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

SPRINX FIRE PROTECTION

EST. 1999

2709 Jahn Ave NW, Suite H2, Gig Harbor WA 98335
Ph. (253) 853-7780– www.SprinxFire.com

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

Signature 04/03/2025 Date

Hydraulic Calculations

SPRINX FIRE PROTECTION INC.
2709 JAHN AVE NW SUITE H2
GIG HARBOR, WA 98335
253-853-7780

Job Name	:	ETC Building E
Drawing	:	FP-3.0
Location	:	2902 E PIONEER PUYALLUP, WA 98372
Remote Area	:	RA#1
Contract	:	24-093CM
Data File	:	ETC Building E Area 1.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME East Town Crossing Building E
Location 2902 E PIONEER PUYALLUP, WA 98372
Drawing # FP-3.0
Contract # 24-093CM
Date 3/21/2025

DESIGN

Remote area # RA#1
Remote area location UNIT 301 - LIVING ROOM
Occupancy classification RESIDENTIAL NFPA 13R
Density 0.05 - Gpm/SqFt
Area of application 256 - SqFt
Coverage/sprinkler 256 16'X16' - SqFt
Type of sprinkler calculated VIKING VK468 RESIDENTIAL PENDENT K=4.9
 # Sprinklers calculated 4
In-rack demand N/A - GPM
Hose streams N/A - GPM
Total water required (including hose streams) 55.4349 - GPM @ 34.5571 - Psi
Type of system WET-CPVC
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 4/16/2024
Location 2902 E PIONEER
Source of info CITY OF PUYALLUP WATER DIVISON

CONTRACTOR INFO SPRINX FIRE PROTECTION
Address 2709 JAHN AVE. / SUITE H2 / GIG HARBOR
Phone # 253-853-7780
Name of designer ALEXANDER J PARADIS
Authority having jurisdiction CITY OF PUYALLUP
NOTES:

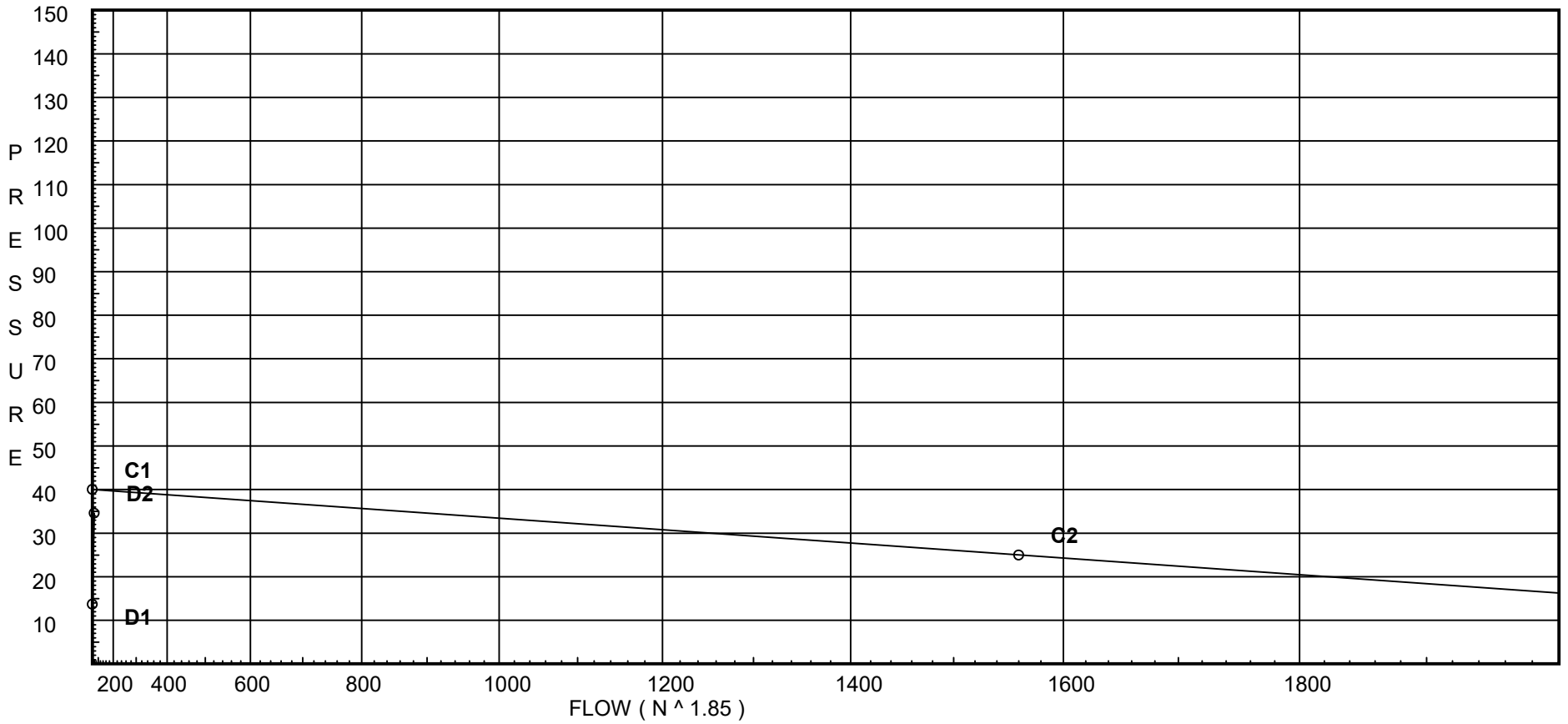
Water Supply Curve

SPRINX FIRE PROTECTION INC.
ETC Building E

Date 3/21/2025

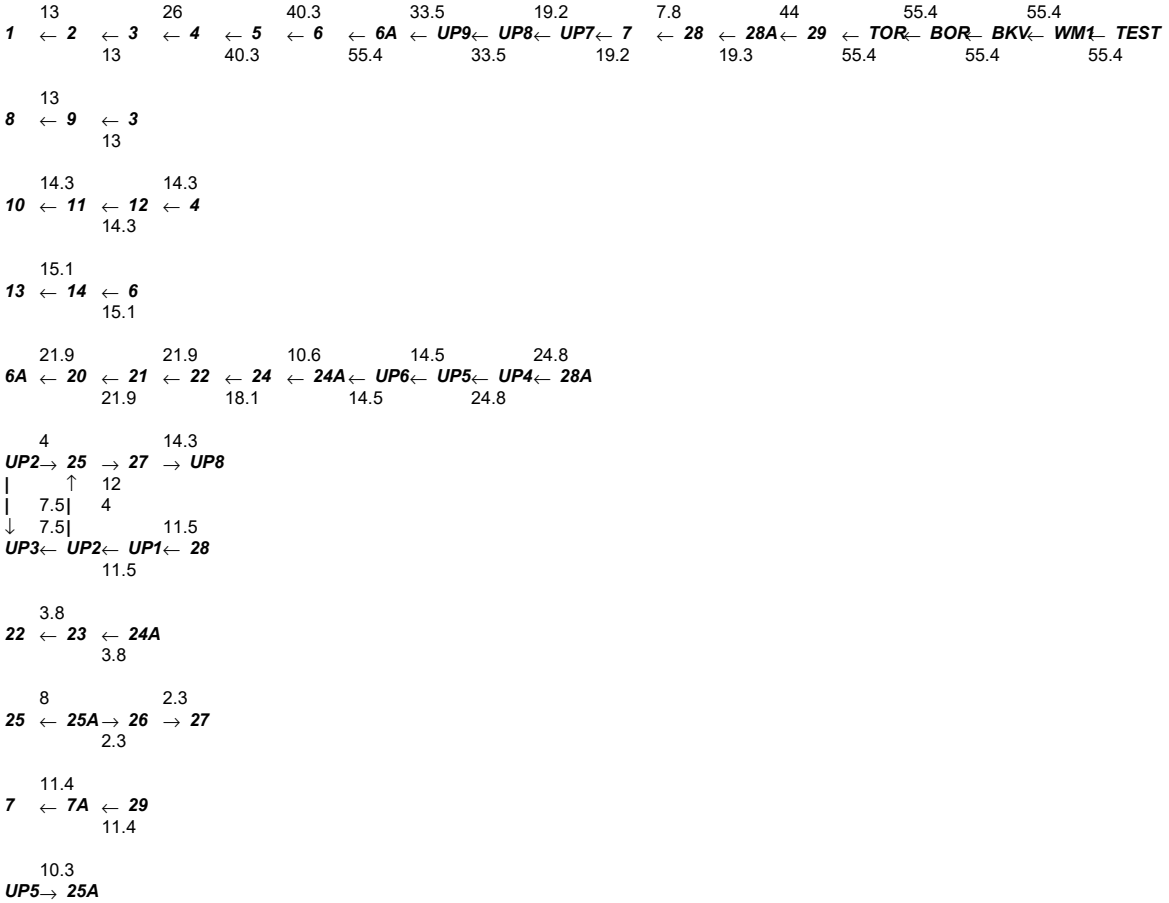
City Water Supply:
- C1 - Static Pressure : 40
- C2 - Residual Pressure: 25
- C2 - Residual Flow : 1560

Demand:
- D1 - Elevation : 13.677
- D2 - System Flow : 55.435
- D2 - System Pressure : 34.557
- Hose (Demand) : _____
- D3 - System Demand : 55.435
- Safety Margin : 5.412



Flow Diagram

SPRINX FIRE PROTECTION INC.
ETC Building E



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	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
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
N *	CPVC 90'Ell Harvel-Spears		7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0
R *	CPVC Coupling Tee - Run	1	1	1	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0
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
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.

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
TEST	40.0	25	1560.0	39.969	55.43	34.557

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1	109.58	4.9	7.04	13.0	0.05	256
2	110.08		6.99			
3	110.08		7.27			
4	110.08		8.99			
5	110.08		9.65			
6	110.08		9.95			
6A	110.08		10.42			
UP9	110.08		10.57			
UP8	99.83		15.12			
UP7	89.58		19.6			
7	89.58		19.99			
28	89.58		20.01			
28A	89.58		20.02			
29	89.58		20.43			
TOR	89.58		22.5			
BOR	80.0		27.41			
BKV	78.0		34.55			
WM1	78.0		34.56			
TEST	78.0		34.56			
8	109.58	4.9	7.05	13.01	0.05	256
9	110.08		7.01			
10	108.58	4.9	8.55	14.33	0.05	256
11	110.08		8.21			
12	110.08		8.45			
13	109.58	4.9	9.48	15.09	0.05	256
14	110.08		9.49			
20	110.08		10.61			
21	110.08		10.71			
22	110.08		10.81			
24	110.08		10.89			
24A	110.08		10.9			
UP6	110.08		10.93			
UP5	99.83		15.39			
UP4	89.58		19.95			
UP2	99.83		15.4			
25	99.83		15.38			
27	99.83		15.34			
UP3	110.08		10.95			
UP1	89.58		19.87			
23	110.08		10.88			
25A	99.83		15.38			
26	99.83		15.37			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
7A	89.58		20.21		

Final Calculations : Hazen-Williams

SPRINX FIRE PROTECTION INC.
ETC Building E

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	109.580	4.90	13.00	1	O	5.0	0.500	150	7.040	
to							5.000		-0.217	
2	110.080		13.0	1.101			5.500	0.0307	0.169	Vel = 4.38
2	110.080		0.0	1	R	1.0	8.000	150	6.992	
to							1.000		0.0	
3	110.080		13.0	1.101			9.000	0.0307	0.276	Vel = 4.38
3	110.080		13.01	1	O	5.0	10.550	150	7.268	
to							5.000		0.0	
4	110.080		26.01	1.101			15.550	0.1107	1.721	Vel = 8.77
4	110.080		14.33	1.25	R	1.0	7.420	150	8.989	
to							1.000		0.0	
5	110.080		40.34	1.394			8.420	0.0790	0.665	Vel = 8.48
5	110.080		0.0	1.25	R	1.0	2.750	150	9.654	
to							1.000		0.0	
6	110.080		40.34	1.394			3.750	0.0789	0.296	Vel = 8.48
6	110.080		15.09	2	O	10.0	9.250	150	9.950	
to							10.000		0.0	
6A	110.080		55.43	2.003			19.250	0.0244	0.469	Vel = 5.64
6A	110.080		-21.92	2	N	11.0	5.080	150	10.419	
to							11.000		0.0	
UP9	110.080		33.51	2.003			16.080	0.0096	0.154	Vel = 3.41
UP9	110.080		0.0	2	R	1.0	10.250	150	10.573	
to							1.000		4.439	
UP8	99.830		33.51	2.003			11.250	0.0096	0.108	Vel = 3.41
UP8	99.830		-14.33	2	R	1.0	10.250	150	15.120	
to							1.000		4.439	
UP7	89.580		19.18	2.003			11.250	0.0035	0.039	Vel = 1.95
UP7	89.580		0.0	2	10R	10.0	74.080	150	19.598	
to					3O	30.0	40.000		0.0	
7	89.580		19.18	2.003			114.080	0.0034	0.390	Vel = 1.95
7	89.580		-11.39	2	3R	3.0	26.000	150	19.988	
to							3.000		0.0	
28	89.580		7.79	2.003			29.000	0.0006	0.018	Vel = 0.79
28	89.580		11.47	2	R	1.0	3.000	150	20.006	
to							1.000		0.0	
28A	89.580		19.26	2.003			4.000	0.0035	0.014	Vel = 1.96
28A	89.580		24.78	2	3R	3.0	23.000	150	20.020	
to							3.000		0.0	
29	89.580		44.04	2.003			26.000	0.0159	0.413	Vel = 4.48
29	89.580		11.39	2	O	10.0	36.000	150	20.433	
to					6R	6.0	49.000		0.0	
TOR	89.580		55.43	2.003	3N	33.0	85.000	0.0243	2.069	Vel = 5.64
TOR	89.580		0.0	2	B	8.183	9.500	120	22.502	
to					S	15.003	23.186		4.149	
BOR	80		55.43	2.203			32.686	0.0231	0.756	Vel = 4.67
BOR	80		0.0	6	T	43.037	66.000	140	27.407	
to					3E	60.252	103.289		7.127	* * Fixed Loss = 6.261
BKV	78		55.43	6.16	Ziw	0.0	169.289	0.0001	0.020	Vel = 0.60

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 ******
BKV	78		0.0	8	T	55.354	45.000	140	34.554	
to					G	6.326	61.680		0.0	
WM1	78		55.43	8.27			106.680	0	0.002	Vel = 0.33
WM1	78		0.0	8			25.000	140	34.556	
to									0.0	
TEST	78		55.43	8.27			25.000	0	0.001	Vel = 0.33
			0.0							
TEST			55.43						34.557	K Factor = 9.43
8	109.580	4.90	13.01	1	O	5.0	0.500	150	7.053	
to							5.000		-0.217	
9	110.080		13.01	1.101			5.500	0.0309	0.170	Vel = 4.38
9	110.080		0.0	1	O	5.0	3.540	150	7.006	
to							5.000		0.0	
3	110.080		13.01	1.101			8.540	0.0307	0.262	Vel = 4.38
			0.0							
3			13.01						7.268	K Factor = 4.83
10	108.580	4.90	14.33	1	N	7.0	1.500	150	8.552	
to							7.000		-0.650	
11	110.080		14.33	1.101			8.500	0.0368	0.313	Vel = 4.83
11	110.080		0.0	1	O	5.0	1.500	150	8.215	
to							5.000		0.0	
12	110.080		14.33	1.101			6.500	0.0368	0.239	Vel = 4.83
12	110.080		0.0	1	2O	10.0	4.580	150	8.454	
to							10.000		0.0	
4	110.080		14.33	1.101			14.580	0.0367	0.535	Vel = 4.83
			0.0							
4			14.33						8.989	K Factor = 4.78
13	109.580	4.90	15.09	1	O	5.0	0.500	150	9.484	
to							5.000		-0.217	
14	110.080		15.09	1.101			5.500	0.0405	0.223	Vel = 5.09
14	110.080		0.0	1	O	5.0	6.390	150	9.490	
to							5.000		0.0	
6	110.080		15.09	1.101			11.390	0.0404	0.460	Vel = 5.09
			0.0							
6			15.09						9.950	K Factor = 4.78
6A	110.080		21.92	2	4R	4.0	30.000	150	10.419	
to					O	10.0	14.000		0.0	
20	110.080		21.92	2.003			44.000	0.0044	0.192	Vel = 2.23
20	110.080		0.0	2	3R	3.0	19.000	150	10.611	
to							3.000		0.0	
21	110.080		21.92	2.003			22.000	0.0044	0.096	Vel = 2.23
21	110.080		0.0	2	4R	4.0	20.170	150	10.707	
to							4.000		0.0	
22	110.080		21.92	2.003			24.170	0.0044	0.106	Vel = 2.23
22	110.080		-3.81	2	3R	3.0	22.000	150	10.813	
to							3.000		0.0	
24	110.080		18.11	2.003			25.000	0.0031	0.077	Vel = 1.84

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 ******
24	110.080		-7.47	2	O	10.0	3.000	150	10.890	
to							10.000		0.0	
24A	110.080		10.64	2.003			13.000	0.0012	0.015	Vel = 1.08
24A	110.080		3.82	2	N	11.0	2.670	150	10.905	
to							11.000		0.0	
UP6	110.080		14.46	2.003			13.670	0.0020	0.027	Vel = 1.47
			0.0							
UP6			14.46						10.932	K Factor = 4.37
UP6	110.080		14.46	2	R	1.0	10.250	150	10.932	
to							1.000		4.439	
UP5	99.830		14.46	2.003			11.250	0.0020	0.023	Vel = 1.47
UP5	99.830		10.33	2	N	11.0	10.250	150	15.394	
to							11.000		4.439	
UP4	89.580		24.79	2.003			21.250	0.0055	0.117	Vel = 2.52
UP4	89.580		0.0	2	O	10.0	2.670	150	19.950	
to							10.000		0.0	
28A	89.580		24.79	2.003			12.670	0.0055	0.070	Vel = 2.52
			0.0							
28A			24.79						20.020	K Factor = 5.54
UP2	99.830		-3.99	2	10R	10.0	76.080	150	15.398	
to					2O	20.0	30.000		0.0	
25	99.830		-3.99	2.003			106.080	-0.0002	-0.020	Vel = 0.41
25	99.830		-8.04	2	3R	3.0	21.580	150	15.378	
to							3.000		0.0	
27	99.830		-12.03	2.003			24.580	-0.0014	-0.035	Vel = 1.22
27	99.830		-2.30	2	10R	10.0	70.830	150	15.343	
to					2O	20.0	41.000		0.0	
UP8	99.830		-14.33	2.003	N	11.0	111.830	-0.0020	-0.223	Vel = 1.46
			0.0							
UP8			-14.33						15.120	K Factor = -3.69
UP3	110.080		7.47	2	R	1.0	10.250	150	10.952	
to							1.000		4.439	
UP2	99.830		7.47	2.003			11.250	0.0006	0.007	Vel = 0.76
UP2	99.830		3.99	2	N	11.0	10.250	150	15.398	
to							11.000		4.439	
UP1	89.580		11.46	2.003			21.250	0.0013	0.028	Vel = 1.17
UP1	89.580		0.0	2	11R	11.0	76.000	150	19.865	
to					2O	20.0	31.000		0.0	
28	89.580		11.46	2.003			107.000	0.0013	0.141	Vel = 1.17
			0.0							
28			11.46						20.006	K Factor = 2.56
22	110.080		3.81	1.25	5R	5.0	47.250	150	10.813	
to					2O	12.0	17.000		0.0	
23	110.080		3.81	1.394			64.250	0.0010	0.065	Vel = 0.80
23	110.080		0.0	1.25	4R	4.0	23.080	150	10.878	
to							4.000		0.0	
24A	110.080		3.81	1.394			27.080	0.0010	0.027	Vel = 0.80
			0.0							

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	******
24A			3.81						10.905	K Factor = 1.15		
25	99.830		8.03	2	R	1.0	2.920	150	15.378			
to							1.000		0.0			
25A	99.830		8.03	2.003			3.920	0.0008	0.003	Vel = 0.82		
25A	99.830		-10.33	1.25	3R	3.0	23.080	150	15.381			
to					O	6.0	9.000		0.0			
26	99.830		-2.3	1.394			32.080	-0.0004	-0.013	Vel = 0.48		
26	99.830		0.0	1.25	5R	5.0	47.580	150	15.368			
to					2O	12.0	17.000		0.0			
27	99.830		-2.3	1.394			64.580	-0.0004	-0.025	Vel = 0.48		
			0.0									
27			-2.30						15.343	K Factor = -0.59		
7	89.580		11.39	1.25	3R	3.0	26.000	150	19.988			
to							3.000		0.0			
7A	89.580		11.39	1.394			29.000	0.0076	0.220	Vel = 2.39		
7A	89.580		0.0	1.25	2R	2.0	21.580	150	20.208			
to					O	6.0	8.000		0.0			
29	89.580		11.39	1.394			29.580	0.0076	0.225	Vel = 2.39		
			0.0									
29			11.39						20.433	K Factor = 2.52		
UP5	99.830		-10.33	2	O	10.0	2.670	150	15.394			
to							10.000		0.0			
25A	99.830		-10.33	2.003			12.670	-0.0010	-0.013	Vel = 1.05		
			0.0									
25A			-10.33						15.381	K Factor = -2.63		
UP3	110.080		-7.47	2	10R	10.0	74.080	150	10.952			
to					2O	20.0	30.000		0.0			
24	110.080		-7.47	2.003			104.080	-0.0006	-0.062	Vel = 0.76		
			0.0									
24			-7.47						10.890	K Factor = -2.26		

SPRINX
FIRE PROTECTION
EST. 1999

2709 Jahn Ave NW, Suite H2, Gig Harbor WA 98335
Ph. (253) 853-7780– www.SprinxFire.com

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

Signature 04/03/2025 Date

Hydraulic Calculations

SPRINX FIRE PROTECTION INC.
2709 JAHN AVE NW SUITE H2
GIG HARBOR, WA 98335
253-853-7780

Job Name	:	ETC Building E
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Remote Area	:	RA#3
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Data File	:	ETC Building E Area 3.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME East Town Crossing Building E
Location 2902 E PIONEER PUYALLUP, WA 98372
Drawing # FP-3.0
Contract # 24-093CM
Date 3/24/2025

DESIGN

Remote area # RA#3
Remote area location STAIRWELL
Occupancy classification LIGHT HAZARD
Density 0.10 - Gpm/SqFt
Area of application 273 - SqFt
Coverage/sprinkler 4 HEADS - SqFt
Type of sprinkler calculated VIKING VK178 QR CHROME DRY HORIZ. SIDEWALL
 # Sprinklers calculated 4
In-rack demand N/A - GPM
Hose streams N/A - GPM
Total water required (including hose streams) 60.1092 - GPM @ 33.6961 - Psi
Type of system WET-CPVC
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 4/16/2024
Location 2902 E PIONEER
Source of info CITY OF PUYALLUP WATER DIVISON

CONTRACTOR INFO SPRINX FIRE PROTECTION
Address 2709 JAHN AVE. / SUITE H2 / GIG HARBOR
Phone # 253-853-7780
Name of designer ALEXANDER J PARADIS
Authority having jurisdiction CITY OF PUYALLUP
NOTES:

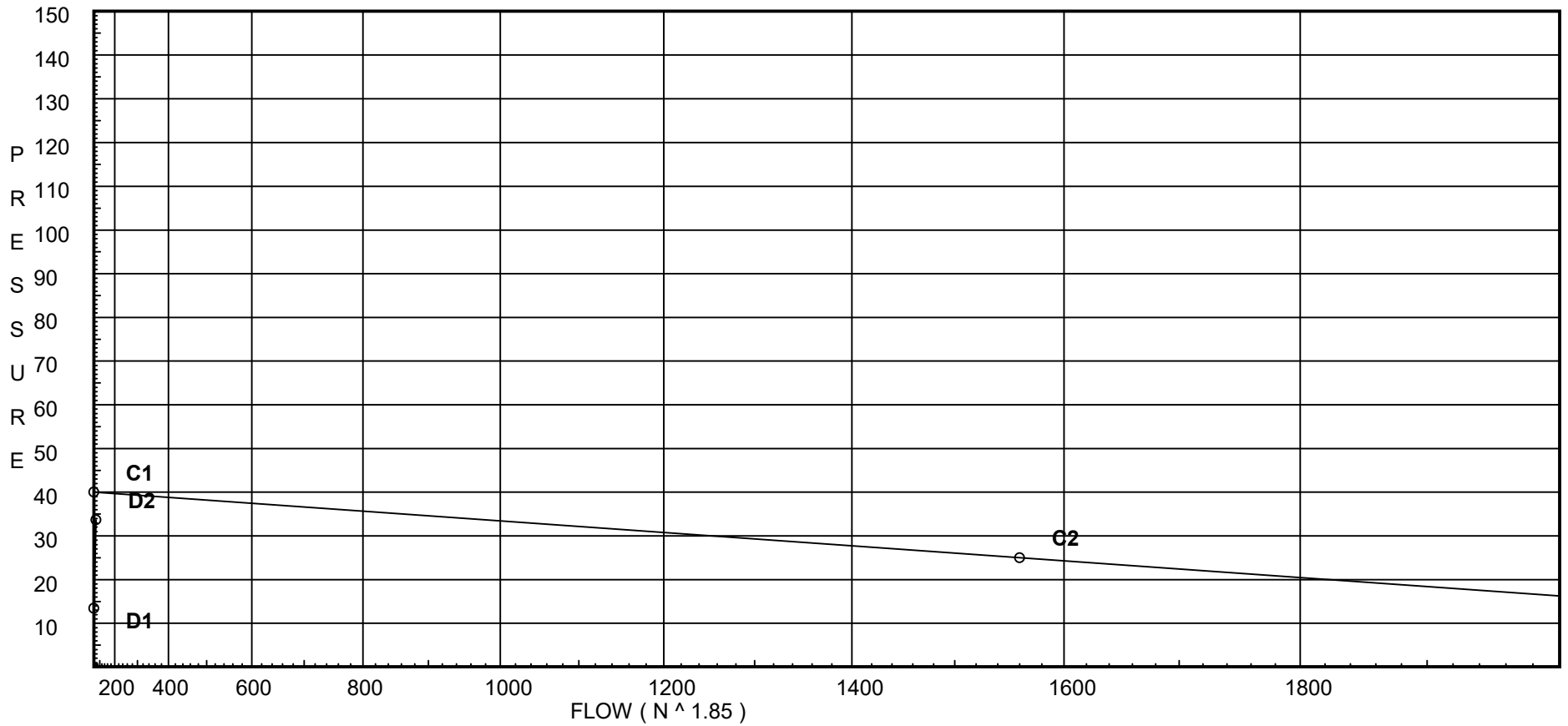
Water Supply Curve

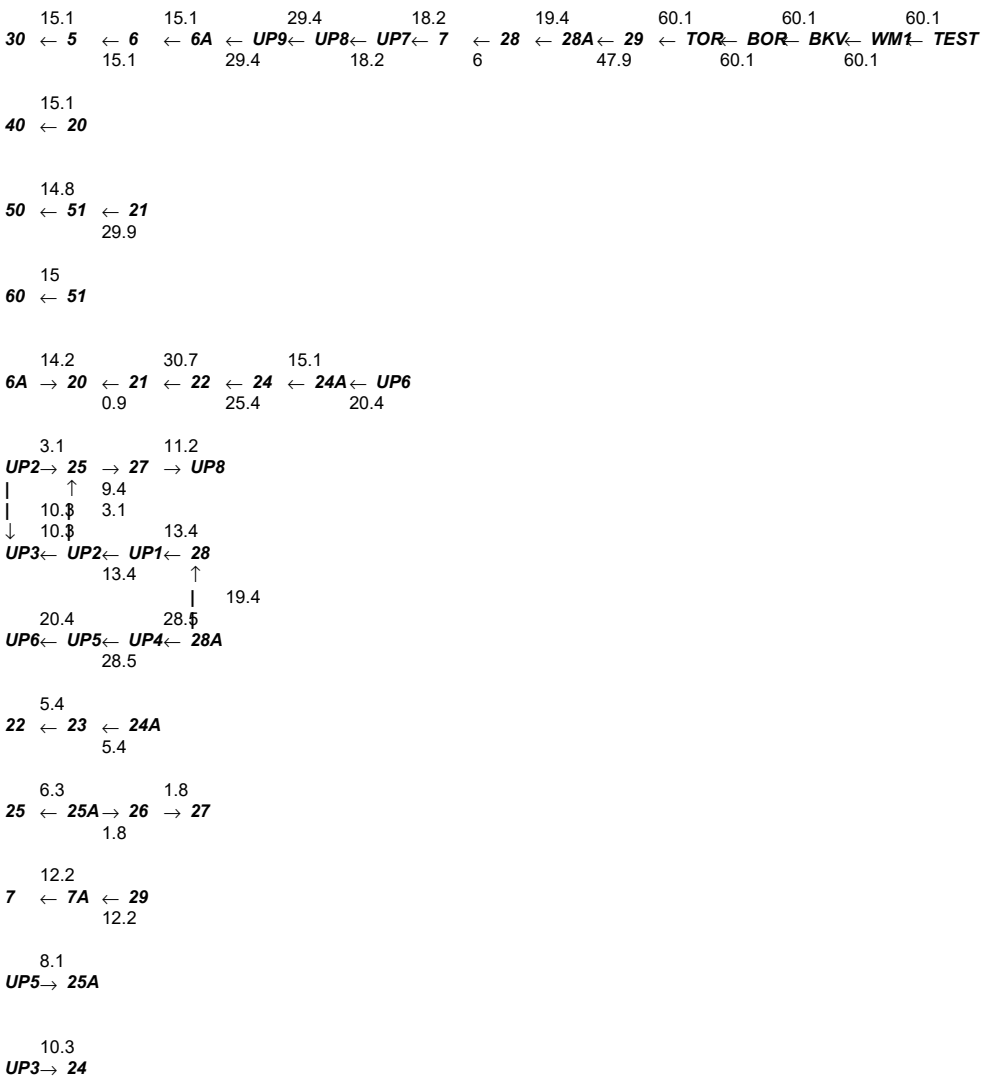
SPRINX FIRE PROTECTION INC.
ETC Building E

Date 3/24/2025

City Water Supply:
- C1 - Static Pressure : 40
- C2 - Residual Pressure: 25
- C2 - Residual Flow : 1560

Demand:
- D1 - Elevation : 13.426
- D2 - System Flow : 60.109
- D2 - System Pressure : 33.696
- Hose (Demand) : _____
- D3 - System Demand : 60.109
- Safety Margin : 6.268




15.1 15.1 29.4 18.2 19.4 60.1 60.1 60.1
30 ← 5 ← 6 ← 6A ← UP9 ← UP8 ← UP7 ← 7 ← 28 ← 28A ← 29 ← TOR ← BOR ← BKV ← WM1 ← TEST
15.1 29.4 18.2 6 47.9 60.1 60.1
15.1
40 ← 20
14.8
50 ← 51 ← 21
29.9
15
60 ← 51
14.2 30.7 15.1
6A → 20 ← 21 ← 22 ← 24 ← 24A ← UP6
0.9 25.4 20.4
3.1 11.2
UP2 → 25 → 27 → UP8
9.4
10.3 3.1
10.3
UP3 ← UP2 ← UP1 ← 28
13.4 13.4
19.4
20.4 28.5
UP6 ← UP5 ← UP4 ← 28A
28.5
5.4
22 ← 23 ← 24A
5.4
6.3 1.8
25 ← 25A → 26 → 27
1.8
12.2
7 ← 7A ← 29
12.2
8.1
UP5 → 25A
10.3
UP3 → 24

Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	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
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
N *	CPVC 90'Ell Harvel-Spears		7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0
R *	CPVC Coupling Tee - Run	1	1	1	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0
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
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.

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
TEST	40.0	25	1560.0	39.964	60.11	33.696

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node		Notes
30	109.0	5.6	7.3	15.13	0.1	130.24
5	110.08		9.1			
6	110.08		9.15			
6A	110.08		9.19			
UP9	110.08		9.31			
UP8	99.83		13.84			
UP7	89.58		18.31			
7	89.58		18.67			
28	89.58		18.68			
28A	89.58		18.69			
29	89.58		19.17			
TOR	89.58		21.58			
BOR	80.0		26.6			
BKV	78.0		33.69			
WM1	78.0		33.7			
TEST	78.0		33.7			
40	109.0	5.6	7.28	15.11	0.1	82.25
50	109.0	5.6	7.0	14.82	0.1	123.37
51	110.08		7.96			
60	109.0	5.6	7.22	15.05	0.1	73.5
20	110.08		9.11			
21	110.08		9.11			
22	110.08		9.31			
24	110.08		9.45			
24A	110.08		9.48			
UP2	99.83		14.01			
25	99.83		14.0			
27	99.83		13.98			
UP3	110.08		9.56			
UP1	89.58		18.49			
UP6	110.08		9.53			
UP5	99.83		14.01			
UP4	89.58		18.6			
23	110.08		9.43			
25A	99.83		14.0			
26	99.83		13.99			
7A	89.58		18.92			

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 ******
30	109	5.60	15.13	1	4N	28.0	20.830	150	7.303	
to					2R	2.0	35.000		-0.468	
5	110.080		15.13	1.101	O	5.0	55.830	0.0406	2.268	Vel = 5.10
5	110.080		0.0	1.25	R	1.0	2.750	150	9.103	
to							1.000		0.0	
6	110.080		15.13	1.394			3.750	0.0131	0.049	Vel = 3.18
6	110.080		0.0	2	O	10.0	9.250	150	9.152	
to							10.000		0.0	
6A	110.080		15.13	2.003			19.250	0.0022	0.042	Vel = 1.54
6A	110.080		14.24	2	N	11.0	5.080	150	9.194	
to							11.000		0.0	
UP9	110.080		29.37	2.003			16.080	0.0075	0.121	Vel = 2.99
UP9	110.080		0.0	2	R	1.0	10.250	150	9.315	
to							1.000		4.439	
UP8	99.830		29.37	2.003			11.250	0.0076	0.085	Vel = 2.99
UP8	99.830		-11.16	2	R	1.0	10.250	150	13.839	
to							1.000		4.439	
UP7	89.580		18.21	2.003			11.250	0.0031	0.035	Vel = 1.85
UP7	89.580		0.0	2	10R	10.0	74.080	150	18.313	
to					3O	30.0	40.000		0.0	
7	89.580		18.21	2.003			114.080	0.0031	0.354	Vel = 1.85
7	89.580		-12.22	2	3R	3.0	26.000	150	18.667	
to							3.000		0.0	
28	89.580		5.99	2.003			29.000	0.0004	0.011	Vel = 0.61
28	89.580		13.39	2	R	1.0	3.000	150	18.678	
to							1.000		0.0	
28A	89.580		19.38	2.003			4.000	0.0035	0.014	Vel = 1.97
28A	89.580		28.51	2	3R	3.0	23.000	150	18.692	
to							3.000		0.0	
29	89.580		47.89	2.003			26.000	0.0186	0.483	Vel = 4.88
29	89.580		12.22	2	O	10.0	36.000	150	19.175	
to					6R	6.0	49.000		0.0	
TOR	89.580		60.11	2.003	3N	33.0	85.000	0.0283	2.402	Vel = 6.12
TOR	89.580		0.0	2	B	8.183	9.500	120	21.577	
to					S	15.003	23.186		4.149	
BOR	80		60.11	2.203			32.686	0.0269	0.878	Vel = 5.06
BOR	80		0.0	6	T	43.037	66.000	140	26.604	
to					3E	60.252	103.289		7.065	* * Fixed Loss = 6.199
BKV	78		60.11	6.16	Ziw	0.0	169.289	0.0001	0.023	Vel = 0.65
BKV	78		0.0	8	T	55.354	45.000	140	33.692	
to					G	6.326	61.680		0.0	
WM1	78		60.11	8.27			106.680	0	0.003	Vel = 0.36
WM1	78		0.0	8			25.000	140	33.695	
to									0.0	
TEST	78		60.11	8.27			25.000	0	0.001	Vel = 0.36
			0.0							
TEST			60.11						33.696	K Factor = 10.36
40	109	5.60	15.11	1	4N	28.0	20.580	150	7.283	
to					3R	3.0	36.000		-0.468	
20	110.080		15.11	1.101	O	5.0	56.580	0.0405	2.292	Vel = 5.09

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 ******
			0.0							
20			15.11						9.107	K Factor = 5.01
50	109	5.60	14.82	1	3N	21.0	10.670	150	7.000	
to					O	5.0	26.000		-0.468	
51	110.080		14.82	1.101			36.670	0.0391	1.433	Vel = 4.99
51	110.080		15.04	1.25	2R	2.0	17.250	150	7.965	
to					O	6.0	8.000		0.0	
21	110.080		29.86	1.394			25.250	0.0453	1.143	Vel = 6.28
			0.0							
21			29.86						9.108	K Factor = 9.89
60	109	5.60	15.05	1	3N	21.0	4.170	150	7.220	
to					O	5.0	26.000		-0.468	
51	110.080		15.05	1.101			30.170	0.0402	1.213	Vel = 5.07
			0.0							
51			15.05						7.965	K Factor = 5.33
6A	110.080		-14.24	2	4R	4.0	30.000	150	9.194	
to					O	10.0	14.000		0.0	
20	110.080		-14.24	2.003			44.000	-0.0020	-0.087	Vel = 1.45
20	110.080		15.12	2	3R	3.0	19.000	150	9.107	
to							3.000		0.0	
21	110.080		0.88	2.003			22.000	0	0.001	Vel = 0.09
21	110.080		29.86	2	4R	4.0	20.170	150	9.108	
to							4.000		0.0	
22	110.080		30.74	2.003			24.170	0.0082	0.197	Vel = 3.13
22	110.080		-5.35	2	3R	3.0	22.000	150	9.305	
to							3.000		0.0	
24	110.080		25.39	2.003			25.000	0.0058	0.144	Vel = 2.59
24	110.080		-10.34	2	O	10.0	3.000	150	9.449	
to							10.000		0.0	
24A	110.080		15.05	2.003			13.000	0.0022	0.028	Vel = 1.53
24A	110.080		5.35	2	N	11.0	2.670	150	9.477	
to							11.000		0.0	
UP6	110.080		20.4	2.003			13.670	0.0038	0.052	Vel = 2.08
			0.0							
UP6			20.40						9.529	K Factor = 6.61
UP2	99.830		-3.06	2	10R	10.0	76.080	150	14.013	
to					2O	20.0	30.000		0.0	
25	99.830		-3.06	2.003			106.080	-0.0001	-0.012	Vel = 0.31
25	99.830		-6.31	2	3R	3.0	21.580	150	14.001	
to							3.000		0.0	
27	99.830		-9.37	2.003			24.580	-0.0009	-0.022	Vel = 0.95
27	99.830		-1.79	2	10R	10.0	70.830	150	13.979	
to					2O	20.0	41.000		0.0	
UP8	99.830		-11.16	2.003	N	11.0	111.830	-0.0013	-0.140	Vel = 1.14
			0.0							
UP8			-11.16						13.839	K Factor = -3.00
UP3	110.080		10.33	2	R	1.0	10.250	150	9.562	
to							1.000		4.439	
UP2	99.830		10.33	2.003			11.250	0.0011	0.012	Vel = 1.05

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 ******
UP2	99.830		3.07	2	N	11.0	10.250	150	14.013	
to							11.000		4.439	
UP1	89.580		13.4	2.003			21.250	0.0018	0.038	Vel = 1.36
UP1	89.580		0.0	2	11R	11.0	76.000	150	18.490	
to					2O	20.0	31.000		0.0	
28	89.580		13.4	2.003			107.000	0.0018	0.188	Vel = 1.36
			0.0							
28			13.40						18.678	K Factor = 3.10
UP6	110.080		20.40	2	R	1.0	10.250	150	9.529	
to							1.000		4.439	
UP5	99.830		20.4	2.003			11.250	0.0039	0.044	Vel = 2.08
UP5	99.830		8.10	2	N	11.0	10.250	150	14.012	
to							11.000		4.439	
UP4	89.580		28.5	2.003			21.250	0.0071	0.151	Vel = 2.90
UP4	89.580		0.0	2	O	10.0	2.670	150	18.602	
to							10.000		0.0	
28A	89.580		28.5	2.003			12.670	0.0071	0.090	Vel = 2.90
			0.0							
28A			28.50						18.692	K Factor = 6.59
22	110.080		5.35	1.25	5R	5.0	47.250	150	9.305	
to					2O	12.0	17.000		0.0	
23	110.080		5.35	1.394			64.250	0.0019	0.121	Vel = 1.12
23	110.080		0.0	1.25	4R	4.0	23.080	150	9.426	
to							4.000		0.0	
24A	110.080		5.35	1.394			27.080	0.0019	0.051	Vel = 1.12
			0.0							
24A			5.35						9.477	K Factor = 1.74
25	99.830		6.31	2	R	1.0	2.920	150	14.001	
to							1.000		0.0	
25A	99.830		6.31	2.003			3.920	0.0005	0.002	Vel = 0.64
25A	99.830		-8.10	1.25	3R	3.0	23.080	150	14.003	
to					O	6.0	9.000		0.0	
26	99.830		-1.79	1.394			32.080	-0.0002	-0.008	Vel = 0.38
26	99.830		0.0	1.25	5R	5.0	47.580	150	13.995	
to					2O	12.0	17.000		0.0	
27	99.830		-1.79	1.394			64.580	-0.0002	-0.016	Vel = 0.38
			0.0							
27			-1.79						13.979	K Factor = -0.48
7	89.580		12.22	1.25	3R	3.0	26.000	150	18.667	
to							3.000		0.0	
7A	89.580		12.22	1.394			29.000	0.0087	0.251	Vel = 2.57
7A	89.580		0.0	1.25	2R	2.0	21.580	150	18.918	
to					O	6.0	8.000		0.0	
29	89.580		12.22	1.394			29.580	0.0087	0.257	Vel = 2.57
			0.0							
29			12.22						19.175	K Factor = 2.79
UP5	99.830		-8.10	2	O	10.0	2.670	150	14.012	
to							10.000		0.0	
25A	99.830		-8.1	2.003			12.670	-0.0007	-0.009	Vel = 0.82

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	******
			0.0									
25A			-8.10						14.003	K Factor = -2.16		
UP3	110.080		-10.33	2	10R	10.0	74.080	150	9.562			
to					2O	20.0	30.000		0.0			
24	110.080		-10.33	2.003			104.080	-0.0011	-0.113	Vel = 1.05		
			0.0									
24			-10.33						9.449	K Factor = -3.36		

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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.

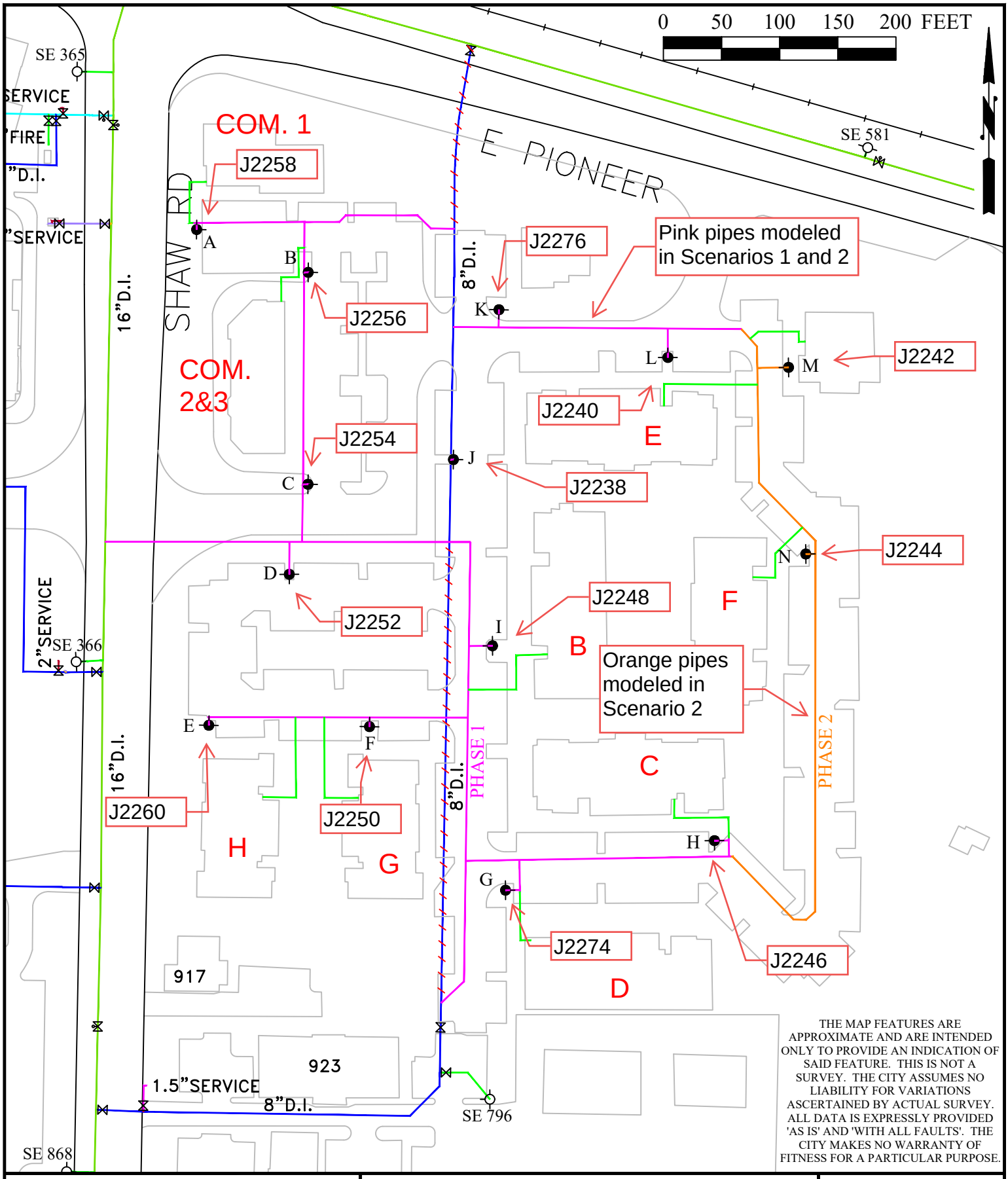
Fire flow to the hydrants is limited by the 10-fps maximum velocity through the existing and proposed 8-inch pipes.

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

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



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CITY OF PUYALLUP
PUBLIC WORKS
WATER DIVISION

HYDRAULIC MODEL FOR EAST TOWN CROSSING

SCALE AS SHOWN

04/10/2024

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