4 OCEAN SOUTH EAST

4.1 Watershed Hydrology Analysis

Ocean South East drainage area is part of the Santa Monica Bay Watershed defined by the County of Los Angeles DPW (Exhibit E and Exhibit F). It is directly tributary to the Pacific Ocean. It has several different storm drain systems that ultimately discharge into the ocean. The drainage systems for this drainage area consist of mostly storm drain pipes that collect water from upstream canyons and streets. There are two major canyons: Klondike and San Ramon. Klondike Canyon is located on the west portion of the watershed. It flows in the north-south direction and enters a 72-inch storm drain under Palos Verdes Drive South then connects to a downstream pipe that collects runoff water from the west area of the Portuguese Bend Beach Club. San Ramon Canyon is located on the east portion of the watershed. The lower San Ramon canyon area has been diverted through a storm drain pipe placed during the summer of 2014, which drains into the ocean. This recent update is included in this Master Plan. Within this watershed, there are storm drain systems that discharge onto the streets. There are also two systems that discharge onto canyons that have inlets downstream to a storm drain pipe. The majority of this drainage area is urbanized. There are two major open spaces areas: the areas draining onto Klondike Canyon and a significant portion of the areas flowing into San Ramon Canyon.

This drainage area receives runoff water from The City of Rolling Hills. A portion of the Portuguese Bend gated community drains into Klondike Canyon. This system was used for hydrology routing, and to consider the changes in flow due to pipe routing, but it is not considered for the storm drain capacity analysis.

This drainage area was split in two OSE-A and OSE-B for modeling. Two different hydrology maps were created as shown on Exhibits D and E. The results for both the hydrology and hydraulic models will be in two separate tables and output files. The cost analysis was completed together to provide a better understanding of the overall drainage area recommended improvements.

The hydrology results for the 10-, 25- and 50-year storm events are provided in Appendix E-1.

4.1.1 Hydrology Results Summary 10-, 25-, 50-year storm events

Ocean South East A was divided into 70 subwatersheds and Table 4-1 summarizes the maximum 10-, 25-, and 50- year storm event discharge flow draining into each node.

Table 4-1: OSE-A Hydrology Summary					
Hydrology ID	**Structure ID**	**Subarea (acres)**	**10-Year Flow (cfs)**	**25-Year Flow (cfs)**	**50-Year Flow (cfs)**
1A	CB4073	6.9	6.4	9.2	11.2
2A	2A	32.7	30.5	43.7	53
3A	3A	56.8	49.2	70	84.6
4A	4A	54.7	34.6	49.4	62
5A	5A	27.4	24.9	34.6	43.7
6A	IS4036	33.2	27	37.8	46.9
7A	MH4908	15.4	18	25.4	31.3
8A	MH4908	11.8	28.2	40	49.6
9B	IS0091	3.8	6.6	9	10.4
10B	CB0389	21.3	21.4	28.7	35.6
11C	IS0097	3.8	7.6	11	12.7
12C	JS0420	9.5	9.1	13	15.7
13C	IS0406	3.4	4.9	7.2	8.3
15B	MH0404	17.4	17.6	25.1	30.4
16C	CB0342	4.4	5.4	7.4	9.2
17C	CB0382	12.7	11.6	17	20.8
19B	MH0396	15.3	18	25.8	32.2
20B	MH0394	8.8	10.3	13.8	17.1
21B	IS0391	6.6	9.3	12.9	15
22C	CB0366	3.2	5.4	7.4	8.2
24B	MH6508	2.3	3.2	4.3	5.2
25D	MH2784	4.8	4.5	6.4	7.7
26D	JS2789	4.3	4.3	5.9	7.1
27D	OS2797	1.6	2.6	3.6	4.4
29D	IS1884	18.9	14.5	21	26.5
30D	MH1880	0.9	1.3	1.9	2.4
31D	MH30120	7.4	7.8	10.3	12.6
34C	IS0424	7.3	11.7	16.3	18.8
35C	CB0476	25.9	19.1	26.9	33.8
36C	MH0474	8.3	9.1	12.6	15.3
37C	MH0436	11.2	10.8	14.8	18.6
38C	MH0470	4.8	6.7	9.1	11.4
39C	MH0467	7.2	12.1	16.6	19.2
40C	MH2142	10.7	12.1	16.6	20.1
41C	MH0464	9.4	13.6	18.3	22.8
42C	MH0462	17.4	17.1	23.9	27.3
43D	43D	37.5	37.7	51.7	65.3
44D	IS0486	14.4	19.1	25.5	31.7
45D	JS0485	8.7	11.4	15.3	19
46D	MH0484	8	9.4	13.3	16.3
47D	MH0482	21	18.5	26.3	32.9
48D	JS2133	11.1	14.5	20.8	26.2
49D	MH0478	3.2	5.5	7.6	8.7
50D	MH0477	7.5	9.3	12.9	15.8
52C	MH29715	2.7	3.7	4.9	5.8
53D	CB0488	19.9	17.6	24.3	27.8
54D	55C	0	17.6	24.3	27.8
55C	IS2436	9.8	11.1	15.5	18.1
57E	58F	10.8	12.8	18.4	22.9

Table 4-1: OSE-A Hydrology Summary					
Hydrology ID	**Structure ID**	**Subarea (acres)**	**10-Year Flow (cfs)**	**25-Year Flow (cfs)**	**50-Year Flow (cfs)**
58F	59F	23.4	20.6	29.2	36.6
59F	TS3468	10.3	12.3	17.6	22
60G	CB3198	16.1	17.2	24.4	30
63F	MH4052	5.3	5.7	8	9.9
65E	JS0524	10.1	10.9	15.3	18.9
66E	67F	3.9	5	7.3	8.4
67F	IS0510	51.6	50.3	69.4	88.1
68F	JS7314	37.8	33.3	46	57.9
69F	MH1912	9.9	11.3	15.7	19.2
70F	MH0516	10.9	11.7	17.1	20.9
71F	MH0501	7.4	9.8	13.6	15.7
73E	JS1943	14	13.7	19.2	23
74E	JS1946	22.1	20.4	27.9	34.4
75E	JS3614	33.4	23.2	32.7	40.7
76E	CB0349	6.4	6.3	8.5	10.5
77H	JS3480	10.7	10	13.9	16.9
78I	MH1851	8.6	9.6	12.9	15.9
80H	CB14511	25.6	21.6	31.7	38.9
81J	CB14510	2.9	2.7	3.6	4.5
82K	CB3134	6.8	7.3	10.1	12.3
83L	CB4073	9.3	8.9	12.2	15.3

Similarly, Ocean South East B was divided into 36 subwatersheds and Table 4-2 summarizes the maximum 10-, 25-, and 50- year storm event discharge flow draining into each node.

Table 4-2: OSE-B Hydrology Summary					
Hydrology ID	**Structure ID**	**Subarea (acres)**	**10-Year Flow (cfs)**	**25-Year Flow (cfs)**	**50-Year Flow (cfs)**
1A	IS0969	18.2	14.3	20.3	25.5
2A	MH0966	9.5	9.9	14.1	17.3
3A	IS0320	10.6	12.5	17.9	20.9
4A	IS0313	9	9.9	14.4	16.9
5B	JS20512	7	7.2	10.5	12.5
6C	IS0967	22.8	19.3	27.6	33.4
7C	IS0317	10.6	11	15.6	19.3
9B	IS0311	4.8	5.3	7.8	9.3
10B	MH0307	5.4	5.9	8.5	10
12B	CB4904	2.2	3.1	4.2	5.2
13C	IS0948	18.3	18.9	27.5	32.6
14C	JS4886	5.1	4.9	6.6	8.2
15C	MH0306	14.3	12.4	17.8	20.6
16C	JS4903	6.5	8.5	11.7	14.1
18B	MH1874	3.5	4.4	6	7.3
19B	OS1877	6	7	10.3	13.1
20B	OS1877	11.6	19.7	27.7	34.8
22D	IS0095	30.5	22.3	31.4	39.6
23E	CB0085	10.2	12	16.4	19.7

Table 4-2: OSE-B Hydrology Summary					
Hydrology ID	**Structure ID**	**Subarea (acres)**	**10-Year Flow (cfs)**	**25-Year Flow (cfs)**	**50-Year Flow (cfs)**
24E	MH34122	4.1	4.8	6.5	7.9
25E	MH0075	8.1	8.4	11.8	14.1
26E	MH0073	18.7	16	22.5	26.8
28D	IS43325	8.4	12.2	16.3	19.5
29F	CB0299	9.1	9	12.6	15.3
30F	OS0302	10.7	15.1	23	26.7
32G	CB36128	17.8	13.3	19	23.7
34H	CB30915	9.8	7.7	11.1	13.5
35I	IS30921	23.1	22.2	31.1	38.1
37H	JS49333	4.4	5.7	7.8	9.9
38H	IS36130	12.8	13.6	19.3	23.7
40J	IS0952	10.8	8.7	12	14.8
41J	IS0943	3.7	5.7	7.5	8.9
43K	IS0950	6	7.4	9.7	12.5
44K	IS0938	4.1	4.9	6.8	8.7
45L	IS0940	2.9	3.8	5.1	6.6
47K	437	38.7	28.8	39.4	49.7
50Q	50Q	39.8	37.3	52.6	64.6
53R	53R	46.9	41.3	56.6	69.7

4.2 Hydraulic Analysis

4.2.1 Existing Condition

Table 4-3 provides important modeling assumptions used for the hydraulic analysis and Appendix E-2 provides the existing condition hydraulic analysis for the 10-, 25- and 50-year storm events.

Table 4-3: OSE Hydraulic Model Assumptions					
System	**Upstream Structure ID**	**Downstream Structure ID**	**Pipe ID**	**Street**	**Assumption**
1	MH0478	MH0446	SD3045	Conqueror Drive	For these pipes there is no profile information. The street slope was used for the model.
	MH0446	JS5325	SD3046		
	JS5325	JS2691	SD3049		
2	GB50935	OS0970	SD49169	Seaclaire Drive	As-built plan 10185.pdf has the outlet at a location that does not match with aerial photography observations. The invert elevation does not match contour elevations either. The pipe was kept to follow the as-built, since this will provide the design slopes and pipe lengths.

4.2.1.1 Results

The Ocean South East drainage area consists of several storm drain systems. The northwest portion is an area that consists mostly of canyons that drain into storm drains. These canyons

have slopes between 10% and 30%, which is considerably steep. For this report, as mentioned in Section 2, a typical cross section was used for the analysis. Further analysis would enable a deeper understanding of these natural channels and of how they affect the storm drain systems. Tables 4-4 and 4-5 list the storm drain structures that were found to be flooded for the 50-year storm event hydraulic analysis in OSE-A and OSE-B, respectively. No storm drain structures within OSE-A flooded in the 10-year storm event hydraulic analysis.

Table 4-4: OSE-A Flooded Storm Drain Structures

Storm Drain Structure ID	Floods in 50-Year Storm Event
MH0507	X
GB1910	X
GB1919	X
JS1945	X
JS1946	X
GB2648	X
CB3134	X
GB4914	X
MH1912	X
CB0389	X

Table 4-5: OSE-B Flooded Storm Drain Structures

Storm Drain Structure ID	Floods in 50-Year Storm Event	Floods in 10-Year Storm Event
MH0073	X	X
IS0967	X	
CB0093	X	
MH0094	X	X
MH0075	X	
CB36128	X	

4.2.2 Recommended Improvements

Tables 4-6 and 4-7 provide the storm drain systems within this drainage area that were found to be deficient following Section 2.4.4 criteria, and improvements are recommended. The recommended improvement maps (atlas map) are attached at the end of this chapter (Figure 4-1). The proposed condition hydraulic analysis results are included in Appendix E-3.

Table 4-6: OSE-A Pipes to be Improved								
System	Owner	Upstream Structure ID	Downstream Structure ID	Pipe ID	Atlas Map	Existing Size (in)	Proposed Size (in)	Street
1	LAC	TS7317	MH1912	SD3035	25C	42	48	Dauntless Drive
		MH1912	GB1913	SD0741		36	48	
		GB1913	GB1911	SD0740		36	48	
		GB1911	MH0507	SD0738		36	48	
		MH0507	GB1910	SD0737		36	48	
		GB1910	JS3425	SD2414		36	48	
		JS3425	GB1909	SD2415		36	48	
		GB1909	MH0516	SD0736		36	48	
2	LAC	GB1919	GB0517	SD0753	25C	30	36	Dauntless Drive at Schooner Drive
		GB0517	JS1918	SD0754		30	36	
		JS1918	MH0516	SD0750		30	36	
3	LAC	JS1947	JS1948	SD0783	28A	45	60	Schooner Drive
		JS1948	JS3614	SD3422		45	60	
		JS3614	TS0514	SD0784		45	60	
		TS0514	MH0489	SD0755		48	60	
		MH0489	OS0513	SD0530		48	60	
4	LAC	GB2648	GB2649	SD1685	25D	18	24	Ganado Drive
		GB2649	JS2650	SD1686		18	24	
		JS2650	GB0418	SD1688		18	24	
		GB0418	OS0417	SD1687		18	24	
5	RPV	CB3134	GB3135	SD2128	28A	18	24	Maritime Road
		GB3135	GB3137	SD2129		18	24	
		GB3137	GB3136	SD2130		18	24	
		GB3136	OS3138	SD2131		18	24	
6	RPV	GB4914	OS4031	SD3830	24D	48	60	Seawall Road
7	LAC & RPV	CB0389	CB0411	SD3038	26C	21	30	Casilina Drive and Hawksmoor Drive
		CB0411	GB0410	SD3039	25D	21	30	
		GB0410	GB2375	SD1332		18	30	
		GB2375	MH0409	SD1333		18	30	
		MH0409	MH2371	SD1326		27	30	

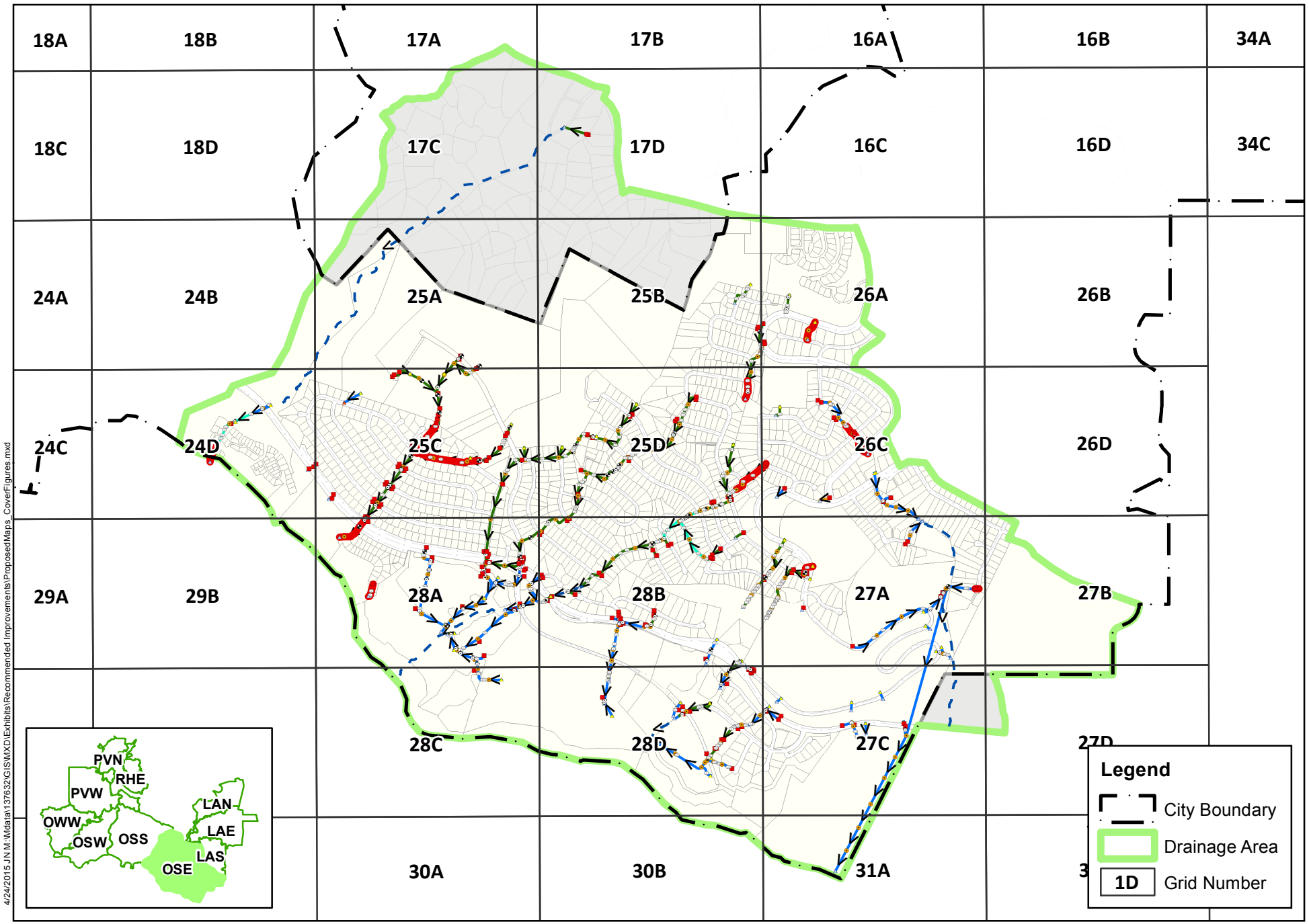
Table 4-7: OSE-B Pipes to be Improved								
System	Owner	Upstream Structure ID	Downstream Structure ID	Pipe ID	Atlas Map	Existing Size (in)	Proposed Size (in)	Street
1	RPV	IS0095	CB0093	SD0443	26A	18	24	Crest Road
		CB0093	MH0094	SD2616		18	24	
		MH0094	MH0092	SD0448		18	24	
		MH0092	OS3564	SD2617		2 x 1.2	4 x 2	
2	RPV	GB34124	MH0075	SD0473	26C	21	30	Dianora Drive and Crest Road
		MH0075	JS0076	SD0474		21	30	
		JS0076	MH0074	SD0476		21	30	
		MH0074	GB34125	SD32740		21	30	
		GB34125	GB34126	SD32741		21	30	
		GB34126	GB34127	SD0479		21	30	
		GB34127	MH0073	SD32742		24	30	
		MH0073	CB0067	SD0480		24	36	
		CB0067	OS0072	SD32732		24	36	
3	LAC	IS0967	GB0333	SD0540	27A	18	24	Palos Verdes

Table 4-7: OSE-B Pipes to be Improved								
System	Owner	Upstream Structure ID	Downstream Structure ID	Pipe ID	Atlas Map	Existing Size (in)	Proposed Size (in)	Street
		GB0333	SD2322	SD1257		21	24	Drive East
		SD2322	TS2321	SD1256		21	24	
		TS2321	MH0332	SD1261		21	24	
4	RPV	CB36128	CB36129	SD35141	27A	18	24	Tarapaca Road

4.2.3 Cost Estimates

Construction cost estimates for this drainage area were completed and the results are shown in Table 4-8. Each improvement project cost was calculated using the procedure mentioned in Section 2.5 of this report (see Appendix B-2).

Table 4-8: OSE Total Cost Estimate	
Atlas Map	Total Project Cost
24D	$253,000
25C	$1,054,000
25D & 26C	$293,000
25D	$107,000
26A	$186,000
26C	$274,000
27A	$153,000
28A	$540,000
Total	**$2,860,000**



Michael Baker INTERNATIONAL

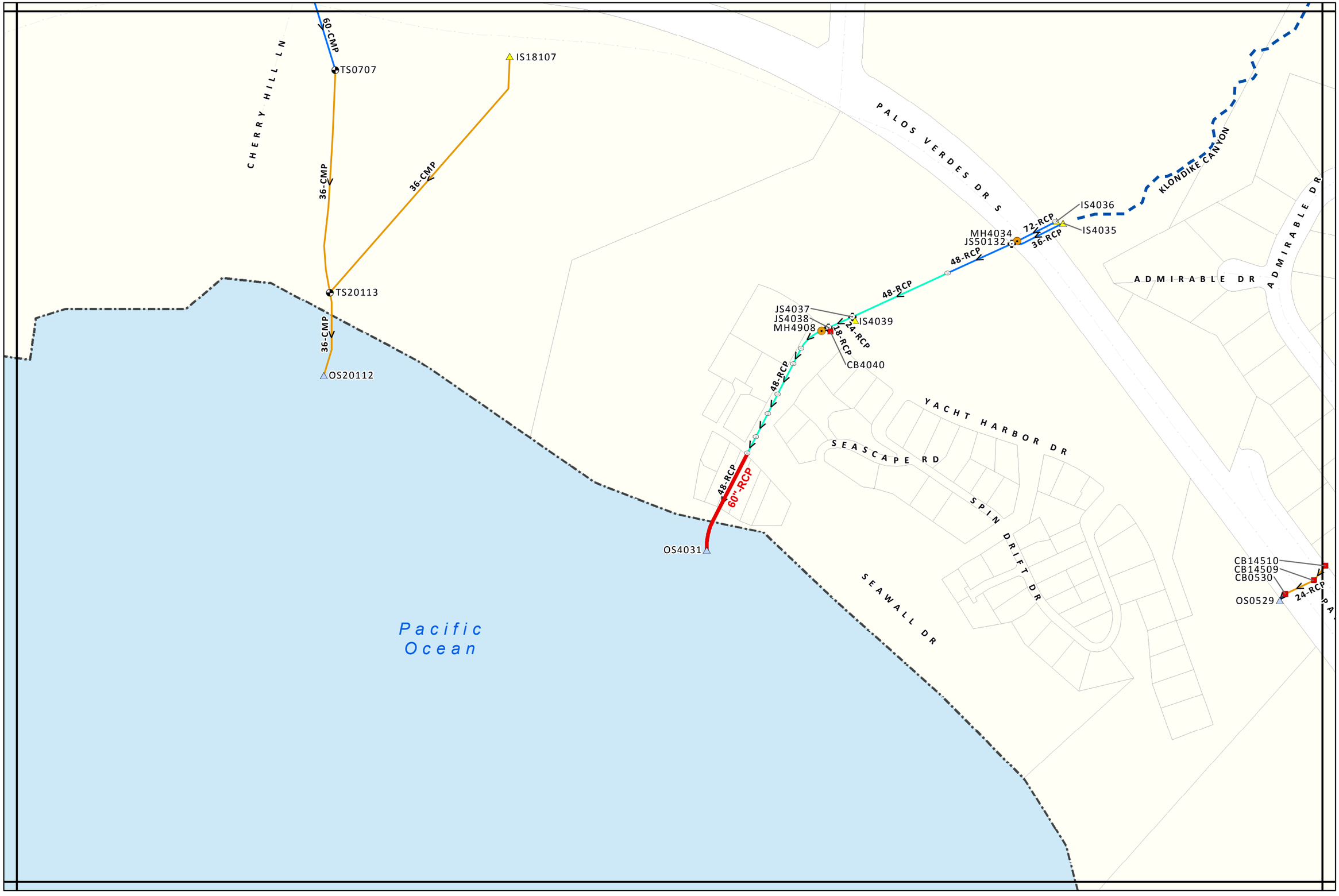
0 500 1,000 2,000 Feet

Source:

CITY OF RANCHO PALOS VERDES MASTER PLAN OF DRAINAGE

OSE - Recommended Improvements Index Map

Figure 4-1



City of Rancho Palos Verdes

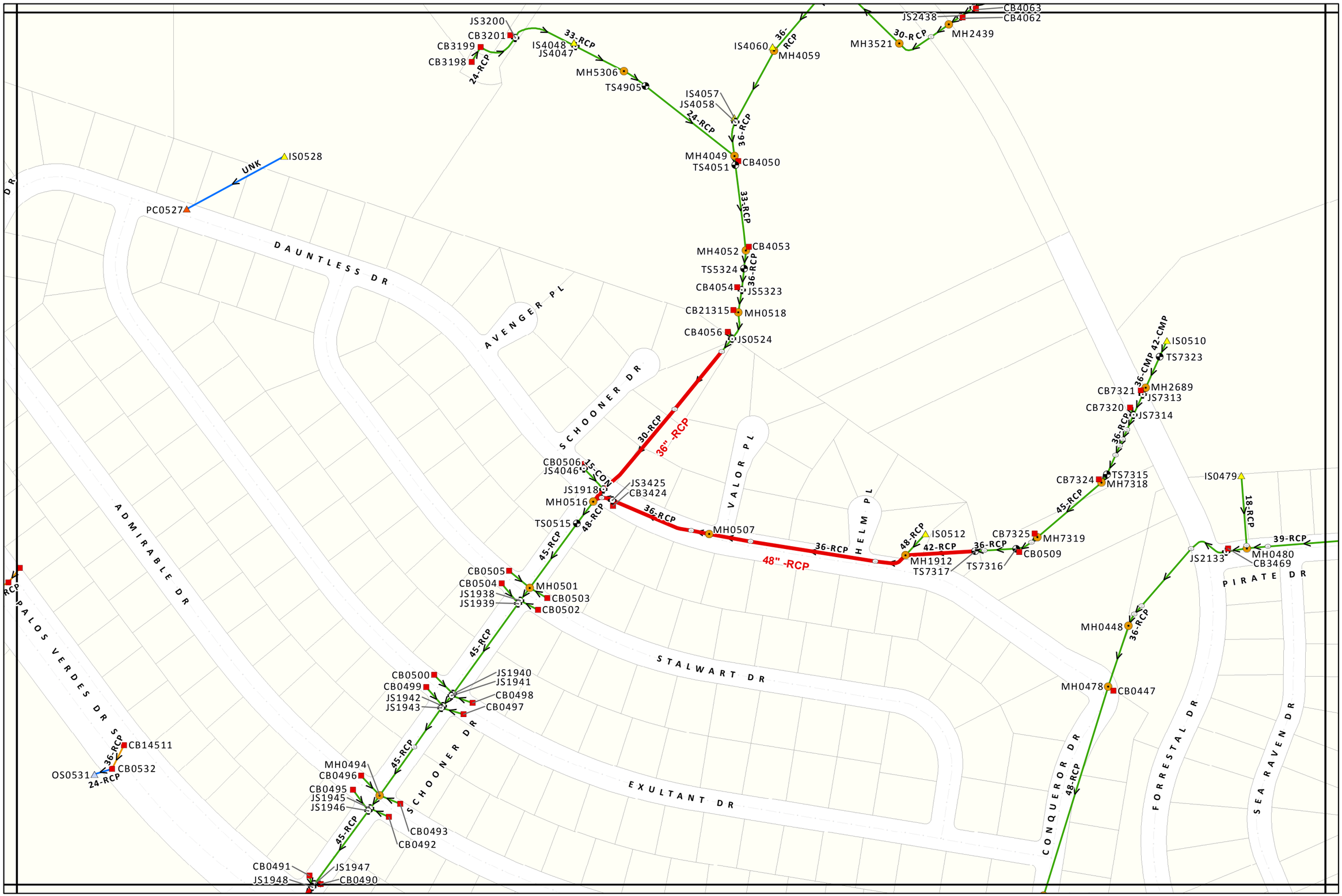
Michael Baker INTERNATIONAL

Storm Water Recommended Improvements

- Catch Basin
- Inlet
- Outlet
- Parkway Outlet
- Manhole
- Junction
- Transition
- Grade Break
- Storm Filter and Storm Gate
- Proposed Pipe
- 30" Proposed Size
- Open Watercourse
- Rancho Palos Verdes
- Rolling Hills Estates
- Palos Verdes Estates
- Private
- City of LA
- County of LA
- Unknown
- City Boundary

0 100 200
Feet

24A	24B	25A
24C	**24D**	25C
29A	29B	28A



City of Rancho Palos Verdes

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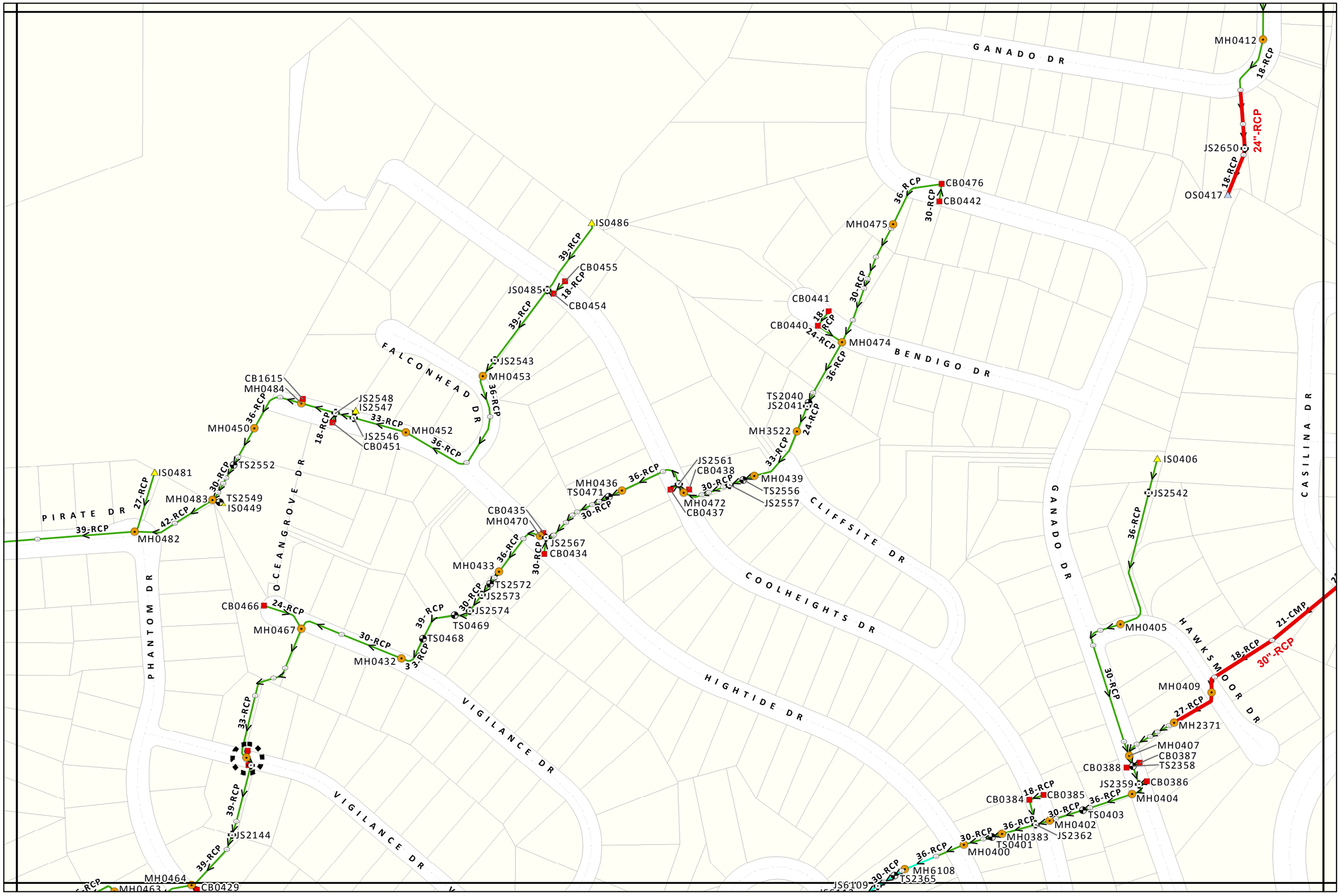
0 100 200
Feet

24B	25A	25B
24D	**25C**	25D
29B	28A	28B



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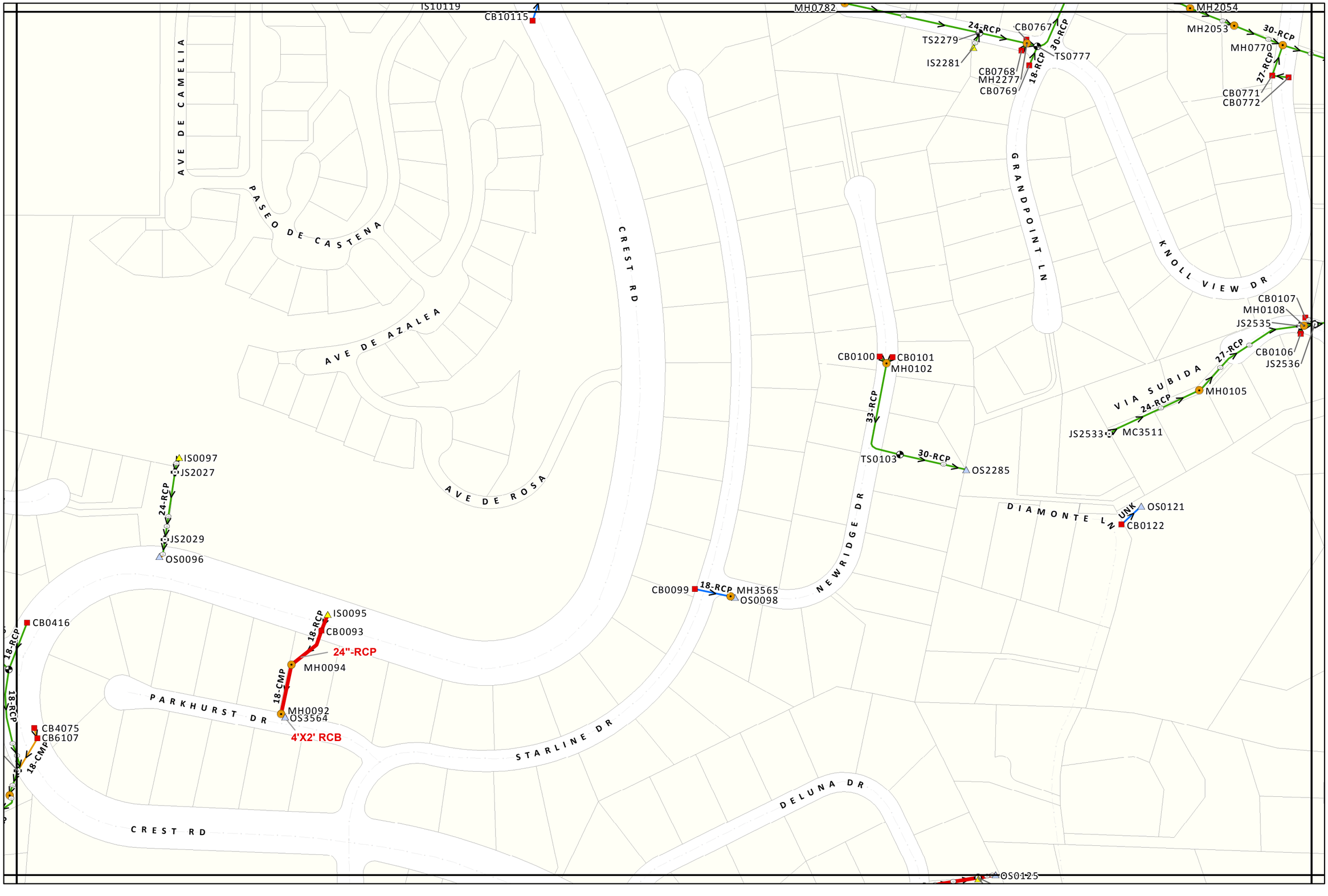
0 100 200
Feet

25A	25B	26A
25C	**25D**	26C
28A	28B	27A



City of Rancho Palos Verdes

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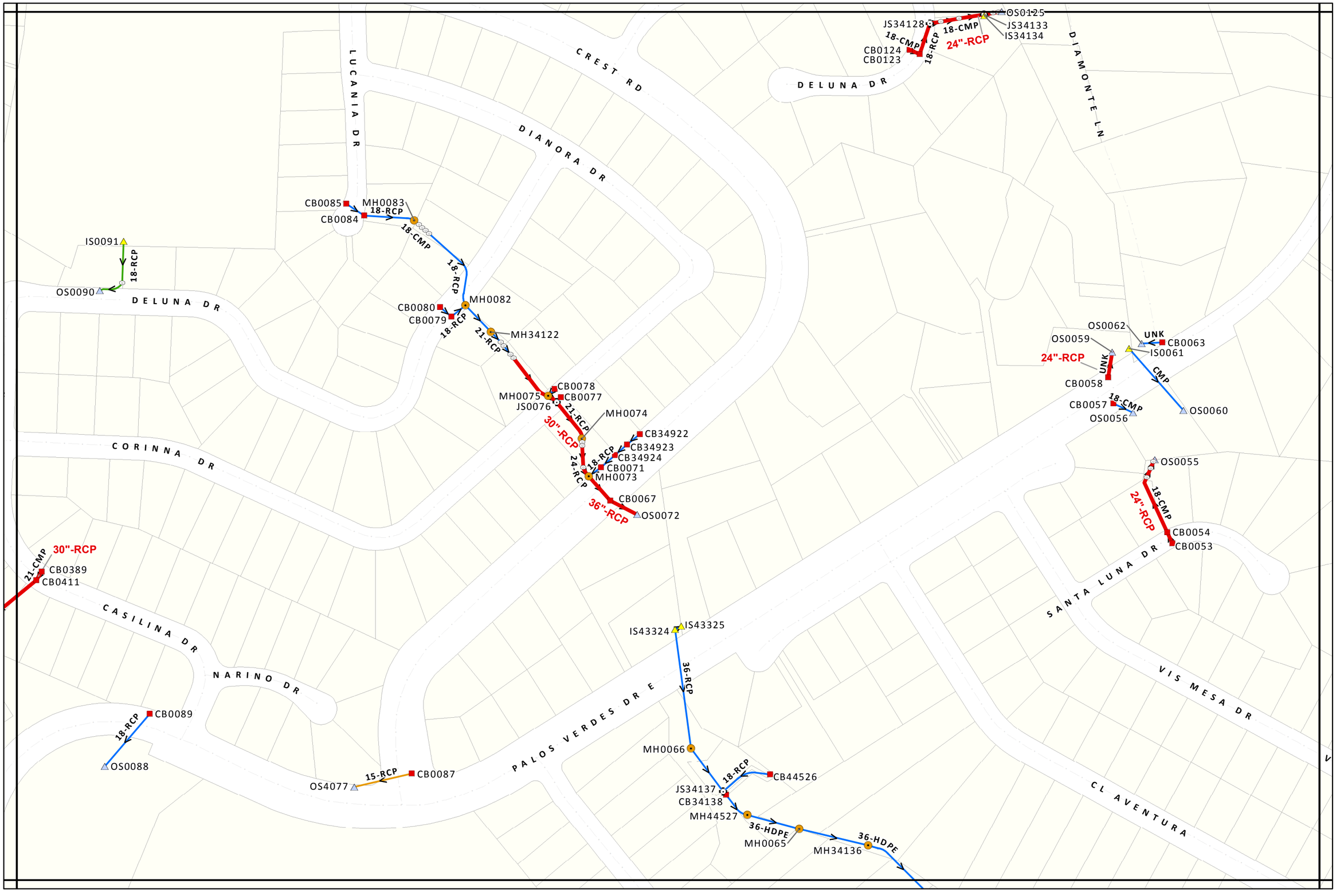
0 100 200
Feet

17D	16C	16D
25B	**26A**	26B
25D	26C	26D



City of Rancho Palos Verdes

Michael Baker INTERNATIONAL

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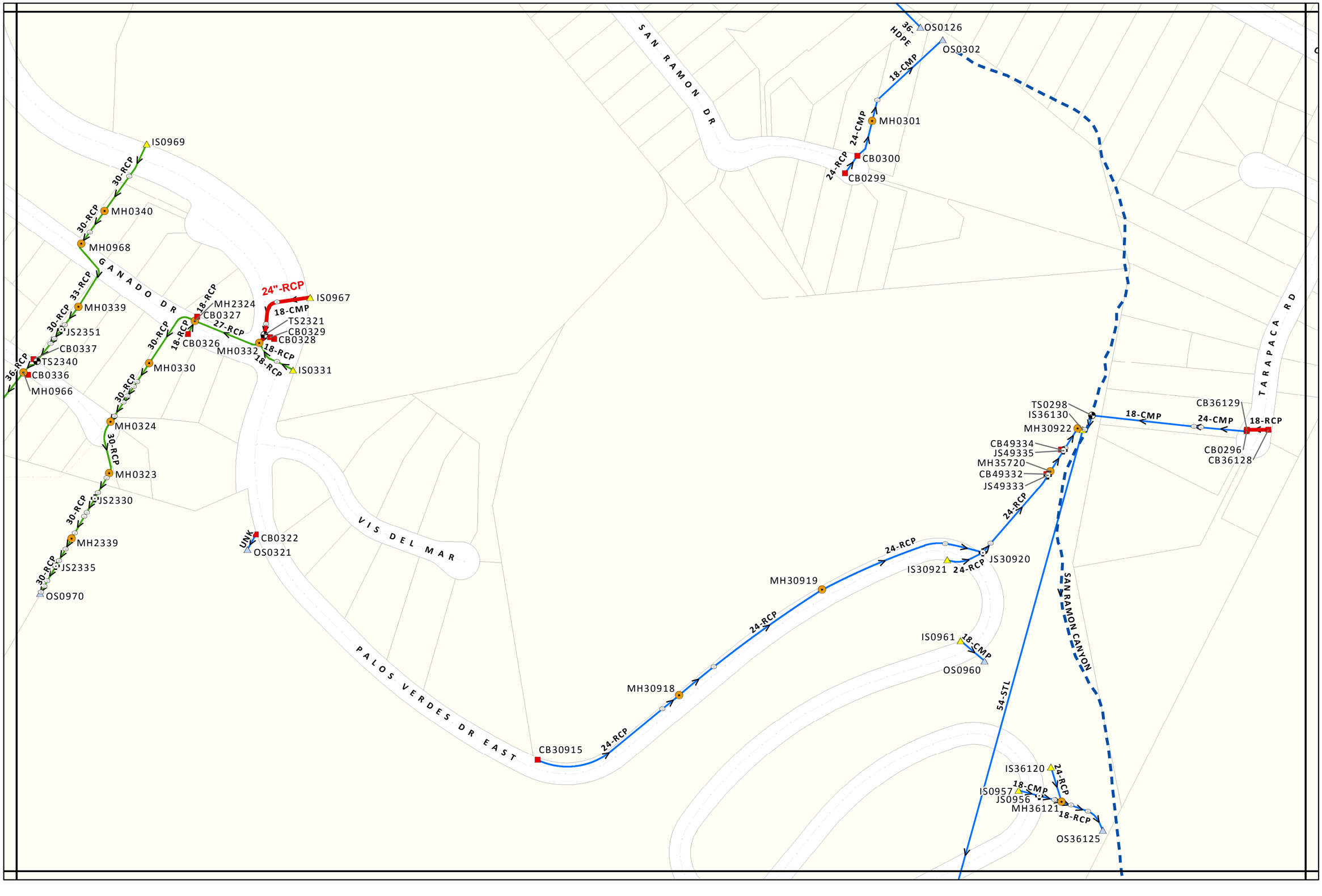
0 100 200
Feet

25B	26A	26B
25D	**26C**	26D
28B	27A	27B



City of Rancho Palos Verdes

Michael Baker INTERNATIONAL

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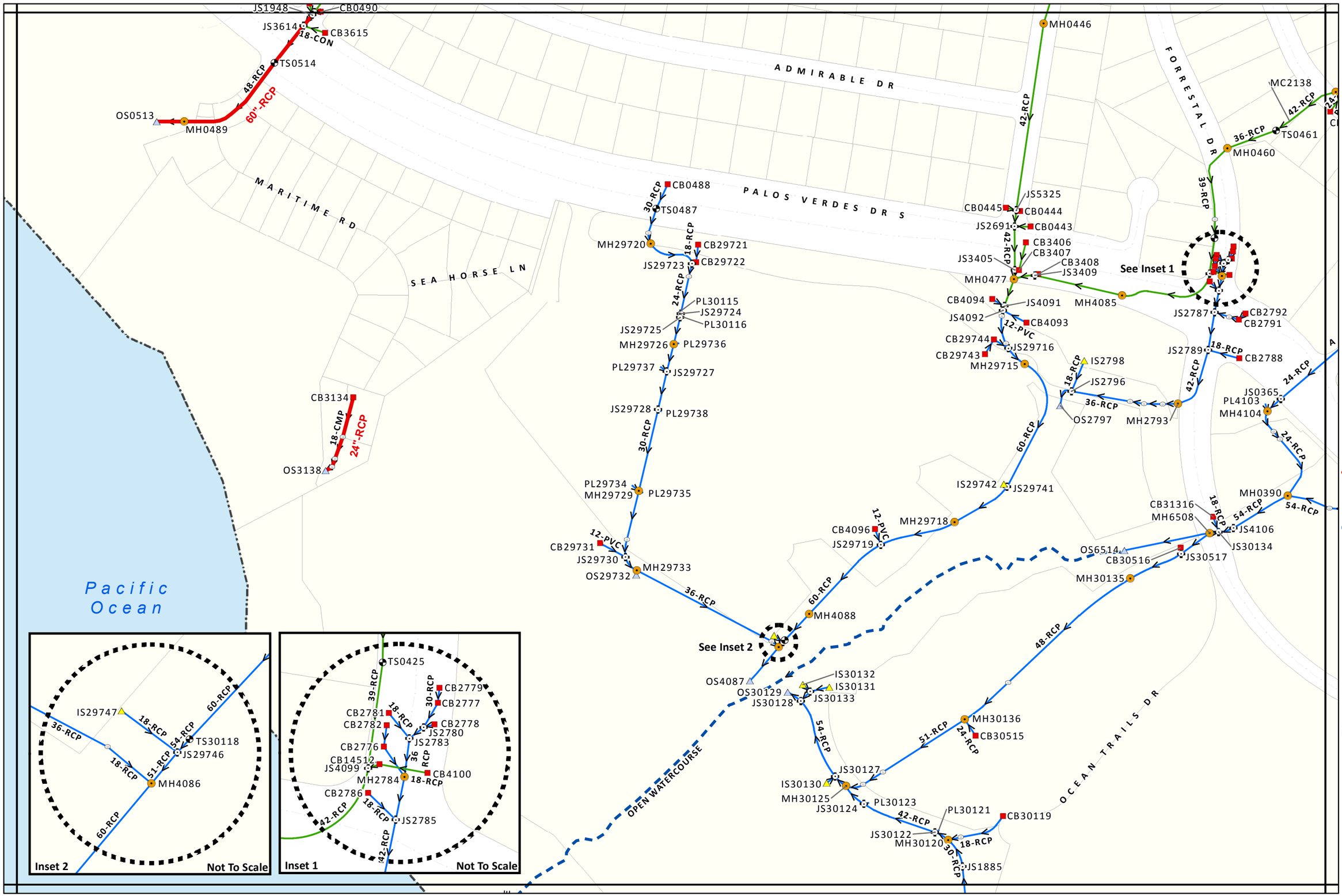
0 100 200
Feet

25D	26C	26D
28B	**27A**	27B
28D	27C	27D



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- County of LA
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- City Boundary

0 100 200
Feet

24D	25C	25D
29B	**28A**	28B
29D	28C	28D