Appendix M2
Public Sewer System Analysis

DEXTER WILSON ENGINEERING, INC.

WATER • WASTEWATER • RECYCLED WATER

CONSULTING ENGINEERS

PUBLIC SEWER SYSTEM ANALYSIS FOR THE RENZULLI ESTATES PROJECT IN THE CITY OF SAN DIEGO

September 3, 2024

2234 FARADAY AVENUE • CARLSBAD, CA • (760) 438-4422

PUBLIC SEWER SYSTEM ANALYSIS
FOR THE RENZULLI ESTATES PROJECT
IN THE CITY OF SAN DIEGO

September 3, 2024

Prepared by:
Dexter Wilson Engineering, Inc.
2234 Faraday Avenue
Carlsbad, CA 92008
(760) 438-4422

REGISTERED PROFESSIONAL ENGINEER
NATALIE J FRASCHETTI
C 77025
EXP. 12/31/2024
CIVIL
STATE OF CALIFORNIA

Job No. 1107-001

TABLE OF CONTENTS

PAGE NO.

Introduction 1
Purpose of Study 3
Study Area 3
City of San Diego Sewer Design Criteria 5
Renzulli Estates Project Sewer Generation 6
Renzulli Estates Offsite Sewer System Analysis 7
Renzulli Estates Preliminary Onsite Sewer System Analysis 7
Conclusions and Recommendations 7

APPENDICES

APPENDIX A CITY OF SAN DIEGO SEWER DESIGN GUIDE EXCERPTS

APPENDIX B ANALYSIS OF EXISTING OFFSITE GRAVITY SEWERS

LIST OF TABLES

PAGE NO.

TABLE 1 CITY OF SAN DIEGO PUBLIC UTILITIES DEPARTMENT SEWER SYSTEM DESIGN CRITERIA 5

TABLE 2 RENZULLI ESTATES PROJECT SEWER GENERATION 6

LIST OF FIGURES

PAGE NO.

FIGURE 1 LOCATION MAP 2

FIGURE 2 EXISTING SEWER FACILITIES STUDY AREA BOUNDARY 4

DEXTER WILSON ENGINEERING, INC.

DEXTER S. WILSON, P.E.
ANDREW M. OVEN, P.E.
NATALIE J. FRASCHETTI, P.E.
STEVEN J. HENDERSON, P.E.
FERNANDO FREGOSO, P.E.
KATHLEEN H. NOEL, P.E.
WILLIAM W. TODD, P.E.

September 3, 2024

1107-001

Green Phair Scripps Partners LLC
945 East J. Street
Chula Vista, CA 91910

Attention: Austin Dias

Subject: Public Sewer System Analysis for the Renzulli Estates Project in the City of San Diego

Introduction

This report is a revision to the October 2023 report to the proposed sewer slopes within the project. This report provides a public sewer system analysis for the Renzulli Estates project in the City of San Diego. The project is located in the Scripps Miramar Ranch community, east of Interstate 15 and south of Scripps Poway Parkway. Figure 1 provides a location map for the project. The purpose of this report is to provide a revised analysis based on the project redesign.

The project encompasses approximately 40.58 gross acres (35.79 net acres) and the existing development presently consists of a single-family residence, miscellaneous outbuildings, and open space. The project proposes to redevelop the site into a 100 unit single-family subdivision and a multi-family parcel with 12 units. Topography of the site drains from south to north. The project will connect to the existing City of San Diego gravity sewer in one location at Angelique Street via Cypress Canyon Road.

2234 FARADAY AVENUE • CARLSBAD, CA 92008 • (760) 438-4422 • FAX (760) 438-0173

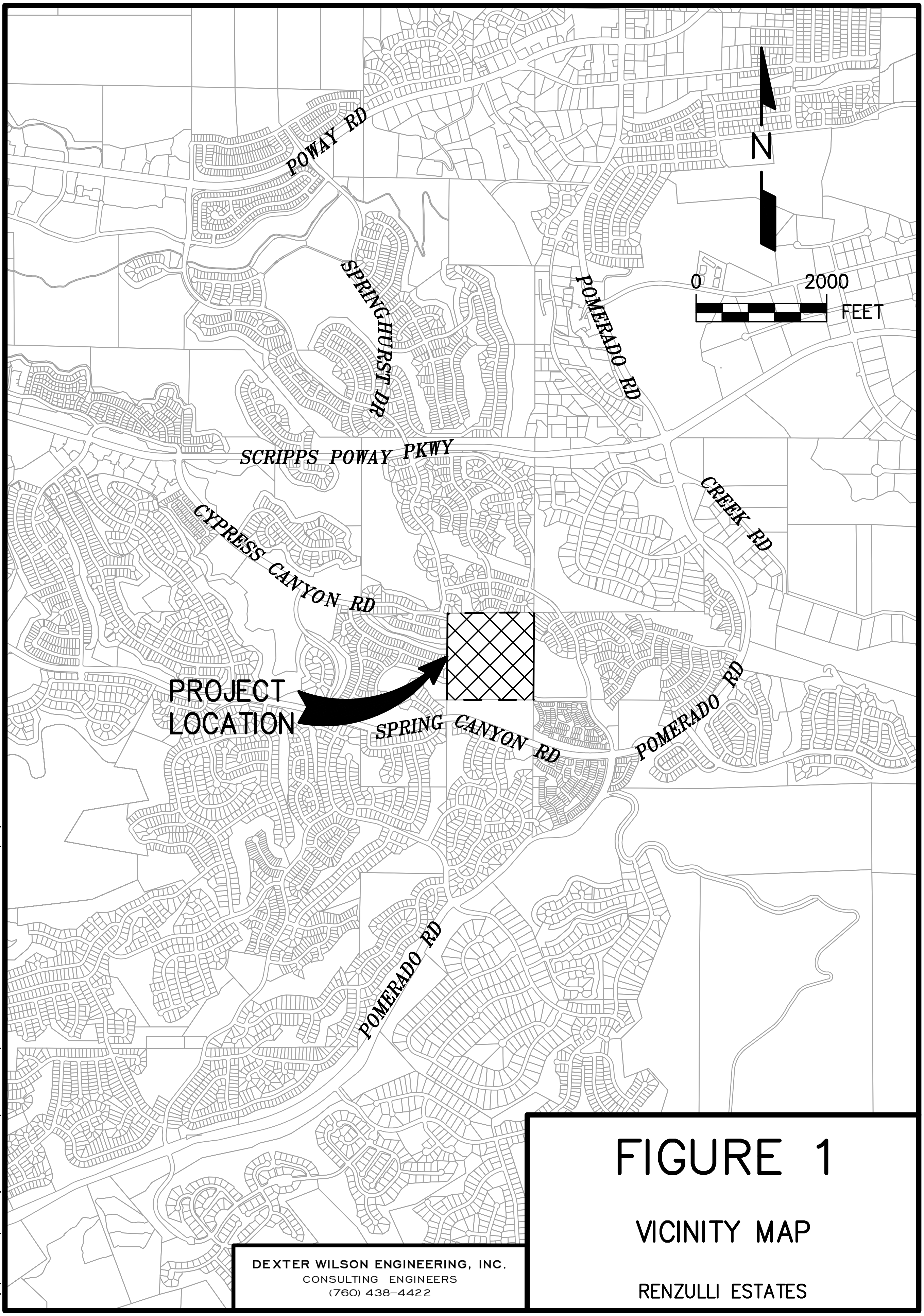


FIGURE 1

VICINITY MAP

RENZULLI ESTATES

DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
(760) 438-4422

Purpose of Study

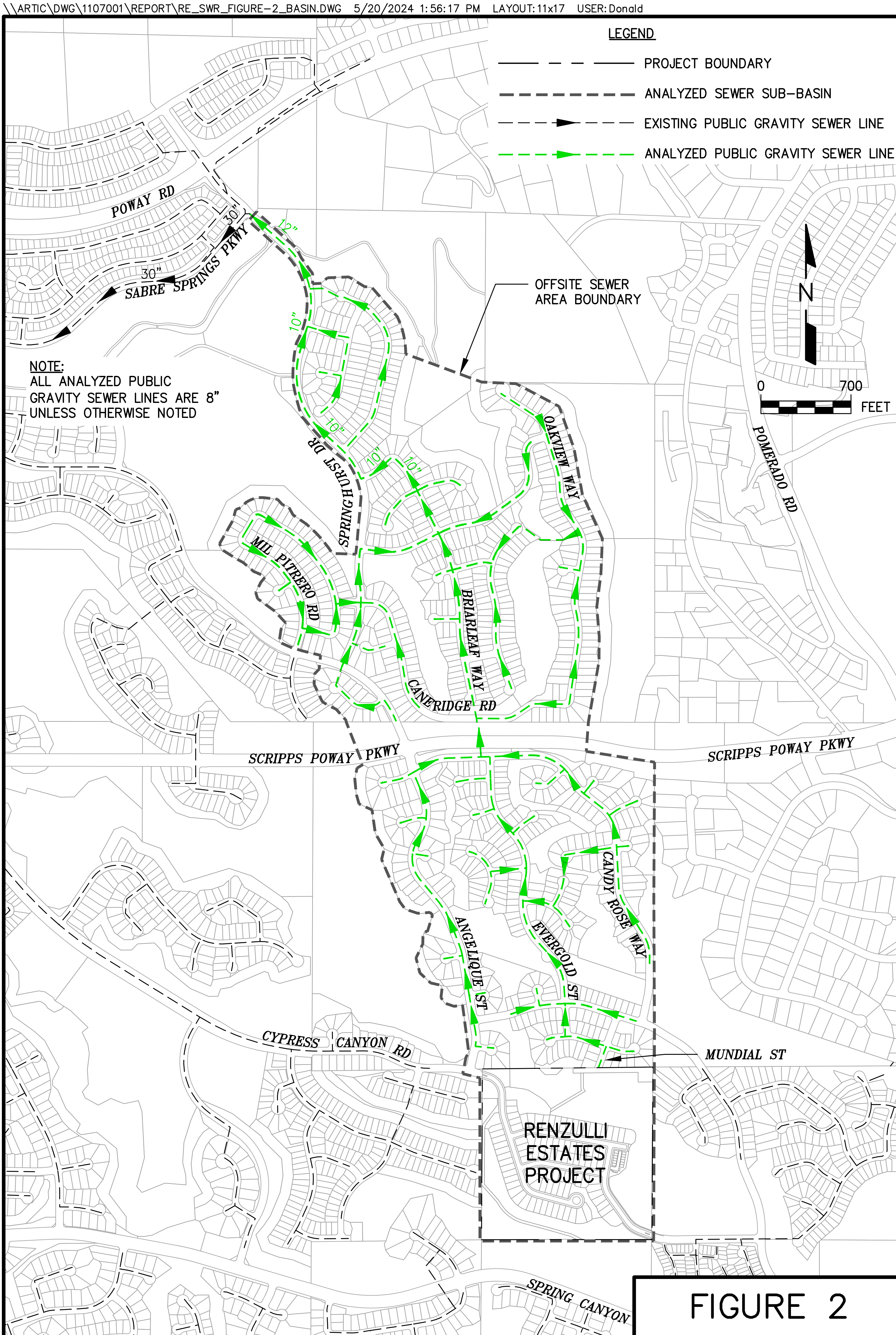
The purpose of this study is to analyze and determine if the existing public gravity sewer system in its current size and configuration has adequate capacity for the Renzulli Estates project. This report will determine the offsite (public) sewer system improvements needed, if any, for the proposed development of the project; this determination will be made in conformance with the City of San Diego sewer system design standards.

The onsite sewer facilities for the Renzulli Estates project are proposed to be public. A preliminary analysis of the proposed onsite and offsite public sewer facilities is included in this study.

Study Area

The study area for this sewer report is a tributary area of the 30-inch City of San Diego trunk sewer in Sabre Springs Parkway as presented in Figure 2. The 30-inch trunk sewer, and subsequent downstream sewers, are not being analyzed in this study as the Renzulli Estates project represents less than 10 percent of the anticipated wastewater flows within the 30-inch trunk sewer.

Wastewater generated from the Renzulli Estates project will flow through one connection to the existing gravity sewer system. The Angelique Street connection will collect wastewater flows all units. This 8-inch gravity sewer flows north toward Scripps Poway Parkway, and then north along Briarleaf Way and Springhurst Drive via 8-inch, 10-inch, and 12-inch sewers prior to connection with the 30-inch sewer in Sabre Springs Parkway. These existing public sewer facilities can be seen on Figure 2.



DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
(760) 438-4422

FIGURE 2

EXISTING SEWER FACILITIES

RENZULLI ESTATES

City of San Diego Sewer Design Criteria

Sewer system analyses criteria are based on the Sewer Design Guide, Revised May 2015, City of San Diego Public Utilities Department. This guide is used for analysis and sizing of new public gravity sewer lines and for analysis of existing gravity sewer lines. A summary of the design criteria from the Sewer Design Guide is presented in Table 1 below.

TABLE 1
CITY OF SAN DIEGO PUBLIC UTILITIES DEPARTMENT
SEWER SYSTEM DESIGN CRITERIA

Criterion	Design Requirement	Design Guide Reference
Sewage Flow Generation	80 gallons per capita	1.3.2.2
Dry Weather Peaking Factor	Figure 1-1 based on population	1.3.2.2
Wet Weather Peaking Factor	Basin specific – determined by City	1.3.2.2
Gravity Flow Hydraulic Formula	Manning's Equation	1.3.3.1
Manning's 'n'	0.013	1.3.3.1
Desirable Gravity Flow Velocity	3 fps to 5 fps	1.3.3.1
Minimum Gravity Flow Velocity	2 fps	1.3.3.1
Where 2 fps is not achievable	Set min. slope at 1%	1.3.3.1
Maximum Gravity Flow Velocity	10 fps	1.3.3.1
Maximum Depth of Flow at Peak Wet Weather		
For 15-inch Diameter Pipe and Smaller	d/D = 0.50	1.3.3.3
For 18-inch Diameter and Larger	d/D = 0.75	1.3.3.3
Minimum Acceptable Gravity Sewer Main Size		
For Residential Areas	8-inch diameter	1.3.3.4
For Commercial, Industrial, and High-Rise Bldgs.	10-inch diameter	1.3.3.4
Net Acreage	= 0.80 x Gross Acres	Table 1-1

Renzulli Estates Project Sewer Generation

The sewer generation estimate for the Renzulli Estates project was developed in accordance with the City of San Diego Sewer Design Guide and the proposed project zoning. The Renzulli Estates project is proposing 100 single-family residences and 12 multi-family units on an RX-1-1 zoning.

Table 2 presents the projected sewer generation for the Renzulli Estates project. Project flows are calculated by their connection to the existing system.

TABLE 2
RENZULLI ESTATES PROJECT
SEWER GENERATION

Land Use	Quantity, units	Population per DU	Generation Rate per DU	Average Sewer Generation, gpd
Single-Family Residential (RX-1-1 Zoning)	100	3.4/DU	280 gpd/DU	28,000
Multi-Family Residential (28.2 DUs/net acre)	12	3.4/DU	280 gpd/DU	3,360
TOTAL PROJECT FLOWS	**112**	—	—	**31,360 gpd** **21.7 gpm**

From the City of San Diego's Sewer Design Guide, Figure 1-1, the peak dry weather flow to average flow ratio is approximately 4.0 based on the formula and table presented in the figure, resulting in an estimated peak dry weather flow of 124,320 gpd (86.4 gpm). The ratio of peak wet weather flow to peak dry weather flow ratio is assumed to be 1.0 resulting in an estimated peak wet weather flow of 124,320 gpd (86.4 gpm). Appendix A of this report provides excerpts from the guide for determining these flows and peaking factors.

Renzulli Estates Offsite Sewer System Analysis

A computer spreadsheet analysis based on the Manning's formula was prepared based on City as-built drawings and is provided in Appendix B. The spreadsheet analysis considers existing offsite flows which are tributary to the gravity sewer system as well as the Renzulli Estates project. Manhole numbering, pipeline diameter, and pipeline slope correspond with City As-Built drawings and correspond with Exhibit A at the back of this report.

For the offsite portion of the analysis from the Renzulli Estates project downstream to the 30-inch pipeline in Sabre Springs Parkway, the maximum d/D which occurs with the Renzulli Estates project under peak wet weather flow conditions is 0.42 and is at the very downstream end of the study area. This maximum d/D for the 12-inch sewer line is less than the design criterion of 0.50 for 12-inch diameter sewer lines.

Renzulli Estates Preliminary Onsite Sewer System Analysis

In addition to the offsite analysis, a preliminary onsite public sewer analysis was prepared. The minimum pipe size shall be 8-inch per the City of San Diego Sewer Design Guide. An 8-inch pipe at 1 percent slope has the capacity to convey in excess of 350,000 gpd of peak wet weather flow. As such, 8-inch piping shall be sufficient throughout the project. At a minimum 1 percent slope, the maximum d/D is 0.25 for the 8-inch diameter pipes. See Appendix B for the computer spreadsheet analysis and Exhibit A for the Manhole Diagram.

Conclusions and Recommendations

The following conclusions and recommendations are summarized based on the sewer system analysis prepared for the proposed Renzulli Estates project.

1. The Renzulli Estates project proposes to construct 100 single-family residences and 12 multi-family units on a property that presently consists of a single-family residence and outbuildings.

2. Development of the project will generate an average sewage flow of 31,360 gpd.

3. The project will connect to the existing City of San Diego gravity sewer system in one location at Angelique Street via Cypress Canyon Road. This connection discharges into the 30-inch gravity sewer in Sabre Springs Parkway.

4. Offsite gravity sewer improvements are required in the immediate project vicinity in order to connect to the existing 8-inch sewer in Angelique Street. Piping shall be extended as 8-inch at a minimum slope of 1 percent.

5. No offsite gravity sewer improvements are required to existing infrastructure to provide sewer service to the proposed Renzulli Estates project.

6. All onsite sewers are proposed to be public, 8-inch in diameter, and installed at a minimum slope of 1 percent.

We appreciate the opportunity to have provided you with this report. If you have any questions regarding the information or conclusions and recommendations presented in this report, please do not hesitate to contact the undersigned.

Dexter Wilson Engineering, Inc.

Natalie J. Fraschetti, P.E.

NF:ck

Attachments

APPENDIX A

CITY OF SAN DIEGO
SEWER DESIGN GUIDE EXCERPTS

Sewer Design Guide

(Revised May, 2015)

City of San Diego

Public Utilities Department

9192 Topaz Way • San Diego, CA 92123
Tel (858) 292-6300   Fax (858) 292-6310

street alignments) and all potential points of entry of sewage from surrounding lands.

1.3.1.3 **Depth of Mains**

The planning study shall clearly identify all existing and/or proposed facilities which will exceed standard depths for sewer mains as defined in Subsection 2.2.1.5. In cases where proposed sewers will exceed 15 feet in depth, a request for design deviation (ATTACHMENT 2) must be submitted to the Water and Sewer Development Review Senior Civil Engineer with the Sewer Planning Study. A design deviation will only be approved in exceptional cases and when adequate justification is provided. Mains more than 20 feet deep shall also require approval from the Wastewater Collection Division Senior Civil Engineer.

1.3.1.4 **Existing Studies**

The City of San Diego maintains an extensive library of sewer planning studies which were prepared for lands throughout the City. These studies are available for review at the Water and Sewer Development Section, Public Utilities Department. All studies are catalogued by subdivision or trunk sewer name. Logs of sewer flow study analyses for recently monitored trunk sewers and a map of sewers which meet the Regional Water Quality Control Board (RWQCB) criteria for being critical or sub-critical may also be viewed. In addition, information regarding proposed CIP projects within the vicinity of a given project may be requested. In many cases, an addendum or reference to one of the existing planning studies may be acceptable in lieu of an independent study. Concurrent with the preparation of planning studies for sewers proposed to connect to existing canyon sewer mains, a study of flow redirection per Council Policy 400-13 and a cost-benefit analysis per Council Policy 400-14 shall be prepared (Refer to ATTACHMENT 1). An existing analysis of redirection of flows and a cost-benefit analysis, as required by Council Policies 400-13 and 400-14 respectively, may be available for reference for various existing canyon sewers.

1.3.2 **Flow Estimation**

1.3.2.1 **Land Use**

Present or future allowable land use, whichever results in higher equivalent population, shall be used to generate potential sewage flows.

1.3.2.2 **Flow Determination**

Flow definitions and calculation procedures are listed below. All calculations shall be tabulated for each sewer main section (manhole to manhole) in the format shown on Figure 1-2.

Equivalent Population: The equivalent population shall be calculated from zoning information (Ref. Section 1.6). For major new facilities such as high rise apartment buildings, flow rates (assuming one lateral) shall be checked based on the most current, adopted edition of the Uniform Plumbing Code. The most conservative flow rate shall govern.

Daily Per Capita Sewer Flow: The sewer flow for the equivalent population shall be 80 gallons per capita per day (gpcd).

Average Dry Weather Flow (ADWF): Equivalent populations shall be used to calculate the average dry weather flow. The average dry weather flow for each sewer main reach (manhole to manhole) shall be determined by multiplying the total accumulated equivalent population contributing to that reach by 80 gallons per capita per day:

Average Dry Weather Flow = (80 gpcpd) x (Equivalent Population)

Peaking Factor for Dry Weather Flow (PFDWF): The peaking factor is the ratio of peak dry weather flow to average dry weather flow. It is dependent upon the equivalent population within a tributary area. The tributary area is the area upstream of, and including, the current reach for the total flow in each reach of pipe. Figure 1-1, consisting of the table prepared by Holmes and Narver in 1960, shall be used to determine peaking factors for each tributary area. In no instance shall the dry weather flow peaking factor be less than 1.5.

Peak Dry Weather Flow (PDWF): The peak dry weather flow for each sewer main reach shall be determined by multiplying the average dry weather flow by the appropriate peaking factor (Note that peak dry weather flows are not algebraically cumulative as routed through the sewer system, i.e. the peak dry weather flow at any point shall be based on the equivalent population in the basin to that point (Ref. Figure 1-2).

Peak Dry Weather Flow = (Average Dry Weather Flow) x (Dry Weather Flow Peaking Factor)

Peaking Factor for Wet Weather Flow (PFWWF): The peaking factor for wet weather flow is the ratio of peak wet weather flow to peak dry weather flow. It is basin-specific and shall be based on essential information available at the time of the planning study. Information such as historical rainfall/sewage flow data, land use, soil data, pipe/manhole age, materials and conditions, groundwater elevations (post development), inflow and infiltration (I/I) studies, size, slope and densities of the drainage basin, etc., should be utilized in the wet weather analysis to estimate the peaking factor for wet weather. Upward adjustments shall be made in areas with expected high inflow and infiltration (i.e. high ground water or in areas with lush landscaping schemes). Flow meters are installed throughout the City's sewer system. Flow data collected from these meters are available upon request. The objective of this analysis is to quantify the magnitude of peak wet weather flow with a 10-year return period on a statistical basis.

The Senior Civil Engineer overseeing the preparation of the planning study shall coordinate with the City Sewer Modeling Group for approval of the peaking factors to be used for design.

Peak Wet Weather Flow (PWWF): The peak wet weather flow (or design flow) for a gravity sewer main reach shall be determined by multiplying the peak dry weather flow (ref. Figure 1-2) by the appropriate wet weather peaking factor. The peak wet weather flow is the design flow for a gravity sewer main. It is determined at any point in the system based on the associated upstream average dry weather flow in the basis to that point times the peaking factor for wet weather.

Peak Wet Weather Flow = (Peak Dry Weather Flow) x (Wet Weather Peaking Factor)

1.3.3 Pipe Sizing Criteria

1.3.3.1 Hydraulic Requirements

Manning's formula for open-channel flows shall be used to calculate flows in gravity sewer mains. Manning's coefficient of roughness "n" shall be assumed to be 0.013 for all types of sewer pipe. Sewer grades shall be designed for velocities of 3 to 5 feet per second (fps) where possible. This is extremely important in areas where peak flow will not be achieved for many years. The minimum allowable velocity is 2 fps at calculated peak dry weather flow, excluding infiltration. Sewer mains that do not sustain 2 fps at peak flows shall be designed to have a minimum slope of 1 percent. Additional slope may be required by the Senior Civil Engineer where fill of varied depth is placed below the pipe in order to provide adequate slope after expected settlement occurs. The maximum allowable velocity shall be 10 fps and shall be avoided by adjusting slopes, by increasing the pipe diameter, or by utilizing a vertical curve transition to lower velocities per subsections 2.2.4 and 2.2.9.4. If the Senior Civil Engineer approves a velocity greater than 10 fps, the pipe shall be upgraded to SDR 18 PVC (standard dimension ratio polyvinyl chloride), concrete-encased VC (vitrified clay), or PVC sheet-lined reinforced concrete pipe.

1.3.3.2 Slope

Slope shall be calculated as the difference in elevation at each end of the pipe divided by the horizontal length of the pipe, and shall be a constant value between manholes.

1.3.3.3 Ratio of Depth of Flow to Pipe Diameter (d_n/D)

New sewer mains 15 inches and smaller in diameter shall be sized to carry the projected peak wet weather flow at a depth not greater than half of the inside diameter of the pipe (d_n/D not to exceed 0.5). New sewer mains 18 inches and larger shall be sized to carry the projected peak wet weather flow at a depth of flow not greater than 3/4 of the inside diameter of the pipe (d_n/D not to exceed 0.75).

1.3.3.4 Minimum Pipe Sizes

The size of a sewer pipe is defined as the inside diameter of the pipe. Sewer mains shall be a minimum of 8 inches in diameter in residential areas, and a minimum of 10 inches in commercial, industrial, and high-rise building areas.

1.3.4 Sewer Study Exhibit Criteria

The DESIGN ENGINEER's sewer study exhibits shall be used to evaluate hydraulics and to establish minimum street and easement widths. Therefore, these documents need to reflect depths and separation of mains from other utilities and improvements. Refer to the Minimum Intake Standards for Sewer Studies in Subsection 1.8.

1.3.5 Private On-Site Wastewater Treatment and Reuse

Refer to Attachment 6 for permitting guidelines of private on-site wastewater treatment and reuse in the City of San Diego.

1.4 SEPARATION OF MAINS

1.4.1 Horizontal Separation

1.4.1.1 Wet Utilities

The separation of water, sewer, reclaimed water mains, and storm drains shall comply with the *State of California Department of Health Services Criteria for the Separation of Water Mains and Sanitary Sewers*. At least 10 feet of horizontal separation shall be maintained between the nearest outer surfaces of sewer lines and potable water mains. More stringent separation requirements

TABLE 1-1
CITY OF SAN DIEGO SEWER DESIGN GUIDE
DENSITY CONVERSIONS

Zone	Maximum Density (DU/Net Ac)	Population per DU	Equivalent Population (Pop/Net Ac)
AR-1-1, RE-1-1	0.1	3.5	0.4
RE-1-2	0.2	3.5	0.7
AR-1-2, RE-1-3	1	3.5	3.5
RS-1-1, RS-1-8	1	3.5	3.5
RS-1-2, RS-1-9	2	3.5	7.0
RS-1-3, RS-1-10	3	3.5	10.5
RS-1-4, RS-1-11	4	3.5	14.0
RS-1-5, RS-1-12	5	3.5	17.5
RS-1-6, RS-1-13	7	3.5	24.5
RS-1-7, RS-1-14	9	3.5	31.5
RX-1-1	11	3.4	37.4
RT-1-1	12	3.3	39.6
RX-1-2, RT-1-2, RU-1-1	14	3.2	44.8
RT-1-3, RM-1-2	17	3.1	52.7
RT-1-4	20	3.0	60.0
RM-1-3	22	3.0	66.0
RM-2-4	25	3.0	75.0
RM-2-5	29	3.0	87.0
RM-2-6	35	2.8	98.0
RM-3-7, RM-5-12	43	2.6	111.8
RM-3-8	54	2.4	129.6
RM-3-9	73	2.2	160.6
RM-4-10	109	1.8	196.2
RM-4-11	218	1.5	327.0

TABLE 1-1
CITY OF SAN DIEGO SEWER DESIGN GUIDE
DENSITY CONVERSIONS (Continued)

Zone	Maximum Density (DU / Net Ac)	Population Per DU	Equivalent Population (Pop/Net Ac)
Schools/Public	8.9	3.5	31.2
Offices	10.9	3.5	38.2*
Commercial/Hotels	12.5	3.5	43.7*
Industrial	17.9	3.5	62.5*
Hospital	42.9	3.5	150.0*

Figures with asterisk (*) represent equivalent population per floor of the building.

Definitions:
DU = Dwelling Units
Ac = Acreage
Pop = Population

Net Acreage is the developable lot area excluding areas that are dedicated as public streets in acres. Gross Area is the entire area in acres of the drainage basin, including lots, streets, etc.

For undeveloped areas, assume Net Acreage = 0.8 x Gross Area in Acres

For developed areas, calculate actual Net Acreage.

Tabulated figures are for general case. The tabulated figures shall not be used if more accurate figures are available.

Population is based on actual equivalent dwelling units (EDU) or the maximum estimate obtained from zoning.

Conversion of Fixture Units to Equivalent Dwelling Units (EDU): The Water Meter Data Card, maintained by the Development Services Department, contains a table of plumbing fixtures that should be used for determining the equivalent dwelling units (EDU's) for the purpose of estimating the rate of wastewater generation in residential, commercial, or industrial areas. Currently, the basis for conversion is: 20 fixtures = 1 EDU and 1 EDU = 280 gallons of wastewater per day.

In high rise building areas, flow rates shall be based on the most current, adopted edition of the applicable Plumbing Code, assuming one lateral per area. The most conservative flow rate shall govern.

PUBLIC UTILITIES DEPARTMENT

PEAKING FACTOR FOR SEWER FLOWS
(Dry Weather)

Ratio of Peak to Average Flow*
Versus Tributary Population

Population	Ratio of Peak to Average Flow	Population	Ratio of Peak to Average Flow
200	4.00	4,800	2.01
500	3.00	5,000	2.00
800	2.75	5,200	1.99
900	2.60	5,500	1.97
1,000	2.50	6,000	1.95
1,100	2.47	6,200	1.94
1,200	2.45	6,400	1.93
1,300	2.43	6,900	1.91
1,400	2.40	7,300	1.90
1,500	2.38	7,500	1.89
1,600	2.36	8,100	1.87
1,700	2.34	8,400	1.86
1,750	2.33	9,100	1.84
1,800	2.32	9,600	1.83
1,850	2.31	10,000	1.82
1,900	2.30	11,500	1.80
2,000	2.29	13,000	1.78
2,150	2.27	14,500	1.76
2,225	2.25	15,000	1.75
2,300	2.24	16,000	1.74
2,375	2.23	16,700	1.73
2,425	2.22	17,400	1.72
2,500	2.21	18,000	1.71
2,600	2.20	18,900	1.70
2,625	2.19	19,800	1.69
2,675	2.18	21,500	1.68
2,775	2.17	22,600	1.67
2,850	2.16	25,000	1.65
3,000	2.14	26,500	1.64
3,100	2.13	28,000	1.63
3,200	2.12	32,000	1.61
3,500	2.10	36,000	1.59
3,600	2.09	38,000	1.58
3,700	2.08	42,000	1.57
3,800	2.07	49,000	1.55
3,900	2.06	54,000	1.54
4,000	2.05	60,000	1.53
4,200	2.04	70,000	1.52
4,400	2.03	90,000	1.51
4,600	2.02	100,000+	1.50

***Based on formula:** **Peak Factor = 6.2945 x (pop)$^{-0.1342}$**
(Holmes & Narver, 1960)

FIGURE 1-1

APPENDIX B

ANALYSIS OF PROPOSED ONSITE AND EXISTING OFFSITE GRAVITY SEWERS

Slope Calculations
Project #: 1107-001, Renzulli Estates

FROM	TO	RIM 1	RIM 2	IE 1	IE 2	LENGTH (ft)	LINE SIZE (inches)	DESIGN SLOPE (%)
4	2	848.5	842.3	838.7	832.0	202.8	8	3.30
6	4	849.4	848.5	839.7	838.7	94.5	8	1.06
10	6	853.2	849.4	843.6	839.7	384.0	8	1.02
14	10	864.7	853.2	855.4	843.6	288.8	8	4.09
18	14	880.5	864.7	871.0	855.7	317.6	8	4.82
22	18	889.4	880.5	877.4	871.0	319.3	8	2.00
26	10	855.5	853.2	846.3	843.6	258.0	8	1.05
48	26	873.4	855.5	864.4	846.3	337.4	8	5.36
52	48	890.8	873.4	881.8	864.4	344.2	8	5.05
56	52	897.3	890.8	888.3	881.8	379.6	8	1.71
32	26	857.2	855.5	848.2	846.3	149.5	8	1.27
36	32	858.2	857.2	849.2	848.2	98.6	8	1.01
40	36	861.0	858.2	852.6	849.2	332.0	8	1.02
44	40	861.0	861.0	853.0	852.6	37.6	8	1.06

Slope based on manhole center to manhole center.
Souce: Hunsaker TTM received May 9, 2024.

DATE 5/20/2024 5/20/2024

SEWER STUDY SUMMARY

FOR: Renzulli Estates Onsite Sewer Analysis - Angelique Street Connection

SHT 1 OF 1

JOB NUMBER: 1107-001

BY: Dexter Wilson Engineering, Inc.

FROM M.H.	TO M.H	POP. PER D.U.	IN-LINE DUs	POPULATION SERVED		SEWAGE PER CAPITA/DAY (gpd/person)	AVG. DRY WEATHER FLOW (gpd)	PEAKING FACTOR	PEAK FLOW (gpd)	PEAK FLOW (DESIGN FLOW)		LINE SIZE (inches)	DESIGN SLOPE (%) (1)	DEPTH K' (2)	dn (feet)	dn/D (3)	C_a for Velocity (4)	VELOCITY (f.p.s.)
				IN-LINE	TOTAL					M.G.D.	C.F.S.							
56	52	3.4	7.00	23.8	23.8	80	1,904	4.000	7,616	0.008	0.012	8	1.71	0.003454	0.04091	0.061	0.0199	1.33
52	48	3.4	12.00	40.8	64.6	80	5,168	4.000	20,672	0.021	0.032	8	5.05	0.005456	0.05072	0.076	0.0274	2.63
48	26	3.4	8.00	27.2	91.8	80	7,344	4.000	29,376	0.029	0.045	8	5.36	0.007525	0.05912	0.089	0.0343	2.98
44	40	3.4	2.00	6.8	6.8	80	544	4.000	2,176	0.002	0.003	8	1.06	0.001253	0.02535	0.038	0.0098	0.77
40	36	3.4	13.00	44.2	51.0	80	4,080	4.000	16,320	0.016	0.025	8	1.02	0.009584	0.06637	0.100	0.0406	1.40
36	32	3.4	3.00	10.2	61.2	80	4,896	4.000	19,584	0.020	0.030	8	1.01	0.011557	0.07257	0.109	0.0463	1.47
32	26	3.4	6.00	20.4	81.6	80	6,528	4.000	26,112	0.026	0.040	8	1.27	0.013742	0.07873	0.118	0.0522	1.74
26	10	3.4	9.00	30.6	204.0	80	16,320	3.987	65,062	0.065	0.101	8	1.05	0.037657	0.12843	0.193	0.1060	2.14
22	18	3.4	23.00	78.2	78.2	80	6,256	4.000	25,024	0.025	0.039	8	2.00	0.010494	0.06925	0.104	0.0433	2.01
18	14	3.4	14.00	47.6	125.8	80	10,064	4.000	40,256	0.040	0.062	8	4.82	0.010875	0.07044	0.106	0.0443	3.16
14	10	3.4	6.00	20.4	146.2	80	11,696	4.000	46,784	0.047	0.072	8	4.09	0.013720	0.07867	0.118	0.0521	3.13
10	6	3.4	9.00	30.6	380.8	80	30,464	3.397	103,496	0.103	0.160	8	1.02	0.060776	0.16310	0.245	0.1489	2.42
6	4	3.4	0.00	0.0	380.8	80	30,464	3.397	103,496	0.103	0.160	8	1.06	0.059618	0.16152	0.242	0.1469	2.45
4	2	3.4	0.00	0.0	380.8	80	30,464	3.397	103,496	0.103	0.160	8	3.30	0.033789	0.12186	0.183	0.0983	3.67

Total DUs	Total Pop.	Min Slope	Max dn/D
112.0	381	1.01	0.24

1 Assumed minimum slope of 1.0%
2 K' based on n = 0.013
3 dn/D using K' Brater King Table 7-14
4 From Brater King Table 7-4 based on dn/D

DATE: 3/3/2023

SEWER STUDY SUMMARY

FOR: Renzulli Estates Offsite Sewer Analysis

SHT 1 OF 1

JOB NUMBER: 1107-001

BY: Dexter Wilson Engineering, Inc.

REFER TO PLAN SHEET:

FROM M.H.	TO M.H	POP. PER D.U.	IN-LINE DUs	POPULATION SERVED		SEWAGE PER CAPITA/DAY (gpd/person)	AVG. DRY WEATHER FLOW (gpd)	PEAKING FACTOR	PEAK FLOW (gpd)	PEAK FLOW (DESIGN FLOW)		LINE SIZE (inches)	DESIGN SLOPE (%)	DEPTH K' [1]	dn (feet)	dn/D[2]	C_a for Velocity[3]	VELOCITY (f.p.s.)
				IN-LINE	TOTAL					M.G.D.	C.F.S.							
2	Ex. 25	3.5	112.00	0	381	80	30,464	3.397	103,496	0.103	0.160	8	1.00	0.061380	0.16392	0.246	0.1500	2.40
Ex 25	Ex 24	3.5	8.00	28.0	408.8	80	32,704	3.304	108,054	0.108	0.167	8	8.61	0.021840	0.09853	0.148	0.0723	5.20
Ex 24	Ex 17	3.5	0.00	0.0	408.8	80	32,704	3.304	108,054	0.108	0.167	8	6.86	0.024467	0.10410	0.156	0.0783	4.80
Ex 17	Ex 16	3.5	12.00	42.0	450.8	80	36,064	3.164	114,106	0.114	0.177	8	5.24	0.029563	0.11419	0.171	0.0895	4.44
Ex 16	Ex 15	3.5	7.00	24.5	475.3	80	38,024	3.082	117,203	0.117	0.181	8	2.00	0.049150	0.14659	0.220	0.1280	3.19
Ex 15	Ex 14	3.5	8.00	28.0	503.3	80	40,264	2.997	120,681	0.121	0.187	8	8.39	0.024709	0.10460	0.157	0.0789	5.33
Ex 14	Ex 13	3.5	4.00	14.0	517.3	80	41,384	2.986	123,555	0.124	0.191	8	6.80	0.028100	0.11137	0.167	0.0863	4.98
Ex 13	Ex 12	3.5	7.00	24.5	541.8	80	43,344	2.965	128,522	0.129	0.199	8	5.92	0.031327	0.11746	0.176	0.0932	4.80
Ex 12	Ex 11	3.5	15.00	52.5	594.3	80	47,544	2.921	138,896	0.139	0.215	8	7.85	0.029401	0.11389	0.171	0.0891	5.43
Ex 11	Ex 10	3.5	12.00	42.0	636.3	80	50,904	2.886	146,930	0.147	0.227	8	8.59	0.029732	0.11450	0.172	0.0898	5.69
Ex 10	Ex 9	3.5	0.00	0.0	636.3	80	50,904	2.886	146,930	0.147	0.227	8	4.16	0.042724	0.13670	0.205	0.1159	4.41
Ex 9	Ex 1	3.5	0.00	0.0	636.3	80	50,904	2.886	146,930	0.147	0.227	8	2.00	0.061617	0.16424	0.246	0.1504	3.40
Ex 1	Ex 2	3.5	283.00	990.5	1626.8	80	130,144	2.355	306,442	0.306	0.474	8	5.15	0.080085	0.18760	0.281	0.1813	5.89
Ex 2	Ex 55	3.5	9.00	31.5	1658.3	80	132,664	2.348	311,540	0.312	0.482	8	2.00	0.130648	0.24220	0.363	0.2578	4.21
Ex 55	Ex 56	3.5	16.00	56.0	1714.3	80	137,144	2.337	320,525	0.321	0.496	8	2.00	0.134416	0.24590	0.369	0.2631	4.24
Ex 56	Ex 57	3.5	10.00	35.0	1749.3	80	139,944	2.330	326,089	0.326	0.505	8	1.82	0.143353	0.25462	0.382	0.2758	4.12
Ex 57	Ex 39	3.5	16.00	56.0	1805.3	80	144,424	2.319	334,911	0.335	0.518	8	3.64	0.104108	0.21485	0.322	0.2188	5.33
Ex 39	Ex 61	3.5	164.00	574.0	2379.3	80	190,344	2.229	424,303	0.424	0.657	8	4.58	0.117584	0.22901	0.344	0.2388	6.19
Ex 61	Ex 62	3.5	192.00	672.0	3051.3	80	244,104	2.135	521,130	0.521	0.806	8	5.02	0.137943	0.24936	0.374	0.2681	6.77
Ex 62	Ex 63	3.5	33.00	115.5	3166.8	80	253,344	2.123	537,930	0.538	0.832	10	2.88	0.103683	0.26799	0.322	0.2182	5.49
Ex 63	Ex 8	3.5	12.00	42.0	3208.8	80	256,704	2.119	544,062	0.544	0.842	10	1.25	0.159174	0.33689	0.404	0.2976	4.07
Ex 8	Ex 9	3.5	0.00	0.0	3208.8	80	256,704	2.119	544,062	0.544	0.842	10	5.80	0.073895	0.22514	0.270	0.1713	7.08
Ex 9	Ex 10	3.5	0.00	0.0	3208.8	80	256,704	2.119	544,062	0.544	0.842	10	5.80	0.073895	0.22514	0.270	0.1713	7.08
Ex 10	Ex 11	3.5	0.00	0.0	3208.8	80	256,704	2.119	544,062	0.544	0.842	10	5.43	0.076371	0.22889	0.275	0.1753	6.92
Ex 11	Ex 12	3.5	0.00	0.0	3208.8	80	256,704	2.119	544,062	0.544	0.842	10	5.07	0.079036	0.23293	0.280	0.1796	6.75
Ex 12	Ex 13	3.5	37.00	129.5	3338.3	80	267,064	2.111	563,713	0.564	0.872	10	5.07	0.081890	0.23719	0.285	0.1842	6.82
Ex 13	Ex 14	3.5	60.00	210.0	3548.3	80	283,864	2.095	594,743	0.595	0.920	12	4.57	0.055963	0.23471	0.235	0.1405	6.55
Ex 14	Ex 15	3.5	105.02	367.6	3915.9	80	313,270	2.058	644,838	0.645	0.998	12	1.00	0.129712	0.36193	0.362	0.2565	3.89
Ex 15	Ex 15A	3.5	0.00	0.0	3915.9	80	313,270	2.058	644,838	0.645	0.998	12	0.60	0.167457	0.41577	0.416	0.3089	3.23
Ex 15A	Ex 20	3.5	0.00	0.0	3915.9	80	313,270	2.058	644,838	0.645	0.998	12	9.22	0.042718	0.20504	0.205	0.1159	8.61

Total DUs	Total Pop.	Min Slope	Max dn/D
1,122.0	3,916	0.60	0.42

1 Assumed minimum slope of 1.0%
2 K' based on n = 0.013
3 dn/D using K' Brater King Table 7-14
4 From Brater King Table 7-4 based on dn/D

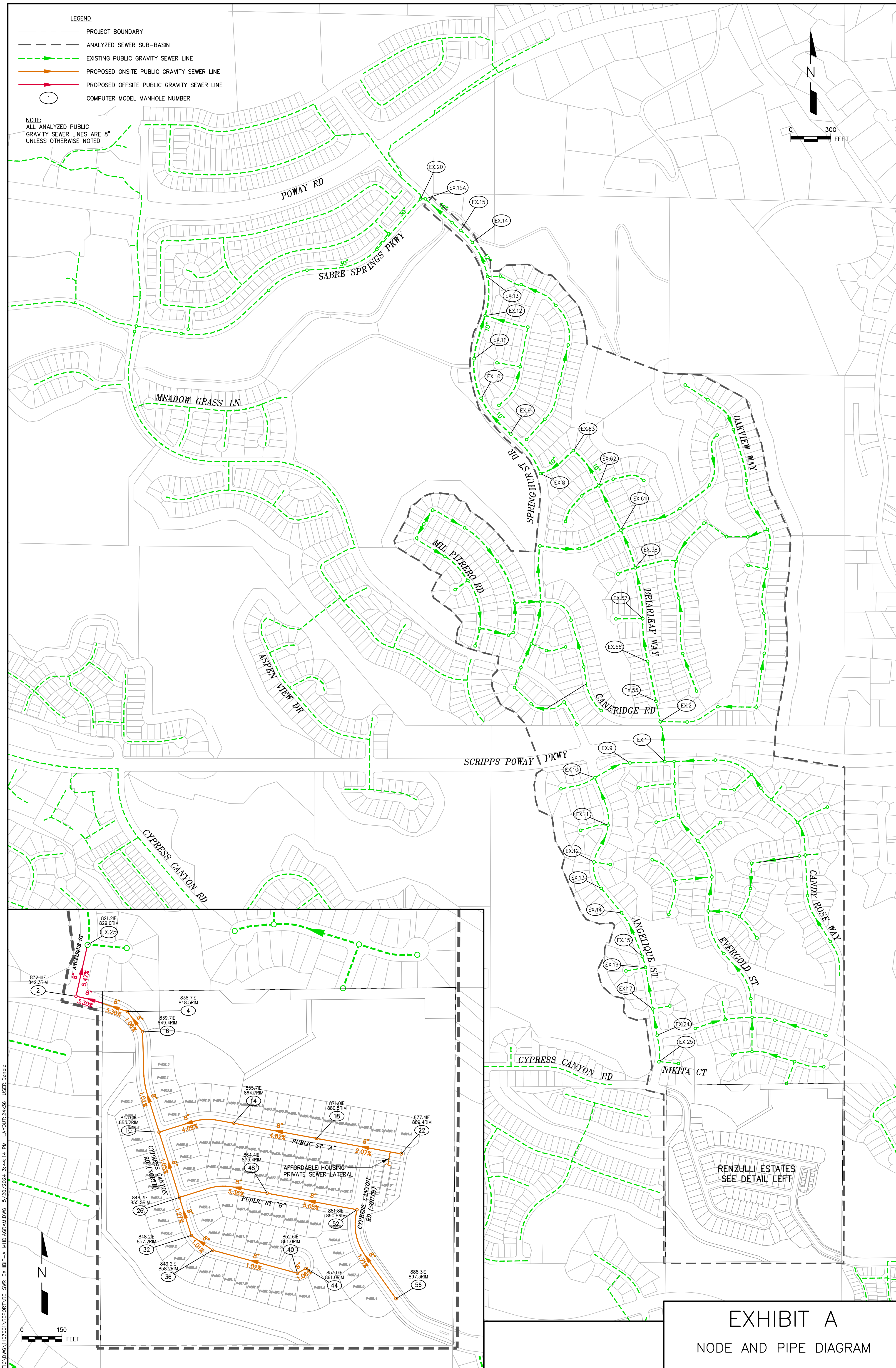


EXHIBIT A

NODE AND PIPE DIAGRAM

RENZULLI ESTATES