

PROJECT NAME O'Fallon Shopping Center

PROJECT #/JOB ORDER # 96184/35285

DATE 9/20/96

DESIGNER C. Maske

PAGE 1/7

**PICKETT RAY & SILVER**

333 Mid Rivers Mall Dr.  
St. Peters, MO 63376

Civil Engineers  
Planners  
Land Surveyors

397-1211

**STORMWATER DETENTION**

Design Storm: 15yr/20 min

Total Area of Project Site = 17.55 Acres

Predeveloped Conditions:

$$17.55 \text{ Acres} \times 1.87 \text{ cfs/Acre} = 32.82 \text{ cfs}$$

Post developed Q to basin:

$$12.21 \text{ Acres} \times 3.85 \text{ cfs/Acre} = 47.01 \text{ cfs}$$

Post developed Q to bypass basin (direct runoff from floodplain to creek):

$$5.34 \text{ Acres} \times 1.87 \text{ cfs/Acre} = 9.99 \text{ cfs}$$

Detention Required:

$$47.01 \text{ cfs} + 9.99 \text{ cfs} = 57.00 \text{ cfs} - 32.82 \text{ cfs} = 24.18 \text{ cfs}$$

$$24.18 \text{ cfs} \times 20 \text{ min} \times 60 \text{ sec/min} = 29,016 \text{ cu. ft. (volume)}$$

Allowable Release from basin:

$$47.01 \text{ cfs} - 24.18 \text{ cfs} = 22.83 \text{ cfs}$$

Peak Outflow = 20.4 cfs at 32 minutes

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PAGE 2/7

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333 Mid Rivers Mall Dr.  
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*
* RECTANGULAR ORIFICE
* 24 in W X 12 in H ELEV= 482
*
* Outlet Pipe - 160 ft - 30 in pipe
* UFL= 482 LFL= 479.5 n= .013
*
* Overflow Structure - Standpipe
* DIAM= 72 in STANDPIPE ELEV= 487.5
*
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15 yr / 20 min

O'FALLON SHOPPING CENTER

9/19/96

SUBMITTAL DATE: 9/20/96

MIN	INFLOW	STORAGE	OUTFLOW	NET DET.	ELEV.
1	141.00	141.00	0.00	141.00	482.06
2	282.00	423.00	5.04	417.96	482.19
3	423.00	840.96	25.72	815.24	482.37
4	564.00	1379.24	70.04	1309.20	482.59
5	705.00	2014.20	142.55	1871.65	482.85
6	846.00	2717.65	243.66	2473.99	483.12
7	987.00	3460.99	462.90	2998.09	483.36
8	1128.00	4126.09	544.27	3581.82	483.62
9	1269.00	4850.82	622.49	4228.33	483.92
10	1410.00	5638.33	698.98	4939.35	484.08
11	1551.00	6490.35	738.52	5751.83	484.21
12	1692.00	7443.83	767.08	6676.75	484.35
13	1833.00	8509.75	798.36	7711.39	484.51
14	1974.00	9685.39	831.94	8853.45	484.68
15	2115.00	10968.45	867.51	10100.94	484.87
16	2256.00	12356.94	904.77	11452.17	485.08
17	2397.00	13849.17	943.47	12905.70	485.30
18	2538.00	15443.70	983.40	14460.30	485.54
19	2679.00	17139.30	1024.38	16114.93	485.79
20	2820.00	18934.93	1066.27	17868.66	486.04
21	2679.00	20547.66	1104.96	19442.70	486.18
22	2538.00	21980.70	1127.34	20853.36	486.31
23	2397.00	23250.36	1147.03	22103.33	486.43
24	2256.00	24359.33	1164.20	23195.13	486.53
25	2115.00	25310.13	1178.99	24131.14	486.61
26	1974.00	26105.14	1191.52	24913.62	486.69
27	1833.00	26746.62	1201.90	25544.72	486.74
28	1692.00	27236.72	1210.21	26026.51	486.79
29	1551.00	27577.51	1216.51	26361.00	486.82
30	1410.00	27771.00	1220.86	26550.14	486.84
31	1269.00	27819.14	1223.32	26595.82	486.84
32	1128.00	27723.82	1223.91	26499.91	486.83
33	987.00	27486.91	1222.67	26264.24	486.81
34	846.00	27110.24	1219.60	25890.64	486.78
35	705.00	26595.64	1214.73	25380.91	486.73
36	564.00	25944.91	1208.06	24736.85	486.67
37	423.00	25159.85	1199.56	23960.29	486.60
38	282.00	24242.29	1189.25	23053.04	486.52
39	141.00	23194.04	1177.08	22016.97	486.42
40	0.00	22016.97	1163.02	20853.95	486.31

PEAK OUTFLOW= 20.4 CFS AT 32 MINUTES



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PAGE 3/7

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Land Surveyors

397-1211

**STORMWATER DETENTION**  
Design Storm: 25yr / 20 min

Total Area of Project Site: 17.55 Acres

Predeveloped Conditions:

$$17.55 \text{ Acres} \times 2.31 \text{ cfs/Acre} = 40.54 \text{ cfs}$$

Post developed Q to basin:

$$12.21 \text{ Acres} \times 4.75 \text{ cfs/Acre} = 58.00 \text{ cfs}$$

Post developed Q to bypass basin (direct runoff):

$$5.34 \text{ Acres} \times 2.31 \text{ cfs/Acre} = 12.33 \text{ cfs}$$

Detention Required:

$$58.00 \text{ cfs} + 12.33 \text{ cfs} = 70.33 \text{ cfs} - 40.54 \text{ cfs} = 29.80 \text{ cfs}$$

$$29.80 \text{ cfs} \times 20 \text{ min} \times 60 \text{ sec/min} = 35,760 \text{ cu. ft.}$$

Allowable Release from basin:

$$58.00 \text{ cfs} - 29.80 \text{ cfs} = 28.20 \text{ cfs}$$

Peak Outflow = 26.03 at 32 minutes

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PAGE 4/7

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333 Mid Rivers Mall Dr.  
St. Peters, MO 63378

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*                               *
* RECTANGULAR ORIFICE          *
* 24 in W X 12 in H  ELEV= 482 *
*                               *
* Outlet Pipe - 160 ft - 30 in pipe *
* UFL= 482  LFL= 479.5  n= .013 *
*                               *
* Overflow Structure - Standpipe *
* DIAM= 72 in  STANDPIPE ELEV= 487.5 *
*                               *
*****

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25yr/20min

O'FALLON SHOPPING CENTER

9/19/96

SUBMITTAL DATE: 9/20/96

MIN	INFLOW	STORAGE	OUTFLOW	NET DET.	ELEV.
1	174.00	174.00	0.00	174.00	482.08
2	348.00	522.00	6.91	515.09	482.23
3	522.00	1037.09	35.18	1001.91	482.45
4	696.00	1697.91	95.44	1602.47	482.73
5	870.00	2472.47	193.03	2279.44	483.03
6	1044.00	3323.44	428.80	2894.64	483.31
7	1218.00	4112.64	529.20	3583.44	483.62
8	1392.00	4975.44	622.69	4352.75	483.97
9	1566.00	5918.75	712.76	5205.99	484.12
10	1740.00	6945.99	748.02	6197.97	484.27
11	1914.00	8111.97	782.33	7329.64	484.45
12	2088.00	9417.64	819.71	8597.93	484.64
13	2262.00	10859.93	859.68	10000.25	484.86
14	2436.00	12436.25	901.82	11534.43	485.09
15	2610.00	14144.43	945.77	13198.66	485.35
16	2784.00	15982.66	991.25	14991.41	485.62
17	2958.00	17949.41	1038.01	16911.40	485.92
18	3132.00	20043.40	1085.86	18957.55	486.14
19	3306.00	22263.55	1120.49	21143.06	486.34
20	3480.00	24623.06	1151.03	23472.03	486.55
21	3306.00	26778.03	1182.71	25595.32	486.75
22	3132.00	28727.32	1210.87	27516.45	486.93
23	2958.00	30474.45	1235.79	29238.66	487.08
24	2784.00	32022.66	1257.72	30764.94	487.22
25	2610.00	33374.94	1276.83	32098.10	487.35
26	2436.00	34534.10	1293.30	33240.81	487.45
27	2262.00	35502.81	1307.25	34195.56	487.54
28	2088.00	36283.56	1343.30	34940.26	487.61
29	1914.00	36854.26	1437.83	35416.43	487.65
30	1740.00	37156.43	1519.52	35636.91	487.67
31	1566.00	37202.91	1560.53	35642.38	487.67
32	1392.00	37034.38	1561.55	35472.83	487.66
33	1218.00	36690.83	1529.78	35161.05	487.63
34	1044.00	36205.05	1472.78	34732.27	487.59
35	870.00	35602.27	1406.96	34195.31	487.54
36	696.00	34891.31	1343.30	33548.01	487.48
37	522.00	34070.01	1310.97	32759.05	487.41
38	348.00	33107.05	1301.38	31805.67	487.32
39	174.00	31979.67	1289.70	30689.97	487.22
40	0.00	30689.97	1275.90	29414.07	487.10

PEAK OUTFLOW= 26.03 CFS AT 32 MINUTES



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PAGE 5/7

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387-1211

**STORMWATER DETENTION**

Design Storm: 100 yr / 20 min

Total Area of Project Site: 17.55 Acres

Predeveloped Conditions:

$$17.55 \text{ Acres} \times 2.95 \text{ cfs/Acre} = 51.77 \text{ cfs}$$

Post developed Q to basin:

$$12.21 \text{ Acres} \times 6.08 \text{ cfs/Acre} = 74.24 \text{ cfs}$$

Post developed Q to bypass basin (direct runoff):

$$5.34 \text{ Acres} \times 2.95 \text{ cfs/Acre} = 15.75 \text{ cfs}$$

Detention Required:

$$74.24 \text{ cfs} + 15.75 \text{ cfs} = 89.99 \text{ cfs} - 51.77 \text{ cfs} = 38.22 \text{ cfs}$$

Allowable Release from basin:

$$74.24 \text{ cfs} - 38.22 \text{ cfs} = 36.02 \text{ cfs}$$

Peak Outflow = 50.22 cfs at 27 minutes\*

\* Basin will not detain 100-yr storm to allowable release rate.  
100 yr storm is not detention criteria.

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PAGE 6/7

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* Overflow Structure - Standpipe
* DIAM= 72 in STANDPIPE ELEV= 487.5
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100yr/20min

O'FALLON SHOPPING CENTER

9/19/96

SUBMITTAL DATE: 9/20/96

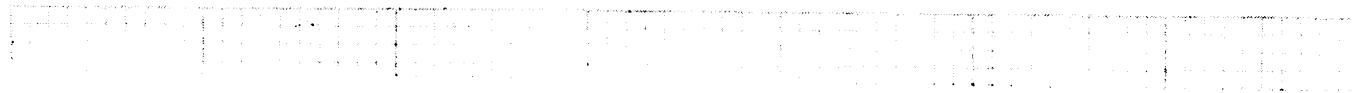
MIN	INFLOW	STORAGE	OUTFLOW	NET DET.	ELEV
1	222.75	222.75	0.00	222.75	482.10
2	445.50	668.25	10.00	658.25	482.30
3	668.25	1326.50	50.82	1275.68	482.58
4	891.00	2166.68	137.10	2029.58	482.92
5	1113.75	3143.33	275.15	2868.18	483.30
6	1336.50	4204.68	525.28	3679.40	483.67
7	1559.25	5238.65	634.62	4604.03	484.03
8	1782.00	6386.03	726.40	5659.63	484.19
9	2004.75	7664.38	763.90	6900.48	484.38
10	2227.50	9127.98	805.73	8322.25	484.60
11	2450.25	10772.50	851.15	9921.35	484.84
12	2673.00	12594.35	899.50	11694.85	485.12
13	2895.75	14590.60	950.25	13640.35	485.42
14	3118.50	16758.85	1002.97	15755.88	485.74
15	3341.25	19097.13	1057.32	18039.81	486.05
16	3564.00	21603.81	1107.42	20496.39	486.28
17	3786.75	24283.14	1142.08	23141.06	486.52
18	4009.50	27150.56	1178.26	25972.30	486.78
19	4232.25	30204.55	1215.80	28988.75	487.06
20	4455.00	33443.75	1254.56	32189.19	487.36
21	4232.25	36421.44	1294.42	35127.02	487.63
22	4009.50	39136.52	1467.20	37669.32	487.86
23	3786.75	41456.07	2052.23	39403.84	488.01
24	3564.00	42967.84	2584.08	40383.76	488.08
25	3341.25	43725.01	2849.32	40875.70	488.11
26	3118.50	43994.20	2975.70	41018.50	488.12
27	2895.75	43914.25	3013.10	40901.15	488.11
28	2673.00	43574.15	2982.35	40591.80	488.09
29	2450.25	43042.05	2902.34	40139.72	488.06
30	2227.50	42367.22	2787.78	39579.44	488.02
31	2004.75	41584.19	2625.67	38958.52	487.98
32	1782.00	40740.52	2457.77	38282.75	487.92
33	1559.25	39842.00	2228.53	37613.47	487.85
34	1336.50	38949.97	2036.83	36913.14	487.79
35	1113.75	38026.89	1846.25	36180.64	487.72
36	891.00	37071.64	1671.27	35400.38	487.65
37	668.25	36068.63	1516.65	34551.98	487.57
38	445.50	34997.48	1383.18	33614.30	487.49
39	222.75	33837.05	1311.77	32525.28	487.39
40	0.00	32525.28	1298.53	31226.75	487.27

PEAK OUTFLOW= 50.22 CFS AT 27 MINUTES

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 PAGE 7/7

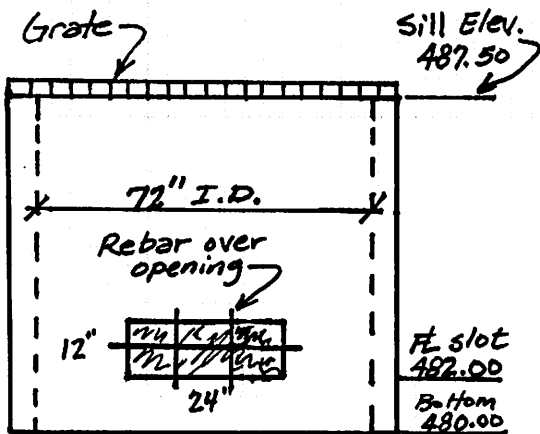
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O'FALLON SHOPPING CENTER                      9/19/96                      SUBMITTAL DATE: 9/20/96

ELEVATION	AREA	VOLUME	CUM. VOLUME
482.00	0		
484.00	4414	4414	4414
486.00	8625	13039	17453
488.00	13117	21742	39195
490.00	17838	30955	70150
492.00	23020	40858	111008
492.50	24332	11838	122846



Outfall Structure  
 # OS-2  
 N.T.S.

72" Inside Diameter Standpipe  
 w/ Grate on Sill

Check Low Flow Blocked:  
 Weir Equation: (25 yr / 20 min)  
 $Q = CLH^{3/2}$   
 $58.0 \text{ cfs} = (3.0)(18.85)H^{3/2}$   
 $H = 1.02 \text{ feet}$   
 $487.67 \text{ H.W.} + 1.02 = 488.69$   
 Dam Elevation = 492.50  
 Normal water level = 482.00  
 100 yr H.W. elev. = 488.12  
4.38 feet freeboard @ 100 yr