ST. CHARLES ENGINEERING & SURVEYING
Consulting Engineers and Land Surveyors
801 South Fifth Street, Suite 202
St. Charles, MO 63301
(314) 947-0607
FAX 947-2448

ORIFICE

$Q = C A \sqrt{2GH}$

$Q = .6 \cdot (1.227) \sqrt{2 \cdot 32.2 \cdot H}$

$11.8 = 5.91 \cdot \sqrt{H}$

$2 = \sqrt{H}$

$4 = H$

$489 + (15''/12) \cdot 1/2 + 4 = 493.6$

Kensington Place
91-576
February 12, 1992
Detention Requirements
Revised - 3/25/92

Site = 34.74 Acres

Differential = 34.74 (3.26 - 2.31) 33.0 c.f.s.

Storage Required = 33.0 x 30 x 60 = 59,400 cu. ft.

Flow to Basin: Q_{15} = 36.25
36.25 - 2.64 = 13.73 Acres to Basin
13.73 Acres x 3.26 (25 Yr. PI Factor) = 44.76 c.f.s.
Q_{25} = 44.76 c.f.s. to Basin

$11.5 = .6 (A) \sqrt{2 (32.2) 6.5}$

$.94 \approx 1 = A$

$13'' = .92$

RING AT PIPE

Allowable Outflow = 44.76 - 33.0 = 11.76 c.f.s.

Low Flow Pipe is 15" C.P. at Elevation 489.00 WITH 13" RING AT SAME EL.

$Q = .6 (.922) \sqrt{2 \cdot 32.2 \cdot (495.8 - 489.54)}$

$Q = 11.2$ CFS

Detention Volume:

Elev.	Average Area	Area	Volume	Cumulative Volume
489.0	0			
489.50	200	100	50	50
490.0	2,875	1,538	769	819
491.0	7,950	5,413	5,413	6,232
492.0	9,425	8,688	8,688	14,920
494.0	12,450	10,938	21,876	36,796
496.0	15,650	14,050	28,100	64,896
498.0	19,100	17,375	34,750	99,646

3.4' — < 59,400

ELEV. 495.92 OK

F.G. 4-15-92

100 Year H.W.:

Note weir to be Standard Double Area Inlet with 12" opening.

100 CF PER ACRE REQ'D
3,500 CF EXTRA
63,000 NEEDED TOTAL

Q_{100} = 13.73 x 4.17 = 57.25

$Q_W = CLH^{3/2}$

$H = \left(\frac{Q}{C \times L}\right)^{2/3}$ $\quad H = \left(\frac{57.25}{(3.0)(19)}\right)^{2/3} = 1.00$

Sill Elev. = 495.90
H = 1.00
100 Yr. H.W. = 496.90

$\frac{HW}{D} = 2.7$ $\quad HW = 2.7 \times \frac{15}{12} = 3.4' + 489 = 492.4$

HW =

2 YEAR SEDIMENT STORAGE REQUIRED

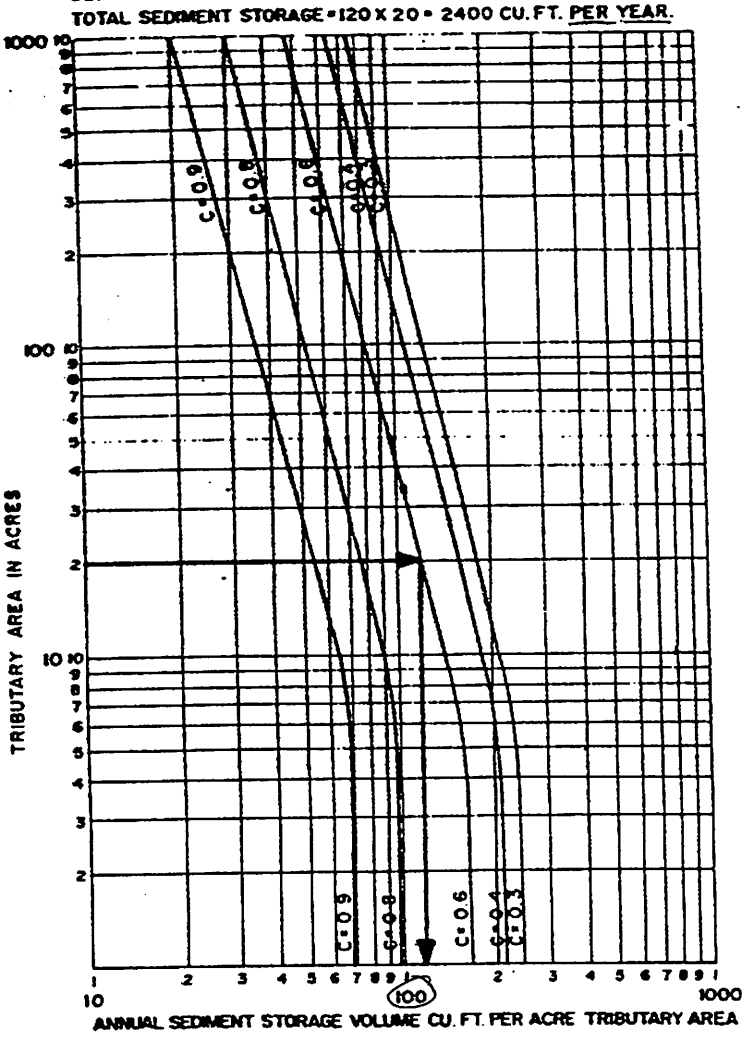
EXAMPLE:

TRIBUTARY AREA = 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.



ANNUAL SEDIMENT STORAGE

FIG. 6

ST. CHARLES ENGINEERING & SURVEYING
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Kensington Place
91-576
February 12, 1992
Detention Requirements
Revised - 3/25/92, 4/29/92

Site = 34.74 Acres

Differential = 34.74 (3.26 - 2.31) 33.0 c.f.s.

Storage Required = 33.0 x 30 x 60 = 59,400 cu. ft. (+ 3,844 cu. ft. for 2 Year Sediment Storage = 63,244)

Flow to Basin: Q_{15} = 36.25
36.25 ÷ 2.64 = 13.73 Acres to Basin
13.73 Acres x 3.26 (25 Yr. PI Factor) = 44.76 c.f.s.
Q_{25} = 44.76 c.f.s. to Basin

Allowable Outflow = 44.76 - 33.0 = 11.76 c.f.s.

Low Flow Pipe is 15" C.P. at Elevation 489.00

Detention Volume:

Elev.	Average Area	Area	Volume	Cumulative Volume
489.0	0			
489.50	200	100	50	50
490.0	2,875	1,538	769	819
491.0	7,950	5,413	5,413	6,232
492.0	9,425	8,688	8,688	14,920
494.0	12,450	10,938	21,876	36,796
496.0	15,650	14,050	28,100	64,896
498.0	19,100	17,375	34,750	99,646

25 Year H.W.: 493.57

100 Year H.W.:

Note weir to be Standard Double Area Inlet with 12" opening.

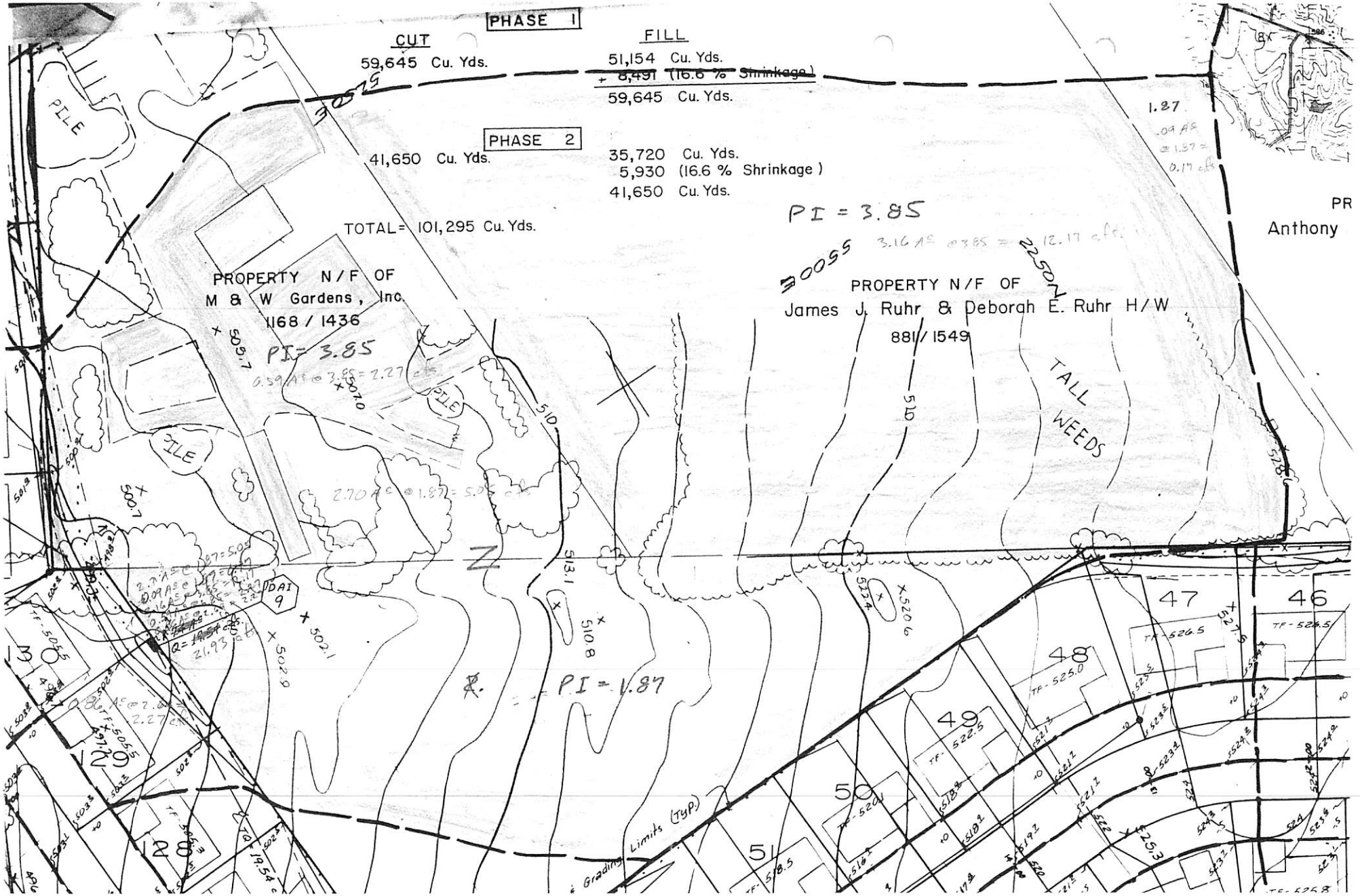
Q_{100} = 13.73 x 4.17 = 57.25

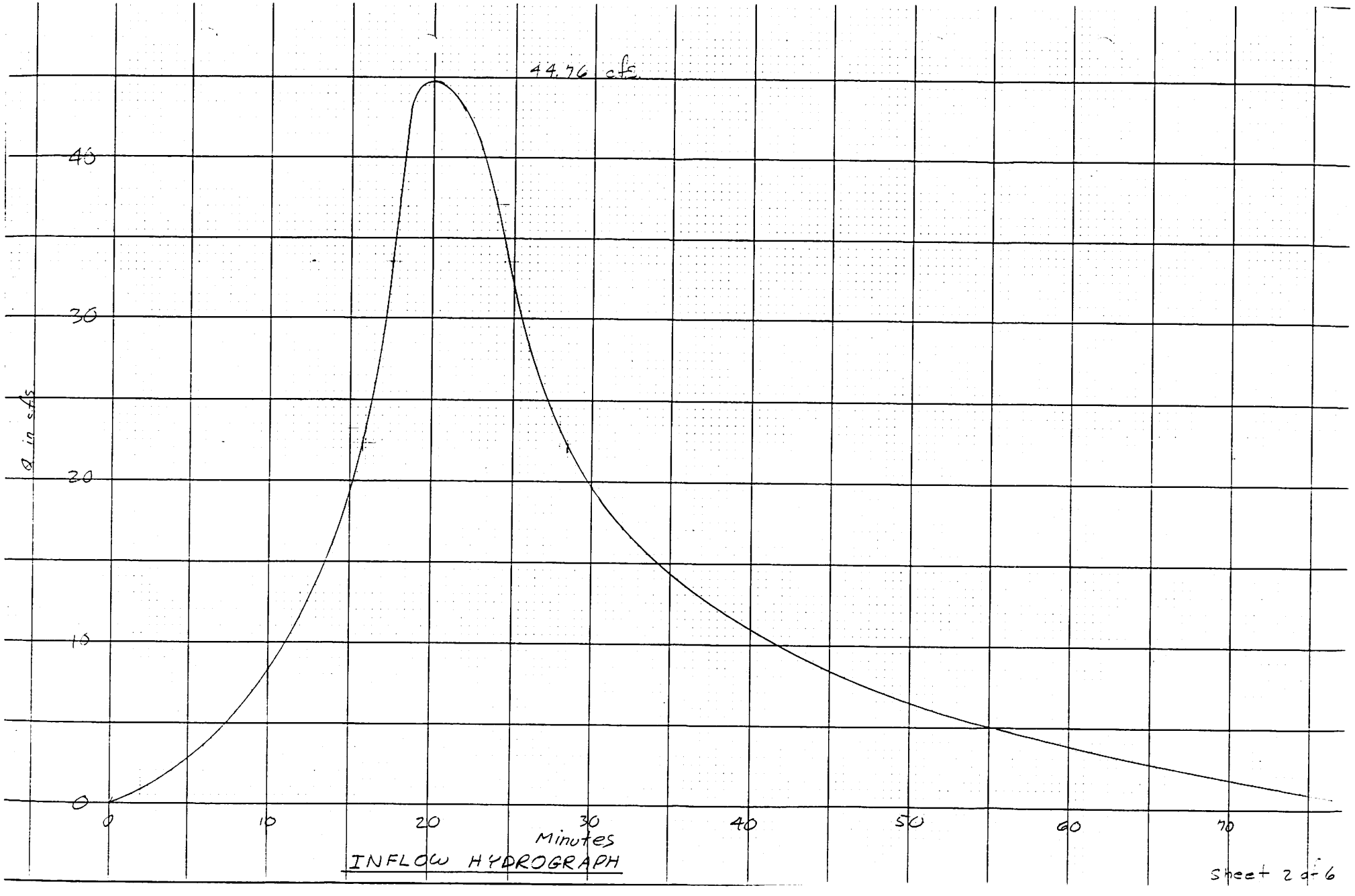
$Q_w = CLH^{3/2}$

$$H = \left(\frac{Q}{C \times L}\right)^{2/3} \qquad H = \left(\frac{57.25}{(3.0)(19)}\right)^{2/3} = 1.00$$

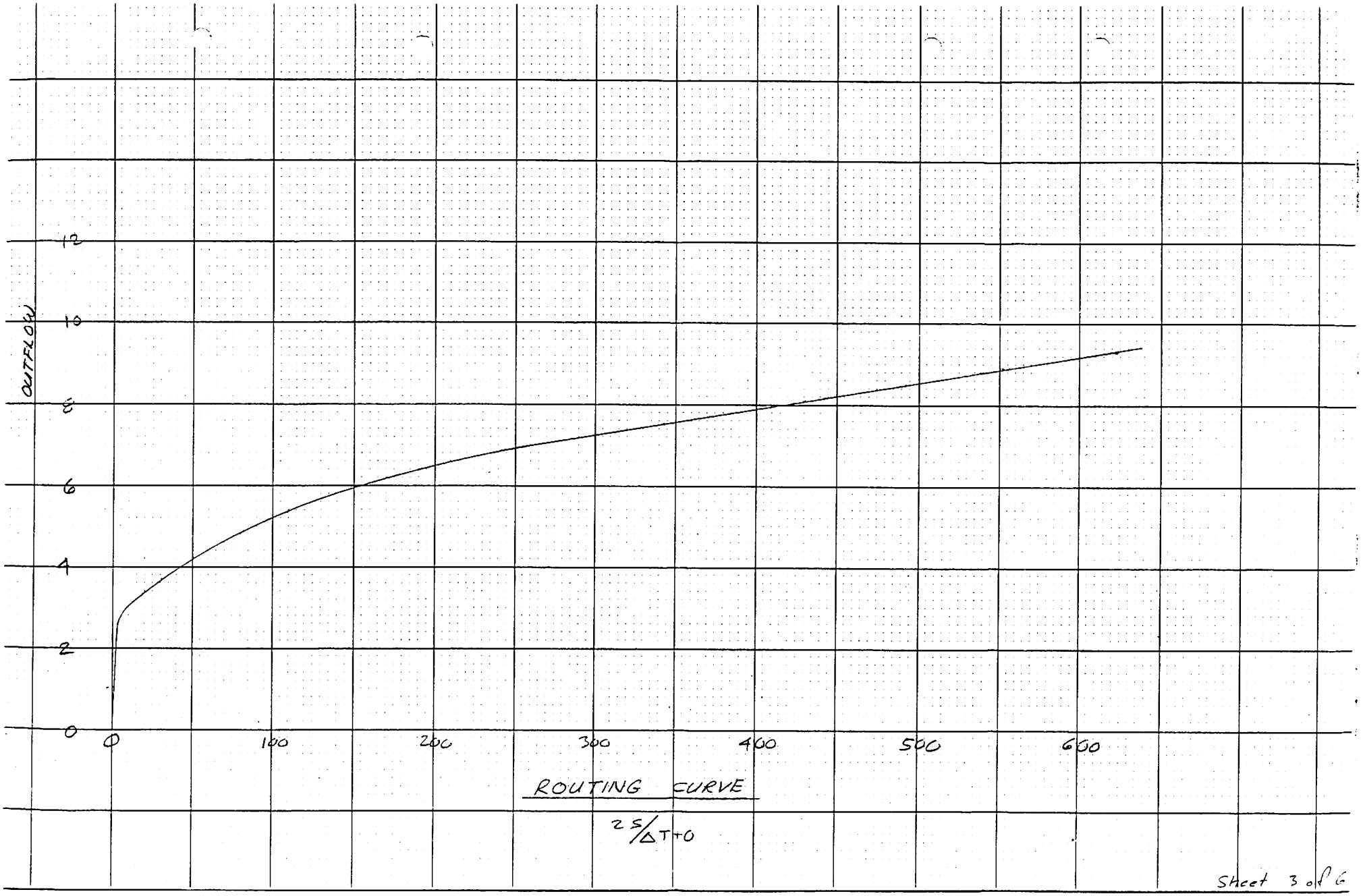
Sill Elev. = 495.92
H = 1.00
100 Yr. H.W. = 496.92

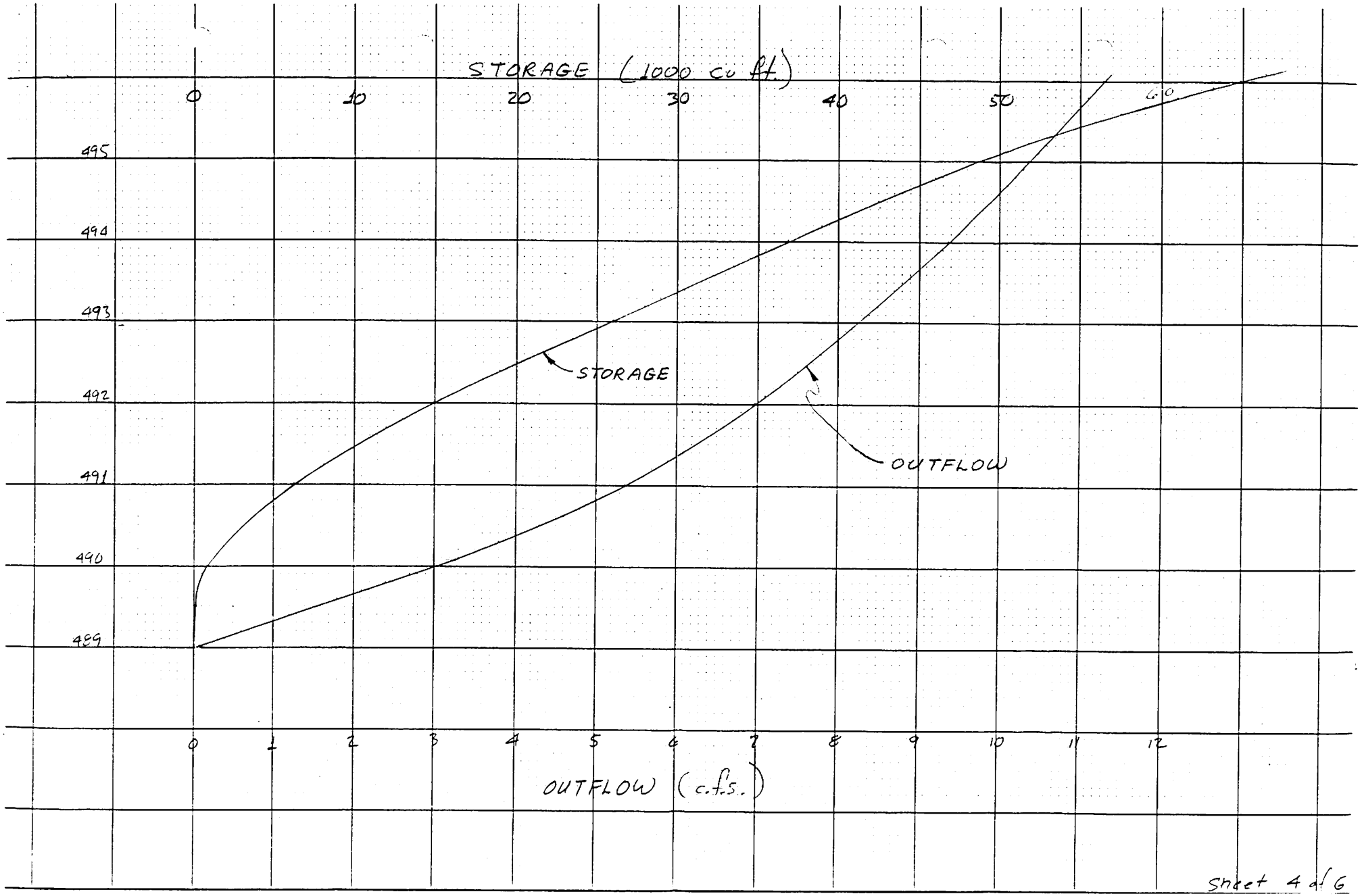
7


PHASE 1
CUT
59,645 Cu. Yds.
FILL
51,154 Cu. Yds.
+ 8,491 (16.6 % Shrinkage)
59,645 Cu. Yds.
PHASE 2
41,650 Cu. Yds.
35,720 Cu. Yds.
5,930 (16.6 % Shrinkage)
41,650 Cu. Yds.
TOTAL = 101,295 Cu. Yds.
PI = 3.85
PI = 1.87
PROPERTY N/F OF
M & W Gardens, Inc.
1168 / 1436
PROPERTY N/F OF
James J. Ruhr & Deborah E. Ruhr H/W
881 / 1549
TALL WEEDS
PILE
Grading Limits (Typ.)
Anthony



INFLOW HYDROGRAPH


OUTFLOW
12
10
8
6
4
2
0
0
100
200
300
400
500
600
ROUTING CURVE
2S/ΔT+O


STORAGE (1000 cu ft.)
0
10
20
30
40
50
60
495
494
493
492
491
490
489
STORAGE
OUTFLOW
0
1
2
3
4
5
6
7
8
9
10
11
12
OUTFLOW (c.f.s.)

Design Pond Routing

FORM 102	0	1	2	3	4	5	6	7
Line	Time	I_1	I_1+I_2	$\frac{2S_1}{\Delta t} - O_1$	$\frac{2S_2}{t} + O_2$	Elev	Outflow O_2	Storage S_2
1	0	0						
2	2	0.9	0.9	0	0.9		0.4	
3	4	2.0	2.9	0.1	3.0		1.4	
4	6	3.7	5.7	0.2	5.9		2.65	
5	8	5.7	9.4	3.6	10.0		3.00	
6	10	9.3	14.0	4.0	18.0		3.52	
7	12	11.7	20.5	10.96	30.96		3.65	
8	14	16.1	27.8	23.66	51.46		4.19	
9	16	23.2	39.3	43.03	92.38	490.75	4.95	
10	18	36.9	60.1	72.62	132.72		5.72	
11	20	44.76	81.66	121.29	202.94		6.50	
12	22	43.0	87.76	187.94	277.70		7.10	
13	24	47.1	90.10	253.5	343.60		7.52	
14	26	28.4	65.50	328.56	394.06		7.92	
15	28	23.1	51.50	379.42	429.92	492.94	9.19	

Design Pond Routing

FORM 102	0	1	2	3	4	5	6	7
Line	Time	I_1	I_1+I_2	$\frac{2S_1}{\Delta t} - O_1$	$\frac{2S_2}{t} + O_2$	Elev	Outflow O_2	Storage S_2
1	28	23.1	51.50	378.42	429.92		3.13	
2	30	19.7	42.8	413.56	456.36	492.96	3.22	
3	32	17.2	36.9	439.92	476.82		3.39	
4	34	15.2	32.4	460.04	492.44	493.20	8.49	
5	36	13.6	28.8	509.42	539.22		3.79	
6	38	12.2	25.8	520.64	546.44		8.81	
7	40	11.3	23.5	528.32	552.02	493.55	3.83	
8	42	10.8	20.8	534.26	555.06	493.56	3.91	
9	44	3.9	3.7	537.23	555.93	493.57	3.90	← Peak
10	46	3.0	16.9	538.18	555.08	493.56	3.91	
11								
12								
13								
14								
15								

Sheet 6 of 45