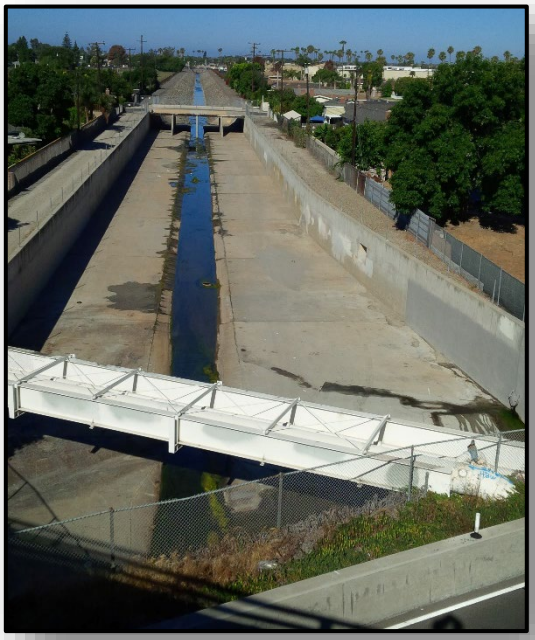
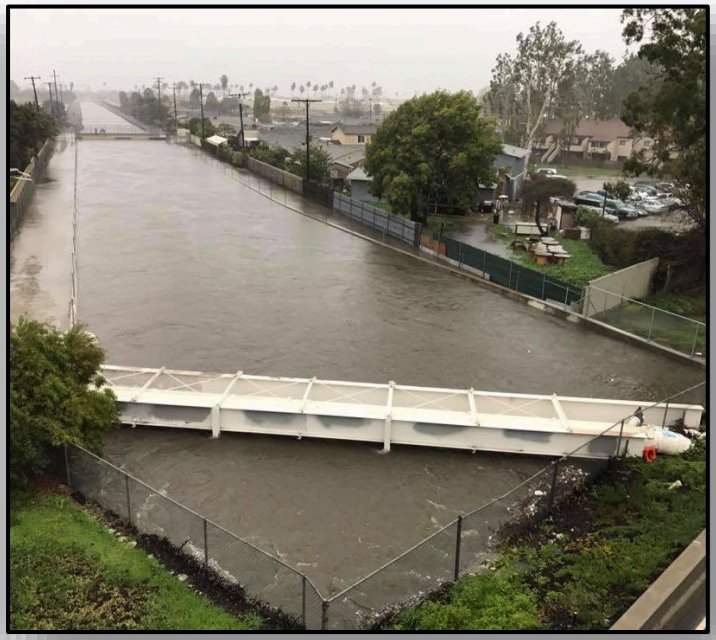
APPENDIX K - U.S. FISH AND WILDLIFE SERVICE COORDINATION ACT REPORT

For

WESTMINSTER, EAST GARDEN GROVE FLOOD RISK MANAGEMENT STUDY





April 2020

US Army Corps of Engineers®
Chicago District

Appendix K: U.S. Fish and Wildlife Service Coordination Act Report

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1.0 Planning Aid Letter (PAL)

Appendix K: U.S. Fish and Wildlife Service Coordination Act Report

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From:	Avery, Jon
To:	Herleth-King, Shawna S CIV USARMY CELRC (US)
Cc:	Carol Roberts; Jonathan Snyder; Davis, Susanne J CIV USARMY CELRC (US); Padilla, Michael C CIV CELRC CELRD (US)
Subject:	[Non-DoD Source] Fish and Wildlife Coordination Act PAL for the proposed Westminster East Garden Grove Flood Risk Management Project
Date:	Tuesday, July 24, 2018 3:51:59 PM
Attachments:	image.png image.png image.png

Shawna,

This email is our first Planning Aid Letter (PAL) for the Westminster East Garden Grove Flood Risk Management Project (Project). Over the last year we have provide to the U.S. Army Corps of Engineers Corps, Chicago District (Corps) verbal (by phone) and written suggestions by email. In previous years we provided email and verbal comments and suggestions on early design concepts to Corps LA District and local sponsor. The project is currently proposed as a general concept and set of alternatives. Due to our workload constraints and the planning timing needs of the Corps we are not sending you this PAL as a formal letter; this email equivalently functions and suffices as a normal letter (PAL) pursuant to the Fish and Wildlife Coordination Act (FWCA). The non-Federal sponsor for the Corps is Orange County Public Works (OCPW).

As part of coordination under the FWCA, the U.S. Fish and Wildlife Service (Service) has prepared this PAL for the Corps with the primary goal of describing issues and opportunities related to the conservation and enhancement of fish and wildlife resources. As noted below, Federal water resources development projects are required to give conservation of fish and wildlife equal consideration with other project purposes. The project, as proposed, would involve flood risk management (flood damage reduction) measures in the watershed of Westminster in and near the communities Garden Grove and Westminster, Orange County, California.

The purpose of the Corps' feasibility study for the proposed Project is to evaluate "residual" flood risk within the Westminster Watershed, located in southern California. This risk is residual after the completion of channelization improvements of the Santa Ana River and the subsequent removal of the Westminster Watershed from the Santa Ana River floodplain. The flood risk to human structures and within the Westminster watershed can be attributed to the combination of development within the watershed (e.g., impervious surfaces in non floodplain areas) and well as development within floodplains (e.g., structures constructed in the floodplain). The current configuration of remnant streams, floodplains, and drainage channels collect runoff generated within the watershed and convey storm runoff and flows from the watershed to the Pacific Ocean. The study area floodplain region is the reportedly the only area within Orange County that remains within the Federal Emergency Management Agency percent Floodplain. Reported analysis indicates that approximately 20,000 structures currently remain in the project area floodplain and are at flood damage risk from a 1 percent storm event, with a reported estimated expected annual damages of $40,000,000.

The goal of the project alternatives is to reduce flood hazards, including risks to human life, safety, and damages to private structures and public infrastructure, from the design storm event (1 percent recurrence) flooding along the Westminster channels, and to reduce flood impacts in the vicinity of Outer Bolsa Bay, including flooding along Pacific Coast Highway, from the same design storm event. The Westminster watershed is approximately 74 square miles in area and includes urbanized areas in the western corner of Orange County. The watershed lies on a

relatively flat coastal plain, and is almost entirely urbanized with residential and commercial development. The watershed is part of the former floodplain of the Santa Ana River, which historically meandered throughout much of the existing watershed as far north as Anaheim Bay. Channelization and large scale flood damage reduction structures have now constrained the Santa Ana River to the river's main stem on the eastern border of the Westminster watershed.

This PAL is provided in accordance with the FWCA of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 et seq.), the Endangered Species Act (ESA) of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 et seq.). This PAL does not constitute the report of the Secretary of the Interior as required by section 2(b) of the FWCA, nor does it constitute a biological opinion under section 7 of the ESA. The purpose of this PAL is to deliver recommendations for use by the Corps and local design/planning teams in developing goals, objectives, and alternatives for the project.

Fish and Wildlife Coordination Act

The FWCA directs and authorizes consultation, reporting, consideration, and in many cases, installation/implementation of fish and wildlife conservation features. The authorities of the FWCA are considered to be “supplementary legislation” to the various Federal project authorizations, such as the Corps public works authorizations (Smalley and Mueller 2004). The FWCA conditions or supplements other water development statutes to require consideration of recommendations generated under the FWCA procedures, including portions of the Clean Water Act (Zabel v. Tabb, 430 F2d 199 [5th Cir. 1970] cert. denied 401 U.S. 910 [1972]). For Federal water resources development projects, the FWCA requires that fish and wildlife conservation receive equal consideration by Federal agencies with other project purposes, and that such conservation be coordinated with other project features. The FWCA authorizes the project implementation of means and measures for both mitigating losses of fish and wildlife resources, and for enhancing these resources beyond offsetting project effects (Smalley and Mueller 2004).

Project Area and Biological Resources

The proposed project action area would involve portions of Orange County inland within 15 miles of the coast of the Pacific Ocean. These upland, wetland, and open water areas have been heavily modified over the last century associated with agricultural, military, commercial, and urban development of Orange County. The potential project direct footprint and nearby areas includes civil engineering and commercial/urban development structures. Much of the project is related to historically natural streams that were partially channelized, relocated, and/or ditched for agricultural development in the 20th century. These channels were then further channelized to varying levels when urban development in the Westminster watershed subsequently occurred; particularly fast development growth in the region occurred in the 1950s and 1960s. Orange County's human population expanded from 131,000 in 1930 to 1,900,000 in 1980 (Jepson 2001). The Westminster watershed is now essentially built out with development, with relatively little remaining natural community areas.

The project area is focused around select non-Federal drainage channels within the Westminster watershed and the receiving waters of one of the project channel systems within the Bolsa Chica Ecological Reserve area. These channels within the Westminster Watershed collect local runoff and vary in size, geometry, and lining. Typical channel configurations include concrete rectangular (including lined invert); riprap-lined trapezoidal (soft-bottomed), concrete-lined trapezoidal (including lined invert), and enclosed culverts. Configurations vary by reach and change throughout the channel systems.

The project watershed cities (Anaheim, Stanton, Cypress, Garden Grove, Westminster, Fountain Valley, Los Alamitos, Seal Beach and Huntington Beach) are located in Orange County. The general project area is backed by low bluffs and mesas, and lowland areas that historically held extensive wetlands. Two mesas occur within Huntington Beach: Bolsa Chica Mesa to the north and Huntington Beach Mesa to the south. These mesas are separated by the Bolsa Chica Gap, which includes Bolsa Bay and the Bolsa Chica wetlands. North of the Bolsa Chica Mesa is the Sunset Gap with Anaheim Bay and Huntington Harbour.

The Westminster watershed drainage has two main channel systems that collect runoff from portions of the cities of Anaheim, Stanton, Cypress, Garden Grove, Westminster, Fountain Valley, Los Alamitos, Seal Beach and Huntington Beach: the East Garden Grove-Wintersberg Channel, with its principal tributary, the Ocean View Channel, drain into Outer Bolsa Bay; and the Bolsa Chica Channel, with its tributaries, the Anaheim-Barber City Channel and Westminster Channel, drain into Huntington Harbour. The current sole ocean outlet for both Outer Bolsa Bay and Huntington Harbor (and thus, the subject channels) is to the north at Anaheim Bay. It is very likely that before development of Pacific Coast Highway and other development of the area that Bolsa Bay and Huntington Harbor would, during mid to large storm events (and resulting high water elevations in the estuaries), episodically break through and erode portions of the relatively narrow barrier beach that separated these water bodies from the Pacific Ocean in some locations, and temporarily flow flood waters and sediment into the ocean. These barrier beaches would then naturally/seasonally re-form, with substantial subsurface flows between the ocean and these estuaries very likely continuing under/through the porous barrier beach matrix with each tidal cycle.

The channels within the Westminster watershed collect local storm water runoff and vary in size, geometry, and lining. Typical channel configurations include concrete rectangular (including lined invert); riprap-lined trapezoidal (soft-bottomed), concrete-lined trapezoidal (including lined invert), and enclosed culverts. Configurations vary by reach and change throughout the channel systems. The East Garden Grove-Wintersburg Channel (EGGWC), noted above, is an approximately 11.8 mile long regional floodcontrol facility in north/central Orange County that is characteristic of most of the project channels. The EGGWC is currently regarded as the largest flood threat to human structures in Orange County. The EGGWC system was reportedly designed and built in the 1960s to convey 65 percent of the 25-year peak discharge (approximately a 10-year storm event). In some reaches this channel is trapezoidal and lined with rip-rap. Most of project channel reaches are channelized, relatively narrow with steep armored slopes, and perennially wet with open water and little native woody vegetation. Very little off-channel/upland refugia with native plant cover exists within any project channel reach. As such, these channels quite artificial and depauperate in plant and wildlife diversity and numbers compared to natural streams with adjacent intact floodplain and upland natural communities. Nevertheless, these channels typically support substantial numbers of shorebirds and waterbirds, and likely considerable aquatic resources. The lower reaches of some project channels have a muted tidal influence.

The Bolsa Chica Ecological Reserve is an approximately 1,341-acre (sometimes listed as 1,445-acre) coastal estuary reserve located in Huntington Beach. As noted above, its location is at the downstream terminus of some of the proposed project channels. The property is owned by the State Lands Commission and managed by the California Department of Fish and Wildlife. This area was part of the historic Rancho La Bolsa Chica Mexican land grant. The Bolsa Chica Ecological Reserve boundaries are roughly Warner Avenue to the north, Seapoint Avenue to the south, Pacific Coast Highway to the west, and residential developments to the east. The East Garden Grove Wintersburg Channel runs through the Reserve. The Newport-Ingelwood fault runs through the reserve. Historically, the site was used for oil and natural gas production.

Bolsa Chica is a coastal lowland area between two mesas, the Bolsa Chica Mesa and the Huntington Beach Mesa. Bolsa Chica, which a century ago was under

full tidal influence, has started to come full circle. Over 100 years ago, Bolsa Chica was diked-off from direct tidal influence but remained below mean sea level, becoming heavily influenced by freshwater and acted as a sump for local drainage. In 1978, restoration began on the State's Ecological Reserve, and muted tidal influence was restored to the Inner Bolsa Bay area. At that time, two small islands, North Tern Island and South Tern Island, were created for nesting California least tern (Sternula antillarum browni = Sterna a. b.), a State and Federal endangered species. In 1997, the Bolsa Chica lowlands were acquired into public ownership. This marked the beginning of a multi-agency effort to design, evaluate, and implement a plan for restoring the fish and wildlife habitats. These habitats had been cut off from the ocean for a century and have been an operating oil field for over 50 years. Construction of the restoration project began in fall 2004 and was completed in August 2006. By the 2006 breeding season, three new nest sites were available for nesting and augmented the pre-existing North and South Tern Islands in Inner Bolsa Bay. The new ocean inlet, referred to as the Full Tidal Basin, was opened after the conclusion of the breeding season in August 2006. The Full Tidal Basin is now subject to water level rise and fall that approximates the unequal semi-diurnal tidal range of southern California's ocean waters. The Muted Tidal Basin was

opened to tidal influence from the Full Tidal Basin through its water control structures in March 2008.

Within Bolsa Chica, 317 acres were restored as fully tidal areas; these areas very likely continue to require substantial tidal exchange to ecologically function at high integrity levels, including support of marine fish. Since completion in 2006, the Bolsa Chica inlet has nearly closed at least once, and tidal water exchange is often muted due to sediment shoaling inside the inlet. This has resulted in a smaller volume of ocean water exchanged during the tidal cycle, a narrower tidal range, and likely reduced wetland ecological functions within the restored tidal areas. In 2009, 2011, and 2015 inlet dredging events restored or improved tidal connectivity at tidal basin of Bolsa Chica.

Fish

The open waters of Huntington Harbor and Bolsa Bay provide habitats for a variety of fish and invertebrate species that utilize these sheltered waters either during early growth or throughout their lives. Due to the repeated periodic dredging disturbance and lack of vegetation and natural shallow water features/complexity within Huntington Harbor, the number of fish species using the harbor is likely smaller than in nearby Anaheim Bay or Bolsa Bay; however, some of the commonly found fish in these waters include the deep body anchovy (Anchoa compressa), jacksmelt (Atherinopsis californiensis), topsmelt (Atherinops affinis), and Pacific staghorn sculpin (Leptocottus armatus). In addition, Anaheim Bay is an important nursery area for Pacific halibut (Hippoglossus stenolepis) and

diamond turbot (Hypsopsetta guttulata). Some juvenile fish very likely utilize the harbor area. Typical aquatic invertebrates found in these waters likely include bay mussel (Mytilus trossulus), acorn barnacles (Sessilia sp.), and tunicates (Tunicata).

Many marine fish species require coastal wetland habitats such as estuaries to complete at least a portion of their life cycle. The vegetative edge of the wetlands is important for many species of foraging juvenile fish as it provides cover for predator avoidance (Herbold et al. 2014). Research indicates that small fish, such as California killifish (Fundulus parvipinis) were able to consume six times more food in marsh habitats than in habitats with no marsh access (West and Zedler 2000). Madon (2008) found that food consumption rates of topsmelt (Atherinops affinis) were 50 percent lower when the tidal inlet at Los Peñasquitos (San Diego County, California) is closed. In addition, halibut are normally affected by closures due to their sensitivity to higher temperatures in less flushed systems. Nearly every fish species captured during post-2006 monitoring conducted at Bolsa Chica was represented by juvenile size classes and usually adults, demonstrating the role of the basin as nursery habitat for spawning or post-larval settlement and rearing (Merkel & Associates 2013). Following restoration in 2006, the fish community in Bolsa Chica was abundant, diverse, and contained biomass levels equivalent to the relatively unaltered Upper Newport Bay and the larger San Diego Bay (Farrugia et al. 2014). Over five years of quarterly monitoring, a total of 52 fish species have been observed within the fully tidal areas at Bolsa Chica (Merkel & Associates 2013). Commercially desirable species found at Bolsa Chica include white seabass (Atractoscion nobilis) and California halibut (Merkel & Associates 2013). Fodrie and Levin (2008) found that about 58 percent of juvenile halibut in southern California had embayment origins in 2003 and 2004, and that lagoon-type habitats such as Bolsa Chica provided nurseries for 16 percent of halibut in 2004. While most of the fish common in southern California bays, lagoons, and estuaries are low in trophic level (Zedler 1982), the species composition within the fully tidal portions of Bolsa Chica currently includes coastal marine fishes from 3-4 trophic levels, including top predators such as leopard shark (Triakis semifasciata), brown smooth-hound (Mustelus henlei), gray smooth-hound (M. californicus), and bat ray (Myliobatis californica). These relatively large fish act as moderate energy links that transfer nutrients among coastal areas (Farrugia et al. 2014).

In contrast, closed and severely muted systems (including some wetland project areas behind levees) are dominated by species with a salinity tolerance generally greater than seawater (approximately 35 parts per thousand), including various gobies (Gobiidae), California killifish, and topsmelt (Merkel & Associates 2009; MEC Analytical Systems 1993); these species, however, are also known to be resident within southern California embayments including open systems (Zedler 1982). Species within closed systems also include those that occur in stagnant water and/or are tolerant of poor water quality and elevated temperatures, such as non-native Western mosquitofish (Gambusia affinis), rainwater killifish (Lucania parva), and sunfish (Centrarchidae) (Wetland Research Associates 1994; MEC Analytical Systems 1993).

Overall, the habitats within the fully tidal portions of Bolsa Chica support more complex habitats and higher biodiversity/integrity than the nearby wetland areas of closed or severely muted tidal systems. Significant areas of eelgrass and cordgrass have expanded in the fully tidal areas within the Bolsa Chica after the 2006 restoration activities (Merkel & Associates 2013). Extensive eelgrass meadows increase the complexity of the system as they support resident fish species, provide egg-laying substrate and protection for breeding species, perform essential ecosystem functions, and form the basis of detritus- and grazing-based food webs (Merkel & Associates 2013; Bernstein et al. 2011). These structured habitats provide good conditions for fish species such as croaker (Sciaenidae), surfperch (Embiotocidae), kelpfish (Chironemidae), and seabass (Sciaenidae) (Merkel & Associates 2013). In contrast, the restricted tidal influence and periodic water quality extremes of the nearby closed or highly muted systems the aquatic communities to a small number of rather hardy species.

Natural Communities

The beaches, lowlands, bluffs, and mesas of Westminster and Huntington Beach are largely developed and landscaped, with some remaining ruderal and disturbed areas. A few limited areas continue to support natural communities; these support a variety of native plants and animals. These natural communities include remnants of coastal strand, coastal salt marsh, freshwater marsh, and associated (albeit limited) riparian scrub and woodlands. Most open areas otherwise consist of ruderal areas, structures, and landscaped ornamental zones. Within Bolsa Chica are open water, mudflats, salt marsh, coastal dunes, seabird nesting islands, riparian, and freshwater marsh. More than 200 bird species have been identified at Bolsa Chica.

Coastal Sand Dunes and Coastal Strand: The coastal strand plant communities, found on undisturbed sandy beaches and dunes above the high tide level, are divided into beach and dune communities. Few plants are adapted to survive the harsh conditions of the sandy beaches and dunes due to winds carrying sand and salt, shifting infertile sandy soil, and human disturbance. A few remaining vestiges of the original vegetation remain in and near the project area, consisting of plants such as sea rocket, beach-primrose, and beach morning-glory. Non-native species such as New Zealand spinach, and several species of ice plant, have aggressively pioneered in areas that have been disturbed. Remnants of dunes along Pacific Coast Highway (PCH) and near the Huntington Beach Wetlands support several shrub species. These dune shrubs are a mixture of native and non native species. Among the natives are three species of willow (Salix sp.), two species of Baccharis, and lemonade berry (Rhus integrifolia). Non-natives include various species of saltbrush, ice-plant (Carpobrotus sp.), castor bean (Ricinus communis) and myoporum (Myoporum laetum). Typical low growing plants include coastal goldenbush (Isocoma menziesii), western goldenrod (Solidago lepida), heliotrope (Phacelia sp.), beach primrose (Chamissonia cheiranthifolia), and saltgrass (Distichlis spicata).

Where the dune-salt marsh plant communities meet; spiny rush (Juncus acutus) and bulrush (Scirpus robustus) form dense stands in some areas (as between Brookhurst Street and Magnolia Street) while coastal goldenbush forms nearly pure stands in others (e.g., Brookhurst Street at PCH). Other plants associated with this transitional zone are western goldenrod (Solidago lepida), yerba mansa (Anemopsis californica) and saltgrass.

Coastal strand provides habitats to to a variety of reptiles, birds and mammals. Reptiles are limited in both species diversity and abundance in the coastal strand community, and amphibians generally do not occur. The side-blotched lizard (Uta stansburiana) is plentiful in the area away from the outer beaches, and the San Diego (southern) alligator lizard (Elgaria multicarinata webbii) may be found in small numbers in the remnant dune areas. Considering the consistent surrounding human presence, birds are the only vertebrates within the project area coastal strand communities that are currently normally abundant.

Many species of shorebirds and gulls use the upper beach as loafing areas and the intertidal zone and inshore waters for foraging. One species, the California least tern typically nests on exposed beaches where, in southern California, it is often placed in direct competition with human beach users for breeding sites. Associated with increased human use of beaches in California and modifications of river mouths, least tern populations declined significantly over the last several decades. California least terns are federally-listed as endangered. Least terns traditionally nested on sand flats in southern California river mouths as well as beaches; most of these river mouths are now heavily modified and no longer support nesting habitat for least terns. Least terns formally used the nearby mouth of the Santa Ana

River and continue to utilize zones adjacent to the mouth of Talbert Channel and at Bolsa Chica in the project area. Several landbirds such as the rock dove (Columba livia), American crow (Corvus brachyrhynchos), house finch (Carpodacus mexicanus), American kestrel (Falco sparverius), and loggerhead shrike (Lanius ludovicianus) utilize the upper beach. In summer, Bolsa Chica hosts breeding colonies of numerous tern species, including reportedly the largest colony of elegant terns (Thalasseus elegans) in the U.S.

Western snowy plovers (Charadrius alexandrines nivosus) are federally-listed as threatened and utilize areas in and near Bolsa Chica. Snowy plover nesting areas within Bolsa Chica include: Seasonal Ponds (Cells 2 through 13), Future Full Tidal Basin (Cells 14 through 40 and Cell 63), Muted Tidal Basin (Cells 41 through 50 and Cell 66), North Tern Island (NTI), South Tern Island (STI), Nest Site 1 (NS1), Nest Site 2 (NS2), Nest Site 3 (NS3), and the Levee Roads of the Full Tidal Basin (Figure 2). Snowy plovers likely use some additional areas in the vicinity of the Bolsa Chica, particularly as habitat for foraging or loafing. Those areas are the ocean beach immediately to the west at Bolsa Chica State Beach, Outer Bolsa Bay, Rabbit Island, and Inner Bolsa Bay to the west of West Levee Road with the exception of NTI and STI. Poor reproductive success resulting from human disturbance, subsidized predation, and inclement weather, combined with permanent or long-term loss of nesting habitat to urban development has led to the decline in active nesting colonies as well as an overall decline in the breeding and wintering population of the western snowy plover along the Pacific coast of the United States. In southern California, the very large human population and the resultant beach recreation activities by humans have precluded the western snowy plover from breeding in several historically used beach strand areas.

Coastal Salt Marsh, Estuarine Open Water, and Mudflat: Plants of the coastal salt marsh community grow along the upper reach of the coastal estuarine community where they receive only periodic inundation by sea water. Freshwater streams often flow through this community in the project area and serve to dilute the salinity of the seawater. The salt marsh community embodies several distinct components: pickleweed marsh, salt flat, saltwater channel, saltwater pond, and a disturbed component. The dominant plant is common pickleweed (Salicornia bigelovii). Other common plants include fivehook bassia (Bassia hyssopifolia), spear saltbush (Atriplex joaquiniana), saltgrass, and to a lesser extent, alkali health (Frankenia salina). Areas of higher elevation may have been subjected to periodic off-road vehicle traffic and are invaded by ruderal (or non-native weedy) species.

Tidal influence extends upstream into both the CO2/CO4 and CO5/CO6 channel systems. The tidal influence within the CO2/CO4 channel systems extends through the CO2 channel, past the CO2/CO4 confluence and approximately 1.5 miles into the CO4 channel. The tide gates located at the downstream end of the CO5 channel systems are not currently functional and tidal influence extends approximately 2.5 miles upstream of the tide gates. The channel segments subject to tidal influence in both channel systems are soft bottom channels with open water, mudflat, and established high function salt marsh vegetation in some areas. Outer Bolsa Bay has some shallow water areas and mud flats zones that are ecologically important aquatic resources.

Grassland: The undeveloped portions of the Bolsa Chica Mesa and other upland areas to the west of the Bolsa Chica lowlands support degraded grassland communities. Most of the grassland species are exotic, having been introduced to the region during the Spanish Colonial period, and competitively favored by disturbance (including historic heavy grazing). Species common to the grasslands here include bromes (Bromus sp.), mustard (Brassica sp.), filaree (Erodium sp.), Russian-thistle (Salsola tragus), and cardoon (Cynara cardunculus). Some native species persist in these areas, including needlegrass (Nassella sp.), owl's clover (Castilleja sp.), and mariposa lily (Calochortus sp.).

Freshwater Marsh, Freshwater Open Water, and Riparian: Elements of these natural communities are found within the project area in soil depressions and channels that have surface fresh water for at least part of the year, and in coastal plains near permanent slow-moving or ponded waters. Some wetland plants occur in ponds or stream channels; others float upon deep water, but most thrive at the open water margins where the soil occurs within a few feet of the water surface. Typical plants are cattails (Typha sp.), rushes (Juncus sp.), spike-rushes (Eleocharis sp.), duckweed (Lemna sp.), Douglas' water hemlock (Cicuta douglasii), and water smartweed (Pesicaria amphibian). Growing in low elevation sandy soils along freshwater waterways are small areas of medium to large trees and shrubs that can form dense or linear stands. In such communities are Fremont cottonwood (Populus fremontii), arroyo willow (Salix lasiolepis), sandbar willow (Salix exigua), and mulefat (Baccharis salicifolia).

Portions of both main project channel systems upstream of the tidally influenced segments include soft bottom channels with important areas of open water, mudflat, vegetated marsh, and some riparian communities. Upstream of the tidally influenced zone in the project's lower channels, about 3.3 miles of soft bottom channel occur within the CO5 channel, approximately 1.8 miles occur within the CO6 channel, and approximately 3.0 miles occur within the CO4 channel. Some portions of CO2/CO4 and CO5/CO6 channel systems have sediments deposited on concrete-lined channel inverts. This material and associated vegetation have be periodically removed in the past as part of channel maintenance by OCPW or eroded by larger storm flow events. Some relatively small vegetated areas are also scattered along other project channel segments within small pockets of deposited sediment in rip rap sections.

Landscaped Ornamental: This community includes areas of ornamental and non-native trees, shrubs, and ground cover associated with urban development is common in areas surrounding much of the proposed project footprint. These plant associations are artificial, perpetuated by cultural activities. For instance, Eucalyptus groves are located within portions of the Bolsa Chica area and other project area locations. Also included are mowed lawns comprised of various non-native grasses, ornamental groundcover, shrubs, and trees.

Ruderal: Ruderal vegetation is found in areas frequently disturbed such as oil production areas or along roadsides, such as along Warner Avenue east of Warner Avenue bridge at Bolsa Chica. Typically, the dominant plant species are highly adaptive and invasive plants, commonly considered to be roadside weeds; however, a few native distrubance-adapted plant species occur in these areas. Typical native plants are California croton (Croton californicus), telegraph weed (Heterotheca grandiflora), pineapple weed (Amblyopappus pusillus), and tarweeds. Introduced plants are scarlet pimpernel (Anagalis arvensis), wild oats (Avena sp.), bromes, mustards, filarees, foxtail barley (Hordeum sp.), cheeseweed (Malva sp.), sweet-clovers (Melolitus sp.), Russian-thistle, and tocalote (Centaurea melitensis).

Listed/Sensitive Species

Several listed or sensitive species have substantial potential to occur in the project study area, based on our preliminary research of the project area. These species include salt marsh bird’s-beak (Cordylanthus maritimus ssp. maritimus), San Diego button-celery (Eryngium aristulatum var. parishii), Ventura marsh milk-vetch (Astragalus pycnostachyus var. lanosissimus), California seablite (Suaeda californica), southern tarplant (Centromadia parryi australis), coast woolly-heads (Nemacaulis denudata var. denudata), California least tern, coastal California gnatcatcher (Polioptila californica californica), least Bell’s vireo (Vireo bellii pusilus), Ridgway’s rail (Rallus obsoletus levipes), western snowy plover, Belding's savannah sparrow (Passerculus sandwichensis beldingi),

California brown pelican (Pelicanus occidentalis californicus), burrowing owl (Athene cunicularia), osprey (Pandion haliaetus), northern harrier (Circus cyaneus), white tailed kite (Elanus leucurus), peregrine falcon (Falco peregrinus anatum), two-striped garter snake (Thamnophis hammondii), silvery legless lizard (Anniella pulchra pulchra), green sea turtle (Chelonia mydas), San Diego fairy shrimp (Branchinecta sandiegonensis), and wandering skipper (Panoquina errans). Within the likely project action the highest potential locations for these species to occur are within the Bolsa Chica Ecological Reserve and environs, and within wetted portions of the project channel systems. Professional evaluations and surveys for these species would be appropriate as part of project planning.

Of these species, California least tern (federally-listed as endangered) and western snowy plover (federally-listed as threatened) have relatively high potential to be affected by project construction and/or operations/maintenance of the various alternatives, particularly by activities that involve open water (e.g., dredging of Bolsa Bay), unvegetated flats, mudflat, beach, levees in or near Bolsa Chica, or shoreline zones. The area currently occupied by Huntington Harbor/Anaheim Bay/Bola Chica lagoon and environs formerly likely included several small undeveloped islands, barrier beaches, and beach/stream mouth sand spits. These islands and spits likely included unvegetated beach and ephemeral open areas and flats that historically supported California least terns and western snowy plovers. California least terns typically nest in colonies on relatively open beach areas near prey (small fish in open water areas) and that are mostly free of vegetation. Sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries are the main coastal habitats for nesting western snowy plovers.

Recommendations

We have three main recommendations per the FWCA for the proposed project:

1) We suggest that a design alternative be developed that provides for moving storm flood flows from Bolsa Bay directly to the Pacific Ocean. This would function similar to how the historic barrier beach at this location would naturally "blow out" to the ocean during flood events; this very likely occurred episodically prior to development of the area over the last century. This suggested design would likely incorporate a new bridge or a series of culverts under Pacific Coast Highway between Bolsa Bay and the ocean, as well as limited annual winter sand removal on the beach side fronting the bridge/culvert structure (in a rectangular swath to the upper beach shore) to about a foot above mean high high water level; this sand removal would be to provide for effective sand barrier breaching and erosion by Bolsa Bay flood waters, while maintaining typical human beach uses in the area on the beach side of the new bridge/culvert 99 percent of the time. By design, when water levels in Bolsa Bay are high during flood events (e.g., 10 percent storm and larger) the sand barrier to the ocean would be passively overtopped and eroded. This project feature would not function as a surface flow tidal channel to Bolsa Bay (and not function as a new ocean outlet), except for a short-term period following breaching; the barrier beach would build back up relatively quickly and naturally over the following year through littoral sand flow and wave action along the shore. The concept here is to eliminate the costs/need/impacts to modify/expand the Warner Avenue bridge and dredge Bolsa Bay to increase flood carrying capacity. Additionally, this bridge or culvert structure would be soft-bottomed, so as partially restore subsurface tidal flows between Bolsa Bay and the ocean that are currently blocked by the compacted soils of Pacific Coast Highway and packing lot subgrades. One of these culverts could also function to provide pedestrian and bicycle access under Pacific Coast Highway. See Figure 1 below.

2) We suggest that soft-bottom channels with the project channels that are proposed to be modified or eliminated (e.g., through channel lining) be retained in location and extent, wherever practicable. Retention of soft-bottom channels has substantial ecological value and would reduce project ecological impacts and the needs for associated offsetting mitigation as compared to proposed fully armored/lined channels. In most locations where project

channels are below design flood capacity and heavily constrained by adjacent development, we suggest that channels cross-sections be expanded through the use of vertical channel walls and incorporation of the footprint for channel access/maintenance roads into the channel itself (e.g., such roads would be above low-flow water levels but incorporated into the channel). In these constrained-width areas and where channel access is desired during flood events (such as for swift-water rescue activities), we suggest that only one access road be retained within proposed channel designs, in order to gain channel width. This single access road would be along the top of the channel bank (as is typical), above design high-flow water level; the often-utilized second access road along the opposite channel side would be eliminated from proposed designs. If a second access road on the adjacent side of the channel is necessary in proposed designs, it should be incorporated into the channel cross-section (to be normally flooded during storm flow events, but dry during low flows) in order to gain capacity space through increased channel horizontal channel section width.

3) We suggest that ecological restoration, mitigation for channel/dredging/bridge impacts, and increases in channel flood capacity be collectively achieved through creation of an approximately 125-acre restoration site immediately north of channel CO2, within the Naval Weapons Station Seal Beach. The main hydrological goal of this site would be restoration of both flood and low flows to the re-created historic floodplain in this area. The existing levee, boundary fencing, and access road along the Weapons Station/channel boundary would be retained, but a series of culverts would be incorporated into the existing levees to divert a portion of low and flood flows (about 50%) to and from this area of the historic floodplain on lands within the Weapons Station that are currently used for an agricultural lease. This lease is reportedly up for renewal soon. These culverts would be designed to prevent human access to the Weapons Station. Directing flood flows into and through this site would increase the effective capacity of the associated CO2 channel system to carry flood flows. This restoration area would be surrounded by new levees, as necessary, to prevent damage from flooding of adjacent lands on the Weapons Station. The restoration area would be graded to provide appropriate ground elevations and hydrology for a mix of open water, mud-flat, freshwater marsh, salt marsh, and riparian scrub natural communities commensurate with the site potential and areas affected by the project. Construction permission and access would require negotiation of construction and maintenance easements from the Weapons Station. A formal contaminants site and railroad in the area can likely be effectively avoided by the restoration activities.

This suggested restoration would cause the loss of some agricultural lease lands on the Weapons Station. Since the ecosystem associated with these channels (and most of Orange County) is heavily lacking in ecologically-intact floodplain areas, adding this restoration component to the project would go very far in making up for overall project biological impacts and would improve flood risk management, as the restoration site would increase floodwater holding-carrying capacity for the system. Negotiating the easement and access for this work with the Navy could be difficult, including access for future maintenance. The vast majority of the restoration area would normally not be subject to any maintenance (e.g., vegetation or sediment management) as part of O&M. Maintenance issues would likely remain minor over several decades, and mostly focused on removing debris from the culverts. Almost all of the new set-back levees on the Weapons Station around the restoration site would not be subject to high velocity flood flows (and thus damage) due to protection afforded them by the new, wide floodplain area. See Figure 2 below.

4) We recommend that levees associated with channel CO5 within Bolsa Chica that are no longer essential for flood risk management be removed, particularly when considering the proposed relocation of the tide gates on channel CO5 to an upstream location. It is expected that known contaminant sites within Bolsa Chica would likely need additional armoring for protection from flood risks as a result. Removal of these levees would restore tidal flow to substantial areas of Bolsa Chica that are currently subject to partially or severely muted tidal flow, as well as restore more natural estuarine flow conditions. This may also reduce or eliminate the need for dredging within Bolsa Bay and widening of the Warner Avenue bridge, as currently proposed. See Figure 3 below.

Thank you,

Jon Avery

Project Alternatives as Currently Proposed by the Army Corps

Alternative 1 – No Action

Flooding will continue throughout the Westminster watershed due to the insufficient capacity of the existing channel systems. Outer Bolsa Bay will continue to flood during frequent storm events, impacting traffic on Pacific Coast Highway. The oil wells in the Bolsa Chica Ecological Reserve will remain at risk of inundation by flows that break out of the CO5 channel upstream of the reserve and travel overland into the Muted Tidal Basin and Seasonal Pond area.

Alternative 2 - Nonstructural

Measures that are included in the nonstructural alternative are floodplain regulation, emergency response, evacuation planning, flood warning system, and removal of impediments to flow.

Floodplain Regulation: This measure seeks to regulate floodplain uses in order to minimize current and future damages by controlling construction activities and land use. This measure utilizes political and/or social controls to minimize land use activities which are incompatible with floodplain conditions, while maximizing more compatible uses such as recreation, open space, habitat, and parking. Examples of floodplain regulation tools include master plans, zoning controls, and building codes.

Emergency Response: This measure involves the development of an emergency plan that provides for dispatch of emergency services and a framework within which local agencies would operate during a flood event.

Evacuation Planning: This measure involves the development of an emergency plan that provides for the physical removal of residents of the floodplain on a temporary basis in the event of a flood.

Flood Warning System: This measure would facilitate the evacuation of flood prone areas during larger storm events.

Removal of Impediments to Flow: This measure involves the removal of vegetation, sediment, and other debris that can accumulate in the channel and interferes with the conveyance of flood flows. Removal may involve mechanical or human actions.

Alternative 3 – In-Channel Modification (Minimum Channel Improvements)

This alternative will reduce flood risk within the watershed by improving conveyance efficiency of existing channels. Trapezoidal channels within CO2, CO4, CO5, and CO6 that currently have an earthen bottom and either earthen or riprap channel banks would be lined with concrete. There would be no alteration to portions of the channels that are rectangular in shape and lined with concrete, nor to portions of the channels with in-channel box and pipe structures. Additionally, the tide gates on CO5 would be replaced in order to improve the flow conditions through the lower reaches of the CO5 channel. The current tide gates leak and therefore allow saltwater to intrude upstream in CO5. This saltwater influence extends upstream from the tide gates on CO5 approximately 2.5 miles. The replacement of the tide gates as part of this alternative would still allow for this tidal influence into the lower reaches of CO5. Lastly, this alternative also includes the widening of the Outer Bolsa Bay channel just upstream of the Warner Avenue Bridge. Widening of the channel would require that the Warner Avenue Bridge and the pedestrian bridge at the Bolsa Chica Conservancy be widened as well. Widening of the Outer Bolsa Bay channel would improve conveyance of flow through the region and the hydraulic efficiency of the lower reaches of the CO5 channel.

Alternative 4 – In-Channel Modification (Medium Channel Improvements)

This alternative will reduce flood risk within the watershed by improving conveyance efficiency and capacity of existing channels. This alternative is a hybrid between Alternatives 3 and 5. Alterations to CO2, CO4, CO5, and CO6 would be done on a reach by reach basis and could include a combination of 1) lining trapezoidal channels that currently have an earthen bottom and either earthen or riprap channel banks with concrete, 2) converting trapezoidal channels with earthen bottom and either earthen or riprap channel banks to rectangular shaped channels lined with concrete, and 3) addition of floodwalls. This alternative would also include the replacement of the tide gates on CO5 and the widening of the Outer Bolsa Bay Channel, Warner Avenue Bridge, and the Bolsa Chica Conservancy pedestrian bridge.

Alternative 5 - In-Channel Modification (Maximum Channel Improvements)

This alternative will reduce flood risk within the watershed by improving conveyance efficiency and capacity of existing channels. Trapezoidal channels within CO2, CO4, CO5, and CO6 will be replaced with rectangular concrete channels to contain a 100 year storm. Additionally, floodwalls could be constructed in the existing channel right of way where necessary. This alternative would also include the replacement of the tide gates on CO5 and the widening of the Outer Bolsa Bay Channel, Warner Avenue Bridge, and the Bolsa Chica Conservancy pedestrian bridge.

Figure 1. (above)

Figure 2 (above)

Figure 3 (above)

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Appendix K: U.S. Fish and Wildlife Service Coordination Act Report

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2.0 Additional PAL

Appendix K: U.S. Fish and Wildlife Service Coordination Act Report

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From:	Avery, Jon
To:	Herleth-King, Shawna S CIV USARMY CELRC (US)
Cc:	Bryant Chesney - NOAA Federal; Carol Roberts; Jonathan Snyder; Christine Medak
Subject:	[Non-DoD Source] Re: [EXTERNAL] Westminster
Date:	Monday, April 8, 2019 11:25:06 AM
Attachments:	2015-1118_Amended Order_R9-2013-0001_storm water.pdf

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Hi Shawna,

I hope you are well. We do not currently need a call. I have been swamped (I know,... of course). We will not be able to get you a draft CAR this month or next. I am hopeful for June. I will look into the funding issue on our end.

I do have some feedback I should to give you on project features since our last big project conference call. This email feedback can be considered like a mini Planning Aid Letter. Here are some thoughts -- some confusion seems to remain per my comments on contaminants and related issues. Typical project contaminant issues for this project area are expected considering the project type and the history and current uses in the watershed. The history for the watershed leads us to have substantial concerns for some contaminants currently in the channel soils and potentially in some of the existing levees (per soils apparently used in their construction) in the potential project footprint. These contaminants should be appropriately evaluated where ground disturbance or project-related scour/soil mobilization would potentially occur.

We have several main concerns per contaminant issues potentially associated with the proposed project:

1) Trash in water: We recommend that typical track racks or better features (e.g., we talked in the field about some new special trash removing equipment that could be deployed) be placed upstream of Bolsa Chica, such that this equipment would capture the vast majority of floating trash debris in the channels during non-storm flows before it reaches the lagoon or ocean. Substantial trash originates in the watershed and is moved by the project channels downstream to Bolsa Chica on an ongoing basis, where it builds up. Additionally, the earlier trash is caught and removed, the less the associated plastics in much of the trash breakdown into micro-plastics that can have more direct effects on fish and wildlife. Local features (such as at storm drains and parking lots) in the watershed could likely reduce these inputs during storm and non storm events; this should be combined with public outreach (e.g., signage at storm drains and channel edges, mailers, informational kiosks) by local governments in the surrounding communities.

2) Contaminants in channel soils: We recommend that appropriate evaluation/analysis and BMPs be implemented when project activities would potentially cause existing contaminants in project channel soils to become mobilized. We expect the history of contaminants released in the watershed has created this existing condition. This mobilization could occur directly through project construction activities, or indirectly through water flow changes resulting from the project. If the project channels have had sediments removed in the past then some historic contaminant loaded may have been removed. A small level of sampling would shed light in this issues.

3) Contaminants in surrounding floodplain areas potentially mobilized by future flood waters: this issue has apparently been addressed in project analysis documents; we recommend BMPs and project design features to prevent mobilization (such as oil field contaminants) from floodplain areas to Bolsa Chica lagoon waters or the ocean.

4) Contaminants in project levees: As you have heard us mention a couple times now, we have concerns with contaminants that are apparently buried within some levees in or near Bolsa Chica. These are contaminants outside the heavily armored "viewpoint" areas in the lagoon. Our concerns are for increased potential for (a) erosion of portions of these levees (e.g., from increased flow velocities caused by project channel geometry/capacity changes upstream) during storm flows, as well as from (b) mobilization of contaminants in these levees from construction-related activities in Bolsa Chica. We suggest that the levees subject to potential disturbance from either sources be identified and evaluated for contaminated fill materials that could be mobilized to downstream areas or exposed on-site as result of these anticipated changes as part of the analysis for the project. Our past experience is that some agencies are typically good about characterizing material that would be removed (for disposal or re-use), but have a poor job of characterizing what would potentially be newly exposed and thus biologically available at the surface.

5) Contaminants in water runoff: Substantial contaminants very likely originate in the project watershed and are transported through storm drains to the project channels and downstream to Bolsa Chica/ocean on an ongoing basis. Public outreach in the surrounding communities would likely be effective in reducing this contaminant loading. Partial biological water quality treatment is also likely possible through establishment/maintenance of native-vegetated wetland areas within portions of the project channels as a project alternative, with minimal effects on flood carrying capacity (e.g., freshwater marsh has a low Manning's "n" value, as it largely just lays flat in a storm flow event). This may trigger the need for some ongoing management of the marsh, but the net benefit could be accrued nonetheless.

Performing "Parcel Level Flood Detention" (with concomitant capturing of contaminants) on a wide or even moderate scale in the watershed would be difficult for this Federal project, based on current development build-out of the watershed. On the other hand, local governments in the project watershed should work with the Santa Ana Regional Water Quality Control Board to finalize the pending Orange County National Pollution Discharge Elimination System (NPDES) Storm Water Permit in order to implement more stringent onsite storm water management similar to the requirement being implemented by the San Diego Regional Water Quality Control Board through their municipal permits, which include requirements for investigated and eliminating illicit discharges in currently developed areas and best management practices for new development or redevelopment that reduce/remove pollutants from storm water and urban run-off. This would likely go a long way in reducing modern contaminants from entering the project channels (and reduce flood volume peaks within the project). Attached is the current San Diego permit; our understanding is the even more stringent requirements will be likely in the new permit.

Cheers,

Jon

~Jon

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Jon Avery
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On Wed, Apr 3, 2019 at 5:55 AM Herleth-King, Shawna S CIV USARMY CELRC (US) <Shawna.S.Herleth-King@usace.army.mil <mailto:Shawna.S.Herleth-King@usace.army.mil> > wrote:

Hi Jon,

I wasn't sure if you thought we needed to have a call today or not. We have that monthly call scheduled at 12 pst/2 cst. We are in the process of getting you funding MIPRd. The funds have been obligated on our end, but it looks like there is a hold up somewhere (I'm not sure if it is on your end or our end). I will try and figure it out this week, so you get the funding for the Coordination Act Report. Do you think you will have a draft CAR to us sometime this month? Know you are extremely busy.

Appreciate everything and just let me know if you want to still have a call today or if there is no need I will cancel. Thanks!

Kind Regards,
Shawna

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FACEBOOK: Blockedhttp://www.facebook.com/usacechicago

Appendix K: U.S. Fish and Wildlife Service Coordination Act Report

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3.0 Draft Coordination Act Report

Appendix K: U.S. Fish and Wildlife Service Coordination Act Report

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United States Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, California 92008

In Reply Refer to:
FWS-OR-08B0229-19CPA0256-19E03080

July 31, 2019
Sent by Email

Colonel Aaron Reisinger
U.S. Army Corps of Engineers, Chicago District
231 S. LaSalle Street, Suite 1500,
Chicago, Illinois 60604

Subject: Draft Coordination Act Report for the Proposed Westminster, East Garden Grove Flood Risk Management Project, Orange County, California

Dear Colonel Reisinger:

The U.S. Fish and Wildlife Service (Service) has prepared this Draft Coordination Act Report (Draft CAR) for the U.S. Army Corps of Engineers (Corps) on the proposed Westminster, East Garden Grove Flood Risk Management Project (Project) to describe biological resources, project-area opportunities and constraints, and provide recommendations related to the conservation and enhancement of fish and wildlife resources. The Corps has worked with Orange County Public Works to advance a feasibility study for proposed flood risk management structures and activities in the Project area; this study is known officially as the Westminster, East Garden Grove Flood Risk Management Study, Draft Integrated Feasibility Report, Environmental Impact Statement/Environmental Impact Report (Corps 2018).

INTRODUCTION

The proposed Project primarily involves modifications to four existing channels to improve flood risk management associated with existing development surrounding these channels. The Project area is located entirely within what is known as the Westminster Watershed in western Orange County, California, approximately 25 miles southeast of the City of Los Angeles. The Project area includes portions of four non-federal drainage channels (former streams, generally) within the watershed. The receiving waters of one of the channel systems is the Bolsa Chica Ecological Reserve (BCER); for another Project channel the receiving waters is Anaheim Bay. The noted watershed is approximately 87 square miles in area and is almost entirely urbanized, except for at its lower ends at BCER and Anaheim Bay. Analysis by the Corps and Orange County indicates that flooding overtops the existing drainage channel infrastructure in the study area between the 20 percent and 10 percent annual chance of exceedance storm events (i.e., 5 and 10 year recurrence intervals, respectively), putting approximately 44,000 structures at risk of inundation from floods.

The Westminster Watershed Feasibility Study was a joint cooperative effort between Corps and the County of Orange on behalf of the Orange County Flood Control District (OCFCD). In 2001, the Corps initiated a comprehensive watershed study. A Reconnaissance Study was completed in

June 2001. Although it was titled the: "Westminster Watershed Reconnaissance Study," it covered three Orange County watersheds: Coyote Creek, Carbon Creek, and Westminster Channel. Upon completion of the Reconnaissance Study, the scope of the study shifted focus away from a watershed feasibility study to a flood risk management feasibility study. Specifically, the current study focuses on the Westminster, East Garden Grove-Wintersberg, and Ocean View creek channel systems within the Westminster Watershed. In 2003, the Corps and OCFCD entered into a cost share agreement to develop solutions for comprehensive flood protection, ecosystem restoration, and water quality improvements for the watershed. In October 2018 the Corps published the Westminster, East Garden Grove Flood Risk Management Study, Draft Integrated Feasibility Report, Environmental Impact Statement/Environmental Impact Report.

The purpose of the Corps' feasibility study for the proposed Project is to evaluate "residual" flood risk within the Westminster Watershed. This residual risk is after the risk that remains following the recent completion of channelization improvements of the Santa Ana River and the subsequent removal of the Westminster Watershed from the Santa Ana River floodplain. The flood risk to human structures within the Westminster watershed can be attributed to the combination of development within the watershed (e.g., impervious surfaces in non-floodplain areas) as well as development within floodplains (e.g., structures constructed in the floodplain). The current configuration of drainage channels collects runoff generated within the watershed and conveys storm runoff and urban flows from the watershed ultimately to the Pacific Ocean. The study area floodplain region is reportedly the only developed area within Orange County that remains within the Federal Emergency Management Agency 1 percent Floodplain (i.e., that associated with the 100 year recurrence interval storm).

The main notable features of the Project area include:

1. *Bolsa Chica Ecological Reserve (at the downstream end of Channel C05)*: BCER is a protected biologically sensitive area.

2. *Non-functioning tide gate and existing tidal influence on the C05 Channel*: On the C05 channel is a tide gate in Reach 1 that originally served to regulate and manage the coastal tidal surface water influence. The tide gate is operated by Orange County Public Works. Tidal influence is also important on a portion of the C02 Channel.

3. *Anaheim Bay-Seal Beach National Wildlife Refuge*: The Refuge is part of the extensive San Diego National Wildlife Refuge (NWR) Complex and is located within the Naval Weapons Station Seal Beach (NWSSB). It encompasses 965 acres of remnant saltwater marsh in the Anaheim Bay estuary and serves as a significant stopover and wintering area along the Pacific Flyway for shorebirds. The Service operates the Nature Center on the Refuge in cooperation with the Navy.

4. *Huntington Harbour*: The Harbour is the current direct discharge point for Channel C02 and includes public and private marinas and facilities that are used by the public. Huntington Harbour also receives flows from the terminus of C05.

The proposed Project would involve portions of four drainage channels with receiving waters that flow into the BCER, Huntington Harbour, Anaheim Bay, and the Pacific Ocean (Figure 1).

The Corps feasibility study analyses were focused on potential modifications to the four channels consisting of:

C02 – Bolsa Chica Channel: The Project involves a portion of the C02 channel that is approximately 1.5 miles long and provides flood risk management for Huntington Beach, Huntington Harbour, and the NWSSB.

C04 – Westminster Channel: The C04 channel is about 7.8 miles long and provides flood risk management for the cities of Garden Grove, Westminster, and Huntington Beach.

C05 – East Garden Grove/Wintersburg Channel: The C05 channel is about 11.6 miles long and provides flood risk management for the cities of Santa Ana, Garden Grove, Westminster, and Huntington Beach.

C06 – Ocean View Channel: The C06 channel is about 4.1 miles in length and provides flood risk management for the cities of Fountain Valley and Huntington Beach.

The four channels included in the proposed Project are divided by the Corps into discrete reaches, based primarily on the varying physical conditions within the channels throughout the Project area, including: concrete rectangular channels, riprap-lined trapezoidal channels, concrete-lined trapezoidal channels, enclosed culverts, levees, and steel sheet pile.

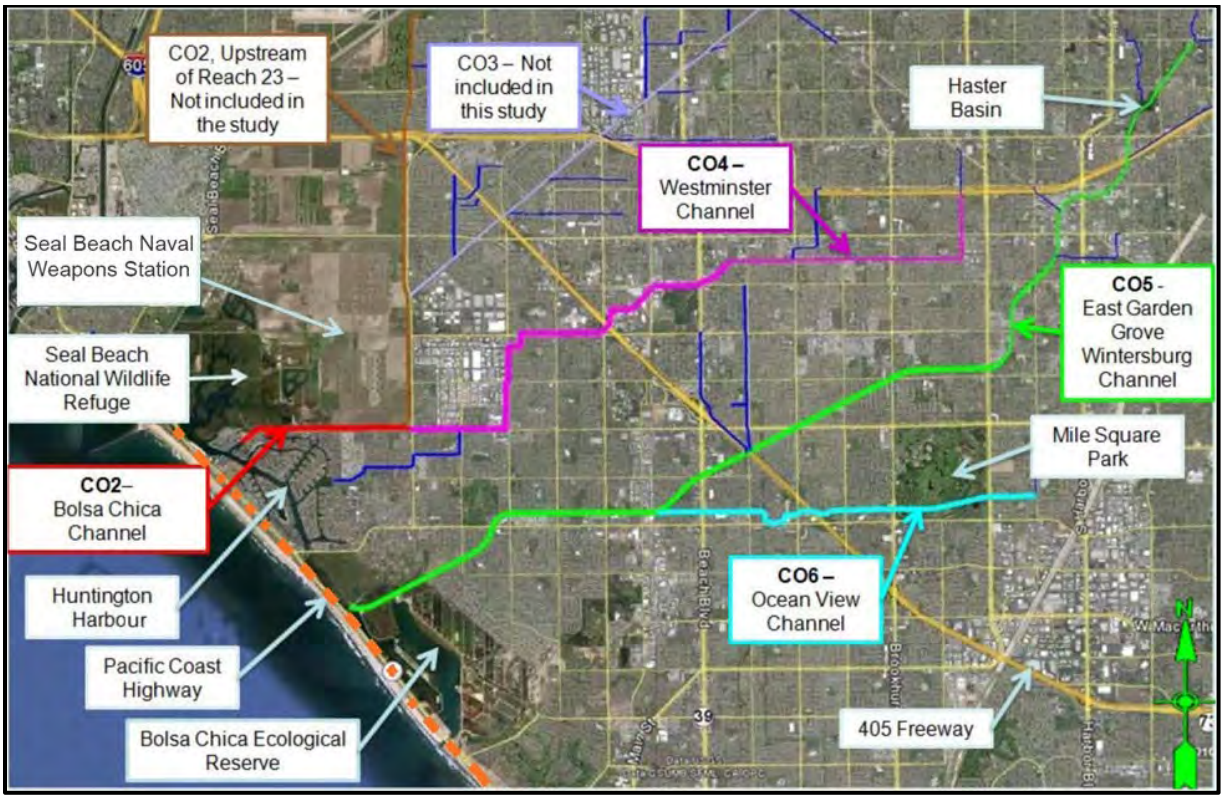

Figure 1. Project Area and Drainage Channels

This draft CAR is provided in accordance with the Fish and Wildlife Coordination Act (FWCA) of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq*.), the Endangered Species Act (ESA) of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq*.), and the scope of work agreed upon by the Corps and the Service. This CAR does not constitute the report of the Secretary of the Interior as required by section 2(b) of the FWCA, nor does it constitute a biological opinion under section 7 of the ESA. The purpose of this CAR is to deliver information and recommendations for use by the Corps design team in developing goals, objectives, and alternatives for the Project.

BACKGROUND

In 2005, average global financial losses due to flooding damage were estimated to be $6 billion, and this is expected to increase to $52 billion by 2050 based on projected socio-economic changes alone for the 136 largest coastal cities in the world (Hallegatte *et al*. 2013). Floods occurring in developed areas often cause economic damage, and this may well escalate in many areas with the predicted changes in climate, as a consequence of the increased frequency and severity of rainfall phenomena (Neri-Flores 2019).

Southern California's coastal wetlands are an interrelated set of resources that collectively provide a broad suite of ecological, hydrological, biogeochemical, and societal functions. The southern California coast supported approximately 48,000 acres of estuarine natural communities before development that has occurred over the last 150 years (Grossinger *et al*. 2011). Approximately 40 percent of this area was vegetated wetlands (e.g., salt marsh), 25 percent was unvegetated wetlands (e.g., salt flat and mudflat), and the remaining 35 percent was subtidal water. In addition to these natural community types, an additional 14,000 acres of "other wetlands" types occurred in coastal southern California, including: wetland dune and beach, woody vegetated wetlands, high marsh, isolated ponds, and riverine community wetlands. Since circa 1850, an overall loss of 23,000 acres (48 percent) of historical estuarine wetland community types has occurred along the southern California coast (Grossinger *et al*. 2011) that included the Project area. Estuarine vegetated wetlands have experienced the greatest loss in terms of absolute area (around 14,000 acres, a 75 percent loss), while estuarine unvegetated wetlands have experienced the greatest proportional loss of 78 percent of the historical extent. In contrast, the contemporary landscape represents a 5 percent increase in subtidal water natural communities from the historical extent. These differential losses have shifted the proportional composition of southern California estuaries (Grossinger *et al*. 2011). Historically there was a relatively even split between estuarine vegetated (40 percent), estuarine unvegetated (25 percent), and subtidal water (35 percent). Currently the proportional composition is artificially heavily weighted towards subtidal water (71 percent), while estuarine vegetated (19 percent) and unvegetated (10 percent) make up less than ⅓ of the total area combined. Most of these changes resulted from channelization of the lower reaches of rivers and streams, development of floodplains, filling of estuaries, and marina/harbor development (Grossinger *et al*. 2011). The lower reaches of the Project channels represent remnants of these noted coastal wetland community types, mostly subtidal and intertidal water.

Similarly, the upper reaches of the Project channels are heavily modified remnants of freshwater creeks and streams that formerly drained the Project area. The rich soils and presence of water that make stream riparian areas biologically rich, also create productive lands for agriculture and

desirable locations for urban development. As the Project area developed, these creeks and streams were type-converted to function as primarily urban run-off and flood conveyance structures for the purpose of human safety. These practices have removed the majority of riparian habitats available to biota and people along these former streams and vastly reduced the ability of rivers and floodplains to provide stream ecological services. Some open water habitats remain in many of the Project channel reaches.

FISH AND WILDLIFE COORDINATION ACT

The Fish and Wildlife Coordination Act of 1934 included requirements that were the first formal expressions in U.S. law of a duty to minimize the negative environmental impacts of major water resource development projects and to compensate for those impacts that remained (Bean 2016).

The FWCA was a response to a U.S. era of big dam building and reflected a concern for the impact of those dams, particularly on anadromous fish (Bean 2016). As originally enacted in 1934, it required consultation with the Bureau of Fisheries (as the Service was then known) prior to the construction of any dam to determine if fish ladders or other aids to migration were necessary and economically practical to minimize impacts on fish populations. It required, as well, the opportunity to use the impounded waters for hatcheries to offset impacts that could not otherwise be avoided. The duties imposed by the FWCA were reinforced and expanded by the National Environmental Policy Act of 1969 (NEPA; Bean 2016). Under NEPA and its implementing regulations, all federal agencies have a duty to assess the impacts of the major actions they propose to undertake and to consider reasonable alternatives to reduce or eliminate those impacts (Bean 2016). The Service, as the federal agency charged by Congress in the Fish and Wildlife Act of 1956 with the responsibility for management, conservation, and protection of fish and wildlife resources, routinely recommends mitigation measures to other federal agencies through the NEPA and FWCA processes (Bean 2016).

The FWCA directs and authorizes consultation, reporting, consideration, and installation/operation of fish and wildlife conservation features. The authorities of the FWCA are considered to be “supplementary legislation” to the various Federal project authorizations, such as the Corps public works authorizations (Smalley and Mueller 2004). The FWCA conditions or supplements other water development statutes to require consideration of recommendations generated under the FWCA procedures, including portions of the Clean Water Act [*Zabel* v. *Tabb*, 430 F2d 199 (5th Cir. 1970) cert. denied 401 U.S. 910 (1972)]. For Federal water resources development projects, the FWCA requires that fish and wildlife conservation receive equal consideration by Federal agencies with other project purposes, and that such conservation be coordinated with other project features. The FWCA authorizes the Federal project implementation of these noted means and measures for both mitigating losses of fish and wildlife resources, and for enhancing these resources beyond the offsetting of project effects (Smalley and Mueller 2004).

PROJECT DESCRIPTION

The Project, as proposed, would involve implementing flood risk management measures (predominately modifications to four existing drainage channels) in the Westminster watershed in Orange County, California. The planning objectives for the Project are:

1. Reduce the risk of flood damages to structures and infrastructure: Reduce the depth, duration, and likelihood of flooding at residential and commercial structures, as well as infrastructure, such as roadways, caused by flooding of the C02/C04 and C05/C06 channel systems in the Westminster watershed during storm events over the 50 year period of analysis.

2. Reduce life-safety risk associated with overbank flooding: Reduce the depth, duration, and likelihood of flooding at key public facilities and access routes required for emergency services caused by flooding of the C02/C04 and C05/C06 channel systems in the Westminster watershed during storm events and improve flood preparedness over the 50 year period of analysis.

3. Reduce the risk of downstream flood damages: Reduce the depth, duration, and likelihood of existing flooding in the vicinity of Outer Bolsa Bay [including flooding along Pacific Coast Highway (PCH)] and reduce the impact of increased storm flows into the bay associated with recommended channel modifications upstream over the 50 year period of analysis.

4. Promote compatible recreation: incorporate and protect access to recreation opportunities such as walking and wildlife viewing in the study area, particularly in the vicinity of BCER over the 50 year period of analysis.

Several planning constraints[1] for the Project are noted by the Corps:

1. Limit extensive changes to local land use designations and zoning by limiting channel modifications to within the existing channel right of way, when feasible.

2. Minimize impacts to culturally sensitive areas.

3. Limited change in elevation across the watershed reduces opportunities for lowering the invert of the existing channel systems.

4. Alternatives plans should avoid induced adverse hydraulic impacts relative to existing conditions and comply with floodplain management requirements.

[1] As noted in the draft Project Feasibility Study, the listed Corps' planning constraints are unlike planning objectives that represent desired positive changes or opportunities. These planning constraints represent restrictions that the Corps has determined should not be violated for the proposed project. Further, the Corps has determined that Project "plan formulation" must provide safe conditions in the interest of public safety and be socially acceptable.

Project Alternatives

The Project currently involves three alternatives, including the No Action Alternative. The two proposed Project alternatives are termed the (1) Minimal Channel Modifications Plan Alternative and the (2) Maximum Channel Modifications Plan Alternative. It should be noted that previous versions of these proposed alternatives included construction of a floodwall along PCH where the road closely parallels the western edge of Bolsa Bay. Additionally, both proposed alternatives originally included replacement of the existing tide gates on Reach 1 of Channel C05. Based on recent changes in Project designs, the PCH floodwall and the replacement of the tide gates on Channel C05-Reach 1 are no longer part of either proposed alternative, and the existing tide gates would be fully removed as part of both proposed alternatives (Corps 2019, pers. comm.).

The two proposed Project alternatives both include increasing the span of Warner Avenue Bridge and channel modifications; however, the extent of the channel modifications and the duration of construction would occur vary among the alternatives. The two proposed Project alternatives also include nonstructural measures including removal of sediment, debris, and vegetation within the channels that may currently constrict conveyance within the channels. No major change to the tidal influence within the channels would occur with implementation of the nonstructural measures, but the biological functions may be adversely affected with the removal of vegetation as a part of these measures.

The Minimum Channel Modifications Plan is the Corps' Tentatively Selected Plan (TSP; the Corps' preferred alternative). The TSP would reduce flood risk by lining the existing drainage channels with concrete, thus increasing flow conveyance efficiency. The Maximum Channel Modifications Plan has been identified as the Locally Preferred Plan (LPP). It would reduce flood risk by altering the geometry of existing drainage channels to increase conveyance efficiency and storage capacity. Both of these alternatives would include additional downstream measures to address the impacts of increased flood flow conveyance resulting from the channel modifications. These downstream measures include increasing the span of Warner Avenue Bridge. As proposed, compatible nonstructural measures would also be also included in the TSP alternative to lessen the human life safety risk associated with flooding in the Project area. Each plan alternative would require mitigation to address the loss of habitats. The TSP has an estimated first cost of $823,541,000 and includes proposed mitigation measures for the direct loss of approximately 24 acres of wetlands/habitats. The LPP has an estimated first cost of $1,475,295,000 and includes proposed mitigation measures for the direct loss of approximately 9 acres of wetlands/habitats.

Minimum Channel Modifications Plan:

Under the proposed Minimum Channel Modifications Alternative, existing earthen or riprap-lined channels would be paved with concrete to increase stormflow water conveyance efficiency. Hydrologic and hydraulic[2] (H&H) modeling by the Corps determined that widening Warner Avenue Bridge and removing the tide gates on C05 Reach 1 would also be necessary measures to

[2] **Hydrologic** and **hydraulic** (**H&H**) modeling is computer software modeling that simulates rainfall runoff flows to predict the extent of channel, creek, and stream water surface levels and flooding and to test ways to reduce the flooding without actually constructing the project.

implement in the Minimum Channel Modifications Plan Alternative, and that leveed sections of channels C02 and C05 (reaches 23 and 1, respectively) would need to be modified to what was termed by the Corps as the "maximum condition."

Table 1: Minimum Channel Modifications Plan Alternative in C02/C04 on a reach-by-reach basis, compared to existing conditions.

Channel	Reach	EXISTING CONDITIONS	MINIMUM CHANNEL MODIFICATIONS
C02	23	Earthen trapezoidal	Widened to 230' soft bottom with double sheet piles on both sides
C04	20	Riprap lined trapezoidal from C02 to Bolsa Chica Street; Earthen & riprap trapezoidal from Bolsa Chica Street to Graham Street; Earthen trapezoidal from Graham Street to McFadden Avenue; Riprap trapezoidal from McFadden Avenue to Bolsa Avenue; Earthen & riprap trapezoidal from Bolsa Avenue to Edwards Street Concrete lined rectangular from Edwards Street to I-405	Concrete lined trapezoidal from C02 to Edwards Street; Concrete lined rectangular from Edwards Street to I-405 (existing);
C04	21	Concrete lined rectangular	Concrete lined rectangular;
C04	22	Concrete lined compound from Beach Blvd to Magnolia Street; Concrete rectangular with soft bottom from Magnolia Street to Brookhurst; Riprap trapezoidal from Brookhurst Street to Westminster Avenue; Concrete lined trapezoidal from Westminster Avenue to SR-22	Concrete lined compound from Beach Blvd to Magnolia Street; Concrete rectangular (sides and bottom) from Magnolia Street to Brookhurst; Concrete lined trapezoidal from Brookhurst Street to SR-22;

Table 2: Minimum Channel Modifications Plan Alternative in C05/C06on a reach-by-reach basis compared to existing conditions.

Channel	Reach	EXISTING CONDITIONS	MINIMUM CHANNEL MODIFICATIONS
C05	1	Earthen levee from tide gates to Graham Street w/ some Steel Sheet Pile (SSP) on south bank below Graham Street; SSP rectangular from Graham Street to Warner Avenue; Earthen levees from Warner Avenue to 1,300 ft upstream of Edwards Avenue	Sheet pile/soft bottom/splash walls (various heights) from tide gates to existing rectangular channel east of Edwards Avenue and west of Goldenwest Street
C05	2	Concrete lined rectangular	Concrete lined rectangular with 1' splash walls from Goldenwest St to Gothard St; Concrete lined rectangular from Gothard Street to C05/C06 confluence Replace crossing at Goldenwest St

Channel	Reach	EXISTING CONDITIONS	MINIMUM CHANNEL MODIFICATIONS
C05	3	Riprap lined trapezoidal from C05/C06 confluence to Woodruff Street; Concrete rectangular from Woodruff Street to I-405	Concrete lined trapezoidal from confluence with C06 to Beach Blvd; Concrete lined rectangular from Beach Blvd. to I-405
C05	4	Concrete lined rectangular from I-405 to Quartz Street; Riprap lined trapezoidal from Quartz Street to Bushard Street	Concrete lined rectangular from I-405 to Magnolia Street; Concrete lined trapezoidal from Magnolia Street to Bushard Street
C05	5	Riprap lined trapezoidal from Bushard Street to Brookhurst Street; 1,300 ft of concrete lined trapezoidal upstream of Brookhurst Street; Riprap lined trapezoidal to 3rd St	Concrete lined trapezoidal
C05	6	Concrete lined trapezoidal	Concrete lined trapezoidal
C05	7	Covered concrete conduit	Covered concrete conduit
C05	8	Concrete lined trapezoidal	Concrete lined trapezoidal
C05	9	Concrete lined trapezoidal	Concrete lined trapezoidal
C05	10	Covered concrete conduit	Covered concrete conduit
C05	11	Covered concrete conduit	Covered concrete conduit
C05	12	Concrete lined trapezoidal (first 1400') and covered concrete conduit (next 1000')	Concrete lined trapezoidal (first 1400') and covered concrete conduit (next 1000')
C06	13	Earthen trapezoidal from C05/C06 confluence to Beach Blvd./RT-39; Riprap lined trapezoidal from Beach Blvd./RT-39 to Ross Lane	Concrete lined trapezoidal
C06	14	Concrete lined rectangular	Concrete lined rectangular
C06	15	Covered concrete conduit	Covered concrete conduit
C06	16	Concrete lined rectangular	Concrete lined rectangular
C06	17	Earthen and riprap lined trapezoidal	Concrete lined trapezoidal
C06	18	Mile Square Park - concrete low flow v-channel	Mile Square Park - concrete low flow v-channel
C06	19	Riprap lined trapezoidal	Concrete lined trapezoidal

Maximum Channel Modifications Plan:

Under the proposed Project Maximum Channel Modifications Alternative, trapezoidal channels would be reconfigured to have a rectangular cross sectional geometry. This would increase both conveyance and capacity. This alternative is designed to contain the 1 percent Annual Chance of Exceedance (ACE) storm event. For reaches that do not contain the 1 percent ACE event after conversion to a concrete rectangular channel, floodwalls would be also added.

H&H modeling by the Corps determined that widening Warner Avenue Bridge and removing the tide gates on C05 Reach 1 would also be necessary measures to implement in the Maximum Channel Modifications Plan Alternative.

Table 3: Maximum Channel Modifications Plan Alternative in C02/C04on a reach-by-reach basis compared to existing conditions.

Channel	Reach	EXISTING CONDITIONS	MAXIMUM CHANNEL MODIFICATIONS
C02	23	Earthen trapezoidal	Widened to 230' soft bottom with double sheet piles on both sides
C04	20	Riprap lined trapezoidal from C02 to Bolsa Chica Street; Earthen & riprap trapezoidal from Bolsa Chica Street to Graham Street; Earthen trapezoidal from Graham Street to McFadden Avenue; Riprap trapezoidal from McFadden Avenue to Bolsa Avenue; Earthen & riprap trapezoidal from Bolsa Avenue to Edwards Street Concrete lined rectangular from Edwards Street to I-405	80' Concrete rectangular with middle 48' left earthen from C02 to McFadden Avenue; 68' Concrete rectangular with middle 40' left earthen from McFadden Avenue to Bolsa Avenue; 55' Concrete rectangular from Bolsa Avenue to Edwards Street; 3 crossings replaced of different dimensions
C04	21	Concrete lined rectangular	Navy railroad reroute pending
C04	22	Concrete lined compound from Beach Blvd to Magnolia Street; Concrete rectangular with soft bottom from Magnolia Street to Brookhurst; Riprap trapezoidal from Brookhurst Street to Westminster Avenue; Concrete lined trapezoidal from Westminster Avenue to SR-22	Base of concrete lined channel increased to 35' from Beach Blvd to Magnolia Street; Soft bottom channel from Magnolia Street to Brookhurst Street concrete lined; Concrete lined trapezoidal from Brookhurst Street to Westminster Avenue; 18' Concrete rectangular from Westminster Avenue to SR-22; 12 crossings replaced of different dimensions

Table 4: Maximum channel modifications in C05/C06on a reach-by-reach basis compared to existing conditions.

Channel	Reach	EXISTING CONDITIONS	MAXIMUM CHANNEL MODIFICATIONS
C05	1	Earthen levee from tide gates to Graham Street w/ some SSP on south bank below Graham Street; SSP rectangular from Graham Street to Warner Avenue; Earthen levees from Warner Avenue to 1,300 ft upstream of Edwards Avenue	Sheet pile/soft bottom/splash walls (various heights) from tide gates to existing rectangular channel east of Edwards Avenue and west of Goldenwest Street
C05	2	Concrete lined rectangular	Concrete rectangular with 1' splash walls from Goldenwest St to Gothard St; Concrete rectangular from Gothard Street to C05/C06 confluence; replace Goldenwest St crossing
C05	3	Riprap lined trapezoidal from C05/C06 confluence to Woodruff Street; Concrete rectangular from Woodruff to 405	Concrete lined rectangular; Some section of 1' splash wall between Beach Blvd and Woodruff Road; 2 crossings replaced of different sizes
C05	4	Concrete lined rectangular from 405 to Quartz; Riprap trapezoidal from Quartz Street to Bushard Street	Concrete lined rectangular with splash walls (various heights); 3 crossings replaced of different sizes
C05	5	Riprap lined trapezoidal from Bushard Street to Brookhurst Street; 1,300 ft of concrete lined trapezoidal upstream of Brookhurst Street; Riprap lined trapezoidal to 3rd St	Concrete lined rectangular with splash walls (various heights); 6 crossings replaced of different dimensions
C05	6	Concrete lined trapezoidal	Concrete lined rectangular; 1 crossing replaced
C05	7	Covered concrete conduit	Replace crossing at New Hope & Hazard
C05	8	Concrete lined trapezoidal	Concrete lined rectangular; 3 crossings replaced of different sizes
C05	9	Concrete lined trapezoidal	Concrete lined rectangular; 5 crossings replaced of different sizes
C05	10	Covered concrete conduit	Covered concrete conduit
C05	11	Covered concrete conduit	Replace crossing at Aspenwood
C05	12	Concrete lined trapezoidal (first 1400') and covered concrete conduit (next 1000')	Concrete lined rectangular with splash walls (various heights); Haster Basin inlet culverts modified
C06	13	Earthen trapezoidal from C05/C06 confluence to Beach Blvd./RT-39; Riprap lined trapezoidal from Beach Blvd./RT-39 to Ross Lane	Concrete lined rectangular at confluence; Concrete lined trapezoidal from confluence to Ross Street; 2 crossings replaced of different sizes
C06	14	Concrete lined rectangular	Concrete lined rectangular from Ross Street to Asari Lane; Concrete lined rectangular with splash walls (1.5-2') from Asari Lane to Riverbend Drive
C06	15	Covered concrete conduit	Covered concrete conduit; 1 crossing replaced
C06	16	Concrete lined rectangular	Concrete lined rectangular, widened to 30’

Channel	Reach	EXISTING CONDITIONS	MAXIMUM CHANNEL MODIFICATIONS
C06	17	Earthen and riprap lined trapezoidal	Concrete lined trapezoidal, ~1 ft splash walls
C06	18	Mile Square Park-concrete low flow v-channel	Mile Square Park-concrete low flow v-channel
C06	19	Riprap lined trapezoidal	Concrete lined trapezoidal

PROJECT REGION HISTORY

The coastal area of the general Project region was formed by sediments deposited over millennia by the Los Angeles, San Gabriel, and Santa Ana rivers and smaller streams), in a multi-river delta at the coast and shelf of San Pedro Bay, a hook-shaped bight in the coastline of southern California (Wiegel 2009) (see Figure 2). San Pedro Bay spans between Point Fermin (southeastern tip of Palos Verdes Hills) on the northwest and Newport Bay/Corona del Mar bluffs at the southeast (Wiegel 2009). This 30-mile long coastal area has been extensively modified by anthropogenic activities, including construction of dams for flood risk management (which also trap sediments including beach sand) and river and stream mouth structures, ground subsidence owing to oil, gas and water withdrawal, structures and dredging at the entrances of bays (e.g., Alamitos, Anaheim, and Newport), development and operation of marinas and navigation channels, and encroachment by buildings and infrastructure. Sandy beaches occur along most of the shore of San Pedro Bay (Wiegel 2009). Most of the lower reaches of the Project area were originally a shallow estuary and mudflat. Anahiem Bay, Huntington Harbour, and Bolsa Chica Bay were historically characterized by substantial subtidal channels, extensive tidal flats, vegetated wetlands, and marsh ponds (Grossinger *et al*. 2011) (see Figures 2–6).

For about a century, Bolsa Chica Bay was connected to Anaheim Bay via Outer Bolsa Bay by a manmade channel (canal) that was dug in 1899 from the outer bay; with a tide gate at the easterly end of the outer bay (Wiegel 2009). Also in 1899, direct tidal flow from the ocean to Bolsa Bay and most of the Bolsa Chica estuary was blocked by construction of a dam across the natural lagoon mouth, installed for the Bolsa Chica Gun Club to improve conditions for waterfowl hunting (Urashima 2012) (see Figures 7–10). The gun club also reportedly installed a series of earthen levees in Bolsa Chica lagoon in 1899 to create ponds to increase waterfowl numbers for hunting; these levees and dams reportedly blocked navigation through the lagoon (Urashima 2012). The *Bolsa Chica Lowlands Restoration Project*, completed in 2006, included a non-navigable ocean entrance which was constructed through the beach at the south end of BCER, rather than a connection to Anaheim Bay and its ocean entrance via the canal and Huntington Harbour (Wiegel 2009). The East Garden Grove/Wintersburg flood channel does not discharge into the *Bolsa Chica Lowlands Restoration Project*. Rather, it currently remains connected, with a non-functional tide gate, to Outer Bolsa Bay, thence through the canal, Huntington Harbour, Anaheim Bay and its ocean entrance.

Thomas Talbert[3] wrote the following of the late 19th century history of Project region: “In the time of heavy floods the Santa Ana River has frequently joined the Freeman River (sic, Creek) to empty into the ocean at Los Patos, Bolsa Chica, It has even been known to swing far enough to

[3] Thomas Talbert was a farmer and store keeper in the Huntington Beach region in the 1890's and a councilman and mayor of Huntington Beach in the 1930s. The “Freeman River” referred to was roughly in the same location as Wintersburg Channel C06 in its lower reaches near the BCER.

the west to join the San Gabriel River and flow out through Alamitos Bay. When this occurred, it was possible to go by boat from the Costa Mesa Bluffs to the Fred Bixby ranch in Long Beach."

Substantial ground subsidence has occurred in Project region over the last 80 years, mostly caused by the removal of hydrocarbons from underground oil wells in the area. Beginning in the 1960s, water was injected underground in the Project area, which stabilized much of the affected area. Estimated ground subsidence in the Project area between 1933 and 1964 was about 0.5 foot at Warner Ave. near the coast, 1.0 foot near the artificial dam in mouth Bolsa Chica (Bolsa Bay), and 1.5 feet near Huntington Mesa (Wiegel 2009). The largest estimated subsidence in the Project area during 1933-1964 was in the area of the southwest (offshore) of Bolsa Chica Bay, at about 4.0 feet (Wiegel 2009). Plotted subsidence data for 1976 through 1985 indicated subsidence along PCH and within the BCER area and environs ranged from 0.002 feet/year at Los Patos (Warner Ave.), to 0.01 feet/year in the middle of the BCER wetlands, to 0.04 feet/year at Huntington Mesa (Wiegel 2009).

Seawater intrusion into the coastal aquifers in the Project region has occurred as a result of pumping water from local wells for use in agriculture, industry, and municipalities (Wiegel 2009). Hydraulic barriers have been constructed and operated in the region to reduce the amount of seawater infiltration from the ocean (e.g., Ostrom 1965; Cho 2009). The first hydraulic barriers were constructed in the Project region in the 1950's; these substantially decreased the amount of seawater that penetrated the freshwater aquifers (e.g., Edwards and Evans 2002). The barriers consist of sets of closely spaced wells drilled and used" ...to inject freshwater into the ground, creating hydraulic pressure ridges or barriers to saltwater intrusion.

Figure 2. Coastal wetlands in the general Project Region in 1894.

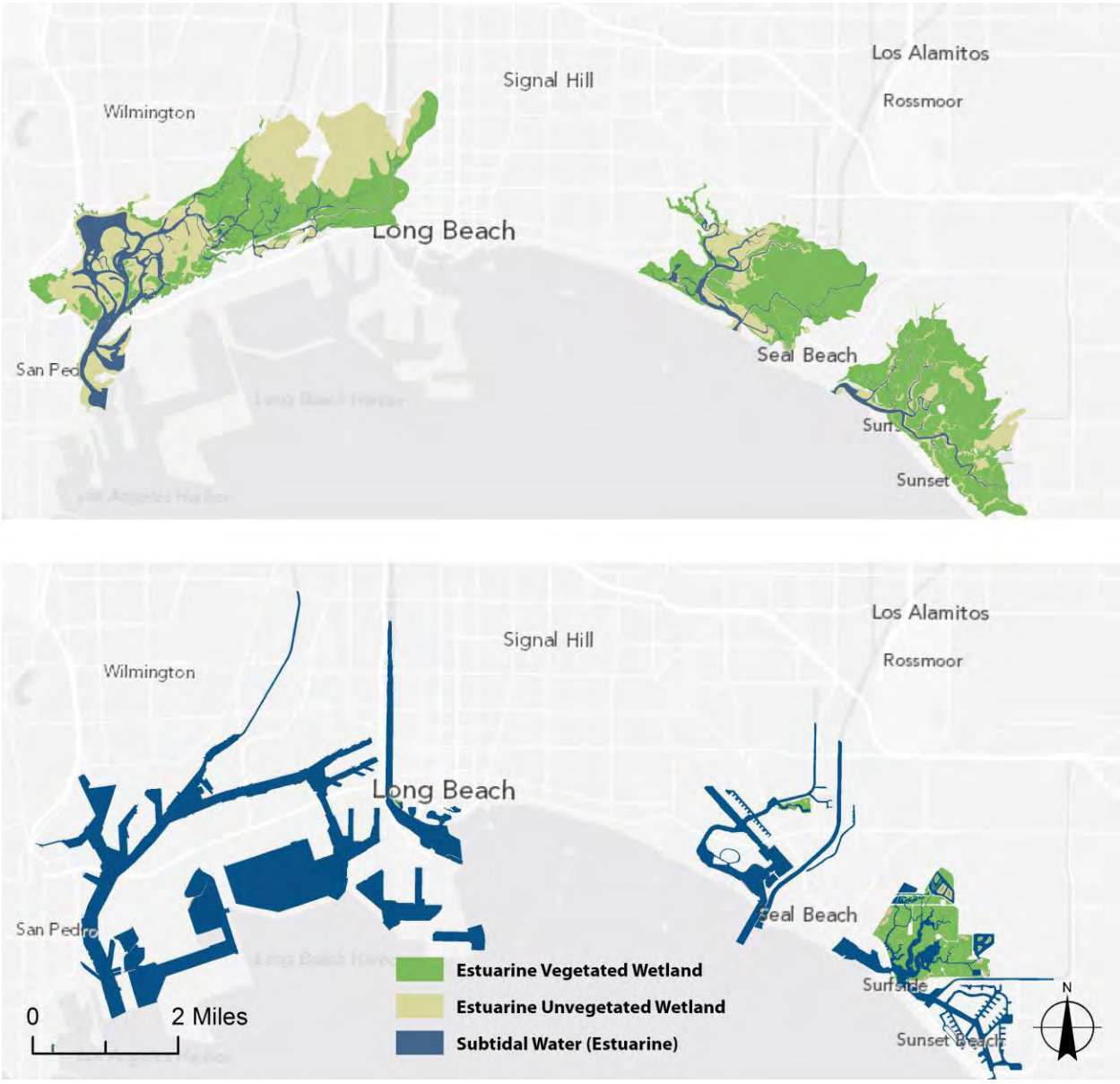

Figure 3. Comparison of historical and contemporary estuarine wetlands in Los Angeles/Long Beach Harbor, Alamitos, and Seal Beach (Grossinger *et al*. 2011). Note the substantial conversion of lagoon historical vegetated wetlands to subtidal water.

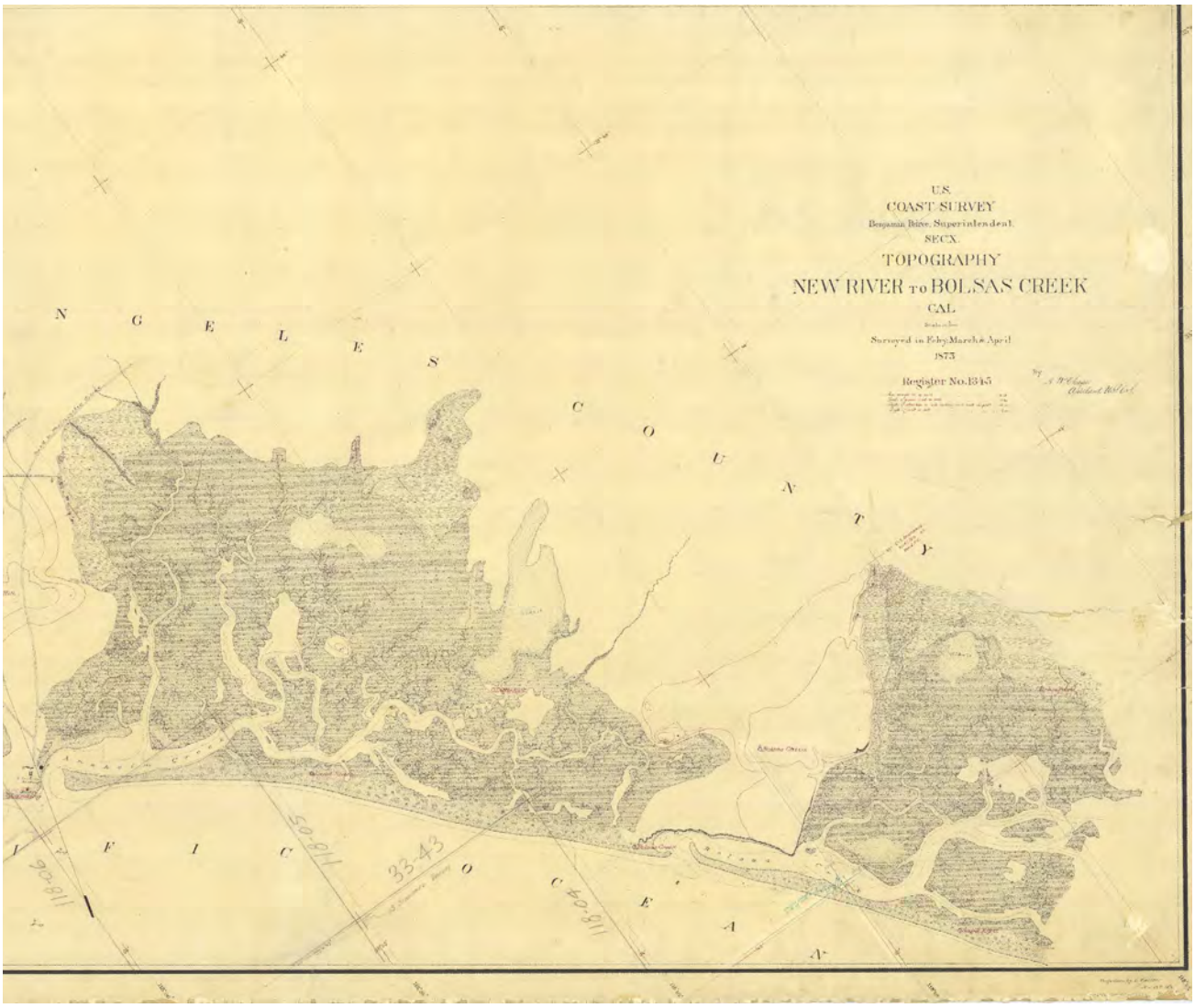

Figure 4. 1873 map of the Pacific Coast from Seal Beach to Bolsa Chica Lagoon (cropped). (Grossinger *et al*. 2011). Note the mouth opening of Bolsa Bay to the Pacific Ocean.

Figure 5. Historical estuarine and related habitats of the Southern California coast, Alimitos Bay to Bolsa Chica Lagoon, overlain on modern aerial photo (cropped) (Grossinger *et al*. 2011)

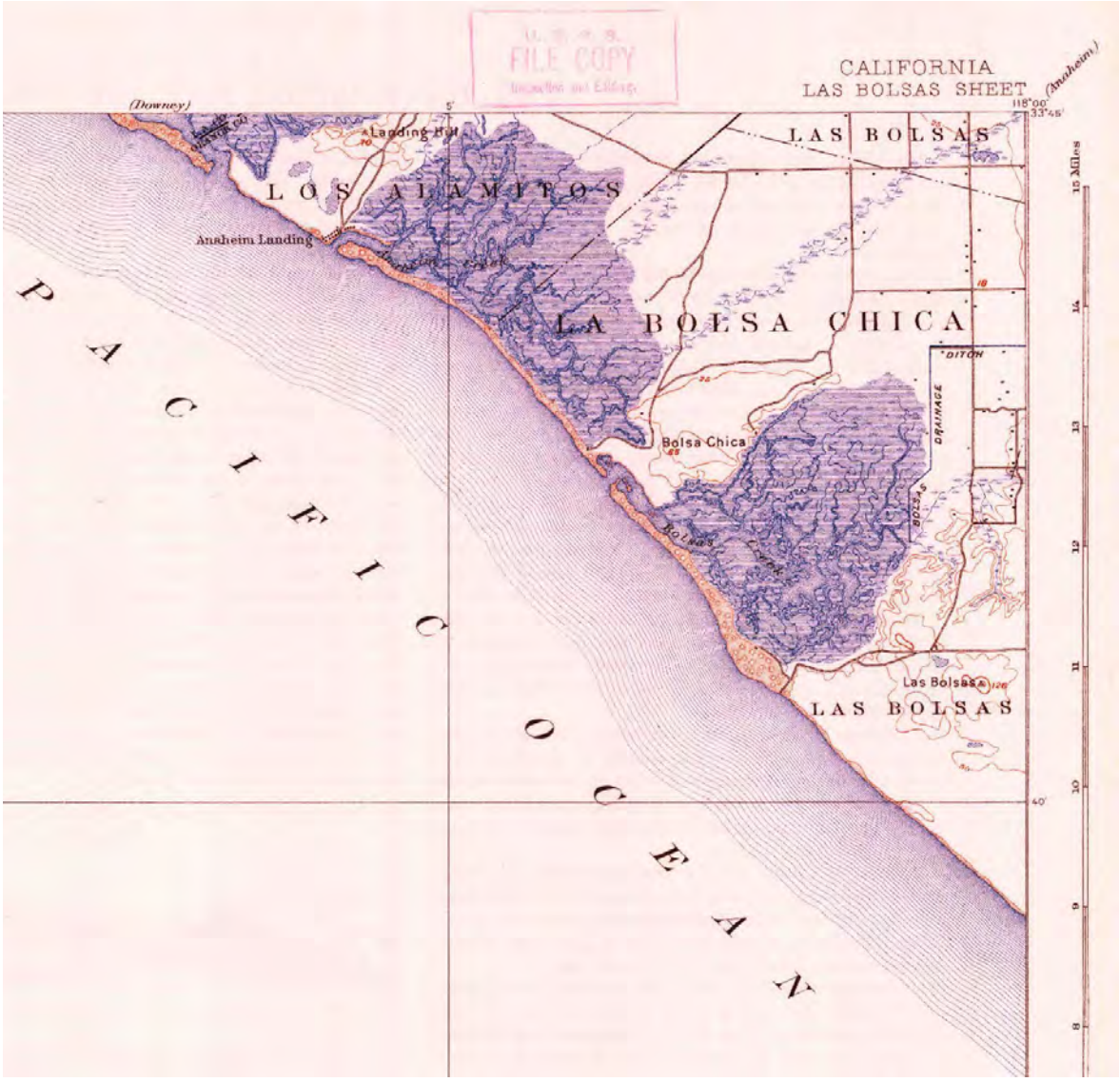

Figure 6. "Las Bolsas" 1896 map (cropped; USGS Topographic Viewer 2019). Note Bolsa Chica lagoon opening to Pacific Ocean at Bolsa Bay.

Figure 7. Bolsa Bay and Huntington Harbour (in the distance). The Bolsa Chica Gun Club former location is in the right foreground. The end of Channel C06 in the left foreground.

Figure 8. Bolsa Chica Gun Club location, Bolsa Bay, circa 1930s (Urashima 2012).

Figure 9. Bolsa Chica Gun Club location, Bolsa Bay today; note the levee across Bolsa Bay.

Figure 10. Seal Beach, Alamitos Bay, and Anaheim Bay 1938.

PROJECT AREA

The proposed Project area involves portions of Orange County inland within 15 miles of the coast of the Pacific Ocean. These upland, wetland, and open water areas have been heavily modified over the last century associated with development of Orange County.

Urbanization of the Westminster watershed is the prime driver for the increased potential for flood related damages and life safety impacts associated with the overtopping of the C02/C04 and C05/C06 channel systems, particularly during short duration, high intensity rainfall events. Urbanization has also increased the total amount of impermeable area, resulting in higher volumes of stormwater being directed to the drainage channels during a storm time period, due to limited infiltration opportunities. Historically, the watershed included large agricultural tracts with limited residential development. Current land use in the watershed is predominantly residential, but includes commercial, military, light industrial, schools and parks.

Much of the Project is related to historically natural streams that were partially channelized, relocated, and/or ditched to divert flows for agricultural development early in the 20th century. These channels and ditches were further channelized to varying levels when urban development in the watershed subsequently occurred; particularly fast development growth in the region occurred in the 1950s and 1960s. Orange County's human population expanded from 131,000 in 1930 to 1,900,000 in 1980 (Jepson 2001).The Project drainage channels within the watershed were originally built in the 1950s and the 1960s to convey residual flood waters after the channelization of the Santa Ana River. The channel systems were mostly designed to contain the 25-year event, although some segments were constructed to only 65 percent of the 25-year capacity. The combination of increased runoff from development and underperforming conveyance channels results in increased flood risk for the residents of the Westminster watershed. The Westminster watershed is now essentially built out with development, with relatively little remaining natural community areas (outside of reserves or federal land). The Project direct footprint and nearby areas are predominantly made up of civil engineering and commercial/urban development structures.

The Project area is centered on the Project drainage channels and the receiving waters within the BCER, Huntington Harbour, and Anaheim Bay. The Project watershed cities are Anaheim, Stanton, Cypress, Garden Grove, Westminster, Fountain Valley, Los Alamitos, Seal Beach and Huntington Beach. The general Project area is backed by low bluffs and mesas, and lowland areas that historically held extensive wetlands. Two mesas occur within Huntington Beach: Bolsa Chica Mesa to the north and Huntington Beach Mesa to the south. These mesas are separated by the Bolsa Chica Gap, which includes Bolsa Bay and the BCER wetlands. North of the Bolsa Chica Mesa is the Sunset Gap with Anaheim Bay and Huntington Harbour. The current sole ocean outlet-inlet for both Outer Bolsa Bay and Huntington Harbor (and thus, the Project channels) is to the north at Anaheim Bay.

Typical Project channel configurations include concrete rectangular (including lined invert); riprap-lined trapezoidal (soft-bottomed), concrete-lined trapezoidal (including lined invert), and enclosed culverts. Configurations vary by reach and change throughout the channel systems. The East Garden Grove/Wintersburg Channel (Wintersburg Channel), is an approximately 11.8 mile long regional floodcontrol facility in north/central Orange County that is characteristic of most of the Project channels. The Wintersburg Channel is currently regarded as the largest flood threat to human structures in Orange County. The Wintersburg Channel system was reportedly designed and built in the 1960s to convey 65 percent of the 25-year peak discharge (i.e., equating to approximately a 10-year storm event). In some reaches this channel is trapezoidal and lined with rip-rap.

Most of Project channel reaches are channelized, relatively narrow with steep armored slopes, and perennially wet with open water and little native woody vegetation. Very few off-channel/upland refugia with native plant cover exist within any Project channel reach. As such, these channels are quite artificial and depauperate in plant and wildlife diversity and numbers compared to natural streams with adjacent intact floodplain and upland natural communities. Nevertheless, these channels typically support substantial numbers of shorebirds and waterbirds,

and likely considerable aquatic resources. The lower reaches of some Project channels have a muted tidal influence.

The BCER is an approximately 1,341-acre coastal estuary reserve located in Huntington Beach. As noted above, its location is at the downstream terminus of the East Garden Grove/Wintersburg Channel. Historically, the site was used for oil and natural gas production

In addition to physical modifications, urban, commercial, military, and recreational activities over the past century have strongly influenced the ecological processes in the Project channels and lagoon areas by adding contaminants, modified runoff flow hydrographs, turbidity, trash, and other environmental stresses. Despite these changes and disturbance history, the Project area today supports moderate-function natural biological communities.

Upland areas in the Project area, outside of areas surrounding BCER, Seal Beach National Wildlife Refuge, and NWSSB, consist almost completely of developed areas that provide very limited terrestrial habitats for native wildlife and plants; almost all beach areas are subject to heavy recreational use. Terrestrial vegetation (outside of the BCER, Seal Beach National Wildlife Refuge, and NWSSB) in the Project area is primarily landscape plantings or weedy exotic species. Sensitive upland plant communities are generally not present in the Project direct footprint (e.g., along Project channels), due to past disturbance, ongoing maintenance, and development.

Some of the Project's existing levees cross over the Newport-Inglewood Fault Zone (the fault also runs through the BCER). It is considered to be one greatest seismic threats in Orange County. These Project levees sit atop liquefiable soils capable of over 6 feet of lateral spreading during a major seismic event.

PHYSICAL FEATURES AND CHARACTERISTICS IN THE PROJECT AREA

Climate

The climate of Project region is generally characterized by warm dry summers and cool wet winters. California is strongly influenced by a persistent zone of high pressure in the north Pacific, a southerly flowing cold water ocean current, and the Sierra Nevada Mountains, which block the continental air from affecting the coastal climate (Hapke *et al*. 2006). During the summer months the northward migration of the semi-permanent North Pacific High diverts most storm tracks to the north. California seldom receives rain from Pacific storms during the summer but coastal fog is widespread. Cold upwelling waters at the surface come into contact with the relatively warm moist air from the Pacific causing massive fog banks to form (Hapke *et al*. 2006). During the winter, the North Pacific High migrates southward directing storms towards California. Occasionally storms will arrive from the southwest and are accompanied by relatively warm temperatures and heavy rains.

Sand Sources

The primary sources of coastal sediment for California beaches are the fluvial drainage systems that reach the coast. These systems range from short, steep, ephemeral streams that deliver a wide mix of sediment grain sizes, to more mature larger rivers which often have well-developed estuaries (such as occurred historically with San Gabriel and Santa Ana rivers). California's coastal streams naturally have exceptionally high sediment loads due to the steep landscapes (for longer streams), geologically young and tectonically active terrain, and, in southern California, relatively sparse vegetation cover (Willis 2002). Primarily due to considerable development build-out within the Project watershed and relatively flat watershed topography, sediment delivery from the Project channels to the coast (e.g., Bolsa Bay, Huntington Harbour) is low.

Tidal Channels

Tidal channels are generally defined by bidirectional tidal flow. The term *tidal channel* can describe features across a range of scales, from large distributaries or cuts between tidal sand bars to small marsh creeks and shallow runnels across tidal flats. Marsh systems often develop over tidal flats or bars with the channels preserved as creeks (Pethick 1969; Perillo and Iribarne 2003; Temmerman *et al*. 2007). Rapid changes in sediment supply, sea-level, or freshwater inputs can change the hydrodynamics of a system, and the resulting morphological adaptation may rework sediment deposits.

In shallow coastal settings, natural and artificial channels provide a pathway for the tide to propagate and are, thus, a primary control on the sedimentation and ecology of these environments (Hughes 2011). Within tidally dominated coastal landscapes, channels provide the conduit through which the tidal current (wave) propagates, driving the exchange of water and sediment between the outer and inner regions of a coastal water body. The nature of the channel network influences local tidal conditions, specifically tidal range, and tidal flow velocity. Within tidal flats and marshes, which are in the intertidal zone, this translates to the period and depth of tidal-driven inundation and potential for erosion and deposition (Hughes 2011). These conditions in turn determine the flux of sediment, nutrients, and biota across an environment, ultimately affecting the long-term morphological evolution of the region. Channels are a primary control on most coastal wetland environments (Hughes 2011).

Estuaries

Estuaries are a flooded stream or river mouth (Dalrymple *et al*. 1992). Estuaries are also the interface between land and sea: semi-closed regions where salt and freshwater mix, leading to unique communities of plants and animals. An estuary can take many forms that are primarily dependent on its mode of formation (rising sea level, tectonic activity, receding glaciers, or shifting substrate) and water circulation (tidal influence, topography, and freshwater out flow). However, high productivity, sediment deposition, varying salinity, and high biodiversity are a few traits most estuaries share. In certain areas, such as southern California, some estuaries may also be referred to as lagoons or bays because low annual rainfall typically brings in comparatively small freshwater input.

Estuaries can be subdivided into natural community types: shallow subtidal, tidal sand or mudflats, salt march, tidal creeks, and the upland transition zone. Shallow subtidal communities are submerged but are rarely deeper than light penetration. Mudflats are intertidal habitats that do not support any vascular vegetation. Salt marshes are tidally flushed low lying areas, bordering the estuary supporting salt tolerant plant species. Tidal creeks are streams predominantly driven by tidal flow. These areas are usually slow moving and further protected from physical forces. The upland transition zone, usually known as riparian communities, is where the aquatic and terrestrial habitats merge. Along the west coast of the U.S., the Pacific Fishery Management Council has identified estuaries as a Habitat Area of Particular Concern.[4]

Varying salinity, tides, freshwater outflow, and water chemistry combine to create very dynamic systems in both tidal creeks and estuaries. Because of these conditions, many organisms in varied ways exploit this environment, leading to high levels of biodiversity. The semi-enclosed nature of most estuaries protects them from wave action and strong currents. Calmer waters in estuaries allow some sediments from freshwater input to settle out before reaching the ocean, therefore capturing some sediments. High nutrient levels are usually associated with these sediment loads in developed watersheds; these nutrients are partially absorbed by many of the plants that occupy estuaries, thus reducing eutrophication. Estuaries are also vital habitats for many marine fish species that use the shallow protected habitats as rearing zones for juveniles. Without these habitats, juveniles would be typically be exposed to physical forces beyond their swimming capabilities as well as high predatory pressure due to lack of cover/shelter. The nutrient input, calm waters, and sedimentation of estuaries, allow many plant species to thrive, forming the base of a very productive ecosystem that influences many habitats and species beyond its borders.

The nutrient filtering ability of estuaries can decrease eutrophication (higher concentrations of nutrient levels) in adjacent coastal waters, protecting other important natural communities from degradation. Many fish species use estuaries as a nursery area before leaving for the open ocean. Losses of estuarine habitats is associated with a drop in recreational and commercial fishing success and depletion of important human food sources. Because of the high productivity of estuarine habitats they are often a sink for carbon dioxide.

The loss of estuarine habitats through land use change and type conversion is indicative of both a loss in biodiversity and functionality compared to contemporary wetland systems within the Project region. Healthy estuaries are among the most productive ecosystems on the planet, comparable to rainforests and coral reefs. In addition to providing habitats for biota, estuaries benefit humans by improving water quality, protecting coastal communities through reduced

[4] Along the west coast of the U.S., National Oceanic and Atmospheric Administration Fisheries relies on Fishery Management Councils to identify habitats that fall within Habitat Areas of Particular Concern (HAPC). These areas provide important ecological functions and/or are especially vulnerable to degradation. HAPCs are discreet subsets of Essential Fish Habitat. HAPCs are considered high priority areas for conservation, management, or research because they are rare, sensitive, stressed by development, or important to ecosystem function. The HAPC designation does not necessarily mean additional protections or restrictions upon an area, but they help to prioritize and focus conservation efforts. Although these habitats are particularly important for healthy fish populations, other EFH areas that provide suitable habitat functions are also necessary to support and maintain sustainable fisheries and a healthy ecosystem.

damage from erosion and flooding, and providing recreational opportunities for wildlife viewing and exploration, fishing, and tourism (Dahl and Stedman 2013). The historical estuaries of the Project region supported a much greater diversity of plants and wildlife than the contemporary subtidal habitats that dominate the current landscape.

Intertidal

The intertidal zone is a dynamic marine environment characterized in part by daily tidal fluctuations (leading to periods of sunlight, aerial exposure and submersion) and wave forces. Organisms residing within the intertidal zone are typified by hardy species that are capable of withstanding stresses associated with waves and daily tidal fluxes. Intertidal zones are found within the Project channels.

PROJECT GEOGRAPHIC AREAS

Bolsa Chica Channel (C02)

The drainage area of the Bolsa Chica Channel (C02) watershed consists of approximately 23,700 acres (about 37 square miles). The Project involves the portion of Channel C02 that extends from its confluence with the C04 channel near Bolsa Chica Street to Huntington Harbour. This channel segment is approximately 1.5 miles long and provides flood risk management for Huntington Beach, Huntington Harbour, and the NWSSB. It also runs through and adjacent to the Joint Forces Training Base - Los Alamitos.

The Anaheim Barber City Channel (C03) and Westminster Channel (C04) comprise about 75 percent of the total watershed that feeds into the Bolsa Chica Channel. Once surface water reaches the Bolsa Chica Channel, it flows south and west to its outlet in Huntington Harbour. Huntington Harbour provides a water connection to the Anaheim Bay wetlands to the north and Bolsa Bay wetlands to the south. Bolsa Chica Channel currently consists of a trapezoidal earth channel from the San Diego Freeway (I-405) downstream to Huntington Harbour. The surrounding land use is predominantly dense residential and commercial, except where it borders the NWSSB.

Within the Project area along the Bolsa Chica channel, developed areas are highly disturbed and/or paved, and consist of residential structures, roadways, parking lots, commercial buildings, and private/public infrastructure outside the channel. This land use type represents the greatest overall acreage of the Project area. Vegetation within the developed area consists primarily of non-native ornamental plantings and non-native grass lawns. Disturbed areas within Project area generally consist of the upland area outside of the flood control channel (i.e., the dirt access road and dirt shoulder that separates the road from adjacent commercial/residential development). Disturbed areas still retain a soil surface and are unpaved. Vegetation within the disturbed area generally consists of sparse non-native ornamental plantings. Within the channel itself vegetation is very sparse because of apparent vegetation management. Much of the earthen channel is barren, likely due to ongoing vegetation control/maintenance; where vegetation does occur, it consists generally of low-growing exotic species. All the Project channels generally have these same land use covers/characteristics.

C04 – Westminster Channel

The C04 channel is approximately 7.8 miles and provides flood risk management for the cities of Garden Grove, Westminster, and Huntington Beach. The channel begins at Highway 22 and continues downstream past Westminster Memorial Park Cemetery, I-405, and the Westminster Mall, before joining with the C02.

C05 – East Garden Grove Wintersburg Channel

The East Garden Grove Wintersburg Channel (Wintersburg Channel) conveys stormwater and urban runoff; it begins upstream in Anaheim and flows through parts of Garden Grove, Orange, Santa Ana, Fountain Valley, and Huntington Beach. Most items that enter the storm drains connected to the channel currently flow downstream and wind up in BCER. During winter storms, substantial stormwater flows move through portions of BCER, mobilizing a flush of contaminants and trash.

The channel begins west of the intersection of Highway 5, Highway 57, and Highway 22 in the city of Santa Ana and flows southwest through Haster Basin, under Interstate-405 (I-405), and through the BCER within an outlet discharging into Outer Bolsa Bay, Huntington Harbor, and eventually the Pacific Ocean.

The C05 channel facility and its tributaries (including the Oceanview Channel (C06)), collect and convey runoff from a watershed of over 28 square miles to the Outer Bolsa Bay. The channels' watershed exists on a flat coastal plain. The Wintersburg Channel System is approximately 11.5 miles long and was originally built to interim standards as part of the 1956 Bond Act for the conveyance of storm water. The channel system consists of a mixture of earthen, riprap, and concrete-lined trapezoidal channels with short segments of concrete, rectangular, and covered box facilities. It was originally designed to convey less than 65 percent of the 25-year peak discharge with box culverts designed for the full 25-year peak discharge based on the Orange County hydrology standards in effect prior to 1973.

The Wintersburg Channel occurs within a densely populated urban area of Huntington Beach, is bordered along its entire length by residential and commercial development. A portion of the Wintersburg Channel falls within designated Essential Fish Habitat for Groundfish.

The Wintersburg Channel is subject to tidal influence, with several feet of water depth in the channel in some lower reach areas at all times. Some of the surrounding residential neighborhoods sit at about 0.0 to 1.0 feet mean sea level, and the channel levees rise up to 10 feet higher than the surrounding street and property grades in those zones.

C06 – Ocean View Channel

The C06 channel is approximately 4.1 miles in length and provides flood risk management for the cities of Fountain Valley and Huntington Beach. The channel begins in the City of Fountain Valley and flows westward through Mile Square Regional Park and under I-405, ultimately discharging into the C05 channel at the confluence near Gothard Street in Huntington Beach.

Huntington Harbour

Huntington Harbour is located on the northwest corner of the City of Huntington Beach, and borders Seal Beach and Sunset Beach. It encompasses five constructed/developed islands bounded by a network of navigable channels and the land surrounding them. Huntington Harbour Marina features 171 boat slips. Huntington Harbour serves as a pleasure craft port in between Long Beach and Newport Beach harbors. It connects with Anaheim Bay to the northwest via a waterway that passes under a bridge on PCH and past NWSSB to the ocean.

Seal Beach National Wildlife Refuge

The Seal Beach National Wildlife Refuge is a wildlife refuge encompassing about 965 acres in the community of Seal Beach. Although it is located in Orange County it is included as part of the San Diego National Wildlife Refuge Complex. It was established in 1972. The refuge is a collaboration between the Service and the Department of the Navy. The refuge is located within NWSSB. Public access in the refuge is limited or restricted to once-a month tour, as it is located within an active military base.

Naval Weapons Station Seal Beach

Naval Weapons Station Seal Beach is a United States Navy weapons and munitions loading, storage and maintenance facility located in Seal Beach, California. It also encloses the Seal Beach National Wildlife Refuge. Naval Weapons Station Seal Beach occupies 5,256 acres, has over 100 ammunition magazines providing ammunition storage space. Ammunition is moved from storage to docks in Anaheim Bay by railroad line and road.

Bolsa Chica Ecological Reserve

The BCER is an approximately 1,341 acre coastal estuary/lagoon/reserve (see Figure 11). Once part of a 165,000 acre Rancho La Bolsa Chica Mexican land grant, the BCER consists of undeveloped coastal wetlands and adjacent upland areas. In 1899, the tidal flows to most of the wetland areas within what is now BCER were largely eliminated when the natural ocean inlet at Bolsa Bay was closed to improve waterfowl hunting. Since then, the areas surrounding and including BCER have been used for agriculture, cattle grazing, military coastal artillery emplacements and oil production. BCER was also substantially affected by oil field activities for about 80 years.

Since the 1960’s numerous development and planning proposals have been made for the Bolsa Chica lagoon marsh and adjacent planning areas. In 1973 the State gained possession of approximately 300 acres of wetlands in what is now the BCER. In 1978, 163 acres of the State Ecological Reserve were returned to tidal action. By 1992, the watershed above the BCER was 85 percent urbanized. Much of the wetlands area outside of the BCER continue in an ecologically degraded state due to lack of tidal/estuarine flow and inundation.

Figure 11. Bolsa Chica Ecological Reserve and Channel C06. Note numerous levees across lagoon. Compare to hydrological conditions apparent in Figures 4 and 6.

After years of controversial development proposals, a portion of the BCER was purchased and set aside for restoration as an offset for construction activities in the Ports of Los Angeles and Long Beach. The California Coastal Conservancy, State Lands Commission, Service, California Department of Fish and Wildlife (CDFW), Regional Water Quality Control Board, Santa Ana Region, and other agencies have oversight of the planning and design of the restoration at the Bolsa Chica Wetlands. The property is owned by the State Lands Commission and managed by the CDFW. The BCER boundaries are roughly Warner Avenue to the north, Seapoint Avenue to the south, Pacific Coast Highway to the west, and residential developments to the east

Natural communities in BCER include open water, mudflats, salt marsh, coastal dunes, (seabird nesting) sandy islands, riparian woodland/scrub, and freshwater marsh. More than 200 avian species have been identified at BCER; the reserve is popular with birders and photographers. BCER is currently the largest saltwater marsh between Monterey Bay and the Tijuana River Estuary. BCER mostly consists of salt marsh and open water with estuarine conditions that occur seasonally in some areas. Year round, tidal salt water enters a portion of the BCER through Anaheim Bay (through Huntington Harbour) in Seal Beach. Within the Full Tidal Basin in BCER, a tidal inlet near the south end of the reserve (just north of Seapoint Avenue along PCH) provides tidal flows. During the rainy season considerable fresh water usually flows into the northern portions of the BCER from the Wintersburg Flood Control Channel, which creates varying estuarine conditions in parts of the BCER, notably Bolsa Bay.

Freshwater/brackish conditions at BCER occur at: a brackish runoff pond at the end of Springdale Street; a swale and cattail marsh fed by runoff from the Seacliff Golf Course; a small marsh at the south end of BCER that is fed by runoff from PCH; fresh and brackish water areas upstream within the Wintersburg Channel itself. In 1973, the California Fish and Game Commission designated the Bolsa Chica lagoon area as an ecological reserve and instituted regulations governing public use of the property to protect the wetlands. By 2012, following the Marine Life Protection Act planning process, an additional level of protection was given to areas within the BCER when two marine protected areas (MPAs), the Bolsa Bay State Marine Conservation Area (SMCA) and the Bolsa Chica Basin SMCA, were established within the BCER boundaries (see Figure 12).

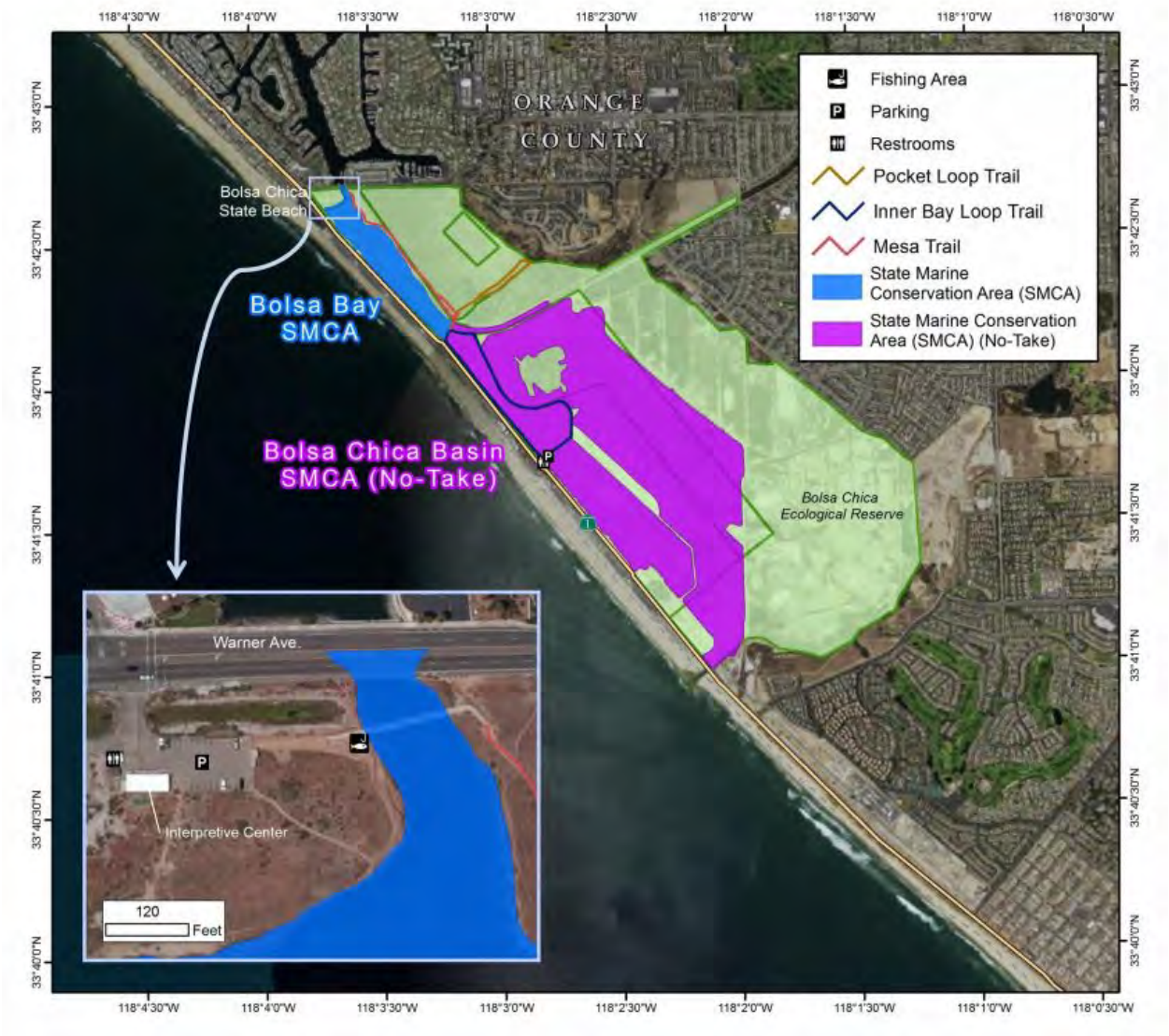

Figure 12. Two California State Marine Protected Areas (MPAs) in Bolsa Chica Ecological Reserve: the Bolsa Bay State Marine Conservation Area (SMCA) and the Bolsa Chica Basin SMCA (No-Take area).

The watershed for the BCER encompasses 27.3 square miles. Historically, Bolsa Bay encompassed 2,300 acres of tidally influenced wetlands and large expanses of freshwater marshes in the interior portion of the bay that were fed by artesian springs of what used to be known as the Freeman River or Freeman Creek. Although once an extensive tidal marsh system, much of the marsh area was removed from tidal influence in 1899.

Despite extensive development and land-use activities within the watershed, the wetlands complex in the BCER is a diverse ecosystem that includes a range of invertebrate, reptile, bird, fish and other species

Sixty nine species of fish have been detected in BCER lagoon. Currently about 107 acres of eelgrass occupy the 367-acre Full Tidal Basin in the lagoon; eelgrass notably serves as an important food source and protection for many fish species. Green sea turtles and sea lions are now observed frequently in the lagoon. Western snowy plovers forage and breed around the lagoon: 113 fledged in 2014 and 129 in 2015. Ridgway's rails began nesting at BCER for the first time in recent decades in 2014. White-faced ibis breed at BCER. Six species of bats have been recorded at BCER.

The Port of Long Beach has participated in restoration projects at the Seal Beach National Wildlife Refuge in Seal Beach and BCER. For the BCER project the port contributed $39 million toward acquisition of 267 acres of degraded wetlands in the reserve. Similarly, in 1997 and 2005, the Port of Los Angeles provided about $51 million in funding to provide for the purchase and restoration of some BCER lowlands and tidal wetlands. This latter project restored tidal flow to a wetland area degraded by past human activities in return for mitigation credit.

The Bolsa Chica Lowlands Restoration Project created or rehabilitated nearly 600 acres of marine and wetland natural communities, restoring a portion of what had historically been a vast estuarine ecosystem. The project was the largest wetland restoration in southern California history. The design included ongoing maintenance of an open ocean inlet to ensure the wetland areas continue to function and to protect the biological benefits gained by the restoration investment.

Restoration culminated in 2006 when a new Full Tidal Basin to the ocean was opened. Post-restoration monitoring has shown that this basin has meaningfully increased the availability of basin habitats to fish, improving southern California fishery resources. Nearly every fish species captured during the restoration biological monitoring program was represented by juvenile size classes (and usually adults as well), demonstrating the role of the basin for providing nursery habitats for spawning or post-larval settlement and rearing. Commercially important species such as California halibut (*Paralichthys californicus*) and white seabass (*Atractoscion nobilis*) are relatively common in BCER. The type and size of fish captured also reflect the extensive eelgrass meadows that now exist there. These eelgrass meadows support resident fish species, provide egg-laying substrates, and protection for breeding fish species.

BCER is a critical stop for migrating shorebirds on the Pacific Flyway. With restoration and the re-establishment of tidal influence in the lagoon, the mudflats created by the restoration provide a rich invertebrate community that is a food source to many of these birds. Over

10,000 individual shorebirds have been observed on the restored mudflats during a single survey. The restoration project also created three specific nesting sites for the western snowy plover and California least tern. These sites are intensively maintained and monitored and provide additional protected habitats for these species within an otherwise highly developed segment of the California coast.

Most of the biological benefits of the restoration are a result of re-establishing daily tidal influence from the ocean. The ocean inlet as currently configured requires consistent maintenance to ensure tidal water connectivity with the ocean. Sand that naturally flows down the coastline's littoral system is continually pulled into the Basin by the action of waves and tides. Without regular removal of sand from the inlet, the Basin would become closed off from the ocean, causing degradation of water quality and related death of the biota in the basin, damage to intertidal plant communities, and loss of important food sources for nesting birds. Continual inlet maintenance through dredge removal of sand is imperative. The initial $15 million set aside for ongoing inlet maintenance (dredging) is now understood as inadequate to meet the long term needs, and BCER is facing a substantial funding deficiency.

DESCRIPTION OF BIOLOGICAL RESOURCES

A more comprehensive description of expected biological resources of the Project area and Project direct footprint is found within the Corps' feasibility study (Corps 2018). Thirteen federally listed species and 77 state listed species/special status species are found within the most current reports of the California Natural Diversity Database for Seal Beach, Newport Beach, and Anaheim Bay 7.5-minute topographic quadrangles (Corps 2018). Comprehensive biological surveys have not been conducted for a majority of the Project area. In 2018, a biological survey was conducted on a reach of C05 extending from approximately 1,250 feet downstream of Goldenwest Street upstream to Gothard Street. No special status species were observed in this area during the survey (Corps 2018)

Plants

We consider the following sensitive plant species to have some potential to occur in the Project study area: salt marsh bird's-beak [*Chloropyron maritimum* subsp. *maritimum* (*Cordylanthus maritimus* subsp. *maritimus*); federally endangered]; San Diego button-celery (*Eryngium aristulatum* var. *parishii*; federally endangered); Ventura marsh milk-vetch (*Astragalus pycnostachyus* var. *lanosissimus*; federally endangered); California seablite (*Suaeda californica*; federally endangered, California Rare Plant); estuary seablite (*Suaeda esteroa*; California Rare Plant); woolly seablite (*Suaeda taxifolia*; CNPS 4.2); southern tarplant (*Centromadia parryi* ssp. *australis*; CNPS 1B.1); and coast woolly-heads (*Nemacaulis denudata* var. *denudata*; CNPS 1B.2). No sensitive or listed plant species are expected to occur within the likely Project footprint, due to a lack of suitable habitats, owing to substantial past and ongoing disturbance, periodic vegetation maintenance within the channels, and existing structures.

Eelgrass (*Zostera marina*) is a unique underwater plant which creates its own multi-use habitat type for fish and is protected by NMFS as a Habitat of Particular Concern. An eelgrass bed

survey was reportedly performed in Project Channel C05 in 2012, and no eelgrass was observed (Corps 2018). It is reportedly unknown if eelgrass occurs within the lower reaches of Project Channel C02 (Corps 2018).

Fish

The open waters of Huntington Harbour and Bolsa Bay provide habitats for a variety of fish and invertebrate species that utilize these sheltered waters either during early growth or throughout their lives. Due to the repeated periodic dredging disturbance and lack of vegetation and natural shallow water features/complexity within Huntington Harbour, the number of fish species using the harbor is likely smaller than in nearby Anaheim Bay or Bolsa Bay; however, some of the commonly found fish in these waters include the deep body anchovy (*Anchoa compressa*), jacksmelt (*Atherinopsis californiensis*), topsmelt (*Atherinops affinis*), and Pacific staghorn sculpin (*Leptocottus armatus*). In addition, Anaheim Bay is an important nursery area for Pacific halibut (*Hippoglossus stenolepis*) and diamond turbot (*Hypsopsetta guttulata*).

Some juvenile fish very likely utilize the Huntington Harbour area. Typical aquatic invertebrates found in these waters likely include bay mussel (*Mytilus trossulus*), acorn barnacles (*Sessilia* sp.), and tunicates (*Tunicata*). Many marine fish species require coastal wetland habitats such as estuaries to complete at least a portion of their life cycle. The vegetative edge of some wetland zones is important for many species of foraging juvenile fish as it provides cover for predator avoidance (Herbold *et al*. 2014). Research indicates that small fish, such as California killifish (*Fundulus parvipinis*) were able to consume six times more food in marsh habitats than in habitats with no marsh access (West and Zedler 2000). Madon (2008) found that food consumption rates of topsmelt were 50 percent lower when the tidal inlet at Los Peñasquitos (San Diego County, California) was closed. In addition, halibut are normally affected by closures due to their sensitivity to higher temperatures in less flushed systems. Nearly every fish species captured during post-2006 monitoring conducted at BCER was represented by juvenile size classes and usually adults, demonstrating the role of the basin as nursery habitat for spawning or post-larval settlement and rearing (Merkel & Associates 2013). Following restoration in 2006, the fish community in BCER was abundant, diverse, and contained biomass levels equivalent to the relatively unaltered Upper Newport Bay and the larger San Diego Bay (Farrugia *et al*. 2014). Over five years of quarterly monitoring, a total of 52 fish species have been observed within the fully tidal areas at Bolsa Chica (Merkel & Associates 2013). Commercially desirable species found at Bolsa Chica include white seabass and California halibut (Merkel & Associates 2013). Fodrie and Levin (2008) found that about 58 percent of juvenile halibut in southern California had embayment origins in 2003 and 2004, and that lagoon-type habitats such as Bolsa Chica provided nurseries for 16 percent of halibut in 2004. While most of the fish common in southern California bays, lagoons, and estuaries are low in trophic level (Zedler 1982), the species composition within the fully tidal portions of Bolsa Chica currently includes coastal marine fishes from 3-4 trophic levels, including top predators such as leopard shark (*Triakis semifasciata*), brown smooth-hound (*Mustelus henlei*), gray smooth-hound (*Mustelus californicus*), and bat ray (*Myliobatis californica*). These relatively large fish act as moderate energy links that transfer nutrients among coastal areas (Farrugia *et al*. 2014). In contrast, closed and severely muted systems are dominated by species with a salinity tolerance generally greater

than seawater (approximately 35 parts per thousand), including various gobies (*Gobiidae*), California killifish, and topsmelt (Merkel & Associates 2009; MEC Analytical Systems 1993); these species, however, are also known to be resident within southern California embayments including open systems (Zedler 1982). Species within closed systems also include those that occur in stagnant water and/or are tolerant of poor water quality and elevated temperatures, such as non-native Western mosquitofish *(Gambusia affinis*), rainwater killifish (*Lucania parva*), and sunfish (*Centrarchidae*) (Wetland Research Associates 1994; MEC Analytical Systems 1993).

Overall, the habitats within the fully tidal portions of BCER support more complex habitats and higher biodiversity/integrity than the nearby wetland areas of closed or severely muted tidal systems. Significant areas of eelgrass and cordgrass have expanded in the fully tidal areas within the BCER after the 2006 restoration activities (Merkel & Associates 2013). Extensive eelgrass meadows increase the complexity of the system as they support resident fish species, provide egg-laying substrate and protection for breeding species, perform essential ecosystem functions, and form the basis of detritus- and grazing-based food webs (Merkel & Associates 2013; Bernstein *et al*. 2011). These structured habitats provide good conditions for fish species such as croaker (Sciaenidae), surfperch (Embiotocidae), kelpfish (Chironemidae), and seabass (Sciaenidae) (Merkel & Associates 2013). In contrast, the restricted tidal influence and periodic water quality extremes of the nearby closed or highly muted systems limit the aquatic communities to a small number of rather hardy species.

Birds

Southern California's coastal areas, including its shorelines, estuaries, bays, connected channels, and developed harbors, provide a variety of natural and artificial communities for large numbers of waterfowl, shorebirds, wading birds, and birds that forage from the air. The predominately open water channel and hardscape/landscape habitats within the portions of the Project that occur upstream of BCER or NWSSB/Seal Beach National Wildlife Refuge provide opportunities for foraging and resting by a low to moderate diversity of bird species. Opportunities for nesting within these same Project channel areas are small for most bird species due to very little woody vegetation, substantial bare ground and artificial structures, disturbance/maintenance occurring in the area, and surrounding development.

Birds that occur in and near the Project footprint are primarily water-associated species; that is, they are dominated by coastal water birds, shorebirds, and waterfowl that depend on marine/estuarine/fresh water natural communities for food and other essentials. Migratory water birds and shorebirds substantially use BCER and Anaheim Bay during annual migrations and for overwintering. Some are year-round residents. Sensitive species that may forage in or over the Project footprint include California brown pelican (CDFW species of special concern), burrowing owl (CDFW species of special concern), osprey (CDFW watch list), northern harrier (CDFW species of special concern), white-tailed kite (CDFW fully protected species), peregrine falcon (CDFW fully protected species), Cooper's hawk (CDFW watch list), black skimmer (CDFW species of special concern), and white-faced ibis (CDFW watch list). It should be noted that BCER is an important nesting site for the black skimmer (*Rynchops niger*), and it was the first California coastal site colonized by the species in 1985 (Molina 2008). The Project footprint

channels normally provide very limited areas of trees and/or shrubs for feeding, resting, cover, and/or nesting; most of this small area of vegetation is made up of exotic landscaping.

In 2014, a nesting bird survey was conducted by LSA Associates along Reach 1 of C05. The survey area extended from the tide gates on C05 upstream to the Graham Street Bridge. During the survey, 15 bird species were confirmed as nesting within 500 feet of the channel. Nesting special status species included Belding's savannah sparrow (State endangered) and Cooper's hawk. A burrowing owl was also observed roosting within approximately 1,300 feet upstream of the C05 tide gates (Corps 2018).

Of these species, we consider the California least tern [*Sternula antillarum browni* (*Sterna a. b.*)], western snowy plover {Pacific Coast population DPS [*Charadrius nivosus nivosus* (*C. alexandrinus n.*)]}, light-footed Ridgway's (=clapper) rail [*Rallus obsoletus* (=*longirostris*) *levipes*], and Belding's savannah sparrow (*Passerculus sandwichensis beldingi*) to be the state and/or federally-listed species with considerable potential to be affected by Project construction activities and/or operations/maintenance of the two proposed Project alternatives, particularly by activities that would involve open water, lower reaches of the Project channels, unvegetated flats, mudflats, beaches/islands, levees in or near BCER, or shoreline zones (particularly proposed activities in the lower reaches of Channel C02 near the Seal Beach National Wildlife Refuge and Channel C05 in and near the BCER).

California Least Tern

Status. The California least tern is federally listed as endangered. The species is also listed as endangered by the State of California.

Distribution and Habitat. The historical breeding range of the California least tern extended along the Pacific Coast from Moss Landing, Monterey County, California, to San José del Cabo in Baja California Sur, Mexico (Service 2006). Since 1970, nesting sites have been document in California from San Francisco Bay area to the Tijuana River at the Mexican Border and in Mexico within the Gulf of California and on the western coast of Baja California from Ensenada to San José del Cabo at the tip of the peninsula (Service 2006). The majority of nesting sites for the species have been concentrated in southern California.

The species nests in colonies of a few to several hundred pairs on relatively open beaches kept free of vegetation by natural scouring from tidal action, along with protected salt flats and dredge spoils near foraging areas. Nests of the California least tern can be a simple scrape in the sand or shell fragments. It is possible for the species to re-nest up to two times if eggs or chicks are lost early in the breeding season. Fall migration for the California least tern typically commences the last week of July and the first week of August (Service 2006). In highly developed coastal California, typical least tern nesting sites are relatively flat, open, barren sandy areas near the ocean where the least terns lay and incubate their eggs and chicks fledge. The least tern nesting period extends from April through August; along the California coast least terns typically begin to arrive (after wintering in Central and South America) in the southern most colony breeding

sites (e.g., San Diego) in early April and they continue to arrive through the later part of May. During the remainder of the year, the birds are gone from the Project region.

The California least tern is a piscivorous (fish eating) sea bird. This species relies on sight for foraging and usually requires relatively clear water to locate its preferred baitfish food sources, northern anchovy, topsmelt, and jacksmelt (LSA 2009). Although there is some field evidence to suggest that least terns will forage in turbid waters to which fish are attracted, the majority of foraging occurs in clearer waters (LSA 2009).

Potential for Occurrence in Project Area. The California least tern is known to nest within the BCER (Sevrens 2018). Nesting islands (i.e., north and south tern island) were created in 1978 within the BCER prompting the California least tern to begin nesting on north tern island. In 2015, the CDFW noted that 204 nests were initiated at the BCER; however, only two of the five nesting colonies were successful. Based on field surveys it was estimated that the number of fledglings at Bolsa Chica in 2015 was between 55 and 65 (Bolsa Chica Land Trust 2015). Nesting and fledgling numbers were lower in 2015 than they were in 2014 when there were 301 nests and an estimated 80 fledglings (Bolsa Chica Land Trust 2015). Also in 2015, the Sea and Sage Audubon Society estimated the number of breeding pairs (i.e., minimum and maximum), nests and number of fledglings (i.e., minimum and maximum) for California least tern at SBNWR/Anaheim Bay. It was estimated that there were between 50-94.5 breeding pairs, 106 nests, and 51-53 fledglings (Sea and Sage Audubon 2016).

Western Snowy Plover

Status. The Pacific coast population of the western snowy plover was listed as federally threatened in 1993. The species is also listed as a species of special concern for the State of California. (Service 1993). Critical Habitat for the Snowy Plover was revised in June 2012. The Service lists three beaches (and the BCER - Subunits CA46 B-F) in Orange County as critical habitat for the snowy plover (Service 2012). These include Bolsa Chica State Beach (CA 46A), Santa Ana River Mouth (Subunit CA 47), and Balboa Beach (Subunit 48) (Service 2012).

Distribution and Habitat. The Pacific coast population of the western snowy plover breeds primarily on coastal beaches from southern Washington to southern Baja California, Mexico (Service 2007). As of 2002 within California, there were eight geographic areas that supported over three-quarters of the California coastal breeding population: San Francisco Bay, Monterey Bay, Morro Bay, the Callendar-Mussel Rock Dunes area, the Point Sal to Point Conception area, the Oxnard lowland, Santa Rosa Island, and San Nicolas Island. Prior to 1940, in Orange County snowy plovers nested at Anaheim Landing, Sunset Beach Bay Fill, Sunset Beach, Bolsa Chica Beach, Bolsa Chica Salt Flats, Newport Beach, and Balboa Beach (Page and Stenzel 1981).The breeding season for the western snowy plover extends from approximately March 15 through September 15 (Service 2007).

Primary nesting habitats include sand spits, dune-backed beaches, beaches at creek and river mouths, and saltpans at lagoons and estuaries (Stenzel *et al*. 1981). Nests generally consist of a shallow scrape lined with beach debris and typically occur in flat, open, sandy areas with little

vegetation (Widrig, 1980, Stenzel *et al*. 1981). Multiple pre-nest scrapes may be dug, with one selected as the nest; these typically begin to appear in late January-early February. Driftwood, kelp, and dune plants provide cover for chicks and harbor invertebrates, an important food source (Page *et al*. 2009). Nests are usually found within 100 meters (328 feet) of water, whether ocean, lagoon, or river mouth (Page and Stenzel 1981, Page *et al*. 2009). In addition to nest scrapes, snowy plovers build roost scrapes throughout the year; these are typically shallower, with no materials placed inside, and are often made from scraped-out footprints in the sand.

Potential for Occurring in Project Area. The western snowy plover does nest within the BCER which is within the Project study area. In addition, 475 acres within the BCER were also designated as critical habitat for the species (77 FR 36727).

Light-footed Ridgway's Rail

Status. The light-footed Ridgway's rail is federally listed as endangered. The species is also listed as endangered by the State of California.

Distribution and Habitat. The historical range of the light-footed Ridgway's rail extended from Santa Barbara County, California, to San Quintin Bay, Baja California, Mexico (Service 2009). As of 2009, the distribution of the species within California extended from Ventura County in the north to the Mexican border in the south. The species had not been detected in Santa Barbara County since 2004 or in Los Angeles County since 1983 according to the Service Ridgway's rail 5-Year Review (Service 2009).

The light-footed Ridgway's rail uses coastal salt marshes, lagoons, and their maritime environs (Service 2009). Nesting habitat includes tall, dense cordgrass (*Spartina foliosa*) and occasionally in pickleweed (*Salicornia virginica*) in the low littoral zone, wrack deposits in the low marsh zone, and hummocks of high marsh within the low marsh zone. In regards to breeding, nesting usually begins in March with late nests hatching by August (Service 2009).

Potential for Occurrence in Project Area. Light-footed Ridgway's rail does occur within the SBNWR and the BCER (Service 2009). In addition, it was noted by the CDFW in their letter dated January 12, 2018 that light-footed Ridgway's rail nests within the BCER (Sevrens 2018).

Belding's Savannah Sparrow

Status. The Belding's savannah sparrow is listed as endangered by the State of California. It is not federally listed.

Distribution and Habitat. The historical range of the Belding's savannah sparrow included salt marshes along the Pacific Coast from Point Conception, California, to El Rosario, Baja California, Mexico.

The Belding's savannah sparrow uses coastal salt marshes, lagoons, and estuaries. Nesting habitat includes pickleweed (Salicornia virginica), Allenrolfea, Suaeda, Atriplex, and Distichlis

as dominant plants in the marsh (Wheelright and Rising 2008), with nests placed in dense pickleweed of the middle marsh (Powell 1993). Nesting generally occurs in March through May.

Potential for Occurrence in Project Area. Belding's savannah sparrow is known to occur in both Seal Beach National Wildlife Refuge and BCER. These two areas support two of the three largest breeding populations in California, with the other being Tijuana Slough (Zembal *et al*. 2015). It is possible that this species may be found in smaller remnant wetlands in the vicinity, although the channels do not appear to support the appropriate vegetation for nesting.

Mammals

In the U.S. most marine mammals are under the jurisdiction of the National Oceanic and Atmospheric Administration (NOAA Fisheries), including all those potentially occurring in or near the Project area. All marine mammals are protected under the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361 *et seq*.) and some are also protected by the ESA. California sea lions (*Zalophus californianus*) are known to occur in BCER. They are not know to breed in the Project area.

Reptiles

Pacific Green Sea Turtle

Status. The green sea turtle (*Chelonia mydas*) is federally listed as threatened as part of the East Pacific Distinct Population Segment. The species has no State status.

Distribution and Habitat. The green sea turtle has a circum-global distribution, occurring throughout tropical, subtropical waters, and, to a lesser extent, temperate waters (NMFS and Service 2007). It is believed that green sea turtles inhabit coastal waters of over 140 countries. Green sea turtles spend the majority of their lives in coastal foraging grounds, which include both open coastline and protected bays and lagoons. These marine habitats are often highly dynamic and in areas with annual fluctuations in seawater and air temperatures (NMFS and Service 2007). Green sea turtles are generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets. The turtles are attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting.

Potential for Occurring in Project Area. The green sea turtle is known to inhabit the BCER and SBNWR, which are within the Project study area. Pacific green sea turtles have been reported from Outer Bolsa Bay and the muted tidal pocket in BCER. The San Gabriel River (nearby) to the north of the Project area is northernmost known year-round habitat for the Pacific green sea turtle (Aquarium of the Pacific 2019). Nesting is not considered likely in the Project region with the high level of disturbance on almost all beaches. Green sea turtles apparently have a strong nesting site fidelity and often make long distance migrations between feeding grounds and nesting beaches.

POTENTIAL IMPACTS OF THE PROPOSED PROJECT ON BIOLOGICAL RESOURCES

The Project Channel C05 currently and as proposed outlets into a portion of the BCER (Bolsa Bay) which includes two marine protected areas -- the Bolsa Bay State Marine Conservation Area and the Bolsa Chica Basin State Marine Conservation Area. In addition, both federally listed and sensitive species inhabit BCER. Both proposed Project alternatives include features whose construction activities could adversely affect listed and sensitive bird species that breed within the BCER, as well as green sea turtles. Depending on the seasonality of construction activities in or near the BCER, listed bird species nesting could be temporarily disrupted by Project construction activities associated with proposed removal of the tide gates and/or modification of the Warner Avenue Bridge. The Corps' feasibility study indicates that commitments would be made as part of the Project to minimize these potential impacts to listed and sensitive nesting birds within the BCER. Green sea turtles have been observed within Outer Bolsa Bay and the lower reaches of Project Channel C05 and Channel C02. Proposed construction activities within these areas could temporarily disrupt movement and foraging by green sea turtles. The feasibility study indicates that environmental commitments would be implemented by the Project to minimize these potential impacts to green sea turtles.

Recent surveys of the vegetation within the Project channels as reported within the feasibility study indicate no detections of sensitive or listed plant species. Based on our partial field reconnaissance and research we expect that no sensitive or listed plant species occur within the likely Project footprint, based in part on the heavily disturbed/maintained nature of most of the Project footprint.

Eelgrass provides important biological benefits and is also important to managed species under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Vegetated shallows that support eelgrass are also considered special aquatic sites under the 404(b)(1) guidelines of the Clean Water Act (40 C.F.R. § 230.43). Pursuant to the MSA, eelgrass is designated as essential fish habitat. Eelgrass is found primarily in the Anaheim Bay/Huntington Harbour area, with smaller amounts occurring in the lower portion of C02 and in Outer Bolsa Bay. In the BCER approximately 140 acres of existing eelgrass occurs adjacent to the likely Project footprint. An eelgrass bed survey was reportedly completed in the lower reaches Project Channel C05 in 2012 (potential habitat), and no eelgrass was observed (Corps 2018). It is reportedly unknown if eelgrass occurs within the lower reaches of Project Channel C02 (Corps 2018). Both of these Project channel reaches would remain soft bottom channel with the proposed Project alternatives, but it is undetermined if channel bottom depths would remain as existing or be directly or indirectly modified with implementation of the either proposed alternative.

The Project channels contain existing soft-bottom areas and wetlands. The wetlands within the Project channels are generally of low to moderate function, providing limited diversity and viability of habitats for native wildlife (notably, the channels provide substantial water bird foraging habitats). The relatively low-to-moderate wetland functions are likely a result of (depending on Project channel reach): (1) steep and highly regular channel slopes, (2) channel slope armoring (precluding vegetation, etc.), or (3) ongoing or periodic channel maintenance

reducing or controlling potential vegetation on earthen channel slopes. The proposed Project would cause the permanent loss of some channel wetlands. The Corps' feasibility study indicates that mitigation is proposed for these losses. The Project Minimum Channel Modifications Alternative would reportedly result in permanent, direct impacts to about 24 acres of channel wetlands. The Maximum Channel Modifications Alternative would reportedly result in permanent, direct impacts to about 9 acres of wetlands. The feasibility study indicates that mitigation opportunities for these wetlands losses are still being explored within the Project area.

The proposed Project alternatives would also directly impact upland and adjacent wetland areas associated with the modification of the Warner Avenue Bridge. The Warner Avenue Bridge modification would reportedly result in permanent, direct impacts to about 1 acre of upland and wetland areas. To offset these impacts, the feasibility study indicates that a wetland mitigation plan is being prepared to replace the acreage of the affected resources elsewhere in/around the Project study area.

RECOMMENDATIONS

The FWCA states that "...wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development projects through the effectual and harmonious planning, development, maintenance, and coordination of wildlife conservation...." (16 U.S.C. 661). Consistent with the FWCA, should the project be implemented, we suggest incorporation of the following recommendations in order avoid, minimize, and compensate potential impacts to fish and wildlife resources, including the project design elements outlined below that would improve fish and wildlife resources.

We have eight main recommendations per the FWCA for the proposed Project:

1. We suggest that a design alternative be analyzed/developed that would provide (through levee removal or modification) for moving storm-flood flows, or both low and storm-flood flows, from Channel C05 within the BCER to the ocean through the Full Tidal Basin. It is expected that known contaminant sites within the BCER (where/when these sites would remain even with Project implementation) would likely need additional armoring for protection from flood risks as a result. Potential mobilization of contaminants (reportedly buried within some existing levees within the BCER) should be fully minimized as part of construction and operations. As is outlined within the Corps' feasibility study, additional flood risk is related to the possible spread of contaminants in BCER resulting from large storm events that overtop Channel C05 upstream of the BCER and inundate the oil fields within it. Similarly, moving C05 flood waters though the Full Tidal Basin could cause increased potential flood inundation the adjacent low-lying oil fields in BCER, with subsequent potential distribution of oil-laden runoff to other portions of the BCER and the ocean; the potential for increased flood risk into these oil fields should be evaluated with this suggested alternative. It is expected that moving storm flows partially through the Full Tidal Basin would eliminate or reduce the need for widening of the Warner Avenue bridge, as currently proposed. While routing low/storm flows through the Full Tidal

Basin would likely introduce some modern contaminants from the Westminster watershed into the basin (with concomitant ecological consequences), funding for ongoing dredging of the ocean mouth of the Full Tidal Basin[5] is currently short. It is expected that a consequence of routing low/storm flows through the basin would result in the proposed Project providing the necessary funding to ensure that the basin mouth is appropriately dredged on regular basis to provide for passage of Project design storm flows.

2. We suggest that Channel C05 levees within the BCER that are not essential for flood risk management be evaluated for removal, where it is determined (with additional analysis) to have an ecological benefit to the BCER lagoon ecosystem and sensitive species, when considering hydrology, watershed and buried contaminants, basin mouth shoaling and dredging costs, trash deposition in the BCER, etc. Removal of the noted C05 levees would restore tidal to substantial areas of the BCER that are currently subject to only partial or muted tidal flow (such as the Muted Tidal Pocket), as well as restore more natural estuarine water flow conditions to portions of the BCER, per freshwater inputs from upstream. Associated with any of these modifications as suggested, Belding's savannah sparrow habitat near the downstream end of Channel C05 should be retained long-term, through protection from erosional flows within existing sparrow habitat areas. Contaminant issues are very similar to Recommendation 1 above for this suggestion.

3. We suggest that a Project design alternative be analyzed/developed that would provide for moving storm flood flows from Bolsa Bay (coming in from Channel C05) directly to the Pacific Ocean. An opening of Bolsa Bay to the ocean naturally and consistently existed at this location before the 1890s. This restored mouth would naturally function similarly to the mouth that historically existed between Bolsa Bay and the ocean (including daily tidal flow exchange), before the mouth was artificially dammed/closed in the late 19th century. This suggested design would likely incorporate a new bridge or a series of large culverts under PCH between Bolsa Bay and the ocean. In part, the concept here is to eliminate the need/costs/impacts of modifying the Warner Avenue bridge to increase flood carrying capacity under the bridge into Huntington Harbour. One of these new culverts or bridge could also function to provide pedestrian and bicycle access under PCH between the BCER (and the east side of highway) and the beach, reducing street level crossings on PCH.

4. We recommend that soft-bottom channels that are proposed to be eliminated as part of the Project (i.e., through channel lining) be retained/expanded in location and extent, wherever practicable. Retention of soft-bottom channels has substantial ecological

[5] Daily tidal water flows in and out through the existing mouth of the Full Tidal Basin in the BCER are essential to the ecological viability of the basin. The mouth currently is subjected to substantial natural littoral sand flow along the coast, with resultant shoaling of the mouth and restriction of tidal flows. As such, the mouth has been dredged annually to maintain tidal flow at a substantial cost, and these costs have exceeded the currently available funds for dredging. It is expected that the proposed Project would ensure the basin mouth is maintained open through dredging as part of a Project alternative that routes low/storm flows from Channel C05 through the Full Tidal Basin to the ocean, pursuant to Project flood risk management and FWCA offsetting/enhancement measures.

value and would reduce the ecological effects of the Project and the need for associated offsetting mitigation as compared to proposed fully armored/lined channels. To this end, in most locations where Project channels are below design flood capacity and heavily constrained by adjacent development/structures, we suggest that channel cross-section widths be expanded through the use of vertical channel walls (rectangular channels) combined with the incorporation of the footprint of proposed channel access/maintenance roads into the channel itself (e.g., such access roads would be above low-flow water levels but incorporated into the channel). In these constrained-width areas and where all-weather channel vehicle access is desired (such as during flood events, for swift-water rescue activities, repair, etc.), we suggest that only one access road (on one side of the channel) be retained within proposed channel designs, in order to gain additional channel width. This single access road would be along the top of the channel bank (as is typical), above design high-flow water level; the second access road along the opposite channel side would be eliminated from proposed designs. If a second parallel access road on the opposite side of the channel is also necessary in proposed designs, it should be incorporated into the channel cross-section (so as to be normally flooded during storm flow events, but dry during low flows) in order to gain water flow rate ("Q")[6] through the increased effective channel width. This additional effective discharge flow rate would likely allow for greater retention of soft-bottom channel sections within the Project. Project-caused losses of soft-bottom channel and earthen channel slopes should be offset elsewhere in the Project region. We suggest that up-to-date surveys for eelgrass beds by performed in potential habitats of the Project footprint, with eelgrass beds being avoided where practicable or replaced in-kind if unavoidable. We recommend that losses of soft-bottom channel and wetland areas from the Project (including proposed Project nonstructural measures with permanent or long-term impacts) be offset in the Project region at a minimum of a 2:1 ratio by area through creation of similar natural community types with commensurate/higher ecological functions and values.

5. We suggest that ecological restoration/enhancement, mitigation for channel and bridge-related impacts, and increases in channel flood capacity be collectively achieved through creation of restoration site(s) immediately north of Channel C02, within NWSSB. The main hydrological goal of establishment of this site(s) would be restoration of both flood and low flows to a re-created historical stream-floodplain in this area. The existing levee, boundary fencing, and access road along the NWSSB /Channel C02 boundary would be retained, but a series of culverts would be incorporated into the existing levees to divert a portion of both low and flood flows (about 50 percent) to and from this area of the historical floodplain, on lands within the NWSSB. These culverts would be designed to prevent human access to the NWSSB. Directing flood flows into and through this site would increase the effective capacity of the associated Channel C02 system to carry flood flows through this area. This

[6] Discharge (Q) is the volumetric flux rate of water as it passes some defining plane perpendicular to the (average) direction the water is traveling. Simply, the flow rate. Discharge is how much water is passing through a river at a particular cross-section.

restoration area would be surrounded by new levees, wherever necessary, to prevent damage from flooding of adjacent lands on NWSSB. The restoration area would be graded as needed to provide appropriate ground elevations and hydrology for a mix of open water, mud-flat, freshwater marsh, salt marsh, and/or riparian scrub natural communities, commensurate with the natural community potential of the selected sites. Construction permission and access would require negotiation of construction and maintenance easements from the NWSSB. A formal contaminants site and the NWSSB railroad in the area can likely be effectively avoided and protected by the restoration activities in the combinations suggested. This recommended restoration (i.e., at the upper portion of Channel C02, near Edinger Avenue and Bolsa Chica Street) may cause the loss of some agricultural lease lands on the NWSSB; restoration in this area would provide a greater ecological "lift" (i.e., wetlands creation) and would thus have higher mitigation value for the Project on a per-acre basis (as compared to restoring stream flows to areas of existing wetlands further downstream). Alternatively, restoring flood flows to the area outside the channel along the lower end of Channel C02 (near Edinger Avenue and Trinidad Lane) potentially could allow for these low and storm flows to exit through the NWSSB/Refuge to Anaheim Bay and the ocean, without returning to Channel C02 and passing through Huntington Harbour. Much of this area is currently muted tidal marsh and open water, and restoring flows to this area from Channel C02 would enhance/restore estuarine conditions (but generally would not result in creation of wetlands, usually associated with stream channel impacts' mitigation requirements). Since the ecosystem associated with the existing Project channels (and most of Orange County) is heavily lacking in ecologically-intact floodplain areas, adding this restoration component (either or both noted sites) to the Project would go very far in offsetting overall Project biological impacts and would improve flood risk management, as the restoration site(s) would increase floodwater holding and carrying capacity for the system. Negotiating the access easements for this work with the Navy could be difficult, including access easements for future maintenance. The vast majority of the restoration area(s) would normally not be subject to any maintenance (e.g., vegetation or sediment management) as part of Operations and Maintenance. Maintenance issues would likely remain minor over several decades, and mostly focused on removing debris from the culverts following larger storm events. Almost all of any new set-back levees on the NWSSB around the restoration site(s) would not be subject to high velocity flood flows (and thus erosion damage) due to protection afforded them by the new, wide floodplain area and the resultant low velocity storm flows.

6. The Corps should implement a construction schedule for the Project that avoids the least tern, snowy plover, Belding's savannah sparrow, black skimmer, and Ridgway's rail breeding seasons, if feasible, for any Project activities that are planned within or adjacent to potential breeding areas for any of these species within the BCER. The Corps should provide a qualified biologist per these species, acceptable to the Service and CDFW, and approved by the Corps, to help monitor and manage Project activities that would occur in or near potential breeding areas of these species or in or near the BCER or Seal Beach National Wildlife Refuge, as appropriate. This monitoring/management program should be carried out during Project activities in

potential sensitive species' breeding areas, including regular coordination with the Service and CDFW. Up-to-date surveys should be performed where needed, as appropriate. If the areas associated with Project activities have substantial potential of supporting sensitive species, the Corps should provide an education program for construction crews, including identification of the potential sensitive species, restricted areas and activities, and actions to be taken if sensitive species are found within and near Project activity areas. Similarly, Project construction activities should be timed/located/monitored to avoid green sea turtle activity periods and areas, as practicable.

7. If least tern, snowy plover, Ridgway's rail, Belding's savannah sparrow, black skimmer, and/or other sensitive wildlife species breeding activity/active nests are found within or directly adjacent to the Project's direct footprint during construction (despite efforts to schedule activities outside their breeding seasons), then all work in the immediate area should be halted, and the Corps biologist should be notified immediately. An appropriate buffer zone around any active nest for exclusion of Project-related activities should be specified by the biologist, in coordination with the Service and CDFW.

8. Mobilized trash and contaminants in urban and storm run-off remains a challenge in the Project area, per its effects on biota and regional water quality. Trash and contaminants from the Project watershed should be minimized before entry in the Project channel systems through a variety best management practices and programs, including community outreach and education (e.g., alternatives and appropriate use of fertilizers and chemicals in watershed), trash racks and signage at storm drains, small-scale and onsite sedimentation/infiltration basins, etc. Trash that makes its way into Project channels should be collected and removed from within Project lower channel reaches with the use of a series of high-function practicable measures, such as trash "wheels," booms, and other effective methods. The Corps and Orange County Public Works should work with upstream cities and state and federal regulatory agencies to address impacts from urban and storm water runoff. The Corps and Orange County Public Works should seek out infrastructure improvements, grant funding, regional partnerships, and technology to improve water quality in the region.

If you have any questions you have regarding this letter, please contact Jon Avery, Federal Projects Coordinator, at 760-431-9440, extension 309.

Sincerely,

for Scott A. Sobiech
Acting Field Supervisor

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PERSONAL COMMUNICATION

[Corps] U.S. Army Corps of Engineers. 2019. Email regarding Project alternatives changes from Shawna Herleth-King, Corps Chicago District Office to Jon Avery, Service Carlsbad Fish and Wildlife Office. July 12.

4.0 USACE Request for Final CAR

Appendix K: U.S. Fish and Wildlife Service Coordination Act Report

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DEPARTMENT OF THE ARMY
CHICAGO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
231 SOUTH LA SALLE STREET, SUITE 1500
CHICAGO IL 60604

January 23, 2019

Planning Branch

Ms. Carol Roberts, Division Chief,
Environmental Contaminants, Federal Projects
U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, California 92008

Dear Ms. Roberts:

This letter serves as a response to your July 31, 2019 Draft Fish and Wildlife Coordination Act Report (Draft CAR) prepared for the Tentatively Selected Plan described in the *Draft Integrated Feasibility Report/Environmental Assessment for the Westminster-East Garden Grove Flood Risk Management Study*. This letter also serves as a formal request for the U.S. Fish and Wildlife Service (Service) to finalize the CAR.

In the Draft CAR that was provided to the U.S. Army Corps of Engineers (Corps), the Service provided eight recommendations. The Corps has reviewed these recommendations and the following responses are provided:

Service Recommendation 1: Design an alternative to be analyzed/developed that would provide (through levee removal or modification) for moving storm-flood flows, or both low and storm-flood flows, from Channel C05 within the Bolsa Chica Ecological Reserve (BCER) to the ocean through the Full Tidal Basin.

Corps Response 1: The Corps conducted an analysis of the opportunity to overflow water from C05 into the muted tidal pocket and the full tidal basin of the BCER instead of through an expanded Warner Avenue Bridge (enclosure 1). This opportunity was analyzed, even though it was determined to be a planning constraint at the initiation of the study, after requests were received from local stakeholders at the end of the public review of the Draft Report. The opportunity was analyzed at a high level in order to determine whether it should be incorporated as an alternative that would be fully analyzed in the Final Report. The high level analysis concluded that the overflow into the full tidal basin has the potential for more impacts environmentally; is not significantly more cost effective than the recommended plan; and has hazardous, toxic, and radioactive waste (HTRW) policy issues that require rejection of the opportunity that conveying flood flows from C05 to the full tidal basin would not require regular dredging of the full tidal basin's ocean outlet for flood risk management purposes.

Service Recommendation 2: Suggest that Channel C05 levees within the BCER that are not essential for flood risk management be evaluated for removal, where it is determined (with additional analysis) to have an ecological benefit to the BCER lagoon ecosystem and sensitive species, when considering hydrology, watershed and buried contaminants, basin mouth shoaling and dredging costs, trash deposition in the BCER, etc.

Corps Response 2: Currently, the Corps Recommended Plan includes fortifying the levees along the C05 Channel within the BCER with double sheet-pile walls. Due to schedule and budget limitations at this phase of the study we are unable to evaluate the feasibility of the proposed modifications to the C05 Channel levees. We believe that the recommendation should be considered, which would include establishing a hydrologic connection between the C05 Channel and portions of the BCER. Although we are unable to evaluate the proposal at this time, we are committed to evaluating this recommendation during the next phase of the project. If Congress authorizes the project and appropriates funds for the preconstruction engineering and design phase (PED) of the project, we are required by Corps policy to perform value engineering (VE) studies on high dollar project components.

Value engineering is an organized effort directed at analyzing proposed building features, systems, equipment, and material for the purpose of achieving essential functions at the lowest life cycle cost consistent with required performance, quality, reliability, and safety. Removal or modification of pertinent sections of the C05 levee will be considered under a VE study very early in the implementation phase of the project because downstream components will be the first to be constructed. Preliminary estimates show that approximately $50,000,000 could be saved by eliminating the work related to this portion of the C05 channel. As noted above, our schedule and budget for the completion of the feasibility study does not allow for full analysis of the recommendation (design, cost, hydraulic modeling, mitigation planning, environmental compliance, etc.) and its subsequent incorporation into the feasibility study documentation at this time. While the Corps is regretful that we cannot evaluate the Service's C05 levee modification recommendation at this time, we are committed to evaluating this recommendation during the PED phase of the project. We take the potential savings of $50,000,000 very seriously and are committed to VE in general. Further, we understand the importance and significance of the Bolsa Chica Ecological Reserve to numerous special status species, rare habitat types, and the surrounding community and support the restoration of the hydrologic regime in the muted tidal basin. We want to ensure that our Recommended Plan does not jeopardize this resource and potential future restoration efforts that may be undertaken at the reserve.

Within the Final Report, the Corps has included the evaluation of this recommendation during the PED phase in Section 8.10.6, Further Studies.

Service Recommendation 3: Design an alternative to be analyzed/developed that would provide for moving storm flood flows from Bolsa Bay (coming in from Channel C05) directly to the Pacific Ocean.

Corps Response 3: During formulation of measures a new ocean outlet was considered. However, this measure was screened from further analysis. A new tidal inlet was created within the BCER in 2006 to allow connectivity between the ocean and the restored full tidal basin. The tidal inlet requires annual dredging to remove sand from the inlet. Without the annual maintenance of the tidal inlet, the full tidal basin would become closed off from the ocean, causing degradation of water quality, impacts to biota in the basin, damage to intertidal plant communities, and loss of an important food source for nesting birds. During consideration of a new ocean outlet as part of the proposed flood risk management study there was concern that annual maintenance to maintain the connection of the new outlet to the ocean would be required, similar to what is currently required for the tidal inlet that was created in 2006. Additionally, the California Department of Fish and Wildlife expressed concern in their scoping response letter about a new ocean outlet and its potential impacts to Rabbit Island and Bolsa Chica Basin (Sevrens 2018 [enclosure 2]).

Service Recommendation 4: Recommend that soft-bottom channels that are proposed to be eliminated as part of the Project (i.e., through channel lining) be retained/expanded in location and extent, wherever practicable.

Corps Response 4: During plan formulation retaining soft-bottom channel habitat were practicable was considered. Although soft-bottom habitat is proposed to be eliminated in some channel reaches, in other channel reaches soft-bottom habitat is being maintained and even increased. *Appenidix H – Plan Formulation* to the main report includes detailed descriptions on the modifications proposed for each channel reach, and where soft-bottom habitat will be retained/increased.

Service Recommendation 5: Suggest that ecological restoration, mitigation for channel and bridge-related impacts, and increases in channel flood capacity be collectively achieved through creation of restoration site(s) immediately north of Channel C02, within the Naval Weapons Station Seal Beach.

Corps Response 5: The Corps did approach the Navy regarding the establishment of a restoration site within the Naval Weapons Station Seal Beach where the base is adjacent to C02 Reach 23. At this time, the Navy did not want to consider portions of its base for construction of a restoration site as part of the recommended project. Therefore, this is not a viable option.

Service Recommendation 6: The Corps should implement a construction schedule for the Project that avoids the least tern, snowy plover, Belding's savannah sparrow, black skimmer, and light-footed Ridgway's rail breeding seasons, if feasible, for any Project activities that are planned within or adjacent to potential breeding areas for any of these species within the BCER.

Corps Response 6: The Corps accepts this recommendation and has included this as a mitigation measure for biological resources. Construction activities along portions of

C02 Reach 23 that are adjacent to Seal Beach National Wildlife Refuge, Warner Avenue Bridge, and along portions of C05 Reach 1 that are adjacent to BCER will only occur between October 1 and February 28, outside of bird nesting season. This mitigation measure is included in the Final Report as MM-BIO-1 in Section 5.8.3.

Service Recommendation 7: If least tern, snowy plover, light-footed Ridgway's rail, Belding's savannah sparrow, black skimmer, and/or other sensitive wildlife species breeding activity/active nests are found within or directly adjacent to the Project's direct footprint during construction (despite efforts to schedule activities outside their breeding season), then all work in the immediate area should be halted, and the Corps biologist should be notified immediately. An appropriate buffer zone around any active nest for exclusion of Project-related activities should be specified by the biologist in coordination with the Service and the California Department of Fish and Wildlife.

Corps Response 7: The Corps accepts this recommendation and has included this as a mitigation measure for biological resources. Prior to construction activities, a biologist that meets the Service standard qualifications will conduct a biological resource sweep of the work area. In the event that sensitive (protected) wildlife species are present, the biologist will determine if the activity would cause adverse impacts that have not been previously considered and evaluated. If it is determined that the activity could have the potential to adversely affect wildlife species in a manner not authorized by Federal or State permits, the activity will cease until the species is no longer in harm's way or is relocated outside of the construction activity impact area. This mitigation measure is included in the Final Report as MM-BIO-2 in Section 5.8.3.

Service Recommendation 8: Mobilized trash and contaminants in urban and storm run-off remains a challenge in the Project area, per its effects on biota and regional water quality. Trash and contaminants from the Project watershed should be minimized before entry in the Project channel systems through a variety of best management practices and programs, including community outreach and education (e.g., alternatives and appropriate use of fertilizers and chemicals in watersheds), trash racks and signage at storm drains, small-scale and onsite sedimentation/infiltration basins, etc.

Corps Response 8: Design of the recommended project does include trash collection systems within the channels to minimize trash entering downstream sensitive areas such as the BCER. In addition, Orange County Public Works, the non-federal sponsor for the project, has several programs in place already that are aimed at reducing trash within the channels through community outreach. These programs include adopt a channel, coastal and inner coastal cleanup day, and various earth day cleanup events. Refer to http://www.ocwatersheds.com/programs/waterways/stormwater/clean_up_day for information on these programs.

The Corps would like to thank the Service for their ongoing coordination regarding the Westminster East Garden Grove Flood Risk Management Project. As the Service may know, the Westminster watershed is the largest remaining Federal Emergency Management Agency Special Flood Hazard Area in Orange County. Preliminary

analysis shows that the existing configuration of the channels within the Westminster watershed puts approximately 400,000 area residents and 44,000 structures at risk during a 0.2% annual chance of exceedance event (i.e., storm event with a 20% chance of occurring in any given year, or a 5-year recurrence-interval storm event). The recommended project is designed to contain the 1% annual chance of exceedance event (i.e., storm event with a 1% chance of occurring in any given year, or a 100-year recurrence-interval storm event), thereby effectively removing these residents and structures from the flood hazard area. Understandably, this project is a priority for the U.S. Army Corps of Engineers (Corps) and was fully funded by Congress in the 2018 disaster supplemental funding appropriation.

The Corps will continue to coordinate with the Service closely to assist in preparation of the Final Fish and Wildlife Coordination Act Report. Should any questions arise, or additional information is needed, please contact Ms. Shawna Herleth-King at (312) 846-5407 or shawna.s.herleth-king@usace.army.mil.

Sincerely,

Susanne Davis, P.E.
Planning Branch Chief

Enclosures (2)

ENCLOSURE 1

Westminster, East Garden Grove, CA Flood Risk Management Study
Decision on Implementation of the Full Tidal Basin Spillover Alternative

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Decision

In a letter to the Corps dated 03 December 2018, the California State Lands Commission requested consideration of an alternative to the current plan for conveying flood flows from the East Garden Grove-Wintersburg (EGGW) Flood Control Channel (C05) to the ocean. The alternative would outlet the flows through the Full Tidal Basin (FTB) of the Bolsa Chica Ecological Reserve (BCER) instead of through an expanded Warner Avenue Bridge to Huntington Harbour to Anaheim Bay. The study team met with representatives of the California State Lands Commission, California Department of Fish and Wildlife, Santa Ana Regional Water Quality Control Board, U.S. Fish and Wildlife Service, and the National Marine Fisheries Service on multiple occasions to discuss the alternative.

The request to consider this alternative was motivated by the potential for a mutually beneficial alternative whereby the Orange County Flood Control District, in operating and maintaining the flood risk management project, would contribute to the maintenance dredging of shoaling at the ocean outlet of BCER. Tidal flow into and out of the BCER is essential to the habitat established by the mitigation project. Outlet dredging activities for the mitigation project cost more than originally estimated and have been impacted by budget shortfalls.

The Corps' subsequent analysis concludes that the alternative is not preferred over the current selected plan of directing the flows into Huntington Harbour. This decision was reached after analyzing the Environmental, Hydrology & Hydraulics (H&H), Cost, and Federal Policy aspects of the alternative. The FTB alternative has more potential impacts environmentally, is not significantly cheaper, and has HTRW policy issues that require rejection of the alternative in the presence of a worthy alternative. The analysis also concludes that conveying flood flows from C05 to the FTB would not require regular dredging of the ocean outlet for the purpose of flood risk management.

Background

A Draft Integrated Feasibility Report (IFR) and Draft Integrated Environmental Impact Statement/Environmental Impact Report (EIS/EIR) is being prepared for the Westminster, East Garden Grove Orange County, California, Flood Risk Management Study. The Draft IFR includes an analysis of a reasonable range of alternatives to reduce the risks to life safety, damages to residential and commercial structures, damages to public infrastructure, and time lost due to traffic delays caused by flooded transportation routes. The Draft IFR also includes an assessment of the environmental impacts of the flood risk management alternatives. Note that when the Corps originally scoped the study in 2006, it specifically excluded consideration of alternatives that might affect the Full Tidal Basin in the BCER. The Bolsa Chica Lowlands Restoration Project was established as a mitigation project for the Ports of Los Angeles and Long Beach through an agreement with the Corps, U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. EPA, California Department of Fish and Game, California Coastal Conservancy, California State Lands Commission, Long Beach Harbor, and Los Angeles Harbor. The decision to avoid the FTB was driven by concerns over the potential to adversely affect the reserve, as well as likely requiring the renegotiation and amendment of the existing mitigation agreement.

Study Area

The study area is the highly urbanized Westminster watershed in western Orange County, California. The watershed is approximately 87 square miles in area and lies on a flat coastal plain. The watershed was formerly part of the floodplain of the Santa Ana River, which historically meandered throughout the existing watershed as far north as Anaheim Bay. Channelization and large scale flood control modifications have constrained the Santa Ana River to the main stem channel on the eastern border of the Westminster watershed.

Cities in the watershed include Anaheim, Stanton, Cypress, Garden Grove, Westminster, Fountain Valley, Los Alamitos, Seal Beach, and Huntington Beach (**Figure 1**).

Naval Weapons Station Seal Beach, Seal Beach National Wildlife Refuge, and the Bolsa Chica Ecological Reserve are significant landmarks on the downstream end of the study area.

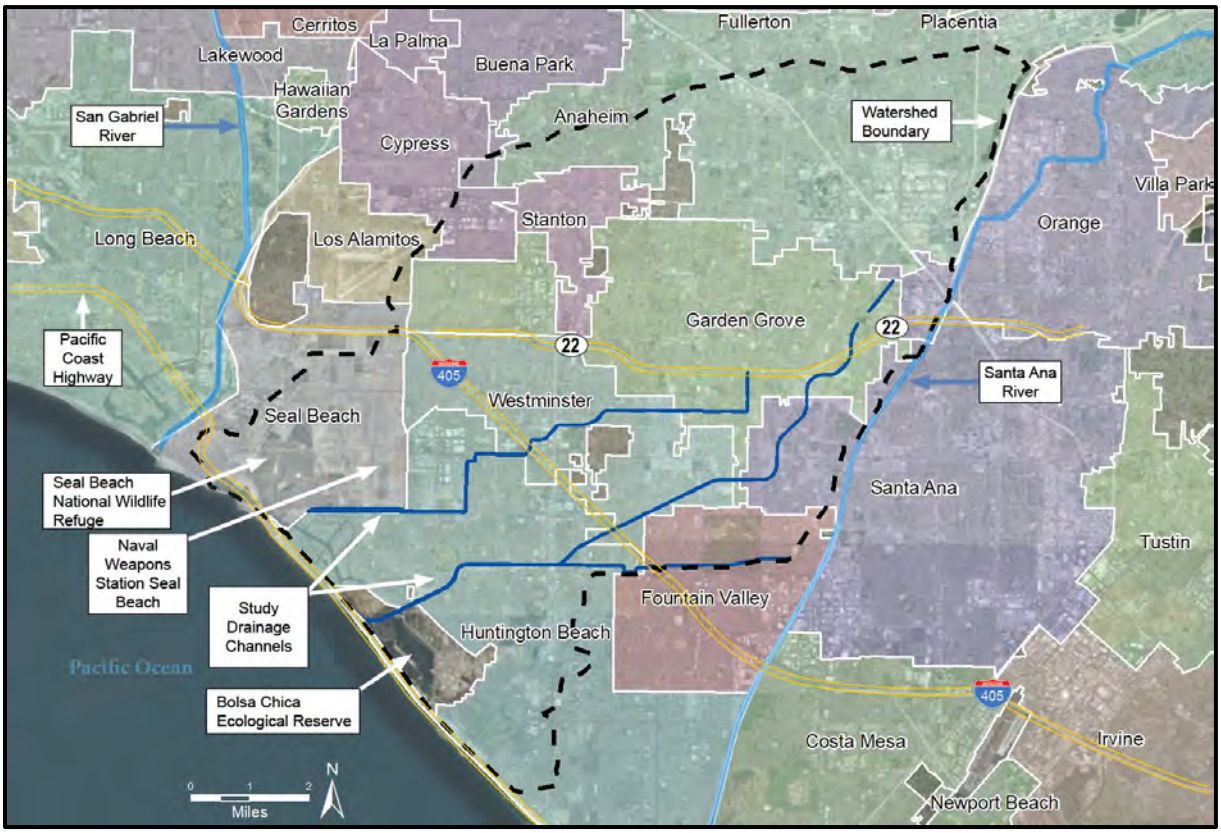

Figure 1 – Study area.

The project area includes portions of four non-federal flood control channels within the Westminster watershed and the receiving waters of one of the flood control channel systems in the Bolsa Chica Ecological Reserve (**Figure 2**).

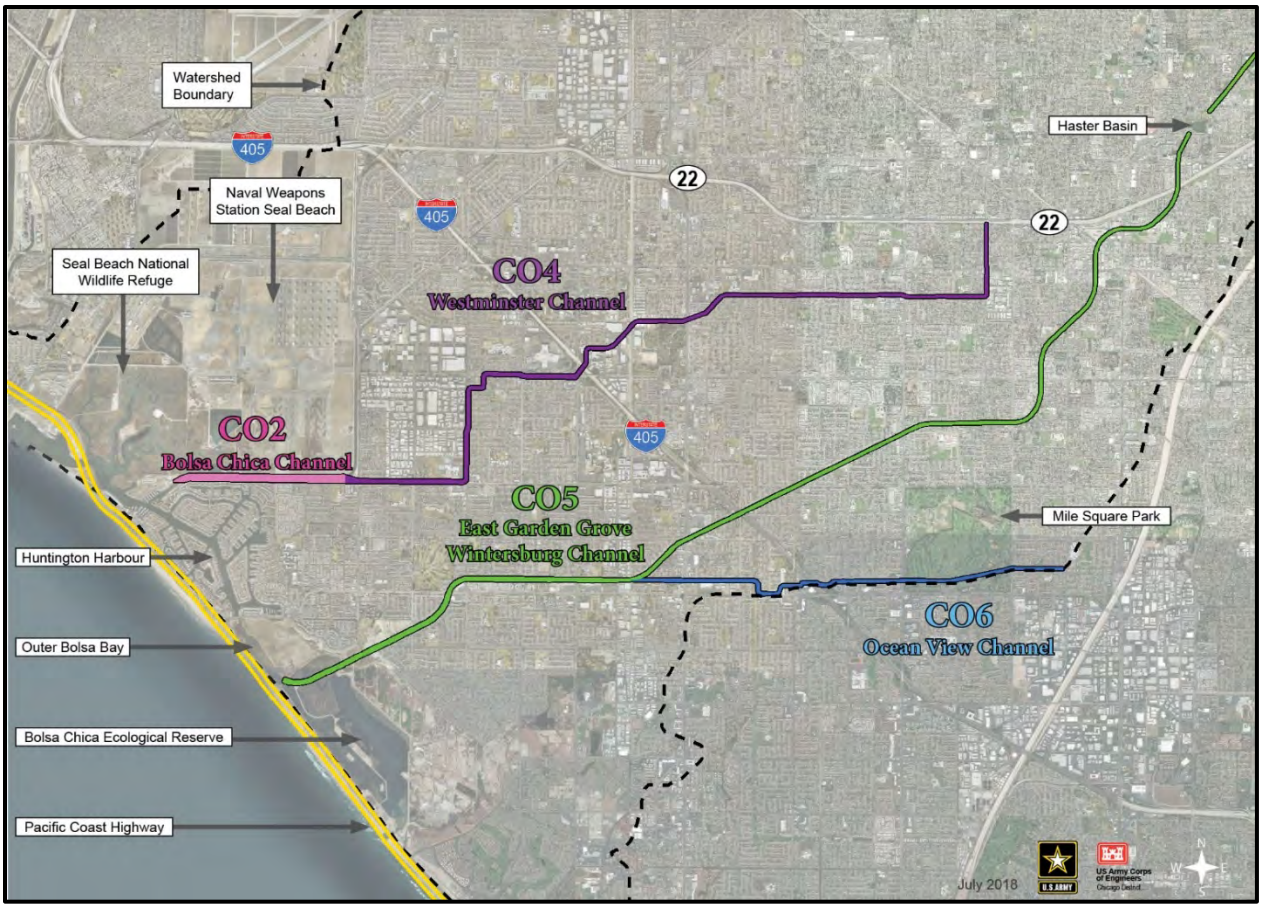

Figure 2 – Drainage channels within the study area.

Full Tidal Basin (FTB) Outlet Alternative Description

The proposed FTB Outlet alternative specifically focuses on the downstream end of C05. C05 begins west of the intersection of Interstate 5, Highway 57, and Highway 22 in the City of Santa Ana and flows southwest through Haster Basin, under Interstate 405, and through the Bolsa Chica Ecological Reserve (BCER). C05 also includes waters from its tributary channels, including the Ocean View Channel (C06), all of which discharge into Outer Bolsa Bay, Huntington Harbour, and eventually the Pacific Ocean at Anaheim Bay.

Under the feasibility study tentatively selected plan and locally preferred plan, floodwaters from the C05 would flow north into Huntington Harbour and eventually out to the Pacific Ocean through Anaheim Bay. The plan requires increasing the span of Warner Avenue Bridge and excavation of the channel upstream of the bridge to accommodate increased flows caused by channel improvements upstream. The proposed alternative would spill water from C05 into the FTB of the BCER. The FTB outlets to the ocean under a bridge on Pacific Coast Highway (PCH). An approximately 1700-foot weir with adjacent erosion protection would be installed along the C05 south levee to allow waters to overflow into the FTB. The weir would be designed to prevent waters from smaller storm events, as well as the initial flush from larger storm events, from entering the FTB. Only storm events greater than approximately the 10-25-year event would be able to overflow into the basin.

Analysis

The discussion of the FTB alternative below considers the Environmental, H&H, Cost and Federal Policy aspects of the decision. The FTB alternative was not part of the original scope of study or NEPA/CEQA documentation, and it has not been evaluated to the extent of the current alternative. However, enough information is available to confirm the preference of the current plan.

Environmental Analysis

The environmental analysis contained in the Bolsa Chica Lowlands Restoration Report (2001) was utilized to understand potential significant adverse impacts to area resources from spilling from C05 into the FTB. Alternative 6 of the report is very similar to the proposed FTB alternative for the Westminster study. The report included the analysis of 8 alternatives, including the No Action Plan and the Proposed Project. Under Alternative 6, an approximately 1200-foot side weir would have been constructed into the south levee of C05 to allow a portion of the peak flows during 10-year and greater storms to discharge into the full tidal basin (**Figure 3**). During peak flows of a 100-year storm, 4,650 cfs would be conveyed to Outer Bolsa Bay via the flood control channel and 4,640 cfs would flow into the wetlands. Flows from C05 would begin spilling into the full tidal basin at about the 10-year storm interval. Alternative 6 had two potentially significant adverse impacts that could not be mitigated to insignificant:

- Elevated *Enterococcus* levels during 10-year or greater storms which may cause temporary closure of nearshore zone water, resulting in a significant, adverse impact.
- Significant water quality impact from exceedance of water quality standards in the wetlands and coastal waters during 10-year or greater storm flows.

Predicted values for three metals, as well as total coliform bacteria, were used to determine the significance of water quality impacts from chemical and bacteriological factors. Modeling results indicated that for 10-, 25-, and 100-year storm flows, metal concentrations in the full tidal basin would have violated both the instantaneous and 4-day criteria for zinc and copper and the 4-day criterion for lead. Metals levels in coastal areas would have violated the instantaneous criterion for copper during the 25- and 100-year storms. Because these violations would have occurred throughout the wetlands and into the coastal areas, this impact would have been significant. In regards to coliforms, modeling results indicated that for all storm flows, the full tidal basin would have had violations only near the diversion structure. No violations would have been expected to occur in coastal waters. Short-term violations close to the diversion structure but not throughout the wetlands or in coastal waters would have resulted in adverse but insignificant impacts. It was noted that it would have been possible that for 10-year storms or greater, beach postings and/or closures may have resulted due to *Enterococcus* levels in ocean waters being above the new criteria, which would have been a significant adverse impact. Conversely, water quality in Outer Bolsa Bay was expected to improve since part of the floodwaters from C05 would have been diverted to the full tidal basin during large storms.

In addition to the aforementioned significant adverse impacts, other potential impacts were expected to be adverse but insignificant in terms of sediment, flora and fauna.

Ultimately, the current mitigation project, referred to as the “Proposed Project” in the Bolsa Chica Lowlands Restoration Report, was selected over all the alternatives including Alternative 6. The reasoning was that of all the restoration alternatives, the Proposed Project was expected to provide the highest quality environment for aquatic fish and invertebrates because C05 would not discharge into the full tidal basin. Therefore, the disturbance to the aquatic community from the freshwater influx and pollutants during storm flows would not occur. In addition, since the Proposed Project would have no

discharges from C05, metals and bacteria would not be carried into the wetlands and ocean. All of the other tidal inlet alternatives, including Alternative 6, were expected to have significant, unmitigable, adverse impacts to water quality in the wetlands and coastal waters from pollutants in storm flows. Bacteria in ocean waters would have likely exceeded thresholds during some storm events and swimming and surfing would have been restricted. Loss of swimming and surfing use of ocean waters during periods when bacteria exceed threshold levels would have been an unmitigable, significant, adverse impact to recreation.

The implementation of the "Proposed Project" included a multi-party legal agreement. All of the parties agreed to implement a project "in substantial conformance with the Concept Plan" and this would serve as mitigation for the work done by the Ports of Long Beach and Los Angeles. The agreement has been expanded/modified three times. The Agreement says: "The parties agree that the Project shall provide, in perpetuity, fish and wildlife habitats in the Bolsa Chica Lowlands consistent with the Concept Plan." To achieve that purpose, the parties agreed "to carry out the Project in substantial conformance with the Concept Plan" and defined "substantial conformance" to mean "not differing in any way that results in a reduction in the habitat values and aquatic functions anticipated from the Project and not in conflict with the requirements of State and Federal law." Any change to the general plan would require the approval of all signatories to the agreement. The concept plan calls for an ecosystem that is "predominantly salt water influenced, but incorporating biologically beneficial freshwater influence." Because an EIS supported the Federal decision to implement this plan, a rather substantial supplemental EIS/EIR would be required to alter it, especially considering the need to reach a contrary conclusion regarding spilling floodwaters from C05 into the basin.

The FTB overflow alternative would need to include modification for the loss of habitat due to the construction of the overflow weir and associated scour protection features. Due to the high ecological value of the existing BCER, it is likely that significant mitigation would be required.

Environmental Analysis Conclusion: the FTB alternative being virtually identical to Alternative 6 of the Bolsa Chica Lowlands Restoration Report can be assumed to cause two known potentially significant adverse impacts that could not be mitigated to insignificant, as discussed above. It was noted that it is possible that water quality has improved somewhat because of environmental regulations that restrict certain metals in vehicle brake pads that went into effect in 2017.

Additionally, high quality habitat has developed in the FTB since the Bolsa Chica Lowlands Restoration Project was implemented, including mudflats, other wetlands, and nesting areas for threatened & endangered bird species. Adverse impacts to these sensitive and high quality species would be possible if spilling was to occur from C05 to the FTB. This potential to impact existing high quality habitat would need to be analyzed and compared to any adverse impacts under the tentatively selected plan. By comparison, all significant adverse environmental impacts of the tentatively selected plan are able to mitigated, and thus there is anticipated to be no net adverse impact. Therefore, the current plan is preferred.

Adopting the FTB alternative would require a time consuming and costly modification to the mitigation project agreement with required EIS/EIR. The current plan EIS/EIR is nearing completion. In addition, including the FTB alternative into the study at this time would significantly delay the completion of the study, require additional funding, and approval of a study schedule extension by Corps HQ.

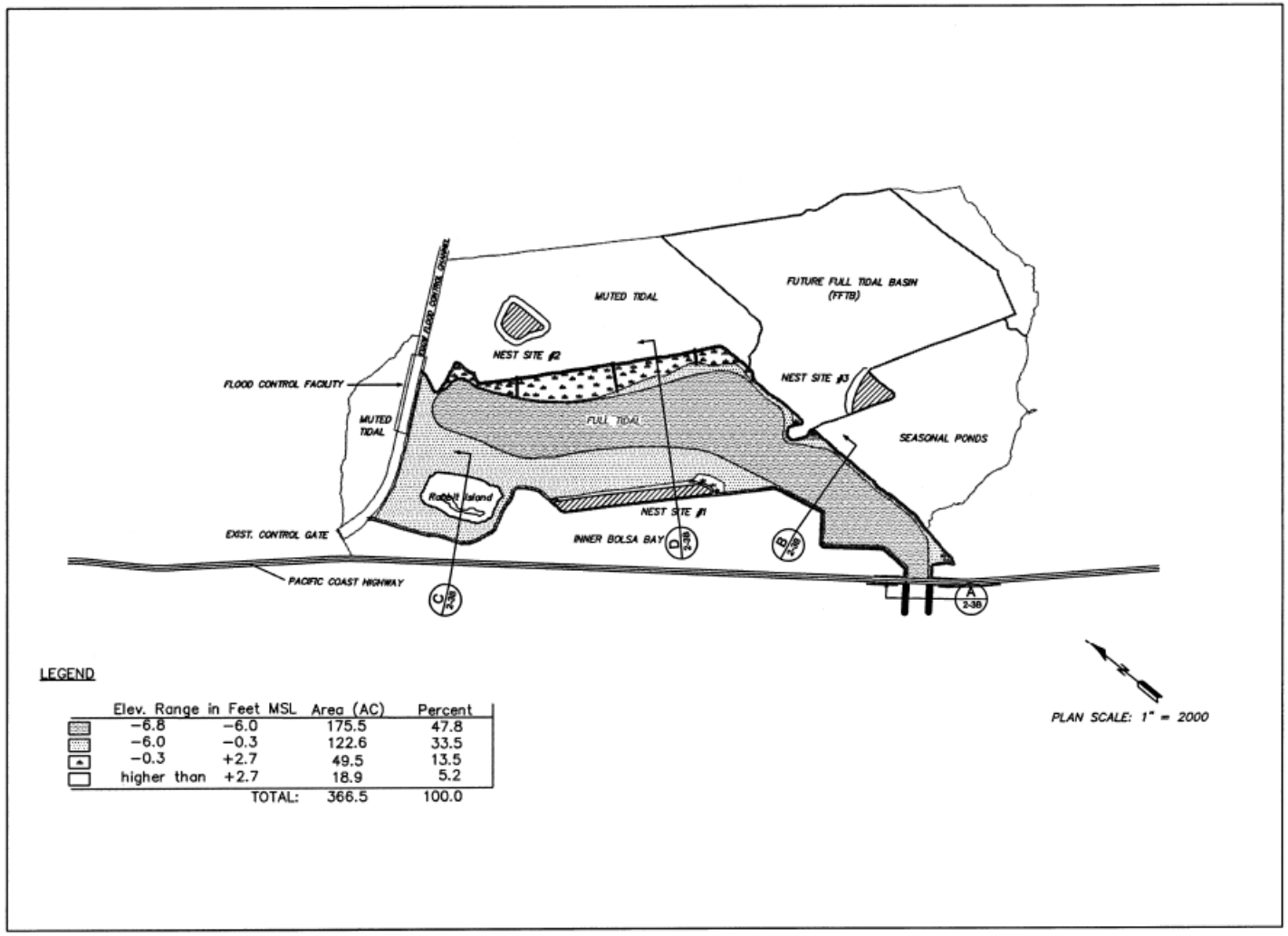

Figure *3* – Alternative 6 Concept Plan Source: Bolsa Chica Lowlands Restoration Report

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Hydrology & Hydraulic Analysis

Hydraulic models were used to evaluate the proposed FTB alternative. The C05 channel would contain flows up to the 10-25 year frequency. For larger storm events, a 1700' long hydraulic structure would be required to safely pass flows into the FTB. Localized armoring for scour protection would also need to be installed in the FTB.

During discussions with the State Lands Commission and other stakeholders it became clear that a "win-win" situation was desired in which flood flows spilling into the FTB would help to clear sand deposition at the ocean outlet or if the flood control project could contribute to the annual dredging costs of the outlet. However, based on the modeling, overflow from C05 into the FTB is unaffected by the dredge condition of the full tidal basin for the 100-year event. Discharge is controlled by the weir capacity of the overflow. A shoaled in pre-dredge condition is not severe enough to cause backwater across the overflow structure. Due to the large hydraulic capacity of the inlet/outlet channel and attenuation for both the pre and post dredge condition, stage increases in the FTB from the overflow are small (tenths of a foot). The model shows that the water surface elevation in FTB under the pre-dredge condition is only a couple of inches greater than the post dredge condition.

The model suggests that the greatest benefit of dredging appears to be establishing the full tidal range in the FTB. Prior to dredging, model results show muting during both high and low tide. This confirms the importance of dredging operations in support of the BCER mitigation project.

H&H Analysis Conclusion: the H&H model analysis only considered the pre and post dredge condition and did not look at long term impacts of not dredging the ocean outlet in the FTB. It is assumed that the current dredging being carried out by the State Lands Commission is integral to the success of the existing restoration project and that it will continue to occur in the future without project condition. Therefore, annual dredging to support the operation of the flood risk management project is not necessary and would not be included in a FTB alternative for flood risk management.

Cost Analysis

The FTB alternative includes construction of a 1700' weir structure, and localized armoring for scour protection. The estimated cost of the 1700' overflow weir has been derived from the costs for a similar structure for alternative 6 discussed in the Bolsa Chica Lowlands Restoration Report (2001). Alternative 6 featured a 1200' weir with riprap erosion protection. The cost of a 1700' weir with riprap, pro-rated from costs estimated for alternative 6 and escalated to today's dollars is $26,187,000. This includes construction, design, construction management and contingency costs.

For comparison, the cost of the tentatively selected plan including the extension of Warner Avenue Bridge, widening of the channel upstream from the bridge, and armor protection for higher flows in Huntington Harbour is $36,541,000.

While an impacts analysis of the weir structure and associated scour protection has not been completed, mitigation would be required. Mitigation for high quality habitat would likely be out of kind, and require significantly higher acre ratio than an equal replacement. Mitigation costs could be significant.

Cost Analysis Conclusion: construction the FTB alternative hydraulic structures appears to be approximately $10 million cheaper than the current plan. However, mitigation costs have not been fully analyzed nor included in the cost analysis. In any case, the cost difference is not large enough to compel selection of the FTB alternative when considering other environmental and HTRW risks/impacts.

Federal Policy on HTRW

Corps policy prohibits the selection of an alternative with HTRW risk when other practicable alternatives are available. The Corps uses the term HTRW for hazardous, toxic, and radioactive wastes. This generally means all materials regulated under a federal environmental statute. More critically, civil works appropriations cannot be used to perform remediation of contaminated sites. The strong policy of the United States is that polluters should bear the costs of pollution:

> [I]t is [Civil Works] policy to not use federal appropriations to remedy contamination that is the responsibility of others and for which there is little or no nexus between the contamination and USACE. The policy to not conduct response actions on sites with other viable PRPs [potentially responsible parties] is based on the following: fiscal law restraints, which limit use of appropriated funds to clean up contamination not caused by USACE; lack of adequate resources to pursue cost-recovery or contribution action; concern that the burden of proof is not unnecessarily shifted to the United States with respect to any action; necessity to preclude diversion of program dollars from other CW activities; desire to avoid incurrence of long-term cost demands; and consistency with the National policy that the "polluter pays" for contamination for which it is liable and that general taxpayer funds should not be used to relieve PRPs of their liability under CERCLA.

Corps guidance requires that HTRW assessments during feasibility studies should determine the type and extent of HTRW contamination, if any, and how HTRW considerations affect project alternatives. Because the alternative to spill floodwaters into the Bolsa Chica Ecological Reserve wasn't part of the original plan formulation, the Corps did not perform a full-scale Phase I environmental site assessment per ASTM E1527-13. Nevertheless, an experienced environmental engineer did assess the potential risks associated with this alternative. That analysis informs the answers to the questions asked by Corps senior leadership prior to approval of projects:

1. *Is avoidance of HTRW practicable?*

As discussed in the draft feasibility report, Corps planners have identified an alternative for managing the flows from C05 that is technically feasible, cost effective, and environmentally acceptable. The alternative to send flows through Huntington Bay and under Warner Avenue is feasible to construct and has benefits that exceed its costs, and thus is considered cost-effective. It is also environmentally acceptable. All significant adverse environmental impacts of the tentatively selected plan are mitigable, and thus there is anticipated to be no net adverse impact.

2. *What is the risk of required response action for proposed alternative under current conditions?*

The construction of the BCER was the result of an agreement between a number of federal and state resource agencies to mitigate the environmental consequences of the expansion of the LA-Long Beach ports. Prior to the construction of the reserve, the area was an active oil field for 50 years. It is still

adjacent to an operating oil field. The service roads that transect the site were originally built to facilitate oil operations.

A review of the environmental impact statement from the Bolsa Chica Lowlands Restoration Project makes clear that the ecological reserve was constructed on a contaminated site, with contaminated soils either hauled off site or used in construction of certain levees, nesting areas, and overlooks that surround the area. It is unclear whether contaminated material was used to construct nest sites or other areas of the ecological reserve. The available data shows that the materials confined on site exceed California's residential exposure standards. The precise locations and extent of contaminated material is unknown and would need to be assessed; whether the containment is intact would also need to be assessed.

Additionally, the full tidal basin and the active oil field are situated below sea level; if the inlet were closed or there was extreme muting of the tidal inlet, rising groundwater levels and oil contamination is possible. Maintenance of the inlet is crucial and emergency dredging, triggered by El Niño storms, has been needed in the recent past (2016-2017).

In sum, though the site is currently functioning as an ecological reserve, the site includes a number of recognized environmental conditions that could potentially require remediation, including risks from deteriorating levees or nest sites, groundwater contamination, and oil contamination from the adjacent oil field.

3. *What is the risk of response action from the proposed FTB alternative?*

If the Corps were to implement the suggested alternative, it would require extensive environmental analysis, sampling, and modeling. The location and extent of contamination throughout the site is unknown, which makes it challenging to determine what mitigating measures would be necessary.

At a minimum, by constructing a portion of the flood risk management on the site, the Corps would likely take on operator liability for both existing and any new releases on the site. The indemnification provisions of the Project Partnership Agreement would help to insulate the Corps from response costs, but could not prevent the Corps from being named a potentially responsible party in a suit by a regulator or third party.

Although preliminary modeling has suggested that the increased flows from the overflow weirs are unlikely to create flows sufficiently large to directly impact the stability of the levees (from scouring, for example), by virtue of its use of the site to direct floodwaters, the Corps would be responsible for ensuring that those levees were sufficient to prevent the incursion of oil from the adjacent oil field or a release from any degradation of the levees. It is also unknown at this point whether groundwater releases are a concern and whether the site could be isolated from either receiving or releasing contaminated groundwater.

4. *Are there adequate legal protections for this alternative?*

As with all cost-shared flood risk management projects, before implementation the Non-Federal Sponsor (in this case Orange County), would be required to sign a project partnership agreement whereby it agrees that if CERLCA-regulated materials are discovered on the project site, the sponsor "shall be responsible, as between the Government and the Non-Federal Sponsor, for the costs of cleanup and response" and that "[s]uch costs shall not be considered part of total project costs."

Although this indemnification agreement would potentially insulate the Corps from the costs of any response, it would not prevent a regulator or third party naming the Corps as a potentially responsible party, and it would require affirmative litigation to seek contribution from Orange County or other PRPs.

HTRW Analysis Conclusion: apart from the engineering and cost concerns with this suggested alternative, the direction of flood flows into the Bolsa Chica Ecological Reserve raises significant risks related to HTRW. With extensive modeling, sampling, and analysis, it may be possible to reduce those risks. Nevertheless, Corps policy requires avoidance of HTRW risks when it is practicable to do so. The tentatively selected plan is a practicable alternative that raises none of the significant HTRW risks potentially implicated by the FTB alternative. Based on this rationale, the FTB alternative is not policy compliant and in light of a valid alternative, is unlikely to be approved by Corps leadership in the agency approval phase of the study.

ENCLOSURE 2

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
South Coast Region
3883 Ruffin Road
San Diego, CA 92123
(858) 467-4201
www.wildlife.ca.gov

EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

January 12, 2018

Ms. Shawna Herleth-King
U.S. Army Corps of Engineers, Chicago District
231 S. LaSalle St., Suite 1500
Chicago, IL 60604
shawna.s.herleth-king@usace.mil

Subject: Comments on the Scoping Notice for the Westminster East Garden Grove Study
SCH# 2017124001

Dear Ms. Herleth-King:

The California Department of Fish and Wildlife (CDFW) has reviewed the above-referenced Scoping Notice for the Westminster East Garden Grove Study (Project). A Notice of Intent to prepare a draft Environmental Impact Statement/Environmental Impact Report was published in 2006. The current Scoping Notice seeks updated comments on the Project and study area to be considered for incorporation into the draft National Environmental Policy Act (NEPA) document.

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California fish and wildlife. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Project that CDFW, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

CDFW ROLE

CDFW is California's Trustee Agency for fish and wildlife resources, and holds those resources in trust by statute for all the people of the State. (Fish & G. Code, §§ 711.7, subd. (a) & 1802; Pub. Resources Code, § 21070; California Environmental Quality Act [CEQA] Guidelines § 15386, subd. (a).) CDFW, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species. (*Id.*, § 1802.) Similarly, for purposes of CEQA, CDFW is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources.

CDFW is also a Responsible Agency under CEQA. (Pub. Resources Code, § 21069; CEQA Guidelines, § 15381.) CDFW may need to exercise regulatory authority as provided by the Fish and Game Code. As proposed, for example, the Project may be subject to CDFW's lake and streambed alteration regulatory authority. (Fish & G. Code, § 1600 et seq.) Likewise, to the extent implementation of the Project as proposed may result in "take" as defined by State law of any species protected under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 et seq.), related authorization as provided by the Fish and Game Code will be required. CDFW also administers the Natural Community Conservation Planning program. CDFW is also the land management agency for the Bolsa Chica Ecological Reserve (BCER) under State Lands Commission leases PRC 4733.9, PRC 4734.9 and PRC 8704.9.

Project Location:
The proposed Westminster East Garden Grove Study (Project) is located within a portion of the Westminster watershed, in western Orange County, California. The Project area includes select non-Federal drainage channels within the watershed and receiving waters. Two main channel systems collect runoff from portions of the cities of Anaheim, Stanton, Cypress, Orange, Santa Ana, Garden Grove, Westminster, Fountain Valley, Los Alamitos, Seal Beach, and Huntington Beach. The East Garden Grove-Wintersburg Flood Control Channel (EGGW) is adjacent to two Bolsa Chica Basin State Marine Conservation Areas (SMCA), and the BCER. The EGGW and its principal tributary, the Ocean View Channel, drain into the Bolsa Bay SMCA that subsequently drains into Huntington Harbor. Two retarding basins exist at the upper end of the EGGW. The Bolsa Chica Channel, and its principal tributaries the Anaheim-Barber City and Westminster Channels, drain the western portion of the Project area directly into Huntington Harbor.

Project Description/Objective:
The Project would evaluate residual flood risk within a portion of the watershed. Project alternatives would look at reducing flood hazards and reducing flood impacts in the Outer Bolsa Bay area, including Pacific Coast Highway. The scoping notice does not provide specific project alternatives; rather, it states, "the District is seeking updated comments on the study and/or study area." CDFW staff met with U.S. Army Corps of Engineers (Corps) staff to discuss the Project during meetings on August 11, 2014, and May 20, 2015. At that time, there were four Project Alternatives under consideration in addition to the No Action Alternative (Alternative 1). Consequently, our comments are based on the following alternatives discussed during our meetings with the Corps:

- Channel Improvements and Mile Square Park Detention (Alternative 2a);
- Channel Improvements, Mile Square Park Detention, and New Ocean Outlet at Outer Bolsa Bay (Alternative 2b);
- Channel Improvements (Alternative 3a); and
- Channel Improvements and New Ocean Outlet at Outer Bolsa Bay (Alternative 3b).

Channel Improvements (Alternatives 2a and 3a) include modifications to a segment of the EGGW in the BCER. This action would involve an intentional levee breach of the EGGW at the muted tidal pocket, which would eliminate the access road and result in the tidal pocket serving as a detention basin. Channel improvements also include the removal, replacement, or relocation of the tide gate as well as modifications to Warner Avenue/Outer Bolsa Bay; that is, widening the Warner Avenue Bridge, removing constrictions in Outer Bolsa Bay, and dredging Outer Bolsa Bay. Raising the segment of Pacific Coast Highway that runs along Outer Bolsa Bay is also proposed. Alternatives 2b and 3b include the construction of a new ocean outlet at Outer Bolsa Bay to ensure that flows from EGGW do not impact Huntington Harbor.

COMMENTS AND RECOMMENDATIONS

CDFW offers the following comments and recommendations to assist the Corps in adequately identifying and/or mitigating the Project's significant, or potentially significant, direct and indirect impacts on fish and wildlife (biological) resources.

Specific Comments

BCER and SMCA Significance

CDFW's primary concerns with the proposed Project are potential adverse impacts to the CDFW-managed BCER and SMCAs. Habitats at BCER include open waters, mudflats, salt marsh, coastal dunes, seabird nesting islands, riparian, and freshwater marsh. More than 200 avian species have been identified at BCER, and 475 acres are designated as Critical Habitat for the western snowy plover (*Charadrius nivosus nivosus*), a threatened species under the Endangered Species Act (ESA) and a state species of special concern (SSC). Ridgway's rail (*Rallus obsoletus levipes*; formally light-footed clapper rail) and California least tern (*Sternula antillarum browni*), both endangered under ESA and CESA and fully protected (FPS) under Fish and Game section 3511, nest at BCER. Belding's savannah sparrow (*Passerculus sandwichensis beldingi*) is also listed as endangered under CESA. Other sensitive birds that inhabit BCER include peregrine falcon (*Falco peregrinus*; FPS), burrowing owl (*Athene cunicularia*; SSC), coastal California gnatcatcher (*Polioptila californica californica*; ESA-threatened, SSC), northern harrier (*Circus cyaneus*; SSC), Cooper's hawk (*Accipiter cooperii*), osprey (*Pandion haliaetus*), black skimmer (*Rynchops niger*; SSC), white-faced ibis (*Plegadis chihi*), and reddish egret (*Egretta rufescens*). Rare and endangered plants include California seablite (*Suaeda californica*; ESA-endangered), woolly seablite (*Suaeda taxifolia*), estuary seablite (*Suaeda esteroa*), coast woolly-heads (*Nemacaulis denudata* var. *denudata*), southern tarplant (*Centromadia parryi* ssp. *australis*), and red sand verbena (*Abronia maritima*). The ESA-threatened green sea turtle (*Chelonia mydas*) is also found at BCER. Sensitive marine resources include eelgrass (*Zostera marina*) beds, beach habitat, intertidal and subtidal habitat nesting/spawning habitat (including grunion, *Leuresthes tenuis*, habitat), mud flats, sand flats, dunes, coastal strand and salt marsh. The ESA-threatened green sea turtle (*Chelonia mydas*) is also found in the project area.

CDFW is primarily concerned with the proposed channel improvements and construction of a new ocean outlet at Outer Bolsa Bay. Specifically, activities that would breach the EGGW levee, eliminate access roads, convert the tidal pocket to a detention basin, modify the tide gate, remove constrictions in Outer Bolsa Bay, dredge Outer Bolsa Bay (enlarge Bay/Basin), widen Warner Avenue Bridge, construct a new ocean outlet, and raise the Pacific Coast Highway. The NEPA document should address the following:

- Breaching the EGGW levee at the muted tidal pocket would result in an influx of freshwater flow and introduce contaminants directly into the system. Avian species diversity is very high in this area, and the proposed action would result in a loss of current function. Additionally, the muted tidal pocket marsh is a mitigation site. Marine life within the pocket marsh would be impacted. Native vegetation that supports raptors and coastal California gnatcatcher could be impacted. Because the green sea turtle is common around the tide gates and within the pocket marsh, this ESA protected species could be impacted as well.

- Removal of the constriction in Outer Bolsa Bay could impact the CDFW-installed pedestrian bridge. This bridge is currently impacted by severe erosion. The NEPA document should analyze whether the proposed project alternatives would improve or worsen the erosion that is threatening the bridge.. Any action that would cause further erosion would need to be fully mitigated.

- Removal of the tide gates would impact marine habitat within the Bolsa Chica Basin SMCA, which includes Inner Bolsa Bay and the Bolsa Basin. Furthermore, these two marine waterbodies are separated by a levee that includes two overlooks and a bird nesting site where contaminated soils have been sequestered. The sequestered soils within the overlooks and nest site must remain protected from soil erosion. Proposed channel improvements would impact the road over the tide gates, an important access point for law enforcement agencies and emergency personal such as fire and paramedics. If the tide gates are removed, an emergency access bridge should be installed over Bolsa Bay to maintain emergency access. Removal of the tide gates could also impact the existing Mesa trail thus public access to existing nature trails would be negatively affected. The NEPA document should analyze all possible consequences from removal, replacement, or relocation of the tide gate and impacts to the road.

- An increase in channel conveyance could result in increased erosion and flooding. Along Bolsa Bay, Pacific Coast Highway is currently vulnerable to flooding during especially high tides and/or intense storms.

- Dredging Outer Bolsa Bay would convert Outer Bolsa Bay mudflats to open water, reducing foraging opportunities for shallow water foragers and habitat for sensitive rare plants. Routine dredging would have impacts on sight-foraging species due to turbidity and conversion of shallow-subtidal habitat to deeper water habitat. Dredging could result in an increase of invasive species. Dredging Outer Bolsa Bay could severely impact public access to the reserve and could temporarily close the only designated fishing area on the reserve.

- Channel modifications and/or a new ocean outlet could impact Rabbit Island, a small island within the Bolsa Basin that is part of the original Ecological Reserve. Sensitive plants exist on Rabbit Island, including but not limited to coast woolly heads and red sand verbena. It is also nesting habitat for Belding's savannah sparrow and likely Ridgway's rail.

- Channel modifications and/or a new ocean outlet could also impact the Bolsa Chica Basin including the basin inlet.

Marine Resources

- Project alternatives may have significant impacts to marine resources in Bolsa Chica Basin, Outer Bolsa Bay, Huntington Harbor, and the open coastal area where a new ocean outlet is proposed. As previously indicated, both Bolsa Chica Basin and Outer Bolsa Bay are SMCAs. In particular, the Project may result in potentially significant impacts to eelgrass habitat. Eelgrass provides a variety of ecological services including nursery habitat for a variety of fish and invertebrate species. Many of the species are both recreationally and commercially important. Other ecological services that eelgrass provides include: a source of food for waterfowl and invertebrates, buffering ocean acidification, nutrient cycling and absorbing nutrients, storing organic matter and carbon sequestration, stabilizing suspended sediments and buffering shorelines from erosion, increasing light attenuation, filtering contaminants, and producing dissolved oxygen (Bjork 2008; Orth et al. 2006; Waycott et al. 2009). Under the CDFW's "no net loss"

wetlands policy (also see General Comment 1), eelgrass is protected for its habitat and habitat values. The CDFW is concerned the Project could eliminate or significantly degrade existing eelgrass habitat in Bolsa Chica Basin, Outer Bolsa Bay, and Huntington Harbor as a result of dredging, scouring, sedimentation, turbidity, introduction of invasive species, and an increase in freshwater input. Impacts to these habitats should be thoroughly analyzed in the NEPA document.

- The NEPA document should also analyze impacts to eelgrass and eelgrass habitat from initial and on-going maintenance such as dredging, scouring, sedimentation, introduction of invasive species, turbidity, water quality, freshwater inputs, and loss of food web sources from floating eelgrass rafts/beach wrack. If eelgrass impacts are unavoidable, the NEPA document should include a comprehensive discussion on minimizing impacts as well as a description of the mitigation measures that will be implemented for any loss of eelgrass. All eelgrass pre- and post-construction monitoring and mitigation requirements should be developed using the National Oceanic and Atmospheric Administration Fisheries *California Eelgrass Mitigation Policy*.

- To adequately address the potential impacts to the various marine resources and their habitats listed above, the NEPA document should include comprehensive studies of eelgrass beds, beach habitat, intertidal and subtidal habitat nesting/spawning habitat, mud flats, sand flats, dunes, coastal strand and salt marsh of existing seabirds, shorebirds, fish, marine invertebrates, sandy beach species, fish habitats and fish migration corridors. The marine surveys should include identifying all listed and non-listed, sensitive, and rare or locally unique fish and bird species and communities within the potential areas of impact in order to determine direct and indirect impacts to these resources.

- Marine hydrology and water quality impacts within the Project footprint that may result from increased volume of flows should also be comprehensively studied. The increase in volumes and flow duration may have significant, long-term impacts to the marine life, habitats, and ecosystems within these areas. Potential hydrology and water quality impacts may include, but are not limited to the following: changes in circulation; increased areas of erosion; increased turbidity and sedimentation; reduced or increased salinity; changes in temperature and dissolved oxygen; changes to the tidal prism, tidal range, and residence time of water and pollutants; long-term reduction in water clarity; and increased nutrient and toxic pollutant load levels from an increase in floodwaters.

- Potentially significant marine fish, invertebrate, and seabird habitat losses and conversion of shallow subtidal/intertidal waters, eelgrass, and intertidal mud and sand flats from fill and dredging should be avoided and/or minimized to the maximum extent practicable in the NEPA document. This is especially relevant to impacts to Bolsa Chica Basin and Outer Bolsa Bay SMCAs.

General Comments

1. CDFW has responsibility for wetland and riparian habitats. It is the policy of CDFW to strongly discourage development in wetlands or conversion of wetlands to uplands. We oppose any project activity that would result in a reduction of wetland acreage or wetland habitat values, unless, at a minimum, project mitigation assures there will be "no net loss" of

either wetland habitat values or acreage. Development and conversion include but are not limited to conversion to subsurface drains, placement of fill or building of structures within the wetland, and channelization or removal of materials from the streambed. All wetlands and watercourses, whether ephemeral, intermittent, or perennial, should be retained and provided with substantial setbacks which preserve the riparian and aquatic values and maintain their value to on-site and off-site wildlife populations. Mitigation measures to compensate for impacts to mature riparian corridors must be included in the environmental document and must compensate for the loss of function and value of a wildlife corridor.

2. CDFW considers adverse impacts to a species protected by CESA, for the purposes of CEQA, to be significant without mitigation. As to CESA, take of any endangered, threatened, or candidate species that results from the project is prohibited, except as authorized by state law (Fish and Game Code, §§ 2080, 2085). Consequently, if the Project, Project construction, or any Project-related activity during the life of the Project will result in take of a species designated as endangered or threatened, or a candidate for listing under CESA, CDFW recommends that the project proponent seek appropriate take authorization under CESA prior to implementing the project. Appropriate authorization from CDFW may include an incidental take permit (ITP) or a consistency determination in certain circumstances, among other options (Fish and Game Code §§ 2080.1, 2081, subds. (b),(c)). Early consultation is encouraged, as significant modification to a project and mitigation measures may be required in order to obtain a CESA Permit. Pursuant to Fish and Game Code section 3511, CDFW cannot issue take for a FPS.

3. To enable CDFW to adequately review and comment on the proposed project from the standpoint of the protection of plants, fish, and wildlife, we recommend the following information be included in the environmental document.

   a) The document should contain a complete discussion of the purpose and need for, and description of, the proposed project, including all staging areas and access routes to the construction and staging areas.

   b) A range of feasible alternatives should be included to ensure that alternatives to the proposed project are fully considered and evaluated; the alternatives should avoid or otherwise minimize impacts to sensitive biological resources, particularly Specific alternative locations should be evaluated in areas with lower resource sensitivity where appropriate.

4. The document should provide a complete assessment of the flora and fauna within and adjacent to the project area, with particular emphasis upon identifying endangered, threatened, sensitive, and locally unique species and sensitive habitats. This should include a complete floral and faunal species compendium of the entire project site, undertaken at the appropriate time of year. The environmental document should include the following information.

   a) CEQA Guidelines, section 15125(c), specifies that knowledge on the regional setting is critical to an assessment of environmental impacts and that special emphasis should be placed on resources that are rare or unique to the region.

b) A thorough, recent floristic-based assessment of special status plants and natural communities, following CDFW's Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (see http://www.dfg.ca.gov/habcon/plant/). CDFW recommends that floristic, alliance-based and/or association-based mapping and vegetation impact assessments be conducted at the Project site and neighboring vicinity. The Manual of California Vegetation, second edition, should also be used to inform this mapping and assessment (Sawyer et al. 2008[1]). Adjoining habitat areas should be included in this assessment where site activities could lead to direct or indirect impacts offsite. Habitat mapping at the alliance level will help establish baseline vegetation conditions.

c) A current inventory of the biological resources associated with each habitat type on site and within the area of potential effect. CDFW's California Natural Diversity Data Base in Sacramento should be contacted at www.wildlife.ca.gov/biogeodata/ to obtain current information on any previously reported sensitive species and habitat, including Significant Natural Areas identified under Chapter 12 of the Fish and Game Code.

d) An inventory of rare, threatened, endangered and other sensitive species on site and within the area of potential effect. Species to be addressed should include all those which meet the CEQA definition (see CEQA Guidelines, § 15380). This should include sensitive fish, wildlife, reptile, and amphibian species. Seasonal variations in use of the project area should also be addressed. Focused species-specific surveys, conducted at the appropriate time of year and time of day when the sensitive species are active or otherwise identifiable, are required. Acceptable species-specific survey procedures should be developed in consultation with CDFW and the U.S. Fish and Wildlife Service.

5. To provide a thorough discussion of direct, indirect, and cumulative impacts expected to adversely affect biological resources, with specific measures to offset such impacts, the following should be addressed in the environmental document.

a) A discussion of potential adverse impacts from lighting, noise, human activity, exotic species, and drainage should also be included. The latter subject should address: project-related changes on drainage patterns on and downstream of the project site; the volume, velocity, and frequency of existing and post-project surface flows; polluted runoff; soil erosion and/or sedimentation in streams and water bodies; and post-project fate of runoff from the project site. The discussions should also address the proximity of the extraction activities to the water table, whether dewatering would be necessary, and the potential resulting impacts on the habitat, if any, supported by the groundwater. Mitigation measures proposed to alleviate such impacts should be included.

b) Discussions regarding indirect project impacts on biological resources, including resources in nearby public lands, open space, adjacent natural habitats, riparian ecosystems, and any designated and/or proposed or existing reserve lands. Impacts on,

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[1] Sawyer, J. O., T. Keeler-Wolf and J.M. Evens. 2009. A Manual of California Vegetation, Second Edition. California Native Plant Society Press, Sacramento.

and maintenance of, wildlife corridor/movement areas, including access to undisturbed habitats in adjacent areas, should be fully evaluated in the environmental document.

c) The zoning of areas for development projects or other uses that are nearby or adjacent to natural areas may inadvertently contribute to wildlife-human interactions. A discussion of possible conflicts and mitigation measures to reduce these conflicts should be included in the environmental document.

d) A cumulative effects analysis should be developed as described under CEQA Guidelines, section 15130. General and specific plans, as well as past, present, and anticipated future projects, should be analyzed relative to their impacts on similar plant communities and wildlife habitats.

6. The environmental document should include measures to fully avoid and otherwise protect Rare Natural Communities from project-related impacts. CDFW considers these communities as threatened habitats having both regional and local significance.

7. The environmental document should include mitigation measures for adverse project-related impacts to sensitive plants, animals, and habitats. Mitigation measures should emphasize avoidance and reduction of project impacts. For unavoidable impacts, on-site habitat restoration or enhancement should be discussed in detail. If on-site mitigation is not feasible or would not be biologically viable and therefore not adequately mitigate the loss of biological functions and values, off-site mitigation through habitat creation and/or acquisition and preservation in perpetuity should be addressed.

8. For proposed preservation and/or restoration, the environmental document should include measures to perpetually protect the targeted habitat values from direct and indirect negative impacts. The objective should be to offset the project-induced qualitative and quantitative losses of wildlife habitat values. Issues that should be addressed include restrictions on access, proposed land dedications, monitoring and management programs, control of illegal dumping, water pollution, increased human intrusion, etc.

9. In order to avoid impacts to nesting birds, the environmental document should require that clearing of vegetation, and when biologically warranted construction, occur outside of the peak avian breeding season which generally runs from February 1 through September 1 (as early as January 1 for some raptors). If project construction is necessary during the bird breeding season a qualified biologist with experience in conducting bird breeding surveys should conduct weekly bird surveys for nesting birds, within three days prior to the work in the area, and ensure no nesting birds in the project area would be impacted by the project. If an active nest is identified, a buffer shall be established between the construction activities and the nest so that nesting activities are not interrupted. The buffer should be a minimum width of 300 feet (500 feet for raptors), be delineated by temporary fencing, and remain in effect as long as construction is occurring or until the nest is no longer active. No project construction shall occur within the fenced nest zone until the young have fledged, are no longer being fed by the parents, have left the nest, and will no longer be impacted by the project. Reductions in the nest buffer distance may be appropriate depending on the avian species involved, ambient levels of human activity, screening vegetation, or possibly other factors.

10. CDFW generally does not support the use of relocation, salvage, and/or transplantation as mitigation for impacts to rare, threatened, or endangered species. Studies have shown that these efforts are experimental in nature and largely unsuccessful.

11. Plans for restoration and revegetation should be prepared by persons with expertise in southern California ecosystems and native plant revegetation techniques. Each plan should include, at a minimum: (a) the location of the mitigation site; (b) the plant species to be used, container sizes, and seeding rates; (c) a schematic depicting the mitigation area; (d) planting schedule; (e) a description of the irrigation methodology; (f) measures to control exotic vegetation on site; (g) specific success criteria; (h) a detailed monitoring program; (i) contingency measures should the success criteria not be met; and (j) identification of the party responsible for meeting the success criteria and providing for conservation of the mitigation site in perpetuity.

CONCLUSION

CDFW appreciates the opportunity to provide comments on the Scoping Notice to assist the Corps in identifying and mitigating Project impacts on biological resources.

Questions regarding this letter or further coordination should be directed to Ms. Jennifer Turner, Environmental Scientist, at (858) 467-4235 or Jennifer.Turner@wildlife.ca.gov. Specific questions concerning Bolsa Chica Ecological Reserve should be directed to Ms. Kelly O'Reilly, Environmental Scientist, at (714) 840-1959 or Kelly.O'Reilly@wildlife.ca.gov.

Sincerely,

Gail K. Sevrens
Environmental Program Manager

ec: Rich Burg, CDFW San Diego
Tim Dillingham, CDFW San Diego
Wendy Hall, California State Lands Commission (wendy.hall@slc.ca.gov)
Bill Paznokas, CDFW San Diego
Office of Planning and Research, State Clearinghouse, Sacramento

References

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5.0 Final Coordination Act Report

Appendix K: U.S. Fish and Wildlife Service Coordination Act Report

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United States Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, California 92008

In Reply Refer to:
FWS-OR-08B0229-19CPA0256-20E01746

March 20, 2020
Sent by Email

Colonel Aaron Reisinger
U.S. Army Corps of Engineers
Chicago District
231 S. LaSalle Street, Suite 1500,
Chicago, Illinois 60604

Subject: Final Coordination Act Report for the Proposed Westminster East Garden Grove Flood Risk Management Project, Orange County, California

Dear Colonel Reisinger:

The U.S. Fish and Wildlife Service (Service) has prepared this Final Fish and Wildlife Coordination Act Report (Final CAR) for the U.S. Army Corps of Engineers (Corps) on the proposed Westminster, East Garden Grove Flood Risk Management Project (Project) to describe biological resources, project-area opportunities and constraints, and provide recommendations related to the conservation and enhancement of fish and wildlife resources. This Final CAR is provided in accordance with the Fish and Wildlife Coordination Act (FWCA) of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq*.). The Corps has worked with Orange County Public Works to advance a feasibility study for proposed flood risk management structures and activities in the Project area; this study is known officially as the Westminster, East Garden Grove Flood Risk Management Study, Draft Integrated Feasibility Report, Environmental Impact Statement/Environmental Impact Report (Study Feasibility Report; Corps 2018). On July 31, 2019, we provided a Draft CAR to the Corps on the proposed Project. The Corps provided a letter responding to our Draft CAR dated January 21, 2020 (received January 31, 2020). As has been discussed between our staffs, we recommend that the Corps not move forward with the Project as currently proposed; we expect to continue to work with the Corps during its upcoming Preconstruction Engineering and Design (PED) phase to develop a Project alternative that would provide equal consideration of, and minimize losses to, conservation of and fish and wildlife resources.

INTRODUCTION

The proposed Project would involve modifications to four existing channels to improve flood risk management associated with existing development surrounding these channels. The Project area is located entirely within what is known as the Westminster Watershed in coastal western Orange County, California, approximately 25 miles southeast of the City of Los Angeles. The

Project area includes portions of four non-federal drainage channels (former streams, generally) within the watershed. The receiving waters of one of the channel systems is the Bolsa Chica Ecological Reserve (BCER); for another Project channel, the receiving waters area is Anaheim Bay. The noted Project watershed is approximately 87 square miles in area and is almost completely urbanized, except for at its lower ends at BCER and Anaheim Bay. Analysis by the Corps and Orange County indicates that flooding overtops the existing Project drainage channel infrastructure in the study area between the 20 percent and 10 percent annual chance of exceedance storm events (i.e., 5 and 10 year recurrence intervals, respectively), putting approximately 44,000 structures at risk of inundation from floods.

The Feasibility Study Report was a joint cooperative effort between Corps and the County of Orange on behalf of the Orange County Flood Control District (OCFCD). In 2001, the Corps initiated a comprehensive watershed study, and a Reconnaissance Study was completed in June 2001. Although it was titled the "Westminster Watershed Reconnaissance Study," it covered three Orange County watersheds: Coyote Creek, Carbon Creek, and Westminster Channel. Upon completion of the Reconnaissance Study, the scope of the study shifted focus away from a watershed feasibility study to a flood risk management feasibility study. Specifically, the current study focuses on the Westminster, East Garden Grove-Wintersberg, and Ocean View creek channel systems within the Westminster Watershed. In 2003, the Corps and OCFCD entered into a cost share agreement to develop solutions for comprehensive flood protection, ecosystem restoration, and water quality improvements for the watershed. In October 2018 the Corps published the Feasibility Study Report.

The purpose of the Corps' Feasibility Study Report for the proposed Project is to evaluate "residual" flood risk within the Westminster Watershed. This residual risk is the risk that remains following the relatively recent completion of channelization improvements of the Santa Ana River and the subsequent removal of the Westminster Watershed from the Santa Ana River floodplain. The current flood risk to human structures within the Westminster watershed can be attributed to the combination of development within the watershed (e.g., impervious surfaces in non-floodplain areas) as well as development within floodplains (e.g., structures constructed in the floodplain). The current configuration of drainage channels collects runoff generated within the watershed and conveys storm runoff and urban flows from the watershed ultimately to the Pacific Ocean. The study area floodplain region is reportedly the only developed area within Orange County that remains within the Federal Emergency Management Agency 1 percent Floodplain (i.e., that associated with the 100 year recurrence interval storm).

The main notable features of the general Project area include:

1. The Bolsa Chica Ecological Reserve (at the downstream end of Channel C05): BCER is a protected biologically sensitive area.

2. A non-functioning tide gate and tidal influence on the C05 and C02 channels: On the C05 channel is a defunct tide gate in Reach 1 that originally served to regulate and manage the coastal tidal surface water influence. The tide gate is operated by Orange

County Public Works. Existing tidal influence is an important feature in a portion of the C05 (partially muted by the tide gate) and C02 channels.

3. The Anaheim Bay-Seal Beach National Wildlife Refuge (SBNWR; adjacent to a portion of Channel C02): The Refuge is part of the extensive San Diego National Wildlife Refuge (SDNWR) Complex and is located within the larger Naval Weapons Station Seal Beach (NWSSB). It encompasses 965 acres of remnant saltwater marsh in the Anaheim Bay estuary,[1] serves as a breeding area for listed/sensitive bird species, and is a significant stopover and wintering area along the Pacific Flyway for shorebirds. The Service operates a Nature Center on the Refuge in cooperation with the Navy.

4. Huntington Harbour: Huntington Harbour is the current direct discharge point for Channel C02 and includes public and private marinas and facilities that are used by the public. Huntington Harbour also ultimately receives flows from the terminus of C05, after moving through Bolsa Bay and the Warner Avenue bridge.

The proposed Project would involve portions of four drainage channels with receiving waters that flow into the BCER, Huntington Harbour, Anaheim Bay, and the Pacific Ocean (Figure 1). The Corps Feasibility Study Report analyses were focused on potential modifications to the four channels consisting of:

C02 **Bolsa Chica Channel:** The Project involves a portion of the C02 channel that is approximately 1.5 miles long and provides flood risk management for Huntington Beach, Huntington Harbour, and NWSSB.

C04 **Westminster Channel:** The C04 channel is about 7.8 miles long and provides flood risk management for the cities of Garden Grove, Westminster, and Huntington Beach.

C05 **East Garden Grove/Wintersburg Channel:** The C05 channel is about 11.6 miles long and provides flood risk management for the cities of Santa Ana, Garden Grove, Westminster, and Huntington Beach.

C06 **Ocean View Channel:** The C06 channel is about 4.1 miles in length and provides flood risk management for the cities of Fountain Valley and Huntington Beach.

The four channels included in the proposed Project are divided by the Corps into discrete reaches, based primarily on the varying structural conditions within the channels throughout the Project area, including: concrete rectangular channels, riprap-lined trapezoidal channels, concrete-lined trapezoidal channels, enclosed culverts, levees, and steel sheet pile.

This Final CAR is provided in accordance with the FWCA, the Endangered Species Act (ESA), and the scope of work agreed upon by the Corps and the Service. The FWCA requires that federal agencies consult with the Service for activities that affect, control, or modify waters of

[1] Estuaries are defined as zones where rivers and ocean waters mix to yield ecosystems with salinity ranges between oceanic and freshwater.

any stream or bodies of water, in order to minimize the potential adverse impacts of such actions on fish and wildlife resources and habitats. This CAR does not constitute a biological opinion under section 7 of the ESA. The purpose of this CAR is to deliver information and recommendations for use by the Corps design and management teams in developing goals, objectives, and alternatives for the Project.

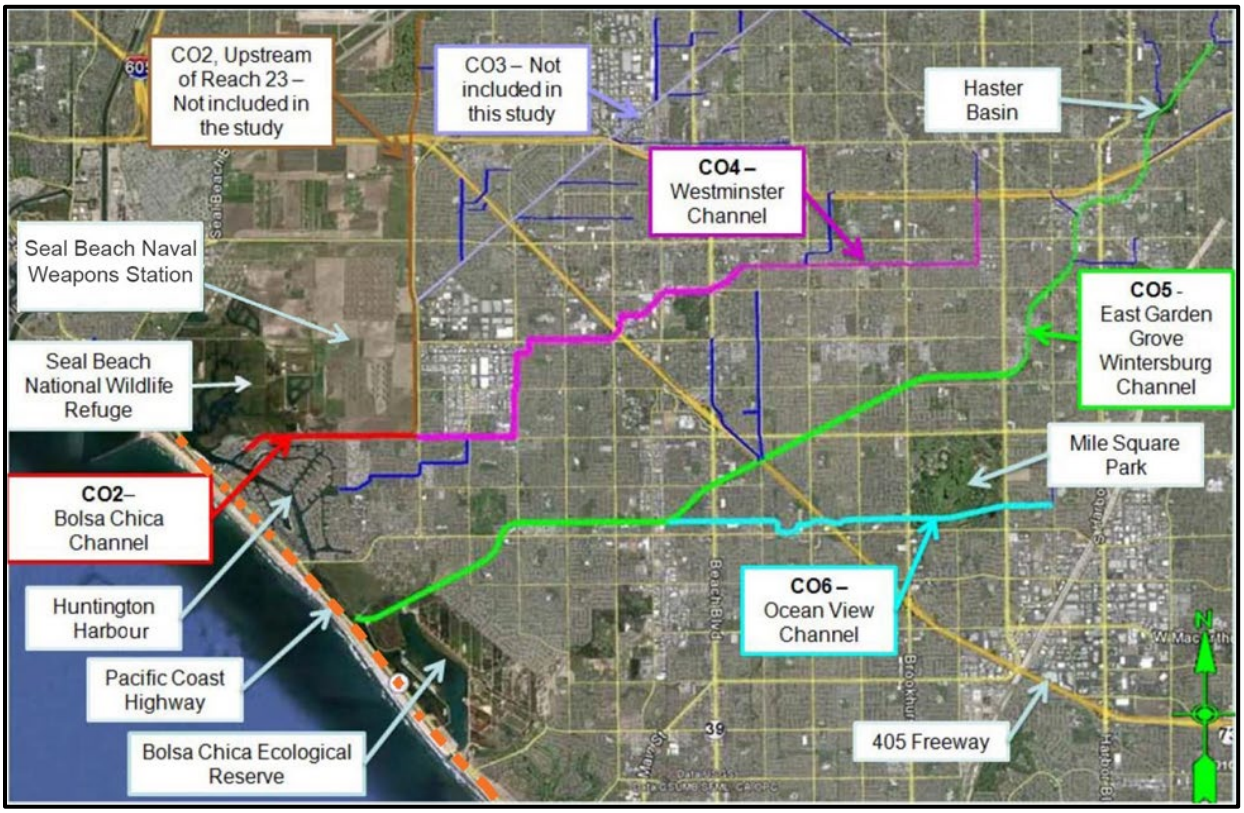

Figure 1. Project Area and Drainage Channels

SECTION 7 CONSULTATION HISTORY

The Corps also submitted a Biological Evaluation (BE) for the Westminster Project to the Service on November 26, 2019 (digital copy via file transfer) with information regarding potential effects to federally listed species: the federally endangered California least tern [Sternula antillarum browni (Sterna a. b.);[2] least tern], the federally endangered light-footed Ridgway's (=clapper) rail [Rallus obsoletus (=longirostris) levipes; Ridgway's rail], the federally threatened coastal California gnatcatcher (Polioptila californica californica; gnatcatcher), the federally threatened coastal population of the western snowy plover {Pacific Coast population DPS [Charadrius nivosus nivosus (C. alexandrinus n.); plover]}, the federally endangered salt marsh bird's-beak [Chloropyron maritimum subsp. maritimum (Cordylanthus maritimus

[2] The California least tern was originally and remains federally- and California State-listed under the generic name of *Sterna antillarum browni*; this original name is now otherwise invalid. The American Ornithologists Union in 2006 changed the valid generic name of the least tern to *Sternula*, with the California least tern then becoming *Sternula a. b.*; Service 2016).

subsp. maritimus); bird's-beak], and the federally endangered Ventura marsh milkvetch (Astragalus pycnostachyus var. lanosissimus; milkvetch). In the BE, the Corps determined that the bird's beak, the milkvetch, and the plover "were not likely to be affected" by the proposed Westminster Project. In an email dated December 19, 2019, from Jon Avery of the Carlsbad Fish and Wildlife Office's (CFWO) staff to Shawna Herleth-King of the Chicago Corps' staff (and others), we indicated that the language used was not applicable, and the determinations by the Corps should be stated as "no effect" for the plants and as "not likely to adversely affect" for the plover (given construction noise and activity may affect the plover as part of this proposed action). The Corps accepted our comments in this regard (email from Michael Padilla of the Chicago Corps staff dated December 20, 2019).

In an email dated December 30, 2019, from Jon Avery to Michael Padilla, we concurred with the Corps determinations of "not likely to adversely affect" for the rail, gnatcatcher, and plover. In that email we indicated that we did not concur with the Corps' determination of "not likely to adversely affect" for potential project impacts to the least tern. Subsequently, the Corps and the CFWO staffs had a phone meeting on January 5, 2020, to identify the specific concerns and outline what additional information the Corps could provide to potentially ameliorate those concerns. The Service indicated that our main concern was that the proposed Project would modify the basic structure of the Project channels near least tern nesting sites within BCER and SBNWR by converting the existing channels with sloping, earthen or rock side-slopes providing shallow-water fish habitats to vertical-sided channels consisting of smooth sheet piles and comparatively deeper water fish habitats. The lack of shallow water fish habitats, notably protection zones and cover utilized by smaller fish, would likely favor larger predatory fish. This change would potentially reduce the availability of appropriately-sized prey fish for the least terns.

In a letter dated January 17, 2020, the Corps provided us with additional information regarding potential effects of the proposed Westminster Project on the least tern. In a phone meeting between the staffs of the CFWO and Chicago Corps on January 24, 2020, additional information regarding potential effects on the least tern was shared and discussed. As a follow up to the call, Shawna Herleth-King provided information and language to be added the proposed Project description to Jon Avery via emails dated January 24 and 27, 2020.

In a letter to the Corps dated February 10, 2020, we concurred that the proposed action (the Westminster Project) is not likely to adversely affect: the least tern, the rail, the gnatcatcher, and the plover. This concluded consultation under the Act for listed species and/or designated critical habitat. The Corps provided additional information in a letter (dated January 21, 2020, and received January 31, 2020) responding to our July 31, 2019, Draft Fish and Wildlife Coordination Act Report.

BACKGROUND

In 2005, average global financial losses due to flooding damage were estimated to be $6 billion, and this is expected to increase to $52 billion by 2050 based on projected socio-economic changes alone for the 136 largest coastal cities in the world (Hallegatte *et al*. 2013). Floods occurring in developed areas often cause economic damage, and this may well escalate in many areas with the predicted changes in climate, as a consequence of the increased frequency and severity of rainfall phenomena (Neri-Flores 2019).

Commercial and recreational fisheries generate billions of dollars each year for the U.S. economy. In 2006, 9.5 billion pounds of commercial catch was valued at $4.0 billion (Lellis-Dibble *et al*. 2008). This value is enhanced by the recreational fishing sector, whose 13 million recreational anglers caught 476 million fish in 2006, generating billions of dollars via small businesses such as tackle shops, restaurants, and hotels (Van Voorhees and Prichard 2007). An analysis of U.S. commercial fishery landings from 2000 through 2004 indicates that estuarine species comprised approximately 46 percent by weight and 68 percent by value of the commercial fish and shellfish landed nationwide (Lellis-Dibble *et al*. 2008). A similar analysis of U.S. recreational landings indicates that for the same time period estuarine species comprised approximately 80 percent of the fish harvested nationwide (Lellis-Dibble *et al*. 2008). Those numbers support the importance of efforts by the Service, National Marine Fisheries Service, California Department of Fish and Wildlife (CDFW), and others to protect and restore estuarine habitats that provide the ecological basis for the majority of our nation's commercial and recreational fisheries (Lellis-Dibble *et al*. 2008).

Southern California's coastal wetlands are an interrelated set of resources that collectively provide a broad suite of ecological, hydrological, biogeochemical, and societal functions. The southern California coast supported approximately 48,000 acres of estuarine natural communities before development that has occurred over the last 150 years (Grossinger *et al*. 2011). Approximately 40 percent of this area was vegetated wetlands (e.g., salt marsh), 25 percent was unvegetated wetlands (e.g., salt flat and mudflat), and the remaining 35 percent was subtidal water. In addition to these natural community types, an additional 14,000 acres of "other wetlands" types occurred in coastal southern California, including: wetland dune and beach, woody vegetated wetlands, high marsh, isolated ponds, and riverine community wetlands. Since circa 1850, an overall loss of 23,000 acres (48 percent) of historical estuarine wetland community types has occurred along the southern California coast (Grossinger *et al*. 2011) including the Project area. Estuarine vegetated wetlands have experienced the greatest loss in terms of absolute area (around 14,000 acres, a 75 percent loss), while estuarine unvegetated wetlands have experienced the greatest proportional loss of 78 percent of the historical extent. In contrast, the contemporary landscape represents a 5 percent increase in subtidal water natural communities from the historical extent. These differential losses have shifted the proportional composition of southern California estuaries (Grossinger *et al*. 2011). Historically, there was a relatively even split between estuarine vegetated (40 percent), estuarine unvegetated (25 percent), and subtidal water (35 percent). Currently the proportional composition is artificially weighted more heavily towards subtidal water (71 percent), while estuarine vegetated (19 percent) and unvegetated (10 percent) wetlands combined make up less than ⅓ of the total area. Most of these changes resulted from channelization of the lower reaches of rivers and streams, development of floodplains, filling of estuaries, and marina/harbor development (Grossinger *et al*. 2011).

The lower reaches of the Project channels represent substantially modified (yet biologically productive) remnants of these above-noted coastal wetland community types, mostly consisting of subtidal and intertidal water and sloping shoreline. Similarly, the upper reaches of the Project channels are heavily modified remnants of freshwater creeks and streams that formerly drained/traversed the Project area. The rich soils, presence of water, and valley-plain topography that make stream riparian areas biologically rich, also create productive lands for agriculture and desirable locations for urban development. As the Project area developed over the last century,

the creeks and streams of the area were type-converted to function as primarily urban run-off and flood conveyance structures for the purpose of structure/human safety. These practices have removed the majority of riparian habitats available to biota and people along these former streams and vastly reduced the ability of rivers and floodplains to provide stream ecological services. Nevertheless, some biologically productive open water and steep shoreline natural communities remain in many of the Project upper channel reaches.

FISH AND WILDLIFE COORDINATION ACT

The Fish and Wildlife Coordination Act of 1934 included requirements that were the first formal expressions in U.S. law of a duty to minimize the negative environmental impacts of major water resource development projects and to compensate for those impacts that remained (Bean 2016). The FWCA was a response to a U.S. era of big dam building and reflected a concern for the impact of those dams, particularly on anadromous fish (Bean 2016). As originally enacted in 1934, it required consultation with the Bureau of Fisheries (as the Service was then known) prior to the construction of any dam to determine if fish ladders or other aids to migration were necessary and economically practical to minimize impacts on fish populations. It required, as well, the opportunity to use the impounded waters for hatcheries to offset impacts that could not otherwise be avoided. The duties imposed by the FWCA were reinforced and expanded by the National Environmental Policy Act of 1969 (NEPA; Bean 2016). Under NEPA and its implementing regulations, all federal agencies have a duty to assess the impacts of the major actions they propose to undertake and to consider reasonable alternatives to reduce or eliminate those impacts (Bean 2016).

The FWCA amendments enacted in 1946 require consultation with the Service and the fish and wildlife agencies of States where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources." The FWCA requires reports and recommendations of the Service be given full consideration and included in project reports to Congress.

The Service, as the federal agency charged by Congress in the Fish and Wildlife Act of 1956 with the responsibility for management, conservation, and protection of fish and wildlife resources, routinely recommends mitigation measures to other federal agencies through the NEPA and FWCA processes (Bean 2016). The FWCA directs and authorizes consultation, reporting, consideration, and installation/operation of fish and wildlife conservation features; under prescribed circumstances, the FWCA authorizes the modification of projects or their operations for fish and wildlife conservation purposes. The authorities of the FWCA are considered to be "supplementary legislation" to the various Federal project authorizations, such as the Corps public works authorizations (Smalley and Mueller 2004). The FWCA conditions or supplements other water development statutes to require consideration of recommendations generated under the FWCA procedures, including portions of the Clean Water Act [*Zabel* v. *Tabb*, 430 F2d 199 (5th Cir. 1970) cert. denied 401 U.S. 910 (1972)].

The 1946 amendments to the FWCA required construction agencies to make "adequate provision consistent with the primary purposes of [water projects] for the conservation, maintenance, and management of wildlife." The 1958 amendments to the FWCA added the goal of wildlife enhancement to the existing goals of loss prevention and mitigation. The FWCA authorizes the Federal project to implement means and measures for both mitigating losses of fish and wildlife resources, and for enhancing these resources beyond the offsetting of project effects (Smalley and Mueller 2004). For Federal water resources development projects, the FWCA requires that fish and wildlife conservation receive equal consideration by Federal agencies with other project purposes, and that such conservation be coordinated with other project features.[3]

Section 2(b) of the FWCA states that:

In furtherance of such purposes, the reports and recommendations of the Secretary of the Interior on the wildlife aspects of such projects and any report of the head of the State agency exercising administration over the wildlife resources of the State, based on surveys and investigations conducted by the United States Fish and Wildlife Service and such State agency for the purpose of determining the possible damage to wildlife resources and for the purpose of determining means and measures that should be adopted to prevent the loss of or damage to such wildlife resources, as well as to provide concurrently for the development and improvement of such resources, shall be made an integral part of any report prepared or submitted by any agency of the Federal Government responsible for engineering surveys and construction of such projects when such reports are presented to the Congress or to any agency or person having the authority or the power, by administrative action or otherwise, (*1*) *to authorize the construction of water-resource development projects or* (*2*) *to approve a report on the modification or supplementation of plans for previously authorized projects, to which this Act applies.*

Recommendations of the Secretary of the Interior shall be as specific as is practicable with respect to features recommended for wildlife conservation and development, lands to be utilized or acquired for such purposes, the results expected, and shall describe the damage to wildlife attributable to the project and the measures proposed for mitigating or compensating for these damages. The reporting officers in project reports of the Federal agencies shall give full consideration to the report and recommendations of the Secretary of the Interior and to any report of the State agency on the wildlife aspects of such projects, and the project plan shall include such justifiable means and measures for wildlife purposes as the reporting agency finds should be adopted to obtain maximum overall project benefits.

PROJECT DESCRIPTION

The Project, as proposed, would involve implementing flood risk management measures (predominately modifications to four existing drainage channels) in the Westminster watershed in Orange County, California. The planning objectives for the Project are:

[3] The 1958 amendments to the FWCA added provisions to recognize the vital contribution of wildlife resources to the Nation and to require equal consideration and coordination of wildlife conservation with other water resources development programs.

1. Reduce the risk of flood damages to structures and infrastructure: Reduce the depth, duration, and likelihood of flooding at residential and commercial structures, as well as infrastructure, such as roadways, caused by flooding of the C05/C06 and C02/C04 channel systems in the Westminster watershed during storm events over the 50 year period of analysis.

2. Reduce life-safety risk associated with overbank flooding: Reduce the depth, duration, and likelihood of flooding at key public facilities and access routes required for emergency services caused by flooding of the C05/C06 and C02/C04 channel systems in the Westminster watershed during storm events and improve flood preparedness over the 50 year period of analysis.

3. Reduce the risk of downstream flood damages: Reduce the depth, duration, and likelihood of existing flooding in the vicinity of Outer Bolsa Bay [including flooding along Pacific Coast Highway (PCH)] and reduce the impact of increased storm flows into the bay associated with recommended channel modifications upstream over the 50 year period of analysis.

4. Promote compatible recreation: incorporate and protect access to recreation opportunities such as walking and wildlife viewing in the study area, particularly in the vicinity of BCER over the 50 year period of analysis.

Several planning constraints[4] for the Project are noted by the Corps:

1. Limit extensive changes to local land use designations and zoning by limiting channel modifications to within the existing channel right of way, when feasible.

2. Minimize impacts to culturally sensitive areas.

3. Limited change in elevation across the watershed reduces opportunities for lowering the invert of the existing channel systems.

4. Alternatives plans should avoid induced adverse hydraulic impacts relative to existing conditions and comply with floodplain management requirements.

PROJECT ALTERNATIVES

The Project currently involves three alternatives, including the No Action Alternative. The two proposed Project alternatives are termed the (1) Minimal Channel Modifications Plan Alternative and the (2) Maximum Channel Modifications Plan Alternative. It should be noted that previous versions of these proposed alternatives included construction of a floodwall along PCH where the road closely parallels the western edge of Bolsa Bay. Additionally, both proposed

[4] As noted in the draft Project Feasibility Study, the listed Corps' planning constraints are unlike planning objectives that represent desired positive changes or opportunities. These planning constraints represent restrictions that the Corps has determined should not be violated for the proposed project. Further, the Corps has determined that Project "plan formulation" must provide safe conditions in the interest of public safety and be socially acceptable.

alternatives originally included replacement of the existing tide gates on Reach 1 of Channel C05. Based on recent changes in Project designs, the PCH floodwall and the replacement of the tide gates on Channel C05-Reach 1 are no longer part of either proposed alternative, and the existing tide gates would be fully removed as part of both proposed alternatives.

The two proposed Project alternatives both include increasing the span of Warner Avenue Bridge and channel modifications; however, the extent of the channel modifications and the duration of construction would occur vary among the alternatives. The two proposed Project alternatives also include nonstructural measures including removal of sediment, debris, and vegetation within the channels that may currently constrict conveyance within the channels. Biological functions may be adversely affected with the removal of vegetation as a part of these measures.

The Minimum Channel Modifications Plan is the Corps' Tentatively Selected Plan (TSP; the Corps' preferred alternative). The TSP would reduce flood risk by lining the existing drainage channels with concrete, thus increasing flow conveyance efficiency. The Maximum Channel Modifications Plan has been identified as the Locally Preferred Plan (LPP). It would reduce flood risk by altering the geometry of existing drainage channels to increase conveyance efficiency and storage capacity. Both of these alternatives would include additional downstream measures to address the impacts of increased flood flow conveyance resulting from the channel modifications. These downstream measures include increasing the span of Warner Avenue Bridge. As proposed, compatible nonstructural measures would also be also included in the TSP alternative to lessen the human life safety risk associated with flooding in the Project area. Each plan alternative would require mitigation to address the loss of habitats. The TSP has an estimated first cost of $823,541,000 and includes proposed mitigation measures for the direct loss of approximately 24 acres of wetlands/habitats. The LPP has an estimated first cost of $1,475,295,000 and includes proposed mitigation measures for the direct loss of approximately 9 acres of wetlands/habitats.

Minimum Channel Modifications Plan:

Under the proposed Minimum Channel Modifications Alternative, existing earthen or riprap-lined channels would be paved with concrete to increase stormflow water conveyance efficiency. Hydrologic and hydraulic (H&H)[5] modeling by the Corps determined that widening Warner Avenue Bridge and removing the tide gates on Channel C05 Reach 1 would also be necessary measures to implement in the Minimum Channel Modifications Plan Alternative, and that leveed sections of channels C02 and C05 (reaches 23 and 1, respectively) would need to be modified to what was termed by the Corps as the "maximum condition."

[5] H&H modeling is computer software modeling that simulates rainfall runoff flows to predict the extent of channel, creek, and stream water surface levels and flooding and to test ways to reduce the flooding without actually constructing the project.

Table 1: Minimum Channel Modifications Plan Alternative in C02/C04 on a reach-by-reach basis, compared to existing conditions.

Channel	Reach	EXISTING CONDITIONS	MINIMUM CHANNEL MODIFICATIONS
C02	23	Earthen trapezoidal	Widened to 230' soft bottom with double sheet piles on both sides
C04	20	Riprap lined trapezoidal from C02 to Bolsa Chica Street; Earthen & riprap trapezoidal from Bolsa Chica Street to Graham Street; Earthen trapezoidal from Graham Street to McFadden Avenue; Riprap trapezoidal from McFadden Avenue to Bolsa Avenue; Earthen & riprap trapezoidal from Bolsa Avenue to Edwards Street Concrete lined rectangular from Edwards Street to I-405	Concrete lined trapezoidal from C02 to Edwards Street; Concrete lined rectangular from Edwards Street to I-405 (existing);
C04	21	Concrete lined rectangular	Concrete lined rectangular;
C04	22	Concrete lined compound from Beach Blvd to Magnolia Street; Concrete rectangular with soft bottom from Magnolia Street to Brookhurst; Riprap trapezoidal from Brookhurst Street to Westminster Avenue; Concrete lined trapezoidal from Westminster Avenue to S-22	Concrete lined compound from Beach Blvd to Magnolia Street; Concrete rectangular (sides and bottom) from Magnolia Street to Brookhurst; Concrete lined trapezoidal from Brookhurst Street to SR-22;

Table 2: Minimum Channel Modifications Plan Alternative in C05/C06 on a reach-by-reach basis compared to existing conditions.

Channel	Reach	EXISTING CONDITIONS	MINIMUM CHANNEL MODIFICATIONS
C05	1	Earthen levee from tide gates to Graham Street w/ some Steel Sheet Pile (SSP) on south bank below Graham Street; SSP rectangular from Graham Street to Warner Avenue; Earthen levees from Warner Avenue to 1,300 ft upstream of Edwards Avenue	Sheet pile/soft bottom/splash walls (various heights) from tide gates to existing rectangular channel east of Edwards Avenue and west of Goldenwest Street
C05	2	Concrete lined rectangular	Concrete lined rectangular with 1' splash walls from Goldenwest St to Gothard St; Concrete lined rectangular from Gothard Street to C05/C06 confluence Replace crossing at Goldenwest St
C05	3	Riprap lined trapezoidal from C05/C06 confluence to Woodruff Street; Concrete rectangular from Woodruff Street to I-405	Concrete lined trapezoidal from confluence with C06 to Beach Blvd; Concrete lined rectangular from Beach Blvd. to I-405
C05	4	Concrete lined rectangular from I-405 to Quartz Street; Riprap lined trapezoidal from Quartz Street to Bushard Street	Concrete lined rectangular from I-405 to Magnolia Street; Concrete lined trapezoidal from Magnolia Street to Bushard Street
C05	5	Riprap lined trapezoidal from Bushard Street to Brookhurst Street; 1,300 ft of concrete lined trapezoidal upstream of Brookhurst Street; Riprap lined trapezoidal to 3rd St	Concrete lined trapezoidal
C05	6	Concrete lined trapezoidal	Concrete lined trapezoidal
C05	7	Covered concrete conduit	Covered concrete conduit
C05	8	Concrete lined trapezoidal	Concrete lined trapezoidal
C05	9	Concrete lined trapezoidal	Concrete lined trapezoidal
C05	10	Covered concrete conduit	Covered concrete conduit
C05	11	Covered concrete conduit	Covered concrete conduit
C05	12	Concrete lined trapezoidal (first 1400') and covered concrete conduit (next 1000')	Concrete lined trapezoidal (first 1400') and covered concrete conduit (next 1000')
C06	13	Earthen trapezoidal from C05/C06 confluence to Beach Blvd./RT-39; Riprap lined trapezoidal from Beach Blvd./RT-39 to Ross Lane	Concrete lined trapezoidal
C06	14	Concrete lined rectangular	Concrete lined rectangular
C06	15	Covered concrete conduit	Covered concrete conduit
C06	16	Concrete lined rectangular	Concrete lined rectangular
C06	17	Earthen and riprap lined trapezoidal	Concrete lined trapezoidal
C06	18	Mile Square Park - concrete low flow v-channel	Mile Square Park - concrete low flow v-channel
C06	19	Riprap lined trapezoidal	Concrete lined trapezoidal

Maximum Channel Modifications Plan:

Under the proposed Project Maximum Channel Modifications Alternative, trapezoidal channels would be reconfigured to have a rectangular cross sectional geometry. This would increase both conveyance and capacity. This alternative is designed to contain the 1 percent annual chance of exceedance (ACE) storm event. For reaches that do not contain the 1 percent ACE event after conversion to a concrete rectangular channel, floodwalls would be also added.

H&H modeling by the Corps determined that widening Warner Avenue Bridge and removing the tide gates on C05 Reach 1 would also be necessary measures to implement in the Maximum Channel Modifications Plan Alternative.

Table 3: Maximum Channel Modifications Plan Alternative in C02/C04 on a reach-by-reach basis compared to existing conditions.

Channel	Reach	EXISTING CONDITIONS	MAXIMUM CHANNEL MODIFICATIONS
C02	23	Earthen trapezoidal	Widened to 230' soft bottom with double sheet piles on both sides
C04	20	Riprap lined trapezoidal from C02 to Bolsa Chica Street; Earthen & riprap trapezoidal from Bolsa Chica Street to Graham Street; Earthen trapezoidal from Graham Street to McFadden Avenue; Riprap trapezoidal from McFadden Avenue to Bolsa Avenue; Earthen & riprap trapezoidal from Bolsa Avenue to Edwards Street Concrete lined rectangular from Edwards Street to I-405	80' Concrete rectangular with middle 48' left earthen from C02 to McFadden Avenue; 68' Concrete rectangular with middle 40' left earthen from McFadden Avenue to Bolsa Avenue; 55' Concrete rectangular from Bolsa Avenue to Edwards Street; 3 crossings replaced of different dimensions
C04	21	Concrete lined rectangular	Navy railroad reroute pending
C04	22	Concrete lined compound from Beach Blvd to Magnolia Street; Concrete rectangular with soft bottom from Magnolia Street to Brookhurst; Riprap trapezoidal from Brookhurst Street to Westminster Avenue; Concrete lined trapezoidal from Westminster Avenue to SR-22	Base of concrete lined channel increased to 35' from Beach Blvd to Magnolia Street; Soft bottom channel from Magnolia Street to Brookhurst Street concrete lined; Concrete lined trapezoidal from Brookhurst Street to Westminster Avenue; 18' Concrete rectangular from Westminster Avenue to SR-22; 12 crossings replaced of different dimensions

Table 4: Maximum channel modifications in C05/C06 on a reach-by-reach basis compared to existing conditions.

Channel	Reach	EXISTING CONDITIONS	MAXIMUM CHANNEL MODIFICATIONS
C05	1	Earthen levee from tide gates to Graham Street w/ some SSP on south bank below Graham Street; SSP rectangular from Graham Street to Warner Avenue; Earthen levees from Warner Avenue to 1,300 ft upstream of Edwards Avenue	Sheet pile/soft bottom/splash walls (various heights) from tide gates to existing rectangular channel east of Edwards Avenue and west of Goldenwest Street
C05	2	Concrete lined rectangular	Concrete rectangular with 1' splash walls from Goldenwest St to Gothard St; Concrete rectangular from Gothard Street to C05/C06 confluence; replace Goldenwest St crossing
C05	3	Riprap lined trapezoidal from C05/C06 confluence to Woodruff Street; Concrete rectangular from Woodruff to 405	Concrete lined rectangular; Some section of 1' splash wall between Beach Blvd and Woodruff Road; 2 crossings replaced of different sizes
C05	4	Concrete lined rectangular from 405 to Quartz; Riprap trapezoidal from Quartz Street to Bushard Street	Concrete lined rectangular with splash walls (various heights); 3 crossings replaced of different sizes
C05	5	Riprap lined trapezoidal from Bushard Street to Brookhurst Street; 1,300 ft of concrete lined trapezoidal upstream of Brookhurst Street; Riprap lined trapezoidal to 3rd St	Concrete lined rectangular with splash walls (various heights); 6 crossings replaced of different dimensions
C05	6	Concrete lined trapezoidal	Concrete lined rectangular; 1 crossing replaced
C05	7	Covered concrete conduit	Replace crossing at New Hope & Hazard
C05	8	Concrete lined trapezoidal	Concrete lined rectangular; 3 crossings replaced of different sizes
C05	9	Concrete lined trapezoidal	Concrete lined rectangular; 5 crossings replaced of different sizes
C05	10	Covered concrete conduit	Covered concrete conduit
C05	11	Covered concrete conduit	Replace crossing at Aspenwood
C05	12	Concrete lined trapezoidal (first 1400') and covered concrete conduit (next 1000')	Concrete lined rectangular with splash walls (various heights); Haster Basin inlet culverts modified
C06	13	Earthen trapezoidal from C05/C06 confluence to Beach Blvd./RT-39; Riprap lined trapezoidal from Beach Blvd./RT-39 to Ross Lane	Concrete lined rectangular at confluence; Concrete lined trapezoidal from confluence to Ross Street; 2 crossings replaced of different sizes
C06	14	Concrete lined rectangular	Concrete lined rectangular from Ross Street to Asari Lane; Concrete lined rectangular with splash walls (1.5-2') from Asari Lane to Riverbend Drive
C06	15	Covered concrete conduit	Covered concrete conduit; 1 crossing replaced
C06	16	Concrete lined rectangular	Concrete lined rectangular, widened to 30’
C06	17	Earthen and riprap lined trapezoidal	Concrete lined trapezoidal, ~1 ft splash walls
C06	18	Mile Square Park-concrete low flow v-channel	Mile Square Park-concrete low flow v-channel
C06	19	Riprap lined trapezoidal	Concrete lined trapezoidal

The proposed Project (per the Corps' preferred alternative, the Maximum Channel Modifications) would include the following important components:

1. Increasing the span of Warner Avenue Bridge;

2. Removing the tide gates at the downstream end of C05 Reach 1 and replacement with an access bridge;

3. Installation of a single steel sheet pile wall along the south levee crest of C02 Reach 23;

4. Installation of double steel sheet pile walls along the north and south levee crests of C05 Reach 1;

5. Converting earthen/riprap/concrete lined trapezoidal channels to open rectangular concrete lined channels in C04 (Reaches 20 and 22), C05 (Reaches 2, 3, 4, 5, 6, 8, 9, and 12) and C06 (Reaches 13, 14, 16, 17, and 19);

6. Constructing a diversion channel connecting C04 Reach 21 to Reach 20; and

7. Compensatory mitigation activities, including addition of sand nesting substrate to least tern nesting islands within BCER.

PROJECT REGION HISTORY

The coastal area of the general Project region was formed by sediments deposited over millennia by the Los Angeles, San Gabriel, and Santa Ana rivers and smaller streams), in a multi-river delta at the coast and shelf of San Pedro Bay, a hook-shaped bight in the coastline of southern California (Wiegel 2009; see Figure 2). San Pedro Bay spans between Point Fermin (southeastern tip of Palos Verdes Hills) on the northwest and Newport Bay/Corona del Mar bluffs at the southeast (Wiegel 2009). This 30-mile long coastal area has been extensively modified by anthropogenic activities, including construction of dams (e.g., Whittier Narrows and Prado Basin dams) for flood risk management (which also trap sediments including beach sand) and river and stream mouth structures, ground subsidence owing to oil, gas, and water withdrawal, structures and dredging at the entrances of bays (e.g., Alamitos, Anaheim, and Newport), development and operation of marinas and navigation channels, and encroachment by buildings and infrastructure. Sandy beaches occur along most of the shore of San Pedro Bay (Wiegel 2009). Most of the lower reaches of the Project area were originally shallow estuaries and mudflats: Anaheim Bay, Huntington Harbour, and Bolsa Bay (Bolsa Chica Bay) were historically characterized by substantial subtidal channels, extensive tidal flats, vegetated wetlands, and marsh ponds (Grossinger *et al*. 2011). The Project area sits between the San Gabriel River and Santa Ana River watersheds.

For about a century, Bolsa Chica Bay was connected to Anaheim Bay via Outer Bolsa Bay by a manmade channel (canal) that was dug in 1899 from the outer bay; with a tide gate at the easterly end of the outer bay (Wiegel 2009). Also in 1899, direct tidal flow from the ocean to Bolsa Bay and most of the Bolsa Chica estuary was blocked by construction of a dam across the natural lagoon mouth to the ocean (at what is now Bolsa Chica State Beach, south of the current

intersection of Warner Avenue and Pacific Coast Highway), installed for the Bolsa Chica Gun Club to improve conditions for waterfowl hunting (Urashima 2012). The gun club also reportedly installed a series of earthen levees in Bolsa Chica lagoon in 1899 to create ponds to increase waterfowl numbers for hunting; these levees and dams blocked navigation and water flow through the lagoon (Urashima 2012). The *Bolsa Chica Lowlands Restoration Project,* completed in 2006, included a non-navigable ocean entrance which was constructed through the beach at the south end of BCER, rather than restoration of the historical ocean mouth at the north end of Outer Bolsa Bay or a connection to Anaheim Bay and its ocean entrance via the canal and Huntington Harbour (Wiegel 2009). The East Garden *Grove* Wintersburg flood channel does not discharge into the *Bolsa Chica Lowlands Restoration Project*. Rather, it currently remains connected, with a non-functional tide gate, to Outer Bolsa Bay, thence through the canal, Huntington Harbour, Anaheim Bay and its ocean entrance.

Thomas Talbert[6] wrote the following of the late 19th century history of Project region: "In the time of heavy floods the Santa Ana River has frequently joined the Freeman River (sic, Creek) to empty into the ocean at Los Patos, Bolsa Chica, It has even been known to swing far enough to the west to join the San Gabriel River and flow out through Alamitos Bay. When this occurred, it was possible to go by boat from the Costa Mesa Bluffs to the Fred Bixby ranch in Long Beach" (Talbert 1952).

Substantial ground subsidence has occurred in Project region over the last 80 years, mostly caused by the removal of hydrocarbons from underground oil wells in the area. Beginning in the 1960s water was injected underground in the Project area, which stabilized much of the affected area. Estimated ground subsidence in the Project area between 1933 and 1964 was about 0.5 foot at Warner Ave. near the coast, 1.0 foot near the artificial dam in mouth Bolsa Chica (Bolsa Bay), and 1.5 feet near Huntington Mesa (Wiegel 2009). The largest estimated subsidence in the Project area during 1933-1964 was in the area of the southwest (offshore) of Bolsa Chica Bay, at about 4.0 feet (Wiegel 2009). Plotted subsidence data for 1976 through 1985 indicated subsidence along PCH and within the BCER area and environs ranged from 0.002 feet/year at Los Patos (Warner Ave.), to 0.01 feet/year in the middle of the BCER wetlands, to 0.04 feet/year at Huntington Mesa (Wiegel 2009).

Seawater intrusion into the coastal aquifers in the Project region has occurred as a result of pumping water from local wells for use in agriculture, industry, and municipalities (Wiegel 2009). Hydraulic barriers have been constructed and operated in the region to reduce the amount of seawater infiltration from the ocean (e.g., Ostrom 1965; Cho 2009). The first hydraulic barriers were constructed in the Project region in the 1950's; these substantially decreased the amount of seawater that penetrated the freshwater aquifers (e.g., Edwards and Evans 2002). The barriers consist of sets of closely spaced wells drilled and used "...to inject freshwater into the ground, creating hydraulic pressure ridges or barriers to saltwater intrusion."

[6] Thomas Talbert was a farmer and store keeper in the Huntington Beach region in the 1890's and a councilman and mayor of Huntington Beach in the 1930s. The "Freeman River" referred to was roughly in the same location as Wintersburg Channel C06 in its lower reaches near the BCER.

Almost all nearshore and estuarine areas of the Project area have changed significantly from their historical physical structures/configurations over the last 150 years, and the vast majority of changes to the shorelines/estuaries/streams have been caused by humans. Total shoreline in Project area has decreased due to simplification, and the areas where the most urban development has occurred have become the most ecologically impaired. Physical changes to nearshore and estuarine areas include altered stream deltas and reduced estuaries, elimination or disconnection of coastal embayments by placement of fill and tidal barriers, altered sediment processes caused by development of watersheds, beaches, and bluffs, and loss of estuarine wetlands. Human-caused stressors that impact ecosystem processes include tidal barriers, nearshore fill, shoreline armoring, nearshore roads, marinas, breakwaters and jetties, stream crossings, impervious surfaces, and land cover development. Development in the Project area has and continues to involve many components, including dredging to create deepwater access to marinas, channelization, removal of shoreline and streamside vegetation, increased amounts of impervious surfaces, contaminant and trash inputs from storm-water systems, and disturbance of riparian wildlife. All of these alterations have affected aquatic and riparian functions, with generally negative consequences for native plant and wildlife species throughout the food web. These changes have caused disruption of ecosystem processes and alteration of habitats that have led to dramatic changes in the Anaheim Bay and Bolsa Bay ecosystems. Restoration and conservation efforts have partially restored some processes and systems.

Within the Project footprint, traditional engineering designs have been applied over the last several decades through channelization structural approaches for floodplain narrowing, flood damage reduction, and flood flow conveyance. The traditional methods for stabilizing the banks of streams and controlling bank erosion have been generally applied, including riprap or concrete lining of channel banks in many reaches. These measures have reduced the natural functions of the biological communities in which they were placed, especially at the interface between water and land.

Figure 2. Coastal wetlands in the general Project Region in 1894.

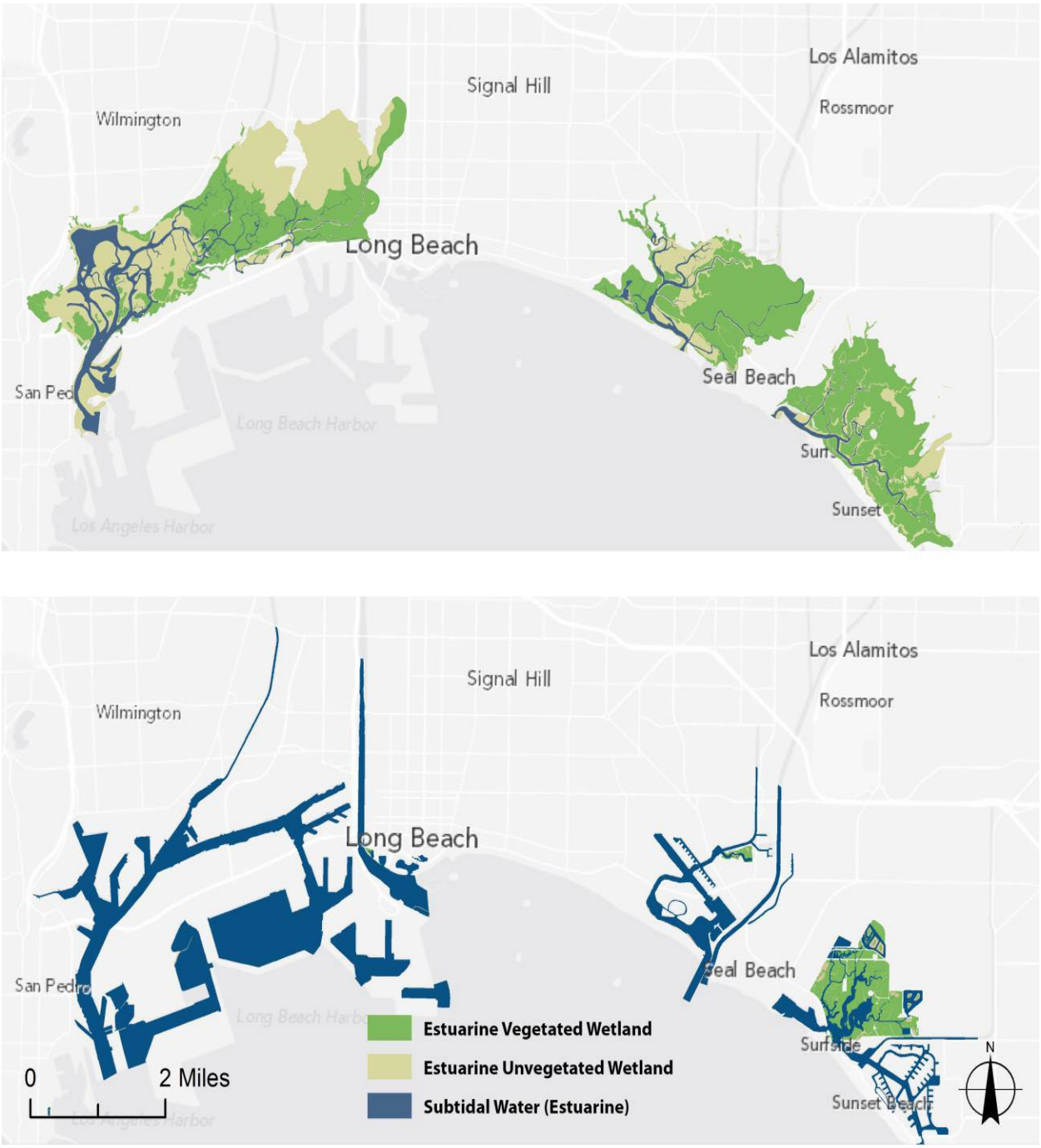

Figure 3. Comparison of historical and contemporary estuarine wetlands in Los Angeles/Long Beach Harbor, Alamitos, and Seal Beach (Grossinger *et al*. 2011). Note the substantial conversion of historical vegetated wetlands to subtidal water.

Figure 4. 1873 map of the Pacific Coast from Seal Beach to Bolsa Chica Lagoon (cropped; Grossinger *et al*. 2011). Note the mouth opening of Bolsa Bay to the Pacific Ocean.

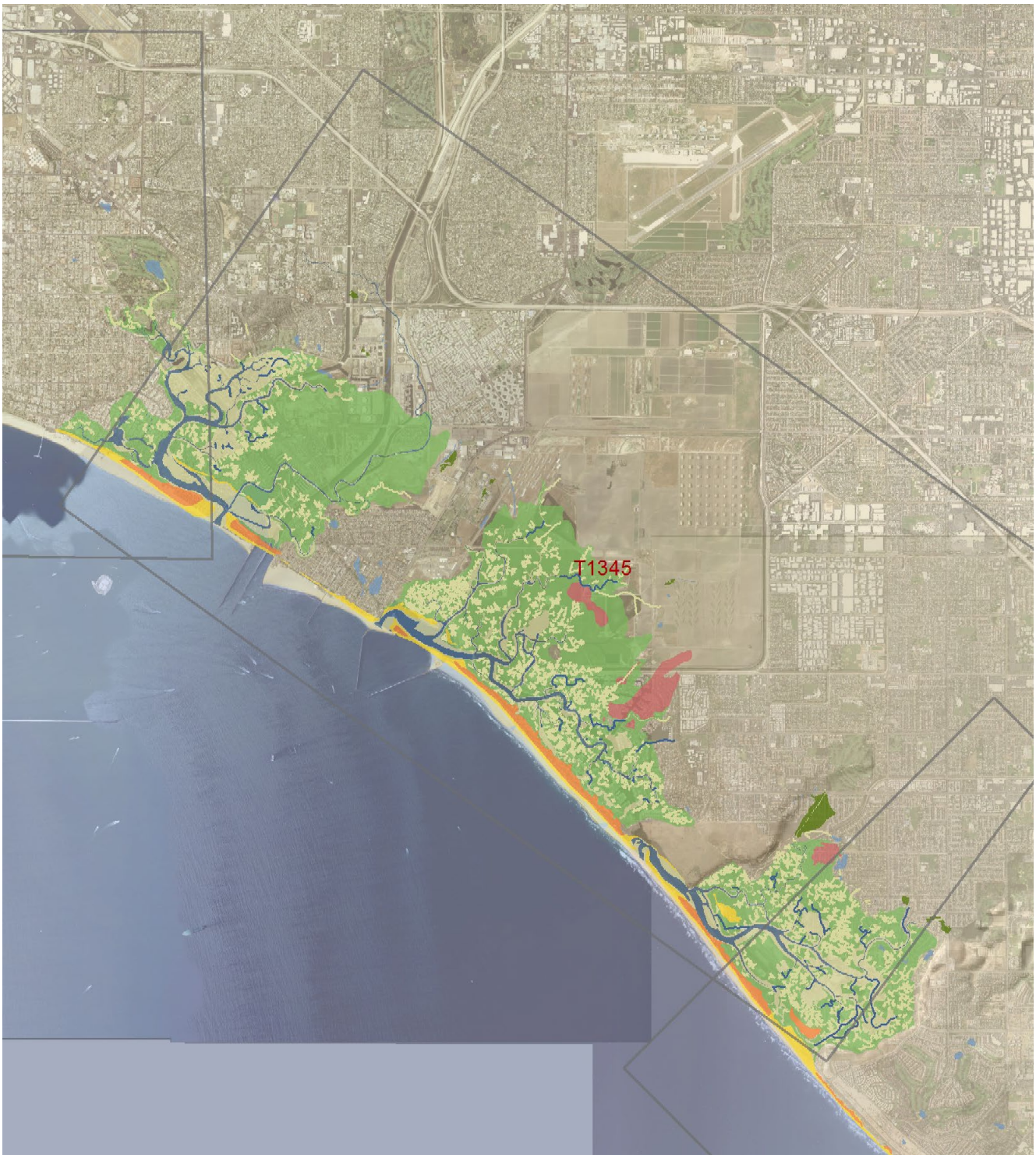

Figure 5. Historical estuarine and related habitats of the Southern California coast, Alamitos Bay to Bolsa Chica Lagoon, overlain on modern aerial photo (cropped; Grossinger *et al*. 2011)

Figure 6. "Las Bolsas" 1896 map, cropped (USGS 2019). Note Bolsa Chica lagoon opening to Pacific Ocean at Bolsa Bay.

Figure 7. Bolsa Bay and Huntington Harbour (in the distance). The Bolsa Chica Gun Club former location is in the right foreground. The end of Channel C05 in the left foreground.

Figures 8 and 9. Bolsa Chica Gun Club location, Bolsa Bay, circa 1930s and today; note the levee fill dividing Bolsa Bay (Urashima 2012).

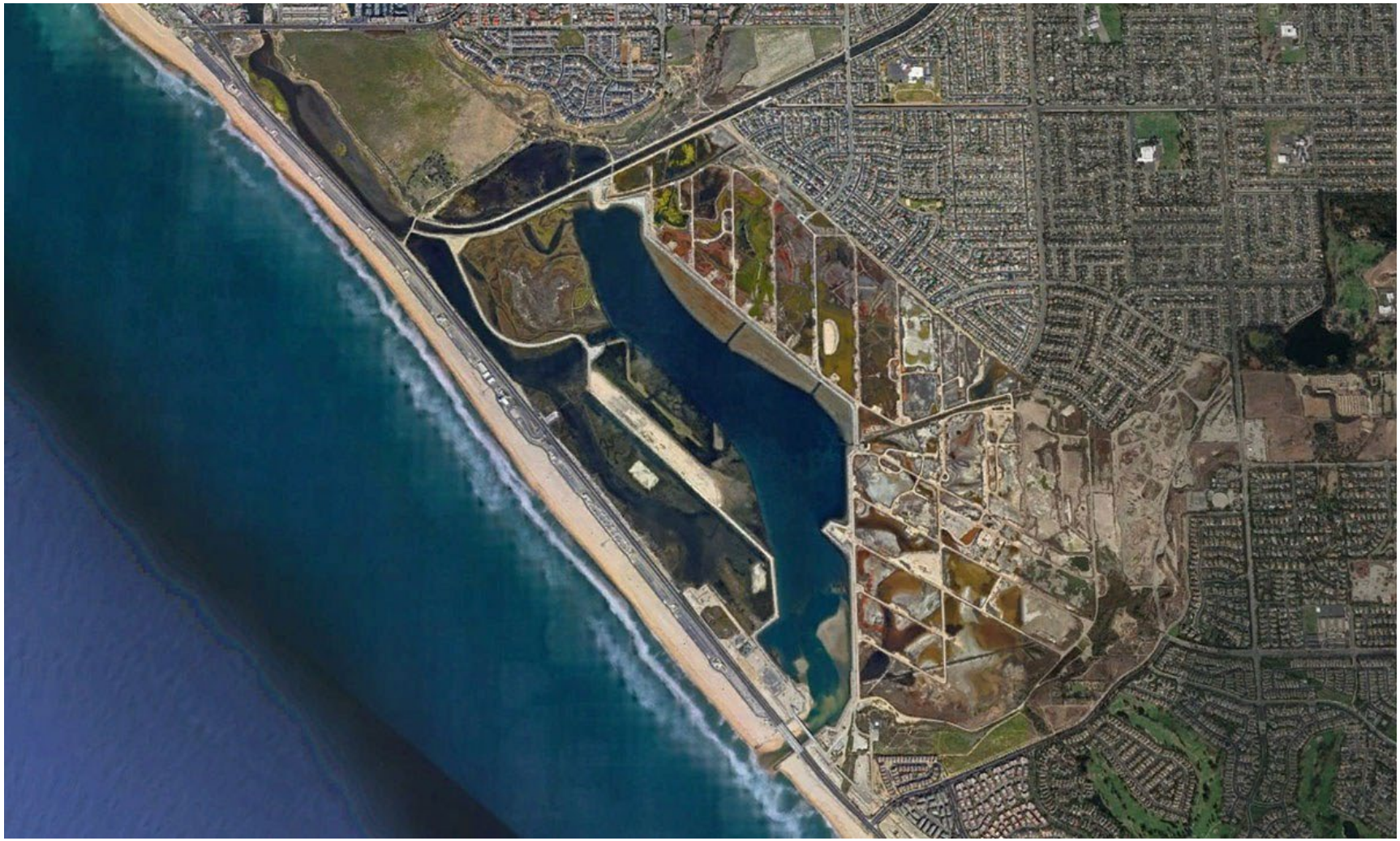

Figure 10. Bolsa Chica Ecological Reserve and Channel C05. Note numerous levees across lagoon. Compare to hydrological conditions apparent in Figures 4 and 6.

Figure 11. Seal Beach, Alamitos Bay, and Anaheim Bay in 1938.

Figure 12. Two California State Marine Protected Areas (MPAs) in Bolsa Chica Ecological Reserve: the Bolsa Bay State Marine Conservation Area (SMCA) and the Bolsa Chica Basin SMCA (No-Take area).

PROJECT AREA

The proposed Project area involves portions of Orange County inland within 15 miles of the coast of the Pacific Ocean. These upland, wetland, and open water areas of this region have been heavily modified over the last century and beyond associated with development of Orange County.

Urbanization of the Westminster watershed and development of the project area floodplains are the prime drivers for the increased potential for flood related damages and life safety impacts associated with the overtopping of the C02/C04 and C05/C06 channel systems, particularly during short duration, high intensity rainfall events. Urbanization has greatly increased the total amount of impermeable area, resulting in higher volumes of stormwater being directed to the drainage channels during a given storm time period, due to limited infiltration opportunities. Historically, the watershed included large agricultural tracts with limited residential development. Current land use in the watershed is predominantly residential, but includes commercial, military, light industrial, schools and parks.

Much of the Project is related to historically natural streams that were partially channelized, relocated, and/or ditched to divert flows for agricultural development early in the 20th century. These channels and ditches were further channelized to varying levels when urban development in the watershed subsequently occurred; particularly fast urban development growth in the region occurred in the 1950s and 1960s. The Project drainage channels within the watershed were originally built predominantly in the 1950s and the 1960s to convey residual flood waters after the channelization of the Santa Ana River. The channel systems were mostly designed to contain the 25-year storm event, although some segments were constructed to only 65 percent of the 25-year capacity. The combination of increased runoff from development (due to increased impermeable surfaces), development within floodplains along these channels, and inadequate flow conveyance within channels results in increased flood risk for the residents of the Westminster watershed. The Westminster watershed is now essentially built out with development, with relatively little remaining natural community areas (outside of reserves or federal land). The Project direct footprint and nearby areas are predominantly made up of civil engineering and commercial/urban development structures.

The Project area is centered on the Project drainage channels and the receiving waters within the BCER, Huntington Harbour, and Anaheim Bay. The Project watershed cities are Anaheim, Stanton, Cypress, Garden Grove, Westminster, Fountain Valley, Los Alamitos, Seal Beach, and Huntington Beach. The general Project area is backed by low bluffs and mesas, and lowland areas that historically held extensive wetlands. Two mesas occur within Huntington Beach: Bolsa Chica Mesa to the north and Huntington Beach Mesa to the south. These mesas are separated by the Bolsa Chica Gap, which includes Bolsa Bay and the BCER wetlands. North of the Bolsa Chica Mesa is the Sunset Gap with Anaheim Bay and Huntington Harbour. The current sole ocean outlet-inlet for both Outer Bolsa Bay and Huntington Harbor (and all of the Project channels) is to the north at Anaheim Bay.

Typical existing Project channel configurations include: concrete rectangular (including lined invert), riprap-lined trapezoidal (soft-bottomed), concrete-lined trapezoidal (including lined

invert), and enclosed culverts. Configurations vary by reach and change throughout the channel systems. The East Garden Grove/Wintersburg Channel (Wintersburg Channel), is an approximately 11.8 mile long regional flood control facility in north/central Orange County that is characteristic of most of the Project channels. The Wintersburg Channel is currently regarded as the largest flood threat to human structures in Orange County. The Wintersburg Channel system was reportedly designed and built in the 1960s to convey 65 percent of the 25-year peak discharge (i.e., equating to approximately a 10-year storm event). In some reaches this channel is trapezoidal and lined with rip-rap.

Most of Project channel reaches are channelized, relatively narrow with steep armored slopes, and perennially wet with open water and little native woody vegetation. Very few off-channel/upland refugia areas with native plant cover exist within any Project channel reach. As such, these channels are quite artificial and depauperate in plant and wildlife diversity and numbers compared to natural streams with adjacent intact floodplain and upland natural communities. Nevertheless, these channels typically support substantial numbers of shorebirds and waterbirds, and likely considerable aquatic resources. The lower reaches of some Project channels have a muted tidal influence.

The BCER is an approximately 1,341-acre coastal estuary reserve located in Huntington Beach. As noted above, its location is at the downstream terminus of the Wintersburg Channel. Historically, the site was used for oil and natural gas production.

In addition to physical modifications, urban, commercial, military, and recreational activities over the past century have strongly influenced the ecological processes in the Project channels and lagoon areas by adding contaminants, modified runoff flow hydrographs, turbidity, trash, and other environmental stresses. Despite these changes and disturbance history, the Project area today supports moderate-function natural biological communities.

Upland areas in the Project area, outside of areas surrounding BCER, Seal Beach National Wildlife Refuge, and NWSSB, consist almost completely of developed areas that provide very limited terrestrial habitats for native wildlife and plants; almost all beach areas are subject to heavy recreational use. Terrestrial vegetation (outside of the BCER, Seal Beach National Wildlife Refuge, and Weapons Station Seal Beach) in the Project area is primarily landscape plantings or weedy exotic species. Sensitive upland plant communities are generally not present in the Project direct footprint (e.g., along Project channels), due to past disturbance, ongoing maintenance, and development.

Some of the Project's existing levees cross over the Newport-Inglewood Fault Zone (the fault also runs through the BCER). It is considered to be one greatest seismic threats in Orange County. These Project levees sit atop liquefiable soils capable of over 6 feet of lateral spreading during a major seismic event.

PHYSICAL FEATURES AND CHARACTERISTICS IN THE PROJECT AREA

Climate

The climate of Project region is generally characterized by warm dry summers and cool wet winters. California is strongly influenced by a persistent zone of high pressure in the north Pacific, a southerly flowing cold water ocean current, and the Sierra Nevada Mountains, which block the continental air from affecting the coastal climate (Hapke *et al*. 2006). During the summer months the northward migration of the semi-permanent North Pacific High diverts most storm tracks to the north. California seldom receives rain from Pacific storms during the summer but coastal fog is widespread. Cold upwelling waters at the surface come into contact with the relatively warm moist air from the Pacific causing massive fog banks to form (Hapke *et al*. 2006). During the winter the North Pacific High migrates southward directing storms towards California. Occasionally storms will arrive from the southwest and are accompanied by relatively warm temperatures and heavy rains.

Sand Sources

The primary sources of coastal sediment for California beaches are the fluvial drainage systems that reach the coast. These systems range from short, steep, ephemeral streams that deliver a wide mix of sediment grain sizes, to more mature larger rivers which often have well-developed estuaries (such as occurred historically with San Gabriel and Santa Ana rivers). California's coastal streams naturally have exceptionally high sediment loads due to the steep landscapes (for longer streams), geologically young and tectonically active terrain, and, in southern California, relatively sparse vegetation cover (Willis 2002). Primarily due to considerable development build-out within the Project watershed and relatively flat watershed topography, sediment delivery from the Project channels to the coast (e.g., Bolsa Bay, Huntington Harbour) is low.

Tidal Channels

Tidal channels are generally defined by bidirectional tidal flow. The term *tidal channel* can describe features across a range of scales, from large distributaries or cuts between tidal sand bars to small marsh creeks and shallow runnels across tidal flats. Marsh systems often develop over tidal flats or bars with the channels preserved as creeks (Pethick 1969; Perillo and Iribarne 2003; Temmerman *et al*. 2007). Rapid changes in sediment supply, sea-level, or freshwater inputs can change the hydrodynamics of a system, and the resulting morphological adaptation may rework sediment deposits.

In shallow coastal settings, natural and artificial channels provide a pathway for the tide to propagate and are, thus, a primary control on the sedimentation and ecology of these environments (Hughes 2011). Within tidally dominated coastal landscapes, channels provide the conduit through which the tidal current (wave) propagates, driving the exchange of water and sediment between the outer and inner regions of a coastal water body. The nature of the channel network influences local tidal conditions, specifically tidal range, and tidal flow velocity. Within tidal flats and marshes, which are in the intertidal zone, this translates to the period and depth of tidal-driven inundation and potential for erosion and deposition (Hughes 2011). These conditions

in turn determine the flux of sediment, nutrients, and biota across an environment, ultimately affecting the long-term morphological evolution of the region. Channels are a primary control on most coastal wetland environments (Hughes 2011).

Estuaries

Estuaries are a flooded stream or river mouth (Dalrymple *et al*. 1992). Estuaries are also the interface between land and sea: semi-closed regions where salt and freshwater mix, leading to unique communities of plants and animals. An estuary can take many forms that are primarily dependent on its mode of formation (rising sea level, tectonic activity, receding glaciers, or shifting substrate) and water circulation (tidal influence, topography, and freshwater out flow). However, high productivity, sediment deposition, varying salinity, and high biodiversity are a few traits most estuaries share. In certain areas, such as southern California, some estuaries may also be referred to as lagoons or bays because low annual rainfall typically brings in comparatively small freshwater input.

Estuaries can be subdivided into natural community types: shallow subtidal, tidal sand or mudflats, salt march, tidal creeks, and the upland transition zone. Shallow subtidal communities are submerged but are rarely deeper than light penetration. Mudflats are intertidal habitats that do not support any vascular vegetation. Salt marshes are tidally flushed low lying areas, bordering the estuary supporting salt tolerant plant species. Tidal creeks are streams predominantly driven by tidal flow. These areas are usually slow moving and further protected from physical forces. The upland transition zone, usually known as riparian communities, is where the aquatic and terrestrial habitats merge. Along the west coast of the U.S., the Pacific Fishery Management Council has identified estuaries as a Habitat Area of Particular Concern (HAPC).[9]

Varying salinity, tides, freshwater outflow, and water chemistry combine to create very dynamic systems in both tidal creeks and estuaries. Because of these conditions, many organisms in varied ways exploit this environment, leading to high levels of biodiversity. The semi-enclosed nature of most estuaries protects them from wave action and strong currents. Calmer waters in estuaries allow some sediments from freshwater input to settle out before reaching the ocean, therefore capturing some sediments. High nutrient levels are usually associated with these sediment loads in developed watersheds; these nutrients are partially absorbed by many of the plants that occupy estuaries, thus reducing eutrophication. Estuaries are also vital habitats for many marine fish species that use the shallow protected habitats as rearing zones for juveniles. Without these habitats, juveniles would be typically be exposed to physical forces beyond their swimming capabilities as well as high predatory pressure due to lack of cover/shelter. The nutrient input,

[9] Along the west coast of the U.S., National Oceanic and Atmospheric Administration (NOAA) Fisheries relies on Fishery Management Councils to identify habitats that fall within HAPC. These areas provide important ecological functions and/or are especially vulnerable to degradation. HAPC are discreet subsets of Essential Fish Habitat (EFH). HAPC are considered high priority areas for conservation, management, or research because they are rare, sensitive, stressed by development, or important to ecosystem function. The HAPC designation does not necessarily mean additional protections or restrictions upon an area, but they help to prioritize and focus conservation efforts. Although these habitats are particularly important for healthy fish populations, other EFH areas that provide suitable habitat functions are also necessary to support and maintain sustainable fisheries and a healthy ecosystem.

calm waters, and sedimentation of estuaries, allow many plant species to thrive, forming the base of a very productive ecosystem that influences many habitats and species beyond its borders.

The nutrient filtering ability of estuaries can decrease eutrophication (higher concentrations of nutrient levels) in adjacent coastal waters, protecting other important natural communities from degradation. Many fish species use estuaries as a nursery area before leaving for the open ocean. Losses of estuarine habitats is associated with a drop in recreational and commercial fishing success and depletion of important human food sources. Because of the high productivity of estuarine habitats they are often a sink for carbon dioxide.

Semi-enclosed bays and estuaries are among the most productive areas on earth, ranking with oceanic regions of upwelling, African savannas, coral reefs, and kelp beds (Haedrich and Hall 1976) in terms of animal tissue produced per year. Bays and estuaries harbor large stocks of nearshore fishes and are important feeding and nursery grounds for many species of fish, including commercially important ones (Allen 1982).

The loss of estuarine habitats through land use change and type conversion (see Figure 3) is indicative of both a loss in biodiversity and functionality compared to contemporary wetland systems within the Project region. Healthy estuaries are among the most productive ecosystems on the planet. In addition to providing habitats for biota, estuaries benefit humans by improving water quality, protecting coastal communities through reduced damage from erosion and flooding, and providing recreational opportunities for wildlife viewing and exploration, fishing, and tourism (Dahl and Stedman 2013). The historical estuaries of the Project region supported a substantially greater diversity of native plants and fish/wildlife than the contemporary subtidal habitats that dominate the current landscape.

Intertidal Zones

The intertidal zone is a dynamic marine environment characterized in part by daily tidal fluctuations (leading to periods of sunlight, aerial exposure and submersion) and wave forces. Organisms residing within the intertidal zone are typified by hardy species that are capable of withstanding stresses associated with waves and daily tidal fluxes.

Shallow Water/Shorelines

Nearshore/shoreline shallow water ecosystems are increasingly recognized as critical habitats for fish of cultural, ecological, and economic significance. These ecosystems are often densely inhabited by juvenile fish, highly productive, and refuges from predation, leading ecologists to characterize them as nurseries (Able *et al*. 1998; Munsch *et al*. 2017). However, shoreline ecosystems are being transformed globally to support demands of growing coastal human populations. Many shorelines are modified by armoring (e.g. seawalls, riprap, steep concrete walls) that minimizes erosion and facilitates human use. These modifications affect the ecology of shoreline and nearshore systems by restructuring or eliminating shallow waters (Munsch *et al*. 2017). Along armored shorelines as compared to unarmored sites, fish assemblages are reportedly different, with fish consuming less epibenthic and terrestrial prey, less successful beach spawning, and fish were typically larger in size (Munsch *et al*. 2017). Shoreline

modifications typically impaired fish habitats by limiting feeding, reproduction, ontogenetic (developmental history of an individual organism) habitat shifts from shallow to deeper waters, and reducing connectivity. Restoring shallow waters and substrate complexity has been shown to partially rehabilitate habitats compromised by shoreline modifications (Munsch *et al*. 2017).

PROJECT GEOGRAPHIC AREAS

Bolsa Chica Channel (C02)

The drainage area of the Bolsa Chica Channel (C02) watershed consists of approximately 23,700 acres (about 37 square miles). The Project involves the portion of Channel C02 that extends from its confluence with the C04 channel near Bolsa Chica Street to Huntington Harbour. This channel segment is approximately 1.5 miles long and provides flood risk management for Huntington Beach, Huntington Harbour, and NWSSB. It also runs through and adjacent to the Joint Forces Training Base - Los Alamitos.

The Anaheim Barber City Channel (C03) and Westminster Channel (C04) comprise about 75 percent of the total watershed that feeds into the Bolsa Chica Channel. Once surface water reaches the Bolsa Chica Channel, it flows south and west to its outlet in Huntington Harbour. Huntington Harbour provides a water connection to the Anaheim Bay wetlands to the north and Bolsa Bay wetlands to the south. Bolsa Chica Channel currently consists of a trapezoidal earth channel from the San Diego Freeway (I-405) downstream to Huntington Harbour. The surrounding land use is predominantly dense residential and commercial, except where it borders NWSSB.

Within the Project area along the Bolsa Chica channel, developed areas are highly disturbed and/or paved, and consist of residential structures, roadways, parking lots, commercial buildings, and private/public infrastructure outside the channel. This land use type represents the greatest overall acreage of the Project area. Vegetation within the developed area consists primarily of non-native ornamental plantings and non-native grass lawns. Disturbed areas within the Project area generally consist of the upland area outside of the flood control channel (i.e., the dirt access road and dirt shoulder that separates the road from adjacent commercial/residential development). Disturbed areas still retain a soil surface and are unpaved. Vegetation within the disturbed area generally consists of sparse non-native ornamental plantings. Within the channel itself vegetation is very sparse because of apparent vegetation management. Much of the earthen channel is barren, likely due to ongoing vegetation control/maintenance; where vegetation does occur, it consists generally of low-growing exotic species. All the Project channels generally have these same land use covers/characteristics.

C04 Westminster Channel

The C04 channel is approximately 7.8 miles and provides flood risk management for the cities of Garden Grove, Westminster, and Huntington Beach. The channel begins at Highway 22 and continues downstream past Westminster Memorial Park Cemetery, I-405, and the Westminster Mall, before joining with the C02.

East Garden Grove/Wintersburg Channel (C05)

The Wintersburg Channel conveys stormwater and urban runoff; it begins upstream in Anaheim and flows through parts of Garden Grove, Orange, Santa Ana, Fountain Valley, and Huntington Beach. Most items that enter the storm drains connected to the channel currently flow downstream and wind up in BCER. During winter storms, substantial stormwater flows move through portions of BCER, mobilizing a flush of contaminants and trash.

The channel begins west of the intersection of Highway 5, Highway 57, and Highway 22 in the city of Santa Ana and flows southwest through Haster Basin, under I-405, and through the BCER within an outlet discharging into Outer Bolsa Bay, Huntington Harbor, and eventually the Pacific Ocean.

The C05 channel facility and its tributaries [including the Oceanview Channel (C06)], collect and convey runoff from a watershed of over 28 square miles to the Outer Bolsa Bay. The channels' watershed exists on a flat coastal plain. The Wintersburg Channel System is approximately 11.5 miles long and was originally built to interim standards as part of the 1956 Bond Act for the conveyance of storm water. The channel system consists of a mixture of earthen, riprap, and concrete-lined trapezoidal channels with short segments of concrete, rectangular, and covered box facilities. It was originally designed to convey less than 65 percent of the 25-year peak discharge with box culverts designed for the full 25-year peak discharge based on the Orange County hydrology standards in effect prior to 1973.

The Wintersburg Channel occurs within a densely populated urban area of Huntington Beach, is bordered along its entire length by residential and commercial development. A portion of the Wintersburg Channel falls within designated Essential Fish Habitat for Groundfish.

The Wintersburg Channel is subject to tidal influence, with several feet of water depth in the channel in lower reach areas at all times. Some of the surrounding residential neighborhoods sit at about 0.0 to 1.0 feet mean sea level, and the channel levees rise up to 10 feet higher than the surrounding street and property grades in those zones.

C06 Ocean View Channel

The C06 channel is approximately 4.1 miles in length and provides flood risk management for the cities of Fountain Valley and Huntington Beach. The channel begins in the City of Fountain Valley and flows westward through Mile Square Regional Park and under I-405, ultimately discharging into the C05 channel at the confluence near Gothard Street in Huntington Beach.

Huntington Harbour

Huntington Harbour is located on the northwest corner of the City of Huntington Beach, and borders Seal Beach and Sunset Beach. It encompasses five constructed/developed islands bounded by a network of navigable channels and the land surrounding them. Huntington Harbour Marina features 171 boat slips. Huntington Harbour serves as a pleasure craft port in between

Long Beach and Newport Beach harbors. It connects with Anaheim Bay to the northwest via a waterway that passes under a bridge on PCH and past NWSSB to the ocean.

Seal Beach National Wildlife Refuge

The SBNWR is a wildlife refuge encompassing about 965 acres in the community of Seal Beach. Although it is located in Orange County, it is included as part of the SDNWR. It was established in 1972. The refuge is a collaboration between the Service and the Department of the Navy. The refuge is located within NWSSB. Public access in the refuge is limited or restricted to once-a month tour, as it is located within an active military base.

Naval Weapons Station Seal Beach

NWSSB is a United States Navy weapons and munitions loading, storage and maintenance facility located in Seal Beach, California. It also encloses the Seal Beach National Wildlife Refuge. NWSSB occupies 5,256 acres, has over 100 ammunition magazines providing ammunition storage space. Ammunition is moved from storage to docks in Anaheim Bay by railroad line and road.

Bolsa Chica Ecological Reserve

The BCER is an approximately 1,341 acre coastal estuary/lagoon/reserve. Once part of a 165,000 acre Rancho La Bolsa Chica Mexican land grant, the BCER consists of undeveloped coastal wetlands and adjacent upland areas. In 1899, the tidal flows to most of the wetland areas within what is now BCER were largely eliminated when the natural ocean inlet at Bolsa Bay was closed to improve waterfowl hunting. Since then, the areas surrounding and including BCER have been used for agriculture, cattle grazing, military coastal artillery emplacements and oil production. BCER was also substantially affected by oil field activities for about 80 years.

Since the 1960's numerous development and planning proposals have been made for the Bolsa Chica lagoon marsh and adjacent planning areas. In 1973 the State gained possession of approximately 300 acres of wetlands in what is now the BCER. In 1978, 163 acres of the State Ecological Reserve were returned to tidal action. By 1992, the watershed above the BCER was 85 percent urbanized. Much of the wetlands area outside of the BCER continue in an ecologically degraded state due to lack of tidal/estuarine flow and inundation.

After years of controversial development proposals, a portion of the BCER was purchased and set aside for restoration as an offset for construction activities in the Ports of Los Angeles and Long Beach. The California Coastal Conservancy, State Lands Commission, Service, CDFW, Regional Water Quality Control Board, Santa Ana Region, and other agencies have oversight of the planning and design of the restoration at the Bolsa Chica Wetlands. The property is owned by the State Lands Commission and managed by the CDFW. The BCER boundaries are roughly Warner Avenue to the north, Seapoint Avenue to the south, Pacific Coast Highway to the west, and residential developments to the east

Natural communities in BCER include open water, mudflats, salt marsh, coastal dunes, (seabird nesting) sandy islands, riparian woodland/scrub, and freshwater marsh. More than 200 avian species have been identified at BCER; the reserve is popular with birders and photographers. BCER is currently the largest saltwater marsh between Monterey Bay and the Tijuana River Estuary. BCER mostly consists of salt marsh and open water with estuarine conditions that occur seasonally in some areas. Year round, tidal salt water enters a portion of the BCER through Anaheim Bay (through Huntington Harbour) in Seal Beach. Within the Full Tidal Basin in BCER, a tidal inlet near the south end of the reserve (just north of Seapoint Avenue along PCH) provides tidal flows. During the rainy season considerable fresh water usually flows into the northern portions of the BCER from the Wintersburg Flood Control Channel, which creates varying estuarine conditions in parts of the BCER, notably Bolsa Bay.

Freshwater/brackish conditions at BCER occur at: a brackish runoff pond at the end of Springdale Street; a swale and cattail marsh fed by runoff from the Seacliff Golf Course; a small marsh at the south end of BCER that is fed by runoff from PCH; fresh and brackish water areas upstream within the Wintersburg Channel itself. In 1973, the California Fish and Game Commission designated the Bolsa Chica lagoon area as an ecological reserve and instituted regulations governing public use of the property to protect the wetlands. By 2012, following the Marine Life Protection Act planning process, an additional level of protection was given to areas within the BCER when two marine protected areas (MPAs), the Bolsa Bay State Marine Conservation Area (SMCA) and the Bolsa Chica Basin SMCA, were established within the BCER boundaries (see Figure 12).

The watershed for the BCER encompasses 27.3 square miles. Historically, Bolsa Bay encompassed 2,300 acres of tidally influenced wetlands and large expanses of freshwater marshes in the interior portion of the bay that were fed by artesian springs of what used to be known as the Freeman River or Freeman Creek. Although once an extensive tidal marsh system, much of the marsh area was removed from tidal influence in 1899.

Despite extensive development and land-use activities within the watershed, the wetlands complex in the BCER is a diverse ecosystem that includes a range of invertebrate, reptile, bird, fish, and other species

Sixty-nine species of fish have been detected in BCER lagoon. Currently about 107 acres of eelgrass occupy the 367-acre Full Tidal Basin in the lagoon; eelgrass notably serves as an important food source and protection for many fish species. Green sea turtles (*Chelonia mydas*) and sea lions (*Zalophus californianus*) are now observed frequently in the lagoon. Plovers forage and breed around the lagoon: 113 fledged in 2014 and 129 in 2015. Ridgway's rails began nesting at BCER for the first time in recent decades in 2014. White-faced ibis (*Plegadis chihi*) breed at BCER. Six species of bats have been recorded at BCER.

The Port of Long Beach has participated in restoration projects at the SBNWR in Seal Beach and BCER. For the BCER project the port contributed $39 million toward acquisition of 267 acres of degraded wetlands in the reserve. Similarly, in 1997 and 2005, the Port of Los Angeles provided about $51 million in funding to provide for the purchase and restoration of

some BCER lowlands and tidal wetlands. This latter project restored tidal flow to a wetland area degraded by past human activities in return for mitigation credit.

The Bolsa Chica Lowlands Restoration Project created or rehabilitated nearly 600 acres of marine and wetland natural communities, restoring a portion of what had historically been a vast estuarine ecosystem. The project was the largest wetland restoration in southern California history. The design included ongoing maintenance of an open ocean inlet to ensure the wetland areas continue to function and to protect the biological benefits gained by the restoration investment.

Restoration culminated in 2006 when a new Full Tidal Basin to the ocean was opened. Post-restoration monitoring has shown that this basin has meaningfully increased the availability of basin habitats to fish, improving southern California fishery resources. Nearly every fish species captured during the restoration biological monitoring program was represented by juvenile size classes (and usually adults as well), demonstrating the role of the basin for providing nursery habitats for spawning or post-larval settlement and rearing. Commercially important species such as California halibut (*Paralichthys californicus*) and white seabass (*Atractoscion nobilis*) are relatively common in BCER. The type and size of fish captured also reflect the extensive eelgrass meadows that now exist there. These eelgrass meadows support resident fish species, provide egg-laying substrates, and protection for breeding fish species.

BCER is a critical stop for migrating shorebirds on the Pacific Flyway. With restoration and the re-establishment of tidal influence in the lagoon, the mudflats created by the restoration provide a rich invertebrate community that is a food source to many of these birds. Over 10,000 individual shorebirds have been observed on the restored mudflats during a single survey. The restoration project also created three specific nesting sites for the plover and California least tern. These sites are intensively maintained and monitored and provide additional protected habitats for these species within an otherwise highly developed segment of the California coast.

Most of the biological benefits of the restoration are a result of re-establishing daily tidal influence from the ocean. The ocean inlet as currently configured requires consistent maintenance to ensure tidal water connectivity with the ocean. Sand that naturally flows down the coastline's littoral system is continually pulled into the Basin by the action of waves and tides. Without regular removal of sand from the inlet, the Basin would become closed off from the ocean, causing degradation of water quality and related death of the biota in the basin, damage to intertidal plant communities, and loss of important food sources for nesting birds. Continual inlet maintenance through dredge removal of sand is imperative. The initial $15 million set aside for ongoing inlet maintenance (dredging) is now understood as inadequate to meet the long term needs. BCER now has a substantial funding deficiency for maintaining ongoing ocean inlet essential maintenance. Considering the considerable annual expense and disturbance of continual dredging of sand from the ocean inlet, modification of the existing ocean inlet and/or other hydrological restoration efforts at BCER (e.g., removal of interior levees, restoration of the historical ocean inlet at Outer Bolsa Bay, etc.) will likely be necessary to maintain ecological functions at BCER.

DESCRIPTION OF BIOLOGICAL RESOURCES

A more comprehensive description of expected biological resources of the Project area and Project direct footprint is found within the Corps' feasibility study (Corps 2018). Thirteen federally listed species and 77 state listed species/special status species are found within the most current reports of the California Natural Diversity Database for Seal Beach, Newport Beach, and Anaheim Bay 7.5-minute topographic quadrangles (Corps 2018). Comprehensive biological surveys have not been conducted for a majority of the Project area. In 2018, a biological survey was conducted on a reach of C05 extending from approximately 1,250 feet downstream of Goldenwest Street upstream to Gothard Street. No special status species were observed in this area during the survey (Corps 2018).

Many species are found in the nearshore areas of the Project. At and near the bottom of the food web are aquatic plants, plankton, shellfish, and crustaceans, which support a variety of species at higher trophic levels, including many fish and seabird species. Smaller fish such as forage fish provide food for smaller piscivorous (fish-eating) birds and larger predatory fish, including well-known commercial and recreational fish. In turn, these fish support larger marine birds and mammals. Many native bird species are associated with the bays, estuaries, and inland marine/estuarine/fresh waters in the general Project area, which are the areas that are most heavily affected by shoreline and floodplain development and channelization.

Plants

We consider the following sensitive plant species to have some potential to occur in the Project study area: bird's-beak (federal endangered); San Diego button-celery (*Eryngium aristulatum* var. *parishii*; federal endangered); Ventura marsh milk-vetch (*Astragalus pycnostachyus* var. *lanosissimus*; federal endangered); California seablite (*Suaeda californica*; federal endangered, California Rare Plant); estuary seablite (*Suaeda esteroa*; California Rare Plant); woolly seablite (*Suaeda taxifolia*; California Rare Plant); southern tarplant (*Centromadia parryi* ssp. *Australis*; California Rare Plant); and coast woolly-heads (*Nemacaulis denudata* var. *denudata*; California Rare Plant). No sensitive or listed plant species are expected to occur within the likely Project footprint, due to a lack of suitable habitats, owing to substantial past and ongoing disturbance, periodic vegetation maintenance within the channels, and existing structures.

Eelgrass (*Zostera marina*) is a unique underwater plant which creates its own multi-use habitat types for fish and is protected by NMFS as a Habitat of Particular Concern. An eelgrass bed survey was performed in Project Channel C05 in 2012, and no eelgrass was observed (Corps 2018). It is reportedly unknown if eelgrass occurs within the lower reaches of Project Channel C02 (Corps 2018).

Fish

The open waters of Huntington Harbour and Bolsa Bay provide habitats for a variety of fish and invertebrate species that utilize these sheltered waters either during early growth or throughout their lives. Due to the repeated periodic dredging disturbance and lack of vegetation and natural shallow water features/complexity within Huntington Harbour, the relative number of fish

species using the harbor is likely smaller than in nearby Anaheim Bay or Bolsa Bay; however, some of the commonly found fish in these waters include the deep body anchovy (*Anchoa compressa*), jacksmelt (*Atherinopsis californiensis*), topsmelt (*Atherinops affinis*), and Pacific staghorn sculpin (*Leptocottus armatus*). In addition, Anaheim Bay is an important nursery area for California halibut (*Paralichthys californicus*) and diamond turbot (*Hypsopsetta guttulata*).

Some juvenile fish very likely utilize the Huntington Harbour area. Typical aquatic invertebrates found in these waters likely include bay mussel (*Mytilus trossulus*), acorn barnacles (*Sessilia* sp.), and tunicates (*Tunicata*). Many marine fish species require coastal wetland habitats such as estuaries to complete at least a portion of their life cycle. The vegetative edge of some wetland zones is important for many species of juvenile fish as it provides cover for predator avoidance (Herbold *et al*. 2014). Research indicates that small fish, such as California killifish (*Fundulus parvipinis*) were able to consume six times more food in marsh habitats than in habitats with no marsh access (West and Zedler 2000). Madon (2008) found that food consumption rates of topsmelt were 50 percent lower when the tidal inlet at Los Peñasquitos (San Diego County, California) was closed. In addition, halibut are normally affected by closures due to their sensitivity to higher temperatures in less flushed systems. Nearly every fish species captured during post-2006 monitoring conducted at BCER was represented by juvenile size classes and usually adults, demonstrating the role of the basin as nursery habitat for spawning or post-larval settlement and rearing (Merkel & Associates 2013). Following restoration in 2006, the fish community in BCER was abundant, diverse, and contained biomass levels equivalent to the relatively unaltered Upper Newport Bay and the larger San Diego Bay (Farrugia *et al*. 2014). Over 5 years of quarterly monitoring, a total of 52 fish species have been observed within the fully tidal areas at Bolsa Chica (Merkel & Associates 2013).

Commercially desirable species found at Bolsa Chica include white seabass and California halibut (Merkel & Associates 2013). Fodrie and Levin (2008) found that about 58 percent of juvenile halibut in southern California had embayment origins in 2003 and 2004, and that lagoon-type habitats such as Bolsa Chica provided nurseries for 16 percent of halibut in 2004. While most of the fish common in southern California bays, lagoons, and estuaries are low in trophic level (Zedler 1982), the species composition within the fully tidal portions of Bolsa Chica currently includes coastal marine fishes from 3-4 trophic levels, including top predators such as leopard shark (*Triakis semifasciata*), brown smooth-hound (*Mustelus henlei*), gray smooth-hound (*Mustelus californicus*), and bat ray (*Myliobatis californica*). These relatively large fish act as moderate energy links that transfer nutrients among coastal areas (Farrugia *et al*. 2014). In contrast, closed and severely muted systems are dominated by species with a salinity tolerance generally greater than seawater (approximately 35 parts per thousand), including various gobies (Gobiidae), California killifish, and topsmelt (Merkel & Associates 2009; MEC Analytical Systems 1993); these species, however, are also known to be resident within southern California embayments including open systems (Zedler 1982). Species within closed systems also include those that occur in stagnant water and/or are tolerant of poor water quality and elevated temperatures, such as non-native western mosquitofish *(Gambusia affinis*), rainwater killifish (*Lucania parva*), and sunfish (Centrarchidae) (Wetland Research Associates 1994; MEC Analytical Systems 1993).

In a study of the Upper Newport Bay (located about 10 miles southwest of the Project area, this bay is ecologically similar to BCER and Anaheim Bay), Allen (1982; see Figure 13) found that topsmelt greatly predominated in numbers (77 percent) and biomass (80 percent). California killifish ranked second in both numbers (12 percent) and biomass (8 percent), followed in order by western mosquitofish (6 percent in numbers), arrow goby (*Clevelandia ios*) (2 percent in numbers), and deep body anchovy (1 percent in numbers). These five species accounted for 98 percent of the total number of individuals and 96 percent of the total biomass caught in survey nets in Upper Newport Bay. The vast majority of individuals of most species were either young-of-the-year or juveniles (Allen 1982). The estuarine/tidal portions of the Project area/footprint are likely similar.

Utilization of temperate embayments and estuaries of southern California by juvenile and adult fishes is markedly seasonal with high abundances corresponding to the warmer, highly productive months of spring through autumn (Allen 1982). Notably, these seasons coincide with piscivorous bird breeding seasons. Seasonal fish species typically spend one spring-autumn period in the shallows of a bay or estuary growing at an accelerated rate in the warm, highly productive waters (see Figure 13; Cronin and Mansueti 1971; Allen 1982).

Young of the year topsmelt (*Atherinops affinis*) make up the majority of total fish production within southern California bays, estuaries, and salt marshes, including the Project area (Allen *et al*. 2006). Shallow water habitats are noted as highly important for topsmelt reproduction and larval development (CDFG 2001), and these same areas are likely highly important for topsmelt juvenile development including aquatic predator avoidance (e.g., Allen *et al*. 2006; Miller and Gerlai 2012; Munsch *et al*. 2016; Munsch *et al*. 2017; see Figure 13). Within the Project area, particularly the BCER and channel areas near NWSSB, least terns likely forage predominantly on juvenile topsmelt, which are normally 4.7 inches (120 mm) in length or less (Monaco and Emmett 1991; CDFW 2011). Topsmelt occupying fresh or brackish waters (such as within the Project area) are usually juveniles (University of California 2020), whereas adult topsmelt are typically open water fish and are not taken by least terns due to their size.

Overall, the habitats within the fully tidal portions of BCER support more complex habitats and higher biodiversity/integrity than the nearby wetland areas of closed or severely muted tidal systems. Significant areas of eelgrass and cordgrass have expanded in the fully tidal areas within the BCER after the 2006 restoration activities (Merkel & Associates 2013). Extensive eelgrass meadows increase the complexity of the system as they support resident fish species, provide egg-laying substrate and protection for breeding species, perform essential ecosystem functions, and form the basis of detritus- and grazing-based food webs (Merkel & Associates 2013; Bernstein *et al*. 2011). These structured habitats provide good conditions for fish species such as croaker (Sciaenidae), surfperch (Embiotocidae), kelpfish (Chironemidae), and seabass (Sciaenidae) (Merkel & Associates 2013). In contrast, the restricted tidal influence and periodic water quality extremes of the nearby closed or highly muted systems limit the aquatic communities to a small number of rather hardy species.

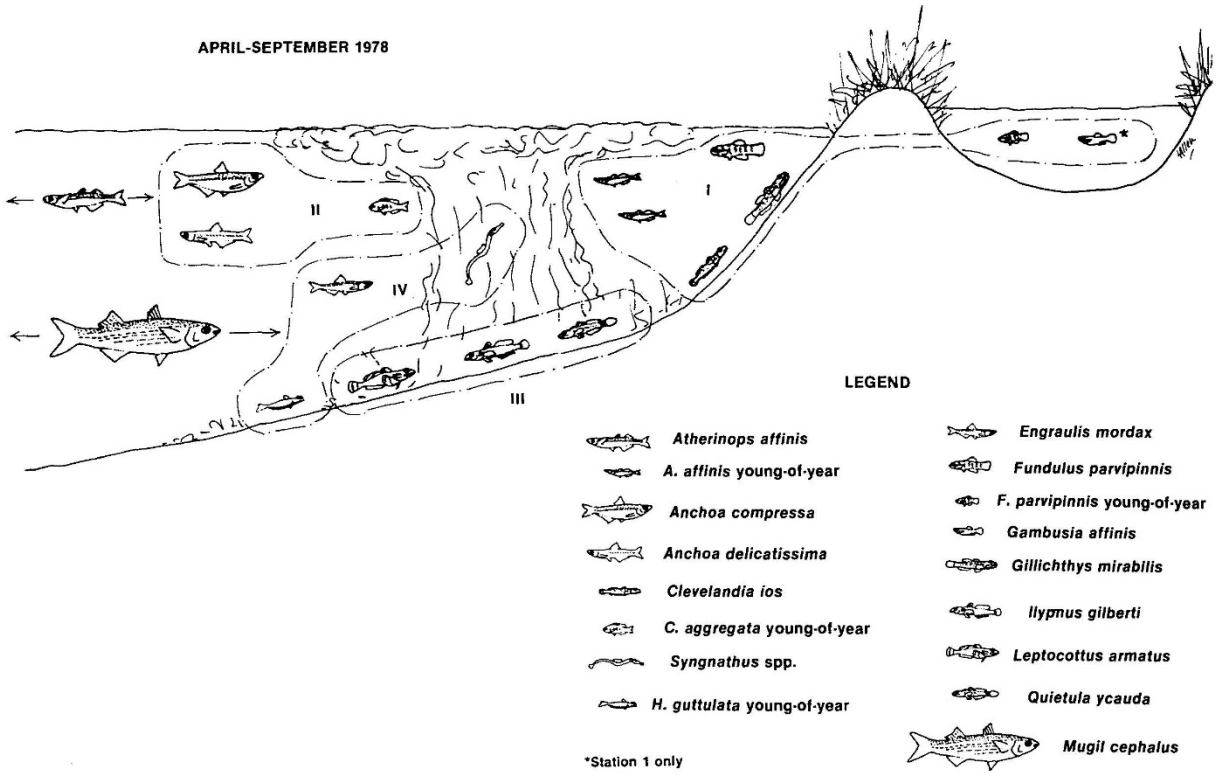

Figure 13. Diagrammatic representation of the principal fish species inhabiting the littoral zone of a southern California bay during April-September (from Allen 1982). Note the predominant use of shallow water-shoreline habitat by topsmelt young-of-the-year.

Birds

Southern California's coastal areas, including its shorelines, estuaries, bays, connected channels, and developed harbors, provide a variety of natural and artificial communities for large numbers of waterfowl, shorebirds, wading birds, and birds that forage from the air. The predominately open water channel and hardscape/landscape habitats within the portions of the Project that occur upstream of BCER or NWSSB/SBNWR provide opportunities for foraging and resting by a moderate diversity of bird species. Opportunities for nesting within these same Project channel areas are quite small for most bird species due to very little woody vegetation, substantial open bare ground and artificial structures, ongoing flood risk management disturbance/maintenance occurring in the area, and surrounding development and associated human/domestic pet activities.

Birds that occur in and near the Project footprint are primarily water-associated species; that is, they are dominated by coastal waterbirds, shorebirds, and waterfowl that depend on marine/estuarine/fresh water natural communities for food and other essentials. Migratory waterbirds and shorebirds substantially use BCER and Anaheim Bay during annual migrations and for overwintering. Some are year-round residents. Sensitive species that may forage in or over the Project footprint include California brown pelican (*Pelecanus occidentalis californicus*; CDFW species of special concern), burrowing owl (*Athene cunicularia*; CDFW species of special concern), osprey (*Pandion haliaetus*; CDFW watch list), northern harrier (*Circus hudsonius*;

CDFW species of special concern), white-tailed kite (*Elanus leucurus*; CDFW fully protected species), peregrine falcon (*Falco peregrinus*; CDFW fully protected species), Cooper's hawk (*Accipiter cooperii*; CDFW watch list), black skimmer (*Rynchops niger*; CDFW species of special concern), and white-faced ibis (CDFW watch list). It should be noted that BCER is an important nesting site for the black skimmer, and it was the first California coastal site colonized by the species in 1985 (Molina 2008). The Project footprint channels provide some important shoreline and sloped shallow water/shoreline habitats, but normally provide very limited areas of trees and/or shrubs for feeding, resting, cover, and/or nesting; most of this small area of vegetation is made up of exotic landscaping.

In 2014, a nesting bird survey was conducted by LSA Associates along Reach 1 of C05. The survey area extended from the tide gates on Channel C05 upstream to the Graham Street Bridge. During the survey, 15 bird species were confirmed as nesting within 500 feet of the channel. Nesting special status species included Belding's savannah sparrow (*Passerculus sandwichensis beldingi*; California endangered) and Cooper's hawk. A burrowing owl was also observed roosting within approximately 1,300 feet upstream of the C05 tide gates (Corps 2018).

Of these species, we consider the least tern, plover, Ridgway's rail, and Belding's savannah sparrow to be the state and/or federally-listed species with considerable potential to be affected by Project construction activities and/or operations/maintenance of the two proposed Project alternatives, particularly by activities that would involve open water, lower reaches of the Project channels, unvegetated flats, mudflats, beaches/islands, levees in or near BCER, or shoreline zones (particularly proposed activities in the lower reaches of Channel C02 near the SBNWR and Channel C05 in and near the BCER).

California Least Tern

Status. The California least tern is federally listed as endangered. The species is also listed as endangered by the State of California.

Distribution and Habitat. The historical breeding range of the California least tern extended along the Pacific Coast from Moss Landing, Monterey County, California, to San José del Cabo in Baja California Sur, Mexico (Service 2006). Since 1970, nesting sites have been documented in California from San Francisco Bay area to the Tijuana River at the Mexican Border and in Mexico within the Gulf of California and on the western coast of Baja California from Ensenada to San José del Cabo at the tip of the peninsula (Service 2006). The majority of nesting sites for the species have been concentrated in southern California.

The species nests in colonies of a few to several hundred pairs on relatively open beaches kept free of vegetation by natural scouring from tidal or storm action, along with protected salt flats and dredge spoils near foraging areas. Nests of the California least tern can be a simple scrape in the sand or shell fragments. It is possible for the species to re-nest up to two times if eggs or chicks are lost early in the breeding season. Fall migration for the California least tern typically commences the last week of July and the first week of August (Service 2006). In highly developed coastal California, typical least tern nesting sites are relatively flat, open, barren sandy

areas near the ocean where the least terns lay and incubate their eggs and chicks fledge. The least tern nesting period extends from April through August; along the California coast least terns typically begin to arrive (after wintering in Central and South America) in the southern most colony breeding sites (e.g., San Diego) in early April and they continue to arrive through the later part of May. During the remainder of the year, the birds are gone from the Project region.

The California least tern is a piscivorous sea bird. This species relies on sight for foraging and usually requires relatively clear water to locate its preferred baitfish food sources, topsmelt, northern anchovy, and jacksmelt (LSA 2009). Although there is some field evidence to suggest that least terns will forage in turbid waters to which some baitfish are attracted, the majority of foraging occurs in clearer waters (LSA 2009).

Potential for Occurrence in Project Area. The California least tern is known to nest within the BCER (California 2015). Nesting islands (i.e., north and south tern island) were created in 1978 within the BCER prompting the California least tern to begin nesting on north tern island. In 2015, the CDFW noted that 204 nests were initiated at the BCER; however, only two of the five nesting colonies were successful. Based on field surveys it was estimated that the number of fledglings at Bolsa Chica in 2015 was between 55 and 65 (Bolsa Chica Land Trust 2015). Nesting and fledgling numbers were lower in 2015 than they were in 2014 when there were 301 nests and an estimated 80 fledglings (Bolsa Chica Land Trust 2015). Also in 2015, the Sea and Sage Audubon Society estimated the number of breeding pairs (i.e., minimum and maximum), nests and number of fledglings (i.e., minimum and maximum) for California least tern at SBNWR/Anaheim Bay; it was estimated that there were between 50-94.5 breeding pairs, 106 nests, and 51-53 fledglings (Sea and Sage Audubon 2016). Within the Project footprint and immediate surrounding areas (particularly within the BCER and channel areas near NWSSB), least terns likely forage predominantly on juvenile topsmelt, as noted above (Monaco and Emmett 1991; CDFW 2011).

Western Snowy Plover

Status. The Pacific coast population of the plover was listed as federally threatened in 1993. The species is also listed as a species of special concern for the State of California. (Service 1993). Critical Habitat for the snowy plover was revised in June 2012. The Service lists three beaches (and the BCER - Subunits CA46 B-F) in Orange County as critical habitat for the snowy plover (USFWS 2012). These include Bolsa Chica State Beach (CA 46A), Santa Ana River Mouth (Subunit CA 47), and Balboa Beach (Subunit 48) (Service 2012).

Distribution and Habitat. The Pacific coast population of the plover breeds primarily on coastal beaches from southern Washington to southern Baja California, Mexico (Service 2007). As of 2002, within California, there were eight geographic areas that supported over three-quarters of the California coastal breeding population: San Francisco Bay, Monterey Bay, Morro Bay, the Callendar-Mussel Rock Dunes area, the Point Sal to Point Conception area, the Oxnard lowland, Santa Rosa Island, and San Nicolas Island. Prior to 1940, in Orange County, plovers nested at Anaheim Landing, Sunset Beach Bay Fill, Sunset Beach, Bolsa Chica Beach, Bolsa Chica Salt Flats, Newport Beach, and Balboa Beach (Page and Stenzel 1981).The breeding season for the plover extends from approximately March 15 through September 15 (Service 2007).

Primary nesting habitats include sand spits, dune-backed beaches, beaches at creek and river mouths, and saltpans at lagoons and estuaries (Stenzel *et al*. 1994). Nests generally consist of a shallow scrape lined with beach debris and typically occur in flat, open, sandy areas with little vegetation (Widrig 1980; Stenzel *et al*. 1994). Multiple pre-nest scrapes may be dug, with one selected as the nest; these typically begin to appear in late January-early February. Driftwood, kelp, and dune plants provide cover for chicks and harbor invertebrates – an important food source (Page *et al*. 2009). Nests are usually found within 100 meters (328 feet) of water, whether ocean, lagoon, or river mouth (Page and Stenzel 1981; Page *et al*. 2009). In addition to nest scrapes, plovers build roost scrapes throughout the year; these are typically shallower, with no materials placed inside, and are often made from scraped-out footprints in the sand.

Potential for Occurring in Project Area. The plover does nest and overwinter within the BCER which is within the Project study area. In addition, 475 acres within the BCER were also designated as critical habitat for the species (77 FR 36727).

Light-footed Ridgway's Rail

Status. The Ridgway's rail is federally listed as endangered. The species is also listed as endangered by the State of California.

Distribution and Habitat. The historical range of the Ridgway's rail extended from Santa Barbara County, California, to San Quintin Bay, Baja California, Mexico (Service 2009). As of 2009, the distribution of the species within California extended from Ventura County in the north to the Mexican border in the south. The species had not been detected in Santa Barbara County since 2004 or in Los Angeles County since 1983 according to the Service's Ridgway's rail 5-Year Review (Service 2009).

The Ridgway's rail uses coastal salt marshes, lagoons, and their maritime environs (Service 2009). Nesting habitat includes tall, dense California cordgrass (*Spartina foliosa*) and occasionally in pickleweed (*Salicornia virginica*) in the low littoral zone, wrack deposits in the low marsh zone, and hummocks of high marsh within the low marsh zone. In regards to breeding, nesting usually begins in March with late nests hatching by August (Service 2009).

Potential for Occurrence in Project Area. Ridgway's rail currently occurs within the SBNWR and the BCER (Service 2009), with breeding currently occurring at both locations (Zembal *et al*. 2018).

Belding's Savannah Sparrow

Status. The Belding's savannah sparrow is listed as endangered by the State of California. It is not federally listed.

Distribution and Habitat. The historical range of the Belding's savannah sparrow included salt marshes along the Pacific Coast from Point Conception, California, to El Rosario, Baja California, Mexico.

The Belding's savannah sparrow uses coastal salt marshes, lagoons, and estuaries. Nesting habitat includes pickleweed, Iodine bush (*Allenrolfea*), seablite (*Suaeda*), saltbush (*Atriplex*), and saltgrass (*Distichlis*) as dominant plants in the marsh (Wheelright and Rising 2008), with nests placed in dense pickleweed of the middle marsh (Powell 1993). Nesting generally occurs in March through May.

Potential for Occurrence in Project Area. Belding's savannah sparrow is known to occur in both SBNWR and BCER. These two areas support two of the three largest breeding populations in California, with the other being Tijuana Slough (Zembal *et al*. 2015). It is possible that this species may be found in smaller remnant wetlands in the vicinity, although the Project channels do not appear to directly support the appropriate vegetation for nesting.

Mammals

In the U.S., most marine mammals are under the jurisdiction of the NOAA Fisheries, including all those potentially occurring in or near the Project area. All marine mammals are protected under the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361 *et seq*.) and some are also protected by the ESA. California sea lions are known to occur in BCER. They are not know to breed in the Project area.

Reptiles

Pacific Green Sea Turtle

Status. The green sea turtle is federally listed as threatened as part of the East Pacific Distinct Population Segment. The species has no State status.

Distribution and Habitat. The green sea turtle has a circumglobal distribution, occurring throughout tropical, subtropical waters, and, to a lesser extent, temperate waters (NMFS and Service 2007). Green sea turtles reportedly inhabit coastal waters of over 140 countries. Green sea turtles spend the majority of their lives in coastal foraging grounds, which include both open coastline and protected bays and lagoons. These marine habitats are often highly dynamic areas with annual fluctuations in seawater and air temperatures (NMFS and Service 2007). Green sea turtles are generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets. The turtles are attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting.

Potential for Occurring in Project Area. The green sea turtle is known to inhabit the BCER and SBNWR, which are within the Project study area. Pacific green sea turtles have been reported from Outer Bolsa Bay and the muted tidal pocket in BCER, adjacent to the Channel C02. The San Gabriel River (nearby) to the north of the Project area is northernmost known year-round habitat for the Pacific green sea turtle (Aquarium of the Pacific 2019). Nesting is not considered likely in the Project region, considering the high level of disturbance on almost all beaches. Green sea turtles apparently have a strong nesting site fidelity and often make long distance migrations between feeding grounds and nesting beaches.

POTENTIAL IMPACTS OF THE PROPOSED PROJECT ON BIOLOGICAL RESOURCES

The Project Channel C05 currently, and as proposed, outlets into a portion of the BCER (Bolsa Bay) which includes two marine protected areas – the Bolsa Bay State Marine Conservation Area and the Bolsa Chica Basin State Marine Conservation Area. In addition, both federally listed and sensitive species inhabit BCER. Both proposed Project alternatives include features whose construction activities could affect listed and sensitive bird species that breed within the BCER, as well as green sea turtles. Depending on the seasonality of construction activities in or near the BCER, listed bird species nesting could be temporarily disrupted by Project construction activities associated with proposed removal of the tide gates, and/or modification of lower reaches of Channel C05 and the Warner Avenue Bridge. The Corps' feasibility study indicates that commitments would be made as part of the Project to minimize these potential impacts to listed and sensitive nesting birds within the BCER, including construction seasonality restrictions. Green sea turtles have been observed within Outer Bolsa Bay and the lower reaches of Project Channel C05 and Channel C02. Proposed construction activities within these areas could temporarily disrupt movement and foraging by green sea turtles. The feasibility study indicates that environmental commitments would be implemented by the Project to minimize these potential impacts to green sea turtles.

Recent surveys of the vegetation within the Project channels as reported within the feasibility study indicate no detections of sensitive or listed plant species. Based on our partial field reconnaissance and research we expect that no sensitive or listed plant species occur within the likely Project direct footprint, based in part on the heavily disturbed/maintained nature of almost all of the Project footprint.

Eelgrass provides important biological benefits and is also important to managed species under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Vegetated shallows that support eelgrass are also considered special aquatic sites under the 404(b)(1) guidelines of the Clean Water Act (40 CFR § 230.43). Pursuant to the MSA, eelgrass is designated as essential fish habitat. Eelgrass is found primarily in the Anaheim Bay/Huntington Harbour area, with smaller amounts occurring in the lower portion of C02 and in Outer Bolsa Bay. In the BCER approximately 140 acres of existing eelgrass occurs adjacent to the likely Project footprint. An eelgrass bed survey was reportedly completed in the lower reaches Project Channel C05 in 2012 (potential habitat), and no eelgrass was observed (Corps 2018). It is reportedly unknown if eelgrass occurs within the lower reaches of Project Channel C02 (Corps 2018). Both of these Project channel reaches would remain soft bottom channel with the proposed Project alternatives, but it is undetermined if channel bottom depths would remain as existing or be directly or indirectly modified with implementation of the either proposed alternative.

The Project channels contain existing soft-bottom areas and wetlands. The wetlands within the Project channels are generally of low to moderate function, providing limited diversity and viability of habitats for native wildlife (notably, the channels provide substantial waterbird and shallow water foraging habitats). The relatively low-to-moderate wetland functions are likely a result of (depending on Project channel reach): (1) steep and highly regular channel slopes,

(2) channel slope armoring (precluding vegetation, etc.), or (3) ongoing or periodic channel maintenance reducing or controlling potential vegetation on earthen channel slopes. The proposed Project would cause the permanent loss of some channel wetlands. The Corps' feasibility study indicates that mitigation is proposed for these losses. The Project Minimum Channel Modifications Alternative would reportedly result in permanent, direct impacts to about 24 acres of channel wetlands. The Maximum Channel Modifications Alternative would reportedly result in permanent, direct impacts to about 9 acres of wetlands. The feasibility study indicates that mitigation opportunities for these wetlands losses are still being explored within the Project area.

The proposed Project alternatives would also directly impact upland and adjacent wetland areas associated with the modification of the Warner Avenue Bridge. The Warner Avenue Bridge modification would reportedly result in permanent, direct impacts to about 1 acre of upland and wetland areas. To offset these impacts, the feasibility study indicates that a wetland mitigation plan is being prepared to replace the acreage of the affected resources elsewhere in/around the Project study area.

The noted Project components are described in more detail in the BE that was provided to the Service. The following proposed project elements are described herein since they may affect important ecological systems or processes of the Project area: (1) installation of a single steel sheet pile wall along the south levee crest of C02 Reach 23, and (2) installation of double sheet pile walls along the north and south levee crests of C05 Reach 1. For example, birds such as least terns are expected to forage in C02 Reach 23 and are known to forage in C05 Reach 1. As the Project is currently proposed, the north levee in C02 Reach 23 would be graded, and "geocells" would be placed to stabilize the existing channel slope (no sheet pile would be driven). Native plantings would then be added to the geocells for further bank stabilization. Substantial shallow water fish habitat would likely be present along the north side of the channel in C02 Reach 23 where the sloped side remains. Along the south side of C02 Reach 23 where a single steel sheet pile wall would be driven, there would be a loss of an approximately 42-foot wide strip of sloped, shallow water tidal habitats along a 9,000-foot length of channel. This would result in the loss of approximately 8.7 acres of shallow water fish and waterbird habitats along the south levee of C02 Reach 23. However, this loss would be replaced (through type-conversion) with approximately 8.7 acres of soft bottom, open-channel tidal (deeper water) habitats with vertical side slopes. As currently proposed, double steel sheet pile walls would be inserted along both the north and south levees of C05 Reach 1, and the levee toes (lower portions of levee slopes) within the channel would be excavated. This would result in the loss of an approximately 16-foot-wide strip of sloped, shallow water fish and waterbird habitats on both sides of the channel, for a total of about 2.2 acres. However, this loss would be replaced with an approximately 35-foot width of soft bottom, open channel tidal habitats on both sides of the channel with vertical side slopes (for a total of 4.8 acres). This would be a net increase of 2.6 acres of (deeper) waters in C05 Reach 1 compared to existing conditions.

Channelization is one of the major factors causing stream habitat loss and degradation and thereby a threat to biodiversity of flowing/running waters (Johansson 2013). Structural modifications to channels often directly alter shoreline geomorphology including tidal elevation

relative to mean lower low water (MLLW),[10] gradient, channel characteristics (depth, width, cross-sectional area, sinuosity), and sediment character and quality (Washington Department of Fish and Wildlife 2001). Geomorphology affects rates of tidal inundation and exchange, and is responsible for most of the distinguishing physical and chemical features of tidal systems. Placement of structures below the ordinary high water (OHW)[11] mark often results in a permanent loss or degradation of fish habitats, reducing the availability and extent of intertidal foraging, spawning, and refuge areas (Dethier 1990; Macdonald *et al*. 1994; Thom *et al*. 1994). Long-term, chronic impacts may reduce intertidal habitat area, bottom complexity, and associated soft-bottom plant and animal communities.

Steel sheet pile and concrete bulkheads are a major part of the proposed Project. Due to their smooth non-porous surfaces, steep sides, and water flow/wave reflective nature, they provide quite limited habitat opportunities for aquatic, shoreline, and riparian species. The existing channels of the Project have been transformed over the past decades from a natural stream system to important conduits for flood flows, but currently are moderate habitat at best for most aquatic, shoreline, waterbird, and riparian species. These channels post-Project would generally be even less ecological viable/productive for many of these species with implementation of the overall Project, even with the proposed tide gate removal, expansion of channel bottoms (due to the excavation of sloped shallow water habitats), and increase in area of waters. The Project channels currently pose considerable challenges for many native aquatic, shoreline, and riparian species due to lack of or degraded habitats, limited food sources, lack of refugia during flood flows, limited shorelines, steep slopes, limited vegetation and cover, low water velocities, and, at certain times of the year, likely low dissolved oxygen and high water temperatures. As noted above, much of the Project would convert Project area channels from trapezoidal channels to rectangular channels with vertical walls, exacerbating the noted ecological degradation in most of these locations. In addition, levee slope toes would also be removed, converting intertidal or shallow water habitats to deeper water habitats; this would simplify the physical characteristics of these channels. The resultant vertical walls (concrete and sheet pile bulkheads) of the wetted-channel sides would provide limited opportunities for aquatic habitat reestablishment, such as slope/shallow water/shoreline features utilized by many waterbirds, shorebirds, and some fish. The proposed project changes would likely benefit aquatic species that utilize deeper embayment and channel water habitats that remain regionally relatively common. Pursuant to these ecological issues, the Corps (e.g., Buffalo District) and other groups have been developing, testing, and implementing technologies to create artificial substitute habitat features (sometimes called "green bulkheads") on bulkheads for fish, while maintaining important human functions of such channels (e.g., see Marrone *et al*. 2016). Such features could likely be effectively incorporated into the proposed Project.

Hardened shorelines with vertical slopes alter hydrology by deflecting flow or wave energy downward, scouring bottom sediments at the toe (Engineering Science 1981;

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[10] Mean Lower Low Water is the average height of the lowest tide recorded at a tide station each day during a recording period, known as the National Tidal Datum Epoch.

[11] Ordinary High Water mark is a line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

Zabawa and Ostrom 1982). Ultimately, this often results in local habitat changes. Added turbulence and scour may prevent vegetation establishment and alter the floral assemblage (Watts 1987; Thom 2002). These changes may result in loss or impairment of species and communities adapted for using higher elevations and particular substrates. Hardened shorelines (e.g., riprap, sheet pile, bulkheads) built below the Mean Higher High Water (MHHW)[12] line usually steepen the natural shoreline, an effect created by the steep face of the structure, and usually result in an increase in the mean water depth and a corresponding loss of the shallow, intertidal habitats preferred by many juvenile fish (Douglass and Pickel 1999; Seattle 2015). During periods of various tides (at least during high tides), the water along the submerged face of the armored slope will generally be deeper, with a steeper slope, than the shallow-water habitats found along a gradually sloping shoreline. Shoreline hardening normally alters the physical characteristics of nearshore biotic communities. These changes in turn can alter distribution, size class abundance, and general abundance of fish within the action area (Hendon *et al*. 2000; Peterson *et al*. 2000; Strayer *et al*. 2012). Bank stabilization techniques in a stream environment reduce the potential for channel complexity. Armoring streambanks limits lateral channel changes (Schmetterling *et al*. 2001) and typically results in a loss of intertidal habitat where organic nutrients accumulate (Brennan and Culverwell 2004).

The proposed Project would include removal of an existing tide gate at the lower end of Channel C05. Importantly, this measure would likely substantially improve Channel C05 hydrological conditions (e.g., tidal exchange), aquatic ecological function, and aquatic connectivity with Bolsa Bay (e.g., see Allen *et al*. 2006; Swamy *et al*. 2002). Additionally, the proposed Project channel widening would expand the areal extent of waters within these channels. Conversely, the vertical sheet pile and channel slope (levee toe) removal proposed within the Project channels would essentially eliminate areas of sloped, shallow water habitats, and substrate heterogeneity along these modified channel sides; it would substantially modify the foreshore, reduce prey and plant production for fish, and thus affect abundance and availability of small fish (potentially including fish less than 4 inches in length typically taken by least terns). Smaller fish are proportionally less abundant along deep shorelines created by intertidal armoring and are more abundant in shallow areas that predators can't access (e.g., see Wiegel 2002; Munsch *et al*. 2016; Munsch *et al*. 2017; Dugan *et al*. 2018).

Shallow water habitats are noted as highly important for topsmelt reproduction and larval development (CDFG 2001), and these same areas are likely important for topsmelt juvenile development including aquatic predator avoidance (e.g., Allen *et al*. 2006; Miller and Gerlai 2012; Munsch *et al*. 2016; Munsch *et al*. 2017). As described above, the Project has elements that could both improve and reduce forage fish availability to least terns; we expect that the net effect of Project channel modifications on least terns is not likely to be measurable.

In order to minimize potential impacts to least terns, plovers and rails, the Corps has committed to prohibiting Project construction activities within C05 Reach 1 (areas near BCER) and C02 Reach 23 (areas near SBNWR) during nesting seasons for these species (i.e., no construction

[12] Mean Higher High Water (MHHW) is the average of the higher high water (higher high water: the average of all the high water heights observed) height of each tidal day observed over the National Tidal Datum Epoch.

during March 1 to September 30). Proposed construction activities in these areas would only be permitted from October 1 to February 28. Additionally, we expect that rail and plover habitats/active use areas would not be adversely affected directly by construction activities, nor would upland least tern use areas be adversely affected by the Project. We do not anticipate temporary impacts (such as noise) to least terns, rails, or plovers due to construction activities from the proposed Project, as Project activities will be prohibited when least terns are present, and sufficient distance is expected to be maintained between the rail and plover use areas and Project activities (based on proposed Project noise estimates) such that adverse effects are not anticipated. The Corps has also proposed conservation measures that would benefit least terns in the form of adding sand substrate to two active least tern nesting islands within the BCER (this, like all Project work, would be performed outside the breeding season). The Corps has also committed to the following:

During the preconstruction engineering and design (PED) phase, additional analysis would be conducted that would evaluate various features with the potential to improve fish habitat within the channels, specifically C05 Reach 1 which runs through the BCER. Additional H&H analysis would have to ensure habitat features for fish can be placed in the channel without impacting flow and conveyance capacity. Potentially improving fish habitat within C05 Reach 1 would be anticipated to improve forage fish availability in the channel for sensitive avian species in the BCER. The fish habitat features could include but are not limited to features such as toe stone piles, textured sheet pile, residual rock shelf or other in-channel structures. If implemented, monitoring of the fish habitat features would occur to ensure the habitat is achieving identified success criteria. If the fish habitat is not meeting the identified success criteria, adaptive management measures, such as adding in additional substrate, would be undertaken.

CONCLUSION

The proposed Project would include removal of an existing tide gate at the lower end of Channel C05. This measure would likely substantially improve Channel C05 hydrological conditions and ecological functions. Additionally, the proposed Project would expand the area of waters within some channels. Conversely, the vertical sheet pile and channel slope removal proposed within the Project channels would eliminate areas of sloped, shallow water habitats along these modified channel sides, affecting some fish and shoreline species. The total combination of proposed Project changes would overall likely benefit aquatic species that make use of deeper water areas, and reduce or eliminate functions for native species that predominantly make use of shoreline and shallow water areas, with a likely net reduction in ecological functions within the Project channels.

Rails, plovers and gnatcatchers would not likely be adversely affected by the proposed Project, as known use areas for these species would not be directly affected by the Project, the hydrology of use areas for the rails and plovers would not be measurably affected, construction activities would be scheduled outside the breeding seasons for these species, and Project construction activities during the non-breeding seasons are not predicted to cause noise levels within use areas for these species that would interfere with their activities (based on the predicted noise levels and separation distances involved).

We expect that the least terns nesting areas in BCER near the Project would likely be improved by the proposed Project (see Recommendations below). As proposed, Project construction activities would be conducted outside the breeding season for least terns, and least terns are gone from the region during the non-breeding season and thus would not be affected by the construction activities themselves. Least tern foraging in Project Channel C05 would likely be considerably improved by the proposed removal of the tide gate at the lower end of Channel C05 and the general expansion of the area of waters within channels C05 and C02. Conversely, least tern foraging would be degraded by the proposed channel modifications involving insertion of proposed sheet pile and levee slope toe removal. In combination, we predict that the net effects of the proposed Project activities/measures would be that no adverse effects on least terns would be likely to occur.

RECOMMENDATIONS

The FWCA states that "...wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development projects through the effectual and harmonious planning, development, maintenance, and coordination of wildlife conservation...." (16 U.S.C. 661). We do not recommend that the proposed Project be implemented as currently designed. Consistent with the FWCA, we suggest incorporation of the following recommendations in order avoid, minimize, and compensate potential impacts to fish and wildlife resources, including the suggested project design elements outlined below that would improve fish and wildlife resources. We fully expect and are available to work with the Corps during the PED stage for the proposed Project to help the Corps perform value engineering and develop a project that better supports the needs of fish and wildlife. To that end, we have eight main recommendations per the FWCA for the proposed Project:

1. **Channel C05 north levee removal**: We suggest the Corps remove the westernmost 3,000 feet of the northern levee at the lower end (lower reach) of Channel C05. This subject portion of Channel C05 is within the BCER, and this levee does not provide flood risk management protection to significant structures or resources. We suggest that about 40 percent of this levee section (i.e., 1,200 feet linear length of levee) should generally be completely removed down to the adjacent C05 channel bottom depth. About 50 percent of the subject levee section linear length (i.e., 1,500 feet of levee) should be removed so as to provide variable shallow water areas (aquatic habitats) ranging roughly from +4 to -2 feet deep MLLW; the remaining 10 percent of the subject levee length (i.e., 300 feet of levee) should be retained (with the existing surface gravel removed) above MHHW as a series of small "islands" surrounded by shallow sloped water areas. Removal of this 3,000-foot levee section would improve hydrological and ecological conditions and connectivity for both the adjacent muted tidal pocket and Channel C05 within the BCER (which would then become one water body), and likely reduce most flood flow velocities within this lower section of Channel C05 in any given storm event through an effectively widened lower reach of Channel C05. Rerouting of recreational foot-traffic currently utilizing the road/path along the north levee would likely be required.

2. **Channel C05 levee sheet pile deletion**: We recommend that the proposed sheet pile to be driven into the lower (westernmost) portions of the Channel C05 north and south levees be removed from the Project design. This portion of Channel C05 is within the BCER and these levees provide minimal flood risk management protection to significant structures or resources. This recommendation applies to the westernmost 4,800 feet of the southern levee, and the westernmost 4,650 feet of the northern levee. Eliminating the insertion of new sheet pile within levees within BCER from the proposed Project maintains future options for essential hydrological restoration to BCER, including potential removal of the western portion of the south levee from Channel C05 (the portion within BCER) to reconnect the BCER full-tidal basin to Outer Bolsa Bay, as it existed before these waters were artificially disconnected with a levee circa 1899 (as noted above). Driving sheet pile in these levees would be a major investment and would be costly and difficult to remove in the future as part of potential future BCER hydrological restoration projects. Eliminating the proposed sheet pile from this portion of the Project would also substantially reduce Project costs (estimated at $50 million by Corps staff).

3. **Channel C05 south levee removal**: We suggest that a design alternative be analyzed/developed that would provide (through levee removal or modification) for moving storm-flood flows, or both low and storm-flood flows, from channel CO5 within the BCER to the ocean through the Full Tidal Basin. It is expected that known contaminant sites within the BCER (where/when these sites would remain even with Project implement) would likely need additional armoring for protection from flood risks as a result. Potential mobilization of contaminants (reportedly buried within some existing levees within the BCER) should be fully minimized as part of construction and operations. It is expected that moving storm flows partially through the Full Tidal Basin would eliminate or reduce the need for widening of the Warner Avenue Bridge, as currently proposed. While routing low/storm flows through the Full Tidal Basin would likely introduce some modern contaminants from the Westminster watershed into the basin (with concomitant ecological consequences), funding for ongoing dredging of the ocean mouth of the Full Tidal Basin[13] is currently short. A consequence of routing low/storm flows through the basin could be additional flushing of sand from the mouth of the Full Tidal Basin, and funding from the Project may be available to ensure that the basin mouth is maintained with the appropriate capacity (via dredging on regular basis) to provide for passage of Project design storm flows. Future evaluations should include consideration of the cost versus benefit of a combination of the elimination of

[13] Daily tidal water flows in and out through the existing mouth of the Full Tidal Basin in the BCER are essential to the ecological viability of the basin. The mouth currently is subjected to substantial natural littoral sand flow along the coast, with resultant shoaling of the mouth and restriction of tidal flows. As such, the mouth has been dredged annually to maintain tidal flow at a substantial cost, and these costs have exceeded the currently available funds for dredging. It is expected that the proposed Project would substantially contribute to ensuring the basin mouth is maintained open through dredging as part of a Project alternative that routes low/storm flows from Channel C05 through the Full Tidal Basin to the ocean, pursuant to Project flood risk management and FWCA offsetting/enhancement measures.

the Warner Avenue bridge widening component combined with periodic dredging of the mouth of the Full Tidal Basin to maintain flow capacity.

4. **Levee removal between Inner and Outer Bolsa Bay**: We recommend that the Corps remove the existing levee between Inner Bolsa Bay and Outer Bolsa Bay (see Figures 7, 8, and 9). This 220-foot-long levee is located at the western terminus of the south levee of Channel C05. The subject levee likely does not provide flood risk management to any structures or resources; its current function appears to solely be to support a dirt access road/path within the estuary of the BCER, between Pacific Coast Highway and the south levee of Channel C05. If a crossing is essential at this location (note that other maintenance and emergency vehicle access points to the south levee are available within 1 mile to the east), then the access road that currently tops this levee should be replaced with a pedestrian or vehicle bridge (as necessary per Orange County Public Works access) with a hydrological opening/deck length that provides for restoration of full tidal flow and faunal connectivity between Inner and Outer Bolsa Bay under the new bridge.

5. **Bird nesting island enhancement measure revision**: The proposed Project includes compensatory mitigation activities, including the addition of fill and sand nesting substrate to least tern nesting islands within BCER to improve their long-tern viability considering predicted sea level rise. We have recently learned that similar enhancement measures at these same nesting locations may already be planned and funded by other parties. If this is so, then we recommend that this Project measure be substituted/converted to predator management (e.g., ongoing control of California least tern nest predators) at these same nesting areas in BCER. Predator management at these nest areas is important and appropriate, and reportedly not currently funded/accomplished.

6. **Trash reduction and removal from Project channels**: Mobilized trash and contaminants in urban and storm run-off remains a challenge in the Project area, per its effects on biota and regional water quality. Trash and contaminants from the Project watershed should be minimized before entry in the Project channel systems through a variety best management practices and programs, including community outreach and education (e.g., alternatives and appropriate use of fertilizers and chemicals in watershed landscaping), trash racks and signage at storm drains, small-scale and onsite sedimentation/infiltration basins, etc. Trash that makes its way into Project channels should be collected and removed from within Project lower channel reaches with the use of a series of high-function practicable measures, such as trash "wheels," booms, and other effective methods. The Corps and Orange County Public Works should work with upstream cities and state and federal regulatory agencies to address impacts from urban and storm water runoff in the watershed. The Corps and Orange County Public Works should seek out infrastructure improvements, grant funding, regional partnerships, and technology to improve water quality in the Project region. Fugitive trash transported within Channel C05 should be captured and removed upstream of BCER, to the extent practicable.

7. **Rectangular channel enhancement**: Much of the Project would convert Project area channels from trapezoidal channels to rectangular channels with vertical walls. As noted above, these vertical walls (concrete and sheet pile bulkheads) would provide very limited opportunities for aquatic or riparian habitat establishment (outside of relatively deep water habitats). Nearshore fish habitats can be rehabilitated to varying degrees within the constraints of flood risk management human use; interest in experimental designs for shoreline features that promote ecological functions is increasing (Munsch *et al* 2016; Munsch *et al*. 2017). Detrimental effects of armoring generally fall into categories of connectivity and accessibility, prey availability, predation risk and reproduction. These habitat attributes may be improved by artificial shoreline features that add complexity to the substrate/bulkhead, replicate or restore low-gradient beaches, and/or add vegetation (or functional substitutes). Some agencies have been developing, testing, and implementing artificial technologies to create habitats on bulkheads for fish while maintaining the flood risk management functions for such channels (e.g., see Toft *et al*. 2013; Dyson and Yocom 2015; Marrone *et al*. 2016). These potential designs include "habitat skirts" that create shallow-water shelves or benches along wall margins (Slogan 2015), rock pools in seawalls (Chapman and Blockley 2009), and adding texture and relief to seawalls (Cordell *et al*. 2017). We suggest the Corps evaluate the altered system dynamics of the Project channels as proposed, and use the principles of biomimicry to develop replicable and durable solutions for creating functional substitute habitats for (at least) larval and juvenile native fish along the Project sheet pile and concrete bulkheads. Desired ecological functions for fish (e.g., shelter, cover, and nourishment) should be minimal essential parts of enhancement designs, along with flood flow conveyance and maintenance issues.

8. **Construction schedule and monitoring**: The Corps should implement a construction schedule for the Project that avoids the least tern, plover, Belding's savannah sparrow, black skimmer, and Ridgway's rail breeding seasons, if feasible, for any Project activities that are planned within or adjacent to potential breeding, foraging, and loafing areas for any of these species within or near the BCER. The Corps should provide a qualified biologist per these species, acceptable to the Service and CDFW, to help monitor and manage Project activities that would occur during the breeding seasons in or near potential breeding areas of these species or in or near the BCER or SBNWR, as appropriate. This monitoring/management program should be carried out during Project activities in potential sensitive species' breeding areas, including regular coordination with the Service and CDFW. Up-to-date surveys should be performed where needed, as appropriate. If the areas associated with Project activities have substantial potential of supporting/affecting sensitive species, the Corps should provide an education program for construction crews, including identification of the potential sensitive species, restricted areas and activities, and actions to be taken if sensitive species are found within and near Project activity areas. Similarly, Project construction activities should be timed/located/monitored to avoid green sea turtle activity periods and areas, as practicable.

9. **Breeding activity avoidance**: If least tern, plover, Ridgway's rail, Belding's savannah sparrow, black skimmer, and/or other sensitive wildlife species breeding activity or active nests are found within or directly adjacent to the Project's direct footprint during construction (despite the scheduling of Project activities in the BCER outside their breeding seasons), then all work in the immediate area should be halted, and the Corps' biologist should be notified immediately. An appropriate buffer zone around any active nest for exclusion of Project-related activity effects should be specified by the biologist, in coordination with the Service and CDFW.

If you have any questions you have regarding this letter, please contact Jon Avery, Federal Projects Coordinator, at 760-431-9440, extension 309.

Sincerely,

For Scott A. Sobiech
Field Supervisor

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