



WATER BASIS OF DESIGN

Silverstone Parcel F

Prepared for:

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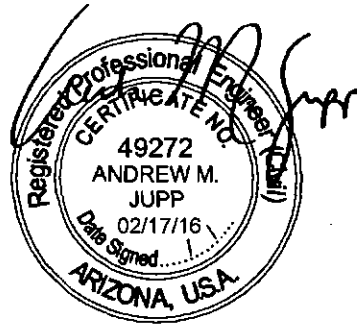
Kimley»»Horn

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WATER BASIS OF DESIGN

SILVERSTONE PARCEL F



FEBRUARY 2016

Prepared By:

Kimley »» Horn

Contents

Introduction	1
Intent	1
Project Description	1
Distribution System Description	2
Existing Distribution System.....	2
Proposed Distribution System.....	2
Basis of Design	3
Conformance With Master Plan	3
Design Methodology	3
Water System Analysis	3
Results	3

Tables

Table 1 Water Demands	3
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Appendices

- Appendix A – Site Location Map
- Appendix B – Proposed Water System Layout
- Appendix C – WaterCAD Analysis Results
- Appendix D – Fire Flow Test Results

INTRODUCTION

INTENT

The purpose of this water report is to support the water system for the proposed Silverstone Parcel F residential development located at the northwest corner of 74th Street and Silverstone Drive in Scottsdale, Arizona. This report presents the basis of design criteria that will be used for the engineering design of the proposed development utilizing current water design standards and guidelines set forth by the City of Scottsdale, Arizona.

PROJECT DESCRIPTION

Silverstone Parcel F, "The Project", is located within the northwest quarter of Section 14 of Township 4 North, Range 4 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The site is bound to the east by 74th Street, Pinnacle Peak Road to the North, and Silverstone Road to the South. The site is bound to the west by the Rawhide Wash. See **Appendix A: Site Location Map**

Silverstone Parcel F is a proposed 22-acre single family residential subdivision, consisting of 100 townhomes and 78 duplex units. The project is zoned as R-4 and is part of the larger Silverstone Master Plan. A Master Potable Water Plan for Silverstone prepared by Wood, Patel and Associates, Inc. was approved by the City of Scottsdale in July 2006 with a revision in November 2007.

DISTRIBUTION SYSTEM DESCRIPTION

EXISTING DISTRIBUTION SYSTEM

A 12-inch DIP water line exists in 74th Street to the east of the site. To the south of the site in Silverstone Road exists an 8-inch DIP water line.

Per the approved master plan, all adjacent lines operate in Pressure Zone 6W with a Hydraulic Grade of 2,020 feet.

PROPOSED DISTRIBUTION SYSTEM

The proposed water system for Silverstone Parcel F will consist of two separate 8-inch water main loops connecting to the 12-inch line in 74th Street. Four connections will be made to the line in 74th Street; two for the northern portion of the site, and two for the southern portion. Connections will be made at each entry.

The proposed on-site distribution system will consist of an 8-inch Class 350 DIP water line that will provide both potable water supply and fire protection. Refer to **Appendix B** for the Proposed Water System Layout Exhibit.

BASIS OF DESIGN

CONFORMANCE WITH MASTER PLAN

The master plan for Silverstone accounts for 186 residential units within Parcel F. The proposed development of 178 units is less than allocated for in the master plan, and produces a lower demand. The Silverstone master plan utilized a single 8-inch waterline through Parcel F. The line connected to the 12-inch line in 74th Street and to the 8-inch line in Silverstone Drive. The proposed water system instead provides two water loops to serve the development, with connections to the 74th Street line.

DESIGN METHODOLOGY

The WaterCAD v8i water system modeling software distributed by Haestad Methods, Inc. was used to model the proposed water network. One flow test was performed to determine the residual and static pressures of the existing system. Flow Test #1 was taken from hydrants connected to Pressure Zone 6W along 74th Street to the east of the site. Refer to **Appendix D** for the results of the fire flow tests. According to the results of this flow test, the maximum operating flow at 20 psi were calculated to be 4,150 gpm. This flow test was incorporated into the WaterCAD v8i model.

According to Section 6-1.407 of the DS&PM, distribution systems shall be designed with a minimum residual pressure of 50 psi and a maximum static pressure of 120 psi. For fire flow scenarios, a minimum design pressure of 30 psi is required.

WATER SYSTEM ANALYSIS

The proposed water distribution system for the project is modeled under 4 design scenarios. Average Day, Max Day, Peak Hour and Max Day plus Fire Flows scenarios are modeled. Average Day Demands are based on Figure 6.1-2 in the DS&PM, with peaking factors per Section 6-1.404. A fire flow of 500 gpm per Section 6-1.501 of the DS&PM was used. See **Table 1** below for a summary of water demands.

Table 1 Water Demands

	Land Use	Dwelling units (du)	Average Daily Demand (gpd/du)	Average Daily Flow (gpd)	ADF (gpm)	Max Day Flow (gpd)	MDF (gpm)	Peak Hour Flow (gpd)	PHF (gpm)
Master Plan	R-5	186	228	42,408	30	84,816	59	148,428	103
Proposed	R-4	178	228	40,584	28	81,168	56	142,044	98

Average Day, Max Day and Peak Hour Demands are applied at hydraulic model nodes based on number of adjacent proposed units. Fire flow demands are applied to all junctions within the project boundary.

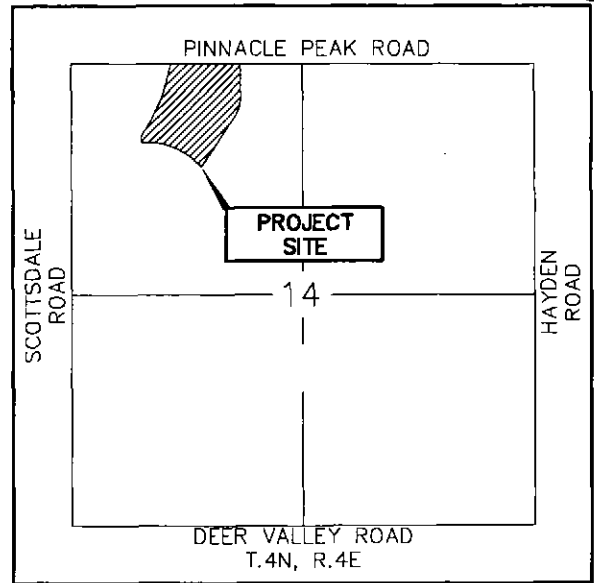
RESULTS

Results from the hydraulic water model indicate that the system is able to supply the calculated demands at or above the minimum required pressures and provide the required fire flows at or above the required residual pressures. The proposed water system is in conformance with the approved master plan for the Silverstone development. Refer to **Appendix C** for the WaterCAD results.

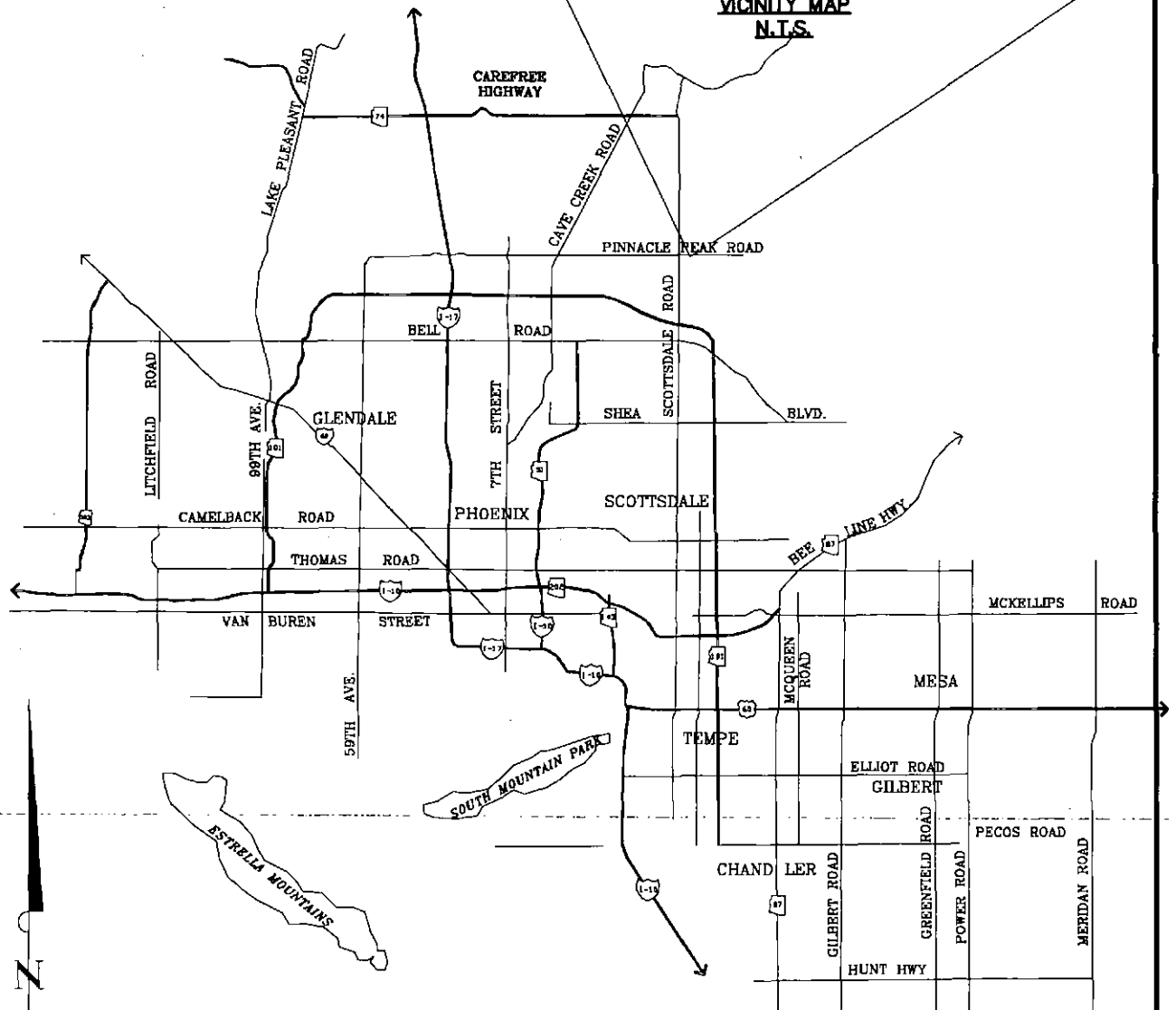
Appendix A – Site Location Map

PROJECT INFORMATION

SITE ADDRESS: SILVERSTONE PARCEL "F"
 SEC OF SCOTTSDALE ROAD
 AND SILVERSTONE DRIVE



VICINITY MAP
 N.T.S.



(N.T.S.)

SITE LOCATION MAP



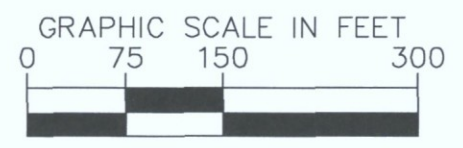
Appendix B – Proposed Water System
Layout

PINNACLE PEAK RD

EX. 12" DIP WATERLINE

EX. PRV 1871 110/65 ARV

8" STUB AND INSTALL BLIND FLANGE AT TEE



CUT IN VALVE

- W — EXISTING WATERLINE
- W — PROPOSED WATERLINE
- ⊗ EXISTING PRV
- EXISTING GATE VALVE
- ⊙ EXISTING FIRE HYDRANT
- TAPPING SLEEVE
- ▲ EXISTING TEE

8" STUB AND INSTALL BLIND FLANGE AT TEE

EX. 8" DIP WATERLINE

EX. 8" DIP WATERLINE

SILVERSTONE DR

74TH ST

Kimley-Horn 7700 North 96th Street, Suite 300 Phoenix, Arizona 85028 (602) 944-2000
PROJECT NO. 191948001 DRAWING NAME WSL.DDWG 1 OF 1
SILVERSTONE PARCEL F WATER BOD WATER SYSTEM LAYOUT SCOTTSDALE, ARIZONA
SCALE (H): 1"=150' SCALE (V): NONE DESIGNED BY: ZAH DRAWN BY: ZAH CHECKED BY: JMB DATE: NOV. 2015
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Appendix C – WaterCAD Analysis Results

Average Day

Max Day

Peak Hour

Max Day Plus Fire Flow

FlexTable: Junction Table
Active Scenario: Average Day

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Zone
J-1	1,860.00	0.0	2,011.69	66	Zone 6W
J-2	1,863.00	0.0	2,011.69	64	Zone 6W
J-3	1,867.00	4.0	2,011.69	63	Zone 6W
J-4	1,862.00	4.0	2,011.69	65	Zone 6W
J-5	1,861.00	4.0	2,011.69	65	Zone 6W
J-6	1,865.00	4.0	2,011.69	63	Zone 6W
J-7	1,855.00	0.0	2,011.69	68	Zone 6W
J-8	1,850.00	0.0	2,011.69	70	Zone 6W
J-9	1,854.00	3.0	2,011.69	68	Zone 6W
J-10	1,851.00	3.0	2,011.69	70	Zone 6W
J-11	1,842.00	3.0	2,011.69	73	Zone 6W
J-12	1,843.00	3.0	2,011.69	73	Zone 6W
J-13	1,837.00	0.0	2,011.69	76	Zone 6W

FlexTable: Pipe Table
Active Scenario: Average Day

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1	150	J-1	J-2	8.0	130.0	7.6	0.05	0.000	0.00
P-2	198	J-2	J-3	8.0	130.0	7.0	0.04	0.000	0.00
P-3	531	J-3	J-4	8.0	130.0	3.0	0.02	0.000	0.00
P-4	103	J-4	J-5	8.0	130.0	-1.0	0.01	0.000	0.00
P-5	589	J-5	J-6	8.0	130.0	-5.0	0.03	0.000	0.00
P-6	158	J-6	J-7	8.0	130.0	-8.4	0.05	0.000	0.00
P-7	184	J-6	J-2	8.0	130.0	-0.6	0.00	0.000	0.00
P-8	186	J-8	J-9	8.0	130.0	6.7	0.04	0.000	0.00
P-9	487	J-9	J-10	8.0	130.0	3.1	0.02	0.000	0.00
P-10	429	J-10	J-11	8.0	130.0	0.1	0.00	0.000	0.00
P-11	490	J-11	J-12	8.0	130.0	-2.9	0.02	0.000	0.00
P-12	224	J-12	J-13	8.0	130.0	-5.3	0.03	0.000	0.00
P-13	515	J-12	J-9	8.0	130.0	-0.6	0.00	0.000	0.00
P-14	500	J-13	J-8	12.0	130.0	-5.3	0.02	0.000	0.00
P-15	232	J-8	J-7	12.0	130.0	16.0	0.05	0.000	0.00
P-16	258	J-7	J-1	12.0	130.0	7.6	0.02	0.000	0.00
P-18	22	J-8	PMP-1	48.0	130.0	-28.0	0.00	0.000	0.00
P-19	29	R-2	PMP-1	48.0	130.0	28.0	0.00	0.000	0.00

FlexTable: Pump Table
Active Scenario: Average Day

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (gpm)	Pump Head (ft)
70	PMP-1	1,850.00	Pump Definition - 1	On	1,850.00	2,011.69	28.0	161.69

FlexTable: Reservoir Table
Active Scenario: Average Day

ID	Label	Elevation (ft)	Zone	Flow (Out net) (gpm)	Hydraulic Grade (ft)
72	R-2	1,850.00	<None>	28.0	1,850.00

FlexTable: Junction Table
Active Scenario: Max Day

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Zone
J-1	1,860.00	0.0	2,011.66	66	Zone 6W
J-2	1,863.00	0.0	2,011.66	64	Zone 6W
J-3	1,867.00	8.0	2,011.66	63	Zone 6W
J-4	1,862.00	8.0	2,011.66	65	Zone 6W
J-5	1,861.00	8.0	2,011.66	65	Zone 6W
J-6	1,865.00	8.0	2,011.66	63	Zone 6W
J-7	1,855.00	0.0	2,011.66	68	Zone 6W
J-8	1,850.00	0.0	2,011.66	70	Zone 6W
J-9	1,854.00	6.0	2,011.66	68	Zone 6W
J-10	1,851.00	6.0	2,011.66	70	Zone 6W
J-11	1,842.00	6.0	2,011.66	73	Zone 6W
J-12	1,843.00	6.0	2,011.66	73	Zone 6W
J-13	1,837.00	0.0	2,011.66	76	Zone 6W

FlexTable: Pipe Table
Active Scenario: Max Day

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Hazen- Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Headloss (ft)
P-1	150	J-1	J-2	8.0	130.0	15.3	0.10	0.000	0.00
P-2	198	J-2	J-3	8.0	130.0	14.1	0.09	0.000	0.00
P-3	531	J-3	J-4	8.0	130.0	6.1	0.04	0.000	0.00
P-4	103	J-4	J-5	8.0	130.0	-1.9	0.01	0.000	0.00
P-5	589	J-5	J-6	8.0	130.0	-9.9	0.06	0.000	0.00
P-6	158	J-6	J-7	8.0	130.0	-16.7	0.11	0.000	0.00
P-7	184	J-6	J-2	8.0	130.0	-1.2	0.01	0.000	0.00
P-8	186	J-8	J-9	8.0	130.0	13.4	0.09	0.000	0.00
P-9	487	J-9	J-10	8.0	130.0	6.1	0.04	0.000	0.00
P-10	429	J-10	J-11	8.0	130.0	0.1	0.00	0.000	0.00
P-11	490	J-11	J-12	8.0	130.0	-5.9	0.04	0.000	0.00
P-12	224	J-12	J-13	8.0	130.0	-10.6	0.07	0.000	0.00
P-13	515	J-12	J-9	8.0	130.0	-1.3	0.01	0.000	0.00
P-14	500	J-13	J-8	12.0	130.0	-10.6	0.03	0.000	0.00
P-15	232	J-8	J-7	12.0	130.0	32.0	0.09	0.000	0.00
P-16	258	J-7	J-1	12.0	130.0	15.3	0.04	0.000	0.00
P-18	22	J-8	PMP-1	48.0	130.0	-56.0	0.01	0.000	0.00
P-19	29	R-2	PMP-1	48.0	130.0	56.0	0.01	0.000	0.00



ALLIANCE FIRE PROTECTION CO.

Phone: (480) 966-9178 Fax: (480) 967-9191
 2114 East Cedar Street • Tempe, Arizona 85281
 E-mail Address: afpc@afpc.com

AZ Lic. C-16 58130
 AZ Lic. L-16 74007
 NV Lic. C-41a 30135

FIRE HYDRANT FLOW TEST

Name: Kimley-Horn

Pinnacle Peak & 74th Street
Scottsdale Arizona

Date: 02/04/16
 Time: 9:00 AM
 Report #: _____
 Tech: R.Pfeiff

Static Hydrant: 200 yards north of Silverstone
on east side of 74th St.

Flowing Hydrant: 200 yards south of Pinnacle Peak
on east side of 74th St.

Elevation: _____

Elevation: _____

Dist. Between Hydrants: 200 Yards

Type of Supply: CITY MAIN

Diameter of Main: Unknown

Static Pressure:

A	70.0	B
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Residual Pressure:

A	60.0	B
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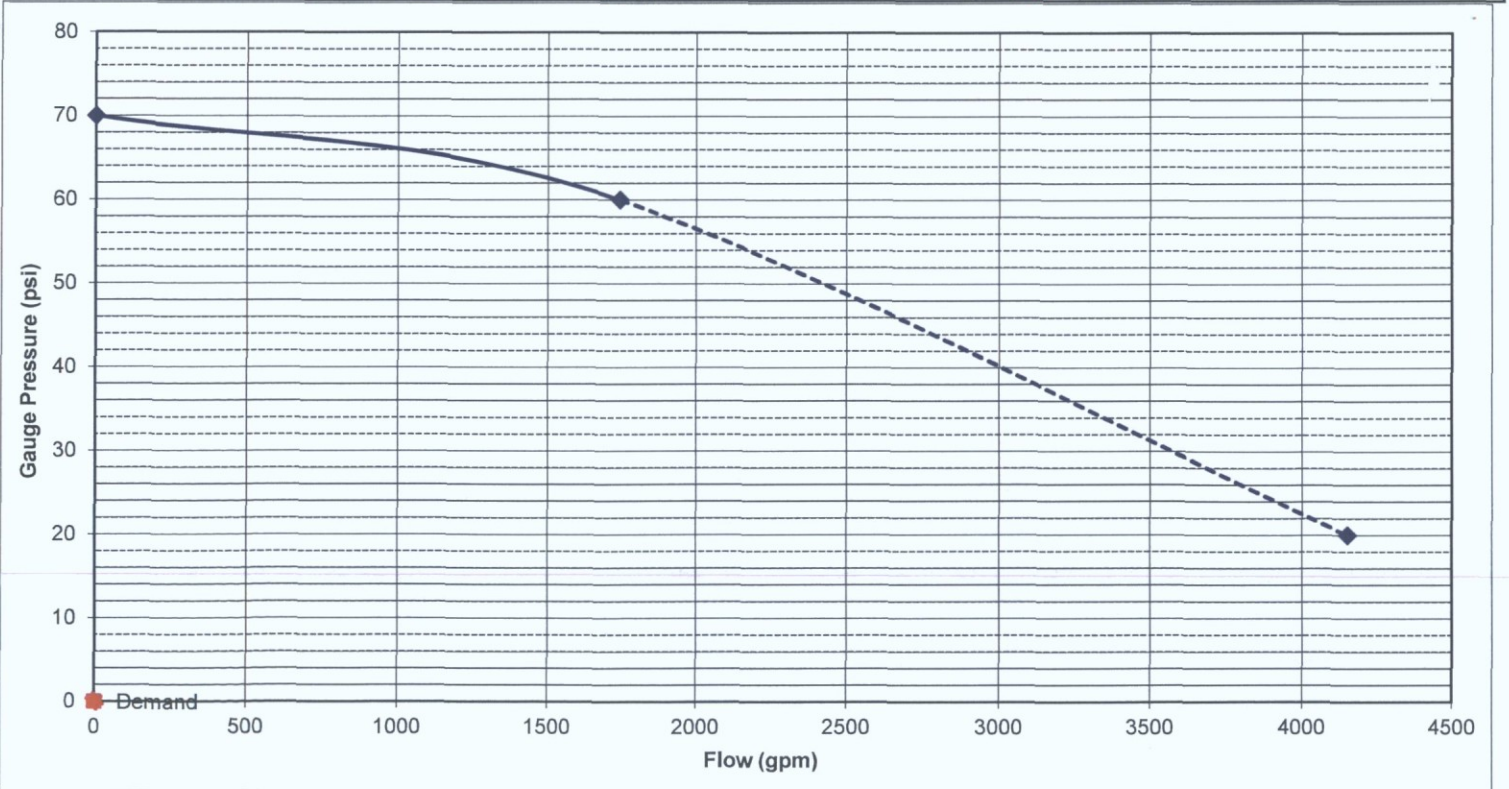
Pump Present: NO

Tank Present: NO

Req. GPM: _____ Req. PSI: _____

Hydrant:	A	A	B	B
Outlet Diameter:	3.5			
Pitot Reading:	28.0			
Coeff:	0.90			
Discharge GPM:	1740	0	0	0

	Flow A			Flow B		
Static pressure of	70	psi @	0 gpm	0	psi @	0 gpm
Residual pressure of	60	psi @	1740 gpm	0	psi @	0 gpm
Available flow @	20	psi @	4150 gpm	20	psi @	gpm



Comments: _____

- 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.