

## **Appendix O-1: Preliminary Wastewater Report**

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# PRELIMINARY WASTEWATER REPORT

## Green River Ranch Business Park City of Corona, County of Riverside, California



### PREPARED FOR:

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April 2022

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# **INTRODUCTION**

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## **1.1 PURPOSE OF STUDY**

The proposed Green River Ranch Business Park Development (Project) is located within the City of Corona Department of Water and Power Sphere of Influence for sewer service. The purpose of this report is to discuss the impacts of the project on the City of Corona Department of Water and Power existing and master planned facilities. More specifically, the trunk sewer lines within Sewershed 10 will be evaluated based on the projected sewer flows from the Project. This report will provide information identifying the projected flows to the existing system and recommended sewer facilities to support development of this project.

The Project is proposing business industrial, general commercial, and estate residential development on approximately 159.1 acres south of the 91 Freeway and Green River Road. The commercial and estate residential are proposed to be developed by others in the future but have been included in this report for planning purposes. The Project's sewer flows are estimated based on the City's 2012 Department of Water and Power design policy. This report will analyze the project's sewer flows and its impacts to the downstream trunk sewer lines and master planned facilities based upon the available pipe capacity as identified in the 2005 Sewer Master Plan.

## **1.2 PROJECT DESCRIPTION**

The project site is within the City of Corona's Sphere of Influence and is proposed to be annexed to the City during the entitlement process. The City of Corona recently completed a Capital Improvement Project for the Green River Road Widening between State Route 91 (SR-91) to Palisades Drive. The improvements included widening the existing roadway from 4 lanes to a 6 lane major arterial roadway with an ultimate right-of-way width of 118 feet. Green River Road is a major thoroughfare leading to the project. **Appendix A** provides a location map for the project and vicinity map of the area.

The Project is generally bounded to the east by a gated community of single-family residences, on the south and west by the Cleveland National Forest, and undeveloped land and the 91 freeway to the north. The undeveloped land to the north of the site is part of the Green River Ranch Specific Plan and was planned in 2001 for Mixed-Use/Office/Commercial Retail. The southern portion of the property was designated for Estate Residential. These portions of the site are not included as part of the Tentative Tract Map being proposed, however, the projected flow contributions from these areas are analyzed as part of this study.

The project site consists of sparsely vegetated and otherwise undeveloped land with the exception of some dirt roads. The site is generally characterized by flat topography on the north end of the site with hillside on the south end of the site which introduces offsite flow into the site. Small ravines are present which convey the natural drainage through the project site.

The proposed development plan for the site consists of five industrial buildings that are 80,320 square feet (SF), 93,868 SF, 124,693 SF, 125,521 SF, and 284,698 SF within the business industrial designation. Only a portion of the site will be graded for development based on the conceptual grading plan. This study includes the sewer analysis for the future 5.5 acres of general commercial north of Green River Road and the 89 acres estate residential situated on the southern portion of the property. **Appendix B** includes the current proposed TTM 37963 for the Project.

### **1.3 RELATED STUDIES**

The City of Corona 2005 Sewer Master Plan, prepared by AKM Consulting Engineers, provides a regional study identifying existing and proposed major sewer facilities within the City's ultimate service area. The master plan also presents design criteria to be utilized in sizing gravity sewer lines, sewer lift stations, and force mains; and provides information on the City's sewer generation rates that can be applied to determine projected average and peak wastewater flows. The master plan reports also identifies deficiencies in the City's Sewer System and discusses the City's future planned Capital Improvement Projects to mitigate for these system deficiencies.

The Project is identified in the Sewer Master Plan as Green River Ranch (SP00-01). The Master Plan has estimated that the Project will produce an average dry weather flow of approximately 98,905 gpd or 0.15 cfs. The Master Plan does not assign a numerical value to the wastewater production for Green River Ranch South area, but states that the flow produced from development in this area will have a negligible impact on existing sewer facilities. Although these flows will be different than those proposed in this Green River Ranch Development Preliminary Wastewater Facilities Plan Report, it provides a baseline for comparison.

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## DESIGN CRITERIA AND PROJECTED SEWAGE FLOWS

This section presents the design criteria used to estimate the sewage flows and evaluate the recommended sewer system improvements required for the Project and surrounding tributary areas within the City’s Sewershed 10 drainage area. **Appendix C** provides the existing sewershed boundaries in this area. The criteria utilized in this study are in accordance with the September 2005 City of Corona Sewer Master Plan and the 2012 City’s Department of Water and Power Design Policy.

### 2.1 SEWAGE FLOWS

The sewage generation factors used to estimate the average daily flows for the Project and surrounding tributary area are listed in **Table 2-1**.

TABLE 2-1

<b>Recommended Unit Sewage Generation Factors</b>			
<b>Land Use category</b>	<b>Existing Unit Flow Factor (gpd/ac)</b>	<b>Ultimate Unit Flow Factor (gpd/ac)</b>	<b>Residential Flow Factors (gpd/du)</b>
Residential Estate (1-3 du/ac)	500	500	300
Mixed Use	700	700	-
Commercial Business District	1,000	1,050	-
General Community Commercial	1,000	1,050	-
Office Professional	1,200	1,260	-
General Industrial	1,100	1,155	-
Light Industrial	800	840	-
Open Space/Recreation	130	130	-

To convert average dry weather daily flows to peak dry weather flows, the following formula was used:

$$\text{Peak Dry Weather Flow} = 1.95 * (\text{Average Dry Weather Flow in cfs})^{0.92}$$

Based on the 2005 Sewer Master Plan, it is recommended that the larger of the two values from the equations below be used to determine peak wet weather flows.

$$\text{Peak Wet Weather Flow (PWWF)} = 2.50 * (\text{Average Dry Weather Flow in cfs})$$

OR

$$\text{Peak Wet Weather Flow (PWWF)} = 1.265 * (\text{PDWF in cfs})$$

## 2.2 GRAVITY SEWERS

All gravity sewers have been designed to convey peak flow. **Table 2-2** lists the maximum d/D peak dry weather flow for proposed and existing gravity sewer lines. All proposed pipes are designed with a d/D less than or equal to 0.50 at peak dry weather flows. Manning’s Equation with an “n” value of 0.013 was used to size all gravity sewers. 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, pipes shall be designed to not exceed a maximum 8 feet per second velocity. All pipes will have a minimum of 7 feet of cover. **Table 2-3** lists the minimum slope requirements for various pipe sizes. When minimum velocities are not able to be met, minimum pipe slopes shall be maintained.

**TABLE 2-2**

<b>d/D Criteria</b>	
<b>Pipe Size</b>	<b>Max d/D Peak Dry Weather Flow</b>
Existing 12-inch diameter or smaller	0.64
Existing 15-inch diameter or larger	0.67
Proposed 12-inch diameter or smaller	0.50
Proposed 15-inch diameter or larger	0.67

**TABLE 2-3**

<b>Minimum Slope Requirements</b>	
<b>Sewer Pipe Size (in)</b>	<b>S (ft/ft)</b>
8	0.0040
10	0.0025
12	0.0020
15	0.0012
18	0.0010
21	0.0008
24	0.0007

## 2.3 FORCE MAINS

All force main sewers will be designed to convey peak wet weather flow. The Hazen-Williams Equation with a friction coefficient “C” value of 130 was used to size all force main sewers. All force mains were designed to maintain a minimum velocity of four feet per second at the minimum design pumping capacity to prevent the deposition of solids. To minimize excessive wear and tear of the pipe, pipes shall be designed to not exceed a maximum 6 feet per second velocity.

## 2.4 LIFT STATIONS

All Lift Stations should be sized to accommodate the influent peak wet weather flows and based upon a 60 percent pump efficiency and 90 percent motor efficiency unless manufacturer specifications recommend otherwise. A minimum of two pumps of equal size should be provided to provide adequate standby capacity if one pump is out of service. Pumps should be able to pass 3-inch minimum solids. The wet well should be sized to limit the number of pump cycles to no more than 6 per hour. It is expected that the lift station will be equipped with submersible pumps in a wet well, a separate meter/valve vault, above ground pump controls housed in an enclosure, telemetry (dialer system at a minimum), and a backup diesel generator.

## 2.5 PROJECTED SEWAGE FLOWS

**Table 2-4** provides the projected average dry weather flow (ADWF), the peak dry weather flow (PDWF), and peak wet weather flow (PWWF) for the Project. The wastewater generation factors are determined by the Department of Water and Power 2012 Design Policy. **Appendix E** provides a more detailed breakdown of projected sewer flow for the Project.

**TABLE 2-4**

<b>Green River Ranch Business Park - Projected Sewage Flows</b>						
<b>Description</b>	<b>Land Use</b>	<b>Quantity</b>	<b>Sewer Generation Factor</b>	<b>ADWF</b>	<b>PDWF</b>	<b>PWWF</b>
				<b>CFS</b>	<b>CFS</b>	<b>CFS</b>
Lot 2	Business Industrial	8.90 ac	840 gpd/ac	0.0116	0.0322	0.0407
Lot 3	Business Industrial	8.43 ac	840 gpd/ac	0.0110	0.0307	0.0388
Lot 4	Business industrial	5.49 ac	840 gpd/ac	0.0071	0.0207	0.0261
Lot 5	Business Industrial	4.70 ac	840 gpd/ac	0.0061	0.0179	0.0226
Lot 1	Business Industrial	16.17 ac	840 gpd/ac	0.0210	0.0558	0.0706
OS A	Open Space	10.13 ac	130 gpd/ac	0.0020	0.0065	0.0083
OS B	Open Space	10.92 ac	130 gpd/ac	0.0022	0.0070	0.0088
<b>Subtotal</b>	--	--	--	<b>0.0610</b>	<b>0.1488</b>	<b>0.1882</b>
Lot 7	Commercial	5.54 ac	1050 gpd/ac	0.0090	0.0256	0.0324
Lot 6	Estate Residential	32 units	300 gpd/unit	0.0149	0.0406	0.0513
<b>Total</b>	--	--	--	<b>0.0849</b>	<b>0.2016</b>	<b>0.2550</b>

**3**

**EXISTING AND PROPOSED  
WASTEWATER FACILITIES**

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This section discusses the existing and proposed wastewater facilities as identified in the City of Corona’s 2005 Sewer Master Plan that are relevant to the Green River Ranch Development. The project’s sewer contributions are tributary to the City’s sewershed 10, which is tributary to Water Reclamation Facility No. 1 (WRF No. 1).

**3.1 EXISTING FACILITIES**

The site is in Sewershed 10 and drains north towards Green River Road. Nearby developments utilize the Sierra Del Oro Lift Station (SDO LS) to convey wastewater easterly through a 12-inch sewer force main in Palisades Drive. Sewage then flows by gravity through the 21-inch Railroad Trunk Sewer to WRF No. 1. The current treatment capacity of WRF No. 1 is 11.5 MGD with an expected future reliable treatment capacity of 14.5 MGD with improvements. It is our understanding that the WRF No. 1 has available treatment capacity to serve the Project.

There is an existing 10-inch gravity sewer line in Green River Road that collects flows from Kraft Ranch and surrounding developments and conveys them easterly to the Sierra Del Oro Lift Station. The Green River Lift Station is located northwest of the Project and conveys flows in an 8-inch force main that runs along the north side of the project and discharges to the existing 10-inch gravity sewer line in Green River Road. The Prado Lift Station is located northeast of the Project and conveys flow through a 4-inch force main to the existing 10-inch gravity sewer line in Green River Road. Per the City 2005 Sewer Master Plan modeling results, the existing 10-inch gravity sewer line in Green River Road is flowing over full pipe capacity and needs to be replaced with a larger line.

The SDO LS was constructed in 1987 and is approaching the end of its useful life. The lift station has a total pumping capacity of 1460 gpm. The 2005 Sewer Master Plan estimates that the ultimate peak wet weather flow to the lift station will be 1950 gpm. From Table 2-4, this study shows a PWWF of 0.255 cfs which equates to 114 gpm from the proposed Business Park and future commercial and estate residential development. The project will be required to participate in the relocation and upgrade of the SDO LS and surrounding improvements.

**3.2 CAPITAL IMPROVEMENT PROJECTS**

In anticipation of the increased sewer flows associated with future developments throughout the City of Corona, the Department of Water and Power has proposed several Capital Improvement Projects to address current and future deficiencies in the existing sewer system. The City has plans to construct a new lift station at the intersection of Green River Road and Palisades Drive

to replace and upgrade the existing SDO LS. The proposed lift station will accommodate flows from existing and future developments, which include the proposed sewer flows from Green River Ranch Development. The new lift station is included in the City's Fiscal Year 2021 through Fiscal year 2025 Capital Improvement Program and also includes 2,600 linear feet of 12-inch gravity sewer and 1,500 lineal feet of 12-inch force main.

### 3.3 PROPOSED FACILITIES

The analysis of projected sewage flows for the Project and its estimated sewer contribution to the overall WRF No. 1 treatment volume is consistent with the wastewater facilities identified with the City of Corona 2005 Sewer Master Plan.

**Figure 3** in **Appendix E** provides a Preliminary Sewer Facilities Plan depicting the existing and proposed concept for providing sewer service to the Project. A majority of the site is comprised of Business Industrial designation with 5.54 acres of commercial area connecting from the north side of Green River Road into the Business Park. Wastewater will be conveyed from this area via 8-inch gravity sewer lines within the proposed drive aisles of the Business Park connecting to the existing sewer in the existing commercial center east of Dominguez Ranch Road (Manhole OMH-01 in the hydraulic model). Wastewater from the future commercial area will also be conveyed via the proposed 8-inch gravity sewer lines. All of the gravity sewers are designed such that the peak velocity is less than 8.0 fps and having a d/D of less than 0.50. **Figure 4** in **Appendix E** provides the Preliminary Onsite Sewer Facilities Plan depicting the proposed concept for providing sewer service to the Project. Preliminary sizing calculations for onsite gravity sewer pipelines are also included in **Appendix E**. The proposed wastewater flows from the Green River Ranch Development will be conveyed to the future SDO LS, near the intersection of Green River Road and Palisades Drive. The peak wet weather flow contributed by the proposed Green River Ranch Specific Plan Development is estimated to be 114 gpm.

In the City's 2005 Sewer Master Plan, the existing 10-inch gravity sewer lines in Green River Road and Palisades Drive west of the existing SDO LS are identified as being deficient under existing conditions. **Table 3-1** identifies these deficient pipe segments and their approximate locations.

To mitigate the deficient 10-inch sewer pipe segments in Green River Road east of Nicholas Place, the existing Green River Lift Station 8-inch sewer force main will be extended from City sewer model ID MH 10-01560 to MH 10-01970. These flows are pumped from the existing Green River LS with a total peak dry weather flow of 0.081 cfs and will bypass existing gravity pipe segments 1749, 1741, 1721, and 8865 in Green River Road. This will allow for more capacity in the pipe bringing the d/D ratio to acceptable levels. Gravity pipe segments 8866, 8864, 8863, the existing SDO LS, and portions of line east of the existing Lift Station will be abandoned or relocated per **Figure 5** Preliminary Offsite Sewer Facilities Plan (provided in **Appendix E**). From MH 10-01970, a proposed 12-inch gravity sewer line in Green River Road and in Palisades Drive will be constructed to the proposed SDO LS located at southeast corner of the intersection of Green River Road and Palisades Drive. A new 12-inch sewer force main then will be constructed from the proposed SDO LS to be connected to the existing 12-inch public sewer force main in Palisades Drive. Per discussions with City of Corona DWP staff and based

on their preliminary sewer modeling results, this proposed pipeline mitigation concept is acceptable and brings the existing deficient pipeline capacities noted in **Table 3-1** to acceptable levels. The extension of the 8-inch force main helps to mitigate an existing deficiency in the exiting 10-inch gravity sewer line and frees up capacity for flows from the proposed Green River ranch development.

**TABLE 3-1**

<b>2005 Sewer Master Plan Deficient Pipelines - Downstream of Green River Ranch</b>						
<b>Pipe Segment</b>	<b>Existing Pipe Diameter (in)</b>	<b>Existing Pipe Length (ft)</b>	<b>Existing Pipe Slope (ft/ft)</b>	<b>Existing Peak Dry Weather Flow (cfs)</b>	<b>Existing Velocity (ft/s)</b>	<b>Existing Peak Dry Weather d/D</b>
Green River Road						
1749	10	148	0.0021	1.6421	3.01	1.00
1741	10	202	0.0045	1.6764	3.07	1.00
1721	10	350	0.0035	1.6764	3.07	1.00
8865	10	220	0.0031	1.6764	3.07	1.00
8866	10	120	0.0036	1.6764	3.07	1.00
8864	10	350	0.0035	1.6764	3.07	1.00
8863	10	109	0.0033	1.6764	3.07	1.00

### **3.4 DOWNSTREAM SEWER ANALYSIS**

Downstream sewer impacts should be analyzed in conjunction with evaluation of the City of Corona’s 2005 Sewer Master Plan model deficiencies and proposed capital improvement projects. In the initial meeting with City of Corona DWP, City staff stated that the downstream sewer modeling analysis will be prepared by the City based on the projected sewer flows provided by the Developer. **Appendix D** provides the City’s modeling and downstream analysis results.

Design of the new Sierra Del Oro Lift Station and its peak pumping capacity will include any wastewater contributions from the Project and future surrounding developments. For proposed offsite facilities that will serve existing development plus the proposed Project, **Section 4** provides the percentage of flows in these facilities that can be attributed to the proposed Project.

### **3.4 PHASING**

The Green River Ranch Specific Plan area is anticipated to develop in the following phases:

- Phase 1 – Business Industrial Area (Parcels 1-5)
- Phase 2 – Commercial Area (Parcel 7)
- Phase 3 – Estate Residential Lots (Parcel 6)

The timing of project development is dependent on the timeline for future approvals and market conditions. The preliminary estimated schedule is to have Phase 1 online in 2023/2024, Phase 2 in 2025/2026, and Phase 3 in approximately 2040.

## CONCLUSIONS

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The Project will require the following Sewer Infrastructure to be constructed and improved:

### Ultimate Build-out and Improvements

- Construction of 2,730 LF onsite 8-inch gravity sewer line within the Business Industrial Development area of the project.
- Construction of 165 LF offsite 8-inch gravity sewer line through Dominguez Ranch Road to adjacent Commercial Center from MH 03 to OMH 01 (10-01000).
- Construction of 830 LF of offsite 8-inch sewer force main in Green River Road from MH 10-01650 to MH 10-01970. This improvement will mitigate an existing deficiency in the 10-inch gravity sewer line downstream of Nicholas Place that is part of the City's Capital Improvement Program for the relocation of the SDO LS.
- Abandon existing Sierra Del Oro Lift Station (SDO LS) and construction of a new SDO LS per the City Capital Improvement Program.
- Abandonment of 638 LF of existing 10-inch gravity sewer line between MH 10-01970 and existing SDO LS and between MH 10-02220 and existing SDO LS. This abandonment is necessary as a result of the relocation of the SDO LS.
- Abandonment of 170 LF of existing 12-inch sewer force main east of existing SDO LS. This abandonment is necessary as a result of the relocation of the SDO LS.
- Abandonment of 77 LF of existing 10-inch gravity sewer from Palisades to existing SDO LS. This abandonment is necessary as a result of the relocation of the SDO LS.
- Construction of 590 feet of offsite 12-inch gravity sewer micro tunneled from MH 10-01970 to the proposed Sierra Del Oro Lift Station (SDO LS). This new gravity line is necessary to get existing and proposed Project flows to the new SDO LS site.
- Construction of 532 feet of offsite 12-inch sewer force main in Palisades Drive from proposed Sierra Del Oro Lift Station (SDO LS) to existing 12-inch sewer force main east of SDO LS. This new sewer force main is necessary as a result of the relocation of the lift station.

The total average flow calculated for the Specific Plan Project is 0.0849 cfs. This is less than what was projected for the project in the 2005 Master Plan. As a result, the Water Reclamation Facility No. 1 will be able to accommodate the anticipated sewer flows from the Project. All onsite sewer facilities are 8-inch gravity sewer pipes and are contained within the proposed drive aisles. The offsite sewer facilities consist of 8-inch and 12-inch gravity sewer lines and force main. The offsite sewer facilities are sized to include future additional flow contributed by Green River Ranch South. The Project onsite sewer facilities presented in this report are preliminary estimates of the anticipated sewer facilities necessary to service the project needs.

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## **REFERENCES**

City of Corona Sewer Master Plan, AKM Consulting Engineers, September 2005.

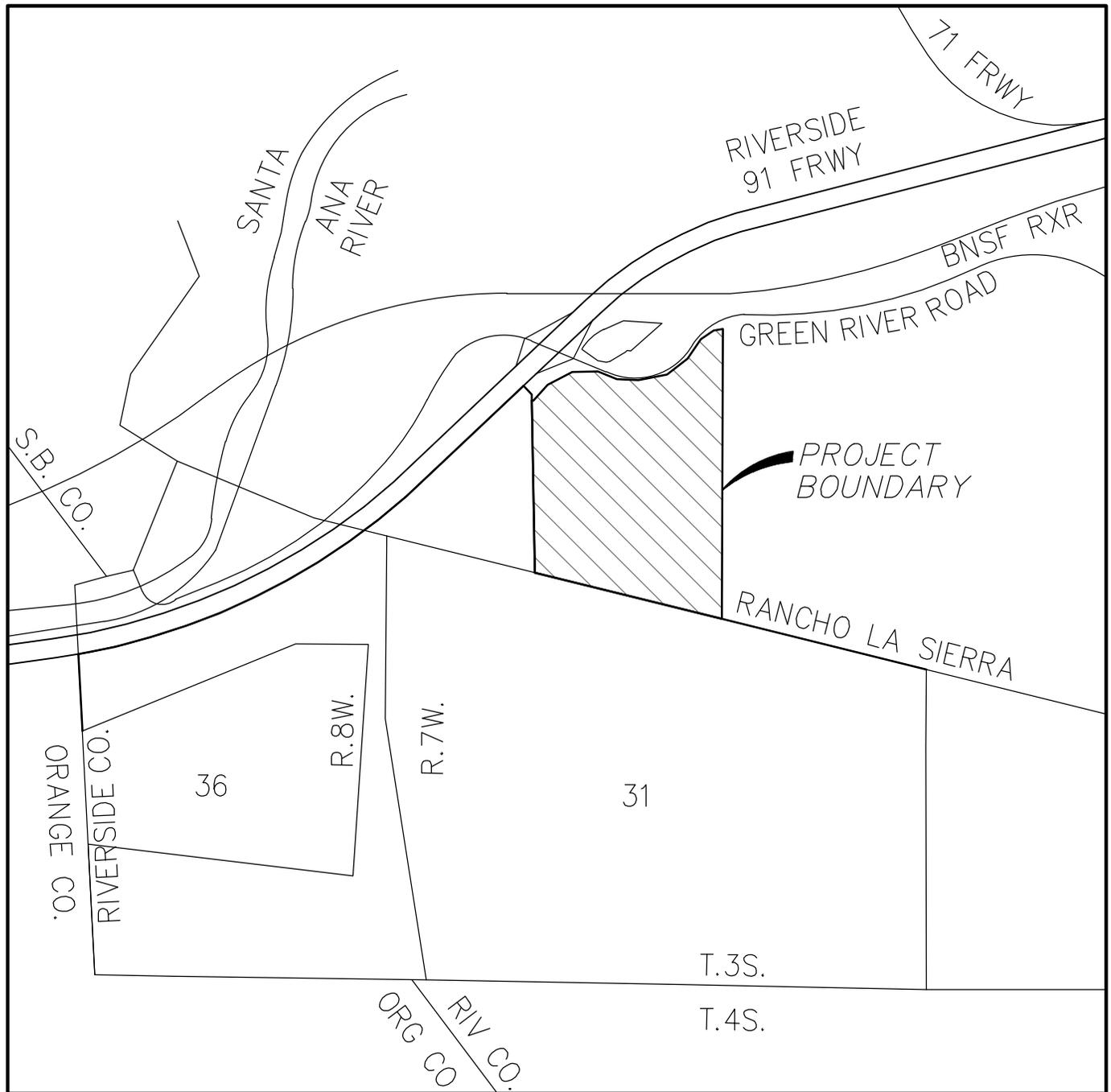
City of Corona Department of Water and Power Design Policy, November 2012.

*Appendix*

**A**

**LOCATION AND VICINITY MAPS**

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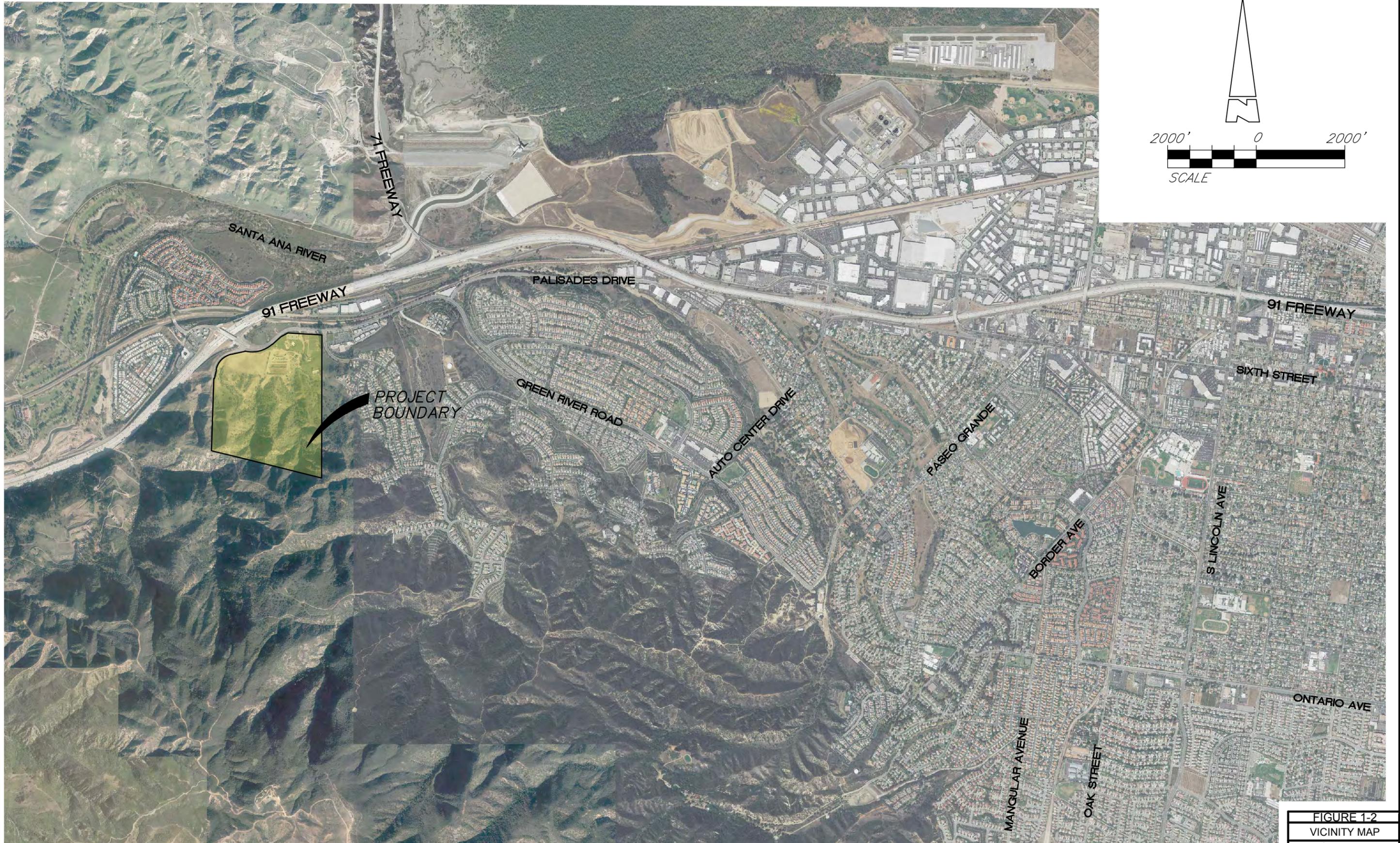
# LOCATION MAP

NOT TO SCALE



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 1880 COMPTON AVENUE, SUITE 100 • CORONA, CA. 92881-3370 • 951-734-2130

FIGURE 1-1



PROJECT  
BOUNDARY

FIGURE 1-2  
VICINITY MAP



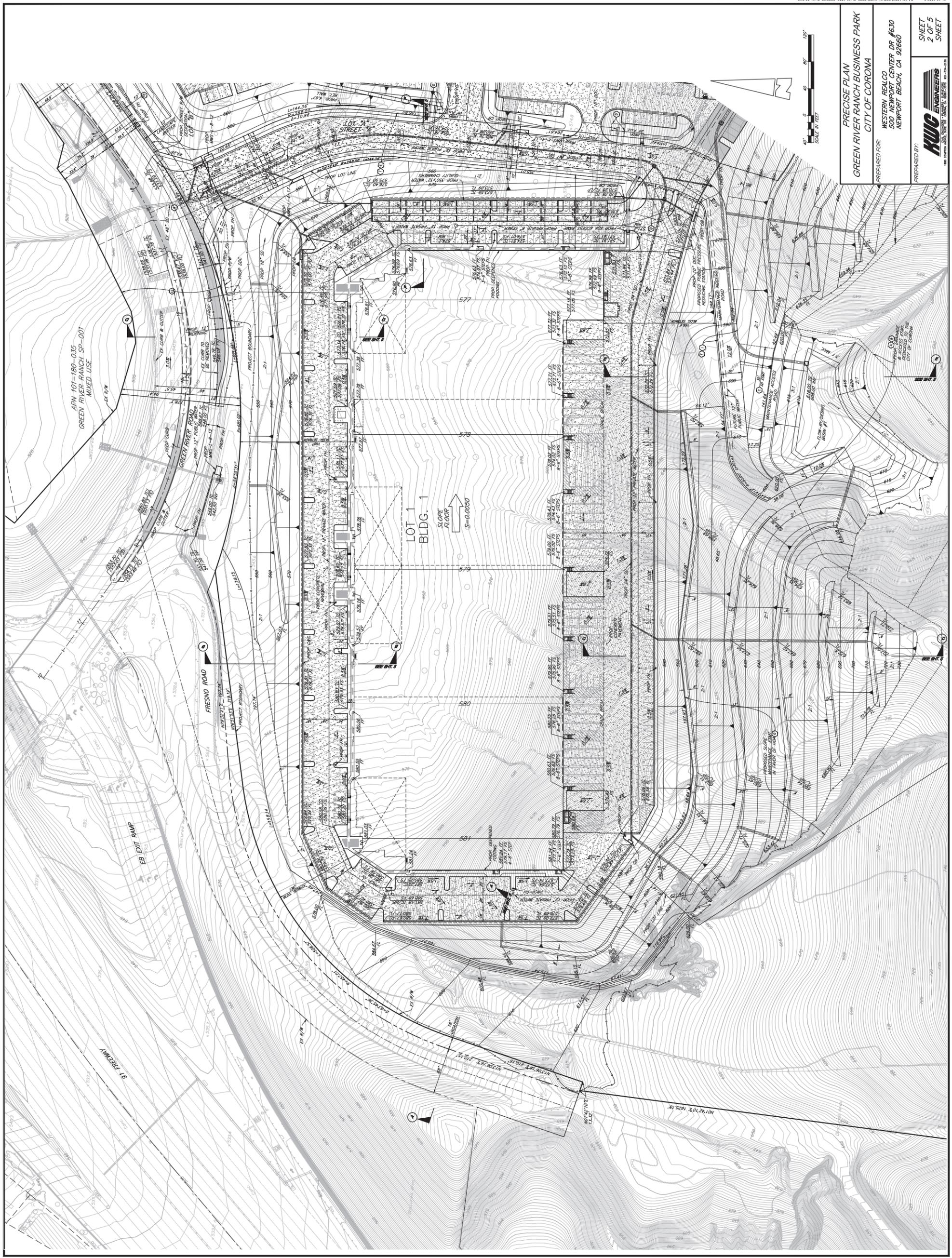
*Appendix*

**B**

**TTM 37963**

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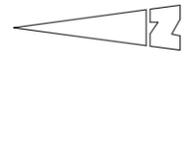
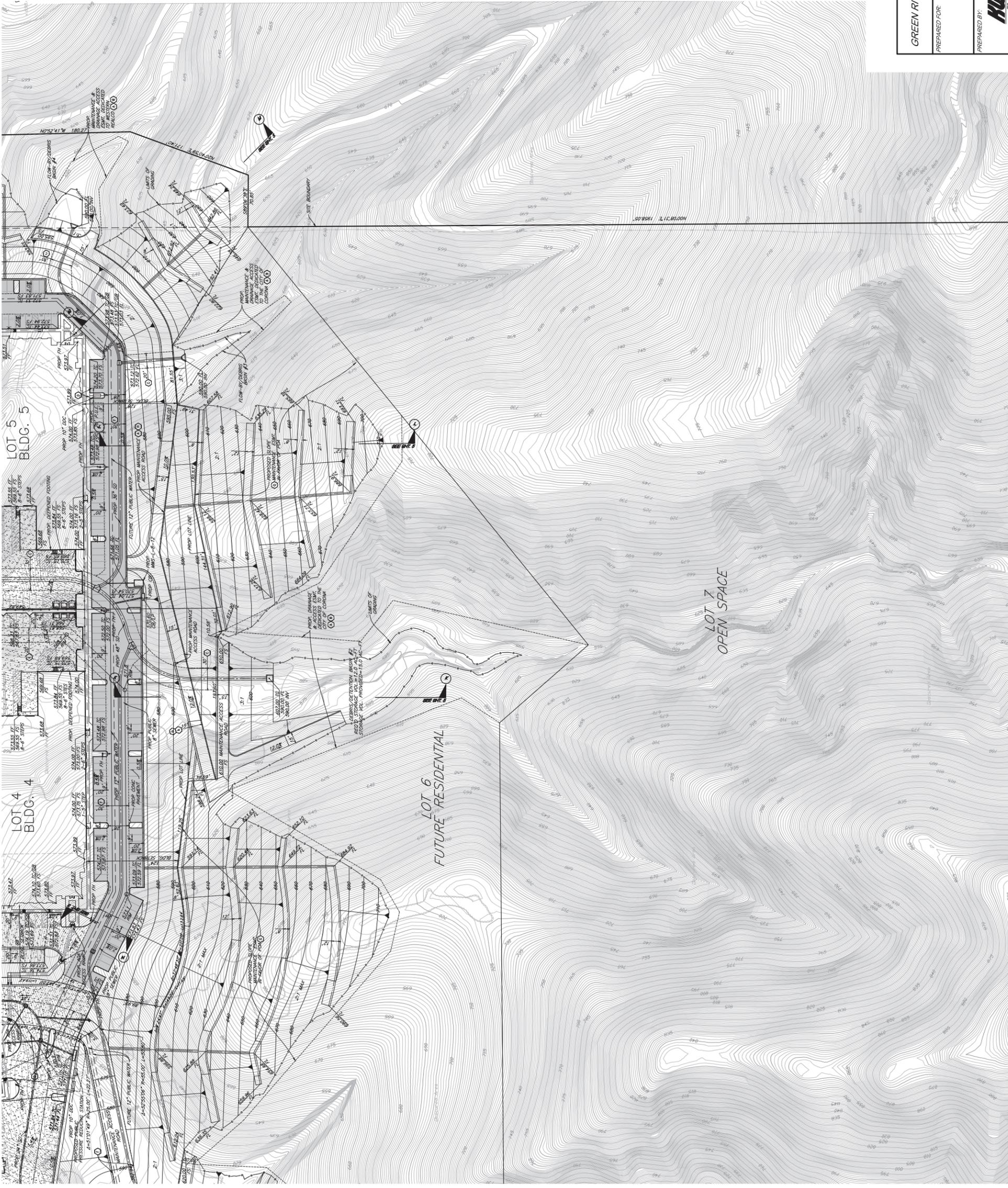


**PRECISE PLAN**  
**GREEN RIVER RANCH BUSINESS PARK**  
**CITY OF CORONA**  
 PREPARED FOR:  
 WESTERN REALCO  
 500 NEWPORT CENTER DR #630  
 NEWPORT BEACH, CA 92660  
 PREPARED BY:  
**KWIC ENGINEERS**  
 1885 CORONA AVENUE, SUITE 100, CORONA, CA 92626  
 SHEET  
 2 OF 5  
 SHEET

APN 101-180-035  
 GREEN RIVER RANCH SP-001  
 MIXED USE

101-180-035  
 GREEN RIVER RANCH SP-001  
 MIXED USE





**PRECISE PLAN**  
**GREEN RIVER RANCH BUSINESS PARK**  
**CITY OF CORONA**

PREPARED FOR:  
**WESTERN REALCO**  
 500 NEWPORT CENTER DR #630  
 NEWPORT BEACH, CA 92660

PREPARED BY:  
**HWC ENGINEERS**  
1800 CORONA AVENUE, SUITE 200, CORONA, CA 92626 949-234-1115

SHEET  
 4 OF 5  
 SHEET

DATE PLOTTED: 11/11/2011 11:58:11 AM  
 PLOTTER: HP DesignJet 2400  
 PLOT SCALE: 1"=40'

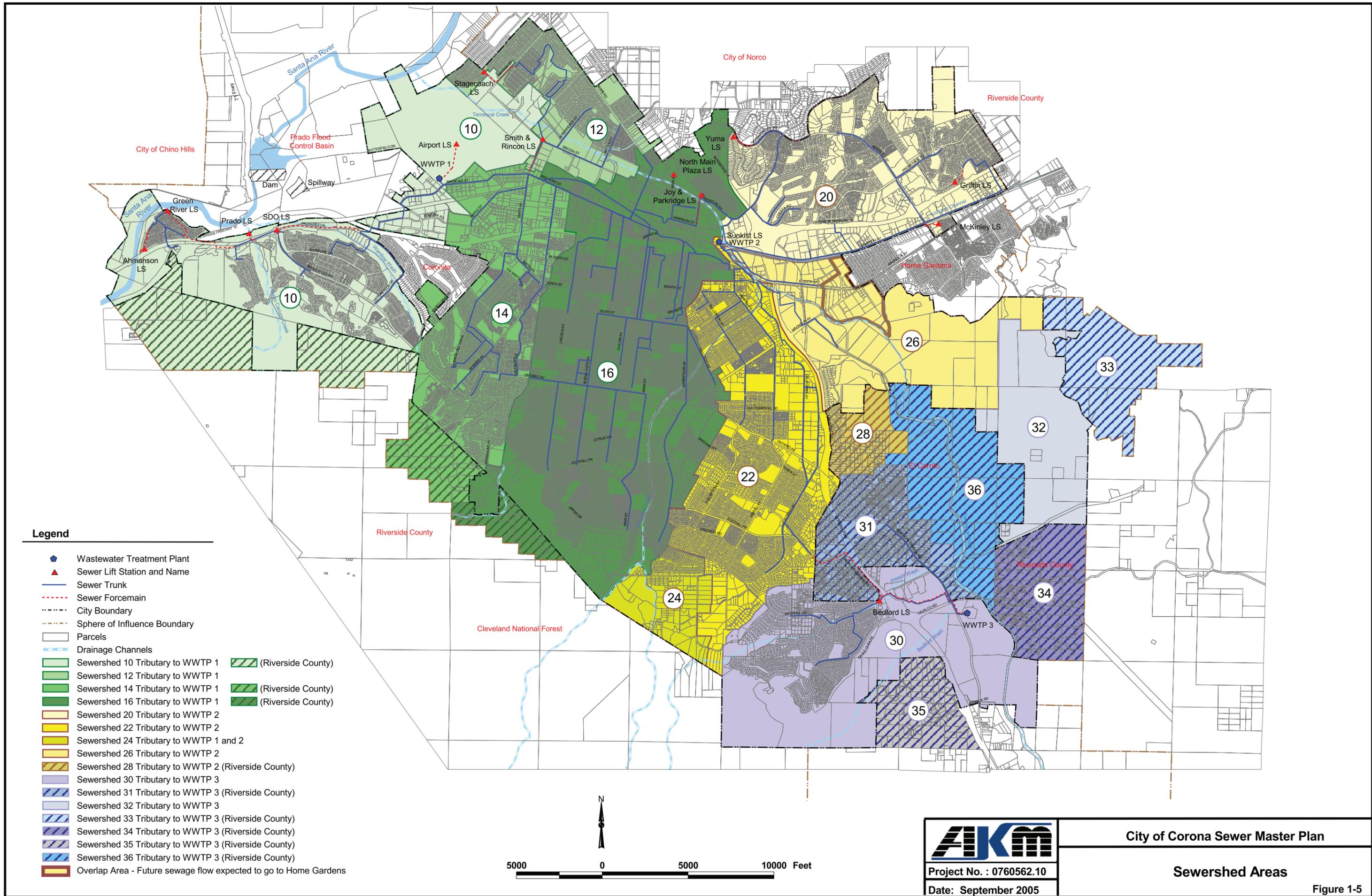


*Appendix*

**C**

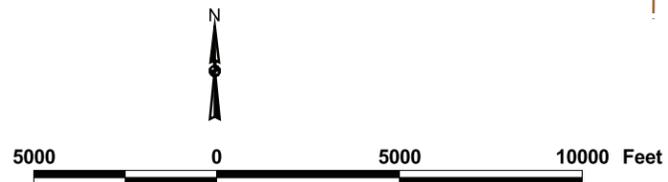
**CITY OF CORONA SEWERSHED MAP**

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**Legend**

- ◆ Wastewater Treatment Plant
- ▲ Sewer Lift Station and Name
- Sewer Trunk
- Sewer Forcemain
- City Boundary
- Sphere of Influence Boundary
- Parcels
- Drainage Channels
- Sewershed 10 Tributary to WWTP 1  (Riverside County)
- Sewershed 12 Tributary to WWTP 1  (Riverside County)
- Sewershed 14 Tributary to WWTP 1  (Riverside County)
- Sewershed 16 Tributary to WWTP 1  (Riverside County)
- Sewershed 20 Tributary to WWTP 2
- Sewershed 22 Tributary to WWTP 2
- Sewershed 24 Tributary to WWTP 1 and 2
- Sewershed 26 Tributary to WWTP 2
- Sewershed 28 Tributary to WWTP 2 (Riverside County)
- Sewershed 30 Tributary to WWTP 3
- Sewershed 31 Tributary to WWTP 3 (Riverside County)
- Sewershed 32 Tributary to WWTP 3
- Sewershed 33 Tributary to WWTP 3 (Riverside County)
- Sewershed 34 Tributary to WWTP 3 (Riverside County)
- Sewershed 35 Tributary to WWTP 3 (Riverside County)
- Sewershed 36 Tributary to WWTP 3 (Riverside County)
- Overlap Area - Future sewage flow expected to go to Home Gardens



**AKM**  
 Project No. : 0760562.10  
 Date: September 2005

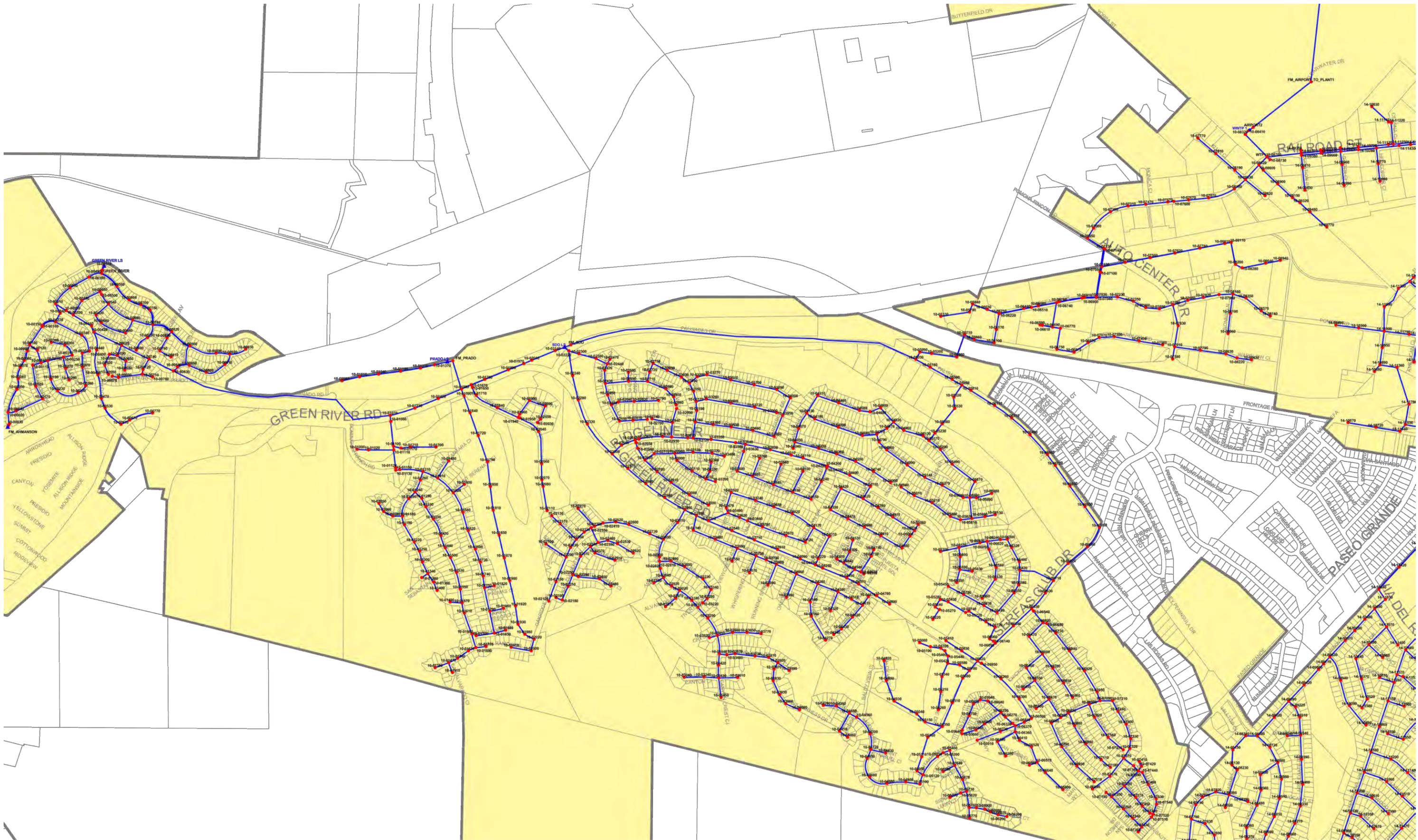
**City of Corona Sewer Master Plan**  
**Sewershed Areas**  
 Figure 1-5

*Appendix*

**D**

**DOWNSTREAM ANALYSIS**

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### Existing Hydraulic Model Results

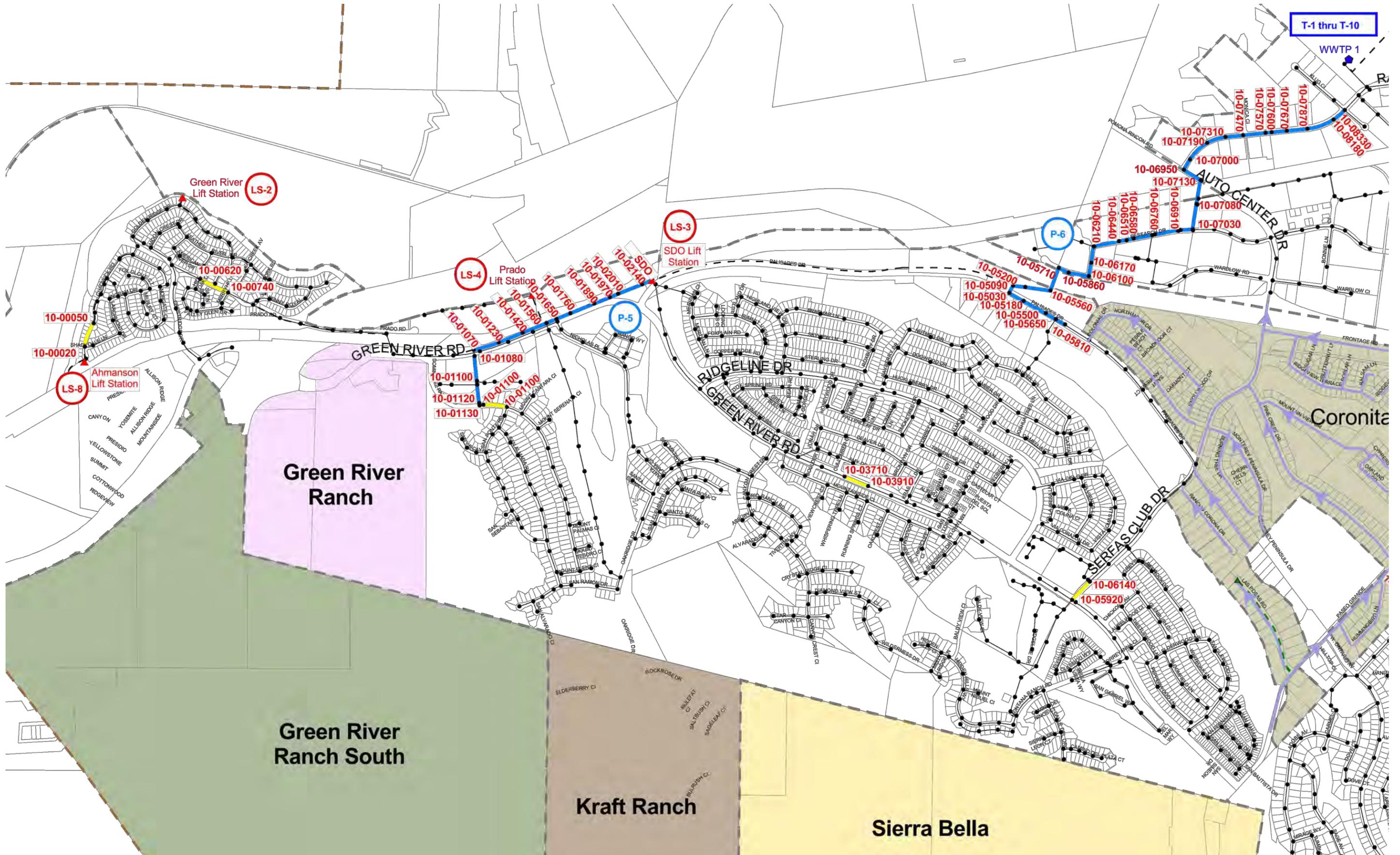
Pipe Model ID	U/S MH Model ID	D/S MH Model ID	Pipe Dia (in)	Length (ft)	Slope	Average Flow (cfs)	Pumped Flow (cfs)	Total Peak Dry Weather Flow (cfs)	Peak Dry Weather Velocity (ft/s)	Peak Dry Weather d/D	Full Flow (cfs)
6616	10-00020	10-00030	8	155	0.0109	0.0220	0.0000	0.0582	1.85	0.15	1.2677
6617	10-00030	AHMANSON	6	47	0.0109	0.0220	0.0000	0.0582	1.91	0.21	0.5863
6593	10-00100	10-00150	8	309	0.0040	0.0286	0.2228	0.2969	2.05	0.43	0.7617
6591	10-00150	10-00220	8	201	0.0060	0.0300	0.2228	0.3003	2.39	0.39	0.9371
6589	10-00220	10-00240	10	135	0.0040	0.0402	0.2228	0.3241	2.08	0.33	1.3894
5641	10-00210	10-00300	15	300	0.0030	0.2086	0.2228	0.6840	2.23	0.30	3.5476
5640	10-00300	10-00390	15	300	0.0030	0.2120	0.2228	0.6908	2.24	0.30	3.5476
8858	10-00390	10-00490	15	200	0.0030	0.2148	0.2228	0.6965	2.24	0.30	3.5441
5659	10-00490	GREEN_RIVER	15	100	0.0040	0.2725	0.2228	0.8123	2.61	0.30	4.1058
2624	10-01470	10-01540	8	135	0.0710	0.0036	0.0000	0.0111	2.14	0.04	3.2282
5636	10-01080	10-01070	10	82	0.0095	0.0977	0.0000	0.2294	2.56	0.22	2.1425
1838	10-01070	10-01230	10	350	0.0030	0.0982	1.0026	1.2331	2.26	1.00	1.1977
1814	10-01230	10-01420	10	350	0.0030	0.0982	1.0026	1.2331	2.26	1.00	1.1975
7260	10-01420	10-01560	10	347	0.0029	0.0982	1.0026	1.2331	2.26	1.00	1.1910
5025	10-01370	PRADO	8	185	0.0069	0.0164	0.0000	0.0445	1.45	0.14	1.0037
1749	10-01560	10-01650	10	148	0.0021	0.1018	1.4036	1.6421	3.01	1.00	1.0067
1741	10-01650	10-01760	10	202	0.0045	0.1179	1.4036	1.6764	3.07	1.00	1.4730
1721	10-01760	10-01890	10	350	0.0035	0.1179	1.4036	1.6764	3.07	1.00	1.3023
8865	10-01890	10-01970	10	220	0.0031	0.1179	1.4036	1.6764	3.07	1.00	1.2315
8866	10-01970	10-02010	10	120	0.0036	0.1179	1.4036	1.6764	3.07	1.00	1.3126
8864	10-02010	10-02140	10	350	0.0035	0.1179	1.4036	1.6764	3.07	1.00	1.3023
8863	10-02140	SDO	10	109	0.0033	0.1179	1.4036	1.6764	3.07	1.00	1.2609
8862	10-02300	10-02220	8	150	0.1254	0.0536	0.0000	0.1321	5.54	0.12	4.2905
8860	10-02240	10-02220	10	353	0.0290	0.3519	0.0000	0.7461	5.35	0.30	3.7409
8859	10-02220	SDO	10	59	0.0461	0.4056	0.0000	0.8500	6.56	0.29	4.7168
8025	10-05770	10-05760	8	132	0.0461	0.0006	0.0000	0.0021	1.12	0.02	2.6027
8024	10-05760	10-05730	8	226	0.0761	0.0068	0.0000	0.0196	2.61	0.05	3.3413
3055	10-05120	10-05050	8	92	0.0951	0.0481	0.0000	0.1196	4.88	0.12	3.7360
1752	10-05810	10-05650	12	144	0.0020	0.3432	0.0000	0.7289	1.99	0.47	1.6036
1743	10-05650	10-05500	12	156	0.0019	0.4208	0.0000	0.8793	2.03	0.54	1.5398
1672	10-05030	10-05090	12	113	0.0063	0.4470	0.0000	0.9297	3.23	0.39	2.8347
1660	10-05090	10-05200	18	162	0.0019	0.4483	3.2529	4.1851	2.96	0.75	4.6133
1664	10-05200	10-05560	18	350	0.0020	0.4498	3.2529	4.1879	2.99	0.74	4.6743

1663	10-05560	10-05710	18	333	0.0041	0.4539	3.2529	4.1958	4.04	0.57	6.7816
1632	10-05710	10-05860	18	147	0.0131	0.4548	3.2529	4.1974	6.21	0.41	12.0566
1640	10-05860	10-06100	18	278	0.0020	0.4555	3.2529	4.1988	3.00	0.74	4.6858
1639	10-06100	10-06170	18	186	0.0292	0.4563	3.2529	4.2004	8.31	0.33	18.0103
7138	10-06170	10-06210	18	219	0.0252	0.4591	3.2529	4.2057	7.88	0.34	16.7247
1553	10-06210	10-06440	18	350	0.0018	0.4605	3.2529	4.2083	2.90	0.77	4.5038
1535	10-06440	10-06580	18	203	0.0014	0.4642	3.2529	4.2153	2.39	1.00	3.9806
1525	10-06580	10-06760	18	294	0.0016	0.4665	3.2529	4.2198	2.39	1.00	4.2111
7440	10-06760	10-06910	18	350	0.0017	0.4693	3.2529	4.2252	2.80	0.80	4.3426
7441	10-06910	10-07030	18	162	0.0017	0.4706	3.2529	4.2276	2.80	0.80	4.3394
1502	10-07030	10-07080	18	350	0.0018	0.5419	3.2529	4.3627	2.90	0.79	4.5038
1424	10-07080	10-07130	18	321	0.0018	0.5432	3.2529	4.3652	2.86	0.81	4.4351
5968	10-07130	10-06950	21	266	0.0017	0.6245	3.2529	4.5175	2.93	0.61	6.5345
5969	10-06950	10-07000	21	178	0.0017	0.6245	3.2529	4.5175	2.97	0.61	6.6301
1257	10-07000	10-07190	21	327	0.0016	0.6365	3.2529	4.5398	2.89	0.62	6.3961
1213	10-07190	10-07310	21	262	0.0013	0.6436	3.2529	4.5530	2.64	0.67	5.7178
1191	10-07310	10-07470	21	238	0.0014	0.6563	3.2529	4.5765	2.74	0.65	5.9993
1184	10-07470	10-07570	21	306	0.0013	0.6678	3.2529	4.5978	2.65	0.68	5.7475
5988	10-07570	10-07600	21	83	0.0042	0.6756	3.2529	4.6123	4.16	0.47	10.2901
5989	10-07600	10-07670	21	205	0.0004	0.6808	3.2529	4.6219	1.92	1.00	3.1391
1167	10-07670	10-07870	21	280	0.0014	0.6885	3.2529	4.6362	2.70	0.67	5.8518
1159	10-07870	10-08180	21	380	0.0015	0.6979	3.2529	4.6535	2.81	0.65	6.1508
5983	10-08180	10-08330	21	201	0.0001	0.7036	3.2529	4.6640	1.94	1.00	1.5864
1093	10-08330	10-08520	21	275	0.0052	0.7504	3.2529	4.7501	4.53	0.45	11.4238
1060	10-08520	10-08700	21	175	0.0079	0.7834	3.2529	4.8107	5.31	0.40	14.1081

### Ultimate Hydraulic Model Results

Pipe Model ID	U/S MH Model ID	D/S MH Model ID	Pipe Dia (in)	Length (ft)	Slope	Average Flow (cfs)	Pumped Flow (cfs)	Total Peak Dry Weather Flow (cfs)	Peak Dry Weather Velocity (ft/s)	Peak Dry Weather d/D	Full Flow (cfs)
6616	10-00020	10-00030	8	155	0.0109	0.0220	0.0000	0.0582	1.85	0.15	1.2677
6617	10-00030	AHMANSON	6	47	0.0109	0.0992	0.0000	0.2326	2.81	0.44	0.5863
6593	10-00100	10-00150	8	309	0.0040	0.0286	0.2674	0.3414	2.12	0.47	0.7617
6591	10-00150	10-00220	8	201	0.0060	0.0300	0.2674	0.3449	2.48	0.42	0.9371
6589	10-00220	10-00240	10	135	0.0040	0.0402	0.2674	0.3687	2.15	0.35	1.3894
5641	10-00210	10-00300	15	300	0.0030	0.2999	0.2674	0.9113	2.42	0.35	3.5476
5640	10-00300	10-00390	15	300	0.0030	0.3032	0.2674	0.9179	2.42	0.35	3.5476
8858	10-00390	10-00490	15	200	0.0030	0.3061	0.2674	0.9235	2.43	0.35	3.5441
5659	10-00490	GREEN_RIVER	15	100	0.0040	0.3741	0.2674	1.0565	2.80	0.35	4.1058
2624	10-01470	10-01540	8	135	0.0710	0.1559	0.0000	0.3528	6.07	0.22	3.2282
5636	10-01080	10-01070	10	82	0.0095	0.4579	0.0000	0.9504	3.81	0.47	2.1425
1838	10-01070	10-01230	10	350	0.0030	0.6110	1.0026	2.2419	4.11	1.00	1.1977
1814	10-01230	10-01420	10	350	0.0030	0.6146	1.0026	2.2487	4.12	1.00	1.1975
7260	10-01420	10-01560	10	347	0.0029	0.6176	1.0026	2.2543	4.13	1.00	1.1910
5025	10-01370	PRADO	8	185	0.0069	0.0159	0.0000	0.0433	1.43	0.14	1.0037
1749	10-01560	10-01650	10	148	0.0021	0.6548	1.2700	2.5909	4.75	1.00	1.0067
1741	10-01650	10-01760	10	202	0.0045	0.6656	1.2700	2.6109	4.79	1.00	1.4730
1721	10-01760	10-01890	10	350	0.0035	0.6688	1.2700	2.6169	4.80	1.00	1.3023
8865	10-01890	10-01970	10	220	0.0031	0.6722	1.2700	2.6231	4.81	1.00	1.2315
8866	10-01970	10-02010	10	120	0.0036	0.6742	1.2700	2.6267	4.82	1.00	1.3126
8864	10-02010	10-02140	10	350	0.0035	0.6772	1.2700	2.6324	4.83	1.00	1.3023
8863	10-02140	SDO	10	109	0.0033	0.6810	1.2700	2.6394	4.84	1.00	1.2609
8862	10-02300	10-02220	8	150	0.1254	0.0791	0.0000	0.1890	6.17	0.14	4.2905
8860	10-02240	10-02220	10	353	0.0290	0.4846	0.0000	1.0014	5.81	0.35	3.7409
8859	10-02220	SDO	10	59	0.0461	0.5648	0.0000	1.1529	7.14	0.34	4.7168
8025	10-05770	10-05760	8	132	0.0461	0.1409	0.0000	0.3215	5.07	0.24	2.6027
8024	10-05760	10-05730	8	226	0.0761	0.1471	0.0000	0.3343	6.12	0.21	3.3413
3055	10-05120	10-05050	8	92	0.0951	0.1776	0.0000	0.3977	6.97	0.22	3.7360
1752	10-05810	10-05650	12	144	0.0020	0.6214	0.0000	1.2588	2.26	0.67	1.6036
1743	10-05650	10-05500	12	156	0.0019	0.7319	0.0000	1.4632	2.23	0.78	1.5398
1672	10-05030	10-05090	12	113	0.0063	0.7487	0.0000	1.4943	3.66	0.52	2.8347
1660	10-05090	10-05200	18	162	0.0019	0.7537	4.1218	5.6251	3.18	1.00	4.6133
1664	10-05200	10-05560	18	350	0.0020	0.7553	4.1218	5.6280	3.18	1.00	4.6743
1663	10-05560	10-05710	18	333	0.0041	0.7579	4.1218	5.6328	4.29	0.70	6.7816

1632	10-05710	10-05860	18	147	0.0131	0.7588	4.1218	5.6344	6.71	0.48	12.0566
1640	10-05860	10-06100	18	278	0.0020	0.7595	4.1218	5.6359	3.19	1.00	4.6858
1639	10-06100	10-06170	18	186	0.0292	0.7611	4.1218	5.6388	9.01	0.38	18.0103
7138	10-06170	10-06210	18	219	0.0252	0.7636	4.1218	5.6434	8.54	0.40	16.7247
1553	10-06210	10-06440	18	350	0.0018	0.7651	4.1218	5.6460	3.19	1.00	4.5038
1535	10-06440	10-06580	18	203	0.0014	0.7687	4.1218	5.6527	3.20	1.00	3.9806
1525	10-06580	10-06760	18	294	0.0016	0.7712	4.1218	5.6573	3.20	1.00	4.2111
7440	10-06760	10-06910	18	350	0.0017	0.7742	4.1218	5.6627	3.20	1.00	4.3426
7441	10-06910	10-07030	18	162	0.0017	0.7755	4.1218	5.6651	3.21	1.00	4.3394
1502	10-07030	10-07080	18	350	0.0018	0.9860	4.1218	6.0466	3.42	1.00	4.5038
1424	10-07080	10-07130	18	321	0.0018	0.9874	4.1218	6.0492	3.42	1.00	4.4351
5968	10-07130	10-06950	21	266	0.0017	1.1021	4.1218	6.2543	3.09	0.78	6.5345
5969	10-06950	10-07000	21	178	0.0017	1.1035	4.1218	6.2568	3.13	0.77	6.6301
1257	10-07000	10-07190	21	327	0.0016	1.1123	4.1218	6.2724	3.03	0.80	6.3961
1213	10-07190	10-07310	21	262	0.0013	1.1189	4.1218	6.2841	2.61	1.00	5.7178
1191	10-07310	10-07470	21	238	0.0014	1.1312	4.1218	6.3061	2.62	1.00	5.9993
1184	10-07470	10-07570	21	306	0.0013	1.1415	4.1218	6.3244	2.63	1.00	5.7475
5988	10-07570	10-07600	21	83	0.0042	1.1486	4.1218	6.3369	4.50	0.57	10.2901
5989	10-07600	10-07670	21	205	0.0004	1.1532	4.1218	6.3451	2.64	1.00	3.1391
1167	10-07670	10-07870	21	280	0.0014	1.1601	4.1218	6.3573	2.64	1.00	5.8518
1159	10-07870	10-08180	21	380	0.0015	1.1677	4.1218	6.3708	2.65	1.00	6.1508
5983	10-08180	10-08330	21	201	0.0001	1.1728	4.1218	6.3797	2.65	1.00	1.5864
1093	10-08330	10-08520	21	275	0.0052	1.2207	4.1218	6.4645	4.89	0.54	11.4238
1060	10-08520	10-08700	21	175	0.0079	1.2496	4.1218	6.5155	5.75	0.48	14.1081



T-1 thru T-10

WWTP 1

Green River Lift Station LS-2

SDO Lift Station LS-3

Prado Lift Station LS-4

Ahmanson Lift Station LS-8

Green River Ranch

Green River Ranch South

Kraft Ranch

Sierra Bella

Coronita

*Appendix*

**E**

**PRELIMINARY SEWER FACILITY MAPS**

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**Green River Ranch Business Park Development - Project Sewer Generation Summary**

<b>Node ID</b>	<b>Area</b>	<b>Land Use Category</b>	<b>Tributary Area (ac)</b>	<b>Dwelling Units (DU)</b>	<b>Sewer Flow Factor (gpd/ac)</b>	<b>Residential Flow Factor (gpd/du)</b>	<b>Average Dry Weather Flow ADWF (MGD)</b>	<b>Average Dry Weather Flow ADWF (cfs)</b>	<b>Peak Dry Weather Flow PDWF<sup>1</sup> (cfs)</b>	<b>Peak Wet Weather Flow PWWF<sup>2</sup> (cfs)</b>
MH 08	Parcel 2	Business Industrial	8.90	--	840	--	0.0075	0.0116	0.0322	0.0407
MH 07	Parcel 3	Business Industrial	8.43	--	840	--	0.0071	0.0110	0.0307	0.0388
MH 12	Parcel 4	Business Industrial	5.49	--	840	--	0.0046	0.0071	0.0207	0.0261
MH 12	Parcel 5	Business Industrial	4.70	--	840	--	0.0039	0.0061	0.0179	0.0226
MH 17	Parcel 1	Business Industrial	16.17	--	840	--	0.0136	0.0210	0.0558	0.0706
MH 14	OS-A	Open Space (OS)	10.13	--	130	--	0.0013	0.0020	0.0065	0.0083
MH 15	OS-B	Open Space (OS)	10.92	--	130	--	0.0014	0.0022	0.0070	0.0088
MH 09	Parcel 7	Commercial (C)	5.54	--	1,050	--	0.0058	0.0090	0.0256	0.0324
MH 16	Parcel 6	Residential Estate (E)	88.88	32	500	300	0.0096	0.0149	0.0406	0.0513
<b>Total</b>			159.16	--	--	--	0.0549	0.0849	0.2016	0.2550

Considering the City's I/I (inflow and infiltration) study, it is recommended that the peak wet weather flow be estimated as the larger of the two following equations:

1. Peak Dry Weather Flow (PDWF) = 1.95 x (ADWF in cfs)<sup>0.92</sup>
2. Peak Wet Weather Flow (PWWF) = 1.265 x Peak Dry Weather Flow (PDWF)

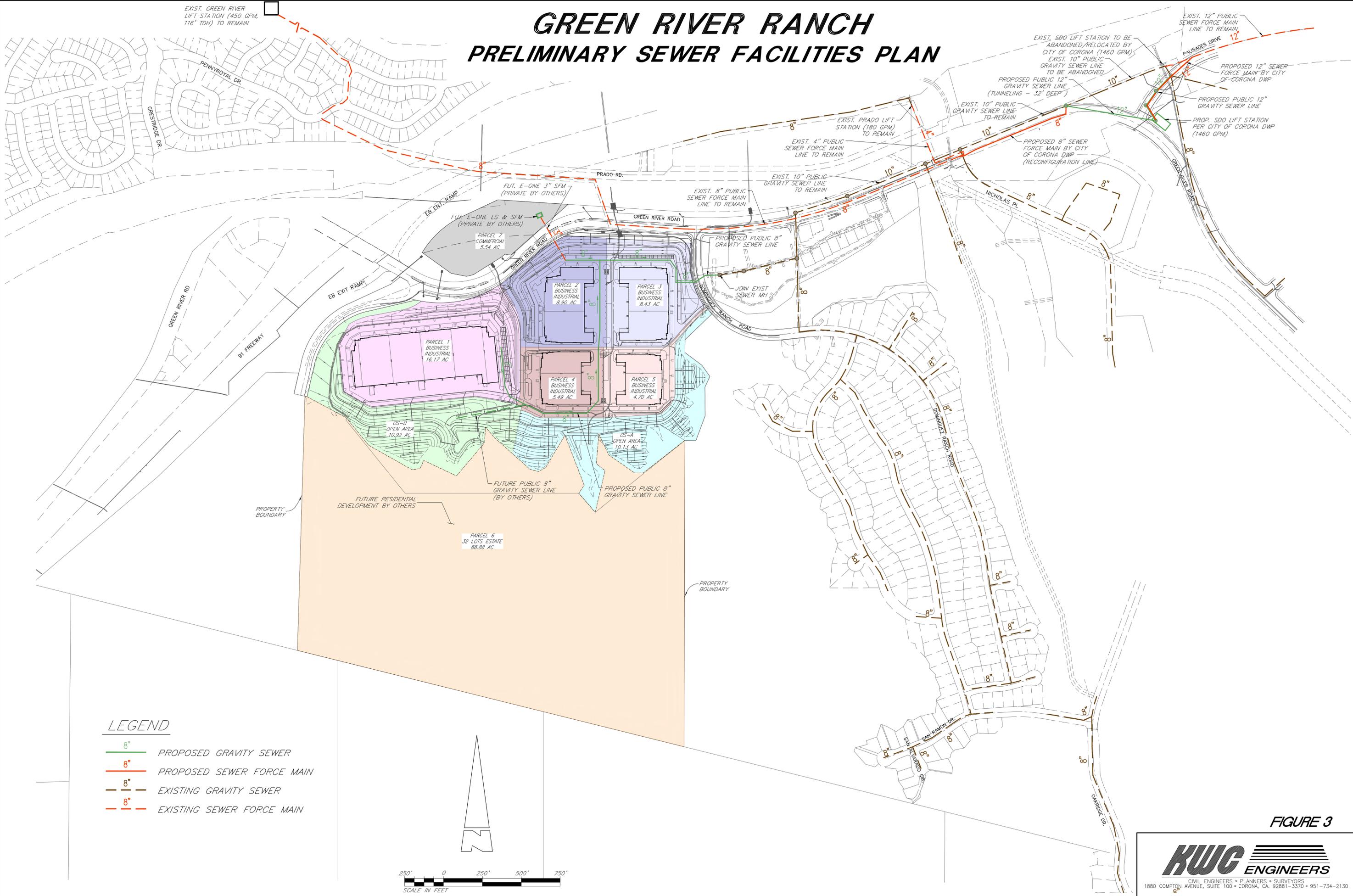
**Green River Ranch Business Park Onsite Sewerage Pipe Capacity Calculation**

Pipe Segment	US MH No.	DS MH No.	Length (ft)	Slope (ft/ft)	Dia (in)	n	Proposed Lateral Inflow (cfs)	Summation Proposed Lateral Flow (cfs)	$(AR^{2/3})/D6(8/3)$	Angle (Rad)	Velocity (fps)	Ultimate Peak Flow d/D
--	18	17	254.71	0.0092	8	0.013	<b>0.0558</b>	0.0558	0.01499	1.586	1.71	<b>0.149</b>
--	17	16	77.21	0.0050	8	0.013	<b>0.0000</b>	0.0558	0.02036	1.716	1.38	<b>0.173</b>
--	16	15	213.88	0.0050	8	0.013	<b>0.0406</b>	0.0964	0.03515	1.985	1.62	<b>0.227</b>
--	15	14	275.14	0.0050	8	0.013	<b>0.0070</b>	0.1033	0.03769	2.023	1.66	<b>0.235</b>
--	14	13	106.72	0.0050	8	0.013	<b>0.0065</b>	0.1099	0.04010	2.058	1.68	<b>0.242</b>
--	13	12	320.19	0.0050	8	0.013	<b>0.0000</b>	0.1099	0.04008	2.057	1.69	<b>0.242</b>
--	12	11	119.29	0.0363	8	0.013	<b>0.0386</b>	0.1131	0.01531	1.595	3.42	<b>0.151</b>
--	11	10	232.62	0.0050	8	0.013	<b>0.0000</b>	0.1131	0.04125	2.074	1.70	<b>0.246</b>
--	10	8	209.04	0.0050	8	0.013	<b>0.0000</b>	0.1131	0.04127	2.074	1.70	<b>0.246</b>
--	9	8	211.76	0.0050	8	0.013	<b>0.0256</b>	0.1387	0.05061	2.196	1.80	<b>0.272</b>
--	8	7	223.63	0.0050	8	0.013	<b>0.0322</b>	0.1709	0.06236	2.333	1.91	<b>0.303</b>
--	7	6	223.63	0.0053	8	0.013	<b>0.0307</b>	0.2016	0.07171	2.431	2.04	<b>0.326</b>
--	6	5	57.68	0.0056	8	0.013	<b>0.0000</b>	0.2016	0.06970	2.411	2.08	<b>0.321</b>
--	5	4	85.46	0.0054	8	0.013	<b>0.0000</b>	0.2016	0.07095	2.423	2.06	<b>0.324</b>
--	4	3	115.72	0.2362	8	0.013	<b>0.0000</b>	0.2016	0.01070	1.456	7.84	<b>0.127</b>
--	3	2	39.61	0.0068	8	0.013	<b>0.0000</b>	0.2016	0.06310	2.341	2.24	<b>0.305</b>
--	2	1	123.23	0.0068	8	0.013	<b>0.0000</b>	0.2016	0.06325	2.342	2.23	<b>0.305</b>

**Flow Contribution by Green River Ranch Business Park**

Pipe Segment	US MH No.	DS MH No.	Length (ft)	Slope (ft/ft)	Dia (in)	n	Proposed ADWF Inflow (cfs)	Proposed PDWF Inflow (cfs)	Existing ADWF System Flow (cfs)	Ultimate Peak Flow (cfs)	% of Ult. Flow Contrib. by Green River Ranch
--	10-01970	New SDO LS	582.00	0.0080	12	0.0130	0.0849	0.2016	0.8600	1.9971	10.09%

# GREEN RIVER RANCH PRELIMINARY SEWER FACILITIES PLAN



### LEGEND

- 8" PROPOSED GRAVITY SEWER
- 8" PROPOSED SEWER FORCE MAIN
- 8" EXISTING GRAVITY SEWER
- 8" EXISTING SEWER FORCE MAIN

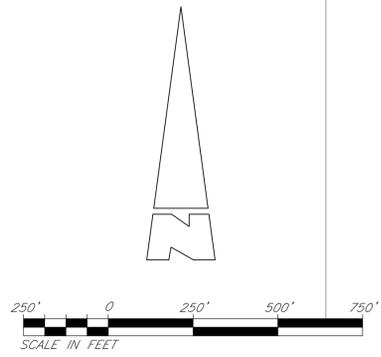


FIGURE 3

**KWC ENGINEERS**  
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R:\19\1886\PRELIM\REPORTS\SEW\FIGURES\FIGURE 3 - PRELIM SEWER FACILITIES.dwg 07/30/2021 18:34



