HILGARTWILSON
ENGINEER | PLAN | SURVEY | MANAGE

SEWER BASIS OF DESIGN REPORT

FOR

SCOTTSDALE CONDO VILLAS

SCOTTSDALE, ARIZONA

Prepared For:
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May 2015
Project No. 1454.0202

1.0 INTRODUCTION

1.1 Project Location

Scottsdale Condo Villas (the Project) is located just north and west of the intersection of Osborn Road and Miller Road in Scottsdale, Arizona. It lies within Section 26, Township 2 North, Range 4 East of the Gila and Salt River Baseline and Meridian. The property is bounded by multi-family residential units on the north and south, Miller Road on the east, and an alley and Scottsdale Stadium on the west. Figure 1 in Appendix A provides a vicinity map for the Project.

1.2 General Description

Scottsdale Condo Villas is a proposed condominium development consisting of 24 units. The Project site currently consists of four multi-family residential buildings consisting of a total of 21 units located on the perimeter of the lot with a courtyard in the center. These existing buildings will be demolished as part of the project. Scottsdale Condo Villas is located within the City of Scottsdale Wastewater Service Area.

1.3 Purpose of Report

The purpose of this Sewer Basis of Design Report is to identify and evaluate the proposed wastewater system infrastructure for serving Scottsdale Condo Villas in accordance with the City of Scottsdale 2010 *Design Standards & Policies Manual.* This Sewer Basis of Design Report discusses the existing wastewater infrastructure within the project vicinity and identifies anticipated average daily wastewater flows and peak flows.

2.0 DESIGN CRITERIA

2.1 City of Scottsdale Design Criteria

The proposed wastewater collection system for Scottsdale Condo Villas has been prepared consistent with the design criteria provided in the City of Scottsdale 2010 *Design Standards & Policies Manual* (City of Scottsdale 2010). A summary of the design criteria is provided in Table 1 below.

TABLE 1 WASTEWATER SYSTEM DESIGN CRITERIA			
Category		Value	Unit
Average Daily Flow			
	High Density Condominium	140	gpd/unit
Peaking Factor			
	High Density Condominium	4.5	
System Layout			
	Minimum Sewer Depth of Cover	4.0	Ft
	Minimum Pipe Diameter	6	Inches
	Maximum Manhole Spacing (dia. < 15")	500	ft
	Manhole Invert Drop	0.1'	Drop across manhole
Minimum Pipe Slopes (assuming minimum Full-flow Velocity of 2.5 fps)			
	6-inch	0.00770	ft/ft
	8-inch	0.00520	ft/ft
System Performance			
	Manning's Roughness Coefficient (n)	0.013	
	Minimum Velocity	2.5	fps
	Maximum Velocity	10.0	fps
	Sewer Capacity Ratio (d/D, max at peak flow)	0.65	

3.0 WASTEWATER FLOWS

3.1 Wastewater Flow Calculations

Anticipated wastewater flows for Scottsdale Condo Villas have been calculated in accordance with the design criteria listed in Table 1. The average daily flow and peak flow for Scottsdale Condo Villas are 3,360 gpd and 15,120 gpd, respectively.

4.0 WASTEWATER SYSTEM INFRASTRUCTURE

4.1 Existing Wastewater System Infrastructure

Existing wastewater infrastructure in the vicinity of the Project includes an 8-inch gravity sewer main located along the alley adjacent to the Scottsdale Stadium property wall to the west. This main which turns to the east and runs parallel with the southern boundary of the Project for approximately 160 feet before turning south and tying into a 12-inch gravity sewer main in Osborn Road. Additionally, there are two parallel gravity sewer mains (15-inch and 24-inch) in Miller road located east of Scottsdale Condo Villas that convey flows south to Osborn Road.

4.2 Proposed Wastewater System Improvements

As shown on the Preliminary Utility Plan in Appendix A, it is proposed that the 24 condominiums in Scottsdale Condo Villas will be served by the existing 8-inch gravity sewer main along the alley to the west and also the 15-inch gravity sewer main along Miller Road to the east.

The 5 condominiums along the western boundary of the Project will have sewer service taps into the existing 8-inch sewer main in the western alley that flows to the south. The remaining 19 condominium units will be served by a proposed network of

6-inch and 8-inch gravity sewer lines that generally flow to the east and tie into the 15-inch gravity sewer main along Miller Road.

5.0 WASTEWATER COLLECTION SYSTEM CALCULATIONS

5.1 Onsite Pipe Capacity Calculations

The capacity of the proposed 6-inch and 8-inch sewer lines within Scottsdale Condo Villas have been calculated using a Manning's n value of 0.013. The capacities of the 6-inch sewer lines were calculated using a minimum slope of 0.0077 ft/ft to achieve minimum full flow velocity of 2.5 fps per City of Scottsdale Design Standards & Policies Manual. Based on the Preliminary Utility Plan, as shown in Appendix A, the maximum number of units contributing to a single 6-inch sewer line is 6 units. As such, as shown in Table B.2 in Appendix B, a 6-inch main at minimum slope has sufficient capacity to serve 6 condominium units with a Depth/Rise (d/D) ratio of 7.6% at peak flow.

The Preliminary Utility Plan shows a maximum of 19 condominium units being served by a single 8-inch gravity sewer main. As such, an 8-inch sewer main at minimum slope (0.0052 ft/ft to achieve minimum full flow velocity of 2.5 fps) has sufficient capacity to serve 19 condominium units with a d/D ratio of 10.1% at peak flow, as shown in Table B.3 in Appendix B. Since both the 6-inch and 8-inch gravity sewer lines are well under the d/D maximum of 65.0% per the City of Scottsdale, the proposed onsite system will adequately handle the anticipated flows from Scottsdale Condo Villas if installed at a minimum slope or greater.

5.2 Offsite Sewer Analysis

As previously noted, the wastewater flows from Scottsdale Condo Villas will be conveyed to the existing 8-inch sewer main along the alley to the west bordering Scottsdale Stadium, and also the 15-inch gravity sewer main along Miller Road. It is understood that the City will confirm that the downstream system has sufficient excess capacity to serve the 24 proposed condominium units in Scottsdale Condo Villas. However, considering that the existing site has 21 units, the proposed development is not anticipated to impact existing capacity.

6.0 CONCLUSIONS

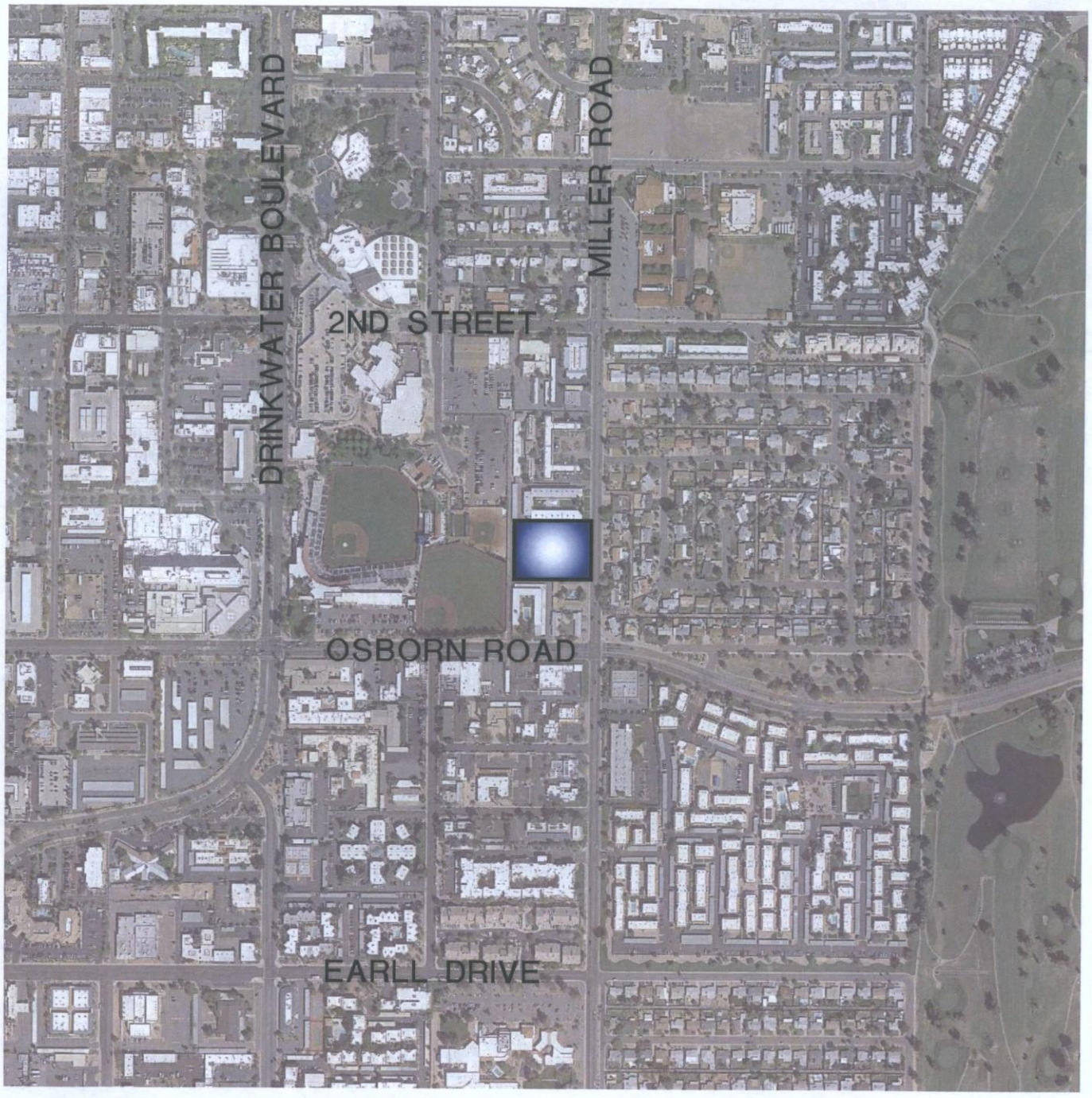
This report provides the locations and sizes of the proposed onsite wastewater collection system infrastructure to convey flows from Scottsdale Condo Villas to the existing 8-inch gravity sewer main along the bordering alley to the west and the existing 15-inch gravity sewer main along Miller Road to the east. The proposed onsite wastewater infrastructure improvements provide sufficient capacity to serve Scottsdale Condo Villas at the anticipated peak flows assuming the installation is at minimum slope or greater. This report has determined the anticipated average daily flow and peak flow for Scottsdale Condo Villas are 3,360 gpd, and 15,120 gpd, respectively.

7.0 REFERENCES

City of Scottsdale (2010). *Design Standards & Policies Manual.* January 2010, Phoenix, AZ.

A

APPENDIX A
FIGURES



LEGEND

PROJECT LOCATION

600 300 0 600

SCALE FEET

N

PROJ.NO.:	1454
DATE:	APR. 2015
SCALE:	1" = 600'
DRAWN BY:	JPG
CHECKED BY:	MI

SCOTTSDALE CONDO VILLAS
3510 N MILLER RD
SCOTTSDALE, ARIZONA

FIG 1: VICINITY MAP

HILGARTWILSON
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U:\1400\1454\ENGR\EXHIBITS\1454 FIG 1 - Vicinity Map.dwg 4/24/2015 1:43 PM

APPENDIX B
TABLES

TABLE B.1 - ONSITE 6-INCH SEWER CAPACITY CALCULATIONS

Project: Scottsdale Condo Villas
Prepared By: Mark Ipson
April 2015

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Scenario: Max flow through a 6-inch sewer main at a minimum slope of 0.0077 ft/ft with a d/D of 0.65.

Contributing Dwelling Units*:	**6**	**units**
Average Number of Gallons per Person:	140	gal/capita/day
Total Average Day Flow:	**840**	**gpd**
Peaking Factor*:	4.50	
Total Peak Flow:	**3,780**	**gpd**

Pipe Parameters:

Sewer Size (D):	**6**	**in.**
Manning's n-value (n):	0.013	
Slope (S):	0.0077	ft/ft
Hydraulic Radius (R):	0.025	ft (part full pipe)
Hydraulic Radius (R):	0.125	ft (full pipe; R=D/4)

Manning's Equation: $V = (1.486/n) * R^{(2/3)} * S^{(1/2)}$

Velocity (V, part full pipe):	0.85	fps
Velocity (V, full pipe):	2.51	fps
Depth/Rise (d/D):	**7.6%**	
% Capacity (Flow/Capacity, Q/Q_{full}):	1.2%	

$Q = (1.49/n) * A * R^{(2/3)} * S^{(1/2)}$

Pipe Capacity (Full Flow):	**0.49**	**cfs**
	319,083	**gpd**
Capacity (Excess Design):	315,281	gpd

Depth/Rise (d/D) is less than 65% under peak flow conditions, therefore adequate capacity is available.

*Notes:

1) The maximum number of condominium units served by a single 6-inch sewer main is 6 units. Scottsdale Condo Villas has a total of 24 units.
2) Minimum Slope = 0.0077 ft/ft per City of Scottsdale (minimum full flow velocity of 2.5 fps)
3) Peaking Factor is 4.5 for condominiums.

TABLE B.2 - ONSITE 8-INCH SEWER CAPACITY CALCULATIONS

Project: Scottsdale Condo Villas
Prepared By: Mark Ipson
April 2015

HILGARTWILSON
ENGINEER | PLAN | SURVEY | MANAGE

Scenario: Max flow through an 8-inch sewer main at a minimum slope of 0.0052 ft/ft with a d/D of 0.65.

Contributing Dwelling Units*:	**19**	**units**
Average Number of Gallons per Person:	140	gal/capita/day
Total Average Day Flow:	**2,660**	**gpd**
Peaking Factor*:	4.50	
Total Peak Flow:	**11,970**	**gpd**

Pipe Parameters:

Sewer Size (D):	**8**	**in.**
Manning's n-value (n):	0.013	
Slope (S):	0.0052	ft/ft
Hydraulic Radius (R):	0.043	ft (part full pipe)
Hydraulic Radius (R):	0.167	ft (full pipe; R=D/4)

Manning's Equation: $V = (1.486/n) * R^{(2/3)} * S^{(1/2)}$

Velocity (V, part full pipe):	1.01	fps
Velocity (V, full pipe):	2.50	fps
Depth/Rise (d/D):	**10.1%**	
% Capacity (Flow/Capacity, Q/Q_{full}):	2.1%	

$Q = (1.49/n) * A * R^{(2/3)} * S^{(1/2)}$

Pipe Capacity (Full Flow):	**0.87**	**cfs**
	564,715	**gpd**
Capacity (Excess Design):	552,707	gpd

Depth/Rise (d/D) is less than 65% under peak flow conditions, therefore adequate capacity is available.

*Notes:

1) The maximum number of condominium units served onsite by a single 8-inch sewer main is 19 units. Scottsdale Condo Villas has a total of 24 units.
2) Minimum Slope = 0.0052 ft/ft per City of Scottsdale (minimum full flow velocity of 2.5 fps)
3) Peaking Factor is 4.5 for condominiums.