



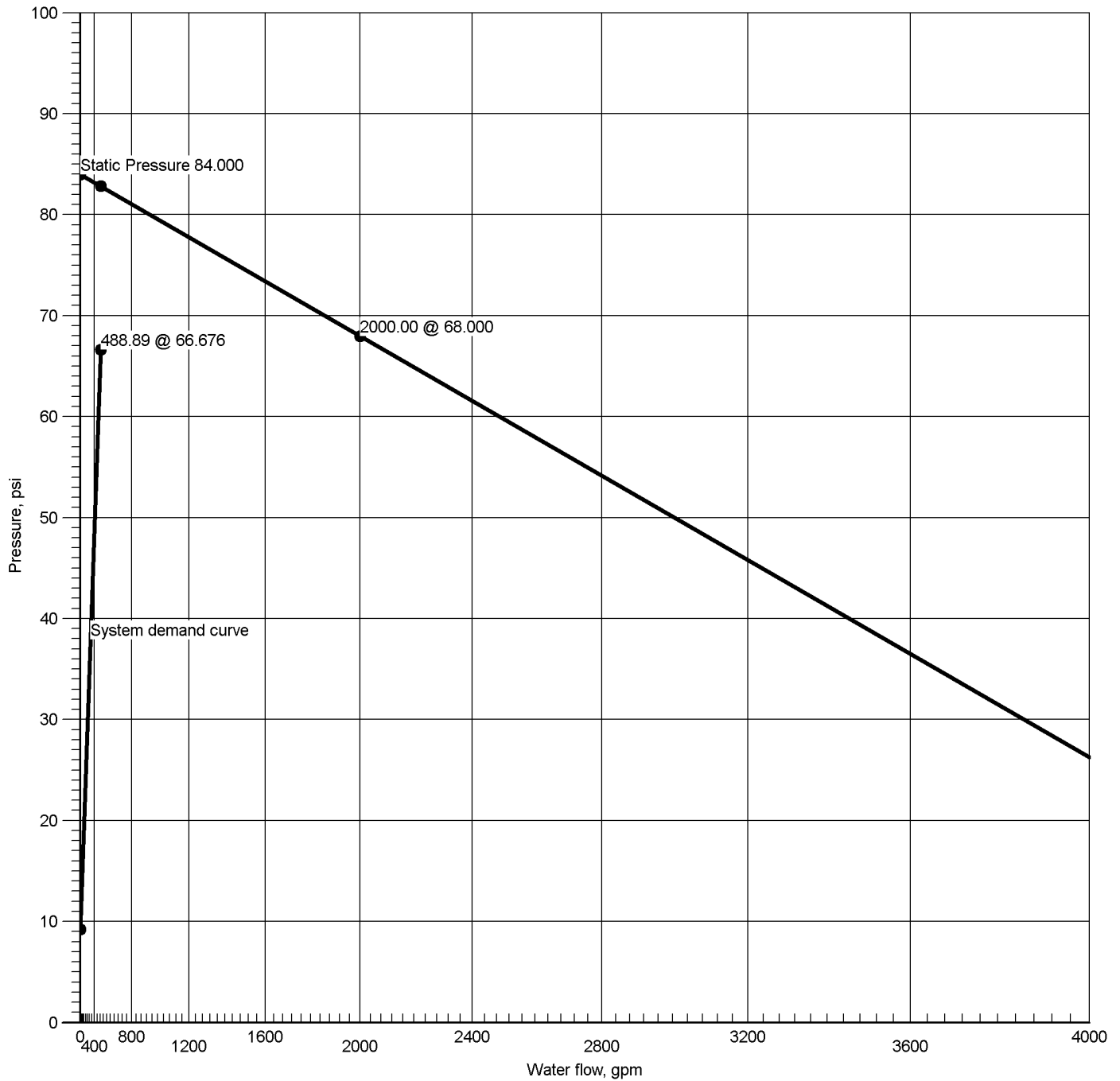
Hydraulic Summary

Job Number: NC-1390
Report Description: Ordinary Group II (Sales Floor)

Job														
Job Number NC-1390					Designer DB									
Job Name: WestLake Lee's Summit					State Certification/License Number									
Address 1 3511 SW Market Street Lee's Summit MO64082					AHJ									
Address 2					Job Site/Building									
Address 3					Drawing Name Westlake Lees summit draw									
System					Remote Area(s)									
Most Demanding Sprinkler Data 5.6 K-Factor 25.86 at 21.322					Occupancy Ordinary Group II			Job Suffix						
Hose Allowance At Source 0.00					Density 0.200 gpm/ft ²			Area of Application 1500.00 ft ² (Actual 1164.36 ft ²)						
Additional Hose Supplies <table><tr><td><u>Node</u></td><td><u>Flow(gpm)</u></td></tr><tr><td>Hydrant At Node 27</td><td>250.00</td></tr></table>					<u>Node</u>	<u>Flow(gpm)</u>	Hydrant At Node 27	250.00	Number Of Sprinklers Calculated 9			Number Of Nozzles Calculated 0		Coverage Per Sprinkler 129.29 ft ²
<u>Node</u>	<u>Flow(gpm)</u>													
Hydrant At Node 27	250.00													
					AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area Left: 66.288 Right: 66.686									
					7-27-23									
Total Hose Streams 250.00														
System Flow Demand 488.89		Total Water Required (Including Hose Allowance) 488.89												
Maximum Pressure Unbalance In Loops 0.000														
Maximum Velocity Above Ground 20.97 between nodes 7 and 6														
Maximum Velocity Under Ground 5.38 between nodes 11 and 10														
Volume capacity of Wet Pipes 754.26 gal		Volume capacity of Dry Pipes												
Supplies														
Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi)	@	Flow (gpm)	Available (psi)	@	Total Demand (gpm)	Required (psi)	Safety Margin (psi)			
11	Water Supply		84.000	68.000		2000.00	82.819		488.89	66.676	16.143			
Contractor														
Contractor Number 1		Contact Name Derek Bisoglio				Contact Title Design								
Name of Contractor: Alliance Fire Protection				Phone				Extension						
Address 1 130 w 9th Ave. Suite 100				FAX										
Address 2 North Kansas City, MO 64116				E-mail dbisoglio@afpsprink.com										
Address 3				Web-Site										



Water Supply at Node 11



Hydraulic Graph

Water Supply at Node 11

Static: Pressure
84.000

Residual: Pressure
68.000 @ 2000.00

Available Pressure at System Demand
82.819 @ 488.89

Required Pressure at System Demand
66.676 @ 488.89

Required Pressure at System Demand (Including Hose Allowance at Source)
66.676 @ 488.89



Summary Of Outflowing Devices

Job Number: NC-1390

Report Description: Ordinary Group II (Sales Floor)

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)			
Hydrant	27	250.00	250.00	0	59.995			
⇒ Sprinkler	101	25.86	25.86	5.6	21.322			
Sprinkler	102	25.88	25.86	5.6	21.365			
Sprinkler	103	25.97	25.86	5.6	21.511			
Sprinkler	104	26.26	25.86	5.6	21.986			
Sprinkler	105	26.57	25.86	5.6	22.510			
Sprinkler	106	26.96	25.86	5.6	23.178			
Sprinkler	107	26.97	25.86	5.6	23.198			
Sprinkler	108	27.12	25.86	5.6	23.449			

⇒ Most Demanding Sprinkler Data



Node Analysis

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Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)
11	-4'-0	S	66.676	488.89
27	1'-6	Hyd	59.995	250.00
101	17'-4	Spr(-21.322)	21.322	25.86
102	17'-4	Spr(-21.365)	21.365	25.88
103	17'-4	Spr(-21.511)	21.511	25.97
104	17'-4	Spr(-21.986)	21.986	26.26
105	17'-4	Spr(-22.510)	22.510	26.57
106	17'-1	Spr(-23.178)	23.178	26.96
107	17'-1	Spr(-23.198)	23.198	26.97
108	17'-1	Spr(-23.449)	23.449	27.12
109	17'-1	Spr(-23.765)	23.765	27.30
1	16'-6	PO(5'-0)	22.904	
2	16'-6	PO(5'-0)	23.104	
3	16'-6	PO(5'-0)	24.155	
4	16'-6	PO(7'-5)	40.128	
5	13'-10	PO(6'-0)	44.339	
6	13'-10	T(12'-3½)	44.990	
7	13'-10		47.557	
8	1'-6	BOR	60.030	
9	-4'-0	E(22'-1)	62.458	
10	-4'-0	T(46'-2½)	62.536	
12	16'-6	PO(5'-0)	22.949	
13	16'-6	PO(5'-0)	23.603	
14	16'-6	PO(7'-5)	31.178	
15	16'-3	PO(7'-5)	31.563	
16	15'-11½	PO(7'-5)	32.659	
17	15'-8	PO(7'-5)	33.399	
18	15'-8	PO(7'-5)	37.235	
19	13'-10	PO(6'-0)	38.321	
20	13'-10	PO(6'-0)	39.168	
21	13'-10	PO(6'-0)	40.424	
22	16'-3	PO(5'-0)	24.858	
23	16'-3	PO(5'-0)	24.879	
24	16'-3	PO(5'-0)	25.476	
25	16'-3	PO(7'-5)	37.211	
26	16'-3	PO(5'-0)	25.143	
28	-4'-0	E(22'-1)	62.427	
29	15'-11½	PO(7'-5)	37.933	
30	15'-4½	PO(7'-5)	36.923	
31	13'-10	PO(6'-0)	37.816	
32	15'-1	PO(7'-5)	36.853	
33	13'-10	PO(6'-0)	37.540	
34	14'-9½	PO(7'-5)	36.814	
35	13'-10	PO(6'-0)	37.398	
36	15'-4½	PO(7'-5)	33.852	
37	15'-1	PO(7'-5)	34.127	
38	14'-9½	PO(7'-5)	34.304	
39	14'-6	PO(7'-5)	34.433	
40	13'-10	PO(7'-5)	37.358	



Hydraulic Analysis

Job Number: NC-1390
Report Description: Ordinary Group II (Sales Floor)

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							
SP	1.0490	25.86	9.60	120	0.209309	0'-10	Pf 1.221
101	17'-4	25.86	5.6	21.322	Sprinkler,	5'-0	Pe 0.361
1	16'-6			22.904	PO(5'-0)	5'-10	Pv
BL	1.4420	17.84	3.51	120	0.022373	8'-11	Pf 0.199
1	16'-6			22.904			Pe
2	16'-6			23.104		8'-11	Pv
BL	1.4420	43.82	8.61	120	0.117901	8'-11	Pf 1.051
2	16'-6	25.97		23.104	Flow (q) from Route 3		Pe
3	16'-6			24.155		8'-11	Pv
BL	1.4420	70.39	13.83	120	0.283357	48'-11½	Pf 15.973
3	16'-6	26.57		24.155	Flow (q) from Route 5	7'-5	Pe -0.000
4	16'-6			40.128	PO(7'-5)	56'-4½	Pv
RN	1.3800	70.39	15.10	120	0.350981	2'-8	Pf 3.048
4	16'-6			40.128		6'-0	Pe 1.163
5	13'-10			44.339	PO(6'-0)	8'-8	Pv
CM	2.1570	70.39	6.18	120	0.039870	4'-0½	Pf 0.651
5	13'-10			44.339		12'-3½	Pe
6	13'-10			44.990	T(12'-3½)	16'-4	Pv
CM	2.1570	238.89	20.97	120	0.382363	6'-8½	Pf 2.567
6	13'-10	168.51		44.990	Flow (q) from Route 2		Pe
7	13'-10			47.557		6'-8½	Pv
FR	2.6350	238.89	14.05	120	0.144253	12'-4	Pf 7.126
7	13'-10			47.557		37'-1	Pe 5.347
8	1'-6			60.030	E(8'-3), sCV(19'-2½), BV(9'-7½) , BOR	49'-5	Pv
UG	6.2800	238.89	2.47	140	0.001579	5'-6	Pf 0.044
8	1'-6			60.030		22'-1	Pe 2.384
9	-4'-0			62.458	E(22'-1)	27'-7	Pv
UG	6.0900	238.89	2.63	150	0.001614	26'-8½	Pf 0.078
9	-4'-0			62.458		21'-7	Pe
10	-4'-0			62.536	2EE(10'-9½)	48'-3½	Pv
UG	6.0900	488.89	5.38	150	0.006072	182'-4½	Pf 4.141
10	-4'-0	250.00		62.536	Flow (q) from Route 10	21'-7	Pe
11	-4'-0			66.676	2EE(10'-9½), BFP(-2.902), S	203'-11	Pv
		0.00			Hose Allowance At Source		
11		488.89					
Route 2							
SP	1.0490	25.88	9.61	120	0.209700	0'-10	Pf 1.223
102	17'-4	25.88	5.6	21.365	Sprinkler,	5'-0	Pe 0.361
12	16'-6			22.949	PO(5'-0)	5'-10	Pv
BL	1.4420	33.90	6.66	120	0.073341	8'-11	Pf 0.654
12	16'-6	8.01		22.949	Flow (q) from Route 20		Pe
13	16'-6			23.603		8'-11	Pv
BL	1.4420	60.16	11.82	120	0.211923	28'-3½	Pf 7.575
13	16'-6	26.26		23.603	Flow (q) from Route 4	7'-5	Pe -0.000
14	16'-6			31.178	PO(7'-5)	35'-9	Pv
CM	2.1570	46.15	4.05	120	0.018264	14'-6	Pf 0.265
14	16'-6			31.178			Pe 0.119
15	16'-3			31.563		14'-6	Pv
CM	2.1570	94.92	8.33	120	0.069333	14'-0½	Pf 0.974
15	16'-3	48.77		31.563	Flow (q) from Route 8		Pe 0.123
16	15'-11½			32.659		14'-0½	Pv
CM	2.1570	73.60	6.46	120	0.043300	14'-2	Pf 0.614
16	15'-11½			32.659			Pe 0.126
17	15'-8			33.399		14'-2	Pv
BL	1.4420	20.92	4.11	120	0.030021	112'-11	Pf 3.836
17	15'-8			33.399	PO(7'-5)	14'-10½	Pe
18	15'-8			37.235	PO(7'-5)	127'-9½	Pv
RN	1.3800	20.92	4.49	120	0.037186	1'-10	Pf 0.291
18	15'-8			37.235		6'-0	Pe 0.795
19	13'-10			38.321	PO(6'-0)	7'-10	Pv
CM	2.1570	87.60	7.69	120	0.059764	14'-2	Pf 0.847
19	13'-10	66.68		38.321	Flow (q) from Route 12		Pe
20	13'-10			39.168		14'-2	Pv



Hydraulic Analysis

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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	
CM	2.1570	108.93	9.56	120		0.089433	14'-0½	Pf 1.256
20	13'-10	21.33		39.168		Flow (q) from Route 11		Pe
21	13'-10			40.424			14'-0½	Pv
CM	2.1570	168.51	14.79	120		0.200468	10'-5½	Pf 4.566
21	13'-10	59.58		40.424		Flow (q) from Route 6	12'-3½	Pe
6	13'-10			44.990		T(12'-3½)	22'-9½	Pv
Route 3								
SP	1.0490	25.97	9.64	120		0.211029	0'-10	Pf 1.231
103	17'-4	25.97	5.6	21.511		Sprinkler,	5'-0	Pe 0.361
2	16'-6			23.104		PO(5'-0)	5'-10	Pv
Route 4								
SP	1.0490	26.26	9.75	120		0.215333	0'-10	Pf 1.256
104	17'-4	26.26	5.6	21.986		Sprinkler,	5'-0	Pe 0.361
13	16'-6			23.603		PO(5'-0)	5'-10	Pv
Route 5								
SP	1.0490	26.57	9.86	120		0.220074	0'-10	Pf 1.284
105	17'-4	26.57	5.6	22.510		Sprinkler,	5'-0	Pe 0.361
3	16'-6			24.155		PO(5'-0)	5'-10	Pv
Route 6								
SP	1.0490	26.96	10.01	120		0.226107	0'-10	Pf 1.319
106	17'-1	26.96	5.6	23.178		Sprinkler,	5'-0	Pe 0.361
22	16'-3			24.858		PO(5'-0)	5'-10	Pv
BL	1.4420	5.31	1.04	120		0.002375	8'-11	Pf 0.021
22	16'-3			24.858			8'-11	Pe
23	16'-3			24.879			8'-11	Pv
BL	1.4420	32.28	6.34	120		0.066994	8'-11	Pf 0.597
23	16'-3	26.97		24.879		Flow (q) from Route 7	8'-11	Pe
24	16'-3			25.476			8'-11	Pv
BL	1.4420	59.58	11.70	120		0.208178	48'-11½	Pf 11.735
24	16'-3	27.30		25.476		Flow (q) from Route 9	7'-5	Pe
25	16'-3			37.211		PO(7'-5)	56'-4½	Pv
RN	1.3800	59.58	12.78	120		0.257860	2'-5	Pf 2.168
25	16'-3			37.211			6'-0	Pe 1.044
21	13'-10			40.424		PO(6'-0)	8'-5	Pv
Route 7								
SP	1.0490	26.97	10.01	120		0.226289	0'-10	Pf 1.320
107	17'-1	26.97	5.6	23.198		Sprinkler,	5'-0	Pe 0.361
23	16'-3			24.879		PO(5'-0)	5'-10	Pv
Route 8								
SP	1.0490	27.12	10.07	120		0.228552	0'-10	Pf 1.333
108	17'-1	27.12	5.6	23.449		Sprinkler,	5'-0	Pe 0.361
26	16'-3			25.143		PO(5'-0)	5'-10	Pv
BL	1.4420	48.77	9.58	120		0.143733	37'-2½	Pf 6.419
26	16'-3	21.65		25.143		Flow (q) from Route 21	7'-5	Pe 0.000
15	16'-3			31.563		PO(7'-5)	44'-8	Pv
Route 9								
SP	1.0490	27.30	10.13	120		0.231405	0'-10	Pf 1.350
109	17'-1	27.30	5.6	23.765		Sprinkler,	5'-0	Pe 0.361
24	16'-3			25.476		PO(5'-0)	5'-10	Pv
Route 10								
UG	6.2800	250.00	2.59	140		0.001718	5'-6	Pf 0.047
27	1'-6	250.00		59.995		Hydrant,	22'-1	Pe 2.384
28	-4'-0			62.427		E(22'-1)	27'-7	Pv
UG	6.0900	250.00	2.75	150		0.001756	15'-8	Pf 0.109
28	-4'-0			62.427			46'-2½	Pe
10	-4'-0			62.536		T(46'-2½)	61'-10½	Pv
Route 11								
RN	1.3800	21.33	4.57	120		0.038542	2'-1½	Pf 0.313
29	15'-11½	21.33		37.933		Flow (q) from Route 19	6'-0	Pe 0.922
20	13'-10			39.168		PO(6'-0)	8'-1½	Pv
Route 12								
RN	1.3800	18.55	3.98	120		0.029771	1'-6½	Pf 0.225
30	15'-4½	18.55		36.923		Flow (q) from Route 15	6'-0	Pe 0.669
31	13'-10			37.816		PO(6'-0)	7'-6½	Pv
CM	2.1570	66.68	5.85	120		0.036077	14'-0	Pf 0.505
31	13'-10	48.13		37.816		Flow (q) from Route 13	14'-0	Pe
19	13'-10			38.321			14'-0	Pv
Route 13								



Hydraulic Analysis

Job Number: NC-1390

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Pipe Type	Diameter	Flow	Velocity	HWC	Pn	Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt		Fittings	Eq. Length	Summary
Upstream							Total Length	
RN	1.3800	14.93	3.20	120		0.019938		1'-3" Pf 0.145
32	15'-1	14.93		36.853		Flow (q) from Route 17		6'-0" Pe 0.542
33	13'-10			37.540		PO(6'-0)		7'-3" Pv
CM	2.1570	48.13	4.23	120		0.019740		14'-0" Pf 0.276
33	13'-10	33.20		37.540		Flow (q) from Route 14		Pe
31	13'-10			37.816				14'-0" Pv
Route 14								
RN	1.3800	16.63	3.57	120		0.024329		0'-11½" Pf 0.169
34	14'-9½	16.63		36.814		Flow (q) from Route 22		6'-0" Pe 0.415
35	13'-10			37.398		PO(6'-0)		6'-11½" Pv
CM	2.1570	33.20	2.91	120		0.009930		14'-4" Pf 0.142
35	13'-10	16.57		37.398		Flow (q) from Route 16		Pe
33	13'-10			37.540				14'-4" Pv
Route 15								
CM	2.1570	52.68	4.63	120		0.023326		14'-0" Pf 0.327
17	15'-8	20.92		33.399		Flow (q) from Route 2		Pe 0.126
36	15'-4½			33.852				14'-0" Pv
BL	1.4420	18.55	3.64	120		0.024035		112'-11" Pf 3.071
36	15'-4½			33.852		PO(7'-5)		14'-10½" Pe -0.000
30	15'-4½			36.923		PO(7'-5)		127'-9½" Pv
Route 16								
CM	2.1570	34.13	3.00	120		0.010451		14'-0" Pf 0.146
36	15'-4½	18.55		33.852		Flow (q) from Route 15		Pe 0.129
37	15'-1			34.127				14'-0" Pv
CM	2.1570	19.20	1.69	120		0.003604		14'-4" Pf 0.052
37	15'-1			34.127				Pe 0.126
38	14'-9½			34.304				14'-4" Pv
CM	2.1570	2.57	0.23	120		0.000087		14'-6" Pf 0.001
38	14'-9½			34.304				Pe 0.128
39	14'-6			34.433				14'-6" Pv
BL	1.4420	16.57	3.26	120		0.019510		112'-11" Pf 2.638
39	14'-6	14.00		34.433		PO(7'-5), Flow (q) from Route 18		22'-3½" Pe 0.286
40	13'-10			37.358		2PO(7'-5)		135'-2½" Pv
CM	2.1570	16.57	1.45	120		0.002745		14'-6" Pf 0.040
40	13'-10			37.358				Pe
35	13'-10			37.398				14'-6" Pv
Route 17								
BL	1.4420	14.93	2.93	120		0.016096		124'-11" Pf 2.728
37	15'-1			34.127		PO(7'-5)		44'-7" Pe -0.002
32	15'-1			36.853		8E(3'-8½), PO(7'-5)		169'-6" Pv
Route 18								
BL	1.4420	14.00	2.75	120		0.014290		129'-3" Pf 2.378
14	16'-6			31.178		PO(7'-5)		37'-2" Pe 0.877
39	14'-6			34.433		2E(3'-8½), 2T(7'-5), PO(7'-5)		166'-5" Pv
Route 19								
BL	1.4420	21.33	4.19	120		0.031116		124'-11" Pf 5.274
16	15'-11½			32.659		PO(7'-5)		44'-7" Pe -0.000
29	15'-11½			37.933		8E(3'-8½), PO(7'-5)		169'-6" Pv
Route 20								
BL	1.4420	8.01	1.57	120		0.005090		8'-11" Pf 0.045
1	16'-6	17.84		22.904		Flow (q) from Route 1		Pe
12	16'-6			22.949				8'-11" Pv
Route 21								
BL	1.4420	21.65	4.25	120		0.032000		8'-11" Pf 0.285
22	16'-3	5.31		24.858		Flow (q) from Route 6		Pe
26	16'-3			25.143				8'-11" Pv
Route 22								
BL	1.4420	16.63	3.27	120		0.019641		112'-11" Pf 2.510
38	14'-9½			34.304		PO(7'-5)		14'-10½" Pe 0.000
34	14'-9½			36.814		PO(7'-5)		127'-9½" 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

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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	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	BaV 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	DeV Deluge Valve	
SN Swing Nipple	Pf	Pressure loss due to friction between points	DPV Dry Pipe Valve	
SP Sprig	Pe	Pressure due to elevation difference between indicated points	E 90° Elbow	
ST Stand Pipe	Pv	Velocity pressure at a point in a pipe	EE 45° Elbow	
UG Underground			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	