

TECHNICAL MEMORANDUM

To: Keith Linker
From: Mike Swan
Date: December 15, 2016
Subject: Sewer Study – 901 East South Street
City Project Tracking No.: OTH2016-00908



Introduction

The purpose of this memorandum is to document a sewer study prepared for a proposed project that would include the demolition of the existing building at the site and the development of a total of 530 homes, including 72 2- and 3-story single family homes, 73 3-story townhomes, 89 3-story court townhomes, and 296 wrap apartment units. The project is proposed to be constructed on Assessor Parcel No. (APN) 037-271-24, approximately 10.37 acres, and APN 037-130-29, approximately 10.31 acres, with the site totaling approximately 20.7 acres. The site is bounded on the south by East South Street, on the west by the railroad right-of-way, on the east by a recycling center and other industrial land uses, and on the north by East Santa Ana Street as shown on Figure 1.

Existing and Proposed Land Use and Sewer Flow

Currently, APN 037-271-24 and APN 037-130-29 are currently industrial land uses. According to the draft First Revision to the Combined Central Anaheim Area Master Plan of Sanitary Sewers (CCAAMPSS) the land use included in the Existing System computer model scenario included the entire site's acreage loaded as industrial land use to the existing 18-inch VCP sewer running along East South Street.

The proposed 530 homes are proposed to be loaded to manhole SW094233 on the 18-inch East South Street sewer, the same manhole to which the site is loaded in the current CCAAMPSS model. The existing and proposed manhole loading with flow generation is summarized in Table 1. Flow factors are in gallons per day (gpd)/acre and gpd/dwelling unit (DU). The existing downstream sewer collection system and the location of the proposed project site are shown on Figure 2.

Based on the CCAAMPSS, the Existing System Scenario included the flows shown in Table 2, with this table also showing the average flow increases due to the proposed project. The existing flow factor for industrial land uses from the CCAAMPSS was 830 gpd/acre. For this detailed sewer study, the proposed flow factors are 250 gpd/DU for single family residences, 240 gpd/DU for townhomes, and 210 gpd/DU for apartments, consistent with the CCAAMPSS. Other ancillary uses such as clubhouses and pools are accounted for in these flow factors and this proposed site does have other uses including three "recreation areas" which include one pool each. As shown in Table 2, the total average daily flow increase to the sewer collection system is 101,876 gpd with the proposed land use (119,040 - 17,164).

Table 1 – Existing and Proposed Manhole Flow Loading

Manhole Number	Existing/Proposed	Units		Flow Factor (gpd/unit)	Existing Flow Rate (gpd)	Proposed Flow
		Acres	DUs			
SW094233						
Miscellaneous Industrial	Existing	20.68		830	17,164	-
Total Flow to SW094233					17,164	-
SW094233						
Single Family Residential	Proposed		72	250	-	18,000
Townhomes	Proposed		162	240	-	38,880
Apartments	Proposed		296	210	-	62,160
Total Flow to SW094233					-	119,040

Table 2 – Existing and Proposed Flow Increases Due to Proposed Project

Project Parcels	Land Use	Units		Flow Factor (gpd/unit)	Flow Rate
		Acres	DUs		
Existing Average Flow					
Miscellaneous Industrial	Industrial	20.68		830	17,164
Total Existing Flow					17,164
Proposed Project Average Flow					
Single Family Residential	Residential		72	250	18,000
Townhomes	Residential		162	240	38,880
Apartments	Residential		296	210	62,160
Total Proposed Flow					119,040
Average Flow Increase					101,876

Existing Condition Sewer Analysis

The Existing Condition Scenario plus the project flows and depth-to-Diameter (d/D) ratios for the sewer collection system from the hydraulic model for the CCAAMPSS are shown in Table 3.

The downstream sewer collection system impacted by the increased flow from this proposed project covers a substantial area and include flow splits at multiple diversion points as shown on Figure 2. Figure 3 details the two diversions at Vermont Avenue and Lemon Street as well as the parallel sewers in Lemon Street between Vermont Avenue and Ball Road. It should be noted that for this study, the sewer collection system analysis was stopped at Vermont Street where it meets the 5-Freeway, and at Lemon Street where it meets Ball Road, instead of continuing the study all the way to an outlet. This is because by the time project flows reach these two locations, the sewers are large enough that the added flow is negligible compared to the capacity of the sewer system and d/D ratios at buildout are well below capacity limits.

At the 5-Freeway, the existing sewer is a 33-inch VCP with a d/D of 0.61 at peak conditions and the increased flow from the proposed project results in a d/D increase of less than 1%. At Ball

Road, the proposed project flow discharges into a parallel Lemon Street sewer system, an 18-inch and a 24-inch VCP. The existing 18-inch sewer has a d/D of 0.60 and existing 24-inch sewer has a d/D 0.46 at peak conditions. The proposed project would only increase the d/D in the parallel sewer system in Ball Road by about 3%. There are currently no deficiencies around either of these areas. For these reasons, the effects of this project past these points downstream were considered negligible for this sewer study.

As seen in Table 3, Existing Scenario, there are five deficiencies in the 15-inch sewer in Lemon Street, just north of Ball Road. These deficiencies are present in the CCAAMPSS and are listed in the Capital Improvement Program as #27. This proposed development project would only add an approximately 3% increase to the d/D values in this sewer. The 15-inch sewer in Lemon Street north of Ball Road is also discussed in the alternative sewer improvements chapter of the CCAAMPSS. Currently, there is a diversion north of the 15-inch Lemon Street sewer, at Vermont Avenue. In the current hydraulic model, this diversion sends 60% of the flow down Vermont Avenue and the remaining 40% of the flow down Lemon Street. By increasing this split to send a greater amount of flow either down Vermont Avenue, or to the parallel downstream 21-inch line in Lemon Street, the deficiency could be resolved. Both the 15-inch sewer in Vermont Avenue and the parallel downstream 21-inch sewer in Lemon Street have capacity to take more flow without exceeding the maximum capacity d/D of 75% for pipes 12-inch or greater even with the additional flow from the proposed project.

Buildout Condition Sewer Analysis

The Buildout Condition Scenario plus the project flows and d/D ratios for the sewer collection system from the hydraulic model for the CCAAMPSS are shown in Table 4.

As seen in Table 4, Buildout Scenario, the same five deficiencies on Lemon Street north of Ball Road are present with the addition of a sixth reach immediately upstream of the previous five. The diversion discussion for the sewer in Lemon Street described above in the Existing Scenario applies to the Buildout Scenario, as well.

Conclusion

As shown above, no additional sewer system improvements are required for the proposed 901 East South Street project including 530 homes. The deficiencies in the Lemon Street sewer shown in Table 3 and 4 are present in the First Revision to the CCAAMPSS, prior to adding the flow from this sewer study and the diversion of flow at Lemon Street/Vermont Avenue is part of the recommended Capital Improvement Program in that master plan. Before the Buildout Condition flows are experienced, this adjustment to the diversion is recommended to be implemented. This proposed development would not change those recommendations.

Attachments: Figures 1, 2 & 3, Tables 3 & 4, William Hezmalchal Architects Inc. Sewer Study Exhibit

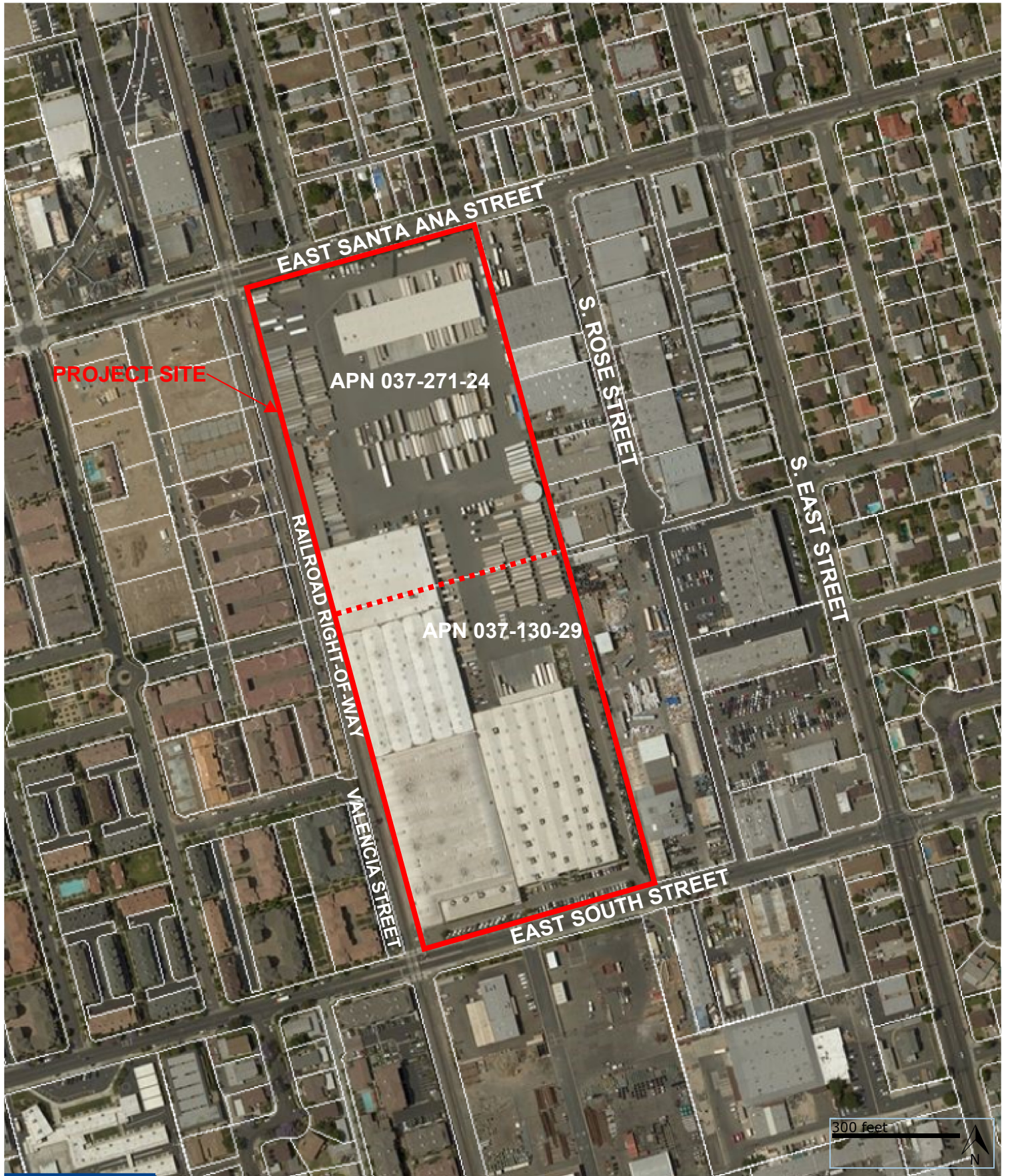


FIGURE 1
LOCATION MAP

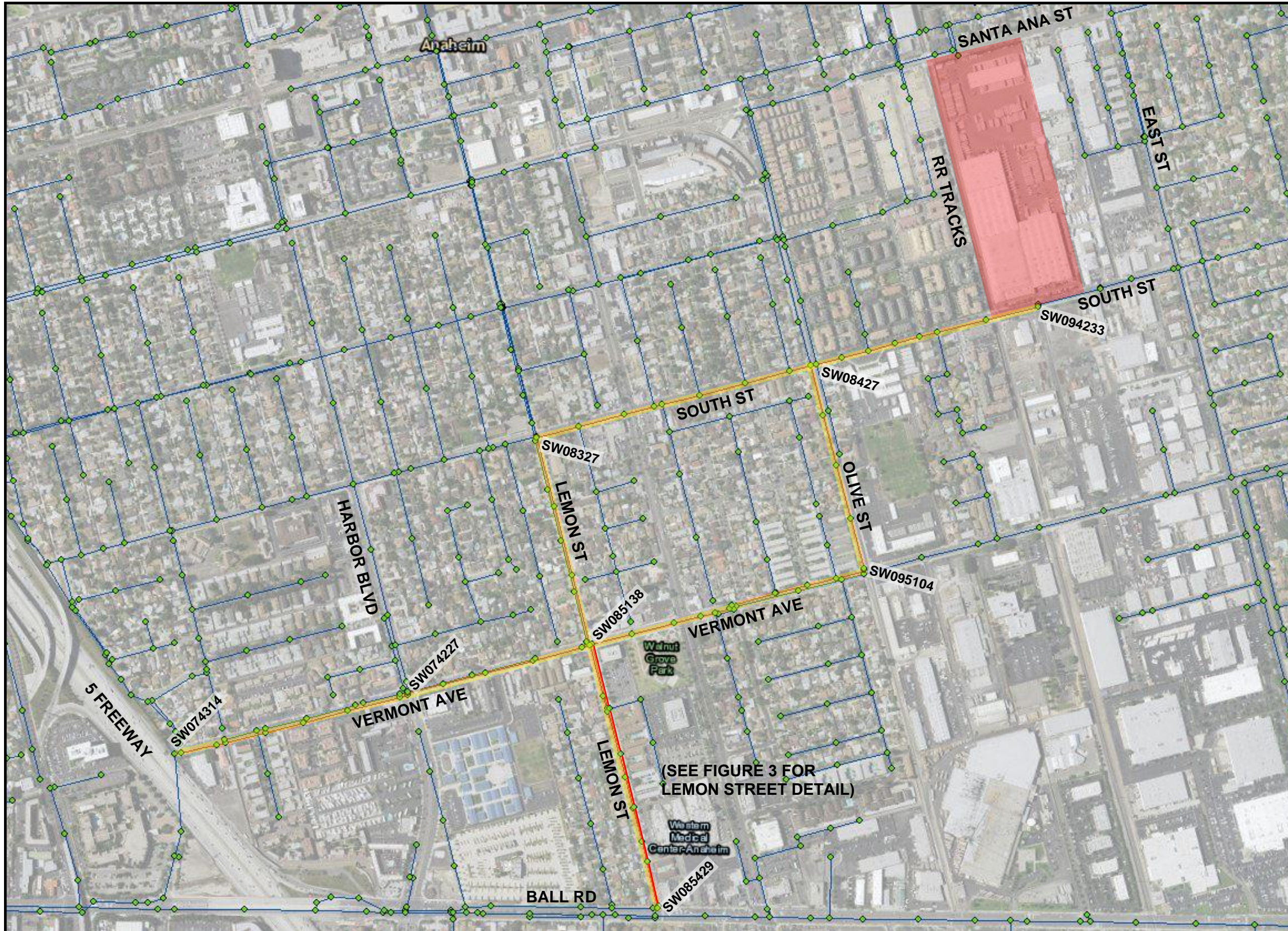


FIGURE 2
TRIBUTARY BASIN MAP

PSOMAS

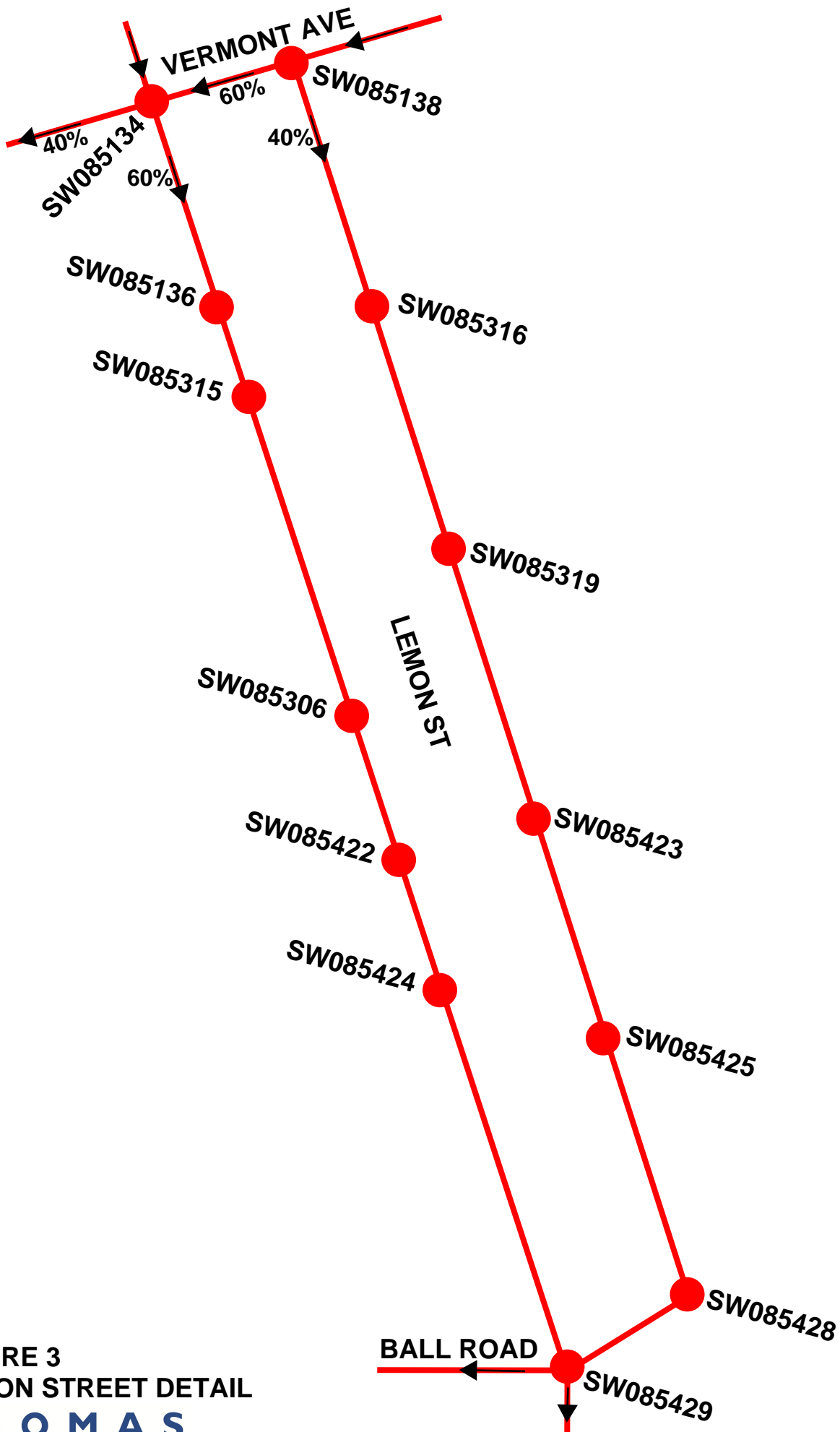


FIGURE 3
 LEMON STREET DETAIL
PSOMAS

Table 3 - Existing Land Use Scenario Plus Project

Street	Cross Street	Upstrm MH-Dwnstrm MH	Size (in)	Length (ft)	Slope (ft/ft)	Peak Flow (gpm)	d/D	
S O U T H	Project	SW094233-SW094234	18	8	0.001	572	0.44	
		SW094234-SW094313	18	336	0.002	572	0.41	
		SW094313-SW094314	18	318	0.002	572	0.41	
		SW094314-SW094315	18	112	0.001	613	0.44	
		SW094315-SW094316	18	158	0.002	618	0.42	
		SW094316-SW094317	18	172	0.001	626	0.44	
	Olive ¹	SW094317-SW084426	18	170	0.002	735	0.47	
		SW084426-SW084427	21	167	0.002	737	0.38	
		SW084427-SW084428	21	41	0.001	873	0.42	
		SW084428-SW084429	21	131	0.002	447	0.27	
		SW084429-SW084430	21	292	0.002	456	0.28	
		SW084430-SW084431	21	295	0.002	471	0.27	
		SW084431-SW084432	21	240	0.002	487	0.27	
		SW084432-SW084433	21	50	0.002	635	0.33	
		SW084433-SW084434	21	193	0.003	647	0.31	
		SW084434-SW084326	21	295	0.006	650	0.25	
Lemon ²	SW084326-SW084327	21	272	0.006	691	0.25		
W E S T E R N	South ²	SW084327-SW085107	24	448	0.001	691	0.36	
		SW085107-SW085118	24	444	0.001	692	0.36	
	Vermont ³	SW085118-SW085134	24	449	0.001	694	0.36	
		SW085134-SW085136	21	330	0.001	1,179	0.51	
		SW085136-SW085315	21	100	0.001	1,186	0.51	
		SW085315-SW085306	21	426	0.001	1,192	0.52	
		SW085306-SW085422	21	199	0.001	1,194	0.52	
		SW085422-SW085424	21	218	0.001	1,195	0.52	
	Ball	SW085424-SW085429	21	427	0.001	1,196	0.52	
	E A S T E R N	Vermont ³	SW085138-SW085316	15	415	0.001	856	0.75
			SW085316-SW085319	15	297	0.001	882	0.77
			SW085319-SW085423	15	342	0.001	890	0.77
SW085423-SW085425			15	348	0.001	890	0.77	
SW085425-SW085428			15	286	0.001	899	0.78	
Ball		SW085428-SW085429	15	14	0.001	899	0.78	
O L I V E	South ¹	SW084428-SW084414	15	319	0.003	565	0.44	
		SW084414-SW084421	15	328	0.002	567	0.48	
		SW084421-SW095101	15	340	0.002	570	0.48	
		SW095101-SW095104	15	325	0.002	572	0.52	
	Vermont	SW095104-SW095105	15	7	0.039	573	0.23	

see footnotes on following page

Table 3 - Existing Land Use Scenario Plus Project

Street	Cross Street	Upstrm MH-Dwnstrm MH	Size (in)	Length (ft)	Slope (ft/ft)	Peak Flow (gpm)	d/D
V E R M O N T	Olive	SW095105-SW085217	15	185	0.002	573	0.49
		SW085217-SW085215	15	181	0.003	594	0.47
		SW085215-SW085233	15	205	0.001	595	0.68
		SW085233-SW085230	15	288	0.001	596	0.64
		SW085230-SW085229	15	24	0.002	598	0.51
		SW085229-SW085212	18	92	0.002	598	0.40
		SW085212-SW085232	24	92	0.002	2,133	0.50
		SW085232-SW085211	24	174	0.002	2,138	0.50
		SW085211-SW085231	24	272	0.002	2,138	0.50
	SW085231-SW085138	24	262	0.002	2,137	0.50	
	Lemon ³	SW085138-SW085134	24	9	0.002	1,284	0.37
		SW085134-SW085133	15	57	0.045	786	0.26
		SW085133-SW085131	24	316	0.001	2,122	0.62
		SW085131-SW085130	24	305	0.001	2,133	0.61
		SW085130-SW085128	24	274	0.001	2,138	0.62
		SW085128-SW074227	24	227	0.001	2,140	0.60
		Harbor	SW074227-SW074226	24	15	0.001	2,140
	SW074226-SW074224		24	48	0.002	2,140	0.50
	SW074224-SW074411		24	336	0.001	2,209	0.63
	SW074411-SW074409		24	289	0.001	2,222	0.64
	SW074409-SW074407		24	243	0.001	2,239	0.63
	SW074407-SW074404		24	262	0.001	2,241	0.64
	SW074404-SW074402		24	59	0.001	2,327	0.63
	SW074402-SW074326		24	224	0.002	2,329	0.57
	5 Fwy	SW074326-SW074314	24	41	0.006	2,329	0.41

- 1) Flow is divereted at manhole SW084428 automatically based on invert elevations and slopes to continue down the 21" on South Street and the 15" on Olive Street.
- 2) Flow is divereted at manhole SW084327 at 100% to continue down the 24" on Lemon Street. No through flow continues on South Street.
- 3) There are two diversions at Vermont Aveune and Lemon Street (see Figure 3). The first diversion occurs at manhole SW085138 at Vermont Avenue and the easterly 15" in Lemon Street. Here, 40% of the flow continues down the 15" in easterly Lemon Street and the remaining 60% continues down Vermont Avenue to the second diversion. The second diversion occurs at manhole SW085134 at Vermont Avenue and the westerly 21" in Lemon Street. Here 60% of the flow continues down the 21" in westerly Lemon Street and the remaining 40% continues down Vermont Avenue.

Red 12" or larger pipes d/D > 0.75 and 10" or smaller pipes d/D > 0.67

Table 4 - Buildout Land Use Scenario Plus Project

Street	Cross Street	Upstrm MH-Dwnstrm MH	Size (in)	Length (ft)	Slope (ft/ft)	Peak Flow (gpm)	d/D
S O U T H	Olive ¹	SW094233-SW094234	18	8	0.001	584	0.45
		SW094234-SW094313	18	336	0.002	584	0.42
		SW094313-SW094314	18	318	0.002	584	0.41
		SW094314-SW094315	18	112	0.001	628	0.44
		SW094315-SW094316	18	158	0.002	634	0.43
		SW094316-SW094317	18	172	0.001	641	0.45
		SW094317-SW084426	18	170	0.002	755	0.48
		SW084426-SW084427	21	167	0.002	758	0.38
		SW084427-SW084428	21	41	0.001	901	0.43
		SW084428-SW084429	21	131	0.002	464	0.28
		SW084429-SW084430	21	292	0.002	474	0.28
		SW084430-SW084431	21	295	0.002	489	0.27
		SW084431-SW084432	21	240	0.002	506	0.28
		SW084432-SW084433	21	50	0.002	659	0.33
		SW084433-SW084434	21	193	0.003	672	0.31
		SW084434-SW084326	21	295	0.006	677	0.25
Lemon ²	SW084326-SW084327	21	272	0.006	718	0.26	
W E S T E R N	South ⁴	SW084327-SW085107	24	448	0.001	718	0.37
		SW085107-SW085118	24	444	0.001	720	0.37
	Vermont ³	SW085118-SW085134	24	449	0.001	721	0.37
		SW085134-SW085136	21	330	0.001	1,229	0.52
		SW085136-SW085315	21	100	0.001	1,237	0.53
		SW085315-SW085306	21	426	0.001	1,244	0.53
		SW085306-SW085422	21	199	0.001	1,245	0.53
		SW085422-SW085424	21	218	0.001	1,246	0.53
	Ball	SW085424-SW085429	21	427	0.001	1,247	0.53
	E A S T E R N	Vermont ³	SW085138-SW085316	15	415	0.001	894
SW085316-SW085319			15	297	0.001	923	0.80
SW085319-SW085423			15	342	0.001	932	0.81
SW085423-SW085425			15	348	0.001	932	0.81
SW085425-SW085428			15	286	0.001	941	0.82
SW085428-SW085429			15	14	0.001	941	0.82
O L I V E	South ¹	SW084428-SW084414	15	319	0.003	582	0.45
		SW084414-SW084421	15	328	0.002	583	0.48
		SW084421-SW095101	15	340	0.002	587	0.49
		SW095101-SW095104	15	325	0.002	589	0.53
	Vermont	SW095104-SW095105	15	7	0.039	590	0.23

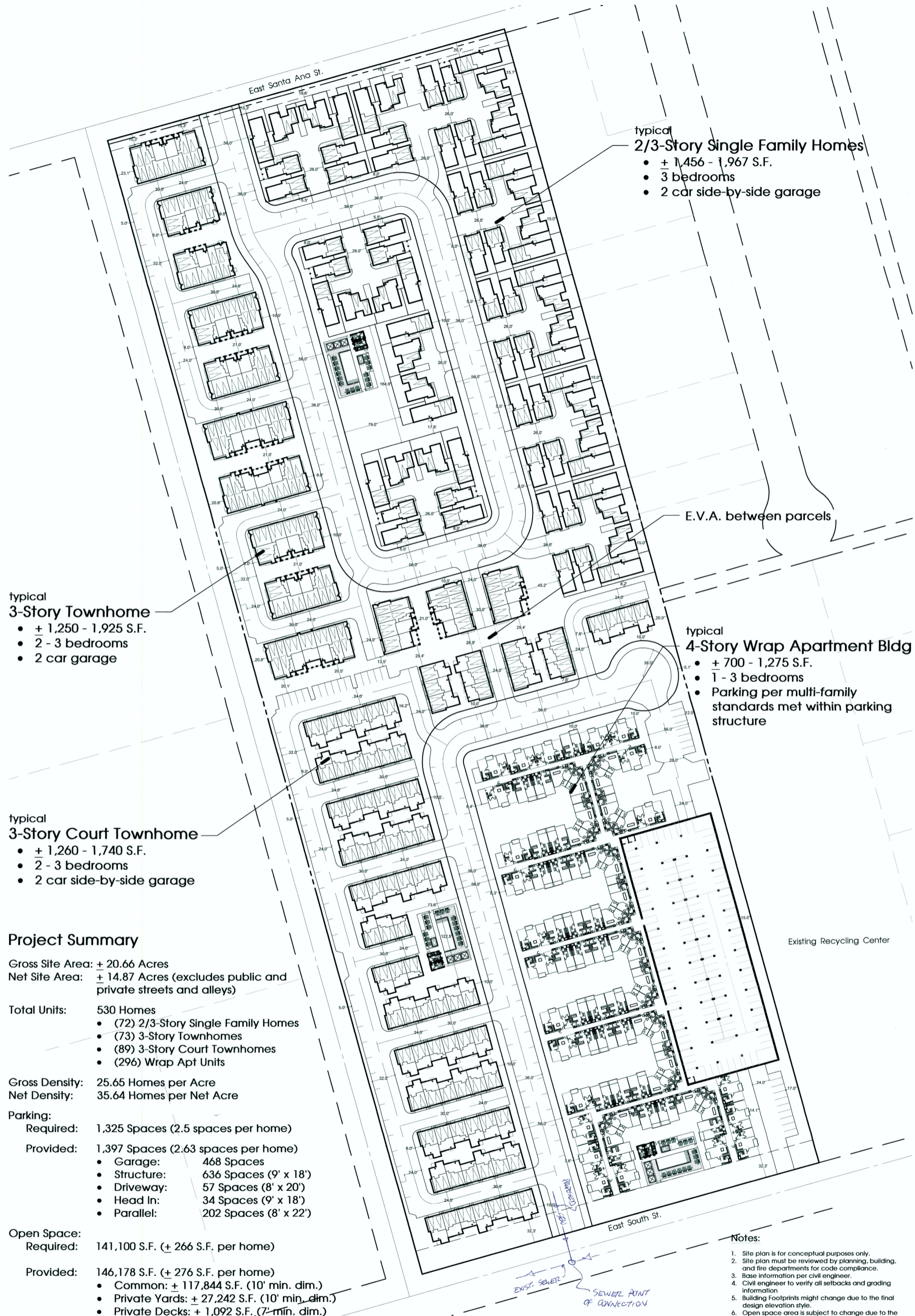
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Table 4 - Buildout Land Use Scenario Plus Project

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V E R M O N T	Olive	SW095105-SW085217	15	185	0.002	590	0.50
		SW085217-SW085215	15	181	0.003	612	0.48
		SW085215-SW085233	15	205	0.001	613	0.69
		SW085233-SW085230	15	288	0.001	614	0.66
		SW085230-SW085229	15	24	0.002	616	0.52
		SW085229-SW085212	18	92	0.002	616	0.40
		SW085212-SW085232	24	92	0.002	2,228	0.51
		SW085232-SW085211	24	174	0.002	2,232	0.51
		SW085211-SW085231	24	272	0.002	2,232	0.51
	SW085231-SW085138	24	262	0.002	2,232	0.51	
	Lemon ³	SW085138-SW085134	24	9	0.002	1,341	0.38
		SW085134-SW085133	15	57	0.045	819	0.27
		SW085133-SW085131	24	316	0.001	2,242	0.64
		SW085131-SW085130	24	305	0.001	2,254	0.64
		SW085130-SW085128	24	274	0.001	2,260	0.64
		SW085128-SW074227	24	227	0.001	2,261	0.62
	Harbor	SW074227-SW074226	24	15	0.001	2,261	0.62
		SW074226-SW074224	24	48	0.002	2,261	0.52
		SW074224-SW074411	24	336	0.001	2,333	0.66
		SW074411-SW074409	24	289	0.001	2,347	0.67
		SW074409-SW074407	24	243	0.001	2,364	0.65
		SW074407-SW074404	24	262	0.001	2,367	0.67
		SW074404-SW074402	24	59	0.001	2,456	0.65
		SW074402-SW074326	24	224	0.002	2,459	0.59
	5 Fwy	SW074326-SW074314	24	41	0.006	2,459	0.42

- 1) Flow is divereted at manhole SW084428 automatically based on invert elevations and slopes to continue down the 21" on South Street and the 15" on Olive Street.
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Red 12" or larger pipes d/D > 0.75 and 10" or smaller pipes d/D > 0.67



typical
2/3-Story Single Family Homes

- + 1,456 - 1,967 S.F.
- 3 bedrooms
- 2 car side-by-side garage

E.V.A. between parcels

typical
3-Story Townhome

- + 1,250 - 1,925 S.F.
- 2 - 3 bedrooms
- 2 car garage

typical
4-Story Wrap Apartment Bldg

- + 700 - 1,275 S.F.
- 1 - 3 bedrooms
- Parking per multi-family standards met within parking structure

typical
3-Story Court Townhome

- + 1,260 - 1,740 S.F.
- 2 - 3 bedrooms
- 2 car side-by-side garage

Project Summary

Gross Site Area: + 20.66 Acres
 Net Site Area: + 14.87 Acres (excludes public and private streets and alleys)

Total Units: 530 Homes

- (72) 2/3-Story Single Family Homes
- (73) 3-Story Townhomes
- (89) 3-Story Court Townhomes
- (296) Wrap Apt Units

Gross Density: 25.65 Homes per Acre
 Net Density: 35.64 Homes per Net Acre

Parking:

Required: 1,325 Spaces (2.5 spaces per home)

Provided: 1,397 Spaces (2.63 spaces per home)

- Garage: 468 Spaces
- Structure: 636 Spaces (9' x 18')
- Driveway: 57 Spaces (8' x 20')
- Head In: 34 Spaces (9' x 18')
- Parallel: 202 Spaces (8' x 22')

Open Space:

Required: 141,100 S.F. (+ 266 S.F. per home)

Provided: 146,178 S.F. (+ 276 S.F. per home)

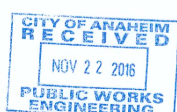
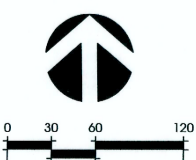
- Common: + 117,844 S.F. (10' min. dim.)
- Private Yards: + 27,242 S.F. (10' min. dim.)
- Private Decks: + 1,092 S.F. (7' min. dim.)

Existing Recycling Center

- Notes:
1. Site plan is for conceptual purposes only.
 2. Site plan must be reviewed by planning, building, and fire departments for code compliance.
 3. Base information per civil engineer.
 4. Civil engineer to verify all setbacks and grading information.
 5. Building Footprints might change due to the final design elevation style.
 6. Open space area is subject to change due to the balcony design of the elevation.
 7. Building setbacks are measured from property lines to building foundation lines.

Conceptual Site Plan

WILLIAM HEZMALHALCH ARCHITECTS, INC. © 2016



OT112016-00908

901 - East South Street
 Anaheim, CA
 The Shopoff Group

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 2016238 October 31, 2016