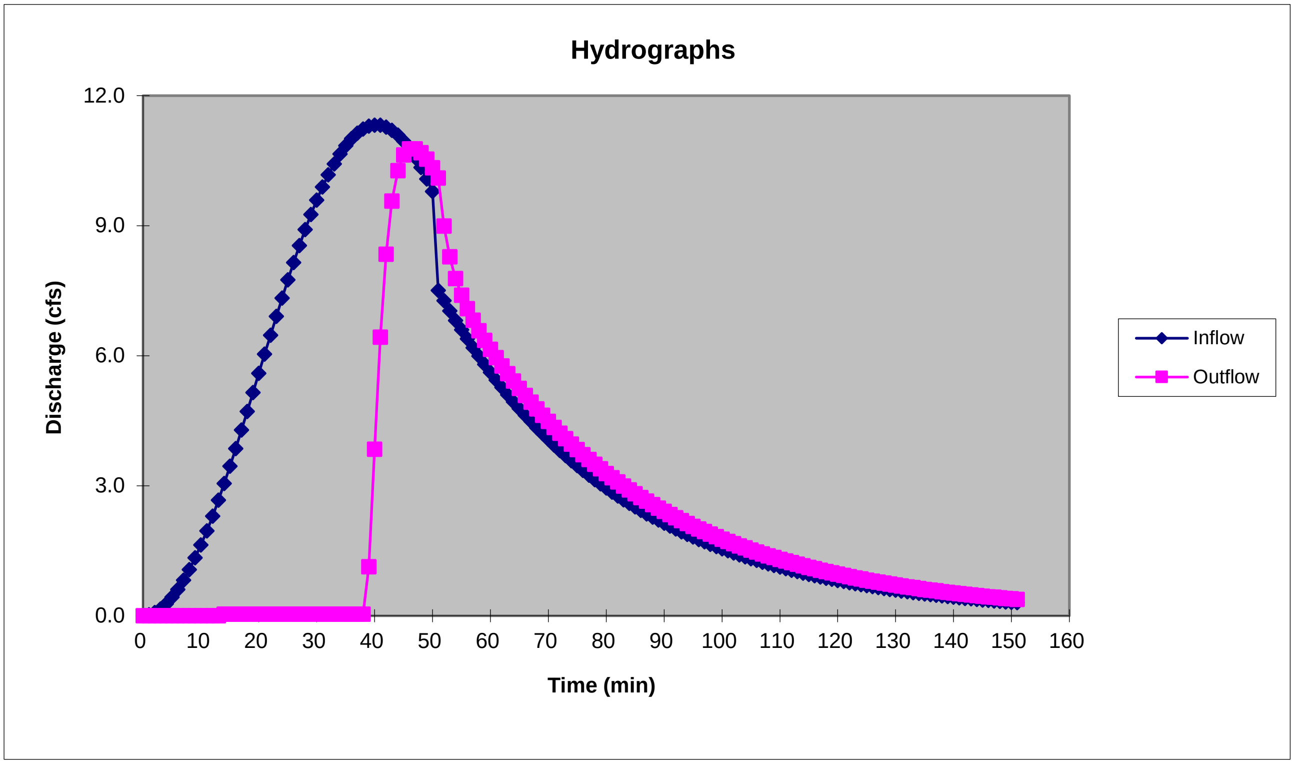
OUTPUT

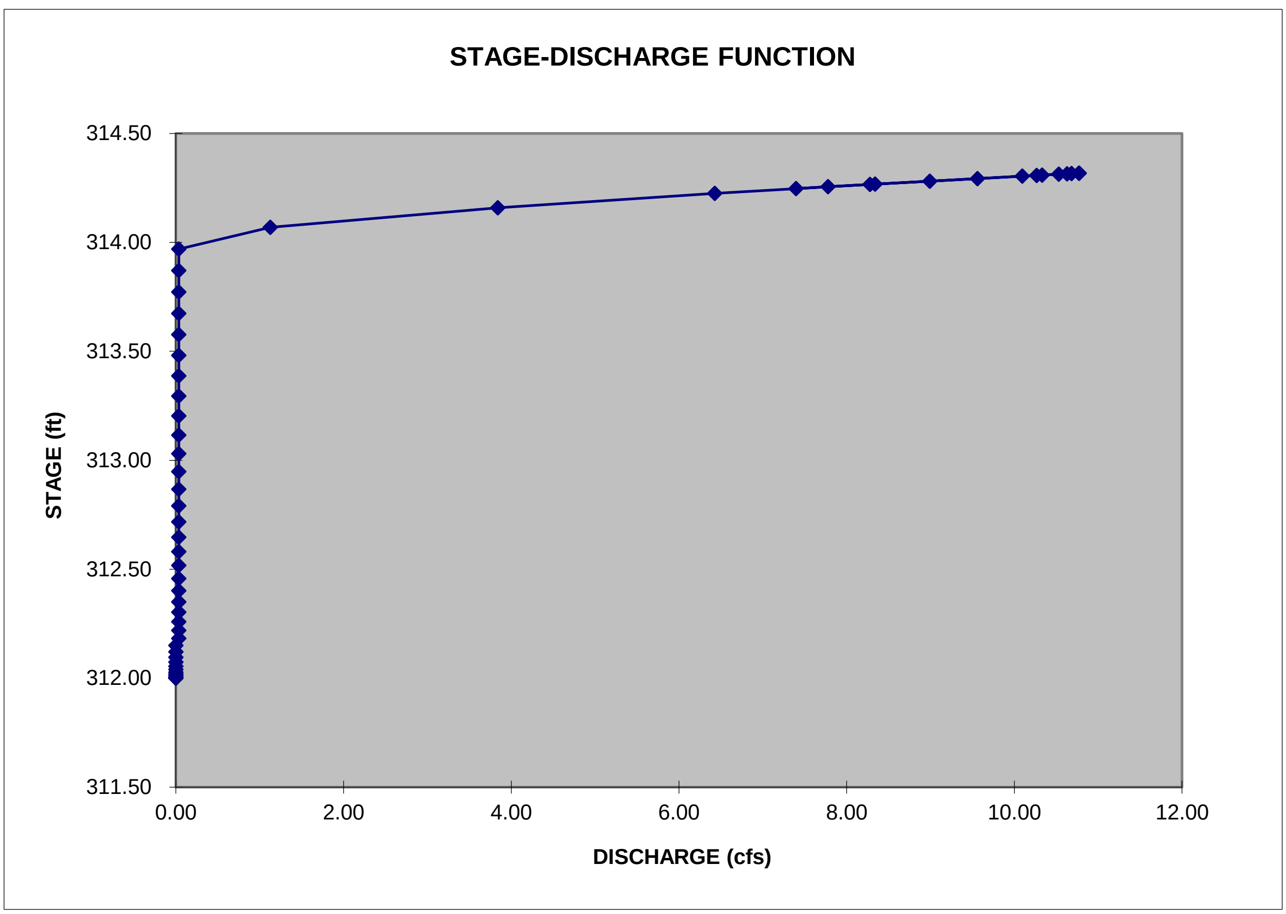
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	312.00	0.0	0.0	0.0		
1	0	0.00	312.00	0.0	0.0	0.00		
2	0	1.03	312.00	0.0	0.0	0.00		
3	0	5.15	312.00	0.0	0.0	0.00		
4	0	14.38	312.01	0.0	0.0	0.00		
5	0	30.75	312.01	0.0	0.0	0.00		
6	1	56.20	312.02	0.0	0.0	0.00		
7	1	92.65	312.03	0.0	0.0	0.00		
8	1	141.93	312.04	0.0	0.0	0.00		
9	1	205.81	312.05	0.0	0.0	0.00		
10	2	285.95	312.07	0.0	0.0	0.00		
11	2	383.95	312.10	0.0	0.0	0.00		
12	2	501.25	312.12	0.0	0.0	0.00		
13	3	639.22	312.15	0.0	0.0	0.00		
14	3	799.07	312.18	0.0	0.0	0.04		
15	3	979.66	312.22	0.0	0.0	0.04		
16	4	1184.17	312.26	0.0	0.0	0.04		
17	4	1413.42	312.30	0.0	0.0	0.04		
18	5	1668.07	312.35	0.0	0.0	0.04		
19	5	1948.60	312.40	0.0	0.0	0.04		
20	6	2255.37	312.46	0.0	0.0	0.04		
21	6	2588.57	312.52	0.0	0.0	0.04		
22	6	2948.22	312.58	0.0	0.0	0.04		
23	7	3334.18	312.65	0.0	0.0	0.04		
24	7	3746.16	312.72	0.0	0.0	0.04		
25	8	4183.71	312.79	0.0	0.0	0.04		
26	8	4646.22	312.87	0.0	0.0	0.04		
27	9	5132.94	312.95	0.0	0.0	0.04		
28	9	5642.95	313.03	0.0	0.0	0.04		
29	9	6175.21	313.12	0.0	0.0	0.04		
30	10	6728.53	313.20	0.0	0.0	0.04		
31	10	7301.62	313.29	0.0	0.0	0.04		
32	10	7893.03	313.39	0.0	0.0	0.04		
33	10	8501.22	313.48	0.0	0.0	0.04		
34	11	9124.57	313.58	0.0	0.0	0.04		
35	11	9761.32	313.67	0.0	0.0	0.04		
36	11	10409.66	313.77	0.0	0.0	0.04		
37	11	11067.70	313.87	0.0	0.0	0.04		
38	11	11733.51	313.97	0.0	0.0	0.04		
39	11	12405.09	314.07	1.1	1.1	0.04		
40	11	13014.92	314.16	3.8	3.8	0.04		
41	11	13463.78	314.22	6.4	6.4	0.04		
42	11	13756.90	314.27	8.3	8.3	0.04		
43	11	13932.92	314.29	9.6	9.5	0.04		
44	11	14031.10	314.31	10.3	10.2	0.04		
45	11	14080.48	314.31	10.6	10.6	0.04		
46	11	14099.76	314.32	10.8	10.7	0.04		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
47	11	14100.13	**314.32**	10.8	10.7	0.04		
48	10	14088.08	314.32	10.7	10.6	0.04		
49	10	14067.32	314.31	10.5	10.5	0.04		
50	10	14039.96	314.31	10.3	10.3	0.04		
51	8	14007.23	314.30	10.1	10.1	0.04		
52	7	13851.71	314.28	9.0	9.0	0.04		
53	7	13748.09	314.27	8.3	8.2	0.04		
54	7	13673.34	314.26	7.8	7.7	0.04		
55	7	13615.29	314.25	7.4	7.4	0.04		
56	6	13567.20	314.24	7.1	7.0	0.04		
57	6	13525.28	314.23	6.8	6.8	0.04		
58	6	13487.30	314.23	6.6	6.5	0.04		
59	6	13451.95	314.22	6.4	6.3	0.04		
60	6	13418.47	314.22	6.1	6.1	0.04		
61	5	13386.37	314.21	6.0	5.9	0.04		
62	5	13355.37	314.21	5.8	5.7	0.04		
63	5	13325.27	314.20	5.6	5.5	0.04		
64	5	13295.98	314.20	5.4	5.4	0.04		
65	5	13267.40	314.20	5.2	5.2	0.04		
66	5	13239.49	314.19	5.1	5.0	0.04		
67	4	13212.21	314.19	4.9	4.9	0.04		
68	4	13185.54	314.18	4.8	4.7	0.04		
69	4	13159.44	314.18	4.6	4.6	0.04		
70	4	13133.90	314.18	4.5	4.4	0.04		
71	4	13108.90	314.17	4.3	4.3	0.04		
72	4	13084.44	314.17	4.2	4.2	0.04		
73	4	13060.49	314.17	4.1	4.0	0.04		
74	4	13037.06	314.16	4.0	3.9	0.04		
75	3	13014.11	314.16	3.8	3.8	0.04		
76	3	12991.65	314.16	3.7	3.7	0.04		
77	3	12969.66	314.15	3.6	3.6	0.04		
78	3	12948.13	314.15	3.5	3.5	0.04		
79	3	12927.06	314.15	3.4	3.3	0.04		
80	3	12906.43	314.14	3.3	3.2	0.04		
81	3	12886.23	314.14	3.2	3.1	0.04		
82	3	12866.45	314.14	3.1	3.0	0.04		
83	3	12847.09	314.13	3.0	3.0	0.04		
84	3	12828.14	314.13	2.9	2.9	0.04		
85	3	12809.58	314.13	2.8	2.8	0.04		
86	2	12791.41	314.13	2.7	2.7	0.04		
87	2	12773.62	314.12	2.6	2.6	0.04		
88	2	12756.20	314.12	2.6	2.5	0.04		
89	2	12739.15	314.12	2.5	2.4	0.04		
90	2	12722.45	314.12	2.4	2.4	0.04		
91	2	12706.10	314.11	2.3	2.3	0.04		
92	2	12690.09	314.11	2.3	2.2	0.04		
93	2	12674.41	314.11	2.2	2.2	0.04		
94	2	12659.06	314.11	2.1	2.1	0.04		
95	2	12644.03	314.10	2.1	2.0	0.04		
96	2	12629.32	314.10	2.0	2.0	0.04		
97	2	12614.91	314.10	1.9	1.9	0.04		
98	2	12600.79	314.10	1.9	1.8	0.04		
99	2	12586.98	314.10	1.8	1.8	0.04		
100	2	12573.44	314.09	1.8	1.7	0.04		
101	1	12560.19	314.09	1.7	1.7	0.04		
102	1	12547.22	314.09	1.7	1.6	0.04		
103	1	12534.51	314.09	1.6	1.6	0.04		
104	1	12522.07	314.09	1.6	1.5	0.04		
105	1	12509.88	314.08	1.5	1.5	0.04		
106	1	12497.94	314.08	1.5	1.4	0.04		
107	1	12486.26	314.08	1.4	1.4	0.04		
108	1	12474.81	314.08	1.4	1.3	0.04		
109	1	12463.60	314.08	1.3	1.3	0.04		
110	1	12452.62	314.08	1.3	1.3	0.04		
111	1	12441.87	314.07	1.3	1.2	0.04		
112	1	12431.33	314.07	1.2	1.2	0.04		
113	1	12421.02	314.07	1.2	1.1	0.04		
114	1	12410.92	314.07	1.1	1.1	0.04		
115	1	12401.02	314.07	1.1	1.1	0.04		
116	1	12391.33	314.07	1.1	1.0	0.04		
117	1	12381.83	314.07	1.0	1.0	0.04		
118	1	12372.53	314.06	1.0	1.0	0.04		
119	1	12363.42	314.06	1.0	0.9	0.04		
120	1	12354.50	314.06	1.0	0.9	0.04		
121	1	12345.76	314.06	0.9	0.9	0.04		
122	1	12337.20	314.06	0.9	0.9	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	12328.81	314.06	0.9	0.8	0.04		
124	1	12320.60	314.06	0.8	0.8	0.04		
125	1	12312.55	314.06	0.8	0.8	0.04		
126	1	12304.66	314.05	0.8	0.8	0.04		
127	1	12296.94	314.05	0.8	0.7	0.04		
128	1	12289.37	314.05	0.8	0.7	0.04		
129	1	12281.96	314.05	0.7	0.7	0.04		
130	1	12274.69	314.05	0.7	0.7	0.04		
131	1	12267.57	314.05	0.7	0.6	0.04		
132	1	12260.60	314.05	0.7	0.6	0.04		
133	1	12253.77	314.05	0.6	0.6	0.04		
134	1	12247.07	314.05	0.6	0.6	0.04		
135	1	12240.51	314.04	0.6	0.6	0.04		
136	0	12234.09	314.04	0.6	0.6	0.04		
137	0	12227.79	314.04	0.6	0.5	0.04		
138	0	12221.61	314.04	0.6	0.5	0.04		
139	0	12215.57	314.04	0.5	0.5	0.04		
140	0	12209.64	314.04	0.5	0.5	0.04		
141	0	12203.83	314.04	0.5	0.5	0.04		
142	0	12198.14	314.04	0.5	0.5	0.04		
143	0	12192.56	314.04	0.5	0.4	0.04		
144	0	12187.09	314.04	0.5	0.4	0.04		
145	0	12181.73	314.04	0.4	0.4	0.04		
146	0	12176.48	314.04	0.4	0.4	0.04		
147	0	12171.33	314.03	0.4	0.4	0.04		
148	0	12166.28	314.03	0.4	0.4	0.04		
149	0	12161.33	314.03	0.4	0.4	0.04		
150	0	12156.48	314.03	0.4	0.4	0.04		
151	0	12151.73	314.03	0.4	0.3	0.04		

GRAPHED DATA FOR 10 YEAR STORM





McADAMS

ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS			
		Peak Stage =	314.35 ft
		Rise =	2.35 ft
Freeboard =	1.65 ft	Peak Outflow =	12.71 cfs

INPUT

Hydrograph Results:		**Weir:**		**Top of Dam:**	316.00 ft
Qp =	13.00 cfs	N =	1		
Tp =	40.3 min	L =	20 ft	**Skimmer Orifice:**	
dT =	1.0 min	Cw =	3.00	Number =	1.00 Ea
Stage-Storage Results:		Zcr =	314.00 ft	Diameter =	2.00 Inches
Ks =	5455			Head =	1.56 inches
b =	1.13				
Z_0 =	312.0 ft (inv)				
Initial Water Level:					
Z_i =	312.00 ft				

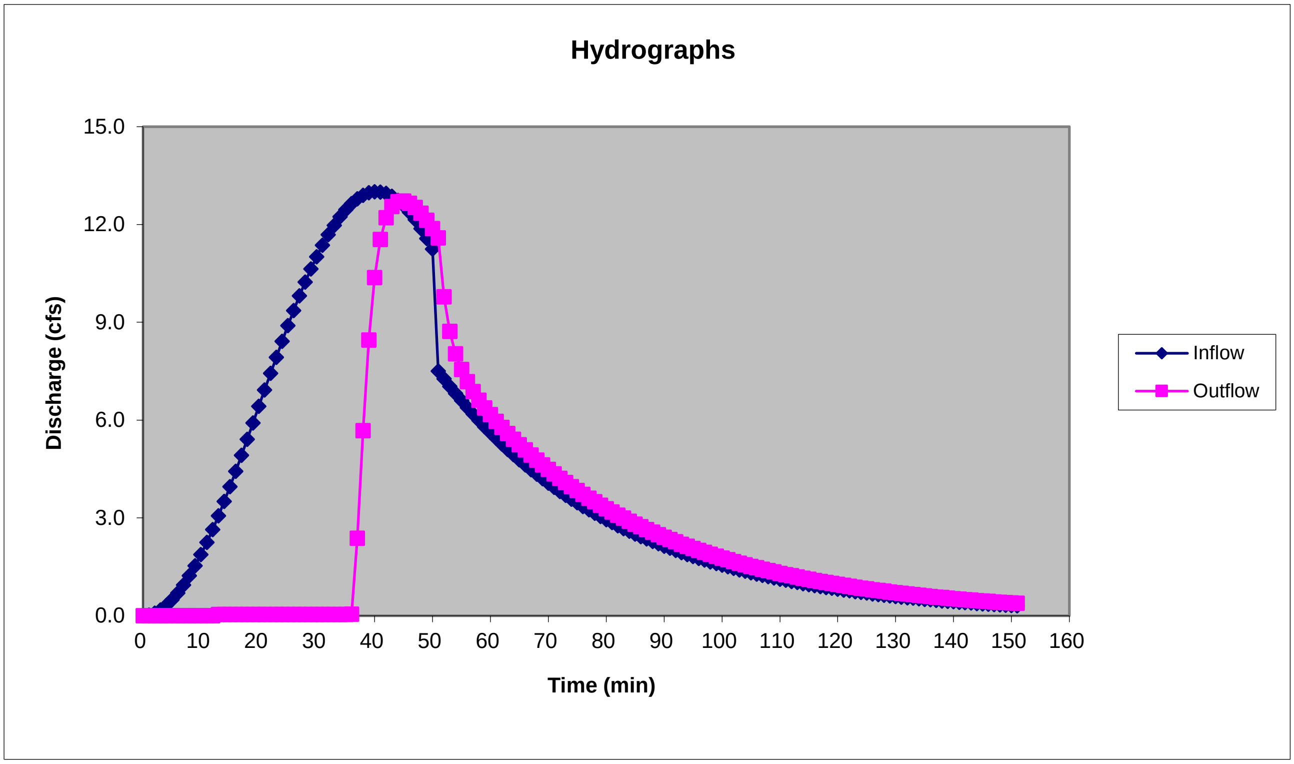
OUTPUT

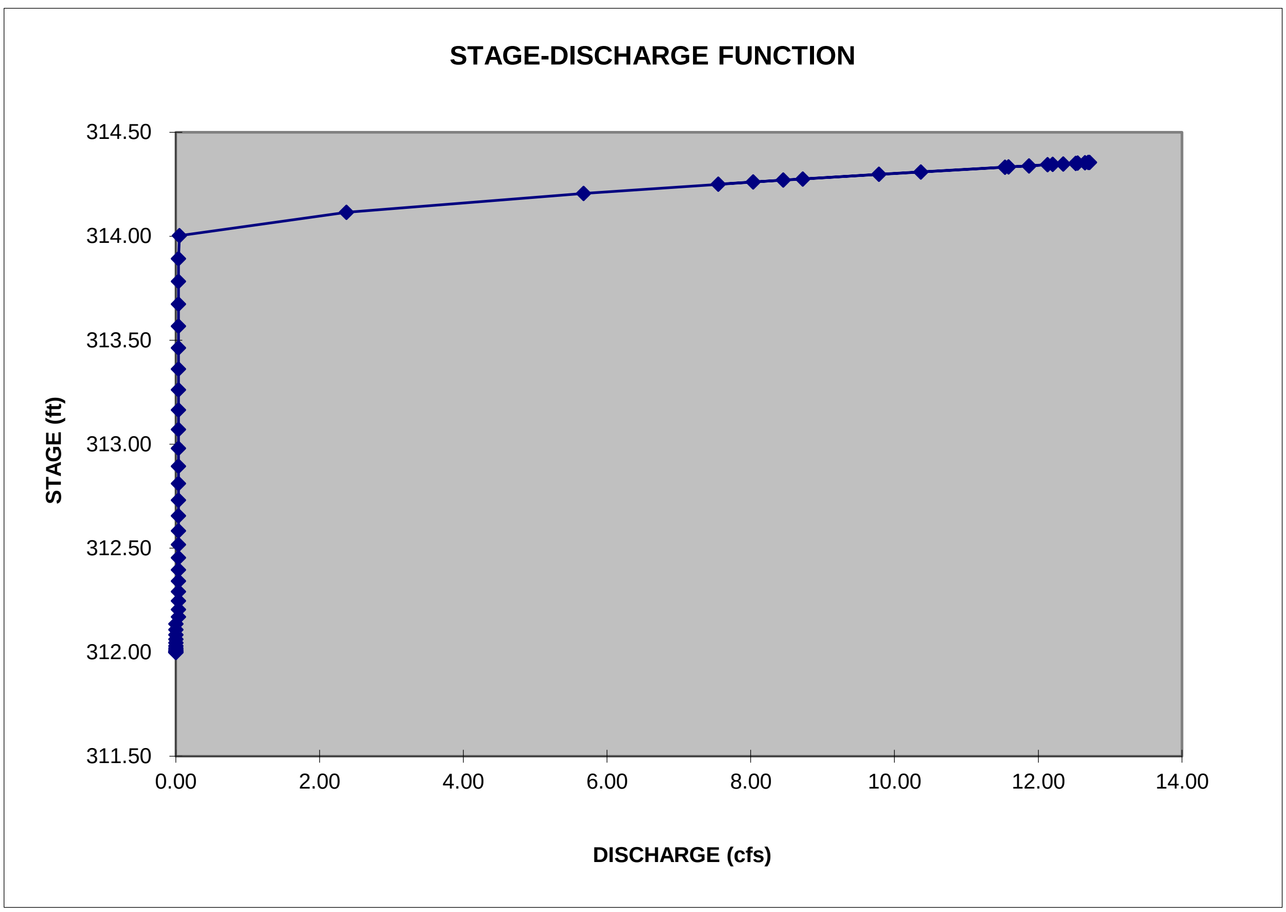
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	312.00	0.0	0.0	0.0		
1	0	0.00	312.00	0.0	0.0	0.00		
2	0	1.18	312.00	0.0	0.0	0.00		
3	0	5.91	312.00	0.0	0.0	0.00		
4	0	16.52	312.01	0.0	0.0	0.00		
5	0	35.31	312.01	0.0	0.0	0.00		
6	1	64.54	312.02	0.0	0.0	0.00		
7	1	106.40	312.03	0.0	0.0	0.00		
8	1	163.00	312.04	0.0	0.0	0.00		
9	2	236.36	312.06	0.0	0.0	0.00		
10	2	328.41	312.08	0.0	0.0	0.00		
11	2	440.95	312.11	0.0	0.0	0.00		
12	3	575.67	312.14	0.0	0.0	0.00		
13	3	734.12	312.17	0.0	0.0	0.04		
14	3	915.47	312.21	0.0	0.0	0.04		
15	4	1123.20	312.25	0.0	0.0	0.04		
16	4	1358.41	312.29	0.0	0.0	0.04		
17	5	1622.03	312.34	0.0	0.0	0.04		
18	5	1914.81	312.40	0.0	0.0	0.04		
19	6	2237.32	312.45	0.0	0.0	0.04		
20	6	2589.97	312.52	0.0	0.0	0.04		
21	7	2972.97	312.58	0.0	0.0	0.04		
22	7	3386.34	312.66	0.0	0.0	0.04		
23	8	3829.94	312.73	0.0	0.0	0.04		
24	8	4303.42	312.81	0.0	0.0	0.04		
25	9	4806.26	312.89	0.0	0.0	0.04		
26	9	5337.77	312.98	0.0	0.0	0.04		
27	10	5897.08	313.07	0.0	0.0	0.04		
28	10	6483.14	313.17	0.0	0.0	0.04		
29	11	7094.76	313.26	0.0	0.0	0.04		
30	11	7730.56	313.36	0.0	0.0	0.04		
31	11	8389.06	313.46	0.0	0.0	0.04		
32	12	9068.61	313.57	0.0	0.0	0.04		
33	12	9767.44	313.67	0.0	0.0	0.04		
34	12	10483.65	313.78	0.0	0.0	0.04		
35	12	11215.27	313.89	0.0	0.0	0.04		
36	13	11960.20	314.00	0.0	0.0	0.04		
37	13	12715.58	314.11	2.4	2.3	0.04		
38	13	13340.28	314.21	5.7	5.6	0.04		
39	13	13773.69	314.27	8.5	8.4	0.04		
40	13	14044.56	314.31	10.4	10.3	0.04		
41	13	14202.67	314.33	11.5	11.5	0.04		
42	13	14290.00	314.35	12.2	12.2	0.04		
43	13	14334.66	314.35	12.5	12.5	0.04		
44	13	14353.51	314.35	12.7	12.7	0.04		
45	13	14356.13	314.35	12.7	12.7	0.04		
46	12	14347.80	314.35	12.7	12.6	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	12	14331.43	314.35	12.5	12.5	0.04		
48	12	14308.60	314.35	12.3	12.3	0.04		
49	12	14280.24	314.34	12.1	12.1	0.04		
50	11	14246.87	314.34	11.9	11.8	0.04		
51	8	14208.87	314.33	11.6	11.5	0.04		
52	7	13963.94	314.30	9.8	9.7	0.04		
53	7	13812.80	314.28	8.7	8.7	0.04		
54	7	13711.52	314.26	8.0	8.0	0.04		
55	7	13638.17	314.25	7.5	7.5	0.04		
56	6	13581.09	314.24	7.2	7.1	0.04		
57	6	13533.79	314.23	6.9	6.8	0.04		
58	6	13492.55	314.23	6.6	6.6	0.04		
59	6	13455.23	314.22	6.4	6.3	0.04		
60	6	13420.52	314.22	6.2	6.1	0.04		
61	5	13387.66	314.21	6.0	5.9	0.04		
62	5	13356.19	314.21	5.8	5.7	0.04		
63	5	13325.80	314.20	5.6	5.6	0.04		
64	5	13296.32	314.20	5.4	5.4	0.04		
65	5	13267.62	314.20	5.2	5.2	0.04		
66	5	13239.64	314.19	5.1	5.0	0.04		
67	4	13212.31	314.19	4.9	4.9	0.04		
68	4	13185.60	314.18	4.8	4.7	0.04		
69	4	13159.48	314.18	4.6	4.6	0.04		
70	4	13133.92	314.18	4.5	4.4	0.04		
71	4	13108.92	314.17	4.3	4.3	0.04		
72	4	13084.45	314.17	4.2	4.2	0.04		
73	4	13060.50	314.17	4.1	4.0	0.04		
74	4	13037.06	314.16	4.0	3.9	0.04		
75	3	13014.11	314.16	3.8	3.8	0.04		
76	3	12991.65	314.16	3.7	3.7	0.04		
77	3	12969.66	314.15	3.6	3.6	0.04		
78	3	12948.14	314.15	3.5	3.5	0.04		
79	3	12927.06	314.15	3.4	3.3	0.04		
80	3	12906.43	314.14	3.3	3.2	0.04		
81	3	12886.23	314.14	3.2	3.1	0.04		
82	3	12866.45	314.14	3.1	3.0	0.04		
83	3	12847.09	314.13	3.0	3.0	0.04		
84	3	12828.14	314.13	2.9	2.9	0.04		
85	3	12809.58	314.13	2.8	2.8	0.04		
86	2	12791.41	314.13	2.7	2.7	0.04		
87	2	12773.62	314.12	2.6	2.6	0.04		
88	2	12756.20	314.12	2.6	2.5	0.04		
89	2	12739.15	314.12	2.5	2.4	0.04		
90	2	12722.45	314.12	2.4	2.4	0.04		
91	2	12706.10	314.11	2.3	2.3	0.04		
92	2	12690.09	314.11	2.3	2.2	0.04		
93	2	12674.41	314.11	2.2	2.2	0.04		
94	2	12659.06	314.11	2.1	2.1	0.04		
95	2	12644.03	314.10	2.1	2.0	0.04		
96	2	12629.32	314.10	2.0	2.0	0.04		
97	2	12614.91	314.10	1.9	1.9	0.04		
98	2	12600.79	314.10	1.9	1.8	0.04		
99	2	12586.98	314.10	1.8	1.8	0.04		
100	2	12573.44	314.09	1.8	1.7	0.04		
101	1	12560.19	314.09	1.7	1.7	0.04		
102	1	12547.22	314.09	1.7	1.6	0.04		
103	1	12534.51	314.09	1.6	1.6	0.04		
104	1	12522.07	314.09	1.6	1.5	0.04		
105	1	12509.88	314.08	1.5	1.5	0.04		
106	1	12497.94	314.08	1.5	1.4	0.04		
107	1	12486.26	314.08	1.4	1.4	0.04		
108	1	12474.81	314.08	1.4	1.3	0.04		
109	1	12463.60	314.08	1.3	1.3	0.04		
110	1	12452.62	314.08	1.3	1.3	0.04		
111	1	12441.87	314.07	1.3	1.2	0.04		
112	1	12431.33	314.07	1.2	1.2	0.04		
113	1	12421.02	314.07	1.2	1.1	0.04		
114	1	12410.92	314.07	1.1	1.1	0.04		
115	1	12401.02	314.07	1.1	1.1	0.04		
116	1	12391.33	314.07	1.1	1.0	0.04		
117	1	12381.83	314.07	1.0	1.0	0.04		
118	1	12372.53	314.06	1.0	1.0	0.04		
119	1	12363.42	314.06	1.0	0.9	0.04		
120	1	12354.50	314.06	1.0	0.9	0.04		
121	1	12345.76	314.06	0.9	0.9	0.04		
122	1	12337.20	314.06	0.9	0.9	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	12328.81	314.06	0.9	0.8	0.04		
124	1	12320.60	314.06	0.8	0.8	0.04		
125	1	12312.55	314.06	0.8	0.8	0.04		
126	1	12304.66	314.05	0.8	0.8	0.04		
127	1	12296.94	314.05	0.8	0.7	0.04		
128	1	12289.37	314.05	0.8	0.7	0.04		
129	1	12281.96	314.05	0.7	0.7	0.04		
130	1	12274.69	314.05	0.7	0.7	0.04		
131	1	12267.57	314.05	0.7	0.6	0.04		
132	1	12260.60	314.05	0.7	0.6	0.04		
133	1	12253.77	314.05	0.6	0.6	0.04		
134	1	12247.07	314.05	0.6	0.6	0.04		
135	1	12240.51	314.04	0.6	0.6	0.04		
136	0	12234.09	314.04	0.6	0.6	0.04		
137	0	12227.79	314.04	0.6	0.5	0.04		
138	0	12221.61	314.04	0.6	0.5	0.04		
139	0	12215.57	314.04	0.5	0.5	0.04		
140	0	12209.64	314.04	0.5	0.5	0.04		
141	0	12203.83	314.04	0.5	0.5	0.04		
142	0	12198.14	314.04	0.5	0.5	0.04		
143	0	12192.56	314.04	0.5	0.4	0.04		
144	0	12187.09	314.04	0.5	0.4	0.04		
145	0	12181.73	314.04	0.4	0.4	0.04		
146	0	12176.48	314.04	0.4	0.4	0.04		
147	0	12171.33	314.03	0.4	0.4	0.04		
148	0	12166.28	314.03	0.4	0.4	0.04		
149	0	12161.33	314.03	0.4	0.4	0.04		
150	0	12156.48	314.03	0.4	0.4	0.04		
151	0	12151.73	314.03	0.4	0.3	0.04		

GRAPHED DATA FOR 25 YEAR STORM





McADAMS

ST-4
SKIMMER BASIN
DESIGN

CHAMBLEE LAKE
ZEBULON, NC
DRH22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Sediment Trap ID	ST-4		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	3.39 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	0.39 ac.	0.35
Undisturbed grassy area	0.00 ac.	3.00 ac.	0.25
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	3.39 ac.	3.39 ac.	
Composite Rational 'c'	0.45	0.26	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	612	feet
Height of watershed =	12	feet
Calculated t(c) =	5.0	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.0	minutes

K Values		
Overland on grassed surfaces:		*2.0*
Overland on paved surfaces:		*0.4*
Channel in natural channels:		*1.0*
Channel in mixed urban setting:		*1.1*
Channel in paved pipes or channels:		*0.2*

Calculate Rainfall Intensity

IDF curves for Raleigh, NC

Return Period	B	D	Intensity	
2	132	18	5.74	in/hr
10	195	22	7.22	in/hr
25	232	23	8.29	in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff	
2-year storm	5.74 in/hr	8.8 cfs	5.09	cfs
10-year storm	7.22 in/hr	11.0 cfs	6.40	cfs
25-year storm	8.29 in/hr	12.6 cfs	7.35	cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	1,800	cubic feet per disturbed acre
Required sediment trap surface area	325	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	100
Bottom width =	50
Sediment depth =	2.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Emergency Spillway =	2.0
Side slopes =	3.0 H:1V
Emergency Spillway length =	20
Height of berm =	4
Top of trap length =	124
Top of trap width =	74
Bottom elevation =	312

Sediment Trap Data

	Required	Provided
Sediment storage volume =	6102 cu. ft.	11890 cu. ft.
Sediment surface area =	3580 sq. ft.	6940 sq. ft.
Sediment storage depth =	3.5 ft. (max.)	2
Trap bottom length to width ratio =	2.0L:1W (min)	2.0L:1W
Spillway length =	10.0 ft. (min)	20
10-Year flow depth over spillway =	0.50 ft. (max)	0.32 ft
Freeboard at 10-Year discharge =	1.00 ft. (min)	1.68 ft

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU
1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Provided for Sediment Basin = 6,102 cubic feet

24 HOURS	Best Option =	1 - 3 inch Skimmers with a 2.4 inch orifice	
2 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.9 inch orifice	
3 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.5 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.2 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

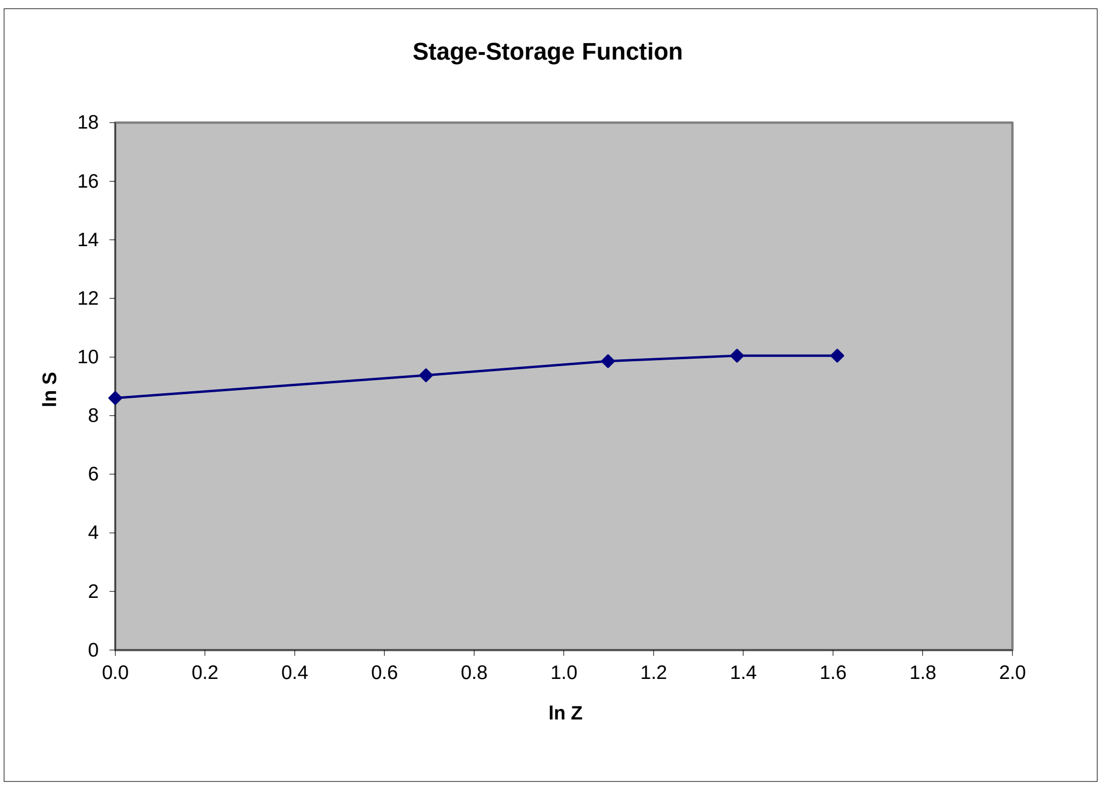
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
312	4979		0	0			
313	5881	5430	5430	1	8.5997	0.0000	0.92
314	6840	6360.5	11790.5	2	9.3750	0.6931	2.09
315	7856	7348	19138.5	3	9.8595	1.0986	3.48
316	0	3928	23066.5	4	10.0461	1.3863	4.23
317	0	0	23066.5	5	10.0461	1.6094	4.23

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 0.95 and **K_s =** 5854



McADAMS

HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	3.39	ac	**Use Kirpich Equation:**	
Disturbed Area =	3.39	ac	**Tc =**	5.0 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	612	ft	**i_1 =**	5.74 in/hr
Vertical Fall =	12	ft	**i_{10} =**	7.22 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	8.29 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	8.8 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	11.0 cfs
h =	23		**Q_{25} =**	12.6 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	29.4	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	39.1	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	42.0	**minutes**

MCADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

Peak Stage =	314.21 ft
Rise =	2.21 ft
Freeboard =	1.79 ft
Peak Outflow =	5.84 cfs

INPUT

Hydrograph Results:

Qp = 8.76 cfs
Tp = 29.4 min
dT = 1.0 min

Stage-Storage Results:

Ks = 5854
b = 0.95
Z_0 = 312.0 ft (inv)

Initial Water Level:

Z_i = 312.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

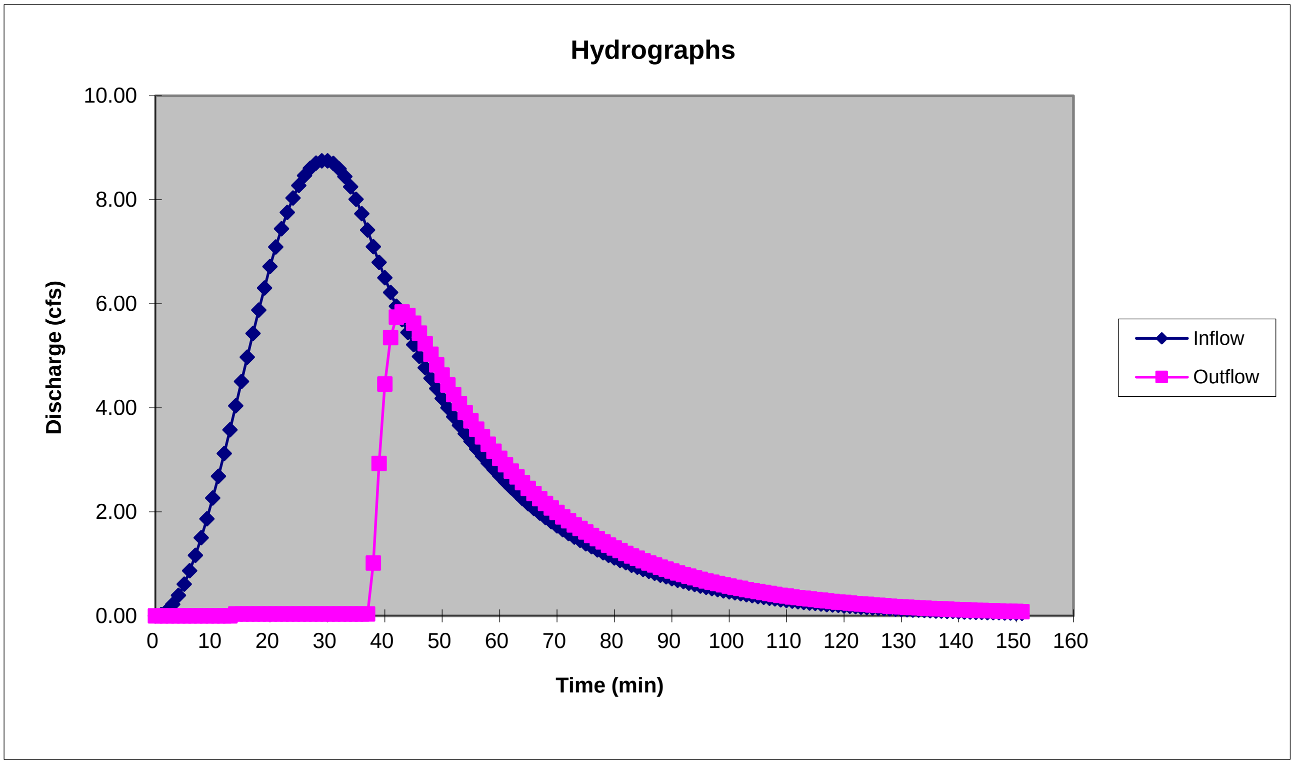
Skimmer Orifice:

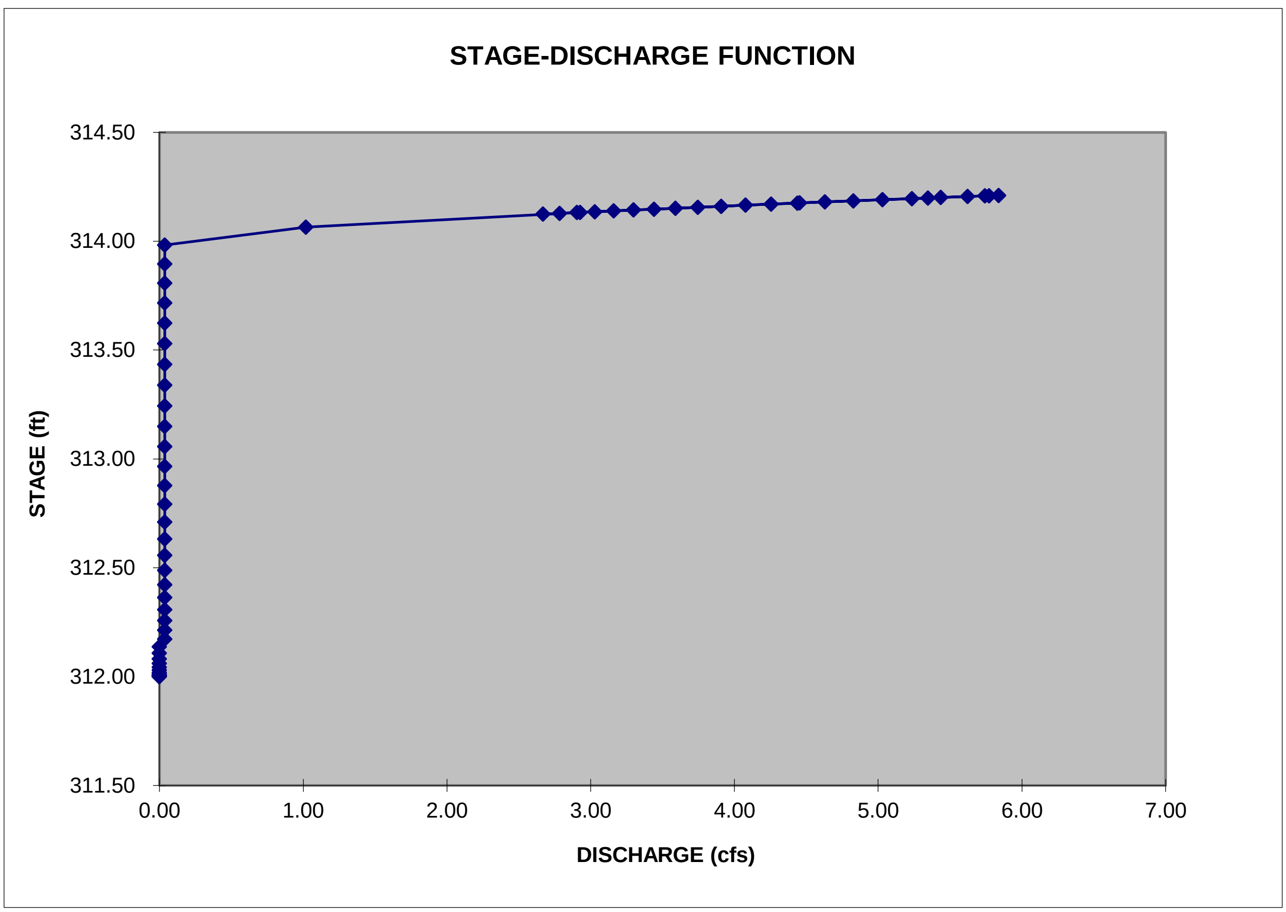
Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 1.52 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	312.00	0.0	0.0	0.0		
1	0	0.00	312.00	0.0	0.0	0.00		
2	0	1.49	312.00	0.0	0.0	0.00		
3	0	7.45	312.00	0.0	0.0	0.00		
4	0	20.78	312.00	0.0	0.0	0.00		
5	1	44.33	312.01	0.0	0.0	0.00		
6	1	80.82	312.01	0.0	0.0	0.00		
7	1	132.81	312.02	0.0	0.0	0.00		
8	1	202.70	312.03	0.0	0.0	0.00		
9	2	292.68	312.04	0.0	0.0	0.00		
10	2	404.71	312.06	0.0	0.0	0.00		
11	3	540.51	312.08	0.0	0.0	0.00		
12	3	701.52	312.11	0.0	0.0	0.00		
13	4	888.90	312.14	0.0	0.0	0.00		
14	4	1103.49	312.17	0.0	0.0	0.04		
15	5	1343.65	312.21	0.0	0.0	0.04		
16	5	1611.80	312.26	0.0	0.0	0.04		
17	5	1907.86	312.31	0.0	0.0	0.04		
18	6	2231.43	312.36	0.0	0.0	0.04		
19	6	2581.79	312.42	0.0	0.0	0.04		
20	7	2957.91	312.49	0.0	0.0	0.04		
21	7	3358.48	312.56	0.0	0.0	0.04		
22	7	3781.90	312.63	0.0	0.0	0.04		
23	8	4226.34	312.71	0.0	0.0	0.04		
24	8	4689.68	312.79	0.0	0.0	0.04		
25	8	5169.63	312.88	0.0	0.0	0.04		
26	8	5663.69	312.97	0.0	0.0	0.04		
27	9	6169.20	313.06	0.0	0.0	0.04		
28	9	6683.38	313.15	0.0	0.0	0.04		
29	9	7203.34	313.24	0.0	0.0	0.04		
30	9	7726.14	313.34	0.0	0.0	0.04		
31	9	8248.78	313.43	0.0	0.0	0.04		
32	9	8768.30	313.53	0.0	0.0	0.04		
33	8	9281.73	313.62	0.0	0.0	0.04		
34	8	9786.22	313.72	0.0	0.0	0.04		
35	8	10278.98	313.81	0.0	0.0	0.04		
36	8	10757.37	313.90	0.0	0.0	0.04		
37	7	11218.91	313.98	0.0	0.0	0.04		
38	7	11661.92	314.06	1.0	1.0	0.04		
39	7	12026.86	314.13	2.9	2.9	0.04		
40	6	12258.80	314.18	4.5	4.4	0.04		

GRAPHED DATA FOR 2 YEAR STORM





McADAMS

ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	314.32 ft
		Rise =	2.32 ft
Freeboard =	1.68 ft	Peak Outflow =	10.71 cfs

INPUT

Hydrograph Results:

Qp = 11.02 cfs
Tp = 39.1 min
dT = 1.0 min

Stage-Storage Results:

Ks = 5854
b = 0.95
Z_0 = 312.0 ft (inv)

Initial Water Level:

Z_i = 312.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number = 1 Ea
Diameter = 2.00 Inches
Head = 1.52 inches

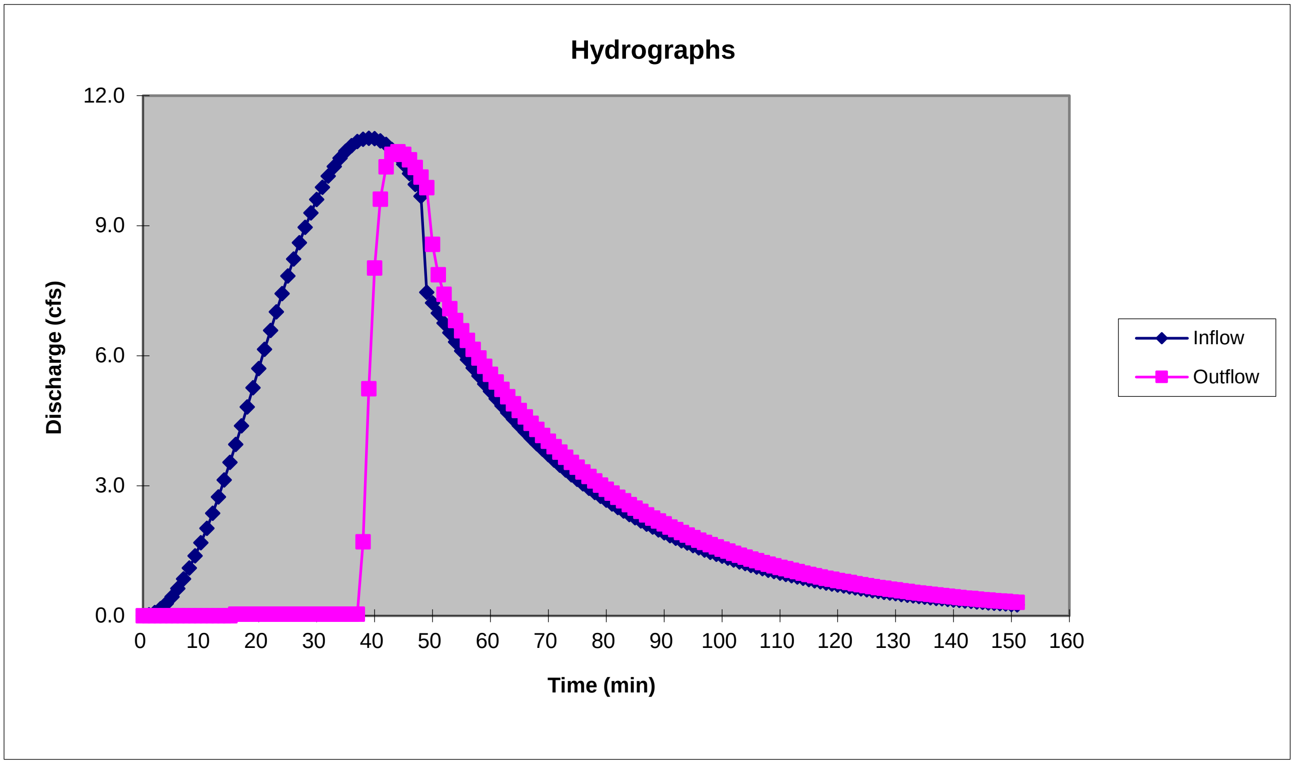
OUTPUT

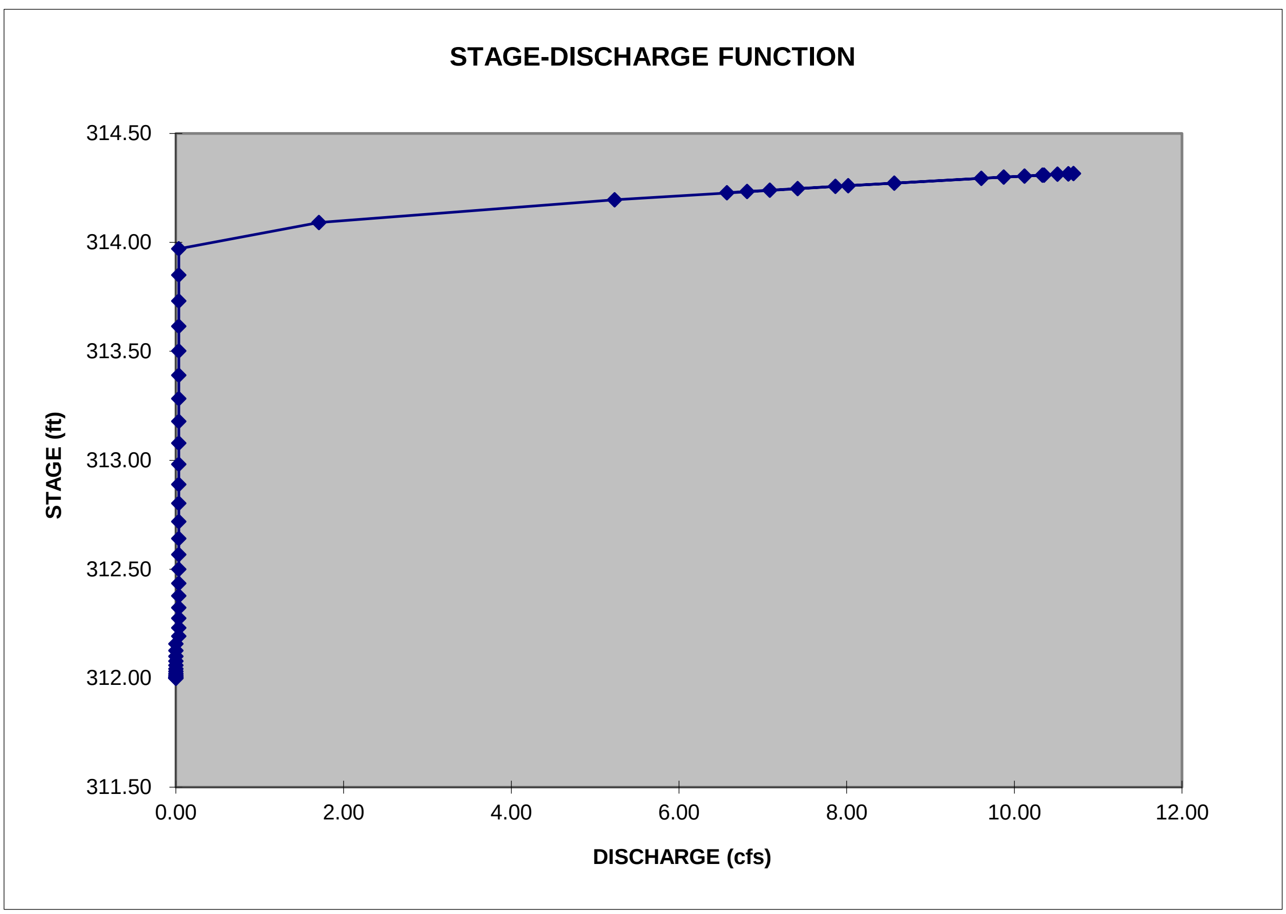
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	312.00	0.0	0.0	0.0		
1	0	0.00	312.00	0.0	0.0	0.00		
2	0	1.06	312.00	0.0	0.0	0.00		
3	0	5.32	312.00	0.0	0.0	0.00		
4	0	14.86	312.00	0.0	0.0	0.00		
5	0	31.76	312.00	0.0	0.0	0.00		
6	1	58.04	312.01	0.0	0.0	0.00		
7	1	95.65	312.01	0.0	0.0	0.00		
8	1	146.49	312.02	0.0	0.0	0.00		
9	1	212.36	312.03	0.0	0.0	0.00		
10	2	294.97	312.04	0.0	0.0	0.00		
11	2	395.90	312.06	0.0	0.0	0.00		
12	2	516.64	312.08	0.0	0.0	0.00		
13	3	658.55	312.10	0.0	0.0	0.00		
14	3	822.83	312.13	0.0	0.0	0.00		
15	4	1010.56	312.16	0.0	0.0	0.00		
16	4	1222.65	312.19	0.0	0.0	0.04		
17	4	1457.67	312.23	0.0	0.0	0.04		
18	5	1718.42	312.28	0.0	0.0	0.04		
19	5	2005.34	312.32	0.0	0.0	0.04		
20	6	2318.70	312.38	0.0	0.0	0.04		
21	6	2658.58	312.44	0.0	0.0	0.04		
22	7	3024.92	312.50	0.0	0.0	0.04		
23	7	3417.47	312.57	0.0	0.0	0.04		
24	7	3835.82	312.64	0.0	0.0	0.04		
25	8	4279.38	312.72	0.0	0.0	0.04		
26	8	4747.42	312.80	0.0	0.0	0.04		
27	9	5239.03	312.89	0.0	0.0	0.04		
28	9	5753.16	312.98	0.0	0.0	0.04		
29	9	6288.62	313.08	0.0	0.0	0.04		
30	10	6844.07	313.18	0.0	0.0	0.04		
31	10	7418.05	313.28	0.0	0.0	0.04		
32	10	8008.97	313.39	0.0	0.0	0.04		
33	10	8615.14	313.50	0.0	0.0	0.04		
34	11	9234.78	313.62	0.0	0.0	0.04		
35	11	9866.00	313.73	0.0	0.0	0.04		
36	11	10506.85	313.85	0.0	0.0	0.04		
37	11	11155.32	313.97	0.0	0.0	0.04		
38	11	11809.36	314.09	1.7	1.7	0.04		
39	11	12366.61	314.20	5.2	5.2	0.04		
40	11	12713.51	314.26	8.0	8.0	0.04		
41	11	12892.52	314.29	9.6	9.6	0.04		
42	11	12973.39	314.31	10.4	10.3	0.04		
43	11	13004.34	314.32	10.6	10.6	0.04		
44	11	13010.71	314.32	10.7	10.7	0.04		
45	10	13004.35	314.32	10.6	10.6	0.04		
46	10	12990.50	314.31	10.5	10.5	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	10	12971.51	314.31	10.3	10.3	0.04		
48	10	12948.42	314.30	10.1	10.1	0.04		
49	7	12921.74	314.30	9.9	9.8	0.04		
50	7	12776.78	314.27	8.6	8.5	0.04		
51	7	12695.52	314.26	7.9	7.8	0.04		
52	7	12642.35	314.25	7.4	7.4	0.04		
53	7	12602.46	314.24	7.1	7.0	0.04		
54	6	12569.21	314.23	6.8	6.8	0.04		
55	6	12539.48	314.23	6.6	6.5	0.04		
56	6	12511.78	314.22	6.4	6.3	0.04		
57	6	12485.37	314.22	6.1	6.1	0.04		
58	6	12459.88	314.21	5.9	5.9	0.04		
59	5	12435.12	314.21	5.8	5.7	0.04		
60	5	12410.98	314.20	5.6	5.5	0.04		
61	5	12387.41	314.20	5.4	5.4	0.04		
62	5	12364.38	314.20	5.2	5.2	0.04		
63	5	12341.85	314.19	5.1	5.0	0.04		
64	5	12319.81	314.19	4.9	4.9	0.04		
65	4	12298.25	314.18	4.7	4.7	0.04		
66	4	12277.15	314.18	4.6	4.5	0.04		
67	4	12256.51	314.18	4.4	4.4	0.04		
68	4	12236.31	314.17	4.3	4.3	0.04		
69	4	12216.55	314.17	4.2	4.1	0.04		
70	4	12197.21	314.16	4.0	4.0	0.04		
71	4	12178.28	314.16	3.9	3.9	0.04		
72	3	12159.76	314.16	3.8	3.7	0.04		
73	3	12141.64	314.15	3.7	3.6	0.04		
74	3	12123.91	314.15	3.5	3.5	0.04		
75	3	12106.55	314.15	3.4	3.4	0.04		
76	3	12089.57	314.14	3.3	3.3	0.04		
77	3	12072.95	314.14	3.2	3.2	0.04		
78	3	12056.69	314.14	3.1	3.1	0.04		
79	3	12040.77	314.14	3.0	3.0	0.04		
80	3	12025.19	314.13	2.9	2.9	0.04		
81	3	12009.95	314.13	2.8	2.8	0.04		
82	2	11995.04	314.13	2.7	2.7	0.04		
83	2	11980.44	314.12	2.6	2.6	0.04		
84	2	11966.16	314.12	2.6	2.5	0.04		
85	2	11952.18	314.12	2.5	2.4	0.04		
86	2	11938.49	314.12	2.4	2.4	0.04		
87	2	11925.10	314.11	2.3	2.3	0.04		
88	2	11912.00	314.11	2.3	2.2	0.04		
89	2	11899.18	314.11	2.2	2.1	0.04		
90	2	11886.63	314.11	2.1	2.1	0.04		
91	2	11874.34	314.10	2.0	2.0	0.04		
92	2	11862.32	314.10	2.0	1.9	0.04		
93	2	11850.56	314.10	1.9	1.9	0.04		
94	2	11839.04	314.10	1.9	1.8	0.04		
95	2	11827.77	314.10	1.8	1.8	0.04		
96	2	11816.74	314.09	1.7	1.7	0.04		
97	2	11805.95	314.09	1.7	1.7	0.04		
98	1	11795.38	314.09	1.6	1.6	0.04		
99	1	11785.04	314.09	1.6	1.5	0.04		
100	1	11774.92	314.09	1.5	1.5	0.04		
101	1	11765.01	314.08	1.5	1.5	0.04		
102	1	11755.32	314.08	1.4	1.4	0.04		
103	1	11745.83	314.08	1.4	1.4	0.04		
104	1	11736.54	314.08	1.4	1.3	0.04		
105	1	11727.44	314.08	1.3	1.3	0.04		
106	1	11718.54	314.07	1.3	1.2	0.04		
107	1	11709.83	314.07	1.2	1.2	0.04		
108	1	11701.30	314.07	1.2	1.2	0.04		
109	1	11692.96	314.07	1.2	1.1	0.04		
110	1	11684.78	314.07	1.1	1.1	0.04		
111	1	11676.78	314.07	1.1	1.0	0.04		
112	1	11668.95	314.07	1.0	1.0	0.04		
113	1	11661.29	314.06	1.0	1.0	0.04		
114	1	11653.78	314.06	1.0	0.9	0.04		
115	1	11646.44	314.06	1.0	0.9	0.04		
116	1	11639.25	314.06	0.9	0.9	0.04		
117	1	11632.21	314.06	0.9	0.9	0.04		
118	1	11625.31	314.06	0.9	0.8	0.04		
119	1	11618.57	314.06	0.8	0.8	0.04		
120	1	11611.96	314.06	0.8	0.8	0.04		
121	1	11605.49	314.05	0.8	0.8	0.04		
122	1	11599.16	314.05	0.8	0.7	0.04		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
123	1	11592.96	314.05	0.7	0.7	0.04		
124	1	11586.89	314.05	0.7	0.7	0.04		
125	1	11580.94	314.05	0.7	0.7	0.04		
126	1	11575.12	314.05	0.7	0.6	0.04		
127	1	11569.42	314.05	0.7	0.6	0.04		
128	1	11563.84	314.05	0.6	0.6	0.04		
129	1	11558.37	314.05	0.6	0.6	0.04		
130	1	11553.02	314.04	0.6	0.6	0.04		
131	0	11547.78	314.04	0.6	0.5	0.04		
132	0	11542.65	314.04	0.6	0.5	0.04		
133	0	11537.62	314.04	0.5	0.5	0.04		
134	0	11532.70	314.04	0.5	0.5	0.04		
135	0	11527.88	314.04	0.5	0.5	0.04		
136	0	11523.16	314.04	0.5	0.5	0.04		
137	0	11518.54	314.04	0.5	0.4	0.04		
138	0	11514.01	314.04	0.5	0.4	0.04		
139	0	11509.57	314.04	0.4	0.4	0.04		
140	0	11505.23	314.04	0.4	0.4	0.04		
141	0	11500.97	314.03	0.4	0.4	0.04		
142	0	11496.80	314.03	0.4	0.4	0.04		
143	0	11492.72	314.03	0.4	0.4	0.04		
144	0	11488.71	314.03	0.4	0.3	0.04		
145	0	11484.79	314.03	0.4	0.3	0.04		
146	0	11480.95	314.03	0.4	0.3	0.04		
147	0	11477.19	314.03	0.3	0.3	0.04		
148	0	11473.50	314.03	0.3	0.3	0.04		
149	0	11469.89	314.03	0.3	0.3	0.04		
150	0	11466.35	314.03	0.3	0.3	0.04		
151	0	11462.88	314.03	0.3	0.3	0.04		

GRAPHED DATA FOR 10 YEAR STORM





ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	314.35 ft
		Rise =	2.35 ft
Freeboard =	1.65 ft	Peak Outflow =	12.52 cfs

INPUT

Hydrograph Results:

Qp = 12.64 cfs
Tp = 39.1 min
dT = 1.0 min

Stage-Storage Results:

Ks = 5854
b = 0.95
Z_0 = 312.0 ft (inv)

Initial Water Level:

Z_i = 312.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 1.52 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	312.00	0.0	0.0	0.0		
1	0	0.00	312.00	0.0	0.0	0.00		
2	0	1.22	312.00	0.0	0.0	0.00		
3	0	6.10	312.00	0.0	0.0	0.00		
4	0	17.05	312.00	0.0	0.0	0.00		
5	1	36.43	312.00	0.0	0.0	0.00		
6	1	66.58	312.01	0.0	0.0	0.00		
7	1	109.74	312.02	0.0	0.0	0.00		
8	1	168.07	312.02	0.0	0.0	0.00		
9	2	243.64	312.04	0.0	0.0	0.00		
10	2	338.40	312.05	0.0	0.0	0.00		
11	2	454.20	312.07	0.0	0.0	0.00		
12	3	592.72	312.09	0.0	0.0	0.00		
13	3	755.52	312.12	0.0	0.0	0.00		
14	4	943.99	312.15	0.0	0.0	0.00		
15	4	1159.36	312.18	0.0	0.0	0.04		
16	5	1400.48	312.22	0.0	0.0	0.04		
17	5	1670.44	312.27	0.0	0.0	0.04		
18	6	1969.91	312.32	0.0	0.0	0.04		
19	6	2299.40	312.37	0.0	0.0	0.04		
20	7	2659.22	312.44	0.0	0.0	0.04		
21	7	3049.48	312.50	0.0	0.0	0.04		
22	8	3470.09	312.58	0.0	0.0	0.04		
23	8	3920.77	312.66	0.0	0.0	0.04		
24	9	4401.04	312.74	0.0	0.0	0.04		
25	9	4910.25	312.83	0.0	0.0	0.04		
26	9	5447.53	312.93	0.0	0.0	0.04		
27	10	6011.86	313.03	0.0	0.0	0.04		
28	10	6602.02	313.13	0.0	0.0	0.04		
29	11	7216.66	313.25	0.0	0.0	0.04		
30	11	7854.22	313.36	0.0	0.0	0.04		
31	11	8513.04	313.48	0.0	0.0	0.04		
32	12	9191.30	313.61	0.0	0.0	0.04		
33	12	9887.06	313.74	0.0	0.0	0.04		
34	12	10598.26	313.87	0.0	0.0	0.04		
35	12	11322.76	314.00	0.0	0.0	0.04		
36	12	12058.13	314.14	3.1	3.1	0.04		
37	13	12617.39	314.24	7.2	7.2	0.04		
38	13	12937.71	314.30	10.0	10.0	0.04		
39	13	13093.14	314.33	11.5	11.5	0.04		
40	13	13161.62	314.34	12.2	12.1	0.04		
41	13	13188.91	314.35	12.4	12.4	0.04		
42	12	13196.59	314.35	12.5	12.5	0.04		
43	12	13193.90	314.35	12.5	12.5	0.04		
44	12	13184.69	314.35	12.4	12.4	0.04		
45	12	13170.53	314.35	12.3	12.2	0.04		
46	12	13152.08	314.34	12.1	12.0	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	11	13129.69	314.34	11.9	11.8	0.04		
48	11	13103.54	314.33	11.6	11.6	0.04		
49	7	13073.77	314.33	11.3	11.3	0.04		
50	7	12842.71	314.28	9.2	9.1	0.04		
51	7	12726.30	314.26	8.1	8.1	0.04		
52	7	12657.28	314.25	7.5	7.5	0.04		
53	7	12609.87	314.24	7.1	7.1	0.04		
54	6	12572.95	314.23	6.8	6.8	0.04		
55	6	12541.39	314.23	6.6	6.6	0.04		
56	6	12512.77	314.22	6.4	6.3	0.04		
57	6	12485.89	314.22	6.1	6.1	0.04		
58	6	12460.15	314.21	5.9	5.9	0.04		
59	5	12435.27	314.21	5.8	5.7	0.04		
60	5	12411.06	314.20	5.6	5.5	0.04		
61	5	12387.46	314.20	5.4	5.4	0.04		
62	5	12364.40	314.20	5.2	5.2	0.04		
63	5	12341.86	314.19	5.1	5.0	0.04		
64	5	12319.82	314.19	4.9	4.9	0.04		
65	4	12298.25	314.18	4.7	4.7	0.04		
66	4	12277.16	314.18	4.6	4.5	0.04		
67	4	12256.51	314.18	4.4	4.4	0.04		
68	4	12236.31	314.17	4.3	4.3	0.04		
69	4	12216.55	314.17	4.2	4.1	0.04		
70	4	12197.21	314.16	4.0	4.0	0.04		
71	4	12178.28	314.16	3.9	3.9	0.04		
72	3	12159.76	314.16	3.8	3.7	0.04		
73	3	12141.64	314.15	3.7	3.6	0.04		
74	3	12123.91	314.15	3.5	3.5	0.04		
75	3	12106.55	314.15	3.4	3.4	0.04		
76	3	12089.57	314.14	3.3	3.3	0.04		
77	3	12072.95	314.14	3.2	3.2	0.04		
78	3	12056.69	314.14	3.1	3.1	0.04		
79	3	12040.77	314.14	3.0	3.0	0.04		
80	3	12025.19	314.13	2.9	2.9	0.04		
81	3	12009.95	314.13	2.8	2.8	0.04		
82	2	11995.04	314.13	2.7	2.7	0.04		
83	2	11980.44	314.12	2.6	2.6	0.04		
84	2	11966.16	314.12	2.6	2.5	0.04		
85	2	11952.18	314.12	2.5	2.4	0.04		
86	2	11938.49	314.12	2.4	2.4	0.04		
87	2	11925.10	314.11	2.3	2.3	0.04		
88	2	11912.00	314.11	2.3	2.2	0.04		
89	2	11899.18	314.11	2.2	2.1	0.04		
90	2	11886.63	314.11	2.1	2.1	0.04		
91	2	11874.34	314.10	2.0	2.0	0.04		
92	2	11862.32	314.10	2.0	1.9	0.04		
93	2	11850.56	314.10	1.9	1.9	0.04		
94	2	11839.04	314.10	1.9	1.8	0.04		
95	2	11827.77	314.10	1.8	1.8	0.04		
96	2	11816.74	314.09	1.7	1.7	0.04		
97	2	11805.95	314.09	1.7	1.7	0.04		
98	1	11795.38	314.09	1.6	1.6	0.04		
99	1	11785.04	314.09	1.6	1.5	0.04		
100	1	11774.92	314.09	1.5	1.5	0.04		
101	1	11765.01	314.08	1.5	1.5	0.04		
102	1	11755.32	314.08	1.4	1.4	0.04		
103	1	11745.83	314.08	1.4	1.4	0.04		
104	1	11736.54	314.08	1.4	1.3	0.04		
105	1	11727.44	314.08	1.3	1.3	0.04		
106	1	11718.54	314.07	1.3	1.2	0.04		
107	1	11709.83	314.07	1.2	1.2	0.04		
108	1	11701.30	314.07	1.2	1.2	0.04		
109	1	11692.96	314.07	1.2	1.1	0.04		
110	1	11684.78	314.07	1.1	1.1	0.04		
111	1	11676.78	314.07	1.1	1.0	0.04		
112	1	11668.95	314.07	1.0	1.0	0.04		
113	1	11661.29	314.06	1.0	1.0	0.04		
114	1	11653.78	314.06	1.0	0.9	0.04		
115	1	11646.44	314.06	1.0	0.9	0.04		
116	1	11639.25	314.06	0.9	0.9	0.04		
117	1	11632.21	314.06	0.9	0.9	0.04		
118	1	11625.31	314.06	0.9	0.8	0.04		
119	1	11618.57	314.06	0.8	0.8	0.04		
120	1	11611.96	314.06	0.8	0.8	0.04		
121	1	11605.49	314.05	0.8	0.8	0.04		
122	1	11599.16	314.05	0.8	0.7	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	11592.96	314.05	0.7	0.7	0.04		
124	1	11586.89	314.05	0.7	0.7	0.04		
125	1	11580.94	314.05	0.7	0.7	0.04		
126	1	11575.12	314.05	0.7	0.6	0.04		
127	1	11569.42	314.05	0.7	0.6	0.04		
128	1	11563.84	314.05	0.6	0.6	0.04		
129	1	11558.37	314.05	0.6	0.6	0.04		
130	1	11553.02	314.04	0.6	0.6	0.04		
131	0	11547.78	314.04	0.6	0.5	0.04		
132	0	11542.65	314.04	0.6	0.5	0.04		
133	0	11537.62	314.04	0.5	0.5	0.04		
134	0	11532.70	314.04	0.5	0.5	0.04		
135	0	11527.88	314.04	0.5	0.5	0.04		
136	0	11523.16	314.04	0.5	0.5	0.04		
137	0	11518.54	314.04	0.5	0.4	0.04		
138	0	11514.01	314.04	0.5	0.4	0.04		
139	0	11509.57	314.04	0.4	0.4	0.04		
140	0	11505.23	314.04	0.4	0.4	0.04		
141	0	11500.97	314.03	0.4	0.4	0.04		
142	0	11496.80	314.03	0.4	0.4	0.04		
143	0	11492.72	314.03	0.4	0.4	0.04		
144	0	11488.71	314.03	0.4	0.3	0.04		
145	0	11484.79	314.03	0.4	0.3	0.04		
146	0	11480.95	314.03	0.4	0.3	0.04		
147	0	11477.19	314.03	0.3	0.3	0.04		
148	0	11473.50	314.03	0.3	0.3	0.04		
149	0	11469.89	314.03	0.3	0.3	0.04		
150	0	11466.35	314.03	0.3	0.3	0.04		
151	0	11462.88	314.03	0.3	0.3	0.04		

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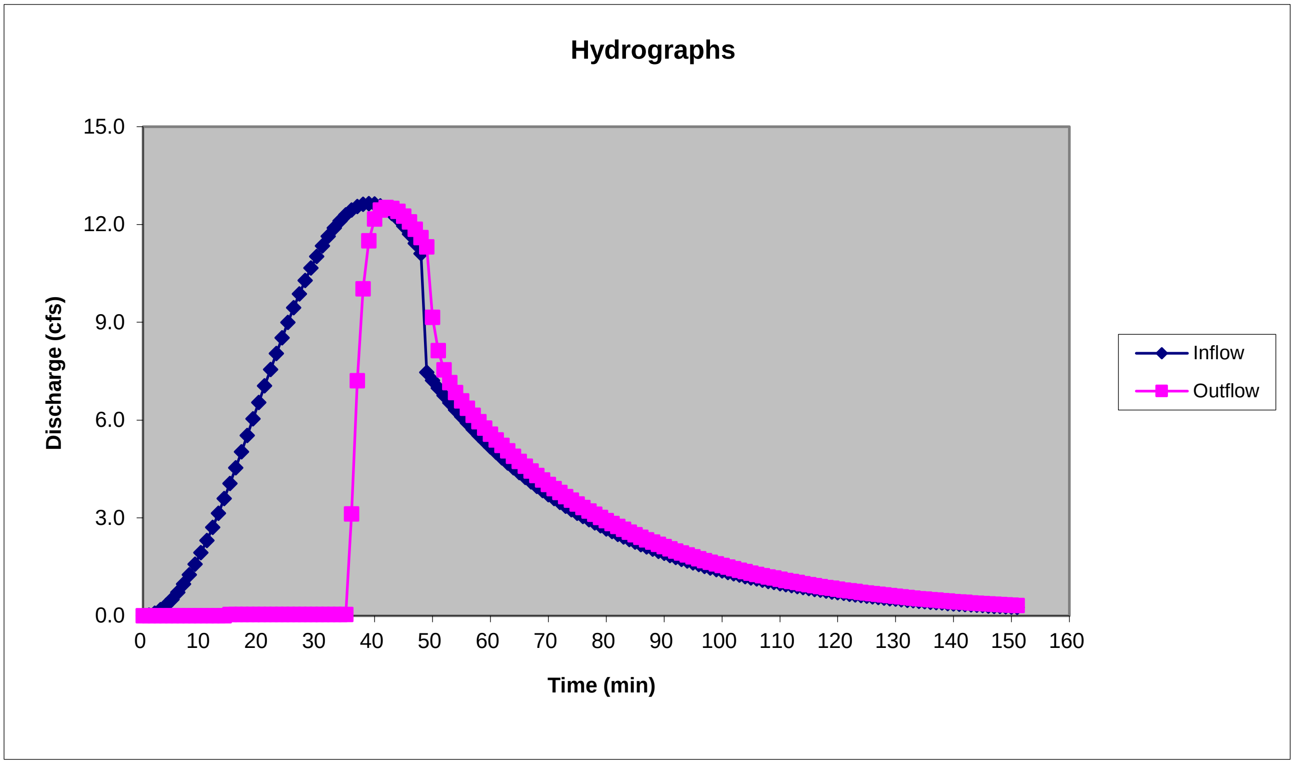
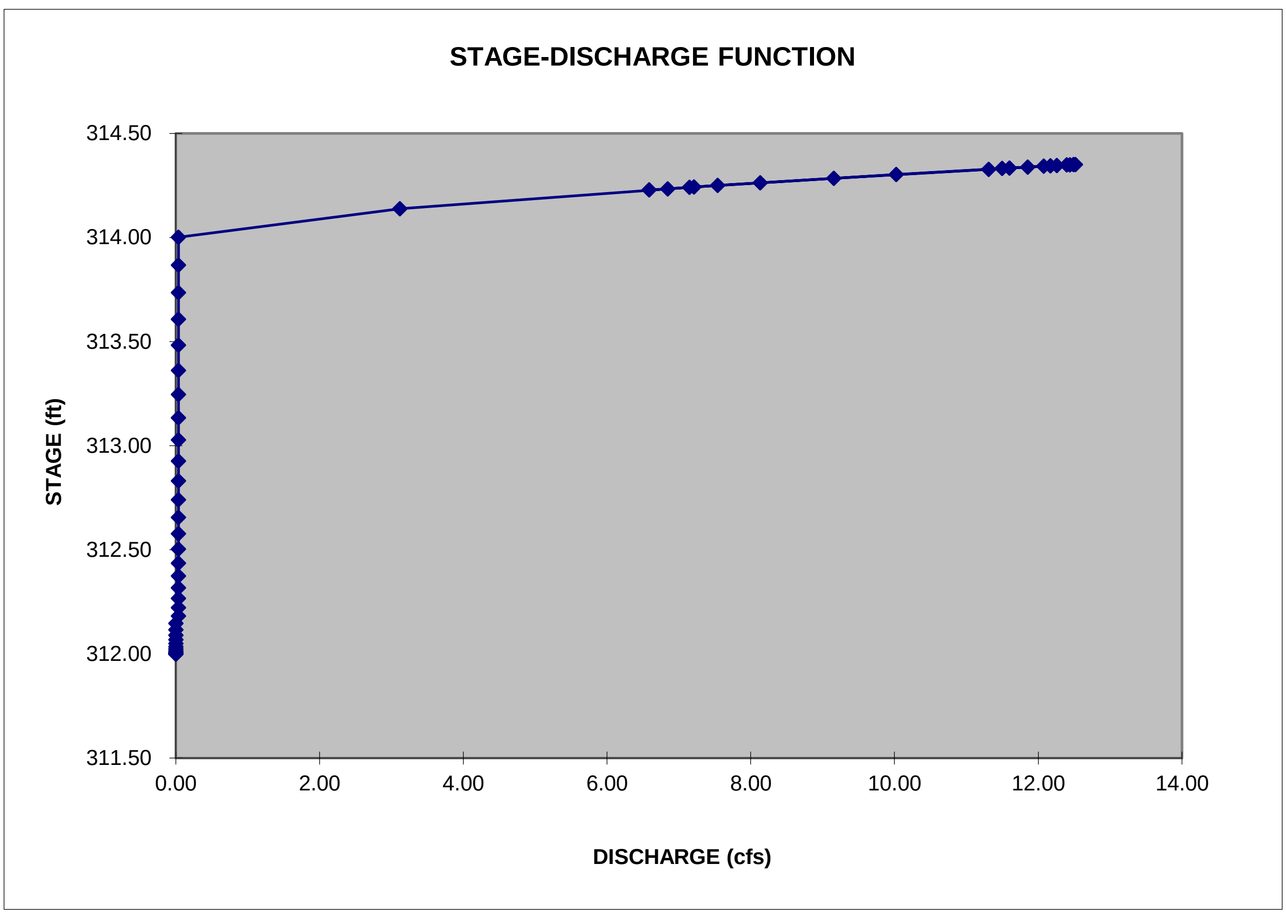
GRAPHED DATA FOR 25 YEAR STORM





ST-5
SKIMMER BASIN DESIGN

CHAMBLEE LAKE
ZEBULON, NC
DRH22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm

MCADAMS

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Sediment Trap ID	ST-5		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	2.54 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	2.54 ac.	0.35
Undisturbed grassy area	0.00 ac.	0.00 ac.	0.25
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	2.54 ac.	2.54 ac.	
Composite Rational 'c'	0.45	0.35	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	481	feet
Height of watershed =	4	feet
Calculated t(c) =	5.7	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.7	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for Raleigh, NC

Return Period	B	D	Intensity
2	132	18	5.56 in/hr
10	195	22	7.03 in/hr
25	232	23	8.07 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	5.56 in/hr	6.4 cfs	4.94 cfs
10-year storm	7.03 in/hr	8.0 cfs	6.25 cfs
25-year storm	8.07 in/hr	9.2 cfs	7.18 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	1,800	cubic feet per disturbed acre
Required sediment trap surface area	325	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	100
Bottom width =	50
Sediment depth =	1.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Emergency Spillway =	1.0
Side slopes =	3.0 H:1V
Emergency Spillway length =	20
Height of berm =	3
Top of trap length =	118
Top of trap width =	68
Bottom elevation =	318

Sediment Trap Data

	Required	Provided
Sediment storage volume =	4572 cu. ft.	5460 cu. ft.
Sediment surface area =	2610 sq. ft.	5940 sq. ft.
Sediment storage depth =	3.5 ft. (max.)	1
Trap bottom length to width ratio =	2.0L:1W (min)	2.0L:1W
Spillway length =	10.0 ft. (min)	20
10-Year flow depth over spillway =	0.50 ft. (max)	0.26 ft
Freeboard at 10-Year discharge =	1.00 ft. (min)	1.74 ft

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU
1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Provided for Sediment Basin = 4,572 cubic feet

24 HOURS	Best Option =	1 - 2.5 inch Skimmers with a 2.3 inch orifice	
2 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.6 inch orifice	
3 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.3 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 1 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

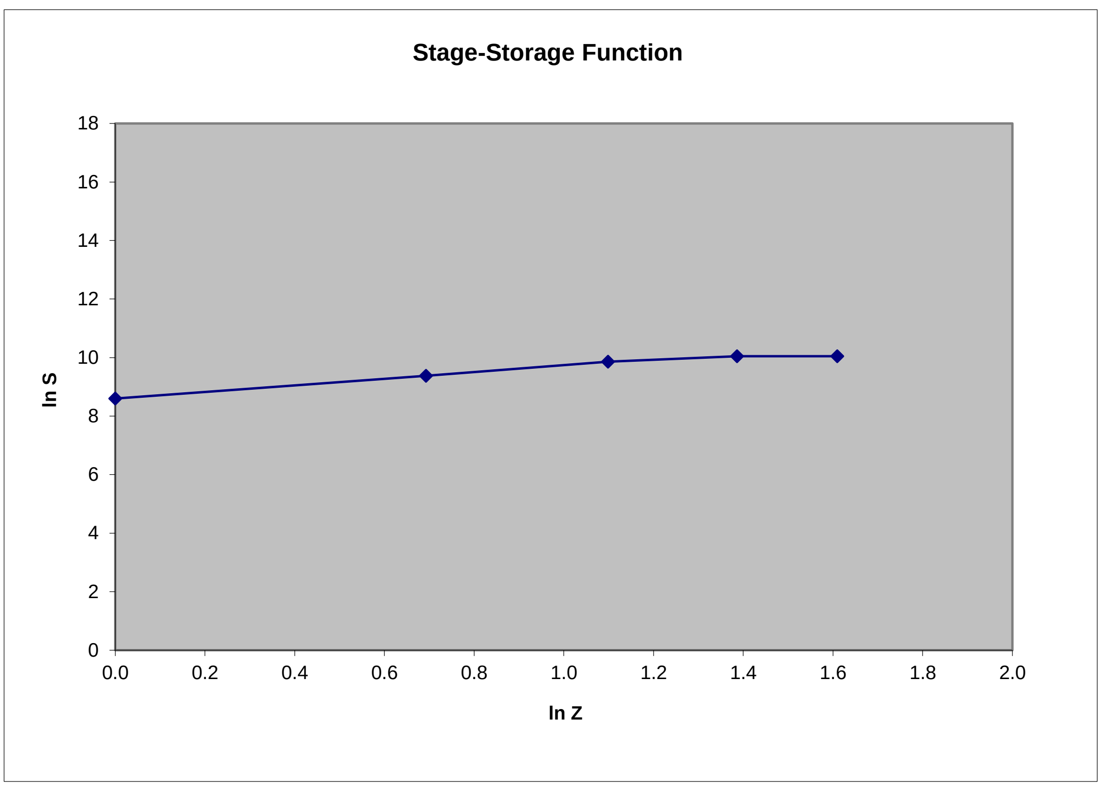
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
318	4979		0	0			
319	5881	5430	5430	1	8.5997	0.0000	0.92
320	6840	6360.5	11790.5	2	9.3750	0.6931	2.09
321	7856	7348	19138.5	3	9.8595	1.0986	3.48
322	0	3928	23066.5	4	10.0461	1.3863	4.23
323	0	0	23066.5	5	10.0461	1.6094	4.23

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 0.95 and **K_s =** 5854



McADAMS

HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT		
Drainage Area, DA =	2.54	ac	**Use Kirpich Equation:**		
Disturbed Area =	2.54	ac	**Tc =**	5.7 min	
Undisturbed Woods =	0.00	ac			
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**		
Hydraulic Length =	481	ft	**i_1 =**	5.56 in/hr	
Vertical Fall =	4	ft	**i_{10} =**	7.03 in/hr	
For 1 yr Storm, g =	132		**i_{25} =**	8.07 in/hr	
h =	18				
For 10 yr Storm, g =	195		**Use Rational Method:**		
h =	22		**Q_2 =**	6.4 cfs	
For 25 yr Storm, g =	232		**Q_{10} =**	8.0 cfs	
h =	23		**Q_{25} =**	9.2 cfs	

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	30.4	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	40.2	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	43.1	**minutes**

McADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**319.20 ft**
		Rise =	**1.20 ft**
Freeboard =	**1.80 ft**	**Peak Outflow =**	**5.58 cfs**

INPUT

Hydrograph Results:

Qp = 6.36 cfs
Tp = 30.4 min
dT = 1.0 min

Stage-Storage Results:

Ks = 5854
b = 0.95
Z_0 = 318.0 ft (inv)

Initial Water Level:

Z_i = 318.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 319.00 ft

Top of Dam: 321.00 ft

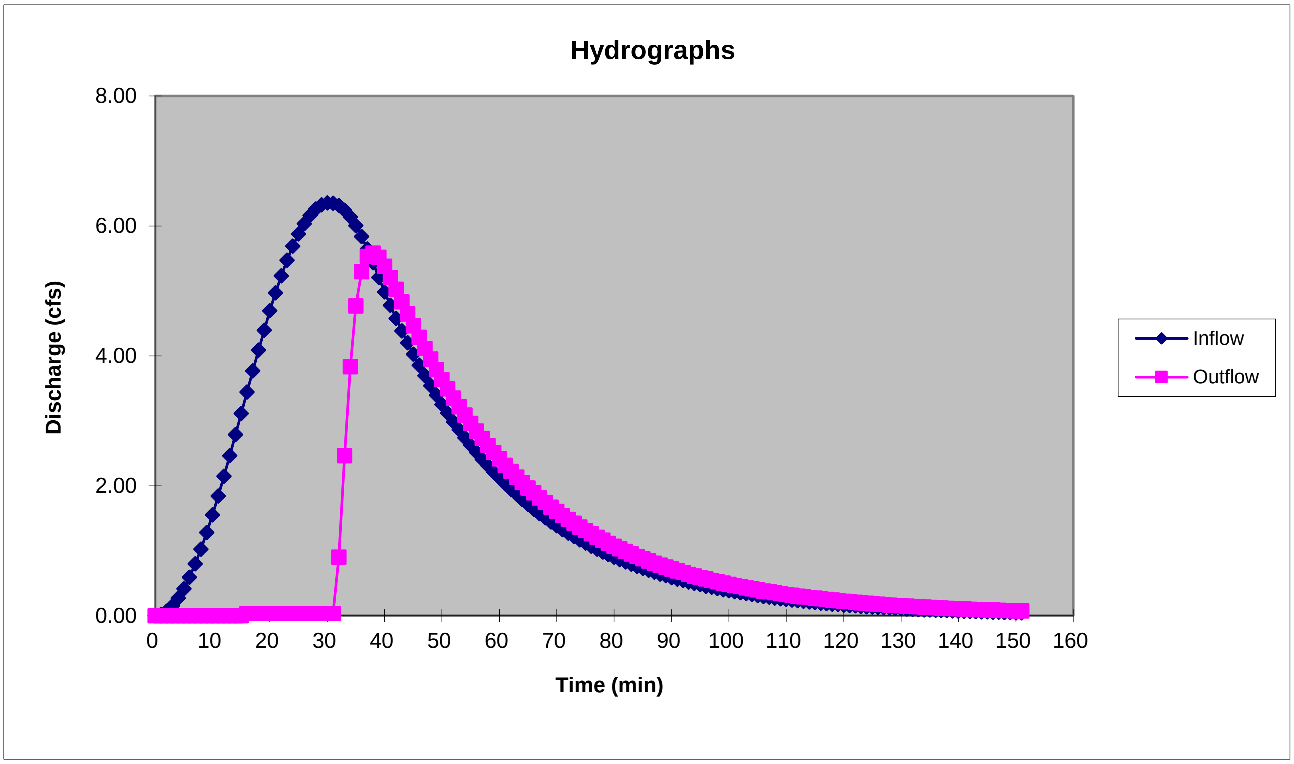
Skimmer Orifice:

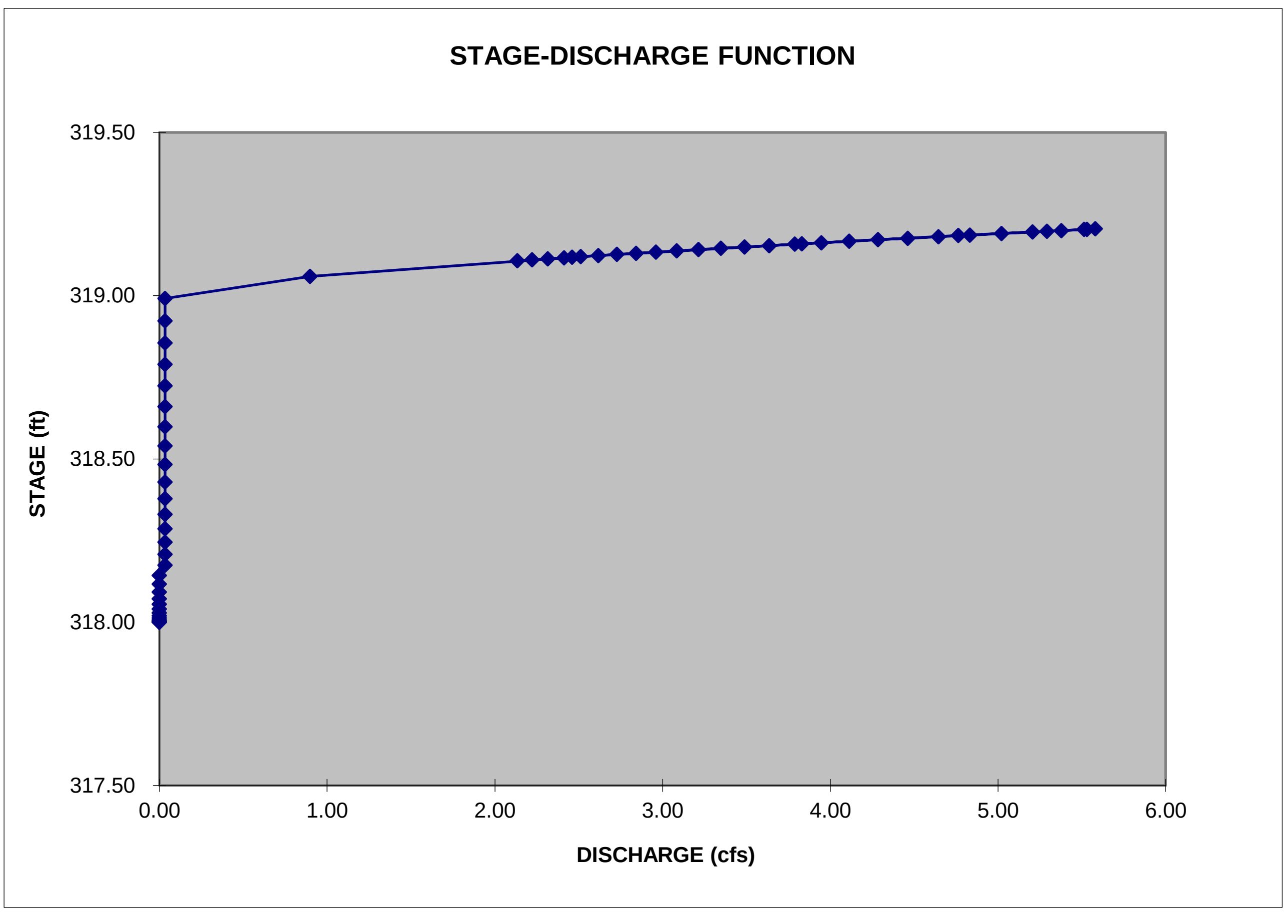
Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 1.31 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	318.00	0.0	0.0	0.0		
1	0	0.00	318.00	0.0	0.0	0.00		
2	0	1.02	318.00	0.0	0.0	0.00		
3	0	5.08	318.00	0.0	0.0	0.00		
4	0	14.17	318.00	0.0	0.0	0.00		
5	0	30.23	318.00	0.0	0.0	0.00		
6	1	55.13	318.01	0.0	0.0	0.00		
7	1	90.63	318.01	0.0	0.0	0.00		
8	1	138.39	318.02	0.0	0.0	0.00		
9	1	199.93	318.03	0.0	0.0	0.00		
10	2	276.64	318.04	0.0	0.0	0.00		
11	2	369.72	318.05	0.0	0.0	0.00		
12	2	480.23	318.07	0.0	0.0	0.00		
13	2	609.01	318.09	0.0	0.0	0.00		
14	3	756.72	318.12	0.0	0.0	0.00		
15	3	923.83	318.14	0.0	0.0	0.00		
16	3	1110.59	318.17	0.0	0.0	0.03		
17	4	1314.98	318.21	0.0	0.0	0.03		
18	4	1538.89	318.25	0.0	0.0	0.03		
19	4	1781.95	318.29	0.0	0.0	0.03		
20	5	2043.56	318.33	0.0	0.0	0.03		
21	5	2322.96	318.38	0.0	0.0	0.03		
22	5	2619.17	318.43	0.0	0.0	0.03		
23	5	2931.05	318.48	0.0	0.0	0.03		
24	6	3257.27	318.54	0.0	0.0	0.03		
25	6	3596.38	318.60	0.0	0.0	0.03		
26	6	3946.76	318.66	0.0	0.0	0.03		
27	6	4306.69	318.72	0.0	0.0	0.03		
28	6	4674.34	318.79	0.0	0.0	0.03		
29	6	5047.80	318.86	0.0	0.0	0.03		
30	6	5425.09	318.92	0.0	0.0	0.03		
31	6	5804.21	318.99	0.0	0.0	0.03		
32	6	6183.12	319.06	0.9	0.9	0.03		
33	6	6507.93	319.12	2.5	2.4	0.03		
34	6	6734.80	319.16	3.8	3.8	0.03		
35	6	6873.16	319.18	4.8	4.7	0.03		
36	6	6947.43	319.20	5.3	5.3	0.03		
37	6	6980.06	319.20	5.5	5.5	0.03		
38	5	6986.78	319.20	5.6	5.5	0.03		
39	5	6977.73	319.20	5.5	5.5	0.03		
40	5	6959.03	319.20	5.4	5.3	0.03		

GRAPHED DATA FOR 2 YEAR STORM





ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	319.26 ft
		Rise =	1.26 ft
Freeboard =	1.74 ft	Peak Outflow =	7.98 cfs

INPUT

Hydrograph Results:

Qp = 8.03 cfs
Tp = 40.2 min
dT = 1.0 min

Stage-Storage Results:

Ks = 5854
b = 0.95
Z_0 = 318.0 ft (inv)

Initial Water Level:

Z_i = 318.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 319.00 ft

Top of Dam: 321.00 ft

Skimmer Orifice:

Number = 1 Ea
Diameter = 2.00 Inches
Head = 1.31 inches

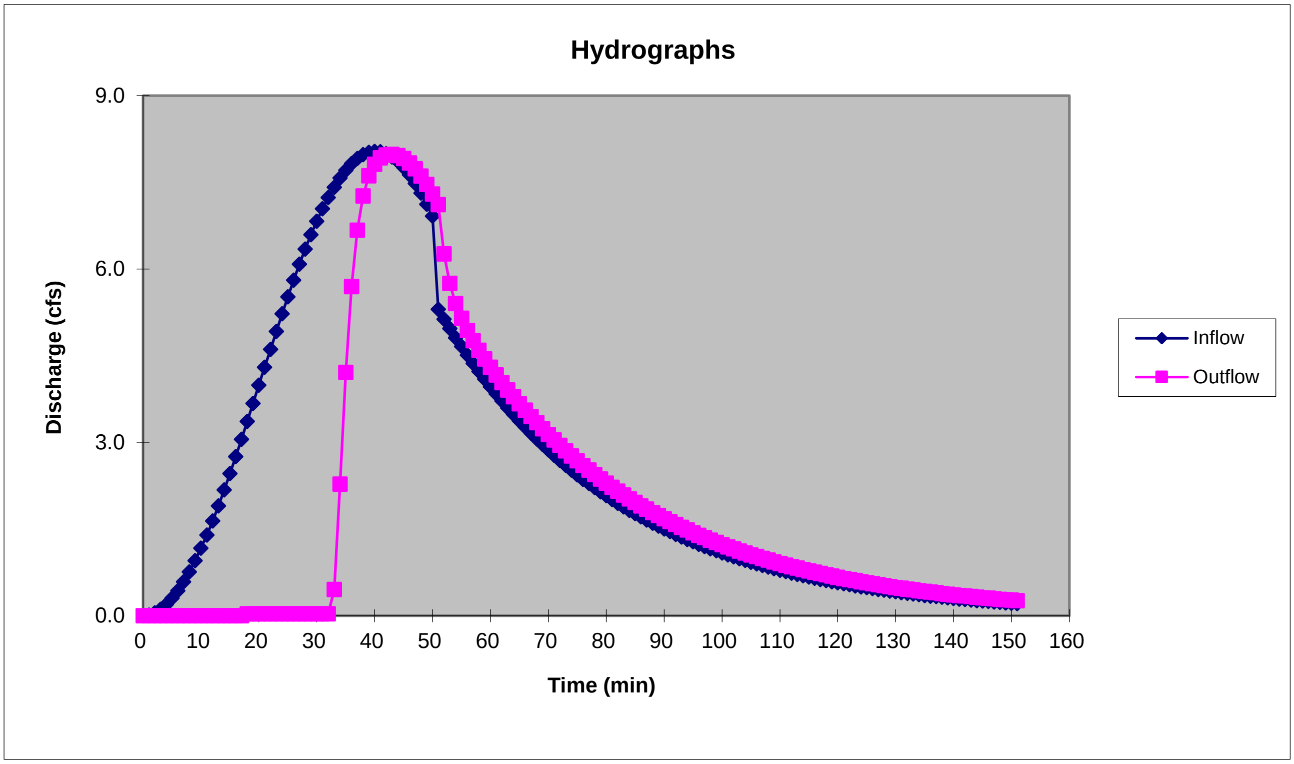
OUTPUT

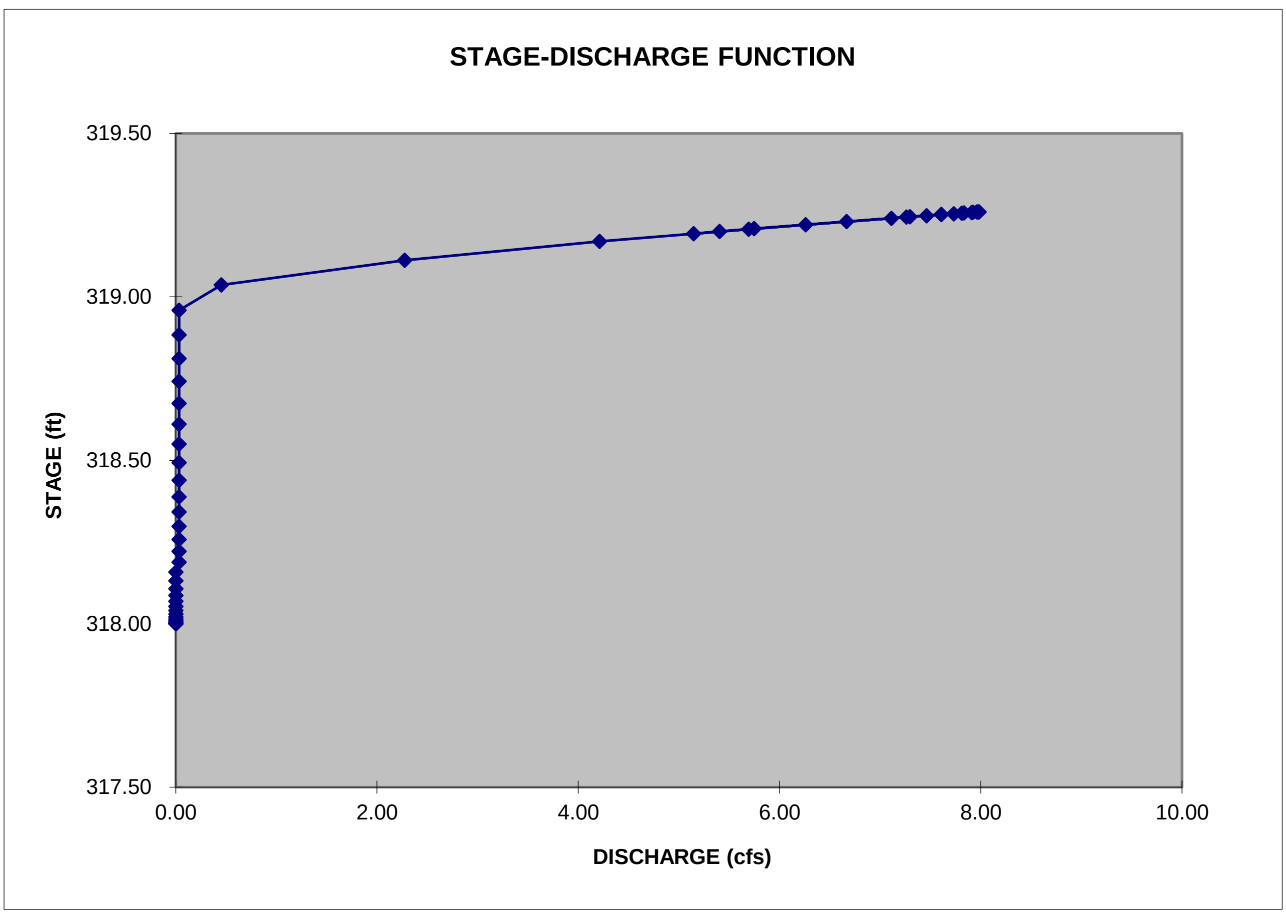
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	318.00	0.0	0.0	0.0		
1	0	0.00	318.00	0.0	0.0	0.00		
2	0	0.74	318.00	0.0	0.0	0.00		
3	0	3.67	318.00	0.0	0.0	0.00		
4	0	10.27	318.00	0.0	0.0	0.00		
5	0	21.95	318.00	0.0	0.0	0.00		
6	0	40.12	318.01	0.0	0.0	0.00		
7	1	66.14	318.01	0.0	0.0	0.00		
8	1	101.31	318.01	0.0	0.0	0.00		
9	1	146.91	318.02	0.0	0.0	0.00		
10	1	204.11	318.03	0.0	0.0	0.00		
11	1	274.05	318.04	0.0	0.0	0.00		
12	2	357.76	318.05	0.0	0.0	0.00		
13	2	456.21	318.07	0.0	0.0	0.00		
14	2	570.27	318.09	0.0	0.0	0.00		
15	2	700.71	318.11	0.0	0.0	0.00		
16	3	848.21	318.13	0.0	0.0	0.00		
17	3	1013.34	318.16	0.0	0.0	0.00		
18	3	1196.56	318.19	0.0	0.0	0.03		
19	4	1396.17	318.22	0.0	0.0	0.03		
20	4	1614.47	318.26	0.0	0.0	0.03		
21	4	1851.58	318.30	0.0	0.0	0.03		
22	5	2107.52	318.34	0.0	0.0	0.03		
23	5	2382.18	318.39	0.0	0.0	0.03		
24	5	2675.33	318.44	0.0	0.0	0.03		
25	6	2986.67	318.49	0.0	0.0	0.03		
26	6	3315.73	318.55	0.0	0.0	0.03		
27	6	3661.97	318.61	0.0	0.0	0.03		
28	6	4024.74	318.67	0.0	0.0	0.03		
29	7	4403.27	318.74	0.0	0.0	0.03		
30	7	4796.73	318.81	0.0	0.0	0.03		
31	7	5204.17	318.88	0.0	0.0	0.03		
32	7	5624.55	318.96	0.0	0.0	0.03		
33	7	6056.77	319.04	0.5	0.4	0.03		
34	8	6474.60	319.11	2.3	2.2	0.03		
35	8	6792.37	319.17	4.2	4.2	0.03		
36	8	7002.14	319.21	5.7	5.7	0.03		
37	8	7129.67	319.23	6.7	6.6	0.03		
38	8	7204.13	319.24	7.3	7.2	0.03		
39	8	7246.99	319.25	7.6	7.6	0.03		
40	8	7271.42	319.26	7.8	7.8	0.03		
41	8	7284.81	319.26	7.9	7.9	0.03		
42	8	7291.09	319.26	8.0	7.9	0.03		
43	8	7292.32	**319.26**	8.0	8.0	0.03		
44	8	7289.57	319.26	8.0	7.9	0.03		
45	8	7283.39	319.26	7.9	7.9	0.03		
46	8	7274.09	319.26	7.8	7.8	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	7	7261.84	319.25	7.7	7.7	0.03		
48	7	7246.76	319.25	7.6	7.6	0.03		
49	7	7228.95	319.25	7.5	7.4	0.03		
50	7	7208.50	319.24	7.3	7.3	0.03		
51	5	7185.50	319.24	7.1	7.1	0.03		
52	5	7076.88	319.22	6.3	6.2	0.03		
53	5	7009.27	319.21	5.7	5.7	0.03		
54	5	6962.54	319.20	5.4	5.4	0.03		
55	5	6927.00	319.19	5.1	5.1	0.03		
56	5	6897.71	319.19	4.9	4.9	0.03		
57	4	6872.05	319.18	4.8	4.7	0.03		
58	4	6848.61	319.18	4.6	4.6	0.03		
59	4	6826.60	319.18	4.4	4.4	0.03		
60	4	6805.59	319.17	4.3	4.3	0.03		
61	4	6785.32	319.17	4.2	4.1	0.03		
62	4	6765.65	319.16	4.0	4.0	0.03		
63	4	6746.49	319.16	3.9	3.9	0.03		
64	3	6727.80	319.16	3.8	3.8	0.03		
65	3	6709.53	319.15	3.7	3.6	0.03		
66	3	6691.66	319.15	3.6	3.5	0.03		
67	3	6674.17	319.15	3.4	3.4	0.03		
68	3	6657.05	319.14	3.3	3.3	0.03		
69	3	6640.30	319.14	3.2	3.2	0.03		
70	3	6623.90	319.14	3.1	3.1	0.03		
71	3	6607.84	319.14	3.0	3.0	0.03		
72	3	6592.11	319.13	2.9	2.9	0.03		
73	3	6576.71	319.13	2.9	2.8	0.03		
74	3	6561.64	319.13	2.8	2.7	0.03		
75	2	6546.87	319.12	2.7	2.6	0.03		
76	2	6532.42	319.12	2.6	2.6	0.03		
77	2	6518.26	319.12	2.5	2.5	0.03		
78	2	6504.39	319.12	2.4	2.4	0.03		
79	2	6490.82	319.11	2.4	2.3	0.03		
80	2	6477.52	319.11	2.3	2.3	0.03		
81	2	6464.51	319.11	2.2	2.2	0.03		
82	2	6451.76	319.11	2.2	2.1	0.03		
83	2	6439.27	319.11	2.1	2.1	0.03		
84	2	6427.05	319.10	2.0	2.0	0.03		
85	2	6415.07	319.10	2.0	1.9	0.03		
86	2	6403.35	319.10	1.9	1.9	0.03		
87	2	6391.87	319.10	1.8	1.8	0.03		
88	2	6380.62	319.09	1.8	1.8	0.03		
89	2	6369.61	319.09	1.7	1.7	0.03		
90	2	6358.82	319.09	1.7	1.6	0.03		
91	1	6348.26	319.09	1.6	1.6	0.03		
92	1	6337.92	319.09	1.6	1.5	0.03		
93	1	6327.79	319.09	1.5	1.5	0.03		
94	1	6317.87	319.08	1.5	1.4	0.03		
95	1	6308.15	319.08	1.4	1.4	0.03		
96	1	6298.64	319.08	1.4	1.4	0.03		
97	1	6289.32	319.08	1.3	1.3	0.03		
98	1	6280.19	319.08	1.3	1.3	0.03		
99	1	6271.25	319.08	1.3	1.2	0.03		
100	1	6262.49	319.07	1.2	1.2	0.03		
101	1	6253.92	319.07	1.2	1.2	0.03		
102	1	6245.52	319.07	1.2	1.1	0.03		
103	1	6237.29	319.07	1.1	1.1	0.03		
104	1	6229.23	319.07	1.1	1.1	0.03		
105	1	6221.34	319.07	1.1	1.0	0.03		
106	1	6213.61	319.06	1.0	1.0	0.03		
107	1	6206.03	319.06	1.0	1.0	0.03		
108	1	6198.62	319.06	1.0	0.9	0.03		
109	1	6191.35	319.06	0.9	0.9	0.03		
110	1	6184.23	319.06	0.9	0.9	0.03		
111	1	6177.26	319.06	0.9	0.8	0.03		
112	1	6170.43	319.06	0.8	0.8	0.03		
113	1	6163.74	319.06	0.8	0.8	0.03		
114	1	6157.19	319.05	0.8	0.8	0.03		
115	1	6150.77	319.05	0.8	0.7	0.03		
116	1	6144.48	319.05	0.8	0.7	0.03		
117	1	6138.32	319.05	0.7	0.7	0.03		
118	1	6132.29	319.05	0.7	0.7	0.03		
119	1	6126.37	319.05	0.7	0.7	0.03		
120	1	6120.58	319.05	0.7	0.6	0.03		
121	1	6114.90	319.05	0.6	0.6	0.03		
122	1	6109.34	319.05	0.6	0.6	0.03		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
123	1	6103.89	319.04	0.6	0.6	0.03		
124	1	6098.56	319.04	0.6	0.6	0.03		
125	0	6093.33	319.04	0.6	0.5	0.03		
126	0	6088.20	319.04	0.6	0.5	0.03		
127	0	6083.18	319.04	0.5	0.5	0.03		
128	0	6078.26	319.04	0.5	0.5	0.03		
129	0	6073.44	319.04	0.5	0.5	0.03		
130	0	6068.71	319.04	0.5	0.5	0.03		
131	0	6064.08	319.04	0.5	0.4	0.03		
132	0	6059.55	319.04	0.5	0.4	0.03		
133	0	6055.10	319.04	0.4	0.4	0.03		
134	0	6050.74	319.04	0.4	0.4	0.03		
135	0	6046.47	319.03	0.4	0.4	0.03		
136	0	6042.28	319.03	0.4	0.4	0.03		
137	0	6038.18	319.03	0.4	0.4	0.03		
138	0	6034.16	319.03	0.4	0.3	0.03		
139	0	6030.22	319.03	0.4	0.3	0.03		
140	0	6026.36	319.03	0.4	0.3	0.03		
141	0	6022.57	319.03	0.4	0.3	0.03		
142	0	6018.86	319.03	0.3	0.3	0.03		
143	0	6015.22	319.03	0.3	0.3	0.03		
144	0	6011.65	319.03	0.3	0.3	0.03		
145	0	6008.15	319.03	0.3	0.3	0.03		
146	0	6004.72	319.03	0.3	0.3	0.03		
147	0	6001.36	319.03	0.3	0.3	0.03		
148	0	5998.07	319.03	0.3	0.2	0.03		
149	0	5994.83	319.03	0.3	0.2	0.03		
150	0	5991.66	319.02	0.3	0.2	0.03		
151	0	5988.56	319.02	0.3	0.2	0.03		

GRAPHED DATA FOR 10 YEAR STORM





ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS					
			Peak Stage =	319.29	ft
			Rise =	1.29	ft
Freeboard =	1.71	ft	Peak Outflow =	9.19	cfs

INPUT

Hydrograph Results:

Qp =	9.23	cfs
Tp =	40.2	min
dT =	1.0	min

Stage-Storage Results:

Ks =	5854	
b =	0.95	
Z_0 =	318.0	ft (inv)

Initial Water Level:

Z_i =	318.00	ft

Weir:

N =	1	
L =	20	ft
Cw =	3.00	
Zcr =	319.00	ft

Top of Dam: 321.00 ft

Skimmer Orifice:

Number =	1.00	Ea
Diameter =	2.00	Inches
Head =	1.31	inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	318.00	0.0	0.0	0.0		
1	0	0.00	318.00	0.0	0.0	0.00		
2	0	0.84	318.00	0.0	0.0	0.00		
3	0	4.22	318.00	0.0	0.0	0.00		
4	0	11.79	318.00	0.0	0.0	0.00		
5	0	25.21	318.00	0.0	0.0	0.00		
6	0	46.07	318.01	0.0	0.0	0.00		
7	1	75.95	318.01	0.0	0.0	0.00		
8	1	116.34	318.02	0.0	0.0	0.00		
9	1	168.70	318.02	0.0	0.0	0.00		
10	1	234.39	318.03	0.0	0.0	0.00		
11	2	314.70	318.05	0.0	0.0	0.00		
12	2	410.83	318.06	0.0	0.0	0.00		
13	2	523.89	318.08	0.0	0.0	0.00		
14	2	654.87	318.10	0.0	0.0	0.00		
15	3	804.66	318.12	0.0	0.0	0.00		
16	3	974.04	318.15	0.0	0.0	0.00		
17	4	1163.66	318.18	0.0	0.0	0.03		
18	4	1372.01	318.22	0.0	0.0	0.03		
19	4	1601.54	318.26	0.0	0.0	0.03		
20	5	1852.53	318.30	0.0	0.0	0.03		
21	5	2125.12	318.34	0.0	0.0	0.03		
22	5	2419.33	318.39	0.0	0.0	0.03		
23	6	2735.03	318.45	0.0	0.0	0.03		
24	6	3071.98	318.51	0.0	0.0	0.03		
25	6	3429.80	318.57	0.0	0.0	0.03		
26	7	3807.98	318.64	0.0	0.0	0.03		
27	7	4205.89	318.71	0.0	0.0	0.03		
28	7	4622.78	318.78	0.0	0.0	0.03		
29	8	5057.78	318.86	0.0	0.0	0.03		
30	8	5509.91	318.94	0.0	0.0	0.03		
31	8	5978.09	319.02	0.2	0.2	0.03		
32	8	6449.15	319.11	2.1	2.1	0.03		
33	9	6819.47	319.17	4.4	4.4	0.03		
34	9	7066.74	319.22	6.2	6.1	0.03		
35	9	7217.59	319.25	7.4	7.3	0.03		
36	9	7306.44	319.26	8.1	8.1	0.03		
37	9	7359.10	319.27	8.5	8.5	0.03		
38	9	7391.20	319.28	8.8	8.8	0.03		
39	9	7411.31	319.28	9.0	9.0	0.03		
40	9	7423.83	319.28	9.1	9.1	0.03		
41	9	7431.00	319.29	9.2	9.1	0.03		
42	9	7433.91	319.29	9.2	9.2	0.03		
43	9	7433.10	319.29	9.2	9.2	0.03		
44	9	7428.85	319.28	9.2	9.1	0.03		
45	9	7421.31	319.28	9.1	9.1	0.03		
46	9	7410.59	319.28	9.0	9.0	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	9	7396.76	319.28	8.9	8.8	0.03		
48	8	7379.89	319.28	8.7	8.7	0.03		
49	8	7360.07	319.27	8.6	8.5	0.03		
50	8	7337.37	319.27	8.4	8.3	0.03		
51	5	7311.88	319.26	8.1	8.1	0.03		
52	5	7141.04	319.23	6.8	6.7	0.03		
53	5	7043.50	319.21	6.0	6.0	0.03		
54	5	6981.35	319.20	5.5	5.5	0.03		
55	5	6937.54	319.20	5.2	5.2	0.03		
56	5	6903.70	319.19	5.0	4.9	0.03		
57	4	6875.50	319.18	4.8	4.7	0.03		
58	4	6850.61	319.18	4.6	4.6	0.03		
59	4	6827.77	319.18	4.5	4.4	0.03		
60	4	6806.28	319.17	4.3	4.3	0.03		
61	4	6785.73	319.17	4.2	4.1	0.03		
62	4	6765.90	319.16	4.0	4.0	0.03		
63	4	6746.64	319.16	3.9	3.9	0.03		
64	3	6727.89	319.16	3.8	3.8	0.03		
65	3	6709.58	319.15	3.7	3.6	0.03		
66	3	6691.69	319.15	3.6	3.5	0.03		
67	3	6674.19	319.15	3.4	3.4	0.03		
68	3	6657.07	319.14	3.3	3.3	0.03		
69	3	6640.31	319.14	3.2	3.2	0.03		
70	3	6623.90	319.14	3.1	3.1	0.03		
71	3	6607.84	319.14	3.0	3.0	0.03		
72	3	6592.11	319.13	2.9	2.9	0.03		
73	3	6576.72	319.13	2.9	2.8	0.03		
74	3	6561.64	319.13	2.8	2.7	0.03		
75	2	6546.87	319.12	2.7	2.6	0.03		
76	2	6532.42	319.12	2.6	2.6	0.03		
77	2	6518.26	319.12	2.5	2.5	0.03		
78	2	6504.39	319.12	2.4	2.4	0.03		
79	2	6490.82	319.11	2.4	2.3	0.03		
80	2	6477.52	319.11	2.3	2.3	0.03		
81	2	6464.51	319.11	2.2	2.2	0.03		
82	2	6451.76	319.11	2.2	2.1	0.03		
83	2	6439.27	319.11	2.1	2.1	0.03		
84	2	6427.05	319.10	2.0	2.0	0.03		
85	2	6415.07	319.10	2.0	1.9	0.03		
86	2	6403.35	319.10	1.9	1.9	0.03		
87	2	6391.87	319.10	1.8	1.8	0.03		
88	2	6380.62	319.09	1.8	1.8	0.03		
89	2	6369.61	319.09	1.7	1.7	0.03		
90	2	6358.82	319.09	1.7	1.6	0.03		
91	1	6348.26	319.09	1.6	1.6	0.03		
92	1	6337.92	319.09	1.6	1.5	0.03		
93	1	6327.79	319.09	1.5	1.5	0.03		
94	1	6317.87	319.08	1.5	1.4	0.03		
95	1	6308.15	319.08	1.4	1.4	0.03		
96	1	6298.64	319.08	1.4	1.4	0.03		
97	1	6289.32	319.08	1.3	1.3	0.03		
98	1	6280.19	319.08	1.3	1.3	0.03		
99	1	6271.25	319.08	1.3	1.2	0.03		
100	1	6262.49	319.07	1.2	1.2	0.03		
101	1	6253.92	319.07	1.2	1.2	0.03		
102	1	6245.52	319.07	1.2	1.1	0.03		
103	1	6237.29	319.07	1.1	1.1	0.03		
104	1	6229.23	319.07	1.1	1.1	0.03		
105	1	6221.34	319.07	1.1	1.0	0.03		
106	1	6213.61	319.06	1.0	1.0	0.03		
107	1	6206.03	319.06	1.0	1.0	0.03		
108	1	6198.62	319.06	1.0	0.9	0.03		
109	1	6191.35	319.06	0.9	0.9	0.03		
110	1	6184.23	319.06	0.9	0.9	0.03		
111	1	6177.26	319.06	0.9	0.8	0.03		
112	1	6170.43	319.06	0.8	0.8	0.03		
113	1	6163.74	319.06	0.8	0.8	0.03		
114	1	6157.19	319.05	0.8	0.8	0.03		
115	1	6150.77	319.05	0.8	0.7	0.03		
116	1	6144.48	319.05	0.8	0.7	0.03		
117	1	6138.32	319.05	0.7	0.7	0.03		
118	1	6132.29	319.05	0.7	0.7	0.03		
119	1	6126.37	319.05	0.7	0.7	0.03		
120	1	6120.58	319.05	0.7	0.6	0.03		
121	1	6114.90	319.05	0.6	0.6	0.03		
122	1	6109.34	319.05	0.6	0.6	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	6103.89	319.04	0.6	0.6	0.03		
124	1	6098.56	319.04	0.6	0.6	0.03		
125	0	6093.33	319.04	0.6	0.5	0.03		
126	0	6088.20	319.04	0.6	0.5	0.03		
127	0	6083.18	319.04	0.5	0.5	0.03		
128	0	6078.26	319.04	0.5	0.5	0.03		
129	0	6073.44	319.04	0.5	0.5	0.03		
130	0	6068.71	319.04	0.5	0.5	0.03		
131	0	6064.08	319.04	0.5	0.4	0.03		
132	0	6059.55	319.04	0.5	0.4	0.03		
133	0	6055.10	319.04	0.4	0.4	0.03		
134	0	6050.74	319.04	0.4	0.4	0.03		
135	0	6046.47	319.03	0.4	0.4	0.03		
136	0	6042.28	319.03	0.4	0.4	0.03		
137	0	6038.18	319.03	0.4	0.4	0.03		
138	0	6034.16	319.03	0.4	0.3	0.03		
139	0	6030.22	319.03	0.4	0.3	0.03		
140	0	6026.36	319.03	0.4	0.3	0.03		
141	0	6022.57	319.03	0.4	0.3	0.03		
142	0	6018.86	319.03	0.3	0.3	0.03		
143	0	6015.22	319.03	0.3	0.3	0.03		
144	0	6011.65	319.03	0.3	0.3	0.03		
145	0	6008.15	319.03	0.3	0.3	0.03		
146	0	6004.72	319.03	0.3	0.3	0.03		
147	0	6001.36	319.03	0.3	0.3	0.03		
148	0	5998.07	319.03	0.3	0.2	0.03		
149	0	5994.83	319.03	0.3	0.2	0.03		
150	0	5991.66	319.02	0.3	0.2	0.03		
151	0	5988.56	319.02	0.3	0.2	0.03		

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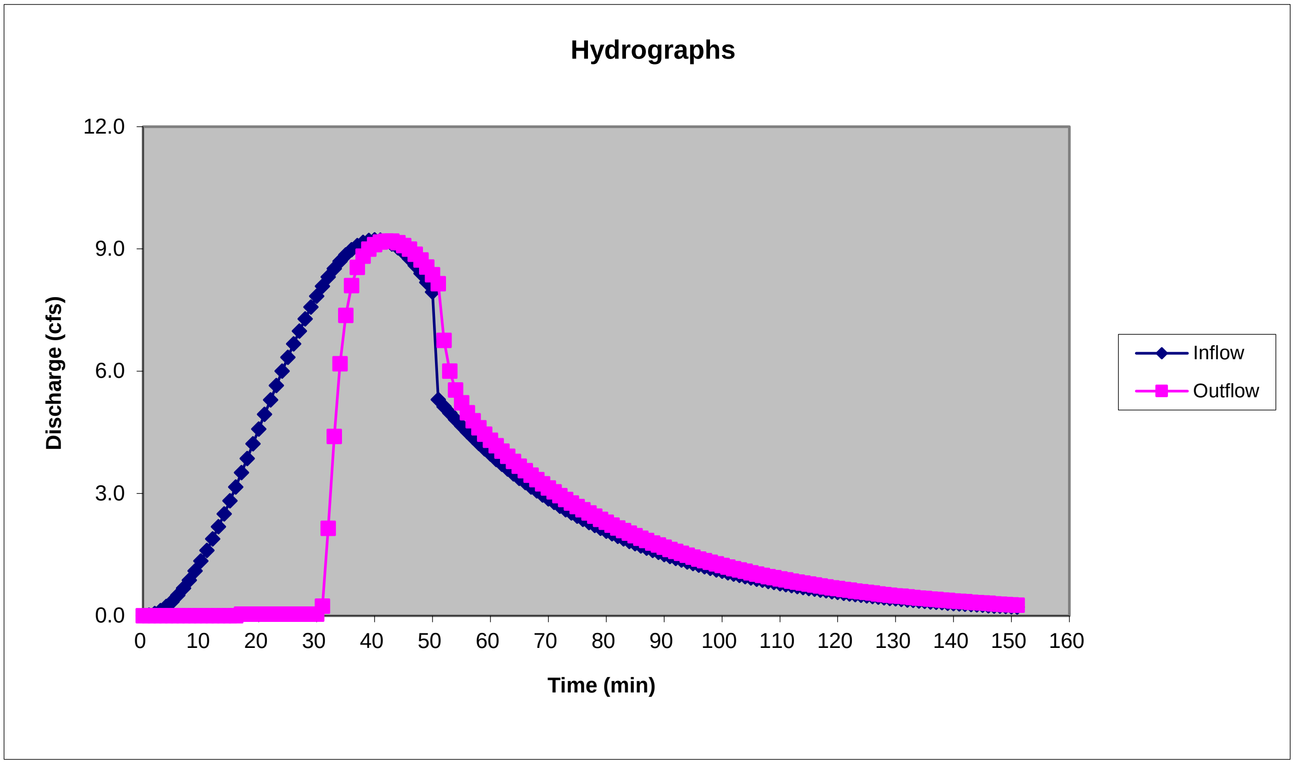
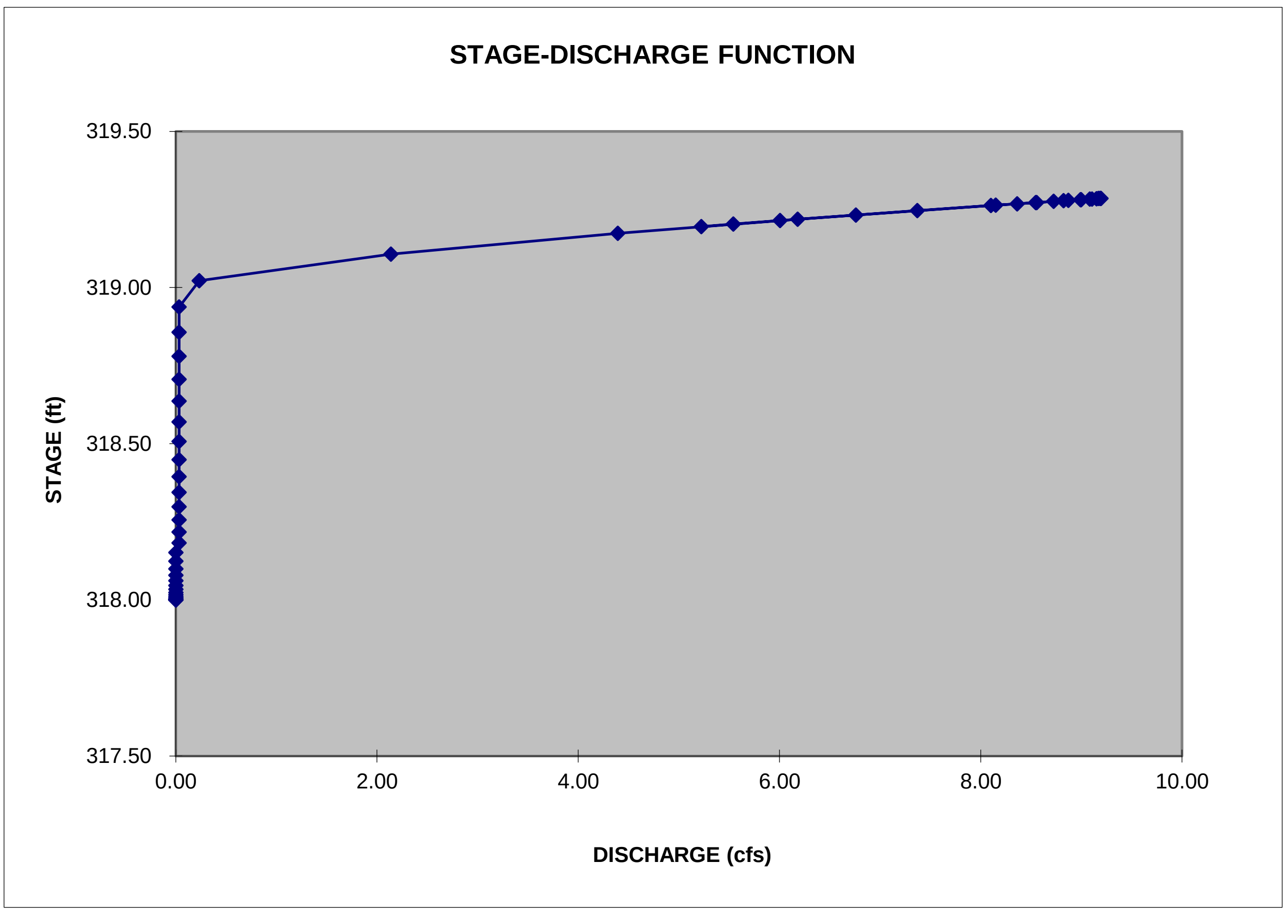
GRAPHED DATA FOR 25 YEAR STORM





ST-6
SKIMMER BASIN DESIGN

CHAMBLEE LAKE
ZEBULON, NC
DRH22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm

McADAMS

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Sediment Trap ID	ST-6		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	2.30 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	2.30 ac.	0.35
Undisturbed grassy area	0.00 ac.	0.00 ac.	0.25
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	2.30 ac.	2.30 ac.	
Composite Rational 'c'	0.45	0.35	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	551	feet
Height of watershed =	8	feet
Calculated t(c) =	5.1	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.1	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for Raleigh, NC

Return Period	B	D	Intensity
2	132	18	5.70 in/hr
10	195	22	7.18 in/hr
25	232	23	8.24 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	5.70 in/hr	5.9 cfs	4.59 cfs
10-year storm	7.18 in/hr	7.4 cfs	5.78 cfs
25-year storm	8.24 in/hr	8.5 cfs	6.64 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	1,800	cubic feet per disturbed acre
Required sediment trap surface area	325	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	100
Bottom width =	50
Sediment depth =	1.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Emergency Spillway =	1.0
Side slopes =	3.0 H:1V
Emergency Spillway length =	20
Height of berm =	3
Top of trap length =	118
Top of trap width =	68
Bottom elevation =	313

Sediment Trap Data

	Required	Provided
Sediment storage volume =	4140 cu. ft.	5460 cu. ft.
Sediment surface area =	2420 sq. ft.	5940 sq. ft.
Sediment storage depth =	3.5 ft. (max.)	1
Trap bottom length to width ratio =	2.0L:1W (min)	2.0L:1W
Spillway length =	10.0 ft. (min)	20
10-Year flow depth over spillway =	0.50 ft. (max)	0.25 ft
Freeboard at 10-Year discharge =	1.00 ft. (min)	1.75 ft

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU
1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Provided for Sediment Basin = 4,140 cubic feet

24 HOURS	Best Option =	1 - 2.5 inch Skimmers with a 2.1 inch orifice	
2 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.5 inch orifice	
3 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.3 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 1 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

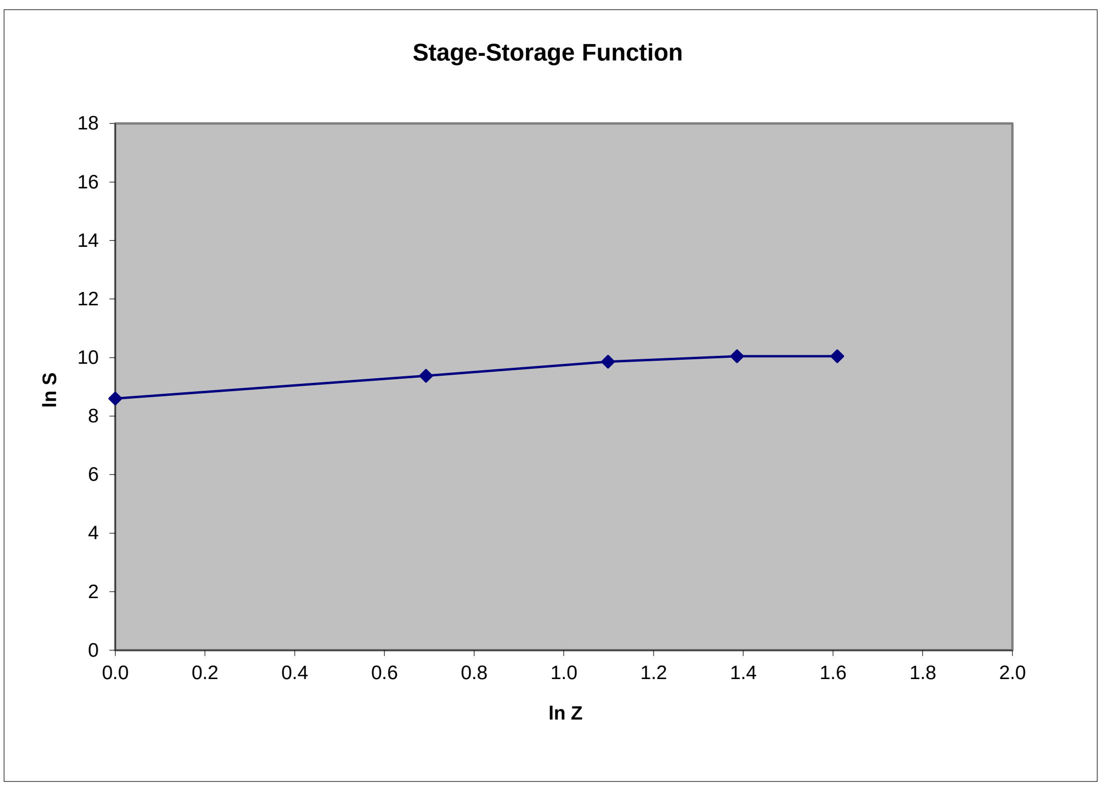
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
313	4979		0	0			
314	5881	5430	5430	1	8.5997	0.0000	0.92
315	6840	6360.5	11790.5	2	9.3750	0.6931	2.09
316	7856	7348	19138.5	3	9.8595	1.0986	3.48
317	0	3928	23066.5	4	10.0461	1.3863	4.23
318	0	0	23066.5	5	10.0461	1.6094	4.23

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 0.95 and **K_s =** 5854



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HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	2.30	ac	**Use Kirpich Equation:**	
Disturbed Area =	2.30	ac	**Tc =**	5.1 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	551	ft	**i_1 =**	5.70 in/hr
Vertical Fall =	8	ft	**i_{10} =**	7.18 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	8.24 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	5.9 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	7.4 cfs
h =	23		**Q_{25} =**	8.5 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	29.6	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	39.3	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	42.2	**minutes**

McADAMS

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	314.19 ft
		Rise =	1.19 ft
Freeboard =	1.81 ft	Peak Outflow =	4.84 cfs

INPUT

Hydrograph Results:

Qp = 5.90 cfs
Tp = 29.6 min
dT = 1.0 min

Stage-Storage Results:

Ks = 5854
b = 0.95
Z_0 = 313.0 ft (inv)

Initial Water Level:

Z_i = 313.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

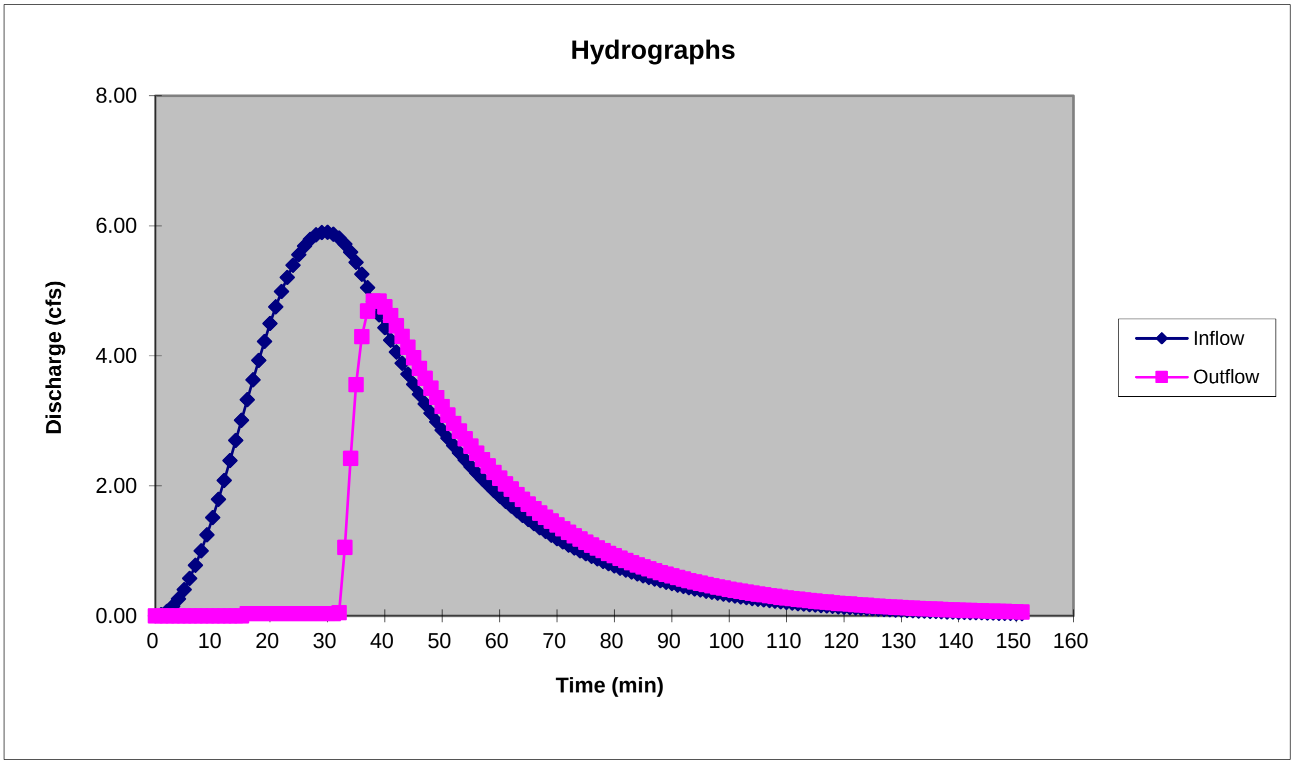
Skimmer Orifice:

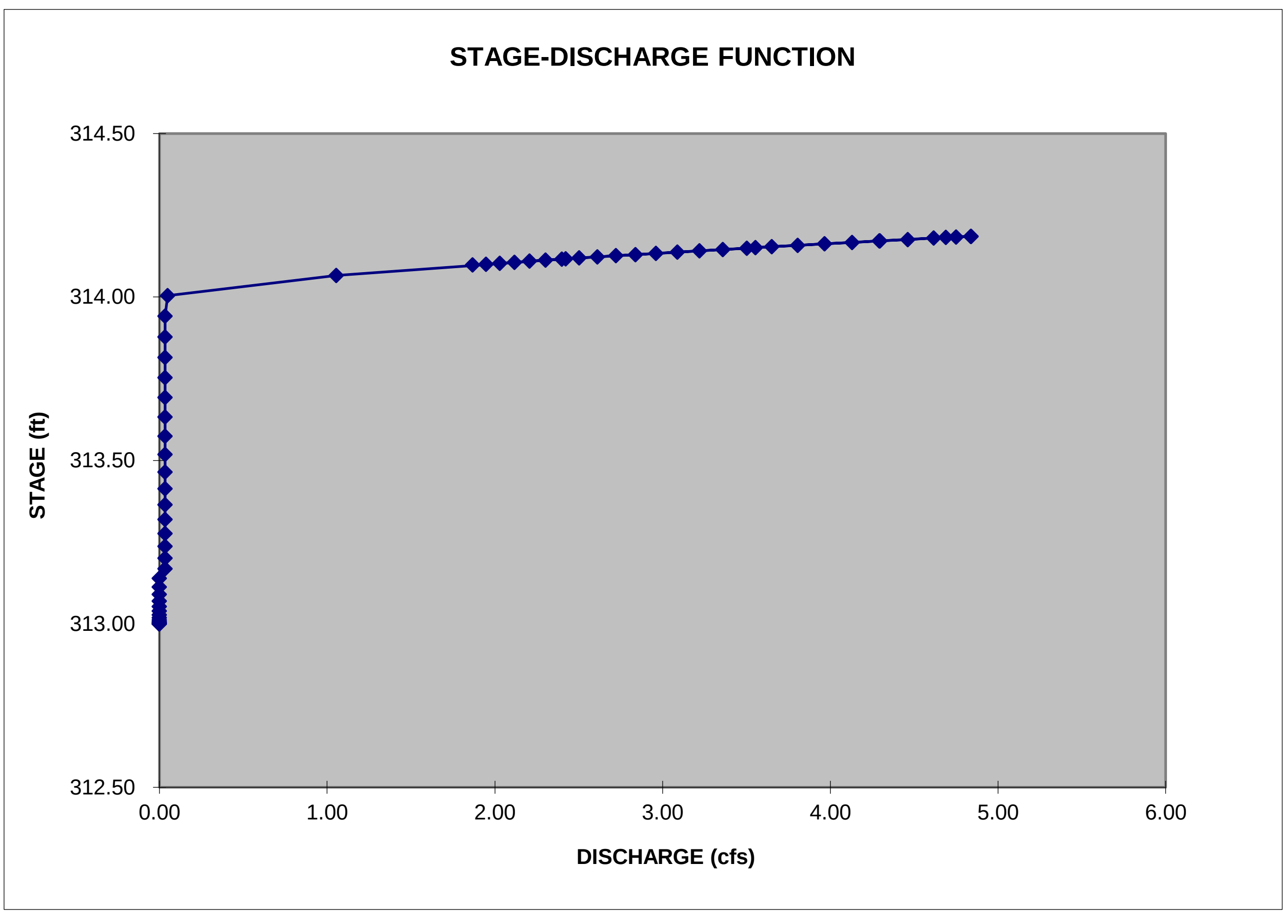
Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 1.25 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	313.00	0.0	0.0	0.0		
1	0	0.00	313.00	0.0	0.0	0.00		
2	0	0.99	313.00	0.0	0.0	0.00		
3	0	4.96	313.00	0.0	0.0	0.00		
4	0	13.84	313.00	0.0	0.0	0.00		
5	0	29.53	313.00	0.0	0.0	0.00		
6	1	53.84	313.01	0.0	0.0	0.00		
7	1	88.48	313.01	0.0	0.0	0.00		
8	1	135.06	313.02	0.0	0.0	0.00		
9	1	195.04	313.03	0.0	0.0	0.00		
10	2	269.73	313.04	0.0	0.0	0.00		
11	2	360.29	313.05	0.0	0.0	0.00		
12	2	467.68	313.07	0.0	0.0	0.00		
13	2	592.70	313.09	0.0	0.0	0.00		
14	3	735.92	313.11	0.0	0.0	0.00		
15	3	897.73	313.14	0.0	0.0	0.00		
16	3	1078.29	313.17	0.0	0.0	0.03		
17	4	1275.58	313.20	0.0	0.0	0.03		
18	4	1491.33	313.24	0.0	0.0	0.03		
19	4	1725.10	313.28	0.0	0.0	0.03		
20	4	1976.22	313.32	0.0	0.0	0.03		
21	5	2243.84	313.36	0.0	0.0	0.03		
22	5	2526.93	313.41	0.0	0.0	0.03		
23	5	2824.26	313.46	0.0	0.0	0.03		
24	5	3134.47	313.52	0.0	0.0	0.03		
25	6	3456.04	313.57	0.0	0.0	0.03		
26	6	3787.33	313.63	0.0	0.0	0.03		
27	6	4126.57	313.69	0.0	0.0	0.03		
28	6	4471.94	313.75	0.0	0.0	0.03		
29	6	4821.51	313.82	0.0	0.0	0.03		
30	6	5173.32	313.88	0.0	0.0	0.03		
31	6	5525.40	313.94	0.0	0.0	0.03		
32	6	5875.75	314.00	0.0	0.0	0.03		
33	6	6221.53	314.07	1.1	1.0	0.03		
34	6	6501.36	314.12	2.4	2.4	0.03		
35	5	6691.56	314.15	3.6	3.5	0.03		
36	5	6804.63	314.17	4.3	4.3	0.03		
37	5	6862.40	314.18	4.7	4.7	0.03		
38	5	6883.93	314.19	4.8	4.8	0.03		
39	5	6883.78	314.19	4.8	4.8	0.03		
40	4	6871.24	314.18	4.8	4.7	0.03		

GRAPHED DATA FOR 2 YEAR STORM





ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	314.25 ft
		Rise =	1.25 ft
Freeboard =	1.75 ft	**Peak Outflow =**	7.35 cfs

INPUT

Hydrograph Results:

Qp = 7.44 cfs
Tp = 39.3 min
dT = 1.0 min

Stage-Storage Results:

Ks = 5854
b = 0.95
Z_0 = 313.0 ft (inv)

Initial Water Level:

Z_i = 313.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 314.00 ft

Top of Dam: 316.00 ft

Skimmer Orifice:

Number = 1 Ea
Diameter = 2.00 Inches
Head = 1.25 inches

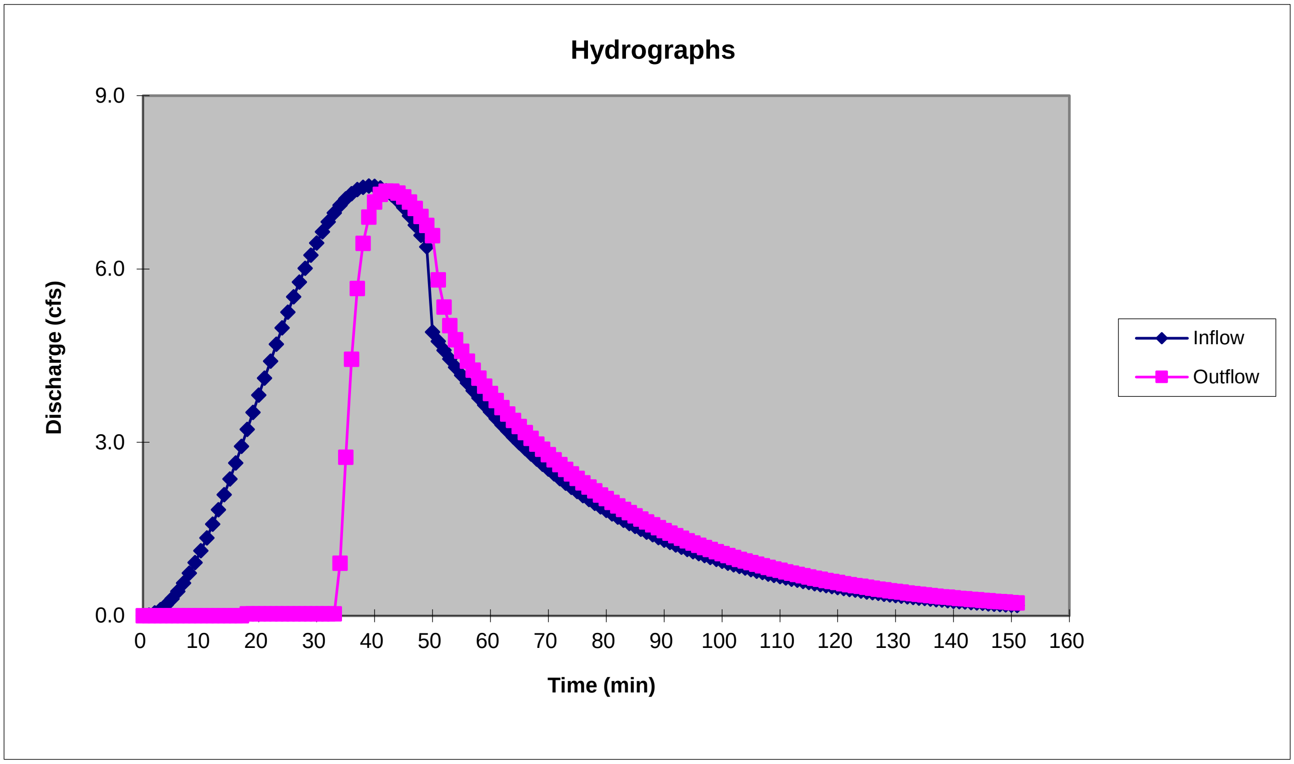
OUTPUT

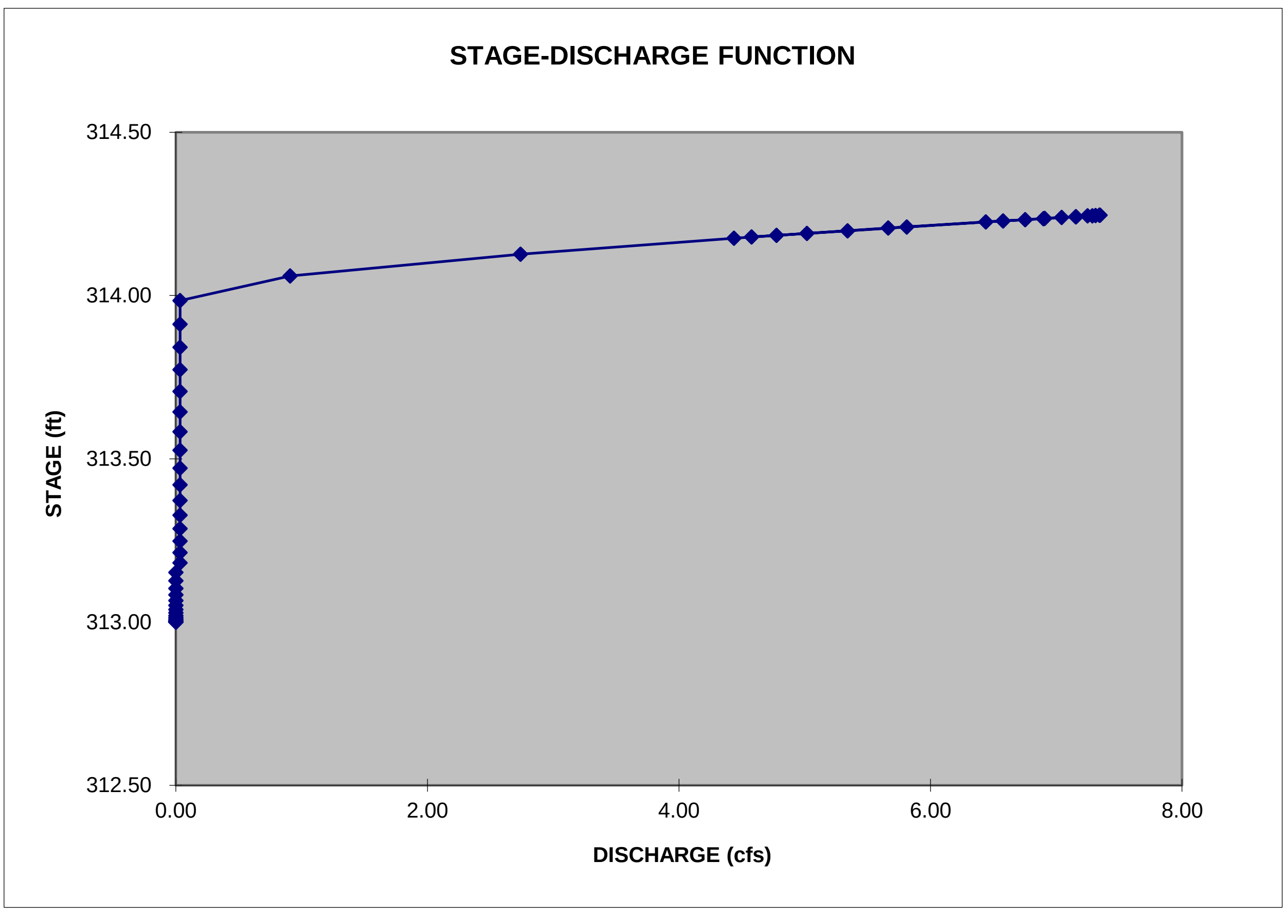
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	313.00	0.0	0.0	0.0		
1	0	0.00	313.00	0.0	0.0	0.00		
2	0	0.71	313.00	0.0	0.0	0.00		
3	0	3.55	313.00	0.0	0.0	0.00		
4	0	9.92	313.00	0.0	0.0	0.00		
5	0	21.21	313.00	0.0	0.0	0.00		
6	0	38.76	313.01	0.0	0.0	0.00		
7	1	63.89	313.01	0.0	0.0	0.00		
8	1	97.86	313.01	0.0	0.0	0.00		
9	1	141.87	313.02	0.0	0.0	0.00		
10	1	197.06	313.03	0.0	0.0	0.00		
11	1	264.51	313.04	0.0	0.0	0.00		
12	2	345.21	313.05	0.0	0.0	0.00		
13	2	440.06	313.07	0.0	0.0	0.00		
14	2	549.88	313.08	0.0	0.0	0.00		
15	2	675.40	313.10	0.0	0.0	0.00		
16	3	817.24	313.13	0.0	0.0	0.00		
17	3	975.91	313.15	0.0	0.0	0.00		
18	3	1151.82	313.18	0.0	0.0	0.03		
19	4	1343.29	313.21	0.0	0.0	0.03		
20	4	1552.48	313.25	0.0	0.0	0.03		
21	4	1779.49	313.29	0.0	0.0	0.03		
22	4	2024.27	313.33	0.0	0.0	0.03		
23	5	2286.67	313.37	0.0	0.0	0.03		
24	5	2566.43	313.42	0.0	0.0	0.03		
25	5	2863.18	313.47	0.0	0.0	0.03		
26	6	3176.42	313.53	0.0	0.0	0.03		
27	6	3505.58	313.58	0.0	0.0	0.03		
28	6	3849.97	313.64	0.0	0.0	0.03		
29	6	4208.79	313.71	0.0	0.0	0.03		
30	6	4581.17	313.77	0.0	0.0	0.03		
31	7	4966.15	313.84	0.0	0.0	0.03		
32	7	5362.69	313.91	0.0	0.0	0.03		
33	7	5769.65	313.98	0.0	0.0	0.03		
34	7	6185.86	314.06	0.9	0.9	0.03		
35	7	6557.57	314.13	2.7	2.7	0.03		
36	7	6826.01	314.18	4.4	4.4	0.03		
37	7	6998.01	314.21	5.7	5.6	0.03		
38	7	7100.49	314.23	6.4	6.4	0.03		
39	7	7158.94	314.24	6.9	6.9	0.03		
40	7	7191.08	314.24	7.2	7.1	0.03		
41	7	7207.59	314.24	7.3	7.3	0.03		
42	7	7214.47	314.25	7.3	7.3	0.03		
43	7	7214.94	314.25	7.3	7.3	0.03		
44	7	7210.72	314.25	7.3	7.3	0.03		
45	7	7202.74	314.24	7.2	7.2	0.03		
46	7	7191.48	314.24	7.2	7.1	0.03		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
47	7	7177.24	314.24	7.0	7.0	0.03		
48	7	7160.20	314.24	6.9	6.9	0.03		
49	6	7140.49	314.23	6.8	6.7	0.03		
50	5	7118.22	314.23	6.6	6.5	0.03		
51	5	7018.01	314.21	5.8	5.8	0.03		
52	5	6954.18	314.20	5.3	5.3	0.03		
53	4	6909.34	314.19	5.0	5.0	0.03		
54	4	6874.89	314.18	4.8	4.7	0.03		
55	4	6846.36	314.18	4.6	4.5	0.03		
56	4	6821.33	314.17	4.4	4.4	0.03		
57	4	6798.48	314.17	4.3	4.2	0.03		
58	4	6777.05	314.17	4.1	4.1	0.03		
59	4	6756.62	314.16	4.0	3.9	0.03		
60	4	6736.94	314.16	3.8	3.8	0.03		
61	3	6717.87	314.16	3.7	3.7	0.03		
62	3	6699.32	314.15	3.6	3.6	0.03		
63	3	6681.22	314.15	3.5	3.5	0.03		
64	3	6663.55	314.15	3.4	3.3	0.03		
65	3	6646.28	314.14	3.3	3.2	0.03		
66	3	6629.39	314.14	3.2	3.1	0.03		
67	3	6612.86	314.14	3.1	3.0	0.03		
68	3	6596.70	314.13	3.0	2.9	0.03		
69	3	6580.88	314.13	2.9	2.8	0.03		
70	3	6565.39	314.13	2.8	2.8	0.03		
71	2	6550.24	314.13	2.7	2.7	0.03		
72	2	6535.41	314.12	2.6	2.6	0.03		
73	2	6520.90	314.12	2.5	2.5	0.03		
74	2	6506.69	314.12	2.5	2.4	0.03		
75	2	6492.78	314.12	2.4	2.3	0.03		
76	2	6479.17	314.11	2.3	2.3	0.03		
77	2	6465.85	314.11	2.2	2.2	0.03		
78	2	6452.81	314.11	2.2	2.1	0.03		
79	2	6440.05	314.11	2.1	2.1	0.03		
80	2	6427.55	314.10	2.0	2.0	0.03		
81	2	6415.32	314.10	2.0	1.9	0.03		
82	2	6403.35	314.10	1.9	1.9	0.03		
83	2	6391.63	314.10	1.8	1.8	0.03		
84	2	6380.16	314.09	1.8	1.7	0.03		
85	2	6368.93	314.09	1.7	1.7	0.03		
86	1	6357.94	314.09	1.7	1.6	0.03		
87	1	6347.18	314.09	1.6	1.6	0.03		
88	1	6336.65	314.09	1.6	1.5	0.03		
89	1	6326.34	314.09	1.5	1.5	0.03		
90	1	6316.25	314.08	1.5	1.4	0.03		
91	1	6306.37	314.08	1.4	1.4	0.03		
92	1	6296.70	314.08	1.4	1.3	0.03		
93	1	6287.23	314.08	1.3	1.3	0.03		
94	1	6277.96	314.08	1.3	1.3	0.03		
95	1	6268.89	314.07	1.3	1.2	0.03		
96	1	6260.00	314.07	1.2	1.2	0.03		
97	1	6251.31	314.07	1.2	1.1	0.03		
98	1	6242.79	314.07	1.1	1.1	0.03		
99	1	6234.46	314.07	1.1	1.1	0.03		
100	1	6226.30	314.07	1.1	1.0	0.03		
101	1	6218.31	314.07	1.0	1.0	0.03		
102	1	6210.49	314.06	1.0	1.0	0.03		
103	1	6202.83	314.06	1.0	0.9	0.03		
104	1	6195.33	314.06	0.9	0.9	0.03		
105	1	6187.99	314.06	0.9	0.9	0.03		
106	1	6180.80	314.06	0.9	0.9	0.03		
107	1	6173.76	314.06	0.9	0.8	0.03		
108	1	6166.87	314.06	0.8	0.8	0.03		
109	1	6160.12	314.06	0.8	0.8	0.03		
110	1	6153.52	314.05	0.8	0.8	0.03		
111	1	6147.05	314.05	0.8	0.7	0.03		
112	1	6140.71	314.05	0.7	0.7	0.03		
113	1	6134.51	314.05	0.7	0.7	0.03		
114	1	6128.44	314.05	0.7	0.7	0.03		
115	1	6122.49	314.05	0.7	0.6	0.03		
116	1	6116.66	314.05	0.6	0.6	0.03		
117	1	6110.96	314.05	0.6	0.6	0.03		
118	1	6105.37	314.05	0.6	0.6	0.03		
119	1	6099.90	314.04	0.6	0.6	0.03		
120	0	6094.54	314.04	0.6	0.5	0.03		
121	0	6089.30	314.04	0.6	0.5	0.03		
122	0	6084.16	314.04	0.5	0.5	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	0	6079.12	314.04	0.5	0.5	0.03		
124	0	6074.19	314.04	0.5	0.5	0.03		
125	0	6069.36	314.04	0.5	0.5	0.03		
126	0	6064.63	314.04	0.5	0.4	0.03		
127	0	6060.00	314.04	0.5	0.4	0.03		
128	0	6055.46	314.04	0.4	0.4	0.03		
129	0	6051.01	314.04	0.4	0.4	0.03		
130	0	6046.66	314.03	0.4	0.4	0.03		
131	0	6042.39	314.03	0.4	0.4	0.03		
132	0	6038.21	314.03	0.4	0.4	0.03		
133	0	6034.12	314.03	0.4	0.3	0.03		
134	0	6030.11	314.03	0.4	0.3	0.03		
135	0	6026.18	314.03	0.4	0.3	0.03		
136	0	6022.32	314.03	0.3	0.3	0.03		
137	0	6018.55	314.03	0.3	0.3	0.03		
138	0	6014.85	314.03	0.3	0.3	0.03		
139	0	6011.23	314.03	0.3	0.3	0.03		
140	0	6007.68	314.03	0.3	0.3	0.03		
141	0	6004.20	314.03	0.3	0.3	0.03		
142	0	6000.79	314.03	0.3	0.3	0.03		
143	0	5997.45	314.03	0.3	0.2	0.03		
144	0	5994.17	314.03	0.3	0.2	0.03		
145	0	5990.96	314.02	0.3	0.2	0.03		
146	0	5987.81	314.02	0.3	0.2	0.03		
147	0	5984.73	314.02	0.2	0.2	0.03		
148	0	5981.71	314.02	0.2	0.2	0.03		
149	0	5978.74	314.02	0.2	0.2	0.03		
150	0	5975.83	314.02	0.2	0.2	0.03		
151	0	5972.99	314.02	0.2	0.2	0.03		

GRAPHED DATA FOR 10 YEAR STORM





MCADAMS

ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**314.27 ft**
		Rise =	**1.27 ft**
Freeboard =	**1.73 ft**	**Peak Outflow =**	**8.49 cfs**

INPUT

Hydrograph Results:

Qp = 8.53 cfs

Tp = 39.3 min

dT = 1.0 min

Stage-Storage Results:

Ks = 5854

b = 0.95

Z_0 = 313.0 ft (inv)

Initial Water Level:

Z_i = 313.00 ft

Weir:

N = 1

L = 20 ft

Cw = 3.00

Zcr = 314.00 ft

Top of Dam:

316.00 ft

Skimmer Orifice:

Number = 1.00 Ea

Diameter = 2.00 Inches

Head = 1.25 inches

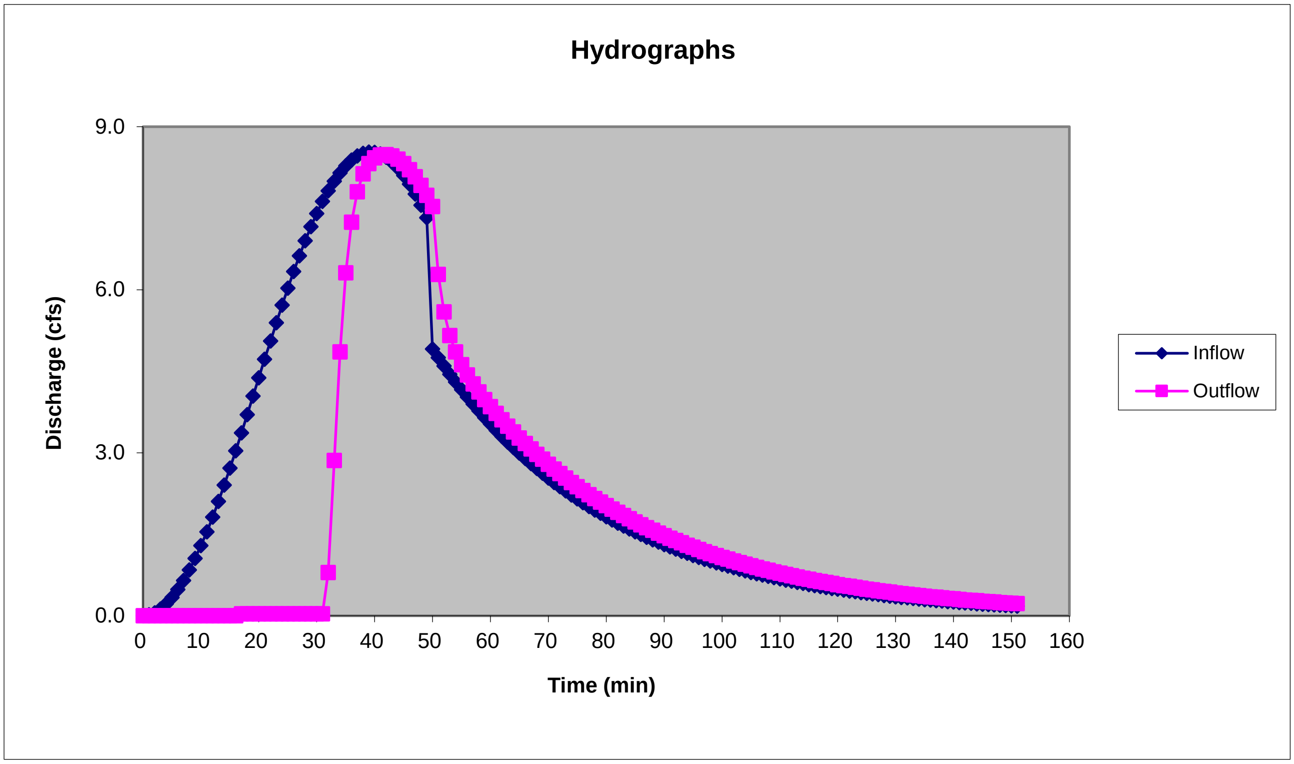
OUTPUT

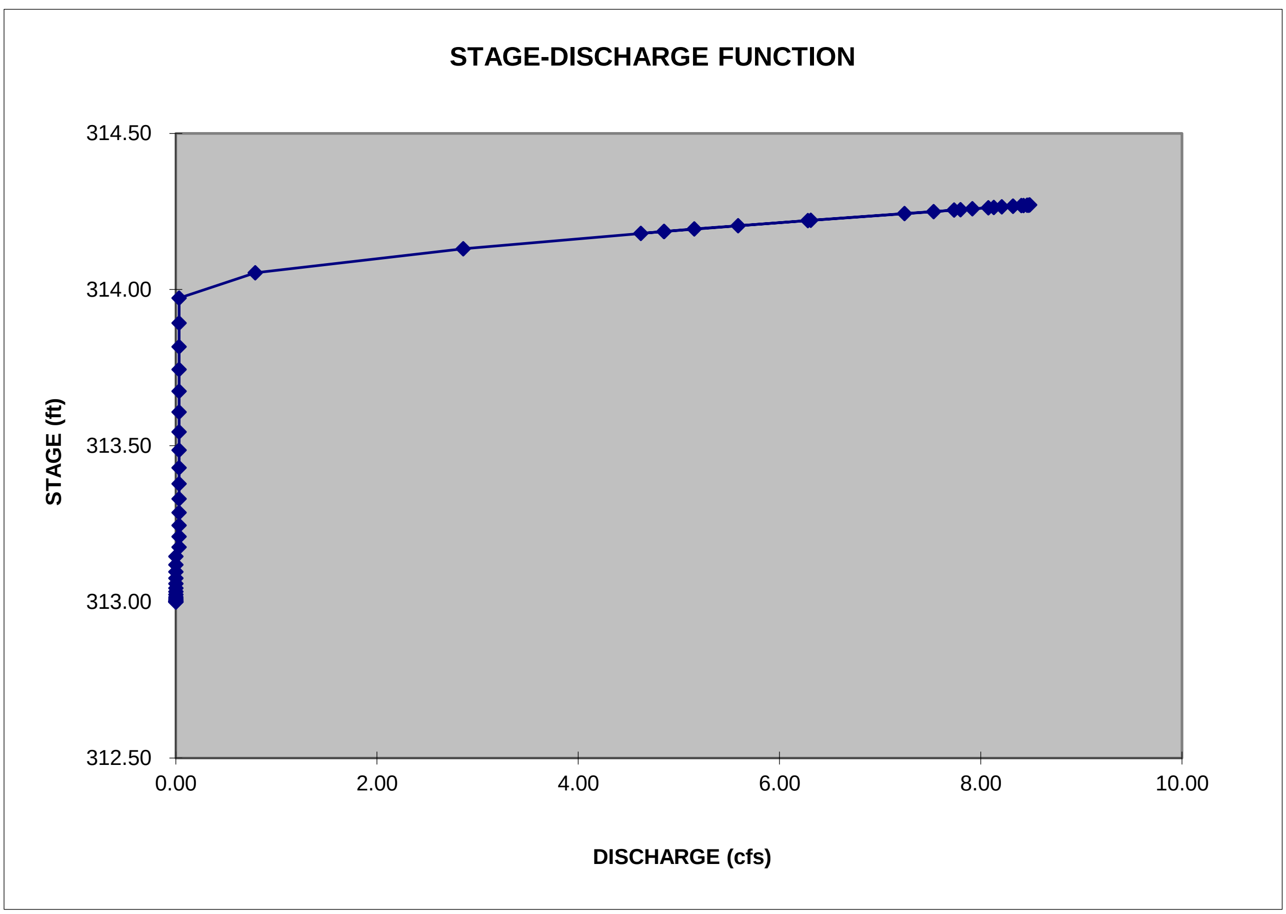
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	313.00	0.0	0.0	0.0		
1	0	0.00	313.00	0.0	0.0	0.00		
2	0	0.82	313.00	0.0	0.0	0.00		
3	0	4.07	313.00	0.0	0.0	0.00		
4	0	11.39	313.00	0.0	0.0	0.00		
5	0	24.34	313.00	0.0	0.0	0.00		
6	0	44.48	313.01	0.0	0.0	0.00		
7	1	73.32	313.01	0.0	0.0	0.00		
8	1	112.29	313.02	0.0	0.0	0.00		
9	1	162.79	313.02	0.0	0.0	0.00		
10	1	226.12	313.03	0.0	0.0	0.00		
11	2	303.52	313.04	0.0	0.0	0.00		
12	2	396.11	313.06	0.0	0.0	0.00		
13	2	504.95	313.08	0.0	0.0	0.00		
14	2	630.97	313.10	0.0	0.0	0.00		
15	3	775.00	313.12	0.0	0.0	0.00		
16	3	937.75	313.15	0.0	0.0	0.00		
17	3	1119.82	313.18	0.0	0.0	0.03		
18	4	1319.68	313.21	0.0	0.0	0.03		
19	4	1539.67	313.25	0.0	0.0	0.03		
20	4	1780.01	313.29	0.0	0.0	0.03		
21	5	2040.79	313.33	0.0	0.0	0.03		
22	5	2321.96	313.38	0.0	0.0	0.03		
23	5	2623.36	313.43	0.0	0.0	0.03		
24	6	2944.67	313.49	0.0	0.0	0.03		
25	6	3285.47	313.54	0.0	0.0	0.03		
26	6	3645.20	313.61	0.0	0.0	0.03		
27	7	4023.20	313.67	0.0	0.0	0.03		
28	7	4418.66	313.74	0.0	0.0	0.03		
29	7	4830.69	313.82	0.0	0.0	0.03		
30	7	5258.29	313.89	0.0	0.0	0.03		
31	8	5700.33	313.97	0.0	0.0	0.03		
32	8	6155.64	314.05	0.8	0.8	0.03		
33	8	6577.42	314.13	2.9	2.8	0.03		
34	8	6885.87	314.19	4.9	4.8	0.03		
35	8	7083.76	314.22	6.3	6.3	0.03		
36	8	7201.84	314.24	7.2	7.2	0.03		
37	8	7270.24	314.26	7.8	7.8	0.03		
38	9	7309.71	314.26	8.1	8.1	0.03		
39	9	7332.43	314.27	8.3	8.3	0.03		
40	9	7345.03	314.27	8.4	8.4	0.03		
41	8	7350.95	314.27	8.5	8.4	0.03		
42	8	7351.95	**314.27**	8.5	8.5	0.03		
43	8	7348.93	314.27	8.5	8.4	0.03		
44	8	7342.33	314.27	8.4	8.4	0.03		
45	8	7332.42	314.27	8.3	8.3	0.03		
46	8	7319.35	314.26	8.2	8.2	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time	Inflow	Storage	Stage	Outflow	Weir	Skimmer		
T	I	S	Z	O	Flow	Flow		
min	cfs	cu-ft	ft	cfs	cfs	cfs		
47	8	7303.24	314.26	8.1	8.0	0.03		
48	8	7284.17	314.26	7.9	7.9	0.03		
49	7	7262.24	314.25	7.7	7.7	0.03		
50	5	7237.54	314.25	7.5	7.5	0.03		
51	5	7080.12	314.22	6.3	6.3	0.03		
52	5	6988.04	314.20	5.6	5.6	0.03		
53	4	6928.31	314.19	5.2	5.1	0.03		
54	4	6885.73	314.19	4.9	4.8	0.03		
55	4	6852.63	314.18	4.6	4.6	0.03		
56	4	6825.00	314.18	4.4	4.4	0.03		
57	4	6800.65	314.17	4.3	4.2	0.03		
58	4	6778.34	314.17	4.1	4.1	0.03		
59	4	6757.40	314.16	4.0	3.9	0.03		
60	4	6737.42	314.16	3.8	3.8	0.03		
61	3	6718.16	314.16	3.7	3.7	0.03		
62	3	6699.49	314.15	3.6	3.6	0.03		
63	3	6681.33	314.15	3.5	3.5	0.03		
64	3	6663.62	314.15	3.4	3.3	0.03		
65	3	6646.32	314.14	3.3	3.2	0.03		
66	3	6629.41	314.14	3.2	3.1	0.03		
67	3	6612.88	314.14	3.1	3.0	0.03		
68	3	6596.71	314.13	3.0	2.9	0.03		
69	3	6580.88	314.13	2.9	2.8	0.03		
70	3	6565.40	314.13	2.8	2.8	0.03		
71	2	6550.25	314.13	2.7	2.7	0.03		
72	2	6535.41	314.12	2.6	2.6	0.03		
73	2	6520.90	314.12	2.5	2.5	0.03		
74	2	6506.69	314.12	2.5	2.4	0.03		
75	2	6492.78	314.12	2.4	2.3	0.03		
76	2	6479.17	314.11	2.3	2.3	0.03		
77	2	6465.85	314.11	2.2	2.2	0.03		
78	2	6452.81	314.11	2.2	2.1	0.03		
79	2	6440.05	314.11	2.1	2.1	0.03		
80	2	6427.55	314.10	2.0	2.0	0.03		
81	2	6415.32	314.10	2.0	1.9	0.03		
82	2	6403.35	314.10	1.9	1.9	0.03		
83	2	6391.63	314.10	1.8	1.8	0.03		
84	2	6380.16	314.09	1.8	1.7	0.03		
85	2	6368.93	314.09	1.7	1.7	0.03		
86	1	6357.94	314.09	1.7	1.6	0.03		
87	1	6347.18	314.09	1.6	1.6	0.03		
88	1	6336.65	314.09	1.6	1.5	0.03		
89	1	6326.34	314.09	1.5	1.5	0.03		
90	1	6316.25	314.08	1.5	1.4	0.03		
91	1	6306.37	314.08	1.4	1.4	0.03		
92	1	6296.70	314.08	1.4	1.3	0.03		
93	1	6287.23	314.08	1.3	1.3	0.03		
94	1	6277.96	314.08	1.3	1.3	0.03		
95	1	6268.89	314.07	1.3	1.2	0.03		
96	1	6260.00	314.07	1.2	1.2	0.03		
97	1	6251.31	314.07	1.2	1.1	0.03		
98	1	6242.79	314.07	1.1	1.1	0.03		
99	1	6234.46	314.07	1.1	1.1	0.03		
100	1	6226.30	314.07	1.1	1.0	0.03		
101	1	6218.31	314.07	1.0	1.0	0.03		
102	1	6210.49	314.06	1.0	1.0	0.03		
103	1	6202.83	314.06	1.0	0.9	0.03		
104	1	6195.33	314.06	0.9	0.9	0.03		
105	1	6187.99	314.06	0.9	0.9	0.03		
106	1	6180.80	314.06	0.9	0.9	0.03		
107	1	6173.76	314.06	0.9	0.8	0.03		
108	1	6166.87	314.06	0.8	0.8	0.03		
109	1	6160.12	314.06	0.8	0.8	0.03		
110	1	6153.52	314.05	0.8	0.8	0.03		
111	1	6147.05	314.05	0.8	0.7	0.03		
112	1	6140.71	314.05	0.7	0.7	0.03		
113	1	6134.51	314.05	0.7	0.7	0.03		
114	1	6128.44	314.05	0.7	0.7	0.03		
115	1	6122.49	314.05	0.7	0.6	0.03		
116	1	6116.66	314.05	0.6	0.6	0.03		
117	1	6110.96	314.05	0.6	0.6	0.03		
118	1	6105.37	314.05	0.6	0.6	0.03		
119	1	6099.90	314.04	0.6	0.6	0.03		
120	0	6094.54	314.04	0.6	0.5	0.03		
121	0	6089.30	314.04	0.6	0.5	0.03		
122	0	6084.16	314.04	0.5	0.5	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	0	6079.12	314.04	0.5	0.5	0.03		
124	0	6074.19	314.04	0.5	0.5	0.03		
125	0	6069.36	314.04	0.5	0.5	0.03		
126	0	6064.63	314.04	0.5	0.4	0.03		
127	0	6060.00	314.04	0.5	0.4	0.03		
128	0	6055.46	314.04	0.4	0.4	0.03		
129	0	6051.01	314.04	0.4	0.4	0.03		
130	0	6046.66	314.03	0.4	0.4	0.03		
131	0	6042.39	314.03	0.4	0.4	0.03		
132	0	6038.21	314.03	0.4	0.4	0.03		
133	0	6034.12	314.03	0.4	0.3	0.03		
134	0	6030.11	314.03	0.4	0.3	0.03		
135	0	6026.18	314.03	0.4	0.3	0.03		
136	0	6022.32	314.03	0.3	0.3	0.03		
137	0	6018.55	314.03	0.3	0.3	0.03		
138	0	6014.85	314.03	0.3	0.3	0.03		
139	0	6011.23	314.03	0.3	0.3	0.03		
140	0	6007.68	314.03	0.3	0.3	0.03		
141	0	6004.20	314.03	0.3	0.3	0.03		
142	0	6000.79	314.03	0.3	0.3	0.03		
143	0	5997.45	314.03	0.3	0.2	0.03		
144	0	5994.17	314.03	0.3	0.2	0.03		
145	0	5990.96	314.02	0.3	0.2	0.03		
146	0	5987.81	314.02	0.3	0.2	0.03		
147	0	5984.73	314.02	0.2	0.2	0.03		
148	0	5981.71	314.02	0.2	0.2	0.03		
149	0	5978.74	314.02	0.2	0.2	0.03		
150	0	5975.83	314.02	0.2	0.2	0.03		
151	0	5972.99	314.02	0.2	0.2	0.03		

GRAPHED DATA FOR 25 YEAR STORM





ST-7
SKIMMER BASIN
DESIGN

CHAMBLEE LAKE
ZEBULON, NC
DRH22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm

SKIMMER BASIN SIZING

MCADAMS

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Sediment Trap ID	ST-7		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	4.89 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	4.89 ac.	0.35
Undisturbed grassy area	0.00 ac.	0.00 ac.	0.25
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	4.89 ac.	4.89 ac.	
Composite Rational 'c'	0.45	0.35	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	1064	feet
Height of watershed =	12	feet
Calculated t(c) =	9.4	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	9.4	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for: Raleigh, NC

Return Period	B	D	Intensity
2	132	18	4.82 in/hr
10	195	22	6.21 in/hr
25	232	23	7.16 in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff
2-year storm	4.82 in/hr	10.6 cfs	8.24 cfs
10-year storm	6.21 in/hr	13.7 cfs	10.63 cfs
25-year storm	7.16 in/hr	15.8 cfs	12.25 cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	1,800	cubic feet per disturbed acre
Required sediment trap surface area	325	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	150
Bottom width =	75
Sediment depth =	1.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Emergency Spillway =	1.0
Side slopes =	3.0 H:1V
Emergency Spillway length =	20
Height of berm =	3
Top of trap length =	168
Top of trap width =	93
Bottom elevation =	312

Sediment Trap Data

	Required	Provided
Sediment storage volume =	8802 cu. ft.	11940 cu. ft.
Sediment surface area =	4440 sq. ft.	12640 sq. ft.
Sediment storage depth =	3.5 ft. (max.)	1
Trap bottom length to width ratio =	2.0L:1W (min)	2.0L:1W
Spillway length =	10.0 ft. (min)	20
10-Year flow depth over spillway =	0.50 ft. (max)	0.36 ft
Freeboard at 10-Year discharge =	1.00 ft. (min)	1.64 ft

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU
1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Provided for Sediment Basin = 8,802 cubic feet

24 HOURS	Best Option =	1 - 3 inch Skimmers with a 2.8 inch orifice	
2 DAYS	Best Option =	1 - 2.5 inch Skimmers with a 2.2 inch orifice	
3 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.8 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.4 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

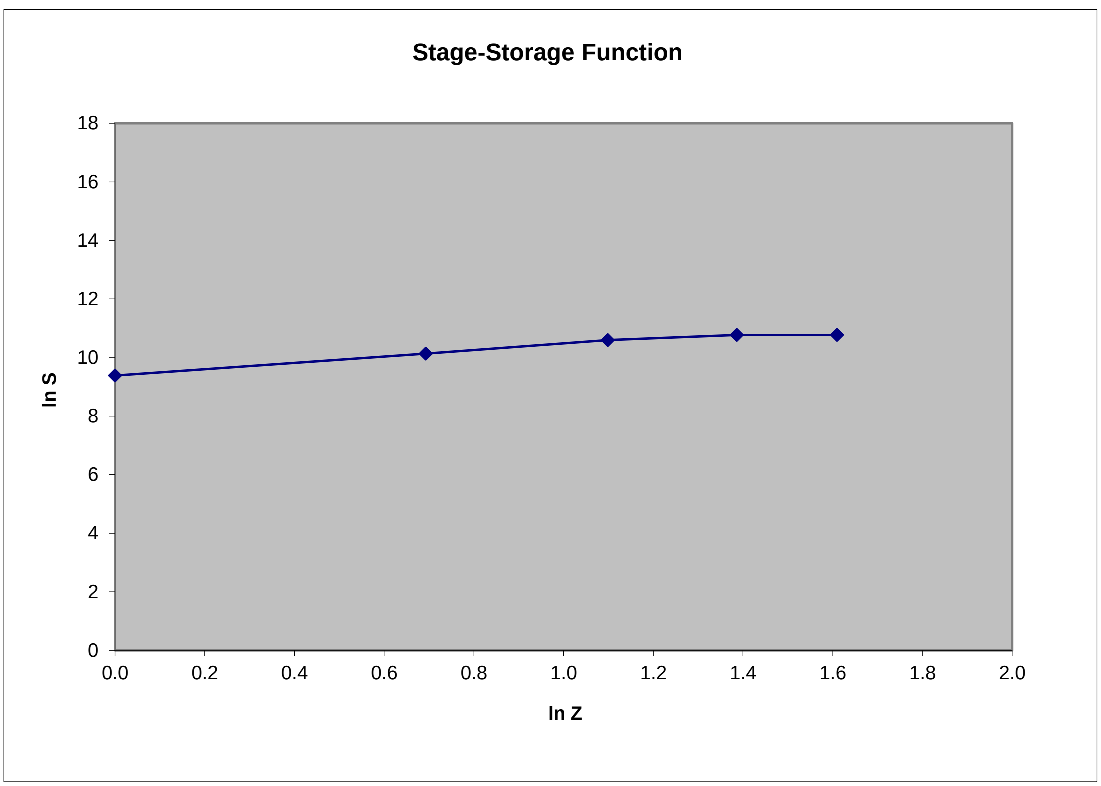
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6 Y	7 X	8
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
312	11229		0	0			
313	12581	11905	11905	1	9.3847	0.0000	0.92
314	13990	13285.5	25190.5	2	10.1342	0.6931	2.10
315	15456	14723	39913.5	3	10.5945	1.0986	3.48
316	0	7728	47641.5	4	10.7715	1.3863	4.22
317	0	0	47641.5	5	10.7715	1.6094	4.22

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 0.91 and **K_s =** 12826



HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	4.89	ac	**Use Kirpich Equation:**	
Disturbed Area =	4.89	ac	**Tc =**	9.4 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	1064	ft	**i_1 =**	4.82 in/hr
Vertical Fall =	12	ft	**i_{10} =**	6.21 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	7.16 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	10.6 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	13.7 cfs
h =	23		**Q_{25} =**	15.8 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	35.1	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	45.5	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	48.6	**minutes**

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**313.25 ft**
		Rise =	**1.25 ft**
Freeboard =	**1.75 ft**	**Peak Outflow =**	**7.66 cfs**

INPUT

Hydrograph Results:

Qp = 10.60 cfs
Tp = 35.1 min
dT = 1.0 min

Stage-Storage Results:

Ks = 12826
b = 0.91
Z_0 = 312.0 ft (inv)

Initial Water Level:

Z_i = 312.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 313.00 ft

Top of Dam: 315.00 ft

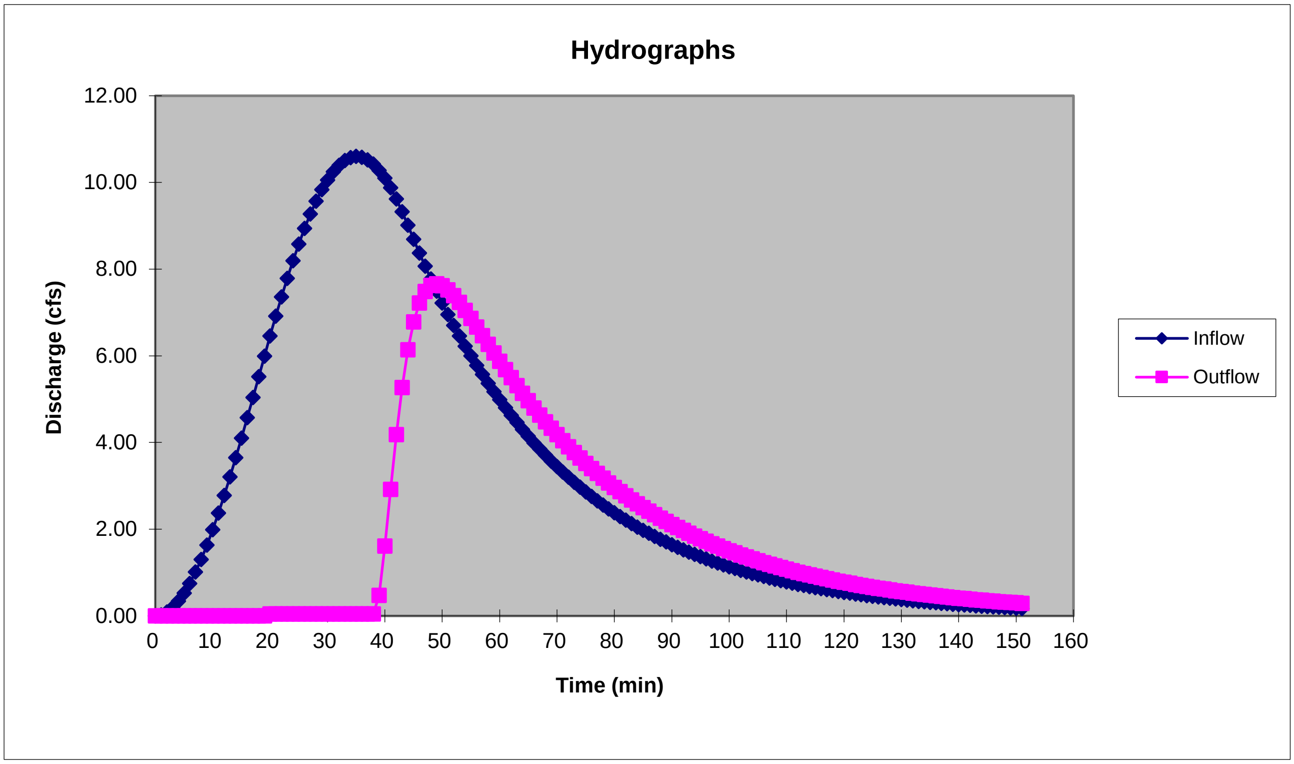
Skimmer Orifice:

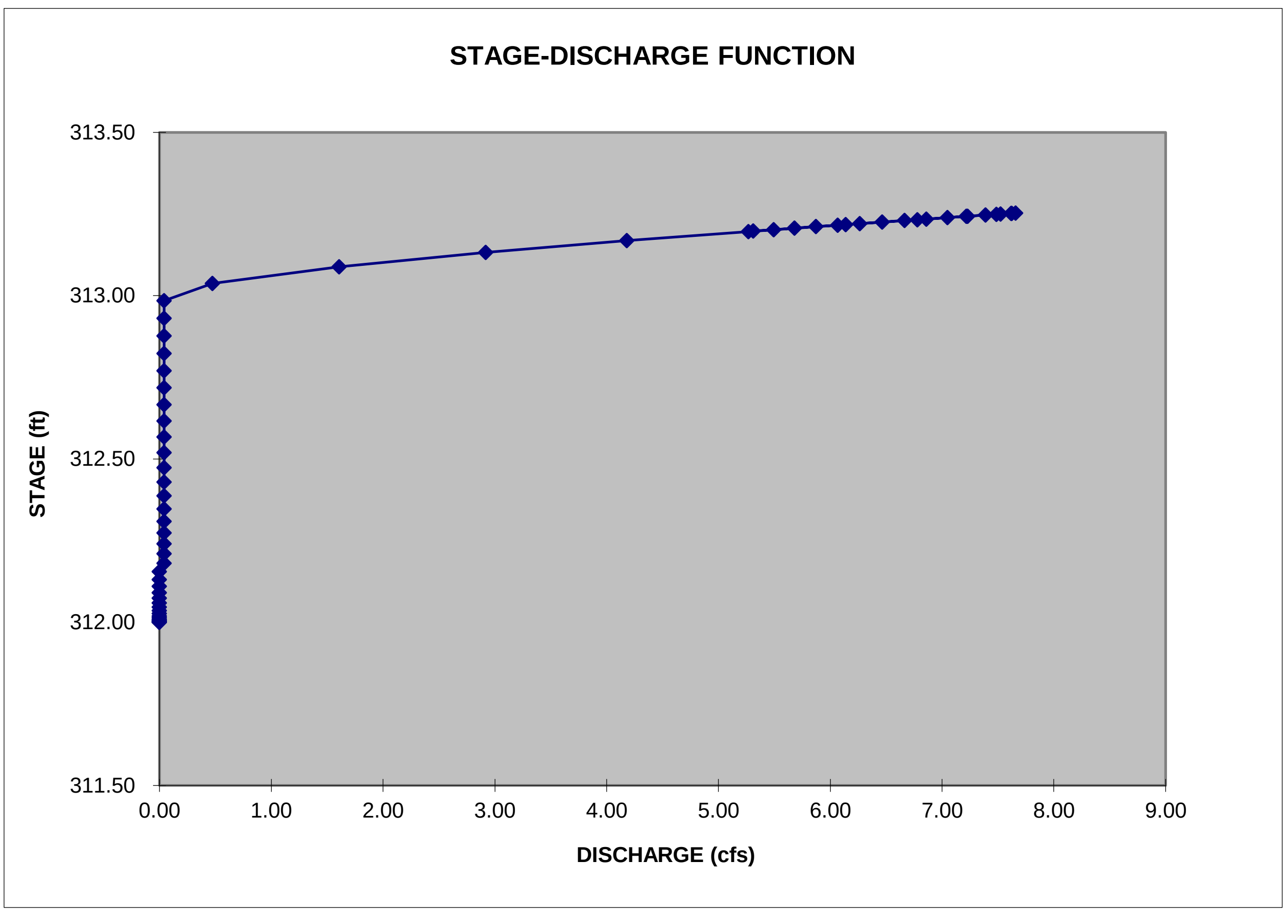
Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 1.82 inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	312.00	0.0	0.0	0.0		
1	0	0.00	312.00	0.0	0.0	0.00		
2	0	1.27	312.00	0.0	0.0	0.00		
3	0	6.36	312.00	0.0	0.0	0.00		
4	0	17.75	312.00	0.0	0.0	0.00		
5	1	37.92	312.00	0.0	0.0	0.00		
6	1	69.25	312.00	0.0	0.0	0.00		
7	1	114.03	312.01	0.0	0.0	0.00		
8	1	174.44	312.01	0.0	0.0	0.00		
9	2	252.56	312.01	0.0	0.0	0.00		
10	2	350.31	312.02	0.0	0.0	0.00		
11	2	469.44	312.03	0.0	0.0	0.00		
12	3	611.55	312.04	0.0	0.0	0.00		
13	3	778.04	312.05	0.0	0.0	0.00		
14	4	970.14	312.06	0.0	0.0	0.00		
15	4	1188.85	312.07	0.0	0.0	0.00		
16	5	1434.96	312.09	0.0	0.0	0.00		
17	5	1709.05	312.11	0.0	0.0	0.00		
18	6	2011.47	312.13	0.0	0.0	0.00		
19	6	2342.35	312.15	0.0	0.0	0.00		
20	6	2701.58	312.18	0.0	0.0	0.04		
21	7	3086.41	312.21	0.0	0.0	0.04		
22	7	3498.71	312.24	0.0	0.0	0.04		
23	8	3937.70	312.27	0.0	0.0	0.04		
24	8	4402.39	312.31	0.0	0.0	0.04		
25	9	4891.59	312.35	0.0	0.0	0.04		
26	9	5403.91	312.39	0.0	0.0	0.04		
27	9	5937.76	312.43	0.0	0.0	0.04		
28	10	6491.41	312.47	0.0	0.0	0.04		
29	10	7062.95	312.52	0.0	0.0	0.04		
30	10	7650.31	312.57	0.0	0.0	0.04		
31	10	8251.34	312.62	0.0	0.0	0.04		
32	10	8863.74	312.67	0.0	0.0	0.04		
33	11	9485.13	312.72	0.0	0.0	0.04		
34	11	10113.06	312.77	0.0	0.0	0.04		
35	11	10745.04	312.82	0.0	0.0	0.04		
36	11	11378.52	312.88	0.0	0.0	0.04		
37	11	12010.96	312.93	0.0	0.0	0.04		
38	10	12639.82	312.98	0.0	0.0	0.04		
39	10	13262.60	313.04	0.5	0.4	0.04		
40	10	13850.76	313.09	1.6	1.6	0.04		

GRAPHED DATA FOR 2 YEAR STORM





McADAMS

ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**313.36** ft
		Rise =	**1.36** ft
Freeboard =	**1.64** ft	**Peak Outflow =**	**13.02** cfs

INPUT

Hydrograph Results:

Qp =	13.66	cfs
Tp =	45.5	min
dT =	1.0	min

Stage-Storage Results:

Ks =	12826	
b =	0.91	
Z_0 =	312.0	ft (inv)

Initial Water Level:

Z_i =	312.00	ft

Weir:

N =	1	
L =	20	ft
Cw =	3.00	
Zcr =	313.00	ft

Top of Dam: 315.00 ft

Skimmer Orifice:

Number =	1	Ea
Diameter =	2.00	Inches
Head =	1.82	inches

OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	312.00	0.0	0.0	0.0		
1	0	0.00	312.00	0.0	0.0	0.00		
2	0	0.98	312.00	0.0	0.0	0.00		
3	0	4.88	312.00	0.0	0.0	0.00		
4	0	13.63	312.00	0.0	0.0	0.00		
5	0	29.16	312.00	0.0	0.0	0.00		
6	1	53.32	312.00	0.0	0.0	0.00		
7	1	87.98	312.00	0.0	0.0	0.00		
8	1	134.90	312.01	0.0	0.0	0.00		
9	1	195.82	312.01	0.0	0.0	0.00		
10	2	272.40	312.01	0.0	0.0	0.00		
11	2	366.22	312.02	0.0	0.0	0.00		
12	2	478.80	312.03	0.0	0.0	0.00		
13	3	611.55	312.04	0.0	0.0	0.00		
14	3	765.78	312.05	0.0	0.0	0.00		
15	3	942.73	312.06	0.0	0.0	0.00		
16	4	1143.48	312.07	0.0	0.0	0.00		
17	4	1369.05	312.09	0.0	0.0	0.00		
18	5	1620.31	312.10	0.0	0.0	0.00		
19	5	1898.01	312.12	0.0	0.0	0.00		
20	6	2202.79	312.14	0.0	0.0	0.00		
21	6	2535.14	312.17	0.0	0.0	0.04		
22	6	2893.01	312.19	0.0	0.0	0.04		
23	7	3279.07	312.22	0.0	0.0	0.04		
24	7	3693.41	312.25	0.0	0.0	0.04		
25	8	4136.00	312.29	0.0	0.0	0.04		
26	8	4606.67	312.32	0.0	0.0	0.04		
27	9	5105.12	312.36	0.0	0.0	0.04		
28	9	5630.92	312.40	0.0	0.0	0.04		
29	10	6183.50	312.45	0.0	0.0	0.04		
30	10	6762.18	312.50	0.0	0.0	0.04		
31	11	7366.13	312.54	0.0	0.0	0.04		
32	11	7994.43	312.60	0.0	0.0	0.04		
33	11	8646.01	312.65	0.0	0.0	0.04		
34	12	9319.72	312.70	0.0	0.0	0.04		
35	12	10014.30	312.76	0.0	0.0	0.04		
36	12	10728.36	312.82	0.0	0.0	0.04		
37	13	11460.46	312.88	0.0	0.0	0.04		
38	13	12209.04	312.95	0.0	0.0	0.04		
39	13	12972.48	313.01	0.1	0.1	0.04		
40	13	13744.04	313.08	1.4	1.3	0.04		
41	13	14452.34	313.14	3.2	3.1	0.04		
42	13	15061.26	313.19	5.1	5.1	0.04		
43	14	15561.60	313.24	6.9	6.9	0.04		
44	14	15958.78	313.27	8.5	8.5	0.04		
45	14	16265.51	313.30	9.8	9.8	0.04		
46	14	16496.86	313.32	10.8	10.8	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	14	16667.44	313.33	11.6	11.5	0.04		
48	14	16789.93	313.34	12.1	12.1	0.04		
49	13	16874.74	313.35	12.5	12.5	0.04		
50	13	16930.01	313.36	12.8	12.8	0.04		
51	13	16961.98	313.36	13.0	12.9	0.04		
52	13	16975.32	**313.36**	13.0	13.0	0.04		
53	13	16973.50	313.36	13.0	13.0	0.04		
54	13	16959.09	313.36	12.9	12.9	0.04		
55	12	16933.96	313.36	12.8	12.8	0.04		
56	12	16899.54	313.35	12.7	12.6	0.04		
57	9	16856.87	313.35	12.5	12.4	0.04		
58	9	16650.99	313.33	11.5	11.5	0.04		
59	9	16486.90	313.32	10.8	10.7	0.04		
60	8	16352.30	313.31	10.2	10.1	0.04		
61	8	16238.87	313.30	9.7	9.6	0.04		
62	8	16140.88	313.29	9.3	9.2	0.04		
63	8	16054.29	313.28	8.9	8.9	0.04		
64	7	15976.26	313.27	8.6	8.5	0.04		
65	7	15904.76	313.27	8.3	8.3	0.04		
66	7	15838.29	313.26	8.0	8.0	0.04		
67	7	15775.79	313.26	7.8	7.7	0.04		
68	7	15716.47	313.25	7.5	7.5	0.04		
69	6	15659.75	313.25	7.3	7.3	0.04		
70	6	15605.19	313.24	7.1	7.1	0.04		
71	6	15552.47	313.24	6.9	6.9	0.04		
72	6	15501.34	313.23	6.7	6.7	0.04		
73	6	15451.63	313.23	6.5	6.5	0.04		
74	6	15403.17	313.22	6.3	6.3	0.04		
75	5	15355.87	313.22	6.2	6.1	0.04		
76	5	15309.64	313.21	6.0	6.0	0.04		
77	5	15264.41	313.21	5.8	5.8	0.04		
78	5	15220.11	313.21	5.7	5.6	0.04		
79	5	15176.72	313.20	5.5	5.5	0.04		
80	5	15134.18	313.20	5.4	5.3	0.04		
81	5	15092.46	313.20	5.2	5.2	0.04		
82	4	15051.55	313.19	5.1	5.1	0.04		
83	4	15011.41	313.19	5.0	4.9	0.04		
84	4	14972.02	313.19	4.8	4.8	0.04		
85	4	14933.36	313.18	4.7	4.7	0.04		
86	4	14895.42	313.18	4.6	4.5	0.04		
87	4	14858.18	313.18	4.4	4.4	0.04		
88	4	14821.62	313.17	4.3	4.3	0.04		
89	4	14785.72	313.17	4.2	4.2	0.04		
90	4	14750.49	313.17	4.1	4.1	0.04		
91	3	14715.89	313.16	4.0	3.9	0.04		
92	3	14681.93	313.16	3.9	3.8	0.04		
93	3	14648.58	313.16	3.8	3.7	0.04		
94	3	14615.84	313.15	3.7	3.6	0.04		
95	3	14583.69	313.15	3.6	3.5	0.04		
96	3	14552.12	313.15	3.5	3.4	0.04		
97	3	14521.12	313.15	3.4	3.3	0.04		
98	3	14490.68	313.14	3.3	3.3	0.04		
99	3	14460.80	313.14	3.2	3.2	0.04		
100	3	14431.45	313.14	3.1	3.1	0.04		
101	3	14402.64	313.14	3.0	3.0	0.04		
102	2	14374.34	313.13	3.0	2.9	0.04		
103	2	14346.55	313.13	2.9	2.8	0.04		
104	2	14319.27	313.13	2.8	2.8	0.04		
105	2	14292.48	313.13	2.7	2.7	0.04		
106	2	14266.17	313.12	2.7	2.6	0.04		
107	2	14240.33	313.12	2.6	2.5	0.04		
108	2	14214.96	313.12	2.5	2.5	0.04		
109	2	14190.05	313.12	2.5	2.4	0.04		
110	2	14165.59	313.12	2.4	2.3	0.04		
111	2	14141.56	313.11	2.3	2.3	0.04		
112	2	14117.97	313.11	2.3	2.2	0.04		
113	2	14094.80	313.11	2.2	2.2	0.04		
114	2	14072.05	313.11	2.1	2.1	0.04		
115	2	14049.71	313.11	2.1	2.0	0.04		
116	2	14027.77	313.10	2.0	2.0	0.04		
117	2	14006.22	313.10	2.0	1.9	0.04		
118	2	13985.06	313.10	1.9	1.9	0.04		
119	2	13964.28	313.10	1.9	1.8	0.04		
120	1	13943.87	313.10	1.8	1.8	0.04		
121	1	13923.83	313.09	1.8	1.7	0.04		
122	1	13904.15	313.09	1.7	1.7	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	13884.82	313.09	1.7	1.6	0.04		
124	1	13865.84	313.09	1.6	1.6	0.04		
125	1	13847.19	313.09	1.6	1.6	0.04		
126	1	13828.88	313.09	1.6	1.5	0.04		
127	1	13810.90	313.08	1.5	1.5	0.04		
128	1	13793.24	313.08	1.5	1.4	0.04		
129	1	13775.89	313.08	1.4	1.4	0.04		
130	1	13758.85	313.08	1.4	1.4	0.04		
131	1	13742.12	313.08	1.4	1.3	0.04		
132	1	13725.69	313.08	1.3	1.3	0.04		
133	1	13709.54	313.08	1.3	1.3	0.04		
134	1	13693.69	313.07	1.3	1.2	0.04		
135	1	13678.12	313.07	1.2	1.2	0.04		
136	1	13662.82	313.07	1.2	1.2	0.04		
137	1	13647.80	313.07	1.2	1.1	0.04		
138	1	13633.05	313.07	1.1	1.1	0.04		
139	1	13618.55	313.07	1.1	1.1	0.04		
140	1	13604.32	313.07	1.1	1.0	0.04		
141	1	13590.33	313.07	1.0	1.0	0.04		
142	1	13576.60	313.06	1.0	1.0	0.04		
143	1	13563.10	313.06	1.0	1.0	0.04		
144	1	13549.85	313.06	1.0	0.9	0.04		
145	1	13536.83	313.06	0.9	0.9	0.04		
146	1	13524.04	313.06	0.9	0.9	0.04		
147	1	13511.48	313.06	0.9	0.9	0.04		
148	1	13499.14	313.06	0.9	0.8	0.04		
149	1	13487.01	313.06	0.9	0.8	0.04		
150	1	13475.10	313.06	0.8	0.8	0.04		
151	1	13463.40	313.05	0.8	0.8	0.04		

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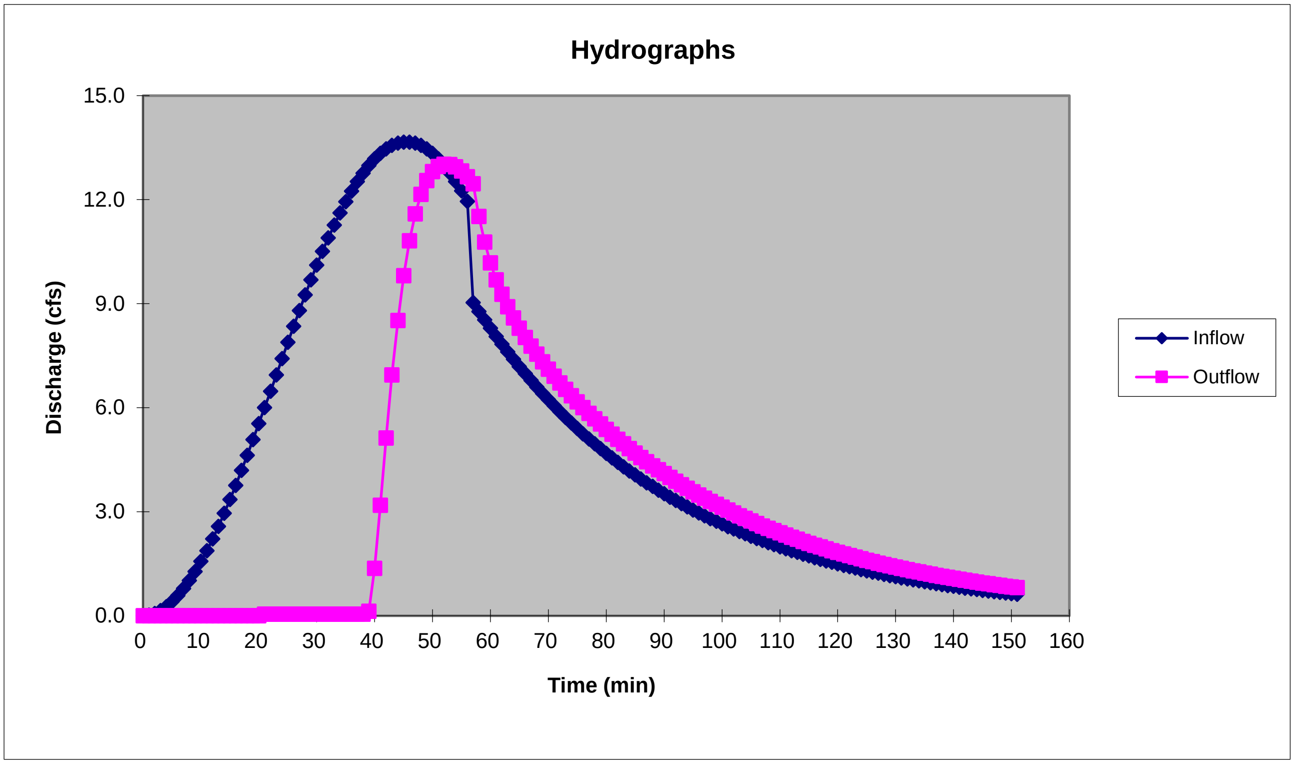
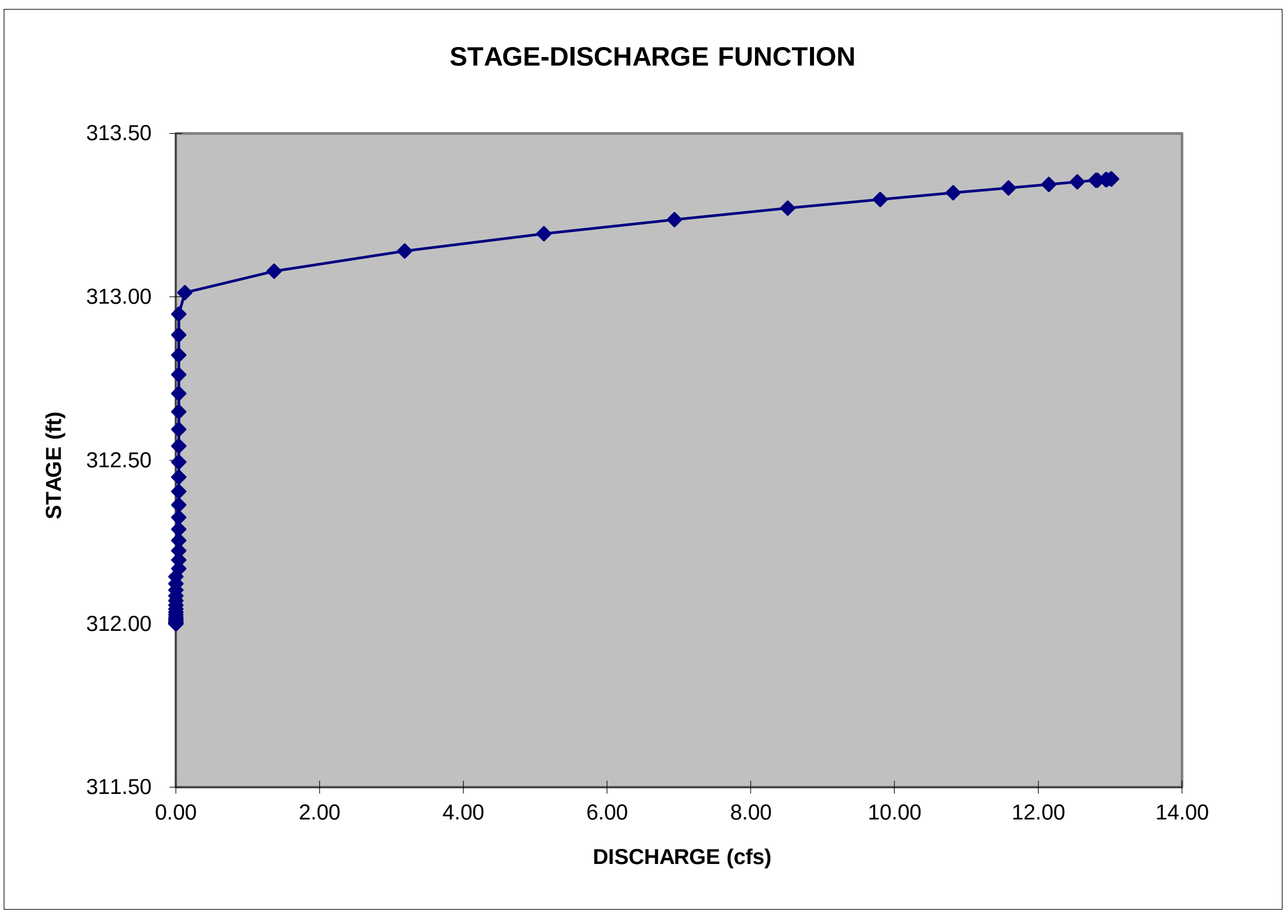
GRAPHED DATA FOR 10 YEAR STORM





ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

Peak Stage =	313.40 ft
Rise =	1.40 ft
Freeboard =	1.60 ft
Peak Outflow =	15.32 cfs

INPUT

Hydrograph Results:

Qp =	15.75	cfs
Tp =	45.5	min
dT =	1.0	min

Stage-Storage Results:

Ks =	12826	
b =	0.91	
Z_0 =	312.0	ft (inv)

Initial Water Level:

Z_i =	312.00	ft

Weir:

N =	1	
L =	20	ft
Cw =	3.00	
Zcr =	313.00	ft

Top of Dam: 315.00 ft

Skimmer Orifice:

Number =	1.00	Ea
Diameter =	2.00	Inches
Head =	1.82	inches

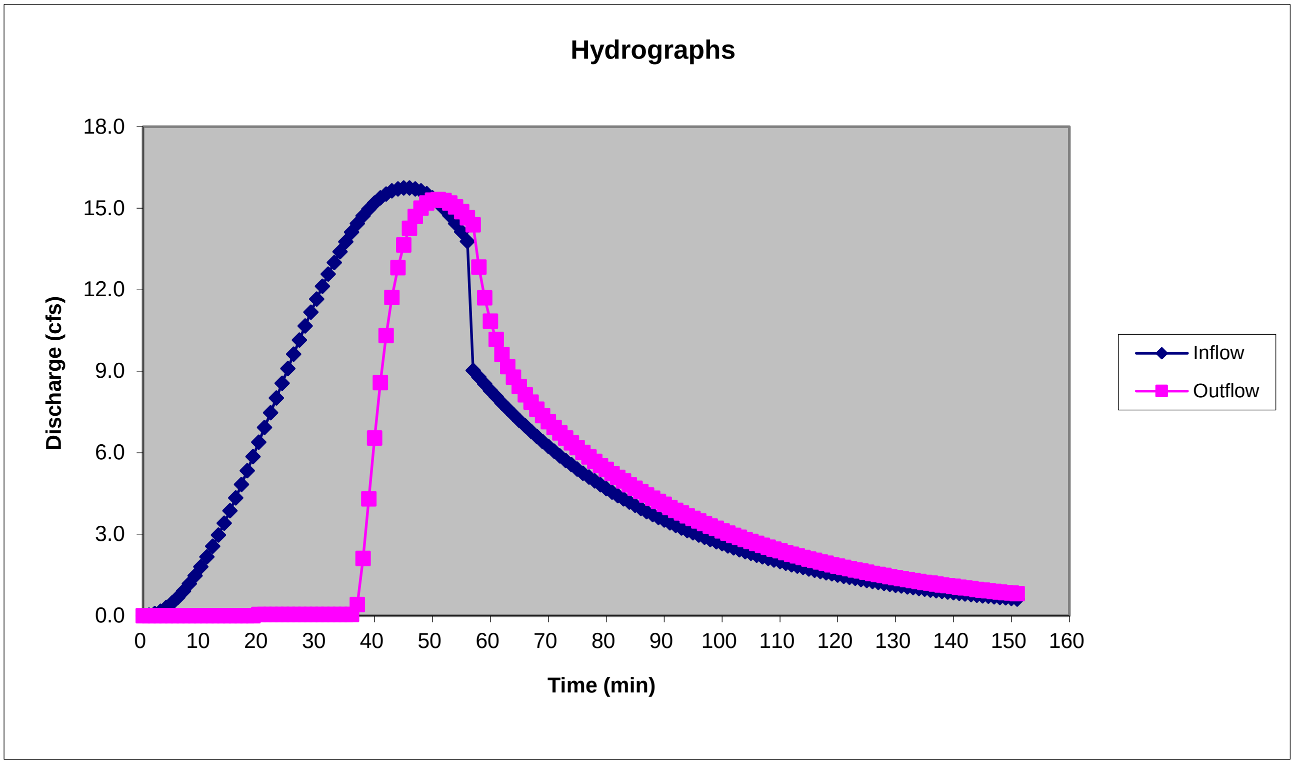
OUTPUT

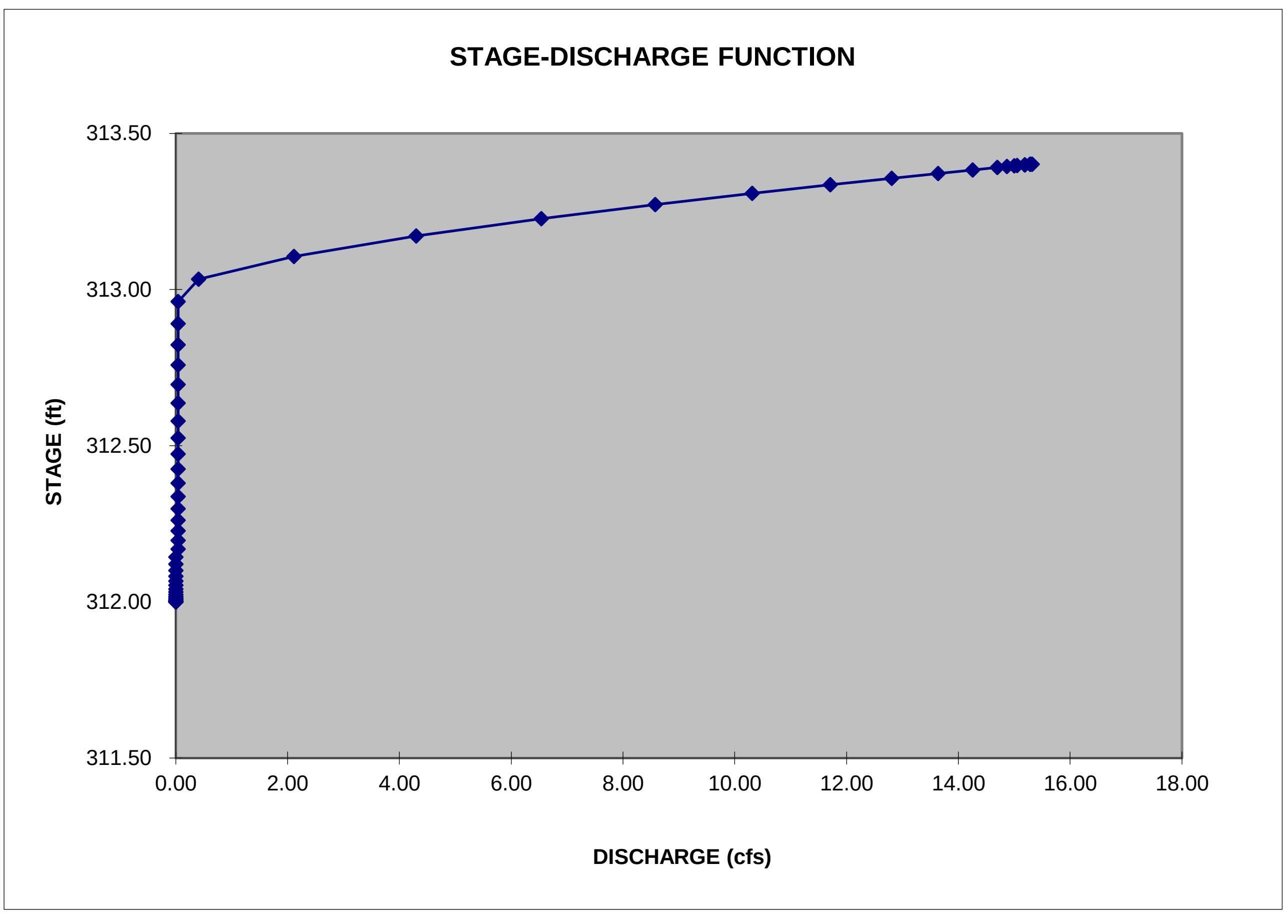
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	312.00	0.0	0.0	0.0		
1	0	0.00	312.00	0.0	0.0	0.00		
2	0	1.13	312.00	0.0	0.0	0.00		
3	0	5.62	312.00	0.0	0.0	0.00		
4	0	15.72	312.00	0.0	0.0	0.00		
5	0	33.62	312.00	0.0	0.0	0.00		
6	1	61.49	312.00	0.0	0.0	0.00		
7	1	101.44	312.00	0.0	0.0	0.00		
8	1	155.54	312.01	0.0	0.0	0.00		
9	1	225.78	312.01	0.0	0.0	0.00		
10	2	314.08	312.02	0.0	0.0	0.00		
11	2	422.27	312.02	0.0	0.0	0.00		
12	3	552.07	312.03	0.0	0.0	0.00		
13	3	705.13	312.04	0.0	0.0	0.00		
14	3	882.97	312.05	0.0	0.0	0.00		
15	4	1086.99	312.07	0.0	0.0	0.00		
16	4	1318.47	312.08	0.0	0.0	0.00		
17	5	1578.56	312.10	0.0	0.0	0.00		
18	5	1868.26	312.12	0.0	0.0	0.00		
19	6	2188.46	312.14	0.0	0.0	0.00		
20	6	2539.88	312.17	0.0	0.0	0.04		
21	7	2920.67	312.20	0.0	0.0	0.04		
22	7	3333.69	312.23	0.0	0.0	0.04		
23	8	3779.19	312.26	0.0	0.0	0.04		
24	9	4257.31	312.30	0.0	0.0	0.04		
25	9	4767.99	312.34	0.0	0.0	0.04		
26	10	5311.06	312.38	0.0	0.0	0.04		
27	10	5886.16	312.43	0.0	0.0	0.04		
28	11	6492.79	312.47	0.0	0.0	0.04		
29	11	7130.31	312.52	0.0	0.0	0.04		
30	12	7797.91	312.58	0.0	0.0	0.04		
31	12	8494.66	312.64	0.0	0.0	0.04		
32	13	9219.47	312.70	0.0	0.0	0.04		
33	13	9971.14	312.76	0.0	0.0	0.04		
34	13	10748.32	312.82	0.0	0.0	0.04		
35	14	11549.55	312.89	0.0	0.0	0.04		
36	14	12373.26	312.96	0.0	0.0	0.04		
37	14	13217.75	313.03	0.4	0.4	0.04		
38	15	14059.11	313.11	2.1	2.1	0.04		
39	15	14815.44	313.17	4.3	4.3	0.04		
40	15	15455.49	313.23	6.5	6.5	0.04		
41	15	15974.52	313.27	8.6	8.5	0.04		
42	16	16382.30	313.31	10.3	10.3	0.04		
43	16	16695.09	313.34	11.7	11.7	0.04		
44	16	16930.50	313.36	12.8	12.8	0.04		
45	16	17104.70	313.37	13.6	13.6	0.04		
46	16	17231.22	313.38	14.3	14.2	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time	Inflow	Storage	Stage	Outflow	Weir	Skimmer		
T	I	S	Z	O	Flow	Flow		
min	cfs	cu-ft	ft	cfs	cfs	cfs		
47	16	17320.80	313.39	14.7	14.7	0.04		
48	16	17381.65	313.40	15.0	15.0	0.04		
49	16	17419.86	313.40	15.2	15.2	0.04		
50	15	17439.92	313.40	15.3	15.3	0.04		
51	15	17445.07	**313.40**	15.3	15.3	0.04		
52	15	17437.66	313.40	15.3	15.2	0.04		
53	15	17419.40	313.40	15.2	15.1	0.04		
54	14	17391.51	313.40	15.1	15.0	0.04		
55	14	17354.93	313.39	14.9	14.8	0.04		
56	14	17310.34	313.39	14.6	14.6	0.04		
57	9	17258.30	313.39	14.4	14.3	0.04		
58	9	16936.73	313.36	12.8	12.8	0.04		
59	9	16693.05	313.34	11.7	11.7	0.04		
60	8	16502.60	313.32	10.8	10.8	0.04		
61	8	16349.40	313.31	10.2	10.1	0.04		
62	8	16222.73	313.29	9.6	9.6	0.04		
63	8	16115.27	313.28	9.2	9.1	0.04		
64	7	16021.93	313.28	8.8	8.7	0.04		
65	7	15939.12	313.27	8.4	8.4	0.04		
66	7	15864.25	313.26	8.1	8.1	0.04		
67	7	15795.49	313.26	7.9	7.8	0.04		
68	7	15731.46	313.25	7.6	7.6	0.04		
69	6	15671.20	313.25	7.4	7.3	0.04		
70	6	15613.97	313.24	7.1	7.1	0.04		
71	6	15559.22	313.24	6.9	6.9	0.04		
72	6	15506.55	313.23	6.7	6.7	0.04		
73	6	15455.65	313.23	6.5	6.5	0.04		
74	6	15406.29	313.22	6.4	6.3	0.04		
75	5	15358.30	313.22	6.2	6.1	0.04		
76	5	15311.54	313.21	6.0	6.0	0.04		
77	5	15265.89	313.21	5.8	5.8	0.04		
78	5	15221.28	313.21	5.7	5.6	0.04		
79	5	15177.63	313.20	5.5	5.5	0.04		
80	5	15134.90	313.20	5.4	5.3	0.04		
81	5	15093.03	313.20	5.2	5.2	0.04		
82	4	15052.00	313.19	5.1	5.1	0.04		
83	4	15011.76	313.19	5.0	4.9	0.04		
84	4	14972.30	313.19	4.8	4.8	0.04		
85	4	14933.59	313.18	4.7	4.7	0.04		
86	4	14895.60	313.18	4.6	4.5	0.04		
87	4	14858.32	313.18	4.4	4.4	0.04		
88	4	14821.73	313.17	4.3	4.3	0.04		
89	4	14785.82	313.17	4.2	4.2	0.04		
90	4	14750.56	313.17	4.1	4.1	0.04		
91	3	14715.96	313.16	4.0	3.9	0.04		
92	3	14681.98	313.16	3.9	3.8	0.04		
93	3	14648.62	313.16	3.8	3.7	0.04		
94	3	14615.87	313.15	3.7	3.6	0.04		
95	3	14583.71	313.15	3.6	3.5	0.04		
96	3	14552.14	313.15	3.5	3.4	0.04		
97	3	14521.14	313.15	3.4	3.3	0.04		
98	3	14490.70	313.14	3.3	3.3	0.04		
99	3	14460.81	313.14	3.2	3.2	0.04		
100	3	14431.46	313.14	3.1	3.1	0.04		
101	3	14402.64	313.14	3.0	3.0	0.04		
102	2	14374.35	313.13	3.0	2.9	0.04		
103	2	14346.56	313.13	2.9	2.8	0.04		
104	2	14319.27	313.13	2.8	2.8	0.04		
105	2	14292.48	313.13	2.7	2.7	0.04		
106	2	14266.17	313.12	2.7	2.6	0.04		
107	2	14240.34	313.12	2.6	2.5	0.04		
108	2	14214.97	313.12	2.5	2.5	0.04		
109	2	14190.05	313.12	2.5	2.4	0.04		
110	2	14165.59	313.12	2.4	2.3	0.04		
111	2	14141.56	313.11	2.3	2.3	0.04		
112	2	14117.97	313.11	2.3	2.2	0.04		
113	2	14094.80	313.11	2.2	2.2	0.04		
114	2	14072.05	313.11	2.1	2.1	0.04		
115	2	14049.71	313.11	2.1	2.0	0.04		
116	2	14027.77	313.10	2.0	2.0	0.04		
117	2	14006.22	313.10	2.0	1.9	0.04		
118	2	13985.06	313.10	1.9	1.9	0.04		
119	2	13964.28	313.10	1.9	1.8	0.04		
120	1	13943.87	313.10	1.8	1.8	0.04		
121	1	13923.83	313.09	1.8	1.7	0.04		
122	1	13904.15	313.09	1.7	1.7	0.04		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	1	13884.82	313.09	1.7	1.6	0.04		
124	1	13865.84	313.09	1.6	1.6	0.04		
125	1	13847.19	313.09	1.6	1.6	0.04		
126	1	13828.88	313.09	1.6	1.5	0.04		
127	1	13810.90	313.08	1.5	1.5	0.04		
128	1	13793.24	313.08	1.5	1.4	0.04		
129	1	13775.89	313.08	1.4	1.4	0.04		
130	1	13758.85	313.08	1.4	1.4	0.04		
131	1	13742.12	313.08	1.4	1.3	0.04		
132	1	13725.69	313.08	1.3	1.3	0.04		
133	1	13709.54	313.08	1.3	1.3	0.04		
134	1	13693.69	313.07	1.3	1.2	0.04		
135	1	13678.12	313.07	1.2	1.2	0.04		
136	1	13662.82	313.07	1.2	1.2	0.04		
137	1	13647.80	313.07	1.2	1.1	0.04		
138	1	13633.05	313.07	1.1	1.1	0.04		
139	1	13618.55	313.07	1.1	1.1	0.04		
140	1	13604.32	313.07	1.1	1.0	0.04		
141	1	13590.33	313.07	1.0	1.0	0.04		
142	1	13576.60	313.06	1.0	1.0	0.04		
143	1	13563.10	313.06	1.0	1.0	0.04		
144	1	13549.85	313.06	1.0	0.9	0.04		
145	1	13536.83	313.06	0.9	0.9	0.04		
146	1	13524.04	313.06	0.9	0.9	0.04		
147	1	13511.48	313.06	0.9	0.9	0.04		
148	1	13499.14	313.06	0.9	0.8	0.04		
149	1	13487.01	313.06	0.9	0.8	0.04		
150	1	13475.10	313.06	0.8	0.8	0.04		
151	1	13463.40	313.05	0.8	0.8	0.04		

GRAPHED DATA FOR 25 YEAR STORM





ST-8
SKIMMER BASIN DESIGN

CHAMBLEE LAKE
ZEBULON, NC
DRH22004

Skimmer Basin Sizing
Stage-Storage Function
Hydrograph Formulation
Routing for the 2-year storm
Graphed Data for the 2-year storm
Routing for the 10-year storm
Graphed Data for the 10-year storm

McADAMS

SKIMMER BASIN SIZING

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Sediment Trap ID	ST-8		

Drainage Area Data

	Disturbed Area	Pre-Developed Area	Rational "C"
Disturbed area	1.41 ac.	0.00 ac.	0.45
Undisturbed wooded area	0.00 ac.	1.41 ac.	0.35
Undisturbed grassy area	0.00 ac.	0.00 ac.	0.25
Other (Impervious)	0.00 ac.	0.00 ac.	0.95
Total drainage area to trap	1.41 ac.	1.41 ac.	
Composite Rational 'c'	0.45	0.35	

Time of Concentration

Use Kerpich (USBR, 1974) equation to calculate time of concentration - t(c)

K =	1	
Length of flow path =	466	feet
Height of watershed =	13	feet
Calculated t(c) =	3.5	minutes
Minimum t(c) =	5.0	minutes
Time of concentration =	5.0	minutes

K Values	
Overland on grassed surfaces:	*2.0*
Overland on paved surfaces:	*0.4*
Channel in natural channels:	*1.0*
Channel in mixed urban setting:	*1.1*
Channel in paved pipes or channels:	*0.2*

Calculate Rainfall Intensity

IDF curves for: Raleigh, NC

Return Period	B	D	Intensity	
2	132	18	5.74	in/hr
10	195	22	7.22	in/hr
25	232	23	8.29	in/hr

Runoff Calculations

Return Period	Rainfall	Runoff	Pre-Developed Runoff	
2-year storm	5.74 in/hr	3.6 cfs	2.83	cfs
10-year storm	7.22 in/hr	4.6 cfs	3.56	cfs
25-year storm	8.29 in/hr	5.3 cfs	4.09	cfs

Sediment Trap Design Data and Constraints

Required sediment trap volume	1,800	cubic feet per disturbed acre
Required sediment trap surface area	325	square feet per 1 cfs of Q
Design Return Period	10	Year

Sediment Trap Dimensions

Bottom length =	60
Bottom width =	30
Sediment depth =	2.0
Freeboard (from sediment depth) =	2.0
Depth to crest of Emergency Spillway =	2.0
Side slopes =	3.0 H:1V
Emergency Spillway length =	20
Height of berm =	4
Top of trap length =	84
Top of trap width =	54
Bottom elevation =	311

Sediment Trap Data

	Required	Provided
Sediment storage volume =	2538 cu. ft.	4770 cu. ft.
Sediment surface area =	1490 sq. ft.	3020 sq. ft.
Sediment storage depth =	3.5 ft. (max.)	2
Trap bottom length to width ratio =	2.0L:1W (min)	2.0L:1W
Spillway length =	10.0 ft. (min)	20
10-Year flow depth over spillway =	0.50 ft. (max)	0.18 ft
Freeboard at 10-Year discharge =	1.00 ft. (min)	1.82 ft

1. Reference for Rational Coefficients:
Malcom, H. Rooney, Elements of Urban Stormwater Design, NCSU
1999, Chapter 2 (Hydrologic Estimates)

SIZING FAIRCLOTH SKIMMER AND ORIFICE

Volume Provided for Sediment Basin = 2,538 cubic feet

24 HOURS	Best Option =	1 - 2 inch Skimmers with a 1.7 inch orifice	
2 DAYS	Best Option =	1 - 2 inch Skimmers with a 1.2 inch orifice	
3 DAYS	Best Option =	1 - 2 inch Skimmers with a 1 inch orifice	<<< USE
4 DAYS	Best Option =	1 - 2 inch Skimmers with a 0.8 inch orifice	

STAGE-STORAGE FUNCTION

CHAMBLEE LAKE

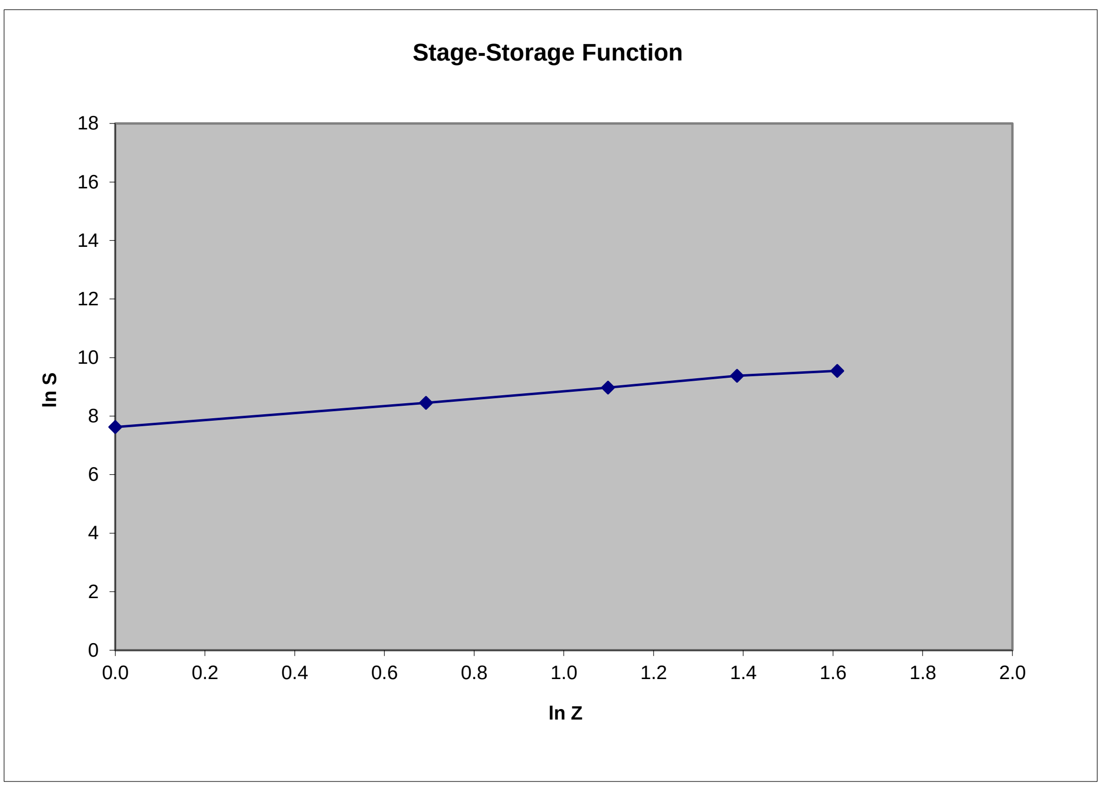
AVERAGE-END CALCULATIONS:

1	2	3	4	5	6	7	8
					Y	X	
CONTOUR	CONTOUR AREA sq ft	INCR VOLUME cu ft	ACCUM VOLUME cu ft	Z STAGE ft	ln S	ln Z	Z est ft
311	1779		0	0			
312	2321	2050	2050	1	7.6256	0.0000	1.00
313	2920	2620.5	4670.5	2	8.4490	0.6931	1.96
314	3578	3249	7919.5	3	8.9771	1.0986	3.02
315	4288	3933	11852.5	4	9.3803	1.3863	4.20
316	0	2144	13996.5	5	9.5466	1.6094	4.81

STAGE-STORAGE FUNCTION:

$$S = K_s * Z^b$$

where: **b =** 1.22 and **K_s =** 2046



HYDROGRAPH FORMULATION

CHAMBLEE LAKE

REFERENCES: *(Malcom, 1991; Wanielista, 1990)*

SOLUTION - Qp: *Use the Kirpich Equation & the Rational Method to compute Qp for Post-Development Condition.*

INPUT			OUTPUT	
Drainage Area, DA =	1.41	ac	**Use Kirpich Equation:**	
Disturbed Area =	1.41	ac	**Tc =**	5.0 min
Undisturbed Woods =	0.00	ac		
Undisturbed Grass =	0.00	ac	**Use Malcom Method:**	
Hydraulic Length =	466	ft	**i_1 =**	5.74 in/hr
Vertical Fall =	13	ft	**i_{10} =**	7.22 in/hr
For 1 yr Storm, g =	132		**i_{25} =**	8.29 in/hr
h =	18			
For 10 yr Storm, g =	195		**Use Rational Method:**	
h =	22		**Q_2 =**	3.6 cfs
For 25 yr Storm, g =	232		**Q_{10} =**	4.6 cfs
h =	23		**Q_{25} =**	5.3 cfs

"C" CALCULATION - See Sediment Trap Sizing

"C" = 0.45

SOLUTION - Tp:

INPUT			OUTPUT		
P_{n6} =	2.7	in (2 Year Storm)	**S =**	0.99	**in**
CN =	91	(newly graded areas)	**Q* =**	1.75	**in**
			T_{p2} =	29.4	**minutes**
P_{n6} =	3.9	in (10 Year Storm)			
			Q* =	2.92	**in**
			T_{p10} =	39.1	**minutes**
P_{n6} =	4.6	in (25 Year Storm)			
			Q* =	3.59	**in**
			T_{p25} =	42.0	**minutes**

ROUTING FOR 2-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	**313.12 ft**
		Rise =	**2.12 ft**
Freeboard =	**1.88 ft**	**Peak Outflow =**	**2.54 cfs**

INPUT

Hydrograph Results:

Qp = 3.64 cfs
Tp = 29.4 min
dT = 1.0 min

Stage-Storage Results:

Ks = 2046
b = 1.22
Z_0 = 311.0 ft (inv)

Initial Water Level:

Z_i = 311.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 313.00 ft

Top of Dam: 315.00 ft

Skimmer Orifice:

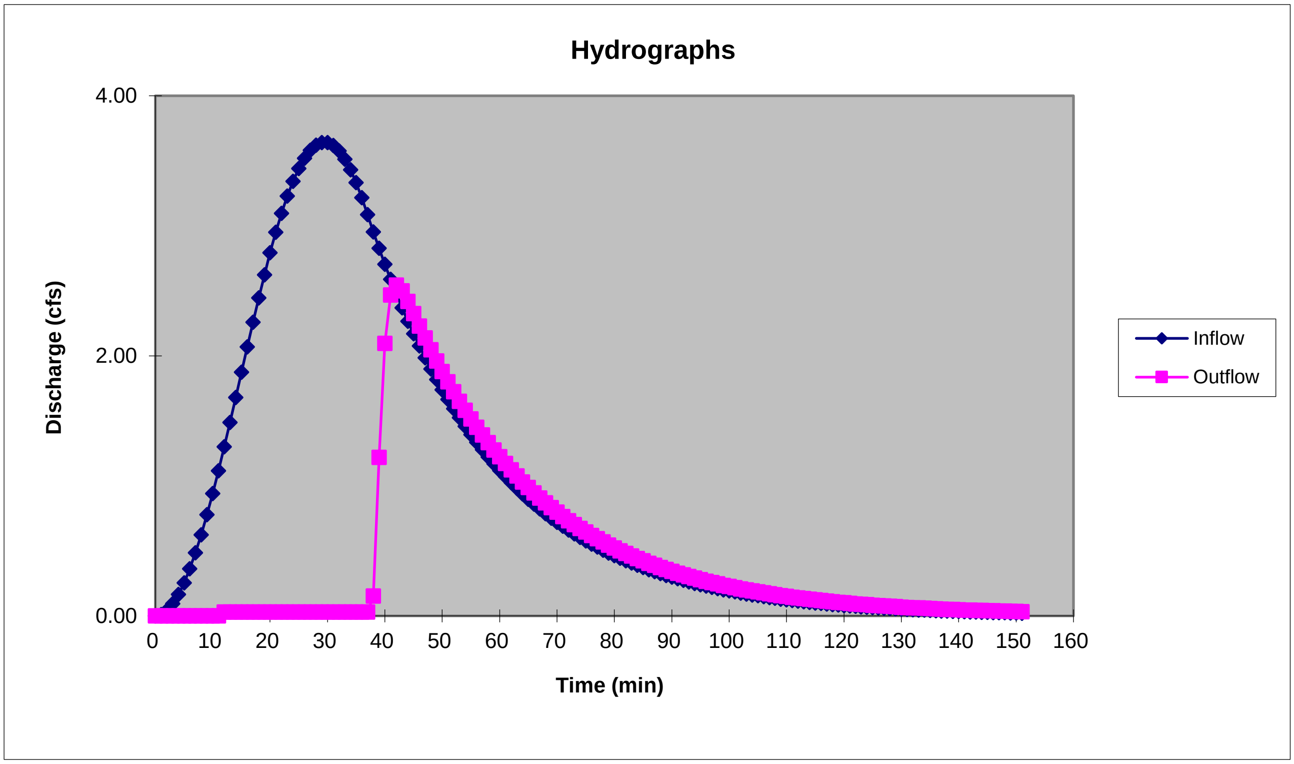
Number = 1.00 Ea
Diameter = 2.00 Inches
Head = 0.98 inches

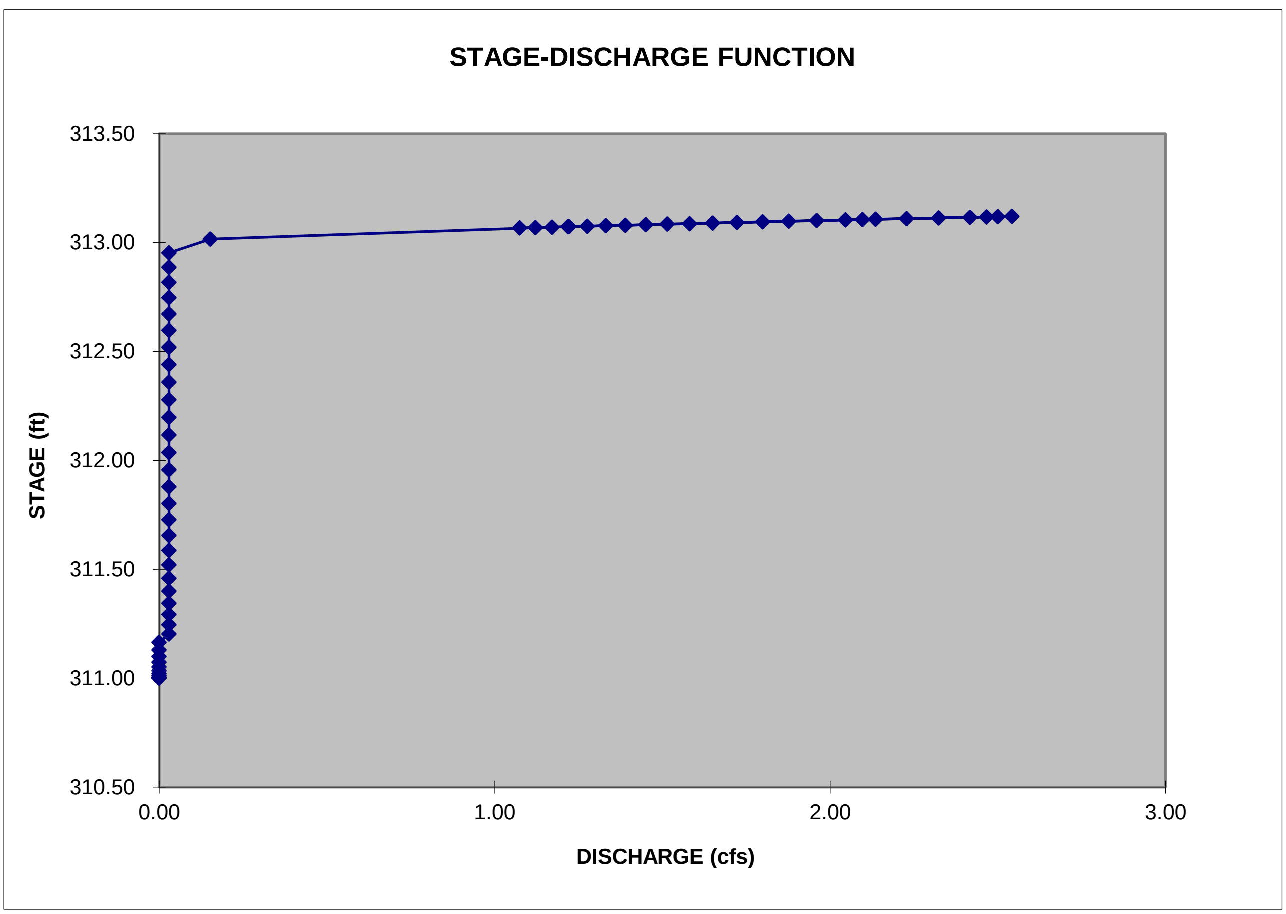
OUTPUT

1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	311.00	0.0	0.0	0.0		
1	0	0.00	311.00	0.0	0.0	0.00		
2	0	0.62	311.00	0.0	0.0	0.00		
3	0	3.10	311.00	0.0	0.0	0.00		
4	0	8.64	311.01	0.0	0.0	0.00		
5	0	18.44	311.02	0.0	0.0	0.00		
6	0	33.61	311.03	0.0	0.0	0.00		
7	0	55.24	311.05	0.0	0.0	0.00		
8	1	84.31	311.07	0.0	0.0	0.00		
9	1	121.73	311.10	0.0	0.0	0.00		
10	1	168.33	311.13	0.0	0.0	0.00		
11	1	224.81	311.16	0.0	0.0	0.00		
12	1	291.78	311.20	0.0	0.0	0.03		
13	1	367.95	311.25	0.0	0.0	0.03		
14	2	455.43	311.29	0.0	0.0	0.03		
15	2	554.47	311.34	0.0	0.0	0.03		
16	2	665.15	311.40	0.0	0.0	0.03		
17	2	787.43	311.46	0.0	0.0	0.03		
18	2	921.16	311.52	0.0	0.0	0.03		
19	3	1066.03	311.59	0.0	0.0	0.03		
20	3	1221.62	311.66	0.0	0.0	0.03		
21	3	1387.37	311.73	0.0	0.0	0.03		
22	3	1562.63	311.80	0.0	0.0	0.03		
23	3	1746.63	311.88	0.0	0.0	0.03		
24	3	1938.50	311.96	0.0	0.0	0.03		
25	3	2137.27	312.04	0.0	0.0	0.03		
26	4	2341.91	312.12	0.0	0.0	0.03		
27	4	2551.31	312.20	0.0	0.0	0.03		
28	4	2764.32	312.28	0.0	0.0	0.03		
29	4	2979.73	312.36	0.0	0.0	0.03		
30	4	3196.33	312.44	0.0	0.0	0.03		
31	4	3412.86	312.52	0.0	0.0	0.03		
32	4	3628.08	312.60	0.0	0.0	0.03		
33	4	3840.79	312.67	0.0	0.0	0.03		
34	3	4049.76	312.75	0.0	0.0	0.03		
35	3	4253.86	312.82	0.0	0.0	0.03		
36	3	4451.98	312.89	0.0	0.0	0.03		
37	3	4643.10	312.95	0.0	0.0	0.03		
38	3	4826.51	313.02	0.2	0.1	0.03		
39	3	4994.58	313.07	1.2	1.2	0.03		
40	3	5090.97	313.11	2.1	2.1	0.03		

MCADAMS

GRAPHED DATA FOR 2 YEAR STORM





ROUTING FOR 10-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS

		Peak Stage =	313.18 ft
		Rise =	2.18 ft
Freeboard =	1.82 ft	**Peak Outflow =**	4.52 cfs

INPUT

Hydrograph Results:

Qp = 4.58 cfs
Tp = 39.1 min
dT = 1.0 min

Stage-Storage Results:

Ks = 2046
b = 1.22
Z_0 = 311.0 ft (inv)

Initial Water Level:

Z_i = 311.00 ft

Weir:

N = 1
L = 20 ft
Cw = 3.00
Zcr = 313.00 ft

Top of Dam: 315.00 ft

Skimmer Orifice:

Number = 1 Ea
Diameter = 2.00 Inches
Head = 0.98 inches

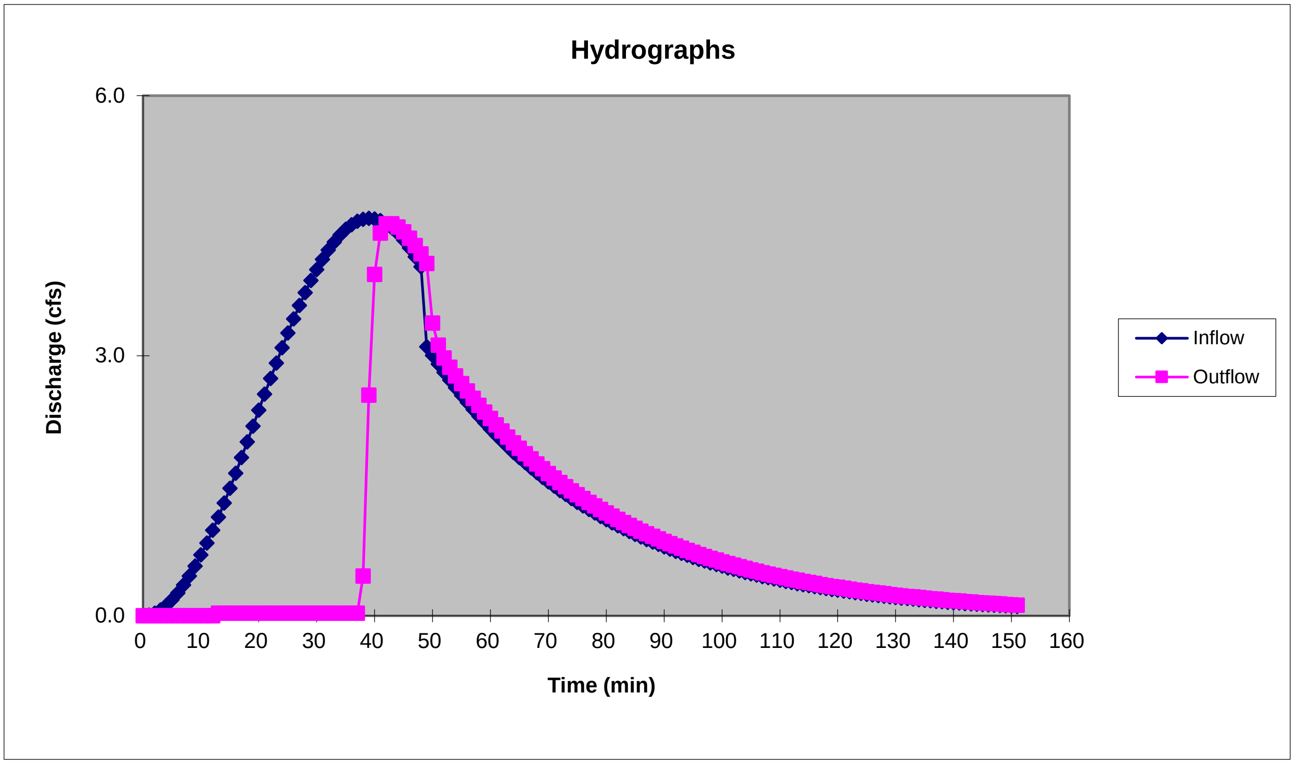
OUTPUT

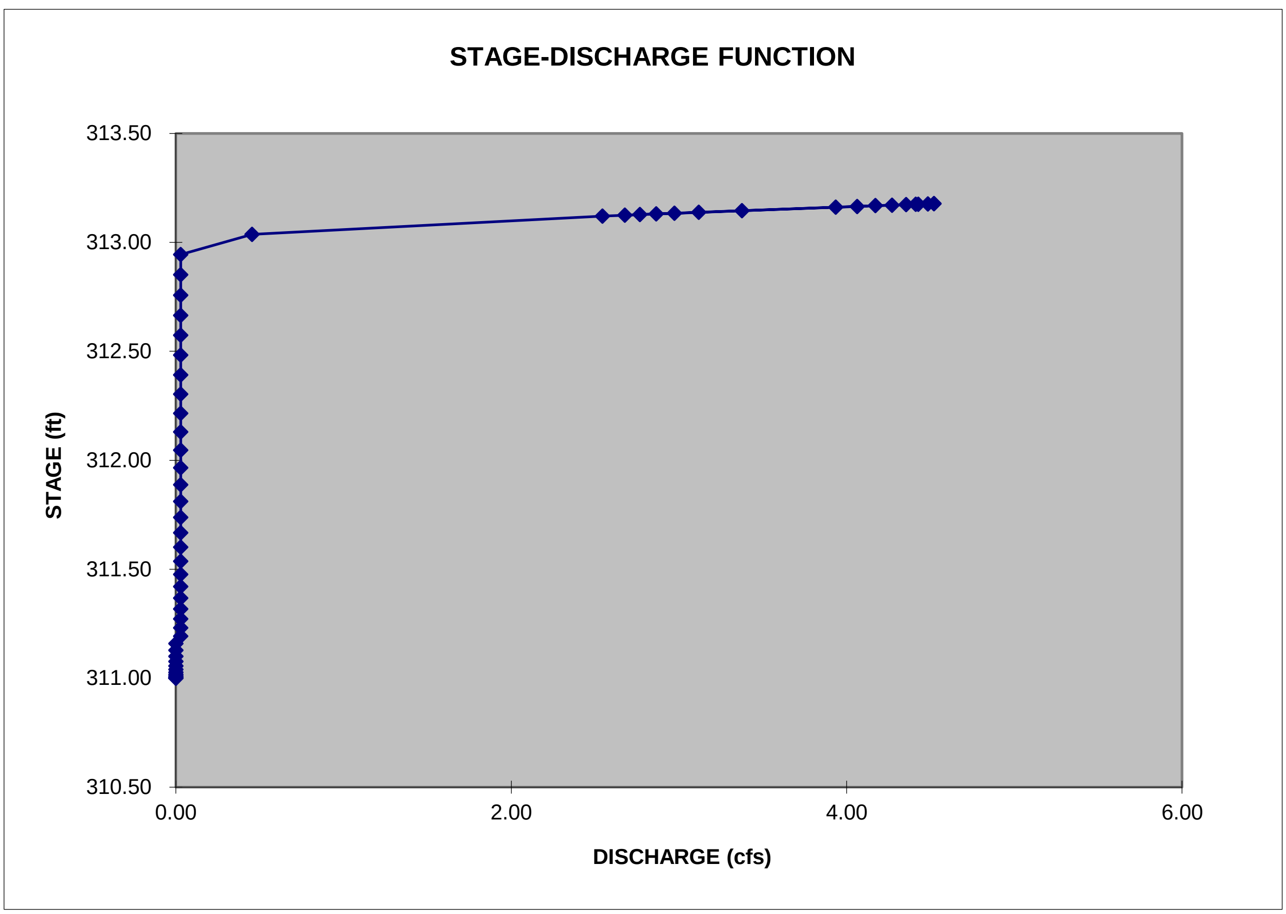
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	311.00	0.0	0.0	0.0		
1	0	0.00	311.00	0.0	0.0	0.00		
2	0	0.44	311.00	0.0	0.0	0.00		
3	0	2.21	311.00	0.0	0.0	0.00		
4	0	6.18	311.01	0.0	0.0	0.00		
5	0	13.21	311.02	0.0	0.0	0.00		
6	0	24.14	311.03	0.0	0.0	0.00		
7	0	39.78	311.04	0.0	0.0	0.00		
8	0	60.93	311.06	0.0	0.0	0.00		
9	1	88.33	311.08	0.0	0.0	0.00		
10	1	122.69	311.10	0.0	0.0	0.00		
11	1	164.67	311.13	0.0	0.0	0.00		
12	1	214.89	311.16	0.0	0.0	0.00		
13	1	273.91	311.19	0.0	0.0	0.03		
14	1	340.47	311.23	0.0	0.0	0.03		
15	1	416.78	311.27	0.0	0.0	0.03		
16	2	503.22	311.32	0.0	0.0	0.03		
17	2	600.12	311.37	0.0	0.0	0.03		
18	2	707.72	311.42	0.0	0.0	0.03		
19	2	826.21	311.48	0.0	0.0	0.03		
20	2	955.69	311.54	0.0	0.0	0.03		
21	3	1096.20	311.60	0.0	0.0	0.03		
22	3	1247.72	311.67	0.0	0.0	0.03		
23	3	1410.14	311.74	0.0	0.0	0.03		
24	3	1583.29	311.81	0.0	0.0	0.03		
25	3	1766.92	311.89	0.0	0.0	0.03		
26	3	1960.74	311.97	0.0	0.0	0.03		
27	4	2164.36	312.05	0.0	0.0	0.03		
28	4	2377.35	312.13	0.0	0.0	0.03		
29	4	2599.21	312.22	0.0	0.0	0.03		
30	4	2829.39	312.30	0.0	0.0	0.03		
31	4	3067.27	312.39	0.0	0.0	0.03		
32	4	3312.20	312.48	0.0	0.0	0.03		
33	4	3563.47	312.57	0.0	0.0	0.03		
34	4	3820.34	312.67	0.0	0.0	0.03		
35	4	4082.03	312.76	0.0	0.0	0.03		
36	5	4347.72	312.85	0.0	0.0	0.03		
37	5	4616.59	312.94	0.0	0.0	0.03		
38	5	4887.77	313.04	0.5	0.4	0.03		
39	5	5134.80	313.12	2.5	2.5	0.03		
40	5	5257.07	313.16	3.9	3.9	0.03		
41	5	5295.56	313.17	4.4	4.4	0.03		
42	5	5304.21	313.18	4.5	4.5	0.03		
43	4	5304.20	313.18	4.5	4.5	0.03		
44	4	5301.25	313.18	4.5	4.5	0.03		
45	4	5296.75	313.18	4.4	4.4	0.03		
46	4	5291.06	313.17	4.4	4.3	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	4	5284.27	313.17	4.3	4.2	0.03		
48	4	5276.42	313.17	4.2	4.1	0.03		
49	3	5267.56	313.17	4.1	4.0	0.03		
50	3	5209.90	313.15	3.4	3.3	0.03		
51	3	5187.44	313.14	3.1	3.1	0.03		
52	3	5174.49	313.13	3.0	2.9	0.03		
53	3	5164.54	313.13	2.9	2.8	0.03		
54	3	5155.67	313.13	2.8	2.7	0.03		
55	3	5147.28	313.12	2.7	2.6	0.03		
56	2	5139.16	313.12	2.6	2.6	0.03		
57	2	5131.26	313.12	2.5	2.5	0.03		
58	2	5123.53	313.12	2.4	2.4	0.03		
59	2	5115.99	313.11	2.3	2.3	0.03		
60	2	5108.60	313.11	2.3	2.2	0.03		
61	2	5101.38	313.11	2.2	2.2	0.03		
62	2	5094.32	313.11	2.1	2.1	0.03		
63	2	5087.41	313.10	2.1	2.0	0.03		
64	2	5080.65	313.10	2.0	2.0	0.03		
65	2	5074.04	313.10	1.9	1.9	0.03		
66	2	5067.58	313.10	1.9	1.8	0.03		
67	2	5061.25	313.10	1.8	1.8	0.03		
68	2	5055.06	313.09	1.8	1.7	0.03		
69	2	5049.01	313.09	1.7	1.7	0.03		
70	2	5043.09	313.09	1.6	1.6	0.03		
71	1	5037.30	313.09	1.6	1.6	0.03		
72	1	5031.63	313.09	1.5	1.5	0.03		
73	1	5026.08	313.08	1.5	1.5	0.03		
74	1	5020.66	313.08	1.4	1.4	0.03		
75	1	5015.35	313.08	1.4	1.4	0.03		
76	1	5010.16	313.08	1.3	1.3	0.03		
77	1	5005.08	313.08	1.3	1.3	0.03		
78	1	5000.11	313.08	1.3	1.2	0.03		
79	1	4995.25	313.07	1.2	1.2	0.03		
80	1	4990.49	313.07	1.2	1.2	0.03		
81	1	4985.84	313.07	1.1	1.1	0.03		
82	1	4981.28	313.07	1.1	1.1	0.03		
83	1	4976.83	313.07	1.1	1.0	0.03		
84	1	4972.47	313.07	1.0	1.0	0.03		
85	1	4968.20	313.06	1.0	1.0	0.03		
86	1	4964.03	313.06	1.0	0.9	0.03		
87	1	4959.94	313.06	0.9	0.9	0.03		
88	1	4955.95	313.06	0.9	0.9	0.03		
89	1	4952.04	313.06	0.9	0.9	0.03		
90	1	4948.21	313.06	0.9	0.8	0.03		
91	1	4944.46	313.06	0.8	0.8	0.03		
92	1	4940.80	313.05	0.8	0.8	0.03		
93	1	4937.21	313.05	0.8	0.7	0.03		
94	1	4933.70	313.05	0.8	0.7	0.03		
95	1	4930.27	313.05	0.7	0.7	0.03		
96	1	4926.91	313.05	0.7	0.7	0.03		
97	1	4923.62	313.05	0.7	0.7	0.03		
98	1	4920.40	313.05	0.7	0.6	0.03		
99	1	4917.24	313.05	0.6	0.6	0.03		
100	1	4914.16	313.05	0.6	0.6	0.03		
101	1	4911.14	313.04	0.6	0.6	0.03		
102	1	4908.19	313.04	0.6	0.6	0.03		
103	1	4905.29	313.04	0.6	0.5	0.03		
104	0	4902.46	313.04	0.5	0.5	0.03		
105	0	4899.69	313.04	0.5	0.5	0.03		
106	0	4896.98	313.04	0.5	0.5	0.03		
107	0	4894.32	313.04	0.5	0.5	0.03		
108	0	4891.73	313.04	0.5	0.4	0.03		
109	0	4889.18	313.04	0.5	0.4	0.03		
110	0	4886.69	313.04	0.4	0.4	0.03		
111	0	4884.25	313.04	0.4	0.4	0.03		
112	0	4881.86	313.03	0.4	0.4	0.03		
113	0	4879.53	313.03	0.4	0.4	0.03		
114	0	4877.24	313.03	0.4	0.4	0.03		
115	0	4875.00	313.03	0.4	0.4	0.03		
116	0	4872.80	313.03	0.4	0.3	0.03		
117	0	4870.65	313.03	0.4	0.3	0.03		
118	0	4868.55	313.03	0.3	0.3	0.03		
119	0	4866.49	313.03	0.3	0.3	0.03		
120	0	4864.47	313.03	0.3	0.3	0.03		
121	0	4862.49	313.03	0.3	0.3	0.03		
122	0	4860.56	313.03	0.3	0.3	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
123	0	4858.66	313.03	0.3	0.3	0.03		
124	0	4856.81	313.03	0.3	0.3	0.03		
125	0	4854.99	313.03	0.3	0.2	0.03		
126	0	4853.21	313.03	0.3	0.2	0.03		
127	0	4851.46	313.02	0.3	0.2	0.03		
128	0	4849.75	313.02	0.3	0.2	0.03		
129	0	4848.08	313.02	0.2	0.2	0.03		
130	0	4846.44	313.02	0.2	0.2	0.03		
131	0	4844.83	313.02	0.2	0.2	0.03		
132	0	4843.26	313.02	0.2	0.2	0.03		
133	0	4841.71	313.02	0.2	0.2	0.03		
134	0	4840.20	313.02	0.2	0.2	0.03		
135	0	4838.72	313.02	0.2	0.2	0.03		
136	0	4837.27	313.02	0.2	0.2	0.03		
137	0	4835.84	313.02	0.2	0.2	0.03		
138	0	4834.45	313.02	0.2	0.2	0.03		
139	0	4833.08	313.02	0.2	0.1	0.03		
140	0	4831.74	313.02	0.2	0.1	0.03		
141	0	4830.42	313.02	0.2	0.1	0.03		
142	0	4829.14	313.02	0.2	0.1	0.03		
143	0	4827.87	313.02	0.2	0.1	0.03		
144	0	4826.63	313.02	0.2	0.1	0.03		
145	0	4825.42	313.02	0.1	0.1	0.03		
146	0	4824.23	313.02	0.1	0.1	0.03		
147	0	4823.06	313.01	0.1	0.1	0.03		
148	0	4821.91	313.01	0.1	0.1	0.03		
149	0	4820.79	313.01	0.1	0.1	0.03		
150	0	4819.68	313.01	0.1	0.1	0.03		
151	0	4818.60	313.01	0.1	0.1	0.03		

GRAPHED DATA FOR 10 YEAR STORM





ROUTING FOR 25-YEAR STORM

(REF: Malcom, 1991)

COMPUTED RESULTS					
			Peak Stage =	313.20	ft
			Rise =	2.20	ft
Freeboard =	1.80	ft	Peak Outflow =	5.25	cfs

INPUT

Hydrograph Results:

Qp =	5.26	cfs
Tp =	39.1	min
dT =	1.0	min

Stage-Storage Results:

Ks =	2046	
b =	1.22	
Z_0 =	311.0	ft (inv)

Initial Water Level:

Z_i =	311.00	ft

Weir:

N =	1	
L =	20	ft
Cw =	3.00	
Zcr =	313.00	ft

Top of Dam: 315.00 ft

Skimmer Orifice:

Number =	1.00	Ea
Diameter =	2.00	Inches
Head =	0.98	inches

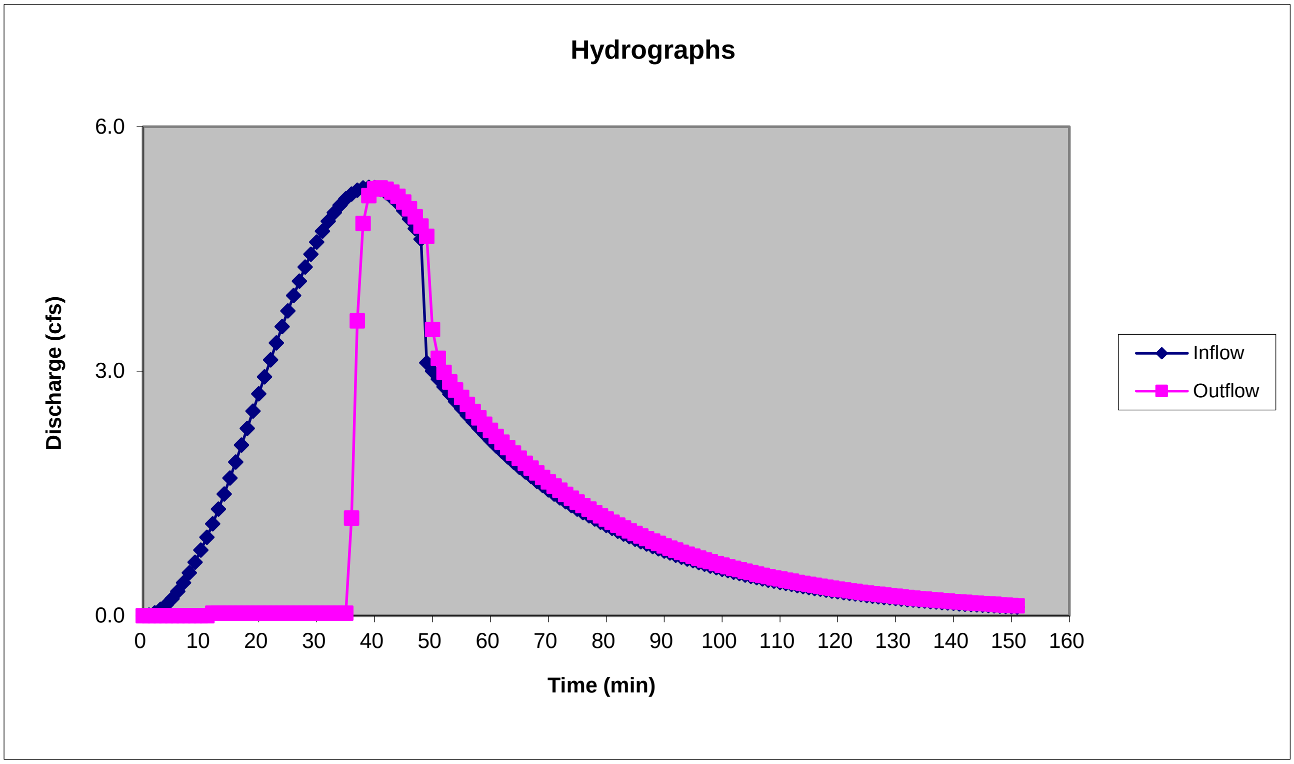
OUTPUT

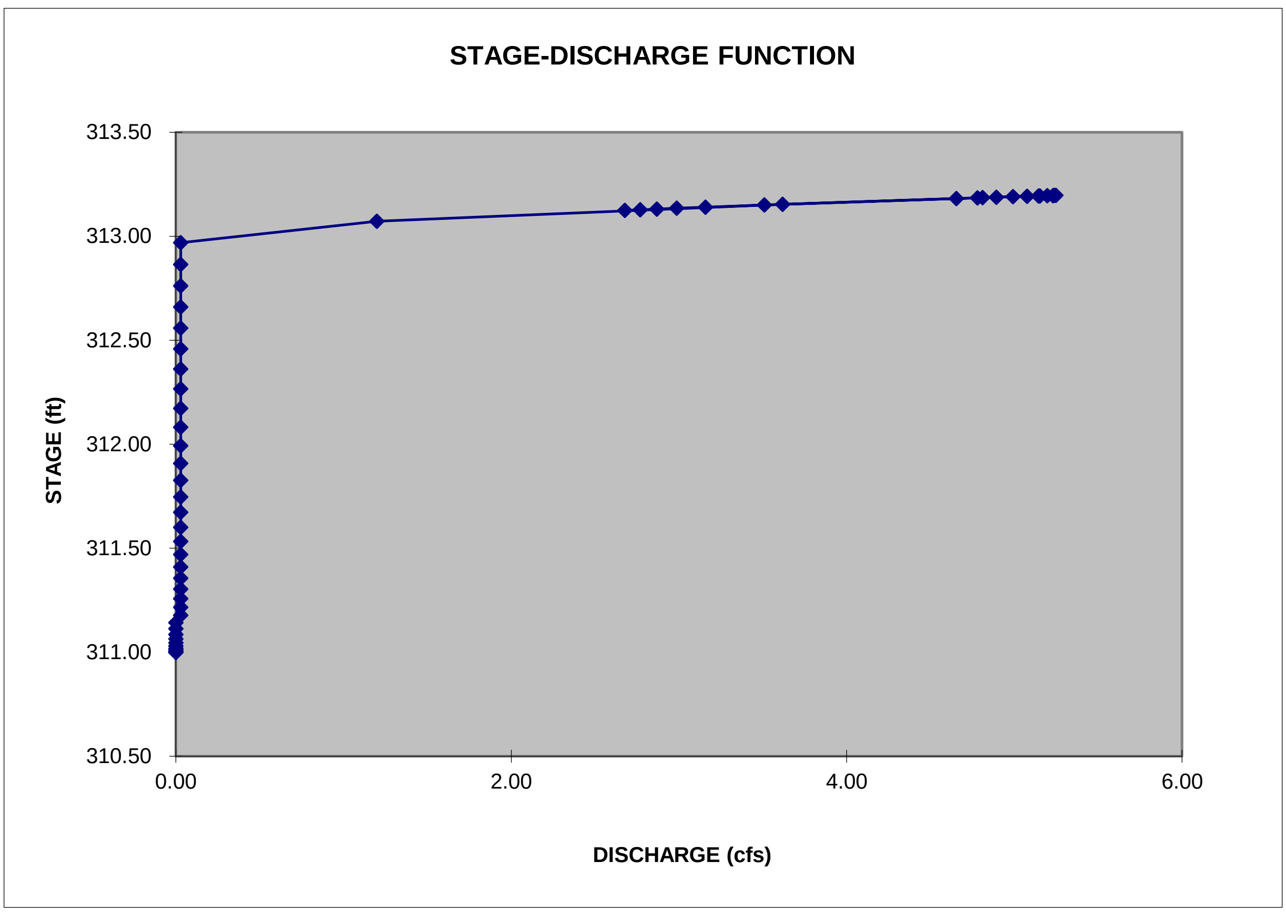
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
0	0	0.00	311.00	0.0	0.0	0.0		
1	0	0.00	311.00	0.0	0.0	0.00		
2	0	0.51	311.00	0.0	0.0	0.00		
3	0	2.54	311.00	0.0	0.0	0.00		
4	0	7.09	311.01	0.0	0.0	0.00		
5	0	15.15	311.02	0.0	0.0	0.00		
6	0	27.69	311.03	0.0	0.0	0.00		
7	0	45.64	311.04	0.0	0.0	0.00		
8	1	69.90	311.06	0.0	0.0	0.00		
9	1	101.34	311.09	0.0	0.0	0.00		
10	1	140.75	311.11	0.0	0.0	0.00		
11	1	188.91	311.14	0.0	0.0	0.00		
12	1	246.53	311.18	0.0	0.0	0.03		
13	1	312.47	311.22	0.0	0.0	0.03		
14	1	389.09	311.26	0.0	0.0	0.03		
15	2	476.90	311.30	0.0	0.0	0.03		
16	2	576.34	311.36	0.0	0.0	0.03		
17	2	687.76	311.41	0.0	0.0	0.03		
18	2	811.47	311.47	0.0	0.0	0.03		
19	3	947.66	311.53	0.0	0.0	0.03		
20	3	1096.47	311.60	0.0	0.0	0.03		
21	3	1257.94	311.67	0.0	0.0	0.03		
22	3	1432.02	311.75	0.0	0.0	0.03		
23	3	1618.62	311.83	0.0	0.0	0.03		
24	4	1817.53	311.91	0.0	0.0	0.03		
25	4	2028.47	311.99	0.0	0.0	0.03		
26	4	2251.09	312.08	0.0	0.0	0.03		
27	4	2484.95	312.17	0.0	0.0	0.03		
28	4	2729.57	312.27	0.0	0.0	0.03		
29	4	2984.36	312.36	0.0	0.0	0.03		
30	5	3248.68	312.46	0.0	0.0	0.03		
31	5	3521.85	312.56	0.0	0.0	0.03		
32	5	3803.11	312.66	0.0	0.0	0.03		
33	5	4091.64	312.76	0.0	0.0	0.03		
34	5	4386.60	312.86	0.0	0.0	0.03		
35	5	4687.08	312.97	0.0	0.0	0.03		
36	5	4992.16	313.07	1.2	1.2	0.03		
37	5	5230.71	313.15	3.6	3.6	0.03		
38	5	5326.70	313.19	4.8	4.8	0.03		
39	5	5352.83	313.19	5.2	5.1	0.03		
40	5	5359.02	313.20	5.2	5.2	0.03		
41	5	5359.89	313.20	5.2	5.2	0.03		
42	5	5358.68	313.20	5.2	5.2	0.03		
43	5	5356.04	313.20	5.2	5.2	0.03		
44	5	5352.12	313.19	5.1	5.1	0.03		
45	5	5346.97	313.19	5.1	5.0	0.03		
46	5	5340.62	313.19	5.0	5.0	0.03		

OUTPUT								
1	2	3	4	5	6	7	8	9
Time T min	Inflow I cfs	Storage S cu-ft	Stage Z ft	Outflow O cfs	Weir Flow cfs	Skimmer Flow cfs		
47	5	5333.09	313.19	4.9	4.9	0.03		
48	5	5324.41	313.18	4.8	4.8	0.03		
49	3	5314.62	313.18	4.7	4.6	0.03		
50	3	5221.48	313.15	3.5	3.5	0.03		
51	3	5190.93	313.14	3.2	3.1	0.03		
52	3	5175.62	313.13	3.0	3.0	0.03		
53	3	5164.92	313.13	2.9	2.8	0.03		
54	3	5155.80	313.13	2.8	2.7	0.03		
55	3	5147.32	313.12	2.7	2.6	0.03		
56	2	5139.18	313.12	2.6	2.6	0.03		
57	2	5131.26	313.12	2.5	2.5	0.03		
58	2	5123.54	313.12	2.4	2.4	0.03		
59	2	5115.99	313.11	2.3	2.3	0.03		
60	2	5108.60	313.11	2.3	2.2	0.03		
61	2	5101.38	313.11	2.2	2.2	0.03		
62	2	5094.32	313.11	2.1	2.1	0.03		
63	2	5087.41	313.10	2.1	2.0	0.03		
64	2	5080.65	313.10	2.0	2.0	0.03		
65	2	5074.04	313.10	1.9	1.9	0.03		
66	2	5067.58	313.10	1.9	1.8	0.03		
67	2	5061.25	313.10	1.8	1.8	0.03		
68	2	5055.06	313.09	1.8	1.7	0.03		
69	2	5049.01	313.09	1.7	1.7	0.03		
70	2	5043.09	313.09	1.6	1.6	0.03		
71	1	5037.30	313.09	1.6	1.6	0.03		
72	1	5031.63	313.09	1.5	1.5	0.03		
73	1	5026.08	313.08	1.5	1.5	0.03		
74	1	5020.66	313.08	1.4	1.4	0.03		
75	1	5015.35	313.08	1.4	1.4	0.03		
76	1	5010.16	313.08	1.3	1.3	0.03		
77	1	5005.08	313.08	1.3	1.3	0.03		
78	1	5000.11	313.08	1.3	1.2	0.03		
79	1	4995.25	313.07	1.2	1.2	0.03		
80	1	4990.49	313.07	1.2	1.2	0.03		
81	1	4985.84	313.07	1.1	1.1	0.03		
82	1	4981.28	313.07	1.1	1.1	0.03		
83	1	4976.83	313.07	1.1	1.0	0.03		
84	1	4972.47	313.07	1.0	1.0	0.03		
85	1	4968.20	313.06	1.0	1.0	0.03		
86	1	4964.03	313.06	1.0	0.9	0.03		
87	1	4959.94	313.06	0.9	0.9	0.03		
88	1	4955.95	313.06	0.9	0.9	0.03		
89	1	4952.04	313.06	0.9	0.9	0.03		
90	1	4948.21	313.06	0.9	0.8	0.03		
91	1	4944.46	313.06	0.8	0.8	0.03		
92	1	4940.80	313.05	0.8	0.8	0.03		
93	1	4937.21	313.05	0.8	0.7	0.03		
94	1	4933.70	313.05	0.8	0.7	0.03		
95	1	4930.27	313.05	0.7	0.7	0.03		
96	1	4926.91	313.05	0.7	0.7	0.03		
97	1	4923.62	313.05	0.7	0.7	0.03		
98	1	4920.40	313.05	0.7	0.6	0.03		
99	1	4917.24	313.05	0.6	0.6	0.03		
100	1	4914.16	313.05	0.6	0.6	0.03		
101	1	4911.14	313.04	0.6	0.6	0.03		
102	1	4908.19	313.04	0.6	0.6	0.03		
103	1	4905.29	313.04	0.6	0.5	0.03		
104	0	4902.46	313.04	0.5	0.5	0.03		
105	0	4899.69	313.04	0.5	0.5	0.03		
106	0	4896.98	313.04	0.5	0.5	0.03		
107	0	4894.32	313.04	0.5	0.5	0.03		
108	0	4891.73	313.04	0.5	0.4	0.03		
109	0	4889.18	313.04	0.5	0.4	0.03		
110	0	4886.69	313.04	0.4	0.4	0.03		
111	0	4884.25	313.04	0.4	0.4	0.03		
112	0	4881.86	313.03	0.4	0.4	0.03		
113	0	4879.53	313.03	0.4	0.4	0.03		
114	0	4877.24	313.03	0.4	0.4	0.03		
115	0	4875.00	313.03	0.4	0.4	0.03		
116	0	4872.80	313.03	0.4	0.3	0.03		
117	0	4870.65	313.03	0.4	0.3	0.03		
118	0	4868.55	313.03	0.3	0.3	0.03		
119	0	4866.49	313.03	0.3	0.3	0.03		
120	0	4864.47	313.03	0.3	0.3	0.03		
121	0	4862.49	313.03	0.3	0.3	0.03		
122	0	4860.56	313.03	0.3	0.3	0.03		

OUTPUT								
1 Time T min	2 Inflow I cfs	3 Storage S cu-ft	4 Stage Z ft	5 Outflow O cfs	6 Weir Flow cfs	7 Skimmer Flow cfs	8	9
123	0	4858.66	313.03	0.3	0.3	0.03		
124	0	4856.81	313.03	0.3	0.3	0.03		
125	0	4854.99	313.03	0.3	0.2	0.03		
126	0	4853.21	313.03	0.3	0.2	0.03		
127	0	4851.46	313.02	0.3	0.2	0.03		
128	0	4849.75	313.02	0.3	0.2	0.03		
129	0	4848.08	313.02	0.2	0.2	0.03		
130	0	4846.44	313.02	0.2	0.2	0.03		
131	0	4844.83	313.02	0.2	0.2	0.03		
132	0	4843.26	313.02	0.2	0.2	0.03		
133	0	4841.71	313.02	0.2	0.2	0.03		
134	0	4840.20	313.02	0.2	0.2	0.03		
135	0	4838.72	313.02	0.2	0.2	0.03		
136	0	4837.27	313.02	0.2	0.2	0.03		
137	0	4835.84	313.02	0.2	0.2	0.03		
138	0	4834.45	313.02	0.2	0.2	0.03		
139	0	4833.08	313.02	0.2	0.1	0.03		
140	0	4831.74	313.02	0.2	0.1	0.03		
141	0	4830.42	313.02	0.2	0.1	0.03		
142	0	4829.14	313.02	0.2	0.1	0.03		
143	0	4827.87	313.02	0.2	0.1	0.03		
144	0	4826.63	313.02	0.2	0.1	0.03		
145	0	4825.42	313.02	0.1	0.1	0.03		
146	0	4824.23	313.02	0.1	0.1	0.03		
147	0	4823.06	313.01	0.1	0.1	0.03		
148	0	4821.91	313.01	0.1	0.1	0.03		
149	0	4820.79	313.01	0.1	0.1	0.03		
150	0	4819.68	313.01	0.1	0.1	0.03		
151	0	4818.60	313.01	0.1	0.1	0.03		

GRAPHED DATA FOR 25 YEAR STORM





Drainage Area Maps

Town Certification. This design has been reviewed by the Engineer for the Town of Zebulon, and to the best of my knowledge and belief, it conforms to the requirements established in the Standard Specifications of the Town of Zebulon.
By: ______________________ Date: ____________
Town Engineer
These plans are approved by the Town of Zebulon and serve as construction plans for this project.
By: ______________________ Date: ____________
Administrator

FINAL DRAWING - NOT RELEASED FOR CONSTRUCTION

M:\Projects\DRH\DRH22004\04-Production\Engineering\Design Files\Erosion Control\EC Drainage Area Map\DRH22004-EC Drainage Areas.dwg, 2/26/2024 5:56:13 PM, Benjamin Kintner

MCADAMS
The John R. McAdams Company, Inc.
621 Hillsborough Street
Suite 500
Raleigh, NC 27603

phone 919. 361. 5000
fax 919. 361. 2269
license number: C-0293, C-187

www.mcadamsco.com

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D.R. HORTON, INC.
7208 FALLS OF NEUSE ROAD, SUITE 201
RALEIGH, NC 27615
PHONE: 919. 809. 4207

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ZEBULON, NORTH CAROLINA

REVISIONS

NO. DATE

PLAN INFORMATION

PROJECT NO.	DRH22004
FILENAME	DRH22004-OAS1
CHECKED BY	RKB
DRAWN BY	
SCALE	1"=150'
DATE	02. 27. 2024

SHEET

EROSION CONTROL DRAINAGE AREAS

Slope Drain and Diversion Ditch Calculations

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-1**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	0.34	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	1.46	cfs	
Q10 =	1.86	cfs	
Q25 =	2.05		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	3.50%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.090	0.66	1.31	4.17	0.31	1.42	0.45	1.86	1.86	1.44	Tall Fescue	**0.090**
0.025	1.42	6.05	8.98	0.67	8.54	n/a	1.86	51.69	3.10	ERONET P300	**0.025**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.355	0.38	2.25	0.17	3.85	n/a	1.46	1.46	0.78	Bare Earth	-
0.055	0.5	0.75	3.16	0.24	1.94	n/a	1.46	1.45	1.09	ERONET DS75	**0.055**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-2**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	1.25	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	5.36	cfs	
Q10 =	6.84	cfs	
Q25 =	7.55		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	4.50%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.059	0.875	2.30	5.53	0.42	2.97	1.23	6.84	6.83	2.46	Tall Fescue	**0.059**
0.025	0.875	2.30	5.53	0.42	7.02	n/a	6.84	16.11	2.46	ERONET P300	**0.031**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.552	0.91	3.49	0.26	5.86	n/a	5.36	5.36	1.55	Bare Earth	-
0.022	0.552	0.91	3.49	0.26	5.86	n/a	5.36	5.36	1.55	ERONET C125	**0.022**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 36 Months

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET C125

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Coconut Fiber - 0.5lb/sy	Heavyweight photodegradable w/ UV additives - 3lb/1000sf	10.0	2.25

T = Top; B = Bottom; M = Middle

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-3**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	0.77	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	3.30	cfs	
Q10 =	4.21	cfs	
Q25 =	4.65		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.02%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.073	1.045	3.28	6.61	0.50	1.29	0.64	4.21	4.22	0.67	Tall Fescue	0.073
0.025	0.875	2.30	5.53	0.42	3.34	n/a	4.21	7.67	0.56	ERONET P300	0.031

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.608	1.11	3.85	0.29	2.98	n/a	3.30	3.30	0.39	Bare Earth	-
0.048	0.813	1.98	5.14	0.39	1.66	n/a	3.30	3.28	0.52	ERONET DS75	0.048

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-4**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	0.55	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	2.36	cfs	
Q10 =	3.01	cfs	
Q25 =	3.32		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.02%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.090	0.997	2.98	6.31	0.47	1.01	0.48	3.01	3.02	0.63	Tall Fescue	**0.090**
0.025	0.875	2.30	5.53	0.42	3.34	n/a	3.01	7.67	0.56	ERONET P300	**0.031**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.535	0.86	3.38	0.25	2.73	n/a	2.36	2.35	0.34	Bare Earth	-
0.050	0.73	1.60	4.62	0.35	1.48	n/a	2.36	2.37	0.46	ERONET DS75	**0.050**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

MCADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-5**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	0.82	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	3.51	cfs	
Q10 =	4.49	cfs	
Q25 =	4.96		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.17%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.073	1.043	3.26	6.60	0.49	1.38	0.68	4.49	4.49	0.76	Tall Fescue	**0.073**
0.025	0.875	2.30	5.53	0.42	3.58	n/a	4.49	8.22	0.64	ERONET P300	**0.031**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.607	1.11	3.84	0.29	3.18	n/a	3.51	3.52	0.44	Bare Earth	-
0.048	0.812	1.98	5.14	0.39	1.77	n/a	3.51	3.51	0.59	ERONET DS75	**0.048**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

McADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Channel Number:	TD-6		

I. FLOW CALCULATIONS

Drainage Area =	7.47	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	9.80	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	4.57	in/hr	
I10 =	5.92	in/hr	
I25 =	6.56		
Q2 =	25.95	cfs	
Q10 =	33.61	cfs	
Q25 =	37.22		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.72%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.040	1.647	8.14	10.42	0.78	4.13	3.23	33.61	33.63	1.77	Tall Fescue	0.040
0.025	0.875	2.30	5.53	0.42	4.34	n/a	33.61	9.96	0.94	ERONET P300	0.031

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	1.195	4.28	7.56	0.57	6.07	n/a	25.95	25.99	1.28	Bare Earth	-
0.034	1.406	5.93	8.89	0.67	4.37	n/a	25.95	25.95	1.51	ERONET DS75	0.034

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-7**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	0.35	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	1.50	cfs	
Q10 =	1.92	cfs	
Q25 =	2.12		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	3.35%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.090	0.67	1.35	4.24	0.32	1.41	0.45	1.92	1.90	1.40	Tall Fescue	**0.090**
0.025	0.875	2.30	5.53	0.42	6.05	n/a	1.92	13.90	1.83	ERONET P300	**0.031**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.362	0.39	2.29	0.17	3.82	n/a	1.50	1.50	0.76	Bare Earth	-
0.055	0.51	0.78	3.23	0.24	1.92	n/a	1.50	1.50	1.07	ERONET DS75	**0.055**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

MCADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Channel Number:	TD-8		

I. FLOW CALCULATIONS

Drainage Area =	4.14	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	7.70	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	4.98	in/hr	
I10 =	6.41	in/hr	
I25 =	7.09		
Q2 =	15.67	cfs	
Q10 =	20.17	cfs	
Q25 =	22.31		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.17%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.046	1.54	7.11	9.74	0.73	2.83	2.07	20.17	20.16	1.12	Tall Fescue	**0.046**
0.025	1.1	3.63	6.96	0.52	4.17	n/a	20.17	15.13	0.80	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	1.063	3.39	6.72	0.50	4.63	n/a	15.67	15.69	0.78	Bare Earth	-
0.037	1.292	5.01	8.17	0.61	3.13	n/a	15.67	15.69	0.94	ERONET DS75	**0.037**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-9**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	3.28	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.80	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.43	in/hr	
I10 =	6.94	in/hr	
I25 =	7.67		
Q2 =	13.52	cfs	
Q10 =	17.31	cfs	
Q25 =	19.12		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.19%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.050	1.496	6.71	9.46	0.71	2.58	1.83	17.31	17.32	1.11	Tall Fescue	**0.050**
0.025	1.1	3.63	6.96	0.52	4.20	n/a	17.31	15.25	0.82	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	1.003	3.02	6.34	0.48	4.49	n/a	13.52	13.55	0.74	Bare Earth	-
0.038	1.23	4.54	7.78	0.58	2.98	n/a	13.52	13.52	0.91	ERONET DS75	**0.038**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

McADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Channel Number:	TD-10		

I. FLOW CALCULATIONS

Drainage Area =	1.86	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.80	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.43	in/hr	
I10 =	6.94	in/hr	
I25 =	7.67		
Q2 =	7.67	cfs	
Q10 =	9.82	cfs	
Q25 =	10.85		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.11%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.059	1.304	5.10	8.25	0.62	1.93	1.19	9.82	9.83	0.90	Tall Fescue	**0.059**
0.025	1.1	3.63	6.96	0.52	4.06	n/a	9.82	14.73	0.76	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.821	2.02	5.19	0.39	3.79	n/a	7.67	7.67	0.57	Bare Earth	-
0.043	1.055	3.34	6.67	0.50	2.29	n/a	7.67	7.66	0.73	ERONET DS75	**0.042**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-11**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	0.83	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	3.54	cfs	
Q10 =	4.52	cfs	
Q25 =	4.99		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.67%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.068	0.952	2.72	6.02	0.45	1.66	0.75	4.52	4.52	0.99	Tall Fescue	**0.068**
0.025	1.1	3.63	6.96	0.52	4.98	n/a	4.52	18.07	1.15	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.57	0.97	3.60	0.27	3.65	n/a	3.54	3.56	0.59	Bare Earth	-
0.049	0.77	1.78	4.87	0.37	2.00	n/a	3.54	3.56	0.80	ERONET DS75	**0.049**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

MCADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-12**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	1.25	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	5.38	cfs	
Q10 =	6.86	cfs	
Q25 =	7.58		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.79%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.059	1.042	3.26	6.59	0.49	2.11	1.04	6.86	6.86	1.16	Tall Fescue	**0.059**
0.025	1.1	3.63	6.96	0.52	5.15	n/a	6.86	18.71	1.23	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.657	1.29	4.16	0.31	4.15	n/a	5.38	5.38	0.73	Bare Earth	-
0.047	0.874	2.29	5.53	0.41	2.35	n/a	5.38	5.39	0.98	ERONET DS75	**0.047**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

McADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-13**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	1.17	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	5.01	cfs	
Q10 =	6.40	cfs	
Q25 =	7.07		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.49%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.061	1.064	3.40	6.73	0.50	1.88	0.95	6.40	6.40	0.99	Tall Fescue	**0.061**
0.025	1.1	3.63	6.96	0.52	4.70	n/a	6.40	17.07	1.02	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.662	1.31	4.19	0.31	3.81	n/a	5.01	5.01	0.62	Bare Earth	-
0.046	0.876	2.30	5.54	0.42	2.20	n/a	5.01	5.05	0.81	ERONET DS75	**0.046**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

McADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-14**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	0.96	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	4.11	cfs	
Q10 =	5.24	cfs	
Q25 =	5.79		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.00%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.068	1.108	3.68	7.01	0.53	1.42	0.75	5.24	5.24	0.69	Tall Fescue	**0.068**
0.025	1.1	3.63	6.96	0.52	3.85	n/a	5.24	13.98	0.69	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.662	1.31	4.19	0.31	3.12	n/a	4.11	4.10	0.41	Bare Earth	-
0.046	0.876	2.30	5.54	0.42	1.80	n/a	4.11	4.14	0.55	ERONET DS75	**0.046**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

MCADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-15**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	3.50	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.80	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.43	in/hr	
I10 =	6.94	in/hr	
I25 =	7.67		
Q2 =	14.41	cfs	
Q10 =	18.45	cfs	
Q25 =	20.38		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.03%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.050	1.574	7.43	9.95	0.75	2.48	1.85	18.45	18.45	1.01	Tall Fescue	**0.050**
0.025	1.1	3.63	6.96	0.52	3.91	n/a	18.45	14.19	0.71	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	1.055	3.34	6.67	0.50	4.32	n/a	14.41	14.42	0.68	Bare Earth	-
0.037	1.282	4.93	8.11	0.61	2.93	n/a	14.41	14.42	0.82	ERONET DS75	**0.037**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

McADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Channel Number:	TD-16		

I. FLOW CALCULATIONS

Drainage Area =	2.43	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	10.41	cfs	
Q10 =	13.30	cfs	
Q25 =	14.69		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	3.26%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.050	1.122	3.78	7.10	0.53	3.52	1.88	13.30	13.31	2.28	Tall Fescue	**0.050**
0.025	1.1	3.63	6.96	0.52	6.96	n/a	13.30	25.25	2.24	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.752	1.70	4.76	0.36	6.13	n/a	10.41	10.40	1.53	Bare Earth	-
0.040	0.946	2.68	5.98	0.45	3.93	n/a	10.41	10.55	1.92	ERONET SC150	**0.040**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 24 Months

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET SC150

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
70% Straw Fiber - 0.35lb/sy 30% Coconut Fiber - 0.15lb/sy	T: Heavyweight photodegradable w/ UV additives - 3lb/1000sf B: Lightweight	8.0	2.00

T = Top; B = Bottom; M = Middle

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-17**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	1.18	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	5.06	cfs	
Q10 =	6.46	cfs	
Q25 =	7.13		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	3.10%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.059	0.919	2.53	5.81	0.44	2.55	1.11	6.46	6.46	1.78	Tall Fescue	**0.059**
0.025	1.1	3.63	6.96	0.52	6.78	n/a	6.46	24.62	2.13	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.58	1.01	3.67	0.28	5.03	n/a	5.06	5.07	1.12	Bare Earth	-
0.049	0.782	1.83	4.95	0.37	2.76	n/a	5.06	5.06	1.51	ERONET DS75	**0.049**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

McADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Channel Number:	TD-18		

I. FLOW CALCULATIONS

Drainage Area =	4.39	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	6.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.37	in/hr	
I10 =	6.88	in/hr	
I25 =	7.61		
Q2 =	17.93	cfs	
Q10 =	22.97	cfs	
Q25 =	25.38		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	3.59%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.043	1.278	4.90	8.08	0.61	4.69	2.84	22.97	22.98	2.86	Tall Fescue	0.043
0.028	1.09	3.56	6.89	0.52	6.48	n/a	22.97	23.09	2.44	ERONET P300	0.028

-------> CHANNEL UNSTABLE - PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.906	2.46	5.73	0.43	7.29	n/a	17.93	17.94	2.03	Bare Earth	-
0.020	0.874	2.29	5.53	0.41	7.82	n/a	17.93	17.93	1.96	ERONET C125	0.020

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 36 Months

Permanent Liner Specifications - ERONET P300

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% UV Stable Polypropylene Fiber - 0.7lb/sy	T: UV-Stabilized Polypropylene - 5lb/1000sf B: UV-Stabilized Polypropylene - 3lb/1000sf	9.0	8.0

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET C125

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Coconut Fiber - 0.5lb/sy	Heavyweight photodegradable w/ UV additives - 3lb/1000sf	10.0	2.25

T = Top; B = Bottom; M = Middle

EROSION CONTROL CHANNEL DESIGN

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Channel Number:	TD-19		

I. FLOW CALCULATIONS

Drainage Area =	0.71	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	3.03	cfs	
Q10 =	3.87	cfs	
Q25 =	4.28		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.53%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.073	0.938	2.64	5.93	0.44	1.47	0.65	3.87	3.87	0.90	Tall Fescue	**0.073**
0.028	1.09	3.56	6.89	0.52	4.23	n/a	3.87	15.07	1.04	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.546	0.89	3.45	0.26	3.39	n/a	3.03	3.03	0.52	Bare Earth	-
0.050	0.742	1.65	4.69	0.35	1.83	n/a	3.03	3.03	0.71	ERONET DS75	**0.050**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

McADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name: CHAMBLEE LAKE
Project Number: DRH22004
Channel Number: TD-20

Date: 2/27/2024
Calculated By: BJK

I. FLOW CALCULATIONS

Drainage Area =	2.14	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	7.70	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	4.98	in/hr	
I10 =	6.41	in/hr	
I25 =	7.09		
Q2 =	8.10	cfs	
Q10 =	10.43	cfs	
Q25 =	11.53		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.02%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.059	1.355	5.51	8.57	0.64	1.89	1.22	10.43	10.43	0.86	Tall Fescue	**0.059**
0.028	1.09	3.56	6.89	0.52	3.45	n/a	10.43	12.31	0.69	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.852	2.18	5.39	0.40	3.73	n/a	8.10	8.12	0.54	Bare Earth	-
0.042	1.085	3.53	6.86	0.51	2.29	n/a	8.10	8.10	0.69	ERONET DS75	**0.042**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

McADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Channel Number:	TD-21		

I. FLOW CALCULATIONS

Drainage Area =	0.73	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.70	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.45	in/hr	
I10 =	6.98	in/hr	
I25 =	7.71		
Q2 =	3.02	cfs	
Q10 =	3.87	cfs	
Q25 =	4.27		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.26%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.073	0.974	2.85	6.16	0.46	1.37	0.63	3.87	3.89	0.77	Tall Fescue	0.073
0.028	1.09	3.56	6.89	0.52	3.84	n/a	3.87	13.68	0.86	ERONET P300	0.028

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.565	0.96	3.57	0.27	3.15	n/a	3.02	3.02	0.44	Bare Earth	-
0.049	0.764	1.75	4.83	0.36	1.73	n/a	3.02	3.03	0.60	ERONET DS75	0.049

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

McADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-22**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	0.92	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.70	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.45	in/hr	
I10 =	6.98	in/hr	
I25 =	7.71		
Q2 =	3.82	cfs	
Q10 =	4.89	cfs	
Q25 =	5.40		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.19%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.068	1.045	3.28	6.61	0.50	1.49	0.74	4.89	4.89	0.78	Tall Fescue	**0.068**
0.028	1.09	3.56	6.89	0.52	3.73	n/a	4.89	13.29	0.81	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.624	1.17	3.95	0.30	3.27	n/a	3.82	3.82	0.46	Bare Earth	-
0.047	0.831	2.07	5.26	0.39	1.85	n/a	3.82	3.84	0.62	ERONET DS75	**0.047**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

EROSION CONTROL CHANNEL DESIGN

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Channel Number:	TD-23		

I. FLOW CALCULATIONS

Drainage Area =	1.57	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.70	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.45	in/hr	
I10 =	6.98	in/hr	
I25 =	7.71		
Q2 =	6.51	cfs	
Q10 =	8.33	cfs	
Q25 =	9.20		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.15%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.059	1.217	4.44	7.70	0.58	1.87	1.08	8.33	8.32	0.87	Tall Fescue	**0.059**
0.028	1.09	3.56	6.89	0.52	3.67	n/a	8.33	13.07	0.78	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.767	1.76	4.85	0.36	3.69	n/a	6.51	6.51	0.55	Bare Earth	-
0.044	0.995	2.97	6.29	0.47	2.19	n/a	6.51	6.52	0.71	ERONET DS75	**0.044**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE** Date: **2/27/2024**
Project Number: **DRH22004** Calculated By: **BJK**
Channel Number: **TD-24**

I. FLOW CALCULATIONS

Drainage Area =	4.13	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	9.40	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	4.64	in/hr	
I10 =	6.01	in/hr	
I25 =	6.65		
Q2 =	14.57	cfs	
Q10 =	18.85	cfs	
Q25 =	20.87		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.08%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.050	1.573	7.42	9.95	0.75	2.54	1.90	18.85	18.86	1.06	Tall Fescue	**0.050**
0.028	1.09	3.56	6.89	0.52	3.55	n/a	18.85	12.66	0.73	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	1.05	3.31	6.64	0.50	4.41	n/a	14.57	14.58	0.71	Bare Earth	-
0.037	1.276	4.88	8.07	0.61	2.99	n/a	14.57	14.59	0.86	ERONET DS75	**0.037**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

McADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name: **CHAMBLEE LAKE**
Project Number: **DRH22004**
Channel Number: **TD-25**

Date: **2/27/2024**
Calculated By: **BJK**

I. FLOW CALCULATIONS

Drainage Area =	2.79	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	8.40	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	4.83	in/hr	
I10 =	6.24	in/hr	
I25 =	6.90		
Q2 =	10.25	cfs	
Q10 =	13.23	cfs	
Q25 =	14.64		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.04%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.050	1.387	5.77	8.77	0.66	2.29	1.51	13.23	13.23	0.90	Tall Fescue	**0.050**
0.028	1.09	3.56	6.89	0.52	3.49	n/a	13.23	12.43	0.71	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.927	2.58	5.86	0.44	3.98	n/a	10.25	10.27	0.60	Bare Earth	-
0.040	1.16	4.04	7.34	0.55	2.54	n/a	10.25	10.27	0.75	ERONET DS75	**0.040**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

MCADAMS

EROSION CONTROL CHANNEL DESIGN

Project Name:	CHAMBLEE LAKE	Date:	2/27/2024
Project Number:	DRH22004	Calculated By:	BJK
Channel Number:	TD-26		

I. FLOW CALCULATIONS

Drainage Area =	1.14	acres	
SCS CN =	88		For newly graded areas, HSG 'A' soils
Rational C =	0.76		C = 0.020 x CN - 1.0
T_C =	5.00	min	Conservative assumption
Return Storm for Temp Liners	2	year	
Return Storm for Permanent Liners	10	year	
I2 =	5.64	in/hr	
I10 =	7.20	in/hr	
I25 =	7.95		
Q2 =	4.88	cfs	
Q10 =	6.23	cfs	
Q25 =	6.89		

II. SWALE CALCULATIONS

Proposed Channel Section

Longitudinal Slope =	1.15%		
Left Sideslope =	3.00	H:V	
Right Sideslope =	3.00	H:V	
Maximum Vel. =	4.50	ft/s	For established grass lined channel
Bottom Width =	0.00	ft	

10-Year Storm Calculation (for Permanent Liner)

Match Manning's "n" to Calculated "n" and adjust Depth until Capacity matches Flow.

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Radius [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Liner Description/ Selection	Calculated "n"
0.064	1.126	3.80	7.12	0.53	1.64	0.88	6.23	6.23	0.81	Tall Fescue	**0.064**
0.028	1.09	3.56	6.89	0.52	3.67	n/a	6.23	13.07	0.78	ERONET P300	**0.028**

-------> NO PERMANENT LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY

2-Year Storm Calculation (for Temporary Liner)

Manning's "n"	Depth [ft]	Flow Area [ft2]	Wetted Perimeter [ft]	Hydraulic Rad. [ft]	Velocity [ft/sec]	VR [ft2/sec]	Flow (Q2) [cfs]	Capacity [cfs]	Shear Stress [lb/ft^2]	Description	Calculated "n"
0.022	0.689	1.42	4.36	0.33	3.44	n/a	4.88	4.89	0.49	Bare Earth	-
0.046	0.908	2.47	5.74	0.43	1.98	n/a	4.88	4.89	0.65	ERONET DS75	**0.046**

-------> CHANNEL UNSTABLE - TEMPORARY LINER REQUIRED
-------> VELOCITY IS OKAY
-------> SHEAR STRESS IS OKAY
Liner Longevity -> 45 Days

Permanent Liner Specifications - NO LINER REQUIRED

Matrix	Netting	Allowable Partially Vegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
#N/A	#N/A	#N/A	#N/A

T = Top; B = Bottom; M = Middle

Temporary Liner Specifications - ERONET DS75

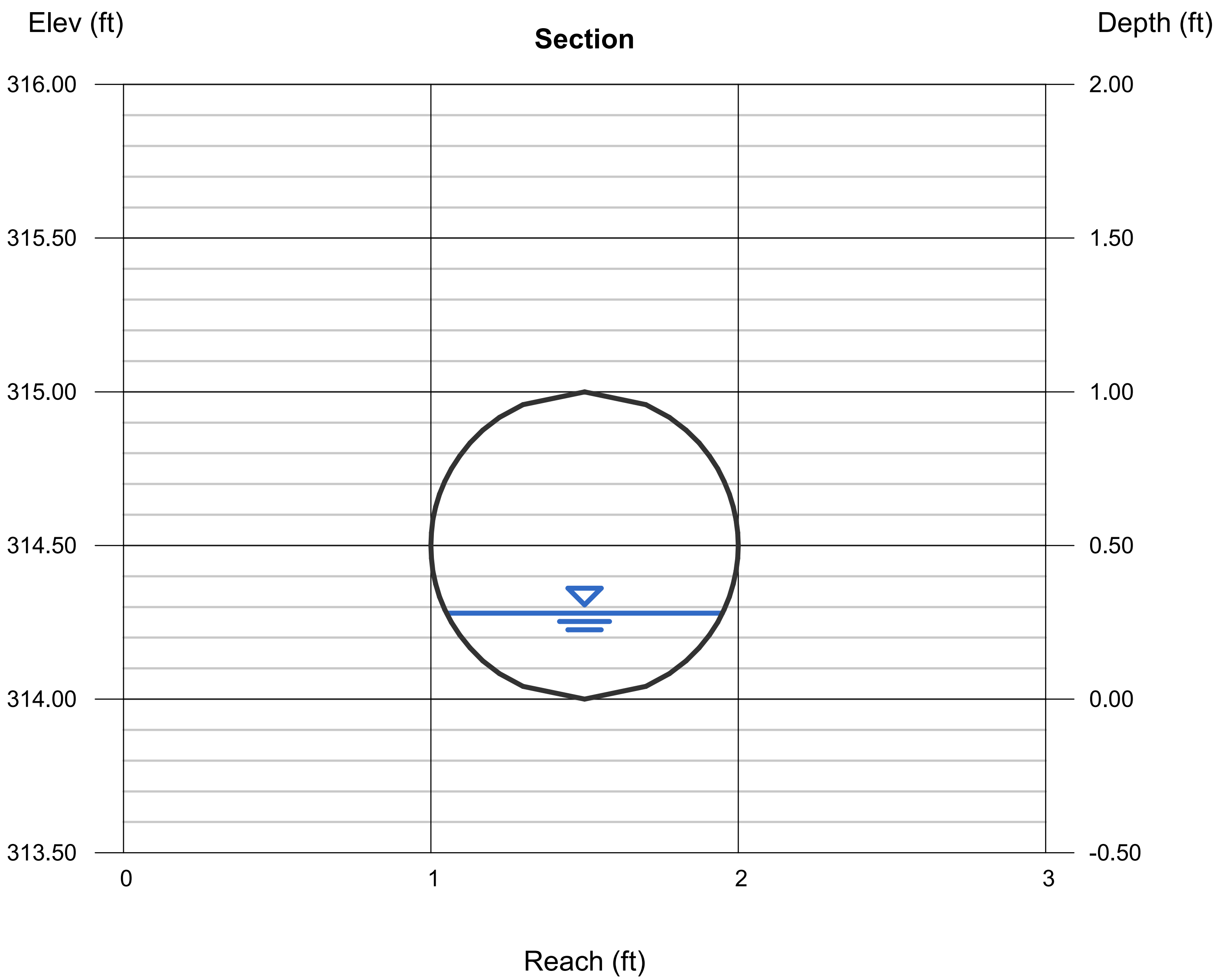
Matrix	Netting	Allowable Unvegetated Velocity (f/s)	Allowable Partially Vegetated Shear Stress [lb/ft^2]
100% Straw Fiber - 0.5lb/sy	T(only): Lightweight photodegradable with photo accelerators - 1.5lb/10000sf	5.0	1.55

T = Top; B = Bottom; M = Middle

Channel Report

TD-1

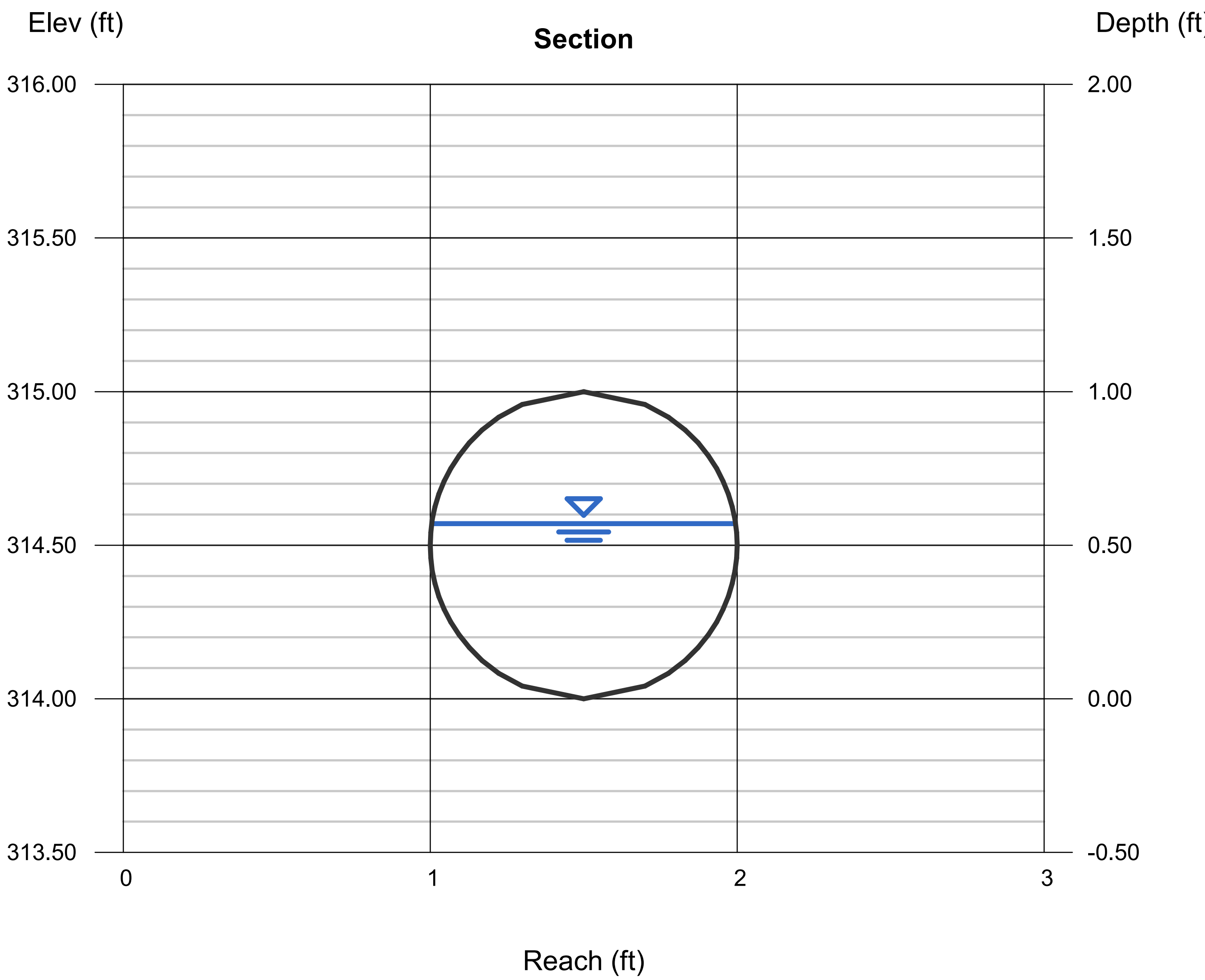
Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.28
		Q (cfs)	= 1.860
		Area (sqft)	= 0.18
Invert Elev (ft)	= 314.00	Velocity (ft/s)	= 10.22
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.12
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.58
		Top Width (ft)	= 0.90
Calculations		EGL (ft)	= 1.90
Compute by:	Known Q		
Known Q (cfs)	= 1.86		



Channel Report

TD-2

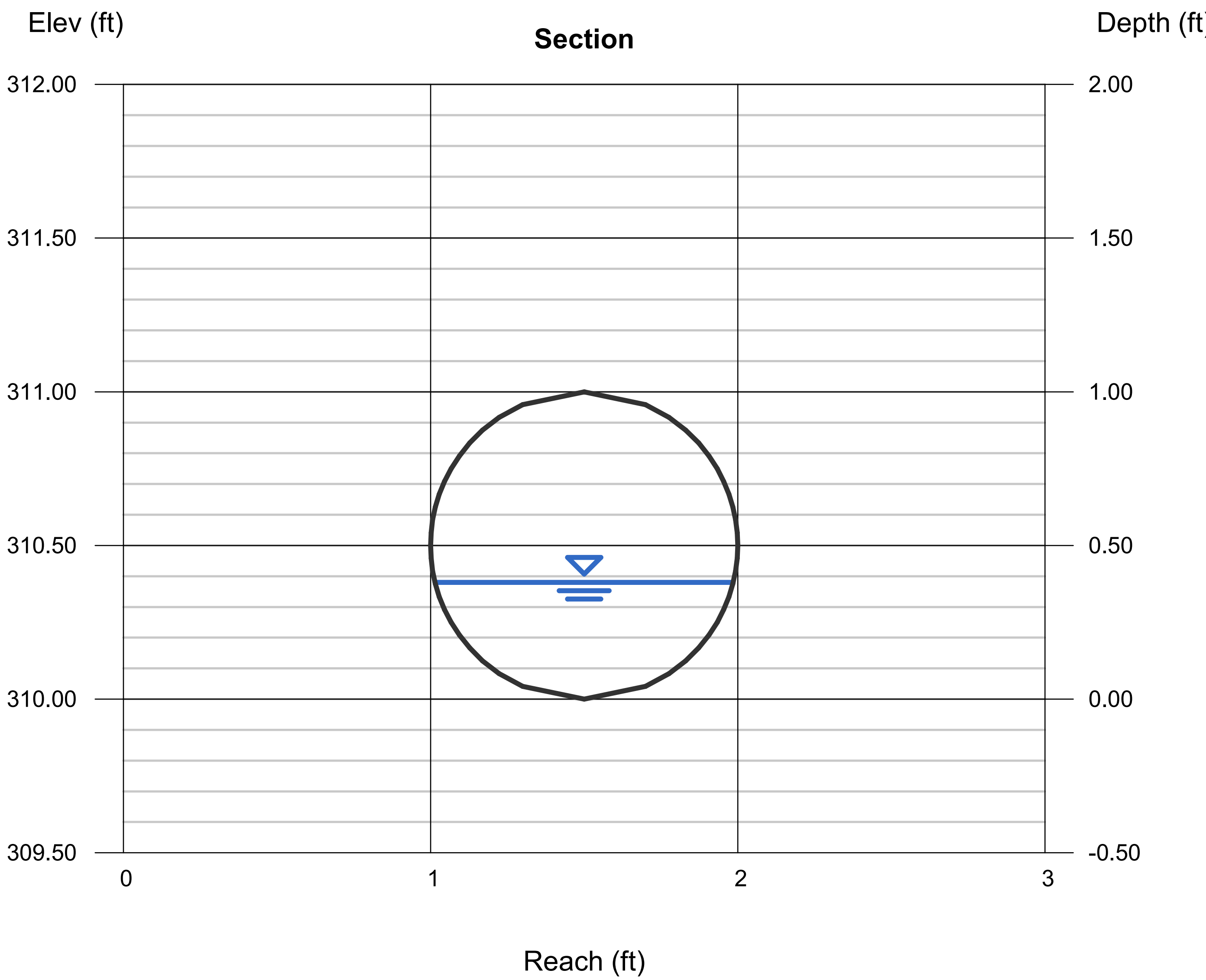
Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.57
		Q (cfs)	= 6.840
		Area (sqft)	= 0.46
Invert Elev (ft)	= 314.00	Velocity (ft/s)	= 14.73
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.71
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.98
		Top Width (ft)	= 0.99
Calculations		EGL (ft)	= 3.94
Compute by:	Known Q		
Known Q (cfs)	= 6.84		



Channel Report

TD-3

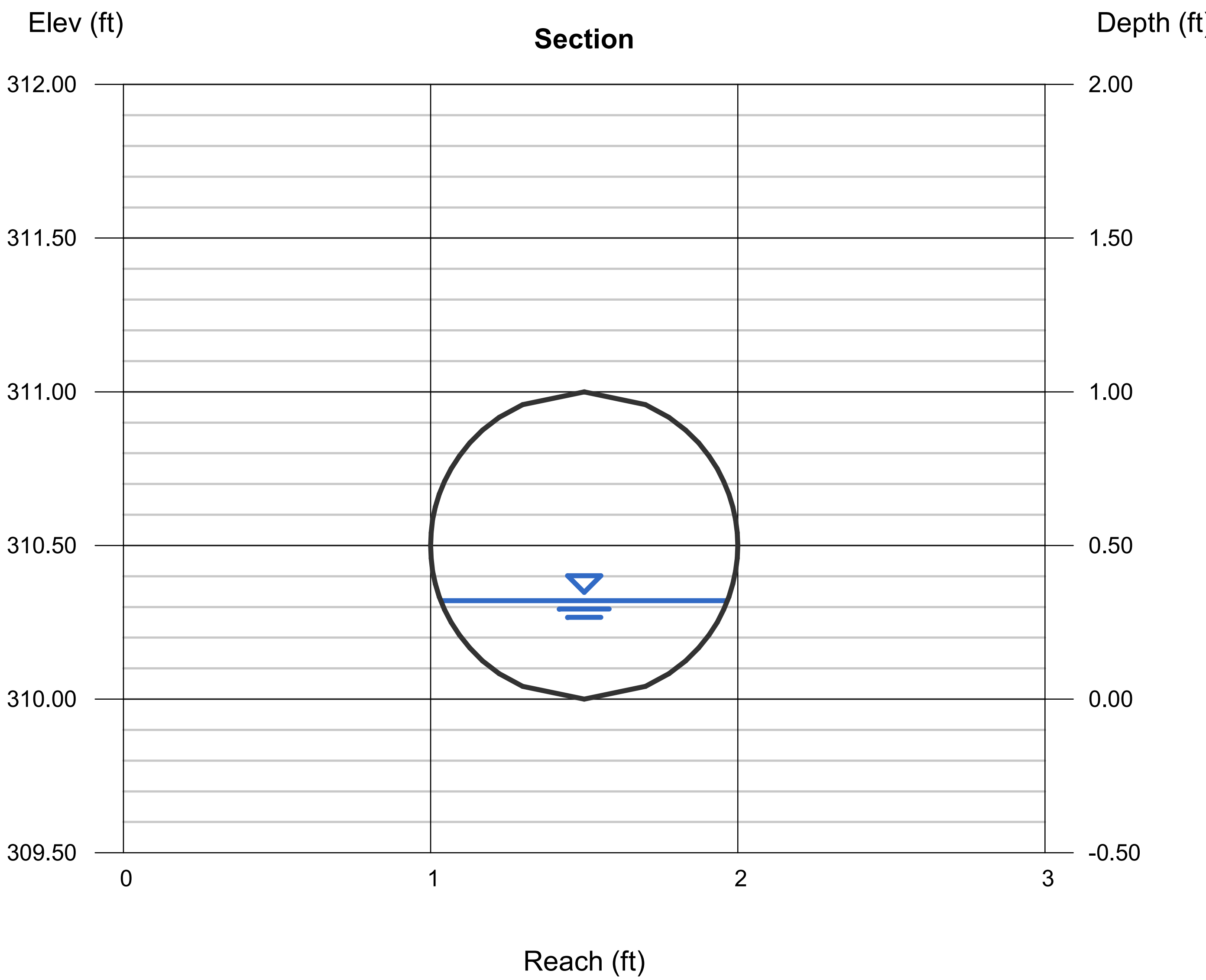
Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.38
		Q (cfs)	= 3.300
		Area (sqft)	= 0.27
Invert Elev (ft)	= 310.00	Velocity (ft/s)	= 12.02
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.33
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.78
		Top Width (ft)	= 0.97
Calculations		EGL (ft)	= 2.63
Compute by:	Known Q		
Known Q (cfs)	= 3.30		



Channel Report

TD-4

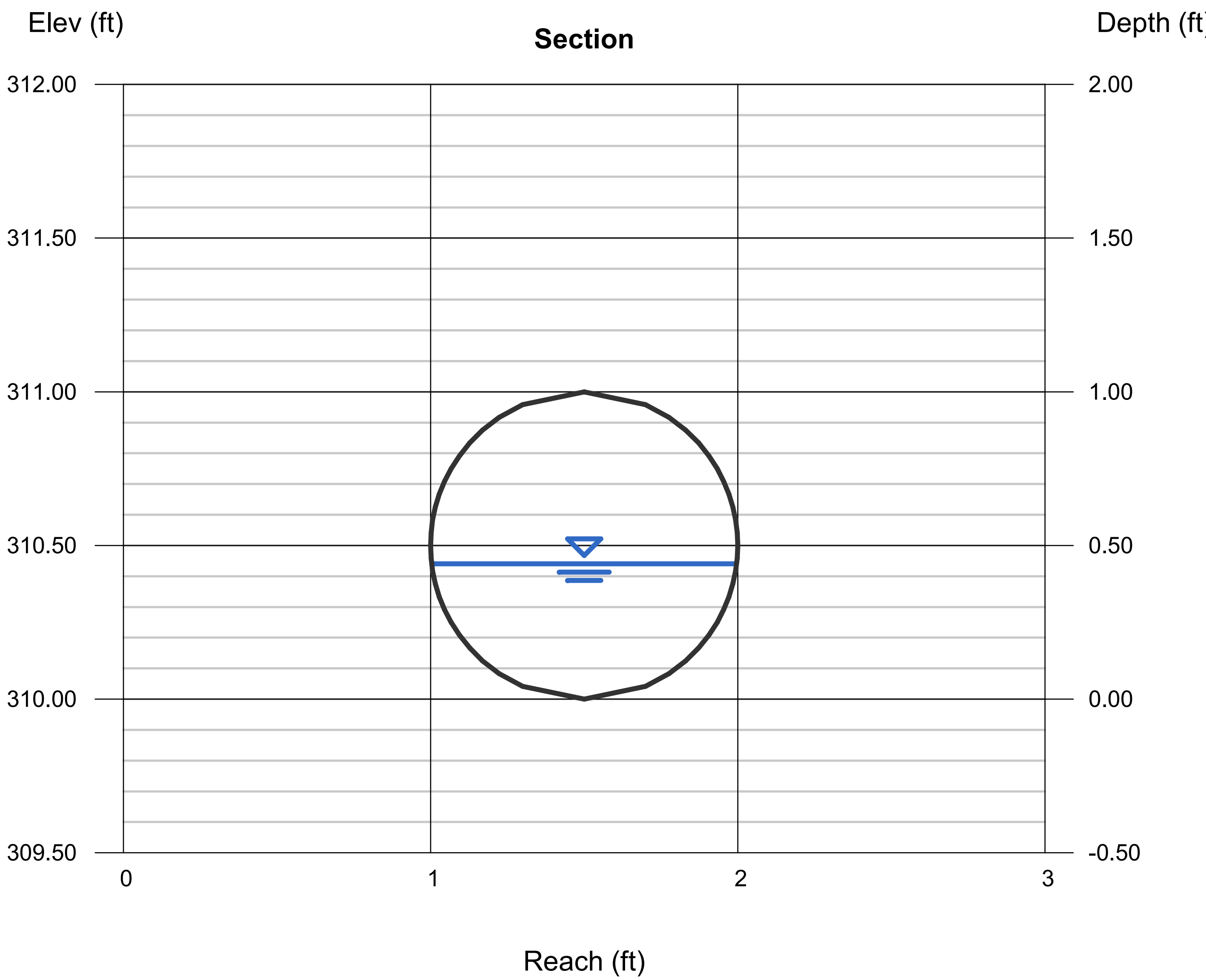
Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.32
		Q (cfs)	= 2.360
		Area (sqft)	= 0.22
Invert Elev (ft)	= 310.00	Velocity (ft/s)	= 10.84
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.20
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.66
		Top Width (ft)	= 0.93
Calculations		EGL (ft)	= 2.15
Compute by:	Known Q		
Known Q (cfs)	= 2.36		



Channel Report

TD-5

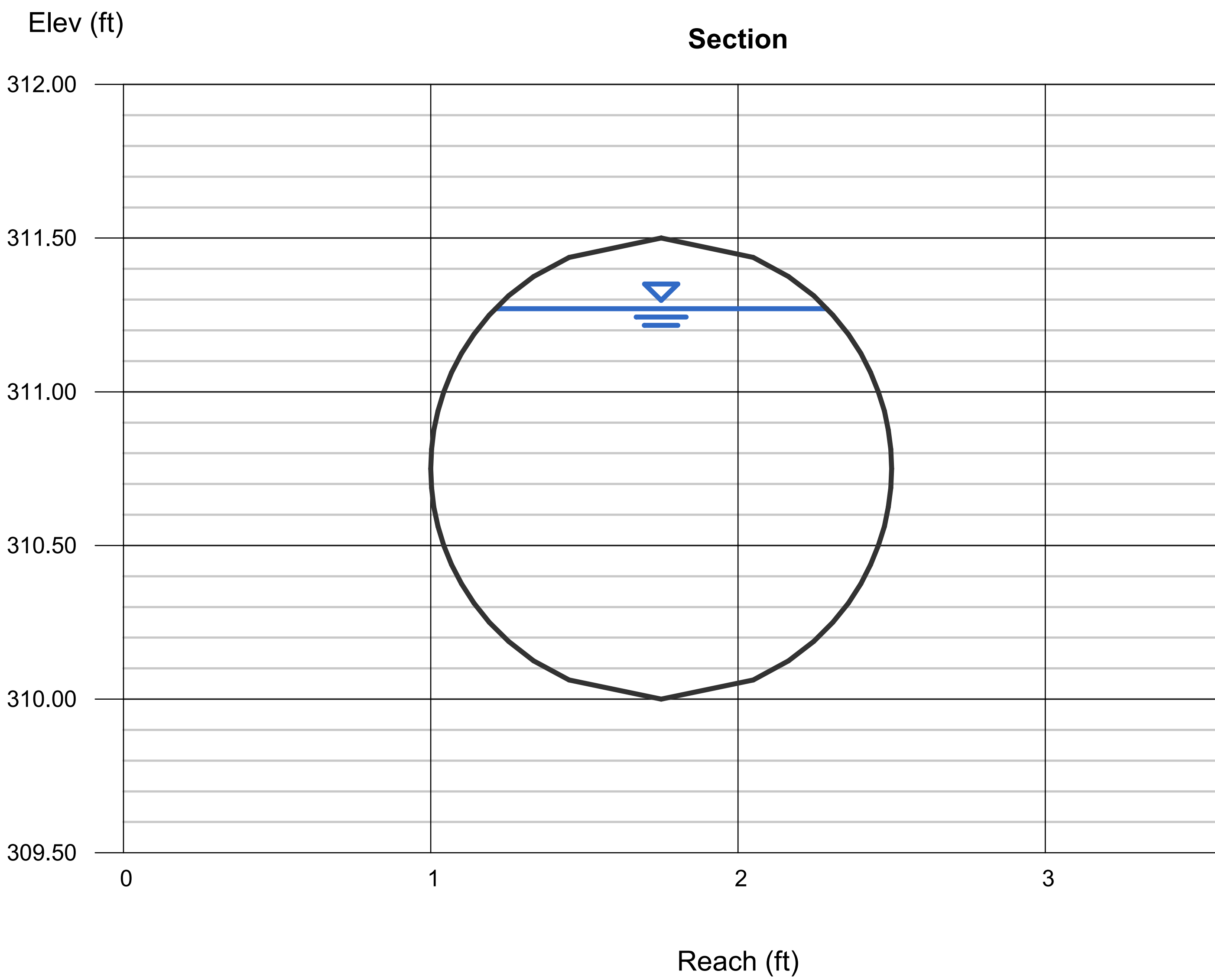
Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.44
		Q (cfs)	= 4.490
		Area (sqft)	= 0.34
Invert Elev (ft)	= 310.00	Velocity (ft/s)	= 13.40
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.45
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.89
		Top Width (ft)	= 0.99
Calculations		EGL (ft)	= 3.23
Compute by:	Known Q		
Known Q (cfs)	= 4.49		



Channel Report

TD-6

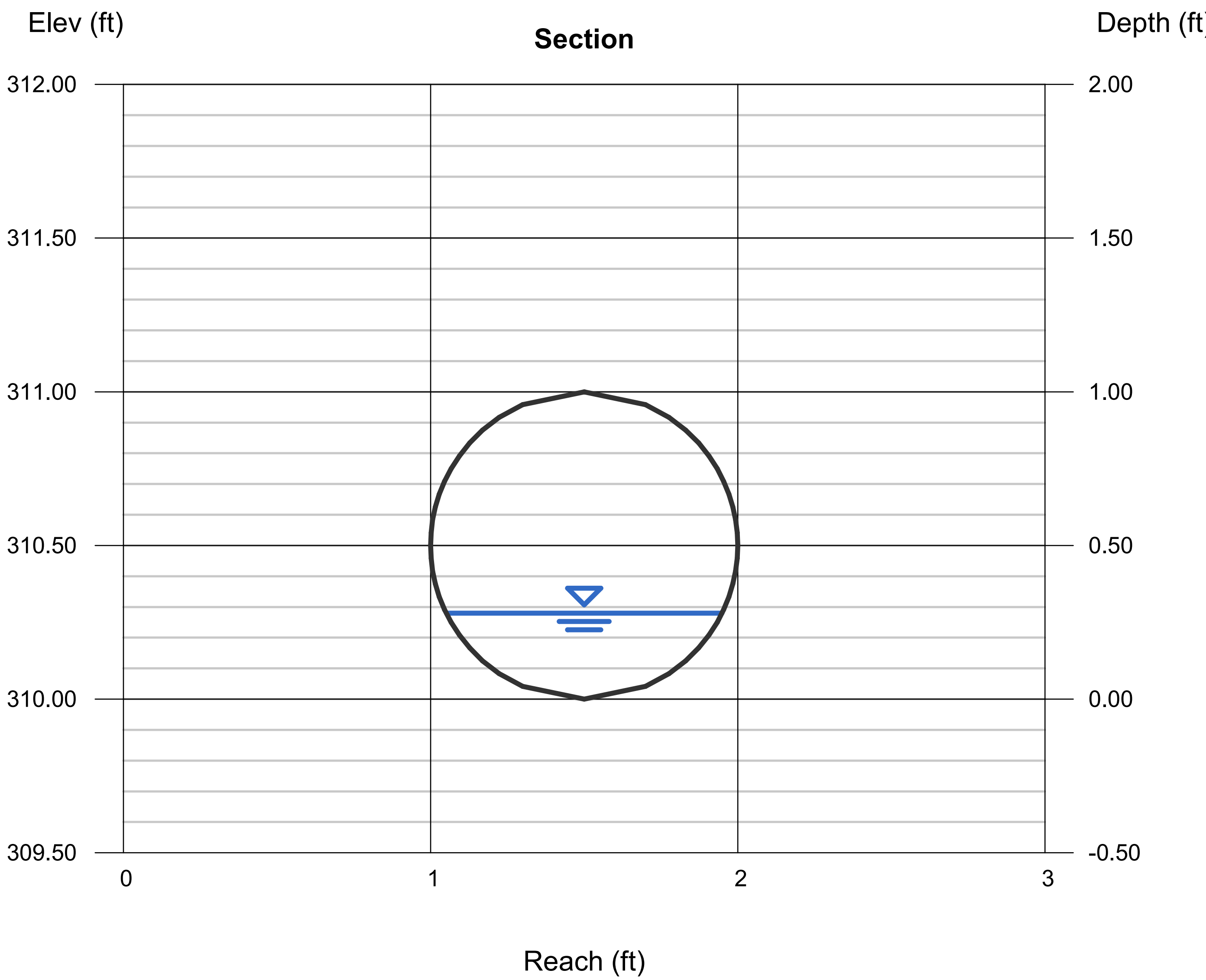
Circular		**Highlighted**	
Diameter (ft)	= 1.50	Depth (ft)	= 1.27
		Q (cfs)	= 33.61
		Area (sqft)	= 1.60
Invert Elev (ft)	= 310.00	Velocity (ft/s)	= 21.04
Slope (%)	= 33.33	Wetted Perim (ft)	= 3.51
N-Value	= 0.024	Crit Depth, Yc (ft)	= 1.50
		Top Width (ft)	= 1.08
Calculations		EGL (ft)	= 8.15
Compute by:	Known Q		
Known Q (cfs)	= 33.61		



Channel Report

TD-7

Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.28
		Q (cfs)	= 1.920
		Area (sqft)	= 0.18
Invert Elev (ft)	= 310.00	Velocity (ft/s)	= 10.55
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.12
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.59
		Top Width (ft)	= 0.90
Calculations		EGL (ft)	= 2.01
Compute by:	Known Q		
Known Q (cfs)	= 1.92		



Channel Report

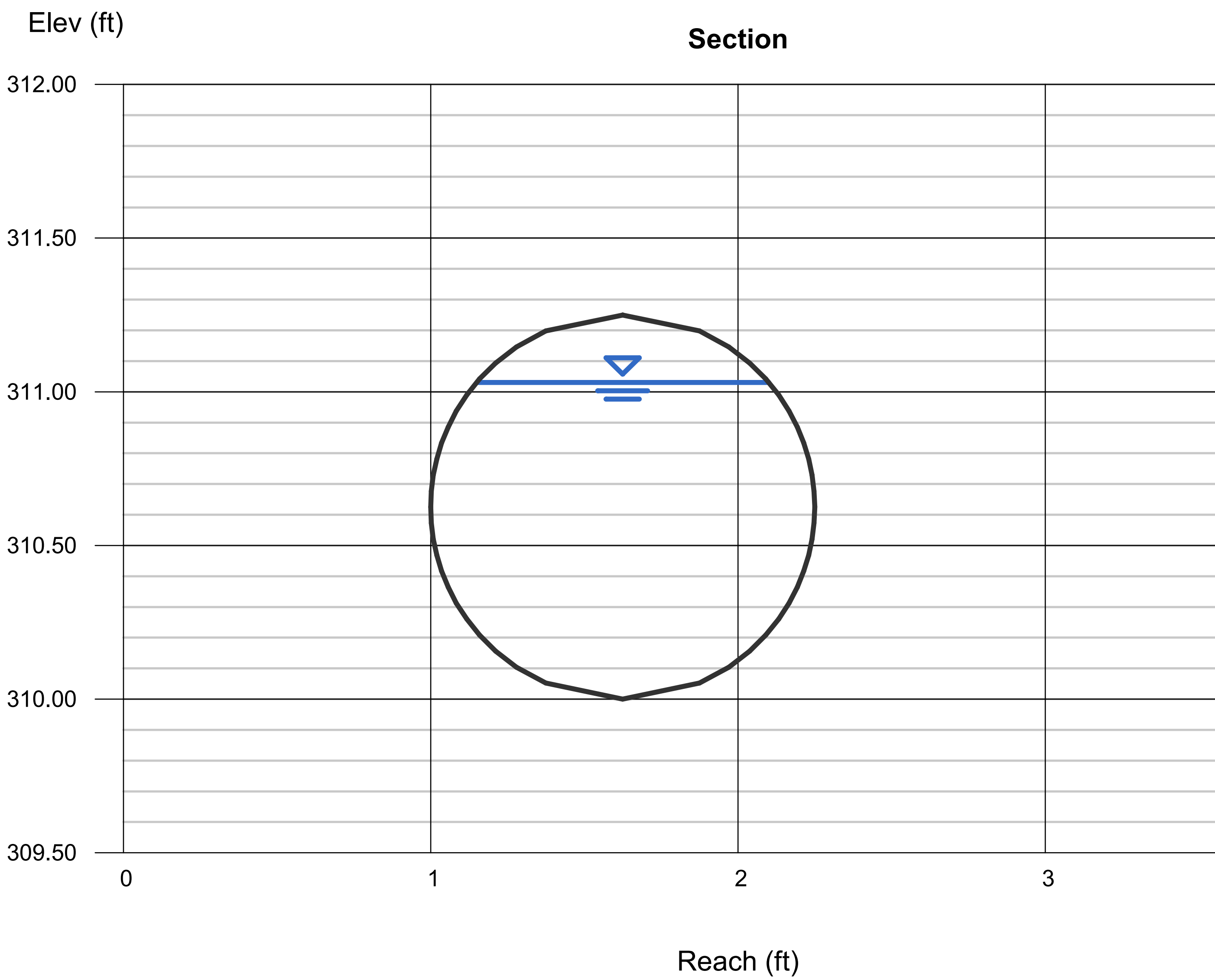
TD-8

Circular
Diameter (ft) = 1.25

Invert Elev (ft) = 310.00
Slope (%) = 33.33
N-Value = 0.024

Calculations
Compute by: Known Q
Known Q (cfs) = 20.17

Highlighted
Depth (ft) = 1.03
Q (cfs) = 20.17
Area (sqft) = 1.08
Velocity (ft/s) = 18.61
Wetted Perim (ft) = 2.85
Crit Depth, Yc (ft) = 1.25
Top Width (ft) = 0.95
EGL (ft) = 6.42



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Feb 1 2024

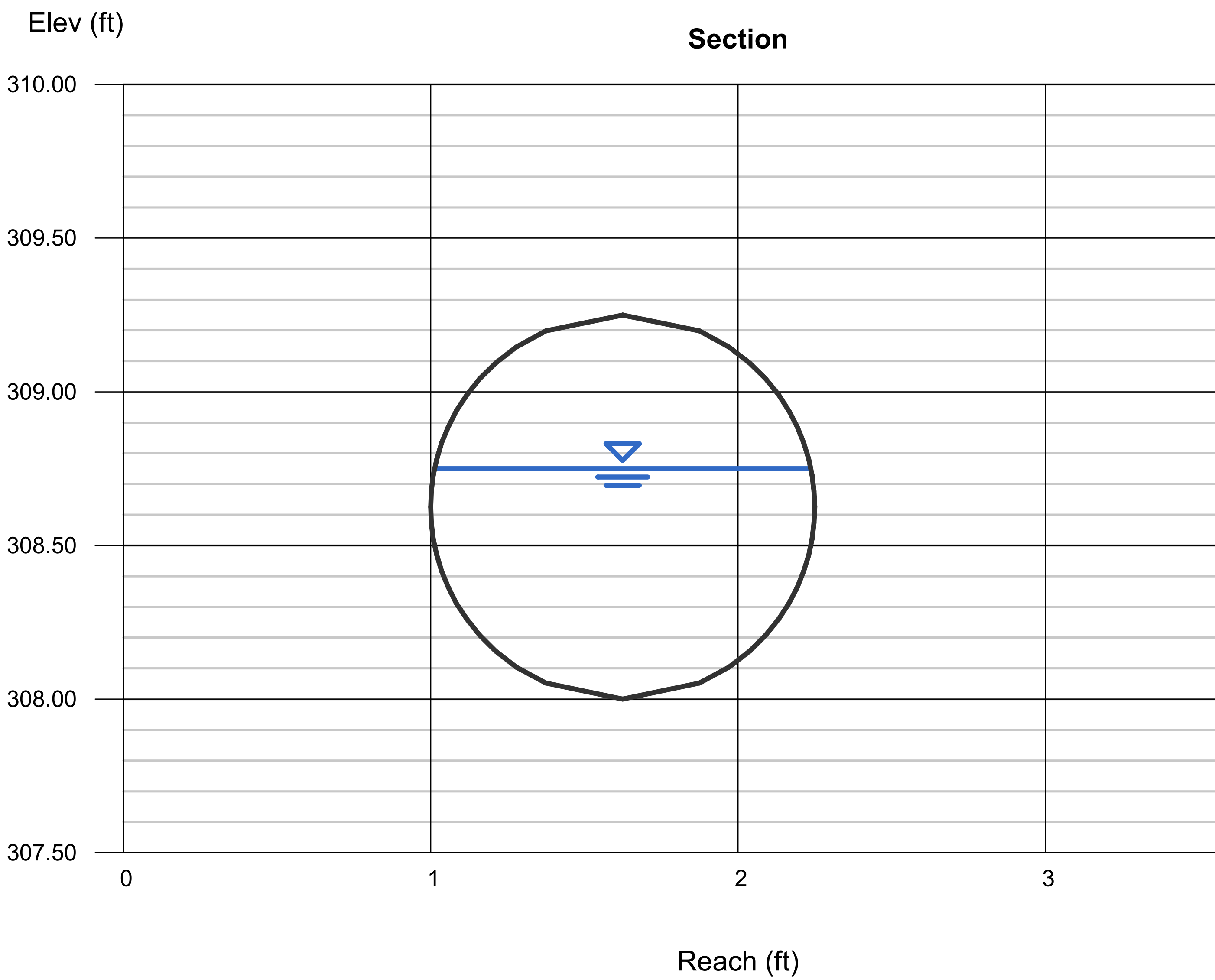
TD-9

Circular
Diameter (ft) = 1.25

Invert Elev (ft) = 308.00
Slope (%) = 33.33
N-Value = 0.024

Calculations
Compute by: Known Q
Known Q (cfs) = 13.52

Highlighted
Depth (ft) = 0.75
Q (cfs) = 13.52
Area (sqft) = 0.77
Velocity (ft/s) = 17.54
Wetted Perim (ft) = 2.22
Crit Depth, Yc (ft) = 1.23
Top Width (ft) = 1.22
EGL (ft) = 5.53

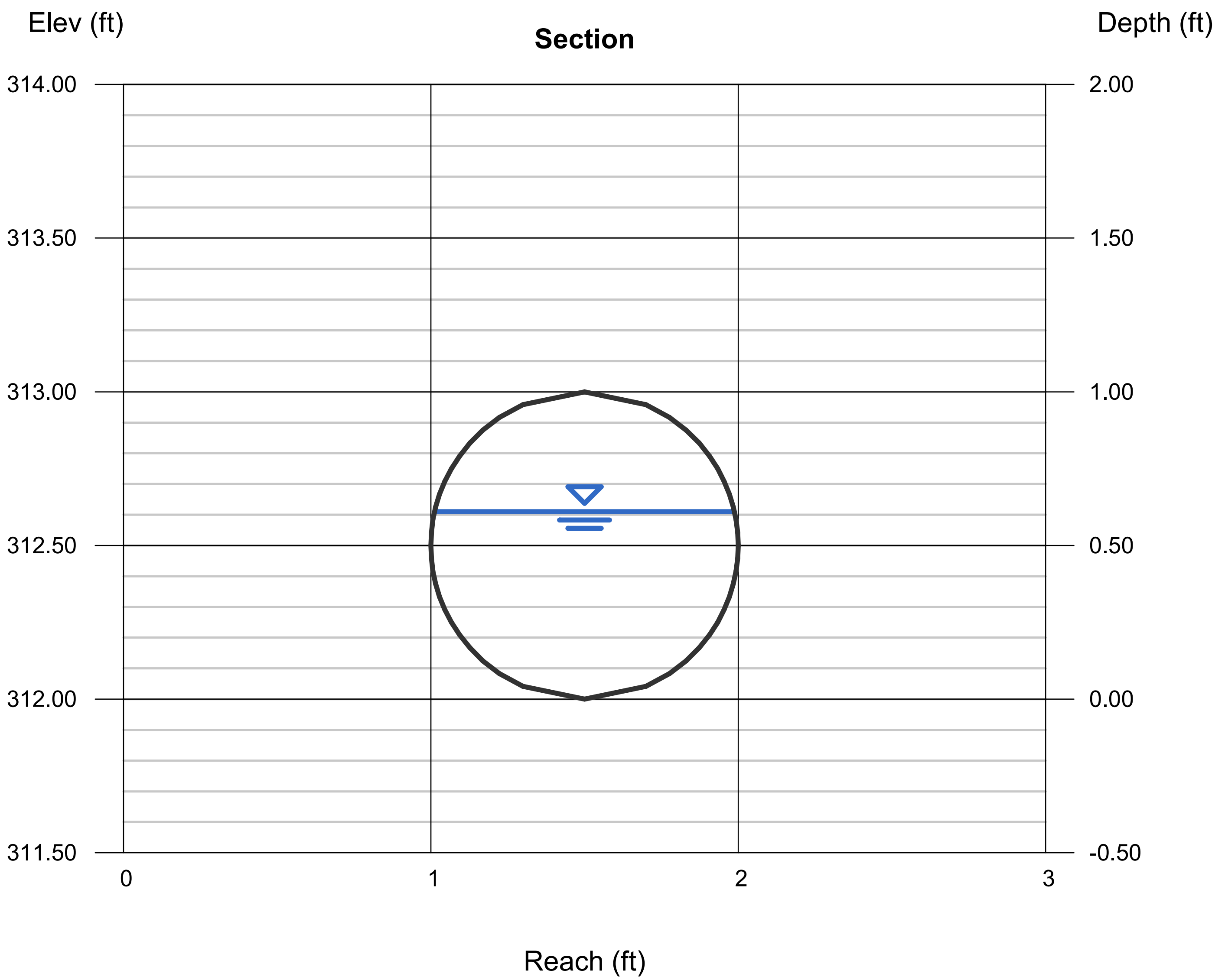


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Feb 1 2024

TD-10

Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.61
		Q (cfs)	= 7.670
		Area (sqft)	= 0.50
Invert Elev (ft)	= 312.00	Velocity (ft/s)	= 15.25
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.79
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.99
		Top Width (ft)	= 0.97
Calculations		EGL (ft)	= 4.23
Compute by:	Known Q		
Known Q (cfs)	= 7.67		

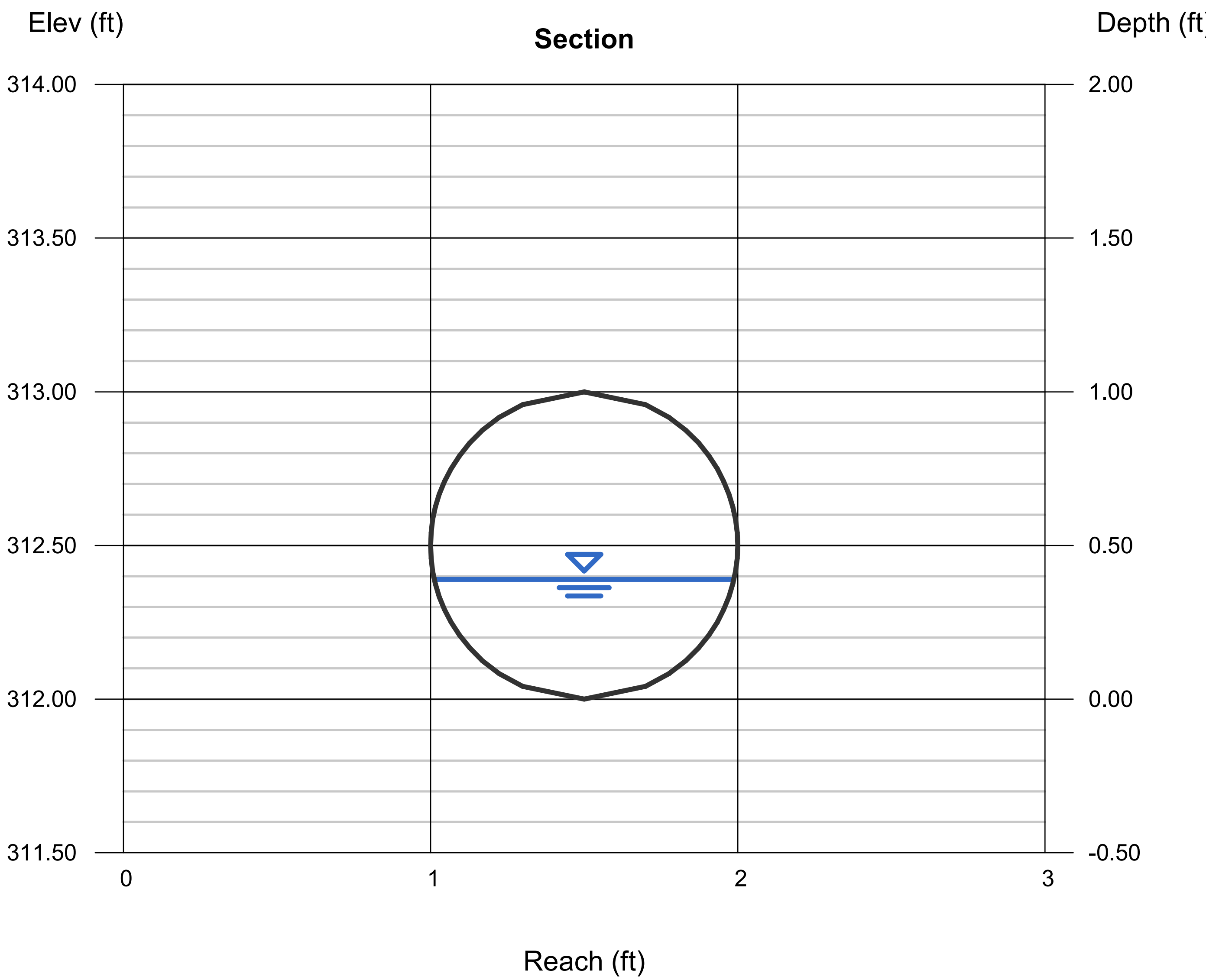


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Feb 1 2024

TD-10

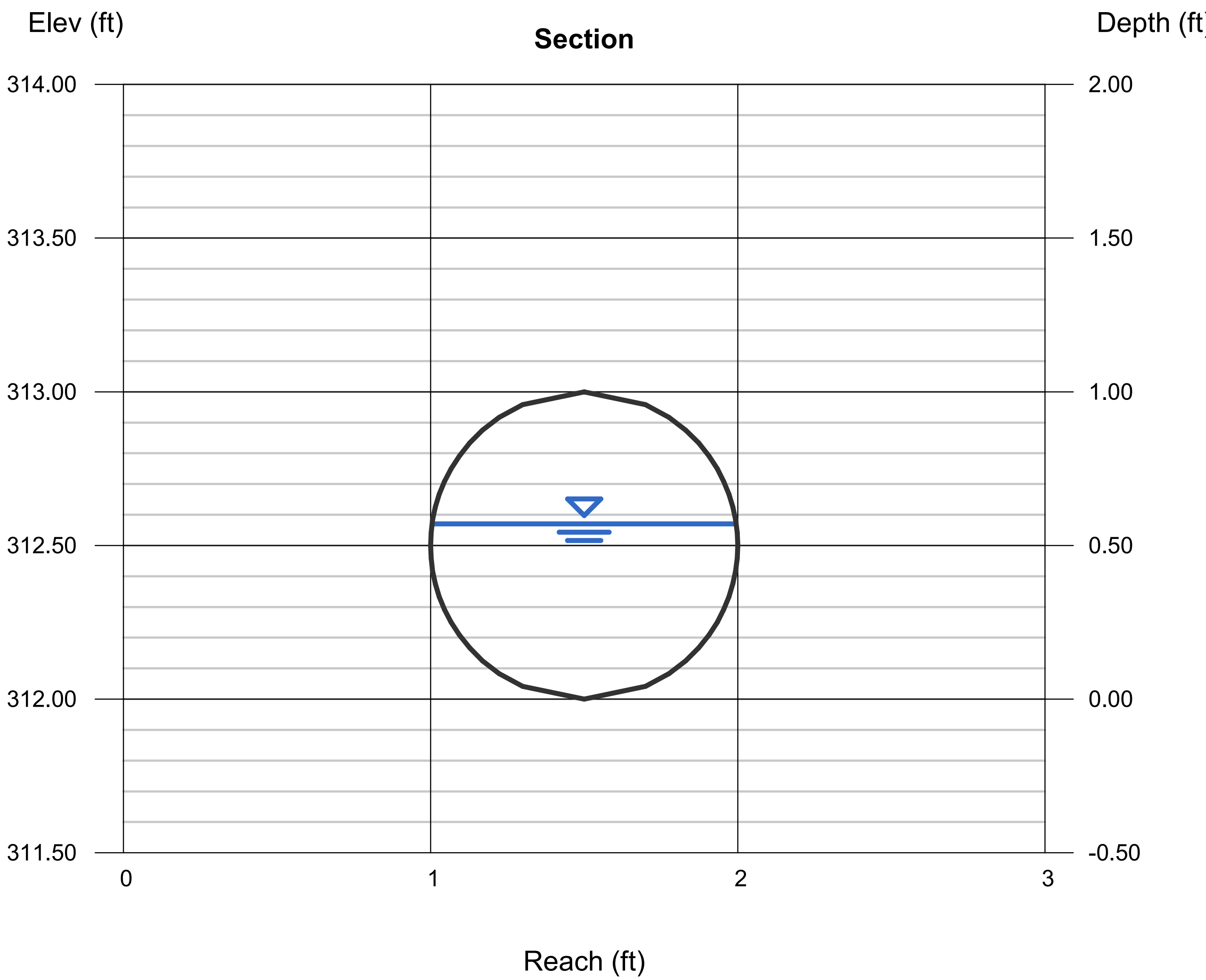
Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.39
		Q (cfs)	= 3.540
		Area (sqft)	= 0.28
Invert Elev (ft)	= 312.00	Velocity (ft/s)	= 12.46
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.35
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.81
		Top Width (ft)	= 0.98
Calculations		EGL (ft)	= 2.80
Compute by:	Known Q		
Known Q (cfs)	= 3.54		



Channel Report

TD-12

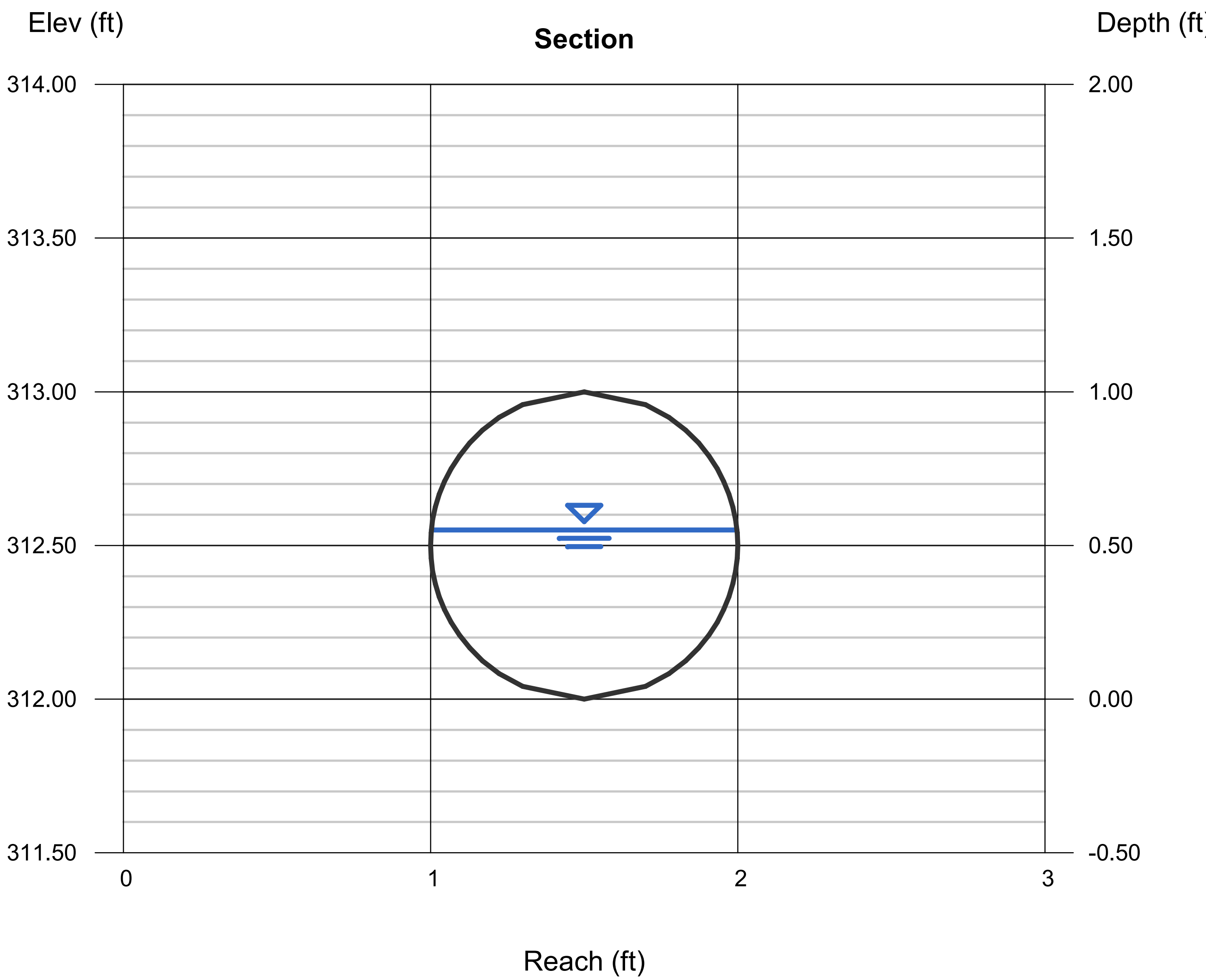
Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.57
		Q (cfs)	= 6.860
		Area (sqft)	= 0.46
Invert Elev (ft)	= 312.00	Velocity (ft/s)	= 14.77
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.71
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.98
		Top Width (ft)	= 0.99
Calculations		EGL (ft)	= 3.96
Compute by:	Known Q		
Known Q (cfs)	= 6.86		



Channel Report

TD-13

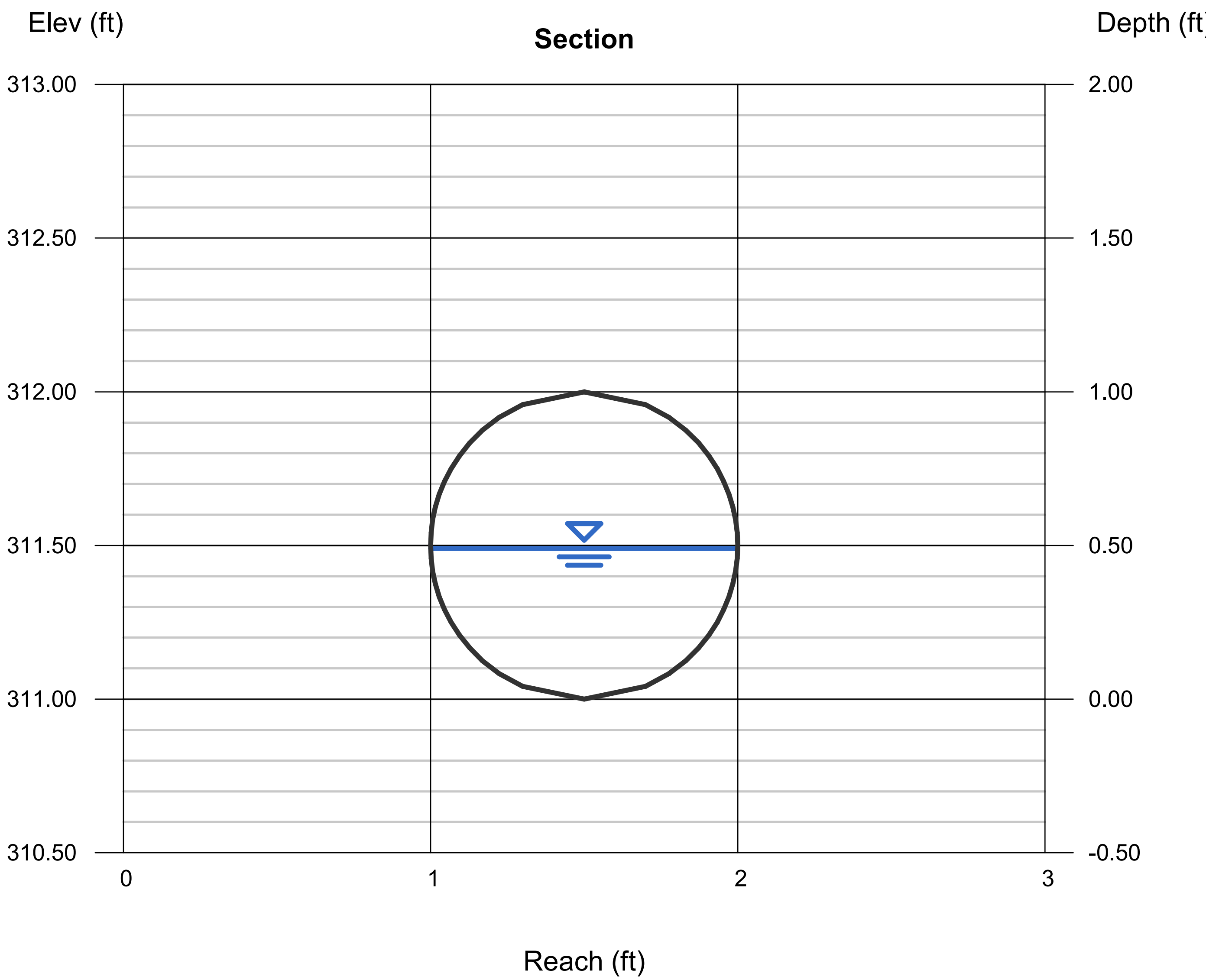
Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.55
		Q (cfs)	= 6.400
		Area (sqft)	= 0.44
Invert Elev (ft)	= 312.00	Velocity (ft/s)	= 14.39
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.67
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.97
		Top Width (ft)	= 0.99
Calculations		EGL (ft)	= 3.77
Compute by:	Known Q		
Known Q (cfs)	= 6.40		



Channel Report

TD-14

Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.49
		Q (cfs)	= 5.240
		Area (sqft)	= 0.38
Invert Elev (ft)	= 311.00	Velocity (ft/s)	= 13.62
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.55
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.93
		Top Width (ft)	= 1.00
Calculations		EGL (ft)	= 3.37
Compute by:	Known Q		
Known Q (cfs)	= 5.24		



Channel Report

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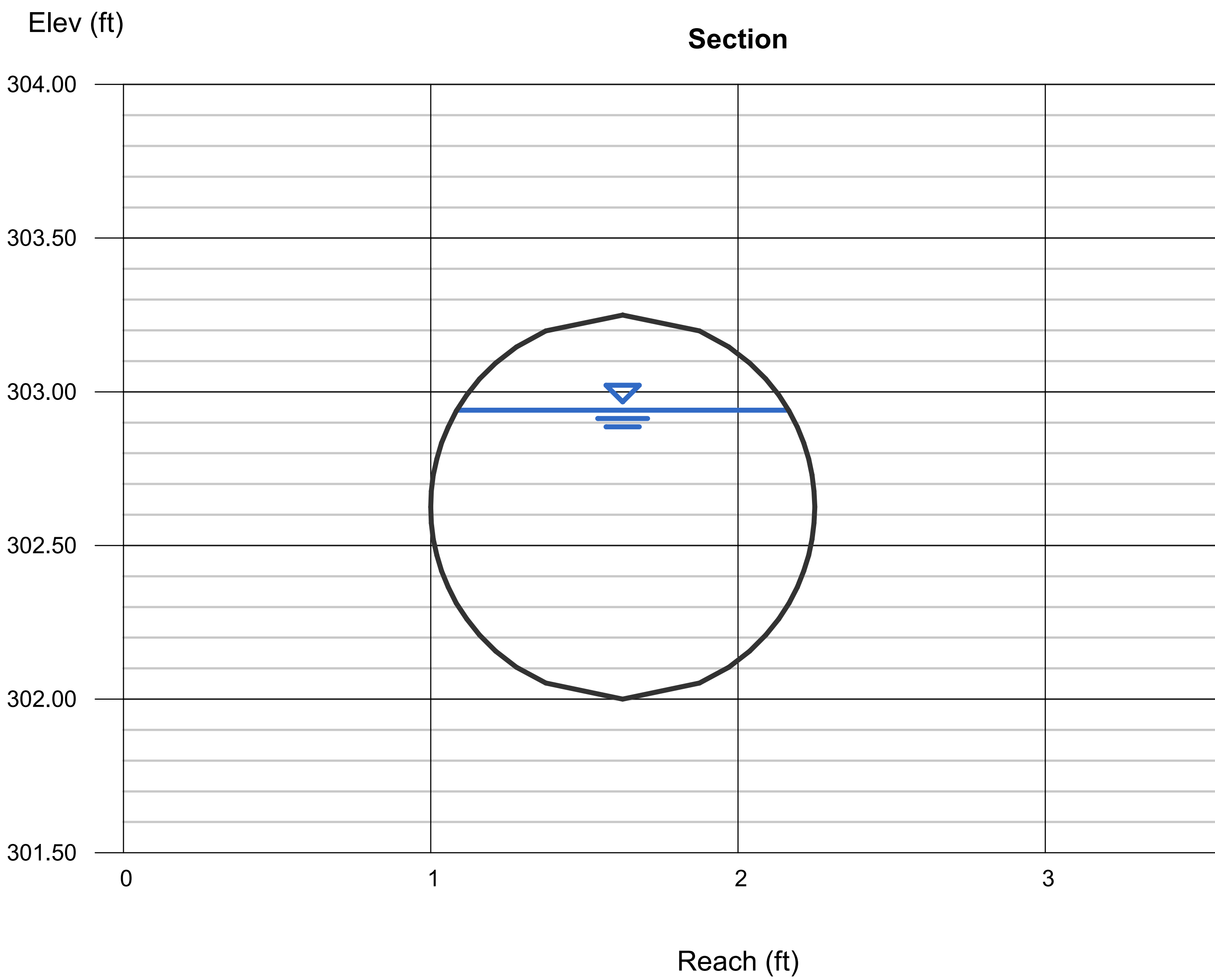
TD-15

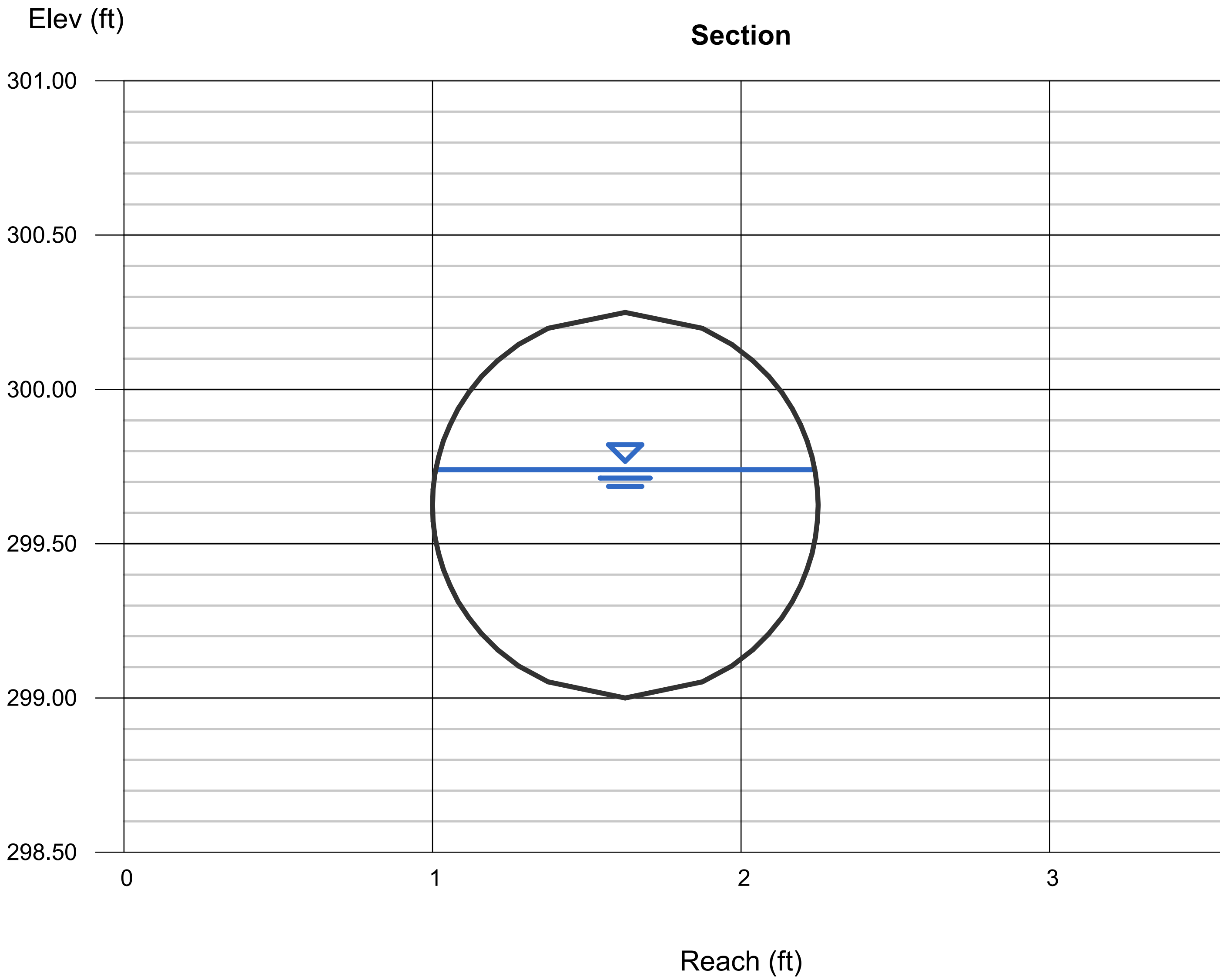
Circular		**Highlighted**	
Diameter (ft)	= 1.25	Depth (ft)	= 0.94
		Q (cfs)	= 18.45
		Area (sqft)	= 0.99
Invert Elev (ft)	= 302.00	Velocity (ft/s)	= 18.63
Slope (%)	= 33.33	Wetted Perim (ft)	= 2.63
N-Value	= 0.024	Crit Depth, Yc (ft)	= 1.25
		Top Width (ft)	= 1.08
Calculations		EGL (ft)	= 6.33
Compute by:	Known Q		
Known Q (cfs)	= 18.45		



Channel Report

TD-16

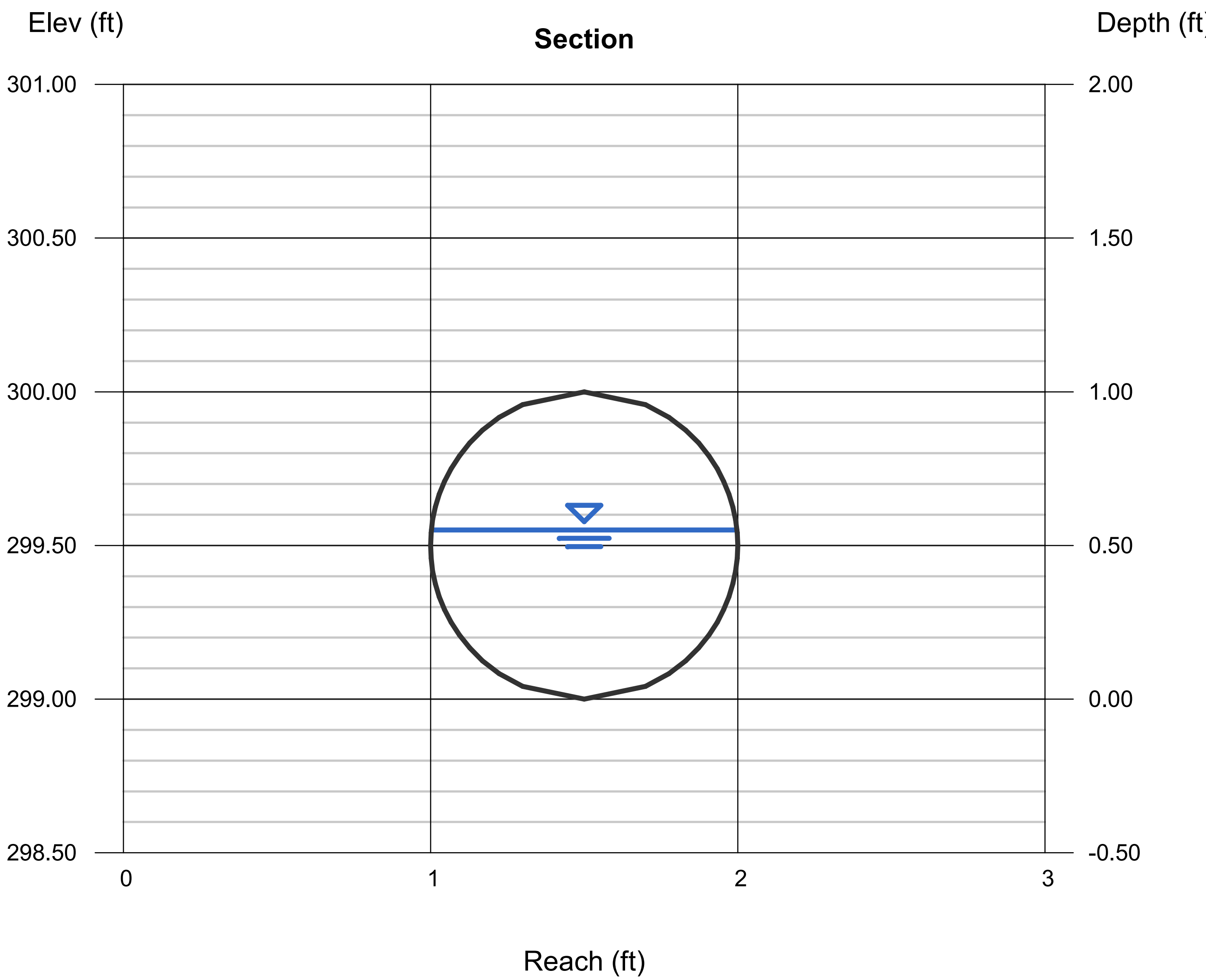
Circular		**Highlighted**	
Diameter (ft)	= 1.25	Depth (ft)	= 0.74
		Q (cfs)	= 13.30
		Area (sqft)	= 0.76
Invert Elev (ft)	= 299.00	Velocity (ft/s)	= 17.51
Slope (%)	= 33.33	Wetted Perim (ft)	= 2.20
N-Value	= 0.024	Crit Depth, Yc (ft)	= 1.23
		Top Width (ft)	= 1.23
Calculations		EGL (ft)	= 5.51
Compute by:	Known Q		
Known Q (cfs)	= 13.30		



Channel Report

TD-17

Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.55
		Q (cfs)	= 6.460
		Area (sqft)	= 0.44
Invert Elev (ft)	= 299.00	Velocity (ft/s)	= 14.53
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.67
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.97
		Top Width (ft)	= 0.99
Calculations		EGL (ft)	= 3.83
Compute by:	Known Q		
Known Q (cfs)	= 6.46		

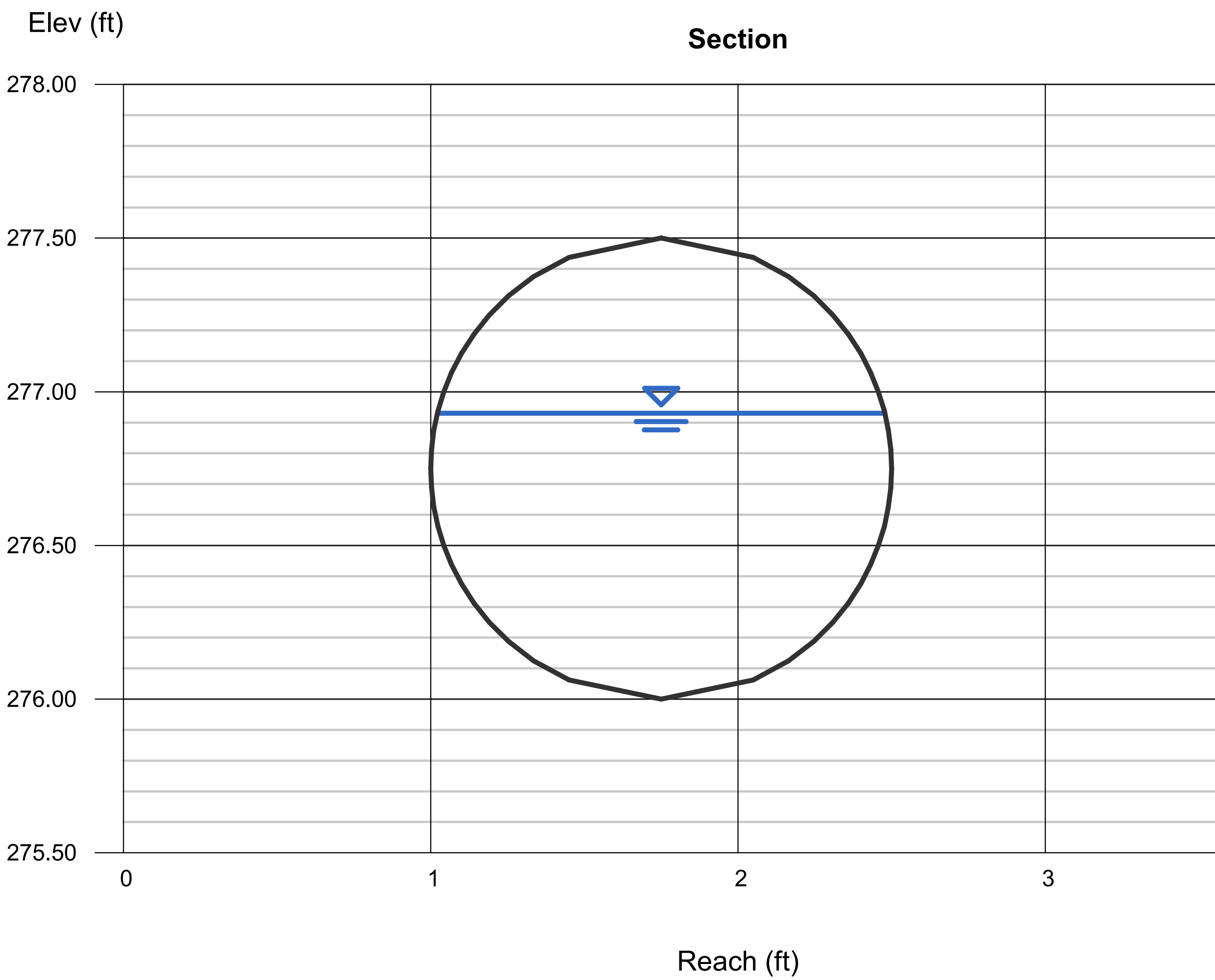


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 20 2024

TD-18

Circular		**Highlighted**	
Diameter (ft)	= 1.50	Depth (ft)	= 0.93
		Q (cfs)	= 22.97
		Area (sqft)	= 1.15
Invert Elev (ft)	= 276.00	Velocity (ft/s)	= 19.92
Slope (%)	= 33.33	Wetted Perim (ft)	= 2.72
N-Value	= 0.024	Crit Depth, Yc (ft)	= 1.49
		Top Width (ft)	= 1.46
Calculations		EGL (ft)	= 7.10
Compute by:	Known Q		
Known Q (cfs)	= 22.97		



Channel Report

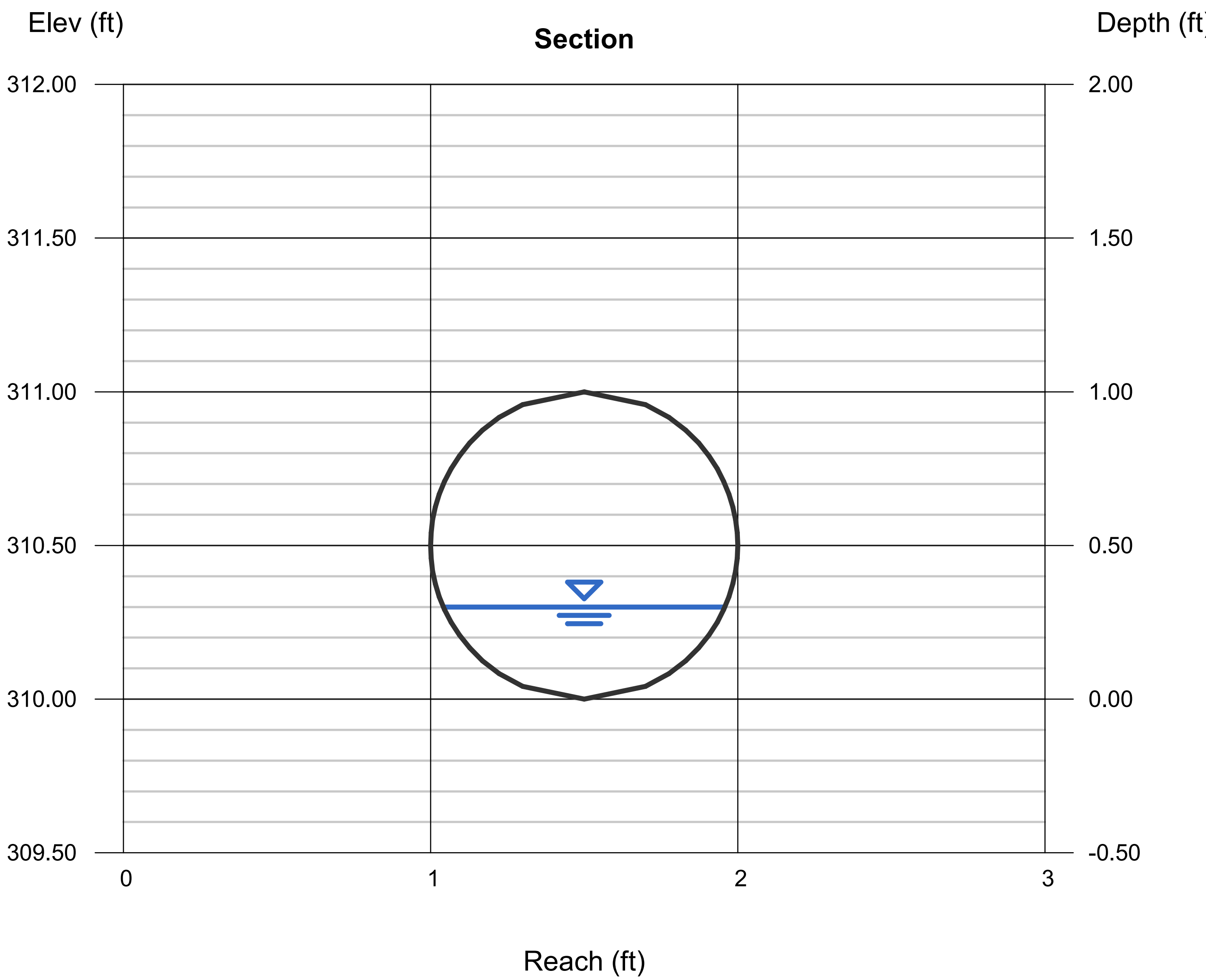
TD-19

Circular
Diameter (ft) = 1.00

Invert Elev (ft) = 310.00
Slope (%) = 33.33
N-Value = 0.024

Calculations
Compute by: Known Q
Known Q (cfs) = 2.11

Highlighted
Depth (ft) = 0.30
Q (cfs) = 2.110
Area (sqft) = 0.20
Velocity (ft/s) = 10.63
Wetted Perim (ft) = 1.16
Crit Depth, Yc (ft) = 0.62
Top Width (ft) = 0.92
EGL (ft) = 2.06



Channel Report

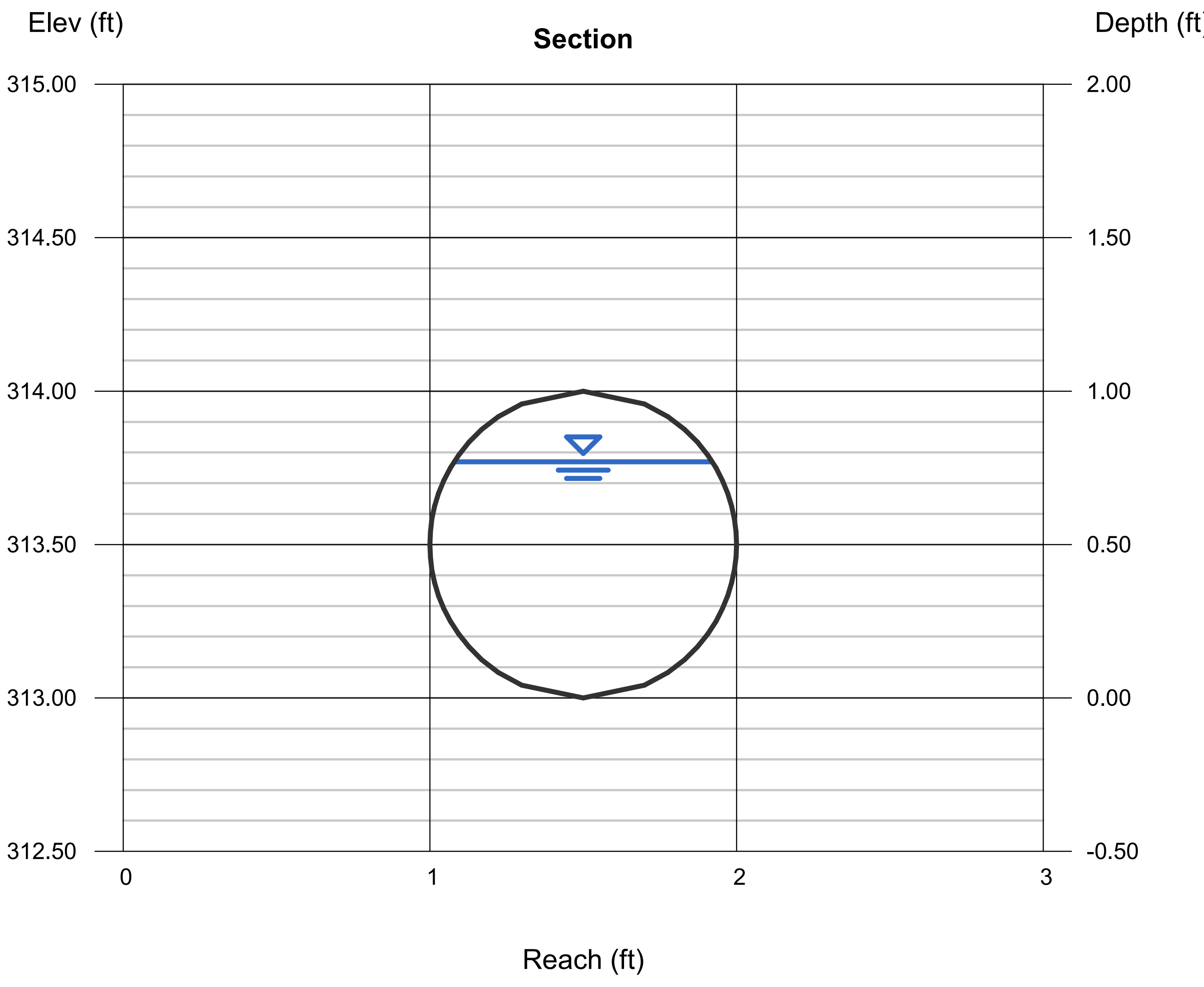
TD-20

Circular
Diameter (ft) = 1.00

Invert Elev (ft) = 313.00
Slope (%) = 33.33
N-Value = 0.024

Calculations
Compute by: Known Q
Known Q (cfs) = 10.43

Highlighted
Depth (ft) = 0.77
Q (cfs) = 10.43
Area (sqft) = 0.65
Velocity (ft/s) = 16.04
Wetted Perim (ft) = 2.15
Crit Depth, Yc (ft) = 1.00
Top Width (ft) = 0.84
EGL (ft) = 4.77



Channel Report

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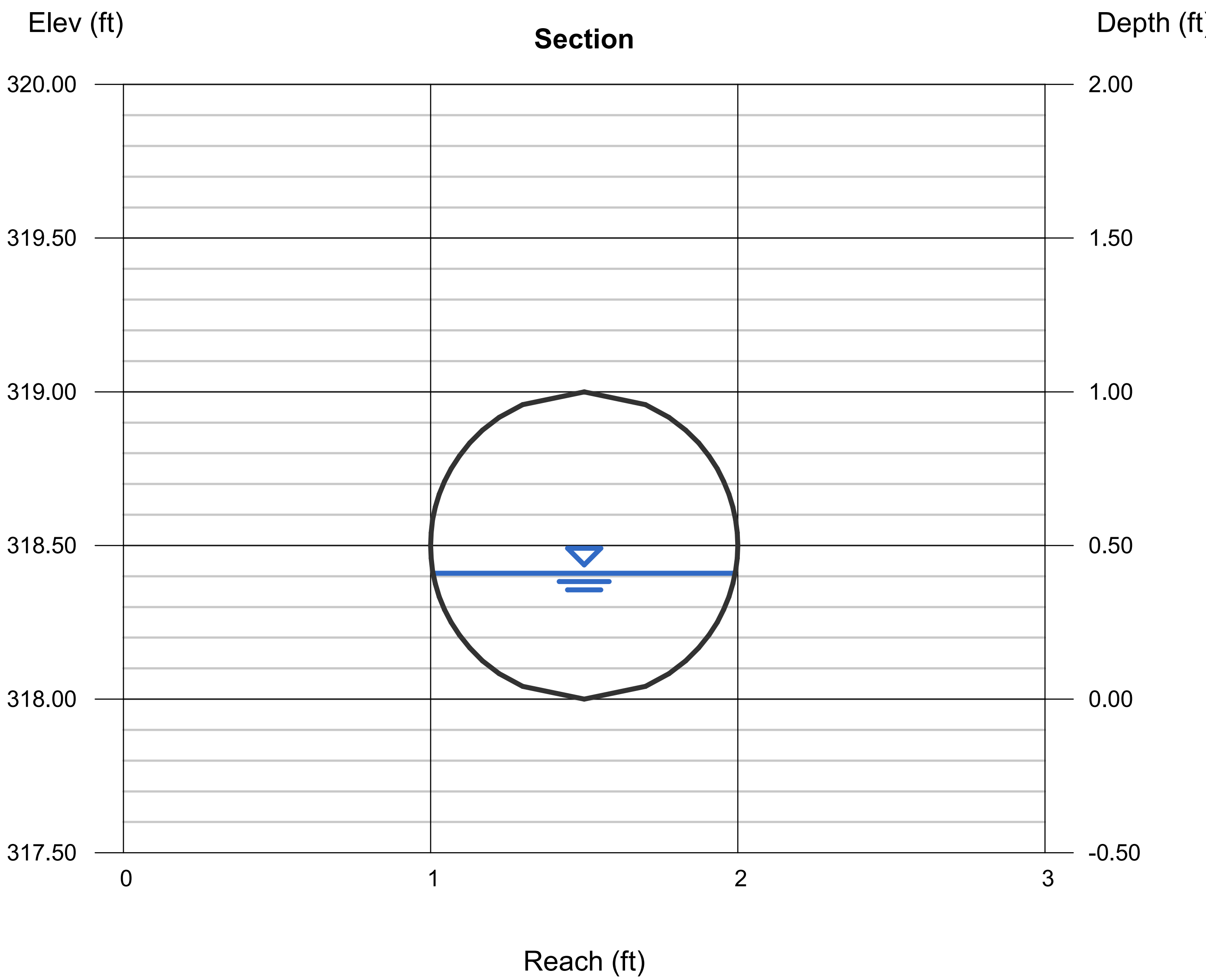
TD-21

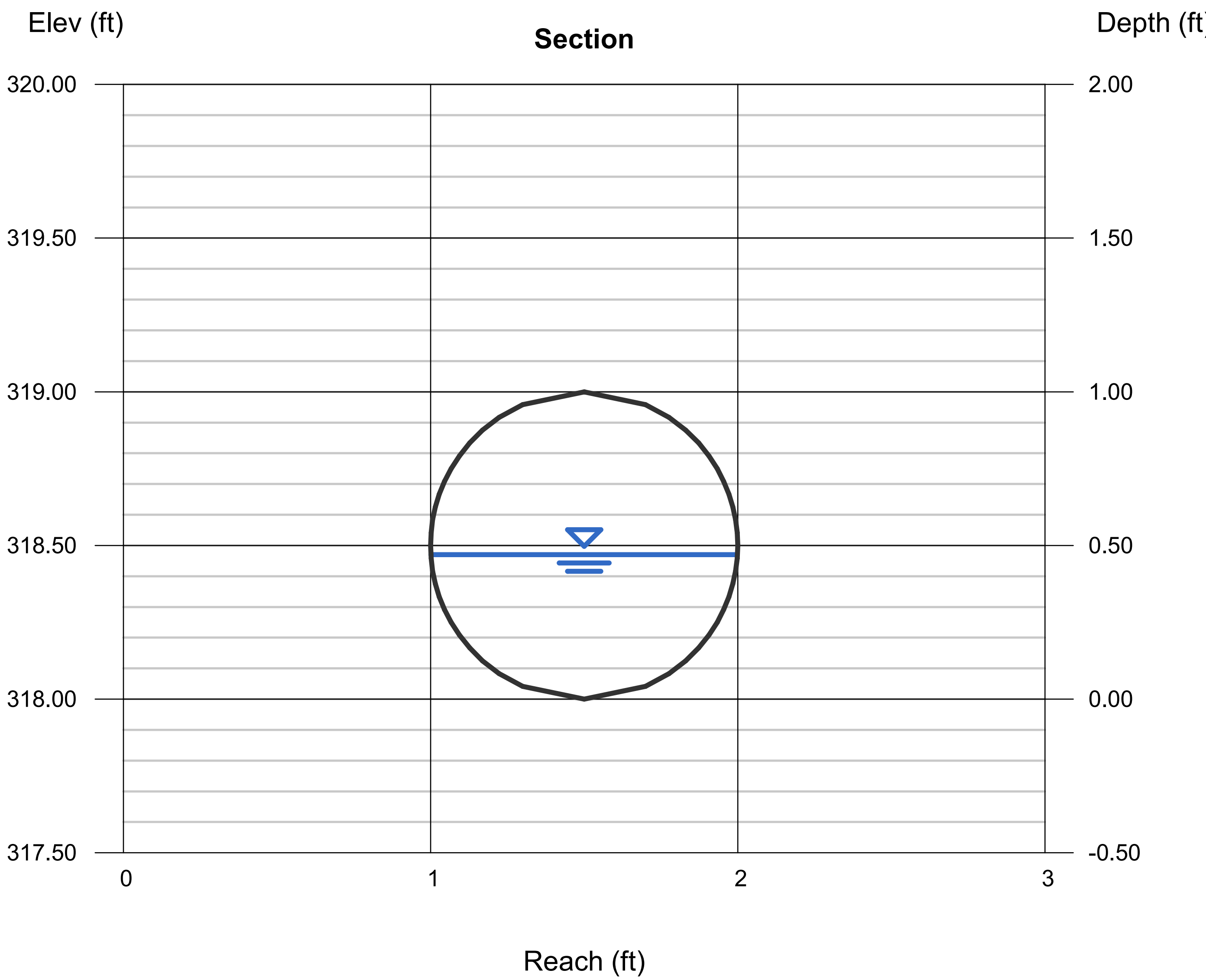
Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.41
		Q (cfs)	= 3.870
		Area (sqft)	= 0.30
Invert Elev (ft)	= 318.00	Velocity (ft/s)	= 12.76
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.39
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.84
		Top Width (ft)	= 0.98
Calculations		EGL (ft)	= 2.94
Compute by:	Known Q		
Known Q (cfs)	= 3.87		



Channel Report

TD-22

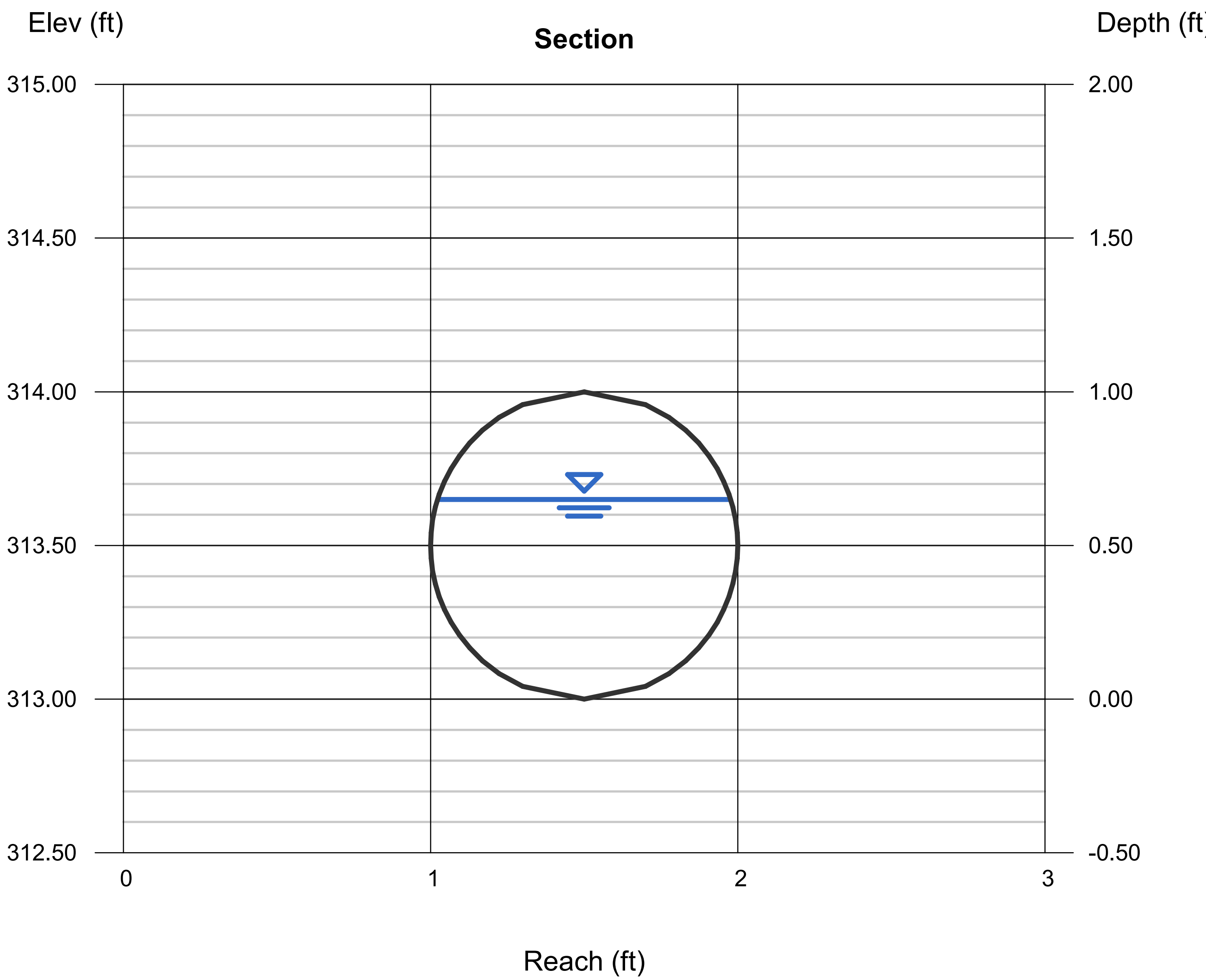
Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.47
		Q (cfs)	= 4.890
		Area (sqft)	= 0.36
Invert Elev (ft)	= 318.00	Velocity (ft/s)	= 13.40
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.51
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.92
		Top Width (ft)	= 1.00
Calculations		EGL (ft)	= 3.26
Compute by:	Known Q		
Known Q (cfs)	= 4.89		



Channel Report

TD-23

Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.65
		Q (cfs)	= 8.330
		Area (sqft)	= 0.54
Invert Elev (ft)	= 313.00	Velocity (ft/s)	= 15.36
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.88
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.99
		Top Width (ft)	= 0.95
Calculations		EGL (ft)	= 4.32
Compute by:	Known Q		
Known Q (cfs)	= 8.33		



Channel Report

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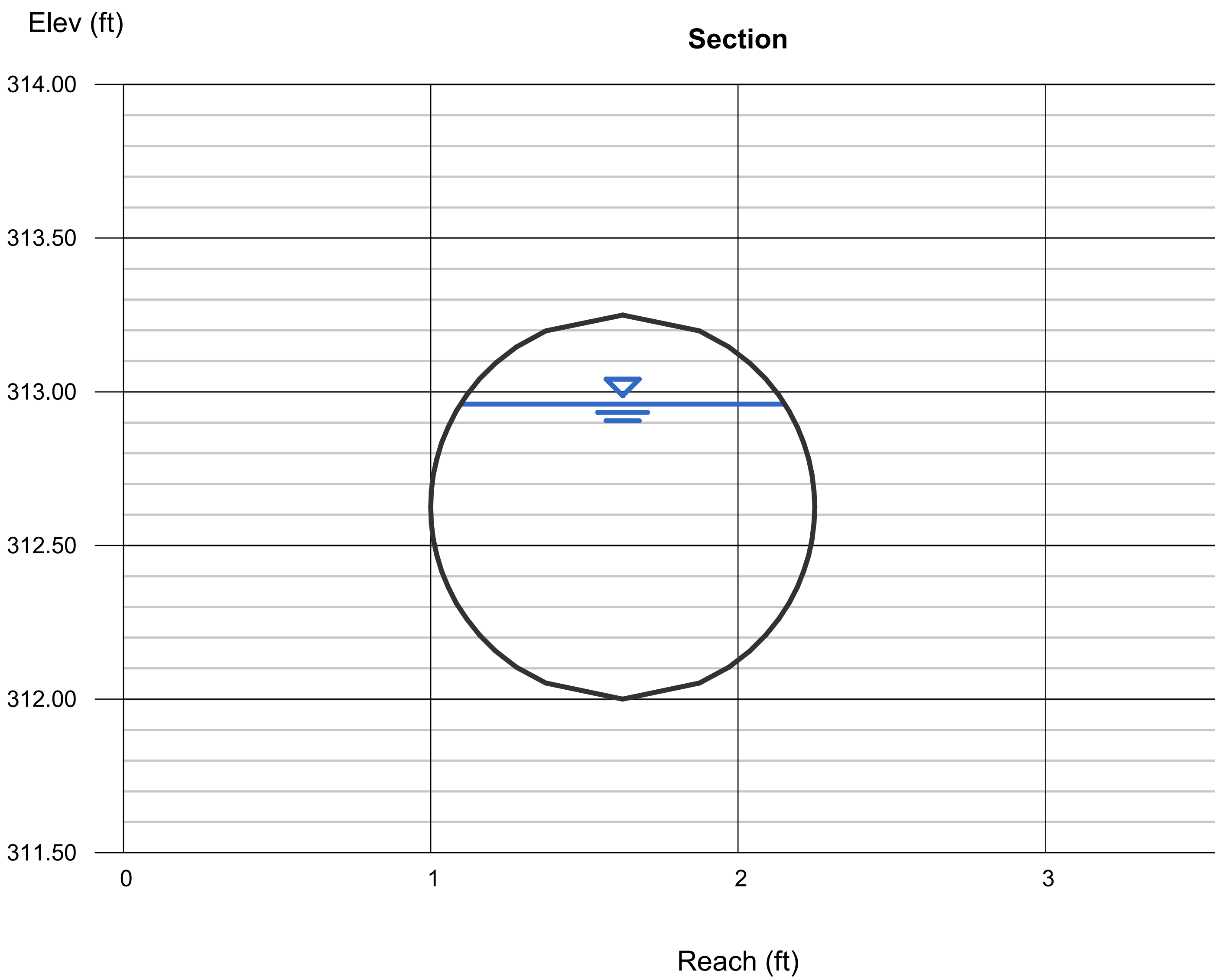
TD-24

Circular
Diameter (ft) = 1.25

Invert Elev (ft) = 312.00
Slope (%) = 33.33
N-Value = 0.024

Calculations
Compute by: Known Q
Known Q (cfs) = 18.85

Highlighted
Depth (ft) = 0.96
Q (cfs) = 18.85
Area (sqft) = 1.01
Velocity (ft/s) = 18.60
Wetted Perim (ft) = 2.68
Crit Depth, Yc (ft) = 1.25
Top Width (ft) = 1.05
EGL (ft) = 6.34

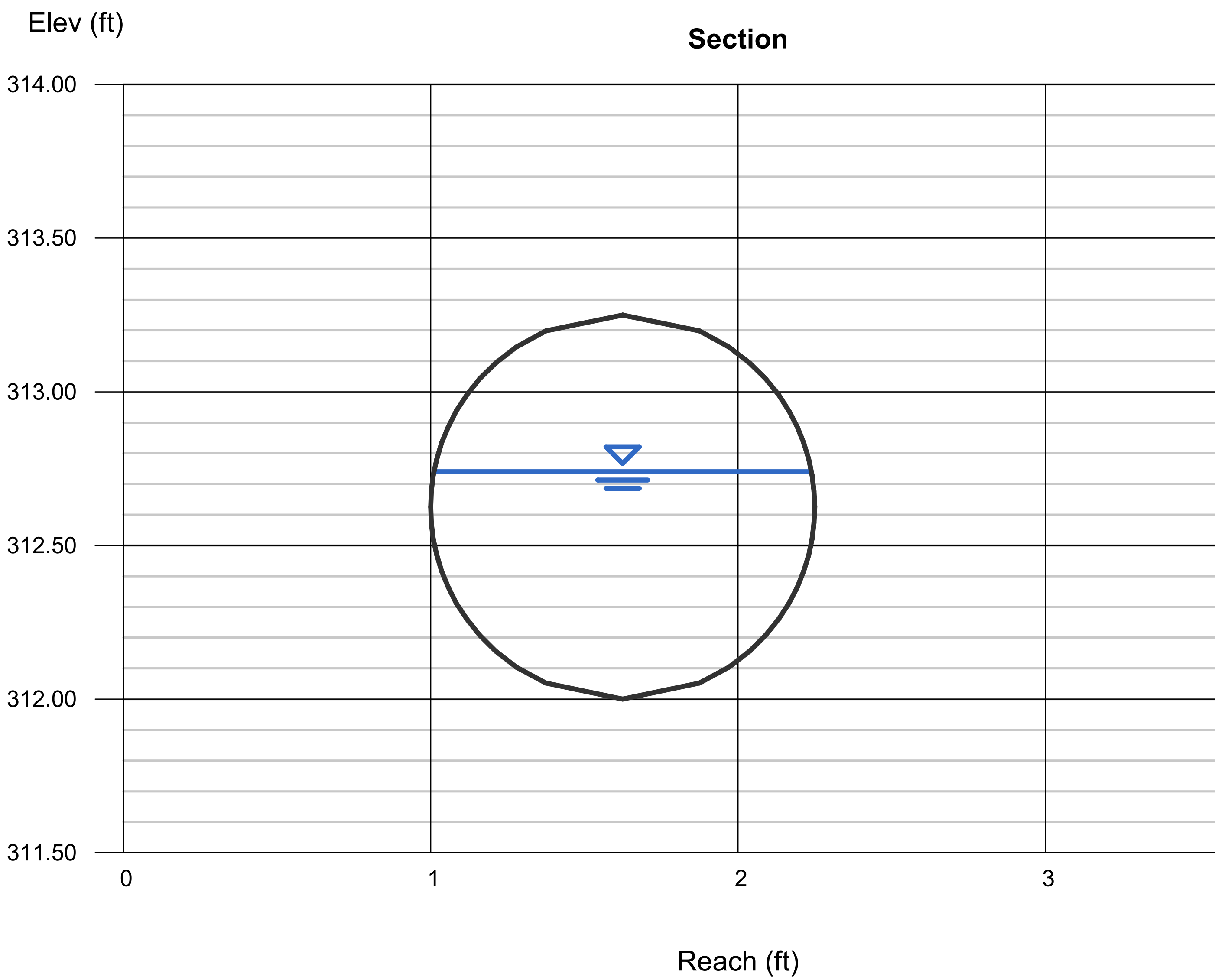


Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 30 2024

TD-25

Circular		**Highlighted**	
Diameter (ft)	= 1.25	Depth (ft)	= 0.74
		Q (cfs)	= 13.23
		Area (sqft)	= 0.76
Invert Elev (ft)	= 312.00	Velocity (ft/s)	= 17.42
Slope (%)	= 33.33	Wetted Perim (ft)	= 2.20
N-Value	= 0.024	Crit Depth, Yc (ft)	= 1.23
		Top Width (ft)	= 1.23
Calculations		EGL (ft)	= 5.46
Compute by:	Known Q		
Known Q (cfs)	= 13.23		



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 30 2024

TD-26

Circular		**Highlighted**	
Diameter (ft)	= 1.00	Depth (ft)	= 0.54
		Q (cfs)	= 6.230
		Area (sqft)	= 0.43
Invert Elev (ft)	= 312.00	Velocity (ft/s)	= 14.33
Slope (%)	= 33.33	Wetted Perim (ft)	= 1.65
N-Value	= 0.024	Crit Depth, Yc (ft)	= 0.97
		Top Width (ft)	= 1.00
Calculations		EGL (ft)	= 3.73
Compute by:	Known Q		
Known Q (cfs)	= 6.23