



Water Basis of Design Report

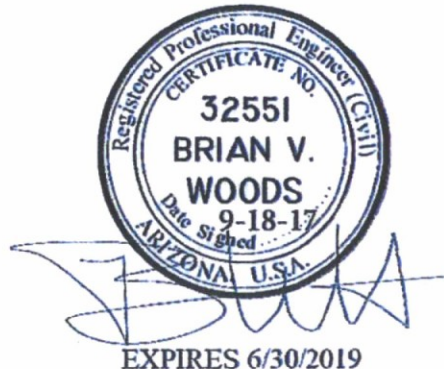
Pinnacle Vista Apartments
6301 E Pinnacle Vista Drive
Scottsdale, AZ 85266

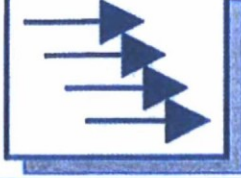
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Accepted For:
City of Scottsdale
Water Resources Department
9379 E. San Salvador
Scottsdale, Arizona

By: R. SACKS
Date: 10/30/17





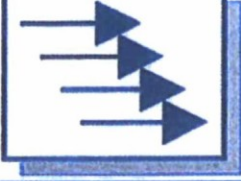
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PROFESSIONAL CIVIL ENGINEERING SERVICES

1.0 Introduction

Proposed are two apartment buildings (16 units) located at 6301 E Pinnacle Vista Drive (APN 212-11-005L) within the city of Scottsdale. Proposed is to provide domestic water and fire services by tapping the existing eight-inch line in Pinnacle Vista Drive. The lot is located within Maricopa County's southeast quarter of Section 33, Township 5 North, Range 4 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The zoning of the area is R-3. The city quarter section associated with the water utilities is 49-42. There are no known designated character areas or studies that will affect the project's design. See aerial below for general information. This report provides proposed demands on the system.





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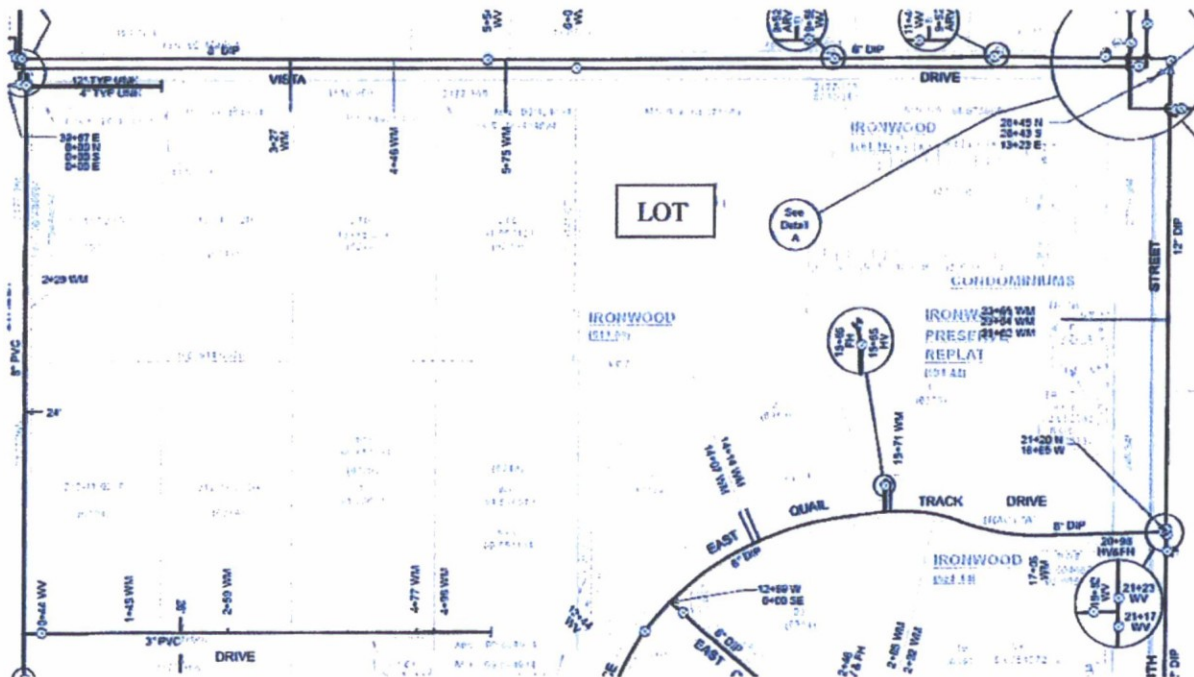
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2.0 Design Documentation

All design procedures, governing policies and methodologies used within this report are as set forth in Chapter 6 of the City of Scottsdale's Design Standards & Policies Manual (DS&PM) dated January 2010.

3.0 Existing Conditions

The lot is undeveloped as shown in the above aerial photograph. There is both an existing twelve inch and eight inch D.I.P. water line located within Pinnacle Vista Drive just north of the parcel. See below for a map of Water Quarter Section 49-42.



4.0 Proposed Conditions

Proposed are two, fire-sprinklered apartment buildings. Fire flow requirements for multi-family residential areas are 1,500 gallons per minute per DS&PM Section 6-1.501. Proposed is to add a domestic water service line, a fire line to the building fire riser, and a new fire hydrant near the proposed entrance. All services will be from the existing public eight-inch water line (not on a dead-end system). According to Pressure Zone



Map Figure 6.1-3 of the DS&PM, the existing eight-inch waterline lies within Zone 7. Zone 7 corresponds with Ground Elevation Range 1920-2050 feet. This is a single lot development with one proposed water meter and one fire hydrant. Water pressures are assumed adequate. Construction in Pinnacle Vista Drive will be within the existing 30-foot roadway and 10-foot utility easements. All construction shall be completed in accordance with the City of Scottsdale design specifications and details.

5.0 Computations

Based on 16 dwelling units within 1.63 acres, the equivalent density is 9.82 DU/ac. Per Figure 6.1-2 DS&PM, the Average Day Water Demand total, for Residential Demand per Dwelling Unit (8 to 11.9 DU/ac) is 227.6 gallons per day per unit.

:

$$\begin{aligned}\text{Average Demand: } & (227.6 \text{ gpd/unit})(16 \text{ units}) = 3,641.6 \text{ gpd} \\ & (3,641.6 \text{ gpd})(1 \text{ day} / 1,440 \text{ min}) = 2.53 \text{ gpm}\end{aligned}$$

$$\begin{aligned}\text{Peak hour flow} &= (3.5)(2.53 \text{ gpm}) = 8.9 \text{ gpm} \\ \text{Maximum day flow} &= (2)(2.53 \text{ gpm}) = 5.1 \text{ gpm}\end{aligned}$$

$$\text{Peak hour with Fire: } 8.9 \text{ gpm} + 1,500 \text{ gpm} = 1,509 \text{ gpm}$$

Pressure loss at proposed fire hydrant is only about 3 psi, which is negligible.

Dia.	6	inch
Flow	1500	gpm
Length	55	feet
start el	77	feet
end el	75	feet
H-W Coeff.	140	C
Static	50	psi
Press.		
Loss	0.06	psi/ft
End Press.	47.62	psi
Velocity	17.03	fps



6.0 Summary

The domestic water service to this lot will be through either a new single or double water meter saddled from the existing eight-inch line located in Pinnacle Vista Drive. One fire hydrant will be added near the entrance to the site. Based on existing city water mains, adequate water pressure and flow shouldn't be an issue.

The proposed project schedule is to start construction in the last quarter of 2017 with a twelve month construction period.

Project Name: EJFT 17221
Project Address: 6301 E Pinnacle Vista Dr, Scottsdale, AZ 85266
Date of Flow Test: 2017-10-27
Time of Flow Test: 7:37 AM
Data Reliable Until: 2018-04-27
Conducted By: Austin Gourley & Eder Cueva (EJ Flow Tests) 602.999.7637
Witnessed By: Brian Dick (City of Scottsdale) 602.228.2187
City Forces Contacted: City of Scottsdale (602.541.0586)
Permit Number: C54101

Note

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

Raw Flow Test Data

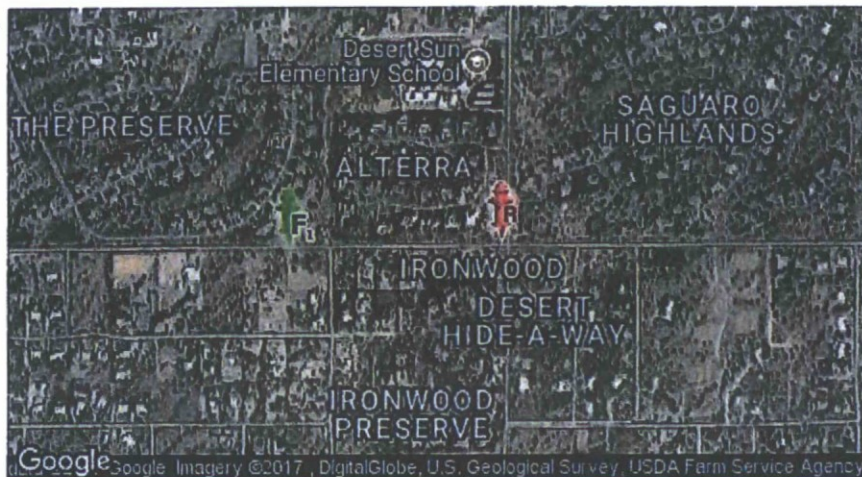
Static Pressure: 90.0 PSI
Residual Pressure: 82.0 PSI
Flowing GPM: 822
GPM @ 20 PSI: 2,653

Data with a 18 PSI Safety Factor

Static Pressure: 72.0 PSI
Residual Pressure: 64.0 PSI
Flowing GPM: 822
GPM @ 20 PSI: 2,259

Hydrant F₁

Pitot Pressure (1): 6 PSI
Coefficient of Discharge (1): 0.9
Hydrant Orifice Diameter (1): 2.5 inches
Pitot Pressure (2): 6 PSI
Coefficient of Discharge (2): 0.9
Hydrant Orifice Diameter (2): 2.5 inches



 Static-Residual Hydrant

 Flow Hydrant

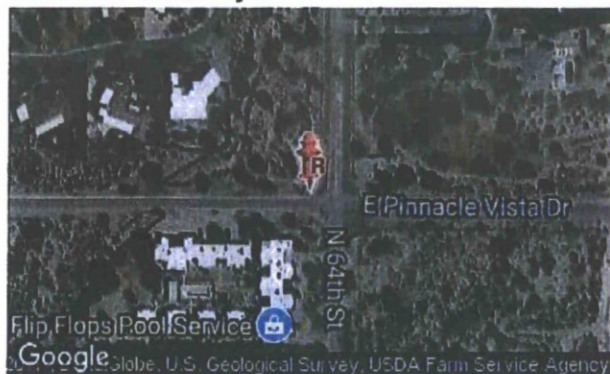
Distance Between F₁ and R
1597 ft (measured linearly)

Static-Residual Elevation
1984 ft (above sea level)

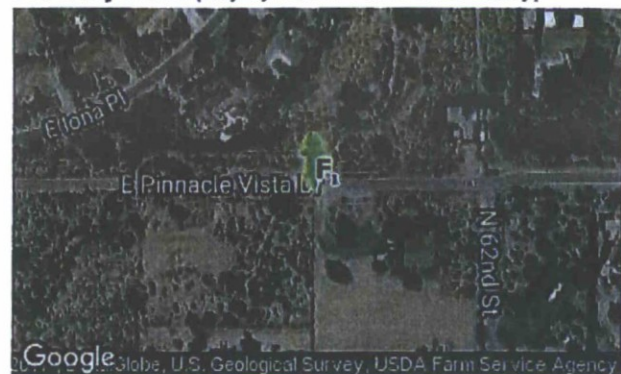
Flow Hydrant (F₁) Elevation
1961 ft (above sea level)

Elevation & distance values are approximate

Static-Residual Hydrant



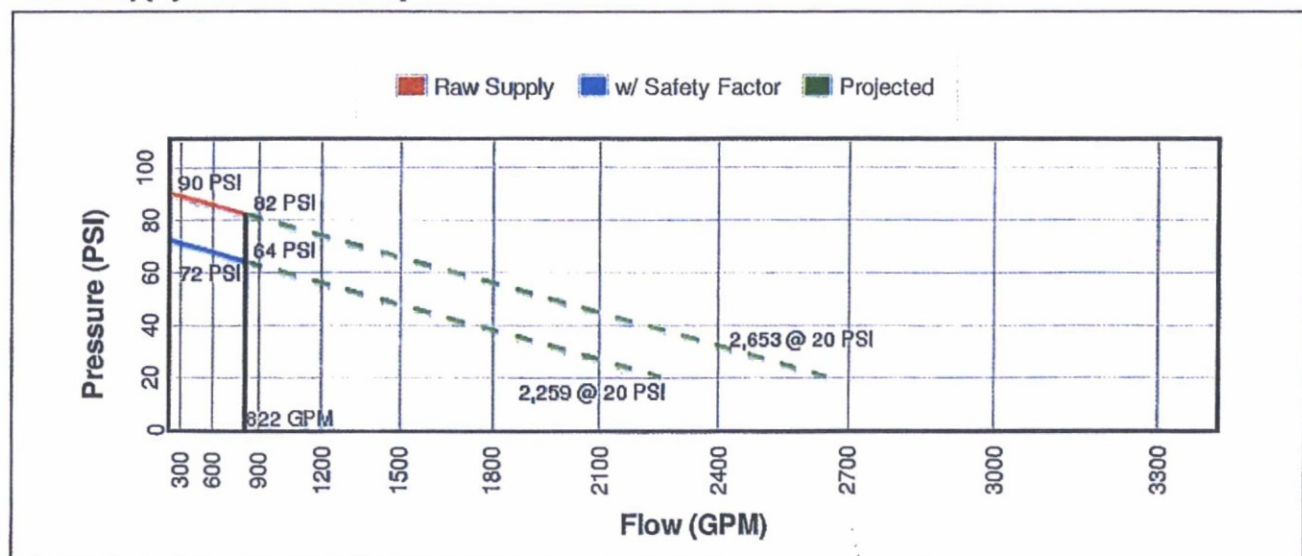
Flow Hydrant (only hydrant F1 shown for clarity)



Approximate Project Site



Map data ©2017 Google

Water Supply Curve $N^{1.85}$ Graph

EJ Flow Tests, LLC

21505 North 78th Ave. | Suite 130 | Peoria, Arizona 85382 | (602) 999-7637 | www.ejengineering.com
John L. Echeverri | NICET Level IV 078493 SME | C-16 FP Contractor ROC 271705 AZ | NFPA CFPS 1915



Flow Test Summary

Project Name: EJFT 17221-1
Project Address: 6301 E Pinnacle Vista Dr, Scottsdale, AZ 85266
Date of Flow Test: 2017-10-27
Time of Flow Test: 8:00 AM
Data Reliable Until: 2018-04-27
Conducted By: Austin Gourley & Eder Cueva (EJ Flow Tests) 602.999.7637
Witnessed By: Brian Dick (City of Scottsdale) 602.228.2187
City Forces Contacted: City of Scottsdale (602.541.0586)
Permit Number: C54101

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

Raw Flow Test Data

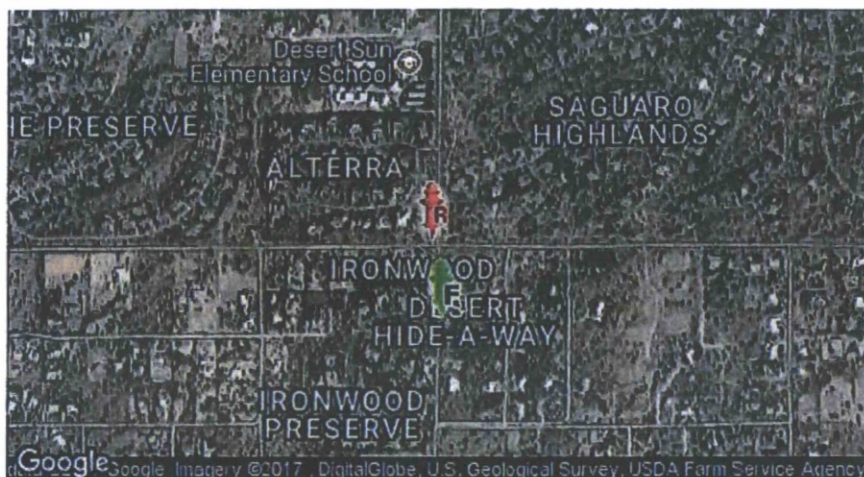
Static Pressure: 90.0 PSI
Residual Pressure: 64.0 PSI
Flowing GPM: 2,042
GPM @ 20 PSI: 3,486

Data with a 18 PSI Safety Factor


Static Pressure: 72.0 PSI
Residual Pressure: 46.0 PSI
Flowing GPM: 2,042
GPM @ 20 PSI: 2,969

Hydrant F₁

Pitot Pressure (1): 36 PSI
Coefficient of Discharge (1): 0.9
Hydrant Orifice Diameter (1): 2.5 inches
Pitot Pressure (2): 38 PSI
Coefficient of Discharge (2): 0.9
Hydrant Orifice Diameter (2): 2.5 inches



 Static-Residual Hydrant

 Flow Hydrant

Distance Between F₁ and R
580 ft (measured linearly)

Static-Residual Elevation
1984 ft (above sea level)

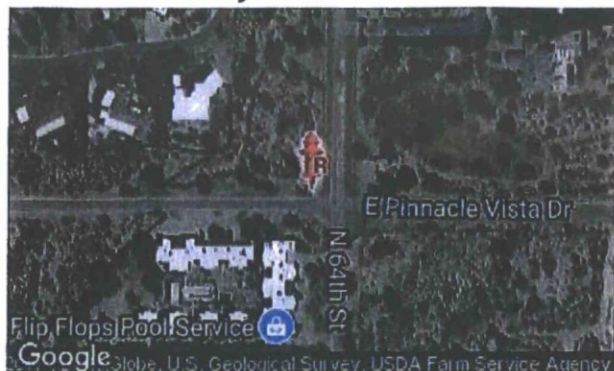
Flow Hydrant (F₁) Elevation
1977 ft (above sea level)

Elevation & distance values are approximate

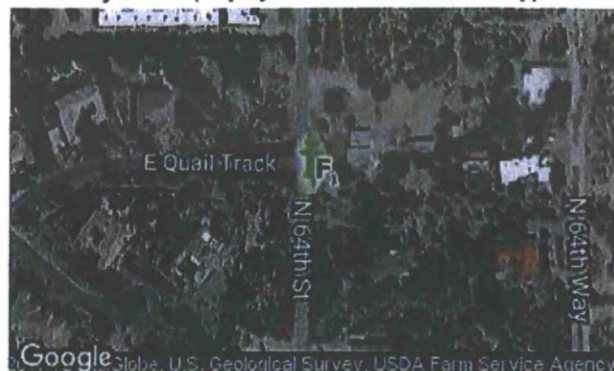
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21505 North 78th Ave. | Suite 130 | Peoria, Arizona 85382 | (602) 999-7637 | www.ejengineering.com
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Static-Residual Hydrant



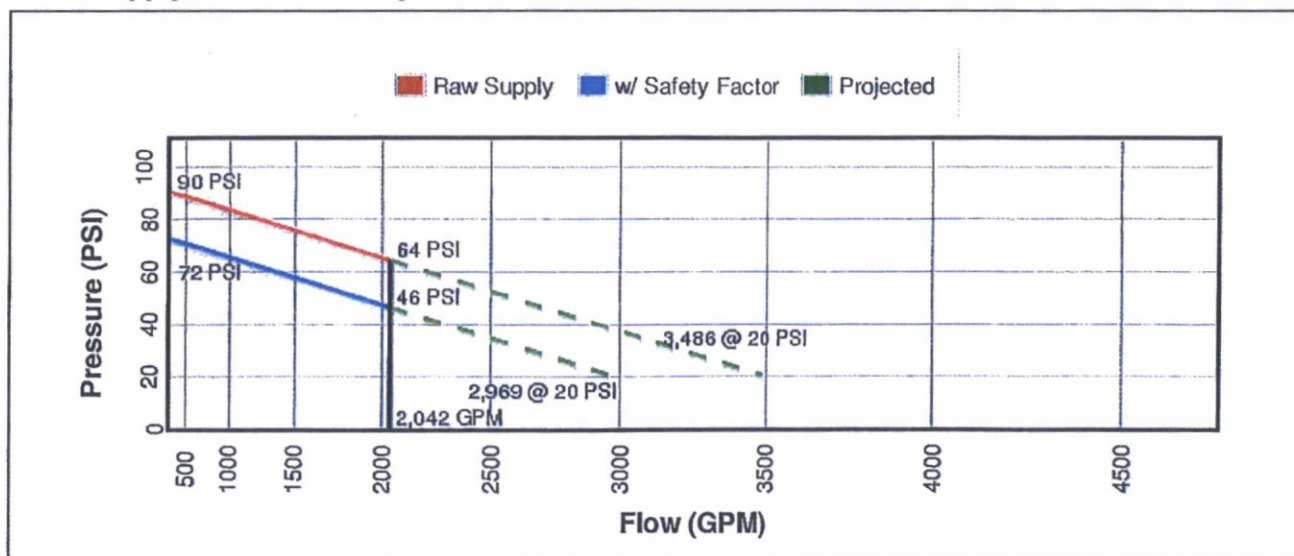
Flow Hydrant (only hydrant F1 shown for clarity)

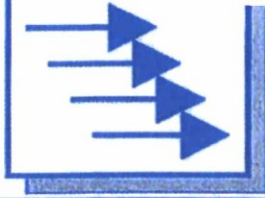


Approximate Project Site



Water Supply Curve $N^{1.85}$ Graph





Sewer Design Report

Accepted For:
City of Scottsdale
Water Resources Department
9379 E. San Salvador
Scottsdale, Arizona

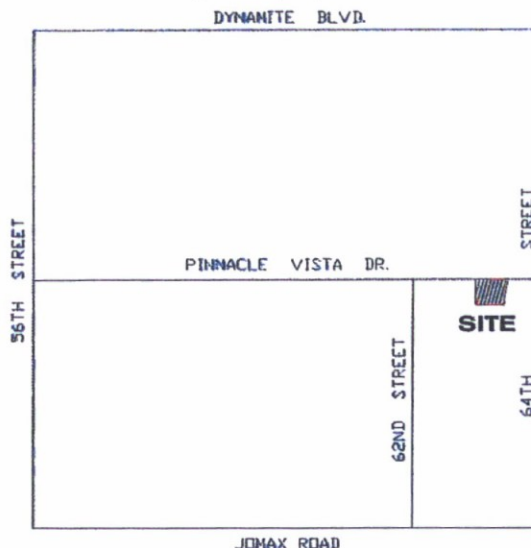
**Pinnacle Vista Apartments
6301 E Pinnacle Vista Drive
Scottsdale AZ 85266**

(G&D Project # 16-1248)

By: R. SACKS
Date: 10/30/17

PROJECT DESCRIPTION

To construct a 16 unit apartment complex and servicing the subject lot with an eight-inch sewer main extension from 62nd Street extending east within Pinnacle Vista Drive. The sewer main alignment will be along the monument line of Pinnacle Vista Drive. Two manholes, a cleanout, and approximately 677 linear feet of eight-inch pipe are required for the extension. Proposed is to tap the existing manhole in 62nd Street and extend an eight inch line south about 12 feet to a new manhole. The proposed line will continue east 500 feet to another new manhole and then extend an additional 165 feet east and terminate in a cleanout. A six-inch sewer service line (approximately 65 linear feet in right of way) will be extended into the subject lot from the eight inch main. See below for vicinity map and last page of this report for proposed (schematic) sewer construction for further information.

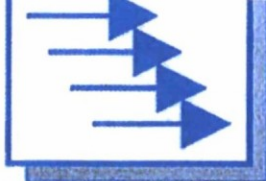


VICINITY MAP

SE 1/4 OF SECTION 33, T5N, R4E
(NOT TO SCALE)



EXPIRES 6/30/2019



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DESIGN FLOWS

Sewer design is based on Section 7-1.403 of City of Scottsdale's Design Standard and Policies Manual. Population density is assumed to be 2.5 persons per apartment. Full flow velocities will not drop below 2.5 fps nor exceed 10 fps at peak flow. Manning's value will be 0.013. Depth to diameter ratio will not exceed 0.65. Maximum manhole spacing is 500 ft.

Population is based on 16 apartment units with 2.5 persons per unit. There is no known future extension or additional residential flows for this proposed sewer main:

Design Population:	(16 unit)(2.5 persons / unit) = 40 persons
Average Daily Flow, Qavg :	(40 persons)(100 gpppd) = 4,000 gpd
Peak Day (Design) Flow:	4(Qavg) = (4)(4,000 gpd) = 16,000 gpd

$$(16,000 \text{ gpd}) / 7.48 \text{ gal/cf} / 24 / 3600 = 0.025 \text{ cfs}$$

HYDRAULIC DESIGN

Sewer system hydraulics is based on Manning's equation with $n = 0.013$. The full flow capacity (Q), velocity (V) and slopes (s) for the 8" system is as follows:

$s = 0.0052'$ per foot (see attached Plan)

$$Q = (1.49 / n)(AR^{2/3} S^{1/2}) = (1.49 / 0.013)(0.34907)(0.16666)^{2/3} (0.0052)^{1/2} = 0.87373 \text{ cfs}$$

$$Q = (0.87373 \text{ cfs})(7.48 \text{ gal/cf})(3600 \text{ sec/hr})(24 \text{ hr/day}) = 564,668 \text{ gpd} \gg 16,000 \text{ gpd required}$$



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The velocity under full flow conditions is:

$$V = (1.49 / n)(R^{2/3})(S^{1/2}) = (1.49 / 0.013) (0.16666)^{2/3} (0.0052)^{1/2} = 2.5 \text{ fps}$$

$$10.0 \text{ fps (max)} > 2.5 \text{ fps} > 2.0 \text{ fps (min)}$$

Hydraulic Toolbox was used to calculate the depth of flow.

8" Sewer main

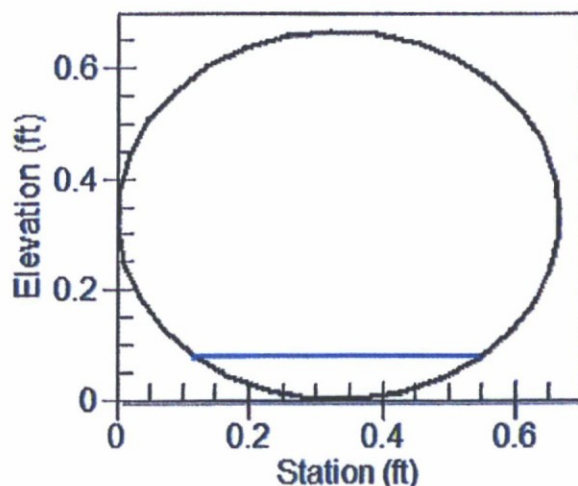
Type:	Circular	Define...
Side slope 1 (Z1):	0.0	H: 1V
Side slope 2 (Z2):	0.0	H: 1V
Channel width (B):	0.0	(ft)
Pipe diameter (D):	0.667	(ft)
Longitudinal slope:	0.0052	(ft/ft)
<input type="checkbox"/> Override default		
Manning's roughness:	0.0130	

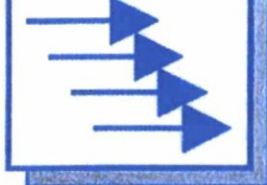
Parameter	Value	Unit
Flow	0.025	cfs
Depth	0.077	ft
Area of Flow	0.023	sq ft
Wetted Perimeter	0.463	ft
Hydraulic Radius	0.049	ft
Average Velocity	1.099	fps
Top Width (T)	0.427	ft
Froude Number	0.843	
Critical Depth	0.071	ft

Depth to Diameter Ratio is as follows:

$$d/D = 0.077 \text{ ft} / 0.667 \text{ ft} = 0.1155 < 0.65$$

Circular Channel

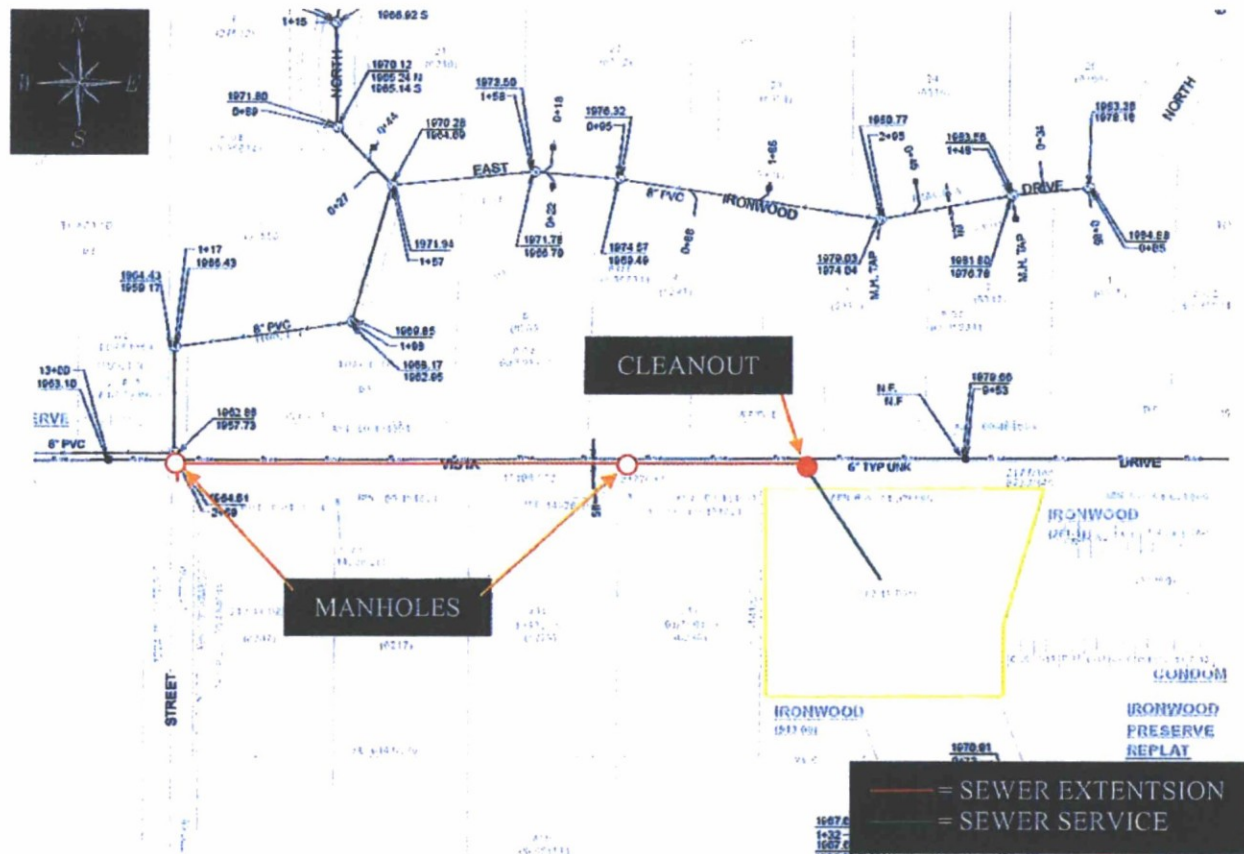




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CONSTRUCTION SCHEMATIC



Similarly, for the proposed on-site six-inch sewer service line, a six inch line is easily capable of handling the full peak flow of 16,000 gpd or 0.025 cfs with less than one-inch flow depth:

6 inch sewer

Type:	Circular	Define
Side slope 1 (L/H)	0.0	H : 1V
Side slope 2 (L/H)	0.0	H : 1V
Channel width (ft)	0.0	(ft)
Pipe diameter (D):	0.5	(ft)
Longitudinal slope:	0.0104	(ft/ft)
<input type="checkbox"/> Override default		
Manning's roughness:	0.0130	

Parameter	Value	Unit
Flow	0.025	cfs
Depth	0.071	ft
Area of Flow	0.017	sq ft
Wetted Perimeter	0.387	ft
Hydraulic Radius	0.044	ft
Average Velocity	1.459	fps
Top Width (T)	0.350	ft
Froude Number	1.161	
Critical Depth	0.077	ft