

CAVASSON

LOCATED NEAR THE NORTHWEST CORNER OF THE HAYDEN ROAD AND THE LOOP 101
FRONTAGE ROAD INTERSECTION

PRELIMINARY SEWER REPORT-PHASE I BASIS OF DESIGN

May 7, 2019

Project No.: 18114-203

PREPARED FOR:

NATIONWIDE REALTY INVESTORS
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H U B
E N G I N

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 scan

DATE 5/8/2019

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INTRODUCTION

1.1 Project Scope

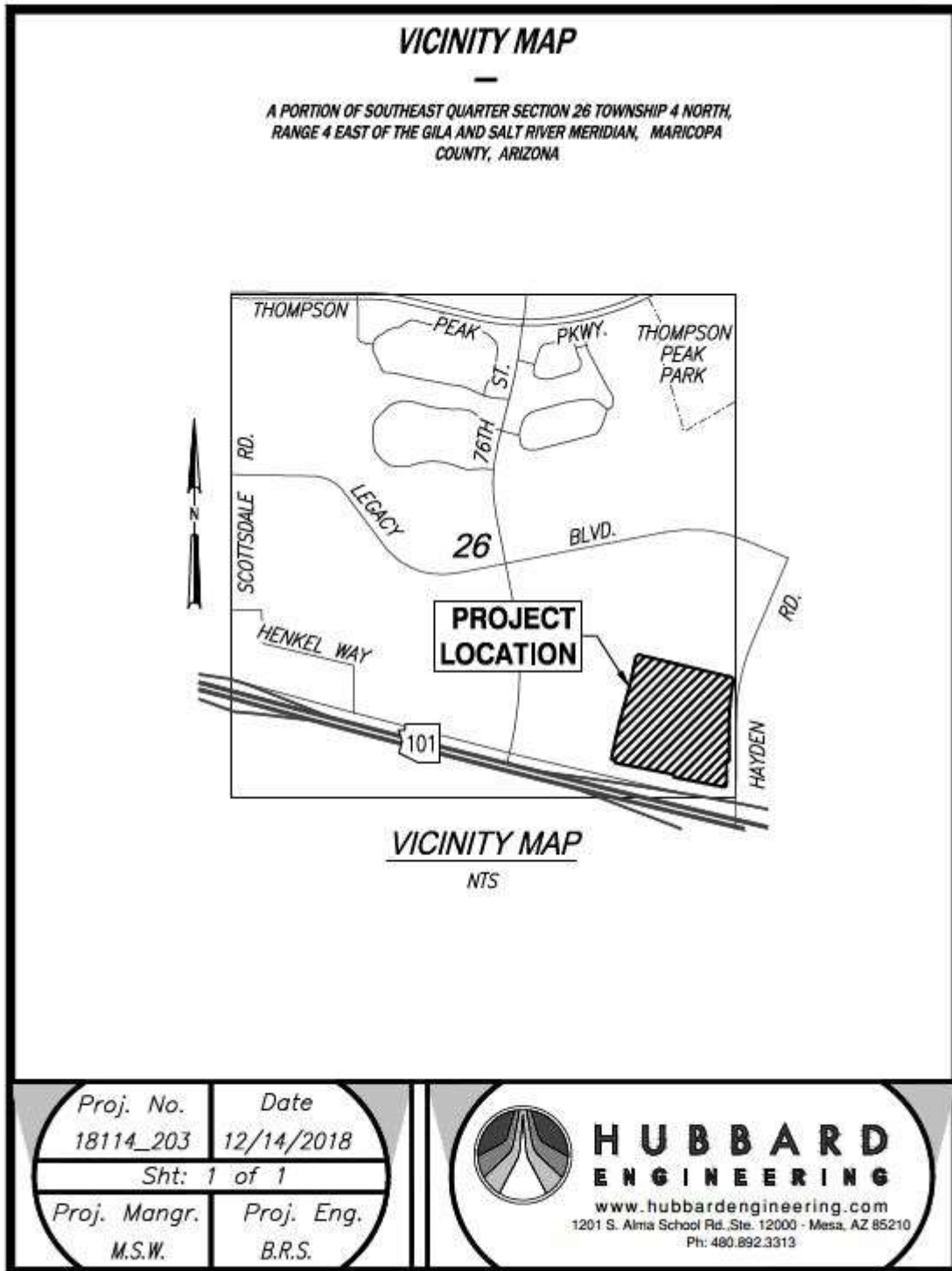
This report presents the results of a *Preliminary Sewer Study* conducted by Hubbard Engineering at the request of Nationwide Realty Investors (“client”), for Phase I of the Cavasson master development (“site”). The purpose of this report is to provide a detailed analysis for the existing and future sanitary sewer system for the development. The sewer analysis of this report will adhere to the City of Scottsdale’s *2012 Water Reuse Master Plan Update* and to Hubbard Engineering’s submitted and approved (pending) *Master Wastewater Report* dated December 18, 2018.

1.2 Site Description

The site is located in the southeast quarter of Section 26, Township 4N, Range 4E of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The site is currently undeveloped, and prior to Nationwide Realty Investor’s acquisition, was held in trust by the Arizona State Land Department (ASLD) as a portion of the overall Crossroads East development, which encompasses approximately 883 gross acres. Phase I of the Cavasson site development is located in the southwest corner of the overall development, near the Hayden Road and Loop 101 frontage 101 intersection. The land naturally falls northeast to southwest.

Phase I of Cavasson is bounded by the Loop 101 Freeway to the south, North Hayden Road to the west, and undeveloped land to the west and north. The site location is shown in **Figure 1.1** on the *Vicinity Map*.

Figure 1.1 – Vicinity Map



1.3 Project Type

The Cavasson development is being developed by Nationwide Reality Investors as a master planned mixed use development with office, retail, hotels, and multifamily residential parcels with public and private roadways that run adjacent and through the development. Phase I of the improvements includes construction of a new 445,000 sq.ft. office building and a parking garage of 3,750+/- spaces. Improvements will include surrounding access drives and utilities through the property to provide domestic water, fire, and sewer services to the proposed building and garage.

1.4 Regulatory Issues

The following documents were utilized in the preparation of this report:

- City of Scottsdale, *Design Standards & Policies Manual*.
- City of Scottsdale, *Water Reuse Master Plan Update 2012*.
- Arizona Department of Environmental Quality (ADEQ), *Engineering Bulletin 11: Minimum Requirements for Design, Submission of Plans and Specifications of Sewage Works*
- Arizona Department of Environmental Quality (ADEQ), *Aquifer Protection Permit (APP) Program*
- Maricopa Association of Governments (MAG), *Uniform Standard Specifications and Details for Public Works Construction, 2016 Edition*
- *2008 Edition of the International Plumbing Code*
- City of Scottsdale, *Ordinance No. 4346*

2. Project Description

2.1 Tie in to Existing System

There will be an 18-inch line along the private drive located just north of the Loop 101 frontage road and south of the Office building and Garage. This offsite sewer will be constructed in the infrastructure package and runs from west to east. A proposed 8-inch line will tie into the 18-inch system, which ultimately connects to the 12-inch existing system in Hayden Road. In the future, the City of Scottsdale will be extending a new 18" gravity line from this location which will travel from west to east under Hayden Road and discharge at a future sewer lift station (by others). 6-inch lines will connect from the garage and office buildings to the main 8-inch line. See **Exhibit 1** for the proposed tie-in location.

2.2 Service Area

The City of Scottsdale has one public wastewater service area. The Cavasson development is located within the City of Scottsdale's Service Area, specifically within the city's Sub-basin 4 collection area. Details regarding the capacity and infrastructure within the service area were discussed in the *Master Wastewater Report*.

The sewer for Phase I will service the proposed 445,000 sq.ft. office building and the garage. Drains located on the lower levels of the garage will drain into the sewer system rather than a storm-sewer system, as there will be oil and grease content leaking from the vehicles. A grease interceptor will also be designed and installed for this purpose. The garage only has nuisance water contributing to it.

2.3 Right of Way and Easements

The proposed sewer line for Phase 1 will be private. This private line will connect into the public sewer line.

3. Design Flows and Basis of Design

3.1 Average Daily Flow

The design unit load was determined to be 1,001 gal/acre/day (gpapd) for the office building, per the City of Scottsdale's *Water Reuse Master Plan Update 2012* and per City of Scottsdale Sewer Lift station design downstream. A multiplying factor of 1.06 was also applied to the average day flows. The unit flow and additional factor were discussed more thoroughly in the Cavasson *Master Wastewater Report*.

The total office tributary area to be serviced by the sewer system for Phase I is 11.3 acres. The garage area is 4.67 acres and the office building is 6.62 acres.

The total average daily flow was thus calculated as follows:

Average Daily Flow (ADF) = Unit Flow*Acres*Future Development Multiplier

*Office: (1,001gpapd) * (6.62 acres) *1.06 = 7041.83 gal/day*

3.2 Peak Flow

In accordance with the Cavasson *Master Wastewater Report*, a peaking factor of 2.6 was used to determine the peak flows. The total peak flows were calculated per the following equations:

Peak Daily Flow = ADF*PF

Office: 7,041.83 gal/day *2.6= 18,308.75 gal/day

The total peak daily flow is therefore 18,308.75 gpd (0.04 cfs).

3.3 Pipe Capacity and Velocity Calculations

The pipe capacity of the proposed system was calculated using the Manning's Equation:

$$Q = \frac{k}{n} R_h^{2/3} S^{1/2} A$$

where:

Q = flow rate, ft³/s;

k = conversion factor = 1.4859 ft^{1/3}/s;

n = headloss coefficient;

R_h = hydraulic radius, ft;

S = slope, ft/ft;

A = pipe cross sectional area, ft.

A summary of the calculated full flow pipe capacities and velocities can be found in **Appendix A**.

4. Design Criteria

**Note: Criteria is full flowing pipe.
Calculation in Appendix A is correct with
minimum slope of 0.0053 ft/ft.**

4.1 Flow Velocities

In accordance with the City of Scottsdale's *Design Standards and Policies Manual*, all sanitary sewers within the city shall be designed and constructed such that the mean velocity in the pipe, when flowing ~~half~~ full, shall not be less than two and a half (2.5) feet per second (fps). At this velocity, the sewer flow will typically provide adequate scouring to clean the pipe. This is standard practice in the design and analysis of sanitary sewer systems as it is greater than the minimum velocity which allows the pipe to be "self-cleaning" and minimizes the settlement of solids within the pipe. Additionally, to prevent abrasion and erosion of the pipe material, the velocity of the peak flow will not exceed 10 fps.

4.2 Manholes

In accordance with the City of Scottsdale's *Design Standards and Policies Manual*, all new sanitary sewer manholes for the 8" lines shall be installed at distances not exceeding 500 feet. There will be two new manholes constructed for Phase I. The standards also state a maximum drop of twenty-four (24) inches between inverts without the use of a drop connection and that manholes with ninety-degree bends require a minimum 0.1-foot drop across the manhole.

4.3 Minimum Pipe Sizing

The main line will be 8-inch diameter and all sanitary sewer pipes running from the buildings and connecting to the main line will be 6-inch. The line size connecting the garage to the main 8-inch line was provided by the City.

4.4 Pipe Material

All new service lines shall be PVC, per the City of Scottsdale's *Design Standards and Policies Manual*.

4.5 Sewer Cover and Separation

In accordance with the City of Scottsdale's *Design Standards and Policies Manual*:

- The sewer collection system shall have a minimum cover of four feet from the crown of a sewer pipe to finish grade.
- The sewer collection system shall have a minimum horizontal distance of six feet from a water line.
- The minimum vertical clearance of a water line crossing under or over a sanitary sewer line must be two feet.

5. Conclusions and Recommendations

A summary of the wastewater system analysis in this report is presented below.

1. Design unit flows were determined from the approved City of Scottsdale's *2012 Water Reuse Master Plan Update Final* report.
2. The site is located in the City of Scottsdale's wastewater Sub-basin 4.
3. The Average Daily Flow is 7,916 gpd. This conforms to the Master Study.
4. The total Peak Flow is 23,747 gpd. This conforms to the Master Study.
5. The proposed pipe is an 8-inch with a minimum slope of ~~0.0034~~ ft/ft
6. The lines connecting from the buildings to this main line are 6-inch lines with slopes of 2.0% The pipe size for the garage was provided by Scottsdale.

See note on page 7

6. References

1. City of Scottsdale, *Design Standards & Policies Manual*, January 18, 2018.
2. Carollo Engineers, *City of Scottsdale Water Reuse Master Plan Update 2012*, 2012.
3. Coe & Van Loo Consultants, Inc. (CVL) *Arizona State Land Department- Crossroads East Wastewater Master Plan Update*, April 13, 2008.
4. Arizona Department of Environmental Quality (ADEQ). *Engineering Bulletin 11: Minimum Requirements for Design, Submission of Plans and Specifications of Sewage Works*. May 1978.
5. Arizona Department of Environmental Quality (ADEQ). *Aquifer Protection Permit (APP) Program*.
6. Maricopa Association of Governments (MAG). *Uniform Standard Specifications and Details for Public Works Construction*. January 2016.
7. International Code Council. *2012 Edition of the International Plumbing Code*. January 1, 2012
8. City of Scottsdale, *Ordinance No. 4346*, June 17, 2018.
9. City of Scottsdale, *Ordinance No. 1147*, June 17, 2018.

Appendix A
Sewer Capacity and Velocity Calculations
Cavasson-Phase I

Hubbard Eng. Job Name: Cavasson-Phase I
 Hubbard Eng. Job No.: 18114-203

Site: Office

Sewage Generation Calculations

	Cavasson-Phase I		
Waste Water Source ¹ :	Office		
Applicable Unit ¹ :	Acres		
Sewage Design Flow per Applicable Unit, (GPD) ¹ :	1,001.00	gal/acre/day	
Number of Units:	7.46	acres	
Future Multiplying Factor:	1.06		
<hr/>			
Sub-Total GPD:	7,916	gal/day	
Total Maximum:	7,916	gal/day	(Total)
<hr/>			
Project Site Total GPD:	7,916	X	3 (Dry weather peaking factor)
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Peak Flow:	23,747	gal/day	
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Total Site GPD:	7,916	gal/day	
Total Site GPD:	5.50	gal/min	
Total Site Peak Flow:	23,747	gal/day	
Total Site Peak Flow:	16.49	gal/min	

Pipe Velocity and Capacity:

Sewer Size (D):	8	in.	
Manning's n-value (n):	0.013		
Slope (S):	0.0053	ft/ft	
Hydraulic Radius (R):	0.167	ft	R = D / 4 (full pipe)
Manning Equation:	$V = \frac{k}{n} R^{2/3} S^{1/2}$		k = 1.486
Velocity (V, full pipe):	2.520	ft/sec	2.5 ft/s. min. per C.O.S.
Pipe Capacity:	0.88	cfs	Q = V * A
	568,550	gpd	
Capacity Check:	OK		

