SECTION 1

EXECUTIVE SUMMARY

1-1 INTRODUCTION

1-1.1 Background

The City of Seal Beach was incorporated in 1917 and has been in operation under its own charter since 1964. It covers an area of 11.15 square miles in the coast of northwestern corner of Orange County.

The City's drainage system consists of City owned facilities as well as regional facilities owned and operated by the Orange County Flood Control District and Los Angeles County Flood Control District. The existing system includes one City owned (West End) and one Orange County Flood Control District (OCFCD) owned (Seal Beach) pump station.

1-1.2 Past Studies

Hydrologic studies, project reports, preliminary design reports, and construction documents have been prepared by the Orange County Flood Control District, the Los Angeles County Department of Public Works, and the U.S. Army Corps of Engineers for the regional facilities serving the City of Seal Beach territories.

The City's last Master Plan of Drainage was completed in 1999. Other hydrologic studies, preliminary design reports and contract documents were prepared for the planning and construction of the City's drainage facilities, including the interim improvements to the West End Pump Station.

The Ad Hoc Street and Storm Drain Committee (Ad Hoc Committee) was formed after the City experienced major flooding on October 17, 2004. In 2005, the Ad Hoc Committee completed the Street and Storm Drain Assessment Report. This report recommended six (6) high and eleven (11) moderate storm drain improvement projects and possible measures to fund these projects.

1-1.3 Federal Emergency Management Agency (FEMA) Studies

The Federal Emergency Management Agency conducted hydrologic and hydraulic studies for developing Flood Insurance Rate Maps (FIRMs). The Flood Insurance Rate Maps for Orange County and the incorporated areas were recently updated, and published on February 18, 2004. According to FEMA studies, the following four areas within the City boundaries are subject to inundation during a 100-year flood.

- Old Town area, generally bounded by 12th Street to the west, Landing Avenue to the North, Seal Beach Boulevard to the east, and Ocean Avenue to the south
- Along Seal Way between 12th Street and east of Dolphin Avenue
- Gold Coast community between 2nd Street and 5th Street.
- Old Ranch Golf Course, which functions as a retarding basin for the tributary area to the north.

1-1.4 Objectives and Scope of Work

The objective of this Master Plan of Drainage is to evaluate the City of Seal Beach's (City) storm drain system and to provide a framework for undertaking the construction of new and replacement facilities in an efficient and cost effective manner. As a planning document, it is general in nature and is predicated upon the best information available at this time. Detailed hydrologic and hydraulic studies will need to be conducted to develop the final design data for the improvements recommended by this Master Plan Update

1-2 STUDY AREA

1-2.1 Location

The City of Seal Beach is a residential community located along the Southern California coastline. The City covers an area of 11.15 square miles in northwest Orange County, and is bounded by the City of Los Alamitos and unincorporated Rossmoor community to the north; Garden Grove, Westminster, and Huntington Beach to the east; the City of Huntington Beach and the Pacific Ocean to the south; and the City of Long Beach to the west.

1-2.2 Topography

The drainage area is relatively flat, except in the Marina Hill area. The highest ground elevation is approximately 57 feet above mean sea level (amsl) near the intersection of Catalina Avenue and Sea Breeze Drive. The lowest ground elevation is sea level where the City borders the Pacific Ocean.

1-2.3 Soils

The City resides on multiple soil types. The predominant soil type within the study area is silty-loam soils which impede downward movement of water. Impervious clay soils can be found south of Westminster Avenue and near Marina Hill, in the U.S. Naval Weapons Station, and in the Wildlife Reserve. Well drained sandy-loam soils are mainly found in the Old Town, Bridgeport, and College Park East communities. Small patches of well-drained sand or gravel soils are located along Pacific Coast Highway, east of Seal Beach Boulevard.

The predominant geologic features of the study area, from north to south, are the Whittier Fault, Norwalk Fault, Los Alamitos Fault, and Newport-Inglewood Fault. The Newport-Inglewood Fault runs through the City, and is parallel to the coastline.

1-2.4 Climate

The climate in the area is typical of coastal Southern California, with generally mild temperatures, virtually no days below freezing, and approximately 340 days of sunshine per year. The average annual rainfall in the City is approximately 10 inches. Most of the rainfall occurs between the months of November and March.

1-2.5 Land Use

Excluding the U.S. Naval Weapons Station, the City of Seal Beach is primarily a residential community with supporting commercial land uses. The City is mostly developed with a mix of residential, commercial, industrial, and public land uses.

1-2.6 Population

Since its incorporation in 1915, the City of Seal Beach has grown from a population of 250 to nearly 25,000. The City experienced its largest population increase between 1960 and 1970 when the resulting population reached 24,441. The California State Department of Finance has estimated that the current (May 2007) population is 25,952.

1-3 EXISTING DRAINAGE SYSTEM

The existing drainage facilities serving the City of Seal Beach include City facilities as well as Los Angeles County and Orange County Flood Control District facilities.

1-3.1 U.S. Army Corps of Engineers/Los Angeles County Flood Control District Facilities

The **San Gabriel River** drains a watershed of 640 square miles, and extends 58 miles from its headwaters in the Angeles National Forest to the Pacific Ocean between Seal Beach and Long Beach. It is under the jurisdiction of U.S. Army Corps of Engineers, and with the exception of Santa Fe Dam and Whittier Narrows Dam, it is maintained by the Los Angeles County Flood Control District (LACFCD). The City areas that drain into the San Gabriel River are the Gum Grove Park, southerly portion of Heron Pointe in the Hellman Ranch Area, as well as portions of the Bridgeport community, and the westerly portion of Old Town and Marina Hill communities. The San Gabriel River is a trapezoidal open channel with earthen bottom and rip-rap lined side slopes through Seal Beach. The Los Angeles County Drainage Area (LACDA) Feasibility Study conducted by the US Army Corps of Engineers shows that the San Gabriel River has a capacity of 55,600 cfs with 3 feet of freeboard below the levies, and the 100-year peak discharge is 55,000 cfs.

1-3.2 Orange County Flood Control District Facilities

The major flood control facilities under the jurisdiction of Orange County Flood Control District that serve the City's westerly area are the **Los Alamitos Channel** (OCFCD Facility No. C01), the **Los Alamitos Retarding Basin** (C01B01), the **Los Alamitos Pump Station** (C01PS01), and its tributary channels. The tributary channels that serve Seal Beach are the **Kempton Storm Channel** (C01S01), **Montecito Storm Channel** (C01S03), **Bixby Storm Channel** (C01P04), and **Federal Storm Channel** (C01S06).

Bolsa Chica Channel, (OCFCD Facility No.C02), serves the easterly portions of College Park East.

The OCFCD's **Seal Beach Storm Drain** (Facility C00P02) extends south on Balboa Avenue, east on Pacific Coast Highway and south on Seal Beach Boulevard between Bolsa Avenue and the Seal Beach Pump Station, serving portions of the Marina Hill and Old Town communities. The Seal Beach Pump Station (C00PS1) is located at the intersection of Seal Beach Boulevard and Electric Avenue. It serves the south easterly portion of the City.

1-3.3 The City of Seal Beach Facilities

A total of eleven (11) study drainage areas are delineated based upon their outflow locations. The City's storm drain facilities are identified by these drainage areas as shown on Figure 4-1. These areas are displayed on Figures 4-2 through 4-5.

1-3.4 Private Facilities

The Old Ranch Golf Course, which is privately owned, acts as a retarding basin for the runoff from the 1,444 acres of land within the Joint Forces Training Center, most of College Park East, Old Ranch Towne Center, and Centex Homes.

1-4 CRITERIA

The criteria used in formulating the recommended improvements include hydrologic criteria to develop design discharges, levels of flood protection to be provided, hydraulic analysis, street capacity, drainage system design, and guidelines for water surface elevations to be used as control elevations in hydraulic analyses.

1-4.1 Hydrology Criteria

The hydrology study criteria are in accordance with the 1986 Orange County Hydrology Manual, 1996 Local Drainage Manual, and the Orange County issued Hydrology Manual Addenda.

1-4.2 Level of Flood Protection

The level of flood protection to be provided within the City boundary shall be in accordance with the Orange County Local Drainage Design Criteria, illustrated on Figure 5-1.

The goal is to maintain the pad elevation of all habitable structures at a minimum of 1 foot above the 100-year flood level. For arterial highways, one lane in each direction must be free from inundation during a 10 year storm. For sump conditions, one lane in each direction must be free from inundation during a 25-year storm.

Sump conditions occur in areas where water will pond and flood the width of the street right-of way before it can drain by gravity.

Drainage facilities serving sump areas and those that are tributary to stormwater pump stations shall be designed to provide 25-year storm protection level.

1.4-3 Hydraulic Analysis Criteria

The Water Surface and Pressure Gradient (WSPG) computer program (F0515P) developed by the Los Angeles County Flood Control District (LACFCD) was utilized to estimate the hydraulic grade line (HGL) in the drainage system.

1.4-4 Street Capacity Criteria

For local streets, when the water level exceeds the top of curb during the design storm event, new storm drains shall be installed. The runoff resulting from the design storm event will be carried by the new system, and the water level at street surface will be lowered to below the top of curb. On arterial streets, one (1) travel lane in each direction shall be free from inundation during the design storm event; otherwise, a storm drain shall be installed.

1.4-5 Proposed Storm Drain Criteria

For the proposed storm drain facilities, the following criteria are applied:

1. Storm drain mainlines shall be designed to convey the design storm peak runoff, with the HGL a minimum of one (1) foot below the street gutter grade. The design storm peak runoff may be conveyed in a combination of the storm drain and the street as long as the water level does not exceed the top of curb.

2. Connector pipes shall be sized to provide a minimum of 6-inch freeboard at drainage inlet, such as catch basin or grate inlet.

   There are exceptions to the previous criteria. Several locations throughout the City cannot meet the criteria, due to one or more of the following restrictions:

   - Limited storm drain easement
   - Shallow ground cover over the pipe
   - Very flat slopes in the system
   - Fixed high invert elevations and/or control water surface elevations at existing downstream facilities
   - Existing utility crossings
   - Existing storm drains are underneath buildings

   The areas east of the Old Ranch Golf Course in the College Park East community will not satisfy the flood protection criteria along Guava Avenue, Elder Avenue, Candleberry Avenue, and Basswood Street with storm drain improvements alone (Alternative No. 1). However, this area will comply with the criteria if the flow is diverted to a new storm water pump station (Alternative No. 2). The recommended improvements along Electric Avenue between Corsair Way and Main Street will not provide the full flood protection in accordance with the criteria.

   Although flooding during the design storm event cannot be prevented at these locations, improvements will still be recommended to shorten the duration of flooding and also reduce the flooding areas.

3. The slope of the main line shall not be less than 0.001 (ft/ft).

4. The storm drains shall be of reinforced concrete pipe (RCP) or box (RCB).

5. The connector pipes between catch basins and mainlines shall be a minimum of 24-inch in diameter or the equivalent box size.

1-4.6 Downstream Water Surface Control Criteria

The City's drainage facilities discharge to the Orange County Flood Control District, and Los Angeles County Flood Control District Facilities, the Anaheim Bay, private facilities, and two pump stations. The downstream water surface control elevation or HGL utilized in hydraulic studies will be based on the drainage design plans or project reports prepared for these facilities.

1-5 HYDROLOGY STUDY

The hydrology studies conducted in this master plan report are prepared in accordance with the 1986 Orange County Hydrology Manual and its subsequent addenda. The RMH OC Version 6.6e computer program is used for the Rational Method hydrology studies, and the LAPRE-1 and HEC-1 programs are used for hydrologic analyses with the Unit Hydrograph Method. The hydrologic calculations were conducted with the 10-year and 25-year frequency design storms.

1-5.1 Hydrologic Study Results

The results of the Rational Method hydrologic studies are shown in Appendix A. The corresponding hydrology maps are shown on Figure 6-2 through Figure 6-4.

1-6 HYDRAULIC ANALYSIS

The mainline drainage facilities are analyzed utilizing the Water Surface and Pressure Gradient (WSPG) computer program. For the most part, the existing drainage system is currently not capable of conveying the 25-year storm design discharge. The recommended improvements and new storm drain facilities were formulated based on the ultimate WSPG analysis. The WSPG program calculates either the water surface elevations in storm drain systems where free water surface exist, or the hydraulic grade line (HGL) elevations where closed storm drain facilities flow full.

1-7 PUMP STATIONS

The City of Seal Beach is served by one local and one regional storm water pump station.

1-7.1 The West End Pump Station

The West End Pump Station, owned and operated by the City, is located east of the San Gabriel River, between the Seal Beach Mobile Home Park and the Oakwood Apartment complex. Its tributary area covers approximately 173 acres of primarily residential and partially commercial land uses in Marina Hill North, Old Town, and Bridgeport communities. The peak runoff from the 25-year design storm is 296 cfs.

The original pump station was constructed in 1955 with a total capacity of 111 cfs. Interim improvements to the West End Pump Station were completed in 2007, which increased the pump station capacity to approximately 200 cfs.

The total pumping capacity will need to be increased to meet the established flood protection criteria. The additional capacity should be provided in a parallel pump station at the property City acquired adjacent to the existing pump station. The capacity of the parallel pump station should be no less than the capacity of the existing pump station (200 cfs) so that when either pump station is taken out of service in the future, the existing level of protection is not reduced. The cost to construct a pump station which will provide the 25-year storm level of protection will be lower than the cost to construct the recommended pump station; however, the difference in cost is not proportional to the discharge capacity of the pumps. For example a 200 cfs pump station will not have a construction cost that is twice as large as a 100 cfs pump station. In fact, the estimated cost of the smaller facility is about 90 percent of the larger pump station. The benefit of providing the existing level of flood protection at all times justifies constructing the larger pump station.

1-7.2 Seal Beach Pump Station

Seal Beach Pump Station (C00PS1), located on the northeast corner of Seal Beach Boulevard and Electric Avenue is owned and operated by the Orange County Flood Control District. This facility was constructed in 1971 to convey 255 cfs, which was the peak flow from a 10-year storm. One Orange County Flood Control District Facility, the Seal Beach Storm Drain (C00S02), and one City of Seal Beach storm drain facility convey the entire runoff to the pump station.

The Seal Beach Pump Station tributary area covers 249 acres of primarily residential land use. The tributary area is divided into the Seal Beach Pump Station Drainage Area North and Seal Beach Pump Station Drainage Area South. Seal Beach Pump Station Drainage Area North includes 143 acres in Marina Hill North, Marina Hill South, and along Seal Beach Boulevard south of Pacific Coast Highway. Seal Beach Pump Station Drainage Area South includes 106 acres in the Old Town area, generally south of Pacific Coast Highway east of Main Street, north of Ocean Avenue, and east of Seal Beach Boulevard.

The OCFCD analyzed the pump station in 1996 following the flooding experienced during the January 4, 1995 storm, which was greater than a 100-year storm. A detailed hydrology study was not conducted. The 25-year discharge was estimated as 310 cfs based upon the hydrology study conducted for C00S01, and City of Seal Beach provided design flow of 143 cfs for its drainage facilities. The pump station was upgraded in 1997 with three 57,000 gpm (127 cfs) pumps, which increased its capacity to 381 cfs. The hydrologic calculations conducted with the currently available information result in a design flow of 403 cfs. This is slightly higher than the existing pump station capacity of 381 cfs.

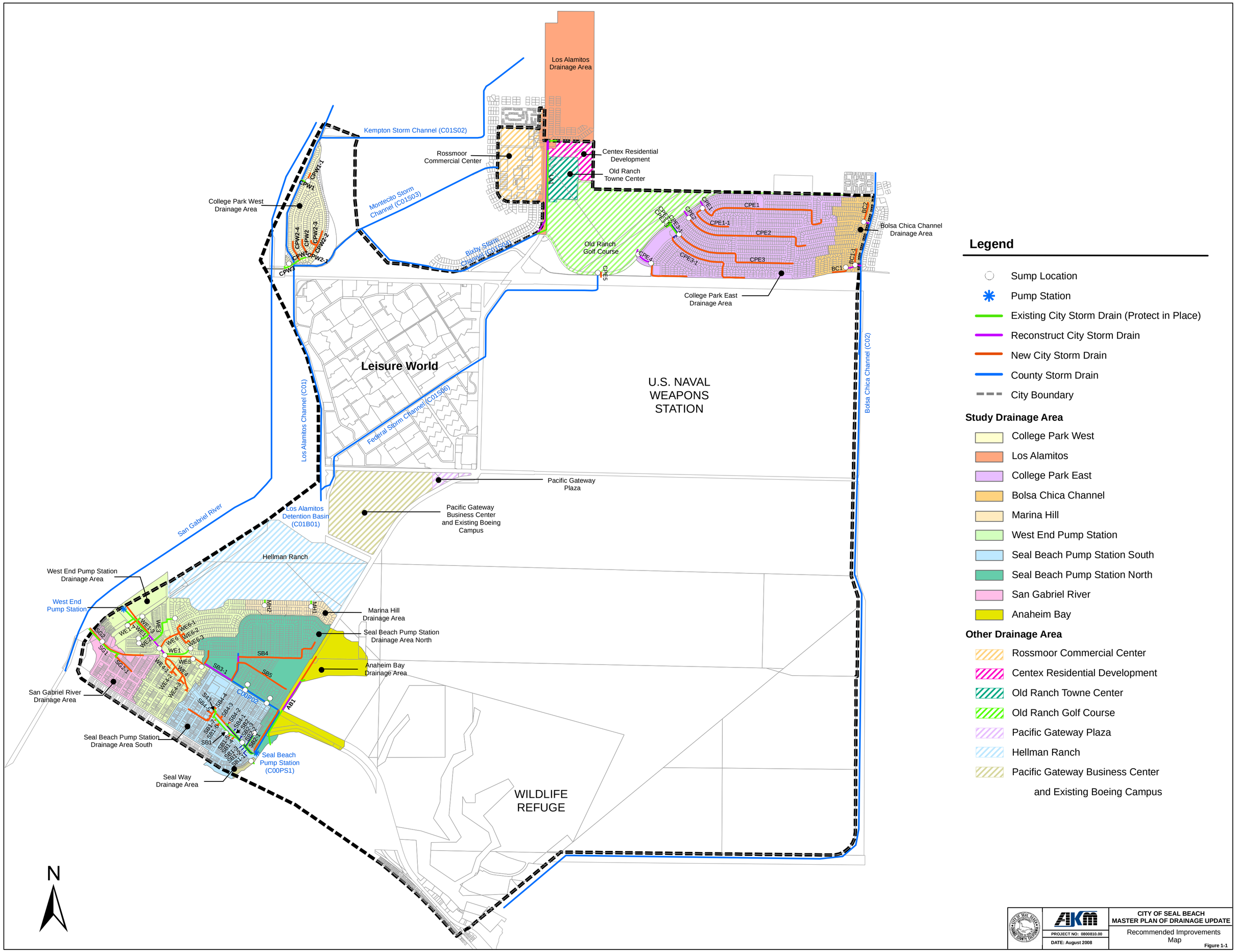
The original pump station was designed to convey the peak runoff from the design 10-year storm based upon the 1969 Hydrology Manual. Therefore, many pump station components, including the discharge pipes, were sized for a much lower flow than the currently calculated design flow. The Orange County Flood Control District increased the capacity of the pump station as much as reasonably possible in 1997. Therefore, the design capacity cannot be provided at the existing pump station without attenuating the peak flow to the existing pump station capacity. This would require a flow-by retarding basin of approximately 3 acre feet capacity.

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

1-8 RECOMMENDATIONS

Storm drain improvement projects to eliminate the existing system deficiencies, as well as new drainage facilities to provide the established flood protection goals in areas without existing storm drains are recommended based upon the results of the hydraulic analyses. Descriptions of the recommended improvements are provided in Section 9. The recommended improvements are presented on Figure 1-1.

The recommended improvements include two pump stations. One of these will be adjacent to the existing West End Pump Station to increase its capacity to the peak flow of 25-year storm. The other new pump station is recommended at the Marina Community Park near the intersection of Marina Drive and First Street to drain this sump area when it cannot drain by gravity to the San Gabriel River.


Los Alamitos Drainage Area
Kempton Storm Channel (C01S02)
Rossmoor Commercial Center
Centex Residential Development
Old Ranch Towne Center
College Park West Drainage Area
Montecito Storm Channel (C01S03)
Bixby Storm Channel (C01S04)
Old Ranch Golf Course
Bolsa Chica Channel Drainage Area
College Park East Drainage Area
Leisure World
U.S. NAVAL WEAPONS STATION
Los Alamitos Channel (C01)
Federal Storm Channel (C01S06)
Bolsa Chica Channel (C02)
Pacific Gateway Plaza
Pacific Gateway Business Center and Existing Boeing Campus
San Gabriel River
Los Alamitos Detention Basin (C01B01)
Hellman Ranch
West End Pump Station Drainage Area
West End Pump Station
Marina Hill Drainage Area
Seal Beach Pump Station Drainage Area North
Anaheim Bay Drainage Area
San Gabriel River Drainage Area
Seal Beach Pump Station Drainage Area South
Seal Beach Pump Station (C00PS1)
Seal Way Drainage Area
WILDLIFE REFUGE
N
Legend
Sump Location
Pump Station
Existing City Storm Drain (Protect in Place)
Reconstruct City Storm Drain
New City Storm Drain
County Storm Drain
City Boundary
Study Drainage Area
College Park West
Los Alamitos
College Park East
Bolsa Chica Channel
Marina Hill
West End Pump Station
Seal Beach Pump Station South
Seal Beach Pump Station North
San Gabriel River
Anaheim Bay
Other Drainage Area
Rossmoor Commercial Center
Centex Residential Development
Old Ranch Towne Center
Old Ranch Golf Course
Pacific Gateway Plaza
Hellman Ranch
Pacific Gateway Business Center and Existing Boeing Campus
CITY OF SEAL BEACH
MASTER PLAN OF DRAINAGE UPDATE
Recommended Improvements Map
PROJECT NO: 0800810.00
DATE: August 2008
Figure 1-1

1-9 CAPITAL IMPROVEMENT PROGRAM (CIP)

The primary goal of the Capital Improvement Program (CIP) is to provide the City of Seal Beach with a long-range planning tool for implementing its storm drain infrastructure improvements in an orderly manner and as a basis for financing these improvements.

The recommended improvements are based upon the information currently available. Therefore, prior to the development of final plans and specifications, preliminary design studies including detailed hydrologic and hydraulic studies should be conducted.

If capacity is not available in either the City or County storm drains, new developments and redevelopment projects that may increase runoff should provide on-site or off-site detention to mitigate the impact of their projects.

All new development projects or redevelopment that would increase runoff should prepare a sub-area master plan detailing how the drainage from the development would be conveyed to a regional facility. The master plans must include detailed hydrologic and hydraulic analysis in accordance with the established criteria.

1-10 CAPITAL IMPROVEMENT PROJECT PRIORITIES

1-10.1 Capital Improvement Project Priorities

The capital improvement projects were selected to minimize the possibility of flooding which can result in property damage, and to provide public safety. The capacity improvement projects were prioritized as follows:

High Priority	Storm drains and pump stations serving sump areas, areas with design or preliminary design work completed,
Medium Priority	Storm drain extensions on the upstream end of high priority projects that will provide compliance with the flood protection goals in arterial and local streets
Low Priority	Storm drain extensions on the upstream end of existing or future medium priority projects that will provide compliance with the flood protection goals in local streets

The storm drain improvement recommendations were not grouped by location. The intent is that each year the City can select the projects to take advantage of concurrent construction such as street paving projects or adjacent infrastructure work.

1-10.2 Capital Improvement Program

The Capital Improvement Program is based upon the results of the hydraulic analyses and priorities as described in Subsection 10-2. The recommended drainage improvement projects are illustrated on Figures 1-2 through 1-5. The priority of capacity improvement projects for the existing storm drains are listed in Tables 10-1 and 10-2. Details of each specific improvement project are provided in Subsection 9-1 through Subsection 9-4.

The construction unit cost for storm drains is based upon $25 per diameter inch per foot of pipe for 30-inch and smaller pipes, and $23 per diameter inch per foot of pipe for 36-inch through 54-inch pipes, and $22 per diameter inch per foot of pipe for larger pipes. Cost estimate for reinforced concrete box (RCB) is based upon $1,400 per cubic yard of reinforced concrete, which includes all material and labor costs for constructing these facilities. Engineering and administration costs, and contingencies are estimated at 40 percent of the

High Priority Improvement Projects

High Priority Rank	Storm Drain	Downstream Location	Upstream Location	Size	Length	Total Cost	Total Project Cost
1	WE 1	Electric Avenue and Corsair Way	Electric Avenue North and Marina Drive	Double 8'(W) x 4'3" (H) RCB	710	2,615,693	2,615,693
2	WE 4	Marina Drive and Electric Avenue North	Marina Street and Electric Avenue South	Double 8'(W) x 4'3" (H) RCB	208	766,287	2,608,459
		Electric Avenue North and Marina Drive	Electric Avenue North and 7th Street	Double 8'(W) x 3'6"(H) RCB	296	1,042,139	
		Electic Avenue North and 7th Street	Electric Avenue north, and 8th Street	42" RCP	322	435,473	
		Electric Avenue north, and 8th Street	Electric Avenue south and Main Street	24" RCP	434	364,560	
3	WE 5A	Marina Drive and Electric Avenue	Marina Drive and 7th Street	48" RCP	515	795,984	998,844
		Marina Drive and 7th Street	Marina Drive and Pacific Coast Highway	42" RCP	150	202,860	
4	SG 2A	Marina Drive and San Gabriel River	Proposed Pump Station	42" RCP	800	1,081,920	7,581,920
		Pump Station, Marina Drive and 1st Street		**Pump Station**	**----**	**6,500,000**	
		High Priority Totals			**3,435**	**13,804,916**	**13,804,916**

Medium Priority Improvement Projects

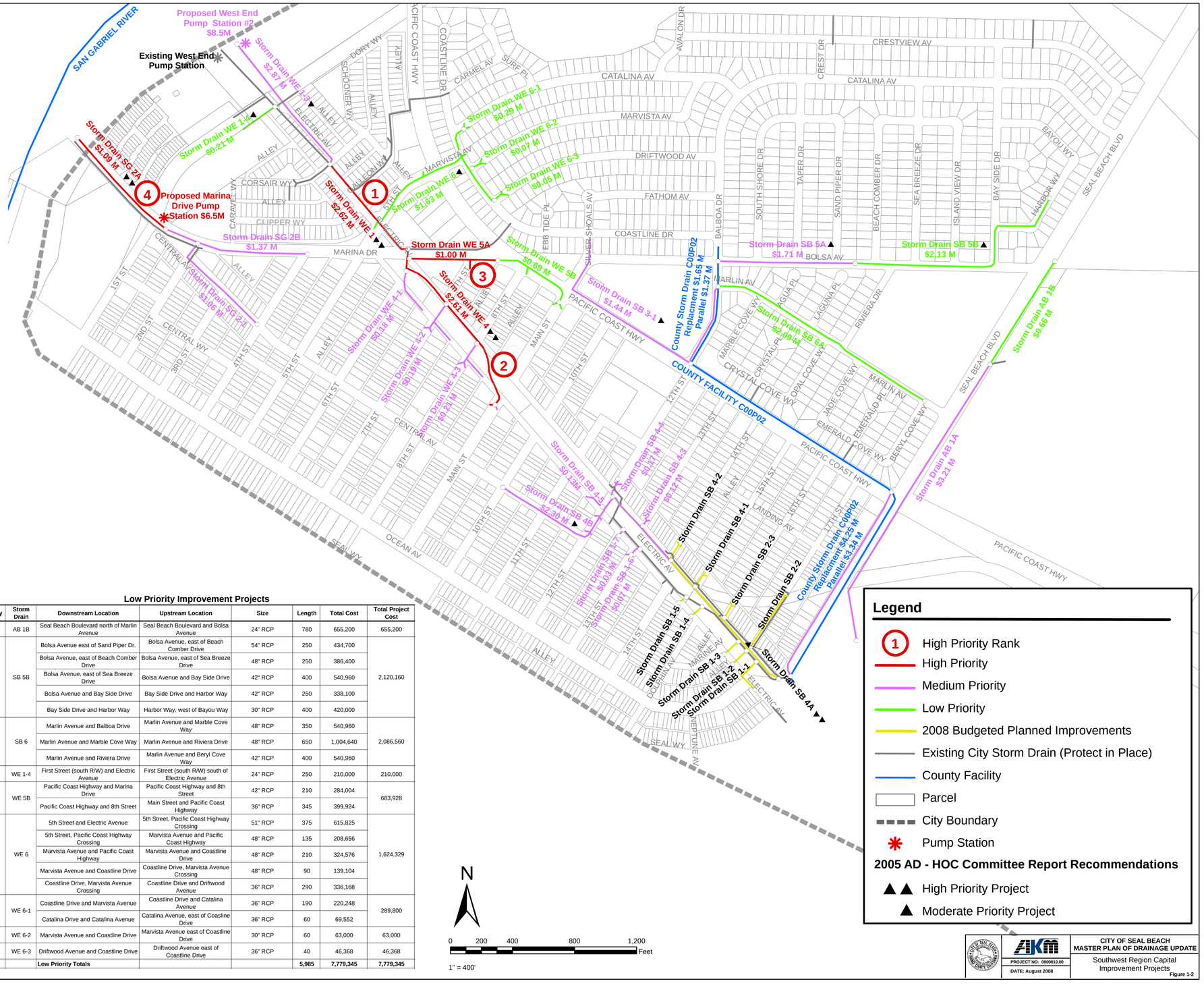
Priority	Storm Drain	Downstream Location	Upstream Location	Size	Length	Total Cost	Total Project Cost
Medium	AB 1A	Seal Beach Boulevard and Anaheim Bay	Seal Beach Boulevard, south of RR R/W	7'6"(W) x 3'(H) RCB	260	438,148	3,206,316
		Seal Beach Boulevard, south of RR R/W	Seal Beach Boulevard at RR R/W	7'6"(W) x 3'(H) RCB	157	264,574	
		Seal Beach Boulevard at RR R/W	Seal Beach Blvd RR R/W Crossing	7'6"(W) x 3'(H) RCB	61	102,796	
		Seal Beach Blvd RR R/W Crossing	Seal Beach Boulevard and Pacific Coast Highway	7'6"(W) x 3'(H) RCB	464	781,926	
		Seal Beach Boulevard and Pacific Coast Highway	Seal Beach Boulevard, Pacific Coast Highway crossing	7'6"(W) x 3'(H) RCB	118	198,852	
		Seal Beach Boulevard, Pacific Coast Highway crossing	Seal Beach Boulevard north of Marlin Avenue	42" RCP	1,050	1,420,020	
Medium	SB 1-6	13th Street and Electric Avenue South	13th Street west of Electric Avenue South	24" RCP	73	61,320	61,320
Medium	SB 1-7	Alley between 12th Street and 13th Street and Electric Avenue South	Alley between 12th Street and 13th Street west of Electric Avenue South	18" RCP	39	24,570	24,570
Medium	SB 4B	Electric Avenue North and14th Street	Electric Avenue North and 13th Street	66" RCP	253	514,298	2,299,164
		Electric Avenue North and 13th Street	Electric Avenue North and 12th Street	66" RCP	217	441,118	
		Electric Avenue North and 12th Street	Electric Avenue North, 12th Street Crossing	66" RCP	67	136,198	
		Electric Avenue North, 12th Street Crossing	12th Street,south of Electric Avenue	66" RCP	80	162,624	
		12th Street,south of Electric Avenue	12th Street, South of Central Avenue	48" RCP	57	88,099	
		12th Street, South of Central Avenue	12th Street, north of Central Avenue	48" RCP	127	196,291	
		12th Street, north of Central Avenue	Central Avenue and 11th Street	36" RCP	330	382,536	
		Central Avenue and 11th Street	Central Avenue and 10th Street	30" RCP	360	378,000	
Medium	SB 5A	Bolsa Avenue and Balboa Drive	Bolsa Avenue east of South Shore Dr.	66" RCP	380	772,464	1,705,704
		Bolsa Avenue east of South Shore Dr.	Bolsa Avenue east of Sand Piper Dr.	60" RCP	505	933,240	
Medium	SB3-1	Pacific Coast Highway and Balboa Drive	Pacific Coast Highway and Silver Shoals Avenue	36" RCP	900	1,043,280	1,437,030
		Pacific Coast Highway and Silver Shoals Avenue	Silver Shoals Avenue and Coastline Drive	30" RCP	375	393,750	
Medium	SB4-3	Proposed 66" SD	13th Street	36" RCP	100	115,920	115,920
Medium	SB4-4	Proposed 66" SD	12th Street (North)	42" RCP	121	163,640	163,640
Medium	SB4-5	Proposed 66" SD	East of 11th Street	24" RCP	150	126,000	126,000
Medium	SG 2-1	Proposed Pump Station	Central Avenue and 4th Street	5'(W) x2'(H) RCB	810	1,058,400	1,058,400
Medium	SG 2B	Marina Drive and 1st Street	Marina Drive and 2nd Street	5'6"(W) x 2.5'(H) RCB	300	413,778	1,361,111
		Marina Drive and 2nd Street	Marina Drive and 4th Street	5'(W) x 2'(H) RCB	725	947,333	
Medium	WE 1-3	Proposed Pump Station on Oakwood Apartments Property	Electric Avenue and Corsair Way	Double 5'(W) x 4'3"(H) RCB	1,000	2,867,407	11,367,407
		Pump Station, West End Pump Station No. 2		**Pump Station**	**----**	**8,500,000**	
Medium	WE 4-1	6th Street and Electric Avenue North	7th Street and Electric Avenue South	24" RCP	210	176,400	176,400
Medium	WE 4-2	7th Street and Electric Avenue North	7th Street and Electric Avenue South	36" RCP	160	185,472	185,472
Medium	WE 4-3	8th Street and Electric Avenue North	8th Street and Electric Avenue South	36" RCP	175	202,860	202,860
		Medium Priority Totals			**10,550**	**23,491,315**	**23,491,315**

Medium Priority Improvement Projects (County Facility)

OCFCD Facility No C00P02							
Priority	**Storm Drain**	**Downstream Location**	**Upstream Location**	**Size**	**Length**	**Total Cost**	**Total Project Cost**
			Replacement				
Medium	C00P02A	Seal Beach Boulevard and Electric Avenue	Seal Beach Boulevard and Pacific Coast Highway	84" RCP	1,640	4,243,008	4,243,008
Medium	C00P02B	Pacific Coast Highway and Balboa Drive	Balboa Drive and Bolsa Avenue	72" RCP	740	1,641,024	1,641,024
		County Totals			**2,380**	**5,884,032**	**5,884,032**
			Parallel				
Medium	C00P02A	Seal Beach Boulevard and Electric Avenue	Seal Beach Boulevard and Pacific Coast Highway	66" RCP	1,640	3,333,792	3,333,792
Medium	C00P02B	Pacific Coast Highway and Balboa Drive	Balboa Drive and Bolsa Avenue	60" RCP	740	1,367,520	1,367,520
		County Totals			**7,140**	**4,701,312**	**4,701,312**

Low Priority Improvement Projects

Priority	Storm Drain	Downstream Location	Upstream Location	Size	Length	Total Cost	Total Project Cost
Low	AB 1B	Seal Beach Boulevard north of Marlin Avenue	Seal Beach Boulevard and Bolsa Avenue	24" RCP	780	655,200	655,200
Low	SB 5B	Bolsa Avenue east of Sand Piper Dr.	Bolsa Avenue, east of Beach Comber Drive	54" RCP	250	434,700	2,120,160
		Bolsa Avenue, east of Beach Comber Drive	Bolsa Avenue, east of Sea Breeze Drive	48" RCP	250	386,400	
		Bolsa Avenue, east of Sea Breeze Drive	Bolsa Avenue and Bay Side Drive	42" RCP	400	540,960	
		Bolsa Avenue and Bay Side Drive	Bay Side Drive and Harbor Way	42" RCP	250	338,100	
		Bay Side Drive and Harbor Way	Harbor Way, west of Bayou Way	30" RCP	400	420,000	
Low	SB 6	Marlin Avenue and Balboa Drive	Marlin Avenue and Marble Cove Way	48" RCP	350	540,960	2,086,560
		Marlin Avenue and Marble Cove Way	Marlin Avenue and Riviera Drive	48" RCP	650	1,004,640	
		Marlin Avenue and Riviera Drive	Marlin Avenue and Beryl Cove Way	42" RCP	400	540,960	
Low	WE 1-4	First Street (south R/W) and Electric Avenue	First Street (south R/W) south of Electric Avenue	24" RCP	250	210,000	210,000
Low	WE 5B	Pacific Coast Highway and Marina Drive	Pacific Coast Highway and 8th Street	42" RCP	210	284,004	683,928
		Pacific Coast Highway and 8th Street	Main Street and Pacific Coast Highway	36" RCP	345	399,924	
Low	WE 6	5th Street and Electric Avenue	5th Street, Pacific Coast Highway Crossing	51" RCP	375	615,825	1,624,329
		5th Street, Pacific Coast Highway Crossing	Marvista Avenue and Pacific Coast Highway	48" RCP	135	208,656	
		Marvista Avenue and Pacific Coast Highway	Marvista Avenue and Coastline Drive	48" RCP	210	324,576	
		Marvista Avenue and Coastline Drive	Coastline Drive, Marvista Avenue Crossing	48" RCP	90	139,104	
		Coastline Drive, Marvista Avenue Crossing	Coastline Drive and Driftwood Avenue	36" RCP	290	336,168	
Low	WE 6-1	Coastline Drive and Marvista Avenue	Coastline Drive and Catalina Avenue	36" RCP	190	220,248	289,800
		Catalina Drive and Catalina Avenue	Catalina Avenue, east of Coastline Drive	36" RCP	60	69,552	
Low	WE 6-2	Marvista Avenue and Coastline Drive	Marvista Avenue east of Coastline Drive	30" RCP	60	63,000	63,000
Low	WE 6-3	Driftwood Avenue and Coastline Drive	Driftwood Avenue east of Coastline Drive	36" RCP	40	46,368	46,368
		Low Priority Totals			**5,985**	**7,779,345**	**7,779,345**



CITY OF SEAL BEACH
MASTER PLAN OF DRAINAGE UPDATE

PROJECT NO: 0800810.00

DATE: August 2008

Southwest Region Capital Improvement Projects

Figure 1-2

High Priority Improvement Projects

High Priority Rank	Storm Drain	Downstream Location	Upstream Location	Size	Length	Total Cost	Total Project Cost
5	CPE 1A Alt 1	Westerly extension of Guava Avenue and Old Ranch Golf Course	Lampson Avenue Crossing, near Guava Avenue	Double 6'(W) x 3'(H) RCB	120	339,733	531,378
		Lampson Avenue Crossing, near Guava Avenue	Guava Avenue and Ironwood Avenue R/W (N)	6'(W) x 3'(H) RCB	120	191,644	
6	CPE 2A Alt 1	Westerly extension of Elder Avenue and Old Ranch Golf Course	Lampson Avenue Crossing	Double 6'(W) x 3'(H) RCB	120	339,733	531,378
		Lampson Avenue Crsossing	Elder Avenue and Ironwood Avenue R/W (N)	6'(W) x 3'(H) RCB	120	191,644	
7	CPE 4A Alt 1	Westerly extension of Basswood Avenue and Old Ranch Golf Course	West of Lampson Avenue	9'(W) x 2'9"(H) RCB	31	61,885	1,109,941
		West of Lampson Avenue	Lampson Avenue Crossing, near Basswood Street	9'(W) x 2'9"(H) RCB	95	189,648	
		Lampson Avenue Crossing, near Basswood Street	Basswood Avenue and Aster Street	9'(W) x 2'9"(H) RCB	430	858,407	
8	BC 1A	Bolsa Chica Channel 250' north of freeway	Wisteria Street	6'(W) x 3'(H) RCB	103	164,495	589,148
		Wisteria Street	Violet Street north of Almond Avenue	42" RCP	314	424,654	
9	BC 2A	Bolsa Chica Channel and easterly extension of Fir Avenue	Wisteria Street and Fir Avenue	48" RCP	130	200,928	200,928
		High Priority Totals			**1,583**	**2,962,773**	**2,962,773**

Medium Priority Improvement Projects

Priority	Storm Drain	Downstream Location	Upstream Location	Size	Length	Total Cost	Total Project Cost
Medium	BC 1-1	Wisteria Lane 250' north of freeway	Wisteria Lane and Candleberry Avenue	30" RCP	485	509,250	509,250
Medium	BC 1B	Violet Street north of Almond Avenue	Almond Avenue, east at Teaberry Circle	36" RCP	300	347,760	526,260
		Almond Avenue, east at Teaberry Circle	Almond Avenue east of Sunflower Circle	30" RCP	170	178,500	
Medium	BC 2B	Wisteria Street and Fir Avenue	Wisteria Street at Hazelnut Avenue	3'(W) x2'(H) RCB	250	254,074	471,852
		Wisteria Street at Hazelnut Avenue	Wisteria Street and Ironwood Avenue	2'6"(W) x 1'6"(H) RCB	250	217,778	
Medium	CPE 1B Alt 1	Guava Avenue and Ironwood Avenue R/W (N)	Guava Avenue and Hazelnut Avenue	Double 6'(W) x 2'3"(H) RCB	370	987,078	4,428,511
		Hazelnut Avenue and Guava Avenue	Hazelnut Avenue and Heather Street	Double 6'(W) x 2'3"(H) RCB	1,290	3,441,433	
Medium	CPE 2B Alt 1	Elder Avenue and Ironwood Avenue R/W (N)	Elder Avenue and Fuchsia Street	Double 6'(W) x 2'3"(H) RCB	1,550	4,135,056	4,135,056
Medium	CPE 3-1B Alt 1	Candleberry Avenue and Aster Street	Candleberry Avenue and Fuschia Street	10'8"(W) x 3'(H) RCB	1,800	4,095,093	4,095,093
Medium	CPE 3-4B Alt 1	Birchwood and Aster Street	Birchwood Avenue and Bluebell Street	7'(W) x 2'3"(H) RCB	200	326,667	2,484,481
		Birchwood Avenue and Bluebell Street	Birchwood Avenue and Daisy Circle	6'(W) x 2'3"(H) RCB	1,450	2,157,815	
Medium	CPE 5 Alt 1	Cal Trans Open Channel	Lampson Avenue	24" RCP	75	63,000	63,000
		Medium Priority Totals			**8,190**	**16,713,503**	**16,713,503**

Low Priority Improvement Projects

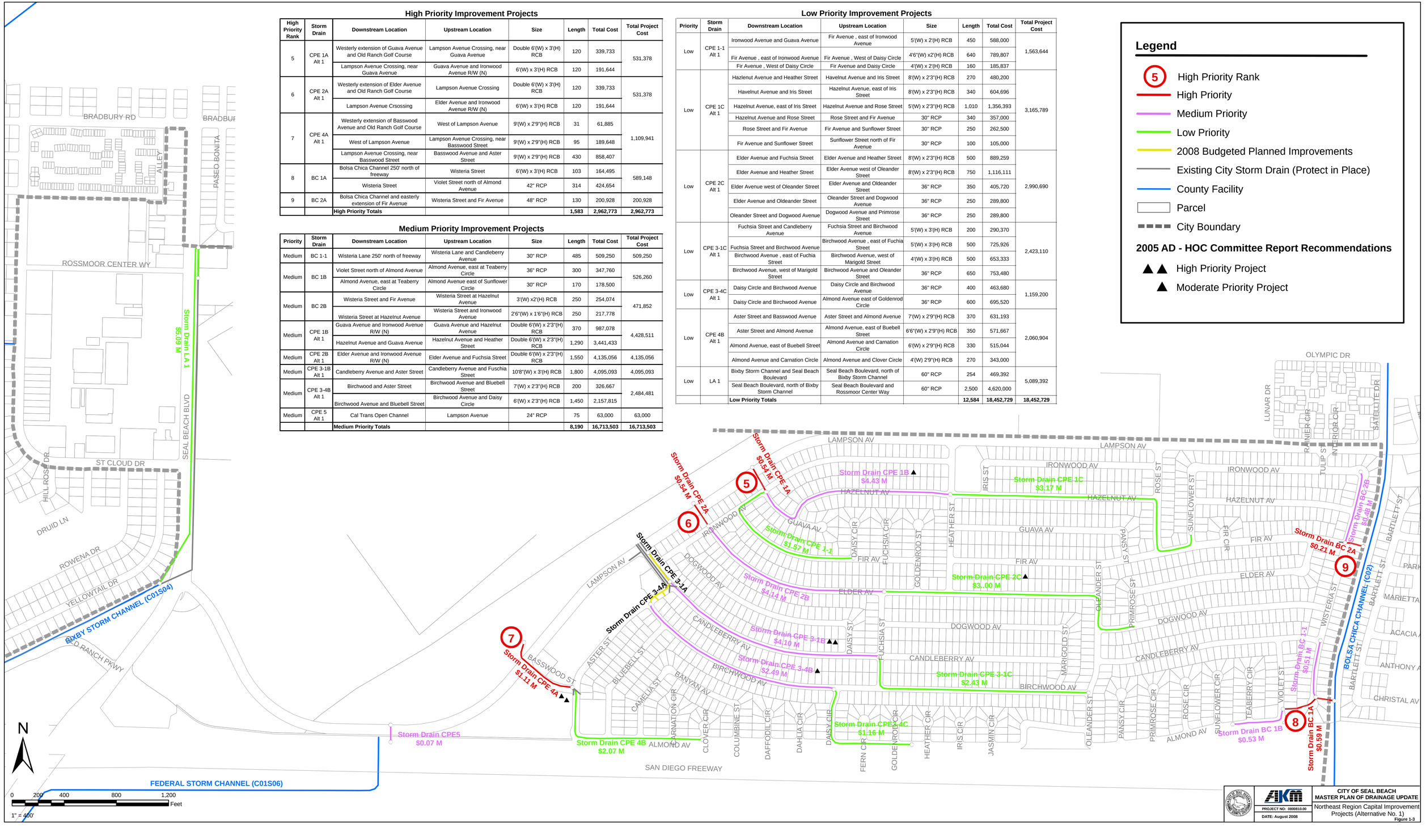
Priority	Storm Drain	Downstream Location	Upstream Location	Size	Length	Total Cost	Total Project Cost
Low	CPE 1-1 Alt 1	Ironwood Avenue and Guava Avenue	Fir Avenue , east of Ironwood Avenue	5'(W) x 2'(H) RCB	450	588,000	1,563,644
		Fir Avenue , east of Ironwood Avenue	Fir Avenue , West of Daisy Circle	4'6"(W) x2'(H) RCB	640	789,807	
		Fir Avenue , West of Daisy Circle	Fir Avenue and Daisy Circle	4'(W) x 2'(H) RCB	160	185,837	
Low	CPE 1C Alt 1	Hazlenut Avenue and Heather Street	Havelnut Avenue and Iris Street	8'(W) x 2'3"(H) RCB	270	480,200	3,165,789
		Havelnut Avenue and Iris Street	Hazelnut Avenue, east of Iris Street	8'(W) x 2'3"(H) RCB	340	604,696	
		Hazelnut Avenue, east of Iris Street	Hazelnut Avenue and Rose Street	5'(W) x 2'3"(H) RCB	1,010	1,356,393	
		Hazelnut Avenue and Rose Street	Rose Street and Fir Avenue	30" RCP	340	357,000	
		Rose Street and Fir Avenue	Fir Avenue and Sunflower Street	30" RCP	250	262,500	
		Fir Avenue and Sunflower Street	Sunflower Street north of Fir Avenue	30" RCP	100	105,000	
Low	CPE 2C Alt 1	Elder Avenue and Fuchsia Street	Elder Avenue and Heather Street	8'(W) x 2'3"(H) RCB	500	889,259	2,990,690
		Elder Avenue and Heather Street	Elder Avenue west of Oleander Street	8'(W) x 2'3"(H) RCB	750	1,116,111	
		Elder Avenue west of Oleander Street	Elder Avenue and Oldeander Street	36" RCP	350	405,720	
		Elder Avenue and Oldeander Street	Oleander Street and Dogwood Avenue	36" RCP	250	289,800	
		Oleander Street and Dogwood Avenue	Dogwood Avenue and Primrose Street	36" RCP	250	289,800	
Low	CPE 3-1C Alt 1	Fuchsia Street and Candleberry Avenue	Fuchsia Street and Birchwood Avenue	5'(W) x 3'(H) RCB	200	290,370	2,423,110
		Fuchsia Street and Birchwood Avenue	Birchwood Avenue , east of Fuchia Street	5'(W) x 3'(H) RCB	500	725,926	
		Birchwood Avenue , east of Fuchia Street	Birchwood Avenue, west of Marigold Street	4'(W) x 3'(H) RCB	500	653,333	
		Birchwood Avenue, west of Marigold Street	Birchwood Avenue and Oleander Street	36" RCP	650	753,480	
Low	CPE 3-4C Alt 1	Daisy Circle and Birchwood Avenue	Daisy Circle and Birchwood Avenue	36" RCP	400	463,680	1,159,200
		Daisy Circle and Birchwood Avenue	Almond Avenue east of Goldenrod Circle	36" RCP	600	695,520	
Low	CPE 4B Alt 1	Aster Street and Basswood Avenue	Aster Street and Almond Avenue	7'(W) x 2'9"(H) RCB	370	631,193	2,060,904
		Aster Street and Almond Avenue	Almond Avenue, east of Buebell Street	6'6"(W) x 2'9"(H) RCB	350	571,667	
		Almond Avenue, east of Buebell Street	Almond Avenue and Carnation Circle	6'(W) x 2'9"(H) RCB	330	515,044	
		Almond Avenue and Carnation Circle	Almond Avenue and Clover Circle	4'(W) 2'9"(H) RCB	270	343,000	
Low	LA 1	Bixby Storm Channel and Seal Beach Boulevard	Seal Beach Boulevard, north of Bixby Storm Channel	60" RCP	254	469,392	5,089,392
		Seal Beach Boulevard, north of Bixby Storm Channel	Seal Beach Boulevard and Rossmoor Center Way	60" RCP	2,500	4,620,000	
		Low Priority Totals			**12,584**	**18,452,729**	**18,452,729**

Legend

- 5 — High Priority Rank
- High Priority
- Medium Priority
- Low Priority
- 2008 Budgeted Planned Improvements
- Existing City Storm Drain (Protect in Place)
- County Facility
- Parcel
- City Boundary

2005 AD - HOC Committee Report Recommendations

- ▲▲ High Priority Project
- ▲ Moderate Priority Project



CITY OF SEAL BEACH
MASTER PLAN OF DRAINAGE UPDATE
Northeast Region Capital Improvement Projects (Alternative No. 1)
Figure 1-3

AKM
PROJECT NO: 0800810.00
DATE: August 2008

High Priority Improvement Projects

High Priority Rank	Storm Drain	Downstream Location	Upstream Location	Size	Length	Total Cost	Total Project Cost
5	CPE6 Alt 2	Aster Street, south of Basswood Street	Aster Street and Birchwood Avenue	90" RCP	1,000	2,772,000	18,700,080
		Aster Street and Birchwood Avenue	Candleberry Avenue and Aster Street	84" RCP	200	517,440	
		Candleberry Avenue and Aster Street	Ironwood Avenue and Candlwberry Avenue	72" RCP	700	1,552,320	
		Ironwood Avenue and Candleberry Avenue	Guava Avnue and Ironwood Avenue	60" RCP	500	924,000	
		Basswood Street and Aster Street	Old Ranch Golf Course Detention Basin	Double 54" Forcemain	700	2,434,320	
		Pump Station, Aster Street, south of Basswood Street		**Pump Station**	**----**	**10,500,000**	
6	BC 1A	Bolsa Chica Channel 250' north of freeway	Wisteria Street	6'(W) x 3'(H) RCB	103	164,495	589,148
		Wisteria Street	Violet Street north of Almond Avenue	42" RCP	314	424,654	
7	BC 2A	Bolsa Chica Channel and easterly extension of Fir Avenue	Wisteria Street and Fir Avenue	48" RCP	130	200,928	200,928
		High Priority Totals			**3,647**	**19,490,156**	**19,490,156**

Medium Priority Improvement Projects

Priority	Storm Drain	Downstream Location	Upstream Location	Size	Length	Total Cost	Total Project Cost
Medium	BC 1-1	Wisteria Lane 250' north of freeway	Wisteria Lane and Candleberry Avenue	30" RCP	485	509,250	509,250
Medium	BC 1B	Violet Street north of Almond Avenue	Almond Avenue, east at Teaberry Circle	36" RCP	300	347,760	526,260
		Almond Avenue, east at Teaberry Circle	Almond Avenue east of Sunflower Circle	30" RCP	170	178,500	
Medium	BC 2B	Wisteria Street and Fir Avenue	Wisteria Street at Hazelnut Avenue	3'(W) x2'(H) RCB	250	254,074	471,852
		Wisteria Street at Hazelnut Avenue	Wisteria Street and Ironwood Avenue	2'6"(W) x 1'6"(H) RCB	250	217,778	
Medium	CPE 1B Alt 2	Guava Avenue and Ironwood Avenue R/W (N)	Hazelnut Avenue and Heather Street	54" RCP	1,660	2,886,408	2,886,408
Medium	CPE 2B Alt 2	Elder Avenue and Ironwood Avenue R/W (N)	Elder Avenue and Fuchsia Street	54" RCP	1,550	2,695,140	2,695,140
Medium	CPE 3-5B Alt 2	Candleberry Avenue and Aster Street	Candleberry Avenue and Fuschia Street	54" RCP	1,800	3,129,840	3,129,840
Medium	CPE 3-4B Alt 2	Birchwood and Aster Street	Birchwood Avenue and Daisy Circle	42" RCP	1,650	2,231,460	2,231,460
Medium	CPE 5	Cal Trans Open Channel	Lampson Avenue	24" RCP	75	63,000	63,000
		Medium Priority Totals			**8,190**	**12,513,210**	**12,513,210**

Low Priority Improvement Projects

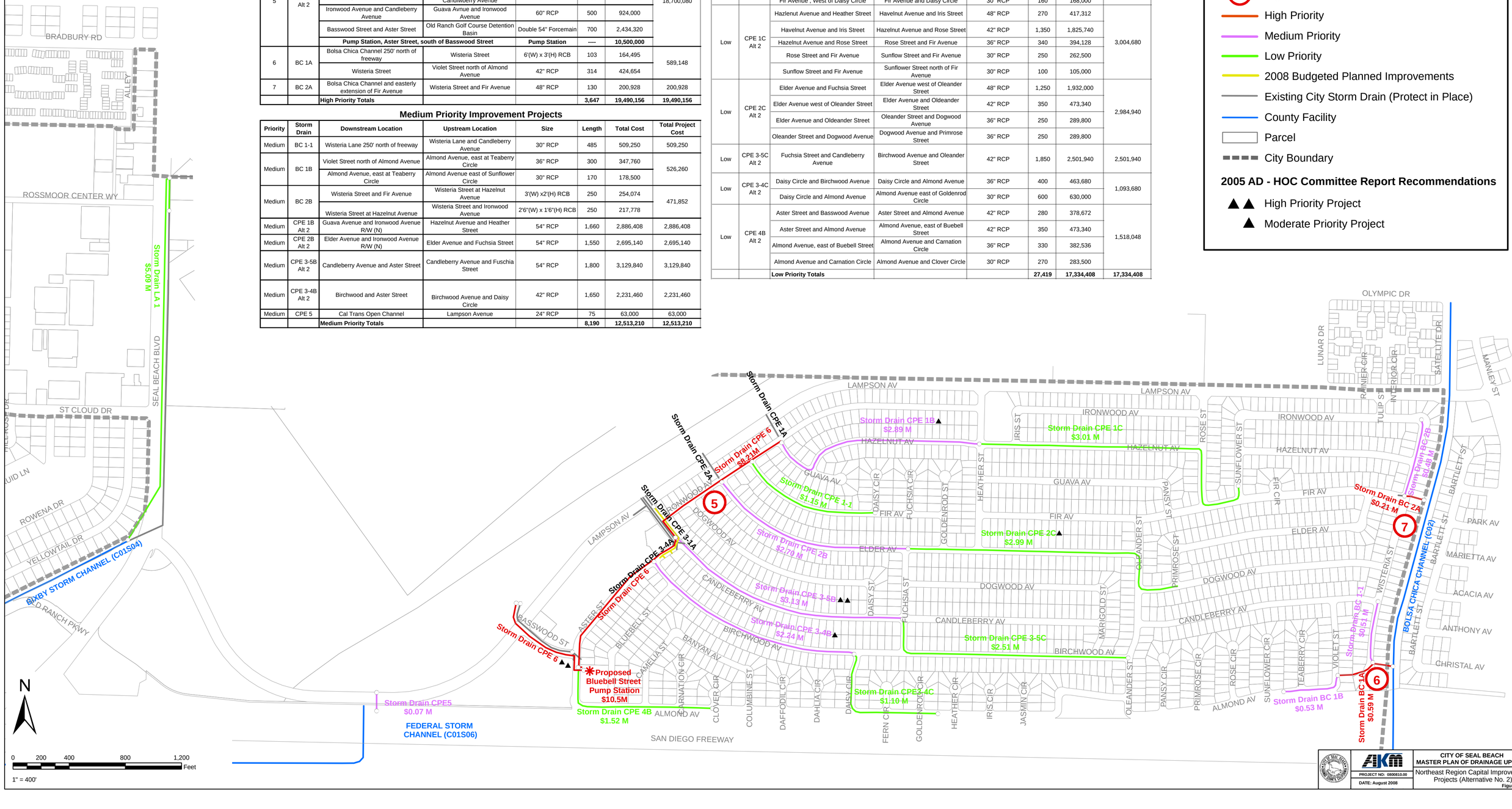
Priority	Storm Drain	Downstream Location	Upstream Location	Size	Length	Total Cost	Total Project Cost
Low	LA 1	Bixby Storm Channel and Seal Beach Boulevard	Seal Beach Boulevard, north of Bixby Storm Channel	60" RCP	254	469,392	5,089,392
		Seal Beach Boulevard, north of Bixby Storm Channel	Seal Beach Boulevard and Rossmoor Center Way	60" RCP	2,500	4,620,000	
Low	CPE 1-1 Alt 2	Fir Avenue and Ironwood Avenue	Fir Avenue , West of Daisy Circle	36" RCP	840	973,728	1,141,728
		Fir Avenue , West of Daisy Circle	Fir Avenue and Daisy Circle	30" RCP	160	168,000	
Low	CPE 1C Alt 2	Hazlenut Avenue and Heather Street	Havelnut Avenue and Iris Street	48" RCP	270	417,312	3,004,680
		Havelnut Avenue and Iris Street	Hazelnut Avenue and Rose Street	42" RCP	1,350	1,825,740	
		Hazelnut Avenue and Rose Street	Rose Street and Fir Avenue	36" RCP	340	394,128	
		Rose Street and Fir Avenue	Sunflow Street and Fir Avenue	30" RCP	250	262,500	
		Sunflow Street and Fir Avenue	Sunflower Street north of Fir Avenue	30" RCP	100	105,000	
Low	CPE 2C Alt 2	Elder Avenue and Fuchsia Street	Elder Avenue west of Oleander Street	48" RCP	1,250	1,932,000	2,984,940
		Elder Avenue west of Oleander Street	Elder Avenue and Oldeander Street	42" RCP	350	473,340	
		Elder Avenue and Oldeander Street	Oleander Street and Dogwood Avenue	36" RCP	250	289,800	
		Oleander Street and Dogwood Avenue	Dogwood Avenue and Primrose Street	36" RCP	250	289,800	
Low	CPE 3-5C Alt 2	Fuchsia Street and Candleberry Avenue	Birchwood Avenue and Oleander Street	42" RCP	1,850	2,501,940	2,501,940
Low	CPE 3-4C Alt 2	Daisy Circle and Birchwood Avenue	Daisy Circle and Almond Avenue	36" RCP	400	463,680	1,093,680
		Daisy Circle and Almond Avenue	Almond Avenue east of Goldenrod Circle	30" RCP	600	630,000	
Low	CPE 4B Alt 2	Aster Street and Basswood Avenue	Aster Street and Almond Avenue	42" RCP	280	378,672	1,518,048
		Aster Street and Almond Avenue	Almond Avenue, east of Buebell Street	42" RCP	350	473,340	
		Almond Avenue, east of Buebell Street	Almond Avenue and Carnation Circle	36" RCP	330	382,536	
		Almond Avenue and Carnation Circle	Almond Avenue and Clover Circle	30" RCP	270	283,500	
		Low Priority Totals			**27,419**	**17,334,408**	**17,334,408**

Legend

- 5 — High Priority Rank
- High Priority
- Medium Priority
- Low Priority
- 2008 Budgeted Planned Improvements
- Existing City Storm Drain (Protect in Place)
- County Facility
- Parcel
- City Boundary

2005 AD - HOC Committee Report Recommendations

- ▲▲ High Priority Project
- ▲ Moderate Priority Project

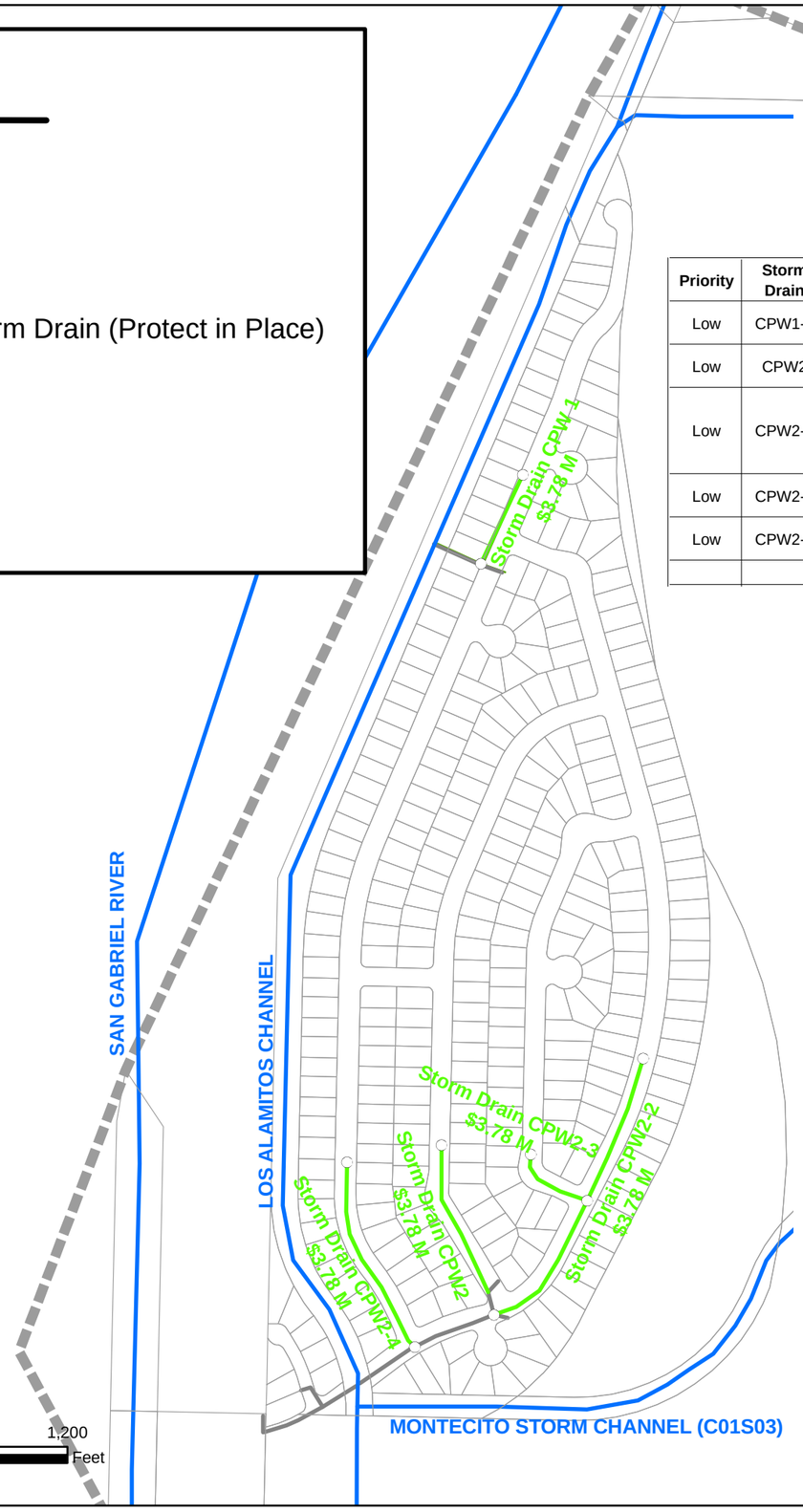


CITY OF SEAL BEACH
MASTER PLAN OF DRAINAGE UPDATE
Northeast Region Capital Improvement Projects (Alternative No. 2)
Figure 1-4

AKM
PROJECT NO: 0800810.00
DATE: August 2008

Legend

- High Priority
- Medium Priority
- Low Priority
- Existing City Storm Drain (Protect in Place)
- County Facility
- Parcel
- City Boundary



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0 200 400 800 1,200 Feet

1" = 400'

Low Priority Improvement Projects

Priority	Storm Drain	Downstream Location	Upstream Location	Size	Length	Total Cost	Total Project Cost
Low	CPW1-1	Harvard Lane, South of College Park Drive	Harvard Lane and Darthmouth Circle	18" RCP	250	157,500	157,500
Low	CPW2	College Park Drive and Stanford Lane	Stanford Lane, North of College Park Drive	30" RCP	500	525,000	525,000
Low	CPW2-2	Stanford Lane and College Park Drive	College Park Drive and Yale Lane	36" RCP	400	463,680	799,680
		College Park Drive and Yale Lane	College Park Drive, north of Yale Lane	24" RCP	400	336,000	
Low	CPW2-3	College Park Drive and Yale Lane	Yale Lane, north of College Park Drive	24" RCP	250	210,000	210,000
Low	CPW2-4	College Park Drive and Harvard Lane	Harvard Lane, north of College Park Drive	24" RCP	600	504,000	504,000
		Low Priority Totals			**2,400**	**2,196,180**	**2,196,180**

CITY OF SEAL BEACH
MASTER PLAN OF DRAINAGE UPDATE

Northwest Region Capital Improvement Projects

Figure 1-5

PROJECT NO: 0800810.00

DATE: August 2008

construction cost. These costs can be considered to be based upon the current (June 2008) Engineering News Record Index for Los Angeles Area (ENRLA) of 9265.94.

The two alternatives recommended for the College Park East Drainage Area affect the total system improvement cost summaries. Alternative No. 1 recommends improvements through the existing four drainage outlets to the Old Ranch Golf Course. Alternative No. 2 recommends constructing a pump station facility at Bluebell Street and Almond Avenue. The total system improvement costs are estimated as follows for each of the College Park East Drainage Area alternatives:

Storm Drain Improvements (With College Park East Alternative No. 1)		
High Priority Storm Drains	$10.2	Million
Medium Priority Storm Drains	$31.7	Million
Low Priority Storm Drains	$28.4	Million
Marina Drive and 1st Street Pump Station	$6.5	Million
West End Pump Station No.2	$8.5	Million
Total Estimated Cost	**$85.4**	**Million**
C00P02 Replacement Cost	*$ 5.9*	*Million*
C00P02 Parallel Facility Cost	*$ 4.7*	*Million*

Note: These improvement costs do not include the projects in design stages budgeted for the 2008 fiscal year.

Storm Drain Improvements (With College Park Alternative No. 2)		
High Priority Storm Drains	$16.3	Million
Medium Priority Storm Drains	$27.5	Million
Low Priority Storm Drains	$27.3	Million
Marina Drive and 1st Street Pump Station	$6.5	Million
Bluebell Street and Almond Avenue Pump Station	$10.5	Million
West End Pump Station No.2	$8.5	Million
Total Estimated Cost	**$96.6**	**Million**
C00P02 Replacement Cost	*$ 5.9*	*Million*
C00P02 Parallel Facility Cost	*$ 4.7*	*Million*

Note: These improvement costs do not include the projects in design stages budgeted for the 2008 fiscal year.

With the implementation of Alternative No. 1, the Capital Improvement Program developed by this study includes 43,800 feet (8.37 miles) of improvement projects and two pump station upgrades at an estimated cost of $85.4 million dollars. The cost of completing the two pump station projects is estimated at $15.0 million.

The Capital Improvement Program developed for Alternative 2 includes 45,500 feet (8.62 miles) of improvement projects and three pump station upgrades at an estimated cost of $96.6 million dollars. The cost of completing the three pump station projects is estimated at $25.5 million.

To analyze just the College Park East Drainage Area improvements costs, the estimated summary to implement the two alternatives are as follows:

College Park East Alternative No. 1 Storm Drain Improvements		
High Priority Storm Drains	$2.2	Million
Medium Priority Storm Drains	$15.1	Million
Low Priority Storm Drains	$13.4	Million
Total Estimated Cost	**$30.7**	**Million**

College Park East Alternative No. 2 Storm Drain Improvements		
High Priority Storm Drains	$8.2	Million
Medium Priority Storm Drains	$11.0	Million
Low Priority Storm Drains	$12.3	Million
Bluebell Street and Almond Avenue Street Pump Station	$10.5	Million
Total Estimated Cost	**$41.9**	**Million**

Note: These improvement costs do not include the projects in design stages budgeted for the 2008 fiscal year.

Note: These improvement cost do not include the projects in design stages budgeted for the 2008 fiscal year.

The College Park East Drainage Area Alternative No. 2 is roughly $11.2 million dollars more expensive than Alternative No. 1, because it requires the additional tributary storm drains as well as the construction of a new pump station. The advantage of Alternative No. 2 over Alternative No. 1 is that the improvements will satisfy the hydraulic criteria during a 25-year storm, while the proposed storm drains in Alternative No. 1 will not.

The recommended CIP has been based upon the best information currently available. It should be updated as new information becomes available. The cost estimates for future projects should be updated based upon ENRLA.