Appendix "C"

El Sobrante Property Assemblage WMWD Sewer Analysis

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El Sobrante Property Assemblage

WMWD SEWER ANALYSIS

Highland Grove I – Tract 36730

Highland Grove II

Greentree Ranch – TTM 38605

Willow Creek

JN: 10308
CLIENT: Pulte Homes
DATE PREPARED
10/27/2023

SEWER FEASIBILITY ANALYSIS

El Sobrante Property Assemblage

Tract 36730 – Highland Grove I
Highland Grove II
TTM 38605 – Greentree Ranch
Willow Creek

Located in the County of Riverside, CA

Prepared For:

PULTE GROUP

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Job No. 10308
October 27, 2023

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Table of Contents

Section 1 - Introduction

1. Introduction

This report provides for a regional sewer analysis for multiple projects within the El Sobrante Policy Area, herein after referred to as the project assemblage. The projects being analyzed are known as Highland Grove-Tract Map No. 36730, formerly Lake Ranch, a subdivision of approximately 272 lots, Greentree Ranch-Tract No. 38605, a subdivision of 163 lots, Willow Creek, a future subdivision of approximately 206 lots and Highland Grove II, a future subdivision of approximately 160 lots. All projects area located in the County of Riverside, CA, served by Western Municipal Water District (WMWD). The projects are generally located at northeast corner of the intersection of El Sobrante Road and McAllister Street in the Lake Matthews area of Riverside County, located just northerly of the Lake Mathews Dam. This report provides information on projected sewer flows, existing facilities, and recommended facilities associated with serving the project. Figure 1.1 provides a location map for the project.

2. Land Use Plan

Highland Grove I – Tract No. 36730 (Formerly Lake Ranch)

Tract 36730 encompasses a total of approximately 104 acres. Figure 1.2 provides the development plan for the project. The plan includes the development of 272 single family residential lots, one recreation and active open space area, three water quality areas, and 17 openspace lots. The developed pads on the project will range in elevation from approximately 1272 feet to approximately 1327 feet. The pad sizes of the residential lots will range from approximately 5,400 square feet to 10,000 square feet. Highland Grove I is currently approved proposing a lift station for approximately 79 units within the development. It is anticipated with the development of the project assemblage, Highland Grove I will be able to gravity sewer through the property to the North (Willow Creek) and connect into a prior development known as Tramonte - Tract 36475, formerly Citrus Heights II, where existing gravity sewer facility exists within Travertine Drive, therefore eliminating the need for the lift station. As part of this analysis a potential sewer alignment for Highland Grove was studied that follows the proposed circulation within Willow Creek. This proposed alignment is shown in Appendix D. At this time Willow Creek is still in the land planning phase, however the intent of the study was to determine feasibility for the possibility of gravity conveyance, which has been confirmed to be possible.

Highland Grove II – Future Project (Currently does not have a Tract No.)

Highland Gove II encompasses a total of approximately 66 acres. There currently is not a land plan finalized for Highland Grove II, however it is anticipated the plan will include the development of 160 single family residential lots, one recreation and active open space area, one water quality areas, and several openspace lots. The developed pads on the project will range in elevation from approximately 1275 feet to approximately 1350 feet. The pad sizes of the residential lots will range from approximately 6,000 square feet to 10,000 square feet. is anticipated the proposed sewer connection for Highland Grove II will be into Highland Grove I and will utilize the proposed gravity sewer alternative, in lieu of utilizing the lift station, as discussed above.

Greentree Ranch – Tract No. 38605

Tract 38605 encompasses a total of approximately 95.96 acres. Figure 1.3 provides the development plan for the project. The plan includes the development of 163 single family residential lots, one recreation and active open space area, three water quality areas, and multiple openspace and conservation lots. The developed pads on the project will range in elevation from approximately 1292 feet to approximately 1375 feet. The pad sizes of the residential lots will be a minimum of 10,000 square feet. It is anticipated that the proposed connection for Greentree Ranch will be in Travertine Drive as installed by Tramonte - Tract 36475, formerly Citrus Heights II, however will be upstream of the connection proposed for Willow Creek, which also will serving both Highland Grove I and Highland Grove II.

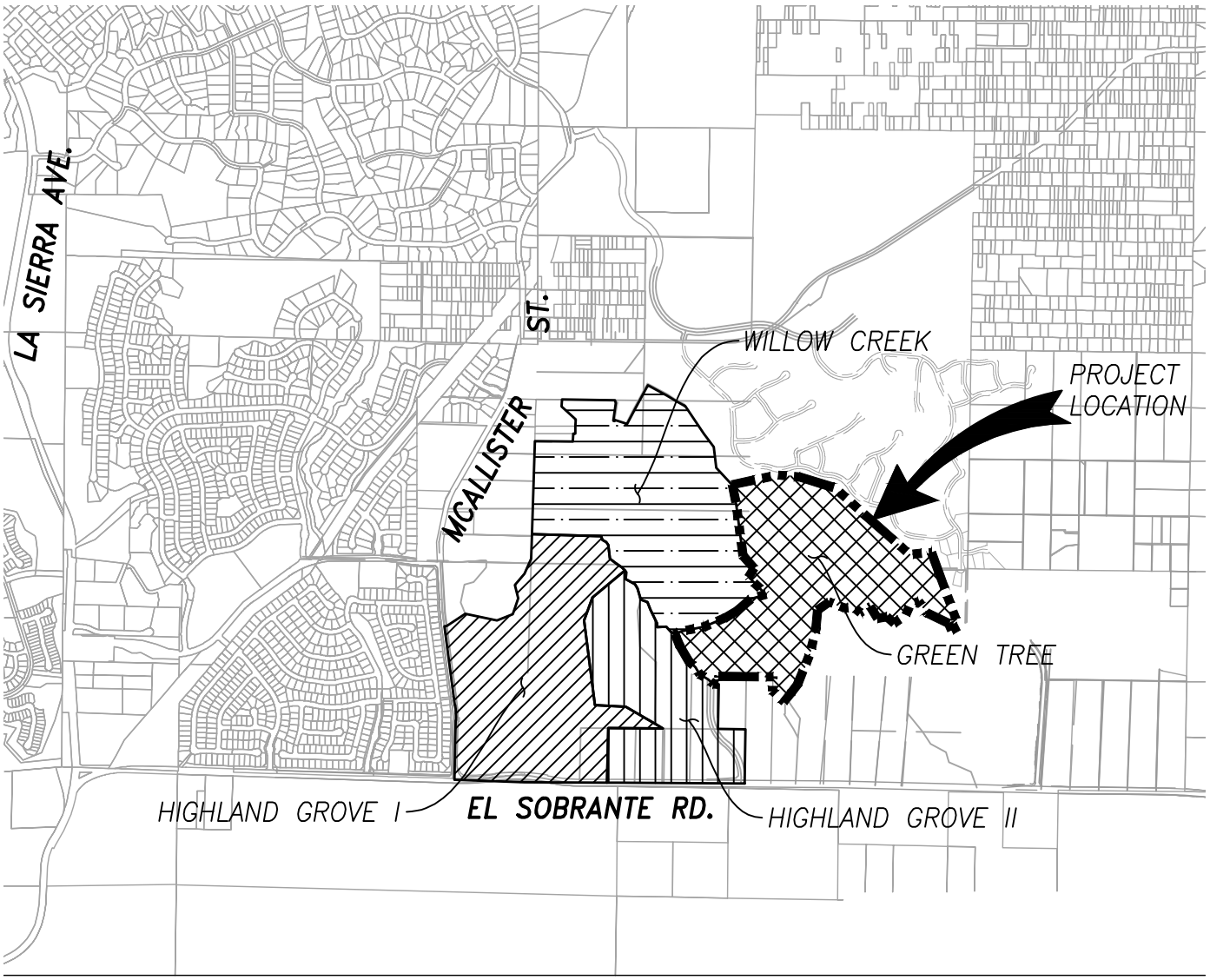
Willow Creek - Future Project (Currently does not have a Tract No.)

Willow Creek encompasses a total of approximately 112.34 acres. There currently is not a land plan finalized for Highland Grove II, however it is anticipated the plan will include the development of 206 single family residential lots, one recreation and active open space area, one water quality area, and several openspace lots. The developed pads on the project will range in elevation from approximately 1195 feet to approximately 1292 feet. The pad sizes of the residential lots will be a minimum of 10,000 square feet. is anticipated the proposed sewer connection for Willow Creek will connect into a prior development known as Tramonte - Tract 36475, formerly Citrus Heights II. Willow Creek is also proposed to facilitate gravity sewer to both Highland Grove I and Highland Grove II thereby eliminating the need for the proposed lift station within Highland Grove I.

3. Purpose of Study

The purpose of this report is to establish the sewer facilities that will be required for the development of Highland Grove I, Highland Grove II, Willow Creek and Greentree Ranch. The sewer analysis will be compatible with the regional planning efforts of WMWD and will ensure that facilities are sized in consideration of future development in the area. A key component to the study will be to analyze the hydraulics of the system to show how the proposed facilities will be integrated with the overall system and meet the operational requirements of the District. Additionally, the study will address feasibility of the removal of the currently proposed lift station within Highland Grove I and demonstrate the feasibility of downstream gravity conveyance while considering future flows from all regionally proposed projects.

4. Figure 1.1 Location Map



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SCALE: 1" = 2000'

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FIGURE 1.1
VICINITY MAP

GREEN TREE
TTM 38605

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5. Figure 1.2 Land Use Map - Highland Grove I – Tract No. 36730

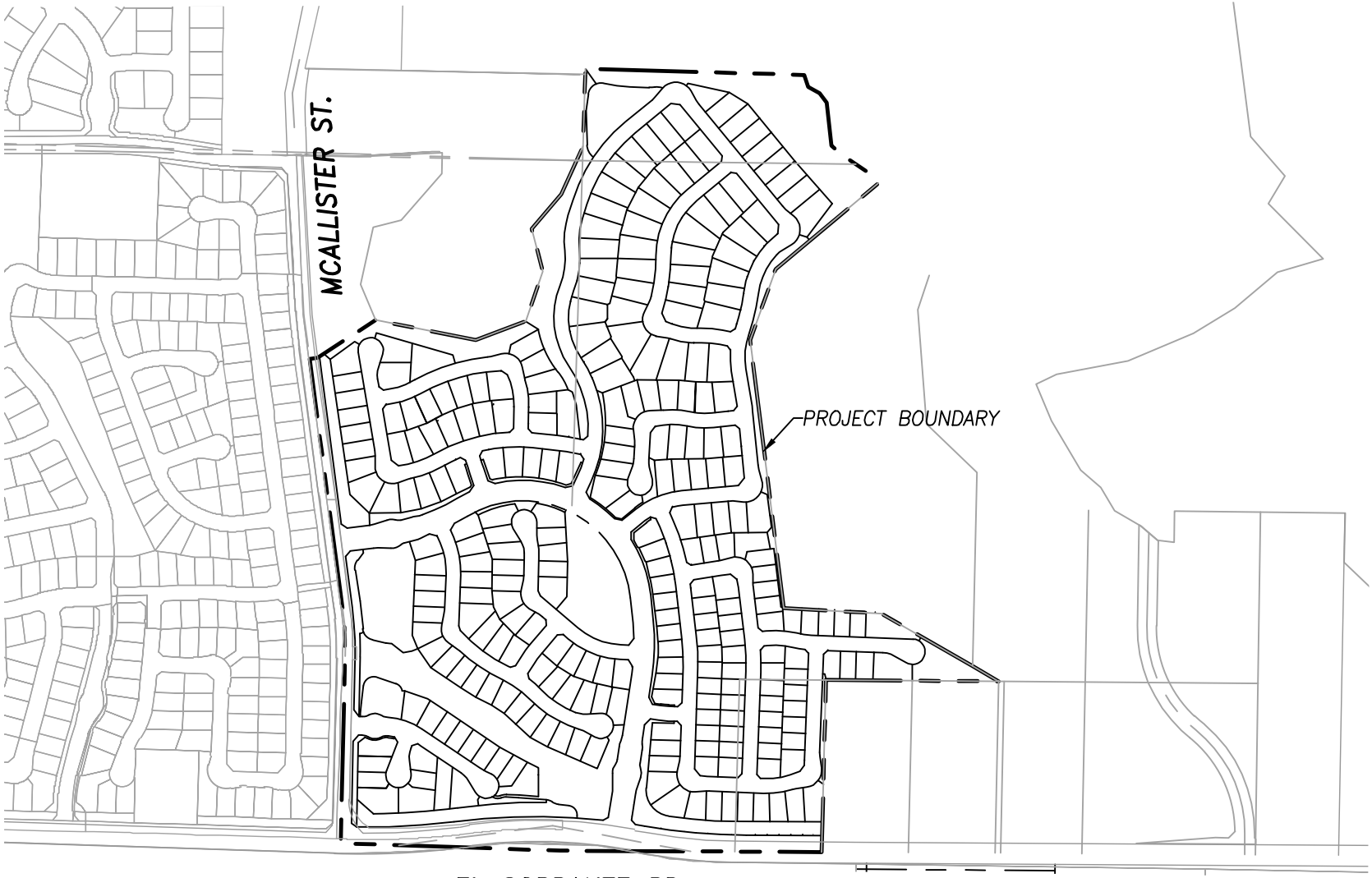

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FIGURE 1.2

LAND USE PLAN

HIGHLAND GROVE I
TTM 36730

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6. Figure 1.3 Land Use Map - Greentree Ranch – Tract No. 38605

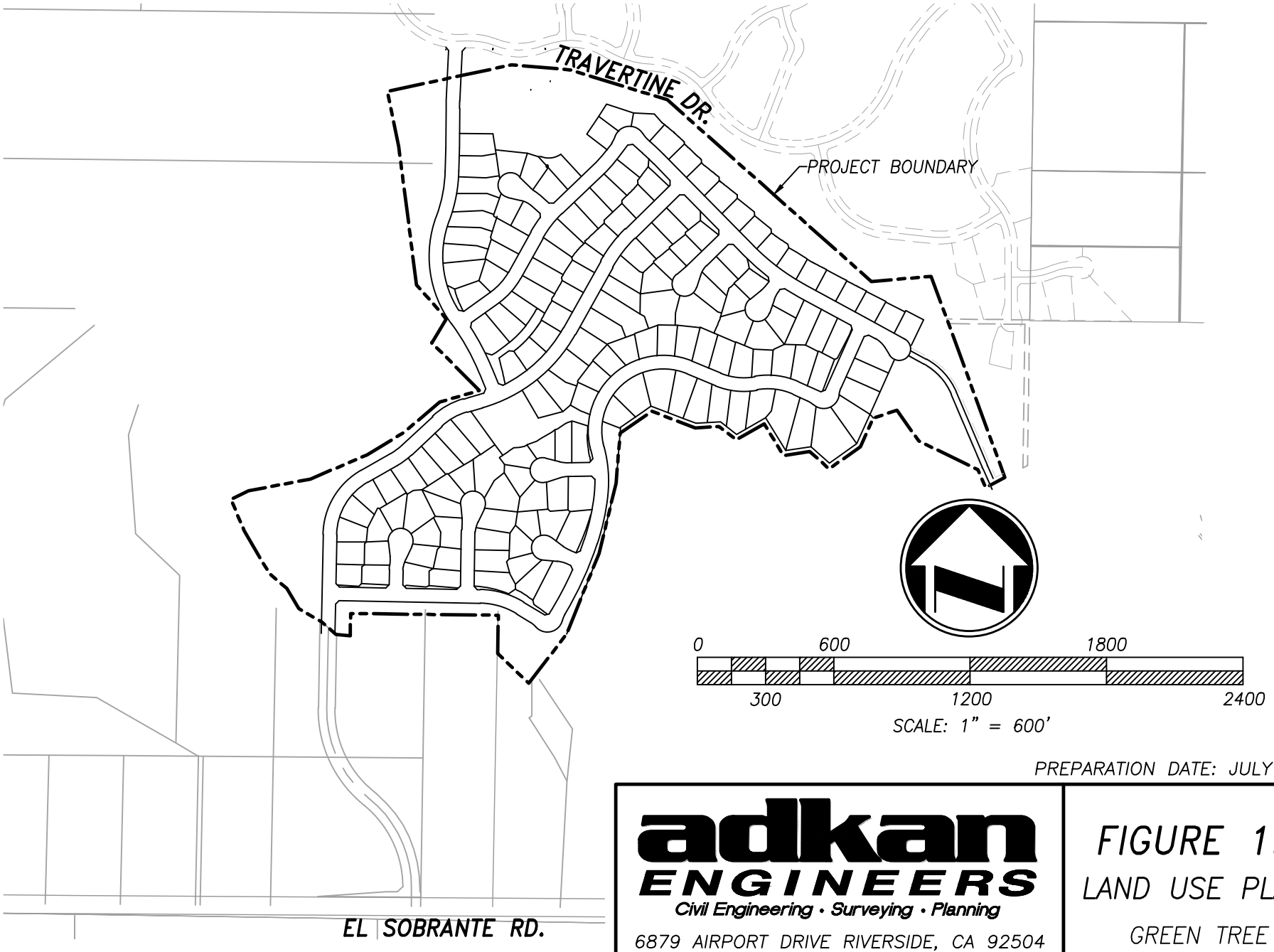

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FIGURE 1.3
LAND USE PLAN
GREEN TREE
TTM 38605

U:\Projects\FOREMOST COMMUNITIES\8794\Waddell\EXHIBIT\HIGHLAND GROVE I LAND USE FIGURE 1.2.dwg

Section 2 – Planning Criteria and Projected Flows

This section presents the planning criteria used to evaluate sewer system requirements for project assemblage. Unless otherwise noted, the criteria utilized in this study are in accordance with the WMWD Sewer Master Plan (Albert A. WEBB 2014) and the WMWD Developers handbook (revised January 2011). Additionally, peaking factors based on a current WMWD master plan update, and provided per the direction of WMWD, were utilized in lieu of the peaking factors per the WMWD Developers Handbook. This criterion is used primarily for sizing of proposed improvements to serve the project.

1. Sewer Generation and Peaking Factors

To convert proposed land uses to projected average sewer flows, sewer generation factors are used for the various land use types. The residential sewer generation factor utilized in the study is 200 gpd/unit for single family residential development as described in the WMWD Sewer Master Plan, Section 3. The active recreational area was assumed to have a generation rate of 1,000 gpd/acre to account for community restrooms that may be located at the site.

To covert from average flows to peak wet weather flows, the WMWD peaking factor chart was used. The peaking factor was provided by WMWD and is reflective of data reading taken from flume meters within the Arizona Trunk Line. While these peaking factors have not been formally published they will be included within the WMWD Riverside Master Plan update. The unpublished peaking factors based on the flume meter monitoring have been provided by WMWD and are included within Appendix "A" of this analysis.

2. Gravity Sewers

WMWD guidelines require collection sewers 12-inch diameter and smaller to convey peak flow with a maximum depth-to-diameter (d/D) ratio of 0.50 and 15-inch diameter and greater to convey peak flows with a maximum depth to diameter (d/D) ratio of 0.75. Manning's formulas with a roughness coefficient of "n" of 0.013 is used to evaluate gravity sewer line sizing.

3. Sewer Slope Criteria

To prevent the deposition of solids, gravity sewer lines are generally designed to maintain a minimum flow velocity of 2.0 feet per second. Table 2-1 summarizes the preferred minimum slopes and minimum slopes for pipes 18-inch and smaller.

Table 2-1 Minimum Gravity Sewer Slope Criteria		
Pipe Diameter, Inches	**Preferred Minimum Slope, ft/ft (3 fps)**	**Minimum Slope, ft/ft (2 fps)**
8	0.0076	0.0034
10	0.0058	0.0026
12	0.0044	0.002
15	0.0033	0.0015
18	0.0025	0.0013

4. Projected Sewer Flows

Table 2.2 provides the sewer flow projection for the project assemblage. As shown, the projected average sewer flow is 0.1278 mgd. Using the peaking factor chart from Appendix A, the projected peak flow is 0.2070 mgd (peak factor = 1.62).

Table 2-2 Tract 37593 – Projected Sewer Flow			
Land Use	**Quantity**	**Generation Factor**	**Total Average Flow (GPD)**
Highland Grove I	79 units	200 gpd/unit*	18,000
Highland Grove II	160 units	200 gpd/unit*	32,000
Greentree Ranch	163 Units	200 gpd/unit*	32,600
Will Creek	206 Units	200 gpd/unit*	41,200
Recreation Center	4 Parks	1,000 gpd/park	4,000
Total			**127,800**

*200 gpd/unit generation factor was used for development of projected flows as outlined within Section 3 of the WMWD Sewer Master Plan.

Section 3 – Existing Sewer Facilities

Existing regional facilities pertinent to the project assemblage consist of collection and treatment facilities. Figure 3-1 graphically shows existing regional facilities in the vicinity of the project and a brief discussion is provided below.

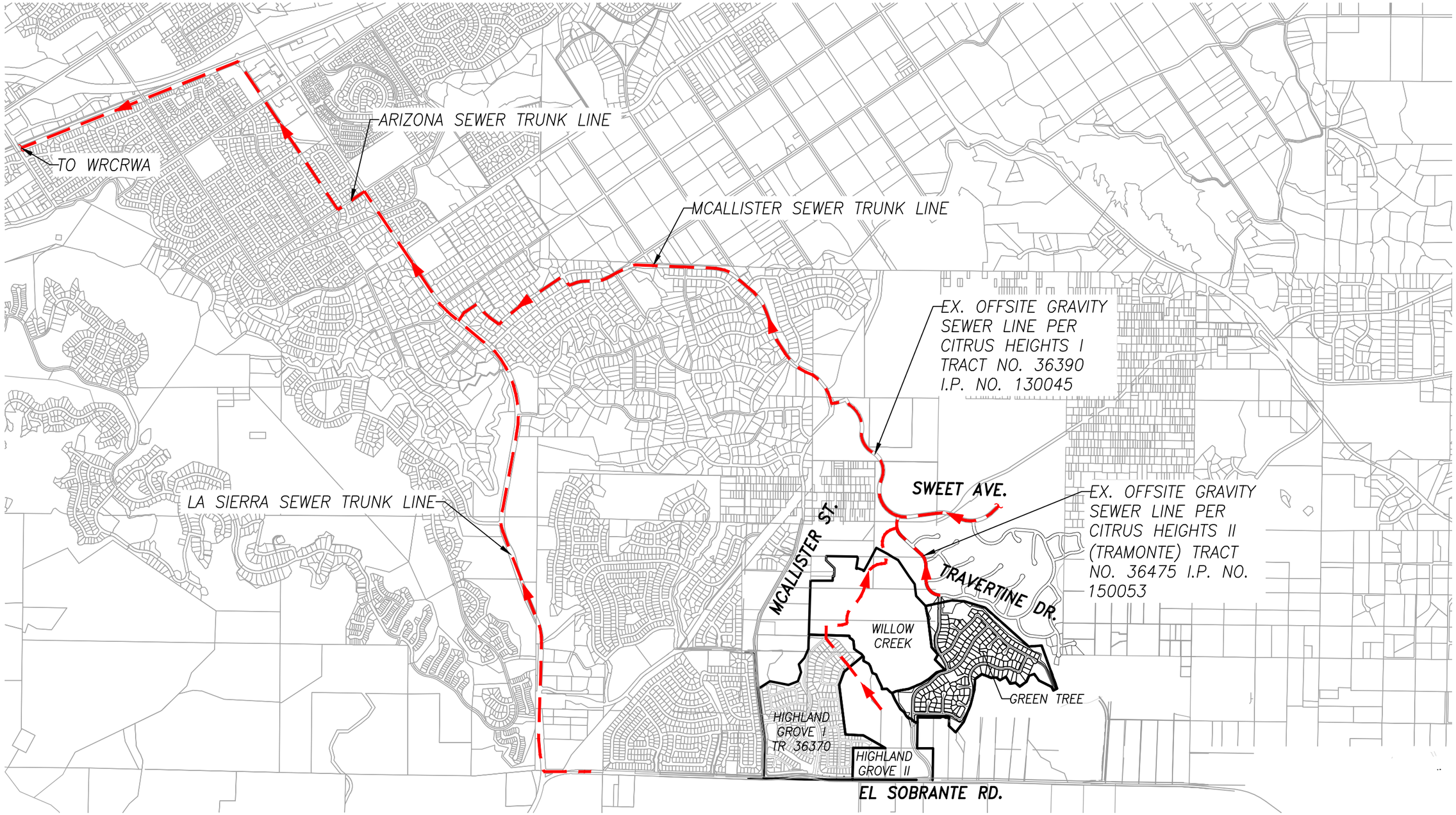
1. Sewer Collection System

The WMWD sewer service area is broken into the West Sewer Service Ares and the East Sewer Service Area. The project assemblage is in the West Sewer Service Area. The West Sewer Service Area is further broken down into several trunk sewer systems. The project assemblage is located to the east of the existing trunk sewer systems. The project assemblage will flow by gravity to the northwest to the McAllister Trunk Sewer. This trunk sewer coneys flows north and west to the Arizona Trunk Sewer. Flows are then conveyed north and west to the Sampson Trunk Line that conveys flows to the South Regional Lift Station. The South Regional Lift Station pumps flows to the Western County Regional Wastewater Authority (WRCRWA) for treatment.

2. Treatment

All flows from the project assemblage will be conveyed to the WRCRWA for treatment and re-use or disposal. This plant was brought on line in 1998 and has a capacity of 8.0 mgd. The plant can be expanded up to 32 mgd in the future. WMWD currently has capacity rights of 1.93 mgd in this facility. The plant is designed with tertiary equipment such that the facility produces recycled water that meets California Title 22 requirements.

3. Figure 3.1 Existing Sewer Facilities



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LEGEND

PROJECT BOUNDARY

EXISTING SEWER TRUNK LINE

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FIGURE 3.1
EXISTING SEWER TRUNK FACILITIES
TTM 38605

Section 4 – Proposed Sewer Facilities

To receive gravity sewer services, the project assemblage will be required to construct onsite gravity sewer lines and construct offsite sewer facilities to convey flow to the existing sewer collection system. Figure 4-1 provides the proposed sewer facilities for the project and a brief summary is provided below.

1. Onsite Sewer System

To convey sewer from the project, an onsite gravity sewer collection system will be required. This system will generally covey flow from south to north to low points located within both Greentree Ranch and Will Creek. From these low points, gravity sewer lines will be constructed north in easements to the property boundary for conveyance through two offsite sewer lines. The onsite and offsite easements will be per WMWD requirements, including adequate access.

2. Onsite Sewer System Analysis

Hydraulic calculations were performed to analyze the recommended backbone onsite gravity sewer system. Appendix B provides the calculations and Exhibit A provides the corresponding node diagram. Slope information for onsite sewers was based on preliminary street grades and should be verified during final design process. The gravity sewer lines were sized to accommodate any offsite flows from the upstream project assemblage.

3. Offsite Sewer System

To convey flow from the project assemblage by gravity, offsite sewer lines to the north to connect to the existing 8-inch sewer line in Travertine Drive of the Tramonte Project – Tract 36475 will be required. The offsite sewer alignments are conceptual at this point and are shown within Appendix C for reference. These preliminary alignments confirm the ability of gravity flow to the existing sewer line and provides the property ownerships along the alignment. The conceptual alignments allow the sewer line to be constructed at a minimum slope of 1.0 percent with adequate access over the entire alignments. The sizing of this offsite gravity sewer and impact of the project assemblage flows on the downstream sewer system have been evaluated to the La Sierra Trunk Sewer based on tract maps and sewer improvement plans provided by WMWD.

The analysis in Appendix B indicated that the existing sewer system has capacity for the project assemblage. All downstream sewer segments have capacity and fall below the d/D threshold for the corresponding pipe sizes.

4. Figure 4.1 Proposed Sewer Facilities

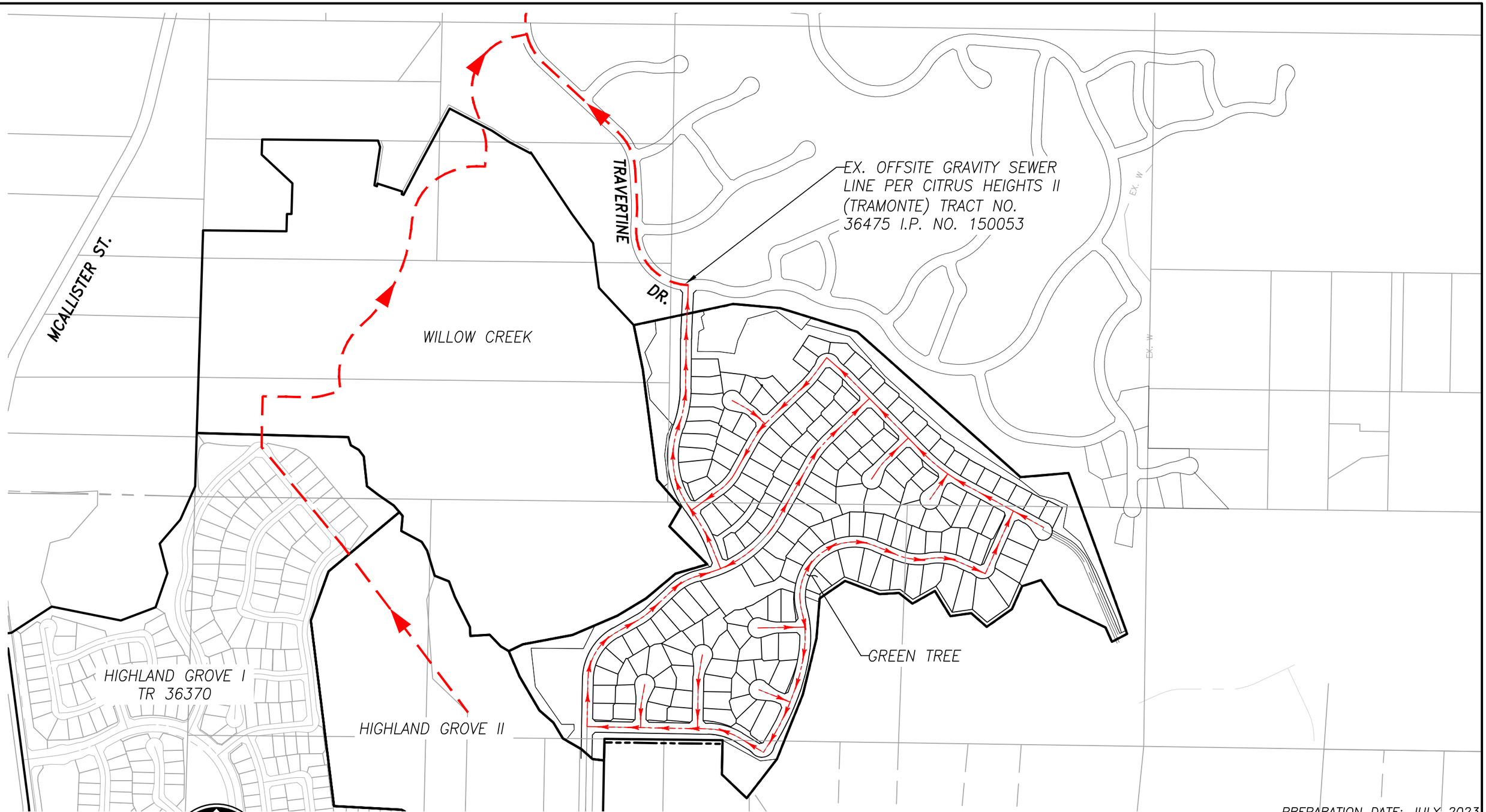

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FIGURE 4.1
PROPOSED SEWER SYSTEM
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Appendix A – Peaking Factor Curve

Sewer Peaking Factor Summary provided by Ginger Han, Principal Engineer, on October 10, 2023 to be utilized to determine sewer generation for d/D flow analysis.

Table 3-19: March 2020 Sewer Peaking Factor Summary

Flow Meter	ADWF (MGD)	PWWF (MGD)	Peaking Factor
WWRF Meters			
Dauchy	0.18	0.32	1.81
Gamble	0.05	0.23	4.12
LS 1269	0.15	0.90	6.14
Meridian	0.61	0.81	1.32
WWRF Influent Meter	0.98	3.96	4.04
WRCRWA Meters			
Arizona	0.92	1.49	1.62
Fillmore	0.17	0.38	2.22
Buchanan	0.17	0.34	1.95
McKinley	0.27	0.38	1.45
Home Gardens*	0.53	2.33	4.37
Norco Cota*	1.10	3.70	3.36
South Regional Lift Station	3.14	9.72	3.10

* Point source load

Appendix B – Sewer System Analysis

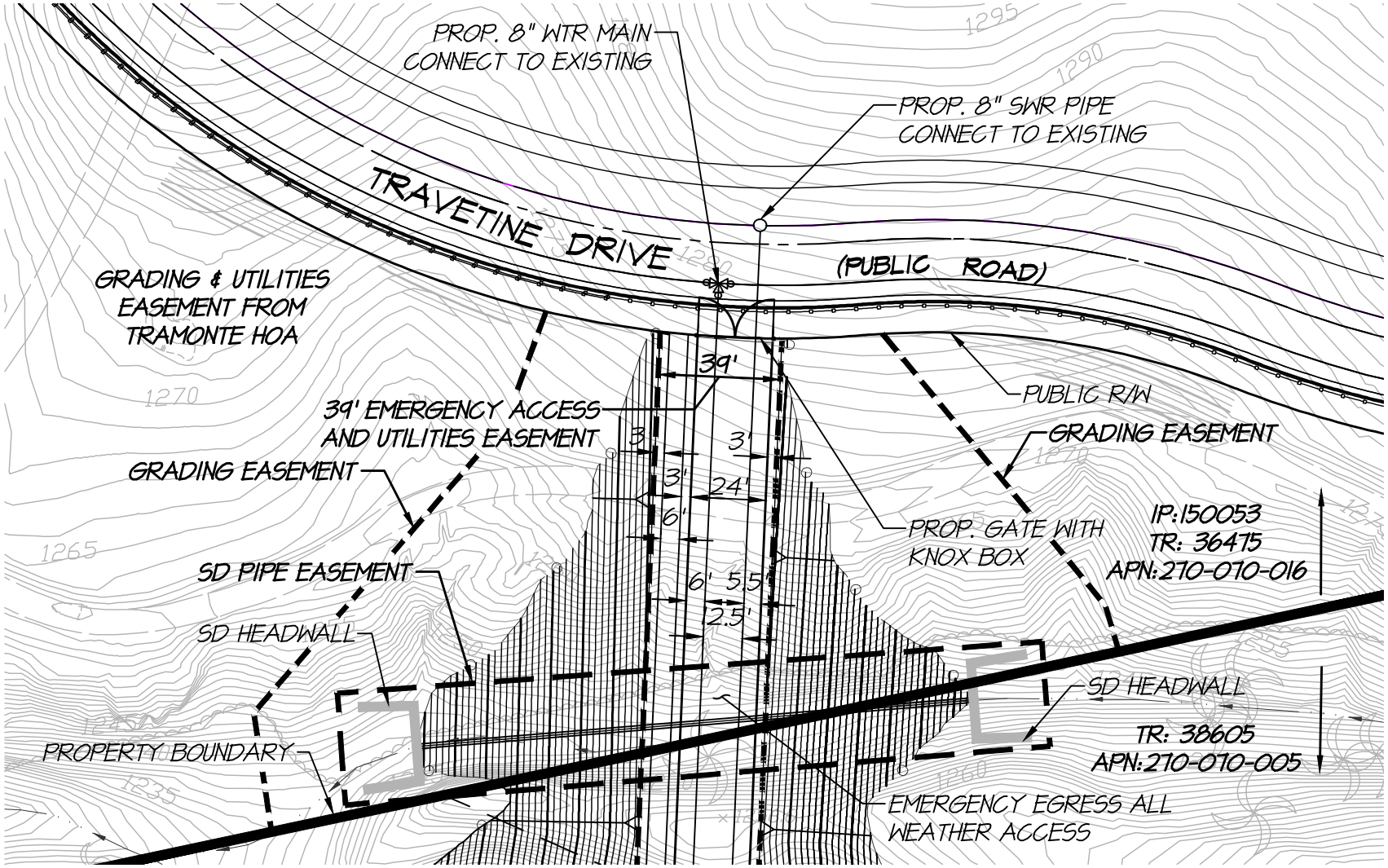
Sewer Study Summary

Date:	10/27/2023		For:	Greentree Ranch	By:	Adkan Engineers			Client:	Pulte Homes				
From	To	In-Line Flow (gpd)	Avg Dry Waether Flow (gpd)	Avg Dry Waether Flow (mgd)	Peaking Factor	Peak Wet Weather Flow	M.G.D.	C.F.S.	Line Size (Inches)	Design Slope (%)	dn (feet)	dn/D	Velocity (f.p.s.)	Remarks
4	E61	33600	33,600	0.034	1.62	54432	0.054	0.0842	8	1.00	0.11	0.17	2.14	163 units from Greentree and Park
E61	E60	15400	49,000	0.049	1.62	79380	0.079	0.1228	8	6.60	0.09	0.13	4.61	77 units from Tract 36475
E60	E59	0	49,000	0.049	1.62	79380	0.079	0.1228	8	5.43	0.09	0.14	4.13	
E59	E58	4200	53,200	0.053	1.62	86184	0.086	0.1333	8	4.40	0.10	0.15	4.06	21 units from Tract 36475
E58	E57	3400	56,600	0.057	1.62	91692	0.092	0.1419	8	4.11	0.11	0.16	3.94	17 units from Tract 36475
E57	E56	0	56,600	0.057	1.62	91692	0.092	0.1419	8	6.30	0.09	0.14	4.78	
E56	E55	2200	58,800	0.059	1.62	95256	0.095	0.1474	8	6.85	0.09	0.14	4.96	11 units from Tract 36475
1	2	33000	33,000	0.033	1.62	53460	0.053	0.0827	8	1.00	0.11	0.17	2.10	160 units from Highland Grove II and Park
2	3	16800	49,800	0.050	1.62	80676	0.081	0.1248	8	1.00	0.14	0.21	2.34	79 units from Highland Grove I and Park
3	E54	42200	92,000	0.092	1.62	149040	0.149	0.2306	8	1.00	0.19	0.29	2.74	206 units from Willow Creek and Park
E54	E53	0	150,800	0.151	1.62	244296	0.244	0.3780	8	6.35	0.15	0.23	6.23	
E53	E52	0	150,800	0.151	1.62	244296	0.244	0.3780	12	0.50	0.26	0.26	2.33	
E52	E51	68800	219,600	0.220	1.62	355752	0.356	0.5504	12	0.40	0.33	0.33	2.44	45 units from Tract 36475 and 299 units from Tract 36390
E51	E50	0	219,600	0.220	1.62	355752	0.356	0.5504	12	0.50	0.31	0.31	2.65	
E50	E49	0	219,600	0.220	1.62	355752	0.356	0.5504	12	0.50	0.31	0.31	2.65	
E49	E48	1600	221,200	0.221	1.62	358344	0.358	0.5544	12	0.50	0.31	0.31	2.67	8 units from Tract 36390
E48	E47	0	221,200	0.221	1.62	358344	0.358	0.5544	12	0.50	0.31	0.31	2.67	
E47	E46	0	221,200	0.221	1.62	358344	0.358	0.5544	12	2.22	0.21	0.21	4.62	
E46	E45	4400	225,600	0.226	1.62	365472	0.365	0.5655	12	0.50	0.32	0.32	2.61	22 units from Tract 36390
E45	E44	0	225,600	0.226	1.62	365472	0.365	0.5655	12	3.13	0.20	0.2	5.06	
E44	E43	2800	228,400	0.228	1.62	370008	0.370	0.5725	12	3.88	0.19	0.19	5.51	14 units from Tract 36390
E43	E42	0	228,400	0.228	1.62	370008	0.370	0.5725	12	0.34	0.35	0.35	2.34	
E42	E41	0	228,400	0.228	1.62	370008	0.370	0.5725	12	0.34	0.35	0.35	2.34	
E41	E40	0	228,400	0.228	1.62	370008	0.370	0.5725	12	0.50	0.32	0.32	2.64	
E40	E39	0	228,400	0.228	1.62	370008	0.370	0.5725	12	0.50	0.32	0.32	2.64	
E39	E38	0	228,400	0.228	1.62	370008	0.370	0.5725	12	0.50	0.32	0.32	2.64	
E38	E37	0	228,400	0.228	1.62	370008	0.370	0.5725	12	6.48	0.17	0.17	6.47	
E37	E36	0	228,400	0.228	1.62	370008	0.370	0.5725	12	6.72	0.16	0.16	7.06	
E36	E35	0	228,400	0.228	1.62	370008	0.370	0.5725	12	6.55	0.16	0.16	7.06	
E35	E34	0	228,400	0.228	1.62	370008	0.370	0.5725	12	4.98	0.18	0.18	5.96	
E34	E33	1200	229,600	0.230	1.62	371952	0.372	0.5755	12	1.88	0.23	0.23	4.22	6 units from Tract 30337
E33	E32	0	229,600	0.230	1.62	371952	0.372	0.5755	12	3.72	0.19	0.19	5.54	
E32	E31	5600	235,200	0.235	1.62	381024	0.381	0.5895	12	4.20	0.19	0.19	5.67	28 units from Tract 30337
E31	E30	0	235,200	0.235	1.62	381024	0.381	0.5895	12	3.96	0.19	0.19	5.67	
E30	E29	400	235,600	0.236	1.62	381672	0.382	0.5905	12	6.56	0.17	0.17	6.67	2 units from Tract 30337
E29	E28	17600	253,200	0.253	1.62	410184	0.410	0.6346	12	3.37	0.21	0.21	5.29	88 units from Tract 30337
E28	E27	0	253,200	0.253	1.62	410184	0.410	0.6346	12	6.51	0.17	0.17	7.17	
E27	E26	0	253,200	0.253	1.62	410184	0.410	0.6346	12	1.07	0.28	0.28	3.53	
E26	E25	0	253,200	0.253	1.62	410184	0.410	0.6346	12	2.93	0.21	0.21	5.29	
E25	E24	0	253,200	0.253	1.62	410184	0.410	0.6346	12	2.09	0.23	0.23	4.65	
E24	E23	16600	269,800	0.270	1.62	437076	0.437	0.6763	12	1.17	0.28	0.28	3.76	83 units from Tract 30337
E23	E22	0	269,800	0.270	1.62	437076	0.437	0.6763	12	2.13	0.24	0.24	4.67	
E22	E21	0	269,800	0.270	1.62	437076	0.437	0.6763	12	1.84	0.25	0.25	4.40	
E21	E20	0	269,800	0.270	1.62	437076	0.437	0.6763	12	0.40	0.37	0.37	2.56	
E20	E19	0	269,800	0.270	1.62	437076	0.437	0.6763	12	0.40	0.37	0.37	2.56	
E19	E18	2600	272,400	0.272	1.62	441288	0.441	0.6828	12	0.85	0.30	0.3	3.45	13 units from Tract 30295
E18	E17	0	272,400	0.272	1.62	441288	0.441	0.6828	12	1.49	0.26	0.26	4.21	
E17	E16	10200	282,600	0.283	1.62	457812	0.458	0.7083	12	7.18	0.18	0.18	7.37	51 units from Tract 30295
E16	E15	0	282,600	0.283	1.62	457812	0.458	0.7083	12	2.65	0.23	0.23	5.19	
E15	E14	2400	285,000	0.285	1.62	461700	0.462	0.7144	12	4.03	0.21	0.21	5.96	12 units from Tract 30295
E14	E13	0	285,000	0.285	1.62	461700	0.462	0.7144	12	1.00	0.30	0.3	3.60	
E13	E12	4000	289,000	0.289	1.62	468180	0.468	0.7244	15	0.15	0.45	0.36	1.82	20 units from Tract 30295
E12	E11	1200	290,200	0.290	1.62	470124	0.470	0.7274	15	0.15	0.45	0.36	1.83	6 units from Tract 30295
E11	E10	1000	291,200	0.291	1.62	471744	0.472	0.7299	15	0.15	0.45	0.36	1.84	5 units from Tract 30295
E10	E9	1000	292,200	0.292	1.62	473364	0.473	0.7324	15	0.15	0.46	0.37	1.77	5 units from Tract 30295
E9	E8	1000	293,200	0.293	1.62	474984	0.475	0.7349	15	0.15	0.46	0.37	1.78	5 units from Tract 30295
E8	E7	1000	294,200	0.294	1.62	476604	0.477	0.7374	15	0.15	0.46	0.37	1.79	5 units from Tract 30295

E7	E6	10800	305,000	0.305	1.62	494100	0.494	0.7645	15	0.66	0.31	0.25	3.19	54 units from Tract 30295
E6	E5	2800	307,800	0.308	1.62	498636	0.499	0.7715	15	1.00	0.29	0.23	3.62	14 units from Tract 30295
E5	E4	400	308,200	0.308	1.62	499284	0.499	0.7725	15	1.46	0.26	0.21	4.12	2 units from Tract 30295
E4	E3	400	308,600	0.309	1.62	499932	0.500	0.7735	15	1.00	0.29	0.23	3.63	2 units from Tract 30295
E3	E2	1000	309,600	0.310	1.62	501552	0.502	0.7760	15	0.71	0.31	0.25	3.23	5 units from Tract 30295
E2	E1	1200	310,800	0.311	1.62	503496	0.503	0.7790	15	4.29	0.20	0.16	6.15	6 units from Tract 30295

Appendix C – Preliminary Offsite Sewer Alignments

TTM 38605 ACCESS, UTILITIES, AND GRADING EXHIBIT



NOTE:

THIS EXHIBIT HAS BEEN PREPARED FOR DISCUSSION PURPOSE ONLY. FINAL DESIGN IS SUBJECT TO REVIEW AND APPROVAL BY THE COUNTY OF RIVERSIDE AND WESTERN MUNICIPAL WATER DISTRICT.

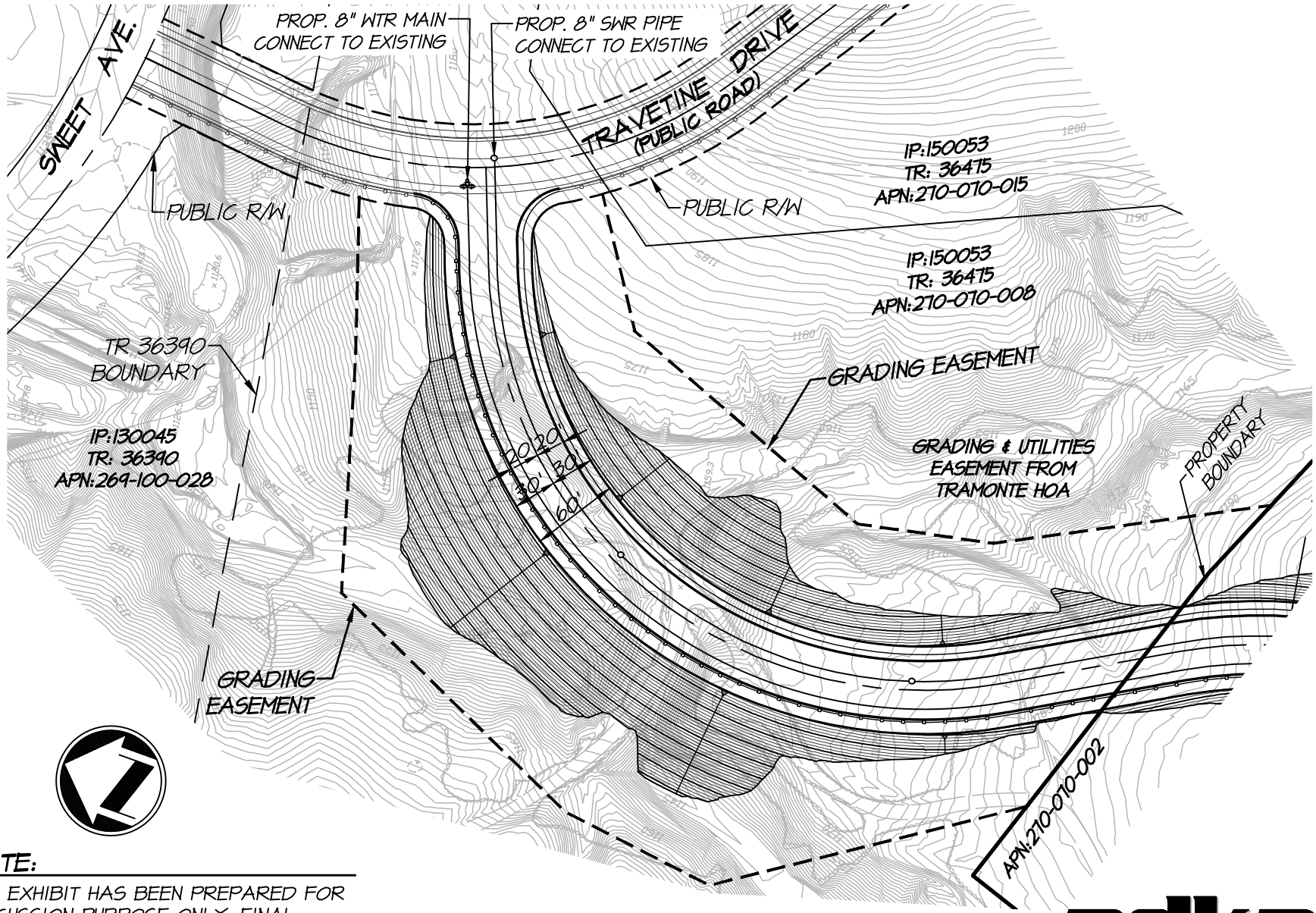
0 50 150

25 100 200

SCALE: 1" = 50'

adkan ENGINEERS
Civil Engineering · Surveying · Planning
6879 Airport Drive, Riverside, CA 92504
Tel:(951) 688-0241 · Fax:(951) 688-0599

WILLOW CREEK ACCESS, UTILITIES, AND GRADING EXHIBIT



NOTE:

THIS EXHIBIT HAS BEEN PREPARED FOR DISCUSSION PURPOSE ONLY. FINAL DESIGN IS SUBJECT TO REVIEW AND APPROVAL BY THE COUNTY OF RIVERSIDE AND WESTERN MUNICIPAL WATER DISTRICT.

0 100 300

50 200 400

SCALE: 1" = 100'

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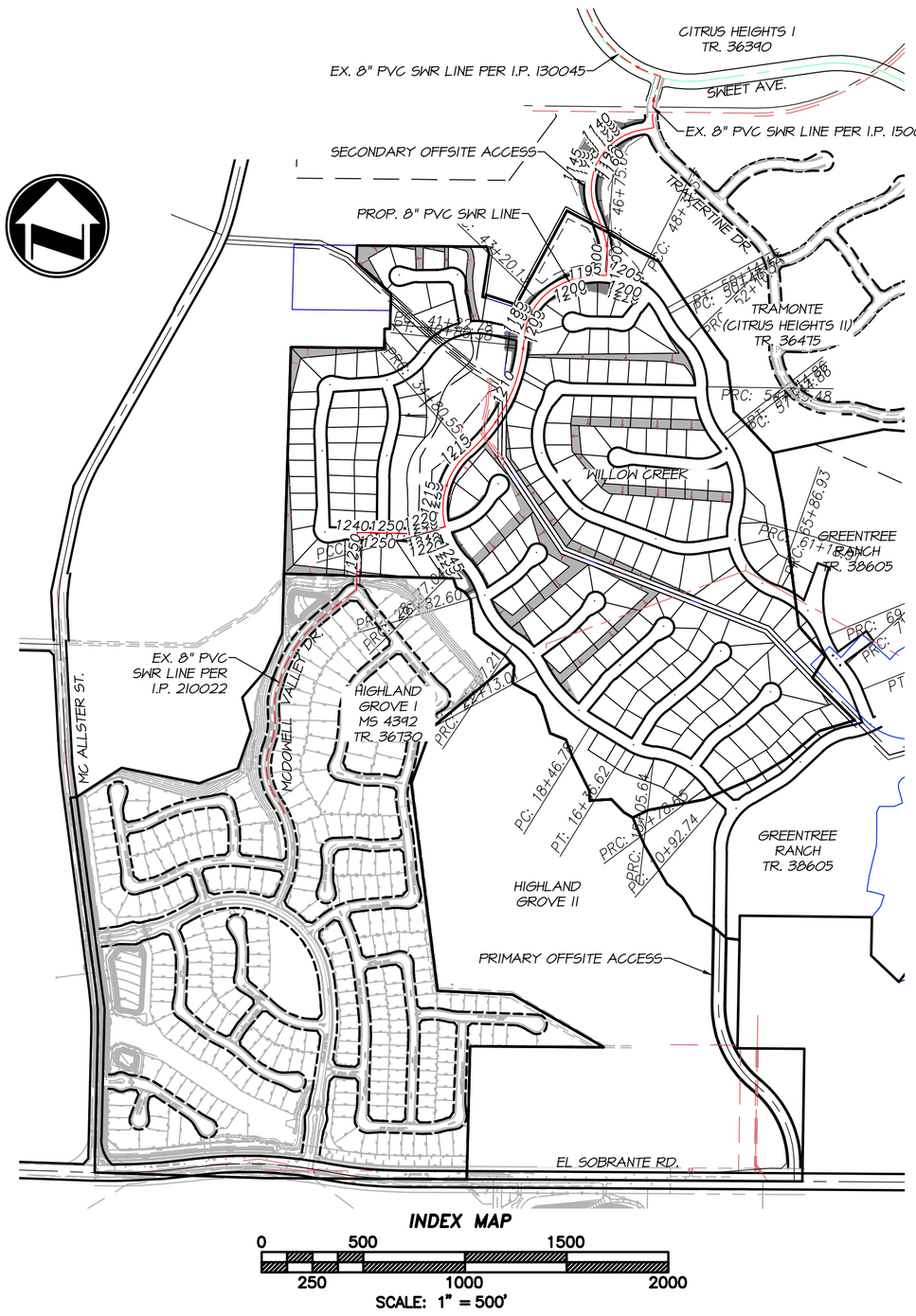
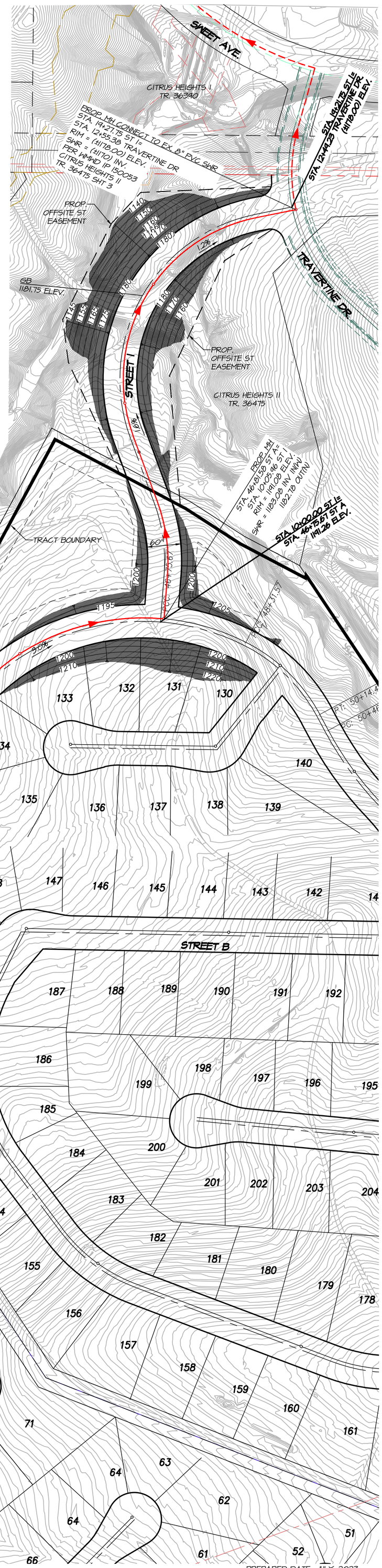
Appendix D – Preliminary Highland Grove Alignment through Willow Creek

This figure depicts the current sewer alignment to allow for Highland Grove I to gravity sewer through Willow Creek and into the existing Tramonte Development. This alignment is currently based on the proposed land plan for Willow Creek.

WILLOW CREEK SEWER ACCESS EXHIBIT





PREPARED DATE: JULY, 2023

PLANS PREPARED BY:

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