POTABLE WATER DISTRIBUTION SYSTEM
ENGINEERING REPORT

for

SOUTHGATE

Section 30, Township 22 South, Range 25 East
City of Groveland, Lake County, Florida

FEBRUARY 2016
TLK PROJECT #T1507

Thomas L. Knight, P.E., Professional Association
Planning, Design, Permitting, Inspection
P.O. Box 120625, Clermont, Florida 34712
Phone: (352)394-8514
Certificate of Authorization No. 29972

Prepared by:

Thomas L. Knight, P.E. #47614
2/15/2016

NARRATIVE

PURPOSE AND SCOPE

The purpose of this engineering report is to provide calculations and supporting documentation for the design of the proposed potable water system at Southgate single family residential subdivision. The proposed development, as detailed on the accompanying construction plans, has been designed to meet the regulatory criteria of the Florida Department of Environmental Protection (FDEP) and the City of Groveland. This report contains calculations and reference information that is the basis of the design for the development.

GENERAL PROJECT INFORMATION

The Southgate project site is located in Section 30, Township 22 South, Range 25 East, City of Groveland, Lake County, Florida. The project entrance is located at S.R. 33.

The subdivision will consist of 85 lots, open space areas, conservation areas and road rights-of-way. The details and specifications for the proposed improvements are included in the Construction Plans for Southgate. The project will be constructed in one phase of development.

The proposed drinking water distribution system will serve all 85 lots in Cypress Oaks.

POTABLE WATER SYSTEM

A potable water system meeting all applicable requirements of the FDEP and the City of Groveland is proposed to serve this project. The proposed system will convey potable water as well as fire flow to the proposed site. A proposed 10" water main will connect to the existing 10" gate valve at the Point of Connection (P.O.C.) located at the northwest corner of Hope International Church.

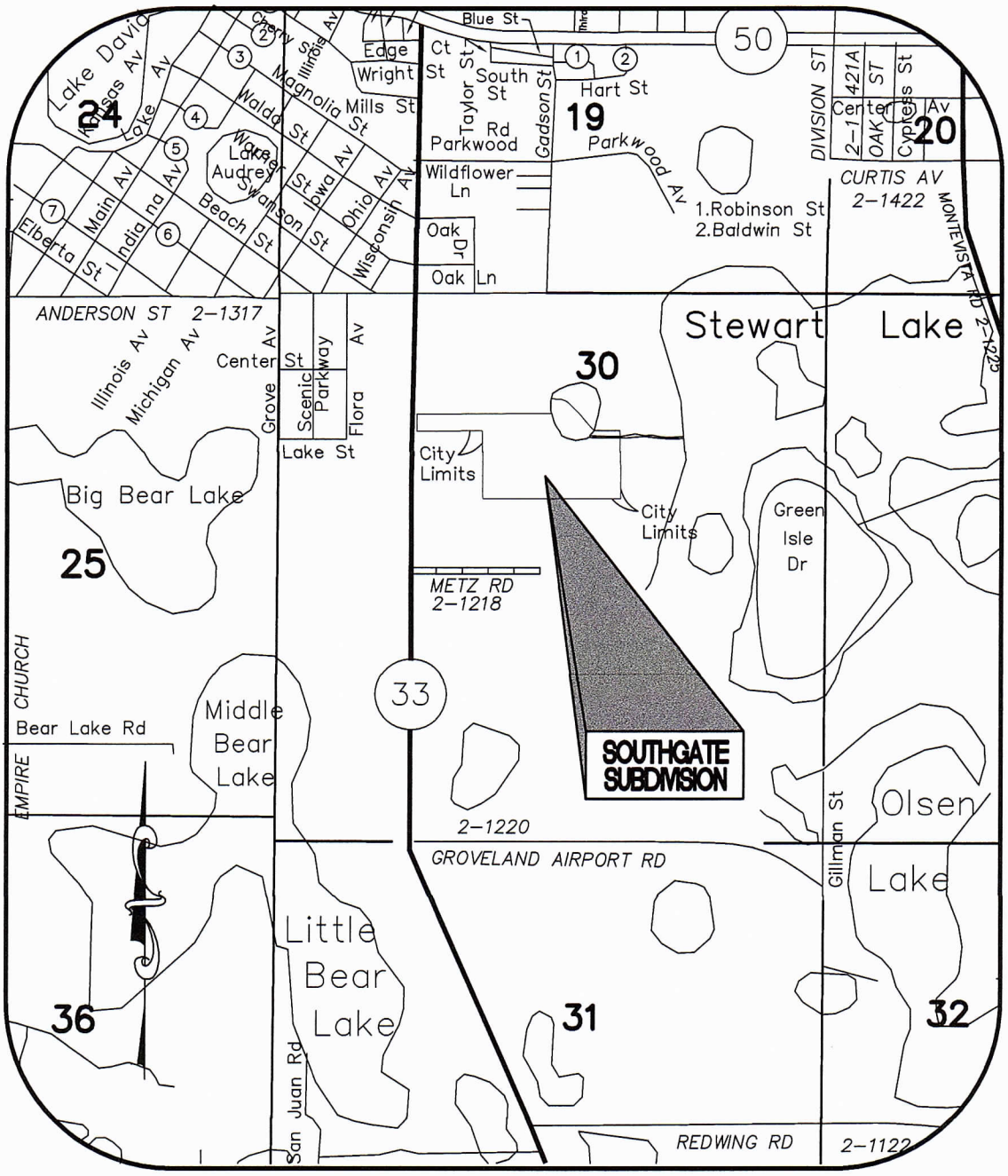
The City of Groveland Utilities Department provided a pressure of 50 psi static pressure and 45 psi residual pressure at fire hydrant near the connection point.

The system design is based on one ERU = 350 GPD, peak hour factor = 4, max. day factor = 2.5, and required fire flow is 1000 GPM with a residual pressure of 20 psi.

Haestaeds "Cybernet" Software was utilized to model the system. The attached results indicate that all design criteria have been met and all pressures and flows are within an acceptable range.

APPENDIX - A

MAPS



LOCATION MAP

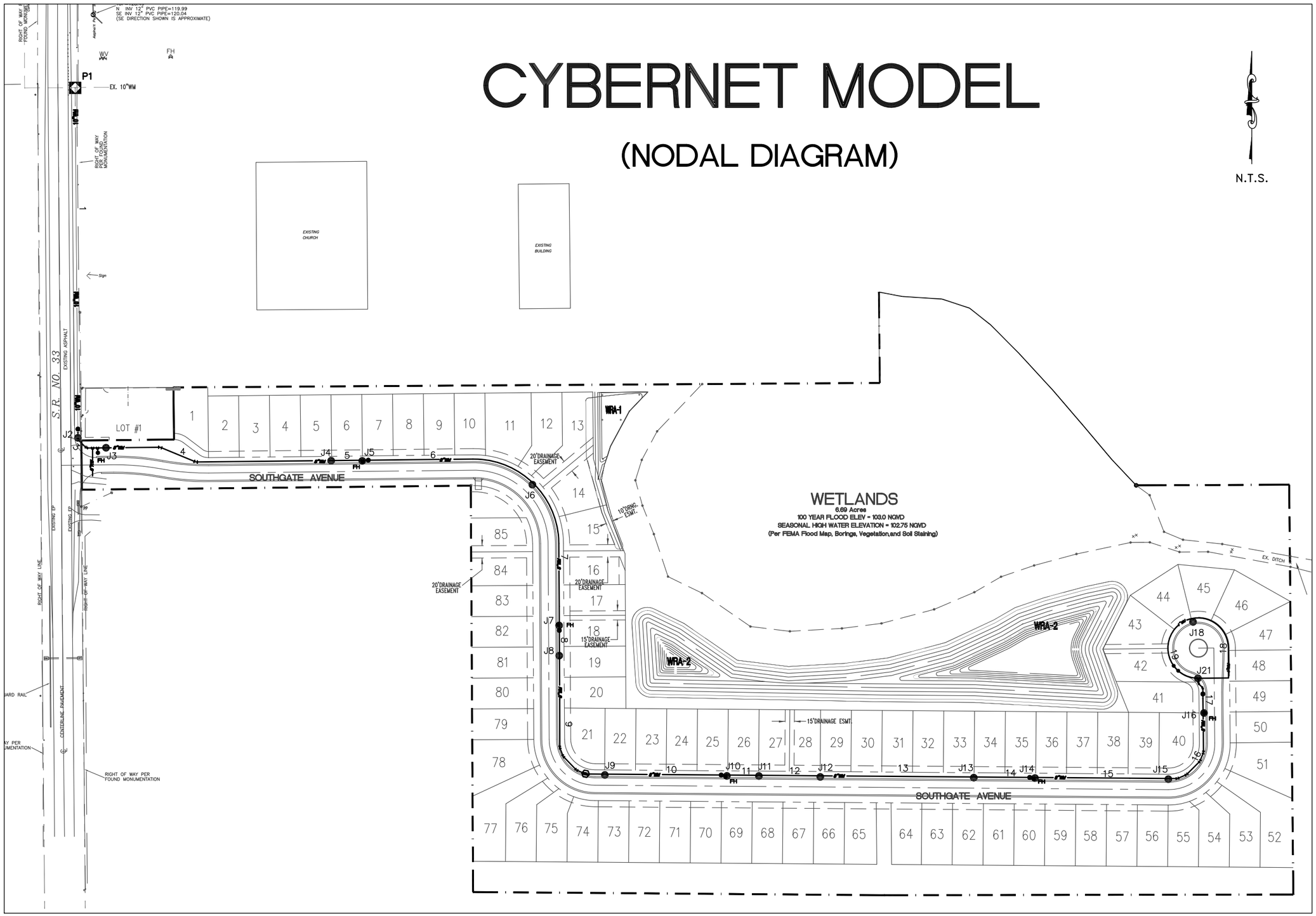
SCALE 1:1600

SECTION 30, TOWNSHIP 22 SOUTH, RANGE 25 EAST
CITY OF GROVELAND, LAKE COUNTY, FLORIDA

CYBERNET MODEL

(NODAL DIAGRAM)

N.T.S.



APPENDIX - B

MODEL RESULTS

SECTION-1
INPUT DATA

INPUT DATA

****
S U M M A R Y O F O R I G I N A L D A T A
****

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: AVG DAY DEMANDS-350gpd/UNIT
Drawing: SG-WTR

P I P E L I N E D A T A

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE

PIPE NUMBER	NODE NOS. #1	#2	LENGTH (ft)	DIAMETER (in)	ROUGHNESS COEFF.	MINOR LOSS COEFF.	BND-HGL (ft)
1-BN	0	2	555.0	8.0	120.00	0.20	239.89
3	2	3	71.0	8.0	120.00	1.50	
4	3	4	370.0	8.0	120.00	1.10	
5	4	5	51.0	8.0	120.00	2.60	
6	5	6	288.0	8.0	120.00	2.80	
7	6	7	241.0	8.0	120.00	4.00	
8	8	7	49.0	8.0	120.00	0.30	
9	8	9	242.0	8.0	120.00	2.90	
10	9	10	200.0	8.0	120.00	0.50	
11	10	11	50.0	8.0	120.00	0.00	
12	11	12	100.0	8.0	120.00	1.60	
13	12	13	249.0	8.0	120.00	0.00	
14	13	14	103.0	8.0	120.00	0.50	
15	14	15	213.0	8.0	120.00	1.60	
16	15	16	142.0	8.0	120.00	2.40	
17	16	21	48.0	8.0	120.00	3.80	
18	21	18	172.0	4.0	120.00	1.60	
19	21	18	145.0	4.0	120.00	1.60	

J U N C T I O N N O D E D A T A

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	CONNECTING PIPES	
2-1	10"x8"REDUCE	0.00	116.00	1	3
3-1	FH	0.00	117.20	3	4
4-1	DMD	2.43	114.70	4	5
5-1	FH	0.00	114.00	5	6
6-1	DMD	2.43	109.70	6	7
7-1	FH	0.00	111.50	7	8
8-1	DMD	2.43	112.20	8	9
9-1	DMD	2.43	114.40	9	10
10-1	FH	0.00	113.60	10	11

11-1	DMD	2.43	113.40	11	12	
12-1	DMD	2.43	113.00	12	13	
13-1	DMD	2.43	110.10	13	14	
14-1	FH	0.00	107.90	14	15	
15-1	DMD	2.43	103.90	15	16	
16-1	FH	0.00	103.00	16	17	
18-1	DMD	1.21	103.00	18	19	
21-1	TEE	0.00	102.88	17	18	19

SECTION-2
ANALYSIS OF FIRE FLOW @ MAX DAY DEMANDS

FIRE FLOW @ MAX DAY DEMANDS

Cybernet Version: 2.18 SN: 1132184896 01-01-1990
Description: FIRE FLOW @ MAX DAY DEMANDS(FACTOR=2.0)
Drawing: C:\DWG\AC12CYB\SG-WTR

Fire Flow Summary.

JCT No.	Max. Day Demand (gpm)	Max. Day Pressure (psi)	Zone No.	Needed Fire Flow (gpm)	Available Fire Flow (gpm)	@Residual Pressure (psi)	Min. Zone Pressure (psi)	@JCT No.
3	0.0	70.1	1	1000.0	1500.0	39.3	40.3	4
5	0.0	71.5	1	1000.0	1500.0	29.6	29.4	9
7	0.0	72.5	1	1000.0	1380.5	21.3	20.0	9
10	0.0	71.6	1	1000.0	1200.5	20.0	20.1	11
14	0.0	74.1	1	1000.0	1120.8	20.0	20.4	13
16	0.0	76.2	1	1000.0	1072.3	20.0	20.0	18

SECTION-3
ANALYSIS OF SYSTEM WITH AVERAGE DAY DEMANDS

AVERAGE DAY DEMANDS

MAXIMUM DIMENSIONS	
Number of pipes	250
Number of pumps	62
Number junction nodes	250
Flow meters	62
Boundary nodes	25
Variable storage tanks	62
Pressure switches	62
Regulating Valves	62
Items for limited output	250
limit for non-consecutive numbering	2572

Cybernet version 2.18. SN: 1132184896-250

Extended Description:

U N I T S S P E C I F I E D

FLOWRATE ..... = gallons/minute
HEAD (HGL) ..... = feet
PRESSURE ..... = psig

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

NUMBER OF PIPES .....(p) = 18
NUMBER OF JUNCTION NODES .....(j) = 17
NUMBER OF PRIMARY LOOPS .....(l) = 1
NUMBER OF BOUNDARY NODES .....(f) = 1
NUMBER OF SUPPLY ZONES .....(z) = 1

****
S I M U L A T I O N R E S U L T S
****

The results are obtained after 5 trials with an accuracy = 0.00325

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: AVG DAY DEMANDS-350gpd/UNIT
Drawing: SG-WTR

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (gpm)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1-BN	0	2	20.66	0.01	0.00	0.00	0.13	0.02
3	2	3	20.66	0.00	0.00	0.00	0.13	0.02
4	3	4	20.66	0.01	0.00	0.00	0.13	0.02
5	4	5	18.23	0.00	0.00	0.00	0.12	0.01
6	5	6	18.23	0.00	0.00	0.00	0.12	0.01
7	6	7	15.80	0.00	0.00	0.00	0.10	0.01
8	8	7	-15.80	0.00	0.00	0.00	0.10	0.01
9	8	9	13.36	0.00	0.00	0.00	0.09	0.01
10	9	10	10.93	0.00	0.00	0.00	0.07	0.00
11	10	11	10.93	0.00	0.00	0.00	0.07	0.00
12	11	12	8.50	0.00	0.00	0.00	0.05	0.00
13	12	13	6.07	0.00	0.00	0.00	0.04	0.00
14	13	14	3.64	0.00	0.00	0.00	0.02	0.00
15	14	15	3.64	0.00	0.00	0.00	0.02	0.00
16	15	16	1.21	0.00	0.00	0.00	0.01	0.00
17	16	21	1.21	0.00	0.00	0.00	0.01	0.00
18	21	18	0.58	0.00	0.00	0.00	0.01	0.00
19	21	18	0.63	0.00	0.00	0.00	0.02	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (gpm)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
2-1	10"x8"REDUCE	0.00	239.89	116.00	123.89	53.68
3-1	FH	0.00	239.88	117.20	122.68	53.16
4-1	DMD	2.43	239.88	114.70	125.18	54.24
5-1	FH	0.00	239.88	114.00	125.88	54.55
6-1	DMD	2.43	239.87	109.70	130.17	56.41
7-1	FH	0.00	239.87	111.50	128.37	55.63
8-1	DMD	2.43	239.87	112.20	127.67	55.32
9-1	DMD	2.43	239.87	114.40	125.47	54.37
10-1	FH	0.00	239.87	113.60	126.27	54.72
11-1	DMD	2.43	239.87	113.40	126.47	54.80
12-1	DMD	2.43	239.87	113.00	126.87	54.97
13-1	DMD	2.43	239.86	110.10	129.76	56.23

14-1 FH	0.00	239.86	107.90	131.96	57.18
15-1 DMD	2.43	239.86	103.90	135.96	58.92
16-1 FH	0.00	239.86	103.00	136.86	59.31
18-1 DMD	1.21	239.86	103.00	136.86	59.31
21-1 TEE	0.00	239.86	102.88	136.98	59.36

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (gpm)
1	20.66

NET SYSTEM INFLOW = 20.66
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 20.66

**** CYBERNET SIMULATION COMPLETED ****

SECTION-4
ANALYSIS OF SYSTEM WITH MAX DAY DEMANDS

MAX DAY DEMANDS

MAXIMUM DIMENSIONS	
Number of pipes	250
Number of pumps	62
Number junction nodes	250
Flow meters	62
Boundary nodes	25
Variable storage tanks	62
Pressure switches	62
Regulating Valves	62
Items for limited output	250
limit for non-consecutive numbering	2572

Cybernet version 2.18. SN: 1132184896-250

Extended Description:

U N I T S S P E C I F I E D

FLOWRATE ..... = gallons/minute
HEAD (HGL) ..... = feet
PRESSURE ..... = psig

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

NUMBER OF PIPES .....(p) = 18
NUMBER OF JUNCTION NODES .....(j) = 17
NUMBER OF PRIMARY LOOPS .....(l) = 1
NUMBER OF BOUNDARY NODES .....(f) = 1
NUMBER OF SUPPLY ZONES .....(z) = 1

****
S I M U L A T I O N R E S U L T S
****

The results are obtained after 4 trials with an accuracy = 0.00399

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: MAX DAY DEMANDS-FACTOR=2
Drawing: SG-WTR

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (gpm)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1-BN	0	2	41.32	0.03	0.00	0.00	0.26	0.06
3	2	3	41.32	0.00	0.00	0.00	0.26	0.06
4	3	4	41.32	0.02	0.00	0.00	0.26	0.06
5	4	5	36.45	0.00	0.00	0.00	0.23	0.05
6	5	6	36.45	0.01	0.00	0.00	0.23	0.05
7	6	7	31.59	0.01	0.00	0.00	0.20	0.04
8	8	7	-31.59	0.00	0.00	0.00	0.20	0.04
9	8	9	26.73	0.01	0.00	0.00	0.17	0.03
10	9	10	21.87	0.00	0.00	0.00	0.14	0.02
11	10	11	21.87	0.00	0.00	0.00	0.14	0.02
12	11	12	17.01	0.00	0.00	0.00	0.11	0.01
13	12	13	12.14	0.00	0.00	0.00	0.08	0.01
14	13	14	7.28	0.00	0.00	0.00	0.05	0.00
15	14	15	7.28	0.00	0.00	0.00	0.05	0.00
16	15	16	2.42	0.00	0.00	0.00	0.02	0.00
17	16	21	2.42	0.00	0.00	0.00	0.02	0.00
18	21	18	1.16	0.00	0.00	0.00	0.03	0.00
19	21	18	1.26	0.00	0.00	0.00	0.03	0.00

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (gpm)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
2-1	10"x8"REDUCE	0.00	239.86	116.00	123.86	53.67
3-1	FH	0.00	239.86	117.20	122.66	53.15
4-1	DMD	4.86	239.83	114.70	125.13	54.22
5-1	FH	0.00	239.83	114.00	125.83	54.53
6-1	DMD	4.86	239.81	109.70	130.11	56.38
7-1	FH	0.00	239.80	111.50	128.30	55.60
8-1	DMD	4.86	239.80	112.20	127.60	55.29
9-1	DMD	4.86	239.79	114.40	125.39	54.34
10-1	FH	0.00	239.79	113.60	126.19	54.68
11-1	DMD	4.86	239.79	113.40	126.39	54.77
12-1	DMD	4.86	239.79	113.00	126.79	54.94
13-1	DMD	4.86	239.79	110.10	129.69	56.20

14-1 FH	0.00	239.79	107.90	131.89	57.15
15-1 DMD	4.86	239.78	103.90	135.88	58.88
16-1 FH	0.00	239.78	103.00	136.78	59.27
18-1 DMD	2.42	239.78	103.00	136.78	59.27
21-1 TEE	0.00	239.78	102.88	136.90	59.33

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (gpm)
1	41.32

NET SYSTEM INFLOW = 41.32
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 41.32

**** CYBERNET SIMULATION COMPLETED ****

SECTION – 5
ANALYSIS OF SYSTEM WITH PEAK HOUR DEMANDS

PEAK HOUR DEMANDS

MAXIMUM DIMENSIONS	
Number of pipes	250
Number of pumps	62
Number junction nodes	250
Flow meters	62
Boundary nodes	25
Variable storage tanks	62
Pressure switches	62
Regulating Valves	62
Items for limited output	250
limit for non-consecutive numbering	2572

Cybernet version 2.18. SN: 1132184896-250

Extended Description:

U N I T S S P E C I F I E D

FLOWRATE ..... = gallons/minute
HEAD (HGL) ..... = feet
PRESSURE ..... = psig

O U T P U T O P T I O N D A T A

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT

S Y S T E M C O N F I G U R A T I O N

NUMBER OF PIPES .....(p) = 18
NUMBER OF JUNCTION NODES .....(j) = 17
NUMBER OF PRIMARY LOOPS .....(l) = 1
NUMBER OF BOUNDARY NODES .....(f) = 1
NUMBER OF SUPPLY ZONES .....(z) = 1

****
S I M U L A T I O N R E S U L T S
****

The results are obtained after 4 trials with an accuracy = 0.00000

S I M U L A T I O N D E S C R I P T I O N

CyberNet Version 2.18. Copyright 1991,92 Haestad Methods Inc.
Run Description: PEAK HOUR DEMANDS-FACTOR=4
Drawing: SG-WTR

P I P E L I N E R E S U L T S

STATUS CODE: XX -CLOSED PIPE BN -BOUNDARY NODE PU -PUMP LINE
CV -CHECK VALVE RV -REGULATING VALVE TK -STORAGE TANK

PIPE NUMBER	NODE NOS. #1	#2	FLOWRATE (gpm)	HEAD LOSS (ft)	PUMP HEAD (ft)	MINOR LOSS (ft)	LINE VELO. (ft/s)	HL/ 1000 (ft/ft)
1-BN	0	2	82.63	0.12	0.00	0.00	0.53	0.21
3	2	3	82.63	0.01	0.00	0.01	0.53	0.21
4	3	4	82.63	0.08	0.00	0.00	0.53	0.21
5	4	5	72.91	0.01	0.00	0.01	0.47	0.17
6	5	6	72.91	0.05	0.00	0.01	0.47	0.17
7	6	7	63.18	0.03	0.00	0.01	0.40	0.13
8	8	7	-63.18	0.01	0.00	0.00	0.40	0.13
9	8	9	53.46	0.02	0.00	0.01	0.34	0.09
10	9	10	43.74	0.01	0.00	0.00	0.28	0.06
11	10	11	43.74	0.00	0.00	0.00	0.28	0.06
12	11	12	34.01	0.00	0.00	0.00	0.22	0.04
13	12	13	24.29	0.01	0.00	0.00	0.16	0.02
14	13	14	14.56	0.00	0.00	0.00	0.09	0.01
15	14	15	14.56	0.00	0.00	0.00	0.09	0.01
16	15	16	4.84	0.00	0.00	0.00	0.03	0.00
17	16	21	4.84	0.00	0.00	0.00	0.03	0.00
18	21	18	2.32	0.00	0.00	0.00	0.06	0.01
19	21	18	2.52	0.00	0.00	0.00	0.06	0.01

J U N C T I O N N O D E R E S U L T S

JUNCTION NUMBER	JUNCTION TITLE	EXTERNAL DEMAND (gpm)	HYDRAULIC GRADE (ft)	JUNCTION ELEVATION (ft)	PRESSURE HEAD (ft)	JUNCTION PRESSURE (psi)
2-1	10"x8"REDUCE	0.00	239.78	116.00	123.78	53.64
3-1	FH	0.00	239.76	117.20	122.56	53.11
4-1	DMD	9.72	239.67	114.70	124.97	54.16
5-1	FH	0.00	239.66	114.00	125.66	54.45
6-1	DMD	9.72	239.60	109.70	129.90	56.29
7-1	FH	0.00	239.56	111.50	128.06	55.49
8-1	DMD	9.72	239.55	112.20	127.35	55.19
9-1	DMD	9.72	239.52	114.40	125.12	54.22
10-1	FH	0.00	239.51	113.60	125.91	54.56
11-1	DMD	9.72	239.51	113.40	126.11	54.65
12-1	DMD	9.72	239.50	113.00	126.50	54.82
13-1	DMD	9.72	239.50	110.10	129.40	56.07

14-1 FH	0.00	239.50	107.90	131.60	57.02
15-1 DMD	9.72	239.49	103.90	135.59	58.76
16-1 FH	0.00	239.49	103.00	136.49	59.15
18-1 DMD	4.84	239.49	103.00	136.49	59.15
21-1 TEE	0.00	239.49	102.88	136.61	59.20

S U M M A R Y O F I N F L O W S A N D O U T F L O W S

(+) INFLOWS INTO THE SYSTEM FROM BOUNDARY NODES
(-) OUTFLOWS FROM THE SYSTEM INTO BOUNDARY NODES

PIPE NUMBER	FLOWRATE (gpm)
1	82.63

NET SYSTEM INFLOW = 82.63
NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 82.63

**** CYBERNET SIMULATION COMPLETED ****