

SECTION 4

EXISTING DRAINAGE SYSTEM

This section describes the existing drainage facilities serving the City of Seal Beach, which include City facilities as well as Los Angeles County and Orange County Flood Control District facilities.

4-1 LOS ANGELES COUNTY FLOOD CONTROL DISTRICT FACILITY

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, portions of the Bridgeport community, and the westerly portion of Old Town and Marina Hill communities. These drainage systems are described in the City Facilities Sub-sections.

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.

4-2 ORANGE COUNTY FLOOD CONTROL DISTRICT FACILITIES

The major flood control facilities under the jurisdiction of Orange County Flood Control District (OCFCD) that serve the City's westerly area are the Los Alamitos Channel (OCFCD Facility No. C01), the Los Alamitos Retarding Basin (C01B01), and its tributary channels. Bolsa Chica Channel (OCFCD Facility No. C02) serves the easterly portions of College Park East. The OCFCD storm drain Facility C00P02 that extends east on Pacific Coast Highway and south on Seal Beach Boulevard north of Electric Avenue, and Seal Beach Pump Station (C00PS1), located at the intersection of Seal Beach Boulevard and Electric Avenue serve the south easterly portion of the City. The OCFCD facilities serving the City of Seal Beach are described below.

4-2.1 Los Alamitos Channel (OCFCD Facility No. C01)

The Los Alamitos Channel (C01) begins at the intersection of Los Alamitos Boulevard and Cerritos Avenue in the City of Los Alamitos. It runs southerly along the City's westerly boundary, parallel to the San Gabriel River. With the construction of the Rossmoor Retarding Basin (C01B02) and Pump Station (C01P02), the portion of the Los Alamitos Channel north of the 405-605 Freeway interchange now drains to the Rossmoor Retarding Basin. This project reduced the drainage area tributary to the most downstream reach of the Los Alamitos Channel from 5,340 acres to 3,584 acres. Presently, only the portion of the Los Alamitos Channel south of the Rossmoor Retarding Basin conveys storm runoff to the City of Seal Beach territories.

The Channel enters the City's boundary at the College Park West Community just south of the Rossmoor Retarding Basin and its confluence with Kempton Storm Channel (C01S01). It extends southerly along the west boundary of College Park West generally paralleling the San Gabriel River, then turns southeasterly and southerly through College Park West. It confluences with Montecito Storm Channel (C01S03) just south of College Park Drive, then crosses the Garden Grove Freeway (SR 22). It extends south along the westerly

boundary of the Leisure World Retirement Community, crosses Westminster Boulevard, confluences with the Federal Storm Channel (C01S06), and terminates at the Los Alamitos Retarding Basin (C01B01). The storm runoff conveyed to the Los Alamitos Retarding Basin is pumped into the San Gabriel River. Per the Basis of Design Report for the Los Alamitos Pump Station and Los Alamitos Retarding Basin, the expected value 100-year discharge at the terminus of the channel is 1,707 cfs. A general description of the facility is as follows:

- Between the San Diego Freeway (I-405) and College Park Drive – Reinforced Concrete Trapezoidal Channel, 11.5' (BW) x 14' (H)
- College Park Drive Crossing – Triple 10' (W) x 8' (H) Reinforced Concrete Box Culvert
- Between College Park Drive and the Garden Grove Freeway – Junction/Transition Reach at Confluence with Montecito Storm Channel (C01S03)
- Garden Grove Freeway Crossing – Triple 10' (W) x 8' (H) Reinforced Concrete Box Culvert
- Between the Garden Grove Freeway and Channel Sta. 83+00 – Earthen Trapezoidal Channel, 20' (BW) x 14' (H)
- Between Channel Sta. 83+00 and Westminster Boulevard – Earthen Trapezoidal Channel, 20' (BW) x 13' (H)
- Westminster Boulevard Crossing – Earthen Trapezoidal Channel, 20' (BW) x 13' (H)
- Between Westminster Boulevard and Federal Storm Channel (C01S06) – Earthen Trapezoidal Channel, 20' (W) x 13' (H)
- Between Federal Storm Channel (C01S06) and Los Alamitos Retarding Basin (C01B01) – Earthen Trapezoidal Channel, 32' (W) x 13' (H)

The 1998 Los Alamitos Channel Project Report did not recommend any improvements to Los Alamitos Channel within the City boundaries.

4-2.2 Los Alamitos Retarding Basin (OCFCD Facility No. C01B01)

The Los Alamitos Retarding Basin is generally located south of Westminster Avenue and east of the San Gabriel River. The Island Village is directly north of the basin, while the Pacific Gateway Business Center is located directly to the east. In order to provide the expected value 100-year flood protection, the water level in the basin cannot exceed 0.0 feet, sea level. It has a total volume of 280 acre-feet below this elevation.

The existing Los Alamitos Pump Station is located at the northwest corner of the basin just south of Island Village. It houses four pumps with a total capacity of 444 cfs. The maximum water level in the basin would be 2.5 feet with the existing pump station capacity, which is too high for the Federal Storm Channel. To mitigate this deficiency, a new pump station is currently being constructed with a total capacity of 800 cfs. The new pump station will maintain the water level in the basin below elevation 0.0 feet.

4-2.3 Kempton Storm Channel (OCFCD Facility No. C01S01)

The Kempton Storm Channel is located north of the City's northerly boundary. It is a trapezoidal reinforced concrete channel varying in base width from 3 feet to 4.5 feet. It begins at Montecito Road, north of Oak Knoll Drive, extends southwesterly along Oak Knoll Drive, southerly between Chauser Road and Silver Fox Road, and westerly between Kempton Drive and Main Way, crosses Martha Ann Drive and the 405-605 interchange, and confluences with the Los Alamitos Storm Channel just south of the Rossmoor Retarding

Basin. At street crossings, the channel consists of reinforced concrete box culverts varying from 3.5 ft (W) x 4 ft (H) to double 6ft (W)x 6 ft (H). The Kempton Storm Channel has a total tributary area of 288 acres, most of which is located in the unincorporated Orange County area of Rossmoor. Only a portion of Rossmoor Center within the City boundaries drains into this County facility.

As recommended in the preliminary Project Report completed in April 1998, the Martha Ann Drive and Foster Drive box culverts have been enlarged to eliminate backwater conditions and to provide the design flood protection.

4-2.4 Montecito Storm Channel (OCFCD Facility No. C01S03)

The Montecito Storm Channel was constructed in the late 1950s to convey the peak runoff from a 10-year storm. It has a total tributary area of 650 acres, including the Bixby Storm Channel tributary area of 248 acres. It is a trapezoidal reinforced concrete channel with box culvert sections at the street and freeway crossings. It begins at Montecito Road, extends southwesterly between Salmon Drive and Copa De Oro Drive, crosses Foster Road, Martha Ann Drive, and the 405 Freeway, and confluences with the Los Alamitos Channel just south of College Park Drive.

It drains the portion of the unincorporated Rossmoor area south of Main Way Drive, as well as Rossmoor Center generally south of Rossmoor Center Way and a portion of College Park West within Seal Beach. The general description of the facility is as follows:

- San Diego Freeway Crossing – Double 8' (W) x 8' (H) Reinforced Concrete Box Culvert
- Between San Diego Freeway and Freeway East Ramp – Reinforced Concrete Trapezoidal Channel, 8' (BW) x 10' (H)
- San Diego Freeway East Ramp Crossing – 10' (W) x 8' (H) Reinforced Concrete Box Culvert
- Between San Diego Freeway East Ramp and San Diego Freeway West Ramp – Earthen Trapezoidal Channel, 8' (BW) x 10' (H)
- San Diego Freeway West Ramp Crossing – 10' (W) x 7' (H) Reinforced Concrete Box Culvert
- Between San Diego Freeway West Ramp and Los Alamitos Channel – Earthen Trapezoidal Channel, 8' (BW) x 10' (H)

The Preliminary Project Report determined that the improvements to the Los Alamitos Retarding Basin and the new Los Alamitos Pump Station will increase the efficiency of the Montecito Storm Channel; however, further improvements are necessary to alleviate flooding on the upstream reaches of the channel. The preliminary design report recommends lining the earthen channel from the Los Alamitos Channel confluence to the I-405 Ramp No. 10 and enlarging the Martha Ann Drive box culvert. If permitted, the report also recommends improving the I-405 Freeway ramp culverts.

4-2.5 Bixby Storm Channel (OCFCD Facility No. C01S04)

The Bixby Storm Channel, constructed in 1959, drains approximately 248 acres at its confluence with the Montecito Storm Channel. It begins at the intersection of Lampson Avenue and Seal Beach Boulevard and extends southwesterly and westerly paralleling Yellowtail Drive, then northwesterly paralleling Martha Ann Drive, confluencing with the Montecito Storm Channel between Copa De Oro Drive and Salmon Drive. It is a reinforced concrete trapezoidal channel with a base width of 3 feet and 1:1 side slopes. It has one reinforced

concrete box maintenance road crossing. The Preliminary Project Report prepared in 1998 determined that the Bixby Channel could not provide the design flood protection without the improvements recommended for the Montecito Storm Channel. Once those improvements are completed, Bixby Storm Channel will provide the design flood protection for its tributary area.

This facility primarily drains the Rossmoor Community, and the City of Los Alamitos area between Los Alamitos Boulevard and the Armed Forces Reserve Center south of Orangewood Avenue. It drains only a small area of the City of Seal Beach along Seal Beach Boulevard generally north of Lampson Avenue. The general description of the facility is as follows:

- From Seal Beach Boulevard to 437 feet West of Seal Beach Boulevard – 3' (BW) x 3.6' (H) Reinforced Concrete Trapezoidal Channel
- From 437 feet West of Seal Beach Boulevard to Silver Fox Road – 3' (BW) x 3.9' (H) Reinforced Concrete Trapezoidal Channel
- Between Silver Fox Road and West of the Old Ranch Parkway cul-de-sac – 3' (BW) x 4.2' (H) Reinforced Concrete Trapezoidal Channel
- Easement Access Crossing – 8' (W) x 5' (H) Reinforced Concrete Box
- Between the Easement Access Crossing and Druid Lane – 3' (W) x 4.3' (H) Reinforced Concrete Trapezoidal Channel
- Between Druid Lane and Brimhall Drive – 3' (BW) x 4.5' (H) Reinforced Concrete Trapezoidal Channel
- Between Brimhall Drive and Montecito Storm Channel – 3' (BW) x 4.6' (H) Reinforced Concrete Trapezoidal Channel

4-2.6 Federal Storm Channel (OCFCD Facility No. C01S06)

The Federal Storm Channel has a total tributary area of 2,345 acres. Approximately 40 percent of the total is in the Los Alamitos Joint Forces Training Center. The Old Ranch Golf Course 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. The Preliminary Project Report prepared in 1998 shows that the maximum 100-year expected value outflow from the Old Ranch Golf Course is 340 cfs. The report states that the 100-year expected value runoff was calculated using 25-year rainfall and AMC II loss rates. In 2003, the golf course was reconstructed to provide larger basin capacity to accommodate the increased storm runoff from the Old Ranch Town Center and Centex residential development. Based on the *Old Ranch County Club, Old Ranch Retarding Basin Hydrology and Flood Routing Calculations*, dated March 2003, the basin outflow discharge is reduced to 239 cfs for the 25-year storm event.

The outlet from the basin is a double 8 ft (W) x 5 ft (H) box culvert that extends below Lampson Avenue and the 405 Freeway.

The Federal Storm Channel starts at the outlet from the Old Ranch Golf Course Retarding Basin, on the south side of the San Diego Freeway. It was constructed in two phases between the Los Alamitos Retarding Basin and the 405 Freeway. Phase I was constructed in 1961 from Seal Beach Boulevard to the outlet. This section is a trapezoidal reinforced concrete channel with box culvert sections at the street crossings within Leisure World, and triple 96-inch diameter pipes at the railroad crossing just north of Westminster Avenue. Phase II was constructed in 1966 as an earthen trapezoidal channel with a base width of 12 feet. It parallels

the 405 Freeway, its south bound on-ramp at Seal Beach Boulevard, and Seal Beach Boulevard to its crossing. A general description of the facility is as follows:

- Between the San Diego Freeway (I-405) Box Culvert and Leisure World Retirement Community Gate Entrance on Seal Beach Boulevard – Earthen Trapezoidal Channel, 12' (BW) x 6' (H)
- Seal Beach Boulevard Crossing – Triple 8' (W) x 4' (H) Reinforced Concrete Box Culvert with a 4.8 feet drop on the downstream end of the crossing
- Between Seal Beach Boulevard and El Dorado Drive – Reinforced Concrete Trapezoidal Channel, 12' (BW) x 7' to 9.5' (H)
- Del Monte Drive Crossing – Double 8' (W) x 6.5' (H) Reinforced Concrete Box Culvert
- Burning Tree Lane Crossing – Double 8' (W) x 6.5' (H) Reinforced Concrete Box Culvert
- Saint Andrews Crossing – Double 8' (W) x 6.5' (H) Reinforced Concrete Box Culvert
- Cedar Crest Lane Crossing – Double 12' (W) x 7' (H) Reinforced Concrete Box Culvert
- El Dorado Drive Crossing – Double 10' (W) x 7' (H) Reinforced Concrete Box Culvert
- Between El Dorado Drive and Westminster Avenue – Reinforced Concrete Trapezoidal Channel, 7' (BW) x 9.5' (H)
- Railroad Crossing – Triple 96-inch Reinforced Concrete Pipe
- Westminster Avenue Bridge crossing
- Between Westminster Boulevard and Los Alamitos Channel – Earthen Trapezoidal Channel, 12' (BW) x 13' (H)

The Leisure World community experienced flooding during the January 5, 1995 storm due to the high water level (6.0 feet) in the Los Alamitos Retarding Basin.

The Preliminary Project Report determined that with the improvements to the Los Alamitos Retarding Basin and the new Los Alamitos Pump Station, the Federal Storm Channel will contain the expected value 100-year design discharge within the channel banks. In order to provide the freeboard requirements, the box culvert crossings at St. Andrews Drive and Burning Tree Lane will need to be replaced with clear span bridges. The preliminary Project Report recommended establishing the original channel section upstream of the Seal Beach Boulevard crossing.

4-2.7 Bolsa Chica Channel (OCFCD Facility No. C02)

Bolsa Chica Channel starts at the intersection of Cerritos Avenue and Valley View Street in the City of Cypress. It extends southerly paralleling Valley View Street to the Stanton Storm Channel (C02S01), turns southwesterly through Cypress and Los Alamitos (Naval Golf Course) territories, then southerly between Garden Grove to the east and Los Alamitos and Seal Beach to the west. It crosses the San Diego Freeway as a triple 12' (W) x 10' (H) RCB box, and extends further south confluencing first with the Anaheim-Barber City Channel (C03), then with the Westminster Channel (C04) just north of Edinger Avenue. The Westminster Channel extends west paralleling Edinger Avenue to its north, then turns southwesterly, outletting into Anaheim Bay.

Only a small portion of College Park East drains to the Bolsa Chica Channel north of the San Diego Freeway. A general description of the facility as obtained from the construction plans is shown below.

- Lampson Avenue crossing – 13 meters (W) x 2.6 meters (H) Reinforced Concrete Box Culvert
- Between Lampson Avenue crossing and Hazelnut Avenue – 13.5 meters (W) x 3.5 meters (H) Reinforced Concrete Rectangular Channel
- Between Hazelnut Avenue and I – 405/22 Interchange – 13.5 meters (W) x 3.35 meters (H) Reinforced Concrete Box
- I – 405/22 Interchange Crossing – Triple 12' (W) x 10' (H) Reinforced Concrete Box Culvert

4-2.8 Seal Beach Storm Drain (OCFCD Storm Facility No. C00P02)

This storm drain facility was constructed in two phases. The first phase was completed in 1971, and included the storm drain on Pacific Coast Highway west of Seal Beach Boulevard, and on Seal Beach Boulevard between Pacific Coast Highway and Electric Avenue, terminating at the Seal Beach Pump Station (OCFCD Facility No. C00PS1) located northeasterly of the Seal Beach Boulevard and Electric Avenue intersection. The second phase was extended in 1976 on Pacific Coast Highway from Seal Beach Boulevard to Balboa Drive and then northerly to Bolsa Avenue. A general description of the facility is as follows:

First Phase (1971)

- Seal Beach Boulevard, between Seal Beach Pump Station and Pacific Coast Highway (North) – 66-inch Reinforced Concrete Pipe
- Seal Beach Boulevard, between Seal Beach Pump Station and Electric Avenue (South) on – 54-inch Reinforced Concrete Pipe

Second Phase (1976)

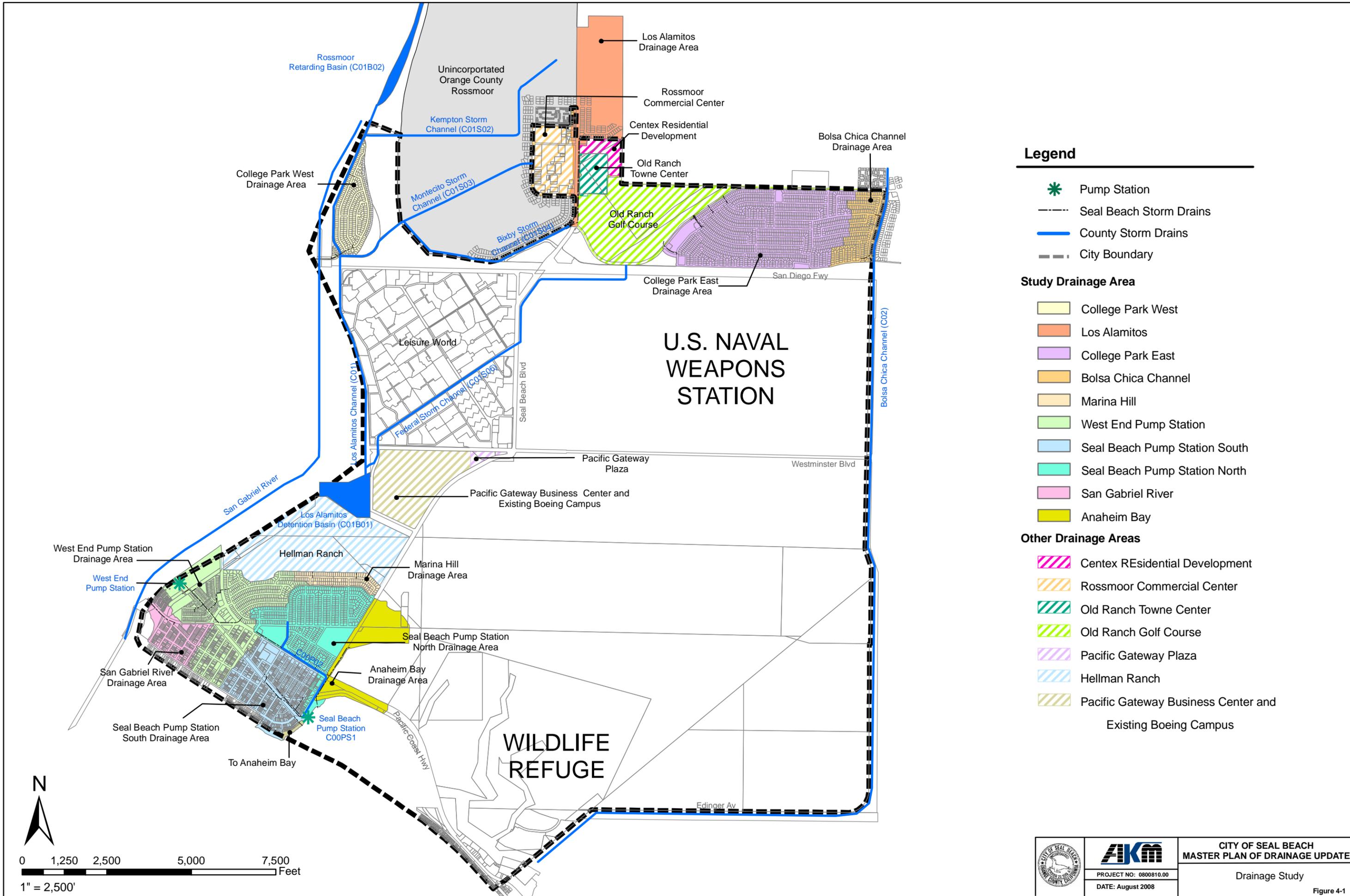
- Pacific Coast Highway, between west of Seal Beach Boulevard and Balboa Drive – 78-inch Reinforced Concrete Pipe
- Balboa Drive, between Pacific Coast Highway and Bolsa Ave – 54-inch Reinforced Concrete Pipe
- Balboa Drive, 50 foot extension from Bolsa Avenue – 54-inch Reinforced Concrete Pipe

4-2.9 Seal Beach Pump Station (OCFCD Facility No. C00PS1)

The Seal Beach Pump Station was constructed in 1971 with a capacity of 255 cfs, which was the calculated peak runoff from the design 10-year storm. It was upgraded in 1997 to its current capacity of approximately 381 cfs. Seal Beach Pump Station is described in detail in Section 8 of this report.

4-3 CITY DRAINAGE AREAS AND 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.



Legend

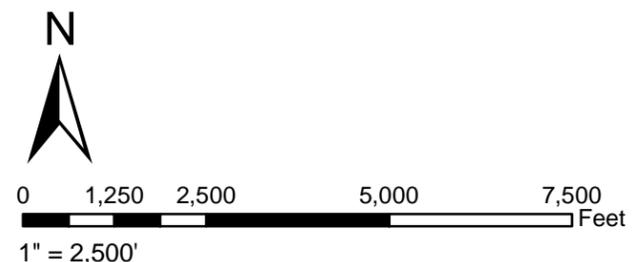
- Pump Station
- Seal Beach Storm Drains
- County Storm Drains
- City Boundary

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

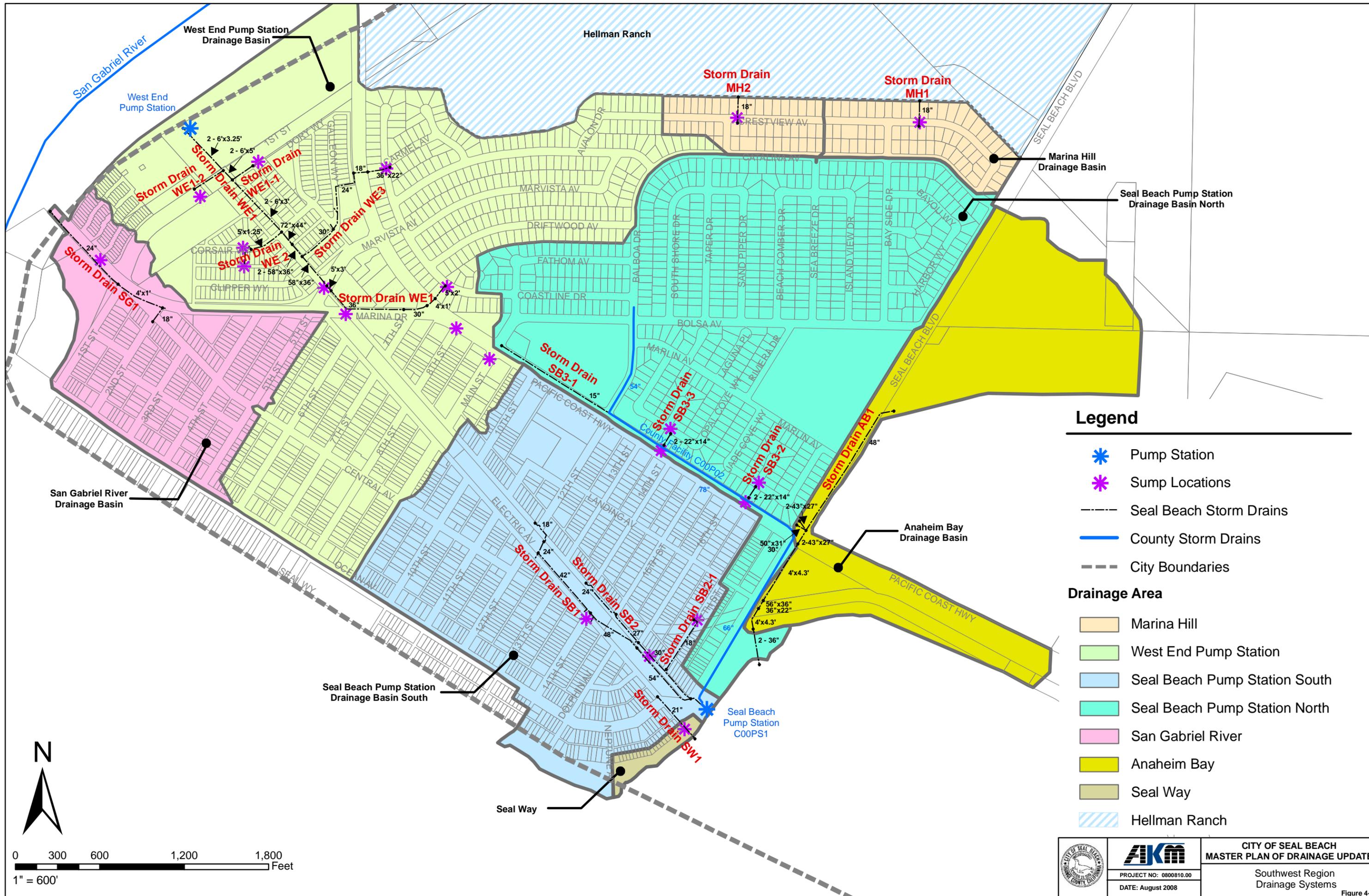
Other Drainage Areas

- Centex Residential Development
- Rossmoor Commercial Center
- Old Ranch Towne Center
- Old Ranch Golf Course
- Pacific Gateway Plaza
- Hellman Ranch
- Pacific Gateway Business Center and Existing Boeing Campus



		<p>CITY OF SEAL BEACH MASTER PLAN OF DRAINAGE UPDATE</p>
		<p>PROJECT NO: 0800810.00</p>
		<p>DATE: August 2008</p>

Drainage Study
Figure 4-1

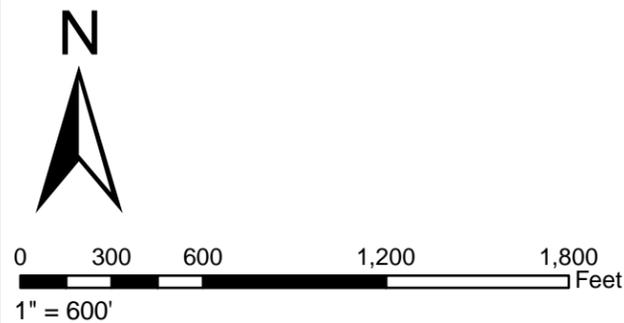


Legend

-  Pump Station
-  Sump Locations
-  Seal Beach Storm Drains
-  County Storm Drains
-  City Boundaries

Drainage Area

-  Marina Hill
-  West End Pump Station
-  Seal Beach Pump Station South
-  Seal Beach Pump Station North
-  San Gabriel River
-  Anaheim Bay
-  Seal Way
-  Hellman Ranch

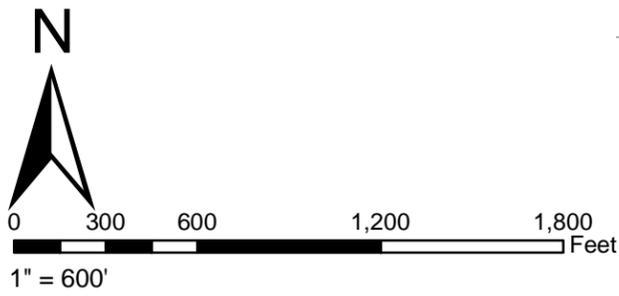
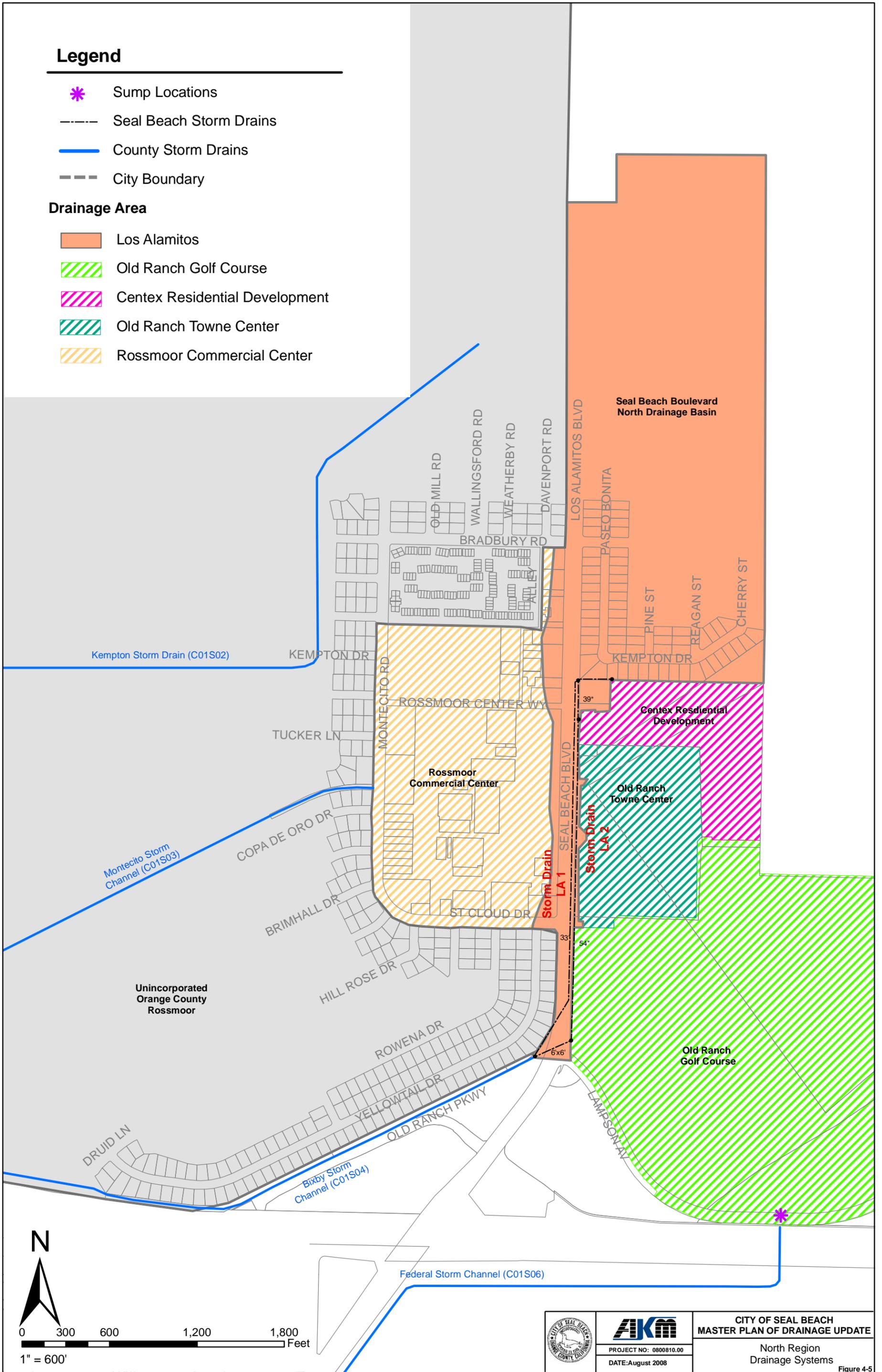


Legend

-  Sump Locations
-  Seal Beach Storm Drains
-  County Storm Drains
-  City Boundary

Drainage Area

-  Los Alamitos
-  Old Ranch Golf Course
-  Centex Residential Development
-  Old Ranch Towne Center
-  Rossmoor Commercial Center



	 PROJECT NO: 0800810.00 DATE: August 2008	CITY OF SEAL BEACH MASTER PLAN OF DRAINAGE UPDATE
		North Region Drainage Systems

Figure 4-5

Southwest Region Drainage Areas and Systems, shown on Figure 4-2, include the following drainage areas;

- Seal Way
- Seal Beach Pump Station South
- Seal Beach Pump Station North
- Marina Hill
- West End Pump Station
- San Gabriel River
- Anaheim Bay

Northeast Region Drainage Areas and Systems, shown on Figure 4-3, include the following drainage areas;

- Bolsa Chica Channel
- College Park East

Northwest Region Drainage System, illustrated on Figure 4-4, includes the College Park West drainage area.

Seal Beach Boulevard North Drainage Area and System, shown on Figure 4-5, includes the Los Alamitos and Seal Beach Boulevard drainage area.

4-3.1 Southwest Region Drainage Systems

4-3.1.1 Seal Way Drainage Area and Storm Drain System

The ultimate Seal Way drainage area is bounded by Neptune Avenue to the south, the alley between Ocean Avenue and Seal Way to the west, Electric Avenue to the north, and Anaheim Bay to the east. The 11 acres north of Seal Way, east of 14th Street, south of Ocean Avenue, and west of the alley between Seal Way and Ocean Avenue, is currently included in the Seal Way drainage area. However it is proposed to be diverted north to the Seal Beach Pump Station. The ultimate Seal Way drainage area consists of 4 acres of high density residential land use which is adjacent to the Pacific Ocean. This area has Soil Group B, which has moderate infiltration rates and moderate runoff potential.

This drainage area is characterized by mild slopes with ground surface elevations ranging from 10.9 feet amsl at the intersection of Neptune Avenue and Seal Way to 8.2 feet amsl at the intersection of Electric Avenue and Seal Way, which is a sump location.

The original drainage system serving the Seal Way Drainage Area and Seal Beach Pump Station South drainage area was on the south side of Electric Avenue. It was constructed in 1946, and discharged to Anaheim Bay. A second storm drain on Electric Avenue (north) was completed in 1960. Some of these systems were abandoned in place with subsequent construction projects. Of these original systems, the 15-inch diameter RCP Storm Drain SW-1 will remain intact to drain the ultimate Seal Way Drainage Area. This facility is described in Table 4-1 and shown on Figure 4-2.

**TABLE 4-1
ORIGINAL ELECTRIC AVENUE DRAINAGE SYSTEM**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope
Electric Avenue South (Directly to Anaheim Bay) (SW1)					
D-0020-B	Anaheim Bay	14th Street	1,200	21" Pipe	0.0015
D-0019-B	14th Street	West to the Alley	110	18" Pipe	0.0015
R-0744-A	Alley	13th Street	140	12" Pipe	0.0015
NOTE: Some of the existing drainage system may have been abandoned in place.					

4-3.1.2 Seal Beach Pump Station-South Drainage Area and Storm Drain System

The ultimate Seal Beach Pump Station-South Drainage Area is bounded by Pacific Coast Highway to the north, 17th Street and Anaheim Bay to the east, Ocean Avenue and Seal Way to the south, and Main Street to the west. An area of approximately 4 acres east of Main Street, from Central Avenue to Pacific Coast Highway, is proposed to be diverted to the west to the West End Pump Station Drainage Area. Conversely, 11 acres north of Seal Way, east of 14th Street, south of Ocean Avenue, and west of the alley between Seal Way and Ocean Avenue, is proposed to be diverted to the Seal Beach Pump Station-South Drainage Area. The ultimate drainage area is approximately 106 acres. It mainly consists of high density residential land use. The entire drainage area is Soil Group B, which has moderate infiltration rates and moderate runoff potential.

The ground surface elevations vary from 22.6 feet amsl at the intersection of Ocean Avenue and Main Street to 5.8 feet amsl at the intersection of Electric Avenue and 14th Street, which is a sump location.

The original drainage systems on Electric Avenue built in 1946 and 1960 were insufficient. After the completion of Seal Beach Pump Station and Seal Beach Storm Drain in 1971, the City constructed new storm drain systems in 1975, 1980 and 1986 on Electric Avenue (South & North) between Seal Beach Boulevard and 12th Street. These newer facilities were constructed to convey the runoff to the Seal Beach Pump Station where it is pumped into Anaheim Bay.

Runoff from the area west of 12th Street drains to Electric Avenue and 12th Street, where it is picked up by 18-inch and 24-inch drains and conveyed to the south side of Electric Avenue. This system, SB1, continues east as 42-inch, 48-inch, and 54-inch drains collecting the runoff from the area between Ocean Avenue and Electric Avenue. It terminates at the Seal Beach Pump Station.

The area between Pacific Coast Highway and westbound Electric Avenue (North) east of 12th Street drains to Electric Avenue North. A separate storm drain system, SB2, starts at 14th Street and extends east as a 24-inch, 27-inch, and 30-inch drain, collecting runoff at 15th, 16th, and 17th Streets. It confluences with Storm Drain SB1 at Seal Beach Boulevard. An 18-inch RCP drain, SB2-1, is located on 17th Street between the north side of the old railroad right of way and Electric Avenue. It was constructed to serve most of the area along 17th Street between Pacific Coast Highway and Electric Avenue.

The Table 4-2 describes these facilities. Figure 4-2 shows the existing system.

**TABLE 4-2
ELECTRIC AVENUE DRAINAGE SYSTEM**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope
Electric Avenue - North & South - To the Seal Beach Pump Station (SB 1)					
D-0304-A	OCFCD Pump Station Inlet Pipe Junction	16th Street	502	54" RCP	0.0102 & 0.002
D-0303-A	16th Street	14th Street	500	48" RCP	0.002
	14th Street	12th Street	508	42" RCP	0.002
D-0303-A	Electric Avenue and 12th Street		109	24" RCP	0.002
			31	18" RCP	0.002
D-0323-A			136	18" RCP	0.005
Electric Avenue - North - to the Seal Beach Pump Station (SB 2)					
D-0326-A	Seal Beach Boulevard	Electric Avenue/Seal Beach Boulevard	32	30" RCP	0.1519
	Electric Avenue/Seal Beach Boulevard	CB at Electric Ave/Seal Beach Blvd.	27		0.0174
D-0040-A	CB at Electric Ave/Seal Beach Blvd.	17th Street (East)	183	30" RCP	0.0016
	17th Street (East)	17th Street (West)	64		0.0012
	17th Street (West)	16th Street (East)	192		0.0016
	16th Street (East)	16th Street (West)	64	27" RCP	0.0012
	16th Street (West)	15th Street (East)	176		0.0016
	15th Street (East)	CB at 15th Street (East)/Electric Avenue	25		
	CB at 15th Street (East)/Electric Avenue	15th Street (West)	48	24" RCP	
	15th Street (West)	14th Street (East)	192		
14th Street (East)	14th Street (West)	62			
17th Street (SB2-1)					
D-0042-A	Electric Avenue	North of Old RR Right of Way	375	18" RCP	0.001

4-3.1.3 Seal Beach Pump Station-North Drainage Area and Storm Drain System

The Seal Beach Pump Station-North Drainage Area covers 145 acres. It is bounded by Catalina Avenue and Driftwood Avenue to the north, Seal Beach Boulevard to the east, Pacific Coast Highway and Electric Avenue to the south, and Coastline Drive and Balboa Avenue to the west. The primary land use is low density

residential with McGaugh Elementary School and commercial land uses along Pacific Coast Highway making up the remainder of the area. Most of the area is underlain by Soil Group D, with a thin strip of Soil Group B along Pacific Coast Highway.

This drainage area is characterized by moderate slopes with ground surface elevations ranging from 56.2 feet amsl at the intersection of Sea Breeze Drive and Catalina Avenue to 6.5 feet amsl at the Seal Beach Boulevard, north of Electric Avenue.

The Seal Beach Storm Drain, OCFCD Facility C00P02, located on Balboa Drive, Pacific Coast Highway, and Seal Beach Boulevard is the main storm drain that serves the Marina Hill community. The storm drain starts at the intersection of Bolsa Avenue and Balboa Drive and terminates at the Seal Beach Pump Station.

The runoff from Fathom Avenue, Coastline Drive, and portions of Bolsa Avenue are collected by Storm Drain SB3-1, which is a 15-inch RCP lateral to the Seal Beach Storm Drain. It extends westerly on Pacific Coast Highway from Balboa Drive to Bolsa Avenue.

There are two sumps in this drainage area. One is at the intersection of Emerald Cove Way and Emerald Place and the other at the intersection of Crystal Cove Way and Crystal Place. The runoff tributary to these sump areas is currently conveyed to the Seal Beach Storm Drain by Storm Drains SB3-2 and SB3-3, which are double 22-inch by 14-inch corrugated metal arch pipes located in easements.

Due to the flooding experienced along Seal Beach Boulevard south of Landing Avenue, the City constructed five catch basins and connector pipes in 2005 to convey the runoff to the Seal Beach Storm Drain. General descriptions of these connector pipes are shown in Table 4-3 below.

**TABLE 4-3
SEAL BEACH BOULEVARD CONNECTOR PIPE DRAINAGE SYSTEM**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope
Project No. 50202	@ C00P02 Sta. 9+76.11	10-Foot Catch Basin	37	18" RCP	0.111
	@ C00P02 Sta. 11+81.05	14-Foot Catch Basin	47	18" RCP	0.089
	@ C00P02 Sta. 13+47.72	14-Foot Catch Basin	37	18" RCP	0.111
	@ C00P02 Sta. 13+67.87	4 Grate Inlet	3	18" RCP	1.665
	@ C00P02 Sta. 14+61.08	4 Grate Inlet	3	18" RCP	1.632

The drainage facilities within the Seal Beach Pump Station Drainage Area-North are shown on Figure 4-2.

4-3.1.4 Marina Hill Drainage Area and Storm Drain System

The Marina Hill Drainage Area is bounded by Seal Beach Boulevard to the east, Catalina Avenue to the South, Avalon Drive to the West, and Gum Grove Park to the north. This drainage area consists of approximately 25 acres of low density residential land use, and is underlain by Soil Groups B, C, and D.

The ground surface elevations vary from 56.7 feet amsl along Crestview Avenue, between Crest Drive and Bayside Drive to 46.4 feet along Crestview Avenue, east of Bayside Drive.

The northern part of the Marina Hill community drains to two sump locations, both along Crestview Avenue. Two 18-inch RCP storm drains described in Table 4-4 and shown on Figure 4-2, convey the runoff northerly into Gum Grove Nature Park, where the runoff is conveyed westerly to the San Gabriel River via natural channels within the Hellman Property and the Haynes Steam Plant cooling channel.

**TABLE 4-4
MARINA HILL DRAINAGE SYSTEM**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope
Crestview Avenue (MH1)					
R-0656-R	Gum Grove National Park	North CB Crestview Avenue, 230' east of Bayside Drive	128	18" RCP	0.1691
	North CB Crestview Avenue, 230' east of Bayside Drive	South CB Crestview Avenue, 230' east of Bayside Drive	40	18" RCP	0.0181
Crestview Avenue (MH2)					
R-0656-R	Gum Grove National Park	North CB Crestview Avenue, 80' east of Crest Drive	128	18" RCP	0.2062
	North CB Crestview Avenue, 80' east of Crest Drive	South CB Crestview Avenue, 80' east of Crest Drive	37	18" RCP	0.015

4-3.1.5 West End Pump Station Drainage Area and Storm Drain System

Currently the West End Pump Station Drainage Area covers 175 acres in the Bridgeport, Marina Hill, and Old Town communities. This drainage area is generally bounded by Hellman Ranch to the north; Balboa Drive, Ebb Tide Place, Silver Shoals Avenue, and Main Street to the east; Ocean Avenue and Marina Drive to the south; and the San Gabriel River to the west. High density residential land use is found on the westerly and southerly portions of the drainage area, while a mix of low density residential, commercial, and recreational land uses make up the rest. Soil Groups B underlies most of the area south of Pacific Coast Highway, as well as a thin strip to the north. Soil Group D is found to the north of Soil Group B, and the westerly area along 1st Street is in Soil Group C.

The ground surface elevations range from 48.3 feet amsl along Crestview Avenue, east of Avalon Drive in the Marina Hill community to 7.1 feet amsl along Welcome Way, north of Cottonwood Lane.

The drainage systems that serve the Marina Hill area were constructed in 1956 at the two (2) sump locations along Coastline Drive at Carmel Avenue and near Driftwood Avenue. The system that drains the sump at Carmel Avenue, Storm Drain WE3, extends southwesterly through easements and across Pacific Coast Highway to Galleon Way. It continues southerly along Galleon Way to Storm Drain WE1 on Electric Avenue.

The system that drains the sump east of Driftwood Avenue, Storm Drain WE1, extends southerly through an easement and across Pacific Coast Highway to Marina Drive, then turns northwesterly on Electric Avenue to the West End Pump Station. Portions of this storm drain west of Corsair Way lie under existing structures.

Runoff at the two (2) local sump locations on 1st Street, north and south of Electric Avenue are conveyed to Storm Drain WE1 by Storm Drain WE1-1 and Storm Drain WE1-2 respectively. The West End Pump Station pumps the runoff into San Gabriel River. The West End Pump Station is discussed in detail in Section 8 of this report.

Storm Drain WE2 is located on Corsair Way southwesterly of Electric Avenue. It was constructed in 2005 to somewhat alleviate the local sump flooding at this location.

Table 4-5 describes the facilities serving the West End Pump Station Drainage Area. The existing drainage facilities are also illustrated on Figure 4-2.

**TABLE 4-5
WEST END PUMP STATION MAIN DRAINAGE SYSTEM**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope
Marina Drive Main Line Drainage System (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
-----	North R/W of First Street	South R/W of First Street	100	Double 6'(W) x 5'(H) RCB	0.001
D-0320-A	South R/W of First Street	Corsair Way	481	Double 6'(W) x 3'(H) RCB	0.0012
R-0436-A	Corsair Way	Alley Between Corsair Way and Galleon Way	158	72"(W) x 44"(H) CMPA	0.001
-----	Alley Between Corsair Way and Galleon Way	Galleon Way	70	Double 58"(W) x 36"(H) CMPA	0.001
R-0442-A	Galleon Way	Fifth Street (West R/W)	245	58"(W) x 36"(H) CMPA	0.0005
D-0332-A	Fifth Street (West R/W)	Fifth Street (East R/W)	77	5'(W) x 3'(H) RCB	0.0005
-----	Fifth Street (East R/W)	7th Street	460	36" RCP	-----
-----	7th Street	Pacific Coast Highway (South R/W)	285	30" RCP	-----
R-0145-A	Pacific Coast Highway (South R/W)	Pacific Coast Highway (North R/W)	75	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	0.0034
Corsair Way (WE2)					
Project 50203	Electric Avenue	Extended Westerly	180	5'(W) x 1.25'(H) RCB	0.0022
Galleon Way (WE 3)					
R-0443-A	Electric Avenue and Galleon Way	Gallen Way and Schooner Way	282	30" RCP	0.001
R-0445-A	Gallen Way and Schooner Way	Extend easterly in Galleon Way to Alley	305	24" RCP	0.0016
R-0446-A	Gallen Way at Alley	Alley Inlet on at PCH	168	24" RCP	0.009
D-0123R	Alley Inlet on at PCH	Across PCH to Catch Basin	74	18" CMP	0.0114
	PCH Catch Basin	Coastline Drive at Carmel Avenue	110	36" x 22" CMP	0.0055

4-3.1.6 San Gabriel River Drainage Area and Storm Drain System

The San Gabriel River Drainage Area is generally bounded by Marina Drive to the north, 5th Street to the east, Ocean Avenue to the south, and the San Gabriel River to the west. Currently this area drains by gravity to the storm drain facility on Marina Drive between 2nd Street and the San Gabriel River.

This drainage basin consists of 45 acres of high density residential land use and open space. The soils in the area are Soil Group B to the east of the 1st Street Alley, and Soil Group C to the west. The drainage area has a sump at the intersection of Marina Drive and 1st Street. Ground elevations vary from 24.4 feet amsl along Ocean Avenue to 7.9 feet amsl at the northwest corner of the 1st Street/Marina Drive intersection. The 100-year water surface elevation at San Gabriel River is approximately 10.5 feet amsl. Therefore, this area cannot be drained to San Gabriel River by gravity flow without ponding during a 100-year flood, or when the water level exceeds about 7 feet amsl in the San Gabriel River.

The San Gabriel River Drainage System (SG1) was built on Marina Drive in the 1970's. It extends from 2nd Street to the San Gabriel River. The general description of the facility is shown in Table 4-6. The drainage facility is shown on Figure 4-2.

**TABLE 4-6
SAN GABRIEL RIVER DRAINAGE SYSTEM**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope
MARINA DRIVE (SG 1)					
D-0018-A	San Gabriel River Outlet	1st Street	538	24" RCP	0.002
R-0744-A					
R-0749-A					
R-0744-A	1st Street	2nd Street	393	4'W x 1'H RCB	0.0018
R-0749-A	Marina Drive and 1st Street Intersection		110	18" RCP	-----

4-3.1.7 Anaheim Bay Drainage Area and Storm Drain System

The Anaheim Bay Drainage Area covers approximately 60 acres including Seal Beach Boulevard between Catalina Avenue and south of Landing Avenue; portions of Pacific Coast Highway east of Seal Beach Boulevard, and portions of the U.S. Naval Weapons Station. The area north of Marlin Avenue is underlain by Soil Group D, and the area to the south has Soil Group A and B. Elevations vary from 53.5 feet in the U.S. Naval Weapons Station property across Catalina Avenue to 8.1 feet also on U.S. Naval Weapons Station property south of Landing Avenue.

The runoff from the Anaheim Bay Drainage Area flows to the City drainage system on Seal Beach Boulevard. The storm drain begins south of Bolsa Avenue, and drains to the Anaheim Bay. At its north end, the runoff from the Seal Beach Naval Weapons Station property is collected in an open trapezoidal channel south of Pelorus Avenue and Flagstaff Court, which drains westerly to Seal Beach Boulevard. The drainage system extends southerly, crosses Pacific Coast Highway in a double corrugated metal arch pipe, continues southerly along the east side of Seal Beach Boulevard as an earthen trapezoidal channel, crosses the U.S. Naval Weapons Station driveway south of Landing Avenue as two CMPAs, and discharges into Anaheim Bay as two 36-inch RCPs. The general description of this system is provided in Table 4-7, and shown on Figure 4-2.

**TABLE 4-7
ANAHEIM BAY DRAINAGE SYSTEM**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope
Seal Beach Boulevard (AB1)					
D-2007	Anaheim Bay (Station 11+26.5)	Station 8+66.5	260	2-36" RCP	0.003
	Station 8+66.5	Station 7+09.5	157	4'(W)x 4.3'(H) Trap Earthen Ditch	0.002
	Station 7+09.5	Station 6+48.5	61	56"x36" CMPA and 36"x22" CMPA	0.002
D-0031A	Station 6+48.5	Station 5+30.5	464	4'(W)x 4.3'(H) Trap Earthen Ditch	0.002
	Station 5+30.5	Pacific Coast Highway	118	2-43"x27" CMP	0.002
	Northeast corner of Pacific Coast Hwy and Seal Beach Blvd	North west corner of Pacific Coast Hwy and Seal Beach Blvd	95	2-43"x27" CMPA	----
	Northeast corner of Pacific Coast Hwy and Seal Beach Blvd	North west corner of Pacific Coast Hwy and Seal Beach Blvd	90	50"x31" CMPA and 30" RCP	----
-----	Pacific Coast Highway	North of Marlin Avenue	1050	24" RCP	-----

4-3.2 Northeast Region Drainage System

4-3.2.1 Bolsa Chica Channel Drainage Area and Storm Drain System

The Bolsa Chica Channel Drainage Area covers 35 acres of low density residential land use. It borders the City of Los Alamitos to the north, Primrose Circle and Sunflower Street to the west, the 405 Freeway to the south, and the City of Garden Grove to the east. Elevations vary from 25.4 feet amsl at Lampson Avenue, west of Tulip Street to 21.3 feet amsl at the southerly cul-de-sac on Wisteria Street. This area has a combination of Soil Group B and C. It drains easterly into the Bolsa Chica Channel, OCFCD Facility No. C02 through two existing storm drains.

The southerly storm drain, BC1, conveys the runoff from the sump located at Violet Street and Wisteria Street to the Bolsa Chica Channel. The northerly drainage facility, BC2, conveys the runoff from the sump at Fir Avenue and Wisteria Street to the Bolsa Chica Channel. The general descriptions of these facilities are listed in Table 4-8, and shown on Figure 4-3.

**TABLE 4-8
BOLSA CHICA CHANNEL DRAINAGE SYSTEM**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope
North of Almond Avenue (BC1)					
TR-6416	Bolsa Chica Channel	Wisteria Street	103	30" RCP	0.0092
	Wisteria Street	Violet Street, 100' North of Almond Avenue	314	30" RCP	0.004
Fir Avenue (BC2)					
TR-5961	Bolsa Chica Channel	Wisteria Street, east catch basin	130	24" RCP	0.02303
	Wisteria Street, east catch basin	Wisteria Street, west catch basin	49	18" RCP	0.0051

4-3.2.2 College Park East Drainage Area and Storm Drain System

The College Park East Drainage Area covers 240 acres of primarily low density residential land use. It borders the City of Los Alamitos to the north, Old Ranch Golf Course to the west, the 405 Freeway to the south, and Primrose Circle and Sunflower Street to the east. The area is underlain by Soil Groups B and C. Elevations vary from 52.4 feet amsl at Lampson Avenue, west of Tulip Street, to 15.1 feet amsl at Basswood Street between Lampson Avenue and Aster Street. This area drains westerly to the Bixby Old Ranch Golf Course, which serves as a flood control retarding basin. Recent construction in 2003 provided greater storage capacity in the golf course to accommodate the additional runoff generated by the Old Ranch Town Center and Centex Homes projects. The basin capacity was increased to contain the 100-year high confidence storm runoff from its tributary area, without impacting the capacity of the downstream Federal Storm Channel (C01S06). Detailed information regarding the basin study can be found in the *"Old Ranch Country Club, Old Ranch Retarding Basin Hydrology and Flood Routing Calculations"*.

There are four existing storm drain systems that serve the College Park East Drainage area. Storm Drain CPE1 collects the runoff at Ironwood Avenue and Guava Avenue, extends northwesterly through an easement between two houses, and across Lampson Avenue, terminating at the Old Ranch Golf Course.

Storm Drain CPE2 collects the runoff at Ironwood Avenue and Elder Avenue, extends northwesterly through an easement between two houses, and across Lampson Avenue, and discharges into Old Ranch Golf Course.

Storm Drains CPE3-1, CPE3-2, and CPE3-3 collect the runoff at Ironwood Avenue and Candleberry Avenue, extend northwesterly across Lampson Avenue, and discharge into Old Ranch Golf Course.

Storm Drain CPE4 extends westerly on Basswood Street from Aster Street and across Lampson Avenue to Old Ranch Golf Course.

Table 4-9 describes the existing storm drains in the College Park East Drainage Area. They are illustrated on Figure 4-3.

**TABLE 4-9
COLLEGE PARK EAST DRAINAGE SYSTEM**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope	
Guava Avenue Storm Drain (CPE 1)						
D-0068-A	Bixby Old Ranch Golf Course, Sta. 0+00	Sta. 2+37	237	36" RCP	0.0005	
	Sta. 0+00	Sta. 0+66	66	24" RCP		
	Sta. 0+00	Sta. 0+84	84	24" RCP		
Elder Avenue Storm Drain (CPE 2)						
D-0069-A	Bixby Old Ranch Golf Course, Sta. 0+00	Sta. 2+06	206	36" RCP	0.0005	
	Sta. 0+00	Sta. 0+81	81	24" RCP		
	Sta. 0+00	Sta. 0+76	76	24" RCP		
Candleberry Avenue Storm Drain (CPE 3-1)						
Project No. 50204	Bixby Old Ranch Golf Course, Sta. 10+00	Sta. 10+54	54	Double 5'(W) x 3'(H) RCB	0.001	
Candleberry Avenue Storm Drain (CPE 3-2)						
D-0070-A	Bixby Old Ranch Golf Course, Sta. 0+00	Sta. 3+27	327	33" RCP	0.0005	
	Sta. 3+27	Sta. 4+19	92	3'-4"(W) x 1'-9" (H) RCB		
	Sta. 0+00	Sta. 0+68	68	21" RCP		
	Lateral at Candelberry Avenue and Aster Street (North)					
		Sta. 0+00	Sta. 0+42	42	18" RCP	0.00076
	Lateral at Candelberry Avenue and Aster Street (South)					
		Sta. 0+00	Sta. 0+52	52	18" RCP	0.0006
Candleberry Avenue Storm Drain (CPE 3-3)						
-----	Bixby Old Ranch Golf Course, Sta. 0+00	Aster Street, Sta. 4+24	424	3'-4"(W) x 1'-9" (H) RCB	-----	
	Aster Street (West)	Aster Street (East)	41	Double 18" RCP	-----	
	Lateral on Lampson Avenue					
	Candleberry Avenue, Sta. 0+00	Lampson Avenue, Sta. 1+55	155	18" RCP	-----	
Basswood Street Storm Drain (CPE 4)						
D-0067-A	Bixby Old Ranch Golf Course, Sta. 0+00	Sta. 0+31	31	30" RCP	0.0005	
	Sta. 0+31	Sta. 1+20	89	2 - 21" RCP		
	Sta. 1+20	Sta. 5+61	441	3'-4"(W) x 1'-9"(H) RCB		

4-3.3 Seal Beach Boulevard North Drainage Area

4-3.3.1 College Park West Drainage Area and Storm Drain System

The College Park West Drainage Area covers 52 acres of low density residential land use bounded by the San Diego Freeway (I-405) to the east, Garden Grove Freeway (S-22) to the south, and the Los Alamitos Storm Channel to the west. The area is underlain entirely by Soil Group C. Elevations vary from 12.9 feet amsl at College Park Drive between Harvard Lane and Stanford Lane to 7.2 feet amsl at College Park Drive and Stanford Lane.

The storm runoff is intercepted at two sump locations. One of these is at the intersection of Harvard Lane and College Park Drive. Storm Drain CPW1 collects the runoff at two catch basins, one on either side of Harvard Lane, extends westerly through an easement and terminates at the Los Alamitos Channel. The second sump, located at the intersection of Stanford Lane and College Park Drive, is drained by Storm Drain CPW2. The runoff at this intersection is collected by three 8-foot wide catch basins and conveyed to the mainline drain on College Park Drive. It extends westerly and discharges into the Los Alamitos Channel. The third storm drain facility, CPW3, is located on College Park Drive on the west side of Los Alamitos Channel. It extends from the south east corner of Edison Park easterly to Los Alamitos Channel. The general description of these facilities is shown in Table 4-10, and the storm drains are illustrated on Figure 4-4.

**TABLE 4-10
COLLEGE PARK WEST DRAINAGE SYSTEM (CPW1-CPW3)**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope
Harvard Lane Storm Drain (CPW 1)					
R-0562-A	Los Alamitos Channel, Sta. 0+14	Sta. 1+42	128	30" RCP	0.024
	Sta. 1+42	Sta. 1+91	29	18" RCP	0.002
College Park Drive Storm Drain (CPW 2)					
R-0562-A	Los Alamitos Channel, Sta. 0+10	Sta. 4+12	402	36" RCP	0.001
	Sta. 4+12	Sta. 4+69	57	30" RCP	0.002
	Sta. 4+69	Sta. 5+09	40	24" RCP	0.0054
College Park Drive Storm Drain (CW 2-1)					
R-0000-A	Sta. 4+12	Sta. 4+56	44	24" RCP	0.002
College Park Drive Storm Drain (CPW 3)					
R-0563-A	Los Alamitos Channel, Sta. 0+10	Sta. 1+05	95	24" RCP	0.0326
	Sta. 1+05	Sta. 3+29	224	18" RCP	0.00935

4-3.4 North Region Drainage System

4-3.4.1 Los Alamitos Drainage Area and Storm Drain System

The Los Alamitos Drainage Area covers approximately 121 acres of low density residential land use within the City of Los Alamitos boundaries. This area is bounded by Orangewood Avenue to the north, the Armed Forces Reserve Center, the Old Ranch Towne Center, and the Old Ranch Golf Course to the east, Lampson

Avenue and Kempton Drive to the south, and Los Alamitos Boulevard and the Rossmoor Commercial Center to the west. It also includes 13 acres within Seal Beach consisting of Seal Beach Boulevard and some of the adjacent areas between the northerly City Boundary and south of Lampson Avenue. Elevations vary from 20 feet amsl at the La Colmena Way east cul-de-sac to 14.3 feet amsl on Seal Beach Boulevard, between Saint Cloud Drive and Lampson Avenue. This drainage area is entirely in Soil Group C.

Although a great majority of the drainage area lies outside the City boundary, the drainage facilities run through Seal Beach along Seal Beach Boulevard from south of Kempton Drive to the Bixby Storm Channel. There are two storm drains within the City of Seal Beach boundaries. Both start at the downstream end of an open channel that extends along the Seal Beach-Los Alamitos boundary south of Kempton Drive. The first one, Storm Drain LA1, is a 33 inch RCP. It extends southerly from the open channel to about 400 feet north of Lampson Avenue on the east side of Seal Beach Boulevard, then crosses Seal Beach Boulevard to the west, and continues southwesterly, and terminates at the Bixby Storm Channel.

The second storm drain, LA2, was constructed in 1973. It starts as a 39-inch drain, extending south on Seal Beach Boulevard to the east of LA1. It increases to 54-inch diameter just south of Rossmoor Center Way, and continues to north of Lampson Avenue, where it discharges into a 6' (W) x 6' (H) RCB. This facility extends west, crossing Seal Beach Boulevard, and terminates at the beginning of the Bixby Storm Channel.

The general description of the existing storm drains is shown in Table 4-11, and the storm drains are illustrated on Figure 4-5.

**TABLE 4-11
LOS ALAMITOS DRAINAGE SYSTEM**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope
Seal Beach Boulevard (LA1)					
-----	Bixby Storm Channel	Rossmoor Center Way	2,500	33" RCP	-----
Seal Beach Boulevard (LA2)					
D-0227A	Bixby Storm Channel	Lampson Avenue	150	6'x6' RCB	-----
	Lampson Avenue	South of Rossmoor Center Way	2,308	54" RCP	0.001
	South of Rossmoor Center Way	Rossmoor Senter Way	254	33" RCP	-----

4-4 OTHER DRAINAGE AREAS

With the exception of the Boeing Integrated Defense Systems, the following drainage boundaries do not have storm drains owned or operated by the City of Seal Beach. These drainage facilities are privately owned; therefore, a detailed analysis is not included in the scope of this master plan study.

4-4.1 The Leisure World Retirement Community

The Leisure World Retirement Community is a privately owned association property. The association operates and maintains the entire drainage system. The runoff within this community is drained to either the Federal Storm Channel (C01S06) or the Los Alamitos Channel (C01).

4-4.2 Rossmoor Center

The Rossmoor Center is bounded by Seal Beach Boulevard to the east, St. Cloud Drive to the South, Montecito Road to the west, and Bradbury Road and Rossmoor Center Way to the north. This commercial area drains to the Montecito Storm Channel at Montecito Road and Copa De Oro, via private storm drains.

4-4.3 Old Ranch Towne Center

The Old Ranch Towne Center is bounded by the Armed Force Reserve Center to the east, the Bixby Ranch Golf Course to the South, Seal Beach Boulevard to the west, and Plymouth Drive to the north. This area drains by private facilities to the detention basins in the Old Ranch Golf Course. For more information, see *Hydrology Map, Kitchell Development Company, by SLS Associates, Inc.*

4-4.4 Centex Residential Development

The Centex Residential Development is bound by the City of Los Alamitos to the north, The Armed Force Reserve Center to the east, Plymouth Drive to the south, and Seal Beach Boulevard to the west. This area drains southeasterly to a desilting basin before it outlets to the Old Ranch Golf Course Retarding Basin. For more information, see *Hydrology Map, for Centex Homes, by Hunsaker & Associates, Inc.*

4-4.5 Old Ranch Golf Course

To accommodate higher flows due to new development, the Bixby Ranch Company increased the storage volume within the Old Ranch Golf Course. The new developments include the Old Ranch Towne Center north of the Golf Course and east of Seal Beach Boulevard, as well as the Centex Residential Development, located north of Plymouth Drive and east of Seal Beach Boulevard. The improvements to the Old Ranch Golf Course are shown in the *Old Ranch Country Club, Lampson Swale Hydraulic Calculations Report (Inclon Kirk Engineers, April 4, 2003)*.

4-4.6 Hellman Ranch

A small portion of the Hellman Ranch property, Tract No. 15402, was developed in 2004 as a gated residential community. The drainage system constructed for this association begins at the southbound curb of Seal Beach Boulevard on the north side of Heron Pointe Road. It conveys the runoff northerly through the residential community to an on-site water quality basin.

4-4.7 Boeing Integrated Defense Systems

In general, the Boeing property is privately owned under several ownerships. The area east of the Los Alamitos Retarding Basin and west of Apollo Drive has been recently developed as the Pacific Gateway Business Center. The drainage facilities are owned and operated by the City, and they convey the runoff westerly toward the Los Alamitos Retarding Basin via three (3) outlets points. For details regarding the drainage system, see the *Pacific Gateway Business Center, Tract No. 16375 (Project No SP4394F)* and the *Storm Water Pollution Prevention Plan (Fuscoe, 2005)*. Table 4-12 describes these facilities.

**TABLE 4-12
PACIFIC GATEWAY BUSINESS CENTER DRAINAGE SYSTEM**

City Plan ID	Downstream Location	Upstream Location	Length (feet)	Existing Facility	Slope
Storm Drain No. 1					
Project No. SP4394F	Los Alamitos Retarding Basin, Sta. 0+44	Sta. 13+53	1,309	48" RCP	0.0019
	Sta. 13+53	Sta. 15+20	167	42" RCP	0.0027
Storm Drain No. 2					
Project No. SP4394F	Los Alamitos Retarding Basin, Sta. 0+30	Sta. 3+25	295	5'(W) x 3'(H) RCB	0.0015
	Sta. 3+25	Sta. 7+89	464	5'(W) x 2'(H) RCB	0.0015
	Sta. 7+89	Sta. 8+24	35	30" RCP	0.0074
	Sta. 8+24	Sta. 11+19	295	19" x 30" RCPA	0.0015
Storm Drain No. 2 - Lateral B					
Project No. SP4394F	Sta. 1+00	Sta. 2+18	118	24" RCP	0.0029
	Sta. 2+18	Sta. 4+46	228	21" RCP	0.002
Storm Drain No. 2 - Lateral D					
Project No. SP4394F	Sta. 1+00	Sta. 1+14	14	18" RCP	0.0207
Storm Drain No. 2 - Lateral E					
Project No. SP4394F	Sta. 1+00	Sta. 3+16	216	24" RCP	0.0037
	Sta. 3+16	Sta. 4+59	143	18" RCP	0.002
Storm Drain No. 2 - Lateral F					
Project No.	Sta. 1+00	Sta. 1+36	36	18" RCP	0.024
Storm Drain No. 2 - Lateral G					
Project No. SP4394F	Sta. 1+00	Sta. 6+86	365	24" RCP	0.0028
	Sta. 6+86	Sta. 7+96	110	18" RCP	0.0028
Storm Drain No. 3					
Project No. SP4394F	Los Alamitos Retarding Basin, Sta. 0+00	Sta. 1+13	113	4'(W) x 2'(H) RCB	0.0022
	Sta. 1+13	Sta. 4+67	354	36" RCP	0.0019
	Sta. 4+67	Sta. 7+98	331	39" RCP	0.0026
	Sta. 7+98	Sta. 8+43	45	29" x 45" RCPA	0.0026
Storm Drain No. 4					
Project No. SP4394F	Los Alamitos Retarding Basin, Sta. 0+00	Sta. 0+88	88	48" RCP	0.0017
	Sta. 0+88	Sta. 4+10	322	42" RCP	0.0017
	Sta. 4+10	Sta. 7+92	382	36" RCP	0.0017
	Sta. 7+92	Sta. 8+43	51	30" RCP	0.0017
Storm Drain No. 5					
Project No. SP4394F	Los Alamitos Retarding Basin, Sta. 0+00	Sta. 0+28	28	48" RCP	0.0014
	Sta. 0+28	Sta. 5+18	490	5'(W) x 3'(H) RCB	0.0014
	Sta. 5+18	Sta. 6+97	179	42" RCP	0.0014
	Sta. 6+97	Sta. 9+56	259	36" RCP	0.0014
	Sta. 9+56	Sta. 10+58	102	33" RCP	0.0012
	Sta. 10+58	Sta. 10+82	24	24" RCP	0.23
Storm Drain No. 6					
Project No. SP4394F	Los Alamitos Retarding Basin, Sta. 0+00	Sta. 2+32	232	29" x 45" RCPA	0.0026
	Sta. 2+32	Sta. 2+41	9	18" RCP	0.01

The area south of Westminster Avenue, west of Seal Beach Boulevard, and east of the Boeing Campus has also been recently developed (Pacific Gateway Plaza). According to the Pacific Gateway Plaza, Lots, 17-20 Tract Map No. 16375 Precise Grading Plan, the northern portions of the Boeing tributary area will be conveyed west toward the Los Alamitos Retarding Basin. Portions of the southerly area will be conveyed northeast along Seal Beach Boulevard where it will discharge into a 3.7'(W) x 3'(H) trapezoidal channel on the U.S. Naval Weapons Station property.

A 4.5 acre development on the Boeing property north of Adolpho Lopez Drive is planned for 87 townhomes, See *The Initial Study/Mitigated Negative Declaration (RBF Consulting, 2007)* for further details.

4-4.8 US Naval Weapons Station

U.S. Naval Weapons Station area is operated by the U.S. Navy, which owns and maintains the drainage system for the majority of the station. A portion of the U.S. Naval Weapons Station is a part of the Anaheim Bay tributary area, as described in Section 2-1.

4-4.9 Anaheim Bay

Anaheim Bay is operated under the U.S. Navy with jetties and an inner harbor constructed to protect the area. There are no City drainage systems located in this community.

4-4.10 The Seal Beach National Wildlife Refuge

The Seal Beach National Wildlife Refuge is south of the U.S. Naval Weapons Station as an extension of the Anaheim Bay natural habitat. There are no City drainage systems located in this area.

4-4.11 Sunset Aquatic Park

Sunset Aquatic Park is located in the center of the Seal Beach National Wildlife Refuge. The surface sheet flow drains either directly into the natural habitat area or the OCFCD Facility No. C02, Bolsa Chica Channel. There are no City drainage systems located in this community.

4-4.12 Surfside

The Surfside Community is located on the east side of Anaheim Bay, south of Pacific Coast Highway, and west of the City of Huntington Beach. The drainage systems in this community consist of several 18-inch RCP local sump drains with basin inlets on Pacific Coast Highway. This community drains southerly to the Pacific Ocean.

4-4.13 Los Alamitos

The City of Los Alamitos contributes runoff to the City's drainage system at Seal Beach Boulevard. This area is described in Section 4-3.4