Hydraulic Overview

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

Job Number: 2220029
Report Description: Light Hazard

Job

Job Number: 2220029	Design Engineer: Michael Hallengren
Job Name: Larson Jeep	Phone: (253) 337-6988 / FAX:
Address 1: 300 River Road	State Certification/License Number: EMERAFL980MR
Address 2: Puyallup, WA 98371	AHJ: City of Puyallup
Address 3:	Job Site/Building:

System

Density: 0.10gpm/ft²	Area of Application: 945ft² (Actual 1020ft²)
Most Demanding Sprinkler Data: 5.6 K-Factor 22.50 at 16.143	Hose Streams: 100.00
Coverage Per Sprinkler: 225ft²	Number Of Sprinklers Calculated: 9 / Number Of Sprinklers Calculated: 0
System Pressure Demand: 45.014	System Flow Demand: 214.21
Total Demand: 314.21 @ 45.014	Pressure Result: +12.655 (21.9%)

Supplies

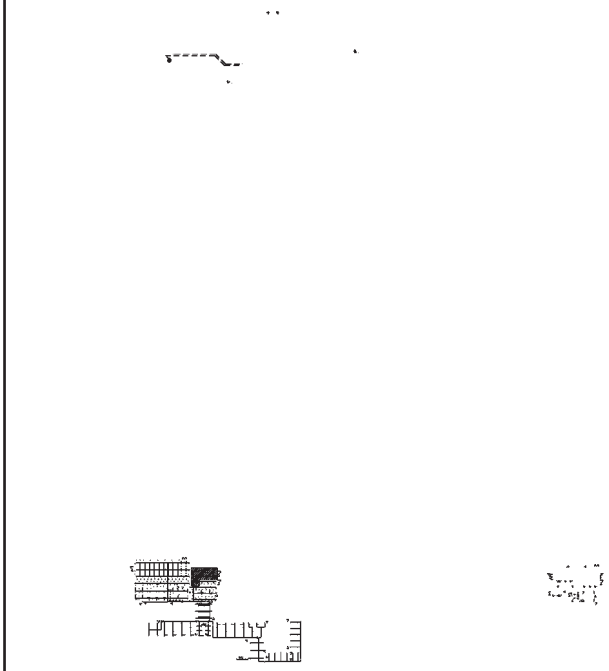
Node	Name	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)
1	Water Supply	1950.00	100.00	59.000	20.000

Check Point Gauges

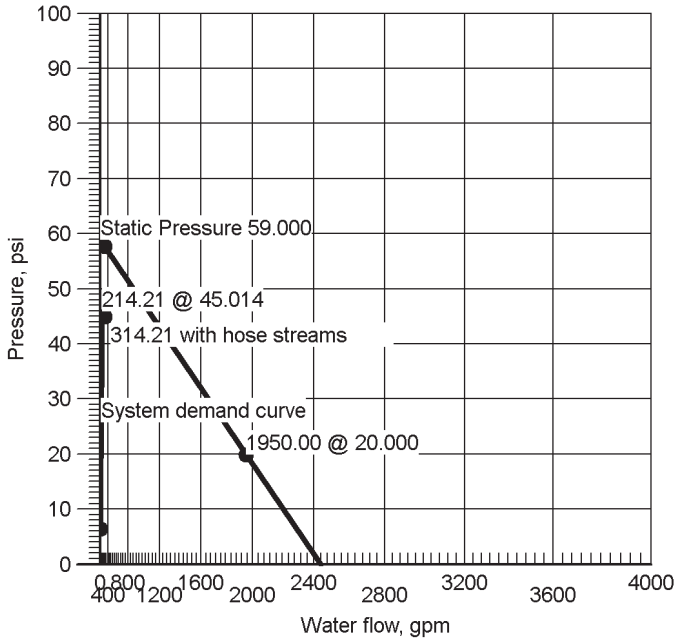
Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)

WASHINGTON STATE
CERTIFICATE OF COMPETENCY
FIRE PROTECTION SPRINKLER SYSTEMS
Michael Todd Hallengren
7223-0107-C Level 3
Emerald Fire, LLC
EMERAFL980MR
Signature
Expires
DEC 31, 22
12-22-9

Larson Jeep.cad



Water Supply at Node 1 (1950.00, 0.00, 59.000, 20.000)



Hydraulic Summary

Job

Job Number: 2220029	Design Engineer: Michael Hallengren
Job Name: Larson Jeep	State Certification/License Number: EMERAFL980MR
Address 1: 300 River Road	AHJ: City of Puyallup
Address 2: Puyallup, WA 98371	Job Site/Building:
Address 3:	Drawing Name: Larson Jeep.cad

System

Most Demanding Sprinkler Data: 5.6 K-Factor 22.50 at 16.143

Hose Allowance At Source: 100.00

Additional Hose Supplies

Node	Flow(gpm)

Total Hose Streams: 100.00

System Flow Demand	Total Water Required (Including Hose Allowance)
214.21	314.21

Maximum Pressure Unbalance In Loops: 0.000

Maximum Velocity Above Ground: 13.74 between nodes 139 and 142

Maximum Velocity Under Ground: 4.91 between nodes 1 and 12

Volume capacity of Wet Pipes	Volume capacity of Dry Pipes
848.48gal	

Remote Area(s)

Occupancy	Job Suffix
Light Hazard	

Density	Area of Application
0.10gpm/ft²	945ft² (Actual 1020ft²)

Number Of Sprinklers Calculated	Number Of Nozzles Calculated	Coverage Per Sprinkler
9	0	225ft²

AutoPeak Results: Pressure For Remote Area(s) Adjacent To Most Remote Area

Left: 45.014 Right: 45.014

Supplies

Node	Name	Hose Flow (gpm)	Static (psi)	Residual (psi) @ Flow (gpm)	Available (psi) @ Total Demand (gpm)	Required (psi)	Safety Margin (psi)
1	Water Supply	100.00	59.000	20.000 @ 1950.00	57.668 @ 314.21	45.014	12.655

Contractor

	Contractor Number	Contact Name	Contact Title
	EMERAFL980MR		

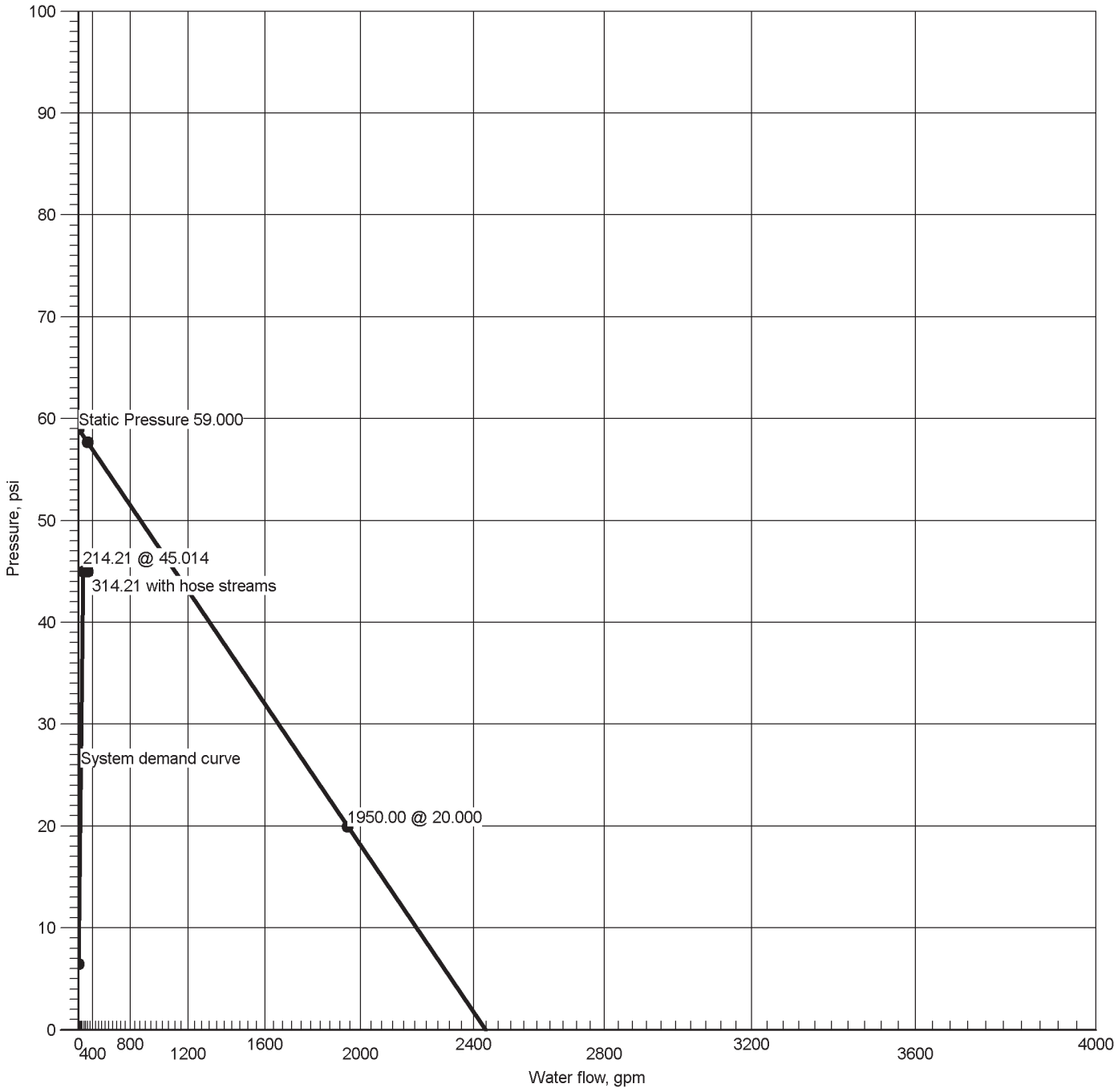
Name of Contractor:	Phone	Extension
Emerald Fire LLC		

Address 1	FAX
11021 Cramer Rd NW	

Address 2	E-mail
Gig Harbor, WA 98329	

Address 3	Web-Site

Water Supply at Node 1



Hydraulic Graph	Water Supply at Node 1
Static: Pressure	59.000
Residual: Pressure	20.000 @ 1950.00
Available Pressure at Time of Test	57.668 @ 314.21
System Demand	45.014 @ 214.21
System Demand (Including Hose Allowance at Source)	45.014 @ 314.21

Summary Of Outflowing Devices

Job Number: 2220029
Report Description: Light Hazard

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	1021	24.57	22.50	5.6	19.249		
Sprinkler	1022	23.77	22.50	5.6	18.017		
Sprinkler	1023	23.46	22.50	5.6	17.555		
Sprinkler	1024	23.38	22.50	5.6	17.437		
Sprinkler	1035	22.88	22.50	5.6	16.695		
Sprinkler	1036	22.58	22.50	5.6	16.264		
Sprinkler	**1037**	**22.50**	**22.50**	**5.6**	**16.143**		
Sprinkler	1038	23.91	22.50	5.6	18.226		
Sprinkler	1042	27.15	22.50	5.6	23.506		

⇨ Most Demanding Sprinkler Data

Node Analysis

Job Number: 2220029
Report Description: Light Hazard

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
1	-3'-0	S	45.014	214.21	
1021	12'-0	Spr(-19.249), fd(24'-0)	19.249	24.57	
1022	12'-0	Spr(-18.017), fd(24'-0)	18.017	23.77	
1023	12'-0	Spr(-17.555), fd(24'-0)	17.555	23.46	
1024	12'-0	Spr(-17.437), fd(24'-0)	17.437	23.38	
1035	12'-0	Spr(-16.695), fd(24'-0)	16.695	22.88	
1036	12'-0	Spr(-16.264), fd(24'-0)	16.264	22.58	
1037	12'-0	Spr(-16.143), fd(24'-0)	16.143	22.50	
1038	9'-0	Spr(-18.226), fd(24'-0)	18.226	23.91	
1042	9'-0	Spr(-23.506), fd(24'-0)	23.506	27.15	
12	0'-6		42.120		
139	12'-6	PO(9'-11)	31.317		
142	13'-6	PO(5'-0)	25.194		
145	13'-5	PO(5'-0)	23.763		
148	13'-3½	PO(5'-0)	23.177		
149	13'-2½	PO(5'-0)	23.048		
170	11'-6	PO(9'-11), C(9'-11)	31.821		
173	13'-6	PO(5'-0)	23.237		
176	13'-5	PO(5'-0)	21.907		
179	13'-3½	PO(5'-0)	21.364		
180	13'-2½	PO(5'-0)	21.247		
265	11'-6	PO(9'-11), C(9'-11)	31.905		
270	13'-6	PO(5'-0)	30.395		

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 1 • • • • •								
AO	1.0490	22.50	8.35	120		0.161813	1'-9	Pf 5.624
1037	12'-0	22.50	5.6	16.143		Sprinkler,	33'-0	Pe -0.520
180	13'-2½			21.247		2E(2'-0), PO(5'-0), fd(24'-0)	34'-9	Pv
BL	1.6820	22.50	3.25	120		0.016234	10'-0	Pf 0.162
180	13'-2½			21.247				Pe -0.045
179	13'-3½			21.364			10'-0	Pv
BL	1.6820	45.08	6.51	120		0.058724	10'-0	Pf 0.587
179	13'-3½	22.58		21.364		Flow (q) from Route 2		Pe -0.045
176	13'-5			21.907			10'-0	Pv
BL	1.6820	67.96	9.81	120		0.125489	11'-0	Pf 1.379
176	13'-5	22.88		21.907		Flow (q) from Route 3		Pe -0.049
173	13'-6			23.237			11'-0	Pv
BL	1.6820	91.87	13.27	120		0.219167	5'-6	Pf 7.712
173	13'-6	23.91		23.237		Flow (q) from Route 7	29'-8½	Pe 0.872
170	11'-6			31.821		T(9'-11), PO(9'-11), C(9'-11)	35'-2½	Pv
CM	4.2600	187.06	4.21	120		0.008843	9'-5½	Pf 0.084
170	11'-6	95.19		31.821		Flow (q) from Route 4		Pe
265	11'-6			31.905			9'-5½	Pv
CM	4.2600	214.21	4.82	120		0.011363	129'-4½	Pf 5.443
265	11'-6	27.15		31.905		Flow (q) from Route 9	64'-3	Pe 4.773
12	0'-6			42.120		2fT(21'-1), E(13'-2), fE(8'-11½), 2f(-0.000), BFP(-3.242)	193'-7½	Pv
UG	4.2200	214.21	4.91	140		0.008945	140'-6	Pf 1.376
12	0'-6			42.120			13'-4½	Pe 1.517
1	-3'-0			45.014		2EE(6'-8½), S	153'-10½	Pv
		100.00				Hose Allowance At Source		
1		314.21						
• • • • • Route 2 • • • • •								
AO	1.0490	22.58	8.38	120		0.162929	1'-9½	Pf 5.666
1036	12'-0	22.58	5.6	16.264		Sprinkler,	33'-0	Pe -0.565
179	13'-3½			21.364		2E(2'-0), PO(5'-0), fd(24'-0)	34'-9½	Pv
• • • • • Route 3 • • • • •								
AO	1.0490	22.88	8.49	120		0.166921	1'-10½	Pf 5.822
1035	12'-0	22.88	5.6	16.695		Sprinkler,	33'-0	Pe -0.610
176	13'-5			21.907		2E(2'-0), PO(5'-0), fd(24'-0)	34'-10½	Pv
• • • • • Route 4 • • • • •								
AO	1.0490	23.38	8.68	120		0.173778	2'-3½	Pf 6.130
1024	12'-0	23.38	5.6	17.437		Sprinkler,	33'-0	Pe -0.520
149	13'-2½			23.048		2E(2'-0), PO(5'-0), fd(24'-0)	35'-3½	Pv
BL	1.6820	23.38	3.38	120		0.017434	10'-0	Pf 0.174
149	13'-2½			23.048				Pe -0.045
148	13'-3½			23.177			10'-0	Pv
BL	1.6820	46.85	6.76	120		0.063046	10'-0	Pf 0.630
148	13'-3½	23.46		23.177		Flow (q) from Route 5		Pe -0.045
145	13'-5			23.763			10'-0	Pv
BL	1.6820	70.62	10.20	120		0.134703	11'-0	Pf 1.480
145	13'-5	23.77		23.763		Flow (q) from Route 6		Pe -0.049
142	13'-6			25.194			11'-0	Pv
BL	1.6820	95.19	13.74	120		0.234021	4'-6	Pf 5.684
142	13'-6	24.57		25.194		Flow (q) from Route 8	19'-9½	Pe 0.438
139	12'-6			31.317		T(9'-11), PO(9'-11)	24'-3½	Pv
CM	4.2600	95.19	2.14	120		0.002534	9'-11½	Pf 0.071
139	12'-6			31.317			17'-10½	Pe 0.434
170	11'-6			31.821		2fE(8'-11½)	27'-10	Pv
• • • • • Route 5 • • • • •								
AO	1.0490	23.46	8.71	120		0.174866	2'-4½	Pf 6.187
1023	12'-0	23.46	5.6	17.555		Sprinkler,	33'-0	Pe -0.565
148	13'-3½			23.177		2E(2'-0), PO(5'-0), fd(24'-0)	35'-4½	Pv
• • • • • Route 6 • • • • •								
AO	1.0490	23.77	8.82	120		0.179115	2'-6	Pf 6.356
1022	12'-0	23.77	5.6	18.017		Sprinkler,	33'-0	Pe -0.610
145	13'-5			23.763		2E(2'-0), PO(5'-0), fd(24'-0)	35'-6	Pv
• • • • • Route 7 • • • • •								
AO	1.0490	23.91	8.88	120		0.181039	5'-6	Pf 6.970
1038	9'-0	23.91	5.6	18.226		Sprinkler,	33'-0	Pe -1.959
173	13'-6			23.237		2E(2'-0), PO(5'-0), fd(24'-0)	38'-6	Pv

Hydraulic Analysis

Job Number: 2220029
Report Description: Light Hazard

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 8 • • • • •								
AO	1.0490	24.57	9.12	120		0.190418	1'-8	Pf 6.604
1021	12'-0	24.57	5.6	19.249		Sprinkler,	33'-0	Pe -0.659
142	13'-6			25.194		2E(2'-0), PO(5'-0), fd(24'-0)	34'-8	Pv
• • • • • Route 9 • • • • •								
AO	1.0490	27.15	10.08	120		0.229072	5'-7½	Pf 8.848
1042	9'-0	27.15	5.6	23.506		Sprinkler,	33'-0	Pe -1.959
270	13'-6			30.395		2E(2'-0), PO(5'-0), fd(24'-0)	38'-7½	Pv
BL	1.6820	27.15	3.92	120		0.022981	5'-6	Pf 0.638
270	13'-6			30.395			22'-3½	Pe 0.872
265	11'-6			31.905		LtE(2'-5½), PO(9'-11), C(9'-11)	27'-9	Pv

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

$$\left(\frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}}\right)^{4.87} = \text{Factor}$$

C Value Multiplier

Value Of C	100	130	140	150
Multiplying Factor	0.713	1.16	1.33	1.51

Pipe Type Legend

AO	Arm-Over
BL	Branch Line
CM	Cross Main
DN	Drain
DR	Drop
DY	Dynamic
FM	Feed Main
FR	Feed Riser
MS	Miscellaneous
OR	Outrigger
RN	Riser Nipple
SP	Sprig
ST	Stand Pipe
UG	Underground

Units Legend

Diameter	Inch
Elevation	Foot
Flow	gpm
Discharge	gpm
Velocity	fps
Pressure	psi
Length	Foot
Friction Loss	psi/Foot
HWC	Hazen-Williams Constant
Pt	Total pressure at a point in a pipe
Pn	Normal pressure at a point in a pipe
Pf	Pressure loss due to friction between points
Pe	Pressure due to elevation difference between indicated points
Pv	Velocity pressure at a point in a pipe

Fittings Legend

ALV	Alarm Valve
AngV	Angle Valve
b	Bushing
BalV	Ball Valve
BFP	Backflow Preventer
BV	Butterfly Valve
C	Cross Flow Turn 90°
cplg	Coupling
Cr	Cross Run
CV	Check Valve
DelV	Deluge Valve
DPV	Dry Pipe Valve
E	90° Elbow
EE	45° Elbow
Ee1	11¼° Elbow
Ee2	22½° Elbow
f	Flow Device
fd	Flex Drop
FDC	Fire Department Connection
fE	90° FireLock(TM) Elbow
fEE	45° FireLock(TM) Elbow
flg	Flange
FN	Floating Node
fT	FireLock(TM) Tee
g	Gauge
GloV	Globe Valve
GV	Gate Valve
Ho	Hose
Hose	Hose
HV	Hose Valve
Hyd	Hydrant
LtE	Long Turn Elbow
mecT	Mechanical Tee
Noz	Nozzle
P1	Pump In
P2	Pump Out
PIV	Post Indicating Valve
PO	Pipe Outlet
PrV	Pressure Relief Valve
PRV	Pressure Reducing Valve
red	Reducer/Adapter
S	Supply
sCV	Swing Check Valve
SFx	Seismic Flex
Spr	Sprinkler
St	Strainer
T	Tee Flow Turn 90°
Tr	Tee Run
U	Union
WirF	Wirsbo
WMV	Water Meter Valve
Z	Cap

Hydraulic Overview

Job Number: 2220029
Report Description: Extra Hazard Group I

Job

Job Number: 2220029	Design Engineer: Michael Hallengren
Job Name: Larson Jeep	Phone: (253) 337-6988 / FAX:
Address 1: 300 River Road	State Certification/License Number: EMERAFL980MR
Address 2: Puyallup, WA 98371	AHJ: City of Puyallup
Address 3:	Job Site/Building:

System

Density: 0.30gpm/ft²	Area of Application: 2500ft² (Actual 227ft²)
Most Demanding Sprinkler Data: 5.6 K-Factor 30.00 at 28.699	Hose Streams: 500.00
Coverage Per Sprinkler: 100ft²	Number Of Sprinklers Calculated: 3 / Number Of Sprinklers Calculated: 0
System Pressure Demand: 48.539	System Flow Demand: 90.16
Total Demand: 590.16 @ 48.539	Pressure Result: +6.187 (11.3%)

Supplies

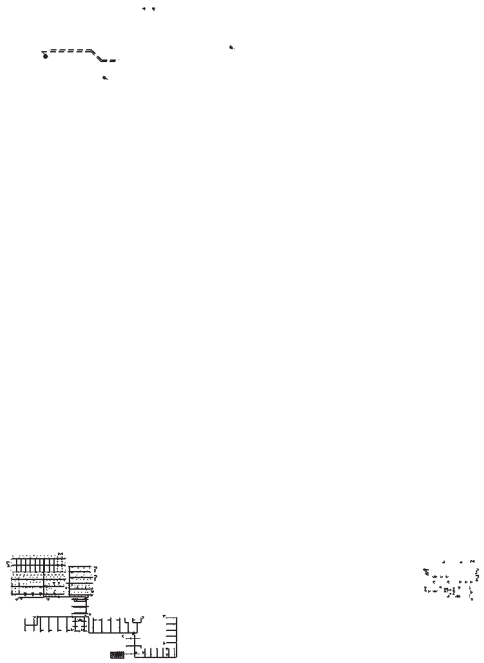
Node	Name	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)
1	Water Supply	1950.00	500.00	59.000	20.000

Check Point Gauges

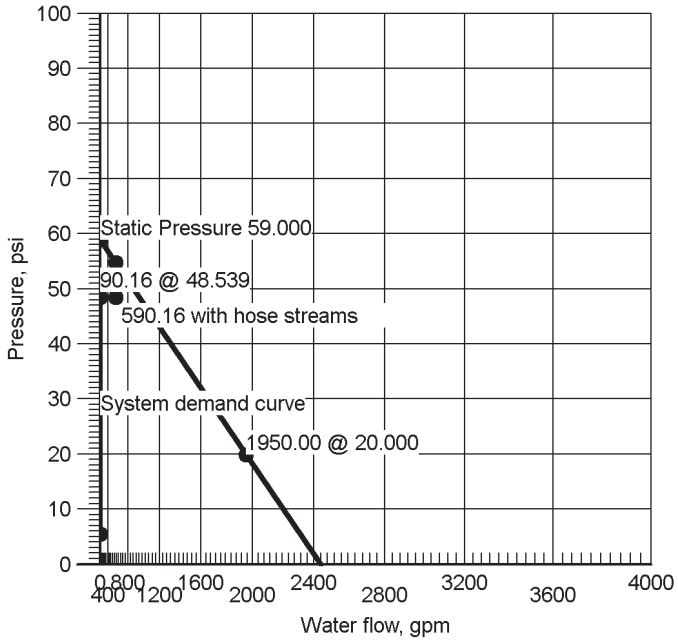
Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)

WASHINGTON STATE
CERTIFICATE OF COMPETENCY
FIRE PROTECTION SPRINKLER SYSTEMS
Michael Todd Hallengren
7223-0107-C Level 3
Emerald Fire, LLC
EMERAFL980MR
Expires DEC 31, 22

Larson Jeep.cad



Water Supply at Node 1 (1950.00, 0.00, 59.000, 20.000)



Hydraulic Summary

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Report Description: Lgtrh Hhahrz d roJp b

Nbu

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Contrhctor

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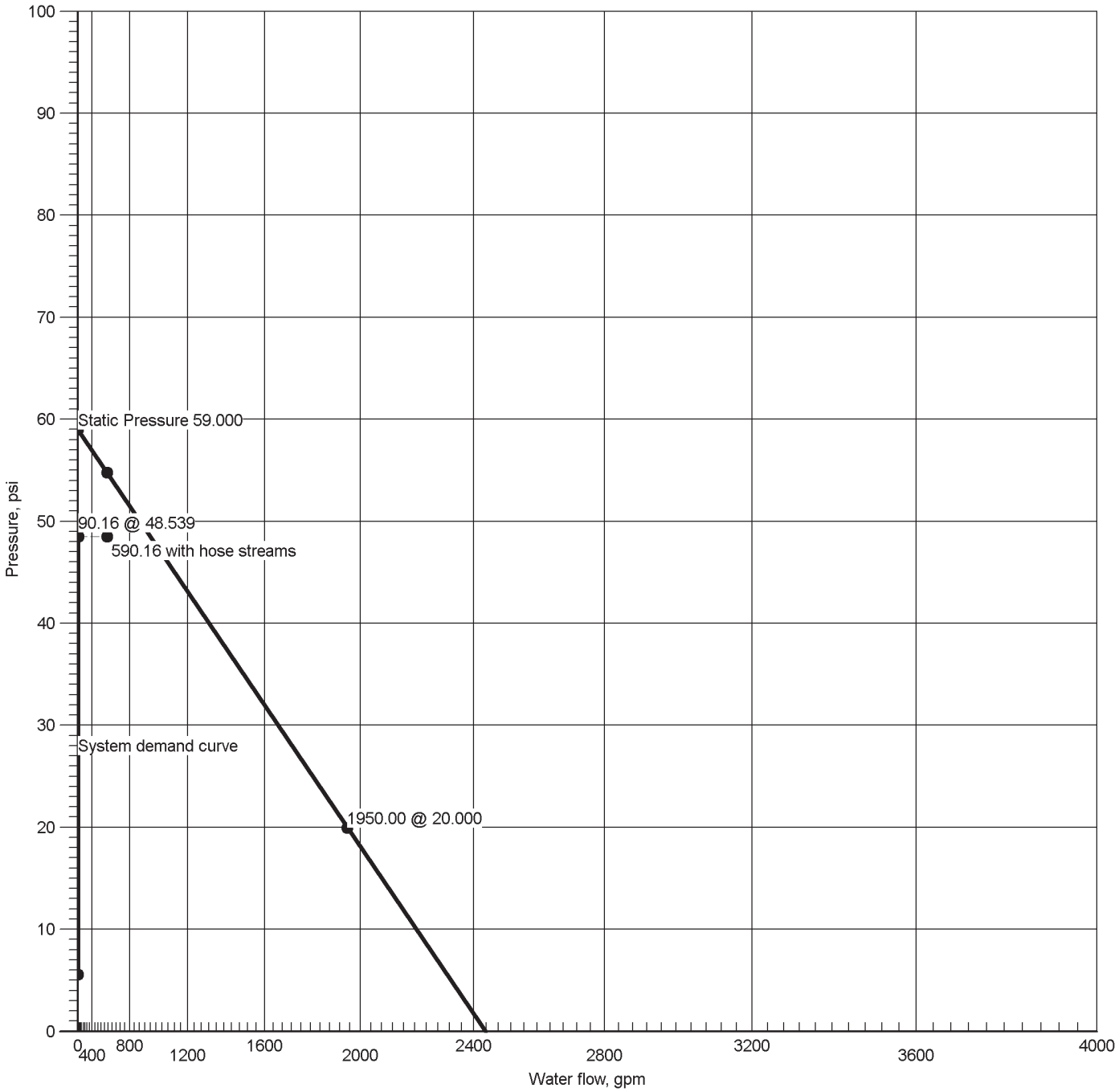
Water Supply at Node 1



Hydraulic Graph
Water Supply at Node 1

Static: Pressure
59.000

Residual: Pressure
20.000 @ 1950.00

Available Pressure at Time of Test
54.726 @ 590.16

System Demand
48.539 @ 90.16

System Demand (Including Hose Allowance at Source)
48.539 @ 590.16

Summary Of Outflowing Devices

Device	Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler 1073	30.13	30.00	5.6	28.951		
Sprinkler 1074	30.02	30.00	5.6	28.744		

Most Demanding Sprinkler Data

Node Analysis

Job Number: 2220029
Report Description: Extra Hazard Group I

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
1	-3'-0	S	48.539	90.16	
1073	9'-11½	Spr(-28.951)	28.951	30.13	
1074	9'-11	Spr(-28.744)	28.744	30.02	
1075	9'-10½	Spr(-28.699)	28.699	30.00	
12	0'-6		46.745		
845	9'-9	PO(12'-3½)	31.826		
847	10'-6	fT(21'-6)	32.082		

Hydraulic Analysis

Job Number: 2220029
Report Description: Lgtrh Hhahrz d roup A

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 1 • • • • •								
O1	2.4580	30.00	2.63	420		0.00' 234	8-76½	Pf 0.062
4085	9-740½	30.00	5.6	2' .699		k prinl ,er		Pe 70.048
408S	9-744			2' .8SS			8-76½	Pv
O1	2.4580	60.02	5.28	420		0.029696	8-76½	Pf 0.22S
408S	9-744	30.02	5.6	2' .8SS		k prinl ,er		Pe 70.048
4083	9-744½			2' .954			8-76½	Pv
O1	2.4580	90.46	8.92	420		0.06302'	23-72½	Pf 2.8' 4
4083	9-744½	30.43	5.6	2' .954		k prinl ,erE	20-744	Pe 0.09S
' S5	9-79			34.' 26		2(L)S-73½PEf B)42-73½P	SS-74½	Pv
Fw	3.2600	90.46	3.S8	420		0.00' S3S	35-76	Pf 0.59S
' S5	9-79			34.' 26			3S-744½	Pe 70.339
' S8	40-76			32.0' 2		2(L)6-7 ½PE(q)24-76P	80-75½	Pv
Fw	S.2600	90.46	2.03	420		0.002292	28S-78	Pf 40.34'
' S8	40-76			32.0' 2			4S' -75½	Pe S.3SS
42	0-76			S6.8S5		6(L)' -744½PE2(q)24-74PE61tL)6-7 8PE21tL)73.500PEL)43-72PE2()70.0 00PEOTf)72.3S9P	S23-70½	Pv
Cd	S.2200	90.46	2.08	4S0		0.004' 0S	4S0-76	Pf 0.28'
42	0-76			S6.8S5			43-7S½	Pe 4.548
4	73-70			S' .539		2LL)6-7 ½PEk	453-740½	Pv

LMuiUh,ent f ipe 1enGt©s o(I h,Ues hnz TittinGs)F / 420 on,KP

) v ctuh, Ansize Dihmeter / k c©ezu,e S0 k tee, f ipe Ansize Dihmeter P S.' 8 / Thctor

F I h,ue w u,tip,ier

I h,ue B (F	400	430	4S0	450
w u,tip,KinG Thctor	0.843	4.46	4.33	4.54

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

f ipe qKpe 1eGenz

vB	vrm7BUer
O1	Orhnc©1ine
Fw	Fross whin
DN	Drhin
DR	Drop
DW	DKnhmic
Tw	Teez whin
TR	Teez Riser
wk	wisce,,hneous
BR	ButriGGer
RN	Riser Nipp,e
kf	kpriG
kq	kthnz f ipe
Cd	CnzerGrounz

Cnits 1eGenz

Dihmeter	Anc©
L,eUhtion	Toot
T,o°	Gpm
Disc©hrGe	Gpm
I e,ocitK	(ps
f ressure	psi
1enGt©	Toot
Triction 1oss	psiYToot
H¼F	Hhaen7¼i,,ihms Fonsthnt
f t	qoth, pressure ht h point in h pipe
f n	Normh, pressure ht h point in h pipe
f (	f ressure ,oss zue to (riction bet° een points
f e	f ressure zue to e,eUhtion zi((erence bet° een inzichtez points
f U	I e,ocitK pressure ht h point in h pipe

TittinGs 1eGenz

v1l	v,hrm l h,Ue
vnGl	vnGe l h,Ue
b	Ous©inG
Oh,l	Oh,, l h,Ue
OTf	Ohcl (,o° f reUenter
Ol	Outter(,K l h,Ue
F	Fross T,o° qurn 90x
cp,G	Foup,inG
Fr	Fross Run
Fl	F©ecl l h,Ue
De,l	De,uGe l h,Ue
Df l	DrKf ipe l h,Ue
L	90x L,bo°
LL	S5x L,bo°
Le4	44Z x L,bo°
Le2	22½x L,bo°
(	T,o° DeUce
(z	T,eg Drop
TDF	Tire Dephrtment Fonnection
(L	90x Tire1ocl)qwPL,bo°
(LL	S5x Tire1ocl)qwPL,bo°
(,G	T,hnGe
TN	T,ohtinGNoze
(q	Tire1ocl)qwPqee
G	d huGe
d ,ol	d ,obe l h,Ue
d l	d hte l h,Ue
Ho	Hose
Hose	Hose
Hl	Hose l h,Ue
HKz	HKzrhnt
1tL	1onGqurn L,bo°
mecq	wec©hnich, qee
Noa	Noaa,e
f 4	f ump An
f 2	f ump But
f A	f ost AnzichtinGl h,Ue
f B	f ipe But,et
f Rl	f ressure RezucinGl h,Ue
f rl	f ressure Re,ie(l h,Ue
rez	RezucerYvzhpter
k	kupp,K
sFl	k° inGF©ecl l h,Ue
kpr	kprinl ,er
kt	ktrhiner
q	qee T,o° qurn 90x
qr	qee Run
C	Cnion
¼irT	¼irsbo
¼wl	¼hter weter l h,Ue
=	Fhp

Hydraulic Overview

Job Number: 2220029
Report Description: Ordinary Group II

Job

Job Number: 2220029	Design Engineer: Michael Hallengren
Job Name: Larson Jeep	Phone: (253) 337-6988 FAX:
Address 1: 300 River Road	State Certification/License Number: EMERAFL980MR
Address 2: Puyallup, WA 98371	AHJ: City of Puyallup
Address 3:	Job Site/Building:

System

Density: 0.20gpm/ft²	Area of Application: 900ft² (Actual 901ft²)
Most Demanding Sprinkler Data: 5.6 K-Factor 25.20 at 20.250	Hose Streams: 250.00
Coverage Per Sprinkler: 126ft²	Number Of Sprinklers Calculated: 7 / Number Of Sprinklers Calculated: 0
System Pressure Demand: 49.029	System Flow Demand: 178.84
Total Demand: 428.84 @ 49.029	Pressure Result: +7.604 (13.4%)

Supplies

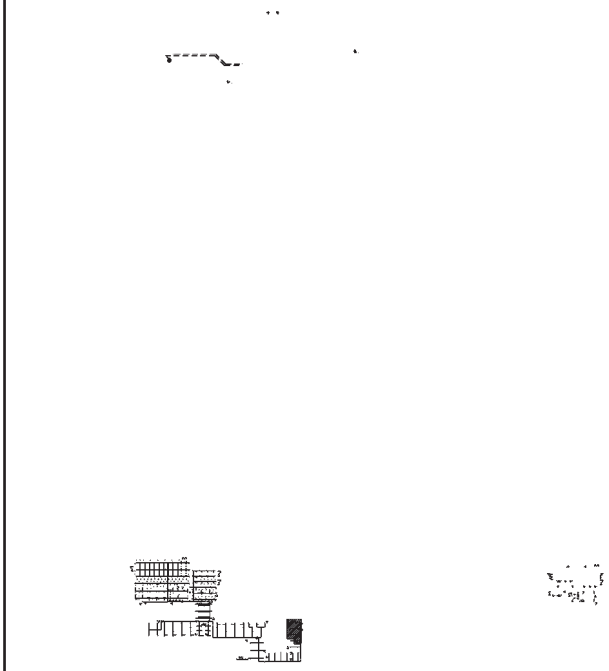
Node	Name	Flow(gpm)	Hose Flow(gpm)	Static(psi)	Residual(psi)
1	Water Supply	1950.00	250.00	59.000	20.000

Check Point Gauges

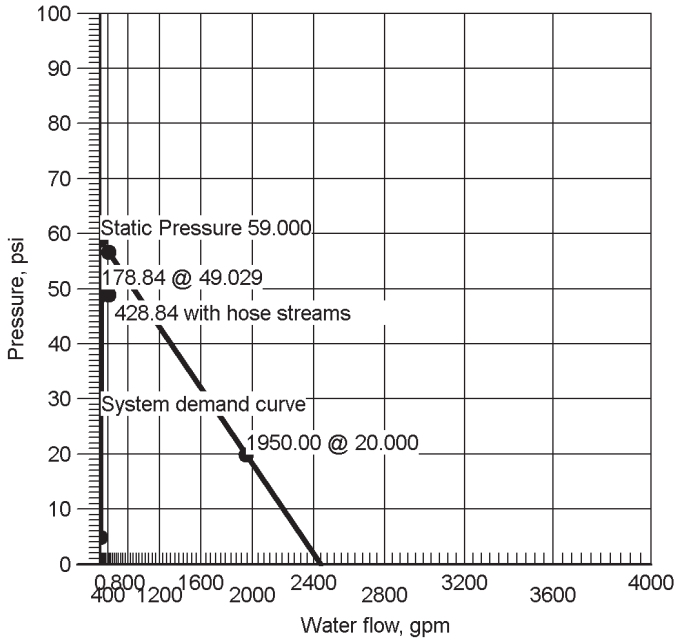
Identifier	Pressure(psi)	K-Factor(K)	Flow(gpm)

WASHINGTON STATE
CERTIFICATE OF COMPETENCY
FIRE PROTECTION SPRINKLER SYSTEMS
Michael Todd Hallengren
7223-0107-C Level 3
Emerald Fire, LLC
EMERAFL980MR
Signature
Expires DEC 31, 22
6-22-22

Larson Jeep.cad



Water Supply at Node 1 (1950.00, 0.00, 59.000, 20.000)



Hydraulic Summary

Job Nzu ber: mmm22m0
Report Description: L rginhrHa rozp db

Job

Job Nzu ber: mmm22m0	Desi(n En(ineer: MicBheFShffen(ren
Job Nhu e: Uhrson Jeep	1thte Oertiyichtion/Uicense Nzu ber: EMERA9U032MR
Aggress 5: 622 River Rohg	ASJ: OitHoyx zHhffzp
Aggress m: x zHhffzp- WA 03645	Job 1ite/, zifgin(
Aggress 6	Drhl in(Nhu e: Uhrson Jeepfchg

1Hsteu

Most Deu hngin(1prinCer Dhth: . f7 GH9hctor m fm2 ht m2fm 2

Sose Affol hnce At 1ozrce: m 2f22

AggitionhFSose 1zppffes: Noge — 9Fol w(pu)

TothFSose 1trehu s: m 2f22

1Hsteu 9Fol Deu hng	TothFWhter Reqzireg whcifgin(Sose Affol hnce)
543f38	8m8f38

Mhl iu zu xresszre PnbhlFhnce dh Ubops: 2f222

Mhl iu zu VelscitHAbove a rozng: 0f03 betl een noges 402 hng 5588

Mhl iu zu VelscitHPnger a rozng	
8f52 betl een noges 5 hng 5m	
Volzu e chphcitHoyWet xipes: 383f83(hF	Volzu e chphcitHoyDrHx ipes:

Reu ote Arehws)

L cczphncH	Job 1zyil
L rginhrHa rozp db	
DensitH: 2fm2(pu /yt²)	Areh oyApplFchtion: 022yt² wActzhF025yt²)
Nzu ber L y1prinCers OhFezlhteg: 4	Nzu ber L yNokkFes OhFezlhteg: 2
Ooverh(e x er 1prinCer: 5m7yt²	

Aztox ehCReszffs: x resszre 9or Reu ote Arehws) Agjhcent To Most Reu ote Areh

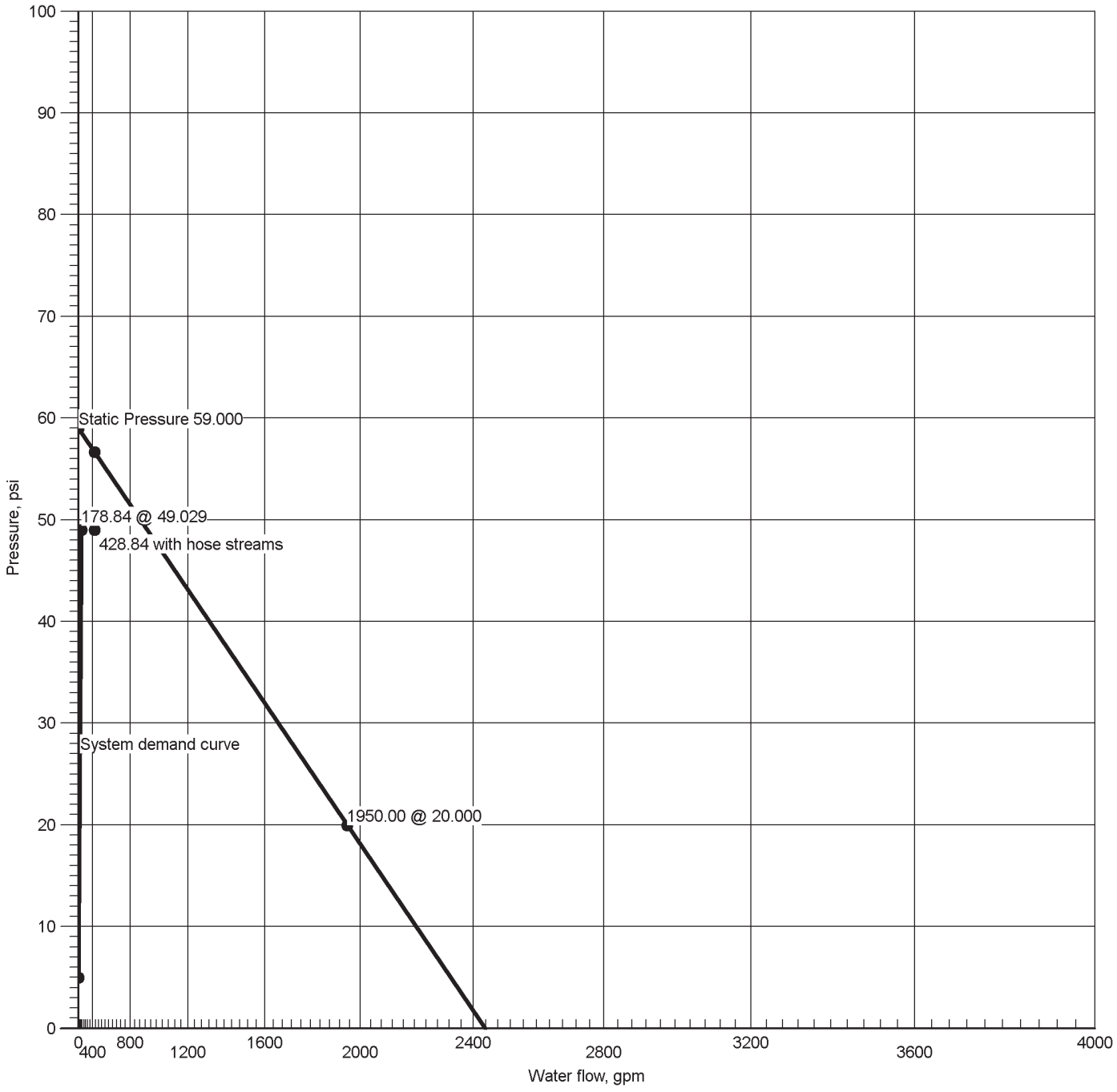
1zppffes

Noge	Nhu e	Sose 9Fol w(pu)	1thtic vpsi)	ResigzhF vpsi)	@ 9Fol w(pu)	AvhilFhbFe vpsi)	@ TothFDeu hng w(pu)	Reqzireg vpsi)	1hyetHMhr(in vpsi)
5	Whter 1zppFH	m 2f22	. 0f222	m2f222	50. 2f22	. 7f766	8m8f38	80f2m0	4f728

Oontrhctor

	Oontrhctor Nzu ber: EMERA9U032MR	Oonthct Nhu e	Oonthct TitFe
Nhu e oyOontrhctor: Eu erhfg 9ire UUO		xBone	El tension
Aggress 5: 552m5 Orhu er Rg NW		9AX	
Aggress m: a i(Shrbor- WA 036m0		EKu hiF	
Aggress 6		WebKite	

Water Supply at Node 1



Hydraulic Graph	Water Supply at Node 1
Static: Pressure	59.000
Residual: Pressure	20.000 @ 1950.00
Available Pressure at Time of Test	56.633 @ 428.84
System Demand	49.029 @ 178.84
System Demand (Including Hose Allowance at Source)	49.029 @ 428.84

Summary Of Outflowing Devices

Job Number: 2220029
Report Description: Ordinary Group II

Device		Actual Flow (gpm)	Minimum Flow (gpm)	K-Factor (K)	Pressure (psi)		
Sprinkler	**1090**	**25.20**	**25.20**	**5.6**	**20.250**		
Sprinkler	1091	25.45	25.20	5.6	20.650		
Sprinkler	1125	25.22	25.20	5.6	20.277		
Sprinkler	1126	25.46	25.20	5.6	20.678		
Sprinkler	1143	25.28	25.20	5.6	20.373		
Sprinkler	1144	25.53	25.20	5.6	20.776		
Sprinkler	1166	26.71	25.20	5.6	22.749		

Most Demanding Sprinkler Data

Node	Elevation(Foot)	Fittings	Pressure(psi)	Discharge(gpm)	
1	-3'-0	S	49.029	178.84	
1090	8'-3½	Spr(-20.250)	20.250	25.20	
1091	8'-6½	Spr(-20.650)	20.650	25.45	
1125	8'-3½	Spr(-20.277)	20.277	25.22	
1126	8'-6½	Spr(-20.678)	20.678	25.46	
1143	8'-3½	Spr(-20.373)	20.373	25.28	
1144	8'-6½	Spr(-20.776)	20.776	25.53	
1166	8'-6½	Spr(-22.749)	22.749	26.71	
12	0'-6		46.526		
689	8'-0½	PO(7'-5)	23.364		
753	8'-0½	PO(7'-5)	23.394		
790	8'-0½	PO(7'-5)	23.504		
847	10'-6	fT(21'-6)	28.998		
858	8'-0½	PO(7'-5)	23.736		

Hydraulic Analysis

Job Number: 2220029
Report Description: L rginhrHa roup zz

Pipe Type / Downstream / Upstream	Diameter / Elevation	Flow / Discharge	Velocity / K-Factor	HWC / Pt	Pn	Friction Loss / Fittings	Length / Eq. Length / Total Length	Pressure Summary
• • • • • Route 1 • • • • •								
dA	O1 . 20	24120	. 194	O20		010. 2582	O2360	Pf 01409
O090	' 365-	24120	417	201240		½prinSler		Pe 60100'
O09O	' 367-			201740			O2360	Pv
dA	O1 . 20	40174	9194	O20		0104. O. 4	4360	Pf 21 ' '
O09O	' 367-	241 4	417	201740		½prinSlerl	OO362	Pe 01227
7' 9	' 360-			25157.		, E536 - (l) L EB364(	O736O-	Pv
Pf	512700	40174	O194	O20		01002902	O364-	Pf 01050
7' 9	' 360-			25157.				Pe
845	' 360-			25159.			O364-	Pv
Pf	512700	OOO155	519	O20		010O0. 79	O364-	Pf 01000
845	' 360-	4017'		25159.		BloF Ew(qrom Route 2		Pe
890	' 360-			25140.			O364-	Pv
Pf	512700	O42105	414	O20		01022202	O364-	Pf 01255
890	' 360-	4010		25140.		BloF Ew(qrom Route 5		Pe
' 4'	' 360-			251857			O364-	Pv
Pf	512700	O8' 1 .	718	O20		010299. 7	O. 936OO	Pf 71559
' 4'	' 360-	27180		251857		BloF Ew(qrom Route .	7O86OO	Pe 601088
' . 8	O0367			2' 199'		7q E736 - (l qTE2O867(	2OO86	Pv
Pf	. 12700	O8' 1 .	. 105	O20		0100' O58	28. 368	Pf O51O .
' . 8	O0367			2' 199'			O. ' 364-	Pe . 15. .
O2	0367			. 71427		7q E' 3600- (l 2qTE2O86O(l 7At, E736 8(l 2At, EB51400(l , EO536 2(l 2qEB010 00(l dB) EB218. O(	. 2536O-	Pv
Ca	. 12200	O8' 1 .	. 100	O. 0		01007. 07	O. 0367	Pf 019' 7
O2	0367			. 71427			O536 -	Pe O14O8
O	65380			. 91029		2, , E736 - (l ½	O4536OO-	Pv
		240100				Mose UkoF hnce Ut ½ource		
O		. 2' 1 .						
• • • • • Route 2 • • • • •								
dA	O1 . 20	24122	. 194	O20		010. 2. 2.	O2360	Pf 01409
OO24	' 365-	24122	417	201288		½prinSler		Pe 60100'
OO27	' 367-			20178'			O2360	Pv
dA	O1 . 20	4017'	9197	O20		0104. 55.	4360	Pf 21 9O
OO27	' 367-	241 7	417	20178'		½prinSlerl	OO362	Pe 01227
845	' 360-			25159.		, E536 - (l) L EB364(	O736O-	Pv
• • • • • Route 3 • • • • •								
dA	O1 . 20	2412'	. 198	O20		010. 27OO	O2360	Pf 01400
OO. 5	' 365-	2412'	417	201585		½prinSler		Pe 60100'
OO. .	' 367-			201887			O2360	Pv
dA	O1 . 20	4010	919'	O20		0104400.	4360	Pf 21402
OO .	' 367-	24145	417	201887		½prinSlerl	OO362	Pe 01227
890	' 360-			25140.		, E536 - (l) L EB364(	O736O-	Pv
• • • • • Route 4 • • • • •								
dA	O1 . 20	27180	4124	O20		010. 8O '	4360	Pf 01872
OO77	' 367-	27180	417	2218. 9		½prinSlerl	OO362	Pe 01227
' 4'	' 360-			251857		, E536 - (l) L EB364(	O736O-	Pv

, wuiGhlent) ipe Aen©tl s oq/ hkGes hng Bittin©s EPKO20 onkH(

$$E = \frac{\text{Uctuhkznsige Dihmeter}}{\text{½cl egule . 0 ½teek) ipe znsige Dihmeter}} \left(\cdot^{18} \right) \text{K Bhctor}$$

P / hkue f ukipkier

/ hkue L qP	O00	O50	O. 0	O40
f ukipkHn©Bhctor	018O5	O1O7	O155	O14O

Hydraulic Analysis

Job Number: 2220029
Report Description: L rginhrHa roup zz

Pipe Type	Diameter	Flow	Velocity	HWC		Friction Loss	Length	Pressure
Downstream	Elevation	Discharge	K-Factor	Pt	Pn	Fittings	Eq. Length	Summary
Upstream							Total Length	

) ipe THpe Ae©eng

UL	Urm6L Ger
dA	drhncl Aine
Pf	Pross f hin
DN	Drhin
DR	Drop
DV	DHnhmic
Bf	Beeg f hin
BR	Beeg Riser
f ½	f iscelkhneous
L R	L utri©©er
RN	Riser Nipple
½)	¼pri©
½T	¼thng) ipe
Ca	Cnger©roung

Cnits Ae©eng

Dihmeter	zncl
, keGhtion	Boot
BloF	©pm
Discl hr©e	©pm
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Briction Aoss	psiyBoot
MWP	Mh° en6Wikkhms Ponsthnt
) t	Tothkpressure ht h point in h pipe
) n	Normhkpressure ht h point in h pipe
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Bittin©s Ae©eng

UA/	Ulkhrm / hkGe
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b	dusl in©
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P	Pross BloF Turn 90¼
cpk©	Poupkin©
Pr	Pross Run
P/	PI ecS/ hkGe
Dek/	Dekuce / hkGe
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,	90¼ kboF
, ,	. 4¼ kboF
, eO	COx ¼ kboF
, e2	22- ¼ kboF
q	BloF DeGce
qg	BkeZ Drop
BDP	Bire Dephrtment Ponnection
q	90½BireAocSETf (, kboF
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qk©	Bkhn©e
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Mose	Mose
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Tr	Tee Run
C	Cnion
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