

# ATTACHMENTS

# ATTACHMENT 1

**To:** Ellaine Taraya  
**Prepared By:** Alex Park, P.E.  
**Reviewed by:** Curtis Lam, P.E.  
**Subject:** Placer Ranch Wastewater Collection System Modeling  
**Date:** July 17, 2017

## INTRODUCTION

The 2009 South Placer Regional Wastewater and Recycled Water Systems Evaluation (Systems Evaluation Report) did not include an expansion of the wastewater collection system into Placer Ranch, which is located in Placer County and is currently undeveloped. The collection system trunk sewers (18-inch diameter and larger) for Placer Ranch were modeled in the same manner as the South Placer Regional wastewater system in order to accurately size the main collection sewers. This technical memorandum (TM) summarizes the modeling and the collection system results of the analysis for the trunk sewers. A separate TM, "Placer Ranch Specific Plan – Conceptual Sewer Lift Station Design" is being written concurrently. Therefore, this TM does not cover lift station design.

## DESIGN AND EVALUATION CRITERIA

This section describes the design criteria including the design flows and the evaluation criteria.

### Design Criteria

The design criteria includes the flows that were used to model the design conditions for the collection system. The flows include base sanitary flow (BSF), dry and wet weather groundwater infiltration (GWI), and rainfall dependent inflow/infiltration (RDI/I).

The BSF for Placer Ranch was provided by MacKay and Somsps Civil Engineers (MSCE) to HydroScience by manhole and land use. The BSF is based on the unit flow factors listed in **Table 1**. For modeling purposes, each of these land uses was assigned into one of three categories for use with hydrographs developed in the original model: residential (Load 1), commercial (Load 2), or light industrial (Load 3).

**Table 1. Placer Ranch Unit Flow Factors**

Land Use	Abbreviation	Flow Factor	Unit	Load 1, 2, or 3
Low Density Residential/ Medium Density Residential	LDR/MDR	180	GPD/DU	1
High Density Residential	HDR	120	GPD/DU	1
Mixed Use	CMU	2160	GPD/ACRE	2
Commercial, Office, Business Park	GC/CP	800	GPD/ACRE	2
University	UZ	160	GPD/ACRE	3
Public Facilities/School	PF	620	GPD/ACRE	3
Park	PARK	10	GPD/ACRE	3

Additionally, BSF originally developed by PSOMAS was provided for the Sunset Area Sewer System. The Sunset Area Sewer System is offsite from the Placer Ranch property and will contribute flow at three locations into the Placer Ranch collection system. These flows are referred to as the “Offsite flows.” These flows were developed using different land use categories than the Placer Ranch area and are summarized below in **Table 2**. Note that originally these unit flow factors were adjusted so that they did not include GWI.

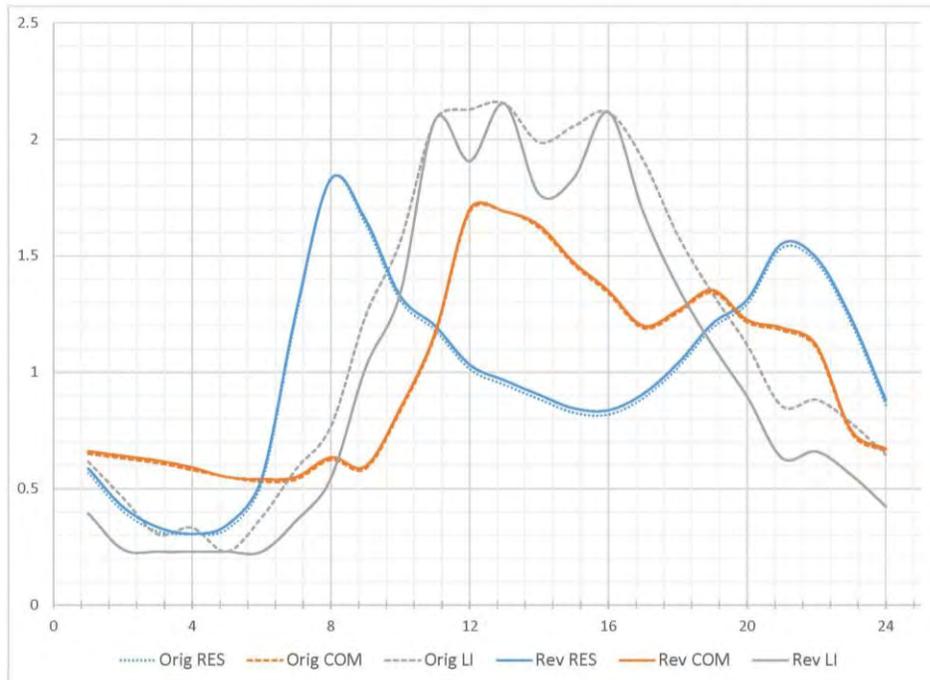
**Table 2. Offsite Unit Flow Factors**

Land Use	Abbreviation	Flow Factor	Unit	Load 1, 2, or 3
Residential	RES	180	GPD/DU	1
Entertainment Mixed Use	CMU	2160	GPD/ACRE	2
Innovation Center East and West, Eco-Industrial	COM, OFF, BP/PC	800	GPD/ACRE	2
Casino, L270 <sup>1</sup>	COM	-	-	2
Business Park, Light Industrial	LI	800	GPD/ACRE	3

<sup>1</sup>This flow was based on ADWF from Athens Ave. Sewer Study.

The original Systems Evaluation model included hydrographs for residential, commercial, and light industrial land uses. These hydrographs are applied in the model to BSFs to account for peak flows occurring at different times of day and the dampening of peaks due to attenuation within the collection system. The original hydrographs that were developed based on flow monitoring and model calibration are shown below in **Figure 1**. These hydrographs were problematic due to the fact that they did not average to 1.0. This resulted in the modeled average flows being higher than the calculated average flows. Therefore, the hydrographs were adjusted to average 1.0 while maintaining peaks and minimums. The revised hydrographs are also shown in **Figure 1**.

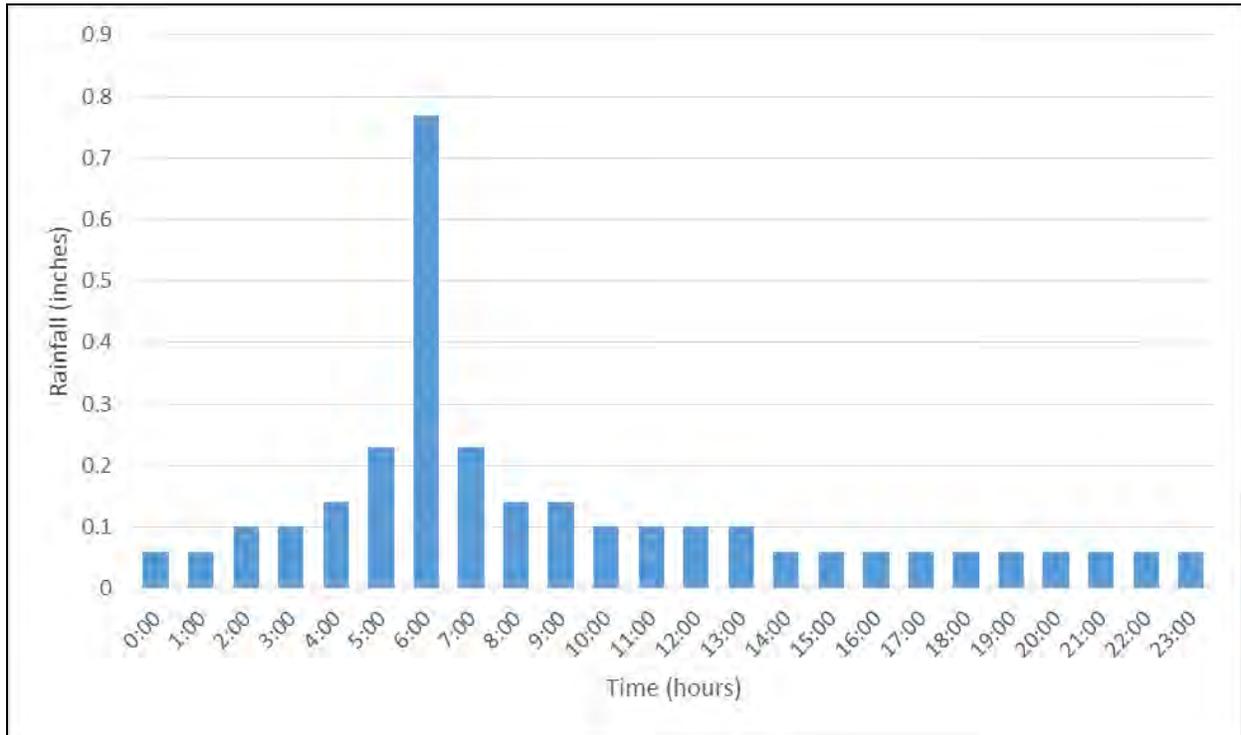
**Figure 1. Diurnal Hydrographs**



The original model included both dry and wet weather GWI based on flow monitoring. The GWI unit flow factors used in the Placer Ranch model are 20 gpd/acre for dry weather and 200 gpd/acre for wet weather as recommended for the Dry Creek watershed in Appendix H – TM 3b Trunk Sewer Hydraulic Analysis, Section 3.1 of the Systems Evaluation Report. The GWI was only assumed to occur in the land uses that are sewered, which does not include Public/Quasi-Public or Parks.

The peak wet weather flow consists of BSF, wet weather GWI, and RDI/I. The RDI/I in the model is predicted using a 10-year 24-hour design storm and an R-factor. An R-factor of 0.5%, distributed evenly between  $R_1$  and  $R_2$  ( $T_1=2$ ,  $K_1=2$ ,  $T_2=8$ ,  $K_2=3$ ) was used based on the recommendation for Urban Growth Areas in Appendix F – TM 2c Wet Weather Flow Projection for the Ultimate SPWA Service Area, Section 8 of the 2009 Report. The peak wet weather design storm that the model used is shown in **Figure 2**. The total 24-hour storm rainfall volume is 2.97 inches.

**Figure 2: 10-year 24-hour Design Storm Hyetograph**



**Evaluation Criteria**

The maximum allowable depth (d) to diameter (D) ratio, or  $d/D$  is 0.7. This is based on the City of Roseville Design Standards 9-4.B.2: lines 12 inches in diameter or larger may be designed to flow full unless direct sewer connections are planned, in which case the 70 percent pipe diameter maximum depth of flow shall govern. To be conservative, it was assumed that there will be connections on all the pipes.

## HYDRAULIC MODEL

The model used to evaluate the pipe network is H2OMap Sewer Pro Suite 10.5, SP 1, Update #11. The model was originally created as part of the South Placer Regional Wastewater and Recycled Water Systems Evaluation (South Placer Evaluation), which was finalized in December 2009. The original model included the existing sewer network that serves the City of Roseville, the South Placer Municipal Utility District, and Placer County; but did not include any pipe for the Placer Ranch area. This section describes the Placer Ranch area model network, flows, and model results.

### Model Network

There were eight separate networks provided, named Exhibit 1 through 8. There are two scenarios. Scenario 1 has a separate basin where most flows east of D Street and south of Park Boulevard end up flowing down Foothills Boulevard rather than Fiddymment Road. Scenario 2 assumes all flow from and going into Placer Ranch will flow to Fiddymment Road. Within each scenario, there are two conditions: the base condition with only flows from Placer Ranch and the condition with Offsite flows and Placer Ranch flows. There are two options for each condition of each scenario: the gravity option where the flow travels by gravity down Fiddymment Road to manhole 400 or the Lift Station option where a lift station on Sunset Boulevard about 800 feet east of Fiddymment road pumps the flow down to manhole 400 via Sunset Boulevard and Fiddymment Road. The eight exhibits are listed in **Table 3**. In all exhibits, there is a pump station (PR94) that pumps the flows from the western corner of Placer Ranch to just east of Fiddymment Road on Sunset Boulevard. These flows remain the same for all exhibits.

**Table 3. Exhibit List**

Scenario	Flow Condition	Option	Exhibit
1	Base (Placer Ranch Only)	Gravity	1
		Lift Station	2
	Base plus Offsite	Gravity	3
		Lift Station	4
2	Base (Placer Ranch Only)	Gravity	5
		Lift Station	6
	Base plus Offsite	Gravity	7
		Lift Station	8

The pipe networks were provided in CAD by MSCE and included pipe and manhole locations, manhole rims, pipe inverts and initial pipe diameter estimates. These estimates were based on a flow peaking factor and will not necessarily match the model results, which provide peak flows based on diurnal curves and a design storm. This information was used to populate the hydraulic model database after the manholes and pipes were imported. Pipes originally predicted to be 18-inches and larger were included in the model, however some were reduced to 15-inches in the model evaluation process. Original Exhibit figures provided by MSCE are included in **Attachment A**. Model results are discussed below and shown in Figures 3 through 10.

## Flows

The flows in the model include the base flow based on the land use specified unit flow factors shown in Table 1, dry and wet weather GWI, diurnal hydrographs for each land use, and RDI/I.

### Dry Weather Flows

Dry weather includes the base flow and dry weather GWI. The base flows were calculated per manhole based on specific land use tributary areas and DUs. These flows were initially provided in spreadsheets by MSCE. The detailed flow information by manhole for each exhibit, the east flows and the west flows (upstream of PR94), and the offsite flows is included in **Attachment B**. Diurnal curves were then applied to these base flows to estimate the daily varied flow with peaks and minimums. Three curves were used in the Placer Ranch model: residential (Load 1), commercial (Load 2), and light industrial (Load 3). Dry weather GWI was applied with a constant curve. The total average dry weather flow (ADWF) includes BSF and dry weather GWI. The peak dry weather flow (PDWF) reported represents the flow at the outlet of the model. **Table 4** includes a summary of the PDWF for each exhibit.

### Wet Weather Flows

Wet Weather includes dry weather flow, wet weather GWI, and RDI/I. The wet weather GWI was applied similar to the dry weather GWI using a constant curve. The 10-year 24-hour storm (**Figure 2**) was set with peak at 6 am close to the time of peak dry weather flow. The R-factor of 0.5 was applied using the tri-triangle synthetic hydrograph method to get the RDI/I estimates within the model. The peak wet weather flow (PWWF) reported represents the flow at the outlet of the model. **Table 4** includes a summary of the PWWF for each exhibit. The PWWF in individual pipes is discussed further in the following model results section.

**Table 4. Flow Summary by Exhibit**

Exhibit	East Only				West <sup>1</sup>		Total ADWF (mgd)	Total PDWF (mgd)	PWWF <sup>2</sup> (mgd)
	Total BSF (mgd)	Total Sewered Acres	DW GWI (mgd)	ADWF (mgd)	ADWF (mgd)				
1	1.22	848	0.017	1.24	0.52	1.75	2.59	3.51	
2	1.22	848	0.017	1.24	0.52	1.75	2.67	3.54	
3	4.34	3127	0.063	4.40	0.52	4.92	7.80	9.88	
4	4.34	3127	0.063	4.40	0.52	4.92	7.84	9.95	
5	1.44	980	0.020	1.46	0.52	1.98	2.85	3.80	
6	1.44	980	0.020	1.46	0.52	1.98	2.93	3.90	
7	4.56	3259	0.065	4.63	0.52	5.14	8.06	10.22	
8	4.56	3259	0.065	4.63	0.52	5.14	8.11	10.28	

<sup>1</sup>This flow is based on the land use upstream of pipe 120, which flows into the PR94 pump station and is the same in all exhibits.

<sup>2</sup>Flow at the outlet of the model, node 400.

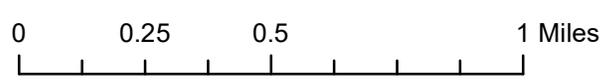
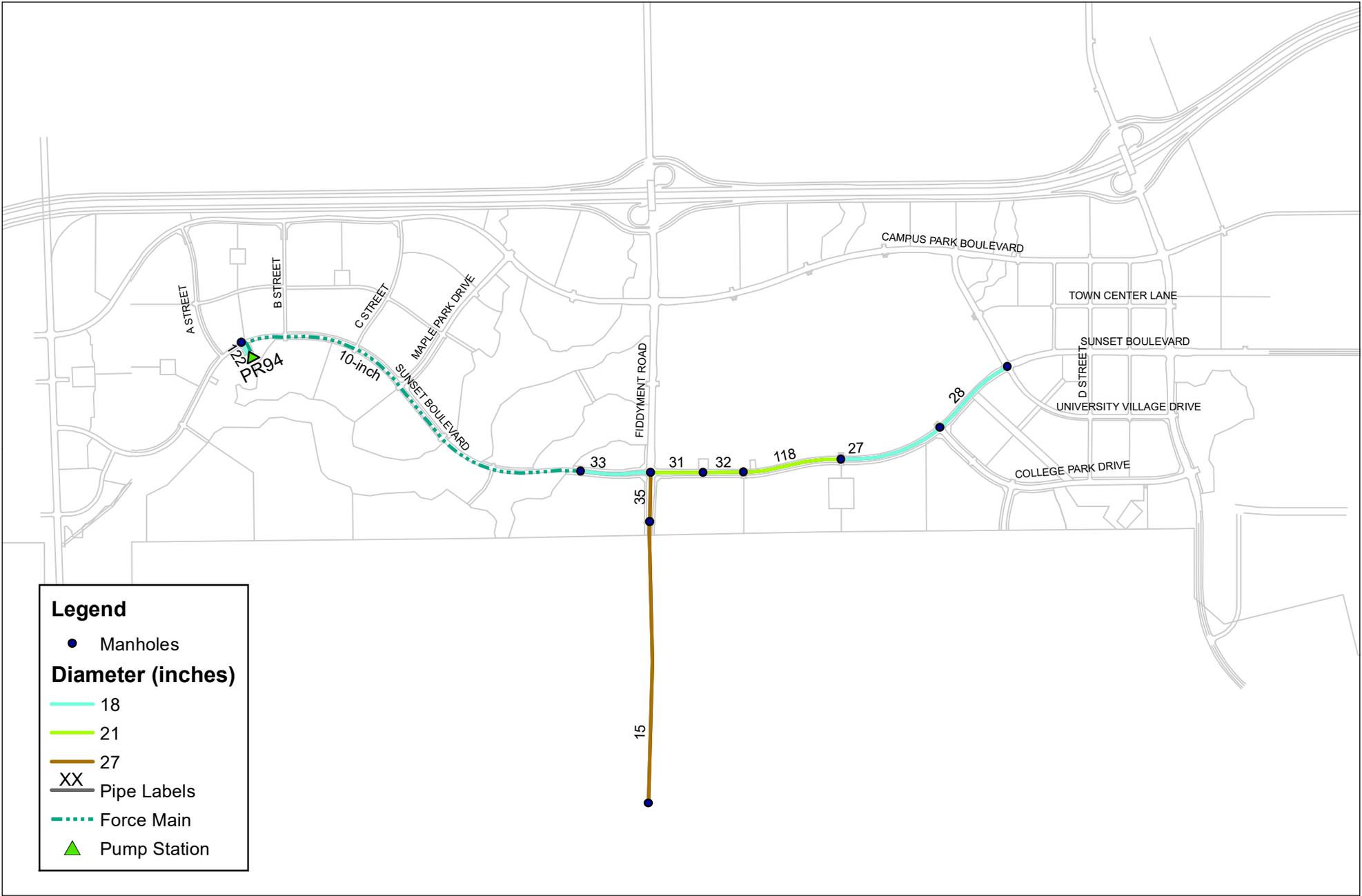
## Model Results

The pipe diameters recommended for the Placer Ranch mains are shown in **Figures 3 to 10** and listed in **Table 5**. The recommended diameters meet the maximum  $d/D \leq 0.7$  during the PWWF. Pipes that could maintain  $d/D \leq 0.7$  and have a diameter < 15-inches will be sized without using the hydraulic model and are not listed in Table 5.

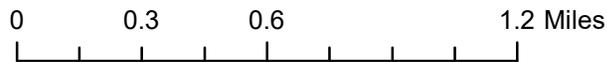
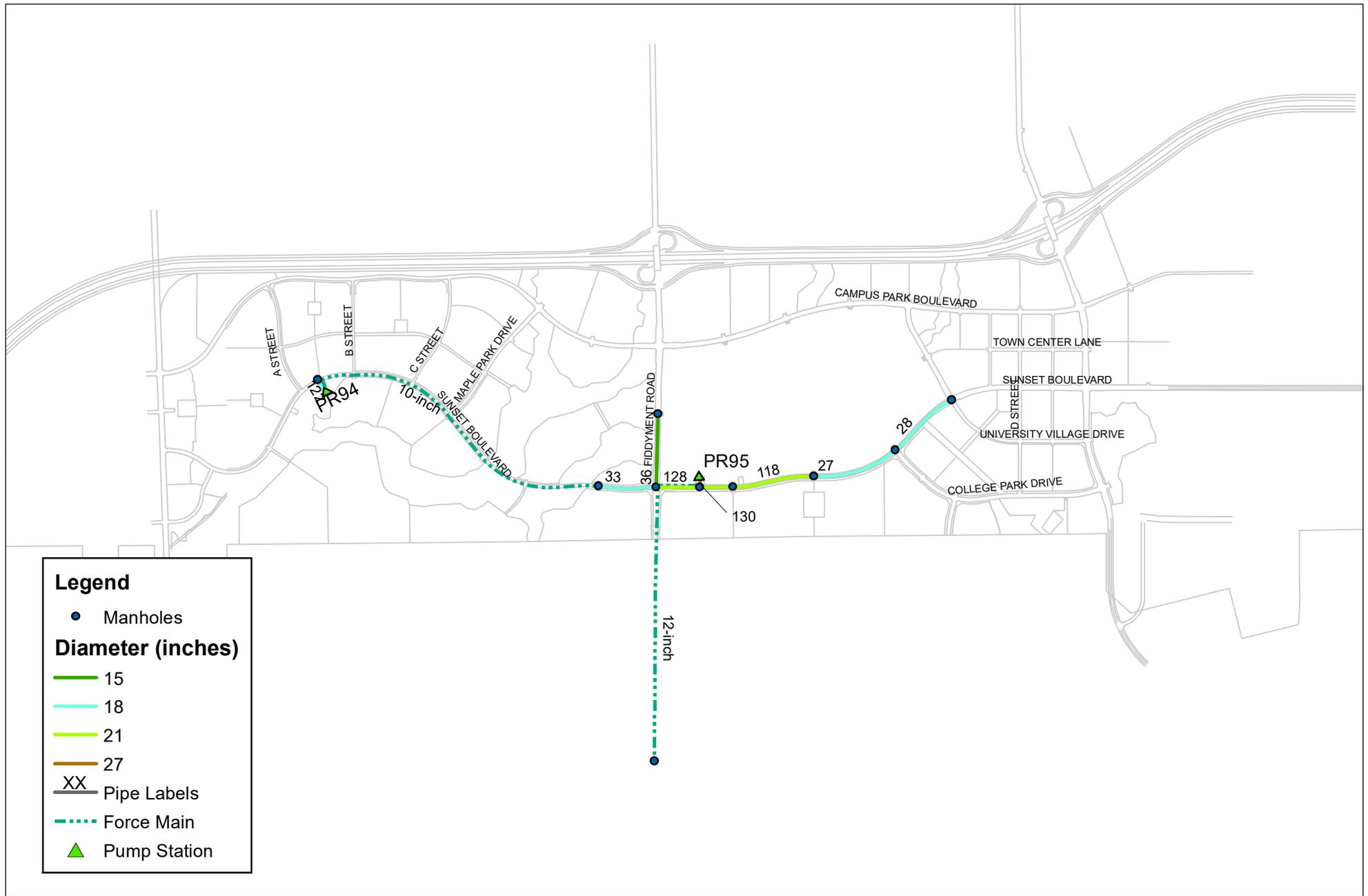
The detailed results by pipe are included in **Attachment C**.

**Table 5. Model Pipe Diameter (inches) Recommendation by Exhibit**

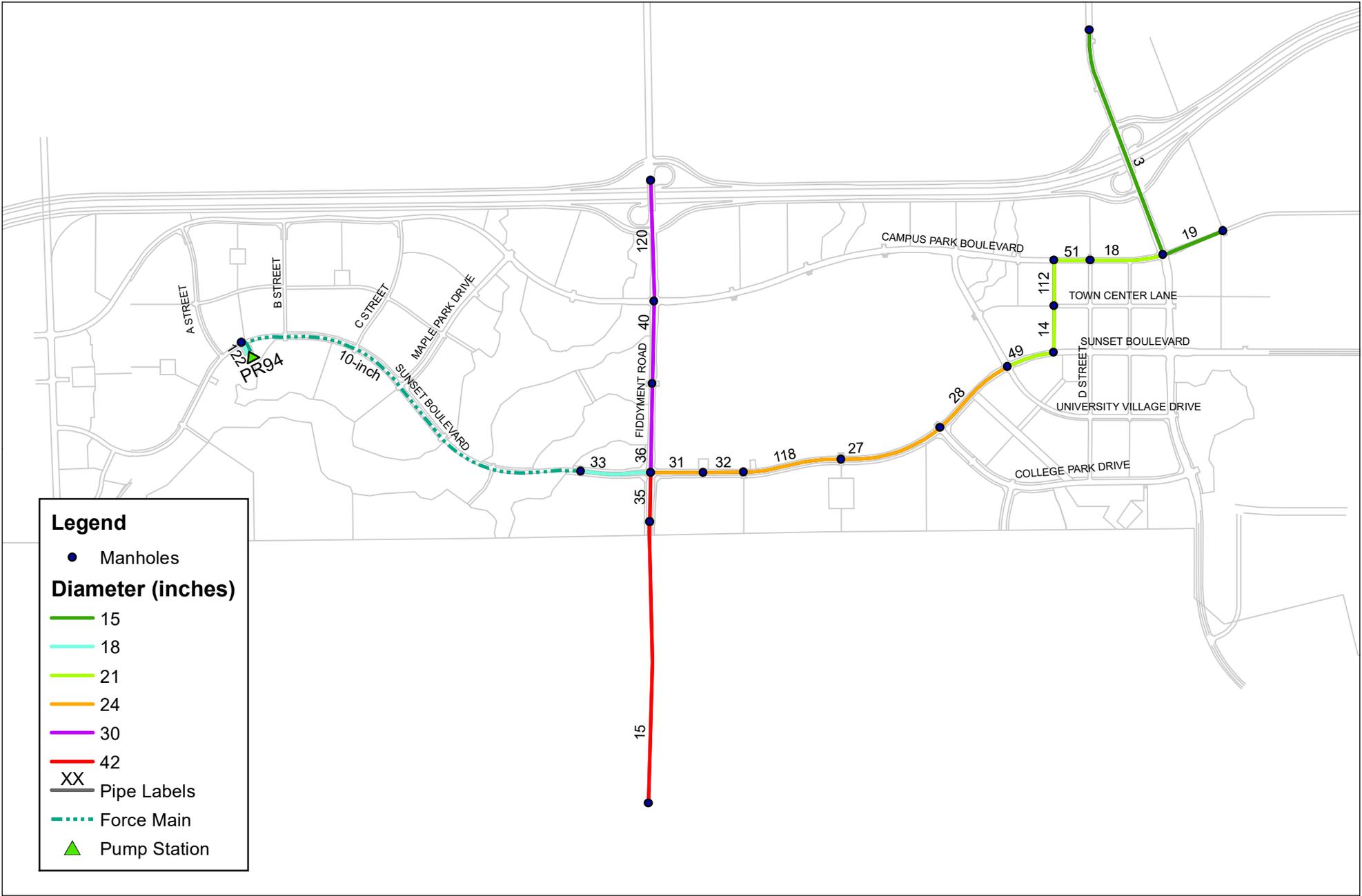
Pipe ID	Exhibit 1 Diam (in)	Exhibit 2 Diam (in)	Exhibit 3 Diam (in)	Exhibit 4 Diam (in)	Exhibit 5 Diam (in)	Exhibit 6 Diam (in)	Exhibit 7 Diam (in)	Exhibit 8 Diam (in)	Length (ft)
3			15	15			15	15	3610
14			21	21			21	21	710
15	27		42		27		42		4274
18			21	21			21	21	1117
19			15	15			15	15	983
27	18	18	24	24	18	18	24	24	1616
28	18	18	24	24	18	18	24	24	1392
31	21		24		21		27		799
32	21	21	24	24	21	21	27	27	611
33	18	18	18	18	18	18	18	18	1064
35	27		42		27		42		750
36		15	30	30		15	30	30	1348
40			30	30			30	30	1250
49			21	21			21	21	737
51			21	21			21	21	550
112			21	21			21	21	692
118	21	21	24	24	21	21	27	27	1500
120			30	30			30	30	1850
122	18	18	18	18	18	18	18	18	185
128		21		36		21		36	798
130		27		42		27		42	100



**Figure 3: Exhibit 1  
Pipe Diameter Recommendations  
Placer Ranch**

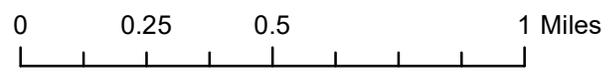


**Figure 4: Exhibit 2  
Pipe Diameter Recommendations  
Placer Ranch**

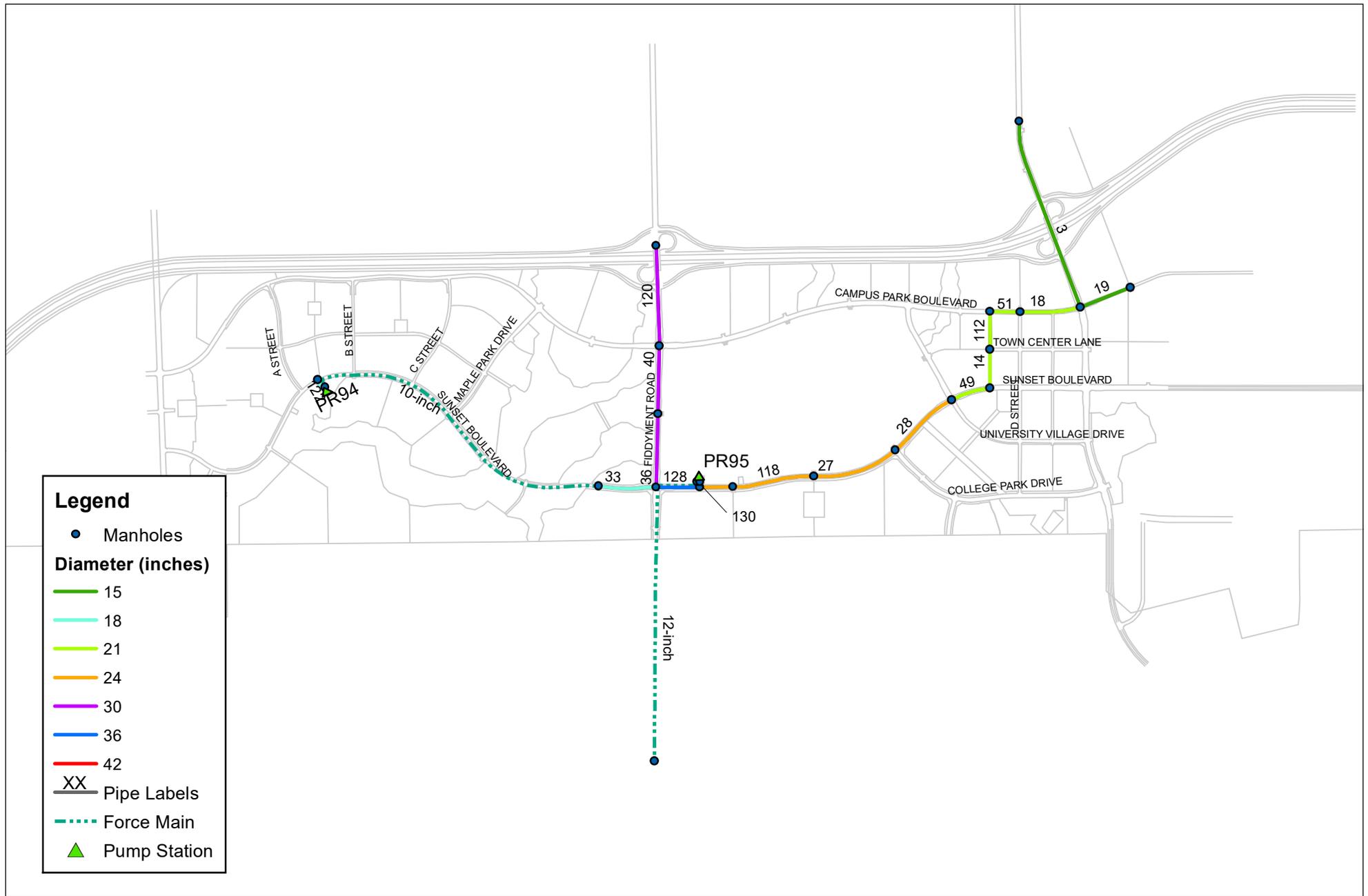


**Legend**

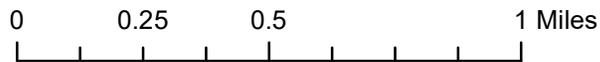
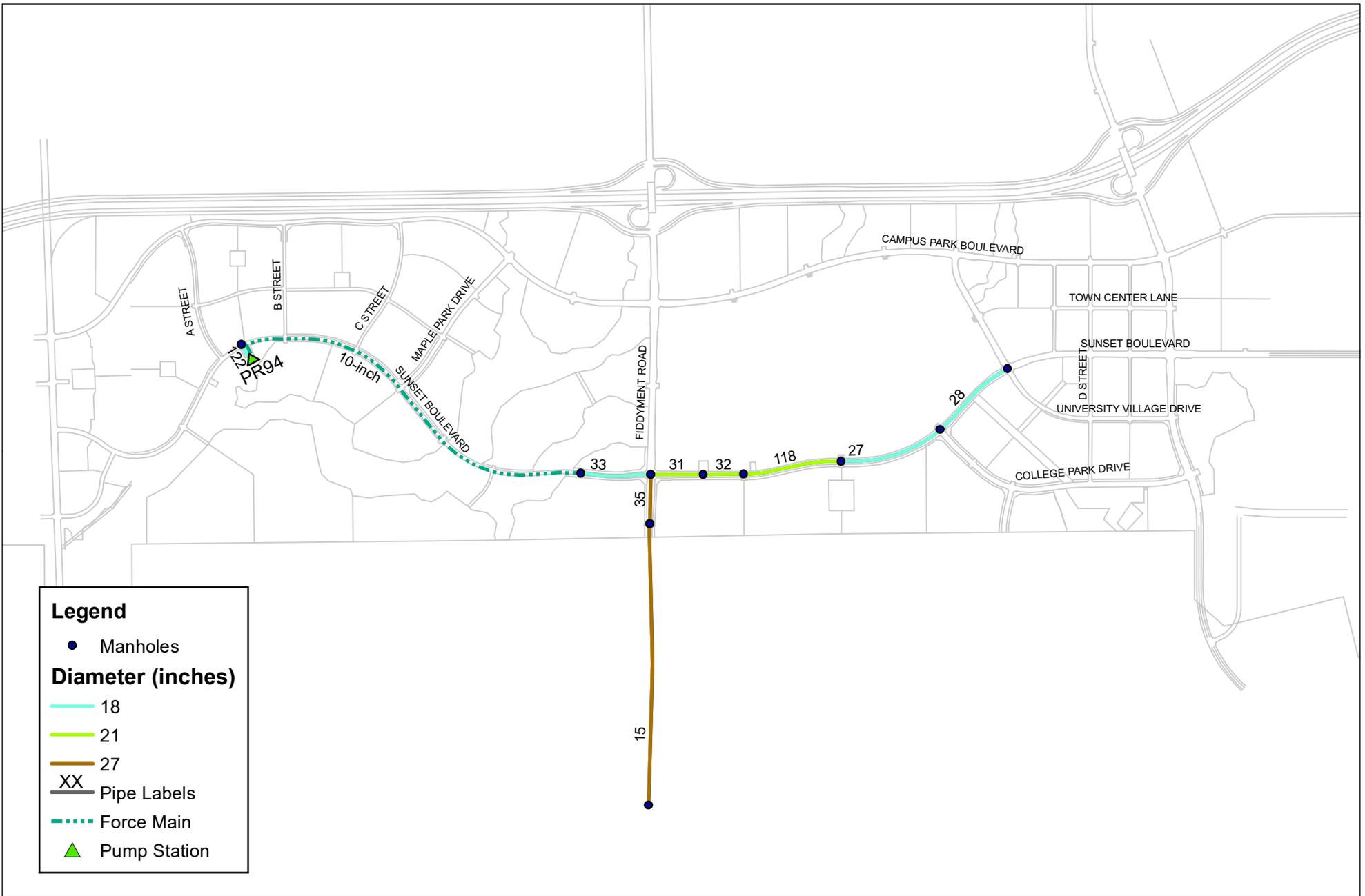
- Manholes
- Diameter (inches)**
- 15
- 18
- 21
- 24
- 30
- 42
- XX Pipe Labels
- Force Main
- ▲ Pump Station



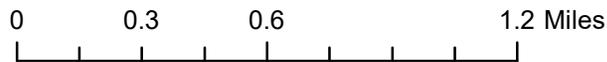
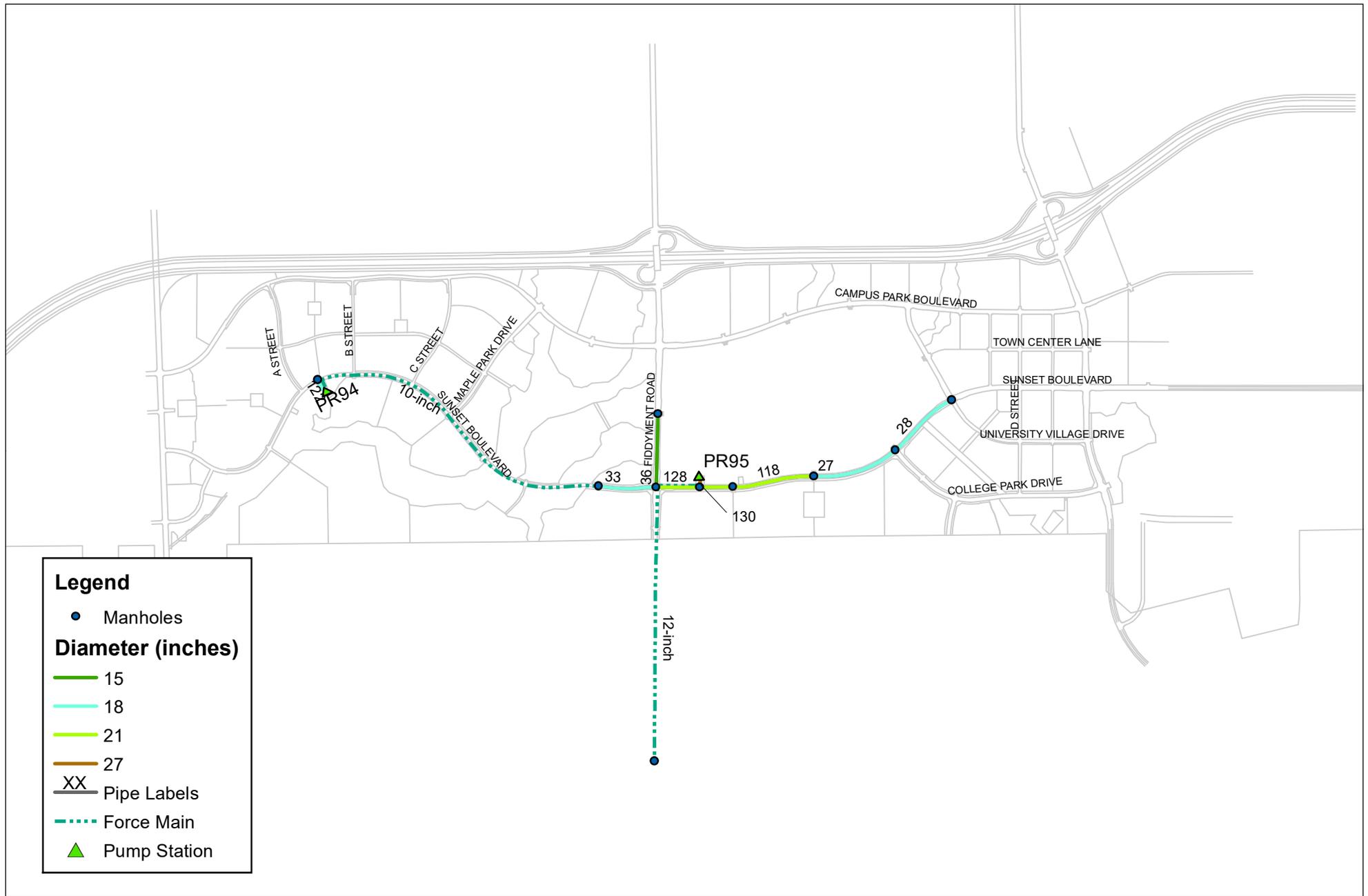
**Figure 5: Exhibit 3  
Pipe Diameter Recommendations  
Placer Ranch**



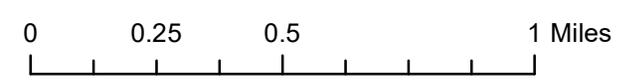
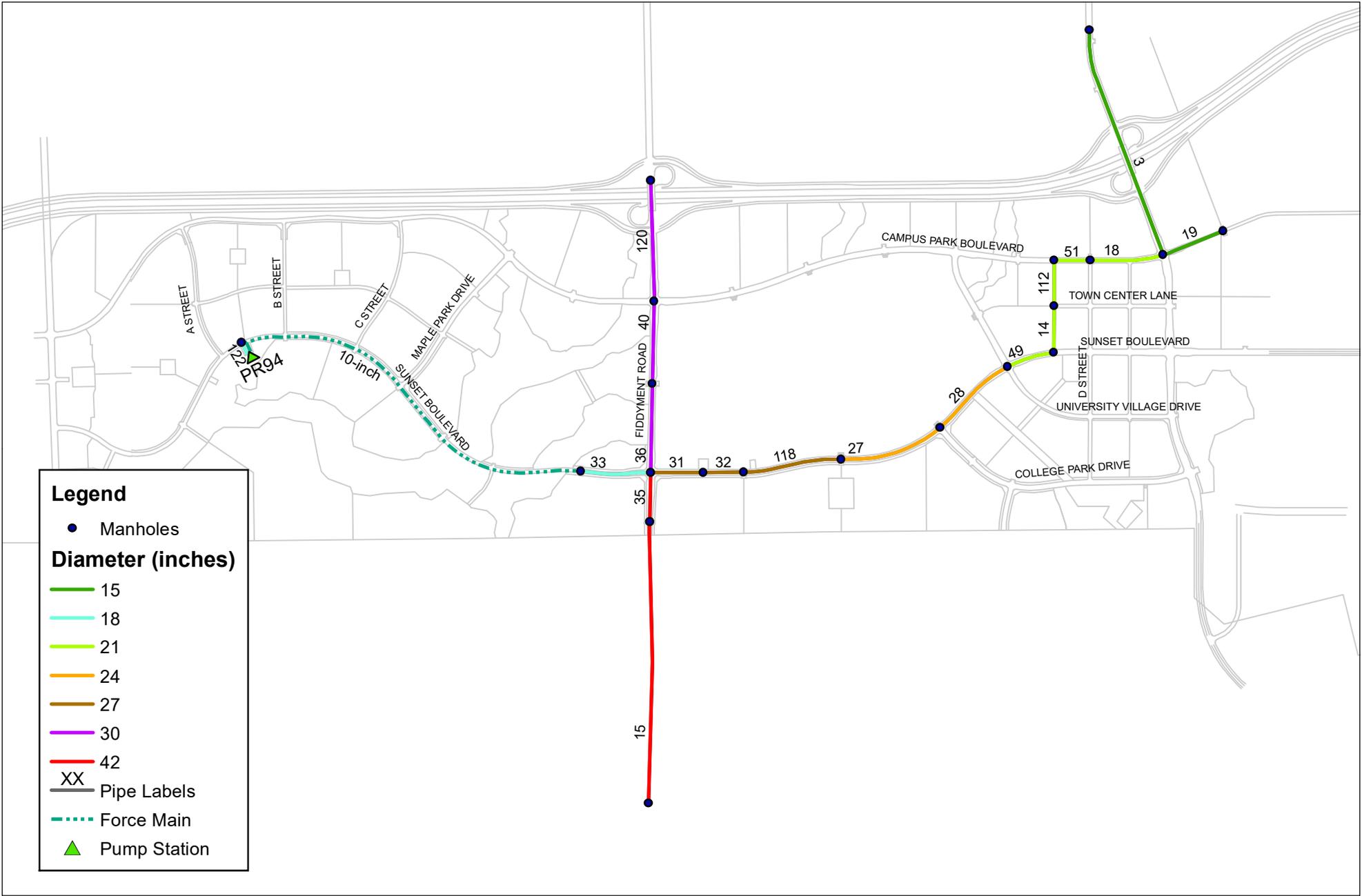
**Figure 6: Exhibit 4  
Pipe Diameter Recommendations  
Placer Ranch**



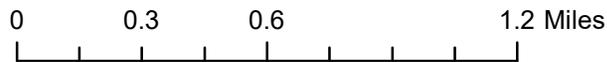
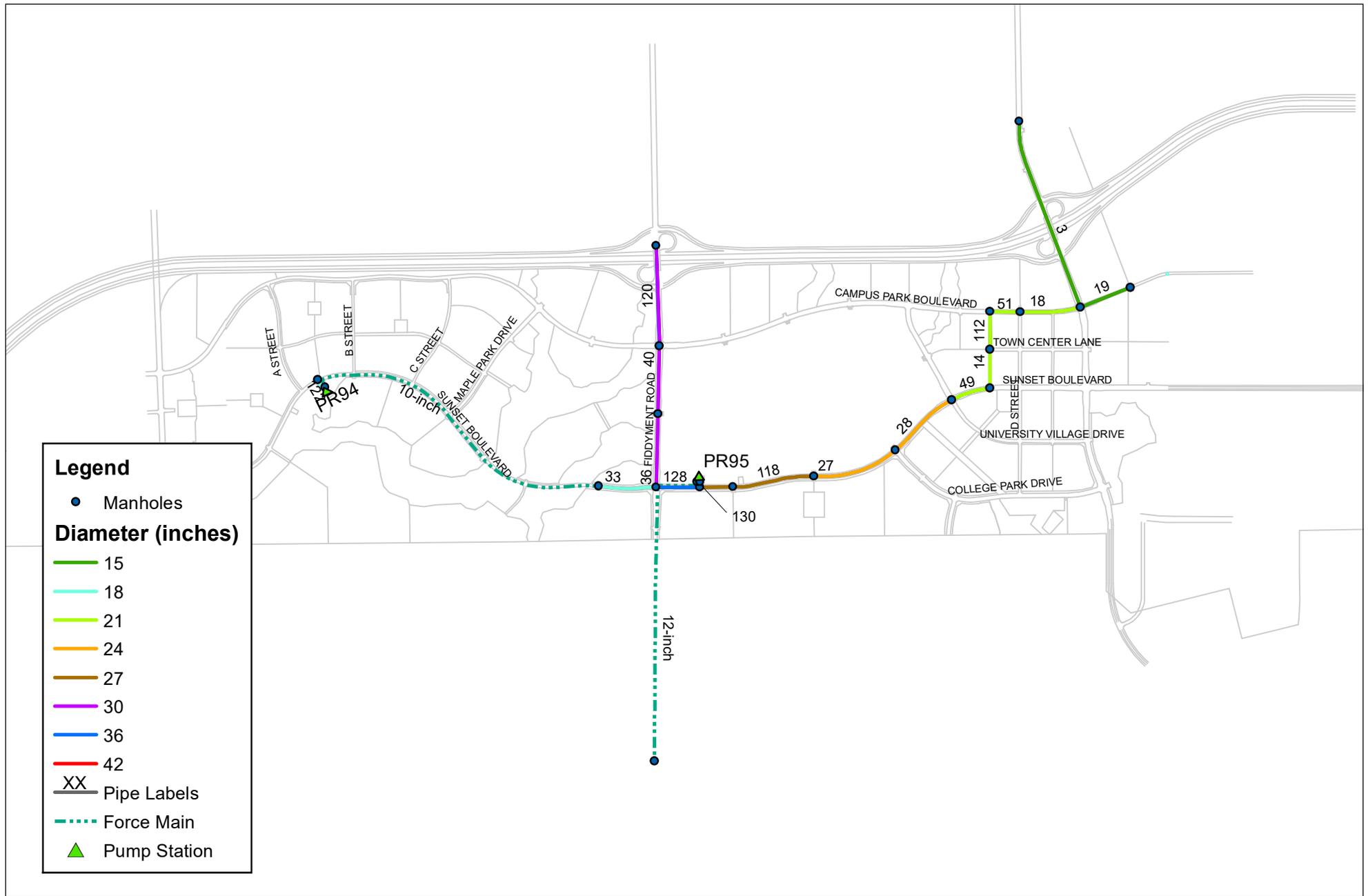
**Figure 7: Exhibit 5  
Pipe Diameter Recommendations  
Placer Ranch**



**Figure 8: Exhibit 6  
Pipe Diameter Recommendations  
Placer Ranch**

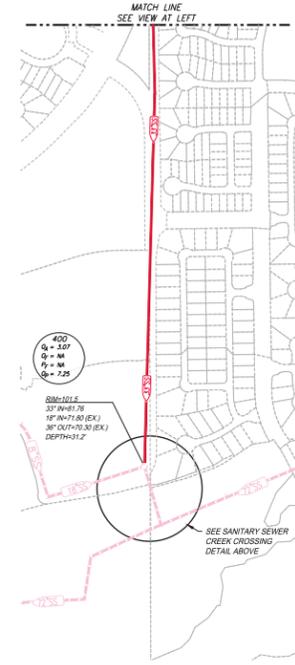
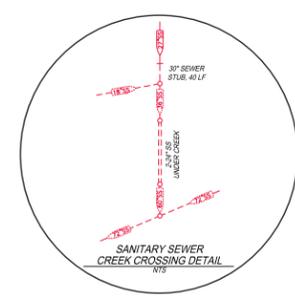
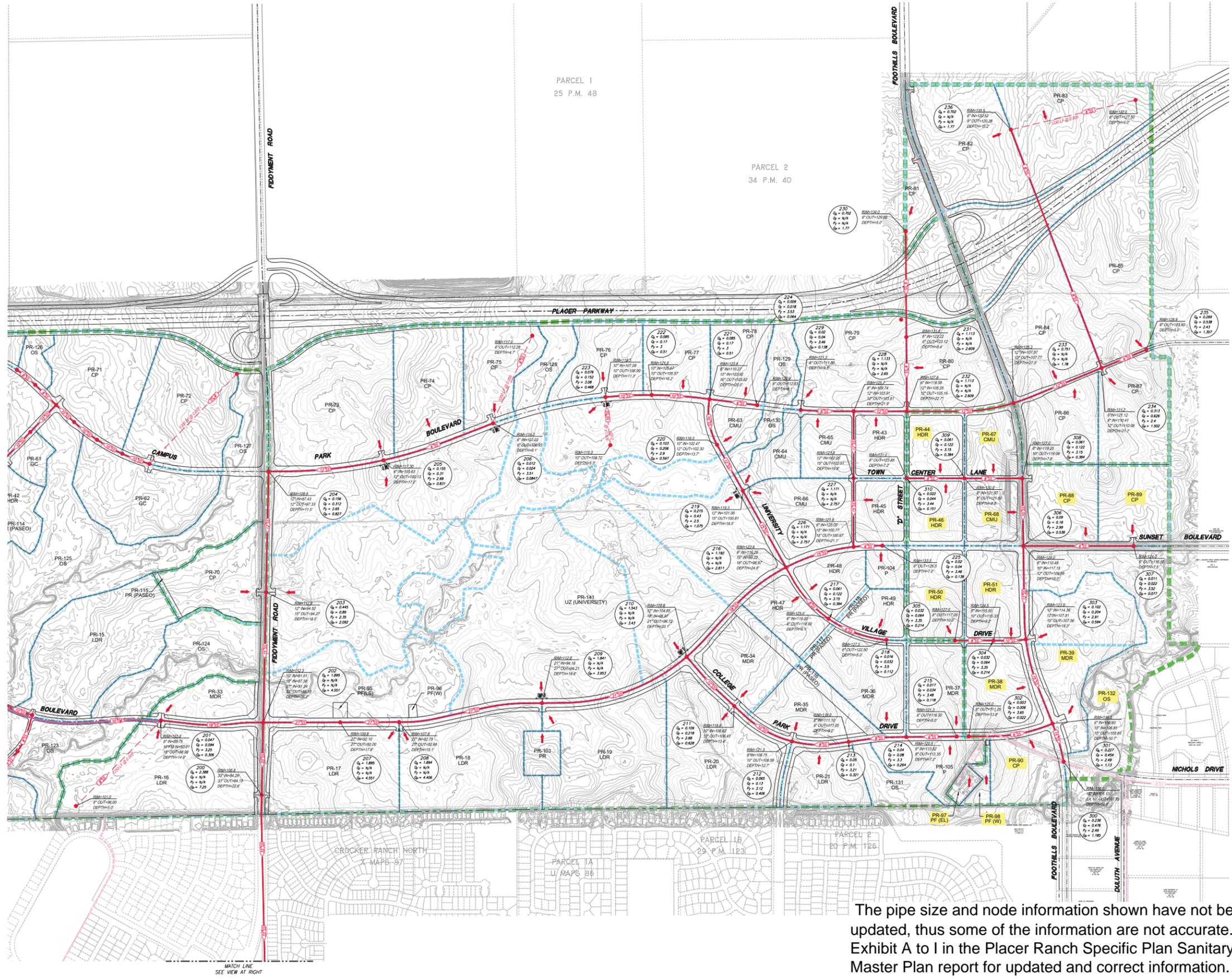


**Figure 9: Exhibit 7  
Pipe Diameter Recommendations  
Placer Ranch**



**Figure 10: Exhibit 8  
Pipe Diameter Recommendations  
Placer Ranch**

**ATTACHMENT A**  
Placer Ranch Wastewater Collection System Model  
Original MSCE Exhibits



CENTRAL SHED NODE DATA				
PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-16	LDR	36.7	183	232
PR-17	LDR	26.3	131	202
PR-18	LDR	30.0	150	202
PR-19	LDR	35.5	177	202
PR-20	LDR	27.9	139	224
PR-21	LDR	10.0	50	222
PR-22	MDR	7.9	39	232
PR-23	MDR	11.5	57	224
PR-24	MDR	9.7	48	239
PR-25	MDR	15.2	76	227
PR-26	MDR	11.3	56	230
PR-27	MDR	7.2	36	210
PR-28	MDR	7.2	36	217
PR-29	MDR	7.7	38	239
PR-30	MDR	5.7	28	210
PR-31	MDR	4.1	20	216
PR-32	MDR	6.1	30	236
PR-33	MDR	7.9	39	210
PR-34	MDR	10.7	53	236
PR-35	MDR	15.5	77	230
PR-36	MDR	35.2	176	229
PR-37	MDR	19.6	98	227
PR-38	MDR	14.4	72	228
PR-39	MDR	12.9	64	212
PR-40	MDR	11.9	59	213
PR-41	MDR	10.4	52	214
PR-42	MDR	23.7	119	209
PR-43	MDR	17.6	88	211
PR-44	MDR	4.5	23	236
PR-45	MDR	26.9	135	238
PR-46	MDR	26.4	132	239
PR-47	MDR	25.7	128	233
PR-48	MDR	33.9	170	234
PR-49	MDR	13.8	69	234
PR-50	MDR	18.3	92	234
PR-51	MDR	4.6	23	239
PR-52	P	3.8	19	217
PR-53	P	9.5	48	220
PR-54	P	28.1	141	212
PR-55	UZ (UNIVERSITY)	27.2	136	206
PR-56	UZ (UNIVERSITY)	32.0	160	204
PR-57	UZ (UNIVERSITY)	89.5	448	203
PR-58	UZ (UNIVERSITY)	41.7	209	209
PR-59	UZ (UNIVERSITY)	52.7	264	230

EASTERN SHED NODE DATA				
PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-60	MDR	12.9	65	302
PR-61	MDR	16.9	85	303
PR-62	MDR	16.3	82	301
PR-63	MDR	7.8	39	315
PR-64	MDR	7.9	39	316
PR-65	MDR	11.4	57	321
PR-66	MDR	11.2	56	320
PR-67	MDR	7.8	39	317
PR-68	MDR	7.5	38	305
PR-69	MDR	12.2	61	305
PR-70	MDR	15.4	77	319
PR-71	MDR	11.4	57	322
PR-72	MDR	11.8	59	323
PR-73	MDR	2.1	11	323

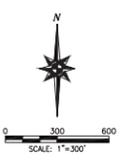
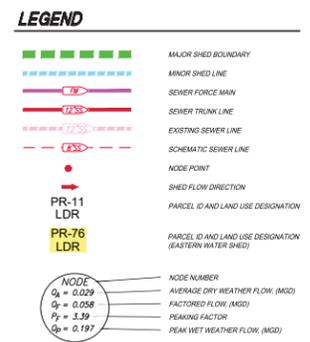


Exhibit 1 - Scenario 1  
Sanitary Sewer Master Plan  
Base Condition without Offsite Flows  
Central & Eastern Sheds

# Placer Ranch Specific Plan

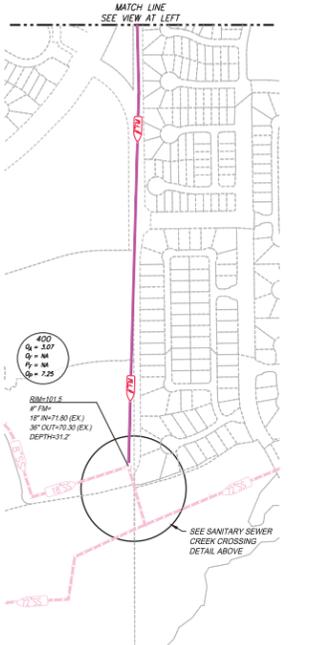
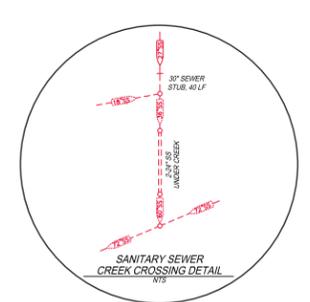
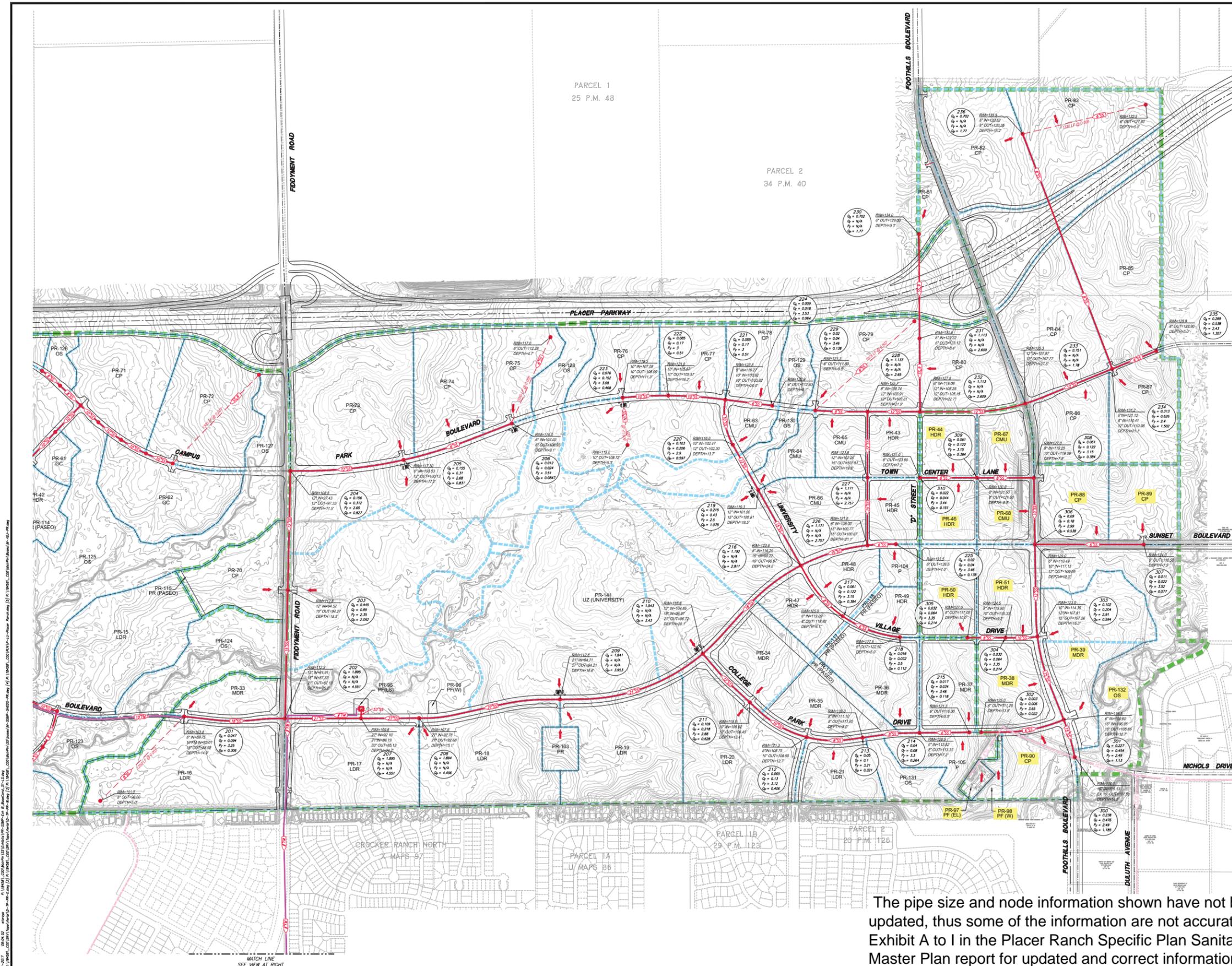
Placer County  
Scale 1"=300'



California  
April 20, 2017  
Job No. 18088.000

The pipe size and node information shown have not been updated, thus some of the information are not accurate. Use Exhibit A to I in the Placer Ranch Specific Plan Sanitary Sewer Master Plan report for updated and correct information.

PRELIMINARY - Subject to Revision



**CENTRAL SHED NODE DATA**

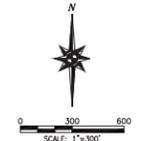
PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
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PR-28	MDR	8.4	42	219
PR-29	MDR	7.7	38	239
PR-30	MDR	5.7	28	210
PR-31	MDR	4.1	20	216
PR-32	MDR	6.1	30	236
PR-33	MDR	7.9	39	210
PR-34	MDR	10.7	53	236
PR-35	MDR	15.5	77	230
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PR-37	CP	19.6	98	227
PR-38	CP	14.4	72	228
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PR-45	CP	26.9	134	238
PR-46	CP	26.4	132	239
PR-47	CP	25.7	128	233
PR-48	CP	33.9	169	234
PR-49	CP	13.8	69	234
PR-50	CP	18.3	91	234
PR-51	CP	4.6	23	239
PR-52	P	3.8	19	217
PR-53	P	9.5	47	220
PR-54	UZ (UNIVERSITY)	28.1	140	212
PR-55	UZ (UNIVERSITY)	27.2	136	206
PR-56	UZ (UNIVERSITY)	32.0	160	204
PR-57	UZ (UNIVERSITY)	89.5	447	203
PR-58	UZ (UNIVERSITY)	41.7	209	229
PR-59	UZ (UNIVERSITY)	52.7	263	230

**EASTERN SHED NODE DATA**

PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-60	MDR	12.9	64	302
PR-61	MDR	16.9	84	303
PR-62	MDR	16.3	82	301
PR-63	MDR	7.8	39	315
PR-64	MDR	7.8	39	316
PR-65	MDR	11.4	57	321
PR-66	MDR	11.2	56	320
PR-67	MDR	7.8	39	317
PR-68	MDR	7.5	37	305
PR-69	MDR	12.2	61	305
PR-70	MDR	15.4	77	319
PR-71	MDR	11.8	59	322
PR-72	MDR	11.4	57	323
PR-73	MDR	2.1	10	323

**LEGEND**

- MAJOR SHED BOUNDARY
- MINOR SHED LINE
- SEWER FORCE MAIN
- SEWER TRUNK LINE
- EXISTING SEWER LINE
- SCHEMATIC SEWER LINE
- NODE POINT
- SHED FLOW DIRECTION
- PR-11 LDR
- PR-76 LDR
- NODE NUMBER
- AVERAGE DRY WEATHER FLOW (MGD)
- FACTORED FLOW (MGD)
- PEAKING FACTOR
- PEAK WET WEATHER FLOW (MGD)



**Exhibit 2 - Scenario 1-LS**  
**Sanitary Sewer Master Plan**  
 Base Condition without Offsite Flows  
 Central & Eastern Sheds

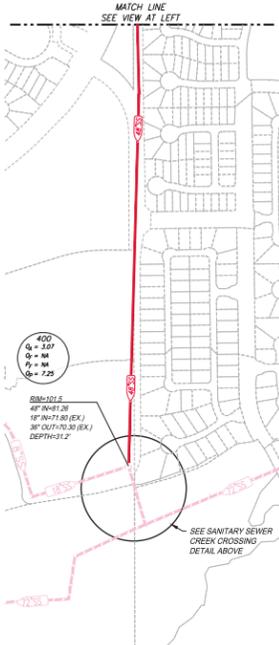
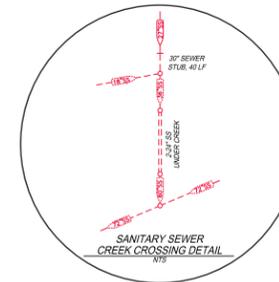
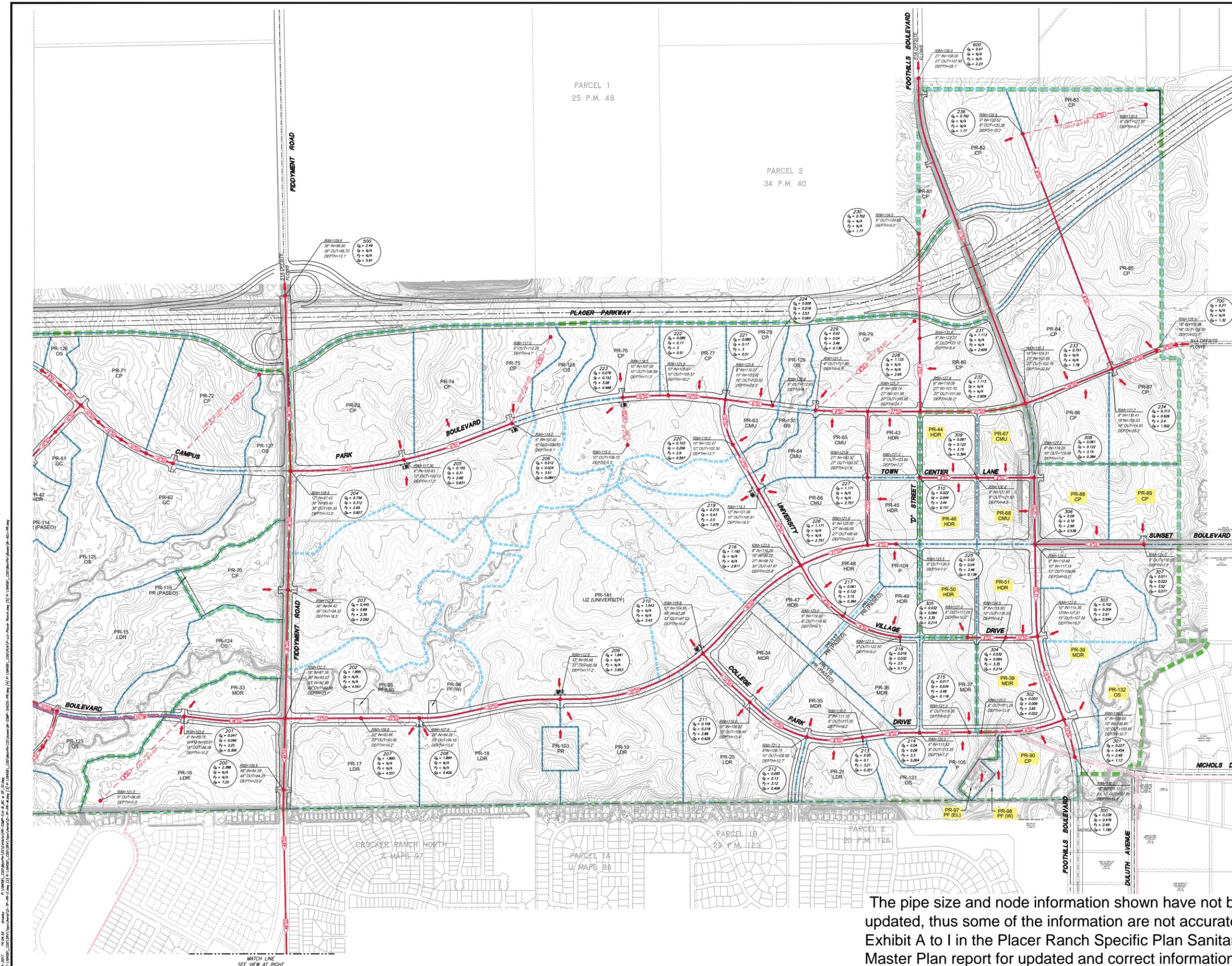
**Placer Ranch Specific Plan**

Placer County  
 Scale 1"=300'



California  
 April 20, 2017  
 Job No. 18088.000

The pipe size and node information shown have not been updated, thus some of the information are not accurate. Use Exhibit A to I in the Placer Ranch Specific Plan Sanitary Sewer Master Plan report for updated and correct information.



CENTRAL SHED NODE DATA				
PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-16	LDR	36.7	183	252
PR-17	LDR	26.3	131	202
PR-18	LDR	30.0	150	202
PR-19	LDR	30.2	152	203
PR-20	LDR	27.9	139	224
PR-21	LDR	10.8	53	222
PR-22	MDR	7.9	39	232
PR-23	MDR	11.8	58	224
PR-24	MDR	8.7	43	223
PR-25	MDR	15.2	75	227
PR-26	MDR	11.3	56	220
PR-27	MDR	7.2	35	210
PR-28	MDR	8.4	41	219
PR-29	MDR	7.7	38	219
PR-30	MDR	5.7	28	218
PR-31	MDR	4.1	20	216
PR-32	MDR	6.1	30	209
PR-33	MDR	7.9	39	210
PR-34	MDR	10.2	50	206
PR-35	MDR	15.5	76	230
PR-36	CP	35.2	175	229
PR-37	CP	19.6	96	227
PR-38	CP	14.4	71	228
PR-39	CP	12.9	63	212
PR-40	CP	11.8	58	213
PR-41	CP	10.4	51	214
PR-42	CP	23.7	117	209
PR-43	CP	17.8	87	211
PR-44	CP	4.5	22	236
PR-45	CP	26.9	132	238
PR-46	CP	36.4	180	239
PR-47	CP	25.7	127	233
PR-48	CP	33.9	166	234
PR-49	CP	13.8	67	233
PR-50	CP	18.3	90	234
PR-51	PR	4.8	23	203
PR-52	P	1.6	7	217
PR-53	P	8.5	41	220
PR-54	UZ (UNIVERSITY)	28.1	139	212
PR-55	UZ (UNIVERSITY)	27.2	133	206
PR-56	UZ (UNIVERSITY)	30.0	149	204
PR-57	UZ (UNIVERSITY)	88.9	433	203
PR-58	UZ (UNIVERSITY)	41.7	207	229
PR-59	UZ (UNIVERSITY)	52.7	262	230

EASTERN SHED NODE DATA				
PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-60	MDR	12.8	63	302
PR-61	MDR	18.9	93	303
PR-62	MDR	10.2	50	301
PR-63	MDR	7.9	39	315
PR-64	MDR	7.9	39	318
PR-65	MDR	11.4	56	321
PR-66	MDR	11.2	54	320
PR-67	MDR	7.8	38	317
PR-68	MDR	7.5	37	305
PR-69	CP	13.2	65	305
PR-70	CP	13.4	66	319
PR-71	CP	11.4	56	322
PR-72	PF (EL)	11.8	58	323
PR-73	PF (W)	2.1	10	323

**LEGEND**

- MAJOR SHED BOUNDARY
- MINOR SHED LINE
- SEWER FORCE MAIN
- SEWER TRUNK LINE
- EXISTING SEWER LINE
- SCHEMATIC SEWER LINE
- NODE POINT
- SHED FLOW DIRECTION
- PARCEL ID AND LAND USE DESIGNATION
- PARCEL ID AND LAND USE DESIGNATION (EASTERN WATER SHED)
- NODE NUMBER
- AVERAGE DRY WEATHER FLOW (MGD)
- FACTORED FLOW (MGD)
- PEAKING FACTOR
- PEAK WET WEATHER FLOW (MGD)

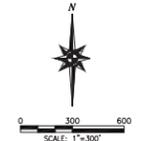


Exhibit 3 - Scenario 1  
Sanitary Sewer Master Plan  
Base Condition & Offsite Flows  
Central & Eastern Sheds

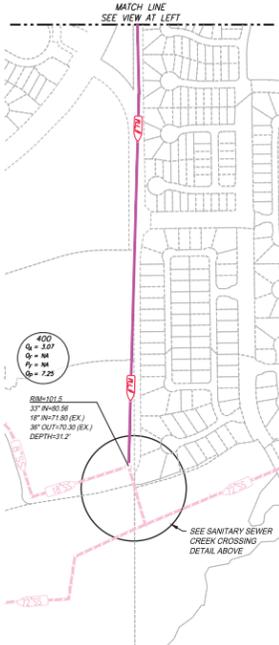
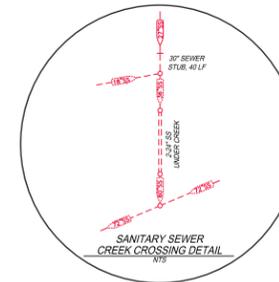
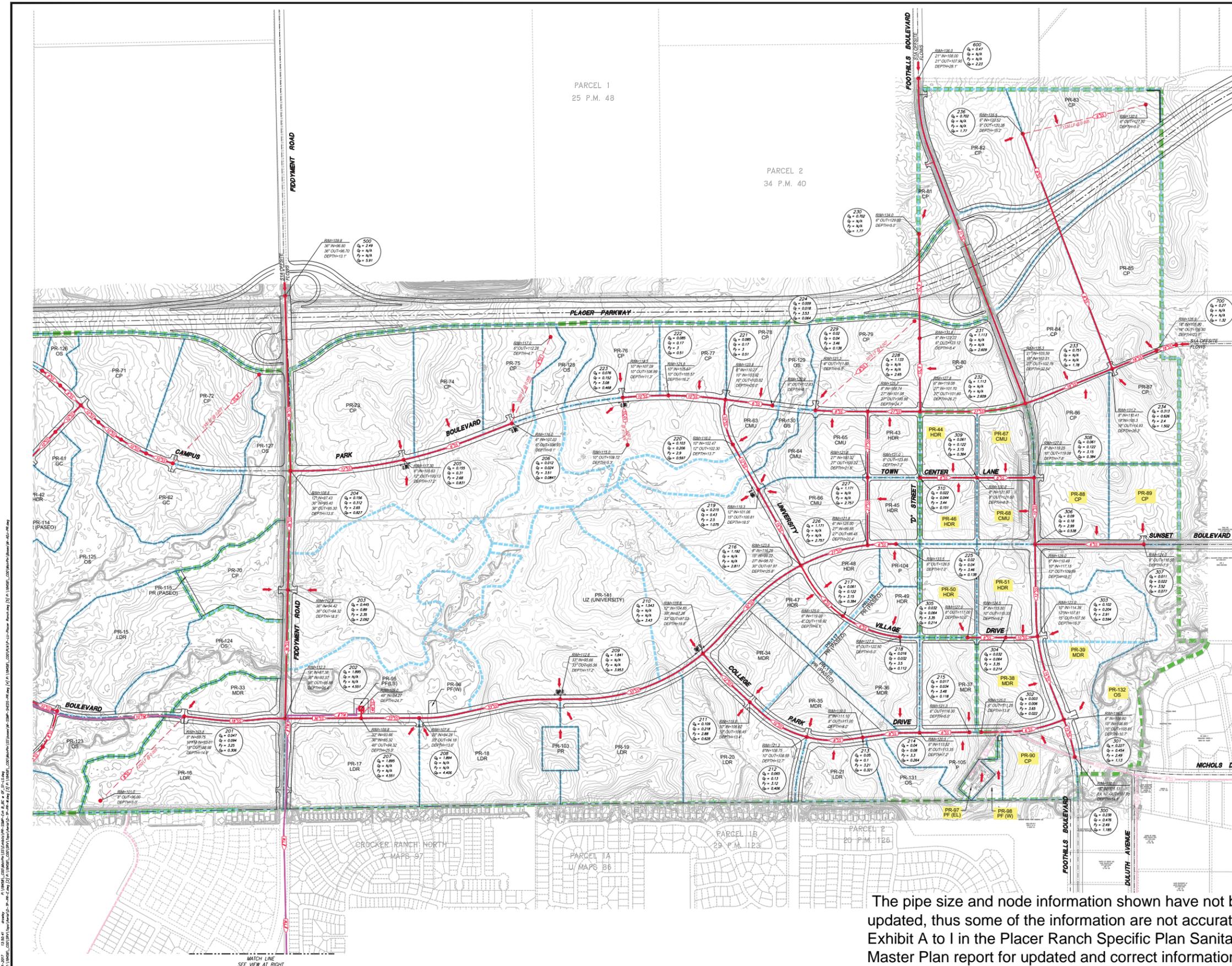
**Placer Ranch Specific Plan**

Placer County  
Scale 1"=300'



California  
April 24, 2017  
Job No. 16WSS-030

The pipe size and node information shown have not been updated, thus some of the information are not accurate. Use Exhibit A to I in the Placer Ranch Specific Plan Sanitary Sewer Master Plan report for updated and correct information.



CENTRAL SHED NODE DATA				
PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-16	LDR	36.7	183	250
PR-17	LDR	26.3	131	202
PR-18	LDR	30.0	150	202
PR-19	LDR	35.2	176	203
PR-20	LDR	27.9	139	204
PR-21	LDR	10.8	53	202
PR-22	MDR	7.9	39	232
PR-23	MDR	11.8	58	224
PR-24	MDR	3.7	18	203
PR-25	MDR	15.2	76	227
PR-26	MDR	11.3	56	200
PR-27	MDR	7.2	36	210
PR-28	MDR	7.7	38	210
PR-29	MDR	7.2	36	217
PR-30	MDR	8.4	41	219
PR-31	MDR	7.7	38	210
PR-32	MDR	5.7	28	210
PR-33	MDR	4.1	20	216
PR-34	MDR	6.1	30	206
PR-35	MDR	10.7	53	210
PR-36	MDR	10.7	53	206
PR-37	MDR	11.8	58	210
PR-38	MDR	10.4	51	214
PR-39	MDR	23.7	118	209
PR-40	MDR	17.8	88	211
PR-41	MDR	4.5	22	236
PR-42	MDR	26.9	134	238
PR-43	MDR	3.4	17	239
PR-44	MDR	25.7	128	233
PR-45	MDR	33.9	169	234
PR-46	MDR	13.8	68	233
PR-47	MDR	18.3	91	234
PR-48	MDR	4.8	24	203
PR-49	MDR	1.8	9	217
PR-50	P	8.5	42	200
PR-51	P	8.5	42	212
PR-52	UZ (UNIVERSITY)	28.1	140	206
PR-53	UZ (UNIVERSITY)	27.2	136	204
PR-54	UZ (UNIVERSITY)	30.0	150	204
PR-55	UZ (UNIVERSITY)	88.8	444	203
PR-56	UZ (UNIVERSITY)	41.7	208	209
PR-57	UZ (UNIVERSITY)	52.7	263	230

EASTERN SHED NODE DATA				
PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-58	MDR	12.8	64	302
PR-59	MDR	18.9	94	303
PR-60	MDR	10.3	51	301
PR-61	MDR	7.9	39	315
PR-62	MDR	7.9	39	318
PR-63	MDR	11.4	57	321
PR-64	MDR	11.2	56	320
PR-65	MDR	7.8	39	317
PR-66	MDR	7.5	37	305
PR-67	MDR	12.2	61	305
PR-68	MDR	13.4	67	319
PR-69	MDR	11.4	57	322
PR-70	MDR	11.4	57	323
PR-71	MDR	2.1	10	323

**LEGEND**

- MAJOR SHED BOUNDARY
- MINOR SHED LINE
- SEWER FORCE MAIN
- SEWER TRUNK LINE
- EXISTING SEWER LINE
- SCHEMATIC SEWER LINE
- NODE POINT
- SHED FLOW DIRECTION
- PR-11 LDR
- PR-76 LDR
- PARCEL ID AND LAND USE DESIGNATION (SEWER WATER SHED)
- PARCEL ID AND LAND USE DESIGNATION (SEWER WATER SHED)
- NODE NUMBER
- AVERAGE DRY WEATHER FLOW (MGD)
- FACTORED FLOW (MGD)
- PEAKING FACTOR
- PEAK WET WEATHER FLOW (MGD)

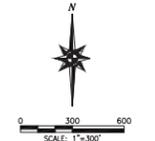


Exhibit 4 - Scenario 1-LS  
Sanitary Sewer Master Plan  
Base Condition & Offsite Flows  
Central & Eastern Sheds

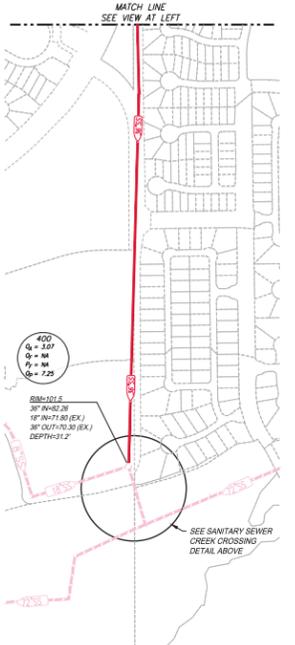
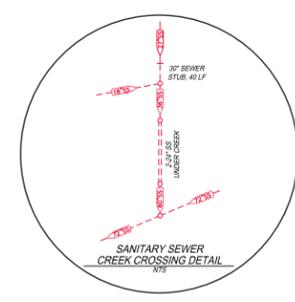
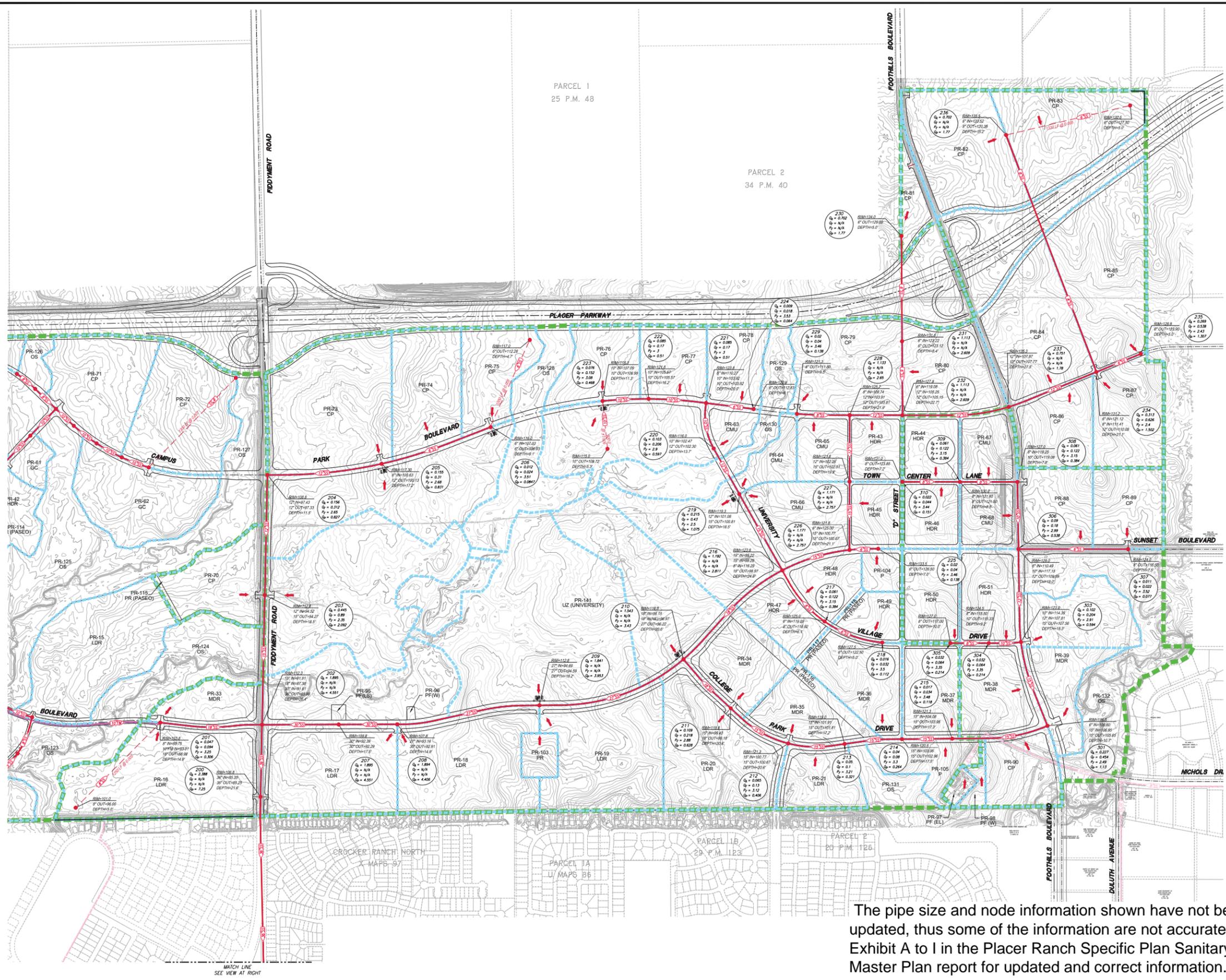
# Placer Ranch Specific Plan

Placer County  
Scale 1"=300'



California  
April 24, 2017  
Job No. 16WSS-030

The pipe size and node information shown have not been updated, thus some of the information are not accurate. Use Exhibit A to I in the Placer Ranch Specific Plan Sanitary Sewer Master Plan report for updated and correct information.



**CENTRAL SHED NODE DATA**

PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-16	LDR	36.7	183	250
PR-17	LDR	26.3	131	202
PR-18	LDR	30.0	150	202
PR-19	LDR	35.2	176	203
PR-20	LDR	27.9	139	204
PR-21	LDR	10.0	50	202
PR-22	MDR	7.9	39	232
PR-23	MDR	11.8	59	224
PR-24	MDR	8.4	42	203
PR-25	MDR	3.4	17	203
PR-26	MDR	15.2	76	227
PR-27	MDR	11.3	56	200
PR-28	MDR	7.2	36	210
PR-29	MDR	8.4	42	219
PR-30	MDR	7.7	38	219
PR-31	MDR	5.7	28	218
PR-32	MDR	4.1	20	216
PR-33	MDR	6.1	30	209
PR-34	MDR	7.9	39	210
PR-35	MDR	15.7	78	230
PR-36	MDR	15.5	77	230
PR-37	CP	35.2	176	229
PR-38	CP	19.6	98	228
PR-39	CP	14.4	72	227
PR-40	CP	12.9	64	212
PR-41	CP	11.8	59	213
PR-42	CP	10.4	52	214
PR-43	CP	23.7	118	209
PR-44	CP	17.6	88	211
PR-45	CP	4.5	22	236
PR-46	CP	26.9	134	238
PR-47	CP	36.4	182	239
PR-48	CP	25.7	128	233
PR-49	CP	33.9	169	234
PR-50	CP	13.8	69	233
PR-51	CP	18.3	91	234
PR-52	CP	4.8	24	203
PR-53	CP	1.8	9	217
PR-54	CP	2.7	13	217
PR-55	P	8.5	42	200
PR-56	P	28.1	140	212
PR-57	UZ (UNIVERSITY)	27.2	136	206
PR-58	UZ (UNIVERSITY)	30.0	150	204
PR-59	UZ (UNIVERSITY)	88.9	444	203
PR-60	UZ (UNIVERSITY)	41.7	208	229
PR-61	UZ (UNIVERSITY)	52.7	263	230

**EASTERN SHED NODE DATA**

PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-62	MDR	12.8	64	302
PR-63	MDR	18.9	94	303
PR-64	MDR	10.3	51	301
PR-65	MDR	7.9	39	315
PR-66	MDR	11.4	57	301
PR-67	MDR	11.2	56	300
PR-68	MDR	7.8	39	317
PR-69	MDR	7.5	37	305
PR-70	MDR	12.2	61	305
PR-71	MDR	13.4	67	319
PR-72	MDR	11.4	57	322
PR-73	MDR	11.8	59	323
PR-74	MDR	2.1	10	323

**LEGEND**

- MAJOR SHED BOUNDARY
- MINOR SHED LINE
- SEWER FORCE MAIN
- SEWER TRUNK LINE
- EXISTING SEWER LINE
- SCHEMATIC SEWER LINE
- NODE POINT
- SHED FLOW DIRECTION
- PARCEL ID AND LAND USE DESIGNATION

**NODE**

- NODE NUMBER
- AVERAGE DRY WEATHER FLOW (MGD)
- FACTORED FLOW (MGD)
- PEAKING FACTOR
- PEAK WET WEATHER FLOW (MGD)

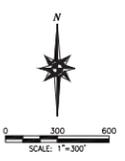


Exhibit 5 - Scenario 2  
 Sanitary Sewer Master Plan  
 Base Condition without Offsite Flows  
 Eastern Shed

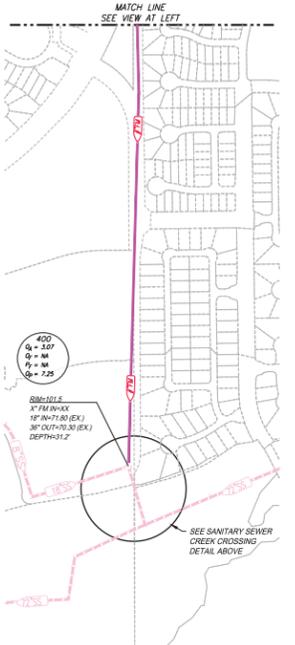
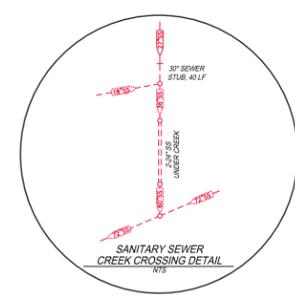
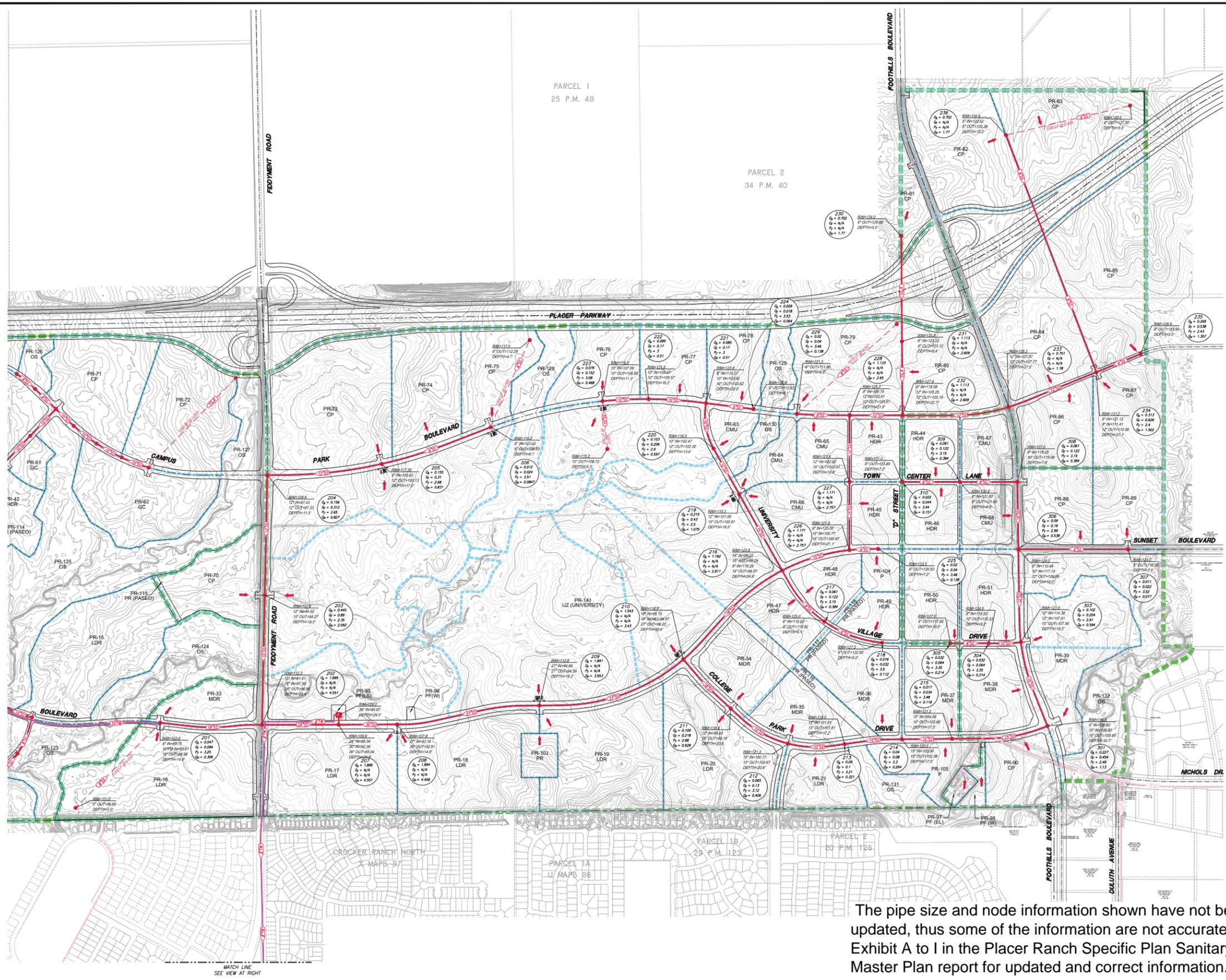
# Placer Ranch Specific Plan

Placer County  
 Scale 1"=300'



California  
 April 24, 2017  
 Job No. 16WSS-030

The pipe size and node information shown have not been updated, thus some of the information are not accurate. Use Exhibit A to I in the Placer Ranch Specific Plan Sanitary Sewer Master Plan report for updated and correct information.



**CENTRAL SHED NODE DATA**

PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-16	LDR	36.7	183	232
PR-17	LDR	26.3	131	202
PR-18	LDR	30.0	150	202
PR-19	LDR	35.5	177	202
PR-20	LDR	27.9	139	224
PR-21	LDR	10.0	50	222
PR-22	MDR	7.8	39	232
PR-23	MDR	11.5	57	224
PR-24	MDR	9.7	48	239
PR-25	MDR	15.2	76	227
PR-26	MDR	11.3	56	230
PR-27	MDR	7.2	36	210
PR-28	MDR	8.4	42	219
PR-29	MDR	7.7	38	239
PR-30	MDR	5.7	28	210
PR-31	MDR	4.1	20	216
PR-32	MDR	6.1	30	236
PR-33	MDR	7.9	39	210
PR-34	MDR	10.7	53	236
PR-35	MDR	15.5	77	230
PR-36	CP	35.2	176	229
PR-37	CP	19.6	98	227
PR-38	CP	14.4	72	228
PR-39	CP	12.9	64	212
PR-40	CP	11.9	59	213
PR-41	CP	10.4	52	214
PR-42	CP	23.7	119	209
PR-43	CP	17.6	88	211
PR-44	CP	4.5	22	236
PR-45	CP	26.9	134	238
PR-46	CP	26.4	132	239
PR-47	CP	25.7	128	233
PR-48	CP	33.9	169	234
PR-49	CP	13.8	69	234
PR-50	CP	18.3	91	234
PR-51	PR	4.6	23	239
PR-52	P	3.8	19	217
PR-53	P	9.5	47	230
PR-54	UZ (UNIVERSITY)	28.1	140	212
PR-55	UZ (UNIVERSITY)	27.2	136	206
PR-56	UZ (UNIVERSITY)	32.0	160	204
PR-57	UZ (UNIVERSITY)	89.5	447	203
PR-58	UZ (UNIVERSITY)	41.7	209	229
PR-59	UZ (UNIVERSITY)	52.7	263	230

**EASTERN SHED NODE DATA**

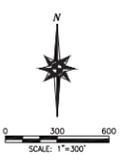
PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-60	MDR	12.9	64	302
PR-61	MDR	16.9	84	303
PR-62	MDR	16.3	82	301
PR-63	MDR	7.8	39	315
PR-64	MDR	7.8	39	316
PR-65	MDR	11.4	57	321
PR-66	MDR	11.2	56	320
PR-67	MDR	7.8	39	317
PR-68	MDR	7.5	37	305
PR-69	MDR	13.2	66	305
PR-70	MDR	15.4	77	319
PR-71	MDR	11.8	59	322
PR-72	MDR	11.4	57	323
PR-73	MDR	2.1	10	323

**LEGEND**

- MAJOR SHED BOUNDARY
- MINOR SHED LINE
- SEWER FORCE MAIN
- SEWER TRUNK LINE
- EXISTING SEWER LINE
- SCHEMATIC SEWER LINE
- NODE POINT
- SHED FLOW DIRECTION
- PR-11 LDR

**NODE**

- Q<sub>a</sub> = 0.029 AVERAGE DRY WEATHER FLOW (MGD)
- Q<sub>f</sub> = 0.058 FACTORED FLOW (MGD)
- P<sub>2</sub> = 1.39 PEAKING FACTOR
- Q<sub>w</sub> = 0.197 PEAK WET WEATHER FLOW (MGD)



**Exhibit 6 - Scenario 2-LS**  
**Sanitary Sewer Master Plan**  
 Base Condition without Offsite Flows  
 Eastern Shed

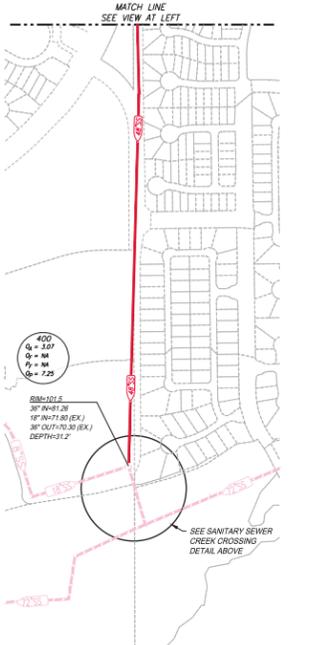
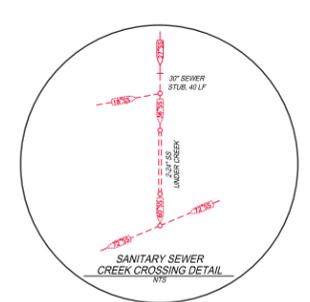
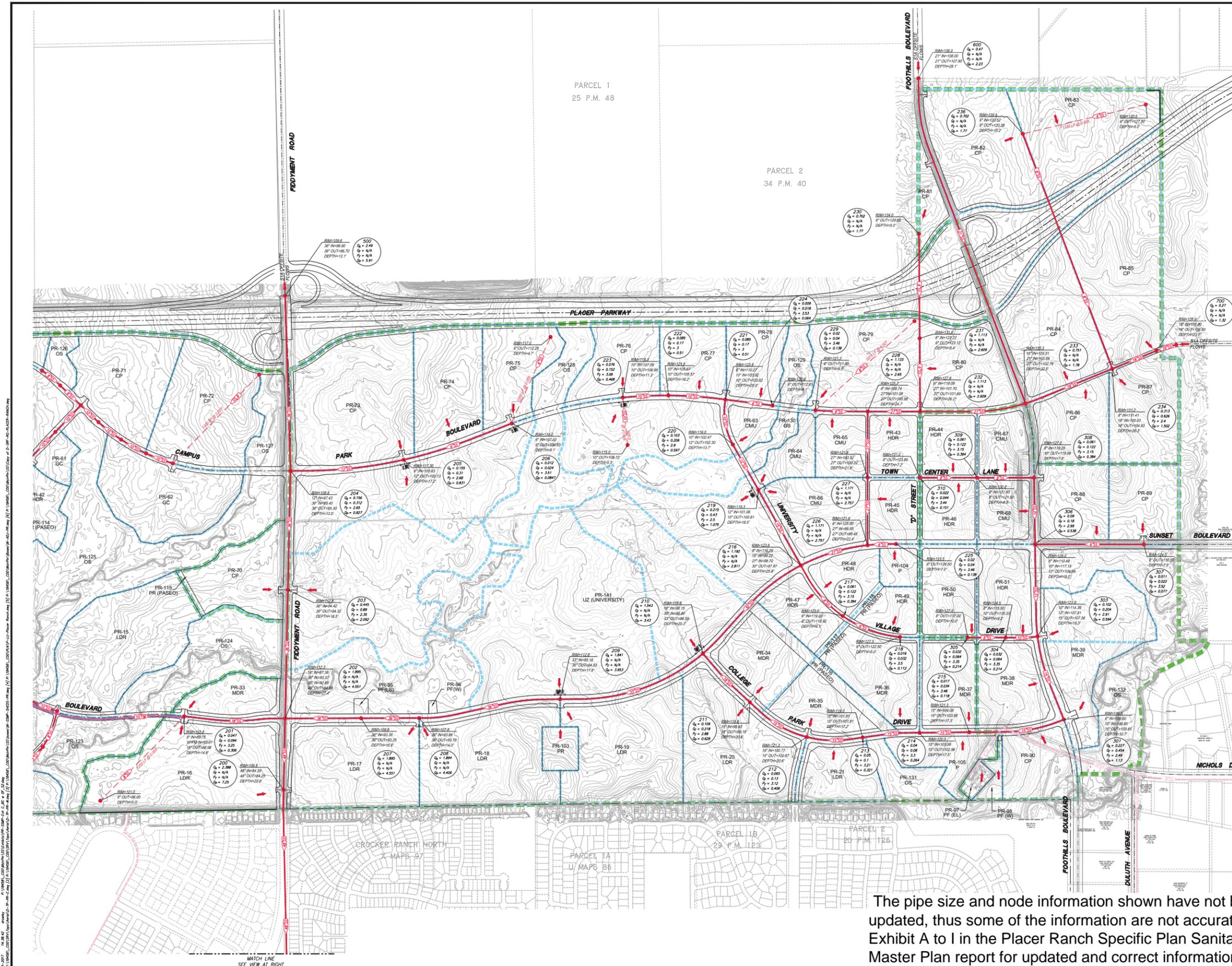
**Placer Ranch Specific Plan**

Placer County  
 Scale 1"=300'



California  
 April 24, 2017  
 Job No. 18088-000

The pipe size and node information shown have not been updated, thus some of the information are not accurate. Use Exhibit A to I in the Placer Ranch Specific Plan Sanitary Sewer Master Plan report for updated and correct information.



CENTRAL SHED NODE DATA				
PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-16	LDR	36.7	183	250
PR-17	LDR	26.3	131	202
PR-18	LDR	30.0	150	202
PR-19	LDR	35.2	176	203
PR-20	LDR	27.9	139	204
PR-21	LDR	10.8	53	202
PR-22	MDR	7.9	39	232
PR-23	MDR	11.8	58	224
PR-24	MDR	8.7	43	203
PR-25	MDR	15.2	76	227
PR-26	MDR	11.3	56	200
PR-27	MDR	7.2	36	210
PR-28	MDR	8.4	41	219
PR-29	MDR	7.7	38	219
PR-30	MDR	5.7	28	218
PR-31	MDR	4.1	20	216
PR-32	MDR	6.1	30	209
PR-33	MDR	7.9	39	210
PR-34	MDR	15.7	78	230
PR-35	MDR	15.5	77	230
PR-36	CP	35.2	176	229
PR-37	CP	19.6	98	228
PR-38	CP	14.4	72	227
PR-39	CP	12.9	64	212
PR-40	CP	11.8	59	213
PR-41	CP	10.4	52	214
PR-42	CP	23.7	119	209
PR-43	CP	17.8	89	211
PR-44	CP	4.5	23	236
PR-45	CP	26.9	135	238
PR-46	CP	36.4	182	239
PR-47	CP	25.7	128	233
PR-48	CP	33.9	169	234
PR-49	CP	13.8	69	233
PR-50	CP	18.3	91	234
PR-51	PR	4.8	24	203
PR-52	P	1.6	8	217
PR-53	P	8.5	42	200
PR-54	UZ (UNIVERSITY)	28.1	141	212
PR-55	UZ (UNIVERSITY)	27.2	136	206
PR-56	UZ (UNIVERSITY)	30.0	150	204
PR-57	UZ (UNIVERSITY)	88.9	445	203
PR-58	UZ (UNIVERSITY)	41.7	209	209
PR-59	UZ (UNIVERSITY)	52.7	263	230

EASTERN SHED NODE DATA				
PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-60	MDR	12.8	64	302
PR-61	MDR	16.9	85	303
PR-62	MDR	18.3	92	301
PR-63	MDR	7.9	39	315
PR-64	MDR	7.9	39	318
PR-65	MDR	11.4	57	321
PR-66	MDR	11.2	56	320
PR-67	MDR	7.8	39	317
PR-68	MDR	7.5	38	305
PR-69	CP	12.2	61	305
PR-70	CP	13.4	67	319
PR-71	CP	11.4	57	322
PR-72	PF (EL)	11.8	59	323
PR-73	PF (W)	2.1	11	323

**LEGEND**

- MAJOR SHED BOUNDARY
- MINOR SHED LINE
- SEWER FORCE MAIN
- SEWER TRUNK LINE
- EXISTING SEWER LINE
- SCHEMATIC SEWER LINE
- NODE POINT
- SHED FLOW DIRECTION
- PR-11 LDR

**NODE**

- NODE NUMBER
- AVERAGE DRY WEATHER FLOW (MGD)
- FACTORED FLOW (MGD)
- PEAKING FACTOR
- PEAK WET WEATHER FLOW (MGD)

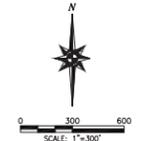
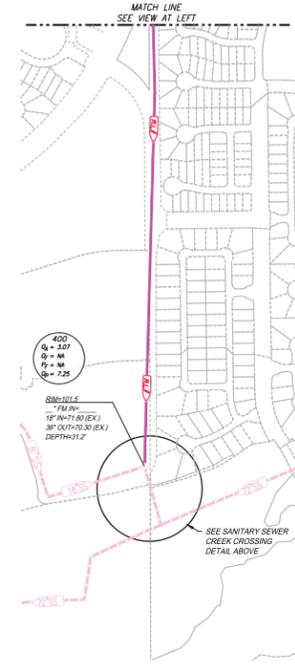
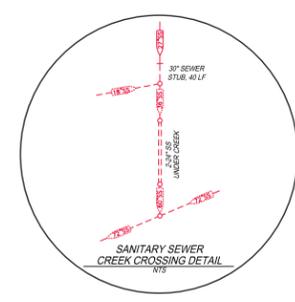
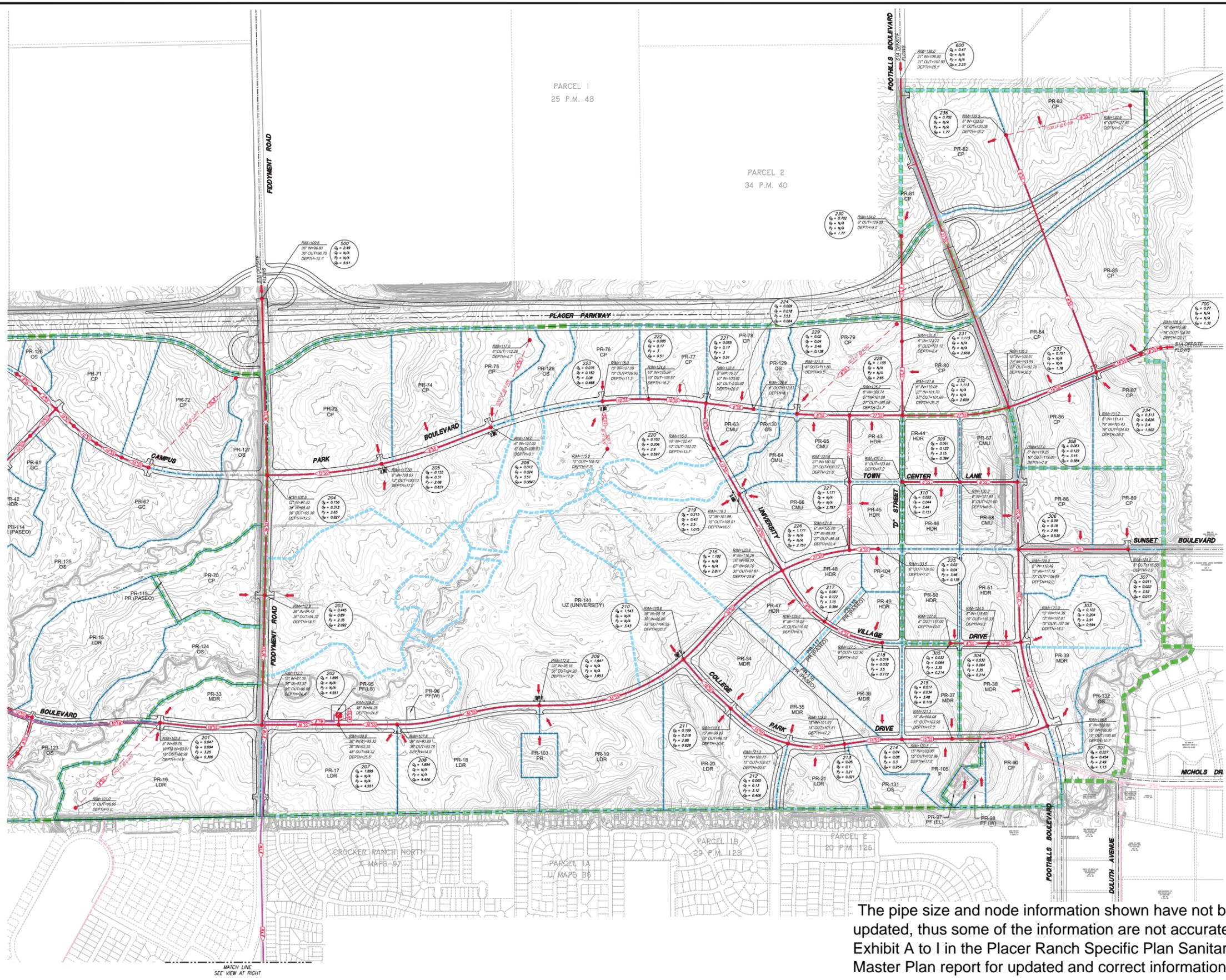


Exhibit 7 - Scenario 2  
Sanitary Sewer Master Plan  
Base Condition with Offsite Flows  
Eastern Shed

**Placer Ranch Specific Plan**

Placer County  
Scale 1"=300'  
Mackay & Somp  
California  
April 24, 2017  
Job No. 16WSS-030

The pipe size and node information shown have not been updated, thus some of the information are not accurate. Use Exhibit A to I in the Placer Ranch Specific Plan Sanitary Sewer Master Plan report for updated and correct information.



**CENTRAL SHED NODE DATA**

PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-16	LDR	36.7	183	232
PR-17	LDR	26.3	131	202
PR-18	LDR	30.0	150	202
PR-19	LDR	35.5	177	203
PR-20	LDR	27.9	139	224
PR-21	LDR	10.0	50	222
PR-22	MDR	7.9	39	232
PR-23	MDR	11.5	57	224
PR-24	MDR	9.7	48	239
PR-25	MDR	15.2	76	227
PR-26	MDR	11.3	56	230
PR-27	MDR	7.2	36	210
PR-28	MDR	8.4	42	219
PR-29	MDR	7.7	38	239
PR-30	MDR	5.7	28	210
PR-31	MDR	7.2	36	217
PR-32	MDR	8.4	42	219
PR-33	MDR	7.7	38	239
PR-34	MDR	5.7	28	210
PR-35	MDR	4.1	20	216
PR-36	MDR	6.1	30	206
PR-37	MDR	7.9	39	210
PR-38	MDR	10.7	53	206
PR-39	MDR	15.5	77	230
PR-40	MDR	35.2	176	229
PR-41	MDR	19.6	98	227
PR-42	MDR	14.4	72	228
PR-43	MDR	12.9	64	212
PR-44	MDR	11.9	59	213
PR-45	MDR	10.4	52	214
PR-46	MDR	23.7	119	209
PR-47	MDR	17.6	88	211
PR-48	MDR	4.5	22	236
PR-49	MDR	26.9	134	238
PR-50	MDR	4.0	20	239
PR-51	MDR	25.7	128	233
PR-52	MDR	33.9	169	234
PR-53	MDR	13.8	69	234
PR-54	MDR	18.3	91	234
PR-55	MDR	3.8	19	217
PR-56	P	9.5	47	230
PR-57	P	8.5	42	212
PR-58	UZ (UNIVERSITY)	28.1	140	206
PR-59	UZ (UNIVERSITY)	27.2	136	206
PR-60	UZ (UNIVERSITY)	32.0	160	204
PR-61	UZ (UNIVERSITY)	69.5	347	203
PR-62	UZ (UNIVERSITY)	41.7	209	209
PR-63	UZ (UNIVERSITY)	52.7	263	230

**EASTERN SHED NODE DATA**

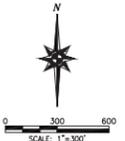
PARCEL	LAND USE	AREA	PROJECTED DU	TRIBUTARY TO NODE
PR-64	MDR	12.9	64	302
PR-65	MDR	16.9	84	303
PR-66	MDR	16.3	82	301
PR-67	MDR	7.9	39	315
PR-68	MDR	7.9	39	316
PR-69	MDR	11.4	57	321
PR-70	MDR	11.2	56	320
PR-71	MDR	7.8	39	317
PR-72	MDR	7.5	37	305
PR-73	MDR	12.2	61	305
PR-74	MDR	15.4	77	319
PR-75	MDR	11.4	57	322
PR-76	MDR	11.8	59	323
PR-77	MDR	11.4	57	323
PR-78	MDR	2.1	10	323

**LEGEND**

- MAJOR SHED BOUNDARY
- MINOR SHED LINE
- SEWER FORCE MAIN
- SEWER TRUNK LINE
- EXISTING SEWER LINE
- SCHEMATIC SEWER LINE
- NODE POINT
- SHED FLOW DIRECTION
- PR-11 LDR

**NODE**

- Q<sub>a</sub> = 0.029 AVERAGE DRY WEATHER FLOW (MGD)
- Q<sub>f</sub> = 0.058 FACTORED FLOW (MGD)
- P<sub>2</sub> = 1.39 PEAKING FACTOR
- Q<sub>w</sub> = 0.197 PEAK WET WEATHER FLOW (MGD)



**Exhibit 8 - Scenario 2-LS**  
**Sanitary Sewer Master Plan**  
 Base Condition & Offsite Flows  
 Eastern Shed

**Placer Ranch Specific Plan**

Placer County  
 Scale 1"=300'



California  
 April 24, 2017  
 Job No. 18088.000

The pipe size and node information shown have not been updated, thus some of the information are not accurate. Use Exhibit A to I in the Placer Ranch Specific Plan Sanitary Sewer Master Plan report for updated and correct information.

**ATTACHMENT B**  
Placer Ranch Wastewater Collection System Model  
Detailed Flow Input Tables