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SEWER STUDY
FOR THE EMERALD HILLS PROJECT
IN THE CITY OF SAN DIEGO

November 13, 2023

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

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Job No. 688-034

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November 13, 2023 688-034

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Attention: Dan Boyd, Vice President - Entitlements

Subject: Sewer Study for the Emerald Hills Project in the City of San Diego

Introduction

This report provides a public sewer study for the Emerald Hills project in the City of San Diego. The project proposes 123 single-family residential units. The 31.2 gross acre project site is located in the Emerald Hills neighborhood of the City located on the west side of 60th Street between Tooley Street and Old Memory Lane. The project site previously consisted of a radio tower and will be redeveloped with the proposed residential project use.

Topography of the buildable portion of the site slopes to a high point in the middle portion. The site will be designed to connect to the existing 8-inch gravity sewer lines at two locations, one in 60th Street east of the project site and one in Old Memory Lane west of the project site. Figure 1 provides a Vicinity Map for the project.

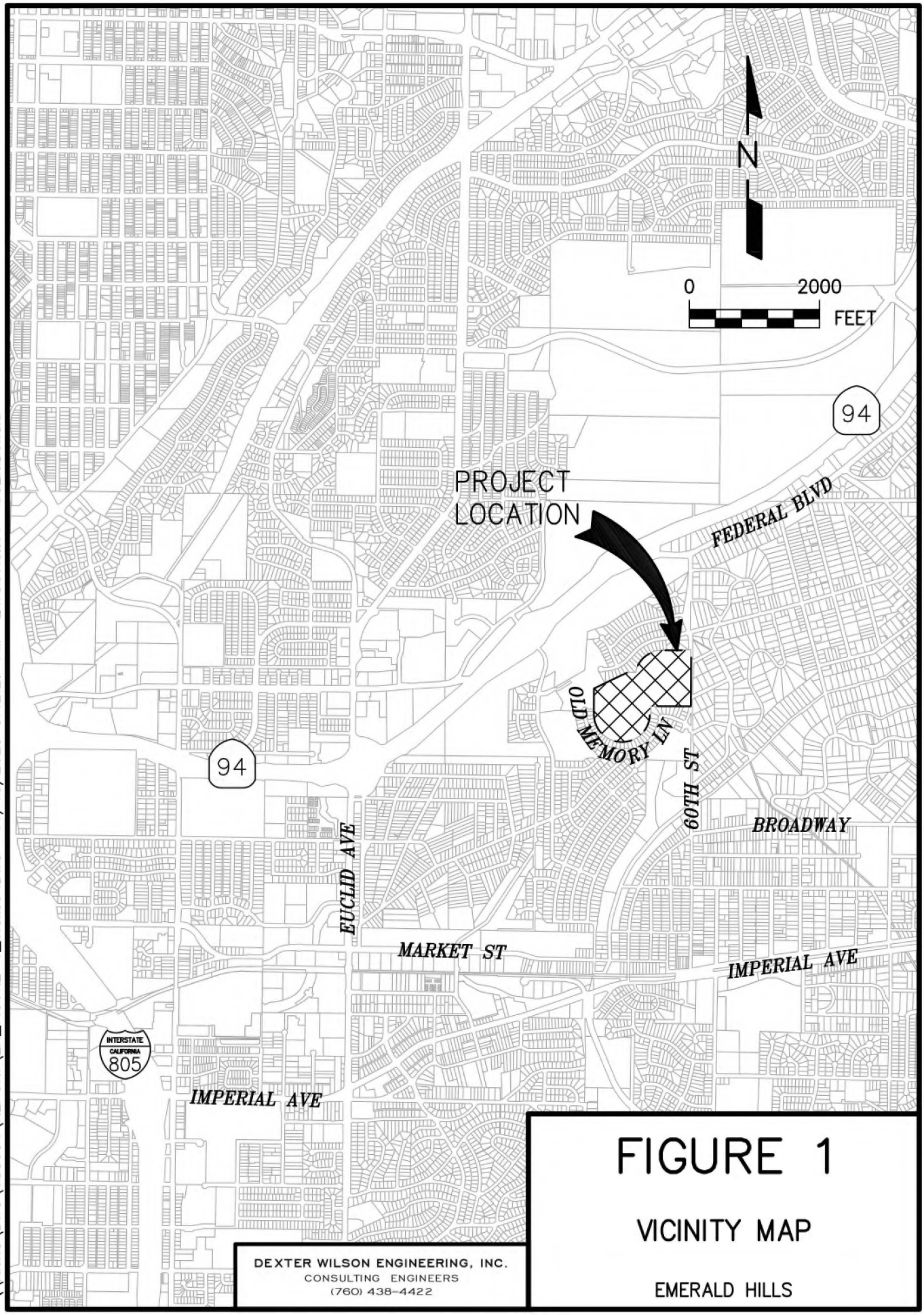

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FIGURE 1

VICINITY MAP

EMERALD HILLS

Purpose of Study

The purpose of this study is to determine if the existing public gravity sewer system is able to provide adequate capacity for the project. This report will address if any offsite (public) sewer system improvements are needed for the development of the project so that the offsite sewer system will be in conformance with the City of San Diego sewer system design standards.

The onsite sewer facilities for the project are proposed to be public. These facilities will be designed in accordance with the City's sewer system design standards as well (e.g., 1% minimum slopes).

The existing offsite and proposed onsite sewer facilities in the project vicinity can be seen in Figure 2.

Study Area

In general, the study area for this sewer study encompasses the sewer lines in the vicinity of the project that are tributary to the Jamacha Road Trunk Sewer up to the 24-inch connections at Imperial Avenue and 54th Street near the Encanto Trunk Sewer. From this point the Jamacha Road and Encanto Trunk Sewers convey sewer southwestward to other ancillary City and Metro trunk sewer facilities eventually to Pump Station 01.

LEGEND

PROJECT BOUNDARY

EXISTING PUBLIC GRAVITY SEWER

PROPOSED PUBLIC GRAVITY SEWER

N

0 200 FEET

CHAUMONT DR

BALLINA DR

TOOLEY ST

DIPPER ST

WEAVER ST

60TH ST

UPLAND ST

BURIAN ST

69TH ST

STREET "A"

STREET "B"

STREET "C"

STREET "D"

OLD MEMORY LN

EX.8"

EX.18"

8"

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FIGURE 2

EXISTING AND PROPOSED SEWER FACILITIES

EMERALD HILLS

\\ARTIC\DWG\688034\REPORT\EH_SWR_FIGURE-2_EXPROSWR.DWG 11/13/2023 4:26:04 PM LAYOUT:11x17 USER:Donald

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 guideline is used for analysis and sizing of new 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 Flow		
For 15" and Smaller	d/D = 0.50	1.3.3.3
For 18" and Larger	d/D = 0.75	1.3.3.3
Net Acreage	= 0.80 x Gross Acres	Table 1-1

Emerald Hills Project Sewer Generation

The sewer generation for the project was developed in accordance with the City of San Diego Design Guidelines and Standards. Residential sewer generation is estimated based on dwelling unit density and a sewage generation of 80 gpd/person as presented in Table 1. The project proposes 123 residential units over 31.2 gross-acres. A gross acreage of 31.2 acres equates to 25.0 net-acres which equals a net-density for Emerald Hills of 4.9 units per acre. Table 1-1 in the City of San Diego Sewer Design Guide, attached as Appendix A, indicates that 4.9 units per acre falls in the range of 3.5 persons per dwelling unit (equivalent to RS-1 zoning). A dwelling unit density of 3.5 persons per dwelling unit and a unit sewage generation of 80 gpd/person results in a sewer generation rate of 280 gpd per dwelling unit for this project.

Table 2 presents the projected sewer generation for the project.

TABLE 2
EMERALD HILLS SEWER GENERATION

Land Use	Quantity	Generation Factor	Average Sewer Generation, gpd
Single-Family Residential (4.9 DUs/net acre)	123 Units	280 gpd/unit	34,440
TOTAL			**34,440 = 24 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 2.79 based on the formula presented in the figure, resulting in an estimated peak dry weather flow of 96,061 gpd (67 gpm).

Appendix A presents the backup data for determining the peaking factors. For estimating the peak flows, average flow was based on the project's average sewer generation presented in Table 2.

Emerald Hills Offsite Sewer System Analysis

The offsite analysis completed for the project calculated the measured and projected sewer flows through the existing gravity sewer lines downstream from the project up to the connection with the existing 24-inch diameter Jamacha Road Trunk Sewer.

These offsite sewer calculations/analyses are presented in Appendix B. Exhibit A in Appendix B presents the corresponding manhole number diagram.

The sewer system analysis for the Emerald Hills project will need to take into account sewage flows from existing development that is downstream of the project site. The Emerald Hills project will be a relatively upstream development along this particular stretch of gravity sewer leading up to the 24-inch diameter Jamacha Road Trunk Sewer.

Record ("As-Built") drawings and GIS data from the City were obtained to accurately model the existing gravity sewer infrastructure (size, slope, location etc.).

Existing Sewage Flow. As shown in Model 1 and Model 2 of the spreadsheet calculations in Appendix B, the existing sewer flow within the study area is shown to be at or below half full under peak dry weather flow in the existing 8-inch diameter gravity sewer lines with the exception of one section. A maximum d/D ratio of 0.54 occurs in one section along the western downstream alignment.

Existing Sewage Flow Plus Project Flow. Model 3 and Model 4 of the spreadsheet calculations in Appendix B present the results of the offsite sewer system analyses when including the estimated flows from the project. The project is proposing to sewer 50 of its units to the existing 8-inch diameter gravity sewer line in Old Memory Lane west of the project site and 73 of its units to the existing 8-inch diameter gravity sewer line in 60th Street east of the project site. Existing gravity sewer lines were analyzed up to the 24-inch Jamacha Road Trunk Sewer.

The maximum d/D ratio increases to 0.57 under peak dry weather flow when the proposed project is added to the existing 8-inch diameter gravity sewer lines downstream of the project. These depths exceed the City design criteria of 0.5 d/D. There has been previous correspondence with the City accepting this deviation for two segments which exceed the City design criteria of 0.5 d/D. This e-mail correspondence is attached as Appendix C to this sewer study.

Conclusions and Recommendations

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

1. The proposed project consisting of 123 multi-family dwelling units will gravity sewer 50 of its units to the existing 8-inch diameter gravity sewer line in Old Memory Lane west of the project site and 73 of its units to the existing 8-inch diameter gravity sewer line in 60th Street east of the project site.

2. The development of the project is projected to result in an average sewage flow of 34,440 gpd.

3. Figure 2 presents the existing and proposed public sewer system in the project vicinity.

4. Existing gravity sewer lines under peak dry weather flow are currently calculated to have a d/D of approximately 0.54 in the 8-inch diameter segments. The addition of the entire project's sewage flow would increase the d/D to 0.57. These depths slightly exceed the City design criteria of 0.5 d/D for the 8-inch diameter segments. There has been previous correspondence with the City accepting this deviation for two segments which exceed the City design criteria of 0.5 d/D. This e-mail correspondence is attached as Appendix C to this sewer study.

5. The proposed public onsite gravity sewer system will be designed according to City of San Diego Sewer Design Guide to comply with all design criteria (depth, velocity, minimum slope, etc.).

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.

Steven Henderson, P.E.

AO:SH:ah

Attachments

APPENDIX A

CITY OF SAN DIEGO SEWER DESIGN CRITERIA

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.

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 = $6.2945 \times (pop)^{-0.1342}$
(Holmes & Narver, 1960)

FIGURE 1-1

APPENDIX B

OFFSITE SEWER ANALYSIS

The following conditions were modeled for The Emerald Hills Project:

1. Existing Flows Only – Western Alignment
2. Existing Flows Only – Eastern Alignment
3. Existing Plus Project Flows – Western Alignment
4. Existing Plus Project Flows – Eastern Alignment

- Reference Exhibit A for Manhole Diagram

DATE: 11/13/2023

SEWER STUDY SUMMARY

FOR: Emerald Hills City of San Diego Existing Public Sewer - Existing Flows Only (Western Portion) SHT 1 OF 4

JOB NUMBER: 688-034 BY: Dexter Wilson Engineering, Inc. REFER TO PLAN SHEET: EXHIBIT A

FROM	I.E.	TO	I.E.	LENGTH	IN-LINE FLOW	AVG. DRY WEATHER FLOW (gpd)	PDWF PEAKING FACTOR	PDWF (gpd)	COMBINED PEAK FLOW (DESIGN FLOW)		LINE SIZE (inches)	MEASURED SLOPE (%)	DEPTH K' (1)	dn (feet)	dn/D(2)	C_a for Velocity(3)	VELOCITY (f.p.s.)	NOTES
									M.G.D.	C.F.S.								
118	303	380	287.00	266	2,240	2,240	4.02	9,016	0.009	0.014	8	6.02	0.002180	0.03333	0.05	0.0147	2.14	8 SF Units
380	287.00	379	274.53	149	10,080	12,320	3.20	39,446	0.039	0.061	8	8.37	0.008087	0.06000	0.09	0.0350	3.92	36 SF Units
379	274.53	125	273.9	157	0	12,320	3.20	39,446	0.039	0.061	8	0.40	0.036931	0.12667	0.19	0.1039	1.32	Johnson Elementary (6 acres)
125	273.9	162	272.95	236	15,000	27,320	2.88	78,607	0.079	0.122	8	0.40	0.073478	0.18000	0.27	0.1711	1.60	5 SF Units
162	272.95	415	272.23	130	1,400	28,720	2.86	82,083	0.082	0.127	8	0.55	0.065413	0.16667	0.25	0.1535	1.86	
415	272.23	159	271.51	144	0	28,720	2.86	82,083	0.082	0.127	8	0.50	0.068845	0.17333	0.26	0.1623	1.76	
159	271.51	210	270.62	220	8,680	37,400	2.76	103,169	0.103	0.160	8	0.40	0.096199	0.20667	0.31	0.2074	1.73	31 SF Units
210	270.62	187	269.22	248	3,920	41,320	2.72	112,468	0.112	0.174	8	0.56	0.088776	0.20000	0.30	0.1982	1.98	14 SF Units
187	269.22	194	267.82	345	1,400	42,720	2.71	115,759	0.116	0.179	8	0.41	0.107772	0.22000	0.33	0.2260	1.78	5 SF Units
194	267.82	147	263.17	310	4,480	47,200	2.67	126,199	0.126	0.195	8	1.50	0.061110	0.16667	0.25	0.1535	2.86	16 SF Units
147	263.17	183	260.71	350	840	48,040	2.67	128,141	0.128	0.198	8	0.70	0.090648	0.20000	0.30	0.1982	2.25	3 SF Units
183	260.71	10	258.8	213	31,920	79,960	2.49	199,188	0.199	0.308	8	0.90	0.124750	0.23333	0.35	0.2450	2.83	114 SF Units
10	258.8	58	252.67	280	12,320	92,280	2.44	225,500	0.225	0.349	8	2.19	0.090386	0.20000	0.30	0.1982	3.96	44 SF units
58	252.67	71	235.62	344	3,080	95,360	2.43	232,002	0.232	0.359	8	4.96	0.061803	0.16667	0.25	0.1535	5.26	11 SF Units
71	235.62	73	230.75	265	840	96,200	2.43	233,770	0.234	0.362	8	1.84	0.102271	0.21333	0.32	0.2167	3.76	3 SF Units
73	230.75	72	229.73	256	21,280	117,480	2.37	277,927	0.278	0.430	8	0.40	0.261129	0.36000	0.54	0.4330	2.23	76 SF Units
72	229.73	67	228.2	256	0	117,480	2.37	277,927	0.278	0.430	8	0.60	0.213211	0.32000	0.48	0.3727	2.60	
67	228.2	66	227.12	100	0	117,480	2.37	277,927	0.278	0.430	8	1.08	0.158607	0.26667	0.40	0.2934	3.30	
66	227.12	379	210.12	194	1,680	119,160	2.36	281,365	0.281	0.435	8	8.76	0.056370	0.16000	0.24	0.1449	6.76	6 SF Units
379	210.12	422	178.14	357	1,960	121,120	2.36	285,367	0.285	0.442	8	8.96	0.056546	0.16000	0.24	0.1449	6.86	7 SF Units
422	178.14	425	165.12	227	1,960	123,080	2.35	289,361	0.289	0.448	8	5.74	0.071656	0.18000	0.27	0.1711	5.89	7 SF Units
425	165.12	426	160.58	295	2,520	125,600	2.34	294,484	0.294	0.456	8	1.54	0.140783	0.25333	0.38	0.2739	3.74	9 SF units
426	160.58	427	151.16	300	1,400	127,000	2.34	297,323	0.297	0.460	8	3.14	0.099511	0.20667	0.31	0.2074	4.99	5 SF Units
427	151.16	421	140.52	326	21,000	148,000	2.29	339,444	0.339	0.525	8	3.26	0.111432	0.22000	0.33	0.2260	5.23	6 acres commercial
421	140.52	418	129.29	410	0	148,000	2.29	339,444	0.339	0.525	8	2.74	0.121640	0.23333	0.35	0.2450	4.82	
418	129.29	478	121.45	363	0	148,000	2.29	339,444	0.339	0.525	8	2.16	0.136984	0.24667	0.37	0.2642	4.47	
478	121.45	482	115.12	360	0	148,000	2.29	339,444	0.339	0.525	8	1.76	0.151818	0.26000	0.39	0.2836	4.17	
482	115.12	102	113.38	30	0	148,000	2.29	339,444	0.339	0.525	8	5.80	0.083591	0.19333	0.29	0.1890	6.25	

Min Slope	Max dn/D	Min Velocity
0.40	0.54	1.32

Note: Slope is measured by: (I.E. From - I.E. To)/Length

1 K' based on n = 0.013
2 dn/D using K' in Brater King Table 7-14
3 From Brater King Table 7-4 based on dn/D

DATE: 11/13/2023

SEWER STUDY SUMMARY

FOR: Emerald Hills City of San Diego Existing Public Sewer - Existing Flows Only (Eastern Portion) SHT 2 OF 4

JOB NUMBER: 688-034 BY: Dexter Wilson Engineering, Inc. REFER TO PLAN SHEET: EXHIBIT A

FROM	I.E.	TO	I.E.	LENGTH	IN-LINE FLOW	AVG. DRY WEATHER FLOW (gpd)	PDWF PEAKING FACTOR	PDWF (gpd)	COMBINED PEAK FLOW (DESIGN FLOW)		LINE SIZE (inches)	MEASURED SLOPE (%)	DEPTH K' (1)	dn (feet)	dn/D (2)	C_a for Velocity (3)	VELOCITY (f.p.s.)	NOTES
									M.G.D.	C.F.S.								
152	294	170	282.62	267	1,120	1,120	4.42	4,947	0.005	0.008	8	4.26	0.001421	0.02667	0.04	0.0105	1.64	4 SF Units
170	282.62	172	270.46	152	11,200	12,320	3.20	39,446	0.039	0.061	8	8.00	0.008271	0.06000	0.09	0.0350	3.92	40 SF Units
172	270.46	173	260.2	50	20,160	32,480	2.81	91,309	0.091	0.141	8	20.52	0.011954	0.07333	0.11	0.0470	6.76	72 SF Units
173	260.2	16	250.12	346	0	32,480	2.81	91,309	0.091	0.141	8	2.91	0.031727	0.12000	0.18	0.0961	3.31	
16	250.12	7	234.12	350	0	32,480	2.81	91,309	0.091	0.141	8	4.57	0.025327	0.10667	0.16	0.0811	3.92	
7	234.12	35	224.12	350	0	32,480	2.81	91,309	0.091	0.141	8	2.86	0.032037	0.12000	0.18	0.0961	3.31	
35	224.12	122	213.12	350	0	32,480	2.81	91,309	0.091	0.141	8	3.14	0.030546	0.11333	0.17	0.0885	3.59	
122	213.12	27	208.41	155	0	32,480	2.81	91,309	0.091	0.141	8	3.04	0.031065	0.12000	0.18	0.0961	3.31	
27	208.41	126	202.77	240	54,880	87,360	2.46	215,052	0.215	0.333	8	2.35	0.083162	0.19333	0.29	0.1890	3.96	196 SF Units
126	202.77	115	197.12	313	0	87,360	2.46	215,052	0.215	0.333	8	1.80	0.094971	0.20667	0.31	0.2074	3.61	
115	197.12	112	192.12	203	0	87,360	2.46	215,052	0.215	0.333	8	2.46	0.081267	0.18667	0.28	0.1800	4.16	
112	192.12	235	185.12	202	0	87,360	2.46	215,052	0.215	0.333	8	3.47	0.068513	0.17333	0.26	0.1623	4.61	
235	185.12	236	176.02	262	0	87,360	2.46	215,052	0.215	0.333	8	3.47	0.068435	0.17333	0.26	0.1623	4.61	
236	176.02	62	169.65	292	0	87,360	2.46	215,052	0.215	0.333	8	2.18	0.086352	0.19333	0.29	0.1890	3.96	
62	169.65	250	168.28	161	0	87,360	2.46	215,052	0.215	0.333	8	0.85	0.138262	0.24667	0.37	0.2642	2.83	
250	168.28	69	166.72	260	0	87,360	2.46	215,052	0.215	0.333	8	0.60	0.164654	0.27333	0.41	0.3032	2.47	
69	166.72	760	163.73	182	1,960	89,320	2.45	219,224	0.219	0.339	8	1.64	0.101436	0.21333	0.32	0.2167	3.52	7 SF Units
760	163.73	385	153.62	212	0	89,320	2.45	219,224	0.219	0.339	8	4.77	0.059537	0.16000	0.24	0.1449	5.27	
385	153.62	396	149.6	248	0	89,320	2.45	219,224	0.219	0.339	8	1.62	0.102119	0.21333	0.32	0.2167	3.52	

Min Slope	Max dn/D	Min Velocity
0.60	0.41	1.64

Note: Slope is measured by: (I.E. From - I.E. To)/Length

1 K' based on n = 0.013
2 dn/D using K' in Brater King Table 7-14
3 From Brater King Table 7-4 based on dn/D

DATE: 11/13/2023

SEWER STUDY SUMMARY

FOR: Emerald Hills City of San Diego Existing plus Project Flows (Western Portion) SHT 3 OF 4

JOB NUMBER: 688-034 BY: Dexter Wilson Engineering, Inc. REFER TO PLAN SHEET: EXHIBIT A

FROM	I.E.	TO	I.E.	LENGTH	IN-LINE FLOW	AVG. DRY WEATHER FLOW (gpd)	PDWF PEAKING FACTOR	PDWF (gpd)	COMBINED PEAK FLOW (DESIGN FLOW)		LINE SIZE (inches)	MEASURED SLOPE (%)	DEPTH K' (1)	dn (feet)	dn/D(2)	C_a for Velocity(3)	VELOCITY (f.p.s.)	NOTES
									M.G.D.	C.F.S.								
118	303	380	287.00	266	16,240	16,240	3.09	50,105	0.050	0.078	8	6.02	0.012116	0.07333	0.11	0.0470	3.71	8 SF Units + 50 proposed units
380	287.00	379	274.53	149	10,080	26,320	2.89	76,110	0.076	0.118	8	8.37	0.015603	0.08667	0.13	0.0600	4.42	36 SF Units
379	274.53	125	273.9	157	0	26,320	2.89	76,110	0.076	0.118	8	0.40	0.071256	0.18000	0.27	0.1711	1.55	Johnson Elementary (6 acres)
125	273.9	162	272.95	236	15,000	41,320	2.72	112,468	0.112	0.174	8	0.40	0.105130	0.21333	0.32	0.2167	1.81	5 SF Units
162	272.95	415	272.23	130	1,400	42,720	2.71	115,759	0.116	0.179	8	0.55	0.092250	0.20000	0.30	0.1982	2.03	
415	272.23	159	271.51	144	0	42,720	2.71	115,759	0.116	0.179	8	0.50	0.097090	0.20667	0.31	0.2074	1.94	
159	271.51	210	270.62	220	8,680	51,400	2.64	135,865	0.136	0.210	8	0.40	0.126686	0.24000	0.36	0.2546	1.86	31 SF Units
210	270.62	187	269.22	248	3,920	55,320	2.62	144,792	0.145	0.224	8	0.56	0.114290	0.22667	0.34	0.2355	2.14	14 SF Units
187	269.22	194	267.82	345	1,400	56,720	2.61	147,959	0.148	0.229	8	0.41	0.137750	0.24667	0.37	0.2642	1.95	5 SF Units
194	267.82	147	263.17	310	4,480	61,200	2.58	158,025	0.158	0.245	8	1.50	0.076522	0.18000	0.27	0.1711	3.22	16 SF Units
147	263.17	183	260.71	350	840	62,040	2.58	159,901	0.160	0.247	8	0.70	0.113116	0.22667	0.34	0.2355	2.36	3 SF Units
183	260.71	10	258.8	213	31,920	93,960	2.44	229,050	0.229	0.354	8	0.90	0.143452	0.25333	0.38	0.2739	2.91	114 SF Units
10	258.8	58	252.67	280	12,320	106,280	2.40	254,834	0.255	0.394	8	2.19	0.102144	0.21333	0.32	0.2167	4.09	44 SF units
58	252.67	71	235.62	344	3,080	109,360	2.39	261,216	0.261	0.404	8	4.96	0.069586	0.17333	0.26	0.1623	5.60	11 SF Units
71	235.62	73	230.75	265	840	110,200	2.39	262,952	0.263	0.407	8	1.84	0.115038	0.22667	0.34	0.2355	3.89	3 SF Units
73	230.75	72	229.73	256	21,280	131,480	2.33	306,383	0.306	0.474	8	0.40	0.287865	0.38000	0.57	0.4620	2.31	76 SF Units
72	229.73	67	228.2	256	0	131,480	2.33	306,383	0.306	0.474	8	0.60	0.235041	0.33333	0.50	0.3930	2.71	
67	228.2	66	227.12	100	0	131,480	2.33	306,383	0.306	0.474	8	1.08	0.174847	0.28667	0.43	0.3229	3.30	
66	227.12	379	210.12	194	1,680	133,160	2.33	309,770	0.310	0.479	8	8.76	0.062061	0.16667	0.25	0.1535	7.03	6 SF Units
379	210.12	422	178.14	357	1,960	135,120	2.32	313,713	0.314	0.485	8	8.96	0.062163	0.16667	0.25	0.1535	7.12	7 SF Units
422	178.14	425	165.12	227	1,960	137,080	2.32	317,649	0.318	0.492	8	5.74	0.078661	0.18667	0.28	0.1800	6.14	7 SF Units
425	165.12	426	160.58	295	2,520	139,600	2.31	322,699	0.323	0.499	8	1.54	0.154271	0.26667	0.40	0.2934	3.83	9 SF units
426	160.58	427	151.16	300	1,400	141,000	2.31	325,499	0.325	0.504	8	3.14	0.108941	0.22000	0.33	0.2260	5.01	5 SF Units
427	151.16	421	140.52	326	21,000	162,000	2.27	367,074	0.367	0.568	8	3.26	0.120503	0.23333	0.35	0.2450	5.22	6 acres commercial
421	140.52	418	129.29	410	0	162,000	2.27	367,074	0.367	0.568	8	2.74	0.131541	0.24000	0.36	0.2546	5.02	
418	129.29	478	121.45	363	0	162,000	2.27	367,074	0.367	0.568	8	2.16	0.148134	0.26000	0.39	0.2836	4.51	
478	121.45	482	115.12	360	0	162,000	2.27	367,074	0.367	0.568	8	1.76	0.164175	0.27333	0.41	0.3032	4.21	
482	115.12	102	113.38	30	0	162,000	2.27	367,074	0.367	0.568	8	5.80	0.090395	0.20000	0.30	0.1982	6.45	

Min Slope	Max dn/D	Min Velocity
0.40	0.57	1.55

Note: Slope is measured by: (I.E. From - I.E. To)/Length

1 K' based on n = 0.013
2 dn/D using K' in Brater King Table 7-14
3 From Brater King Table 7-4 based on dn/D

DATE: 11/13/2023

SEWER STUDY SUMMARY

FOR: Emerald Hills City of San Diego Existing Public Sewer - Existing plus Project Flows (Eastern Portion) SHT 4 OF 4

JOB NUMBER: 688-034 BY: Dexter Wilson Engineering, Inc. REFER TO PLAN SHEET: EXHIBIT A

FROM	I.E.	TO	I.E.	LENGTH	IN-LINE FLOW	AVG. DRY WEATHER FLOW (gpd)	PDWF PEAKING FACTOR	PDWF (gpd)	COMBINED PEAK FLOW (DESIGN FLOW)		LINE SIZE (inches)	MEASURED SLOPE (%)	DEPTH K' (1)	dn (feet)	dn/D(2)	C_a for Velocity(3)	VELOCITY (f.p.s.)	NOTES
									M.G.D.	C.F.S.								
152	294	170	282.62	267	21,560	21,560	2.97	64,037	0.064	0.099	8	4.26	0.018396	0.09333	0.14	0.0668	3.34	4 SF Units + 73 proposed units
170	282.62	172	270.46	152	11,200	32,760	2.81	91,990	0.092	0.142	8	8.00	0.019289	0.09333	0.14	0.0668	4.79	40 SF Units
172	270.46	173	260.2	50	20,160	52,920	2.63	139,337	0.139	0.216	8	20.52	0.018242	0.09333	0.14	0.0668	7.26	72 SF Units
173	260.2	16	250.12	346	0	52,920	2.63	139,337	0.139	0.216	8	2.91	0.048415	0.14667	0.22	0.1281	3.79	
16	250.12	7	234.12	350	0	52,920	2.63	139,337	0.139	0.216	8	4.57	0.038650	0.13333	0.20	0.1118	4.34	
7	234.12	35	224.12	350	0	52,920	2.63	139,337	0.139	0.216	8	2.86	0.048888	0.14667	0.22	0.1281	3.79	
35	224.12	122	213.12	350	0	52,920	2.63	139,337	0.139	0.216	8	3.14	0.046613	0.14000	0.21	0.1199	4.05	
122	213.12	27	208.41	155	0	52,920	2.63	139,337	0.139	0.216	8	3.04	0.047405	0.14667	0.22	0.1281	3.79	
27	208.41	126	202.77	240	54,880	107,800	2.39	257,987	0.258	0.399	8	2.35	0.099764	0.21333	0.32	0.2167	4.14	196 SF Units
126	202.77	115	197.12	313	0	107,800	2.39	257,987	0.258	0.399	8	1.80	0.113931	0.22667	0.34	0.2355	3.81	
115	197.12	112	192.12	203	0	107,800	2.39	257,987	0.258	0.399	8	2.46	0.097491	0.20667	0.31	0.2074	4.33	
112	192.12	235	185.12	202	0	107,800	2.39	257,987	0.258	0.399	8	3.47	0.082192	0.19333	0.29	0.1890	4.75	
235	185.12	236	176.02	262	0	107,800	2.39	257,987	0.258	0.399	8	3.47	0.082098	0.19333	0.29	0.1890	4.75	
236	176.02	62	169.65	292	0	107,800	2.39	257,987	0.258	0.399	8	2.18	0.103591	0.21333	0.32	0.2167	4.14	
62	169.65	250	168.28	161	0	107,800	2.39	257,987	0.258	0.399	8	0.85	0.165865	0.27333	0.41	0.3032	2.96	
250	168.28	69	166.72	260	0	107,800	2.39	257,987	0.258	0.399	8	0.60	0.197527	0.30667	0.46	0.3527	2.55	
69	166.72	760	163.73	182	1,960	109,760	2.39	262,043	0.262	0.405	8	1.64	0.121249	0.23333	0.35	0.2450	3.72	7 SF Units
760	163.73	385	153.62	212	0	109,760	2.39	262,043	0.262	0.405	8	4.77	0.071165	0.17333	0.26	0.1623	5.62	
385	153.62	396	149.6	248	0	109,760	2.39	262,043	0.262	0.405	8	1.62	0.122065	0.23333	0.35	0.2450	3.72	

Min Slope	Max dn/D	Min Velocity
0.60	0.46	2.55

Note: Slope is measured by: (I.E. From - I.E. To)/Length

1 K' based on n = 0.013
2 dn/D using K' in Brater King Table 7-14
3 From Brater King Table 7-4 based on dn/D

\\ARTIC\DWG\688034\REPORT\EH_SWR_EXHIBIT-A_MH-DIAGRAM.DWG 11/13/2023 4:34:26 PM LAYOUT:11x17 USER:Donald

LEGEND

PROJECT BOUNDARY

EXISTING PUBLIC GRAVITY SEWER

PROJECT LOCATION

WESTERN TRIBUTARY SEWER LINE

EASTERN TRIBUTARY SEWER LINE

JAMACHA RD TRUNK SEWER LINE

N

0 500 FEET

EXHIBIT A

OFFSITE SEWER MANHOLE DIAGRAM

EMERALD HILLS

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

APPENDIX C

E-MAIL CORRESPONDENCE

Andrew Oven

From: Andrew Oven
Sent: Thursday, May 18, 2023 10:17 AM
To: Meg Carroll - REDP, Inc. (meg@redpinc.com); Daniel Boyd
Subject: FW: [EXTERNAL] Re: Emerald Hills - Radio Drive Sewer

Dan and Meg,

Forwarding the written clarification and confirmation that the City will not be requiring any offsite sewer upgrades for the Emerald Hills project based on the west side connecting 56 EDUs. If that number increases, then the City would have to re-analyze. It would be best if the project could stay with 56 EDUs flowing west.

Thanks.

ANDREW OVEN, P.E.
DEXTER WILSON ENGINEERING, INC.
760-438-4422

From: Itkin, Irina <IItkin@sandiego.gov>
Sent: Thursday, May 18, 2023 9:25 AM
To: Andrew Oven <andrew@dwilsoneng.com>
Cc: Li, David <DLi@sandiego.gov>
Subject: Re: [EXTERNAL] Re: Emerald Hills - Radio Drive Sewer

Andrew,
You right, you don't need upsized the critical two reaches, based on modeling report.
Thank you,
Irina

From: Andrew Oven <andrew@dwilsoneng.com>
Sent: Thursday, May 18, 2023 9:14:58 AM
To: Itkin, Irina <IItkin@sandiego.gov>
Cc: Li, David <DLi@sandiego.gov>
Subject: RE: [EXTERNAL] Re: Emerald Hills - Radio Drive Sewer

---

Irina,

Just to confirm – we do not have to upgrade the two segments of existing 8" sewer on the west side which flow at 0.58 and 0.51 d/D?

Thank you.

ANDREW OVEN, P.E.
DEXTER WILSON ENGINEERING, INC.
760-438-4422

From: Itkin, Irina <IItkin@sandiego.gov>
Sent: Friday, May 12, 2023 11:00 AM
To: Meg Carroll <meg@redpinc.com>; Andrew Oven <andrew@dwilsoneng.com>
Cc: Li, David <DLi@sandiego.gov>
Subject: RE: [EXTERNAL] Re: Emerald Hills - Radio Drive Sewer

Andrew,

We have completed our review of the provided calculation spreadsheets for the offsite sewer for the proposed Emerald Hills project.
The West side has flow added for 56 EDUs (280 gpd/EDU), and the East side has 75 proposed EDUs.

According to the modeling section there is no upgrade required.

Prior the submittal of the subject project, please prepare the full sewer study for the proposed development.

Thank you,

Irina Itkin
Associate Engineer-Civil
City of San Diego
Development Services Department
Water and Sewer Development Review
☎: 619-446-5422
SanDiego.gov/DSD

From: Itkin, Irina
Sent: Monday, May 8, 2023 3:09 PM
To: Meg Carroll <meg@redpinc.com>
Cc: andrew@dwilsoneng.com; Li, David <DLi@sandiego.gov>
Subject: RE: [EXTERNAL] Re: Emerald Hills - Radio Drive Sewer

Meg,

The subject sewer study under review by modeling section.
We will complete the review by the end of the week.

Thank you,

Irina Itkin
Associate Engineer-Civil
City of San Diego
Development Services Department
Water and Sewer Development Review
☎: 619-446-5422
SanDiego.gov/DSD

Need to request a second opinion on an interpretation, or contact my supervisor for further assistance?
Supervisor name and title: Leonard Wilson, Senior Civil Engineer
Phone: (619) 446-5421
Email: LLWilson@sandiego.gov

From: Meg Carroll <meg@redpinc.com>
Sent: Thursday, May 4, 2023 11:55 AM
To: Itkin, Irina <IItkin@sandiego.gov>
Cc: Andrew Oven <andrew@dwilsoneng.com>
Subject: [EXTERNAL] Re: Emerald Hills - Radio Drive Sewer

Hi Irina
Could you let me know the status of your review for the Emerald Hills project? Thank you!

Best regards,

Meg Carroll, PE, PMP
REDP, Inc.
5205 Avenida Encinas Suite A
Carlsbad, CA 92008
(760) 707-9325 cell
meg@REDPinc.com

On Wed, Apr 19, 2023 at 10:15 AM Andrew Oven <andrew@dwilsoneng.com> wrote:

> Meg,
>
> I had a brief conversation with Irina yesterday prior to another meeting and she asked me for the calculations we have done for the offsite sewers as part of our preliminary analysis. I am working to get that information to her today so she can continue with her review.
>
> Thanks.
>
> ANDREW OVEN, P.E.
> **DEXTER WILSON ENGINEERING, INC.**

760-438-4422

From: Meg Carroll <meg@redpinc.com>
Sent: Wednesday, April 19, 2023 10:12 AM
To: Irina Itkin - City of San Diego Water and Sewer Development Review (IItkin@sandiego.gov) <iitkin@sandiego.gov>
Cc: Andrew Oven <andrew@dwilsoneng.com>
Subject: Re: Emerald Hills - Radio Drive Sewer

Hi Irina
I was just following up on below. Could you let me know of any updates? Thanks!

Best regards,

Meg Carroll, PE, PMP
REDP, Inc.
5205 Avenida Encinas Suite A
Carlsbad, CA 92008
(760) 707-9325 cell
meg@REDPinc.com

On Wed, Apr 12, 2023 at 11:24 AM Meg Carroll <meg@redpinc.com> wrote:

Hi Irina
Thanks for last week's meeting to discuss the Emerald HIlls project. Per the meeting, I was just following up on the items below. If you could let me know the status, I'd appreciate it. Thanks!

- Irina will ask CIP for an update on Radio Canyon sewer status & schedule
- Irina will provide CIP point of contact.
- Irina will ask the Maintenance Group for status of the existing sewer at Radio Canyon.

Best regards,

Meg Carroll, PE, PMP
REDP, Inc.
5205 Avenida Encinas Suite A
Carlsbad, CA 92008
(760) 707-9325 cell
meg@REDPinc.com

On Mon, Apr 3, 2023 at 3:21 PM Andrew Oven <andrew@dwilsoneng.com> wrote:

Irina,

Attached are the two exhibits we discussed this morning for the Emerald Hills project. I have added the estimated number of dwelling units connecting to each leg of the offsite existing sewer system: 63 on the west side and 60 on the east side.

Let me know if you need anything else to pursue your conversation with PUD. Thanks.

Andrew Oven, P.E.
Dexter Wilson Engineering, Inc.
760-438-4422

-----Original Appointment-----
From: Andrew Oven
Sent: Thursday, March 30, 2023 3:20 PM
To: Andrew Oven; David Li; Itkin, Irina; Meg Carroll; Daniel Boyd
Subject: Emerald Hills - Radio Drive Sewer
When: Monday, April 3, 2023 11:00 AM-11:30 AM (UTC-08:00) Pacific Time (US & Canada).
Where: Microsoft Teams Meeting

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