Appendix Q –
Preliminary Sewer Reports, Option 1 and Option 2
Prepared by KWC Engineers dated June 2013

PRELIMINARY SEWER REPORT

for the ESPERANZA HILLS PROJECT
STONEHAVEN DRIVE OPTION 1
in the Unincorporated Area of
County of Orange, California

PREPARED FOR :

Yorba Linda Estates, LLC
7114 East Stetson Drive, Suite 350
Scottsdale, AZ 85251

June 20, 2013

PREPARED BY:

KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS

KWC Engineers
1880 Compton Avenue, Suite 100
Corona, CA 92881
Tel: (951) 734-2130
www.kwcengineers.com

REGISTERED PROFESSIONAL ENGINEER
VICTOR A. ELIA
64803
Exp. 06/30/15
CIVIL
STATE OF CALIFORNIA

Victor Elia

Victor Elia, RCE 64803

TABLE OF CONTENTS

Section Name **Page Number**

Section

1

INTRODUCTION

1.1 PURPOSE OF STUDY

The purpose of this report is to discuss the estimated project sewer contributions for the Esperanza Hills project, and how they relate to existing improvements in the area. This report will provide information concerning existing sewer facilities, recommended sewer facilities and projected phasing to support the project. This report will also identify the approximate alignments and pipe sizes of the proposed sewer facilities. The Esperanza Hills Project sewer contributions are based on the Esperanza Hills Site Plan / Conceptual Grading Plan Option 1 Stonehaven Drive in **Appendix C**.

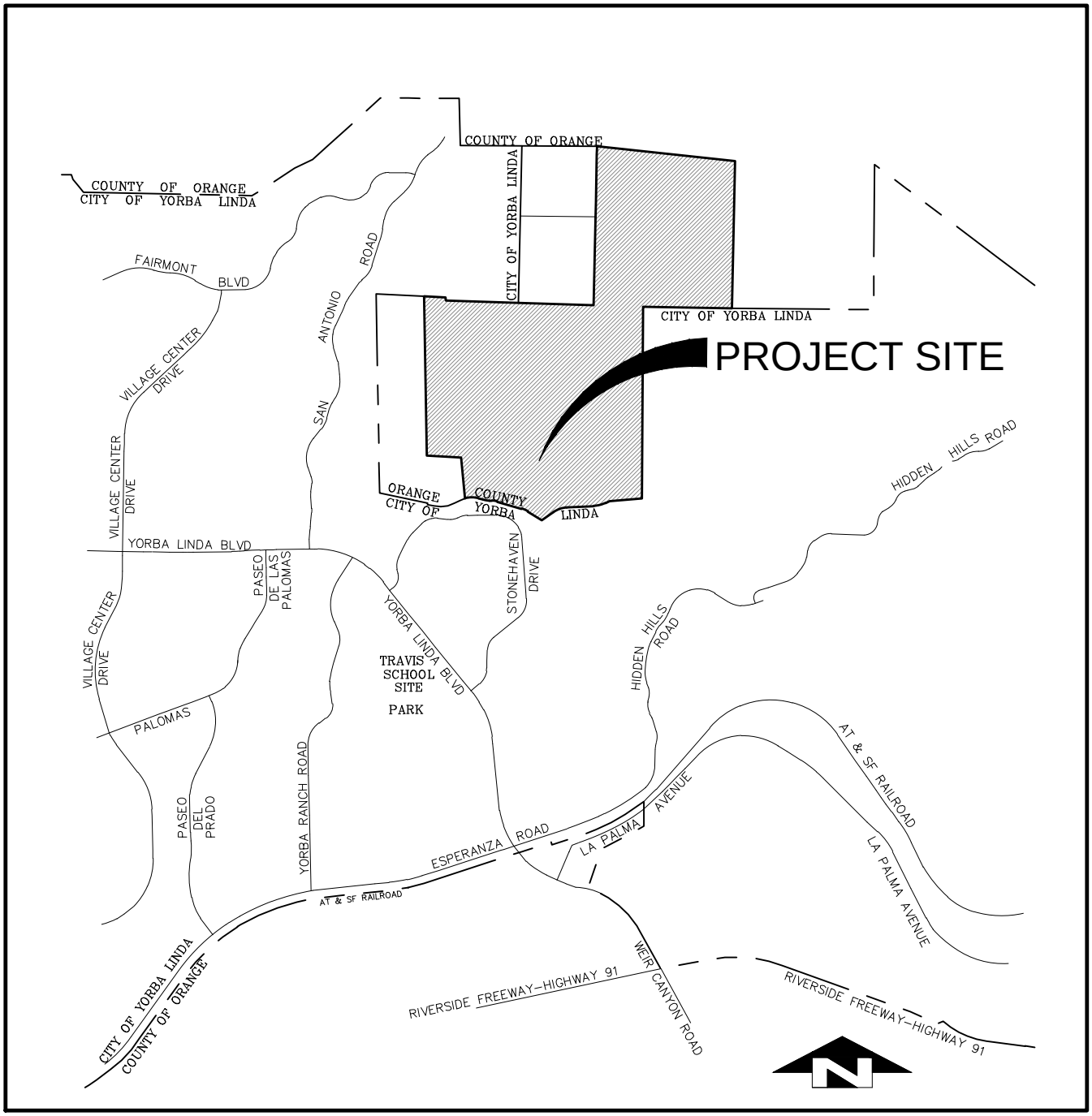
1.2 PROJECT DESCRIPTION

The Esperanza Hills project is located in the unincorporated area in the County of Orange, in the sphere of influence for the City of Yorba Linda. The site is in the Orange County Sanitation District (OCSD) service area for sewer treatment and the Yorba Linda Water District for local sewer service (recently acquired). As proposed by The Esperanza Hills Specific Plan, the project site consists of 334 single family residential homes. The Esperanza Hills site is comprised of approximately 469 acres of undeveloped land. However, of the 469 acres, 323 acres is developable land based on the conceptual grading plan. **Figure 1** shows a vicinity map of the area. Adjacent properties include: Sage property (VTTM 17341), and Friend property (approximately 42 lots) as shown in **Figure 2**. This area is planned for a multifaceted community consisting of open space, trail system and low density residential lots. San Antonio Road is the main north-south thoroughfare into the community connecting to Yorba Linda Boulevard and the Interstate 91 Freeway. The development of Esperanza Hills and adjacent communities will enhance the northern area of the City of Yorba Linda.

1.3 RELATED STUDIES

Orange County Sanitation District
The Orange County Sanitation District (OCSD) Facilities Master Plan, prepared in December 2009, provides a regional study identifying existing and proposed major sewer facilities within the OCSD ultimate service area. The study also presents capital improvements required for the OCSD to maintain the required level of service.

Yorba Linda Water District 2010 Sewer Master Plan Update
The Yorba Linda Water District 2010 Sewer Master Plan Update, dated February 2011, provides a regional study of the area to the west of this site, identifying existing and proposed major sewer facilities within the District's service area. An update to the Sewer Master Plan to incorporate the recently acquired sewer service area from the City of Yorba Linda, which would include this project and the downstream facilities has **not** been completed yet. Refer to **Appendix G**.



LOCATION MAP

NOT TO SCALE

KWC ENGINEERS
CIVIL ENGINEERS ● PLANNERS ● SURVEYORS
1880 COMPTON AVENUE, SUITE 100 ● CORONA, CA. 92881-3370 ● 951-734-2130

FIGURE 1-1

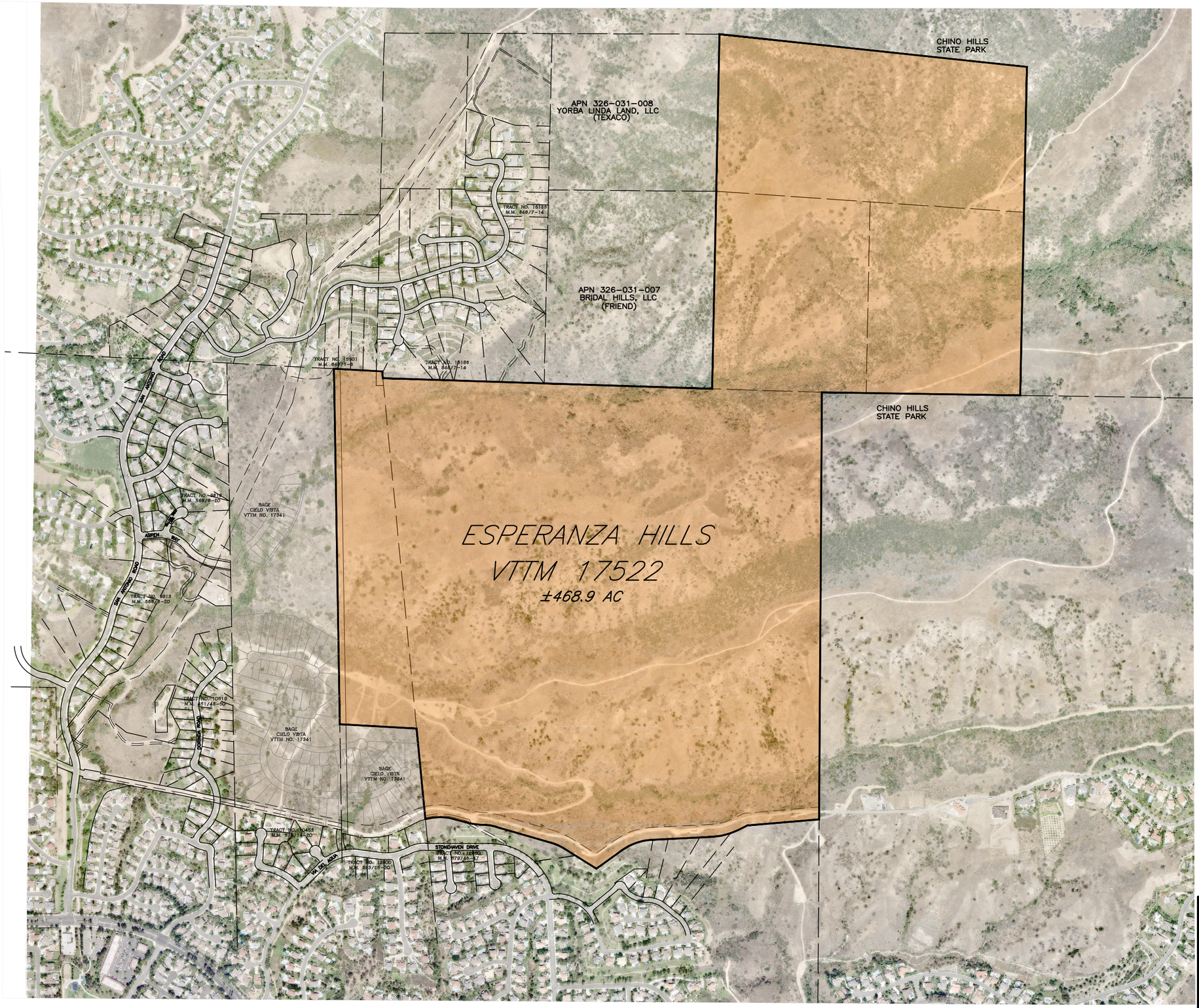


FIGURE 1-2

VICINITY MAP

KWC ENGINEERS

CIVIL ENGINEERS ● PLANNERS ● SURVEYORS
1880 COMPTON AVENUE, SUITE 100 ● CORONA, CA. 92881-3370 ● 951-734-2130

JN 09.1200.4 R:\09\1200\PRELIM\REPORTS\WAT Option 1\Vicinity Map.dwg 06/21/2013 08:12

Section

2

DESIGN CRITERIA

This section presents the design criteria used to estimate the sewage flows and evaluate recommended and existing sewer system improvements required for the Esperanza Hills project. The criteria utilized in this study are in accordance with the Yorba Linda Water District standards for sewer design and the YLWD 2010 Sewer Master Plan Update.

2.1 DESIGN CRITERIA

The design criteria from the YLWD are summarized below in **Table 2-1**.

TABLE 2-1

DESIGN CRITERIA		
Description	**YLWD**	**Unit**
Average Daily Flow – Planned Residential Development	0.0015	cfs/ac
Multiplication Factor ADF to Peak Flow	2	ratio
Minimum Diameter of Pipe (VCP)	8	inch
Velocity - minimum	2	fps
Velocity - maximum	15	fps
Slope - minimum (8")	0.40	%
Slope - maximum	15	%
Maximum d/D: 8" – 12" diameter	0.5	ratio
Maximum d/D: 15" – 18" diameter	0.75	ratio
Depth of Cover - minimum	7	feet
Distance between manholes for 8" – 15" - maximum	300	feet
Radius of Curvature for 8" – 12" - minimum	150	feet

2.2 GRAVITY SEWERS

Gravity sewers are designed to convey peak flow. For pipes with a diameter of 8-inches to 12-inches, the sewers have been designed to convey this flow when flowing half full. Manning's Equation with an "n" value of 0.012 was used to size all gravity sewers per the master plan assuming VCP pipe for all sewerlines. All new sewers were designed to maintain a minimum velocity of two feet per second at design capacity to prevent the deposition of solids. To minimize excessive wear and tear of the pipe, the maximum velocity was not to exceed 15 feet per second.

Section

3

EXISTING AND PROPOSED SEWER FACILITIES

3.1 EXISTING FACILITIES

The Esperanza Hills project was designed to convey the sewer flows out towards Stonehaven Drive per preliminary design meetings with Yorba Linda Water District, as shown on the Sewer Network Analysis exhibit in **Appendix D**. There is an existing 10" sewer line in Stonehaven Drive, draining to the south, which drains into an existing 10" main in Yorba Linda Boulevard, then a 12" main in Via De La Escuela. Flows are conveyed southwesterly toward the 51" OCSD Santa Ana River Interceptor (trunk line) which drains southwesterly to Wastewater Treatment Plant #1 in Fountain Valley.

The OCSD Facilities Master Plan lists out the Capital Improvements required to maintain the required level of service. No improvements are proposed along the downstream path of this site.

3.2 PROPOSED FACILITIES

The project proposes to install approximately 32,100 feet of 8" VCP gravity sewer. Except for two locations, the proposed sewers will be installed in typical private street sections, within an easement to YLWD. The first exception is a cul-de-sac which drains through an easement and down an engineered slope and the second exception is the project outlet through the Sage property.

A sewer siphon will be required at a low point in the Sage property, about 250 feet north of the intersection of Stonehaven Drive and Via De La Roca. A portion of the adjacent Sage property VTTM 17341 (95 lots) just north of Stonehaven Drive will also drain into the proposed sewer pipe connecting to the existing Stonehaven Drive sewer pipe which will be located in a paved access road except through the existing wash. The proposed point of connection to the existing 10" sewer in Stonehaven Drive is approximately 170 feet northeast of the intersection of Stonehaven Drive and Via De La Roca.

Section

4

PROJECTED SEWAGE FLOWS and SEWER SIZING

This section provides the projected sewage flows for the Esperanza Hills project. The critical location that was analyzed is the existing 10" sewer in Yorba Linda Boulevard prior to Via De La Escuela where it changes to a 12" sewer.

4.1 PROJECTED SEWAGE FLOWS

The projected sewage flows were determined on a per lot basis, based on typical generation rates supplied in the YLWD Sewer Master Plan Update as shown below:

TABLE 4-1

TYPICAL GENERATION RATES	
Typical Household Density	3.1 people per DU
Average Generation Rate	77 gallons per capita per Day
Peaking Factor	2 x Average Flow

Using the above criteria, the average sewer generation rate results in 0.000369 cfs per lot.

The Sewer Network Analysis exhibit in **Appendix D** identifies the lots from the Esperanza Hills, Friend and Sage properties which are proposed to drain into Stonehaven Drive as well as the existing lots along the sewerlines downstream. The Sage property includes 95 lots based on VTTM 17341 that would drain towards Stonehaven Drive. The Friend property includes 42 lots based upon a preliminary lotting study by KWC Engineers. The table below identifies the corresponding estimated project sewer flows for the ultimate build-out condition.

TABLE 4-2

PROJECTED SEWER FLOWS			
Phase	**Number of Lots**	**Average Flow (cfs)**	**Peak Flow (cfs)**
1 Esperanza Hills	334	0.125	0.250
2 Friend property	42	0.015	0.031
3 Sage property	95	0.035	0.070
Total	**471**	**0.175**	**0.350**

4.2 SEWER LINE SIZING

The peak sewer generations from Table 4-2 were used in the Sewer Network Analysis utilizing the H2OMAP SWMM computer software to analyze the existing and proposed sewer lines per the Yorba Linda Water District design guidelines. Refer to the Sewer Network Analysis exhibit in **Appendix D** for the identification of sewer conduits (CDT), junctions (JCT), delineated tributary areas (lot counts) and peak flows**.**

Existing Sewer Lines

The existing 10" VCP sewer in Yorba Linda Blvd. was analyzed from Via del Agua to Via de la Escuela for the proposed condition. The existing slope varies from 2.52% to 6.20%. Calculated flow depths of d/D are less than 0.5 in the proposed condition. The results are summarized below in **Table 4-3.** Calculations are included in **Appendix E.**

TABLE 4-3
YORBA LINDA BOULEVARD EXISTING 10" SEWER
PROPOSED CONDITION

	Upstream of Via Del Cerro (CDT-95)	Downstream of Via Del Cerro (CDT-97)
Slope	6.2%	2.52%
Flow (cfs)	0.408	0.430
d/D	0.041	0.202
Max d/D	0.415	0.415
Velocity (fps)	1.33	3.95

Proposed Sewer Lines

The proposed 8" VCP sewer lines onsite were analyzed using the computer modeling software, design criteria, and peak flow generation as described above. Proposed pipe slopes were determined by using the Site Plan / Grading Plan, assuming manholes would typically be 8 feet deep. Slopes range from 0.4% to 11.8%, with flow depths ranging up to 0.17 feet (2.04 inches). The maximum velocity is 4.96 ft./sec. Calculations are included in **Appendix E.**

Section

5

CONCLUSIONS

The estimated sewer flows from the Esperanza Hills project will not negatively affect the existing downstream sewer network based on this analysis. The existing 10" sewer lines in Stovehaven Drive and Yorba Linda Boulevard will be sufficient to accept the proposed flows from the Esperanza Hills project as well as flows from the future Sage and Friend projects. Onsite 8" sewer lines will be sufficient to serve the project and the future Friend project. Until the time that the Sage project sewer system is installed, an interim sewer siphon will be required at the existing wash just north of Stonehaven Drive.

These proposed sewer infrastructure facilities with respect to their proximate locations, alignments, and sizes are consistent with the Yorba Linda Water District 2010 Sewer Master Plan Update and the OCSD Facilities Master Plan. The proposed Esperanza Hills onsite sewer facilities presented in this report are preliminary estimates of the anticipated sewer facilities necessary to service the project needs. Further studies may be required by YLWD during the development phase of the project.

Appendix

A
REFERENCES

Esperanza Hills Specific Plan

City of Yorba Linda General Plan – Land Use Map

Orange County Sanitation District Facilities Master Plan, December 2009.

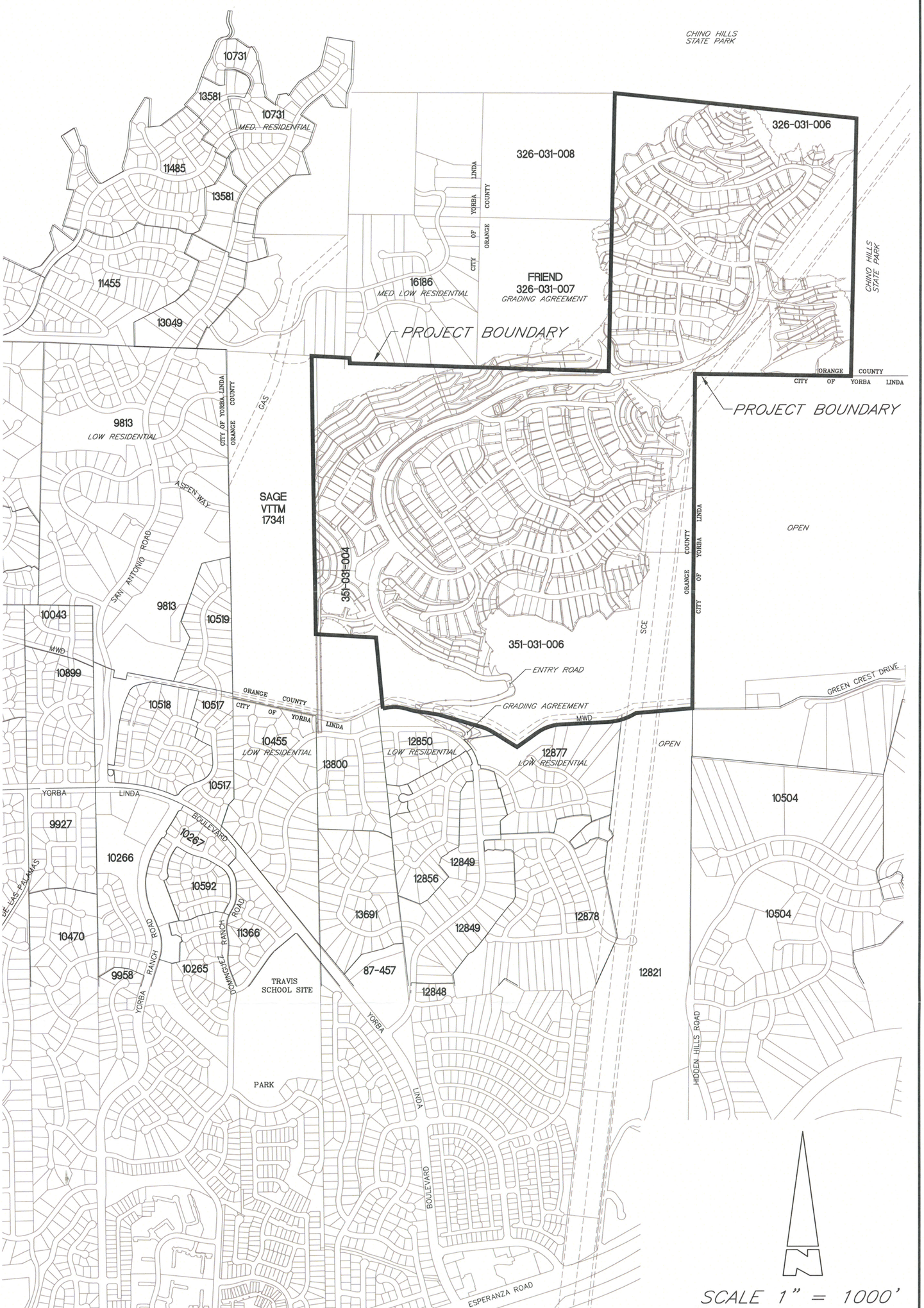
Yorba Linda Water District Standard Specifications and Drawings for Construction of Domestic Water and Sewer Facilities, Design Criteria for Sewer Facilities, November 2010.

Appendix

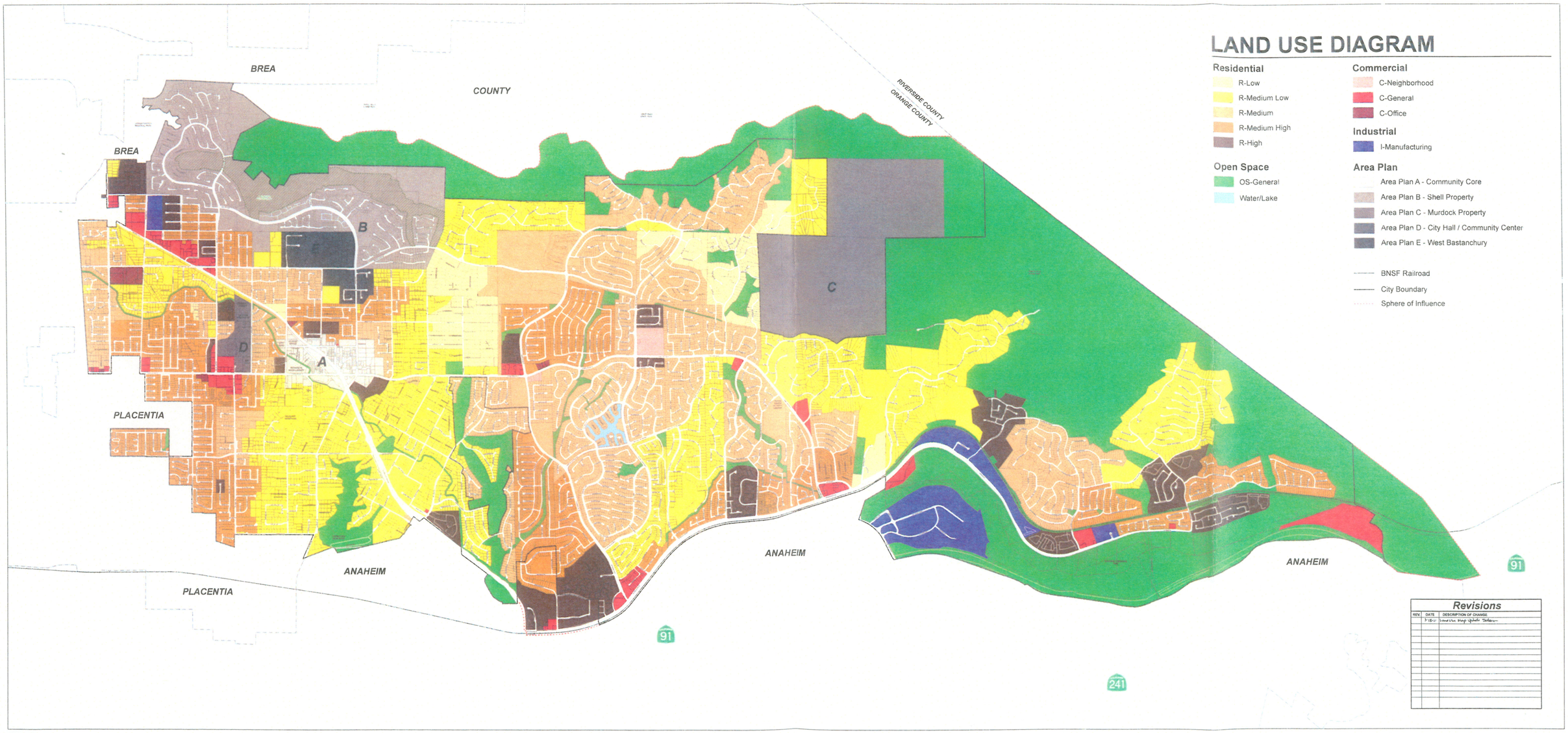
B

- Surrounding Area Map
- City of Yorba Linda Land Use Map

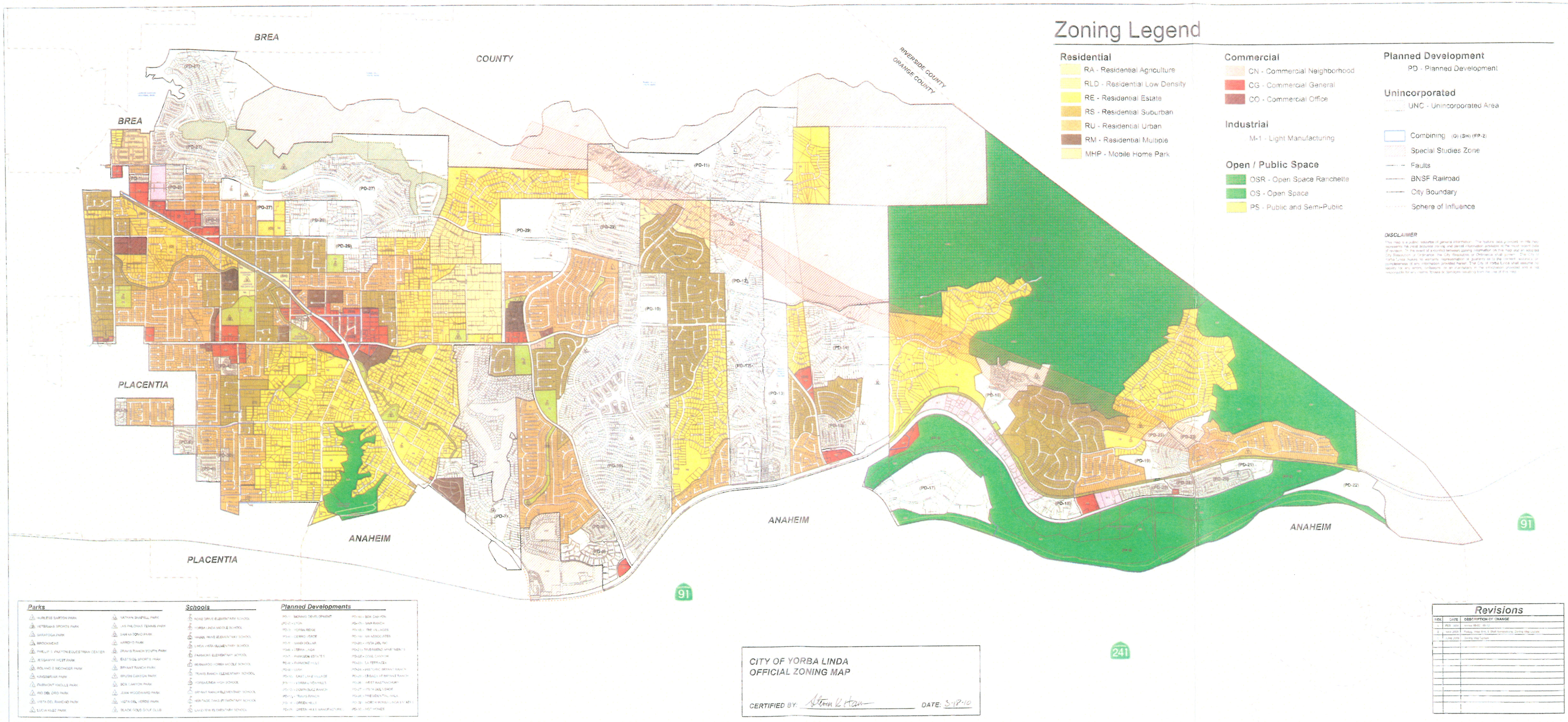
ESPERANZA HILLS – OPTION 1
SURROUNDING PLANNING AREAS



KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 • CORONA, CA. 92881-3370 • 951-734-2130



CITY OF YORBA LINDA LAND USE MAP



CITY OF YORBA LINDA ZONING MAP

Appendix

C

ESPERANZA HILLS
SITE PLAN / GRADING PLAN

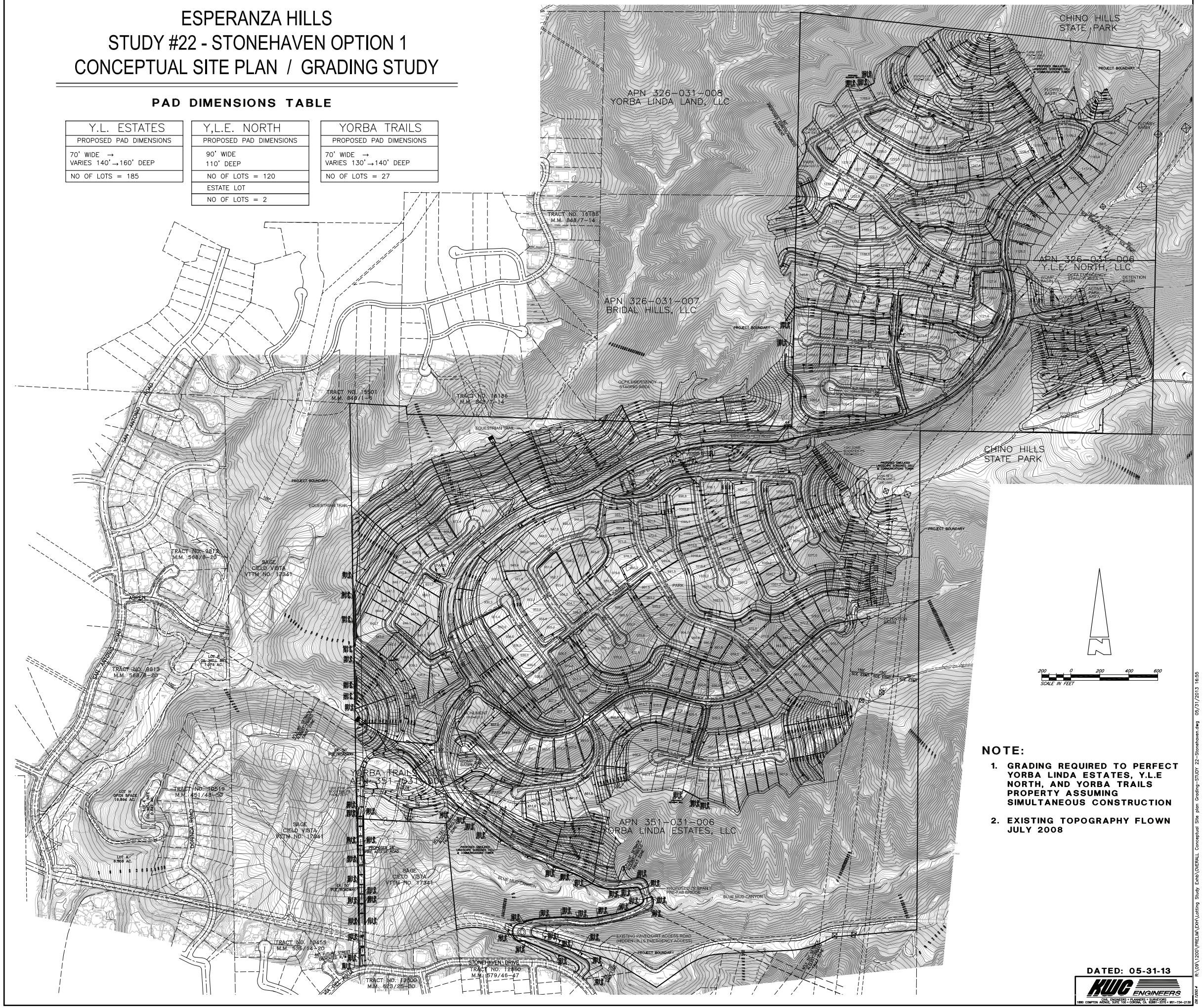
ESPERANZA HILLS
STUDY #22 - STONEHAVEN OPTION 1
CONCEPTUAL SITE PLAN / GRADING STUDY

PAD DIMENSIONS TABLE

Y.L. ESTATES
PROPOSED PAD DIMENSIONS
70' WIDE → VARIES 140'→160' DEEP
NO OF LOTS = 185

Y,L.E. NORTH
PROPOSED PAD DIMENSIONS
90' WIDE 110' DEEP
NO OF LOTS = 120
ESTATE LOT
NO OF LOTS = 2

YORBA TRAILS
PROPOSED PAD DIMENSIONS
70' WIDE → VARIES 130'→140' DEEP
NO OF LOTS = 27



NOTE:

1. GRADING REQUIRED TO PERFECT YORBA LINDA ESTATES, Y.L.E NORTH, AND YORBA TRAILS PROPERTY ASSUMING SIMULTANEOUS CONSTRUCTION
2. EXISTING TOPOGRAPHY FLOWN JULY 2008

DATED: 05-31-13

KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 • CORONA, CA 92881-3313 • 951-734-2130

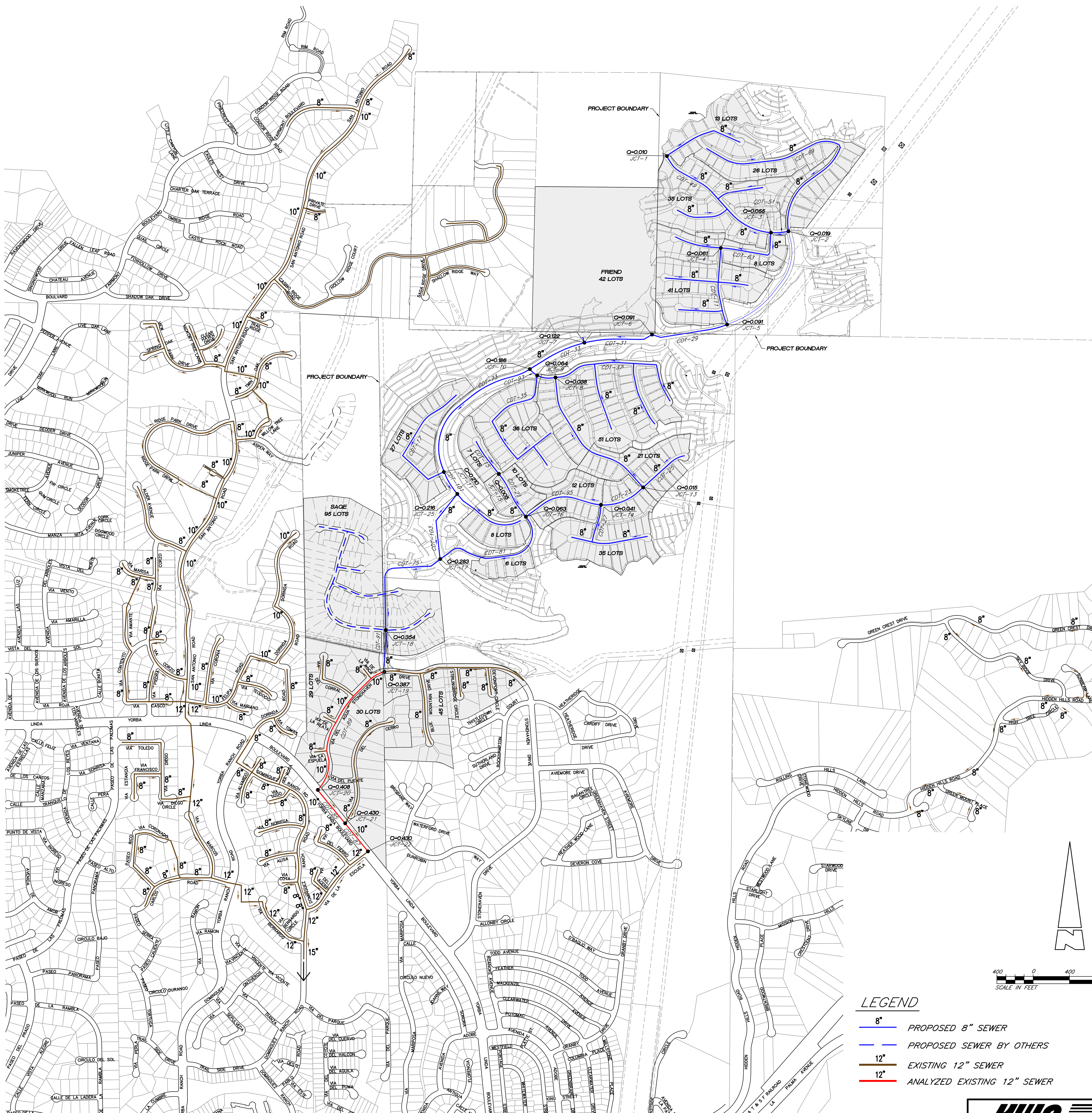
08-0265-4 K:\08\1265\PRELIM\DWG\Lotting Study Exh\OVERALL Conceptual Site plan Grading-STUDY 22-Stonehaven.dwg 05/31/2013 16:55

Appendix

D

SEWER NETWORK ANALYSIS EXHIBIT

ESPERANZA HILLS OPTION 1
SEWER NETWORK ANALSIS



KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 • CORONA, CA. 92881-3370 • 951-734-2130

R:\09\1200\PRELIM\REPORTS\SEWER Option 1\Prop Sewer Facilities Fig 4-1.dwg 06/24/2013 07:58

09.1200.4

Appendix

E

PIPE CAPACITY CALCULATIONS

ULTIMATE BUILD-OUT CONDITION SEWER FLOWS

Tributary Areas		Average Daily Flow (cfs)	Peak Flow (cfs)
JCT 1			
Planned Residential Development units	13	0.005	0.010
JCT 2			
Planned Residential Development units	26	0.010	0.019
JCT 3			
Planned Residential Development units	35	0.013	0.026
Subtotal		0.027	0.055
JCT 4			
Planned Residential Development units	8	0.003	0.006
Subtotal		0.030	0.061
JCT 5			
Planned Residential Development units	41	0.015	0.030
Subtotal		0.045	0.091
JCT 6		0.045	0.091
JCT 7			
Planned Residential Development units	42	0.015	0.031
Subtotal		0.061	0.122
JCT 8			
Planned Residential Development units	51	0.019	0.038
JCT 9			
Planned Residential Development units	36	0.013	0.027
Subtotal		0.032	0.064
JCT 10			
Subtotal		0.093	0.186
JCT 11			
Planned Residential Development units	25	0.012	0.024
Subtotal		0.105	0.210
JCT 12			
Planned Residential Development units	8	0.003	0.006
Subtotal		**0.108**	**0.216**
JCT 13			
Planned Residential Development units	21	0.008	0.015
JCT 14			
Planned Residential Development units	35	0.013	0.026
JCT 16			
Planned Residential Development units	12	0.004	0.009
Subtotal		0.025	0.050
JCT 15			
Planned Residential Development units	7	0.003	0.005
JCT 16			
Planned Residential Development units	10	0.004	0.007
Subtotal		0.006	0.013
Subtotal		**0.031**	**0.063**
JCT 17			
Planned Residential Development units	6	0.002	0.004
Subtotal		0.034	0.067
Total - Project		**0.142**	**0.283**
JCT 18			
Planned Residential Development units	95	0.035	0.070
Subtotal	**471**	0.177	0.353
JCT 19			
Existing Residential Development units	45	0.017	0.033
Subtotal		0.193	0.386
JCT 20			
Existing Residential Development units	29	0.011	0.021
Subtotal		0.204	0.408
JCT 21			
Existing Residential Development units	30	0.011	0.022
JCT 22			
Total	**575**	**0.215**	**0.430**

ESPERANZA HILLS SEWER REPORT

		ID	From ID	To ID	Type	Length (ft)	Slope	Flow (cfs)	Flow Class	Depth (ft)	HGL (ft)	Velocity (ft/s)	Froude Number	d/D	Surcharged d/D
1		CDT-101	JCT-11	JCT-25	Circular Conduit	285.000	0.035	0.098	Free Surface	0.085	822.095	3.808	2.784	0.127	0.127
2		CDT-103	JCT-25	JCT-17	Circular Conduit	807.000	0.080	0.096	Free Surface	0.081	812.074	3.994	2.995	0.121	0.121
3		CDT-11	JCT-4	JCT-5	Circular Conduit	859.000	0.079	0.033	Free Surface	0.053	1,100.043	2.587	2.413	0.079	0.079
4		CDT-15	JCT-91	JCT-15	Circular Conduit	467.000	0.004	0.000	Free Surface	0.003	918.000	0.000	0.000	0.005	0.005
5		CDT-17	JCT-92	JCT-11	Circular Conduit	1,669.000	0.024	0.000	Free Surface	0.048	862.000	0.000	0.000	0.071	0.071
6		CDT-21	JCT-15	JCT-16	Circular Conduit	534.000	0.068	0.001	Free Surface	0.019	916.006	0.213	0.331	0.028	0.028
7		CDT-23	JCT-13	JCT-14	Circular Conduit	521.000	0.046	0.002	Free Surface	0.017	946.012	0.607	0.987	0.026	0.026
8		CDT-25	JCT-93	JCT-13	Circular Conduit	582.000	0.034	0.000	Free Surface	0.006	966.000	0.000	0.000	0.009	0.009
9		CDT-27	JCT-94	JCT-14	Circular Conduit	422.000	0.047	0.000	Free Surface	0.012	942.000	0.000	0.000	0.017	0.017
10		CDT-29	JCT-5	JCT-6	Circular Conduit	847.000	0.057	0.058	Free Surface	0.065	1,032.062	3.300	2.752	0.098	0.098
11		CDT-31	JCT-6	JCT-7	Circular Conduit	765.000	0.060	0.074	Free Surface	0.079	984.069	3.156	2.390	0.119	0.118
12		CDT-33	JCT-7	JCT-10	Circular Conduit	669.000	0.027	0.080	Free Surface	0.086	938.089	3.029	2.191	0.129	0.130
13		CDT-35	JCT-95	JCT-9	Circular Conduit	1,748.000	0.025	0.000	Free Surface	0.013	966.000	0.000	0.000	0.019	0.019
14		CDT-37	JCT-96	JCT-9	Circular Conduit	1,789.000	0.081	0.000	Free Surface	0.013	1,066.000	0.000	0.000	0.019	0.019
15		CDT-49	JCT-1	JCT-3	Circular Conduit	1,466.000	0.015	0.006	Free Surface	0.046	1,126.028	0.527	0.523	0.069	0.069
16		CDT-51	JCT-2	JCT-3	Circular Conduit	196.000	0.010	0.003	Free Surface	0.045	1,106.025	0.338	0.342	0.067	0.067
17		CDT-63	JCT-3	JCT-4	Circular Conduit	793.000	0.005	0.016	Free Surface	0.054	1,104.064	1.193	1.100	0.081	0.081
18		CDT-69	JCT-90	JCT-2	Circular Conduit	2,890.000	0.049	0.000	Free Surface	0.012	1,246.000	0.000	0.000	0.019	0.018
19		CDT-73	JCT-10	JCT-11	Circular Conduit	1,691.000	0.058	0.108	Free Surface	0.089	920.083	3.865	2.748	0.134	0.134
20		CDT-75	JCT-17	JCT-18	Circular Conduit	1,546.000	0.096	0.152	Free Surface	0.093	748.087	5.136	3.574	0.140	0.140
21		CDT-81	JCT-16	JCT-17	Circular Conduit	1,255.000	0.106	0.019	Free Surface	0.059	880.032	1.247	1.091	0.089	0.089
22		CDT-85	JCT-20	JCT-21	Circular Conduit	495.000	0.062	0.273	Free Surface	0.139	535.120	4.538	2.571	0.167	0.167
23		CDT-89	JCT-19	JCT-20	Circular Conduit	1,584.000	0.025	0.221	Free Surface	0.130	575.140	4.047	2.375	0.156	0.156
24		CDT-91	JCT-18	JCT-19	Circular Conduit	325.000	0.077	0.179	Free Surface	0.120	600.099	4.196	2.563	0.180	0.180
25		CDT-93	JCT-9	JCT-10	Circular Conduit	107.000	0.019	0.005	Free Surface	0.054	922.025	0.353	0.324	0.081	0.081
26		CDT-95	JCT-14	JCT-16	Circular Conduit	902.000	0.047	0.006	Free Surface	0.027	922.023	1.329	1.724	0.041	0.041
27		CDT-97	JCT-21	JCT-23	Circular Conduit	389.000	0.026	0.312	Free Surface	0.168	504.759	3.955	2.031	0.202	0.202
~~28~~		~~CDT-99~~	~~JCT-23~~	~~JCT-24~~	~~Circular Conduit~~	~~259.000~~	~~0.016~~	~~0.355~~	~~Free Surface~~	~~0.589~~	~~494.779~~	~~0.737~~	~~0.186~~	~~0.589~~	~~0.589~~

OUTFALL

Customized Junction Report

	JUNCTION: ID (Char)	JCTHYD: INV_ELEV (Real)	OUTPUT: DEPTH (ft)	OUTPUT: T_INFLOW (cfs)	OUTPUT: HEAD (ft)
1	JCT-4	1,100.000	0.043	0.016	1,100.043
2	JCT-5	1,032.000	0.062	0.033	1,032.062
3	JCT-15	916.000	0.006	0.000	916.006
4	JCT-91	918.000	0.000	0.000	918.000
5	JCT-92	862.000	0.000	0.000	862.000
6	JCT-11	822.000	0.095	0.108	822.095
7	JCT-16	880.000	0.032	0.007	880.032
8	JCT-13	946.000	0.012	0.000	946.012
9	JCT-93	966.000	0.000	0.000	966.000
10	JCT-14	922.000	0.023	0.002	922.023
11	JCT-94	942.000	0.000	0.000	942.000
12	JCT-6	984.000	0.069	0.058	984.069
13	JCT-7	938.000	0.089	0.074	938.089
14	JCT-10	920.000	0.083	0.085	920.083
15	JCT-95	966.000	0.000	0.000	966.000
16	JCT-9	922.000	0.025	0.000	922.025
17	JCT-96	1,066.000	0.000	0.000	1,066.000
18	JCT-1	1,126.000	0.028	0.000	1,126.028
19	JCT-3	1,104.000	0.064	0.009	1,104.064
20	JCT-2	1,106.000	0.025	0.000	1,106.025
21	JCT-90	1,246.000	0.000	0.000	1,246.000
22	JCT-17	748.000	0.087	0.115	748.087
23	JCT-19	575.000	0.140	0.179	575.140
24	JCT-20	535.000	0.120	0.221	535.120
25	JCT-21	504.600	0.159	0.273	504.759
26	JCT-18	600.000	0.099	0.152	600.099
27	JCT-24	490.400	1.000	0.355	491.400
28	JCT-23	494.600	0.179	0.312	494.779
29	JCT-25	812.000	0.074	0.098	812.074

ESPERANZA HILLS OPTION 1 SEWER REPORT

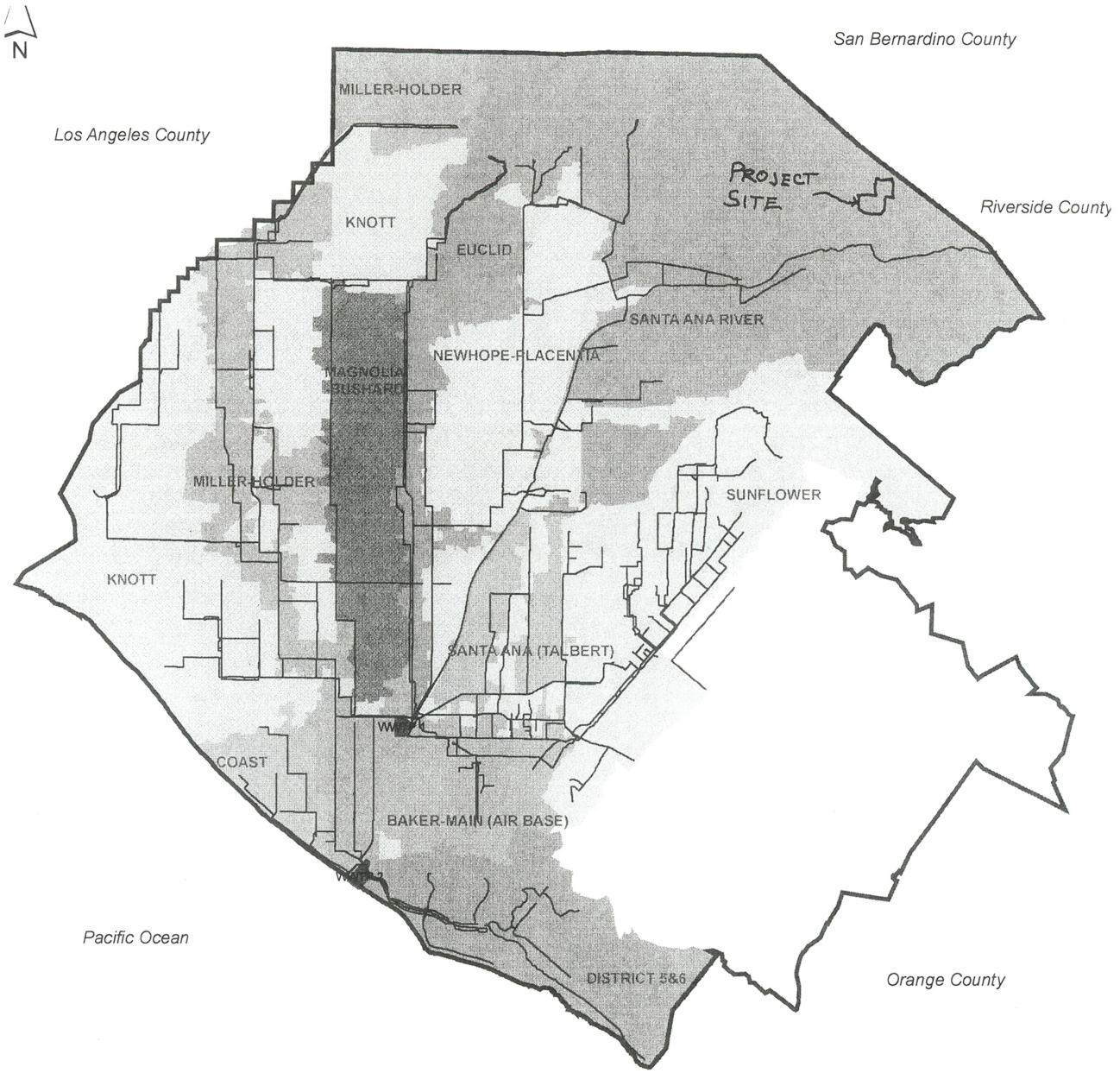
Prepared By:

Date: Tuesday, October 23, 2012

Appendix

F

OCSD MAJOR TRUNKSHEDS EXHIBIT



Legend

- Major OCSD Sewers
- 2005 OCSD Trunksheds
- OCSD Service Area

NOTE: BOUNDARIES SHOWN ARE APPROXIMATE

EXHIBIT 1-2
OCSD Major Trunksheds

Orange County Sanitation District
2009 Master Plan

Appendix

G

YORBA LINDA WATER DISTRICT
2010 SEWER MASTER PLAN UPDATE

YORBA LINDA WATER DISTRICT
2010 SEWER MASTER PLAN UPDATE

DISTRICT PROJECT NO. 200916

FEBRUARY 2011

Prepared for:
YORBA LINDA WATER DISTRICT

Prepared by:

IDModeling
ENGINEERING INNOVATION
55 East Huntington Drive
Suite 130
Arcadia, CA 91006
Project No. 086-001

PSOMAS
3 Hutton Centre Drive
Suite 200
Santa Ana, CA 92707
Project No. 2IDM010100

5.0 PLANNING DATA

5.1 Existing Connections and Population

The Yorba Linda Water District wastewater collection system has approximately 14,800 service connections. The majority of these customer connections are residential. YLWD categorizes its customers into four major categories: residential, commercial, industrial, and open space. Figure 5-1 depicts the land uses within the City of Yorba Linda.

Within the YLWD service area, the land use is comprised of 66.0% residential, 2.3% commercial, 0.3% industrial, 16.0% open space and 15.5% planned community areas.

The historical 2000 population per dwelling unit (DU) was 3.05 for the City of Yorba Linda with a total dwelling unit count of 19,534 per the U.S. Census Bureau. A household density of 3.1 people per DU was assumed for single family residential (SFR) (17,421 SFR units per the Census) and the housing density for multi-family residential (MFR) was back calculated to 2.64 (2,113 MFR units per the Census).

5.2 Projected Development and Population

For build-out population projections, information provided by the District was used to estimate build-out connections and population for the sewer system. Four future residential development categories were identified and population projections were developed as described below:

Known Planned Developments – Information on currently known planned developments within the City of Yorba Linda was provided by District staff. Build-out population was determined based on a single family residential household density of 3.10 people per DU. Information on the known planned developments is provided in Table 5-1 with their location shown on Figure 5-2.

Table 5-1
Known Planned Developments

Map ID	Development Name	# of Dwelling Units	# of Dwelling Units Serviced	Additional Population
P-1	Cielo Vista	83	0	0
P-2	Casino Ridge	11	0	0
P-3	Single Family Residential	119	119	369
P-4	Single Family Residential	49	49	152
P-5	Condominium	146	146	453
P-6	The Preserve	318	0	0
	Total	**726**	**314**	**974**

The additional population for the District excludes the Cielo Vista (P-1), Casino Ridge (P-2), and The Preserve (P-6) planned developments for which sewer service will be provided by the City of Yorba Linda and not the District.

Infill Development – Existing developments with limited or marginal development were identified based on a review of land use maps and water meter locations. The land use and number of additional DUs projected within each development area was determined and the potential additional population at build-out was calculated based on a single family residential household density of 3.10 people per DU. Information on the existing development infill is provided in Table 5-2 with their location shown on Figure 5-2.

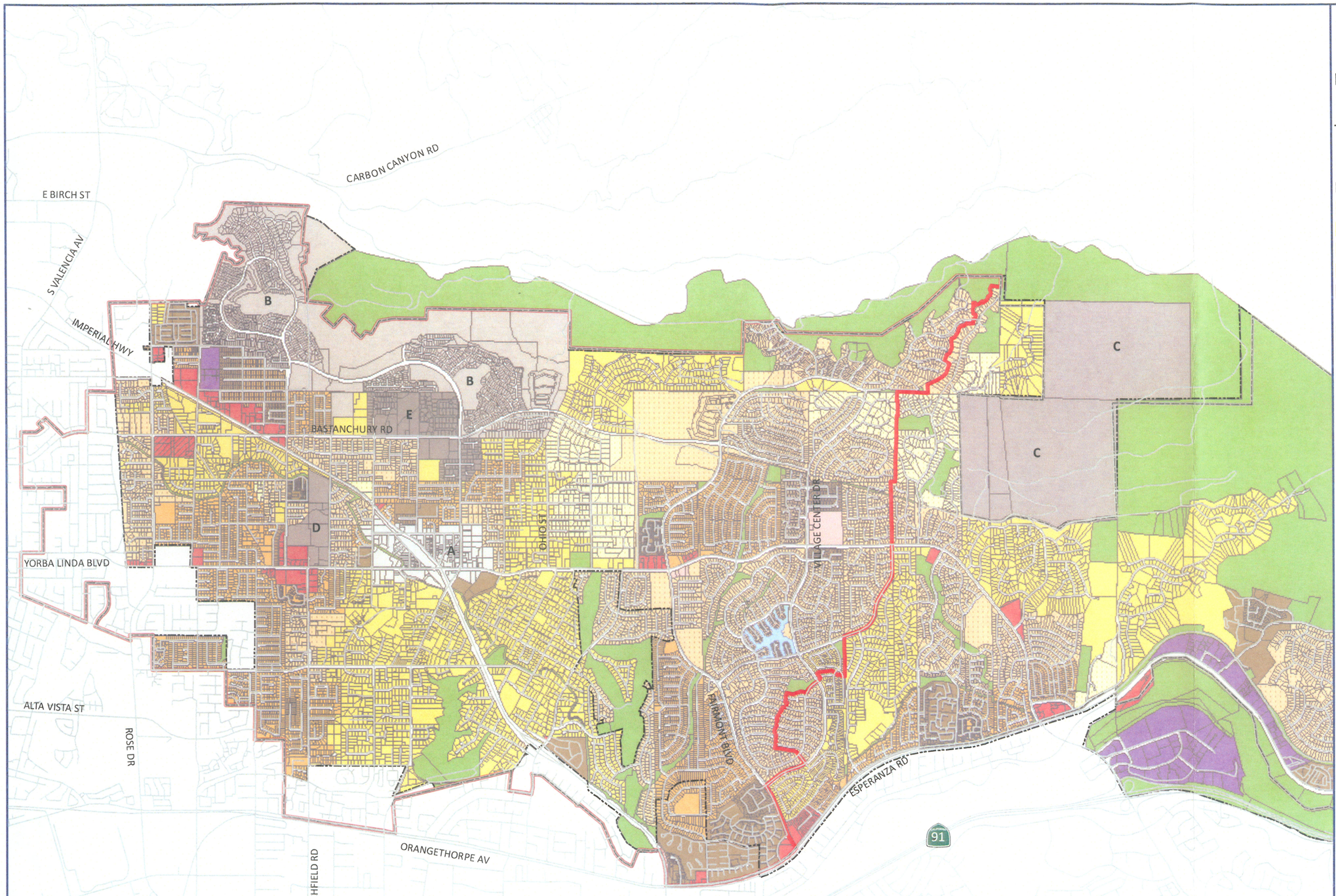
Table 5-2
Infill Development in Existing Areas

Map ID	Development Name	# of Dwelling Units	# of Existing Dwelling Units	# of Units To Be Built	Additional Population
E-1	Single Family Residential	259	35	224	694
E-2	Single Family Residential	41	0	41	127
E-3	Single Family Residential	218	3	215	667
	Total	**518**	**38**	**480**	**1,488**

The additional population for the District includes only dwelling units that are not yet existing.

High-Density Redevelopment Areas – Also reviewed as part of the Sewer Master Plan Update was the City of Yorba Linda's *2008-2014 Draft Housing Element and Implementation Programs Initial Study* dated May 2010. The study identified thirteen parcels that are planned for conversion from existing commercial, industrial, and residential land use to multi-family residential (MFR) land use. Existing densities and sewer flows are low in each of the existing parcels. Build-out population was determined based on a MFR household density of 2.64 people per DU. Information on the high-density redevelopment areas is provided in Table 5-3 and their locations are shown on Figure 5-2.

Yorba Linda Water District 2010 Sewer Master Plan Update



Legend

- Streets
- City Limits
- YLWD Boundary
- YLWD Sewer Service Area

Residential

- R-Low
- R-Medium Low
- R-Medium
- R-Medium High
- R-High

Open Space

- OS-General
- OS-G Merged
- Water/Lake

Commercial

- C-Neighborhood
- C-General
- C-Office

Industrial

- I-Manufacturing

Area Plan

- A - Community Core
- B - Shell Property
- C - Murdock Property
- D - City Hall / Community Center
- E - West Bastanchury

N W E S

0 1,500 3,000 Feet

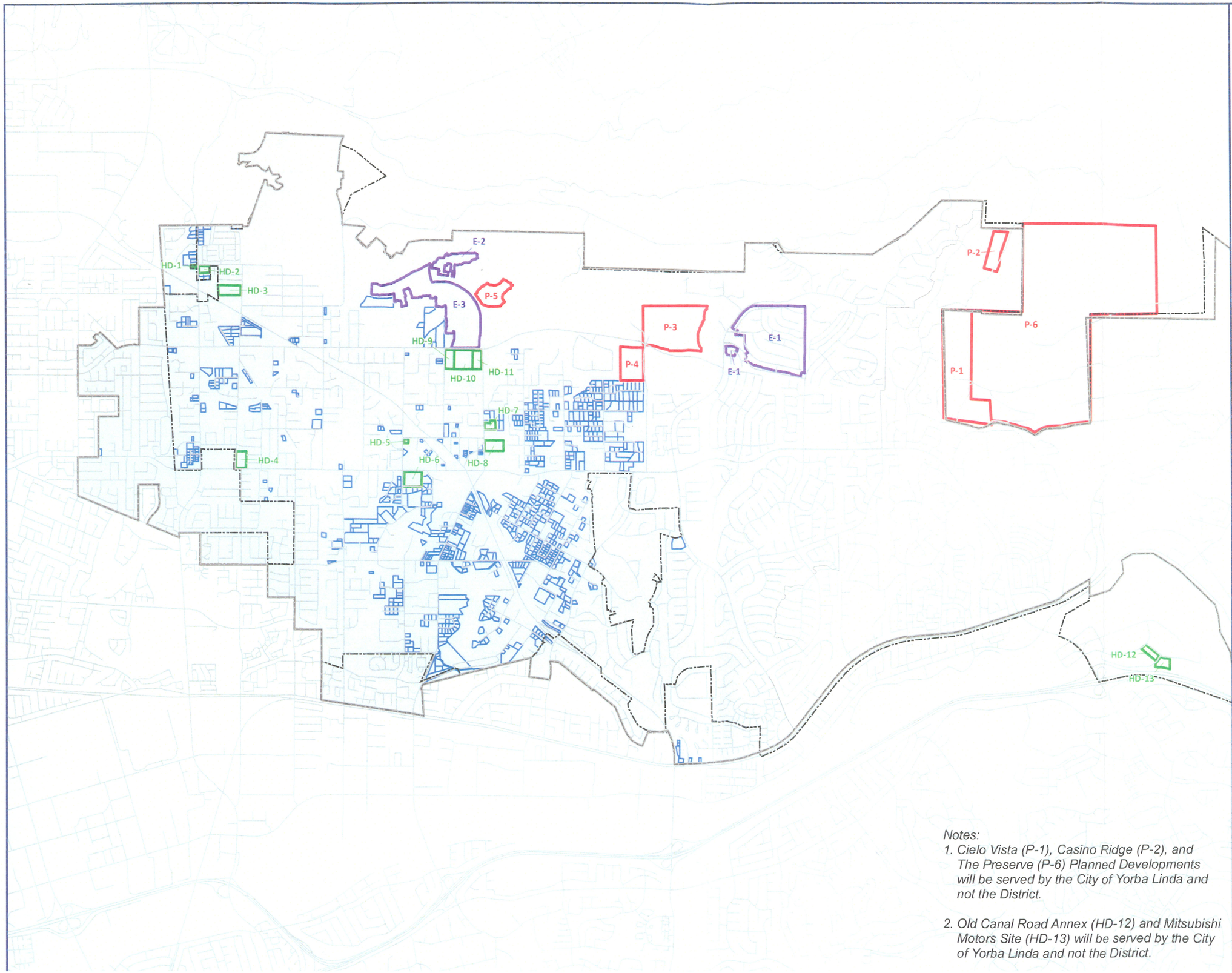
FIGURE 5-1

CITY OF YORBA LINDA LAND USE

IDModeling ENGINEERING INNOVATION

PSOMAS

Yorba Linda Water District 2010 Sewer Master Plan Update



Legend

- Streets
- Yorba Linda City Limits
- YLWD Boundary
- YLWD Sewer Service Area

Development Areas with Map ID

- Known Planned Developments
- Existing Development Infill
- High Density Re-Development
- Parcels with No Sewer Service

N
W E
S

0 1,500 3,000 Feet

Notes:

1. *Cielo Vista (P-1), Casino Ridge (P-2), and The Preserve (P-6) Planned Developments will be served by the City of Yorba Linda and not the District.*
2. *Old Canal Road Annex (HD-12) and Mitsubishi Motors Site (HD-13) will be served by the City of Yorba Linda and not the District.*

FIGURE 5-2

PROJECTED DEVELOPMENT AREAS

IDModeling
ENGINEERING INNOVATION

PSOMAS

would require approval of more than 50 percent of the property owners voting, on a dollar-weighted assessment basis.

Since the City ultimately controls the issuance of building permits for new construction, it may be possible for the District to work with City officials to develop a program to encourage septic system conversions to sewers. It may also be possible to obtain grants or low-interest loans to help defer some of the costs of this program or to help reduce assessment district financing costs.

5.4 Existing and Projected Flows

5.4.1 Average Dry Weather Flow

The average dry weather flow (ADWF) initially input into the sewer model was calculated based on water consumption data from 2004 through 2010 and averaged for the months of January and February. These months correspond to when irrigation uses were minimal, so that the data has the highest proportion of water use returned to the sewer system, therefore introducing less error. The consumption data was adjusted to match the recorded average dry weather flows obtained from the temporary flow monitoring program, by tributary sub-basin.

The population growth determined from the projected developments was used to determine the projected flow increase at build-out. The increased flows were added to the existing ADWF to determine the build-out flows.

Existing per capita usage in the District's system was evaluated based on results from the flow monitoring program. Per capita flow was calculated for four (4) sub-basin areas and the recorded average day dry weather flow and number of connections (parcels) within each area were used to derive an average per capita flow rate for each sub-basin. The criteria used to select the four representative areas included the following:

- Sub-basin containing primarily single family residential connections
- Geographically distributed throughout the District's service area
- Contained a representative sample of low, low-medium, medium, and medium-high single family residential land use densities.
- Lot size representative of future single family developments (approximately 0.15 to 1 acre)

To calculate the average per capita flow, the total gallons per day of flow under average day dry weather conditions was divided by the number of connections within the four representative sub-basins. The resulting flows per connection in gallons per day (gpd) were then divided by the single family DU density of 3.1 persons per dwelling unit to estimate a per capita flow. Table 5-5 provides a summary of the per capita flows for the four sub-basins. A weighted average per capita flow rate of 77 gallons per capita per day

(gpcd) was calculated based on the number of connections in each of the sub-basins and was used for projection of future flows.

Table 5-5
Per Capita Flows

Sub-Basin	Area (acres)	Number of Connections	Measured Flow (gpd)	Per Capita Use (gpcd)
1-3	50.64	154	35,553.60	74
2-5	258.72	768	174,254.40	73
3-2	116.61	281	78,033.60	90
3-7	109.83	250	57,297.60	74
			Weighted Average	**77**

5.4.2 Peak Dry Weather Flow

Peak dry weather flow (PDWF) is the highest measured hourly flow that occurs on a dry weather day plus groundwater infiltration. The peak dry weather flows were developed by applying a peaking factor based on a peaking equation developed from the temporary flow monitoring program.

5.4.3 Design Wet Weather Flow

Design wet weather flow is the highest measured hourly flow that occurs during a design wet weather rain event. It consists of the average dry weather flow plus any rainfall-dependent infiltration/inflow and groundwater infiltration. Although the temporary flow monitoring program captured wet weather events, the flows captured did not indicate a significant increase. Therefore, this SMPU will use the peak dry weather flows to determine pipe deficiencies, with an adequate allowance for peak wet weather flows provided via the allowable depth of flow sewer design criteria utilized, as discussed in the following section.

6.0 SEWER DESIGN CRITERIA

Sewer pipe capacities are dependent upon many factors. These include the roughness of the pipe, the maximum allowable depth of flow, and limiting velocity and slope. The Continuity Equation and the Manning's Equation for steady state flow are used for gravity sewer hydraulic calculations:

Continuity Equation: $Q = V A$

where:
Q = peak flow, cfs
V = velocity, fps
A = cross-sectional area of flow, sq. ft. (when d/D = 1.0)

Manning's Equation: $Q = (1.486 AR^{2/3} S^{1/2})/n$

where:
V = velocity, fps
n = Manning's coefficient of friction
R = hydraulic radius (area divided by wetted perimeter), ft
S = slope of energy gradient (approximated by slope of pipe), ft/ft

6.1 Manning Coefficient (n)

The Manning coefficient 'n' is a friction coefficient and varies depending on the type of material. For example, glass would have an 'n' value of 0.010 while earth channels would have an 'n' value of 0.020. There has been much debate about the appropriate 'n' value to use for different piping materials in sanitary sewer systems. To complicate the debate, the slime layer that thrives on the wetted portions of the sanitary piping also contributes to and affects the actual value of 'n'. This study will utilize an 'n' value of 0.012 based on a conservative value for VCP, which makes up the majority of the District's sewer collection system.

6.2 Design Velocities

In an effort to maintain the suspension of solids in sewers, the minimum design velocity shall be 2 ft/sec during the peak dry-weather flow (PDWF) at the time the pipe is placed into service. The maximum design velocity shall be limited to 10 ft/sec at the peak flow rate. Using Manning's Equation above, one can calculate the minimum slope necessary to achieve the minimum design velocity of 2 ft/sec for a given diameter of pipe. Performing this calculation for pipes 6 inches to 30 inches in diameter results in the minimum slopes shown on Table 6-1.

Table 6-1
Minimum Slopes by Pipe Size

Pipe Size (in)	Minimum Slope (ft/ft)
6	0.0055
8	0.0040
10	0.0028
12	0.0022
15	0.0015
18	0.0012
21	0.0010
24	0.0008
27	0.00067
30	0.00058

6.3 Existing Pipe Flow Depth Criteria (d/D)

The capacity criteria for gravity sewers are typically evaluated by a ratio of flow depth over pipe diameter (d/D). Sewers for this analysis shall be sized so the d/D ratios (specified below) are not exceeded while flowing under the peak dry-weather flow (PDWF) conditions. Utilizing these d/D ratios for peak dry weather flow provides an adequate allowance for peak wet weather flow in the top portion of the pipe, especially considering the results of the I/I analysis within the District as discussed in Section 4, above.

- Pipe Size $\leq$ 12-inches: d/D $\leq$ 50%
- Pipe Size > 12-inches: d/D $\leq$ 75%

6.4 Recommended Pipe Improvements Criteria

Recommended improvements for pipelines with capacity deficiencies are based on the following sizing criteria:

- Pipe replacement is recommended for existing small diameter (8", 10" and 12") pipes rather than recommending a parallel system, as there are only minimal cost savings in using these smaller lines along with an additional parallel line. Also, street sections are more cluttered with two sets of pipes and manholes.
- Either pipe replacement or a parallel system is recommended for existing 15" diameter pipes, on a case-by-case basis. This decision would typically be dependent on the pipeline's useful life remaining and available room within the street section.

- Generally only a parallel system is recommended for existing 18" diameter pipes and larger.
- For pipe diameters 12" and larger, only downsizing by one pipe size is allowed, when proceeding downstream in a sewer line.
- For pipe diameters 8" and 10", no downsizing is allowed.

Water service for Basin 1-8 is provided by the Golden State Water Company (GSWC). As such, spatially located water consumption data was not available. The land use for the study area was provided by the District so the sewer loads for Basin 1-8 were developed by applying estimated per-acre flows to each land use class. Table 7-2 shows the total flows estimated for Basin 1-8. The flow within each land parcel was distributed to model manholes based on the manhole's contributing area (Thiessen polygon methodology).

Table 7-2
Basin 1-8 Flows Based on Land Use

Land Use	Flow Factor (gpm/acre)	Acres	Total Sewer Flow (gpm)
Commercial	1.41	17.90	25
High Density Residential	2.97	17.92	53
Medium-High Density Residential	1.41	324.35	457
Total		**360.17**	**535**

Point loads were added to appropriate model manholes to account for flows generated from the Metropolitan Water District's (MWD) Diemer Water Treatment Facility in Basin 3-1 and flow from the City of Yorba Linda wastewater collection system in Basin 1-6. The flow allocations for the City of Yorba Linda system were determined by the metered water sales data. At two locations, a new manhole was added to best allocate the point loads.

For each phase of the flow monitoring, flow and rainfall data was reviewed to select a time period where sewer flows were not influenced by rainfall events. The average flow rate at each temporary flow monitor was determined for the dry weather periods and the model allocations were adjusted to match this ADWF.

The initial flow allocations at each manhole were adjusted to match the monitored average dry weather flows using the return to sewer ratios shown in Table 7-3. A return to sewer ratio is the ratio of the amount of water that was returned to the sewer system during average dry weather conditions divided by the amount purchased or passing through the water meter.

SECTION 00600

DESIGN CRITERIA FOR SEWER FACILITIES

600.1 MINIMUM SIZE

The District will not accept for maintenance sewer lines smaller than 8 inches nor any sewer line that is within a common trench (two or more utilities in the same trench).

600.2 MINIMUM AND MAXIMUM SLOPE DESIGN

600.2.1 Slopes

All sewers shall be so designed and constructed to give mean velocities, when flowing half full at the estimated peak flow, of not less than 2.0 fps, based on Manning's formula using an "n" value of 0.013. The following are minimum slopes; however, slopes greater than these are desirable. The District reserves the right to require greater slopes where deemed necessary.

Sewer Size (inches)	Minimum Slope in Feet per 100 Feet
8	0.40
10	0.28
12	0.22
15	0.16
18	0.12
21	0.10
24	0.08

Maximum slopes shall be 15% unless authorized by the District.

600.2.2 High Velocity Protection

Where flow velocities greater than 15 fps are attained, special provision shall be made to protect against displacement by erosion and shock for pipe entering a manhole and for concrete manhole base and flow channels.

600.3 FLOW DESIGN CRITERIA

600.3.1 Criteria for Average Daily Flow Calculations

The following table summarizes the unit flow coefficients for various land uses. Sewerage generation rates for land uses not shown shall be established by the District.

Unit Flow Coefficients for Various Land Uses	
Land Use	**Average Unit Flow Coefficients (cfs/acre)**
Residential Agriculture	0.0010
Residential Suburban	0.0012
Residential Urban	0.0015
Residential Multiple	0.0039
Planned Residential Development	0.0015
Planned Community	0.0018
Public and Semi-Public School	0.0030 cfs/100 enrollment
Open Space	0.0003
Commercial Office	0.0050
Commercial Neighborhood	0.0050
General Commercial	0.0050
Senior Citizen	0.0040

600.3.2 Peak Flows

Pipeline design shall be based on the peak flows as determined from Manning's formula and the following: Q(peak) = 2 x Q (avg).

Design peak flows in pipelines 12 inches in diameter and smaller are to be limited to approximately d/D = 0.5. Pipes over 12 inches are to be limited to approximately d/D = 0.75. "d/D" is the ratio of calculated flow depth to pipe diameter.

600.4 SEWER PIPE MATERIAL

All gravity sewer main lines and all sewer service laterals shall be extra strength vitrified clay pipe (VCP). All sewer force mains shall be of a pipe material approved by the District.

600.5 STANDARD LOCATION AND ALIGNMENT

600.5.1 Location

Wherever possible, in local residential and industrial streets, pipe is to be located 5 feet off the street centerline. In major, primary, and secondary highways, pipe shall be located in the center of the driving lane nearest to the center of the street. Pipe shall not be located in median strips or parking lanes. On curvilinear streets, pipe shall parallel as nearly as possible the street centerline by means of horizontal curves.

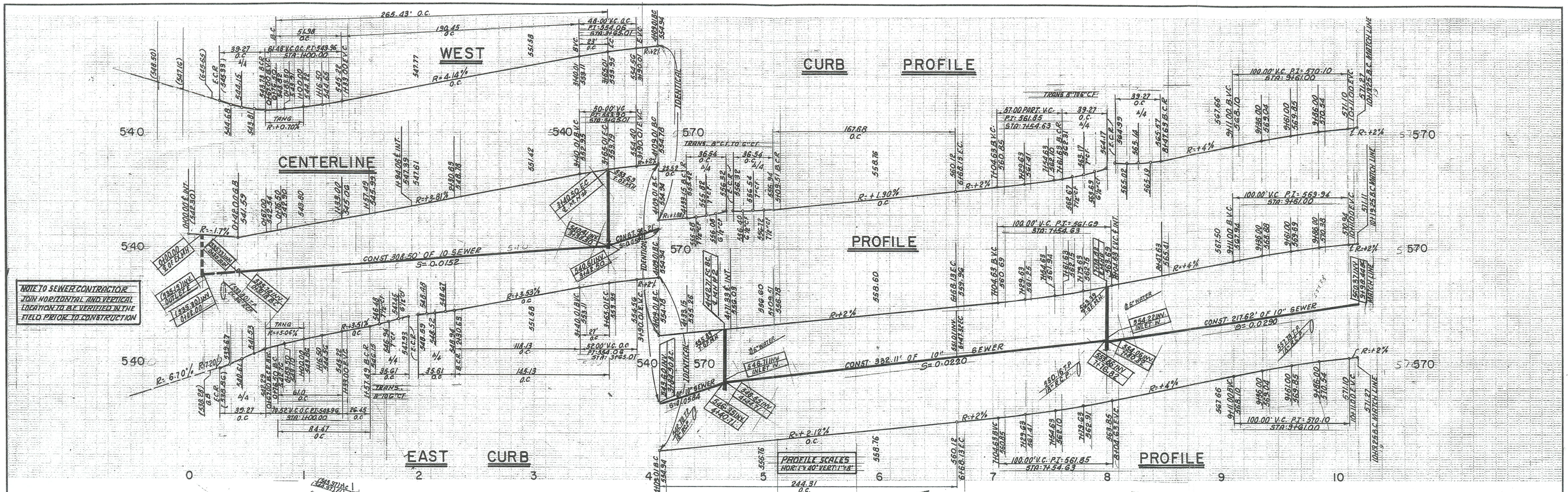
600.5.2 Alignment

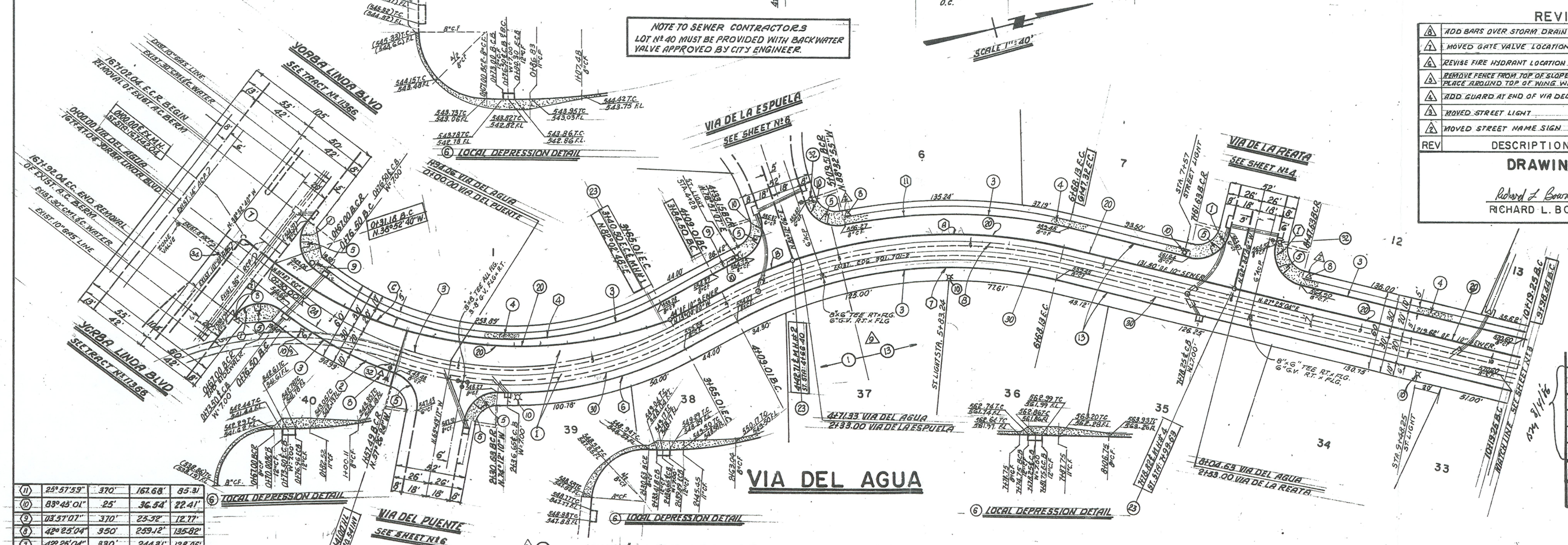
Barring other limiting design and construction considerations, a maximum separation between sewer and domestic water mains in new subdivisions shall be achieved by the following construction procedures:

Appendix

H

EXISTING IMPROVEMENT PLANS for STONEHAVEN DRIVE





NO.	Δ	R	L	T
11	25°57'59"	370'	167.68'	85.31
10	83°45'01"	25'	36.54'	22.41'
9	03°57'07"	370'	25.52'	12.77'
8	42°25'04"	350'	259.12'	135.82'
7	42°25'04"	330'	244.31'	128.06'
6	30°47'50"	270'	145.13	74.36'
5	81°37'07"	25'	35.61'	21.59'
4	66°07'20"	230'	265.43'	149.71'
3	66°07'20"	250'	288.51'	162.73'
2	18°33'44"	270'	87.47'	44.12'
1	90°00'00"	25'	39.27'	25.00

NO.	Δ	R	L	T
C	59°04'31"	300'	309.32'	169.99'
B	9°23'41"	355'	58.21'	29.17
A	33°01'23"	355'	204.61'	105.23

- (13) Δ9 CONST. 3" A.C. PAVEMENT AND 4.5" A.B. - STA. 5+00 TO 10+19.25
- (10) INSTALL STREET LIGHT 5800 LHPSV PER O.C.E.M.A. STD. PLAN 411
- (9) INSTALL STOP SIGN.
- (8) INSTALL STREET NAME SIGN.
- (7) REM. A.C. BERM AND JOIN EXISTING CURB AND GUTTER
- (6) CONST. LOCAL DEPRESSION PER O.C.E.M.A. STD. PLAN 308 AND DETAIL THIS SHEET.
- (5) CONST. CONC. SIDEWALK RETURN AND ACCESS RAMP PER O.C.E.M.A. STD. PLAN 111
- (4) CONST. CONC. SIDEWALK PER O.C.E.M.A. STD. PLAN 205
- (3) CONST. 8" CONC. CURB AND GUTTER TYPE "A-2" PER O.C.E.M.A. STD PLAN 201
- Δ9 (1) CONST 3" A.C. PAVEMENT AND 4" BASE - STA. 0+42 TO 5+00
- (24) REMOVE EXISTING PLUG AND JOIN.
- (23) CONST. MANHOLE PER YLCWD STD SP-3
- (22) CONST. 4" V.C.P.-ABS OR PVC HOUSE LATERAL PER YLCWD STD. SP-2
- (20) CONST. 10" V.C.P. ABS OR PVC SEWER MAIN PER YLCWD STD SP-1
- (34) REMOVE EXISTING PLUG AND JOIN
- (32) INSTALL 8"x6" TEE RT x FLG, 6" G.V. RT x FLG & FIRE HYDRANT PER YLCWD STD 5
- (30) CONST. 8" A.C.P. WATER MAIN

REVISIONS

REV	DESCRIPTION	SHT	INIT.	APP'D	DATE
8	ADD BARS OVER STORM DRAIN	9	RB		4-15-86
7	MOVED GATE VALVE LOCATION	5	RB		4-15-86
6	REVISE FIRE HYDRANT LOCATION	4	RB		4-15-86
5	REMOVE FENCE FROM TOP OF SLOPE AND PLACE AROUND TOP OF WING WALLS	3	RB	8/6/86	4-15-86
4	ADD GUARD AT END OF VIA DEL AGUA	3	RB		4-15-86
3	MOVED STREET LIGHT	2-4	RB		4-15-86
2	MOVED STREET NAME SIGN	2-3-4-5	RB		4-15-86

BJY, 8-4-86

DRAWING OF RECORD

Richard L. Bowman — 4-21-86

RICHARD L. BOWMAN RCE 24573 — DATE

REV	DESCRIPTION	SHEET	INIT.	APP'D	DATE
13	MODIFIED "V" DITCH AT INLET PER INSPECTOR	8	RB	8/6/86	7-86
12	MOVE BLOW-OFF PER INSPECTOR	6	RB		7-86
11	ADD FENCE AROUND INLET	3	RB		7-86
10	ADD ℄ DRIVEWAY LOCATION	3-6	RB		7-86
9	ADD PAVEMENT SECTIONS PER INSPECTOR	2-6	RB		7-86

BJY 8/4/86

REVISIONS

PREPARED BY VTN CONSOLIDATED
UNDER THE SUPERVISION OF
George [signature] 10/4/84
R.C.E. 13960 DATE

TRACT NO. 10455

VIA DEL AGUA

NORTH CURB PROFILE

CENTERLINE PROFILE

SOUTH CURB PROFILE

PROFILE SCALES
HOR: 1"=40' VERT: 1"=8'

SOUTH CURB PROFILE

CENTERLINE PROFILE

NORTH CURB PROFILE

SCALE 1"=40'

VIA DEL CORRAL
SEE SHEET NO. 4

VIA DE LA ROCA
SHOWN AT RIGHT

VIA DEL AGUA

VIA DEL AGUA
SHOWN AT LEFT

VIA DEL AGUA
SHOWN AT LEFT

VIA DE LA ROCA

SCALE 1"=20'

NO.	Δ	R:	L:	T:	NO.	Δ	R:	L:	T:
(12)	24°27'52"	38'	160.81'	—	(D)	26°18'51"	355'	163.02'	82.98'
(11)	31°13'56"	100'	54.51'	27.95'	(C)	4°20'39"	355'	26.95'	13.48'
(10)	83°45'01"	25'	86.54'	22.41'	(B)	2°50'18"	505'	25.02'	12.51'
(9)	34°50'36"	25'	37.02'	22.86'	(A)	14°56'24"	505'	131.68'	66.22'
(8)	7°10'26"	370'	46.33'	23.19'					
(7)	30°28'19"	350'	186.14'	95.83'					
(6)	29°38'32"	330'	170.74'	87.32'					
(5)	87°43'44"	25'	38.28'	24.09'					
(4)	85°28'29"	25'	37.30'	23.10'					
(3)	10°38'55"	520'	99.61'	49.99'					
(2)	17°46'42"	500'	155.15'	78.20'					
(1)	17°45'42"	480'	148.94'	75.01'					

(G) LOCAL DEP. DETAIL

(6) LOCAL DEPRESSION DETAIL

(6) LOCAL DEPRESSION DETAIL

(14) INSTALL CHAIN LINK FENCE WITH 6' GATE PER OCEMA STD. PLAN 418
(A 12) INSTALL GUARD RAIL WITH REFLECTORS
(11) INSTALL BARRICADE PER O.C.E.M.A. STD. PLAN 401
(10) INSTALL STREET LIGHT 5800 LH PSV PER O.C.E.M.A STD. PLAN 411
(8) INSTALL STREET NAME SIGN
(6) CONST. LOCAL DEPRESSION PER OCEMA STD. PLAN 308 AND DETAIL THIS SHEET
(5) CONST. CONC. SIDEWALK RETURN & ACCESS RAMP PER O.C.E.M.A. STD. PLAN 111
(4) CONST. CONC. SIDEWALK PER O.C.E.M.A. STD. PLAN 205
(3) CONST. 8" CONC. CURB AND GUTTER TYPE "A-2" PER O.C.E.M.A STD. PLAN 201
(2) CONST. 6" CONC. CURB AND GUTTER TYPE "D" PER O.C.E.M.A. STD. PLAN 201
(A 13) CONST. 3" A.C. PAVEMENT AND 4.5" BASE

(27) CONST. 10" PLUG.
(23) CONST. MANHOLE PER YLCWD STD. S.P. 3
(22) CONST. 4" V.C.P.-ABS OR PVC HOUSE LATERAL PER YLCWD STD. S.P. 2
(21) CONST. 8" V.C.P.-ABS OR PVC SEWER MAIN PER YLCWD. STD. S.P. 1
(20) CONST. 10" V.C.P. ABS OR PVC. SEWER MAIN PER Y.L.C.W.D. STD. S.P. 1

(33) INSTALL 6"xG" TEE R.T.x FLG.-6" GV. R.T.x FLG. & F.H. PER YLCWD STD 5.
(32) CONST. BLOW-OFF ASSEMBLY PER YLCWD. STD G
(31) INSTALL 8"x6" TEE R.T.x FLG.-6" GV R.T.x FLG & FIRE HYDRANT PER YLCWD STD 5
(30) CONST. 6" P.V.C. WATER MAIN.
(29) CONST. 8" P.V.C. WATER MAIN.

REVISIONS

APP'D	REV	DESCRIPTION	INIT	DATE
	11	ADD FENCE AROUND INLET	RB	7-86
	10	ADD 6' DRIVEWAY LOCATIONS	RB	7-86
	9	ADD PAVEMENT SECTION PER INSPECTOR	RB	7-86
	8	REMOVE FENCE FROM TOP OF SLOPE AND PLACE AROUND TOP OF WING WALLS	RB	4-15-86
	7	ADD GUARD RAIL AT END OF VIA DEL AGUA	RB	4-15-86
	6	MOVED STREET NAME SIGN	RB	4-15-86

DRAWING OF RECORD

Richard L. Bowman — 4-21-86
RICHARD L. BOWMAN RCE 24573 — DATE

REVISION

№	DESCRIPTION		DATE
1	REV. NORTH & SOUTH CURB PROFILE FROM STA 0+42.45 TO M.O.C. REV. CENTERLINE PROFILE FROM STA 0+80 TO STA 1+18.00 AND LOCAL DEP. DETAIL, REV. EL. TOP MH #10 ON VIA DE LA ROCA	RB	7/24/85

PREPARED BY VTN CONSOLIDATED
UNDER THE SUPERVISION OF
Gary L. Taylor — 10/4/85
R.C.E. 13980 — DATE

TRACT NO. 10455
VIA DEL AGUA
VIA DE LA ROCA

PRELIMINARY SEWER REPORT

for the ESPERANZA HILLS PROJECT
ASPEN WAY OPTION 2
in the Unincorporated Area of
County of Orange, California

PREPARED FOR :

Yorba Linda Estates, LLC
7114 East Stetson Drive, Suite 350
Scottsdale, AZ 85251

June 20, 2013

PREPARED BY:

KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS

KWC Engineers
1880 Compton Avenue, Suite 100
Corona, CA 92881
Tel: (951) 734-2130
www.kwcengineers.com

REGISTERED PROFESSIONAL ENGINEER
VICTOR A. ELIA
64803
Exp. 06/30/15
CIVIL
STATE OF CALIFORNIA

Victor Elia

Victor Elia, RCE 64803

TABLE OF CONTENTS

Section Name **Page Number**

Section

1

INTRODUCTION

1.1 PURPOSE OF STUDY

The purpose of this report is to discuss the estimated project sewer contributions for the Esperanza Hills project, and how they relate to existing improvements in the area. This report will provide information concerning existing sewer facilities, recommended sewer facilities and projected phasing to support the project. This report will also identify the approximate alignments and pipe sizes of the proposed sewer facilities. The Esperanza Hills Project sewer contributions are based on the Esperanza Hills Site Plan / Conceptual Grading Plan Option 2 Aspen Way in **Appendix C**.

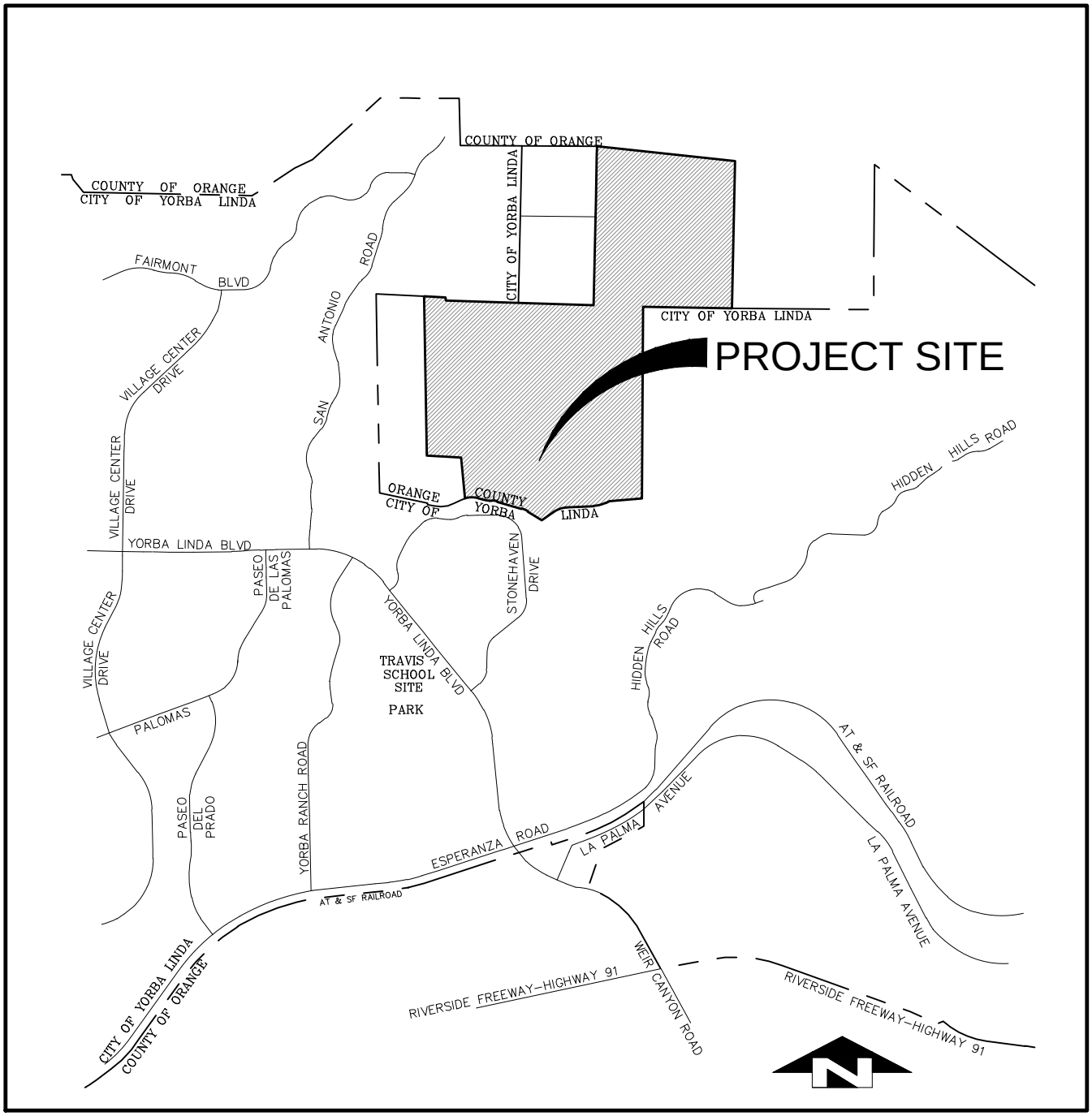
1.2 PROJECT DESCRIPTION

The Esperanza Hills project is located in the unincorporated area in the County of Orange, in the sphere of influence for the City of Yorba Linda. The site is in the Orange County Sanitation District (OCSD) service area for sewer treatment and the Yorba Linda Water District for local sewer service (recently acquired). As proposed by The Esperanza Hills Specific Plan, the project site consists of 340 single family residential homes. The Esperanza Hills site is comprised of approximately 469 acres of undeveloped land. However, of the 469 acres, 308 acres is developable land based on the conceptual grading plan. **Figure 1** shows a vicinity map of the area. Adjacent properties include: Sage property (VTTM 17341), and Friend property (approximately 42 lots) as shown in **Figure 2**. This area is planned for a multifaceted community consisting of open space, trail system and low density residential lots. San Antonio Road is the main north-south thoroughfare into the community connecting to Yorba Linda Boulevard and the Interstate 91 Freeway. The development of Esperanza Hills and adjacent communities will enhance the northern area of the City of Yorba Linda.

1.3 RELATED STUDIES

Orange County Sanitation District
The Orange County Sanitation District (OCSD) Facilities Master Plan, prepared in December 2009, provides a regional study identifying existing and proposed major sewer facilities within the OCSD ultimate service area. The study also presents capital improvements required for the OCSD to maintain the required level of service.

Yorba Linda Water District 2010 Sewer Master Plan Update
The Yorba Linda Water District 2010 Sewer Master Plan Update, dated February 2011, provides a regional study of the area to the west of this site, identifying existing and proposed major sewer facilities within the District's service area. An update to the Sewer Master Plan to incorporate the recently acquired sewer service area from the City of Yorba Linda, which would include this project and the downstream facilities has **not** been completed yet. Refer to **Appendix G**.



LOCATION MAP

NOT TO SCALE

KWC ENGINEERS
CIVIL ENGINEERS ● PLANNERS ● SURVEYORS
1880 COMPTON AVENUE, SUITE 100 ● CORONA, CA. 92881-3370 ● 951-734-2130

FIGURE 1-1

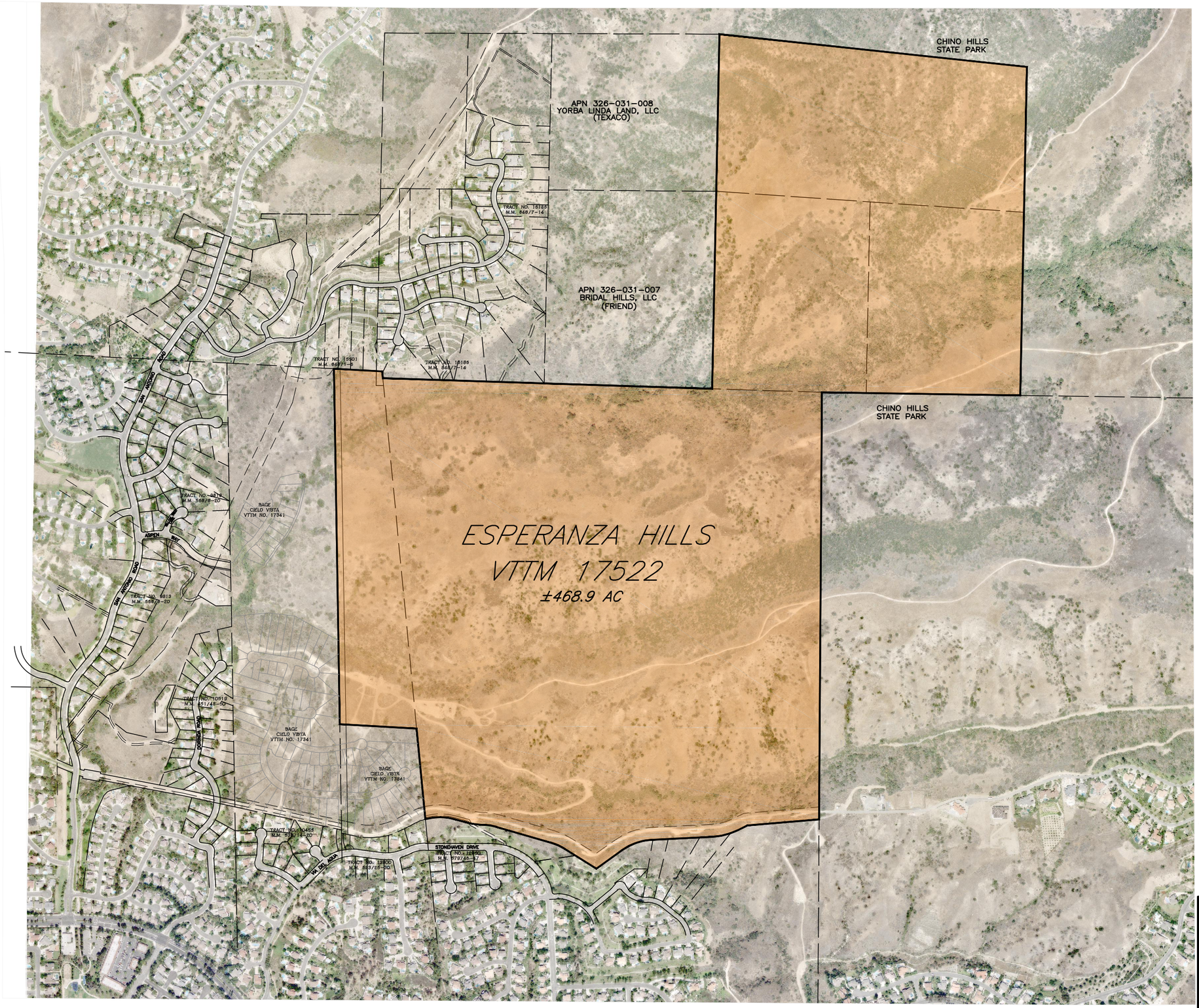


FIGURE 1-2

VICINITY MAP

KWC ENGINEERS

CIVIL ENGINEERS ● PLANNERS ● SURVEYORS
1880 COMPTON AVENUE, SUITE 100 ● CORONA, CA. 92881-3370 ● 951-734-2130

JN 09.1200.4 R:\09\1200\PRELIM\REPORTS\WAT Option 1\Vicinity Map.dwg 06/21/2013 08:12

Section

2

DESIGN CRITERIA

This section presents the design criteria used to estimate the sewage flows and evaluate recommended and existing sewer system improvements required for the Esperanza Hills project. The criteria utilized in this study are in accordance with the Yorba Linda Water District standards for sewer design and the YLWD 2010 Sewer Master Plan Update.

2.1 DESIGN CRITERIA

The design criteria from the YLWD are summarized below in **Table 2-1**.

TABLE 2-1

DESIGN CRITERIA		
Description	**YLWD**	**Unit**
Average Daily Flow – Planned Residential Development	0.0015	cfs/ac
Multiplication Factor ADF to Peak Flow	2	ratio
Minimum Diameter of Pipe (VCP)	8	inch
Velocity - minimum	2	fps
Velocity - maximum	15	fps
Slope - minimum (8")	0.40	%
Slope - maximum	15	%
Maximum d/D: 8" – 12" diameter	0.5	ratio
Maximum d/D: 15" – 18" diameter	0.75	ratio
Depth of Cover - minimum	7	feet
Distance between manholes for 8" – 15" - maximum	300	feet
Radius of Curvature for 8" – 12" - minimum	150	feet

2.2 GRAVITY SEWERS

Gravity sewers are designed to convey peak flow. For pipes with a diameter of 8-inches to 12-inches, the sewers have been designed to convey this flow when flowing half full. Manning's Equation with an "n" value of 0.012 was used to size all gravity sewers per the master plan assuming VCP pipe for all sewerlines. All new sewers were designed to maintain a minimum velocity of two feet per second at design capacity to prevent the deposition of solids. To minimize excessive wear and tear of the pipe, the maximum velocity was not to exceed 15 feet per second.

Section

3

EXISTING AND PROPOSED SEWER FACILITIES

3.1 EXISTING FACILITIES

The Esperanza Hills project was designed to convey the sewer flows out towards Stonehaven Drive per preliminary design meetings with Yorba Linda Water District, as shown on the Sewer Network Analysis exhibit in **Appendix D**. There is an existing 10" sewer line in Stonehaven Drive, draining to the south, which drains into an existing 10" main in Yorba Linda Boulevard, then a 12" main in Via De La Escuela. Flows are conveyed southwesterly toward the 51" OCSD Santa Ana River Interceptor (trunk line) which drains southwesterly to Wastewater Treatment Plant #1 in Fountain Valley.

The OCSD Facilities Master Plan lists out the Capital Improvements required to maintain the required level of service. No improvements are proposed along the downstream path of this site.

3.2 PROPOSED FACILITIES

The project proposes to install approximately 32,100 feet of 8" VCP gravity sewer. Except for two locations, the proposed sewers will be installed in typical private street sections, within an easement to YLWD. The first exception is a cul-de-sac which drains through an easement and down an engineered slope and the second exception is the project outlet through the Sage property.

A sewer siphon will be required at a low point in the Sage property, about 250 feet north of the intersection of Stonehaven Drive and Via De La Roca. A portion of the adjacent Sage property VTTM 17341 (95 lots) just north of Stonehaven Drive will also drain into the proposed sewer pipe connecting to the existing Stonehaven Drive sewer pipe which will be located in a paved access road except through the existing wash. The proposed point of connection to the existing 10" sewer in Stonehaven Drive is approximately 170 feet northeast of the intersection of Stonehaven Drive and Via De La Roca.

Section

4

PROJECTED SEWAGE FLOWS and SEWER SIZING

This section provides the projected sewage flows for the Esperanza Hills project. The critical location that was analyzed is the existing 10" sewer in Yorba Linda Boulevard prior to Via De La Escuela where it changes to a 12" sewer.

4.1 PROJECTED SEWAGE FLOWS

The projected sewage flows were determined on a per lot basis, based on typical generation rates supplied in the YLWD Sewer Master Plan Update as shown below:

TABLE 4-1

TYPICAL GENERATION RATES	
Typical Household Density	3.1 people per DU
Average Generation Rate	77 gallons per capita per Day
Peaking Factor	2 x Average Flow

Using the above criteria, the average sewer generation rate results in 0.000369 cfs per lot.

The Sewer Network Analysis exhibit in **Appendix D** identifies the lots from the Esperanza Hills, Friend and Sage properties which are proposed to drain into Stonehaven Drive as well as the existing lots along the sewerlines downstream. The Sage property includes 95 lots based on VTTM 17341 that would drain towards Stonehaven Drive. The Friend property includes 42 lots based upon a preliminary lotting study by KWC Engineers. The table below identifies the corresponding estimated project sewer flows for the ultimate build-out condition.

TABLE 4-2

PROJECTED SEWER FLOWS			
Phase	**Number of Lots**	**Average Flow (cfs)**	**Peak Flow (cfs)**
1 Esperanza Hills	340	0.125	0.250
2 Friend property	42	0.015	0.031
3 Sage property	95	0.035	0.070
Total	**477**	**0.175**	**0.350**

4.2 SEWER LINE SIZING

The peak sewer generations from Table 4-2 were used in the Sewer Network Analysis utilizing the H2OMAP SWMM computer software to analyze the existing and proposed sewer lines per the Yorba Linda Water District design guidelines. Refer to the Sewer Network Analysis exhibit in **Appendix D** for the identification of sewer conduits (CDT), junctions (JCT), delineated tributary areas (lot counts) and peak flows**.**

Existing Sewer Lines

The existing 10" VCP sewer in Yorba Linda Blvd. was analyzed from Via del Agua to Via de la Escuela for the proposed condition. The existing slope varies from 2.52% to 6.20%. Calculated flow depths of d/D are less than 0.5 in the proposed condition. The results are summarized below in **Table 4-3.** Calculations are included in **Appendix E.**

TABLE 4-3
YORBA LINDA BOULEVARD EXISTING 10" SEWER
PROPOSED CONDITION

	Upstream of Via Del Cerro (CDT-95)	Downstream of Via Del Cerro (CDT-97)
Slope	6.2%	2.52%
Flow (cfs)	0.408	0.430
d/D	0.041	0.202
Max d/D	0.415	0.415
Velocity (fps)	1.33	3.95

Proposed Sewer Lines

The proposed 8" VCP sewer lines onsite were analyzed using the computer modeling software, design criteria, and peak flow generation as described above. Proposed pipe slopes were determined by using the Site Plan / Grading Plan, assuming manholes would typically be 8 feet deep. Slopes range from 0.4% to 11.8%, with flow depths ranging up to 0.17 feet (2.04 inches). The maximum velocity is 4.96 ft./sec. Calculations are included in **Appendix E.**

Section

5

CONCLUSIONS

The estimated sewer flows from the Esperanza Hills project will not negatively affect the existing downstream sewer network based on this analysis. The existing 10" sewer lines in Stovehaven Drive and Yorba Linda Boulevard will be sufficient to accept the proposed flows from the Esperanza Hills project as well as flows from the future Sage and Friend projects. Onsite 8" sewer lines will be sufficient to serve the project and the future Friend project. Until the time that the Sage project sewer system is installed, an interim sewer siphon will be required at the existing wash just north of Stonehaven Drive.

These proposed sewer infrastructure facilities with respect to their proximate locations, alignments, and sizes are consistent with the Yorba Linda Water District 2010 Sewer Master Plan Update and the OCSD Facilities Master Plan. The proposed Esperanza Hills onsite sewer facilities presented in this report are preliminary estimates of the anticipated sewer facilities necessary to service the project needs. Further studies may be required by YLWD during the development phase of the project.

Appendix

A
REFERENCES

Esperanza Hills Specific Plan

City of Yorba Linda General Plan – Land Use Map

Orange County Sanitation District Facilities Master Plan, December 2009.

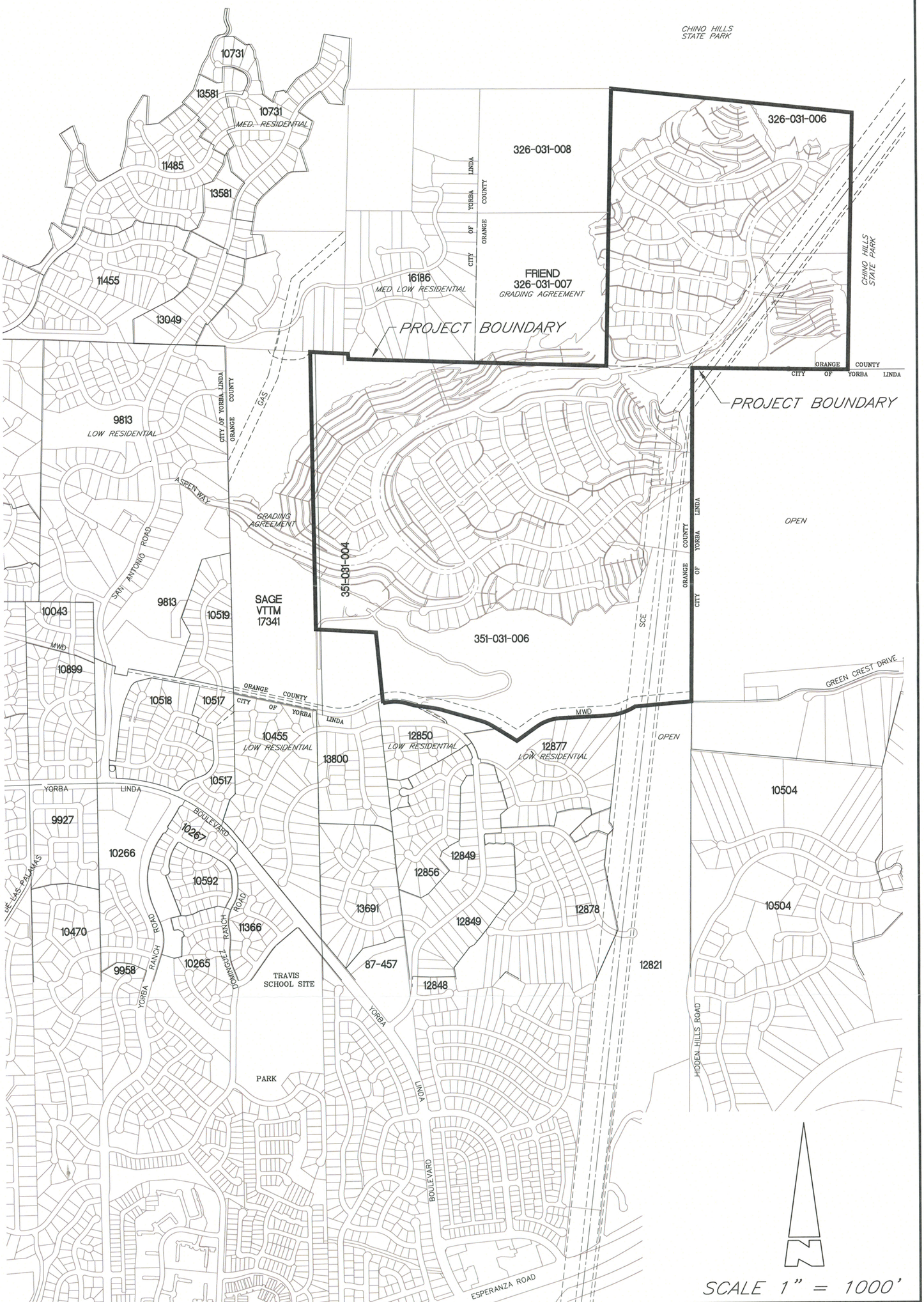
Yorba Linda Water District Standard Specifications and Drawings for Construction of Domestic Water and Sewer Facilities, Design Criteria for Sewer Facilities, November 2010.

Appendix

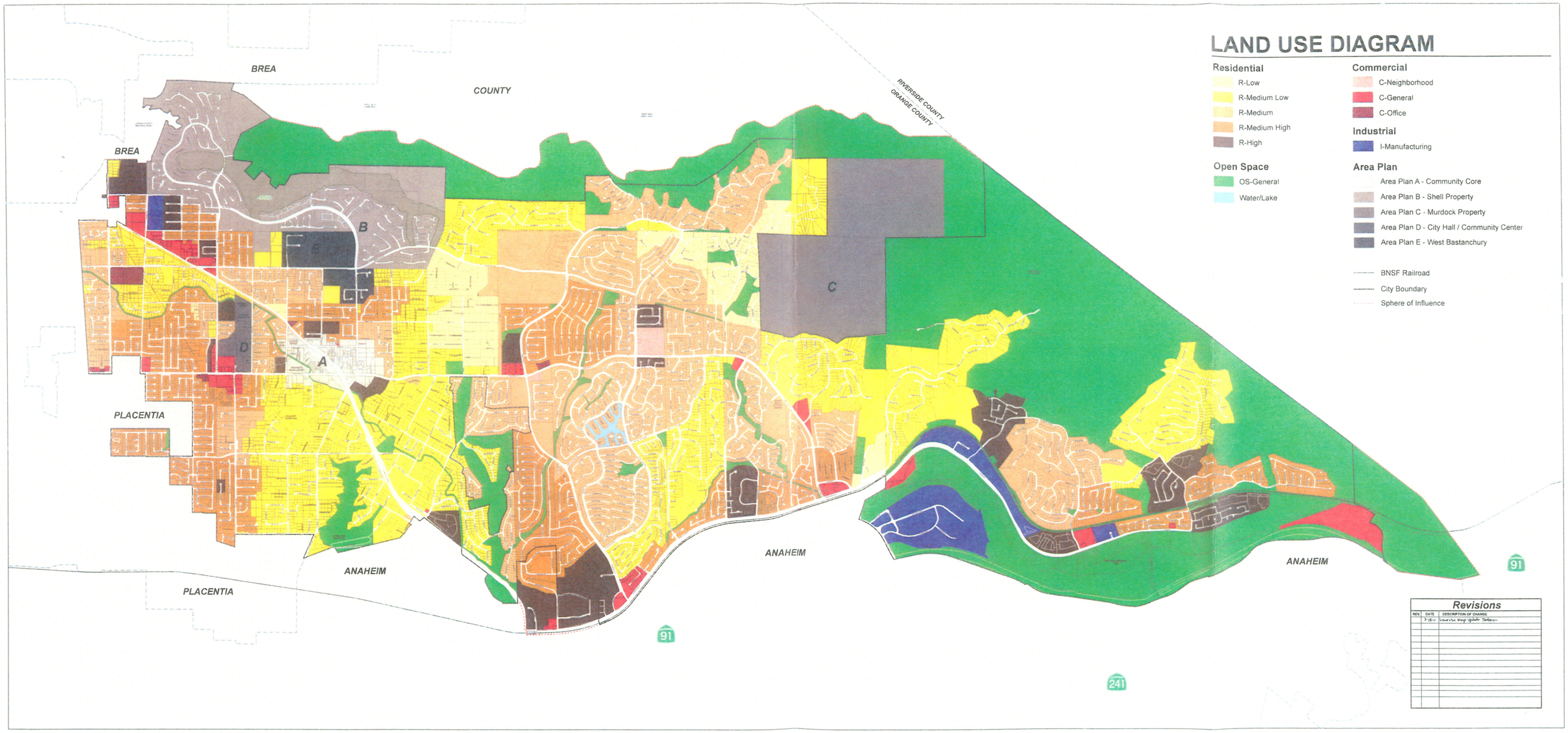
B

- Vicinity Map
- Surrounding Area Map
- City of Yorba Linda Land Use Map

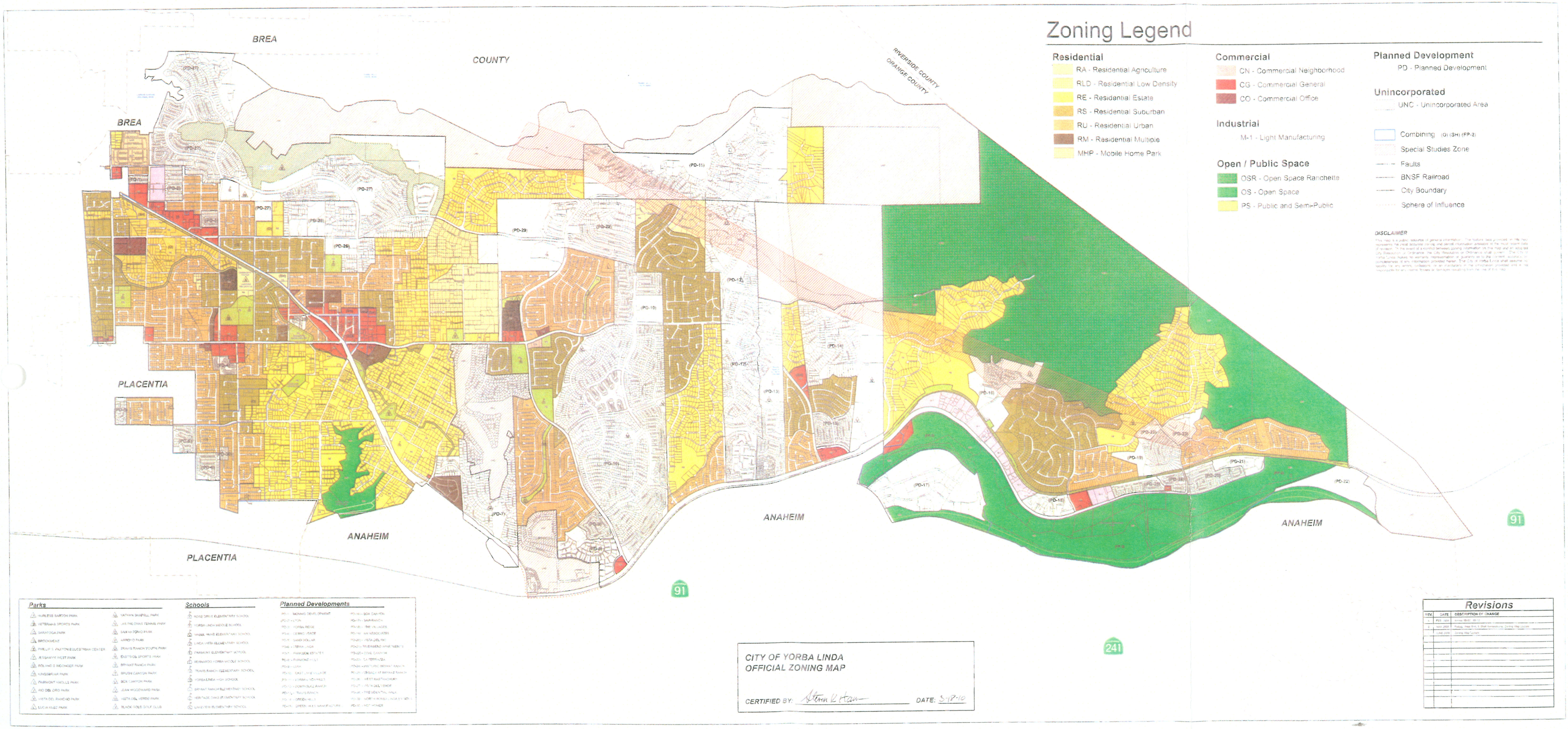
ESPERANZA HILLS – OPTION 2
SURROUNDING PLANNING AREAS



KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 • CORONA, CA. 92881-3370 • 951-734-2130



CITY OF YORBA LINDA LAND USE MAP



CITY OF YORBA LINDA ZONING MAP

Appendix

C

ESPERANZA HILLS
SITE PLAN / GRADING PLAN

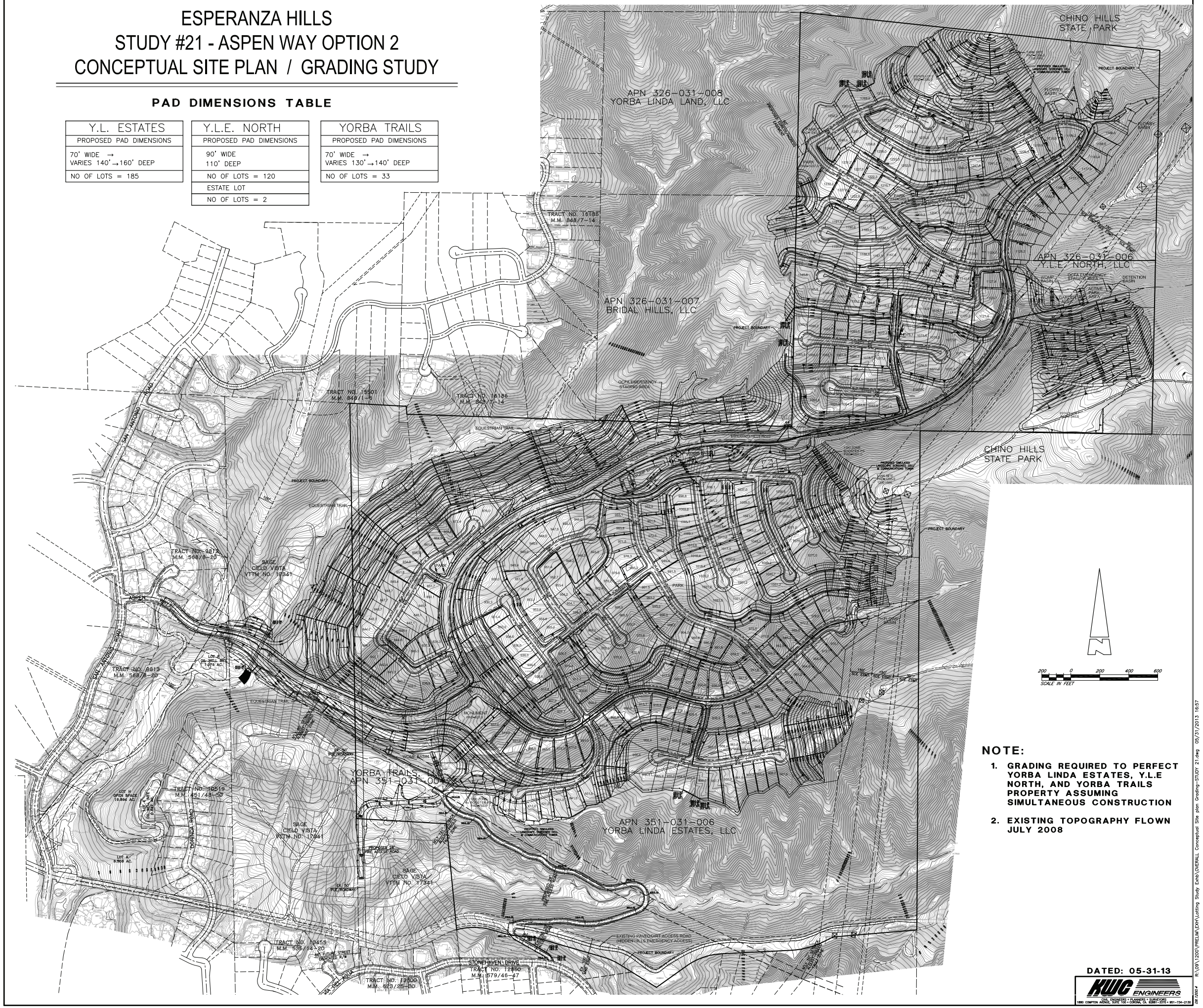
ESPERANZA HILLS
STUDY #21 - ASPEN WAY OPTION 2
CONCEPTUAL SITE PLAN / GRADING STUDY

PAD DIMENSIONS TABLE

Y.L. ESTATES
PROPOSED PAD DIMENSIONS
70' WIDE → VARIES 140'→160' DEEP
NO OF LOTS = 185

Y.L.E. NORTH
PROPOSED PAD DIMENSIONS
90' WIDE 110' DEEP
NO OF LOTS = 120
ESTATE LOT
NO OF LOTS = 2

YORBA TRAILS
PROPOSED PAD DIMENSIONS
70' WIDE → VARIES 130'→140' DEEP
NO OF LOTS = 33



NOTE:

1. GRADING REQUIRED TO PERFECT YORBA LINDA ESTATES, Y.L.E NORTH, AND YORBA TRAILS PROPERTY ASSUMING SIMULTANEOUS CONSTRUCTION
2. EXISTING TOPOGRAPHY FLOWN JULY 2008

DATED: 05-31-13

KWC ENGINEERS
CIVIL • PROGRAMMING • PLANNING • SURVEYING
1880 COMPTON AVENUE, SUITE 100 • CORONA, CA 92881-3301 • 951-734-2130

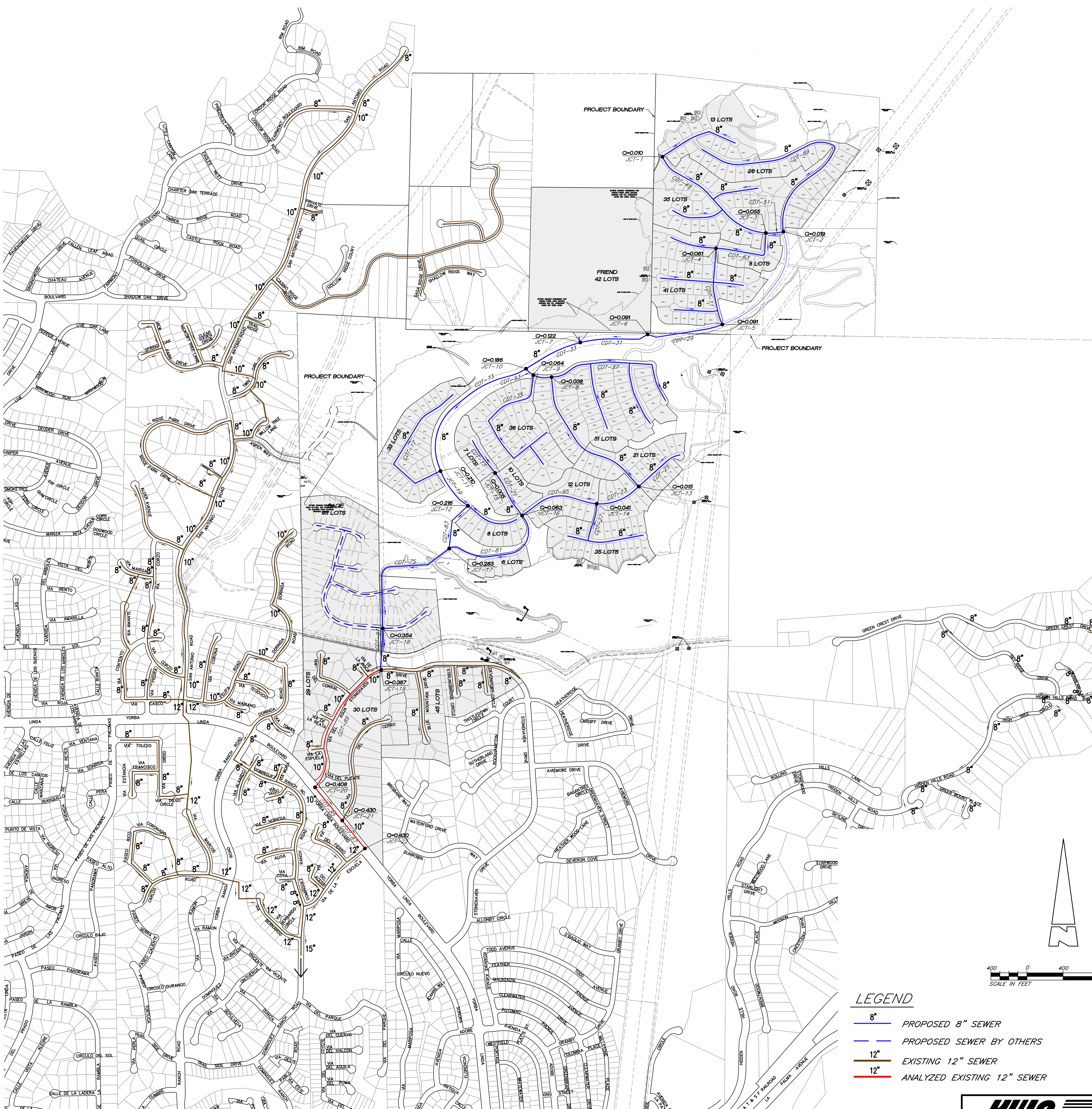
08-0269-4 R:\08\1269\PRELIM\DWG\Lotting Study Exh\OVERALL Conceptual Site plan Grading-STUDY 21.dwg 05/31/2013 16:57

Appendix

D

SEWER NETWORK ANALYSIS EXHIBIT

ESPERANZA HILLS OPTION 2
SEWER NETWORK ANALSIS



LEGEND

8"	PROPOSED 8" SEWER
	PROPOSED SEWER BY OTHERS
12"	EXISTING 12" SEWER
12"	ANALYZED EXISTING 12" SEWER

KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 • CORONA, CA. 92881-3370 • 951-734-2130

09.1200.4

R:\09\1200\PRELIM\REPORTS\SEWER\Prop Sewer Facilities Fig 4-1.dwg 06/24/2013 09:26

Appendix

E

PIPE CAPACITY CALCULATIONS

ULTIMATE BUILD-OUT CONDITION SEWER FLOWS

Tributary Areas		Average Daily Flow (cfs)	Peak Flow (cfs)
JCT 1			
Planned Residential Development units	13	0.005	0.010
JCT 2			
Planned Residential Development units	26	0.010	0.019
JCT 3			
Planned Residential Development units	35	0.013	0.026
Subtotal		0.027	0.055
JCT 4			
Planned Residential Development units	8	0.003	0.006
Subtotal		0.030	0.061
JCT 5			
Planned Residential Development units	41	0.015	0.030
Subtotal		0.045	0.091
JCT 6		0.045	0.091
JCT 7			
Planned Residential Development units	42	0.015	0.031
Subtotal		0.061	0.122
JCT 8			
Planned Residential Development units	51	0.019	0.038
JCT 9			
Planned Residential Development units	36	0.013	0.027
Subtotal		0.032	0.064
JCT 10			
Subtotal		0.093	0.186
JCT 11			
Planned Residential Development units	33	0.012	0.024
Subtotal		0.105	0.210
JCT 12			
Planned Residential Development units	8	0.003	0.006
Subtotal		**0.108**	**0.216**
JCT 13			
Planned Residential Development units	21	0.008	0.015
JCT 14			
Planned Residential Development units	35	0.013	0.026
JCT 16			
Planned Residential Development units	12	0.004	0.009
Subtotal		0.025	0.050
JCT 15			
Planned Residential Development units	7	0.003	0.005
JCT 16			
Planned Residential Development units	10	0.004	0.007
Subtotal		0.006	0.013
Subtotal		**0.031**	**0.063**
JCT 17			
Planned Residential Development units	6	0.002	0.004
Subtotal		0.034	0.067
Total - Project		**0.142**	**0.283**
JCT 18			
Planned Residential Development units	95	0.035	0.070
Subtotal		0.177	0.354
JCT 19			
Existing Residential Development units	45	0.017	0.033
Subtotal		0.193	0.387
JCT 20			
Existing Residential Development units	29	0.011	0.021
Subtotal		0.204	0.408
JCT 21			
Existing Residential Development units	30	0.011	0.022
JCT 22			
Total		**0.215**	**0.430**

ESPERANZA HILLS SEWER REPORT

	ID	Invert Elevation (ft)	Maximum Depth (ft)	Depth (ft)	Head (ft)	Head Class	Pressure (psi)	Volume (ft3)	Lateral Inflow (cfs)	Total Inflow (cfs)
1	JCT-1	1,126.000	0.667	0.028	1,126.028	Below Link Crown	0.012	0.000	0.000	0.000
2	JCT-10	920.000	0.667	0.083	920.083	Below Link Crown	0.036	0.000	0.000	0.085
3	JCT-11	822.000	0.667	0.107	822.107	Below Link Crown	0.046	0.000	0.000	0.106
4	JCT-12	813.000	0.667	0.062	813.062	Below Link Crown	0.027	0.000	0.000	0.085
5	JCT-13	946.000	0.667	0.012	946.012	Below Link Crown	0.005	0.000	0.000	0.000
6	JCT-14	922.000	0.667	0.023	922.023	Below Link Crown	0.010	0.000	0.000	0.002
7	JCT-15	916.000	0.667	0.006	916.006	Below Link Crown	0.003	0.000	0.000	0.000
8	JCT-16	880.000	0.667	0.032	880.032	Below Link Crown	0.014	0.000	0.000	0.007
9	JCT-17	748.000	0.667	0.084	748.084	Below Link Crown	0.036	0.000	0.000	0.100
10	JCT-18	600.000	0.667	0.098	600.098	Below Link Crown	0.042	0.000	0.000	0.142
11	JCT-19	575.000	0.833	0.139	575.139	Below Link Crown	0.060	0.000	0.000	0.174
12	JCT-2	1,106.000	0.667	0.025	1,106.025	Below Link Crown	0.011	0.000	0.000	0.000
13	JCT-20	535.000	0.833	0.120	535.120	Below Link Crown	0.052	0.000	0.000	0.218
14	JCT-21	504.600	0.833	0.158	504.758	Below Link Crown	0.069	0.000	0.000	0.271
15	JCT-23	494.600	1.000	0.178	494.778	Below Link Crown	0.077	0.000	0.000	0.311
16	JCT-24	490.400	1.000	1.000	491.400	Below Maximum Depth	0.433	0.000	0.000	0.354
17	JCT-3	1,104.000	0.667	0.064	1,104.064	Below Link Crown	0.028	0.000	0.000	0.009
18	JCT-4	1,100.000	0.667	0.043	1,100.043	Below Link Crown	0.019	0.000	0.000	0.016
19	JCT-5	1,032.000	0.667	0.062	1,032.062	Below Link Crown	0.027	0.000	0.000	0.033
20	JCT-6	984.000	0.667	0.069	984.069	Below Link Crown	0.030	0.000	0.000	0.058
21	JCT-7	938.000	0.667	0.089	938.089	Below Link Crown	0.039	0.000	0.000	0.074
22	JCT-9	922.000	0.667	0.025	922.025	Below Link Crown	0.011	0.000	0.000	0.000
23	JCT-90	1,246.000	0.667	0.000	1,246.000	Below Link Invert	0.000	0.000	0.000	0.000
24	JCT-91	918.000	0.667	0.000	918.000	Below Link Invert	0.000	0.000	0.000	0.000
25	JCT-92	862.000	0.667	0.000	862.000	Below Link Invert	0.000	0.000	0.000	0.000
26	JCT-93	966.000	0.667	0.000	966.000	Below Link Invert	0.000	0.000	0.000	0.000
27	JCT-94	942.000	0.667	0.000	942.000	Below Link Invert	0.000	0.000	0.000	0.000
28	JCT-95	966.000	0.667	0.000	966.000	Below Link Invert	0.000	0.000	0.000	0.000
29	JCT-96	1,066.000	0.667	0.000	1,066.000	Below Link Invert	0.000	0.000	0.000	0.000

ESPERANZA HILLS SEWER REPORT

	ID	From ID	To ID	Type	Length (ft)	Slope	Flow (cfs)	Flow Class	Depth (ft)	HGL (ft)	Velocity (ft/s)	Froude Number	d/D	Surcharged d/D
1	CDT-11	JCT-4	JCT-5	Circular Conduit	859.000	0.079	0.033	Free Surface	0.053	1,100.043	2.587	2.414	0.079	0.079
2	CDT-15	JCT-91	JCT-15	Circular Conduit	467.000	0.004	0.000	Free Surface	0.003	918.000	0.000	0.000	0.005	0.005
3	CDT-17	JCT-92	JCT-11	Circular Conduit	1,669.000	0.024	0.000	Free Surface	0.053	862.000	0.000	0.000	0.080	0.080
4	CDT-19	JCT-11	JCT-12	Circular Conduit	469.000	0.019	0.085	Free Surface	0.084	822.107	3.285	2.403	0.127	0.127
5	CDT-21	JCT-15	JCT-16	Circular Conduit	534.000	0.068	0.001	Free Surface	0.019	916.006	0.213	0.332	0.028	0.028
6	CDT-23	JCT-13	JCT-14	Circular Conduit	521.000	0.046	0.002	Free Surface	0.017	946.012	0.607	0.987	0.026	0.026
7	CDT-25	JCT-93	JCT-13	Circular Conduit	582.000	0.034	0.000	Free Surface	0.006	966.000	0.000	0.000	0.009	0.009
8	CDT-27	JCT-94	JCT-14	Circular Conduit	422.000	0.047	0.000	Free Surface	0.012	942.000	0.000	0.000	0.017	0.017
9	CDT-29	JCT-5	JCT-6	Circular Conduit	847.000	0.057	0.058	Free Surface	0.065	1,032.062	3.301	2.752	0.098	0.098
10	CDT-31	JCT-6	JCT-7	Circular Conduit	765.000	0.060	0.074	Free Surface	0.079	984.069	3.153	2.387	0.119	0.119
11	CDT-33	JCT-7	JCT-10	Circular Conduit	669.000	0.027	0.080	Free Surface	0.086	938.089	3.040	2.201	0.129	0.129
12	CDT-35	JCT-95	JCT-9	Circular Conduit	1,748.000	0.025	0.000	Free Surface	0.013	966.000	0.000	0.000	0.019	0.019
13	CDT-37	JCT-96	JCT-9	Circular Conduit	1,789.000	0.081	0.000	Free Surface	0.013	1,066.000	0.000	0.000	0.019	0.019
14	CDT-49	JCT-1	JCT-3	Circular Conduit	1,466.000	0.015	0.006	Free Surface	0.046	1,126.028	0.527	0.523	0.069	0.069
15	CDT-51	JCT-2	JCT-3	Circular Conduit	196.000	0.010	0.003	Free Surface	0.045	1,106.025	0.338	0.342	0.067	0.067
16	CDT-63	JCT-3	JCT-4	Circular Conduit	793.000	0.005	0.016	Free Surface	0.054	1,104.064	1.193	1.100	0.081	0.081
17	CDT-69	JCT-90	JCT-2	Circular Conduit	2,890.000	0.049	0.000	Free Surface	0.012	1,246.000	0.000	0.000	0.019	0.018
18	CDT-73	JCT-10	JCT-11	Circular Conduit	1,691.000	0.058	0.106	Free Surface	0.095	920.083	3.491	2.408	0.142	0.142
19	CDT-75	JCT-17	JCT-18	Circular Conduit	1,546.000	0.096	0.142	Free Surface	0.091	748.084	4.963	3.499	0.136	0.136
20	CDT-81	JCT-16	JCT-17	Circular Conduit	1,255.000	0.106	0.019	Free Surface	0.058	880.032	1.300	1.155	0.087	0.087
21	CDT-83	JCT-12	JCT-17	Circular Conduit	553.000	0.118	0.081	Free Surface	0.073	813.062	3.877	3.053	0.110	0.110
22	CDT-85	JCT-20	JCT-21	Circular Conduit	495.000	0.062	0.271	Free Surface	0.139	535.120	4.526	2.568	0.167	0.167
23	CDT-89	JCT-19	JCT-20	Circular Conduit	1,584.000	0.025	0.218	Free Surface	0.130	575.139	4.026	2.369	0.156	0.156
24	CDT-91	JCT-18	JCT-19	Circular Conduit	325.000	0.077	0.174	Free Surface	0.118	600.098	4.136	2.540	0.178	0.178
25	CDT-93	JCT-9	JCT-10	Circular Conduit	107.000	0.019	0.005	Free Surface	0.054	922.025	0.355	0.327	0.081	0.081
26	CDT-95	JCT-14	JCT-16	Circular Conduit	902.000	0.047	0.006	Free Surface	0.027	922.023	1.330	1.726	0.041	0.041
27	CDT-97	JCT-21	JCT-23	Circular Conduit	389.000	0.026	0.311	Free Surface	0.168	504.758	3.949	2.029	0.202	0.202
~~28~~	~~CDT-99~~	~~JCT-23~~	~~JCT-24~~	~~Circular Conduit~~	~~259.000~~	~~0.016~~	~~0.354~~	~~Free Surface~~	~~0.589~~	~~494.778~~	~~0.736~~	~~0.185~~	~~0.589~~	~~0.589~~

OUTFALL

ESPERANZA HILLS SEWER REPORT

	ID	Velocity*Depth (ft2/second)	Entry Loss (ft)	Exit Loss (ft)
1	CDT-11	0.136	0.000	0.000
2	CDT-15	0.000	0.000	0.000
3	CDT-17	0.000	0.000	0.000
4	CDT-19	0.277	0.000	0.000
5	CDT-21	0.004	0.000	0.000
6	CDT-23	0.011	0.000	0.000
7	CDT-25	0.000	0.000	0.000
8	CDT-27	0.000	0.000	0.000
9	CDT-29	0.216	0.000	0.000
10	CDT-31	0.249	0.000	0.000
11	CDT-33	0.262	0.000	0.000
12	CDT-35	0.000	0.000	0.000
13	CDT-37	0.000	0.000	0.000
14	CDT-49	0.024	0.000	0.000
15	CDT-51	0.015	0.000	0.000
16	CDT-63	0.064	0.000	0.000
17	CDT-69	0.000	0.000	0.000
18	CDT-73	0.331	0.000	0.000
19	CDT-75	0.451	0.000	0.000
20	CDT-81	0.075	0.000	0.000
21	CDT-83	0.283	0.000	0.000
22	CDT-85	0.629	0.000	0.000
23	CDT-89	0.522	0.000	0.000
24	CDT-91	0.490	0.000	0.000
25	CDT-93	0.019	0.000	0.000
26	CDT-95	0.036	0.000	0.000
27	CDT-97	0.664	0.000	0.000
28	CDT-99	0.434	0.000	0.000

ESPERANZA HILLS
SEWER REPORT

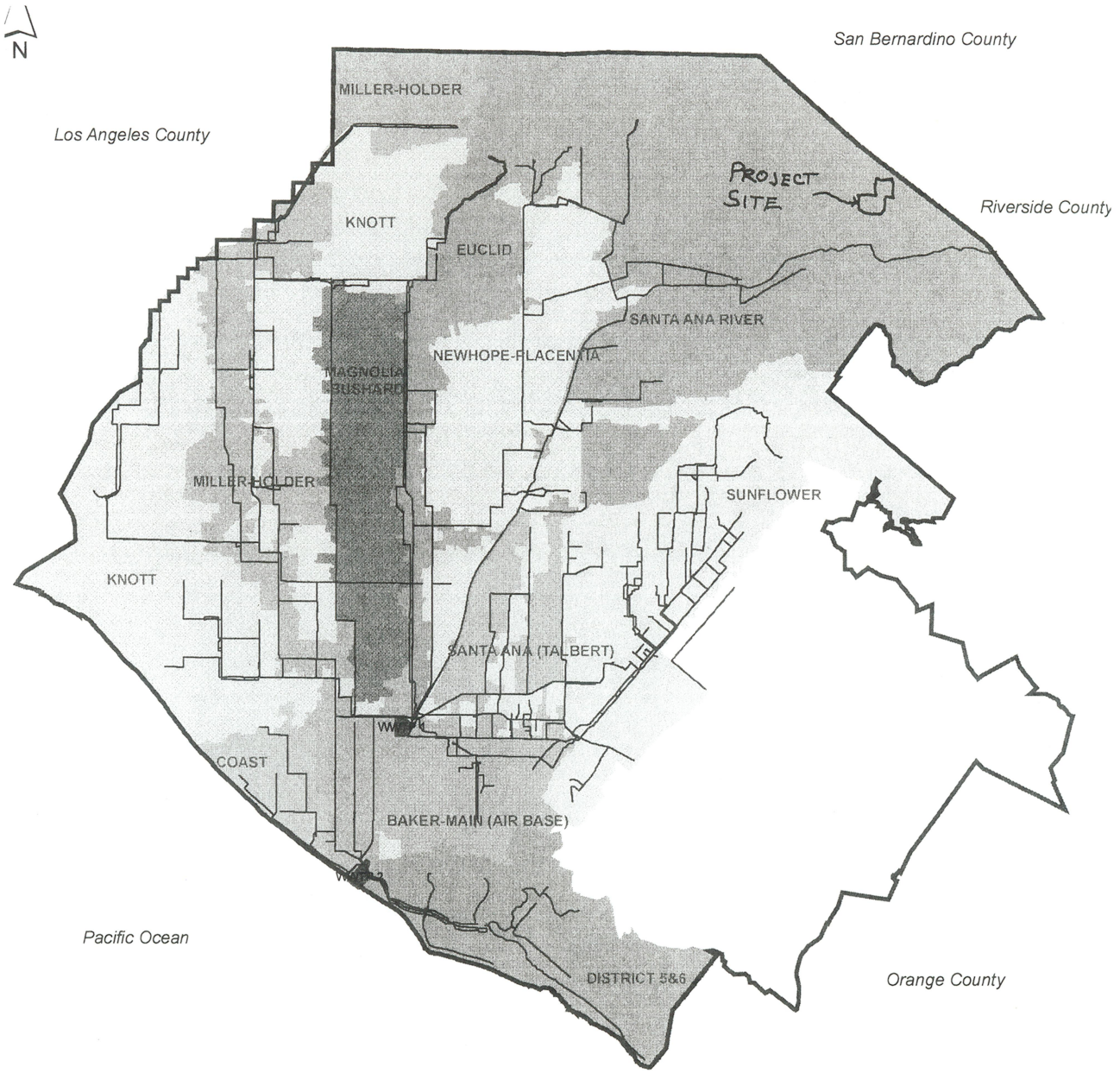
Prepared By:

Date: Wednesday, October 17, 2012

Appendix

F

OCSD MAJOR TRUNKSHEDS EXHIBIT



Legend

- Major OCSD Sewers
- 2005 OCSD Trunksheds
- OCSD Service Area

NOTE: BOUNDARIES SHOWN ARE APPROXIMATE

EXHIBIT 1-2
OCSD Major Trunksheds

Orange County Sanitation District
2009 Master Plan

Appendix

G

YORBA LINDA WATER DISTRICT
2010 SEWER MASTER PLAN UPDATE

YORBA LINDA WATER DISTRICT
2010 SEWER MASTER PLAN UPDATE

DISTRICT PROJECT NO. 200916

FEBRUARY 2011

Prepared for:
YORBA LINDA WATER DISTRICT

Prepared by:

IDModeling
ENGINEERING INNOVATION
55 East Huntington Drive
Suite 130
Arcadia, CA 91006
Project No. 086-001

PSOMAS
3 Hutton Centre Drive
Suite 200
Santa Ana, CA 92707
Project No. 2IDM010100

5.0 PLANNING DATA

5.1 Existing Connections and Population

The Yorba Linda Water District wastewater collection system has approximately 14,800 service connections. The majority of these customer connections are residential. YLWD categorizes its customers into four major categories: residential, commercial, industrial, and open space. Figure 5-1 depicts the land uses within the City of Yorba Linda.

Within the YLWD service area, the land use is comprised of 66.0% residential, 2.3% commercial, 0.3% industrial, 16.0% open space and 15.5% planned community areas.

The historical 2000 population per dwelling unit (DU) was 3.05 for the City of Yorba Linda with a total dwelling unit count of 19,534 per the U.S. Census Bureau. A household density of 3.1 people per DU was assumed for single family residential (SFR) (17,421 SFR units per the Census) and the housing density for multi-family residential (MFR) was back calculated to 2.64 (2,113 MFR units per the Census).

5.2 Projected Development and Population

For build-out population projections, information provided by the District was used to estimate build-out connections and population for the sewer system. Four future residential development categories were identified and population projections were developed as described below:

Known Planned Developments – Information on currently known planned developments within the City of Yorba Linda was provided by District staff. Build-out population was determined based on a single family residential household density of 3.10 people per DU. Information on the known planned developments is provided in Table 5-1 with their location shown on Figure 5-2.

Table 5-1
Known Planned Developments

Map ID	Development Name	# of Dwelling Units	# of Dwelling Units Serviced	Additional Population
P-1	Cielo Vista	83	0	0
P-2	Casino Ridge	11	0	0
P-3	Single Family Residential	119	119	369
P-4	Single Family Residential	49	49	152
P-5	Condominium	146	146	453
P-6	The Preserve	318	0	0
	Total	**726**	**314**	**974**

The additional population for the District excludes the Cielo Vista (P-1), Casino Ridge (P-2), and The Preserve (P-6) planned developments for which sewer service will be provided by the City of Yorba Linda and not the District.

Infill Development – Existing developments with limited or marginal development were identified based on a review of land use maps and water meter locations. The land use and number of additional DUs projected within each development area was determined and the potential additional population at build-out was calculated based on a single family residential household density of 3.10 people per DU. Information on the existing development infill is provided in Table 5-2 with their location shown on Figure 5-2.

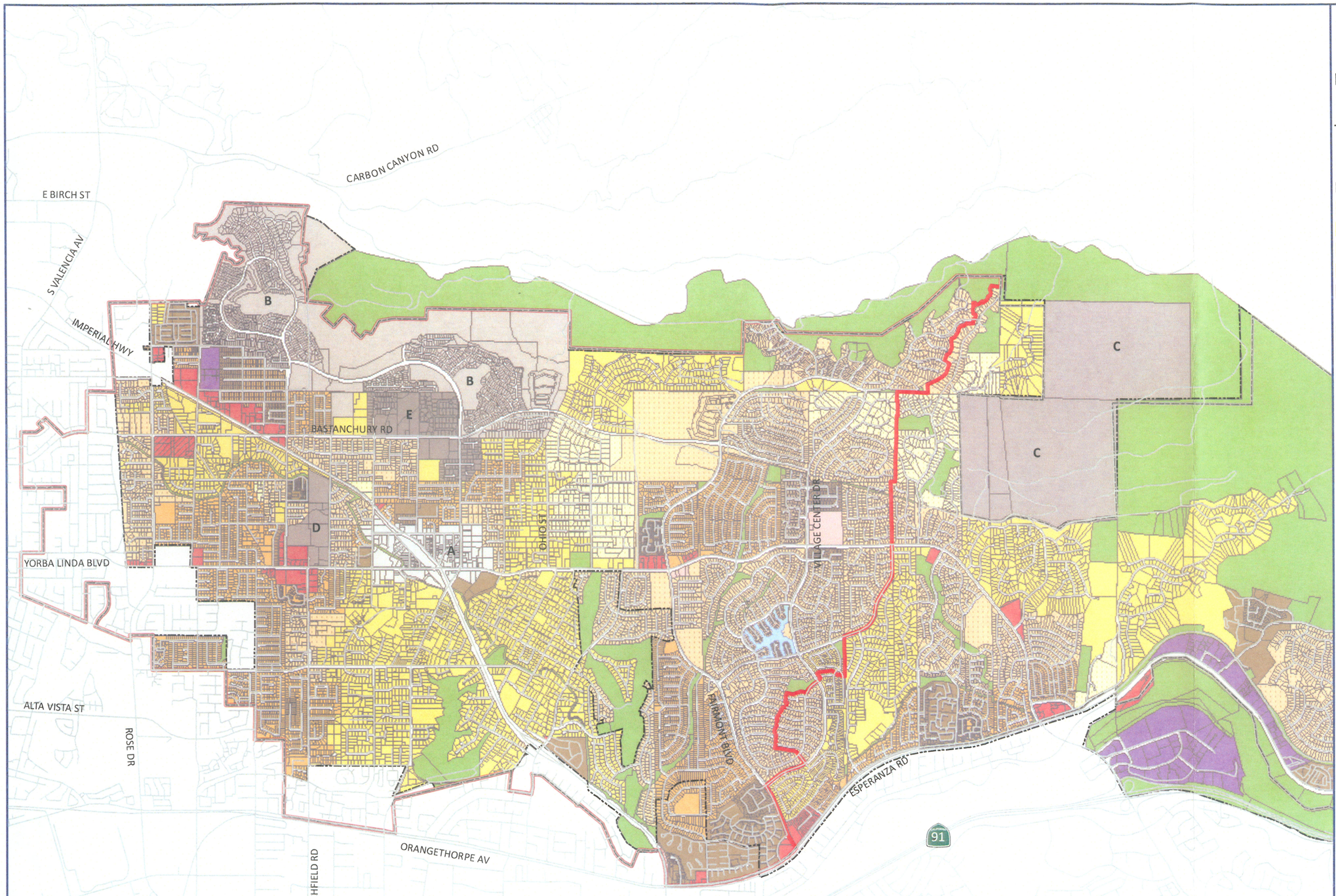
Table 5-2
Infill Development in Existing Areas

Map ID	Development Name	# of Dwelling Units	# of Existing Dwelling Units	# of Units To Be Built	Additional Population
E-1	Single Family Residential	259	35	224	694
E-2	Single Family Residential	41	0	41	127
E-3	Single Family Residential	218	3	215	667
	Total	**518**	**38**	**480**	**1,488**

The additional population for the District includes only dwelling units that are not yet existing.

High-Density Redevelopment Areas – Also reviewed as part of the Sewer Master Plan Update was the City of Yorba Linda's *2008-2014 Draft Housing Element and Implementation Programs Initial Study* dated May 2010. The study identified thirteen parcels that are planned for conversion from existing commercial, industrial, and residential land use to multi-family residential (MFR) land use. Existing densities and sewer flows are low in each of the existing parcels. Build-out population was determined based on a MFR household density of 2.64 people per DU. Information on the high-density redevelopment areas is provided in Table 5-3 and their locations are shown on Figure 5-2.

Yorba Linda Water District 2010 Sewer Master Plan Update



Legend

- Streets
- City Limits
- YLWD Boundary
- YLWD Sewer Service Area

Residential

- R-Low
- R-Medium Low
- R-Medium
- R-Medium High
- R-High

Open Space

- OS-General
- OS-G Merged
- Water/Lake

Commercial

- C-Neighborhood
- C-General
- C-Office

Industrial

- I-Manufacturing

Area Plan

- A - Community Core
- B - Shell Property
- C - Murdock Property
- D - City Hall / Community Center
- E - West Bastanchury

N W E S

0 1,500 3,000 Feet

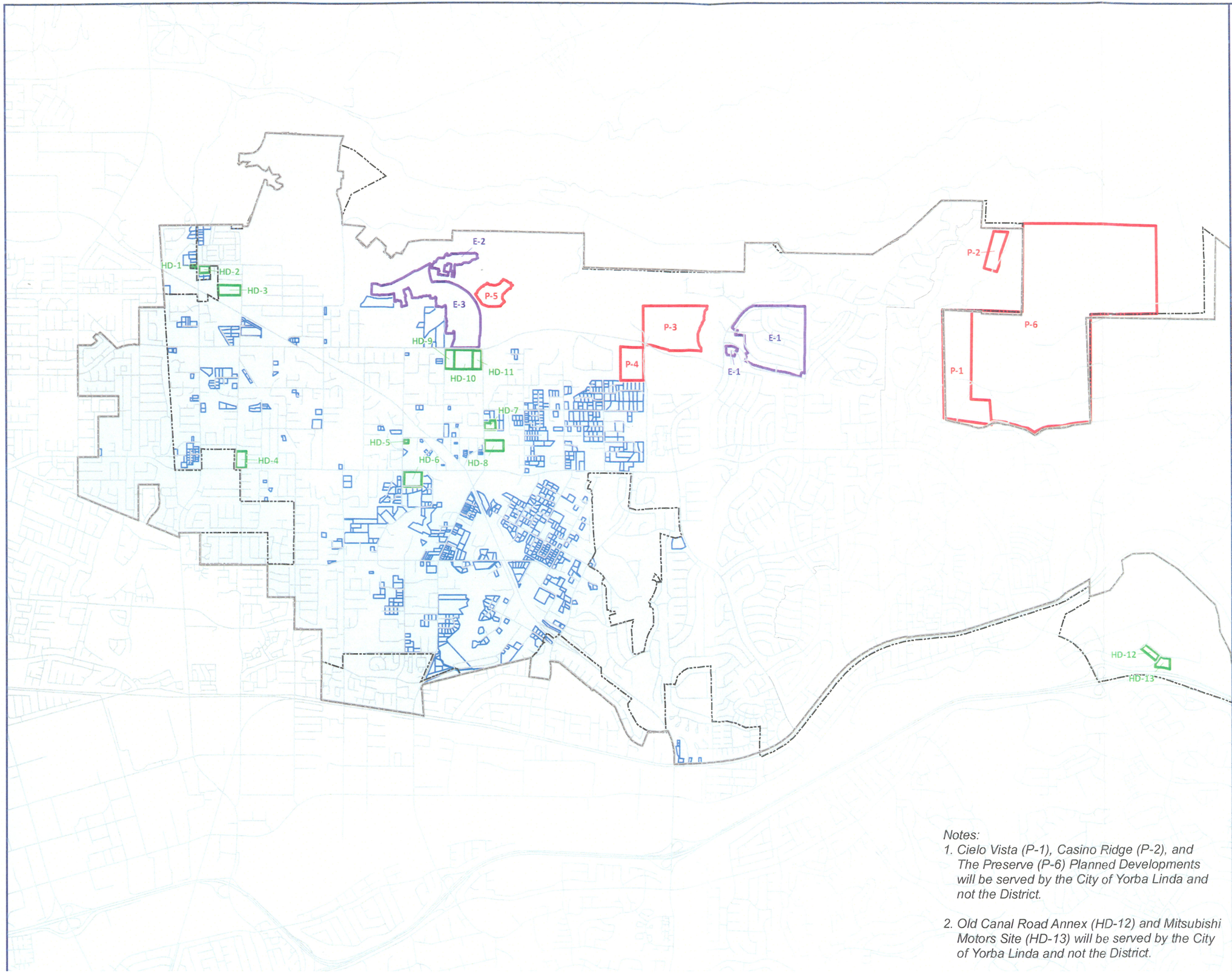
FIGURE 5-1

CITY OF YORBA LINDA LAND USE

IDModeling ENGINEERING INNOVATION

PSOMAS

Yorba Linda Water District 2010 Sewer Master Plan Update



Legend

- Streets
- Yorba Linda City Limits
- YLWD Boundary
- YLWD Sewer Service Area

Development Areas with Map ID

- Known Planned Developments
- Existing Development Infill
- High Density Re-Development
- Parcels with No Sewer Service

N
W E
S

0 1,500 3,000 Feet

Notes:

1. *Cielo Vista (P-1), Casino Ridge (P-2), and The Preserve (P-6) Planned Developments will be served by the City of Yorba Linda and not the District.*
2. *Old Canal Road Annex (HD-12) and Mitsubishi Motors Site (HD-13) will be served by the City of Yorba Linda and not the District.*

FIGURE 5-2

PROJECTED DEVELOPMENT AREAS

IDModeling
ENGINEERING INNOVATION

PSOMAS

would require approval of more than 50 percent of the property owners voting, on a dollar-weighted assessment basis.

Since the City ultimately controls the issuance of building permits for new construction, it may be possible for the District to work with City officials to develop a program to encourage septic system conversions to sewers. It may also be possible to obtain grants or low-interest loans to help defer some of the costs of this program or to help reduce assessment district financing costs.

5.4 Existing and Projected Flows

5.4.1 Average Dry Weather Flow

The average dry weather flow (ADWF) initially input into the sewer model was calculated based on water consumption data from 2004 through 2010 and averaged for the months of January and February. These months correspond to when irrigation uses were minimal, so that the data has the highest proportion of water use returned to the sewer system, therefore introducing less error. The consumption data was adjusted to match the recorded average dry weather flows obtained from the temporary flow monitoring program, by tributary sub-basin.

The population growth determined from the projected developments was used to determine the projected flow increase at build-out. The increased flows were added to the existing ADWF to determine the build-out flows.

Existing per capita usage in the District's system was evaluated based on results from the flow monitoring program. Per capita flow was calculated for four (4) sub-basin areas and the recorded average day dry weather flow and number of connections (parcels) within each area were used to derive an average per capita flow rate for each sub-basin. The criteria used to select the four representative areas included the following:

- Sub-basin containing primarily single family residential connections
- Geographically distributed throughout the District's service area
- Contained a representative sample of low, low-medium, medium, and medium-high single family residential land use densities.
- Lot size representative of future single family developments (approximately 0.15 to 1 acre)

To calculate the average per capita flow, the total gallons per day of flow under average day dry weather conditions was divided by the number of connections within the four representative sub-basins. The resulting flows per connection in gallons per day (gpd) were then divided by the single family DU density of 3.1 persons per dwelling unit to estimate a per capita flow. Table 5-5 provides a summary of the per capita flows for the four sub-basins. A weighted average per capita flow rate of 77 gallons per capita per day

(gpcd) was calculated based on the number of connections in each of the sub-basins and was used for projection of future flows.

Table 5-5
Per Capita Flows

Sub-Basin	Area (acres)	Number of Connections	Measured Flow (gpd)	Per Capita Use (gpcd)
1-3	50.64	154	35,553.60	74
2-5	258.72	768	174,254.40	73
3-2	116.61	281	78,033.60	90
3-7	109.83	250	57,297.60	74
			Weighted Average	**77**

5.4.2 Peak Dry Weather Flow

Peak dry weather flow (PDWF) is the highest measured hourly flow that occurs on a dry weather day plus groundwater infiltration. The peak dry weather flows were developed by applying a peaking factor based on a peaking equation developed from the temporary flow monitoring program.

5.4.3 Design Wet Weather Flow

Design wet weather flow is the highest measured hourly flow that occurs during a design wet weather rain event. It consists of the average dry weather flow plus any rainfall-dependent infiltration/inflow and groundwater infiltration. Although the temporary flow monitoring program captured wet weather events, the flows captured did not indicate a significant increase. Therefore, this SMPU will use the peak dry weather flows to determine pipe deficiencies, with an adequate allowance for peak wet weather flows provided via the allowable depth of flow sewer design criteria utilized, as discussed in the following section.

6.0 SEWER DESIGN CRITERIA

Sewer pipe capacities are dependent upon many factors. These include the roughness of the pipe, the maximum allowable depth of flow, and limiting velocity and slope. The Continuity Equation and the Manning's Equation for steady state flow are used for gravity sewer hydraulic calculations:

Continuity Equation: $Q = V A$

where:
Q = peak flow, cfs
V = velocity, fps
A = cross-sectional area of flow, sq. ft. (when d/D = 1.0)

Manning's Equation: $Q = (1.486 AR^{2/3} S^{1/2})/n$

where:
V = velocity, fps
n = Manning's coefficient of friction
R = hydraulic radius (area divided by wetted perimeter), ft
S = slope of energy gradient (approximated by slope of pipe), ft/ft

6.1 Manning Coefficient (n)

The Manning coefficient 'n' is a friction coefficient and varies depending on the type of material. For example, glass would have an 'n' value of 0.010 while earth channels would have an 'n' value of 0.020. There has been much debate about the appropriate 'n' value to use for different piping materials in sanitary sewer systems. To complicate the debate, the slime layer that thrives on the wetted portions of the sanitary piping also contributes to and affects the actual value of 'n'. This study will utilize an 'n' value of 0.012 based on a conservative value for VCP, which makes up the majority of the District's sewer collection system.

6.2 Design Velocities

In an effort to maintain the suspension of solids in sewers, the minimum design velocity shall be 2 ft/sec during the peak dry-weather flow (PDWF) at the time the pipe is placed into service. The maximum design velocity shall be limited to 10 ft/sec at the peak flow rate. Using Manning's Equation above, one can calculate the minimum slope necessary to achieve the minimum design velocity of 2 ft/sec for a given diameter of pipe. Performing this calculation for pipes 6 inches to 30 inches in diameter results in the minimum slopes shown on Table 6-1.

Table 6-1
Minimum Slopes by Pipe Size

Pipe Size (in)	Minimum Slope (ft/ft)
6	0.0055
8	0.0040
10	0.0028
12	0.0022
15	0.0015
18	0.0012
21	0.0010
24	0.0008
27	0.00067
30	0.00058

6.3 Existing Pipe Flow Depth Criteria (d/D)

The capacity criteria for gravity sewers are typically evaluated by a ratio of flow depth over pipe diameter (d/D). Sewers for this analysis shall be sized so the d/D ratios (specified below) are not exceeded while flowing under the peak dry-weather flow (PDWF) conditions. Utilizing these d/D ratios for peak dry weather flow provides an adequate allowance for peak wet weather flow in the top portion of the pipe, especially considering the results of the I/I analysis within the District as discussed in Section 4, above.

- Pipe Size $\leq$ 12-inches: d/D $\leq$ 50%
- Pipe Size > 12-inches: d/D $\leq$ 75%

6.4 Recommended Pipe Improvements Criteria

Recommended improvements for pipelines with capacity deficiencies are based on the following sizing criteria:

- Pipe replacement is recommended for existing small diameter (8", 10" and 12") pipes rather than recommending a parallel system, as there are only minimal cost savings in using these smaller lines along with an additional parallel line. Also, street sections are more cluttered with two sets of pipes and manholes.
- Either pipe replacement or a parallel system is recommended for existing 15" diameter pipes, on a case-by-case basis. This decision would typically be dependent on the pipeline's useful life remaining and available room within the street section.

- Generally only a parallel system is recommended for existing 18" diameter pipes and larger.
- For pipe diameters 12" and larger, only downsizing by one pipe size is allowed, when proceeding downstream in a sewer line.
- For pipe diameters 8" and 10", no downsizing is allowed.

Water service for Basin 1-8 is provided by the Golden State Water Company (GSWC). As such, spatially located water consumption data was not available. The land use for the study area was provided by the District so the sewer loads for Basin 1-8 were developed by applying estimated per-acre flows to each land use class. Table 7-2 shows the total flows estimated for Basin 1-8. The flow within each land parcel was distributed to model manholes based on the manhole's contributing area (Thiessen polygon methodology).

Table 7-2
Basin 1-8 Flows Based on Land Use

Land Use	Flow Factor (gpm/acre)	Acres	Total Sewer Flow (gpm)
Commercial	1.41	17.90	25
High Density Residential	2.97	17.92	53
Medium-High Density Residential	1.41	324.35	457
Total		**360.17**	**535**

Point loads were added to appropriate model manholes to account for flows generated from the Metropolitan Water District's (MWD) Diemer Water Treatment Facility in Basin 3-1 and flow from the City of Yorba Linda wastewater collection system in Basin 1-6. The flow allocations for the City of Yorba Linda system were determined by the metered water sales data. At two locations, a new manhole was added to best allocate the point loads.

For each phase of the flow monitoring, flow and rainfall data was reviewed to select a time period where sewer flows were not influenced by rainfall events. The average flow rate at each temporary flow monitor was determined for the dry weather periods and the model allocations were adjusted to match this ADWF.

The initial flow allocations at each manhole were adjusted to match the monitored average dry weather flows using the return to sewer ratios shown in Table 7-3. A return to sewer ratio is the ratio of the amount of water that was returned to the sewer system during average dry weather conditions divided by the amount purchased or passing through the water meter.

SECTION 00600

DESIGN CRITERIA FOR SEWER FACILITIES

600.1 MINIMUM SIZE

The District will not accept for maintenance sewer lines smaller than 8 inches nor any sewer line that is within a common trench (two or more utilities in the same trench).

600.2 MINIMUM AND MAXIMUM SLOPE DESIGN

600.2.1 Slopes

All sewers shall be so designed and constructed to give mean velocities, when flowing half full at the estimated peak flow, of not less than 2.0 fps, based on Manning's formula using an "n" value of 0.013. The following are minimum slopes; however, slopes greater than these are desirable. The District reserves the right to require greater slopes where deemed necessary.

Sewer Size (inches)	Minimum Slope in Feet per 100 Feet
8	0.40
10	0.28
12	0.22
15	0.16
18	0.12
21	0.10
24	0.08

Maximum slopes shall be 15% unless authorized by the District.

600.2.2 High Velocity Protection

Where flow velocities greater than 15 fps are attained, special provision shall be made to protect against displacement by erosion and shock for pipe entering a manhole and for concrete manhole base and flow channels.

600.3 FLOW DESIGN CRITERIA

600.3.1 Criteria for Average Daily Flow Calculations

The following table summarizes the unit flow coefficients for various land uses. Sewerage generation rates for land uses not shown shall be established by the District.

Unit Flow Coefficients for Various Land Uses	
Land Use	**Average Unit Flow Coefficients (cfs/acre)**
Residential Agriculture	0.0010
Residential Suburban	0.0012
Residential Urban	0.0015
Residential Multiple	0.0039
Planned Residential Development	0.0015
Planned Community	0.0018
Public and Semi-Public School	0.0030 cfs/100 enrollment
Open Space	0.0003
Commercial Office	0.0050
Commercial Neighborhood	0.0050
General Commercial	0.0050
Senior Citizen	0.0040

600.3.2 Peak Flows

Pipeline design shall be based on the peak flows as determined from Manning's formula and the following: Q(peak) = 2 x Q (avg).

Design peak flows in pipelines 12 inches in diameter and smaller are to be limited to approximately d/D = 0.5. Pipes over 12 inches are to be limited to approximately d/D = 0.75. "d/D" is the ratio of calculated flow depth to pipe diameter.

600.4 SEWER PIPE MATERIAL

All gravity sewer main lines and all sewer service laterals shall be extra strength vitrified clay pipe (VCP). All sewer force mains shall be of a pipe material approved by the District.

600.5 STANDARD LOCATION AND ALIGNMENT

600.5.1 Location

Wherever possible, in local residential and industrial streets, pipe is to be located 5 feet off the street centerline. In major, primary, and secondary highways, pipe shall be located in the center of the driving lane nearest to the center of the street. Pipe shall not be located in median strips or parking lanes. On curvilinear streets, pipe shall parallel as nearly as possible the street centerline by means of horizontal curves.

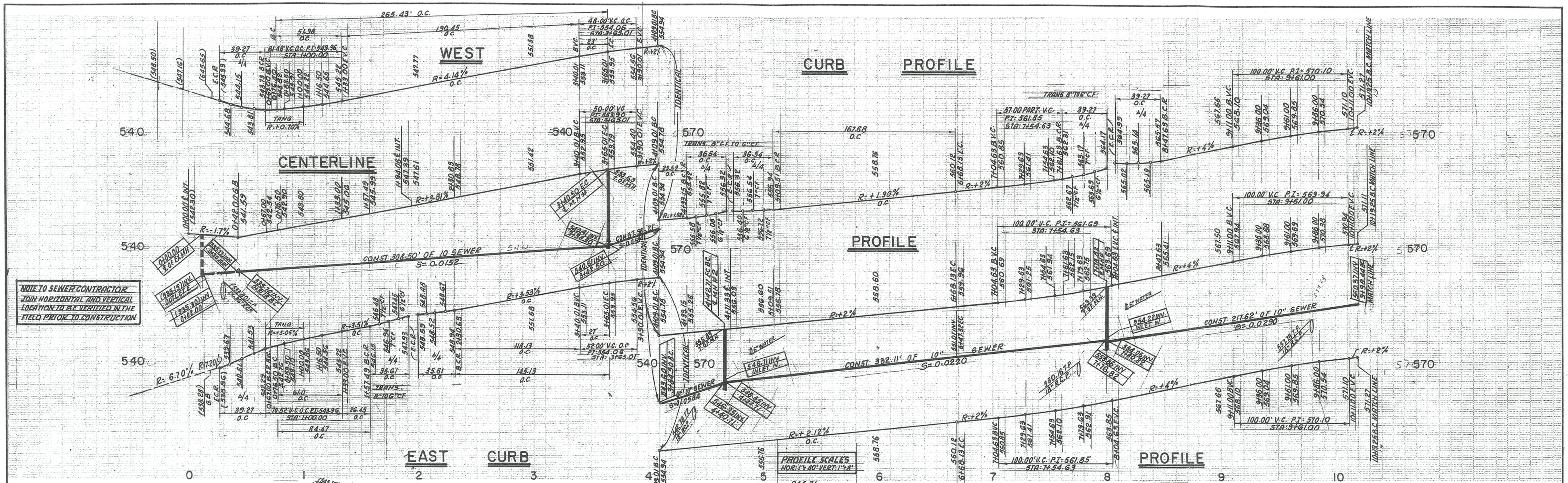
600.5.2 Alignment

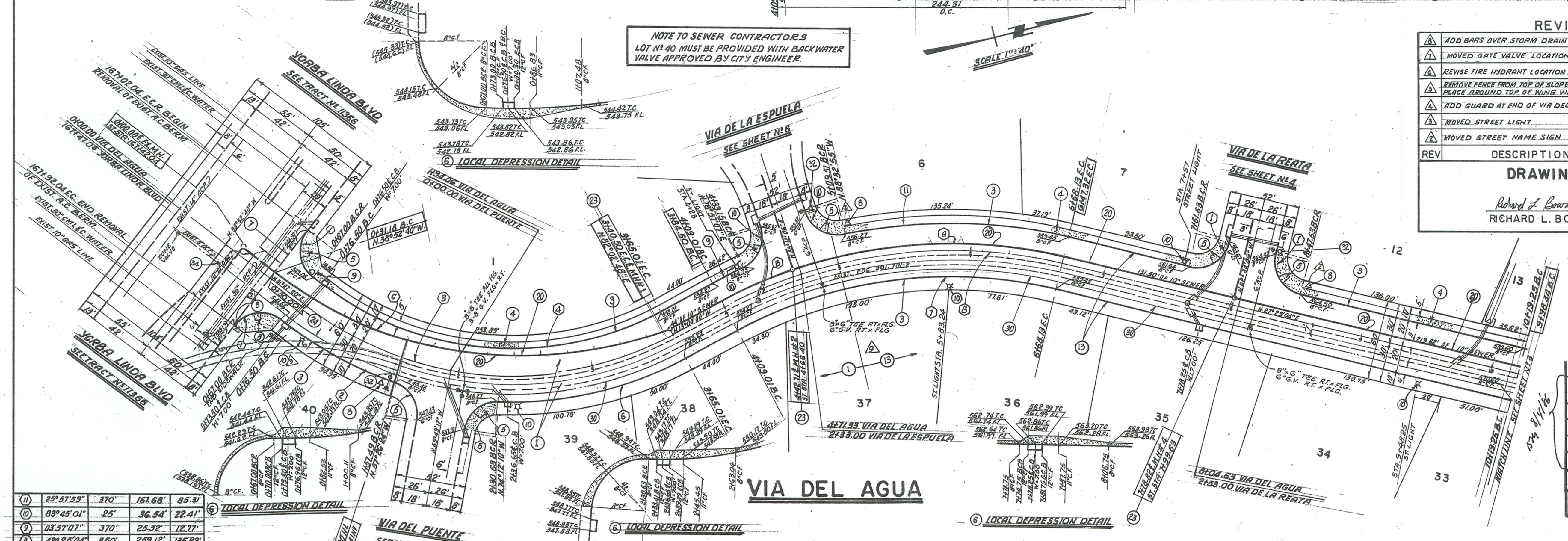
Barring other limiting design and construction considerations, a maximum separation between sewer and domestic water mains in new subdivisions shall be achieved by the following construction procedures:

Appendix

H

EXISTING IMPROVEMENT PLANS for STONEHAVEN DRIVE





NO.	Δ	R	L	T
11	25°57'59"	370'	167.68'	85.31
10	83°45'01"	25'	36.54'	22.41'
9	03°57'07"	370'	25.32'	12.77'
8	42°25'04"	350'	259.12'	135.82'
7	42°25'04"	330'	244.31'	128.06'
6	30°47'50"	270'	145.13	74.36'
5	81°37'07"	25'	35.61'	21.59'
4	66°07'20"	230'	265.43'	149.71'
3	66°07'20"	250'	288.51'	162.73'
2	18°33'44"	270'	87.47'	44.12'
1	90°00'00"	25'	39.27'	25.00

NO.	Δ	R	L	T
C	59°04'31"	300'	309.32'	169.99'
B	9°23'41"	355'	58.21'	29.17
A	33°01'23"	355'	204.61'	105.23

- (13) CONST. 3" A.C. PAVEMENT AND 4.5" A.B. - STA. 5+00 TO 10+17.25
- (10) INSTALL STREET LIGHT 5800 LH PSV PER O.C.E.M.A. STD. PLAN 411
- (9) INSTALL STOP SIGN.
- (8) INSTALL STREET NAME SIGN.
- (7) REM. A.C. BERM AND JOIN EXISTING CURB AND GUTTER
- (6) CONST. LOCAL DEPRESSION PER O.C.E.M.A. STD. PLAN 308 AND DETAIL THIS SHEET.
- (5) CONST. CONC. SIDEWALK RETURN AND ACCESS RAMP PER O.C.E.M.A. STD. PLAN 111
- (4) CONST. CONC. SIDEWALK PER O.C.E.M.A. STD. PLAN 205
- (3) CONST. 8" CONC. CURB AND GUTTER TYPE "A-2" PER O.C.E.M.A. STD PLAN 201
- (1) CONST 3" A.C. PAVEMENT AND 4" BASE - STA. 0+42 TO 5+00
- (24) REMOVE EXISTING PLUG AND JOIN.
- (23) CONST. MANHOLE PER YLCWD. STD SP-3
- (22) CONST. 4" V.C.P.-ABS OR PVC HOUSE LATERAL PER YLCWD STD. SP-2
- (20) CONST. 10" V.C.P. ABS OR PVC SEWER MAIN PER YLCWD STD SP-1
- (34) REMOVE EXISTING PLUG AND JOIN
- (32) INSTALL 8"x6" TEE RT x FLG 6" G.V. RT x FLG & FIRE HYDRANT PER YLCWD STD 5 @ B.S.R.
- (30) CONST. 8" A.C.P. WATER MAIN

REVISIONS

REV	DESCRIPTION	SHT	INIT.	APP'D	DATE
8	ADD BARS OVER STORM DRAIN	9	RB		4-15-86
7	MOVED GATE VALVE LOCATION	5	RB		4-15-86
6	REVISE FIRE HYDRANT LOCATION	4	RB		4-15-86
5	REMOVE FENCE FROM TOP OF SLOPE AND PLACE AROUND TOP OF WING WALLS	3	RB	8/6/86	4-15-86
4	ADD GUARD AT END OF VIA DEL AGUA	3	RB		4-15-86
3	MOVED STREET LIGHT	2-4	RB		4-15-86
2	MOVED STREET NAME SIGN	2-3-4-5	RB		4-15-86

B.M. 8-4-86

DRAWING OF RECORD

Richard L. Bowman — 4-21-86
RICHARD L. BOWMAN RCE 24573 — DATE

REV	DESCRIPTION	SHEET	INIT.	APP'D	DATE
13	MODIFIED "V" DITCH AT INLET PER INSPECTOR	8	RB	8/16/86	7-86
12	MOVE BLOW-OFF PER INSPECTOR	6	RB		7-86
11	ADD FENCE AROUND INLET	3	RB		7-86
10	ADD ℄ DRIVEWAY LOCATION	3-6	RB		7-86
9	ADD PAVEMENT SECTIONS PER INSPECTOR	2-6	RB		7-86

B.M. 8/4/86

REVISIONS

PREPARED BY VTN CONSOLIDATED
UNDER THE SUPERVISION OF
George [signature] — 10/4/84
R.C.E. 13960 — DATE

TRACT NO. 10455

VIA DEL AGUA

NORTH CURB PROFILE

CENTERLINE PROFILE

SOUTH CURB PROFILE

PROFILE SCALES
HOR: 1"=40' VERT: 1"=8'

SOUTH CURB PROFILE

CENTERLINE PROFILE

NORTH CURB PROFILE

SCALE 1"=40'

VIA DEL CORRAL
SEE SHEET NO. 4

VIA DE LA ROCA
SHOWN AT RIGHT

VIA DEL AGUA

VIA DEL AGUA
SHOWN AT LEFT

VIA DEL AGUA
SHOWN AT LEFT

VIA DE LA ROCA

SCALE 1"=20'

NO.	Δ	R:	L:	T:	NO.	Δ	R:	L:	T:
(12)	24°27'52"	38'	160.81'	—	(D)	26°18'51"	355'	163.02'	82.98'
(11)	31°13'56"	100'	54.51'	27.95'	(C)	4°20'39"	355'	26.95'	13.48'
(10)	83°45'01"	25'	86.54'	22.41'	(B)	2°50'18"	505'	25.02'	12.51'
(9)	34°50'36"	25'	37.02'	22.86'	(A)	14°56'24"	505'	131.68'	66.22'
(8)	7°10'26"	370'	46.33'	23.19'					
(7)	30°28'19"	350'	186.14'	95.83'					
(6)	29°38'32"	330'	170.74'	87.32'					
(5)	87°43'44"	25'	38.28'	24.09'					
(4)	85°28'29"	25'	37.30'	23.10'					
(3)	10°38'55"	520'	99.61'	49.99'					
(2)	17°46'42"	500'	155.15'	78.20'					
(1)	17°45'42"	480'	148.94'	75.01'					

(G) LOCAL DEP. DETAIL

(6) LOCAL DEPRESSION DETAIL

(6) LOCAL DEPRESSION DETAIL

(14) INSTALL CHAIN LINK FENCE WITH 6' GATE PER OCEMA STD. PLAN 418
(A 12) INSTALL GUARD RAIL WITH REFLECTORS
(11) INSTALL BARRICADE PER O.C.E.M.A. STD. PLAN 401
(10) INSTALL STREET LIGHT 5800 LH PSV PER O.C.E.M.A STD. PLAN 411
(8) INSTALL STREET NAME SIGN
(6) CONST. LOCAL DEPRESSION PER OCEMA STD. PLAN 308 AND DETAIL THIS SHEET
(5) CONST. CONC. SIDEWALK RETURN & ACCESS RAMP PER O.C.E.M.A. STD. PLAN 111
(4) CONST. CONC. SIDEWALK PER O.C.E.M.A. STD. PLAN 205
(3) CONST. 8" CONC. CURB AND GUTTER TYPE "A-2" PER O.C.E.M.A STD. PLAN 201
(2) CONST. 6" CONC. CURB AND GUTTER TYPE "D" PER O.C.E.M.A. STD. PLAN 201
(A 13) CONST. 3" A.C. PAVEMENT AND 4.5" BASE

(27) CONST. 10" PLUG.
(23) CONST. MANHOLE PER YLCWD STD. S.P. 3
(22) CONST. 4" V.C.P.-ABS OR PVC HOUSE LATERAL PER YLCWD STD. S.P. 2
(21) CONST. 8" V.C.P.-ABS OR PVC SEWER MAIN PER YLCWD. STD. S.P. 1
(20) CONST. 10" V.C.P. ABS OR PVC. SEWER MAIN PER Y.L.C.W.D. STD. S.P. 1

(33) INSTALL 6"xG" TEE R.T.x FLG.-6" GV. R.T.x FLG. & F.H. PER YLCWD STD 5.
(32) CONST. BLOW-OFF ASSEMBLY PER YLCWD. STD G
(31) INSTALL 8"x6" TEE R.T.x FLG.-6" GV R.T.x FLG & FIRE HYDRANT PER YLCWD STD 5
(30) CONST. 6" P.V.C. WATER MAIN.
(29) CONST. 8" P.V.C. WATER MAIN.

REVISIONS

APP'D	REV	DESCRIPTION	INIT	DATE
	11	ADD FENCE AROUND INLET	RB	7-86
	10	ADD 6' DRIVEWAY LOCATIONS	RB	7-86
	9	ADD PAVEMENT SECTION PER INSPECTOR	RB	7-86
	8	REMOVE FENCE FROM TOP OF SLOPE AND PLACE AROUND TOP OF WING WALLS	RB	4-15-86
	7	ADD GUARD RAIL AT END OF VIA DEL AGUA	RB	4-15-86
	6	MOVED STREET NAME SIGN	RB	4-15-86

DRAWING OF RECORD

Richard L. Bowman — 4-21-86
RICHARD L. BOWMAN RCE 24573 — DATE

REVISION

№	DESCRIPTION		DATE
1	REV. NORTH & SOUTH CURB PROFILE FROM STA 0+42.45 TO M.O.C. REV. CENTERLINE PROFILE FROM STA 0+80 TO STA 1+18.00 AND LOCAL DEP. DETAIL, REV. EL. TOP MH #10 ON VIA DE LA ROCA	RB	7/24/85

PREPARED BY VTN CONSOLIDATED
UNDER THE SUPERVISION OF
Gary L. Taylor — 10/4/85
R.C.E. 13980 — DATE

TRACT NO. 10455
VIA DEL AGUA
VIA DE LA ROCA