

WATER SERVICE DEMAND REPORT

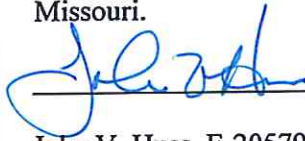
City of Lee's Summit

Jackson County, Missouri

**Summit Technology Campus
Summit Innovation Center**

March, 2015

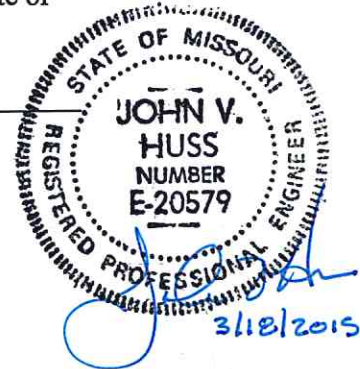
I certify that this report was prepared by me or under my direct supervision, and that I am a duly registered Professional Engineer under the law of the State of Missouri.



John V. Huss, E-20579
Expiration 12.31.2015

3/18/2015

Date



Prepared by:

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THHinc

..... *about the possibilities*

Introduction

This report details the preliminary design of the potable water system to support the Summit Innovation Center Preliminary Development Plan (PDP), a mixed-use development, at the Summit Technology Campus (STC) located in Lee's Summit, Missouri. See Figure 1 for a site location map.

Project Description

The Summit Technology Campus is located southeast of the Interstate-470/State Highway 50 interchange. The entire development covers approximately 367 acres, and is bordered to the south by Chipman Road, to the north by I-470, to the west by Blue Parkway, and to the east by the Union Pacific Railroad. The Summit Technology Campus is split by Ward Road which was opened to traffic in October 2008.

Townsend Capital LLC proposes improvements to the existing Summit Technology Campus, including the addition of a variety of mixed business commercial and residential uses along Ward Road. In this report, the site for these improvements will be referred to as the "35 Acre Tract." The current proposed building layout for the 35 Acre Tract can be found in the PDP.

Existing Water System

There are several existing waterlines on Chipman Road. These include a 20 inch, 12 inch, 10 inch and a 6 inch water line. There are 8 inch and 12 inch waterlines that extend from Chipman Road to Ward Road on Old Blue Parkway. There is also a 12 inch waterline running on the east side of Blue Parkway, north to Ward Road, and then west on Ward Road.

Proposed Water Facilities:

To support this development, we proposed to construct a new 12 inch water line from the existing 20 inch water line on Chipman Road, just east of Outerview Drive to the southeast corner of Southwest Blue parkway and Ward Road. The 12 inch waterline will parallel the west side of Ward Road approximately 4,850 feet to the proposed tie in at the existing 12 inch waterline at SW Blue Parkway. To serve the buildings in Summit Innovation center we propose an 8 inch waterline loop along Innovation parkway and Tudor Road to and from the 12" waterline. Figure 2 depicts a schematic layout of the proposed water systems and tie in points.

All water facilities will be constructed in accordance with MoDNR and Lee's Summit standards and specifications.

Design and Methodology:

The water system has been modeled and calibrated utilizing the WaterCad Water Distribution Modeling Software by Haestad Methods, Inc. The model simulates the connection point to the existing 20 inch waterline on Chipman Road and the 12 inch waterline at Ward Road and the STC site.

Flow test data and model information provided by the City of Lee's Summit was used to calibrate the system model. A tank was placed with a hydraulic grade line equal to the measured static conditions for the given fire hydrants. The system was calibrated for friction losses and demands between the supply tank and the connection point by placing fictitious demands on the fire hydrants where data was taken, then adjusting to match the residual pressures measured during testing.

Table 1: Hydrant flow data from the City of Lee's Summit

Hydrant No.	Location	Static	Residual	Flow at Residual
689	Near intersection of Chipman Rd & Outer View Rd	78.33 psi	75.19 psi	18,290.33 gpm
6238	Near intersection of Chipman Rd & Blue Pkwy	68.42 psi	63.31 psi	8,943.13 gpm
6240	NE Corner of Northern Xing & Blue Pkwy	74.97 psi	54.56 psi	2,819.79 gpm
6242	SE Corner of Blue Pkwy & Ward Rd	80.17 psi	60.62 psi	3,212.70 gpm

Results of Analysis:

To calculate average daily water demand, the City of Lee's Summit assumes 100-GPD per employee for commercial and industrial uses. However, the number of employees is unknown for this development. For the 90 room hotel located on Lot 2 we used MoDNR estimation method of 50-GPD per guest. We assumed 3 guests per hotel room. The average daily demand for the remaining commercial properties was assumed to be 200 gallons per day per 1000 square feet of building space.

The maximum daily demand was calculated by increasing the average daily demand by a factor of 2.4. Similarly the peak hour demand was calculated by multiplying the maximum daily demand by 2.

The required fire flow for commercial areas in Lee's Summit is 1500 gpm while maintaining 20 psi in the water system. Demand for the calibrated system was then analyzed for the peak hour demand combined with fire flow conditions.

The commercial fire flow was superimposed on the peak hour demand at the proposed hydrant locations. Under fire flow conditions the critical hydrant locations were at Junction 2. The pressure at Junction 2 will be 71.03 psi during fire flow conditions. These results indicate that the proposed system as designed will meet the required pressure and demand criteria for full build out during ultimate fire flow conditions. A full packet of the water system analysis can be found in the appendix.

Based on the modeling, the proposed 12" and 8" waterlines are sufficient to provide both domestic and fire demand for this development. Attached is the results of the hydraulic modeling.

APPENDIX

	<u>Pages</u>
Figure 1 – Vicinity Map	1
Figure 2 – Waterline Layout	1
Water System Steady State Analysis – Haestad Methods WaterCAD	5

SITE LOCATION MAP

REVISIONS

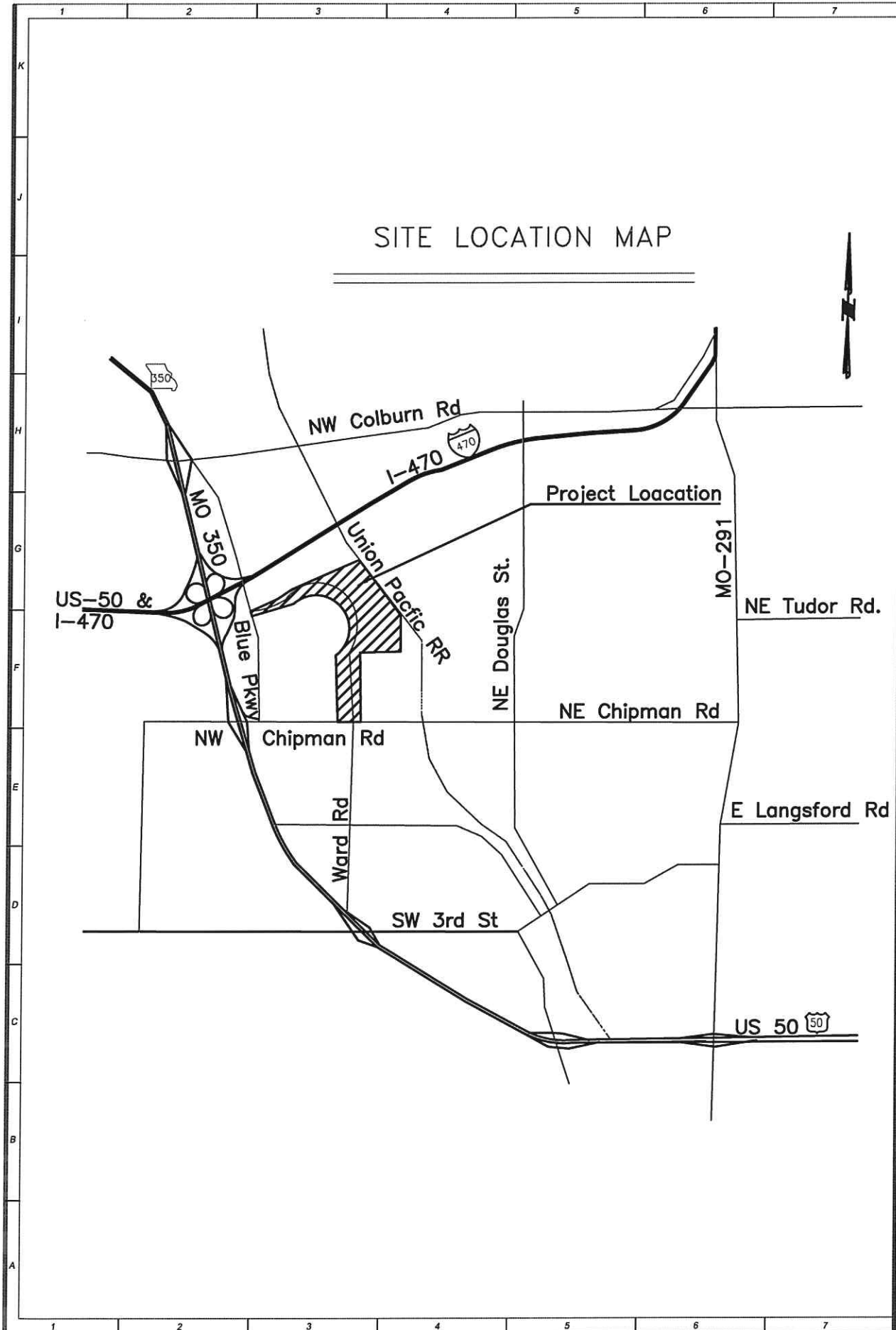
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Townsend Capitol, LLC
Summit Technology Campus
35 Acre Tract PDP
Site Location Map

Client Proj # 0000
THHinc Proj # 4907
Engineer: TPW
Designer: TBB
Drafter: GRK
Plotted: 3/26/2009

DWG. Fig 1
SHT. 1 OF 1



Haestad Junction

J2
J4
J6
J12
J13
J14
J15
J16

Description
Ward & Chipman Commercial Property
Future Senior Care Facility
Office/Retail Property West of Ward Road
35 Acre Tract - Lot 5
35 Acre Tract - Lot 4
35 Acre Tract - Lot 3
35 Acre Tract - Lot 1
35 Acre Tract - Lot 2

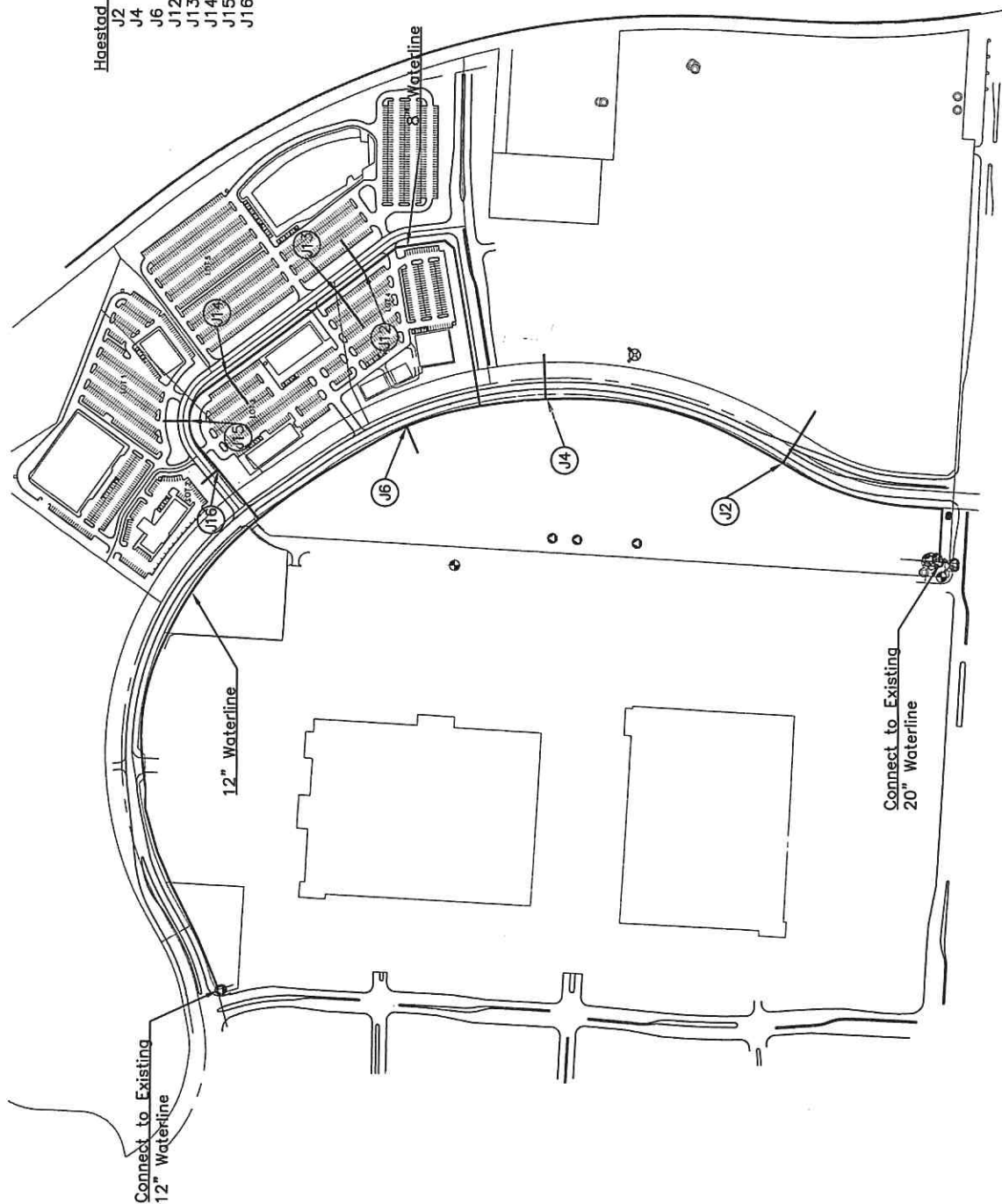
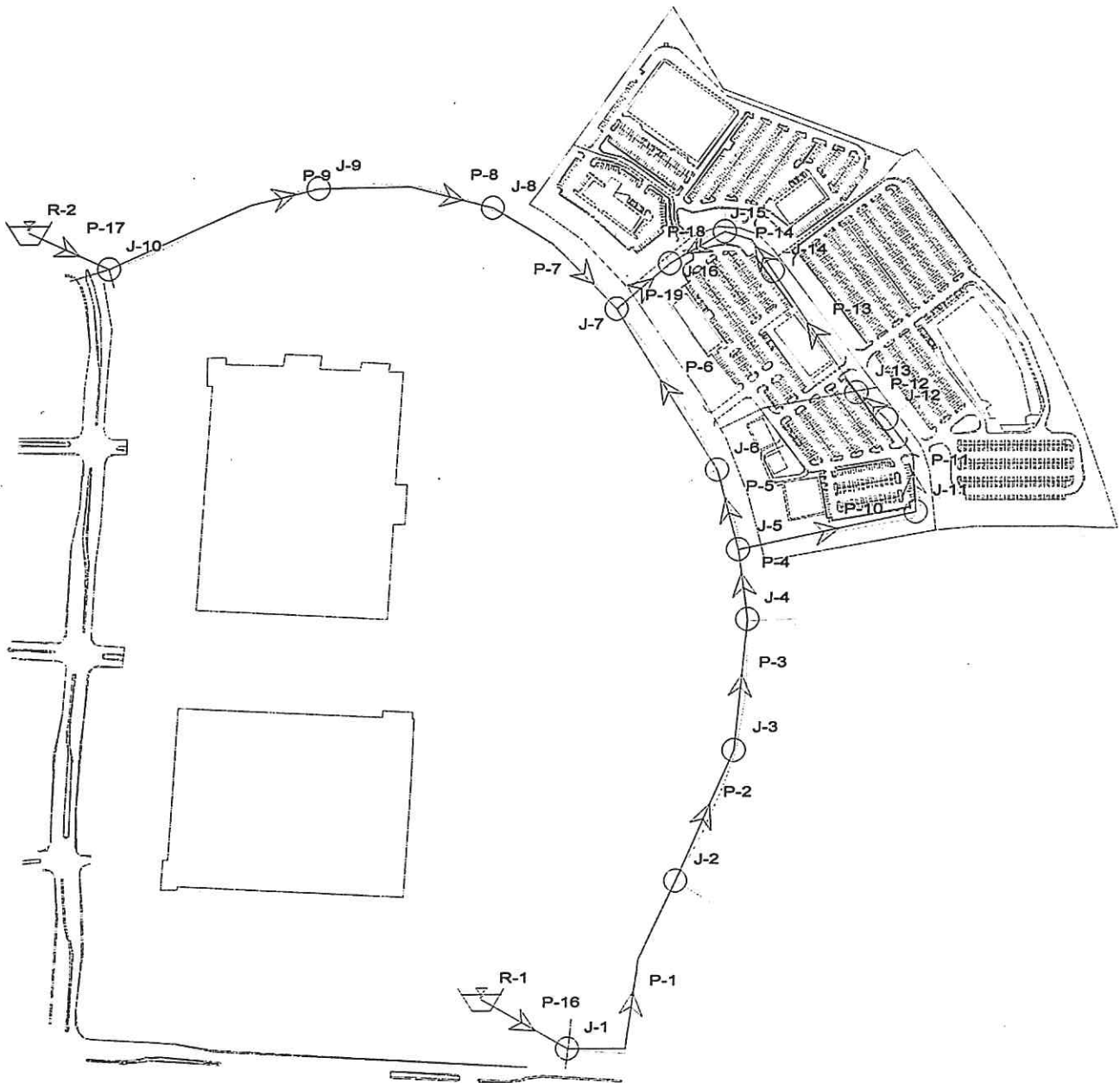


FIGURE 2

Trabue, Hansen & Hinshaw, Inc.
Consulting Engineers

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Steady State Analysis



Steady State Analysis Junction Report

Node Label	Elevation (ft)	Demand Pattern	Demand Type	Demand (gpm)	Calculated Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	1,000.00	Fixed	Demand	0.00	0.00	1,180.77	78.17
J-2	1,006.00	Fixed	Demand	67.00	67.00	1,176.93	73.92
J-3	1,003.00	Fixed	Demand	0.00	0.00	1,174.83	74.31
J-4	990.00	Fixed	Demand	40.00	40.00	1,172.91	79.09
J-5	980.00	Fixed	Demand	0.00	0.00	1,171.91	82.99
J-6	970.00	Fixed	Demand	40.00	40.00	1,171.20	87.00
J-7	978.00	Fixed	Demand	0.00	0.00	1,169.66	82.88
J-8	977.00	Fixed	Demand	0.00	0.00	1,168.33	82.74
J-9	980.00	Fixed	Demand	0.00	0.00	1,167.01	80.87
J-10	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.01
J-11	980.00	Fixed	Demand	0.00	0.00	1,170.74	82.48
J-12	980.00	Fixed	Demand	146.40	146.40	1,170.06	82.19
J-13	980.00	Fixed	Demand	16.50	16.50	1,169.98	82.15
J-14	980.00	Fixed	Demand	60.00	60.00	1,169.72	82.04
J-15	980.00	Fixed	Demand	52.00	52.00	1,169.67	82.02
J-16	980.00	Fixed	Demand	35.60	35.60	1,169.66	82.02

Steady State Analysis Junction Report

Node Label	Elevation (ft)	Demand Pattern	Demand Type	Demand (gpm)	Calculated Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	1,000.00	Fixed	Demand	0.00	0.00	1,180.76	78.17
J-2	1,006.00	Fixed	Demand	1,500.00	1,500.00	1,170.70	71.22
J-3	1,003.00	Fixed	Demand	0.00	0.00	1,169.57	72.03
J-4	990.00	Fixed	Demand	40.00	40.00	1,168.53	77.20
J-5	980.00	Fixed	Demand	0.00	0.00	1,168.01	81.30
J-6	970.00	Fixed	Demand	40.00	40.00	1,167.64	85.47
J-7	978.00	Fixed	Demand	0.00	0.00	1,166.88	81.68
J-8	977.00	Fixed	Demand	0.00	0.00	1,166.34	81.88
J-9	980.00	Fixed	Demand	0.00	0.00	1,165.81	80.35
J-10	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-11	980.00	Fixed	Demand	0.00	0.00	1,167.32	81.00
J-12	980.00	Fixed	Demand	146.40	146.40	1,166.93	80.84
J-13	980.00	Fixed	Demand	16.50	16.50	1,166.91	80.82
J-14	980.00	Fixed	Demand	60.00	60.00	1,166.84	80.80
J-15	980.00	Fixed	Demand	52.00	52.00	1,166.84	80.80
J-16	980.00	Fixed	Demand	35.60	35.60	1,166.85	80.80

Steady State Analysis Junction Report

Node Label	Elevation (ft)	Demand Pattern	Demand Type	Demand (gpm)	Calculated Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	1,000.00	Fixed	Demand	0.00	0.00	1,180.76	78.17
J-2	1,006.00	Fixed	Demand	67.00	67.00	1,173.52	72.44
J-3	1,003.00	Fixed	Demand	0.00	0.00	1,169.46	71.98
J-4	990.00	Fixed	Demand	1,500.00	1,500.00	1,165.72	75.99
J-5	980.00	Fixed	Demand	0.00	0.00	1,165.54	80.24
J-6	970.00	Fixed	Demand	40.00	40.00	1,165.43	84.51
J-7	978.00	Fixed	Demand	0.00	0.00	1,165.23	80.96
J-8	977.00	Fixed	Demand	0.00	0.00	1,165.17	81.37
J-9	980.00	Fixed	Demand	0.00	0.00	1,165.10	80.04
J-10	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-11	980.00	Fixed	Demand	0.00	0.00	1,165.22	80.09
J-12	980.00	Fixed	Demand	146.40	146.40	1,165.03	80.01
J-13	980.00	Fixed	Demand	16.50	16.50	1,165.03	80.01
J-14	980.00	Fixed	Demand	60.00	60.00	1,165.03	80.01
J-15	980.00	Fixed	Demand	52.00	52.00	1,165.05	80.02
J-16	980.00	Fixed	Demand	35.60	35.60	1,165.11	80.05

Steady State Analysis Junction Report

Node Label	Elevation (ft)	Demand Pattern	Demand Type	Demand (gpm)	Calculated Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	1,000.00	Fixed	Demand	0.00	0.00	1,180.76	78.17
J-2	1,006.00	Fixed	Demand	67.00	67.00	1,174.64	72.93
J-3	1,003.00	Fixed	Demand	0.00	0.00	1,171.23	72.75
J-4	990.00	Fixed	Demand	40.00	40.00	1,168.09	77.01
J-5	980.00	Fixed	Demand	0.00	0.00	1,166.45	80.63
J-6	970.00	Fixed	Demand	1,500.00	1,500.00	1,165.02	84.33
J-7	978.00	Fixed	Demand	0.00	0.00	1,165.01	80.87
J-8	977.00	Fixed	Demand	0.00	0.00	1,165.01	81.30
J-9	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-10	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-11	980.00	Fixed	Demand	0.00	0.00	1,165.63	80.27
J-12	980.00	Fixed	Demand	146.40	146.40	1,165.16	80.07
J-13	980.00	Fixed	Demand	16.50	16.50	1,165.12	80.05
J-14	980.00	Fixed	Demand	60.00	60.00	1,165.01	80.00
J-15	980.00	Fixed	Demand	52.00	52.00	1,165.00	80.00
J-16	980.00	Fixed	Demand	35.60	35.60	1,165.00	80.00

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Node Label	Elevation (ft)	Demand Pattern	Demand Type	Demand (gpm)	Calculated Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	1,000.00	Fixed	Demand	0.00	0.00	1,180.76	78.17
J-2	1,006.00	Fixed	Demand	67.00	67.00	1,174.76	72.98
J-3	1,003.00	Fixed	Demand	0.00	0.00	1,171.42	72.83
J-4	990.00	Fixed	Demand	40.00	40.00	1,168.35	77.12
J-5	980.00	Fixed	Demand	0.00	0.00	1,166.75	80.76
J-6	970.00	Fixed	Demand	40.00	40.00	1,166.21	84.85
J-7	978.00	Fixed	Demand	0.00	0.00	1,165.07	80.90
J-8	977.00	Fixed	Demand	0.00	0.00	1,165.05	81.32
J-9	980.00	Fixed	Demand	0.00	0.00	1,165.04	80.02
J-10	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-11	980.00	Fixed	Demand	0.00	0.00	1,158.96	77.39
J-12	980.00	Fixed	Demand	1,500.00	1,500.00	1,154.52	75.47
J-13	980.00	Fixed	Demand	16.50	16.50	1,155.40	75.85
J-14	980.00	Fixed	Demand	60.00	60.00	1,158.85	77.34
J-15	980.00	Fixed	Demand	52.00	52.00	1,160.71	78.14
J-16	980.00	Fixed	Demand	35.60	35.60	1,162.71	79.01

Steady State Analysis Junction Report

Node Label	Elevation (ft)	Demand Pattern	Demand Type	Demand (gpm)	Calculated Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	1,000.00	Fixed	Demand	0.00	0.00	1,180.76	78.17
J-2	1,006.00	Fixed	Demand	67.00	67.00	1,174.71	72.96
J-3	1,003.00	Fixed	Demand	0.00	0.00	1,171.34	72.80
J-4	990.00	Fixed	Demand	40.00	40.00	1,168.24	77.08
J-5	980.00	Fixed	Demand	0.00	0.00	1,166.63	80.70
J-6	970.00	Fixed	Demand	40.00	40.00	1,166.11	84.80
J-7	978.00	Fixed	Demand	0.00	0.00	1,165.01	80.87
J-8	977.00	Fixed	Demand	0.00	0.00	1,165.01	81.30
J-9	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-10	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-11	980.00	Fixed	Demand	0.00	0.00	1,158.44	77.16
J-12	980.00	Fixed	Demand	146.40	146.40	1,153.77	75.15
J-13	980.00	Fixed	Demand	1,500.00	1,500.00	1,152.46	74.58
J-14	980.00	Fixed	Demand	60.00	60.00	1,157.05	76.56
J-15	980.00	Fixed	Demand	52.00	52.00	1,159.46	77.61
J-16	980.00	Fixed	Demand	35.60	35.60	1,162.02	78.71

Steady State Analysis Junction Report

Node Label	Elevation (ft)	Demand Pattern	Demand Type	Demand (gpm)	Calculated Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	1,000.00	Fixed	Demand	0.00	0.00	1,180.76	78.17
J-2	1,006.00	Fixed	Demand	67.00	67.00	1,174.92	73.05
J-3	1,003.00	Fixed	Demand	0.00	0.00	1,171.67	72.94
J-4	990.00	Fixed	Demand	40.00	40.00	1,168.68	77.27
J-5	980.00	Fixed	Demand	0.00	0.00	1,167.13	80.92
J-6	970.00	Fixed	Demand	40.00	40.00	1,166.45	84.95
J-7	978.00	Fixed	Demand	0.00	0.00	1,165.01	80.87
J-8	977.00	Fixed	Demand	0.00	0.00	1,165.01	81.30
J-9	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-10	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-11	980.00	Fixed	Demand	0.00	0.00	1,161.56	78.51
J-12	980.00	Fixed	Demand	146.40	146.40	1,158.40	77.14
J-13	980.00	Fixed	Demand	16.50	16.50	1,157.58	76.79
J-14	980.00	Fixed	Demand	1,500.00	1,500.00	1,154.68	75.54
J-15	980.00	Fixed	Demand	52.00	52.00	1,157.85	76.91
J-16	980.00	Fixed	Demand	35.60	35.60	1,161.17	78.34

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Node Label	Elevation (ft)	Demand Pattern	Demand Type	Demand (gpm)	Calculated Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	1,000.00	Fixed	Demand	0.00	0.00	1,180.76	78.17
J-2	1,006.00	Fixed	Demand	67.00	67.00	1,175.02	73.09
J-3	1,003.00	Fixed	Demand	0.00	0.00	1,171.83	73.01
J-4	990.00	Fixed	Demand	40.00	40.00	1,168.89	77.36
J-5	980.00	Fixed	Demand	0.00	0.00	1,167.36	81.02
J-6	970.00	Fixed	Demand	40.00	40.00	1,166.61	85.02
J-7	978.00	Fixed	Demand	0.00	0.00	1,165.00	80.86
J-8	977.00	Fixed	Demand	0.00	0.00	1,165.00	81.30
J-9	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-10	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-11	980.00	Fixed	Demand	0.00	0.00	1,162.85	79.07
J-12	980.00	Fixed	Demand	146.40	146.40	1,160.28	77.96
J-13	980.00	Fixed	Demand	16.50	16.50	1,159.65	77.69
J-14	980.00	Fixed	Demand	60.00	60.00	1,157.44	76.73
J-15	980.00	Fixed	Demand	1,500.00	1,500.00	1,156.65	76.39
J-16	980.00	Fixed	Demand	35.60	35.60	1,160.53	78.07

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Node Label	Elevation (ft)	Demand Pattern	Demand Type	Demand (gpm)	Calculated Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	1,000.00	Fixed	Demand	0.00	0.00	1,180.76	78.17
J-2	1,006.00	Fixed	Demand	67.00	67.00	1,175.14	73.14
J-3	1,003.00	Fixed	Demand	0.00	0.00	1,172.02	73.09
J-4	990.00	Fixed	Demand	40.00	40.00	1,169.14	77.47
J-5	980.00	Fixed	Demand	0.00	0.00	1,167.65	81.15
J-6	970.00	Fixed	Demand	40.00	40.00	1,166.80	85.10
J-7	978.00	Fixed	Demand	0.00	0.00	1,164.97	80.85
J-8	977.00	Fixed	Demand	0.00	0.00	1,164.98	81.29
J-9	980.00	Fixed	Demand	0.00	0.00	1,164.99	80.00
J-10	980.00	Fixed	Demand	0.00	0.00	1,165.01	80.00
J-11	980.00	Fixed	Demand	0.00	0.00	1,164.28	79.69
J-12	980.00	Fixed	Demand	146.40	146.40	1,162.37	78.86
J-13	980.00	Fixed	Demand	16.50	16.50	1,161.94	78.68
J-14	980.00	Fixed	Demand	60.00	60.00	1,160.46	78.04
J-15	980.00	Fixed	Demand	52.00	52.00	1,159.96	77.82
J-16	980.00	Fixed	Demand	1,500.00	1,500.00	1,159.62	77.67