

H:\projects\2004\04078A2 - Whispering Woods Phase 1\dwg\04078 - Street & Storm Plans.dwg

DATE PLOTTED: 4/24/2018 4:43 PM ; LAST SAVE DATE: 4/24/2018 4:38 PM

| DATE: 04/17/2018                                |          | STORM SEWER PIPE AND STRUCTURE TABLE |                    |      |            |          |                 |                   |                |             |                    |                |               |              |                    |              |                |      |                  |                   |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|-------------------------------------------------|----------|--------------------------------------|--------------------|------|------------|----------|-----------------|-------------------|----------------|-------------|--------------------|----------------|---------------|--------------|--------------------|--------------|----------------|------|------------------|-------------------|---------------------|----------------------------|---------------------|----------------------------|-----------------------|------------------|----------------|-------------------|--------------------|-----------------------|-----------------------|----------|--|
| TITLE: WHIPSERING WOODS, LEE'S SUMMIT, MO       |          |                                      |                    |      |            |          |                 |                   |                |             |                    |                |               |              |                    |              |                |      |                  |                   |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
| JOB #: 04078                                    |          |                                      |                    |      |            |          |                 |                   |                |             |                    |                |               |              |                    |              |                |      |                  |                   |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
| DESIGN CONDITIONS: PUBLIC - 10 YEAR STORM EVENT |          |                                      |                    |      |            |          |                 |                   |                |             |                    |                |               |              |                    |              |                |      |                  |                   |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
| STRUCTURES                                      |          | RUNOFF CALCULATIONS                  |                    |      |            |          |                 |                   |                | PIPE DESIGN |                    |                |               |              |                    |              |                |      |                  |                   |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
| FROM                                            | TO       | DIRECT AREA (ACRES)                  | TOTAL AREA (ACRES) | C    | KC (K=1.0) | Tc (MIN) | FLOW TIME (MIN) | INTENSITY (IN/HR) | DESIGN Q (CFS) | DESCRIPTION | PIPE LENGTH (L.F.) | PIPE SLOPE (%) | PIPE DIA (IN) | Q FULL (CFS) | PIPE AREA (SQ.FT.) | V FULL (F/S) | DESIGN V (F/S) | Hw/D | MH TOP ELEVATION | UPSTREAM FLOWLINE | DOWNSTREAM FLOWLINE | DOWNSTREAM WATER ELEVATION | FRICTION HEAD (h f) | ENTRY LOSS COEFFICIENT (k) | ACTUAL ENTRY LOSS (k) | ENTRY LOSS (h m) | h f + h m (FT) | HW, INLET CONTROL | HW, OUTLET CONTROL | HYDRAULIC GRADE ELEV. | HYDRAULIC GRADE (MAX) | Comments |  |
| D-2                                             |          | 0.42                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 2.04           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 982.08            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | C-7, D-1 |                                      | 0.42               | 0.66 | 0.66       | 5.00     | 0.09            | 7.35              | 2.04           | 15" RCP     | 34.00              | 2.61           | 15            | 13.60        | 1.23               | 11.09        | 6.60           | 0.77 |                  | 982.08            | 977.45              | 976.56                     | 978.51              | 0.02                       | 0.40                  | 1.00             | 0.68           | 0.70              | 978.42             | 979.21                | 979.21                | 979.21   |  |
| E-2                                             |          | 2.16                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 10.48          | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 975.27            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | C-6, E-1 |                                      | 2.16               | 0.66 | 0.66       | 5.00     | 0.24            | 7.35              | 10.48          | 24" RCP     | 129.37             | 1.86           | 24            | 40.22        | 3.14               | 12.80        | 8.88           | 0.89 |                  | 975.27            | 970.19              | 967.78                     | 968.63              | 0.17                       | 0.40                  | 1.00             | 1.23           | 1.39              | 971.97             | 970.19                | 971.97                | 973.77   |  |
| F-2                                             |          | 0.35                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 1.70           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 968.55            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | C-4, F-1 |                                      | 0.35               | 0.66 | 0.66       | 5.00     | 0.42            | 7.35              | 1.70           | 18" RCP     | 98.29              | 1.77           | 18            | 18.22        | 1.77               | 10.31        | 3.94           | 0.69 |                  | 968.55            | 964.23              | 962.49                     | 960.92              | 0.02                       | 0.40                  | 1.00             | 0.24           | 0.26              | 965.27             | 964.23                | 965.27                | 967.05   |  |
| C-7, D-1                                        |          | 1.12                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 5.44           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 982.08            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | C-6, E-1 |                                      | 7.90               | 0.66 | 0.66       | 6.96     | 0.27            | 6.79              | 35.42          | 36" RCP     | 250.70             | 3.60           | 36            | 164.96       | 7.07               | 23.34        | 15.36          | 1.00 |                  | 982.08            | 975.50              | 966.47                     | 968.63              | 0.42                       | 0.40                  | 0.40             | 1.46           | 1.89              | 978.51             | 975.50                | 978.51                | 980.58   |  |
| C-6, E-1                                        |          | 0.71                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 3.45           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 972.60            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | C-5      |                                      | 9.03               | 0.66 | 0.66       | 7.23     | 0.03            | 6.72              | 40.06          | 36" RCP     | 34.00              | 8.76           | 36            | 257.32       | 7.07               | 36.40        | 21.90          | 1.10 |                  | 972.60            | 965.34              | 962.36                     | 965.34              | 0.07                       | 0.40                  | 0.40             | 2.98           | 3.05              | 968.63             | 968.39                | 968.63                | 971.10   |  |
| C-5                                             |          | 0.30                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 1.46           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 972.60            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | C-4, F-1 |                                      | 9.68               | 0.66 | 0.66       | 7.26     | 0.19            | 6.72              | 42.90          | 36" RCP     | 157.36             | 2.39           | 36            | 134.41       | 7.07               | 19.01        | 13.92          | 1.16 |                  | 972.60            | 961.86              | 958.10                     | 960.92              | 0.39                       | 0.40                  | 0.40             | 1.20           | 1.59              | 965.34             | 962.51                | 965.34                | 971.10   |  |
| C-4, F-1                                        |          | 0.66                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 3.20           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 967.32            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | C-3      |                                      | 10.69              | 0.66 | 0.66       | 7.44     | 0.10            | 6.67              | 47.04          | 42" RCP     | 58.97              | 0.92           | 42            | 125.79       | 9.62               | 13.07        | 9.97           | 0.94 |                  | 967.32            | 957.62              | 957.08                     | 959.85              | 0.08                       | 0.40                  | 0.40             | 0.62           | 0.69              | 960.92             | 960.54                | 960.92                | 965.82   |  |
| C-3                                             |          | 0.40                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 1.94           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 966.48            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | C-2      |                                      | 11.09              | 0.66 | 0.66       | 7.54     | 0.32            | 6.64              | 48.62          | 48" RCP     | 156.64             | 0.51           | 48            | 133.72       | 12.57              | 10.64        | 8.05           | 0.82 |                  | 966.48            | 956.57              | 955.77                     | 958.53              | 0.11                       | 0.40                  | 0.40             | 0.40           | 0.51              | 959.85             | 959.04                | 959.85                | 964.98   |  |
| C-2                                             |          | 0.00                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 0.00           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 962.07            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | C-1      |                                      | 11.09              | 0.66 | 0.66       | 7.87     | 0.61            | 6.56              | 48.03          | 48" RCP     | 282.14             | 0.46           | 48            | 126.99       | 12.57              | 10.11        | 7.73           | 0.82 |                  | 962.07            | 955.27              | 953.97                     | 957.84              | 0.19                       | 0.40                  | 0.40             | 0.37           | 0.56              | 958.53             | 958.40                | 958.53                | 960.57   |  |
| G-5, N-1                                        |          | 0.36                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 1.75           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 991.97            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | G-4      |                                      | 3.14               | 0.66 | 0.66       | 6.57     | 0.51            | 6.90              | 14.30          | 24" RCP     | 329.87             | 2.47           | 24            | 46.34        | 3.14               | 14.75        | 10.70          | 1.08 |                  | 991.97            | 982.43              | 974.28                     | 975.98              | 0.79                       | 0.40                  | 0.40             | 0.71           | 1.50              | 984.59             | 982.43                | 984.59                | 990.47   |  |
| G-4                                             |          | 0.31                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 1.50           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 978.32            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | G-3      |                                      | 3.45               | 0.66 | 0.66       | 7.08     | 0.04            | 6.76              | 15.40          | 24" HDPE    | 35.76              | 4.67           | 24            | 63.72        | 3.14               | 20.28        | 13.78          | 1.15 |                  | 978.32            | 973.68              | 972.01                     | 972.55              | 0.10                       | 0.40                  | 0.40             | 1.18           | 1.28              | 975.98             | 973.83                | 975.98                | 976.82   |  |
| G-3                                             |          | 0.43                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 2.09           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 978.3             |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | G-2      |                                      | 3.88               | 0.66 | 0.66       | 7.13     | 0.09            | 6.75              | 17.29          | 24" RCP     | 79.54              | 4.51           | 24            | 62.62        | 3.14               | 19.93        | 14.04          | 1.27 |                  | 978.3             | 970.00              | 966.41                     | 964.88              | 0.28                       | 0.40                  | 0.40             | 1.22           | 1.50              | 972.55             | 970.00                | 972.55                | 974.85   |  |
| G-2                                             |          | 0.06                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 0.29           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 976.35            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | G-1      |                                      | 3.94               | 0.66 | 0.66       | 7.22     | 0.21            | 6.73              | 17.49          | 24" RCP     | 156.39             | 3.24           | 24            | 53.08        | 3.14               | 16.90        | 12.47          | 1.29 |                  | 976.35            | 962.31              | 957.24                     | 957.84              | 0.56                       | 0.40                  | 0.40             | 0.97           | 1.52              | 964.88             | 962.31                | 964.88                | 974.85   |  |
| A-3                                             |          | 0.86                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 4.17           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 957.29            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | A-2      |                                      | 0.86               | 0.66 | 0.66       | 5.00     | 0.16            | 7.35              | 4.17           | 24" HDPE    | 40.00              | 0.50           | 24            | 20.85        | 3.14               | 6.64         | 4.29           | 0.71 |                  | 957.29            | 953.29              | 953.09                     | 954.15              | 0.01                       | 0.40                  | 1.00             | 0.29           | 0.29              | 954.70             | 954.44                | 954.70                | 955.79   |  |
| A-2                                             |          | 0.43                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 2.09           | Curb Inlet  |                    |                |               |              |                    |              |                |      |                  | 957.15            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | A-1      |                                      | 1.29               | 0.66 | 0.66       | 5.16     | 0.14            | 7.31              | 6.22           | 24" HDPE    | 43.62              | 0.62           | 24            | 23.22        | 3.14               | 7.39         | 5.17           | 0.75 |                  | 957.15            | 952.65              | 952.38                     | 953.70              | 0.02                       | 0.40                  | 0.40             | 0.17           | 0.19              | 954.15             | 953.89                | 954.15                | 955.65   |  |
| A1 - 2                                          |          | 0.50                                 |                    | 0.66 | 0.66       | 5.00     |                 | 7.35              | 2.43           | FES         |                    |                |               |              |                    |              |                |      |                  | 956.45            |                     |                            |                     |                            |                       |                  |                |                   |                    |                       |                       |          |  |
|                                                 | A1 -1    |                                      | 0.50               | 0.66 | 0.66       | 5.00     | 0.28            | 7.35              | 2.43           | 18" RCP     | 106.90             | 2.08           | 18            | 19.75        | 1.77               | 11.17        | 6.28           | 0.72 |                  | 956.45            | 954.66              | 952.44                     | 953.70              | 0.03                       | 0.40                  | 1.00             | 0.61           | 0.65              | 955.74             | 954.66                | 955.74                | 954.95   |  |

Date: 04/19/2018

| Slope # | Inlet        | Area Number | Area (Acres) | Street Slope (ft/ft) | Max Gutter Flow | Gutter Flow, cfs (+bypass) |           | Cross Slope (%) | Gutter Spread (ft) |        | Inlet Length (ft) | Curb Type (A or B) | Inlet Intercept |          | Inlet Bypass |          |
|---------|--------------|-------------|--------------|----------------------|-----------------|----------------------------|-----------|-----------------|--------------------|--------|-------------------|--------------------|-----------------|----------|--------------|----------|
|         |              |             |              |                      |                 | Q-10 yr                    | Q- 100 yr |                 | 10 yr              | 100 yr |                   |                    | 10-Year         | 100-Year | 10-Year      | 100-Year |
| 1       | A-3 (W)      | 1           | 0.07         | 2.18                 | 5.84            | 0.34                       | 0.60      | 2               | 3.97               | 4.90   | 5                 | A                  | 0.33            | 0.56     | 0.01         | 0.03     |
| 2       | A-3 (E)      | 2           | 1.17         | 6.16                 | 9.81            | 5.68                       | 9.96      | 2               | 9.40               | 11.60  | 5                 | A                  | 1.96            | 2.08     | 3.71         | 7.88     |
| -       | A-3 (low pt) | 21          | 1.24         | 0                    | -               | 6.02                       | 10.56     | 2               | -                  | -      | 5                 | A                  | 6.02            | 10.56    | 0.00         | 0.00     |
| 1       | A-2 (W)      | 3           | 0.07         | 2.18                 | 5.84            | 0.34                       | 0.60      | 2               | 3.97               | 4.90   | 5                 | A                  | 0.33            | 0.56     | 0.01         | 0.03     |
| 2       | A-2 (E)      | 4           | 0.55         | 6.16                 | 9.81            | 2.67                       | 4.68      | 2               | 7.08               | 8.74   | 5                 | A                  | 1.52            | 1.88     | 1.15         | 2.80     |
| -       | A-2 (low pt) | 22          | 0.62         | 0                    | -               | 3.01                       | 5.28      | 2               | -                  | -      | 5                 | A                  | 3.01            | 5.28     | 0.00         | 0.00     |
| 4       | B-2 (N)      | 5           | 0.29         | 1.84                 | 5.36            | 1.67                       | 4.26      | 2               | 7.44               | 10.58  | 5                 | A                  | 1.43            | 2.87     | 0.24         | 1.39     |
| 3       | B-2 (S)      | 6           | 0.45         | 3.64                 | 7.54            | 2.18                       | 3.83      | 2               | 7.25               | 8.95   | 5                 | A                  | 1.57            | 2.19     | 0.61         | 1.64     |
| -       | B-2 (low pt) | 23          | 0.74         | 0                    | -               | 3.85                       | 8.09      | 2               | -                  | -      | 5                 | A                  | 3.85            | 8.09     | 0.00         | 0.00     |
| 4       | B-1 (N)      | 7           | 0.19         | 1.84                 | 5.36            | 2.29                       | 6.13      | 2               | 8.38               | 12.13  | 5                 | A                  | 1.85            | 3.52     | 0.44         | 2.61     |
| 3       | B-1 (S)      | 8           | 0.38         | 3.64                 | 7.54            | 1.84                       | 3.24      | 2               | 6.80               | 8.40   | 5                 | A                  | 1.40            | 2.01     | 0.45         | 1.23     |
| -       | B-1 (low pt) | 24          | 0.57         | 0                    | -               | 4.13                       | 9.36      | 2               | -                  | -      | 5                 | A                  | 4.13            | 9.36     | 0.00         | 0.00     |
| 8       | C-7, D-1     | 9           | 1.12         | 3.78                 | 7.68            | 6.94                       | 13.43     | 2               | 11.10              | 14.22  | 5                 | A                  | 2.68            | 2.93     | 4.25         | 10.50    |
| 8       | C-6, E-1     | 10          | 0.71         | 3.78                 | 7.68            | 7.70                       | 16.55     | 2               | 11.54              | 15.38  | 5                 | A                  | 2.75            | 2.95     | 4.95         | 13.60    |
| 8       | C-5          | 11          | 0.30         | 3.78                 | 7.68            | 3.05                       | 6.79      | 2               | 8.16               | 11.01  | 5                 | A                  | 1.92            | 2.67     | 1.13         | 4.12     |
| 5       | C-4, F-1     | 12          | 0.21         | 1                    | 3.95            | 2.15                       | 5.91      | 2               | 9.18               | 13.42  | 5                 | A                  | 1.89            | 4.13     | 0.26         | 1.79     |
| 4       | C-3          | 13          | 0.40         | 1.84                 | 5.36            | 4.21                       | 8.57      | 2               | 10.54              | 13.75  | 5                 | A                  | 2.85            | 4.06     | 1.36         | 4.51     |
| 8       | D-2          | 14          | 0.71         | 3.78                 | 7.68            | 3.73                       | 6.92      | 2               | 8.79               | 11.09  | 5                 | A                  | 2.13            | 2.68     | 1.60         | 4.24     |
| 6       | F-2 (N)      | 16          | 0.46         | 5.62                 | 9.37            | 2.23                       | 3.92      | 2               | 6.74               | 8.32   | 5                 | A                  | 1.42            | 1.86     | 0.81         | 2.06     |
| 5       | F-2 (S)      | 17          | 0.44         | 1                    | 3.95            | 2.14                       | 3.75      | 2               | 9.16               | 11.31  | 5                 | A                  | 1.88            | 2.98     | 0.26         | 0.77     |
| -       | F-2 (low pt) | 25          | 0.90         | 0                    | -               | 4.37                       | 7.66      | 2               | -                  | -      | 5                 | A                  | 4.37            | 7.66     | 0.00         | 0.00     |
| 15      | G-4          | 18          | 0.31         | 2                    | 5.59            | 1.95                       | 3.86      | 2               | 7.78               | 10.04  | 5                 | A                  | 1.61            | 2.64     | 0.34         | 1.22     |
| 15      | G-3          | 19          | 0.43         | 2                    | 5.59            | 2.21                       | 4.03      | 2               | 8.14               | 10.21  | 5                 | A                  | 1.77            | 2.71     | 0.44         | 1.32     |
| 6       | G-2          | 20          | 0.86         | 5.62                 | 9.37            | 4.17                       | 7.32      | 2               | 8.52               | 10.52  | 5                 | A                  | 1.90            | 2.16     | 2.27         | 5.17     |