Hydraulic Summary

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#2

Job

Job Number: S24-028	Design Engineer: Queen
Job Name: Powell Ryka Survey	State Certification/License Number:
Address 1: 4102 S. Meridian, Ste D	AHJ:
Address 2: Puyallup, WA 98373	Job Site/Building:
Address 3:	Drawing Name: S24-028 Powell Ryka Survey - 1-8th scale 12

System

Most Demanding Sprinkler Data: 11.2 K-Factor 29.63 at 7.00

Hose Allowance At Source: 250.00

Additional Hose Supplies

Node	Flow(gpm)

Total Hose Streams: 250.00

System Flow Demand	Total Water Required (Including Hose Allowance)
618.69	868.69

Maximum Pressure Unbalance In Loops: 0.00

Maximum Velocity Above Ground: 9.71 between nodes 132 and 160

Maximum Velocity Under Ground: 3.59 between nodes 4 and 14

Volume capacity of Wet Pipes	Volume capacity of Dry Pipes
11010.64gal	

Remote Area(s)

Occupancy: Ordinary Group II - Sales RA#2	Job Suffix:
Density: 0.20gpm/ft²	Area of Application: 1500.00ft² (Actual 1521.30ft²)
Number Of Sprinklers Calculated: 20	Coverage Per Sprinkler: 130.00ft²

Expires DEC 31, 24

WASHINGTON STATE CERTIFICATE OF COMPETENCY FIRE SPRINKLER SYSTEMS

Theodore M. Queen
4930-0205-C Level 3
Archer Construction, Inc.
ARCHEI*219DR

Signature: Ted Queen Date: 12·6·24

City of Puyallup
Development & Permitting Services
ISSUED PERMIT
Building | Planning | Engineering | Public Works | Fire | Traffic

Supplies

Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi) @ Flow (gpm)	Available (psi) @ Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply	250.00	40.00	38.00 @ 950.00	38.31 @ 868.69	38.24	0.07

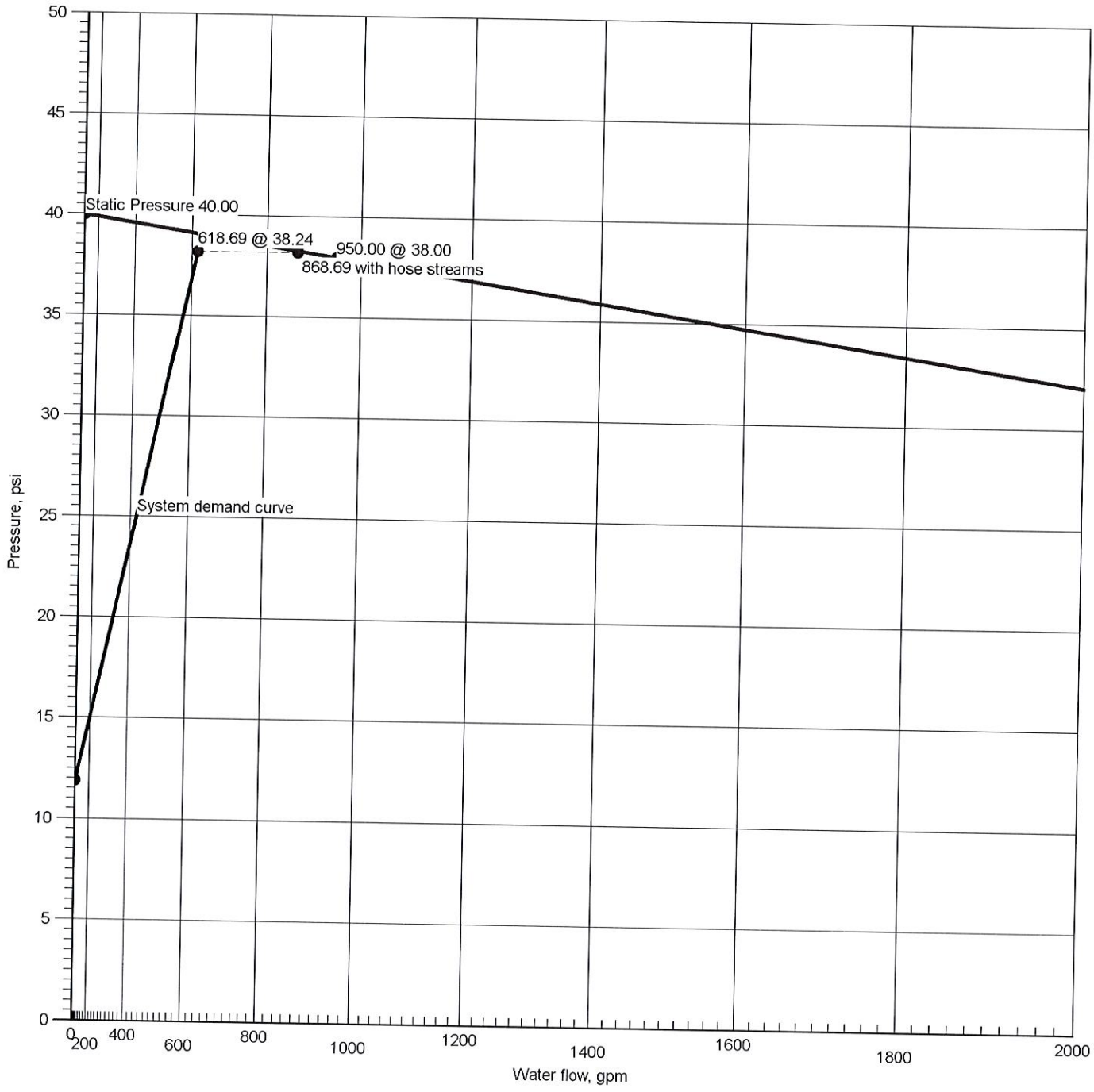
A great deal of additional 'Safety Margin' is provided in these calculations due to the fact that the existing heads in the space are 11.2k. In order to meet the minimum 7 psi end head condition, the existing 11.2k heads are flowing at a minimum of 29.6 gpm each. With max. existing head spacing at 100 sq. ft., 100 ft² x 0.2 density = 20 gpm required/head. Thus the floor is going to be getting hit with about 50% more. water vs. a typical OH2 installation with 5.6 or 8.0k heads.

$Q = k \sqrt{p} = 11.2 \sqrt{7} =$
$11.2 \times 2.65 = 29.6$ gpm

Contractor

	Contractor Number: 22	Contact Name:	Contact Title:
Name of Contractor: Archer Construction		Phone:	Extension:
Address 1: 7855 South 206th ST		FAX:	
Address 2: Kent, WA 98032		E-mail:	
Address 3:		Web-Site:	

Water Supply at Node 1



Hydraulic Graph	Water Supply at Node 1
Static: Pressure	40.00
Residual: Pressure	38.00 @ 950.00
Available Pressure at Time of Test	38.31 @ 868.69
System Demand	38.24 @ 618.69
System Demand (Including Hose Allowance at Source)	38.24 @ 868.69

Summary Of Outflowing Devices

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#2

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	2001	30.60	29.63	11.2	7.47		
Sprinkler	2002	30.01	29.63	11.2	7.18		
Sprinkler	2003	29.68	29.63	11.2	7.02		
⇨ **Sprinkler**	**2004**	**29.63**	**29.63**	**11.2**	**7.00**		
Sprinkler	2005	29.66	29.63	11.2	7.01		
Sprinkler	2006	29.93	29.63	11.2	7.14		
Sprinkler	2007	30.58	29.63	11.2	7.45		
Sprinkler	2008	31.08	29.63	11.2	7.70		
Sprinkler	2009	30.45	29.63	11.2	7.39		
Sprinkler	2010	30.08	29.63	11.2	7.21		
Sprinkler	2011	30.03	29.63	11.2	7.19		
Sprinkler	2012	30.05	29.63	11.2	7.20		
Sprinkler	2013	30.30	29.63	11.2	7.32		
Sprinkler	2014	30.91	29.63	11.2	7.62		
Sprinkler	2015	33.12	29.63	11.2	8.74		
Sprinkler	2016	32.51	29.63	11.2	8.42		
Sprinkler	2017	32.34	29.63	11.2	8.34		
Sprinkler	2018	32.34	29.63	11.2	8.34		
Sprinkler	2019	32.47	29.63	11.2	8.41		
Sprinkler	2020	32.92	29.63	11.2	8.64		

⇨ Most Demanding Sprinkler Data

Node Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#2

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
1	-4-0	S	38.24	618.69	
2001	23-6	Spr(-7.47)	7.47	30.60	
2002	23-6	Spr(-7.18)	7.18	30.01	
2003	23-6	Spr(-7.02)	7.02	29.68	
2004	23-6	Spr(-7.00)	7.00	29.63	
2005	23-6	Spr(-7.01)	7.01	29.66	
2006	23-6	Spr(-7.14)	7.14	29.93	
2007	23-6	Spr(-7.45)	7.45	30.58	
2008	23-5½	Spr(-7.70)	7.70	31.08	
2009	23-5½	Spr(-7.39)	7.39	30.45	
2010	23-5½	Spr(-7.21)	7.21	30.08	
2011	23-5½	Spr(-7.19)	7.19	30.03	
2012	23-5½	Spr(-7.20)	7.20	30.05	
2013	23-5½	Spr(-7.32)	7.32	30.30	
2014	23-5½	Spr(-7.62)	7.62	30.91	
2015	23-4½	Spr(-8.74)	8.74	33.12	
2016	23-4½	Spr(-8.42)	8.42	32.51	
2017	23-4½	Spr(-8.34)	8.34	32.34	
2018	23-4½	Spr(-8.34)	8.34	32.34	
2019	23-4½	Spr(-8.41)	8.41	32.47	
2020	23-4½	Spr(-8.64)	8.64	32.92	
2	-4-0	T(42-11½)	38.23		
3	-4-0	T(59-4½)	38.05		
4	-4-0	T(59-4½)	37.70		
5	-4-0	T(98-3½)	38.15		
14	0-7		30.38		
20	1-8½	PO(41-1½)	29.37		
30	4-8½	LtE(15-3)	28.12		
40	1-8½	PO(37-8½)	29.23		
104	17-1	PO(6-0)	21.18		
105	18-4½	PO(6-0)	20.63		
106	19-8	PO(6-0)	19.57		
107	20-7	PO(12-3½)	16.97		
108	20-7	PO(12-3½)	18.79		
109	20-8	PO(12-3½)	16.94		
110	20-8	PO(12-3½)	18.64		
111	20-9	PO(12-3½)	16.90		
112	20-9	PO(12-3½)	18.51		
113	20-9½	PO(12-3½)	16.84		
114	20-9½	PO(12-3½)	18.38		
115	20-10½	PO(12-3½)	16.78		
116	20-10½	PO(12-3½)	18.27		
117	20-11½	PO(12-3½)	16.70		
118	20-11½	PO(12-3½)	18.16		
119	21-0	PO(12-3½)	16.59		
120	21-0	PO(12-3½)	18.06		
121	21-1	PO(12-3½)	16.46		
122	21-1	PO(12-3½)	17.97		
123	21-2	PO(12-3½)	16.30		
124	21-2	PO(12-3½)	17.88		
125	21-3	PO(12-3½)	16.11		
126	21-3	PO(12-3½)	17.80		
127	21-3½	PO(12-3½)	15.89		
128	21-3½	PO(12-3½)	17.72		
129	21-4½	PO(12-3½)	15.63		
130	21-4½	PO(12-3½)	17.66		
131	21-5½	PO(12-3½)	15.48		
132	21-5½	PO(12-3½)	17.61		
133	21-6	PO(12-3½)	17.57		
134	21-6	PO(12-3½)	15.42		
135	22-7	PO(12-3½)	16.22		
136	22-7	PO(12-3½)	17.81		

Node Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#2

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
137	22-8	PO(12-3½)	16.17		
138	22-8	PO(12-3½)	17.67		
139	22-9	PO(12-3½)	16.12		
140	22-9	PO(12-3½)	17.53		
141	22-9½	PO(12-3½)	16.08		
142	22-9½	PO(12-3½)	17.42		
143	22-10½	PO(12-3½)	16.00		
144	22-10½	PO(12-3½)	17.31		
145	22-11½	PO(12-3½)	15.91		
146	22-11½	PO(12-3½)	17.20		
147	23-0	PO(12-3½)	15.82		
148	23-0	PO(12-3½)	17.11		
149	23-1	PO(12-3½)	15.69		
150	23-1	PO(12-3½)	17.01		
151	23-2	PO(12-3½)	15.53		
152	23-2	PO(12-3½)	16.91		
153	23-3	PO(12-3½)	15.34		
154	23-3	PO(12-3½)	16.82		
155	23-3½	PO(12-3½)	15.14		
156	23-3½	PO(12-3½)	16.75		
157	23-4½	PO(12-3½)	13.76		
158	23-4½	PO(12-3½)	15.69		
159	23-5½	PO(12-3½)	13.47		
160	23-5½	PO(12-3½)	15.42		
161	23-6	PO(12-3½)	15.48		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt / Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 1 • • • • •							
BL	2.1570	16.60	1.46	120	0.002755	7-8½	Pf 0.02
2004	23-6	29.63	11.2	7.00	Sprinkler		Pe
2003	23-6			7.02		7-8½	Pv
BL	2.1570	46.28	4.06	120	0.018357	8-8	Pf 0.16
2003	23-6	29.68	11.2	7.02	Sprinkler		Pe
2002	23-6			7.18		8-8	Pv
BL	2.1570	76.29	6.70	120	0.046280	6-2	Pf 0.29
2002	23-6	30.01	11.2	7.18	Sprinkler		Pe
2001	23-6			7.47		6-2	Pv
BL	2.1570	106.89	9.39	120	0.086372	73-1	Pf 8.01
2001	23-6	30.60	11.2	7.47	Sprinkler,	19-8½	Pe
161	23-6			15.48	2LtE(3-8½), PO(12-3½)	92-9½	Pv
RN	2.1570	106.89	9.39	120	0.086372	2-0	Pf 1.23
161	23-6			15.48		12-3½	Pe 0.86
133	21-6			17.57	PO(12-3½)	14-3½	Pv
CM	6.3570	106.89	1.08	120	0.000447	9-3½	Pf 0.00
133	21-6			17.57			Pe 0.03
132	21-5½			17.61		9-3½	Pv
CM	6.3570	217.50	2.20	120	0.001664	10-7	Pf 0.02
132	21-5½	110.61		17.61	Flow (q) from Route 3		Pe 0.03
130	21-4½			17.66		10-7	Pv
CM	6.3570	318.03	3.21	120	0.003360	11-0	Pf 0.04
130	21-4½	100.53		17.66	Flow (q) from Route 5		Pe 0.03
128	21-3½			17.72		11-0	Pv
CM	6.3570	347.36	3.51	120	0.003956	10-8	Pf 0.04
128	21-3½	29.33		17.72	Flow (q) from Route 2		Pe 0.03
126	21-3			17.80		10-8	Pv
CM	6.3570	375.40	3.79	120	0.004567	11-0	Pf 0.05
126	21-3	28.04		17.80	Flow (q) from Route 7		Pe 0.03
124	21-2			17.88		11-0	Pv
CM	6.3570	402.46	4.07	120	0.005195	11-0	Pf 0.06
124	21-2	27.06		17.88	Flow (q) from Route 8		Pe 0.03
122	21-1			17.97		11-0	Pv
CM	6.3570	428.87	4.34	120	0.005843	11-0	Pf 0.06
122	21-1	26.40		17.97	Flow (q) from Route 9		Pe 0.03
120	21-0			18.06		11-0	Pv
CM	6.3570	454.93	4.60	120	0.006517	10-9	Pf 0.07
120	21-0	26.07		18.06	Flow (q) from Route 10		Pe 0.03
118	20-11½			18.16		10-9	Pv
CM	6.3570	480.95	4.86	120	0.007223	10-3	Pf 0.07
118	20-11½	26.02		18.16	Flow (q) from Route 11		Pe 0.03
116	20-10½			18.27		10-3	Pv
CM	6.3570	507.19	5.13	120	0.007969	10-3	Pf 0.08
116	20-10½	26.24		18.27	Flow (q) from Route 12		Pe 0.03
114	20-9½			18.38		10-3	Pv
CM	6.3570	533.88	5.40	120	0.008762	11-0	Pf 0.10
114	20-9½	26.68		18.38	Flow (q) from Route 13		Pe 0.03
112	20-9			18.51		11-0	Pv
CM	6.3570	561.24	5.67	120	0.009610	11-0	Pf 0.11
112	20-9	27.37		18.51	Flow (q) from Route 14		Pe 0.03
110	20-8			18.64		11-0	Pv
CM	6.3570	589.47	5.96	120	0.010524	11-0	Pf 0.12
110	20-8	28.22		18.64	Flow (q) from Route 15		Pe 0.03
108	20-7			18.79		11-0	Pv
CM	6.3570	618.69	6.25	120	0.011509	9-5	Pf 0.37
108	20-7	29.22		18.79	Flow (q) from Route 16	22-7½	Pe 0.41
106	19-8			19.57	2LtE(11-4)	32-0½	Pv
CM	6.3570	618.69	6.25	120	0.011509	30-7	Pf 1.89
106	19-8			19.57		133-3½	Pe 7.78
40	1-8½			29.23	2PO(37-8½), 4LtE(11-4), BV(12-7)	163-10½	Pv
CM	8.2490	618.69	3.71	120	0.003236	1-10½	Pf 0.14
40	1-8½			29.23		41-1½	Pe -0.00
20	1-8½			29.37	PO(41-1½)	42-11½	Pv
FR	8.2490	618.69	3.71	120	0.003236	3-0	Pf 0.06
20	1-8½			29.37		15-3	Pe -1.30
30	4-8½			28.12	LtE(15-3)	18-3½	Pv
CM	8.2490	618.69	3.71	120	0.003236	15-3½	Pf 0.46
30	4-8½			28.12		126-10	Pe 1.79
14	0-7			30.38	3LtE(15-3), 2BV(14-1), CV(52-10)	142-1½	Pv

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt / Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
UG	8.3900	618.69	3.59	140	0.002240	24-1	Pf 5.34
14	0-7			30.38		127-3	Pe 1.99
4	-4-0			37.70	2E(30-6½), BFP(-5.00), GV(6-9½), T(59-4½)	151-3½	Pv
UG	8.3900	358.10	2.08	140	0.000815	483-11½	Pf 0.44
4	-4-0			37.70		61-1	Pe
5	-4-0			38.15	4EE(15-3)	545-0½	Pv
UG	12.4600	358.10	0.94	140	0.000119	770-0½	Pf 0.09
5	-4-0			38.15			Pe
1	-4-0			38.24	Water Supply	770-0½	Pv
		250.00			Hose Allowance At Source		
1		868.69					
••••• Route 2 •••••							
BL	2.1570	13.03	1.14	120	0.001759	8-0	Pf 0.01
2004	23-6	29.63	11.2	7.00	Sprinkler		Pe
2005	23-6			7.01		8-0	Pv
BL	2.1570	42.69	3.75	120	0.015810	8-2	Pf 0.13
2005	23-6	29.66	11.2	7.01	Sprinkler		Pe
2006	23-6			7.14		8-2	Pv
BL	2.1570	72.63	6.38	120	0.042249	7-4	Pf 0.31
2006	23-6	29.93	11.2	7.14	Sprinkler		Pe
2007	23-6			7.45		7-4	Pv
BL	2.1570	103.20	9.06	120	0.080932	61-3	Pf 5.95
2007	23-6	30.58	11.2	7.45	Sprinkler,	12-3½	Pe
162	23-6			13.41	PO(12-3½)	73-6½	Pv
RN	2.1570	103.20	9.06	120	0.080932	2-0	Pf 1.16
162	23-6			13.41		12-3½	Pe 0.86
134	21-6			15.42	PO(12-3½)	14-3½	Pv
CM	4.2600	103.20	2.32	120	0.002943	10-9½	Pf 0.03
134	21-6			15.42			Pe 0.03
131	21-5½			15.48		10-9½	Pv
CM	4.2600	205.48	4.63	120	0.010521	10-7	Pf 0.11
131	21-5½	102.28		15.48	Flow (q) from Route 4		Pe 0.03
129	21-4½			15.63		10-7	Pv
CM	4.2600	300.65	6.77	120	0.021274	11-0	Pf 0.23
129	21-4½	95.17		15.63	Flow (q) from Route 6		Pe 0.03
127	21-3½			15.89		11-0	Pv
RN	2.1570	29.33	2.58	120	0.007894	2-0	Pf 0.11
127	21-3½			15.89	PO(12-3½)	12-3½	Pe -0.86
155	23-3½			15.14		14-3½	Pv
BL	2.1570	29.33	2.58	120	0.007894	178-10½	Pf 1.61
155	23-3½			15.14	PO(12-3½)	24-7½	Pe
156	23-3½			16.75	PO(12-3½)	203-6	Pv
RN	2.1570	29.33	2.58	120	0.007894	2-0	Pf 0.11
156	23-3½			16.75		12-3½	Pe 0.86
128	21-3½			17.72	PO(12-3½)	14-3½	Pv
••••• Route 3 •••••							
BL	2.1570	19.00	1.67	120	0.003535	7-8½	Pf 0.03
2011	23-5½	30.03	11.2	7.19	Sprinkler		Pe
2010	23-5½			7.21		7-8½	Pv
BL	2.1570	49.08	4.31	120	0.020464	8-8	Pf 0.18
2010	23-5½	30.08	11.2	7.21	Sprinkler		Pe
2009	23-5½			7.39		8-8	Pv
BL	2.1570	79.53	6.98	120	0.049979	6-2	Pf 0.31
2009	23-5½	30.45	11.2	7.39	Sprinkler		Pe
2008	23-5½			7.70		6-2	Pv
BL	2.1570	110.61	9.71	120	0.092004	71-7	Pf 7.72
2008	23-5½	31.08	11.2	7.70	Sprinkler,	12-3½	Pe
160	23-5½			15.42	PO(12-3½)	83-10½	Pv
RN	2.1570	110.61	9.71	120	0.092004	2-0	Pf 1.32
160	23-5½			15.42		12-3½	Pe 0.87
132	21-5½			17.61	PO(12-3½)	14-4	Pv
••••• Route 4 •••••							
BL	2.1570	11.03	0.97	120	0.001292	8-0	Pf 0.01
2011	23-5½	30.03	11.2	7.19	Sprinkler		Pe
2012	23-5½			7.20		8-0	Pv
BL	2.1570	41.07	3.61	120	0.014719	8-2	Pf 0.12
2012	23-5½	30.05	11.2	7.20	Sprinkler		Pe
2013	23-5½			7.32		8-2	Pv
BL	2.1570	71.37	6.27	120	0.040908	7-4	Pf 0.30
2013	23-5½	30.30	11.2	7.32	Sprinkler		Pe
2014	23-5½			7.62		7-4	Pv

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt / Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
BL	2.1570	102.28	8.98	120	0.079602	61-3	Pf 5.86
2014	23-5½	30.91	11.2	7.62	Sprinkler,	12-3½	Pe
159	23-5½			13.47	PO(12-3½)	73-6½	Pv
RN	2.1570	102.28	8.98	120	0.079602	2-0	Pf 1.14
159	23-5½			13.47		12-3½	Pe 0.87
131	21-5½			15.48	PO(12-3½)	14-4	Pv
Route 5							
BL	2.1570	2.56	0.22	120	0.000087	8-0	Pf 0.00
2018	23-4½	32.34	11.2	8.34	Sprinkler		Pe
2017	23-4½			8.34		8-0	Pv
BL	2.1570	34.91	3.06	120	0.010893	7-8½	Pf 0.08
2017	23-4½	32.34	11.2	8.34	Sprinkler		Pe
2016	23-4½			8.42		7-8½	Pv
BL	2.1570	67.41	5.92	120	0.036810	8-8	Pf 0.32
2016	23-4½	32.51	11.2	8.42	Sprinkler		Pe
2015	23-4½			8.74		8-8	Pv
BL	2.1570	100.53	8.83	120	0.077097	77-9	Pf 6.94
2015	23-4½	33.12	11.2	8.74	Sprinkler,	12-3½	Pe
158	23-4½			15.69	PO(12-3½)	90-0½	Pv
RN	2.1570	100.53	8.83	120	0.077097	2-0	Pf 1.10
158	23-4½			15.69		12-3½	Pe 0.87
130	21-4½			17.66	PO(12-3½)	14-3½	Pv
Route 6							
BL	2.1570	29.78	2.61	120	0.008121	8-2	Pf 0.07
2018	23-4½	32.34	11.2	8.34	Sprinkler		Pe
2019	23-4½			8.41		8-2	Pv
BL	2.1570	62.25	5.47	120	0.031769	7-4	Pf 0.23
2019	23-4½	32.47	11.2	8.41	Sprinkler		Pe
2020	23-4½			8.64		7-4	Pv
BL	2.1570	95.17	8.36	120	0.069670	61-3	Pf 5.12
2020	23-4½	32.92	11.2	8.64	Sprinkler,	12-3½	Pe
157	23-4½			13.76	PO(12-3½)	73-6½	Pv
RN	2.1570	95.17	8.36	120	0.069670	2-0	Pf 1.00
157	23-4½			13.76		12-3½	Pe 0.87
129	21-4½			15.63	PO(12-3½)	14-3½	Pv
Route 7							
CM	4.2600	271.33	6.11	120	0.017595	10-8	Pf 0.19
127	21-3½			15.89			Pe 0.03
125	21-3			16.11		10-8	Pv
RN	2.1570	28.04	2.46	120	0.007265	2-0	Pf 0.10
125	21-3			16.11	PO(12-3½)	12-3½	Pe -0.87
153	23-3			15.34		14-4	Pv
BL	2.1570	28.04	2.46	120	0.007265	178-10½	Pf 1.48
153	23-3			15.34	PO(12-3½)	24-7½	Pe
154	23-3			16.82	PO(12-3½)	203-6	Pv
RN	2.1570	28.04	2.46	120	0.007265	2-0	Pf 0.10
154	23-3			16.82		12-3½	Pe 0.87
126	21-3			17.80	PO(12-3½)	14-4	Pv
Route 8							
CM	4.2600	243.28	5.48	120	0.014379	11-0	Pf 0.16
125	21-3			16.11			Pe 0.03
123	21-2			16.30		11-0	Pv
RN	2.1570	27.06	2.38	120	0.006801	2-0	Pf 0.10
123	21-2			16.30	PO(12-3½)	12-3½	Pe -0.87
151	23-2			15.53		14-4	Pv
BL	2.1570	27.06	2.38	120	0.006801	178-10½	Pf 1.38
151	23-2			15.53	PO(12-3½)	24-7½	Pe
152	23-2			16.91	PO(12-3½)	203-6	Pv
RN	2.1570	27.06	2.38	120	0.006801	2-0	Pf 0.10
152	23-2			16.91		12-3½	Pe 0.87
124	21-2			17.88	PO(12-3½)	14-4	Pv
Route 9							
CM	4.2600	216.22	4.87	120	0.011561	11-0	Pf 0.13
123	21-2			16.30			Pe 0.03
121	21-1			16.46		11-0	Pv
RN	2.1570	26.40	2.32	120	0.006500	2-0	Pf 0.09
121	21-1			16.46	PO(12-3½)	12-3½	Pe -0.87
149	23-1			15.69		14-3½	Pv
BL	2.1570	26.40	2.32	120	0.006500	178-10½	Pf 1.32
149	23-1			15.69	PO(12-3½)	24-7½	Pe
150	23-1			17.01	PO(12-3½)	203-6	Pv

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
RN	2.1570	26.40	2.32	120		0.006500	2-0	Pf 0.09
150	23-1			17.01			12-3½	Pe 0.87
122	21-1			17.97		PO(12-3½)	14-3½	Pv
• • • • • Route 10 • • • • •								
CM	4.2600	189.82	4.27	120		0.009086	11-0	Pf 0.10
121	21-1			16.46				Pe 0.03
119	21-0			16.59			11-0	Pv
RN	2.1570	26.07	2.29	120		0.006347	2-0	Pf 0.09
119	21-0			16.59		PO(12-3½)	12-3½	Pe -0.86
147	23-0			15.82			14-3½	Pv
BL	2.1570	26.07	2.29	120		0.006347	178-10½	Pf 1.29
147	23-0			15.82		PO(12-3½)	24-7½	Pe
148	23-0			17.11		PO(12-3½)	203-6	Pv
RN	2.1570	26.07	2.29	120		0.006347	2-0	Pf 0.09
148	23-0			17.11			12-3½	Pe 0.86
120	21-0			18.06		PO(12-3½)	14-3½	Pv
• • • • • Route 11 • • • • •								
CM	4.2600	163.75	3.69	120		0.006913	10-9	Pf 0.07
119	21-0			16.59				Pe 0.03
117	20-11½			16.70			10-9	Pv
RN	2.1570	26.02	2.28	120		0.006327	2-0	Pf 0.09
117	20-11½			16.70		PO(12-3½)	12-3½	Pe -0.87
145	22-11½			15.91			14-4	Pv
BL	2.1570	26.02	2.28	120		0.006327	178-10½	Pf 1.29
145	22-11½			15.91		PO(12-3½)	24-7½	Pe
146	22-11½			17.20		PO(12-3½)	203-6	Pv
RN	2.1570	26.02	2.28	120		0.006327	2-0	Pf 0.09
146	22-11½			17.20			12-3½	Pe 0.87
118	20-11½			18.16		PO(12-3½)	14-4	Pv
• • • • • Route 12 • • • • •								
CM	4.2600	137.73	3.10	120		0.005019	10-3	Pf 0.05
117	20-11½			16.70				Pe 0.03
115	20-10½			16.78			10-3	Pv
RN	2.1570	26.24	2.30	120		0.006425	2-0	Pf 0.09
115	20-10½			16.78		PO(12-3½)	12-3½	Pe -0.87
143	22-10½			16.00			14-3½	Pv
BL	2.1570	26.24	2.30	120		0.006425	178-10½	Pf 1.31
143	22-10½			16.00		PO(12-3½)	24-7½	Pe
144	22-10½			17.31		PO(12-3½)	203-6	Pv
RN	2.1570	26.24	2.30	120		0.006425	2-0	Pf 0.09
144	22-10½			17.31			12-3½	Pe 0.87
116	20-10½			18.27		PO(12-3½)	14-3½	Pv
• • • • • Route 13 • • • • •								
CM	4.2600	111.49	2.51	120		0.003395	10-3	Pf 0.03
115	20-10½			16.78				Pe 0.03
113	20-9½			16.84			10-3	Pv
RN	2.1570	26.68	2.34	120		0.006628	2-0	Pf 0.09
113	20-9½			16.84		PO(12-3½)	12-3½	Pe -0.86
141	22-9½			16.08			14-3½	Pv
BL	2.1570	26.68	2.34	120		0.006628	178-10½	Pf 1.35
141	22-9½			16.08		PO(12-3½)	24-7½	Pe
142	22-9½			17.42		PO(12-3½)	203-6	Pv
RN	2.1570	26.68	2.34	120		0.006628	2-0	Pf 0.09
142	22-9½			17.42			12-3½	Pe 0.86
114	20-9½			18.38		PO(12-3½)	14-3½	Pv
• • • • • Route 14 • • • • •								
CM	4.2600	84.81	1.91	120		0.002047	11-0	Pf 0.02
113	20-9½			16.84				Pe 0.03
111	20-9			16.90			11-0	Pv
RN	2.1570	27.37	2.40	120		0.006944	2-0	Pf 0.10
111	20-9			16.90		PO(12-3½)	12-3½	Pe -0.87
139	22-9			16.12			14-4	Pv
BL	2.1570	27.37	2.40	120		0.006944	178-10½	Pf 1.41
139	22-9			16.12		PO(12-3½)	24-7½	Pe
140	22-9			17.53		PO(12-3½)	203-6	Pv
RN	2.1570	27.37	2.40	120		0.006944	2-0	Pf 0.10
140	22-9			17.53			12-3½	Pe 0.87
112	20-9			18.51		PO(12-3½)	14-4	Pv
• • • • • Route 15 • • • • •								
CM	4.2600	57.44	1.29	120		0.000995	11-0	Pf 0.01
111	20-9			16.90				Pe 0.03
109	20-8			16.94			11-0	Pv

Hydraulic Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#2

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
RN	2.1570	28.22	2.48	120		0.007353	2-0	Pf 0.11
109	20-8			16.94		PO(12-3½)	12-3½	Pe -0.87
137	22-8			16.17			14-4	Pv
BL	2.1570	28.22	2.48	120		0.007353	178-10½	Pf 1.50
137	22-8			16.17		PO(12-3½)	24-7½	Pe
138	22-8			17.67		PO(12-3½)	203-6	Pv
RN	2.1570	28.22	2.48	120		0.007353	2-0	Pf 0.11
138	22-8			17.67			12-3½	Pe 0.87
110	20-8			18.64		PO(12-3½)	14-4	Pv
••••• Route 16 •••••								
CM	4.2600	29.22	0.66	120		0.000285	11-0	Pf 0.00
109	20-8			16.94				Pe 0.03
107	20-7			16.97			11-0	Pv
RN	2.1570	29.22	2.57	120		0.007839	2-0	Pf 0.11
107	20-7			16.97		PO(12-3½)	12-3½	Pe -0.87
135	22-7			16.22			14-3½	Pv
BL	2.1570	29.22	2.57	120		0.007839	178-10½	Pf 1.60
135	22-7			16.22		PO(12-3½)	24-7½	Pe
136	22-7			17.81		PO(12-3½)	203-6	Pv
RN	2.1570	29.22	2.57	120		0.007839	2-0	Pf 0.11
136	22-7			17.81			12-3½	Pe 0.87
108	20-7			18.79		PO(12-3½)	14-3½	Pv
••••• Route 17 •••••								
UG	7.8500	260.58	1.73	140		0.000626	249-2½	Pf 0.18
3	-4-0	260.58		38.05		Flow (q) from Route 18	42-11½	Pe
2	-4-0			38.23		T(42-11½)	292-2	Pv
UG	12.4600	260.58	0.69	140		0.000066	106-0½	Pf 0.01
2	-4-0			38.23				Pe
1	-4-0			38.24			106-0½	Pv
••••• Route 18 •••••								
UG	8.3900	260.58	1.51	140		0.000452	704-8	Pf 0.35
4	-4-0			37.70			59-4½	Pe
3	-4-0			38.05		T(59-4½)	764-0½	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

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
BalV	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
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
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

Hydraulic Summary

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#1

Job

Job Number: S24-028	Design Engineer: Queen
Job Name: Powell Ryka Survey	State Certification/License Number:
Address 1: 4102 S. Meridian, Ste D	AHJ:
Address 2: Puyallup, WA 98373	Job Site/Building:
Address 3:	Drawing Name: S24-028 Powell Ryka Survey - 1-8th scale 12

System

Most Demanding Sprinkler Data: 11.2 K-Factor 29.63 at 7.00

Hose Allowance At Source: 250.00

Additional Hose Supplies

Node	Flow(gpm)

Total Hose Streams: 250.00

System Flow Demand	Total Water Required (Including Hose Allowance)
619.32	869.32

Maximum Pressure Unbalance In Loops: 0.00

Maximum Velocity Above Ground: 11.89 between nodes 132 and 160

Maximum Velocity Under Ground: 3.59 between nodes 4 and 14

Volume capacity of Wet Pipes	Volume capacity of Dry Pipes
11010.64gal	

Remote Area(s)

Occupancy	Job Suffix
Ordinary Group II - Sales RA#1	
Density	**Area of Application**
0.20gpm/ft²	1500.00ft² (Actual 1538.00ft²)
Number Of Sprinklers Calculated	**Coverage Per Sprinkler**
20	130.00ft²

Expires DEC 31, 24

WASHINGTON STATE
CERTIFICATE OF COMPETENCY
FIRE SPRINKLER SYSTEMS

Theodore M. Queen
4930-0205-C Level 3
Archer Construction, Inc.
ARCHEI*219DR

Signature: Ted Queen Date: 12·6·24

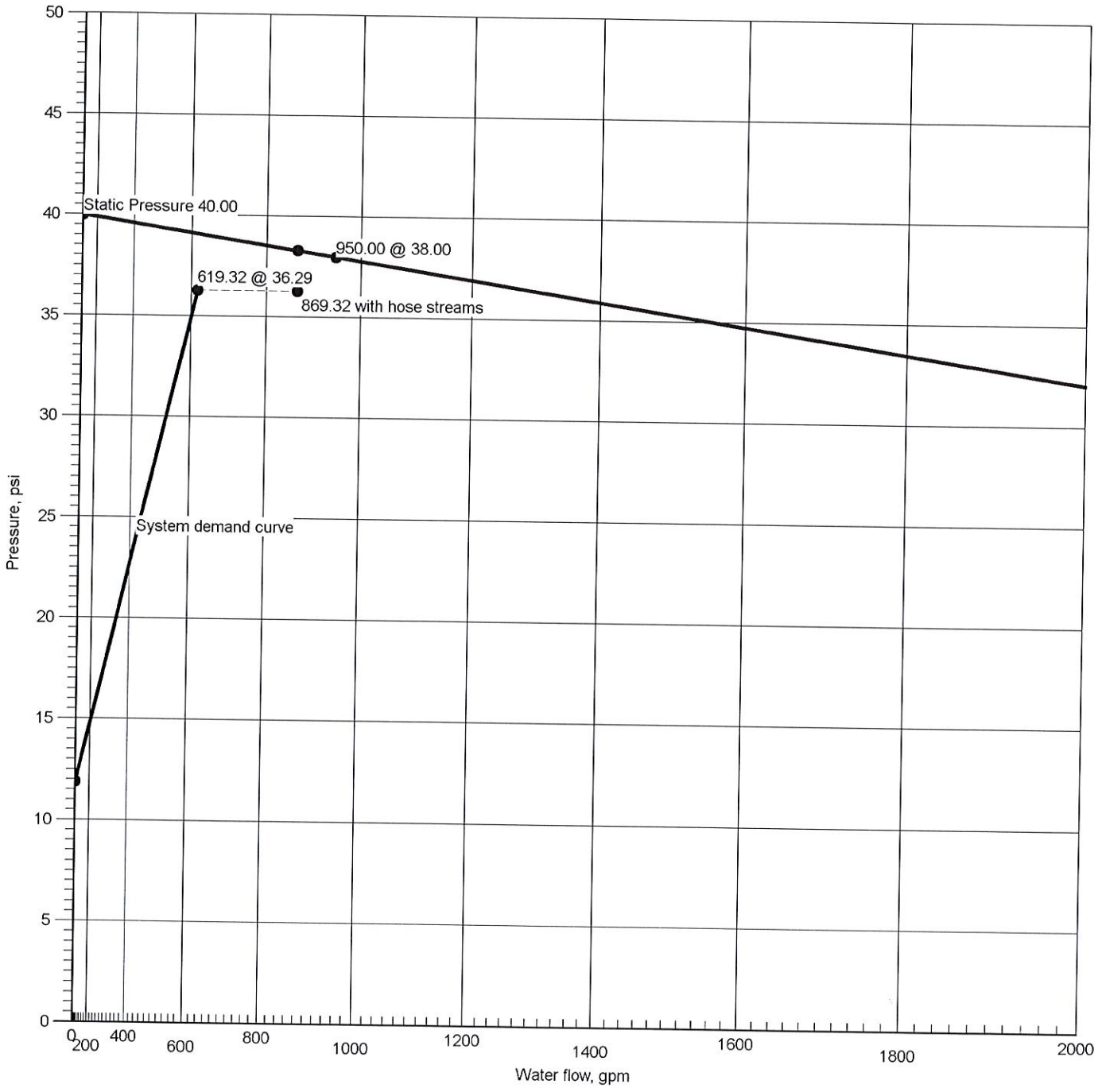
Supplies

Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi) @ Flow (gpm)	Available (psi) @ Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply	250.00	40.00	38.00 @ 950.00	38.30 @ 869.32	36.29	2.01

Contractor

	Contractor Number: 22	Contact Name:	Contact Title:
Name of Contractor: Archer Construction		Phone:	Extension:
Address 1: 7855 South 206th ST		FAX:	
Address 2: Kent, WA 98032		E-mail:	
Address 3:		Web-Site:	

Water Supply at Node 1



Hydraulic Graph	Water Supply at Node 1
Static: Pressure	40.00
Residual: Pressure	38.00 @ 950.00
Available Pressure at Time of Test	38.30 @ 869.32
System Demand	36.29 @ 619.32
System Demand (Including Hose Allowance at Source)	36.29 @ 869.32

Summary Of Outflowing Devices

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#1

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	1001	33.54	29.63	11.2	8.97		
Sprinkler	1002	32.65	29.63	11.2	8.50		
Sprinkler	1003	32.21	29.63	11.2	8.27		
Sprinkler	1004	32.09	29.63	11.2	8.21		
Sprinkler	1005	32.09	29.63	11.2	8.21		
Sprinkler	1006	32.26	29.63	11.2	8.29		
Sprinkler	1007	31.92	29.63	11.2	8.12		
Sprinkler	1008	30.77	29.63	11.2	7.55		
Sprinkler	1009	30.10	29.63	11.2	7.22		
Sprinkler	1010	29.83	29.63	11.2	7.09		
Sprinkler	1011	29.80	29.63	11.2	7.08		
Sprinkler	1012	29.84	29.63	11.2	7.10		
Sprinkler	1013	30.18	29.63	11.2	7.26		
Sprinkler	1014	31.99	29.63	11.2	8.16		
Sprinkler	1015	30.86	29.63	11.2	7.59		
Sprinkler	1016	30.21	29.63	11.2	7.27		
Sprinkler	1017	29.66	29.63	11.2	7.01		
⇨ **Sprinkler**	**1018**	**29.63**	**29.63**	**11.2**	**7.00**		
Sprinkler	1019	29.68	29.63	11.2	7.02		
Sprinkler	1020	30.03	29.63	11.2	7.19		

⇨ Most Demanding Sprinkler Data

Node Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#1

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
123	21-2	PO(12-3½)	15.07		
124	21-2	PO(12-3½)	15.86		
125	21-3	PO(12-3½)	14.94		
126	21-3	PO(12-3½)	15.76		
127	21-3½	PO(12-3½)	14.80		
128	21-3½	PO(12-3½)	15.67		
129	21-4½	PO(12-3½)	14.63		
130	21-4½	PO(12-3½)	15.59		
131	21-5½	PO(12-3½)	14.54		
132	21-5½	PO(12-3½)	15.53		
133	21-6	PO(12-3½)	15.49		
134	21-6	PO(12-3½)	14.49		
135	22-7	PO(12-3½)	14.79		
136	22-7	PO(12-3½)	15.90		
137	22-8	PO(12-3½)	14.75		
138	22-8	PO(12-3½)	15.75		
139	22-9	PO(12-3½)	14.70		
140	22-9	PO(12-3½)	15.61		
141	22-9½	PO(12-3½)	14.66		
142	22-9½	PO(12-3½)	15.50		
143	22-10½	PO(12-3½)	14.60		
144	22-10½	PO(12-3½)	15.38		
145	22-11½	PO(12-3½)	14.53		
146	22-11½	PO(12-3½)	15.26		
147	23-0	PO(12-3½)	14.46		
148	23-0	PO(12-3½)	15.16		
149	23-1	PO(12-3½)	14.36		
150	23-1	PO(12-3½)	15.05		
151	23-2	PO(12-3½)	14.25		
152	23-2	PO(12-3½)	14.94		
153	23-3	PO(12-3½)	14.12		
154	23-3	PO(12-3½)	14.84		
155	23-3½	PO(12-3½)	13.99		
156	23-3½	PO(12-3½)	14.76		
157	23-4½	PO(12-3½)	13.23		
158	23-4½	PO(12-3½)	13.03		
159	23-5½	PO(12-3½)	12.99		
160	23-5½	PO(12-3½)	12.74		
161	23-6	PO(12-3½)	12.74		
1	-4-0	S	36.29	619.32	
1001	23-4½	Spr(-8.97)	8.97	33.54	
1002	23-4½	Spr(-8.50)	8.50	32.65	
1003	23-4½	Spr(-8.27)	8.27	32.21	
1004	23-4½	Spr(-8.21)	8.21	32.09	
1005	23-4½	Spr(-8.21)	8.21	32.09	
1006	23-4½	Spr(-8.29)	8.29	32.26	
1007	23-5½	Spr(-8.12)	8.12	31.92	
1008	23-5½	Spr(-7.55)	7.55	30.77	
1009	23-5½	Spr(-7.22)	7.22	30.10	
1010	23-5½	Spr(-7.09)	7.09	29.83	
1011	23-5½	Spr(-7.08)	7.08	29.80	
1012	23-5½	Spr(-7.10)	7.10	29.84	
1013	23-5½	Spr(-7.26)	7.26	30.18	
1014	23-6	Spr(-8.16)	8.16	31.99	
1015	23-6	Spr(-7.59)	7.59	30.86	
1016	23-6	Spr(-7.27)	7.27	30.21	
1017	23-6	Spr(-7.01)	7.01	29.66	
1018	23-6	Spr(-7.00)	7.00	29.63	
1019	23-6	Spr(-7.02)	7.02	29.68	
1020	23-6	Spr(-7.19)	7.19	30.03	
2	-4-0	T(42-11½)	36.29		
3	-4-0	T(59-4½)	36.10		

Node Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#1

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
4	-4-0	T(59-4½)	35.76		
5	-4-0	T(98-3½)	36.20		
14	0-7		28.43		
20	1-8½	PO(41-1½)	27.42		
30	4-8½	LtE(15-3)	26.18		
40	1-8½	PO(37-8½)	27.28		
104	17-1	PO(6-0)	19.23		
105	18-4½	PO(6-0)	18.68		
106	19-8	PO(6-0)	17.62		
107	20-7	PO(12-3½)	15.58		
108	20-7	PO(12-3½)	16.84		
109	20-8	PO(12-3½)	15.55		
110	20-8	PO(12-3½)	16.69		
111	20-9	PO(12-3½)	15.51		
112	20-9	PO(12-3½)	16.55		
113	20-9½	PO(12-3½)	15.46		
114	20-9½	PO(12-3½)	16.42		
115	20-10½	PO(12-3½)	15.41		
116	20-10½	PO(12-3½)	16.30		
117	20-11½	PO(12-3½)	15.35		
118	20-11½	PO(12-3½)	16.19		
119	21-0	PO(12-3½)	15.27		
120	21-0	PO(12-3½)	16.07		
121	21-1	PO(12-3½)	15.18		
122	21-1	PO(12-3½)	15.96		

Hydraulic Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#1

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure / Summary
• • • • • Route 1 • • • • •								
BL	2.1570	12.09	1.06	120		0.001533	8-3½	Pf 0.01
1018	23-6	29.63	11.2	7.00		Sprinkler		Pe
1017	23-6			7.01			8-3½	Pv
BL	2.1570	41.75	3.67	120		0.015173	9-10½	Pf 0.26
1017	23-6	29.66	11.2	7.01		Sprinkler,	7-4½	Pe
1016	23-6			7.27		2LtE(3-8½)	17-3	Pv
BL	2.1570	71.96	6.32	120		0.041536	7-7	Pf 0.31
1016	23-6	30.21	11.2	7.27		Sprinkler		Pe
1015	23-6			7.59			7-7	Pv
BL	2.1570	102.82	9.03	120		0.080373	7-1	Pf 0.57
1015	23-6	30.86	11.2	7.59		Sprinkler		Pe
1014	23-6			8.16			7-1	Pv
BL	2.1570	134.81	11.84	120		0.132669	22-2½	Pf 4.58
1014	23-6	31.99	11.2	8.16		Sprinkler,	12-3½	Pe
161	23-6			12.74		PO(12-3½)	34-6	Pv
RN	2.1570	134.81	11.84	120		0.132669	2-0	Pf 1.90
161	23-6			12.74			12-3½	Pe 0.86
133	21-6			15.49		PO(12-3½)	14-3½	Pv
CM	6.3570	134.81	1.36	120		0.000687	9-3½	Pf 0.01
133	21-6			15.49				Pe 0.03
132	21-5½			15.53			9-3½	Pv
CM	6.3570	270.25	2.73	120		0.002486	10-7	Pf 0.03
132	21-5½	135.44		15.53		Flow (q) from Route 3		Pe 0.03
130	21-4½			15.59			10-7	Pv
CM	6.3570	396.68	4.01	120		0.005057	11-0	Pf 0.06
130	21-4½	126.43		15.59		Flow (q) from Route 5		Pe 0.03
128	21-3½			15.67			11-0	Pv
CM	6.3570	416.34	4.21	120		0.005531	10-8	Pf 0.06
128	21-3½	19.66		15.67		Flow (q) from Route 2		Pe 0.03
126	21-3			15.76			10-8	Pv
CM	6.3570	435.37	4.40	120		0.006008	11-0	Pf 0.07
126	21-3	19.03		15.76		Flow (q) from Route 7		Pe 0.03
124	21-2			15.86			11-0	Pv
CM	6.3570	454.04	4.59	120		0.006493	11-0	Pf 0.07
124	21-2	18.68		15.86		Flow (q) from Route 8		Pe 0.03
122	21-1			15.96			11-0	Pv
CM	6.3570	472.65	4.78	120		0.006994	11-0	Pf 0.08
122	21-1	18.60		15.96		Flow (q) from Route 9		Pe 0.03
120	21-0			16.07			11-0	Pv
CM	6.3570	491.44	4.97	120		0.007517	10-9	Pf 0.08
120	21-0	18.79		16.07		Flow (q) from Route 10		Pe 0.03
118	20-11½			16.19			10-9	Pv
CM	6.3570	510.65	5.16	120		0.008069	10-3	Pf 0.08
118	20-11½	19.21		16.19		Flow (q) from Route 11		Pe 0.03
116	20-10½			16.30			10-3	Pv
CM	6.3570	530.46	5.36	120		0.008658	10-3	Pf 0.09
116	20-10½	19.82		16.30		Flow (q) from Route 12		Pe 0.03
114	20-9½			16.42			10-3	Pv
CM	6.3570	551.07	5.57	120		0.009291	11-0	Pf 0.10
114	20-9½	20.60		16.42		Flow (q) from Route 13		Pe 0.03
112	20-9			16.55			11-0	Pv
CM	6.3570	572.66	5.79	120		0.009975	11-0	Pf 0.11
112	20-9	21.60		16.55		Flow (q) from Route 14		Pe 0.03
110	20-8			16.69			11-0	Pv
CM	6.3570	595.38	6.02	120		0.010720	11-0	Pf 0.12
110	20-8	22.72		16.69		Flow (q) from Route 15		Pe 0.03
108	20-7			16.84			11-0	Pv
CM	6.3570	619.32	6.26	120		0.011531	9-5	Pf 0.37
108	20-7	23.94		16.84		Flow (q) from Route 16	22-7½	Pe 0.41
106	19-8			17.62		2LtE(11-4)	32-0½	Pv
CM	6.3570	619.32	6.26	120		0.011531	30-7	Pf 1.89
106	19-8			17.62			133-3½	Pe 7.78
40	1-8½			27.28		2PO(37-8½), 4LtE(11-4), BV(12-7)	163-10½	Pv
CM	8.2490	619.32	3.72	120		0.003242	1-10½	Pf 0.14
40	1-8½			27.28			41-1½	Pe -0.00
20	1-8½			27.42		PO(41-1½)	42-11½	Pv
FR	8.2490	619.32	3.72	120		0.003242	3-0	Pf 0.06
20	1-8½			27.42			15-3	Pe -1.30
30	4-8½			26.18		LtE(15-3)	18-3½	Pv

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt / Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
CM	8.2490	619.32	3.72	120	0.003242	15-3½	Pf 0.46
30	4-8½			26.18		126-10	Pe 1.79
14	0-7			28.43	3LtE(15-3), 2BV(14-1), CV(52-10)	142-1½	Pv
UG	8.3900	619.32	3.59	140	0.002245	24-1	Pf 5.34
14	0-7			28.43		127-3	Pe 1.99
4	-4-0			35.76	2E(30-6½), BFP(-5.00), GV(6-9½), T(59-4½)	151-3½	Pv
UG	8.3900	358.47	2.08	140	0.000816	483-11½	Pf 0.44
4	-4-0			35.76		61-1	Pe
5	-4-0			36.20	4EE(15-3)	545-0½	Pv
UG	12.4600	358.47	0.94	140	0.000119	770-0½	Pf 0.09
5	-4-0			36.20			Pe
1	-4-0			36.29	Water Supply	770-0½	Pv
		250.00			Hose Allowance At Source		
1		869.32					
••••• Route 2 •••••							
BL	2.1570	17.54	1.54	120	0.003050	7-2½	Pf 0.02
1018	23-6	29.63	11.2	7.00	Sprinkler		Pe
1019	23-6			7.02		7-2½	Pv
BL	2.1570	47.22	4.15	120	0.019051	8-8	Pf 0.17
1019	23-6	29.68	11.2	7.02	Sprinkler		Pe
1020	23-6			7.19		8-8	Pv
BL	2.1570	77.24	6.78	120	0.047354	109-5½	Pf 5.77
1020	23-6	30.03	11.2	7.19	Sprinkler,	12-3½	Pe
162	23-6			12.95	PO(12-3½)	121-9	Pv
RN	2.1570	77.24	6.78	120	0.047354	2-0	Pf 0.68
162	23-6			12.95		12-3½	Pe 0.86
134	21-6			14.49	PO(12-3½)	14-3½	Pv
CM	4.2600	77.24	1.74	120	0.001722	10-9½	Pf 0.02
134	21-6			14.49			Pe 0.03
131	21-5½			14.54		10-9½	Pv
CM	4.2600	154.24	3.47	120	0.006188	10-7	Pf 0.07
131	21-5½	76.99		14.54	Flow (q) from Route 4		Pe 0.03
129	21-4½			14.63		10-7	Pv
CM	4.2600	222.64	5.01	120	0.012204	11-0	Pf 0.13
129	21-4½	68.40		14.63	Flow (q) from Route 6		Pe 0.03
127	21-3½			14.80		11-0	Pv
RN	2.1570	19.66	1.73	120	0.003766	2-0	Pf 0.05
127	21-3½			14.80	PO(12-3½)	12-3½	Pe -0.86
155	23-3½			13.99		14-3½	Pv
BL	2.1570	19.66	1.73	120	0.003766	178-10½	Pf 0.77
155	23-3½			13.99	PO(12-3½)	24-7½	Pe
156	23-3½			14.76	PO(12-3½)	203-6	Pv
RN	2.1570	19.66	1.73	120	0.003766	2-0	Pf 0.05
156	23-3½			14.76		12-3½	Pe 0.86
128	21-3½			15.67	PO(12-3½)	14-3½	Pv
••••• Route 3 •••••							
BL	2.1570	12.83	1.13	120	0.001709	8-3½	Pf 0.01
1011	23-5½	29.80	11.2	7.08	Sprinkler		Pe
1010	23-5½			7.09		8-3½	Pv
BL	2.1570	42.65	3.74	120	0.015784	8-4½	Pf 0.13
1010	23-5½	29.83	11.2	7.09	Sprinkler		Pe
1009	23-5½			7.22		8-4½	Pv
BL	2.1570	72.76	6.39	120	0.042392	7-7	Pf 0.32
1009	23-5½	30.10	11.2	7.22	Sprinkler		Pe
1008	23-5½			7.55		7-7	Pv
BL	2.1570	103.52	9.09	120	0.081401	7-1	Pf 0.58
1008	23-5½	30.77	11.2	7.55	Sprinkler		Pe
1007	23-5½			8.12		7-1	Pv
BL	2.1570	135.44	11.89	120	0.133832	22-2½	Pf 4.62
1007	23-5½	31.92	11.2	8.12	Sprinkler,	12-3½	Pe
160	23-5½			12.74	PO(12-3½)	34-6	Pv
RN	2.1570	135.44	11.89	120	0.133832	2-0	Pf 1.92
160	23-5½			12.74		12-3½	Pe 0.87
132	21-5½			15.53	PO(12-3½)	14-4	Pv
••••• Route 4 •••••							
BL	2.1570	16.97	1.49	120	0.002869	7-2½	Pf 0.02
1011	23-5½	29.80	11.2	7.08	Sprinkler		Pe
1012	23-5½			7.10		7-2½	Pv

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
BL	2.1570	46.81	4.11	120		0.018748		
1012	23-5½	29.84	11.2	7.10		Sprinkler	8-8	Pf 0.16
1013	23-5½			7.26				Pe
							8-8	Pv
BL	2.1570	76.99	6.76	120		0.047067		
1013	23-5½	30.18	11.2	7.26		Sprinkler,	109-5½	Pf 5.73
159	23-5½			12.99		PO(12-3½)	12-3½	Pe
							121-9	Pv
RN	2.1570	76.99	6.76	120		0.047067		
159	23-5½			12.99			2-0	Pf 0.67
131	21-5½			14.54		PO(12-3½)	12-3½	Pe 0.87
							14-4	Pv
Route 5								
BL	2.1570	28.04	2.46	120		0.007262		
1004	23-4½	32.09	11.2	8.21		Sprinkler	8-4½	Pf 0.06
1003	23-4½			8.27				Pe
							8-4½	Pv
BL	2.1570	60.24	5.29	120		0.029897		
1003	23-4½	32.21	11.2	8.27		Sprinkler	7-7	Pf 0.23
1002	23-4½			8.50				Pe
							7-7	Pv
BL	2.1570	92.89	8.16	120		0.066611		
1002	23-4½	32.65	11.2	8.50		Sprinkler	7-1	Pf 0.47
1001	23-4½			8.97				Pe
							7-1	Pv
BL	2.1570	126.43	11.10	120		0.117823		
1001	23-4½	33.54	11.2	8.97		Sprinkler,	22-2½	Pf 4.07
158	23-4½			13.03		PO(12-3½)	12-3½	Pe
							34-6	Pv
RN	2.1570	126.43	11.10	120		0.117823		
158	23-4½			13.03			2-0	Pf 1.69
130	21-4½			15.59		PO(12-3½)	12-3½	Pe 0.87
							14-3½	Pv
Route 6								
BL	2.1570	4.05	0.36	120		0.000203		
1004	23-4½	32.09	11.2	8.21		Sprinkler	8-3½	Pf 0.00
1005	23-4½			8.21				Pe
							8-3½	Pv
BL	2.1570	36.15	3.17	120		0.011621		
1005	23-4½	32.09	11.2	8.21		Sprinkler	7-2½	Pf 0.08
1006	23-4½			8.29				Pe
							7-2½	Pv
BL	2.1570	68.40	6.01	120		0.037818		
1006	23-4½	32.26	11.2	8.29		Sprinkler,	118-1½	Pf 4.93
157	23-4½			13.23		PO(12-3½)	12-3½	Pe
							130-5	Pv
RN	2.1570	68.40	6.01	120		0.037818		
157	23-4½			13.23			2-0	Pf 0.54
129	21-4½			14.63		PO(12-3½)	12-3½	Pe 0.87
							14-3½	Pv
Route 7								
CM	4.2600	202.98	4.57	120		0.010285		
127	21-3½			14.80			10-8	Pf 0.11
125	21-3			14.94				Pe 0.03
							10-8	Pv
RN	2.1570	19.03	1.67	120		0.003546		
125	21-3			14.94		PO(12-3½)	2-0	Pf 0.05
153	23-3			14.12			12-3½	Pe -0.87
							14-4	Pv
BL	2.1570	19.03	1.67	120		0.003546		
153	23-3			14.12		PO(12-3½)	178-10½	Pf 0.72
154	23-3			14.84		PO(12-3½)	24-7½	Pe
							203-6	Pv
RN	2.1570	19.03	1.67	120		0.003546		
154	23-3			14.84			2-0	Pf 0.05
126	21-3			15.76		PO(12-3½)	12-3½	Pe 0.87
							14-4	Pv
Route 8								
CM	4.2600	183.95	4.14	120		0.008573		
125	21-3			14.94			11-0	Pf 0.09
123	21-2			15.07				Pe 0.03
							11-0	Pv
RN	2.1570	18.68	1.64	120		0.003425		
123	21-2			15.07		PO(12-3½)	2-0	Pf 0.05
151	23-2			14.25			12-3½	Pe -0.87
							14-4	Pv
BL	2.1570	18.68	1.64	120		0.003425		
151	23-2			14.25		PO(12-3½)	178-10½	Pf 0.70
152	23-2			14.94		PO(12-3½)	24-7½	Pe
							203-6	Pv
RN	2.1570	18.68	1.64	120		0.003425		
152	23-2			14.94			2-0	Pf 0.05
124	21-2			15.86		PO(12-3½)	12-3½	Pe 0.87
							14-4	Pv
Route 9								
CM	4.2600	165.28	3.72	120		0.007033		
123	21-2			15.07			11-0	Pf 0.08
121	21-1			15.18				Pe 0.03
							11-0	Pv
RN	2.1570	18.60	1.63	120		0.003400		
121	21-1			15.18		PO(12-3½)	2-0	Pf 0.05
149	23-1			14.36			12-3½	Pe -0.87
							14-3½	Pv

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
BL	2.1570	18.60	1.63	120		0.003400	178-10½	Pf 0.69
149	23-1			14.36		PO(12-3½)	24-7½	Pe
150	23-1			15.05		PO(12-3½)	203-6	Pv
RN	2.1570	18.60	1.63	120		0.003400	2-0	Pf 0.05
150	23-1			15.05			12-3½	Pe 0.87
122	21-1			15.96		PO(12-3½)	14-3½	Pv
Route 10								
CM	4.2600	146.67	3.30	120		0.005639	11-0	Pf 0.06
121	21-1			15.18				Pe 0.03
119	21-0			15.27			11-0	Pv
RN	2.1570	18.79	1.65	120		0.003464	2-0	Pf 0.05
119	21-0			15.27		PO(12-3½)	12-3½	Pe -0.86
147	23-0			14.46			14-3½	Pv
BL	2.1570	18.79	1.65	120		0.003464	178-10½	Pf 0.70
147	23-0			14.46		PO(12-3½)	24-7½	Pe
148	23-0			15.16		PO(12-3½)	203-6	Pv
RN	2.1570	18.79	1.65	120		0.003464	2-0	Pf 0.05
148	23-0			15.16			12-3½	Pe 0.86
120	21-0			16.07		PO(12-3½)	14-3½	Pv
Route 11								
CM	4.2600	127.88	2.88	120		0.004376	10-9	Pf 0.05
119	21-0			15.27				Pe 0.03
117	20-11½			15.35			10-9	Pv
RN	2.1570	19.21	1.69	120		0.003609	2-0	Pf 0.05
117	20-11½			15.35		PO(12-3½)	12-3½	Pe -0.87
145	22-11½			14.53			14-4	Pv
BL	2.1570	19.21	1.69	120		0.003609	178-10½	Pf 0.73
145	22-11½			14.53		PO(12-3½)	24-7½	Pe
146	22-11½			15.26		PO(12-3½)	203-6	Pv
RN	2.1570	19.21	1.69	120		0.003609	2-0	Pf 0.05
146	22-11½			15.26			12-3½	Pe 0.87
118	20-11½			16.19		PO(12-3½)	14-4	Pv
Route 12								
CM	4.2600	108.67	2.45	120		0.003238	10-3	Pf 0.03
117	20-11½			15.35				Pe 0.03
115	20-10½			15.41			10-3	Pv
RN	2.1570	19.82	1.74	120		0.003823	2-0	Pf 0.05
115	20-10½			15.41		PO(12-3½)	12-3½	Pe -0.87
143	22-10½			14.60			14-3½	Pv
BL	2.1570	19.82	1.74	120		0.003823	178-10½	Pf 0.78
143	22-10½			14.60		PO(12-3½)	24-7½	Pe
144	22-10½			15.38		PO(12-3½)	203-6	Pv
RN	2.1570	19.82	1.74	120		0.003823	2-0	Pf 0.05
144	22-10½			15.38			12-3½	Pe 0.87
116	20-10½			16.30		PO(12-3½)	14-3½	Pv
Route 13								
CM	4.2600	88.86	2.00	120		0.002231	10-3	Pf 0.02
115	20-10½			15.41				Pe 0.03
113	20-9½			15.46			10-3	Pv
RN	2.1570	20.60	1.81	120		0.004107	2-0	Pf 0.06
113	20-9½			15.46		PO(12-3½)	12-3½	Pe -0.86
141	22-9½			14.66			14-3½	Pv
BL	2.1570	20.60	1.81	120		0.004107	178-10½	Pf 0.84
141	22-9½			14.66		PO(12-3½)	24-7½	Pe
142	22-9½			15.50		PO(12-3½)	203-6	Pv
RN	2.1570	20.60	1.81	120		0.004107	2-0	Pf 0.06
142	22-9½			15.50			12-3½	Pe 0.86
114	20-9½			16.42		PO(12-3½)	14-3½	Pv
Route 14								
CM	4.2600	68.25	1.54	120		0.001370	11-0	Pf 0.02
113	20-9½			15.46				Pe 0.03
111	20-9			15.51			11-0	Pv
RN	2.1570	21.60	1.90	120		0.004481	2-0	Pf 0.06
111	20-9			15.51		PO(12-3½)	12-3½	Pe -0.87
139	22-9			14.70			14-4	Pv
BL	2.1570	21.60	1.90	120		0.004481	178-10½	Pf 0.91
139	22-9			14.70		PO(12-3½)	24-7½	Pe
140	22-9			15.61		PO(12-3½)	203-6	Pv
RN	2.1570	21.60	1.90	120		0.004481	2-0	Pf 0.06
140	22-9			15.61			12-3½	Pe 0.87
112	20-9			16.55		PO(12-3½)	14-4	Pv
Route 15								

Hydraulic Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#1

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
CM	4.2600	46.66	1.05	120		0.000678	11-0	Pf 0.01
111	20-9			15.51				Pe 0.03
109	20-8			15.55			11-0	Pv
RN	2.1570	22.72	1.99	120		0.004922	2-0	Pf 0.07
109	20-8			15.55		PO(12-3½)	12-3½	Pe -0.87
137	22-8			14.75			14-4	Pv
BL	2.1570	22.72	1.99	120		0.004922	178-10½	Pf 1.00
137	22-8			14.75		PO(12-3½)	24-7½	Pe
138	22-8			15.75		PO(12-3½)	203-6	Pv
RN	2.1570	22.72	1.99	120		0.004922	2-0	Pf 0.07
138	22-8			15.75			12-3½	Pe 0.87
110	20-8			16.69		PO(12-3½)	14-4	Pv
Route 16								
CM	4.2600	23.94	0.54	120		0.000197	11-0	Pf 0.00
109	20-8			15.55				Pe 0.03
107	20-7			15.58			11-0	Pv
RN	2.1570	23.94	2.10	120		0.005421	2-0	Pf 0.08
107	20-7			15.58		PO(12-3½)	12-3½	Pe -0.87
135	22-7			14.79			14-3½	Pv
BL	2.1570	23.94	2.10	120		0.005421	178-10½	Pf 1.10
135	22-7			14.79		PO(12-3½)	24-7½	Pe
136	22-7			15.90		PO(12-3½)	203-6	Pv
RN	2.1570	23.94	2.10	120		0.005421	2-0	Pf 0.08
136	22-7			15.90			12-3½	Pe 0.87
108	20-7			16.84		PO(12-3½)	14-3½	Pv
Route 17								
UG	7.8500	260.85	1.73	140		0.000627	249-2½	Pf 0.18
3	-4-0	260.85		36.10		Flow (q) from Route 18	42-11½	Pe
2	-4-0			36.29		T(42-11½)	292-2	Pv
UG	12.4600	260.85	0.69	140		0.000066	106-0½	Pf 0.01
2	-4-0			36.29				Pe
1	-4-0			36.29			106-0½	Pv
Route 18								
UG	8.3900	260.85	1.51	140		0.000453	704-8	Pf 0.35
4	-4-0			35.76			59-4½	Pe
3	-4-0			36.10		T(59-4½)	764-0½	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

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
BalV	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 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

Hydraulic Summary

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#3

Job

Job Number: S24-028	Design Engineer: Queen
Job Name: Powell Ryka Survey	State Certification/License Number:
Address 1: 4102 S. Meridian, Ste D	AHJ:
Address 2: Puyallup, WA 98373	Job Site/Building:
Address 3:	Drawing Name: S24-028 Powell Ryka Survey - 1-8th scale 12

System

Most Demanding Sprinkler Data: 11.2 K-Factor 29.63 at 7.00

Hose Allowance At Source: 250.00

Additional Hose Supplies

Node	Flow(gpm)

Total Hose Streams: 250.00

System Flow Demand: 582.30

Total Water Required (Including Hose Allowance): 832.30

Maximum Pressure Unbalance In Loops: 0.00

Maximum Velocity Above Ground: 8.01 between nodes 134 and 162

Maximum Velocity Under Ground: 3.38 between nodes 4 and 14

Volume capacity of Wet Pipes: 11010.64gal

Volume capacity of Dry Pipes:

Remote Area(s)

Occupancy: Ordinary Group II - Sales RA#3	Job Suffix:
Density: 0.20gpm/ft²	Area of Application: 1500.00ft² (Actual 1544.55ft²)
Number Of Sprinklers Calculated: 19	Coverage Per Sprinkler: 130.00ft²

Expires DEC 31, 24

WASHINGTON STATE CERTIFICATE OF COMPETENCY FIRE SPRINKLER SYSTEMS

Theodore M. Queen
4930-0205-C Level 3
Archer Construction, Inc.
ARCHEI*219DR

Signature: Ted Queen Date: 12·6·24

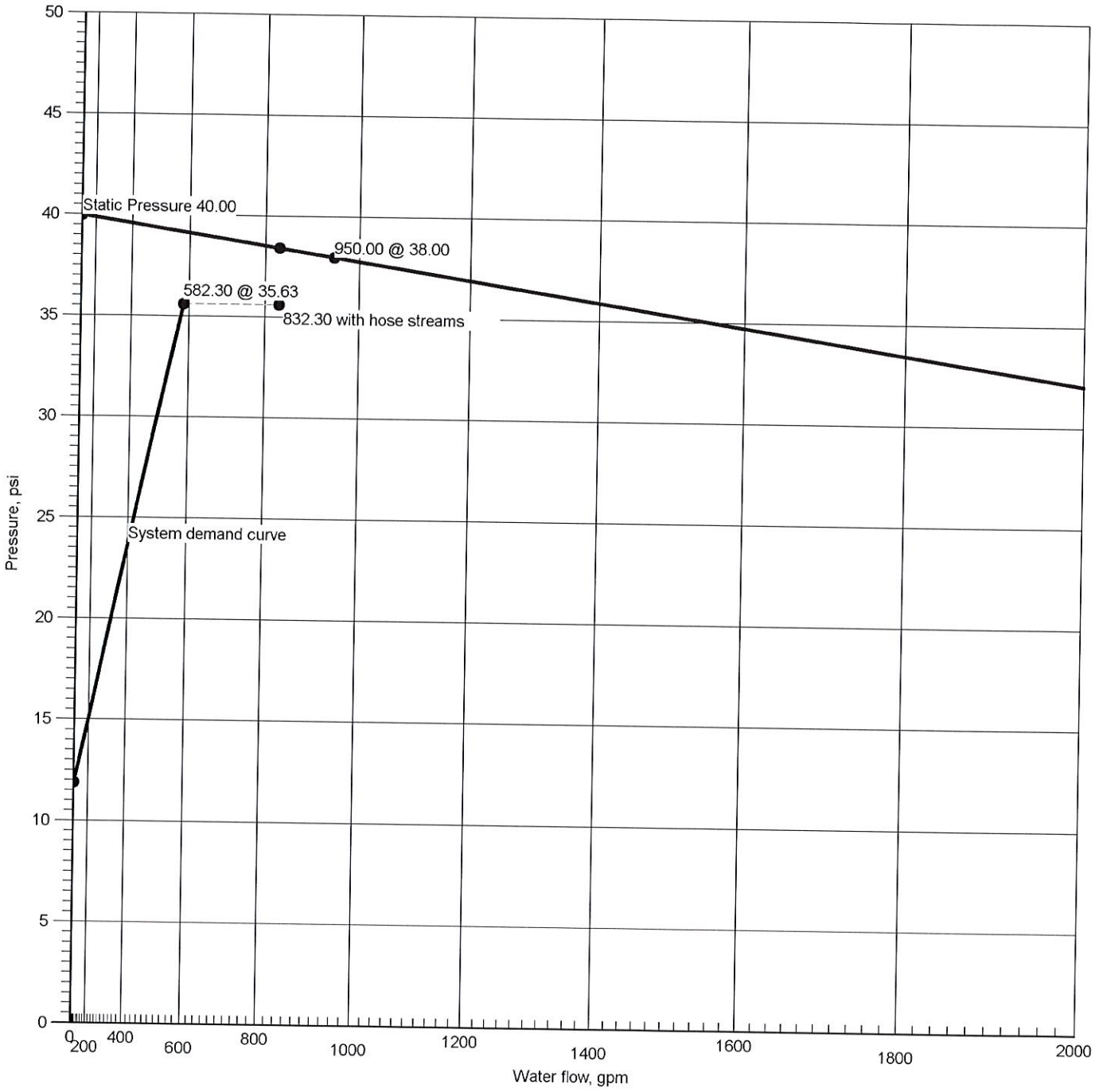
Supplies

Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi) @ Flow (gpm)	Available (psi) @ Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply	250.00	40.00	38.00 @ 950.00	38.43 @ 832.30	35.63	2.81

Contractor

Contractor Number: 22	Contact Name: / Contact Title:
Name of Contractor: Archer Construction	Phone: / Extension:
Address 1: 7855 South 206th ST	FAX:
Address 2: Kent, WA 98032	E-mail:
Address 3:	Web-Site:

Water Supply at Node 1



Hydraulic Graph	Water Supply at Node 1
Static: Pressure	40.00
Residual: Pressure	38.00 @ 950.00
Available Pressure at Time of Test	38.43 @ 832.30
System Demand	35.63 @ 582.30
System Demand (Including Hose Allowance at Source)	35.63 @ 832.30

Summary Of Outflowing Devices

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#3

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	2003	30.20	29.63	11.2	7.27		
Sprinkler	2004	29.76	29.63	11.2	7.06		
⇨ **Sprinkler**	**2005**	**29.63**	**29.63**	**11.2**	**7.00**		
Sprinkler	2006	29.63	29.63	11.2	7.00		
Sprinkler	2007	29.77	29.63	11.2	7.07		
Sprinkler	2010	30.55	29.63	11.2	7.44		
Sprinkler	2011	30.07	29.63	11.2	7.21		
Sprinkler	2012	29.93	29.63	11.2	7.14		
Sprinkler	2013	29.93	29.63	11.2	7.14		
Sprinkler	2014	30.06	29.63	11.2	7.20		
Sprinkler	2016	30.65	29.63	11.2	7.49		
Sprinkler	2017	30.18	29.63	11.2	7.26		
Sprinkler	2018	30.04	29.63	11.2	7.20		
Sprinkler	2019	30.04	29.63	11.2	7.20		
Sprinkler	2020	30.17	29.63	11.2	7.26		
Sprinkler	2021	30.29	29.63	11.2	7.31		
Sprinkler	2022	30.56	29.63	11.2	7.44		
Sprinkler	2023	30.68	29.63	11.2	7.50		
Sprinkler	2024	40.15	29.63	11.2	12.85		

⇨ Most Demanding Sprinkler Data

Node Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#3

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
1	-4-0	S	35.63	582.30	
2003	23-6	Spr(-7.27)	7.27	30.20	
2004	23-6	Spr(-7.06)	7.06	29.76	
2005	23-6	Spr(-7.00)	7.00	29.63	
2006	23-6	Spr(-7.00)	7.00	29.63	
2007	23-6	Spr(-7.07)	7.07	29.77	
2010	23-5½	Spr(-7.44)	7.44	30.55	
2011	23-5½	Spr(-7.21)	7.21	30.07	
2012	23-5½	Spr(-7.14)	7.14	29.93	
2013	23-5½	Spr(-7.14)	7.14	29.93	
2014	23-5½	Spr(-7.20)	7.20	30.06	
2016	23-4½	Spr(-7.49)	7.49	30.65	
2017	23-4½	Spr(-7.26)	7.26	30.18	
2018	23-4½	Spr(-7.20)	7.20	30.04	
2019	23-4½	Spr(-7.20)	7.20	30.04	
2020	23-4½	Spr(-7.26)	7.26	30.17	
2021	23-6	Spr(-7.31)	7.31	30.29	
2022	23-5½	Spr(-7.44)	7.44	30.56	
2023	23-4½	Spr(-7.50)	7.50	30.68	
2024	23-3½	Spr(-12.85)	12.85	40.15	
2	-4-0	T(42-11½)	35.62		
3	-4-0	T(59-4½)	35.46		
4	-4-0	T(59-4½)	35.15		
5	-4-0	T(98-3½)	35.55		
14	0-7		27.86		
20	1-8½	PO(41-1½)	26.91		
30	4-8½	LtE(15-3)	25.66		
40	1-8½	PO(37-8½)	26.78		
104	17-1	PO(6-0)	18.88		
105	18-4½	PO(6-0)	18.33		
106	19-8	PO(6-0)	17.32		
107	20-7	PO(12-3½)	14.80		
108	20-7	PO(12-3½)	16.58		
109	20-8	PO(12-3½)	14.76		
110	20-8	PO(12-3½)	16.45		
111	20-9	PO(12-3½)	14.72		
112	20-9	PO(12-3½)	16.32		
113	20-9½	PO(12-3½)	14.66		
114	20-9½	PO(12-3½)	16.21		
115	20-10½	PO(12-3½)	14.60		
116	20-10½	PO(12-3½)	16.11		
117	20-11½	PO(12-3½)	14.52		
118	20-11½	PO(12-3½)	16.01		
119	21-0	PO(12-3½)	14.42		
120	21-0	PO(12-3½)	15.92		
121	21-1	PO(12-3½)	14.28		
122	21-1	PO(12-3½)	15.84		
123	21-2	PO(12-3½)	14.12		
124	21-2	PO(12-3½)	15.76		
125	21-3	PO(12-3½)	13.93		
126	21-3	PO(12-3½)	15.68		
127	21-3½	PO(12-3½)	13.71		
128	21-3½	PO(12-3½)	15.62		
129	21-4½	PO(12-3½)	13.49		
130	21-4½	PO(12-3½)	15.56		
131	21-5½	PO(12-3½)	13.37		
132	21-5½	PO(12-3½)	15.52		
133	21-6	PO(12-3½)	15.48		
134	21-6	PO(12-3½)	13.31		
135	22-7	PO(12-3½)	14.04		
136	22-7	PO(12-3½)	15.61		
137	22-8	PO(12-3½)	14.00		

Node Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#3

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
138	22-8	PO(12-3½)	15.47		
139	22-9	PO(12-3½)	13.94		
140	22-9	PO(12-3½)	15.35		
141	22-9½	PO(12-3½)	13.90		
142	22-9½	PO(12-3½)	15.25		
143	22-10½	PO(12-3½)	13.83		
144	22-10½	PO(12-3½)	15.15		
145	22-11½	PO(12-3½)	13.74		
146	22-11½	PO(12-3½)	15.05		
147	23-0	PO(12-3½)	13.65		
148	23-0	PO(12-3½)	14.97		
149	23-1	PO(12-3½)	13.51		
150	23-1	PO(12-3½)	14.87		
151	23-2	PO(12-3½)	13.35		
152	23-2	PO(12-3½)	14.79		
153	23-3	PO(12-3½)	13.17		
154	23-3	PO(12-3½)	14.70		
155	23-3½	PO(12-3½)	12.85		
156	23-3½	PO(12-3½)	14.56		
157	23-4½	PO(12-3½)	11.70		
158	23-4½	PO(12-3½)	13.78		
159	23-5½	PO(12-3½)	11.59		
160	23-5½	PO(12-3½)	13.73		
161	23-6	PO(12-3½)	13.76		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt / Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 1 • • • • •							
BL	2.1570	28.08	2.46	120	0.007281	8-0	Pf 0.06
2005	23-6	29.63	11.2	7.00	Sprinkler		Pe
2004	23-6			7.06		8-0	Pv
BL	2.1570	57.83	5.08	120	0.027720	7-8½	Pf 0.21
2004	23-6	29.76	11.2	7.06	Sprinkler		Pe
2003	23-6			7.27		7-8½	Pv
BL	2.1570	88.03	7.73	120	0.060311	87-11	Pf 6.49
2003	23-6	30.20	11.2	7.27	Sprinkler,	19-8½	Pe
161	23-6			13.76	2LtE(3-8½), PO(12-3½)	107-7½	Pv
RN	2.1570	88.03	7.73	120	0.060311	2-0	Pf 0.86
161	23-6			13.76		12-3½	Pe 0.86
133	21-6			15.48	PO(12-3½)	14-3½	Pv
CM	6.3570	88.03	0.89	120	0.000312	9-3½	Pf 0.00
133	21-6			15.48			Pe 0.03
132	21-5½			15.52		9-3½	Pv
CM	6.3570	178.74	1.81	120	0.001157	10-7	Pf 0.01
132	21-5½	90.70		15.52	Flow (q) from Route 3		Pe 0.03
130	21-4½			15.56		10-7	Pv
CM	6.3570	269.43	2.72	120	0.002473	11-0	Pf 0.03
130	21-4½	90.70		15.56	Flow (q) from Route 5		Pe 0.03
128	21-3½			15.62		11-0	Pv
CM	6.3570	309.30	3.13	120	0.003192	10-8	Pf 0.03
128	21-3½	39.86		15.62	Flow (q) from Route 7		Pe 0.03
126	21-3			15.68		10-8	Pv
CM	6.3570	337.91	3.42	120	0.003759	11-0	Pf 0.04
126	21-3	28.61		15.68	Flow (q) from Route 2		Pe 0.03
124	21-2			15.76		11-0	Pv
CM	6.3570	365.46	3.69	120	0.004346	11-0	Pf 0.05
124	21-2	27.55		15.76	Flow (q) from Route 9		Pe 0.03
122	21-1			15.84		11-0	Pv
CM	6.3570	392.28	3.97	120	0.004954	11-0	Pf 0.05
122	21-1	26.82		15.84	Flow (q) from Route 10		Pe 0.03
120	21-0			15.92		11-0	Pv
CM	6.3570	418.66	4.23	120	0.005588	10-9	Pf 0.06
120	21-0	26.39		15.92	Flow (q) from Route 11		Pe 0.03
118	20-11½			16.01		10-9	Pv
CM	6.3570	444.91	4.50	120	0.006254	10-3	Pf 0.06
118	20-11½	26.25		16.01	Flow (q) from Route 12		Pe 0.03
116	20-10½			16.11		10-3	Pv
CM	6.3570	471.29	4.76	120	0.006957	10-3	Pf 0.07
116	20-10½	26.37		16.11	Flow (q) from Route 13		Pe 0.03
114	20-9½			16.21		10-3	Pv
CM	6.3570	498.01	5.03	120	0.007704	11-0	Pf 0.08
114	20-9½	26.72		16.21	Flow (q) from Route 14		Pe 0.03
112	20-9			16.32		11-0	Pv
CM	6.3570	525.31	5.31	120	0.008503	11-0	Pf 0.09
112	20-9	27.30		16.32	Flow (q) from Route 15		Pe 0.03
110	20-8			16.45		11-0	Pv
CM	6.3570	553.36	5.59	120	0.009362	11-0	Pf 0.10
110	20-8	28.05		16.45	Flow (q) from Route 16		Pe 0.03
108	20-7			16.58		11-0	Pv
CM	6.3570	582.30	5.89	120	0.010288	9-5	Pf 0.33
108	20-7	28.94		16.58	Flow (q) from Route 17	22-7½	Pe 0.41
106	19-8			17.32	2LtE(11-4)	32-0½	Pv
CM	6.3570	582.30	5.89	120	0.010288	30-7	Pf 1.69
106	19-8			17.32		133-3½	Pe 7.78
40	1-8½			26.78	2PO(37-8½), 4LtE(11-4), BV(12-7)	163-10½	Pv
CM	8.2490	582.30	3.50	120	0.002893	1-10½	Pf 0.12
40	1-8½			26.78		41-1½	Pe -0.00
20	1-8½			26.91	PO(41-1½)	42-11½	Pv
FR	8.2490	582.30	3.50	120	0.002893	3-0	Pf 0.05
20	1-8½			26.91		15-3	Pe -1.30
30	4-8½			25.66	LtE(15-3)	18-3½	Pv
CM	8.2490	582.30	3.50	120	0.002893	15-3½	Pf 0.41
30	4-8½			25.66		126-10	Pe 1.79
14	0-7			27.86	3LtE(15-3), 2BV(14-1), CV(52-10)	142-1½	Pv
UG	8.3900	582.30	3.38	140	0.002003	24-1	Pf 5.30
14	0-7			27.86		127-3	Pe 1.99
4	-4-0			35.15	2E(30-6½), BFP(-5.00), GV(6-9½), T(59-4½)	151-3½	Pv

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt / Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
UG	8.3900	337.04	1.96	140	0.000728	483-11½	Pf 0.40
4	-4-0			35.15		61-1	Pe
5	-4-0			35.55	4EE(15-3)	545-0½	Pv
UG	12.4600	337.04	0.89	140	0.000106	770-0½	Pf 0.08
5	-4-0			35.55			Pe
1	-4-0			35.63	Water Supply	770-0½	Pv
		250.00			Hose Allowance At Source		
1		832.30					
• • • • • Route 2 • • • • •							
BL	2.1570	1.56	0.14	120	0.000035	8-2	Pf 0.00
2005	23-6	29.63	11.2	7.00	Sprinkler		Pe
2006	23-6			7.00		8-2	Pv
BL	2.1570	31.19	2.74	120	0.008846	7-4	Pf 0.06
2006	23-6	29.63	11.2	7.00	Sprinkler		Pe
2007	23-6			7.07		7-4	Pv
BL	2.1570	60.96	5.35	120	0.030559	8-2	Pf 0.25
2007	23-6	29.77	11.2	7.07	Sprinkler		Pe
2021	23-6			7.31		8-2	Pv
BL	2.1570	91.25	8.01	120	0.064454	53-1	Pf 4.21
2021	23-6	30.29	11.2	7.31	Sprinkler,	12-3½	Pe
162	23-6			11.53	PO(12-3½)	65-4½	Pv
RN	2.1570	91.25	8.01	120	0.064454	2-0	Pf 0.92
162	23-6			11.53		12-3½	Pe 0.86
134	21-6			13.31	PO(12-3½)	14-3½	Pv
CM	4.2600	91.25	2.05	120	0.002344	10-9½	Pf 0.03
134	21-6			13.31			Pe 0.03
131	21-5½			13.37		10-9½	Pv
CM	4.2600	181.66	4.09	120	0.008376	10-7	Pf 0.09
131	21-5½	90.40		13.37	Flow (q) from Route 4		Pe 0.03
129	21-4½			13.49		10-7	Pv
CM	4.2600	272.72	6.14	120	0.017762	11-0	Pf 0.20
129	21-4½	91.06		13.49	Flow (q) from Route 6		Pe 0.03
127	21-3½			13.71		11-0	Pv
CM	4.2600	273.00	6.15	120	0.017797	10-8	Pf 0.19
127	21-3½	0.29		13.71	Flow (q) from Route 8		Pe 0.03
125	21-3			13.93		10-8	Pv
RN	2.1570	28.61	2.51	120	0.007541	2-0	Pf 0.11
125	21-3			13.93	PO(12-3½)	12-3½	Pe -0.87
153	23-3			13.17		14-4	Pv
BL	2.1570	28.61	2.51	120	0.007541	178-10½	Pf 1.53
153	23-3			13.17	PO(12-3½)	24-7½	Pe
154	23-3			14.70	PO(12-3½)	203-6	Pv
RN	2.1570	28.61	2.51	120	0.007541	2-0	Pf 0.11
154	23-3			14.70		12-3½	Pe 0.87
126	21-3			15.68	PO(12-3½)	14-4	Pv
• • • • • Route 3 • • • • •							
BL	2.1570	0.15	0.01	120	0.000000	8-2	Pf 0.00
2013	23-5½	29.93	11.2	7.14	Sprinkler		Pe
2012	23-5½			7.14		8-2	Pv
BL	2.1570	30.08	2.64	120	0.008273	8-0	Pf 0.07
2012	23-5½	29.93	11.2	7.14	Sprinkler		Pe
2011	23-5½			7.21		8-0	Pv
BL	2.1570	60.15	5.28	120	0.029816	7-8½	Pf 0.23
2011	23-5½	30.07	11.2	7.21	Sprinkler		Pe
2010	23-5½			7.44		7-8½	Pv
BL	2.1570	90.70	7.96	120	0.063739	86-5	Pf 6.29
2010	23-5½	30.55	11.2	7.44	Sprinkler,	12-3½	Pe
160	23-5½			13.73	PO(12-3½)	98-8½	Pv
RN	2.1570	90.70	7.96	120	0.063739	2-0	Pf 0.91
160	23-5½			13.73		12-3½	Pe 0.87
132	21-5½			15.52	PO(12-3½)	14-4	Pv
• • • • • Route 4 • • • • •							
BL	2.1570	29.79	2.62	120	0.008123	7-4	Pf 0.06
2013	23-5½	29.93	11.2	7.14	Sprinkler		Pe
2014	23-5½			7.20		7-4	Pv
BL	2.1570	59.85	5.25	120	0.029533	8-2	Pf 0.24
2014	23-5½	30.06	11.2	7.20	Sprinkler		Pe
2022	23-5½			7.44		8-2	Pv
BL	2.1570	90.40	7.94	120	0.063350	53-1	Pf 4.14
2022	23-5½	30.56	11.2	7.44	Sprinkler,	12-3½	Pe
159	23-5½			11.59	PO(12-3½)	65-4½	Pv

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
RN	2.1570	90.40	7.94	120		0.063350		
159	23-5½			11.59			2-0	Pf 0.91
131	21-5½			13.37		PO(12-3½)	12-3½	Pe 0.87
							14-4	Pv
• • • • • Route 5 • • • • •								
BL	2.1570	29.87	2.62	120		0.008165		
2018	23-4½	30.04	11.2	7.20		Sprinkler	8-0	Pf 0.07
2017	23-4½			7.26				Pe
							8-0	Pv
BL	2.1570	60.05	5.27	120		0.029717		
2017	23-4½	30.18	11.2	7.26		Sprinkler	7-8½	Pf 0.23
2016	23-4½			7.49				Pe
							7-8½	Pv
BL	2.1570	90.70	7.96	120		0.063731		
2016	23-4½	30.65	11.2	7.49		Sprinkler,	86-5	Pf 6.29
158	23-4½			13.78		PO(12-3½)	12-3½	Pe
							98-8½	Pv
RN	2.1570	90.70	7.96	120		0.063731		
158	23-4½			13.78			2-0	Pf 0.91
130	21-4½			15.56		PO(12-3½)	12-3½	Pe 0.87
							14-3½	Pv
• • • • • Route 6 • • • • •								
BL	2.1570	0.17	0.02	120		0.000001		
2018	23-4½	30.04	11.2	7.20		Sprinkler	8-2	Pf 0.00
2019	23-4½			7.20				Pe
							8-2	Pv
BL	2.1570	30.22	2.65	120		0.008342		
2019	23-4½	30.04	11.2	7.20		Sprinkler	7-4	Pf 0.06
2020	23-4½			7.26				Pe
							7-4	Pv
BL	2.1570	60.39	5.30	120		0.030029		
2020	23-4½	30.17	11.2	7.26		Sprinkler	8-2	Pf 0.25
2023	23-4½			7.50				Pe
							8-2	Pv
BL	2.1570	91.06	8.00	120		0.064206		
2023	23-4½	30.68	11.2	7.50		Sprinkler,	53-1	Pf 4.20
157	23-4½			11.70		PO(12-3½)	12-3½	Pe
							65-4½	Pv
RN	2.1570	91.06	8.00	120		0.064206		
157	23-4½			11.70			2-0	Pf 0.92
129	21-4½			13.49		PO(12-3½)	12-3½	Pe 0.87
							14-3½	Pv
• • • • • Route 7 • • • • •								
BL	2.1570	39.86	3.50	120		0.013927		
2024	23-3½	40.15	11.2	12.85		Sprinkler,	110-3½	Pf 1.71
156	23-3½			14.56		PO(12-3½)	12-3½	Pe
							122-7	Pv
RN	2.1570	39.86	3.50	120		0.013927		
156	23-3½			14.56			2-0	Pf 0.20
128	21-3½			15.62		PO(12-3½)	12-3½	Pe 0.86
							14-3½	Pv
• • • • • Route 8 • • • • •								
BL	2.1570	0.29	0.03	120		0.000002		
2024	23-3½	40.15	11.2	12.85		Sprinkler,	68-7	Pf 0.00
155	23-3½			12.85		PO(12-3½)	12-3½	Pe
							80-10½	Pv
RN	2.1570	0.29	0.03	120		0.000002		
155	23-3½			12.85			2-0	Pf 0.00
127	21-3½			13.71		PO(12-3½)	12-3½	Pe 0.86
							14-3½	Pv
• • • • • Route 9 • • • • •								
CM	4.2600	244.39	5.50	120		0.014501		
125	21-3			13.93			11-0	Pf 0.16
123	21-2			14.12				Pe 0.03
RN	2.1570	27.55	2.42	120		0.007033	11-0	Pv
123	21-2			14.12		PO(12-3½)	2-0	Pf 0.10
151	23-2			13.35			12-3½	Pe -0.87
							14-4	Pv
BL	2.1570	27.55	2.42	120		0.007033		
151	23-2			13.35		PO(12-3½)	178-10½	Pf 1.43
152	23-2			14.79		PO(12-3½)	24-7½	Pe
							203-6	Pv
RN	2.1570	27.55	2.42	120		0.007033		
152	23-2			14.79			2-0	Pf 0.10
124	21-2			15.76		PO(12-3½)	12-3½	Pe 0.87
							14-4	Pv
• • • • • Route 10 • • • • •								
CM	4.2600	216.84	4.88	120		0.011622		
123	21-2			14.12			11-0	Pf 0.13
121	21-1			14.28				Pe 0.03
RN	2.1570	26.82	2.35	120		0.006688	11-0	Pv
121	21-1			14.28		PO(12-3½)	2-0	Pf 0.10
149	23-1			13.51			12-3½	Pe -0.87
							14-3½	Pv
BL	2.1570	26.82	2.35	120		0.006688		
149	23-1			13.51		PO(12-3½)	178-10½	Pf 1.36
150	23-1			14.87		PO(12-3½)	24-7½	Pe
							203-6	Pv
RN	2.1570	26.82	2.35	120		0.006688		
150	23-1			14.87			2-0	Pf 0.10
122	21-1			15.84		PO(12-3½)	12-3½	Pe 0.87
							14-3½	Pv
• • • • • Route 11 • • • • •								

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
CM	4.2600	190.02	4.28	120		0.009104		
121	21-1			14.28			11-0	Pf 0.10
119	21-0			14.42				Pe 0.03
RN	2.1570	26.39	2.32	120		0.006492	11-0	Pv
119	21-0			14.42		PO(12-3½)		
147	23-0			13.65			2-0	Pf 0.09
BL	2.1570	26.39	2.32	120		0.006492	12-3½	Pe -0.86
147	23-0			13.65		PO(12-3½)	14-3½	Pv
148	23-0			14.97		PO(12-3½)		
RN	2.1570	26.39	2.32	120		0.006492	178-10½	Pf 1.32
148	23-0			14.97			24-7½	Pe
120	21-0			15.92		PO(12-3½)	203-6	Pv
Route 12							2-0	Pf 0.09
CM	4.2600	163.63	3.68	120		0.006904	12-3½	Pe 0.86
119	21-0			14.42			14-3½	Pv
117	20-11½			14.52				
RN	2.1570	26.25	2.30	120		0.006430		
117	20-11½			14.52		PO(12-3½)	10-9	Pf 0.07
145	22-11½			13.74				Pe 0.03
BL	2.1570	26.25	2.30	120		0.006430	10-9	Pv
145	22-11½			13.74		PO(12-3½)		
146	22-11½			15.05		PO(12-3½)	2-0	Pf 0.09
RN	2.1570	26.25	2.30	120		0.006430	12-3½	Pe -0.87
146	22-11½			15.05			14-4	Pv
118	20-11½			16.01		PO(12-3½)		
Route 13							178-10½	Pf 1.31
CM	4.2600	137.39	3.09	120		0.004996	24-7½	Pe
117	20-11½			14.52			203-6	Pv
115	20-10½			14.60				
RN	2.1570	26.37	2.32	120		0.006486		
115	20-10½			14.60		PO(12-3½)	2-0	Pf 0.09
143	22-10½			13.83			12-3½	Pe 0.87
BL	2.1570	26.37	2.32	120		0.006486	14-4	Pv
143	22-10½			13.83		PO(12-3½)		
144	22-10½			15.15		PO(12-3½)		
RN	2.1570	26.37	2.32	120		0.006486	10-3	Pf 0.05
144	22-10½			15.15				Pe 0.03
116	20-10½			16.11		PO(12-3½)	10-3	Pv
Route 14							2-0	Pf 0.09
CM	4.2600	111.01	2.50	120		0.003368	12-3½	Pe -0.87
115	20-10½			14.60			14-3½	Pv
113	20-9½			14.66				
RN	2.1570	26.72	2.35	120		0.006645		
113	20-9½			14.66		PO(12-3½)	178-10½	Pf 1.32
141	22-9½			13.90			24-7½	Pe
BL	2.1570	26.72	2.35	120		0.006645	203-6	Pv
141	22-9½			13.90		PO(12-3½)		
142	22-9½			15.25		PO(12-3½)		
RN	2.1570	26.72	2.35	120		0.006645	2-0	Pf 0.09
142	22-9½			15.25			12-3½	Pe 0.86
114	20-9½			16.21		PO(12-3½)	14-3½	Pv
Route 15								
CM	4.2600	84.29	1.90	120		0.002023		
113	20-9½			14.66			11-0	Pf 0.02
111	20-9			14.72				Pe 0.03
RN	2.1570	27.30	2.40	120		0.006913	11-0	Pv
111	20-9			14.72		PO(12-3½)		
139	22-9			13.94			2-0	Pf 0.10
BL	2.1570	27.30	2.40	120		0.006913	12-3½	Pe -0.87
139	22-9			13.94		PO(12-3½)	14-4	Pv
140	22-9			15.35		PO(12-3½)		
RN	2.1570	27.30	2.40	120		0.006913	178-10½	Pf 1.41
140	22-9			15.35			24-7½	Pe
112	20-9			16.32		PO(12-3½)	203-6	Pv
Route 16							2-0	Pf 0.10
CM	4.2600	56.99	1.28	120		0.000981	12-3½	Pe 0.87
111	20-9			14.72			14-4	Pv
109	20-8			14.76				
RN	2.1570	28.05	2.46	120		0.007270		
109	20-8			14.76		PO(12-3½)	11-0	Pf 0.01
137	22-8			14.00				Pe 0.03
							11-0	Pv
							2-0	Pf 0.10
							12-3½	Pe -0.87
							14-4	Pv

Hydraulic Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#3

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
BL	2.1570	28.05	2.46	120		0.007270	178-10½	Pf 1.48
137	22-8			14.00		PO(12-3½)	24-7½	Pe
138	22-8			15.47		PO(12-3½)	203-6	Pv
RN	2.1570	28.05	2.46	120		0.007270	2-0	Pf 0.10
138	22-8			15.47			12-3½	Pe 0.87
110	20-8			16.45		PO(12-3½)	14-4	Pv
Route 17								
CM	4.2600	28.94	0.65	120		0.000280	11-0	Pf 0.00
109	20-8			14.76				Pe 0.03
107	20-7			14.80			11-0	Pv
RN	2.1570	28.94	2.54	120		0.007701	2-0	Pf 0.11
107	20-7			14.80		PO(12-3½)	12-3½	Pe -0.87
135	22-7			14.04			14-3½	Pv
BL	2.1570	28.94	2.54	120		0.007701	178-10½	Pf 1.57
135	22-7			14.04		PO(12-3½)	24-7½	Pe
136	22-7			15.61		PO(12-3½)	203-6	Pv
RN	2.1570	28.94	2.54	120		0.007701	2-0	Pf 0.11
136	22-7			15.61			12-3½	Pe 0.87
108	20-7			16.58		PO(12-3½)	14-3½	Pv
Route 18								
UG	7.8500	245.26	1.63	140		0.000559	249-2½	Pf 0.16
3	-4-0	245.26		35.46		Flow (q) from Route 19	42-11½	Pe
2	-4-0			35.62		T(42-11½)	292-2	Pv
UG	12.4600	245.26	0.65	140		0.000059	106-0½	Pf 0.01
2	-4-0			35.62				Pe
1	-4-0			35.63			106-0½	Pv
Route 19								
UG	8.3900	245.26	1.42	140		0.000404	704-8	Pf 0.31
4	-4-0			35.15			59-4½	Pe
3	-4-0			35.46		T(59-4½)	764-0½	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

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
BalV	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
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
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

Hydraulic Summary

Job

Job Number: S24-028	Design Engineer: Queen
Job Name: Powell Ryka Survey	State Certification/License Number:
Address 1: 4102 S. Meridian, Ste D	AHJ:
Address 2: Puyallup, WA 98373	Job Site/Building:
Address 3:	Drawing Name: S24-028 Powell Ryka Survey - 1-8th scale 12

System

Most Demanding Sprinkler Data: 11.2 K-Factor 29.63 at 7.00

Hose Allowance At Source: 250.00

Additional Hose Supplies

Node	Flow(gpm)

Total Hose Streams: 250.00

System Flow Demand	Total Water Required (Including Hose Allowance)
594.47	844.47

Maximum Pressure Unbalance In Loops: 0.00

Maximum Velocity Above Ground: 11.07 between nodes 129 and 157

Maximum Velocity Under Ground: 3.45 between nodes 4 and 14

Volume capacity of Wet Pipes	Volume capacity of Dry Pipes
11010.64gal	

Remote Area(s)

Occupancy	Job Suffix
Ordinary Group II - Sales RA#4	
Density	**Area of Application**
0.20gpm/ft²	1500.00ft² (Actual 1513.83ft²)
Number Of Sprinklers Calculated	**Coverage Per Sprinkler**
19	130.00ft²

Expires DEC 31, 24

WASHINGTON STATE CERTIFICATE OF COMPETENCY FIRE SPRINKLER SYSTEMS

Theodore M. Queen
4930-0205-C Level 3
Archer Construction, Inc.
ARCHEI*219DR

Signature: Ted Queen Date: 12·6·24

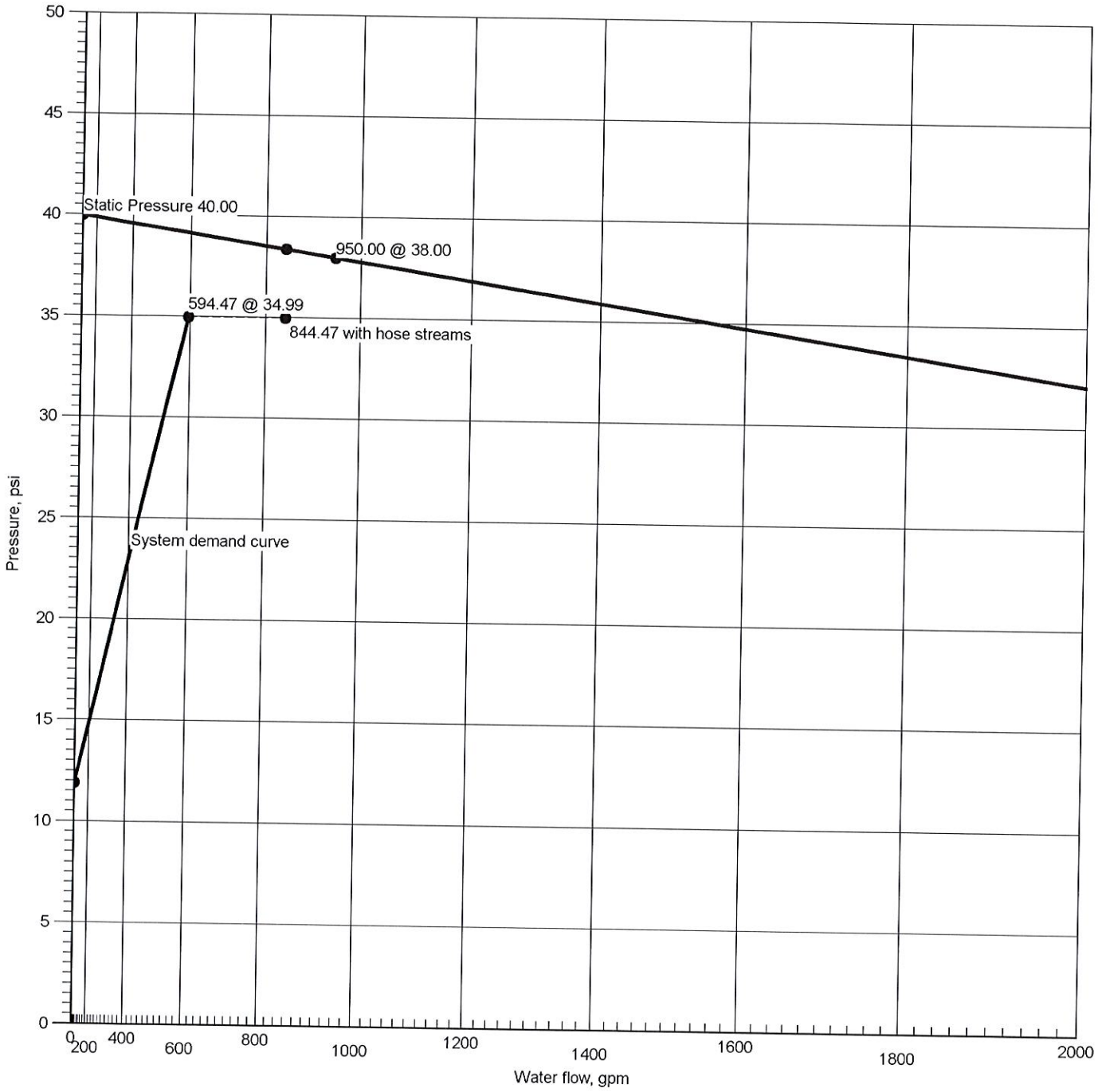
Supplies

Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi) @ Flow (gpm)	Available (psi) @ Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply	250.00	40.00	38.00 @ 950.00	38.39 @ 844.47	34.99	3.40

Contractor

Contractor Number: 22	Contact Name / Contact Title
Name of Contractor: Archer Construction	Phone / Extension
Address 1: 7855 South 206th ST	FAX
Address 2: Kent, WA 98032	E-mail
Address 3:	Web-Site

Water Supply at Node 1



Hydraulic Graph	Water Supply at Node 1
Static: Pressure	40.00
Residual: Pressure	38.00 @ 950.00
Available Pressure at Time of Test	38.39 @ 844.47
System Demand	34.99 @ 594.47
System Demand (Including Hose Allowance at Source)	34.99 @ 844.47

Summary Of Outflowing Devices

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#4

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	3001	31.87	29.63	11.2	8.10		
Sprinkler	3002	31.75	29.63	11.2	8.04		
Sprinkler	3003	31.75	29.63	11.2	8.04		
Sprinkler	3004	30.30	29.63	11.2	7.32		
Sprinkler	3005	29.76	29.63	11.2	7.06		
⇨ **Sprinkler**	**3006**	**29.63**	**29.63**	**11.2**	**7.00**		
Sprinkler	3007	32.02	29.63	11.2	8.18		
Sprinkler	3008	31.90	29.63	11.2	8.11		
Sprinkler	3009	31.90	29.63	11.2	8.11		
Sprinkler	3010	30.43	29.63	11.2	7.38		
Sprinkler	3011	29.89	29.63	11.2	7.12		
Sprinkler	3012	29.76	29.63	11.2	7.06		
Sprinkler	3013	32.28	29.63	11.2	8.30		
Sprinkler	3014	32.16	29.63	11.2	8.25		
Sprinkler	3015	32.16	29.63	11.2	8.25		
Sprinkler	3016	30.70	29.63	11.2	7.51		
Sprinkler	3017	30.15	29.63	11.2	7.25		
Sprinkler	3018	30.02	29.63	11.2	7.18		
Sprinkler	3019	36.03	29.63	11.2	10.35		

⇨ Most Demanding Sprinkler Data

Node Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#4

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
1	-4-0	S	34.99	594.47	
3001	23-6	Spr(-8.10)	8.10	31.87	
3002	23-6	Spr(-8.04)	8.04	31.75	
3003	23-6	Spr(-8.04)	8.04	31.75	
3004	23-6	Spr(-7.32)	7.32	30.30	
3005	23-6	Spr(-7.06)	7.06	29.76	
3006	23-6	Spr(-7.00)	7.00	29.63	
3007	23-5½	Spr(-8.18)	8.18	32.02	
3008	23-5½	Spr(-8.11)	8.11	31.90	
3009	23-5½	Spr(-8.11)	8.11	31.90	
3010	23-5½	Spr(-7.38)	7.38	30.43	
3011	23-5½	Spr(-7.12)	7.12	29.89	
3012	23-5½	Spr(-7.06)	7.06	29.76	
3013	23-4½	Spr(-8.30)	8.30	32.28	
3014	23-4½	Spr(-8.25)	8.25	32.16	
3015	23-4½	Spr(-8.25)	8.25	32.16	
3016	23-4½	Spr(-7.51)	7.51	30.70	
3017	23-4½	Spr(-7.25)	7.25	30.15	
3018	23-4½	Spr(-7.18)	7.18	30.02	
3019	23-3½	Spr(-10.35)	10.35	36.03	
2	-4-0	T(42-11½)	34.98		
3	-4-0	T(59-4½)	34.81		
4	-4-0	T(59-4½)	34.49		
5	-4-0	T(98-3½)	34.91		
14	0-7		27.19		
20	1-8½	PO(41-1½)	26.22		
30	4-8½	LtE(15-3)	24.97		
40	1-8½	PO(37-8½)	26.09		
104	17-1	PO(6-0)	18.14		
105	18-4½	PO(6-0)	17.59		
106	19-8	PO(6-0)	16.56		
107	20-7	PO(12-3½)	12.99		
108	20-7	PO(12-3½)	15.81		
109	20-8	PO(12-3½)	12.95		
110	20-8	PO(12-3½)	15.68		
111	20-9	PO(12-3½)	12.90		
112	20-9	PO(12-3½)	15.55		
113	20-9½	PO(12-3½)	12.84		
114	20-9½	PO(12-3½)	15.44		
115	20-10½	PO(12-3½)	12.75		
116	20-10½	PO(12-3½)	15.35		
117	20-11½	PO(12-3½)	12.64		
118	20-11½	PO(12-3½)	15.26		
119	21-0	PO(12-3½)	12.48		
120	21-0	PO(12-3½)	15.18		
121	21-1	PO(12-3½)	12.28		
122	21-1	PO(12-3½)	15.11		
123	21-2	PO(12-3½)	12.03		
124	21-2	PO(12-3½)	15.04		
125	21-3	PO(12-3½)	11.73		
126	21-3	PO(12-3½)	14.98		
127	21-3½	PO(12-3½)	11.37		
128	21-3½	PO(12-3½)	14.93		
129	21-4½	PO(12-3½)	10.98		
130	21-4½	PO(12-3½)	14.89		
131	21-5½	PO(12-3½)	10.80		
132	21-5½	PO(12-3½)	14.85		
133	21-6	PO(12-3½)	14.82		
134	21-6	PO(12-3½)	10.72		
135	22-7	PO(12-3½)	12.30		
136	22-7	PO(12-3½)	14.77		
137	22-8	PO(12-3½)	12.25		

Node Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#4

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
138	22-8	PO(12-3½)	14.64		
139	22-9	PO(12-3½)	12.19		
140	22-9	PO(12-3½)	14.52		
141	22-9½	PO(12-3½)	12.14		
142	22-9½	PO(12-3½)	14.42		
143	22-10½	PO(12-3½)	12.04		
144	22-10½	PO(12-3½)	14.32		
145	22-11½	PO(12-3½)	11.92		
146	22-11½	PO(12-3½)	14.22		
147	23-0	PO(12-3½)	11.79		
148	23-0	PO(12-3½)	14.15		
149	23-1	PO(12-3½)	11.59		
150	23-1	PO(12-3½)	14.07		
151	23-2	PO(12-3½)	11.35		
152	23-2	PO(12-3½)	13.98		
153	23-3	PO(12-3½)	11.05		
154	23-3	PO(12-3½)	13.91		
155	23-3½	PO(12-3½)	10.51		
156	23-3½	PO(12-3½)	13.84		
157	23-4½	PO(12-3½)	8.44		
158	23-4½	PO(12-3½)	13.58		
159	23-5½	PO(12-3½)	8.29		
160	23-5½	PO(12-3½)	13.53		
161	23-6	PO(12-3½)	13.53		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 1 • • • • •								
BL	2.1570	29.63	2.60	120		0.008046	7-7½	Pf 0.06
3006	23-6	29.63	11.2	7.00		Sprinkler		Pe
3005	23-6			7.06			7-7½	Pv
BL	2.1570	59.39	5.21	120		0.029123	8-10½	Pf 0.26
3005	23-6	29.76	11.2	7.06		Sprinkler		Pe
3004	23-6			7.32			8-10½	Pv
BL	2.1570	89.70	7.88	120		0.062436	2-2½	Pf 0.91
3004	23-6	30.30	11.2	7.32		Sprinkler,	12-3½	Pe
162	23-6			8.23		PO(12-3½)	14-6	Pv
RN	2.1570	124.44	10.93	120		0.114407	2-0	Pf 1.63
162	23-6	34.74		8.23		Flow (q) from Route 5	12-3½	Pe 0.86
134	21-6			10.72		PO(12-3½)	14-3½	Pv
CM	4.2600	124.44	2.80	120		0.004160	10-9½	Pf 0.04
134	21-6			10.72				Pe 0.03
131	21-5½			10.80			10-9½	Pv
CM	4.2600	248.50	5.59	120		0.014955	10-7	Pf 0.16
131	21-5½	124.07		10.80		Flow (q) from Route 2		Pe 0.03
129	21-4½			10.98			10-7	Pv
CM	4.2600	374.64	8.43	120		0.031960	11-0	Pf 0.35
129	21-4½	126.13		10.98		Flow (q) from Route 3		Pe 0.03
127	21-3½			11.37			11-0	Pv
RN	2.1570	7.40	0.65	120		0.000619	2-0	Pf 0.01
127	21-3½			11.37		PO(12-3½)	12-3½	Pe -0.86
155	23-3½			10.51			14-3½	Pv
BL	2.1570	43.43	3.81	120		0.016321	178-10½	Pf 3.32
155	23-3½	36.03		10.51		PO(12-3½), Flow (q) from Route	24-7½	Pe
156	23-3½			13.84		10	203-6	Pv
						PO(12-3½)		
RN	2.1570	43.43	3.81	120		0.016321	2-0	Pf 0.23
156	23-3½			13.84			12-3½	Pe 0.86
128	21-3½			14.93		PO(12-3½)	14-3½	Pv
CM	6.3570	227.23	2.30	120		0.001804	10-8	Pf 0.02
128	21-3½	183.80		14.93		Flow (q) from Route 4		Pe 0.03
126	21-3			14.98			10-8	Pv
CM	6.3570	267.24	2.70	120		0.002435	11-0	Pf 0.03
126	21-3	40.00		14.98		Flow (q) from Route 11		Pe 0.03
124	21-2			15.04			11-0	Pv
CM	6.3570	305.57	3.09	120		0.003121	11-0	Pf 0.03
124	21-2	38.33		15.04		Flow (q) from Route 12		Pe 0.03
122	21-1			15.11			11-0	Pv
CM	6.3570	342.63	3.46	120		0.003857	11-0	Pf 0.04
122	21-1	37.06		15.11		Flow (q) from Route 13		Pe 0.03
120	21-0			15.18			11-0	Pv
CM	6.3570	378.78	3.83	120		0.004643	10-9	Pf 0.05
120	21-0	36.15		15.18		Flow (q) from Route 14		Pe 0.03
118	20-11½			15.26			10-9	Pv
CM	6.3570	414.39	4.19	120		0.005483	10-3	Pf 0.06
118	20-11½	35.61		15.26		Flow (q) from Route 15		Pe 0.03
116	20-10½			15.35			10-3	Pv
CM	6.3570	449.79	4.55	120		0.006381	10-3	Pf 0.07
116	20-10½	35.40		15.35		Flow (q) from Route 16		Pe 0.03
114	20-9½			15.44			10-3	Pv
CM	6.3570	485.27	4.91	120		0.007343	11-0	Pf 0.08
114	20-9½	35.47		15.44		Flow (q) from Route 17		Pe 0.03
112	20-9			15.55			11-0	Pv
CM	6.3570	521.07	5.27	120		0.008377	11-0	Pf 0.09
112	20-9	35.80		15.55		Flow (q) from Route 18		Pe 0.03
110	20-8			15.68			11-0	Pv
CM	6.3570	557.41	5.63	120		0.009489	11-0	Pf 0.10
110	20-8	36.34		15.68		Flow (q) from Route 19		Pe 0.03
108	20-7			15.81			11-0	Pv
CM	6.3570	594.47	6.01	120		0.010689	9-5	Pf 0.34
108	20-7	37.06		15.81		Flow (q) from Route 20	22-7½	Pe 0.41
106	19-8			16.56		2LtE(11-4)	32-0½	Pv
CM	6.3570	594.47	6.01	120		0.010689	30-7	Pf 1.75
106	19-8			16.56			133-3½	Pe 7.78
40	1-8½			26.09		2PO(37-8½), 4LtE(11-4),	163-10½	Pv
						BV(12-7)		
CM	8.2490	594.47	3.57	120		0.003005	1-10½	Pf 0.13
40	1-8½			26.09			41-1½	Pe -0.00
20	1-8½			26.22		PO(41-1½)	42-11½	Pv

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt / Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
FR	8.2490	594.47	3.57	120	0.003005		
20	1-8½			26.22		3-0	Pf 0.05
30	4-8½			24.97	LtE(15-3)	15-3	Pe -1.30
						18-3½	Pv
CM	8.2490	594.47	3.57	120	0.003005		
30	4-8½			24.97		15-3½	Pf 0.43
14	0-7			27.19	3LtE(15-3), 2BV(14-1), CV(52-10)	126-10	Pe 1.79
						142-1½	Pv
UG	8.3900	594.47	3.45	140	0.002081		
14	0-7			27.19		24-1	Pf 5.31
4	-4-0			34.49	2E(30-6½), BFP(-5.00), GV(6-9½), T(59-4½)	127-3	Pe 1.99
						151-3½	Pv
UG	8.3900	344.08	2.00	140	0.000757		
4	-4-0			34.49		483-11½	Pf 0.41
5	-4-0			34.91	4EE(15-3)	61-1	Pe
						545-0½	Pv
UG	12.4600	344.08	0.91	140	0.000110		
5	-4-0			34.91		770-0½	Pf 0.08
1	-4-0			34.99	Water Supply		Pe
		250.00			Hose Allowance At Source	770-0½	Pv
1		844.47					
••••• Route 2 •••••							
BL	2.1570	29.76	2.61	120	0.008109		
3012	23-5½	29.76	11.2	7.06	Sprinkler	7-7½	Pf 0.06
3011	23-5½			7.12			Pe
						7-7½	Pv
BL	2.1570	59.64	5.24	120	0.029350		
3011	23-5½	29.89	11.2	7.12	Sprinkler	8-10½	Pf 0.26
3010	23-5½			7.38			Pe
						8-10½	Pv
BL	2.1570	90.07	7.91	120	0.062922		
3010	23-5½	30.43	11.2	7.38	Sprinkler,	2-2½	Pf 0.91
159	23-5½			8.29	PO(12-3½)	12-3½	Pe
						14-6	Pv
RN	2.1570	124.07	10.89	120	0.113780		
159	23-5½	33.99		8.29	Flow (q) from Route 7	2-0	Pf 1.63
131	21-5½			10.80	PO(12-3½)	12-3½	Pe 0.87
						14-4	Pv
••••• Route 3 •••••							
BL	2.1570	30.02	2.64	120	0.008241		
3018	23-4½	30.02	11.2	7.18	Sprinkler	7-7½	Pf 0.06
3017	23-4½			7.25			Pe
						7-7½	Pv
BL	2.1570	60.17	5.28	120	0.029830		
3017	23-4½	30.15	11.2	7.25	Sprinkler	8-10½	Pf 0.26
3016	23-4½			7.51			Pe
						8-10½	Pv
BL	2.1570	90.87	7.98	120	0.063952		
3016	23-4½	30.70	11.2	7.51	Sprinkler,	2-2½	Pf 0.93
157	23-4½			8.44	PO(12-3½)	12-3½	Pe
						14-6	Pv
RN	2.1570	126.13	11.07	120	0.117311		
157	23-4½	35.27		8.44	Flow (q) from Route 9	2-0	Pf 1.68
129	21-4½			10.98	PO(12-3½)	12-3½	Pe 0.87
						14-3½	Pv
••••• Route 4 •••••							
BL	2.1570	28.77	2.53	120	0.007616		
3002	23-6	31.75	11.2	8.04	Sprinkler	7-7	Pf 0.06
3001	23-6			8.10			Pe
						7-7	Pv
BL	2.1570	60.63	5.32	120	0.030256		
3001	23-6	31.87	11.2	8.10	Sprinkler,	159-9½	Pf 5.43
161	23-6			13.53	2LtE(3-8½), PO(12-3½)	19-8½	Pe
						179-6	Pv
RN	2.1570	60.63	5.32	120	0.030256		
161	23-6			13.53		2-0	Pf 0.43
133	21-6			14.82	PO(12-3½)	12-3½	Pe 0.86
						14-3½	Pv
CM	6.3570	60.63	0.61	120	0.000157		
133	21-6			14.82		9-3½	Pf 0.00
132	21-5½			14.85			Pe 0.03
						9-3½	Pv
CM	6.3570	122.47	1.24	120	0.000575		
132	21-5½	61.84		14.85	Flow (q) from Route 6	10-7	Pf 0.01
130	21-4½			14.89			Pe 0.03
						10-7	Pv
CM	6.3570	183.80	1.86	120	0.001219		
130	21-4½	61.33		14.89	Flow (q) from Route 8	11-0	Pf 0.01
128	21-3½			14.93			Pe 0.03
						11-0	Pv
••••• Route 5 •••••							
BL	2.1570	2.99	0.26	120	0.000115		
3002	23-6	31.75	11.2	8.04	Sprinkler	7-11	Pf 0.00
3003	23-6			8.04			Pe
						7-11	Pv
BL	2.1570	34.74	3.05	120	0.010798		
3003	23-6	31.75	11.2	8.04	Sprinkler,	5-1	Pf 0.19
162	23-6			8.23	PO(12-3½)	12-3½	Pe
						17-4½	Pv
••••• Route 6 •••••							

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
BL	2.1570	29.81	2.62	120		0.008136		
3008	23-5½	31.90	11.2	8.11		Sprinkler	7-7	Pf 0.06
3007	23-5½			8.18				Pe
							7-7	Pv
BL	2.1570	61.84	5.43	120		0.031376		
3007	23-5½	32.02	11.2	8.18		Sprinkler,	158-3½	Pf 5.35
160	23-5½			13.53		PO(12-3½)	12-3½	Pe
							170-7	Pv
RN	2.1570	61.84	5.43	120		0.031376		
160	23-5½			13.53			2-0	Pf 0.45
132	21-5½			14.85		PO(12-3½)	12-3½	Pe 0.87
							14-4	Pv
Route 7								
BL	2.1570	2.09	0.18	120		0.000060		
3008	23-5½	31.90	11.2	8.11		Sprinkler	7-11	Pf 0.00
3009	23-5½			8.11				Pe
							7-11	Pv
BL	2.1570	33.99	2.98	120		0.010373		
3009	23-5½	31.90	11.2	8.11		Sprinkler,	5-1	Pf 0.18
159	23-5½			8.29		PO(12-3½)	12-3½	Pe
							17-4½	Pv
Route 8								
BL	2.1570	29.06	2.55	120		0.007760		
3014	23-4½	32.16	11.2	8.25		Sprinkler	7-7	Pf 0.06
3013	23-4½			8.30				Pe
							7-7	Pv
BL	2.1570	61.33	5.39	120		0.030907		
3013	23-4½	32.28	11.2	8.30		Sprinkler,	158-3½	Pf 5.27
158	23-4½			13.58		PO(12-3½)	12-3½	Pe
							170-7	Pv
RN	2.1570	61.33	5.39	120		0.030907		
158	23-4½			13.58			2-0	Pf 0.44
130	21-4½			14.89		PO(12-3½)	12-3½	Pe 0.87
							14-3½	Pv
Route 9								
BL	2.1570	3.10	0.27	120		0.000124		
3014	23-4½	32.16	11.2	8.25		Sprinkler	7-11	Pf 0.00
3015	23-4½			8.25				Pe
							7-11	Pv
BL	2.1570	35.27	3.10	120		0.011103		
3015	23-4½	32.16	11.2	8.25		Sprinkler,	5-1	Pf 0.19
157	23-4½			8.44		PO(12-3½)	12-3½	Pe
							17-4½	Pv
Route 10								
BL	2.1570	36.03	3.16	120		0.011550		
3019	23-3½	36.03	11.2	10.35		Sprinkler,	2-2½	Pf 0.17
155	23-3½			10.51		PO(12-3½)	12-3½	Pe
							14-6	Pv
Route 11								
CM	4.2600	367.23	8.27	120		0.030801		
127	21-3½			11.37			10-8	Pf 0.33
125	21-3			11.73				Pe 0.03
RN	2.1570	40.00	3.51	120		0.014017	10-8	Pv
125	21-3			11.73		PO(12-3½)	2-0	Pf 0.20
153	23-3			11.05			12-3½	Pe -0.87
BL	2.1570	40.00	3.51	120		0.014017	14-4	Pv
153	23-3			11.05		PO(12-3½)	178-10½	Pf 2.85
154	23-3			13.91		PO(12-3½)	24-7½	Pe
RN	2.1570	40.00	3.51	120		0.014017	203-6	Pv
154	23-3			13.91			2-0	Pf 0.20
126	21-3			14.98		PO(12-3½)	12-3½	Pe 0.87
							14-4	Pv
Route 12								
CM	4.2600	327.23	7.37	120		0.024883		
125	21-3			11.73			11-0	Pf 0.27
123	21-2			12.03				Pe 0.03
RN	2.1570	38.33	3.37	120		0.012955	11-0	Pv
123	21-2			12.03		PO(12-3½)	2-0	Pf 0.19
151	23-2			11.35			12-3½	Pe -0.87
BL	2.1570	38.33	3.37	120		0.012955	14-4	Pv
151	23-2			11.35		PO(12-3½)	178-10½	Pf 2.64
152	23-2			13.98		PO(12-3½)	24-7½	Pe
RN	2.1570	38.33	3.37	120		0.012955	203-6	Pv
152	23-2			13.98			2-0	Pf 0.19
124	21-2			15.04		PO(12-3½)	12-3½	Pe 0.87
							14-4	Pv
Route 13								
CM	4.2600	288.90	6.50	120		0.019761		
123	21-2			12.03			11-0	Pf 0.22
121	21-1			12.28				Pe 0.03
RN	2.1570	37.06	3.25	120		0.012167	11-0	Pv
121	21-1			12.28		PO(12-3½)	2-0	Pf 0.17
149	23-1			11.59			12-3½	Pe -0.87
BL	2.1570	37.06	3.25	120		0.012167	14-3½	Pv
149	23-1			11.59		PO(12-3½)	178-10½	Pf 2.48
150	23-1			14.07		PO(12-3½)	24-7½	Pe
							203-6	Pv

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
RN	2.1570	37.06	3.25	120		0.012167	2-0	Pf 0.17
150	23-1			14.07			12-3½	Pe 0.87
122	21-1			15.11		PO(12-3½)	14-3½	Pv
••••• Route 14 •••••								
CM	4.2600	251.84	5.67	120		0.015329	11-0	Pf 0.17
121	21-1			12.28				Pe 0.03
119	21-0			12.48			11-0	Pv
RN	2.1570	36.15	3.17	120		0.011625	2-0	Pf 0.17
119	21-0			12.48		PO(12-3½)	12-3½	Pe -0.86
147	23-0			11.79			14-3½	Pv
BL	2.1570	36.15	3.17	120		0.011625	178-10½	Pf 2.37
147	23-0			11.79		PO(12-3½)	24-7½	Pe
148	23-0			14.15		PO(12-3½)	203-6	Pv
RN	2.1570	36.15	3.17	120		0.011625	2-0	Pf 0.17
148	23-0			14.15			12-3½	Pe 0.86
120	21-0			15.18		PO(12-3½)	14-3½	Pv
••••• Route 15 •••••								
CM	4.2600	215.69	4.86	120		0.011508	10-9	Pf 0.12
119	21-0			12.48				Pe 0.03
117	20-11½			12.64			10-9	Pv
RN	2.1570	35.61	3.13	120		0.011304	2-0	Pf 0.16
117	20-11½			12.64		PO(12-3½)	12-3½	Pe -0.87
145	22-11½			11.92			14-4	Pv
BL	2.1570	35.61	3.13	120		0.011304	178-10½	Pf 2.30
145	22-11½			11.92		PO(12-3½)	24-7½	Pe
146	22-11½			14.22		PO(12-3½)	203-6	Pv
RN	2.1570	35.61	3.13	120		0.011304	2-0	Pf 0.16
146	22-11½			14.22			12-3½	Pe 0.87
118	20-11½			15.26		PO(12-3½)	14-4	Pv
••••• Route 16 •••••								
CM	4.2600	180.08	4.05	120		0.008242	10-3	Pf 0.08
117	20-11½			12.64				Pe 0.03
115	20-10½			12.75			10-3	Pv
RN	2.1570	35.40	3.11	120		0.011183	2-0	Pf 0.16
115	20-10½			12.75		PO(12-3½)	12-3½	Pe -0.87
143	22-10½			12.04			14-3½	Pv
BL	2.1570	35.40	3.11	120		0.011183	178-10½	Pf 2.28
143	22-10½			12.04		PO(12-3½)	24-7½	Pe
144	22-10½			14.32		PO(12-3½)	203-6	Pv
RN	2.1570	35.40	3.11	120		0.011183	2-0	Pf 0.16
144	22-10½			14.32			12-3½	Pe 0.87
116	20-10½			15.35		PO(12-3½)	14-3½	Pv
••••• Route 17 •••••								
CM	4.2600	144.67	3.26	120		0.005497	10-3	Pf 0.06
115	20-10½			12.75				Pe 0.03
113	20-9½			12.84			10-3	Pv
RN	2.1570	35.47	3.11	120		0.011224	2-0	Pf 0.16
113	20-9½			12.84		PO(12-3½)	12-3½	Pe -0.86
141	22-9½			12.14			14-3½	Pv
BL	2.1570	35.47	3.11	120		0.011224	178-10½	Pf 2.28
141	22-9½			12.14		PO(12-3½)	24-7½	Pe
142	22-9½			14.42		PO(12-3½)	203-6	Pv
RN	2.1570	35.47	3.11	120		0.011224	2-0	Pf 0.16
142	22-9½			14.42			12-3½	Pe 0.86
114	20-9½			15.44		PO(12-3½)	14-3½	Pv
••••• Route 18 •••••								
CM	4.2600	109.20	2.46	120		0.003267	11-0	Pf 0.04
113	20-9½			12.84				Pe 0.03
111	20-9			12.90			11-0	Pv
RN	2.1570	35.80	3.14	120		0.011414	2-0	Pf 0.16
111	20-9			12.90		PO(12-3½)	12-3½	Pe -0.87
139	22-9			12.19			14-4	Pv
BL	2.1570	35.80	3.14	120		0.011414	178-10½	Pf 2.32
139	22-9			12.19		PO(12-3½)	24-7½	Pe
140	22-9			14.52		PO(12-3½)	203-6	Pv
RN	2.1570	35.80	3.14	120		0.011414	2-0	Pf 0.16
140	22-9			14.52			12-3½	Pe 0.87
112	20-9			15.55		PO(12-3½)	14-4	Pv
••••• Route 19 •••••								
CM	4.2600	73.40	1.65	120		0.001567	11-0	Pf 0.02
111	20-9			12.90				Pe 0.03
109	20-8			12.95			11-0	Pv

Hydraulic Analysis

Job Number: S24-028
Report Description: Ordinary Group II - Sales RA#4

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt / Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
RN	2.1570	36.34	3.19	120	0.011738	2-0	Pf 0.17
109	20-8			12.95	PO(12-3½)	12-3½	Pe -0.87
137	22-8			12.25		14-4	Pv
BL	2.1570	36.34	3.19	120	0.011738	178-10½	Pf 2.39
137	22-8			12.25	PO(12-3½)	24-7½	Pe
138	22-8			14.64	PO(12-3½)	203-6	Pv
RN	2.1570	36.34	3.19	120	0.011738	2-0	Pf 0.17
138	22-8			14.64		12-3½	Pe 0.87
110	20-8			15.68	PO(12-3½)	14-4	Pv
• • • • • Route 20 • • • • •							
CM	4.2600	37.06	0.83	120	0.000442	11-0	Pf 0.00
109	20-8			12.95			Pe 0.03
107	20-7			12.99		11-0	Pv
RN	2.1570	37.06	3.25	120	0.012168	2-0	Pf 0.17
107	20-7			12.99	PO(12-3½)	12-3½	Pe -0.87
135	22-7			12.30		14-3½	Pv
BL	2.1570	37.06	3.25	120	0.012168	178-10½	Pf 2.48
135	22-7			12.30	PO(12-3½)	24-7½	Pe
136	22-7			14.77	PO(12-3½)	203-6	Pv
RN	2.1570	37.06	3.25	120	0.012168	2-0	Pf 0.17
136	22-7			14.77		12-3½	Pe 0.87
108	20-7			15.81	PO(12-3½)	14-3½	Pv
• • • • • Route 21 • • • • •							
UG	7.8500	250.38	1.66	140	0.000581	249-2½	Pf 0.17
3	-4-0	250.38		34.81	Flow (q) from Route 22	42-11½	Pe
2	-4-0			34.98	T(42-11½)	292-2	Pv
UG	12.4600	250.38	0.66	140	0.000061	106-0½	Pf 0.01
2	-4-0			34.98			Pe
1	-4-0			34.99		106-0½	Pv
• • • • • Route 22 • • • • •							
UG	8.3900	250.38	1.45	140	0.000420	704-8	Pf 0.32
4	-4-0			34.49		59-4½	Pe
3	-4-0			34.81	T(59-4½)	764-0½	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: S24-028
Report Description: Ordinary Group II - Sales RA#4

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
BalV	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
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
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

FRUITLAND MUTUAL WATER COMPANY

P.O. Box 73759 ~ 4001 9th St. S.W.~ Puyallup, WA 98373 ~ (253) 848-5519

FIRE FLOW TESTS

Area Surveyed: Best Buy

Flow Test Conducted By: Ben Ames, Charles Blar **Date: 10/5/2010**

Pumps and Tanks Operating During Flow Test: 2A, 3

System Consumption Rate During Test: **Time of Day: 1:45 pm**

	PRESSURE-LBS/SQ. IN.				DISCHARGE GPM			*
LOCATION	STATIC	RESID.	PITOT	ORIFICE	OBSERVED	REC.	20 LBS.	DISTRICT
Parking lot at Best Buy	40	38	36	2.5	950		3183	

Flow Formulas from Fair and Geyer-"Elements of Water Supply and Waste Water Disposal".

Q_1 (GPM) $= 29.82cd^2\sqrt{p}$

(Using c = 0.9 and d = 2½")

$Q_1 = 167.74\sqrt{p}$

*DISTRICTS

PB-Principal Business

OB-Other Business

SC-Shopping Center

IND-Industrial

RES-Residential

INS-Institutional

SR-Single Risk

$$Q_2 \text{ (GPM)} = Q_1 \bullet P_1/P_2 = Q_1\sqrt{\frac{(P_s - 20)}{(P_s - P_r)}}$$

Where:

"Static" pressure-(P_s)-indicates normal pressure in main at time of test.

"Residual" pressure-(P_r)-indicates pressure in main during flow at hydrant (s).

"Pitot" pressure-(p)-indicates measured velocity head of stream at hydrant outlet.

"Observed" discharge-(Q_1)-shows flow computed from noted pressures.

"Discharged-20psi"-(Q_2)-is computed flow available for pumping engines.

"Recommended" discharge-(Rec.)-is the flow considered for fire insurance grading purposes.

Column headed "Orifice" shows number and size (inches) of outlets opened.

NOTE: Tests are taken to determine ability of the distribution system to deliver supply for fire use at designated residual pressures.

All comments and recommendations made by these Departments relate solely to Fire Insurance rating or grading considerations and other uses by these Departments. No representations or warranties of any kind are intended or made.

Ted Queen

From: Ted Hardiman <ted@fruitlandwater.com>
Sent: Wednesday, April 3, 2024 8:47 AM
To: Ted Queen
Subject: Emailing: Best Buy
Attachments: Best Buy.xls

Ted,

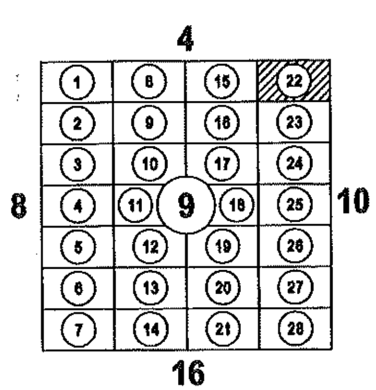
The test is older but our hydraulics have not changed.

Ted

Your message is ready to be sent with the following file or link attachments:

Best Buy

Note: To protect against computer viruses, e-mail programs may prevent sending or receiving certain types of file attachments. Check your e-mail security settings to determine how attachments are handled.

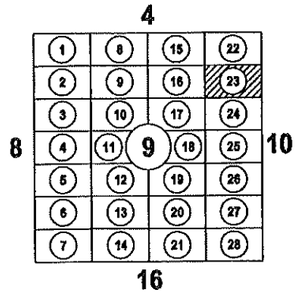


SCALE IN FEET
0 50 100

THIS MAP SHOWS THE APPROXIMATE LOCATION OF THE WATER MAINS AND APPURTENANCES LOCATED WITHIN THE SERVICE AREA OF FRUITLAND MUTUAL WATER COMPANY. IT SHOULD NOT BE USED FOR CONSTRUCTION OR DESIGN PURPOSES. THIS IS NOT AN AS-BUILT OR RECORD DRAWING AND IS NOT MEANT TO REPLACE INFORMATION ATTAINABLE BY A SURVEY OF THE WATER MAIN LOCATION BASED ON VISIBLE APPURTENANCES.

UPDATED: MAR 2011	SHEET 9-22 09-19-4E
SCALE: 1"=100'	FRUITLAND MUTUAL WATER CO.

FILE: SECT-09-22 LA1 ... PLOTTED BY: Belzyjoh IMAGES: Fruitland | XREF'S: XSU1992001P27-BA | XSU1992001P27-TB | XSU1992001P27-BA-EX SURF
DATE: May 17, 2011 - 10:...



SCALE IN FEET
0 50 100

THIS MAP SHOWS THE APPROXIMATE LOCATION OF THE WATER MAINS AND APPURTENANCES LOCATED WITHIN THE SERVICE AREA OF FRUITLAND MUTUAL WATER COMPANY. IT SHOULD NOT BE USED FOR CONSTRUCTION OR DESIGN PURPOSES. THIS IS NOT AN AS-BUILT OR RECORD DRAWING AND IS NOT MEANT TO REPLACE INFORMATION ATTAINABLE BY A SURVEY OF THE WATER MAIN LOCATION BASED ON VISIBLE APPURTENANCES.

UPDATED: MAR 2011	SHEET 9-23 09-19-4E
SCALE: 1"=100'	FRUITLAND MUTUAL WATER CO.

FILE: SECT-09-23 LAYOUT: 9-23
DATE: Apr 07, 2011 - 2:29pm PLOTTED BY: brentkat
IMAGES: Fruitland | XSU1992001P27-6A | XSU1992001P27-7B | XSU1992001P27-8A-DX SURF | topo#2006_dtp
XREFS: XSU1992001P27-6A