

418
 Lot 17th Midpoint Ind.
 Detention Report

PICKETT RAY & SILVER
 333 MID RIVERS MALL DR.
 ST. PETERS, MO 63376
 PHONE 636-397-1211

PAGE 1

LOT 17 MIDPOINT
 88134 13:39:05

HYDRAULIC
 DATA

LINE		PIPE		SLOPE		FLOW LINE		SURFACE		
UP	DOWN	LENGTH	SIZE	FT/FT		UP	DOWN	UP	DOWN	
		AREA	P.I.	AREA	P.I.	QUANTITY	PIPE	DEPTH		
		AC.		AC.		INCR. TOTAL	CAP.	FLOW		
						CFS CFS	CFS	FT.		
		HYDR.	VEL.	VEL.	VEL.	FRIC.	TURN	HYD.	ELEV.	N
		GRADE	FPS	HEAD	HEAD	HEAD	LOSS	UP	DOWN	
		FT/FT		FT.	CHANGE	FT.	FT.			
CI1	EXCI	18	12	.0100		612.18	612.00	618.10	616.34	
		0.08	3.8			0.3	3.0	3.6		4.67
		.0073	3.87	0.23	0.04	0.13	0.00	613.43	613.25	.013
OS2	CI1	163	12	.0210		615.60	612.18	619.00	618.10	
		0.71	3.8			2.7	2.7	5.2		2.88
		.0059	3.48	0.19	0.19	0.96	0.00	616.12	613.43	.013

333 Mid Rivers Mall Drive
St. Peters, MO 63376

Civil Engineers
Planners
Land Surveyors (636) 397-1211

Project Name LOTS 17 & 18 MIDPOINT
Project Number 88134.
Date 1/3/2003
Designer DLS
Page _____

Stormwater Detention

Design Storm: 100 year/ 20 min.

100 YEAR Q = 4.3 cfs

Check Low Flow Blocked

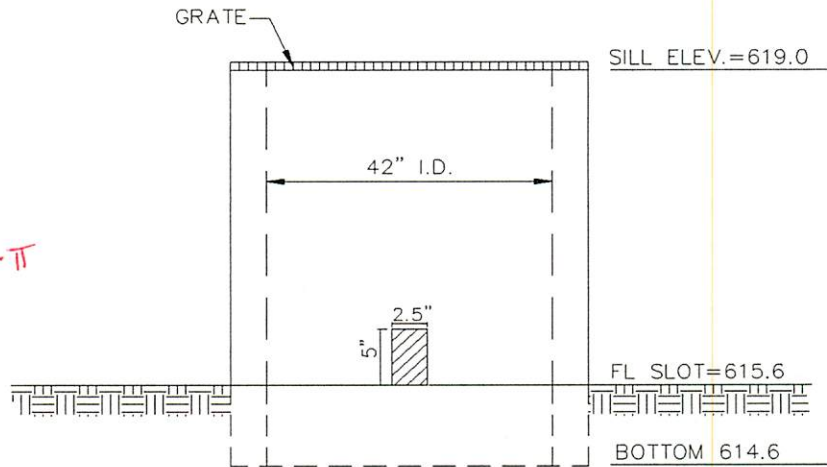
$$Q = CLH^{3/2}$$

$$C = 3$$

$$L = 10.99$$

$$H = 0.26$$

$$= \frac{42}{12} \cdot \pi$$



100 Year High Water Elevation

$$H.W.E. = \text{sill elev.} + H$$

$$\text{sill elev.} = 619.00$$

$$H.W.E. = 619.26$$

OUTFALL STRUCTURE 2
42" INSIDE DIAMETER STANDPIPE
WITH GRATE ON SILL

Pickett, Ray & Silver, Inc.

LOTS 17 & 18 MIDPOINT INDUSTRIAL
88134.UNPR.00C
12-23-02

STORMWATER DETENTION CALCULATIONS 2 YEAR/20 MIN.

21 Peak outflow is greater than max.
allowable release for 2yr storm

SITE AREA: 1.00 ACRES

DIFFERENTIAL RUN-OFF:

UNDEVELOPED: 1.00 ACRES @ 1.15 = 1.15 CFS
DEVELOPED: 1.00 ACRES @ 2.39 = 2.39 CFS

DIFFERENTIAL: 1.24 CFS

MAXIMUM ALLOWABLE RELEASE:

1.00 ACRES @ 1.15 CFS/ACRE = 1.15 CFS
BYPASS 0.29 ACRES @ 2.39 CFS/ACRE = 0.69 CFS

ALLOWABLE RELEASE 0.46 CFS

STORAGE REQUIRED:

1.24 CFS x (30 MIN. x 60 SEC) = 2232 CU. FT.
2232 CU. FT. x 1.39 = 3102 CU. FT. (100YEAR)

DIRECT RUN-OFF TO BASIN:

0.71 ACRES @ 2.39 CFS/ACRE = 1.70 CFS
1.70 CFS x 60 SEC, = 102 CFM

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Pickett, Ray & Silver, Inc.

LOTS 17 & 18 MIDPOINT INDUSTRIAL
88134 UNPR.00C
12-23-02

STORMWATER DETENTION CALCULATIONS 2 YEAR 20 MIN.

SITE AREA 1.00 ACRES

DIFFERENTIAL RUN-OFF:

UNDEVELOPED: 1.00 ACRES @ 1.15 = 1.15 CFS
DEVELOPED: 1.00 ACRES @ 2.39 = 2.39 CFS
DIFFERENTIAL: 1.24 CFS

MAXIMUM ALLOWABLE RELEASE:

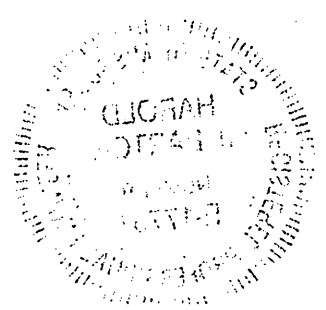
1.00 ACRES @ 1.15 CFS/ACRE = 1.15 CFS
BYPASS 0.29 ACRES @ 2.39 CFS/ACRE = 0.69 CFS
ALLOWABLE RELEASE 0.48 CFS

STORAGE REQUIRED:

1.24 CFS x (30 MIN. x 60 SEC) = 2232 CU. FT.
2.39 CFS x 1.39 = 3102 CU. FT. (100YEAR)

DIRECT RUN-OFF TO BASIN:

0.71 ACRES @ 2.39 CFS/ACRE = 1.70 CFS
1.70 CFS x 60 SEC = 102 CFM



88134 12-23-02 SUBMITTAL DATE:

ELEVATION	AREA	VOLUME	CUM. VOLUME
615.60	0	25	25
616.00	127	2592	2617
618.00	2465	3129	5746
619.00	3793		

 *
 * RECTANGULAR ORIFICE *
 * 2.5 in W X 5 in H ELEV= 615.6 *
 *
 * Outlet Pipe - 163 ft - 12 in pipe *
 * UFL= 615.6 LFL= 612.18 n= .013 *
 *
 * Overflow Structure - Standpipe *
 * DIAM= 42 in STANDPIPE ELEV= 619 *
 *

88134 12-23-02 SUBMITTAL DATE:

MIN	INFLOW	STORAGE	OUTFLOW	NET DET.	ELEV.
1	5.10	5.10	0.00	5.10	615.68
2	10.20	15.30	0.74	14.56	615.83
3	15.30	29.86	3.57	26.29	616.00
4	20.40	46.69	8.24	38.45	616.01
5	25.50	63.95	8.54	55.41	616.02
6	30.60	86.01	11.82	74.19	616.04
7	35.70	109.89	12.21	97.68	616.06
8	40.80	138.48	12.68	125.80	616.08
9	45.90	171.70	13.23	158.47	616.10
10	51.00	209.47	13.83	195.64	616.13
11	56.10	251.74	14.49	237.25	616.16
12	61.20	298.45	15.19	283.26	616.20
13	66.30	349.56	15.94	333.62	616.24
14	71.40	405.02	16.71	388.31	616.28
15	76.50	464.81	17.51	447.30	616.33
16	81.60	528.90	18.34	510.56	616.37
17	86.70	597.26	19.18	578.08	616.43
18	91.80	669.88	20.05	649.83	616.48
19	96.90	746.73	20.92	725.81	616.54
20	102.00	827.81	21.82	805.99	616.60
21	96.90	902.89	22.72	880.17	616.66
22	91.80	971.97	23.52	948.45	616.71
23	86.70	1035.15	24.24	1010.91	616.76
24	81.60	1092.51	24.88	1067.63	616.80
25	76.50	1144.13	25.44	1118.69	616.84
26	71.40	1190.09	25.94	1164.15	616.88
27	66.30	1230.45	26.38	1204.07	616.91

28	61.20	1265.27	26.75	1238.51	616.94
29	56.10	1294.61	27.08	1267.53	616.96
30	51.00	1318.53	27.34	1291.19	616.98
31	45.90	1337.09	27.56	1309.53	616.99
32	40.80	1350.33	27.73	1322.60	617.00
33	35.70	1358.30	27.84	1330.46	617.01
34	30.60	1361.06	27.91	1333.15	617.01
35	25.50	1358.65	27.94	1330.71	617.01
36	20.40	1351.11	27.92	1323.19	617.00
37	15.30	1338.49	27.85	1310.64	616.99
38	10.20	1320.84	27.74	1293.10	616.98
39	5.10	1298.20	27.58	1270.62	616.96
40	0.00	1270.62	27.37	1243.25	616.94

PEAK OUTFLOW= .47 CFS AT 35 MINUTES

Pickett, Ray & Silver, Inc.

LOTS 17 & 18 MIDPOINT INDUSTRIAL
88134.UNPR.00C
12-23-02

STORMWATER DETENTION CALCULATIONS 15 YEAR/20 MIN.

SITE AREA: 1.00 ACRES

DIFFERENTIAL RUN-OFF:

UNDEVELOPED: 1.00 ACRES @ 1.87 = 1.87 CFS

DEVELOPED: 1.00 ACRES @ 3.85 = 3.85 CFS

DIFFERENTIAL: 1.98 CFS

MAXIMUM ALLOWABLE RELEASE:

1.00 ACRES @ 1.87 CFS/ACRE = 1.87 CFS

BYPASS 0.29 ACRES @ 3.85 CFS/ACRE = 1.12 CFS

ALLOWABLE RELEASE 0.75 CFS

STORAGE REQUIRED:

1.98 CFS x (30 MIN. x 60 SEC) = 3564 CU. FT.

3564 FT. x 1.39 = 4954 FT. (100YEAR)

15 → 100; x1.39

DIRECT RUN-OFF TO BASIN:

0.71 ACRES @ 3.85 CFS/ACRE = 2.73 CFS

2.73 x 60 SEC, = 163.8 CFM

Pickett, Ray & Silver, Inc.

LOTS 17 & 18 MIDPOINT INDUSTRIAL
 88134.UINR.00C
 13-53-05

STORMWATER DETENTION CALCULATIONS
 15 YEAR 20 MIN.

SITE AREA: 1.00 ACRES

DIFFERENTIAL RUN-OFF:

UNDEVELOPED: 1.00 ACRES @ 1.87 = 1.87 CFS
 DEVELOPED: 1.00 ACRES @ 2.85 = 2.85 CFS
 DIFFERENTIAL: 0.98 CFS

MAXIMUM ALLOWABLE RELEASE:

1.00 ACRES @ 1.87 CFS/ACRE = 1.87 CFS
 BYPASS 0.25 ACRES @ 2.85 CFS/ACRE = 0.71 CFS
 ALLOWABLE RELEASE: 0.75 CFS

STORAGE REQUIRED:

1.98 CFS x (30 MIN. x 60 SEC) = 3564 CU. FT.
 3564 CU. FT. x 1.35 = 4811 FT. (100 YEAR)

DIRECT RUN-OFF TO BASIN:

0.71 ACRES @ 2.85 CFS/ACRE = 2.03 CFS
 2.03 x 60 SEC. = 121.8 CFM


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*****
*
* RECTANGULAR ORIFICE
* 2.5 in W X 5 in H ELEV= 615.6
*
* Outlet Pipe - 163 ft - 12 in pipe
* UFL= 615.6 LFL= 612.18 n= .013
*
* Overflow Structure - Standpipe
* DIAM= 42 in STANDPIPE ELEV= 619
*
*****

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88134 12-23-02 SUBMITTAL DATE:

MIN	INFLOW	STORAGE	OUTFLOW	NET DET.	ELEV.
1	8.19	8.19	0.00	8.19	615.73
2	16.38	24.57	1.51	23.06	615.96
3	24.57	47.63	7.11	40.52	616.01
4	32.76	73.28	8.58	64.70	616.03
5	40.95	105.65	12.01	93.64	616.05
6	49.14	142.78	12.60	130.18	616.08
7	57.33	187.51	13.31	174.20	616.11
8	65.52	239.72	14.12	225.60	616.15
9	73.71	299.31	15.00	284.31	616.20
10	81.90	366.21	15.95	350.26	616.25
11	90.09	440.35	16.96	423.39	616.31
12	98.28	521.67	18.01	503.66	616.37
13	106.47	610.13	19.09	591.04	616.44
14	114.66	705.70	20.21	685.49	616.51
15	122.85	808.34	21.35	786.99	616.59
16	131.04	918.03	22.51	895.52	616.67
17	139.23	1034.75	23.69	1011.06	616.76
18	147.42	1158.48	24.88	1133.60	616.86
19	155.61	1289.21	26.09	1263.12	616.96
20	163.80	1426.92	27.30	1399.62	617.06
21	155.61	1555.23	28.53	1526.70	617.16
22	147.42	1674.12	29.62	1644.50	617.25
23	139.23	1783.73	30.61	1753.12	617.33
24	131.04	1884.16	31.48	1852.68	617.41
25	122.85	1975.53	32.27	1943.26	617.48
26	114.66	2057.92	32.96	2024.96	617.54
27	106.47	2131.43	33.58	2097.85	617.60
28	98.28	2196.13	34.12	2162.01	617.65
29	90.09	2252.10	34.59	2217.51	617.69
30	81.90	2299.41	34.99	2264.42	617.73
31	73.71	2338.13	35.32	2302.81	617.76
32	65.52	2368.33	35.59	2332.74	617.78
33	57.33	2390.07	35.80	2354.27	617.80
34	49.14	2403.41	35.95	2367.46	617.81
35	40.95	2408.41	36.05	2372.36	617.81
36	32.76	2405.12	36.08	2369.04	617.81
37	24.57	2393.61	36.06	2357.55	617.80
38	16.38	2373.93	35.98	2337.95	617.78

39
40

8.19
0.00

2346.14
2310.30

35.84
35.65

2310.30
2274.65

617.76
617.74

PEAK OUTFLOW= .6 CFS AT 36 MINUTES

Pickett, Ray & Silver, Inc.

LOTS 17 & 18 MIDPOINT INDUSTRIAL
88134.UNPR.00C
12-23-02
REV. 3-11-03

STORMWATER DETENTION CALCULATIONS 25YEAR/20 MIN.

SITE AREA: 1.00 ACRES

DIFFERENTIAL RUN-OFF:

UNDEVELOPED: 1.00 ACRES @ 2.31 = 2.31 CFS
DEVELOPED: 1.00 ACRES @ 4.75 = 4.75 CFS

DIFFERENTIAL: 2.44 CFS

MAXIMUM ALLOWABLE RELEASE:

1.00 ACRES @ 2.31 CFS/ACRE = 2.31 CFS
BYPASS 0.29 ACRES @ 4.75 CFS/ACRE = 1.38 CFS

ALLOWABLE RELEASE 0.93 CFS

STORAGE REQUIRED:

2.44 CFS x (30 MIN. x 60 SEC) = 4392 CU. FT.
4392 FT. x 1.39 = 6105 FT. (100YEAR)

15 → 25 × 1.18
75 → 100 × 1.39
× 7.64

DIRECT RUN-OFF TO BASIN:

0.71 ACRES @ 4.75 CFS/ACRE = 3.37 CFS
3.37 x 60 SEC, = 202.2 CFM

Pickett, Ray & Silver, Inc.

LOTS 17 & 18 MIDPOINT INDUSTRIAL
88134 UNPR.00C
13-53-05

STORMWATER DETENTION CALCULATIONS 25 YEAR 20 MIN.

SITE AREA: 1.00 ACRES

DIFFERENTIAL RUN-OFF:

UNDEVELOPED: 1.00 ACRES @ 2.31 CFS = 2.31 CFS
DEVELOPED: 1.00 ACRES @ 4.75 CFS = 4.75 CFS

DIFFERENTIAL: 2.44 CFS

MAXIMUM ALLOWABLE RELEASE

1.00 ACRES @ 2.31 CFS/ACRE = 2.31 CFS
BYPASS 0.29 ACRES @ 4.75 CFS/ACRE = 1.38 CFS

ALLOWABLE RELEASE 0.93 CFS

STORAGE REQUIRED:

2.44 CFS x (30 MIN x 60 SEC) = 4392 CU. FT.
4392 FT. x 1.38 = 6105 FT. (100 YEAR)

DIRECT RUN-OFF TO BASIN:

0.71 ACRES @ 4.75 CFS/ACRE = 3.37 CFS
3.37 x 60 SEC = 202.2 CFM

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*****
*
*   RECTANGULAR ORIFICE
*   2.5 in W X 5 in H   ELEV= 615.6
*
*   Outlet Pipe - 163 ft - 12 in pipe
*   UFL= 615.6   LFL= 612.18   n= .013
*
*   Overflow Structure - Standpipe
*   DIAM= 42 in   STANDPIPE ELEV= 619
*
*****

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88134 12-23-02 SUBMITTAL DATE:

MIN	INFLOW	STORAGE	OUTFLOW	NET DET.	ELEV.
1	10.11	10.11	0.00	10.11	615.76
2	20.22	30.33	2.07	28.26	616.00
3	30.33	58.59	8.29	50.30	616.02
4	40.44	90.74	11.71	79.03	616.04
5	50.55	129.58	12.31	117.27	616.07
6	60.66	177.93	13.06	164.87	616.11
7	70.77	235.64	13.95	221.69	616.15
8	80.88	302.57	14.94	287.63	616.20
9	90.99	378.62	16.00	362.62	616.26
10	101.10	463.72	17.14	446.58	616.33
11	111.21	557.79	18.33	539.46	616.40
12	121.32	660.78	19.56	641.22	616.48
13	131.43	772.65	20.82	751.83	616.56
14	141.54	893.37	22.11	871.26	616.65
15	151.65	1022.91	23.43	999.48	616.75
16	161.76	1161.24	24.76	1136.48	616.86
17	171.87	1308.35	26.11	1282.24	616.97
18	181.98	1464.22	27.48	1436.74	617.09
19	192.09	1628.83	28.85	1599.98	617.21
20	202.20	1802.18	30.24	1771.94	617.35
21	192.09	1964.03	31.63	1932.40	617.47
22	181.98	2114.38	32.88	2081.50	617.59
23	171.87	2253.37	34.00	2219.37	617.69
24	161.76	2381.13	35.00	2346.13	617.79
25	151.65	2497.78	35.90	2461.88	617.88
26	141.54	2603.42	36.70	2566.72	617.96
27	131.43	2698.15	37.41	2660.74	618.01
28	121.32	2782.06	37.86	2744.20	618.04
29	111.21	2855.41	38.09	2817.32	618.06
30	101.10	2918.42	38.29	2880.13	618.08
31	90.99	2971.12	38.46	2932.66	618.10
32	80.88	3013.54	38.60	2974.94	618.11
33	70.77	3045.71	38.72	3006.99	618.12
34	60.66	3067.65	38.80	3028.85	618.13
35	50.55	3079.40	38.86	3040.54	618.14
36	40.44	3080.98	38.89	3042.09	618.14
37	30.33	3072.42	38.90	3033.52	618.13
38	20.22	3053.74	38.87	3014.87	618.13

39	10.11	3024.98	38.82	2986.16	618.12
40	0.00	2986.16	38.75	2947.41	618.11

PEAK OUTFLOW= .65 CFS AT 37 MINUTES

Pickett, Ray & Silver, Inc.

LOTS 17 & 18 MIDPOINT INDUSTRIAL
88134.UNPR.00C
12-23-02

STORMWATER DETENTION CALCULATIONS 100YEAR/20 MIN.

SITE AREA: 1.00 ACRES

DIFFERENTIAL RUN-OFF:

UNDEVELOPED: 1.00 ACRES @ 2.95 = 2.95 CFS
DEVELOPED: 1.00 ACRES @ 6.08 = 6.08 CFS

DIFFERENTIAL: 3.13 CFS

MAXIMUM ALLOWABLE RELEASE:

1.00 ACRES @ 2.95 CFS/ACRE = 2.95 CFS
BYPASS 0.29 ACRES @ 6.08 CFS/ACRE = 1.76 CFS

ALLOWABLE RELEASE 1.19 CFS

STORAGE REQUIRED:

3.13 CFS x (30 MIN. x 60 SEC) = 5634 CU. FT.

DIRECT RUN-OFF TO BASIN:

0.71 ACRES @ 6.08 CFS/ACRE = 4.32 CFS
4.32 x 60 SEC, = 259.2 CFM

Pickett, Ray & Silver, Inc.

LOTS 17 & 18 MIDPOINT INDUSTRIAL
88134 UNPR.00C
13-53-05

STORMWATER DETENTION CALCULATIONS
100 YEAR 250 MIN.

SITE AREA: 1.00 ACRES

DIFFERENTIAL RUN-OFF:

DEVELOPED: 1.00 ACRES @ 8.08 = 8.08 CFS
UNDEVELOPED: 1.00 ACRES @ 2.95 = 2.95 CFS

DIFFERENTIAL: 3.13 CFS

MAXIMUM ALLOWABLE RELEASE:

1.00 ACRES @ 2.95 CFS/ACRE = 2.95 CFS
BYPASS 0.28 ACRES @ 6.08 CFS/ACRE = 1.70 CFS

ALLOWABLE RELEASE: 1.19 CFS

STORAGE REQUIRED:

3.13 CFS x (30 MIN. x 60 SEC) = 5634 CU. FT.

DIRECT RUN-OFF TO BASIN:

0.71 ACRES @ 6.08 CFS/ACRE = 4.32 CFS
4.32 x 60 SEC. = 259.2 CFM


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*****
*
* RECTANGULAR ORIFICE
* 2.5 in W X 5 in H ELEV= 615.6
*
* Outlet Pipe - 163 ft - 12 in pipe
* UFL= 615.6 LFL= 612.18 n= .013
*
* Overflow Structure - Standpipe
* DIAM= 42 in STANDPIPE ELEV= 619
*
*****

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88134 12-23-02 SUBMITTAL DATE:

MIN	INFLOW	STORAGE	OUTFLOW	NET DET.	ELEV.
1	12.96	12.96	0.00	12.96	615.80
2	25.92	38.88	3.00	35.88	616.01
3	38.88	74.76	8.47	66.29	616.03
4	51.84	118.13	12.05	106.08	616.06
5	64.80	170.88	12.85	158.03	616.10
6	77.76	235.79	13.83	221.96	616.15
7	90.72	312.68	14.94	297.74	616.21
8	103.68	401.42	16.16	385.26	616.28
9	116.64	501.90	17.47	484.43	616.35
10	129.60	614.03	18.84	595.19	616.44
11	142.56	737.75	20.26	717.49	616.53
12	155.52	873.01	21.72	851.29	616.64
13	168.48	1019.77	23.21	996.56	616.75
14	181.44	1178.00	24.73	1153.27	616.87
15	194.40	1347.67	26.27	1321.40	617.00
16	207.36	1528.76	27.83	1500.93	617.14
17	220.32	1721.25	29.41	1691.84	617.29
18	233.28	1925.12	30.99	1894.13	617.44
19	246.24	2140.37	32.59	2107.78	617.61
20	259.20	2366.98	34.19	2332.79	617.78
21	246.24	2579.03	35.80	2543.23	617.94
22	233.28	2776.51	37.25	2739.26	618.04
23	220.32	2959.58	38.08	2921.50	618.10
24	207.36	3128.86	38.57	3090.29	618.15
25	194.40	3284.69	39.02	3245.67	618.20
26	181.44	3427.11	39.44	3387.67	618.25
27	168.48	3556.15	39.81	3516.34	618.29
28	155.52	3671.86	40.14	3631.72	618.32
29	142.56	3774.28	40.44	3733.84	618.36
30	129.60	3863.44	40.70	3822.74	618.39
31	116.64	3939.38	40.93	3898.45	618.41
32	103.68	4002.13	41.12	3961.01	618.43
33	90.72	4051.73	41.28	4010.45	618.45
34	77.76	4088.21	41.40	4046.81	618.46
35	64.80	4111.61	41.49	4070.12	618.46
36	51.84	4121.96	41.55	4080.41	618.47
37	38.88	4119.29	41.58	4077.71	618.47
38	25.92	4103.63	41.57	4062.06	618.46

39	12.96	4075.02	41.53	4033.49	618.45
40	0.00	4033.49	41.46	3992.03	618.44

PEAK OUTFLOW= .69 CFS AT 37 MINUTES