



Hydraulic Calculations by HydraCALC

Hydratec Incorporated
64 Haverhill Road
Route 111
Windham, NH 03087
603-434-0502

Job Name : BLDG B ALT K22 SYS 4
Drawing : HIGH PILED STORAGE
Location : NY312 & PUGSLEY RD, BREWSTER, NY 10509
Remote Area : SYSTEM 4
Contract : 5031092
Data File : Lincoln Equities - BLDG B ALTERNATE SYS 4 K22 8.23.23.WXF



Hydraulic Design Information Sheet

Name - BLDG B ALT K22 SYS 4 Date - 8.23.23
Location - NY312 & PUGSLEY RD, BREWSTER, NY 10509
Building - HIGH PILED STORAGE System No. - SYSTEM 4
Contractor - SA COMUNALE Contract No. - 5031092
Calculated By - JUSTIN BEOUGHER Drawing No. - PG.13
Construction: () Combustible (X) Non-Combustible Ceiling Height - 45'-6
Occupancy - ESFR

S (X) NFPA 13 () Lt. Haz. Ord.Haz.Gp. () 1 () 2 () 3 () Ex.Haz.
Y () Figure Curve

S Other

T Specific Ruling

Made By

Date

	Number of ESFR Sprinklers	- 12	System Type	Sprinkler/Nozzle
M	End Head Pressure (PSI)	- 40	(X) Wet	Make RELIABLE
D	ESFR K-Factor	- 22.4	() Dry	Model P22
E	Elevation at Highest Outlet	- 43'-10½	() Deluge	Size 1"
S	Hose Allowance - Inside	- 100	() Preaction	K-Factor 22.4
I	Rack Sprinkler Allowance	- NA	() Other	Temp.Rat.165
G	Hose Allowance - Outside	- 150		

N

Note

Calculation Flow Required - 1956.74 Press Required - 111.949
Summary C-Factor Used: 120 Overhead 150 Underground

W	Water Flow Test:	Pump Data:	Tank or Reservoir:
A	Date of Test -		Cap. -
T	Time of Test -	Rated Cap.- 2000	Elev.-
E	Static Press -	@ Press - 149	
R	Residual Press -	Elev. - 2	Well
	Flow -		Proof Flow
S	Elevation -		

U

P Location - PUMP

P WATER STORAGE TANK

L Source of Information -

Y

C	Commodity GROUP A CARTONED UNEXP.	Class 1-4	Location
O	Storage Ht. 40 FT	Area	Aisle W.
M	Storage Method:	Solid Piled %	Palletized % Rack
M	() Single Row	() Conven. Pallet	() Auto. Storage () Encap.
S	() Double Row	() Slave Pallet	() Solid Shelf () Non
T	() Mult. Row		() Open Shelf

O

R	K	Flue Spacing	Clearance:Storage to Ceiling
A		Longitudinal	Transverse

G

E Horizontal Barriers Provided:

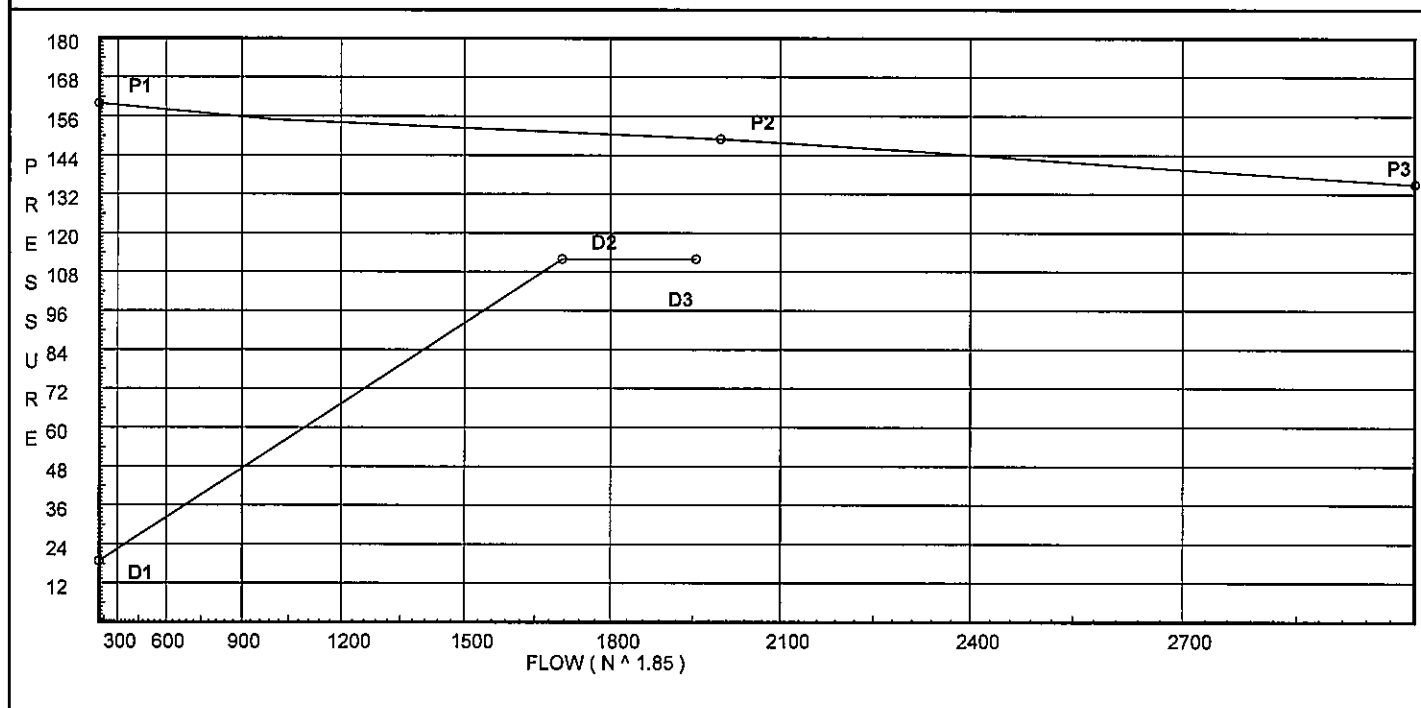
Water Supply Curve C

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 2
Date 8.23.23

Pump Data:
P1 - Pump Churn Pressure : 160
P2 - Pump Rated Pressure : 149
P2 - Pump Rated Flow : 2000
P3 - Pump Pressure @ Max Flow : 135
P3 - Pump Max Flow : 3000

Demand:
D1 - Elevation : 18.840
D2 - System Flow : 1706.74
D2 - System Pressure : 111.949
Hose (Demand) : 250
D3 - System Demand : 1956.74
Safety Margin : 37.380



Fittings Used Summary

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 3
Date 8.23.23

Fitting Legend		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
Abbrev.	Name																				
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
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
L	NFPA 13 Long Turn Elbow	0.5	1	2	2	2	3	4	5	5	6	8	9	13	16	18	24	27	30	34	40
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° Ell 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
X	90° Tee-Branch Firelock002	0	0	0	0	0	8.5	10.8	13	0	16	21	25	33	9.3	11	0	0	0	0	0

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

Hydratec Incorporated
BLDG B ALT K22 SYS 4Page 4
Date 8.23.23**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>
PO	See Information on Pump Curve			149.329	1956.74	111.949

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>
R13	45.5		65.9		
1	45.5		65.15		
2	45.5		65.04		
3	45.5		64.92		
4	45.5		64.8		
R14	45.5		65.9		
5	45.5		65.14		
6	45.5		65.04		
7	45.5		64.92		
8	45.5		64.8		
R15	45.5		65.9		
9	45.5		65.13		
10	45.5		65.03		
11	45.5		64.91		
12	45.5		64.79		
R16	45.5		65.91		
R17	45.5		59.68		
H1	45.5	22.4	40.5	142.56	
H2	45.5	22.4	40.0	141.67	
H3	45.5	22.4	40.0	141.67	
H4	45.5	22.4	40.52	142.59	
R18	45.5		59.75		
H5	45.5	22.4	40.53	142.61	
H6	45.5	22.4	40.03	141.72	
H7	45.5	22.4	40.03	141.72	
H8	45.5	22.4	40.54	142.63	
R19	45.5		59.92		
H9	45.5	22.4	40.66	142.83	
H10	45.5	22.4	40.15	141.94	
H11	45.5	22.4	40.15	141.94	
H12	45.5	22.4	40.67	142.86	
R20	45.5		66.54		
R21	45.5		66.92		
R22	45.5		67.32		
R23	45.5		67.74		
R24	45.5		68.2		
R25	45.5		68.7		
R26	45.5		69.22		
R27	45.5		69.78		

Flow Summary - NFPA

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 5
Date 8.23.23

NODE ANALYSIS (cont.)

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes
R28	45.5		70.39		
13	45.5		66.29		
14	45.5		66.29		
15	45.5		66.3		
16	45.5		66.31		
17	45.5		66.33		
18	45.5		66.41		
19	45.5		66.6		
20	45.5		66.92		
21	45.5		67.28		
22	45.5		67.67		
23	45.5		68.1		
24	45.5		68.59		
25	45.5		69.12		
26	45.5		69.7		
27	45.5		70.33		
28	45.5		71.02		
29	45.5		63.08		
30	45.5		63.07		
31	45.5		63.03		
32	45.5		62.95		
33	45.5		62.81		
34	45.5		62.81		
35	45.5		63.02		
36	45.5		63.72		
37	45.5		64.29		
38	45.5		64.75		
39	45.5		65.13		
40	45.5		65.41		
41	45.5		65.61		
42	45.5		65.73		
43	45.5		65.8		
44	45.5		65.81		
FMJ	45.5		72.26		
TR3	45.5		74.33		
BR3	2.0		95.86	100.0	
FLG	2.0		96.26		
UG7	-5.0		105.81		
UG8	-5.0		106.72		
UG9	-5.0		107.63		
UG10	-5.0		109.54		
UG11	-5.0		110.0		
NL	-5.0		110.06		
UG12	-5.0		110.22		
UG13	-5.0		107.06		
UG14	-5.0		101.55	150.0	
UG15	-5.0		103.38		
UG16	-5.0		104.7		
UG6	-5.0		113.66		

Flow Summary - NFPA

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 6
Date 8.23.23

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>
PUMP	2.0		110.94		
PO	2.0		111.95		

Final Calculations : Hazen-Williams

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 7
Date 8.23.23

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	*****
R13 to 1	45.500 45.500		-61.94 -61.94	2.5 2.635	0.0 0.0 0.0	63.917 0.0 63.917	120 -0.0119	65.904 0.0 -0.759		Vel = 3.64	
1 to 2	45.500 45.500		0.0 -61.94	2.5 2.635	0.0 0.0 0.0	8.708 0.0 8.708	120 -0.0118	65.145 0.0 -0.103		Vel = 3.64	
2 to 3	45.500 45.500		0.0 -61.94	2.5 2.635	0.0 0.0 0.0	10.000 0.0 10.000	120 -0.0119	65.042 0.0 -0.119		Vel = 3.64	
3 to 4	45.500 45.500		0.0 -61.94	2.5 2.635	0.0 0.0 0.0	10.000 0.0 10.000	120 -0.0118	64.923 0.0 -0.118		Vel = 3.64	
4 to R29	45.500 45.500		0.0 -61.94	2.5 2.635	0.0 0.0 0.0	112.375 0.0 112.375	120 -0.0119	64.805 0.0 -1.335		Vel = 3.64	
R29			0.0 -61.94					63.470		K Factor = -7.77	
R14 to 5	45.500 45.500		-62.07 -62.07	2.5 2.635	0.0 0.0 0.0	63.917 0.0 63.917	120 -0.0119	65.904 0.0 -0.762		Vel = 3.65	
5 to 6	45.500 45.500		0.0 -62.07	2.5 2.635	0.0 0.0 0.0	8.708 0.0 8.708	120 -0.0118	65.142 0.0 -0.103		Vel = 3.65	
6 to 7	45.500 45.500		0.0 -62.07	2.5 2.635	0.0 0.0 0.0	10.000 0.0 10.000	120 -0.0119	65.039 0.0 -0.119		Vel = 3.65	
7 to 8	45.500 45.500		0.0 -62.07	2.5 2.635	0.0 0.0 0.0	10.000 0.0 10.000	120 -0.0120	64.920 0.0 -0.120		Vel = 3.65	
8 to R30	45.500 45.500		0.0 -62.07	2.5 2.635	0.0 0.0 0.0	112.375 0.0 112.375	120 -0.0119	64.800 0.0 -1.339		Vel = 3.65	
R30			0.0 -62.07					63.461		K Factor = -7.79	
R15 to 9	45.500 45.500		-62.53 -62.53	2.5 2.635	0.0 0.0 0.0	63.917 0.0 63.917	120 -0.0121	65.905 0.0 -0.773		Vel = 3.68	
9 to 10	45.500 45.500		0.0 -62.53	2.5 2.635	0.0 0.0 0.0	8.708 0.0 8.708	120 -0.0121	65.132 0.0 -0.105		Vel = 3.68	
10 to 11	45.500 45.500		0.0 -62.53	2.5 2.635	0.0 0.0 0.0	10.000 0.0 10.000	120 -0.0121	65.027 0.0 -0.121		Vel = 3.68	
11 to 12	45.500 45.500		0.0 -62.53	2.5 2.635	0.0 0.0 0.0	10.000 0.0 10.000	120 -0.0121	64.906 0.0 -0.121		Vel = 3.68	
12 to R31	45.500 45.500		0.0 -62.53	2.5 2.635	0.0 0.0 0.0	112.375 0.0 112.375	120 -0.0121	64.785 0.0 -1.358		Vel = 3.68	

Final Calculations : Hazen-Williams

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 8
Date 8.23.23

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	*****
R31			0.0 -62.53						63.427		K Factor = -7.85	
R16 to R32	45.500 45.500		-63.50 -63.5	2.5 2.635		0.0 0.0 0.0	205.041 0.0 205.041	120 -0.0124	65.905 0.0 -2.549		Vel = 3.74	
R32			0.0 -63.50						63.356		K Factor = -7.98	
R17 to H1	45.500 45.500		-288.27 -288.27	2.5 2.635		0.0 0.0 0.0	93.917 0.0 93.917	120 -0.2042	59.683 0.0 -19.179		Vel = 16.96	
H1 to H2	45.500 45.500	22.40	142.56 -145.71	2.5 2.635		0.0 0.0 0.0	8.708 0.0 8.708	120 -0.0578	40.504 0.0 -0.503		Vel = 8.57	
H2 to H3	45.500 45.500	22.40	141.67 -4.04	2.5 2.635		0.0 0.0 0.0	10.000 0.0 10.000	120 -0.0001	40.001 0.0 -0.001		Vel = 0.24	
H3 to H4	45.500 45.500	22.40	141.67 137.63	2.5 2.635		0.0 0.0 0.0	10.000 0.0 10.000	120 0.0520	40.000 0.0 0.520		Vel = 8.10	
H4 to R33	45.500 45.500	22.40	142.59 280.22	2.5 2.635		0.0 0.0 0.0	82.375 0.0 82.375	120 0.1938	40.520 0.0 15.963		Vel = 16.49	
R33			0.0 280.22						56.483		K Factor = 37.29	
R18 to H5	45.500 45.500		-288.60 -288.6	2.5 2.635		0.0 0.0 0.0	93.917 0.0 93.917	120 -0.2046	59.752 0.0 -19.220		Vel = 16.98	
H5 to H6	45.500 45.500	22.40	142.60 -146.0	2.5 2.635		0.0 0.0 0.0	8.708 0.0 8.708	120 -0.0580	40.532 0.0 -0.505		Vel = 8.59	
H6 to H7	45.500 45.500	22.40	141.72 -4.28	2.5 2.635		0.0 0.0 0.0	10.000 0.0 10.000	120 -0.0001	40.027 0.0 -0.001		Vel = 0.25	
H7 to H8	45.500 45.500	22.40	141.72 137.44	2.5 2.635		0.0 0.0 0.0	10.000 0.0 10.000	120 0.0519	40.026 0.0 0.519		Vel = 8.09	
H8 to R34	45.500 45.500	22.40	142.63 280.07	2.5 2.635		0.0 0.0 0.0	82.375 0.0 82.375	120 0.1936	40.545 0.0 15.947		Vel = 16.48	
R34			0.0 280.07						56.492		K Factor = 37.26	
R19 to H9	45.500 45.500		-288.95 -288.95	2.5 2.635		0.0 0.0 0.0	93.917 0.0 93.917	120 -0.2051	59.923 0.0 -19.263		Vel = 17.00	
H9 to H10	45.500 45.500	22.40	142.84 -146.11	2.5 2.635		0.0 0.0 0.0	8.708 0.0 8.708	120 -0.0581	40.660 0.0 -0.506		Vel = 8.60	

Final Calculations : Hazen-Williams

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 9
Date 8.23.23

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	*****
H10 to H11	45.500 45.500	22.40	141.94 -4.17	2.5 2.635		0.0 0.0 0.0	10.000 0.0 10.000	120 0	40.154 0.0 0.0		Vel = 0.25	
H11 to H12	45.500 45.500	22.40	141.94 137.77	2.5 2.635		0.0 0.0 0.0	10.000 0.0 10.000	120 0.0521	40.154 0.0 0.521		Vel = 8.11	
H12 to R35	45.500 45.500	22.40	142.86 280.63	2.5 2.635		0.0 0.0 0.0	82.375 0.0 82.375	120 0.1943	40.675 0.0 16.006		Vel = 16.51	
R35			0.0 280.63						56.681		K Factor = 37.27	
R20 to R36	45.500 45.500		-61.85 -61.85	2.5 2.635		0.0 0.0 0.0	205.041 0.0 205.041	120 -0.0118	66.536 0.0 -2.428		Vel = 3.64	
R36			0.0 -61.85						64.108		K Factor = -7.72	
R21 to R37	45.500 45.500		-59.59 -59.59	2.5 2.635		0.0 0.0 0.0	205.041 0.0 205.041	120 -0.0111	66.919 0.0 -2.267		Vel = 3.51	
R37			0.0 -59.59						64.652		K Factor = -7.41	
R22 to R38	45.500 45.500		-58.87 -58.87	2.5 2.635		0.0 0.0 0.0	205.041 0.0 205.041	120 -0.0108	67.317 0.0 -2.216		Vel = 3.46	
R38			0.0 -58.87						65.101		K Factor = -7.30	
R23 to R39	45.500 45.500		-59.38 -59.38	2.5 2.635		0.0 0.0 0.0	205.041 0.0 205.041	120 -0.0110	67.738 0.0 -2.252		Vel = 3.49	
R39			0.0 -59.38						65.486		K Factor = -7.34	
R24 to R40	45.500 45.500		-61.59 -61.59	2.5 2.635		0.0 0.0 0.0	205.041 0.0 205.041	120 -0.0118	68.204 0.0 -2.410		Vel = 3.62	
R40			0.0 -61.59						65.794		K Factor = -7.59	
R25 to R41	45.500 45.500		-65.02 -65.02	2.5 2.635		0.0 0.0 0.0	205.041 0.0 205.041	120 -0.0130	68.697 0.0 -2.664		Vel = 3.83	
R41			0.0 -65.02						66.033		K Factor = -8.00	
R26 to R42	45.500 45.500		-69.45 -69.45	2.5 2.635		0.0 0.0 0.0	205.041 0.0 205.041	120 -0.0147	69.221 0.0 -3.009		Vel = 4.09	
R42			0.0 -69.45						66.212		K Factor = -8.54	

Final Calculations : Hazen-Williams

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 10
Date 8.23.23

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	*****
R27 to R43	45.500 45.500		-74.67 -74.67	2.5 2.635		0.0 0.0	205.041 0.0	120 -0.0168	69.783 0.0		Vel = 4.39	
R43			0.0 -74.67						66.343		K Factor = -9.17	
R28 to R44	45.500 45.500		-80.44 -80.44	2.5 2.635		0.0 0.0	205.041 205.041	120 -0.0193	70.391 -3.949		Vel = 4.73	
R44			0.0 -80.44						66.442		K Factor = -9.87	
13 to R13	45.500 45.500		-61.94 -61.94	2.5 2.635	X T	14.827 16.474	1.250 31.301	120 -0.0119	66.291 0.0		Vel = 3.64	
R13			0.0 -61.94						65.904		K Factor = -7.63	
14 to R14	45.500 45.500		-62.07 -62.07	2.5 2.635	X T	14.827 16.474	1.250 31.301	120 -0.0119	66.292 0.0		Vel = 3.65	
R14			0.0 -62.07						65.904		K Factor = -7.65	
15 to R15	45.500 45.500		-62.53 -62.53	2.5 2.635	X T	14.827 16.474	1.250 31.301	120 -0.0121	66.298 0.0		Vel = 3.68	
R15			0.0 -62.53						65.905		K Factor = -7.70	
16 to R16	45.500 45.500		-63.50 -63.5	2.5 2.635	X T	14.827 16.474	1.250 31.301	120 -0.0124	66.310 0.0		Vel = 3.74	
R16			0.0 -63.50						65.905		K Factor = -7.82	
17 to R17	45.500 45.500		-288.27 -288.27	2.5 2.635	X T	14.827 16.474	1.250 31.301	120 -0.2042	66.330 0.0		Vel = 16.96	
R17			0.0 -288.27						59.683		K Factor = -37.31	
18 to R18	45.500 45.500		-288.60 -288.6	2.5 2.635	X T	14.827 16.474	1.250 31.301	120 -0.2047	66.414 0.0		Vel = 16.98	
R18			0.0 -288.60						59.752		K Factor = -37.34	
19 to R19	45.500 45.500		-288.95 -288.95	2.5 2.635	X T	14.827 16.474	1.250 31.301	120 -0.2051	66.599 0.0		Vel = 17.00	
R19			0.0 -288.95						59.923		K Factor = -37.33	
20 to R20	45.500 45.500		-61.85 -61.85	2.5 2.635	X T	14.827 16.474	1.250 31.301	120 -0.0119	66.922 0.0		Vel = 3.64	

Final Calculations : Hazen-Williams

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 11
Date 8.23.23

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftns Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
R20			0.0 -61.85						66.536		K Factor = -7.58	
21 to R21	45.500 45.500		-59.59	2.5	X T	14.827 16.474	1.250 31.301	120	67.279 0.0			
			-59.59	2.635		0.0	32.551	-0.0111	-0.360		Vel = 3.51	
R21			0.0 -59.59						66.919		K Factor = -7.28	
22 to R22	45.500 45.500		-58.87	2.5	X T	14.827 16.474	1.250 31.301	120	67.669 0.0			
			-58.87	2.635		0.0	32.551	-0.0108	-0.352		Vel = 3.46	
R22			0.0 -58.87						67.317		K Factor = -7.18	
23 to R23	45.500 45.500		-59.38	2.5	X T	14.827 16.474	1.250 31.301	120	68.095 0.0			
			-59.38	2.635		0.0	32.551	-0.0110	-0.357		Vel = 3.49	
R23			0.0 -59.38						67.738		K Factor = -7.21	
24 to R24	45.500 45.500		-61.59	2.5	X T	14.827 16.474	1.250 31.301	120	68.586 0.0			
			-61.59	2.635		0.0	32.551	-0.0117	-0.382		Vel = 3.62	
R24			0.0 -61.59						68.204		K Factor = -7.46	
25 to R25	45.500 45.500		-65.02	2.5	X T	14.827 16.474	1.250 31.301	120	69.119 0.0			
			-65.02	2.635		0.0	32.551	-0.0130	-0.422		Vel = 3.83	
R25			0.0 -65.02						68.697		K Factor = -7.84	
26 to R26	45.500 45.500		-69.45	2.5	X T	14.827 16.474	1.250 31.301	120	69.699 0.0			
			-69.45	2.635		0.0	32.551	-0.0147	-0.478		Vel = 4.09	
R26			0.0 -69.45						69.221		K Factor = -8.35	
27 to R27	45.500 45.500		-74.67	2.5	X T	14.827 16.474	1.250 31.301	120	70.330 0.0			
			-74.67	2.635		0.0	32.551	-0.0168	-0.547		Vel = 4.39	
R27			0.0 -74.67						69.783		K Factor = -8.94	
28 to R28	45.500 45.500		-80.44	2.5	X T	14.827 16.474	1.250 31.301	120	71.017 0.0			
			-80.44	2.635		0.0	32.551	-0.0192	-0.626		Vel = 4.73	
R28			0.0 -80.44						70.391		K Factor = -9.59	
29 to R29	45.500 45.500		61.94	2.5	X T	14.827 16.474	1.333 31.301	120	63.082 0.0			
			61.94	2.635		0.0	32.634	0.0119	0.388		Vel = 3.64	
			0.0									

Final Calculations : Hazen-Williams

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 12
Date 8.23.23

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	*****
R29			61.94						63.470		K Factor = 7.77	
30 to R30	45.500 45.500		62.07 62.07	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0119	63.072 0.0 0.389			Vel = 3.65
R30			0.0 62.07						63.461		K Factor = 7.79	
31 to R31	45.500 45.500		62.53 62.53	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0121	63.033 0.0 0.394			Vel = 3.68
R31			0.0 62.53						63.427		K Factor = 7.85	
32 to R32	45.500 45.500		63.50 63.5	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0124	62.950 0.0 0.406			Vel = 3.74
R32			0.0 63.50						63.356		K Factor = 7.98	
33 to R33	45.500 45.500		-280.22 -280.22	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 -0.1938	62.807 0.0 -6.324			Vel = 16.49
R33			0.0 -280.22						56.483		K Factor = -37.29	
34 to R34	45.500 45.500		-280.07 -280.07	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 -0.1936	62.810 0.0 -6.318			Vel = 16.48
R34			0.0 -280.07						56.492		K Factor = -37.26	
35 to R35	45.500 45.500		-280.63 -280.63	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 -0.1943	63.023 0.0 -6.342			Vel = 16.51
R35			0.0 -280.63						56.681		K Factor = -37.27	
36 to R36	45.500 45.500		61.85 61.85	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0118	63.722 0.0 0.386			Vel = 3.64
R36			0.0 61.85						64.108		K Factor = 7.72	
37 to R37	45.500 45.500		59.59 59.59	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0110	64.292 0.0 0.360			Vel = 3.51
R37			0.0 59.59						64.652		K Factor = 7.41	
38 to R38	45.500 45.500		58.87 58.87	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0108	64.749 0.0 0.352			Vel = 3.46
R38			0.0 58.87						65.101		K Factor = 7.30	

Final Calculations : Hazen-Williams

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 13
Date 8.23.23

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	*****
39 to R39	45.500 45.500		59.38 59.38	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0110	65.127 0.0 0.359		Vel = 3.49	
R39			0.0 59.38						65.486		K Factor = 7.34	
40 to R40	45.500 45.500		61.59 61.59	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0117	65.411 0.0 0.383		Vel = 3.62	
R40			0.0 61.59						65.794		K Factor = 7.59	
41 to R41	45.500 45.500		65.02 65.02	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0130	65.609 0.0 0.424		Vel = 3.83	
R41			0.0 65.02						66.033		K Factor = 8.00	
42 to R42	45.500 45.500		69.45 69.45	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0147	65.733 0.0 0.479		Vel = 4.09	
R42			0.0 69.45						66.212		K Factor = 8.54	
43 to R43	45.500 45.500		74.67 74.67	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0168	65.796 0.0 0.547		Vel = 4.39	
R43			0.0 74.67						66.343		K Factor = 9.17	
44 to R44	45.500 45.500		80.44 80.44	2.5 2.635	X T	14.827 16.474 0.0	1.333 31.301 32.634	120 0.0192	65.814 0.0 0.628		Vel = 4.73	
R44			0.0 80.44						66.442		K Factor = 9.87	
13 to 14	45.500 45.500		61.94 61.94	6 6.357		0.0 0.0 0.0	9.417 0.0 9.417	120 0.0001	66.291 0.0 0.001		Vel = 0.63	
14 to 15	45.500 45.500		62.08 124.02	6 6.357		0.0 0.0 0.0	9.417 0.0 9.417	120 0.0006	66.292 0.0 0.006		Vel = 1.25	
15 to 16	45.500 45.500		62.53 186.55	6 6.357		0.0 0.0 0.0	9.417 0.0 9.417	120 0.0013	66.298 0.0 0.012		Vel = 1.89	
16 to 17	45.500 45.500		63.50 250.05	6 6.357		0.0 0.0 0.0	9.417 0.0 9.417	120 0.0021	66.310 0.0 0.020		Vel = 2.53	
17 to 18	45.500 45.500		288.27 538.32	6 6.357		0.0 0.0 0.0	9.417 0.0 9.417	120 0.0089	66.330 0.0 0.084		Vel = 5.44	
18 to 19	45.500 45.500		288.60 826.92	6 6.357		0.0 0.0 0.0	9.417 0.0 9.417	120 0.0196	66.414 0.0 0.185		Vel = 8.36	

Final Calculations : Hazen-Williams

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 14
Date 8.23.23

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	*****
19 to 20	45.500 45.500		288.95 1115.87	6 6.357	0.0 0.0	9.417 9.417	120 0.0343	66.599 0.0 0.323		Vel = 11.28	
20 to 21	45.500 45.500		61.86 1177.73	6 6.357	0.0 0.0	9.417 9.417	120 0.0379	66.922 0.0 0.357		Vel = 11.91	
21 to 22	45.500 45.500		59.58 1237.31	6 6.357	0.0 0.0	9.417 9.417	120 0.0414	67.279 0.0 0.390		Vel = 12.51	
22 to 23	45.500 45.500		58.88 1296.19	6 6.357	0.0 0.0	9.417 9.417	120 0.0452	67.669 0.0 0.426		Vel = 13.10	
23 to 24	45.500 45.500		59.38 1355.57	6 6.357	0.0 0.0	10.000 10.000	120 0.0491	68.095 0.0 0.491		Vel = 13.70	
24 to 25	45.500 45.500		61.59 1417.16	6 6.357	0.0 0.0	10.000 10.000	120 0.0533	68.586 0.0 0.533		Vel = 14.33	
25 to 26	45.500 45.500		65.03 1482.19	6 6.357	0.0 0.0	10.000 10.000	120 0.0580	69.119 0.0 0.580		Vel = 14.98	
26 to 27	45.500 45.500		69.45 1551.64	6 6.357	0.0 0.0	10.000 10.000	120 0.0631	69.699 0.0 0.631		Vel = 15.68	
27 to 28	45.500 45.500		74.67 1626.31	6 6.357	0.0 0.0	10.000 10.000	120 0.0687	70.330 0.0 0.687		Vel = 16.44	
28 to FMJ	45.500 45.500		80.43 1706.74	6 6.357	V 12.573 0.0	4.000 12.573 16.573	120 0.0752	71.017 0.0 1.247		Vel = 17.25	
FMJ			0.0 1706.74					72.264		K Factor = 200.77	
29 to 30	45.500 45.500		-61.94 -61.94	4 4.26	0.0 0.0	9.417 9.417	120 -0.0011	63.082 0.0 -0.010		Vel = 1.39	
30 to 31	45.500 45.500		-62.08 -124.02	4 4.26	0.0 0.0	9.417 9.417	120 -0.0041	63.072 0.0 -0.039		Vel = 2.79	
31 to 32	45.500 45.500		-62.53 -186.55	4 4.26	0.0 0.0	9.417 9.417	120 -0.0088	63.033 0.0 -0.083		Vel = 4.20	
32 to 33	45.500 45.500		-63.50 -250.05	4 4.26	0.0 0.0	9.417 9.417	120 -0.0152	62.950 0.0 -0.143		Vel = 5.63	
33 to 34	45.500 45.500		280.22 30.17	4 4.26	0.0 0.0	9.417 9.417	120 0.0003	62.807 0.0 0.003		Vel = 0.68	

Final Calculations : Hazen-Williams

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 15
Date 8.23.23

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	*****
34 to 35	45.500 45.500		280.07 310.24	4 4.26		0.0 0.0 0.0	9.417 0.0 9.417	120 0.0226	62.810 0.0 0.213			
										Vel = 6.98		
35 to 36	45.500 45.500		280.63 590.87	4 4.26		0.0 0.0 0.0	9.417 0.0 9.417	120 0.0742	63.023 0.0 0.699			
										Vel = 13.30		
36 to 37	45.500 45.500		-61.85 529.02	4 4.26		0.0 0.0 0.0	9.417 0.0 9.417	120 0.0605	63.722 0.0 0.570			
										Vel = 11.91		
37 to 38	45.500 45.500		-59.59 469.43	4 4.26		0.0 0.0 0.0	9.417 0.0 9.417	120 0.0485	64.292 0.0 0.457			
										Vel = 10.57		
38 to 39	45.500 45.500		-58.87 410.56	4 4.26		0.0 0.0 0.0	10.000 0.0 10.000	120 0.0378	64.749 0.0 0.378			
										Vel = 9.24		
39 to 40	45.500 45.500		-59.38 351.18	4 4.26		0.0 0.0 0.0	10.000 0.0 10.000	120 0.0284	65.127 0.0 0.284			
										Vel = 7.90		
40 to 41	45.500 45.500		-61.60 289.58	4 4.26		0.0 0.0 0.0	10.000 0.0 10.000	120 0.0198	65.411 0.0 0.198			
										Vel = 6.52		
41 to 42	45.500 45.500		-65.02 224.56	4 4.26		0.0 0.0 0.0	10.000 0.0 10.000	120 0.0124	65.609 0.0 0.124			
										Vel = 5.05		
42 to 43	45.500 45.500		-69.46 155.1	4 4.26		0.0 0.0 0.0	10.000 0.0 10.000	120 0.0063	65.733 0.0 0.063			
										Vel = 3.49		
43 to 44	45.500 45.500		-74.66 80.44	4 4.26		0.0 0.0 0.0	10.000 0.0 10.000	120 0.0018	65.796 0.0 0.018			
										Vel = 1.81		
44			0.0 80.44						65.814		K Factor = 9.92	
FMJ to TR3	45.500 45.500		1706.74 1706.74	8 8.249	2V	30.537 0.0 0.0	67.125 30.537 97.662	120 0.0212	72.264 0.0 2.066			
										Vel = 10.25		
TR3 to BR3	45.500 2		0.0 1706.74	8 8.249	T	41.108 0.0 0.0	38.875 41.108 79.983	120 0.0211	74.330 19.840 1.691			
										** Fixed Loss = 1 Vel = 10.25		
BR3 to FLG	2 2	H100	100.00 1806.74	8 7.98	L	19.632 0.0 0.0	2.000 19.632 21.632	150 0.0183	95.861 0.0 0.395			
										Vel = 11.59		
FLG to UG14	2 -5		0.0 1806.74	8 7.98	L T	19.632 52.855 0.0	51.125 72.487 123.612	150 0.0183	96.256 3.032 2.259			
										Vel = 11.59		
UG14			0.0 1806.74						101.547		K Factor = 179.29	

Final Calculations : Hazen-Williams

Hydratec Incorporated
BLDG B ALT K22 SYS 4

Page 16
Date 8.23.23

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	*****
UG7 to UG8	-5 -5		523.92	8	G	6.041	483.333	150	105.812			
						0.0	6.040		0.0			
			523.92	7.98		0.0	489.373	0.0018	0.905	Vel =	3.36	
UG8 to UG9	-5 -5		0.0	8	G	6.041	486.000	150	106.717			
						0.0	6.040		0.0			
			523.92	7.98		0.0	492.040	0.0019	0.911	Vel =	3.36	
UG9 to UG10	-5 -5		0.0	8	6F 2G	81.548 12.081	937.542 93.630	150	107.628			
						0.0	1031.172	0.0019	1.908	Vel =	3.36	
UG10 to UG11	-5 -5		0.0	8	G	6.041	242.917	150	109.536			
						0.0	6.040		0.0			
			523.92	7.98		0.0	248.957	0.0019	0.461	Vel =	3.36	
UG11 to NL	-5 -5		0.0	12	G	8.05	213.250	150	109.997			
						0.0	8.049		0.0			
			523.92	11.65		0.0	221.299	0.0003	0.064	Vel =	1.58	
NL to UG12	-5 -5		0.0	12	2F	34.882	489.875	150	110.061			
						0.0	34.883		0.0			
			523.92	11.65		0.0	524.758	0.0003	0.154	Vel =	1.58	
UG12 to UG13	-5 -5		-1956.75	8	F G	13.591 6.041	245.208 19.632	150	110.215			
						0.0	264.840	-0.0119	-3.152	Vel =	9.19	
UG13 to UG14	-5 -5		0.0	8	G	6.041	457.500	150	107.063			
						0.0	6.040		0.0			
			-1432.83	7.98		0.0	463.540	-0.0119	-5.516	Vel =	9.19	
UG14 to UG15	-5 -5	H150	1956.75	8	2F G	27.183 6.041	960.000 33.222	150	101.547			
						0.0	993.222	0.0019	1.838	Vel =	3.36	
UG15 to UG16	-5 -5		0.0	8	4F G	54.365 6.041	648.583 60.405	150	103.385			
						0.0	708.988	0.0019	1.312	Vel =	3.36	
UG16 to UG7	-5 -5		0.0	8	G	6.041	596.667	150	104.697			
						0.0	6.040		0.0			
			523.92	7.98		0.0	602.707	0.0018	1.115	Vel =	3.36	
UG7			0.0									
			523.92						105.812	K Factor =	50.93	
UG12 to UG6	-5 -5		1956.74	12	6F 3G	104.647 24.149	817.042 209.294	150	110.215			
						80.498	1026.336	0.0034	3.444	Vel =	5.89	
UG6 to PUMP	-5 2		0.0	12	2L	48.299	45.500	150	113.659			
						0.0	48.298		-3.032			
			1956.74	11.65		0.0	93.798	0.0034	0.315	Vel =	5.89	
PUMP to PO	2 2		0.0	10	2V S	10.89 66.551	15.000 100.431	120	110.942			
						22.99	115.431	0.0087	1.007	Vel =	7.36	
PO			0.0									
			1956.74						111.949	K Factor =	184.94	