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Ballona Wetlands
Existing Conditions Report

Prepared for

State Coastal Conservancy

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with

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1. INTRODUCTION

The Ballona Wetlands is an ecological treasure within urban Los Angeles County. The project area includes 600 acres of open space, including coastal wetlands and adjacent habitat. It is estimated that coastal wetlands in Los Angeles County have been reduced by 96% compared with pre-development conditions (Hendrickson, 1991a). The Ballona Wetlands is the largest wetland restoration project in Los Angeles County and offers an important opportunity to help restore regionally limited habitats while also providing opportunities for the public to experience these environments.

1.1 BALLONA WETLANDS PROJECT AREA

The Ballona Wetlands Project Area includes 600 acres owned by the State of California: 540 acres owned by the California Department of Fish and Game (CDFG); and 60 acres owned by the State Lands Commission (SLC), including the 24 acre Freshwater Marsh. A portion of the site is in unincorporated Los Angeles County and the rest is in the City of Los Angeles. As discussed in this report, the Ballona Wetlands once occupied approximately 2000 acres, extending northwards from the bluffs. Remnant areas of that wetland complex include Del Rey Lagoon, Ballona Lagoon, Marina Del Rey, and the Venice Canals. These areas are not the primary focus of the restoration planning effort, but are considered in this report to give a landscape context.

In previous studies, part of the wetlands have been divided into three areas designated as Areas A, B, and C as shown in Figure 1-1. This nomenclature will be continued to allow cross-reference with previous work. A description of each of these areas is provided below.

1.1.1 Area A

Area A is approximately 139 acres in size and lies north of Ballona Creek, west of Lincoln Boulevard and south of Fiji Way. Elevations range between approximately nine and 17 feet relative to mean sea level (MSL); fill was placed on Area A during the excavations of Ballona Creek and Marina Del Rey. Area A is undeveloped with the exception of a parking area along the western boundary and a drainage channel along the northern boundary. In addition, the Gas Company currently maintains four monitoring well sites in the western end of this area.

1.1.2 Area B

Area B, approximately 338 acres in size, lies south of Ballona Creek and west of Lincoln Boulevard. Area B extends south to Cabora Drive, a utility access road near the base of the Playa Del Rey Bluffs. To the west, Area B extends into the dunes that border homes along Vista Del Mar. Elevations across Area B range between approximately two and five feet MSL in the lower flat portions, and up to 50 feet MSL below the Del Rey Bluffs. Area B contains the largest area of remnant unfilled wetlands with abandoned agricultural lands to the southwest, and the Freshwater Marsh to the northeast. The Gas Company has easements for oil wells, one of which is active, and supporting access routes in Area B.

1.1.3 Area C

Area C is north of Ballona Creek and east of Lincoln Boulevard in the City of Los Angeles. The Marina Freeway forms the northeastern border of Area C. The area is approximately 66 acres in size and is traversed in an east-west direction by Culver Boulevard. Area C contains fill from the construction of the Ballona Creek flood control channel, and developments such as Marina Del Rey, the Pacific Electric Railroad, the raising of Culver Boulevard and the Marina Freeway. Elevations within Area C range from approximately 4.5 to 25 feet MSL. Area C is mostly undeveloped with the exception of the ball fields and supporting minor structures.

1.1.4 Freshwater Marsh

The Freshwater Marsh is located west of Lincoln Boulevard, and south of Jefferson Boulevard, adjacent to Area B in the City of Los Angeles. The Freshwater Marsh was constructed between 2001 and 2003. The Freshwater Marsh treats urban runoff and stormwater from the Playa Vista development (central inlet) and from Jefferson Boulevard (Jefferson inlet). It is operated and managed by the Ballona Wetlands Conservancy, a non-profit organization established for that purpose. A riparian corridor east of Lincoln Boulevard and outside of the project area is currently being constructed that will connect to the southern end of the Freshwater Marsh

1.1.5 Ballona Creek

CDFG owns the part of Ballona Creek that flows through the project area. The channel is trapezoidal, with bottom widths varying from 80 to 200 feet and depths varying from 19 to 23 feet from the top of the levee. The side slopes are lined with concrete, paving stones and riprap; the channel bottom is not armored.

1.2 BALLONA WETLANDS RESTORATION PLAN

The State Coastal Conservancy, Department of Fish and Game and the State Lands Commission are working with a wide range of stakeholders to develop a restoration plan for the Ballona Wetlands Project Area. The goals of the plan are to:

> 1. Restore, enhance, and create estuarine habitat and processes in the Ballona Ecosystem to support a natural range of habitats and functions, especially as related to estuarine dependent plants and animal**s**.
>
> 2. Create opportunities for aesthetic, cultural, recreation, research and educational use of the Ballona Ecosystem that are compatible with the environmentally sensitive resources of the area.

PWA has been hired as a technical consultant to assist in the development of the Ballona Wetlands Restoration Plan. Working with the state agencies and all other stakeholders, PWA will help to:

- Characterize the existing conditions within the project area;
- Identify potential restoration alternatives based on the opportunities and constraints; and
- Develop a conceptual restoration plan.

The final product will be a conceptual restoration plan that achieves the project goals.

1.3 PURPOSE OF THIS REPORT

This report is a summary and synthesis of existing information about the project area. Historical conditions are considered to provide a baseline for understanding how the site has changed through time. Information that is not relevant to producing a conceptual restoration plan is not necessarily considered at this time. Some information will have to be gathered later for environmental review and permitting purposes as well as for detailed technical investigations necessary to move toward implementation of the restoration plan. The topic areas included in this report are:

- Regional and historic context
- Physical setting (soils and substrate, topography and bathymetry, hydrology)
- Biological resources (habitats and vegetation, invertebrates, fish, reptiles and amphibians, mammals, birds, sensitive/endangered species, invasive and nuisance species)
- Cultural resources
- Water and sediment quality (chemistry, toxicity)
- Land use (utilities, easements, access)
- Public access and recreation
- Transportation and circulation (traffic, bicycles, pedestrians)
- Regulatory framework

The information presented in this report will be used to evaluate site specific opportunities and constraints to achieve the project goals and objectives, such as where and how the site conditions support or constrain attainment of the project goals. Based on this analysis, it will be possible to identify potential restoration actions and to refine the project objectives. This process will be used to develop restoration options that will be analyzed for feasibility and developed into conceptual restoration alternatives.

1.4 REPORT SUMMARY

Physical Setting

Ballona Wetlands developed during the post-glacial rise in sea-level, from around 7,000 years ago. Before human development the lowland areas comprised a back-barrier lagoon with large areas of fringing saltmarsh. Post-colonization, the wetlands were progressively land-claimed by straightening of channels, construction of infrastructure and development of oil and gas fields. Dredged spoil from the excavation of Marina Del Rey raised the land surface elevation to above 15 feet MSL in places.

The project area is divided into Areas A, B and C. Area A occupies 139 acres to the north of Ballona Creek, bounded by Marina Del Rey to the west. This entire area has been filled with dredged materials to elevations up to 18 feet MSL and is drained by Marina Ditch at its northern boundary. Area B covers 338 acres to the south of Ballona Creek and is bounded to the south by Del Rey Bluffs. Much of this area remains unfilled and, with the exception of areas around oil and gas platforms, the ground surface represents the original marsh surface. The area is drained by a series of channel networks connected to tide gates at the Ballona Creek southern levee. Area B is dissected by several major roads and drainage bypasses these through a series of culverts. Area C occupies 66 acres and lies to the east of Area A. It has been filled to high levels by dredged materials, particularly in its southern part.

Biological Resources

A compendium of all wetland and upland vascular plants describes over 170 species present within Ballona Wetlands (Areas A, B, C), Del Rey Lagoon, Ballona Lagoon, Marina Del Rey, and Ballona Creek. Common species on the saltmarshes include pickleweed (*Sarcocornia pacifica* syn: *Salicornia virginica*) with sub-ordinate salt grass (*Distichlis spicata*) and alkali heath (*Frankenia salina*). Saltmarsh vegetation is present in Areas A, B, and C, though most of the saltmarsh habitat in Areas A and C is non-tidal. The Freshwater Marsh is dominated by cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.). Other freshwater habitat includes willow scrub in riparian corridors near to freshwater sources. Coastal dunes occur at the western end of Area B and comprise a mixture of pioneer and scrub-dominated dune habitat. Ballona Wetlands supports several special-status plant species.

Approximately 44 species of fish inhabit Ballona Wetlands, Ballona Creek and Marina Del Rey, and approximately 11 species are known to have historically inhabited these same areas. A common species in Ballona Creek is the cheekspot goby, with northern anchovy and queenfish in lower Marina Del Rey. In Area B, topsmelt was the most abundant fish. Round stingray and other fish are ooccasionally observed in the tidal channel in Area A. No special-status fish are known to inhabit Ballona Wetlands.

Numerous bird species are known to use Ballona Wetlands including shorebirds, wading birds, fish foragers and waterfowl, and several species of raptor, including several endangered species. A resident population of Belding's savannah sparrow, state-listed as an endangered species is present on Area B, and at least two other endangered species, the California least tern and peregrine falcon forage at Ballona Wetlands.

Cultural Resources

At least 14 prehistoric deposits have been identified in the vicinity of the project area, relating to environmental and cultural change adjacent to the wetlands over the last 6,500 years. These include a major mortuary complex east of Area B

Water Quality

The results of the available water quality monitoring in Ballona Creek indicate impacts from urban runoff and stormwater. Bacteriological indicators and several metals (dissolved and total lead and total copper) consistently exceed freshwater water quality objectives (WQO). Toxicity effects were observed in stormwater samples that may be associated with heavy metals and volatile organic compounds (no specific compound was identified). Water quality within the tidal section of Ballona Creek indicates similar water quality issues with regard to metals concentrations when compared to the salt water WQOs. Copper, lead and zinc exceeded these criteria in the samples collected, with greater exceedances reported for copper.

Sediment Quality

The results of the available data on sediment quality in the tidal section of Ballona Creek indicate exceedances of the criteria for copper, lead, and zinc, which are also detected at concentrations that exceed criteria in water samples in the creek and its tributaries. DDT and total detectable chlordane were also found to exceed sediment quality criteria. Sediment toxicity was identified as moderately toxic to the test organisms at one station and highly toxic at three stations. The samples from Ballona Creek provide an indication of potential long-term sediment quality of the marsh if the primary inputs are from the Creek. Concentrations of constituents in the Creek samples would be expected to be greater in the tidal section compared to the tidal marsh due to greater overall loading from the Ballona Creek watershed.

Land Use

California Fish and Game Commission recently designated a 577-acre portion of the project area as the Ballona Wetlands Ecological Reserve. Surrounding areas are predominantly urban and include marinas, roads, commercial and residential areas. The site is also near several parks and recreation areas as described including Del Rey Lagoon, Marina Del Rey, and the Ballona Creek Bike Path.

Public Access and Recreation

Ballona Wetlands offer an opportunity for public access and provision for recreational activities, including education, wildlife viewing, hiking and bicycling along several trails located through and around the periphery of the wetlands area.

Transportation and Circulation

Three primary roads pass into and through Ballona Wetlands, including Lincoln Boulevard, Jefferson Boulevard and Culver Boulevard. All three are significant roads and are classified as Major or Secondary Highways. Lincoln Boulevard is a major regional transportation route through the area. Culver Boulevard is the primary east-west road in the project area. In addition to the three roads, two transit routes pass through the project area and several other transit routes run adjacent to the area.

Regulatory Framework

Eleven regulations protecting sensitive resources within Ballona Wetlands are identified. These include the California and Federal Endangered Species Acts, sections of the Clean Water Act, National Historic Preservation Act, Title 14 of the California Code of Regulations, and sections of the California Fish and Game Code.

1.5 SECTION 1 FIGURES

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Figure 1-1 Project Area

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2. REGIONAL CONTEXT

2.1 SOUTHERN CALIFORNIA COASTAL WETLANDS

The Ballona Wetlands ecosystem is one of the last remaining major coastal wetlands in Los Angeles County. There are approximately 40 coastal wetlands along the 160 km coastline of the US portion of the Southern California bight, between Point Conception and the border with Mexico (Southern California Wetlands Inventory, 1998; http://ceres.ca.gov/wetlands/geo_info/so_cal.html).

Historically, Southern California wetlands naturally occurred across a wide range of conditions, from larger systems that were almost always under tidal influence to smaller systems that were intermittently closed and non-tidal. Most of these wetlands have been modified by human activity, resulting in losses of natural wetland habitat. The modern wetlands generally exist under disturbed conditions and are often surrounded by extensive urban development (Zedler, 1982, 2001). The remaining natural coastal wetlands comprise a variety of environments including saline lagoons, embayments, river mouth marshes and saltmarshes, depending on their physiographic location along the coast (Ferren et al., 1995).

Most of the Southern California wetlands are small and isolated, being confined to narrow river valleys and separated by coastal hills and mountains. They occur within two distinct groups of tidally-influenced estuaries and coastal lagoons (Macdonald, 1988). The first includes relatively deep water lagoons and ocean inlets with tidal prisms large enough to maintain permanent tidal exchange throughout the system. The second group is made up of smaller, shallower estuaries and lagoons that can periodically close at the inlet due to longshore transport of sand forming a sand bar across their mouths, smaller tidal prisms, and lower downstream freshwater flows. Generally, the longshore transport of sediment is stronger than the stream discharges at the inlet and the entrance to the coastal wetland is closed for long periods, only to be opened again when stream discharges increase during floods in winter. The Mediterranean climate provides low levels of precipitation (occurring seasonally during wet winters) and, depending on the inflow of freshwater and salt water, the soils may vary considerably in salinity during the year (Zedler, 1982). Soil salinity, in turn, directly affects the distribution of plants within the wetland (Hendrickson, 1991a; Zedler, 1982, 2001).

Zedler (1982) reported 19 dominant species of plant within the saltmarshes of Southern California. The general composition of plant communities changes with elevation (although most species have broad ranges of distribution and a degree of overlap occurs) with cordgrass (*Spartina foliosa*) typical of the lower elevations (with open mudflat within the stands are often colonized by *Salicornia bigelovii* and *Batis maritima*) while pickleweed (*Sarcocornia pacifica* syn: *Salicornia virginica*) dominates in the low to middle elevations. Pickleweed has the broadest distribution, occurring throughout most of the elevational range of cordgrass as well as being capable of becoming established on disturbed soils. Common species in the middle to high elevations include fleshy jaumea (*Jaumea carnosa*), salt grass (*Distichlis spicata*), and alkali heath (*Frankenia salina*). Although the flora of Southern California wetlands is limited, the tolerant species form highly dynamic communities both within wetlands, and between wetlands, that respond to both natural and anthropogenic environmental changes.

The smaller marshes are more likely to be dominated by pickleweed because environmental conditions become more extreme when ocean inlets close or narrow and tidal influence is absent or decreased for extended periods. If freshwater inputs dominate the water levels and salinity regimes, brackish marsh can become dominant. Upper marsh species might remain well represented, and large numbers of opportunistic weed species are usually present.

In general, the Southern California saltmarshes with a long history of good tidal flushing tend to have more native saltmarsh plant species than marshes with inlets that are closed (PERL, 1990). Drought and hypersalinity due to limited tidal flushing or mouth closure can lead to the elimination of the less tolerant halophytes, such as cordgrass, while promoting the more tolerant species, like pickleweed (Boland and Zedler, 1991; Zedler, 1996; Callaway and Zedler, 2004).

2.2 HISTORICAL CHANGE TO SOUTHERN CALIFORNIA COASTAL WETLANDS

Many Southern California coastal wetlands have been altered or eliminated by human activities over the past 150 years. The total area of Southern California coastal wetlands is estimated to be approximately 25-30% of what it was prior to European colonization (the Southern California Wetlands Inventory, 1998, estimated historic coastal wetland extent to be between 45,000 and 55,000 acres).

The California Coastal Commission, in its Procedural Guidance for the Review of Wetland Projects in California's Coastal Zone (http://www.coastal.ca.gov/web/wetrev/wettc.html) identified a variety of human activities that have caused losses and impacts to coastal wetlands. These activities include: draining wetlands and converting to agricultural uses; deposition of fill on top of wetlands to construct urban areas, roads, railways or oil development; dredging new and expanded channels to create marinas; filling wetlands to increase the area of shoreline support facilities; and constructing flood control projects that result in the dredging, filling, and channelization of wetlands to prevent the natural dissipation of water and sediment into low-lying areas. The Ballona ecosystem has experienced all of these impacts.

Such activities lead to significant changes to the wetland processes and the geomorphological and ecological linkage between coastal watersheds, wetlands and the marine system. The main changes to these systems include draining, filling and converting wetlands, hydrological modification, alterations to sediment transport processes and degradation of water quality (Wetlands Recovery Project, 2001). Freshwater inflows to many Southern California estuaries have been substantially altered and tidal inlets have been restricted. Although dams have reduced sediment inputs, increased freshwater inflows and storm inputs have led to sediment accumulation and infilling of many estuarine systems (e.g. Greer and Stow, 2003).

In recognition of the losses of coastal wetlands and the importance of these resources for habitat, water quality and other benefits, there are a number of efforts underway to protect and restore wetlands. Major restoration projects are underway at many coastal wetlands in Southern California, including projects at:

Ormond Beach, Malibu Lagoon, Bolsa Chica, Huntington Beach Wetlands, San Elijo Lagoon, Buena Vista Lagoon and Tijuana Estuary to name a few. Due to the changes in wetland processes and ecological linkages described above, there are many challenges and constraints to wetland restoration. In many cases, these projects involve creating a functioning wetland system, but not necessarily re-creating the historic conditions.

In the late 1990s, the Southern California Wetlands Recovery Project (WRP) was formed to develop a regional strategy for wetland recovery in the U.S. portion of the Southern California Bight (Wetlands Recovery Project, 2001). The WRP identified six regional goals to achieve its vision to re-establish functioning wetland systems that support a diverse range of fauna and flora, while providing socio-economic benefits. These are:

- Preserve and restore coastal wetland systems.
- Preserve and restore stream corridors and wetland ecosystems in coastal watersheds.
- Recover native habitat and species diversity.
- Integrate wetlands recovery with other public services.
- Promote education and compatible access related to coastal wetlands and watersheds.
- Advance the science of wetland restoration and management in Southern California.

The focus of the WRP is preservation and restoration of coastal wetland ecosystems, aquatic and riparian habitat, and re-establishment of ecosystem functions such as hydrological processes, sediment transport and water quality.

2.3 SANTA MONICA BAY

Within the Southern California Bight eco-region, it is useful to consider Ballona Wetlands more specifically in the context of the wetlands of the Santa Monica Bay watershed. Josselyn et al. (1993) undertook a wetland inventory for the Santa Monica Bay Watershed Project to characterize the current status of the wetlands within the watershed. The tidal wetlands in the Santa Monica Bay watershed are concentrated in two main locations, Ballona and Malibu. Ballona Wetlands (including Ballona and Del Rey Lagoons and Ballona Creek) is the largest coastal wetland along the Santa Monica Bay.

Wetlands were divided into three main habitat types:

- Riverine – all wetland and deep-water habitats that flow within a channel.
- Palustrine – non-tidal wetlands dominated by vegetation, further divided into those related to riparian corridors and floodplains and those associated with open water such as lakes, ponds and reservoirs.
- Estuarine – deep-water tidal habitats and associated tidal wetlands with salinities exceeding 0.5ppt. In Southern California, lagoons are the predominant type of estuary.

Table 2-1 (from Josselyn et al., 1993) shows the distribution and extent of each wetland type that he found. The total wetland acreage for the Santa Monica watershed was estimated to be approximately 3000 acres, of which about 9% were classified as estuarine coastal marsh or lagoon habitat. The majority of the area, about 60%, was riverine and palustrine wetlands associated with streams (riparian and floodplain palustrine). Open water habitat, including many anthropogenic recreational and storage lakes, made up 31% of the remaining wetland habitats

Of the estuarine wetlands in the watershed, 41% (24 acres) of the lagoon saltmarsh and 100% (225 acres) of the diked wetlands occur at Ballona (Josselyn et al., 1993). The majority of the remaining estuarine wetlands were found in Malibu.

Table 2-1. Areas (in acres) of Wetland Types in the Santa Monica Bay Watershed

Quadrangle	Riverine	Palustrine Riparian/ floodplain	Palustrine Open water	Lagoons Saltmarsh	Diked Wetlands
Beverley Hills	31.0	10.7	228.5	0.0	0.0
Burbank	4.8		15.9	0.0	0.0
Calabasas	37.2	143.4	4.6	0.0	0.0
Canoga Park	3.2	3.9	1.0	0.0	0.0
Hollywood	3.3		103.6	0.0	0.0
Inglewood	0.5	11.0	4.7	0.0	0.0
Malibu Beach	105.9	365.8	23.3	32.7	0.0
Newbury Park	9.2	50.4	19.7	0.0	0.0
Point Dume	100.5	303.1	82.3	1.1	0.0
Redondo Beach	15.3		3.3	0.0	0.0
San Pedro	9.0	0.0	0.0	0.0	0.0
Thousand Oaks	47.8	109.1	402.7	0.0	0.0
Topanga	62.4	243.6	19.3	0.0	0.0
Torrance	3.9		26.3	0.0	0.0
Triunfo pass	39.3	78.1	5.3	0.0	0.0
Van Nuys	3.9		1.2	0.0	0.0
Venice (Ballona)	9.0	24.3	0.3	23.8	225.0
Total	486.2 16%	1343.4 44%	942.0 31%	57.6 2%	225.0 7%

2.4 BALLONA CREEK WATERSHED

The Ballona Creek watershed covers approximately 130 square miles located in the western portion of the Los Angeles Basin (Figure 2-1). The headwaters of the watershed are located in the Santa Monica Mountains to the north and the Baldwin Hills to the south. The urbanized areas account for 80% of the watershed area, and the partially developed foothills and mountains (Hollywood Hills, Santa Monica Mountains) make up the remaining 20%.

Most of the Ballona Creek channel network has been modified into storm drains, underground culverts, and open concrete channels to provide drainage and flood management. Ballona Creek itself is an open trapezoidal channel with armored banks between Venice Boulevard and Pickford Street and its confluence with Santa Monica Bay (a length of approximately nine miles) at Playa Del Rey. Runoff from the watershed is discharged from the channel into Marina Del Rey’s south entrance channel and Santa Monica Bay at the mouth of Ballona Creek. Ballona Creek is tidally influenced to just above the confluence with Centinela Creek; which includes the section of channel adjacent to restoration Areas A, B, and C.

2.5 SECTION 2 FIGURES

Figure 2-1 Ballona Creek Watershed

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3. HISTORICAL ECOLOGY OF THE BALLONA WETLANDS

3.1 PREHISTORIC SITE EVOLUTION

The historic Ballona Wetlands formed as rising sea levels inundated the mouth of Ballona Creek following the last glacial maximum about 18,000 years ago. Initially, the inundation by sea water formed a lagoon which gradually filled with sediment deposited at the mouth of the creek. Continued sedimentation eventually formed wetlands. The continuation of oceanic and fluvial processes in the formation of Ballona Wetlands produced spatial and temporal variability in flora and fauna, landforms and salinity. The historical wetland was about 2,120 acres (Hendrickson, 1991a; Clark, 1979), an area roughly four times as large as the current restoration project area.

Observations on the evolution of the physical environment are available from archaeological investigations. Since 1989, Statistical Research has conducted archaeological investigations in combination with environmental analyses in the reconstruction of the Ballona Wetlands prior to European settlement (Altschul et al., 1992, 2003, 2005; Homburg et al., 2003). The main stages in the evolutionary model of Altschul et al (2005) are described below and shown in Figure 3-1.

18,000 to 7,000 years ago - Between 18,000 and 7,000 years ago, the morphologic evolution of the area was dominated by the sea-level and the inundation of the coastal plain between the Del Rey Bluffs, the Baldwin Hills, and the Santa Monica Mountains. This created a lagoon that gradually filled with sediment deposited from the creeks.

7,000 years ago – The rate of sea-level rise began to decrease as glacier melting slowed, providing less freshwater to the global ocean. At this time sea levels were between 30 and 45 feet below present level and the shoreline located between 500 and 1000 yards offshore of its present location. While the lagoon remained a marine environment (open to the ocean), it continued to experience fluvial deposition. This is evident in the existence of an offshore submarine delta adjacent to the lagoon. It was at this time that fluvial sediment supply began to keep pace with the slower rise of sea level and marshes were created.

4,000 years ago – Sea-level rise due to melting of the ice sheets was much slower and morphologic evolution was driven primarily by the deposition of fluvial sediments within the lagoon. An alluvial fan formed out of a canyon in the Del Rey Bluffs (where today Lincoln Boulevard emerges from the bluffs onto the coastal plains) and it is likely that mid-bay bars formed at the ‘null’ point where the fluvially-dominanted lagoon transitioned into coastal-dominanted lagoon. It is also likely that offshore subtidal bars and shoals evolved into an almost fully formed barrier spit at the mouth. Continued deposition within the lagoon brought about the southward expansion of the coastal plain from the north and westward accretion of saltmarshes from the east.

4,000 to 2,000 years ago - An inner lagoon was formed by the mid-bay bars and the extension of the alluvial fans, which gradually accumulated sediment and grew into saltmarsh. During this period, the Los Angeles River intermittently discharged to the ocean along Ballona Creek, depositing substantial amounts of fluvial sediment and allowing the rapid accretion of the coastal plain and saltmarshes into the lagoon.

2,000 to 200 years ago - Fluvial sediments continued to fill the lagoon. Deposited sediments resulted in coastal plain accretion in a southwesterly direction and saltmarsh expansion west towards the inlet. Altschul et al. (2005) inferred that a double barrier at the inlet formed about 1,000 years ago as a result of the sediment-rich environment and that extensive mudflats also formed within the lagoon. By 200 years ago, sediment accumulation almost entirely eliminated the lagoon and formed a complex of salt and freshwater marshes, ephemeral freshwater pools and sandy islands behind the barrier. At this stage the marshes extended south to El Segundo Sand Dunes and Del Rey Bluffs, north beyond Ballona Lagoon and Venice Canals and east as far as the confluence of the Ballona and Centinela Creeks.

3.2 HABITATS

The general emergence of the California coastline, in addition to changing sea levels and climatic conditions in the more recent past, suggests there occurred drowned valleys and creek and river mouths along the coast, with sand spits and dune fields at the ocean interface of the coastal wetland ecosystems and developing alluvial fans and deltas within the inland portions of these ecosystems from intermittent rivers as they grade towards the coast. This complex interplay of marine, estuarine, and riverine/fluvial processes made for a dynamic system in portions of the coastal wetland subject to periods of storm-related runoff, deposition, and erosion and oceanic wave action that among other effects produced marine deltas at the mouths of estuaries and wherever dune systems failed. The interplay of freshwater from the landscape and salt water from the ocean also influenced the relationship and distribution of habitats within the ecosystem.

A complex group of habitats likely coexisted within the ecosystem. River channels and their distributaries deposited sediment forming upland alluvial fans of coarse-grained or poorly mixed particle sizes and freshwater wetland channels and basins supporting emergent, scrub/shrub, and forested wetlands; and deltas of fine sediments with palustrine wetlands including delta scrub and emergent wetlands including haline vernal wetlands formed from storm tide inundation and delta formation on saltmarsh habitats. At the limit of non-storm high tides, delta margins in the Mediterranean-type-climate estuaries are characterized by a euryhaline zone of fluctuating salinity levels, followed down-slope by a hyperhaline zone and then high saltmarsh. Each of these habitats supports a variety of estuarine restricted organisms, some of which are rare or endangered such as the Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*). Deltas also can be the site of seeps and springs and mouths of distributaries at which brackish marshes form. These wetland features can support a variety of emergent wetland species important for wildlife habitat.

Other margins of the estuarine ecosystem were likely characterized by bluffs, escarpments, and terraces that supported a variety of scrub types including coastal sage scrub, coastal bluff scrub, and possibly maritime chaparral as seen elsewhere along the coast. Alluvial plains, terraces and transitional areas along deltas likely supported a mixture of grasslands including salt-affected, seasonal palustrine wetlands characterized by native annual species such as alkali barley (*Hordeum depressum*) and perennial species such as alkali ryegrass (*Leymus triticoides*). The interface of the Ballona Wetlands was likely characterized by sand spits and dune fields. Dune field vegetation is characterized by dune herb and dune scrub. These dynamic habitats included seasonal blowouts and other disturbances produced by storm conditions that eroded old dunes and created new ones.

3.3 POST-EUROPEAN COLONIZATION CHANGES

Over the past two centuries, there have been significant changes to the Ballona Wetlands, both anthropogenic and natural, that are summarized below. These have resulted in major changes in the size and function of coastal wetland habitats at Ballona Wetlands. The most important of these was construction of the Ballona Creek flood control channel, which significantly altered wetland hydrology. Additional alterations of coastal wetland habitats included conversion of saltmarsh to agricultural uses in Area B, construction of Culver Boulevard through Area B, and deposition of dredged spoil on Area A during construction of the harbor in Marina Del Rey. Figure 3-2 shows Ballona Wetlands in 1876 (by which time some modification had already occurred) and 1903, and Figure 3-3 shows the Ballona Wetlands of 1904 overlaying a more recent USGS map.

The mouth of the Los Angeles River has historically shifted between its present position in San Pedro Bay and Ballona Creek as a response to extreme flood events. During floods of 1825 the river broke out of its course and flowed southward to San Pedro Bay. In 1862, and again in 1884, some flood water reoccupied Ballona Creek. Since 1884 the course of the Los Angeles River has been maintained to the south and away from Ballona Creek. This removed a major, but sporadic, source of flooding and sediment to Ballona Wetlands.

The construction of railroad tracks and roads has bisected the project area, altering the natural routing of freshwater and tidal flow. In the 1900’s the Pacific Electric Railroad to Playa Del Rey was extended through parts of Areas A, B and C. This included the placement of fill to elevate the tracks above tidal elevation. While the railroad tracks have gone, the fill remains, creating upland areas within the former wetlands. The construction of Lincoln and Jefferson Boulevards followed in 1918, bisecting the wetlands to the east. Flows from the east were routed through culverts under Culver Boulevard in Area B.

Commercial activities on the project area included farming of lima beans and barley from the 1930’s up to 1985 in Area B, east of the Gas Company road (Sanders, 2000). Agriculture was also important in Area C which was entirely in agricultural production by 1933. Many tidal channels were filled by farming operations.

In the 1920’s, oil and gas production began. Fill was placed to construct and raise platforms to protect oil and gas facilities from extreme tides. These platforms were connected by a series of access roads also elevated on fill. The Gas Company road in Area B is particularly significant as its culverts slow the recession of floodwaters from the east. In Area A the platforms and access roads have created a number of depressions which may pond water (Straw 2000).

In the early 1930's, Ballona Creek was straightened and the banks armored by the U.S. Army Corps of Engineers (USACE). Construction of the eastern portion of the flood control channel was started before 1934, while construction of the channel through the western portion was completed by 1934 (Dock and Schreiber, 1981 suggest a date of 1932 for completion). The creek was confined to a defined channel during virtually all flow events with severe limitation of both tidal interaction and freshwater supply to the wetlands. The south bank of the channel prevented normal tidal exchange between the creek and the wetlands in Area B. Drainage from Area B to the channel was accommodated by culverts equipped with flap-gates. Leakage and occasional blockage of the gates allowed some limited tidal exchange to continue. Material from the construction of the channel was sidecast mostly north of the channel in a broad band approximately 300 to 400 feet wide.

Centinela Ditch was excavated through Area B sometime before 1950 (Straw, 1987) channelizing freshwater flows from east of Lincoln Boulevard. In 1962, Centinela Creek was channelized and diverted to Ballona Creek which diverted drainage from about 15% of the Centinela Ditch watershed east of Lincoln Boulevard and significantly reduced freshwater flow into Area B. Throughout the 20th century substantial urbanization has occurred around the whole project area which has changed the routing of surface flows and increased the volume of storm runoff flows. The runoff from the bluffs has been substantially altered and its route on to the wetlands is now confined.

One of the largest changes to the area came in the early 1960's with the excavation of Marina Del Rey and the disposal of dredged fill from that project on to the remaining wetlands north of Ballona Creek. Fill was placed on both Areas A and C. The land surface was raised 12 to 15 feet above MSL, above tidal inundation and burying the existing marsh surface and drainage channels.

More recently, two projects have altered flows within Area B. In 2003 the Freshwater Marsh was constructed which diverted freshwater flows from Centinela Ditch, Lincoln Boulevard, and Jefferson Boulevard storm drain into the new marsh and out into Ballona Creek, away from Area B. In the same year the flap-gates on the east channel in Area B were replaced with self-regulating tide-gates to provide control over the muted tidal inundation regime in Area B.

3.4 SECTION 3 FIGURES

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Figure 3-1   Prehistoric Model of Ballona Lagoon

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Figure 3-2 Evolution of Ballona Wetlands: 1876 to 1903

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Figure 3-3 Historic Drainage of Ballona Creek

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4. PHYSICAL SETTING

This section provides an assessment of the physical setting of Ballona Wetlands. A summary of the biological resources is given in Section 5.

4.1 GEOLOGY

The alluvial sediments of Ballona Wetlands are underlain by the early Pleistocene age San Pedro Formation to a depth of 200 feet. Below depths of 200 feet lies a 5,800-feet sequence of Tertiary age sedimentary rocks which overlie metamorphic basement rocks of Mesozoic age Catalina Schist (Law/Crandall, Inc., 1991a, b). Portions of the area are underlain by oil deposits created by organic matter deposited long ago and subsequently covered by layers of rock and other sediments.

The bedrock beneath the coastal zone in the vicinity of Ballona Wetlands is characterized by faulting and tectonic activity. Although there are no faults known to pass directly below the project area, there are numerous fault systems in the vicinity including the Newport-Inglewood Fault, the Malibu Coast Fault, the Charnock Fault, the Overland Fault, the Santa Monica-Hollywood Fault, and the Palos Verdes Fault (Law/Crandall, Inc., 1991a, b). The Charnock Fault and the Overland Faults are the closest faults, located 1.3 miles northwest and 2.5 miles northeast of the wetlands, respectively. They extend in a northwesterly direction and act as a barrier to the flow of groundwater.

The original soils comprising Ballona Wetlands were derived from both fluvial and marine environments. A shift in relative dominance is visible in the sediment stratigraphy at around 50 feet depth, below which level, sediments are primarily alluvial, and above which sediments are mixed alluvial and estuarine. The alluvial sediments below 50 feet are primarily channel and floodplain sand and gravel and are referred to as the ‘Ballona Aquifer’ or ‘50-foot Aquifer’, whereas the mixed sediments above 50 feet consist of silt, clay and sand derived from the stream bed, floodplain, tidal flats and coastal dunes. Sand is more prevalent in the upper layers of soil profiles in locations close to the ocean due to the combined effects of littoral and wind transport and deposition.

The area was subsequently overlain by fill dredged during the construction of Marina Del Rey and excavated from the flood management projects of Ballona Creek. Fill materials are comprised of clay, silt, silty sand, and sand and range in depth from zero to 18 feet across Areas A and C (Law/Crandall, Inc., 1991a, b).

Liquefaction hazards have been investigated by the California Geological Survey (2001). In their evaluation report they noted high liquefaction susceptability for the beach, estuarine, and young alluvium deposits. These deposits account for most of the project area. Artificial fill in the Marina Del Rey area were considered too thin to affect the liquefaction hazard and no effort was made to determine their sub-surface characteristics (California Geological Survey, 2001).

4.2 CLIMATE

Southern California experiences a Mediterranean climate with moderate seasonal temperature fluctuation due to the marine influence. The Los Angeles Basin contains a number of microclimates affected by proximity of the ocean, prevailing wind direction and local topography. The Ballona Wetlands, located adjacent to the Santa Monica Bay, experience moderate temperatures and seasonal coastal fog caused by land-sea temperature differences during the summer.

The nearest long-term weather station is located at Los Angeles Airport. Daily (1944 - present) and monthly (1914 - present) records of temperature and precipitation can be found at the NOAA Western Regional Climate Center website (http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?calosa).

4.2.1 Temperature

Ballona Wetlands experience mild temperatures year round due to temperance by the adjacent ocean waters. The highest temperatures occur in June, July, and August. However, the temperature can fall in mid summer due to fog, making it warmest in late spring and early fall, with a mid-summer drop in temperature near the coast (Purer, 1942; Swift and Frantz, 1981). The average summer temperature for 1914 to the present was 68.9ºF and the average winter temperature was 57.1ºF.

4.2.2 Wind

Wind speed data is available for Los Angeles Airport. Average wind speed is 7.8 mph and the mean monthly wind speed varies between 6.5 mph in the winter (November) and nine mph in the spring (April).

4.2.3 Precipitation

The seasonal variation of high and low pressure systems determines the frequency and amount of rainfall. The Pacific Ocean provides a consistent source of moisture to the low pressure systems over the north Pacific. Saturated air masses reach the shore from areas to the west, resulting in precipitation.

The average annual precipitation at Los Angeles Airport is 13.5 inches for the period 1914 to the present. Average monthly precipitation for the same period is shown in Figure 4-1, describing high seasonal variation. Average winter (December, January, and February) precipitation was 8.26 inches while that of summer (June, July, and August) was 0.13 inches. The average seasonal distribution of the annual precipitation was:

Winter	61%
Spring	24%
Summer	1%
Fall	14%

Total annual precipitation has ranged from 4.4 to 30.5 inches per water year. The annual data at Los Angeles Airport (Figure 4-2) shows that most years are drier than the average annual of 13.5 inches while only a few are anomalously wet. Figure 4-2 therefore highlights the high interannual variability in precipitation. This variability is important because wet years typically drive many of the physical and biological dynamics of wetland systems (sedimentation events, low salinity events and plant recruitment, high stress years with little rainfall, etc.).

While there is not a consistent long-term trend in precipitation, there appears to be some cyclical component associated with the El Nino/Southern Oscillation phenomenon. El Nino events enhance precipitation and occur with varying intensity at a frequency of 7-12 years. Figure 4-2 shows increased precipitation in the late 1930's and early 1940's, early 1980's and mid-1990's, concurrent with strong El Nino events. Droughts of one to several years are common.

4.2.4 Evapotranspiration

Evaporation from the land surface and vegetation, and transpiration by plants is a significant element of hydrologic conditions at the project area. These processes, together called 'evapotranspiration', are affected by the length of solar exposure and temperature. They vary seasonally with changes in day length, temperature and solar intensity. During winter months when precipitation is greatest, evapotranspiration rates are low, while during the summer months evapotranspiration rates are highest.

The estimated annual evaporation rate for coastal Southern California is about 26 inches of water per year. Average annual precipitation is 13.5 inches, indicating a general moisture discrepancy. The excess of evaporation over precipitation results in the loss of large amounts of water to the atmosphere following rainfall events. Standing water accumulations within small depressions are ephemeral and soils remain dry most of the time. During wet years, precipitation may exceed evaporation during the winter months, resulting in the wetting of the soils. However, on average, precipitation rates during the winter do not exceed winter evaporation rates and soils do not experience extensive long-term wetting (Straw, 1987).

4.3 TIDES

Santa Monica Bay experiences mixed semidiurnal tides, with two high and two low tides of unequal heights each day (Figure 4-3). In addition, the tides exhibit strong spring-neap tide variability; spring tides exhibit the greatest difference between high and low tides while neap tides show a smaller than average range (Figure 4-4). The spring-neap tides also vary on an annual cycle, with the highest spring tides occurring in June-July and December-January and the weakest neap tides occurring in March-April and September-October.

The National Oceanic and Atmospheric Administration (NOAA) tidal datums for the 1983-2001 epoch for Los Angeles tide gauge are summarized in Table 4-1 and Figure 4-5. This table also illustrates the differences of the 1983-2001 datums with those from the previous epoch. The mean tidal range, defined as mean high water (MHW) minus mean low water (MLW) is 3.81 ft, and the diurnal tidal range defined as mean higher high water (MHHW) minus mean lower low water (MLLW) is 5.49 feet.

Table 4-1. NOAA Tidal Datum for the 1983-2001 Epoch for Los Angeles Tide Gauge

	MLLW (ft)	MSL (ft)	NGVD 29 (ft)	NAVD 88 (ft)
MLLW	0.0	-2.82	-2.63	-0.21
MLW	0.94	-1.88	-1.69	0.74
MTL	2.84	0.02	0.21	2.64
MHW	4.75	1.93	2.12	4.55
MHHW	5.49	2.67	2.86	5.29

Tides propagate through the mouth of Ballona Creek and influence surface water elevations upstream to the Centinela Bridge (USACE, 2000). Tidal flow is restricted primarily to Ballona Creek. In Area A, tidal flow enters Marina Ditch through a culvert connecting it to Marina Del Rey. In Area B, a series of flap-gates, and more recently self-regulating tide-gates, have allowed muted tidal flows to enter the wetlands.

4.3.1 Sea-Level Rise

Historical trends in relative sea level are measured at tide gauges which capture relative vertical movements of the land as well as changes in the global or eustatic sea level. These records measure the local rates of sea-level rise relative to the coast. NOAA (http://co-ops.nos.noaa.gov/sltrends/sltrends) estimates that relative sea levels have been rising at a rate of 0.84 $mmyr^{-1}$ (0.28 ft/century) at the Los Angeles tide gauge (1924–1999) and 1.59 $mmyr^{-1}$ (0.52 ft/century) at the Santa Monica tide gauge (1933–1999) (Figure 4-6). The historical relative sea-level rise at Ballona Wetlands is likely to be between these two estimates because the Los Angeles tide gauge is subject to the impacts of uplift (along the Newport-Inglewood fault) and the Santa Monica tide gauge may exhibit some subsidence.

The Intergovernmental Panel on Climate Change (IPCC) estimated that the future rate of sea-level rise will likely accelerate. IPCC (2001) predicted that global sea level will likely rise by between 0.08 m (0.25 ft) and 0.8 m (2.6 ft) by the year 2100. Cayan et al. (2006) indicated a global sea level rise of between 15 and 17 cm (0.49 and 0.56 ft) by 2050 and between 26 and 39 cm (0.85 and 1.28 ft) by 2100 based on the median values for a range of greenhouse gas emission scenarios. Extreme high water levels may change more than mean sea level due to alterations in the occurrence of strong winds and low pressures. However, this has not been extensively studied for the project area (IPCC, 2001).

4.4 SOURCES OF INFLOWS

Inflows to the wetlands, combined with their morphology, create the hydrologic regime of the project area. This has a major influence on the type of vegetation present and helps establish the internal channel network. The potential amount of water contributed, frequency of contribution, type of water contributed (saline, fresh, polluted) and flows into the wetland system are important in the consideration of the hydrologic functions of the wetland.

The potential inflows to Areas A, B and C are shown on Figure 4-7. These inflows include:

- Ballona Creek
- Marina Del Rey
- Urban Runoff and Stormwater
- Groundwater

4.4.1 Ballona Creek

Ballona Creek drains an area of approximately 130 square miles, 80% of which is urbanized while the remaining 20% is composed of partially developed foothills and mountains. While some of the headwaters remain in their natural form, the majority of the Ballona Creek drainage network has been modified into storm drains, underground culverts and open concrete channels. Ballona Creek, in the vicinity of the project area, has an earth invert with quarry stone backfill and grouted stone side slopes. All of its tributaries flow in either concrete channels or culverts. Table 4-2 summarizes the runoff flow conditions of Ballona Creek at Sawtelle Boulevard for return periods ranging from one to 500 years. The channel is designed to discharge a 500-year storm at capacity.

Streamflow data from the period of record between 1935 and 2005 reflect mean daily winter/spring flows of 82.1 cubic feet per second (cfs) and mean daily summer/fall flows of 19.8 cfs. The range of the seasonal mean daily flows is evidence of the seasonality of precipitation and the relative insignificance of snowmelt during the dry season. The difference between the maximum flow and the mean daily flow for winter (the wet season) is indicative of the episodic nature of large rainfall events.

Table 4-2. Ballona Creek Extreme Runoff Flow Conditions at Sawtelle Boulevard

Return period (year)	Discharge (cfs)
1	7769
5	17657
10	22000
50	32135
100	36020
200	38103
500	44283

Source: USACE, Marina Del Rey and Ballona Creek Feasibility Study (2003).

The movement of sediment within Ballona Creek has been greatly altered from natural conditions over the 20th century. Development of the Ballona Creek watershed and channel straightening has modified both the sediment supply and the ability of flows to transport sediments. Additionally, channelization of the creek has cut off the banks and floodplains of the natural river. Sediments carried in flows are not stored within the banks but are rather transported to the outlet of Ballona Creek where they are deposited. The USACE periodically dredges the mouth of Ballona Creek and Marina Del Rey to prevent sediment build-up.

The Los Angeles County Department of Public Works (LADPW) monitors suspended sediment concentrations (SSC) within Ballona Creek at a stream gauge near Sawtelle Boulevard during wet events and dry periods in accordance with their NPDES permit requirements. Their monitoring results show a wide range of suspended sediment concentrations that are largely dependent upon antecedent dry period as well as streamflow.

Suspended sediment concentrations are greatest during storm flows that follow long periods of dry weather. As shown in Figure 4-8, the greatest SSC of a cluster of events occurring around the same time, consistently appear to be in the first event. Additionally, dry weather SSCs tend to be much less than those during storm events. Dry weather SSC between 1998 and 2004 range from five to 84 mgl^{-1} while wet weather SSC range between 26 and 908 mgl^{-1}.

It is estimated that approximately 60,000 yd^3 of sediment moves through the system on an annual basis, of which about 90% (54,000 yd^3) is sand and 10% (6,000 yd^3) is silt (USACE, 2003). An adequate supply of fine-grained sediment is important to tidal wetlands, firstly to allow them to attain equilibrium with respect to tide elevations, and secondly to maintain that equilibrium with rising sea levels.

4.4.2 Marina Del Rey

Marina Del Rey harbor opens to the Pacific Ocean in Santa Monica Bay. As shown on Figure 1-1, the mouth of Ballona Creek to Santa Monica Bay is shared with the entrance channel to Marina Del Rey and separated by a jetty. The entrance channel is split into two channels located adjacent to the north and south sides of a detached breakwater, referred to as the North and South Entrance channels. Marina Del Rey is located in unincorporated County of Los Angeles, surrounded by the city of Los Angeles and Culver City. The Marina was developed in the late 1950’s and early 1960’s on parts of the former Ballona Wetlands, the jetties were completed in 1959 and the breakwater was added in 1965. The current area of the Marina Del Rey watershed is approximately 2.9 square miles and drains a highly urbanized area with land use that includes residential, commercial and industrial. The Marina is the largest artificial small-craft harbor in the U.S. and accommodates more than 5,000 privately owned pleasure craft.

Periodic maintenance dredging of the North and South Entrance channels, the Main Entrance channel and the mouth of Ballona Creek is undertaken to maintain navigable depths (Figure 4-9). Marina Del Rey has a significant build-up of sediments that affects the safety of navigation. Routine maintenance dredging has been hindered by the lack of suitable disposal sites for the contaminated dredged material. Marina Del Rey is directly connected to Areas A and C through a culvert under Fiji Way that connects to Marina Ditch (Figure 1-1).

4.4.3 Urban Runoff and Stormwater

Inflows from urban runoff and storm drains are important sources of freshwater for Area B and the Freshwater Marsh, in particular. These inflows are described for each individual area in the following sections. No sediment concentration data related to bluff erosion, freshwater urban runoff and stormwater has been identified.

4.4.4 Groundwater

Historically, Ballona Wetlands received water from artesian upwellings (Hendrickson, 1991a).At the turn of the 20th century, the water table in the project area was about 10 feet MSL and those areas of the wetland with an elevation below 10 feet received water from this source. Therefore, artesian water may well have played a significant role in the development of the wetland.

Straw (1987) described the groundwater distribution in Areas A, B and C. Although the historic level of groundwater was high, today it is much lower. Groundwater is present in the surficial materials forming an unconfined water table aquifer under Area B. The water table ranges in elevation from 1.0 feet MSL to -2.0 feet MSL. Recharge to the water table aquifer is by infiltration through the soil column following rainfall events and during inundation of the soil by surface water. The level fluctuates seasonally between wet and dry years and also reflects longer-term cycles in precipitation.

Straw (1987) also described a confined aquifer with artesian pressure under Area B. The groundwater is strongly controlled by the adjacent uplands, which act as recharge areas for the confined aquifers, and by Ballona Creek and the coast which are discharge areas. The water table, therefore, slopes from the Del Rey Bluffs towards Ballona Creek. The inflow of groundwater into Area B is indicated by the reduced occurrence of salt water and the presence of willows (generally salt water intolerant) along the base of the bluff slope.

No major part of Areas A and C receive standing water from groundwater discharge, with the possible exception of seepage into Marina Ditch. There are observations of ‘shallow’ groundwater or ‘perched’ water tables that appear to be occurring in Area A (at least in wet years).

4.5 AREA A

4.5.1 Topography

Area A includes 139 acres and is bounded by Marina Del Rey channel on the west, Ballona Creek on the south, Fiji Way to the north and Lincoln Boulevard to the east. Figure 4-10 is an oblique aerial photograph of Area A from 2000 and Figure 4-11 shows its topography. The entire marsh surface is buried under fill material, which occurred during several periods of filling in the 20th century. Present surface elevations appear similar to those immediately after the discharge of fill material, with only slight modification by surface runoff and shallow subsidence as the fill dried and consolidated. In general, the perimeter of Area A is slightly higher, and slopes down to a central shallow depression.

Fill was placed in the southeast corner at the beginning of the 20th century for the construction of the Pacific Electric Railroad levee, which can also be traced through Areas B and C. In the 1920's platforms were constructed in the southwest corner of Area A by placing fill on the marsh surface so that oil production facilities could be placed above extreme high tide levels. Surface elevations of up to 18 feet MSL occur in this area. During the channelization of Ballona Creek, dredged material from the channel was sidecast to construct the levee and this forms the southern boundary of the area. The eastern portion of the area was filled in the early 1960's with the hydraulic disposal of dredged material from the excavation of Marina Del Rey boat basin and channel. This was placed on the remaining marsh to the east of the oil platforms, raising land elevations to about 15 feet MSL.

The topography and distribution of sediments suggests that the Marina Del Rey fill occurred as follows (based on Straw, 1987). The western margin was produced by pumping material from the Marina Del Rey channel through outlets positioned along the channel. These formed high areas close to the channel, such as between the oil platforms and the northern margin of the area. The discharge of dredged material was then directed from the margins towards the interior of Area A. The competence and capacity of the flows decreased with distance from the outlets positioned along the channel. As a result, coarser sand was deposited close to the margins of the site and fine sand and coarse silt formed the slopes extending between the margin and the stilling basin depression. The silt and clay, which would have been held in suspension, settled out in the stilling basin formed by the north-south ridges, the Ballona Creek levee and Marina Ditch.

Excess water from the stilling basin was decanted through the northern dike through a corrugated metal pipe, acting as an overflow weir, and into Marina Ditch. This water would have had relatively low sediment concentrations.

As a result of this process of filling, the topography of Area A is characterized by three sub-divisions that run north-south, almost perpendicular to Ballona Creek. The western third of the area contains a series of ridges and platforms that separate a number of isolated depressions. This portion is separated from the eastern two thirds of the area by a low, wide, ridge running north-south from the oil and gas facilities to Marina Boulevard. The eastern third of the area is about 600 feet wide, bounded by Lincoln Boulevard and a narrow sharp ridge that runs north-south to Marina Ditch. Within this area the surface slopes westward. The central third is a broad, shallow depression bounded by the two ridges. This is the remnant of the 'stilling basin' used during the filling process.

4.5.2 Sediments

Converse Consultants (1981) conducted a geotechnical investigation of Area A, taking 28 borings, which varied in depth from 20 to 100 feet. The boring results showed that while the thickness of sediment layers varied a little, in general, sediment stratigraphy for Area A is spatially consistent.

Area A is covered by an extensive layer of fill that ranges in thickness from nine to 18 feet in the western portions to zero feet in the eastern portions. The fill material is comprised of loose to medium dense sand, silty sand, silty clay, clay, clayey silt, sandy silt and silt which becomes wet at depths of 0.3 to five feet. The fill material is underlain by a layer of soft to firm silty clay and clay with intervals of silt and sand ranging in thickness from 15 to 30 feet. This, in turn, is underlain by firm to stiff silty clay and clay with interlayers of silt and sand which are zero to 25 feet thick. Underlying the alluvium, at approximately 90 feet depth, is dense sand with gravel. The compressibility of the sediments decreases with depth while shear strength increases with depth. The top two layers appear to correspond to the fill layer and buried marsh deposits.

The oil platforms appear to have been constructed with poorly sorted coarse fill. Fill in the center is a mixture of dredged fill deposits from Marina Del Rey and dredging dumped from Ballona Creek – these tend to be relatively fine sediments. In the southeast corner, along the railroad levee, the fill tends to be sandier. This may reflect the dredging of deltaic deposits of Ballona Creek prior to channelization.

Borehole data from Converse Consultants (1981) and Law/Crandall, Inc. (1991a) show a general relationship between fill thickness and the elevation of the surface of the underlying marsh deposits. The original marsh surface can be as low as two feet below MSL beneath a fill thickness of 17 feet rising to four fet above MSL for fill thicknesses less than two feet. This indicates a potential subsidence of the original marsh surface of up to six feet depending on the thickness of the fill overburden.

4.5.3 Hydrology

Marina Ditch, which runs along the northern boundary of Area A, is connected to Basin H in Marina Del Rey via culverts under Fiji Way. In Area A this straight, unlined, trapezoidal channel appears to have been cut to allow dewatering of dredged fill from Marina Del Rey. The ditch channel continues into Area C where it appears to follow an old creek alignment. It drains stormwater from approximately 163 acres of existing development north of Area C, drains major parts of Areas A and C and accepts occasional overflows from Alla Road and Lincoln Boulevard North Storm Drain. The portion of Marina Ditch in Area A is tidal.

Surface drainage follows three main pathways as shown in Figure 4-11 (Straw, 1987).

1. A number of small areas drain to closed depressions. These are found to the north of the oil platforms and in the former stilling basin. These areas are isolated from Marina Ditch.
2. A narrow margin drains from around the northern perimeter directly into Marina Ditch.
3. Most of the area drains to the site of the former ‘stilling basin’. The stilling basin overflows and conveys water to Marina Ditch. In the winter and spring of 2005 ‘springs’ were day-lighting and flowing from the former stilling basin into Marina Ditch.

The hydrology of the area is strongly influenced by the permeability of the fill layers and therefore the manner by which the fill was placed. Infiltration rates in the southwest corner of the area are high due to the coarseness of the fill around the oil and gas facilities. Along the northern margin, adjacent to the Marina Del

Rey dredge pump outlet, the soils are also permeable. The area has relatively steep slopes, so that surface water infiltrates or flows downslope. Water collects in the low depressions north of the oil and gas facilities and in the stilling basin where the surficial and underlying materials are fine-grained and relatively impermeable. The amount of water that can accumulate in the depressions is a function of:

- Rainfall – frequency, intensity, duration;
- Depth of depression;
- Permeability of underlying soils; and
- Evapotranspiration rate.

Standing water in Area A can only persist in depressions of low permeability i.e. where fine silt and clay has been deposited and which lie below the elevation of the flow path to the Marina storm drain. These depressions would only tend to fill in winter when precipitation is high and evapotranspiration rates are low. A detailed description of depressions which retain water is provided by Straw (2000) and further mapping of ponding in the area was conducted by Hodder (J. Hodder, personal communication). These depressions have hydrologic functions that affect the distribution of vegetation and wetlands characteristics.

4.6 AREA B

4.6.1 Topography

Area B covers 338 acres, bounded on the north by Ballona Creek, on the south by the Del Rey Bluffs, and lies between Lincoln Boulevard and Playa Del Rey (Figure 4-12 and Figure 4-13). The hypsometry (the distribution of land area at different elevations) of Area B is depicted in Figure 4-14. This area was not filled as extensively as Areas A and C and the topography reflects natural marsh features as well as more recent grading associated with the construction of oil platforms and access roads.

Area B is bisected by roads that significantly affect its hydrology. In previous studies, Area B has been sub-divided into four smaller areas that conform more closely to the hydrology. These are:

- North Wetland: the area north of Culver Boulevard, west of the Gas Company road, south of Ballona Creek and east of Playa Del Rey;
- South Wetland: located north of the Del Rey Bluffs, west of the Gas Company road, south of Culver Boulevard and east of Playa Del Rey;
- East Wetland: located north of the Del Rey Bluffs, west of the Freshwater Marsh, south of Jefferson Boulevard and east of the Gas Company road. This area includes the alluvial fan at Hastings Canyon, and the lower portions of the Del Rey Bluffs;
- Northeast Wetland: located north of Jefferson Boulevard, south of Ballona Creek and east of the Gas Company road.

The lowest points of the North Wetland are located near Centinela Ditch and Jefferson Drain. The land surface adjacent to these ditches is low (from zero to +2 feet MSL) and reflects the old marsh surface. At the western and southwestern margins of the wetland, the area is bounded by dunes. To the east, the land rises to just over seven feet MSL. Bisecting the North Wetland is the berm of the abandoned Pacific Electric railroad which runs parallel to Culver Boulevard along most of the eastern and southeastern margins of the wetland. In the middle of the North Wetland, fill was placed to create elevated oil well platforms and connecting service roads, although the intervening surface appears to be the original marsh surface. Along the northern boundary with Ballona Creek, dredged material from the construction of the channel was deposited inside the levee on the marsh surface.

The South Wetland is relatively flat with surface elevations ranging from 2.0 to 2.8 feet MSL. Construction of pipelines and other oil and gas facilities in addition to the side-casting of material from ditches, elevated parts of the South Wetland to up to 3.0 feet MSL. The Gas Company facility is constructed at the base of the Del Rey Bluffs. North of the facility, alluvial sediments and eroded material from the bluffs have extended into the southern portion of the wetland. Centinela Ditch crosses the South Wetland, passes through the Gas Company facility and flows in a westerly direction under Culver Boulevard. Previously the flow from Jefferson Drain was conveyed in a ditch that extended in a southwesterly direction to a point just north of Centinela Ditch. The Jefferson Drain is now routed through the Freshwater Marsh before discharging to Ballona Creek.

The East Wetland can be divided into an eastern and western section separated by an alluvial fan that extends from the now-filled Hastings Canyon northwards into the wetland. To the east, the ground slopes gently from Jefferson Boulevard south toward Centinela Ditch. The surface elevation ranges between four feet MSL in the north down to three feet MSL in the south. This land was used for agriculture (lima beans and barley) from the 1930’s to 1985 (Sanders, 2000) and evidence of tilling is visible. To the west of the fan, the land surface slopes from the northeast to the southwest with a broad shallow depression just east of the Gas Company road. A low swale is evident which appears to follow the former course of Centinela Ditch. Near the abandoned outlet to the Jefferson Drain, mounds of material excavated during its construction have been deposited. The southern margin of the East Wetland is a low area between Del Rey Bluffs and Centinela Ditch.

The Northeast Wetland is enclosed by the Ballona Creek levee and by fill from the construction of Lincoln, Culver and Jefferson Boulevards. The gently undulating surface lies between 3.0 and 7.5 feet MSL. The lowest area is to the south of Culver Boulevard and elevations increase westward.

4.6.2 Sediments

The sedimentary characteristics of Area B are discussed in a geotechnical report by Crandall and Associates (1987). They recovered 18 borings which spanned Area B diagonally from the northeast to southwest. They found that sediments in the upper 50 feet were fine-grained while those below 50 feet were composed of nearly uniform sand and gravel. The western portion of Area B, which is closest to the ocean, are rich in sand; the deeper sediments are predominantly sand while the shallow sediments are a mix of silt and sand. In contrast, the eastern portion of Area B is rich in clay and silt. The upper layers of sediment contain abundant clay and virtually no sand. There was very little organic sediment found in any of the borings.

4.6.3 Hydrology

The sources of water to Area B include direct precipitation, tidal flow through gates along the Ballona Creek levee, and runoff from the Del Rey bluffs and the commercial district of Playa del Rey. Freshwater input to Centinela Ditch and Jefferson Drain was rerouted into Freshwater Marsh following its construction. Freshwater seepage is also suspected to be an important influence along the base of the bluffs.

4.6.3.1 Tidal Connection

The construction of Ballona Creek levees in 1932 isolated the existing Ballona Wetlands from the regular tidal influence of Santa Monica Bay. Until 2003, two sets of flap-gated culverts were located within the south levee of Ballona Creek. Their failure to close completely allowed some tidal exchange with the wetlands due to the ocean wave surge in the channel that would open and close the gates by changing water pressure as the wave passed. Psomas (1998) monitored the flap-gates and found that flood tides flowed through the tide-gates at an average flow rate of eight cfs and a maximum flow rate of 12 cfs. At a maximum, 11 acre-feet of salt water was exchanged, which flooded three acres of tidal channels. However, it was found that during spring tides, higher water levels were sometimes achieved within the wetlands than in Ballona Creek. At the same time, freshwater runoff from Centinela Ditch would also pond within the wetlands.

The east channel (of the North Wetland) flap-gates were replaced with self-regulating tide-gates (SRTs) (Table 4-3 and Figure 4-15) installed as part of the USACE 1135 project, allowing control over the tidal inundation and existing habitat functions. The replacement of the flap-gates with the SRTs allows controlled tidal exchange and increased marsh salinity. The frequency of inundation has increased as the tidal inundation occurs daily to a fixed elevation. The SRTs allow for flood tide flows to fill the wetland to 3.6 feet MLLW (0.78 feet MSL) (this elevation may be increased to about +4.0 feet MLLW or 1.18feet MSL).

The west channel of the North Wetland is connected to Ballona Creek by a 36-inch corrugated metal pipe (CMP) (invert of -3.72 feet MSL) with a flap-gate on the creek side (Table 4-3 and Figure 4-15). The culvert with flap-gate on the west channel prevents tidal flows from entering the wetlands while allowing the drainage of flood waters.

4.6.3.2 Channels and Flow Structures

Internal circulation of inflows occurs via the channel networks which are connected by culverts (Table 4-3 and Figure 4-15) under Culver Boulevard and the Gas Company road. In the past there were significant freshwater flows along Centinela Ditch and the Jefferson Drain.

In the North Wetland, the west channel is approximately 12 to 15 feet wide while the east channel varies in width from six to 15 feet near Culver Boulevard, to 45 feet at the Ballona Creek culverts. Each channel is about 1.5 to four feet deep. The improved tidal connection with Ballona Creek through the SRT has increased the tidal prism of the North Wetland and evidence of this can be seen in the localized erosion of the east channel along its banks. This represents the natural enlargement of the channel in response to greater tidal prism. Under average high tide conditions with the old flap-gates (and probably similar with the SRT), salt water flows eastward from the North Wetland under Culver Boulevard into the South Wetland. Occasionally, tidal flows can reach under the Gas Company road into the East Wetland.

Within the North Wetland, between the sand dune complex and the oil well platforms, the water table is within one foot of the land surface and the soils are saturated for extended periods during most years (Straw, 1987). Areas along the margins of the channels south of the abandoned Pacific Electric Railway show similar hydraulic conditions. East of the oil well platforms, a low enclosed area also has saturated soils for extended periods due to precipitation.

The east and west channels of the North Wetland are connected to the South Wetland via two 24-inch, one 18-inch, and one 42-inch reinforced concrete pipes (RCPs) under Culver Boulevard (Table 4-3 and Figure 4-15). Within the South Wetland, flows are confined to Centinela Ditch and the Jefferson Drain, both of which are approximately 27 feet wide and 0.3 to 0.6 feet deep.

The South Wetland is connected to the East Wetland via two 42-inch and one 60-inch corrugated metal pipes under the Gas Company road. The area to the west of the Hastings Canyon alluvial fan contains a low swale and a closed depression adjacent to the Gas Company road. This was created by the construction of the Gas Company road which blocked flows down the natural slope causing this area to pond. The Centinela Ditch was partially blocked in the early 1990’s by the expansion of the alluvial fan. Complete blockage occurred in the winter of 1997/1998, redirecting water from the ditch to flow through breaches in the Centinela Ditch berm northward into the eastern portion of the East Wetland (formerly an agricultural field). The water flowed northwest into the ditch extending westward to the Jefferson Drain. The alluvial fan is now a relict feature following the filling of Hastings Canyon.

Table 4-3. Details of Primary Flow Control Structures in Area B

Structure ID	Label	X	Y	Description
1	2 x 3.5 feet CMP	367119.76	3759298	Between South and East Wetland (Gas Co. Access Rd)
2	1 x 5 feet CMP	367089.96	3759338	Between South and East Wetland (Gas Co. Access Rd)
3	1 x 1.5 feet RCP	367036.99	3759444	Between South and East Wetland (Gas Co. Access Rd)
4	1 x 3.5 feet RCP	366717.65	3759125	Between South and North Wetland (Culver Boulevard)
5	2 x 2 feet RCP	366635.31	3758996	Between South and North Wetland (Culver Boulevard)
6	1 x 3 feet CMP flapgate	366017.72	3759145	Between N. Wetland (west channel) & Ballona Creek
7	3 x 5 feet CMP w/ SRT	366161.83	3759246	Between N. Wetland (east channel) & Ballona Creek
8	Tidegate(open usually)	365806.24	3759022	Del Rey Lagoon to Marina Del Rey
9	Tidegate(open during day)	365600.38	3759372	Ballona Lagoon to Marina Del Rey
10	1 x 10 feet culvert	366895.44	3760430	Marina Del Rey to Fiji Ditch
11	1 weir	367350.21	3760639	Lincoln and Fiji Way
12	2 x 1.5 feet culverts	368063.25	3759580	Lincoln and Freshwater Marsh
13	1 flapgate	367275.35	3759978	Ballona Creek to Freshwater Marsh
14	1 tidegate	365759.84	3761503	Oxford Basin
15	5 culverts	364704.41	3760951	Washington Street.

CMP = Corrugated Metal Pipe; RCP = Reinforced Concrete Pipe; SRT = Self-Regulating Tidegate

4.6.3.3 *Stormwater or Runoff*

The primary source of freshwater into Area B occurs via storm drains. Prior to the construction of the Freshwater Marsh, runoff entered the East Wetland from the Lincoln Boulevard and Jefferson Boulevard Drains, Centinela Ditch and the Del Rey Bluffs. At that time, the tributary area draining directly into the East Wetland was approximately 1,177 acres including 367 acres to the Jefferson Drain, 85 acres to the Lincoln Drain and 560 acres to Centinela Ditch. The Freshwater Marsh was designed to receive stormwater runoff from the Lincoln and Jefferson Boulevard Drain, the central storm drain and the eastern portion of the Del Rey Bluffs for discharge into Ballona Creek. Only major storm flows are allowed to overflow into Area B, though at present the adjustable weirs at the outlet have retained these flows in the Freshwater Marsh. Therefore, the freshwater discharge to Area B has diminished considerably.

Runoff into the South Wetland is from the Del Rey Bluffs in the vicinity of Falmouth Avenue and from the Gas Company facilities at the toe of the bluffs. Falmouth Avenue drains most of the Del Rey Bluffs to the west. Parts of the wetlands fill with standing water when Centinela Ditch floods but these drain relatively rapidly as the land slopes towards the channels. The South Wetland also receives flows from the East Wetland, and urban runoff from Culver Boulevard near Nicholson Street.

The majority of inflows to the North Wetland are surface runoff from within the area and stormwater flows from the South Wetland. The only direct inflow into the North Wetland is from the Pershing Drive Drain which occasionally overflows. Urban runoff from the commercial district of Playa del Rey also enters the tidal slough system from both sides of Culver Boulevard.

Along the southern boundary of the South and East Wetlands, water seepage from the Del Rey Bluffs is significant, particularly for the area between the West Bluffs and the Centinela Ditch. Rainwater ponds in this low-lying area as the low mound that runs along the channel prevents water from draining back to the ditch.

4.6.4 Freshwater Marsh

The Freshwater Marsh (26 acres) is located in the eastern portion of Area B (Figure 4-16). It receives stormwater runoff flows from the central inlet that drains the Playa Vista development and the Jefferson Boulevard drain. It is designed to accommodate runoff generated by a 1-year frequency storm event and smaller. Water flows into the marsh year-round from the storm drains and an adjustable outlet weir allows for water level control. The marsh will also receive water from the riparian corridor restoration project that will run between Loyola Marymount University and the Playa Vista development.

Stormwater runoff that discharges into this marsh flows southwest to an outlet weir (Figure 4-15 and Figure 4-16) that maintains water elevations in the marsh. The invert elevation of the structure is –2.8 feet MSL, with the top of the weir at 4.0 feet MSL. The Freshwater Marsh outlet flows into an underground culvert that flows northwards under Jefferson and Culver Boulevards and discharges into Ballona Creek. Flap-gates prevent the flow of tidal water in Ballona Creek back into the Freshwater Marsh.

The marsh also includes a spillway that is designed to allow overflow into a siltation pond and then into the East Wetland of Area B. If overflow did occur, the siltation pond would act as a sediment trap to reduce sediment entering the East Wetland during storm events. Flashboard weirs have been constructed which could be removed to allow the Freshwater Marsh to be hydrologically connected to Area B. In addition, a sluice gate is located at the southern end of the marsh that could be used to manage the periodic release of freshwater into the East Wetland.

4.7 AREA C

4.7.1 Topography

Area C covers an area of 66 acres and is located south of Marina Village, north of Ballona Creek, and extends eastwards from Lincoln Boulevard to the Marina Freeway (Figure 4-17 and Figure 4-18). Area C was filled in the early 1960’s with material dredged from the Marina Del Rey boat basin. The fill covered the existing marsh and significantly raised the land surface elevation. The area is divided by Culver Boulevard.

Some fill was placed during the construction of the Pacific Electric Railroad levee in the southwest corner of Area C. More recently fill has also been associated with highway construction. However, the largest impact on the area was the hydraulically placed fill from Marina Del Rey. Slurry was pumped onto Area C, with the excess water returning to the boat basin through Marina Ditch. When the fill had been completed the channel was left in place as an extension of the drain. This left Area C with a high central area, sloping down to the perimeter. The resultant sloping topography does not retain water for extended periods of time (Straw, 2000).

The southern section of Area C, south of Culver Boulevard, is filled very high. Baseball diamonds and a parking area are located in this area.

4.7.2 Sediments

Law/Crandall, Inc. (1991a, b) conducted a geotechnical investigation of Area C for the Playa Vista development. The boring results indicated that the plot is covered by 3.5 to 15 feet of fill consisting of sand, silt, and clay with variable amounts of debris. Like Areas A and B, the fill is underlain by Holocene alluvium consisting of silt, clay, elastic silt and layers of sand and silty sand. The clay in the borings was expansive, and ranged from medium stiff to stiff. The silt was medium stiff to stiff while the elastic silt was soft. The interbedded layers of sand and silty sand are medium dense to dense. At depths of 41 to 57 ft, the sediments transition into dense to very dense sand and gravel, as occurs in Areas A and B. Holocene alluvium is estimated to extend down to depths of 100 ft, under which lies the early Pleistocene age San Pedro Foundation to about 200 feet.

Sandy sediments are found along the line of the Pacific Electric Railroad levee, which was constructed from dredging of Ballona Creek.

4.7.3 Hydrology

The hydrology of Area C results from a combination of direct precipitation, runoff from Area C, flow in Marina Ditch and water backed up behind flap-gates (Straw, 2000).

Marina Ditch is an open channel that runs along the western third of the northern margin of Area C and then extends diagonally to the southeast across the northern half of Area C (this last section appears to follow the line of an old marsh creek). This channel connects to Area B under Lincoln Boulevard.

Straw (2000) identified direct precipitation and overflows from storm drains as the main inflows to Area C. The Alla Road Storm Drain collects water from approximately 246 acres off-site and from smaller storm drains north of Area C, and discharges into Ballona Creek. The drain has no input from Area C. The Lincoln Boulevard North Storm Drain takes runoff from a portion of Lincoln Boulevard north of Ballona Creek.

During flood events on Ballona Creek, the flap-gates on the storm drain close and back-up may cause overflows to occur. These overflows are conveyed to the open channel in Area C to Marina Ditch. Marina Ditch passes through a culvert under Lincoln Boulevard. The hydraulic connection allows only minimal tidal exchange. Rainstorms which are of sufficient intensity to close the Alla Road Storm Drain flap-gates are infrequent and brief and likely to generate runoff from the surface of Area C into the open channel (Straw, 2000).

4.8 SECTION 4 FIGURES

Figure 4-1   Average Monthly Precipitation

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Figure 4-2 Long-Term Precipitation Patterns

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Figure 4-3 Average Daily Tidal Cycle

Figure 4-4 Average Spring-Neap Tidal Cycle

Figure 4-5 Reference Datums

Figure 4-6 Rise of Monthly Mean Sea Levels at Santa Monica and Los Angeles

Figure 4-7 Potential Inflows to Area B

Figure 4-8 Suspended Sediment Contributions at Ballona Creek

Figure 4-9 Dredging Locations in Marina Del Rey

Figure 4-10 Oblique Photograph of Area A

Figure 4-11 Topography of Area A

Figure 4-12 Oblique Photograph of Area B

Figure 4-13 Topography of Area B

Figure 4-14 Hypsometry of Area B

Figure 4-15 Culvert Locations

Figure 4-16 Freshwater Marsh

Figure 4-17 Oblique Photograph of Area C

Figure 4-18 Topography of Area C

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5. BIOLOGICAL RESOURCES

5.1 INTRODUCTION

This section summarizes the biological resources of Ballona Wetlands. A summary of the regulatory framework protecting sensitive biological resources is given in Section 11.

5.2 HABITATS AND VEGETATION

5.2.1 Tidal Marsh Development and Plant Ecology

Coastal saltmarshes can be defined as areas vegetated by herbs, grasses or low shrubs, bordering salt water bodies (Adam, 1990). These areas are periodically inundated with water due to tidal fluctuation and flooding, and occupy the interface between land and sea; therefore, they represent flora and fauna with both marine and terrestrial elements. The organisms essential for the recognition of a saltmarsh are the dominant vascular plants, and the primary abiotic factors that control the distribution of these plants are hydroperiod and soil salinity (HTHA et al., 1982; Josselyn, 1983; Zedler et al., 1992; Zedler et al., 1999; Zedler, 2001). Edaphic factors, such as nutrient and chemical concentrations, and soil mineral and organic matter have a critical role in coastal saltmarsh development, and the role of precipitation and evapotranspiration, anthropogenic changes, such as point and non-point source pollution (i.e. nutrients and sediments), and regional/global climate changes (e.g. drought, temperature, and sea level) all contribute to the structure and ecology in a saltmarsh (Boyer and Zedler, 1999; Kennish, 2001).

5.2.2 Marsh Vegetation Pattern and Development

The relationships and dispersal of plant species in a typical California saltmarsh follow a vertically distributed pattern set up by tidal activity and accumulated sediment. The fluctuation of the mixed semidiurnal tide at Ballona Wetlands, not only on a daily basis, but on a seasonal basis, has a dramatic impact on the saltmarsh vegetation. The timing and duration of tidal inundation and exposure is an important factor in determining which saltmarsh plant species will thrive (Zedler et al., 2001). At Ballona Wetlands, the tides have been modified or excluded from some areas of the wetland by the construction of levees, tide-gates, roads and the Ballona Creek flood control channel.

Tidal activity can generally be broken down into vertical overlapping zones. The lowest level, the subtidal zone is continually covered by water. Above this is the intertidal zone, which is affected by the fluctuating tidal levels. The lowest portion of the intertidal zone consists of unvegetated mudflats. The mid and upper portions of the intertidal zone include vegetated tidal flats or saltmarsh.

The processes of sedimentation and plant colonization and subsequent dynamics lead to establishment of tidal saltmarsh or tidal brackish habitat depending on water column and interstitial soil salinities. The tidal saltmarsh plant community will likely be pickleweed (*Sarcocornia pacifica* syn: *Salicornia virginica*) -

dominated as sedimentation raises the site elevation to form a marsh plain between MHW and MHHW elevations. Cordgrass (*Spartina foliosa*), if present, will only dominate the lowest elevations and along the lower order slough channels that form within the marsh. The slough channels provide narrow, sinuous corridors of intertidal mudflat habitat. The vegetation of the saltmarsh plain might include native species such as salt grass (*Distichlis spicata*), alkali heath (*Frankenia salina*), spearscale (*Atriplex triangularis*), fleshy jaumea (*Jaumea carnosa*), seaside arrow-grass (*Triglochin concinna*), saltmarsh dodder (*Cuscuta salina*), and saltwort (*Batis maritima*).

The high marsh can be defined as the area from approximately MHHW to extreme high water (Josselyn, 1983). The high marsh zone's flooded wetlands include hypersaline or eurysaline areas within the marsh-upland ecotone. Hypersaline areas have salt concentrations greater than sea water, usually in enclosed bodies of water. Eurysaline areas can have a wide range of salt concentration. Pickleweed and salt grass dominate a varied group of halophytes that occur in this zone, which also include spearscale (*Atriplex triangularis*), saltmarsh dodder, fleshy jaumea, seaside arrowgrass, and alkali heath; and the introduced brass buttons (*Cotula coronopifolia*) and rabbitsfoot grass (*Polypogon monspeliensis*). Plants in this zone must tolerate high salinity, as salt is deposited during intermittent inundation and accumulates during long periods of soil water evaporation.

Historically, the diking of tidal marsh habitats, including Ballona Wetlands, has impacted the high marsh and ecotone, creating a very sharp boundary between the tidal marsh and upland (Josselyn, 1983). This can cause a substantial decline in species diversity because the halophytic marsh zone and adjacent upland transition zone often have a higher diversity of plants that the lower marsh vegetation zones.

A brackish marsh habitat will be dominated by tule or bulrush species (*Schoenoplectus* spp. and *Bolboschoenus* spp. syn: *Scirpus* spp.); these species will occur on the tidal marsh plain between MHW and MHHW elevations only where there is substantial and persistent inflow of freshwater. Common pickleweed will be abundant in the brackish marsh - saltmarsh transition.

Above the intertidal zone is the terrestrial or upland zone. The terrestrial zone is not tidally influenced, but receives moist winds from the ocean that regulate daily temperatures. Habitats within this zone typically include coastal dunes, grasslands and coastal scrub.

5.2.3 Ballona Wetlands Tidal Marsh

Within Ballona Wetlands, the lower portions of the intertidal zone are submerged by salt water twice daily. Elsewhere in Southern California, this zone is typically dominated by cordgrass, but this species is lacking at Ballona. The intermediate margins of the intertidal zone are covered by the higher tides, but not every day. These areas are subject to prolonged periods of exposure, usually not more that 15 days. In this zone, the common pickleweed is usually dominant. The lower and intermediate areas of the intertidal zone are well represented in the Ballona Wetlands, but with reduced species diversity (Hendrickson, 1991a).

The upper portions of the intertidal zone extend above the MHW mark to the extreme high water level in the marsh. This zone is occasionally inundated by salt water and excludes many species that are intolerant of salt water. This portion of the saltmarsh can undergo long periods of drying and the surface of the soil may become highly saline. Although Ballona Wetlands has many of the species common to this zone, such as shoregrass (*Monanthochloe littoralis*), salt grass, Parish's glasswort (*Arthrocnemum subterminale* syn: *Salicornia subterminails*) and pickleweed, the species distributions differ from other saltmarshes in Southern California. The modified vegetation is most likely due to the affects of restrictions to tidal flushing as well as changes in the freshwater inundation levels (Hendrickson, 1991b).

5.2.4 Historical Species Composition of Ballona Wetlands

The floral compendium in Appendix B-1 includes all wetland and upland vascular plants species published, reported, noted, listed, observed, or collected within the delineated boundaries of Ballona Wetlands (Areas A, B, C), Del Rey Lagoon, Ballona Lagoon, Marina Del Rey, Grand Canal, Ballona Creek, and the Oxford Basin. The sources of information regarding these plants include, but are not necessarily limited to, the following: Altschul and Homburg (1992), Reed (2002), MEC Analytical Systems (2001), Clark (1979), Hendrickson (1991a), Zedler (1982), Clark et al. (1979), Drennan (2004), and Ferren (personal communication). Many of the plants listed the compendium are not documented with one or more voucher specimens deposited in a recognized herbarium. Therefore, until voucher specimens are provided, these undocumented entities are preliminary identifications.

The intent of this compendium is to list each entity, preferably under one name, and generally following the nomenclature and taxonomy provided in the Jepson Manual (Hickman, 1993), except where recent taxonomic changes have been published in the botanical literature. These names may not be those names applied in the above mentioned sources for a variety of reasons including application of older names, use of different taxonomic treatments resulting in lumping or splitting of named entities, and presumed misidentifications. The ideal floral compendium, a goal of ongoing efforts, is to document all recently observed entities with voucher specimens and to cite as many herbarium specimens as feasible for all plants known for the Ballona Wetlands area including those presumably extirpated sometime in the past. Preparation of a separate list for those species anticipated to occur, or to have occurred at one time, but now extirpated within the ecosystem, is possible only once a more thorough investigation is completed. The known extirpated species, as well as the presumed extirpated native species, are potential candidates for reintroduction or introduction into the Ballona Wetlands region as part of the ongoing efforts to restore the habitats.

Since the floral compendium is compiled from primarily historic sources and un-documented accounts, and habitat conditions continue to change on-site (e.g. tide-gate modifications, invasive species spread and proliferation, habitat restoration), there remains a potentially significant data gap with respect to on-site habitats. For the purposes of developing the conceptual restoration plan, the combination of these sources could be utilized to develop a comprehensive vegetation map. However, mapping inconsistencies and gaps would have to be covered through development of a generalized unifying classification.

Recognizing these gaps, the CDFG has retained the services of Dr. Todd Keeler-Wolf to help prepare a new detailed vegetation map for Ballona Wetlands using the California Native Plant Society (CNPS) classification system as described in the *Manual of California Vegetation* (Sawyer and Keeler-Wolf, 1995). It has been adopted as the standard vegetation classification by state and federal agencies such as CDFG, the U.S. Forest Service (USFS), National Park Service, and U.S. Geological Survey. This mapping effort will be a later supplement to this report.

5.3 HABITAT CLASSIFICATION

Habitats of the Ballona area can be divided into two major categories: upland and wetland. These are distinguished by hydrology, soil, and/or vegetation characteristics, which depend in part on how the boundary between the two categories is distinguished. This section provides a general guide to the classification of the types once a boundary has been established between uplands and wetlands.

5.3.1 Uplands

The great majority of the upland habitats that remain have been altered or they were created by filling or grading. These uplands may or may not be characterized by upland vegetation. Examples of the major types of upland habitats include the following:

- **Natural Upland Habitats:**
    - Dunes
    - Bluffs
    - Alluvial Fans and Deltas

- **Created Habitats:**
    - Berms and Dikes
    - Fields
    - Spoils
    - Roads, Roadsides, and Parking Areas
    - Revetment, Rubble
    - Trails

These natural and created habitats may be colonized by native and/or exotic species but the vegetation structure regardless of origin generally includes the following habitat types:

5.3.1.1 Herbaceous Types

These habitat types are dominated by annual and perennial herbaceous species. These types include dune herbs where the dominant cover during the spring will be from native and non-native annual wildflowers such as sun cups (*Camissonia* spp.), popcorn flowers (*Cryptantha* spp.), lotus (*Lotus* spp.), plantains (*Plantago* spp.) and California croton (*Croton californica*). Also included in these types are grasslands, which in the

Ballona Wetlands region are dominated by non-native grasses like wild oats (*Avena* spp.), bromes (*Bromus* spp.), barleys (*Hordeum* spp.), and ryegrass (*Lolium* spp.), along with some native species (e.g. *Nasella cernua*). These types are common in disturbed areas.

5.3.1.2 Scrub/Shrub Types

These habitat types are usually dominated by perennial shrub and sub-shrub species, even during the spring season. These types include dune scrub where the dune system is stable enough to support the dune shrub species like beach bur (*Ambrosia chamissonis*), sand verbena (*Abronia unbellata*), dune buckwheat (*Eriogonum parviflorum*), salt bush species (*Atriplex* spp.), and coastal bush lupine (*Lupinus chamissonis*). Another shrub type is the coastal bluff scrub which is dominated by species tolerant of a constant exposure to salt spray such as dudleya species (*Dudleya* spp.), sand aster (*Lessingia filaginifolia*), and goldenbush species (*Ericameria* spp.).

In addition to the dune and bluff scrub, there is a disturbed coastal sage scrub on the central fill areas of the wetland. The vegetation that is on top of the historical fill area is primarily non-native, but patches of remnant and/or recovering sage scrub are present. This disturbed coastal sage scrub habitat has scattered coyote bush (*Baccharis pilularis*) and California sagebrush (*Artemisia californica*) shrubs with a few laurel sumacs (*Malosma laurina*).

These habitat types also include areas of non-native scrub vegetation such as castor bean (*Ricinis communis*), pampass grass (*Cortaderia selloana*), Brazilian peppertree (*Schinus terebinthifolius*), ngaio tree (*Myoporum laetum)*, and wattle or acacia (*Acacia* spp.), as well as cultivated vegetation.

5.3.1.3 Forested/Woodland Types

These types include woodland areas, groves, stands, and rows of tree species, native and non-native. In the Ballona Wetlands area, the native examples of these habitat types (e.g. riparian woodland) are no longer present or greatly reduced due to habitat loss, but small stands of non-native trees are present such as eucalyptus (*Eucalyptus* spp.), pepper trees (*Schinus* spp.), date and fan palms (*Phoenix* spp. and *Washintonia* spp.), sweet-gum (*Liquidambar styraciflua*), and olive trees (*Olea europea*).

5.3.2 Wetlands

Wetlands are classified according to the U.S. Fish and Wildlife Service (USFWS) system developed by Cowardin et al. (1979) and expanded upon by Ferren et al. (1995). The major systems, sub-systems, and classes include the following:

5.3.2.1 Marine

Marine systems include the open-ocean and coastlines. Within this system are the sub-systems of subtidal and intertidal and within these sub-systems are the classes Unconsolidated Bottom (sub-classes sand and mud), Unconsolidated Shore (sub-classes sand and mud), and Aquatic Bed (sub-classes algal, rooted vascular, and floating vascular).

5.3.2.2 Estuarine

Estuarine systems include deep water tidal habitats and adjacent tidal wetlands that have a high salinity. As with the marine system, this system includes the sub-systems of subtidal and intertidal and within these sub-systems are the classes Unconsolidated Bottom (sub-classes sand and mud), Unconsolidated Shore (sub-classes sand and mud), Aquatic Bed (sub-classes algal, rooted vascular, and floating vascular), Emergent (sub-classes persistent and non-persistent), Scrub-shrub Wetland (sub-classes broad-leaved deciduous and broad-leaved evergreen), and Forested Wetland (sub-class broad-leaved deciduous).

5.3.2.3 Riverine

Riverine systems include all deep water habitats and wetlands contained within a channel with low salinity and low to moderate vegetation. This system includes the sub-systems of lower perennial and intermittent and within these sub-systems are the classes Unconsolidated Bottom (sub-classes sand and mud), Unconsolidated Shore (sub-classes sand, mud, and vegetated), Aquatic Bed (sub-classes algal, rooted vascular, and floating vascular), and Emergent (sub-class non-persistent).

5.3.2.4 Palustrine

Palustrine systems include small (<20 acres), vegetated, shallow (<6.6 feet), and non-saline wetlands. This system does not have any sub-systems, but has at least five classes known from Ballona Wetlands, including Unconsolidated Bottom (sub-classes sand and mud), Unconsolidated Shore (sub-classes sand, mud, and vegetated), Aquatic Bed (sub-classes algal, rooted vascular, and floating vascular), Emergent (sub-classes persistent and non-persistent), Scrub-shrub Wetland (sub-classes broad-leaved deciduous and broad-leaved evergreen), and Forested Wetland (sub-class broad-leaved deciduous).

Various hydrogeomorphic units can be added to the classification to establish landform context, such as flats, berms, channels, ditches, banks, slopes, shores, etc.

5.3.3 Specific Vegetation and Habitat Resources

Specific vegetation and associated habitat types were evaluated as part of the development of the Ballona Wetlands vegetation compendium (Appendix B-1). The compendium relies primarily on historic sources and reports habitat type for each species listed. Generally, habitat resources within Ballona Wetlands fall into the following broader plant community types which will be further detailed in future vegetation mapping efforts.

5.3.3.1 Saltmarsh

Vegetation of saltmarsh communities (estuarine and palustrine types) consists of halophytic (salt-tolerant) plants that are mostly low-growing herbaceous perennials. In general terms for Ballona Wetlands, this includes all portions of the project area where pickleweed is a major or dominant species. Other common saltmarsh species (e.g. salt grass, alkali heath, etc.) may or may not be present. Within this community type, sub-categories can be broken out for degree (full tidal or muted tidal) or lack of tidal influence, salt flat areas, and marsh-like areas resulting from depressed basins associated with soil settlement. Saltmarsh vegetation can be observed in Areas A, B, and C in some form or another, though most of the saltmarsh habitat in Areas A and C is non-tidal.

5.3.3.2 Freshwater Marsh

Freshwater marshes (palustrine emergent wetlands) occur in nutrient-rich mineral soil that is saturated through most or all of the year. The dominant plants of freshwater marsh communities are mostly perennial monocots that can reproduce vegetatively by underground rhizomes. At Ballona Wetlands, these areas are dominated by freshwater emergent monocots such as cattails (*Typha* spp.) and bulrushes. Within the project area, freshwater marsh is primarily limited to the created Freshwater Marsh at the southeastern end of Area B, and stands of cattails and bulrushes along a remnant riparian drainage running across the southern boundary of Area B. Included within this vegetation type are areas that could be considered willow scrub, that are dominated by ‘thickets’ of willows such as arroyo willow (*Salix lasiolepis*), narrow-leaved willow (*Salix exigua*) and red willow (*Salix laevigata*). Willow scrub typically occurs in riparian corridors near freshwater sources. Within the project area, it notably occurs in Area B below the Del Rey Bluffs and at the western end of Area B adjacent to the dunes. Willow scrub species were also planted in association with the Freshwater Marsh in Area B, and can be found as isolated patches elsewhere.

5.3.3.3 Coastal Sage

The coastal sage scrub communities of Southern California occur on a variety of substrates, generally in soils with moisture available in the upper horizons only during the winter-spring growing season. Plants of the coastal sage scrub are adapted to these conditions, and are a mixture of herbaceous, suffrutescent, and shrubby species. In general terms for Ballona Wetlands, coastal sage scrub includes all upland or transitional habitat areas where coastal sage scrub plant species are dominant. Such species include California sagebrush (*Artemisia californica*), coyote brush (*Baccharis pilularis*), laurel sumac (*Malosma laurina*) and others.

5.3.3.4 Dune Scrub

In general the dune scrub type habitat in Southern California is a mixture of pioneer dune habitat along the coastal strand with dune scrub plants located inland from the pioneer dune community. At Ballona Wetlands, the sandy areas are a remnant of the dune system that pre-existee the surrounding residential development, and are a mixture of pioneer and scrub-dominated dune habitat. Notable species of this plant community include dune lupine (*Lupinus chamissonis*), sand verbena (*Abronia* sp.), coast buckwheat (*Eriogonum* *parvifolium*), deerweed (*Lotus scoparius* var. *scoparius*) and branching phacelia (*Phacelia ramosissima*). Coastal dune habitat occurs primarily in the western end of Area B. However, a similar sandy area occurs in the southeastern end of Area A.

5.3.3.5 Annual Grassland

Annual grassland communities are assemblages of plants that thrive in disturbed areas, roadsides, and similar sites in developed areas. Dominant species include annual grasses (ryegrass – *Lolium multiflorum*, etc.), pampas grass (*Cortaderia* sp.), bristly ox-tongue (*Picris echioides*), ice plants (*Mesembryanthemum* spp. and *Carpobrotus* spp.) and others. Such areas occur throughout the project area, but tend to be less common in areas with wetland hydrology.

5.3.4 Special-Status Plants

Numerous studies, investigations and surveys have occurred within Ballona Wetlands and the surrounding area. This section discusses special-status plant species discussed in the preceding sections and the following:

- State and Federally Listed Endangered, Threatened and Rare Plants of California, CDFG, Natural Heritage Division, July 2006 (CDFG, 2006). Available at: http://www.dfg.ca.gov/whdab/pdfs/TEPlants.pdf;

- California Natural Diversity Data Base (CNDDB, 2006). Available at: http://www.dfg.ca.gov/whdab/html/cnddb.html; and

- California Native Plant Society (CNPS, 2006) (7th Edition). Available at: http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi

According to a 2006 query of the CNDDB, 13 special-status plant species (all CNPS List 1B with one 1A species) potentially occur within a three-mile radius of the Ballona Wetlands area. Of these, 6 species are believed to be extant including the Parish's brittlescale (*Atriplex parishii*), southern tarplant (*Centromadia parryi* ssp. *australis),* Orcutt's pincushion (*Chaenactis glabrata* var. *fernandina*), mud nama (*Nama stenocarpum*), Brand's phacelia (*Phacelia stelleris*), and salt marsh checkerbloom (*Sidalcea neomexicana*). According to CNNDB, a total of 7 species are considered extirpated from the area, including the Ventura marsh milk-vetch (*Astragalus pycnostachyus* var. *lanosissimus*), coastal dunes milk-vetch (*Astragalus tener* var. *titi*), beach spectaclepod (*Dithyrea maritima*), San Fernando Valley spineflower (*Chorizanthe parryi* var. *fernandina*), salt marsh bird's beak (*Cordylanthus maritimus* ssp. *maritimus*), Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*), and Ballona cinquefoil (*Potentilla multijuga*).

The CNPS inventory, queried by topographic quad, lists 11 special-status plant species (CNPS List 1A, 1B and one 3), including the Ventura marsh milk-vetch (*Astragalus pycnostachyus* var. *lanosissimus*), southern tarplant (*Centromadia parryi* ssp. *australis*), San Fernando Valley spineflower (*Chorizanthe parryi* var.

fernandina), beach spectaclepod (*Dithyrea maritima*), many-stemmed dudleya (*Dudleya multicaulis*), Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*), Brand's phacelia (*Phacelia stelleris*), Ballona cinquefoil (*Potentilla multijuga*), Lewis's evening-primrose (*Camissonia lewisii*), Orcutt's pincushion (*Chaenactis glabriuscula* var. *orcuttiana*), and Prostrate navarretia (*Navarretia prostrata*).

A number of species are listed in both CNNDB and CNPS inventory; however these databases present some conflicting information. Two species, Ventura marsh milk-vetch and San Fernando Valley spineflower, are described within CNDDB as extirpated while within the CNPS inventory lists them as recently rediscovered in 1997 and 1999, respectively.

The Psomas study (1995) revealed two other CNPS List 3 and 4 special-status plants known to occur in the project area including the Lewis's evening primrose (*Camissonia lewisii*) and suffrutescent wallflower (*Erysimum insulare* ssp. *suffrutescens*). Both of these species are known to occur in Areas B and C. Lewis's evening primrose occurs in sandy areas, generally away from dense grasses and weeds. Its population is estimated as 5,000 individuals in Area B and 6,000 individuals in Area C. Suffrutescent wallflower occurs in dune habitats at the western end of Area B and its population is estimated at 10 individuals.

This same study confirmed occurrences of the southern tarplant as occurring along the margins of marshes and in grasslands and areas supporting vernal pools. Approximately 30 individuals have been estimated to occur east of the ball fields in Area C (Psomas, 1995). In addition, wooly seablite (*Suaeda taxifolia*) is known to occur on site and is a CNPS List 4 species (plants of limited distribution) (Hendrickson, 1991b; Reed, 2002; Ferren, 2006).

While numerous studies have occurred in the Ballona Wetlands region, many special-status plant species may have occurred within the area but were not inventoried or collected and their historic presence will never be known. For instance, the Los Angeles sunflower (*Helianthus nuttallii* ssp. *parishii*) is believed to have occupied the Ballona Wetlands region historically, however, this species is presumed to be extirpated from the area (Mason, 1957; CNPS, 2006).

5.4 JURISDICTIONAL WETLANDS

A few jurisdictional wetland determinations have been made, particularly for Areas A and B. In 1989, the Los Angeles District of the USACE determined that 'waters of the U.S.' totaled 9.83 acres in Area A, 170.56 acres in Area B, and 1.80 acres in Area C. In a later study of Area A, jurisdictional wetlands using the California Coastal Act definition of wetlands (Entrix, 1992) were found to total 22.49 acres. As this example illustrates, the extent of wetlands present within a given area depends on the jurisdictional definition considered. For many years, the CDFG delineation completed in the 1980's has been the basis for some California Coastal Commission permitting decisions for Ballona Wetlands, although a number of recent delineations disagree with previous delineations. No recent delineation report covering the entire project site addressing all wetland regulatory agencies has been completed, and hence the extent of jurisdictional wetlands is not fully known.

For the purposes of conceptual restoration planning, a number of assumptions could be made combining prior wetland delineation results with current vegetation mapping to come up with a reasonable ‘snap shot’ of jurisdictional wetlands within the project area. For future phases, following conceptual restoration design planning, including environmental review under the California Environmental Quality Act (CEQA) and project permitting prior to implementation, a new wetland delineation will be required in consultation with the appropriate regulatory agencies.

5.5 WILDLIFE RESOURCES

5.5.1 Invertebrates

The Ballona Wetlands are an important site for coastal saltmarsh insects due to the rarity of this type of habitat in Southern California. However, information regarding historical invertebrates in Ballona Wetlands is limited (Table 5-1). As of 1981 there had never been a complete survey of the insect fauna of a pristine coastal locality in Southern California (Nagano et al., 1981). In 1981, when Nagano and colleagues produced their insect and terrestrial arthropod report, they noted that it was unusual for insects to be included in an ecological conditions report. A previous Ballona study referenced insects primarily as a food source for higher invertebrates, although it did note the presence of wandering skipper *(Panoquina errans),* an insect then under consideration for Threatened Species status (Nagano et al., 1981). Although there are few studies of invertebrates in the region, it can be assumed that in the 20th century, populations of native species declined along with nearly all coastal wildlife. No new surveys were performed in conjunction with this report; therefore an exact snapshot of the current invertebrate population at Ballona cannot be determined.

Table 5-1. Terrestrial Invertebrate Surveys

Year	Author	Geographic Extent	Description
2000	Psomas	Area B	Survey for El Segundo blue butterfly for Playa Capital
1996	Hawks Biological Consulting	Areas A, B, and C	Sensitive insect survey for Impact Sciences
1991	Mattoni	Area B	Terrestrial arthropod survey for Playa Vista EIR
1991	Boland and Zedler	Area B	Fish and invertebrate research sponsored by the National Audubon Society
1981	Nagano et al.	Areas A and B	Baseline report on insects and related terrestrial arthropods for *Biota of the Ballona Region* report

Throughout the 2.5-month sensitive-species terrestrial invertebrate survey in 1996 (Hawks Biological Consulting, 1996), 16 orders were collected from Areas A, B, and C, including Collembola (springtails), Thysanura (silverfish), Microcoryphia (bristletails), Odonata (dragonflies and damselflies), Orthoptera (grasshoppers, mantids, roaches, etc.), Dermaptera (earwigs), Isoptera (termites), Psocoptera (psocids and lice), Thysanoptera (thirps), Hemiptera (true bugs), Homoptera (cicadas, hoppers, aphids, etc.), Neuroptera (lacewings, antlions, etc.), Coleoptera (beetles), Lepidoptera (butterflies and moths), Diptera (flies), and Hymenoptera (bees, wasps, and ants). Four sensitive species were found: wandering skipper, western mudflat tiger beetle (*Cicindela trifasciata sigmoidea*), globose dune beetle (*Coleus globosus*), and Dorothy's dune weevil (*Trigonoscuta dorothea dorothea*). In addition, some new species were found: Jerusalem cricket (*Stenopelmatus* new species) and sand roach (*Arenivaga* new species). Western mudflat tiger beetle, Jerusalem cricket, and sand roach were each also reported by Nagano et al. (1981) and by Mattoni (1991). Nagano et al. (1981) also listed two other tiger beetles, neither of which were found in later surveys (Hawks Biological Consulting, 1996).

Benthic invertebrates have been sampled in Area B several times between 1981 and 2004 (Table 5-2). Data regarding Areas A and C is more limited. The tidally-influenced portions of Marina Ditch in Area A were sampled in 1995 and 1999. Area C has never been sampled for benthic invertebrates due to a lack of tidal influence. Many benthic invertebrates are sessile, so water quality parameters such as temperature and salinity are important determinants of the invertebrate species that colonize a habitat (Zedler, 2001).

Table 5-2. Benthic Invertebrate Surveys

Year	Author	Geographic Extent	Description
2004	MEC-Weston	Area B	Vegetation, fish, bird, and benthic infauna study, provided monitoring data for USACE 1135
2001	MEC-Weston	Area B	Vegetation, fish, bird, and benthic infauna study, provided monitoring data for USACE 1135
2003	Wetlands Research Associates	Area B	Benthic infauna survey
2001	Glen Lukos Associates	Areas A, B, and C	Habitat assessment for Riverside and San Diego Fairy Shrimp for Playa Capital
1999	Chambers Group	Areas A and B	Benthic infauna survey for Impact Sciences
1996	Chambers Group	Areas A and B	Benthic infauna survey for Impact Sciences
1991	Carter	Areas A, B, and C	Non-insect invertebrate survey for Playa Vista EIR
1991	Boland and Zedler	Area B	Fish and invertebrate research sponsored by the National Audubon Society.
1981	Ramirez	Area B	Mollusk survey for *Biota of the Ballona Region* report

5.5.1.1 Area A

Terrestrial Invertebrates

Sensitive-species surveys performed in 1995 collected the western mudflat tiger beetle *(Cicindela trifasciata sigmoidea)* from Area A (Hawks Biological Consulting, 1996). Although not specifically recognized as a sensitive species, the western mudflat tiger beetle is considered to be sensitive due to its restricted distribution in declining Southern California coastal habitats (Hawks Biological Consulting, 1996). Carter (1991) reported that Area A yielded almost no non-insect terrestrial invertebrates except for the African land snail *(Otala lacteal)*.

Benthic Infauna

The only benthic invertebrate habitat in Area A is Marina Ditche. It was sampled for benthic invertebrates in 1995 and 1998 by Chambers Group (1996, 1999). In 1998 the estuarine polychaete worm *(Polydora nuchalis)* accounted for 80% of the animals collected in the ditch (Chambers Group, 1999). Only five taxa were collected. Other species included *Streblospio benedicti*, *Capitella capitata,* Oligochaete, and *Corophium acherusicum*. Results from the 1998 sampling showed less diversity compared to the results from 1995, which showed three species to be abundant, the estuarine polychaete worm and two cosmopolitan amphipod crustaceans *(Corophium indidiosum* and *Grandidierella japonica)*. Total number of taxa in 1995 was eleven, twice as many as in 1998.

5.5.1.2 Area B

Terrestrial Invertebrates

Surveys performed in 1995 collected some species considered to be sensitive due to their restricted distribution in declining Southern California coastal habitats: the western mudflat tiger beetle *(Cicindela trifasciata sigmoidea)*, two undescribed species of Jerusalem cricket *(Stenopelmatus* new species), and one undescribed species of sand roach *(Arenivage* new species*)* (Hawks Biological Consulting, 1996). Each of these was also found in previous studies by Mattoni (1991) and Nagano et al. (1981).

Benthic Infauna

The most recent surveys of benthic infaunal invertebrates in the channels of Area B were performed by MEC-Weston (2005), and by Wetlands Research Associates (WRA, 2004). These surveys provide information on channel invertebrate populations after the installation of self-regulating tide-gates by the Ballona Wetlands 1135 Restoration Project (USACE, 2000). The new tide-gates became operational in March 2003.

MEC-Weston (2005) sampled benthic invertebrates at eight stations in August 2003. Late summer is the time of maximum diversity and abundance of estuarine benthic fauna. These populations tend to be affected negatively by winter rains (Onuf, 1987). The survey identified 37 taxa, a slight decrease from the 43 taxa identified in core samples taken in August 2001 (MEC-Weston, 2005). Annelid worms were represented by the most taxa (12), followed by mollusks with nine taxa, and arthropods with seven taxa. Minor phyla collected in 2003 included cnidaria and nemertea. At their entire sample sites WRA (2004) found a greater total number of invertebrates in September 2003 than in February 2003. However, the greatest increases in number of invertebrates were at the sampling locations closest to the channel, thus the change was not believed to be only seasonal. In the July 1998 study of Chambers Group (1999) a total of 21 taxa were identified, one less than in August 1995 (Chambers Group, 1996). Carter found 35 taxa in Area B during her 1990-1991 survey.

The amphipod *Monocorophium insidiosum* was abundant at all stations in 2003. The tube building amphipod *Grandidierella japonica* was the dominant species at one station. The polychaete *Polydora nuchalis* was the most abundant taxa at one station and was found at three others. *Grandidierella* and the gastropod *Acteocina inculta* were the most abundant species at a station.

The total number of taxa per station ranged from a low of seven taxa to a high of 21 in 2003. In general, the stations farthest from the tide-gates had fewer taxa than stations closer to the tide-gates. This pattern is similar to that observed before the 2001 restoration.

Clams were collected in cores at two stations in both 2001 and 2003. During the 2003 sampling, two little neck clams (*Protothaca* sp.) and one jackknife clam (*Tagelus affinis*) were collected in Area B. Although no clams were collected in long cores, four California chione clams (*Chione californiensis*) were collected in regular cores. This pattern in clam distribution is the same as was observed in 2001 before the restoration. Therefore, increased tidal flow does not appear to have resulted in a greater distribution of clams throughout the wetlands.

5.5.1.3 Area C

Terrestrial Invertebrates
No formal arthropod surveys have been conducted on Area C.

Benthic Infauna
Area C has not been sampled for benthic invertebrate fauna on the basis that it contains no tidal channels or other appropriate habitat for non-insect invertebrates. However, Marina Ditch does run through Area C and this does have a tidal connection to Marina Del Rey. One non-insect invertebrate was collected in Area C in 1991, the invasive African land snail *(Otata lactea)* (Carter, 1991).

5.5.1.4 Special-Status Species

Terrestrial Invertebrates
The restored wetlands in Area B are expected to be used by sensitive insects including the El Segundo blue butterfly (*Euphilotes battoides alluni*), wandering skipper, Belkin's dune tabanid fly (*Brennania belkini*), Dorothy's sand dune weevil (*Trigonoscuta dorothea*), the western mudflat tiger beetle, and the sandy beach tiger beetle (*Cicindela hirticollis gravida*) (Tsihrintzis et al., 1996).

According to a November 2005 download from the CNDDB, six special-status species of terrestrial invertebrates and one special-status species of gastropod may be present in Ballona Wetlands. Two butterflies are listed, the wandering skipper and the monarch *(Danaus plexippus* — which uses the project area as a wintering site, according the CNDDB). The other five species listed are Belkin's dune tabanid fly, Dorothy's El Segunda dune weevil, the globose dune beetle *(Coelus globosus)*, and Lange's El Segundo dune weevil *(Onychobaris langei)*. The brackish water snail *(Tryonia imitator)* is the sole gastropod listed. Additionally, Psomas (2001) evaluated Areas A, B, and C in 2000 for four additional federal endangered species, two species of fairy shrimp and two butterflies.

Wandering skipper is currently designated as a Lower Risk/near threatened (LR/nt) species on the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened

Species. Psomas and Lockhart (2001) reported that wandering skipper were present in Areas A and B. They were also found in Areas A and B during surveys in 1995, 1991, and 1981 (Hawks Biological Consulting, 1996; Mattoni, 1991; Nagano, 1981).

An estimated 1,000 individual monarch butterflies were observed roosting in Area B in December 1997 (CNDDB, 2005). This species was also reported by Nagano et al (1981) and Mattoni (1991). They were the most commonly seen of all insects, although populations varied, with at least 500 in mid-October 1990 until the end of February 1991, and a maximum of 5,000 in January 1991 (Mattoni, 1991). Their distribution was highly non-random due to a roosting site in a eucalyptus grove in Area B (Mattoni, 1991). The monarch butterfly is on the IUCN Red List of Threatened Species. Along with eucalyptus trees supporting wintering habitat, the Ballona Wetlands also supports narrowleaf milkweed (*Asclepias fascicularis*), which is used as a larval host plant in Area C (B. Henderson, CDFG, PC).

Belkin's dune tabanid fly is also listed as a vulnerable species on the IUCN Red List of Threatened Species, and has not been found in the Ballona Wetlands region since the 1980's (Hawks Biological Consulting, 1996). Mattoni (1991) noted that the fly had been present in the mid-1980's but was 'recently' extirpated.

Dorothy's El Segundo dune weevil is listed on both the USFWS Federal Species of Concern and the CNDDB Special Animals list, with no particular designation. It was found in Area B in 1995 and more recently in the dune system immediately west of Area B (Hawks Biological Consulting, 1996; Psomas and Lockhart, 2001). It was the 15th most common insect collected by pitfall traps in 1991 and one of the most abundant weevils on the dunes (Mattoni, 1991).

The globose dune beetle is listed as a USFWS Species of Concern, although the CNDDB no longer uses this USFWS designation because it was not maintained on a state-wide basis. It is also designated as Vulnerable on the IUCN Red List of Threatened Species. This species has been found in recent surveys, in Area B in 1995, and more recently in the dune system immediately west of Area B (Hawks Biological Consulting, 1996; Psomas and Lockhart, 2001). It also occurs at the Los Angeles Airport dunes (Mattoni, 1991). Nagano et al.(1981) searched for the beetle but noted that it had never been recorded from the Ballona Wetlands region, although it was known at the time to occur at nearby Dockweiler State Beach. Mattoni (1991) noted that this species had never been found in the Ballona Wetlands region, but if it were to occur anywhere, it would occur in the sand dunes.

Lange's El Segundo dune weevil is listed on both the USFWS Federal Species of Concern and the CNDDB Special Animals list, with no particular designation. This species was found in recent surveys to inhabit the dune system immediately west of Area B (Psomas and Lockhart, 2001). It was also collected by Nagano et al. 1981 and Mattoni (1991).

The brackish water snail *(Tryonia imitator)* has Data Deficient (DD) status on the IUCN Red List of Threatened Species and is also a USFWS Federal Species of Concern. This snail has not been observed in the project area since the 1970's (CNDDB). The brackish water snail was not reported from the Playa Vista development area during recent surveys (Psomas and Lockhart, 2001).

Two species of endangered fairy shrimp, Riverside fairy shrimp (*Strephtocephalus woottoni)* and San Diego fairy shrimp *(Branchinecta sandiegonensis),* which reside in vernal pools, were evaluated in the Ballona Wetlands region over one week in early May 2000 (GLA, 2000). The nearest occurrence of habitat occupied by adult Riverside fairy shrimp is in Ventura County, 34 miles northwest of Ballona Wetlands, although viable cysts were identified just a few miles away at Los Angeles Airport. The nearest occurrence of habitat of San Diego fairy shrimp is in Fairview Park, about 40 miles southeast of the Ballona Wetlands region (GLA, 2000). A non-listed species of fairy shrimp, *B. lindahli* is known to occur at Madrona Marsh in Torrance, a city in Los Angeles County, and there are plans to try to establish Riverside fairy shrimp there as mitigation for the LAX population (D. Christopher Rogers, personal communication).

Areas A, B, and C were evaluated for habitat suitable for both the Riverside and the San Diego fairy shrimp, although the habitat assessment did not include either wet- or dry-season sampling (GLA, 2000). Wherever substantial ponding was observed during the May 2000 assessments, the water was measured for specific conductance and visual observations of any aquatic invertebrates and vegetation were collected. No ponds in Areas A, B, or C were determined to be capable of supporting either type of fairy shrimp due to high salinities or inadequate length or depth of ponding, and thus, both the Riverside fairy shrimp and the San Diego fairy shrimp were determined to be absent from the project area (Psomas, 2001; Psomas and Lockhart, 2001). Subsequently, fairy shrimp were identified adjacent to the Ballona Wetlands and further studies are being undertaken by CDFG (Brad Henderson, personal communication). In order to rule-out endangered fairy shrimp populations in the Ballona Wetlands region, both wet- and dry-season surveys would need to be performed in order to follow the proper protocols (D. Christopher Rogers, personal communication).

Surveys in 2000 also determined that two endangered butterflies, El Segundo blue butterfly, and Quino checkerspot butterfly *(Euphydryas editha quino)* were absent from the project area (Psomas, 2001, Psomas and Lockhart, 2001). Nagano et al. (1981) searched extensively for El Segundo blue butterfly, but had no success in capturing or observing a specimen. The El Segundo blue has a population at the Los Angeles Airport just a few miles away, but has not been recorded in the Ballona Wetlands region since the mid-1980's when one male was sighted at Playa Del Rey (Mattoni, 1991). This is likely to be a reaction to the decline of its host plant *Eriogonum parvifolium* in the area, which had lost about 65% of its population between the mid 1980's and 1991 (Mattoni, 1991). However, this plant is still found in Area B and has been extensively planted by the Friends of Ballona Wetlands in the dunes that border the western edge of Area B. The assessment of the Quino checkerspot butterfly was based on frequent visits to the area as well as current information on species range (Psomas and Lockhart, 2001). It was not found on-site by any of the 1981, 1991, or 1996 surveys.

Benthic Infauna

No special-status benthic invertebrates are known to inhabit the project area, nor are any known to have in the past.

5.5.2 Fish

Swift and Franz (1981) conducted the first detailed study of the Ballona Wetlands fish community. This was the first ever study of an upper marsh fish community in Southern California and serves as a baseline for future marshes, as well as providing a wealth of information about likely conditions in the past. Prior to modifications of the region, when the Los Angeles River emptied into the Ballona Wetlands during flood events, the fish assemblage would have included all the species known to have inhabited the River. Most of these species are currently absent from the project area and have been since the 1950's (Swift et al., 1993). The course of the Los Angeles River has been maintained to the south and away from Ballona Creek since 1884.

Since the first detailed study of the Ballona Wetlands fish community by Swift and Franz (1981), eight other fish assemblage studies of the tidal marsh within Area B and/or Ballona Creek have been undertaken (Table 5-3). Fish surveys of Marina Del Rey are also included, due to the high potential for recruitment from the harbor.

Table 5-3. Fish Surveys

Year	Author	Geographic Extent	Description
2004	MEC-Weston	Area B	Vegetation, fish, and bird study, provided monitoring data for USACE 1135
2003	MEC-Weston	Area B	Vegetation, fish, birds, and benthic infauna study, provided monitoring data for USACE 1135
2001	MEC-Weston	Area B	Vegetation, fish, birds, and benthic infauna study, provided monitoring data for USACE 1135
1996	Haglund et al.	Area B Ballona Creek Marina Del Rey	Fish survey performed for Impact Sciences
1993	Swift et al.	Southern California	Journal article. 'The status and distribution of the freshwater fishes of Southern California'. Bulletin of the Southern California Academy of Sciences
1991	Soltz	Area B	Fish survey for Playa Vista EIR
1991	Allen	Ballona Creek Low Marina Del Rey	Fish survey for Playa Vista EIR
1991	Boland and Zedler	Area B	Fish and invertebrate research sponsored by the National Audubon Society.
1981	Swift and Frantz	Area B	Fish survey for *Biota of the Ballona Region* report

No new surveys were performed in conjunction with this report; therefore an exact snapshot of the current fish population at Ballona cannot be determined. If the species has been reported as present during a survey, the area in which it was found and the author and year of the report is listed. Species which have been specifically surveyed and never found are listed as NA, as are species which are believed to have occurred historically but which have never been documented.

The surveys listed in Table 5-3 described 55 species of fish that inhabit or have been known to inhabit Area B, Ballona Creek, and/or Marina Del Rey (Appendix B-2). Eleven of these species were believed to have historically inhabited the Ballona Wetlands area but were not found in any survey from the past 25 years. Under more natural conditions, species including bay pipefish (*Syngnathus leptorhynchus),* barred pipefish (*Syngnathus auliscus)*, starry flounder *(Platichythus stellatus)*, and tidewater goby *(Eucyclogobius newberri)*, should occur (Swift and Frantz, 1981; C. Swift, personal communication). Starry flounder is very rare in estuaries south of Point Conception (C. Swift, personal communication). When the Los Angeles River emptied into the marsh during flood events in historial times, additional species would also have included steelhead trout (*Oncorynchus mykiss)*, unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni)*, Santa Ana sucker (*Castostomus santaanae)*, arroyo chub (*Gila orcutti*), Santa Ana speckled dace (*Rhinichthys osculus*), Pacific lamprey (*Lampetra tridentate)*, and western brook lamprey (*Lampetra richardsoni*) (Swift et al., 1993).

Taken together, the studies listed in Table 5-3 list a total of 44 species found in Area B, Ballona Creek, and Marina Del Rey in the past 25 years (Appendix B-2). Eight species were common to all three areas. Three species were reported to have been found in Area B and either Ballona Creek or Marina Del Rey, and five species were found only in Area B. The remaining 28 species were found only in Ballona Creek, Marina Del Rey, or both. Of these, nine were unique to Ballona Creek and nine to Marina Del Rey. The remaining 10 species were found in both the Creek and Marina Del Rey.

Species found in all three areas include arrow goby *(Clevelandia ios),* California halibut *(Paralichthys californicus)*, cheekspot goby *(Ilypnus gilberti)*, diamond turbot *(Hypsopsetta guttulata),* queenfish (*Seriphus politus),* shadow goby (*Quietula y-cauda),* shiner perch (*Cymatogaster aggregate)*, and topsmelt *(Atherinops affinis)*. Longjaw mudsucker (*Gillichthys mirabilis)* was found in Area B and in Ballona Creek. Pacific staghorn sculpin (*Leptocottus armatus)* and yellowfin goby (*Acanthogobius flavimanus*) were each found in Area B and Marina Del Rey.

Species found only within Area B included California killifish (*Fundulus parvipinnis)*, mosquitofish (*Gambusia affinis*), sailfin molly (*Poecilia latipinna*), black perch (*Embiotoca jacksoni*), and striped mullet (*Mugil cephalus*). Black perch is a coastal marine species and its occurrence in only Area B can only be interpreted as an unlikely event (C. Swift, personal communication). Striped mullet were also often seen in Ballona Creek in the 1990's and probably also exist there today (C. Swift, personal communication).

Species in both Ballona Creek and Marina Del Rey included barred sea bass (*Paralabrax nebulifer),* bat ray (*Myliobaris californica*), jacksmelt (*Atherinopsis califoriensis*), kelp bass (*Paralabrax clathratus),* mussel blenny (*Hypsoblennius jenkinsi*), Pacific sardine (*Sardinops sagax),* spotted kelpfish (*Gibbonsia elegans*), spotted turbot (*Pleuronichthys ritteri)*, white croaker (*Genyonemus lineatus*), and white seabass (*Atractoscion nobilis).*

California corbina (*Menticirrhus undulates)*, California needlefish (*Strongylura exilis)*, fantail sole (*Xystreurys liolepis*), horneyhead turbot (*Pleuronichthys verticalis)*, opaleye (*Girella nigricans)*, sargo (*Anisotremus davidsoni)*, white surfperch (*Phanerodon furcatus*), yellowfin croaker (*Umbrina roncador*), and zebra perch (*Hermosilla azurea)* were reported exclusively from Ballona Creek.

Species exclusively found in Marina Del Rey included California clingfish (*Gobiesox rhessodon*), California tonguefish (*Symphurus atricauda)*, giant kelpfish (*Heterostichus rostratus*), Northern anchovy (*Engraulis mordax*), Pacific barracuda (*Sphyraena argentea*), round stingray (*Urolophus halleri*), salema (*Xenistrius califoriensis*), specklefin midshipman (*Porichthys myriaster*), and spotted sand bass (*Paralabrax maculatofasciatus*).

5.5.2.1 Ballona Creek and Marina Del Rey Harbor

Ballona Creek and Marina Del Rey were sampled in 1991 by otter trawl tows. Samples were collected in July and October 1990 and in January 1991. Samples were also collected from Marina Del Rey in April 1991. Ballona Creek was not sampled in April due to an upstream oil spill.

During 1991 sampling of Ballona Creek, 594 individual fish of 13 species were collected, of which nearly 83% were cheekspot goby. Next highest in abundance was California halibut with nearly 7%. Barred sand bass and arrow goby each made up about 2.5% of the catch, followed by post-larval goby, kelp bass, topsmelt, diamond turbot, spotted turbot, hornyhead turbot, and Pacific sardine. One kelp fish, one mussel blenny, and one California needlefish were also captured. The highest numbers of fish (364) were caught in July, while only 11 fish were caught in January (Allen, 1991). This sampling was considered depauperate compared to Marina Del Rey (Allen, 1991).

The fish species found to inhabit lower Marina Del Rey during the 1991 sampling event were characteristic of harbor habitats throughout Southern California (Allen, 1991). Collection methods included otter trawl, gill net, minnow trap, visual surveys, and minnow seine, and 5469 fish representative of 22 species were collected. Northern anchovy and queenfish were the most abundant species, each representing about 43% of the total catch. White croaker comprised nearly 6% of the total, cheekspot goby 3.5%, and California halibut about 1%. The remaining species each represented less than 1% of the total, and included, in decending order of abundance: barred sand bass, arrow goby, California tonguefish, yellowfin goby, diamond turbot, giant kelpfish, Pacific staghorn sculpin, mussel blenny, kelp bass, spotted turbot, white sea bass, bat ray, Pacific barracuda, shiner perch, California clingfish, round stingray, and salema.

Ballona Creek and Marina Del Rey were also sampled using various methods by Haglund et al.(1996) between December 10, 1995 and January 31, 1996. Otter trawl tows, minnow traps, and gill nets were used at each site, and in addition, Ballona Creek was surveyed visually by snorkeling.

In the 1996 results for Ballona Creek, nine of the species that were collected in 1991 were found again: arrow goby, barred sand bass, California halibut, California needlefish, cheekspot goby, diamond turbot, mussel blenny, spotted turbot, and topsmelt. The 1996 collection effort also yielded 13 species not captured in 1991, including California corbina, jacksmelt, longjaw mudsucker, opaleye, queenfish, sargo, shadow goby, shiner perch, spotted kelpfish, white croaker, white seabass, yellowfin croaker, and zebra perch. The larger number of species collected in 1996 may have been due to the addition of nocturnal sampling, which was not performed in the 1991 survey (Haglund et al., 1996).

In 1996, Marina Del Rey yielded 20 species: bat ray, Pacific sardine, Northern anchovy, specklefin midshipman, topsmelt, jacksmelt, spotted sand bass, barred sand bass, salema, white sea bass, white croaker, queenfish, shiner perch, Pacific barracuda, arrow goby, cheekspot goby, shadow goby, California halibut, spotted turbot, and California tonguefish (Haglund et al., 1996). Of these, six species (Pacific sardine, specklefin midshopman, topsmelt, jacksmelt, spotted sand bass, and shadow goby) had not been captured in 1991. Eight species caught in 1991 were not caught in 1996; yellowfin goby, diamond turbot, giant kelpfish, Pacific staghorn sculpin, mussel blenny, kelp bass, California clingfish, and round stingray.

5.5.2.2 Area A

No formal studies of fish populations in Area A are known to have been undertaken, although Marina Ditch receives tidal flow via a culvert from Marina Del Rey. According to Soltz (1991), Area A does not contain sufficient water to support fish, although there are reports that Marina Ditch is used by striped mullet and round stingray (van de Hoek, personal communication). Several people have seen and photographed round stingray in Area A.

5.5.2.3 Area B

A total of 16 species of fish have been found in Area B over the past 25 years (Appendicx C-2). Several of these species (black perch, California halibut, and queenfish) were collected in 1981 and have not been recorded since then. Swift and Frantz (1981) collected three or four species from the upstream or southeastern half of Area B southeast of Culver Boulevard during their sampling. When Haglund et al. (1996) attempted to repeat sampling at these upstream stations, water was lacking at some stations and sampling could not be conducted (C. Swift, personal communication). Four species were collected in 1981 and in later surveys, but not in the three most recent rounds of sampling. These species are shadow goby, shiner perch, striped mullet, and yellowfin goby (an introduced species). Spotted turbot has been collected in only two sampling events in the past 25 years, by Allen (1991) and Haglund et al. (1996).

Most of the species that have not been collected in Area B in recent years still occur in Ballona Creek and Marina Del Rey, and thus can probably still be found on occasion within Area B. Some species have never been reported outside Area B, including California killifish, mosquitofish, sailfin molly, black perch, and striped mullet. Of these, only mosquitofish and sailfin molly, both non-indigenous introduced species, are likely to be restricted to the marsh by habitat type (C. Swift, personal communication). Neither black perch nor striped mullet have been reported from surveys of Ballona Creek or Marina Del Rey, although anecdotal evidence suggests that striped mullet do currently inhabit Ballona Creek.

The fish species assemblage in Area B is likely to be composed of the nine species that have been collected consistently between the first survey in 1981 and the most recent surveys in the 2000's. These include arrow goby, California killifish, cheekspot goby, longjaw mudsucker, mosquitofish, and sailfin molly, which spend most of their life cycle in brackish water; and topsmelt, diamond turbot, and Pacific staghorn sculpin, which use the marsh as breeding grounds or nurseries. Each of these, with the exception of cheekspot goby (which was found in 2001 and 2003), were found in the most recent sampling event in 2004.

The channels within Area B were sampled in July of 2004 to provide data on fish populations using the wetlands after implementation of the USACE 1135 project, which was a restoration of the tide-gates to increase tidal flushing of Area B. Prior to the tide-gate restoration project, baseline conditions were documented in 2001 (MEC-Weston, 2001). The same methods used during the 2001 baseline study were implemented during four seasonal post-restoration surveys in 2003 (MEC-Weston, 2004). The July 2004 was intended to provide further information on the development of fish populations under post-restoration conditions.

Fish were sampled at eight stations in Ballona Wetlands on July 15, 2004. The stations were located as close as practicable to the sampling stations established during the 2001 baseline study and the 2003 post-restoration study previously used by MEC-Weston (2001, 2004). The 2004 survey was scheduled to coincide with neap tidal conditions in order to avoid extremes in water depth and current velocity. Fish were collected using a standard beach seine. Two replicate hauls, spaced approximately 10 yards apart, were taken at each station.

A total of 1,766 fish representing eight species were collected during the July 2004 survey. Topsmelt was the most abundant species collected at all stations combined, with 1,023 individuals. Both adult and juvenile topsmelt were collected at every station except one. California killifish was second in abundance, with 325 individuals collected, and was present at all stations. Adult to juvenile size killifish were collected throughout the wetland. Longjaw mudsucker was third in abundance with 187 individuals collected, and was present at all stations. Arrow goby was present in moderately high numbers, with 141 total individuals. One diamond turbot and one Pacific staghorn sculpin were each caught. The mean total abundance per station ranged from 34 individual fish per haul to 200 fish per haul. Mean wet weight biomass per station ranged from 79 g of fish per haul to 802 g of fish per haul.

The fish species assemblage found in 2004 was similar to that of the surveys conducted in 2001 and 2003, before and after the tide-gate restoration, which may indicate that there is little recruitment of fish from Ballona Creek into Ballona Wetlands (MEC-Weston, 2004). There were no fish species collected in 2004 that were not collected in 2003. The July 2004 total abundance (1,766 individuals) was within the range of the June (565 individuals) and August surveys (3,055 individuals) of 2003.

5.5.2.4 Area C

Although not documented, it is reported that Marina Ditch in Area C supports California killifish and mosquitofish (e.g. R. van de Hoek, personal communication).

5.5.2.5 Special-Status Species

According to a November 2005 download from the CNDDB, no special-status species of fish are known to inhabit the Ballona Wetlands region. This is confirmed by the fish surveys performed in Area B by MEC-Weston (2001, 2003, 2004). No known survey in the last 25 years has ever collected an individual of a special-status species.

Under more natural conditions, federally endangered tidewater goby should occur in Area B (Swift and Frantz, 1981). The recently published USFWS *Recovery Plan for the Tidewater Goby* includes Ballona Creek as a potential introduction site within a list of 160 locations where tidewater goby either occurs, occurred historically, has unverified occurrence records, or is not known to occur but could potentially be introduced. If chosen, the Ballona Creek recovery sub-unit would be a potential introduction site, as there are no records of historic tidewater goby use in the area. The recovery plan estimates that 2.0 to 5.0 acres of potential tidewater goby habitat are available but also notes that Ballona Creek is designated as ‘Water Quality Limited’ by the State Water Resources Control Board and that restoration would be beneficial prior to introduction. The threats to introduction listed for Ballona Creek include municipal runoff, possible vehicular or railroad contamination, sewage treatment effluent, oil contamination/oil fields in the vicinity of habitat, encroaching developmemt, stream channelization, water diversions/groundwater pumping, salinity regime affected, reduction or modification of habitat, native predators, and exotic fish species (USFWS, 2005).

If the Los Angeles River still emptied into the Ballona Wetlands, additional species would potentially include two federally endangered species, steelhead trout and unarmored threespine stickleback; the federally threatened Santa Ana sucker; and two California species of concern, arroyo chub and Santa Ana speckled dace. The course of the Los Angeles River has been maintained to the south and away from Ballona Creek since 1884 (Section 3). The 1985 recovery plan for unarmored threespine stickleback (USFWS, 1985) recommended re-introduction into the Los Angeles Basin, which may include Ballona Wetlands (C. Swift, personal communication).

Although none of these special-status species are known to inhabit the area, evaluations of special-status species were performed by Psomas (2001) and Psomas and Lockhart, 2001 for the Playa Capital Company, LLC. All areas of the Playa Vista development area were specifically evaluated for steelhead trout, tidewater goby, and arroyo chub. The steelhead trout requires clear, cold water in higher elevation headwaters of coastal streams in order to spawn (Psomas and Lockhart, 2001). Each life stage of the tidewater goby takes place in upper lagoons of shallow coastal streams where salinities are below 10 ppt (Psomas and Lockhart, 2001). The arroyo chub inhabits slow-moving or backwater sections of warm to cool streams with mud or sand substrates, which do not occur in either the Centinella Ditch or the Freshwater Marsh area (Psomas, 2001). Therefore, each of these species was found to be absent from the project area and have no potential of occurrence at the site due to the lack of suitable habitat and the absence of the species during past surveys of the area (Psomas, 2001; Psomas and Lockhart, 2001).

In addition, Area C and portions of Area B designated for Freshwater Marsh restoration and residential development were evaluated for the unarmored threespine stickleback and for Santa Ana sucker. There is no historic record of occurrence of the threespine stickleback nor is there suitable habitat in the region at this time. The Santa Ana sucker has been historically recorded from the Los Angeles River, and thus probably in or near the Ballona Wetlands region, since the river once emptied nearby (Swift et al 1993). No area of the Ballona Wetlands region contains suitable habitat for the Santa Ana sucker today. Both of these species were determined to be absent from the project area and have no likelihood of occurrence (Psomas, 2001).

5.5.3 Reptiles and Amphibians

The ecology of the Ballona Wetlands region has been considerably modified since the turn of the century (Hayes and Guyer, 1981). Twenty five years ago, only a portion of Ballona's original herpetofauna was believed to remain. Amphibian populations may have been affected by habitat alteration and pollution of freshwater habitats required for reproduction, while reptile populations have probably been affected by habitat encroachment by exotic vegetation (Hayes and Guyer, 1981). Some species of reptiles may benefit from physical changes in the region, such as the increase in area above tidal influx and the increase in cover-providing debris. For example, the access roads to the oil and gas wells in Areas A and B are believed to have created habitat for four species of reptiles (southern alligator lizard (*Gerrhonotus multicarinatus)*, western fence lizard (*Sceloporus occidentalis)*, common kingsnake (*Lampropeltis getulus*), and gopher snake (*Pituophis melanoleucus*)), which would otherwise be absent from marsh areas (Hayes and Guyer, 1981).

Many species are believed to have inhabited the historical freshwater marsh system, but have never been observed in a published survey (Table 5-4). These species include the southwestern pond turtle (*Clemmys marmorata pallida*), California red-legged frog (*Rana aurora draytoni*), common garter snake (*Thamnophis sirtalis*), red sided garter snake (*Thamnophis sirtalis parietalis*), and two-striped garter snake (*Thamnophis couchi hammondi*) (C. Swift, personal communication; Psomas 2001; Hayes and Guyer, 1981). Reptiles believed to have historically inhabited the drier areas of the Ballona Wetlands area include the red racer (*Masticophis flagellum*), yellow-bellied racer (C*oluber constrictor*), Pacific rattlesnake, (*Crotalus viridis*), and the coast horned lizard (*Phrynosoma coronatum*) (Hayes and Guyer, 1981).

Table 5-4. Reptile and Amphibian Surveys

Year	Author	Geographic Extent	Description
1996	Impact Sciences, Inc.	Areas A, B, and C	Amphibian and reptile survey
1991	Hovore	Areas A, B, and C	Amphibian, reptile, and mammal survey for Playa Vista EIR
1981	Hayes and Guyer	Areas A and B	Herpetofauna survey for *Biota of the Ballona Region* report

Three surveys are described here (Tables 5-6 and Appendix B-3). No new surveys were performed in conjunction with this report; therefore an exact snapshot of the current reptile and amphibian populations at Ballona cannot be determined. If the species has been reported as present during a survey, the area in which it was found and the author and year of the report is listed. Species which have been specifically surveyed and never found are listed as NA, as are species which are believed to have occurred historically but which have never been documented.

Hayes and Guyer (1981) summarized information on nine species of amphibians and reptiles: four lizards, two snakes, a frog, a toad, and a salamander (Appendix B-3). It also consolidated what little was previously known about reptiles and amphibians in Areas A and B. Species reported in the 1981 survey include: Silvery legless lizard *(Anniella pulchra pulchra*—a sub-species of the California legless lizard and a California Special Concern species), southern alligator lizard (*Gerrhonotus multicarinatus),* western fence lizard (*Sceloporus occidentalis*), side-blotched lizard (*Uta stansburiana),* common kingsnake (*Lampropeltis getulus*), gopher snake (*Pituophis melanoleucus),* Pacific treefrog (*Pseudacris regilla)*, Pacific slender salamander (*Batrachoseps pacificus*), and the California toad (*Bufo boreas halophilus)*. The California toad was formerly known as western toad (*Bufo boreas*) until the western toad was sub-divided into the Boreal toad (*Bufo boreas boreas)* and the California toad (Jennings, 2004). The species along the coast and Ballona Wetlands is the California toad (C. Swift, personal communication).

The most recent surveys of the project area for reptiles and amphibians were by Impact Sciences (1996), and by Hovore (1991) (Appendix B-3). Native species found during both of these surveys included common kingsnake, gopher snake, side-blotched lizard, southern alligator lizard, and western fence lizard. Pacific treefrog and California toad were found in 1996. Pacific slender salamander and silvery legless lizard were reported in 1991. Silvery legless lizards have been reported to occur commonly by restoration volunteers on the dunes in Area B, with the most recent sighting occurring in March 2006 (K. Rose, personal communication). No invasive species of amphibians or reptiles have been reported in the project area.

5.5.3.1 Area A

Amphibians

Impact Sciences (1996) reported Pacific treefrog and California toad in Area A. These species were also found in 1981 (Hayes and Guyer, 1981). California toad was also reported by Hovore (1991), along with one other amphibian species, Pacific slender salamander. Pacific slender salamander was found in low numbers in the early 1980’s and 1990’s, with the size ranges found in 1991 indicating successful on-site breeding due to the presence of both juvenile and adult stages (Hovore, 1991). The 1991 study determined that the abundance of frogs and toads in general were reduced compared to the 1981 study, again likely due to drought conditions in 1991. Although no published surveys have been performed during peak conditions in normal rainfall conditions, the site is typically teeming with toads and frogs in season.

Reptiles

Four reptile species were found in Area A during the Hovore (1991) study; western fence lizard, side-blotch lizard, California kingsnake and gopher snake. During the Impact Sciences (1996) survey, 20 western fence lizards and one southern alligator lizard were captured in 190 pitfall trapnights. Southern alligator lizard, western fence lizard, common kingsnake, and gopher snake were also found in 1981 (Hayes and Guyer, 1981).

5.5.3.2 Area B

Amphibians

California toad and Pacific treefrogs were found in Area B by Hayes and Guyer (1981). No evidence of amphibians was found during the 1991 surveys, most likely due to the drought conditions of the winter of 1990-1991 and a massive discharge of street runoff into the Centinela Ditch in the fall of 1990, which flushed Area B with freshwater of dubious water quality. In 1996, low numbers of Pacific treefrogs and California toad were observed in Area B (Impact Sciences, 1996). It is likely that typical conditions in Area B more closely align with earlier observations, which reported that Pacific treefrogs were found wherever slow moving or standing freshwater occurred (Hayes and Guyer, 1981). Although the 1981 study observed only one California toad (Hayes and Guyer, 1981), it was noted that the low numbers were surprising and that more were expected.

In normal to high rainfall years, breeding Pacific treefrogs and California toads are commonly observed in freshwater pools throughout Area B (Brad Henderson, personal communication). In 2005, Area B had several centers of treefrog breeding with large numbers of larvae, metamorphs and adults, as well as one large California toad pool with hundreds of metamorphs.

Reptiles

During the Impact Science (1996) survey, 32 western fence lizards, one southern alligator lizard, and 47 side-blotched lizards were captured in the 390 pitfall trapnights conducted in Area B. In addition, four southern alligator lizards, 11 side-blotched lizards, two common kingsnakes, and two gopher snakes were observed on the project area. All these species were observed in earlier studies, and generally in greater numbers (Hayes and Guyer, 1981). In addition, the 1981 and 1991 studies also captured California legless lizard. This species has also been observed in the dunes by restoration volunteers and was last seen on March 10th, 2006 by Kelly Rose, the Program Director for Friends of Ballona Wetlands (K. Rose, personal communication).

5.5.3.3 Area C

During the Impact Sciences (1996) survey, eight western fence lizards and one southern alligator lizard were captured in 100 pitfall trapnights conducted in Area C, and one western fence lizard was found during a small mammal trapping event. No snakes or amphibians were found during sampling in 1991 (Hovore, 1991). Hayes and Guyer (1981) did not include Area C.

5.5.3.4 Special-Status Species

Evaluations of special-status species were performed by Psomas (2001) for the Playa Capital Company, LLC, although, according to a November 2005 download from the CNDDB, no special-status species of amphibians or reptiles are known to currently inhabit the Ballona Wetlands region. Special-status species were evaluated in two phases. Phase One included Area C as well as the portions of Area B designated for

Freshwater Marsh creation and residential development. Phase Two was composed of Area A and the portion of Area B designated for the restoration project. Three amphibians and four reptiles were evaluated.

Amphibians

The federally endangered arroyo toad *(Bufo microscaphus californicus)* and the federally threatened California red-legged frog *(Rana aurora draytonii)*, were evaluated in Phase One. Both species were found to be absent from the project area (Psomas, 2001). These species were also not found in the surveys by Hayes and Guyer (1981), Hovore (1991), or Impact Sciences (1996) and suitable habitat to support these species does not exist. A third amphibian, the western spadefoot toad *(Scaphiopus hammondii)*, was evaluated in Phase Two and was also determined to be absent from the area, although there are western spadefoot toad in the Los Angeles Airport dunes, one to two miles away. Hayes and Guyer (1981) did not find the western spadefoot, but suggested that the toad may have been missed in their study due to limited rainfall. Neither Hovore (1991) nor Impact Sciences (1996) reported finding any western spadefoot toad in their studies, and it is believed that there is limited potential habitat for the species.

Reptiles

Four special-status species of reptiles were evaluated in Phase Two: San Diego coastal horned lizard *(Phrynosoma coronatum blainvillei)*, western pond turtle *(Clemmys marmorata)*, silvery legless lizard *(Anniella pulchra pulchra)*, and South Coast garter snake *(Thamnophis sirtalis ssp.)*. None of the four species were detected in the project area, although the silvery legless lizard and the South Coast garter snake were declared to have a low potential to be present within the project area (Psomas and Lockhart, 2001). Only the silvery legless lizard has been observed in the Ballona Wetlands in previous studies or since the survey was reported. It is likely that the South Coast garter snake inhabited the original freshwater marsh system (C. Swift, personal communication).

The silvery legless lizard was last recorded in a survey in 1991 in Area B near Hasting's Canyon but is sighted somewhat commonly by restoration volunteers in the dunes. This species is also known to inhabit the LAX dunes just a few miles away. The most recent sighting in Area B occurred March 10th 2006 by Kelly Rose, the Program Director for Friends of Ballona Wetlands (K. Rose, personal communication). It was captured during sampling in Area B in 1981, but not in 1996, possibly because of the difficulties detecting the species using the methods employed by the survey (pit-fall traps and visual encounter surveys).

The San Diego coastal horned lizard also has some limited potential to occur in Area B, as one of its key habitat elements is sandy soils and it is known to occur at LAX. However, it also prefers an abundance of native ant species and the region is dominated by the Argentine ant. The native red *Pogonomyrmex* ant is still common on the dunes and elsewhere in sandy soils.

Other reptile species which would most likely have inhabited the original freshwater marsh system, but which have never been observed in a published survey include two California Special Concern Species: southwestern pond turtle (*Clemmys marmorata pallida*) and two-striped garter snake (*Thamnophis couchi hammondi*) (C. Swift, personal communication).

5.5.4 Mammals

In 1871 the Ballona Wetlands region was described as 'teeming with native wildlife' - but it has suffered the same decline in native populations and increases in introduced species as most areas in Southern California (Friesen et al., 1981). About 32 species lived in the vicinity of Ballona Wetlands, including marsupials, insectivores, bats, lagomorphs, rodents, carnivores, and artiodactyls. It is likely that many of the current and former resident species in the nearby San Gabriel Valley and Los Angeles Basin, such as deer, antelope, grizzly bears, wolves, and wildcats, also once foraged in the Ballona Wetlands area (Friesen et al., 1981). However, urbanization has since isolated coastal marshes, reducing species range.

Table 5-5. Mammal Surveys

Year	Author	Geographic Extent	Description
2000	Erickson	Area B	Survey for sensitive species of small mammal for Playa Capital Co.
1996	Impact Sciences	Areas A, B, and C	Mammal survey
1991	Hovore	Areas A, B, and C	Amphibian, reptile, and mammal survey for Playa Vista EIR
1981	Friesen et al.	Area A and B	Mammal survey for *Biota of the Ballona Region* report

Four surveys are described here (Tables 5-5 and Appendix B-4). No new surveys were performed in conjunction with this report; therefore an exact snapshot of the current wildlife population at Ballona cannot be determined. If the species has been reported as present during a survey, the area in which it was found and the author and year of the report is listed. Species which have been specifically surveyed and never found are listed as NA, as are species which are believed to have occurred historically but which have never been documented.

Native species of mammals found included western harvest mouse *(Reithrodontomys megalotis)*, pocket gopher *(Thomomys bottae)*, desert cottontail *(Sylvilagus audubonii)*, striped skunk *(Mephitis mephitis)*, raccoon (*Procyon lotor psora*), California ground squirrel *(Spermophilus beecheyi)*, and the sensitive species South Coast marsh vole *(Microtus californicus stephensi)*. Invasive species found included house mouse *(Mus musculus)*, black rat *(Rattus rattus)*, Norway rat (*Rattus norvegicus)*, domestic cat *(Felis cattus)*, Virginia opossum *(Didelphis virginiana)*, domestic dog (*Canis familiaris)*, and red fox *(Vulpes vulpes)*. Native coyote (*Canis latrans)* and invasive fox squirrel (*Sciurus niger*) have also been documented recently, although in 1981 it was deemed likely that coyote no longer occurred on-site (Friesen et al., 1981). The study of Hovore (1991) found low populations of small mammals likely to be the direct result of depredation by red foxes, and that fox were an immediate threat to the continued viability of the Ballona ecosystem. Most species found in the Friesen et al. (1981) study have also been found in later studies.

Eight species of bats are known to have occurred in the area, as evidenced by voucher specimens from the Natural History Museum of Los Angeles County and the San Diego Museum of Natural History (Friesen et al., 1981). No bats were sighted or taken during surveys in 1981, which utilized traplines, Sherman live traps, Museum Special traps, and extensive observations. At the time of the survey, bats were rarely seen within the Los Angeles Basin except for areas near mountains (Friesen et al., 1981). There are no documented records of bat occurrence within the Ballona area, although specialized bat surveys were performed in 1996 by Impact Sciences. This survey included examination of potential bat roost sites for guano, staining, and other indications of bats, as well as use of a hand-held bat detector. No evidence of bats in Areas A, B, or C was uncovered, although a high frequency echo-location was picked up in an adjacent area (Impact Sciences, 1996).

It has also been speculated that at some point in the past, the edges of the marsh may have been used by marine mammals (Friesen et al., 1981). Several species of cetaceans have been observed to occasionally come ashore for short periods or stand along the beaches adjacent to the wetlands (Friesen et al., 1981).

5.5.4.1 Area A

Area A was last evaluated for mammal species by Impact Sciences (1996). Native species encountered included western harvest mouse, pocket gopher, desert cottontail, and striped skunk. The Area A survey used a variety of methods, including 469 effective Sherman live-trapping nights, 190 effective pitfall trapping nights, two nights of scent station monitoring, two nights of spotlight monitoring, and two nights of track station monitoring. The live-traps captured 78 small mammals of both native and non-native species, native species captured consisted of three animals total, two western harvest mouse and one pocket gopher. No native species were caught by pitfall trapping. One scent station in Area A was operated for two nights and attracted desert cottontail and striped skunk in addition to non-native species. The spotlight and tracking stations each recorded one native species, desert cottontail. Non-native species found in Area A include house mouse, black rat, Norway rat, Virginia opossum, domestic dog, and red fox. Two special-status species, San Diego black-tailed jackrabbit and South Coast marsh vole have been known to occur in Area A.

5.5.4.2 Area B

Area B was evaluated for sensitive species of small mammals in October 2000. During this sampling event, four non-sensitive species, two native and two non-native species, were found in the 1,860 Sherman live-traps set over six nights (Psomas, 2001). The two native species found were California ground squirrel (one recovered) and western harvest mouse (nine recovered). The presence of pocket gopher was also noted, meaning the species was seen, heard, or identified by the presence of tracks, scat, or other signs.

Area B was also evaluated for mammal species by Impact Sciences (1996). The survey used a variety of methods, including 2,486 effective Sherman live-trapping nights, 490 effective pitfall trapping nights, six effective nights of scent station monitoring, two nights of spotlight monitoring, and two nights of track station monitoring. The live-traps captured 229 small mammals of both native and non-native species, including 41 native harvest mouse, and 14 native South Coast marsh vole *(Microtus californicus stephensi)*, which is a special-status species. Other native species found included one pocket gopher captured in a pitfall trap and desert cottontail, which were observed at two of the three scent stations, during one night of spotlight monitoring, and at one track station.

Hovore (1991) found that small mammal population densities appeared to be much lower in 1991 than in 1981. In general, the species found in 1981 were the same as those found in later surveys, with a few additions in later years, such as red fox.

Non-native species found in Area B include house mouse, black rat, Norway rat, domestic cat, Virginia opossum, domestic dog, and red fox. Special-status species that have been known to inhabit Area B include San Diego black-tailed jackrabbit, South Coast marsh vole and saltmarsh shrew.

5.5.4.3 Area C

Area C was last evaluated for mammal species by Impact Sciences (1996). The survey used a variety of methods and included 250 effective Sherman live-trapping nights, 100 effective pitfall trapping nights, two nights of scent station monitoring, two nights of spotlight surveys, and two nights of track station monitoring. No native species were found in any of the live-traps or pitfall traps, although native species including striped skunk and desert cottontail were observed during the spotlight survey. Desert cottontail was also observed during both track station nights. Western harvest mouse was noted to occur in Area C by Hovore (1991).

Non-native species found in Area C include house mouse and domestic cats and dogs. No special-status species have ever been documented within Area C.

5.5.4.4 Special-Status Species

Several special-status species of mammal are known to occur within the Ballona Wetlands region. According to a November 2005 download from the CNDDB, three special-status species of mammals have been known to inhabit Areas A and B. These include the South Coast marsh vole *(Microtus californicus stephensi)*, Pacific pocket mouse *(Perognathus longimembris pacificus)*, and Southern California saltmarsh shrew *(Sorex ornatus salicornicus)*. The saltmarsh shrew is also listed in Area C. The most recent sensitive-species surveys of the Area were Impact Sciences (1996) and Psomas and Lockhart (2001).

The San Diego black-tailed jackrabbit, currently a California Special Concern Species, was found to have a low potential for occurrence (Psomas and Lockhart, 2001) due to its population at Los Angeles Airport and its presence in Area D[1]; in the early 1990's. It was not found by Impact Sciences (1996) survey, but was observed in Areas A and B in 1981 (Friesen et al., 1981). Friesen et al. (1981) reported interviewing hunters who frequently visited Area A on Saturday nights in order to drink beer and shoot rabbits, which may have been a factor in their population decline. Hawks, owls, and gopher snakes are also known predators of the black-tailed jackrabbit.

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[1] Area D, located east of Lincoln Boulevard, was considered part of the Ballona Wetlands until the late 1990's, when a residential development project was constructed there. Thus, Area D is not currently part of the Ballona Wetlands evaluated for the Conceptual Restoration Plan.

Three species of bat, all Federal Species of Concern at the time, were also evaluated for potential occurrence. The long-eared myotis *(Myotis evotis)* and the pale big-eared bat *(Corynorhinus townsendii pallescens)* are no longer federally listed but are California Special Concern Species. The Yuma myotis bat *(Myotis yumanensis)* is currently a Bureau of Land Management Sensitive Species. None were detected within the project area in 2000 or 1981, although no specialized survey methods were used to determine presence or absence (Psomas and Lockhart, 2001; Friesen et al., 1981). Other sensitive-species of bat that may have occurred historically include California Special Concern species California leaf-nosed bat (*Macrotus californicus californicus*), pallid bat (*Antrozous pallidus pacificus*), and western mastiff bat (*Eumops perotis californicus*) (Friesen et al., 1981). A bat survey was performed by Impact Sciences in 1996 which included examination of potential bat roost sites for guano, staining, and other indications of bats, as well as use of a hand-held bat detector. No evidence of bats in Areas A, B, or C was uncovered, although a high frequency echo-location was picked up in an adjacent area (Impact Sciences, 1996).

The South Coast marsh vole, currently a California Special Concern species, has been found in Area B in each of the three most recent sampling events. The species was observed in 2000, 1996, 1991, and 1981. During Impact Sciences (1996) trapping efforts, 14 individuals were captured. The study of Hovore (1991) recovered two individual South Coast marsh voles, one each in Areas A and B. Three specimens were captured in salt grass areas within Area B in 1981.

The last recorded observance of the saltmarsh shrew, a California Special Concern species, was in Area B by Hovore (1991). The saltmarsh shrew was also found in Area B by Friesen et al. (1981). No Southern California saltmarsh shrews were captured during Impact Sciences (1996) trapping efforts. Psomas (2001) evaluated the entire project area for Southern California saltmarsh shrew and determined that the species had a low potential for occurrence, as it had not been observed within the past 10 years.

The federally endangered Pacific pocket mouse has not been observed or captured in the project area since 1938 (CNDDB). None were recovered or observed during Impact Sciences (1996) trapping efforts or by Friesen et al. (1981). In 2000, Area C and portions of Area B designated for Freshwater Marsh restoration and residential development were evaluated and the pocket mouse was found to be absent (Psomas and Lockhart, 2001).

5.5.5 Birds

Prior to human modifications, when Ballona Wetlands consisted of a large coastal saltmarsh system, the area probably supported a bird species composition typical of relatively undisturbed coastal wetlands in Southern California. Birds at Ballona Wetlands probably included a variety of shorebirds including plovers and sandpipers, wading birds including herons and egrets, fish foragers including pelicans and terns; waterfowl including dabbling ducks (feeding in shallow water), diving ducks (feeding in deeper water), loons, grebes, and cormorants. The wetlands and uplands of the Ballona area also probably supported several species of raptors. Some of these species continue to use the habitats currently available in the Ballona Wetlands area (Dock and Schreiber, 1981).

The majority of Ballona Wetlands currently lack tidal flushing and are dominated by non-native vegetation, rendering them largely unsuitable for most breeding and wintering birds found in Southern California wetlands subject to tidal influence. Intertidal mudflats to support foraging shorebirds are limited to a small area in the northwest of Area B surrounding a tidal channel regulated with tide-gates from Ballona Creek. Coastal saltmarsh dominated by tidally-influenced pickleweed is also limited to a similar area of Area B, although extensive areas of non-tidal pickleweed are present in Area B south of Culver Boulevard and Area A. Shallow water habitat for wading birds and dabbling ducks is limited to the few tidal channels in the northwestern portion of Area B, and no deep water is present for diving ducks and other birds that dive from the surface for fish. Foraging habitat for most raptors is limited to the western portion of Area B since much of the remaining area is densely vegetated with non-native species.

Nevertheless, many bird species forage at Ballona Wetlands during migration or for longer periods, including several special-status species. A resident population of Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), state-listed as an endangered species, is still present on Area B. Two other endangered species, the California least tern (*Sterna antillarum browni*) and peregrine falcon (*Falco peregrinus*), forage at Ballona Wetlands, and several other special-status bird species make use of habitats at Ballona frequently to rarely. The Ballona Wetlands provide habitat for a variety of bird species found in the few coastal saltmarshes remaining in coastal Southern California (Dock and Schreiber, 1981).

5.5.5.1 Bird Surveys

The first recorded systematic surveys of the Ballona Wetlands avifauna were conducted from February 1979 through June 1981 (Dock and Schreiber, 1981). Surveys were conducted each week along established transect routes, providing an excellent baseline of habitat use data for breeding, resident, wintering, and migrant species. The survey area encompassed Areas A (which they called Unit 3) and B (North and South Wetlands, which they called Unit 1 and 2, respectively) as well as Ballona Lagoon. They did not cover Area C. They recorded a total of 129 species but admitted this number was likely an underestimate as it did not include species that may occasionally use the area during migration.

The majority of the birds they observed, in terms of species and numbers, were migrants and wintering birds. Numbers of individuals ranged from over 3,000 in January to about 300 in May. Another peak in abundance occurred in late summer in Area B, corresponding to an influx of migrating waterbirds. Two endangered species, Belding's savannah sparrow and California least tern, were observed nesting on Area B. Foraging by least terns was noted at Ballona Creek and Ballona Lagoon. Belding's savannah sparrows were also observed breeding on Area A; following the nesting season, they were seen foraging on the Area B South Wetland.

Seasonal ponds on Area B supported semipalmated plover (*Charadrius semipalmatus*), killdeer (*Charadrius vociferus*), black-bellied plover (*Pluvialis squatarola*), black and ruddy turnstone (*Arenaria melanocephala* and *Arenaria interpres*), whimbrel (*Numenius phaeopus*), willet (*Catoptrophorus semipalmatus*), red-necked (formerly northern) phalarope (*Phalaropus lobatus*), short- and long-billed dowitchers (*Limnodromus griseus* and *Limnodromus scolopaceus*), dunlin (*Calidris alpina*), western sandpiper (*Calidris mauri*), and least sandpiper (*Calidris minutilla*). They recorded wading birds typical of Southern California wetlands, including great blue heron (*Ardea herodias*), green heron (*Butorides virescens*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), and black-crowned night heron (*Nycticorax nycticorax*). Waterfowl were abundant and diverse and included gadwall (*Anas strepera*), northern pintail (*Anas acuta*), green-winged and blue-winged teal (*Anas crecca* and *Anas discors*), American wigeon (*Anas americana*), northern shoveler (*Anas clypeata*), red-breasted merganser (*Mergus serrator*), and ruddy duck (*Oxyura jamaicensis*). They recorded freshwater marsh species uncommon in Southern California, including bank swallow (*Riparia riparia*) and yellow-headed blackbird (*Xanthocephalus xanthocephalus*). Some less-commonly observed species not associated with wetlands included California quail (*Callipepla californica*), burrowing owl (*Athene cunicularia*), western kingbird (*Tyrannus verticalis*), ash-throated flycatcher (*Myiarchus cinerascens*), loggerhead shrike (*Lanius ludovicianus*), Lincoln's sparrow (*Melospiza lincolnii*), and lark sparrow (*Chondestes grammacus*).

Dock and Schreiber (1981) recorded Virginia rail (*Rallus limicola*) in winter on the South Wetland of Area B but no black rails (*Latterallus jamaicensis coturniculus*) or light-footed clapper rails (*Rallus longirostris levipes*). They observed a short-eared owl (*Asio flammeus*) on Area A in February 1979, and two long-eared owls (*Asio otus*) on Area B in fall 1980. Western snowy plovers (*Charadrius alexandrinus nivosus*) were recorded occasionally on Area B mudflats in September and October 1980, and April 1981. Observed raptors included osprey (*Pandion haliaetus*), white-tailed kite (*Elanus leucurus*), and northern harrier (*Circus cyaneus*) during winter in Areas A and B, and red-tailed hawk (*Buteo jamaicensis*) and Cooper's hawk (*Accipiter cooperii*), residents in the area. Two pairs of burrowing owls nested on Area A near Ballona Creek, and burrowing owls were also believed to nest along the base of the bluffs at the eastern end of Area B (Dock and Schreiber, 1981).

Systematic ornithological surveys were again conducted from April 1990 to April 1991 (Corey, 1991). He surveyed the project area covering more area than the 1979-1981 transects, although surveys were less frequent, conducted bimonthly rather than weekly. He observed a total of 80 species, including 19 not reported by Dock and Schreiber (1981), most of which were non-resident species including house wren (*Troglodytes aedon*), warbling vireo (*Vireo gilvus*), MacGillivray's warbler (*Oporornis tolmiei*), Nashville warbler (*Vermivora ruficapilla*), and fox sparrow (*Passerella iliaca*). Conversely, many waterbird and waterfowl species seen by Dock and Schreiber (1981) were not observed by Corey (1991), probably, in part, because of differences in weather patterns (1990-1991 were drought years, while the region experienced regular or higher than normal rainfall in 1979-1981). For example, Corey (1991) did not record the majority of grebes, waterfowl, shorebirds and gulls seen by Dock and Schreiber (1981). In addition, Corey (1991) did not observe snowy plover, California quail, long-eared owl or short-eared owl. One burrowing owl was observed along the bluffs of Area D; nesting was not confirmed. No least terns were reported nesting or foraging. Belding's savannah sparrows were recorded nesting on Area B but were only observed on Area A from October through February. Raptor sightings (aside from red-tailed hawk and American kestrel - [*Falco sparverius*]) included white-tailed kite, Cooper's hawk, osprey, and red-shouldered hawk (*Buteo lineatus*) (Corey, 1991).

Dan Kahane, formerly a local birder very familiar with Ballona Wetlands, as well as Art Pickus and Richard Barth, conducted weekly surveys for the National Audubon Society from 1993 to 1998. Their survey area included Ballona Creek, Ballona Lagoon, and the western portion of the North Wetland of Area B (tidal channels and mudflats). They regularly observed various species of shorebirds and waterfowl (particularly during winter months), and raptors such as white-tailed kites and northern harriers. They also occasionally observed peregrine falcons. Some of the less common migrating species they recorded include pelagic cormorant (*Phalacrocorax pelagicus*), oldsquaw (*Clangula hyemalis*), wood duck (*Aix sponsa*), ring-necked duck (*Aythya collaris*), wandering tattler (*Heteroscelus incanus*), surfbird (*Aphriza virgata*), black skimmer (*Rynchops niger*), gray flycatcher (*Empidonax wrightii*), and willow flycatcher (*Empidonax traillii*) (National Audubon Society, 1996).

Bird surveys of Areas A, B and C were conducted by Keane Biological Consulting in 1995, 1998, and 2001 as part of environmental documentation for the proposed Playa Vista development (KBC, 1996, 1998, 2001). All bird observations were recorded as part of surveys for special-status species, and surveys covered only the spring months. Hamilton (1997) conducted breeding bird surveys in riparian habitat of Area B, now part of the Freshwater Marsh. He detected 10 species with one or more breeding territories, including mourning dove, barn owl, Anna’s hummingbird, Allen’s hummingbird, bushtit, western scrub-jay, common yellowthroat, California towhee, black-headed grosbeak, and song sparrow (Hamilton, 1997).

Beginning in 2001, bird surveys of a portion of Area B were conducted to provide baseline information for the evaluation of a tide-gate modification project by the USACE (KBC, 2001). One-day surveys were conducted in the spring and summer. Follow-up surveys to assess changes in the Belding’s savannah sparrow population as a result of increased tidal inundation were conducted by KBC (2004, 2005) (three spring and two summer surveys each year), although other birds were recorded during surveys. Surveys focused on the portion of Area B potentially subject to increased tidal inundation as a result of the tide-gate modifications.

From 1970 to the present, local bird experts have conducted regular bird surveys at portions of Ballona Wetlands and maintained field notes of their sightings (Cooper, 2005b). Their observations have been compiled into a bird list available at: http://www.ca.audubon.org/Ballona_checklist.pdf (Cooper, 2005c).

Some of the more common birds observed on Areas A, B, and C during recent surveys are discussed below. However, several additional species are known to visit Ballona Wetlands briefly during migration (see the website address above). Although the presence of these brief visitors is generally not strongly indicative of habitat quality, many of the same species can be observed by vigilant birdwatchers in residential areas, parks and other areas of horticultural vegetation. Thus, this discussion focuses on the more common bird species of Ballona Wetlands, those that are resident (present year-round), that are summer residents (known to or believed to nest at or in the vicinity of Ballona Wetlands and forage frequently over the wetlands), or are winter residents (that are frequently observed during winter months).

5.5.5.2 Area A

Prior to the deposition of dredged material from the Marina Del Rey channel, Area A coastal saltmarsh habitat supported a bird species composition typical of Southern California coastal wetlands. However, Area A is now predominantly upland habitat dominated by non-native vegetation, although small areas of saltflats, non-tidal pickleweed, coyotebush scrub and mulefat scrub are also present. The upland habitats of Area A support mourning dove (*Zenaida macroura*), rock dove (*Columba livia*), Anna's hummingbird (*Calypte anna*), black phoebe (*Sayornis nigricans*), bushtit (*Psaltriparus minimus*), American crow (*Corvus brachyrhynchos*), northern mockingbird (*Mimus polyglottos*), European starling (*Sturnus vulgaris*), Brewer's blackbird (*Euphagus cyanocephalus*), song sparrow, lesser goldfinch (*Carduelis psaltria*), house finch (*Carpodacus mexicanus*), and house sparrow (*Passer domesticus*). Belding's savannah sparrows formerly nested at Area A, but the quality of potential habitat for this bird on Area A has declined over time due to leaching of residual salts, and none have been recorded nesting here since 1987. Raptors observed foraging over Area A include the red-tailed hawk and American kestrel, and the white-tailed kite. Several recent sightings of burrowing owl have been recorded on Area A during the winter, although it is not currently known whether the species has or will remain to breed. Great blue herons and great egrets often use Area A for roosting, and great blue herons, which nest in trees on the north side of Fiji Way, use Area A for gathering nesting materials.

5.5.5.3 Area B

Bird species that can be observed nearly year-round in and adjacent to tidal channels on Area B include great blue heron, black-crowned night heron, green heron (less common), great egret, snowy egret, killdeer, and willet. Western meadowlark (*Sturnella neglecta*) nests in the pickleweed habitat of the western portion of Area B. Belding's savannah sparrows breed in pickleweed saltmarsh habitat in the northwestern portion of Area B. Great blue herons formerly nested in a cottonwood tree at the western end of Area B (KBC, 1996) and currently nest in trees north of Ballona Creek (Cooper, 2005a-f).

Wintering species of the Area B tidal saltmarsh, tidal channels and saltflats include black-bellied plover, willet, whimbrel, western sandpiper, and least sandpiper. California brown pelicans (*Pelicanus occidentalis californicus*) are occasionally observed flying over Area B but more frequently over Ballona Creek (the tidal channels of Area B are generally too shallow for foraging). Less commonly observed species of Area B tidal channels, and on flooded saltpans following heavy rains, include brant (*Branta bernicla*), northern shoveler (Cooper, 2005b), and gadwall. Gull species observed on Area B saltflats include California gull (*Larus californicus*), ring-billed gull (*Larus delawarensis*), Western gull (*Larus occidentalis*), and Bonaparte's gull (*Larus philadelphia*). During early spring months, flocks of elegant terns (*Sterna elegans*), Caspian terns (*Sterna caspia*) and black-bellied plovers are observed on the Area B saltflats.

Species observed in the spring on Area B include northern rough-winged swallow (*Stelgidopteryx serripennis*), barn swallow, cliff swallow (*Hirundo pyrrhonota*), Bullock's oriole (*Icterus bullockii*), and both Caspian and elegant terns roosting on saltflats. The saltflats of Area B historically supported nesting by the California least tern, and one pair nested here unsuccessfully in 2001. During the late summer, several species of sandpiper and plover that arrived in Southern California from breeding grounds in Canada and Alaska occasionally make use of Area B tidal channels and saltflats subject to tidal inundation.

The most commonly observed bird species in the upland habitats of Area B are American crow, European starling, common yellowthroat (*Geothlypis trichas*) and house finch; other species include mourning dove, belted kingfisher (*Ceryle alcyon*), Anna's hummingbird, western kingbird, black phoebe, bushtit, northern mockingbird, western scrub-jay (*Aphelocoma californica*)[2], red-winged blackbird, song sparrow, California towhee (*Pipilo crissalis*), lesser goldfinch, and house sparrow. In the winter months, Say's phoebe (*Sayornis saya*), blue-gray gnatcatcher (*Polioptila caerulea*), ruby-crowned kinglet (*Regulus satrapa*), yellow-rumped warbler (*Dendroica coronata*), and white-crowned sparrow (*Zonotrichia leucophrys*) have been observed in the uplands of Area B. Great-tailed grackles (*Quiscalus mexicanus*)[3] have also been recently observed on Area B. A loggerhead shrike (*Lanius ludovicianus*) has also been observed south of Culver Boulevard in 2001, 2003, and 2004 (KBC, 2001, 2004, 2005). Vagrant species (birds out of range) seen during recent surveys on Area B include a bobolink (*Dolichonyx oryzivorus*), a bird typically observed in the northern United States, in 2001, and a grasshopper sparrow (*Ammodramus savannarum*), generally observed in extensive undisturbed grasslands, in 2004 (KBC, 2001, 2004).

Common raptors of Area B include American kestrels, red-tailed hawk, which roosts and possibly nests in the eucalyptus trees in the southwestern end of Area B, red-shouldered hawk (*Buteo lineatus*), Cooper's hawk, white-tailed kite, and occasionally great horned owl (*Bubo virginianus*). Peregrine falcons are frequently observed foraging over Area B.

Following construction of the Freshwater Marsh, bird surveys were conducted by KBC (2003) and Cooper (2004, 2005a). The various habitats of the marsh (open water, emergent, mixed riparian, willow scrub, mudflat) have been visited by more than 135 species of birds and breeding has been documented by species including pied-billed grebe (*Podilymbus podiceps*), black-necked stilt (*Himantopus mexicanus*), barn swallow (*Hirundo rustica*), common yellowthroat (*Geothlypis trichas*), red-winged blackbird (*Agelaius phoeniceus*), ruddy duck, and song sparrow (*Melospiza melodia*) (Edith Read, personal communication and the Ballona Freshwater Marsh website:

http://www.cnlm.org/cms/index.php?option=com_content&task=view&id=36&Itemid=80).

5.5.5.4 Area C

Area C consists primarily of non-native vegetation as well as habitats dominated by native plant species, such as coyote brush and coastal sage scrub species, and supports a low diversity of birds as compared to Areas A and B. In addition, it is subject to higher levels of human disturbance than Areas A and B - tracks of domestic dog (*Canis domesticus*) and humans, including mountain bicycle tracks, are present throughout Area C. Bird

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[2] Observed year-round at Ballona since 2002 but otherwise scarce along the immediate coast in the vicinity of Ballona (Cooper, 2005a-f).

[3] This species was first observed at Ballona in 2002 and 42 pairs nested at the Ballona Freshwater Marsh in 2003 (Cooper, 2005a-f).

species typically observed on Area C during recent surveys included American kestrel, mourning dove, rock dove, killdeer (*Charadrius vociferus*), Anna's hummingbird, American crow, black phoebe, northern mockingbird, song sparrow, California towhee, house finch, and house sparrow. Peregrine falcons are occasionally observed foraging over Area C (Cooper, 2005d).

5.5.5.5 Adjacent Habitats

Wetland habitats adjacent to Ballona Wetlands include Ballona Creek, Ballona Lagoon, Del Rey lagoon, and the open water habitat of Marina Del Rey. Birds frequently observed flying over Ballona Creek include brown pelican, great blue heron, willet, Caspian tern, elegant tern, California least tern, and other species foraging for fish and benthic invertebrates including double-crested cormorant (*Phalacrocorax auritus*), and a variety of wading birds and shorebirds during the winter months. Several species of gull are often observed flying over Ballona Creek, and California least terns are frequently observed foraging over Ballona Creek during their nesting season - a protected California least tern nesting site, one of only two in Los Angeles County, is present just north of the Marina Del Rey channel mouth. Ballona Creek also provides important habitat for several bird species for feeding and roosting including the Bonaparte's gull (up to 2500 birds in winter), black-bellied plover (up to 700 birds), willet (up to 1000 birds), and marbled godwit (*Limosa fedoa*) (over 100 birds). In addition, the strongly tidal section between Lincoln Boulevard and Centinela Creek can support 100's of waterfowl (particularly green-winged teal and American wigeon) and mudflat species such as dowitchers (*Limnodromus* sp.), as well as roosting terns. West of Lincoln Boulevard, the Creek deepens towards the ocean and supports species typically found in deeper waters such as lesser scaup (*Aythya affinis*) and bufflehead (*Bucephala albeola*), also found in Santa Monica Bay. Thus, Ballona Creek is ecologically linked to Santa Monica Bay and Ballona Wetlands (Cooper, 2005f).

Bird species observed at Ballona Lagoon include nesting green herons (Cooper, 2005b), great blue herons, great egrets, snowy egrets, and a variety of waterfowl species during the winter months. The Santa Monica Bay Audubon Society conducted 29 monthly surveys of Ballona Lagoon in 1996 and 1997 and counted 59 bird species (Almdale, 1998). The open-water habitat of Marina Del Rey supports brown pelicans, several species of gull, double-crested cormorant, and occasional waterfowl and grebe species. California least terns have been observed foraging in Marina Del Rey near the Coast Guard Station. Great blue herons and black-crowed night herons nest in horticultural trees in Marina Del Rey along Fiji Way and Admiralty Way (Keane, personal communication).

Bird species of Del Rey Lagoon south of Ballona Creek are most diverse in late summer, late fall and spring because of the presence of migratory shorebirds including long-billed dowitcher, western and least sandpipers, black-bellied and semipalmated plovers, killdeer, greater yellowlegs and whimbrel. Waders such as great blue heron and great and snowy egrets are observed foraging here year-round. During the winter, gulls and waterfowl are the most common species at the Lagoon including lesser scaup, bufflehead, American coot; black-bellied plover, willet and marbled godwit. Vegetation surrounding the Lagoon is also important to several species of briefly-visiting migratory land birds (Cooper, 2006).

Upland habitats adjacent to Ballona Wetlands are limited to developed areas including both residential and commercial developments. Bird species well adapted to human-modified habitats in coastal Southern California, most commonly found in these areas, include mourning dove, Anna's hummingbird, Allen's hummingbird (*Selasphorus sasin*), black phoebe, American crow, northern mockingbird, European starling, house finch, and house sparrow.

5.5.5.6 Special-Status Birds

Several bird species known to occur in the vicinity of Ballona Wetlands are afforded special-status designation by resource agencies and conservation organizations, as follows:

- birds listed, proposed for listing, or candidates for listing as threatened or endangered under the Federal Endangered Species Act (FESA) or the California Endangered Species Act (CESA);
- birds listed as 'fully protected' under the California Fish and Game Code;
- birds designated as 'Species of Special Concern' by the CDFG, which serves as a designation for species of limited distribution or that have had substantial reductions in range or habitat, such that threats to their populations may be imminent.

In addition to the bird surveys in Section 5.5.5.1, references consulted for sightings of special-status bird species at Ballona Wetlands and vicinity included the CNDDB and a list of special-status species of Ballona Wetlands (Cooper, 2005b). Other references used to determine the status of special-status species included:

- State and Federally Listed Endangered and Threatened Animals of California, CDFG, Natural Heritage Division, July 2005 (CDFG 2005a). Available: http://www.dfg.ca.gov/whdab/pdfs/TEAnimals.pdf
- State and Federally Listed Endangered, Threatened and Rare Plants of California, CDFG, Natural Heritage Division, July 2005 (CDFG 2005b). Available: http://www.dfg.ca.gov/whdab/pdfs/TEPlants.pdf
- Special Animals (including California Species of Special Concern), CDFG, Natural Heritage Division, July 2005 (CDFG 2005). Available: <http://www.dfg.ca.gov/whdab/pdfs/spanimals.pdf>.

Historical Perspective for Special-Status Birds

Prior to human modifications, Ballona Wetlands supported many species of breeding birds that are less common today because of the loss or degradation of coastal wetlands in California. For example, California black rail, which may be extirpated as a breeder from coastal Southern California is reported as occurring at Ballona Wetlands in the early 1900's (Bent, 1926). Light-footed clapper rails were recorded until at least 1949 in Playa Del Rey (Garrett and Dunn, 1981). Western snowy plovers nested near 'Ballona Swamp' in 1903 (Chambers, 1904); and in 'Del Rey' in 1914 (Willett, 1933). California least terns nested on the beaches of Los Angeles County from 'Santa Monica southward' in 1899 (Bent, 1921) and likely foraged in tidal channels throughout Ballona Wetlands. They were also reported nesting at Playa Del Rey (Grinnell and Miller, 1944). Belding's savannah sparrow nested in extensive pickleweed that was present prior to human disturbance; they were reported from Ballona Wetlands in the late 1800's (Grinnell, 1898). Several raptor species less common today were probably residents (present throughout the year) in the area, including northern harrier, short-eared owl, and burrowing owl. Riparian habitats in the area supported red-shouldered hawks, Cooper's hawks and white-tailed kites (Cooper, 2005e).

Surveys for Special-Status Birds

From 1973 to 1981, surveys for nesting California least tern were conducted at Area B; thereafter, these birds nested at a site created north of Ballona Creek. Surveys for Belding's savannah sparrow were conducted some years from 1977 to 1994 on Areas A and B. Numerous sightings of special-status species have been recorded in recent years by birders very active in Ballona Wetlands and vicinity; those since 2003 are summarized by Cooper (2005e). Otherwise, focused surveys for special-status species at Ballona Wetlands were sporadic until 1995, when KBC conducted biological surveys for the proposed Playa Vista development. Surveys were conducted in spring 1995 in areas of suitable habitat and pursuant to available and current survey protocol (or, if no protocol were established, according to methods recommended by known experts on the species) for the following special-status bird species with at least a marginal potential for occurring at Ballona Wetlands: black rail, light-footed clapper rail, western snowy plover, California least tern, white-tailed kite, northern harrier, peregrine falcon, Cooper's hawk, osprey, long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*), burrowing owl, southwestern willow flycatcher (*Empidonax trailii extimus*), California gnatcatcher (*Polioptila californica californica*), least Bell's vireo (*Vireo belli pusillus*), and Belding's savannah sparrow. Survey results in 1995 (KBC, 1996) were limited to:

- Occasional foraging dives in Area B tidal channels by California least terns;
- Twenty one Belding's savannah sparrows exhibiting territorial behavior suggesting nesting on Area B near the Ballona Creek tide-gates (none were observed on Area A);
- One willow flycatcher (unknown sub-species) in nontypical nesting habitat on Area A; it was not singing or exhibiting other breeding behavior and was not seen again, indicating it was a migrant and not breeding at Ballona Wetlands; no least Bell's vireos or southwestern willow flycatchers were observed and are not discussed further;
- One peregrine falcon observed over Area C during related surveys;
- Foraging white-tailed kites and northern harriers were observed at Areas A and B.

Follow-up surveys by KBC which were conducted in 1998 and 2001, found Belding's savannah sparrows nesting at Area B but not Area A, and foraging by California least terns in Area B tidal channels. A white-tailed kite was observed in Area B in 2001, but no other special-status species were observed during the surveys. Focused surveys for Belding's savannah sparrows were conducted in 2001, 2002, 2004 and 2005. No focused surveys for other special-status birds have been conducted since 2001. Results of these surveys and the status of other special-status species for which potential habitat is present at Ballona Wetlands are discussed below.

Current Perspective for Special-Status Birds

The Ballona Wetlands currently support habitat for two species listed by CDFG: the Belding's savannah sparrow, present year-round and the only endangered bird species known to currently breed at Ballona Wetlands; and the peregrine falcon, which forages occasionally to commonly. In addition, one species listed as endangered by both CDFG and the USFWS, the California least tern, forages in the tidal channels of Area B. California least terns historically nested, and recently, occasionally (as in 2001) attempted to nest on the Area B saltflats (KBC, 2001). A variety of other bird species designated as California Species of Special Concern also make use of habitats at Ballona Wetlands. Each of these is discussed below and summarized Appendix B-5.

Endangered Birds Currently Present

Brown Pelican

The California brown pelican occurs in the marine environments of North and South America, including open beaches, lagoons, tidal rivers, rocky coasts, jetties and breakwaters, and islands. California brown pelicans do not breed on the mainland but nest colonially on the Channel Islands off the coast of Southern California, on islands along the west coast of Baja California, and in the Gulf of California (Anderson and Gress, 1983). The California brown pelican population has increased in recent years but it remains federally and state-listed as an endangered species.

After the breeding season, brown pelicans leave the islands and disperse along the entire California coast and thus are most common in Southern California from June to October (Garrett and Dunn, 1981). Six aerial surveys by Jacques et al. (1995) from the California-Mexico border to Point Conception found the highest numbers in June and September. The majority of pelicans (65%) were found on artificial structures, primarily breakwaters, most of which were associated with harbors and marinas (Jacques et al., 1995). The Marina Del Rey breakwater supported the second-highest percentage of total roosting pelicans of 20 roosting sites surveyed.

Brown pelicans are occasionally observed flying over Ballona Wetlands but are more commonly observed over Ballona Creek, since tidal channels at the wetlands are too shallow to support brown pelican foraging.

California Least Tern

The California least tern is a migratory species that nests from April through August along the coast of California from San Francisco south to Baja California, nesting on sparsely vegetated sandy beaches, salt flats, and dredged spoil in colonies of up to several 100 nesting pairs. It presumably winters in Central America or northern South America, although the specific location of its wintering range is unknown (Massey 1974). The sub-species was listed as endangered under the Federal Endangered Species Act in 1970 and by the California Endangered Species Act in 1971, when state-wide censuses indicated that nesting pairs were limited to 600.

The salt flats of Area B North Wetland, just east of the main drainage channel, were used by 10 to 22 pairs of least terns from 1973 through 1976 (Dock and Schreiber, 1981; Loosli, 1978). Flooding of the salt flats due to rain early in the 1977 nesting season apparently prompted birds to nest for the first time on the beach (the 'Venice Beach' site) north of the Marina Del Rey channel. A small group also nested in 1977 along a channel at the end of Beethoven Street (north of Area C), which was not used thereafter. Approximately 25 pairs of terns used the salt flats of Area B in 1978 and 1979 (CDFG unpublished annual reports). Dock and Schreiber (1981) reported 17 pairs in 1979. Terns continued to nest on the salt flats in 1980 and 1981, although flooding both years precluded the production of any fledglings. Table 5-6 summarizes least tern nesting activity and productivity in the Ballona Wetlands vicinity through 2005.

Table 5-6. History Of California Least Tern Nesting in the Vicinity of Ballona Wetlands, 1973-2005

Year	Nesting Location	Number Of Nesting Pairs	Number Of Fledglings
1973 - 1976	Salt flats Area B	10 to 22	not recorded
1977	Venice Beach	35	30+
1977	Beethoven Street Fill	3	None
1978	Salt flats Area B	25-30	30
1978	Venice Beach	60-75	75
1979	Salt flats Area B	18-25	25
1979	Venice Beach	80-95	140
1980	Salt flats Area B	+	0
1980	Venice Beach	150-165	240
1981	Salt flats Area B	16	0
1981	Venice Beach	140-160	195
1982-1996	Salt flats Area B	0	0
1982-2005	Venice Beach[a]	82 to over 300	60 to over 300[b]

[a] one pair of least terns nested at Area B in 2001 but the nest was unsuccessful (KBC, 2001)

[b] the number of fledglings produced in recent years has been very low to zero due to predation by American crows

Studies on least tern foraging behavior in 1980 and 1981 included potential foraging habitat in the vicinity of the Venice Beach least tern nesting site just north of Ballona Creek (Atwood and Minsky, 1983). The tidal channels of Area B supported up to 13% of the total foraging of a given survey date in 1980, but foraging at Area B was less frequent in 1981. In 1995, 1998, and 2001, KBC conducted foraging surveys for least terns at the tidal channels of Area B and Marina Ditch in Area A. Foraging was documented in Area B tidal channels on three of seven survey dates in 1995, on three of 14 survey dates in 1998 and on seven of 17 surveys in 2001 (KBC, 1996, 1998, 2001). No least terns were observed at Area A.

It is unlikely that California least terns will attempt to nest again at Ballona Wetlands without an effective predator management plan that includes adequate and well-maintained fencing and a reduction in the red fox population. However, California least terns will likely continue to forage in the freshwater and tidal creeks of Ballona Wetlands as long as these areas support small fish. The tidal channels on Area B may be most important during the chick phase of nesting, as well as during years when offshore prey is limited.

Peregrine Falcon

The peregrine falcon was once a fairly common permanent resident along the coast of California, taking various species of birds as prey (Grinnell and Miller, 1944). No historical records specifically denote its occurrence in the vicinity of Ballona Wetlands, but it was probably uncommon to fairly common during winter and migration. Peregrine falcons are frequently recorded at Ballona Wetlands by National Audubon Society observers (Pickus, 1996). The peregrine falcon is listed as an endangered species by the State of California; it was formerly also listed by the USFWS but its national population recovered to the point that it was delisted in August 1999. Peregrine falcons are frequently observed (13 sightings in 2003; 11 sightings in 2004) foraging over Area B and occasionally over Area C (one sighting in 2003). It may also forage at Area A, at least occasionally, but this area is not visited as frequently by birders to document its presence.

Belding's Savannah Sparrow

Several of the 17 sub-species of savannah sparrow (*Passerculus sandwichensis*) are residents of coastal saltmarshes of the southwestern United States and Mexico. These include the large-billed savannah sparrow (*Passerculus sandwichensis rostratus*), which occurs along the east and west shores of the Gulf of California and is occasionally observed at Ballona Wetlands (Cooper, 2005a-f) and the Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), which is found from Morro Bay south to El Rosario, Baja California (Wheelwright and Rising, 1993) and nests at Ballona Wetlands and several other coastal saltmarshes in Southern California. The Belding's savannah sparrow was listed by the CDFG as endangered in 1974. It is not currently listed as endangered or threatened by the USFWS.

Belding's savannah sparrows occupy coastal saltmarshes and estuaries where pickleweed is dominant. They eat a variety of crustaceans as well as seeds of pickleweed and may forage in other nearby habitats including along rock jetties (Garrett and Dunn, 1981).

State-wide censuses are conducted approximately every five years. In 1986 the count was 2,274 breeding pairs, with the majority at Point Mugu Naval Air Station in Ventura County (Zembal et al., 1988). Upper Newport Bay and Bolsa Chica in Orange County also supported high-quality habitat and relatively stable populations (Zembal et al., 1988). A state-wide survey in 1996 estimated 2,350 breeding pairs, and the most recent survey in 2001 estimated 2,902 breeding pairs (R. Zembal, personal communication). Thus, the population at Ballona Wetlands that year (13) represented 0.45% of the State's population.

Grinnell and Miller (1944) reported Belding's savannah sparrow at Ballona Wetlands in the late 1800's. They have likely continued to nest on Area B since that time, and several focused surveys conducted since 1977 (Table 5-7) indicate that the recent population on Area B appears to be relatively stable, with 11 to 13 pairs from 1998 to 2005.

Table 5-7. Results of Surveys for Belding's Savannah Sparrow at Playa Vista, 1977 to 2005

Year	# Pairs Parcel B	# Pairs Parcel A	Surveys Conducted By
1977	37 pairs	No data	Massey 1977
1979	21	18	Dock and Schreiber 1981
1980	18	10	Dock and Schreiber 1981

Year	# Pairs Parcel B	# Pairs Parcel A	Surveys Conducted By
1981	13	10-13	Dock and Schreiber 1981
1982 – 1985	No data	No data	--
1986	32	No data	Zembal et al. 1988
1987	30	5	Massey 1987
1988	No data	No data	--
1989	31	0	White 1989
1990	11-12	0	Corey and Massey 1990
1991	1 to 30 throughout the year	0 breeding; up to 7 Oct. to Feb.	Corey 1991
1992 – 1993	No data	No data	--
1994	10	0	Lockhart 1994
1995	21	0	Keane Biological Consulting 1996
1996	37[a]	0	John Konecny, USFWS
1997	No surveys	No surveys	No surveys
1998	12 to 13	0	Keane Biological Consulting 1998
1999	No surveys	No surveys	--
2000	No surveys	No surveys	--
2001	13 to 15	0	Keane Biological Consulting 2001
2002	No surveys	No surveys	--
2003	No surveys[b]	No surveys	Keane Biological Consulting 2004
2004	12	No surveys	Keane Biological Consulting 2004b
2005	11	No surveys	Keane Biological Consulting 2005

Boland and Zedler also observed territorial Belding's savannah sparrows in Area B in 1990 (Boland and Zedler, 1991).

Area A supported nesting Belding's savannah sparrows through the mid-1980's. However, Dock and Schreiber (1981) noted that the quality of pickleweed habitat on Area A appeared to decline over their study period from 1979 to 1981. Even at that time, Area A was not subject to tidal influence, and pickleweed was present only because of leaching by winter rains of residual salt in dredged spoils left from construction of Marina Del Rey. Dock and Schreiber (1981) predicted that the health of the pickleweed habitat on Area A would continue to decline to the point where Belding's savannah sparrows may no longer nest there. As predicted, Massey (1989, 1990) found no breeding pairs on Area A in 1989 or 1990, stating that 'the habitat did not look healthy; the ground was very dry and there were many invasive upland weeds in the Salicornia'. Corey (1991) noted up to seven individuals on Area A during the fall/winter months of 1990 and 1991, occasionally in mixed flocks with the migrant sub-species of savannah sparrow, but did not record any breeding pairs, and none have been observed on Area A during focused surveys in 1995, 1998, and 2001 (KBC, 1996, 1998, 2001). Thus, Belding's savannah sparrows may forage occasionally on Area A during winter months (Corey, 1991), but are unlikely to nest on Area A in its current condition.

Other Special-Status Species Currently Present

Elegant Tern

The elegant tern is a California Species of Special Concern that in recent years has been observed roosting in large numbers on Area B in the early spring and late summer. These individuals are likely to nest in Los Angeles Harbor, where elegant terns initiated nesting within a protected area set aside for the California least tern, beginning in 1997 (KBC, 1997). Although 1000's of elegant terns from Mexico spend the summer and fall along the California coast, the Los Angeles Harbor, Bolsa Chica wetlands, and the salt work dikes at the southern end of San Diego Bay are the only breeding sites in California. The Ballona Wetlands appear to be very important for pre- and post-breeding concentrations of several 100 elegant terns (Cooper, 2005e).

Burrowing Owl

Burrowing owls breed throughout much of western North America and in California are most common in desert areas. They are nearly extirpated as a nesting species from many areas of coastal Southern California, but a small influx of burrowing owls occurs in the winter (Garrett and Dunn, 1981) . The burrowing owl has been listed as a California Species of Special Concern since 1978. It is currently not listed by California or federal Endangered Species Acts, although an attempt to list it recently under the California Endangered Species Act failed. Burrowing owls forage primarily at night but are also relatively active in daytime hours compared with most other owls. They do not dig burrows, but in Southern California primarily use those of California ground squirrels (*Spermophilus beechyi*), enlarging and modifying them as needed.

Dock and Schreiber (1981) reported that two pairs of burrowing owls apparently nested on Unit 3 (Area A), and that owls were observed occasionally on Units 1 and 2 (Area B North and South Wetlands) and 'along bluffs south of the agricultural area, where they probably nest.' Corey (1991) mentions, 'one on the Westchester Bluffs in April 1990. Nesting not confirmed.' Burrowing owl surveys were conducted by KBC (1995). No burrowing owls were observed during the surveys, although a pellet that may have been discarded by a burrowing owl was located on Area A on June 8, 1995. California ground squirrels and their burrows were noted in some locations, and the physical habitat required by burrowing owls appears to remain on the site.

Several recent burrowing owl observations have been reported by a local birder (Cooper, 2005e), and at least one wintering owl occupied a burrow in Area B, but this individual did not remain to breed in 2006 (B. Henderson PC) The potential for long-term occurrence of burrowing owls at Ballona Wetlands in their current condition is low due to the high density of non-native predators, including domestic dogs, cats, and red foxes.

Northern Harrier

Formerly called marsh hawk when designated a California Species of Special Concern in 1978, the northern harrier was historically a common resident of the Southern California coast (Grinnell and Miller, 1944), but both breeding and wintering populations have declined. It is now considered fairly common in winter, and rare and local as a breeder in coastal Southern California (Garrett and Dunn 1981). Northern harriers nested at Ballona Wetlands as recently as 1953 (Cooper, 2005a-f). The species was recorded as a sporadic visitor by

Dock and Schreiber (1981). Northern harriers forage over open habitats including coastal saltmarshes such as Ballona Wetlands and formerly occurred here throughout the winter through the mid-1990's (Cooper, 2005a-f). Winter residents are no longer documented, although individual northern harriers are recorded at least once every winter (Cooper, 2005a-f).

White-tailed Kite

The white-tailed kite, a California fully-protected species, was formerly widespread in valley and foothill habitats prior to 1895. It typically forages in open grasslands, meadows and marshes (Grinnell and Miller, 1944). It was regularly seen on Areas A, B, and C during winter by Dock and Schreiber (1981), and was observed occasionally on Area B by Corey (1991). During 1995 surveys, one adult and one juvenile were observed occasionally, most commonly on Area A, and three to five birds are observed through the spring and summer (Cooper, 2005a-f). They may nest somewhere at Ballona Wetlands and are probably residents in the area.

Cooper's Hawk

The Cooper's hawk, a California Species of Special Concern, is a resident species that was formerly common to abundant in California during the fall in open riparian and deciduous woodlands (Grinnell and Miller, 1944) and is now becoming more common in some residential areas. The species was likely to be fairly common at least in winter and during migration at Ballona Wetlands. Both Dock and Schreiber (1981) and Corey (1991) recorded occasional sightings of Cooper's hawk on Areas A and B. Cooper's hawk is commonly observed at Ballona wetlands, and may nest in the eucalyptus grove or in adjacent residential areas.

Osprey

Osprey was formerly a summer resident in Southern California and an occasional winter visitor, occurring near the ocean and lakes (Grinnell and Miller, 1944). It was an uncommon migrant over Areas A and B in 1979-1981 (Dock and Schreiber, 1981). Corey (1991) recorded one over Area B during the summer of 1990, but it likely did not nest here. Several individuals were observed in 2005, including one near Ballona Creek and Area C in September 2005 and July 2006 (Brad Henderson, personal communication). The osprey is expected to occur occasionally at Ballona Wetlands, particularly during the winter months.

Loggerhead Shrike

The loggerhead shrike, a California Species of Special Concern, is an uncommon but widespread resident and winter visitor in lowlands and foothills throughout California. It prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. It is generally rare in urbanized areas but can occasionally be found in suburban parks. It preys upon small birds, reptiles, and insects in open habitats with scattered trees. This type of habitat is becoming scarce in Southern California, and in the Los Angeles Basin and adjacent valleys and Santa Monica Mountains, the loggerhead shrike breeding population has declined in recent years to an estimated three to eight pairs. Numbers of wintering shrikes have also declined from double-digit numbers to one or two individuals (Garrett, personal communication). The last locally nesting shrikes were recorded on Ballona Wetlands in the mid-1990's, although territorial behavior was observed east of Lincoln Boulevard in 1998, and an adult accompanied by a juvenile was present for one day near the

Freshwater Marsh (Cooper, 2005b). This species breeds in tall shrubs and trees, and was frequently observed south of Culver Boulevard on Area B during spring surveys in 2001, during summer and fall surveys in 2003 and during summer surveys in 2004 (KBC, 2001, 2004, 2005) and thus may have nested at Ballona Wetlands.

Special-Status Birds No Longer (or Rarely) Present

California Black Rail

Black rail is the smallest rail in North America and has a wide distribution in both coastal and freshwater marshes. Black rails along the west coast tend to nest in the upper reaches of coastal saltmarshes, in areas dominated by rushes and sedges; pickleweed-dominated habitats support few rails (Evens et al., 1994). Despite the lack of suitable habitat at Ballona Wetlands, because the species historically occurred in the area, KBC conducted focused surveys for black rail in areas of suitable habitat in 1995 and 2001. No black rails were seen or heard. Given the paucity of recent sightings for this species south of Morro Bay, the lack of well-developed coastal saltmarsh habitat on Ballona Wetlands, and the presence of red fox in the area, it is highly unlikely that black rails would currently breed at Ballona Wetlands. In any case, models predict that 10 to 25 breeding pairs are necessary to sustain a population (Shaffer, 1981 in Evens et al., 1991). Population isolation and the lack of significant dispersal indicates that the probability of sustained existence for black rail in many areas is low (Evens et al., 1991).

Light-footed Clapper Rail

The light-footed clapper rail occurs along the Pacific Coast from Bahia de San Quintin, Baja California, north to Carpinteria Marsh, Santa Barbara County (Zembal and Massey, 1981; Zembal, 1991). It is a resident of coastal saltmarshes of Southern California and occupies tidal habitats dominated by cordgrass (*Spartina* sp.) and pickleweed. Light-footed clapper rail was listed as endangered by the USFWS in 1970, and by CDFG in 1971.

Light-footed clapper rail was recorded as recently as 1949 at ‘Playa Del Rey’ (Garrett and Dunn, 1981). However, rail has been absent as a breeder from Los Angeles County since the 1960’s (Massey et al., 1984), although individuals may occur here during dispersal. A clapper rail was observed and photographed in January 1995 by David de Lange near Ballona Creek in the North Wetland of Area B (H. Towner, personal communication). Censuses for clapper rails have been conducted state-wide from 1980 through 2005, but surveys have typically not covered the Ballona Wetlands area due to a lack of suitable breeding habitat. Focused surveys for light-footed clapper rail were conducted by KBC in 1995 and 2001, and no clapper rails were observed (KBC, 1996, 2001). Because of a lack of suitable breeding habitat and the presence of red fox, light-footed clapper rails are unlikely to breed at Ballona Wetlands. In addition, breeding habitat typically includes a large component of cordgrass, which does not occur on Ballona Wetlands (Hendrickson, 1991a). However, individual clapper rails, such as the one observed in January 1995, may occur for short periods at Ballona Wetlands during dispersal but are unlikely to breed at Ballona Wetlands in their current state.

Western Snowy Plover

The coastal population of western snowy plover (*Charadrius alexandrinus nivosus*) breeds along the Pacific coast from southern Washington to southern Baja California on sparsely vegetated beaches backed by dunes, dredged spoils, flats of salt evaporation ponds, and river bars. During winter months it withdraws from the northerly parts of its range southwards (Grinnell and Miller, 1944). The coastal population of western snowy plover was listed as threatened by the USFWS in 1993 (USFWS, 1993a).

Western snowy plovers nested near ‘Ballona Swamp’ in 1903 (Chambers, 1904) and in ‘Del Rey’ in 1914 (Willett, 1933). In 1903, one egg collector reported 50 pairs of plovers along a two-mile stretch of beach (‘Ballona Beach’) between Ballona and Santa Monica (Page et al., 1991). In 1947, a plover incubating its eggs was photographed on Manhattan Beach (Page et al., 1991). Page and Stenzel (1981) also reported that suitable habitat, but no nesting plovers, was seen in 1923 at the ‘Playa Del Rey Salt Flats’. Surveys during the 1978 breeding season included Manhattan Beach, Playa Del Rey, Playa Del Rey Salt Flats (probably Area B), and Ballona Beach and no plovers were observed (Page and Stenzel, 1981).

Snowy plovers were recorded occasionally on Area B mudflats in September and October 1980 and April 1981 but no nesting individuals were reported (Dock and Schreiber, 1981). Surveys for wintering populations by Page et al. (1986) from 1978 to 1985 included nine counts at Ballona Creek and Playa Del Rey. Corey (1991) did not observe snowy plovers during any of his surveys. Snowy plovers have been recorded recently along beaches in the vicinity of Ballona Wetlands but none have been observed on Areas A, B or C. KBC conducted focused surveys for western snowy plover on Areas A and B in spring 1995 and none were observed (KBC, 1995). KBC focused surveys on Area A in 1998 and 2001 and on Area B in 2004 and 2005 recorded no western snowy plovers (KBC, 1998, 2001). The prevalence of red foxes (they were observed during nearly every survey, and/or tracks or droppings were noted) suggests that western snowy plovers are unlikely to currently breed at Ballona Wetlands, although they may be present briefly during the winter and during migration.

Short-eared Owl

Short-eared owls breed in tall grasslands and the upper portions of coastal saltmarshes and were apparently uncommon breeders in coastal Southern California up until at least the 1920’s (Grinnell and Miller, 1944). They have since been completely or nearly extirpated, with only a single known breeding (Santa Barbara Island; McCaskie, 1992) in nearly 50 years (Remsen, 1978; Garret and Dunn, 1981). Formerly common in Southern California in the winter (Grinnell and Miller, 1944), they are now rare to very uncommon (Garrett and Dunn, 1981). The short-eared owl is listed as a California Species of Special Concern and currently has no listing status per the Federal or California Endangered Species Acts.

Dock and Schreiber (1981) observed a short-eared owl on Area A in February 1979. Three short-eared owls have been sighted during 14 winters between 1947 and 1996; recent observations are limited to one individual in 2000 and one in 2004 (Cooper, 2005a-f). Suitable habitat for the short-eared owl is limited to the non-tidal marsh uplands, such as the weedy fields of Area A and the eastern end of Area B. Focused surveys for the short-eared owl were conducted by KBC in 1995, and no short-eared owls were observed (KBC, 1995). Because Ballona Wetlands are heavily visited by potential predators, including domestic dogs and cats, as well as non-native red fox, it is unlikely that any pioneering short-eared owl would be successful in attempting to breed. However, recent records indicate that the migrating short-eared owls may continue to occur rarely at Ballona Wetlands.

Long-eared Owl

This species was formerly rather common and widespread as a breeder throughout Southern California, but is now described as rare and local (Bloom, 1994). In California, breeding habitat for long-eared owls includes desert oases, tamarisk thickets and dense riparian habitats (especially oak riparian woodlands) (Marks et al., 1994). Numbers of long-eared owls increase in the winter, but the species is still very uncommon during winter in coastal Southern California (Garrett and Dunn, 1981). The long-eared owl is listed as a California Species of Special Concern but the listing refers only to its nesting grounds. It currently has no listing status per the Federal or California Endangered Species Acts.

Dock and Schreiber (1981) reported 'one or two individuals flushed from trees along Unit 3 in February of 1979,' although other ornithologists have questioned the reliability of this sighting, given the fact that most recent records were from 1929 and 1934 (Cooper, 2005a-f). Suitable habitat for the long-eared owl at Ballona Wetlands is limited to areas of dense trees, such as the eucalyptus trees at the western end of Area B and the willow woodland just west of Lincoln Boulevard on Area B. KBC conducted surveys for long-eared owl in 1995 and none were observed (KBC, 1995). Given the limited nature of potential habitat at Ballona Wetlands, the lack of sightings during the past 70 years, and the presence of known predators including great horned owls and red-tailed hawks, it is highly unlikely this species will breed or winter at Ballona Wetlands in their current state.

Other Special-Status Birds Considered Extirpated from Ballona

A variety of other special-status species that were observed historically at Ballona Wetlands and may return following restoration include the least Bell's vireo and California gnatcatcher (no sightings of these two species have been recorded in recent years and none were observed during focused surveys in 1995, 1998 and 2001 in areas of suitable habitat in southeastern Area B [KBC 1996, 1998, 2001]), horned lark (*Eremophila alpestris*), yellow-breasted chat, tricolored blackbird (*Agelaius tricolor*), and large-billed savannah sparrow (*Passerculus sandwichensis rostratus*). More information is available on these species at http://www.dfg.ca.gov/hcpb/species/species.shtml.

Several additional species considered extirpated from Ballona Wetlands but not on state or federal special-status lists since they are observed in suitable habitat elsewhere in Southern California may occur following restoration (Cooper 2005b, 2005e).

Special-Status Birds Seen During Migration

Several California Species of Special Concern observed occasionally during migration at Ballona include the long-billed curlew (*Numenius americanus*), primarily observed flying over Area B, Vaux's swift (*Chaetura vauxi*), willow flycatcher, and yellow warbler (*Dendroica petechia*). Other species observed during migration at Ballona Wetlands, not on any federal or state list of special-status species but considered locally significant by some birders since habitat is limited in the Los Angeles Basin, include the brant (*Branta bernicla*), black-bellied plover, Bonaparte's gull, royal tern (*Sterna maxima*), and American pipit (*Anthus rufescens*) (Cooper, 2005e).

Special-Status Birds Observed at the Ballona Freshwater Marsh

Several other birds that are California Species of Special Concern have been recently recorded at the Freshwater Marsh. These include the least bittern (*Ixobrychus exilis*), redhead (*Aythya americana*), and yellow-headed blackbird (*Xanthocephalus xanthocephalus*). Several other birds observed at the Freshwater Marsh but not included on any current state or federal lists of special-status species, but considered locally significant by some birders since they are otherwise rare in the Los Angeles Basin, are American bittern (*Botaurus lentiginosus*), white-faced ibis (*Plegadis chihi*), common moorhen (*Gallinula chloropus*), Wilson's phalarope (*Phalaropus tricolor*), western meadowlark, and blue grosbeak (*Guiraca caerulea*) (Cooper, 2005b, 2005e). The western meadowlark and blue grosbeak are also locally significant since the habitats in which they are observed at Ballona Wetlands (dune willows for blue grosbeak; freshwater and saltmarsh for the western meadowlark) are otherwise rare in Los Angeles County (Cooper, 2005e).

5.6 INVASIVE AND NUISANCE SPECIES

Invasive species can adversely affect natural areas that support native ecosystems, including ecological reserves and wildlife areas. This section describes some of the invasive species known to occur within Ballona Wetlands that will need to be considered in the development of restoration and adaptive management plans.

5.6.1 Invasive Plant Species

Developing a restoration and management plan for Ballona Wetlands requires consideration of the extent, impact and growth trend of the non-native plant species on site, as well as a strategy for removing and/or controlling these weed species. Now that development pressures have been removed from Ballona Wetlands, there is probably no greater challenge to the success of the wetland restoration than the issue of non-native plant species. Even without further disturbances, the weedy plant species will most likely continue to alter the wetland in ways that will reduce the value of the site as habitat, not only for native plants, but also for native wildlife.

The presence of non-native species throughout the different habitat types on the site (Appendix B-1) is an indication of past disturbances to the wetland. Many of these weedy plant species are very effective competitors to the native plants, and once established, will not be replaced by natives without active restoration and management.

5.6.1.1 Vegetation

A comprehensive invasive species inventory currently does not exist for the Ballona Wetlands area, although a number of exotic plant species have been identified throughout the project area. Appendix B-1 lists a total of 171 annual and perennial non-native plant species known from the various habitat types at Ballona Wetlands. While not all of these species are currently a problem for habitat quality, many of these species have become established in enough areas to be currently excluding the native habitats of the wetland.

The non-native plant species at Ballona Wetlands include both perennial and annual weed species. Some of the more problematic perennial species include terracina spurge (*Euphorbia terracina*), Australian saltbush (*Atriplex semibaccata*), pampas grass (*Cortaderia* spp.), Brazilian pepper (*Schinus terebinthifolius*), at least three species of wattle/acacias (*Acacia* spp.), castor bean (*Ricinus communis*), ice plants (*Carpobrotus* spp., *Malephora crocea*, etc.), myoporum (*Myoporum laetum*), giant reed (*Arundo donax*), and fennel (*Foeniculum vulgare*). The wetland also has extensive populations of annual weed species, including Russian thistle (*Salsola tragus*), sweet clovers (*Melilotus* spp.), tocalote (*Centaurea melitensis*), mustards (*Brassica* spp.), brome grass (*Bromus* spp.), ryegrass (*Lolium* spp.) and garland chrysanthemum (*Chrysanthemum coronarium*).

Although it is difficult to quantify whether the perennial or annual weeds are more of a problem across the entire system, it is anticipated that additional detailed information regarding the extent of invasive plant species within the project area will be forthcoming as part of CDFG's vegetation assessment and mapping efforts.

In general, the most serious weed threat to the saltmarsh system (tidal and/or impounded nontidal) comes from the perennial weed species (e.g. *Limonium*, *Atriplex semibaccata*, etc.), which can compete directly with the native perennial species throughout the entire year. Many of these perennial weed species within the wetland are also adapted to a saline environment (e.g. *Mesembryantheumum* spp.), and in many cases the weed species are the superior competitors (Zedler et. al., 1992). Introduced species of 'sea lavender' are increasingly becoming a problem in tidal saltmarsh habitats where few exotic species have been able to invade. These plants of the genus *Limonium* are from European saltmarshes and other habitats of the Mediterranean region and have been introduced through the horticultural trade. *Limonium ramosissimum* is perhaps the most common of these relative recent introduced perennial weeds.

The typical native saltmarsh system is dominated by perennial species; so exotic competitors that are annual species do not always have the same impact as the exotic perennials. The exotic annual species thrive for just a short period of the year, so the competition is limited to the annual life cycle. Remaining dead thatch from these annual weed species can also adversely impact native habitat, especially after multiple seasons of thatch build-up. This thatch build-up can not only hinder the germination of native seedlings, but can also restrict perennial sub-shrubs and shrubs that grow low and spreading. Examples of annual weed species of the upper marsh, especially in zones of fluctuating salinity regimes, include grasses such as *Polypogon monspeliensis, Lolium multiflorum,* and *Parapholis incurva*, and Brass-buttons (*Cotula coronopifolia*). Annual iceplants such as *Mesembryanthemum nodiflorum*, concentrate salts and can change the character of habitats by excluding native species in transition areas where the increase in salinity can reach toxic levels.

To date, removal and management efforts for non-native plant species at Ballona Wetlands have focused on removal of iceplant and other herbaceous exotic species in the western dunes portion of Area B; and targeted removal of woody nonnative shrubs in upland areas of Areas A, B, and C.

5.6.2 Invasive Wildlife Species

5.6.2.1 Invertebrates

The Argentine ant *(Iridomyrmex humilis)* has been found to be the most abundant insect in the Ballona Wetlands region (Nagano et al., 1981). During a survey in the early 1980's it was not uncommon to pull a single pitfall trap with over 10,000 individuals in it (Nagano et al., 1981). It is believed that the overwhelming numbers of this introduced species has led to the decline of native ant species, and loss of food resources for horned lizards and other species that depend on native ants. The honey bee *(Apis mellifera)*, which was introduced to the U.S. in the middle of the 19th century and is now present nearly everywhere in California, may compete with native bees for flowers (Nagano et al., 1981). One non-insect invertebrate, the invasive African land snail *(Otata lacteal)* was collected in Area C in 1991 (Carter, 1991).

5.6.2.2 Fish

Introduced species of fish found in Area B, Marina Del Rey, and Ballona Creek include mosquitofish, sailfin molly, and yellowfin goby. Mosquitofish were widely introduced in order to control mosquitoes and entered California in 1922 (Swift and Frantz, 1981). This freshwater species has been collected in each survey of Area B from the past 25 years. In 1981 it was one of the two dominant fish in Area B (Swift and Frantz, 1981). In 1991, mosquitofish accounted for 61% of all individuals collected (Soltz, 1991). In 1996 it was the second most abundant species found in Area B and between 2001 and 2004 it was the third most abundant fish in Area B. This species is believed to be detrimental to native fishes (Haglund et al., 1996).

Sailfin molly are an invasive species believed to have been introduced to the area by release from home aquariums. They have been collected during nearly each sampling event since 1991. In 1991 it was the third most abundant fish sampled and the 155 fish accounted for 1.6% of all individuals collected. In 1996 two sailfin mollies were captured. Eight individuals were caught between 2001 and 2004, less than 0.01% of all individuals collected.

Yellowfin goby are native to Japan, Korea, and China are are believed to have been introduced from ballast water. They are predators and can impact native fishes through either predation or competition for limited resources. The species was first found in San Francisco Bay in the 1960's and reached San Diego County in the 1980's (Zedler, 2001). Yellowfin goby were first found in Area B in 1981 and were found in both Area B and Marina Del Rey in 1991. In Area B, one specimen was captured in the fall of 1990, which represented just over 0.1% of the total catch, while three were captured in the spring of 1991. Again, this number represented less than 0.2% of the total capture. In Marina Del Rey, eight yellowfin goby were collected out of 5,469 total fish, 0.15% of the total catch in 1991.

5.6.2.3 Reptiles and Amphibians

Areas A, B, and C were evaluated for amphibians and reptiles most recently by Impact Sciences (1996) and all recorded amphibians and reptiles were found to be native. Earlier studies also found no invasive species of reptile or amphibian (Hovore, 1991; Hayes and Guyer, 1981).

5.6.2.4 Mammals

Non-native mammal species found in Ballona Wetlands include house mouse *(Mus musculus)*, black rat *(Rattus rattus)*, Norway rat (*Rattus norvegicus)*, domestic cat *(Felis cattus)*, Virginia opossum *(Didelphis virginiana)*, domestic dog (*Canis familiaris)*, and red fox *(Vulpes vulpes)*. In general, in 1981, native and non-native species were about equally abundant. In 1996, only 18% of all captures were native species.

House mice have been observed in each of the Ballona Wetlands areas in which mammal populations have been studied. Impact Sciences (1996) found there had been a substantial increase in the density of the house mouse in the past 15 to 20 years. The 1996 study also concluded that the aggressive house mouse had likely displaced native fauna such as Stephens' vole and native mouse due to its ability to out-compete these species for resources.

Black rat were captured in Areas A and B in 1996. Norway rat were captured in Area B in 1996 and in both Areas A and B in 1981. Impact Sciences (1996) survey found domestic cats in Areas B and C. Virginia opossum were observed in Area B in each survey in 1981, 1991, and 1996. The opossum is typical of urban areas with disturbed open space (Impact Sciences, 1996). They were also observed in Area A in 1996. Dogs were observed in Areas A and B in 1981 and in Areas B and C in 1996.

Red fox were observed in Areas A and B in 1991 and in Area B in 1996. Hovore (1991) found that species diversity had decreased and that the species most vulnerable to fox predation, such as voles and rabbits, were significantly reduced or absent from formerly occupied areas. Loss of diversity within the Ballona Wetlands region can also be attributed to the general degradation of the habitat quality, although it appears that many of the specific declines by taxon may be a direct result of red fox predation (Hovore, 1991). In addition to native small mammals, red fox has also had a substantial affect on populations of ground-nesting birds, amphibians, and reptiles (Impact Sciences, 1996).

5.6.2.5 Birds

Several non-native bird species common to Southern California are found in Ballona Wetlands, including the European starling (*Sturnus vulgaris*) and house sparrow (*Passer domesticus*). Both are species native to Britain that were introduced into the United States during the early- to mid-1900's. Both species take over nesting habitat of native bird species, thereby reducing the populations of native species. For example, the European starling nests in cavities (small holes in trees or other structures) and has been implicated in a nationwide reduction in the populations of western bluebirds (*Sialia mexicana*). Starlings have even been observed (rarely) preying upon California least tern chicks (Collins, personal communication). The European starling and house sparrow were observed during all KBC surveys on Areas A, B, and C.

Some native bird species that are a problem for other native birds include the American crow, brown-headed cowbird (*Molothrus ater*) and great-tailed grackle. American crows are very well adapted for living in residential areas, and they prey heavily on native bird species. During surveys for Belding's savannah sparrow in Ballona Wetlands, several crows were observed foraging within the pickleweed marsh, likely searching for garbage blown in or washed up during high tides, as well as for eggs of native nesting birds. American crows have been implicated in the lack of California least tern reproductive success in 2004 and 2005 at the 'Venice Beach' nesting site just north of Ballona Creek. The brown-headed cowbird population has expanded with agricultural practices; these birds are nest parasites that locate and remove eggs from nests of native birds, replacing them with their own. The native birds typically do not recognize the foreign eggs and raise the young as if they were their own, thus producing no offspring of their own. At the Freshwater Marsh in 2005, a common yellowthroat was observed feeding a juvenile brown-headed cowbird, but brown-headed cowbirds are otherwise uncommon in migration and throughout the summer at Ballona Wetlands (Cooper, 2005b). Great-tailed grackles have recently colonized Ballona Wetlands and nested at the Freshwater Marsh in 2003 (Cooper, 2005b). Although a species native to the United States, it is a relatively new arrival and has been reported competing for nest sites with red-winged blackbirds (Rutledge and Chandler, 1979) and preying on other birds (Johnson and Peer, 2001).

Non-native, non-bird predators on birds at Ballona Wetlands include feral cats, a widespread problem in many areas of Southern California. However, the predominant non-native predator on birds at Ballona Wetlands and other Southern California coastal wetlands is the red fox, which is very well adapted to human modified habitats and was frequently observed (as were its tracks and scat) during surveys on Areas A and C, but particularly on Area B. The red fox population at Ballona Wetlands is apparently supplemented by red fox at Los Angeles Airport. Red fox have perpetrated substantial reductions in bird reproductive success as well as in populations of special-status bird species (Jurek, 1992). For example, prior to an intensive trapping program during the late 1980's that removed red fox from the Anaheim Bay marsh at the Seal Beach Naval Weapons Station, red fox had extirpated light-footed clapper rails from the area. The clapper rail population at Seal Beach recovered following removal of red fox from the area.

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6. CULTURAL RESOURCES

6.1 PREHISTORY AND HISTORY OF BALLONA WETLANDS

Archaeological evidence suggests that significant human occupation of the Ballona Wetlands area began between 7,000 and 6,000 years ago. At that time, settlement appears to have been limited mainly to the bluff tops, overlooking what was at that time a shallow lagoon that had formed during the early Holocene (Section 3). This pattern of bluff-top settlement increased for the next few thousand years, such that by about 3,000 years ago several large settlements had been established along the bluffs south of Ballona Wetlands.

By 3,000 years ago, accumulating sediments had reduced the size of the prehistoric lagoon and created expanses of tidal marshes around the inland margins (Section 3). While the bluff-top sites continued to be occupied, new settlements began to appear in the lowlands along Ballona Creek and Centinela Creek. Paleoenvironmental reconstruction based on sediment cores suggest that much of the project area was still covered by open water at this time. However, as sediment continued to accumulate on the eastern margin of the lagoon, the lowlands were increasingly utilized, and by about 1,000 years ago several settlements had been established in the lowland areas.

At approximately 1,000 years ago, however, a more significant settlement shift took place at Ballona Wetlands, in that the extensive bluff-top settlements appear to have been abandoned and a series of discrete components were established in the lowlands closer to the lagoon edge. Because until recently the Late Prehistoric record in the lowlands has been limited, it was suggested either that occupation of the area was reduced at this time, or that populations were aggregating at an as-yet undiscovered Late Prehistoric village (Altschul et al., 2005). The recent discovery at CA-LAN-62 of a major cemetery dating to the Late Prehistoric and post-contact times seems most consistent with the latter hypothesis, in that a significant degree of settlement organization and aggregation in the Late Prehistoric is implied.

At historic contact, the Ballona Wetlands area was occupied by the Tongva (also known as the Gabrielino), who controlled most of the Los Angeles Basin. They lived in a series of politically autonomous villages along the major drainages and in favorable locations along the coast, with each village inhabited by about 50 to 200 people (Bean and Smith, 1978). Subsistence resources included a wide variety of plants and animals, with the acorn a primary staple. Wetland areas along the coast such as Ballona Wetlands provided shellfish, fish, small game, medicinal plants, and reeds as building materials (Martin Acala, personal communication) Evidence of Protohistoric (A.D. 1769-1800) and early historic (A.D. 1800-1850) occupation in Ballona Wetlands has until recently been limited to Mission period shell and trade beads, butchered bone, and a few very late radiocarbon dates (Altschul et al., 2003, 2005). However, continued excavations at CA-LAN-62, immediately east of the project area along Centinela Creek, have now revealed a major Native American cemetery that dates primarily to this period. Although analysis of these materials is ongoing, it is likely that the cemetery and other deposits in CA-LAN-262 represent a major Tongva settlement. Likely candidates would include Sa'angna or Guaspita, both of which are reputed by some sources to have been located in Ballona Wetlands (Altschul et al., 2003).

Euroamerican occupation of the Ballona Wetlands area began in the latter half of the 19th century with the development of the small community of Machado, located along Ballona Creek to the east of the project area, which became known as Rancho La Ballona. During the 1920's and 1930's, the project area was used for agriculture by a community of ethnic Japanese farmers, although this was curtailed shortly after the attack on Pearl Harbor. In 1941, large areas of Ballona Wetlands were purchased by Hughes Aircraft, which developed a large-scale manufacturing operation near the project area.

6.2 KNOWN RESOURCES IN THE PROJECT AREA

Archaeologists first visited Ballona Wetlands and adjacent bluff tops nearly 100 years ago, and since then have identified numerous prehistoric deposits. Recent syntheses of the work conducted for the Playa Vista development in Ballona Wetlands (Altschul et al., 1992; Altschul and Grenda, 2002; Altschul et al., 2003) document at least 14 archaeological sites in the vicinity of the present project area. These sites reveal important land use changes that relate to both social and environmental forces occurring over the past 6,500 years.

The project area is within the Ballona Lagoon Archaeological District, a National Register-eligible district that includes large portions of Ballona Wetlands and adjacent bluff tops (Altscul et al., 2003). Of the cultural sites that have been identified within the lowlands, three (CA-LAN-54, -62, and -2676) are within or near the present project area. CA-LAN-54 is within Area C along Culver Boulevard. Consisting of artifacts and shellfish remains, this small site is thought to have been established before about 1,000 years ago. It has been determined eligible for the National Register of Historic Places, and was subjected to data recovery in 2002 as part of the proposed widening of Culver Boulevard (report pending).

CA-LAN-2676 is located just east of Area B, near Lincoln Boulevard. Tested in 1999, this site is interpreted as a short-term resource processing area in a disturbed context. Also just outside the project area is CA-LAN-62, an extensive and highly significant prehistoric deposit containing a major mortuary complex. This deposit extends more than three km along the base of the bluffs east of Lincoln Boulevard and is the subject of ongoing data recovery by Statistical Research, Inc. To date, nearly 400 human burials have been identified at the site, most of which appear to date to the Late Prehistoric or Mission periods (Robert Dorame, personal communication). A variety of artifacts, including Mission-era beads and other items, have also been recovered. The clustering of most of the burials within a limited area indicates it to be a discrete cemetery and implies a degree of settlement organization at Ballona at that time.

Based on current information, only one known site (CA-LAN-54) is within the project area. Although this site has been determined eligible for the National Register of Historic Places, it has been subjected to additional data recovery investigations that have removed additional deposits. Data presented in the final report of these investigations, currently in preparation by Statistical Research, Inc., will clarify whether additional investigations would be necessary for the Ballona Wetlands Restoration Project.

It is important to note that continued sediment accumulation during the late Holocene may have buried significant cultural deposits. In lowland alluvial areas such as the project area, such deposits could occur at substantial depth, and may be encountered during any site excavations (depending on site design) elsewhere within the project area.

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7. WATER AND SEDIMENT QUALITY

This section presents a summary of the available water and sediment quality data for the project area. This summary also identifies additional data needs and potential impacts from inflows that are to be considered in the development and evaluation of restoration alternatives for Ballona Wetlands. A literature review was conducted and existing data obtained and summarized. This section does not summarize all the existing data, but focuses on the more recent and comprehensive data sets in order to develop a baseline condition for alternative evaluation.

7.1 BASELINE WATER QUALITY OF BALLONA CREEK

7.1.1 Water Chemistry

The most comprehensive and recent data set of water quality in Ballona Creek is collected by the Los Angeles Department of Public Works (LADPW) as part of the Core Monitoring Program required under the municipal separate storm sewer systems (MS4s) National Pollutant Discharge Elimination System (NPDES) permit. The Los Angeles County Flood Control District, the County of Los Angeles, and 84 incorporated cities within the Los Angeles County Flood Control District (collectively referred to as Permittees) are covered under this municipal NPDES permit for discharge of urban runoff to waters of the United States. The Core Monitoring Program includes wet and dry weather sampling and analysis of water samples within Ballona Creek watershed, upstream of the wetland and above the tidally-influenced sections of the creek. This monitoring program includes bioassessment surveys within the creek channel and shoreline sampling and analysis for bacteriological indicators along the Santa Monica Bay shoreline. The results of this monitoring are presented in the LADPW Integrated Receiving Water Impact Report (Weston, 2005). The following discussion summarizes the findings of this report.

Water quality monitoring has been conducted during the past 10 years at the Ballona Creek mass emission site (S01) as shown on Figure 7-1. Water quality monitoring has also been conducted at six Tributary Monitoring Stations that were established in 2004-2005. The locations of these monitoring points are shown on Figure 7-1. Table 7-1 presents the annual mean concentration for constituents measured at the Ballona Creek mass emission site from 1994 to 2005 for both wet and dry weather sampling events. The monitoring program has identified several constituents of concern (COCs) that persistently exceed the water quality objectives (WQOs). The lowest WQOs used to compare with the average concentrations are shown on Table 7-1 and are based on freshwater criteria. The criteria used for metals is based on the California Toxics Rule (CTR) Criterion Continuous Concentrations (CCC) adjusted for hardness as described in the CTR using the average hardness for the year reported.

Table 7-1. Annual Mean Concentration for Constituents Measured at the Ballona Creek Mass Emission Site, 1994 to 2005

Constituent	Units	Lowest WQO[1]	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	Frequency Ratio	Mean Exceedance Ratio[2]
General															
Alkalinity	mg/l				27.0	68.6	69.0	66.7	68.1	60.9	189.2	166.6	114.7	0.0	
Bicarbonate	mg/l				27.0	68.6	69.0	80.1	82.9	74.3			166.3	0.0	
BOD	mg/l				29.4	19.7	45.9	12.9	9.4	19.2	10.7	16.7	21.3	0.0	
Calcium	mg/l				10.3	30.6	31.5	26.0	27.1	25.3			43.1	0.0	
Carbonate	mg/l								1.0	1.0			1.0	0.0	
Chloride	mg/l	500			5.9	29.1	24.2	27.9	25.1	22.8	73.7	75.1	40.9	0.0	0.1
COD	mg/l				118.2	103.2	63.7	41.6	53.1	148.1	64.7	43.3	55.5	0.0	
Cyanide	mg/l	0.004							0.01	0.01	0.01	0.01	0.01	1.0	1.7
Dissolved Oxygen	mg/l	<5									8.6	9.9	10.3	0.0	0.5
Fluoride	mg/l	1.6				0.1	0.2	0.2	0.2	0.2	0.4	0.3	0.3	0.0	0.2
Hardness	mg/l				34.0	124.4	117.8	97.2	126.1	108.2	276.2	273.0	171.4	0.0	
Magnesium	mg/l				2.0	11.7	9.5	7.9	11.8	11.8			15.5	0.0	
MBAS	mg/l						0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	
Oil and Grease	mg/l		2.2	3.0	2.5		7.1	3.5	4.0	5.7	3.8	2.5	2.1	0.0	
pH		6.5/8.5			7.1	7.1	7.4	7.2	7.3	7.2	8.2	7.6	7.0	0.0	
Potassium	mg/l				1.8	3.5	3.5	3.4	3.8	4.5			4.7	0.0	
Sodium	mg/l				5.4	19.3	22.9	20.7	24.5	25.2			34.1	0.0	
Specific Conductance	umhos/cm				113.3	357.0	346.2	342.4	322.0	306.5	786.0	798.6	468.2	0.0	
Sulfate	mg/l	500			8.8	53.4	42.8	38.8	41.2	40.5	106.2	124.1	62.6	0.0	0.1
Total Dissolved Solids	mg/l	2000			69.5	221.6	217.8	206.5	194.5	206.3	511.0	503.2	282.8	0.0	0.1
Total Organic Carbon	mg/l				5.1	8.7	11.8	9.2	9.5	14.6	7.3	6.5	10.7	0.0	
Total Phenols	mg/l								0.1	0.1	0.1	0.1	2.5	0.0	
Total Suspended Solids	mg/l				108.5	264.8	200.7	170.2	164.9	291.7	199.0	63.6	385.4	0.0	
TPH	Mg/l			2.57	2.99	2.69		2.73	2.34	3.19	2.35	1.70	0.37	0.0	
Turbidity	ntu	225			30.0	81.3	91.0	65.7	47.0	62.5	17.9	15.6	23.3	0.0	0.2
Volatile Suspended Solids	mg/l				42.0	76.0	61.5	48.3	46.6	82.8	14.2	26.8	98.8	0.0	
Nutrients															
Ammonia	mg/l				0.23	0.76	0.45	0.63	0.56	0.45			0.84	0.0	
Dissolved Phosphorus	mg/l				0.17	0.31	0.24	0.27	0.20	0.32	0.20	0.19	0.26	0.0	
Kjeldahl-N	mg/l				1.67	2.38	4.48	2.82	2.20	3.94	3.16	1.16	3.84	0.0	
NH3-N	mg/l				0.18	0.63	0.37	0.52	0.47	0.37	0.54	0.26	0.70	0.0	
Nitrate	mg/l				2.14	4.04	3.64	5.23	3.04	2.18	3.66	4.28	1.80	0.0	
Nitrate-N	mg/l	10			0.48	0.91	0.82	1.28	0.70	0.49	0.83	1.01	0.50	0.0	0.1
Nitrite-N	mg/l	1			0.06	0.10	0.18	0.14	0.21	0.16	1.01	0.42	0.24	0.1	0.3
Total Phosphorus	mg/l				0.42	0.34	0.35	0.36	0.24	56.00	0.31	0.21	0.43	0.0	
Indicator Bacteria															
Fecal Coliform	mpn/100ml	400	209,500	3,301,667	73,000	3,103,333	65,293	137,556	2,538,375	277,625	88,753	62,320	20,325	1.0	2245
Enterococcus	mpn/100ml	104	355,283	1,203,333			196,667	168,911	615,000	276,000	118,670	74,216	115,125	1.0	3337
Fecal Streptococcus	mpn/100ml		401,667	1,853,333	291,667	430,000	266,693	348,222	1,000,000	431,000	128,670	108,416	152,625	0.0	
Total Coliform	mpn/100ml	10,000	528,333	4,633,333	2,891,667	3,486,667	441,539	378,889	3,506,375	482,000	187,503	166,220	143,100	1.0	153
Metals															
Dissolved Aluminum	ug/l					1284.3	77.2	119.2	71.2	50.0	50.0	50.0	50.0	0.0	

Table 7-1. Annual Mean Concentration for Constituents Measured at the Ballona Creek Mass Emission Site, 1994 to 2005

Constituent	Units	Lowest WQO[1]	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	Frequency Ratio	Mean Exceedance Ratio[2]
Dissolved Antimony	ug/l								2.5	1.8	1.3	1.6	1.4	0.0	
Dissolved Arsenic	ug/l								2.5	2.0	2.2	2.4	1.8	0.0	
Dissolved Barium	ug/l				8.0	46.9	35.4	38.1	29.5	33.3			34.6	0.0	
Dissolved Berylium	ug/l								0.5	0.5	0.5	0.5	0.5	0.0	
Dissolved Boron	ug/l					164.0	194.3	132.8	133.1	125.6			297.6	0.0	
Dissolved Cadmium	ug/l	1-4.7							0.5	0.5	0.5	0.5	0.5	0.0	0.2
Dissolved Chromium	ug/l	27-150.3			2.8				3.0	1.6	2.7	2.8	2.0	0.0	0.0
Dissolved Chromium +6	ug/l								5.0	5.0	5.0	5.0	5.0	0.0	
Dissolved Copper	ug/l	3.6-21.3			2.3	30.4	9.3	8.8	6.9	9.9	7.1	9.8	7.4	0.3	0.9
Dissolved Iron	ug/l				117.5	1679.9	103.1	246.7	129.0	210.7	113.3	76.0	95.2	0.0	
Dissolved Lead	ug/l	0.8-7.5				19.4			2.5	1.7	2.1	2.2	2.0	0.2	1.4
Dissolved Manganese	ug/l					85.4			50.0	61.3			50.0	0.0	
Dissolved Mercury	ug/l								0.5	0.5	0.5	0.5	0.5	0.0	
Dissolved Nickel	ug/l	20.9-122.9			2.9	11.3			3.6	4.7	5.3	4.3	4.4	0.0	0.1
Dissolved Selenium	ug/l								2.5	2.5	3.3	3.4	2.5	0.0	
Dissolved Silver	ug/l								0.5	0.5	0.5	0.5	0.5	0.0	
Dissolved Thallium	ug/l								2.5	2.5	2.5	2.5	2.5	0.0	
Dissolved Zinc	ug/l	47-277.1			46.3	154.9	50.1		57.0	49.2	30.0	43.8	34.5	0.1	0.5
Total Aluminum	ug/l	1000				2320.0	446.1	341.3	400.8	76.0	73.7	128.0	2984.6	0.3	0.8
Total Antimony	ug/l	6							2.5	1.7	1.4	1.7	2.4	0.0	0.3
Total Arsenic	ug/l	32			1.4				2.5	1.5	2.3	2.5	2.8	0.0	0.1
Total Barium	ug/l				20.5	72.4	47.7	50.8	36.8	36.7			101.3	0.0	
Total Beryllium	ug/l	4							0.5	0.5	0.5	0.5	0.5	0.0	0.1
Total Boron	ug/l					236.6	245.3	176.1	157.0	168.2			781.4	0.0	
Total Cadmium	ug/l	1.1-5.5				0.8			0.5	0.5	0.5	0.5	0.9	0.0	0.2
Total Chromium	ug/l	50			5.8	6.4			3.0	2.4	7.0	5.5	8.0	0.0	0.1
Total Chromium +6	ug/l										5.0	5.0	5.0	0.0	
Total Copper	ug/l	3.7-22.2			12.0	39.3	18.3	16.1	14.8	20.0	12.2	16.4	49.5	0.8	2.0
Total Iron	ug/l				404.0	7564.6	597.2	832.5	797.0	370.0	238.0	188.0	4128.6	0.0	
Total Lead	ug/l	0.8-11.6			8.8	35.1	6.5	4.9	6.1	2.4	2.7	1.9	36.6	0.7	3.4
Total Manganese	ug/l					126.0			57.4	164.4			169.6	0.0	
Total Mercury	ug/l	0.16			19.9				0.5	0.5	0.5	0.5	0.5	1.0	23.3
Total Nickel	ug/l	20.9-123.2			4.0	6.9	6.8	5.7	4.4	5.5	11.2	5.4	10.6	0.0	0.1
Total Selenium	ug/l	60			2.6				2.5	2.5	3.3	3.6	2.5	0.0	0.1
Total Silver	ug/l	2.8							0.5	0.5	0.5	0.5	0.61	0.0	0.2
Total Thallium	ug/l	2							2.5	2.5	2.5	2.5	2.5	1.0	1.3
Total Zinc	ug/l	48-283			80.3	382.1	95.9	73.1	87.0	52.1	49.7	60.1	180.4	0.2	0.9
Pesticides															
Diazinon	ug/l	0.08					0.005		0.005	0.074	0.051	0.030	0.037	0.0	0.4
Prometryn	ug/l										1	1	2.59	0.0	

[1] WQO for metals are hardness dependent and were based on minimum hardness by year.

[2] Mean Exceedance Ratio calculated using annual mean concentrations reported up to four significant figures. Ratio shown may not exactly equal ratio of mean values shown in table due to rounding of presented means.

Blue = WQO Exceedances; Yellow = DL above WQO; Orange = Frequency ratio > 0.5, Mean exceedance > 1.0.

The COCs identified include cyanide, indicator bacteria (total coliform, fecal coliform and enterococcus) and metals (total copper and total and dissolved lead). None of the COCs had concentrations that were shown to have significantly increasing or decreasing trends. However, bicarbonate, potassium, and MBAS were shown to have significantly increasing concentrations, while the concentrations of total petroleum hydrocarbons significantly decreased during the same time period (1996-2004).

Table 7-2 summarizes the constituents of concern based on the mass emission data and compares them to pollutants on the 303(d) list for Ballona Creek. Constituents indicating increasing trends are also shown in Table 7-2. The first column of the table lists constituents of concern as determined from the integrated data set of annual mean values; the second column lists constituents that show an increasing trend even though concentrations may be below water quality objectives; and the third column is presented for comparison purposes and provides constituents that are 303(d) listed. The constituents listed as COCs that are consistent with the 303(d) listing include fecal and total coliform and dissolved lead. The magnitude of the exceedances of the WQOs for the COCs listed in Table 7-2 is graphically shown in Figure 7-2. Figure 7-2 shows that the greatest exceedances are observed for the bacteriological indicators and total lead and copper.

Table 7-2. COCs, Increasing Trends and Comparison to 303(d) List for Ballona Creek

Constituent	Constituents of Concern Based on Mass Emission Data Frequency/Magnitude	Constituents Indicating Increasing Trend	Constituents on the 303(d) List
Cyanide	X		
Enterococcus	X		
Fecal Coliform	X		X
Total Coliform	X		X
Total Copper	X		
Total Lead	X		
Total Selenium			X
Dissolved Copper			X
Dissolved Lead	X		X
Dissolved Zinc			X
MBAS		X	
Potassium		X	
Bicarbonate		X	

These results represent water quality conditions at the base of the watershed above the tidal prism. Based on these results, freshwater inputs from Ballona Creek would be expected to contain, on average, concentrations of bacteriological indicators and several total and dissolved metals (copper, lead, and zinc) that exceed the water quality objectives. Discussion of potential long-term impacts to wetland habitat that would receive these waters is presented later in this section.

In addition to wet and dry weather sampling at the mass emission site, LADPW has conducted tributary sampling in 2004-2005 at the locations shown on Figure 7-1 (sites identified as TS-07 to TS-12). The results of this sampling are presented on Figure 7-3 for each sampling event and whether the concentration detected in the stormwater samples exceeded the WQO. The results from the Ballona Creek mass emission site are also presented for comparison. Boxes that are colored under each sampling event indicate an exceedance of the WQOs at that designated tributary or mass emission sampling site for the constituent listed. The results in Figure 7-3 indicate that bacteriological indicators, total copper, and total lead exceeded WQOs at the mass emission site on nearly every monitoring date and those exceedances coincided at many, if not all tributaries. Total zinc and cyanide had exceedances at the mass emission site for two events with corresponding exceedances in many of the tributary stations. Other constituents had less of a connection between water quality exceedances at the mass emission site and exceedances at the tributary stations.

No one or set of tributaries appear to be a primary source of bacterial indicator exceedances based on concentration. Based on concentration, Sepulveda Creek (TS08) and the further upstream tributaries (see Figure 7-1) appear to exhibit greater exceedances of the WQO for the selected metals. These results are consistent with the findings of the dry weather characterization study of Ballona Creek conducted by the Southern California Coastal Water Research Project. The results of this study also indicated that the distribution of higher metals and elevated bacteria concentrations for the dry weather flows was ‘bimodal’ (Southern California Coastal Water Research Project, 2004). The highest concentrations were detected between kilometers 3 and 6, immediately upstream of the tidal portion of Ballona Creek, and between kilometers 9 and 12, below the portion of the watershed where Ballona Creek daylights from an underground storm drain to an exposed channel.

Shoreline monitoring for bacteriological indicators was conducted between 2001 and 2004 along the Santa Monica Bay shoreline within the Ballona Creek watershed. The locations of the shoreline sampling points are shown on Figure 7-1. The results reported from the shoreline monitoring indicated exceedances of bacteria standards of at least one indicator bacteria at all stations during dry or wet weather in all three sampling seasons, with more exceedances occurring during wet weather. These exceedances correspond with the bacteria exceedances that occurred at the mass emission site and the tributary stations within the Ballona Creek watershed.

In addition to the results reported by LADPW for Ballona Creek, additional metals data are presented in the Total Maximum Daily Load (TMDL) report for metals in Ballona Creek (U.S. EPA, Region IX, 2004). Additional data was collected by the City of Los Angeles from April 2001 through May 2003 and by the Southern California Coastal Water Research Project (SCCWRP) in May, July, and September 2003.

The City sampled four locations along Ballona Creek during dry weather, at National Boulevard, Overland Avenue, Centinella Boulevard, and Pacific Avenue. The data from National Boulevard and Overland Avenue are representative of Ballona Creek and were compared to freshwater criteria based on CTR values. Data from Centinella Boulevard and Pacific Avenue are representative of the tidal sections of Ballona Creek and were compared to salt water criteria.

In Ballona Creek, between 44 and 48 samples were analyzed for cadmium, copper, lead, total selenium, silver, and zinc. The acute criteria were exceeded for copper four times, for silver one time, and for zinc two times. The chronic criteria were exceeded for copper and lead seven times and for zinc two times. The detection limits for lead and selenium were, in many cases, above the chronic criteria.

In the tidal section of Ballona Creek, 48 samples were analyzed for cadmium, copper, lead, silver, and zinc. Selenium was analyzed in 44 samples. The acute criteria were exceeded 10 times for copper and twice for zinc. The chronic criteria were also exceeded 10 times for copper and twice for zinc, as well as seven times for lead. Detection limits for copper were, in many cases, above both the acute and chronic criteria. The detection limits for lead were above the salt water chronic criterion as they were for freshwater criterion. The detection limit for silver was higher than the acute criterion.

SCCWRP sampled 12 sites within Ballona Creek and 35-40 storm drain discharges (depending on whether the drain was flowing during sampling events) during dry weather. Three of the Ballona Creek sites were representative of the tidal section, while the remaining nine were representative of Ballona Creek above the tidal limit. In the tidal section, copper exceeded both the acute and chronic criteria in five samples, while lead exceeded the chronic criterion five times. The reporting limits were higher than the chronic criteria for lead, copper, and selenium and higher then the acute criteria for copper and silver. In all, 27 samples were analyzed for cadmium, copper, lead, selenium, and zinc, and 18 for silver at the tidal sites.

Other water quality data include the results of the State's Surface Water Ambient Monitoring Program (SWAMP), which included sampling at four stations in Ballona Creek, conducted in 2003 (LARWCQB, 2003). The results reported for the metals analysis at the sampling stations at the confluence with Centinella Creek indicated generally lower concentrations than detected in the tributary sampling in Centinella Creek by LADPW as summarized above. Concentrations reported for total phosphorus, nitrate as N, and sulfate at the four sample locations (Centinella Creek, Sepulveda Channel, Sawtelle Creek and middle of Ballona Creek) were all below the WQO.

7.1.2 Bioassessment

Stream bioassessment monitoring in Ballona Creek was conducted in October 2003 and October 2004 to assess biological integrity and to detect biological trends and responses to pollution in receiving waters within the watershed. The location of the bioassessment monitoring site is shown in Figure 7-1. The Ballona Creek site was located in an urbanized portion of the watershed. The benthic macroinvertebrate community had CFG Southern California Index of Biotic Integrity scores of six and 10, and quality ratings of Very Poor for both years. As summarized above, total copper and total and dissolved lead consistently exceeded water quality objectives in the stormwater samples collected at the mass emission site and many of the tributary locations. High concentrations of heavy metals are known to negatively impact macroinvertebrate communities (e.g. Winner et al., 1980). Bacteria levels were consistently well above the WQO, and while bacteria alone likely did not directly impact the benthic community, high densities generally indicate other water quality issues such as elevated fine organic matter or nutrients that could degrade the system. Two pesticides were detected in stormwater samples, diazinon and prometryn, and these would likely have a deleterious effect on the macroinvertebrate community.

7.1.3 Water Column Toxicity

Water column toxicity monitoring has been conducted for wet weather stormwater samples collected at the mass emission site in Ballona Creek for two storm events in 2004. The results of the toxicity testing on this sample indicated that stormwater did not affect cladoceran survival or reproduction. However, the toxicity results also indicated that sea urchin reproduction was inhibited. Toxicity monitoring performed prior to the 2004-2005 season also determined that some stormwater samples collected from Ballona Creek inhibited sea urchin fertilization. The Study of the Impact of Storm Water Discharge on the Beneficial Uses of Santa Monica Bay found that sea urchin fertilization was significantly reduced by exposure to undiluted wet weather stormwater samples collected from Ballona Creek in 1995-1996, 1996-1997, and 1997-1998. Stormwater from the season's first storm demonstrated the greatest toxicity response. Dry season samples from 2002-2003 and 2003-2004 did not indicate toxicity effects, but wet season stormwater samples significantly inhibited sea urchin fertilization. Toxicity Identification Evaluations (TIEs) determined the toxicity in 2002-2003 stormwater was due to particulate-bound toxicants, one or more non-polar organic compounds and cationic metals. In 2003-2004 the toxic pollutant in stormwater was believed to be a volatile compound.

7.2 BASELINE SEDIMENT QUALITY IN THE TIDAL SECTION OF BALLONA CREEK

Sediment quality data for the tidal section of Ballona Creek was collected during the 2003 Southern California Bight Regional Monitoring Program. The tidal section of Ballona Creek was monitored to estimate the extent and magnitude of ecological change in the Southern California Bight and to determine the mass balance of pollutants that currently reside within the area. Sediments from five stations within the tidal section of Ballona Creek were analyzed for chemistry, toxicity, and benthic macroinvertebrate diversity. The locations of these monitoring stations are shown in Figure 7-4. As shown on Figure 7-4, the locations are within Ballona Creek and adjacent to the project area. Although no sediment samples were collected within the existing tidal marsh, these samples provide an indication of potential long-term sediment quality of the marsh if the primary inputs are from Ballona Creek. Concentrations of constituents in the samples would, however, be expected to be greater in the tidal section of Ballona Creek compared to the tidal marsh in Area B due to greater overall loading from the watershed. Flow into the existing tidal marsh (Area B) is restricted by tide-gates, but not eliminated. Furthermore, waters from Ballona Creek that flow into Area B are from the tidally influenced portion of the creek where mixing of the freshwater creek flows with the salt water of Santa Monica Bay occurs.

The results from these sampling events are presented in Table 7-3. Data is also summarized from results reported in the TMDL for Toxic Pollutants in the tidal section of Ballona Creek from sampling and analysis conducted by the Contaminated Sediments Task Force (CRWQCB, 2005). In the CRWQCB study, sediment chemistry data from samples collected from Southern California estuaries were compared to the Effect Range-Low (ER-L) and Effect Range-Median (ER-M) values to evaluate the potential for sediment to cause adverse biological effects (Long et al., 1995). The guidelines were intended to provide informal (non-regulatory) effects-based benchmarks of sediment chemistry data (Long et al., 1998). In addition, for each tidal ER-M, values were used to calculate a mean ER-M quotient (ERM-Q). The concentration of each constituent was divided by its ER-M to produce a quotient, or proportion of the ER-M equivalent to the magnitude by which the ER-M value is exceeded or not exceeded. The mean ERM-Q for each estuary was then calculated by summing the ERM-Qs for each constituent and then dividing by the total number of ERM-Qs assessed. ERM-Qs were not calculated for constituents below the detection limit and thus were not used in the generation of the mean ERM-Q. The mean ERM-Q thus represents an assessment for each estuary of the cumulative sediment chemistry relative to the threshold values. In this way, the cumulative risks of effect to the benthic community can provide a mechanism to compare estuaries. This method has been used and evaluated by several researchers (Hyland et al., 1999; Carr et al., 1996; Chapman, 1996; and Long et al., 1995) throughout the country.

The aggregate approach using an ERM-Q is a more reliable predictor of potential toxicity but should not be used to infer causality of specific contaminants. ER-L and ER-M values were originally derived to be broadly applicable and they cannot account for site-specific features that may affect their applicability on a more local or regional level. Local differences in geomorphology can result in chemicals being more or less available and therefore more or less toxic than an ER-L or ER-M value might indicate. Additionally, some regions of the country are naturally enriched in certain metals and local organisms have become adapted.

Table 7-3. Analytical Results for Constituents Analyzed in the Tidal Section of Ballona Creek

Constituent	Units	ER-L*	ER-M*	Station ID				
				4053	4213	5735	5767	5787
Toxicity								
Mean *Eohaustorius* Survival	%			0	59	27	19	90
Infauna Community Indices								
Number of species	#/0.1 m^2			37	12	45	53	85
Total abundance	#/0.1 m^2			16,836	5767	1628	1800	3809
Shannon-Wiener diversity				1.31	1.09	2.57	2.52	2.23
Evenness				0.36	0.44	0.67	0.63	0.50
Dominance				2	2	6	5	4
Sediment Size and TOC								
Gravel	%			55.00	55.70	0.21	0.29	0.68
Sand	%			35.62	42.34	48.53	57.80	79.65
Silt	%			8.62	1.80	48.76	39.84	18.97
Clay	%			0.84	0.16	2.50	2.07	0.70
Median size	microns			2222.89	2187.01	58.30	125.47	710.87
Mean size	microns			1759.90	2093.95	115.75	133.83	221.73
TOC	%			4.946	0.497	0.669	1.196	0.352
Metals	mg/kg							
Arsenic	mg/kg	8.2	70	4.01	2.37	3.54	7.52	2.97
Cadmium	mg/kg	1.2	9.6	0.84	0.13	0.83	0.96	0.31
Chromium	mg/kg	81	370	21.9	19.5	21.1	19.3	10.6
Copper	mg/kg	34	270	**36.4**	11.5	32.9	33.4	10.6
Lead	mg/kg	46.7	220	41.0	12.7	**111.0**	**59.3**	35.5
Mercury	mg/kg	0.15	0.71	0.11	0.03	0.05	0.08	0.03
Nickel	mg/kg	20.9	51.6	13.1	9.7	13.3	12.5	7.6
Silver	mg/kg	1	3.7	0.86	0.44	0.66	0.87	0.36
Zinc	mg/kg	150	410	**202.0**	73.5	**186.0**	**165.0**	107.0
Pesticides								
Total detectable DDT	µg/kg	1.58	46.l	**17.3**	1.4	**5.4**	**9.7**	0.0
Total detectable chlordane	µg/kg	0.6	6	21.6	1.3	0	0	0
PAHs								
Total detectable PAHs	µg/kg	4022	44,800	1929	69	182	488	408
PCBs								
Total detectable PCBs	µg/kg	22.7	180	0.0	0.0	8.0	0.0	0.0
Mean ER-M quotient				**0.44**	0.08	**0.15**	**0.14**	0.07

* Effects Range-Low and Effects Range-Median (Long et al., 1995)
Chemistry results in **bold** = exceeds ER-L
Chemistry results in **bold** = exceeds ER-M
Toxicity in **bold** = identified as moderately toxic (Bight 03 draft report, SCCWRP, 2004)
Toxicity in **bold** = identified as highly toxic (Bight 03 draft report, SCCWRP, 2004)
Mean ERM-Q in **bold** = above 0.10 threshold (Long et al., 1998)
NR = not reported
J = Estimated value above MDL and below RL

7.2.1 Sediment Chemistry

Sediments were analyzed for four groups of constituents: metals, pesticides, PAHs and PCBs (CRWQCB, 2005). Three metals, including copper, lead, and zinc, exceeded the ER-L at some of the stations within the tidal section of Ballona Creek. Copper exceeded the ER-L at one station, 4053, with a value of 36.4 mg/kg. Lead exceeded the ER-L at two stations, 5735 and 5767, with values of 111 and 59.3 mg/kg, respectively. Zinc exceeded the ER-L at three of the five stations with values ranging from 165 to 202 mg/kg. There were detections of all other metals at all stations; however, concentrations were below the ER-L and ER-M values.

The only pesticides with concentrations above ER-L and ER-M values were total detectable DDT and total detectable chlordane. Total detectable DDT exceeded the ER-L at three stations, with values ranging from 5.4 to 17.3 µg/kg. Total detectable DDT was below the ER-L value at station 4213 and was not detected at station 5787. Total detectable chlordane exceeded the ER-L at one station, 4213, with a value of 1.3 µg/kg and exceeded the ER-M at station 4053 with a value of 21.6 µg/kg. Total detectable chlordane was not detected at the other three stations.

Total detectable PAHs were below the ER-L values at all five stations monitored in the tidal section of Ballona Creek. Total detectable PCBs were only detected at station 5735 but were below the ER-L.

ERM-Q values were above the threshold of 0.10 at three out of the five stations monitored in the tidal section of Ballona Creek. Stations 4053, 5735 and 5767 had mean ERM-Q values above the 0.10 threshold, with values of 0.44, 0.15 and 0.14, respectively. The other two stations had mean ERM-Q values below 0.10, with values of 0.07 and 0.08.

Three of the stations displayed similar patterns of exceedances in the tidal section of Ballona Creek. Stations 4053, 5735, and 5767, the stations in the middle of the tidal section, had the most number of exceedances and all had mean ERM-Q values above the 0.10 threshold. The sediments at these stations were also identified as highly toxic to the test organisms (see below). The station located at the downstream end of the tidal section, 5787, did not have any exceedances, and had the lowest ERM-Q value and the highest percent survival rate of *Eohaustorius estuarius.*

In addition to the sediment quality data for the tidal section of Ballona Creek provided during the 2003 Bight program, additional metals data is presented in the draft Total Maximum Daily Load report for Toxic Pollutants in Ballona Creek (CRWQCB and U.S. EPA, Region IX, 2005). The TMDL report reviewed data compiled through the Contaminated Sediments Task Force (CSTF) in order to assess impacts to sediments.

The CSTF data was compared to ER-L and ER-M values for metals, pesticides, PCBs, and PAHs. More constituents were found to exceed ER-Ls and ER-Ms in the CSTF data then were found during Bight 2003 sampling, and previous exceedances were generally larger in magnitude.

Copper, lead, and zinc were found to be in exceedance in both 2003 and in the CSTF data. In addition to these three metals, cadmium and silver were also found to exceed ER-Ls in CSTF data. While no metals were found to exceed ER-Ms in 2003, both lead and zinc exceeded this upper limit in the earlier CSTF data.

DDTs and chlordane were both found to frequently exceed ER-Ms in the CSTF data, while chlordane exceeded this level only once in 2003 and DDT not at all. In comparison, chlordane was found to exceed the ER-M in 20 out of 20 samples compiled by the CSTF. Both DDTs and chlordane exceeded ER-Ls in 100% of CSTF sample data. CSTF data also included dieldrin results, which exceeded ER-Ls in 100% of the sample data.

PCBs exceeded the ER-L in 20 samples and exceeded the ER-M in 10 samples, both out of 28 total samples in the CSTF database. Only one sample analyzed in 2003 detected PCBs, and that value was below the ER-L.

PAHs were detected in eight out of eight samples in the CSTF database, with one sample exceeding the ER-L. Although PAHs were detected in all of the 2003 data, none exceeded limits.

7.2.2 Sediment Toxicity

The mean percent survival of the test organism, *E. estuarius,* exposed to Ballona Creek tidal sediments ranged from zero to 90%. Percent survival was the lowest at stations 4053, 5735, and 5767, with values of 0%, 27% and 19%, respectively. These values suggest that the sediments in these areas are toxic to the test organisms (Bight 2003 draft report, SCCWRP, 2004). The mean percent survival of *E. estuarius* at station 4213 was 59%, suggesting that the sediments in this area were moderately toxic to the test organisms. Station 5787 had a mean percent survival of 90%, which suggests that the sediments in this area were not toxic.

7.2.3 Benthic Community Structure

Total abundance ranged from 1,628 organisms/0.1m^2 at station 5735 to 16,836 organisms/0.1m^2 at station 4053. The total number of species ranged from 12 at station 4213 to 85 organisms/0.1m^2 at station 5787. Species diversity was highest at station 5735 with a value of 2.57 and lowest at station 4213 with a value of 1.09. Evenness values ranged from 0.36 at station 4053 to 0.67 at station 5735. Dominance values ranged from two to six.

7.2.4 Sediment Particle Size

Sand, gravel, and silt were the dominant sediment constituents at the stations monitored in the tidal section of Ballona Creek. Sand dominated the sediment composition at two stations, 5767 and 5787, followed by silt. Gravel was the dominant sediment constituent at stations 4053 and 4213 followed by sand; silt was the dominant constituent at station 5735, followed by sand. Median particle size ranged from 58.3 to 2222.9 microns. TOC content ranged from 0.35 to 4.95%. Station 4053 had the largest median particle size and the highest TOC content.

7.3 WATER AND SEDIMENT QUALITY DATA FOR THE EXISTING TIDAL MARSH

Water quality data from within the existing tidal marsh in Area B is limited. The City of Los Angeles Department of Public Works, Bureau of Sanitation collects field measurements of general water quality parameters that include salinity, dissolved oxygen, temperature, pH, and turbidity. Loyola Marymount University (LMU) is also conducting water quality measurements in the tidal marsh for salinity and bacteria (J. Dorsey, LMU). These measurements provide for comparison of general water chemistry, but not on potential impacts from inflows from Ballona Creek or urban runoff. Evaluation of the accumulation and potential impacts of constituents identified as COCs in Ballona Creek freshwater samples above the tidal prism or in water and sediments within the tidal section of Ballona Creek cannot be performed with the currently limited data set.

The research of existing available data did not identify any analytical results from water or sediment sampling within the existing tidal marsh in Area B. No chemical analytical data was identified for sediment samples in Areas A and C. Although the existing tidal marsh areas have been subject to tidal flows from Ballona Creek, these inflows have been restricted. Furthermore, the tidal marsh is not subject to the total flows and loadings from the Ballona Creek watershed, but restricted input from the tidal section and stormwater from drainage areas surrounding the marsh. Available results from tidal samples indicate exceedances of salt water criteria for several metals, including copper and lead.

Although sediment quality results are available from the tidal section of Ballona Creek, a direct correlation to the current sediment characteristics in the existing tidal marsh cannot be made due to the significant difference in long-term loading history of these sediments. The sediments within the tidal section of Ballona Creek have been subject to the total flows and loadings from the Ballona Creek watershed, compared to restricted flows and subsequent loadings into the tidal marsh.

7.4 WATER AND SEDIMENT QUALITY OF THE FRESHWATER MARSH

In order to comply with a series of permits from various agencies, annual monitoring is conducted during the wet and dry seasons at various locations throughout the Freshwater Marsh. The following sections summarizes the results of this monitoring program as they are presented for the Freshwater Marsh in the Playa Wetland Annual Report of Monitoring, Operation, and Maintenance, Year 2 (Center for Natural Lands Management and Geosyntec Consultants, 2005). The monitoring program within the Freshwater Marsh includes the following analyses:

- Field Parameters (DO, turbidity, pH, temperature, conductivity)
- Wet Chemistry (nutrients, bacteria, metals, pesticides, organics, SSC, hardness, salinity)
- Toxicity (acute and chronic for water flea and minnow)
- Sediments (metals, pesticides, organics, nutrients)

7.4.1 Field Parameters

The ranges of field parameters in the Freshwater Marsh are generally similar to those that would be expected in a natural wetland system. A summary of this data is provided below:

- *Dissolved Oxygen*: Dissolved oxygen (DO) concentrations at the Freshwater Marsh inlets range from 3.9 mgl^{-1} to 13.1 mgl^{-1}, with an average of approximately 6.7 mgl^{-1}. Outlet DO concentrations range from 3.7 to 13.5 mgl^{-1}, with an average concentration of 8.3 mgl^{-1} during the summer months.
- *Temperature*: Water temperatures in the Freshwater Marsh range from approximately 55 degrees Fahrenheit during the winter to 72 degrees Fahrenheit during the summer months.
- *Conductivity*: Specific conductance at the Freshwater Marsh showed a high degree of variability, with values ranging from 330 to 2,120 umhos/cm at the inlets and 462 to 2,239 umhos/cm at the outlet. This range was thought to be due to the tide-gates malfunctioning from debris.
- *pH*: pH in the Freshwater Marsh varied within the small range of 7.4 to 9.3, with an average of 7.8.
- *Turbidity*: Turbidity levels at the inlets ranged from 3.27 to 36.5 NTU with an average of greater than 10 NTU (nephelometric turbidity unit). The outlet levels were consistently lower, ranging from 0.74 to 5.67 NTU, with an average below five NTU.

7.4.2 Bacteria

There were no evident trends in bacterial concentrations within the Freshwater Marsh, although concentrations tended to be higher in wet weather samples than dry weather samples. The majority of the dry weather samples were above the Rec-1 criteria for fecal coliform during the 2003-2004 monitoring year. This is likely to be due to the presence of waterfowl within the marsh. Inlet bacteria concentrations range from 95 MPN/100 ml to >1600 MPN/100 ml, while outlet concentrations ranged from 4.1 MPN/100 ml to >1600 MPN/100 ml.

7.4.3 Toxicity

Acute and chronic toxicity sampling was conducted for *Pimephales promelas* (fathead minnow) and *Ceriodaphnia dubia* (water flea). All of the samples collected, except one during 2003-2004, had 100% survival of both species for acute and chronic testing. The exception to this was one inlet sample which had a 95% survival rate in the fathead minnow acute toxicity test. It was reported that this result was not statistically different from the tests where survival was 100%. Furthermore, the results of the chronic test showed 100% survival.

7.4.4 Metals

The majority of samples collected were below the method detection limit for metals. Those samples that did contain detectable concentrations were consistently less than the acute and chronic freshwater toxicity values for cadmium, copper, lead, and zinc. The ranges of concentrations for the detected metals are summarized in Table 7-4.

Table 7-4. Freshwater Marsh Metal Concentration Ranges

Metal	Form	Inlet Range (µg/l)	Outlet Range (µg/l)
Arsenic	Total	4 – 10	4.2 - 10
	Dissolved	4 – 10	4 – 9.1
Cadmium	Total	0.2U – 0.8	0.2U – 0.6
	Dissolved	0.2U – 0.6	0.2U – 0.2
Copper	Total	1.5 - 17	0.5U – 3.8
	Dissolved	1.4 -5.9	1.2 – 3.5
Nickel	Total	1.8 – 6.8	2 – 5.4
	Dissolved	1.8 – 6.4	1.9 – 4.9
Lead	Total	0.2U – 3.8	0.2U – 3.3
	Dissolved	0.2U – 1.3	0.2U – 0.9
Zinc	Total	2 - 65	1.7 - 25
	Dissolved	2 - 30	1.2 - 11

7.4.5 PAH, VOC, Pesticides, and Hydrocarbons

None of the samples collected had detectable levels of PAH, VOCs, PAHs, or PCBs.

7.4.6 Nutrients

Phosphorus concentrations measured within the Freshwater Marsh were generally low, less than 0.2 mgl^{-1}, which is typical of natural wetlands. Dissolved phosphorus concentrations at the inlets ranged from non-detect to 0.83 mgl^{-1} and the outlet ranged from non-detect to 0.25 mgl^{-1}. Total phosphorus concentrations ranged from 0.02 to 0.64 mgl^{-1} at the inlets and from 0.02 to 0.63 mgl^{-1} at the outlet.

Ammonia, nitrate, TKN, and nitrite were all measured in the Freshwater Marsh. Nitrite was below the method detection limit in all samples. Ammonia, nitrogen and TKN were well within the ranges typically reported for natural wetlands (0.4 to 1.7 mgl^{-1}; Kadlec and Knight, 1996). Nitrite levels were generally below the detection limits with a few exceptions in the winter months. Nitrate concentrations at the inlets ranged from non-detect to 0.47 mgl^{-1}, while nitrate concentrations at the outlet ranged from non-detect to 0.49 mgl^{-1}.

7.4.7 Particulates

The Freshwater Marsh was designed to reduce particulate concentrations from upstream runoff areas. The concentration in samples collected at the marsh outlet are less than the concentrations at the inlet. Inlet SSCs range from non-detect to 39 mgl^{-1}, while outlet concentrations ranged from non-detect to 15 mgl^{-1}.

7.4.8 Sediment Quality

With respect to metals, there were no spatial patterns observed in concentrations throughout the Freshwater Marsh. The metals concentrations in outlet sediments were consistently below the SQuiRT PEL values during all years sampled. The ranges of concentrations for the metals typically of most concern are listed in Table 7-5.

Table 7-5. Freshwater Marsh Sediment Metal Concentration Ranges

Metal	Inlet Range (mg/kg)	Outlet Range (mg/kg)
Arsenic	2.2 – 4.9	1.3 – 9.3
Cadmium	0.3 – 0.8	1.7 – 2.0
Copper	15 - 25	18 – 28
Nickel	8.2 - 17	12 – 19
Lead	5.1 - 34	5.7 – 7.4
Zinc	37 - 350	32 – 52

No pesticides, PCBs, or VOCs were detected in any of the sediment samples. There were some PAHs detected at the inlets, but concentrations were below NOAA probably effect levels.

7.5 LOCAL URBAN RUNOFF WATER QUALITY

Results of sampling and analysis of local urban runoff inputs are limited to characterization of runoff into the Freshwater Marsh as summarized above. Similar characteristics can be expected from runoff entering the tidal marsh from surrounding urbanized areas. Results of the analysis of stormwater samples entering the Freshwater Marsh from Jefferson Boulevard indicate the presence of constituents common to urban runoff, including metals, bacteriological indicators, and nutrients. The concentrations of these constituents compared to the WQO were reported to be below these criteria. Dissolved lead concentrations in the inlets were slightly below the chronic CTR. Stormwater entering the Freshwater Marsh from other areas that drain into the marsh should be characterized to determine potential impacts and monitored as part of the operation monitoring and maintenance program.

7.6 WATER QUALITY OF MARINA DEL REY AND SANTA MONICA BAY

Water and sediment quality, benthic infauna and fish surveys were conducted from 1994-2004 by the Aquatic Bioassay and Consulting Laboratories for the County of Los Angeles Department of Beaches and Harbors (LACDBH). The results of the 2003-2004 monitoring year and a comparison to historical data are presented in The Marine Environment of Marina Del Rey Harbor 2003-2004 (Aquatic Bioassay and Consulting Laboratories, 2004). The following discussion summarizes the findings of this report.

7.6.1 Water Quality

Water quality monitoring was conducted monthly at 19 stations within Marina Del Rey during 2003-2004. The locations of these monitoring stations are shown in Figure 7-5. The water quality parameters measured in the monitoring program include temperature, salinity, dissolved oxygen, pH, ammonia, biological oxygen demand, light transmittance, surface transparency, water color, total coliforms, fecal coliforms and enterococcus. Constituents with the most water quality objective exceedances include total coliforms, fecal coliforms and enterococcus. Indicator bacteria densities were compared to REC-1 criteria which are summarized in Table 7-6.

Table 7-6. REC-1 Bacteriological Standards

	30-Day Limit[1]	Single Sample Limit
Total Coliform	1,000 MPN/ 100 ml[2]	10,000 MPN/100 ml
Fecal Coliform	*200 MPN/ 100 ml*	400 MPN/ 100 ml
Enterococcus	35 MPN/ 100 ml	104 MPN/ 100 ml

1 = 30 day limit is based on the geometric mean of at least five weekly samples

2 = MPN is Most Probable Number

In general, the majority of bacterial exceedances occurred in Oxford Lagoon, the back-basins of Marina Del Rey and at Ballona Creek. There were 22 total coliform exceedances out of 228 measurements collected during 2003-2004. The majority of total coliform exceedances occurred in Oxford Lagoon (Stations 13 and 22) with a total of 13 exceedances. Exceedances were also observed in Basin E (Stations 10 and 20), at the Marina entrance (Station 1), at Ballona Creek (Station 12), and in Basin H (Station 7). Stations 10, 20, 1 and 12 each exceeded criteria two times during 2003-2004, while Station 7 exceeded once during the monitoring year. The number of exceedances in 2003-2004 were intermediate compared to previous years data. The least number of exceedances occurred in 1994-1995 with a total of 5, while the most exceedances occurred in 2001-2002 with a total of 35.

There were a total of 29 fecal coliform exceedances out of 228 measurements collected during 2003-2004. The majority of fecal coliform exceedances occurred in Oxford Lagoon (Stations 13 and 22), Basin E (Stations 10 and 20) and in Ballona Creek (Station 12). There were nine exceedances in Oxford Lagoon, seven exceedances in Basin E and five exceedances at Station 12 in Ballona Creek during 2003-2004. Exceedances were also observed in Basin D (Stations 18 and 19) with four exceedances and in Basin H (Station 7) with two exceedances. One exceedance during 2003-2004 was observed in Basin B (Station 6) and at Station 4 in the mid-channel. The number of exceedances in 2003-2004 was among the lowest compared to previous years data. The least number of exceedances occurred in 2000-2001 with 17, while the most exceedances occurred in 2001-2002 with 63.

There were a total of 21 enterococcus exceedances out of 228 measurements collected during 2003-2004. The majority of enterococcus exceedances occurred in Oxford Lagoon with eight exceedances and in Basin E (Stations 10, 11 and 20) with six exceedances. Exceedances were also observed in Basin D at Station 19 and in Ballona Creek at Station 12, each with two exceedances. One exceedance during 2003-2004 was observed in Basin F (Station 9), in the mid-channel (Station 25), and at the Ballona Creek mouth (Station 1). The number of exceedances in 2003-2004 was intermediate compared to previous year's data. The least number of exceedances occurred in 1994-1995 with two, while the most exceedances occurred in 2001-2002 with 44.

All other water quality constituents have generally remained within the average seasonal ranges during most sampling events throughout the monitoring period. However, decreased water quality has been observed in the back-basins of Marina Del Rey and in Oxford Lagoon (which drains into Basin E), including the highest temperature, pH, ammonia, and BOD values, and the lowest dissolved oxygen, light transmittance, and surface transparency levels. Oxford Lagoon and the back-basins of Marina Del Rey, especially Basins E and F, experience less circulation than the Marina entrance and the mid-channel. In addition, Basin F is located near the public boat launch where there is increased boat emissions and washing which may have contributed to the decreased water quality.

In general, the water quality in Marina Del Rey appears to be largely influenced by location. Stations located in Oxford Lagoon and Basin E, located farthest away from the Marina entrance, and Ballona Creek appear to have lower water quality and a greater number of bacteria exceedances compared to the stations located in the basins closer to the Marina entrance and in the mid-channel. Oxford Lagoon and Basin E receive less tidal mixing and circulation which most likely contributes to the degraded water quality, while stations in the main channel and in basins closer to the Marina entrance have displayed water quality measurements most similar to open ocean conditions. The majority of bacterial exceedances appear to be attributable to Ballona Creek or Oxford Lagoon drainages (Aquatic Bioassay and Consulting Laboratories, 2004). Sample results indicate that flows from Oxford Lagoon may directly impact Basin E and the other basins located at the upper end of Marina Del Rey, while flows from Ballona Creek may impact the Marina entrance and the main channel. With regard to potential inflows to the future restoration areas, the water quality in the main channel entrance that is adjacent to Area A (sampling stations 4 and 25) is significantly better with regard to bacteriological indicators, compared to the tidal section of Ballona Creek (sample Station 12). Furthermore, Basin H possesses lower water quality than the entrance channel adjacent to Area A, but higher than the tidal section of Ballona Creek (Station 12).

7.6.2 Sediment Quality

Sediment quality monitoring was conducted monthly at 15 stations within Marina Del Rey during 2003-2004. The locations of these monitoring stations are shown on Figure 7-5. The sediment quality parameters measured in the monitoring program include heavy metals, chlorinated pesticides and polychlorinated biphenyls (PCB's), undifferentiated organics, and minerals/other compounds. Sediment chemistry data was compared to the ER-L, ER-M and Apparent Effects Threshold (AET) (concentrations above which statistically significant biological effects always occur and are expected), and are presented in Table 7-7.

Table 7-7. Sediment Quality Thresholds

Constituent	ER-L	ER-M	AET
Metals			
Arsenic	8.2	70	50
Cadmium	1.2	9.6	5
Chromium	81	370	-
Copper	34	270	300
Lead	46.7	218	300
Mercury	0.15	0.71	1
Nickel	20.9	51.6	-
Silver	1	3.7	1.7
Zinc	150	410	260
Hydrocarbons			
p,p'DDD	2	20	10
p,p'DDE	2.2	27	7.5
p,p'DDT	1	7	6
Total DDT	1.58	180	-
Chlordane	0.5	6	2
Dieldrin	0.02	8	-
PCB's	22.7	180	370

In general, the majority of heavy metal concentrations were greater in the tidal section of Ballona Creek and the mid-channel and back-basins of Marina Del Rey compared to samples located near the Marina entrance during 2003-2004. Stations 5, 6, 9, 10, 11, and 25, which are located in either the mid-channel or back-basins, each had six metals that exceeded ER-L values. The ER-L threshold represents concentrations below which adverse biological effects are rarely observed, and is therefore a conservative criterion. Station 25 is located adjacent to Area A. Of the four stations located at or near the Marina entrance, only one metal exceeded the ER-L threshold at Stations 1 and 2. At Station 12, located in the tidal section of Ballona Creek, there were four ER-L (cadmium, copper, mercury, and lead) and one ER-M (zinc) exceedances. These findings are similar to historical data collected since 1997, in which metal concentrations were generally lowest at the Marina entrance and consistently higher in the mid-channel and back-basins of the Marina.

The highest concentrations of DDT's measured in 2003-2004 were in back-Basin F, in mid-channel and at the Marina entrance. There were a total of 19 DDT exceedances out of 22 measurements which occurred either in the back-basins, in mid-channel or the Marina entrance. Total PCB's exceeded the ER-M threshold only at Station 22 in Oxford Lagoon. These findings are similar to historical data collected since 1997, in which DDT and PCB concentrations were generally higher in the back-basins and Oxford Lagoon. Total DDT exceeded the ER-L in the sediment sample collected in the tidal section of Ballona Creek (Station 12). PCBs were below detection limits in the tidal section of Ballona Creek sample and the two stations adjacent to Area A.

Similar to heavy metals, DDT's, and PCB's, concentrations for the majority of undifferentiated organics were highest in the mid-channel and back-basins. These findings are comparable to historical data.

Similar to water quality, sediment quality also appears to be related to location within Marina Del Rey. The major sources of contamination appear to be Oxford Lagoon and Ballona Creek (Aquatic Bioassay and Consulting Laboratories, 2004). Since there is less tidal flushing in the back-basins and Oxford Lagoon, contaminants are able to settle out and persist in the sediments.

Sediment samples were also analyzed for benthic infauna composition. The Marina entrance and mid-channel had the highest species abundance, number of species and diversity, while the back-basins had generally lower abundances, number of species and diversity. These findings are similar to historical data collected since 1997.

The results of the sediment sampling and analysis in Marina Del Rey that included the tidal section of Ballona Creek, confirms previously summarized results that indicate exceedances of sediment quality criteria for metals (copper, lead, zinc and cadmium) and pesticides (DDT). PCBs were detected and exceeded criteria, but these impacted sediments appear to be localized to Oxford Lagoon. The sediment chemistry results for samples collected in the entrance channel adjacent to Area A (sampling stations 4 and 25) indicate similar sediment quality issues. Two primary sources of these impacts to sediment were identified, and included Oxford Lagoon and Ballona Creek.

7.7 SECTION 7 FIGURES

Figure 7-1. Drainage Areas and Stormwater Monitoring Station in Ballona Creek

Figure 7-2. Mean Exceedance Ratio for Constituents Frequently Exceeding WQOs at Ballona Creek Mass Emission Site

Figure 7-3 Comparative Summary of Constituents Frequently Exceeding WQOs at Ballona Creek and its Tributaries

Figure 7-4. Sediment Sampling Locations – tidal section of Ballona Creek – Bight03 Program

Figure 7-5. Sampling Location - Marine Del Rey Water Quality Sampling Program

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8. LAND USE

8.1 EXISTING LAND USE

8.1.1 Ecological Reserve Designation

Per an amendment to Section 630, Title 14 of the California Code of Regulations, the California Fish and Game Commission recently designated a portion of the project area as a State Ecological Reserve. The Ecological Reserve (Figure 8-1) includes the land owned by CDFG and the Expanded Wetlands Parcel (approximately 36 acres) which is owned by SLC but managed by CDFG pursuant to a lease agreement. The Freshwater Marsh was not included in the Ecological Reserve.

As specified in California State Law (CCR 14.1.2 Ch.11 Sec. 630), the purpose of the Ecological Reserve designation is to provide protection for rare, threatened or endangered native plants, wildlife, aquatic organisms and specialized terrestrial or aquatic habitat types. Public entry and use of ecological reserves is subject to general rules and regulations to ensure that it is compatible with the primary purposes of resource protection. The special regulations adopted for the Ballona Wetlands Ecological Reserve, which go into effect May 10th 2006, are list below:

- Allowing pedestrian use only on designated trails for the protection of sensitive species and habitats.
- Allowing bicycle use only on a designated bicycle path north of the Ballona Creek flood control channel for the protection of sensitive species and habitats.
- Allowing fishing only with barbless hooks from the shoreline in designated areas along Ballona Creek or from boats within the Ballona Creek channel for the protection of sensitive habitats and species along Ballona Creek and to minimize mortality of fish and aquatic species caught by anglers and returned to Ballona Creek.
- Allowing boating only in the Ballona Creek channel for protection of sensitive habitats and species (since boating is not normally permitted on ecological reserves, the special regulation is necessary when the department determines boating is appropriate and will cause no impacts to protected species and habitats).
- Allowing existing recreational uses under license agreement and existing parking areas under lease agreements unless other uses are deemed more appropriate (since these licensed recreational and leased parking activities are not normally permitted on ecological reserves, the special regulations are necessary when the department determines these public uses are appropriate and will cause no impacts to sensitive species and habitats).

In addition to the special regulations adopted for the Reserve, general rules and regulations from the California Code of Regulations (CCR) Title 14, Natural Resources, Division 1, Sub-division 2, Chapter 11 were also adopted for the Ballona Wetlands Ecological Reserve. These are:

1. Protection of Resources. No person shall mine or disturb geological formations or archeological artifacts or take or disturb any bird or nest, or eggs thereof, or any plant, mammal, fish, mollusk, crustacean, amphibian, reptile, or any other form of plant or animal life in an ecological reserve except as provided in Sub-sections 630(a)(2) and (a)(8). The department may implement enhancement and protective measures to assure proper utilization and maintenance of ecological reserves.

2. Fishing. Fishing shall be allowed in accordance with the general fishing regulations of the commission except that the method of taking fish shall be limited to angling from shore. No person shall take fish for commercial purposes in any ecological reserve except by permit from the commission.

3. Collecting. No collecting shall be done in an ecological reserve except by permit issued pursuant to Section 650 of these regulations. Any person applying for a permit must have a valid scientific collecting permit issued pursuant to Part 3 of this title.

4. Motor Vehicles. No person shall drive, operate, leave, or stop any motor vehicle, bicycle, tractor, or other type of vehicle in an ecological reserve except on designated access roads and parking areas.

5. Swimming. No person shall swim, wade, dive, or use any diving equipment within an ecological reserve except as authorized under the terms of a permit issued pursuant to Sub-section (3).

6. Boating. No person shall launch or operate a boat or other floating device within an ecological reserve except by permit from the commission.

7. Trails. The department may designate areas within an ecological reserve where added protection of plant or animal life is desirable, and may establish equestrian or walking trails or paths within such designated areas. No person shall walk or ride horseback in such areas except upon the established trails or paths.

8. Firearms. No person shall fire or discharge any firearm, bow and arrow, air or gas gun, spear gun, or any other weapon of any kind within or into an ecological reserve or possess such weapons within an ecological reserve, except law enforcement personnel and as provided for in individual area regulations that allow for hunting.

9. Ejection. Employees of the department may eject any person from an ecological reserve for violation of any of these rules or regulations or for any reason when it appears that the general safety or welfare of the ecological reserve or persons thereon is endangered.

10. Public Entry. Public entry may be restricted on any area at the discretion of the department to protect the wildlife, aquatic life, or habitat. No person, except state and local law enforcement officers, fire

suppression agencies and employees of the department in the performance of their official duties or persons possessing written permission from the department, may enter any ecological reserve, or portion thereof, which is closed to public entry. No person may enter any ecological reserve between sunset and sunrise except with written permission from the Department, which may be granted for purposes including night fishing in accordance with Sub-section (a)(2) from designated shore areas only.

11. Introduction of Species. Unless authorized by the commission, the release of any fish or wildlife species, including domestic or domesticated species, or the introduction of any plant species, is prohibited. The Department may reintroduce endemic species on ecological reserves for management purposes.

12. Feeding of Wildlife. The feeding of wildlife is prohibited.

13. Pesticides. The use of pesticides is prohibited on any ecological reserve unless authorized by the commission with the exception that the Department may use pesticides for management purposes and for public safety.

14. Litter. No person shall deposit, drop, or scatter any debris on any ecological reserve except in a receptacle or area designated for that purpose. Where no designated receptacles are provided, any refuse resulting from a person's use of an area must be removed from that area by such person.

15. Grazing. The grazing of livestock is prohibited on any ecological reserve.

16. Falconry. Falconry is prohibited.

17. Aircraft. No person shall operate any aircraft or hovercraft within a reserve, except as authorized by a permit from the commission.

18. Pets. Pets, including dogs and cats, are prohibited from entering reserves unless they are retained on a leash of less than 10 feet or are inside a motor vehicle, except as provided for in individual area regulations that allow for hunting or training activities.

19. Fires. No person shall light fireworks or other explosive or incendiary devices, or start or maintain any fire on or in any reserve, except for management purposes as provided in Sub-section (a)(1).

20. Camping. No person shall camp on/in any ecological reserve.

21. Vandalism. No person shall tamper with, damage or remove any property not his own when such property is located within an ecological reserve.

8.2 SURROUNDING LAND USE

Generally, the wetlands are surrounded by the urbanized metropolitan area of Los Angeles. Land use along the northern and western boundary of Area A includes Marina Del Rey and Chase Burton Park. The northern and southern boundaries of Area C contain mixed office, commercial and multifamily residential uses. The northeastern border of Area C is the Marina Expressway, with additional mixed office and commercial uses lying beyond it to the north. Ballona Creek separates Areas A and C from Area B.

The Del Rey Bluffs lie immediately south of Area B. Above these, land use along the southern boundary of Area B includes mixed office, commercial, and apartment uses, as well as mixed residential uses. The Gas Company has a facility on privately-held land at the base of the Del Rey Bluffs next to Area B. The western border of Area B is composed of residential communities. The southeastern portions of the Area B border are bounded by bluffs. Loyola Marymount University and the Westchester community lie atop these bluffs. Area B is bound on the north by Ballona Creek and to the east by mixed office/commercial/residential uses.

In a larger context, the project area is surrounded by the City of Los Angeles communities of Westchester on the south, Del Rey to the northeast, Venice/Mar Vista further to the north, and Playa Del Rey further to the west. The Los Angeles County community of Marina Del Rey lies further to the northwest and Culver City further to the east.

Natural resource areas in the vicinity of Ballona Wetlands include Del Rey Lagoon and Ballona Lagoon to the west of the project area. Further west are Dockweiler State Beach Park and the Pacific Ocean. Centinela Creek feeds into Ballona Creek across from the northeastern end of Area C. Oxford Lagoon lies to the north of the project area. The El Segundo dune complex occurs south of the project area at Los Angeles Airport.

Marina Del Rey is currently in the first phase of a major rennovation that will include two shopping center makeovers, redevelopment of two apartment houses, and leveling and replacing Fisherman’s Village with a newer version including a hotel. The existing bicycle trail will be extended all the way round the Marina.

8.3 UTILITIES AND EASEMENTS

8.3.1 Existing Utilities

Several public utilities occur within Ballona Wetlands. These include the Gas Company, the City of Los Angeles Department of Water and Power, the General Telephone Company, Southern California Edison, and the Los Angeles County Flood Control District (Tetra Tech, 1991). A composite of ALTA surveys (Psomas, 2005) illustrates the extent of utilities and easements within and adjacent to the project area.

8.3.1.1 Gas Company Operations

The Gas Company owns thirteen active natural gas storage wells and four abandoned wells within the project area. Through existing easements, the Gas Company has access rights to their wells to keep them operational.

Access is achieved using existing dirt roads. A network of utility lines connects the wells with the Gas Company's plant at the southern edge of Area B. At some time in the future, the Gas Company may abandon surface facilities within Area A and portions of Area B.

Operations within the Ballona wetlands project area include the following (Peterson, 2005):

- Operation of the 1167 main gas pipeline and adjacent wastewater pipeline; access must be maintained for inspection, maintenance, and response in case of pipeline leak.
- Use of a secondary access road to the plant's Tank Farm area (southern end of Area B); secondary access required by the Los Angeles Fire Department. This road also serves as access to a gas storage well.
- Operation of gas storage wells, monitoring wells, observation wells, and an oil well in the wetlands; access roads, surface location, and underground well cellars must be accessible for well operation, maintenance, and rig work activities.
- Operation of oil and gas pipelines connecting the gas storage wells and oil well in the wetlands to the plant's Tank Farm area; access must be maintained for inspection, maintenance, and response in case of pipeline leak.

8.3.1.2 Los Angeles Department of Water and Power

The Department of Water and Power (DWP) has a 230 kV high voltage power line under Culver Boulevard in Area B. DWP also maintains approximately 2,700 linear feet of overhead power lines in Area B, most of which parallel Culver Boulevard and continue east on Jefferson Boulevard.

8.3.1.3 General Telephone Company

The General Telephone Company has an eight transite duct under Culver Boulevard, approximately 2,800 feet in length (Tetra Tech, 1991).

8.3.1.4 Southern California Edison

Southern California Edison (SCE) owns a 16 kV overhead power line running approximately 2,800 linear feet along the north side of Culver Boulevard. At some time in the future, it is believed that SCE will abandon this line in place (Tetra Tech, 1991).

8.3.1.5 Los Angeles County Flood Control District

The Flood Control District maintains a 12 feet by 7 feet 3 inches reinforced concrete storm drain box that runs southwest under Jefferson Boulevard, discharging into the Freshwater Marsh.

8.3.2 Existing Easements, Leases or Access Rights

8.3.2.1 Freshwater Marsh

The Freshwater Marsh is a 26.1-acre component of the larger 51.1-acre Ballona Freshwater Wetland System developed by the Playa Capital Company, LLC to mitigate development impacts. An additional management area of 13.4 acres surrounds the Freshwater Marsh, and includes trails, upland buffer habitats between the Freshwater Marsh and Ballona Wetlands saltmarsh, and an open space area east of the marsh to be incorporated into Lincoln Boulevard improvements.

A conservation easement deed has been recorded for the Freshwater Marsh parcel in favor of the Ballona Wetlands Conservancy for development and maintenance of the marsh consistent with regulatory permit approvals, including the USACE (Section 404 Permit No. 90-426-EV), the California Coastal Commission (Coastal Development Permit No. 5-91-463), the State Water Resources Control Board (Section Water Quality Certification T576), and the CDFG (Section 1600 Streambed Alteration Agreement No. 5-639-93).

8.3.2.2 Playa Vista Little League

The Playa Vista Little League has a month to month lease for the four baseball diamonds and parking area on Area C. As of 2006, the Little League has been in existence for 46 years.

8.3.2.3 Other Easements and Access Rights

A number of parties have acquired past rights to occupy small portions of Ballona Wetlands for various uses. These include the following (State of California, 2003):

- Leases granted to the County of Los Angeles for parking for the County Sheriff and for the Department of Beaches and Harbors upon a small portion of Area A.
- A lease granted to the County of Los Angeles Flood Control District to access Ballona Creek from Area A to remove trash and debris.
- A license granted to the Friends of Ballona Wetlands for restoration of sand dunes located in the wetlands and interpretation.
- A license to the Ballona Wetlands Foundation allowing the Foundation (in association with Loyola Marymount University) to restore habitat and perform other educational functions within a portion of the wetlands.
- Licenses granted to several business owners along Culver Boulevard for minor encroachments upon the wetlands.
- Easements running in favor of a majority of homeowners located along the western boundary of Ballona Wetlands for small encroachments.

- Easements running in favor of Playa Vista development for the widening of Culver and Lincoln Boulevards and for the installation of other infrastructure relating to the Playa Vista development.
- A grant to the Ballona Wetlands Foundation to develop the Ballona Outdoor Learning and Discovery (BOLD) project, to be developed consistent with the larger restoration project.

Existing and surrounding land use will need to be considered in the development and phasing of the preferred restoration alternative.

8.4 SECTION 8 FIGURES

Figure 8-1. Ballona Wetlands Ecological Reserve

9. PUBLIC ACCESS AND RECREATION

An Interim Stewardship and Access Management Plan was drafted in 2005 for Ballona Wetlands (State Coastal Conservancy, 2005). This document forms the basis of the discussion provided below.

9.1 REGIONAL SETTING

The Ballona Wetlands offers a regionally important opportunity for the public to access and experience these environments. The project is owned by the State of California and public access is currently limited to authorized users and stewards. On-site activities must be consistent with CDFG's habitat protection mission, restoration and enhancement goals for the wetlands, existing regulations, wildlife needs, the safety of users, and must not have any adverse impacts on sensitive species and habitats.

As discussed in Section 8.1.1, the California Fish and Game Commission recently approved designation of Ballona Wetlands as an Ecological Reserve. This designation provides additional protection for rare, threatened and endangered species, as well as compatible public entry and uses. Authorized public use of the Ballona Wetlands Ecological Reserve includes educational tours and wildlife viewing trips, scientific research and monitoring, active recreational activities such as hiking, bicycling, fishing and boating (in Ballona Creek only), baseball, and habitat restoration.

Adjacent public land use also influences access and use of Ballona Wetlands. These include public beaches at Playa Del Rey and Venice, Marina Del Rey, Burton Chase Park, Del Rey Lagoon (a City of Los Angeles park) and a regional system of bikeways (e.g. the South Bay Bicycle Trail, the Ballona Creek Bicycle Path) linking the perimeter of the project area to the surrounding beach communities and residential areas. As disccused above, the site is adjacent to residential, commercial and some industrial land uses.

9.2 TYPES OF ACTIVITIES AND USES

9.2.1 Educational Tours and Wildlife Viewing

A number of community non-profits offer organized natural history tours, school field trips, and related environmental education programs within the project area. In addition, there is a self-guided interpretive tour along the perimeter of the Freshwater Marsh (located on Jefferson and Lincoln Boulevards). Informal wildlife viewing is also possible from a variety of periphery vantage points along Areas A and C, as well as within Area B along Jefferson Boulevard and Culver Boulevard. Formal wildlife viewing/interpretive features of Ballona Wetlands include a viewing platform within Area B, located on the berm overlooking the trestle along the old Pacific Electric causeway, and the self-guided tour established at the Freshwater Marsh.

9.2.2 Volunteer Stewardship Activities

Much of the existing interim management of Ballona Wetlands relies on volunteer stewardship efforts in conjunction with local organizations. Current projects at Ballona Wetlands are varied, and include some restoration of the back dunes and adjacent habitats within Area B as well as invasive species removal (e.g. chrysanthemum, myoporum, pampas grass, castor bean). In addition, some groups have conducted planting activities, placement of new trail markings, and trash clean-up. Most of these efforts rely heavily on the volunteer labor from community and school groups.

9.2.3 Scientific Research and Monitoring

Research and monitoring within Ballona Wetlands is undertaken by many individuals, groups and organizations. Activities include water and sediment sampling, tide-gate monitoring, and bird count surveys. Access to the site is granted through permission letter, easement, lease, or license agreement. An individual or organization may obtain a permission letter by submitting a written request to the South Coast Land Management and Monitoring Supervisor along with a detailed description of the proposed research. These proposals are reviewed on a case-by-case basis, and staff will determine the value of the proposed research along with any potential adverse impacts. In many cases permission will be granted via a written authorization from the region. All data collected must be shared with the CDFG. If the research would result in capture or collection of specimens, or any other activity that may be incompatible with the Ecological Reserve regulations, special provisions may apply.

CDFG also oversees a variety of ongoing and proposed research/monitoring projects in co-ordination with the City of Los Angeles Environmental Monitoring Division; University of California, Los Angeles; California State University, Long Beach; and University of California, Santa Barbara. Research topics include inventory of terrestrial invertebrates and responses to disturbance in sand dune scrub; inventory and measurement of the effects of disturbance on fish, crabs, snails, and birds, and development of protocols for assessing the diversity and abundance of wetland benthic invertebrates, fish, and birds by assessing larval trematodes in horn snails.

9.2.4 Active Recreation

9.2.4.1 Hiking

There are self-guided interpretive tours along the perimeter of the Freshwater Marsh. Currently, access to the remainder of the State-owned lands is authorized on a case-by-case basis, and these areas are not yet open to the general public. Unauthorized dog-walking (mostly off-leash) occurs in Areas A, B, and C, but has resulted in particularly adverse impacts in Area C. This is due in part to the higher site contours, resulting in limited area of wetlands (approximately 2.5 acres), poor or non-existent fencing, and the adjacent high density multi-family residential properties. Residences adjacent to Area B have immediate access to the beach. No residences occur adjacent to Area A.

9.2.4.2 Biking

Several formal bicycle routes are found near Ballona Wetlands with east-west bicycle access provided via an off-street (Class I) bicycle path along the northern levee of Ballona Creek, a north-south bicycle access provided via the Coastal Bicycle Trail, and bicycling routes along Culver and Jefferson Boulevards adjacent to Area B. No formal off-road or trail bicycle paths exist within the wetlands. Unauthorized off-road BMX bicycle and motorcycle use has been a management concern as jumps and tracks have been created within Areas A and C, with a substantial amount of damage to wetland habitats.

9.2.4.3 Fishing

Fishing currently occurs on both sides of Ballona Creek along the levees and from the pedestrian bridge crossing the channel.

9.2.4.4 Water Sports

Kayaking and crew rowing are common activities in Ballona Creek.

9.2.4.5 Field Sports

Playa Vista Little League plays baseball on three fields located in Area C.

9.2.5 Unauthorized Uses

There have been numerous homeless encampments within the wetlands, particularly in the upland scrub habitats in Areas A and C. BMX and motorcycle use within Areas A and C is also an ongoing concern. Because Areas A and C are both higher in elevation, have few formal access points, and are relative screened from established roads, they are prone to unauthorized use.

9.3 ACCESS POINTS

9.3.1 Access Points

Currently, the public, non-profit organizations, agencies, scientists, institutions and utility companies utilize more than 50 formal and informal access points into the wetlands.

Informal public access conditions vary between Areas A, B, and C. The perimeters of Area A and a portion of Area C are fenced off; however, unauthorized access into these areas is made through holes in the fence, unlocked gates, by jumping the fence, or entry through unfenced locations. Culver Boulevard and Jefferson Boulevard bisect Area B and much of this alignment is not fenced off, meaning that the interior of Area B is accessible from anywhere along these roads. However, parking in the immediate vicinity of Area B is limited and hence, informal access is greatly reduced. In addition, unauthorized activities can easily be seen from afar because of the low growth of saltmarsh plant species. The dirt lot behind Gordon's Market provides an important informal meeting place and access point for hiking into the dune and saltmarsh areas of Area B.

Formal public access exists only at the baseball fields (from both Culver Boulevard and Ballona Creek) in Area C and along the perimeter of the Freshwater Marsh in the southeastern portion of Area B. Both locations provide legal parking areas.

9.3.1.1 Bicycle-Related

Within the project area, east-west bicycle access is provided along the northern levee of Ballona Creek via the off-street (Class I) bicycle path, while north-south bicycle access is provided via an on- and off-street (Class I and II) coastal bicycle trail. To enter the Ballona Creek bicycle path, bicyclists must use entry points at the end of McConnell Avenue, at Lincoln Boulevard (access here is dangerous), and at the end of Fiji Way. Culver and Jefferson Boulevards are also used by bicycles even though the conditions are challenging.

The City of Culver City is leading an effort to enhance and extend bicycle access as part of their Ballona Creek and Trail Focused Special Study. Upon implementation, this would improve bicycle access along Ballona Creek, providing a linkage to the Baldwin Hills Park area as well as other bikeways in Culver City such as Culver Boulevard, Exposition Boulevard, and downtown Culver City.

Bicycle parking is available at Fisherman's Village. Bicycle parking elsewhere is non-existent and often results in bicycles being locked to fences along the perimeter of the project area.

9.3.1.2 Public Transit-Related

Currently, there are six MTA bus lines, six Culver City lines, three Santa Monica bus lines, and three LADOT lines that operate in the vicinity of the project area (City of Los Angeles, 2003). The Santa Monica Big Blue Bus #3 and MTA Buses #108, #115, and #220 provide direct bus access to the wetlands. Bus stops near the project area are generally uncovered, do not contain informative or interpretive information regarding Ballona Wetlands, and do not include secure bicycle parking or trash receptacles.

9.3.1.3 Automobile-Related

Three regional freeways serve the project area. The Santa Monica Freeway (I-10) provides an east-west link to downtown Los Angeles. The San Diego Freeway (I-405) is the major north-south facility in western Los Angeles. The Marina Freeway (SR-90) provides an east-west link from the San Diego Freeway to Marina Del Rey. The project area is also served by a network of local and arterial streets. Major arterials in the vicinity that currently serve the project area are Lincoln Boulevard, Jefferson Boulevard, and Culver Boulevard, as well as occasional cul-de-sacs in multi-family residential areas to the west and north.

On-site parking includes two paved lots in Area A, an unimproved lot behind Gordon’s Market in Area B, limited paved on-street parking along Jefferson Boulevard and unpaved paring in isolated areas along Culver Boulevard in Area B, and the Little League baseball fields in Area C.

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10. TRANSPORTATION AND CIRCULATION

10.1 ROAD SYSTEM DESCRIPTION

Three roads cross into the Ballona Wetlands area; Lincoln Boulevard (State Highway 1), Culver Boulevard and Jefferson Boulevard. Other streets located along the outer boundary of the project area include Fiji Way, Cabora Drive and the Marina Freeway (SR 90). Figure 10-1 illustrates the road system in the project area. In addition to the roads that pass directly through the area, the Marina Freeway provides regional access at the northern end, and Manchester Avenue provides assess to the area to the south. Figure 10-2 illustrates the existing road characteristics in terms of the number of lanes and speed limits of the key roads.

Lincoln Boulevard (State Highway 1) provides regional access to the project area. Although located in the City of Los Angeles, Lincoln Boulevard is State Highway, and as such is owned, maintained and controlled by Caltrans. Lincoln Boulevard runs north-south through the project area, it has two to three lanes in each direction and a typical posted speed of 45 mph. There are no raised medians adjacent to the project area, and on-street parking is not permitted.

Culver Boulevard runs diagonally through the project area, it as between one and three lanes in each direction, and a posted speed of 35-45 mph. There are no raised medians on Culver Boulevard within the area and on-street parking is only permitted between Vista Del Mar and Nicholson Street, along the southern end of the project area. Culver Boulevard also serves as an access route for traffic to and from the South Bay communities, via its connection to Vista Del Mar.

Jefferson Boulevard starts at Culver Boulevard in the middle of the project area and extends northeast past Lincoln Boulevard to the I-405 freeway. Within the Ballona Wetlands area, Jefferson Boulevard has two to three lanes in each direction, and has an average speed limit of 45 mph.

Fiji Way does not enter Ballona Wetlands but it forms the northern boundary of the project area. It is located in the County of Los Angeles unincorporated area. Fiji Way has one to two lanes in each direction, with posted speeds of 30-35 mph. There is a raised median and street parking is not permitted.

10.1.1 Traffic Volume

Figure 10-3 illustrates the existing Average Daily Traffic (ADT) volume on area roads. The figure shows that Lincoln Boulevard carries from 55,000 to 65,000 vehicles per day through the project area. Lincoln Boulevard is a major route for north-south traffic on the Westside, as evidenced by the relatively large volume of daily traffic. With four through lanes, Lincoln Boulevard is actually undersized for the large volume of traffic that it handles. Streets with traffic volumes over 50,000 to 60,000 vehicles per day typically have at least six through lanes. Jefferson Boulevard, east of the project area also carries a very high volume of traffic at over 61,000 vehicles per day. However, to the west of Lincoln Boulevard (and within the project area), Jefferson Boulevard carries a much smaller volume of traffic (14,600 vehicles per day). The only available traffic count for Culver Boulevard is on the segment east of Lincoln Boulevard, which carries 23,700 vehicles per day. To better understand the operational characteristics of Culver Boulevard, additional traffic data will be required, specifically on the segments between Lincoln Boulevard and Jefferson Boulevard, and also to the west of Jefferson Boulevard.

10.1.2 Planned Road Improvements

There are a series of planned road improvements within and near the Ballona Wetlands area. Some of the improvements were proposed as part of the Playa Vista development, others are part of the City of Los Angeles or County of Los Angeles capital improvement programs. The planned road improvements are described below.

Per Playa Vista agreements with state and local governments, the following transportation improvements have been recently completed and/or scheduled around the Playa Vista development:

- Road widening and intersection improvements along Jefferson Boulevard and between Lincoln Boulevard and Beethoven Street.
- Road improvements to Lincoln Boulevard, between La Tijera Boulevard and Fiji Avenue.
- Loop ramp improvements at Lincoln Boulevard and Culver Boulevard to enhance the transition to the Marina Freeway.
- Implementation of an Automated Traffic Surveillance and Control System (ATSAC) at 10 intersections along Lincoln Boulevard to monitor traffic flow and co-ordinate signal timing.
- Intersection improvements at four locations with the project area.

Per information obtained by the Los Angeles Department of Transportation, the following transportation improvements are currently under construction or planned to start within the next three years. There are also other longer-range improvements that are tied to future potential phased development, which is not yet known. Note that some of the improvements for the Playa Vista development may overlap with the projects listed below. Figure 10-4 illustrates the locations of these improvements.

- Caltrans has a programmed improvement to widen Lincoln Boulevard between La Tijera Boulevard and Loyola Marymount University Drive to provide a fourth northbound lane (the new configuration would be four northbound lands and three southbound lanes).
- Caltrans is currently widening Lincoln Boulevard between Loyola Marymount University Drive and Jefferson Boulevard to provide four lanes in each direction.
- Caltrans has a programmed improvement to restripe Lincoln Boulevard between Jefferson Boulevard and Fiji Way to provide three lanes in each direction.

- Caltrans is currently reconfiguring the at-grade intersection of Culver Boulevard and the Marina Freeway (SR-90) to provide a new interchange. When complete, the Marina Freeway will be grade separated over Culver Boulevard with ramps connecting it to Culver Boulevard.

10.1.3 Road Functional Classification

Road functional classifications are used to describe the function and character of streets and highways. Figure 10-5 illustrates the functional classification system of the roads according to the 'City of Los Angeles General Plan Transportation Element, Highways and Freeways, Westside Subarea.' The roads that traverse the project area include three functional classification types; Divided Major Class I (Lincoln Boulevard), Major Class II (Culver Boulevard east of Lincoln Boulevard and Jefferson Boulevard), and Divided Secondary (Culver Boulevard west of Lincoln Boulevard). Different types of streets are intended to handle different types of traffic. Traffic movements are channeled through a hierarchical system that progresses from a lower classification of roads that handle short, locally oriented trips to higher classifications that connect regional and inter-regional traffic generators, handling longer trips.

The road classification system is used to describe the total volume of traffic on a road, as well as the trip length, trip type, local access (number and type of curb cuts and driveway access), posted speeds, parking, median type, traffic control and other characteristics. While the classification system describes the general functions of each type of road, there is often overlap between classifications for certain characteristics. For example, not every major road has the same number of curb cuts or carries the same traffic volume. In some cases, a lower classified road may carry a higher volume of traffic than a higher classified road, but in the future it would be expected that the volume on the higher classified road will grow to meet the criteria for that road type. The general standards designated by the City of Los Angeles for each of the road classifications is described below.

Major Highway Class I – This road classification standard includes 126 feet of right of way, 12-feet sidewalk/parkway, 13-feet curb lane, six full time through lanes, two part time parking lanes, and one median/left turn lane.

Major Highway Class II - This road classification standard includes 104 feet of right of way, 12-feet sidewalk/parkway, 13-feet curb lane, four full time through lanes, two part time parking lanes, and one median/left turn lane.

Secondary Highway - This road classification standard includes 90 feet of right of way, 10-feet sidewalk/parkway, 13-feet curb lane, four full time through lanes, all-day parking lanes, and one median/left turn lane.

10.2 TRANSIT SYSTEM DESCRIPTION

There are three transit agencies that provide service through and around the Ballona Wetlands area; Metropolitan Transportation Authority (MTA), Santa Monica Municipal Bus (Big Blue Bus) and Los Angeles

Department of Transportation (Figure 10-6). The three agencies run five bus routes in and around the area, as follows:

- *Metro Line 108/358* (Marina Del Rey - Slauson Avenue - Pico Rivera) - Metro Line 108 runs east-west around the project area via Admiralty Way, starting at Paramount Boulevard and Slauson Avenue in Pico Rivera and terminating at Washington Boulevard and Palawan Way in Marina Del Rey. Metro Line 358 is a limited stop service that shares some stops with Metro Line 108, and runs Monday through Friday. Line 108 runs Monday through Sunday, including all major holidays. The AM peak period headway in Marina Del Rey ranges between 22 and 43 minutes, the PM peak period headway ranges between 19 and 31 minutes, and the weekend mid-day peak period headway is approximately one hour.

- *Metro Line 115/315* (Manchester Boulevard - Firestone Boulevard) - Metro Line 115/315 runs east-west around the project area via Manchester Avenue, starting at the I-605/I-105 Metro Station in Norwalk and terminating at Pacific Avenue and Culver Boulevard in Playa Del Rey. Metro Line 315 is a limited stop service that shares some stops with Metro Line 115, and runs Monday through Friday. Line 115 runs Monday through Sunday, including all major holidays. The AM peak period headway in Playa Del Rey ranges between 32 and 42 minutes, the PM peak period headway ranges between 35 and 39 minutes, and the weekend mid-day peak period headway ranges between 30 and 40 minutes.

- *Metro Line 220* (Robertson Boulevard -Culver Boulevard - LAX City Bus Center) - Metro Line 220 runs through the project area on Culver Boulevard, Jefferson Boulevard and Lincoln Boulevard and north-south around the project area via Fiji Way, starting at Santa Monica Boulevard and San Vicente in West Hollywood and terminating at the City Bus Center at Los Angeles Airport. Line 220 runs Monday through Sunday, including all major holidays. The headway in Marina Del Rey during the AM, PM and weekend mid-day peak period is approximately one hour.

- *Santa Monica Big Blue Bus Line 3* (Aviation Metro Rail Station - LAX City Bus Center - Lincoln Boulevard/Montana Avenue/UCLA) - SM3 runs north-south around the project area via Lincoln Boulevard, starting at the Green Line Station in El Segundo and terminating at the UCLA Transit Center. Line 3 runs Monday through Sunday, including all major holidays. The headway in Marina Del Rey during the AM, PM and weekend mid-day peak period is approximately 15 minutes.

- *LADOT Commuter Express 437* (Venice - Marina Del Rey - Culver City) - LADOT CE 437 runs east-west around the project area via Admiralty Way, starting at Temple Avenue and Los Angeles Street in downtown Los Angeles and terminating at Pacific Avenue and Washington Boulevard in Marina Del Rey. Days of operation are Monday through Friday. No service is provided on Saturday, Sunday or on major holidays. The AM peak period headway is approximately 20 minutes and the PM peak period headway is 30 minutes.

10.3 BICYCLE AND PEDESTRIAN PATHS

There are five bicycle paths/bikeways that run through or near Ballona Wetlands, as follows:

- *Ballona Creek Bicycle Path* - The Ballona Creek Bicycle Path begins near the intersection of National Boulevard and Jefferson Boulevard in Culver City, and runs along the levee of Ballona Creek to Playa Del Rey. Within the project area, the path runs east-west before joining the South Bay Bicycle Trail near the dunes of Dockweiler Beach State Park. Access points near the project area include McConnell Avenue, Lincoln Boulevard, and Fiji Way. The Ballona Creek Bicycle Path extends approximately nine miles long and is classified as a Class I bicycle path in the City of Los Angeles General Plan, Transportation Element, Bicycle Plan.

- *Culver Boulevard Bicycle Path* - The Culver Boulevard Bicycle Path begins at the intersection of Elenda Street and Culver Boulevard, near Veterans Memorial Park and extends south to McConnell Boulevard. At McConnell Boulevard, the path joins the Ballona Creek Bicycle Path for access to Playa Del Rey. The Culver Boulevard Bicycle Path is approximately 2.1 miles long and is classified as a Class I bicycle path in the City of Los Angeles General Plan, Transportation Element, Bicycle Plan.

- *Pershing Drive Bikeway* - The Pershing Drive Bikeway begins at Pershing Drive and Manchester Avenue, just south of the project area, and runs along the west border of Los Angeles Airport to Imperial Highway. The Pershing Drive Bikeway runs north-south, extends approximately 2.4 miles, and is classified as Class II (bicycle lanes) in the City of Los Angeles General Plan, Transportation Element, Bicycle Plan.

- *Westchester Parkway Bikeway*- The Westchester Parkway Bikeway begins at the intersection of Westchester Parkway and Sepulveda Boulevard, and runs east-west below the project area to Pershing Drive. It extends approximately 2.5 miles and is classified as Class II (bicycle lanes) in the City of Los Angeles General Plan, Transportation Element, Bicycle Plan.

- *Teale Street Bikeway* - The Teale Street Bikeway begins at the intersection of Centinela Avenue and Bluff Creek Drive and runs east-west to the intersection of Teale Street and Lincoln Boulevard, east of the project area. The Teale Street Bikeway extends approximately two miles and is classified as Class II (bicycle lanes) in the City of Los Angeles General Plan, Transportation Element, Bicycle Plan.

Pedestrian circulation is generally provided alongside the roads on sidewalks, and crosswalks across the roads. Figure 10-7 illustrates the locations of the existing sidewalks and crosswalks.

10.4 SECTION 10 FIGURES

Figure 10-1 Project Area Road System

Figure 10-2 Road Characteristics

Figure 10-3 Average Daily Traffic

Figure 10-4 Transportation Improvements

Figure 10-5 City of Los Angeles Road Classifications

Figure 10-6 Existing Transit System

Figure 10-7 Crosswalks and Sidewalks

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11. REGULATORY FRAMEWORK

This section provides insight into the regulations protecting sensitive resources within Ballona Wetlands, and briefly identifies the regulatory permits that may be necessary for future implementation of the restoration project.

11.1 FEDERAL ENDANGERED SPECIES ACT

Both the NOAA Fisheries and the USFWS share responsibility for administration of the Federal Endangered Species Act (FESA). The FESA protects listed wildlife species from harm or ‘take’. The term ‘take’ is broadly defined as ‘harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct’. An activity is defined as a ‘take’ even if it is unintentional or accidental. Individuals planning to conduct any activity resulting in the ‘take’ of an endangered or threatened species, whether or not deliberate, must possess an Incidental Take Authorization Permit to perform that activity. This permit would consist of a Biological Opinion and Incidental Take Statement which must establish that the proposed ‘take’ would not jeopardize the continued existence of the endangered or threatened species.

Issuance of an Incidental Take Authorization may occur either under Section 10(a) of the FESA for projects that have no other federal involvement, or under Section 7 of the FESA for projects that require funding or permits from other federal agencies. Since the proposed Ballona Wetlands Restoration Project would likely require a Clean Water Act Section 404 permit (Section 11.2) from the USACE, Section 7 consultation between the USACE and the USFWS and/or NOAA Fisheries would be required for any identified federally-listed endangered and threatened species.

11.2 CLEAN WATER ACT SECTION 404

The USACE is responsible under Section 404 of the Clean Water Act (CWA) for regulating discharges of fill or dredged material into waters of the United States. Waters of the U.S. and their lateral limits are defined in 33 CFR (Code of Federal Regulations) Part 328.3(a) and include streams that are tributary to navigable waters and adjacent wetlands. Wetlands that are not adjacent to waters of the U.S. are termed ‘isolated wetlands’ and may be subject to USACE jurisdiction if they have a hydrological connection to waters of the U.S. In general, either a Nationwide or Individual Section 404 permit must be obtained before placing fill or dredging in designated wetlands or other waters of the U.S. Nationwide permits are authorized for certain categories of projects that are deemed to have minimal impacts on aquatic resources. NEPA review is required for each Nationwide permit, although once established, project specific NEPA compliance is not required for subsequent actions.

The Ballona Wetlands Restoration Project will likely require a Section 404 permit. The type of permit required, Nationwide or Individual, depends on the amount of acreage involved and the end purpose of any proposed fill.

11.3 NATIONAL HISTORIC PRESERVATION ACT SECTION 106

Section 106 of the National Historic Preservation Act (NHPA) is triggered by federal agency involvement (e.g. USACE Section 404 permit, federal funding source, or related actions) and requires federal agencies to consider the effects of their actions on historic properties, and provide the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on federal projects prior to implementation. The regulations implementing Section 106 are promulgated by the Secretary of the Interior, as codified in Title 36 of the Code of Federal Regulations (CFR) Part 800 (as amended).

Federal agencies are responsible for initiating Section 106 consultation with tribal organizations and other interested individuals or parties. The State Historic Preservation Officer (SHPO) co-ordinates the State's historic preservation program and consults with agencies during Section 106 review.

To successfully complete the Section 106 process, federal agencies must:

- determine if Section 106 of the NHPA applies to a given project and, if so, initiate the review;
- gather information to decide which properties in the project area are listed in the National Register of Historic Places (NRHP), or may be eligible for listing;
- determine how historic properties might be affected;
- explore alternatives to avoid or reduce harm to historic properties; and
- reach agreement with the SHPO, Indian tribes, and other stakeholders (the Native American Heritage Commission, local historical preservation groups, and possibly the ACHP) on measures to deal with any adverse effects.

In order to be considered during Section 106 review, a property must either be already listed in the NRHP or be eligible for listing. A property is considered eligible when it meets specific criteria established by the National Park Service. During the Section 106 process, the federal agency evaluates properties against those criteria and seeks the consensus of the SHPO, Indian tribes, and other interested parties regarding eligibility. Cultural and archaeological resources are typically considered eligible for inclusion in the NRHP due to links with important persons, places or events in the past, as examples of artistic achievement, or because of the information they contain or may be likely to yield.

Determining the NRHP eligibility of a site or district is guided by the specific legal context of the site's significance, as set out in 36 CFR 60.4. The NHPA authorizes the Secretary of the Interior to maintain and expand a national register of districts, sites, buildings, structures, and objects of significance in American history, architecture, archaeology, engineering and culture. A property may be listed in the NRHP if it meets the criteria for evaluation defined in 36 CFR 60.4:

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- that are associated with events that have made a significant contribution to the broad patterns of our history; or
- that are associated with the lives of persons significant in our past; or
- that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- that have yielded, or may be likely to yield, information important in prehistory or history.

Intensity of impacts to cultural resources is determined based on the importance of the information or associations the resources contain, and their integrity. When historic properties will be adversely affected by a federal action, the Section 106 process usually concludes with a legally binding agreement between the federal agency, the SHPO, and consulting parties that establishes how the federal agency will mitigate for adverse effects.

The project area is within the Ballona Lagoon Archaeological District, a National Register-eligible district that includes large portions of Ballona Wetlands and adjacent bluff tops. Assessment of the Ballona Wetlands Restoration Project for compliance with Section 106 would be required in conjunction with USACE permit issuance under Section 404 of the CWA.

11.4 FISH AND WILDLIFE CO-ORDINATION ACT

The Fish and Wildlife Co-ordination Act (16 USC Sections 661-667e, March 10, 1934, as amended 1946, 1958, 1978 and 1995) requires federal agencies to consult with the USFWS, NOAA Fisheries, and CDFG before they undertake or approve projects that control or modify surface water. The consultation is intended to prevent the loss of or damage to fish and wildlife in connection with water projects and to develop and improve these resources. Compliance with the Fish and Wildlife Co-ordination Act is incorporated into a project’s NEPA process and is therefore relevant to the proposed project only after NEPA compliance has been triggered. Most USFWS comments on applications for permits under Section 404 of the CWA or Section 10 of the Rivers and Harbors Act are conveyed to the USACE through the consultation process required by this co-ordination act. However, although the USACE must consult with USFWS, it is not required to implement USFWS recommendations.

11.5 MIGRATORY BIRD TREATY ACT AND BALD AND GOLDEN EAGLE PROTECTION ACT

The Migratory Bird Treaty Act (16 USC 703–711) prohibits the take of any migratory bird or any part, nest, or eggs of any such bird. Under the act, take is defined as pursuing, hunting, shooting, capturing, collecting, or killing, or attempting to do so. Additionally, Executive Order (EO) 13186 (January 11, 2001) requires that any project with federal involvement address impacts of federal actions on migratory birds with the purpose of promoting conservation of migratory bird populations. The EO requires federal agencies to work with the USFWS to develop a memorandum of understanding. The Bald and Golden Eagle Protection Act (16 USC

668) prohibits the take or commerce of any part of these species. The USFWS reviews actions that might affect these species.

11.6 CALIFORNIA ENDANGERED SPECIES ACT

The CDFG has jurisdiction over threatened or endangered species that are formally listed by the State under the California Endangered Species Act (CESA). The CESA is similar to the FESA both in process and substance, with the intention of providing additional protection to threatened and endangered species in California. The CESA does not supersede the FESA, but operates in conjunction with it. Species may be listed as threatened or endangered under both acts (in which case the provisions of both state and federal laws apply) or under only one act. The California endangered species laws prohibit the take of any plant listed as endangered, threatened, or rare, even when incidental take is permitted under FESA. For example, species such as the clapper rail are fully protected from incidental take under CESA.

As landowner, CDFG is charged with ensuring that interim and long-term restoration actions comply with CESA, although CDFG does not need to issue itself a CESA permit.

11.7 FULLY PROTECTED SPECIES AND SPECIES OF SPECIAL CONCERN

CDFG maintains a list of Fully Protected Species and an informal list of Species of Special Concern. Fully protected species cannot be harmed or possessed at any time, and many of these species are also threatened or endangered.

Species of Special Concern are broadly defined as wildlife species that are of concern to the CDFG because of population declines and restricted distributions, and/or they are associated with habitats that are declining in California. Some of these species are inventoried in the CNDDB regardless of their legal status. Impacts to species of special concern may be considered significant under CEQA.

11.8 CALIFORNIA FISH AND GAME CODE SECTION 3503

According to Section 3503.5 of the California Fish and Game Code (Protection of Nesting Birds and Raptors), it is unlawful to take, possess, or destroy any birds of prey (i.e. species in the orders Falconiformes and Strigiformes) or to take, possess, or destroy any nest or eggs of such birds. Active nests of all other birds (except English sparrow and European starling) are similarly protected under Section 3503 of the California Fish and Game Code, as well as birds designated in the International MBTA under Section 3513 of the California Fish and Game Code. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered ‘take’ by CDFG. This statute does not provide for the issuance of an incidental take permit.

11.9 CALIFORNIA FISH AND GAME CODE SECTION 1602

All diversions, obstructions, or changes to the natural flow, or bed, channel, or bank of any river, stream, or lake in California that supports wildlife resources are subject to regulation by CDFG, pursuant to Section

1602 of the California Fish and Game Code. Section 1602 states that it is unlawful for any person to substantially divert or obstruct the natural flow, or substantially change the bed, channel, or bank of any river, stream, or lake designated by CDFG, or to use any material from the streambeds, without first notifying CDFG of such activity. The regulatory definition of a stream is a body of water that flows at least periodically or intermittently through a bed or channel that has banks and supports fish or other aquatic life. This includes watercourses with a surface or sub-surface flow that supports or has supported riparian vegetation. CDFG's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife.

As landowner, CDFG is charged with ensuring that interim and long-term restoration actions comply with the Fish and Game Code,although CDFG does not need to issue itself a Section 1602 permit.

11.10 CALIFORNIA NATIVE PLANT SOCIETY

The California Native Plant Society (CNPS) *Inventory of Rare and Endangered Plants of California (6th Edition, 2001)* includes five lists for categorizing plant species of concern:

- List 1A – Plants presumed extinct in California
- List 1B – Plants rare, threatened, or endangered in California and elsewhere
- List 2 – Plants rare, threatened, or endangered in California but more common elsewhere
- List 3 – Plants about which we need more information – a review list
- List 4 – Plants of limited distribution

The plants listed on CNPS lists 1B and 2 are considered rare, endangered, and/or threatened plants pursuant to Section 15370 of the CEQA. The plants on these lists often meet the definitions under the CESA and may be eligible for state listing.

11.11 CLEAN WATER ACT SECTION 401

Section 401 of the federal CWA specifies that states must certify that any activity subject to a permit issued by a federal agency, such as the USACE, meets all state water quality standards. The Los Angeles Regional Water Quality Control Board (RWQCB) is regionally responsible for taking certification actions for activities subject to any permit issued by the USACE pursuant to Section 404 (or for any other USACE permit, such as permits issued pursuant to Section 10 of the Rivers and Harbors Act of 1899). Actions may include issuance of a 401 certification noting that the activity subject to the federal permit complies with state water quality standards, issuance of a conditional 401 certification, and denial of 401 certification. In instances where the 401 certification is denied, the associated federal permit is also deemed denied.

The Ballona Wetlands Restoration Project will require consultation with the RWQCB pursuant to Section 401.

11.12 PORTER-COLOGNE WATER QUALITY CONTROL ACT

Projects that affect wetlands or waters must also meet waste discharge requirements (WDRs) of the RWQCB under California's Porter–Cologne Water Quality Control Act. Under this Act, the RWQCB regulates the 'discharge of waste' to 'waters of the State'. Both of the terms 'discharge of waste' and 'waters of the State' are broadly defined in Porter-Cologne, such that discharges of waste include fill, any material resulting from human activity, or any other 'discharge' that may directly or indirectly impact 'waters of the State.' It is important to note that, while USACE Section 404 permits and RWCQB 401 certifications are required when the activity results in fill or discharge directly below the ordinary high water line of waters of the United States, any activity that results or may result in a discharge that directly or indirectly impacts waters of the State or the beneficial uses of those waters are subject to WDRs.

WDRs may be applied to the Ballona Wetlands Restoration Project depending on the ultimate project design and use of fill materials.

11.13 CALIFORNIA COASTAL ACT

The California Coastal Commission regulates the use of land and water in the coastal zone in accordance with the Coastal Act (Division 20 of the Public Resources Code). The Coastal Act includes specific policies that address issues such as shoreline public access and recreation, lower cost visitor accommodations, terrestrial and marine habitat protection, visual resources, landform alteration, agricultural lands, commercial fisheries, industrial uses, water quality, offshore oil and gas development, transportation, development design, power plants, ports, and public works.

Development activities in the coastal zone typically require a coastal development permit from the California Coastal Commission, or in instances where local government has developed an approved Local Coastal Program (LCP), from the local governing agency. Areas A, B, and C of the Ballona Wetlands Restoration Project are all located within the coastal zone, and thus are within the jurisdiction of the California Coastal Commission. No LCP currently exists providing coverage of the project area, while there is, for instance, an LCP for nearby Marina Del Rey. Therefore, a Coastal Development Permit would be issued by the California Coastal Commission following their review.

11.14 LOCAL GOVERNMENT

The CDFG, as a public agency, receives intergovernmental immunity under California Government Code Sections 53090 et seq. Such immunity exempts the extraterritorial lands owned by CDFG from the planning and building laws of any other city or county in which those lands are located. Thus, the zoning and building codes, general plans, specific plans, and other planning and building policies of Los Angeles County or the City of Los Angeles would not apply to the Ballona Wetlands Restoration Project.

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APPENDIX A
GLOSSARY

APPENDIX B
SPECIES LISTS