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STORMWATER DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
THE KNOLLS - O'FALLON
BAX PROJECT NO. **97-9197**
JANUARY 29, 1997

INTRODUCTION:

The tract of land is presently an undeveloped site located in the City of O'Fallon, Missouri. It is proposed that 31.67 acres of the 60.6 acre tract be developed into residential lots. A stormwater detention basin shall be constructed near the southwest corner of the site. This basin will provide detention for the development when considering the increased runoff for the entire site. The storage volume and outflow rates shall be proportioned to insure that the peak rate of runoff leaving the site under post-developed conditions is less than or equal to the peak rate of runoff leaving the site under pre-developed conditions for the 25 year-20 minute design storm. The basin was also analyzed for the 2, 15 and 100 year frequency - 20 minute duration design storms.

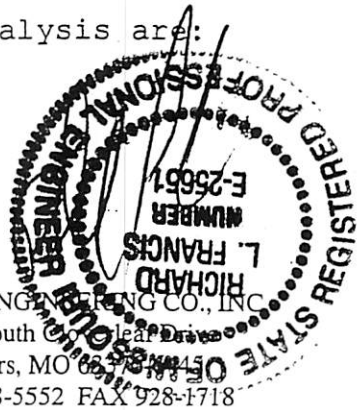
GENERAL SITE DATA AND RUNOFF CALCULATIONS:

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

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

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

2 year - 100% impervious	1.61 cfs/ac.
15 year - 100% impervious	2.64 cfs/ac.
25 year - 100% impervious	3.26 cfs/ac.
100 year - 100% impervious	4.17 cfs/ac.



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TIME OF CONCENTRATION:

Of the inflows to the basin, the most remote point lies to the northeast near the intersection of McGwire Ct. and Cinnamon Teal Dr. Flows will travel approximately 400 feet overland to an inlet then 1200 feet via stormpipe to the detention basin. Time of concentration is estimated as follows:

A) T(overland) : L = 400 feet
Elevation difference = 500 - 496 = 4 feet
T(overland) = 9 minutes : See figure 1

B) T(stormpipe) : L = 1200 feet
Elevation difference = 496 - 484 = 12 feet
T(stormpipe) = 1.9 minutes : See figure 1

Total 10.9 min >> Use 10 min.

BASIN PEAK INFLOWS:

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

25 year-20 minute storm

13.06 Ac. x 3.26 cfs/Ac. = 42.58 cfs

2 year-20 minute storm:	21.03 cfs
15 year-20 minute storm:	34.48 cfs
100 year-20 minute storm:	54.46 cfs

REQUIRED ATTENUATION:

= TRACT AREA x [PI(post) - PI(pre)]

15 year-20 minute storm
31.67 x [3.26 - 2.31] = 30.09 cfs

PERMITTED RELEASE RATE:

The permitted release rate of the basin is found by subtracting the required attenuation from the peak basin inflow.

25 year-20 minute storm
Permitted release rate:

42.58 cfs - 30.09 cfs = 12.49 cfs

STORM ROUTING CALCULATIONS AND RESULTS:

A computer program was used in routing the design 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	-	1.57 cfs	482.98
15 YR	-	1.84 cfs	484.33
25 YR	12.49 cfs	1.99 cfs	485.05

As shown above, the calculated release rate of the design storm is less than the respective permitted release rate as required for the detention basin.

CHECK 100 YEAR OUTFLOW: (low-flow blocked)

WEIR FLOW : $Q = C \times L \times H^{(3/2)}$

where 100-YEAR FLOW Q = 54.46 cfs
C = 3.32
48" standpipe L = 12.57 ft
H = 1.19 ft

sill = 485.25
100 yr h/w = 486.44

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SUMMARY:

25 year-20min H.W.	485.05
100 year-20min H.W.(low flow blocked)	486.44
Low Flow Slot	4" wide x 6" high
Low Flow Slot Elevation	479.12
Overflow Standpipe Elevation	485.25
Top Of Berm	494.00

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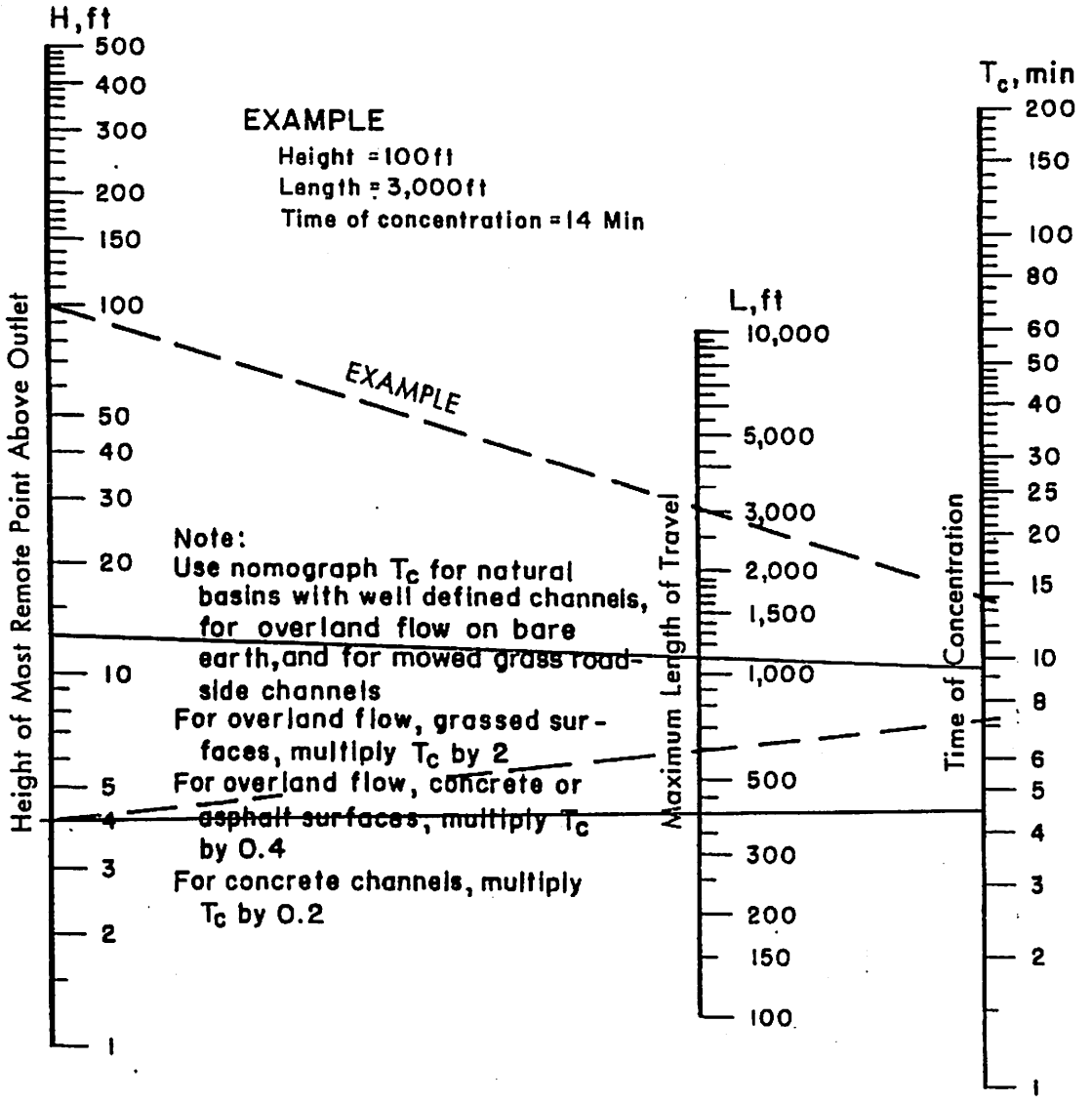
SHEET ___ of ___

Project: THE KNOLLS

Date: 1-5-98 Project No: 97-9197

Designed: AD) Checked: ___

FIGURE 1



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

OVERLAND 400 FT 500 - 496 = 4 4.5 × 2.0 = 9.0 MIN

PIPES 1200 FT 496 - 484 = 12 9.5 × 0.2 = 1.9 MIN

10.90 MIN

USE 10 MIN.

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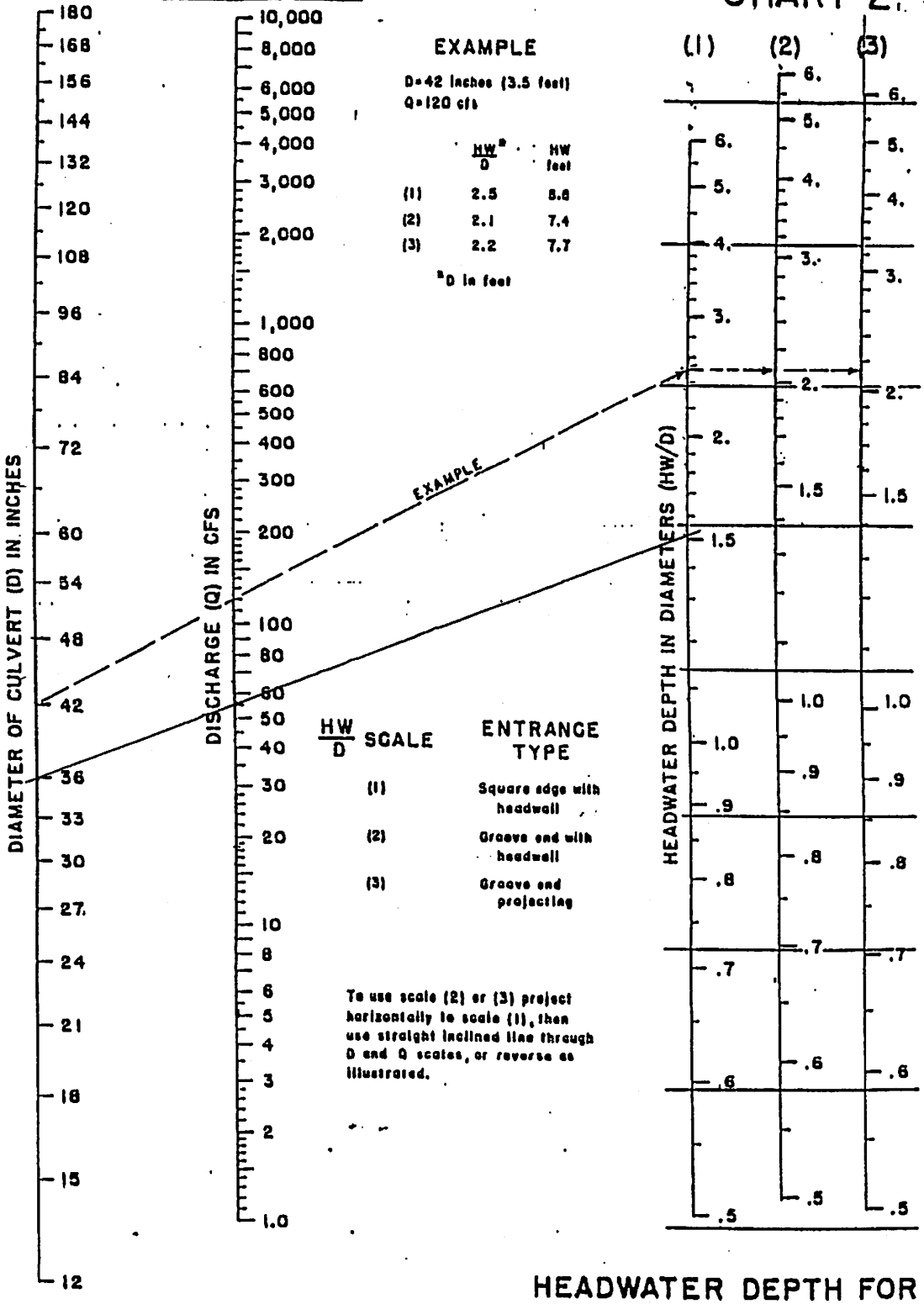
CHECK OUTFLOW PIPE

CHART 2



EXAMPLE

D=42 inches (3.5 feet)
Q=120 cfs

	HW/D[a]	HW feet
(1)	2.5	8.8
(2)	2.1	7.4
(3)	2.2	7.7

[a] D in feet

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

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36" x 1.5 = 4.5'

<485.25

OK

POND-2 Version: 5.20
S/N:

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JANUARY 5, 1998

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DISK FILE: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .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)
479.12	0.00	0.00	0.00	0.00	0.00
480.00	3,396.00	0.08	0.08	0.02	0.02
482.00	9,419.00	0.22	0.42	0.28	0.31
484.00	12,188.00	0.28	0.74	0.49	0.80
486.00	15,194.00	0.35	0.94	0.63	1.43
488.00	18,476.00	0.42	1.16	0.77	2.20
490.00	22,022.00	0.51	1.39	0.93	3.13
492.00	25,987.00	0.60	1.65	1.10	4.23
494.00	30,188.00	0.69	1.93	1.29	5.52

* 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

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JANUARY 5, 1998
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***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
479.12	0.0	1
479.62	0.4	1
480.12	0.7	2
480.62	0.9	2
481.12	1.1	2
481.62	1.2	2
482.12	1.4	2
482.62	1.5	2
483.12	1.6	2
483.62	1.7	2
484.12	1.8	2
484.62	1.9	2
485.12	2.0	2
485.62	2.0	2
486.12	2.1	2
486.62	2.2	2
487.12	2.3	2
487.62	2.4	2
488.12	2.4	2
488.62	2.5	2
489.12	2.6	2
489.62	2.6	2
490.12	2.7	2
490.62	2.7	2
491.12	2.8	2
491.62	2.9	2
492.12	2.9	2
492.62	3.0	2
493.12	3.0	2
493.62	3.1	2
494.00	3.1	2

Outlet Structure File: 9197 .STR

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Outlet Structure File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .STR
Planimeter Input File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .VOL
Rating Table Output File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND

Min. Elev.(ft) = 479.12 Max. Elev.(ft) = 494 Incr.(ft) = .5

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

****
SYSTEM CONNECTIVITY
****

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

Outflow rating table summary was stored in file:
C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND

Outlet Structure File: 9197 .STR

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Date Executed: Time Executed:

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

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)? 479.12
E2 elev.(ft)? 494.001
Weir coefficient? 3
Weir elev.(ft)? 479.12
Length (ft)? .3333333
Contracted/Suppressed (C/S)? S

Outlet Structure File: 9197 .STR

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

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

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	479.62
E2 elev.(ft)?	494.001
Orifice coeff.?	0.6
Invert elev.(ft)?	479.120
Datum elev.(ft) ?	479.3700
Orifice area (sq ft)?	0.17000

Outlet Structure File: 9197 .STR

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

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

Elevation (ft)	Q (cfs)	Computation Messages
479.12	0.0	H =0.0
479.62	0.4	H =.5
480.12	1.0	H =1.0
480.62	1.8	H =1.5
481.12	2.8	H =2.0
481.62	4.0	H =2.5
482.12	5.2	H =3.0
482.62	6.5	H =3.5
483.12	8.0	H =4.0
483.62	9.5	H =4.5
484.12	11.2	H =5.0
484.62	12.9	H =5.5
485.12	14.7	H =6.0
485.62	16.6	H =6.5
486.12	18.5	H =7.0
486.62	20.5	H =7.5
487.12	22.6	H =8.0
487.62	24.8	H =8.5
488.12	27.0	H =9.0
488.62	29.3	H =9.5
489.12	31.6	H =10.0
489.62	34.0	H =10.5
490.12	36.5	H =11.0
490.62	39.0	H =11.5
491.12	41.6	H =12.0
491.62	44.2	H =12.5
492.12	46.9	H =13.0
492.62	49.6	H =13.5
493.12	52.4	H =14.0
493.62	55.2	H =14.5
494.00	57.4	H =14.88

C = 3 L (ft) = .3333333
H (ft) = Table elev. - Invert elev. (479.12 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: 9197 .STR

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

Elevation (ft)	Q (cfs)	Computation Messages
479.12	0.0	E < E1=479.62
479.62	0.4	H =.25
480.12	0.7	H =.750
480.62	0.9	H =1.25
481.12	1.1	H =1.75
481.62	1.2	H =2.25
482.12	1.4	H =2.75
482.62	1.5	H =3.25
483.12	1.6	H =3.75
483.62	1.7	H =4.25
484.12	1.8	H =4.75
484.62	1.9	H =5.25
485.12	2.0	H =5.75
485.62	2.0	H =6.25
486.12	2.1	H =6.75
486.62	2.2	H =7.25
487.12	2.3	H =7.75
487.62	2.4	H =8.25
488.12	2.4	H =8.75
488.62	2.5	H =9.25
489.12	2.6	H =9.75
489.62	2.6	H =10.25
490.12	2.7	H =10.75
490.62	2.7	H =11.25
491.12	2.8	H =11.75
491.62	2.9	H =12.25
492.12	2.9	H =12.75
492.62	3.0	H =13.25
493.12	3.0	H =13.75
493.62	3.1	H =14.25
494.00	3.1	H =14.63

C = .6 A = .17 sq.ft.
H (ft) = Table elev. - Datum elev. (479.37 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: 9197 .STR

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Outflow Rating Table A
Table A = 1 ? 2

Elevation (ft)	Q (cfs)	Contributing Structures
479.12	0.0	1
479.62	0.4	1
480.12	0.7	2
480.62	0.9	2
481.12	1.1	2
481.62	1.2	2
482.12	1.4	2
482.62	1.5	2
483.12	1.6	2
483.62	1.7	2
484.12	1.8	2
484.62	1.9	2
485.12	2.0	2
485.62	2.0	2
486.12	2.1	2
486.62	2.2	2
487.12	2.3	2
487.62	2.4	2
488.12	2.4	2
488.62	2.5	2
489.12	2.6	2
489.62	2.6	2
490.12	2.7	2
490.62	2.7	2
491.12	2.8	2
491.62	2.9	2
492.12	2.9	2
492.62	3.0	2
493.12	3.0	2
493.62	3.1	2
494.00	3.1	2

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Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-025.HYD
Rating Table file: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND

----INITIAL CONDITIONS----
Elevation = 479.12 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
479.12	0.0	0.000
479.62	0.4	0.004
480.12	0.7	0.033
480.62	0.9	0.082
481.12	1.1	0.147
481.62	1.2	0.229
482.12	1.4	0.332
482.62	1.5	0.445
483.12	1.6	0.567
483.62	1.7	0.696
484.12	1.8	0.834
484.62	1.9	0.980
485.12	2.0	1.134
485.62	2.0	1.298
486.12	2.1	1.470
486.62	2.2	1.651
487.12	2.3	1.841
487.62	2.4	2.041
488.12	2.4	2.250
488.62	2.5	2.470
489.12	2.6	2.699
489.62	2.6	2.939
490.12	2.7	3.189
490.62	2.7	3.450
491.12	2.8	3.722
491.62	2.9	4.005
492.12	2.9	4.301
492.62	3.0	4.608
493.12	3.0	4.926
493.62	3.1	5.257
494.00	3.1	5.517

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
6.1	6.5
47.3	48.0
118.9	119.8
213.1	214.2
333.2	334.4
481.7	483.1
646.7	648.2
823.1	824.7
1011.1	1012.8
1211.0	1212.8
1423.0	1424.9
1647.3	1649.3
1884.1	1886.1
2134.0	2136.1
2396.9	2399.1
2673.3	2675.6
2963.4	2965.8
3267.7	3270.1
3586.2	3588.7
3919.2	3921.8
4267.0	4269.6
4630.1	4632.8
5009.0	5011.7
5404.1	5406.9
5815.8	5818.7
6244.5	6247.4
6690.1	6693.1
7153.1	7156.1
7633.6	7636.7
8010.8	8013.9

Time increment (t) = 1.0 min.

POND-2 Version: 5.20 S/N:
EXECUTED: 01-30-1998 14:14:21

Return Freq: 25 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-025.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970025.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	479.12
1.0	4.30	4.3	3.8	4.3	0.27	479.45
2.0	8.50	12.8	15.6	16.6	0.47	479.74
3.0	12.80	21.3	35.7	36.9	0.62	479.99
4.0	17.00	29.8	64.0	65.5	0.75	480.24
5.0	21.30	38.3	100.6	102.3	0.85	480.50
6.0	25.49	46.8	145.5	147.4	0.96	480.77
7.0	29.79	55.3	198.6	200.7	1.07	481.05
8.0	34.09	63.9	260.2	262.5	1.14	481.32
9.0	38.29	72.4	330.2	332.6	1.20	481.61
10.0	42.59	80.9	408.5	411.1	1.30	481.88
11.0	42.60	85.2	490.8	493.6	1.41	482.15
12.0	42.60	85.2	573.1	576.0	1.46	482.40
13.0	42.60	85.2	655.3	658.3	1.51	482.65
14.0	42.60	85.2	737.4	740.5	1.55	482.88
15.0	42.60	85.2	819.4	822.6	1.60	483.11
16.0	42.60	85.2	901.3	904.6	1.64	483.33
17.0	42.60	85.2	983.1	986.5	1.69	483.55
18.0	42.60	85.2	1064.9	1068.3	1.73	483.76
19.0	42.60	85.2	1146.6	1150.1	1.77	483.96
20.0	42.60	85.2	1228.1	1231.8	1.81	484.16
21.0	38.32	80.9	1305.4	1309.1	1.85	484.35
22.0	34.12	72.4	1374.0	1377.8	1.88	484.51
23.0	29.82	63.9	1434.2	1438.0	1.91	484.65
24.0	25.52	55.3	1485.7	1489.5	1.93	484.76
25.0	21.32	46.8	1528.6	1532.5	1.95	484.86
26.0	17.02	38.3	1563.0	1566.9	1.96	484.94
27.0	12.82	29.8	1588.9	1592.9	1.97	484.99
28.0	8.52	21.3	1606.3	1610.2	1.98	485.03
29.0	4.32	12.8	1615.1	1619.1	1.99	485.05
30.0	0.03	4.4	1615.5	1619.5	1.99	485.05
31.0	0.00	0.0	1611.6	1615.6	1.98	485.04
32.0	0.00	0.0	1607.6	1611.6	1.98	485.04
33.0	0.00	0.0	1603.7	1607.6	1.98	485.03
34.0	0.00	0.0	1599.7	1603.7	1.98	485.02
35.0	0.00	0.0	1595.7	1599.7	1.98	485.01
36.0	0.00	0.0	1591.8	1595.7	1.98	485.00
37.0	0.00	0.0	1587.8	1591.8	1.97	484.99
38.0	0.00	0.0	1583.9	1587.8	1.97	484.98
39.0	0.00	0.0	1580.0	1583.9	1.97	484.97
40.0	0.00	0.0	1576.0	1580.0	1.97	484.97
41.0	0.00	0.0	1572.1	1576.0	1.97	484.96
42.0	0.00	0.0	1568.1	1572.1	1.97	484.95
43.0	0.00	0.0	1564.2	1568.1	1.96	484.94
44.0	0.00	0.0	1560.3	1564.2	1.96	484.93

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-025.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970025.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	1556.4	1560.3	1.96	484.92
46.0	0.00	0.0	1552.5	1556.4	1.96	484.91
47.0	0.00	0.0	1548.5	1552.5	1.96	484.90
48.0	0.00	0.0	1544.6	1548.5	1.96	484.90
49.0	0.00	0.0	1540.7	1544.6	1.95	484.89
50.0	0.00	0.0	1536.8	1540.7	1.95	484.88
51.0	0.00	0.0	1532.9	1536.8	1.95	484.87
52.0	0.00	0.0	1529.0	1532.9	1.95	484.86
53.0	0.00	0.0	1525.1	1529.0	1.95	484.85
54.0	0.00	0.0	1521.2	1525.1	1.94	484.84
55.0	0.00	0.0	1517.4	1521.2	1.94	484.83
56.0	0.00	0.0	1513.5	1517.4	1.94	484.83
57.0	0.00	0.0	1509.6	1513.5	1.94	484.82
58.0	0.00	0.0	1505.7	1509.6	1.94	484.81
59.0	0.00	0.0	1501.9	1505.7	1.94	484.80
60.0	0.00	0.0	1498.0	1501.9	1.93	484.79
61.0	0.00	0.0	1494.1	1498.0	1.93	484.78
62.0	0.00	0.0	1490.3	1494.1	1.93	484.77
63.0	0.00	0.0	1486.4	1490.3	1.93	484.77
64.0	0.00	0.0	1482.5	1486.4	1.93	484.76
65.0	0.00	0.0	1478.7	1482.5	1.93	484.75
66.0	0.00	0.0	1474.8	1478.7	1.92	484.74
67.0	0.00	0.0	1471.0	1474.8	1.92	484.73
68.0	0.00	0.0	1467.2	1471.0	1.92	484.72
69.0	0.00	0.0	1463.3	1467.2	1.92	484.71
70.0	0.00	0.0	1459.5	1463.3	1.92	484.71
71.0	0.00	0.0	1455.7	1459.5	1.92	484.70
72.0	0.00	0.0	1451.8	1455.7	1.91	484.69
73.0	0.00	0.0	1448.0	1451.8	1.91	484.68
74.0	0.00	0.0	1444.2	1448.0	1.91	484.67
75.0	0.00	0.0	1440.4	1444.2	1.91	484.66
76.0	0.00	0.0	1436.6	1440.4	1.91	484.65
77.0	0.00	0.0	1432.7	1436.6	1.91	484.65
78.0	0.00	0.0	1428.9	1432.7	1.90	484.64
79.0	0.00	0.0	1425.1	1428.9	1.90	484.63
80.0	0.00	0.0	1421.3	1425.1	1.90	484.62
81.0	0.00	0.0	1417.5	1421.3	1.90	484.61
82.0	0.00	0.0	1413.7	1417.5	1.90	484.60
83.0	0.00	0.0	1410.0	1413.7	1.89	484.59
84.0	0.00	0.0	1406.2	1410.0	1.89	484.58
85.0	0.00	0.0	1402.4	1406.2	1.89	484.58
86.0	0.00	0.0	1398.6	1402.4	1.89	484.57
87.0	0.00	0.0	1394.8	1398.6	1.89	484.56
88.0	0.00	0.0	1391.1	1394.8	1.89	484.55
89.0	0.00	0.0	1387.3	1391.1	1.88	484.54

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

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-025.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970025.HYD

Starting Pond W.S. Elevation = 479.12 ft

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

Peak Inflow	=	42.60 cfs
Peak Outflow	=	1.99 cfs
Peak Elevation	=	485.05 ft

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

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.11 ac-ft
Total Storage in Pond	=	1.11 ac-ft

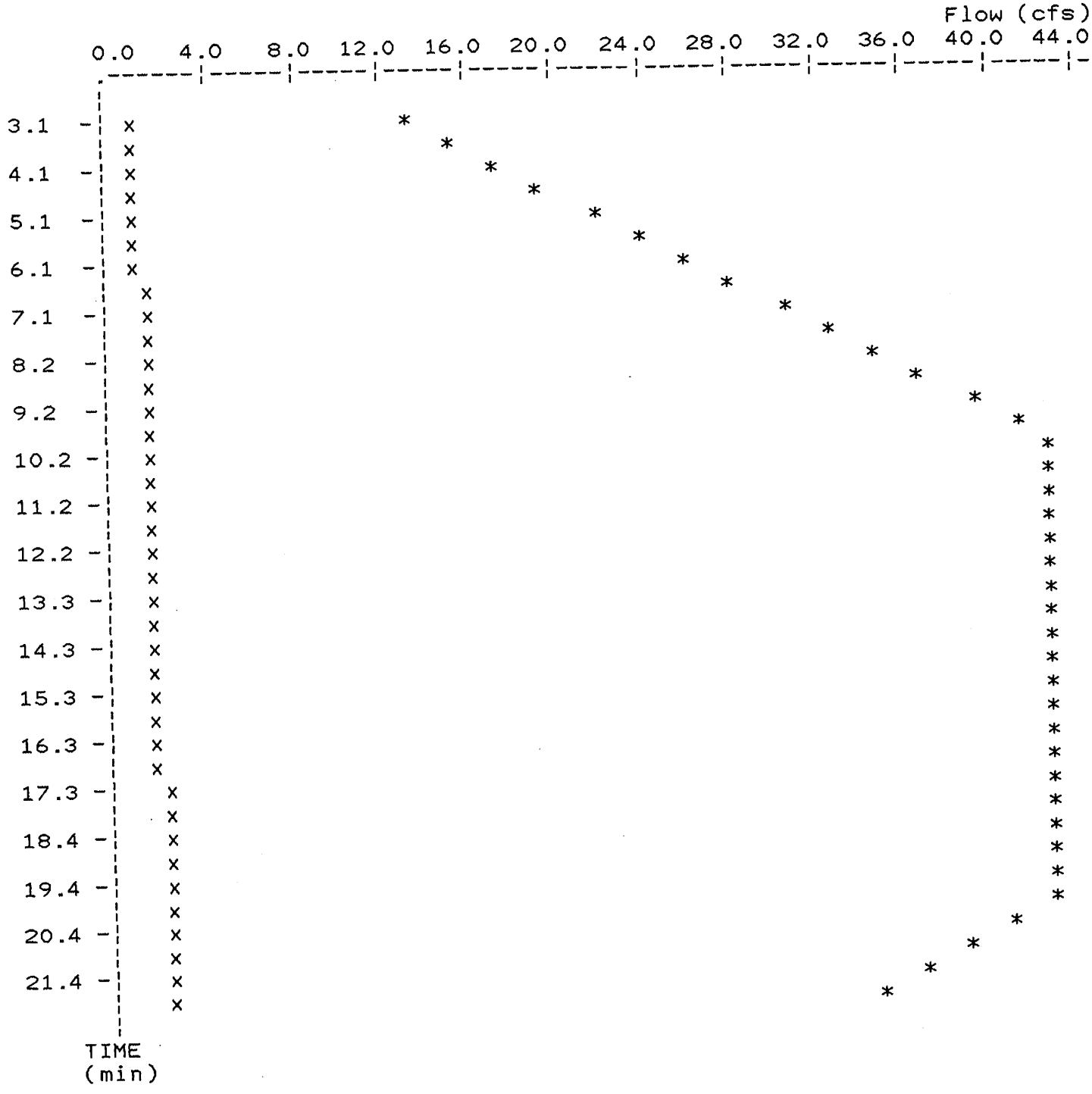
POND-2 Version: 5.20 S/N:

Return Freq: 25 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-025.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970025.HYD

EXECUTED: 01-30-1998
14:14:21

Peak Inflow = 42.60 cfs
Peak Outflow = 1.99 cfs
Peak Elevation = 485.05 ft



x File: C:\WINDOWS\DESKTOP\PONDPA~1\91970025.HYD Qmax = 2.0 cfs
* File: C:\WINDOWS\DESKTOP\PONDPA~1\9197-025.HYD Qmax = 42.6 cfs

****
*
* THE KNOLLS
* DETENTION ANALYSIS
* PREPARED BY: BAX ENGINEERING CO., INC.
* JANUARY 5, 1998
*
****

Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-015.HYD
Rating Table file: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND

----INITIAL CONDITIONS----
Elevation = 479.12 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
479.12	0.0	0.000
479.62	0.4	0.004
480.12	0.7	0.033
480.62	0.9	0.082
481.12	1.1	0.147
481.62	1.2	0.229
482.12	1.4	0.332
482.62	1.5	0.445
483.12	1.6	0.567
483.62	1.7	0.696
484.12	1.8	0.834
484.62	1.9	0.980
485.12	2.0	1.134
485.62	2.0	1.298
486.12	2.1	1.470
486.62	2.2	1.651
487.12	2.3	1.841
487.62	2.4	2.041
488.12	2.4	2.250
488.62	2.5	2.470
489.12	2.6	2.699
489.62	2.6	2.939
490.12	2.7	3.189
490.62	2.7	3.450
491.12	2.8	3.722
491.62	2.9	4.005
492.12	2.9	4.301
492.62	3.0	4.608
493.12	3.0	4.926
493.62	3.1	5.257
494.00	3.1	5.517

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
6.1	6.5
47.3	48.0
118.9	119.8
213.1	214.2
333.2	334.4
481.7	483.1
646.7	648.2
823.1	824.7
1011.1	1012.8
1211.0	1212.8
1423.0	1424.9
1647.3	1649.3
1884.1	1886.1
2134.0	2136.1
2396.9	2399.1
2673.3	2675.6
2963.4	2965.8
3267.7	3270.1
3586.2	3588.7
3919.2	3921.8
4267.0	4269.6
4630.1	4632.8
5009.0	5011.7
5404.1	5406.9
5815.8	5818.7
6244.5	6247.4
6690.1	6693.1
7153.1	7156.1
7633.6	7636.7
8010.8	8013.9

Time increment (t) = 1.0 min.

POND-2 Version: 5.20 S/N:
EXECUTED: 01-30-1998 14:14:21

Return Freq: 15 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-015.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970015.HYD

INFLOW HYDROGRAPH

TIME (min)	INFLOW (cfs)
0.0	0.00
1.0	3.48
2.0	6.88
3.0	10.36
4.0	13.76
5.0	17.24
6.0	20.63
7.0	24.12
8.0	27.60
9.0	31.00
10.0	34.48
11.0	34.48
12.0	34.48
13.0	34.48
14.0	34.48
15.0	34.48
16.0	34.48
17.0	34.48
18.0	34.48
19.0	34.48
20.0	34.48
21.0	31.02
22.0	27.62
23.0	24.14
24.0	20.66
25.0	17.25
26.0	13.78
27.0	10.37
28.0	6.90
29.0	3.49
30.0	0.02
31.0	0.00
32.0	0.00
33.0	0.00
34.0	0.00
35.0	0.00
36.0	0.00
37.0	0.00
38.0	0.00
39.0	0.00
40.0	0.00
41.0	0.00
42.0	0.00
43.0	0.00
44.0	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
-----	0.0	0.0	0.00	479.12
3.5	3.1	3.5	0.21	479.39
10.4	12.5	13.4	0.45	479.70
17.2	28.6	29.8	0.57	479.90
24.1	51.3	52.7	0.71	480.15
31.0	80.7	82.3	0.80	480.36
37.9	116.8	118.6	0.90	480.61
44.8	159.6	161.5	0.99	480.84
51.7	209.1	211.3	1.09	481.10
58.6	265.4	267.7	1.14	481.34
65.5	328.5	330.9	1.20	481.61
69.0	394.9	397.5	1.28	481.83
69.0	461.1	463.8	1.37	482.06
69.0	527.2	530.1	1.43	482.26
69.0	593.2	596.2	1.47	482.46
69.0	659.2	662.2	1.51	482.66
69.0	725.0	728.1	1.55	482.85
69.0	790.8	794.0	1.58	483.03
69.0	856.6	859.8	1.62	483.21
69.0	922.2	925.5	1.65	483.39
69.0	987.8	991.2	1.69	483.56
65.5	1049.9	1053.3	1.72	483.72
58.6	1105.0	1108.5	1.75	483.86
51.8	1153.2	1156.8	1.77	483.98
44.8	1194.4	1198.0	1.79	484.08
37.9	1228.7	1232.3	1.81	484.17
31.0	1256.1	1259.7	1.82	484.23
24.2	1276.6	1280.3	1.83	484.28
17.3	1290.2	1293.9	1.84	484.31
10.4	1296.9	1300.6	1.84	484.33
3.5	1296.7	1300.4	1.84	484.33
0.0	1293.1	1296.7	1.84	484.32
0.0	1289.4	1293.1	1.84	484.31
0.0	1285.7	1289.4	1.84	484.30
0.0	1282.0	1285.7	1.83	484.29
0.0	1278.4	1282.0	1.83	484.28
0.0	1274.7	1278.4	1.83	484.27
0.0	1271.1	1274.7	1.83	484.27
0.0	1267.4	1271.1	1.83	484.26
0.0	1263.7	1267.4	1.83	484.25
0.0	1260.1	1263.7	1.82	484.24
0.0	1256.5	1260.1	1.82	484.23
0.0	1252.8	1256.5	1.82	484.22
0.0	1249.2	1252.8	1.82	484.21
0.0	1245.5	1249.2	1.82	484.21

POND-2 Version: 5.20 S/N:
EXECUTED: 01-30-1998 14:14:21

Return Freq: 15 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-015.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970015.HYD

INFLOW HYDROGRAPH

TIME (min)	INFLOW (cfs)
45.0	0.00
46.0	0.00
47.0	0.00
48.0	0.00
49.0	0.00
50.0	0.00
51.0	0.00
52.0	0.00
53.0	0.00
54.0	0.00
55.0	0.00
56.0	0.00
57.0	0.00
58.0	0.00
59.0	0.00
60.0	0.00
61.0	0.00
62.0	0.00
63.0	0.00
64.0	0.00
65.0	0.00
66.0	0.00
67.0	0.00
68.0	0.00
69.0	0.00
70.0	0.00
71.0	0.00
72.0	0.00
73.0	0.00
74.0	0.00
75.0	0.00
76.0	0.00
77.0	0.00
78.0	0.00
79.0	0.00
80.0	0.00
81.0	0.00
82.0	0.00
83.0	0.00
84.0	0.00
85.0	0.00
86.0	0.00
87.0	0.00
88.0	0.00
89.0	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	1241.9	1245.5	1.82	484.20
0.0	1238.3	1241.9	1.81	484.19
0.0	1234.7	1238.3	1.81	484.18
0.0	1231.0	1234.7	1.81	484.17
0.0	1227.4	1231.0	1.81	484.16
0.0	1223.8	1227.4	1.81	484.15
0.0	1220.2	1223.8	1.81	484.15
0.0	1216.6	1220.2	1.80	484.14
0.0	1213.0	1216.6	1.80	484.13
0.0	1209.4	1213.0	1.80	484.12
0.0	1205.8	1209.4	1.80	484.11
0.0	1202.2	1205.8	1.80	484.10
0.0	1198.6	1202.2	1.79	484.09
0.0	1195.0	1198.6	1.79	484.08
0.0	1191.4	1195.0	1.79	484.08
0.0	1187.9	1191.4	1.79	484.07
0.0	1184.3	1187.9	1.79	484.06
0.0	1180.7	1184.3	1.79	484.05
0.0	1177.1	1180.7	1.78	484.04
0.0	1173.6	1177.1	1.78	484.03
0.0	1170.0	1173.6	1.78	484.02
0.0	1166.5	1170.0	1.78	484.01
0.0	1162.9	1166.5	1.78	484.00
0.0	1159.4	1162.9	1.78	484.00
0.0	1155.8	1159.4	1.77	483.99
0.0	1152.3	1155.8	1.77	483.98
0.0	1148.7	1152.3	1.77	483.97
0.0	1145.2	1148.7	1.77	483.96
0.0	1141.7	1145.2	1.77	483.95
0.0	1138.1	1141.7	1.76	483.94
0.0	1134.6	1138.1	1.76	483.93
0.0	1131.1	1134.6	1.76	483.92
0.0	1127.6	1131.1	1.76	483.92
0.0	1124.1	1127.6	1.76	483.91
0.0	1120.5	1124.1	1.76	483.90
0.0	1117.0	1120.5	1.75	483.89
0.0	1113.5	1117.0	1.75	483.88
0.0	1110.0	1113.5	1.75	483.87
0.0	1106.5	1110.0	1.75	483.86
0.0	1103.0	1106.5	1.75	483.85
0.0	1099.6	1103.0	1.75	483.85
0.0	1096.1	1099.6	1.74	483.84
0.0	1092.6	1096.1	1.74	483.83
0.0	1089.1	1092.6	1.74	483.82
0.0	1085.6	1089.1	1.74	483.81

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

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-015.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970015.HYD

Starting Pond W.S. Elevation = 479.12 ft

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

Peak Inflow	=	34.48 cfs
Peak Outflow	=	1.84 cfs
Peak Elevation	=	484.33 ft

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

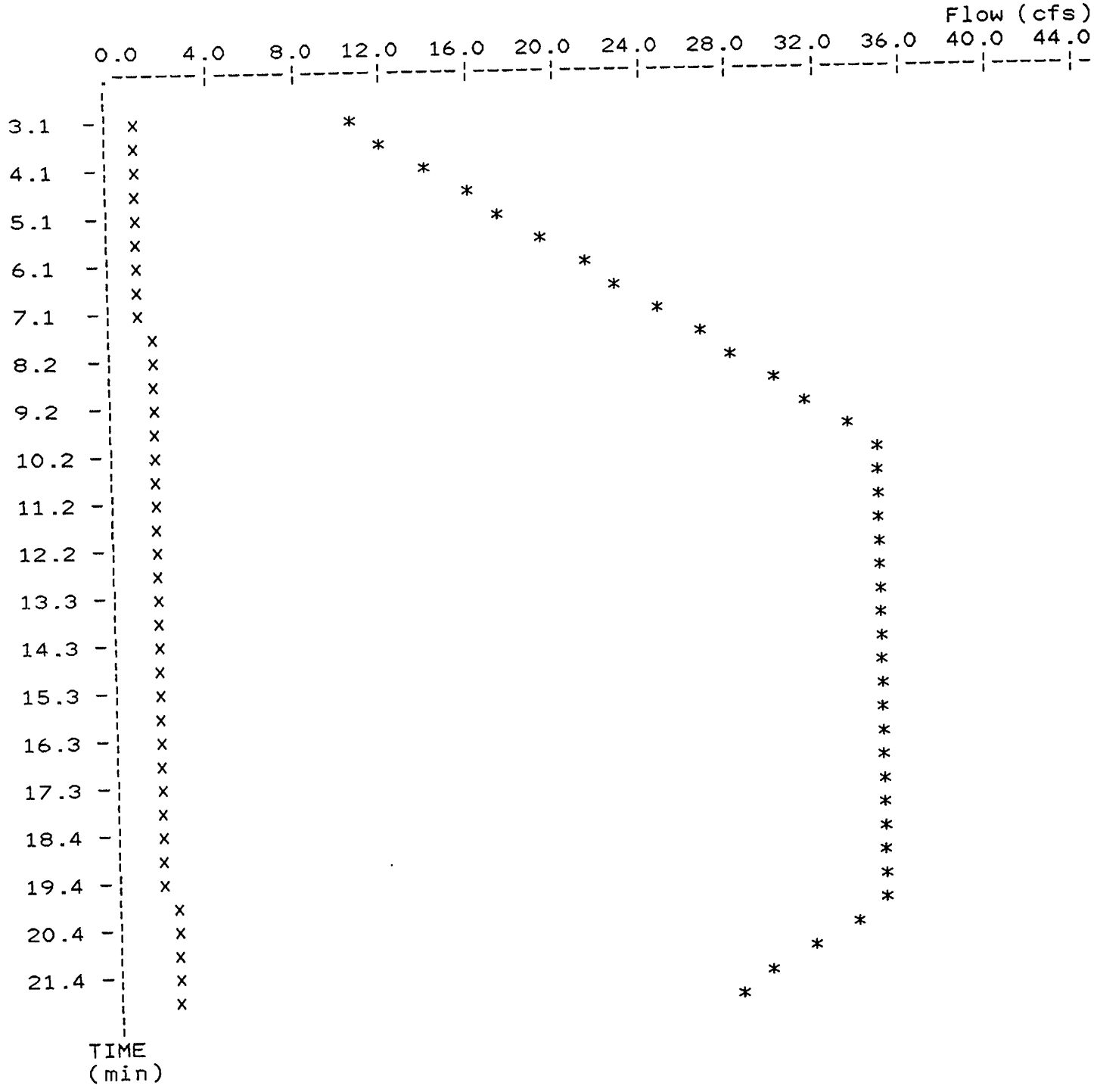
Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	0.89 ac-ft
Total Storage in Pond	=	0.89 ac-ft

POND-2 Version: 5.20 S/N:

Return Freq: 15 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-015.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970015.HYD
EXECUTED: 01-30-1998 14:14:21

Peak Inflow = 34.48 cfs
Peak Outflow = 1.84 cfs
Peak Elevation = 484.33 ft



x File: C:\WINDOWS\DESKTOP\PONDPA~1\91970015.HYD Qmax = 1.8 cfs
* File: C:\WINDOWS\DESKTOP\PONDPA~1\9197-015.HYD Qmax = 34.5 cfs

POND-2 Version: 5.20 S/N:
EXECUTED: 01-30-1998 14:14:21

Return Freq: 2 years

THE KNOLLS
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
JANUARY 5, 1998

Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-002.HYD
Rating Table file: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND

----INITIAL CONDITIONS----
Elevation = 479.12 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
479.12	0.0	0.000
479.62	0.4	0.004
480.12	0.7	0.033
480.62	0.9	0.082
481.12	1.1	0.147
481.62	1.2	0.229
482.12	1.4	0.332
482.62	1.5	0.445
483.12	1.6	0.567
483.62	1.7	0.696
484.12	1.8	0.834
484.62	1.9	0.980
485.12	2.0	1.134
485.62	2.0	1.298
486.12	2.1	1.470
486.62	2.2	1.651
487.12	2.3	1.841
487.62	2.4	2.041
488.12	2.4	2.250
488.62	2.5	2.470
489.12	2.6	2.699
489.62	2.6	2.939
490.12	2.7	3.189
490.62	2.7	3.450
491.12	2.8	3.722
491.62	2.9	4.005
492.12	2.9	4.301
492.62	3.0	4.608
493.12	3.0	4.926
493.62	3.1	5.257
494.00	3.1	5.517

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
6.1	6.5
47.3	48.0
118.9	119.8
213.1	214.2
333.2	334.4
481.7	483.1
646.7	648.2
823.1	824.7
1011.1	1012.8
1211.0	1212.8
1423.0	1424.9
1647.3	1649.3
1884.1	1886.1
2134.0	2136.1
2396.9	2399.1
2673.3	2675.6
2963.4	2965.8
3267.7	3270.1
3586.2	3588.7
3919.2	3921.8
4267.0	4269.6
4630.1	4632.8
5009.0	5011.7
5404.1	5406.9
5815.8	5818.7
6244.5	6247.4
6690.1	6693.1
7153.1	7156.1
7633.6	7636.7
8010.8	8013.9

Time increment (t) = 1.0 min.

POND-2 Version: 5.20 S/N:
EXECUTED: 01-30-1998 14:14:21

Return Freq: 2 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-002.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970002.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	479.12
1.0	2.12	2.1	1.9	2.1	0.13	479.28
2.0	4.20	6.3	7.4	8.2	0.41	479.64
3.0	6.32	10.5	16.9	17.9	0.48	479.76
4.0	8.40	14.7	30.5	31.6	0.58	479.92
5.0	10.52	18.9	48.0	49.4	0.70	480.13
6.0	12.58	23.1	69.6	71.1	0.76	480.28
7.0	14.70	27.3	95.2	96.8	0.84	480.46
8.0	16.83	31.5	124.9	126.7	0.91	480.66
9.0	18.90	35.7	158.6	160.6	0.99	480.84
10.0	21.02	39.9	196.4	198.5	1.07	481.04
11.0	21.03	42.1	236.2	238.5	1.12	481.22
12.0	21.03	42.1	276.0	278.3	1.15	481.39
13.0	21.03	42.1	315.7	318.0	1.19	481.55
14.0	21.03	42.1	355.2	357.7	1.23	481.70
15.0	21.03	42.1	394.7	397.3	1.28	481.83
16.0	21.03	42.1	434.1	436.8	1.34	481.96
17.0	21.03	42.1	473.4	476.2	1.39	482.10
18.0	21.03	42.1	512.6	515.5	1.42	482.22
19.0	21.03	42.1	551.8	554.7	1.44	482.34
20.0	21.03	42.1	590.9	593.9	1.47	482.46
21.0	18.92	40.0	627.9	630.9	1.49	482.57
22.0	16.84	35.8	660.6	663.7	1.51	482.66
23.0	14.72	31.6	689.1	692.2	1.52	482.74
24.0	12.59	27.3	713.4	716.5	1.54	482.81
25.0	10.52	23.1	733.4	736.5	1.55	482.87
26.0	8.41	18.9	749.2	752.3	1.56	482.91
27.0	6.33	14.7	760.8	763.9	1.57	482.95
28.0	4.21	10.5	768.2	771.4	1.57	482.97
29.0	2.13	6.3	771.4	774.6	1.57	482.98
30.0	0.01	2.1	770.4	773.5	1.57	482.98
31.0	0.00	0.0	767.3	770.4	1.57	482.97
32.0	0.00	0.0	764.1	767.3	1.57	482.96
33.0	0.00	0.0	761.0	764.1	1.57	482.95
34.0	0.00	0.0	757.9	761.0	1.56	482.94
35.0	0.00	0.0	754.8	757.9	1.56	482.93
36.0	0.00	0.0	751.6	754.8	1.56	482.92
37.0	0.00	0.0	748.5	751.6	1.56	482.91
38.0	0.00	0.0	745.4	748.5	1.56	482.90
39.0	0.00	0.0	742.3	745.4	1.56	482.90
40.0	0.00	0.0	739.2	742.3	1.55	482.89
41.0	0.00	0.0	736.1	739.2	1.55	482.88
42.0	0.00	0.0	733.0	736.1	1.55	482.87
43.0	0.00	0.0	729.9	733.0	1.55	482.86
44.0	0.00	0.0	726.8	729.9	1.55	482.85

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-002.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970002.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	723.7	726.8	1.54	482.84
46.0	0.00	0.0	720.6	723.7	1.54	482.83
47.0	0.00	0.0	717.5	720.6	1.54	482.83
48.0	0.00	0.0	714.5	717.5	1.54	482.82
49.0	0.00	0.0	711.4	714.5	1.54	482.81
50.0	0.00	0.0	708.3	711.4	1.54	482.80
51.0	0.00	0.0	705.2	708.3	1.53	482.79
52.0	0.00	0.0	702.2	705.2	1.53	482.78
53.0	0.00	0.0	699.1	702.2	1.53	482.77
54.0	0.00	0.0	696.1	699.1	1.53	482.76
55.0	0.00	0.0	693.0	696.1	1.53	482.76
56.0	0.00	0.0	690.0	693.0	1.53	482.75
57.0	0.00	0.0	686.9	690.0	1.52	482.74
58.0	0.00	0.0	683.9	686.9	1.52	482.73
59.0	0.00	0.0	680.8	683.9	1.52	482.72
60.0	0.00	0.0	677.8	680.8	1.52	482.71
61.0	0.00	0.0	674.8	677.8	1.52	482.70
62.0	0.00	0.0	671.7	674.8	1.52	482.70
63.0	0.00	0.0	668.7	671.7	1.51	482.69
64.0	0.00	0.0	665.7	668.7	1.51	482.68
65.0	0.00	0.0	662.7	665.7	1.51	482.67
66.0	0.00	0.0	659.6	662.7	1.51	482.66
67.0	0.00	0.0	656.6	659.6	1.51	482.65
68.0	0.00	0.0	653.6	656.6	1.50	482.64
69.0	0.00	0.0	650.6	653.6	1.50	482.64
70.0	0.00	0.0	647.6	650.6	1.50	482.63
71.0	0.00	0.0	644.6	647.6	1.50	482.62
72.0	0.00	0.0	641.6	644.6	1.50	482.61
73.0	0.00	0.0	638.6	641.6	1.50	482.60
74.0	0.00	0.0	635.6	638.6	1.49	482.59
75.0	0.00	0.0	632.7	635.6	1.49	482.58
76.0	0.00	0.0	629.7	632.7	1.49	482.57
77.0	0.00	0.0	626.7	629.7	1.49	482.56
78.0	0.00	0.0	623.7	626.7	1.49	482.55
79.0	0.00	0.0	620.7	623.7	1.49	482.55
80.0	0.00	0.0	617.8	620.7	1.48	482.54
81.0	0.00	0.0	614.8	617.8	1.48	482.53
82.0	0.00	0.0	611.9	614.8	1.48	482.52
83.0	0.00	0.0	608.9	611.9	1.48	482.51
84.0	0.00	0.0	606.0	608.9	1.48	482.50
85.0	0.00	0.0	603.0	606.0	1.47	482.49
86.0	0.00	0.0	600.1	603.0	1.47	482.48
87.0	0.00	0.0	597.1	600.1	1.47	482.47
88.0	0.00	0.0	594.2	597.1	1.47	482.47
89.0	0.00	0.0	591.2	594.2	1.47	482.46

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

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-002.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970002.HYD

Starting Pond W.S. Elevation = 479.12 ft

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

Peak Inflow	=	21.03 cfs
Peak Outflow	=	1.57 cfs
Peak Elevation	=	482.98 ft

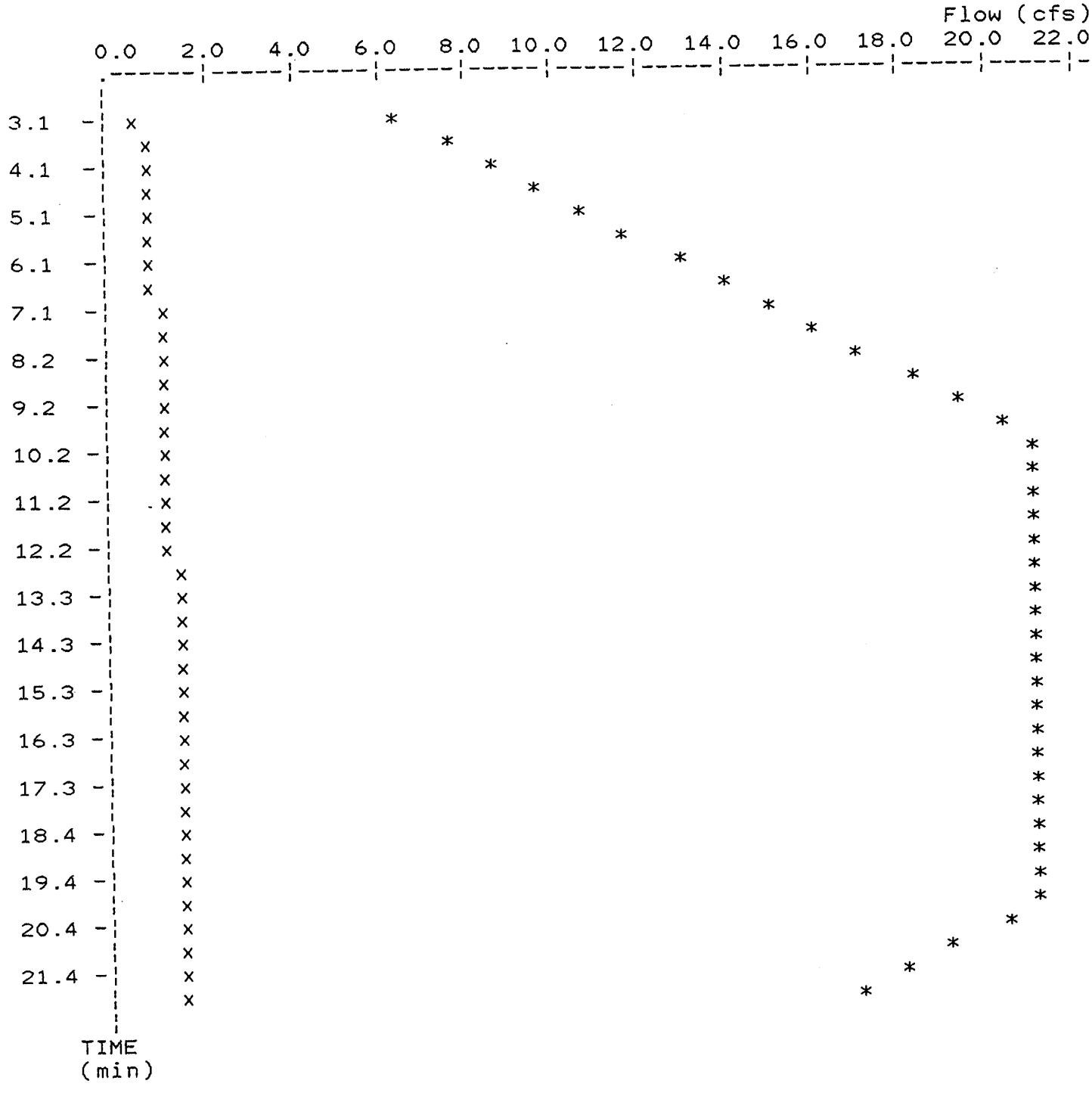
***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	0.53 ac-ft
Total Storage in Pond	=	0.53 ac-ft

Return Freq: 2 years

Pond File: C:\WINDOWS\DESKTOP\PONDPA~1\9197 .PND
Inflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\9197-002.HYD
Outflow Hydrograph: C:\WINDOWS\DESKTOP\PONDPA~1\91970002.HYD
EXECUTED: 01-30-1998 14:14:21

Peak Inflow = 21.03 cfs
Peak Outflow = 1.57 cfs
Peak Elevation = 482.98 ft



x File: C:\WINDOWS\DESKTOP\PONDPA~1\91970002.HYD Qmax = 1.6 cfs
* File: C:\WINDOWS\DESKTOP\PONDPA~1\9197-002.HYD Qmax = 21.0 cfs

10:39 AM 3/9/98

Channel Calculator

Given Input Data:

Shape	Advanced
Solving for	Depth of Flow
Flowrate	4.0000 cfs
Slope	0.0100 ft/ft
Manning's n	0.0500
Height	12.0000 in
Bottom width	0.0000 in
Left radius	0.0000 in
Right radius	0.0000 in
Left slope	3.0000 ft/ft
Right slope	3.0000 ft/ft

Computed Results:

Depth	10.7058 in
Velocity	1.6752 fps
Flow area	2.3878 ft2
Flow perimeter	67.7091 in
Hydraulic radius	5.0782 in
Top width	64.2345 in
Area	3.0000 ft2
Perimeter	75.8947 in
Percent full	89.2146 %

Critical Information

Critical depth	7.7243 in
Critical slope	0.0570 ft/ft
Critical velocity	3.2179 fps
Critical area	1.2430 ft2
Critical perimeter	48.8531 in
Critical hydraulic radius	3.6640 in
Critical top width	46.3461 in
Specific energy	0.9358 ft
Minimum energy	0.9655 ft
Froude number	0.4422
Flow condition	Subcritical

Weir Calculator

Given Input Data:

Weir Type	Rectangular
Equation	Suppressed
Solving for	Depth of Flow
Flowrate	219.9000 cfs
Coefficient	2.6000
Height	24.0000 in

Computed Results:

Depth of Flow	11.4358 in
Full Flow	668.5648 cfs
Velocity	13.5735 fps
Width	204.0000 in
Area	34.0000 ft2
Perimeter	252.0000 in
Wet Perimeter	226.8716 in
Wet Area	16.2007 ft2
Percent Full	47.6491 %

Weir Calculator

Given Input Data:

Weir Type	Rectangular
Equation	Suppressed
Solving for	Depth of Flow
Flowrate	151.0800 cfs
Coefficient	2.6000
Height	24.0000 in

Computed Results:

Depth of Flow	8.9040 in
Full Flow	668.5648 cfs
Velocity	11.9771 fps
Width	204.0000 in
Area	34.0000 ft2
Perimeter	252.0000 in
Wet Perimeter	221.8081 in
Wet Area	12.6140 ft2
Percent Full	37.1001 %

Weir Calculator

Given Input Data:

Weir Type	Rectangular
Equation	Suppressed
Solving for	Depth of Flow
Flowrate	108.5900 cfs
Coefficient	2.6000
Height	24.0000 in

Computed Results:

Depth of Flow	7.1446 in
Full Flow	668.5648 cfs
Velocity	10.7287 fps
Width	204.0000 in
Area	34.0000 ft2
Perimeter	252.0000 in
Wet Perimeter	218.2891 in
Wet Area	10.1215 ft2
Percent Full	29.7690 %

BAX ENGINEERING
Engineering - Planning - Surveying

1052 South Cloverleaf Drive
St. Peters, MO 63376-6445
314-928-5552
FAX 928-1718

SHEET 1 of 1

Project: The Knolls
Date: 3-9-99 Project No: 97-9197
Designed: KEEBLER Checked: _____

ANTI-SEEP COLLAR DESIGN

Use 100yr/20 minute H.W. Elev. = 486.44 ft,
Flowline of pipe outflow = 479.12 ft.

Solution: Determine the length of pipe within the saturated zone of the embankment.

$$L_s = y(z+4)\left[1 + \frac{\text{Pipe slope}}{0.25 - \text{pipe slope}}\right]$$

$$L_s = 7.32'(3+4)\left[1 + \frac{0.01}{0.25 - 0.01}\right]$$

$$L_s = 53.38 \text{ feet}$$

Use Table 1 - to use to find number and size of collars.

Pipe diameter - 2.50 feet

No 2 Collars

Size = 6.30' x 6.30'

Design 2 anti-seep Collars (6.30' x 6.30')
Place both of the anti-seep collars within the saturation zone as shown on the profiles.

ANTI-SEEP COLLAR DESIGN

This procedure provides the anti-seep collar dimensions for only temporary sediment basins to increase the seepage length by 15% for various pipe slopes, embankment slopes and riser heights.

The first step in designing anti-seep collars is to determine the length of pipe within the saturated zone of the embankment. This can be done graphically or by the following equation, assuming that the upstream slope of the embankment intersects the invert of the pipe at its upstream end. (See embankment-invert intersection on the drawing below:

$$L_s = y\ (z + 4) \left[1 + \frac{\text{pipe slope}}{0.25\text{-pipe slope}}\right]$$

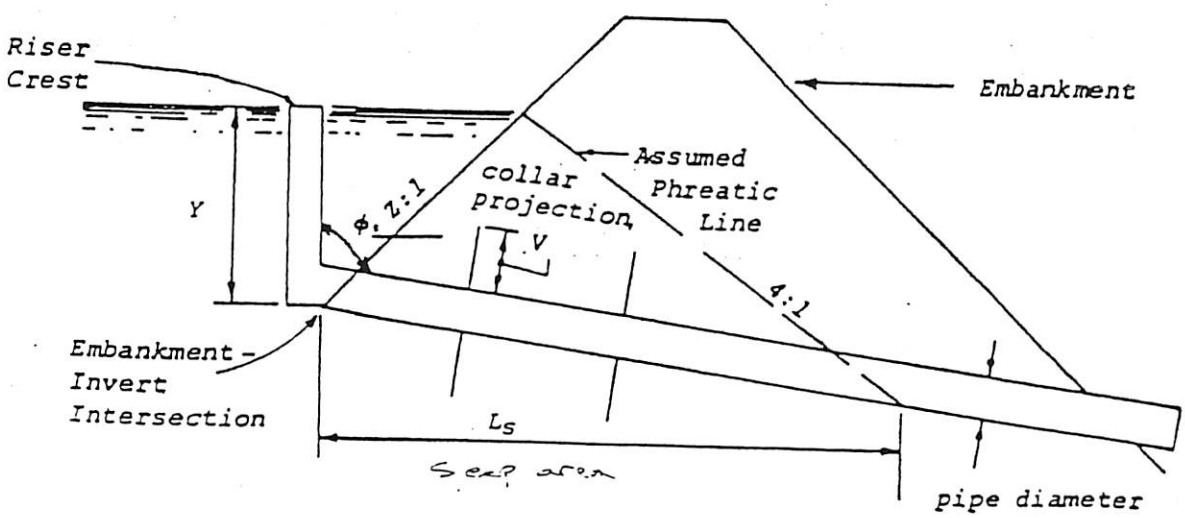
where: L_s = length of pipe in the saturated zone (ft.)

y = distance in feet from upstream invert of pipe to highest normal water level expected to occur during the life of the structure, usually the top of the riser.

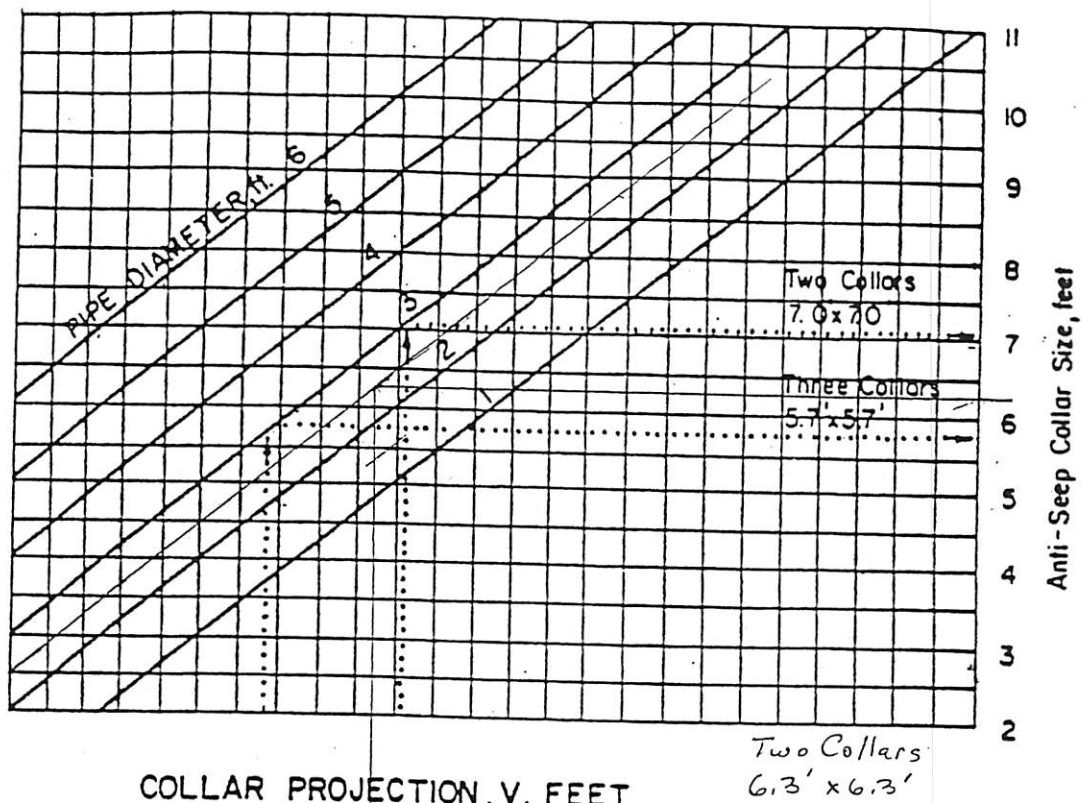
z = slope of upstream embankment as a ratio of z ft. horizontal to one ft. vertical.

pipe slope = slope of pipe in feet per foot.

This procedure is based on the approximation of the phreatic line as shown in the drawing below:

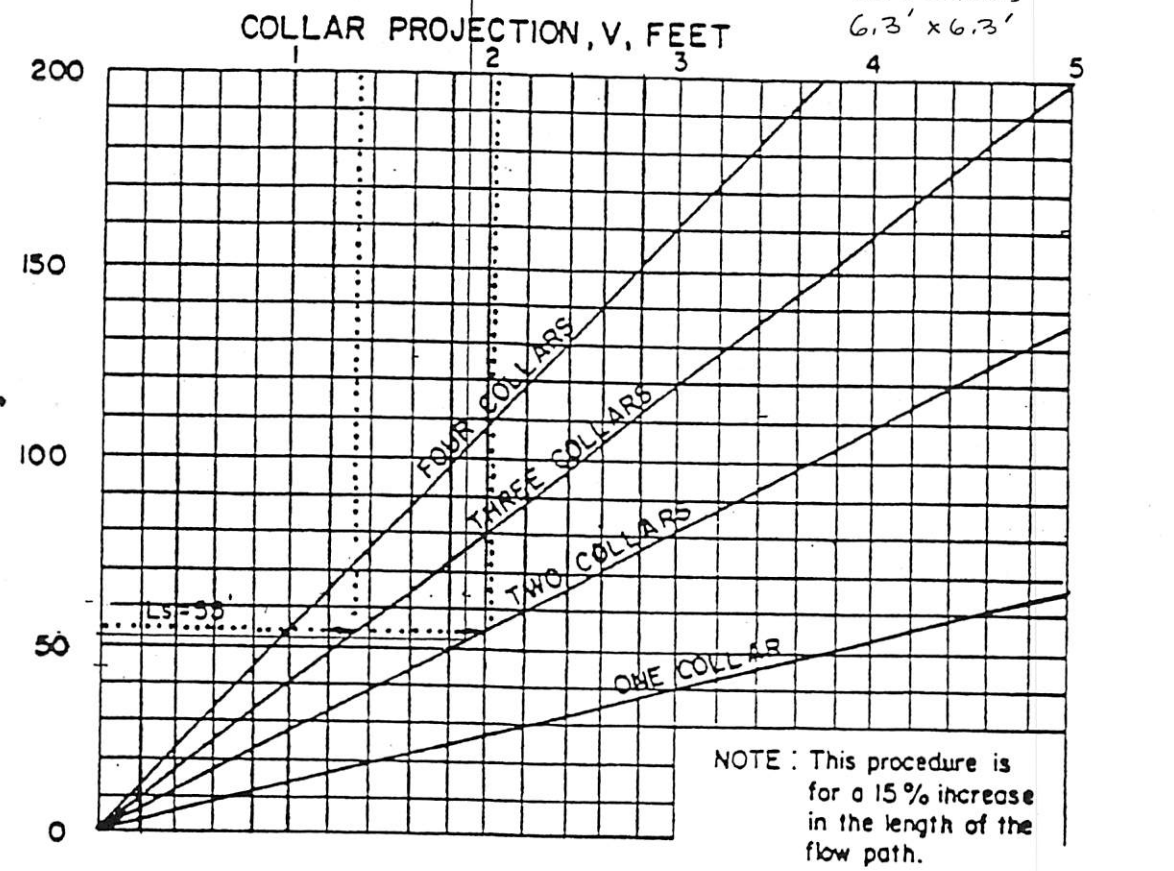


ANTI-SEEP COLLAR DESIGN



D = 2.50 ft.

Two Collars
6.3' x 6.3'



L_s = 53.38 ft.

ENGINEERING

PLANNING

SURVEYING

DATE: March 9, 1998

TO: City of O'Fallon
Attn: Joan Gallup
138 South Main Street
O'Fallon, MO 63366

RE: The Knolls
BAX PROJECT NO. 97-9197

ATTACHED ARE:

QUANTITY	DESCRIPTION
4 Sets	Revised Construction Plans
4 Copies	Revised Hydraulic Calculations
1 Copy	Inlet control on FE49
1 Copy	F.I.R.M. Map and Flood Profiles
1 Copy	Spillway Calculations
1 Copy	Swale Calculations
1 Original	Flood Plain Development Application
1 Copy	C.O.E. Permit

THESE ARE TRANSMITTED FOR:

( ) As You Requested	( ) For Your Information
( ) Review and Approval	( ) Address Assignment
( ) Grading Permit	( ) Fire Hydrant Recommendation
(X) Final Approval/Required Sets	( ) Easement Requests

REMARKS: Please review and approve the revised construction plans and send us one stamped and approved set of plans for our file. Any questions please call me. Thank You.

(X) PLEASE RETURN 1 PLAN(S) WITH INFORMATION REQUESTED

SINCERELY,

Michael Keebler

Michael R. Keebler, E.I.T.

cc: Jerry Schneidegger

BAX ENGINEERING CO., INC.
1052 South Cloverleaf Drive
St. Peters, MO 63376-6445
314-928-5552 FAX 928-1718
e-mail: baxeng@msn.com

ENGINEERING

PLANNING

SURVEYING

SILTATION/SEDIMENT STORAGE CALCULATIONS
The Knolls - O'Fallon
BAX PROJECT NO. 97-9197
DECEMBER 23, 1997

Siltation/Sediment storage will be provided by over excavation of the basin. The following calculations are based on a nomograph provided by the City of O'Fallon.

Total disturbed area tributary to lake	31.7 AC.
Rational Method "C" Factor	0.40 %

FROM FIGURE 1:

The required siltation volume for 2 year construction period:

260 Cu.Ft./Ac. x 31.7 Ac. = 8,242 Cu.Ft.

Volume Calculations:

ELEVATION	OVER-EX* AREA Sq.Ft.	(-) FINAL AREA Sq.Ft.	(=) SUM AREA Sq.Ft.	DEPTH Ft.	TOTAL VOLUME Cu.Ft.
481.0	8,134	0	8,134		0
482.0	9,419	3,069	6,350	1.0	7,242
483.0	10,772	7,565	3,207	1.0	4,779
484.0	12,188	12,188	0	1.0	6,382

* over-excavated area above basin outflow.

ELEVATION	AREA Sq.Ft.	DEPTH Ft.	VOLUME Cu.Ft.	
481.0	8,134	0.0	0	
480.0	6,918	1.0	7,526	
479.5	6,335	0.5	11,143	(> 8,242)

Based on the above calculations the basin will be required to be over-excavated 1.5' (see site plan) to provide storage for the anticipated siltation. 6,382 cubic feet of storage above the basin outflow is also provided for sediment storage.

BAX ENGINEERING CO., INC.
1052 South Cloverleaf Drive
St. Peters, MO 63376-6445
314-928-5552 FAX 928-1718

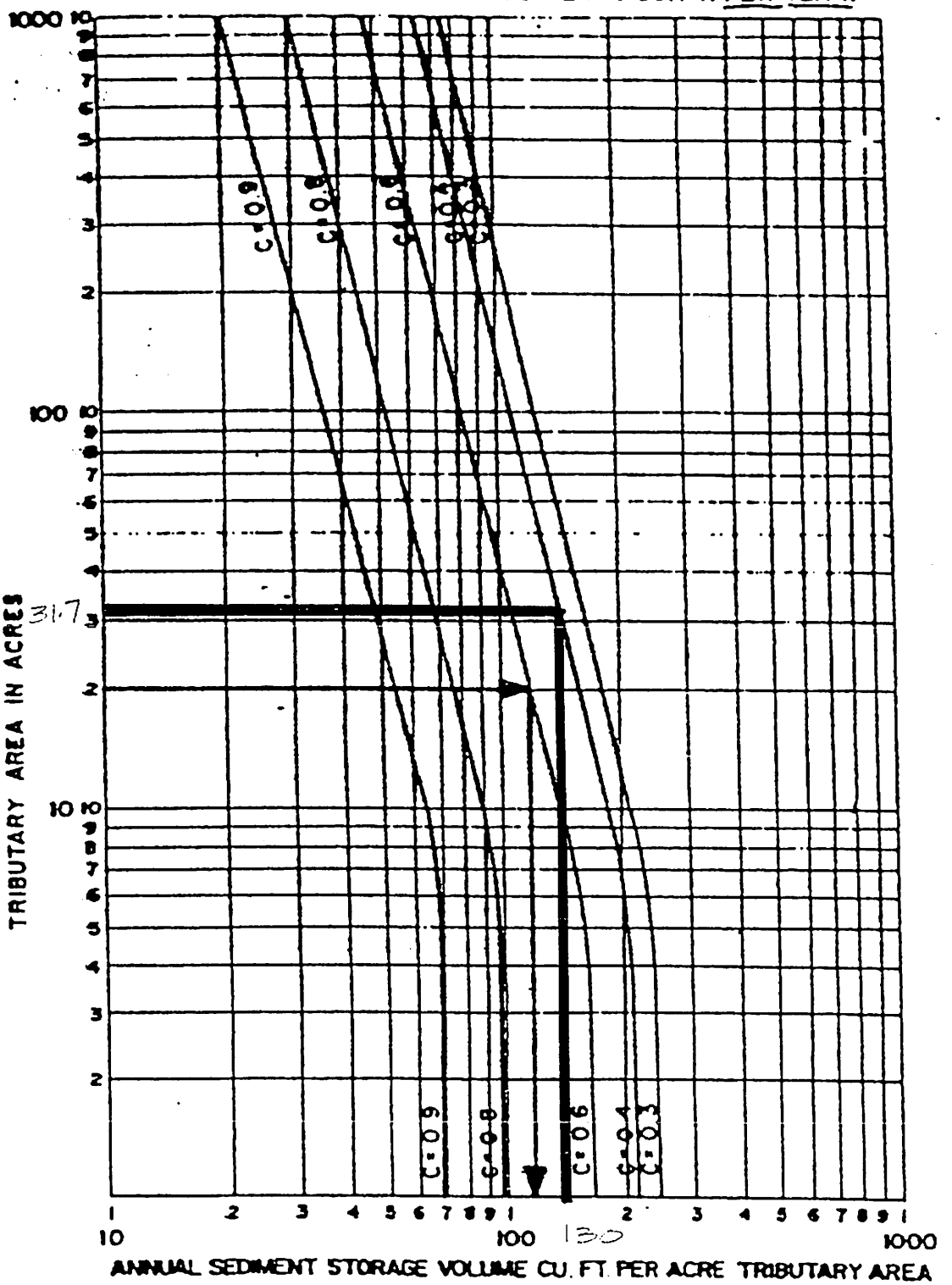
EXAMPLE:

TRIBU :YAREA = 20 ACRES

RATIONAL METHOD RUNOFF COEFFICIENT "C" = 0.6

SEDIMENT STORAGE = 120 CU. FT. PER ACRE PER YEAR

TOTAL SEDIMENT STORAGE = 120 X 20 = 2400 CU. FT. PER YEAR.



130 x 2 = 260

ANNUAL SEDIMENT STORAGE

FIG. 6