FINAL WATER CAPACITY REPORT

Wolff Legacy Scottsdale

Assisted Living
8890 E Legacy
Scottsdale, AZ

Prepared Fo

THE WOLFF C

Since 1949

FINAL Basis of Design Report

☑ APPROVED

☐ APPROVED AS NOTED

☐ REVISE AND RESUBMIT

CITY OF SCOTTSDALE

SCOTTSDALE WATER

9379 E San Salvador Dr.
Scottsdale, AZ 85258

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 scan DATE 6/5/2018

Prepared by:

Registered Professional Engineer (Civil)
CERTIFICATE NO.
45621
ALI SAMIH
FAKIH
Date Signed 05-02-18
ARIZONA, U.S.A.

EXPIRES 12-31-18

SEG

Sustainability Engineering Group
8280 E. Gelding Drive, Suite 101
Scottsdale, AZ 85260
480.588.7226 www.azSEG.com

Project Number: 170726

14-DR-2018
5/03/18

Submittal Date: November 20, 2017 (Zoning)
Resubmitted: April 2018 (Zoning)
Revision Date: May 2, 2018 (DRB)
Case No.: 791-PA-2017; 7-GP-2017 **Plan Check No.: TBD**

TABLE OF CONTENTS:

LIST OF TABLES:

LIST OF FIGURES:

APPENDIX:

1. EXECUTIVE SUMMARY

The proposed development consists of the construction of a new assisted living facility with 151 apartment type units within the north and south larger buildings, a communal area with a theater, salon, and 6,000 sf restaurant in the central building, and 22 cottage units. The purpose of this water capacity design report is to provide analysis of the impact that this development will have on the City's water system.

Water service for the development is to be provided by the City of Scottsdale. An existing 12" ACP water main runs along the southern property line approximately 85' north of Legacy Blvd center line interior to the property. An 8" C900 main runs along Pima Rd 50' east of the street centerline but will not be used for this project. Refer to **Figure 3** for COS Quarter Section map.

A certified fire hydrant flow testing was performed on November 2, 2017, by Arizona Flow Testing LLC at locations as shown on the provided report. The test was performed at 8:00 a.m. Considering a 40 psi safety factor, the fire flow test recorded a static pressure of 72.0 psi and residual pressure of 62.0 psi at 1,842 gpm with a calculated flow at 20 psi of 4,487 gpm. The flow test documentation is included in **Appendix I**.

2. INTRODUCTION

2.1 PLAN OBJECTIVE:

The purpose of this report is to provide discussions and calculations defining the water system design necessary to comply with the requirements outlined in the City of Scottsdale Design Standards & Policy Manual (DS&PM). Preparation of this report has been done in accordance with Chapter 6 of the DS&PM.

2.2 SITE LOCATION

The project property consists of a parcel of land located in a portion of the SW ¼ of Section 30 and the NW ¼ of Section 31, Township 4 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The parcel ID number is 215-07-238 and the parcel area is 531,822.9 square feet, 12.209 +/- acres. Refer to **FIGURE 1 - Vicinity Map** for the project's location with respect to major cross streets.

2.3 PROPOSED DEVELOPMENT

2.3.1 Existing Site Description:

Land ownership, as defined by ALTA/NSPS Land Title Survey by AW Land Surveying, LLC dated 11/13/2017 includes 531,822.9 square feet, 12.209 +/- acres (net) of commercially zoned land. City of Scottsdale zoning map designates this parcel as C-2 ESL HD. The C.O.S. conceptual land use map designates this parcel for commercial use.

This site is an undeveloped parcel. The topography generally slopes from the north east (elevation 1660+/-) to the southwest (elevation 1638 +/-) at approximately 2% with a change in elevation of approximately thirty-eight (38) feet. The site consists of grass, brush, rock, and other desert landscape.

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

The City of Scottsdale Water & Sewer Quarter Section Map (39-49) shows water mains onsite along Legacy Blvd and in Pima Rd. as follows:

- One 12" ACP water main runs interior to the site approximately 85' north of the centerline along Legacy Blvd.
- One 8" C900 water main runs north/south approximately 50' east side of the centerline along Pima Rd.
- One 12" DIP water main runs north/south along the centerline of Pima Rd.

Refer to **Figure 3** for the COS Water **Quarter Section Map (39-49).**

2.3.2 Proposed Site Development:

The development is proposed to be 2 new buildings for assisted living units, a community center building, 22 cottages, and parking. Refer to **APPENDIX III** for Utility Plans.

The 12" ACP along Legacy Blvd will be tapped in two places for an 8" line to create a looped water system onsite. Fire, irrigation, and domestic services will be tapped off the new 8" public waterline created.

3. DESIGN CRITERIA

3.1 UTILITY DEVELOPER GUIDE CRITERIA

This project is designed in accordance with the City of Scottsdale DS&PM. Refer to **Table 1** below for applicable "Design Criteria for Water Systems".

Table 1: COS Design Criteria by demand type

Land Use	Average Day Demand (gpd)	Max Day Peaking Factor	Peak Hour Peaking Factor
Apts (High Density Condo)	185.3 / unit	2	3.5
Restaurant	1.3 / sq. ft.	2	3.5
Cottages (12-22DU/Ac)	227.6 / sq. ft.	2	3.5

The apartments will be treated as high density condo units. The cottages have a building and outside space of approximately 3,000 sf. This equates to about 14.50DU/ac.
(43,560 sf) / (3,000 sf/DU) = 14.52 DU/ac

The water system pressures, velocities, head losses and fire flow are in accordance with the COS DS&PM as follows:

Minimum Pressures:

50 psi residual pressure at the highest delivery point and 30 psi @ max day +fire flow

Maximum Pressures:

In accordance with the DS&PM, all structures shall have an individual pressure reducing valve on the customer side of the meter.

Velocity & Head loss:

- *10 ft. headloss maximum per 1,000 linear feet of pipe for pipes less than 16 inches in diameter.*

Hazen-Williams Coefficient *130 (for new pipes).*

Fire Flows:

Based on preliminary development concepts, a 1,500 gpm system fire flow demand is assumed. The fire hydrant flow test in Appendix I and max day + fire flow demand results support this demand.

4. DEMANDS

4.1 PROJECT USE DESCRIPTION

Refer to **Table 2** below for the proposed water demand calculations based on the design criteria established in *Section 3.1* above.

Table 2: WATER DEMAND CALCULATIONS

	Units or Area (sq. ft.)	ADD (gpd)	Max Day Peaking Factor	Peak Hour Peaking Factor	Avg. Day Demand (GPD)	Max. Day Demand (GPD)	Peak Hour (GPD)
Apartments (North)	71	185.3	2	3.5	13,156.3	26,312.6	46,047.1
Apartments (South)	80	185.3	2	3.5	14,824.0	29,648.0	51,884.0
Restaurant	6,000	1.3	2	3.5	7,800.0	15,600.0	27,300.0
Cottages	22	227.6	2	3.5	5,007.2	10,014.4	17,525.2
		TOTAL DEMANDS (GPD):			40,787.5	81,575.0	142,756.3
		TOTAL DEMANDS (gpm):			28.3	56.6	99.1

4.2 ZONING

Per Figure 6.1-3 in the DS&PM, this project is in pressure zone 5.

4.3 PHASING OF DEMANDS

The project is proposed to be constructed in a single phase.

4.4 SUMMARY NARRATIVE OF DEMANDS

The demand scenario that governs the design was the peak hour demand.

5. EXISTING FACILITIES / CONDITIONS

5.1 PREVIOUS MASTER PLANS

No existing master plan or water report is available from COS for this project.

6. PROPOSED FACILITIES

6.1 DISTRIBUTION SYSTEM PIPING

6.1.1 Onsite:

The proposed water supply will consist of approximately 1,804 lf of new 8" water line and approximately 45 lf of new 6" water line to 3 new fire hydrants. The proposed pipe will be DIP in accordance with COS requirements.

Domestic service will be provided to the apartment buildings by 1 ½" meters, the communal area by a 1" meter, single or duplex cottages will be fed by a 1" water meter. Irrigation will be provided by a 1" meter / service connection. All meters, except single cottages, will be provided w/ backflow prevention.

6.1.2 Offsite Infrastructure:
No offsite infrastructure is proposed with this site.

7. WATER COMPUTATIONS

7.1 DESCRIPTION OF MODEL

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

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

Network analysis input parameters included the following:

1. Pipe diameters (inches)
2. Pipe lengths (feet)
3. Pipes invert elevations (feet)
4. General Purpose Valve to model Water Meter and Double Check Valve Assembly
5. A reservoir and a pump to model the fire flow test performed
6. System demands (gpm)
7. Fire flows (gpm)
8. Model piping is ductile iron pipe using Hazen-Williams frictional losses (C = 130)

Output parameters included but were not limited to:

1. Pressure (psig)
2. Flow rates (gpm)
3. Velocities (fps)
4. Head loss (feet)

7.2 ASSUMPTIONS

Please refer to *Section 3.1* for the design criteria.

The general methodology used to design this public water infrastructure consists of modeling a network of water distribution mains to meet COS 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 flow test results.

Irrigation, water feature, and pool filling if applicable are from a dedicated service and meter. It is assumed that these water uses occur during low peak hours and are therefore not considered in this modeling.

7.3 SUMMARY OF RESULTS

A summary of the modeling results is presented below in **Table 3**. Detailed WaterCAD® results are presented in **Appendix III**.

Table 3: WaterCAD® Analysis Results

Demand Scenario	Water Demand (GMP)	Pressure (PSIG)				Velocity (ft/s)	Pipe ID
		Min.	Node	Max.	Node		
Average Day	28.3	67	J-6	74	J-1	0.13	P-1
Maximum Day	56.6	67	J-6	74	J-1	0.25	P-1
Peak Hour	99.1	67	J-6	74	J-1	0.44	P-1
Max. + Fire Flow	1500 + Max day	30	J-8	N/A	N/A	N/A	N/A

These results indicate that the proposed water system meets *COS DS&PM* for daily water usage and fire flow events.

8. SUMMARY / CONCLUSIONS

8.1 CONFORMANCE TO DESIGN GOALS

- The proposed water main is designed in accordance with COS design standards and policies[2].
  - Minimum 50 psi static, 30 psi @ peak hour required, 67 psi provided.
  - Minimum 30 psi (10 psi fs) @ max+ fire flow required, 30 psi provided.
  - 10 fps maximum velocity is not exceeded.
  - The system supports the minimum 1,500 gpm fire flow requirements.
- It is shown in section 7.3 that the proposed water system meets the COS criteria for Daily water usage and fire flow events as described in Section 3.1.

8.2 REQUIRED FACILITIES AND PHASING

- Proposed facility improvements for this project are limited to a new 8" DIP on-site water line loop connection, 14 new 1" domestic water meters, 2 new 1.5" domestic water meters, a new 1" landscape meter, and 3 new fire hydrants.
- This project will be constructed in a single phase.

9. REFERENCES

1. *COS QS Water Plan number 39-49*
2. *City of Scottsdale Design Standards & Policies Manual, 2010 (Chapter 6 – Water)*

FIGURE 1
VICINITY MAP

FIGURE 2
AERIAL

40-49

39-48

39-50

PROJECT LOCATION

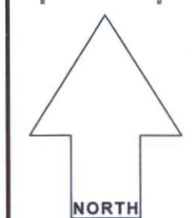
GENERAL NOTES:

- THIS IS A COMPUTER GENERATED DRAWING. FOR ANY REVISIONS PLEASE CONTACT THE CITY OF SCOTTSDALE GIS DEPARTMENT AT (480) 312-7782.
- THE SECTION LINE BEARING AND DISTANCES ARE BASED ON THE CITY OF SCOTTSDALE GPS SURVEY OF SEPTEMBER 1991. BEARINGS ARE NAD 83 GRID AND DISTANCES ARE FLATTENED TO GROUND. WHERE NO CORNER WAS FOUND THE DIMENSIONS ARE GIVEN TO CALCULATED SECTION CORNERS AND ARE NOTED AS 'CALCULATED' ON THE MAP.

LEGEND:

- Air Release Valve
- Non-potable Air Release Valve
- Blowoff
- Cap
- Cathodic Protection
- Fill Drain
- Fire Hydrant
- Non-GPS Point
- Pressure Reducing Valve
- Pump
- Reducer
- Sample Station
- Water Manhole
- Non-Potable Manhole
- Well
- Valve
- Non-potable Valve
- Vault
- Water Main
- Non-Potable Main
- Fire / Private Main
- Non-Scottsdale Main

VICINITY MAP



NORTH

SCALE: 1" = 100'

0 50 100 200

The map scale of 1" = 100' is based on a full size print of 30" x 36"

WATER

QUARTER SECTION MAP

39-49

SW 1/4 SEC. 30 T4N R5E

FIGURE 3

SCOTTSDALE GEOGRAPHIC INFORMATION SYSTEMS
3629 North Drinkwater Boulevard
Scottsdale, Arizona 85251

29-OCT-17

APPENDIX I

Flow Test Data

Arizona Flow Testing LLC

HYDRANT FLOW TEST REPORT

Project Name:	Not Provided
Project Address:	Pima Rd. & Legacy (NWC), Scottsdale, Arizona 85255
Client Project No.:	Not Provided
Arizona Flow Testing Project No.:	17242
Flow Test Permit No.:	C54157
Date and time flow test conducted:	November 2, 2017 at 8:00 AM
Data is current and reliable until:	May 2, 2018
Conducted by:	Floyd Vaughan – Arizona Flow Testing, LLC (480-250-8154)
Witnessed by:	Larry Frandle –City of Scottsdale-Inspector (602-828-0847)

Raw Test Data

Static Pressure: **112.0 PSI**
(Measured in pounds per square inch)

Residual Pressure: **102.0 PSI**
(Measured in pounds per square inch)

Pitot Pressure: **24.0 PSI**
(Measured in pounds per square inch)

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

Coefficient of Diffuser: .7875

Flowing GPM: **1,842 GPM**
(Measured in gallons per minute)

GPM @ 20 PSI: **6,105 GPM**

Data with 40 PSI Safety Factor

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

Residual Pressure: **62.0 PSI**
(Measured in pounds per square inch)

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

Distance between hydrants: Approx. 920 Feet

Main size: Not Provided

Flowing GPM: **1,842 GPM**

GPM @ 20 PSI: **4,487 GPM**

Flow Test Location

North

North Pima Road

Project Site
Pima Rd. & Legacy
(NWC)

Legacy Blvd.

Flow Fire Hydrant

East Rockwood Drive

North 90th Way

Pressure Fire Hydrant

APPENDIX II

Utility Plan

APPENDIX III

Water Model Calculations

Pump Definition Detailed Report: Fire Flow Test
Active Scenario: Peak Hour Scenario

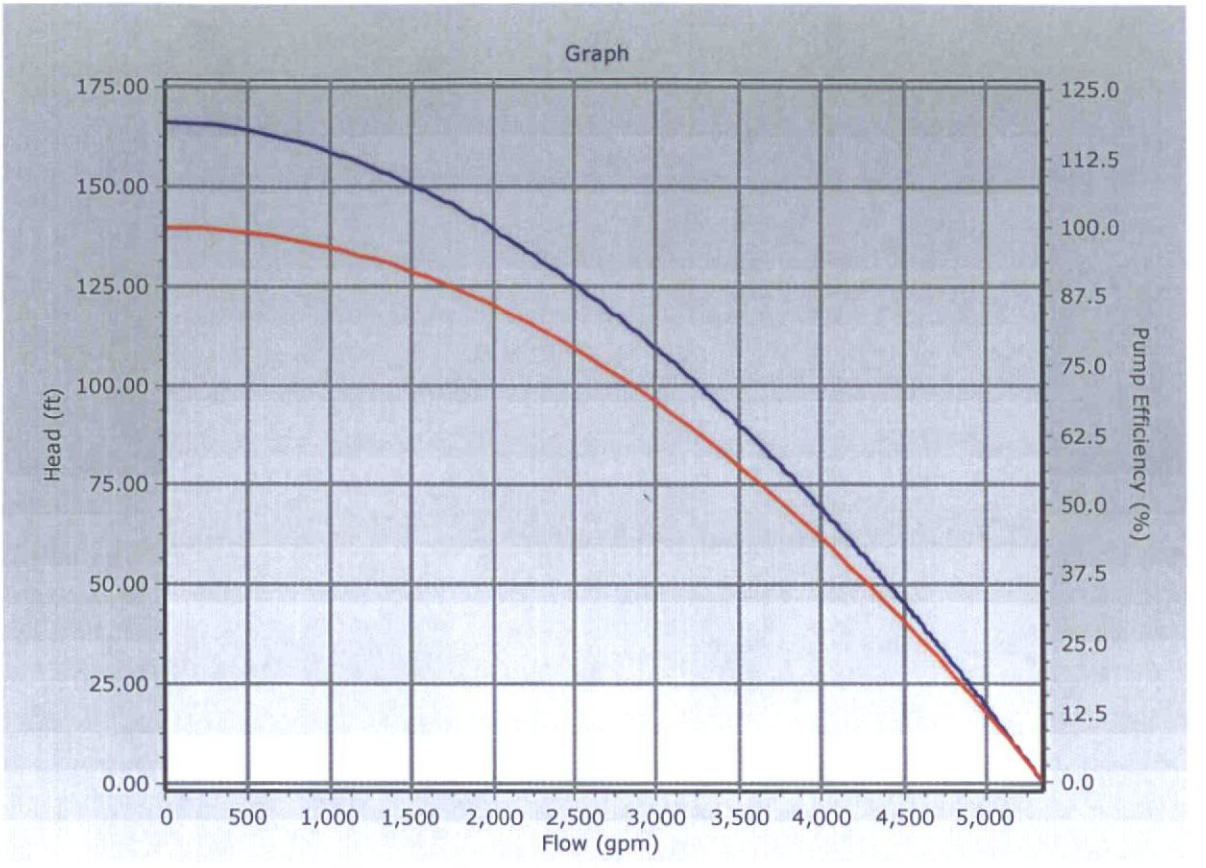
Element Details			
ID	65	Notes	
Label	Fire Flow Test		

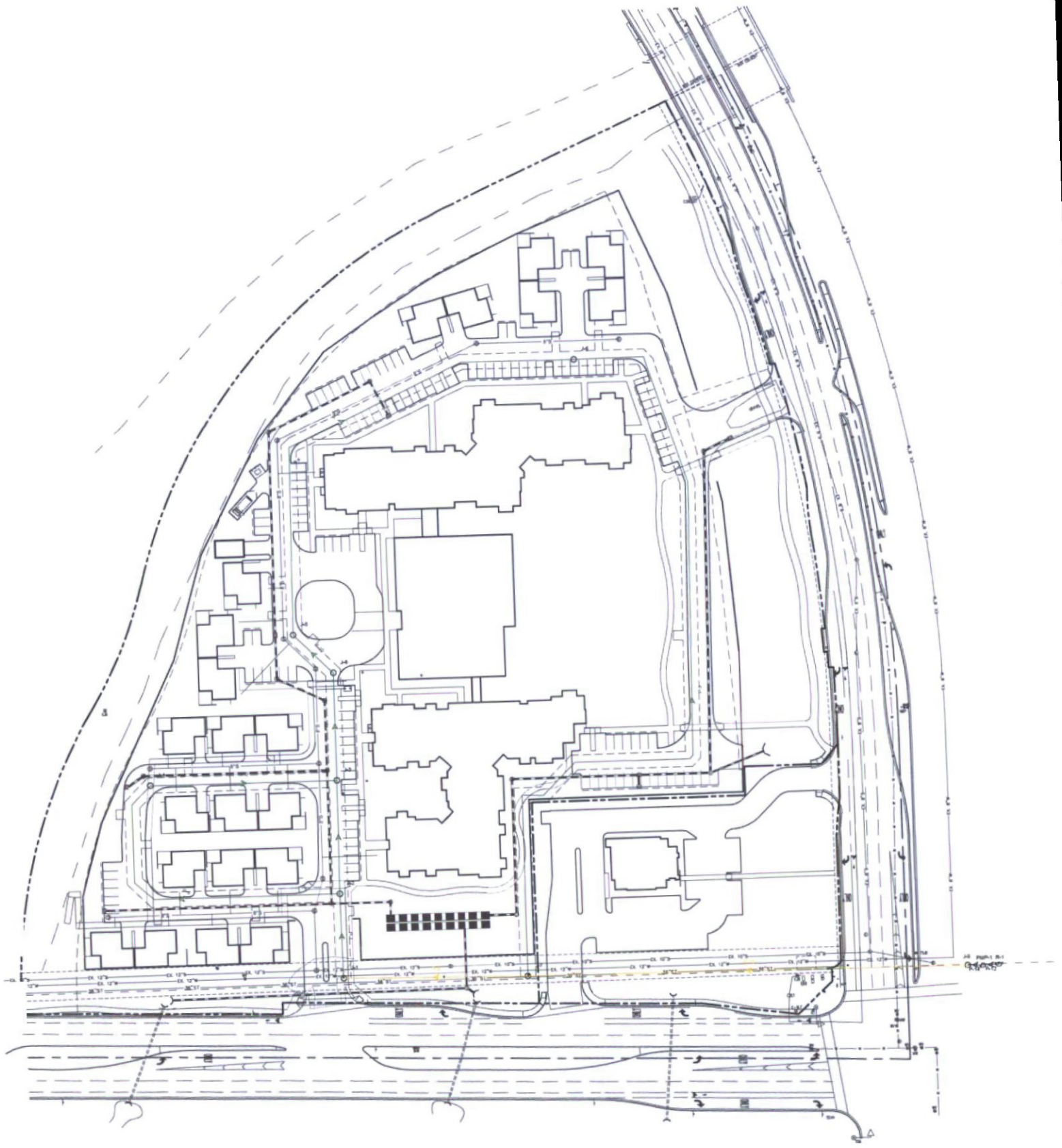
Pump Definition Type			
Pump Definition Type	Standard (3 Point)	Design Head	143.22 ft
Shutoff Flow	0 gpm	Maximum Operating Flow	4,487 gpm
Shutoff Head	166.32 ft	Maximum Operating Head	46.20 ft
Design Flow	1,842 gpm		

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·ft²	Specific Speed	SI=25, US=1280
Speed (Full)	0 rpm	Reverse Spin Allowed?	True

Pump Definition Detailed Report: Fire Flow Test
Active Scenario: Peak Hour Scenario





8" PIPE

12" PIPE

FlexTable: Junction Table

Active Scenario: Average Day Demand Scenario

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	40.00	0	210.81	74
J-2	47.50	0	210.81	71
J-3	47.75	10	210.81	71
J-4	45.50	2	210.81	72
J-5	49.00	0	210.81	70
J-6	56.00	10	210.81	67
J-7	43.00	0	210.81	73
J-8	52.00	5	210.81	69
J-9	43.00	0	210.81	73

FlexTable: Pipe Table

Active Scenario: Average Day Demand Scenario

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	90	J-1	J-2	8.0	130.0	20	0.13	0.000
P-2	120	J-2	J-3	8.0	130.0	13	0.08	0.000
P-3	195	J-3	J-4	8.0	130.0	-5	0.03	0.000
P-4	332	J-4	J-2	8.0	130.0	-7	0.04	0.000
P-6	523	J-5	J-6	8.0	130.0	1	0.01	0.000
P-7	902	J-6	J-7	8.0	130.0	-9	0.06	0.000
P-8	197	J-7	J-1	12.0	130.0	20	0.06	0.000
P-9	114	J-3	J-8	8.0	130.0	7	0.05	0.000
P-10	58	J-8	J-5	8.0	130.0	2	0.01	0.000
P-12	17	PMP-1	R-1	24.0	130.0	-28	0.02	0.000
P-13	465	J-7	J-9	12.0	130.0	-28	0.08	0.000
P-14	16	J-9	PMP-1	24.0	130.0	-28	0.02	0.000

FlexTable: Pump Table

Active Scenario: Average Day Demand Scenario

Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
PMP-1	44.50	Fire Flow Test	On	44.50	210.81	28	166.31

FlexTable: Reservoir Table

Active Scenario: Average Day Demand Scenario

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	44.50	28	44.50

FlexTable: Junction Table

Active Scenario: Max Day Demand Scenario

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	40.00	0	210.78	74
J-2	47.50	0	210.77	71
J-3	47.75	21	210.77	71
J-4	45.50	4	210.77	72
J-5	49.00	1	210.77	70
J-6	56.00	20	210.77	67
J-7	43.00	0	210.78	73
J-8	52.00	11	210.77	69
J-9	43.00	0	210.78	73

FlexTable: Pipe Table

Active Scenario: Max Day Demand Scenario

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	90	J-1	J-2	8.0	130.0	39	0.25	0.000
P-2	120	J-2	J-3	8.0	130.0	26	0.17	0.000
P-3	195	J-3	J-4	8.0	130.0	-9	0.06	0.000
P-4	332	J-4	J-2	8.0	130.0	-13	0.08	0.000
P-6	523	J-5	J-6	8.0	130.0	3	0.02	0.000
P-7	902	J-6	J-7	8.0	130.0	-17	0.11	0.000
P-8	197	J-7	J-1	12.0	130.0	39	0.11	0.000
P-9	114	J-3	J-8	8.0	130.0	15	0.09	0.000
P-10	58	J-8	J-5	8.0	130.0	4	0.02	0.000
P-12	17	PMP-1	R-1	24.0	130.0	-57	0.04	0.000
P-13	465	J-7	J-9	12.0	130.0	-57	0.16	0.000
P-14	16	J-9	PMP-1	24.0	130.0	-57	0.04	0.000

FlexTable: Pump Table

Active Scenario: Max Day Demand Scenario

Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
PMP-1	44.50	Fire Flow Test	On	44.50	210.78	57	166.28

FlexTable: Reservoir Table

Active Scenario: Max Day Demand Scenario

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	44.50	57	44.50

Fire Flow Node FlexTable: Fire Flow Report

Active Scenario: Max Day + Fire Flow Scenario

Label	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (System)	Velocity of Maximum Pipe (ft/s)
J-1	1,500	3,468	34	J-6	10.00
J-2	1,500	1,895	56	J-6	10.00
J-3	1,500	1,997	53	J-6	10.00
J-4	1,500	1,943	54	J-6	10.00
J-5	1,500	2,244	46	J-6	10.00
J-6	1,500	2,704	30	J-8	8.98
J-7	1,500	3,468	34	J-6	10.00
J-8	1,500	2,164	47	J-6	10.00
J-9	1,500	3,500	39	J-6	2.52

FlexTable: Junction Table

Active Scenario: Peak Hour Scenario

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	40.00	0	210.70	74
J-2	47.50	0	210.69	71
J-3	47.75	36	210.68	70
J-4	45.50	7	210.68	71
J-5	49.00	2	210.68	70
J-6	56.00	35	210.68	67
J-7	43.00	0	210.70	73
J-8	52.00	19	210.68	69
J-9	43.00	0	210.72	73

FlexTable: Pipe Table

Active Scenario: Peak Hour Scenario

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	90	J-1	J-2	8.0	130.0	69	0.44	0.000
P-2	120	J-2	J-3	8.0	130.0	46	0.29	0.000
P-3	195	J-3	J-4	8.0	130.0	-16	0.10	0.000
P-4	332	J-4	J-2	8.0	130.0	-23	0.15	0.000
P-6	523	J-5	J-6	8.0	130.0	5	0.03	0.000
P-7	902	J-6	J-7	8.0	130.0	-30	0.19	0.000
P-8	197	J-7	J-1	12.0	130.0	69	0.20	0.000
P-9	114	J-3	J-8	8.0	130.0	26	0.16	0.000
P-10	58	J-8	J-5	8.0	130.0	7	0.04	0.000
P-12	17	PMP-1	R-1	24.0	130.0	-99	0.07	0.000
P-13	465	J-7	J-9	12.0	130.0	-99	0.28	0.000
P-14	16	J-9	PMP-1	24.0	130.0	-99	0.07	0.000

FlexTable: Pump Table

Active Scenario: Peak Hour Scenario

Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
PMP-1	44.50	Fire Flow Test	On	44.50	210.72	99	166.22

FlexTable: Reservoir Table

Active Scenario: Peak Hour Scenario

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	44.50	99	44.50