

PICKETT RAY & SILVER

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

Civil Engineers
Planners
Land Surveyors

397-1211

PROJECT NAME HUTCHINGS FARM PLAZA

PROJECT #/JOB ORDER # 95234.ARM.000

DATE 12/11/2003

DESIGNER ERIC KIRCHNER

PAGE 1

EXISTING CONDITIONS

* DRAINAGE AREA TO REAR OF PROPERTY
2.57 AC

* DRAINAGE AREA TO FRONT OF PROPERTY
1.52 AC + 0.47 AC = 1.99 AC

EXISTING DRAINAGE

2 YR

FRONT DRAINAGE = (1.99 AC)(1.15) = 2.29 cfs

REAR DRAINAGE = (2.57 AC)(1.15) = 2.96 cfs

TOTAL FROM SITE = 5.25 cfs

15 YR

FRONT DRAINAGE = (1.99 AC)(1.7) = 3.38 cfs

REAR DRAINAGE = (2.57 AC)(1.7) = 4.37 cfs

TOTAL FROM SITE = 7.75 cfs

PROPOSED CONDITIONS

* DRAINAGE AREA TO REAR OF PROPERTY
1.07 AC PAVED + 0.38 AC UNPAVED

* DRAINAGE AREA TO FRONT OF PROPERTY
2.99 AC PAVED + 0.078 AC UNPAVED

2 YR

FRONT DRAINAGE = (2.99)(2.3) + (0.078)(1.31) = 6.98 cfs

REAR DRAINAGE = (1.07)(2.3) + (0.38)(1.31) = 2.96 cfs

* 6.88 cfs TO DETENTION

15 YR

FRONT DRAINAGE = (2.99)(3.5) + (0.078)(1.7) = 10.60 cfs

REAR DRAINAGE = (1.07)(3.5) + (0.38)(1.7) = 4.38 cfs

* 10.47 cfs TO DETENTION

ALLOWABLE DISCHARGE FROM DETENTION

2 YR

5.25 cfs - 2.96 - 0.10 = 2.19 cfs

15 YR

7.75 cfs - 4.38 - .13 = 3.24 cfs

POST DEVELOPMENT DISCHARGE FROM BASIN

2 YR - 20 MIN = 2.07 cfs ∴ OK

15 YR - 20 MIN = 2.56 cfs ∴ OK



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DATE 12/11/2003

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PAGE 2

BASIN CALCULATIONS

TIME OF CONCENTRATION

$C = 0.8$

$L = 292.10 \text{ ft}$

$S = 2.14\%$

$t_r = 20 \text{ min}$

$$t_c = \frac{(1.0)(1.1 - 0.8)\sqrt{292.10}}{(2.14)^{.33}} = 7.18 \text{ min}$$

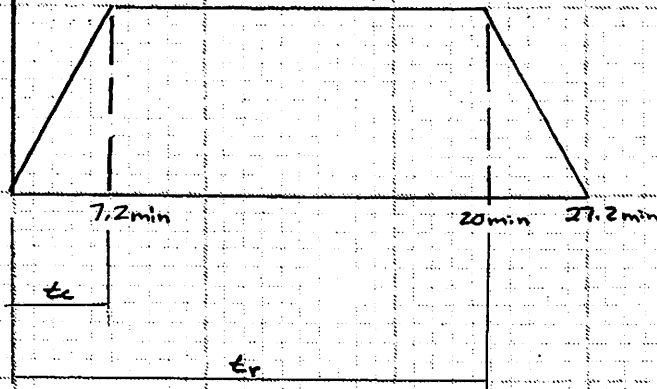
2 YR $Q_p = 6.88 \text{ cfs}$

15 YR $Q_p = 10.47 \text{ cfs}$

2 YR $\theta = 43.7^\circ$

15 YR $\theta = 55.5^\circ$

Q_p



| TIME (min) | 2YR-20MIN Q (cfs) | 15YR-20MIN Q (cfs) |
|------------|------------------------|-------------------------|
| 0 | 0 | 0 |
| 1 | 0.96 | 1.46 |
| 2 | 1.92 | 2.92 |
| 3 | 2.88 | 4.38 |
| 4 | 3.84 | 5.84 |
| 5 | 4.80 | 7.30 |
| 6 | 5.76 | 8.76 |
| 6.72 | 6.88 | 10.22 |
| 8 | 6.88 | 10.47 |
| 9 | 6.88 | 10.47 |
| 10 | 6.88 | 10.47 |
| 11 | 6.88 | 10.47 |
| 12 | 6.88 | 10.47 |
| 13 | 6.88 | 10.47 |
| 14 | 6.88 | 10.47 |
| 15 | 6.88 | 10.47 |
| 16 | 6.88 | 10.47 |
| 17 | 6.88 | 10.47 |
| 18 | 6.88 | 10.47 |
| 19 | 6.88 | 10.47 |
| 20 | 6.88 | 10.47 |
| 21 | 6.88 | 10.47 |
| 22 | 6.72 | 10.22 |
| 23 | 5.76 | 8.76 |
| 24 | 4.80 | 7.30 |
| 25 | 3.84 | 5.84 |
| 26 | 2.88 | 4.38 |
| 27 | 1.92 | 2.92 |
| 28 | 0.96 | 1.46 |
| 29 | 0 | 0 |

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HUTCHINGS FARM PLAZA CI 102-MH 100
95234 13:40:31

HYDRAULIC
DATA

| LINE | | PIPE | | SLOPE | | FLOW LINE | | SURFACE | | |
|--------|--------|--------|------|-------|--------|-----------|--------|---------|--------|------|
| UP | DOWN | LENGTH | SIZE | FT/FT | 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. | | | |
| CI 102 | GI 101 | 140 | 15 | .0200 | | 581.09 | 578.30 | 587.50 | 585.75 | |
| | | 0.11 | 3.5 | | | 0.4 | 0.4 | 9.1 | 0.18 | |
| | | .0000 | 0.31 | 0.00 | 0.00 | 0.00 | 0.00 | 581.55 | 581.54 | .013 |
| GI 101 | MH 100 | 15 | 15 | .0199 | | 578.30 | 578.00 | 585.75 | 585.80 | |
| | | 0.53 | 3.5 | | | 1.9 | 2.2 | 9.1 | 0.42 | |
| | | .0012 | 1.83 | 0.05 | 0.05 | 0.02 | 0.00 | 581.54 | 581.47 | .013 |

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HUTCHINGS FARM PLAZA CI 205-OS 200
 95234 14:17:20

HYDRAULIC
 DATA

| LINE UP | DOWN | PIPE | | SLOPE | | FLOW LINE | | SURFACE | | N |
|------------|--------|--------|------|-------|--------|-----------|--------|---------|--------|------|
| | | LENGTH | SIZE | FT/FT | 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. | |
| | | GRADE | FPS | HEAD | HEAD | HEAD | LOSS | UP | DOWN | |
| | | FT/FT | | FT. | CHANGE | FT. | FT. | | | |
| CI 205 | GI 204 | 291 | 12 | .0100 | | 580.75 | 577.85 | 585.10 | 583.50 | |
| | | 0.26 | 3.5 | | | 0.9 | 0.9 | 3.6 | 0.34 | |
| | | .0007 | 1.16 | 0.02 | 0.02 | 0.19 | 0.01 | 582.68 | 582.47 | .013 |
| GI 204 | CI 203 | 82 | 18 | .0100 | | 577.85 | 577.03 | 583.50 | 583.50 | |
| | | 0.53 | 3.5 | | | 1.9 | 2.8 | 10.5 | 0.52 | |
| | | .0007 | 1.56 | 0.04 | 0.02 | 0.06 | 0.00 | 582.46 | 582.38 | .013 |
| CI 203 | CI 202 | 48 | 18 | .0100 | | 577.03 | 576.55 | 583.50 | 583.50 | |
| | | 0.06 | 3.5 | | | 0.2 | 3.0 | 10.5 | 0.54 | |
| | | .0008 | 1.68 | 0.04 | 0.01 | 0.04 | 0.00 | 582.38 | 582.34 | .013 |
| CI 202 | CI 201 | 18 | 18 | .0100 | | 576.55 | 576.37 | 583.50 | 583.50 | |
| | | 0.05 | 3.5 | | | 0.2 | 3.1 | 10.5 | 0.56 | |
| | | .0009 | 1.77 | 0.05 | 0.01 | 0.02 | 0.02 | 582.34 | 582.32 | .013 |
| CI 201 | OS 200 | 87 | 18 | .0100 | | 576.37 | 575.50 | 583.50 | 585.00 | |
| | | 1.46 | 3.5 | | | 5.1 | 8.2 | 10.5 | 1.00 | |
| | | .0062 | 4.67 | 0.34 | 0.29 | 0.54 | 0.00 | 582.30 | 581.47 | .013 |

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HUTCHINGS FARM PLAZA CI 400 -EX AI 7 HYDRAULIC
 95234 16:04:56 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. | | | |
| CI 400 | EXAI 7 | 48 | 15 | .2237 | | 577.20 | 566.46 | 584.50 | 572.16 | |
| | | 1.25 | 3.5 | | | 4.4 | 4.4 | 30.6 | 0.32 | |
| | | .0046 | 3.57 | 0.20 | 0.20 | 0.22 | 0.00 | 577.52 | 567.66 | .013 |
| EXAI 7 | EXMH 6 | 95 | 15 | .0100 | | 566.38 | 565.43 | 575.00 | 572.30 | |
| | | 0.60 | 2.6 | | | 1.6 | 6.0 | 6.5 | 0.95 | |
| | | .0085 | 4.86 | 0.37 | 0.17 | 0.81 | 0.00 | 567.66 | 566.68 | .013 |

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OUT 95234 13:57:31 HYDRAULIC DATA

| LINE | | PIPE | | SLOPE | | FLOW LINE | | SURFACE | | |
|--------|--------|--------|------|-------|--------|-----------|--------|---------|--------|------|
| UP | DOWN | LENGTH | SIZE | FT/FT | 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. | | | |
| EX GI1 | MH 300 | 86 | 30 | .0614 | | 589.30 | 584.01 | 594.28 | 592.50 | |
| | | 1.24 | 3.5 | | | 4.3 | 4.3 | 101.6 | 0.35 | |
| | | .0001 | 0.88 | 0.01 | 0.01 | 0.01 | 0.00 | 589.65 | 584.41 | .013 |
| MH 300 | EX GI2 | 270 | 30 | .0352 | | 584.01 | 574.51 | 592.50 | 581.50 | |
| | | 0.00 | 0.0 | | | 0.0 | 4.3 | 76.9 | 0.40 | |
| | | .0001 | 0.88 | 0.01 | 0.00 | 0.03 | 0.01 | 584.41 | 574.91 | .013 |
| OS 200 | EX GI2 | 82 | 30 | .0303 | | 575.00 | 572.51 | 585.00 | 581.50 | |
| | | 2.99 | 3.5 | | | 10.5 | 10.5 | 71.4 | 0.65 | |
| | | .0007 | 2.13 | 0.07 | 0.07 | 0.05 | 0.02 | 575.65 | 574.73 | .013 |
| EX GI2 | EX GI3 | 167 | 36 | .0057 | | 572.51 | 571.55 | 581.50 | 577.71 | |
| | | 1.04 | 3.5 | | | 3.6 | 18.4 | 50.5 | 1.25 | |
| | | .0008 | 2.61 | 0.11 | 0.04 | 0.13 | 0.07 | 574.71 | 574.55 | .013 |