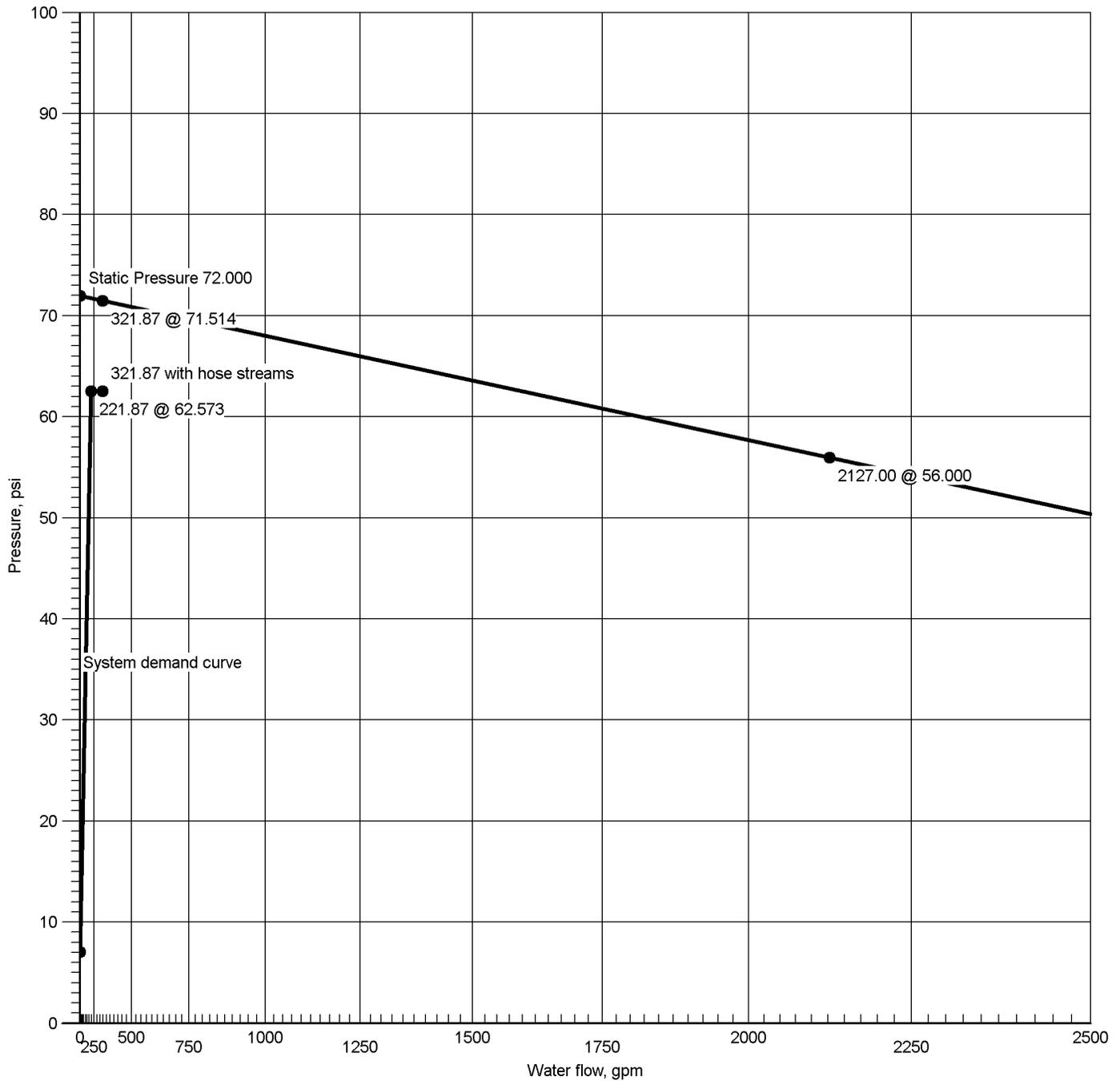




Water Supply at Node 1



Hydraulic Graph
Water Supply at Node 1

Static: Pressure
72.000

Residual: Pressure
56.000 @ 2127.00

Available Flow @ 20 PSI:
4019.62

Available Pressure at System Demand
71.514 @ 321.87

Required Pressure at System Demand
62.573 @ 221.87

Required Pressure at System Demand (Including Hose Allowance at Source)
62.573 @ 321.87



Summary Of Outflowing Devices

| Device | Actual Flow (gpm) | Minimum Flow (gpm) | K-Factor (K) | Pressure (psi) | | | |
|------------------------|-------------------|--------------------|--------------|----------------|--|--|--|
| Sprinkler 546 | 42.11 | 33.00 | 11.2 | 14.134 | | | |
| Sprinkler 569 | 36.84 | 33.00 | 11.2 | 10.821 | | | |
| ⇒ Sprinkler 582 | 33.00 | 33.00 | 11.2 | 8.681 | | | |
| Sprinkler 595 | 17.71 | 14.30 | 5.6 | 9.997 | | | |
| Sprinkler 596 | 17.74 | 14.30 | 5.6 | 10.035 | | | |
| Sprinkler 597 | 17.88 | 14.30 | 5.6 | 10.198 | | | |
| Sprinkler 598 | 18.19 | 14.30 | 5.6 | 10.556 | | | |
| Sprinkler 599 | 18.77 | 15.60 | 5.6 | 11.236 | | | |

⇒ Most Demanding Sprinkler Data



Node Analysis

Job Number: NC1505

Report Description: Light Hazard (2 Dry)

| Node | Elevation(Foot) | Fittings | Pressure(psi) | Discharge(gpm) |
|------|-----------------|-----------------------|---------------|----------------|
| 1 | -6'-0 | S | 62.573 | 221.87 |
| 546 | 10'-4 | Spr(-14.134) | 14.134 | 42.11 |
| 569 | 10'-3½ | Spr(-10.821) | 10.821 | 36.84 |
| 582 | 10'-3 | Spr(-8.681) | 8.681 | 33.00 |
| 595 | 10'-1½ | Spr(-9.997), PO(3'-7) | 9.997 | 17.71 |
| 596 | 10'-2 | Spr(-10.035) | 10.035 | 17.74 |
| 597 | 10'-2 | Spr(-10.198) | 10.198 | 17.88 |
| 598 | 10'-2½ | Spr(-10.556) | 10.556 | 18.19 |
| 599 | 10'-2½ | Spr(-11.236) | 11.236 | 18.77 |
| 600 | 10'-3 | Spr(-12.277) | 12.277 | 19.62 |
| 30 | 1'-8 | | 58.769 | |
| 42 | 4'-10 | DPV | 44.153 | |
| 189 | 10'-4 | E(4'-4½) | 28.352 | |
| 208 | 10'-4 | PO(3'-7) | 22.124 | |
| 284 | 10'-3½ | PO(3'-7) | 17.062 | |
| 320 | 10'-3 | PO(3'-7) | 13.770 | |
| 354 | 10'-3 | T(8'-9½) | 12.378 | |



Hydraulic Analysis

Job Number: NC1505
Report Description: Light Hazard (2 Dry)

| Pipe Type | Diameter | Flow | Velocity | HWC | Friction Loss | Length | Pressure |
|----------------|-----------|-----------|----------|--------|--------------------------|--------------|-----------|
| Downstream | Elevation | Discharge | K-Factor | Pt | Pn | Eq. Length | Summary |
| Upstream | | | | | | Total Length | |
| Route 1 | | | | | | | |
| BL | 1.0490 | 33.00 | 12.25 | 100 | 0.460482 | 7'-6" | Pf 5.091 |
| 582 | 10'-3" | 33.00 | 11.2 | 8.681 | Sprinkler, | 3'-7" | Pe -0.002 |
| 320 | 10'-3" | | | 13.770 | PO(3'-7) | 11'-0½" | Pv |
| CM | 2.1570 | 142.92 | 12.55 | 100 | 0.207106 | 15'-11½" | Pf 3.306 |
| 320 | 10'-3" | 109.92 | | 13.770 | Flow (q) from Route 3 | | Pe -0.014 |
| 284 | 10'-3½" | | | 17.062 | | 15'-11½" | Pv |
| CM | 2.1570 | 179.76 | 15.78 | 100 | 0.316568 | 16'-0½" | Pf 5.077 |
| 284 | 10'-3½" | 36.84 | | 17.062 | Flow (q) from Route 2 | | Pe -0.014 |
| 208 | 10'-4" | | | 22.124 | | 16'-0½" | Pv |
| CM | 2.1570 | 221.87 | 19.48 | 100 | 0.467258 | 4'-6½" | Pf 6.231 |
| 208 | 10'-4" | 42.11 | | 22.124 | Flow (q) from Route 5 | 8'-9½" | Pe -0.003 |
| 189 | 10'-4" | | | 28.352 | 2E(4'-4½) | 13'-4" | Pv |
| CM | 2.6350 | 221.87 | 13.05 | 100 | 0.176281 | 52'-7½" | Pf 13.417 |
| 189 | 10'-4" | | | 28.352 | | 23'-6" | Pe 2.384 |
| 42 | 4'-10" | | | 44.153 | 4E(5'-10½), DPV | 76'-1½" | Pv |
| FR | 2.6350 | 221.87 | 13.05 | 120 | 0.125811 | 3'-2½" | Pf 13.243 |
| 42 | 4'-10" | | | 44.153 | | 49'-5" | Pe 1.373 |
| 30 | 1'-8" | | | 58.769 | 3T(16'-5½), BFP(-6.621) | 52'-7½" | Pv |
| CM | 6.2800 | 221.87 | 2.30 | 140 | 0.001377 | 271'-5" | Pf 0.480 |
| 30 | 1'-8" | | | 58.769 | | 77'-2½" | Pe 3.324 |
| 1 | -6'-0" | | | 62.573 | 3E(22'-1), EE(11'-0½), S | 348'-8" | Pv |
| | | 100.00 | | | Hose Allowance At Source | | |
| 1 | | 321.87 | | | | | |
| Route 2 | | | | | | | |
| BL | 1.0490 | 36.84 | 13.68 | 100 | 0.564553 | 7'-6" | Pf 6.241 |
| 569 | 10'-3½" | 36.84 | 11.2 | 10.821 | Sprinkler, | 3'-7" | Pe 0.000 |
| 284 | 10'-3½" | | | 17.062 | PO(3'-7) | 11'-0½" | Pv |
| Route 3 | | | | | | | |
| CM | 2.1570 | 17.71 | 1.55 | 100 | 0.004348 | 11'-0" | Pf 0.048 |
| 595 | 10'-1½" | 17.71 | 5.6 | 9.997 | Sprinkler | | Pe -0.010 |
| 596 | 10'-2" | | | 10.035 | | 11'-0" | Pv |
| CM | 2.1570 | 35.45 | 3.11 | 100 | 0.015704 | 11'-0" | Pf 0.173 |
| 596 | 10'-2" | 17.74 | 5.6 | 10.035 | Sprinkler | | Pe -0.010 |
| 597 | 10'-2" | | | 10.198 | | 11'-0" | Pv |
| CM | 2.1570 | 53.33 | 4.68 | 100 | 0.033434 | 11'-0" | Pf 0.368 |
| 597 | 10'-2" | 17.88 | 5.6 | 10.198 | Sprinkler | | Pe -0.010 |
| 598 | 10'-2½" | | | 10.556 | | 11'-0" | Pv |
| CM | 2.1570 | 71.52 | 6.28 | 100 | 0.057547 | 12'-0" | Pf 0.691 |
| 598 | 10'-2½" | 18.19 | 5.6 | 10.556 | Sprinkler | | Pe -0.011 |
| 599 | 10'-2½" | | | 11.236 | | 12'-0" | Pv |
| CM | 2.1570 | 90.30 | 7.93 | 100 | 0.088566 | 4'-2" | Pf 1.146 |
| 599 | 10'-2½" | 18.77 | 5.6 | 11.236 | Sprinkler, | 8'-9½" | Pe -0.004 |
| 354 | 10'-3" | | | 12.378 | T(8'-9½) | 12'-11½" | Pv |
| CM | 2.1570 | 109.92 | 9.65 | 100 | 0.127426 | 11'-0" | Pf 1.402 |
| 354 | 10'-3" | 19.62 | | 12.378 | Flow (q) from Route 4 | | Pe -0.010 |
| 320 | 10'-3" | | | 13.770 | | 11'-0" | Pv |
| Route 4 | | | | | | | |
| CM | 2.1570 | 19.62 | 1.72 | 100 | 0.005258 | 8'-10" | Pf 0.093 |
| 600 | 10'-3" | 19.62 | 5.6 | 12.277 | Sprinkler, | 8'-9½" | Pe 0.008 |
| 354 | 10'-3" | | | 12.378 | T(8'-9½) | 17'-7½" | Pv |
| Route 5 | | | | | | | |
| BL | 1.0490 | 42.11 | 15.63 | 100 | 0.722793 | 7'-6" | Pf 7.990 |
| 546 | 10'-4" | 42.11 | 11.2 | 14.134 | Sprinkler, | 3'-7" | Pe -0.000 |
| 208 | 10'-4" | | | 22.124 | PO(3'-7) | 11'-0½" | Pv |

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

C Value Multiplier

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$$

| | | | | |
|--------------------|-------|------|------|------|
| Value Of C | 100 | 130 | 140 | 150 |
| Multiplying Factor | 0.713 | 1.16 | 1.33 | 1.51 |



Hydraulic Analysis

| Pipe Type | Diameter | Flow | Velocity | HWC | Friction Loss | | Length | Pressure |
|------------|-----------|-----------|----------|-----|---------------|----------|--------------|----------|
| Downstream | Elevation | Discharge | K-Factor | Pt | Pn | Fittings | Eq. Length | Summary |
| Upstream | | | | | | | Total Length | |

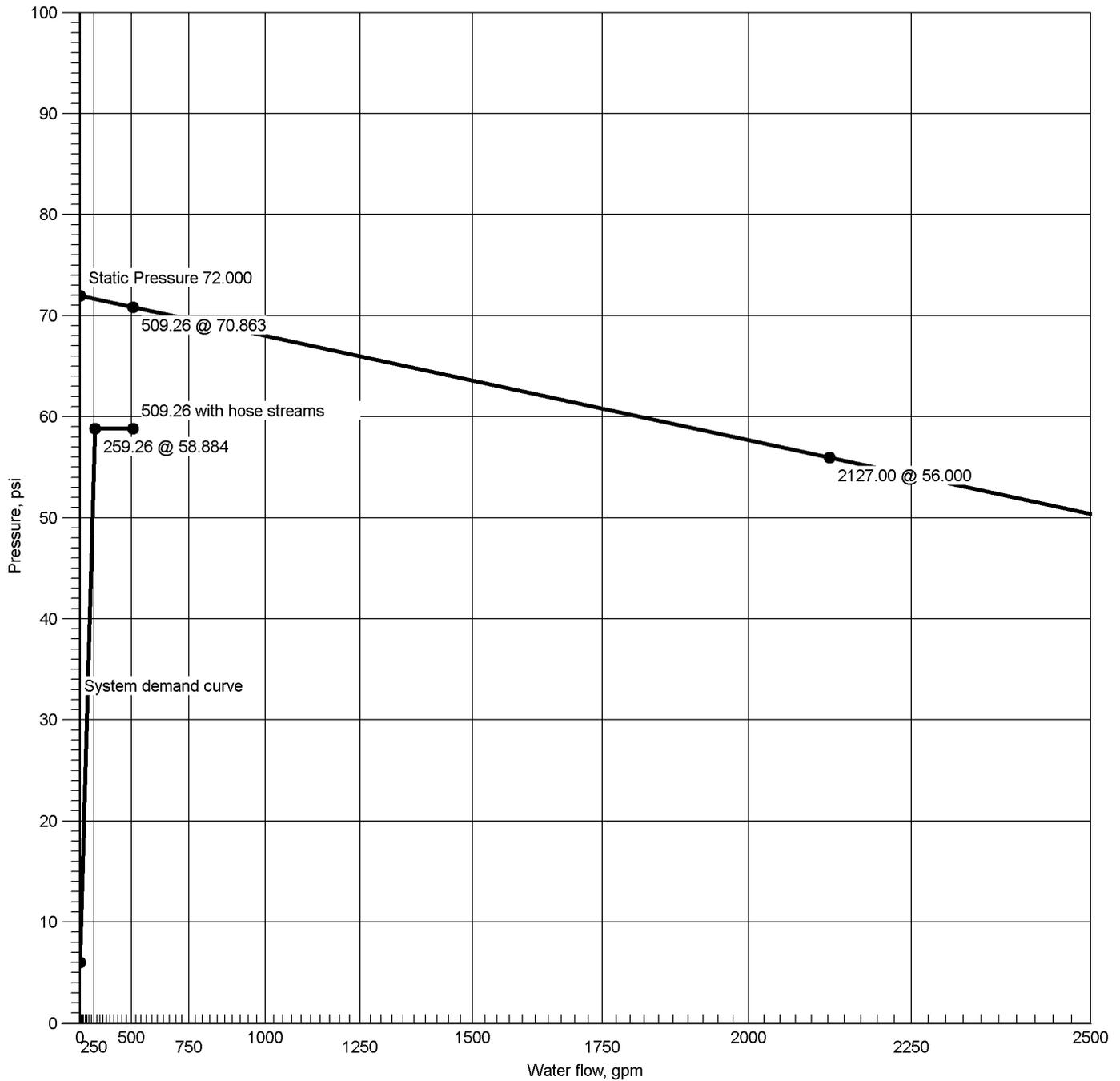
| Pipe Type Legend | |
|------------------|---------------|
| AO | Arm-Over |
| BL | Branch Line |
| CM | Cross Main |
| DN | Drain |
| DR | Drop |
| DY | Dynamic |
| FM | Feed Main |
| FR | Feed Riser |
| MS | Miscellaneous |
| OR | Outrigger |
| RN | Riser Nipple |
| SN | Swing Nipple |
| SP | Sprig |
| ST | Stand Pipe |
| UG | Underground |

| Units Legend | |
|---------------|---|
| Diameter | Inch |
| Elevation | Foot |
| Flow | gpm |
| Discharge | gpm |
| Velocity | fps |
| Pressure | psi |
| Length | Foot |
| Friction Loss | psi/Foot |
| HWC | Hazen-Williams Constant |
| Pt | Total pressure at a point in a pipe |
| Pn | Normal pressure at a point in a pipe |
| Pf | Pressure loss due to friction between points |
| Pe | Pressure due to elevation difference between indicated points |
| Pv | Velocity pressure at a point in a pipe |

| Fittings Legend | |
|-----------------|----------------------------|
| ALV | Alarm Valve |
| AngV | Angle Valve |
| b | Bushing |
| BalV | Ball Valve |
| BFP | Backflow Preventer |
| BV | Butterfly Valve |
| C | Cross Flow Turn 90° |
| cplg | Coupling |
| Cr | Cross Run |
| CV | Check Valve |
| DeV | Deluge Valve |
| DPV | Dry Pipe Valve |
| E | 90° Elbow |
| EE | 45° Elbow |
| Ee1 | 11¼° Elbow |
| Ee2 | 22½° Elbow |
| f | Flow Device |
| fd | Flex Drop |
| FDC | Fire Department Connection |
| fE | 90° FireLock(TM) Elbow |
| fEE | 45° FireLock(TM) Elbow |
| flg | Flange |
| FN | Floating Node |
| fT | FireLock(TM) Tee |
| g | Gauge |
| GloV | Globe Valve |
| GV | Gate Valve |
| Ho | Hose |
| Hose | Hose |
| HV | Hose Valve |
| Hyd | Hydrant |
| LtE | Long Turn Elbow |
| mecT | Mechanical Tee |
| Noz | Nozzle |
| P1 | Pump In |
| P2 | Pump Out |
| PIV | Post Indicating Valve |
| PO | Pipe Outlet |
| PRV | Pressure Reducing Valve |
| PrV | Pressure Relief Valve |
| red | Reducer/Adapter |
| S | Supply |
| sCV | Swing Check Valve |
| Spr | Sprinkler |
| St | Strainer |
| T | Tee Flow Turn 90° |
| Tr | Tee Run |
| U | Union |
| WirF | Wirsbo |
| WMV | Water Meter Valve |
| Z | Cap |



Water Supply at Node 1



Hydraulic Graph
Water Supply at Node 1

Static: Pressure
72.000

Residual: Pressure Available Flow @ 20 PSI:
56.000 @ 2127.00 4019.62

Available Pressure at System Demand
70.863 @ 509.26

Required Pressure at System Demand
58.884 @ 259.26

Required Pressure at System Demand (Including Hose Allowance at Source)
58.884 @ 509.26



Summary Of Outflowing Devices

| Device | | Actual Flow (gpm) | Minimum Flow (gpm) | K-Factor (K) | Pressure (psi) | | | |
|--------------------|------------|-------------------|--------------------|--------------|----------------|--|--|--|
| Sprinkler | 522 | 20.39 | 15.60 | 5.6 | 13.254 | | | |
| Sprinkler | 523 | 20.00 | 15.60 | 5.6 | 12.756 | | | |
| Sprinkler | 524 | 19.90 | 15.60 | 5.6 | 12.633 | | | |
| Sprinkler | 525 | 19.91 | 15.60 | 5.6 | 12.636 | | | |
| Sprinkler | 530 | 19.77 | 19.50 | 5.6 | 12.468 | | | |
| Sprinkler | 531 | 20.10 | 15.60 | 5.6 | 12.880 | | | |
| Sprinkler | 532 | 20.80 | 16.57 | 5.6 | 13.796 | | | |
| ⇒ Sprinkler | 539 | 19.50 | 19.50 | 5.6 | 12.125 | | | |
| Sprinkler | 540 | 20.45 | 19.50 | 5.6 | 13.338 | | | |
| Sprinkler | 544 | 19.58 | 19.50 | 5.6 | 12.227 | | | |
| Sprinkler | 550 | 19.51 | 19.50 | 5.6 | 12.132 | | | |
| Sprinkler | 551 | 19.80 | 19.50 | 5.6 | 12.503 | | | |
| Sprinkler | 552 | 19.55 | 19.50 | 5.6 | 12.185 | | | |

⇒ Most Demanding Sprinkler Data



Node Analysis

| Node | Elevation(Foot) | Fittings | Pressure(psi) | Discharge(gpm) |
|------|-----------------|-------------------------|---------------|----------------|
| 1 | -6'-0 | S | 58.884 | 259.26 |
| 522 | 8'-0 | Spr(-13.254), fd(32'-0) | 13.254 | 20.39 |
| 523 | 8'-0 | Spr(-12.756), fd(32'-0) | 12.756 | 20.00 |
| 524 | 8'-0 | Spr(-12.633), fd(32'-0) | 12.633 | 19.90 |
| 525 | 8'-0 | Spr(-12.636), fd(32'-0) | 12.636 | 19.91 |
| 530 | 8'-0 | Spr(-12.468), fd(32'-0) | 12.468 | 19.77 |
| 531 | 8'-0 | Spr(-12.880), fd(32'-0) | 12.880 | 20.10 |
| 532 | 8'-0 | Spr(-13.796), fd(32'-0) | 13.796 | 20.80 |
| 539 | 8'-0 | Spr(-12.125), fd(32'-0) | 12.125 | 19.50 |
| 540 | 8'-0 | Spr(-13.338), fd(32'-0) | 13.338 | 20.45 |
| 544 | 8'-0 | Spr(-12.227), fd(32'-0) | 12.227 | 19.58 |
| 550 | 8'-0 | Spr(-12.132), fd(32'-0) | 12.132 | 19.51 |
| 551 | 8'-0 | Spr(-12.503), fd(32'-0) | 12.503 | 19.80 |
| 552 | 8'-0 | Spr(-12.185), fd(32'-0) | 12.185 | 19.55 |
| 30 | 1'-8 | | 54.920 | |
| 61 | 13'-9½ | PO(7'-5) | 23.364 | |
| 77 | 13'-9½ | PO(7'-5) | 33.751 | |
| 82 | 12'-1½ | PO(6'-0) | 23.019 | |
| 83 | 12'-1½ | PO(6'-0) | 35.540 | |
| 129 | 13'-11½ | PO(7'-5) | 20.221 | |
| 131 | 13'-11½ | PO(5'-0) | 16.792 | |
| 132 | 13'-11½ | PO(5'-0) | 16.082 | |
| 133 | 13'-11½ | PO(5'-0) | 15.907 | |
| 134 | 13'-11½ | PO(5'-0) | 15.911 | |
| 136 | 13'-11½ | PO(5'-0) | 16.189 | |
| 137 | 13'-11½ | PO(5'-0) | 16.792 | |
| 138 | 13'-11½ | PO(5'-0) | 18.134 | |
| 141 | 13'-11½ | PO(7'-5) | 30.145 | |
| 144 | 12'-3½ | PO(6'-0) | 22.819 | |
| 145 | 12'-3½ | PO(6'-0) | 34.508 | |
| 176 | 14'-2½ | PO(7'-5) | 20.668 | |
| 179 | 12'-7 | PO(6'-0) | 22.726 | |
| 214 | 14'-4½ | PO(5'-0) | 15.193 | |
| 215 | 14'-4½ | PO(5'-0) | 15.444 | |
| 216 | 14'-4½ | PO(5'-0) | 17.217 | |
| 220 | 14'-4½ | PO(7'-5) | 27.934 | |
| 223 | 12'-8½ | PO(6'-0) | 31.317 | |
| 234 | 14'-5 | PO(5'-0) | 15.574 | |
| 235 | 14'-5 | PO(5'-0) | 15.118 | |
| 237 | 14'-5 | PO(5'-0) | 15.042 | |
| 273 | 14'-8½ | PO(7'-5) | 23.144 | |
| 282 | 14'-8½ | PO(7'-5) | 29.644 | |
| 285 | 13'-0½ | PO(6'-0) | 23.251 | |
| 286 | 13'-0½ | PO(6'-0) | 30.984 | |
| 299 | 15'-0½ | PO(7'-5) | 23.144 | |
| 309 | 15'-0½ | E(3'-8½) | 29.454 | |
| 310 | 13'-4 | PO(6'-0) | 23.252 | |



Hydraulic Analysis

| Pipe Type | Diameter | Flow | Velocity | HWC | Friction Loss | Length | Pressure |
|----------------|-----------|-----------|----------|--------|--|--------------|-----------|
| Downstream | Elevation | Discharge | K-Factor | Pt | Pn | Eq. Length | Summary |
| Upstream | | | | | | Total Length | |
| Route 1 | | | | | | | |
| AO | 1.0490 | 19.50 | 7.24 | 120 | 0.124177 | 8'-0" | Pf 6.082 |
| 539 | 8'-0" | 19.50 | 5.6 | 12.125 | Sprinkler, | 41'-0" | Pe -2.764 |
| 215 | 14'-4½" | | | 15.444 | 2E(2'-0"), PO(5'-0), fd(32'-0) | 49'-0" | Pv |
| BL | 1.4420 | 49.52 | 9.73 | 120 | 0.147841 | 12'-0" | Pf 1.773 |
| 215 | 14'-4½" | 30.02 | | 15.444 | Flow (q) from Route 2 | | Pe |
| 216 | 14'-4½" | | | 17.217 | | 12'-0" | Pv |
| BL | 1.4420 | 69.97 | 13.75 | 120 | 0.280266 | 30'-9½" | Pf 10.717 |
| 216 | 14'-4½" | 20.45 | | 17.217 | Flow (q) from Route 7 | 7'-5" | Pe |
| 220 | 14'-4½" | | | 27.934 | PO(7'-5) | 38'-3" | Pv |
| RN | 1.3800 | 69.97 | 15.01 | 120 | 0.347153 | 1'-8" | Pf 2.661 |
| 220 | 14'-4½" | | | 27.934 | | 6'-0" | Pe 0.721 |
| 223 | 12'-8½" | | | 31.317 | PO(6'-0) | 7'-8" | Pv |
| CM | 2.6350 | 133.68 | 7.87 | 120 | 0.049282 | 28'-0" | Pf 3.004 |
| 223 | 12'-8½" | 63.71 | | 31.317 | Flow (q) from Route 3 | 32'-11½" | Pe 0.187 |
| 145 | 12'-3½" | | | 34.508 | 2T(16'-5½") | 60'-11½" | Pv |
| CM | 2.6350 | 216.56 | 12.74 | 120 | 0.120304 | 8'-0" | Pf 0.962 |
| 145 | 12'-3½" | 82.88 | | 34.508 | Flow (q) from Route 5 | | Pe 0.071 |
| 83 | 12'-1½" | | | 35.540 | | 8'-0" | Pv |
| CM | 2.6350 | 259.26 | 15.25 | 120 | 0.167824 | 17'-3" | Pf 14.850 |
| 83 | 12'-1½" | 42.69 | | 35.540 | Flow (q) from Route 10 | 24'-8½" | Pe 4.530 |
| 30 | 1'-8" | | | 54.920 | T(16'-5½"), E(8'-3), f(-0.000), BFP(-7.809) | 41'-11½" | Pv |
| CM | 6.2800 | 259.26 | 2.69 | 140 | 0.001837 | 271'-5" | Pf 0.641 |
| 30 | 1'-8" | | | 54.920 | | 77'-2½" | Pe 3.324 |
| 1 | -6'-0" | | | 58.884 | 3E(22'-1), EE(11'-0½"), S | 348'-8" | Pv |
| | | 250.00 | | | Hose Allowance At Source | | |
| 1 | | 509.26 | | | | | |
| Route 2 | | | | | | | |
| AO | 1.0490 | 19.51 | 7.24 | 120 | 0.124237 | 4'-10" | Pf 5.695 |
| 550 | 8'-0" | 19.51 | 5.6 | 12.132 | Sprinkler, | 41'-0" | Pe -2.785 |
| 237 | 14'-5" | | | 15.042 | 2E(2'-0"), PO(5'-0), fd(32'-0) | 45'-10" | Pv |
| BL | 1.4420 | 10.44 | 2.05 | 120 | 0.008295 | 8'-3" | Pf 0.130 |
| 237 | 14'-5" | | | 15.042 | | 7'-5" | Pe 0.021 |
| 214 | 14'-4½" | | | 15.193 | 2E(3'-8½") | 15'-8" | Pv |
| BL | 1.4420 | 30.02 | 5.90 | 120 | 0.058565 | 4'-3½" | Pf 0.251 |
| 214 | 14'-4½" | 19.58 | | 15.193 | Flow (q) from Route 4 | | Pe |
| 215 | 14'-4½" | | | 15.444 | | 4'-3½" | Pv |
| Route 3 | | | | | | | |
| AO | 1.0490 | 19.55 | 7.26 | 120 | 0.124744 | 4'-10" | Pf 5.718 |
| 552 | 8'-0" | 19.55 | 5.6 | 12.185 | Sprinkler, | 41'-0" | Pe -2.785 |
| 235 | 14'-5" | | | 15.118 | 2E(2'-0"), PO(5'-0), fd(32'-0) | 45'-10" | Pv |
| BL | 1.4420 | 28.62 | 5.62 | 120 | 0.053610 | 8'-6" | Pf 0.456 |
| 235 | 14'-5" | 9.07 | | 15.118 | Flow (q) from Route 14 | | Pe |
| 234 | 14'-5" | | | 15.574 | | 8'-6" | Pv |
| BL | 1.4420 | 48.42 | 9.51 | 120 | 0.141828 | 20'-5" | Pf 5.006 |
| 234 | 14'-5" | 19.80 | | 15.574 | Flow (q) from Route 6 | 14'-10½" | Pe 0.087 |
| 176 | 14'-2½" | | | 20.668 | 2E(3'-8½"), PO(7'-5) | 35'-3½" | Pv |
| RN | 1.3800 | 48.42 | 10.39 | 120 | 0.175675 | 1'-8" | Pf 1.344 |
| 176 | 14'-2½" | | | 20.668 | | 6'-0" | Pe 0.715 |
| 179 | 12'-7" | | | 22.726 | PO(6'-0) | 7'-8" | Pv |
| CM | 2.1570 | 63.71 | 5.59 | 120 | 0.033161 | 21'-10½" | Pf 0.725 |
| 179 | 12'-7" | 15.29 | | 22.726 | Flow (q) from Route 15 | | Pe -0.201 |
| 285 | 13'-0½" | | | 23.251 | | 21'-10½" | Pv |
| CM | 2.1570 | 31.93 | 2.80 | 120 | 0.009237 | 14'-0" | Pf 0.129 |
| 285 | 13'-0½" | | | 23.251 | | | Pe -0.128 |
| 310 | 13'-4" | | | 23.252 | | 14'-0" | Pv |
| RN | 1.3800 | 31.93 | 6.85 | 120 | 0.081311 | 1'-8½" | Pf 0.625 |
| 310 | 13'-4" | | | 23.252 | PO(6'-0) | 6'-0" | Pe -0.733 |
| 299 | 15'-0½" | | | 23.144 | | 7'-8½" | Pv |
| BL | 1.4420 | 31.93 | 6.27 | 120 | 0.065645 | 84'-11½" | Pf 6.310 |
| 299 | 15'-0½" | | | 23.144 | PO(7'-5) | 11'-2" | Pe |
| 309 | 15'-0½" | | | 29.454 | E(3'-8½") | 96'-1½" | Pv |
| RN | 1.3800 | 31.93 | 6.85 | 120 | 0.081311 | 1'-8" | Pf 0.623 |
| 309 | 15'-0½" | | | 29.454 | | 6'-0" | Pe 0.722 |
| 311 | 13'-4½" | | | 30.799 | PO(6'-0) | 7'-8" | Pv |



Hydraulic Analysis

| Pipe Type | Diameter | Flow | Velocity | HWC | Friction Loss | Length | Pressure |
|-----------------|-----------|-----------|----------|--------|-------------------------------|--------------|-----------|
| Downstream | Elevation | Discharge | K-Factor | Pt | Pn | Eq. Length | Summary |
| Upstream | | | | | | Total Length | |
| CM | 2.6350 | 31.93 | 1.88 | 120 | 0.003485 | 14'-0 | Pf 0.049 |
| 311 | 13'-4½ | | | 30.799 | | | Pe 0.136 |
| 286 | 13'-0½ | | | 30.984 | | 14'-0 | Pv |
| CM | 2.6350 | 63.71 | 3.75 | 120 | 0.012510 | 14'-11½ | Pf 0.187 |
| 286 | 13'-0½ | 31.79 | | 30.984 | Flow (q) from Route 16 | | Pe 0.145 |
| 223 | 12'-8½ | | | 31.317 | | 14'-11½ | Pv |
| Route 4 | | | | | | | |
| AO | 1.0490 | 19.58 | 7.27 | 120 | 0.125136 | 4'-9½ | Pf 5.730 |
| 544 | 8'-0 | 19.58 | 5.6 | 12.227 | Sprinkler, | 41'-0 | Pe -2.764 |
| 214 | 14'-4½ | | | 15.193 | 2E(2'-0), PO(5'-0), fd(32'-0) | 45'-9½ | Pv |
| Route 5 | | | | | | | |
| AO | 1.0490 | 19.77 | 7.34 | 120 | 0.127423 | 8'-5 | Pf 6.297 |
| 530 | 8'-0 | 19.77 | 5.6 | 12.468 | Sprinkler, | 41'-0 | Pe -2.577 |
| 136 | 13'-11½ | | | 16.189 | 2E(2'-0), PO(5'-0), fd(32'-0) | 49'-5 | Pv |
| BL | 1.4420 | 41.98 | 8.25 | 120 | 0.108941 | 5'-6½ | Pf 0.603 |
| 136 | 13'-11½ | 22.21 | | 16.189 | Flow (q) from Route 8 | | Pe |
| 137 | 13'-11½ | | | 16.792 | | 5'-6½ | Pv |
| BL | 1.4420 | 62.08 | 12.20 | 120 | 0.224629 | 5'-11½ | Pf 1.342 |
| 137 | 13'-11½ | 20.10 | | 16.792 | Flow (q) from Route 12 | | Pe |
| 138 | 13'-11½ | | | 18.134 | | 5'-11½ | Pv |
| BL | 1.4420 | 82.88 | 16.28 | 120 | 0.383381 | 23'-11 | Pf 12.011 |
| 138 | 13'-11½ | 20.80 | | 18.134 | Flow (q) from Route 11 | 7'-5 | Pe |
| 141 | 13'-11½ | | | 30.145 | PO(7'-5) | 31'-4 | Pv |
| RN | 1.3800 | 82.88 | 17.78 | 120 | 0.474876 | 1'-8 | Pf 3.641 |
| 141 | 13'-11½ | | | 30.145 | | 6'-0 | Pe 0.722 |
| 145 | 12'-3½ | | | 34.508 | PO(6'-0) | 7'-8 | Pv |
| Route 6 | | | | | | | |
| AO | 1.0490 | 19.80 | 7.35 | 120 | 0.127751 | 4'-10 | Pf 5.856 |
| 551 | 8'-0 | 19.80 | 5.6 | 12.503 | Sprinkler, | 41'-0 | Pe -2.785 |
| 234 | 14'-5 | | | 15.574 | 2E(2'-0), PO(5'-0), fd(32'-0) | 45'-10 | Pv |
| Route 7 | | | | | | | |
| AO | 1.0490 | 20.45 | 7.59 | 120 | 0.135622 | 8'-0 | Pf 6.643 |
| 540 | 8'-0 | 20.45 | 5.6 | 13.338 | Sprinkler, | 41'-0 | Pe -2.764 |
| 216 | 14'-4½ | | | 17.217 | 2E(2'-0), PO(5'-0), fd(32'-0) | 49'-0 | Pv |
| Route 8 | | | | | | | |
| AO | 1.0490 | 19.90 | 7.39 | 120 | 0.128983 | 4'-4½ | Pf 5.851 |
| 524 | 8'-0 | 19.90 | 5.6 | 12.633 | Sprinkler, | 41'-0 | Pe -2.577 |
| 133 | 13'-11½ | | | 15.907 | 2E(2'-0), PO(5'-0), fd(32'-0) | 45'-4½ | Pv |
| BL | 1.4420 | 2.30 | 0.45 | 120 | 0.000507 | 8'-0 | Pf 0.004 |
| 133 | 13'-11½ | | | 15.907 | | | Pe |
| 134 | 13'-11½ | | | 15.911 | | 8'-0 | Pv |
| BL | 1.4420 | 22.21 | 4.36 | 120 | 0.033543 | 8'-3½ | Pf 0.278 |
| 134 | 13'-11½ | 19.91 | | 15.911 | Flow (q) from Route 9 | | Pe |
| 136 | 13'-11½ | | | 16.189 | | 8'-3½ | Pv |
| Route 9 | | | | | | | |
| AO | 1.0490 | 19.91 | 7.39 | 120 | 0.129009 | 4'-4½ | Pf 5.852 |
| 525 | 8'-0 | 19.91 | 5.6 | 12.636 | Sprinkler, | 41'-0 | Pe -2.577 |
| 134 | 13'-11½ | | | 15.911 | 2E(2'-0), PO(5'-0), fd(32'-0) | 45'-4½ | Pv |
| Route 10 | | | | | | | |
| AO | 1.0490 | 20.00 | 7.42 | 120 | 0.130136 | 4'-4½ | Pf 5.903 |
| 523 | 8'-0 | 20.00 | 5.6 | 12.756 | Sprinkler, | 41'-0 | Pe -2.577 |
| 132 | 13'-11½ | | | 16.082 | 2E(2'-0), PO(5'-0), fd(32'-0) | 45'-4½ | Pv |
| BL | 1.4420 | 37.60 | 7.39 | 120 | 0.088843 | 8'-0 | Pf 0.711 |
| 132 | 13'-11½ | 17.60 | | 16.082 | Flow (q) from Route 17 | | Pe |
| 131 | 13'-11½ | | | 16.792 | | 8'-0 | Pv |
| BL | 1.4420 | 57.99 | 11.39 | 120 | 0.198005 | 9'-10½ | Pf 3.429 |
| 131 | 13'-11½ | 20.39 | | 16.792 | Flow (q) from Route 13 | 7'-5 | Pe |
| 129 | 13'-11½ | | | 20.221 | PO(7'-5) | 17'-4 | Pv |
| RN | 1.3800 | 57.99 | 12.44 | 120 | 0.245260 | 1'-8 | Pf 1.879 |
| 129 | 13'-11½ | | | 20.221 | | 6'-0 | Pe 0.719 |
| 144 | 12'-3½ | | | 22.819 | PO(6'-0) | 7'-8 | Pv |
| CM | 2.1570 | 42.69 | 3.75 | 120 | 0.015812 | 8'-0 | Pf 0.126 |
| 144 | 12'-3½ | | | 22.819 | | | Pe 0.073 |
| 82 | 12'-1½ | | | 23.019 | | 8'-0 | Pv |
| RN | 1.3800 | 42.69 | 9.16 | 120 | 0.139196 | 1'-8 | Pf 1.067 |
| 82 | 12'-1½ | | | 23.019 | PO(6'-0) | 6'-0 | Pe -0.722 |
| 61 | 13'-9½ | | | 23.364 | | 7'-8 | Pv |



Hydraulic Analysis

| Pipe Type | Diameter | Flow | Velocity | HWC | Friction Loss | Length | Pressure |
|-----------------|-----------|-----------|----------|--------|-------------------------------|--------------|-----------|
| Downstream | Elevation | Discharge | K-Factor | Pt | Pn | Eq. Length | Summary |
| Upstream | | | | | | Total Length | |
| BL | 1.4420 | 42.69 | 8.39 | 120 | 0.112377 | 77'-7" | Pf 10.387 |
| 61 | 13'-9½" | | | 23.364 | PO(7'-5) | 14'-10½" | Pe |
| 77 | 13'-9½" | | | 33.751 | PO(7'-5) | 92'-5" | Pv |
| RN | 1.3800 | 42.69 | 9.16 | 120 | 0.139196 | 1'-8" | Pf 1.067 |
| 77 | 13'-9½" | | | 33.751 | | 6'-0" | Pe 0.722 |
| 83 | 12'-1½" | | | 35.540 | PO(6'-0) | 7'-8" | Pv |
| Route 11 | | | | | | | |
| AO | 1.0490 | 20.80 | 7.72 | 120 | 0.139921 | 8'-5" | Pf 6.915 |
| 532 | 8'-0" | 20.80 | 5.6 | 13.796 | Sprinkler, | 41'-0" | Pe -2.577 |
| 138 | 13'-11½" | | | 18.134 | 2E(2'-0), PO(5'-0), fd(32'-0) | 49'-5" | Pv |
| Route 12 | | | | | | | |
| AO | 1.0490 | 20.10 | 7.46 | 120 | 0.131305 | 8'-5" | Pf 6.489 |
| 531 | 8'-0" | 20.10 | 5.6 | 12.880 | Sprinkler, | 41'-0" | Pe -2.577 |
| 137 | 13'-11½" | | | 16.792 | 2E(2'-0), PO(5'-0), fd(32'-0) | 49'-5" | Pv |
| Route 13 | | | | | | | |
| AO | 1.0490 | 20.39 | 7.57 | 120 | 0.134828 | 4'-4½" | Pf 6.116 |
| 522 | 8'-0" | 20.39 | 5.6 | 13.254 | Sprinkler, | 41'-0" | Pe -2.577 |
| 131 | 13'-11½" | | | 16.792 | 2E(2'-0), PO(5'-0), fd(32'-0) | 45'-4½" | Pv |
| Route 14 | | | | | | | |
| BL | 1.4420 | 9.07 | 1.78 | 120 | 0.006397 | 12'-0" | Pf 0.077 |
| 237 | 14'-5" | 10.44 | | 15.042 | Flow (q) from Route 2 | | Pe |
| 235 | 14'-5" | | | 15.118 | | 12'-0" | Pv |
| Route 15 | | | | | | | |
| CM | 2.1570 | 15.29 | 1.34 | 120 | 0.002367 | 13'-8½" | Pf 0.032 |
| 144 | 12'-3½" | 42.69 | | 22.819 | Flow (q) from Route 10 | | Pe -0.126 |
| 179 | 12'-7" | | | 22.726 | | 13'-8½" | Pv |
| Route 16 | | | | | | | |
| RN | 1.3800 | 31.79 | 6.82 | 120 | 0.080641 | 1'-8" | Pf 0.619 |
| 285 | 13'-0½" | | | 23.251 | PO(6'-0) | 6'-0" | Pe -0.725 |
| 273 | 14'-8½" | | | 23.144 | | 7'-8" | Pv |
| BL | 1.4420 | 31.79 | 6.24 | 120 | 0.065104 | 84'-11½" | Pf 6.500 |
| 273 | 14'-8½" | | | 23.144 | PO(7'-5) | 14'-10½" | Pe -0.000 |
| 282 | 14'-8½" | | | 29.644 | PO(7'-5) | 99'-10" | Pv |
| RN | 1.3800 | 31.79 | 6.82 | 120 | 0.080641 | 1'-8" | Pf 0.618 |
| 282 | 14'-8½" | | | 29.644 | | 6'-0" | Pe 0.722 |
| 286 | 13'-0½" | | | 30.984 | PO(6'-0) | 7'-8" | Pv |
| Route 17 | | | | | | | |
| BL | 1.4420 | 17.60 | 3.46 | 120 | 0.021815 | 8'-0" | Pf 0.175 |
| 133 | 13'-11½" | 2.30 | | 15.907 | Flow (q) from Route 8 | | Pe |
| 132 | 13'-11½" | | | 16.082 | | 8'-0" | Pv |

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

C Value Multiplier

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$$

| | | | | |
|--------------------|-------|------|------|------|
| Value Of C | 100 | 130 | 140 | 150 |
| Multiplying Factor | 0.713 | 1.16 | 1.33 | 1.51 |



Hydraulic Analysis

| Pipe Type | Diameter | Flow | Velocity | HWC | Friction Loss | | Length | Pressure |
|------------|-----------|-----------|----------|-----|---------------|----------|--------------|----------|
| Downstream | Elevation | Discharge | K-Factor | Pt | Pn | Fittings | Eq. Length | Summary |
| Upstream | | | | | | | Total Length | |

| Pipe Type Legend | |
|------------------|---------------|
| AO | Arm-Over |
| BL | Branch Line |
| CM | Cross Main |
| DN | Drain |
| DR | Drop |
| DY | Dynamic |
| FM | Feed Main |
| FR | Feed Riser |
| MS | Miscellaneous |
| OR | Outrigger |
| RN | Riser Nipple |
| SN | Swing Nipple |
| SP | Sprig |
| ST | Stand Pipe |
| UG | Underground |

| Units Legend | |
|---------------|---|
| Diameter | Inch |
| Elevation | Foot |
| Flow | gpm |
| Discharge | gpm |
| Velocity | fps |
| Pressure | psi |
| Length | Foot |
| Friction Loss | psi/Foot |
| HWC | Hazen-Williams Constant |
| Pt | Total pressure at a point in a pipe |
| Pn | Normal pressure at a point in a pipe |
| Pf | Pressure loss due to friction between points |
| Pe | Pressure due to elevation difference between indicated points |
| Pv | Velocity pressure at a point in a pipe |

| Fittings Legend | |
|-----------------|----------------------------|
| ALV | Alarm Valve |
| AngV | Angle Valve |
| b | Bushing |
| BalV | Ball Valve |
| BFP | Backflow Preventer |
| BV | Butterfly Valve |
| C | Cross Flow Turn 90° |
| cplg | Coupling |
| Cr | Cross Run |
| CV | Check Valve |
| DeV | Deluge Valve |
| DPV | Dry Pipe Valve |
| E | 90° Elbow |
| EE | 45° Elbow |
| Ee1 | 11¼° Elbow |
| Ee2 | 22½° Elbow |
| f | Flow Device |
| fd | Flex Drop |
| FDC | Fire Department Connection |
| fE | 90° FireLock(TM) Elbow |
| fEE | 45° FireLock(TM) Elbow |
| flg | Flange |
| FN | Floating Node |
| fT | FireLock(TM) Tee |
| g | Gauge |
| GloV | Globe Valve |
| GV | Gate Valve |
| Ho | Hose |
| Hose | Hose |
| HV | Hose Valve |
| Hyd | Hydrant |
| LiE | Long Turn Elbow |
| mecT | Mechanical Tee |
| Noz | Nozzle |
| P1 | Pump In |
| P2 | Pump Out |
| PIV | Post Indicating Valve |
| PO | Pipe Outlet |
| PrV | Pressure Relief Valve |
| PRV | Pressure Reducing Valve |
| red | Reducer/Adapter |
| S | Supply |
| sCV | Swing Check Valve |
| SFx | Seismic Flex |
| Spr | Sprinkler |
| St | Strainer |
| T | Tee Flow Turn 90° |
| Tr | Tee Run |
| U | Union |
| WirF | Wirsbo |
| WMV | Water Meter Valve |
| Z | Cap |