3 OCEAN SOUTH SOUTH

3.1 Watershed Hydrology Analysis

The Ocean South South drainage area is part of the Santa Monica Bay Watershed defined by the County of Los Angeles DPW (Exhibit D). It is directly tributary to the Pacific Ocean. It has several different storm drain systems that discharge into canyons that ultimately drain into the ocean. The drainage systems for this watershed consist mostly of unimproved open channels within the canyons. Ocean South South has three major canyons: Portuguese Bend Canyon, Altamira Canyon and Paint Brush Canyon. Paint Brush Canyon includes two debris basins in series at the downstream end before discharging to a natural reserve area within the Portuguese Bend Reserve. There are catch basins and grate inlets on the streets that enter different storm drain pipeline systems under the major city streets located within this watershed. This drainage area is mostly comprised of open space areas with important reserves and open space like The Portuguese Bend Reserve, Filiorum Reserve, Del Cerro Park and The Abalone Cove Shoreline Park.

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

3.1.1 Hydrology results summary 10-, 25- and 50-year storm event.

This drainage area was divided into 83 subareas. Table 3-1 summarizes the maximum 10-, 25-, and 50- year storm event discharge flow draining into each node.

Table 3-1: OSS Hydrology Summary

Hydrology ID	Structure ID	Subarea (acres)	10-Year Flow (cfs)	25-Year Flow (cfs)	50-Year Flow (cfs)
1A	CB0977	9.3	9.9	13.5	16.4
2B	CB3288	22.1	16.8	24.1	30.4
4B	CB3290	13.6	7.3	10.7	13.7
5B	JS3292	39.4	22.6	32.5	40.6
7B	CB0990	20.5	10.6	15.8	20.1
9B	CB0988	4.9	5.9	8.5	10.8
10C	CB0987	3.4	4.3	6.1	7.9
13B	CB0978	5.2	6.1	8.4	10.8
14B	14B	3.2	3.8	6	7
15B	15B	8.8	11.7	18.1	22.2
17A	17A	6.6	7.3	11.2	13.1
18A	18A	26.8	20.2	30.5	40.1
19B	CB1039	5.7	5.5	7.8	9.6
20C	CB1041	2.7	2	2.9	3.6
22C	CB1047	2.9	2.7	4	4.9
23D	CB1048	20.9	15.4	22.5	28.2
25C	CB1044	4.9	4.4	6.1	7.8
27C	CB1045	9.6	6.9	10	12.5
29C	CB1054	2.4	3	4	4.8
30C	CB1057	8.3	7.2	10.4	13.2
32C	CB1052	12.3	7.6	11	13.6
33C	CB2676	3.6	2.3	3.5	4.4
35C	CB1036	2.6	2.8	4	4.9

Table 3-1: OSS Hydrology Summary					
Hydrology ID	**Structure ID**	**Subarea (acres)**	**10-Year Flow (cfs)**	**25-Year Flow (cfs)**	**50-Year Flow (cfs)**
36D	CB1035	6.1	6.2	8.8	10.8
38D	CB1033	2.9	2.7	4.2	5.2
40D	CB1031	3.4	4.3	6.1	7.9
42C	42C	1.9	2.7	3.8	4.4
43C	43C	1.1	4.2	5.9	7.2
45B	45B	8.9	9.4	13.7	16
46B	46B	21.5	21.1	30.3	36.8
47B	47B	44.4	61.7	88	109.5
49A	IS0718	22.9	20.9	29.7	37.4
50B	CB0982	3.9	5.3	7.4	9.4
51B	CB0973	21.8	15.6	22.8	28.4
52B	OS3476	5.1	6.7	9.3	12
53B	IS0710	53.2	51	70.6	89.8
54B	54B	25	12.7	20.2	26.7
55B	55B	27.1	29	45	58.2
57A	57A	61.5	22.8	38.6	50.6
58A	58A	12.7	31.1	51.8	67
59B	59B	54.8	54.4	75.8	92.3
60B	60B	58.3	33.2	51.3	65.7
61B	IS0697	13.9	8.6	13.6	17.5
62B	IS0697	44.7	23.6	38.2	50.2
64B	IS0612	1.6	2.6	3.7	5
65B	IS0701	4.5	5.1	7.4	9.6
66B	CB0703	2.5	2.4	3.4	4.4
67B	CB0700	1.8	1.9	3	3.5
68C	CB0704	8.1	7.1	10.6	13.4
69C	JS0706	5.8	4.3	6.5	8.6
71B	71B	7.6	5.4	8.3	11
72E	CB4487	19.7	13.6	19.2	24.3
73C	CB4489	6.4	7.7	10.3	12.8
75C	CB4492	7.4	11.8	16.5	21.3
77C	CB4497	10.7	14.6	21.5	25
78C	CB4498	2.3	4.6	6.6	7.6
79C	79C	0.3	0.7	1	1.2
80C	80C	6.2	8.6	12.5	14.5
82B	82B	12.5	15.2	20.3	25.1
83B	83B	32.4	30.8	42.7	54.4
84C	84C	39.1	42.3	57.7	73.2
85D	85D	61.6	40	56.8	71.1
86D	86D	49.6	39.4	55.9	70
87D	87D	22.9	59.9	85.7	107.9
89D	89D	39.5	36	52	66.2
90D	90D	40.5	47.5	68.3	85.4
91D	91D	18.4	14.5	20.6	25.9
92D	92D	29.1	39.7	57	70
94C	94C	19.1	17.8	24.8	31.7
95C	95C	7.5	26.2	36.7	46.5
97B	97B	34.0	23	33	42
98B	IS0708	1.3	1	1.6	2

Table 3-1: OSS Hydrology Summary					
Hydrology ID	**Structure ID**	**Subarea (acres)**	**10-Year Flow (cfs)**	**25-Year Flow (cfs)**	**50-Year Flow (cfs)**
99B	IS0708	43.6	23.4	37	47.2
100B	IS0708	38.4	54.6	83.1	103.2
102B	IS18107	4.4	3.1	4.9	6.2
103C	102C	3.6	4.9	6.4	7.6
104F	IS4016	5.9	4.8	7.6	9.7
105G	104G	19.2	9.2	14.9	19.8
106G	CB3456	35.1	17.5	27.6	36.4
108I	CB0661	17.5	15.8	22.9	28
109I	CB8510	1	1.1	1.5	1.9
110H	CB0663	27.9	23.9	33.3	41.3
111H	CB9308	1.3	1.9	2.5	3.2
112J	111J	21.9	12.1	19.3	24.7

3.2 Hydraulic Analysis

3.2.1 Existing Condition

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

<table>
<tr><th colspan="6">Table 3-2: OSS Hydraulic Model Assumptions</th></tr>
<tr><th>System</th><th>Upstream Structure ID</th><th>Downstream Structure ID</th><th>Pipe ID</th><th>Street</th><th>Assumption</th></tr>
<tr><td rowspan="2">1</td><td>CB3288</td><td>CB3289</td><td>SD2276</td><td rowspan="2">Valley View Road</td><td rowspan="2">Compared to the 2006 topographic contour elevations, the as-built plan outlet invert elevation is 5 feet below the contour elevation. In the XP-SWMM model, the invert elevations were changed. These changes were made using the pipe cover and the slopes shown in the as-built plan.</td></tr>
<tr><td>CB3289</td><td>OS3287</td><td>SD2277</td></tr>
<tr><td rowspan="4">2</td><td>CB3456</td><td>GB3459</td><td>SD2466</td><td rowspan="4">Palos Verdes Drive South at Pepertree Drive</td><td rowspan="4">These pipes were originally built in 1997 above ground. The as-built plans invert elevations compared to the existing topographic contour elevations were significantly different. The analysis was run using the existing ground elevations as the pipes invert elevations, instead of the as-built plans invert elevations.</td></tr>
<tr><td>GB3459</td><td>GB3460</td><td>SD2467</td></tr>
<tr><td>GB3460</td><td>GB3458</td><td>SD2468</td></tr>
<tr><td>GB3458</td><td>TS19313</td><td>SD13126</td></tr>
<tr><td rowspan="4">3</td><td>IS0708</td><td>TS0707</td><td>SD2469</td><td rowspan="4">Palos Verdes Drive South</td><td rowspan="4">These pipes were installed above ground and modeled using the topographic contour elevations as the storm drain pipe invert elevations.</td></tr>
<tr><td>TS0707</td><td>TS20113</td><td>SD13129</td></tr>
<tr><td>IS18107</td><td>TS20113</td><td>SD14327</td></tr>
<tr><td>TS20113</td><td>OS20112</td><td>SD19531</td></tr>
</table>

3.2.1.1 Portuguese Bend Land Slide Area

Ocean South South includes the Portuguese Bend Landslide (PBL). PBL has been historically known for being geologically unstable. Continuous soil displacement and landslides have been an issue for many years. According to the Zone 2 Landslide Moratorium Ordinance Revisions Environmental Report (September 2012), there is an average movement rate of 3 feet per year in PBL. This movement had reached rates of 1.5 inches per day after high rainfall seasons and slowed down to 0.05 inch per day after the redistribution of landslide mass. In the past, insufficient maintenance in the drainage systems had increased infiltration of water into the landslide, increasing weight at the head of the slide causing additional failures. The continuous movement in PBL causes all structures to persistently fail. Drainage facilities and other utilities are placed above ground in this portion of the City. There are different storm water pipe systems that serve to drain the runoff water from the north side of Palos Verdes Drive South into the ocean. These pipes are either CMP or Advance Drainage Systems Corrugated Polyethylene Drainage Pipes (ADS N-12), which are more cost efficient to maintain.

The Geotechnical Study for The Preparation of an Environmental Impact Report for The Zone 2 Landslide Moratorium Ordinance Revisions within the City of Rancho Palos Verdes, prepared by LGC Valley, Inc. concluded that groundwater is the controlling factor in initiating slide movement and the only factor that can reasonably be manipulated to minimize slide movement for all areas within the Ancient Portuguese Bend Landslide. The City has had success in slowing landslide movement in the Abalone Cove landslide area using dewatering wells.

During the field visits in July 2014, it was observed that these pipes are not in optimal conditions, some of them are broken, not properly connected, or the inlet has lifted away from the low point. These issues are caused by lack of regular maintenance, which is required continuously in this area. It is important to repair the broken structures prior to each rainy season and to inspect the pipes throughout the rainy season. This analysis considered that the pipes were not broken. Assuming they will be in good repair prior to the rainy season.

3.2.1.2 Results

The Ocean South South drainage area consists of two main storm drain systems. One is located on the west portion of this drainage area and the other one on the east portion. The west portion includes the storm drain pipes located in the northwest portion of the catchment that ultimately drain into Altamira Canyon. Altamira Canyon runs through a private community crossing Narcissa Drive and Sweelbay Road. Each crossing has a 120-inch diameter CMP culvert (SD0386 and SD0399). Results show these have enough capacity for the 50-year storm event flow rates. Appendix A-1 shows the profile obtained from XP-SWMM for the two culverts and the Altamira Canyon open channel located upstream of Narcissa Drive and downstream of Sweelbay Road. Downstream of the private community, Altamira Canyon drains into a 120-inch storm drain culvert (SD2975) that goes under Narcissa Drive at Palos Verdes Drive South and discharges into a canyon that discharges into the ocean. This culvert is also properly sized, the profile is provided in Appendix A-2. Altamira Canyon is eroding significantly, and the canyon wall collapse is encroaching on private property at both crossing. Table 3-3 provides the maximum velocity rates for the 10-, 25 and 50-year storm event analysis at the Altamira Canyon private property crossings and the outlet (OS0698).

Table 3-3: Altamira Canyon Velocity Summary							
Upstream Structure ID	Downstream Structure ID	Pipe ID	Hydrology ID	10-year Velocity (ft/s)	25-year Velocity (ft/s)	50-year Velocity (ft/s)	Street
IS00718	OS00717	SD0386	49A	20.79	23.81	25.31	Narcissa Drive
IS00714	OS00713	SD0399	55B	21.34	23.52	25.40	Sweelbay Road
IS00697	GB04503	SD2975	60B	22.49	24.86	26.33	Narcissa Drive at Palos Verdes Drive South
JS2682	OS0698	SD2995	-	30.67	34.35	36.96	

The east portion consists of mostly open channel area within PBL, two storm drain systems located on Portuguese Bend Road between Crest Road East and Ranchero Road, and storm drain pipes above ground south of Palos Verdes Drive South. The two storm drain pipes located on Portuguese Bend Road are part of the City of Rolling Hills and discharge onto Paint Brush Canyon. They were used in the analysis to obtain accurate peak flow rates downstream, but they will not be analyzed hydraulically. Paint Brush Canyon has two debris basins in series, which, for this MPD, were not included in the analysis.

In the existing condition at Node 110J, there is no existing outlet structure to drain the runoff water. The tributary area to Node 110J is part of the PBL area, a storm drain structure should be placed to drain the runoff water reaching this node.

Table 3-4 lists the storm drain structures that flooded in the 50- and the 10- year storm events analysis.

Table 3-4: OSS Flooded Storm Drain Structures		
Storm Drain Structure ID	Floods in 50-Year Storm Event	Floods in 10-Year Storm Event
CB0973	X	X
CB0977	X	
GB3458	X	

3.2.2 Recommended Improvements

Table 3-5 provides 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 3-1). The proposed condition hydraulic analysis results are included in Appendix D-3.

Table 3-5: OSS 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	CB0973	CB0972	SD0309	13C	18	24	Amber Sky Drive
		CB0972	MC0971	SD0315		18	24	
2	RPV	CB0977	OS0976	SD0316	13D	18	24	Oceanaire Drive
3	RPV	CB3456	GB3458	SD2466	24C	24	30	Palos Verdes Drive South at Pepertree Drive
		GB3458	TS19313	SD13126		30	36	
		TS19313	JS4019	SD18731		24	36	
		JS4019	OS19712	SD3824		24	36	
4	RPV	IS54000 (110J)	JS54001	SD52000*	24C	-	24	Palos Verdes Drive South
		JS54001	OS54002	SD52001*		-	24	

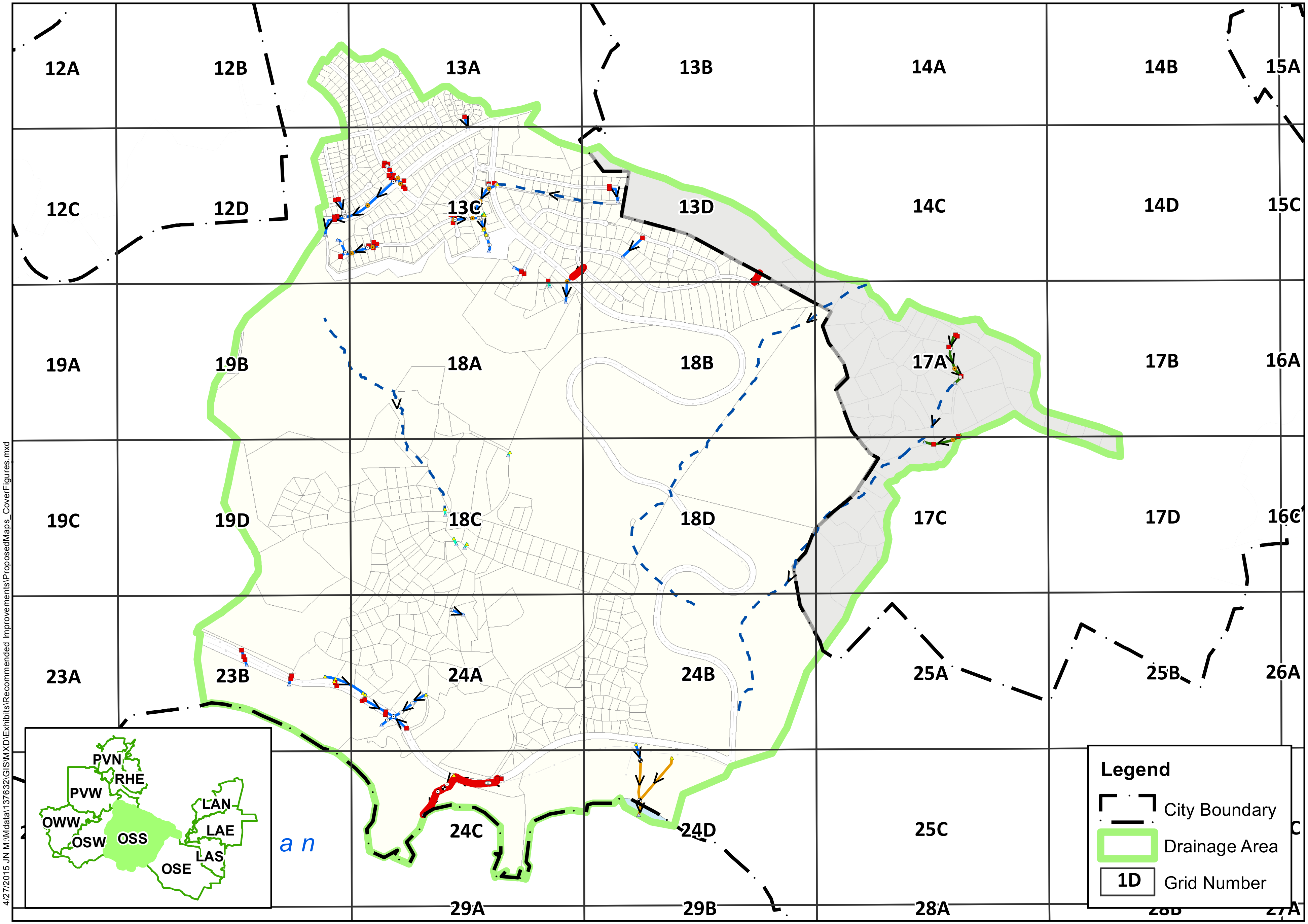
Notes:
*New Storm Drain

The storm drain system located within the PBL area should be considered for continuous maintenance and improvements to alleviate landslide issues.

3.2.3 Cost Estimates

Table 3-6 provides an estimate of the construction cost of recommended improvements for this drainage area. Appendix B-1 includes the cost estimates for each recommended improvement map.

Table 3-6: OSS Total Cost Estimate	
Atlas Map	Total Project Cost
13C	$90,000
13D	$68,000
24C	$1,155,000
Total	**$1,313,000**



4/27/2015 JN M:\Mdata\137632\GIS\MXD\Exhibits\Recommended Improvements\ProposedMaps_CoverFigures.mxd

Michael Baker
INTERNATIONAL

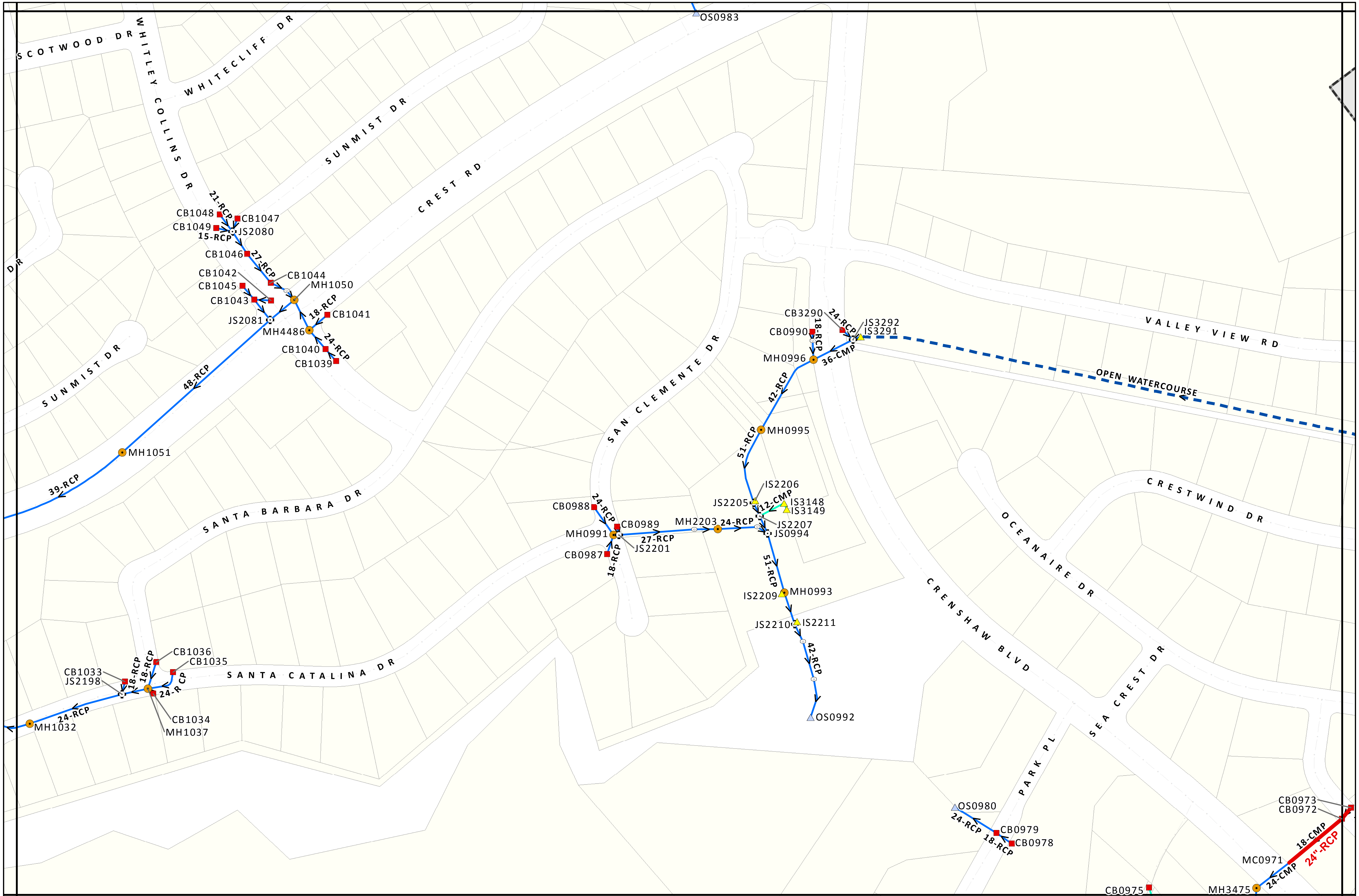
0 500 1,000 2,000
Feet

Source:

CITY OF RANCHO PALOS VERDES MASTER PLAN OF DRAINAGE

OSS - Recommended Improvements Index Map

Figure 3-1



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

12B	13A	13B
12D	13C	13D
19B	18A	18B

City of Rancho Palos Verdes

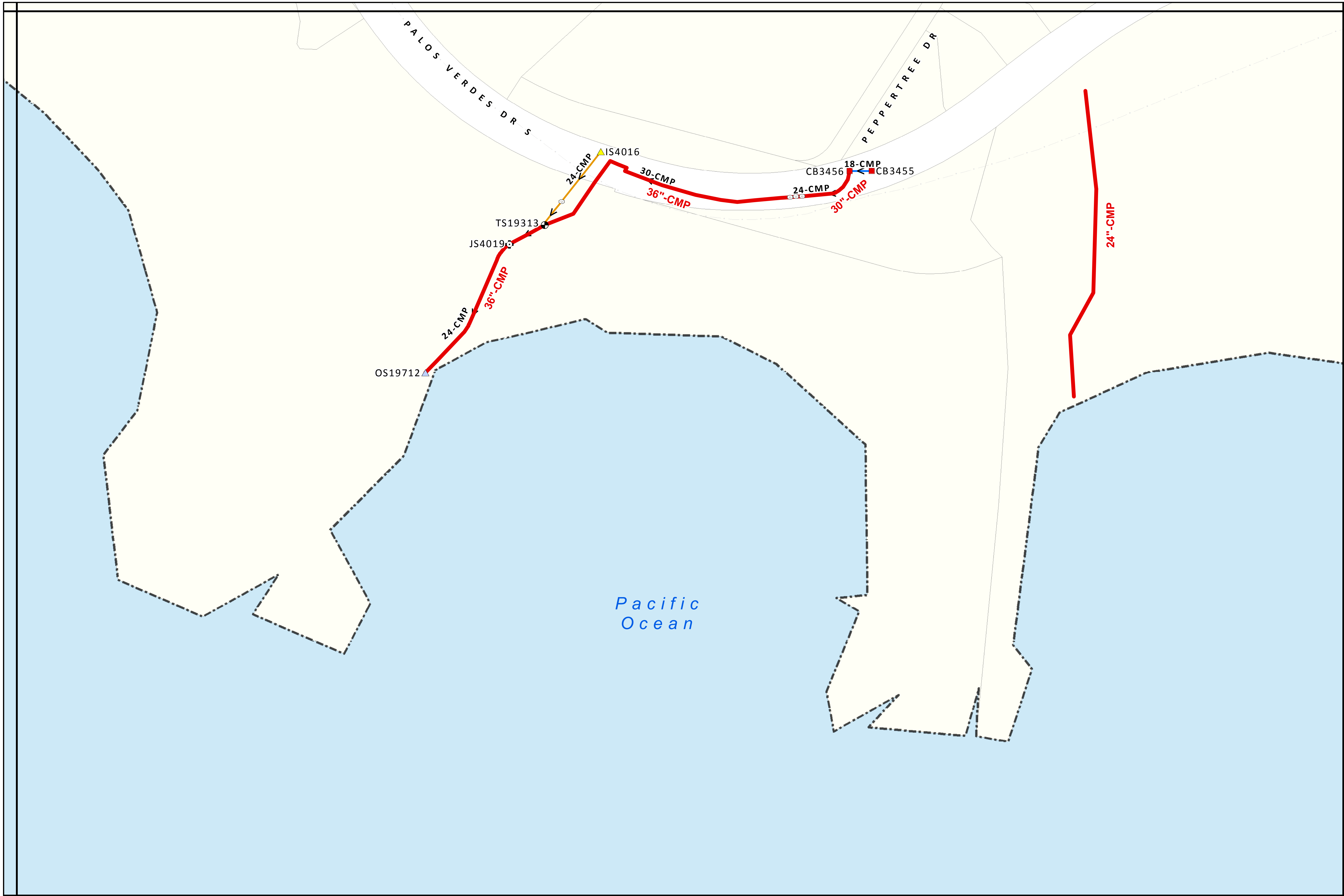
Michael Baker INTERNATIONAL

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

13A	13B	14A
13C	13D	14C
18A	18B	17A



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

23B	24A	24B
23D	**24C**	24D
	29A	29B