



# Hydraulic Overview

Job Number: 2210130 - Market  
Report Description: Ordinary Group II (1 - Market)

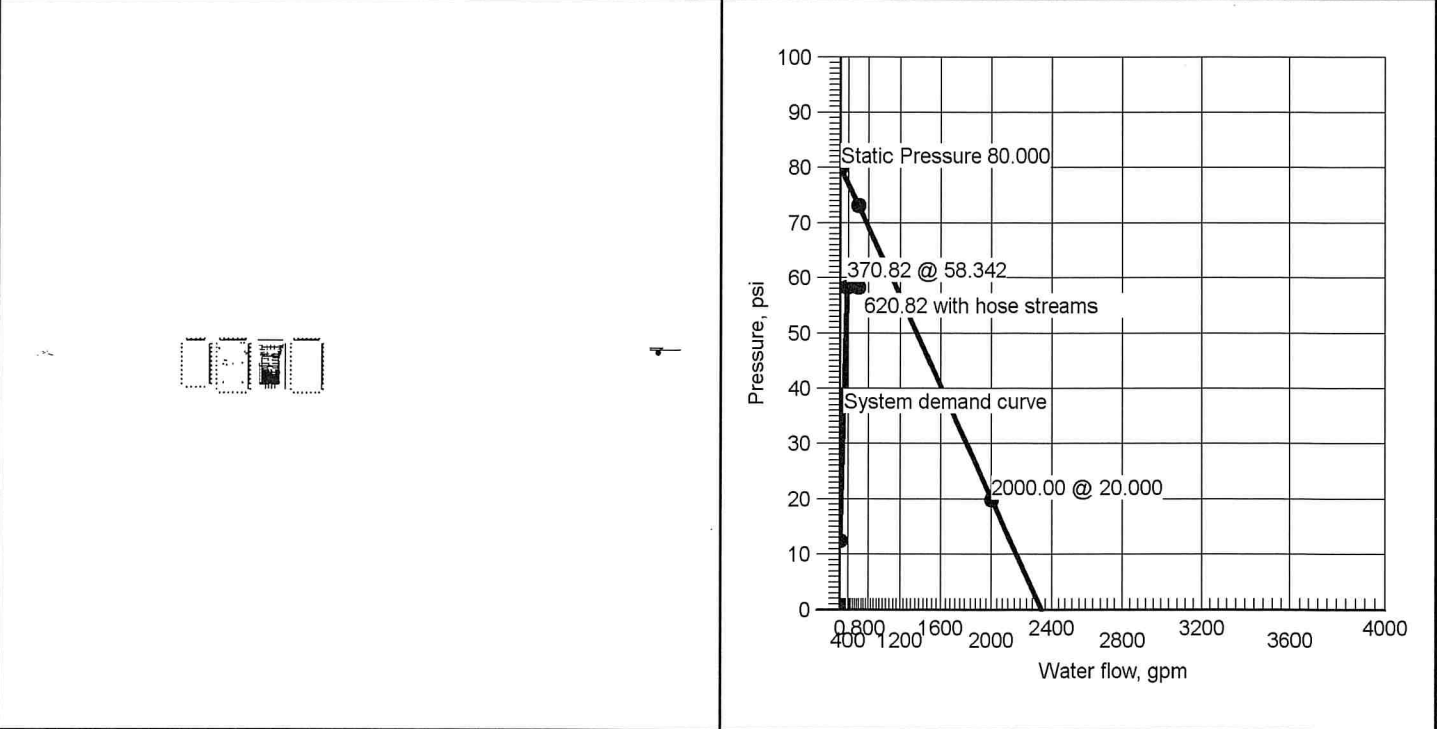
<b>Job</b>	
Job Number 2210130	Design Engineer Michael Hallengren
Job Name: Gateway Step By Step	Phone 253-377-6988
Address 1 3303 8th Ave SE	State Certification/License Number EMERAFLL980MR
Address 2 Puyallup, Wa 98372	AHJ City of Puyallup
Address 3	Job Site/Building

<b>System</b>	
Density 0.20gpm/ft <sup>2</sup>	Area of Application 1500ft <sup>2</sup> (Actual 1503ft <sup>2</sup> )
Most Demanding Sprinkler Data 5.6 K-Factor 24.00 at 18.367	Hose Streams 250.00
Coverage Per Sprinkler 120ft <sup>2</sup>	Number Of Sprinklers Calculated 15
System Pressure Demand 58.342	System Flow Demand 370.82
Total Demand 620.82 @ 58.342	Pressure Result +14.768 (20.2%)

<b>Supplies</b>						<b>Check Point Gauges</b>			
<u>Node</u>	<u>Name</u>	<u>Flow(gpm)</u>	<u>Hose Flow(gpm)</u>	<u>Static(psi)</u>	<u>Residual(psi)</u>	<u>Identifier</u>	<u>Pressure(psi)</u>	<u>K-Factor(K)</u>	<u>Flow(gpm)</u>
1	Water Supply	2000.00	250.00	80.000	20.000	BOR	56.618	49.28	370.82



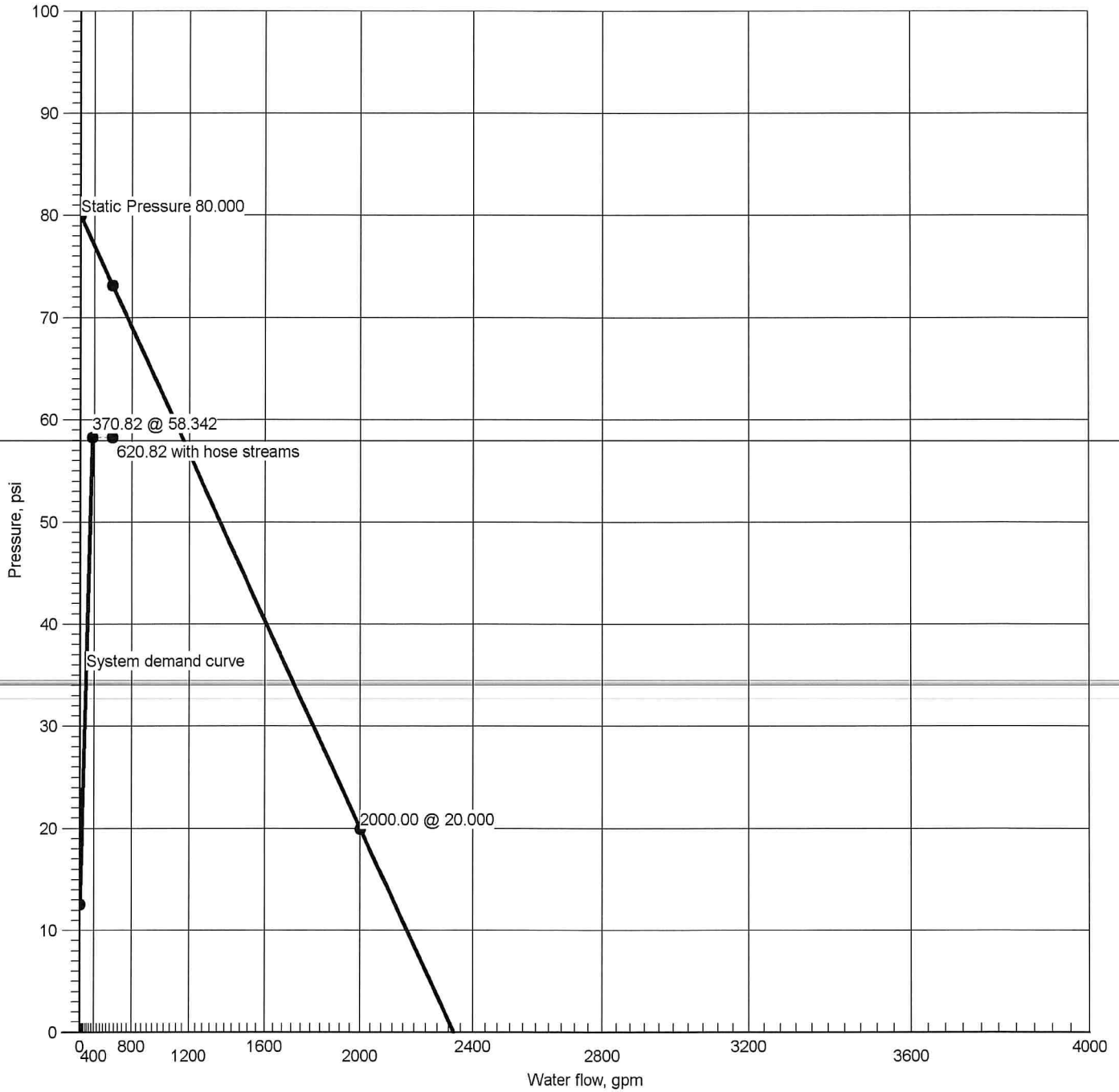
### Gateway Step by Step







# Water Supply at Node 1



Hydraulic Graph

## Water Supply at Node 1

Static Pressure  
80.000

Residual Pressure  
20.000 @ 2000.00

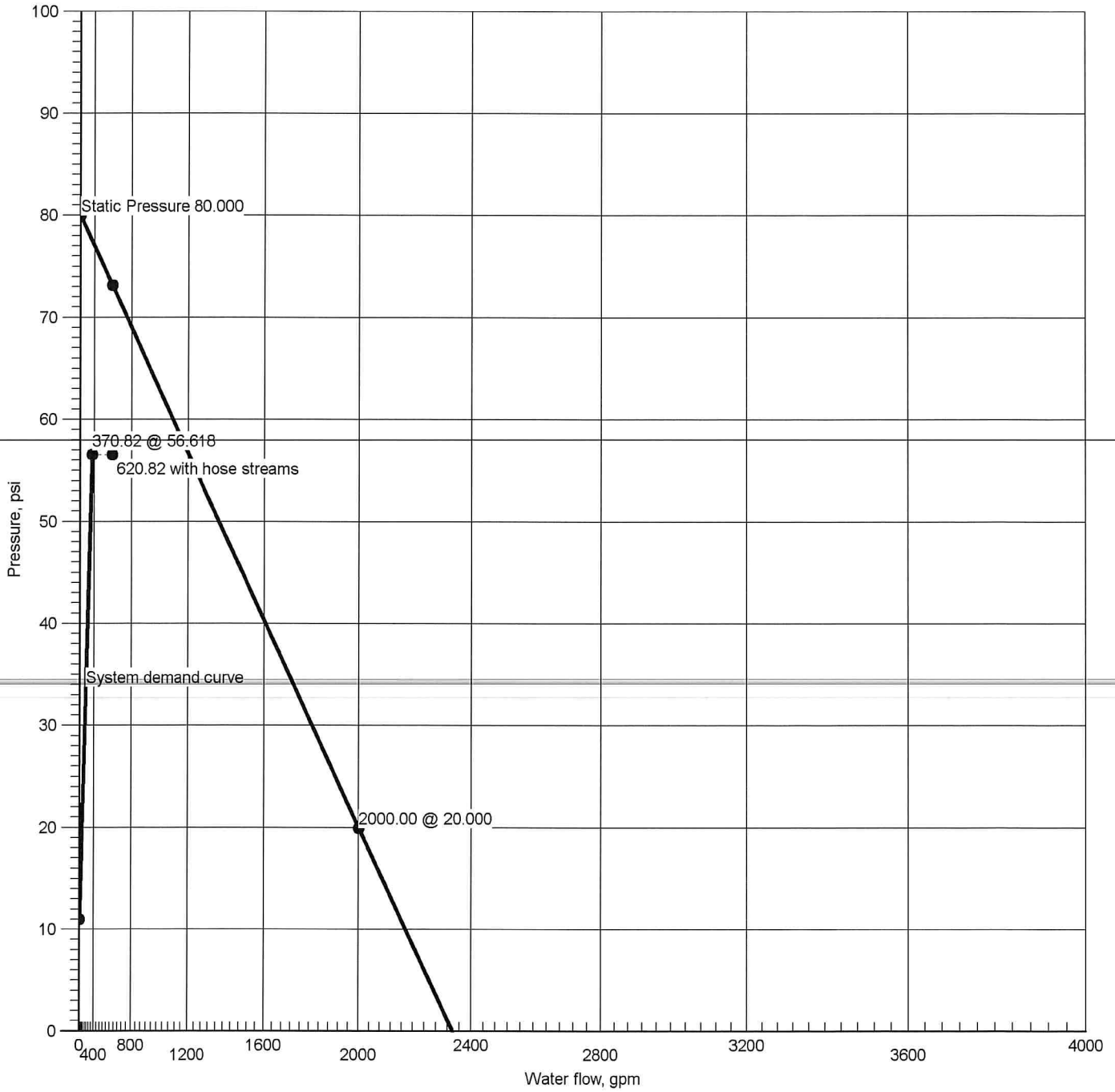
Available Pressure at Time of Test  
73.110 @ 620.82

System Demand  
58.342 @ 370.82

System Demand (Including Hose Allowance at Source)  
58.342 @ 620.82



# BOR



Hydraulic Graph

BOR

Static Pressure

N/A

Residual Pressure

N/A

Available Pressure at Time of Test

N/A

System Demand

56.618 @ 370.82

System Demand (Including Hose Allowance at Source)

56.618 @ N/A



# Node Analysis

Job Number: 2210130 - Market  
Report Description: Ordinary Group II (1 - Market)

Node	Elevation(foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-3'-0	S	58.342	370.82
287	15'-0½	Spr(-21.643)	21.643	26.05
288	18'-1	Spr(-19.755)	19.755	24.89
475	15'-1	Spr(-23.642)	23.642	27.23
479	15'-1	Spr(-21.784)	21.784	26.14
492	15'-1	Spr(-21.467)	21.467	25.95
493	18'-1	Spr(-19.582)	19.582	24.78
494	18'-1	Spr(-19.744)	19.744	24.88
496	20'-5	Spr(-18.367)	18.367	24.00
497	20'-5	Spr(-18.377)	18.377	24.01
502	15'-6	Spr(-21.391)	21.391	25.90
503	15'-6	Spr(-20.707)	20.707	25.48
504	19'-5	Spr(-18.414)	18.414	24.03
505	19'-5	Spr(-19.078)	19.078	24.46
590	26'-1	Spr(-13.738)	13.738	20.76
591	26'-1	Spr(-15.815)	15.815	22.27
2	0'-8	BOR	56.618	
3	2'-10	BFP(-11.000)	55.344	
4	4'-11½	DPV(9'-4½)	43.398	
5	2'-10	PO(20'-2)	44.212	
230	10'-9	fT(17'-5½)	29.314	
248	12'-0	PO(9'-11)	25.886	
257	12'-0	PO(9'-11)	26.620	
286	12'-0	PO(9'-11)	25.473	
295	12'-0	PO(9'-11)	26.263	
303	26'-1	PO(5'-0)	15.857	
306	12'-0	PO(9'-11)	25.299	
307	26'-1	PO(5'-0)	18.229	
313	12'-0	PO(9'-11)	26.067	
325	12'-0	PO(6'-0)	26.033	
328	12'-0	PO(6'-0)	25.266	



# Hydraulic Analysis

Job Number: 2210130 - Market  
Report Description: Ordinary Group II (1 - Market)

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	
<b>Route 1</b>								
BL	1.6820	20.72	2.99	120		0.013939	10'-2½"	Pf 0.211
496	20'-5"	24.00	5.6	18.367		Sprinkler,	4'-11½"	Pe 1.004
493	18'-1"			19.582		2LtE(2'-5½")	15'-2"	Pv
BL	1.6820	45.50	6.57	120		0.059737	9'-7"	Pf 0.572
493	18'-1"	24.78	5.6	19.582		Sprinkler		Pe 1.313
492	15'-1"			21.467			9'-7"	Pv
BL	1.6820	71.45	10.32	120		0.137648	5'-9½"	Pf 2.499
492	15'-1"	25.95	5.6	21.467		Sprinkler,	12'-4½"	Pe 1.333
306	12'-0"			25.299		LtE(2'-5½"), PO(9'-11")	18'-2"	Pv
CM	3.2600	120.96	4.65	120		0.014527	12'-0"	Pf 0.174
306	12'-0"	49.51		25.299		Flow (q) from Route 3		Pe
286	12'-0"			25.473			12'-0"	Pv
CM	3.2600	192.66	7.41	120		0.034368	12'-0"	Pf 0.412
286	12'-0"	71.70		25.473		Flow (q) from Route 5		Pe
248	12'-0"			25.886			12'-0"	Pv
CM	3.2600	178.25	6.85	120		0.029765	76'-11½"	Pf 2.891
248	12'-0"			25.886			20'-2"	Pe 0.538
230	10'-9"			29.314		3fE(6'-8½")	97'-1½"	Pv
CM	3.2600	370.82	14.25	120		0.115410	41'-7"	Pf 11.471
230	10'-9"	192.57		29.314		Flow (q) from Route 2	57'-9½"	Pe 3.427
5	2'-10"			44.212		fE(6'-8½"), fT(17'-5½"), 2f(-0.000) , BV(13'-5½"), PO(20'-2")	99'-4½"	Pv
CM	4.2600	370.82	8.35	120		0.031361	4'-2½"	Pf 11.132
5	2'-10"			44.212				Pe 0.000
3	2'-10"			55.344		BFP(-11.000)	4'-2½"	Pv
CM	4.2600	370.82	8.35	150		0.020754	2'-2"	Pf 0.326
3	2'-10"			55.344			13'-6"	Pe 0.948
2	0'-8"			56.618		fE(13'-6"), BOR	15'-8½"	Pv
UG	6.2800	370.82	3.84	140		0.003562	37'-9"	Pf 0.135
2	0'-8"			56.618				Pe 1.590
1	-3'-0"			58.342		S	37'-9"	Pv
		250.00				Hose Allowance At Source		
1		620.82						
<b>Route 2</b>								
BL	1.6820	3.28	0.47	120		0.000460	7'-1"	Pf 0.008
496	20'-5"	24.00	5.6	18.367		Sprinkler,	9'-11"	Pe 0.002
497	20'-5"			18.377		4LtE(2'-5½")	16'-11½"	Pv
BL	1.6820	27.29	3.94	120		0.023192	10'-2½"	Pf 0.351
497	20'-5"	24.01	5.6	18.377		Sprinkler,	4'-11½"	Pe 1.016
494	18'-1"			19.744		2LtE(2'-5½")	15'-1½"	Pv
BL	1.6820	52.17	7.53	120		0.076928	9'-7"	Pf 0.736
494	18'-1"	24.88	5.6	19.744		Sprinkler		Pe 1.304
479	15'-1"			21.784			9'-7"	Pv
BL	1.6820	78.31	11.31	120		0.163078	5'-9"	Pf 2.955
479	15'-1"	26.14	5.6	21.784		Sprinkler,	12'-4½"	Pe 1.328
313	12'-0"			26.067		LtE(2'-5½"), PO(9'-11")	18'-1½"	Pv
CM	3.2600	128.67	4.95	120		0.016285	12'-0"	Pf 0.195
313	12'-0"	50.36		26.067		Flow (q) from Route 4		Pe 0.000
295	12'-0"			26.263			12'-0"	Pv
CM	3.2600	178.16	6.85	120		0.029737	12'-0"	Pf 0.357
295	12'-0"	49.50		26.263		Flow (q) from Route 6		Pe
257	12'-0"			26.620			12'-0"	Pv
CM	3.2600	192.57	7.40	120		0.034338	31'-11"	Pf 2.157
257	12'-0"	14.41		26.620		Flow (q) from Route 9	30'-11"	Pe 0.538
230	10'-9"			29.314		2fE(6'-8½"), fT(17'-5½")	62'-10"	Pv
<b>Route 3</b>								
BL	1.3800	24.03	5.15	120		0.048067	12'-4½"	Pf 0.595
504	19'-5"	24.03	5.6	18.414		Sprinkler		Pe 1.698
503	15'-6"			20.707			12'-4½"	Pv
BL	1.3800	49.51	10.62	120		0.183093	7'-7"	Pf 3.034
503	15'-6"	25.48	5.6	20.707		Sprinkler,	9'-0"	Pe 1.525
328	12'-0"			25.266		E(3'-0"), PO(6'-0")	16'-7"	Pv
CM	3.2600	49.51	1.90	120		0.002783	12'-0"	Pf 0.033
328	12'-0"			25.266				Pe
306	12'-0"			25.299			12'-0"	Pv
<b>Route 4</b>								



# Hydraulic Analysis

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Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream						Total Length	
BL	1.3800	24.46	5.25	120	0.049668	12'-4½"	Pf 0.615
505	19'-5"	24.46	5.6	19.078	Sprinkler		Pe 1.698
502	15'-6"			21.391			Pv
BL	1.3800	50.36	10.80	120	0.188927	7'-6" 9'-0" 16'-6"	Pf 3.121
502	15'-6"	25.90	5.6	21.391	Sprinkler,		Pe 1.521
325	12'-0"			26.033	E(3'-0), PO(6'-0)		Pv
CM	3.2600	50.36	1.94	120	0.002872	12'-0" 12'-0"	Pf 0.034
325	12'-0"			26.033			Pe -0.000
313	12'-0"			26.067			Pv
<b>Route 5</b>							
BL	1.6820	45.65	6.59	120	0.060087	9'-7" 9'-7"	Pf 0.575
288	18'-1"	24.89	5.6	19.755	Sprinkler		Pe 1.313
287	15'-0½"			21.643			Pv
BL	1.6820	71.70	10.35	120	0.138541	5'-9" 12'-4½" 18'-1½"	Pf 2.511
287	15'-0½"	26.05	5.6	21.643	Sprinkler,		Pe 1.319
286	12'-0"			25.473	LtE(2'-5½), PO(9'-11)		Pv
<b>Route 6</b>							
BL	1.6820	49.50	7.15	120	0.069804	6'-1½" 12'-4½" 18'-6"	Pf 1.292
475	18'-1"	22.27	5.6	23.642	Sprinkler,, Flow (q) from Route 8		Pe 1.328
295	12'-0"			26.263	LtE(2'-5½), PO(9'-11)		Pv
<b>Route 7</b>							
BL	1.0490	20.76	7.71	120	0.139377	10'-2½" 5'-0" 15'-2½"	Pf 2.120
590	26'-1"	20.76	5.6	13.738	Sprinkler,		Pe
303	26'-1"			15.857	PO(5'-0)		Pv
BL	1.6820	20.76	3.00	120	0.013983	17'-8½" 12'-4½" 30'-1"	Pf 0.421
303	26'-1"			15.857			Pe 3.478
288	18'-1"			19.755	5LtE(2'-5½)		Pv
<b>Route 8</b>							
BL	1.0490	22.27	8.27	120	0.158765	10'-2½" 5'-0" 15'-2½"	Pf 2.415
591	26'-1"	22.27	5.6	15.815	Sprinkler,		Pe
307	26'-1"			18.229	PO(5'-0)		Pv
BL	1.6820	22.27	3.22	120	0.015928	27'-3½" 12'-4½" 39'-8"	Pf 0.632
307	26'-1"			18.229			Pe 4.781
475	15'-1"			23.642	5LtE(2'-5½)		Pv
<b>Route 9</b>							
BL	1.6820	14.41	2.08	120	0.007115	58'-6½" 44'-6½" 103'-1½"	Pf 0.734
248	12'-0"			25.886	PO(9'-11)		Pe 0.000
257	12'-0"			26.620	10LtE(2'-5½), PO(9'-11)		Pv

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

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

### C Value Multiplier

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





# Hydraulic Analysis

Job Number: 2210130 - Market  
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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
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
BaV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	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 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



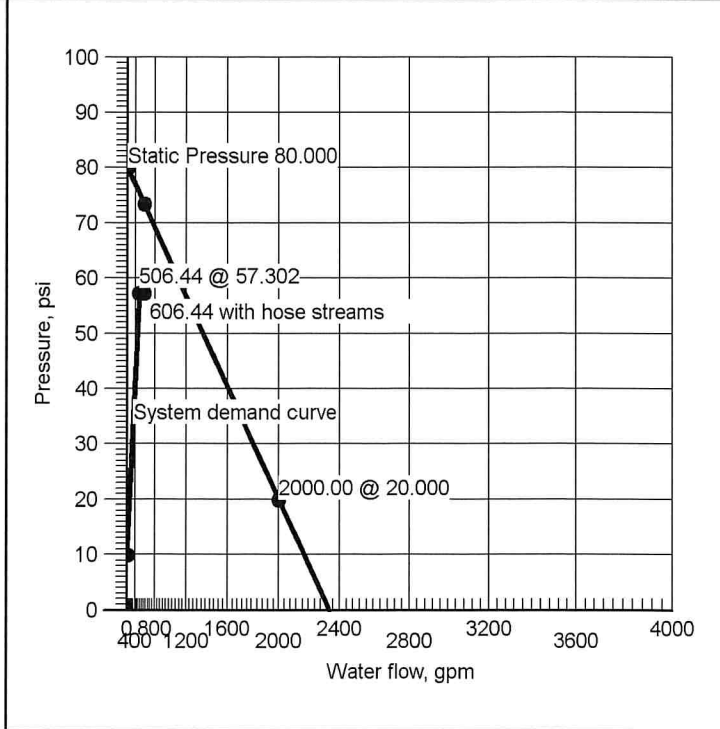
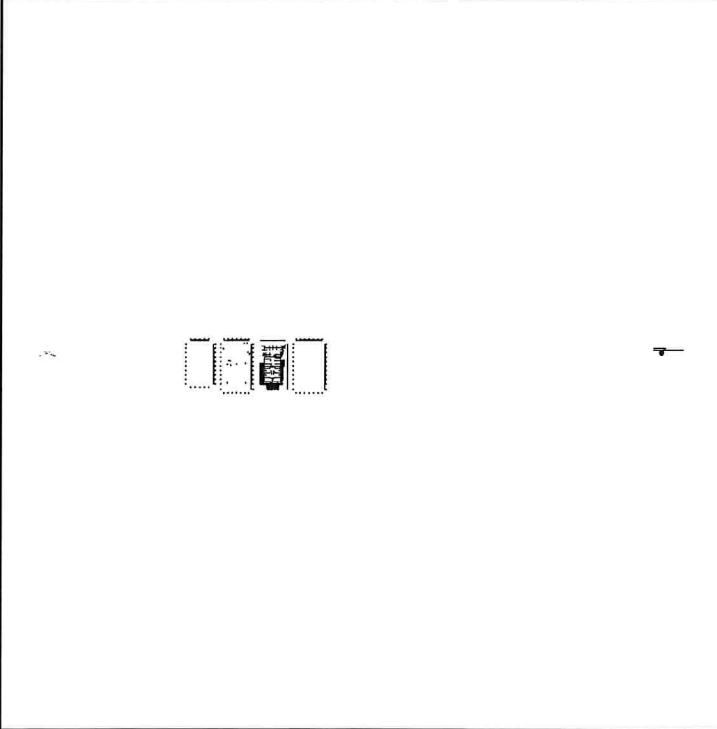


Job	
Job Number 2210130	Design Engineer Michael Hallengren
Job Name Gateway Step By Step	Phone 253-377-6988
Address 1 3303 8th Ave SE	State Certification/License Number EMERAF1980MR
Address 2 Puyallup, Wa 98372	AHJ City of Puyallup
Address 3	Job Site/Building

System	
Density 0.10gpm/ft <sup>2</sup>	Area of Application 1500ft <sup>2</sup> (Actual 1464ft <sup>2</sup> )
Most Demanding Sprinkler Data 5.6 K-Factor 14.82 at 7.000	Hose Streams 100.00
Coverage Per Sprinkler 120ft <sup>2</sup>	Number Of Sprinklers Calculated 27
System Pressure Demand 57.302	System Flow Demand 506.44
Total Demand 606.44 @ 57.302	Pressure Result +16.100 (21.9%)

Supplies				Check Point Gauges					
Node	Name	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)	Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)
1	Water Supply	2000.00	100.00	80.000	20.000	BOR	55.473	68	506.44

Gateway Step by Step Water Supply at Node 1 (2000.00, 0.00, 80.000, 20.000)





# Hydraulic Summary

Job Number: 2210130 - Dry Canopy  
Report Description: Light Hazard (2 - Overhang)

<b>Job</b>	
Job Number 2210130	Design Engineer Michael Hallengren
Job Name Gateway Step By Step	State Certification/License Number EMERAFL980MR
Address 1 3303 8th Ave SE	AHU City of Puyallup
Address 2 Puyallup, Wa 98372	Job Site/Building
Address 3	Drawing Name Gateway Step by Step

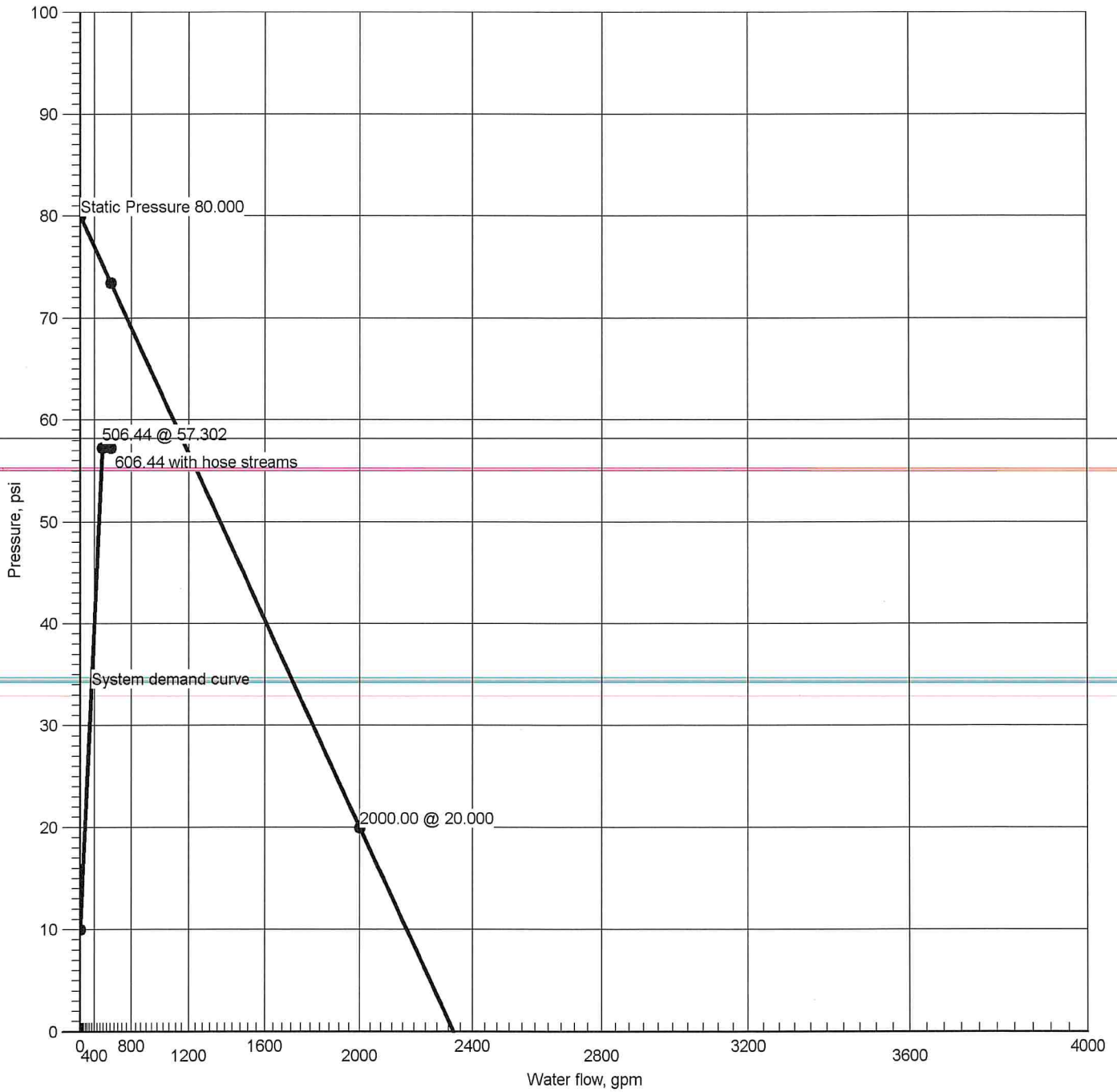
<b>System</b>		<b>Remote Area(s)</b>	
Most Demanding Sprinkler Data 5.6 K-Factor 14.82 at 7.000		Occupancy Light Hazard	Job Suffix Dry Canopy
Hose Allowance At Source 100.00		Density 0.10gpm/ft <sup>2</sup>	Area of Application 1500ft <sup>2</sup> (Actual 1464ft <sup>2</sup> )
Additional Hose Supplies <u>Node</u> <u>Flow(gpm)</u>		Number Of Sprinklers Calculated 27	Number Of Nozzles Calculated 0
		Coverage Per Sprinkler 120ft <sup>2</sup>	
AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area			
Total Hose Streams 100.00			
System Flow Demand 506.44	Total Water Required (Including Hose Allowance) 606.44		
Maximum Pressure Unbalance In Loops 0.000			
Maximum Velocity Above Ground 19.47 between nodes 176 and 316			
Maximum Velocity Under Ground 5.25 between nodes 1 and 2			
Volume capacity of Wet Pipes 395.54gal	Volume capacity of Dry Pipes 132.71gal		

<b>Supplies</b>											
Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply	100.00	80.000	20.000	@	2000.00	73.402	@	606.44	57.302	16.100

<b>Contractor</b>			
Contractor Number		Contact Name	
Name of Contractor: EMERALD FIRE		Contact Title	
Address 1 11021 Cramer Rd NW		Phone	
Address 2 Gig Harbor, WA 98329		Extension	
Address 3		FAX	
		E-mail	
		Web-Site	



### Water Supply at Node 1



Hydraulic Graph

Water Supply at Node 1

Static Pressure  
80.000

Residual Pressure  
20.000 @ 2000.00

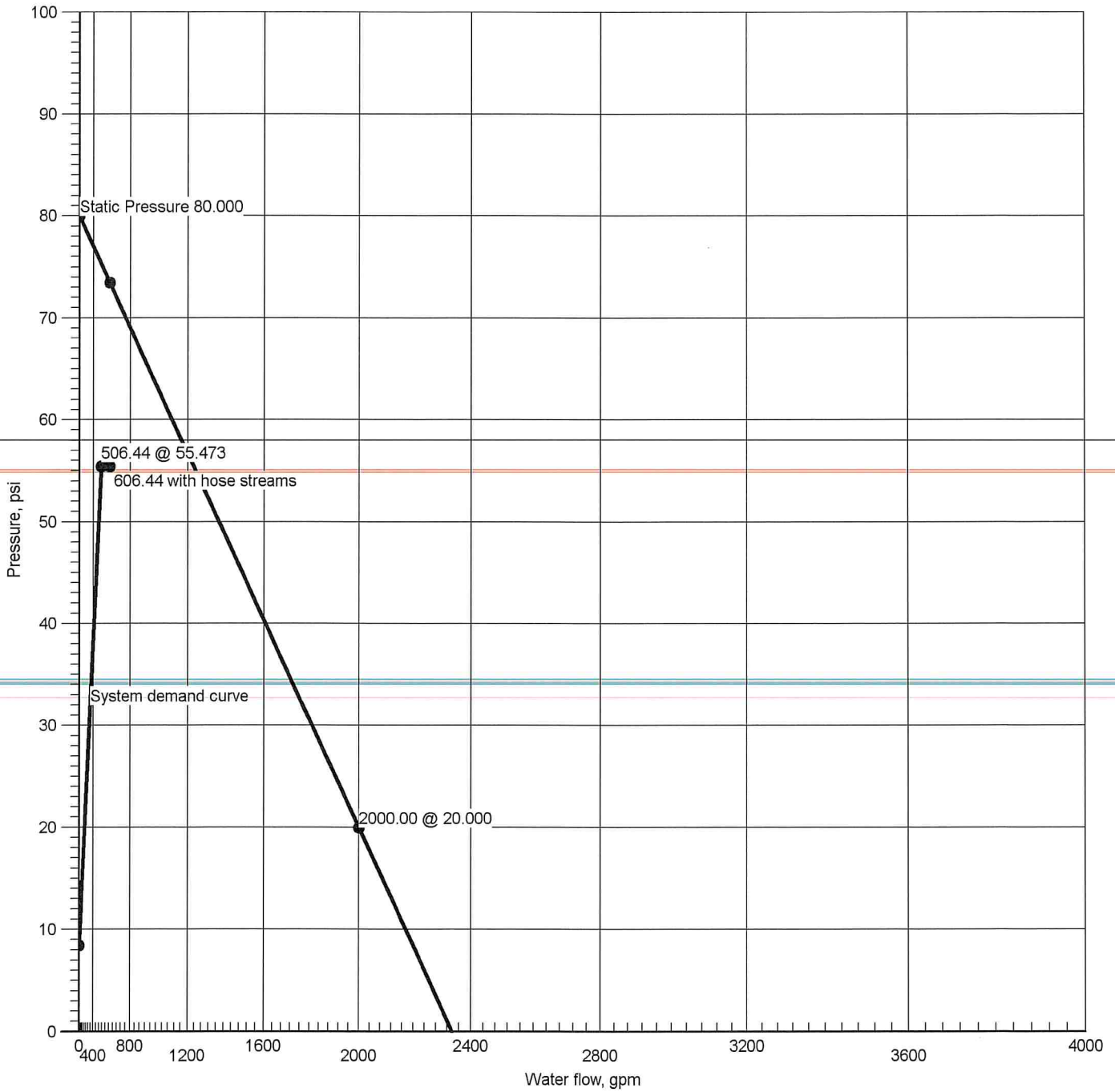
Available Pressure at Time of Test  
73.402 @ 606.44

System Demand  
57.302 @ 506.44

System Demand (Including Hose Allowance at Source)  
57.302 @ 606.44



# BOR



Hydraulic Graph

BOR

Static: Pressure

N/A

Residual: Pressure

N/A

Available Pressure at Time of Test

N/A

System Demand

55.473 @ 506.44

System Demand (Including Hose Allowance at Source)

55.473 @ N/A



# Summary Of Outflowing Devices

Job Number: 2210130 - Dry Canopy  
Report Description: Light Hazard (2 - Overhang)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	393	19.08	12.00	5.6	11.603		
Sprinkler	562	21.46	12.00	5.6	14.683		
Sprinkler	570	19.59	12.00	5.6	12.231		
Sprinkler	572	21.71	12.00	5.6	15.036		
Sprinkler	573	20.37	12.00	5.6	13.227		
Sprinkler	580	22.24	12.00	5.6	15.769		
Sprinkler	582	20.00	12.00	5.6	12.755		
Sprinkler	585	21.80	12.00	5.6	15.159		
Sprinkler	586	21.45	12.00	5.6	14.675		
Sprinkler	587	19.69	12.00	5.6	12.364		
Sprinkler	588	19.44	12.00	5.6	12.047		
Sprinkler	589	19.23	12.00	5.6	11.796		
Sprinkler	592	21.21	12.00	5.6	14.346		
Sprinkler	594	17.04	12.00	5.6	9.254		
Sprinkler	595	16.05	12.00	5.6	8.215		
⇒ Sprinkler	<b>596</b>	<b>14.82</b>	<b>12.00</b>	<b>5.6</b>	<b>7.000</b>		
Sprinkler	598	19.04	12.00	5.6	11.565		
Sprinkler	599	19.91	12.00	5.6	12.644		
Sprinkler	600	16.68	12.00	5.6	8.872		
Sprinkler	601	15.07	12.00	5.6	7.245		
Sprinkler	602	17.81	12.00	5.6	10.114		
Sprinkler	603	19.49	12.00	5.6	12.116		
Sprinkler	604	16.44	12.00	5.6	8.617		
Sprinkler	605	14.85	12.00	5.6	7.031		
Sprinkler	606	17.56	12.00	5.6	9.828		
Sprinkler	607	19.29	12.00	5.6	11.871		

⇒ Most Demanding Sprinkler Data



# Node Analysis

Job Number: 2210130 - Dry Canopy  
Report Description: Light Hazard (2 - Overhang)

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
1	-3'-0	S	57.302	506.44
393	11'-10½	Spr(-11.603)	11.603	19.08
562	13'-9½	Spr(-14.683)	14.683	21.46
570	12'-0	Spr(-12.231)	12.231	19.59
572	13'-9½	Spr(-15.036)	15.036	21.71
573	12'-0	Spr(-13.227)	13.227	20.37
580	13'-9	Spr(-15.769)	15.769	22.24
582	11'-11½	Spr(-12.755)	12.755	20.00
585	13'-8½	Spr(-15.159)	15.159	21.80
586	13'-7½	Spr(-14.675)	14.675	21.45
587	11'-11½	Spr(-12.364)	12.364	19.69
588	11'-11	Spr(-12.047)	12.047	19.44
589	11'-11	Spr(-11.796)	11.796	19.23
592	13'-7	Spr(-14.346)	14.346	21.21
594	15'-0	Spr(-9.254)	9.254	17.04
595	17'-2½	Spr(-8.215)	8.215	16.05
596	19'-11	Spr(-7.000)	7.000	14.82
598	17'-3	Spr(-11.565)	11.565	19.04
599	15'-0	Spr(-12.644)	12.644	19.91
600	10'-3½	Spr(-8.872)	8.872	16.68
601	13'-3	Spr(-7.245)	7.245	15.07
602	13'-2½	Spr(-10.114)	10.114	17.81
603	10'-3½	Spr(-12.116)	12.116	19.49
604	10'-4	Spr(-8.617)	8.617	16.44
605	13'-3½	Spr(-7.031)	7.031	14.85
606	13'-3	Spr(-9.828)	9.828	17.56
607	10'-4	Spr(-11.871)	11.871	19.29
613	20'-2	Spr(-7.293)	7.293	15.12
2	0'-8	BOR	55.473	
3	2'-10	BFP(-11.000)	53.945	
4	4'-11½	DPV(9'-4½)	39.539	
5	2'-10	PO(20'-2)	42.874	
176	10'-2½	fE(6'-6)	32.259	
311	12'-0	fE(4'-9½), T(14'-4½)	14.629	
316	10'-3	fT(12'-5½)	20.746	
318	13'-9½	fE(4'-9½), T(14'-4½)	17.262	
391	13'-7	fT(16'-0), C(12'-3½)	14.318	
397	11'-10½	fT(11'-5), C(8'-9½)	11.595	
400	10'-3	PO(5'-3½)	10.016	
402	10'-3½	PO(4'-3½)	9.900	
403	13'-2½	LtE(1'-9)	7.908	
410	10'-3½	PO(4'-3½)	13.267	
412	13'-2½	LtE(1'-9)	11.012	
413	10'-3	PO(7'-5)	13.411	
610	20'-0½	PO(3'-0)	10.320	





# Hydraulic Analysis

Job Number: 2210130 - Dry Canopy  
Report Description: Light Hazard (2 - Overhang)

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	
<b>Route 1</b>								
BL	2.1570	14.82	1.30	100		0.003127	9'-2"	Pf 0.029
596	19'-11"	14.82	5.6	7.000		Sprinkler		Pe 1.187
595	17'-2½"			8.215			9'-2"	Pv
BL	2.1570	30.87	2.71	100		0.012158	7'-4"	Pf 0.089
595	17'-2½"	16.05	5.6	8.215		Sprinkler		Pe 0.949
594	15'-0"			9.254			7'-4"	Pv
BL	2.1570	47.90	4.21	100		0.027413	13'-0½"	Pf 0.995
594	15'-0"	17.04	5.6	9.254		Sprinkler,	23'-3"	Pe 1.346
397	11'-10½"			11.595		fE(3'-1), fT(11'-5), C(8'-9½)	36'-3½"	Pv
CM	3.2600	110.94	4.26	100		0.017346	0'-6"	Pf 0.009
397	11'-10½"	63.04		11.595		Flow (q) from Route 2		Pe -0.000
393	11'-10½"			11.603			0'-6"	Pv
CM	3.2600	130.02	5.00	100		0.023264	8'-7½"	Pf 0.201
393	11'-10½"	19.08	5.6	11.603		Sprinkler		Pe -0.008
589	11'-11"			11.796			8'-7½"	Pv
CM	3.2600	149.25	5.74	100		0.030028	8'-7½"	Pf 0.259
589	11'-11"	19.23	5.6	11.796		Sprinkler		Pe -0.008
588	11'-11"			12.047			8'-7½"	Pv
CM	3.2600	168.69	6.48	100		0.037660	8'-7½"	Pf 0.325
588	11'-11"	19.44	5.6	12.047		Sprinkler		Pe -0.008
587	11'-11½"			12.364			8'-7½"	Pv
CM	3.2600	188.38	7.24	100		0.046194	8'-7½"	Pf 0.398
587	11'-11½"	19.69	5.6	12.364		Sprinkler		Pe -0.008
582	11'-11½"			12.755			8'-7½"	Pv
CM	3.2600	208.38	8.01	100		0.055675	8'-7½"	Pf 0.480
582	11'-11½"	20.00	5.6	12.755		Sprinkler		Pe -0.008
573	12'-0"			13.227			8'-7½"	Pv
CM	3.2600	228.75	8.79	100		0.066158	2'-1"	Pf 1.406
573	12'-0"	20.37	5.6	13.227		Sprinkler,	19'-2"	Pe -0.005
311	12'-0"			14.629		fE(4'-9½), T(14'-4½)	21'-3"	Pv
BL	3.2600	248.33	9.55	100		0.077017	52'-5½"	Pf 5.368
311	12'-0"	19.59		14.629		Flow (q) from Route 7	17'-3"	Pe 0.750
316	10'-3"			20.746		fE(4'-9½), fT(12'-5½)	69'-8½"	Pv
CM	3.2600	506.44	19.47	100		0.287838	33'-4½"	Pf 11.485
316	10'-3"	258.11		20.746		Flow (q) from Route 3	6'-6"	Pe 0.027
176	10'-2½"			32.259		fE(6'-6)	39'-11"	Pv
CM	4.2600	506.44	11.40	100		0.078216	35'-5"	Pf 5.001
176	10'-2½"			32.259			28'-6"	Pe 2.280
4	4'-11½"			39.539		3fE(6'-4½), DPV(9'-4½)	63'-11"	Pv
FR	4.2600	506.44	11.40	120		0.055822	2'-8"	Pf 13.500
4	4'-11½"			39.539			42'-1½"	Pe 0.905
3	2'-10"			53.945		BV(15'-9½), PO(26'-4), BFP(-11.000)	44'-9½"	Pv
CM	4.2600	506.44	11.40	150		0.036942	2'-2"	Pf 0.580
3	2'-10"			53.945			13'-6"	Pe 0.948
2	0'-8"			55.473		fE(13'-6), BOR	15'-8½"	Pv
UG	6.2800	506.44	5.25	140		0.006340	37'-9"	Pf 0.239
2	0'-8"			55.473				Pe 1.590
1	-3'-0"			57.302		S	37'-9"	Pv
		100.00						Hose Allowance At Source
1		606.44						
<b>Route 2</b>								
BL	1.4420	14.85	2.92	100		0.022316	8'-10½"	Pf 0.198
605	13'-3½"	14.85	5.6	7.031		Sprinkler		Pe 0.016
601	13'-3"			7.245			8'-10½"	Pv
BL	1.4420	29.92	5.88	100		0.081579	6'-2½"	Pf 0.651
601	13'-3"	15.07	5.6	7.245		Sprinkler,	1'-9"	Pe 0.011
403	13'-2½"			7.908		LtE(1'-9)	8'-0"	Pv
RN	1.3800	29.92	6.42	100		0.101048	2'-11"	Pf 0.727
403	13'-2½"			7.908			4'-3½"	Pe 1.265
402	10'-3½"			9.900		PO(4'-3½)	7'-2½"	Pv
CM	2.1570	29.92	2.63	100		0.011479	8'-9"	Pf 0.100
402	10'-3½"			9.900				Pe 0.016
400	10'-3"			10.016			8'-9"	Pv





Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	
CM	2.1570	63.04	5.53	100		0.045561		
400	10'-3	33.12		10.016		Flow (q) from Route 4	18'-2½	Pf 2.289
397	11'-10½			11.595		fE(4'-3½), T(8'-9½), fT(11'-5), C(8'-9½)	32'-0½	Pe -0.710
							50'-3	Pv
<b>Route 3</b>								
DY	0.6220	15.12	15.97	120		0.989081		
613	20'-2	15.12	5.6	7.293		Sprinkler,	0'-0	Pf 2.967
610	20'-0½			10.320		PO(3'-0)	3'-0	Pe 0.060
							3'-0	Pv
BL	2.1570	15.12	1.33	100		0.003248		
610	20'-0½			10.320			9'-2½	Pf 0.030
598	17'-3			11.565			9'-2½	Pe 1.215
								Pv
BL	2.1570	34.17	3.00	100		0.014671		
598	17'-3	19.04	5.6	11.565		Sprinkler	7'-4	Pf 0.108
599	15'-0			12.644			7'-4	Pe 0.972
								Pv
BL	2.1570	54.08	4.75	100		0.034309		
599	15'-0	19.91	5.6	12.644		Sprinkler,	7'-9	Pf 1.063
391	13'-7			14.318		fE(3'-1), fT(16'-0), C(8'-9½)	23'-3	Pe 0.611
							31'-0	Pv
CM	3.2600	128.23	4.93	100		0.022676		
391	13'-7	74.15		14.318		Flow (q) from Route 5	1'-4	Pf 0.030
592	13'-7			14.346			1'-4	Pe -0.002
								Pv
CM	3.2600	149.44	5.74	100		0.030099		
592	13'-7	21.21	5.6	14.346		Sprinkler	11'-7½	Pf 0.350
586	13'-7½			14.675			11'-7½	Pe -0.021
								Pv
CM	3.2600	170.89	6.57	100		0.038576		
586	13'-7½	21.45	5.6	14.675		Sprinkler	13'-2	Pf 0.508
585	13'-8½			15.159			13'-2	Pe -0.024
								Pv
CM	3.2600	192.70	7.41	100		0.048172		
585	13'-8½	21.80	5.6	15.159		Sprinkler	13'-2	Pf 0.634
580	13'-9			15.769			13'-2	Pe -0.024
								Pv
CM	3.2600	214.94	8.26	100		0.058957		
580	13'-9	22.24	5.6	15.769		Sprinkler,	6'-5½	Pf 1.509
318	13'-9½			17.262		fE(4'-9½), T(14'-4½)	19'-2	Pe -0.017
							25'-7	Pv
BL	3.2600	258.11	9.92	100		0.082718		
318	13'-9½	43.17		17.262		Flow (q) from Route 8	6'-5	Pf 1.958
316	10'-3			20.746		fE(4'-9½), fT(12'-5½)	17'-3	Pe 1.526
							23'-8	Pv
<b>Route 4</b>								
BL	1.4420	16.44	3.23	100		0.026935		
604	10'-4	16.44	5.6	8.617		Sprinkler	8'-10½	Pf 0.239
600	10'-3½			8.872			8'-10½	Pe 0.016
								Pv
BL	1.4420	33.12	6.51	100		0.098426		
600	10'-3½	16.68	5.6	8.872		Sprinkler,	6'-2½	Pf 1.133
400	10'-3			10.016		PO(5'-3½)	5'-3½	Pe 0.011
							11'-6	Pv
<b>Route 5</b>								
BL	1.4420	17.56	3.45	100		0.030419		
606	13'-3	17.56	5.6	9.828		Sprinkler	8'-10½	Pf 0.270
602	13'-2½			10.114			8'-10½	Pe 0.016
								Pv
BL	1.4420	35.36	6.95	100		0.111132		
602	13'-2½	17.81	5.6	10.114		Sprinkler,	6'-2½	Pf 0.887
412	13'-2½			11.012		LtE(1'-9)	1'-9	Pe 0.011
							8'-0	Pv
RN	1.3800	35.36	7.59	100		0.137653		
412	13'-2½			11.012			2'-11	Pf 0.990
410	10'-3½			13.267		PO(4'-3½)	4'-3½	Pe 1.264
							7'-2½	Pv
CM	2.1570	35.36	3.11	100		0.015637		
410	10'-3½			13.267			8'-9	Pf 0.137
413	10'-3			13.411			8'-9	Pe 0.008
								Pv
CM	2.1570	74.15	6.51	100		0.061519		
413	10'-3	38.79		13.411		Flow (q) from Route 6	14'-10½	Pf 2.345
391	13'-7			14.318		fE(3'-1), fT(16'-0), C(8'-9½)	23'-3	Pe -1.438
							38'-1½	Pv
<b>Route 6</b>								
BL	1.4420	19.29	3.79	120		0.025854		
607	10'-4	19.29	5.6	11.871		Sprinkler	8'-10½	Pf 0.229
603	10'-3½			12.116			8'-10½	Pe 0.016
								Pv
BL	1.4420	38.79	7.62	120		0.094093		
603	10'-3½	19.49	5.6	12.116		Sprinkler,	6'-2½	Pf 1.284
413	10'-3			13.411		PO(7'-5)	7'-5	Pe 0.011
							13'-8	Pv
<b>Route 7</b>								



# Hydraulic Analysis

Job Number: 2210130 - Dry Canopy  
Report Description: Light Hazard (2 - Overhang)

Pipe Type	Diameter	Flow	Velocity	HWC	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Eq. Length	Summary
Upstream						Total Length	
BL	1.0490	19.59	7.27	100	0.175399	6'-6½"	Pf 2.397
570	12'-0"	19.59	5.6	12.231	Sprinkler,	7'-1½"	Pe
311	12'-0"			14.629	fE(4'-9½"), T(3'-7)	13'-8"	Pv
◆ ◆ ◆ ◆ ◆ Route 8 ◆ ◆ ◆ ◆ ◆							
BL	1.4420	21.46	4.22	100	0.044098	8'-0"	Pf 0.353
562	13'-9½"	21.46	5.6	14.683	Sprinkler		Pe
572	13'-9½"			15.036		8'-0"	Pv
BL	1.4420	43.17	8.48	100	0.160735	4'-1½"	Pf 2.226
572	13'-9½"	21.71	5.6	15.036	Sprinkler,	9'-8½"	Pe
318	13'-9½"			17.262	fE(4'-9½"), T(5'-3½")	13'-10"	Pv

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)	C Value Multiplier										
$\left( \frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$	<table border="1"> <tr> <td>Value Of C</td> <td>100</td> <td>130</td> <td>140</td> <td>150</td> </tr> <tr> <td>Multiplying Factor</td> <td>0.713</td> <td>1.16</td> <td>1.33</td> <td>1.51</td> </tr> </table>	Value Of C	100	130	140	150	Multiplying Factor	0.713	1.16	1.33	1.51
Value Of C	100	130	140	150							
Multiplying Factor	0.713	1.16	1.33	1.51							

Pipe Type Legend	Units Legend	Fittings Legend
AO Arm-Over	Diameter Inch	ALV Alarm Valve
BL Branch Line	Elevation Foot	AngV Angle Valve
CM Cross Main	Flow gpm	b Bushing
DN Drain	Discharge gpm	BaIV Ball Valve
DR Drop	Velocity fps	BFP Backflow Preventer
DY Dynamic	Pressure psi	BV Butterfly Valve
FM Feed Main	Length Foot	C Cross Flow Turn 90°
FR Feed Riser	Friction Loss psi/Foot	cplg Coupling
MS Miscellaneous	HWC Hazen-Williams Constant	Cr Cross Run
OR Outrigger	Pt Total pressure at a point in a pipe	CV Check Valve
RN Riser Nipple	Pn Normal pressure at a point in a pipe	DeIV Deluge Valve
SP Sprig	Pf Pressure loss due to friction between points	DPV Dry Pipe Valve
ST Stand Pipe	Pe Pressure due to elevation difference between indicated points	E 90° Elbow
UG Underground	Pv Velocity pressure at a point in a pipe	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 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