

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

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. Hamilton</i>	01/18/2025	
Signature	Date	

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

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

HYDRAULIC CALCULATIONS
for

JOB NAME East Town Crossing Building C
Location 2902 E PIONEER PUYALLUP, WA 98372
Drawing # FP-3.0
Contract # 24-093CM
Date 1/16/2025

DESIGN

Remote area # RA#1
Remote area location UNIT 307 - 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 @ 34.1688 - 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:

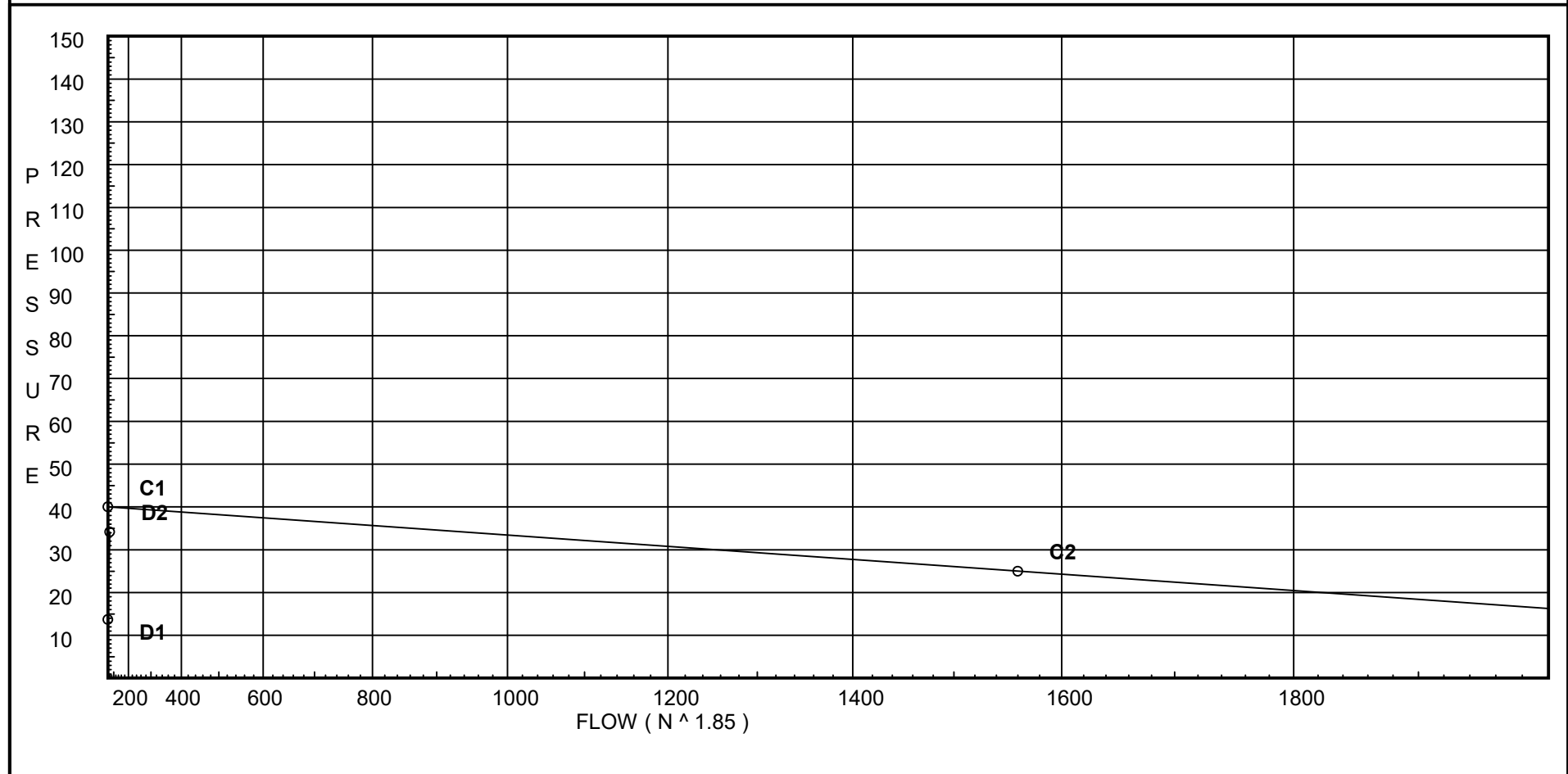
Water Supply Curve

SPRINX FIRE PROTECTION INC.
ETC Building C

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

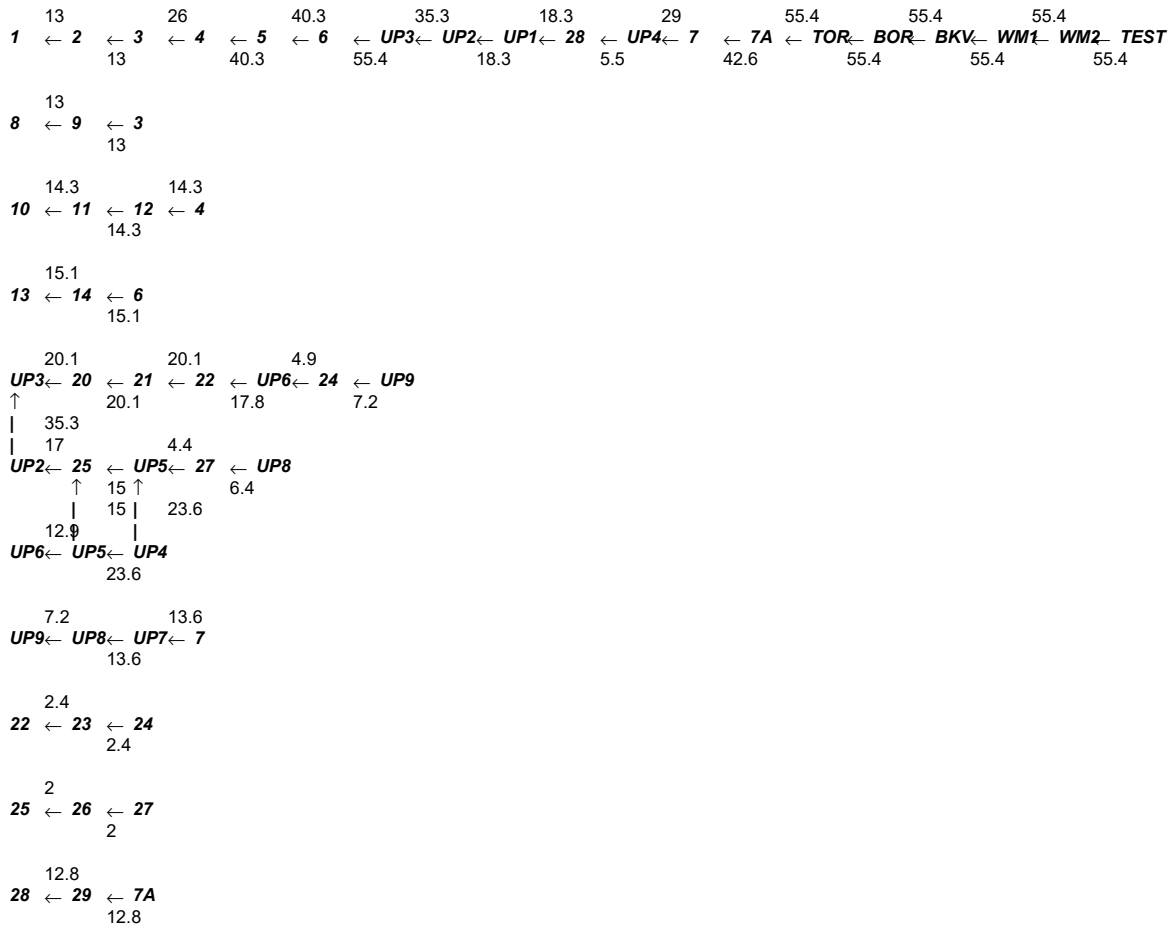
Demand:
D1 - Elevation : 13.677
D2 - System Flow : 55.435
D2 - System Pressure : 34.169
Hose (Demand) : _____
D3 - System Demand : 55.435
Safety Margin : 5.800



Flow Diagram

SPRINX FIRE PROTECTION INC.
ETC Building C

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Fittings Used Summary

SPRINX FIRE PROTECTION INC.
ETC Building C

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Date 1/16/2025

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
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'El 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.

Flow Summary - NFPA

SPRINX FIRE PROTECTION INC.
ETC Building C

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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	25	1560.0	39.969	55.43	34.169

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	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			
UP3	110.08		10.38			
UP2	99.83		14.94			
UP1	89.58		19.44			
28	89.58		19.75			
UP4	89.58		19.76			
7	89.58		19.92			
7A	89.58		20.35			
TOR	89.58		22.1			
BOR	80.0		27.01			
BKV	78.0		34.15			
WM1	78.0		34.17			
WM2	78.0		34.17			
TEST	78.0		34.17			
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		10.55			
21	110.08		10.63			
22	110.08		10.72			
UP6	110.08		10.76			
24	110.08		10.76			
25	99.83		15.19			
UP5	99.83		15.21			
27	99.83		15.22			
UP9	110.08		10.82			
UP8	99.83		15.26			
UP7	89.58		19.74			
23	110.08		10.73			
26	99.83		15.2			
29	89.58		20.07			

Final Calculations : Hazen-Williams

SPRINX FIRE PROTECTION INC.
ETC Building C

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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	109.580 110.080	4.90	13.00 13.0	1 1.101	O	5.0	0.500 5.000 5.500	150 0.0307	7.040 -0.217 0.169		Vel = 4.38	
2 to 3	110.080 110.080		0.0 13.0	1 1.101	R	1.0	8.000 1.000 9.000	150 0.0307	6.992 0.0 0.276		Vel = 4.38	
3 to 4	110.080 110.080		13.01 26.01	1 1.101	O	5.0	10.550 5.000 15.550	150 0.1107	7.268 0.0 1.721		Vel = 8.77	
4 to 5	110.080 110.080		14.33 40.34	1.25 1.394	R	1.0	7.420 1.000 8.420	150 0.0790	8.989 0.0 0.665		Vel = 8.48	
5 to 6	110.080 110.080		0.0 40.34	1.25 1.394	R	1.0	2.750 1.000 3.750	150 0.0789	9.654 0.0 0.296		Vel = 8.48	
6 to UP3	110.080 110.080		15.09 55.43	2 2.003	O	10.0	7.640 10.000 17.640	150 0.0244	9.950 0.0 0.430		Vel = 5.64	
UP3 to UP2	110.080 99.830		-20.14 35.29	2 2.003	R	1.0	10.250 1.000 11.250	150 0.0105	10.380 4.439 0.118		Vel = 3.59	
UP2 to UP1	99.830 89.580		-17.03 18.26	2 2.003	O	10.0	10.250 10.000 20.250	150 0.0032	14.937 4.439 0.064		Vel = 1.86	
UP1 to 28	89.580 89.580		0.0 18.26	2 2.003	9R 2O	9.0 20.0	70.830 29.000 99.830	150 0.0031	19.440 0.0 0.311		Vel = 1.86	
28 to UP4	89.580 89.580		-12.80 5.46	2 2.003	2R	2.0	10.670 2.000 12.670	150 0.0003	19.751 0.0 0.004		Vel = 0.56	
UP4 to 7	89.580 89.580		23.58 29.04	2 2.003	R O	1.0 10.0	11.000 11.000 22.000	150 0.0074	19.755 0.0 0.162		Vel = 2.96	
7 to 7A	89.580 89.580		13.60 42.64	2 2.003	3R	3.0	26.000 3.000 29.000	150 0.0150	19.917 0.0 0.434		Vel = 4.34	
7A to TOR	89.580 89.580		12.79 55.43	2 2.003	5R 2O N	5.0 20.0 11.0	36.000 36.000 72.000	150 0.0243	20.351 0.0 1.752		Vel = 5.64	
TOR to BOR	89.580 80		0.0 55.43	2 2.203	B S	8.183 15.003	9.500 23.186 32.686	120 0.0231	22.103 4.149 0.756		Vel = 4.67	
BOR to BKV	80 78		0.0 55.43	6 6.16	T 3E Ziw	43.037 60.252 0.0	62.000 103.289 165.289	140 0.0001	27.008 7.127 0.020		* * Fixed Loss = 6.261 Vel = 0.60	
BKV to WM1	78 78		0.0 55.43	6 6.16	T E G	43.037 20.084 4.304	38.000 67.425 105.425	140 0.0001	34.155 0.0 0.012		Vel = 0.60	

Final Calculations : Hazen-Williams

SPRINX FIRE PROTECTION INC.
ETC Building C

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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	*****
WM1 to WM2	78 78		0.0 55.43	8 8.27	T	55.354	3.000 55.354	140 0	34.167 0.0			
										Vel =	0.33	
WM2 to TEST	78 78		0.0 55.43	8 8.27			12.000 12.000	140 0.0001	34.168 0.0			
										Vel =	0.33	
TEST			0.0 55.43						34.169		K Factor =	9.48
8 to 9	109.580 110.080	4.90	13.01 13.01	1 1.101	O	5.0	0.500 5.000 5.500	150 0.0309	7.053 -0.217 0.170			Vel = 4.38
9 to 3	110.080 110.080		0.0 13.01	1 1.101	O	5.0	3.540 5.000 8.540	150 0.0307	7.006 0.0 0.262			Vel = 4.38
3			0.0 13.01						7.268		K Factor =	4.83
10 to 11	108.580 110.080	4.90	14.33 14.33	1 1.101	N	7.0	1.500 7.000 8.500	150 0.0368	8.552 -0.650 0.313			Vel = 4.83
11 to 12	110.080 110.080		0.0 14.33	1 1.101	O	5.0	1.500 5.000 6.500	150 0.0368	8.215 0.0 0.239			Vel = 4.83
12 to 4	110.080 110.080		0.0 14.33	1 1.101	2O	10.0	4.580 10.000 14.580	150 0.0367	8.454 0.0 0.535			Vel = 4.83
4			0.0 14.33						8.989		K Factor =	4.78
13 to 14	109.580 110.080	4.90	15.09 15.09	1 1.101	O	5.0	0.500 5.000 5.500	150 0.0405	9.484 -0.217 0.223			Vel = 5.09
14 to 6	110.080 110.080		0.0 15.09	1 1.101	O	5.0	6.390 5.000 11.390	150 0.0404	9.490 0.0 0.460			Vel = 5.09
6			0.0 15.09						9.950		K Factor =	4.78
UP3 to 20	110.080 110.080		20.14 20.14	2 2.003	4R O	4.0 10.0	31.670 14.000 45.670	150 0.0037	10.380 0.0 0.170			Vel = 2.05
20 to 21	110.080 110.080		0.0 20.14	2 2.003	3R	3.0	19.000 3.000 22.000	150 0.0037	10.550 0.0 0.082			Vel = 2.05
21 to 22	110.080 110.080		0.0 20.14	2 2.003	3R	3.0	20.170 3.000 23.170	150 0.0038	10.632 0.0 0.087			Vel = 2.05
22 to UP6	110.080 110.080		-2.35 17.79	2 2.003	2R	2.0	10.670 2.000 12.670	150 0.0030	10.719 0.0 0.038			Vel = 1.81

Final Calculations : Hazen-Williams

SPRINX FIRE PROTECTION INC.
ETC Building C

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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	*****
UP6 to 24	110.080 110.080		-12.94 4.85	2 2.003	2R	2.0	11.000 2.000 13.000	150 0.0002	10.757 0.0 0.003			Vel = 0.49
24 to UP9	110.080 110.080		2.36 7.21	2 2.003	10R 2O	10.0 20.0	70.830 30.000 100.830	150 0.0006	10.760 0.0 0.057			Vel = 0.73
UP9			0.0 7.21						10.817			K Factor = 2.19
UP2 to 25	99.830 99.830		17.04 17.04	2 2.003	10R O	10.0 10.0	71.000 20.000 91.000	150 0.0027	14.937 0.0 0.250			Vel = 1.73
25 to UP5	99.830 99.830		-2.01 15.03	2 2.003	2R	2.0	10.670 2.000 12.670	150 0.0022	15.187 0.0 0.028			Vel = 1.53
UP5 to 27	99.830 99.830		-10.64 4.39	2 2.003	2R	2.0	11.000 2.000 13.000	150 0.0002	15.215 0.0 0.003			Vel = 0.45
27 to UP8	99.830 99.830		2.00 6.39	2 2.003	9R 2O	9.0 20.0	70.830 29.000 99.830	150 0.0004	15.218 0.0 0.044			Vel = 0.65
UP8			0.0 6.39						15.262			K Factor = 1.64
UP6 to UP5	110.080 99.830		12.94 12.94	2 2.003	R	1.0	10.250 1.000 11.250	150 0.0017	10.757 4.439 0.019			Vel = 1.32
UP5 to UP4	99.830 89.580		10.64 23.58	2 2.003	O	10.0	10.250 10.000 20.250	150 0.0050	15.215 4.439 0.101			Vel = 2.40
UP4			0.0 23.58						19.755			K Factor = 5.31
UP9 to UP8	110.080 99.830		7.21 7.21	2 2.003	R	1.0	10.250 1.000 11.250	150 0.0005	10.817 4.439 0.006			Vel = 0.73
UP8 to UP7	99.830 89.580		6.39 13.6	2 2.003	O	10.0	10.250 10.000 20.250	150 0.0018	15.262 4.439 0.037			Vel = 1.38
UP7 to 7	89.580 89.580		0.0 13.6	2 2.003	8R 2O	8.0 20.0	71.000 28.000 99.000	150 0.0018	19.738 0.0 0.179			Vel = 1.38
7			0.0 13.60						19.917			K Factor = 3.05
22 to 23	110.080 110.080		2.36 2.36	1.25 1.394	3R O	3.0 6.0	26.000 9.000 35.000	150 0.0004	10.719 0.0 0.015			Vel = 0.50
23 to 24	110.080 110.080		0.0 2.36	1.25 1.394	5R 2O	5.0 12.0	47.580 17.000 64.580	150 0.0004	10.734 0.0 0.026			Vel = 0.50
			0.0									

Final Calculations : Hazen-Williams

SPRINX FIRE PROTECTION INC.
ETC Building C

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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	*****
			2.36						10.760		K Factor = 0.72	
24 to 25	99.830		2.00	1.25	3R O	3.0 6.0	26.000 9.000	150	15.187 0.0			
25 to 26	99.830		2.0	1.394			35.000	0.0003	0.011		Vel = 0.42	
26 to 27	99.830		0.0	1.25	5R 2O	5.0 12.0	47.580 17.000	150	15.198 0.0			
27 to 28	99.830		2.0	1.394			64.580	0.0003	0.020		Vel = 0.42	
27 to 29			0.0 2.00						15.218		K Factor = 0.51	
28 to 29	89.580		12.80	1.25	2R O	2.0 6.0	26.000 8.000	150	19.751 0.0			
29 to 7A	89.580		12.8	1.394			34.000	0.0094	0.321		Vel = 2.69	
29 to 7A	89.580		0.0	1.25	2R O	2.0 6.0	21.580 8.000	150	20.072 0.0			
7A to 7A	89.580		12.8	1.394			29.580	0.0094	0.279		Vel = 2.69	
7A to 7A			0.0 12.80						20.351		K Factor = 2.84	

SPRINX

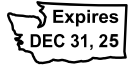

FIRE PROTECTION

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	
	01/18/2025
Signature	Date

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

Job Name : ETC Building C
Drawing : FP-3.0
Location : 2902 E PIONEER PUYALLUP, WA 98372
Remote Area : RA#3
Contract : 24-093CM
Data File : ETC Building C Area 3.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME East Town Crossing Building C
Location 2902 E PIONEER PUYALLUP, WA 98372
Drawing # FP-3.0
Contract # 24-093CM
Date 1/16/2025

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) 60.3415 - GPM @ 33.3356 - 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 C

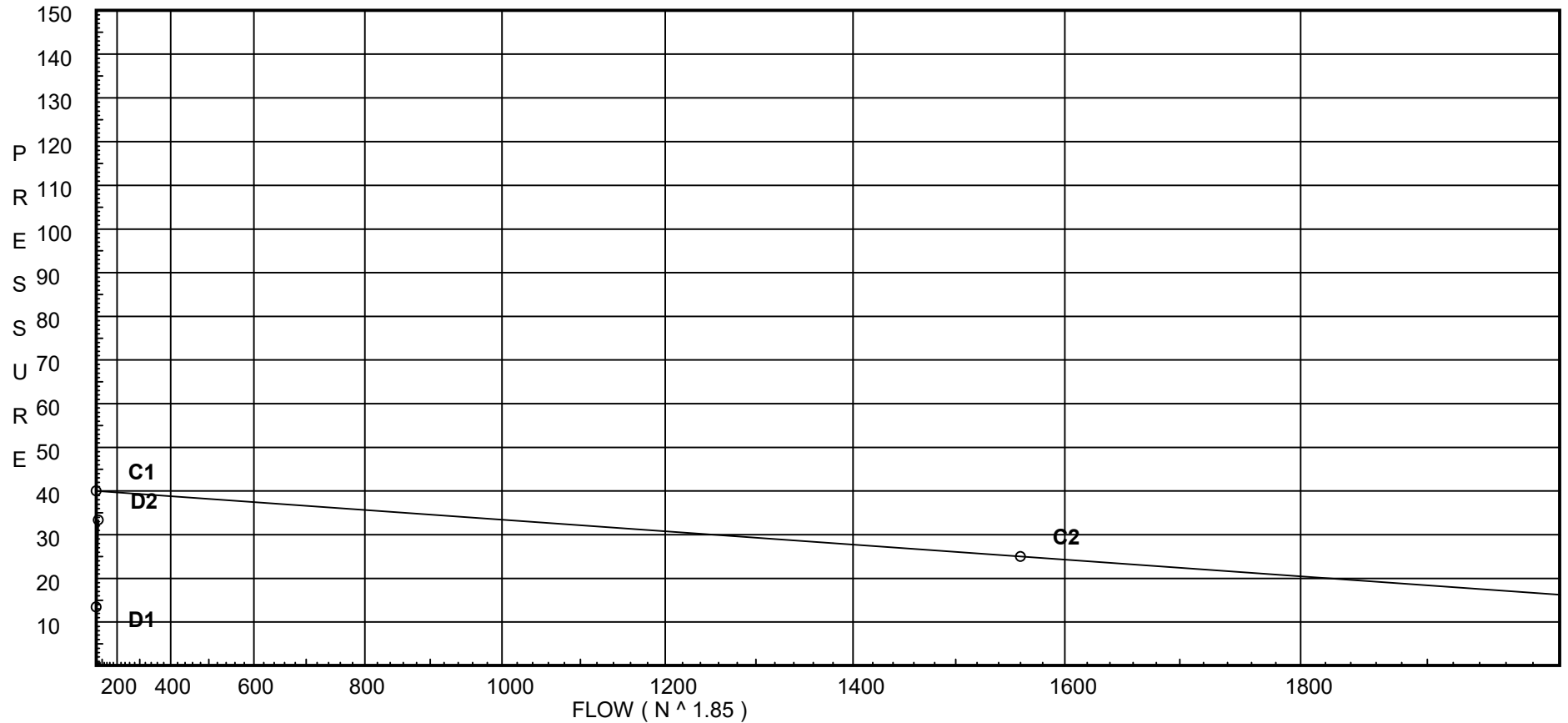
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City Water Supply:

C1 - Static Pressure : 40
C2 - Residual Pressure: 25
C2 - Residual Flow : 1560

Demand:

D1 - Elevation : 13.426
D2 - System Flow : 60.342
D2 - System Pressure : 33.336
Hose (Demand) : _____
D3 - System Demand : 60.342
Safety Margin : 6.628



Flow Diagram

SPRINX FIRE PROTECTION INC.
ETC Building C

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15.4 15.4 16.3 2.5 46.5 60.3 60.3 60.3
30 ← 5 ← 6 ← UP3 ← UP2 ← UP1 ← 28 ← UP4 ← 7 ← 7A ← TOR ← BOR ← BKV ← WM1 ← WM2 ← TEST
15.4 29.1 16.3 31 60.3 60.3 60.3

15.1
40 ← 20

14.8
50 ← 51 ← 21
29.9

15
60 ← 51

13.8 31.2 5.5
UP3 → 20 ← 21 ← 22 ← UP6 ← 24 ← UP9
↑ 1.3 27.6 9.1
|
29.1
|
12.8 4.9
UP2 ← 25 ← UP5 ← 27 ← UP8
↑ 11.2 6.5
| 11.2 28.4
22.2 |
UP6 ← UP5 ← UP4
28.4

9.1 15.5
UP9 ← UP8 ← UP7 ← 7
15.5

3.6
22 ← 23 ← 24
3.6

1.6
25 ← 26 ← 27
1.6

13.8
28 ← 29 ← 7A
13.8

Fittings Used Summary

SPRINX FIRE PROTECTION INC.
ETC Building C

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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
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'EI 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.

Flow Summary - NFPA

SPRINX FIRE PROTECTION INC.
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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	25	1560.0	39.963	60.34	33.336

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>
30	109.0	5.6	7.53	15.37	0.1	130.24
5	110.08		9.1			
6	110.08		9.15			
UP3	110.08		9.19			
UP2	99.83		13.71			
UP1	89.58		18.2			
28	89.58		18.46			
UP4	89.58		18.46			
7	89.58		18.64			
7A	89.58		19.15			
TOR	89.58		21.2			
BOR	80.0		26.23			
BKV	78.0		33.32			
WM1	78.0		33.33			
WM2	78.0		33.34			
TEST	78.0		33.34			
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		9.3			
UP6	110.08		9.39			
24	110.08		9.39			
25	99.83		13.86			
UP5	99.83		13.88			
27	99.83		13.88			
UP9	110.08		9.48			
UP8	99.83		13.93			
UP7	89.58		18.41			
23	110.08		9.33			
26	99.83		13.87			
29	89.58		18.83			

Final Calculations : Hazen-Williams

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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 to 5	109 110.080	5.60	15.37	1	4N	28.0	20.830 28.000 48.830	150	7.529 -0.468 2.041			Vel = 5.18
5 to 6	110.080 110.080		0.0	1.25	R	1.0	2.750 1.000 3.750	150	9.102 0.0 0.050			Vel = 3.23
6 to UP3	110.080 110.080		0.0	2	O	10.0	7.640 10.000 17.640	150	9.152 0.0 0.040			Vel = 1.56
UP3 to UP2	110.080 99.830		13.76	2	R	1.0	10.250 1.000 11.250	150	9.192 4.439 0.083			Vel = 2.97
UP2 to UP1	99.830 89.580		-12.78	2	O	10.0	10.250 10.000 20.250	150	13.714 4.439 0.052			Vel = 1.66
UP1 to 28	89.580 89.580		0.0	2	9R 2O	9.0 20.0	70.830 29.000 99.830	150	18.205 0.0 0.253			Vel = 1.66
28 to UP4	89.580 89.580		-13.84	2	2R	2.0	10.670 2.000 12.670	150	18.458 0.0 0.002			Vel = 0.26
UP4 to 7	89.580 89.580		28.45	2	R O	1.0 10.0	11.000 11.000 22.000	150	18.460 0.0 0.182			Vel = 3.15
7 to 7A	89.580 89.580		15.55	2	3R	3.0	26.000 3.000 29.000	150	18.642 0.0 0.510			Vel = 4.74
7A to TOR	89.580 89.580		13.83	2	5R 2O	5.0 20.0	36.000 36.000 72.000	150	19.152 0.0 2.049			Vel = 6.14
TOR to BOR	89.580 80		0.0	2	B S	8.183 15.003	9.500 23.186 32.686	120	21.201 4.149 0.885			Vel = 5.08
BOR to BKV	80 78		0.0	6	T 3E	43.037 60.252	62.000 103.289 165.289	140	26.235 7.062 0.022		** Fixed Loss = 6.195	Vel = 0.65
BKV to WM1	78 78		0.0	6	T E	43.037 20.084	38.000 67.425 105.425	140	33.319 0.0 0.014			Vel = 0.65
WM1 to WM2	78 78		0.0	8	T	55.354	3.000 55.354 58.354	140	33.333 0.0 0.002			Vel = 0.36
WM2 to TEST	78 78		0.0	8			12.000 12.000	140	33.335 0.0 0.001			Vel = 0.36
TEST			0.0 60.34						33.336		K Factor = 10.45	
40 to 20	109 110.080	5.60	15.11	1	4N 3R O	28.0 3.0 5.0	20.580 36.000 56.580	150	7.282 -0.468 2.293			Vel = 5.09

Final Calculations : Hazen-Williams

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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 15.11						9.107		K Factor = 5.01	
50 to 51	109 110.080	5.60	14.82	1	3N O	21.0 5.0	10.670 26.000 36.670	150	7.000 -0.468 1.433		Vel = 4.99	
51 to 21	110.080 110.080		14.82	1.101	2R O	2.0 6.0	17.250 8.000 25.250	150	7.965 0.0 1.143		Vel = 6.28	
			0.0 29.86						9.108		K Factor = 9.89	
60 to 51	109 110.080	5.60	15.05	1	3N O	21.0 5.0	4.170 26.000 30.170	150	7.220 -0.468 1.213		Vel = 5.07	
			0.0 15.05						7.965		K Factor = 5.33	
UP3 to 20	110.080 110.080		-13.77	2	4R O	4.0 10.0	31.670 14.000 45.670	150	9.192 0.0 -0.085		Vel = 1.40	
20 to 21	110.080 110.080		15.12	2	3R	3.0	19.000 3.000 22.000	150	9.107 0.0 0.001		Vel = 0.14	
21 to 22	110.080 110.080		29.86	2	3R	3.0	20.170 3.000 23.170	150	9.108 0.0 0.194		Vel = 3.18	
22 to UP6	110.080 110.080		-3.59	2	2R	2.0	10.670 2.000 12.670	150	9.302 0.0 0.085		Vel = 2.81	
UP6 to 24	110.080 110.080		-22.16	2	2R	2.0	11.000 2.000 13.000	150	9.387 0.0 0.005		Vel = 0.56	
24 to UP9	110.080 110.080		3.59	2	10R 2O	10.0 20.0	70.830 30.000 100.830	150	9.392 0.0 0.086		Vel = 0.92	
			0.0 9.05						9.478		K Factor = 2.94	
UP2 to 25	99.830 99.830		12.78	2	10R O	10.0 10.0	71.000 20.000 91.000	150	13.714 0.0 0.147		Vel = 1.30	
25 to UP5	99.830 99.830		-1.57	2	2R	2.0	10.670 2.000 12.670	150	13.861 0.0 0.016		Vel = 1.14	
UP5 to 27	99.830 99.830		-6.29	2	2R	2.0	11.000 2.000 13.000	150	13.877 0.0 0.003		Vel = 0.50	
27 to UP8	99.830 99.830		1.57	2	9R 2O	9.0 20.0	70.830 29.000 99.830	150	13.880 0.0 0.046		Vel = 0.66	

Final Calculations : Hazen-Williams

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ETC Building C

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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	*****
UP8			0.0 6.49						13.926		K Factor = 1.74	
UP6 to UP5	110.080 99.830		22.16 22.16	2 2.003	R	1.0	10.250 1.000 11.250	150	9.387 4.439		Vel = 2.26	
UP5 to UP4	99.830 89.580		6.29 28.45	2 2.003	O	10.0	10.250 10.000 20.250	150	13.877 4.439		Vel = 2.90	
UP4			0.0 28.45						18.460		K Factor = 6.62	
UP9 to UP8	110.080 99.830		9.05 9.05	2 2.003	R	1.0	10.250 1.000 11.250	150	9.478 4.439		Vel = 0.92	
UP8 to UP7	99.830 89.580		6.49 15.54	2 2.003	O	10.0	10.250 10.000 20.250	150	13.926 4.439		Vel = 1.58	
UP7 to 7	89.580 89.580		0.0 15.54	2 2.003	8R 2O	8.0 20.0	71.000 28.000 99.000	150	18.413 0.0		Vel = 1.58	
7			0.0 15.54						18.642		K Factor = 3.60	
22 to 23	110.080 110.080		3.59 3.59	1.25 1.394	3R O	3.0 6.0	26.000 9.000 35.000	150	9.302 0.0		Vel = 0.75	
23 to 24	110.080 110.080		0.0 3.59	1.25 1.394	5R 2O	5.0 12.0	47.580 17.000 64.580	150	9.334 0.0		Vel = 0.75	
24			0.0 3.59						9.392		K Factor = 1.17	
25 to 26	99.830 99.830		1.58 1.58	1.25 1.394	3R O	3.0 6.0	26.000 9.000 35.000	150	13.861 0.0		Vel = 0.33	
26 to 27	99.830 99.830		0.0 1.58	1.25 1.394	5R 2O	5.0 12.0	47.580 17.000 64.580	150	13.868 0.0		Vel = 0.33	
27			0.0 1.58						13.880		K Factor = 0.42	
28 to 29	89.580 89.580		13.83 13.83	1.25 1.394	2R O	2.0 6.0	26.000 8.000 34.000	150	18.458 0.0		Vel = 2.91	
29 to 7A	89.580 89.580		0.0 13.83	1.25 1.394	2R O	2.0 6.0	21.580 8.000 29.580	150	18.829 0.0		Vel = 2.91	
7A			0.0 13.83						19.152		K Factor = 3.16	



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

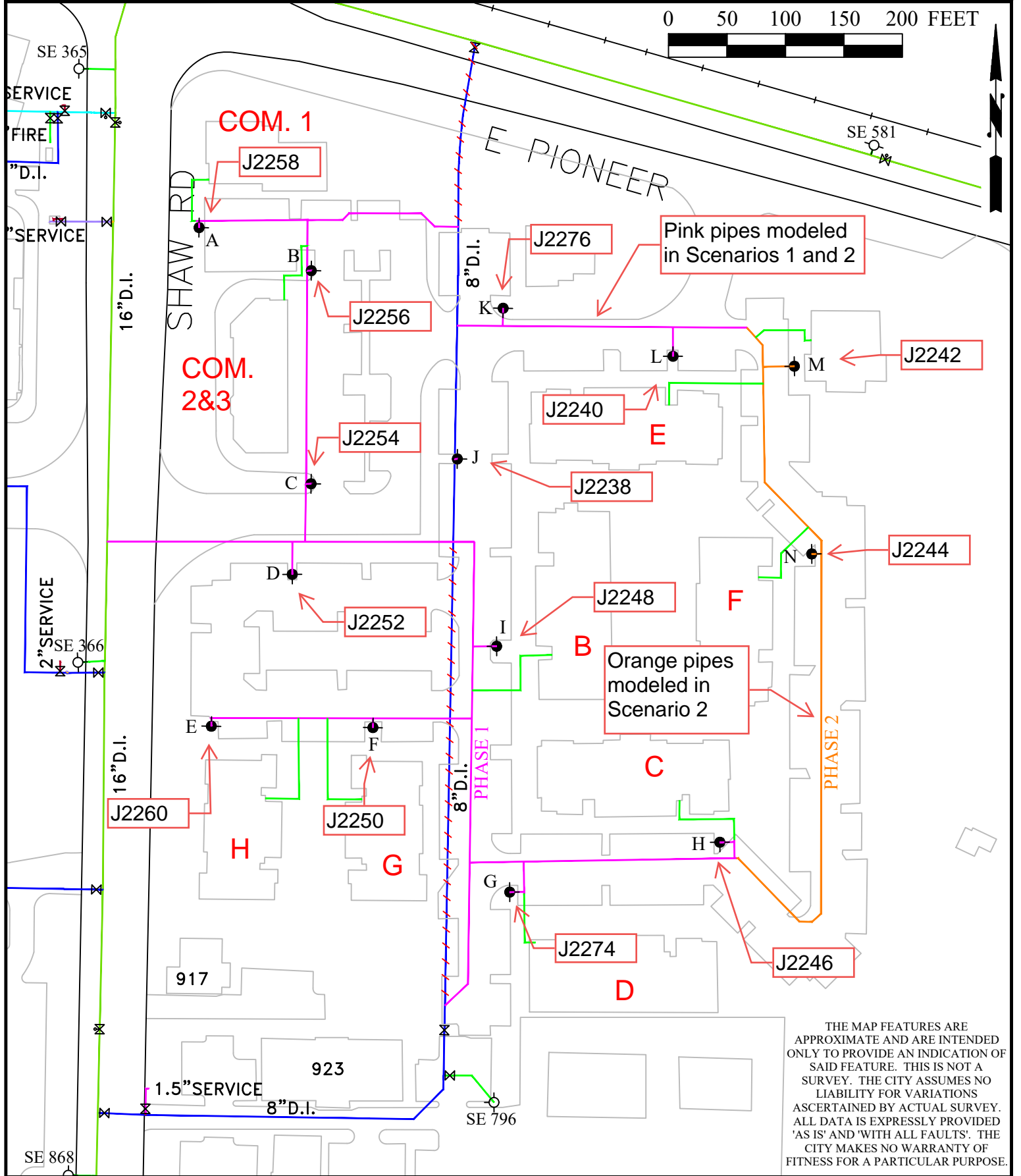


April 16, 2024
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the City may not provide pressure higher than 30 psi in the future. The flows and pressures determined in this memo are based on the approximate hydrant elevation at ground level. The Developer may design their sprinkler system for whatever 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