# APPENDIX C

# Pipe and Pump Sizing Calculations

## Conveyance Piping Size Calculations

hf = Major friction head loss in ft (from Hazen & Williams) =

$0.002083 \times L(100/C)^{1.85} \times Q^{1.85}/D^{4.8655}$

Assume commercial steel for raw water calculations so use C = 100

Assume PVC for treated water calculations so use C = 130

L = Length of pipe in ft

D = Piping diameter in inches

Q = Flow

v = kinematic viscosity in $ft^2/sec = 1.2913 \times 10^{-5}$ for 55 $^oF$ water

Pipe Section W-8 to W-7
Q=33 gpm and L=500

| Pipe Diameter in inches | hf |
|---|---|
| 2.00 | 23.03 |
| 3.00 | 3.20 |
| 4.00 | 0.79 |
| 5.00 | 0.27 |
| 6.00 | 0.11 |

Pipe Section W-4 to W-3
Q=108 gpm and L=300

| Pipe Diameter in inches | hf |
|---|---|
| 2.00 | 123.87 |
| 3.00 | 17.23 |
| 4.00 | 4.25 |
| 5.00 | 1.43 |
| 6.00 | 0.59 |

Pipe Section W-7 to W-6
Q=66 gpm and L=350

| Pipe Diameter in inches | hf |
|---|---|
| 2.00 | 58.11 |
| 3.00 | 8.08 |
| 4.00 | 1.99 |
| 5.00 | 0.67 |
| 6.00 | 0.28 |

Pipe Section W-1 to W-2
Q=39 gpm and L=500

| Pipe Diameter in inches | hf |
|---|---|
| 2.00 | 31.37 |
| 3.00 | 4.36 |
| 4.00 | 1.08 |
| 5.00 | 0.36 |
| 6.00 | 0.15 |

Pipe Section W-6 to W-5
Q=80 gpm and L=220

| Pipe Diameter in inches | hf |
|---|---|
| 2.00 | 52.14 |
| 3.00 | 7.25 |
| 4.00 | 1.79 |
| 5.00 | 0.60 |
| 6.00 | 0.25 |

Pipe Section W-2 to W-3
Q=76 gpm and L=300

| Pipe Diameter in inches | hf |
|---|---|
| 2.00 | 64.66 |
| 3.00 | 8.99 |
| 4.00 | 2.22 |
| 5.00 | 0.75 |
| 6.00 | 0.31 |

Pipe Section W-5 to W-4
Q=94 gpm and L=300

| Pipe Diameter in inches | hf |
|---|---|
| 2.00 | 95.82 |
| 3.00 | 13.32 |
| 4.00 | 3.29 |
| 5.00 | 1.11 |
| 6.00 | 0.46 |

Pipe Section W-3 to Treatment Building
Q=210 gpm and L=250

| Pipe Diameter in inches | hf |
|---|---|
| 2.00 | 353.24 |
| 3.00 | 49.12 |
| 4.00 | 12.12 |
| 5.00 | 4.09 |
| 6.00 | 1.69 |

Treatment Building to Discharge Point
Q=210 gpm and L=1000

| Pipe Diameter in inches | hf |
|---|---|
| 2.00 | 869.64 |
| 3.00 | 120.94 |
| 4.00 | 29.83 |
| 5.00 | 10.07 |
| 6.00 | 4.15 |

| Major Friction Head Loss Calculations for Pump Sizing | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pump | Design Flow | Elevation Head | W-8 to W-7 | W-7 to W-6 | W-6 to W-5 | W-5 to W-4 | W-4 to W-3 | W-3 to Trt Bldg | W-1 to W-2 | W-2 to W-3 | Total |
| RW-107 | 33 | 80 | 23.0 | 8.1 | 7.3 | 13.3 | 17.2 | 12.1 | N/A | N/A | 161.0 |
| RW-106 | 33 | 80 | N/A | 8.1 | 7.1 | 12.8 | 16.9 | 12.1 | N/A | N/A | 137.0 |
| RW-105 | 14 | 80 | N/A | N/A | 7.1 | 12.8 | 16.9 | 12.1 | N/A | N/A | 128.9 |
| RW-104 | 14 | 80 | N/A | N/A | N/A | 12.8 | 16.9 | 12.1 | N/A | N/A | 121.9 |
| RW-103 | 14 | 80 | N/A | N/A | N/A | N/A | 16.9 | 12.1 | N/A | N/A | 109.1 |
| RW-102 | 26 | 80 | N/A | N/A | N/A | N/A | N/A | 12.1 | N/A | N/A | 92.1 |
| RW-101 | 37 | 80 | N/A | N/A | N/A | N/A | N/A | 12.1 | N/A | 64.7 | 156.8 |
| RW-100 | 39 | 80 | N/A | N/A | N/A | N/A | N/A | 12.1 | 31.4 | 64.7 | 188.1 |