

SPRINX

FIRE PROTECTION

EST. 1999

2709 Jahn Ave NW, Suite H2, Gig Harbor WA 98335

Ph. (253) 853-7780 - www.SprinxFire.com

Hydraulic Calculations

 Expires DEC 31, 25	WASHINGTON STATE CERTIFICATE OF COMPETENCY FIRE SPRINKLER SYSTEMS
Joseph G. Faulkner 9491-0699-CEG Level 3 Sprinx Fire Protection, Inc. SPRINFP011LS	
<i>Joseph G. Faulkner</i> Signature	<i>12/03/2025</i> Date

Sprinx Fire Protection, Inc.
2709 Jahn Ave NW
Suite H2
Gig Harbor, WA 98335
(253)853-7780

Job Name : ETC Lot-1 Remote Area #1
Drawing : FP2.0
Location : 2902 E PIONEER, PUYALLUP WA 98372
Remote Area : #1
Contract : 24-093CM
Data File : ETC Lot-1 Area 1.WXF
Date/Time : 12/03/2025 - 03:38 PM

HYDRAULIC CALCULATIONS
for

JOB NAME ETC Lot-1 Remote Area #1
Location 2902 E PIONEER, PUYALLUP WA 98372
Drawing # FP2.0
Contract # 24-093CM
Date 12/03/2025

DESIGN

Remote area # #1
Remote area location WEST TENANT SPACE
Occupancy classification "M" OCCUPANCY ORDINARY HAZARD GP-2
Density 0.2 - Gpm/SqFt
Area of application 1070 - SqFt
Coverage/sprinkler 96 - SqFt
Type of sprinkler calculated QR K=5.6
Sprinklers calculated 11
In-rack demand N/A - GPM
Hose streams 250 - GPM
Total water required (including hose streams) 471.962 - GPM @ 32.8092 - Psi
Type of system WET
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 4/16/2024
Location SITE FIRE FLOW AVAILABILITY
Source of info GREY & OSBORNE ENG.

CONTRACTOR INFO Sprinx Fire Protection, Inc.
Address 2709 Jahn Ave NW / Suite H2 / Gig Harbor, WA 98335
Phone # (253)853-7780
Name of designer JGF/BW
Authority having jurisdiction CITY OF PUYALLUP

NOTES:

QR AREA REDUCTION OF 30% FOR 16'-0" CEILINGS
1050 SQ FT REQUIRED

text1(35) - invisible

Water Supply Curve

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #1

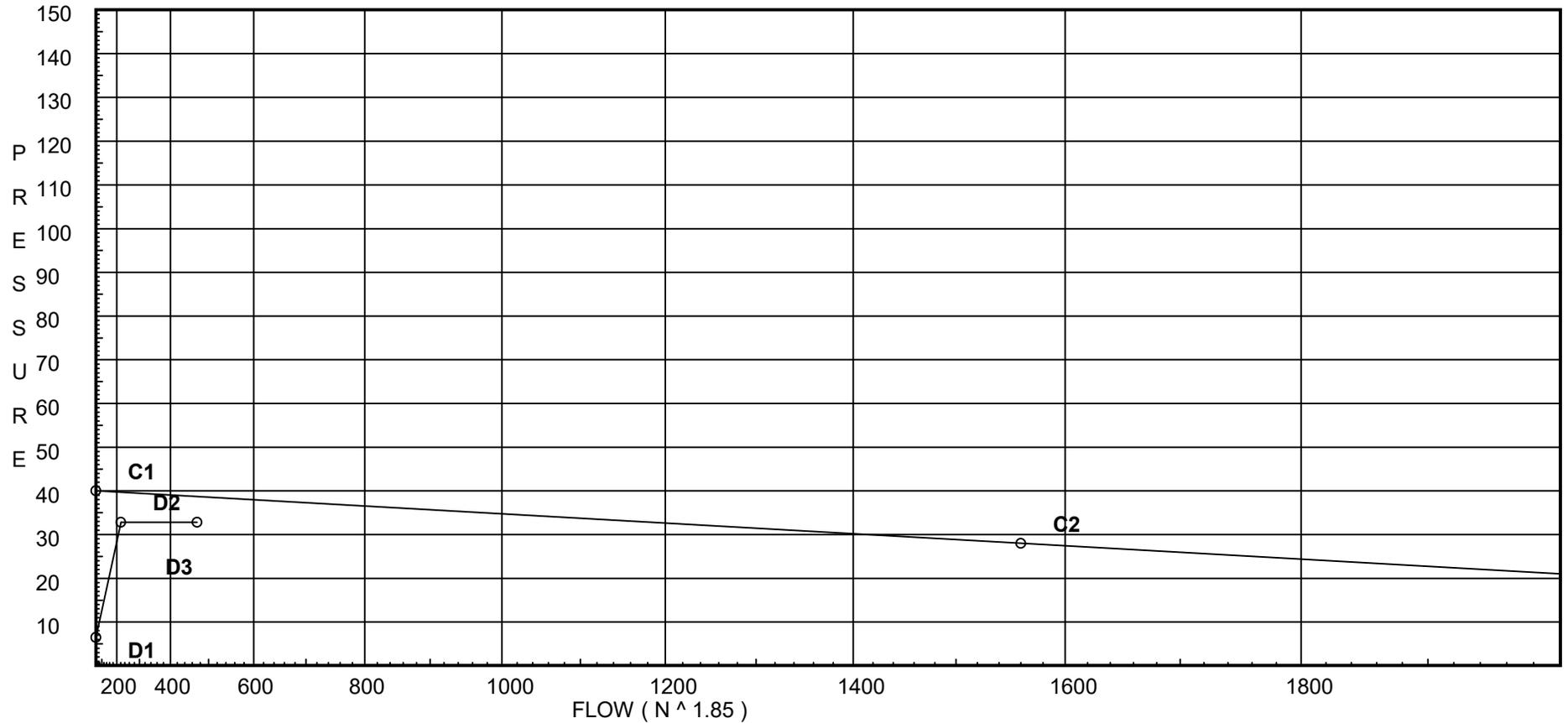
Page 2
Date 12/03/2025

City Water Supply:

C1 - Static Pressure : 40
C2 - Residual Pressure: 28
C2 - Residual Flow : 1560

Demand:

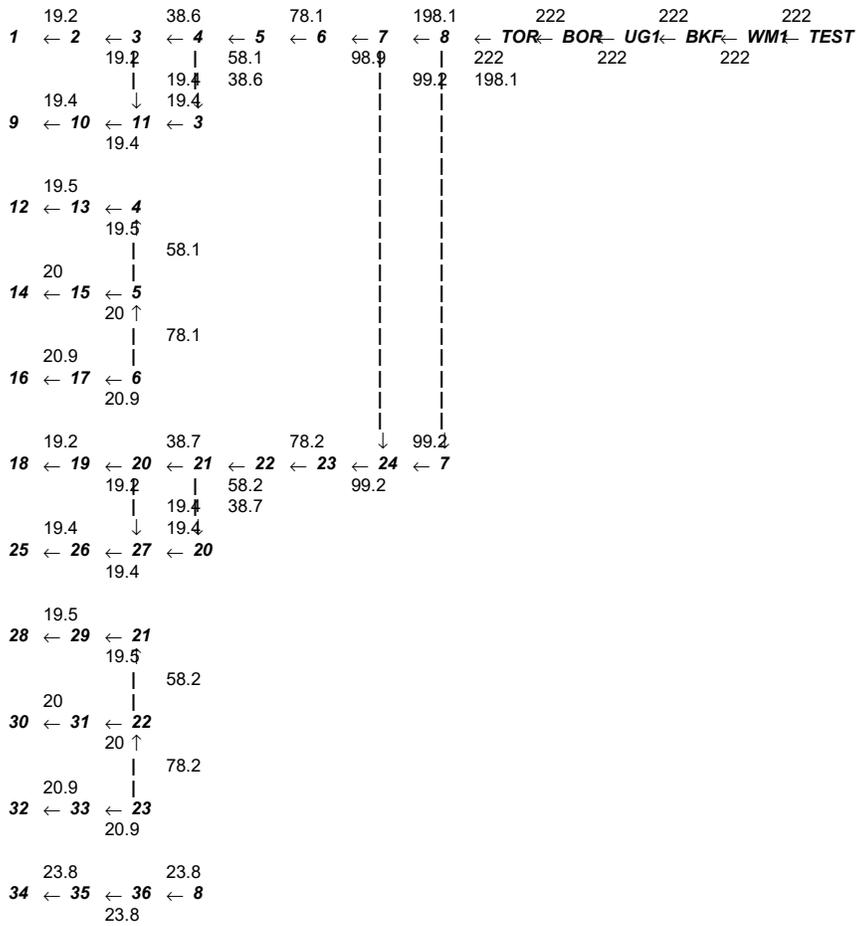
D1 - Elevation : 6.462
D2 - System Flow : 221.962
D2 - System Pressure : 32.809
Hose (Demand) : 250
D3 - System Demand : 471.962
Safety Margin : 5.877



Flow Diagram

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #1

Page 3
Date 12/03/2025



Fittings Used Summary

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #1

Page 4
Date 12/03/2025

Fitting Legend

Abbrev.	Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
V	90' EII Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0
Ziw	Wilkins 350AST	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Flow Summary - NFPA

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #1

Page 5
Date 12/03/2025

SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
TEST	40.0	28	1560.0	38.686	471.96	32.809

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
1	14.92	5.6	11.76	19.2	96
2	12.5		13.34		
3	12.5		14.0		
4	12.5		14.35		
5	12.5		15.09		
6	12.5		16.37		
7	12.5		21.32		
8	12.5		21.42		
TOR	12.5		22.14		
BOR	3.0		27.01		
UG1	1.0		27.9		
BKF	0.0		28.58		
WM1	0.0		32.72		
TEST	0.0		32.81	250.0	
9	14.92	5.6	12.0	19.4	96
10	12.5		13.6		
11	12.5		13.9		
12	14.92	5.6	12.07	19.46	96
13	12.5		13.67		
14	14.92	5.6	12.75	20.0	96
15	12.5		14.37		
16	14.92	5.6	13.92	20.89	96
17	12.5		15.59		
18	14.7	5.6	11.81	19.25	96
19	12.5		13.27		
20	12.5		13.94		
21	12.5		14.29		
22	12.5		15.03		
23	12.5		16.32		
24	12.5		21.29		
25	14.7	5.6	12.06	19.45	96
26	12.5		13.53		
27	12.5		13.84		
28	14.7	5.6	12.13	19.5	96
29	12.5		13.61		
30	14.7	5.6	12.81	20.04	96
31	12.5		14.31		
32	14.7	5.6	13.99	20.95	96
33	12.5		15.54		
34	15.13	5.6	18.1	23.82	96
35	12.5		20.07		
36	12.5		21.06		

Flow Summary - NFPA

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #1

Page 6
Date 12/03/2025

NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
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Final Calculations : Hazen-Williams

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #1

Page 7
Date 12/03/2025

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
1 to 2	14.92 12.5	5.60	19.20 19.2	1 1.049	E	2.0	2.420 2.000 4.420	120 0.1206	11.755 1.048 0.533			Vel = 7.13
2 to 3	12.5 12.5		0.0 19.2	1 1.049	T	5.0	0.500 5.000 5.500	120 0.1207	13.336 0.0 0.664			Vel = 7.13
3 to 4	12.5 12.5		19.40 38.6	1.5 1.728			9.000 9.000	120 0.0387	14.000 0.0 0.348			Vel = 5.28
4 to 5	12.5 12.5		19.46 58.06	1.5 1.728			9.000 9.000	120 0.0822	14.348 0.0 0.740			Vel = 7.94
5 to 6	12.5 12.5		20.00 78.06	1.5 1.728			9.000 9.000	120 0.1421	15.088 0.0 1.279			Vel = 10.68
6 to 7	12.5 12.5		20.89 98.95	1.5 1.728	T	11.29	11.160 11.290 22.450	120 0.2205	16.367 0.0 4.950			Vel = 13.54
7 to 8	12.5 12.5		99.19 198.14	4 4.31			10.670 10.670	120 0.0093	21.317 0.0 0.099			Vel = 4.36
8 to TOR	12.5 12.5		23.82 221.96	4 4.31	3V	28.431	34.710 28.431 63.141	120 0.0115	21.416 0.0 0.724			Vel = 4.88
TOR to BOR	12.5 3		0.0 221.96	4 4.31	V B S	9.477 16.724 30.661	9.500 56.862 66.362	120 0.0115	22.140 4.114 0.761			Vel = 4.88
BOR to UG1	3 1		0.0 221.96	4 4.31			2.000 2.000	120 0.0115	27.015 0.866 0.023			Vel = 4.88
UG1 to BKF	1 0		0.0 221.96	6 6.16	3E 2F	60.252 20.084	80.000 80.336 160.336	140 0.0015	27.904 0.433 0.243			Vel = 2.39
BKF to WM1	0 0		0.0 221.96	6 6.16	Ziw G T	0.0 4.304 43.037	18.000 47.341 65.341	140 0.0015	28.580 4.041 0.098		** Fixed Loss = 4.041	Vel = 2.39
WM1 to TEST	0 0		0.0 221.96	6 6.16	T G	43.037 4.304	12.000 47.341 59.341	140 0.0015	32.719 0.0 0.090			Vel = 2.39
TEST			250.00 471.96						32.809		Qa = 250.00 K Factor = 82.40	
9 to 10	14.92 12.5	5.60	19.40 19.4	1 1.049	E	2.0	2.420 2.000 4.420	120 0.1231	12.003 1.048 0.544			Vel = 7.20
10 to 11	12.5 12.5		0.0 19.4	1 1.049	E	2.0	0.500 2.000 2.500	120 0.1232	13.595 0.0 0.308			Vel = 7.20
11 to 3	12.5 12.5		0.0 19.4	1.5 1.728			9.000 9.000	120 0.0108	13.903 0.0 0.097			Vel = 2.65

Final Calculations : Hazen-Williams

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #1

Page 8
Date 12/03/2025

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
			0.0 19.40					14.000		K Factor =	5.18
3 to 12	14.92	5.60	19.46	1	E 2.0	2.420	120	12.073			
12 to 13	12.5		19.46	1.049		2.000 4.420	0.1238	1.048 0.547		Vel =	7.22
13 to 4	12.5		0.0	1	T 5.0	0.500	120	13.668			
4 to 14	12.5		19.46	1.049		5.000 5.500	0.1236	0.0 0.680		Vel =	7.22
			0.0 19.46					14.348		K Factor =	5.14
4 to 14	14.92	5.60	20.00	1	E 2.0	2.420	120	12.750			
14 to 15	12.5		20.0	1.049		2.000 4.420	0.1299	1.048 0.574		Vel =	7.42
15 to 5	12.5		0.0	1	T 5.0	0.500	120	14.372			
5 to 16	12.5		20.0	1.049		5.000 5.500	0.1302	0.0 0.716		Vel =	7.42
			0.0 20.00					15.088		K Factor =	5.15
5 to 16	14.92	5.60	20.89	1	E 2.0	2.420	120	13.920			
16 to 17	12.5		20.89	1.049		2.000 4.420	0.1410	1.048 0.623		Vel =	7.75
17 to 6	12.5		0.0	1	T 5.0	0.500	120	15.591			
6 to 18	12.5		20.89	1.049		5.000 5.500	0.1411	0.0 0.776		Vel =	7.75
			0.0 20.89					16.367		K Factor =	5.16
6 to 18	14.7	5.60	19.25	1	E 2.0	2.200	120	11.811			
18 to 19	12.5		19.25	1.049		2.000 4.200	0.1212	0.953 0.509		Vel =	7.15
19 to 20	12.5		0.0	1	T 5.0	0.500	120	13.273			
20 to 21	12.5		19.25	1.049		5.000 5.500	0.1213	0.0 0.667		Vel =	7.15
21 to 22	12.5		19.44	1.5		9.000	120	13.940			
22 to 23	12.5		38.69	1.728		9.000	0.0388	0.0 0.349		Vel =	5.29
23 to 24	12.5		19.51	1.5		9.000	120	14.289			
24 to 25	12.5		58.2	1.728		9.000	0.0826	0.0 0.743		Vel =	7.96
25 to 26	12.5		20.04	1.5		9.000	120	15.032			
26 to 27	12.5		78.24	1.728		9.000	0.1428	0.0 1.285		Vel =	10.70
27 to 28	12.5		20.95	1.5	T 11.29	11.160	120	16.317			
28 to 29	12.5		99.19	1.728		11.290 22.450	0.2215	0.0 4.972		Vel =	13.57
29 to 30	12.5		0.0	4		10.670	120	21.289			
30 to 7	12.5		99.19	4.31		10.670	0.0026	0.0 0.028		Vel =	2.18

Final Calculations : Hazen-Williams

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #1

Page 9
Date 12/03/2025

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
7			0.0 99.19					21.317		K Factor = 21.48	
25 to 26	14.7 12.5	5.60	19.45	1	E 2.0	2.200 2.000 4.200	120	12.061 0.953		Vel = 7.22	
26 to 27	12.5 12.5		0.0	1	E 2.0	0.500 2.000 2.500	120	13.533 0.0		Vel = 7.22	
27 to 20	12.5 12.5		0.0	1.5		9.000	120	13.842 0.0		Vel = 2.66	
20			0.0 19.45					13.940		K Factor = 5.21	
28 to 29	14.7 12.5	5.60	19.50	1	E 2.0	2.200 2.000 4.200	120	12.131 0.953		Vel = 7.24	
29 to 21	12.5 12.5		0.0	1	T 5.0	0.500 5.000 5.500	120	13.606 0.0		Vel = 7.24	
21			0.0 19.50					14.289		K Factor = 5.16	
30 to 31	14.7 12.5	5.60	20.04	1	E 2.0	2.200 2.000 4.200	120	12.812 0.953		Vel = 7.44	
31 to 22	12.5 12.5		0.0	1	T 5.0	0.500 5.000 5.500	120	14.314 0.0		Vel = 7.44	
22			0.0 20.04					15.032		K Factor = 5.17	
32 to 33	14.7 12.5	5.60	20.95	1	E 2.0	2.200 2.000 4.200	120	13.990 0.953		Vel = 7.78	
33 to 23	12.5 12.5		0.0	1	T 5.0	0.500 5.000 5.500	120	15.538 0.0		Vel = 7.78	
23			0.0 20.95					16.317		K Factor = 5.19	
34 to 35	15.13 12.5	5.60	23.82	1	E 2.0	2.630 2.000 4.630	120	18.099 1.139		Vel = 8.84	
35 to 36	12.5 12.5		0.0	1	T 5.0	0.500 5.000 5.500	120	20.071 0.0		Vel = 8.84	
36 to 8	12.5 12.5		0.0	1.5	T 11.29	11.160 11.290 22.450	120	21.060 0.0		Vel = 3.26	
8			0.0 23.82					21.416		K Factor = 5.15	

Final Calculations : Hazen-Williams

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #1

Page 10
Date 12/03/2025

Node1	Elev1	K	Qa	Nom	Fitting		Pipe	CFact	Pt			
to					or		Ftngs		Pe	*****	Notes	*****
Node2	Elev2	Fact	Qt	Act	Equiv	Len	Total	Pf/Ft	Pf			

SPRINX

FIRE PROTECTION

EST. 1999

2709 Jahn Ave NW, Suite H2, Gig Harbor WA 98335

Ph. (253) 853-7780 - www.SprinxFire.com

Hydraulic Calculations

 Expires DEC 31, 25	WASHINGTON STATE CERTIFICATE OF COMPETENCY FIRE SPRINKLER SYSTEMS
Joseph G. Faulkner 9491-0699-CEG Level 3 Sprinx Fire Protection, Inc. SPRINFP011LS	
<i>Joseph P. Faulkner</i> Signature	<i>12/03/2025</i> Date

Sprinx Fire Protection, Inc.
2709 Jahn Ave NW
Suite H2
Gig Harbor, WA 98335
(253)853-7780

Job Name	: ETC Lot-1 Remote Area #2
Drawing	: FP2.0
Location	: 2902 E PIONEER, PUYALLUP WA 98372
Remote Area	: #2
Contract	: 24-093CM
Data File	: ETC Lot-1 Area 2.WXF
Date/Time	: 12/03/2025 - 03:39 PM

HYDRAULIC CALCULATIONS
for

JOB NAME ETC Lot-1 Remote Area #2
Location 2902 E PIONEER, PUYALLUP WA 98372
Drawing # FP2.0
Contract # 24-093CM
Date 12/03/2025

DESIGN

Remote area # #2
Remote area location EAST TENANT SPACE
Occupancy classification "M" OCCUPANCY ORDINARY HAZARD GP-2
Density 0.2 - Gpm/SqFt
Area of application 1070 - SqFt
Coverage/sprinkler 96 - SqFt
Type of sprinkler calculated QR K=5.6
Sprinklers calculated 13
In-rack demand N/A - GPM
Hose streams 250 - GPM
Total water required (including hose streams) 491.364 - GPM @ 29.7902 - Psi
Type of system WET
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 4/16/2024
Location SITE FIRE FLOW AVAILABILITY
Source of info GREY & OSBORNE ENG.

CONTRACTOR INFO Sprinx Fire Protection, Inc.
Address 2709 Jahn Ave NW / Suite H2 / Gig Harbor, WA 98335
Phone # (253)853-7780
Name of designer JGF/BW
Authority having jurisdiction CITY OF PUYALLUP

NOTES:

QR AREA REDUCTION OF 30% FOR 16'-0" CEILINGS
1050 SQ FT REQUIRED

text1(35) - invisible

Water Supply Curve

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #2

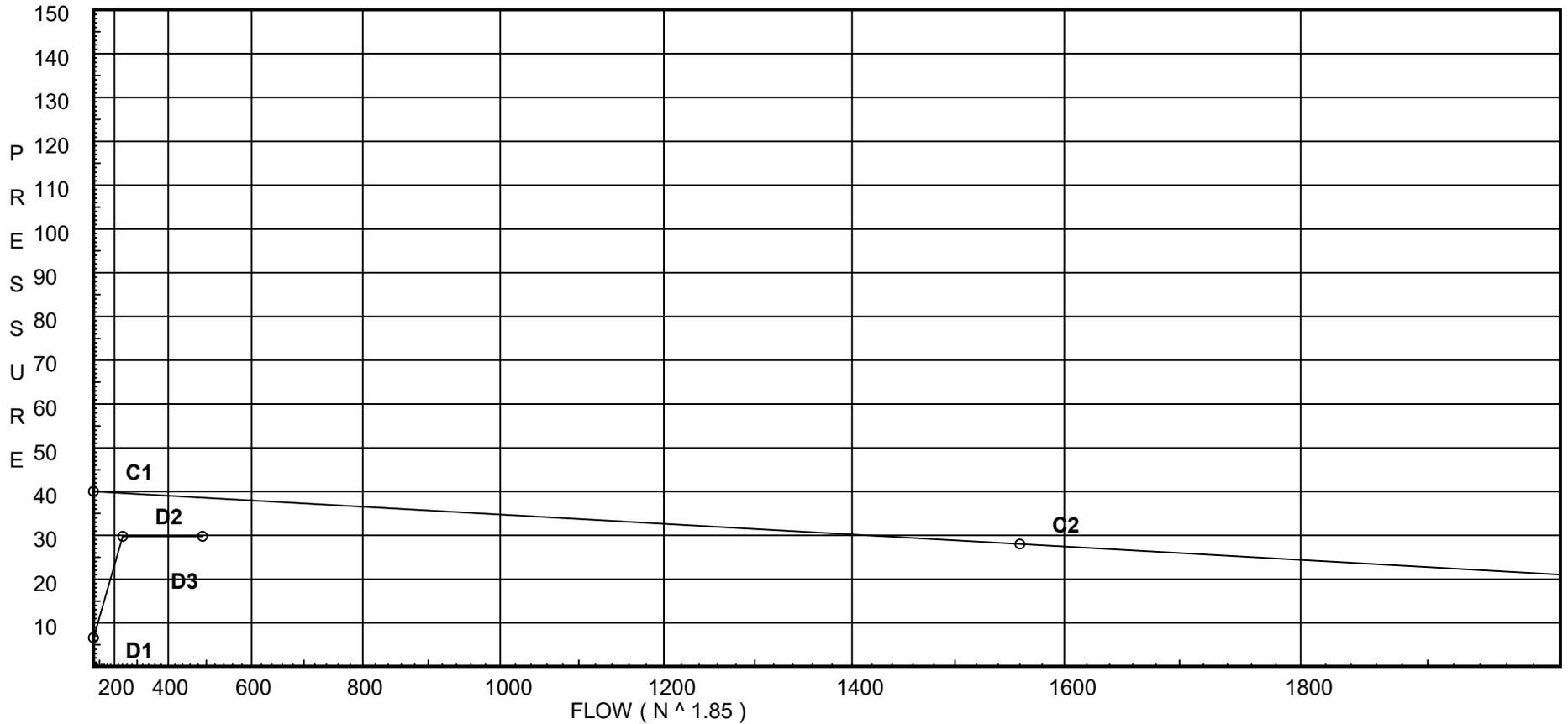
Page 2
Date 12/03P/2025

City Water Supply:

C1 - Static Pressure : 40
C2 - Residual Pressure: 28
C2 - Residual Flow : 1560

Demand:

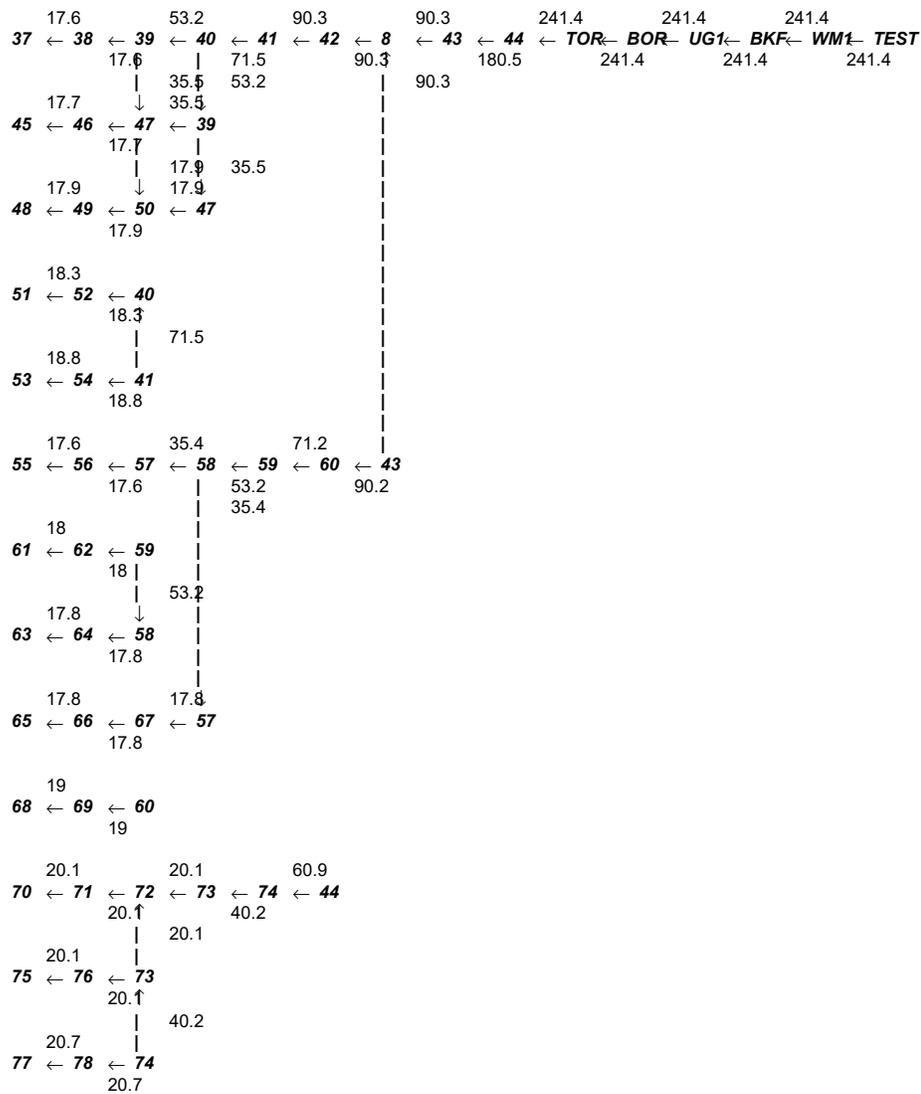
D1 - Elevation : 6.605
D2 - System Flow : 241.364
D2 - System Pressure : 29.790
Hose (Demand) : 250
D3 - System Demand : 491.364
Safety Margin : 8.794



Flow Diagram

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #2

Page 3
Date 12/03P/2025



Fittings Used Summary

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #2

Page 4
Date 12/03P/2025

Fitting Legend

Abbrev.	Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
V	90' EII Firelock #001	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0
Ziw	Wilkins 350AST	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Flow Summary - NFPA

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #2

Page 5
Date 12/03P/2025

SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
TEST	40.0	28	1560.0	38.584	491.36	29.79

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>		<i>Notes</i>
37	15.03	5.6	9.91	17.63	0.2	88
38	12.5		11.78			
39	12.5		12.35			
40	12.5		12.91			
41	12.5		13.87			
42	12.5		18.43			
8	12.5		18.45			
43	12.5		18.46			
44	12.5		18.54			
TOR	12.5		19.18			
BOR	3.0		24.18			
UG1	1.0		25.07			
BKF	0.0		25.79			
WM1	0.0		29.69			
TEST	0.0		29.79	250.0		
45	15.03	5.6	9.95	17.66	0.2	88
46	12.5		11.51			
47	12.5		12.08			
48	15.03	5.6	10.17	17.86	0.2	88
49	12.5		11.75			
50	12.5		12.01			
51	15.03	5.6	10.7	18.32	0.2	88
52	12.5		12.3			
53	15.03	5.6	11.27	18.8	0.2	88
54	12.5		12.66			
55	15.25	5.6	9.88	17.6	0.2	88
56	12.5		11.56			
57	12.5		12.12			
58	12.5		12.38			
59	12.5		12.94			
60	12.5		13.9			
61	15.25	5.6	10.33	18.0	0.2	88
62	12.5		12.36			
63	15.25	5.6	10.12	17.81	0.2	88
64	12.5		11.81			
65	15.25	5.6	10.1	17.79	0.2	88
66	12.5		11.79			
67	12.5		12.05			
68	15.25	5.6	11.5	18.99	0.2	88
69	12.5		13.25			
70	15.47	5.6	12.86	20.09	0.2	88
71	12.5		15.2			

Flow Summary - NFPA

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #2

Page 6
Date 12/03P/2025

NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>		<i>Notes</i>
72	12.5		15.92			
73	12.5		16.01			
74	12.5		16.34			
75	15.47	5.6	12.95	20.15	0.2	88
76	12.5		15.28			
77	15.47	5.6	13.61	20.66	0.2	88
78	12.5		15.58			

Final Calculations : Hazen-Williams

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #2

Page 7
Date 12/03P/2025

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
37 to 38	15.03 12.5	5.60	17.63	1	T	5.0	2.530 5.000 7.530	120	9.910 1.096 0.776			Vel = 6.54
38 to 39	12.5 12.5		0.0	1	T	5.0	0.500 5.000 5.500	120	11.782 0.0 0.567			Vel = 6.54
39 to 40	12.5 12.5		35.52	1.5			8.000 8.000	120	12.349 0.0 0.558			Vel = 7.27
40 to 41	12.5 12.5		18.32	1.5			8.000 8.000	120	12.907 0.0 0.967			Vel = 9.78
41 to 42	12.5 12.5		18.80	1.5	T	11.29	13.230 11.290 24.520	120	13.874 0.0 4.561			Vel = 12.35
42 to 8	12.5 12.5		0.0	4			5.970 5.970	120	18.435 0.0 0.013			Vel = 1.99
8 to 43	12.5 12.5		90.27	4.31			5.970 5.030	120	18.448 0.0 0.011			Vel = 1.99
43 to 44	12.5 12.5		90.27	4.31			5.030 11.000	120	0.0022 18.459 0.0			Vel = 3.97
44 to TOR	12.5 12.5		180.47	4.31			11.000 18.680 28.431 47.111	120	18.459 18.545 0.0 0.631			Vel = 5.31
TOR to BOR	12.5 3		241.36	4.31	V B S	9.477 16.724 30.661	9.500 56.862 66.362	120	19.176 4.114 0.888			Vel = 5.31
BOR to UG1	3 1		0.0	4			2.000 2.000	120	24.178 0.866 0.027			Vel = 5.31
UG1 to BKF	1 0		241.36	4.31			2.000 80.000 20.084 80.336 160.336	140	25.071 0.433 0.284			Vel = 2.60
BKF to WM1	0 0		0.0	6	Zlw G T	0.0 4.304 43.037	18.000 47.341 65.341	140	25.788 3.782 0.115		** Fixed Loss = 3.782	Vel = 2.60
WM1 to TEST	0 0		0.0	6	T G	43.037 4.304	12.000 47.341 59.341	140	29.685 0.0 0.105			Vel = 2.60
TEST			250.00 491.36						29.790		Qa = 250.00 K Factor = 90.03	
45 to 46	15.03 12.5	5.60	17.66	1	E	2.0	2.530 2.000 4.530	120	9.951 1.096 0.468			Vel = 6.56
46 to 47	12.5 12.5		0.0	1	T	5.0	0.500 5.000 5.500	120	11.515 0.0 0.569			Vel = 6.56

Final Calculations : Hazen-Williams

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #2

Page 8
Date 12/03P/2025

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
47 to 39	12.5 12.5		17.86 35.52	1.5 1.728			8.000 8.000	120 0.0331	12.084 0.0 0.265		Vel = 4.86	
39			0.0 35.52						12.349		K Factor = 10.11	
48 to 49	15.03 12.5	5.60	17.86 17.86	1 1.049	E	2.0	2.530 2.000 4.530	120 0.1055	10.172 1.096 0.478		Vel = 6.63	
49 to 50	12.5 12.5		0.0 17.86	1 1.049	E	2.0	0.500 2.000 2.500	120 0.1052	11.746 0.0 0.263		Vel = 6.63	
50 to 47	12.5 12.5		0.0 17.86	1.5 1.728			8.000 8.000	120 0.0094	12.009 0.0 0.075		Vel = 2.44	
47			0.0 17.86						12.084		K Factor = 5.14	
51 to 52	15.03 12.5	5.60	18.32 18.32	1 1.049	E	2.0	2.530 2.000 4.530	120 0.1106	10.702 1.096 0.501		Vel = 6.80	
52 to 40	12.5 12.5		0.0 18.32	1 1.049	T	5.0	0.500 5.000 5.500	120 0.1105	12.299 0.0 0.608		Vel = 6.80	
40			0.0 18.32						12.907		K Factor = 5.10	
53 to 54	15.03 12.5	5.60	18.80 18.8	1 1.049			2.530 2.530	120 0.1158	11.266 1.096 0.293		Vel = 6.98	
54 to 41	12.5 12.5		0.0 18.8	1 1.049	2T	10.0	0.500 10.000 10.500	120 0.1161	12.655 0.0 1.219		Vel = 6.98	
41			0.0 18.80						13.874		K Factor = 5.05	
55 to 56	15.25 12.5	5.60	17.60 17.6	1 1.049	E	2.0	2.750 2.000 4.750	120 0.1025	9.878 1.191 0.487		Vel = 6.53	
56 to 57	12.5 12.5		0.0 17.6	1 1.049	T	5.0	0.500 5.000 5.500	120 0.1029	11.556 0.0 0.566		Vel = 6.53	
57 to 58	12.5 12.5		17.79 35.39	1.5 1.728			8.000 8.000	120 0.0329	12.122 0.0 0.263		Vel = 4.84	
58 to 59	12.5 12.5		17.82 53.21	1.5 1.728			8.000 8.000	120 0.0699	12.385 0.0 0.559		Vel = 7.28	
59 to 60	12.5 12.5		18.00 71.21	1.5 1.728			8.000 8.000	120 0.1200	12.944 0.0 0.960		Vel = 9.74	

Final Calculations : Hazen-Williams

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #2

Page 9
Date 12/03P/2025

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
60 to 43	12.5 12.5		18.99 90.2	1.5 1.728	T	11.29	13.230 11.290 24.520	120 0.1858	13.904 0.0 4.555			Vel = 12.34
43			0.0 90.20						18.459			K Factor = 20.99
61 to 62	15.25 12.5	5.60	18.00 18.0	1 1.049	T	5.0	2.750 5.000 7.750	120 0.1071	10.334 1.191 0.830			Vel = 6.68
62 to 59	12.5 12.5		0.0 18.0	1 1.049	T	5.0	0.500 5.000 5.500	120 0.1071	12.355 0.0 0.589			Vel = 6.68
59			0.0 18.00						12.944			K Factor = 5.00
63 to 64	15.25 12.5	5.60	17.81 17.81	1 1.049	E	2.0	2.750 2.000 4.750	120 0.1051	10.117 1.191 0.499			Vel = 6.61
64 to 58	12.5 12.5		0.0 17.81	1 1.049	T	5.0	0.500 5.000 5.500	120 0.1051	11.807 0.0 0.578			Vel = 6.61
58			0.0 17.81						12.385			K Factor = 5.06
65 to 66	15.25 12.5	5.60	17.79 17.79	1 1.049	E	2.0	2.750 2.000 4.750	120 0.1048	10.097 1.191 0.498			Vel = 6.60
66 to 67	12.5 12.5		0.0 17.79	1 1.049	E	2.0	0.500 2.000 2.500	120 0.1048	11.786 0.0 0.262			Vel = 6.60
67 to 57	12.5 12.5		0.0 17.79	1.5 1.728			8.000 8.000	120 0.0092	12.048 0.0 0.074			Vel = 2.43
57			0.0 17.79						12.122			K Factor = 5.11
68 to 69	15.25 12.5	5.60	18.99 18.99	1 1.049	E	2.0	2.750 2.000 4.750	120 0.1183	11.501 1.191 0.562			Vel = 7.05
69 to 60	12.5 12.5		0.0 18.99	1 1.049	T	5.0	0.500 5.000 5.500	120 0.1182	13.254 0.0 0.650			Vel = 7.05
60			0.0 18.99						13.904			K Factor = 5.09
70 to 71	15.47 12.5	5.60	20.09 20.09	1 1.049	T	5.0	2.970 5.000 7.970	120 0.1312	12.864 1.286 1.046			Vel = 7.46
71 to 72	12.5 12.5		0.0 20.09	1 1.049	T	5.0	0.500 5.000 5.500	120 0.1311	15.196 0.0 0.721			Vel = 7.46
72 to 73	12.5 12.5		0.0 20.09	1.5 1.728			8.000 8.000	120 0.0115	15.917 0.0 0.092			Vel = 2.75

Final Calculations : Hazen-Williams

Sprinx Fire Protection, Inc.
ETC Lot-1 Remote Area #2

Page 10
Date 12/03P/2025

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
73 to 74	12.5 12.5		20.14 40.23	1.5 1.728			8.000 8.000	120 0.0418	16.009 0.0 0.334			Vel = 5.50
74 to 44	12.5 12.5		20.66 60.89	1.5 1.728	T	11.29	13.230 11.290 24.520	120 0.0898	16.343 0.0 2.202			Vel = 8.33
44			0.0 60.89						18.545			K Factor = 14.14
75 to 76	15.47 12.5	5.60	20.15 20.15	1 1.049	T	5.0	2.970 5.000 7.970	120 0.1320	12.946 1.286 1.052			Vel = 7.48
76 to 73	12.5 12.5		0.0 20.15	1 1.049	T	5.0	0.500 5.000 5.500	120 0.1318	15.284 0.0 0.725			Vel = 7.48
73			0.0 20.15						16.009			K Factor = 5.04
77 to 78	15.47 12.5	5.60	20.66 20.66	1 1.049	E	2.0	2.970 2.000 4.970	120 0.1382	13.610 1.286 0.687			Vel = 7.67
78 to 74	12.5 12.5		0.0 20.66	1 1.049	T	5.0	0.500 5.000 5.500	120 0.1382	15.583 0.0 0.760			Vel = 7.67
74			0.0 20.66						16.343			K Factor = 5.11



MEMORANDUM

TO: BRIAN JOHNSON, WATER SYSTEM
SPECIALIST
FROM: KERRI SIDEBOTTOM, P.E.
DATE: APRIL 16, 2024
SUBJECT: EAST TOWN CROSSING ADDITIONAL
FIRE FLOW AVAILABILITY
CITY OF PUYALLUP, PIERCE COUNTY,
WASHINGTON
G&O #21415.19

Per your request, I have analyzed the available fire flow at the proposed East Town Crossing development, in the central part of the City's water service area. Fire flow at this location was previously analyzed in a memo from Gray & Osborne, dated February 14, 2024. The Developer has proposed a Revised Water Piping Plan for the site, which has been analyzed in this memo. The setup of the hydraulic model and the assumptions used to determine the static pressure and available fire flow are noted as follows.

- The available fire flows and pressures are measured at 14 nodes, corresponding to the proposed hydrants within the development, as shown in the attached figure.
- Water system demands are based on projected 2038 demands and reservoirs are depleted of fire suppression and equalizing storage, as established in the *2019 Water System Plan (WSP)*, approved by the Department of Health (DOH). The City's water model was updated in 2021 to reflect additional system improvements since the WSP was developed.
- All pump stations are idle, and the Salmon Springs source is operating at 1,100 gallons per minute (gpm).

The development is located in Zone 1, which is supplied by Maplewood Springs and the 15th Avenue SE Reservoirs. The system was modeled as-is, with the proposed piping indicated on the attached figure. The model was run for two different scenarios, all of which include new 8-inch piping. The new piping for Scenario 1 includes the Phase 1 piping shown on the attached figure in pink. Scenario 2 includes additional piping for Phase 2 of the development is shown in orange on the attached figure.



The available pressure under 2038 peak hour demands at the hydrants is included in Table 1.

TABLE 1

Peak Hour Pressure

Node	Hydrant	Elevation, feet	Peak Hour Pressure, psi
J2238	J	71	41
J2240	L	72	41
J2242	M	72	40
J2244	N	76	39
J2246	H	76	39
J2248	I	76	41
J2250	F	73	40
J2252	D	69	42
J2254	C	67	43
J2256	B	66	43
J2258	A	66	43
J2260	E	72	41
J2274	G	75	39
J2276	K	71	41

The peak hour pressures within the development are essentially the same under either of the proposed scenarios, and the looping does not appreciably impact the pressures.

SCENARIO 1

Scenario 1 includes the piping planned for Phase 1, shown in pink on the attached figure. The piping includes 8-inch mains, mostly dead-ends, extending from the existing 8-inch main running from north to south through the site, as well as a connection to the 16-inch main on Shaw Road, to the west. Part of the existing 8-inch main will be replaced during construction of the development.

Available fire flow was modeled at 12 of the proposed hydrants in the development; Hydrants A through L. The hydrants are located on 8-inch pipes throughout the development, many of which are dead-ends. The results of this modeling are included in Table 2. The modeled fire flow is available at any hydrant individually, but not simultaneously.



TABLE 2
Modeled Fire Flow Availability, Scenario 1

Node	Hydrant	Available Fire Flow, gpm	Residual Pressure at Available Fire Flow, psi	Minimum System Pressure at Available Fire Flow, psi
J2238	J	2,140 ⁽¹⁾	25	25
J2240	L	1,560 ⁽¹⁾	23	23
J2246	H	1,560 ⁽¹⁾	22	22
J2248	I	2,580 ⁽¹⁾	23	23
J2250	F	1,560 ⁽¹⁾	25	25
J2252	D	2,170 ⁽¹⁾	28	28
J2254	C	1,920 ⁽¹⁾	29	28
J2256	B	2,230 ⁽¹⁾	26	26
J2258	A	1,560 ⁽¹⁾	28	28
J2260	E	1,560 ⁽¹⁾	23	23
J2274	G	1,560 ⁽¹⁾	25	25
J2276	K	1,560 ⁽¹⁾	27	27

(1) Limited by maximum system-wide velocity of 10 feet per second.

Fire flow to all of the hydrants is limited by the 10-fps maximum velocity through the existing and proposed 8-inch pipes in this scenario.

SCENARIO 2

Scenario 2 includes the piping indicated for Phases 1 and 2, shown in pink and orange on the attached figure. The piping includes 8-inch pipes extending from the existing 8-inch main running from north to south through the site, a connection to the existing 16-inch main on Shaw Road to the west, and improved looping as compared with Scenario 1.

Available fire flow was measured at the 14 proposed hydrants in the development; Hydrants A through N. The hydrants are located on 8-inch pipes throughout the development. The results of this modeling are included in Table. The modeled fire flow is available at any hydrant individually, but not simultaneously.



TABLE 3
Modeled Fire Flow Availability, Scenario 2

Node	Hydrant	Available Fire Flow, gpm	Residual Pressure at Available Fire Flow, psi	Minimum System Pressure at Available Fire Flow, psi
J2238	J	2,430 ⁽¹⁾	25	25
J2240	L	2,340 ⁽¹⁾	21	21
J2242	M	2,320 ⁽²⁾	20	20
J2244	N	2,120 ⁽²⁾	20	20
J2246	H	2,330 ⁽¹⁾	20	20
J2248	I	2,540 ⁽¹⁾	24	24
J2250	F	1,560 ⁽¹⁾	26	26
J2252	D	2,230 ⁽¹⁾	28	28
J2254	C	1,980 ⁽¹⁾	29	28
J2256	B	2,340 ⁽¹⁾	26	26
J2258	A	1,560 ⁽¹⁾	38	38
J2260	E	1,560 ⁽¹⁾	23	23
J2274	G	1,980 ⁽¹⁾	25	25
J2276	K	2,040 ⁽¹⁾	25	25

(1) Limited by maximum system-wide velocity of 10 fps.

(2) Limited by minimum system-wide pressure of 20 psi at all service locations.

Fire flow to the hydrants is limited by the 10-fps maximum velocity through the existing and proposed 8-inch pipes.

It should be noted that the dead-end 8-inch mains within the proposed site can only provide 1,560 gpm, due to the City's 10-fps velocity limitation considered for the fire flow analysis. Therefore, if 1,500 gpm is required at the hydrant, located on a dead-end main, there is essentially no additional flow available for the sprinkler system supplied by the same dead-end main. This impacts Hydrants A, E, and F in both scenarios, and additionally Hydrants G and H in Scenario 1 only.

The Department of Health and City Standards for water distribution systems are to meet the peak hourly demand of the system while providing a minimum pressure of 30 psi, system-wide. Under peak daily demand with a fire flow, the system is designed to maintain a minimum pressure of 20 psi, system-wide. Although the peak hourly demand pressure may currently be higher than these standards, the Developer must recognize that

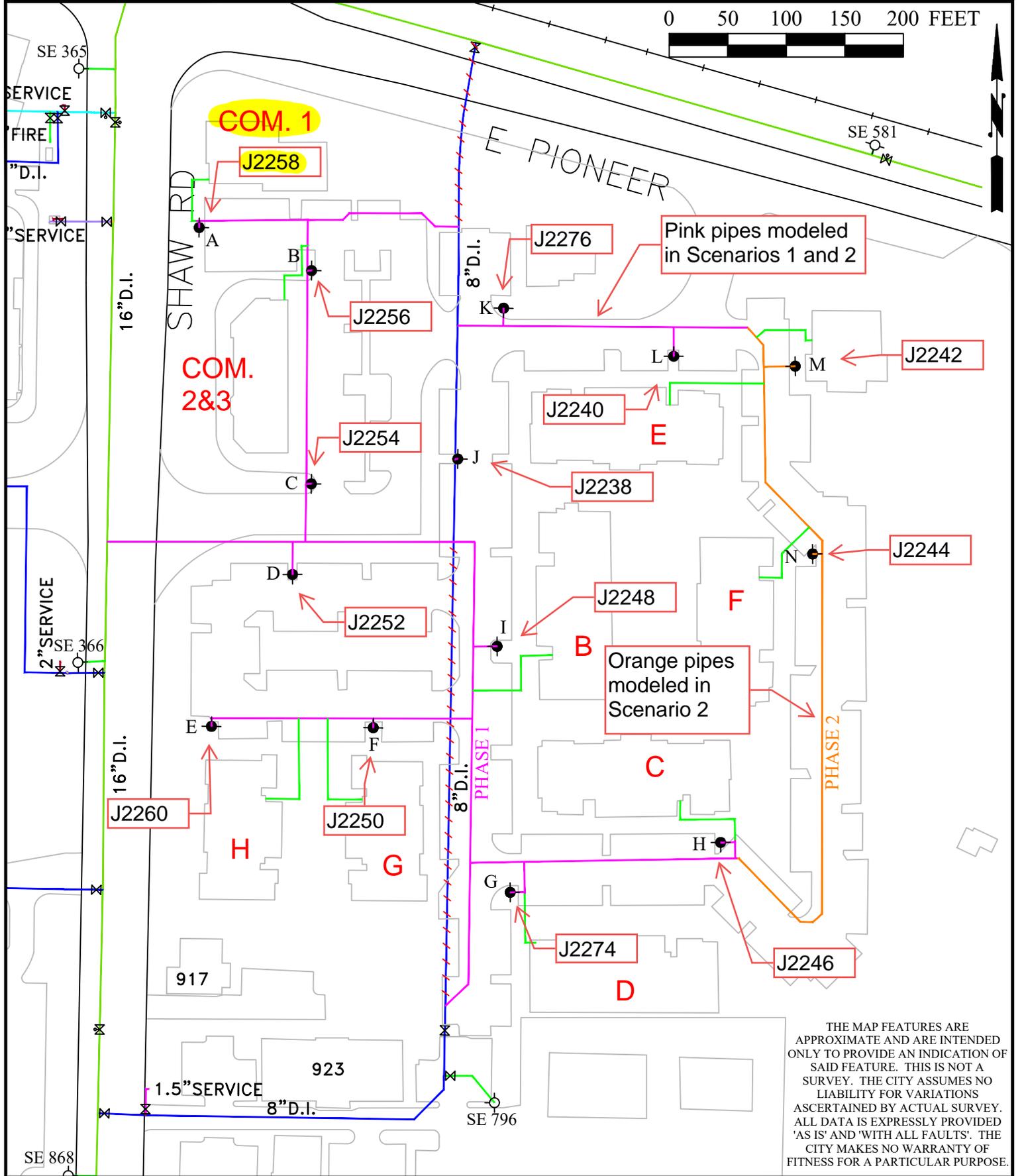


April 16, 2024
Page 5

the City may not provide pressure higher than 30 psi in the future. The flows and pressures determined in this memo are based on the approximate hydrant elevation at ground level. The Developer may design their sprinkler system for whatever pressure they wish, however they must recognize and be responsible for conditions when the pressure may be less than currently exists.

KS/sr

0 50 100 150 200 FEET



THE MAP FEATURES ARE APPROXIMATE AND ARE INTENDED ONLY TO PROVIDE AN INDICATION OF SAID FEATURE. THIS IS NOT A SURVEY. THE CITY ASSUMES NO LIABILITY FOR VARIATIONS ASCERTAINED BY ACTUAL SURVEY. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. THE CITY MAKES NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.



CITY OF PUYALLUP
PUBLIC WORKS
WATER DIVISION

HYDRAULIC MODEL FOR EAST TOWN CROSSING

SCALE AS SHOWN

04/10/2024

COP/PW/WATER/S_MAINT/PDF/QSEC/
PG104/MODEL EAST TOWN CROSSING