

SECTION 9

RECOMMENDATIONS

Most of the areas within the City boundaries are in sump conditions. Per the flood protection goals, the storm drain systems in these areas have to provide protection from the peak runoff resulting from a 25-year storm. Currently, the existing facilities are not capable of conveying the 25-year storm flows.

The drainage improvements recommended by this Master Plan are based upon planning level hydrologic and hydraulic studies conducted in preparing the Master Plan of Drainage Update. They will have to be verified and updated based upon detailed hydrologic and hydraulic studies, as well as existing and planned utilities during preliminary and final design of the facilities.

The recommended improvements consist of replacement of the existing facilities, and/or constructing parallel systems. New drainage facilities are also recommended for areas without existing facilities, where hydraulic calculations indicate that the flood protection criteria are not met. The recommended projects encompass the seventeen projects included in the 2005 Ad Hoc Committee Report.

The recommended drainage improvements are organized by the drainage areas. The major drainage areas are displayed on four figures (Figure 9-1 to Figure 9-4). Figure 9-1, Southwest Region Recommendations, includes the Seal Beach Pump Station South, Seal Beach Pump Station North, Marina Hill, West End Pump Station, San Gabriel River, and Anaheim Bay Drainage Areas. Figures 9-2 and 9-3, Northeast Region Recommendations, includes the Bolsa Chica Channel and College Park East Drainage Areas. Figure 9-4, Northwest Region Recommendations, includes the College Park West and Los Alamitos Drainage Areas.

9-1 SOUTHWEST REGION DRAINAGE AREAS

9-1.1 Seal Beach Pump Station

The Seal Beach Pump Station was originally designed to convey the peak runoff from the design 10-year storm based upon the 1969 Hydrology Manual criteria. Therefore, many pump stations components, including the discharge pipes, were sized for a much lower flow than the currently calculated design flow. The Orange County Flood Control District increased the capacity of the pump station in 1997. The existing capacity of 381 cfs is somewhat lower than the peak runoff of 410 cfs resulting from the 25-year storm. Therefore, in order to meet the flood protection goal, either the inflow to the pump station has to be attenuated, or a new pump station has to be constructed. Currently, there is not adequate property to construct a flood flow attenuation basin near the pump station.

When the current Seal Beach Pump Station reaches the end of its useful life, the new replacement facility should have a minimum capacity of 410 cfs to provide the flood protection to its entire tributary area in accordance with the existing goals. The ultimate drainage area should also include the properties located between Electric Avenue and Neptune Avenue south of Ocean Avenue.

City of Long Beach

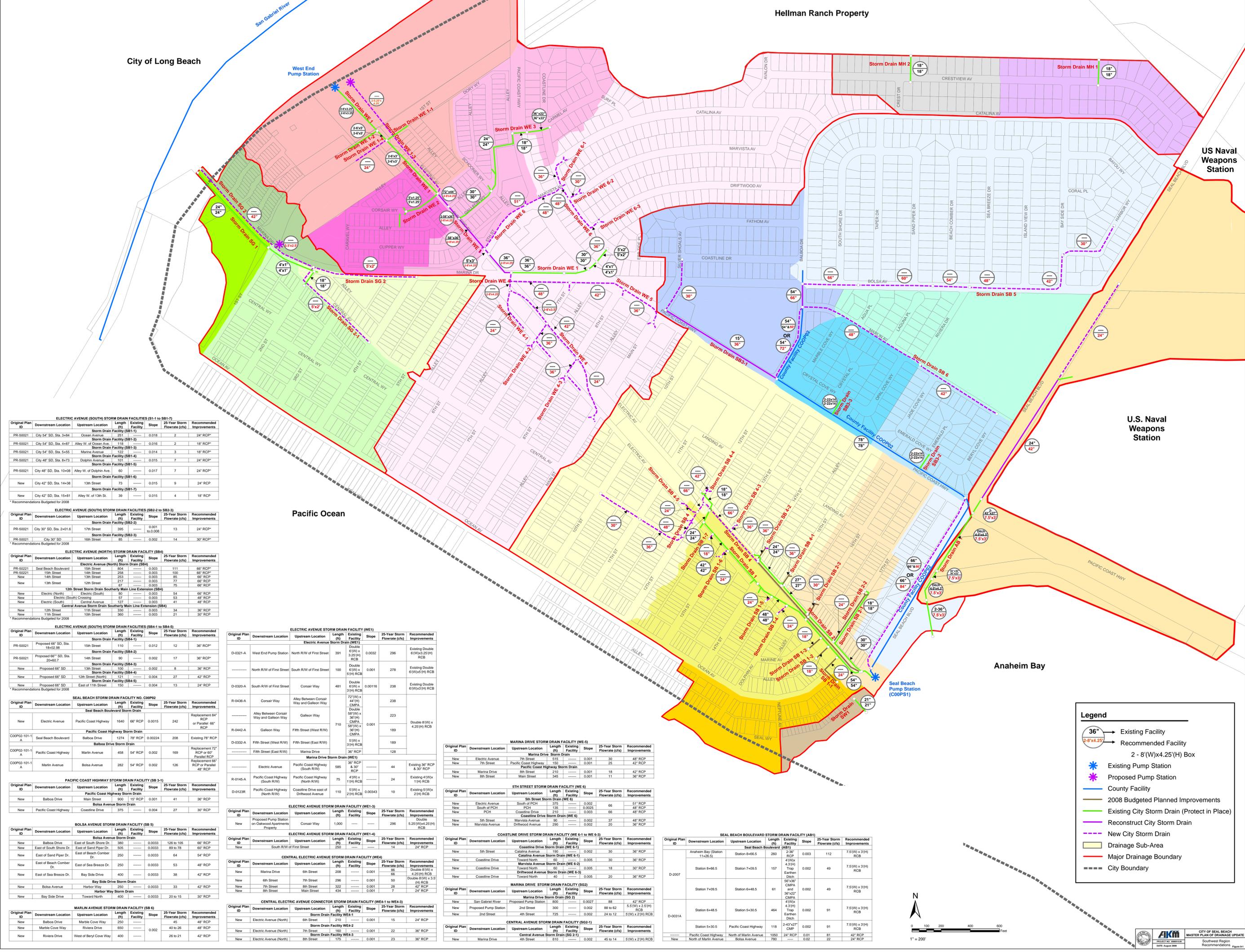
Hellman Ranch Property

US Naval Weapons Station

U.S. Naval Weapons Station

Anaheim Bay

Pacific Ocean



ELECTRIC AVENUE (SOUTH) STORM DRAIN FACILITIES (SB1-1 to SB1-7)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
PR-50021	City 54' SD, Sta. 3+84	Ocean Avenue	251	24"	0.018	2	24" RCP
PR-50021	City 54' SD, Sta. 4+87	Alley W. of Ocean Ave.	116	18"	0.016	2	18" RCP
PR-50021	City 54' SD, Sta. 5+55	Marina Avenue	122	18"	0.014	3	18" RCP
PR-50021	City 48' SD, Sta. 8+73	Dolphin Avenue	107	24"	0.015	7	24" RCP
PR-50021	City 48' SD, Sta. 10+08	Alley W. of Dolphin Ave.	60	24"	0.017	7	24" RCP
New	City 42' SD, Sta. 14+38	13th Street	73	24"	0.015	9	24" RCP
New	City 42' SD, Sta. 15+81	Alley W. of 13th St.	39	18"	0.015	4	18" RCP

ELECTRIC AVENUE (SOUTH) STORM DRAIN FACILITIES (SB2-2 to SB2-3)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
PR-50021	City 30' SD, Sta. 2+01.6	17th Street	395	24"	0.001	13	24" RCP
PR-50021	City 30' SD	16th Street	92	30"	0.002	14	30" RCP

ELECTRIC AVENUE (NORTH) STORM DRAIN FACILITY (SB4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
PR-50021	Seal Beach Boulevard	15th Street	304	60"	0.003	111	60" RCP
PR-50021	15th Street	14th Street	258	60"	0.003	100	60" RCP
New	14th Street	13th Street	353	60"	0.003	85	60" RCP
New	13th Street	12th Street	317	60"	0.003	77	60" RCP
New	12th Street	11th Street	273	60"	0.003	75	60" RCP
New	Electric (North)	Electric (South)	80	60"	0.003	54	60" RCP
New	Electric (South)	Central Avenue	57	48"	0.003	53	48" RCP
New	Electric (South)	Central Avenue	127	48"	0.003	41	48" RCP
New	12th Street	11th Street	330	30"	0.003	34	30" RCP
New	11th Street	10th Street	360	30"	0.003	21	30" RCP

ELECTRIC AVENUE (SOUTH) STORM DRAIN FACILITIES (SB4-1 to SB4-5)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
PR-50021	Proposed 60' SD, Sta. 18+02.88	15th Street	110	36"	0.012	12	36" RCP
PR-50021	Proposed 60' SD, Sta. 20+60.7	14th Street	90	36"	0.002	17	36" RCP
New	Proposed 60' SD	13th Street	100	36"	0.002	8	36" RCP
New	Proposed 60' SD	12th Street (North)	12	42"	0.004	27	42" RCP
New	Proposed 60' SD	East of 11th Street	150	24"	0.004	13	24" RCP

SEAL BEACH STORM DRAIN FACILITY NO. COOP92

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Electric Avenue	Pacific Coast Highway	1640	60" RCP	0.0015	242	Replace with 84" or Parallel 60" RCP
COOP92-101-1 A	Seal Beach Boulevard	Balboa Drive	1274	78" RCP	0.00224	208	Existing 78" RCP
COOP92-101-1 A	Pacific Coast Highway	Marin Avenue	458	54" RCP	0.002	169	Replace with 60" Parallel RCP
COOP92-101-1 A	Marlin Avenue	Bolsa Avenue	282	54" RCP	0.002	126	Replace with 60" RCP or Parallel 48" RCP

PACIFIC COAST HIGHWAY STORM DRAIN FACILITY (SB 3-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Balboa Drive	Main Street	900	15" RCP	0.001	41	36" RCP
New	Pacific Coast Highway	Coastline Drive	375	30"	0.004	27	30" RCP

BOLSA AVENUE STORM DRAIN FACILITY (SB 5)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Balboa Drive	East of South Shore Dr.	300	60"	0.0033	126 to 105	60" RCP
New	East of South Shore Dr.	East of Sand Piper Dr.	505	60"	0.0033	89 to 78	60" RCP
New	East of Sand Piper Dr.	East of Beach Comber Dr.	250	54"	0.0033	64	54" RCP
New	East of Beach Comber Dr.	East of Sea Breeze Dr.	250	48"	0.0033	53	48" RCP
New	East of Sea Breeze Dr.	Bay Side Drive	400	42"	0.0033	38	42" RCP
New	Bolsa Avenue	Harbor Way	250	42"	0.0033	33	42" RCP
New	Bay Side Drive	Toward North	400	30"	0.0033	20 to 15	30" RCP

MARLIN AVENUE STORM DRAIN FACILITY (SB 6)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Balboa Drive	Marble Cove Way	250	48"	0.002	40 to 26	48" RCP
New	Marble Cove Way	Riviera Drive	650	42"	0.002	26 to 21	42" RCP
New	Riviera Drive	West of Bay Cove Way	400	48"	0.002	26 to 21	48" RCP

ELECTRIC AVENUE STORM DRAIN FACILITY (WE1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
D-0321-A	West End Pump Station	North R/W of First Street	391	6" (W) x 3.25" (H) RCB	0.0032	296	Existing Double 6"(W)x3.25"(H) RCB
-----	North R/W of First Street	South R/W of First Street	100	Double 6"(W) x 5"(H) RCB	0.001	278	Existing Double 6"(W)x5"(H) RCB
D-0320-A	South R/W of First Street	Corсар Way	481	Double 6"(W) x 3"(H) RCB	0.00116	238	Existing Double 6"(W)x3"(H) RCB
R-0436-A	Corсар Way	Alley Between Corсар Way and Gallion Way	-----	72"(W) x 44"(H) CMAA, Double 6"(W) x 38"(H) CMAA	-----	238	-----
-----	Alley Between Corсар Way and Gallion Way	Gallion Way	710	Double 6"(W) x 38"(H) CMAA	0.001	189	Double 6"(W) x 4.25"(H) RCB
R-0442-A	Gallion Way	Fifth Street (West R/W)	-----	58"(W) x 38"(H) CMAA	-----	189	-----
D-0332-A	Fifth Street (West R/W)	Fifth Street (East R/W)	-----	6"(W) x 3"(H) RCB	-----	189	-----
-----	Fifth Street (East R/W)	Marina Drive	36"	36" RCP	-----	128	-----

MARINA DRIVE STORM DRAIN FACILITY (WE-6)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Electric Avenue	Pacific Coast Highway (South R/W)	585	30" RCP	0.002	44	Existing 30" RCP & 30" RCP
R-0145-A	Pacific Coast Highway (South R/W)	Pacific Coast Highway (North R/W)	75	4"(W) x 1"(H) RCB	0.001	24	Existing 4"(W) x 1"(H) RCB
D-0123-R	Pacific Coast Highway (North R/W)	Coastline Drive east of Driftwood Avenue	110	5"(W) x 2"(H) RCB	0.00343	10	Existing 5"(W) x 2"(H) RCB

ELECTRIC AVENUE STORM DRAIN FACILITY (WE-3)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Proposed Pump Station on Outward Apartments Property	Corсар Way	1,000	Double 6"	0.002	296	Double 6"(W)x4.25"(H) RCB

ELECTRIC AVENUE STORM DRAIN FACILITY (WE-4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	South R/W of First Street	South R/W of First Street	250	-----	-----	14	24" RCP

CENTRAL ELECTRIC AVENUE STORM DRAIN FACILITY (WE4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Electric Avenue (North)	6th Street	210	-----	0.001	15	24" RCP
New	Storm Drain Facility WE-4	Storm Drain Facility WE-2	-----	-----	-----	22	36" RCP
New	Electric Avenue (North)	7th Street	160	-----	0.001	22	36" RCP
New	Storm Drain Facility WE-3	Storm Drain Facility WE-1	-----	-----	0.001	23	36" RCP

CENTRAL ELECTRIC AVENUE STORM DRAIN FACILITY (SG-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Marina Drive	4th Street	810	-----	0.002	45 to 14	5"(W) x 2"(H) RCB

MARINA DRIVE STORM DRAIN FACILITY (WE-5)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Electric Avenue	7th Street	515	-----	0.001	30	48" RCP
New	7th Street	Pacific Coast Highway	136	-----	0.0026	28	42" RCP
New	Marina Drive	Pacific Coast Highway Storm Drain	210	-----	0.001	18	42" RCP
New	8th Street	Main Street	345	-----	0.001	11	36" RCP

5TH STREET STORM DRAIN FACILITY (WE 6)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Electric Avenue	South of PCH	375	-----	0.002	66	51" RCP
New	7th Street	PCH	136	-----	0.0026	28	42" RCP
New	PCH	Coastline Drive	210	-----	0.003	66	48" RCP
New	5th Street	Marina Avenue	30	-----	0.002	37	48" RCP
New	Marina Avenue	Driftwood Avenue	290	-----	0.002	20	36" RCP

COASTLINE DRIVE STORM DRAIN FACILITY (WE 6-1 to WE 6-3)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	5th Street	Coastline Drive Storm Drain (WE 6-1)	190	-----	0.002	30	36" RCP
New	Coastline Drive	Catalina Avenue Storm Drain (WE 6-2)	60	-----	0.005	30	36" RCP
New	Coastline Drive	Toward North	60	-----	0.005	18	30" RCP
New	Coastline Drive	Toward North	40	-----	0.005	20	36" RCP

MARINA DRIVE STORM DRAIN FACILITY (SG2)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	San Gabriel Street	Proposed Pump Station	300	-----	0.0027	88	42" RCP
New	Proposed Pump Station	2nd Street	300	-----	0.002	88 to 62	5.5"(W) x 2.5"(H) RCB
New	2nd Street	4th Street	725	-----	0.002	24 to 12	5"(W) x 2"(H) RCB

CENTRAL ELECTRIC AVENUE STORM DRAIN FACILITY (SG-2-1)

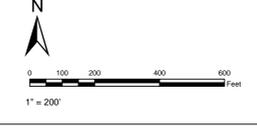
Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Marina Drive	4th Street	810	-----	0.002	45 to 14	5"(W) x 2"(H) RCB

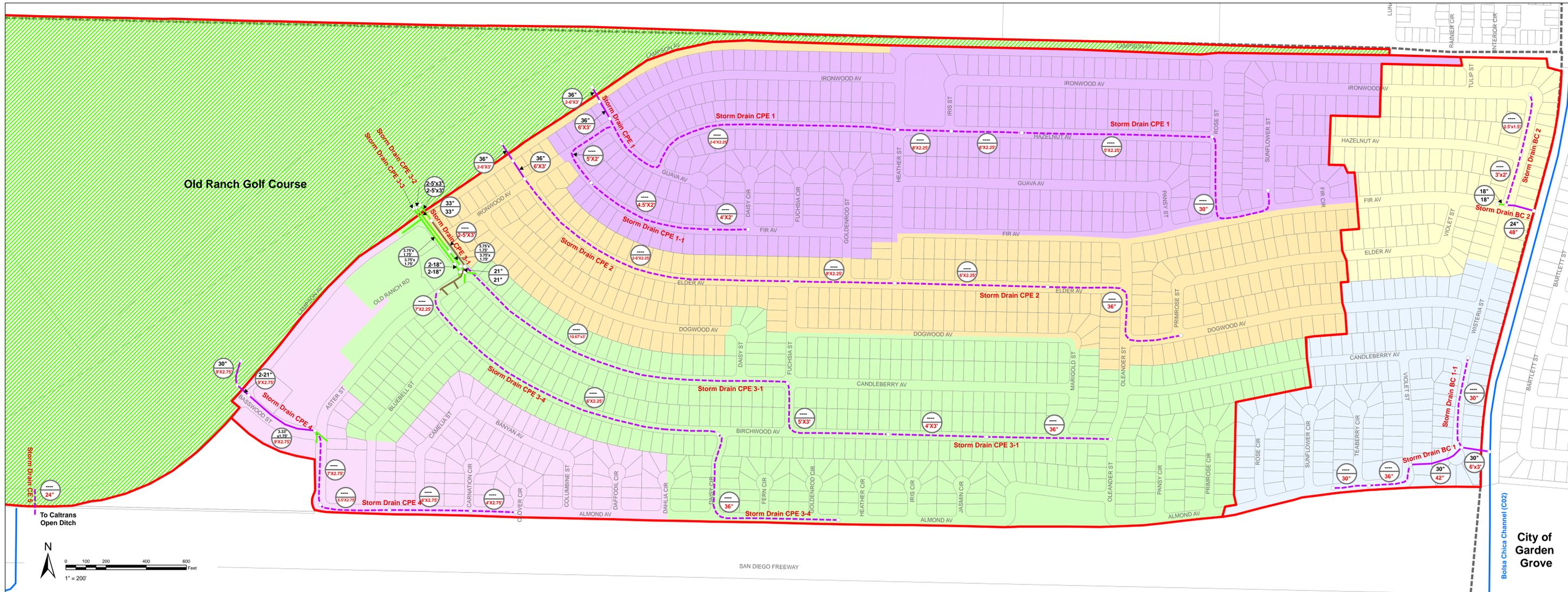
SEAL BEACH BOULEVARD STORM DRAIN FACILITY (AB1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
D-2007	Anaheim Bay (Station 11+26.5)	Station 6+66.5	260	3.86" RCP, 4"(W) x 4.3"(H) Trap, Eastern Ditch	0.003	112	7.5"(W) x 3"(H) RCB
D-0031A	Station 6+66.5	Station 7+09.5	157	58" x 36" CMAA, 48" x 36" CMAA, 48" x 36" CMAA, 48" x 36" CMAA, 48" x 36" CMAA	0.002	49	7.5"(W) x 3"(H) RCB
D-0031A	Station 7+09.5	Station 6+48.5	61	58" x 36" CMAA, 48" x 36" CMAA, 48" x 36" CMAA, 48" x 36" CMAA	0.002	49	7.5"(W) x 3"(H) RCB
D-0031A	Station 6+48.5	Station 5+30.5	464	48" x 36" CMAA, 48" x 36" CMAA, 48" x 36" CMAA, 48" x 36" CMAA	0.002	91	7.5"(W) x 3"(H) RCB
D-0031A	Pacific Coast Highway	Pacific Coast Highway	118	24" x 36" RCP	0.002	91	7.5"(W) x 3"(H) RCB
D-0031A	Station 5+30.5	Station 4+30.5	100	24" RCP	0.01	81	42" RCP
D-0031A	Station 4+30.5	Station 3+30.5	780	-----	0.02	22	24" RCP

Legend

- 36" Existing Facility
- 2-8"x4.25" Recommended Facility
- 2 - 8"(W)x4.25"(H) Box
- Existing Pump Station
- Proposed Pump Station
- County Facility
- 2008 Budgeted Planned Improvements
- Existing City Storm Drain (Protect in Place)
- Reconstruct City Storm Drain
- New City Storm Drain
- Drainage Sub-Area
- Major Drainage Boundary
- City Boundary





GUAVA AVENUE STORM DRAIN FACILITY (CPE 1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Guava Avenue Storm Drain (CE 1)							
D-0068-A	Old Ranch Golf Course	Lampson Avenue R/W (S)	120	36" RCP	0.0005	76	Double 6'(W) x 3'(H) RCB
	Lampson Avenue R/W (S)	Ironwood Avenue R/W (N)	120	36" RCP	0.0005	69	6'(W) x 3'(H) RCB
New	Ironwood Avenue R/W (N)	Hazelnut Avenue	370	-----	0.0005	64	Double 6'(W) x 2'-3'(H) RCB
Hazelnut Avenue Storm Drain (CPE 1 Extension)							
	Guava Avenue	Heather Street	1,290	-----	0.0005	64 to 42	Double 6'(W) x 2'-3'(H) RCB
	Heather Street	Iris Street	270	-----	0.001	42	8'(W) x 2'-3'(H) RCB
	Iris Street	East of Iris Street	340	-----	0.001	29	6'(W) x 2'-3'(H) RCB
	East of Iris Street	Rose Street	1,010	-----	0.001	26 to 24	5'(W) x 2'-3'(H) RCB
Rose Street Storm Drain (CPE 1 Extension)							
New	Hazelnut Avenue	Fir Avenue	340	-----	0.001	17	30" RCP
Fir Avenue Storm Drain (CPE 1 Extension)							
New	Rose Street	Sunflower Street	250	-----	0.001	13	30" RCP
Sunflower Street Storm Drain (CPE 1 Extension)							
New	Fir Avenue	Sunflower Street Toward North	100	-----	0.001	13	30" RCP

FIR AVENUE STORM DRAIN FACILITY (CPE 1-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	East of Ironwood Avenue	West of Daisy Circle	640	-----	0.0005	17	4.5'(W) x 2'(H) RCB
	West of Daisy Circle	Daisy Circle	160	-----	0.0005	13	4.0'(W) x 2'(H) RCB

ELDER AVENUE STORM DRAIN FACILITY (CPE 2)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Elder Avenue Storm Drain (CPE 2)							
D-0069-A	Old Ranch Golf Course	Lampson Avenue R/W (S)	120	36" RCP	0.0005	71	Double 6'(W) x 3'(H) RCB
	Lampson Avenue R/W (S)	Ironwood Avenue R/W (N)	120	36" RCP	0.0005	71	6'(W) x 3'(H) RCB
	Ironwood Avenue R/W (N)	Fuchsia Street	1,550	-----	0.001	57 to 51	Double 6'(W) x 2'-3'(H) RCB
	Fuchsia Street	Heather Street	500	-----	0.001	40	8'(W) x 2'-3'(H) RCB
	Heather Street	West of Oleander Street	750	-----	0.001	34 to 31	6'(W) x 2'-3'(H) RCB
	West of Oleander Street	Oleander Street	350	-----	0.001	31 to 29	36" RCP
Oleander Street Storm Drain (CPE 2 Extension)							
New	Elder Avenue	Dogwood Avenue	250	-----	0.001	20	36" RCP
Dogwood Avenue Storm Drain (CPE 2 Extension)							
New	Oleander Street	Primrose Street	250	-----	0.001	20	36" RCP

CANDLEBERRY AVENUE STORM DRAIN FACILITY (CPE 3-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Candleberry Avenue Storm Drain - Design Phase per Project No. 50204 (CPE 3-1)							
Project No. 50204	Lampson Avenue, North R/W	Aster Street Junction Structure	392	-----	0.001	88	Double 5'(W) x 3'(H) RCB* 10'-8" (W) x 3'(H) RCB*
	Aster Street Junction Structure	Fuchsia Street	17	-----	0.001	88	10'-8" (W) x 3'(H) RCB*
Candleberry Avenue Storm Drain Conceptual Design (CPE 3-1 Extension)							
New	Aster Street Junction Structure	Fuchsia Street	1,800	-----	0.001	61 to 56	10'-8" (W) x 3'(H) RCB
Fuchsia Street Storm Drain Conceptual Design (CPE 3-1 Extension)							
New	Candleberry Avenue	Birchwood Avenue	200	-----	0.001	34	5' (W) x 3'(H) RCB
Birchwood Avenue Storm Drain Conceptual Design (CPE 3-1 Extension)							
New	Fuchsia Street	East of Fuchsia Street	500	-----	0.001	34	5' (W) x 3'(H) RCB
	East of Fuchsia Street	West of Marigold Street	500	-----	0.001	30	4' (W) x 3'(H) RCB
	West of Marigold Street	Oleander Street	650	-----	0.001	27	36" RCP

ASTER STREET STORM DRAIN FACILITY (CPE 3-4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Aster Street Connector Pipes per Project No. 50204							
Project No. 50204	@ Main Line Sta. 20+74	CB on S. Curb Face	15	-----	0.0256	39	Double 27" RCP*
	@ Main Line Sta. 21+35	CB on S. Curb Face	15	-----	0.03	21	Double 24" RCP*
Aster Street Design Phase per Project No. 50204 (CPE 3-4)							
Project No. 50204	Aster Street Junction Structure	East of Birchwood Avenue	142	-----	0.0021	37	7'(W) x 2'-3'(H) RCB*
	Aster Street Junction Structure	Birchwood Avenue	85	-----	0.0021	37	7'(W) x 2'-3'(H) RCB
Aster Street Storm Drain Conceptual Design (CPE 3-4 Extension)							
New	End of Project No. 50204	Birchwood Avenue	85	-----	0.0021	37	7'(W) x 2'-3'(H) RCB
Birchwood Avenue Storm Drain Conceptual Design (CPE 3-4 Extension)							
New	Aster Street	Bluebell Street	200	-----	0.001	37	7'(W) x 2'-3'(H) RCB
	Bluebell Street	Daisy Circle	1,450	-----	0.001	37 to 23	6'(W) x 2'-3'(H) RCB
Daisy Circle Storm Drain Conceptual Design (CE 3-4 Extension)							
New	Birchwood Avenue	Almond Avenue	400	-----	0.001	19	36" RCP
Almond Avenue Storm Drain Conceptual Design (CPE 3-4 Extension)							
New	Daisy Circle	East of Goldenrod Circle	600	-----	0.001	15 to 12	36" RCP

BASSWOOD AVENUE STORM DRAIN FACILITY (CPE 4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Basswood Avenue Storm Drain (CPE 4 Extension)							
D-0067-A	Old Ranch Golf Course	Lampson Avenue (west)	31	30" RCP	0.0005	30	9'(W) x 2'-9"(H) RCB
	Lampson Avenue (west)	Lampson Avenue (east)	95	2-21" RCP	0.0005	30	9'(W) x 2'-9"(H) RCB
	Lampson Avenue (east)	Aster Street	430	3'4"(W) x 1'9"(H) RCB	0.0005	30	9'(W) x 2'-9"(H) RCB
Aster Street Storm Drain (CPE 4 Extension)							
New	Basswood Avenue	Almond Avenue	370	-----	0.0005	27	7'(W) x 2'-9"(H) RCB
Almond Avenue Storm Drain (CPE 4 Extension)							
	Aster Street	West of Camelia Street	350	-----	0.0005	26	6'-6"(W) x 2'-9"(H) RCB
	West of Camelia Street	Carnation Circle	330	-----	0.0005	17	6'(W) x 2'-9"(H) RCB
	Carnation Circle	Clover Circle	270	-----	0.0005	12	4'(W) x 2'-9"(H) RCB

LAMPSON AVENUE STORM DRAIN FACILITY (CPE5)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
-----	Cal Trans Open Channel	Lampson Avenue	75	-----	-----	-----	24" RCP

ALMOND AVENUE STORM DRAIN FACILITY (BC1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
North of Almond Avenue (BC1)							
TR-6416	Bolsa Chica Channel	Wisteria Street	103	30" RCP	0.001	43	6'Wx3'H RCB
	Wisteria Street	Violet Street	314	30" RCP	0.001	25	42" RCP
Almond Avenue (BC1)							
-----	Violet Street	East of Teaberry Circle	300	-----	0.001	19	36" RCP
-----	East of Teaberry Circle	East of Sunflower Circle	170	-----	0.001	13	30" RCP

WISTERIA STREET STORM DRAIN FACILITY (BC1-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
-----	175' North of the San Diego Freeway	Candleberry Avenue	485	-----	0.002	18	30" RCP

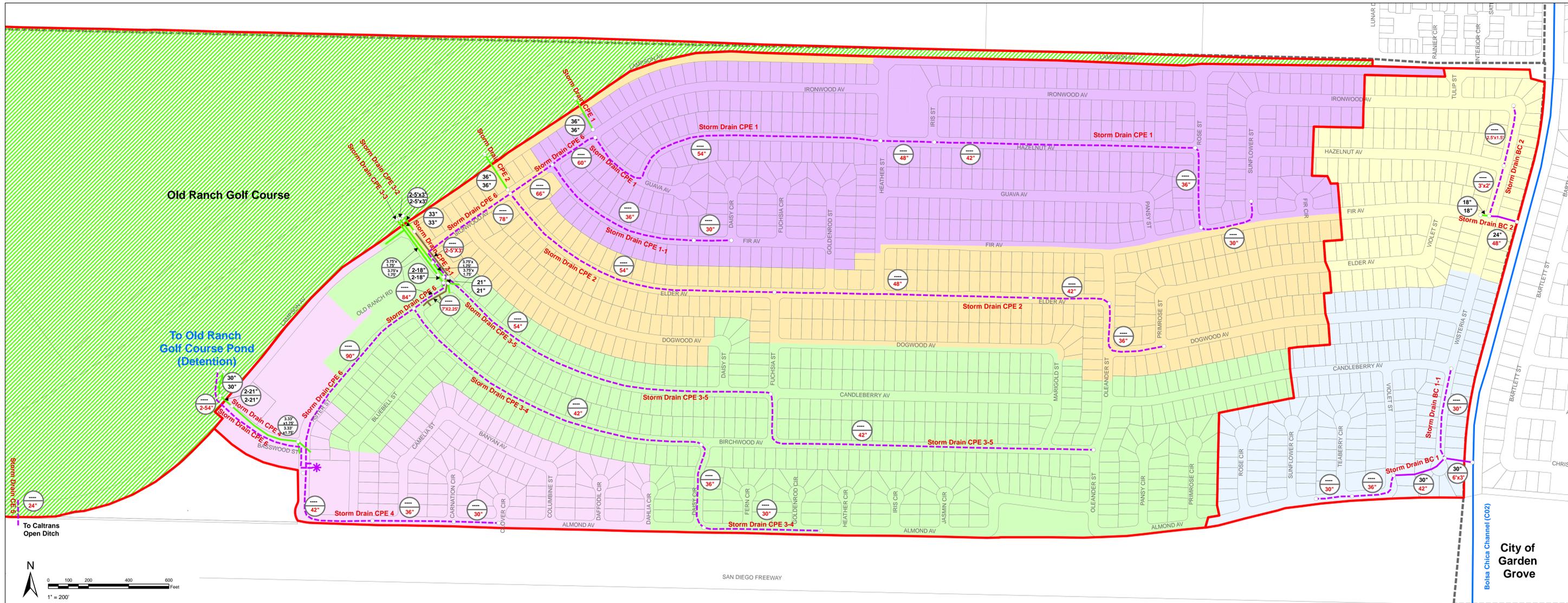
FIR AVENUE STORM DRAIN FACILITY (BC2)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Fir Avenue (BC2)							
TR-5961	Bolsa Chica Channel	Wisteria Street, east catch basin	130	24" RCP	0.003	41	48" RCP
Wisteria Street (BC2)							
New	Fir Avenue	Hazelnut Avenue	250	-----	0.002	24	3'Wx2'H RCB
New	Hazelnut Avenue	Ironwood Avenue	250	-----	0.002	14	2.5'Wx1.5'H RCB

US Naval Weapons Station
City of Garden Grove
City of Westminster

Legend

- 30" Existing Facility
- 6'x3' Recommended Facility
- 6'(W)x3'(H) Box
- County Facility
- Existing City Storm Drain (Protect in place)
- 2008 Budgeted Planned Improvements
- Reconstruct City Storm Drain
- New City Storm Drain
- Drainage Sub-Area
- Major Drainage Boundary
- City Boundary



IRONWOOD AVENUE STORM DRAIN FACILITY (CPE 6)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Proposed Pump Station	Birchwood Avenue	1,000	-----	0.0015	258	90" RCP
		Candleberry Avenue	200	-----	0.0015	224	84" RCP
New	Aster Street	Birchwood Avenue	200	-----	0.0015	164	72" RCP
		Ironwood Avenue	200	-----	0.0015	164	72" RCP
New	Candleberry Avenue	Elder Avenue	500	-----	0.0015	164	72" RCP
		Elder Avenue	500	-----	0.0015	77-95	60" RCP
New	Old Ranch Golf Course	Basswood Street	700	-----	0.0015	164	2-54" RCP
		Aster Street	700	-----	0.0015	164	2-54" RCP

GUAVA AVENUE STORM DRAIN FACILITY (CPE 1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Ironwood Avenue R/W (N)	Hazelnut Avenue	370	-----	0.0015	64	54" RCP
		Hazelnut Avenue Storm Drain (CPE 1)					
New	Guava Avenue	Heather Street	1,290	-----	0.0015	64 to 42	54" RCP
		Heather Street	270	-----	0.0015	42	48" RCP
		Iris Street	1,350	-----	0.0015	29 to 24	42" RCP
New	Hazelnut Avenue	Fir Avenue	340	-----	0.0015	17	36" RCP
		Rose Street Storm Drain (CPE 1)					
New	Rose Street	Fir Avenue	250	-----	0.0015	13	30" RCP
		Sunflower Street Storm Drain (CPE 1)					
New	Fir Avenue	Sunflower Street Toward North	100	-----	0.0015	13	30" RCP
		Sunflower Street Storm Drain (CPE 1)					

FIR AVENUE STORM DRAIN FACILITY (CPE 1-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Ironwood Avenue	West of Daisy Circle	840	-----	0.0015	22 to 17	36" RCP
		West of Daisy Circle	160	-----	0.0015	13	30" RCP

ELDER AVENUE STORM DRAIN FACILITY (CPE 2)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Ironwood Avenue R/W (N)	Fuchsia Street	1,550	-----	0.0015	57 to 51	54" RCP
		Fuchsia Street	40 to 31	-----	0.0015	48" RCP	
		West of Oleander Street	350	-----	0.0015	31 to 29	42" RCP
New	Elder Avenue	Dogwood Avenue	250	-----	0.0015	20	36" RCP
		Dogwood Avenue Storm Drain (CPE 2)					
New	Oleander Street	Primrose Street	250	-----	0.0015	20	36" RCP
		Oleander Street Storm Drain (CPE 2)					

CANDLEBERRY AVENUE STORM DRAIN FACILITY (CPE 3-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Project No. 50204	Lampson Avenue, North R/W	Aster Street Junction Structure	392	-----	0.0015	88	2-5'(W)x3'(H) RCB*
		Aster Street Junction Structure	17	-----	0.0015	88	7'(W)x3'(H) RCB*
		Aster Street Junction Structure	17	-----	0.0015	88	7'(W)x3'(H) RCB*
New	Aster Street Junction Structure	Fuchsia Street	1,800	-----	0.0015	61 to 56	54" RCP
		Fuchsia Street Storm Drain Conceptual Design (CPE 3-5)					
New	Candleberry Avenue	Birchwood Avenue	200	-----	0.0015	34	42" RCP
		Birchwood Avenue Storm Drain Conceptual Design (CPE 3-5)					
New	Fuchsia Street	Oleander Street	1,650	-----	0.0015	34 to 27	42" RCP
		Oleander Street Storm Drain Conceptual Design (CPE 3-5)					

ASTER STREET STORM DRAIN FACILITY (CPE 3-4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Project No. 50204	@ Main Line Sta. 20+74	CB on S. Curb Face	15	-----	0.0256	39	Double 27" RCP*
		CB on S. Curb Face	15	-----	0.03	21	Double 24" RCP*
Project No. 50204	Aster Street Junction Structure	East of Birchwood Avenue	142	-----	0.0021	37	7'(W)x3'(H) RCB*
		Birchwood Avenue Storm Drain Conceptual Design (CPE 3-4)					
New	Aster Street	Daisy Circle	1,650	-----	0.0015	37 to 23	42" RCP
		Daisy Circle Storm Drain Conceptual Design (CPE 3-4)					
New	Birchwood Avenue	Almond Avenue	400	-----	0.0015	19	36" RCP
		Almond Avenue Storm Drain Conceptual Design (CPE 3-4)					
New	Daisy Circle	East of Goldenrod Circle	600	-----	0.0015	15 to 12	30" RCP
		East of Goldenrod Circle Storm Drain Conceptual Design (CPE 3-4)					

BASSWOOD AVENUE STORM DRAIN FACILITY (CPE 4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Proposed Pump Station	Almond Avenue	280	-----	0.0015	27	42" RCP
		Aster Street Storm Drain (CPE 4)					
New	West of Camelia Street	West of Camelia Street	350	-----	0.0015	26	42" RCP
		Carnation Circle	330	-----	0.0015	17	36" RCP
		Clover Circle	270	-----	0.0015	12	30" RCP

LAMPSON AVENUE STORM DRAIN FACILITY (CPE5)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
-----	Cal Trans Open Channel	Lampson Avenue	75	-----	-----	-----	24" RCP

ALMOND AVENUE STORM DRAIN FACILITY (BC1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
TR-6416	Bolsa Chica Channel	Wisteria Street	103	30" RCP	0.001	43	6'Wx3'H RCB
		Wisteria Street	314	30" RCP	0.001	25	42" RCP
-----	Violet Street	East of Teaberry Circle	300	-----	0.001	19	36" RCP
-----	East of Teaberry Circle	East of Sunflower Circle	170	-----	0.001	13	30" RCP

WISTERIA STREET STORM DRAIN FACILITY (BC1-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
-----	175' North of the San Diego Freeway	Candleberry Avenue	485	-----	0.002	18	30" RCP

FIR AVENUE STORM DRAIN FACILITY (BC2)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
TR-5961	Bolsa Chica Channel	Wisteria Street, east catch basin	130	24" RCP	0.003	41	48" RCP
		Wisteria Street (BC2)					
New	Fir Avenue	Hazelnut Avenue	250	-----	0.002	24	3'Wx2'H RCB
		Hazelnut Avenue	250	-----	0.002	14	2.5'Wx1.5'H RCB

Legend

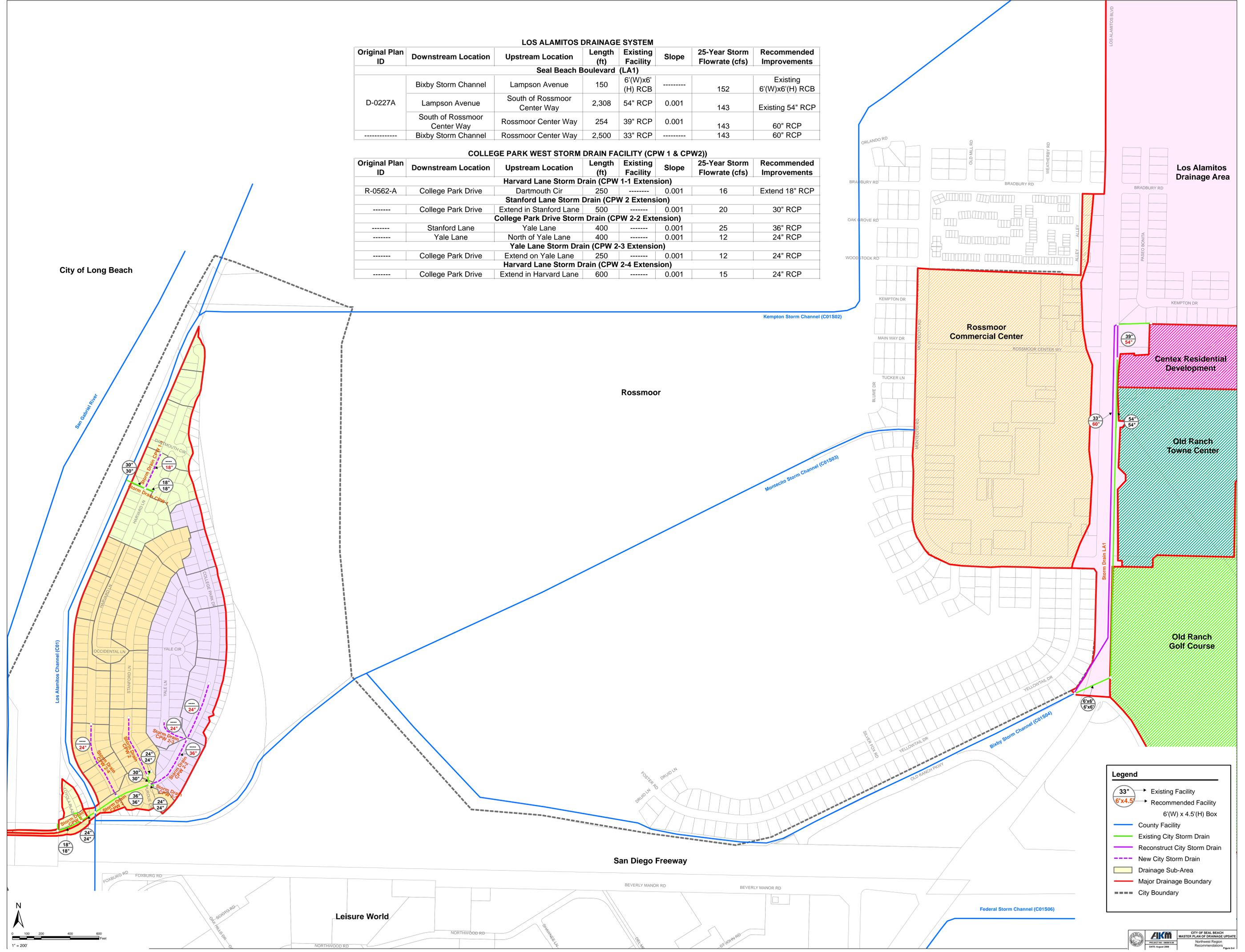
- 30" → Existing Facility
- 6'x3' → Recommended Facility
- County Facility
- Existing City Storm Drain (Protect in place)
- 2008 Budgeted Planned Improvements
- Reconstruct City Storm Drain
- New City Storm Drain
- Drainage Sub-Area
- Major Drainage Boundary
- City Boundary

LOS ALAMITOS DRAINAGE SYSTEM

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Seal Beach Boulevard (LA1)							
D-0227A	Bixby Storm Channel	Lampson Avenue	150	6'(W)x6'(H) RCB	-----	152	Existing 6'(W)x6'(H) RCB
	Lampson Avenue	South of Rossmoor Center Way	2,308	54" RCP	0.001	143	Existing 54" RCP
	South of Rossmoor Center Way	Rossmoor Center Way	254	39" RCP	0.001	143	60" RCP
	-----	Bixby Storm Channel	Rossmoor Center Way	2,500	33" RCP	-----	143

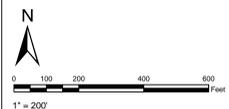
COLLEGE PARK WEST STORM DRAIN FACILITY (CPW 1 & CPW2)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Harvard Lane Storm Drain (CPW 1-1 Extension)							
R-0562-A	College Park Drive	Dartmouth Cir	250	-----	0.001	16	Extend 18" RCP
Stanford Lane Storm Drain (CPW 2 Extension)							
-----	College Park Drive	Extend in Stanford Lane	500	-----	0.001	20	30" RCP
College Park Drive Storm Drain (CPW 2-2 Extension)							
-----	Stanford Lane	Yale Lane	400	-----	0.001	25	36" RCP
-----	Yale Lane	North of Yale Lane	400	-----	0.001	12	24" RCP
Yale Lane Storm Drain (CPW 2-3 Extension)							
-----	College Park Drive	Extend on Yale Lane	250	-----	0.001	12	24" RCP
Harvard Lane Storm Drain (CPW 2-4 Extension)							
-----	College Park Drive	Extend in Harvard Lane	600	-----	0.001	15	24" RCP



Legend

- 33" → Existing Facility
- 6'x4.5' → Recommended Facility
- 6'(W) x 4.5'(H) Box
- County Facility
- Existing City Storm Drain
- Reconstruct City Storm Drain
- New City Storm Drain
- Drainage Sub-Area
- Major Drainage Boundary
- City Boundary



9-1.2 Seal Beach Pump Station-South Drainage Area

The existing drainage systems SB1 and SB2, described in Sub-sections 4-3, were analyzed and determined to be deficient during a 25-year storm event. Improvements to the Electric Avenue drainage systems are required to meet the flood protection goals.

Electric Avenue Drainage System (SB1, SB2, and SB4)

A new storm drain system, SB4, paralleling the existing storm drain systems, is recommended on the westbound Electric Avenue (north) between Seal Beach Boulevard and 12th Street. It will extend southwest to the intersection of 10th Street and Central Avenue. Connector pipes (SB1-1 through SB1-7) will need to be constructed to the existing Electric Avenue Facility (SB1) along Ocean Avenue, Marine Avenue Alley, Marine Avenue, Dolphin Avenue, Dolphin Avenue Alley, 13th Street, and 13th Street Alley. These pipes will intercept the runoff from the areas between Electric Avenue and Ocean Avenue. Connector pipes (SB2-2 and SB2-3) will also be constructed to the existing Electric Avenue Facility (SB2) along 17th Street and 16th Street to intercept the runoff between Pacific Coast Highway and Electric Avenue. The general description of the recommended drainage system is shown in Table 9-1 and on Figure 9-1. Design plans for several of these storm drains were prepared concurrently with the Master Plan of Drainage report. As of June, 2008, Plan PR-5002 included the proposed storm drain on Electric Avenue between 14th Street and Seal Beach Boulevard as well as its connector pipes and catch basins. These improvements have been funded, and will be constructed in 2008.

**TABLE 9-1
RECOMMENDED IMPROVEMENTS
SEAL BEACH PUMP STATION SOUTH DRAINAGE AREA
ELECTRIC AVENUE STORM DRAINS (SB1, SB2, AND SB4)**

ELECTRIC AVENUE (SOUTH) STORM DRAIN FACILITIES (S1-1 to SB1-7)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Storm Drain Facility (SB1-1)							
PR-50021	City 54" SD, Sta. 3+84	Ocean Avenue	251	-----	0.018	2	24" RCP*
Storm Drain Facility (SB1-2)							
PR-50021	City 54" SD, Sta. 4+87	Alley W. of Ocean Ave.	118	-----	0.016	2	18" RCP*
Storm Drain Facility (SB1-3)							
PR-50021	City 54" SD, Sta. 5+55	Marine Avenue	122	-----	0.014	3	18" RCP*
Storm Drain Facility (SB1-4)							
PR-50021	City 48" SD, Sta. 8+73	Dolphin Avenue	101	-----	0.015	7	24" RCP*
Storm Drain Facility (SB1-5)							
PR-50021	City 48" SD, Sta. 10+08	Alley W. of Dolphin Ave.	60	-----	0.017	7	24" RCP*
Storm Drain Facility (SB1-6)							
New	City 42" SD, Sta. 14+38	13th Street	73	-----	0.015	9	24" RCP
Storm Drain Facility (SB1-7)							
New	City 42" SD, Sta. 15+81	Alley W. of 13th St.	39	-----	0.015	4	18" RCP

* Recommendations Budgeted for 2008

ELECTRIC AVENUE (SOUTH) STORM DRAIN FACILITIES (SB2-2 to SB2-3)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Storm Drain Facility (SB2-2)							
PR-50021	City 30" SD, Sta. 2+01.6	17th Street	395	-----	0.001 to 0.008	13	24" RCP*
Storm Drain Facility (SB2-3)							
PR-50021	City 30" SD	16th Street	85	-----	0.002	14	30" RCP*

* Recommendations Budgeted for 2008

ELECTRIC AVENUE (NORTH) STORM DRAIN FACILITY (SB4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Electric Avenue (North) Storm Drain (SB4)							
PR-50221	Seal Beach Boulevard	15th Street	804	-----	0.003	111	66" RCP*
PR-50221	15th Street	14th Street	258	-----	0.003	100	66" RCP*
New	14th Street	13th Street	253	-----	0.003	85	66" RCP
New	13th Street	12th Street	217	-----	0.003	77	66" RCP
			67	-----	0.003	75	66" RCP
12th Street Storm Drain Southerly Main Line Extension (SB4)							
New	Electric (North)	Electric (South)	80	-----	0.003	54	66" RCP
New	Electric (South) Crossing		57	-----	0.003	53	48" RCP
New	Electric (South)	Central Avenue	127	-----	0.003	41	48" RCP
Central Avenue Storm Drain Southerly Main Line Extension (SB4)							
New	12th Street	11th Street	330	-----	0.003	34	36" RCP
New	11th Street	10th Street	360	-----	0.003	21	30" RCP

* Recommendations Budgeted for 2008

ELECTRIC AVENUE (SOUTH) STORM DRAIN FACILITIES (SB4-1 to SB4-5)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Storm Drain Facility (SB4-1)							
PR-50021	Proposed 66" SD, Sta. 18+02.98	15th Street	110	-----	0.012	12	36" RCP*
Storm Drain Facility (SB4-2)							
PR-50021	Proposed 66" SD, Sta. 20+60.7	14th Street	90	-----	0.002	17	36" RCP*
Storm Drain Facility (SB4-3)							
New	Proposed 66" SD	13th Street	100	-----	0.002	8	36" RCP
Storm Drain Facility (SB4-4)							
New	Proposed 66" SD	12th Street (North)	121	-----	0.004	27	42" RCP
Storm Drain Facility (SB4-5)							
New	Proposed 66" SD	East of 11th Street	150	-----	0.004	13	24" RCP

* Recommendations Budgeted for 2008

9-1.3 Seal Beach Pump Station-North Drainage Area

Orange County Facility No. C00P02 is currently the main drainage facility within this drainage area. To prevent flooding during a 25-year storm event, new facilities are proposed in the Marina Hill along Bolsa Avenue, Balboa Drive, Marlin Avenue, Pacific Coast Highway, Silver Shoals Avenue, and Seal Beach Boulevard.

Seal Beach Storm Drain, OCFCD Facility No. C00P02

The main facilities in this drainage area are the Seal Beach Storm Drain, OCFCD Facility No. C00P02, and the Seal Beach Pump Station, C00PS1. Descriptions of these facilities are included in Sub-section 4-2. The downstream 66-inch RCP storm drain along Seal Beach Boulevard between Pacific Coast Highway and the Seal Beach Pump Station was completed in 1971, with the 10-year storm design discharges ranging between 149 cfs and 153 cfs. This reach is not currently capable of conveying the 25-year storm runoff of 242 cfs, which is considerably higher than the design discharge.

The middle portion of Seal Beach Storm Drain was completed in 1976 along Pacific Coast Highway between Balboa Drive and 300 feet west of Seal Beach Boulevard. This existing 78-inch RCP facility was designed to convey the discharges of 125 cfs to 180 cfs, which is less than the current 25-year storm runoff, ranging from 208 cfs to 242 cfs. However, this facility has the capacity to convey the current 25-year storm runoff.

The upstream facility along Balboa Drive, between Bolsa Avenue and Pacific Coast Highway was completed in 1976. This 54-inch storm drain was designed to convey discharges between 85 cfs and 90 cfs, which are significantly less than the 25-year storm peak runoff ranging between 126 cfs and 169 cfs.

The recommendations to improve the County C00P02 facility include options for storm drain replacement and new parallel drainage systems. These recommendations are described in Table 9-2 and shown on Figure 9-1.

TABLE 9-2
RECOMMENDED IMPROVEMENTS
SEAL BEACH PUMP STATION DRAINAGE AREA NORTH
SEAL BEACH STORM DRAIN C00P02
SEAL BEACH STORM DRAIN FACILITY NO. C00P02

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Seal Beach Boulevard Storm Drain							
New	Electric Avenue	Pacific Coast Highway	1640	66" RCP	0.0015	242	Replacement 84" RCP or Parallel 66" RCP
Pacific Coast Highway Storm Drain							
C00P02-101-1 A	Seal Beach Boulevard	Balboa Drive	1274	78" RCP	0.00224	208	Existing 78" RCP
Balboa Drive Storm Drain							
C00P02-101-1 A	Pacific Coast Highway	Marlin Avenue	458	54" RCP	0.002	169	Replacement 72" RCP or 60" Parallel RCP
C00P02-101-1 A	Marlin Avenue	Bolsa Avenue	282	54" RCP	0.002	126	Replacement 66" RCP or Parallel 48" RCP

Seal Beach Pump Station, OCFCD Facility No. C00PS1

Several improvements have been made to the existing Seal Beach Pump Station, which include the addition of a third pump as well as increasing the total pumping capacity to 381 cfs. Since the ultimate 25-year peak flow rate into the pump station is 410 cfs, the Seal Beach Pump Station facility is undersized. This facility should be replaced with a 410 cfs capacity pump station at the end of its useful life.

Pacific Coast Highway Storm Drain System (SB3-1)

The existing 15-inch storm drain on Pacific Coast Highway between Balboa Drive to Silver Shoals Avenue, drains to the OCFCD Facility C00P02. The existing 15-inch drain is not capable of conveying the 25-year storm runoff of 41 cfs. It should be replaced with a 36-inch RCP, and extended along Silver Shoals Avenue from Pacific Coast Highway to Coastline Drive. The recommended improvements are listed in Table 9-3 and shown on Figure 9-1.

TABLE 9-3
RECOMMENDED IMPROVEMENTS
SEAL BEACH PUMP STATION DRAINAGE AREA NORTH
PACIFIC COAST HIGHWAY STORM DRAINS (SB3-1)
PACIFIC COAST HIGHWAY STORM DRAIN FACILITY (SB 3-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Pacific Coast Highway Storm Drain							
New	Balboa Drive	Main Street	900	15" RCP	0.001	41	36" RCP
Bolsa Avenue Storm Drain							
New	Pacific Coast Highway	Coastline Drive	375	-----	0.004	27	30" RCP

Bolsa Avenue, Bay Side Drive, and Harbor Way Storm Drain System (SB5)

Currently, the County facility terminates at the intersection of Balboa Drive and Bolsa Avenue. The proposed City storm drain will extend easterly along Bolsa Avenue from the existing system to Bay Side Drive where it turns northerly to Harbor Way and ends on Harbor Way, located 400 feet northeast of Bay Side Drive. The general description of the recommended drainage system is listed in Table 9-4, and shown on Figure 9-1.

**TABLE 9-4
RECOMMENDED IMPROVEMENTS
SEAL BEACH PUMP STATION DRAINAGE AREA NORTH
BOLSA AVENUE, BAY SIDE DRIVE, AND HARBOR WAY STORM DRAINS (SB5)**

BOLSA AVENUE STORM DRAIN FACILITY (SB 5)							
Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Bolsa Avenue Storm Drain							
New	Balboa Drive	East of South Shore Dr.	380	-----	0.0033	126 to 105	66" RCP
New	East of South Shore Dr.	East of Sand Piper Dr.	505	-----	0.0033	89 to 78	60" RCP
New	East of Sand Piper Dr.	East of Beach Comber Dr.	250	-----	0.0033	64	54" RCP
New	East of Beach Comber Dr.	East of Sea Breeze Dr.	250	-----	0.0033	53	48" RCP
New	East of Sea Breeze Dr.	Bay Side Drive	400	-----	0.0033	38	42" RCP
Bay Side Drive Storm Drain							
New	Bolsa Avenue	Harbor Way	250	-----	0.0033	33	42" RCP
Harbor Way Storm Drain							
New	Bay Side Drive	Toward North	400	-----	0.0033	20 to 15	30" RCP

Marlin Avenue Storm Drain System (SB6)

Because of the flat slopes ($S=0.002$), this area may experience street inundation problems. Therefore, a storm drain is recommended on in Marlin Avenue. The Marlin Avenue Storm Drain will extend from the County facility C00P02 at Balboa Avenue to J. H. McGaugh Elementary School. The recommended drainage system is listed in Table 9-5, and shown on Figure 9-1.

**TABLE 9-5
RECOMMENDED IMPROVEMENTS
SEAL BEACH PUMP STATION DRAINAGE AREA NORTH
MARLIN AVENUE STORM DRAINS (SB6)**

MARLIN AVENUE STORM DRAIN FACILITY (SB 6)							
Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Balboa Drive	Marble Cove Way	250	-----	0.002	45	48" RCP
New	Marble Cove Way	Riviera Drive	650	-----		40 to 26	48" RCP
New	Riviera Drive	West of Beryl Cove Way	400	-----		26 to 21	42" RCP

9-1.4 Marina Hill Drainage Area

Storm Drains MH1 and MH2 in the Marina Hill drainage area are capable of draining the runoff at the two (2) sump locations along Crestview Avenue. These 18-inch RCP facilities are able to convey the 25-year storm runoff because of the steep slopes at these locations. No improvements are currently recommended.

9-1.5 West End Pump Station Drainage Area

West End Pump Station

Currently, the West End Pump Station has a capacity of approximately 200 cfs, and the peak runoff from the 25-year storm event is 296 cfs. The additional capacity to meet the flood protection goals should be provided in a parallel new pump station located east of the existing pump station.

The City obtained a site at the adjacent Oakwood Apartment parking area for the parallel pump station. A parallel inflow storm drain is proposed along Electric Avenue (WE1-3) to convey the runoff to the new pumping facility. The runoff should be split at the intersection of Corsair Way and Electric Avenue, where it will travel west via the existing storm drain to the West End Pump Station or via the proposed facility in Electric Avenue to the new pumping facility. The proposed storm drain should have the capacity to convey the entire tributary flow to the new pump station so that the existing storm drain, over which several houses have been built, can be removed from service at the end of its useful life.

Electric Avenue Drainage System (WE1)

The existing drainage facility on Electric Avenue between Marina Drive and Corsair Way is currently inadequate. This storm drain will receive additional runoff from an approximately 4 acre area near Main Street and Electric Avenue.

The alignment along Electric Avenue has significant constraints, including several sumps in the tributary area, shallow ground cover over the storm drains, very flat slopes ($S=0.005$), existing gravity sewer lines, and closeness of the existing facilities. Because of these limitations, it is not possible to completely eliminate the street flooding in several areas. The recommendations of this Master Plan will minimize the street inundation and shorten the street ponding duration during the 25-year storm event.

To convey the 25-year storm peak runoff to the West End Pump Station, the existing corrugated metal arch pipe along Electric Avenue will need to be replaced with a double 8'(W)x4.25'(H) RCB.

To prevent flooding at the sump located at the intersection of 1st Street and Welcome Lane, catch basins and 24-inch RCP are recommended to connect to the existing double 6'(W)x5'(H) mainline drain (WE1), following the completion of Storm Drain WE1 improvements. The general description of the recommended drainage system is listed in Table 9-6, and shown on Figure 9-1.

**TABLE 9-6
RECOMMENDED IMPROVEMENTS
WEST END PUMP STATION DRAINAGE AREA
ELECTRIC AVENUE STORM DRAINS (WE1)**

ELECTRIC AVENUE STORM DRAIN FACILITY (WE1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Electric Avenue Storm Drain (WE1)							
D-0321-A	West End Pump Station	North R/W of First Street	391	Double 6'(W) x 3.25'(H) RCB	0.0032	296	Existing Double 6'(W)x3.25'(H) RCB
-----	North R/W of First Street	South R/W of First Street	100	Double 6'(W) x 5'(H) RCB	0.001	278	Existing Double 6'(W)x5'(H) RCB
D-0320-A	South R/W of First Street	Corsair Way	481	Double 6'(W) x 3'(H) RCB	0.00116	238	Existing Double 6'(W)x3'(H) RCB
R-0436-A	Corsair Way	Alley Between Corsair Way and Galleon Way	710	72"(W) x 44"(H) CMPA	0.001	238	Double 8'(W) x 4.25'(H) RCB
-----	Alley Between Corsair Way and Galleon Way	Galleon Way		Double 58"(W) x 36"(H) CMPA		223	
R-0442-A	Galleon Way	Fifth Street (West R/W)		58"(W) x 36"(H) CMPA		189	
D-0332-A	Fifth Street (West R/W)	Fifth Street (East R/W)		5'(W) x 3'(H) RCB		189	
-----	Fifth Street (East R/W)	Marina Drive		36" RCP		128	
Marina Drive Storm Drain (WE1)							
-----	Electric Avenue	Pacific Coast Highway (South R/W)	585	36" RCP & 30" RCP	-----	44	Existing 36" RCP & 30" RCP
R-0145-A	Pacific Coast Highway (South R/W)	Pacific Coast Highway (North R/W)	75	4'(W) x 1'(H) RCB	-----	24	Existing 4'(W)x 1'(H) RCB
D-0123R	Pacific Coast Highway (North R/W)	Coastline Drive east of Driftwood Avenue	110	5'(W) x 2'(H) RCB	0.00343	10	Existing 5'(W)x 2'(H) RCB

ELECTRIC AVENUE STORM DRAIN FACILITY (WE1-3)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Proposed Pump Station on Oakwood Apartments Property	Corsair Way	1,000	-----	-----	296	Double 5.25'(W)x4.25'(H) RCB

ELECTRIC AVENUE STORM DRAIN FACILITY (WE1-4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	South R/W of First Street		250	-----	-----	14	24" RCP

5th Street Drainage System (WE6)

To alleviate flooding in the Marina Hill community, an additional drainage system (WE6) is proposed on 5th Street from Electric Avenue northeasterly to Coastline Drive (51-inch to 48-inch), and on Coastline Drive between Catalina Avenue and Driftwood Avenue (48-inch to 36-inch). Connector facilities on Catalina Avenue, Mar Vista Avenue, and Driftwood Avenue are proposed to collect the runoff along these streets. When this system is completed, the existing storm drain on Galleon Way and on Marina Drive east of Electric Avenue will be capable of conveying the 25-year storm runoff. The Storm Drain System WE6 should be constructed following the completion of the improvements on Electric Avenue between Corsair Way and Marina Drive (WE1). A general description of the recommended drainage system is listed in Table 9-7, and shown on Figure 9-1.

**TABLE 9-7
RECOMMENDED IMPROVEMENTS
WEST END PUMP STATION DRAINAGE AREA
FIFTH STREET AND COASTLINE DRIVE STORM DRAINS (WE6)**

5TH STREET STORM DRAIN FACILITY (WE 6)							
Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
5th Street Storm Drain (WE 6)							
New	Electric Avenue	South of PCH	375	-----	0.002	66	51" RCP
New	South of PCH	PCH	135	-----	0.0025		48" RCP
New	PCH	Coastline Drive	210	-----	0.003	66	48" RCP
Coastline Drive Storm Drain (WE 6)							
New	5th Street	Marvista Avenue	90	-----	0.002	37	48" RCP
New	Marvista Avenue	Driftwood Avenue	290	-----	0.002	20	36" RCP
COASTLINE DRIVE STORM DRAIN FACILITY (WE 6-1 to WE 6-3)							
Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Coastline Drive Storm Drain (WE 6-1)							
New	5th Street	Catalina Avenue	190	-----	0.002	30	36" RCP
Catalina Avenue Storm Drain (WE 6-1)							
New	Coastline Drive	Toward North	60	-----	0.005	30	36" RCP
Marvista Avenue Storm Drain (WE 6-2)							
New	Coastline Drive	Toward North	60	-----	0.005	18	30" RCP
Driftwood Avenue Storm Drain (WE 6-3)							
New	Coastline Drive	Toward North	40	-----	0.005	20	36" RCP

Electric Avenue, and Marina Drive/Pacific Coast Highway Drainage Systems (WE4, WE5)

Currently, the City does not have drainage facilities that serve the center of the Old Town area. During storm events, street inundation occurs along Marina Drive at Pacific Coast Highway, 7th Street, and Electric Avenue. In order to minimize the flooding at these locations, new drainage facilities (WE4 and WE5) are recommended along Electric Avenue, Marina Drive, and Pacific Coast Highway. These systems will tie into the proposed drainage facilities on Electric Avenue west of Marina Drive (WE1) that drain westerly to the West End Pump Station.

Electric Avenue-Main Street Drainage System (WE4)

The WE4 drainage system is proposed on Electric Avenue as a 24-inch RCP from Main Street to 8th Street, a 42-inch RCP to 7th Street, and a double 8' (W) x 4.25' (H) RCB to Marina Drive, where it will connect to the proposed WE1 Storm Drain.

Connector drains are proposed along 6th Street (24-inch RCP), 7th Street (36-inch RCP), and Main Street (36-inch RCP) to alleviate the street flooding south of Electric Avenue. These facilities are described in Table 9-8 and are shown on Figure 9-1.

**TABLE 9-8
RECOMMENDED IMPROVEMENTS
WEST END PUMP STATION DRAINAGE AREA
ELECTRIC AVENUE-MAIN STREET STORM DRAINS (WE4)**

CENTRAL ELECTRIC AVENUE STORM DRAIN FACILITY (WE4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Marina Drive	6th Street	208	-----	0.001	86	Double 8'(W) x 4.25'(H) RCB
						66	
New	6th Street	7th Street	296	-----	0.001	50	Double 8'(W) x 3.5'(H) RCB
New	7th Street	8th Street	322	-----	0.001	28	42" RCP
New	8th Street	Main Street	434	-----	0.001	7	24" RCP

CENTRAL ELECTRIC AVENUE CONNECTOR STORM DRAIN FACILITY (WE4-1 to WE4-3)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Storm Drain Facility WE4-1							
New	Electric Avenue (North)	6th Street	210	-----	0.001	15	24" RCP
Storm Drain Facility WE4-2							
New	Electric Avenue (North)	7th Street	160	-----	0.001	22	36" RCP
Storm Drain Facility WE4-3							
New	Electric Avenue (North)	8th Street	175	-----	0.001	23	36" RCP

Marina Drive – Pacific Coast Highway Drainage System (WE5)

A dual drainage system is proposed on Marina Drive between Pacific Coast Highway and Electric Avenue. The existing 36-inch storm drain on Marina Drive will remain in place to convey runoff from the Marina Hill area to the West End Pump Station. The new facility (WE5) will convey runoff from the Old Town area south of Pacific Coast Highway to the existing facility (WE1).

The proposed Marina Drive Storm Drain will extend northeasterly from Electric Avenue to 7th Street as a 48-inch RCP, and to Pacific Coast Highway as a 42-inch RCP. It will continue easterly on Pacific Coast Highway as a 42-inch RCP to 8th Street, and as a 36-inch RCP to Main Street. A local sump is located at the intersection of Pacific Coast Highway and Marina Drive. This proposed drainage system will drain the sump runoff and minimize the street inundation in this area. The general description of the recommended drainage system is listed in Table 9-9, and the facilities are shown on Figure 9-1.

**TABLE 9-9
RECOMMENDED IMPROVEMENTS
WEST END PUMP STATION DRAINAGE AREA
MARINA DRIVE AND PACIFIC COAST HIGHWAY STORM DRAINS (WE5)**

MARINA DRIVE STORM DRAIN FACILITY (WE-5)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Marina Drive Storm Drain							
New	Electric Avenue	7th Street	515	-----	0.001	30	48" RCP
New	7th Street	Pacific Coast Highway	150	-----	0.001	25	42" RCP
Pacific Coast Highway Storm Drain							
New	Marina Drive	8th Street	210	-----	0.001	18	42" RCP
New	8th Street	Main Street	345	-----	0.001	11	36" RCP

9-1.6 San Gabriel River Drainage Area

This area has a single existing facility, which is on Marina Drive between 2nd Street and San Gabriel River. It is inadequate due to the high water levels in and levied conditions along San Gabriel River, as well as flat slopes along Marina Drive. This area has a sump at the intersection of Marina Drive and 1st Street. The elevations at the sump and the surrounding area (approximately 9 feet amsl) are lower than the design water surface elevations in San Gabriel River (11 feet amsl). The peak discharge of the 25-year flow in this drainage area is 88 cfs.

A new pump station is recommended to convey the peak 25-year flow to the San Gabriel River. The pump station can be constructed in Marina Park located at the northeast corner of 1st Street and Marina Drive. It can be constructed with a single pump or two pumps. The discharge pipe(s) should be sized to keep the velocity to below 10 feet per second. The details of the pump station should be developed through a preliminary design report.

The influent storm drains will be located on Marina Drive (Storm Drain SG2), and on Central Avenue (Storm Drain SG2-1). The recommended improvements are listed in Table 9-10, and are shown on Figure 9-1.

**TABLE 9-10
RECOMMENDED IMPROVEMENTS
SAN GABRIEL RIVER DRAINAGE AREA
MARINA DRIVE AND CENTRAL AVENUE STORM DRAINS (SG2)
MARINA DRIVE STORM DRAIN FACILITY (SG2)**

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Marina Drive Storm Drain (SG 2)							
New	San Gabriel River	Proposed Pump Station	800	-----	0.0027	88	42" RCP
New	Proposed Pump Station	2nd Street	300	-----	0.002	88 to 62	5.5'(W) x 2.5'(H) RCB
New	2nd Street	4th Street	725	-----	0.002	24 to 12	5'(W) x 2'(H) RCB

CENTRAL AVENUE STORM DRAIN FACILITY (SG2-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Central Avenue Storm Drain (SG 2-1)							
New	Marina Drive	4th Street	810	-----	0.002	45 to 14	5'(W) x 2'(H) RCB

9-1.7 Anaheim Bay Drainage Area

The main drainage facility from the Anaheim Bay Drainage Area is located on Seal Beach Boulevard. This facility drains portions of Seal Beach Boulevard and Pacific Coast Highway, as well as portions of the military housing at the U.S. Naval Weapons Station.

Anaheim Bay Drainage System (AB1)

Currently, the existing drainage facility consisting of 24-inch RCP storm drain, various corrugated metal pipe culverts, and open channels, is not capable of conveying the 25-year storm runoff of 112 cfs. While the tributary area north of Pacific Coast Highway is characterized moderate slopes, the downstream portion located on the U.S. Naval Weapons Station Property is relatively flat. The recommendations hereon include replacing the existing facilities within the Naval Weapons Station property with a 7.5'(W) x 3.0'(H) RCB as well as adding 42-inch and 24-inch RCP storm drain extensions along Seal Beach Boulevard. The proposed storm drain improvements are listed in Table 9-11 and shown on Figure 9-1.

**TABLE 9-11
RECOMMENDED IMPROVEMENTS
ANAHEIM BAY DRAINAGE AREA
SEAL BEACH BOULEVARD STORM DRAINS (AB1)
SEAL BEACH BOULEVARD STORM DRAIN FACILITY (AB1)**

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Seal Beach Boulevard (AB1)							
D-2007	Anaheim Bay (Station 11+26.5)	Station 8+66.5	260	2-36" RCP	0.003	112	7.5'(W) x 3'(H) RCB
	Station 8+66.5	Station 7+09.5	157	4'(W)x 4.3'(H) Trap Earthen Ditch	0.002	49	7.5'(W) x 3'(H) RCB
	Station 7+09.5	Station 6+48.5	61	56"x36" CMPA and 36"x22" CMPA	0.002	49	7.5'(W) x 3'(H) RCB
D-0031A	Station 6+48.5	Station 5+30.5	464	4'(W)x 4.3'(H) Trap Earthen Ditch	0.002	91	7.5'(W) x 3'(H) RCB
	Station 5+30.5	Pacific Coast Highway	118	2-43"x27" CMP	0.002	91	7.5'(W) x 3'(H) RCB
-----	Pacific Coast Highway	North of Marlin Avenue	1050	24" RCP	0.01	81	42" RCP
New	North of Marlin Avenue	Bolsa Avenue	780	-----	0.02	22	24" RCP

9-2 NORTHEAST REGION DRAINAGE AREAS

9-2.1 Bolsa Chica Channel Drainage Area

The College Park East Community has two easterly drainage facilities along Wisteria Street that outlet into Bolsa Chica Channel (C02).

Almond Avenue Storm Drain (BC1)

The existing drainage facility north of Almond Avenue is a 30-inch RCP, and cannot currently convey the 25-year storm peak runoff of 43 cfs. The existing storm drain along the easement has to be replaced by a 6' (W) x 3' (H) RCB between Bolsa Chica Channel and Wisteria Street, and by a 42-inch RCP to Violet Street. It has to be extended south along Violet Street and west along Almond Avenue as a 36-inch RCP to Teaberry Circle, and a 30-inch RCP to east of Sunflower Circle. The proposed system includes a 30-inch RCP on Wisteria Street between Candleberry Avenue and the existing drain. Table 9-12 describes the proposed system in detail. Figure 9-2 illustrates the recommended improvements.

**TABLE 9-12
RECOMMENDED IMPROVEMENTS
BOLSA CHICA CHANNEL DRAINAGE AREA
ALMOND AVENUE STORM DRAINS (BC1)
ALMOND AVENUE STORM DRAIN FACILITY (BC1)**

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
North of Almond Avenue (BC1)							
TR-6416	Bolsa Chica Channel	Wisteria Street	103	30" RCP	0.001	43	6'Wx3'H RCB
	Wisteria Street	Violet Street	314	30" RCP	0.001	25	42" RCP
Almond Avenue (BC1)							
-----	Violet Street	East of Teaberry Circle	300	-----	0.001	19	36" RCP
-----	East of Teaberry Circle	East of Sunflower Circle	170	-----	0.001	13	30" RCP

WISTERIA STREET STORM DRAIN FACILITY (BC1-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Wisteria Street (BC1-1)							
-----	175' North of the San Diego Freeway	Candleberry Avenue	485	-----	0.002	18	30" RCP

Fir Avenue Proposed Storm Drain (BC2)

The existing 24-inch RCP near Fir Avenue, between Bolsa Chica Channel and Wisteria Street, does not have the capacity to convey the 25-year storm peak runoff of 41 cfs to Bolsa Chica Channel. It needs to be replaced by a 48-inch RCP. This system needs to be extended north on Wisteria Street between Fir Avenue and Hazelwood Avenue as a 3' (W) x 2' (H) RCB, and a 2.5' (W) x 1.5' (H) RCB to Ironwood Avenue. Table 9-13 lists the proposed facilities, which are illustrated on Figure 9-2.

**TABLE 9-13
RECOMMENDED IMPROVEMENTS
BOLSA CHICA CHANNEL DRAINAGE AREA
FIR AVENUE STORM DRAINS (BC2)**

FIR AVENUE STORM DRAIN FACILITY (BC2)

Fir Avenue (BC2)							
TR-5961	Bolsa Chica Channel	Wisteria Street, east catch basin	130	24" RCP	0.003	41	48" RCP
Wisteria Street (BC2)							
New	Fir Avenue	Hazelnut Avenue	250	-----	0.002	24	3'Wx2'H RCB
New	Hazelnut Avenue	Ironwood Avenue	250	-----	0.002	14	2.5'Wx1.5'H RCB

9-2.2 College Park East Drainage Area

Currently, there are four drainage outlets that drain westerly from the College Park East community to the Old Ranch Golf Course, which is a regional detention basin for the Federal Storm Channel.

The capacities of these outlets are heavily restricted by the high water levels in the Old Ranch Golf Course detention basin during the design storm. There are four sump locations along Ironwood Avenue and Aster Street with street elevations just over 15 feet amsl draining to the golf course detention basin. During the 25-year storm event, the water level in the swale is approximately 17 feet amsl; therefore, these sump areas are not capable of draining to the basin. These facilities are also restricted by the 10-foot wide storm drain easement; a 34-inch diameter high pressure gas line on Lampson Avenue; shallow ground cover over the storm drains; and existing gravity sewer lines. Because of these limitations, it is not possible to completely eliminate the street flooding problems by draining through the existing four drainage outlet points. The hydraulic criteria can be satisfied if the entire flow can be pumped from the College Park East community across Lampson Avenue into the Old Ranch Golf Course.

Two alternatives have been developed for the College Park East Drainage area. The first alternative includes improvements which utilize the four existing drainage outlet alignments, and it does not include a pump station facility. The layout of this alternative is illustrated on Figure 4-2. The second alternative requires a pump station that discharges into the Old Ranch Golf Course. The improvements recommended for this alternative are shown on Figure 4-3.

9-2.2.1 College Park East Drainage Area Alternative 1

This alternative consists of draining the majority of the College Park East community through the four (4) existing facilities which terminate at the Old Ranch Golf Course. Although this alternative cannot eliminate the street flooding problems entirely, the proposed drainage systems will minimize the street inundation and shorten the street ponding duration at the downstream locations during the 25-year storm event. The Guava Avenue Storm Drain, Elder Avenue Storm Drain, Candleberry Avenue Storm Drains, and Basswood Street Storm Drain improvements are discussed in detail below.

Guava Avenue Storm Drain (CPE1)

The existing 36-inch RCP extends from the golf course easterly across Lampson Avenue, and through a 10-foot wide storm drain easement to the intersection of Ironwood Avenue and Guava Avenue. Two (2) laterals extend across Ironwood Avenue to intercept the runoff from Guava Avenue. The street intersection is a sump location where ponding occurs.

The recommended improvements include a double 6' (W) x 3' (H) RCB across Lampson Avenue. Due to the limited easement width, the maximum facility width along the existing easement would be approximately 6 feet. Because of the vertical constraints, only a 6' (W) x 3' (H) reinforced concrete box can be constructed to replace the existing 36-inch RCP. Without backwater conditions from the golf course swale, the system is capable of draining 56 cfs. The recommended storm drain will still not be able to convey the entire peak 25-year storm runoff of 69 cfs. Therefore, this area will experience street flooding with the design storm even after the improvements are implemented. The severity and duration of flooding will be significantly reduced by the recommended improvements. The proposed storm drain system will intercept the runoff on Guava Avenue, Hazelnut Avenue, and Fir Avenue. The recommended system on Guava Avenue and on Hazelwood Avenue west of Heather Street is a double 6' (W) x 2.25' (H) RCB. This system will continue east as an 8'

(W) x 2.25' (H) RCB, 6' (W) x 2.25' (H) RCB, and a 5' (W) x 2.25' (H) RCB to Rose Street, and as a 30-inch RCP on Rose Street, Fir Avenue, and Sunflower Street. The Fir Avenue System (CPE1-1) is a 5' (W) x 2' (H) RCB on Ironwood Avenue, and a 4.5' (W) x 2 and 4' (W) x 2' (H) RCB on Fir Avenue. The recommended improvements are described in Table 9-14, and shown on Figure 9-2.

TABLE 9-14
RECOMMENDED IMPROVEMENTS
COLLEGE PARK EAST DRAINAGE AREA ALTERNATIVE 1
GUAVA AVENUE, HAZELWOOD AVENUE, AND FIR AVENUE STORM DRAINS (CPE1)

GUAVA AVENUE STORM DRAIN FACILITY (CPE 1)							
Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Guava Avenue Storm Drain (CE 1)							
D-0068-A	Old Ranch Golf Course	Lampson Avenue R/W (S)	120	36" RCP	0.0005	76	Double 6'(W) x 3'(H) RCB
	Lampson Avenue R/W (S)	Ironwood Avenue R/W (N)	120	36" RCP		69	6'(W) x 3'(H) RCB
New	Ironwood Avenue R/W (N)	Hazelnut Avenue	370	-----		64	Double 6'(W) x 2'-3"(H) RCB
Hazelnut Avenue Storm Drain (CPE 1 Extension)							
New	Guava Avenue	Heather Street	1,290	-----	0.0005	64 to 42	Double 6'(W) x 2'-3"(H) RCB
	Heather Street	Iris Street	270			42	8'(W) x 2'-3"(H) RCB
	Iris Street	East of Iris Street	340		0.001	29	6'(W) x 2'-3"(H) RCB
	East of Iris Street	Rose Street	1,010			26 to 24	5'(W) x 2'-3"(H) RCB
Rose Street Storm Drain (CPE 1 Extension)							
New	Hazelnut Avenue	Fir Avenue	340	-----	0.001	17	30" RCP
Fir Avenue Storm Drain (CPE 1 Extension)							
New	Rose Street	Sunflower Street	250	-----	0.001	13	30" RCP
Sunflower Street Storm Drain (CPE 1 Extension)							
New	Fir Avenue	Sunflower Street Toward North	100	-----	0.001	13	30" RCP

FIR AVENUE STORM DRAIN FACILITY (CPE 1-1)							
Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Ironwood Avenue R/W (N)	Fir Avenue east of Ironwood Avenue	450	-----	0.0005	22	5'(W) x 2'(H) RCB
	East of Ironwood Avenue	West of Daisy Circle	640			17	4.5'(W) x 2'(H) RCB
	West of Daisy Circle	Daisy Circle	160			13	4.0'(W) x 2'(H) RCB

Elder Avenue Storm Drain (CPE2)

Like the Guava Avenue Storm Drain, the Elder Avenue Storm Drain extends from the Old Ranch Golf Course easterly across Lampson Avenue, and through a 10-foot wide easement to the intersection of Elder Avenue and Ironwood Avenue. The sump at this intersection experiences ponding.

The recommended improvements include a double 6' (W) x 3' (H) RCB across Lampson Avenue. Due to the limited easement width, the maximum facility width along the existing easement would be approximately 6 feet. Because of the vertical constraints, only a 6' (W) x 3' (H) reinforced concrete box can be constructed to replace the existing 36-inch RCP. Without backwater conditions from the golf course swale, the system is capable of draining 56 cfs. The recommended storm drain will still not be able to convey the entire 25-year

storm peak runoff of 71 cfs. Therefore, this area will experience street flooding with the design storm even after the improvements are implemented. The severity and duration of flooding will be significantly reduced by the recommended improvements.

This system will extend east on Elder Avenue as a double 6' (W) x 2.25' (H) RCB to Fuchsia Street, then as an 8' (W) x 2.25' (H) and 6' (W) x 2.25' (H) RCB to west of Oleander Street. It will continue east on Elder Avenue, south on Oleander Street, and east on Dogwood Avenue to Primrose Street as a 36-inch RCP.

The recommendations are described in Table 9-15, and are shown on Figure 9-2.

**TABLE 9-15
RECOMMENDED IMPROVEMENTS
COLLEGE PARK EAST DRAINAGE AREA ALTERNATIVE 1
ELDER AVENUE STORM DRAIN (CPE2)**

ELDER AVENUE STORM DRAIN FACILITY (CPE 2)							
Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Elder Avenue Storm Drain (CPE 2)							
D-0069-A	Old Ranch Golf Course	Lampson Avenue R/W (S)	120	36" RCP	0.0005	71	Double 6'(W) x 3'(H) RCB
	Lampson Avenue R/W (S)	Ironwood Avenue R/W (N)	120	36" RCP	0.0005	71	6'(W) x 3'(H) RCB
New	Ironwood Avenue R/W (N)	Fuchsia Street	1,550	-----	0.001	57 to 51	Double 6'(W) x 2'-3"(H) RCB
	Fuchsia Street	Heather Street	500	-----	0.001	40	8'(W) x 2'-3"(H) RCB
	Heather Street	West of Oleander Street	750	-----	0.001	34 to 31	6'(W) x 2'-3"(H) RCB
	West of Oleander Street	Oleander Street	350	-----	0.001	31 to 29	36" RCP
Oleander Street Storm Drain (CPE 2 Extension)							
New	Elder Avenue	Dogwood Avenue	250	-----	0.001	20	36" RCP
Dogwood Avenue Storm Drain (CPE 2 Extension)							
New	Oleander Street	Primrose Street	250	-----	0.001	20	36" RCP

Candleberry Avenue Storm Drain (CPE 3)

Parallel storm drains were constructed on Candleberry Avenue between the golf course and Aster Street as described in Sub-section 4-3. Due to the high water level in the golf course, as well as the sump location at the intersection of Aster Street and Candleberry Avenue, the existing storm drains are not capable of conveying the peak runoff from the 25-year storm. In order to reduce the ponding at this sump, a third storm drain system is recommended.

This third drain has been designed (Project No. 50204) parallel to the two (2) existing drainage facilities. The proposed storm drain will intercept the majority of the runoff, and the remaining flows will be intercepted by the existing systems. The downstream 54 feet portion of this facility was constructed in 2006 as a double 5' (W) x 3' (H) RCB from the Lampson Swale to south of the Lampson Avenue right-of-way. The design plans also include extending the drainage facility east on Candleberry Avenue to Aster Street, then south to Birchwood Avenue. Project No. 50204 has been funded and is included in the City's 2008-2009 budget.

The extension from Birchwood Avenue and Aster Street to the intersection of Almond Avenue and Heather Circle is also analyzed at a conceptual level. A storm drain from Candleberry Avenue and Aster Street to Birchwood Avenue and Oleander Street are also recommended as extensions to the Project No. 50204 improvements. The recommended improvements are listed in Table 9-16, and are illustrated on Figure 9-2.

**TABLE 9-16
RECOMMENDED IMPROVEMENTS
COLLEGE PARK EAST DRAINAGE AREA ALTERNATIVE 1
CANDLEBERRY AVENUE STORM DRAINS (CPE3)
CANDLEBERRY AVENUE STORM DRAIN FACILITY (CPE 3-1)**

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Candleberry Avenue Storm Drain - Design Phase per Project No. 50204 (CPE 3-1)							
Project No. 50204	Lampson Avenue, North R/W	Aster Street Junction Structure	392	-----	0.001	88	Double 5'(W) x 3'(H) RCB*
	Aster Street Junction Structure		17			88	10'-8" (W) x 3'(H) RCB*
Candleberry Avenue Storm Drain Conceptual Design (CPE 3-1 Extension)							
New	Aster Street Junction Structure	Fuchsia Street	1,800	-----	0.001	61 to 56	10'-8" (W) x 3'(H) RCB
Fuchsia Street Storm Drain Conceptual Design (CPE 3-1 Extension)							
New	Candleberry Avenue	Birchwood Avenue	200	-----	0.001	34	5' (W) x 3'(H) RCB
Birchwood Avenue Storm Drain Conceptual Design (CPE 3-1 Extension)							
New	Fuchsia Street	East of Fuchsia Street	500	-----	0.001	34	5' (W) x 3'(H) RCB
	East of Fuchsia Street	West of Marigold Street	500			30	4' (W) x 3'(H) RCB
	West of Marigold Street	Oleander Street	650			27	36" RCP

* Recommendations Budgeted for 2008

ASTER STREET STORM DRAIN FACILITY (CPE 3-4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Aster Street Connector Pipes per Project No. 50204							
Project No. 50204	@ Main Line Sta. 20+74	CB on S. Curb Face	15	-----	0.0256	39	Double 27" RCP*
	@ Main Line Sta. 21+35	CB on S. Curb Face	15		0.03	21	Double 24" RCP*
Aster Street Design Phase per Project No. 50204 (CPE 3-4)							
Project No. 50204	Aster Street Junction Structure	East of Birchwood Avenue	142	-----	0.0021	37	7'(W) x 2'-3"(H) RCB*
Aster Street Storm Drain Conceptual Design (CPE 3-4 Extension)							
New	End of Project No. 50204	Birchwood Avenue	85	-----	0.0021	37	7'(W) x 2'-3"(H) RCB
Birchwood Avenue Storm Drain Conceptual Design (CPE 3-4 Extension)							
New	Aster Street	Bluebell Street	200	-----	0.001	37	7'(W) x 2'-3"(H) RCB
	Bluebell Street	Daisy Circle	1,450		0.001	37 to 23	6'(W) x 2'-3"(H) RCB
Daisy Circle Storm Drain Conceptual Design (CE 3-4 Extension)							
New	Birchwood Avenue	Almond Avenue	400	-----	0.001	19	36" RCP
Almond Avenue Storm Drain Conceptual Design (CPE 3-4 Extension)							
New	Daisy Circle	East of Goldenrod Circle	600	-----	0.001	15 to 12	36" RCP

* Recommendations Budgeted for 2008

Basswood Street Storm Drain (CPE 4)

The current drainage facility along Basswood Street, between Aster Street and the Old Ranch Golf Course, is not capable of conveying the 25-year storm runoff of 42 cfs. The existing system drains directly into the detention basin on the golf course property. The existing drainage system has very little ground cover. There appears to be ample distance between the invert elevation of the storm drain and the bottom of the detention basin; however, there is a double 21-inch gas main along Lampson Avenue which restricts the size of the storm drain facility. The recommended improvements are listed in Table 9-17, and shown on Figure 9-2.

**TABLE 9-17
RECOMMENDED IMPROVEMENTS
COLLEGE PARK EAST DRAINAGE AREA ALTERNATIVE 1
BASSWOOD AVENUE STORM DRAINS (CPE4)**

BASSWOOD AVENUE STORM DRAIN FACILITY (CPE 4)							
Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Basswood Avenue Storm Drain (CPE 4 Extension)							
D-0067-A	Old Ranch Golf Course	Lampson Avenue (west)	31	30" RCP	0.0005	30	9'(W) x 2'-9"(H) RCB
	Lampson Avenue (west)	Lampson Avenue (east)	95	2-21" RCP		30	9'(W) x 2'-9"(H) RCB
	Lampson Avenue (east)	Aster Street	430	3'4"(W)x 1'9"(H) RCB		30	9'(W) x 2'-9"(H) RCB
Aster Street Storm Drain (CPE 4 Extension)							
New	Basswood Avenue	Almond Avenue	370	-----	0.0005	27	7'(W) x 2'-9"(H) RCB
Almond Avenue Storm Drain (CPE 4 Extension)							
New	Aster Street	West of Camelia Street	350	-----	0.0005	26	6'-6"(W) x 2'-9"(H) RCB
	West of Camelia Street	Carnation Circle	330	-----		17	6'(W) x 2'-9"(H) RCB
	Carnation Circle	Clover Circle	270	-----		12	4'(W) x 2'-9"(H) RCB

9-2.2.2 College Park East Drainage Area Alternative 2

This alternative includes the construction of a pump station facility and its tributary storm drain system, which will provide a 25-year storm protection for this drainage area. Currently, the pump station facility site is proposed at the existing Bluebell Park, which is located at Aster Street and Almond Avenue. The recommended tributary drainage system will convey the runoff from the College Park East Drainage Area (241 acres) southwesterly to the proposed pump station. The 25-year storm peak runoff at the proposed site was calculated as 293 cfs. With two 150 cfs pumps, two 54-inch diameter discharge pipes will be needed. The proposed facility will pump the runoff westerly on Basswood Street directly into the Old Ranch Golf Course detention basin. The recommended improvements for this alternative are described below:

Ironwood Avenue Storm Drain (CPE6)

The recommendations include extending a 90-inch RCP storm drain or an equivalent RCB from the proposed pump station, northeasterly on Aster Street to Birchwood Avenue. This system will continue north as an 84-inch RCP, 72-inch RCP, and 60-inch RCP to the intersection of Ironwood Avenue and Guava Avenue. The pump station will pump the runoff westerly on Basswood Street, across Lampson Avenue into the detention basin in the Old Town Golf Course. The recommended improvements are included in Table 9-18 and shown on Figure 9-3.

**TABLE 9-18
RECOMMENDED IMPROVEMENTS
COLLEGE PARK EAST DRAINAGE AREA ALTERNATIVE 2
ASTER STREET, CANDLEBERRY AVENUE, AND IRONWOOD AVENUE STORM DRAINS (CPE6)
IRONWOOD AVENUE STORM DRAIN FACILITY (CPE 6)**

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Aster Street Storm Drain (CPE 6)							
New	Proposed Pump Station	Birchwood Avenue	1,000	-----	0.0015	258	90" RCP
	Birchwood Avenue	Candleberry Avenue	200			224	84" RCP
Candleberry Avenue Storm Drain (CPE 6)							
New	Aster Street	Ironwood Avenue	200	-----	0.0015	164	72" RCP
Ironwood Avenue Storm Drain (CPE 6)							
New	Candleberry Avenue	Elder Avenue	500	-----	0.0015	164	72" RCP
	Elder Avenue	Guava Avenue	500			77-95	60" RCP
Basswood Street Forcemain (CPE 6)							
New	Old Ranch Golf Course	Aster Street	700	-----	0.0015	164	2-54" RCP

Guava Avenue Storm Drain (CPE1)

The existing 36-inch RCP extends from the golf course easterly across Lampson Avenue, and through a 10-foot wide storm drain easement to the intersection of Ironwood Avenue and Guava Avenue. The street intersection is a sump location where ponding occurs. The recommended improvements will collect the surface runoff and convey it westerly directly to Storm Drain CPE6 near the sump location. CPE6 will convey the flow southerly to the proposed pump station. The recommended improvements are included in Table 9-19 and shown on Figure 9-3.

**TABLE 9-19
RECOMMENDED IMPROVEMENTS
COLLEGE PARK EAST DRAINAGE AREA ALTERNATIVE 2
GUAVA AVENUE, HAZELWOOD AVENUE, AND FIR AVENUE STORM DRAINS (CPE1)
GUAVA AVENUE STORM DRAIN FACILITY (CPE 1)**

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Guava Avenue Storm Drain (CE 1)							
New	Ironwood Avenue R/W (N)	Hazelnut Avenue	370	-----	0.0015	64	54" RCP
Hazelnut Avenue Storm Drain (CPE 1)							
New	Guava Avenue	Heather Street	1,290	-----	0.0015	64 to 42	54" RCP
	Heather Street	Iris Street	270		0.0015	42	48" RCP
	Iris Street	East of Iris Street	340		29	42" RCP	
	East of Iris Street	Rose Street	1,010		26 to 24	42" RCP	
Rose Street Storm Drain (CPE 1)							
New	Hazelnut Avenue	Fir Avenue	340	-----	0.0015	17	36" RCP
Fir Avenue Storm Drain (CPE 1)							
New	Rose Street	Sunflower Street	250	-----	0.0015	13	30" RCP
Sunflower Street Storm Drain (CPE 1)							
New	Fir Avenue	Sunflower Street Toward North	100	-----	0.0015	13	30" RCP

FIR AVENUE STORM DRAIN FACILITY (CPE 1-1)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
New	Ironwood Avenue	West of Daisy Circle	900	-----	0.0015	22 to 17	36" RCP
	West of Daisy Circle	Daisy Circle	160			13	30" RCP

Elder Avenue Storm Drain (CPE2)

Like the Guava Avenue Storm Drain, the Elder Avenue Storm Drain extends from the Old Ranch Golf Course easterly across Lampson Avenue, and through a 10-foot wide easement to the intersection of Elder Avenue and Ironwood Avenue. The sump at this intersection also currently experiences ponding. The following recommendations include building a tributary drainage system which will convey the surface runoff westerly to Storm Drain CPE 6 near the current sump location. Storm Drain CPE6 will then convey the flow from the sump, southerly to the proposed pump station. The recommended improvements are included in Table 9-20 and shown on Figure 9-3.

**TABLE 9-20
RECOMMENDED IMPROVEMENTS
COLLEGE PARK EAST DRAINAGE AREA ALTERNATIVE 2
ELDER AVENUE STORM DRAIN (CPE2)
ELDER AVENUE STORM DRAIN FACILITY (CPE 2)**

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Elder Avenue Storm Drain (CPE 2)							
New	Ironwood Avenue R/W (N)	Fuchsia Street	1,550	-----	0.0015	57 to 51	54" RCP
	Fuchsia Street	Heather Street	500	-----	0.0015	40	48" RCP
	Heather Street	West of Oleander Street	750	-----	0.0015	34 to 31	48" RCP
	West of Oleander Street	Oleander Street	350	-----	0.0015	31 to 29	42" RCP
Oleander Street Storm Drain (CPE 2)							
New	Elder Avenue	Dogwood Avenue	250	-----	0.0015	20	36" RCP
Dogwood Avenue Storm Drain (CPE 2)							
New	Oleander Street	Primrose Street	250	-----	0.0015	20	36" RCP

Candleberry Avenue Storm Drain (CPE 3)

Parallel storm drains were constructed on Candleberry Avenue between the golf course and Aster Street as described in Sub-section 4-3. Due to the high water level in the golf course, as well as the sump location at the intersection of Aster Street and Candleberry Avenue, the existing storm drains are not capable of conveying the peak runoff during the 25-year storm event. The following improvements recommend building a drainage system which conveys the runoff westerly toward the sump location, where it is intercepted by Storm Drain CPE6 which will convey the runoff southerly to the proposed pump station. The recommended improvements are included in Table 9-21 and shown on Figure 9-3.

**TABLE 9-21
RECOMMENDED IMPROVEMENTS
COLLEGE PARK EAST DRAINAGE AREA ALTERNATIVE 2
CANDLEBERRY AVENUE STORM DRAINS (CPE3)**

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Candleberry Avenue Storm Drain Facility (CPE 3-1)							
Candleberry Avenue Storm Drain - Design Phase per Project No. 50204 (CPE 3-1)							
Project No. 50204	Lampson Avenue, North R/W	Aster Street Junction Structure	392	-----	0.0015	88	2- 5'(W)x 3'(H) RCB*
	Aster Street Junction Structure		17			88	7'(W)x3'(H) RCB*
Candleberry Avenue Storm Drain Conceptual Design (CPE 3-5)							
New	Aster Street Junction Structure	Fuchsia Street	1,800	-----	0.0015	61 to 56	54" RCP
Fuchsia Street Storm Drain Conceptual Design (CPE 3-5)							
New	Candleberry Avenue	Birchwood Avenue	200	-----	0.0015	34	42" RCP
Birchwood Avenue Storm Drain Conceptual Design (CPE 3-5)							
New	Fuchsia Street	East of Fuchsia Street	500	-----	0.0015	34	42" RCP
	East of Fuchsia Street	West of Marigold Street	500			30	42" RCP
	West of Marigold Street	Oleander Street	650			27	42" RCP

* Recommendations Budgeted for 2008

ASTER STREET STORM DRAIN FACILITY (CPE 3-4)

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Aster Street Connector Pipes per Project No. 50204							
Project No. 50204	@ Main Line Sta. 20+74	CB on S. Curb Face	15	-----	0.0256	39	Double 27" RCP*
	@ Main Line Sta. 21+35	CB on S. Curb Face	15	-----	0.03	21	Double 24" RCP*
Aster Street Design Phase per Project No. 50204 (CPE 3-4)							
Project No. 50204	Aster Street Junction Structure	East of Birchwood Avenue	142	-----	0.0021	37	7'(W)x3'(H) RCB*
Birchwood Avenue Storm Drain Conceptual Design (CPE 3-4)							
New	Aster Street	Bluebell Street	200	-----	0.0015	37	42" RCP
	Bluebell Street	Daisy Circle	1,450	-----	0.0015	37 to 23	42" RCP
Daisy Circle Storm Drain Conceptual Design (CE 3-4)							
New	Birchwood Avenue	Almond Avenue	400	-----	0.0015	19	36" RCP
Almond Avenue Storm Drain Conceptual Design (CPE 3-4)							
New	Daisy Circle	East of Goldenrod Circle	600	-----	0.0015	15 to 12	30" RCP

* Recommendations Budgeted for 2008

Basswood Street Storm Drain (CPE 4)

The current drainage facility along Basswood Street, between Aster Street and the Old Ranch Golf Course, is not capable of conveying the 25-year storm runoff. The following improvements recommend conveying the flow northwesterly to the proposed pump station, where it is pumped to the Old Ranch Golf Course. The recommended improvements are included in Table 9-22 and shown on Figure 9-3.

**TABLE 9-22
RECOMMENDED IMPROVEMENTS
COLLEGE PARK EAST DRAINAGE AREA ALTERNATIVE 2
BASSWOOD AVENUE STORM DRAINS (CPE4)
BASSWOOD AVENUE STORM DRAIN FACILITY (CPE 4)**

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Aster Street Storm Drain (CPE 4)							
New	Proposed Pump Station	Almond Avenue	370	-----	0.0015	27	42" RCP
Almond Avenue Storm Drain (CPE 4)							
New	Aster Street	West of Camelia Street	350	-----	0.0015	26	42" RCP
	West of Camelia Street	Carnation Circle	330	-----		17	36" RCP
	Carnation Circle	Clover Circle	270	-----		12	30" RCP

Lampson Avenue Storm Drain (CPE5)

Currently, the south side of Lampson Avenue has a history of flooding problems. A catch basin and a connector storm drain should be constructed from Lampson Avenue to the Caltrans open channel to the south. The recommendations are listed in Table 9-123 and shown on Figure 9-2.

**TABLE 9-23
RECOMMENDED IMPROVEMENTS
COLLEGE PARK EAST DRAINAGE AREA
LAMPSON AVENUE STORM DRAINS (CPE5)
LAMPSON AVENUE STORM DRAIN FACILITY (CPE5)**

Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Lampson Avenue (CPE5)							
-----	Cal Trans Open Channel	Lampson Avenue	75	-----	-----	-----	24" RCP

9-3 NORTHWEST REGION DRAINAGE AREAS

9-3.1 College Park West Drainage Area

The College Park West Community has two sump locations. The northerly sump is located at the intersection of Harvard Lane and College Park Drive. The southerly sump is located at the intersection of Stanford Lane and College Park Drive. Even though the existing drainage systems are capable of conveying the 25-year storm runoff, the existing catch basins are too small to sufficiently intercept the street runoff. Therefore, street inundation problems may be experienced during the design storm. The existing systems should be extended upstream in order to minimize the street flooding. The recommendations are listed in Table 9-24 and shown on Figure 9-4.

**TABLE 9-24
RECOMMENDED IMPROVEMENTS
COLLEGE PARK WEST DRAINAGE AREA
HARVARD LANE, STANFORD LANE, COLLEGE PARK DRIVE, AND YALE LANE STORM DRAINS
(CPW1-CPW2)**

COLLEGE PARK WEST STORM DRAIN FACILITY (CPW 1 & CPW2)							
Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Harvard Lane Storm Drain (CPW 1-1 Extension)							
R-0562-A	College Park Drive	Dartmouth Cir	250	-----	0.001	16	Extend 18" RCP
Stanford Lane Storm Drain (CPW 2 Extension)							
-----	College Park Drive	Extend in Stanford Lane	500	-----	0.001	20	30" RCP
College Park Drive Storm Drain (CPW 2-2 Extension)							
-----	Stanford Lane	Yale Lane	400	-----	0.001	25	36" RCP
-----	Yale Lane	North of Yale Lane	400	-----	0.001	12	24" RCP
Yale Lane Storm Drain (CPW 2-3 Extension)							
-----	College Park Drive	Extend on Yale Lane	250	-----	0.001	12	24" RCP
Harvard Lane Storm Drain (CPW 2-4 Extension)							
-----	College Park Drive	Extend in Harvard Lane	600	-----	0.001	15	24" RCP

9-3.2 LOS ALAMITOS DRAINAGE AREA

This drainage area is primarily within the City of Los Alamitos boundary; however, the drainage facilities are owned by the City and require improvements to prevent flooding. The existing facilities convey the runoff along Seal Beach Boulevard from Kempton Drive to Bixby Storm Channel at Lampson Avenue.

Los Alamitos Drainage Facility (LA1)

The existing dual storm drain system of 54-inch to 39-inch RCP, and 33-inch RCP is not capable of conveying the 25-year storm peak runoff of 152 cfs. Currently, there are only two (2) drainage inlets located on the west side of Seal Beach Boulevard near Lampson Avenue to intercept the runoff. It is recommended to construct additional catch basins further upstream to minimize street flooding.

The recommendations are to replace the entire 33-inch RCP with a 60-inch RCP and replace the upstream 39-inch RCP reach with 54-inch RCP on Seal Beach Boulevard between Kempton Drive and Rossmoor Center Way. The combined system will have the required capacity to convey the 25-year storm runoff. Table 9-25 describes the recommended options. Figure 9-4 illustrates the proposed system.

**TABLE 9-25
RECOMMENDED IMPROVEMENTS
LOS ALAMITOS DRAINAGE AREA
SEAL BEACH BOULEVARD STORM DRAIN (LA1)**

LOS ALAMITOS DRAINAGE SYSTEM							
Original Plan ID	Downstream Location	Upstream Location	Length (ft)	Existing Facility	Slope	25-Year Storm Flowrate (cfs)	Recommended Improvements
Seal Beach Boulevard (LA1)							
D-0227A	Bixby Storm Channel	Lampson Avenue	150	6'(W)x6'(H) RCB	-----	152	Existing 6'(W)x6'(H) RCB
	Lampson Avenue	South of Rossmoor Center Way	2,308	54" RCP	0.001	143	Existing 54" RCP
	South of Rossmoor Center Way	Rossmoor Center Way	254	39" RCP	0.001	143	60" RCP
-----	Bixby Storm Channel	Rossmoor Center Way	2,500	33" RCP	-----	143	60" RCP

9-4 COMMUNITIES OUTSIDE THE STUDY AREA

9-4.1 The Leisure World Retirement Community

The drainage facilities in this community are privately owned and managed by the homeowners association. Therefore, this system has not been analyzed, and no recommendations are provided.

9-4.2 Boeing Integrated Defense Systems

Boeing Integrated Defense Systems Community is a privately owned property with private storm drains. To accommodate OCFCD policy, the storm runoff is conveyed to on-site water quality control basin(s), which restricts the discharge to the OCFCD Facility; Los Alamitos Retarding Basin.

9-4.3 Hellman Ranch

Hellman Ranch Community is a privately owned property. The area drains through private drains to an on-site water quality control basin, which restricts the discharge to the OCFCD Facility; Los Alamitos Retarding Basin.

9-4.4 Seal Beach National Wildlife Refuge

Since this area is governed by the U.S. Navy and the U.S. Fish and Wildlife Service, no City drainage system is recommended.

9-4.5 Sunset Aquatic Park

The Sunset Aquatic Park is owned by the County of Orange. Therefore, this area was not studied, and no drainage facility recommendations are made.

9-4.6 U.S. Naval Weapons Station

Since this area is governed by the U.S. Navy, no City drainage system is recommended.

9-4.7 Surfside

This private residential area is between Pacific Coast Highway and the Pacific Ocean. It has not been studied as part of this Master Plan, and no recommendations are provided.

9-5 INUNDATION HISTORY AND RECOMMENDATION

The City has recognized several inundation areas throughout its boundary. The locations with a history of flooding are illustrated on Figure 9-5. The majority of the flooding areas are in the Old Town and Bridgeport Communities. Once the City has completed the improvements that are proposed in this document, the inundation problems at these documented areas should be resolved or minimized. The location of the inundation areas and the recommended solutions are shown in Table 9-26.

**TABLE 9-26
IMPROVEMENTS TO CURRENT INUNDATION AREAS**

	Inundation Area	Drainage Area	Recommended Improvements
1	Candleberry Avenue and Aster Street	College Park East	CE3
2	Lampson Avenue (South Side) near Golf Course Driving Range	College Park East	CE5
3	First Street (East Side), near Welcome Lane	West End Pump Station	WE1-2
4	First Street and Marina Drive	San Gabriel River	SG2, SB2-1
5	Marina Drive and Caravel Way (East Side)	San Gabriel River	SG2, SB2-1
6	Marina Drive and 7th Street	West End Pump Station	WE5
7	Electric Avenue (North Side, and 7th Street)	West End Pump Station	WE4
8	Main Street (West Side), 300 Block	West End Pump Station	WE4
9	17th Street and Red Car Right-of-Way	Seal Beach Pump Station South	SB1-2
10	Electric Avenue and Seal Way to Boardwalk	Seal Beach Pump Station South	SB1, SB2, SB3

9-6 AD HOC STREET AND STORM DRAIN COMMITTEE ASSESSMENT REPORT

On October 17, 2004, the City experience major flooding, which led to the formation of the Ad Hoc Street and Storm Drain Committee. The committee reviewed numerous storm drain and street improvement reports to develop recommend improvement projects in 2005. It also analyzed numerous financing options to fund improvements. The study report recommended six (6) high and eleven (11) moderate priority improvements as detailed in Table 9-27. Most of these projects are included in the Master Plan recommended improvements, and some of the 17 projects are not included in the Master Plan CIP because of revised storm drain alignments.



Inundation Areas

1. Candleberry Avenue and Aster Street
2. Lampson Avenue (South Side), near Golf Course Driving Range
3. First Street (East Side), near Welcome Lane
4. First Street and Marina Drive
5. Marina Drive and Caravel Way (East Side)
6. Marina Drive and 7th Street
7. Electric Avenue (North Side) and 7th Street
8. Main Street (West Side) 300 Block
9. 17th Street and Red Car Right-of-Way
10. Electric Avenue and Seal Way to Boardwalk



**TABLE 9-27
AD HOC STREET AND STORM DRAIN COMMITTEE IMPROVEMENT PRIORITIES**

Ad Hoc Street and Storm Drain Committee		2008 Seal Beach Master Plan of Drainage		
Priority	Recommendations	Equivalent Improvement ID	Priority	Recommendations
High	Enhance local drainage for 300 block of Main Street	WE4	High	Install WE4 which conveys storm runoff from Main Street and Electric Avenue to existing facility WE1 at Marina Drive and Electric Avenue
High	Enlarge the storm drain connecting Basswood Avenue to the Old Ranch Golf Course	CPE 4 (Alt #1), CPE6 (Alt #2)	High	Alternative #1 - Enlarge CPE4 along Basswood Avenue from Aster Street to the Old Ranch Golf Course. Alternative #2 - Construct new pump station, which pumps entire College Park East tributary runoff through Basswood Avenue to the Old Ranch Golf Course.
High	Install a new storm drain and catch basins on Candleberry Avenue from Aster Street to Fuchsia Street	CPE3-1 (Alt #1), CPE3-5 (Alt #2)	Medium	Alternative #1 and #2 - Construct storm drain on Candleberry Avenue from Aster Street to Fuchsia Street.
High	Increase the size of the storm drain under Electric Avenue from 14th Street to Seal Beach Boulevard	SB4	High	Install SB4 under Electric Avenue from 14th Street to Seal Beach Blvd. Project Plan No PR-50221.
High	Increase the size of the storm drain under Marina Dr. from 2nd Street to the San Gabriel River	SG2	High	Install pump facility at Marina Park to San Gabriel River
High	Enlarge storm drains that run under Electric Avenue, connecting to terminal branch at western end of Marina Drive	WE1	High	Enlarge existing facility WE1, along Electric Avenue between Corsair Way and Marina Drive
Moderate	Install a storm drain and catch basin on Fuchsia Street and Elder Avenue from Fuchsia Street to Heather Street.	CPE2	Medium to Low	Install CPE2 on Elder Avenue from Fuchsia Street to Oleander Street.
Moderate	Install a storm drain and catch basins on Elder Avenue from Heather Street to Oleander Street			
Moderate	Install a storm drain and catch basins on Birchwood Avenue.	CPE3-1	Medium to Low	Install CPE 3-1 to intercept runoff on Birchwood Avenue
Moderate	Install a new storm drain and catch basins on Heather Avenue.	Handled by 2008 storm drain alignment	Medium to Low	Install CPE1 on Hazelnut Avenue to intercept runoff from upstream Heather Avenue.
Moderate	Install a new storm drain and catch basins on Hazelnut Avenue and Heather Avenue.	CPE1	Medium to Low	Install CPE1 on Hazelnut Avenue
Moderate	Install new catch basins at 10th Street, 11th Street, and 12th Street intersections.	SB4	Low	Extend storm drain from end of high priority project at Electric Avenue and 14th Street to 10th Street and Central Avenue. The improvements along Electric Avenue will reduce the inundation problems stated in the Ad Hoc Committee report.
Moderate	Install a new storm drain under Bolsa Avenue from Bayside Drive to Balboa Drive.	SB5	Medium to Low	Install SB5 along Bolsa Avenue between Balboa Drive and Bayside Drive
Moderate	Enlarge the storm drain on First Street north of Marina Drive.	WE1-4	Low	Install WE1-4 to intercept the runoff on the south side of 1st Street
Moderate	Enlarge the storm drain under Galleon Way.	WE6	Medium	Install WE 6 to intercept excess flow normally tributary to Storm Drain WE3 and Storm Drain WE1.
Moderate	Enlarge the storm drain on the northern portion of Coastline Drive.	SB3-1	Low	Extend Storm Drain SB3-1 from County Facility C00P02 to Coastline Drive and Silvershoals Avenue.
Moderate	Install a storm drain line that parallels the existing line to the West End Pump Station	WE1-3	Medium	Construct new pump station on Oakwood Apartment Parking lot. Extend Storm Drain WE1-3 from new pump station to Corsair Way and Electric Avenue.