ENGINEERING

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STORM WATER DETENTION ANALYSIS
PREPARED BY: BAX ENGINEERING CO., INC.
COOL SPRINGS INDUSTRIAL- O'FALLON, MO
BAX PROJECT NO. **04-13117A**
May 27, 2005

INTRODUCTION:

The presently undeveloped tract of land is located in the City of O'Fallon, Missouri. A dry detention basin is proposed off site to the south of Cool Springs Industrial Drive. The proposed basin has been sized to accommodate the proposed development and possible future development on the same tract of land, which the proposed basin will be created on. The storage volume and outflow rate 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 2, 15, 25 and 100 Year – 20 Minute design storms for the proposed site. The detention facility was also analyzed for safe passage of the 100 Year - 20 Minute duration design storms under an emergency situation.

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/a
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	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

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TIME OF CONCENTRATION:

Of the inflows to the basin, the approximate flow path used will start at the mid point on the western edge of the development flowing in an eastwardly direction until intercepted by the swale that drains to AI 101. Time of concentration is estimated as follows:

T(overland): L = 515 feet

Elevation difference = 12.0 feet
T(overland) = 4.0 minutes: See Figure 1

Total time = 4.00 use **4 minutes**

BASIN PEAK INFLOWS:

Inflows to the basin have been estimated from the drainage area map included in the construction plans.

2 year-20 minute storm:

Onsite	1.25 ac x	1.15 cfs/ac	=	1.44 cfs
Onsite	5.98 ac x	2.39 cfs/ac	=	14.29 cfs
Offsite	12.92 ac x	1.15 cfs/ac	=	+ 14.86 cfs
		Total	=	30.59 cfs

15 year-20 minute storm:

Onsite	1.25 ac x	1.87 cfs/ac	=	2.34 cfs
Onsite	5.98 ac x	3.85 cfs/ac	=	23.02 cfs
Offsite	12.92 ac x	1.87 cfs/ac	=	+ 24.16 cfs
		Total	=	49.52 cfs

25 year-20 minute storm:

Onsite	1.25 ac x	2.31 cfs/ac	=	2.89 cfs
Onsite	5.98 ac x	4.75 cfs/ac	=	28.41 cfs
Offsite	12.92 ac x	2.31 cfs/ac	=	+ 29.85 cfs
		Total	=	61.15 cfs

100 year-20 minute storm:

Onsite	1.25 ac x	2.95 cfs/ac =	3.69 cfs
Onsite	5.98 ac x	6.08 cfs/ac =	36.36 cfs
Offsite	12.92 ac x	2.95 cfs/ac =	+ 38.11 cfs
		Total =	78.16 cfs

2 year-20 minute storm:	30.59 cfs
15 year-20 minute storm:	49.52 cfs
25 year-20 minute storm:	61.15 cfs
100 year-20 minute storm:	78.16 cfs

REQUIRED ATTENUATION: (20 minute storms)

The Required Attenuation can be found by subtracting the existing runoff rate from the proposed runoff rate for the developed portion of the site. Since the offsite water will remain constant in the pre-developed and post-developed run off rates, it can be left out of this calculation.

Existing Runoff

2 year-20 minute storm:

11.41 ac x 1.15 cfs/ac = 13.12 cfs

15 year-20 minute storm:

11.41 ac x 1.87 cfs/ac = 21.34 cfs

25 year-20 minute storm:

11.41 ac x 2.31 cfs/ac = 26.36 cfs

100 year-20 minute storm:

11.41 ac x 2.95 cfs/ac = 33.66 cfs

2 year-20 minute storm:	13.12 cfs
15 year-20 minute storm:	21.34 cfs
25 year-20 minute storm:	26.36 cfs
100 year-20 minute storm:	33.66 cfs

Proposed Runoff

2 year-20 minute storm:

5.25 ac x	1.15 cfs/ac	=	6.04 cfs
6.16 ac x	2.39 cfs/ac	=	+ 14.72 cfs
	Total	=	20.76 cfs

15 year-20 minute storm:

5.25 ac x	1.87 cfs/ac	=	9.82 cfs
6.16 ac x	3.85 cfs/ac	=	+ 23.72 cfs
	Total	=	33.54 cfs

25 year-20 minute storm:

5.25 ac x	2.31 cfs/ac	=	12.13 cfs
6.16 ac x	4.75 cfs/ac	=	+ 29.26 cfs
	Total	=	41.39 cfs

100 year-20 minute storm:

5.25 ac x	2.95 cfs/ac	=	15.49 cfs
6.16 ac x	6.08 cfs/ac	=	+ 37.45 cfs
	Total	=	52.94 cfs

2 year-20 minute storm:	20.76 cfs
15 year-20 minute storm:	33.54 cfs
25 year-20 minute storm:	41.39 cfs
100 year-20 minute storm:	52.94 cfs

Required Attenuation

DESIGN STORM	PROPOSED RUNOFF	-	EXISTING RUNOFF	=	REQUIRED ATTENUATION
2 year	20.76 cfs	-	13.12 cfs	=	7.64 cfs
15 year	33.54 cfs	-	21.34 cfs	=	12.20 cfs
25 year	41.39 cfs	-	26.36 cfs	=	15.03 cfs
100 year	52.94 cfs	-	33.66 cfs	=	19.28 cfs

PERMITTED RELEASE RATE:

The permitted release rate of the basin was found by subtracting the required attenuation from the peak inflow to the basin for each design storm:

DESIGN STORM	PEAK INFLOW	-	REQUIRED ATTENUATION	=	PERMITTED RELEASE
2 year	30.59 cfs	-	7.64 cfs	=	22.95 cfs
15 year	49.52 cfs	-	12.20 cfs	=	37.32 cfs
25 year	61.15 cfs	-	15.03 cfs	=	46.12 cfs
100 year	78.16 cfs	-	19.28 cfs	=	58.88 cfs

STORM ROUTING CALCULATIONS AND RESULTS:

A computer program was used in routing the 2, 15, 25 and 100 Year Design storms through the basin. As found in the routing calculations, the results are as follows:

20 MIN STORM	PEAK INFLOW	PERMITTED RELEASE RATE	CALCULATED RELEASE RATE	PEAK ELEVATION
2 year	30.59 cfs	22.95 cfs	21.59 cfs	472.26 ft
15 year	49.52 cfs	37.32 cfs	33.83 cfs	473.45 ft
25 year	61.15 cfs	46.12 cfs	42.88 cfs	474.00 ft
100 year	78.16 cfs	58.88 cfs	57.92 cfs	474.67 ft

SEDIMENT VOLUME CALCULATIONS:

The basin shall be analyzed to accommodate 2 years of sediment storage.

- The drainage area to the basin = 20.15 acres
- Rational Method runoff coefficient 'c' = 0.6
- Annual sediment storage volume (from figure 2) = 120 cf/ac
- The sediment storage and volume required =
  2 yrs of sediment storage = 20.15 acres (120 cf/ac/year)(2 years) = **4,836** cf

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

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

Where 100-YEAR FLOW Q	=	78.16 cfs
C	=	3.0
L	=	15.71 ft
H	=	1.40 ft
Sill	=	475.00 ft
100 yr h/w	=	476.40 ft

SUMMARY:

2 Year – 20 MINUTE HIGH-WATER	472.26 ft
15 Year - 20 MINUTE HIGH-WATER	473.45 ft
25 Year – 20 MINUTE HIGH-WATER	474.00 ft
100 Year - 20 MINUTE HIGH-WATER	474.67 ft
100 Year – 20 MINUTE LOW FLOW BLOCKED HIGH WATER	476.40 ft
LOW FLOW SLOT	21" W x 24" H
LOW FLOW SLOT ELEVATION	469.00 ft
UPPER FLOW SLOT	36" W x 24" H
UPPER FLOW SLOT ELEVATION	472.50 ft
EMERGENCY OVERFLOW SILL ELEVATION	475.00 ft
TOP OF BERM	478.00 ft

TIME OF CONCENTRATION FOR SMALL DRAINAGE BASINS

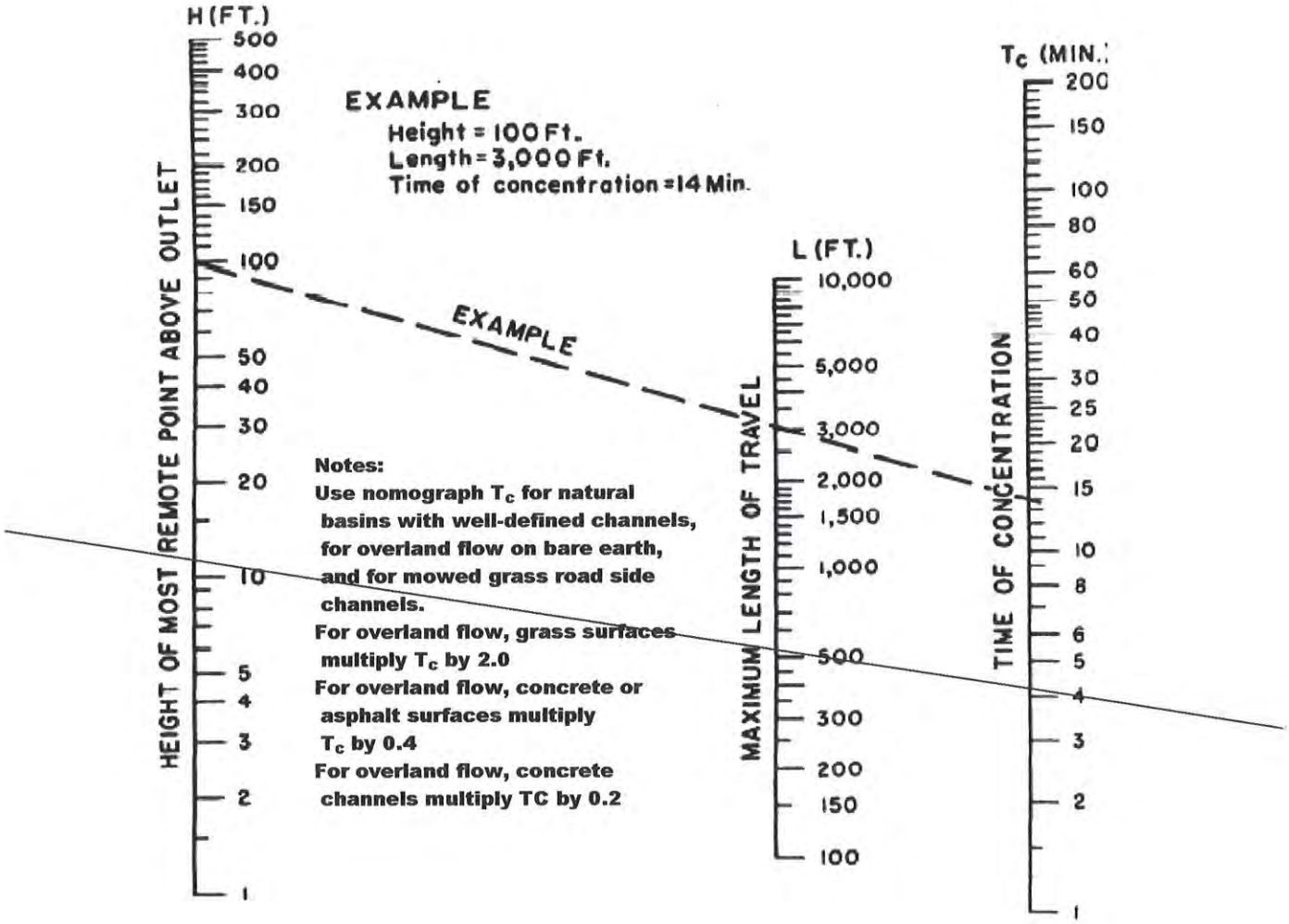

FIGURE 1

Approximate flow path to be used will start at the mid point of the western edge of the development
flowing in an eastwardly direction until intercepted by the swale that drains to AI 101.

Length = 515 ft Height = 12 ft Tc=4 minutes

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04-13117A 05-27-2005
JCJ

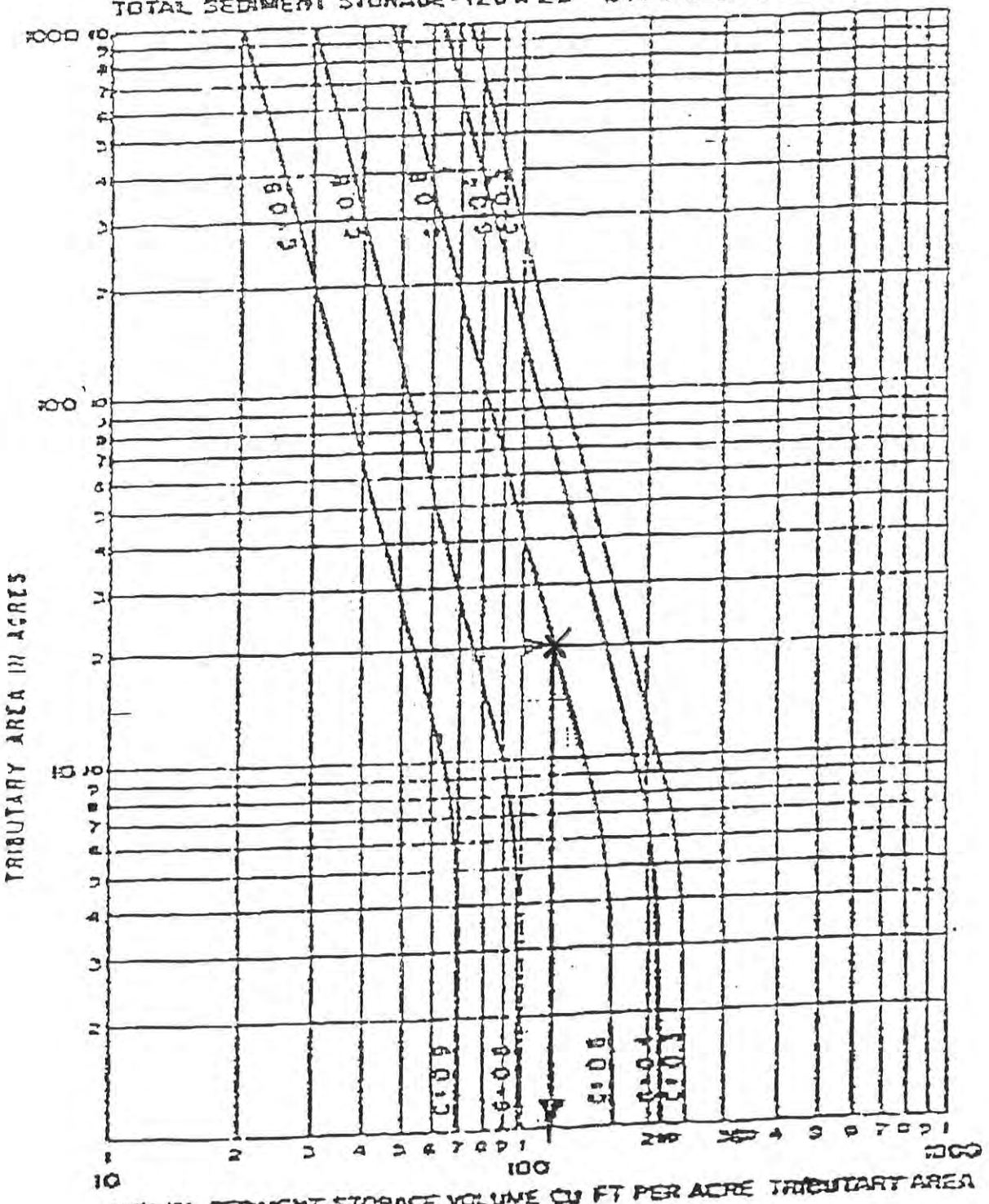
EXAMPLE: 20.15 Ac x 120 FT3/Ac/YR x 2YR = 4,836 FT3

TRIBUTARY AREA = 20 ACRES

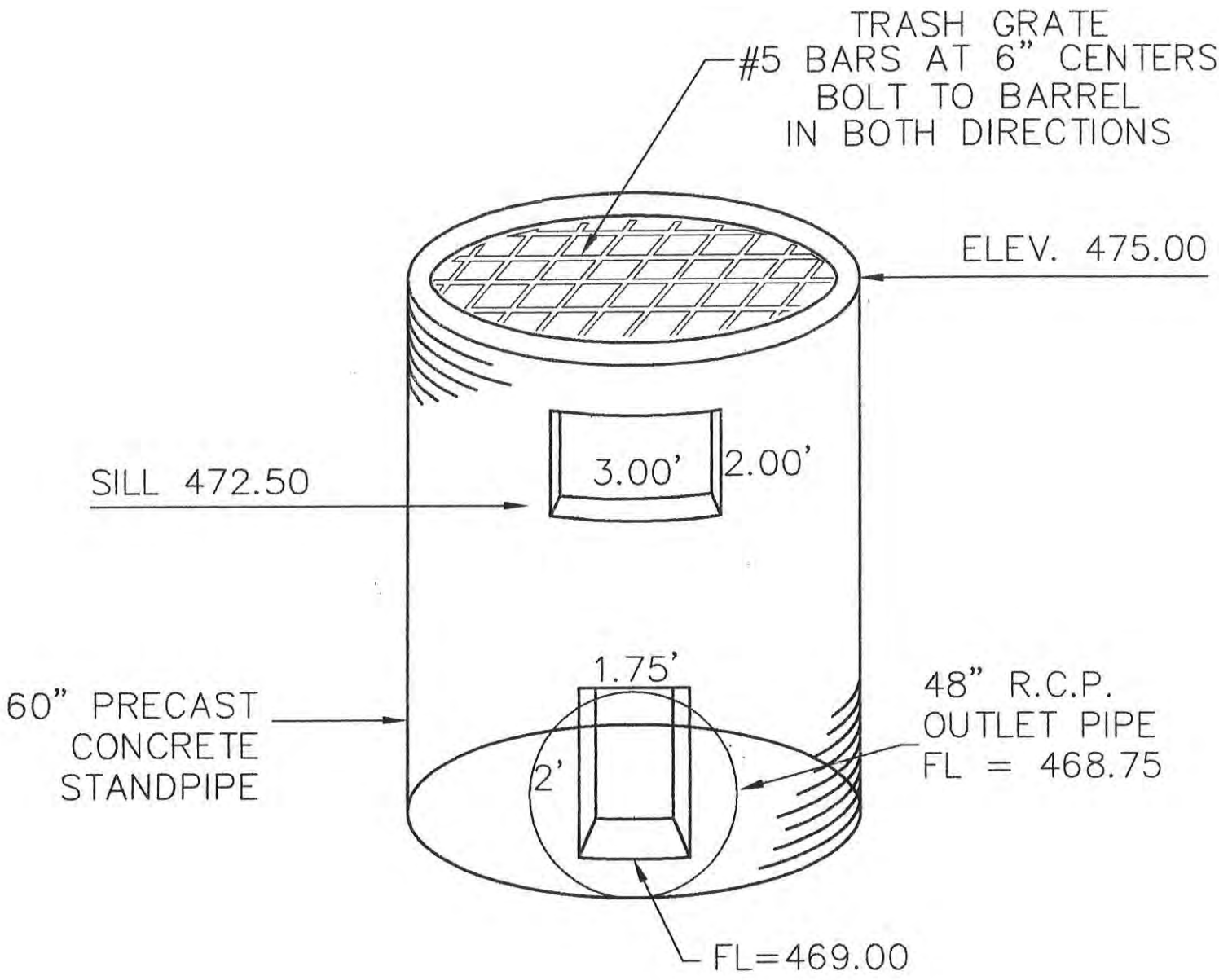
RATIONAL METHOD RUNOFF COEFFICIENT "C" = 0.6

SEDIMENT STORAGE = 120 CU FT PER ACRE PER YEAR

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



ANNUAL SEDIMENT STORAGE



OVERFLOW STRUCTURE DETAIL

NOT TO SCALE

2 YEAR HIGHWATER 472.26
15 YEAR HIGHWATER 473.45
25 YEAR HIGHWATER 474.00
100 YEAR HIGHWATER 474.67

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HYG file =
HYG ID = 2 YR
HYG Tag =

Peak Discharge =	30.59 cfs
Time to Peak =	4.00 min
HYG Volume =	36708 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	7.65	15.30	22.94	30.59
5.00	30.59	30.59	30.59	30.59	30.59
10.00	30.59	30.59	30.59	30.59	30.59
15.00	30.59	30.59	30.59	30.59	30.59
20.00	30.59	22.94	15.30	7.65	.00

HYG file =
HYG ID = 15 YR
HYG Tag =

Peak Discharge =	49.52 cfs
Time to Peak =	4.00 min
HYG Volume =	59424 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	12.38	24.76	37.14	49.52
5.00	49.52	49.52	49.52	49.52	49.52
10.00	49.52	49.52	49.52	49.52	49.52
15.00	49.52	49.52	49.52	49.52	49.52
20.00	49.52	37.14	24.76	12.38	.00

HYG file =
HYG ID = 25 YR
HYG Tag =

Peak Discharge =	61.15 cfs
Time to Peak =	4.00 min
HYG Volume =	73380 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	15.29	30.58	45.86	61.15
5.00	61.15	61.15	61.15	61.15	61.15
10.00	61.15	61.15	61.15	61.15	61.15
15.00	61.15	61.15	61.15	61.15	61.15
20.00	61.15	45.86	30.58	15.29	.00

HYG file =
HYG ID = 100 YR
HYG Tag =

Peak Discharge =	78.16 cfs
Time to Peak =	4.00 min
HYG Volume =	93792 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	19.54	39.08	58.62	78.16
5.00	78.16	78.16	78.16	78.16	78.16
10.00	78.16	78.16	78.16	78.16	78.16
15.00	78.16	78.16	78.16	78.16	78.16
20.00	78.16	58.62	39.08	19.54	.00

TIME vs. ELEVATION (ft)

Output Time increment = 1.00 min

Time min	Time on left represents time for first value in each row.				
.00	469.00	469.59	469.93	470.25	470.57
5.00	470.85	471.04	471.19	471.32	471.44
10.00	471.54	471.64	471.72	471.80	471.87
15.00	471.94	472.00	472.06	472.12	472.17
20.00	472.23	472.26	472.24	472.19	472.09
25.00	471.97	471.84	471.72	471.59	471.45
30.00	471.31	471.17	471.02	470.88	470.75
35.00	470.63	470.51	470.39	470.27	470.16
40.00	470.05	469.94	469.83	469.72	469.59
45.00	469.43	469.24	469.00		

TIME vs. ELEVATION (ft)

Output Time increment = 1.00 min

Time min	Time on left represents time for first value in each row.				
.00	469.00	469.71	470.13	470.55	470.96
5.00	471.30	471.56	471.78	471.97	472.14
10.00	472.30	472.45	472.59	472.72	472.85
15.00	472.96	473.06	473.16	473.25	473.33
20.00	473.41	473.45	473.44	473.37	473.26
25.00	473.12	472.98	472.85	472.72	472.60
30.00	472.48	472.36	472.23	472.11	471.99
35.00	471.87	471.74	471.61	471.48	471.34
40.00	471.20	471.05	470.91	470.78	470.66
45.00	470.53	470.41	470.30	470.18	470.08
50.00	469.97	469.86	469.74	469.62	469.47
55.00	469.30	469.00			

TIME vs. ELEVATION (ft)

Output Time increment = 1.00 min

Time min	Time on left represents time for first value in each row.				
.00	469.00	469.76	470.23	470.71	471.16
5.00	471.54	471.84	472.09	472.32	472.53
10.00	472.72	472.90	473.06	473.21	473.35
15.00	473.47	473.59	473.69	473.79	473.87
20.00	473.95	474.00	473.98	473.90	473.77
25.00	473.61	473.46	473.31	473.17	473.03
30.00	472.90	472.77	472.65	472.52	472.40
35.00	472.28	472.16	472.04	471.92	471.79
40.00	471.66	471.53	471.39	471.25	471.10
45.00	470.96	470.82	470.70	470.57	470.45
50.00	470.34	470.22	470.11	470.01	469.90
55.00	469.79	469.66	469.53	469.36	469.13
60.00	469.00				

TIME vs. ELEVATION (ft)

Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	469.00	469.84	470.37	470.91	471.43
5.00	471.86	472.20	472.51	472.79	473.04
10.00	473.27	473.47	473.66	473.82	473.97
15.00	474.11	474.24	474.35	474.46	474.55
20.00	474.63	474.67	474.63	474.53	474.37
25.00	474.18	474.00	473.83	473.67	473.52
30.00	473.37	473.22	473.09	472.95	472.82
35.00	472.70	472.57	472.45	472.33	472.21
40.00	472.09	471.96	471.84	471.71	471.58
45.00	471.45	471.31	471.16	471.01	470.87
50.00	470.75	470.62	470.50	470.38	470.27
55.00	470.15	470.05	469.94	469.83	469.71
60.00	469.58	469.43	469.23	469.00	

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	0	168	676	1530	2706
5.00	3968	5038	5962	6831	7660
10.00	8451	9208	9937	10640	11309
15.00	11957	12590	13196	13787	14360
20.00	14916	15230	15084	14491	13461
25.00	12231	11045	9904	8805	7749
30.00	6747	5788	4884	4117	3492
35.00	2933	2435	1989	1597	1254
40.00	956	696	481	306	168
45.00	68	11	0		

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	0	293	1174	2628	4582
5.00	6672	8615	10482	12276	14015
10.00	15704	17342	18935	20464	21920
15.00	23300	24603	25831	26985	28067
20.00	29084	29671	29504	28630	27090
25.00	25287	23591	21988	20472	19031
30.00	17644	16300	14993	13724	12490
35.00	11292	10139	9033	7969	6952
40.00	5989	5067	4284	3637	3060
45.00	2546	2091	1689	1333	1024
50.00	755	529	342	197	88
55.00	22	0			

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	0	368	1483	3316	5772
5.00	8443	10999	13469	15859	18181
10.00	20424	22564	24584	26491	28279
15.00	29955	31524	32988	34353	35624
20.00	36809	37473	37201	36066	34118
25.00	31863	29755	27786	25939	24204
30.00	22572	21023	19553	18148	16792
35.00	15470	14186	12938	11728	10561
40.00	9433	8354	7323	6334	5403
45.00	4552	3847	3253	2715	2238
50.00	1817	1447	1125	845	605
55.00	403	240	120	38	2
60.00	0				

TIME vs. VOLUME (cu.ft)

Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	0	483	1939	4317	7560
5.00	11152	14624	17988	21234	24319
10.00	27230	29961	32514	34897	37118
15.00	39187	41107	42892	44501	45915
20.00	47206	47853	47325	45688	43107
25.00	40226	37551	35058	32739	30575
30.00	28551	26658	24881	23206	21627
35.00	20130	18699	17324	15990	14693
40.00	13430	12201	11016	9877	8779
45.00	7724	6724	5765	4864	4097
50.00	3474	2917	2421	1977	1586
55.00	1244	947	690	475	301
60.00	164	65	10	0	

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POND VOLUME CALCULATIONS

Planimeter scale: 1.00 ft/in

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	Volume (cu.ft)	Volume Sum (cu.ft)
469.00	.000	0	0	0	0
470.00	2486.000	2486	2486	829	829
472.00	10100.000	10100	17597	11731	12560
474.00	14999.000	14999	37407	24938	37498
476.00	18273.000	18273	49827	33218	70716
478.00	21774.000	21774	59994	39996	110712

POND VOLUME EQUATIONS

* 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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REQUESTED POND WS ELEVATIONS:

Min. Elev.= 469.00 ft
Increment = .10 ft
Max. Elev.= 478.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Stand Pipe	5	--->	CV	475.000	478.000
Weir-Rectangular	3	--->	CV	472.500	474.500
Orifice-Area	4	--->	CV	474.500	478.000
Orifice-Area	2	--->	CV	471.000	478.000
Weir-Rectangular	1	--->	CV	469.000	471.000
Culvert-Circular	CV	--->	TW	468.750	478.000

TW SETUP, DS Channel

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OUTLET STRUCTURE INPUT DATA

Structure ID	= 5	
Structure Type	= Stand Pipe	
# of Openings	= 1	
Invert Elev.	= 475.00	ft
Diameter	= 5.0000	ft
Orifice Area	= 19.6350	sq.ft
Orifice Coeff.	= .600	
Weir Length	= 15.71	ft
Weir Coeff.	= 3.000	
K, Submerged	= .000	
K, Reverse	= 1.000	
Kb,Barrel	= .000000	(per ft of full flow)
Barrel Length	= .00	ft
Mannings n	= .0000	

Structure ID	= 3	
Structure Type	= Weir-Rectangular	
# of Openings	= 1	
Crest Elev.	= 472.50	ft
Weir Length	= 3.00	ft
Weir Coeff.	= 3.000000	

Weir TW effects (Use adjustment equation)

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OUTLET STRUCTURE INPUT DATA

Structure ID = 4
Structure Type = Orifice-Area

# of Openings	=	1
Invert Elev.	=	472.50 ft
Area	=	6.0000 sq.ft
Top of Orifice	=	474.50 ft
Datum Elev.	=	473.50 ft
Orifice Coeff.	=	.600

Structure ID = 2
Structure Type = Orifice-Area

# of Openings	=	1
Invert Elev.	=	469.00 ft
Area	=	3.5000 sq.ft
Top of Orifice	=	471.00 ft
Datum Elev.	=	470.00 ft
Orifice Coeff.	=	.600

Structure ID = 1
Structure Type = Weir-Rectangular

# of Openings	=	1
Crest Elev.	=	469.00 ft
Weir Length	=	1.75 ft
Weir Coeff.	=	3.000000

Weir TW effects (Use adjustment equation)

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OUTLET STRUCTURE INPUT DATA

Structure ID = CV
Structure Type = Culvert-Circular

No. Barrels	=	1
Barrel Diameter	=	4.0000 ft
Upstream Invert	=	468.75 ft
Dnstream Invert	=	468.00 ft
Horiz. Length	=	42.00 ft
Barrel Length	=	42.01 ft
Barrel Slope	=	.01786 ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130	
Ke	=	.0000	(forward entrance loss)
Kb	=	.004925	(per ft of full flow)
Kr	=	.0000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0098
Inlet Control M	=	2.0000
Inlet Control c	=	.03980
Inlet Control Y	=	.6700
T1 ratio (HW/D)	=	1.151
T2 ratio (HW/D)	=	1.298
Slope Factor	=	-.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 473.36 ft ---> Flow = 87.96 cfs
At T2 Elev = 473.94 ft ---> Flow = 100.53 cfs

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...

Maximum Iterations	=	30
Min. TW tolerance	=	.01 ft
Max. TW tolerance	=	.01 ft
Min. HW tolerance	=	.01 ft
Max. HW tolerance	=	.01 ft
Min. Q tolerance	=	.10 cfs
Max. Q tolerance	=	.10 cfs

File.... H:\PONDPACK\A13000PLUS\13117A\DETENTION\13177A.PPW

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

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
469.00	.00	Free Outfall		(no Q: 5,3,4,2,1,CV)
469.10	.17	Free Outfall		1,CV (no Q: 5,3,4,2)
469.20	.47	Free Outfall		1,CV (no Q: 5,3,4,2)
469,30	.81	Free Outfall		1,CV (no Q: 5,3,4,2)
469.40	1.19	Free Outfall		1,CV (no Q: 5,3,4,2)
469.50	1.59	Free Outfall		1,CV (no Q: 5,3,4,2)
469.60	2.05	Free Outfall		1,CV (no Q: 5,3,4,2)
469.70	2.54	Free Outfall		1,CV (no Q: 5,3,4,2)
469.80	3.08	Free Outfall		1,CV (no Q: 5,3,4,2)
469.90	3.68	Free Outfall		1,CV (no Q: 5,3,4,2)
470.00	4.29	Free Outfall		1,CV (no Q: 5,3,4,2)
470.10	4.93	Free Outfall		1,CV (no Q: 5,3,4,2)
470.20	5.61	Free Outfall		1,CV (no Q: 5,3,4,2)
470.30	6.31	Free Outfall		1,CV (no Q: 5,3,4,2)
470.40	7.05	Free Outfall		1,CV (no Q: 5,3,4,2)
470.50	7.82	Free Outfall		1,CV (no Q: 5,3,4,2)
470.60	8.61	Free Outfall		1,CV (no Q: 5,3,4,2)
470.70	9.43	Free Outfall		1,CV (no Q: 5,3,4,2)
470.80	10.28	Free Outfall		1,CV (no Q: 5,3,4,2)
470.90	11.15	Free Outfall		1,CV (no Q: 5,3,4,2)
471.00	14.53	Free Outfall		2,CV (no Q: 5,3,4,1)
471.10	15.15	Free Outfall		2,CV (no Q: 5,3,4,1)
471.20	15.75	Free Outfall		2,CV (no Q: 5,3,4,1)
471.30	16.26	Free Outfall		2,CV (no Q: 5,3,4,1)
471.40	16.87	Free Outfall		2,CV (no Q: 5,3,4,1)
471.50	17.46	Free Outfall		2,CV (no Q: 5,3,4,1)
471.60	18.03	Free Outfall		2,CV (no Q: 5,3,4,1)
471.70	18.59	Free Outfall		2,CV (no Q: 5,3,4,1)
471.80	19.15	Free Outfall		2,CV (no Q: 5,3,4,1)
471.90	19.76	Free Outfall		2,CV (no Q: 5,3,4,1)
472.00	20.28	Free Outfall		2,CV (no Q: 5,3,4,1)
472.10	20.80	Free Outfall		2,CV (no Q: 5,3,4,1)
472.20	21.31	Free Outfall		2,CV (no Q: 5,3,4,1)
472.30	21.81	Free Outfall		2,CV (no Q: 5,3,4,1)
472.40	22.30	Free Outfall		2,CV (no Q: 5,3,4,1)
472.50	22.79	Free Outfall		2,CV (no Q: 5,3,4,1)
472.60	23.49	Free Outfall		3,2,CV (no Q: 5,4,1)
472.70	24.38	Free Outfall		3,2,CV (no Q: 5,4,1)

Type.... Composite Rating Curve
Name.... Outlet 1

File.... H:\PONDPACK\A13000PLUS\13117A\DETENTION\13177A.PPW

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

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
472.80	25.37	Free Outfall		3,2,CV (no Q: 5,4,1)
472.90	26.46	Free Outfall		3,2,CV (no Q: 5,4,1)
473.00	27.63	Free Outfall		3,2,CV (no Q: 5,4,1)
473.10	28.89	Free Outfall		3,2,CV (no Q: 5,4,1)
473.20	30.21	Free Outfall		3,2,CV (no Q: 5,4,1)
473.30	31.60	Free Outfall		3,2,CV (no Q: 5,4,1)
473.40	33.05	Free Outfall		3,2,CV (no Q: 5,4,1)
473.50	34.56	Free Outfall		3,2,CV (no Q: 5,4,1)
473.60	36.12	Free Outfall		3,2,CV (no Q: 5,4,1)
473.70	37.75	Free Outfall		3,2,CV (no Q: 5,4,1)
473.80	39.42	Free Outfall		3,2,CV (no Q: 5,4,1)
473.90	41.14	Free Outfall		3,2,CV (no Q: 5,4,1)
474.00	42.91	Free Outfall		3,2,CV (no Q: 5,4,1)
474.10	44.73	Free Outfall		3,2,CV (no Q: 5,4,1)
474.20	46.60	Free Outfall		3,2,CV (no Q: 5,4,1)
474.30	48.50	Free Outfall		3,2,CV (no Q: 5,4,1)
474.40	50.45	Free Outfall		3,2,CV (no Q: 5,4,1)
474.50	55.27	Free Outfall		4,2,CV (no Q: 5,3,1)
474.60	56.88	Free Outfall		4,2,CV (no Q: 5,3,1)
474.70	58.43	Free Outfall		4,2,CV (no Q: 5,3,1)
474.80	59.93	Free Outfall		4,2,CV (no Q: 5,3,1)
474.90	61.40	Free Outfall		4,2,CV (no Q: 5,3,1)
475.00	62.82	Free Outfall		4,2,CV (no Q: 5,3,1)
475.10	65.45	Free Outfall		5,4,2,CV (no Q: 3,1)
475.20	69.07	Free Outfall		5,4,2,CV (no Q: 3,1)
475.30	73.33	Free Outfall		5,4,2,CV (no Q: 3,1)
475.40	78.10	Free Outfall		5,4,2,CV (no Q: 3,1)
475.50	83.23	Free Outfall		5,4,2,CV (no Q: 3,1)
475.60	88.79	Free Outfall		5,4,2,CV (no Q: 3,1)
475.70	93.51	Free Outfall		5,4,2,CV (no Q: 3,1)
475.80	97.91	Free Outfall		5,4,2,CV (no Q: 3,1)
475.90	125.89	Free Outfall		5,CV (no Q: 3,4,2,1)
476.00	134.05	Free Outfall		5,CV (no Q: 3,4,2,1)
476.10	134.05	Free Outfall		5,CV (no Q: 3,4,2,1)
476.20	134.05	Free Outfall		5,CV (no Q: 3,4,2,1)
476.30	134.05	Free Outfall		5,CV (no Q: 3,4,2,1)
476.40	140.25	Free Outfall		5,CV (no Q: 3,4,2,1)
476.50	142.34	Free Outfall		5,CV (no Q: 3,4,2,1)

File.... H:\PONDPACK\A13000PLUS\13117A\DETENTION\13177A.PPW

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

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
476.60	143.72	Free Outfall	5,CV	(no Q: 3,4,2,1)
476.70	145.10	Free Outfall	5,CV	(no Q: 3,4,2,1)
476.80	146.46	Free Outfall	5,CV	(no Q: 3,4,2,1)
476.90	147.80	Free Outfall	5,CV	(no Q: 3,4,2,1)
477.00	149.13	Free Outfall	5,CV	(no Q: 3,4,2,1)
477.10	150.47	Free Outfall	5,CV	(no Q: 3,4,2,1)
477.20	151.78	Free Outfall	5,CV	(no Q: 3,4,2,1)
477.30	153.06	Free Outfall	5,CV	(no Q: 3,4,2,1)
477.40	154.38	Free Outfall	5,CV	(no Q: 3,4,2,1)
477.50	155.64	Free Outfall	5,CV	(no Q: 3,4,2,1)
477.60	156.93	Free Outfall	5,CV	(no Q: 3,4,2,1)
477.70	158.17	Free Outfall	5,CV	(no Q: 3,4,2,1)
477.80	159.43	Free Outfall	5,CV	(no Q: 3,4,2,1)
477.90	160.67	Free Outfall	5,CV	(no Q: 3,4,2,1)
478.00	161.89	Free Outfall	5,CV	(no Q: 3,4,2,1)

Type.... Pond E-V-Q Table
Name.... BASIN
File.... H:\PONDPACK\A13000PLUS\13117A\DETENTION\13177A.PPW

LEVEL POOL ROUTING DATA

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\DETENTION\
Inflow HYG file = NONE STORED - BASIN IN 2
Outflow HYG file = NONE STORED - BASIN OUT 2

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	469.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
469.00	.00	0	0	.00	.00	.00
469.10	.17	1	25	.00	.17	.19
469.20	.47	7	99	.00	.47	.69
469.30	.81	22	224	.00	.81	1.55
469.40	1.19	53	398	.00	1.19	2.96
469.50	1.59	104	622	.00	1.59	5.04
469.60	2.05	179	895	.00	2.05	8.01
469.70	2.54	284	1218	.00	2.54	12.02
469.80	3.08	424	1591	.00	3.08	17.22
469.90	3.68	604	2014	.00	3.68	23.81
470.00	4.29	829	2486	.00	4.29	31.91
470.10	4.93	1090	2745	.00	4.93	41.27
470.20	5.61	1378	3017	.00	5.61	51.54
470.30	6.31	1694	3301	.00	6.31	62.77
470.40	7.05	2039	3598	.00	7.05	75.01
470.50	7.82	2414	3909	.00	7.82	88.28
470.60	8.61	2821	4232	.00	8.61	102.64
470.70	9.43	3261	4568	.00	9.43	118.13
470.80	10.28	3735	4916	.00	10.28	134.77
470.90	11.15	4244	5278	.00	11.15	152.63

Type.... Pond E-V-Q Table
Name.... BASIN
File.... H:\PONDPACK\A13000PLUS\13117A\DETENTION\13177A.PPW

LEVEL POOL ROUTING DATA

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\DETENTION\
Inflow HYG file = NONE STORED - BASIN IN 2
Outflow HYG file = NONE STORED - BASIN OUT 2

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 469.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
471.00	14.53	4791	5652	.00	14.53	174.22
471.10	15.15	5375	6039	.00	15.15	194.32
471.20	15.75	5999	6439	.00	15.75	215.72
471.30	16.26	6663	6852	.00	16.26	238.38
471.40	16.87	7370	7277	.00	16.87	262.52
471.50	17.46	8119	7716	.00	17.46	288.10
471.60	18.03	8913	8167	.00	18.03	315.14
471.70	18.59	9753	8631	.00	18.59	343.70
471.80	19.15	10640	9108	.00	19.15	373.81
471.90	19.76	11575	9597	.00	19.76	405.59
472.00	20.28	12560	10100	.00	20.28	438.95
472.10	20.80	13581	10322	.00	20.80	473.50
472.20	21.31	14625	10546	.00	21.31	508.79
472.30	21.81	15690	10773	.00	21.81	544.81
472.40	22.30	16779	11003	.00	22.30	581.60
472.50	22.79	17891	11234	.00	22.79	619.15
472.60	23.49	19026	11468	.00	23.49	657.70
472.70	24.38	20185	11705	.00	24.38	697.20
472.80	25.37	21367	11944	.00	25.37	737.60
472.90	26.46	22573	12185	.00	26.46	778.91

LEVEL POOL ROUTING DATA

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\DETENTION\
Inflow HYG file = NONE STORED - BASIN IN 2
Outflow HYG file = NONE STORED - BASIN OUT 2

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	469.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
473.00	27.63	23804	12429	.00	27.63	821.11
473.10	28.89	25059	12675	.00	28.89	864.20
473.20	30.21	26339	12924	.00	30.21	908.19
473.30	31.60	27644	13174	.00	31.60	953.06
473.40	33.05	28974	13428	.00	33.05	998.85
473.50	34.56	30330	13684	.00	34.56	1045.55
473.60	36.12	31711	13942	.00	36.12	1093.16
473.70	37.75	33118	14203	.00	37.75	1141.69
473.80	39.42	34552	14466	.00	39.42	1191.13
473.90	41.14	36011	14731	.00	41.14	1241.52
474.00	42.91	37498	14999	.00	42.91	1292.84
474.10	44.73	39006	15155	.00	44.73	1344.92
474.20	46.60	40529	15312	.00	46.60	1397.57
474.30	48.50	42068	15469	.00	48.50	1450.76
474.40	50.45	43623	15628	.00	50.45	1504.55
474.50	55.27	45194	15787	.00	55.27	1561.73
474.60	56.88	46781	15947	.00	56.88	1616.22
474.70	58.43	48383	16108	.00	58.43	1671.20
474.80	59.93	50002	16270	.00	59.93	1726.66
474.90	61.40	51637	16432	.00	61.40	1782.63

Type.... Pond E-V-Q Table
Name.... BASIN
File.... H:\PONDPACK\A13000PLUS\13117A\DETENTION\13177A.PPW

LEVEL POOL ROUTING DATA

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\DETENTION\
Inflow HYG file = NONE STORED - BASIN IN 2
Outflow HYG file = NONE STORED - BASIN OUT 2

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 469.00 ft
Starting Volume = 0 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
475.00	62.82	53289	16596	.00	62.82	1839.10
475.10	65.45	54956	16760	.00	65.45	1897.33
475.20	69.07	56641	16925	.00	69.07	1957.10
475.30	73.33	58341	17090	.00	73.33	2018.03
475.40	78.10	60059	17257	.00	78.10	2080.05
475.50	83.23	61793	17424	.00	83.23	2142.99
475.60	88.79	63544	17592	.00	88.79	2206.91
475.70	93.51	65311	17761	.00	93.51	2270.55
475.80	97.91	67096	17931	.00	97.91	2334.43
475.90	125.89	68897	18102	.00	125.89	2422.46
476.00	134.05	70716	18273	.00	134.05	2491.25
476.10	134.05	72552	18441	.00	134.05	2552.44
476.20	134.05	74405	18609	.00	134.05	2614.20
476.30	134.05	76273	18779	.00	134.05	2676.49
476.40	140.25	78160	18949	.00	140.25	2745.58
476.50	142.34	80063	19120	.00	142.34	2811.11
476.60	143.72	81984	19291	.00	143.72	2876.52
476.70	145.10	83922	19463	.00	145.10	2942.50
476.80	146.46	85876	19637	.00	146.46	3009.00
476.90	147.80	87849	19810	.00	147.80	3076.09

Type.... Pond E-V-Q Table
Name.... BASIN
File.... H:\PONDPACK\A13000PLUS\13117A\DETENTION\13177A.PPW

LEVEL POOL ROUTING DATA

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\DETENTION\
Inflow HYG file = NONE STORED - BASIN IN 2
Outflow HYG file = NONE STORED - BASIN OUT 2

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	469.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
477.00	149.13	89839	19985	.00	149.13	3143.75
477.10	150.47	91846	20161	.00	150.47	3212.00
477.20	151.78	93871	20337	.00	151.78	3280.81
477.30	153.06	95913	20514	.00	153.06	3350.17
477.40	154.38	97974	20691	.00	154.38	3420.16
477.50	155.64	100052	20870	.00	155.64	3490.70
477.60	156.93	102148	21049	.00	156.93	3561.85
477.70	158.17	104262	21229	.00	158.17	3633.56
477.80	159.43	106393	21410	.00	159.43	3705.87
477.90	160.67	108544	21592	.00	160.67	3778.79
478.00	161.89	110712	21774	.00	161.89	3852.28

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN IN

HYG Directory: H:\PONDPACK\A13000PLUS\13117A\DETENTION\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
ROUTE	STORM		2 YR	

INFLOWS TO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	2 YR		36708	4.00	30.59

TOTAL FLOW INTO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	BASIN IN	2	36708	4.00	30.59

TOTAL NODE INFLOW...
HYG file =
HYG ID = BASIN IN
HYG Tag = 2

Peak Discharge =	30.59 cfs
Time to Peak =	4.00 min
HYG Volume =	36708 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	7.65	15.30	22.94	30.59
5.00	30.59	30.59	30.59	30.59	30.59
10.00	30.59	30.59	30.59	30.59	30.59
15.00	30.59	30.59	30.59	30.59	30.59
20.00	30.59	22.94	15.30	7.65	.00

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN IN

HYG Directory: H:\PONDPACK\A13000PLUS\13117A\DETENTION\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
ROUTE	STORM		15 YR	

INFLOWS TO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	15 YR		59424	4.00	49.52

TOTAL FLOW INTO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	BASIN IN	15	59424	4.00	49.52

TOTAL NODE INFLOW...
HYG file =
HYG ID = BASIN IN
HYG Tag = 15

Peak Discharge =	49.52 cfs
Time to Peak =	4.00 min
HYG Volume =	59424 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	12.38	24.76	37.14	49.52
5.00	49.52	49.52	49.52	49.52	49.52
10.00	49.52	49.52	49.52	49.52	49.52
15.00	49.52	49.52	49.52	49.52	49.52
20.00	49.52	37.14	24.76	12.38	.00

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN IN

HYG Directory: H:\PONDPACK\A13000PLUS\13117A\DETENTION\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
ROUTE	STORM		25 YR	

INFLOWS TO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	25 YR		73380	4.00	61.15

TOTAL FLOW INTO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	BASIN IN	25	73380	4.00	61.15

TOTAL NODE INFLOW...
HYG file =
HYG ID = BASIN IN
HYG Tag = 25

Peak Discharge =	61.15 cfs
Time to Peak =	4.00 min
HYG Volume =	73380 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min

Time min	Time on left represents time for first value in each row.				
.00	.00	15.29	30.58	45.86	61.15
5.00	61.15	61.15	61.15	61.15	61.15
10.00	61.15	61.15	61.15	61.15	61.15
15.00	61.15	61.15	61.15	61.15	61.15
20.00	61.15	45.86	30.58	15.29	.00

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN IN

HYG Directory: H:\PONDPACK\A13000PLUS\13117A\DETENTION\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
ROUTE	STORM		100 YR	

INFLOWS TO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	100 YR		93792	4.00	78.16

TOTAL FLOW INTO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	BASIN IN	100	93792	4.00	78.16

TOTAL NODE INFLOW...
HYG file =
HYG ID = BASIN IN
HYG Tag = 100

Peak Discharge =	78.16 cfs
Time to Peak =	4.00 min
HYG Volume =	93792 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	19.54	39.08	58.62	78.16
5.00	78.16	78.16	78.16	78.16	78.16
10.00	78.16	78.16	78.16	78.16	78.16
15.00	78.16	78.16	78.16	78.16	78.16
20.00	78.16	58.62	39.08	19.54	.00

LEVEL POOL ROUTING SUMMARY

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\DETENTION\
Inflow HYG file = NONE STORED - BASIN IN 2
Outflow HYG file = NONE STORED - BASIN OUT 2

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	469.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	30.59 cfs	at	4.00 min
Peak Outflow	=	21.59 cfs	at	21.00 min
Peak Elevation	=	472.26 ft		
Peak Storage	=	15230 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	36708
- Infiltration	=	0
- HYG Vol OUT	=	36708
- Retained Vol	=	0
Unrouted Vol	=	0 cu.ft (.000% of Outflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\DETENTION\
Inflow HYG file = NONE STORED - BASIN IN 15
Outflow HYG file = NONE STORED - BASIN OUT 15

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	469.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	49.52 cfs	at	4.00 min
Peak Outflow	=	33.83 cfs	at	21.00 min
Peak Elevation	=	473.45 ft		
Peak Storage	=	29671 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	59424
- Infiltration	=	0
- HYG Vol OUT	=	59424
- Retained Vol	=	0
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\DETENTION\
Inflow HYG file = NONE STORED - BASIN IN 25
Outflow HYG file = NONE STORED - BASIN OUT 25

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	469.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	61.15 cfs	at	4.00 min
Peak Outflow	=	42.88 cfs	at	21.00 min
Peak Elevation	=	474.00 ft		
Peak Storage	=	37473 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	73380
- Infiltration	=	0
- HYG Vol OUT	=	73380
- Retained Vol	=	0
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\DETENTION\
Inflow HYG file = NONE STORED - BASIN IN 100
Outflow HYG file = NONE STORED - BASIN OUT 100

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	469.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	78.16 cfs	at	4.00 min
Peak Outflow	=	57.92 cfs	at	21.00 min
Peak Elevation	=	474.67 ft		
Peak Storage	=	47853 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	93792
- Infiltration	=	0
- HYG Vol OUT	=	93792
- Retained Vol	=	0
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

Index of Starting Page Numbers for ID Names

BAX ENGINEERING

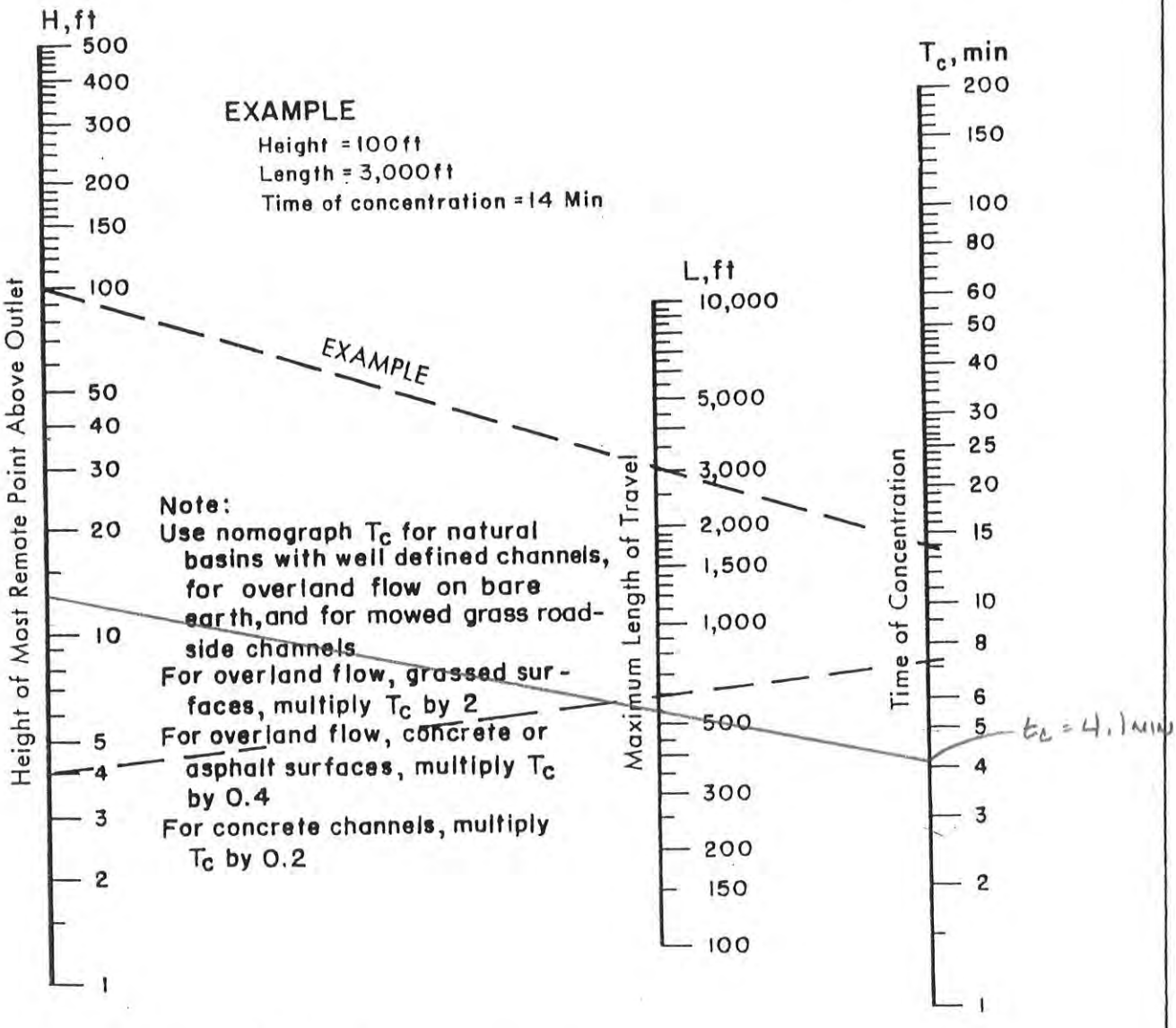
SHEET ___ of ___

Project: COOL SPRINGS IND.

Date: 9-6-05 Project No: 04-1311-7A

Designed: CAL Checked: ___

ΔH 500 - 487 = 13'
L = 553.21'



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

t_c = 4.1 MIN. ∴ USE 4 MIN

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

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Table of Contents (continued)

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

	Node ID		Type	HYG Vol cu.ft	Trun.	Qpeak min	Qpeak cfs	Max WSEL ft
	BASIN	IN	POND	18060		4.00	15.05	
	BASIN	OUT	POND	18060		5.00	15.05	487.80
Outfall	OUTFALL		JCT	18060		5.00	15.05	
	STORM		HYG	18060		4.00	15.05	

HYG file =
HYG ID = 15 YR
HYG Tag =

Peak Discharge =	15.05 cfs
Time to Peak =	4.00 min
HYG Volume =	18060 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	.00	3.76	7.53	11.29	15.05
5.00	15.05	15.05	15.05	15.05	15.05
10.00	15.05	15.05	15.05	15.05	15.05
15.00	15.05	15.05	15.05	15.05	15.05
20.00	15.05	11.29	7.53	3.76	.00
25.00	.00	.00	.00	.00	.00
30.00	.00	.00	.00	.00	.00
35.00	.00	.00	.00	.00	.00
40.00	.00	.00	.00	.00	.00
45.00	.00	.00	.00	.00	.00
50.00	.00	.00	.00	.00	.00
55.00	.00	.00	.00	.00	.00
60.00	.00	.00	.00	.00	.00
65.00	.00	.00	.00	.00	.00
70.00	.00	.00	.00	.00	.00
75.00	.00	.00	.00	.00	.00
80.00	.00	.00	.00	.00	.00
85.00	.00	.00	.00	.00	.00
90.00	.00	.00	.00	.00	.00
95.00	.00	.00	.00	.00	.00
100.00	.00	.00	.00	.00	.00
105.00	.00	.00	.00	.00	.00
110.00	.00	.00	.00	.00	.00
115.00	.00	.00	.00	.00	.00
120.00	.00	.00	.00	.00	.00
125.00	.00	.00	.00	.00	.00
130.00	.00	.00	.00	.00	.00
135.00	.00	.00	.00	.00	.00
140.00	.00	.00	.00	.00	.00
145.00	.00	.00	.00	.00	.00
150.00	.00	.00	.00	.00	.00

HYDROGRAPH ORDINATES (cfs)
Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
155.00	.00	.00	.00	.00	.00
160.00	.00	.00	.00	.00	.00
165.00	.00	.00	.00	.00	.00
170.00	.00	.00	.00	.00	.00
175.00	.00	.00	.00	.00	.00
180.00	.00	.00	.00	.00	.00
185.00	.00	.00	.00	.00	.00
190.00	.00	.00	.00	.00	.00
195.00	.00	.00	.00	.00	.00
200.00	.00	.00	.00	.00	.00
205.00	.00	.00	.00	.00	.00
210.00	.00	.00	.00	.00	.00
215.00	.00	.00	.00	.00	.00
220.00	.00	.00	.00	.00	.00
225.00	.00	.00	.00	.00	.00
230.00	.00	.00	.00	.00	.00
235.00	.00	.00	.00	.00	.00
240.00	.00				

TIME vs. ELEVATION (ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	487.00	487.22	487.45	487.61	487.74
5.00	487.80	487.80	487.80	487.80	487.80
10.00	487.80	487.80	487.80	487.80	487.80
15.00	487.80	487.80	487.80	487.80	487.80
20.00	487.80	487.74	487.61	487.45	487.22
25.00	487.00				

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	0	3	24	63	114
5.00	144	144	144	144	144
10.00	144	144	144	144	144
15.00	144	144	144	144	144
20.00	144	114	63	24	3
25.00	0				

File.... H:\PONDPACK\A13000PLUS\13117A\DETENTION\13117APONDINGCALCS.PPW

POND VOLUME CALCULATIONS

Planimeter scale: 1.00 ft/in

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	Volume (cu.ft)	Volume Sum (cu.ft)
487.00	.000	0	0	0	0
488.00	828.600	829	829	276	276

POND VOLUME EQUATIONS

* 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

File.... H:\PONDPACK\A13000PLUS\13117A\DETENTION\13117APONDINGCALCS.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 487.00 ft
Increment = .10 ft
Max. Elev.= 488.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Inlet Box	5	--->	CV	487.000	489.000
Culvert-Circular	CV	--->	TW	479.350	489.000

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = 5
Structure Type = Inlet Box

# of Openings	=	1	
Invert Elev.	=	487.00	ft
Orifice Area	=	10.6975	sq.ft
Orifice Coeff.	=	.600	
Weir Length	=	11.67	ft
Weir Coeff.	=	3.000	
K, Submerged	=	.000	
K, Reverse	=	1.000	
Kb,Barrel	=	.000000	(per ft of full flow)
Barrel Length	=	.00	ft
Mannings n	=	.0000	

File.... H:\PONDPACK\A13000PLUS\13117A\DETENTION\13117APONDINGCALCS.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = CV
Structure Type = Culvert-Circular

No. Barrels	=	1
Barrel Diameter	=	3.0000 ft
Upstream Invert	=	479.35 ft
Dnstream Invert	=	478.21 ft
Horiz. Length	=	38.85 ft
Barrel Length	=	38.87 ft
Barrel Slope	=	.02934 ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130
Ke	=	.0000 (forward entrance loss)
Kb	=	.007228 (per ft of full flow)
Kr	=	.0000 (reverse entrance loss)
HW Convergence	=	.001 +/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0098
Inlet Control M	=	2.0000
Inlet Control c	=	.03980
Inlet Control Y	=	.6700
T1 ratio (HW/D)	=	1.146
T2 ratio (HW/D)	=	1.292
Slope Factor	=	-.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 482.79 ft ---> Flow = 42.85 cfs
At T2 Elev = 483.23 ft ---> Flow = 48.97 cfs

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...

Maximum Iterations	=	30
Min. TW tolerance	=	.01 ft
Max. TW tolerance	=	.01 ft
Min. HW tolerance	=	.01 ft
Max. HW tolerance	=	.01 ft
Min. Q tolerance	=	.10 cfs
Max. Q tolerance	=	.10 cfs

File.... H:\PONDPACK\A13000PLUS\13117A\DETENTION\13117APONDINGCALCS.PPW

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

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
487.00	.00	Free Outfall		(no Q: 5,CV)
487.10	1.11	Free Outfall		5,CV
487.20	3.13	Free Outfall		5,CV
487.30	5.75	Free Outfall		5,CV
487.40	8.86	Free Outfall		5,CV
487.50	12.38	Free Outfall		5,CV
487.60	16.27	Free Outfall		5,CV
487.70	20.50	Free Outfall		5,CV
487.80	25.05	Free Outfall		5,CV
487.90	29.89	Free Outfall		5,CV
488.00	35.01	Free Outfall		5,CV

LEVEL POOL ROUTING DATA

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\DETENTION\
Inflow HYG file = NONE STORED - BASIN IN 2
Outflow HYG file = NONE STORED - BASIN OUT 2

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	487.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
487.00	.00	0	0	.00	.00	.00
487.10	1.11	0	8	.00	1.11	1.12
487.20	3.13	2	33	.00	3.13	3.21
487.30	5.75	7	75	.00	5.75	6.00
487.40	8.86	18	133	.00	8.86	9.45
487.50	12.38	35	207	.00	12.38	13.53
487.60	16.27	60	298	.00	16.27	18.26
487.70	20.50	95	406	.00	20.50	23.66
487.80	25.05	141	530	.00	25.05	29.76
487.90	29.89	201	671	.00	29.89	36.60
488.00	35.01	276	829	.00	35.01	44.22

LEVEL POOL ROUTING SUMMARY

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\DETENTION\
Inflow HYG file = NONE STORED - BASIN IN 15
Outflow HYG file = NONE STORED - BASIN OUT 15

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	487.00 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	15.05 cfs	at	4.00 min
Peak Outflow	=	15.05 cfs	at	5.00 min
Peak Elevation	=	487.80 ft		
Peak Storage	=	144 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	18060
- Infiltration	=	0
- HYG Vol OUT	=	18060
- Retained Vol	=	0
Unrouted Vol	=	0 cu.ft (.000% of Outflow Volume)

Index of St. .ng Page Numbers for ID Names

Sediment Storage Calculations

Prepared By: Bax Engineering CO., INC

Cool Springs Industrial

Bax Project NO. 04-13117A

May 26, 2005

Permanent Sediment Basin "1":

Inflow Data

Basin design to accommodate the 25 year, 20 minute design storm and allowing for 1 foot minimum of freeboard above the 25 year high-water elevation.

Disturbed area to the basin = 3.91 Acres

25-Year, 20 minute P.I. – 3.00(onsite), 2.31(offsite), 4.75(offsite)

Discharge Q = 3.91 x 3.00 + 14.51 x 2.31 + 0.43 x 4.75 = 47.29 cfs

Total drainage area to basin 18.85 Ac.

Total discharge to basin 47.29 cfs

Annual sediment storage volume required per City of O'Fallon requirements is 125 ft³ of sediment storage/Acre of disturbed area to sediment basin.

A. **Sediment storage volume required**

2 years of sediment storage = 3.91 Acres (125 ft³/Acre/year)(2 years)

2 years of sediment storage = **978 ft³**

Basin Volume:

ELEVATION	AREA (SF)	VOLUME (CF)	TOTAL VOLUME (CF)
469.00	0.00	0.00	0.00
470.00	2,486.00	829.00	829.00
472.00	10,100.00	11,731.00	12,560.00
474.00	14,999.00	24,938.00	37,498.00
476.00	20,592.00	35,444.00	72,942.00
478.00	24,755.00	45,283.00	118,225.00

Sediment storage volume achieved at elevation: **470.03**

B. **"Wet" storage volume required**

Note: "Wet" storage volume to be provided above sediment storage volume elevation.

67 yd³ / Ac x 27 ft³ / yd x 3.91 Ac = **7,074 ft³**

"Wet" storage volume achieved at elevation: **471.23**

C. **"Dry" storage volume required**

Note: "Dry" storage volume to be provided above "wet" storage volume elevation

67 yd^3 / Ac x 27 ft^3 / yd x 3.91 Ac = **7,074 ft^3**

"Dry" storage volume achieved at elevation: **472.21**

D. **Basin interim outfall structure**

Structure to consist of a permanent 48" R.C.P. with 48" C.M.P. insert. Connection to be wrapped with fabric, tied and connected to a temporary 48" C.M.P. with a dewatering device. Dewatering device to be composed of 8" perforated polyethylene drainage tubing connected to the C.M.P. riser at the "wet" storage volume elevation. Top of riser is set at a 473.00 elevation. See Figure 2 for details.

E. **25-Year routing results**

See attached calculations for details. Calculations ran assuming a starting water surface elevation equal to the sediment storage volume: 472.21

25-Year H.W. – 474.12

Top of Berm – 478.00

Freeboard – 3.88'

ENGINEERING

PLANNING

SURVEYING

PROJECT: COOL SPRINGS INDUSTRIAL PARK
DATE: 05-25-2005 . PROJECT NO: 04-13117A
DESIGNED: JLJ .CHECKED: CLH

TIME OF CONCENTRATION FOR SMALL DRAINAGE BASINS

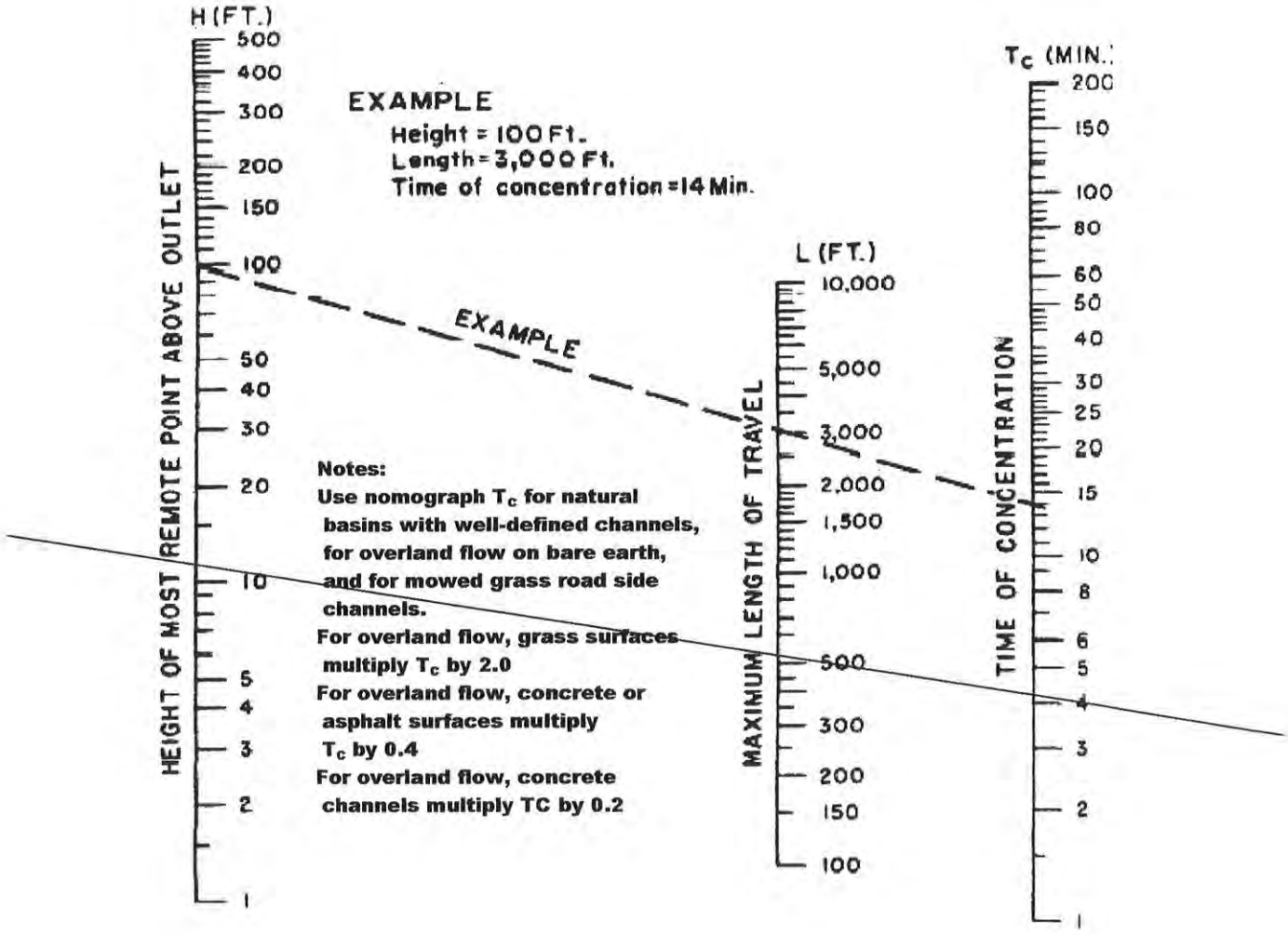

FIGURE 1

Approximate flow path to be used will start at the mid point of the western edge of the development flowing in an eastwardly direction until intercepted by the swale that drains to AI 101.

Length = 515 ft Height = 12 ft
Tc = 4 minutes

BAX ENGINEERING CO., INC.
1052 South Cloverleaf Drive
St. Peters, MO 63376-6445
636-928-5552 FAX 928-1718

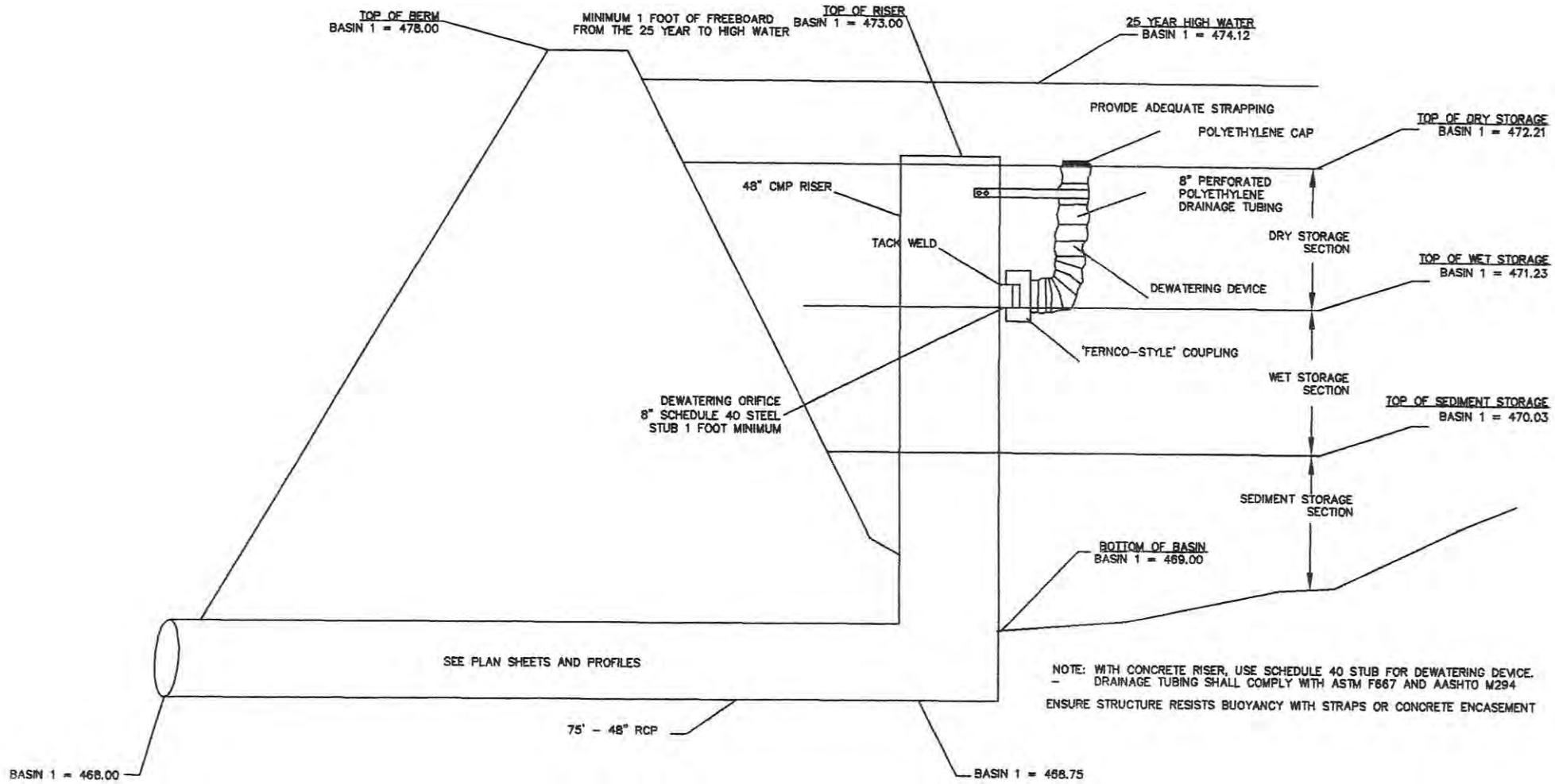

FIGURE 2

TYPICAL TEMPORARY SEDIMENT BASIN CONTROL STRUCTURE DETAIL
NOT TO SCALE

PREPARED FOR:
HOOKER CONSTRUCTION
221 SPENCER ROAD, SUITE Q
ST.PETERS, MO 63376
636-696-0825

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I hereby specify that the documents intended to be authenticated by my seal are limited to this sheet, and I hereby disclaim any responsibility for all other Drawings, Specifications, Estimates, Reports or other documents or instruments relating to or intended to be used for any part or parts of the architectural or engineering project or survey.

REVISIONS

ENGINEERING
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1052 South Cloverleaf Drive
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(636)928-5552
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05/26/05
DATE

04-13117A
PROJECT NUMBER

13117AGRD.dwg
FILE NAME

JLJ — ***DRAWN***
CLH — ***CHECKED***

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TIME vs. ELEVATION (ft)

Output Time increment = 1.00 min
Time on left represents time for first value in each row.

Time min					
.00	472.21	472.24	472.34	472.50	472.72
5.00	472.95	473.17	473.36	473.52	473.65
10.00	473.76	473.84	473.91	473.96	474.00
15.00	474.04	474.06	474.09	474.10	474.11
20.00	474.12	474.11	474.06	473.98	473.86
25.00	473.75	473.66	473.58	473.51	473.46
30.00	473.41	473.37	473.33	473.30	473.27
35.00	473.25	473.23	473.21	473.20	473.18
40.00	473.17	473.16	473.15	473.14	473.13
45.00	473.12	473.11	473.11	473.10	473.09
50.00	473.09	473.08	473.08	473.07	473.07
55.00	473.07	473.06	473.06	473.06	473.05
60.00	473.05	473.05	473.04	473.04	473.04
65.00	473.04	473.04	473.03	473.03	473.03
70.00	473.03	473.03	473.03	473.02	473.02
75.00	473.02	473.02	473.02	473.02	473.02
80.00	473.02	473.02	473.01	473.01	473.01
85.00	473.01	473.01	473.01	473.01	473.01
90.00	473.01	473.01	473.01	473.01	473.01
95.00	473.01	473.01	473.01	473.01	473.01
100.00	473.01	473.00	473.00	473.00	473.00
105.00	473.00	473.00	473.00	473.00	473.00
110.00	473.00	473.00	473.00	473.00	473.00
115.00	473.00	473.00	473.00	473.00	473.00
120.00	473.00	473.00	473.00	473.00	473.00
125.00	473.00	473.00	473.00	473.00	473.00
130.00	473.00	473.00	473.00	473.00	473.00
135.00	473.00	473.00	473.00	473.00	473.00
140.00	473.00	473.00	473.00	473.00	473.00
145.00	473.00	473.00	473.00	473.00	473.00
150.00	473.00	473.00	473.00	473.00	

TIME vs. VOLUME (cu.ft)

Time min	Output Time increment = 1.00 min Time on left represents time for first value in each row.				
.00	14730	15082	16146	17922	20403
5.00	23239	25993	28496	30655	32462
10.00	33953	35166	36150	36935	37567
15.00	38067	38465	38783	39035	39232
20.00	39388	39195	38405	37142	35494
25.00	33846	32505	31405	30493	29727
30.00	29084	28534	28063	27661	27307
35.00	26999	26728	26492	26283	26095
40.00	25925	25772	25634	25510	25399
45.00	25298	25207	25125	25051	24981
50.00	24916	24854	24795	24740	24687
55.00	24638	24592	24548	24506	24467
60.00	24430	24396	24363	24331	24302
65.00	24274	24248	24224	24200	24178
70.00	24158	24138	24119	24102	24085
75.00	24070	24055	24041	24028	24015
80.00	24004	23993	23982	23972	23963
85.00	23954	23946	23938	23931	23923
90.00	23917	23911	23905	23899	23894
95.00	23889	23884	23880	23876	23872
100.00	23868	23865	23861	23858	23855
105.00	23852	23849	23847	23844	23843
110.00	23840	23838	23836	23835	23833
115.00	23831	23830	23828	23827	23826
120.00	23825	23824	23822	23821	23821
125.00	23819	23819	23818	23817	23816
130.00	23816	23815	23814	23814	23813
135.00	23813	23813	23812	23811	23811
140.00	23811	23810	23810	23810	23810
145.00	23809	23809	23809	23808	23808
150.00	23808	23808	23808	23807	

File.... H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\SEDIMENT 13177A.PPW

POND VOLUME CALCULATIONS

Planimeter scale: 1.00 ft/in

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	Volume (cu.ft)	Volume Sum (cu.ft)
469.00	.000	0	0	0	0
470.00	2486.000	2486	2486	829	829
472.00	10100.000	10100	17597	11731	12560
474.00	14999.000	14999	37407	24938	37498
476.00	20592.000	20592	53165	35444	72942
478.00	24755.000	24755	67925	45283	118225

POND VOLUME EQUATIONS

* 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

File.... H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\SEDIMENT 13177A.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 469.00 ft
Increment = .10 ft
Max. Elev.= 478.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Stand Pipe	1	--->	CV	473.000	478.000
Culvert-Circular	CV	--->	TW	468.750	478.000

TW SETUP, DS Channel

File.... H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\SEDIMENT 13177A.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID	=	1	
Structure Type	=	Stand Pipe	
# of Openings	=	1	
Invert Elev.	=	473.00	ft
Diameter	=	4.0000	ft
Orifice Area	=	12.5664	sq.ft
Orifice Coeff.	=	.600	
Weir Length	=	12.57	ft
Weir Coeff.	=	3.000	
K, Submerged	=	.000	
K, Reverse	=	1.000	
Kb,Barrel	=	.000000	(per ft of full flow)
Barrel Length	=	.00	ft
Mannings n	=	.0000	

File.... H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\SEDIMENT 13177A.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = CV
Structure Type = Culvert-Circular

No. Barrels	=	1
Barrel Diameter	=	4.0000 ft
Upstream Invert	=	468.75 ft
Dnstream Invert	=	468.00 ft
Horiz. Length	=	75.00 ft
Barrel Length	=	75.00 ft
Barrel Slope	=	.01000 ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130	
Ke	=	.0000	(forward entrance loss)
Kb	=	.004925	(per ft of full flow)
Kr	=	.0000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0098
Inlet Control M	=	2.0000
Inlet Control c	=	.03980
Inlet Control Y	=	.6700
T1 ratio (HW/D)	=	1.155
T2 ratio (HW/D)	=	1.302
Slope Factor	=	-.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...
At T1 Elev = 473.37 ft ---> Flow = 87.96 cfs
At T2 Elev = 473.96 ft ---> Flow = 100.53 cfs

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...

Maximum Iterations	=	30
Min. TW tolerance	=	.01 ft
Max. TW tolerance	=	.01 ft
Min. HW tolerance	=	.01 ft
Max. HW tolerance	=	.01 ft
Min. Q tolerance	=	.10 cfs
Max. Q tolerance	=	.10 cfs

File.... H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\SEDIMENT 13177A.PPW

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

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
469.00	.00	Free Outfall		(no Q: 1,CV)
469.10	.00	Free Outfall		(no Q: 1,CV)
469.20	.00	Free Outfall		(no Q: 1,CV)
469.30	.00	Free Outfall		(no Q: 1,CV)
469.40	.00	Free Outfall		(no Q: 1,CV)
469.50	.00	Free Outfall		(no Q: 1,CV)
469.60	.00	Free Outfall		(no Q: 1,CV)
469.70	.00	Free Outfall		(no Q: 1,CV)
469.80	.00	Free Outfall		(no Q: 1,CV)
469.90	.00	Free Outfall		(no Q: 1,CV)
470.00	.00	Free Outfall		(no Q: 1,CV)
470.10	.00	Free Outfall		(no Q: 1,CV)
470.20	.00	Free Outfall		(no Q: 1,CV)
470.30	.00	Free Outfall		(no Q: 1,CV)
470.40	.00	Free Outfall		(no Q: 1,CV)
470.50	.00	Free Outfall		(no Q: 1,CV)
470.60	.00	Free Outfall		(no Q: 1,CV)
470.70	.00	Free Outfall		(no Q: 1,CV)
470.80	.00	Free Outfall		(no Q: 1,CV)
470.90	.00	Free Outfall		(no Q: 1,CV)
471.00	.00	Free Outfall		(no Q: 1,CV)
471.10	.00	Free Outfall		(no Q: 1,CV)
471.20	.00	Free Outfall		(no Q: 1,CV)
471.30	.00	Free Outfall		(no Q: 1,CV)
471.40	.00	Free Outfall		(no Q: 1,CV)
471.50	.00	Free Outfall		(no Q: 1,CV)
471.60	.00	Free Outfall		(no Q: 1,CV)
471.70	.00	Free Outfall		(no Q: 1,CV)
471.80	.00	Free Outfall		(no Q: 1,CV)
471.90	.00	Free Outfall		(no Q: 1,CV)
472.00	.00	Free Outfall		(no Q: 1,CV)
472.10	.00	Free Outfall		(no Q: 1,CV)
472.20	.00	Free Outfall		(no Q: 1,CV)
472.30	.00	Free Outfall		(no Q: 1,CV)
472.40	.00	Free Outfall		(no Q: 1,CV)
472.50	.00	Free Outfall		(no Q: 1,CV)
472.60	.00	Free Outfall		(no Q: 1,CV)
472.70	.00	Free Outfall		(no Q: 1,CV)

File.... H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\SEDIMENT 13177A.PPW

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

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
472.80	.00	Free Outfall		(no Q: 1,CV)
472.90	.00	Free Outfall		(no Q: 1,CV)
473.00	.00	Free Outfall		(no Q: 1,CV)
473.10	1.19	Free Outfall		1,CV
473.20	3.37	Free Outfall		1,CV
473.30	6.19	Free Outfall		1,CV
473.40	9.54	Free Outfall		1,CV
473.50	13.33	Free Outfall		1,CV
473.60	17.52	Free Outfall		1,CV
473.70	22.08	Free Outfall		1,CV
473.80	26.97	Free Outfall		1,CV
473.90	32.19	Free Outfall		1,CV
474.00	37.70	Free Outfall		1,CV
474.10	43.49	Free Outfall		1,CV
474.20	49.56	Free Outfall		1,CV
474.30	55.88	Free Outfall		1,CV
474.40	62.45	Free Outfall		1,CV
474.50	69.26	Free Outfall		1,CV
474.60	76.30	Free Outfall		1,CV
474.70	114.25	Free Outfall		1,CV
474.80	115.97	Free Outfall		1,CV
474.90	117.68	Free Outfall		1,CV
475.00	119.35	Free Outfall		1,CV
475.10	121.00	Free Outfall		1,CV
475.20	122.64	Free Outfall		1,CV
475.30	124.24	Free Outfall		1,CV
475.40	125.81	Free Outfall		1,CV
475.50	127.39	Free Outfall		1,CV
475.60	128.94	Free Outfall		1,CV
475.70	130.46	Free Outfall		1,CV
475.80	131.99	Free Outfall		1,CV
475.90	133.47	Free Outfall		1,CV
476.00	134.94	Free Outfall		1,CV
476.10	136.42	Free Outfall		1,CV
476.20	137.85	Free Outfall		1,CV
476.30	139.28	Free Outfall		1,CV
476.40	140.71	Free Outfall		1,CV
476.50	142.10	Free Outfall		1,CV

Type.... Composite Rating Curve
Name.... Outlet 1

File.... H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\SEDIMENT 13177A.PPW

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

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
476.60	143.50	Free Outfall		1,CV
476.70	144.86	Free Outfall		1,CV
476.80	146.25	Free Outfall		1,CV
476.90	147.58	Free Outfall		1,CV
477.00	148.92	Free Outfall		1,CV
477.10	150.25	Free Outfall		1,CV
477.20	151.56	Free Outfall		1,CV
477.30	152.87	Free Outfall		1,CV
477.40	154.16	Free Outfall		1,CV
477.50	155.45	Free Outfall		1,CV
477.60	156.71	Free Outfall		1,CV
477.70	157.98	Free Outfall		1,CV
477.80	159.22	Free Outfall		1,CV
477.90	160.48	Free Outfall		1,CV
478.00	161.70	Free Outfall		1,CV

LEVEL POOL ROUTING DATA

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\
Inflow HYG file = NONE STORED - BASIN IN 25
Outflow HYG file = NONE STORED - BASIN OUT 25

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 472.21 ft
Starting Volume = 14730 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
469.00	.00	0	0	.00	.00	.00
469.10	.00	1	25	.00	.00	.03
469.20	.00	7	99	.00	.00	.22
469.30	.00	22	224	.00	.00	.75
469.40	.00	53	398	.00	.00	1.77
469.50	.00	104	622	.00	.00	3.45
469.60	.00	179	895	.00	.00	5.97
469.70	.00	284	1218	.00	.00	9.47
469.80	.00	424	1591	.00	.00	14.14
469.90	.00	604	2014	.00	.00	20.14
470.00	.00	829	2486	.00	.00	27.62
470.10	.00	1090	2745	.00	.00	36.34
470.20	.00	1378	3017	.00	.00	45.94
470.30	.00	1694	3301	.00	.00	56.46
470.40	.00	2039	3598	.00	.00	67.96
470.50	.00	2414	3909	.00	.00	80.47
470.60	.00	2821	4232	.00	.00	94.03
470.70	.00	3261	4568	.00	.00	108.69
470.80	.00	3735	4916	.00	.00	124.49
470.90	.00	4244	5278	.00	.00	141.48

Name.... BASIN
File.... H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\SEDIMENT 13177A.PPW

LEVEL POOL ROUTING DATA

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\
Inflow HYG file = NONE STORED - BASIN IN 25
Outflow HYG file = NONE STORED - BASIN OUT 25

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 472.21 ft
Starting Volume = 14730 cu.ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = 1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
471.00	.00	4791	5652	.00	.00	159.69
471.10	.00	5375	6039	.00	.00	179.18
471.20	.00	5999	6439	.00	.00	199.97
471.30	.00	6663	6852	.00	.00	222.11
471.40	.00	7370	7277	.00	.00	245.66
471.50	.00	8119	7716	.00	.00	270.64
471.60	.00	8913	8167	.00	.00	297.11
471.70	.00	9753	8631	.00	.00	325.11
471.80	.00	10640	9108	.00	.00	354.66
471.90	.00	11575	9597	.00	.00	385.84
472.00	.00	12560	10100	.00	.00	418.66
472.10	.00	13581	10322	.00	.00	452.70
472.20	.00	14625	10546	.00	.00	487.48
472.30	.00	15690	10773	.00	.00	523.01
472.40	.00	16779	11003	.00	.00	559.30
472.50	.00	17891	11234	.00	.00	596.36
472.60	.00	19026	11468	.00	.00	634.20
472.70	.00	20185	11705	.00	.00	672.83
472.80	.00	21367	11944	.00	.00	712.23
472.90	.00	22573	12185	.00	.00	752.45

LEVEL POOL ROUTING DATA

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\
Inflow HYG file = NONE STORED - BASIN IN 25
Outflow HYG file = NONE STORED - BASIN OUT 25

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	= 472.21	ft
Starting Volume	= 14730	cu.ft
Starting Outflow	= .00	cfs
Starting Infiltr.	= .00	cfs
Starting Total Qout	= .00	cfs
Time Increment	= 1.00	min

Elevation ft	Outflow cfs	Storage cu.ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
475.00	119.35	53822	17685	.00	119.35	1913.40
475.10	121.00	55604	17966	.00	121.00	1974.47
475.20	122.64	57415	18249	.00	122.64	2036.47
475.30	124.24	59254	18534	.00	124.24	2099.36
475.40	125.81	61121	18821	.00	125.81	2163.19
475.50	127.39	63018	19111	.00	127.39	2227.99
475.60	128.94	64944	19403	.00	128.94	2293.73
475.70	130.46	66899	19697	.00	130.46	2360.43
475.80	131.99	68883	19993	.00	131.99	2428.08
475.90	133.47	70897	20291	.00	133.47	2496.71
476.00	134.94	72942	20592	.00	134.94	2566.33
476.10	136.42	75011	20791	.00	136.42	2636.78
476.20	137.85	77100	20991	.00	137.85	2707.85
476.30	139.28	79209	21192	.00	139.28	2779.57
476.40	140.71	81338	21394	.00	140.71	2851.98
476.50	142.10	83488	21597	.00	142.10	2925.02
476.60	143.50	85658	21801	.00	143.50	2998.76
476.70	144.86	87848	22006	.00	144.86	3073.13
476.80	146.25	90059	22211	.00	146.25	3148.19
476.90	147.58	92290	22418	.00	147.58	3223.91

LEVEL POOL ROUTING DATA

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\
Inflow HYG file = NONE STORED - BASIN IN 25
Outflow HYG file = NONE STORED - BASIN OUT 25

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	472.21 ft
Starting Volume	=	14730 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

Elevation ft	Outflow cfs	Storage cu.ft	Area sq.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
477.00	148.92	94542	22626	.00	148.92	3300.32
477.10	150.25	96816	22834	.00	150.25	3377.43
477.20	151.56	99110	23044	.00	151.56	3455.21
477.30	152.87	101424	23254	.00	152.87	3533.67
477.40	154.16	103760	23466	.00	154.16	3612.82
477.50	155.45	106117	23678	.00	155.45	3692.69
477.60	156.71	108496	23892	.00	156.71	3773.24
477.70	157.98	110896	24106	.00	157.98	3854.51
477.80	159.22	113317	24321	.00	159.22	3936.44
477.90	160.48	115760	24538	.00	160.48	4019.14
478.00	161.70	118225	24755	.00	161.70	4102.51

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN IN

HYG Directory: H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
ROUTE	STORM		25 YR	

INFLOWS TO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	25 YR		56748	4.00	47.29

TOTAL FLOW INTO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time min	Peak Flow cfs
	BASIN IN	25	56748	4.00	47.29

LEVEL POOL ROUTING SUMMARY

HYG Dir = H:\PONDPACK\A13000PLUS\13117A\SEDIMENT\
Inflow HYG file = NONE STORED - BASIN IN 25
Outflow HYG file = NONE STORED - BASIN OUT 25

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	472.21 ft
Starting Volume	=	14730 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	1.00 min

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	47.29 cfs	at	4.00 min
Peak Outflow	=	44.99 cfs	at	20.00 min
Peak Elevation	=	474.12 ft		
Peak Storage	=	39388 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	14730
+ HYG Vol IN	=	56748
- Infiltration	=	0
- HYG Vol OUT	=	47671
- Retained Vol	=	23807
Unrouted Vol	= -	cu.ft (.000% of Inflow Volume)

T.R. HUGHES BLVD.

COOL SPRINGS INDUSTRIAL DRIVE
(VARIABLE WIDTH)

13.10 ac. @ 2.31
Q = 30.26 c.f.s.

2.91 ac. @ 3.40
Q = 7.71 c.f.s.

1.41 ac. @ 2.31
0.43 ac. @ 4.75
Q = 3.39 c.f.s.

GRAVEL

GRAVEL

GRAPHIC SCALE

100 0 50 100

(IN FEET)
1 inch = 100 ft.

PREPARED FOR:
HOOKER CONSTRUCTION
221 SPENCER ROAD, SUITE Q
ST.PETERS, MO 63376
636-696-0825

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FILE NAME

JLJ — CLH
DRAWN — *CHECKED*