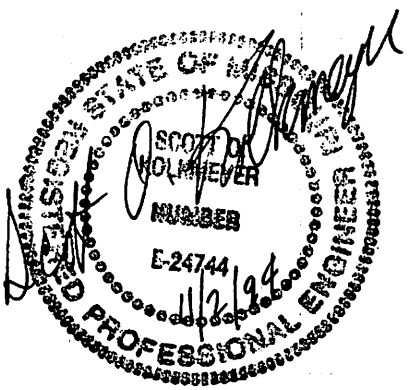
BAX ENGINEERING

Project: WINTERHAVEN
Date: 10/27/94 Project No: 94-5208
Designed: _____ Checked: _____

STORMWATER DETENTION ANALYSIS
WINTERHAVEN
PREPARED BY: BAX ENGINEERING CO., INC.
OCTOBER 27, 1994

INTRODUCTION

The purpose of this analysis is to analyze the stormwater detention basin proposed for "WINTERHAVEN" a single family residential subdivision to be located in the City of O'fallon MO. The basin shall be designed to meet City of O'fallon requirements such that the storage volume and outflow rates are proportional 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 predeveloped conditions for the design 25 year-20 minute duration storm. Detention for the increased runoff of the 100 year-20 minute design storm shall also be checked.



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St. Charles, MO 63301

314-946-6588
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GENERAL SITE DATA & RUNOFF CALCULATIONS

1.) Area of tract = 56.85 A^c
Area of common ground = 1.182 A^c
Area of park ground = 17.634 A^c
Developed area = 38.034 A^c

2.) The pre-developed P.I. factors to be used for the analysis are:
(Assumed 0%-5% impervious)

25 year-20 minute storm: 2.31 c.f.s./A^c
100 year-20 minute storm: 2.95 c.f.s./A^c

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

25 year-20 minute storm: 3.26 c.f.s./A^c
100 year-20 minute storm: 4.17 c.f.s./A^c

4.) The required attenuation due to development is estimated at:

25 year-20 minute storm: $38.034 A^c \times (3.26 \text{ c.f.s./} A^c - 2.31 \text{ c.f.s./} A^c) = 36.13$ c.f.s.
100 year-20 minute storm: $38.034 A^c \times (4.17 \text{ c.f.s./} A^c - 2.95 \text{ c.f.s./} A^c) = 46.40$ c.f.s.

5.) From the Drainage Area Map of the project the peak inflow to the basin is found as:

$Q_{15/20} = 58.73$ c.f.s.
$Q_{25/20} = 1.234 \times 58.73$ c.f.s. $= 72.47$ c.f.s.
$Q_{100/20} = 1.58 \times 58.73$ c.f.s. $= 92.79$ c.f.s.

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6.) The permitted release rates of the detention basin is found by subtracting the required attenuation from the peak inflow to the basin. The Permitted release rates therefore are as follows:

25 year-20 minute storm: 72.47 c.f.s. − 36.13 c.f.s. = 36.34 c.f.s.
100 year-20 minute storm: 92.79 c.f.s. − 46.40 c.f.s. = 46.39 c.f.s.

7.) Of the flows that will inflow to the proposed detention basin, the most remote point of origination lies approximately 1715 feet upstream of the basin. Because the area shall be served by a storm sewer system, the travel time will be estimated by assuming an average velocity of 7 ft./sec. The travel time is then estimated as 1715 feet/7 ft./sec = 4.08 minutes. Therefore the time of concentration to be used for the analysis shall be 4 minutes.

8.) A computer program "PONDPACK" shall be utilized in routing the design storm through the basin. The routing calculations are attached as Exhibits 'A', 'B', and 'C'. Exhibit 'C' is a routing of the 15 year -20 minute storm. Its purpose is only to provide the 15 year-20 minute storm highwater of the detention basin.

9.) The basin shall discharge to area within the limits of the 100 year special flood hazard area. The 100 year flood elevation per the latest F.I.R.M. is 516. Therefore the design storms shall be routed assuming the water elevation at 516. Any volume within the detention basin below elevation 516 will not be counted. Two calculations are to be made. One estimates the discharge being at weir flow at elevation 516 and is shown in Exhibit 'C'. (This is a rough approximation for a submerged weir) The other estimates the flow being orific flow with the orifice partially submerged as shown in Exhibit 'A'. The worst estimates, that being the highest peak elevation of Exhibit 'A' and 'B' and the highest peak outflow of Exhibits 'A' and 'B' for the respective design storms will be used. The results are as follows:

25 YEAR-20 Minute Storm:
Peak Discharge = 32.72 c.f.s. (< 36.34 c.f.s. ✓) Sheet A-9
Peak Elevation = 519.43 (Top Berm = 522 ; 522 − 519.43 = 2.57' > 2.0' ✓) Sheet B-12

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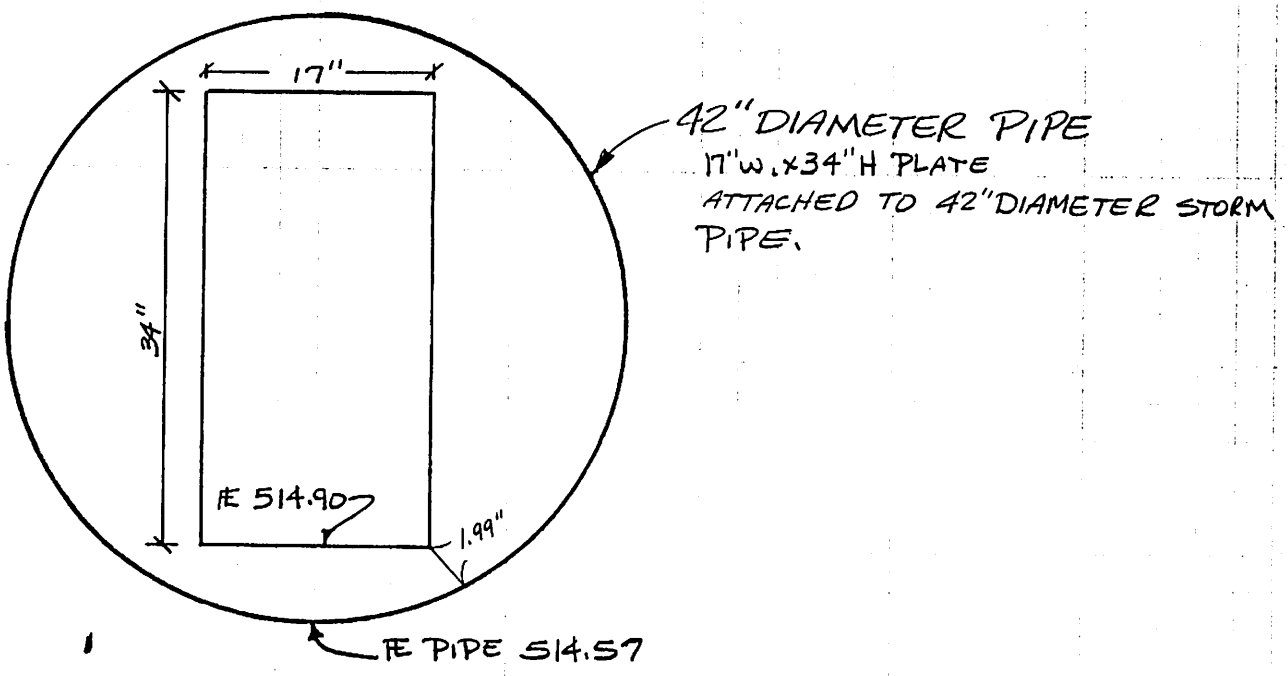
100 year - 20 Minute Storm:
Peak Discharge = 37.38 c.f.s. (< 46.39 c.f.s. ✓) Sheet A-13
Peak Elevation = 520.19 (Top Berm = 522; 522 - 520.19 = 1.81' > 1.0' ✓) Sheet B-17

15 year - 20 Minute Storm
Peak Elevation = 518.88

DISCHARGE STRUCTURE DETAIL



NO SCALE

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S/N:

WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994

CALCULATED 11-01-1994 15:04:47
DISK FILE: WINTR .VOL

Planimeter scale: 1 inch = 50 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
516.00	6.97	0.40	0.00	0.00	0.00
518.00	8.21	0.47	1.31	0.87	0.87
520.00	9.50	0.55	1.52	1.02	1.89
522.00	11.05	0.63	1.77	1.18	3.07

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

Outlet Structure File: WINTR .STR

POND-2 Version: 3.17 S/N:
Date Executed: Time Executed:

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WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

Elevation (ft)	Q (cfs)	Contributing Structures
516.00	0.0	1
516.50	13.7	1
517.00	19.3	1
517.50	23.7	1
518.00	27.3	1
518.50	30.6	1
519.00	33.5	1
519.50	36.2	1
520.00	38.7	1
520.50	41.0	1
521.00	43.2	2 +1
521.50	55.9	2 +1
522.00	0.0	

EXHIBIT 'A'

A-1

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

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WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

Outlet Structure File: WINTR .STR
Planimeter Input File: WINTR .VOL
Rating Table Output File: WINTR .PND

Min. Elev.(ft) = 516 Max. Elev.(ft) = 522 Incr.(ft) = .5

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

****
SYSTEM CONNECTIVITY
****

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

Outflow rating table summary was stored in file:
WINTR .PND

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	521.00
E2 elev.(ft)?	522.00
Weir coefficient?	3
Weir elev.(ft)?	521.00
Length (ft)?	10
Contracted/Suppressed (C/S)?	S

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	516.00
E2 elev.(ft)?	522.00
Orifice coeff.?	0.6
Invert elev.(ft)?	514.90
Datum elev.(ft) ?	516.00
Orifice area (sq ft)?	4.0139

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

Outflow Rating Table for Structure #2
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
516.00	0.0	E < Inv.El.= 521
516.50	0.0	E < Inv.El.= 521
517.00	0.0	E < Inv.El.= 521
517.50	0.0	E < Inv.El.= 521
518.00	0.0	E < Inv.El.= 521
518.50	0.0	E < Inv.El.= 521
519.00	0.0	E < Inv.El.= 521
519.50	0.0	E < Inv.El.= 521
520.00	0.0	E < Inv.El.= 521
520.50	0.0	E < Inv.El.= 521
521.00	0.0	H =0.0
521.50	10.6	H =.5
522.00	0.0	E = or > E2=522.00

C = 3 L (ft) = 10
H (ft) = Table elev. - Invert elev. (521 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

Outflow Rating Table for Structure #1
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
516.00	0.0	H =0.0
516.50	13.7	H =.5
517.00	19.3	H =1.0
517.50	23.7	H =1.5
518.00	27.3	H =2.0
518.50	30.6	H =2.5
519.00	33.5	H =3.0
519.50	36.2	H =3.5
520.00	38.7	H =4.0
520.50	41.0	H =4.5
521.00	43.2	H =5.0
521.50	45.3	H =5.5
522.00	0.0	E = or) E2=522.00

C = .6 A = 4.0139 sq.ft.
H (ft) = Table elev. - Datum elev. (516 ft)
Q (cfs) = C * A * sqr(2g * H)

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*********************************************
*                                           *
*                WINTERHAVEN                *
*     DETENTION ANALYSIS  25 YEAR STORM     *
*  PREPARED BY: BAX ENGINEERING CO., INC.   *
*              NOVEMBER 1, 1994             *
*                                           *
*********************************************
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Inflow Hydrograph: WINTR25 .HYD
Rating Table file: WINTR .PND

----INITIAL CONDITIONS----
Elevation = 516.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
516.00	0.0	0.000
516.50	13.7	0.204
517.00	19.3	0.418
517.50	23.7	0.640
518.00	27.3	0.871
518.50	30.6	1.111
519.00	33.5	1.360
519.50	36.2	1.619
520.00	38.7	1.887
520.50	41.0	2.165
521.00	43.2	2.454
521.50	55.9	2.754

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
296.9	310.6
606.4	625.7
928.8	952.5
1264.4	1291.7
1613.2	1643.8
1975.1	2008.6
2350.5	2386.7
2739.5	2778.2
3143.2	3184.2
3562.7	3605.9
3998.4	4054.3

Time increment (t) = 1.0 min.

Pond File: WINTR .PND
Inflow Hydrograph: WINTR25 .HYD
Outflow Hydrograph: OUT .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	516.00
1.0	18.12	18.1	16.5	18.1	0.80	516.03
2.0	36.24	54.4	64.6	70.9	3.13	516.11
3.0	54.35	90.6	141.5	155.2	6.85	516.25
4.0	72.47	126.8	244.7	268.3	11.84	516.43
5.0	72.47	144.9	359.4	389.6	15.10	516.63
6.0	72.47	144.9	470.1	504.3	17.14	516.81
7.0	72.47	144.9	576.8	615.0	19.11	516.98
8.0	72.47	144.9	680.5	721.7	20.59	517.15
9.0	72.47	144.9	781.5	825.5	21.99	517.31
10.0	72.47	144.9	879.7	926.4	23.35	517.46
11.0	72.47	144.9	975.7	1024.7	24.47	517.61
12.0	72.47	144.9	1069.7	1120.7	25.49	517.75
13.0	72.47	144.9	1161.7	1214.6	26.48	517.89
14.0	72.47	144.9	1251.7	1306.6	27.44	518.02
15.0	72.47	144.9	1340.1	1396.7	28.28	518.15
16.0	72.47	144.9	1426.8	1485.1	29.11	518.27
17.0	72.47	144.9	1511.9	1571.8	29.93	518.40
18.0	72.47	144.9	1595.4	1656.9	30.70	518.52
19.0	72.47	144.9	1677.7	1740.4	31.37	518.63
20.0	72.47	144.9	1758.5	1822.6	32.02	518.75
21.0	54.35	126.8	1820.3	1885.4	32.52	518.83
22.0	36.24	90.6	1845.5	1910.9	32.72	518.87
23.0	18.12	54.4	1834.6	1899.8	32.64	518.85
24.0	0.00	18.1	1788.2	1852.7	32.26	518.79
25.0	0.00	0.0	1724.7	1788.2	31.75	518.70

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

Pond File: WINTR .PND
Inflow Hydrograph: WINTR25 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 516.00 ft

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

Peak Inflow	=	72.47 cfs
Peak Outflow	=	32.72 cfs
Peak Elevation	=	518.87 ft

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

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.29 ac-ft
Total Storage in Pond	=	1.29 ac-ft

Pond File: WINTR .PND
Inflow Hydrograph: WINTR25 .HYD
Outflow Hydrograph: OUT .HYD

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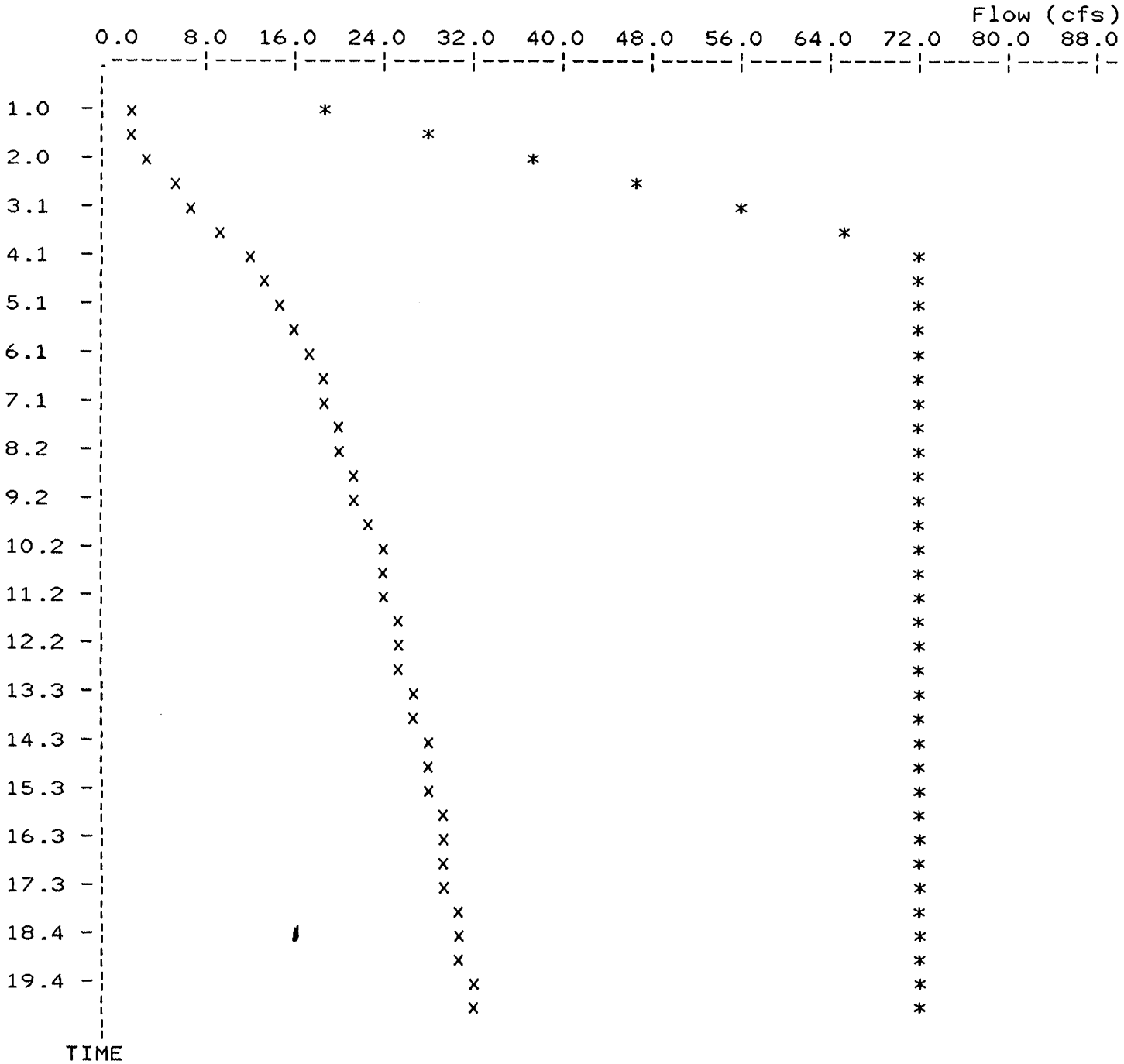
Peak Inflow = 72.47 cfs
Peak Outflow = 32.72 cfs
Peak Elevation = 518.87 ft



x File: WINTR25 .HYD Qmax = 32.7 cfs
* File: OUT .HYD Qmax = 72.5 cfs

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*********************************************
*                                           *
*                WINTERHAVEN                *
*    DETENTION ANALYSIS  100 YEAR STORM     *
*  PREPARED BY: BAX ENGINEERING CO., INC.   *
*             NOVEMBER 1, 1994              *
*                                           *
*********************************************
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Inflow Hydrograph: WINTR100.HYD
Rating Table file: WINTR .PND

----INITIAL CONDITIONS----
Elevation = 516.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
516.00	0.0	0.000
516.50	13.7	0.204
517.00	19.3	0.418
517.50	23.7	0.640
518.00	27.3	0.871
518.50	30.6	1.111
519.00	33.5	1.360
519.50	36.2	1.619
520.00	38.7	1.887
520.50	41.0	2.165
521.00	43.2	2.454
521.50	55.9	2.754

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
296.9	310.6
606.4	625.7
928.8	952.5
1264.4	1291.7
1613.2	1643.8
1975.1	2008.6
2350.5	2386.7
2739.5	2778.2
3143.2	3184.2
3562.7	3605.9
3998.4	4054.3

Time increment (t) = 1.0 min.

Pond File: WINTR .PND
Inflow Hydrograph: WINTR100.HYD
Outflow Hydrograph: OUT .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	516.00
1.0	23.20	23.2	21.2	23.2	1.02	516.04
2.0	46.40	69.6	82.7	90.8	4.00	516.15
3.0	69.59	116.0	181.2	198.7	8.77	516.32
4.0	92.79	162.4	315.0	343.6	14.29	516.55
5.0	92.79	185.6	466.4	500.6	17.08	516.80
6.0	92.79	185.6	612.7	652.0	19.65	517.04
7.0	92.79	185.6	755.0	798.3	21.62	517.26
8.0	92.79	185.6	893.5	940.6	23.54	517.48
9.0	92.79	185.6	1029.0	1079.1	25.04	517.69
10.0	92.79	185.6	1161.6	1214.6	26.48	517.89
11.0	92.79	185.6	1291.6	1347.2	27.82	518.08
12.0	92.79	185.6	1419.1	1477.2	29.04	518.26
13.0	92.79	185.6	1544.2	1604.7	30.23	518.44
14.0	92.79	185.6	1667.2	1729.8	31.28	518.62
15.0	92.79	185.6	1788.3	1852.8	32.26	518.79
16.0	92.79	185.6	1907.4	1973.8	33.22	518.95
17.0	92.79	185.6	2024.8	2093.0	34.10	519.11
18.0	92.79	185.6	2140.5	2210.4	34.94	519.27
19.0	92.79	185.6	2254.5	2326.1	35.77	519.42
20.0	92.79	185.6	2367.0	2440.1	36.54	519.57
21.0	69.59	162.4	2455.2	2529.4	37.11	519.68
22.0	46.40	116.0	2496.4	2571.2	37.38	519.74
23.0	23.20	69.6	2491.3	2566.0	37.35	519.73
24.0	0.00	23.2	2440.5	2514.5	37.02	519.66
25.0	0.00	0.0	2367.4	2440.5	36.54	519.57

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

Pond File: WINTR .PND
Inflow Hydrograph: WINTR100.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 516.00 ft

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

Peak Inflow	=	92.79 cfs
Peak Outflow	=	37.38 cfs
Peak Elevation	=	519.74 ft

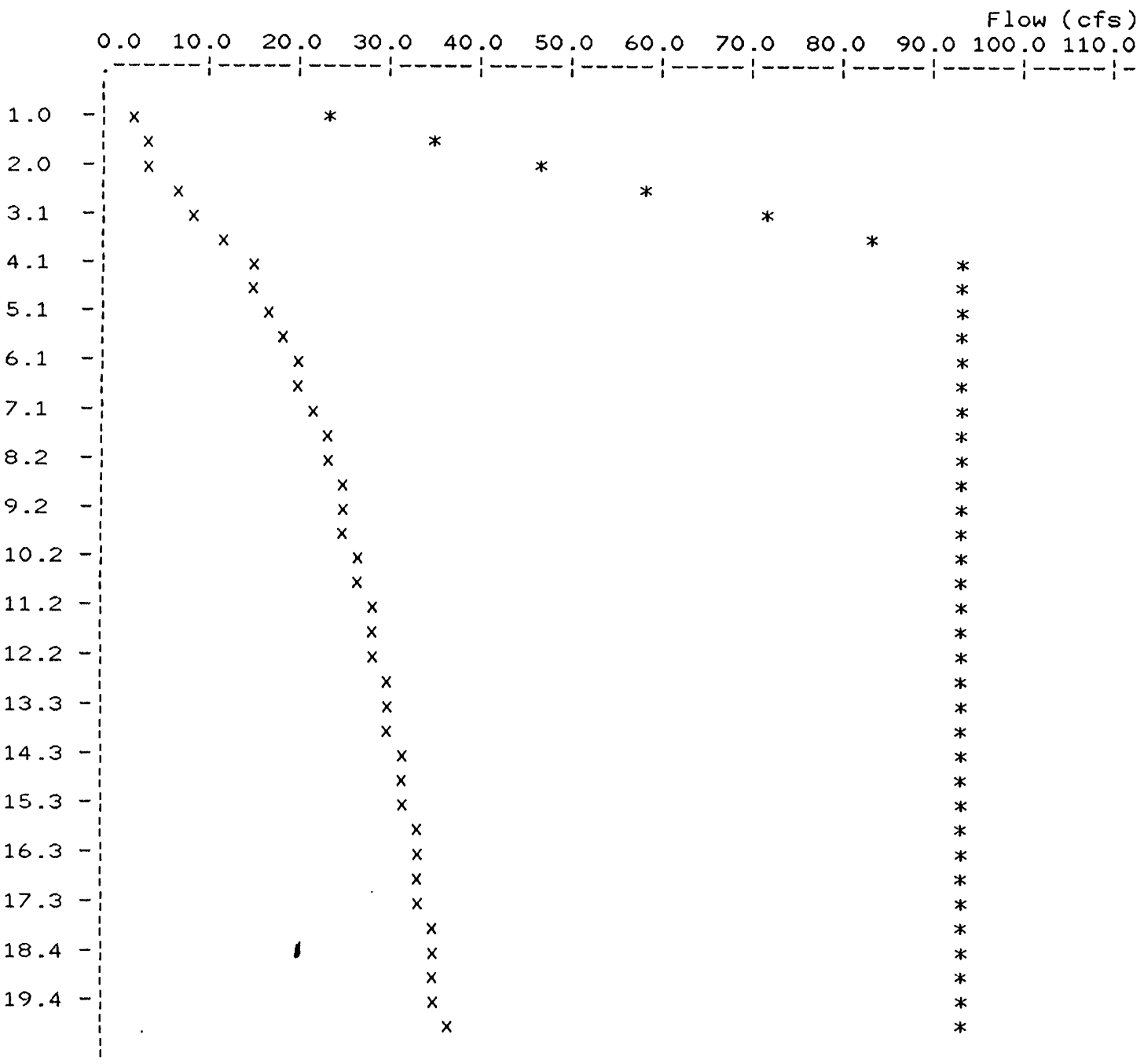
***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.75 ac-ft
Total Storage in Pond	=	1.75 ac-ft

Pond File: WINTR .PND
Inflow Hydrograph: WINTR100.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-01-1994
14:26:16

Peak Inflow = 92.79 cfs
Peak Outflow = 37.38 cfs
Peak Elevation = 519.74 ft



x File: WINTR100.HYD Qmax = 37.4 cfs
* File: OUT .HYD Qmax = 92.8 cfs

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

Elevation (ft)	Q (cfs)	Contributing Structures
516.00	0.0	1
516.50	1.5	1
517.00	4.3	1
517.50	7.8	1
518.00	12.0	1
518.50	16.8	1
519.00	22.1	1
519.50	27.8	1
520.00	34.0	1
520.50	40.6	1
521.00	43.2	3 +2
521.50	55.9	3 +2
522.00	0.0	

EXHIBIT 'B'

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

Outlet Structure File: WINTR .STR
Planimeter Input File: WINTR .VOL
Rating Table Output File: WINTR .PND

Min. Elev.(ft) = 516 Max. Elev.(ft) = 522 Incr.(ft) = .5

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

****
SYSTEM CONNECTIVITY
****

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

Outflow rating table summary was stored in file:
WINTR .PND

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	521.00
E2 elev.(ft)?	522.00
Weir coefficient?	3
Weir elev.(ft)?	521.00
Length (ft)?	10
Contracted/Suppressed (C/S)?	S

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	516.00
E2 elev.(ft)?	522.00
Weir coefficient?	3
Weir elev.(ft)?	516.00
Length (ft)?	1.4167
Contracted/Suppressed (C/S)?	S

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	516.00
E2 elev.(ft)?	522.00
Orifice coeff.?	0.6
Invert elev.(ft)?	514.90
Datum elev.(ft) ?	516.00
Orifice area (sq ft)?	4.0139

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

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

Elevation (ft)	Q (cfs)	Computation Messages
516.00	0.0	E < Inv.El.= 521
516.50	0.0	E < Inv.El.= 521
517.00	0.0	E < Inv.El.= 521
517.50	0.0	E < Inv.El.= 521
518.00	0.0	E < Inv.El.= 521
518.50	0.0	E < Inv.El.= 521
519.00	0.0	E < Inv.El.= 521
519.50	0.0	E < Inv.El.= 521
520.00	0.0	E < Inv.El.= 521
520.50	0.0	E < Inv.El.= 521
521.00	0.0	H =0.0
521.50	10.6	H =.5
522.00	0.0	E = or > E2=522.00

C = 3 L (ft) = 10
H (ft) = Table elev. - Invert elev. (521 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: WINTR .STR

POND-2 Version: 5.47 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

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

Elevation (ft)	Q (cfs)	Computation Messages
516.00	0.0	H =0.0
516.50	1.5	H =.5
517.00	4.3	H =1.0
517.50	7.8	H =1.5
518.00	12.0	H =2.0
518.50	16.8	H =2.5
519.00	22.1	H =3.0
519.50	27.8	H =3.5
520.00	34.0	H =4.0
520.50	40.6	H =4.5
521.00	47.5	H =5.0
521.50	54.8	H =5.5
522.00	0.0	E = or > E2=522.00

C = 3 L (ft) = 1.4167
H (ft) = Table elev. - Invert elev. (516 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

Elevation (ft)	Q (cfs)	Computation Messages
516.00	0.0	H =0.0
516.50	13.7	H =.5
517.00	19.3	H =1.0
517.50	23.7	H =1.5
518.00	27.3	H =2.0
518.50	30.6	H =2.5
519.00	33.5	H =3.0
519.50	36.2	H =3.5
520.00	38.7	H =4.0
520.50	41.0	H =4.5
521.00	43.2	H =5.0
521.50	45.3	H =5.5
522.00	0.0	E = or) E2=522.00

C = .6 A = 4.0139 sq.ft.
H (ft) = Table elev. - Datum elev. (516 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

Outflow Rating Table A
Table A = 1 ? 2

Elevation (ft)	Q (cfs)	Contributing Structures
516.00	0.0	1
516.50	1.5	1
517.00	4.3	1
517.50	7.8	1
518.00	12.0	1
518.50	16.8	1
519.00	22.1	1
519.50	27.8	1
520.00	34.0	1
520.50	40.6	1
521.00	43.2	2
521.50	45.3	2
522.00	0.0	-

```
*********************************************
*                                           *
*                WINTERHAVEN                *
*             DETENTION ANALYSIS            *
*  PREPARED BY: BAX ENGINEERING CO., INC.   *
*              NOVEMBER 1, 1994             *
*                                           *
*********************************************
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Inflow Hydrograph: WINTR25 .HYD
Rating Table file: WINTR .PND

----INITIAL CONDITIONS----
Elevation = 516.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
516.00	0.0	0.000
516.50	1.5	0.204
517.00	4.3	0.418
517.50	7.8	0.640
518.00	12.0	0.871
518.50	16.8	1.111
519.00	22.1	1.360
519.50	27.8	1.619
520.00	34.0	1.887
520.50	40.6	2.165
521.00	43.2	2.454
521.50	55.9	2.754

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
296.9	298.4
606.4	610.7
928.8	936.6
1264.4	1276.4
1613.2	1630.0
1975.1	1997.2
2350.5	2378.3
2739.5	2773.5
3143.2	3183.8
3562.7	3605.9
3998.4	4054.3

Time increment (t) = 1.0 min.

Pond File: WINTR .PND
Inflow Hydrograph: WINTR25 .HYD
Outflow Hydrograph: OUT .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	516.00
1.0	18.12	18.1	17.9	18.1	0.09	516.03
2.0	36.24	54.4	71.6	72.3	0.36	516.12
3.0	54.35	90.6	160.5	162.2	0.82	516.27
4.0	72.47	126.8	284.5	287.4	1.44	516.48
5.0	72.47	144.9	424.1	429.4	2.67	516.71
6.0	72.47	144.9	561.1	569.0	3.93	516.93
7.0	72.47	144.9	695.4	706.1	5.32	517.15
8.0	72.47	144.9	826.8	840.4	6.77	517.35
9.0	72.47	144.9	955.3	971.8	8.23	517.55
10.0	72.47	144.9	1080.6	1100.2	9.82	517.74
11.0	72.47	144.9	1202.8	1225.5	11.37	517.93
12.0	72.47	144.9	1321.8	1347.7	12.97	518.10
13.0	72.47	144.9	1437.6	1466.7	14.58	518.27
14.0	72.47	144.9	1550.2	1582.5	16.16	518.43
15.0	72.47	144.9	1659.7	1695.1	17.74	518.59
16.0	72.47	144.9	1766.0	1804.6	19.32	518.74
17.0	72.47	144.9	1869.2	1910.9	20.85	518.88
18.0	72.47	144.9	1969.4	2014.1	22.35	519.02
19.0	72.47	144.9	2066.7	2114.4	23.85	519.15
20.0	72.47	144.9	2161.0	2211.6	25.31	519.28
21.0	54.35	126.8	2234.9	2287.8	26.45	519.38
22.0	36.24	90.6	2271.5	2325.5	27.01	519.43
23.0	18.12	54.4	2271.8	2325.8	27.02	519.43
24.0	0.00	18.1	2237.0	2289.9	26.48	519.38
25.0	0.00	0.0	2185.6	2237.0	25.69	519.31

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

Pond File: WINTR .PND
Inflow Hydrograph: WINTR25 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 516.00 ft

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

Peak Inflow	=	72.47 cfs
Peak Outflow	=	27.02 cfs
Peak Elevation	=	519.43 ft

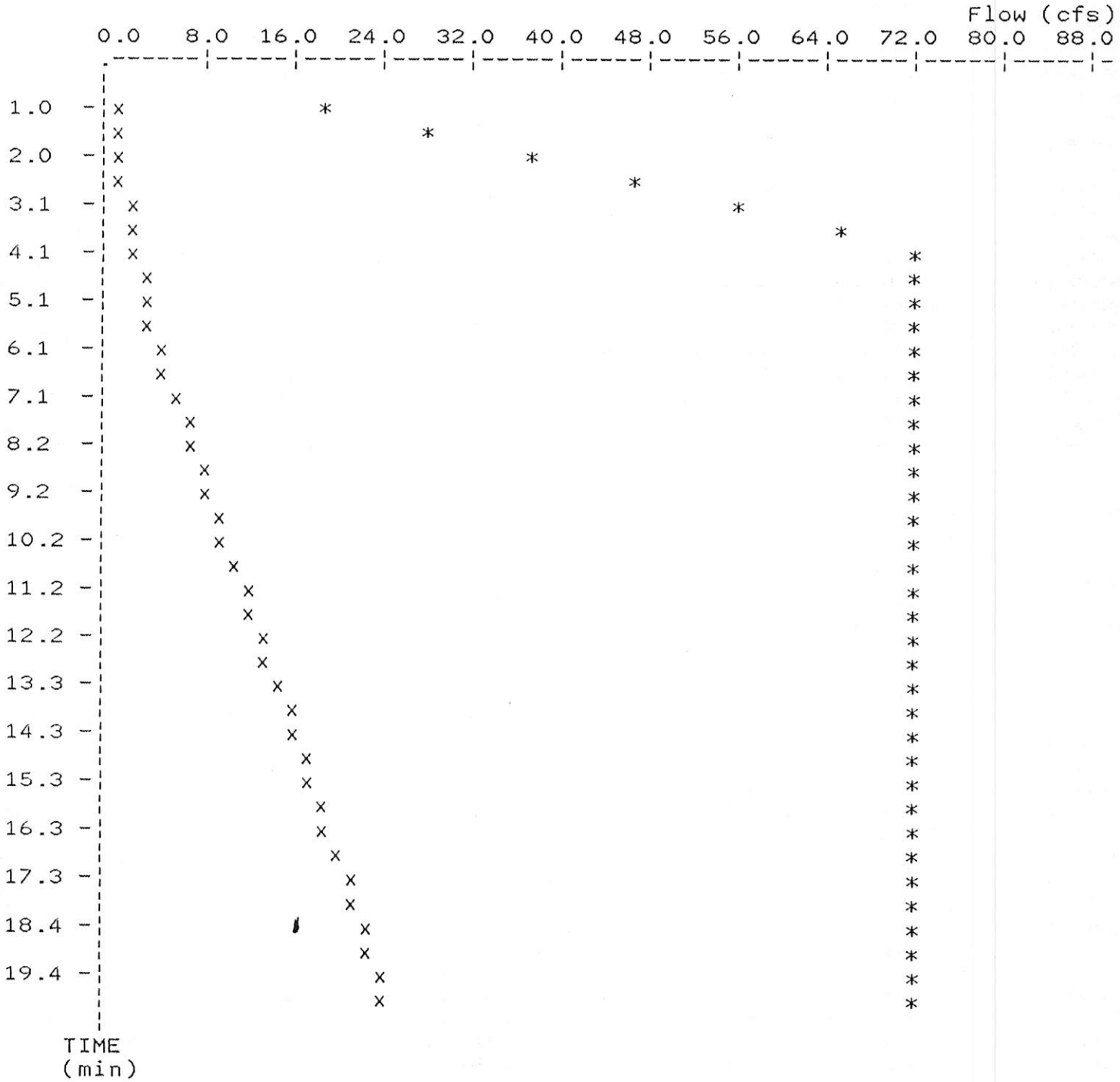
***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.58 ac-ft
Total Storage in Pond	=	1.58 ac-ft

Pond File: WINTR .PND
Inflow Hydrograph: WINTR25 .HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-01-1994
11:47:20

Peak Inflow = 72.47 cfs
Peak Outflow = 27.02 cfs
Peak Elevation = 519.43 ft



x File: WINTR25 .HYD Qmax = 27.0 cfs
* File: OUT .HYD Qmax = 72.5 cfs

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*********************************************
*                                           *
*                WINTERHAVEN                *
*    DETENTION ANALYSIS  100 YEAR STORM     *
*  PREPARED BY: BAX ENGINEERING CO., INC.   *
*             NOVEMBER 1, 1994              *
*                                           *
*********************************************
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Inflow Hydrograph: WINTR100.HYD
Rating Table file: WINTR   .PND

----INITIAL CONDITIONS----
Elevation = 516.00 ft
Outflow   =   0.00 cfs
Storage   =   0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
516.00	0.0	0.000
516.50	1.5	0.204
517.00	4.3	0.418
517.50	7.8	0.640
518.00	12.0	0.871
518.50	16.8	1.111
519.00	22.1	1.360
519.50	27.8	1.619
520.00	34.0	1.887
520.50	40.6	2.165
521.00	43.2	2.454
521.50	55.9	2.754

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
296.9	298.4
606.4	610.7
928.8	936.6
1264.4	1276.4
1613.2	1630.0
1975.1	1997.2
2350.5	2378.3
2739.5	2773.5
3143.2	3183.8
3562.7	3605.9
3998.4	4054.3

Time increment (t) = 1.0 min.

Pond File: WINTR .PND
Inflow Hydrograph: WINTR100.HYD
Outflow Hydrograph: OUT .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	516.00
1.0	23.20	23.2	23.0	23.2	0.12	516.04
2.0	46.40	69.6	91.6	92.6	0.47	516.16
3.0	69.59	116.0	205.5	207.6	1.04	516.35
4.0	92.79	162.4	363.7	367.9	2.12	516.61
5.0	92.79	185.6	541.8	549.3	3.75	516.90
6.0	92.79	185.6	716.2	727.3	5.55	517.18
7.0	92.79	185.6	887.0	901.8	7.43	517.45
8.0	92.79	185.6	1053.6	1072.5	9.48	517.70
9.0	92.79	185.6	1216.1	1239.2	11.54	517.95
10.0	92.79	185.6	1374.3	1401.7	13.70	518.18
11.0	92.79	185.6	1528.1	1559.8	15.85	518.40
12.0	92.79	185.6	1677.7	1713.7	18.01	518.61
13.0	92.79	185.6	1822.9	1863.3	20.17	518.82
14.0	92.79	185.6	1964.0	2008.5	22.27	519.01
15.0	92.79	185.6	2100.8	2149.6	24.38	519.20
16.0	92.79	185.6	2233.5	2286.4	26.43	519.38
17.0	92.79	185.6	2362.2	2419.1	28.44	519.55
18.0	92.79	185.6	2486.9	2547.8	30.46	519.71
19.0	92.79	185.6	2607.6	2672.5	32.42	519.87
20.0	92.79	185.6	2724.6	2793.2	34.32	520.02
21.0	69.59	162.4	2815.3	2887.0	35.83	520.14
22.0	46.40	116.0	2858.2	2931.3	36.54	520.19
23.0	23.20	69.6	2854.9	2927.8	36.48	520.19
24.0	0.00	23.2	2806.7	2878.1	35.68	520.13
25.0	0.00	0.0	2737.6	2806.7	34.53	520.04

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

Pond File: WINTR .PND
Inflow Hydrograph: WINTR100.HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 516.00 ft

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

Peak Inflow	=	92.79 cfs
Peak Outflow	=	36.54 cfs
Peak Elevation	=	520.19 ft

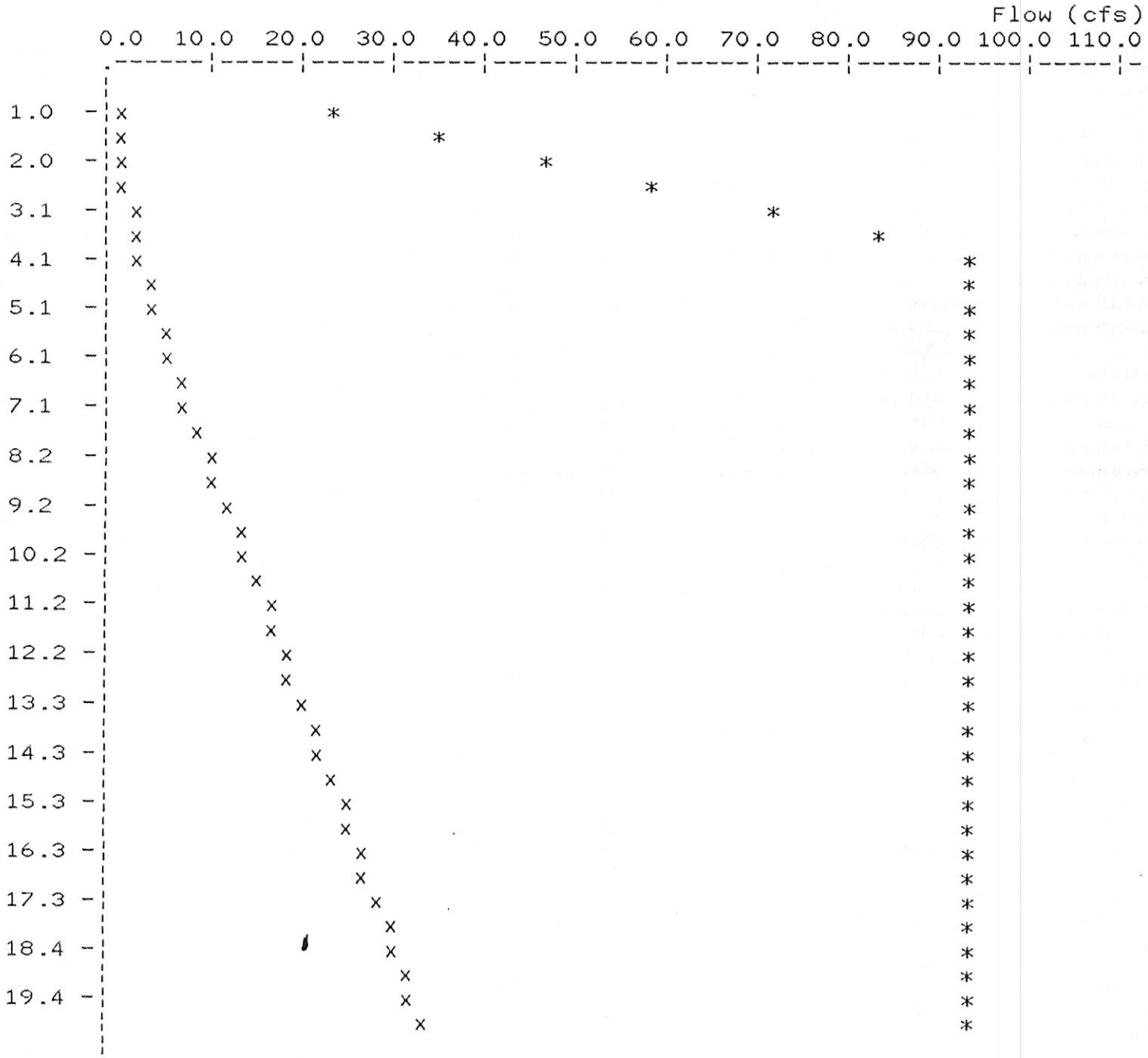
***** Summary of Approximate Peak Storage *****

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.99 ac-ft
Total Storage in Pond	=	1.99 ac-ft

Pond File: WINTR .PND
Inflow Hydrograph: WINTR100.HYD
Outflow Hydrograph: OUT .HYD

EXECUTED: 11-01-1994
14:11:51

Peak Inflow = 92.79 cfs
Peak Outflow = 36.54 cfs
Peak Elevation = 520.19 ft



x File: WINTR100.HYD Qmax = 36.5 cfs
* File: OUT .HYD Qmax = 92.8 cfs

Outlet Structure File: WINTR .STR

POND-2 Version: [redacted] S/N: [redacted]
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

Elevation (ft)	Q (cfs)	Contributing Structures
516.00	0.0	1
516.50	1.5	1
517.00	4.3	1
517.50	7.8	1
518.00	12.0	1
518.50	16.8	1
519.00	22.1	1
519.50	27.8	1
520.00	34.0	1
520.50	40.6	1
521.00	43.2	3 +2
521.50	55.9	3 +2
522.00	0.0	

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

Outlet Structure File: WINTR .STR
Planimeter Input File: WINTR .VOL
Rating Table Output File: WINTR .PND

Min. Elev.(ft) = 516 Max. Elev.(ft) = 522 Incr.(ft) = .5

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

****
SYSTEM CONNECTIVITY
****

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

Outflow rating table summary was stored in file:
WINTR .PND

C-2

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	521.00
E2 elev.(ft)?	522.00
Weir coefficient?	3
Weir elev.(ft)?	521.00
Length (ft)?	10
Contracted/Suppressed (C/S)?	S

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	516.00
E2 elev.(ft)?	522.00
Weir coefficient?	3
Weir elev.(ft)?	516
Length (ft)?	1.4167
Contracted/Suppressed (C/S)?	S

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	516.00
E2 elev.(ft)?	522.00
Orifice coeff.?	0.6
Invert elev.(ft)?	514.90
Datum elev.(ft) ?	516.00
Orifice area (sq ft)?	4.0139

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

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

Elevation (ft)	Q (cfs)	Computation Messages
516.00	0.0	E < Inv.El.= 521
516.50	0.0	E < Inv.El.= 521
517.00	0.0	E < Inv.El.= 521
517.50	0.0	E < Inv.El.= 521
518.00	0.0	E < Inv.El.= 521
518.50	0.0	E < Inv.El.= 521
519.00	0.0	E < Inv.El.= 521
519.50	0.0	E < Inv.El.= 521
520.00	0.0	E < Inv.El.= 521
520.50	0.0	E < Inv.El.= 521
521.00	0.0	H =0.0
521.50	10.6	H =.5
522.00	0.0	E = or > E2=522.00

C = 3 L (ft) = 10
H (ft) = Table elev. - Invert elev. (521 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

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

Elevation (ft)	Q (cfs)	Computation Messages
516.00	0.0	H =0.0
516.50	1.5	H =.5
517.00	4.3	H =1.0
517.50	7.8	H =1.5
518.00	12.0	H =2.0
518.50	16.8	H =2.5
519.00	22.1	H =3.0
519.50	27.8	H =3.5
520.00	34.0	H =4.0
520.50	40.6	H =4.5
521.00	47.5	H =5.0
521.50	54.8	H =5.5
522.00	0.0	E = or > E2=522.00

C = 3 L (ft) = 1.4167
H (ft) = Table elev. - Invert elev. (516 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

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

Elevation (ft)	Q (cfs)	Computation Messages
516.00	0.0	H =0.0
516.50	13.7	H =.5
517.00	19.3	H =1.0
517.50	23.7	H =1.5
518.00	27.3	H =2.0
518.50	30.6	H =2.5
519.00	33.5	H =3.0
519.50	36.2	H =3.5
520.00	38.7	H =4.0
520.50	41.0	H =4.5
521.00	43.2	H =5.0
521.50	45.3	H =5.5
522.00	0.0	E = or > E2=522.00

C = .6 A = 4.0139 sq.ft.
H (ft) = Table elev. - Datum elev. (516 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: WINTR .STR

POND-2 Version: 5.17 S/N:
Date Executed: Time Executed:

****
WINTERHAVEN
DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
NOVEMBER 1, 1994
****

Outflow Rating Table A
Table A = 1 ? 2

Elevation (ft)	Q (cfs)	Contributing Structures
516.00	0.0	1
516.50	1.5	1
517.00	4.3	1
517.50	7.8	1
518.00	12.0	1
518.50	16.8	1
519.00	22.1	1
519.50	27.8	1
520.00	34.0	1
520.50	40.6	1
521.00	43.2	2
521.50	45.3	2
522.00	0.0	-

```
*********************************************
*                                           *
*                WINTERHAVEN                *
*     DETENTION ANALYSIS  15 YEAR STORM     *
*  PREPARED BY: BAX ENGINEERING CO., INC.   *
*              NOVEMBER 1, 1994             *
*                                           *
*********************************************
```

Inflow Hydrograph: WINTR15 .HYD
Rating Table file: WINTR .PND

----INITIAL CONDITIONS----
Elevation = 516.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
516.00	0.0	0.000
516.50	1.5	0.204
517.00	4.3	0.418
517.50	7.8	0.640
518.00	12.0	0.871
518.50	16.8	1.111
519.00	22.1	1.360
519.50	27.8	1.619
520.00	34.0	1.887
520.50	40.6	2.165
521.00	43.2	2.454
521.50	55.9	2.754

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
296.9	298.4
606.4	610.7
928.8	936.6
1264.4	1276.4
1613.2	1630.0
1975.1	1997.2
2350.5	2378.3
2739.5	2773.5
3143.2	3183.8
3562.7	3605.9
3998.4	4054.3

Time increment (t) = 1.0 min.

Pond File: WINTR .PND
Inflow Hydrograph: WINTR15 .HYD
Outflow Hydrograph: OUT .HYD

INFLOW HYDROGRAPH

TIME (min)	INFLOW (cfs)
0.0	0.00
1.0	14.68
2.0	29.37
3.0	44.05
4.0	58.73
5.0	58.73
6.0	58.73
7.0	58.73
8.0	58.73
9.0	58.73
10.0	58.73
11.0	58.73
12.0	58.73
13.0	58.73
14.0	58.73
15.0	58.73
16.0	58.73
17.0	58.73
18.0	58.73
19.0	58.73
20.0	58.73
21.0	44.05
22.0	29.37
23.0	14.68
24.0	0.00
25.0	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	516.00
14.7	14.5	14.7	0.07	516.02
44.1	58.0	58.6	0.29	516.10
73.4	130.1	131.4	0.66	516.22
102.8	230.5	232.9	1.17	516.39
117.5	344.1	348.0	1.94	516.58
117.5	455.6	461.6	2.96	516.76
117.5	565.2	573.1	3.96	516.94
117.5	672.5	682.6	5.07	517.11
117.5	777.5	789.9	6.23	517.28
117.5	880.2	895.0	7.35	517.44
117.5	980.6	997.7	8.56	517.59
117.5	1078.5	1098.1	9.80	517.74
117.5	1173.9	1195.9	11.01	517.88
117.5	1267.0	1291.4	12.20	518.02
117.5	1357.5	1384.4	13.47	518.15
117.5	1445.6	1475.0	14.70	518.28
117.5	1531.2	1563.0	15.89	518.41
117.5	1614.6	1648.7	17.07	518.53
117.5	1695.5	1732.0	18.27	518.64
117.5	1774.1	1812.9	19.44	518.75
102.8	1836.1	1876.8	20.36	518.84
73.4	1867.9	1909.5	20.83	518.88
44.1	1870.2	1911.9	20.87	518.88
14.7	1843.9	1884.8	20.48	518.85
0.0	1804.1	1843.9	19.89	518.79

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

Pond File: WINTR .PND
Inflow Hydrograph: WINTR15 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 516.00 ft

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

Peak Inflow	=	58.73 cfs
Peak Outflow	=	20.87 cfs
Peak Elevation	=	518.88 ft

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

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.30 ac-ft
Total Storage in Pond	=	1.30 ac-ft

POND-2 Version: 5.1[illegible]N:

Pond File: WINTR .PND
Inflow Hydrograph: WINTR15 .HYD
Outflow Hydrograph: OUT .HYD

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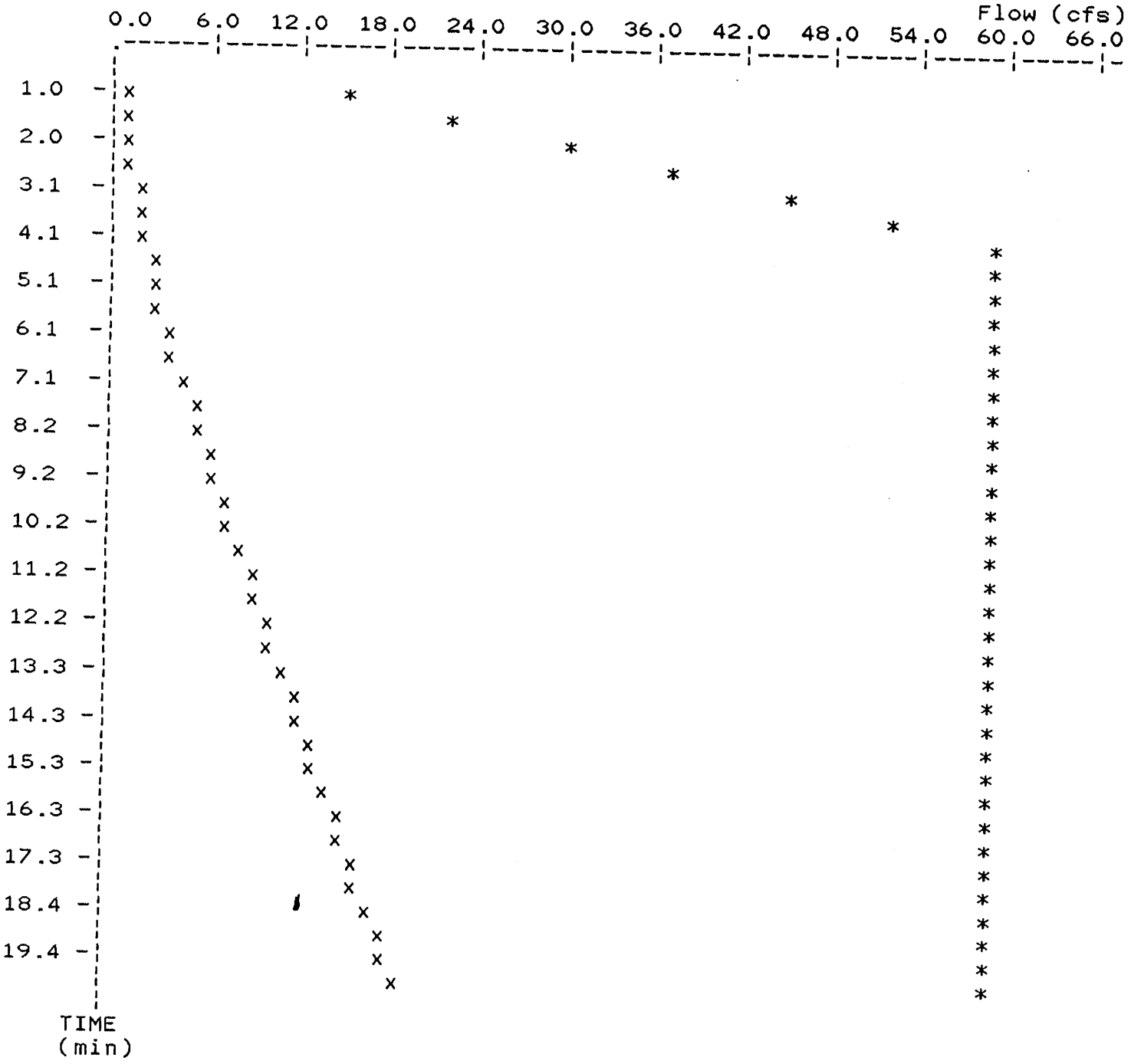
Peak Inflow = 58.73 cfs
Peak Outflow = 20.87 cfs
Peak Elevation = 518.88 ft



x File: WINTR15 .HYD Qmax = 20.9 cfs
* File: OUT .HYD Qmax = 58.7 cfs