Fravell Tract (Hwy P & M)

ENGINEERING

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FRAVELL
STORMWATER DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
Hwy P & M - O'FALLON
BAX PROJECT NO. **95-7632**
April 5, 1999 - revised April 15, 99

INTRODUCTION:

This tract of land is presently an undeveloped site located in the City of O'Fallon, Missouri. It is proposed that the 11.46 acre tract be developed into commercial lots with a strip of multi-family lots along Old Schaefer Road. A dry stormwater detention basin will be constructed in the southwest corner of the site. The storage volume and outflow rates shall be proportioned to insure that the peak rate of runoff leaving the tract under post-developed conditions is less than or equal to the peak rate of runoff under pre-developed conditions for the 2, 15, and 25 year-20 minute design storm. The basin was also analyzed for the 100 year frequency - 20 minute duration design storm.

GENERAL SITE DATA AND RUNOFF CALCULATIONS:

The pre-developed P.I. factors to be used for the analysis are:

2 year - 0-5% impervious	1.15 cfs/ac.
15 year - 0-5% impervious	1.87 cfs/ac.
25 year - 0-5% impervious	2.31 cfs/ac.
100 year - 0-5% impervious	2.95 cfs/ac.

The post-developed P.I. factors to be used for the analysis are:

2 year - 70% impervious	2.00 cfs/ac.
15 year - 70% impervious	3.30 cfs/ac.
25 year - 70% impervious	4.07 cfs/ac.
100 year - 70% impervious	5.21 cfs/ac.
2 year - 100% impervious	2.39 cfs/ac.
15 year - 100% impervious	3.85 cfs/ac.
25 year - 100% impervious	4.75 cfs/ac.
100 year - 100% impervious	6.08 cfs/ac.

STATE OF MISSOURI
RICHARD L. FRANCIS
NUMBER E-25651
REGISTERED PROFESSIONAL ENGINEER

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1052 South Cloverleaf Drive
St. Peters, MO 63376-6445
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e-mail: baxeng@msn.com

ALLOWABLE OUTFLOWS:

Allowable outflows are limited to the pre-developed flows.
(see attached pre-developed drainage area map)

2 year-20 minute storm:	13.58 cfs
15 year-20 minute storm:	22.08 cfs
25 year-20 minute storm:	27.28 cfs

TIME OF CONCENTRATION:

Of the inflows to the basin, the most remote point lies to the south near the cul-de-sac. Flows will travel approximately 600 feet overland to the detention basin. Time of concentration is estimated as follows:

T(overland): L = 600 feet
Elevation difference = 500 - 486 = 14 feet
T(overland) = 9.0 minutes: See figure 1

Use **9** min.

BASIN PEAK INFLOWS:

Inflows to the basin have been estimated from the drainage area map.

25 year-20 minute storm

9.19 Ac. x 4.75 cfs/Ac.	43.65 cfs
2.62 Ac. x 4.07 cfs/Ac.	10.66 cfs
	54.32 cfs

2 year-20 minute storm:	27.20 cfs
15 year-20 minute storm:	44.03 cfs
100 year-20 minute storm:	69.53 cfs

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STORM ROUTING CALCULATIONS AND RESULTS:

A computer program was used in routing the 2, 15, and 25 year-20 minute storm through the basin. As found in the routing calculations, the results are as follows:

20 MIN STORM	PERMITTED RELEASE RATE	CALCULATED RELEASE RATE	PEAK ELEVATION
2 YR	13.58	12.42 cfs ✓	481.67
15 YR	22.08	16.32 cfs ✓	482.86
25 YR	27.28	23.84 cfs ✓	483.50

CHECK 100-YEAR OUTFLOW: (low-flow blocked)

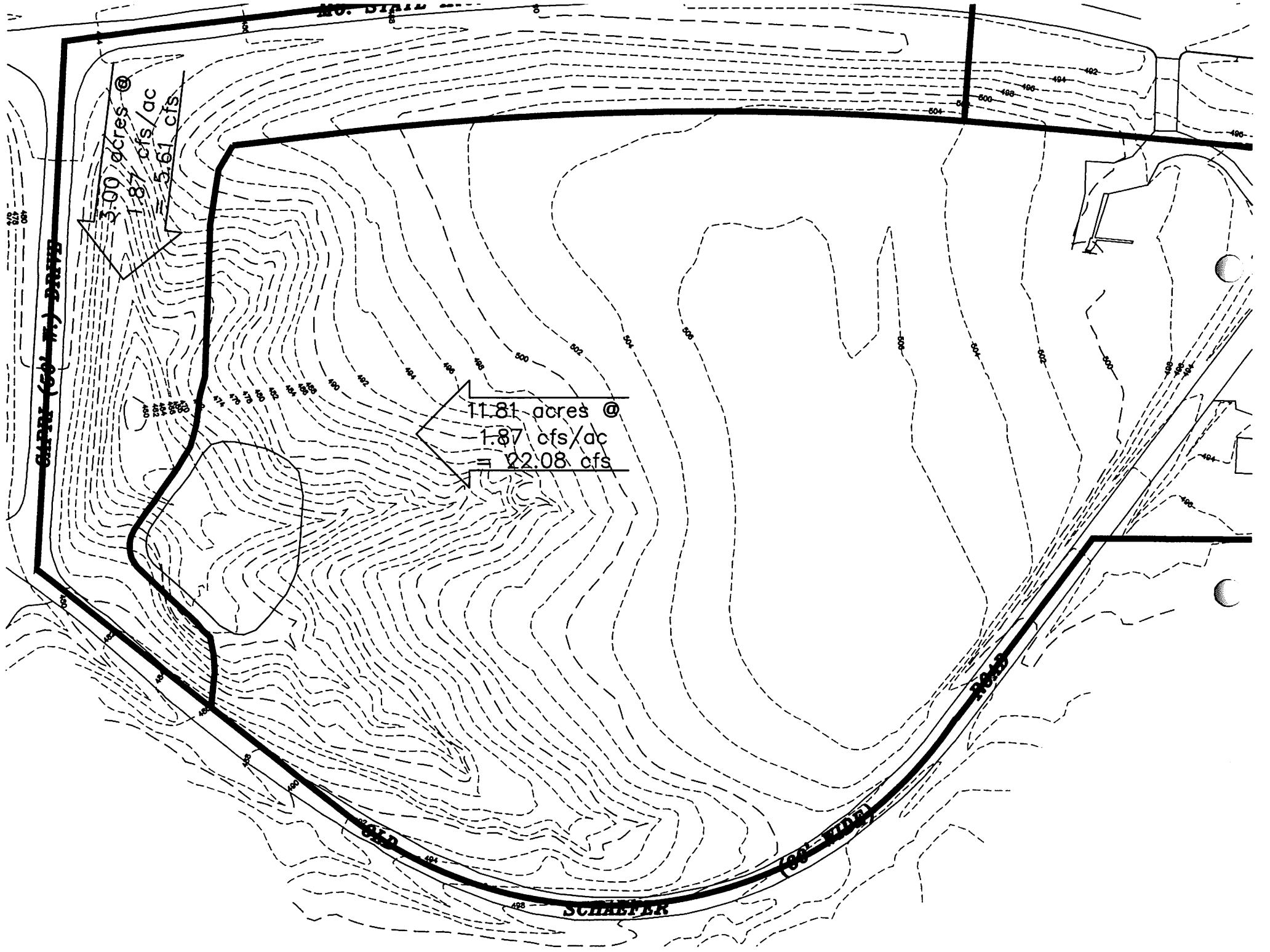
WEIR FLOW: Q = C x L x H (3/2)

28 ft. overflow spillway

100-YEAR FLOW Q =	69.53 cfs
C =	2.6
L =	28 ft
H =	0.97 ft
Sill =	484.00
100 yr h/w =	484.97

SUMMARY

25 year-20min H.W.	483.50
100 year-20min H.W.(low flow blocked)	484.97
Lower Slot	12" wide x 24" high
Lower Slot Elevation	479.00
Upper Slot (Std. Area Inlet)	11.67' wide x 6" high
Upper Slot Elevation	483.20
28' Overflow Spillway Elevation	484.00
Top Of Berm	486.00


3.00 acres @
1.87 cfs/ac
= 5.61 cfs
11.81 acres @
1.87 cfs/ac
= 22.08 cfs
SCHAEFER
Road
(66' R.O.W.)

POND-2 Version: 5.20
S/N:

HWY P - HWY M
BAX ENGINEERING COMPANY INCORPORATED

APRIL 9, 1999

CALCULATED 04-09-1999 15:46:54
DISK FILE: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
479.00	0.00	0.00	0.00	0.00	0.00
480.00	9,486.00	0.22	0.22	0.07	0.07
482.00	12,596.00	0.29	0.76	0.51	0.58
484.00	15,226.00	0.35	0.96	0.64	1.22
486.00	18,085.00	0.42	1.15	0.76	1.98

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

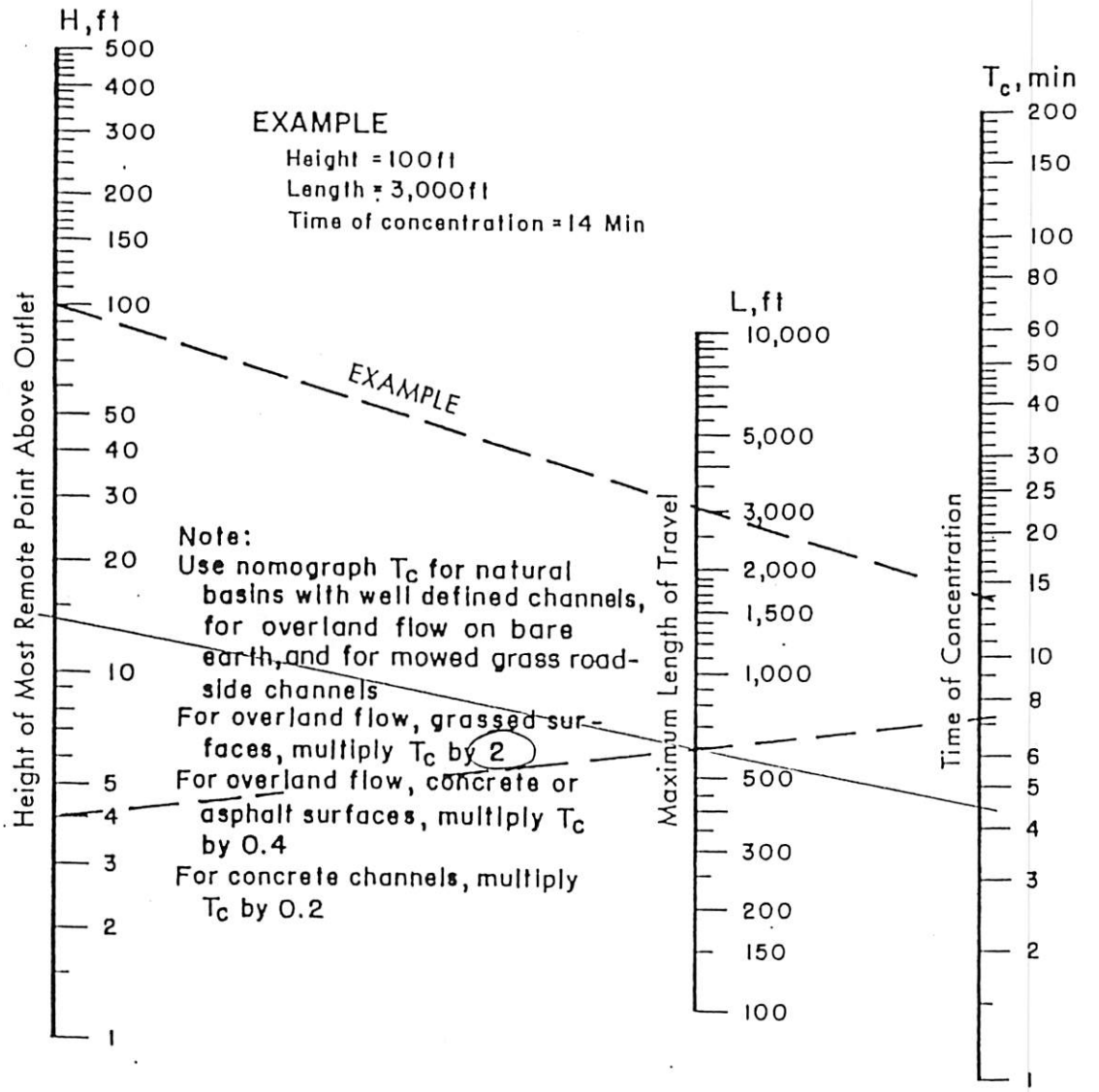
where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

BAX ENGINEERING

Project: HWY M - HWY P SHEET ___ of ___

Date: 4-1-99 Project No: 95-7632

Designed: ADJ Checked: ___



Based on study by P.Z. Kirpich,
Civil Engineering, Vol. 10, No. 6, June 1940, p. 362

OVERLAND PATH ≈ 600'
DROP (500 - 480) = 14'
4.5 × 2 = 9 MIN

1052 South Cloverleaf Drive
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****
*
* HWY M - HWY P
* DETENTION ANALYSIS
* PREPARED BY: BAX ENGINEERING CO., INC.
* APRIL 1, 1999
*
****

Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-002.HYD
Rating Table file: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND

----INITIAL CONDITIONS----
Elevation = 479.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
479.00	0.0	0.000	0.0	0.0
479.25	0.4	0.001	1.6	2.0
479.50	1.1	0.009	13.2	14.3
479.75	1.9	0.031	44.5	46.4
480.00	3.0	0.073	105.4	108.4
480.25	4.2	0.128	186.0	190.2
480.50	5.5	0.186	269.6	275.1
480.75	6.9	0.245	356.3	363.2
481.00	8.5	0.307	446.3	454.8
481.25	10.1	0.372	539.5	549.6
481.50	11.8	0.438	635.9	647.7
481.75	12.7	0.507	735.8	748.5
482.00	13.6	0.578	839.0	852.6
482.25	14.4	0.651	945.3	959.7
482.50	15.2	0.726	1054.2	1069.4
482.75	16.0	0.803	1165.8	1181.8
483.00	16.7	0.882	1280.1	1296.8
483.25	17.8	0.962	1397.2	1415.0
483.50	23.8	1.045	1517.0	1540.8
483.75	32.9	1.129	1639.6	1672.5
484.00	44.3	1.216	1765.0	1809.3
484.25	57.5	1.304	1893.3	1950.8
484.50	72.3	1.394	2024.5	2096.8
484.75	88.5	1.487	2158.7	2247.2
485.00	106.1	1.581	2295.7	2401.8
485.25	124.8	1.678	2435.7	2560.5
485.50	144.7	1.776	2578.8	2723.5
485.75	165.7	1.877	2724.9	2890.6
486.00	187.6	1.979	2874.0	3061.6

Time increment (t) = 1.0 min.

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-002.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320002.HYD

INFLOW HYDROGRAPH

ROUTING COMPUTATIONS

TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	0.00	-----	0.0	0.0	0.00	479.00
1.0	2.72	2.7	1.8	2.7	0.44	479.26
2.0	5.44	8.2	8.3	10.0	0.86	479.41
3.0	8.16	13.6	19.3	21.9	1.29	479.56
4.0	10.88	19.0	35.0	38.4	1.70	479.69
5.0	16.32	27.2	57.8	62.2	2.18	479.81
6.0	19.04	35.4	87.7	93.2	2.73	479.94
7.0	21.76	40.8	121.9	128.5	3.29	480.06
8.0	24.48	46.2	160.4	168.1	3.88	480.18
9.0	27.20	51.7	203.0	212.1	4.54	480.31
10.0	27.20	54.4	246.9	257.4	5.23	480.45
11.0	27.20	54.4	289.5	301.3	5.92	480.57
12.0	27.20	54.4	330.7	343.9	6.59	480.70
13.0	27.20	54.4	370.6	385.1	7.28	480.81
14.0	27.20	54.4	409.0	425.0	7.98	480.92
15.0	27.20	54.4	446.1	463.4	8.65	481.02
16.0	27.20	54.4	482.0	500.5	9.27	481.12
17.0	27.20	54.4	516.6	536.4	9.88	481.22
18.0	27.20	54.4	550.1	571.0	10.47	481.30
19.0	27.20	54.4	582.4	604.5	11.05	481.39
20.0	27.20	54.4	613.5	636.8	11.61	481.47
21.0	24.48	51.7	641.3	665.2	11.96	481.54
22.0	21.76	46.2	663.2	687.6	12.16	481.60
23.0	19.04	40.8	679.4	704.0	12.30	481.64
24.0	16.32	35.4	690.0	714.8	12.40	481.67
25.0	10.88	27.2	692.4	717.2	12.42	481.67
26.0	8.16	19.0	686.7	711.4	12.37	481.66
27.0	5.44	13.6	675.7	700.3	12.27	481.63
28.0	2.72	8.2	659.6	683.9	12.12	481.59
29.0	0.00	2.7	638.5	662.4	11.93	481.54
30.0	0.00	0.0	615.2	638.5	11.64	481.48
31.0	0.00	0.0	592.7	615.2	11.24	481.42
32.0	0.00	0.0	571.0	592.7	10.85	481.36
33.0	0.00	0.0	550.1	571.0	10.47	481.30
34.0	0.00	0.0	529.9	550.1	10.11	481.25
35.0	0.00	0.0	510.3	529.9	9.77	481.20
36.0	0.00	0.0	491.5	510.3	9.44	481.15
37.0	0.00	0.0	473.2	491.5	9.12	481.10
38.0	0.00	0.0	455.6	473.2	8.81	481.05
39.0	0.00	0.0	438.6	455.6	8.51	481.00
40.0	0.00	0.0	422.2	438.6	8.22	480.96
41.0	0.00	0.0	406.3	422.2	7.93	480.91
42.0	0.00	0.0	391.0	406.3	7.65	480.87
43.0	0.00	0.0	376.2	391.0	7.38	480.83
44.0	0.00	0.0	362.0	376.2	7.13	480.79

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-002.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320002.HYD

INFLOW HYDROGRAPH

ROUTING COMPUTATIONS

TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
45.0	0.00	0.0	348.2	362.0	6.88	480.75
46.0	0.00	0.0	334.9	348.2	6.66	480.71
47.0	0.00	0.0	322.0	334.9	6.45	480.67
48.0	0.00	0.0	309.5	322.0	6.24	480.63
49.0	0.00	0.0	297.4	309.5	6.05	480.60
50.0	0.00	0.0	285.7	297.4	5.85	480.56
51.0	0.00	0.0	274.4	285.7	5.67	480.53
52.0	0.00	0.0	263.4	274.4	5.49	480.50
53.0	0.00	0.0	252.7	263.4	5.32	480.47
54.0	0.00	0.0	242.4	252.7	5.16	480.43
55.0	0.00	0.0	232.4	242.4	5.00	480.40
56.0	0.00	0.0	222.7	232.4	4.85	480.37
57.0	0.00	0.0	213.3	222.7	4.70	480.35
58.0	0.00	0.0	204.2	213.3	4.55	480.32
59.0	0.00	0.0	195.4	204.2	4.42	480.29
60.0	0.00	0.0	186.8	195.4	4.28	480.27

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-002.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320002.HYD

Starting Pond W.S. Elevation = 479.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	27.20 cfs
Peak Outflow	=	12.42 cfs
Peak Elevation	=	481.67 ft

***** Summary of Approximate Peak Storage *****

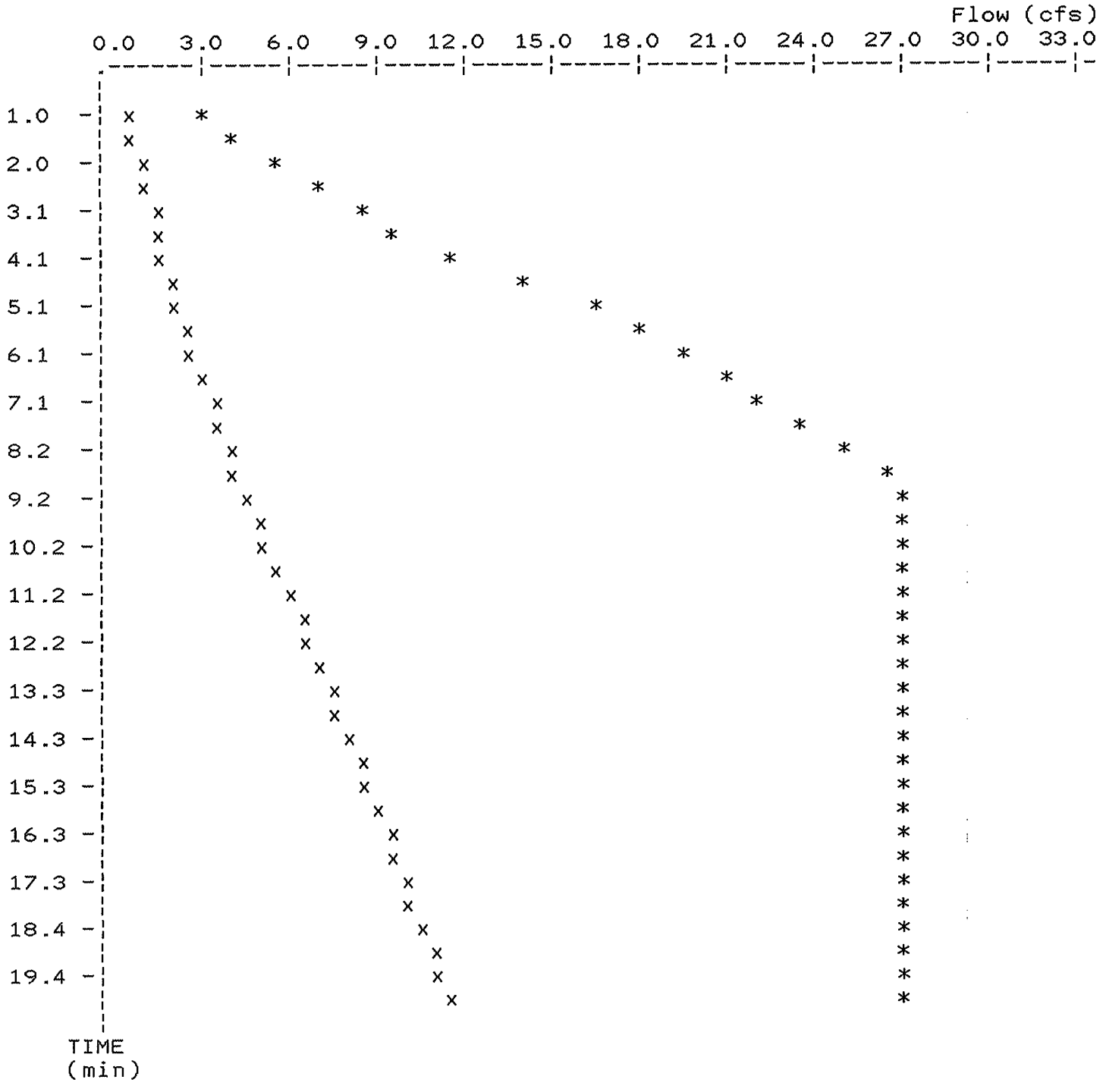
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	0.49 ac-ft
Total Storage in Pond	=	0.49 ac-ft

Return Freq: 2 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-002.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320002.HYD

EXECUTED: 04-15-1999 09:23:43

Peak Inflow = 27.20 cfs
Peak Outflow = 12.42 cfs
Peak Elevation = 481.67 ft



x File: C:\WINDOWS\DESKTOP\PONDPA~1\76320002.HYD Qmax = 12.4 cfs
* File: C:\WINDOWS\DESKTOP\PONDPA~1\7632-002.HYD Qmax = 27.2 cfs

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* HWY M - HWY P
* DETENTION ANALYSIS
* PREPARED BY: BAX ENGINEERING CO., INC.
* APRIL 1, 1999
*
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Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-015.HYD
Rating Table file: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND

----INITIAL CONDITIONS----
Elevation = 479.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

INTERMEDIATE ROUTING COMPUTATIONS

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
479.00	0.0	0.000	0.0	0.0
479.25	0.4	0.001	1.6	2.0
479.50	1.1	0.009	13.2	14.3
479.75	1.9	0.031	44.5	46.4
480.00	3.0	0.073	105.4	108.4
480.25	4.2	0.128	186.0	190.2
480.50	5.5	0.186	269.6	275.1
480.75	6.9	0.245	356.3	363.2
481.00	8.5	0.307	446.3	454.8
481.25	10.1	0.372	539.5	549.6
481.50	11.8	0.438	635.9	647.7
481.75	12.7	0.507	735.8	748.5
482.00	13.6	0.578	839.0	852.6
482.25	14.4	0.651	945.3	959.7
482.50	15.2	0.726	1054.2	1069.4
482.75	16.0	0.803	1165.8	1181.8
483.00	16.7	0.882	1280.1	1296.8
483.25	17.8	0.962	1397.2	1415.0
483.50	23.8	1.045	1517.0	1540.8
483.75	32.9	1.129	1639.6	1672.5
484.00	44.3	1.216	1765.0	1809.3
484.25	57.5	1.304	1893.3	1950.8
484.50	72.3	1.394	2024.5	2096.8
484.75	88.5	1.487	2158.7	2247.2
485.00	106.1	1.581	2295.7	2401.8
485.25	124.8	1.678	2435.7	2560.5
485.50	144.7	1.776	2578.8	2723.5
485.75	165.7	1.877	2724.9	2890.6
486.00	187.6	1.979	2874.0	3061.6

Time increment (t) = 1.0 min.

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-015.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320015.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	0.00	-----	0.0	0.0	0.00	479.00
1.0	4.40	4.4	3.3	4.4	0.54	479.30
2.0	8.81	13.2	14.2	16.5	1.16	479.52
3.0	13.21	22.0	33.0	36.2	1.65	479.67
4.0	17.61	30.8	59.4	63.8	2.21	479.82
5.0	26.42	44.0	97.6	103.4	2.91	479.98
6.0	30.82	57.2	147.4	154.8	3.68	480.14
7.0	35.22	66.0	204.4	213.5	4.56	480.32
8.0	39.63	74.8	268.1	279.2	5.57	480.51
9.0	44.03	83.7	338.3	351.7	6.72	480.72
10.0	44.03	88.1	410.4	426.4	8.00	480.92
11.0	44.03	88.1	480.0	498.4	9.24	481.12
12.0	44.03	88.1	547.2	568.0	10.42	481.30
13.0	44.03	88.1	612.1	635.2	11.58	481.47
14.0	44.03	88.1	675.6	700.1	12.27	481.63
15.0	44.03	88.1	738.0	763.6	12.83	481.79
16.0	44.03	88.1	799.3	826.0	13.37	481.94
17.0	44.03	88.1	859.6	887.4	13.86	482.08
18.0	44.03	88.1	919.1	947.7	14.31	482.22
19.0	44.03	88.1	977.7	1007.1	14.75	482.36
20.0	44.03	88.1	1035.4	1065.7	15.17	482.49
21.0	39.63	83.7	1087.9	1119.0	15.55	482.61
22.0	35.22	74.8	1131.0	1162.8	15.86	482.71
23.0	30.82	66.0	1164.9	1197.1	16.09	482.78
24.0	26.42	57.2	1189.6	1222.1	16.25	482.84
25.0	17.61	44.0	1201.0	1233.7	16.32	482.86
26.0	13.21	30.8	1199.3	1231.9	16.30	482.86
27.0	8.81	22.0	1188.8	1221.3	16.24	482.84
28.0	4.40	13.2	1169.8	1202.0	16.12	482.79
29.0	0.00	4.4	1142.3	1174.2	15.95	482.73
30.0	0.00	0.0	1110.8	1142.3	15.72	482.66
31.0	0.00	0.0	1079.8	1110.8	15.49	482.59
32.0	0.00	0.0	1049.3	1079.8	15.27	482.52
33.0	0.00	0.0	1019.2	1049.3	15.05	482.45
34.0	0.00	0.0	989.5	1019.2	14.83	482.39
35.0	0.00	0.0	960.3	989.5	14.62	482.32
36.0	0.00	0.0	931.5	960.3	14.40	482.25
37.0	0.00	0.0	903.1	931.5	14.19	482.18
38.0	0.00	0.0	875.1	903.1	13.98	482.12
39.0	0.00	0.0	847.6	875.1	13.77	482.05
40.0	0.00	0.0	820.5	847.6	13.56	481.99
41.0	0.00	0.0	793.8	820.5	13.32	481.92
42.0	0.00	0.0	767.7	793.8	13.09	481.86
43.0	0.00	0.0	741.9	767.7	12.87	481.80
44.0	0.00	0.0	716.7	741.9	12.64	481.73

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-015.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320015.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
45.0	0.00	0.0	691.8	716.7	12.42	481.67
46.0	0.00	0.0	667.4	691.8	12.19	481.61
47.0	0.00	0.0	643.5	667.4	11.98	481.55
48.0	0.00	0.0	620.0	643.5	11.73	481.49
49.0	0.00	0.0	597.4	620.0	11.32	481.43
50.0	0.00	0.0	575.5	597.4	10.93	481.37
51.0	0.00	0.0	554.4	575.5	10.55	481.32
52.0	0.00	0.0	534.1	554.4	10.18	481.26
53.0	0.00	0.0	514.4	534.1	9.84	481.21
54.0	0.00	0.0	495.4	514.4	9.51	481.16
55.0	0.00	0.0	477.0	495.4	9.19	481.11
56.0	0.00	0.0	459.3	477.0	8.88	481.06
57.0	0.00	0.0	442.1	459.3	8.58	481.01
58.0	0.00	0.0	425.5	442.1	8.28	480.97
59.0	0.00	0.0	409.6	425.5	7.99	480.92
60.0	0.00	0.0	394.2	409.6	7.71	480.88

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-015.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320015.HYD

Starting Pond W.S. Elevation = 479.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	44.03 cfs
Peak Outflow	=	16.32 cfs
Peak Elevation	=	482.86 ft

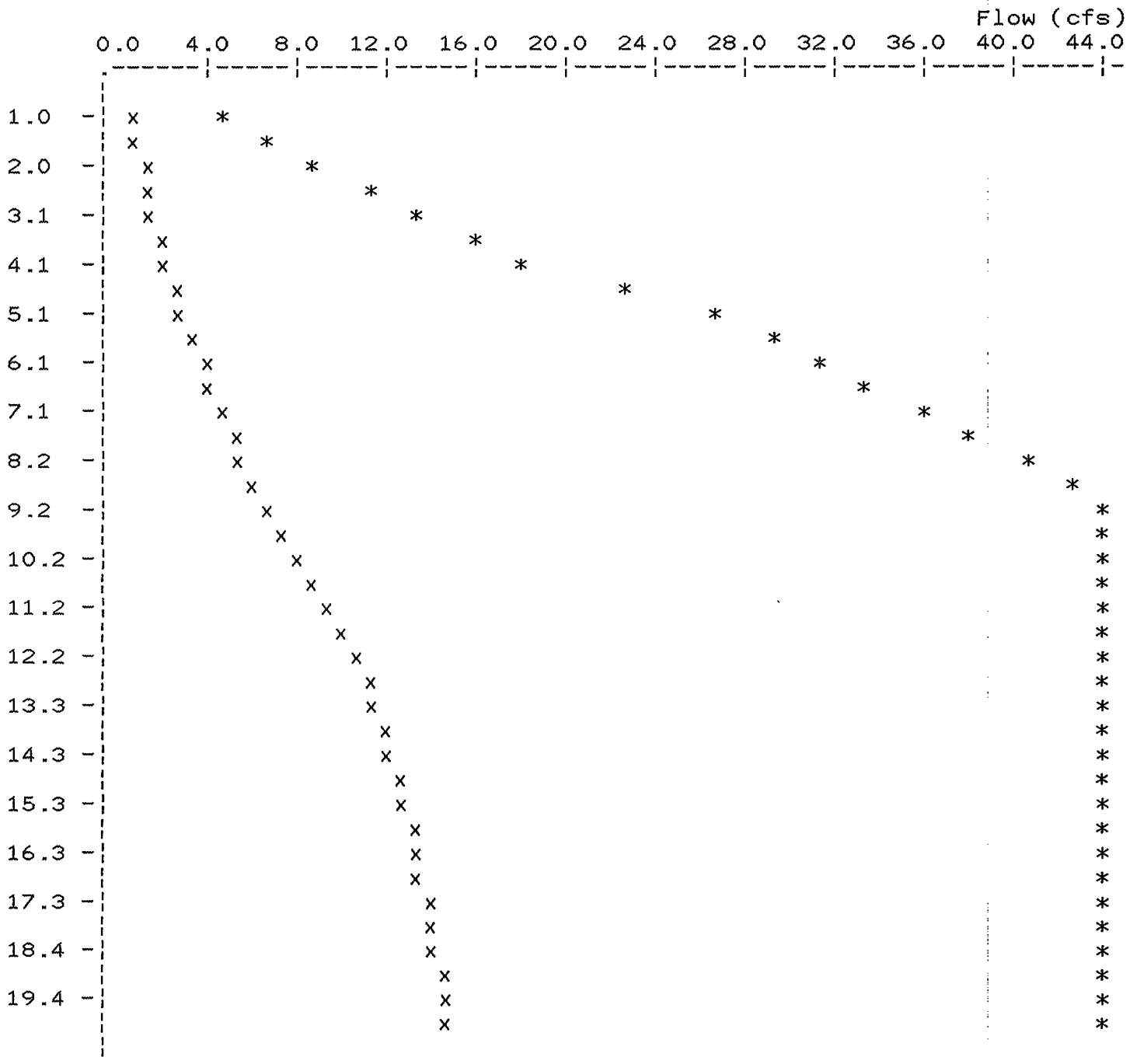
***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	0.84 ac-ft
Total Storage in Pond	=	0.84 ac-ft

Return Freq: 15 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-015.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320015.HYD
EXECUTED: 04-15-1999 09:23:43

Peak Inflow = 44.03 cfs
Peak Outflow = 16.32 cfs
Peak Elevation = 482.86 ft



x File: C:\WINDOWS\DESKTOP\PONDPA~1\76320015.HYD Qmax = 16.3 cfs
* File: C:\WINDOWS\DESKTOP\PONDPA~1\7632-015.HYD Qmax = 44.0 cfs

****
*
* HWY M - HWY P
* DETENTION ANALYSIS
* PREPARED BY: BAX ENGINEERING CO., INC.
* APRIL 1, 1999
*
****

Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-025.HYD
Rating Table file: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND

----INITIAL CONDITIONS----
Elevation = 479.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
479.00	0.0	0.000
479.25	0.4	0.001
479.50	1.1	0.009
479.75	1.9	0.031
480.00	3.0	0.073
480.25	4.2	0.128
480.50	5.5	0.186
480.75	6.9	0.245
481.00	8.5	0.307
481.25	10.1	0.372
481.50	11.8	0.438
481.75	12.7	0.507
482.00	13.6	0.578
482.25	14.4	0.651
482.50	15.2	0.726
482.75	16.0	0.803
483.00	16.7	0.882
483.25	17.8	0.962
483.50	23.8	1.045
483.75	32.9	1.129
484.00	44.3	1.216
484.25	57.5	1.304
484.50	72.3	1.394
484.75	88.5	1.487
485.00	106.1	1.581
485.25	124.8	1.678
485.50	144.7	1.776
485.75	165.7	1.877
486.00	187.6	1.979

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
1.6	2.0
13.2	14.3
44.5	46.4
105.4	108.4
186.0	190.2
269.6	275.1
356.3	363.2
446.3	454.8
539.5	549.6
635.9	647.7
735.8	748.5
839.0	852.6
945.3	959.7
1054.2	1069.4
1165.8	1181.8
1280.1	1296.8
1397.2	1415.0
1517.0	1540.8
1639.6	1672.5
1765.0	1809.3
1893.3	1950.8
2024.5	2096.8
2158.7	2247.2
2295.7	2401.8
2435.7	2560.5
2578.8	2723.5
2724.9	2890.6
2874.0	3061.6

Time increment (t) = 1.0 min.

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-025.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320025.HYD

INFLOW HYDROGRAPH

ROUTING COMPUTATIONS

TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	0.00	-----	0.0	0.0	0.00	479.00
1.0	5.43	5.4	4.2	5.4	0.59	479.32
2.0	10.86	16.3	18.0	20.5	1.26	479.55
3.0	16.30	27.2	41.4	45.2	1.87	479.74
4.0	21.73	38.0	74.5	79.5	2.49	479.88
5.0	32.59	54.3	122.2	128.8	3.30	480.06
6.0	38.02	70.6	184.3	192.8	4.24	480.26
7.0	43.46	81.5	255.1	265.8	5.36	480.47
8.0	48.89	92.3	334.2	347.5	6.65	480.71
9.0	54.32	103.2	421.0	437.4	8.20	480.95
10.0	54.32	108.6	510.1	529.6	9.76	481.20
11.0	54.32	108.6	596.1	618.7	11.30	481.43
12.0	54.32	108.6	680.2	704.8	12.31	481.64
13.0	54.32	108.6	762.7	788.8	13.05	481.85
14.0	54.32	108.6	843.9	871.3	13.74	482.04
15.0	54.32	108.6	923.8	952.5	14.35	482.23
16.0	54.32	108.6	1002.6	1032.4	14.93	482.42
17.0	54.32	108.6	1080.2	1111.2	15.50	482.59
18.0	54.32	108.6	1156.8	1188.9	16.04	482.77
19.0	54.32	108.6	1232.4	1265.4	16.51	482.93
20.0	54.32	108.6	1306.8	1341.0	17.11	483.09
21.0	48.89	103.2	1374.5	1410.0	17.75	483.24
22.0	43.46	92.3	1426.3	1466.9	20.28	483.35
23.0	38.02	81.5	1463.3	1507.8	22.23	483.43
24.0	32.59	70.6	1487.0	1534.0	23.48	483.49
25.0	21.73	54.3	1493.6	1541.3	23.84	483.50
26.0	16.30	38.0	1484.9	1531.7	23.37	483.48
27.0	10.86	27.2	1467.2	1512.1	22.43	483.44
28.0	5.43	16.3	1441.4	1483.5	21.07	483.39
29.0	0.00	5.4	1408.2	1446.8	19.32	483.31
30.0	0.00	0.0	1372.7	1408.2	17.74	483.24
31.0	0.00	0.0	1337.9	1372.7	17.41	483.16
32.0	0.00	0.0	1303.7	1337.9	17.08	483.09
33.0	0.00	0.0	1270.2	1303.7	16.76	483.01
34.0	0.00	0.0	1237.1	1270.2	16.54	482.94
35.0	0.00	0.0	1204.4	1237.1	16.34	482.87
36.0	0.00	0.0	1172.2	1204.4	16.14	482.80
37.0	0.00	0.0	1140.3	1172.2	15.93	482.73
38.0	0.00	0.0	1108.9	1140.3	15.70	482.66
39.0	0.00	0.0	1077.9	1108.9	15.48	482.59
40.0	0.00	0.0	1047.4	1077.9	15.26	482.52
41.0	0.00	0.0	1017.3	1047.4	15.04	482.45
42.0	0.00	0.0	987.7	1017.3	14.82	482.38
43.0	0.00	0.0	958.5	987.7	14.60	482.31
44.0	0.00	0.0	929.7	958.5	14.39	482.25

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-025.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320025.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
45.0	0.00	0.0	901.4	929.7	14.18	482.18
46.0	0.00	0.0	873.4	901.4	13.96	482.11
47.0	0.00	0.0	845.9	873.4	13.76	482.05
48.0	0.00	0.0	818.8	845.9	13.54	481.98
49.0	0.00	0.0	792.2	818.8	13.31	481.92
50.0	0.00	0.0	766.1	792.2	13.08	481.85
51.0	0.00	0.0	740.4	766.1	12.85	481.79
52.0	0.00	0.0	715.1	740.4	12.63	481.73
53.0	0.00	0.0	690.3	715.1	12.40	481.67
54.0	0.00	0.0	665.9	690.3	12.18	481.61
55.0	0.00	0.0	642.0	665.9	11.96	481.55
56.0	0.00	0.0	618.6	642.0	11.70	481.49
57.0	0.00	0.0	596.0	618.6	11.30	481.43
58.0	0.00	0.0	574.2	596.0	10.90	481.37
59.0	0.00	0.0	553.2	574.2	10.53	481.31
60.0	0.00	0.0	532.8	553.2	10.16	481.26

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-025.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320025.HYD

Starting Pond W.S. Elevation = 479.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	54.32 cfs
Peak Outflow	=	23.84 cfs
Peak Elevation	=	483.50 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.05 ac-ft
Total Storage in Pond	=	1.05 ac-ft

Return Freq: 25 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\7632-025.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\76320025.HYD

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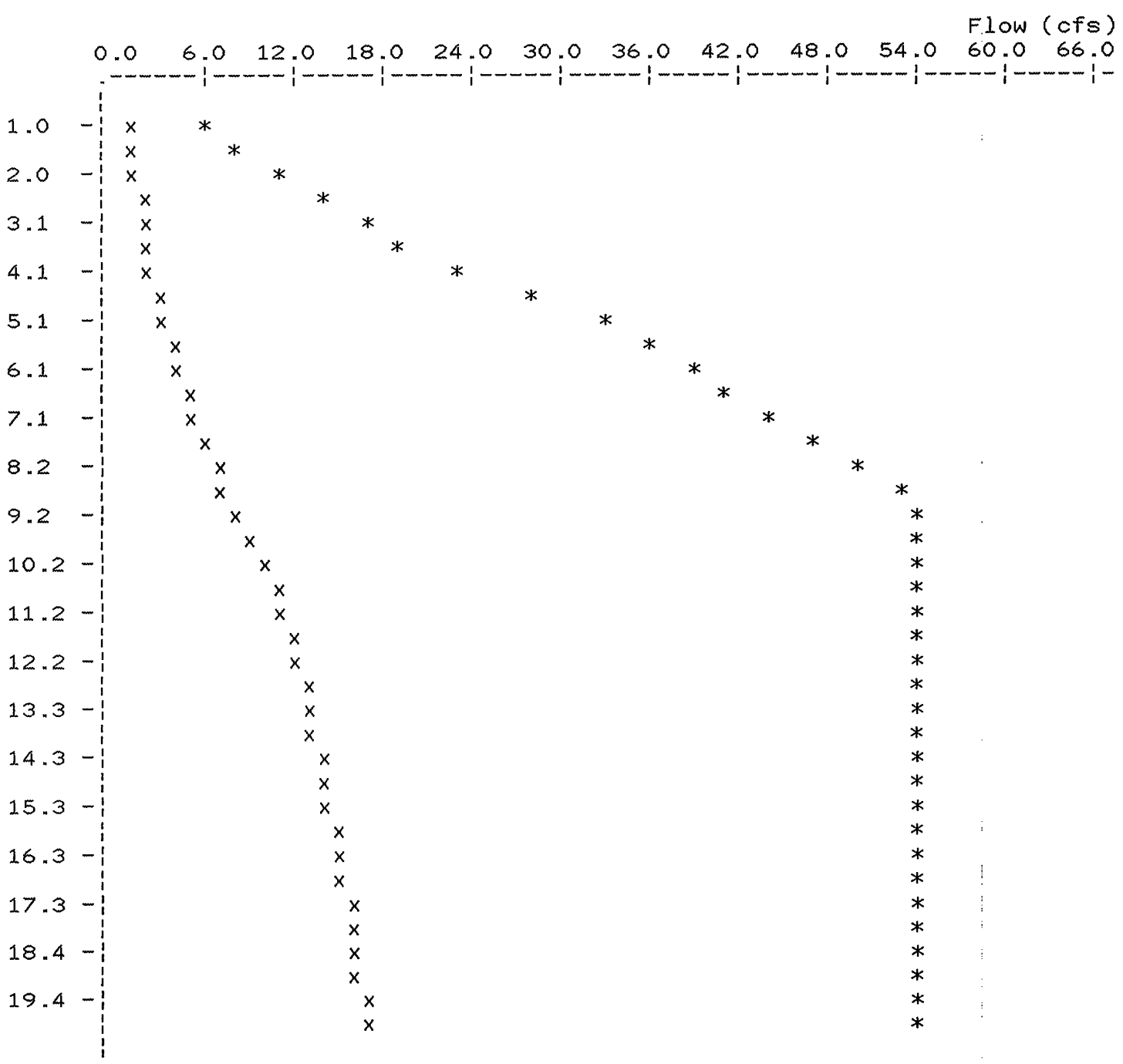
Peak Inflow = 54.32 cfs
Peak Outflow = 23.84 cfs
Peak Elevation = 483.50 ft



x File: C:\WINDOWS\DESKTOP\PONDPA~1\76320025.HYD Qmax = 23.8 cfs
* File: C:\WINDOWS\DESKTOP\PONDPA~1\7632-025.HYD Qmax = 54.3 cfs

Outlet Structure File: 7632 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
HWY P - HWY M
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
APRIL 1, 1999
****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
479.00	0.0	1
479.25	0.4	1
479.50	1.1	1
479.75	1.9	1
480.00	3.0	1
480.25	4.2	1
480.50	5.5	1
480.75	6.9	1
481.00	8.5	1
481.25	10.1	1
481.50	11.8	2
481.75	12.7	2
482.00	13.6	2
482.25	14.4	2
482.50	15.2	2
482.75	16.0	2
483.00	16.7	2
483.25	17.8	2 +3
483.50	23.8	2 +3
483.75	32.9	2 +3
484.00	44.3	2 +3
484.25	57.5	2 +3
484.50	72.3	2 +3
484.75	88.5	2 +3
485.00	106.1	2 +3
485.25	124.8	2 +3
485.50	144.7	2 +3
485.75	165.7	2 +3
486.00	187.6	2 +3

Outlet Structure File: 7632 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
HWY P - HWY M
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
APRIL 1, 1999
****

Outlet Structure File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .STR
Planimeter Input File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .VOL
Rating Table Output File: C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND

Min. Elev.(ft) = 479 Max. Elev.(ft) = 486 Incr.(ft) = .25

Additional elevations (ft) to be included in table:
* *

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
WEIR-VR	1		->	1
ORIFICE	2	? 1	->	A
WEIR-VR	3		->	3

Outflow rating table summary was stored in file:
C:\WINDOWS\DESKTOP\PONDPA~1\7632 .PND

Outlet Structure File: 7632 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
HWY P - HWY M
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
APRIL 1, 1999
****

›››››› Structure No. 1 ‹‹‹‹‹‹
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)? 479
E2 elev.(ft)? 486.001
Weir coefficient? 3
Weir elev.(ft)? 479.00
Length (ft)? 1.0
Contracted/Suppressed (C/S)? S

Outlet Structure File: 7632 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
HWY P - HWY M
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
APRIL 1, 1999
****

›››››› Structure No. 2 ‹‹‹‹‹‹
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	481
E2 elev.(ft)?	486.001
Orifice coeff.?	0.6
Invert elev.(ft)?	479.000
Datum elev.(ft) ?	480.0
Orifice area (sq ft)?	2.0

Outlet Structure File: 7632 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
HWY P - HWY M
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
APRIL 1, 1999
****

>>>>>> Structure No. 3 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)? 483.2
E2 elev.(ft)? 486.001
Weir coefficient? 3
Weir elev.(ft)? 483.2
Length (ft)? 11.67
Contracted/Suppressed (C/S)? S

Outlet Structure File: 7632 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
HWY P - HWY M
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
APRIL 1, 1999
****

Outflow Rating Table for Structure #1
WEIR-VR Weir - Vertical Rectangular

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
479.00	0.0	H =0.0
479.25	0.4	H =.25
479.50	1.1	H =.5
479.75	1.9	H =.750
480.00	3.0	H =1.0
480.25	4.2	H =1.25
480.50	5.5	H =1.5
480.75	6.9	H =1.75
481.00	8.5	H =2.0
481.25	10.1	H =2.25
481.50	11.9	H =2.5
481.75	13.7	H =2.75
482.00	15.6	H =3.0
482.25	17.6	H =3.25
482.50	19.6	H =3.5
482.75	21.8	H =3.75
483.00	24.0	H =4.0
483.25	26.3	H =4.25
483.50	28.6	H =4.5
483.75	31.1	H =4.75
484.00	33.5	H =5.0
484.25	36.1	H =5.25
484.50	38.7	H =5.5
484.75	41.4	H =5.75
485.00	44.1	H =6.0
485.25	46.9	H =6.25
485.50	49.7	H =6.5
485.75	52.6	H =6.75
486.00	55.6	H =7.0

C = 3 L (ft) = 1
H (ft) = Table elev. - Invert elev. (479 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: 7632 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
HWY P - HWY M
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
APRIL 1, 1999
****

Outflow Rating Table for Structure #2
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
479.00	0.0	E < E1=481
479.25	0.0	E < E1=481
479.50	0.0	E < E1=481
479.75	0.0	E < E1=481
480.00	0.0	E < E1=481
480.25	0.0	E < E1=481
480.50	0.0	E < E1=481
480.75	0.0	E < E1=481
481.00	9.6	H =1.0
481.25	10.8	H =1.25
481.50	11.8	H =1.5
481.75	12.7	H =1.75
482.00	13.6	H =2.0
482.25	14.4	H =2.25
482.50	15.2	H =2.5
482.75	16.0	H =2.75
483.00	16.7	H =3.0
483.25	17.4	H =3.25
483.50	18.0	H =3.5
483.75	18.6	H =3.75
484.00	19.3	H =4.0
484.25	19.9	H =4.25
484.50	20.4	H =4.5
484.75	21.0	H =4.75
485.00	21.5	H =5.0
485.25	22.1	H =5.25
485.50	22.6	H =5.5
485.75	23.1	H =5.75
486.00	23.6	H =6.0

C = .6 A = 2 sq.ft.
H (ft) = Table elev. - Datum elev. (480 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: 7632 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
HWY P - HWY M
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
APRIL 1, 1999
****

Outflow Rating Table for Structure #3
WEIR-VR Weir - Vertical Rectangular

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
479.00	0.0	E < Inv.El.= 483.2
479.25	0.0	E < Inv.El.= 483.2
479.50	0.0	E < Inv.El.= 483.2
479.75	0.0	E < Inv.El.= 483.2
480.00	0.0	E < Inv.El.= 483.2
480.25	0.0	E < Inv.El.= 483.2
480.50	0.0	E < Inv.El.= 483.2
480.75	0.0	E < Inv.El.= 483.2
481.00	0.0	E < Inv.El.= 483.2
481.25	0.0	E < Inv.El.= 483.2
481.50	0.0	E < Inv.El.= 483.2
481.75	0.0	E < Inv.El.= 483.2
482.00	0.0	E < Inv.El.= 483.2
482.25	0.0	E < Inv.El.= 483.2
482.50	0.0	E < Inv.El.= 483.2
482.75	0.0	E < Inv.El.= 483.2
483.00	0.0	E < Inv.El.= 483.2
483.25	0.4	H =.05
483.50	5.8	H =.3
483.75	14.3	H =.55
484.00	25.1	H =.8
484.25	37.7	H =1.05
484.50	51.9	H =1.3
484.75	67.6	H =1.55
485.00	84.5	H =1.8
485.25	102.8	H =2.05
485.50	122.1	H =2.3
485.75	142.6	H =2.55
486.00	164.0	H =2.8

C = 3 L (ft) = 11.67
H (ft) = Table elev. - Invert elev. (483.2 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: 7632 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
HWY P - HWY M
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
APRIL 1, 1999
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Outflow Rating Table A
Table A = 1 ? 2

Elevation (ft)	Q (cfs)	Contributing Structures
479.00	0.0	1
479.25	0.4	1
479.50	1.1	1
479.75	1.9	1
480.00	3.0	1
480.25	4.2	1
480.50	5.5	1
480.75	6.9	1
481.00	8.5	1
481.25	10.1	1
481.50	11.8	2
481.75	12.7	2
482.00	13.6	2
482.25	14.4	2
482.50	15.2	2
482.75	16.0	2
483.00	16.7	2
483.25	17.4	2
483.50	18.0	2
483.75	18.6	2
484.00	19.3	2
484.25	19.9	2
484.50	20.4	2
484.75	21.0	2
485.00	21.5	2
485.25	22.1	2
485.50	22.6	2
485.75	23.1	2
486.00	23.6	2

HWY P - HWY M
100 YEAR FLOWS - 30" PIPE ACROSS CAPRI DRIVE April 09, 1999
95 - 7632

UPP STR	LOW STR	L	DIA	UPPER FL LN	LOWER FL LN	PS	UPPER ST EL	DEPTH HY GR	UPPER HY EL	LOWER HY EL	HYDR GRADE	FR HEAD	VEL	VEL HEAD	JUNC LOSS	TURN LOSS	STR GRADE	INL CAP	DR AREA	PI	Q	TQ	PIPE CAP		REMARKS
os	ai	90.99	30	475.00	470.00	5.50	484.00	2.97	481.03	474.26	.02870	2.61	14.16	3.12	4.16	0.00	LOW	11.00	0.00	0.00	0.00	69.53	96.15	1	
ai	fe	180.00	30	459.65	455.56	2.27	479.00	4.74	474.26	465.70	.03650	6.57	15.97	3.96	1.59	0.40	LOW	57.58	3.00	3.54	8.85	78.38	61.83	2	hw 465.70

465.70 HW PER FIRM MAP PANEL 230

ACTA DEL ESTADO DE [illegible]

[illegible]

[illegible]

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