

FINAL WATER BASIS OF DESIGN REPORT

Residential Healthcare Facility

90th Street and Raintree Drive
Scottsdale, AZ 85260

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Project Number: 200626

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Case No.: 16-ZN-2020

Plan Check No.: TBD

**FINAL Basis of Design
Report**

- APPROVED
 APPROVED AS NOTED
 REVISE AND RESUBMIT



Disclaimer: If approved; the approval is granted under the condition that the final construction documents submitted for city review will match the information herein. Any subsequent changes in the water or sewer design that materially impact design criteria or standards will require re-analysis, re-submittal, and approval of a revised basis of design report prior to the plan review submission.; this approval is not a guarantee of construction document acceptance. For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

BY rsacks

DATE 2/10/2021

4-DR-2021
2/8/2021

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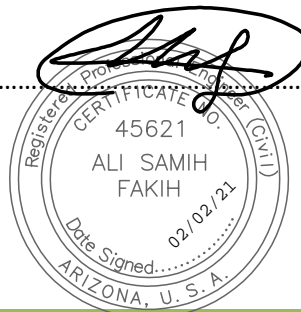
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1. INTRODUCTION

1.1 SUMMARY OF PROPOSED DEVELOPMENT:

The report presents the service requirements for a residential healthcare facility located at the 90th Street and Raintree Drive in Scottsdale, AZ. The proposed development consists of a new 4-story residential healthcare building (179,296 sf) with a maximum of 152 units with a lobby, parking and a common area with a pool. The purpose of this report is to provide an analysis of the impact that this development will have on the city's water system.

1.2 LEGAL DESCRIPTION:

The project property consists of land located at a portion of Section 7, Township 3 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Scottsdale, Arizona. The project site consists of the following parcels:

Parcel ID: Parcel 217-15-033; SFI Raintree Scottsdale LLC, Zoning R1-35

Refer to **FIGURE 1 - Vicinity Map** for the project's location with respect to major cross streets.

1.3 EXISTING AND PROPOSED SITE ZONING AND LAND USES:

The project area includes approximately 203,311 sq. ft. (4.67 acres) of land designated as R1-35 zoning. The existing site consists of an undeveloped parcel. West of the proposed development is an undeveloped parcel under I-1 zoning. East of the proposed development is residential development zoned as R1-7. North of the proposed development is an office building under I-7 zoning. South of the proposed development is commercial development under I-7 zoning. The proposed project will be a Residential Healthcare Facility and therefore will be rezoned to Commercial Office (C-O).

2. DESIGN DOCUMENTATION

2.1. DESIGN COMPLIANCE:

The proposed water system is designed to meet the criteria of the City of Scottsdale ("the City") Water Resources Department, the Arizona Department of Environmental Quality ("ADEQ"), and Maricopa County Environmental Services Department ("MCESD").

2.2. PROCEDURES, POLICIES AND METHODOLOGIES:

The general methodology used to design this public water infrastructure consists of modeling a network of water distribution mains to meet the City's pressure, head loss, and water demand requirements during daily demands and fire events. The connection to the water system is modeled as a reservoir and pump. The pump will simulate the pressure drop and the available flow from the existing water system as depicted by the fire flow test. Refer to **APPENDIX I** for a copy of the fire hydrant flow test results.

2.3 SOFTWARE ACKNOWLEDGEMENT:

Bentley WaterCAD® Version 8i is the computer modeling tool used in this water study.

3. EXISTING CONDITIONS

3.1 EXISTING TOPOGRAPHY, VEGETATION AND LANDFORM FEATURES:

Per Topographic Survey prepared by AW Land Surveying LLC, the site slopes from northwest to south east at approximately 0.5%. Elevation varies from approximately 1480.66 at the northwest corner to approximately 1476.82 at the southeast corner.

Refer to **FIGURE 2** for an aerial of the overall project existing conditions.

FIRM Map Number 04013C1760L dated October 16, 2013 indicates the site is designated as Zone "X" shaded. As such, it is defined as areas determined to an area of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; areas protected by levees from 1% annual chance flood.

Refer to **FIGURE 3** for the FIRM.

3.2 EXISTING WATER MAIN:

Water: City of Scottsdale (QS 34-49)

- An existing 8" DIP east of the site along the west curb of 90th Street coming from the north to approximately mid-way of the frontage, and a 12" PVC water line along the east curb of 90th Street across the full frontage.
- An 8" DIP line runs south of the site, from north to south and extends into Raintree Drive.
- An 8" DIP line with higher pressure runs north and west from the northwest property corner.
- A 20" line of unknown material runs on the east side of Pima Freeway, to the west of the site.
- Hydrants exist to the east of the site on the east curb of 90th street approximately 200 feet from the southeast corner of the property line, to the south of the site on Raintree Drive approximately 60 feet from the southeast corner of the property line.

Refer to **FIGURE 4** for COS existing QS 34-49.

3.3 CERTIFIED FLOW TEST RESULTS OF EXISTING WATER SYSTEM:

Certified fire hydrant flow testing for the onsite domestic and fire flow improvements was performed on July 16, 2020 by Arizona Flow Testing LLC at 7:00 a.m. A fire flow test on the eastern pressure zone recorded a static pressure of 83 psi and residual pressure of 70 psi at 1,764 gpm. The City's DS+PM requires the domestic water pressures to be reduced to 72 psi when the flow test exceeds 80 psi. Both hydraulic model runs are provided in APPENDIX I for comparison. The fire hydrant flow test for the western pressure zone (higher pressure) was taken from the design report for the Self-Storage Facility prepared by Helix Engineering. That flow test recorded a static pressure of 100 psi and residual pressure of 45 psi at 3,340 gpm on May 20, 2019. Flow test documentation is included in the **APPENDIX I**.

4. PROPOSED CONDITIONS

4.1 SITE PLAN:

Proposed development consists of a new residential healthcare facility with 3 and 4 story components, parking, and a common area with a pool.

4.2 PROPOSED WATER SYSTEM:

A new 8" DIP will be looped along the east side of the building tying into the existing 8" DIP dead-end at the northeast corner of the site and an existing water stub located approximately mid-site. The existing 8" system at the northwest corner of the site will be tapped for a new onsite fire line servicing two fire hydrants providing coverage to the west area and will not be used for domestic service. New fire hydrants off the eastern water system are proposed to be located at the northeast and southeast corners of the building.

4.3 WATER REQUIREMENTS:

The required fire flow was determined per the International Building Code, Fire Flow Calculation Table B105.1 (2) and Table B05.2. Per table B05.2 the minimum required fire flow for commercial buildings are 25% the value in Table 105.1(2). Considering that the total gross floor area for the building is 179,296 sf, with material type V-A, the required fire flow is 6,500 gpm. With the 75% credit for the sprinklered structures, the calculated fire flow required is the following:

Fire Flow Required= 7,500 gpm x 0.25 = 1,875 gpm.

4.4 MAINTENANCE RESPONSIBILITIES:

The mains, meters and hydrants will be located within water easements dedicated to the City and be maintained by the City. Private backflow prevention devices will be installed on all metered devices.

5. WATER SYSTEM COMPUTATIONS

5.1 WATER DEMANDS:

The proposed development consists of residential use and a pool, with corresponding areas shown in Table 1 below. The residential area consists of 151 units. Average day water demands are described in Section 6-1.205, Figure 6.1-2 of the City of Scottsdale's Design Standards & Policies Manual ("DS&PM"). A summary of the total water demands for the site are presented below in Table 1.

Table 1 - Water Demand

Use	Units	Area (sq. ft.)	Unit Demand (gpm)	Avg Day (gpm)	Max Day (gpm)	Peak Hour (gpm)
High Density Residential	152	-	0.27	41	82	144
Office	-		8.34E-04	0	0	0

Note: Irrigation Demand Assumed as 5 gpm with No Peaking Factor

5.2 SOFTWARE MODELING:

Bentley WaterCAD Version 8i is the computer modeling tool used in this study.

Network analysis input parameters included the following:

1. Pipe diameters (feet)
2. Pipe lengths (feet)
3. Pipes invert elevations (feet)
4. Pressure 1 at the intersection to model the fire flow test performed
5. System demands (gpm)
6. Fire flow (gpm)
7. Model piping is ductile iron pipe using Hazen-Williams frictional losses ($C = 130$)

Output parameters included but were not limited to:

1. Pressure (psi)
2. Flow rates (gpm)
3. Velocities (fps)

5.3 MINIMUM PRESSURE REQUIREMENTS:

The following system pressure requirements are in accordance with the City's design standards:

- Average day, maximum day and peak hour flow demands:
 - Minimum pressure = 50 psi
 - Maximum pressure = 120 psi
- Maximum day plus coincident fire flow demand:
 - Minimum pressure = 30 psi
 - Maximum pressure = 120 psi
- Daily scenario head loss shall not exceed 10 feet per 1,000 feet length of pipe.

Refer to **APPENDIX II** for computer modeling results.

5.4 WATER SYSTEM ANALYSIS:

The proposed water system was analyzed under 5 scenarios: initial service design flow, average day demand, maximum day demand, peak hour demand, and fire flow demand.

The initial service design flow scenario was analyzed through the following assumptions:

- The pressure loss between meters and backflow preventers is approximately 7.5 psi.
- The highest unit fixture is located 48 feet above finish ground elevation; the resulting static loss is 20.8 psi.
- The model indicates 81 psi as peak hour pressure at the metered nodes. Provided domestic service pressure = Initial pressure – total pressure loss
$$= 81 \text{ psi} - (20.8 \text{ psi} + 7.5 \text{ psi})$$

The provided domestic pressure at the highest point of the proposed development is **52.7 psi** meeting the minimum **50 psi** requirement noted in the City's DS+PM. Internal pipe sizing and routing may require the MPE consultant to consider building pumps.

The following table represents flow and pressure available at ground level.

Table 2 - WaterCAD® Analysis Results

Table 2a - WaterCAD® Analysis Results (Raw Flow Test Data)

Demand Scenario	Water Demand (gpm)	Pressure (PSIG)				Velocity (ft/s)	Pipe ID
		Min.	Node	Max.	Node		
Average Day (ADD)	46	81	J-10	82	J-14	0.15	P-8
Maximum Day (MDD)	87	81	J-10	82	J-14	0.29	P-8
Peak Hour (PHD)	148	81	J-10	82	J-14	0.5	P-8
FF + MDD	1962	62	J-10	65	J-14	15	P-19

Table 2b - WaterCAD® Analysis Results (Adjusted Flow Test Data)

Demand Scenario	Water Demand (gpm)	Pressure (PSIG)				Velocity (ft/s)	Pipe ID
		Min.	Node	Max.	Node		
Average Day (ADD)	46	70	J-10	71	J-14	0.15	P-8
Maximum Day (MDD)	87	70	J-10	71	J-14	0.29	P-8
Peak Hour (PHD)	148	70	J-10	71	J-14	0.5	P-8
FF + MDD	1962	51	J-10	54	J-14	15	P-19

Maximum velocity is only noted on the northwest designated fire hydrant run.

These results indicate that the proposed water system follows the City's criteria for daily water usage and fire flow events. The proposed system maintains adequate pressure throughout the proposed

scenarios. The minimum provided pressure under fire flow conditions is 51 psi; which meets the minimum 30 psi requirement.

6. SUMMARY

6.1 SUMMARY OF PROPOSED WATER IMPROVEMENTS:

- The proposed water main is designed in accordance with City of Scottsdale's design standards and policies².
 - Minimum 50 psi @ peak hour required; 70 psi is calculated.
 - Minimum 30 psi @ fire flow required; 51 psi provided.
 - The system supports the minimum 1962 gpm fire flow requirements.
- The results shown in the modeling summary (refer to Section 5.4) indicate that the proposed water system meets the City's criteria for Daily water usage and fire flow events as described in Section 5.3.
- Pressure regulating valves will be installed on all building services and backflow prevention devices on all metered services.

6.2 PROJECT SCHEDULE:

The infrastructure and buildings are proposed to be constructed in a single phase.

7 SUPPORTING MAPS

7.1 SITE UTILITY PLAN

Refer to the Preliminary Utility Plan in **APPENDIX III**.

8 REFERENCES

1. *COS QS Water Plan number 34-49.*
2. *City of Scottsdale Design Standards & Policies Manual, 2018 (Chapter 6 – Water)*

FIGURES

FIGURE 1 - Vicinity Map

FIGURE 2 - Aerial

FIGURE 3 - FIRM Excerpt

FIGURE 4 - Water QS 34-49



FIGURE 1 – Vicinity Map



FIGURE 2 - Aerial

APPENDIX I

Fire Hydrant Flow Tests

Arizona Flow Testing LLC

HYDRANT FLOW TEST REPORT

Project Name:	90th Street & Raintree
Project Address:	14900 North 90th Street, Scottsdale, Arizona 85260
Client Project No.:	Not Provided
Arizona Flow Testing Project No.:	20259
Flow Test Permit No.:	C62625
Date and time flow test conducted:	July 16, 2020 at 7:00 AM
Data is current and reliable until:	January 16, 2021
Conducted by:	Floyd Vaughan – Arizona Flow Testing, LLC (480-250-8154)
Witnessed by:	Jared Berry – City of Scottsdale-Inspector (602-541-4942)

Raw Test Data

Static Pressure: **83.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **70.0 PSI**
(Measured in pounds per square inch)

Pitot Pressure: **22.0 PSI**
(Measured in pounds per square inch)

Diffuser Orifice Diameter: One 4-inch Hose Monster
(Measured in inches)

Coefficient of Diffuser: .7875

Flowing GPM: **1,764 GPM**
(Measured in gallons per minute)

GPM @ 20 PSI: **4,135 GPM**

Data with 11PSI Safety Factor

Static Pressure: **72.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **59.0 PSI**
(Measured in pounds per square inch)

Distance between hydrants: Approx. 440 Feet

Main size: Not Provided

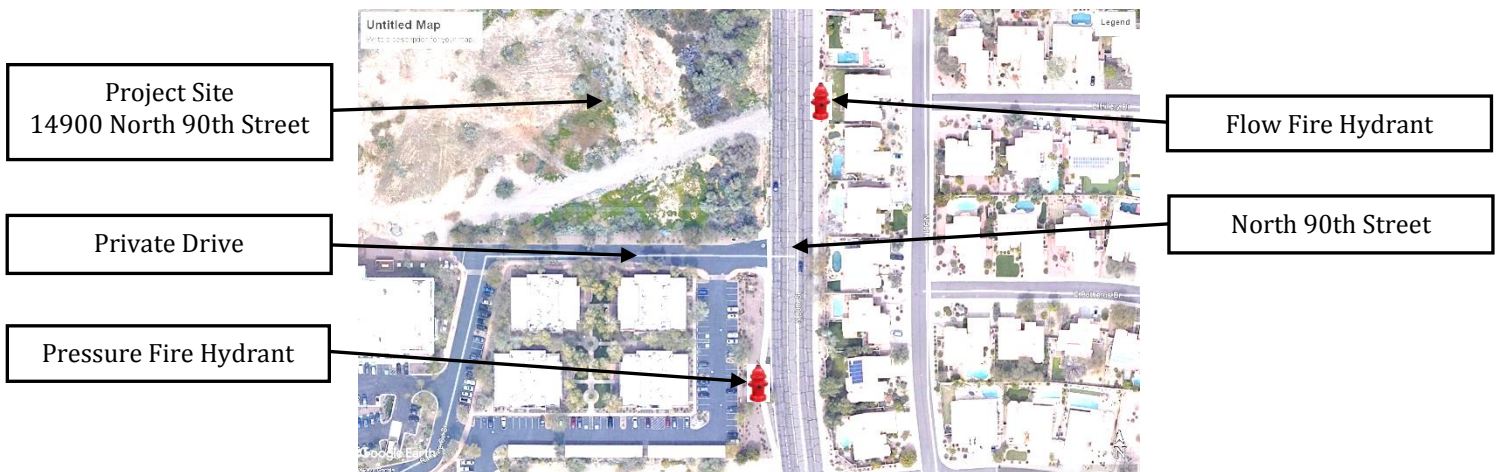
Flowing GPM: **1,764 GPM**

GPM @ 20 PSI: **3,728 GPM**

Scottsdale requires a maximum Static Pressure of 72 PSI for AFES Design.

Flow Test Location

North ↑





Flow Test Summary

Project Name: EJFT 19106
 Project Address: 15111 N Pima Rd, Scottsdale, AZ 85260
 Date of Flow Test: 2019-05-20
 Time of Flow Test: 7:10 AM
 Data Reliable Until: 2019-11-20
 Conducted By: Austin Gourley & Eder Cueva (EJ Flow Tests) 602.999.7637
 Witnessed By: Jared Berry (City of Scottsdale) 602.541.4942
 City Forces Contacted: City of Scottsdale (602.541.4942)
 Permit Number: C58327

Note Scottsdale requires a max static pressure of 72 psi for safety factor

Raw Flow Test Data

Static Pressure: 100.0 PSI
 Residual Pressure: 45.0 PSI
 Flowing GPM: 3,340
 GPM @ 20 PSI: 4,089

Data with a 28 PSI Safety Factor

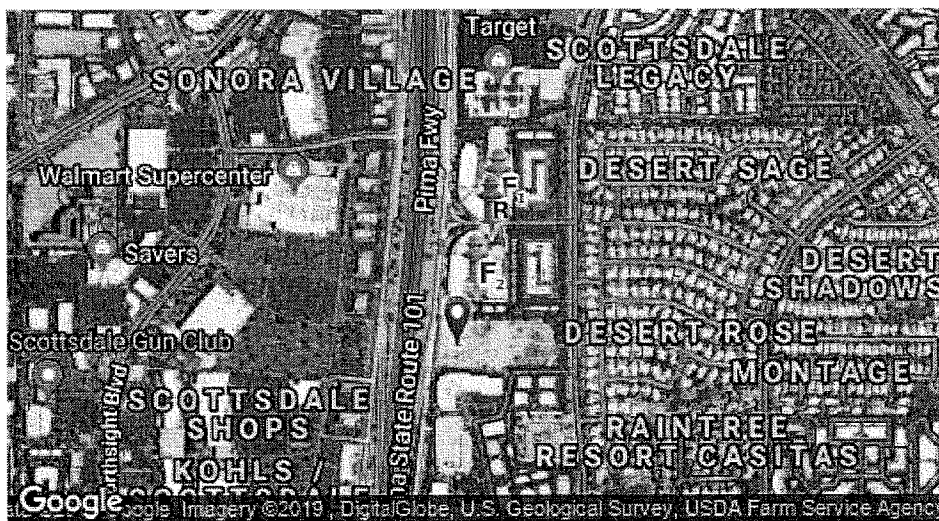
Static Pressure: 72.0 PSI
 Residual Pressure: 17.0 PSI
 Flowing GPM: 3,340
 GPM @ 20 PSI: 3,240

Hydrant F₁

Pitot Pressure (1): 30 PSI
 Coefficient of Discharge (1): 0.9
 Hydrant Orifice Diameter (1): 2.5 inches
 Pitot Pressure (2): 30 PSI
 Coefficient of Discharge (2): 0.9
 Hydrant Orifice Diameter (2): 2.5 inches

Hydrant F₂

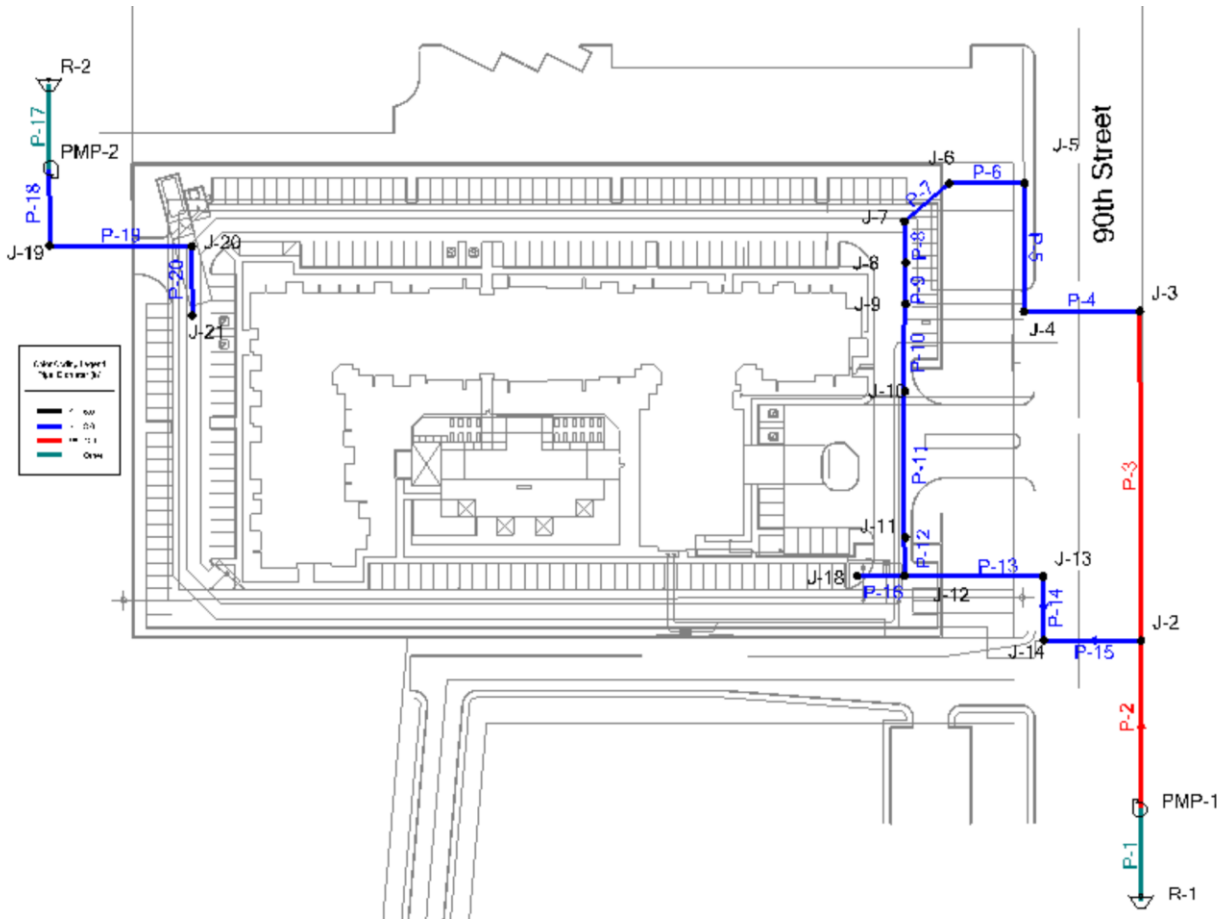
Pitot Pressure (1): 20 PSI
 Coefficient of Discharge (1): 0.9
 Hydrant Orifice Diameter (1): 2.5 inches
 Pitot Pressure (2): 20 PSI
 Coefficient of Discharge (2): 0.9
 Hydrant Orifice Diameter (2): 2.5 inches



- Project Site
- Static-Residual Hydrant
- Flow Hydrant
- Distance Between F₁ and R
179 ft (measured linearly)
- Static-Residual Elevation
1486 ft (above sea level)
- Flow Hydrant (F₁) Elevation
1489 ft (above sea level)
- Elevation & distance values are approximate

APPENDIX II

WaterCAD Model Results
- with Raw FH Test Data
- with Modified FH Test Data



APPENDIX II - WATER MODEL MAP

200626-90th and Raintree.wtg
Active Scenario: Average Day Demand
FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-2	1,480.30	0	1,668.94	82
J-3	1,481.50	0	1,668.94	81
J-4	1,481.90	0	1,668.94	81
J-5	1,481.70	0	1,668.94	81
J-6	1,481.00	0	1,668.94	81
J-7	1,480.70	0	1,668.94	81
J-8	1,481.80	41	1,668.94	81
J-9	1,481.80	0	1,668.94	81
J-10	1,481.40	0	1,668.94	81
J-11	1,481.80	5	1,668.94	81
J-12	1,481.20	0	1,668.94	81
J-13	1,481.30	0	1,668.94	81
J-14	1,479.00	0	1,668.94	82
J-18	1,481.80	0	1,668.94	81
J-19	1,477.00	0	1,711.70	102
J-20	1,481.40	0	1,711.70	100
J-21	1,482.30	0	1,711.70	99

200626-90th and Raintree.wtg
Active Scenario: Average Day Demand
FlexTable: Pipe Table

Label	Diameter (in)	Material	Length (Scaled) (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)
P-1	24.0	Ductile Iron	65	130.0	46	0.03	0.00
P-2	12.0	Ductile Iron	117	130.0	46	0.13	0.00
P-3	12.0	PVC	230	150.0	24	0.07	0.00
P-4	8.0	Ductile Iron	81	130.0	24	0.15	0.00
P-5	8.0	Ductile Iron	89	130.0	24	0.15	0.00
P-6	8.0	Ductile Iron	53	130.0	24	0.15	0.00
P-7	8.0	Ductile Iron	41	130.0	24	0.15	0.00
P-8	8.0	Ductile Iron	29	130.0	-24	0.15	0.00
P-9	8.0	Ductile Iron	33	130.0	17	0.11	0.00
P-10	8.0	Ductile Iron	61	130.0	17	0.11	0.00
P-11	8.0	Ductile Iron	102	130.0	17	0.11	0.00
P-12	8.0	Ductile Iron	23	130.0	22	0.14	0.00
P-13	8.0	Ductile Iron	97	130.0	22	0.14	0.00
P-14	8.0	Ductile Iron	44	130.0	22	0.14	0.00
P-15	8.0	Ductile Iron	68	130.0	22	0.14	0.00
P-16	8.0	Ductile Iron	33	130.0	0	0.00	0.00
P-17	24.0	Ductile Iron	59	130.0	0	0.00	0.00
P-18	8.0	Ductile Iron	53	130.0	0	0.00	0.00
P-19	8.0	Ductile Iron	99	130.0	0	0.00	0.00
P-20	8.0	Ductile Iron	48	130.0	0	0.00	0.00

200626-90th and Raintree.wtg
Active Scenario: Average Day Demand
FlexTable: Pump Table

Label	Elevation (ft)	Pump Status	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
PMP-1	1,476.50	On	1,477.50	1,668.94	46	191.44
PMP-2	1,480.60	On	1,480.80	1,711.70	0	230.90

200626-90th and Raintree.wtg
Active Scenario: Average Day Demand
FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	1,477.50	46	1,477.50
R-2	1,480.80	0	1,480.80

200626-90th and Raintree.wtg
Active Scenario: Max Day Demand
FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-2	1,480.30	0	1,668.86	82
J-3	1,481.50	0	1,668.86	81
J-4	1,481.90	0	1,668.86	81
J-5	1,481.70	0	1,668.85	81
J-6	1,481.00	0	1,668.85	81
J-7	1,480.70	0	1,668.85	81
J-8	1,481.80	82	1,668.84	81
J-9	1,481.80	0	1,668.84	81
J-10	1,481.40	0	1,668.85	81
J-11	1,481.80	5	1,668.85	81
J-12	1,481.20	0	1,668.85	81
J-13	1,481.30	0	1,668.86	81
J-14	1,479.00	0	1,668.86	82
J-18	1,481.80	0	1,668.85	81
J-19	1,477.00	0	1,711.70	102
J-20	1,481.40	0	1,711.70	100
J-21	1,482.30	0	1,711.70	99

200626-90th and Raintree.wtg
Active Scenario: Max Day Demand
FlexTable: Pipe Table

Label	Diameter (in)	Material	Length (Scaled) (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)
P-1	24.0	Ductile Iron	65	130.0	87	0.06	0.00
P-2	12.0	Ductile Iron	117	130.0	87	0.25	0.00
P-3	12.0	PVC	230	150.0	46	0.13	0.00
P-4	8.0	Ductile Iron	81	130.0	46	0.29	0.00
P-5	8.0	Ductile Iron	89	130.0	46	0.29	0.01
P-6	8.0	Ductile Iron	53	130.0	46	0.29	0.00
P-7	8.0	Ductile Iron	41	130.0	46	0.29	0.00
P-8	8.0	Ductile Iron	29	130.0	-46	0.29	0.00
P-9	8.0	Ductile Iron	33	130.0	36	0.23	0.00
P-10	8.0	Ductile Iron	61	130.0	36	0.23	0.00
P-11	8.0	Ductile Iron	102	130.0	36	0.23	0.00
P-12	8.0	Ductile Iron	23	130.0	41	0.26	0.00
P-13	8.0	Ductile Iron	97	130.0	41	0.26	0.00
P-14	8.0	Ductile Iron	44	130.0	41	0.26	0.00
P-15	8.0	Ductile Iron	68	130.0	41	0.26	0.00
P-16	8.0	Ductile Iron	33	130.0	0	0.00	0.00
P-17	24.0	Ductile Iron	59	130.0	0	0.00	0.00
P-18	8.0	Ductile Iron	53	130.0	0	0.00	0.00
P-19	8.0	Ductile Iron	99	130.0	0	0.00	0.00
P-20	8.0	Ductile Iron	48	130.0	0	0.00	0.00

200626-90th and Raintree.wtg
Active Scenario: Max Day Demand
FlexTable: Pump Table

Label	Elevation (ft)	Pump Status	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
PMP-1	1,476.50	On	1,477.50	1,668.87	87	191.37
PMP-2	1,480.60	On	1,480.80	1,711.70	0	230.90

200626-90th and Raintree.wtg
Active Scenario: Max Day Demand
FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	1,477.50	87	1,477.50
R-2	1,480.80	0	1,480.80

200626-90th and Raintree.wtg
Active Scenario: Peak Hour Demand
FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-2	1,480.30	0	1,668.66	81
J-3	1,481.50	0	1,668.66	81
J-4	1,481.90	0	1,668.65	81
J-5	1,481.70	0	1,668.63	81
J-6	1,481.00	0	1,668.62	81
J-7	1,480.70	0	1,668.62	81
J-8	1,481.80	144	1,668.61	81
J-9	1,481.80	0	1,668.62	81
J-10	1,481.40	0	1,668.62	81
J-11	1,481.80	5	1,668.63	81
J-12	1,481.20	0	1,668.64	81
J-13	1,481.30	0	1,668.65	81
J-14	1,479.00	0	1,668.66	82
J-18	1,481.80	0	1,668.64	81
J-19	1,477.00	0	1,711.70	102
J-20	1,481.40	0	1,711.70	100
J-21	1,482.30	0	1,711.70	99

200626-90th and Raintree.wtg
Active Scenario: Peak Hour Demand
FlexTable: Pipe Table

Label	Diameter (in)	Material	Length (Scaled) (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss (ft)
P-1	24.0	Ductile Iron	65	130.0	148	0.11	0.00
P-2	12.0	Ductile Iron	117	130.0	148	0.42	0.01
P-3	12.0	PVC	230	150.0	79	0.22	0.00
P-4	8.0	Ductile Iron	81	130.0	79	0.50	0.01
P-5	8.0	Ductile Iron	89	130.0	79	0.50	0.01
P-6	8.0	Ductile Iron	53	130.0	79	0.50	0.01
P-7	8.0	Ductile Iron	41	130.0	79	0.50	0.01
P-8	8.0	Ductile Iron	29	130.0	-79	0.50	0.00
P-9	8.0	Ductile Iron	33	130.0	64	0.41	0.00
P-10	8.0	Ductile Iron	61	130.0	64	0.41	0.01
P-11	8.0	Ductile Iron	102	130.0	64	0.41	0.01
P-12	8.0	Ductile Iron	23	130.0	69	0.44	0.00
P-13	8.0	Ductile Iron	97	130.0	69	0.44	0.01
P-14	8.0	Ductile Iron	44	130.0	69	0.44	0.01
P-15	8.0	Ductile Iron	68	130.0	69	0.44	0.01
P-16	8.0	Ductile Iron	33	130.0	0	0.00	0.00
P-17	24.0	Ductile Iron	59	130.0	0	0.00	0.00
P-18	8.0	Ductile Iron	53	130.0	0	0.00	0.00
P-19	8.0	Ductile Iron	99	130.0	0	0.00	0.00
P-20	8.0	Ductile Iron	48	130.0	0	0.00	0.00

200626-90th and Raintree.wtg
Active Scenario: Peak Hour Demand
FlexTable: Pump Table

Label	Elevation (ft)	Pump Status	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
PMP-1	1,476.50	On	1,477.50	1,668.67	148	191.17
PMP-2	1,480.60	On	1,480.80	1,711.70	0	230.90

200626-90th and Raintree.wtg
Active Scenario: Peak Hour Demand
FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	1,477.50	148	1,477.50
R-2	1,480.80	0	1,480.80

200626-90th and Raintree.wtg

Active Scenario: Fire Flow Demand

Fire Flow Node FlexTable: Fire Flow Report

Label	Needed Fire Flow (gpm)	Calculated Pressure at Junction (psi)	Flow (Total Available) (gpm)	Junction w/ Minimum Pressure	Junction Pressure (psi)	Pipe w/ Maximum Velocity	Pipe Velocity (ft/s)
J-2	1,875	65	2,500	J-4	54	P-2	7.34
J-3	1,875	64	2,500	J-4	53	P-2	7.34
J-4	1,875	63	2,500	J-5	52	P-4	11.85
J-5	1,875	62	2,500	J-6	51	P-5	10.43
J-6	1,875	63	2,500	J-8	50	P-5	9.74
J-7	1,875	62	2,500	J-8	50	P-7	9.25
J-8	1,875	62	2,582	J-9	50	P-7	8.91
J-9	1,875	62	2,500	J-8	50	P-7	8.54
J-10	1,875	62	2,500	J-9	50	P-13	8.66
J-11	1,875	62	2,505	J-18	50	P-13	9.88
J-12	1,875	63	2,500	J-18	50	P-13	10.17
J-13	1,875	63	2,500	J-18	52	P-14	11.66
J-14	1,875	65	2,500	J-13	52	P-15	12.59
J-18	1,875	62	2,350	J-11	53	P-16	15.00
J-19	1,875	81	2,350	J-21	69	P-18	15.00
J-20	1,875	77	2,350	J-21	65	P-19	15.00
J-21	1,875	75	2,350	J-20	65	P-20	15.00

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Average Day Demand

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-2	1,480.30	0	1,643.74	71
J-3	1,481.50	0	1,643.74	70
J-4	1,481.90	0	1,643.74	70
J-5	1,481.70	0	1,643.74	70
J-6	1,481.00	0	1,643.74	70
J-7	1,480.70	0	1,643.74	71
J-8	1,481.80	41	1,643.74	70
J-9	1,481.80	0	1,643.74	70
J-10	1,481.40	0	1,643.74	70
J-11	1,481.80	5	1,643.74	70
J-12	1,481.20	0	1,643.74	70
J-13	1,481.30	0	1,643.74	70
J-14	1,479.00	0	1,643.74	71
J-18	1,481.80	0	1,643.74	70
J-19	1,477.00	0	1,711.74	102
J-20	1,481.40	0	1,711.74	100
J-21	1,482.30	0	1,711.74	99

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Average Day Demand

FlexTable: Pipe Table

Label	Diameter (in)	Material	Length (Scaled) (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Pressure Loss (psi)
P-1	24.0	Ductile Iron	65	130.0	46	0.03	0.0
P-2	12.0	Ductile Iron	117	130.0	46	0.13	0.0
P-3	12.0	PVC	230	150.0	24	0.07	0.0
P-4	8.0	Ductile Iron	81	130.0	24	0.15	0.0
P-5	8.0	Ductile Iron	89	130.0	24	0.15	0.0
P-6	8.0	Ductile Iron	53	130.0	24	0.15	0.0
P-7	8.0	Ductile Iron	41	130.0	24	0.15	0.0
P-8	8.0	Ductile Iron	29	130.0	-24	0.15	0.0
P-9	8.0	Ductile Iron	33	130.0	17	0.11	0.0
P-10	8.0	Ductile Iron	61	130.0	17	0.11	0.0
P-11	8.0	Ductile Iron	102	130.0	17	0.11	0.0
P-12	8.0	Ductile Iron	23	130.0	22	0.14	0.0
P-13	8.0	Ductile Iron	97	130.0	22	0.14	0.0
P-14	8.0	Ductile Iron	44	130.0	22	0.14	0.0
P-15	8.0	Ductile Iron	68	130.0	22	0.14	0.0
P-16	8.0	Ductile Iron	33	130.0	0	0.00	0.0
P-17	24.0	Ductile Iron	59	130.0	0	0.00	0.0
P-18	8.0	Ductile Iron	53	130.0	0	0.00	0.0
P-19	8.0	Ductile Iron	99	130.0	0	0.00	0.0
P-20	8.0	Ductile Iron	48	130.0	0	0.00	0.0

**2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg
Active Scenario: Average Day Demand**

FlexTable: Pump Table

Label	Elevation (ft)	Pump Status	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
PMP-1	1,476.50	On	1,477.50	1,643.74	46	166.24
PMP-2	1,480.60	On	1,480.80	1,711.74	0	230.94

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Average Day Demand

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	1,477.50	46	1,477.50
R-2	1,480.80	0	1,480.80

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Max Day Demand

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-2	1,480.30	0	1,643.66	71
J-3	1,481.50	0	1,643.66	70
J-4	1,481.90	0	1,643.66	70
J-5	1,481.70	0	1,643.65	70
J-6	1,481.00	0	1,643.65	70
J-7	1,480.70	0	1,643.65	70
J-8	1,481.80	82	1,643.64	70
J-9	1,481.80	0	1,643.64	70
J-10	1,481.40	0	1,643.65	70
J-11	1,481.80	5	1,643.65	70
J-12	1,481.20	0	1,643.65	70
J-13	1,481.30	0	1,643.66	70
J-14	1,479.00	0	1,643.66	71
J-18	1,481.80	0	1,643.65	70
J-19	1,477.00	0	1,711.74	102
J-20	1,481.40	0	1,711.74	100
J-21	1,482.30	0	1,711.74	99

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Max Day Demand

FlexTable: Pipe Table

Label	Diameter (in)	Material	Length (Scaled) (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Pressure Loss (psi)
P-1	24.0	Ductile Iron	65	130.0	87	0.06	0.0
P-2	12.0	Ductile Iron	117	130.0	87	0.25	0.0
P-3	12.0	PVC	230	150.0	46	0.13	0.0
P-4	8.0	Ductile Iron	81	130.0	46	0.29	0.0
P-5	8.0	Ductile Iron	89	130.0	46	0.29	0.0
P-6	8.0	Ductile Iron	53	130.0	46	0.29	0.0
P-7	8.0	Ductile Iron	41	130.0	46	0.29	0.0
P-8	8.0	Ductile Iron	29	130.0	-46	0.29	0.0
P-9	8.0	Ductile Iron	33	130.0	36	0.23	0.0
P-10	8.0	Ductile Iron	61	130.0	36	0.23	0.0
P-11	8.0	Ductile Iron	102	130.0	36	0.23	0.0
P-12	8.0	Ductile Iron	23	130.0	41	0.26	0.0
P-13	8.0	Ductile Iron	97	130.0	41	0.26	0.0
P-14	8.0	Ductile Iron	44	130.0	41	0.26	0.0
P-15	8.0	Ductile Iron	68	130.0	41	0.26	0.0
P-16	8.0	Ductile Iron	33	130.0	0	0.00	0.0
P-17	24.0	Ductile Iron	59	130.0	0	0.00	0.0
P-18	8.0	Ductile Iron	53	130.0	0	0.00	0.0
P-19	8.0	Ductile Iron	99	130.0	0	0.00	0.0
P-20	8.0	Ductile Iron	48	130.0	0	0.00	0.0

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Max Day Demand

FlexTable: Pump Table

Label	Elevation (ft)	Pump Status	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
PMP-1	1,476.50	On	1,477.50	1,643.67	87	166.17
PMP-2	1,480.60	On	1,480.80	1,711.74	0	230.94

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Max Day Demand

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	1,477.50	87	1,477.50
R-2	1,480.80	0	1,480.80

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Peak Hour Demand

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-2	1,480.30	0	1,643.46	71
J-3	1,481.50	0	1,643.46	70
J-4	1,481.90	0	1,643.45	70
J-5	1,481.70	0	1,643.43	70
J-6	1,481.00	0	1,643.42	70
J-7	1,480.70	0	1,643.42	70
J-8	1,481.80	144	1,643.41	70
J-9	1,481.80	0	1,643.42	70
J-10	1,481.40	0	1,643.42	70
J-11	1,481.80	5	1,643.43	70
J-12	1,481.20	0	1,643.44	70
J-13	1,481.30	0	1,643.45	70
J-14	1,479.00	0	1,643.46	71
J-18	1,481.80	0	1,643.44	70
J-19	1,477.00	0	1,711.74	102
J-20	1,481.40	0	1,711.74	100
J-21	1,482.30	0	1,711.74	99

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Peak Hour Demand

FlexTable: Pipe Table

Label	Diameter (in)	Material	Length (Scaled) (ft)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Pressure Loss (psi)
P-1	24.0	Ductile Iron	65	130.0	149	0.11	0.0
P-2	12.0	Ductile Iron	117	130.0	149	0.42	0.0
P-3	12.0	PVC	230	150.0	79	0.22	0.0
P-4	8.0	Ductile Iron	81	130.0	79	0.50	0.0
P-5	8.0	Ductile Iron	89	130.0	79	0.50	0.0
P-6	8.0	Ductile Iron	53	130.0	79	0.50	0.0
P-7	8.0	Ductile Iron	41	130.0	79	0.50	0.0
P-8	8.0	Ductile Iron	29	130.0	-79	0.50	0.0
P-9	8.0	Ductile Iron	33	130.0	64	0.41	0.0
P-10	8.0	Ductile Iron	61	130.0	64	0.41	0.0
P-11	8.0	Ductile Iron	102	130.0	64	0.41	0.0
P-12	8.0	Ductile Iron	23	130.0	69	0.44	0.0
P-13	8.0	Ductile Iron	97	130.0	69	0.44	0.0
P-14	8.0	Ductile Iron	44	130.0	69	0.44	0.0
P-15	8.0	Ductile Iron	68	130.0	69	0.44	0.0
P-16	8.0	Ductile Iron	33	130.0	0	0.00	0.0
P-17	24.0	Ductile Iron	59	130.0	0	0.00	0.0
P-18	8.0	Ductile Iron	53	130.0	0	0.00	0.0
P-19	8.0	Ductile Iron	99	130.0	0	0.00	0.0
P-20	8.0	Ductile Iron	48	130.0	0	0.00	0.0

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Peak Hour Demand

FlexTable: Pump Table

Label	Elevation (ft)	Pump Status	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
PMP-1	1,476.50	On	1,477.50	1,643.47	149	165.97
PMP-2	1,480.60	On	1,480.80	1,711.74	0	230.94

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Peak Hour Demand

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	1,477.50	149	1,477.50
R-2	1,480.80	0	1,480.80

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg

Active Scenario: Fire Flow Demand

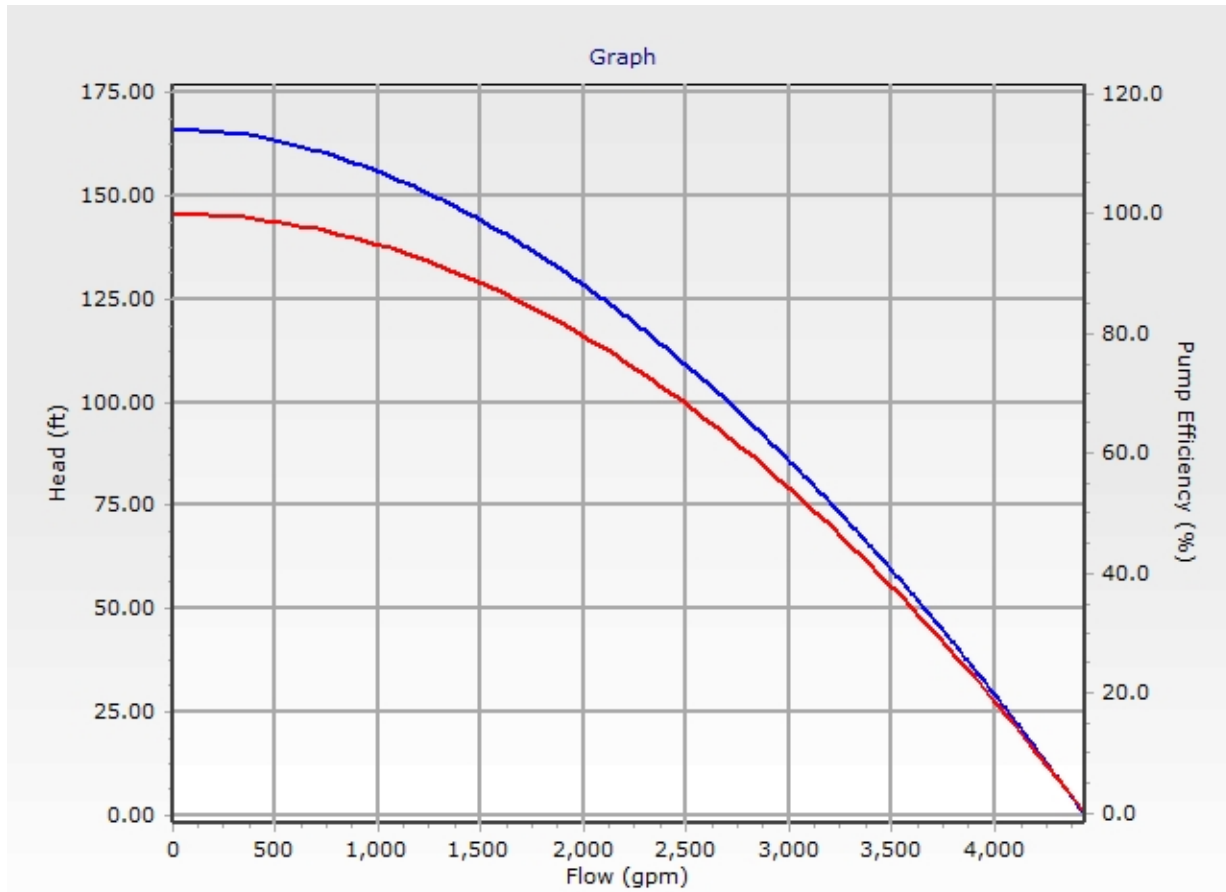
Fire Flow Node FlexTable: Fire Flow Report

Label	Needed Fire Flow (gpm)	Calculated Pressure at Junction (psi)	Max Day + Fire Flow at Junction (gpm)	Junction w/ Minimum Pressure	Junction Pressure (psi)	Notes	Pipe w/ Maximum Velocity	Pipe Velocity (ft/s)
J-2	1,875	54	2,500	J-4	43		P-2	7.34
J-3	1,875	53	2,500	J-4	42		P-2	7.34
J-4	1,875	52	2,500	J-5	41		P-4	11.85
J-5	1,875	52	2,500	J-6	40		P-5	10.43
J-6	1,875	52	2,500	J-8	39		P-5	9.74
J-7	1,875	52	2,500	J-8	39		P-7	9.25
J-8	1,875	51	2,582	J-9	39		P-7	8.91
J-9	1,875	51	2,500	J-8	39		P-7	8.54
J-10	1,875	51	2,500	J-9	39		P-13	8.66
J-11	1,875	51	2,505	J-18	39		P-13	9.88
J-12	1,875	52	2,500	J-18	39		P-13	10.17
J-13	1,875	52	2,500	J-18	41		P-14	11.66
J-14	1,875	54	2,500	J-13	41		P-15	12.59
J-18	1,875	51	2,350	J-11	42		P-16	15.00
J-19	1,875	81	2,350	J-21	69		P-18	15.00
J-20	1,875	77	2,350	J-21	65		P-19	15.00
J-21	1,875	75	2,350	J-20	65		P-20	15.00

2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg
Active Scenario: Fire Flow Demand
Pump Definition Detailed Report: PMP-1

Element Details			
ID	68	Notes	
Label	PMP-1		
Pump Definition Type			
Pump Definition Type	Standard (3 Point)	Design Head	136.25 ft
Shutoff Flow	0 gpm	Maximum Operating Flow	3,728 gpm
Shutoff Head	166.28 ft	Maximum Operating Head	46.20 ft
Design Flow	1,764 gpm		
Pump Efficiency Type			
Pump Efficiency Type	Best Efficiency Point	Motor Efficiency	100.0 %
BEP Efficiency	100.0 %	Is Variable Speed Drive?	False
BEP Flow	0 gpm		
Transient (Physical)			
Inertia (Pump and Motor)	0.000 lb·ft ²	Specific Speed	SI=25, US=1280
Speed (Full)	0 rpm	Reverse Spin Allowed?	True

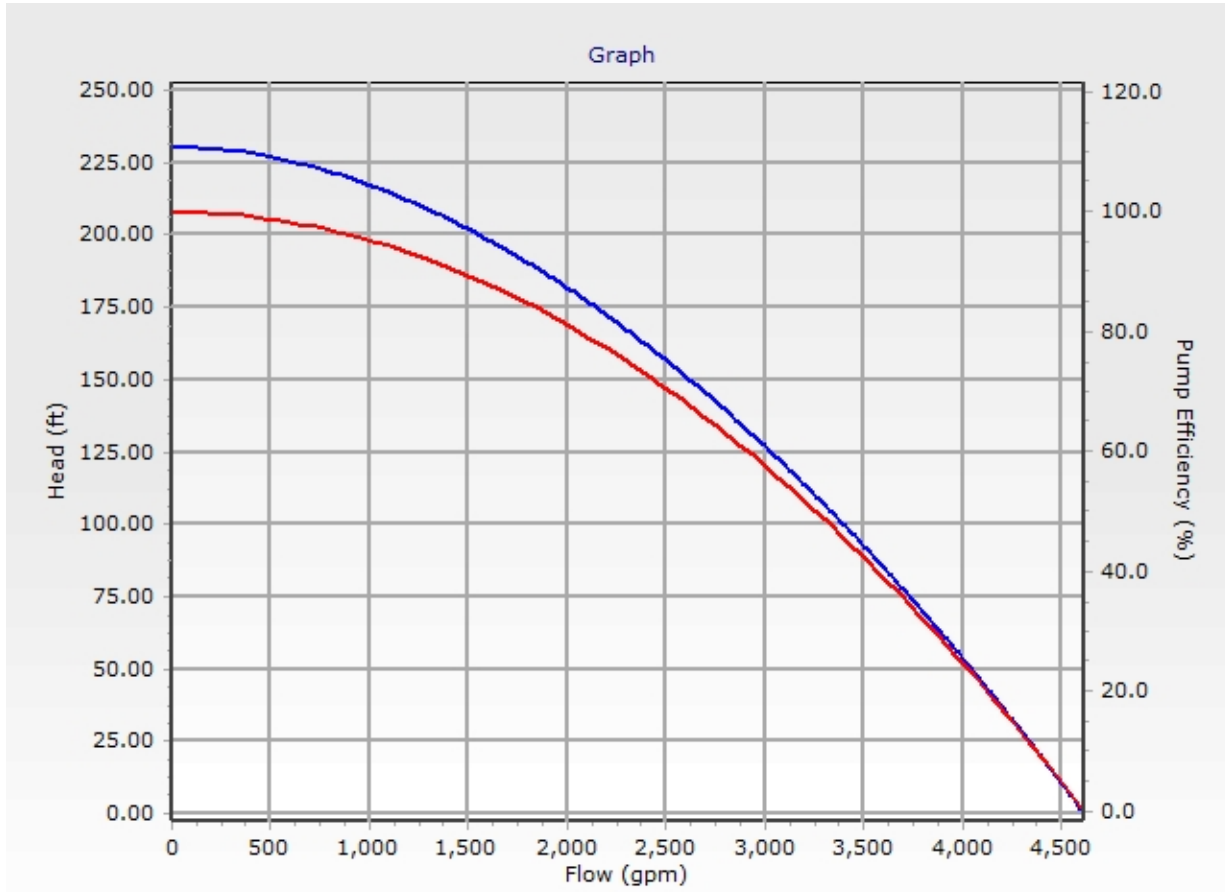
2021-01-21 -90th and Raintree with Pressure Reduced to 72 psi.wtg
Active Scenario: Fire Flow Demand
Pump Definition Detailed Report: PMP-1



200626-90th and Raintree.wtg
Active Scenario: Fire Flow Demand
Pump Definition Detailed Report: PMP-2

Element Details			
ID	122	Notes	
Label	PMP-2		
Pump Definition Type			
Pump Definition Type	Standard (3 Point)	Design Head	103.90 ft
Shutoff Flow	0 gpm	Maximum Operating Flow	4,089 gpm
Shutoff Head	230.90 ft	Maximum Operating Head	46.20 ft
Design Flow	3,340 gpm		
Pump Efficiency Type			
Pump Efficiency Type	Best Efficiency Point	Motor Efficiency	100.0 %
BEP Efficiency	100.0 %	Is Variable Speed Drive?	False
BEP Flow	0 gpm		
Transient (Physical)			
Inertia (Pump and Motor)	0.000 lb·ft ²	Specific Speed	SI=25, US=1280
Speed (Full)	0 rpm	Reverse Spin Allowed?	True

200626-90th and Raintree.wtg
Active Scenario: Fire Flow Demand
Pump Definition Detailed Report: PMP-2





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APPENDIX III

Utility Plan