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SEWER STUDY FOR THE OCEAN KAMP PROJECT IN THE CITY OF OCEANSIDE

March 13, 2020

**SEWER STUDY
FOR THE OCEAN KAMP PROJECT
IN THE
CITY OF OCEANSIDE**

March 13, 2020

Prepared by:
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3-13-2020

Job No. 921-003

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March 13, 2020

921-003

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Attention: Michael Grehl, Senior Vice President

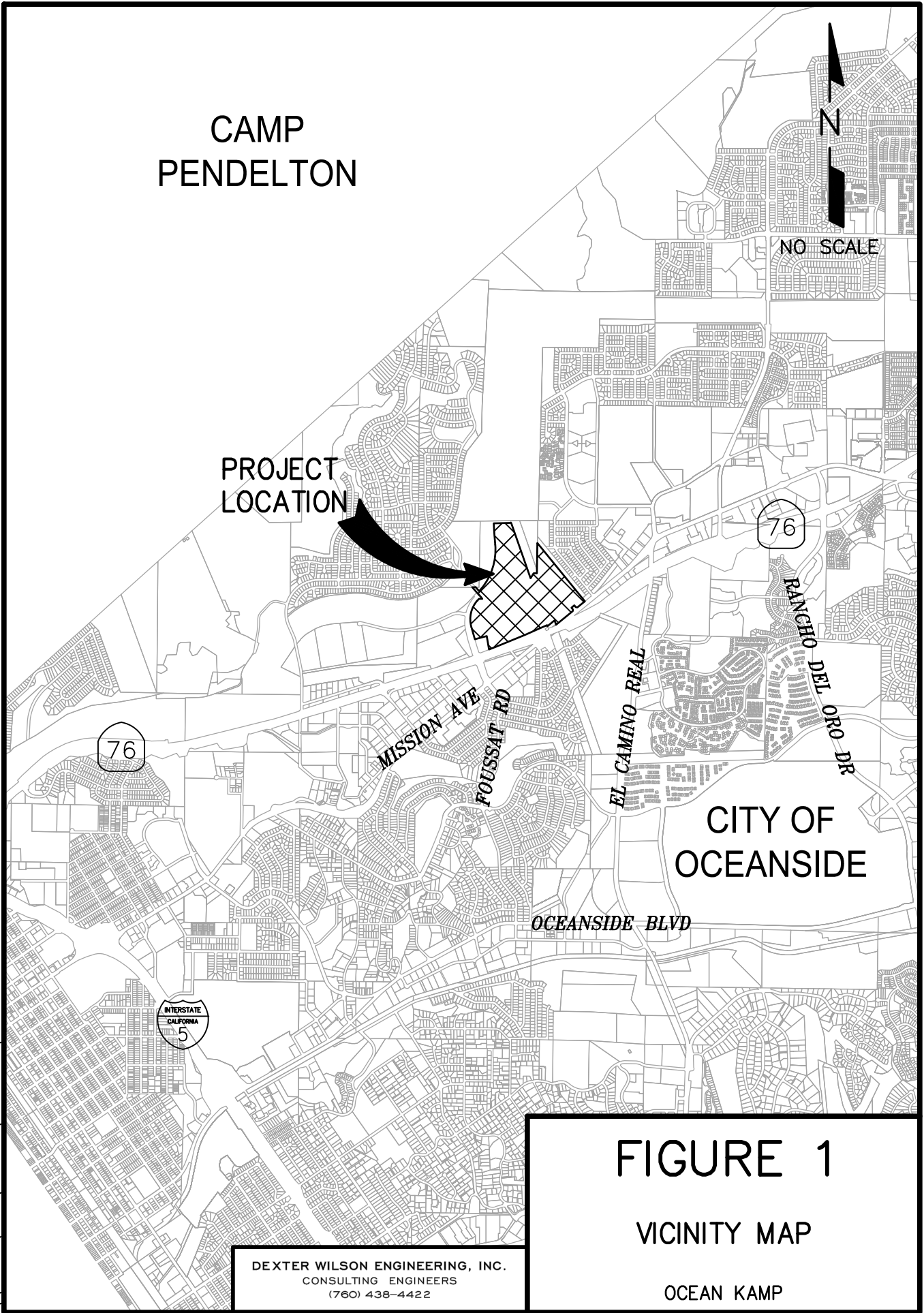
Subject: Sewer Study for the Ocean Kamp Project in the City of Oceanside

Introduction

The Ocean Kamp project is located in the northern portion of the City of Oceanside. It is generally situated east of US Interstate 5 and west of El Camino Real. Specifically, it is bound by open space to the north, Mission Avenue and Highway 76 to the south, existing development on Fireside Street to the east, and Foussat Road and the San Luis Rey River to the west. See Figure 1 for the location of the project. Historically, the site has functioned as a drive-in movie theater and was until May of 2019 a meeting location for a weekly swap meet.

Features to note in proximity to the project are the two utility easements traversing the project. The larger of the two easements, in the eastern portion of the property, contains City of Oceanside water and sewer lines as well as San Diego Gas and Electric transmission lines. The easement in the western portion of the property is a prior alignment of Foussat Road (referred to as Old Foussat Road) and contains City water and sewer lines.

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Ocean Kamp Development Plan

The Ocean Kamp project proposes to construct a combination of resort and residential development. The central portion of the project consists of a 300-room hotel, a wave pool and associated amenities, and 126,000 square feet of commercial space. The residential component will include 700 multi-family residential dwelling units.

Sewer service to the project will be provided by an on-site sewer system a portion of which will be public and the remainder will be private. The onsite sewer will connect to the City of Oceanside's public sewer system near the existing Mission Avenue Sewer Lift Station.

Purpose for the Sewer Study

The purpose of this report is to present an overview of the Ocean Kamp project's proposed sewer system including detailing the sewage flows generated by the project, identifying the connection point to the City of Oceanside's public sewer system, and evaluating the public system components which will convey these flows.

Also, the sewer study will discuss associated sewer improvements such as the relocation of the Mar Lado Sewer Lift Station force main and the upsizing of the Mission Avenue Trunk Sewer.

Sewer System Design Criteria

The design criteria used for the evaluation of the sewer system serving the Ocean Kamp project is based on Section 3 of the City of Oceanside Design and Construction Manual, revised August 2017. Based on this Manual, sewage generation is estimated based on land use; the flow generation factors in the Manual are consistent with the Wastewater Master Plan, October 2015, Table 3-3. The rates are presented in Table 1.

TABLE 1 SEWAGE GENERATION RATES	
Land Use	Generation Rate
Low Density Residential	170 gpd/EDU
Mid Density Residential	140 gpd/EDU
Industrial	1,000 gpd/acre
Commercial	1,000 gpd/acre
Hotels	100 gpd/room

Land uses within Ocean Kamp are commercial, hotel, wave pool, and multi-family residential. The design guide covers all land uses but the wave pool. For the wave pool, we are estimating sewage generation as 80 percent of the water use which is estimated to be 14,400 gpd. Thus, the sewage generation is 11,520 gpd average.

Peaking Factors. The peaking factor is identified in the City of Oceanside Design & Construction Manual. To convert average dry weather flows to peak wet weather flows, the peaking factors in Table 2 are used.

TABLE 2 PEAK FACTORS	
Population	Peak Factor
< 500	3.5
500-1,000	2.75
1,000-5,000	2.50
> 5,000	2.00

Manning's "n". The gravity sewer analyses are made using a computer spreadsheet which uses the Manning Equation for all of its calculations. The Manning's "n" used by the computer spreadsheet is held as a constant for all depths in a circular conduit. The value of Manning's "n" used for this study is 0.013.

Sewer Depth of Flow Criteria. Public sewer main design criteria include a maximum d/D criterion (depth to diameter ratio) of 0.5 for pipes 10-inch and smaller and a maximum d/D of 2/3 for pipes 12-inch and larger.

Flow Velocity Criteria. A minimum velocity of 2 feet per second (fps) must be achieved in the pipe at peak flow to avoid the deposition of solids. If 2 fps cannot be achieved, the minimum slope of the sewer must be 1.6 percent.

Projected Wastewater Flows

Table 1 below summarizes the wastewater flows to be generated by the Ocean Kamp project.

TABLE 1 OCEAN KAMP PROJECT WASTEWATER FLOWS					
Land Use	Quantity	Generation Rate	Average Flow, gpd	Average Flow, gpm	Peak Flow, gpm
Commercial	126,000 SF = 10.3 gr acres	1,000 gpd/ac	10,300	7.2	21.5
Hotel	300 rooms	100 gpd/room	30,000	20.8	62.5
Wave Pool	1.7 acres		11,520	8.0	20.3
Residential	700 units	140 gpd/unit	98,000	68.1	204.2
TOTAL			149,820	104.1	1

1. Cumulative Peak Flow is 215 gpm, not the summation of individual peak flows.

Existing Sewer Facilities

Figure 2 shows the existing sewer facilities located within and around the Ocean Kamp development site. There are several sewage pipelines within the SDG&E easement; however, no grading or improvements are proposed within the SDG&E easement so these existing sewer utilities will remain in place undisturbed.

Two other existing sewer facilities are of interest in reference to the Ocean Kamp project. First is the existing 8-inch Mar Lado Sewer Lift Station force main. It crosses the San Luis Rey River in Foussat Road and presently continues south in Old Foussat Road, crosses SR 76, and discharges into a 12-inch gravity sewer in Mission Avenue. From there the sewage flows east to the Mission Avenue Lift Station.

The second facility of interest is the existing 24-inch Mission Avenue Interceptor which flows from east to west and discharges into the 30-inch influent sewer line to the Mission Avenue Lift Station. The City has identified this interceptor sewer to be upsized to 30-inch diameter as part of Water Utilities' capital improvement program.

Proposed Onsite Sewer System Layout

Figure 3 shows the proposed onsite sewer system layout. Identified on Figure 3 are the proposed private and public sewer lines within the site. The onsite sewer will be public where it is providing service to the multi-family residential areas. This is because the residential areas are expected to be constructed by several home builders thus having separate ownerships. The City requires that separate ownerships are served by a public sewer.

West Side Onsite Sewer. The commercial component of the project in the northwest area of the Ocean Kamp site will be served by a private sewer until it reaches the south side of the project parallel to Mission Avenue. At this location the relocated Mar Lado Sewer Lift Station force main is proposed to connect into the gravity sewer which will require the gravity sewer to become a public facility. The Mar Lado Sewer Lift Station force main currently extends across the property in the old Foussat Road alignment. The force main will be routed into new Foussat Road just short of Mission Avenue and then extended east within a utility easement through the Ocean Kamp project to the new onsite public sewer.

\\ARTIC\DWG\921003\REPORTS\PCO_SWR_FIGURE-2-EXSWR.DWG 03-13-20 15:12:46 LAYOUT: LAYOUT

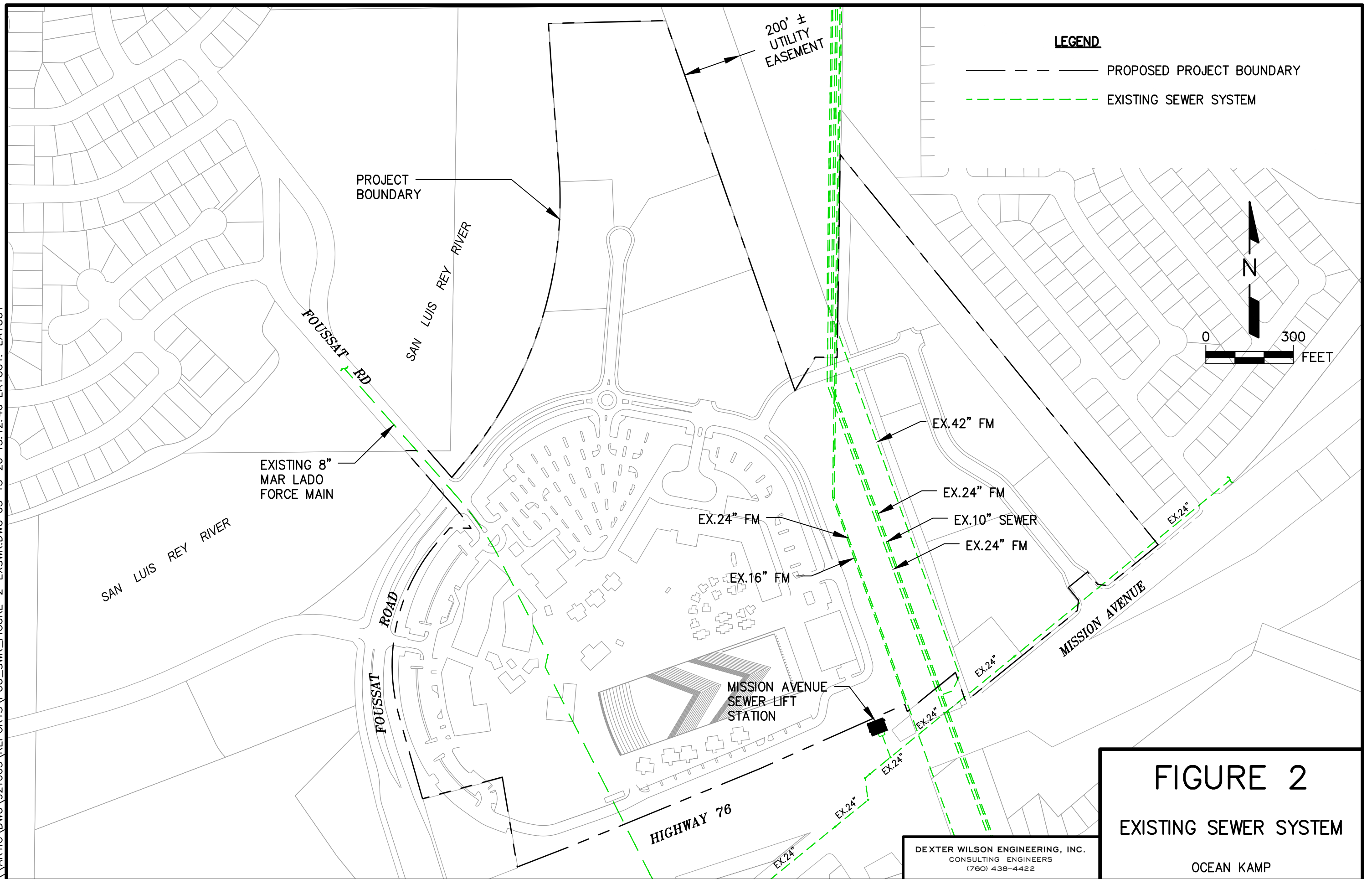


FIGURE 2
EXISTING SEWER SYSTEM

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From the multi-family residential lots at the north end of the western portion of Ocean Kamp, a public gravity sewer will extend south in the Loop Road and connect to the public sewer line extending from the west parallel to Mission Avenue. These two onsite public sewers will then be routed in one gravity sewer line around the west and south sides of the Mission Avenue Lift Station and connect to the existing 30-inch Lift Station influent line with a new manhole.

East Side Onsite Sewer. The east side of the Ocean Kamp project only has multi-family residential development. Sewer will flow south to Mission Avenue. Where the new onsite public sewer line would expect to be connected to the 24-inch Mission Avenue Interceptor, the current approach is for Ocean Kamp to construct a new 30-inch gravity sewer in Mission Avenue from their connection point west to the Mission Avenue Lift Station. This work would be done in lieu of constructing a parallel 8-inch sewer just for the Ocean Kamp project. Prior to the construction of the new 30-inch sewer interceptor, the City and Ocean Kamp would enter into a reimbursement agreement in which the City would fund this capital improvement except for the equivalent cost of building an 8-inch parallel sewer just for Ocean Kamp.

Onsite Sewer Facilities Analysis

The public and private onsite sewer system was analyzed based on the tentative map level sewer slopes to determine what sizes are necessary to accommodate peak sewage flow from the Ocean Kamp project.

Ocean Kamp Project Flows. The sewer flow calculation spreadsheets for Ocean Kamp project flows within the onsite sewer system are included in Appendix B. The manhole numbering diagram associated with the sewer calculation spreadsheet is Exhibit A at the back of this report. Individual spreadsheets are provided for the west side sewer system and the east side sewer line.

The results of the onsite sewer calculations show that 8-inch gravity sewer piping throughout the site is adequate to convey the Ocean Kamp peak sewage flows. The west side analysis shows a maximum d/D of 0.43 for 8-inch sewer lines at 0.50 percent slope.

The majority of the onsite gravity sewer system is designed at 0.50 percent slope because the project site has very little grade differential. For this reason, several segments of the upstream-most sewer serving the west side multi-family lots have flow velocity less than 2 fps.

For the east side multi-family lots, the run of sewer is shorter which enables the sewer slope to be greater. The 8-inch sewer for the east side is designed at 1.0 percent slope.

Ocean Kamp Plus Mar Lado Lift Station Flows. A separate set of spreadsheet calculations has been prepared to show the effect of adding Mar Lado Lift Station flows into the onsite public sewer system. The 8-inch Mar Lado Sewer Lift Station force main is being relocated by the Ocean Kamp project; the force main is currently in the Old Foussat Road alignment. In addition to relocating the force main into Foussat Road, the force main will be routed within the south side of the Ocean Kamp project and will discharge into the onsite gravity sewer. This will eliminate the force main crossing under SR 76.

When adding the Mar Lado Lift Station force main flow of 800 gpm, the onsite gravity sewer increases from 8-inch diameter to 12-inch diameter. This sewer line is at a slope of 1.0 percent. Depth of peak flow in the proposed 12-inch sewer line with Mar Lado Lift Station force main discharge of 800 gpm is 0.51 d/D .

These spreadsheet calculations are provided in Appendix C and use the same manhole numbering diagram, Exhibit A.

Mission Avenue 24-inch Interceptor. The 24-inch gravity sewer line in Mission Avenue is planned to be upgraded to a 30-inch sewer by the City Water Utilities Department as a capital improvement project. Since this interceptor is already slated for upgrade, this sewer study does not include any capacity analysis of this line. Figure 3 shows the conceptual horizontal alignment of the new 30-inch sewer interceptor within Mission Avenue. This alignment which is shown on the Ocean Kamp tentative map will need to be further vetted during the final design phase.

Existing 30-inch Sewer Influent to the Lift Station. In meetings with Water Utilities a question was raised regarding the capacity in the 30-inch influent sewer directly upstream of the Mission Avenue Lift Station. We do not have total existing peak flow or projected future peak flow expected to flow into the Mission Avenue Lift Station. Therefore, we cannot determine the available capacity nor determine if the existing 30-inch influent sewer should be upgraded.

The As-Built drawings for this line show a slope of 0.26 percent. Based on the City's maximum d/D requirement of 2/3, the 30-inch sewer line's maximum design capacity calculates to be approximately 10.6 mgd or 7,300 gpm. At full pipe flow, the capacity is 13.5 mgd or 9,300 gpm.

Conclusions

The following conclusions are summarized based on the sewer system analysis performed for the proposed Ocean Kamp project.

1. The Ocean Kamp project, consisting of a hotel, commercial center, wave pool, and 700 multi-family dwelling units will obtain sewer service from the City of Oceanside.
2. Sewer generated by the Ocean Kamp project will gravity flow to the existing Mission Avenue Lift Station.

3. Onsite gravity sewer mains within the Ocean Kamp project are 8-inch and 12-inch diameter. Portions of the sewer system are private.
4. Several existing sewage facilities are located within the Ocean Kamp project. Utilities within the Old Foussat Road alignment will be relocated. Those within the SDG&E easement will remain in place undisturbed.
5. The relocated Mar Lado Lift Station force main will be relocated into Foussat Road and will discharge into the new onsite public sewer system.
6. The existing 24-inch Mission Avenue Interceptor has been identified by the City to be upsized to 30-inch. The Ocean Kamp project will perform the construction of a segment of this new sewer and enter into a reimbursement agreement with the City.

We appreciate the opportunity to assist you with the sewer system planning for the Ocean Kamp project. If you have any questions regarding the information presented in this report, please do not hesitate to contact us.

Dexter Wilson Engineering, Inc.



Andrew Owen, P.E.

AO:ps

Attachments

APPENDIX A

DESIGN GUIDE REFERENCE INFORMATION

SECTION 3 - SEWER SYSTEMS DESIGN GUIDELINES

3.1 GENERAL

- A. All sewer system construction shall conform to the most recent edition of the City of Oceanside's Water, Sewer, and Reclaimed Water Design & Construction Manual.
- B. If a conflict arises between the requirements in this manual, the order of precedence shall take place:
 - 1. Sections 1-4, Required Notes, & Appendix
 - 2. Standard Drawings
 - 3. Standard Specifications
- C. If the standard that is sought does not appear in this Manual, then the following standards shall be utilized in the order listed:
 - 1. State of California Department of Health Services
 - 2. American Water Works Association (AWWA) Standards
 - 3. San Diego County Regional Standard Drawings
 - 4. Standard Specifications for Public Works Construction (SSPWC or "Greenbook"), latest Edition.

Exceptions to this and all other guidelines appearing in this manual may be allowed only upon the approval of the Water Utilities Director.

- B. The sewer facilities listed below will require telemetry and control equipment to be incorporated into the design of the facility. The Water Utilities Department will provide specific design requirements when improvement plans are submitted for Plan Check.
 - 1. Treatment Facilities
 - 2. Sewer Lift Stations and force mains
 - 3. Metering Stations

3.2 MAINS

- A. Minimum size shall be 8 inches.
- B. All mains not meeting the minimum main diameter and material shall be replaced to meet current design requirements. This is applicable for all new commercial, industrial, institutional, and residential developments of four (4) units or more. Where the full replacement length(s) from manhole to manhole along the property frontage length impacts more than one main and significantly exceeds the developed

property(ies) or is deemed in excess of the overall project cost, the developer may pay an in-lieu fee upon the approval of the Water Utilities Director.

- C. Slip-lining or replacement of sewer mains 8-inch or larger may be required if the main is determined to be in poor condition per CCTV report.
- D. For diameters 10 inches and smaller, maximum depth of flow shall not exceed $\frac{1}{2}$ the diameter. For diameters 12 inches and larger, depth of flow shall not exceed $\frac{2}{3}$ the diameter.
- E. No vertical or horizontal curves shall be permitted, unless otherwise approved by the Water Utilities Director.
- F. The maximum slope of sewer line shall be 14% unless otherwise approved by the Water Utilities Director.
- G. If the main and/or lateral is at a depth of 20 feet or more than the type of pipe material must be approved by the Water Utilities Department. Calculations must be provided to the Water Utilities Department to verify that the pipe material will accommodate the design depths.

H. Locations:

- 1. Alley: Mains shall be offset a minimum of 3 feet from the centerline to clear alley gutter. Separation from waterlines shall be per Oceanside Standard Drawing S-1 and S-1a.
- 2. Street: Sewer main locations shall be located in center of the street. A minimum 10-foot separation outside of pipe to outside of pipe from waterlines shall be maintained.
- 3. Streets with 84 feet of right-of-way or more may require special location as approved by the Water Utilities Director.
- 4. Minimum cover for sewer mains shall be 6 feet below the finished grade, unless otherwise approved by the Water Utilities Director.

I. Minimum Slopes:

A minimum velocity of 2 FPS shall be maintained at peak flow. Where 2 FPS is not attainable, a minimum slope of 1.6% shall be used. When velocities are 2.0 FPS or greater the following design criteria will govern:

<u>Pipe Diameter</u>	<u>Minimum Slope</u>
8 Inch	0.50%
10 Inch and larger	0.40%

J. Demands:

- 1. Average daily sewer generation rates shall be:

LAND USE	LAND USE CATEGORY	UNITS
----------	-------------------	-------

Low Density Residential	EA-R, EB-R, SDF-R	170 gpd/EDU
Mid Density Residential	MDA-R, MDB-R, MDC-R, HD-R, UHD-R	140 gpd/EDU
Industrial	LI	1,000 gpd/acre
Commercial	CC, NC, GC, SC, PC, GI, RP-I, CI, PI	1,000 gpd/acre
Hotels		100 gpd/room

Peak daily flows for residential developments, shall be based on a ratio of peak to average flow as shown below:

<u>Population</u>	<u>Ratio of Peak to Average Flow</u>
Less than 500	3.5
500 to 1,000	2.75
1,000 to 5,000	2.50
Greater than 5,000	2.00

3. Peak daily flows for all other uses shall be based on the following formula:

$$Q_p = 1.84 Q_a^{.92}$$

Where Q_p = Peak Flow in CFS

Q_a = Average Flow in CFS

- I. Residential area easements shall be constructed by the developer. They shall be fenced on both sides parallel to the easement with a gate at the entrance and the exit. Easements shall be dedicated to the City and maintained by Property Owner with a lock feature.
- J. All sewer mains not located within the public right-of-way shall be provided with a minimum 20-foot wide sewer easement. In some special cases, a wider easement may be required; the Water Utilities Director shall determine size. All easements shall be easily accessible to City maintenance equipment with all weather roadways. An access road will be built for trucks and as approved by the Water Utilities Department.
- K. All utility easements that contain sewer mains, which will be publicly maintained, shall demonstrate that the largest vehicle within the Sewer Collections Fleet can transverse the streets without damage to both public and private property. The turning radius of this vehicle will be made available upon request.
- L. Where water and sewer mains are located within the same easement, the minimum easement size shall be 30 feet wide. All easements shall be easily accessible to the City's maintenance equipment with all-weather access roadways. No trees or structures or building overhang are allowed within the City easements. When easements are located on private properties, the property owner shall keep the easement free and clear of weeds and debris.
- M. 3-inch minimum width color coded detector tape marked "SEWER" in 1-½ inch black letters shall be placed on the compacted and graded bedding material one foot above and centered over the sewer main prior to backfilling the trench.

APPENDIX B

ONSITE SEWER SYSTEM ANALYSIS PROPOSED OCEAN KAMP PROJECT FLOWS

DATE: 3/13/2020

SEWER STUDY SUMMARY

JOB NUMBER: 921-003

FOR: West Ocean Kamp Onsite Sewer System - Proposed Pipes; Proposed Flows

BY: Dexter Wilson Engineering, Inc.

SHT 1 OF 1

REFER TO PLAN SHEET: Exhibit A

FROM	TO	LENGTH (ft)	POP. PER D.U.	IN-LINE EDUs	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.)	COMMENTS
					IN-LINE	TOTAL					M.G.D.	C.F.S.								
20	19		2.5	120	300	300	56	16,800	3.500	58,800	0.059	0.091	8	0.50	0.049317	0.14684	0.220	0.1283	1.60	MF Residential - 120 Dus
19	18		2.5	100	250	550	56	30,800	2.750	84,700	0.085	0.131	8	0.50	0.071040	0.17646	0.265	0.1664	1.77	MF Residential - 100 Dus
18	61		2.5	100	250	800	56	44,800	2.750	123,200	0.123	0.191	8	0.50	0.103331	0.21401	0.321	0.2176	1.97	MF Residential - 100 DUs
21	61		1.79	100	179	179	56	10,002	3.500	35,006	0.035	0.054	8	2.00	0.014680	0.08128	0.122	0.0547	2.23	Hotel - 100 Rooms, Private Sewer Main
61	17		0.00	10	0	979	56	54,802	2.750	150,704	0.151	0.233	8	0.50	0.126400	0.23798	0.357	0.2517	2.08	
17	16		2.50	100	250	1229	56	68,802	2.500	172,004	0.172	0.266	8	0.50	0.144264	0.25549	0.383	0.2770	2.16	MF Residential - 100 DUs
16	15		0.00	0	0	1229	56	68,802	2.500	172,004	0.172	0.266	8	0.50	0.144264	0.25549	0.383	0.2770	2.16	
15	14		0.00	0	0	1229	56	68,802	2.500	172,004	0.172	0.266	8	0.50	0.144264	0.25549	0.383	0.2770	2.16	
14	13		0.00	0	0	1229	56	68,802	2.500	172,004	0.172	0.266	8	0.50	0.144264	0.25549	0.383	0.2770	2.16	
58	13		1.79	150	268	268	56	15,002	3.500	52,508	0.053	0.081	8	2.00	0.022020	0.09893	0.148	0.0728	2.51	Hotel - 150 Rooms, Private Sewer Main
13	12		0.00	100	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
12	11		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
11	22		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
22	23		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
23	201		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
201	24		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
24	25		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
25	26		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
33	31		17.86	3.4	61	61	56	3,400	3.500	11,900	0.012	0.018	8	1.00	0.007057	0.05730	0.086	0.0327	1.27	Commercial - 3.4 acres, Private Sewer Main
32	31		1.79	50	89	89	56	5,001	3.500	17,503	0.018	0.027	8	1.00	0.010380	0.06889	0.103	0.0429	1.42	Hotel - 50 Rooms, Private Sewer Main
31	30		17.86	3	61	211	56	11,801	3.500	41,303	0.041	0.064	8	1.00	0.024495	0.10416	0.156	0.0784	1.83	Commercial - 3.4 Acres, Private Sewer Main
35	34		17.86	3.5	62	62	56	3,500	3.500	12,250	0.012	0.019	8	1.00	0.007265	0.05811	0.087	0.0334	1.28	Commercial - 3.5 Acres, Private Sewer Main
34	30		0.00	0	0	62	56	3,500	3.500	12,250	0.012	0.019	8	1.00	0.007265	0.05811	0.087	0.0334	1.28	Private Sewer Main
30	29		121.00	1.7	206	479	56	26,820	3.500	93,870	0.094	0.145	8	1.00	0.055671	0.15607	0.234	0.1399	2.34	Wave Pool - 1.7 Acres, Private Sewer Main
29	28		0.00	0	0	479	56	26,820	3.500	93,870	0.094	0.145	8	1.00	0.055671	0.15607	0.234	0.1399	2.34	Private Sewer Main
36	28		0.00	0	0	0	56	0	3.500	0	0.000	0.000	8	0.50	0.000000	0.00000	0.000	0.0000	0.00	No sewer flow from Mar Lado SLS
28	27		0.00	0	0	479	56	26,820	3.500	93,870	0.094	0.145	8	1.00	0.055671	0.15607	0.234	0.1399	2.34	
27	26		0.00	0	0	479	56	26,820	3.500	93,870	0.094	0.145	8	1.00	0.055671	0.15607	0.234	0.1399	2.34	
26	101		0.00	0	0	1975	56	110,624	2.500	276,560	0.277	0.428	8	1.70	0.125797	0.23737	0.356	0.2508	3.84	
101	102		0.00	0	0	1975	56	110,624	2.500	276,560	0.277	0.428	8	1.70	0.125797	0.23737	0.356	0.2508	3.84	
102	103		0.00	0	0	1975	56	110,624	2.500	276,560	0.277	0.428	8	1.70	0.125797	0.23737	0.356	0.2508	3.84	

Total EDUs
842

Total Pop.
1975

Min Slope
0.50

Max dn/D
0.43

FROM	TO	LENGTH (ft)	POP. PER D.U.	IN-LINE EDUs	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.)	COMMENTS
					IN-LINE	TOTAL					M.G.D.	C.F.S.								
57	56		2.5	70	175	175	56	9,800	3.500	34,300	0.034	0.053	8	1.00	0.020342	0.09520	0.143	0.0688	1.74	MF Residential - 70 DUs
56	55		2.5	70	175	350	56	19,600	3.500	68,600	0.069	0.106	8	1.00	0.040684	0.13347	0.200	0.1120	2.13	MF Residential - 70 DUs
55	54		2.5	0	0	350	56	19,600	3.500	68,600	0.069	0.106	8	1.00	0.040684	0.13347	0.200	0.1120	2.13	
54	53		2.5	70	175	525	56	29,400	2.750	80,850	0.081	0.125	8	1.00	0.047950	0.14477	0.217	0.1258	2.24	MF Residential - 70 DUs
53	52		2.5	0	0	525	56	29,400	2.750	80,850	0.081	0.125	8	1.00	0.047950	0.14477	0.217	0.1258	2.24	
52	51		2.5	70	175	700	56	39,200	2.750	107,800	0.108	0.167	8	1.00	0.063933	0.16735	0.251	0.1544	2.43	MF Residential - 70 DUs

Total EDUs
280

Total Pop.
700

Min Slope
1.00

Max dn/D
0.25

APPENDIX C

ONSITE SEWER SYSTEM ANALYSIS PROPOSED OCEAN KAMP PROJECT FLOWS PLUS MAR LADO FORCE MAIN FLOW

DATE: 3/13/2020

SEWER STUDY SUMMARY

JOB NUMBER: 921-003

FOR: West Ocean Kamp Onsite Sewer System - Proposed Pipes & Flows Plus Mar Lado SLS

BY: Dexter Wilson Engineering, Inc.

SHT 1 OF 1

REFER TO PLAN SHEET: Exhibit A

FROM	TO	LENGTH (ft)	POP. PER D.U.	IN-LINE EDUs	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.)	COMMENTS
					IN-LINE	TOTAL					M.G.D.	C.F.S.								
20	19		2.5	120	300	300	56	16,800	3.500	58,800	0.059	0.091	8	0.50	0.049317	0.14684	0.220	0.1283	1.60	MF Residential - 120 Dus
19	18		2.5	100	250	550	56	30,800	2.750	84,700	0.085	0.131	8	0.50	0.071040	0.17646	0.265	0.1664	1.77	MF Residential - 100 Dus
18	61		2.5	100	250	800	56	44,800	2.750	123,200	0.123	0.191	8	0.50	0.103331	0.21401	0.321	0.2176	1.97	MF Residential - 100 DUs
21	61		1.79	100	179	179	56	10,002	3.500	35,006	0.035	0.054	8	2.00	0.014680	0.08128	0.122	0.0547	2.23	Hotel - 100 Rooms, Private Sewer Main
61	17		0.00	10	0	979	56	54,802	2.750	150,704	0.151	0.233	8	0.50	0.126400	0.23798	0.357	0.2517	2.08	
17	16		2.50	100	250	1229	56	68,802	2.500	172,004	0.172	0.266	8	0.50	0.144264	0.25549	0.383	0.2770	2.16	MF Residential - 100 DUs
16	15		0.00	0	0	1229	56	68,802	2.500	172,004	0.172	0.266	8	0.50	0.144264	0.25549	0.383	0.2770	2.16	
15	14		0.00	0	0	1229	56	68,802	2.500	172,004	0.172	0.266	8	0.50	0.144264	0.25549	0.383	0.2770	2.16	
14	13		0.00	0	0	1229	56	68,802	2.500	172,004	0.172	0.266	8	0.50	0.144264	0.25549	0.383	0.2770	2.16	
58	13		1.79	150	268	268	56	15,002	3.500	52,508	0.053	0.081	8	2.00	0.022020	0.09893	0.148	0.0728	2.51	Hotel - 150 Rooms, Private Sewer Main
13	12		0.00	100	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
12	11		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
11	22		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
22	23		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
23	201		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
201	24		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
24	25		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
25	26		0.00	0	0	1497	56	83,804	2.500	209,510	0.210	0.324	8	0.50	0.175721	0.28470	0.427	0.3200	2.28	
33	31		17.86	3.4	61	61	56	3,400	3.500	11,900	0.012	0.018	8	1.00	0.007057	0.05730	0.086	0.0327	1.27	Commercial - 3.4 acres, Private Sewer Main
32	31		1.79	50	89	89	56	5,001	3.500	17,503	0.018	0.027	8	1.00	0.010380	0.06889	0.103	0.0429	1.42	Hotel - 50 Rooms, Private Sewer Main
31	30		17.86	3	61	211	56	11,801	3.500	41,303	0.041	0.064	8	1.00	0.024495	0.10416	0.156	0.0784	1.83	Commercial - 3.4 Acres, Private Sewer Main
35	34		17.86	3.5	62	62	56	3,500	3.500	12,250	0.012	0.019	8	1.00	0.007265	0.05811	0.087	0.0334	1.28	Commercial - 3.5 Acres, Private Sewer Main
34	30		0.00	0	0	62	56	3,500	3.500	12,250	0.012	0.019	8	1.00	0.007265	0.05811	0.087	0.0334	1.28	Private Sewer Main
30	29		121.00	1.7	206	479	56	26,820	3.500	93,870	0.094	0.145	8	1.00	0.055671	0.15607	0.234	0.1399	2.34	Wave Pool - 1.7 Acres, Private Sewer Main
29	28		0.00	0	0	479	56	26,820	3.500	93,870	0.094	0.145	8	1.00	0.055671	0.15607	0.234	0.1399	2.34	Private Sewer Main
36	28		3.00	3,429	10287	10287	56	576,072	2.000	1,152,144	1.152	1.783	12	0.50	0.327755	0.62094	0.621	0.5128	3.48	800 gpm Mar Lado SLS flow
28	27		0.00	0	0	10766	56	602,892	2.000	1,205,784	1.206	1.866	12	1.00	0.242548	0.51443	0.514	0.4074	4.58	
27	26		0.00	0	0	10766	56	602,892	2.000	1,205,784	1.206	1.866	12	1.00	0.242548	0.51443	0.514	0.4074	4.58	
26	101		0.00	0	0	12262	56	686,696	2.000	1,373,392	1.373	2.125	12	1.70	0.211884	0.47472	0.475	0.3533	6.01	
101	102		0.00	0	0	12262	56	686,696	2.000	1,373,392	1.373	2.125	12	1.70	0.211884	0.47472	0.475	0.3533	6.01	
102	103		0.00	0	0	12262	56	686,696	2.000	1,373,392	1.373	2.125	12	1.70	0.211884	0.47472	0.475	0.3533	6.01	

Total EDUs
4271

Total Pop.
12262

Min Slope
0.50

Max dn/D
0.62

EXHIBIT A

ONSITE SEWER MANHOLE NUMBERING DIAGRAM

\\ARTIC\DWG\921003\REPORTS\PCO_SWR_EXHIBIT-A_MH-NUM.DWG 03-13-20 15:16:00 LAYOUT: LAYOUT

