CITY OF SCOTTSDALE

Water and Wastewater Study
Combined

HUNTER
ENGINEERING

CIVIL AND SURVEY

Final Design Report
Water Report
For
Platinum Storage
8585 E. Princess Drive
Scottsdale, Arizona

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 3/5/2020

Expires 3/5/2020

January 2020

Prepared by:
Hunter Engineering, Inc.
10450 North 74th Street, #200
Scottsdale, AZ 85258

7-DR-2020
2/6/2020

Final Design Report
Water Report
For
Platinum Storage
8585 E. Princess Drive
Scottsdale, Arizona

Prepared For:

Platinum Construction
1450 TL Townsend Dr.,
Rockwall, TX 75032

Prepared By:

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Hunter Engineering, Inc.
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H.E. Project No. PLAT003

TABLE OF CONTENTS

SECTION	TITLE	PAGE NO.
1.0	Introduction	1
2.0	Existing Site Conditions	1
3.0	Existing Water Distribution System	1
4.0	Proposed Domestic Water Demand	1
5.0	Proposed Fire Flow Demand	2
6.0	Conclusions	2
7.0	References	3

FIGURES	TITLE	LOCATIONS
1	Vicinity Map	Appendix A
2	Conceptual Utility Plan	Appendix A

APPENDIX	TITLE	LOCATIONS
A	Figures	Appendix A
B	Calculations	Appendix B
C	Reference Information	Appendix C
D	Fire Flow Test	Appendix D

7-DR-2020
2/6/2020

1.0 INTRODUCTION

This Water Report has been prepared under a contract from Platinum Construction, Owner/Developer of the Platinum Storage site. The purpose of this report is to provide a water analysis, required by the City of Scottsdale, to support this development. Preparations of this report have been done in accordance with the procedures detailed in the City of Scottsdale *Design Standards and Policies Manual* (Reference 1).

This development is located at the southwest corner of Princess Drive and N. Pima Road. The Site is specifically located in the Southeast Quarter of Section 36, Township 4 North, Range 4 East of The Gila and Salt River Base and Meridian, Maricopa County, Arizona. Figure 1 in Appendix A illustrates the location of the project in relation to the City of Scottsdale street system.

On-site improvements include a new storage building with associated parking, utilities, drainage facilities and landscaped areas. The proposed site is bound by Princess Drive to the north, N. Pima Road to the east, and the Pima Medical Center facilities to the south and west. Access to the site will be provided by existing driveways located on Princess Drive and N. Pima Road.

2.0 EXISTING SITE CONDITIONS

The site is located on an undeveloped parcel surrounded by multiple commercial buildings. There is an existing 8” waterline that loops around the commercial buildings and supplies the existing fire hydrants on-site. The existing 8” waterline runs along the drive aisles located to the west and the south of the proposed development. The existing 8” waterline on-site ties into a public 8” waterline located in Princess Drive to the north and a public 8” waterline located in Anderson Drive to the south.

3.0 EXISTING WATER DISTRIBUTION SYSTEM

A fire hydrant flow test was performed on 01/07/2020 by Summit Fire Protection Co. The results show that the existing water distribution system has a static pressure of 85 psi and a residual pressure of 73 psi with a corresponding flow rate of 2430 GPM. The results of the flow test are including in Appendix D.

4.0 PROPOSED DOMESTIC WATER DEMAND

The average day demand (ADD), maximum day demand (MDD), and peak hour demand (PHD) for this development were calculated using the City of Scottsdale *Design Standards & Policies Manual*, Figure 6.1-2 (Appendix C). The maximum day demand is 2 times the average day demand and peak hour demand is 3.5 times the average day demand. See the table below for a summary of these calculations:

Land Use	Building Area (sf)	Average Day Water Demands		Average Day Total Use Flow (ADTUF) (gpd)	Average Day Total Use Flow (ADTUF) (gpm)	Maximum Day Demand (ADTUF* 2) (gpm)	Peak Hour Demand (ADTUF * 3.5) (gpm)
		Figure 6.1-2 City of Scottsdale Design Standards & Policies Manual					
Commercial / Retail	109,759	0.80	gal per s.f.	87,807	61.0	122.0	213.5

5.0 PROPOSED FIRE FLOW DEMAND

The proposed system was modeled using WATERCAD, a pipe network analysis program by Haestad Methods. A reservoir and pump were added to the model near the hydrant flow test location to simulate the pressure versus flow curve. The model has been calibrated to match the results of the hydrant test. Note that the pipes connecting the pump and reservoir are not a part of the system and are oversized to 120-inch to minimize system losses. Pipes and junctions were added to the network model matching the pipe sizes, materials and elevations of the proposed system.

The model is completed as a closed system without extensive information from the entire city pipe network, which is not feasible for the requirements of this report. A closed system is conservative having one-point source of water supply and pressure whereas the existing system can have multiple supply sources feeding the pipe network surrounding the development. The flow test should be representative of the demand adjacent properties have on the system.

Per the International Fire Code (IFC), the maximum fire flow is based on the construction type of the building and its square footage. The total building area is 109,759 sf. The building construction type is II-B. This requires a fire flow of 7,000 GPM be achieved at a minimum pressure of 20 PSI. The proposed building will utilize sprinklers; therefore, a 50% reduction in the fire flow requirement may be applied. This reduces the required fire flow to 3,500 GPM. The resultant pressure for the fire flow is 56.46 psi which is more than the minimum required 20 psi. Results from the WaterCAD analysis can be found in Appendix B.

6.0 CONCLUSIONS

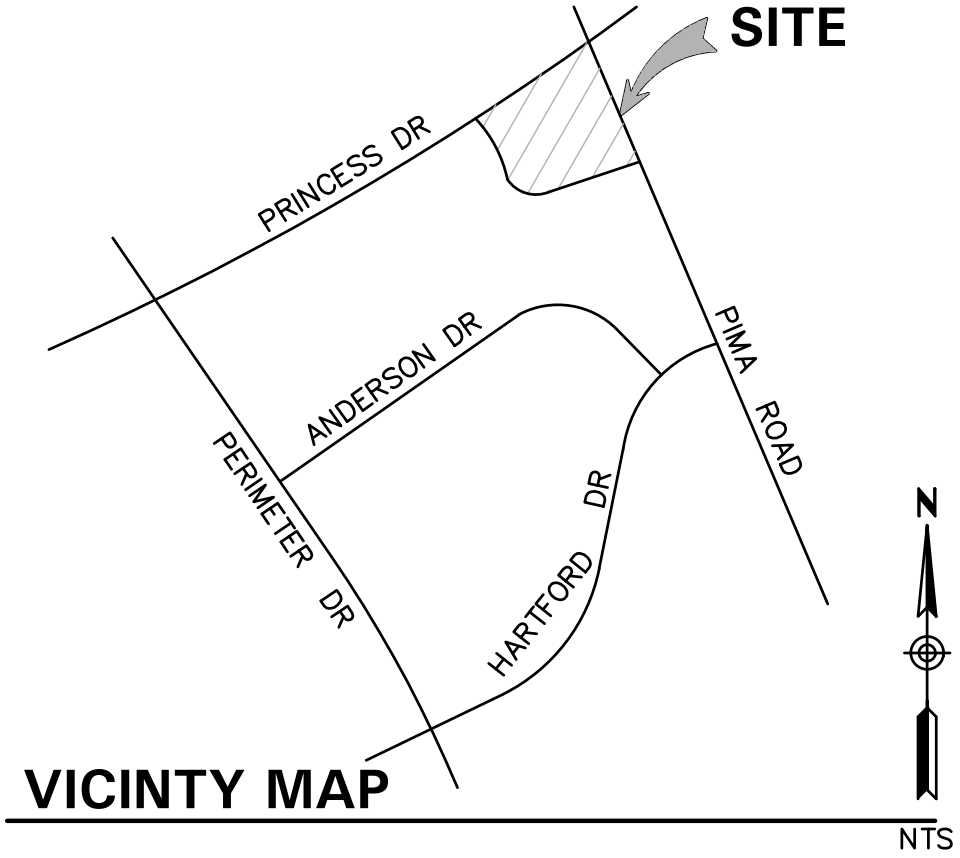
Based on the results of this study, it can be concluded that:

- The proposed water network meets the requirements to support this development.
- Results of the WaterCAD model indicate that the proposed water network does provide the needed fire flow and pressure to service this development.

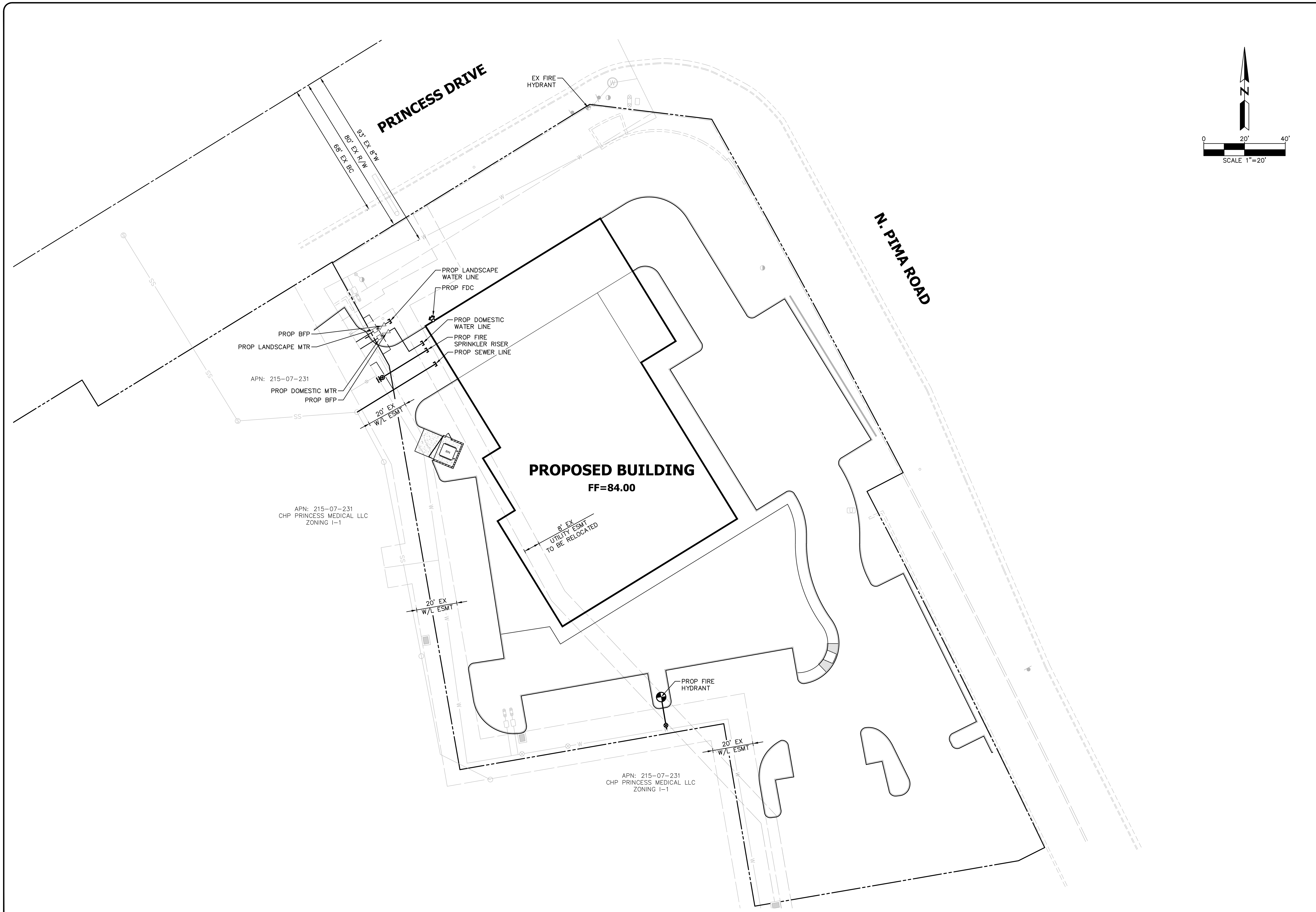
7.0 REFERENCES

1. *City of Scottsdale Design Standards & Policies Manual, January 2018.*

APPENDIX A
FIGURES



VICINITY MAP
FIGURE 1



NO.	DATE	REVISION	BY

PURPOSE:
1ST CONCEPTUAL SUBMITTAL

DESIGN BY: AS
DRAWN BY: GM
CHECKED BY: GH

HUNTER ENGINEERING CIVIL AND SURVEY
10450 NORTH 74TH STREET, SUITE 200
SCOTTSDALE, AZ 85258
T 480 991 3985
F 480 991 3986

Registered Professional Engineer
CERTIFICATE NO. 63946
GRANT D. HIRNEISE
Date Signed 02/04/20
ARIZONA, U.S.A.
(11410)

CONCEPTUAL UTILITY PLAN FOR PLATINUM STORAGE
8585 E. PRINCESS DRIVE
SCOTTSDALE, ARIZONA 85255

THESE PLANS ARE NOT APPROVED FOR CONSTRUCTION WITHOUT AN APPROVED SIGNATURE FROM THE GOVERNING MUNICIPALITY.

PROJECT NAME: PLATINUM STORAGE

HE NO.: PLAT003
SCALE: 1"=20'

SHEET:
C3

7-DR-2020
2/6/2020

APPENDIX B
WATERCAD CALCULATIONS

Project: Platinum Storage
Project Number: PLAT003
City: Scottsdale
Date: 2/3/2020

PROJECTED MAXIMUM DOMESTIC WATER DEMANDS

Land Use	Building Area (sf)	Average Day Water Demands Figure 6-2 Design Standards Manual For Water and Wastewater Systems		Average Day Total Use Flow (ADTUF) (gpd)	Average Day Total Use Flow (ADTUF) (gpm)	Maximum Day Demand (ADTUF * 2) (gpm)	Peak Hour Demand (ADTUF * 3.5) (gpm)
Commercial/ Retail	109,759	0.8	gal per s.f.	87,807	61.0	122	213.5

FIRE FLOW SUMMARY

Land Use	Building Area (sf)	Estimated Construction Type	Minimum Required Fire Flow, Table B105.1, 2015 International Fire Code (gpm)	50% Sprinklered Fire Flow (gpm)	Building Sprinklered
Commercial/ Retail	109,759	II-B	7,000	3,500	YES

WATER FLOW TEST REPORT

Project: **Princess Storage**
Project Number: PLAT003
Test Date: 1/27/2020

TOTAL FLOW DURING TEST: **2430** GPM

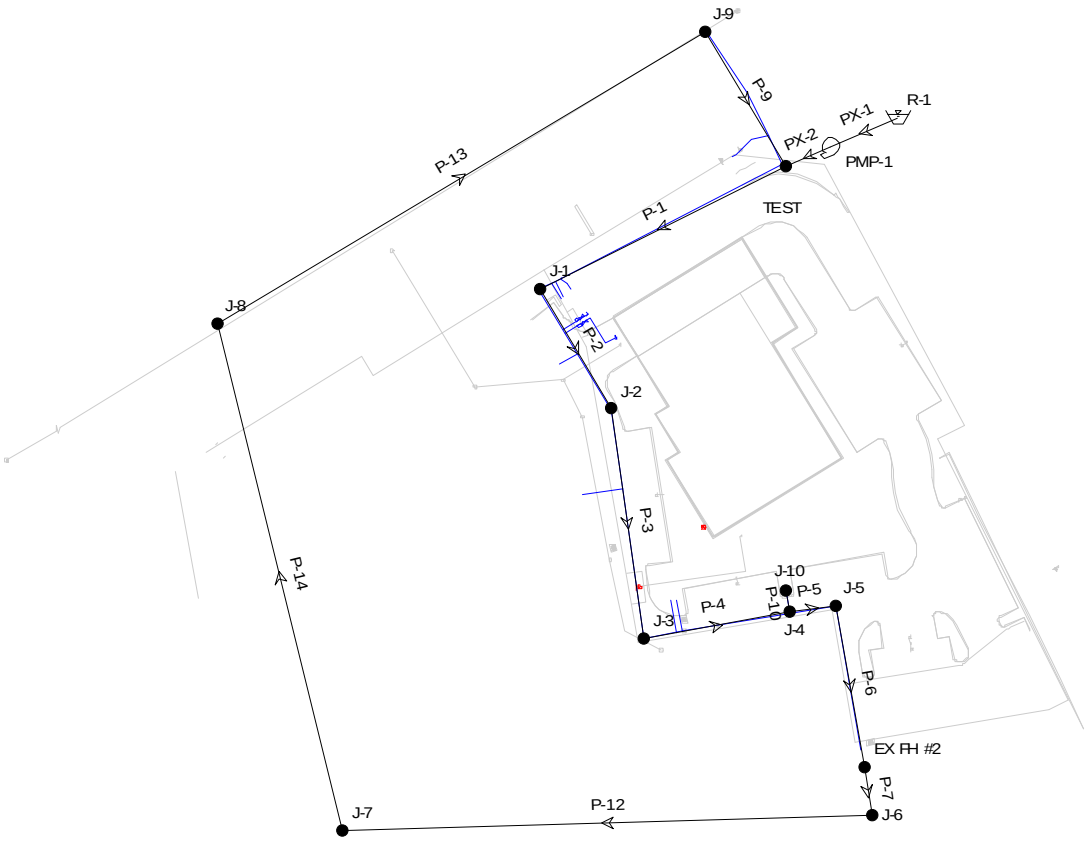
STATIC READING: 85 PSI RESIDUAL: 73 PSI

RESULTS: AT 20 PSI RESIDUAL **6051** GPM AT 0 PSI **6994** GPM

REMARKS:

	Shutoff Head	Design	Max Operating
	85 psi	73 psi	0 psi
psi X 2.31 = ft	196.35 ft	168.63 ft	0 ft
		2430 flow	6994 flow

Scenario: Residual



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Scenario: Peak
Steady State Analysis
Pipe Report

Label	Length (ft)	Diameter (in)	Material	Hazen-Williams C	Discharge (gpm)	Upstream Structure Hydraulic Grade (ft)	Downstream Structure Hydraulic Grade (ft)	Pressure Pipe Headloss (ft)	Headloss Gradient (ft/1000ft)	Velocity (ft/s)
P-1	185.00	8.0	Ductile Iron	130.0	158.97	282.04	281.93	0.11	0.61	1.01
P-2	95.00	8.0	Ductile Iron	130.0	158.97	281.93	281.87	0.06	0.61	1.01
P-3	155.00	8.0	Ductile Iron	130.0	-54.53	281.87	281.89	0.01	0.08	0.35
P-4	100.00	8.0	Ductile Iron	130.0	-54.53	281.89	281.89	0.01	0.08	0.35
P-5	30.00	8.0	Ductile Iron	130.0	-54.53	281.89	281.90	0.00	0.08	0.35
P-6	175.00	8.0	Ductile Iron	130.0	54.53	281.91	281.90	0.01	0.08	0.35
P-7	25.00	8.0	Ductile Iron	130.0	54.53	281.91	281.91	0.00	0.08	0.35
P-9	100.00	8.0	Ductile Iron	130.0	-54.53	282.03	282.04	0.01	0.08	0.35
P-10	15.00	8.0	Ductile Iron	130.0	0.00	281.89	281.89	0.00	0.00	0.00
P-12	657.00	8.0	Ductile Iron	130.0	-54.53	281.91	281.97	0.05	0.08	0.35
P-13	700.00	8.0	Ductile Iron	130.0	-54.53	281.98	282.03	0.06	0.08	0.35
P-14	643.00	12.0	Ductile Iron	130.0	-54.53	281.97	281.98	0.01	0.01	0.15
PX-1	1.00	120.0	Ductile Iron	130.0	213.50	86.00	86.00	0.00	0.00	0.01
PX-2	1.00	120.0	Ductile Iron	130.0	213.50	282.04	282.04	0.00	0.00	0.01

Scenario: Peak
Steady State Analysis
Junction Report

Label	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
EX FH #2	76.00	0.00	0.00	281.91	89.09
J-1	81.50	0.00	0.00	281.93	86.72
J-2	80.00	213.50	213.50	281.87	87.34
J-3	79.00	0.00	0.00	281.89	87.78
J-4	79.00	0.00	0.00	281.89	87.78
J-5	79.25	0.00	0.00	281.90	87.68
J-6	75.00	0.00	0.00	281.91	89.52
J-7	70.00	0.00	0.00	281.97	91.71
J-8	82.00	0.00	0.00	281.98	86.52
J-9	87.00	0.00	0.00	282.03	84.38
J-10	79.50	0.00	0.00	281.89	87.57
TEST	86.00	0.00	0.00	282.04	84.82

>50 psi OK

Scenario: Average Day
Steady State Analysis
Junction Report

Label	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
EX FH #2	76.00	0.00	0.00	282.31	89.26
J-1	81.50	0.00	0.00	282.31	86.88
J-2	80.00	61.00	61.00	282.30	87.53
J-3	79.00	0.00	0.00	282.30	87.96
J-4	79.00	0.00	0.00	282.31	87.96
J-5	79.25	0.00	0.00	282.31	87.85
J-6	75.00	0.00	0.00	282.31	89.69
J-7	70.00	0.00	0.00	282.31	91.86
J-8	82.00	0.00	0.00	282.31	86.67
J-9	87.00	0.00	0.00	282.32	84.51
J-10	79.50	0.00	0.00	282.31	87.74
TEST	86.00	0.00	0.00	282.32	84.94

>50 psi OK

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Scenario: Max Day
Steady State Analysis
Junction Report

Label	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
EX FH #2	76.00	0.00	0.00	282.19	89.21
J-1	81.50	0.00	0.00	282.20	86.83
J-2	80.00	122.00	122.00	282.18	87.47
J-3	79.00	0.00	0.00	282.19	87.91
J-4	79.00	0.00	0.00	282.19	87.91
J-5	79.25	0.00	0.00	282.19	87.80
J-6	75.00	0.00	0.00	282.20	89.64
J-7	70.00	0.00	0.00	282.21	91.82
J-8	82.00	0.00	0.00	282.22	86.62
J-9	87.00	0.00	0.00	282.24	84.47
J-10	79.50	0.00	0.00	282.19	87.69
TEST	86.00	0.00	0.00	282.24	84.90

>50 psi OK

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Scenario: Max Day + Fire
Steady State Analysis
Junction Report

Label	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
EX FH #2	76.00	0.00	0.00	212.34	58.99
J-1	81.50	0.00	0.00	219.20	59.58
J-2	80.00	122.00	122.00	216.58	59.09
J-3	79.00	0.00	0.00	213.05	58.00
J-4	79.00	0.00	0.00	210.78	57.01
J-5	79.25	0.00	0.00	211.00	57.00
J-6	75.00	0.00	0.00	212.53	59.50
J-7	70.00	0.00	0.00	217.53	63.83
J-8	82.00	0.00	0.00	218.21	58.93
J-9	87.00	0.00	0.00	223.54	59.07
J-10	79.50	1,750.00	1,750.00	210.00	56.46
TEST	86.00	1,750.00	1,750.00	224.30	59.84

>20 psi OK

Scenario: Static
Steady State Analysis
Junction Report

Label	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
EX FH #2	76.00	0.00	0.00	282.35	89.28
J-1	81.50	0.00	0.00	282.35	86.90
J-2	80.00	0.00	0.00	282.35	87.55
J-3	79.00	0.00	0.00	282.35	87.98
J-4	79.00	0.00	0.00	282.35	87.98
J-5	79.25	0.00	0.00	282.35	87.87
J-6	75.00	0.00	0.00	282.35	89.71
J-7	70.00	0.00	0.00	282.35	91.87
J-8	82.00	0.00	0.00	282.35	86.68
J-9	87.00	0.00	0.00	282.35	84.52
J-10	79.50	0.00	0.00	282.35	87.76
TEST	86.00	0.00	0.00	282.35	84.95

≈85 psi OK

Scenario: Residual
Steady State Analysis
Junction Report

Label	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
EX FH #2	76.00	0.00	0.00	254.63	77.28
J-1	81.50	0.00	0.00	254.63	74.91
J-2	80.00	0.00	0.00	254.63	75.55
J-3	79.00	0.00	0.00	254.63	75.99
J-4	79.00	0.00	0.00	254.63	75.99
J-5	79.25	0.00	0.00	254.63	75.88
J-6	75.00	0.00	0.00	254.63	77.72
J-7	70.00	0.00	0.00	254.63	79.88
J-8	82.00	0.00	0.00	254.63	74.69
J-9	87.00	0.00	0.00	254.63	72.53
J-10	79.50	0.00	0.00	254.63	75.77
TEST	86.00	2,430.00	2,430.00	254.63	72.96

≈73 psi OK

Scenario: Calculated
Steady State Analysis
Junction Report

Label	Elevation (ft)	Base Flow (gpm)	Demand (Calculated) (gpm)	Calculated Hydraulic Grade (ft)	Pressure (psi)
EX FH #2	76.00	0.00	0.00	132.19	24.31
J-1	81.50	0.00	0.00	132.19	21.93
J-2	80.00	0.00	0.00	132.19	22.58
J-3	79.00	0.00	0.00	132.19	23.01
J-4	79.00	0.00	0.00	132.19	23.01
J-5	79.25	0.00	0.00	132.19	22.91
J-6	75.00	0.00	0.00	132.19	24.74
J-7	70.00	0.00	0.00	132.19	26.91
J-8	82.00	0.00	0.00	132.19	21.72
J-9	87.00	0.00	0.00	132.19	19.55
J-10	79.50	0.00	0.00	132.19	22.80
TEST	86.00	6,051.00	6,051.00	132.19	19.98

≈20 psi OK

Detailed Report for Reservoir: R-1

Note:
The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary	
Scenario	Residual
Active Topology Alternative	Base-Active Topology
Physical Alternative	Base-Physical
Demand Alternative	Demand-Residual
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational
Age Alternative	Base-Age Alternative
Constituent Alternative	Base-Constituent
Trace Alternative	Base-Trace Alternative
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

Geometric Summary			
X	5,109.61 ft	Elevation	86.00 ft
Y	5,024.32 ft	Zone	Zone

Calculated Results Summary

Time (hr)	Calculated Hydraulic Grade (ft)	Inflow (gpm)	Outflow (gpm)
0.00	86.00	2,430.00	,430.00

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Detailed Report for Pump: PMP-1

Note:
The input data may have been modified since the last calculation was performed.
The calculated results may be outdated.

Scenario Summary	
Scenario	Residual
Active Topology Alternative	Base-Active Topology
Physical Alternative	Base-Physical
Demand Alternative	Demand-Residual
Initial Settings Alternative	Base-Initial Settings
Operational Alternative	Base-Operational
Age Alternative	Base-Age Alternative
Constituent Alternative	Base-Constituent
Trace Alternative	Base-Trace Alternative
Fire Flow Alternative	Base-Fire Flow
Capital Cost Alternative	Base-Capital Cost
Energy Cost Alternative	Base-Energy Cost
User Data Alternative	Base-User Data

Global Adjustments Summary			
Demand	<None>	Roughness	<None>

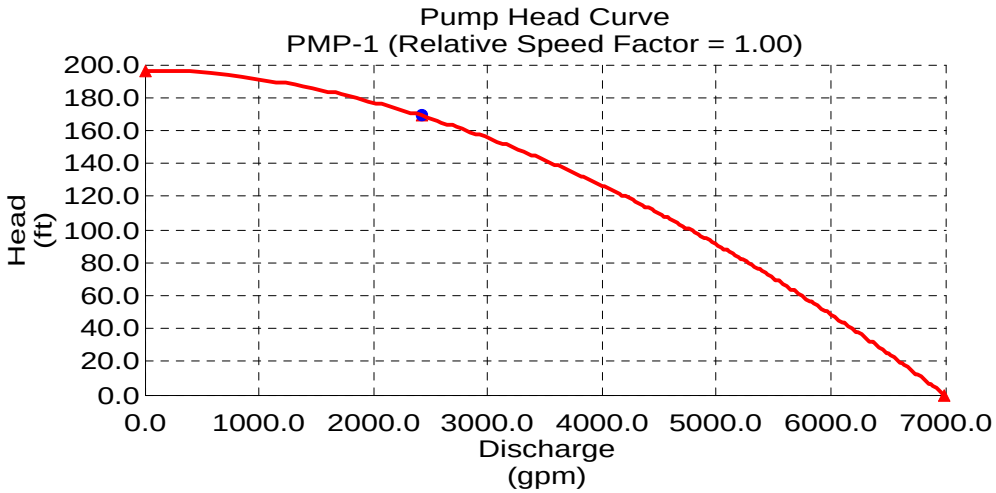
Geometric Summary			
X	5,064.87 ft	Upstream Pipe	PX-1
Y	5,004.81 ft	Downstream Pipe	PX-2
Elevation	86.00 ft		

Pump Definition Summary	
Pump Definition	PLAT003

Initial Status			
Initial Pump Status	On	Initial Relative Speed Facto	1.00

Calculated Results Summary

Time (hr)	Control Status	Intake Pump Grade (ft)	Discharge Pump Grade (ft)	Discharge (gpm)	Pump Head (ft)	Relative Speed	Calculated Water Power (Hp)
0.00	On	86.00	254.63	2,430.00	68.63	1.00	103.46



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APPENDIX C
REFERENCE INFORMATION

CITY OF SCOTTSDALE

DESIGN STANDARDS & POLICIES MANUAL

7-DR-2020
2/6/2020

DESIGN FLOW & HEAD LOSS 6-1.404

The ultimate design flow within the city's water transmission and distribution system will be based on the city's current Integrated Water Master Plan. Water demand for each development will be calculated using the average day demands, as shown in Figure 6-1.2, to ensure that the existing distribution supply is sufficient. Designs will include all necessary improvements, including booster pumping stations, reservoirs, lines and appurtenances to meet the system's ultimate demand.

A. The four hydraulic modeling scenarios detailed in 6-1.202 will demonstrate that the system is adequately designed.
B. Select model scenario flows and their respective peaking factors are as follows:
   1. Maximum day: Defined as 2 times the average day total use flow as determined per Figure 6-1.2 (use gpm value).
   2. Peak hour: Defined as 3.5 times the average day total use as determined per Figure 6-1.2 (use gpm value).
   3. Note: These peaking factors shall be appropriately increased for restaurants and high-demand water users, or as designated by the Water Resources Department after review.
C. The maximum allowable pipe head loss for the various water pipelines is as follows:
   1. Transmission mains: 8 feet per 1,000 feet (3.5 psi per 1,000 feet)
   2. Distribution lines: 10 feet per 1,000 feet (4.3 psi per 1,000 feet)
   3. Service lines – domestic, dedicated fire, or combined domestic/fire: size as required to satisfy both hydraulic modeling requirements and Fire Code. Generally, velocities of more than 5 feet per second are undesirable. Velocities more than 7.5 feet per second are not allowed.
   4. As otherwise designated by the Water Resources Department

SYSTEM FLOW TEST REQUIREMENTS & USE OF RESULTS 6-1.405

Pressure and available flow information for existing water lines must be obtained by having a fire hydrant flow test performed on the system. Hydrant flow tests are required for the following situations:

A. On all commercial projects, multi-family residential projects, and public extensions of the city's water distribution system.
B. For any proposed system connecting to the existing distribution system, the design capacity of the existing system (flow versus pressure) will need to be determined by the engineer.
C. Prior to acceptance by the city, all platted subdivisions shall conduct an additional flow test at the lowest and highest elevation available in which the development is constructed.
D. Developments that cross pressure zone boundaries must conduct a flow test within each pressure zone.

A private fire protection company shall perform the tests and certify the results. A right-of-way permit issued by the One Stop Shop is required for a flow test and the Inspection Services Division will be notified a minimum of 48 hours before performing the flow test. The permit is also available online. Refer to the flow test design form.

d. Pipe flow velocity in feet per second (fps)
e. Each pipe segment's head loss rate (ft. /1,000ft or psi/ft.)
f. PRVs: Upstream and downstream pressures (psi or HGL elevation)
g. Tanks: Inflow and outflow (gpm)
h. Shows all units for the values presented or provide a legend on the diagram page that indicates the units used

AVERAGE DAY WATER DEMANDS [1]							
IN GALLONS PER DAY (GPD) [2]				IN GALLONS PER MINUTE (GPM) [2][3]			
Land Use	Inside Use	Outside Use	Total Use	Inside Use	Outside Use	Total Use	Units
Residential Demand per Dwelling Unit							
< 2 dwelling unit per acre (DU/ac)	208.9	276.7	485.6	0.30	0.39	0.69	per unit
2 – 2.9 DU/ac	193.7	276.7	470.4	0.27	0.39	0.66	per unit
3 – 7.9 DU/ac	175.9	72.3	248.2	0.25	0.11	0.36	per unit
8 – 11.9 DU/ac	155.3	72.3	227.6	0.22	0.11	0.33	per unit
12 – 22 DU/ac	155.3	72.3	227.6	0.22	0.11	0.33	per unit
High Density Condominium (condo)	155.3	30	185.3	0.22	0.05	0.27	per unit
Resort Hotel (includes site amenities)	401.7	44.6	446.3	0.56	0.07	0.63	per room
Service and Employment							
Restaurant	1.2	0.1	1.3	1.67E-03	1.39E-04	1.81E-03	per square foot (sq.ft.)
Commercial/ Retail	0.7	0.1	0.8	9.73E-04	1.39E-04	1.11E-03	per sq.ft.
Commercial High Rise	0.5	0.1	0.6	6.95E-04	1.39E-04	8.34E-04	per sq.ft.

AVERAGE DAY WATER DEMANDS [1]							
IN GALLONS PER DAY (GPD) [2]				IN GALLONS PER MINUTE (GPM) [2][3]			
Office	0.5	0.1	0.6	6.95E-04	1.39E-04	8.34E-04	per sq.ft.
Institutional	670	670	1340	0.94	0.94	1.88	per acre
Industrial	873	154	1027	1.22	0.22	1.44	per acre
Research and Development	1092	192	1284	1.52	0.27	1.79	per acre
Special Use Areas							
Natural Area Open Space	0	0	0	0.0	0.0	0.0	per acre
Developed Open Space – Parks	0	1786	1786	0.0	2.49	2.49	per acre
Developed Open Space – Golf Course	0	4285	4285	0.0	5.96	5.96	per acre

Notes:
(1) These values shall not be used directly for service line or water meter sizing.
(2) Gallon per day values are provided for reference only. The instantaneous gallon per minute flow rates presented are intended for use in the required hydraulic modeling scenarios. The gpm values assume a 12-hour active water use period per 24-hour day. In large or specialty developments or master plans the hydraulic analysis criteria and parameters should be discussed with the Water Resources Department. Seasonal peaking should also be considered. Upon review, the Water Resources Department reserves the right to designate flows to be used in hydraulic modeling scenarios that may be different from those presented here.
(3) The hydraulic modeling peaking factors used in select modeling scenarios are to be applied to the gpm values shown here. Max day and peak hour peaking factors can be found in Section 6-1.404.

FIGURE 6-1.2 AVERAGE DAY WATER DEMANDS

SECTION B101
GENERAL

B101.1 Scope.

The procedure for determining fire-flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix. This appendix does not apply to structures other than buildings.

SECTION B102
DEFINITIONS

B102.1 Definitions.

For the purpose of this appendix, certain terms are defined as follows:

FIRE FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

SECTION B103
MODIFICATIONS

B103.1 Decreases.

The *fire code official* is authorized to reduce the *fire-flow* requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full *fire-flow* requirements is impractical.

B103.2 Increases.

The *fire code official* is authorized to increase the *fire-flow* requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall be not more than twice that required for the building under consideration.

B103.3 Areas without water supply systems.

For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the *fire code official* is authorized to utilize NFPA 1142 or the *International Wildland-Urban Interface Code*.

SECTION B104
FIRE-FLOW CALCULATION AREA

B104.1 General.

The *fire-flow calculation area* shall be the total floor area of all floor levels within the *exterior walls*, and under the horizontal projections of the roof of a building, except as modified in Section B104.3.

B104.2 Area separation.

Portions of buildings that are separated by *fire walls* without openings, constructed in accordance with the *International Building Code*, are allowed to be considered as separate *fire-flow calculation areas*.

B104.3 Type IA and Type IB construction.

The *fire-flow calculation area* of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: *Fire-flow calculation area* for open parking garages shall be determined by the area of the largest floor.

SECTION B105
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

B105.1 One- and two-family dwellings, Group R-3 and R-4 buildings and townhouses.

The minimum *fire-flow* and flow duration requirements for one- and two-family *dwellings*, Group R-3 and R-4 buildings and *townhouses* shall be as specified in Tables B105.1(1) and B105.1(2).

TABLE B105.1(1)
REQUIRED FIRE FLOW FOR ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

FIRE-FLOW CALCULATION AREA (square feet)	AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE FLOW (gallons per minute)	FLOW DURAT (hours)
0–3,600	No automatic sprinkler system	1,000	1
3,601 and greater	No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B at the required fire-
0–3,600	Section 903.3.1.3 of the *International Fire Code* or Section P2904 of the *International Residential Code*	500	$^1/_2$
3,601 and greater	Section 903.3.1.3 of the *International Fire Code* or Section P2904 of the *International Residential Code*	$^1/_2$ value in Table B105.1(2)	1

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m.

TABLE B105.1(2)
REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	
145,901-	82,101-92,400	52,501-59,100	37,901-42,700	23,301-	4,250	

7-DR-2020
2/6/2020

164,200				26,300		
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	4
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a.Types of construction are based on the *International Building Code*.

b.Measured at 20 psi residual pressure.

B105.2 Buildings other than one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses.

The minimum *fire-flow* and flow duration for buildings other than one- and two-family *dwellings*, Group R-3 and R-4 buildings and *townhouses* shall be as specified in Tables B105.2 and B105.1(2).

TABLE B105.2
REQUIRED FIRE FLOW FOR BUILDINGS OTHER THAN ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

7-DR-2020
2/6/2020

AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE FLOW (gallons per minute)	FLOW DURATION (hours)
No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2)
Section 903.3.1.1 of the *International Fire Code*	25% of the value in Table B105.1(2)[a]	Duration in Table B105.1(2) at the reduced flow rate
Section 903.3.1.2 of the *International Fire Code*	25% of the value in Table B105.1(2)[b]	Duration in Table B105.1(2) at the reduced flow rate

For SI: 1 gallon per minute = 3.785 L/m.

a. The reduced fire flow shall be not less than 1,000 gallons per minute.

b. The reduced fire flow shall be not less than 1,500 gallons per minute.

B105.3 Water supply for buildings equipped with an automatic sprinkler system.

For buildings equipped with an *approved automatic sprinkler system*, the water supply shall be capable of providing the greater of:

1. The *automatic sprinkler system* demand, including hose stream allowance.
2. The required *fire flow*.

SECTION B106
REFERENCED STANDARDS

ICC IBC—18	International Building Code	B104.2
ICC IWUIC—18	International WildlandUrban Interface Code	B103.3
ICC IRC—18	International Residential Code	Table B105.1(1)
NFPA 1142—17	Standard on Water Supplies for Suburban and Rural Fire Fighting	B103.3

APPENDIX D
FIRE FLOW TEST

SUMMIT FIRE PROTECTION CO.

Phone: (480) 966-9178 Fax: (480) 967-9191 AZ Lic. C-16 275324
2114 East Cedar Street • Tempe, Arizona 85281
E-mail Address: EBeckman@SummitCoUS.com

FIRE HYDRANT FLOW TEST

Name: SWC Pima Rd & Princess Dr
Scottsdale, AZ

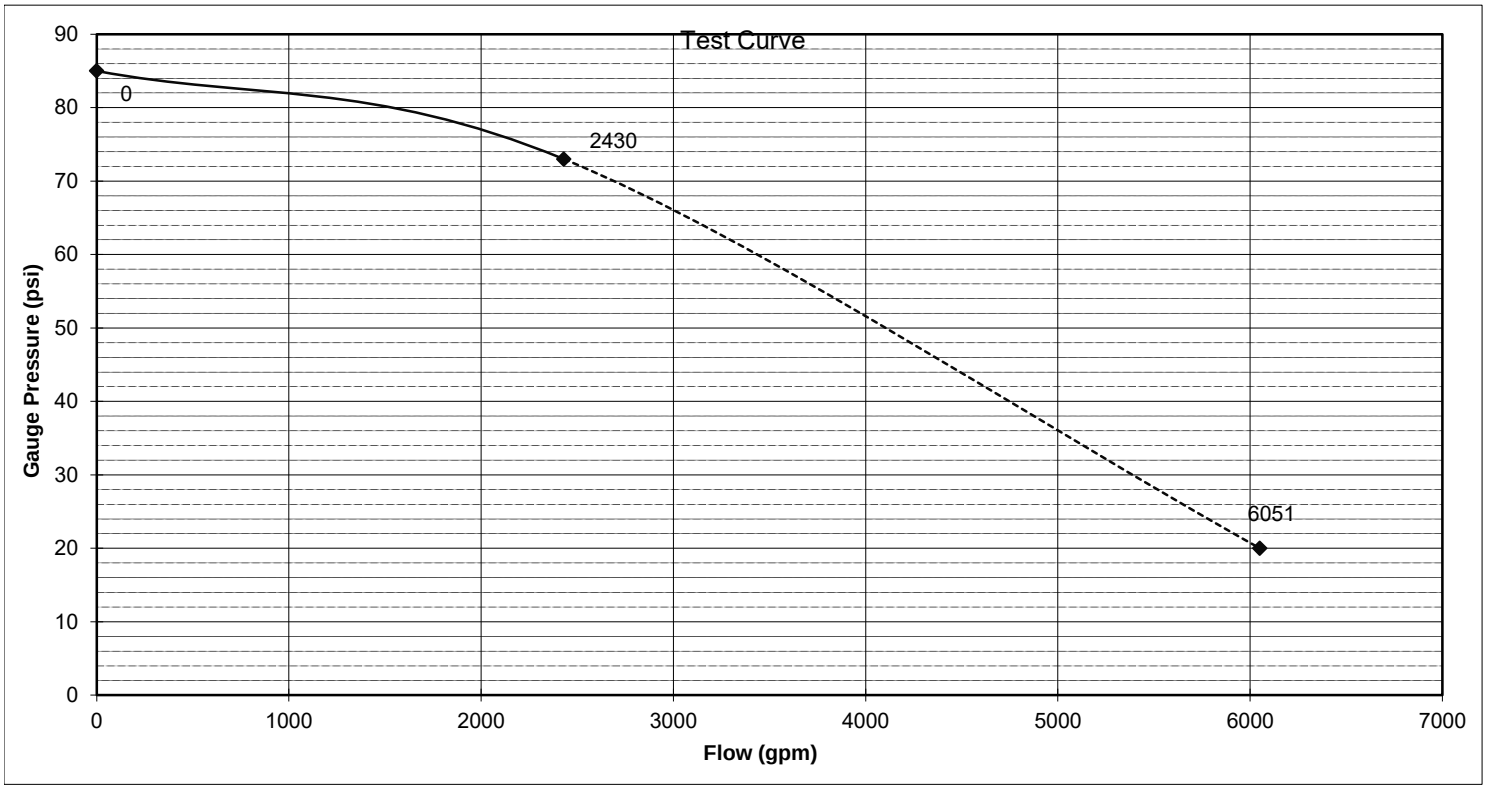
Date: 01/07/20
Time: 8:00AM
Report #
Tech: Darryl Cross

Static Hydrant: SWC of Pima Rd and Princess Drive
Elevation:
Dist. Between Hydrants: 500'
Diameter of Main: 8"
Static Pressure: 85.0
Residual Pressure: 73.0
Pump Present:
Tank Present:
Req. GPM: Req. PSI:

Flowing Hydrant: SEC of building @ 8575 E. Princess Dr. in parking island
Elevation: 0
Type of Supply: City Main

Hydrant:	1	2	3	4
Outlet Diameter:	4.0			
Pitot Reading:	32.0			
Coeff:	0.900			
Discharge GPM:	2430	0	0	0

Static pressure of	85	psi	@	0	gpm
Residual pressure of	73	psi	@	2430	gpm
Available flow @	20	psi	@	6051	gpm



Comments: with Jared Berry from City of Scottsdale 602-541-4942

NOTES:

1. Flowing hydrant is assumed to be on a circulating main or downstream of the pressure test hydrant on a dead-end system.
2. Flow analysis assumes a gravity flow system with no distribution pumps and having no demand, other than the test
3. The distance between hydrants, elevations & main diameters are for information only.

7-DR-2020
2/6/2020