

**FINAL WASTEWATER REPORT**  
**Residential Healthcare Facility**  
**90<sup>th</sup> Street and Raintree Drive**  
**Scottsdale, AZ 85260**

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**Project Number: 200626**

**Submittal Date: February 2, 2021**

**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

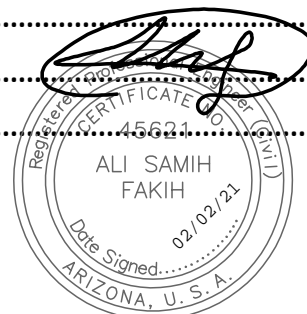
DATE 2/10/2021

**Building service line shall be 6" diameter not 4" as shown on Utility Plan.**

**4-DR-2021**  
**2/8/2021**

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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 90<sup>th</sup> 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 REPORT INTENT:

This report is being prepared to evaluate the existing and proposed wastewater demands compliant to the City's Design Standards and Policies Manual and the projects impact to the area's wastewater collection system along 90<sup>th</sup> street.

### 1.3 SITE and 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.

## 2. DESIGN DOCUMENTATION

### 2.1 DESIGN COMPLIANCE:

The proposed sewer 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 evaluate the wastewater infrastructure consists of utilizing the DS+PM unit demands for onsite flows. Sewer service pipe hydraulic capacities will be analyzing to assure conformance to the City's DS+PM criteria.

### 2.3 SOFTWARE ACKNOWLEDGEMENT:

Bentley FlowMaster® Version 8i is the computer software used for analyzing sewer hydraulics.

### 3. EXISTING CONDITIONS

#### 3.1 ZONING & LAND USE:

Land ownership includes 4.67+/- net acres of undeveloped land zoned R1-35.

#### 3.2 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.

#### 3.3 EXISTING SEWER MAINS:

City of Scottsdale Q-S 34-49 includes the proposed development. Existing sewer lines consist of:

- an 8" vitreous clay pipe (VCP) running north-south on 90<sup>th</sup> Street
- an 18" polyvinyl chloride pipe (PVC) running north-south on Pima Freeway
- a 6-inch sewer stub off the 90<sup>th</sup> Street line located approximately mid-site

Refer to **FIGURE 4** for the referenced COS sewer Q-S Maps.

#### 3.4 FLOW MONITORING:

Flow monitoring will not be needed on the main sewer line along 90<sup>th</sup> Street to analyze capacity in existing conditions.

### 4. PROPOSED CONDITIONS

#### 4.1 SITE PLAN:

Proposed development consists of a new 152-unit residential healthcare facility with 3 and 4-story components, parking, and a common area with a pool.

#### 4.2 PROPOSED SEWER SYSTEM:

Sanitary sewer service will be provided by connection to an existing 6-inch stub off the 8" VCP sewer line along 90<sup>th</sup> Street. Grease interceptors will be installed for proposed food service uses. See **APPENDIX I** for a site plan/utility plan.

#### 4.4 SEWER REQUIREMENTS:

The City’s design standards govern pipe hydraulics. Sewer should be designed to provide 2.5 fps full flow velocity while not exceeding 15 fps. The design depth over diameter (d/D) ratio of the pipe is 0.65 for pipes 12” and smaller. The d/D ratio may be bumped to 0.80 when accounting for backwash from proposed pools. Service lines will be a minimum 6” diameter at 1% minimum slope.

#### 4.5 MAINTENANCE RESPONSIBILITIES:

The on-site sewer service lines will be private and maintained by the property owner. The grease interceptor will be owned and maintained by the property owner.

### 4. SEWER SYSTEM COMPUTATIONS

#### 5.1 ONSITE SEWER DEMANDS:

The proposed development at the site consists of a residential healthcare facility including a community pool. The associated DS+PM demands along with the peaking factors are shown in Table 1 below. A summary of the total sewer demands for the proposed site are presented below in Table 2.

**Table 1: Sewer Demand Criteria**

Use	Units	Demand (gpd)	Peaking Factor
High Density Residential	per unit	140	4.50
Pool Backwash	gpm	100	N/A

**Table 2: ONSITE SEWER DEMAND CALCULATIONS PER DS+PM**

Land Use	Count	Unit	ADD per Unit (gpd)	Avg. Day Demand (gpm)	Peak Demand (gpm)
High Density Residential	152	sq. Ft.	140	15	67
Pool Backwash	1	Each	144,000	100.0	100.0
<b>Totals</b>				<b>114.8</b>	<b>166.5</b>

The proposed 6” sewer service line at S=3.0 % has a capacity of 330 gpm at d/D=0.65, sufficient to convey the peak design flow of 167 gpm. The existing 6” sewer stub at 90<sup>th</sup> Street at 1.0% has a capacity of 191 gpm at d/D=0.65, sufficient to convey the peak design flow of 167 gpm. See **APPENDIX II** for the sewer hydraulic calculations.

## 5.2 SOFTWARE ANALYSIS:

Bentley FlowMaster® Version 8i is the computer software tool used in this study.

Analysis input parameters included the following:

1. Pipe diameters (inches)
2. Pipes slopes
3. System demands (gpm)
4. Piping is PVC Manning's N-Values (n = 0.013)

Output parameters included but were not limited to:

1. Flow rate (gpm)
2. Velocities (fps)
3. Percent Full (d/D)

## 5.3 OFFSITE SEWER DEMANDS:

According to the City of Scottsdale sewer model, the existing flow discharging from the 8" sewer line on 90<sup>th</sup> street to the 10" sewer line on Raintree Drive is 70 gpm. Per the Arizona Administrative Code, the peaking factor for the residential development to the west of the property is calculated as follows:

$$PF = (6.330 \times p^{-0.231}) + 1.094$$

where:

PF= Dry weather peaking factor

p= Upstream population

$$PF = (6.330 \times (2500^{-0.231}) + 1.094 = 2.13$$

Therefore, the existing flow from the residential development is from the 8" sewer line on 90<sup>th</sup> street to the 10" sewer line on Raintree Drive is:

$$70 \text{ gpm} \times 2.13 = \mathbf{149 \text{ gpm.}}$$

**Table 3** summarizes flows to the existing 8" sewer line along 90<sup>th</sup> Street.

**Table 3 - Sewer Demands - Proposed Conditions**

Address	Street	Land Use	Units/ Area (sf)	Demand	Average Day Demand	Peaking Factor	Peak Demand	
				(gpd / unit or area)	(gpd)		gpd	gpm
Healthcare Facility	90th	High Density Residential	152	140	21,280	4.5	95,760	67
Healthcare Facility	90th	Pool	-	-	-	-	-	100
Residential Development	90th	Residential	1000	-	100,800	2.13	214,704	149
<b>Totals</b>					<b>122,080</b>		<b>310,464</b>	<b>316</b>

The existing 8" sewer service line at S=0.65% and d/D=0.8 has a capacity of 427 gpm, sufficient to convey the peak flow of 316 gpm. Refer to **APPENDIX II** for the pipe hydraulic calculation and **Appendix III** for City of Scottsdale Sewer Model.

## 6. SUMMARY

### 6.1 SUMMARY OF PROPOSED SEWER IMPROVEMENTS:

- The proposed wastewater improvements are designed based on the current City of Scottsdale's design standards and policies.
- All new on-site service line infrastructure will be privately maintained. The service line can adequately convey the onsite sewer peak demand of 167 gpm.
- Privately owned and maintained grease interceptors will be installed to serve all food preparation facilities.

### 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 Preliminary Site Plan / Utility Plan in **APPENDIX I**.

## 8 REFERENCES

1. COS QS Sewer Plan number 34-49
2. City of Scottsdale Design Standards & Policies Manual, 2017 (Chapter 7 – Sewer)

## *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*  
*Preliminary Site /*  
*Utility Plan*

# *APPENDIX I*

## *Sewer Pipe Hydraulics*

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**6" Pipe @ 0.03'/', d/D=0.65**

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**Project Description**

Friction Method	Manning Formula
Solve For	Discharge

**Input Data**

Roughness Coefficient	0.013
Channel Slope	0.03000 ft/ft
Normal Depth	3.90 in
Diameter	6.00 in

**Results**

Discharge	329.9 gpm
Flow Area	0.14 ft <sup>2</sup>
Wetted Perimeter	0.94 ft
Hydraulic Radius	1.73 in
Top Width	0.48 ft
Critical Depth	0.43 ft
Percent Full	65.0 %
Critical Slope	0.01587 ft/ft
Velocity	5.44 ft/s
Velocity Head	0.46 ft
Specific Energy	0.79 ft
Froude Number	1.80
Maximum Discharge	1.05 ft <sup>3</sup> /s
Discharge Full	0.97 ft <sup>3</sup> /s
Slope Full	0.01716 ft/ft
Flow Type	SuperCritical

## APPENDIX II – Sewer Hydraulics

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**6" Sewer @ 0.017', d/D=0.65**


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**Project Description**

Friction Method	Manning Formula
Solve For	Discharge

**Input Data**

Roughness Coefficient	0.013
Channel Slope	0.01000 ft/ft
Normal Depth	3.90 in
Diameter	6.00 in

**Results**

Discharge	190.5 gpm
Flow Area	0.14 ft <sup>2</sup>
Wetted Perimeter	0.94 ft
Hydraulic Radius	1.73 in
Top Width	0.48 ft
Critical Depth	0.33 ft
Percent Full	65.0 %
Critical Slope	0.00946 ft/ft
Velocity	3.14 ft/s
Velocity Head	0.15 ft
Specific Energy	0.48 ft
Froude Number	1.04
Maximum Discharge	0.60 ft <sup>3</sup> /s
Discharge Full	0.56 ft <sup>3</sup> /s
Slope Full	0.00572 ft/ft
Flow Type	SuperCritical

## APPENDIX II – Sewer Hydraulics

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**8" Pipe @0.0065'/'; d/D=0.8**


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**Project Description**

Friction Method	Manning Formula
Solve For	Discharge

**Input Data**

Roughness Coefficient	0.013
Channel Slope	0.00650 ft/ft
Normal Depth	6.40 in
Diameter	8.00 in

**Results**

Discharge	427.4 gpm
Flow Area	0.30 ft <sup>2</sup>
Wetted Perimeter	1.48 ft
Hydraulic Radius	2.43 in
Top Width	0.53 ft
Critical Depth	0.46 ft
Percent Full	80.0 %
Critical Slope	0.00905 ft/ft
Velocity	3.18 ft/s
Velocity Head	0.16 ft
Specific Energy	0.69 ft
Froude Number	0.75
Maximum Discharge	1.05 ft <sup>3</sup> /s
Discharge Full	0.97 ft <sup>3</sup> /s
Slope Full	0.00621 ft/ft
Flow Type	SubCritical

## APPENDIX II – Sewer Hydraulics

## *APPENDIX III*

### *COS Sewer Model Screenshot*



CONDUIT: 29356

(ID)	29356
Description	
REVIEWED	No
<input checked="" type="checkbox"/> Output	
Flow	0.10126 mgd
Flow Class	Free Surface
Depth	0.15074 ft
Critical Depth	0.18091 ft
HGL	1457.66614 ft
Velocity	2.64596 ft/s
Flow Volume	11.66602 ft <sup>3</sup>
Froude Number	1.43085
Capacity d/D	0.16963
Surcharged d/D	0.22602
Velocity*Depth	0.39884 ft <sup>2</sup> /second
Top Width	0.55756 ft
Entry Loss	0.00000 ft
Exit Loss	0.00000 ft
Seepage Rate	0.00000 mgd
Type	Circular Conduit
Flap Gate	No
Upstream Offset	0.00000 ft
Downstream Offset	0.00000 ft
Length	195.69093 ft
Friction	0.01300
Slope	0.02740
Maximum Depth	8.00000 in
Maximum Width	8.00000 ft
Full Flow	1.29283 mgd

Conduit: 29356

