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SEWER SYSTEM ANALYSIS FOR THE WEST OAKS PROJECT

January 18, 2019

**SEWER SYSTEM ANALYSIS
FOR THE
WEST OAKS PROJECT**

January 18, 2019



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Job No.: 930-011

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930-011

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Attention: Greg Waite, Project Manager

Subject: West Oaks Project Sewer System Analysis

Introduction

This letter-report summarizes our evaluation of the sewer system that will serve the proposed West Oaks Project in Carlsbad. The project is located along the south side of Palomar Airport Road at Palomar Oaks Way. Figure 1 provides a vicinity map for the project.

The existing zoning for the property is industrial. The proposed land use for the project is a mix of market rate and affordable multi-family residential units totaling 192 units. The project area is within the City of Carlsbad for service. This study provides recommendations for the sewer system that will provide service to the project.

\\ARTIC\DWG\930011\FIGURE-1-LOCATION.DWG 07-25-17 15:13:01 LAYOUT: LAYOUT1

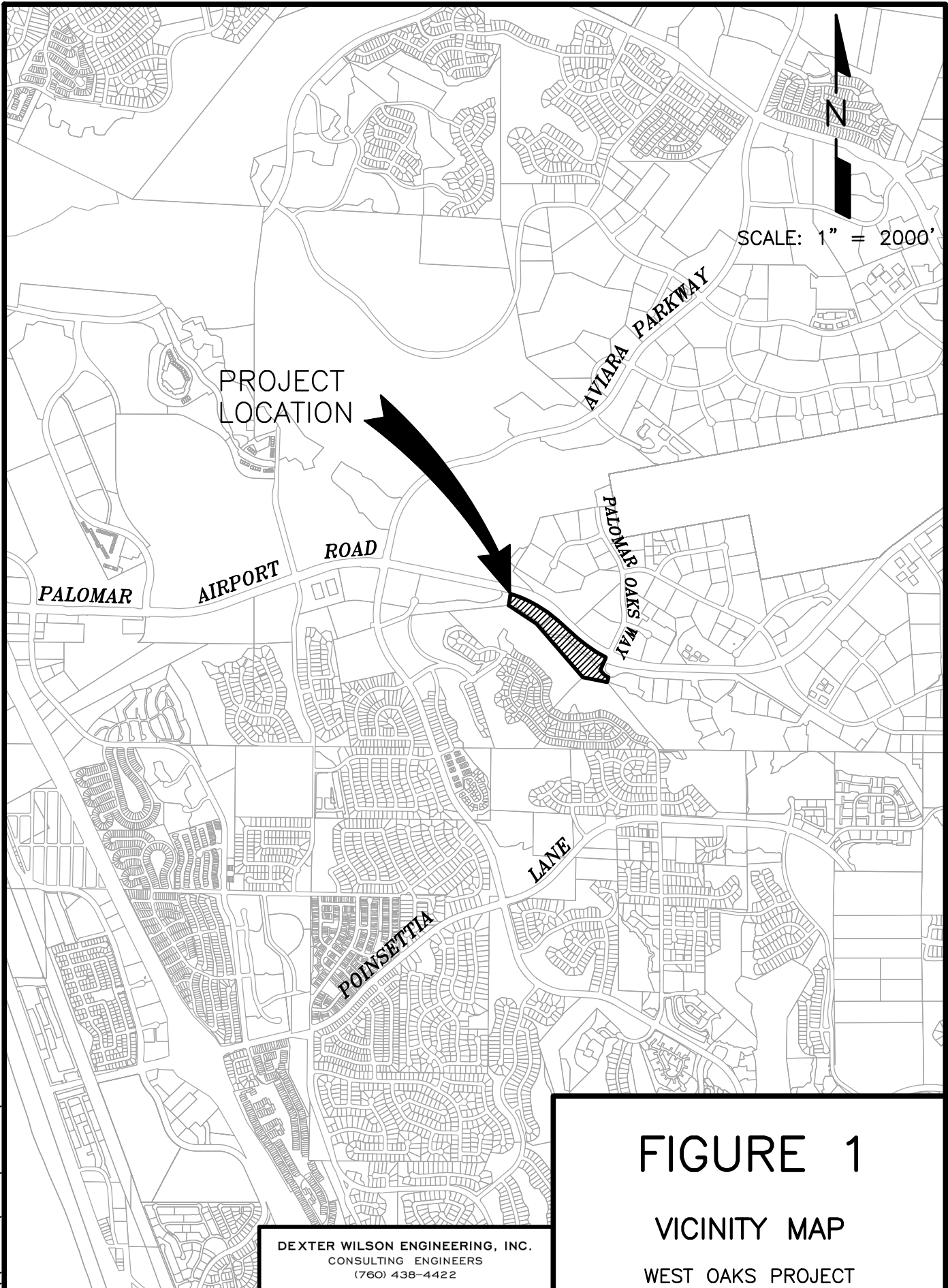


FIGURE 1

VICINITY MAP

WEST OAKS PROJECT

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Sewer Service Design Criteria

The sewer system planning criteria used in this study are in accordance with the 2016 City of Carlsbad Engineering Standards Volume 1. The criteria pertinent to this study are summarized below:

- Manning's Equation Coefficient = 0.011
- Multi-Family Residential Sewage Generation Factor = 176 gpd/unit
- Peak Flow Factor = 2.5 x Avg. Flow
- Minimum Pipeline Velocity at Peak Flow = 2.0 ft/s
- Maximum Depth-to-Diameter, new 12" and smaller pipes = 0.50
- Maximum Depth-to-Diameter, new 15" and larger pipes = 0.75

When a minimum velocity of 2.0 feet per second cannot be achieved, a minimum pipe slope of 1.0 percent is recommended where possible.

Projected Sewer Flows

Table 1 summarizes the projected sewer flows for the West Oaks Project.

TABLE 1 WEST OAKS PROJECT PROJECTED SEWER FLOWS				
Description	Quantity	Demand Factor	Average Day Demand, gpd	EDUs¹
Multi-Family Residential	192 units	176 gpd/unit	33,792	154

¹ Based on 220 gpd/EDU.

The projected peak flow for the project is 84,480 gpd (59 gpm).

Existing Sewer System

The West Oaks project site has already been graded and West Oaks Way has already been constructed with utilities through the project. The project is within the City of Carlsbad for

sewer service, but there are also Vallecitos Water District (VWD) and Buena Sanitation District (BSD) interceptor sewers located within or adjacent to the site.

The Vallecitos Interceptor consists of gravity sewer lines and inverted siphons that range from 30-inches to 54-inches in size. The interceptor is 30-inches in size and is located in Palomar Airport Road adjacent to the West Oaks project.

The Vallecitos Interceptor has a minimum capacity of 20.85 mgd. The Vallecitos Water District has capacity rights of 11.2 mgd in this interceptor while BSD has rights to 3.75 mgd and the City of Carlsbad has rights to 5.0 mgd. Currently, BSD is not conveying any flow to the Vallecitos Interceptor and Carlsbad is conveying peak wet weather flows of approximately 2.0 mgd (per Carlsbad 2012 Master Plan). Thus, the Vallecitos Interceptor has significant available capacity for the BSD and Carlsbad.

The Buena Interceptor is owned and operated by the City of Vista which operates BSD facilities. The section of the Buena Interceptor that transverses the site is an 18-inch gravity sewer that is installed in an easement south of Palomar Airport Road. There is an existing stub off this line in the west side of the project. The City of Carlsbad has capacity ownership rights in the Buena Interceptor that vary from reach to reach. The segment of gravity sewer line that traverses the project is in Reach B3 and the City has capacity rights of 1.28 mgd in that segment. BSD also has a failsafe line from the decommissioned Shadowridge Water Reclamation Facility that parallels the Buena Interceptor and is a 16-inch line where it transverses the project.

For the section of gravity interceptor adjacent to the West Oaks project, the interceptor has a total capacity of 6.79 mgd with the City of Carlsbad having capacity rights of 1.28 mgd. Per the 2012 Carlsbad Master Plan, this section of line experiences peak wet weather flows of approximately 8.0 mgd which causes the line to surcharge. Unlike the Vallecitos Interceptor, there is currently not available capacity in the Buena Interceptor.

To provide service to existing development in the area, the City of Carlsbad has local sewers with connections to the Buena and Vallecitos Interceptors. Figure 2 graphically shows the location of existing sewers in the vicinity of the project.

\\ARTIC\DWG\930011\SEWER\FIGURE-2-EX-S.DWG 07-27-17 08:24:11 LAYOUT: LAYOUT

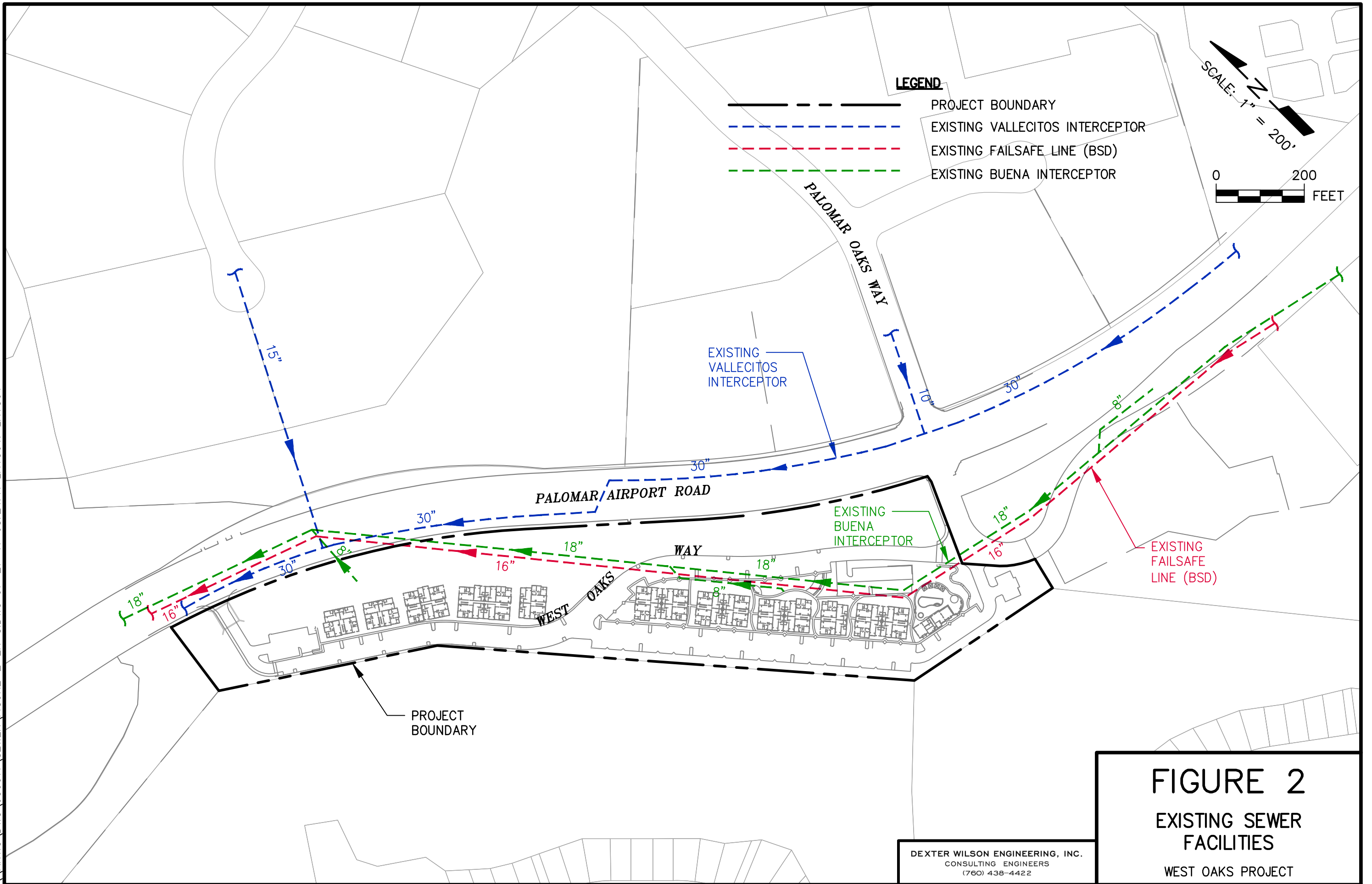


FIGURE 2
EXISTING SEWER FACILITIES
 WEST OAKS PROJECT

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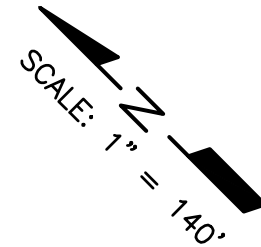
Proposed Sewer System

The West Oaks project proposes to receive sewer service by conveying flows to the Buena Interceptor. The project proposes to construct a local 8-inch sewer to convey flow west and connect to an existing 8-inch stub off the Buena Interceptor. The project also proposes to relocate a section of the Buena Interceptor, but no connections will be made to this new section of line. Figure 3 provides the proposed sewer system for the project.





As mentioned previously, the Buena Interceptor does not have any excess capacity under existing flow conditions. The City of Vista is proposing to install the Buena Outfall Force Main project. This project will allow 3.75 mgd of BSDs flows that currently go to the Buena Interceptor to be diverted to the Vallecitos Interceptor. This project has been fully designed and the City of Vista plans to implement it in the near future, pending some easement acquisitions that are necessary. At the completion of this project, only Carlsbad flows would remain in the Buena Interceptor and the City of Vista and City of Carlsbad anticipate entering into an agreement for the transfer of this interceptor to the City of Carlsbad. This project is anticipated to be implemented prior to the development of the West Oaks project and would free up capacity to serve the project as verified by the hydraulic analysis provided as part of this study.

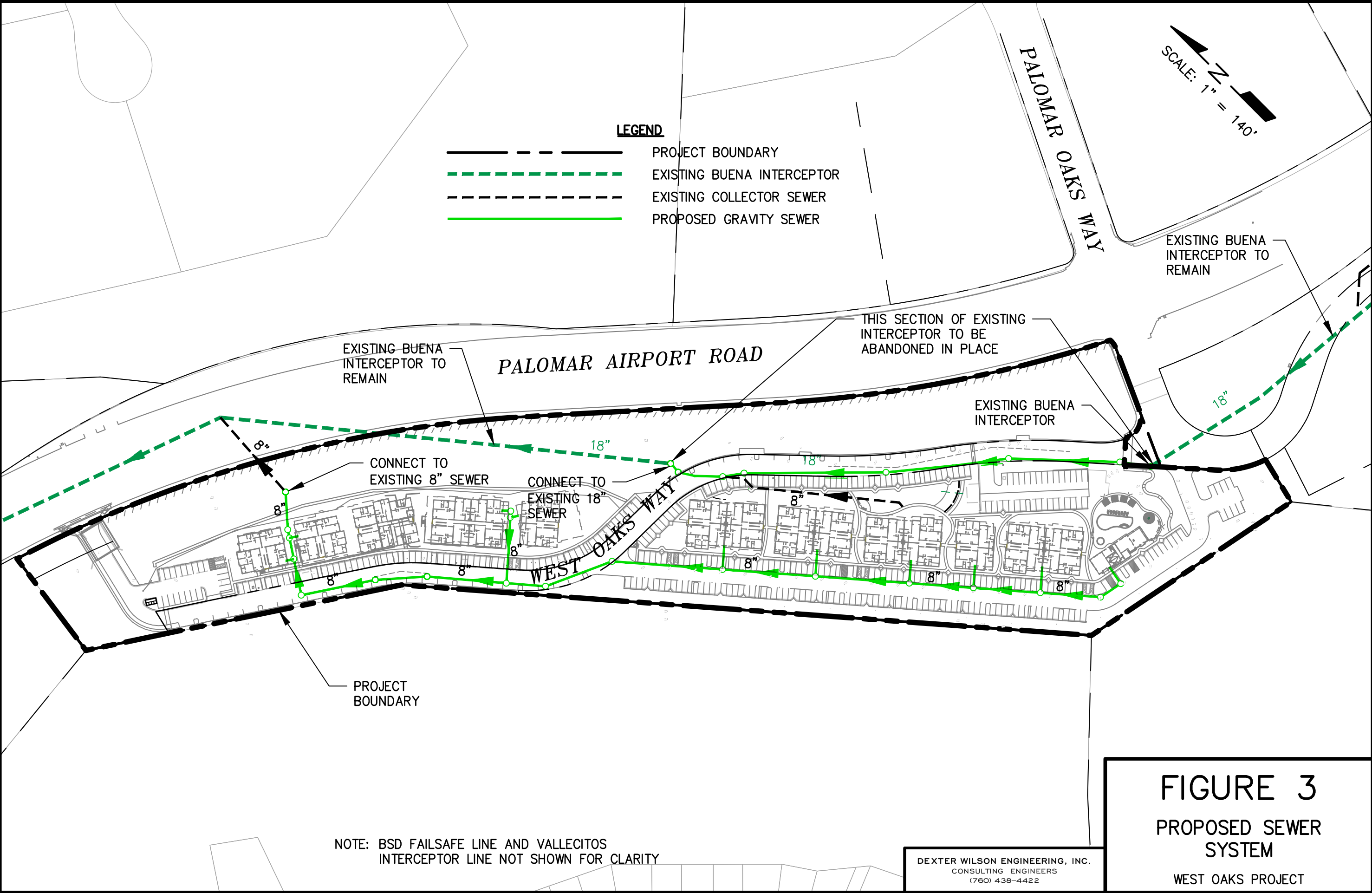
As stated previously, Carlsbad has 5.0 mgd of capacity rights in the Vallecitos Interceptor and currently conveys peak wet weather flows of approximately 2.0 mgd. With the addition of the West Oaks project, peak wet weather flows would increase to approximately 2.1 mgd.

\\ARTIC\DWG\930011\SEWER\FIGURE-3-PRO-S.DWG 01-18-19 08:50:03 LAYOUT: LAYOUT



LEGEND

-  PROJECT BOUNDARY
-  EXISTING BUENA INTERCEPTOR
-  EXISTING COLLECTOR SEWER
-  PROPOSED GRAVITY SEWER



NOTE: BSD FAILSAFE LINE AND VALLECITOS INTERCEPTOR LINE NOT SHOWN FOR CLARITY

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FIGURE 3
PROPOSED SEWER SYSTEM
 WEST OAKS PROJECT

Sewer Hydraulic Analysis

Assuming that the City of Vista Buena Outfall Force Main Project has been completed, the relocated section of the Buena Interceptor was evaluated to verify the capacity of this system. The system was evaluated based on existing conditions with Carlsbad peak flows equal to their current capacity rights of 1.28 mgd and with the addition of flows from the West Oaks project. The final slope of the relocated section of Buena Interceptor will be determined during final engineering, but expected to be approximately 0.50% based on a preliminary evaluation. Based on these assumptions the results of the analysis are provided in Appendix A. The results indicate that this section of line will flow at a depth-to-diameter (d/D) ratio of 0.33 when flows from the West Oaks project are added.

Local Facilities Management Plan

The West Oaks project is within Zone 5 of the Local Facilities Management Plan (LFMP) prepared by the City of Carlsbad in 1987. For sewer service, the LFMP further split this area into Zone 5A and Zone 5B with Zone 5A being the area tributary to the Buena and Vallecitos (formerly San Marcos) Interceptors and Zone 5B being the area tributary to the South Agua Hedionda Interceptor. Within Zone 5A, the LFMP projected existing, committed, and future development by converting commercial and industrial square footage estimates to equivalent dwelling units (EDUs). The conversion factor used for commercial and industrial development was 1,800 sf/EDU. The LFMP evaluated future capacity in the Buena and Vallecitos Interceptors combined and concluded that these interceptors had adequate capacity for existing and near term flows, but that certain reaches might have flows that exceed pipe capacity in the future condition.

If developed as industrial, the West Oaks project would consist of an estimated 93,915 square feet of building space. This converts to 52 EDUs using the factor of 1,800 sf/EDU from the LFMP. By comparison, the total projected flow from the West Oaks project as currently proposed would represent 154 EDUs (see Table 1). Thus, rezoning of the project increases the sewer EDU projections by 102 EDUs. The amount of flow that is generated from industrial development can vary widely based on the use of the space (office versus warehouse) and the type of business. The City of San Diego uses a factor of 5,000 gpd per net acre to estimate sewage flows from industrial areas. With an estimated 7.2 net acres, this would equate to 36,000 gpd, or 164 EDUs of projected flow. Thus, if the industrial parcel were developed as a higher water use facility such as brewing or similar the estimated flows would be similar to the current proposed land use.

The rezoning of the West Oaks project will result in an increase of 102 sewer EDUs using LFMP criteria, but the actual increase could be less depending on the type of use and method for projecting flows. Even in a worst case increase of 102 EDUs, the increase in peak sewer flows from this project would be equal to approximately 1.0 percent of the capacity of the relocated Buena Interceptor. This increase will be negligible when Vista redirects its flows to the Vallecitos Interceptor such that the Buena Interceptor conveys flows from Carlsbad only.

Conclusions

Sewer service can be provided to the West Oaks project by the City of Carlsbad by conveying flow to the Buena Interceptor. Figure 3 graphically shows the location of proposed facilities. The project proposes to construct an 8-inch collector sewer to convey flow westerly and connect to an existing 8-inch stub off the Buena Interceptor. The project also proposes to realign a portion of the Buena Interceptor, but no new connections are proposed to the new section of line. The Buena Interceptor does not currently have excess capacity, but will have capacity when the City of Vista completes the Buena Outfall Force Main project and re-routes 3.75 mgd from this line to the Vallecitos Interceptor.

Greg Waite
January 18, 2019

If you have any questions on the information contained herein, please let us know.

Dexter Wilson Engineering, Inc.

Stephen M. Nielsen

Stephen M. Nielsen, P.E.

SMN:pjs



APPENDIX A

SEWER HYDRAULIC ANALYSIS

SEWER STUDY SUMMARY

DATE: 1/17/2019
 JOB NUMBER: 930-011

FOR: West Oaks Sewer System Analysis
 BY: Dexter Wilson Engineering

SHT 1 OF 1
 REFER TO PLAN SHEET: Exhibit A

Relocated Buena Interceptor - Carlsbad Flows (No West Oaks)

LINE	FROM	TO	IN-LINE FLOW (gpd)	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.)	Remarks
							M.G.D.	C.F.S.								
			512,000	512,000	2.5	1,280,000	1.280	1.981	18	0.50	0.104502	0.48000	0.32	0.2167	4.06	Based on Carlsbad's existing capacity rights in the Buena Interceptor assuming that Vista flows have been diverted to the Vallecitos Interceptor

Max dn/D
0.32

¹ K' based on n = 0.011

² dn/D using K' in Brater King Table 7-14

³ From Brater King Table 7-4 based on dn/D

SEWER STUDY SUMMARY

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 JOB NUMBER: 930-011

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SHT 1 OF 1
 REFER TO PLAN SHEET: Exhibit A

Relocated Buena Interceptor - Carlsbad Flows + West Oaks

LINE	FROM	TO	IN-LINE FLOW (gpd)	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.)	Remarks
							M.G.D.	C.F.S.								
			545,792	545,792	2.5	1,364,480	1.364	2.111	18	0.50	0.111399	0.49500	0.33	0.2260	4.15	Based on Carlsbad's existing capacity rights in the Buena Interceptor plus the addition of the West Oaks project.

Max dn/D
0.33

¹ K' based on n = 0.011

² dn/D using K' in Brater King Table 7-14

³ From Brater King Table 7-4 based on dn/D