DRAFT

Final Restoration Plan
for the Otay River Estuary Restoration Project

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MAY 2014

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1 INTRODUCTION

1.1 Background

The Otay River Estuary Restoration Project (ORERP) is a partnership between Poseidon Water (Channelside) L.P. (Poseidon), the U.S. Fish and Wildlife Service (Service or USFWS), and San Diego Bay National Wildlife Refuge (Refuge). The ORERP project involves the creation, restoration, and enhancement of coastal wetlands to benefit native fish, wildlife, and plant species and to provide habitat for migratory seabirds and shorebirds and salt marsh-dependent species within the South San Diego Bay Unit of the Refuge (see Figure 1). Restoration is consistent with the goals and objectives of the Service's San Diego Bay National Wildlife Refuge Comprehensive Conservation Plan (CCP) (USFWS 2006a) and the terms and conditions of the permits issued by the California Coastal Commission (Coastal Commission) and San Diego Regional Water Quality Control Board (Regional Board) for the Carlsbad Desalination Project. In 2006, the Service completed the CCP and accompanying Environmental Impact Statement (EIS) and Record of Decision (ROD). The CCP guides the management of the Refuge over a 15-year period and describes the wildlife and habitat management goals for the South San Diego Bay Unit.

On November 15, 2007, the Commission approved a Coastal Development Permit (CDP No. E-06-013) for Poseidon's proposal to construct and operate a desalination facility in Carlsbad, San Diego County, California. As part of that approval, the Commission required Poseidon, through Special Condition 8, to submit for additional Commission review and approval a Marine Life Mitigation Plan (MLMP) to address the impacts to be caused by the facility's use of estuarine water and its entrainment of marine organisms. The MLMP was conditionally approved by the Coastal Commission on August 6, 2008 (CCC 2008). With the incorporation of the Commission's revisions, the MLMP was finalized on November 21, 2008 (Poseidon 2008). On May 13, 2009, the RWQCB added a fish productivity requirement and approved the MLMP, as incorporated within the March 27, 2009, Minimization Plan. This approval is outlined within Order No. R9-2009-0038. In September 2009, Poseidon agreed to increase the number of restored acres from 55.4 to 66.4 to provide 11 additional acres.

The MLMP and associated actions described above require Poseidon to submit a proposed mitigation site and preliminary restoration plan that achieved the following mitigation requirements:

- Create or substantially restore tidal wetland habitat preferably in the San Diego Region
- Provide at least 66.4 acres of mitigation at a maximum of two sites
- The chosen site must be available and protected against future degradation
- Fish productivity must be at least 1,717.5 kg/year

After conducting a comparison study that evaluated 15 sites in the Southern California Bight based on the MLMP's objectives, and meeting with Commission staff and the Scientific Advisory Panel (SAP) with representatives from Federal and State agencies over the course of a year, Poseidon concluded that the Otay River Floodplain Site was the most suitable mitigation site to fulfill the requirements, objectives, and restrictions outlined in the MLMP. On February 9, 2011, the Commission agreed with Poseidon and unanimously approved the Otay River Floodplain Site and preliminary restoration plan (CCC 2011). The site was approved by the Regional Board on March 9, 2011 (RWQCB 2011). The Service and Poseidon Resources entered into a Memorandum of Understanding (MOU) to establish a partnership to facilitate the restoration of property within the Refuge consistent with the CCP and Poseidon's Commission permit requirements.

Since November 2011, Poseidon's project team has worked in conjunction with the Service, Commission staff, the SAP, Regional Board staff, Port of San Diego, California Department of Fish and Wildlife, and California State Coastal Conservancy staff on potential design alternatives to the originally proposed preliminary restoration plan. Collectively, this collaborative relationship is known as the "MLMP Workgroup." The MLMP Workgroup has reviewed site opportunities and constraints, and evaluated restoration project design alternatives prior to finalizing the ORERP for the environmental review process.

In coordination with the MLMP Workgroup, Poseidon conducted several site-specific studies to aid in the development of project alternatives. Based on these studies, Poseidon proposed a revised mitigation site and preliminary restoration plan. The revised mitigation site would encompass two restoration areas – the Otay River Floodplain Site and Pond 15 Site, located in the southeast corner of the South San Diego Bay Unit of the San Diego Bay National Wildlife Refuge (Refuge). The revised preliminary restoration plan would decrease the mitigation footprint of the Otay River Floodplain Site to the area west of Nestor Creek, to avoid potential impacts associated with cultural resources and contaminated soils, and expand the mitigation footprint to incorporate Pond 15. Poseidon would receive approximately 70% of the required mitigation credit from the restored salt ponds and approximately 30% from the Otay site. On December 11, 2013, the Coastal Commission approved the proposed modification to the Otay River Floodplain Mitigation Site and Preliminary Restoration Plan submitted by Poseidon, in compliance with the MLMP, approved on August 6, 2008 in accordance with Special Condition 8 of CDP No. E-06-013. A Draft EIS, concurrently written with this Final Restoration Plan (FRP), analyzes two alternatives for the ORERP that would fulfill requirements of the MLMP. These alternatives are the Intertidal Alternative and the Subtidal Alternative. Between these two alternatives, the Intertidal Alternative was determined to be the preferred action and is subject of this FRP. A detailed description of the proposed restoration plan is provided in Section 4.0 of this FRP.

BASE SOURCE: ESRI

FIGURE 1

Regional Map

Final Restoration Plan for the Otay River Estuary Restoration Project

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1.2 Final Restoration Plan Purpose

This FRP focuses primarily on the restoration effort proposed by Poseidon and the Service of subtidal, intertidal mudflat, intertidal coastal salt marsh, and transitional habitats as well as associated upland habitats on a total of approximately 168 acres among two non-contiguous sites San Diego Bay National Wildlife Refuge-South San Diego Bay Unit as compensatory mitigation for estimated entrainment and impingement impacts associated with the Carlsbad Desalination Plant stand-alone operations.

1.3 Final Restoration Plan Elements

The required FRP elements are presented below, including each element's corresponding section within this FRP:

1. Detailed review of existing, biological, hydrological conditions, ownership, land use, and regulation (Section 2.0).
2. Evaluation of site-specific and regional restoration goals and compatibility with the goal of mitigating for the Carlsbad Desalination Plant impacts (Section 5.0).
3. Identification of site opportunities and constraints (Section 3.0).
4. Restoration design, including: (Section 4.0)
    a. Proposed cut and fill, water control structures, stormwater control measures, buffers and transition areas, management and maintenance requirements.
    b. Planting programs, including removal of exotic species, sources of plants and/or seeds (local, if possible), protection of existing salt marsh plants, methods for preserving top soil and augmenting soils with nitrogen and other necessary soil amendments before planting, timing of plant, plans for irrigation until establish, and location of planting and elevations on the topographic drawings.
    c. Proposed habitat types (including approximate size and location).
    d. Assessment of significant impacts of design (especially on existing habitat values) and net habitat benefits.
    e. Location, alignment and specifications for public access facilities.
    f. Evaluation of steps for implementation (e.g., permits and approvals, development agreements, acquisitions of property rights).
    g. Cost estimates.
    h. Topographic drawings for final restoration plan at 1"-100' scale with a one-foot contour interval.

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2 EXISTING CONDITIONS

2.1 Land Use

The approximately 168-acre project site includes two separate non-contiguous areas, the Otay River Floodplain Site and the Pond 15 Site, as shown in Figure 2. The 78-acre Otay River Floodplain Site is open space, primarily used for wildlife habitat purposes. The project site is located within the City of San Diego and is designated as an open space floodplain zone (City of San Diego 2005). The purpose of this zoning designation is to protect the natural character of floodplains while permitting development that will not constitute a dangerous condition or an impediment to the flow of flood waters. It also seeks to preserve the function of floodplains including the moderation of flood water flows, ground water recharge and wildlife habitat (City of San Diego 2012).

The Pond 15 Site is located within the City of National City, within the jurisdiction of the San Diego Unified Port District. The San Diego Unified Port Master Plan identifies the Pond 15 Site within the South Bay Salt Ponds Planning Subarea, which designates the area for "conservation/wetlands" land use (Port of San Diego 2012). The approximately 90-acre Pond 15 Site is an active salt pond within the 1,068 acre South Bay Salt Works. The Salt Works is a salt production facility that as of 2006, produced between 60,000 to 80,000 tons of salt per year. Various portions of the Salt Works are owned privately or leased from the Airport Authority (USFWS 2006a).

Interstate 5 (I-5) is located within one-quarter mile east of the project site, and provides regional access to the project area. Public access to the site is restricted to both portions of the project site, due to wildlife preservation on the Otay River Floodplain Site and active salt production within the Pond 15 Site. The Saturn Boulevard right-of-way contains a paved recreational trail that runs along the eastern border of the Otay River Floodplain Site, located in City of San Diego jurisdiction. This trail runs between Palm Avenue to the south and Main Street to the northeast. The Bayshore Bikeway, which extends 26 miles around the San Diego Bay, passes directly north of the Otay River Floodplain Site between the salt ponds and the Otay River channel within the old Coronado Branch of the San Diego and Arizona eastern railroad right-of-way (USFWS 2006a).

Land uses surrounding the project site generally include open space, neighborhood residential and commercial development. Directly east of the project site are lands that currently exist as wildlife habitat bounded to the east by I-5. This land is located within the Otay River floodplain as a part of the Refuge. The open space area contains various underground and overhead public utilities located within easements or dedicated street rights-of-way within City of San Diego jurisdiction and are not included within the Refuge boundary (USFWS 2006a). Parcels zoned for

agricultural residential and light industrial uses by the City of San Diego are located to the northeast of I-5. Further northeast, the City of Chula Vista maintains jurisdiction over land zoned for limited industrial and thoroughfare commercial uses (City of Chula Vista 2009).

Additionally, the 55 acre Chula Vista Wildlife Reserve is located north of the Pond 15 Site, built from dredged material from the development of the Chula Vista Harbor. The Chula Vista Wildlife Reserve is managed by the Port in addition to tidelands within the bay and on the bayfront currently used for various recreational, open space and marine-related industrial purposes. City of Chula Vista and the Port-owned lands within this area are subject to development as governed under the Bayfront Redevelopment area. These improvements would include an increase in the intensity of uses around the Chula Vista Marina and improved public access to the bay (USFWS 2006a).

Areas located southwest of the project site, under the jurisdiction of the City of Imperial Beach, are primarily zoned for medium density or two-family detached residential uses and contain various residential neighborhoods, including light industrials uses, an elementary school and a mobile home park (City of Imperial Beach 2010). Lands owned by the Navy are located further northwest of the project site, including uplands and wetlands currently used for military training operations. The Imperial Beach General Plan encourages the increase of public access opportunities to the bay and the extension of bicycle and pedestrian paths along the bay front.

South of the project site includes lands located within the City of San Diego zoned multi-unit residential and community oriented commercial development. These lands contain a mobile home park and commercial developments including a Home Depot, Vons and several financial institutions. A sewer pump station operated by the City of San Diego's Metropolitan Wastewater Department is located further west. Additionally, Pond 20A, located immediately south of the Otay River Floodplain Site, is owned by the Port of San Diego and occurs within the City of San Diego jurisdictional boundaries. The northern portion of Pond 20A is included within the management acquisition boundary for the Refuge (USFWS 2006a).

2.2 Property Ownership

Both portions of the project site are located within the Refuge. The Service is the current owner and manager of the Refuge that is part of the larger San Diego National Wildlife Refuge Complex. Specifically, the Pond 15 Site is within the South Bay Salt Works, which is a private facility that operates in accordance with a Special Use Permit issued by the Service to the Airport Authority. South Bay Salt Works operates under this lease with the Airport Authority and under an agreement with the Port of San Diego to continue production until 2009 (USFWS 2006a).

SOURCE: BING MAPPING SERVICE

FIGURE 2

Project Site and Vicinity Map

Final Restoration Plan for the Otay River Estuary Restoration Project

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2.3 Regulation

A number of federal, state and local agencies have jurisdiction over the restoration actions that would occur on the site. The Service owns the Otay River Floodplain Site, while the Pond 15 Site is owned by the State Lands Commission, and leased to the Service. Both portions of the project site exist within the Refuge. Therefore, the project must be consistent with the San Diego Bay National Wildlife Refuge Comprehensive Conservation Plan and Environmental Impact Statement prepared in August 2006. Compliance with Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System, Refuge Recreation Act of 1962, as amended, and the National Wildlife Refuge System Act of 1966, as amended, and the National Wildlife Refuge System Improvement Act of 1997 would also be required.

The Service's Consistency Determination for the project with the CCP would also need to receive concurrence from the Coastal Commission. This involves a determination that the CCP is consistent to the maximum extent practicable with the California Coastal Management Program in Section 307 of the Coastal Zone Management Act of 1972. The Coastal Commission will also be required to determine if the project is consistent with the requirements, objectives and restrictions in the Marine Life Mitigation Plan (MLMP).

Through a wetlands delineation, it was determined that the project site does contain waters and wetlands that could be jurisdictional by the Army Corps of Engineers (ACOE), the San Diego Regional Water Quality Control Board (RWQCB) and the Coastal Commission. Although the non-tidal portion of the Otay River channel would have qualified for California Department of Fish and Game (CDFG) jurisdiction, the portion is on federal land, and thus not subject to Section 1600 et seq. of the California Fish and Game Code. As shown in Section 2.5, Biology, there are 14.51 acres of wetlands and non-wetland waters under the joint jurisdiction of the ACOE, RWQCB, and Coastal Commission as shown in Figure 6 (Dudek 2012). As such, the project would be subject to regulation under the Clean Water Act. Activities proposed within the project site would require a Clean Water Act 404 Permit from the ACOE.

Prior to obtaining a Section 404 permit, a Section 401 Water Quality Certification from the RWQCB will be required. Through the certification review process, the RWQCB is expected to require a National Pollution Discharge Elimination System (NPDES) permit for the disposal of dredged/excavated material and may require coverage under the State's General NPDES permit to control potential water quality impacts from construction activities. A portion of the project site is also located within the Otay River floodplain and will need to comply with Executive Order 11988, Floodplain Management, which prohibits federal agencies from contributing to adverse impacts associated with the modification of floodplains. In addition, a USACOE Section 10 Rivers and Harbors Act Section 10 Permit would be required due to the impacts associated

with the existing wetlands and filling waters of the U.S. Depending on the final construction methods, all dewatering activity may be subject to the appropriate RWQCB permit.

Additionally, the project would require a project-level internal Section 7 consultation, as appropriate under the authorities of the Endangered Species Act (ESA), prior to the implementation of the action proposed in accordance with the CCP that may affect federally listed endangered or threatened species in the Otay River floodplain. A programmatic Biological Opinion was prepared under the authorities of the ESA for the CCP. Furthermore, the project must comply with the Migratory Bird Treaty Act of 1918, as amended, the Fish and Wildlife Act of 1956, as amended, Executive Order 13113, Invasive Species, and Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds. The project could also affect fish habitat and would require consultation with the National Marine Fisheries Service (NMFS) under the Magnuson-Stevens Fishery Conservation and Management Act for federal permitting and funding activities that could adversely affect Essential Fish Habitat, affect the endangered east Pacific green turtle.

Wildlife habitat changes resulting from proposed project implementation would also apply to the City of San Diego Subarea Plan for the Multiple Species Conservation Program (MSCP), which addresses the multiple species habitat needs and the preservation of native vegetation communities in southwestern San Diego County. The Subarea Plan was prepared prior to establishment of the CCP, and therefore, is not entirely reflective of the current plans for the South San Diego Bay Unit as described in the CCP. The project site is also located on federally owned land and would not need to comply with the provisions of the MSCP. However, the Subarea Plan does clarify that if the site is converted to a new use, the use should be "compatible with the resource goals and objectives of the MHPA and other regulations and polices applicable to the site, or enhanced/restored" (City of San Diego 1997).

To ensure protection of potentially occurring cultural resources on-site, the project would be required to comply with Executive Order 11593, Protection and Enhancement of the Cultural Environment, Executive Order 13007, and the National Historic Preservation Act of 1966, as amended. Protection of cultural resources would also be required to follow the provisions of the Indian Sacred Sites, Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, Antiquities Act of 1906, the American Indian Religious Freedom Act of 1978, and the Native American Graves Protection and Repatriation Act of 1990. Furthermore, compliance with the Archaeological Resources Protection Act of 1979 and the 36 CFR 79: Curation of Federally Owned and Administered Archaeological Collections would be required to protect archaeological resources that may exist on the site the project.

Regarding air quality, the project would need to comply with Rule 1501 of the San Diego Air Pollution Control District's (District) Rules and Regulations. This would ensure that Federal Agencies do not take actions that are inconsistent with the efforts of the District to achieve the National Ambient Air Quality Standards (NAAQS), and that federal agencies do not fail to take advantage of opportunities to assist in the achievement of the NAAQS (San Diego Air Pollution Control District 1995).

2.4 Physical

2.4.1 Geology/Soils

Soils

The Pond 15 Site is comprised of 140 million gallons of water, and underlain by Quaternary Alluvium. This is a silt, sand, clay, and gravel with minor cobbles and boulders generally found in river and stream bottom, valley fill, flood plain, fan, beach sand, swamp, and sand dune deposits. The Pond 15 Site is within a liquefaction hazard area, or an area with shallow groundwater tables and poorly consolidated granular sediments potentially subject to hazards associated with seismically induced liquefaction, per the City of Chula Vista General Plan EIR Geologic Maps (Figures 5.5-1 and 5.5-2 in the General Plan EIR) (City of Chula Vista 2005).

The Otay River Floodplain Site is located at the western terminus of the Otay River within the Otay River floodplain. The groundwater level exists between a range of 3 to 8 feet below the surface due to the local groundwater gradient (USFWS 2006a). In general, the floodplain is characterized by soft Alluvial/Bay Deposits under three to five feet of uncompacted fill soils. As shown in Figure 3, the Otay River Floodplain Site is almost entirely composed of Grangeville fine sandy loam at slopes ranging from 0 to 2%. This type of soil is often found in alluvial fans and has a high capacity to transmit water. The soil is considered fertile, with a very high water capacity and a low possibility of erosion. This soil type extends onto the open space land to the east of the project site where Visalia gravelly sandy loam ranging from 2 to 5% slopes comprises the majority of the land. Visalia gravelly sandy loam is also commonly found in alluvial fans and has a high capacity for transmitting water. However, this soil only contains a moderate available water capacity compared to the soil on the project site. Additionally the open space area to the east of the Otay River Floodplain Site contains areas of Riverwash and Tujunga sand, both of which are common in floodplains. These soils have high water transmitting capabilities and only moderate available water capacity (NRCS 2011).

As outlined within the report titled, "Sampling and Analysis Report Otay River Estuary Restoration Soil Characterization Program" as prepared by Anchor QEA, L.P. (Anchor QEA,

L.P. 2013), the Otay River floodplain was sampled for grain size, total organic carbon (TOC), metals, pesticides, total petroleum hydrocarbons (TPHs), polycholoronated biphyenls (PCBs), and semi-volatile organic carbons (SVOCs). Borings were taken from six locations within the project site, ranging from the surface to eight feet below the surface. 10 additional boring sites with the same elevation ranges were sampled within the floodplain adjacent to the Otay River Floodplain Site. Within the boundary of the Otay River Floodplain Site, none of the soil samples included the tested contaminants. However, contaminants were detected within samples in the Otay River floodplain in the vicinity of the project site, including DDTs, toxaphene, PCBs, and elevated concentrations of metals including copper, zinc, and lead.

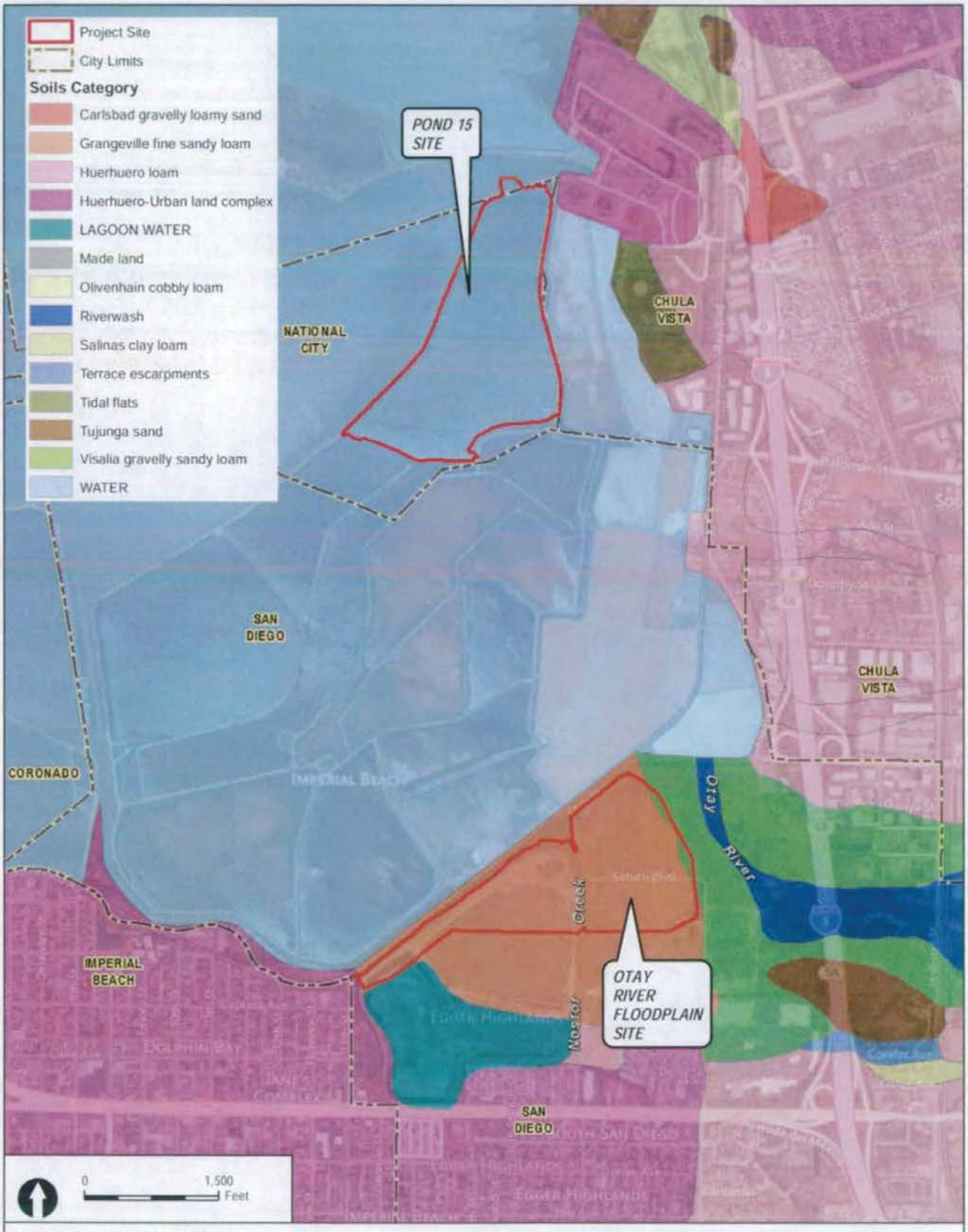
Seismicity

Faults

No known faults exist on the project with the closest mapped fault being the Rose Canyon Fault that traverses through downtown San Diego and passes the project site offshore to the west. The Rose Canyon Fault is estimated to be able to produce a maximum seismic event of 6.0 to 6.5 on the Richter Scale (GEOCON 1986). The La Nacion Fault Zone, a quaternary fault area, also exists approximately 4 miles to the east of the project site (California Geological Survey 2010). This fault zone has an estimated potential of producing a maximum seismic event of 5.0 to 6.0 on the Richter Scale. However, the probability of such an event occurring is remote. The Coronado Bank Fault Zone and the San Diego Trough Fault Zone also traverse approximately 10 to 25 miles west of the project site. These fault zones are considered to be "potentially active" having produced a Magnitude 4.6 earthquake on June 29, 1983 approximately 10 miles west of San Diego (GEOCON 1986).

Ground Shaking

The potential ground motions that could be experienced from an earthquake event are typically expressed as a fraction of acceleration due to gravity (g). The estimated peak ground accelerations that could occur at the project site, which have a 10% probability of being exceeded in a 50-year span of time, range from approximately 0.25 g to 0.32 g (California Geological Survey 2003).



SOURCE: BING MAPPING SERVICE

FIGURE 3

Project Site Soils

Final Restoration Plan for the Otay River Estuary Restoration Project

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Liquefaction

Liquefaction refers to an instance where soil that typically behaves as a solid is transformed into soil that behaves as a liquid, similar to quicksand. This occurs when soil below the water table is subjected to vibrations, such as those produce by earthquakes, and causes the water pressure in the pores of the soil to increase, decreasing soil strength. The Pond 15 Site is comprised of approximately 140 million gallons of water, and therefore liquefaction hazard in this area is high. According to a geotechnical investigation performed by GEOCON in 1986 on the Otay River floodplain, the loose to moderately dense, silty sand deposits found on the Otay River Floodplain Site are considered susceptible to potential liquefaction in the event of a moderate to heavy ground motion. It was determined that these soils have a moderate to high potential for liquefaction considering the shaking characteristics of a 6.0 Magnitude earthquake. However, the clayey silts, silty clays and sandy gravels of the Alluvial/Bay Deposits were determined to possess a low liquefaction potential (GEOCON 1986).

2.4.2 Natural Resources

The City of San Diego has produced mineral resources that include salt, sand and gravel for decades. Sand and gravel used for building and construction materials are extracted primarily north of the project site in the Mission Valley, Carroll Canyon, and Mission Gorge areas. Some open pit mining operations for sand, gravel and rock do exist within the areas covered by the Multiple Species Conservation Program subarea plan. Salt production in San Diego is principally conducted in the South Bay Salt Works, located within the South San Diego Bay Unit of the Refuge. This area, which includes the Pond 15 Site, contains approximately 1,068 acres and has produced salt for over 130 years. The current operation uses solar evaporation in diked ponds to facilitate the concentration and precipitation of salt from the bay water (City of San Diego 2008). The approximately 90-acre Pond 15 Site is an active solar salt pond included within this operation which produces between 60,000 to 80,000 tons of salt per year (USFWS 2006a).

Mineral Resource Zones for the City of San Diego, which indicate the probability of an area having valuable mineral resources, are shown in Figure 4. Although Pond 15 Site is a part of the salt production at the Salt Works, the area is not classified as Mineral Resource Zone. The Otay River Floodplain Site is classified by the City of San Diego as a Mineral Resource Zone 1, which is considered an area where no significant mineral deposits are present, or where it is judged that there is little likelihood for their presence (City of San Diego 2008). No mineral resources of value are expected to occur on the Otay River Floodplain Site.

Agricultural Resources

Both the County of San Diego and the City of San Diego have experienced a loss in available agriculture land from the expansion of urban development. The areas designated as important agricultural resources by the Department of Conservation Farmland Mapping and Monitoring Program are identified in Figure 5. The best soils for agricultural production in San Diego County are primarily located in the western inland areas and in northern parts of the County. In the City of San Diego, agriculture is primarily located in the San Pasqual Valley where it represents over 30% of the land use (City of San Diego 2008). Portions of the Otay River floodplain were identified as Prime Farmland in 1998 according to the California Department of Conservation. Prime Farmland is defined as land with the best combination of physical and chemical characteristics able to sustain long-term production of agricultural crops (USFWS 2006a). However, in 2008 these portions of the Otay River floodplain were designated as Farmland of Local Importance, which is described as land that meets all the characteristics of Prime Farmland and Farmland of Statewide Importance, with the exception of irrigation. The soils of these lands are suited for truck crops and orchard crops and have a history of good production for locally adapted crops of significant economic importance to the County (California Department of Conservation 2011).

As described in Section 2.4.1 above, the Otay River Floodplain Site is primarily comprised of Visalia sandy loam and Grangeville fine sandy loam soils. These soils are recognized as fertile soils for agricultural production. The project site is also located within the Maritime Climate Zone where temperatures and humidity depend primarily on the conditions of the Pacific Ocean. The climate is favorable to agriculture based on the small range of season and diurnal temperature changes and high humidity (USFWS 2006a). The Otay River floodplain was utilized for agricultural purposes from the mid 1930's until 1988 for production of various crops including bell peppers, beans, cucumbers, tomatoes, cabbage and celery, with tomatoes as the principal crop on the land. The land was taken out of agricultural production due to the market uncertainty as well as increasing costs for water and labor compared to the surrounding areas. (USFWS 2006a). As of 2012, the Department of Conservation identifies the Otay River Floodplain Site as mostly other land, with 35.6 acres of Farmland of Local Importance. The Pond 15 Site is designated as "other land," not specified for agricultural use (California Department of Conservation 2012).

AERIAL SOURCE: BING MAPPING SERVICE

FIGURE 4

Mineral Resource Zones

Final Restoration Plan for the Otay River Estuary Restoration Project

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SOURCE: BING MAPPING SERVICE

FIGURE 5

Farmland Mapping and Monitoring Program Designations

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2.4.3 Landforms and Visual Quality

Otay River Floodplain Site

The Otay River Floodplain Site is located within the uplands of the Otay River floodplain at the south end of the San Diego Bay. The relatively flat floodplain gently slopes from southeast to northwest ranging in elevation from approximately 18.5 to 9.5 feet. The relatively flat elevation of the site and surrounding areas allows for direct views of the surrounding salt ponds and the San Diego Bay to the north. These two features are some of the most prominent landforms surrounding the project site. The levees that form the salt ponds at the south end of the bay are visible from around the bay and much of the developed upland areas that border to bay to the south (USFWS 2006a). Another prominent landform that is visible from to the east of the project site is the San Ysidro Mountain Range. Otay Mountain, which is the highest point in the mountain range, is located over 12 miles from the project site and is visible on the horizon from the site.

The Otay River Floodplain Site is distinct because almost all of the open land on the bayfront has been developed and there is little remaining Coastal Sage/Maritime Sage vegetation surrounding the bay (City of Imperial Beach 2010). Channelized water flows through the site along the northern boundary through Otay River, and through the center of the site in a north-south direction in Nestor Creek. The western portion of the site contains levees and basins that were constructed as part of the former solar salt evaporation system. Soils on-site, as outlined in Section 2.4.1 above, are excessively drained and rapidly permeable. Many areas are barren of vegetation or support scattered sycamores, coast live oaks, and sparse shrubs and forbs occur in patches (USFWS 2006a).

Due to the generally flat elevation of the Otay River Floodplain Site and the surrounding area, there are limited locations where the project site is visible. Relatively unobstructed views of the site are possible from various public vantage points including the Bayshore Bikeway, I-5 and State Route 75 (SR-75). The Bayshore Bikeway is located within the San Diego-Eastern Arizona Railroad right of way, which is a thin strip of land that passes along the northern border of the Otay River Floodplain Site. Looking south from the bike path the entire Otay River Floodplain Site is visible and unobstructed, except by a chain-link fence that borders the bike path. Portions of the Otay River channel are visible as well as the locations of standing water and wetlands on the project site. Variations in coastal vegetation are also highly visible from the bike path.

Less than half a mile south of the project site, SR-75 travels east/west, also known as Palm Avenue. This roadway segment is designated as an eligible state scenic highway at its closest vantage point of the Otay River Floodplain Site (Caltrans 2012). Views of the Otay River

Floodplain Site are completely obstructed along most of the road by buildings, trees and landscaping associated with development. A portion of open space exists at the location of Pond 20A between 16th Street and 13th Street in the City of Imperial Beach where it is possible to view the Otay River Floodplain Site from a distance. However, these views are limited because of the roadway and the project site are at the same relative elevation.

I-5 runs north/south and is located less than a quarter mile to the east of the project site boundary. Due to the slight elevation of I-5 in relation to the surrounding land, it is possible to view the Otay River Floodplain Site at a distance. However, views of the Otay River Floodplain Site are intermittent and often obstructed by trees and other vegetation that line the western side of the road. The most unobstructed views of the project site occur around Charles Avenue where the open space area of the project site is visible. It is possible to view vegetation on the project site at a distance and the overhead electrical transmission lines that run along the eastern border of the site are highly visible due to their height.

Pond 15 Site

The Pond 15 Site is relatively flat), directly on the edge of the San Diego Bay, with the Pacific Ocean approximately 1.5 miles west. The Otay River tidal channel flows north into San Diego Bay between Pond 11 and Pond 12. .The Palomar Street tidal channel flows north into San Diego Bay at the eastern boundary of the northern portion of the Pond 15 Site (USFWS 2006a). The prominent visual features from this portion of the Pond 15 Site as viewed from outside the Refuge include the levee barrier system to separate the pond from tidal circulation of the surrounding bay. The water filled pond has little to no vegetation due to the high salinity, and views of this area can often include periods of very low water levels.

Chula Vista Bayfront Park is located approximately half a mile north of the Pond 15 Site. This area also has an uninterrupted view of the Pond 15 Site, with only the waters of the bay and portions of the salt works operation between the two areas. The levees and salt ponds, including the Pond 15 Site, are visible from throughout the bay and much of the developed upland area that borders the south of the bay, including the industrially developed sites located east and northeast of the salt ponds. The Pond 15 Site is also visible between 1-2 miles across the Bay from the Bayshore Bikeway, the Silver Strand (State Route 75), and residential properties.

Visual Significance

Although the project site is not identified as a specific visual resource by the City of San Diego, it is one of the few remaining open space areas adjacent to the southern portion of the San Diego Bay. The portion of I-5 from the international border with Mexico to where it intersects with

State Route 75/Palm Avenue is designated as an eligible scenic highway (Caltrans 2012). Due to the roadway segment's distance from the project site as well as the obstruction from development and trees, it is not possible to view the project site along this location. SR-75 is also designated as an eligible scenic highway from the intersection with I-5 in Palm City, to its second intersection with I-5 in San Diego. Views of the project site are very distant from across the bay to the Pond 15 Site, or obstructed along this roadway segment from roadside development and trees, except for a views of the Otay River Floodplain Site from small open space area that occurs between 16th Street and 13th Street in the City of Imperial Beach.

2.5 Biology

This section describes the biological resources present within the project site both from a regional context and at the site-specific level. Descriptions are provided of the Refuge's vegetation communities, plants, wildlife, fish, and listed and sensitive species. The information presented is based on the results of field studies conducted by Dudek from February through July 2011 for the Otay River Floodplain Site, as documented in the Biological Technical Report (Dudek 2012), and in March 2013 for the Pond 15 Site (Dudek 2013), as well as biological resources data included in the CCP/EIS (USFWS 2006a).

2.5.1 Background

The natural wetlands included within the Sweetwater Marsh and South San Diego Bay Units represent two of the 23 coastal wetland systems remaining in San Diego County. Much of what remains of San Diego Bay's historical shallow subtidal, intertidal mudflat, and salt marsh habitats are preserved within the Refuge. In addition to these natural wetland habitats, the Refuge also includes a system of salt ponds and associated levees that provide roosting, foraging, and/or nesting opportunities for tens of thousands of migratory birds. As such, the Refuge protects habitats essential to the migratory birds of the Pacific Flyway. In recognition of the importance of the foraging and nesting habitats protected within this Refuge and the specific species these habitats support, the south bay has been designated a Western Hemisphere Shorebird Reserve Network Site and each Unit is recognized as a Globally Important Bird Area by the American Bird Conservancy (USFWS 2006a).

Additionally, these natural wetland systems are of regional significance as they are permanently open to tidal flushing. As a result, they support a high diversity of salt marsh plant species, including a number of low marsh species, such as cordgrass, annual pickleweed (*Salicornia bigelovii*), and saltwort (*Batis maritima*), which are generally absent from nontidal wetland systems. Today, approximately half of the coastal wetlands in the Southern California Bight are either frequently closed or always closed to tidal influence, primarily because of human

disturbance. Such closures reduce the availability of nutrients and dramatically alter salinities in the water column and within the soil. Many salt marsh plant species cannot tolerate these conditions, which over time have resulted in reduced native plant species diversity and lower habitat values (USFWS 2006a).

Although now included within the Refuge, the majority of the San Diego Bay's remaining wetlands have not escaped the impacts of human disturbance. For example, the salt ponds within the South San Diego Bay Unit receive no benefit from tidal flushing. As a result, there are opportunities available within the Refuge for improving habitat values for wildlife and avian species in particular (USFWS 2006a).

Although spared the impact of extensive dredging, the South Bay has nevertheless experienced significant habitat loss. Changes to the habitats in the South Bay began in 1871 with the construction of the La Punta Salt Works, a small-scale solar salt evaporation facility. Between 1911 and 1916, the area utilized for solar salt production was expanded to include the entire end of the South Bay. In 1933, the land now occupied by Ponds 11, 12, 14, and 15 was acquired for incorporation into the salt works. By 1942, Ponds 12, 14, and 15 had been constructed, followed later by the construction of Pond 11. Based on the existing elevations of these ponds, it appears that in creating the salt ponds, significance portions of the intertidal mudflat and salt marsh habitat at the south end of the bay were eliminated (USFWS 2006a).

Some dredging, although limited, has occurred in the South Bay. In the late 1960s, dredging was conducted to create the Chula Vista Marina and the mooring areas around the Coronado Cays. Several boat navigation channels have also been created to provide access to the Chula Vista Marina and adjacent shipyard, as well as to the Coronado Cays. The last major dredging activity to occur in the South Bay took place in the late 1970s, when a channel was created in Emory Cove. Tidelands now filled to support development occurred along the bayfront in National City, between G and J Streets in Chula Vista, and at the site of the Chula Vista Wildlife Reserve. The native upland and wetland habitat of the Otay River floodplain was all but eliminated during the twentieth century because of industrial, agricultural, and municipal activities. Maps dating back as far as 1916 depict the Otay River in its present channelized configuration. A narrow corridor of salt marsh, freshwater marsh, and native riparian habitat are supported within the river channel, and remnant maritime succulent scrub habitat can still be found in the vicinity of the railroad right-of-way that extends between the south end of the salt works and the Otay River channel (USFWS 2006a).

2.5.2 Habitat and Vegetation

The Refuge provides protection and management of a large number of endangered, threatened, migratory, and native species and their habitats within the San Diego Bay region. Nesting, foraging, and resting sites are managed for a number of species of shorebirds, colonial seabirds, and wintering waterfowl. Waterfowl and shorebirds over-winter or pass through, using the area for foraging and resting, as they migrate along the Pacific Flyway. Enhanced and restored wetlands provide high quality habitat for fish, birds, and plants. Endangered species, such as, light-footed clapper rail occur within salt marsh areas. Suitable protected nesting areas, primarily the levees of the existing salt ponds, are used by the threatened western snowy plover, endangered California least tern, and a diverse number of ground nesting seabirds and shorebirds. Within the Otay River floodplain, non-native weeds and exotic grasses dominate the upland portions of the site. The freshwater wetland habitat of the Otay River includes components of southern willow scrub habitat, as well as a variety of exotic, invasive wetland species such as giant reed, salt cedar, and castor bean. This freshwater wetland habitat transitions into salt marsh habitat downstream of I-5, at which point the channel supports coastal salt marsh species (USFWS 2006a).

2.5.2.1 Vegetation Communities

Prior to the 1900s, San Diego Bay was a fertile, shallow flat-bottomed bay surrounded by extensive mudflats and salt marshes (USFWS 2006a). Over the past hundred years, significant portions of the bay, particularly the northern two-thirds of the bay, have been dredged to support ship movement or the bay has been filled to accommodate port development. At the southernmost end of the bay, much of the original salt marsh and intertidal mudflat habitat was diked to create solar evaporation ponds for producing salt. Today, a small percentage of the previous salt marsh and intertidal habitat remain. Most of this remaining native habitat is located within the Refuge boundary. The coastal wetlands that remain not only provide habitat for several federally listed endangered and threatened species, but also represent a vital link in the Pacific Flyway as noted above.

Otay River Floodplain Site

The Otay River Floodplain Site is approximately 78 acres, consisting of mostly of disturbed and native upland habitat and approximately 8.82 acres of wetland habitat. Historically, some of these upland areas within the Otay River Floodplain Site supported either freshwater or riparian habitat but appear to have predominantly been composed of coastal salt marsh habitat (USFWS 2006a). Over time, these wetland areas were converted to upland due to the channelization of the Otay River, construction of solar salt ponds, and past agricultural activity.

The Otay River Floodplain Site includes seven vegetation communities or land covers as listed in Table 1, Vegetation Communities and Land Cover Types for the Otay River Floodplain Site, and shown in Figure 6, Otay River Floodplain Site Vegetation Communities. Each vegetation community within the project site is described in greater detail below.

Table 1
Vegetation Communities and Land Cover Types for the Otay River Floodplain Site

Vegetation Community/Land Cover Type	Acreage
Isocoma Scrub	11.97
Brackish Water Channel or Floodway	0.80
Cismontane Alkali Marsh	1.28
Mulefat Scrub	0.25
Southern Coastal Salt Marsh	2.35
Disturbed Habitat	50.21
Former Salt Pond Bottom and Borrow Area	10.82
Grand Total	**77.68**

Source: Dudek 2012, as revised January 2014.

Vegetation community classification for the Otay River Floodplain Site was based on the *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986), as modified by Oberbauer et al. (2008) in the *Draft Vegetation Communities of San Diego County* (referred to herein as the Holland/Oberbauer Classification System). The vegetation community descriptions provided in The *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986) were used to describe vegetation communities, with modifications, as necessary, to account for site specific differences between the dominant species in the observed communities compared to the dominant species described by Holland (1986) and classified by Oberbauer et al. (2008).

Isocoma Scrub

Isocoma scrub is dominated by coast goldenbush (*Isocoma menziesii*). The stands of *Isocoma* scrub vegetation on the site, which occur to the west of Nestor Creek, form a sparse to open shrub layer. The overall height of these shrubs varies from 0–3 feet and overall vegetation shrub cover is approximately 50%. There are a few patches of coast cholla (*Opuntia prolifera*) within the community, but the community lacks diversity, and is predominantly composed of a nearly monotypic stand of coast goldenbush in the shrub layer. The understory is predominantly composed of non-native annual weeds such as filaree (*Erodium* spp.), mustard (*Brassica nigra; Hirschfeldia incana*), tocalote (*Centaurea melitensis*), and annual grasses (*Bromus* spp., *Avena* spp.).

Figure 6

Otay River FloodplainSite Vegetation Communities

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Mulefat Scrub

Mulefat (*Baccharis salicifolia*) scrub is a tall, herbaceous riparian scrub strongly dominated by mulefat. It typically occurs along intermittent stream channels with generally sandy soils and a moderate depth to the water table. The community is maintained by frequent flooding, or succeeds to cottonwood (*Populus* sp.) or sycamore (*Platanus* sp.) dominated communities. Willows (*Salix* spp.), stinging nettle (*Urtica* sp.), and sedge may also be present (Holland 1986).

The mulefat scrub vegetation community on site is composed of fragmented patches of a continuous shrub layer where mulefat (*Baccharis salicifolia*) dominates.

Southern Coastal Salt Marsh

Southern coastal salt marsh typically occurs in bays, lagoons, and estuaries along the coast and is subject to tidal inundation. Dominant species include alkaliheath (*Frankenia* sp.), sea blite (*Suaeda* sp.), and Parish's glasswort (*Arthrocnemum subterminale*) along the drier upper edges of the marshes; Pacific pickleweed (*Sarcocornia [Salicornia] pacifica*), Bigelow's pickleweedt (*Salicornia bigelovii*), and saltwort (*Batis maritima*) at middle elevations; and California cordgrass (*Spartina foliosa*) at the lowest elevations.

On site, southern coastal salt marsh generally occurs along the channels of the Otay River that extend along the northern edge of the site, within Nestor Creek, at the convergence of the Otay River and Nestor Creek near the center of the site. The southern coastal salt marsh on site includes species of *Suaeda*, Pacific pickleweed, Parish's glasswort, and cordgrass.

Cismontane Alkali Marsh

Cismontane alkali marsh typically occurs in areas that are wet or inundated throughout most to all of the year (Holland 1986). Dominant species include rushes (*Juncus* spp.), salt grass (*Distichilis spicata*), sedges (*Carex* spp.), yerba mansa (*Anemopsis californica*), and alkali heath (*Frankenia grandifolia*). This community occurs at lake beds and flood plains below 1,000 feet, characterized by higher levels of salts than are found in the freshwater marsh habitat. It differs from coastal saltmarsh primarily in that it is not subject to tidal inundation. Cismontane alkali marsh supports many of the same wildlife species found in coastal and valley freshwater marsh.

The cismontane alkali marsh on site is dominated by Pacific pickleweed. This community occurs in a few distinct areas in the northeastern portion of the site.

Brackishwater Channel

Brackishwater channel refers to tidal channels that are unvegetated, and thus does not fit into other wetland habitat categories. The lack of vegetation may be due to the depth of water, scouring effects of floods or regular tidal inundation, or man-caused vegetation removal for flood control, access, sand mining or other purposes.

The brackishwater channels on site receive water from the ocean with regular tidal inundation, as well as freshwater influence from upstream sources. One channel is located along the northern edge of the site (Otay River Channel) and a second is oriented north-south through the center of the site (Nestor Creek). Within the Study Area, both channels are subject to regular tidal inundation.

Former Salt Pond Bottom and Borrow Area

The former salt pond bottom and borrow areas consist of a series of low-lying areas that are remnants of former industrial salt evaporation pond construction and operations. The bottom and borrow areas are surrounded by a tall levee that separates them from the adjacent tidal channels. The levee was constructed, in part, using soil excavated from within the basin (borrow area) which has resulted in a low-lying area that holds water from rain events occasionally. Because of this area's historical long-term use as an industrial salt evaporation pond, the soil conditions are hypersaline, and the land mapped as former salt pond bottom and borrow area does not support vegetation. The former salt pond bottom and borrow areas are located to the south and west of the Otay River and Nestor Creek channels in the western portion of the site.

Disturbed Habitat

Disturbed habitat refers to areas that are not developed yet lack vegetation, and generally are the result of severe or repeated mechanical perturbation. The disturbed habitat on site includes an area that was farmed in the past and is periodically mowed by the Refuge to control non-native weeds (specifically for garland chrysanthemum [*Glebionus coronaria*]) and for fire management purposes. The northwestern portion of this disturbed area was also the former site of a sewage treatment facility. The area is dominated by non-native forbs and was mowed during the time period that the surveys were conducted for this project.

Pond 15 Site

The Pond 15 Site consists of 90 acres of approximately 2.70 acres of disturbed and native upland habitat (levees) and approximately 86.41 acres of non-vegetated habitat including the brines contained in the salt ponds as well as areas mapped as bay, beach, and the jurisdictional portions

of the salt pond levees. Prior to diking for salt production, the entire area within the Pond 15 Site was composed of intertidal mudflat.

The Pond 15 Site and is part of a larger salt works operation that currently produces salt for commercial purposes using solar radiation to evaporate water from seawater and concentrate and eventually crystallize the salts through a sequential evaporation technique. The salt evaporation ponds are separated from the adjacent San Diego Bay and tidal channels by levees that surround the ponds. These levees reach a maximum elevation of approximately 8 feet, slightly greater than the highest observed water level (7.71 feet NAVD 88). The Pond 15 Site includes the four habitat types or land covers listed in Table 2, Vegetation Communities and Land Cover Types for the Pond 15 Site, and shown on Figure 7, Salt Pond 15 Site Communities. Each vegetation community within the project site is described in greater detail below.

Table 2
Vegetation and Non-Vegetated Communities and Land Cover Types for the Pond 15 Site

Vegetation Community/Land Cover Type	Acreage
Bay	0.59
Beach	0.01
Disturbed Land	2.70
Open Water	82.24
Salt Pond Levee	3.57
Southern Coastal Salt Marsh	0.84
Disturbed Southern Coastal Salt Marsh	0.10
Grand Total	**90.05**

Source: Dudek 2013, revised January 2014

Vegetation community classification for the Pond 15 Site was based on the *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986), as modified by Oberbauer et al. (2008) in the *Draft Vegetation Communities of San Diego County* (referred to herein as the Holland/Oberbauer Classification System). The vegetation community descriptions provided in The *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986) were used to describe vegetation communities, with modifications, as necessary, to account for site-specific differences between the dominant species in the observed communities compared to the dominant species described by Holland (1986) and classified by Oberbauer et al. (2008).

Bay

Areas mapped as Bay refer to the open water located within the San Diego Bay. An area mapped as bay is located at the north of Pond 15.

Beach

Beach refers to areas that are on the bay side of the levees and that are subject to tidal inundation but are generally exposed sand. Areas that are mapped as beach are lacking vegetation. Beach areas are infrequently tidally inundated whereas tidal flat or mudflat areas are inundated on a daily basis.

Disturbed Land

Disturbed land refers to areas that are not developed yet lack vegetation, and generally are the result of severe or repeated mechanical perturbation. The disturbed land on site includes the top surface of the levees surrounding the Pond 15 Site. These areas are driven on for vehicular access, and do not support vegetation.

Open Water

Open Water consists of concentrated brines and includes areas that are perennially inundated by brines within the Pond 15 Site. The salt pond brines are hypersaline and vary in salinity from pond to pond, depending on its position in the sequential evaporative water process. Overall salinities within the Salt Works varies from the salinity of the South San Diego Bay [32 parts per thousand (PPT)] to 356 ppt with the Pond 15 Site varying from 71.3 to 128.5 ppt (USFWS 2006a). As a matter of reference, ocean water salinity varies from 32 to 37 ppt (ONR 2014).

Salt Pond Levee

The salt pond levees separate the salt ponds for controlling the salinity as part of the salts works operation. The levees vary in the degree to which they are compacted with the lower and outer edges being less compacted, and the surfaces intended for vehicle access being more compacted. Areas with less compaction occasionally support disjunct patches of vegetation, while the compacted areas are devoid of vegetation. Areas intended for driving access that are devoid of vegetation were classified as disturbed habitat (see below) to distinguish them in the context of regulated versus non-regulated jurisdictional areas. Patchy vegetation occurring on the salt pond levees consists of a combination of native and non-native species. Native species that occur on the levees are typical of middle and upper salt marsh habitat, such as salt grass, seaheath, glasswort, and seepweed. Non-native species occurring on the levees consists of ice plant (*Mesembryanthemum* spp.), annual grasses (e.g., *Bromus*), as well as patches of Australian saltbrush (*Atriplex semibaccata*).

FIGURE 7
Pond 15 Site Vegetation Communities
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Southern Coastal Salt Marsh and Disturbed Southern Coastal Salt Marsh

Southern coastal salt marsh typically occurs in bays, lagoons, and estuaries along the coast and is subject to tidal inundation. Dominant species include seaheath, seepweed, and Parish's glasswort along the drier upper edges of the marshes; Virginia glasswort, dwarf saltwort, and turtleweed (also known as saltwort [*Batis maritima]*) at middle elevations; and cordgrass closest to the water.

On site, southern coastal salt marsh occurs as small patches of vegetation along the levee that surrounds the salt pond. It is classified as a disturbed form of the habitat in areas where there is overall low vegetative cover of the community. Salt marsh vegetation is also present off site along some of the internal levees of the Salt Works, on the river and bay side of the levee system, and along the Palomar ditch and channel east of Pond 15. In general, for the Pond 15 Site, the internal levees are lacking in vegetation. The southern coastal salt marsh on site includes seepweed species (*Suaeda* spp.), Virginia glasswort, Parish's glasswort, and cordgrass.

2.5.2.2 Jurisdictional Waters

The U.S. Army Corps of Engineers (ACOE), California Department of Fish and Wildlife (CDFW), Regional Water Quality Control Board (RWQCB), and California Coastal Commission (CCC) regulate certain activities within streams, wetlands, riparian areas, and coastal zone in California.

U.S. Army Corps of Engineers

The ACOE regulates "discharge of dredged or fill material" into "waters of the U.S.," which includes tidal waters, interstate waters, and all other waters that are part of a tributary system to interstate waters or to navigable "waters of the U.S.," the use, degradation, or destruction of which could affect interstate or foreign commerce or which are tributaries to waters subject to the ebb and flow of the tide (33 CFR. 328.3(a)), pursuant to provisions of Section 404 of the Clean Water Act (CWA) and Section 10 of the RHA. The ACOE jurisdiction within rivers and streams extends to the "ordinary high water mark" (OHWM). The ACOE defines jurisdictional wetlands as areas supporting a predominance of hydrophytic vegetation, hydric soils, and wetland hydrology, in accordance with the procedures established in the ACOE Wetland Delineation Manual (Environmental Laboratory 1987). However, the United States Supreme Court ruling in the Solid Waste Agency of Northern Cook County vs. United States Army Corps of Engineers, No. 99-1178 (January 9, 2001) ("the SWANCC case"), held that the CWA does not give the federal government regulatory authority over non-navigable, isolated, intrastate waters. Because of this decision, some previously regulated depressional areas such as mudflats, sandflats, wetlands, prairie potholes, wet meadows, playa lakes, natural ponds, and vernal pools, which lack a hydrologic connection to other intra- or interstate "waters of the U.S.," are no

longer regulated by the ACOE. However, some of these areas (e.g., isolated streams, lakes or ponds) may still be regulated by the CDFW under Section 1600 of the Fish and Game Code or the RWQCB under the Porter-Cologne Act.

For tidally influenced waters, the Corps has two limits to jurisdiction: one for Section 10 and one for Section 404. The shoreward limit to the ACOE Regulatory program jurisdiction under the Section 10 authorities of the RHA in coastal areas extends to the line on the shore reached by the plane of the mean high water, which is 5 feet above MLLW (Mean Low Low Water (MLLW) = 0 datum). The shoreward limit for the Regulatory programs jurisdiction under the ACOE Section 404 authorities is based on the high tide line, or in the San Diego Bay 7.79 feet above MLLW. If there are wetlands meeting the ACOE criteria abutting or adjacent the high tide line, then the ACOE jurisdiction under section 404 would extend to the limit of those wetlands.

California Department of Fish and Wildlife

Section 1600 et seq. of the California Fish and Game Code (Streambed Alteration) authorizes CDFW to regulate activities which "will substantially divert, obstruct, or substantially change the natural flow or bed, channel or bank, of any river, stream, or lake designated by the Department in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit." Typically, CDFW takes jurisdiction to the top of bank of a stream, or the limit of the adjacent riparian vegetation, referred to in this report as "streambed and associated riparian habitats." Within estuary environments, a preponderance of evidence standard is used where it is not readily apparent where Section 1600 jurisdiction ends. Under this standard, the geometry of the water feature, the predominant salinity of the waters, the composition of vegetation, and the predominant fauna are used to determine the limits of CDFW jurisdiction under section 1600.

Activities are not regulated under Section 1600 of the Fish and Game Code where waters are principally marine, aquatic shorelines are shaped principally by tidal current and wave action not by fluvial processes, vegetation is saline marsh and not brackish or freshwater vegetation, and marine fish and invertebrate communities are prevalent. In addition, CDFW does not have jurisdiction over activities on federally owned lands, including the current project sites. Pond 15 is on lands owned by the State of California and leased to the Refuge by the State Lands Commission. However, CDFW has and will continue to participate with the Service in development and review of wetland restoration proposals on the Refuge.

Regional Water Quality Control Board

The RWQCB regulates discharging waste, or proposing to discharge waste, within any region that could affect the "waters of the state" (SWRCB 2014), pursuant to provisions of the Porter-Cologne Act. "Waters of the State" are defined as "any surface water or groundwater, including

saline waters, within the boundaries of the state" (SWRCB 2014). Although the Porter-Cologne Act definition of "Waters of the State" may not apply on federally owned land, the RWQCB may still assert jurisdiction over qualifying aquatic resources on land owned by the US where the CWA Section 401 applies. Before the ACOE will issue a CWA Section 404 permit, applicants must receive a CWA Section 401 Water Quality Certification from the RWQCB.

California Coastal Commission

Under the California Coastal Act (CCA), the Coastal Commission regulates impacts to wetlands in the "coastal zone" and requires a coastal development permit for almost all development within this zone. From three miles seaward the coastal zone generally extends approximately 1,000 yards inland. In less developed areas, it can extend up to 5 miles inland from the mean high tide line, but can also be considerably less than 1,000 yards inland in developed areas. While the Coastal Zone Management Act (CZMA) excludes from its definition of the coastal zone "lands the use of which by law is subject solely to the discretion of or which is held in trust by the Federal Government" (15 U.S.C. 1453(1)).

The CCA also protects designated sensitive coastal areas by providing additional review and approvals for proposed actions in these areas. Section 30121 of the CCA defines wetlands as "...lands within the coastal zone which may be covered periodically or permanently with shallow water and include saltwater marshes, swamps, mudflats, and fens..." and considers them to be Environmentally Sensitive Habitats (ESH). The CCA only allows impacts to occur to ESHs or wetlands for certain defined uses, one of which includes wetland restoration.

In contrast to the ACOE, which uses a three-parameter definition to delineate wetlands, the Coastal Commission essentially uses the Cowardin method of wetlands classification, which defines wetland boundaries by a single parameter (i.e., hydric soils, hydrophytic vegetation, or hydrology) (Cowardin et al. 1979).

The Coastal Commission wetland definition is generally more encompassing than either the ACOE or CDFW definition in most respects. However, Section 13577(b) of the Administrative Regulations suggests that, where conditions are not capable of supporting hydric soils or hydrophytic vegetation, hydrologic indicators of saturation or surface waters should be expressed on an annual basis ("at some time during each year") rather than under ordinary high water conditions as is the case under the federal regulatory standard.

Otay River Floodplain Site

Biological surveys of the Otay River Floodplain Site were conducted by Dudek biologists in February 2011 with focused surveys conducted in spring and summer 2011. The surveys included vegetation mapping, jurisdictional delineation, and focused surveys for coastal

California gnatcatcher (*Polioptila californica californica*), burrowing owl (*Athene cunicularia*), least Bell's vireo (*Vireo bellii pusillus*), Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), northern harrier (*Circus cyaneus*), light-footed clapper rail (*Rallus longirostris levipes*), and rare plants (Dudek 2012). The jurisdictional delineation identified 8.82 acres of wetlands and non-wetland waters under the joint jurisdiction of the ACOE (under the Preliminary Jurisdictional Determination procedures), RWQCB, and Coastal Commission (Figure 8).

In general, the predominant native vegetation communities associated with the wetlands are adjacent to tidal channels and support southern coastal salt marsh and cismontane alkali marsh,. Soils in these areas are characterized by variable textures (including clay loam, sand, loam, clay, loamy sand, loamy clay, and sandy clay loam) with redox dark surfaces or a loamy gleyed matrix. Wetland hydrology indicators present include surface water, high water table, and saturation. Areas supporting all three wetland indicators were mapped as ACOE, RWQCB, and Coastal Commission wetlands. Additionally, in some locations along the tidal channels, there is a narrow strip along the outer perimeter of the salt marsh habitat where hydrology indicators were not apparent and soils did not have hydric indicators. In these instances, ACOE jurisdiction was assumed because they are tidally influenced areas that are below the elevation of the high tide line (7.79 feet above MLLW).

The Otay River Floodplain Site supports two geographically distinct cismontane alkali marsh areas (1.28 acres) that, based on intensive field review, support greater than 50% hydrophytic vegetation and, in some instances, hydric soils but lack hydrology indicators (Table 3). A sewer treatment facility and settling ponds were formerly located in this area. For the purposes of the Preliminary Jurisdictional Delineation (PJD), the ACOE determined that although the areas are more than 700 feet from the hydrophytic vegetation associated with the tidal channel, that these areas were close enough to be considered adjacent wetlands under the ACOE's jurisdiction. These areas also meet the definition of wetland pursuant to Coastal Commission guidelines. However, because these areas are on federal land and because they are more than 700 feet from the tidal channels, CDFW jurisdiction is not presumed.

The western portion of the Otay River Floodplain Site contains a series of low-lying areas that are remnants from the construction and operation of the former industrial salt evaporation pond, as described in section 3.3-1 of this document. The functions and values of these areas are considered degraded and low due to the extensive site disturbance, lack of vegetation, lack of surface water hydrologic connectivity, and excessive salinity.

Figure 8

Otay River FloodplainSite Jurisdictional Delineation

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The portions of the former salt pond bottom and borrow area can occasionally become inundated from precipitation, as was the case during the February site review. However, with the exception of a few small areas in the southwestern corner, the areas were completely dry during the July site review. A review of aerial photographs shows that ponding does not occur in every year and varies in location and extent. While the borrow areas may exhibit periods of ponding during the rainy season, the surface water evaporates quickly.

While not physically connected to either tidal channels or freshwater channels due to the presence of perimeter berms, the ACOE classified them as jurisdictional for the purposes of the PJD. The portions of these areas that support hydrophytic vegetation were classified as wetlands, and the remaining areas below the ordinary high water mark were classified as non-wetlands Waters of the U.S.

Table 3
Otay River Floodplain Site Wetland Delineation Existing Acreage Summary

Vegetation Community	Jurisdiction *ACOE, RWQCB, Coastal Commission*
Brackish water	0.80
Cismontane Alkali Marsh	1.28
Former Salt Pond Bottom and Borrow Area	4.39
Southern Coastal Salt Marsh	2.35
Total	**8.82**

Source: Dudek 2012.

One area within the Otay River Floodplain Site was mapped by Dudek as mulefat scrub. The isolated patch of mulefat scrub in the eastern portion of the site did not meet any of the three criteria (i.e., hydric soils, hydrology, or hydrophytic vegetation). Hydrology indicators such as an OHWM via a bed and bank, surface cracks, drainage patterns, drift deposits, scour/erosion, saturation, permanence of surface water, and wetland vegetation were not present. A sewer treatment facility was formerly located in this area.

Because the mulefat scrub area lacked all three wetland parameters necessary to define an ACOE wetland, and lacked a single parameter needed to define a Coastal Commission wetland pursuant to the Cowardin method, this area does not meet the definition of a wetland and therefore is not jurisdictional by any regulating authority in the context of this analysis.

Pond 15 Site

Based on the Section 404 jurisdictional determination conducted by Dudek in March 2013, there are approximately 87.35 acres of wetland and non-wetland "Waters of the U.S." under the joint

jurisdiction of the ACOE, RWQCB, and Coastal Commission within the Pond 15 Site. The jurisdictional features identified on site are listed in Table 4, Pond 15 Site Draft Wetland Delineation Existing Acreage Summary and shown on Figure 9, Salt Pond 15 Site Jurisdictional Delineation. The jurisdictional features identified are primarily unvegetated, with the exception of one patch along the salt pond levee. Areas surrounding the Otay River and Palomar Street tidal channels, which are outside of the project area also contain patchy areas of vegetation. Coastal salt marsh is the dominant native vegetation community associated with wetlands on site. When present, vegetation consisted of species typical of southern coastal salt marsh habitat, including estuary seablite, alkali heath, Pacific pickleweed, turtleweed, sea lavender (*Limonium californica*), and Bigelow's pickleweed. Also observed in the southern coastal salt marsh habitat were coast weed (*Amblyopappus pusilus*), non-native iceplant (*Mesembryanthemum nodiflorum*; *M. crystalinum*), and arrow grass (*Triglochin maritima*).

The portions of the Pond 15 Site that met all three parameters were classified as wetlands, and the remaining areas containing salt brines below the high tide line (7.71 feet) were classified as non-wetlands "Waters of the U.S.". The top of the salt pond levees is above the high tide line and does not meet the three parameters. Therefore, these areas were mapped as disturbed habitat and were classified as non-jurisdictional.

Table 4
Pond 15 Site Wetland Delineation Existing Acreage Summary

Vegetation Community	Jurisdiction
	ACOE, RWQCB, Coastal Commission
Open Water (Brines)	82.24
Salt Pond Levee	3.57
Southern Coastal Salt Marsh	0.84
Disturbed Southern Coastal Salt Marsh	0.10
Bay	0.59
Beach	0.01
Total	**87.35**

Source: Dudek 2013.

AERIAL SOURCE: BING MAPPING SERVICE

FIGURE 9

Pond 15 Site Jurisdictional Delineation

Final Restoration Plan for the Otay River Estuary Restoration Project

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2.5.3 Wildlife and Fisheries

Otay River Floodplain Site

The Otay River Floodplain Site offers moderate habitat value for wildlife species, primarily for migratory birds and common upland species, but also provides foraging habitat for a number of raptor species. The habitat supports a number of upland species prevalent within disturbed and urbanized areas. The habitat within the project site lacks cover and structural diversity and is dominated by non-native species on the eastern side providing relatively few resources for wildlife. A total of 83 species of wildlife (79 birds and four mammals) were observed on the project site (Dudek 2012). Typical species commonly observed on site include house finch (*Carpodacus mexicanus*) and lesser goldfinch (*Spinus tristis*). Several swallow species were observed over the survey period and many individuals were observed foraging over the site. A number of raptor species were observed foraging on small mammals within the vegetation. Coastal shorebirds and gulls were periodically observed flying over the site. No reptile or amphibian species were observed on site. Some species that are likely to occur include western fence lizard (*Sceloporus occidentalis*), side-blotched lizard (*Uta stansburiana*), and gopher snake (*Pituophis melanoleucus*). Four common species of mammals were recorded in upland parts of the site including brush rabbit (*Sylvilagus bachmanii*), coyote (*Canis latrans*), and California ground squirrel (*Spermophilus beecheyi*). Other mammals adapted to living in areas near human disturbance, such as striped skunk (Mephitis mephitis), and Virginia opossum (*Didelphis virginica*), may also occur on the site. Special-status wildlife species observed on the Otay River Floodplain Site are discussed in Section 2.5.3.

Pond 15 Site

The Pond 15 Site offers moderate habitat value for wildlife species, primarily for migratory and water birds, with some support for common upland species that typically inhabit a wide range of sites. During a visit to the site, it was noted that while numbers of birds within the Pond 15 Site were high, the species richness was low. In comparison, immediately adjacent to the Pond 15 Site, within the San Diego Bay, species richness was very high as species responded to the tidal influence cycles and the foraging opportunities within the periodically exposed mudflat. The habitat within the project site consists of mostly open water, with a narrow upland perimeter formed by the levee system. A number of bird species use the salt ponds but there are a few species that dominate use of the salt ponds. Within the shorebird group, the most common species include red-necked phalarope (*Phalaropus*), Wilson's phalarope (*P. tricolor*), western sandpiper (*Calidris mauri*), marbled godwit (*Limosa fedoa*), willet (*Tringa semipalmatus*), and black-necked stilt (*Himantopus mexicanus*). Eared grebes (*Podiceps nigricollis*) represent the largest population of any species occurring within the Pond 15 Site. California brown pelican

(*Pelecanus occidentalis*), California gull (*Larus californicus*), double-crested cormorant (*Phalacrocorax auritus*), and elegant terns (*Thalasseus elegans*) also show a large population size at the salt ponds. Various levees within the salt works provide nesting habitat for a diverse and abundant array of colonial nesting seabirds, including the federally endangered California least tern (*Sternula antillarum browni*), Caspian tern (*Hydroprogne caspia*), elegant tern, royal tern (*Thalasseus maximus*), gull-billed tern (*Gelochelidon nilotica vanrossemi*), Forster's tern (*Sterna forsteri*), and black skimmer (*Rynchops niger*).

2.5.4 Endangered and Threatened Species and Other Species of Concern

Special-status species are those species that have been afforded special recognition by Federal, State, or local resource agencies or organizations. Special-status species are of relatively limited distribution and typically require unique habitat conditions. Special-status species are defined as meeting one or more of the following criteria: listed as threatened or endangered or candidates for future listing as threatened or endangered under the federal Endangered Species Act (FESA) or California Endangered Species Act (CESA); listed as species of concern by CDFW; bird species identified by the Service as Birds of Conservation Concern (USFWS 2008) plant species considered by the CNPS to be "rare, threatened, or endangered in California" (California Rare Plant Rank [CRPR] 1A, 1B, and 2, as well as CRPR 3 and 4[1] plant species); a plant listed as rare under the California Native Plant Protection Act[2]; or a plant considered a locally significant species, that is, a species that is not rare from a statewide perspective but is rare or uncommon in a local context such as within a county or region or is so designated in local or regional plans, policies, or ordinances including Multiple Species Conservation Program (MSCP).

2.5.4.1 Plants

Otay River Floodplain Site

Dudek biologists Andy Thomson and Katie Dayton surveyed the Otay River Floodplain Site for special-status plant species on May 19, 2011. No Federal or State listed plant species were observed on the Otay River Floodplain Site. Four special-status plant species were observed within the Otay River Floodplain Site, as listed in Table 5 Special-Status Plants Detected on the

[1] List 3 and 4 plants are included in the CNDDB's *Special Vascular Plants, Bryophytes, and Lichens List*. [Refer to the current online-published list available at: http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp.] Data on Lists 3 and 4 plants should be submitted to CNDDB. Such data aids in determining or revising priority ranking (CDFW 2014).

[2] As defined by the California Native Plant Protection Act, a plant is rare when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens (California Fish and Game Code, Section 1901) (CDFW 2014).

Otay River Floodplain Site. The locations of these plants are shown on Figure 10, Otay River Floodplain Site Special-Status Plant Species.

Table 5
Special-Status Plant Species Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Rare Plant Rank	Primary Habitat Associations/ Life Form/Blooming Period/Elevation Range	Status on Site or Potential to Occur
Juncus acutus spp. *leopoldii*	Southwestern spiny rush	None/None/None	4.2	Coastal dunes (mesic), meadows and alkaline seeps, coastal saltwater marshes and swamps/rhizomatous herb/May–June/<3000 feet	Observed during focused plant survey (Figure 10).
Lycium californicum	California box-thorn	None/None/None	4.2	Costal bluff scrub, coastal scrub/perennial shrub/December–August/15–590 feet	Observed during focused plant survey (Figure 10).
Suaeda esteroa	Estuary seablite	None/None/None	1B.2	Coastal salt marshes and swamps/perennial herb/May–October (Jan)/< 20 feet	Observed during focused plant survey (Figure 10).
Suaeda taxifolia	woolly seablite	None/None/None	4.2	Coastal bluff scrub, coastal dunes, Marshes and swamps (margins of coastal salt)/perennial evergreen shrub/January–December/0–165 feet	Observed during focused plant survey (Figure 11).

Source: Dudek 2012.

Pond 15 Site

Dudek biologists Andy Thomson and Katie Dayton surveyed the Pond 15 Site for special-status plant species on March 13, 2013. No Federal or State listed plant species were observed on the Pond 15 Site. One special-status plant species was observed within the Pond 15 Site, as listed in Table 6 Special-Status Plant Species Detected on the Pond 15 Site. The locations of the plant species are shown on Figure 10, Salt Pond 15 Site Special-Status Plant Species.

Table 6
Special-Status Plant Species Detected on the Pond 15 Site

Scientific Name	Common Name	Status Federal/State/ MSCP	Rare Plant Rank	Primary Habitat Associations/Life Form/Blooming Period/Elevation Range	Status on Site or Potential to Occur
Suaeda esteroa	Estuary seablite	None/None/None	1B.2	Coastal salt marshes and swamps/perennial herb/May–October (Jan)/< 20 feet	Observed during focused plant survey (Figure 11).

Source: Dudek 2013.

2.5.4.2 Wildlife

Otay River Floodplain Site

Dudek biologists Anita Hayworth, Ph.D., Stuart Fraser, Kevin Shaw, Thomas Liddicoat and subconsultant John Konecny surveyed the Otay River Floodplain Site for special-status wildlife species in February through July 2011 (Dudek 2012). A total of 23 visits were made to the site to conduct protocol surveys for various species including Belding's savannah sparrow, burrowing owl, least Bell's vireo, California gnatcatcher, northern harrier, and light-footed clapper rail. During these visits, two Federal or State listed species were observed on site, light-footed clapper rail and Belding's savannah sparrow. Additionally, nine special status wildlife species were observed on the site (Table 7). Figure 12, Otay River Floodplain Site Special-Status Wildlife Species, indicates where the nine special status wildlife species were observed on the site. Observations of special status species previously recorded on the site are also included in this analysis (Table 8; USFWS 2006a).

A brief discussion of the natural history of the Federal or State listed species is provided below.

***California Least Tern* (Sternula antillarum browni)**

The California Least Tern is a migratory tern species known to travel along the Pacific and Gulf coasts, summering in California from April through August in order to breed (Thompson et al. 1997). They are the smallest of the tern species and are known primarily to be a predators of fish and rely on a number of fish species in a variety of sizes as their primary food source (USFWS 2006a, USFWS 2006b). When they are juveniles, the terns require a source of smaller fish as they learn to hunt for themselves. Many scientists agree that this need for a smaller prey source is met by freshwater systems, such as lagoons and estuaries, which often occur near the nesting sites. This is why it is crucial to preserve such habitats for breeding terns (USFWS 2006a). The terns are known to nest along sand banks, dried mudflats, gravel and sand pits in flat areas clear of significant vegetation in bay and inlet areas along the coast of California. They are social birds that forage, roost and nest in colonies, typically consisting of approximately 25 pair but varying widely from a low of 3 to a high of 64 pair (USFWS 2006b). Because of the movements of the individual birds, the actual colony size is somewhat arbitrary and difficult to define and thus the nesting sites are described in terms of geographic clusters of sites (USFWS 2006b). They require both secure nesting habitat and open foraging habitat for juveniles and adults to congregate and disperse (USFWS 2006b).

Figure 10

Otay River Floodplain Site Special-Status Plant Species

Final Restoration Plan for the Otay River Estuary Restoration Project

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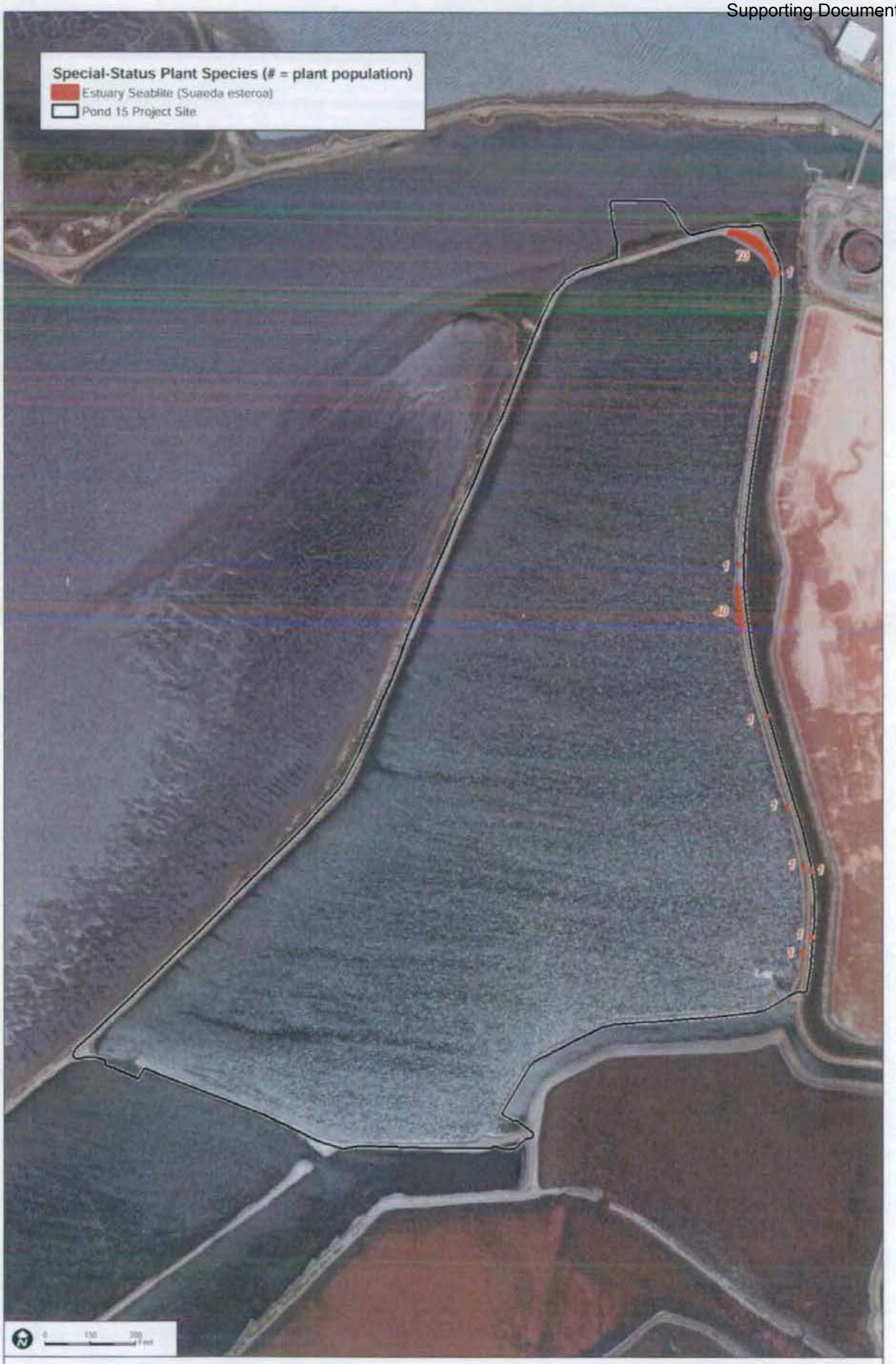

AERIAL SOURCE: BING MAPPING SERVICE

FIGURE 11

Pond 15 Site Special-Status Plant Species

Final Restoration Plan for the Otay River Estuary Restoration Project

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Figure 12
Otay River Floodplain Site Special Status Wildlife Species

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Historically, the species is known to have nested discontinuously throughout the California coastal zone, including relatively undisturbed sandy beaches near estuaries, bays, and inlets, with majority of the numbers occurring between Santa Barbara and San Diego Counties (USFWS 2006a). Statewide, numbers were in the tens of thousands before the 1960's. San Diego Bay and the Tijuana Estuary complex annually hosts about one-fourth of the entire statewide breeding population (Collins pers. comm.). Within the Salt Works levee area of the Refuge, there were 60 recorded pairs recorded during surveys conducted in 1968. However, when surveyed again in 1970, only two breeding pairs were seen. These numbers have fluctuated over the years but there have never been more than 60 pairs at the Salt Works since 1968 (USFWS 2006a).

The Western Salt Pond Restoration Project began construction in February 2011 and was completed in December 2011. This project is in the process of changing the previous commercial salt ponds to restored wetlands. It takes place within the three western-most ponds (Ponds 10a, 10, and 11) and includes creation of subtidal, intertidal mudflat, intertidal salt marsh and transition habitats. The project has restored, created, and enhanced habitats that support the California least tern, light-footed clapper rail, western snowy plover, Belding's savannah sparrow, and eastern Pacific green sea turtle. In addition, the restoration will benefit tens of thousands of migratory birds that stop over at San Diego Bay as well as various species of fish, and other marine organisms (USFWS 2012).

The California least tern was greatly affected by the development and recreational use of California's coastline and beaches. They have also suffered from increase in predation from feral dogs and cats as well as from predatory birds, such as peregrine falcons (*Falco peregrinus*) and owls that prey on breeding adults. In 1970, when California least tern' numbers statewide plummeted to only a few hundred, the least tern was added to the Federal Endangered Species List as an endangered subspecies. It is also listed as endangered by the State of California and is a covered species under the San Diego Multiple Species Conservation Program (MSCP).Today, the species is known to occur in limited areas along the Central and Southern California coastline. Within San Diego County, beaches that are still known to support nesting least terns (from April – August) include the South San Diego Bay Unit, Tijuana Estuary, Naval Amphibious Base Coronado, and Naval Base Coronado as well as a section of Ocean Beach near the San Diego River mouth (Thompson et al. 1997, USFWS 2006a).

Around San Diego Bay, least terns are known to nest in six locations, including the salt works levees within the South San Diego Bay and the D Street Fill, which is located north of the project site in the Sweetwater Marsh Unit.

***Western Snowy Plover* (Charadrius nivosus nivosus)**

The western snowy plover breeds and winters along the California coast. Its breeding season can generally be described as occurring from March 1 to September 15 in any given year. They nest in shallow, generally unvegetated coastal areas, crafting depressed nests which are dug out in sandy or saline soils. The species forages in coastal areas using a run-and-glean strategy for preying on invertebrates. Their young are precocial and begin foraging within hours of hatching under the direction and supervision of the adult(s).

Historically known to breed and winter throughout beach strand habitats along the California coast, western snowy plovers have been steadily declining over the last several decades, leading to the coastal population to being federally listed as threatened in 1993 and remaining listed today as both federally threatened and a State Species of Special Concern (SSC) (Shuford et al. 2008). The western snowy plover is also a covered species under the San Diego MSCP.

Today, there are very few known breeding snowy plover populations in Southern California within the Salt Works levees onthe Refuge representing one site where nesting generally occurs on an annual basis but in low numbers. as summarized below (USFWS 2006a). This species is threatened by disturbance of its natural habitat by humans, predation by domestic cats, dogs, and other terrestrial and avian predators, and from inadequate access to open foraging areas that it relies on for survival (USFWS 2006c).

Summaries of western snowy plover breeding sites through 2013 are provided for all the known nesting areas in the San Diego Bay region including: the Refuge inclusive of the Salt Works, Cardiff State Beach and San Elijo Lagoon, Tijuana Slough National Wildlife Refuge, and Border Field State Park Sites (Collins pers. comm.).

South San Diego Bay Refuge – Salt Works. Numbers of western snowy plovers and nests have steadily increased over the past few years A maximum of nine nests in any one year was recorded for 1999-2010, 25 nests by at least eight females and 12 males was recorded in 2011, 37 nests by at least 13 females and 16 males was recorded in 2012. Based on the maximum number of concurrently active nests and broods, at least 14 female and 24 male snowy plovers bred within the Salt Works in 2013. At least 45 nests were initiated from late March to mid-July 2013. The densest nesting was on the expanse of waste salt deposited at the south-southwest edge of pond 20, where 16 nests were established. The color, pattern, and texture of this substrate made eggs and chicks exceedingly difficult to detect and likely contributed to this season's success. At least 101 chicks hatched from 38 nests and at least 21 to 22 young of 14 to 15 broods are estimated to have fledged in 2013. The reason for failure of several nests may have been due to predation based on either direct or indirect observation or sign such as coyote tracks. The

maximum numbers of plovers observed early in the season before nests were established were seven on 22 March and late season at least 46 to 49 with nine fledglings on 17 July.

Cardiff State Beach and San Elijo Lagoon. Snowy plovers were observed from January to early May and from late July through October. No breeding activity was documented, most observations were of roosting and/or foraging birds along the beach, and foraging on mudflats in the lagoon was noted on two dates.

Tijuana Estuary. Although nest numbers were lower than in 2012, numbers of plovers and nests remained relatively high with at least 13 female and 22 male snowy plovers breeding along the upper beach of Tijuana Slough Nation Wildlife Refuge and Border Field State Park in 2013.

Light-footed clapper rail **(Rallus longirostris levipes)**

Light-footed clapper rails inhabit coastal salt marshes from Santa Barbara County south to Baja California, Mexico. They rely on Southern California's coastal salt marshes, lagoons and estuaries for nesting and foraging habitat year round. They prefer nesting habitats located in the zone below the high water mark that have thick cordgrass that can be used for cover and rarely travel more than a few miles from their home territory (USFWS 2009). They are also known to nest in coastal marshland dominated by pickleweed. Typically, these birds forage for crustaceans and other invertebrates in shallow water areas and mudflats that are regularly inundated with flooding water, usually tidal, and do not stray far from their nesting territories (USFWS 2006a, USFWS 2009). There is one population in the upper Newport Bay in Orange County that has been successfully reproducing since 1980, however, other subpopulations, such as the one in Refuge, have shown more fluctuation in population numbers in response to variable environmental conditions.

It is thought that in the past light-footed clapper rails inhabited virtually all the salt marshes along their Southern California coastal range. However, current data tells us that only 50% of the coastal wetland areas formerly occupied by the species, are being used by light-footed clapper rails today. As a result, the species was listed as federally endangered in 1970 and was also listed as a State endangered species in 1971 due largely to the destruction and development of coastal wetlands. This rail is also a covered species under the San Diego MSCP. This loss and fragmentation of habitat combined with impacts from degradation or modification of habitat due to dredging actions and changes to tidal influences or siltation, contaminants as well as predation from the non-native red fox, some predatory bird species and domestic cats, have had significant impacts on historic clapper rail populations in California (USFWS 2009). The number of pairs has increased from 203 in 1980 to more than 500 pairs in 2013. The Tijuana Marsh National Wildlife Refuge was at its third highest recorded level with 105 breeding pairs, an increase of 4% over the 2012 breeding season but 26% lower than the record high of 142 pairs in 2007 (Zembal et al. 2013). There is also a breeding population in the South Bay Biological Study area

adjacent to the South San Diego Bay Unit (typically 2–5 breeding pairs were identified each year from 1999–2004) (USFWS 2006a). However the Service rank it as a species with low recovery potential that is facing a high degree of threat because of the limited number of salt marshes remaining in California and the even more limited number of marshes actually inhabited by clapper rails (USFWS 2009).

The five-year review of this species conducted by the Service in 2009 indicated that progress has been made to increase the number of light-footed clapper rails since listing, and regulatory mechanisms have been successful for stopping destruction and adverse modification of marsh lands. Conservation efforts including habitat restoration, such as the restoration of 223 acres of salt marsh habitat in the western salt ponds on the South San Diego Bay Unit of the San Diego Bay NWR, have been implemented to support the recovery of this species. Unfortunately, in its best year since listing, the light-footed clapper rail population was only half way to the 800 pairs suggested by the species recovery plan for downlisting. Therefore, despite conservation efforts, the light-footed clapper rail continues to meet the definition of endangered (USFWS 2009).

***Belding's Savannah Sparrow* (Passerculus sandwichensis beldingi)**

The Belding's savannah sparrow is a ground dwelling sparrow subspecies that is unique from other sparrow species because of its year-round reliance on the marine riparian habitat provided by California's coastal salt marshes for breeding and foraging. These State endangered songbirds primarily nest from late March through early July within stands of pickleweed where they are known to group together semi-colonially in dense patches of their preferred habitat (Hoffman 2010, USFWS 2006a).

The species has been known to occur from Santa Barbara County south through Baja California. Statewide, the sparrow's population numbers have been rising since 1973 from 1,610 breeding pairs to as high as 2,902 pairs according to 2011 surveys (Citation TBP). However, these numbers have fluctuated dramatically over that time period leading it to be listed as a State endangered species in 1974. This species currently has no federal listing status, but is a covered species under the San Diego MSCP. A statewide survey ranked Tijuana Slough National Wildlife Refuge subpopulation as third largest in California in 2010. There were 109 Belding's territories in the Oneonta Lagoon section north of the river and 208 territories to the south of the river (Zembal and Hoffman 2010). The survey identified about 169 territories in the Salt Works levees and Otay River mouth in 2010. The survey total represents a 141% increase over the 2006 count, and places the Salt Works as the seventh largest subpopulation in 2010. The Belding's Savannah sparrows were concentrated along the outer Otay River Channel and in a thick patch of Salicornia on the northeastern corner of the Salt Works (Zembal and Hoffman 2010).

Based upon the 2010 observations in 32 coastal wetlands, the most critical management issues for Belding's savannah sparrow include maintenance or enhancement of tidal flushing and the control of sediment, people, their pets, and exotic predators (Zembal and Hoffman 2010. However, because of conservation measures such as securing, restoring, and managing coastal wetlands, the overall population trend has been positive, with more than three times as many breeding Belding's in 2010 as were documented in 1973.

***Eastern Pacific Green Sea Turtle* (Chelonia mydas)**

The eastern Pacific green sea turtle is one of six species of sea turtles that inhabit the waters of the United States. These turtles rely on the shallow waters of bays, reefs, inlets and undisturbed sandy beaches for egg laying. The hatchlings have been known to feed on a variety of plants and animals, however, the adult turtles feed primarily on sea grasses and marine algae, however, it has been recently found that, when in the open ocean, adults sometimes forage on sea invertebrates such as jelly fish and sea pens (USFWS 2007). They are known to be widely migratory, often traveling between several different feeding and nesting sites, while showing fidelity to these sites over time (USFWS 2007). The easternPacific green sea turtle was listed as federally endangered in 1978 as a result of a number of threats, including human removal of eggs and adult turtles. Direct take combined with modern development of areas near beach nesting sites make up the primary threats to this species today (USFWS 2006a).

There has been a consistent population of turtles that reside in south San Diego Bay, although it is thought that individuals migrate in and out of the bayat different times. Researchers believe that these individuals return to this location due to the abundance of eel-grass available in the south Bay, as well as the relief from predation and poaching that the Bay provides (USFWS 2006a).

Table 7
Special-Status Wildlife Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP[1]	Primary Habitat Associations	Status on Site or Potential to Occur
		Birds		
Asio flammeus	Short-eared owl	None/SSC/Not covered	Open areas with few trees, such as grasslands, prairies, dunes, meadows, irrigated lands, saline and fresh emergent wetlands. Breeds in coastal areas in Del Norte and Humboldt Cos., San Francisco Bay Delta, northeastern Modoc plateau, east side of Sierra from Lake Tahoe south to Inyo Co., and San Joaquin Valley. Uncommon winter migrant in southern California, and widespread during winter in Central Valley and coastline.	Observed. The species was observed once during other focused surveys. It was observed resting under a shrub in March. It was only observed the one time.
Athene cunicularia (burrow sites and some wintering sites)	Burrowing owl	BCC/SSC/MSCP	Grassland, lowland scrub, agriculture, coastal dunes and other artificial open areas.	Observed. Has been recorded in the region. There are numerous holes for their use. Soils are sandy. However, vegetation grows so tall that there is little vantage point for them to use. One owl was observed once at the beginning of the breeding season. It did not stay to breed. 3 were observed nearby in off-site surveys conducted in 2011 (SWIA data_Citation TBP).
Circus cyaneus (nesting)	Northern harrier	None/SSC/MSCP	Open wetlands (nesting), pasture, old fields, dry uplands, grasslands, rangelands, coastal sage scrub.	Observed. Suitable foraging areas are present on site. Nesting could occur within the Isocoma scrub or possibly the disturbed habitat. One to 3 harriers were detected during almost every site visit. They were observed foraging. In surveys conducted nearby, west of the site from 2010 to 2012, a total of 42 observations were recorded (SWIA data_Citation TBP). No nesting was detected however a nesting attempt was observed in 2012 off site near the dirt access road for the sewer pump station.

Table 7
Special-Status Wildlife Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP[1]	Primary Habitat Associations	Status on Site or Potential to Occur
Elanus leucurus (nesting)	White-tailed kite	None/FP/Not covered	Open grasslands, savannah-like habitats, agriculture, wetlands, oak woodlands, riparian.	Observed. Suitable foraging areas are present on site. Nesting could occur within the eucalyptus trees on site or the riparian adjacent to the site. Kites were detected during a number of the site visits and in nearby areas as well. They were observed foraging. No nesting was detected.
Dendroica petechia brewsteri (nesting)	Yellow warbler	None/SSC/Not covered	Nests in lowland and foothill riparian woodlands dominated by cottonwoods, alders and willows; winters in a variety of habitats.	Observed. Detected within the eucalyptus on site and within the willow habitat off site.
Gelochelidon nilotica vanrossemi	Western Gull-billed tern	BCC/SSC/Not covered	Nest on protected spits, berms, and islands composed of sand or other small material. Forage primarily in freshwater ponds and flooded agricultural fields. Forages for small fish, crayfish, lizards, butterflies, beetles, crickets, weevils, and occasionally, the young chicks of other shorebirds.	Observed. A number of individuals of the species were observed possibly foraging over or flying over the site during focused surveys for other species.
Passerculus sandwichensis beldingi	Belding's savannah sparrow	None/SE/MSCP	Saltmarsh, pickleweed.	Observed. Approximately 18 birds were observed on site and over many were observed nearby off site within the San Diego Bay National Wildlife Refuge from 2010 to 2012 (SWIA data_Citation TBP).
Thalasseus [=Sterna] elegans (nesting colony)	Elegant tern	BCC/WL/MSCP	Coastal waters, estuaries, large bays and harbors, mudflats.	Observed. Suitable flat areas are present and the species is known for the area. There are salt pans present. The species was observed flying over the site a number of times but did not forage on site.

Table 7
Special-Status Wildlife Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP[1]	Primary Habitat Associations	Status on Site or Potential to Occur
		Mammals		
Lepus californicus bennettii	San Diego black-tailed jackrabbit	None/SSC/Not covered	Arid habitats with open ground; grasslands, coastal sage scrub, agriculture, disturbed areas, rangelands.	Observed. Several jackrabbits were detected on site during surveys.

[1] The federal and state status of species primarily is based on the Special Animals List (CDFG 2011).

Federal Designations:

BCC Fish and Wildlife Service: Birds of Conservation Concern
(FD) Federally delisted; monitored for five years
FE Federally listed Endangered
FT Federally listed as Threatened

State Designations:

CSC California Species of Special Concern
FP California Department of Fish and Game Protected and Fully Protected Species
(SD) State-delisted
SE State-listed as Endangered
ST State-listed as Threatened
WL California Department of Fish and Game Watch List

MSCP:

MSCP Covered by the MSCP
Not Covered Not covered by the MSCP

Source: Dudek 2013.

Table 8
Special-Status Wildlife Potentially Occurring but Not Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
			Amphibians		
Spea [=Scaphiopus] hammondi	Western spadefoot	None/SSC/Not covered	Most common in grasslands, coastal sage scrub near rain pools or vernal pools; riparian habitats.	Low potential. Small amount of suitable habitat is present within the cismontane alkali marsh habitat.	DUDEK 2012
			Reptiles		
Salvadora hexalepis virgultea	Coast patch-nosed snake	None/SSC/Not covered	Chaparral, washes, sandy flats, rocky areas.	Low potential. Small amount of suitable habitat is present within the *Isocoma* scrub however there are no rocky areas within the habitat.	DUDEK 2012
Phrynosoma coronatum (blainvillei population)	Coast (San Diego) horned lizard	None/SSC/MSCP	Coastal sage scrub, annual grassland, chaparral, oak and riparian woodland, coniferous forest.	Moderate potential to occur within the sandy soils and in the *Isocoma* scrub areas.	DUDEK 2012
Eumeces skiltonianus interparietalis	Coronado Island skink	None/SSC/Not covered	Grassland, woodlands, pine forests, chaparral. Prefers rocky areas near streams with lots of vegetation but is also found away from water.	Low potential. Small amount of suitable habitat is present within the *Isocoma* scrub however there are no rocky areas within the habitat. The disturbed habitat areas are regularly mowed.	DUDEK 2012
Crotalus ruber ruber	Northern red-diamond rattlesnake	None/SSC/Not covered	Variety of shrub habitats where there is heavy brush, large rocks, or boulders.	Low potential. Small amount of suitable habitat is present within the *Isocoma* scrub however there are no rocky areas within the habitat.	DUDEK 2012
Aspidoscelis hyperythra	Orange-throated whiptail	None/SSC/MSCP	Coastal sage scrub, chaparral, grassland, juniper and oak woodland.	Moderate potential to occur within the sandy soils and in the *Isocoma* scrub areas.	DUDEK 2012
Thamnophis hammondii	Two-striped garter snake	None/SSC/Not covered	Streams, creeks, pools, streams with rocky beds, ponds, lakes, vernal pools.	Moderate potential. Suitable habitat is present within the freshwater portion of the Otay River channel and Nestor Creek.	DUDEK 2012

Table 8
Special-Status Wildlife Potentially Occurring but Not Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
			Birds		
Cistothorus palustris clarkae	Clark's marsh wren	None/SSC/Not covered	Narrowly distributed along the coast of southern California. Restricted to freshwater and brackish marshes dominated by bulrushes or cattails.	11 individuals were detected within the Otay River channel and San Diego Bay coastline immediately off site to the West. Other individuals could be present within suitable habitat in the channel.	DUDEK 2012
Falco columbarius	Merlin	None/WL/Not covered	Coastlines, open grasslands, savannahs, woodlands, lakes, wetlands, montane hardwood-conifer habitats, ponderosa pine. Found throughout western half of state below 1500m.	The species was observed perched just off site on a post at the western end of the site. It was only observed once.	DUDEK 2012
Icteria virens (nesting)	Yellow-breasted chat	None/SSC/Not covered	Dense, relatively wide riparian woodlands and thickets of willows, vine tangles and dense brush.	Detected within the riparian habitat off site and adjacent to the Otay River Floodplain Site.	DUDEK 2012
Rallus longirostris levipes	Light-footed clapper rail	FE/SE, P/ MSCP	Coastal saltmarsh.	There is suitable marsh habitat within the channel of the Otay River. One bird was detected in an area just off site of the Otay River Floodplain Site during focused surveys.	DUDEK 2012
Falco peregrinus anatum	American peregrine falcon	BCC/DL/ MSCP	Nests on cliffs, buildings, bridges; forages in wetlands, riparian, meadows, croplands, especially where waterfowl are present.	High potential to occur on site for foraging. The species is well known to forage on shorebirds during the winter.	DUDEK 2012, USFWS 2006a

Table 8
Special-Status Wildlife Potentially Occurring but Not Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Pelecanus erythrorhynchos	American White Pelican	None/SSC/ Not covered	Nests colonially on isolated islands in freshwater lakes with sandy, earthen, or rocky substrates; minimal disturbance from humans or mammalian predators required, as is close access to productive foraging areas; forages on inland marshes, lakes or rivers; winters on shallow coastal bays, inlets and estuaries.	Low Potential to occur due to lack of fresh water habitat and the site's proximity to urbanization.	USFWS 2006a
Haliaeetus leucocephalus (nesting and nonbreeding/wintering)	Bald eagle	(FD)/SE/ MSCP	Seacoasts, rivers, swamps, large lakes; winters at large bodies of water in lowlands and mountains.	Could winter or occur on site in transit for foraging: a juvenile was photographed there in 2013 (Collins pers. Comm)	DUDEK 2012
Amphispiza belli bell (nesting)	Bell's sage sparrow	BCC/WL/ Not covered	Coastal sage scrub and dry chaparral along coastal lowlands and inland valleys.	Low potential due to small amount of habitat. *Isocoma* scrub is marginal and appears artificially planted.	DUDEK 2012
Rynchops niger	Black Skimmer	BCC/SSC/ Not covered	Nests on barrier beaches, shell banks, spoil islands and salt marsh; forages over open water; roosts on sandy beaches and gravel bars.	High potential to occur. Has been observed nearby off site during 2010 to 2012 surveys and suitable marsh nesting areas occur on the west side of the project area.	USFWS 2006a; SWIA data _Citation TBP
Chlidonias niger	Black Tern	None/SSC/Not covered	Freshwater marsh with emergent vegetation; in the Central Valley primarily breed and forage in rice fields and other flooded agricultural fields with weeds and other residual aquatic vegetation.	Moderate potential to occur. Four individuals were observed nearby in off-site areas during 2012 focused surveys (SWIA). Limited foraging habitat on the project site.	SWIA data_Citation TBP

Table 8
Special-Status Wildlife Potentially Occurring but Not Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Branta bernicla	Brant	None/SSC/Not covered	Breeding habitat includes the edges of salt marshes in the low Arctic Region. Migratory habitats include shallow marine lakes. Winter range includes intertidal mudflats in shallow marine alters with abundant eelgrass and/or green algae.	Moderate potential to occur. Could occur in the area during winter months and was observed nearby off site during surveys conducted from 2010 to 2012. Limited habitat occurs on site.	USFWS 200a6; SWIA data_Citation TBP
Laterallus jamaicensis coturniculus	California black rail	BCC/ST/ Not covered	Saline, brackish, and fresh emergent wetlands.	Low potential due to lack of extensive emergent habitat. The species was recorded in the region but is assumed to be extirpated.	DUDEK 2012
Pelecanus occidentalis californicus (nesting colony and communal roosts)	California brown pelican	FE (DL)/DL/ MSCP	Open sea, large water bodies, coastal bays and harbors.	Low potential due to lack of extensive open water. The species could perch on posts located within the site or could occur within the Otay River channel however the channel is relatively narrow. The species does occur within the region. Species was observed nearby off-site in surveys conducted in 2011 and 2012.	DUDEK 2012, USFWS 2006a; SWIA data_Citation TBP
Larus californicus	California Gull	None/WL/ Not covered	Nests in alkali and freshwater lacustrine habitats; abundant in coastal and interior lowlands during nonbreeding period.	High potential to occur. Suitable habitat occurs on the North and West portions of the site. The species was also observed during surveys conducted nearby off site in 2011 and 2012.	USFWS 2006a; SWIA data_Citation TBP
Eremophila alpestris actia	California horned lark	None/WL/ Not covered	Open habitats, grassland, rangeland, shortgrass prairie, montane meadows, coastal plains, fallow grain fields.	High potential to occur on site especially during winter. Could breed on site.	DUDEK 2012, USFWS 2006a

Table 8

Special-Status Wildlife Potentially Occurring but Not Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Sternula [=Sterna] antillarum browni (nesting colony)	California least tern	FE/SE/ MSCP	Coastal waters, estuaries, large bays and harbors, mudflats; nests on sandy beaches.	High potential. Suitable flat areas are present and the species is known for the area. There are salt pans present.	DUDEK 2012, USFWS 2006a; SWIA
Hydroprogne caspia	Caspian tern	BCC/None/Not covered	Coastal estuarine, salt marsh and barrier islands; nests on islands in rivers and salt lakes.	High potential to occur. Known to reside year round in coastal San Diego County. Suitable marsh habitat occurs on the North and Western portions of the site. Was observed nearby off site during surveys in 2011 and 2012.	USFWS 2006a; SWIA
Polioptila californica californica	Coastal California gnatcatcher	FT/SSC/ MSCP	Coastal sage scrub, coastal sage scrub-chaparral mix, coastal sage scrub-grassland ecotone, riparian in late summer.	Low potential due to lack of suitable habitat. In addition, focused survey conducted nearby in 2006 was negative. The species was detected off site within suitable habitat. It was observed at the southern portion of the area adjacent to the parking lot near Home Depot.	DUDEK 2012
Gavia immer	Common Loon	None/SSC/Not covered	Extirpated as a breeder from California; winters in coastal waters such as bays, channels, coves, and inlets; also winters inland at large, deep lakes and reservoirs.	Low potential to occur. Range has been limited in California from anthropogenic activities. Known to visit San Diego coastal areas during winter months, but lacks habitat on the project site.	USFWS 2006a

Table 8
Special-Status Wildlife Potentially Occurring but Not Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Accipiter cooperii (nesting)	Cooper's hawk	None/WL/MSCP	Riparian and oak woodlands, montane canyons.	High potential to occur within the willows that are adjacent to the site. They frequently roost and forage in neighboring suburban areas (Collins pers.comm) High potential to forage on site and nest in adjacent riparian areas to the east. One Cooper's hawk was observed flying over the area but did not land or pause on site. It may have been hunting or may have been in transit.	DUDEK 2012, USFWS 2006a
Phalacrocorax auritus	Double-crested Cormorant	None/WL/ Not covered	Nests in riparian trees near ponds, lakes, artificial impoundments, slow-moving rivers, lagoons, estuaries and open coastlines; winter habitat includes lakes, rivers, and coastal areas.	Low potential to occur. Was observed during surveys nearby off site from 2010 to 2012. However, there is limited suitable habitat on site.	USFWS 2006a; SWIA
Buteo regalis (Nonbreeding/wintering)	Ferruginous hawk	BCC/WL/ MSCP	Open, dry country, grasslands, open fields, agriculture.	May forage on site during migration or for wintering. Would not breed in the region.	DUDEK 2012
Aquila chrysaetos (nesting and nonbreeding/wintering)	Golden eagle	BCC/WL/ MSCP	Open country, especially hilly and mountainous regions; grassland, coastal sage scrub, chaparral, oak savannas, open coniferous forest.	Low potential. May forage over the site but no nesting habitat is present.	DUDEK 2012
Ammodramus savannarum (nesting)	Grasshopper sparrow	None/SSC/Not covered	Open grassland and prairie, especially native grassland with a mix of grasses and forbs.	Low potential due to lack of suitable grassland habitat.	DUDEK 2012

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Special-Status Wildlife Potentially Occurring but Not Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Passerculus sandwichensis rostratus (nonbreeding/wintering)	Large-billed savannah sparrow	None/SSC/MSCP	Saltmarsh, pickleweed.	High potential to occur on site during winter due to presence of suitable habitat.	DUDEK 2012
Vireo bellii pusillus (nesting)	Least Bell's vireo	FE, BCC/SE/ MSCP	Nests in southern willow scrub with dense cover within 1–2 meters of the ground; habitat includes willows, cottonwoods, baccharis, wild blackberry or mesquite on desert areas.	Low potential due to lack of suitable habitat. Suitable habitat is located off site to the east within the channel of the Otay River however this habitat is limited. Focused surveys were negative.	DUDEK 2012
Lanius ludovicianus	Loggerhead Shrike	BCC/SSC/ Not covered	Nests and forages in open habitats with scattered shrubs, trees, or other perches.	Low potential to occur. Limited perching structures and suitable habitat occur across the project site.	USFWS 2006a
Numenius americanus (nesting)	Long-billed curlew	BCC/WL/ MSCP	Nests in upland shortgrass prairies and wet meadows in northeast California; winters in coastal estuaries, open grasslands and croplands.	High potential to occur on site during the winter for foraging within the marsh areas or the former agriculture field.	DUDEK 2012, USFWS 2006a
Charadrius montanus (Nonbreeding/wintering)	Mountain plover	BCC/SSC/MSCP	Nests in open, shortgrass prairies or grasslands; winters in shortgrass plains, plowed fields, open sagebrush, and sandy deserts.	Low potential. Not know for the region. Does not nest within the region but may forage on site during winter.	DUDEK 2012

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Special-Status Wildlife Potentially Occurring but Not Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Aythya americana	Redhead	None/SSC/Not covered	Breeds in relatively deep (>3 ft) permanent or semi-permanent wetlands of at least one acre, with about 75% open water and emergent tules, bulrushes (Scirpus spp.) and cattails (Typha spp.) up to about three feet in height; winters in coastal estuaries and large, deep ponds, lakes, and reservoirs of the interior.	Low potential to occur. Limited suitable habitat occurs on the site. Seven individuals were observed nearby off site in surveys conducted from 2011 to 2012, but none were detected in surveys covering the same area in 2010.	USFWS 2006a; SWIA
Accipiter striatus	Sharp-shinned Hawk	None/WL/ Not covered	Nests in coniferous forests, ponderosa pine, black oak, riparian deciduous, mixed conifer, Jeffrey pine; winters in lowland woodlands and other habitats.	No potential to occur due to lack of suitable habitat on the project site or nearby areas.	USFWS 2006a
Aimophila ruficeps canescens	Southern California rufous-crowned sparrow	None/WL/MSCP	Grass-covered hillsides, coastal sage scrub, chaparral with boulders and outcrops.	Low potential due to small amount of habitat in the *Isocoma* scrub area.	DUDEK 2012
Buteo swainsoni (nesting)	Swainson's hawk	BCC/ST/ MSCP	Open grassland, shrublands, croplands.	May forage on site during migration. Would not breed in the region.	DUDEK 2012
Agelaius tricolor (nesting colony)	Tricolored blackbird	BCC/SSC/MSCP	Nests near fresh water, emergent wetland with cattails or tules; forages in grasslands, woodland, agriculture.	Low potential. Small amount of suitable habitat is present.	DUDEK 2012
Charadrius alexandrinus nivosus (nesting)	Western snowy plover (coastal population)	FT, BCC/SSC/MSCP	Nests primarily on coastal beaches, in flat open areas, with sandy or saline substrates; less commonly in salt pans, dredged spoil disposal sites, dry salt ponds and levees.	High potential. Suitable flat areas are present and the species is known for the area. There are salt pans present.	DUDEK 2012, USFWS 2006a

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Special-Status Wildlife Potentially Occurring but Not Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Plegadis chihi (rookery site)	White-faced ibis	None/WL/MSCP	Nests in marsh; winter foraging in shallow lacustrine waters, muddy ground of wet meadows, marshes, ponds, lakes, rivers, flooded fields and estuaries.	High potential to occur on site during the winter for foraging within the marsh areas or the former agriculture field.	DUDEK 2012, USFWS 2006a
			Mammals		
Taxidea taxus	American badger	None/SSC/MSCP	Dry, open treeless areas, grasslands, coastal sage scrub.	Moderate potential due to sandy soils. No signs of digging were observed.	DUDEK 2012
Nyctinomops macroti	Big free-tailed bat	None/SSC/Not covered	Rugged, rocky canyons.	No roost habitat is present but could forage on site or overhead.	DUDEK 2012
Chaetodipus californicus femoralis	Dulzura pocket mouse	None/SSC/Not covered	Coastal sage scrub, chaparral, riparian-scrub ecotone; more mesic areas.	Moderate potential due to presence of sandy soils .and *Isocoma* scrub habitat.	DUDEK 2012
Choeronycteris mexicana	Mexican long-tongued bat	None/SSC/Not covered	Desert and montane riparian, desert succulent scrub, desert scrub, and pinyon-juniper woodland. Roosts in caves, mines, and buildings.	No roost habitat is present but could forage on site or overhead.	DUDEK 2012
Felis concolor	Mountain lion	None/None/MSCP	Occupies a wide variety of habitats: swamps, riparian woodlands, broken country with good cover of brush or woodland.	Low potential due to location in an urbanized area. Cover is limited on site.	DUDEK 2012
Chaetodipus fallax fallax	Northwestern San Diego pocket mouse	None/SSC/Not covered	Coastal sage scrub, grassland, sage scrub-grassland ecotones, sparse chaparral; rocky substrates, loams and sandy loams.	Moderate potential due to presence of sandy soils and *Isocoma* scrub habitat..	DUDEK 2012

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Special-Status Wildlife Potentially Occurring but Not Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Perognathus longimembris pacificus	Pacific pocket mouse	FE/SSC/ Not covered	Grassland, coastal sage scrub with sandy soils; along immediate coast.	Moderate potential due to presence of sandy soils and *Isocoma* scrub habitat. However known locations of the species are a long distance away (Camp Pendleton and southern Orange County).	DUDEK 2012
Antrozous pallidus	Pallid bat	None/SSC/Not covered	Rocky outcrops, cliffs, and crevices with access to open habitats for foraging	No roost habitat is present but could forage on site or overhead.	DUDEK 2012
Nyctinomops femorosaccus	Pocketed free-tailed bat	None/SSC	Rocky desert areas with high cliffs or rock outcrops.	No roost habitat is present but could forage on site or overhead.	DUDEK 2012
Neotoma lepida intermedia	San Diego desert woodrat	None/SSC/Not covered	Coastal sage scrub, chaparral, pinyon-juniper woodland with rock outcrops, cactus thickets, dense undergrowth.	Moderate potential due to presence of sandy soils and *Isocoma* scrub habitat..	DUDEK 2012
Euderma maculatum	Spotted bat	None/SSC/Not covered	Arid deserts and grasslands through mixed conifer forests; roosts in cliffs, feeds over water and along washes.	No roost habitat is present but could forage on site or overhead.	DUDEK 2012
Eumops perotis californicus	Western mastiff bat	None/SSC/Not covered	Roosts in small colonies in cracks and small holes, seeming to prefer man-made structures.	No roost habitat is present but could forage on site or overhead.	DUDEK 2012
Lasiurus blossevillii	Western red bat	None/SSC/Not covered	Roosts in forests and woodlands from sea level up through mixed conifer forests. Feeding habitat variable and includes grasslands, shrublands, open woodlands and forests, and croplands. Not found in desert areas.	No roost habitat is present but could forage on site or overhead.	DUDEK 2012

Table 8
Special-Status Wildlife Potentially Occurring but Not Detected on the Otay River Floodplain Site

Scientific Name	Common Name	Status Federal/State/MSCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
			Invertebrates		
Branchinecta sandiegonensis	San Diego fairy shrimp	FE/None/ Not covered	Small, shallow vernal pools, occasionally ditches and road ruts.	No potential due to lack of suitable habitat.	DUDEK 2012
Euphydryas editha quino	Quino checkerspot butterfly	FE/None/ Not covered	Sparsely vegetated hilltops, ridgelines, occasionally rocky outcrops; host plant *Plantago erecta* and nectar plants must be present.	No potential due to lack of suitable habitat. Project is outside of current survey area for the species.	DUDEK 2012
Streptocephalus woottoni	Riverside fairy shrimp	FE/None/ Not covered	Deep, long-lived vernal pools, vernal pool-like seasonal ponds, stock ponds; warm water pools that have low to moderate dissolved solids.	No potential due to lack of suitable habitat.	DUDEK 2012

Pond 15 Site

Due to limited accessibility of the site, focused wildlife surveys were not conducted by Dudek staff. However, observation data was available through State and Federal agencies (2010–2012 CDFW) as well as through CNDDB records. Three Federal or State listed species have been observed within the Pond 15 Site boundary: California Least Tern, western snowy plover, and Belding's savannah sparrow. Additionally, nine special status wildlife species were observed on the site during the surveys conducted in 2010 – 2012 as listed in Table 9 Special Status Wildlife Detected on the Pond 15 Site. Special status species documented for the salt pond area and that have high potential to occur within the Pond 15 Site include: American peregrine falcon (*Falco peregrinus anatum*), black skimmer , California brown pelican, California gull (*Larus californicus*), California horned lark (*Eremophila alpestris*), Caspian tern (*Hydroprogne caspia*), double-crested cormorant (*Phalacrocorax auritus*), elegant tern (*Thalasseus elegans*), long-billed curlew (*Numenius americanus*).

Table 9
Special-Status Wildlife Potentially Occurring on Pond 15 Site

Scientific Name	Common Name	Status Federal/State/MSHCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
			Birds		
Falco peregrinus anatum	American peregrine falcon	BCC/DL/ MSCP	Nests on cliffs, buildings, bridges; forages in wetlands, riparian, meadows, croplands, especially where waterfowl are present.	High potential to occur on site for foraging. The species is well known to forage on shorebirds during the winter. Individuals observed during surveys conducted from 2010 to 2012 (SWIA data_Citation TBP).	USFWS 2006a, SWIA data_ Citation To Be Provided
Pelecanus erythrorhynchos	American White Pelican	None/SSC/ Not covered	Nests colonially on isolated islands in freshwater lakes with sandy, earthen, or rocky substrates; minimal disturbance from humans or mammalian predators required, as is close access to productive foraging areas; forages on inland marshes, lakes or rivers; winters on shallow coastal bays, inlets and estuaries.	Low Potential to occur due to lack of fresh water habitat and the site's proximity to urbanization.	USFWS 2006a
Passerculus sandwichensis beldingi	Belding's Savannah Sparrow	None/SE/ MSCP	Nests and forages in coastal salt marsh dominated by pickleweed.	Documented as occurring within the Pond 15 Site. Suitable salt marsh habitat occurs in a small area on the site. Was observed during surveys conducted from 2010 to 2012 (SWIA data_Citation To Be Provided). A total of 211 birds were recorded in 2012.	USFWS 2006a, SWIA data_Citation To Be Provided

Table 9
Special-Status Wildlife Potentially Occurring on Pond 15 Site

Scientific Name	Common Name	Status Federal/State/MSHCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Rynchops niger	Black Skimmer	BCC/SSC/ Not covered	Nests on barrier beaches, shell banks, spoil islands and salt marsh; forages over open water; roosts on sandy beaches and gravel bars.	High potential to occur. Was observed during surveys conducted from 2010 to 2012 (SWIA data_Citation TBP) surveys and some suitable marsh nesting areas occur on the south western end of the project area and open water for foraging occurs over the salt works ponds.	USFWS 2006a, SWIA data_Citation To Be Provided
Chlidonias niger	Black Tern	None/SSC/ Not covered	Freshwater marsh with emergent vegetation; in the Central Valley primarily breed and forage in rice fields and other flooded agricultural fields with weeds and other residual aquatic vegetation.	Moderate potential to occur. Four individuals were observed during 2012 (Dudek 2012) focused surveys and were recorded off site of the Otay River Floodplain Site. Some foraging habitat occurs on the project site. Was not recorded during surveys of the site in 2010 – 2012 (SWIA data_Citation TBP)	USFWS 2006a, SWIA data_ Citation To Be Provided
Branta bernicla	Brant	None/SSC/ Not covered	Breeding habitat includes the edges of salt marshes in the low Arctic Region. Migratory habitats include shallow marine lakes. Winter range includes intertidal mudflats in shallow marine alters with abundant eelgrass and/or green algae.	Moderate potential to occur. Could occur in the area during winter months and was observed adjacent to Salt ponds during surveys conducted from 2010 to 2012 (SWIA data_Citation To Be Provided). Suitable migratory habitat does occur within project boundaries.	USFWS 2006a, SWIA data_ Citation To Be Provided

Table 9
Special-Status Wildlife Potentially Occurring on Pond 15 Site

Scientific Name	Common Name	Status Federal/State/MSHCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Pelecanus occidentalis californicus (nesting colony and communal roosts)	California brown pelican	FE (DL)/DL/ MSCP	Open sea, large water bodies, coastal bays and harbors.	High potential to occur over open water areas on project site. The species does occur within the region. Species was observed during surveys conducted from 2010 to 2012 (SWIA data. Citation To Be Provided).	USFWS 2006a, SWIA data Citation To Be Provided
Larus californicus	California Gull	None/WL/ Not covered	Nests in alkali and freshwater lacustrine habitats; abundant in coastal and interior lowlands during nonbreeding period.	High potential to occur. Suitable habitat occurs on the North and West portions of the site. The species was observed during surveys conducted from 2010 to 2012 (SWIA data_Citation To Be Provided).	USFWS 2006a, SWIA data_ Citation To Be Provided
Eremophila alpestris actia	California horned lark	None/WL/ Not covered	Open habitats, grassland, rangeland, shortgrass prairie, montane meadows, coastal plains, fallow grain fields.	High potential to occur on site especially during winter. Individuals were observed during surveys conducted from 2010 to 2012 (SWIA data_Citation To Be Provided).	USFWS 2006a, SWIA data_Citation To Be Provided
Sternula [=Sterna] antillarum browni (nesting colony)	California least tern	FE/SE/ MSCP	Coastal waters, estuaries, large bays and harbors, mudflats; nests on sandy beaches.	High potential. Suitable flat areas are present and the species is known for the area. There are salt pans present. Individuals have been known to occur within the salt pond area according to CNDDB reports. Individuals were observed during surveys conducted from 2010 to 2012 (SWIA data_Citation To Be Provided).	USFWS 2006a, CDFW 2014, SWIA data_Citation To Be Provided

Table 9
Special-Status Wildlife Potentially Occurring on Pond 15 Site

Scientific Name	Common Name	Status Federal/State/MSHCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Hydroprogne caspia	Caspian tern	BCC/None/Not covered	Coastal estuarine, salt marsh and barrier islands; nests on islands in rivers and salt lakes.	High potential to occur. Known to reside year round in coastal San Diego County. Suitable marsh habitat occurs on the North and Western portions of the site. Was observed nearby off site during surveys in 2011 and 2012 (SWIA data_Citation To Be Provided).	USFWS 2006a, SWIA data_Citation To Be Provided
Polioptila californica californica	Coastal California gnatcatcher	FT/SSC/ MSCP	Coastal sage scrub, coastal sage scrub-chaparral mix, coastal sage scrub-grassland ecotone, riparian in late summer.	No potential to occur due to lack of suitable habitat.	DUDEK 2012
Gavia immer	Common Loon	None/SSC/ Not covered	Extirpated as a breeder from California; winters in coastal waters such as bays, channels, coves, and inlets; also winters inland at large, deep lakes and reservoirs.	Low potential to occur. Range has been limited in California from anthropogenic activities. Known to visit San Diego coastal areas during winter months, but lacks significant suitable habitat on the project site.	USFWS 2006a
Accipiter cooperii (nesting)	Cooper's hawk	None/WL/ MSCP	Riparian and oak woodlands, montane canyons.	Low potential to occur on the project site. Could forage on site and nest in nearby woodland areas to the east.	USFWS 2006a, SWIA data_Citation To Be Provided
Phalacrocorax auritus	Double-crested Cormorant	None/WL/ Not covered	Nests in riparian trees near ponds, lakes, artificial impoundments, slow-moving rivers, lagoons, estuaries and open coastlines; winter habitat includes lakes, rivers, and coastal areas.	High potential to occur. Large numbers of individuals were observed during surveys conducted from 2010 to 2012 (SWIA data_Citation To Be Provided) and there is suitable habitat on the project site.	USFWS 2006a, SWIA data_Citation To Be Provided

Table 9
Special-Status Wildlife Potentially Occurring on Pond 15 Site

Scientific Name	Common Name	Status Federal/State/MSHCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Thalasseus [=Sterna] elegans (nesting colony)	Elegant tern	BCC/WL/ MSCP	Coastal waters, estuaries, large bays and harbors, mudflats.	High potential to occur. Large numbers of individuals were observed during surveys conducted from 2010 to 2012 (SWIA data_Citation To Be Provided) and there is suitable habitat on the project site.	USFWS 2006a, SWIA data_Citation To Be Provided
Passerculus sandwichensis rostratus (nonbreeding/wintering)	Large-billed savannah sparrow	None/SSC/ MSCP	Saltmarsh, pickleweed.	Moderate potential to occur on site during winter due to presence of some suitable habitat on site. Not recorded for the site in 2010–2012.	SWIA data_Citation To Be Provided
Vireo bellii pusillus (nesting)	Least Bell's vireo	FE, BCC/SE/ MSCP	Nests in southern willow scrub with dense cover within 1–2 meters of the ground; habitat includes willows, cottonwoods, baccharis, wild blackberry or mesquite on desert areas.	No potential due to lack of suitable habitat.	DUDEK 2012
Lanius ludovicianus	Loggerhead Shrike	BCC/SSC	Nests and forages in open habitats with scattered shrubs, trees, or other perches.	No potential to occur due to lack of suitable habitat and foraging structures on the project site (SWIA data_Citation To Be Provided).	USFWS 2006a; SWIA data_Citation To Be Provided
Numenius americanus (nesting)	Long-billed curlew	BCC/WL/ MSCP	Nests in upland shortgrass prairies and wet meadows in northeast California; winters in coastal estuaries, open grasslands and croplands.	High potential to occur on site during the winter for foraging within the marsh areas. Individuals were observed during focused surveys conducted from 2010 to 2012 (SWIA data_Citation To Be Provided).	USFWS 2006a, SWIA data_Citation To Be Provided

Table 9
Special-Status Wildlife Potentially Occurring on Pond 15 Site

Scientific Name	Common Name	Status Federal/State/MSHCP	Primary Habitat Associations	Status on Site or Potential to Occur	Source
Aythya americana	Redhead	None/SSC/ Not covered	Breeds in relatively deep (>3 ft) permanent or semi-permanent wetlands of at least one acre, with about 75% open water and emergent tules, bulrushes (Scirpus spp.) and cattails (Typha spp.) up to about three feet in height; winters in coastal estuaries and large, deep ponds, lakes, and reservoirs of the interior.	Moderate potential to occur. Limited suitable habitat occurs on the site. Seven individuals were observed during surveys conducted in 2012 (SWIA data_Citation To Be Provided), but none were detected in surveys covering the same area in 2010.	USFWS 2006a, SWIA data_Citation To Be Provided
Accipiter striatus	Sharp-shinned Hawk	None/WL/ Not covered	Nests in coniferous forests, ponderosa pine, black oak, riparian deciduous, mixed conifer, Jeffrey pine; winters in lowland woodlands and other habitats.	Low potential to occur due to lack of suitable habitat on the project site or nearby areas. Could forage over the site.	USFWS 2006a
Charadrius alexandrinus nivosus (nesting)	Western snowy plover (coastal population)	FT, BCC/SSC/ MSCP	Nests primarily on coastal beaches, in flat open areas, with sandy or saline substrates; less commonly in salt pans, dredged spoil disposal sites, dry salt ponds and levees.	High potential. Suitable flat areas are present and the species is known for the area. Has not been recorded on the site.	USFWS 2006a
Plegadis chihi (rookery site)	White-faced ibis	None/WL/ MSCP	Nests in marsh; winter foraging in shallow lacustrine waters, muddy ground of wet meadows, marshes, ponds, lakes, rivers, flooded fields and estuaries.	Low potential to occur on site during the winter for foraging within the marsh areas due to the small size of the area for foraging. Was not observed during surveys conducted from 2010 to 2012 (SWIA data_Citation To Be Provided).	USFWS 2006a, SWIA data_Citation To Be Provided

2.6 Hydrology and Hydraulics

The Otay River Watershed is located in San Diego County, California. The 145-square mile watershed is situated between the Sweetwater and Tijuana River Watersheds, as shown in Figure 13. The Otay River originates in the Cleveland National Forest along Dulzera Creek, with several tributaries including Hollenbeck Canyon Creek, Jamul Creek, and Proctor Valley Creek. Watershed flows are cutoff by two reservoirs that are a part of the City of San Diego Water Supply System: the Upper Otay Reservoir and the Lower Otay Reservoir. Formed by the Savage Dam, the Lower Otay Reservoir captures 68% of the watershed. The Otay River runs westward approximately 11 miles through primarily undeveloped lands from Savage Dam to San Diego Bay. Tributaries in this section of the river include O'Neal Canyon Creek, Poggi Canyon Creek, Salt Creek, Johnson Canyon, Wolf Canyon, and Dennery Canyon (Everest 2014).

The Otay River conveys flows from the I-5 bridge through the Otay River floodplain and estuarine portion of the Otay River. From the floodplain, the river channel turns northwest towards Ponds 50 and 51, and turns westward along the perimeter of the salt ponds adjacent to Ponds 48, 20, and 22 specifically, as shown in Figure 2. After confluence with Nestor Creek, the Otay River continues along Pond 23 and then north along the Western Salt Pond Restoration until discharging into the San Diego Bay (Everest 2014).

Hydraulic conditions along the Otay River are affected by a combination of tidal exchanges with San Diego Bay and watershed flows from the Otay River. Tidal influence extends from San Diego Bay toward the floodplain near Ponds 48 and 50.

2.6.1 Otay River Runoff

The Otay River Watershed has a semi-arid climate, typical of southern California with dry summers and relatively wet winters. Temperatures are generally mild throughout the year, as summarized in Table 10. Monthly average temperatures range from 56.4 degrees Fahrenheit in January to 71.0 degrees Fahrenheit in August with an average annual temperature is 63.2 degrees Fahrenheit. Precipitation typically occurs during winter months (December through February) with little to no rainfall during summer months (June through August).

Table 10
Monthly Average Temperature and Precipitation for San Diego

Month	Monthly Average Temperature (°F)	Monthly Average Precipitation (inches)
January	56.4	2.00
February	57.4	1.98
March	58.9	1.63

Table 10
Monthly Average Temperature and Precipitation for San Diego

Month	Monthly Average Temperature (°F)	Monthly Average Precipitation (inches)
April	61.1	0.78
May	63.3	0.21
June	65.9	0.05
July	69.6	0.02
August	71.0	0.06
September	69.8	0.17
October	66.1	0.51
November	61.4	0.97
December	57.2	1.77
Annual	63.2	10.13

Source: Western Regional Climate Center, San Diego WSO Airport (1914-2012)

In San Diego County, heavy precipitation is generally caused by large weather systems generated in the Pacific Ocean. Local floods are commonly the result of localized, intense thunder storms normally in late summer and fall months. Floods can also be due to tropical storms generated in the Tropical Pacific (County of San Diego 2007).

The average annual precipitation across the Otay River Watershed is illustrated in Figure 14. The average annual precipitation in the lower Otay River Watershed ranges from approximately 10 to 11 inches per year, Precipitation in the upper Otay River Watershed generally ranges from 13 to 20 inches per year. The highest annual precipitation occurs at the mountain peaks of the San Miguel Mountain, Jamul Mountains, Otay Mountain, and Lyons Peak (see Figure 14).

Differences in monthly and annual precipitation across the Otay River Watershed are shown in Table 11 for three regions: coastal, inland, and mountain. Based on gage elevations, three NOAA cooperative stations monitored by the Western Regional Climate Center were selected to represent conditions of the three regions within the Otay River Watershed. Coastal precipitation was represented by the gage at the San Diego WSO Airport (COOP 047740), Inland precipitation in the central portion of the watershed was characterized by the gage at the Lower Otay Reservoir (COOP 045162), and precipitation in the mountain region was classified using Barrett Dam (COOP 040514). Elevations of these stations are approximately 10 feet, 520 feet, and 1,620 feet, respectively.

Table 11
Monthly Precipitation by Region

Month	Coastal Precipitation* (in)	Inland Precipitation** (in)	Mountain Precipitation*** (in)
January	2.00	2.12	3.18
February	1.98	1.16	3.56
March	1.63	2.28	2.93
April	0.78	1.09	1.77
May	0.21	0.32	0.64
June	0.05	0.03	0.07
July	0.02	0.02	0.11
August	0.06	0.10	0.20
September	0.17	0.03	0.28
October	0.51	0.48	0.73
November	0.97	0.97	1.44
December	1.77	2.46	2.86
Annual	10.13	11.07	17.77

Source: Western Regional Climate Center
*San Diego WSO Airport – COOP 047740 (1914-2012)
**Lower Otay Reservoir – COOP 045162 (1940-1956)
***Barrett Dam – COOP 040514 (1913-1980)

2.6.2 Otay River Flooding

Flood hazards are identified by the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS). The most recent FIS for San Diego County (FEMA 2012) documents return period peak flows for Otay River, as summarized in Table 12. The initial hydrologic and hydraulic analyses for the Otay River were conducted by the California Department of Water Resources for FEMA (completed in 1981). Hydrologic and hydraulic analyses for the Otay River between Nestor Creek and San Diego Bay were updated by the USACE, Los Angeles District in December 1989. There are no major flooding problems along the Otay River, although some areas downstream of Broadway Avenue will be inundated by the 100-year flood (FEMA 2012). In addition, the Otay River below Savage Dam is within the dam inundation zone (County of San Diego 2007).

Table 12
FEMA Return Period Peak Discharges for Otay River

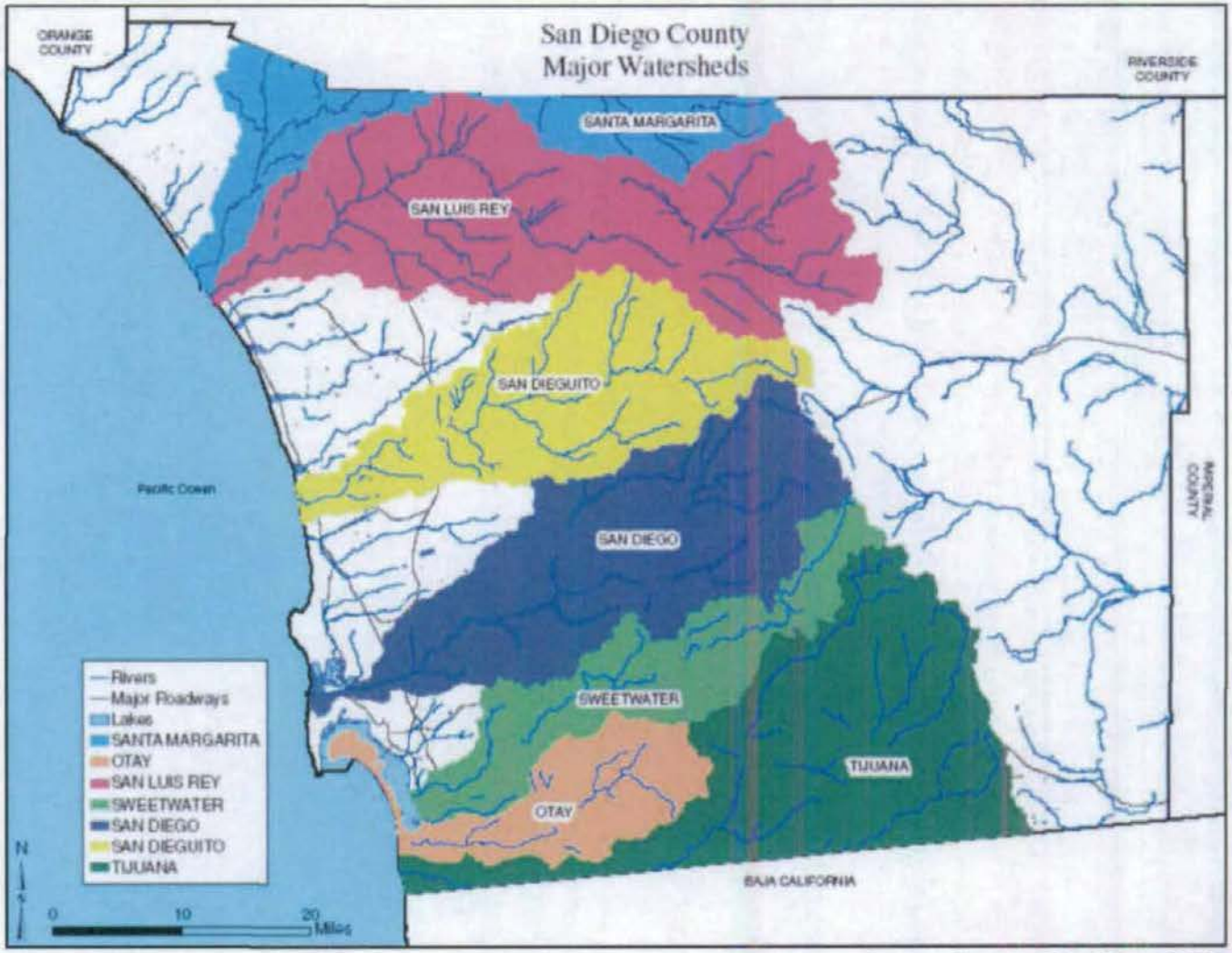
Otay River	Drainage Area (mi^2)	Return Peak Discharges (cfs)			
		10-Year	*50-Year*	*100-Year*	*500-Year*
at Otay Valley Road	122.7	1,200	12,000	22,000	50,000

Source: FEMA 2012

2.6.3 San Diego Bay Circulation

Currents in San Diego Bay are predominately produced by tides (Wang et al. 1998). This tidal exchange between the ocean and the bay is a result of a phenomenon called "tidal pumping" (Chadwick, et al.. 1997). The "pumping" of water is due to the flow difference between the ebb and the flood flows. Being located at mid-latitude, tides and currents within the San Diego Bay are dominated by a mixed diurnal-semidiurnal component (Peeling 1975). Typical tidal current speeds range between 0.3-0.5 m/s near the inlet and 0.1 m/s to 0.2 m/s in the southern region of the bay. The phase propagation suggests that the tides behave almost as standing waves with typical lags between the mouth and the back portion of the bay of 10 min and an increase in tidal amplitude in the inner bay compared to the outer bay.

The overall tidal prism for the bay is 5.5×10^7 m^3 and the tidal excursion is larger than the mouth with a value of 4.4 km (Chadwick and Largier 1996). Chu, et al. (2012) measured mass exchange between San Diego Bay and the Pacific Ocean using a combination of flow measurements by acoustic Doppler current profiling and tracer measurements using a naturally occurring ultraviolet fluorescence tracer. They found that variations in exchange with tidal range could be isolated by separately evaluating the ebb and flood tidal transport budgets. The tracer transport during the ebb increased rapidly with tidal range, while during the flood tide, the transport increased more gradually. The resulting difference in tidal transport between the ebb and flood accounts for the exchange between the bay and ocean. For weak tides, the exchange tends to increase rapidly with increasing tidal range, while for stronger tides, the exchange is more constant.



Source: County of San Diego 2007

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FIGURE 13
Otay River Watershed

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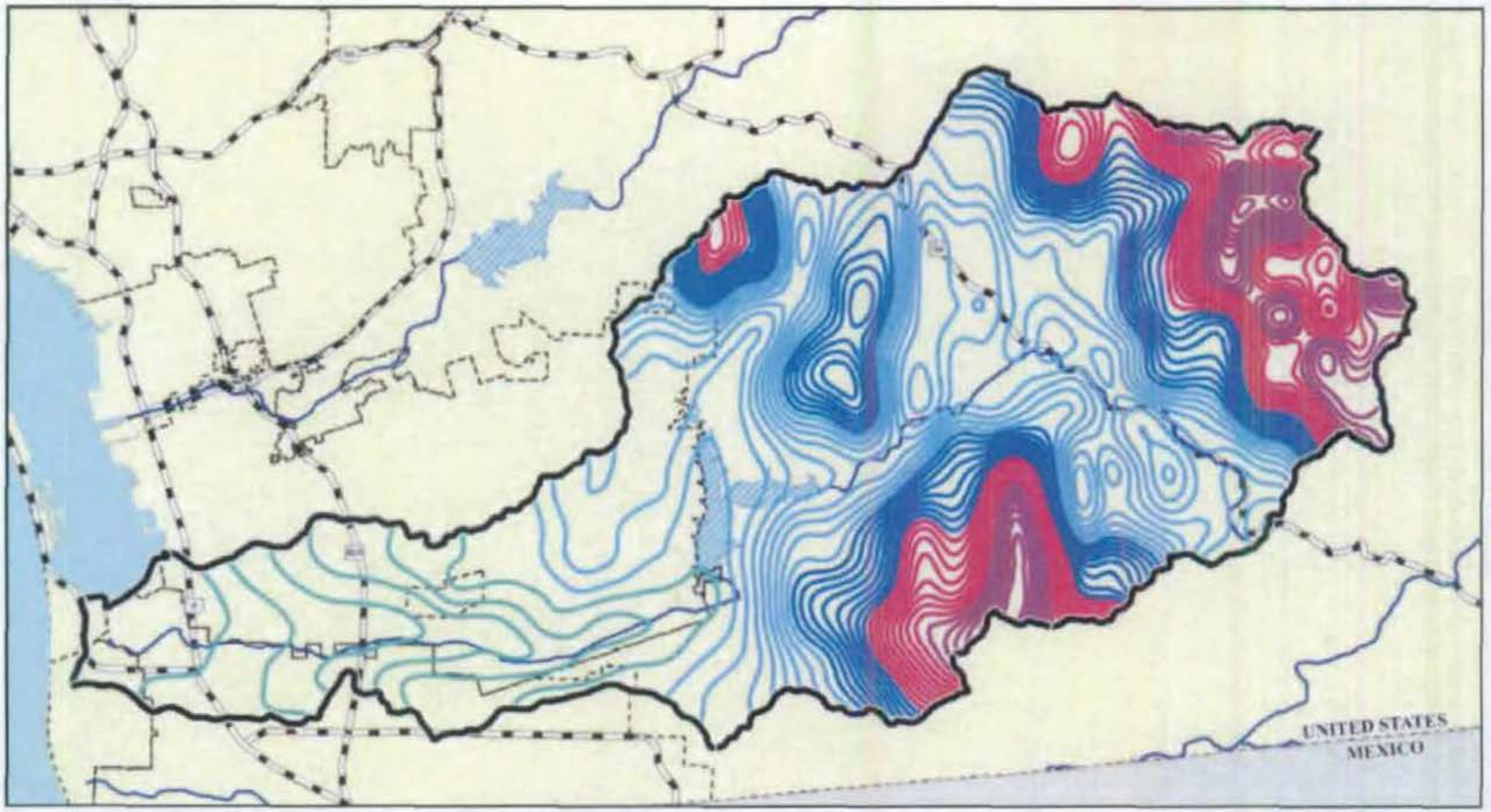

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FIGURE 14
Otay River Watershed Aveage Annual Precipitation

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2.6.4 San Diego Bay Sea Level and Tidal Regimes

The flow of sea water into and out of the Otay River Channel, the South Bay salt ponds and the proposed restoration tidal basins are driven by the time variation in San Diego Bay water level. The nearest NOAA tide gage to the Otay River and South Bay salt ponds is located at the Navy Pier in San Diego Bay. This tide gage (NOAA #941-0170) was last leveled using the 1983-2001 tidal epoch. Elevations of tidal datums referred to NAVD 88 are given in Table 13 below.

Table 13
Tidal Datums for San Diego Bay at NOAA #941-0170 Navy Pier

Category	Range
Highest Water Level (01/27/1983)	7.71 ft NAVD (8.1402 ft MLLW)
Mean Higher High Water	5.292 ft NAVD (5.7253 ft MLLW)
Mean High Water	4.5507 ft NAVD (4.9838 ft MLLW)
Mean Tide Level	2.5264 ft NAVD (2.9595 ft MLLW)
Mean Sea Level	2.5067 ft NAVD (2.9398 ft MLLW)
Mean Low Water	0.5020 ft NAVD (0.9351 ft MLLW)
North American Vertical Datum	0.00 ft NAVD (0.4331 ft MLLW)
Mean Lower Low Water	-0.4331 ft NAVD (0.000 ft MLLW)
Lowest Water Level (12/17/1937)	-3.5238 ft NAVD (-3.0907 MLLW ft)

Tidal data in Table 13 indicates that tidal ranges in San Diego Bay are greater than those found on the open coast. Mean diurnal tidal ranges are 5.72 ft as compared to 5.33 ft on the open coast, an increase of 0.39 ft of diurnal range in San Diego Bay. The extreme water level range is 11.23 ft in San Diego Bay as compared to 10.51 ft on the open coast, an increase of 0.72 ft of extreme range in the bay. All high water datum in the bay exceed those on the open coast and all the low water level datum are lower in the bay than on the open coast. This occurs because San Diego Bay is a resonant tidal system where higher harmonics of the K1 lunar-solar diurnal tidal constituent and the M2 principal lunar semi-diurnal tidal constituent are bathymetrical trapped in the bay, leading to a build-up in tidal amplitude. The tidal resonance of San Diego Bay provides additional tidal energy for forcing tidal inundation of the proposed tidal basins in the Otay River Floodplain Site and in Pond 15 Site, and is an attribute of this site that increases the chance of achieving a sustainable functioning wetland restoration.

2.7 Soil Characterization

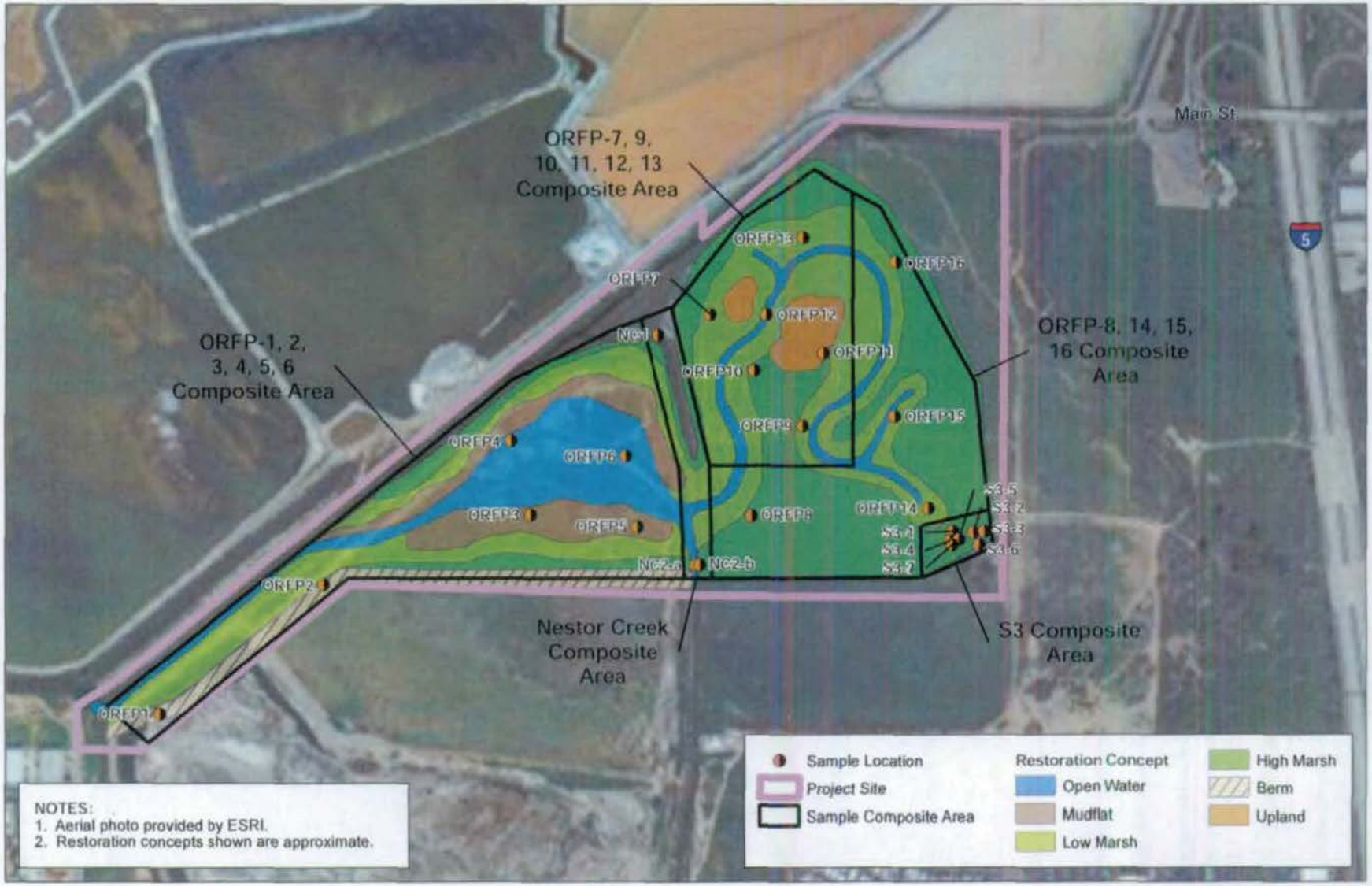
The soil characterization program was performed and managed by Anchor QEA, L.P., who worked with a team of subcontractors. Sampling locations were pre-selected based on the current conceptual plan for ORERP. The sampling program was subdivided into four areas: the Otay

River Floodplain (the majority of the ORERP site), Subarea 3 (the former agricultural equipment storage and supply area [subjected to a higher density of sampling]), Nestor Creek, and the Otay River. Sampling areas are presented on Figures 14 and 15. All sampling points were located and advanced in compliance with the Sampling and Analysis Plan (SAP) (Anchor QEA, L.P. 2012), with a few exceptions and deviations needed to avoid biological and Native American resources.

A total of 31 stations were identified to characterize Salt Ponds 12, 13, 14, and 15. Station density was based on the previous sediment characterization of Salt Ponds 10, 10a, and 11, with approximately one station per 10 acres (Everest and Anchor QEA, L.P. 2009). As previously described, an additional station was placed within the Pond 15 Site, resulting in a slightly higher station density in this pond. Sediments in Salt Ponds 12, 13, 14, and 15 may be excavated to a depth of -2 feet NAVD88, plus 1 foot of allowable overdepth (i.e., -3 feet NAVD88). Sediment cores targeted this layer plus an additional 1 foot beyond this depth (i.e., -4 feet NAVD88) to allow for the evaluation of the newly exposed surface layer. For each core, sediment from the surface to -3 feet NAVD88 was submitted for analysis to evaluate sediment that may be disturbed during restoration activities. Each 1-foot interval from the entire sediment core, including the new surface layer, was archived for potential future analysis.

Soil and sediment composite samples were analyzed for grain size, total solids, TOC, pesticides, metals, TPHs, PCBs, and SVOCs in accordance with test methods provided in the SAP (Anchor QEA, L.P. 2012). Results of physical and chemical analyses on composite samples are discussed above in Section 2.4.1.

Soil and sediment were predominately found to consist of silts and clays, with pockets of fine to medium sand. Metals were detected in all surface and subsurface composite samples. Metal concentrations in surface and subsurface soils are similar across all areas sampled, with the exception of composite samples from ORFP-7,9,10,11,12,13. Samples from this area contained elevated concentrations of metals, including copper, lead, and zinc. PCBs were detected in the surface composite samples from ORFP-7,9,10,11,12,13 and Subarea 3. No detections were observed for TPHs and polycyclic aromatic hydrocarbons (PAHs); phenols were generally not detected in most composite samples analyzed. Phthalates were detected; however, many samples were B qualified, indicating these results may be biased high due to chemicals being present in the laboratory's analytical blank samples.



SOURCE: Anchor QEA, L.P., 2013

FIGURE 15
Soil Sampling Locations–Otay River Floodplain Site

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Pesticides—DDT compounds, toxaphene, and dieldrin—were detected in the surface and/or subsurface samples of composites from the majority of samples. In the Otay River floodplain, DDTs were detected in composite samples from ORFP-7,9,10,11,12,13 in the surface (top 1 foot) and second depth interval (extending down to 0 feet NAVD88). For composite samples from ORFP-8,14,15,16, detections were observed in the surface, and in the second and third depth intervals (extending down to -6 feet NAVD88). Toxaphene was detected in the surface from ORFP-7,9,10,11,12,13 and in the surface and second depth interval (extending down to 0 feet NAVD88) from ORFP-8,14,15,16. No pesticides were detected within composite samples from ORFP-1,2,3,4,5,6. In Subarea 3, DDTs, dieldrin, and toxaphene were detected in the surface and second depth interval (extending to +6 feet NAVD88). In Nestor Creek, DDT compounds were detected in the surface and second depth interval (extending to -6 feet NAVD88). Dieldrin and toxaphene were detected in the surface. In the Otay River, DDT compounds were detected in the lower depth interval (from -4 to -6 feet mean lower low water [MLLW]) for composite samples from OR-1,2,3. For composite samples from OR-7,8,9, similar detections were observed in the upper depth interval (from mudline to -4 feet MLLW).

Salt pond sediments were predominantly fine-grained materials, consisting of 78.9 to 100% fines (silt and clay). TOC concentrations ranged from 0.53 to 6.5%.

All metals were detected in salt pond sediments. Chromium, selenium, silver, and zinc concentrations were less than screening levels in all samples. Arsenic, cadmium, copper, lead, mercury, and nickel were measured at concentrations greater than screening levels in at least one sample (Table 13). A summary of results is provided below.

- Arsenic concentrations were greater than both Residential and Commercial/Industrial CHHSLs and RSLs at all stations. Stations 13-03 and 13-04 also exceeded the ERL value and Zeeman risk-based screening level for benthic invertebrates. However, all concentrations of arsenic were less than the southern California regional background level of 12 milligrams per kilogram (mg/kg; Chernoff et al. 2008).
- Cadmium concentrations were relatively low, with the exception of Station 1. This station exceeded the Zeeman screening levels for fish and tern.
- Copper concentrations were greater than Zeeman screening levels at 12 stations, which included one station in each of Ponds 12 and 14 and approximately 60% of stations in Ponds 13 and 15. All stations exceeded the Zeeman screening level for benthic invertebrates, five stations exceeded the screening level for benthic vegetation, and two stations (15-01 and 15-10) exceeded the screening level for wigeon, scooter, and tern. Stations 15-01 and 15-10 also exceeded the ERL value.

- Lead concentrations were greater than Zeeman screening levels at all stations. All stations exceeded the screening level for wigeon, scooter, tern, grebe, and skimmer. Nineteen stations exceeded the screening level for pelican. Stations 15-01 and 15-10 exceeded the screening level for turtle.
- Mercury concentrations were greater than Zeeman screening levels at six stations, which included four stations within Pond 12 and two stations within the Pond 15 Site. All stations exceeded the screening level for tern. Station 15-10 exceeded the screening level for skimmer.
- Nickel concentrations were relatively low, with the exception of Stations 15-01 and 15-10. Both stations exceeded the ERL value and Zeeman screening level for benthic invertebrates. Station 15-01 also exceeded Zeeman screening levels for sea lion and tern.

PAHs and pesticides were detected in salt pond sediments. PAHs were measured at low concentrations in approximately half of the samples from Ponds 12 and 13 and all of the samples from Ponds 14 and 15. Station 15-01 exceeded the ERL value for total low molecular weight PAHs, while Station 12-09 exceeded the Residential RSL for benzo(a)pyrene.

DDTs and dieldrin were the only pesticides detected in salt pond sediments. DDTs were measured at four stations (13-07, 14-04A, 15-01, and 15-10). Station 15-01 exceeded the ERL values for 4,4'-DDE and total DDTs. Dieldrin was measured at four stations (12-10, 13-02, 13-07, and 14-04A). All concentrations were greater than the ERL value. PCB congeners were not detected in salt pond sediment.

2.8 Water Quality

Water Quality within the project site is regulated by the Regional Water Quality Control Board, through the Water Quality Control Plan for the San Diego Basin (Basin Plan). This plan designates beneficial uses for water bodies in the San Diego Region, established water quality objectives, and implementation plans to protect those beneficial uses. The proposed project is located within the Otay Hydrologic Unit, and specifically within the Otay Valley Hydrologic Area, designated 910.2 (RWQCB 2004).

2.8.1 Groundwater

Groundwater elevations range from approximately 3 to 8 feet below mean sea level. In addition, capillary fringe of this groundwater may extend approximately 1 to 2 feet above groundwater elevation (GEOCON 1986). Due to tidal influence of the Otay River Floodplain Site, groundwater is slightly brackish limiting vegetation to species with salt tolerance.

2.8.2 Surface Waters

Nestor Creek bisects the Otay River Floodplain Site from the southern edge, and outlets into the Otay River. The Otay River flows along the eastern edge, and continues along the northern and western boundary of the Otay River Floodplain Site, before bisecting Pond 11 and Pond 12 to outletinto San Diego Bay. In addition to the Basin Plan's water quality objectives, the Clean Water Act 303(d) list highlights any impaired surface water bodies within the region. Both of these freshwater inputs are not listed within the Clean Water Act Section 303(d) List 2010 Integrated report as impaired water bodies.

2.8.3 San Diego Bay

Historically, water quality within San Diego Bay suffered serious degradation due to discharge of untreated municipal sewage and industrial wastes. Due to the plethora of different surrounding jurisdictions as well as the number of separate agencies discharging to the bay, the San Diego Bay Interagency Water Quality Panel was established in 1988 to address the Bay's water quality concerns, and ensure the long-term viability of the bay. This panel completed a Comprehensive Management Plan for San Diego Bay in 1998, to protect the value and resources within the bay. Also in 1998, the San Diego Bay was included within the California Section 303(d) list as an impaired water body by the California State Water Resources Control Board (SWRCB) due to benthic community degradation and toxicity. San Diego Bay is still currently listed on the 303(d) list, but only for PCBs (Polychlorinated biphenyls).

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3 SITE OPPORTUNITIES AND CONSTRAINTS

The opportunities and constraints that have significant influence on the wetlands restoration of the Otay River Floodplain Site and the Pond 15 Site are summarized in Table 14. The opportunities and constraints presented in Table 14 are similar to those presented in the Preliminary Restoration Plan submitted to the Coastal Commission. This table is general in scope related to the overall project. Detailed mitigation measures for potential impacts associated with the project are provided in the FEIS.

Table 14
Site Opportunities and Constraints Related to the Development of the Final Restoration Plan

Category	Specific Issue	Design Consideration
	Opportunities	
Hydrology	Location suitable for tidal habitat restoration	Open and continuous tidal connection is required for both the Otay River Floodplain Site and the Pond 15 Site. Detailed hydrologic studies were undertaken by Poseidon to determine if any muting or restriction of tidal flows would occur at these sites and design changes were made to promote full tidal exchange. The hydrologic modeling shows some muting at the lower end of the tidal range for the floodplain portion of the project due to some deposition within the Otay River channel; however, this is not expected to present any problem in water quality or establishment of a mix of subtidal or intertidal habitats. The inlets to the Pond 15 Site have been designed to allow for a full tidal exchange.
Elevation	Higher elevations can lead to the need for excessive amounts of material to be excavated and trucked off site	Both sites are within the boundary of historic tidal marsh and transitional habitat in San Diego Bay and therefore are close to the elevations associated with tidal marsh habitats. Some excavation and subsidence has occurred within the Pond 15 Site. The project has been designed to minimize the amount of material that will be trucked off site. Excess materials excavated from the Otay River Floodplain Site will be transported to the Pond 15 Site to raise elevations suitable to create vegetated tidal marsh and nesting sites. The project is generally balanced overall in terms of cut and fill.
Existing Conditions	Minimal development exists in the surrounding area and existing conditions are largely degraded due to past or current uses	The past and current use of the restoration areas is for solar salt production through evaporation in sequential ponds that lead to crystallizer beds. As a result, high levels of salinity are present either in the soils or in the brines within the Pond 15 Site. This has minimized the presence of sensitive biological resources and the occurrence of high value habitats. While the Pond 15 Site is used by migratory birds, including the California least tern, and the Otay River channel is occupied by the light footed clapper rail, the project construction windows and buffers can be designed to minimize impacts to these species. Project design will result in substantial restoration of habitat for tidal wetland species, a net increase in wetland area, and minimal impact to sensitive habitats or species. In addition, the restoration areas are either surrounded or abut open space areas and there is substantial undeveloped buffer around the restoration sites to assure that wetland habitat and sensitive species will remain undisturbed.
Accessibility	Constructability is feasible without new construction access	Both sites have suitable access for construction access, staging, and transport of materials and workers. Alternative access routes are possible as are construction methods.

Table 14
Site Opportunities and Constraints Related to the Development of the Final Restoration Plan

Category	Specific Issue	Design Consideration
Long term maintenance and management	Site is located within the Refuge	Management will be provided by the Service in conjunction with other lands owned by the Service once the performance standards are met.
	Constraints	
Flooding	100 year flood conditions could change as a result of the project	The excavation and change in land configuration could have an effect on the 100 year flood elevations. The project design has been evaluated for any changes in the 100 year flood elevations based on standard FEMA modeling and adjustments have been made in the project design to eliminate any change in 100 year flood elevations as a result of land change.
Soil contamination	Soil contamination could result in substantial amount of soil being trucked to off-site locations	Soil sampling was conducted in both the Otay River floodplain and the Pond 15 Site. Some elevated levels of DDT, DDE, and its degradation products, as well as toxaphene, were found in the Otay River floodplain. It was determined that if these areas were disturbed, the soils could not be reused for restoration purposes and would need to be disposed of within an approved landfill. This would have made the project infeasible. Therefore, the project footprint was changed to avoid impacting or disturbing these areas. Additional soil sampling will be conducted during the excavation process to assure that contaminated soils are not used in any portion of the restoration site.
Air Quality	Truck traffic could contribute to exceedance of air pollution standards	The project has been designed to minimize truck traffic, either to haul materials off-site or to transport materials within the project footprint. Alternative means of transporting excavated sediment have and will be considered to further reduce truck traffic, including the use of slurry transport through pipes. Appropriate mitigation will be adopted to reduce air quality impacts during construction.
Sensitive Species	Sensitive species may be disturbed or killed during project construction	Light footed clapper rail, western snowy plover, and the California least tern are known to occur in the area and may occur in the construction area. The project will require permitting from the US Fish and Wildlife Service through a Federal Endangered Species Act Section 7 consultation with the U.S. Army Corps of Engineers and appropriate pre-construction surveys, construction best management practices, and environmental work windows will be established to protect these species. The project will have beneficial effects for these species after construction.
Existing wetlands	Existing wetlands within the footprint of the project	There are some existing degraded wetlands within the Otay River floodplain footprint. The project will not receive any credit towards the requirements of the MLMP for any wetland area converted to tidal wetland and will need to provide 4:1 mitigation for any existing wetland converted to upland (for flood control levees). The project has been designed to accommodate these impacts and will still meet the MLMP requirements. The Pond 15 Site is an existing industrial solar salt production pond but does have some ecological function for migratory birds. As a result, the applicant undertook a functional lift assessment in consultation with the Science Advisory Panel appointed by the California Coastal Commission. It was determined that for each acre that was restored to tidal habitat within the Pond 15 Site, only 0.75 acres would be applied towards the MLMP requirements.

4 RESTORATION PROJECT DESCRIPTION

4.1 Introduction/Background

This restoration plan focuses on the restoration activities, which are planned to accomplish a set of site-specific and regional goals. The goals are listed in Section 5.2 of this FRP, as well as explanation of compliance of each goal.

As discussed in Section 1.0, the Intertidal Alternative addressed in the Draft EIS is the preferred alternative. This restoration plan is a reflection of the Intertidal Alternative, which is shown in Figures 16, 17, 18, and 19 below. Figures 16 and 17, Otay River Floodplain Site Restoration Year 2018 and Pond 15 Site Restoration Year 2018, respectively, show the two sites upon completion of restoration, while Figures 18 and 19, Otay River Floodplain Site Restoration Year 2050 and Pond 15 Site Restoration Year 2050, respectively, show the two sites under a 2050 mean sea level rise assumption of 1.17 feet. Restoration activities will occur at two separate non-contiguous locations within the Refuge: (i) the Otay River Floodplain Site and (ii) the Pond 15 Site. The approximately 78-acre Otay River Floodplain Site is located west of Interstate 5 (I-5) between Main Street to the north and Palm Avenue to the south. The Pond 15 Site consists of an approximately 90-acre solar salt pond located in the northeast portion of the Refuge, to the northwest of the intersection of Bay Boulevard and Palomar Street in Chula Vista.

The ORERP will involve excavation of a portion of the Otay River Floodplain Site and fill of the Pond 15 Site to create elevations suitable for subtidal, intertidal mudflat, intertidal coastal salt marsh, and transitional habitats as well as associated uplands. Restoration conducted in the Otay River Floodplain Site will be limited to the portion of the floodplain located west of Nestor Creek, as shown in Figures 16. This is due in part to presence of contaminated soils on the eastern portions of Refuge from past agricultural uses. Within this portion of the Otay River Floodplain Site the ground will be lowered to elevations suitable to support the target wetland habitats and wetland-associated upland habitats. In addition, the existing dike running through Pond 20A will be removed and the flood protection functionality of this feature will be replaced through construction of a levee along the southern boundary of this portion of the Otay River Floodplain Site. No restoration activities will be conducted in the former agricultural areas east of Nestor Creek, but this area will be available and used for staging associated with construction. In addition to the work in the Otay River Floodplain Site and Pond 15 Site, a portion of the existing dike between Salt Ponds 21 and 22 will be raised two feet to offset potential project-induced flood impacts. Besides earthwork, the restoration project might include slope armoring (e.g., riprap) to protect the Bayshore Bikeway Bridge and a railroad bridge located just under the Bayshore Bikeway Bridge. The need for this slope protection will be evaluated as part of final design and permitting.

The restoration plan is composed of approximately 20% intertidal mudflat and 80% intertidal salt marsh as shown in Figures 16 and 17. Both the Otay River Floodplain Site and the Pond 15 Site will be planted with a mix of native wetland vegetation that will mature into low marsh, mid marsh, and high marsh vegetative communities. The intertidal areas and unvegetated mudflat will provide foraging habitat for adult and juvenile fish. Specific details regarding each habitat type are discussed in Section 4.2 below.

4.2 Detailed Description of Project Components

4.2.1 Subtidal Habitat

All of the approximately 9.5 acres of subtidal habitat will be located within the Pond 15 Site upon completion of restoration. Under the 2050 sea level rise assumptions, the Otay River Floodplain Site is anticipated to still have no subtidal habitat, while the Pond 15 Site is anticipated to increase to 13.5 acres of subtidal habitat.

4.2.2 Intertidal Mudflat Habitat

Upon completion of restoration, approximately 5.2 acres of intertidal mudflat habitat will be located within the Otay River Floodplain Site and approximately 17.9 acres will be located within the Pond 15 Site. Under the 2050 sea level rise assumptions, both intertidal mudflat habitats would increase to 16.6 acres and 31.4 acres within the Otay River Floodplain Site and the Pond 15 Site, respectively.

4.2.3 Intertidal Coastal Salt Marsh Habitat

Upon completion of restoration, approximately 24.6 acres of intertidal coastal salt marsh habitat will be located within the Otay River Floodplain Site and approximately 55.8 acres will be located within the Pond 15 Site. Under the 2050 sea level rise assumptions, the salt marsh habitat within the Otay River Floodplain Site is anticipated to increase to approximately 48.4 acres, while the habitat in the Pond 15 Site is anticipated to decrease to 39.8 acres. The salt marsh habitats will be planted with species that include California cordgrass, Salt marsh daisy, Sea lavender, and saltgrass. Detailed discussion of plantings is found in Section 4.3 below.

AERIAL SOURCE: Bing maps. Contours from U.S. Fish and Wildlife Service.
HORIZONTAL DATUM: California State Plane, Zone 6, NAD83, U.S. Feet.
VERTICAL DATUM: NAVD88.

LEGEND:

- ●#-# Actual Core Sampling Location
- ▲#-# Actual Grab Sampling Location
- Salt Pond Boundary
- —5— Existing Contour

SOURCE: Anchor QEA, L.P., 2013

FIGURE 16
Soil Sampling Locations - Pond 15 Site

Final Restoration Plan for the Otay River Estuary Restoration Project

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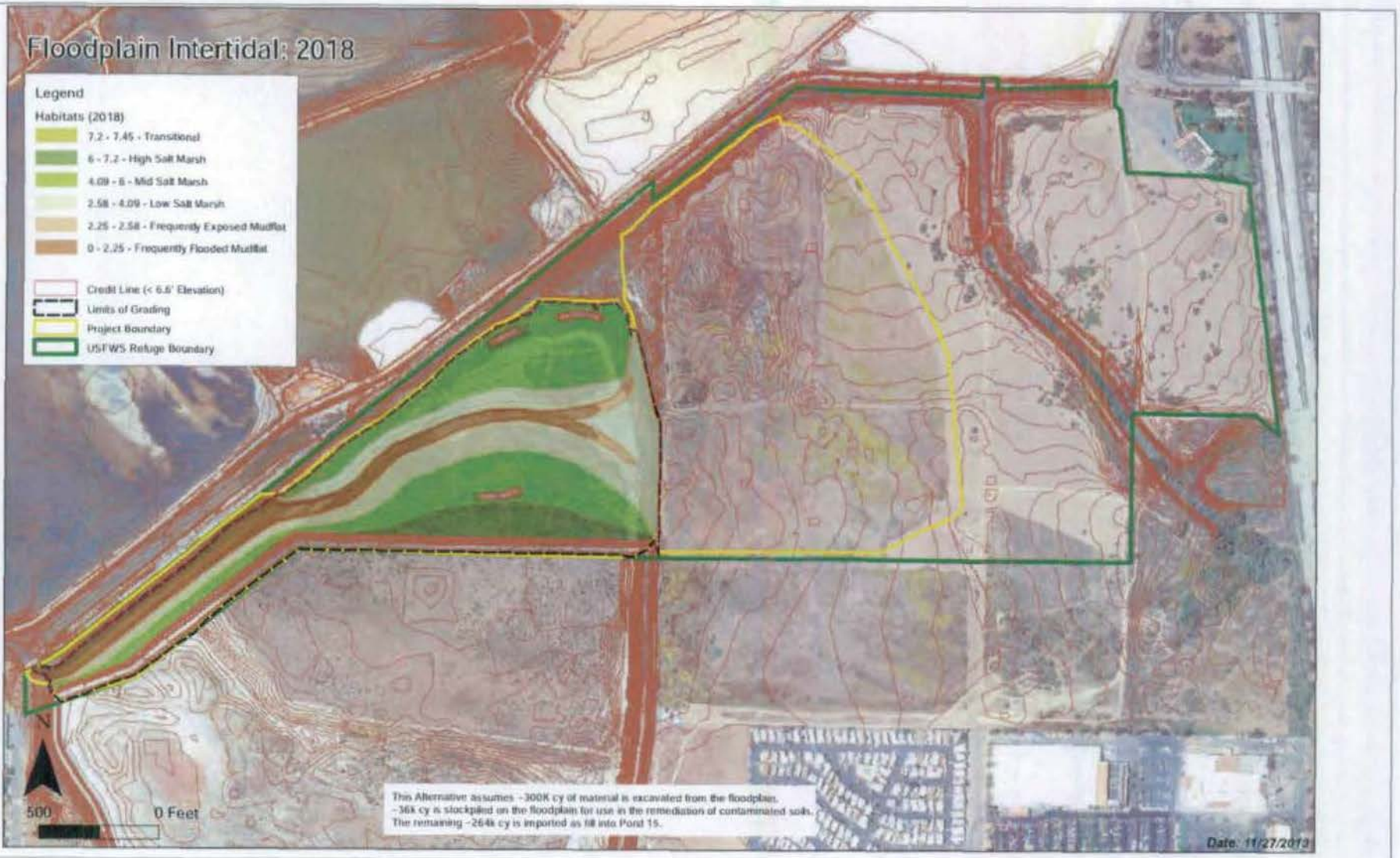

FIGURE 17
Otay River Floodplain Site Restoration Year 2018
Final Restoration Plan for the Otay River Estuary Restoration Project

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SOURCE: USFWS

FIGURE 18
Pond 15 Site Restoration Year 2018
Final Restoration Plan for the Otay River Estuary Restoration Project

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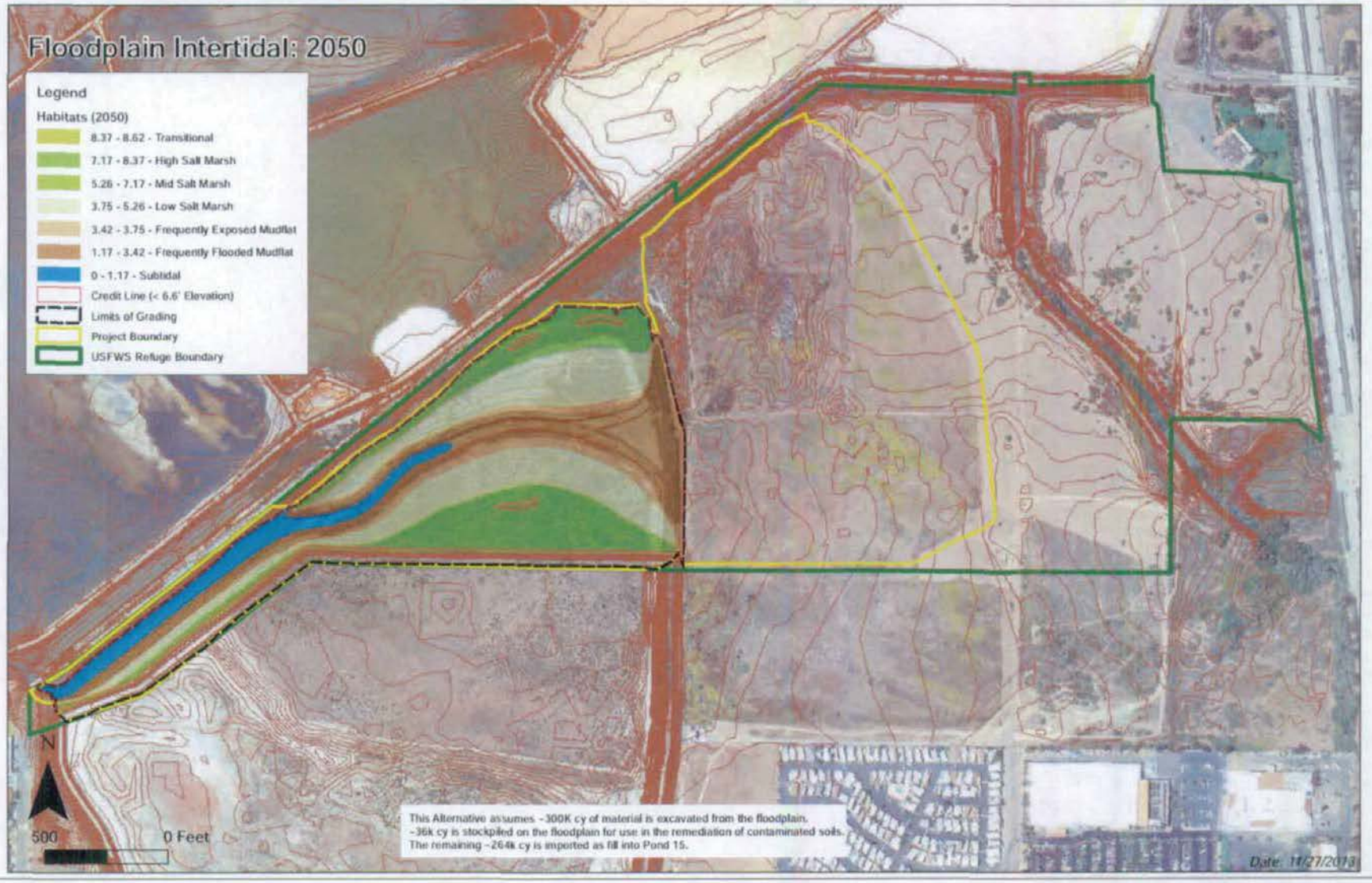

FIGURE 19
Otay River Floodplain Site Restoration Year 2050
Final Restoration Plan for the Otay River Estuary Restoration Project

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4.2.4 Transitional Habitats

A relatively small portion of the upland habitats will be restored as transitional habitats. Approximately 0.7 acres and 0.4 acres will be located within the Otay River Floodplain Site and the Pond 15 Site, respectively. Under the 2050 sea level rise assumptions, the transitional habitat located within the Otay River Floodplain Site is anticipated to increase slightly to 0.8 acres, while the Pond 15 Site transitional habitat is anticipated to decrease slightly to 0.4 acres. The transitional habitats will be planted with species that include alkali weed, saltgrass, and boxthorn. Detailed discussion of plantings is found in Section 4.3 below.

4.2.5 Nesting Sites

Nesting sites will be created to increase suitable habitat for birds that include the California least tern, the light-footed clapper rail, the western snowy plover, and colonial nesting seabirds.

4.2.6 Tidal Inlet at Pond 15 Site

In order to allow for tidal influence at the restored Pond 15 Site, an approximately 200 foot wide portion of the levee separating the Pond 15 Site from San Diego Bay will be removed.

4.2.7 Stockpile Sites

All suitable excavated material from the Otay River Floodplain Site will be placed within the Pond 15 Site, as well as fill for levees and berms as described below. The remainder of the material will be stockpiled within the Otay River Floodplain Site, but outside the restoration area and where there is no existing soil contamination. The stockpiled soils will be spread and compacted using conventional earthmoving equipment, watered during construction to mitigate for dust generation, and seeded with temporary vegetation once construction is complete to control wind and water-related erosion until the stockpile material can be reused. The Service anticipates that the stockpiled soils can be used to fill the eastern portion of the site, once the contaminated soils are properly removed. The stockpiled material will remain upon completion of restoration for use by the Service on future projects within the Refuge.

4.3 Hydrologic Modeling

4.3.1 Tidal Modeling Results

The model, analysis methods, and supporting data bases used herein are the same as those utilized in the Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the San Dieguito Wetland Restoration Project, (EIR/EIS, 2000), and for the preparation of the San Dieguito Wetlands Restoration Project, Final Restoration Plan, (SCE, 2005). Monitoring data for the newly completed San Dieguito Lagoon Restoration Project was also used to calibrate tidal

the hydraulics model. San Dieguito Lagoon was selected as a proxy for the restoration alternatives because of morphologic similarities: in particular, both restoration sites have a long "goose-neck" feeder channel connecting source water to interior tidal basins of comparable acreage and distance from the source water. Habitat surveys conducted during the San Dieguito Lagoon Restoration Project by Josselyn & Whelchel (1999), and then later updated by vegetation surveys in the lower Otay River flood plain by Josselyn (2012), were used to develop functional relationships between habitat breaks and amounts of time for wetting and drying (hydroperiod functions). These relationships were used to transpose tidal hydraulics model output into calculations of acreage of various wetland habitat types created by the restoration alternatives. Calculations of habitat creation were based on long-term tidal hydraulics simulations using tidal forcing at the mouth of the Otay River, derived from a spectral correction applied to the NOAA tide gage #941-0170 located at the Navy Pier.

Figure 21, Intertidal Plan Spring Flood Tide Progressive Vector Flow Simulation, gives the flow trajectories and depth averaged tidal currents computed by the calibrated TIDE_FEM model during spring flooding tides on 18 September 2009. Velocities of tidal currents are portrayed according to the color coded velocity scale appearing in the lower left corner of the figure. Maximum flooding spring tidal currents in the deeper sections of the inlet channel to the proposed Otay River Floodplain Site basin (north/south reach of the Otay River near its mouth) are about 0.10 m/sec (0.33 ft/sec), and then accelerate in the narrower east/west reach to 0.2 m/sec (0.66 ft/sec) before entering the Otay River Floodplain Site tidal basin. Flood tide currents entering the tidal basin initially form a well-defined jet at the west bank with speeds of about 0.08 m/s (0.26 ft/sec). This entry jet quickly diverges into a complex set of clockwise rotating eddies that populate the interior of the tidal basin. Eddy speeds in the tidal basin are on the order of 0.02 m/sec (0.07 ft/sec), insufficient to transport fine sand but an important stirring mechanism for mixing the tidal basin water mass to maintain high oxygen levels and to sustain fine silt and clay sized sediment particles in suspension. Maximum flooding spring tidal currents in the inlet channel to the Pond 15 Site are about 0.07 m/sec (0.22 ft/sec), and then decelerate as a weak entry jet with speeds of about 0.05 m/s (0.16 ft/sec). This entry jet also quickly diverges into a complex set of counter rotating eddies that populate the interior of the tidal basin. Eddy speeds in the Pond 15 Site tidal basin are on the order of 0.01 m/sec (0.03 ft/sec), again insufficient to transport fine sand or cohesive silts, but also providing a stirring mechanism for mixing the Pond 15 Site water mass to maintain high oxygen levels and to sustain suspension of fine silt and clay sized sediment particles.

Figure 22, Ebb Tide Progressive Vector Flow Simulation at Mean Low Water, gives the flow trajectories and depth averaged tidal currents computed by the TIDE_FEM model during spring ebbing tides on 18 September 2009. The wetted area of the Otay River Floodplain Site tidal

basin is significantly reduced relative to the flood tide area in Figure 21, due to the fact that the grading plan allows for almost complete drainage at mean low water tidal stages. In Figure 22 creeping flow drains from the remnant dendritic channel on the north side of the Otay River Floodplain Site basin, forming a feeder current in the upper river channel with speeds on the order of -0.01 m/sec (-0.03 ft/sec). This feeder current evacuates the tidal basin and then accelerates to -0.1 m/sec (-0.32 ft/sec) as it passes through the pinch point under the railroad bridge in the narrow east/west reach of channel. (We adopt the convention of negative velocities for ebb tide flows and positive velocities for flood tide flows.) Ebb flow in the channel then decelerates to -0.08 m/sec (-0.26 ft/sec) in the deeper north/south reach before discharging into San Diego Bay. In the Pond 15 Site during ebb tide flow at mean low water level, the eastern half of the basin is completely drained and exposed, while a week feeder current evacuates the western half with ebb flow of about -0.02 m/sec (-0.07 ft/sec). This feeder current accelerates to about 0.08 m/sec as it flows out the inlet of Pond 15 Site, and is far below the threshold scour speed of the sediments along the bank of the Chula Vista Wildlife Reserve.

Comparing the standard Hjulstrom Curve against the median grain sizes from the project borings reported in Section 2.7 indicates that native sediments in the lower Otay River Channel and near the inlet to Pond 15 Site have a threshold of motion of 0.72 ft/sec (0.22 m/s). Tidal current speeds between 0.35 ft/ sec (0.1 m/sec) and 0.72 ft/sec (0.22) would lead to bed load transport but not erosion. Erosion and scour would only occur for tidal currents that exceed 0.72 ft/sec, while currents less 0.35 ft/sec would yield deposition. Comparing these sediment thresholds to the tidal currents predicted for maximum range spring tides in Figures 21 and 22, it can be concluded that the only potentially problematic areas are at the two pinch points in the east/west reach of Otay River channel during flooding tides (Figure 20). Scour is a non-factor in the inlet to Pond 15 Site due to the very low current speeds through that relatively wide inlet. Some spot channel hardening may be advisable at the Otay River pinch points, but otherwise there are no apparent tidal current scour or erosion concerns with the restoration plan during either flood or ebb flow, not even during maximum range spring tides such as occurred on 18 September 2009.

The hydroperiod function (used to calculate the habitat acreage creation of the restoration plan) is calculated by the model for both present and future extremes of sea level in the year 2050 from estimates of both maximum and minimum sea level rise. By the California State CAT-OPC guidance, sea level rise projections range between 4.68 and 24 inches (12 to 61 cm) by 2050. To calculate the hydroperiod function for these potential future sea levels, it is necessary to anticipate the tidal response inside San Diego Bay to these ranges of sea level rise on the open coastline. Two approaches are used. The first is linear superposition of the open ocean sea level rise on to the present 30 year time series of south San Diego Bay tides developed from spectral corrections to the NOAA Navy Pier tides detailed in Section 2.6.4. The second is to apply a

spectral correction derived from the Navy's Bay tide model for sea level rise (ICLEI, 2012). Figure 23, Comparison of South San Diego Bay tides for Present Sea Level versus South Bay Tidal Response on 2050, shows a data snippet comparing tides at the mouth of the Otay River at present sea level (gray) versus the South Bay tidal response predicted for 2050 by the linear superposition method (red) and by the spectral correction method (blue). Obviously the higher-high and lower-low water levels will all be higher in 2050 based on the maximum CAT OPC guidance for sea level rise of 24 inches. The decisive issue is what will the South Bay tidal range be at these higher sea levels. The linear superposition method predicts the exact same tidal range as present, only oscillating around a 2 ft. higher sea level. The spectral correction method predicts the exact same higher high water levels as the linear superposition method, but yields a larger tidal range. This is due to the fact that the 2050 tidal spectra derived from the Navy's Bay tide model predicts principal spectral peaks with a diminished second harmonic of the K1 lunar-solar diurnal tidal constituent at the mouth of the Otay River, (Figure 24), indicating diminished bottom friction over the South Bay Shelf due to two feet of additional water depth at higher sea level. Also there is further enhancement of resonant triad sub-harmonic (difference frequency) between the K1 lunar-solar diurnal tidal constituent and the M2 principal lunar semi-diurnal tidal constituent measured at the mouth of the Otay River, (Figure 23), indicating bathymetrically trapped tidal oscillations on the South Bay Shelf has intensified in the presence of deeper water and diminished bottom friction.

Using these various methods for providing long-term, locally relevant tidal forcing for the model, the hydroperiod functions are calculated at present and future sea levels for the Otay River Floodplain Site basin in Figure 25, Hydroperiod Function of Restoration Plan on Otay River Floodplain Site, and for the Pond 15 Site basin in Figure 26, Hydroperiod Function for the Restoration Plan - Pond 15 Site Tidal Basin. The elevation breaks (zonation) between the different wetland habitat types from the hydroperiod curves are summarized in Tables 15 and 16. The elevations for the habitat breaks in these figures and tables are applied to the KTUA grading designs and yield the acreages of habitat creation discussed in Section 4.7. For all possible sea level scenarios, the elevation limit of subtidal habitat in the Otay River Floodplain Site basin is limited by existing bars and channel bottom features at the inlet and inside the branch channel into this basin that create an inlet sill at 0.0 ft NAVD 88. The restoration plan calls for no construction dredging of the existing Otay River channel so as not to disrupt existing habitat residing down-river from the inlet to the Otay River Floodplain Site basin. That existing down-river habitat consist of additional mud flat residing below – 0.0 ft NAVD 88 and subtidal habitat below -1.01 ft NAVD 88. Low tide drainage of the Pond 15 Site is constrained by the tidal muting of the South Bay Shelf, which varies with sea level. At present sea level, Pond 15 Site will not drain below – 1.65 ft. NAVD 88. However, with a moderate amount of sea level rise, the linear SLR = 4.68 in. solution indicates a moderate improvement in drainage to – 1.70 ft NAVD

88. If sea level were to rise by 2 ft. according to the maximum sea level rise prediction in 2050, the available tidal range is not sufficient to prevent a rise in subtidal elevations in Pond 15 Site. This amount of sea level rise will raise the elevations of the zonation of all habitat types (Figure 25). This upward displacement of wetland zonation is largest for the linear superposition scenario, because the spectral correction scenario predicts a larger tidal range of about 1.0 ft. Under the 24 in. spectral sea level rise scenario at 2050, intertidal wetland habitat would begin at an elevation 0f -0.25 ft NAVD, and the mud flat habitat would reside about 0.4 ft - .0.5 ft. lower than under the linear super-position scenario; while the low marsh habitat would reside about 0.25 ft. lower than under the linear super-position scenario. Therefore there is some apparent differences between the habitat mix predictions of these two sea-level rise prediction methods; although both give the same estimate of the maximum elevation of high salt marsh wetland zonation in both of the propose basins of the restoration plan.

Table 15
Elevations of Habitat Breaks in the Otay River Floodplain Site Basin

Elevation of Habitat Breaks (Units of ft. NAVD 88)	@ Present Sea Level	@ 4.68 in. linear Sea Level Rise	@ 24 in. linear Sea Level Rise	@ 24 in. spectral Sea Level Rise
Sub-tidal	0.00 ft.	0.00 ft.	0.25 ft.	0.00 ft.
Frequently Flooded Mud Flat	2.40 ft.	3.40 ft.	4.50 ft.	4.10 ft.
Frequently Exposed Mud Flat	2.70 ft.	3.70 ft.	4.85 ft.	4.45 ft.
Low Marsh	4.30 ft.	4.90 ft.	6.55 ft.	6.25 ft.
Mid Marsh	6.30 ft.	6.80 ft.	8.55 ft.	8.50 ft.
High Marsh	7.55 ft.	8.05 ft.	9.85 ft.	9.85 ft.

Table 16
Habitat Breaks in the Pond 15 Site Basin

Elevation of Habitat Breaks (Units of ft. NAVD 88)	@ Present Sea Level	@ 4.68 in. linear Sea Level Rise	@ 24 in. linear Sea Level Rise	@ 24 in. spectral Sea Level Rise
Sub-tidal	-1.65 ft.	-1.70 ft.	0.25 ft.	-0.25 ft.
Frequently Flooded Mud Flat	2.40 ft.	2.50 ft.	4.50 ft.	4.10 ft.
Frequently Exposed Mud Flat	2.70 ft.	2.85 ft.	4.85 ft.	4.45 ft.
Low Marsh	4.30 ft.	4.50 ft.	6.50 ft.	6.25 ft.
Mid Marsh	6.30 ft.	6.55 ft.	8.55 ft.	8.50 ft.
High Marsh	7.50 ft.	7.90ft.	9.85 ft.	9.85 ft.

Figure 27, Residence Time of South Bay Water in the Tidal Basin on Otay River Floodplain Site, presents the model results of residence time of South Bay water in the tidal basins of the restoration plan for the Otay River Floodplain Site basin (blue) and the Pond 15 Site basin (red). Residence time of South Bay water is 2 days in the floodplain basin and 3 days in the Pond15 Site basin. Residence time is less in the Otay River Floodplain Site basin because its maximum storage volume at higher-high water level is only 4.4 million cubic ft. and nearly completely drains at mean lower low water levels; whereas the maximum storage volume of the Pond 15 Site basin is 3.6 times greater at 15.9 million cubic ft., and about 700 hundred thousand cubic ft. of water fail to drain after one diurnal tidal cycle. Regardless, the residence time numbers for the restoration are rather good for marginalizing potential dissolve oxygen depletion, although the DO of South water can become quite low during evaporative summer time conditions. Maximum diurnal tidal prisms at present sea levels are 4.3 million cubic ft. for the proposed Otay River Floodplain Site basin; and 15.2 million cubic ft. for the proposed Pond 15 Site basin.

4.3.2 Flood Modeling Results

Using the TUFLOW model, flood modeling was conducted to establish the flow pattern and water elevations during flood events. The flood impact analysis conducted for the 100-year flood includes the Otay River, Poggi Canyon Creek, and Nestor Creek. Flood conditions were analyzed in the existing condition and after restoration, and then compared to evaluate changes in flow pattern and maximum water elevations. In the existing condition, floods inundate the Otay River floodplain and then enter the salt pond area through Ponds 51, 20, and 22, as shown in Figure 28. The salt ponds fill from the west and east sides before overtopping the levees into San Diego Bay. Through restoration, flood flows would be redistributed through the project area and enter the salt ponds through Ponds 51 and 22. A greater amount of flooding would occur from the west side of the salt ponds compared to the east side inundating all the ponds except for the Pond 15 Site, which would be isolated from flood flows. Higher flood elevations in the northern portion of the salt ponds would result in greater flows overtopping into San Diego Bay along Ponds 12 and 14 as well as greater flows into Ponds 28 and 29.

SOURCE: USFWS

FIGURE 20

Pond 15 Site Restoration Year 2050

Final Restoration Plan for the Otay River Estuary Restoration Project

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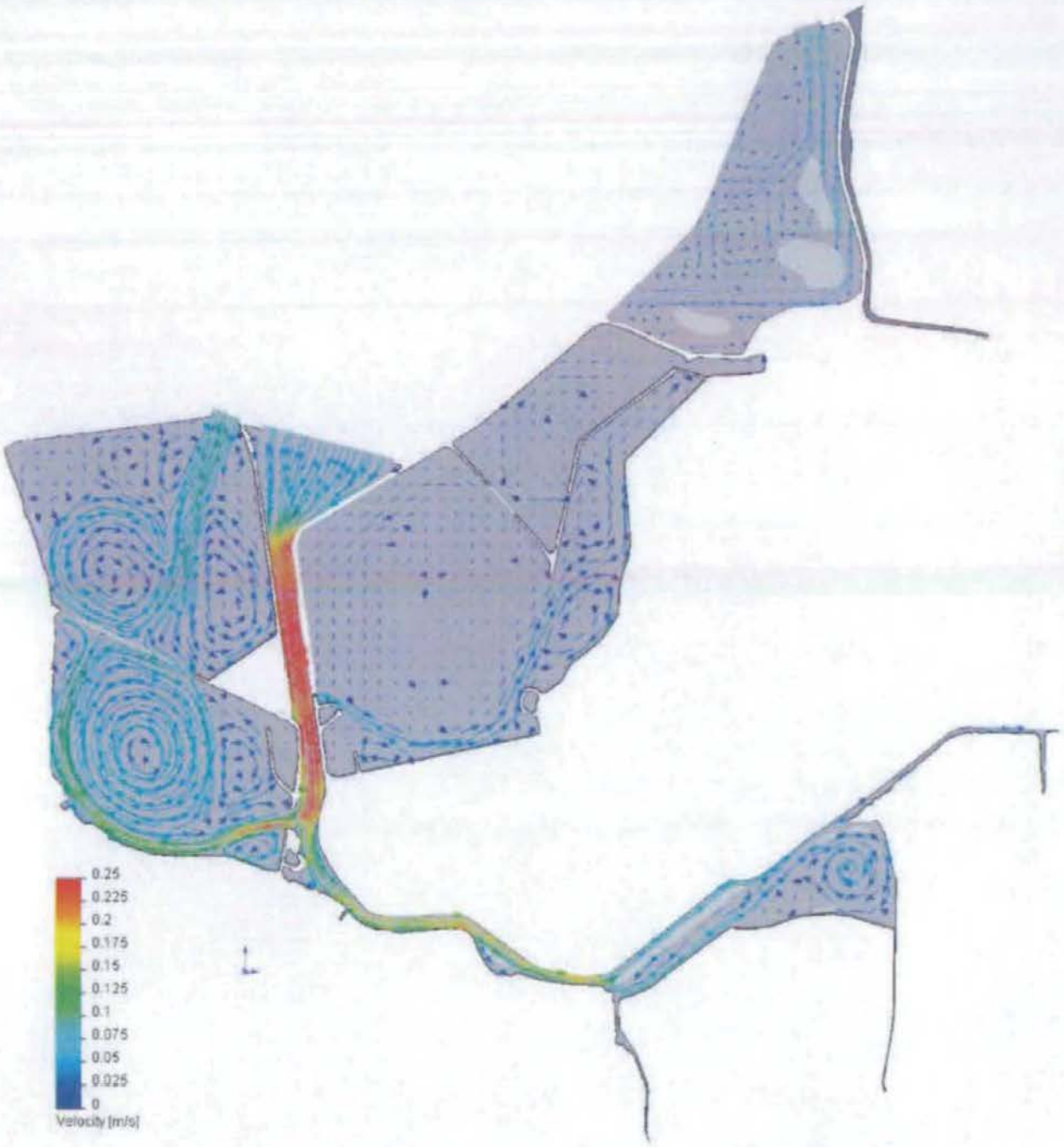

Intertidal Plan Spring Flood Tide Progressive Vector Flow Simulation (30 min time integration).

SOURCE:

FIGURE 21
Intertidal Plan Spring Flood Tide Progressive Vector Flow Simulation

Final Restoration Plan for the Otay River Estuary Restoration Project

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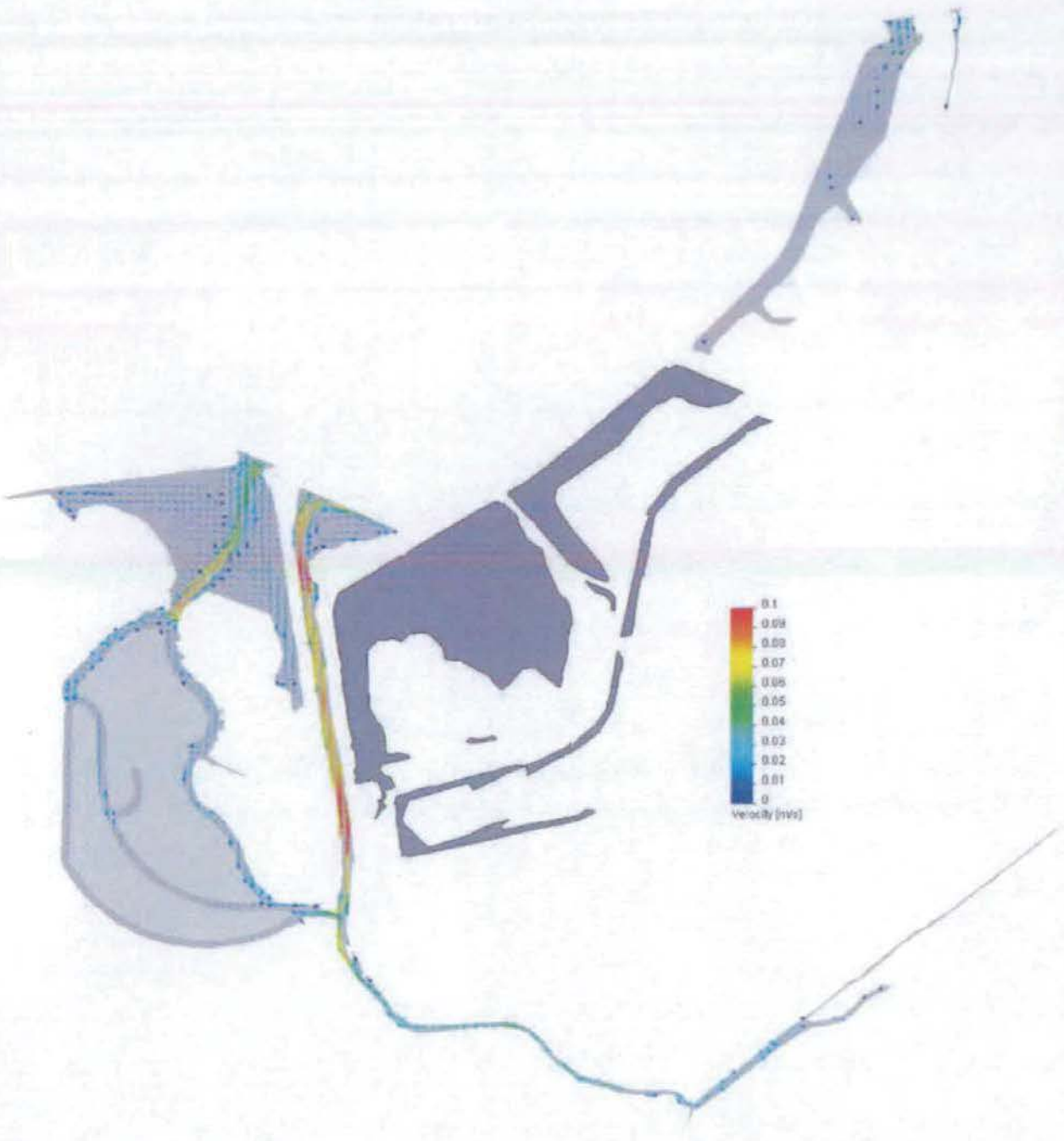

Intertidal Plan Ebb Tide Progressive Vector Flow Simulation at Mean Low Water (30 min time integration)

SOURCE:

FIGURE 22
Ebb Tide Progressive Vector Flow Simulation at Mean Low Water

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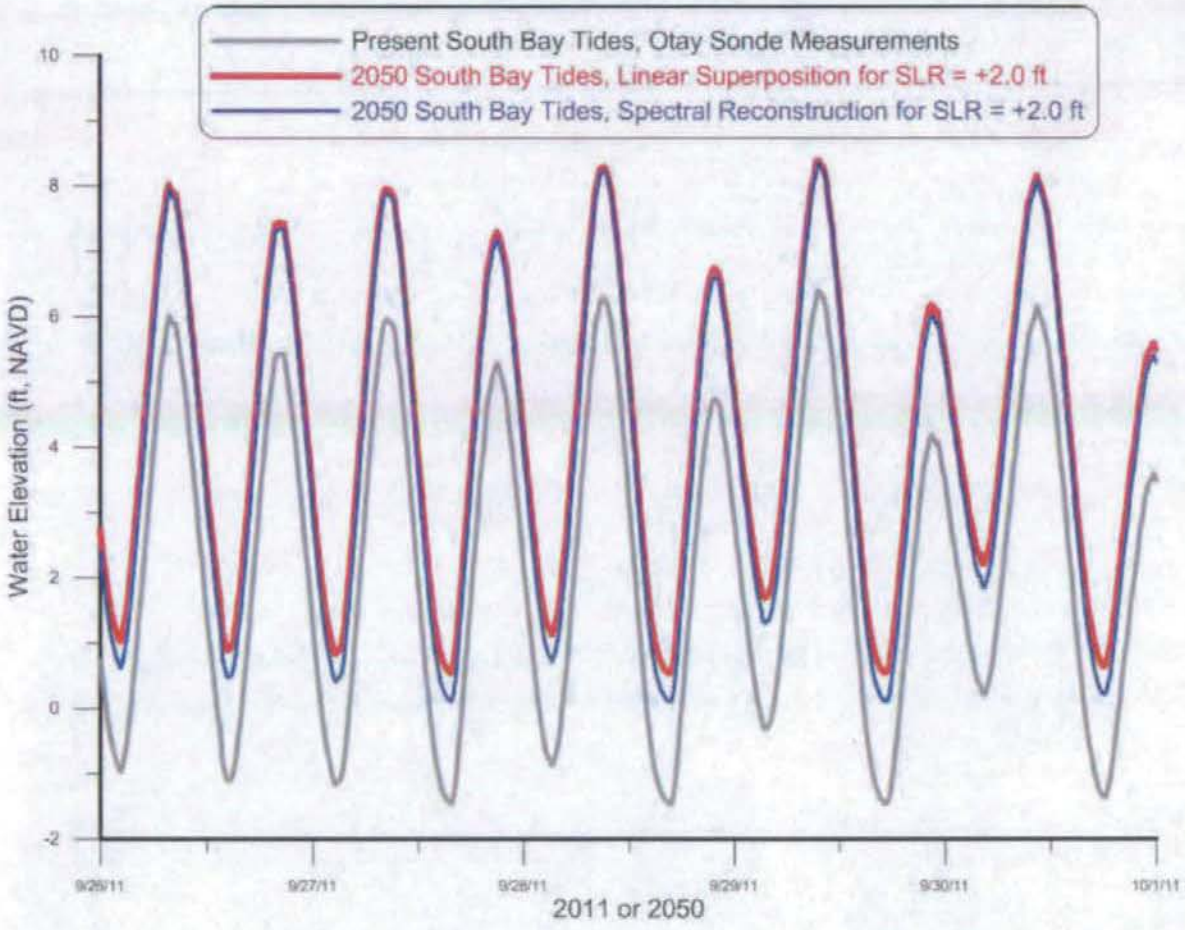

Comparison of South San Diego Bay tides for present sea level (gray) versus South Bay tidal response on 2050 by the linear superposition method (red) and the spectral correction method (blue).

SOURCE:

FIGURE 23

Comparison of South San Diego Bay Tides with Sea Level and 2050 South Bay Tidal Response

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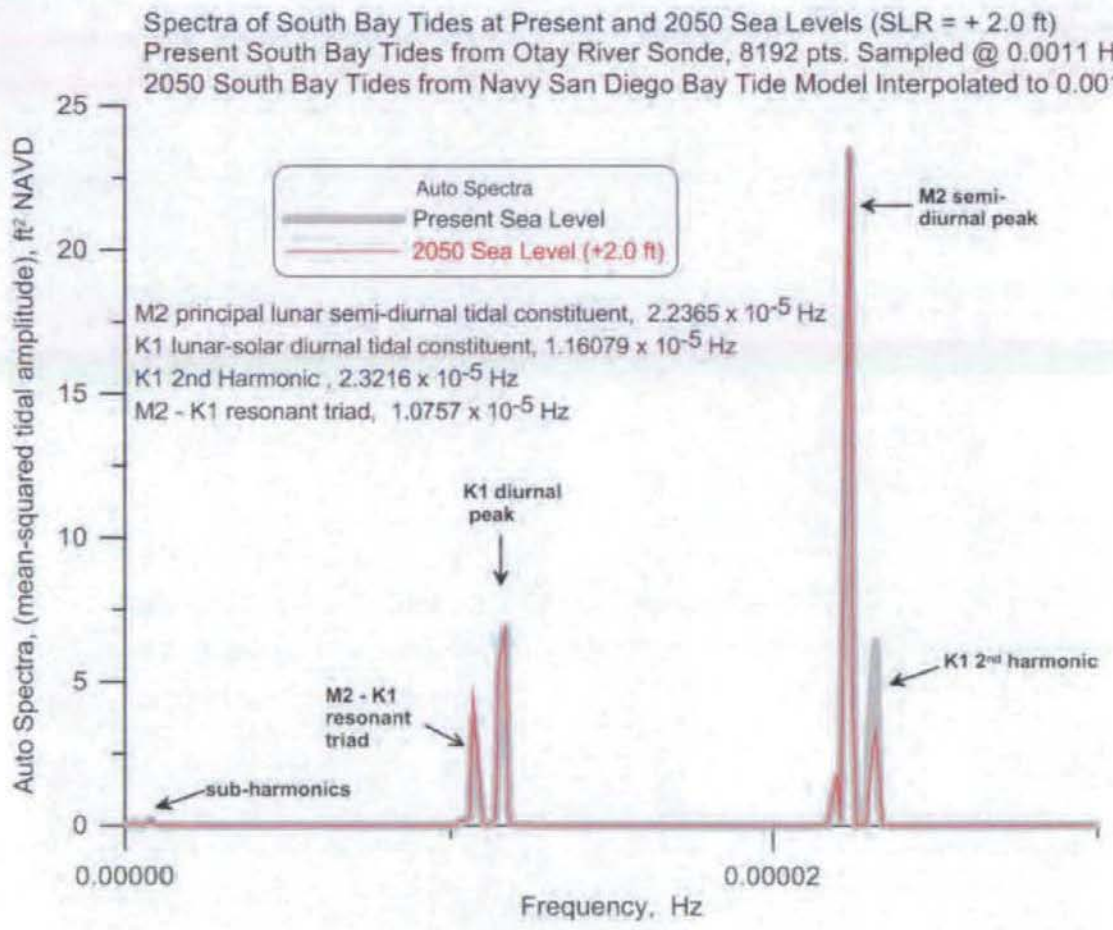

Comparison of spectra South San Diego Bay tides for present sea level (gray) versus South Bay tidal response for maximum estimated sea level rise in 2050 (red).

SOURCE:

FIGURE 24

Comparison of Spectra South San Diego Bay Tides and 2050 South Bay Tidal Response

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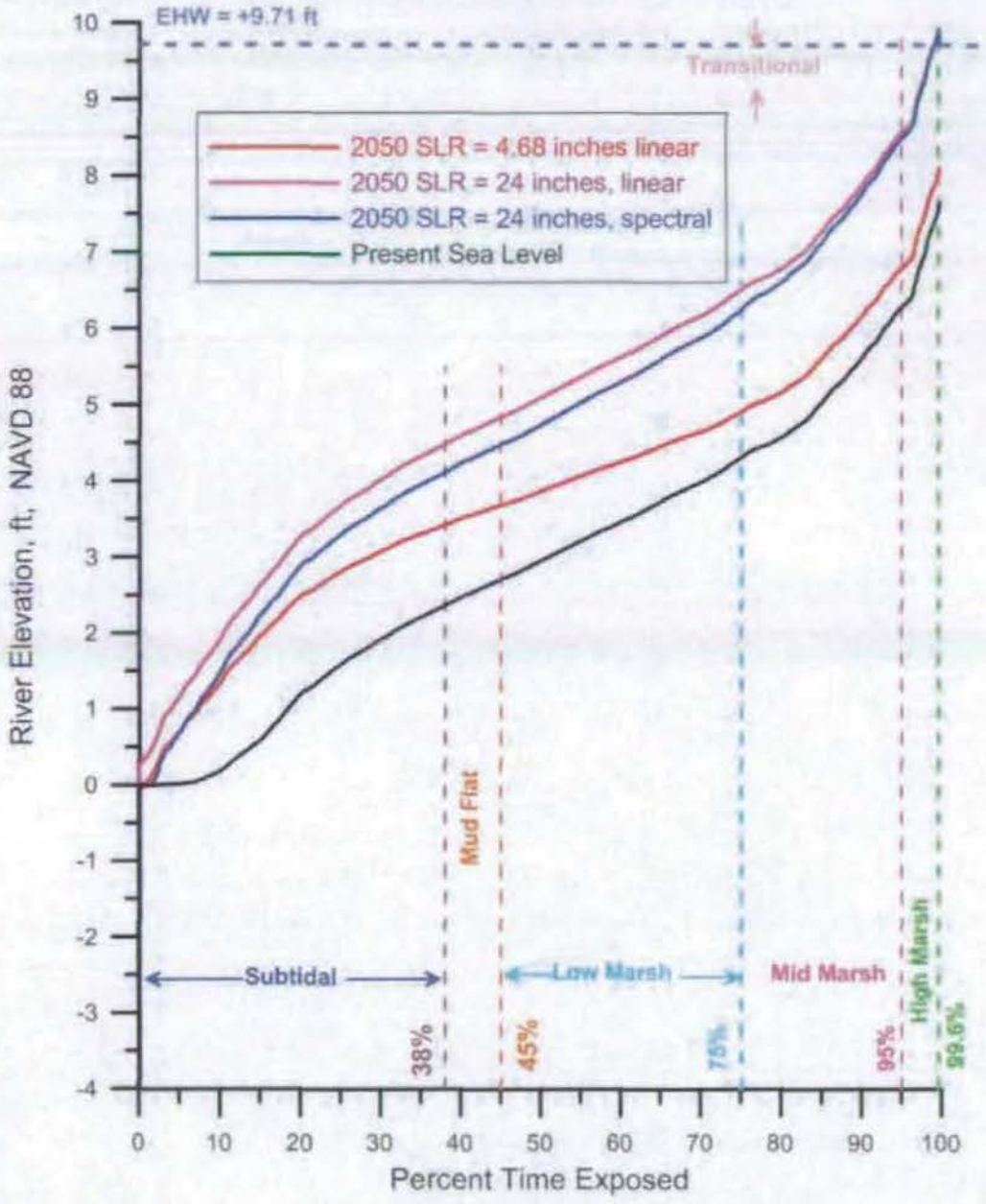

Hydroperiod Function for Intertidal Plan, Otay Floodplain Tidal Basin for present sea level and 2050 sea level rise per CAT OPC guidance. Based on Otay Habitat Survey Data Evaluated By Josselyn (2012) and water level data from NOAA tide gage #941-0170, with spectral correction from Otay River Sonde. Manning's roughness, $n0$ =0.0261

SOURCE:

FIGURE 25

Hydroperiod Function for Restoration Plan on Otay River Floodplain Site

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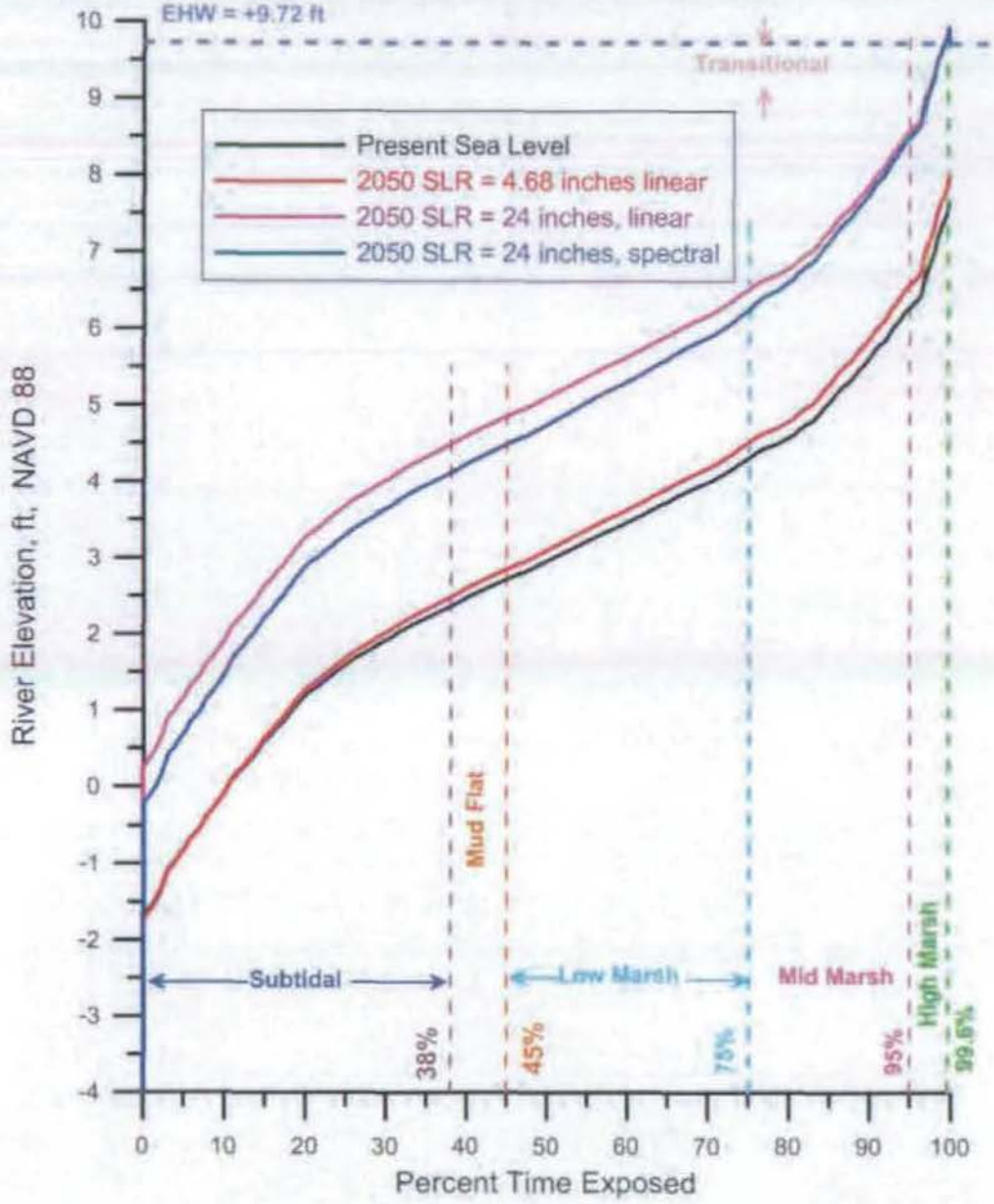

Hydroperiod Function for the Intertidal Plan Pond #15 Tidal Basin for present sea level and 2050 sea level rise per CAT OPC guidance. Based on Otay Habitat Survey Data Evaluated By Josselyn (2012) and water level data from NOAA tide gage #941-0170, with spectral correction from Otay River Sonde. Manning's roughness, $n0$ =0.0261.

SOURCE:

FIGURE 26
Hydroperiod Function for Restoration Plan on Pond 15 Site

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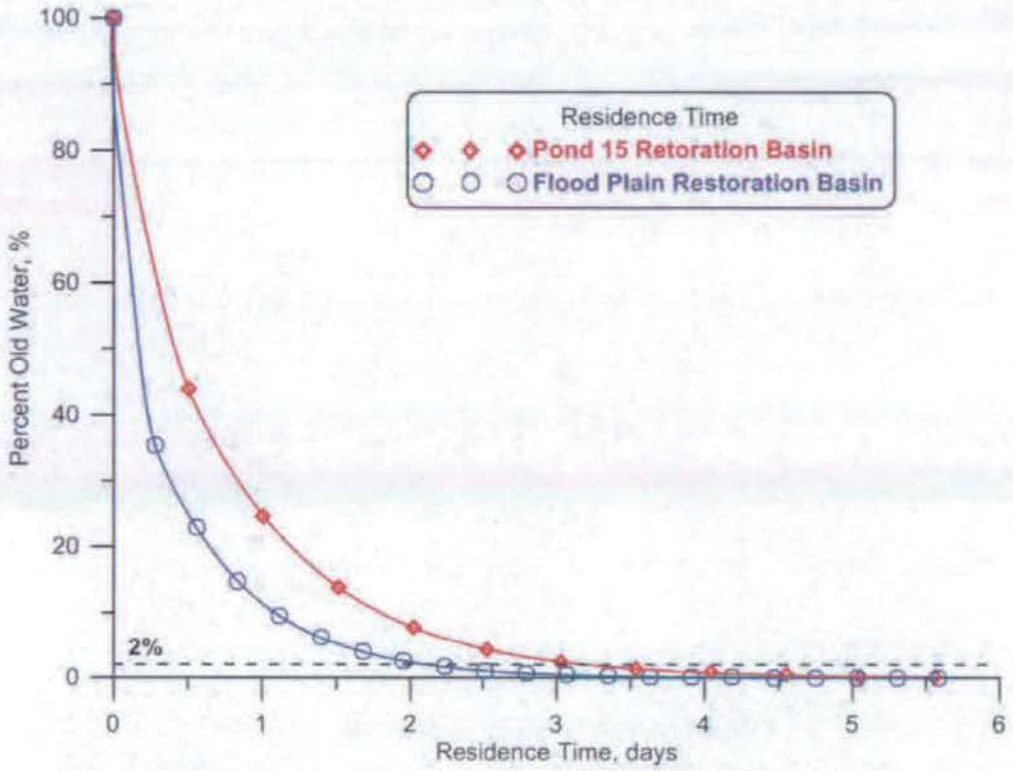

Residence time of South Bay water in the tidal basins of the Intertidal Plan: Otay River floodplain basin (blue); Pond #15 basin (red).

SOURCE:

FIGURE 27

Residence Time of South Bay Water in Tidal Basin on Otay River Floodplain Site

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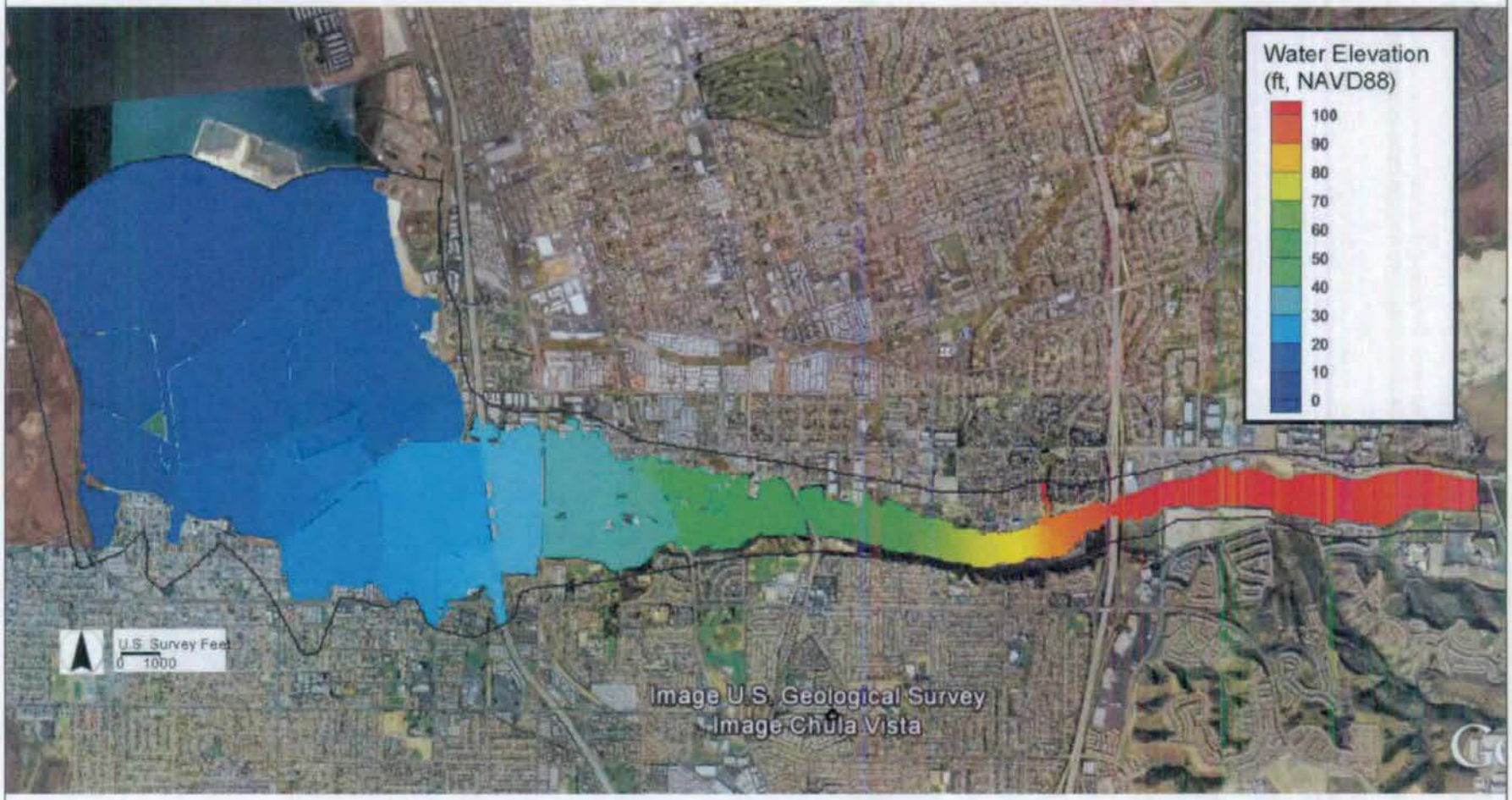

SOURCE: EVEREST INTERNATIONAL CONSULTANTS, INC. 2013

FIGURE 28

100 Year Flood Water Elevations for Existing Conditions

Final Restoration Plan for the Otay River Estuary Restoration Project

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The differences in area flooding between the existing condition and proposed restoration are shown in Figure 29. Reductions in flood elevations primarily occur in the Otay River floodplain, Pond 20A, Pond 15 and Pond 20 through restoration of the Otay River Floodplain Site and Pond 15 Site. In addition, proposed restoration would reduce flood elevations at the north end of the bike path adjacent to Pond 48. In general, the proposed restoration would not change flood elevations in tidally influence areas, including the Western Salt Pond Restoration area (formerly Ponds 10A, 10, and 11). Stockpile areas, the Pond 15 Site, and the residential area near Palm Avenue are susceptible to flooding in the existing condition, but would no longer be flooded after restoration. Increases in 100-year flood elevations were found for the south end of the bike path along Pond 22, Pond 12, 13, 14, 28, and 29. The proposed restoration would not alleviate existing potential flooding of the bike path for extreme flood events (e.g., 100-year flood), but would prevent flooding of the bike path for smaller flood events (e.g., 15-year flood).

4.4 Construction Methods

This chapter describes a range of construction methods and equipment that could be used for the construction of the ORERP. Similar to other coastal wetland restoration projects, the major construction activity of this restoration plan is earthwork.

Construction involves lowering the existing ground elevations in the Otay River Floodplain Site to form subtidal, mudflat, salt marsh, and upland habitats; and filling the Pond 15 Site with excavated material to restore wetland habitats. Specifically, the restoration plan requires the excavation (cut) of approximately 376,000 cubic yards of soil within the Otay River Floodplain Site. Most of the excavated material would be transported to the Pond 15 Site. A small portion of the excavated material would be used to construct a new berm along the southern edge of the Otay River Floodplain Site.

These methods, equipment, and schedules have been developed based on restoration plan requirements and constraints, in combination with experience from past projects of a similar nature. The construction methodology ultimately used would be determined by the contractor selected for construction with due consideration to the requirements specified in permits, agreements, and approval documents. If the selected contractor chooses a construction methodology that is substantially different than those considered herein then additional environmental review may be needed to verify that the restoration plan would not result in substantial environmental impacts beyond those already considered. Figure 30 provides locational information referred to as it relates to construction methods.

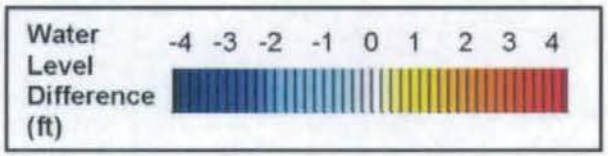
4.4.1 General Construction Methodology

4.4.1.1 Mobilization and Vegetation Removal

Heavy construction equipment may be brought to the both restoration sites either by land or water. Equipment transported by land would likely be trucked to the restoration sites via Main Street. Large and heavy equipment would be transported during off-peak traffic so as to minimize traffic congestion. The site entrance/exit points are discussed in Section 3 above. If transported by water then the construction equipment would likely be brought into the site via San Diego Bay and the Otay River. Some large equipment may be brought into the restoration sites in several pieces and then be assembled on site. Regardless of whether construction equipment is mobilized to the restoration sites from land, sea, or both the potential environmental impacts should be assessed as part of environmental review under NEPA and CEQA. The EIS for the project, prepared concurrently with this FRP, addresses and analyzes the worst-case environmental impacts associated these different options.

Prior to construction, all areas to be graded will be cleared and grubbed with the resulting brush, trash and debris disposed of in a safe and legal manner. Existing southern coastal salt marsh will be avoided to the extent possible; however, there may be minor impacts where the proposed grading daylights at Nestor Creek. Other native vegetation communities on portions of the Otay River Floodplain Site include Isocoma scrub and southern coastal salt marsh. Unvegetated land forms include non-vegetated channels and disturbed habitat. Isocoma scrub comprises the majority of the site with southern coastal salt marsh occurring along the Otay River channel and Nestor Creek channel. These will be impacted during clearing, grubbing and grading but will be replaced with ESHA after completion of the wetland restoration plan.

At the end of construction, the equipment would be demobilized. Demobilization of equipment would use the same route as mobilization. Staging areas, access routes, and other disturbed areas would be uncompacted, revegetated, and restored to preconstruction conditions or as specified in the construction documents. Any temporary equipment, structures, or utilities (e.g., water and power) installed at both the Otay River Floodplain Site and Pond 15 Site would be removed at the completion of construction.



SOURCE: EVEREST INTERNATIONAL CONSULTANTS, INC. 2013

FIGURE 29

100 Year Flood Impacts –Change in Maximum Water Elevations when compared with existing conditions

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SOURCE:

FIGURE 30
Project Construction Areas

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4.4.1.2 Access Routes

Roads that can be used for construction access routes in the vicinity of the restoration sites are shown in Figure 30. Saturn Boulevard is the north-south running road located along the eastern edge of the restoration plan area. The other major roads in the vicinity are Palm Avenue (State Route 75) to the south, Main Street to the north of the Otay River Floodplain Site, and Interstate 5 to the east. There are interchanges to Interstate 5 at Main Street and Palm Avenue. Using one of these interchanges, construction equipment would access the Otay River Floodplain Site via the north-eastern corner of the restoration sites where West Frontage Road, Main Street, and the Bayshore Bikeway intersect. Construction equipment would access the Pond 15 Site via a Service easement located off Bay Boulevard just north of the entrance to the Salt Works operational facility. To complete the construction work on the dike between Ponds 22 and 23, construction equipment would access the site via the main entrance to the Salt Pond Complex located off Bay Boulevard and then wind around the southern boundary of the Salt Pond Complex.

Within the restoration sites, temporary dirt roads would be established to provide access for construction equipment between the excavation, staging, beneficial use, disposal, and fill areas. For material transport, access routes would be established and maintained for public safety and environmental pollution control. To access the western portion of the Otay River Floodplain Site from the construction area, the contractor would have to install temporary crossings across Nestor Creek and Otay River. Access to the construction site would be controlled through the use of gates, fencing, and/or site security services.

Construction equipment transporting material to the Pond 15 Site would utilize some of the existing salt pond dikes. Since the existing dikes were not built to accommodate this use, temporary improvements (e.g., widening and resurfacing) may be necessary depending on the method used to haul material between the excavation site (Otay River Floodplain Site), beneficial use/disposal site (the Pond 15 Site), and fill site (dike between Ponds 22 and 23). Three possible methods for material hauling and disposal are described in Section 4 below.

Staging areas would be located upland away from construction activities. The area east of Nestor Creek in the Otay River Floodplain Site would be used for staging (Figure 30). Stockpiling of excavated material for dewatering and sorting may also be carried out at this location. This area is also near the entrance/exit to/from the excavation site (Otay River Floodplain Site). Any permits and/or approvals required to conduct the dewatering activities would need to be obtained prior to commencing with this activity.

4.4.1.3 Earthwork

Earthwork is the major construction activity of the restoration plan. The restoration plan requires the excavation of approximately 376,000 cubic yards of soil (material) within the Otay River Floodplain Site and from the Pond 15 Site. The majority of the soil would be beneficially used as fill and cover within the Pond 15 Site to raise the ground to elevations suitable to support coastal salt marsh habitat and nesting areas. The excavated material would also be disposed of on-site as fill for dikes, levees, and upland habitat creation. The remainder of the material would be stockpiled within the Otay River Floodplain Site for use on future projects within the Refuge.

If the contractor decides to use land-based equipment to complete the earthwork under dry conditions then it is likely that the work would be done using an approach similar to the one described here. Excavation would most likely be done with land-based equipment for areas above groundwater. Soil within two feet below the groundwater elevation may be wet, but excavation with land-based equipment would likely still be feasible without dewatering. In locations where groundwater is present, dewatering would likely be necessary to conduct work under dry conditions.

Land-based excavation would be conducted with a combination of bulldozers, front loaders, backhoes, graders, scrapers, excavators, and trucks. Excavated material would either be loaded directly onto trucks and conveyor belts or it would be stockpiled temporarily near the excavation site. The stockpiled material would then be loaded onto trucks for hauling to the placement sites (Pond 15 and Pond 22/23 dike).

If excavation is conducted using land-based equipment below +3 feet, NAVD88, dewatering may be necessary. Dewatering may be achieved by blocking off the excavation site and then pumping water out of the excavation site. Alternatively, wet material may be excavated by a long-reach excavator and then dewatered on site before being hauled to the placement sites.

If the contractor decides to use a combination of land-based and water-based equipment to complete the earthwork under wet conditions then it is likely that the work would be done using an approach similar to the one described here. The contractor would use land-based equipment to excavate material from the Otay River Floodplain Site in matter as described in Section 4.1.1.3. Material excavated from the Otay River Floodplain Site would be dumped into a pit and mixed with water taken from the Otay River to form a slurry. The slurry would then be pumped to the Pond 15 Site via a pipeline. The pit would be hydraulically isolated from the Otay River until project completion at which time it would be opened and connected to the Otay River to restore tidal exchange to the restored area. To minimize impacts to water quality in San Diego Bay, a two-way pipeline system would be installed

between the Otay River Floodplain Site and the Pond 15 Site to convey slurried material to the Pond 15 Site while bringing water back to the Otay River Floodplain Site for subsequent use. Water would occasionally be pumped from the Otay River to supplement water lost to groundwater and evaporation during operations.

4.4.2 Disposal Methods

Material disposal involves the transportation of excavated material to the final placement sites. The restoration plan calls for most of the excavated material from Otay River Floodplain Site (approximately 258,000 cubic yards) to be transported to the Pond 15 Site, with only a small volume (approximately 21,100 cubic) to be used on-site in the Otay River Floodplain Site for levee construction and upland restoration. About 30,000 cubic yards to 40,000 cubic yards would be stockpiled in the Otay River Floodplain Site to the east of Nestor Creek for future Service projects in the Refuge. The stockpiled material would be watered during construction to mitigate for dust generation. Upon completion of project construction, suitable and appropriate upland vegetation would be planted to control wind and water-related erosion until the stockpile material is reused by the Service for future Refuge projects.

Approximately 53,000 cubic yards to 55,400 cubic yards would be excavated from the Pond 15 Site. Based on soil sampling and testing, the majority of this material is expected to be free of contaminants; however, it is anticipated that a small portion of soil (<5,000 cubic yards) in the vicinity of the dike that would be breached would contain elevated levels of heavy metals. This contaminated material would be buried inside the Pond 15 Site under clean fill from the Otay River Floodplain Site such that the contaminants would not be available to ecological receptors (e.g., capped under fill material). Excavated material would be disposed of using some combination of scrapers, trucks, bulldozers, loaders, graders, conveyor belts, or pipelines.

If dump trucks are used to transport material from the Otay River Floodplain Site to the Pond 15 Site then a system of haul roads and access points would need to be established and maintained. A few possible hauling configurations are discussed in Section 4.2.1. Dry material would be loaded onto trucks using front loaders or backhoes or it would be excavated and hauled directly using scrapers. Wet material would be dewatered and then transported via trucks equipped with a lining to retain water that remains in the soil. Bulldozers may be used to move excavated material to stockpile areas, which may be necessary for dewatering or staging before being transported by truck. Bulldozers may also be used to move material to on-site upland area or for berm construction.

Conveyor belts may be used to move excavated material within the Otay River Floodplain Site, part of the distance between the Otay River Floodplain Site and the Pond 15 Site, or all the way

from the Otay River Floodplain Site to the Pond 15 Site. Within the Otay River Floodplain Site, conveyor belts could be used to transport material from the excavation area to the stockpile area. A conveyor belt system could be used to move excavated material across the Otay River and Bayshore Bikeway. Once across (under) the Bayshore Bikeway, and within the Salt Pond Complex, the conveyor belt would transport material to the Pond 15 Site.

Three methods for moving excavated material from the Otay River Floodplain Site to the Pond 15 Site were identified for consideration in evaluating potential environmental impacts. The three methods are described below.

- Truck
- Conveyor Belt
- Pipeline

These three methods represent a range that would likely be considered by a contractor given the site conditions, quantity of material, construction schedule, and likely mitigation measures to minimize environmental impacts. The three methods are described in more detail below.

4.4.2.1 Truck

Under this method, the contractor would use dump trucks to transport material from the Otay River Floodplain Site to the Pond 15 Site. The most likely truck haul route is shown in Figure 31. Temporary crossings would be necessary for the trucks to cross Nestor Creek and Otay River. Truck traffic on this route would interfere with the Bayshore Bikeway and City of San Diego bike path where the trucks exit the Otay River Floodplain Site onto West Frontage Road. Traffic flow at this intersection would be maintained by a flagman in order to ensure public safety. From West Frontage Road, the trucks would turn onto Anita Street and then to Bay Boulevard. The trucks would enter the Salt Ponds Complex via the Service easement located just north of the Salt Works operational facility off Bay Boulevard. The dikes within the salt ponds that would be used by construction traffic would be improved and widened to 30 feet to allow for two-way traffic, an exception is the dike around the Pond 15 Site where one-way traffic in a loop can be established. The dike improvements would likely require the placement of small amounts of fill into the ponds. Any such fill would be removed upon the completion of construction activities thus returning the ponded area to pre-project conditions. The round trip distance of the truck route shown in Figure 31 is about 5 miles. A round trip, including loading and dumping, would likely take about 36 minutes. A contractor using 12-cubic yard trucks would have to make about 28,000-34,000 trips.

SOURCE:

FIGURE 31
Truck Haul Routes

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4.4.2.2 Conveyor Belt

Under this method, the contractor would use a system of conveyor belts to transport material from Otay River Floodplain Site to the Pond 15 Site. Two possible routes are shown in Figure 32 and the length would be approximately 1.5 miles. The conveyor belt would be installed over the Otay River and under the existing eastern Bayshore Bikeway crossing. After crossing the Otay River and Bayshore Bikeway, the conveyor belt would continue northward using the existing dikes for support. One end of the conveyor belt would be near the Otay River Floodplain Site excavation site and the other end would end either directly into the Pond 15 Site or into awaiting trucks in the Pond 15 Site, which would move the material a short distance within the pond.

If the Otay River Floodplain Site excavated material is transported to the Pond 15 Site via dump truck or conveyor belt then it would be dried before being hauled from the Otay River Floodplain Site. In order to place this dry material effectively, the Pond 15 Site would be dewatered prior to material placement. Dewatering of the Pond 15 Site would be one of the first tasks the contractor would complete during construction. This would be done by first modifying the dikes within and around Ponds 12, 13, and 14 (Figure 2 for pond locations) to bypass the brine water around the Pond 15 Site to the rest of the active salt-producing salt ponds. Next, the dikes around the Pond 15 Site would be modified to hydraulically isolate the Pond 15 Site from the rest of the salt pond system. At that point, the isolated brine water remaining in the Pond 15 Site would be pumped into the active salt-producing salt ponds. The Pond 15 Site is about 90 acres in area with an average water depth of about 5 feet so the volume of water in the Pond 15 Site is estimated to be about 140 million gallons. Pumping this volume of water into the active salt-producing salt ponds would take about a month using several heavy duty water pumps. After the initial pumping to drain the Pond 15 Site, dewatering would continue during construction in order to keep the placement area relatively dry.

When the Pond 15 Site is dewatered and ready for receiving fill material, material brought to the Pond 15 Site by trucks or conveyor belts would be placed in the pond. Distribution of material would be carried out with land-based equipment, such as bulldozers, scrapers, and/or long-reach backhoes. To avoid sinking in the wet and soft sediment in the pond, the bulldozers would initially push and spread the Otay River Floodplain Site fill material outward into the pond from the dikes. The newly formed fill area extending from the dike would provide the working area for the trucks and bulldozers to reach farther into the pond.

4.4.2.3 Pipeline

Under this method, the contractor would use a pipeline to hydraulically transport material from Otay River Floodplain Site to the Pond 15 Site. Two possible pipeline routes are shown in Figure 33. The pipeline would be installed over the Otay River and under the existing eastern Bayshore

Bikeway crossing. After crossing the Otay River and Bayshore Bikeway, the pipeline would continue northward. One option of the pipeline route considers using the existing dikes for support, while the other option assumes a more direct path, with some sections floating on the salt ponds. One end of the pipeline would be located in a pit within the Otay River Floodplain Site excavation site and the other end would end directly into the Pond 15 Site. The pipeline would be approximately 1.1 to 1.5 miles in length depending on whether the pipeline remains on the dikes or if it takes a more direct route across (floating) the salt ponds.

If the Otay River Floodplain Site excavated material is transported to the Pond 15 Site via pipeline then it would arrive at the Pond 15 Site as a slurry mixture of water and soil. the Pond 15 Site would be dewatered prior to material placement as described above. When the Pond 15 Site is dewatered and ready for receiving fill material, material brought to the Pond 15 Site by pipeline would be pumped into the pond. The material would be distributed throughout the pond by periodic relocation of the dredge pipeline discharge location. It is anticipated that it would take a relatively long period of time for the material to achieve a level of consolidation that would allow the safe use of land-based equipment. Consequently, once all the material from the Otay River Floodplain Site has been pumped to the Pond 15 Site the material would be left in place until final consolidation has been achieved, which is currently estimated at one to five years. After final consolidation has been achieved construction equipment would be mobilized to the site to complete final grading within the Pond 15 Site.

Final grading would be conducted in the Otay River Floodplain Site to achieve final elevations in the excavated area. When the excavation reaches the approximate finished ground elevations, land-based equipment would be used to grade the site to the designed contours and slope variations. Final grading would also be conducted in the Pond 15 Site to achieve final elevations in the fill area. When the fill reaches the approximate finished ground elevations, land-based or amphibious construction equipment would be used to grade the site to the designed contours and slope variations.

The restoration construction would include removal of the southern levee of the Otay River within the project site, restoration of upland habitat, construction of a new levee along the southern border of the restored wetland, and modification of the Pond 22/23 dike. These construction activities would be conducted with land-based equipment. At this time, it is assumed that suitable fill material for the levee construction, upland restoration, and dike modification would be available on-site via project excavation. If suitable material is not available on site then such material would be imported to the project site. Suitable material would be compacted to a density recommended by the project geotechnical engineer.

SOURCE:

FIGURE 32
Conveyor Belt Haul Routes

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SOURCE:

FIGURE 33
Pipeline Haul Routes

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4.4.3 Construction Windows and Environmental Constraints

The timing and phasing of the various construction activities are important considerations in restoration planning. Dewatering of the Pond 15 Site would be a critical path task that would be started right after the brine water is bypassed around the Pond 15 Site. Other mobilization and staging area construction would follow. The access/truck routes would be strengthened and widened as necessary and conveyor belts would be installed, if applicable. The site would be cleared and grubbed to begin excavation. Excavation and disposal of excavated materials would occur simultaneously; otherwise excavated material would be stockpiled while waiting for transport to the fill area. Planting would begin upon completion of earthwork. The final step would be to open the restored areas to tidal exchange and demobilize the remaining construction equipment and material from the site.

The existing levee along the southern bank of the Otay River helps to keep tidal and fluvial water from entering the excavation site. In order to maintain a water barrier between the Otay River Floodplain Site and Otay River during excavation, the existing levee would remain in place until excavation is complete. To maintain flood protection, a new levee along the southern edge of the restored wetland would be constructed prior to removing the existing levee along the southern bank of the Otay River. In addition, there would be several operations maintained throughout most of the construction period, including the Pond 15 Site dewatering, access/haul road resurfacing, bike and pedestrian safety, and pollution and dust control.

The contractor would follow local jurisdiction time restrictions for construction equipment operation. It is anticipated that construction would take place Monday through Friday from 7 AM to 6 PM. Work may or may not occur on holidays, depending on the contractor and local jurisdiction restrictions. In addition, construction activities would be scheduled around the bird nesting season, which generally runs from February 15 to September 30. The construction windows for specific site locations would be determined by the Service Refuge Manager during final restoration design. In addition, the construction window schedule may change during construction depending on actual nesting activities at the time of construction. For the purpose of assessing environmental impacts, a preliminary construction schedule was developed for the restoration plan based on the assumptions and information above. The schedule, presented in Table 17, is based on hauling the excavated material to the Pond 15 Site via truck and/or conveyor belt. If the contractor opts to slurry the material and use a pipeline to transport the material from the Otay River Floodplain Site to the Pond 15 Site then an additional one to five years would be needed to complete the construction operation.

Table 17
Preliminary Construction Schedule

Activity	Start Date	Finish Date	Duration
Mobilization	8/1/2016	9/30/2016	2 months
Earthwork	10/1/2016	1/31/2017	4 months
* Shut Down	2/1/2017	2/28/2017	1 month
Core Nesting Season	3/1/2017	7/31/2017	5 months
* Remobilization	8/1/2017	8/31/2017	1 month
Earthwork	9/1/2017	12/31/2017	4 months
Demobilization	1/1/2018	2/28/2018	2 months

* Denotes periods when field activities may occur in specifically delineated areas. Delineation of operations zones is dependent on variation of wildlife community and individual species or species groups' activities in a given season. Areas of avoidance will be determined on a case by case basis by the Service Refuge Manager.

" Assumes selection of the project alternative by the Service by 11/30/14 and receipt of permits needed to start construction within 21 months of the decision by the Service.

The type of equipment used to construct the restoration plan and the number of various pieces of equipment would ultimately be determined by the contractor during construction. A preliminary list of construction equipment was developed to provide the information needed to evaluate potential environmental impacts. The type and number of major construction equipment used to construct the restoration plan are presented in Table 18 below. The type of fuel for each type of construction equipment is also provided to allow evaluation of impacts to air quality and greenhouse gas emissions.

Table 18
Construction Equipment Summary

Equipment	Fuel Type	Equipment Quantity		
		Truck Haul	*Conveyor Belt Haul*	*Pipeline Haul*
Backhoe	Diesel	4	4	4
Loader	Diesel	4	4	4
Scraper	Diesel	4	4	4
Bulldozer	Diesel	4	4	4
Dump Truck	Diesel	28	4	4
Conveyor Belt	Electric	None	1.5 to 2.0 miles	None
Pipeline	Electric	None	None	1.1 to 1.5 miles

4.4.4 Erosion Control and Water Quality Protection

The contractor would be required to comply with National Pollutant Discharge Elimination System (NPDES) stormwater permit conditions as well as other local, state, and federal permit/approval

requirements. A stormwater pollution prevention plan (SWPPP) would be prepared and implemented by the contractor to achieve NPDES permit compliance. The contractor would identify and implement best management practices (BMPs) to protect water quality, air quality, and sensitive biological/wildlife resources as well as to reduce construction related noise.

As discussed in the previous section, construction activities would be scheduled around the bird nesting season. The construction windows for specific site locations as well as the noise and pollution restrictions of the construction equipment would be assessed and determined in the EIS and implemented by the Service Refuge Manager during final restoration design.

The Bayshore Bikeway runs along the northern bank of the Otay River along the perimeter of the Otay River Floodplain Site. Transport of excavated material to the salt ponds through the use of a temporary bridge would likely interfere with bikeway users. The extent and types of interruption to the Bayshore Bikeway would be discussed with local authorities during the final design phase such that best management practices and safety measures are developed prior to construction and then implemented during construction.

Utilities have been identified along the extension of Saturn Boulevard east of the Otay River Floodplain Site, including overhead electric lines and poles, high pressure gas line, sewers, and storm drains. A few manholes were also found east of Saturn Boulevard. These utilities would not need to be relocated, but the contractor would need to maintain and protect them during construction.

The operation of the Salt Works may be impacted by the conveyor belt operation and truck traffic. Coordination with the Salt Works operators should occur during the final design and construction phases. The removal of water from the Pond 15 Site would also require the cooperation of the Salt Works operators. The Salt Pond dikes would be used for access by construction vehicles and/or conveyors transporting and disposing material to the Salt Ponds. These dikes would need to be improved and maintained during construction. When construction is complete, the dikes would be restored to preconstruction conditions.

4.4.5 Cost Estimates for Construction

Most of the cost associated with the restoration construction is earthwork. More than 300,000 cubic yards (CY) will be excavated from the Otay River Floodplain Site, and moved to the Pond 15 Site. Due to the fact that construction method for transporting the cut and fill material from the has not yet been finalized, there is still some ambiguity in the total cost of construction. Three hauling options were considered in the preparation of the cost estimate. The cost estimate of the first option (Conveyor Belt) is based on the use of a conveyor system which will move excavated material across the Otay River and under the bikeway, then the conveyor extends all the way to

Pond 15, with a total distance of about 1.5 miles long. If the conveyor belt option is implemented, costs will range from $16,832,000 to $17,353,000. The cost estimate of the second option (Truck) is based on using only trucks to haul materials between the floodplain and Pond 15. The truck route will require 4 temporary bridge crossings.If the truck only option is implemented, costs will range from $12,697,000 to $14,028,000. The cost estimate of the third option (Pipeline) is based on the use of a pipeline to hydraulically transport material from the Otay River floodplain to Pond 15. For this option, it is assumed that the fill material in Pond 15 will require at least one year to consolidate before grading and planting. If this pipeline method is implemented, costs will range from $11,816,000 to $12,954,000.

Table 19
Construction Cost Estimate

Item	Estimated Cost Range*	
	Low	*High*
Permitting	$3,507,000	$3,507,000
Site Access, Mobilization, Demolition	$1,447,200	$7,213,700
Earthwork	$4,656,510	$5,238,235
Planting	$902,790	$990,565
Contingencies	$2,302,800	$3,831,900
Construction/Project Management	$710,000	$760,000
Environmental Monitoring During Construction	$300,000	$320,000
Engineering/Design	$1,220,000	$1,330,330
Monitoring Oversight SAP and CCC (through construction)	$560,000	$560,000
Total	**$15,606,300**	**$23,751,730**

Range estimated for the potential restoration alternatives and three construction methods.

4.5 Planting Program

4.5.1 Goal and Objectives

The overall goal of the planting program is to create self-sustaining intertidal wetland that meets the mitigation requirements described in the MLMP.

MLMPconditions that relate to vegetation within the wetland portion of the mitigation site include:

- **Vegetation.** The proportion of total vegetation cover and open space in the marsh shall be similar to those proportions found in reference sites. The percent cover of algae shall be similar to percent cover found in reference sites.
- **Spartina Canopy Architecture.** The restored wetland shall have a canopy architecture that is similar to the reference sites, with an equivalent proportion of stems over 3 feet tall.
- **Reproductive Success.** Certain plant species, as specified in the work program, shall have demonstrated reproduction (i.e., seed set) at least once every three years.
- **Exotics.** The important functions of the wetland shall not be impaired by exotic species.

4.5.2 Habitats Considered for Planting

Implementation of the restoration plan will create three types of wetland habitats, as well as transition zone and upland habitats not subject to Coastal Commission permit conditions, (Figures 16 and 17) and return regular diurnal tidal flushing to both project components (Otay River Floodplain Site and Pond 15 Site) within the Refuge. Restoration targets for the establishment of native vegetation within the project area are presented in detail below.

Low marsh in southern California salt marshes is dominated by California cordgrass (*Spartina foliosa*), which forms a thick canopy approximately three feet in height. This is the preferred nesting habitat of the light-footed clapper rail (*Rallus longirostris levipes*), a federal-listed and state-listed endangered bird. Creation of cordgrass habitat is critical to the recovery of this species. Based on local conditions, the target for low marsh is approximately +2.6 to +4.0 feet NAVD88 at the Otay River Floodplain Site and +2.73 to +4.31 NAVD88 at the Pond 15 Site. Approximately 10 acres of low marsh habitat will restored at the Otay River Floodplain Site component and approximately 15.7 acres will be restored in the Pond 15 Site.

Mid-elevation salt marsh overlaps in elevation with the cordgrass-dominated low marsh and with high marsh typified by grasses and succulents tolerant of desiccation and hypersalinity. Based on local conditions, the target for mid-marsh is approximately +4.0 to + 6.0 feet NAVD88 at the Otay River Floodplain Site and +4.31 to +6.33 feet NAVD88 at the Pond 15 Site. This marsh zone is dominated by Pacific pickleweed and a mosaic of several other plant species. In past restoration projects in the region, the natural recruitment of pickleweed has been highly successful and this species may even become excessively dominant if planted. Therefore, this species will not be planted, but allowed to colonize the restoration site naturally. Approximately 11 acres of mid-marsh habitat will restored at the Otay River Floodplain Site component and approximately 35 acres will be restored in the Pond 15 Site.

High elevation salt marsh is typified by perennial grasses and succulents tolerant of high salinities and infrequent inundation. Typical dominant species include saltgrass (*Distichlis spicata*) shoregrass (*Monanthochloe littoralis*) and Parish's pickleweed (*Arthrocnemum subterminale*). The endangered salt marsh bird's beak (*Cordylanthus maritimus* ssp. *maritimus*) is restricted to the high marsh zone. The target elevation for high marsh in the project is +6.0 to +7.1 feet NAVD88 at the Otay River Floodplain Site and +6.33 to +7.4 feet NAVD88 at the Pond 15 Site, based on site-specific tidal conditions. Approximately 3 acres of high marsh habitat will be restored at the Otay River Floodplain Site component and approximately 6 acres will be restored in the Pond 15 Site.

Transition zone habitat is defined as the elevation where habitat transitions from wetland to upland. At south San Diego Bay, the transition zone is that area between the high marsh and the coastal sage scrub habitat that typifies the dominant upland habitat, where it exists. The target elevation range for transition zone in the western ponds project is +7.1 to +7.4 feet NAVD88 at the Otay River Floodplain Site and +7.4 to +7.7 feet NAVD88 at the Pond 15 Site. Approximately 1 acre of transition zone habitat will restored at the Otay River Floodplain Site component and approximately 0.5 acre will be restored in the Pond 15 Site. Although not subject to Coastal Commission permit requirements, transition zone has been included in this planting plan for the purpose of preparing a cost estimate for plant propagation and installation.

4.5.3 Planting Program Description

4.5.3.1 Low Salt Marsh

The restored low marsh areas will be planted exclusively with California cordgrass. All cordgrass will be obtained from plants at an existing donor site located along the Otay River near its confluence with San Diego Bay, pending approval by the Service. Cordgrass root divisions, referred to as "plugs" or ramets, are obtained by dividing existing stands of cordgrass into small divisions composed of two to five growing stems and attached rhizomes. Each cordgrass plug is approximately six inches in diameter including attached native soil, which buffers the plant from transplant shock. Plugs will be harvested by hand, transported to the transplant site, and replanted within a 24-hour period. All cordgrass plantings will be spaced at 6 feet on center (Table 20).

In south San Diego Bay, Bigelow's pickleweed often co-occurs with cordgrass in the low salt marsh. In previous restoration projects in south San Diego Bay, this annual species has established naturally from seed. It is anticipated that this species will recruit naturally at this restoration site.

Table 20
Species Composition and Recommended Propagation Method for Salt Marsh and Transition Zone Habitats

Habitat Type	Common Name	Scientific Name	Propagation Method	Spacing on Center
Low Salt Marsh	California cordgrass	*Spartina foliosa*	Plugs	6 feet
Mid-Salt Marsh	Saltwort	*Batis maritima*	Cuttings in rosepots	6 feet
	Salt marsh daisy	*Jaumea carnosa*	Cuttings in rosepots	
	Sea blite	*Suaeda esteroa*	Cuttings in rosepots	
High Salt Marsh	Saltgrass	*Distichlis spicata*	Cuttings in rosepots	6 feet
	Alkali heath	*Frankenia salina*	Cuttings in rosepots	
	Shoregrass	*Monathochloe littoralis*	Cuttings in rosepots	
	Parish's pickleweed	*Arthrocnemum subterminale*	Seed in rosepots	
	Sea lavender	*Limonium californicum*	Cuttings in rosepots	
Transition Zone	Alkali weed	*Cressa truxillensis*	Seed in rosepots	6 feet
	Boxthorn	*Lycium californicum*	Cuttings in rosepots	
	Shoregrass	*Monathochloe littoralis*	Cuttings in irosepots	
	Parish'spickleweed	*Arthrocnemum subterminale*	Seed in rosepots	
	Palmer's frankenia	*Frankenia palmeri*	Cuttings in rosepots	

4.5.3.2 Mid-Salt Marsh

The mid-salt marsh zone will be planted with equal proportions of saltwort. salt marsh daisy, and sea blite (Table 20). All species will be propagated from seeds or cuttings harvested from the existing salt marshes in south San Diego Bay. Individual plants will be grown to suitable size in 2.25 inch wide, 3-inch deep, "rosepot" liners (Table 20). All rosepots will be planted at 6 feet on center. All propagated plants will be "hardened" prior to delivery to the site and planting. Hardening is a process whereby plants are watered with gradually increasing levels of salt until reaching the level of sea water (~ 35 parts per thousand). Hardening reduces transplant shock thereby enhancing survival. It is anticipated that Pacific pickleweed will colonize the mid-salt marsh through natural recruitment from seed.

4.5.3.3 High Salt Marsh

The high salt marsh zone will be planted with equal proportions of saltgrass (, alkali heath (*Frankenia salina*), shoregrass. (*Monathochloe littoralis*), Parish's pickleweed, and sea lavender. All species will be propagated from seeds or cuttings harvested from the existing salt marshes in south San Diego Bay. Individual plants will be grown to suitable size in 2.25 inch wide, 3 inch deep, rosepot liners (Table 20). All plants will be hardened prior to delivery and installation. All rosepots will be planted at 6 feet on center.

4.5.3.4 Transition Zone

The wetland/upland transition zone will be planted with equal proportions of alkali weed (*Cressus trexillensis*), saltgrass, boxthorn (*Lycium californicum*), shoregrass, Parish's pickleweed, coast goldenbush (*Isocoma menziesii*), and Palmer's frankenia (*Frankenia palmeri*) (Table 20). Palmer's frankenia occurs in the upland areas of Gunpowder Point in south San Diego Bay. This is the northernmost distribution of this species, which is more common in Baja California, Mexico. This species is considered threatened or rare in California but common elsewhere by the California Native Plant Society (CNPS 2001). It has been included in transition zone plantings for this project in an effort to increase its distribution within the bay.

All species will be propagated from cuttings or seed harvested from existing populations in south San Diego Bay. Individual plants will be grown to suitable size in rosepot liners (Table 20). High salt marsh species, including alkali weed, saltgrass, shoregrass, and Parish's pickleweed will be hardened prior to delivery and installation. All rosepots will be planted at 6 feet on center. Irrigation will be provided by a temporary overhead irrigation system or water truck as presented in Section 4.5.3.6.

4.5.3.5 Planting Layout

In an effort to ensure adequate establishment and balanced representation of each species within each habitat, plantings will occur in groupings. Specifically, each species will be planted in groupings of three-to-nine individuals in a reasonably random grouping pattern within the planting zone. To ensure that large monoculture plant groupings do not result in this design, each species grouping cannot occur immediately adjacent to another grouping of the same species. This method should result in a random patchwork of each species across each habitat zone. Initially, these plantings will appear sparse, but plantings are expected to establish quickly and naturalize within three to five years to form dense cover typical of the salt marsh habitats used by the Commission as reference sites.

The majority of plant material will be provided in rosepot liners, which have been successfully used before in salt marsh restoration projects. All plants will be planted in holes of sufficient depth to accommodate the root mass and any attached soil. Holes will then be back-filled with native soil. Care will be taken to ensure that the entire root mass is buried and not exposed to air and sunlight.

4.5.3.6 Irrigation

The proposed salt marsh restoration will be achieved by grading (Otay River Floodplain Site) or filling (the Pond 15 Site) the project sites to elevations that are inundated by diurnal tides.

Therefore, much of the site will not require irrigation. However, the transition zone will be less influenced by tides and supplemental watering will be required.

Irrigation will be provided by either a temporary overhead irrigation system or pressurized water truck, or a combination of both. Water is available at the Otay River Floodplain Site and is currently being used by River Partners and the Service to establish riparian habitats. Although water may be available in close proximity to the Pond 15 Site, installation of a temporary irrigation system may not be compatible with on-going salt operations. The irrigation system/water truck will be used to provide supplemental water to the restoration sites until plantings have become established. Irrigation will be phased out gradually depending on the local weather conditions during the establishment period (e.g., after the first one or two growing seasons).

All plants should be irrigated immediately after planting. The amount of water and duration of irrigation should be determined by the revegetation contractor and approved by the Project Biologist. Each watering episode should allow for deep penetration of the water into the soil. Deep soaking of the soil will promote good root development and will enhance survivorship of container stock. Irrigation will be provided on an as-needed basis for a minimum of the first year after planting. The need for irrigation to continue beyond the first year will be evaluated by the Project Biologist, based on the overall survival and vigor of the planted material. Local drought conditions should be considered when evaluating the need and time period for supplemental irrigation. The irrigation program will be designed to provide water necessary for the initial establishment of the plantings, but the goal of the restoration effort is to create self-sustaining habitats supported by natural weather conditions. However, irrigation of the site will be necessary until the plants are determined to be self-sufficient.

4.5.3.7 As-Built Conditions

Within 60 days of completion of mitigation site construction, a report will be submitted describing the as-built status of the restoration project. The report will include "as built" plans showing final grading, plant installation, hydrological features, and erosion control measures. In addition, topographic maps showing as-built contours of the restoration site, as well as locations of plantings, will be provided. Changes from original plans will be indicated in indelible red ink. Significant changes from the original planting plan will be coordinated with and approved by the appropriate agencies prior to implementation.

4.5.4 Cost estimates for planting

With all plants installed on 6 feet centers, a total of 1,397 plants would be required per acre. Under this restoration plan, 13,888 cordgrass plugs would be required to plant the 9.94 acres of

low marsh at the Otay River Floodplain Site (Table 16). An additional 21,542 plugs would be required to plant the low salt marsh in the Pond 15 Site for a total of 34,430 plugs. At a unit cost of $15.50 per plug the cost to plant the low marsh under this alternative would be $549,161.

Using a similar formula, the cost to restore mid-salt marsh under the restoration plan would be $306,666, based on 6 feet centers and a unit cost of $4.50 per rosepot installed. High marsh and transition zone would cost $68,211 and $7,043, respectively for a total cost of $931,081.

Table 21
Estimated Cost - Restoration Plan

Habitat Type	Otay River Floodplain Site (acres)	# of Plugs or Rosepots	Pond 15 Site(acres)	# of Plugs or Rosepots	Total # Plugs or Rosepots	Unit Cost Installed	Subtotal Cost
Low Marsh (Plugs)	9.94	13,888	15.42	21,542	35,430	$15.50	$549,161
Mid Marsh (Rosepots)	14.00	19,558	34.78	48,588	68,146	$4.50	$306,666
High Marsh (Rosepots)	5.73	8,005	5.12	7,153	15,158	$4.50	$68,211
Transition (Rosepots)	0.68	950	0.44	615	1,565	$4.50	$7,043
Total	**30.25**		**55.76**				**$931,081**

4.6 Assessment of Significant Impacts

<<TO BE COMPLETED PENDING EIS ANALYSIS>>

4.6.1 Assessment of Created or Substantially Restored Wetland Habitat

4.6.1.1 Habitat Impacts and Net Acreage Created

The Otay River Floodplain Site and the Pond 15 Site both contain existing jurisdictional wetlands. The vast majority of the existing jurisdictional wetlands are being replaced by jurisdictional wetlands as part of the proposed restoration at a 1:1 ratio. For areas of existing wetlands that are converted to uplands and mitigation ration of 4:1 has been assumed. Table 3 documents the existing and proposed wetlands within the two project areas. Figure 8 shows the existing wetlands being impacted within the Otay River Floodplain Site and Figure 9 shows the existing wetlands being impacted within the Pond 15 Site, as well as upland areas being converted to wetlands.

4.6.1.1 *Functional Lift Analysis for the Pond 15 Site*

A portion of the proposed restoration will involve the restoration of existing solar evaporation ponds that are part of the industrial process of salt production. One of the ponds, the Pond 15 Site, will be restored to tidal marsh using material excavated from the Otay Floodplain and breaching the levee to introduce tidal action. Currently, the salt evaporator ponds are non-tidal basins containing brines of varying levels of salinity and are used as part of the solar salt production system operated by the South Bay Salt Works. The Salt Works takes in bay water to supply the source of the salt, and through a process of sequential evaporation, produces crystalline salt at the plant site. The salt evaporator ponds do not support tidal wetland vegetation and since salinities in the ponds quickly exceed those tolerable to marine life, do not support fish or invertebrates typical or similar to that found in San Diego Bay. The restoration of these basins to intertidal habitats will likely improve the diversity and productivity of these ponds and provide increased fish production to San Diego Bay. Because the Pond 15 Site does support some migratory birds and contains some plankton that are tolerant of high salinities; there are existing biological values. As a result, the Science Advisory Panel to the Commission recommended that an analysis be conducted to determine the functional lift associated with the restoration of the Pond 15 Site to determine the number of acreage credits that can be attributed to those activities.

A functional lift analysis was prepared in consultation with the Science Advisory Panel, the Coastal Commission staff, and the Service (WRA 2013). The analysis relied on the change expected in biological communities in the before and after condition. Four biological communities were considered: vegetation, fish, macro-invertebrates, and birds. These communities were selected for two reasons. First, they are associated with the performance standards required to be met by the restoration after completion. Therefore, these biological communities are directly relevant to determining the success of the restoration and the improvement in their condition following restoration will be used as a measure of the substantial restoration achieved by the project. Secondly, data is available on these communities for the Pond 15 Site (or nearby associated ponds) to determine the before conditions and, as a result of current monitoring being undertaken by the Coastal Commission for the San Dieguito Wetland restoration project, data were available on the expected condition following restoration. These data can then be combined into a fairly simple analysis that considers both species number and abundance as outlined below in Table 22.

Table 22
Functional Lift Index of Pond 15 Site Associated with Restoration

	Vegetation	Macro-invertebrates		Birds		Fish	
	Percent cover	*Species (# spp/m²)*	*Abundance (#/m²)*	*Species (# spp)*	*Abundance (#/m²)*	*Species (# spp/m²)*	*Abundance (#/m²)*
Before Pond 15	VA	MA	MC	BA	BC	FA	FC
After (Reference)	VB	MB	MD	BB	BD	FB	FD

The calculation of the change from the before condition to a project in compliance with the reference wetlands is described by the Functional Lift Index (FLI):

$$FLI = \frac{FLI_V + FLI_M + FLI_B + FLI_F}{4}$$

Where:

$$FLI_V = [(VB-VA)/VB]$$

$$FLI_M = \frac{[(MB-MA)/MB] + [(MD-MC)/MD]}{2}$$

$$FLI_B = \frac{[(BB-BA)/BB] + [(BD-BC)/BD]}{2}$$

$$FLI_F = \frac{[(FB-FA)/FB] + [(FD-FC)/FD]}{2}$$

Each of the four component FLI's is between 0 and 1 with 0 representing no improvement and 1 representing 100% improvement. The value of the composite FLI equally weighted between the four components is between 0 and 1 with 0 representing no improvement and 1 representing 100% improvement.

A full description of the data and the analysis is contained in WRA (2013). In the before condition, the high salinities of the brines contained in the Pond 15 Site preclude establishment of wetland vegetation and are above the salinity tolerance of either estuarine fish or invertebrates (with the notable exception of brine flies and brine shrimp). Therefore, the before values for vegetation, fish, and invertebrates is zero; whereas the expected improvements for the restoration

must be at least the same as the tidal reference wetlands. Assuming that the Pond 15 Site does is similar to the tidal reference wetlands (which by definition it must be for the site to be determined successful, the functional lift for these variables is 1. On the other hand, there are a considerable number of migratory birds that use the solar evaporation ponds and therefore the before condition can be compared to the expected after condition as found in the reference tidal wetlands. The data on bird use was reviewed and converted to annual numbers to compare to the data generated by the Coastal Commission from the reference tidal wetlands. The functional lift for birds was determined to be 0.43.

When completed, the analysis determined that the functional lift was:

$$FLI = \frac{1.0 + 1.0 + 0.43 + 1.0}{4} = 0.86$$

Upon review by the Science Advisory Panel and the Commission, it was determined that this number should be adjusted based on several uncertainties associated with the analysis, specifically as it relates to birds. A number of case scenarios were reviewed by the Science Advisory Panel and the resultant recommendation was that the final FLI should be adjusted to 0.75.

Based on this recommendation and the assumption that the performance of the tidal marsh restoration in the Pond 15 Site must meet the performance requirements as set forth in the MLMP, the total credit associated with the Pond 15 Site is 87.35 acres x 0.75 or 65.51 acres.

4.6.1.3 Analysis of Sea Level Rise on Change in Habitats

The design of the restoration project has considered potential sea level rise. Figures 19 and 20 characterize the predicted effects of sea level rise within the Otay River floodplain and Pond 15 Site consistent with the Coastal Commission Draft Sea-Level Rise Policy Guidance from October 2013. The Otay River floodplain site allows for additional sea level rise adaptation east of the restoration site as there are no existing or planned landform barriers preventing habitat migration towards I-5 within the Refuge.

The Otay River floodplain site is more sensitive to sea level rise than the Pond 15 Site as shown by the predicted amount of vegetated marsh that shifts to mudflat under the lowest sea level rise prediction of 4.68 inches. Both sites are more dramatically affected by the higher 24" inch sea level rise where the mid and upper elevations of vegetated marsh are almost completely lost.

4.7 Evaluation of Steps for Implementation

The next step in the implementation process for the restoration project is to complete permitting. There are many agreements that will be needed in addition to the required permits and construction documents. The necessary permits, agreements, and approvals that will be required to move forward with project implementation are summarized below. A preliminary schedule for project implementation is presented in Table 17. Permit time frames are given in relation to the time required following decision by the US Fish and Wildlife Service on the final selected alternative. It may be possible to submit some applications prior to that decision, but most permits can only be issued after the Record of Decision and the FEIS.

Federal

- Section 404 Permit-NWP 27 (USACOE)
- Section 7 Consultation (The Service)
- Conditional Letter of Map Revision (FEMA)

State

- Section 401 Water Quality Certification (RWQCB)
- National Pollutant Discharge Elimination System (RWQCB)
- Streambed Alteration Agreement (CDFW)
- Coastal Development Permit (Coastal Commission)

Local

- Grading Permit (San Diego)
- Site Development Permit (San Diego)
- Floodplain Development Permit (San Diego)

Other permits may be required as needed for specific activities within easements or encroachments on private or public property.

It is expected that the federal agencies will utilize the EIS document or, in the case of the Corps of Engineers, rely on the EA prepared for the Section 404 Permit-NWP 27 for processing of their permits. For the state permits issued by the RWQCB, CDFW, and California Coastal Commission, it is expected that the Commission, in its consideration of the CDP, will prepare a

CEQA compliant review for the restoration project and that will suffice for the other agencies as well. Otherwise, either the RWQCB or the CDFW may rely on the NEPA environmental review for their initial study and determine that the project qualifies as a categorical exemption, a Negative Declaration or a Mitigated Negative Declaration as part of their permitting process.

Consistent with and following the permit authorizations, final engineering design, contracting, and bidding will be necessary before determining the start date of construction. Permit compliance items will also need to be submitted and approved by the appropriate agencies. Environmental working windows may also affect the start date of construction.

Table 23
Estimated Permit Timeframe Following Selection of Project Alternative by the Service*

Permit	Time in Quarters of a Year Following Approval of Project Alternative							
	Year 2015				Year 2016			
	1	2	3	4	1	2	3	4
Section 404 Nationwide Permit 27 (ACOE)								
Section 7 Endangered Species Consultation								
Section 106 Historic and Cultural Resources								
CLOMAR Map Revision (FEMA)								
Coastal Development Permit (Coastal Commission)								
401 Water Quality Certification (RWQCB)								
Streambed Alteration Agreement (CDFW)								
Various Local Permits/Encroachment								
Engineering Design								
Bidding, Contractor Selection								
Notice to Proceed								
Mobilization								

* Assumes selection of project alternative by the Service by 11/30/14

4.8 Management and Maintenance Requirements

4.8.1 Tidal Wetland Habitat

The tidally influenced wetland habitats restored under the restoration plan are designed to be self-sustaining and are expected to require little maintenance except during initial establishment. Initial maintenance will be limited to ensuring that native plant species installed within low, mid- and high marsh elevations become established so that they can spread vegetatively and from seed. Some species, such as *Salicornia bigelovii* and *S. pacifica* are expected to colonize naturally and have not been included in the plant palette. There are few invasive plant species that can invade the hypersaline soils of southern California salt marshes; however, future

introductions may warrant monitoring and control as necessary. Algerian sea lavender has invaded the mid- and high salt marshes of several regional wetlands. Should this noxious weed species become established at the ORERP, measures for its control and eradication would be undertaken as needed. No invasive plant species have been noted in the Western Salt Ponds Restoration located nearby the proposed ORERP in south San Diego Bay now approximately 2.5 years after construction.

4.8.2 Invasives

Control of invasive plant species is species-specific and dependent upon the level of invasiveness. Poseidon contractors will conduct regular site inspections to determine if species that are included in the California Exotic Pest Plant Council listings have become established. Poseidon will cooperate with the Service Refuges Division regarding appropriate eradication measures.

4.8.3 Inlets to the Pond 15 Site

Protective Berms and Raised Berm Between Ponds 22 and 23

The berm along the south boundary of the Otay River Floodplain Site and the berm between Ponds 22 and 23 that will be raised to provide flood protection for low lying areas of Imperial Beach will be inspected annually and after major storm events (greater than 10 year flood). Any damage judged to result in a loss of structural integrity will be repaired through minor construction activities, such as import of rock or soil for reinforcement.

Bayshore Bikeway Bridge Slope Protection

The proposed project has the potential to increase water velocities under the two Bayshore Bikeway Bridges that cross the Otay River. The tidal and fluvial hydraulic modeling analyses suggested that the proposed project may increase velocities at the bridge located along the western project boundary to the point where slope protection is required to maintain the integrity of the bridge structures. Consequently, the proposed project includes slope protection at this location, although additional engineering analyses to be conducted during final design might reveal that such protection is not needed.

The proposed slope protection would consist of a stone revetment to armor the side slopes on both sides of the channel under the Bayshore Bikeway Bridge. The slope protection would be placed at a 2:1 (horizontal to vertical) slope and it would extend deep enough (e.g., 1 foot to 10 feet) to provide adequate protection for scour. The slope protection would extend 10 to 30 feet upstream and downstream to provide adequate protection. Directly under the Bayshore Bikeway

Bridge, the bottom might be armored to protect the remains of the existing railroad bridge that has been designated as a cultural resource.

Maintenance for the slope protection would consist of annual (pre-storm season) condition monitoring to assess the integrity of the structure. The above water portion of the structure would be monitored for signs of toe undermining as well as degradation, slumping, and settling of the stones. In addition to annual monitoring, monitoring should be conducted following a major storm event (e.g., >25-year event) to assess the condition of the slope protection such that any remedial actions can be implemented prior to the next storm event. Based on the results of the monitoring program, maintenance activities would be implemented to remediate any problems identified from the monitoring. Maintenance activities would include slope repair via relocation of existing stones and/or addition of new stone or replacement of damaged stone.

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5 COMPLIANCE OF PROJECT TO FULFILL POSEIDON MLMP PERMIT REQUIREMENTS

5.1 Poseidon Permit Requirements

According to the MLMP, the wetland restoration project site(s) and preliminary plan(s) must meet the following minimum standards:

a. Location within Southern California Bight;

   The selection of the Otay River Floodplain Site and Pond 15 Site of the Refuge satisfies the requirement that the mitigation site be located within the southern California bight.

b. Potential for restoration as tidal wetland, with extensive intertidal and subtidal areas;

   The Otay River Floodplain Site and Pond 15 Site will result in restoration of tidal action to areas that have been leveed and isolated from San Diego Bay for over 80 years. Historic maps indicate that the area proposed for restoration was formerly intertidal mudflat and salt marsh that has been filled for agriculture and salt production. Thus, the potential for successful restoration is high. The restoration plans call for restoration of establishment, through excavation, placement of fill materials, and grading of a mixture of subtidal, intertidal and transitional wetland areas that will support a full array of estuarine and intertidal organisms.

c. Creates or substantially restores a minimum of 37 acres and up to at least 66.4 acres [all locations] acres of habitat similar to the affected habitats in Agua Hedionda Lagoon, excluding buffer zone and upland transition area;

   The requirement of restoration of up to 66.4 acres of habitat similar to that affected at Aqua Hedionda Lagoon will be achieved through the restoration approximately 29 acres of subtidal and intertidal habitat (below 6.6 feet NAVD) in the Otay River Floodplain Site and approximately 81 acres of subtidal and intertidal habitat in the Pond 15 Site. The Otay River floodplain contains some existing wetlands as defined by the Coastal Commission and the placement of necessary flood control levees will impact some wetlands. No credit towards substantial restoration will be given for the conversion of existing wetlands to tidal wetlands and a 4:1 mitigation requirement has been placed on any wetlands converted to upland levees. Therefore, the amount of acreage credit that will be achieved within the Floodplain area is approximately 21 acres. According to the agreed functional lift associated with the substantial restoration of the Pond 15 Site, the total credited acreage will be approximately 57 acres (after subtracting the area that is converted to nesting areas). Therefore the total credited acreage is approximately 78 acres.

d. Provides a buffer zone of a size adequate to ensure protection of wetland values, and at least 100 feet wide, as measured from the upland edge of the transition area.

The proposed restoration of the Otay River Floodplain Site and the Pond 15 Site will provide buffer zones in excess of 100 feet in all directions.

e. Any existing site contamination problems would be controlled or remediated and would not hinder restoration;

A field sampling program was conducted that detected Dichlorodiphenyltrichloroethane (DDT) and metabolites (dichlorodiphenyldichlor-oethylene [DDE] and dichlorodiphenyldichloroethane [DDD]) and toxaphene in the samples collected in portions of the initially proposed Otay River Floodplain Site. The source of DDT is directly related to the historic use of this property for agricultural production, primarily tomatoes and other truck crops. A sewer treatment plant that operated within the Otay River floodplain between the mid-1950s and the early 1960s is considered the source of the various metals detected in some of soil samples. Although former agricultural activities have resulted in high levels of DDT and derivatives on a portion of the floodplain, the project was redesigned to avoid disturbance of these areas and therefore will not result in any redistribution of these contaminants. A soil sampling program will be part of the restoration project and all material excavated from the Otay River Floodplain Site that is suitable for use for restoration will be placed in Pond 15 Site.

f. Site preservation is guaranteed in perpetuity (through appropriate public agency or nonprofit ownership, or other means approved by the Executive Director), to protect against future degradation or incompatible land use;

The Otay River Floodplain Site, east of Nestor Creek, was purchased by the Coastal Conservancy, conveyed to SWIA, who then conveyed ownership to the Service for the purpose of restoration. The portion of the Otay River Floodplain Site west of Nestor Creek and the Pond 15 Site of the Refuge is owned by the California State Lands Commission and leased to the Service exclusively for restoration of coastal wetlands and associated uplands.

g. Feasible methods are available to protect the long-term wetland values on the site(s), in perpetuity;

The Refuge is managed by the Service. The Service will provide management of the restored wetlands to protect its ecological value in perpetuity.

h. Does not result in a net loss of existing wetlands; and

The proposed restoration entails the conversion of a former salt evaporation pond and current salt evaporation pond to intertidal salt marsh, mudflats and subtidal habitats. The former salt evaporation pond contains highly saline soils and has no value to fish or invertebrates. The existing solar evaporation pond contains highly saline brines as part of the industrial process for producing salt and does not support wetland vegetation, fish or invertebrates. Some bird use does occur. The Commission established a process by which credits could be determined for both sites that recognizes that conversion of existing wetlands within the Otay River Floodplain Site will not receive any credit towards meeting the acreage requirement and, for the Pond 15 Site, a method to determine functional lift based on a comparison to reference tidal wetlands. Any conversion of existing wetlands to uplands as needed to address flood control in the Otay River Floodplain Site will have a 4:1 replacement requirement. As a result of these measures, there will be a net increase in existing wetlands as a result of the project.

i. Does not result in an adverse impact on endangered animal species or an adverse unmitigated impact on endangered plant species.

The CCP and EIS prepared for the project identified all endangered plant and animal species in the project location and the potential impacts associated from implementation of the preferred alternative. In general, the document presents the potential effects to endangered species associated with construction of the habitat restoration and the long-term effects of the habitat restoration. The document concludes that the potential for adverse effects to the Refuge's endangered and threatened species during restoration-related grading activities would be minimized by controlling the level of construction activity permitted in the vicinity of active nest areas, including restricting some activities to the non-breeding season; establishing construction boundaries that minimize impacts to native vegetation and sensitive habitat areas; and monitoring sensitive habitat areas during construction to assess actual disturbance levels and, where necessary, developing and implementing additional protective measures.

The long-term effects on threatened and endangered species of the restored habitats are considered beneficial.

5.2 Compliance with Site-Specific and Regional Restoration Goals

The following objectives represent the factors that will contribute to the overall value of the wetland. The selected site(s) shall be determined to achieve these objectives. These objectives shall also guide preparation of the restoration plan.

a. Provides maximum overall ecosystem benefits, e.g., maximum upland buffer, enhancement of downstream fish values, provides regionally scarce habitat, potential for local ecosystem diversity;

   The proposed restoration of the Otay River Floodplain Site and the Pond 15 Site entails the conversion of a former and existing solar evaporation ponds to intertidal salt marsh and mudflats and subtidal habitats. Intertidal salt marsh, intertidal mudflat, and subtidal habitats are regionally scarce habitats targeted for restoration/creation in the southern California Bight. Located just upstream of San Diego Bay, the fisheries of the bay would be considered the downstream fishery. The fisheries of South San Diego Bay are recognized as a valuable resource that will be enhanced by the restoration process. The extensive shallow water habitat and eelgrass beds of the South Bay provide important habitat for these and a variety of fish, including midwater, schooling fishes, such as northern anchovies, slough anchovies, and topsmelt. These species, in turn, represent a major forage resource for predatory fish and avian species. The warmer, hypersaline waters of the South Bay also offer shelter for a number of fish species commonly encountered further south in the Eastern Subtropical and Tropical Pacific. The south end of San Diego Bay also functions as an important nursery area for juvenile California halibut and young spotted and barred sand bass.

   The American Bird Conservancy has designated the South San Diego Bay Unit as a Globally Important Bird Area due to the presence of globally significant populations of nesting gull-billed terns, and continentally significant populations of surf scoters, Caspian terns and western snowy plovers. The entire southern end of San Diego Bay has been recognized as a Western Hemisphere Shorebird Reserve Network Site. The proposed restoration has been designed to preserve and enhance this biological diversity.

b. Provides substantial fish habitat compatible with other wetland values at the site(s);

   The conversion of the former and existing evaporation ponds to intertidal salt marsh, mudflats and subtidal habitat will provide substantial fish habitat where none exists today. The role of unvegetated tidal creeks and sloughs as breeding areas and nurseries for estuarine-dependent fishes has been well studied. The transient use of the intertidal salt marsh by species such as California killifish has likewise been demonstrated. These values will all be enhanced by the proposed project. Furthermore, the intertidal mudflats

created by the project will provide breeding habitat for the goby species that are prevalent in Agua Hedionda Lagoon.

c. Provides a buffer zone of an average of at least 300 feet wide, and not less than 100 feet wide, as measured from the upland edge of the transition area.

The Otay River Floodplain Site is located in an isolated corner of South San Diego Bay with buffers on all sides, including the restoration of a riparian and brackish marsh area to the east. The nearest human habitation from the entrance channel to the floodplain restoration is 100 feet; however, it is generally greater than 700 feet. The existing pedestrian trail is from 75 to 125 feet from the restoration, but will be separated by a flood control levee along the Otay River. The Pond 15 Site is further isolated from human habitation or use and will meet the requirements set forth.

d. Provides maximum upland transition areas (in addition to buffer zones);

A gradual transitional area is being provided to allow for sea-level rise and this zone will provide a substantial area of transitional wetland habitat around the perimeter of the Otay River Floodplain.

Restoration involves minimum adverse impacts on existing functioning wetlands and other sensitive habitats;

e. The proposed restoration entails the conversion of a former and existing salt evaporation ponds to intertidal salt marsh, mudflats and subtidal habitats. The former and existing salt evaporation ponds do not contain highly functioning wetlands or other sensitive habitats due to human alteration, high salinities, and continuing industrial use. Mitigation is being provided for any project impact to existing wetlands. Thus, the project will have minimal adverse impacts to existing wetlands and other sensitive habitats.

Site selection and restoration plan reflect a consideration of site specific and regional wetland restoration goals;

f. The following goals provided the guiding principles for the South San Diego Bay Unit. They are consistent with Refuge purposes, National Wildlife Refuge System goals, the National Wildlife Refuge System Improvement Act, Service policies, and international treaties. These goals apply to all of the management alternatives evaluated for this Refuge Unit.

Goal 1: Protect, manage, enhance, and restore open water, coastal wetlands, and native upland habitat to benefit the native fish, wildlife, and plant species supported within the South San Diego Bay Unit.

Goal 2: Support recovery and protection efforts for the federally and state listed threatened and endangered species and species of concern that occur within the South San Diego Bay Unit.

Goal 3: Provide high quality foraging, resting, and breeding habitat for colonial nesting seabirds, migratory shorebirds and waterfowl, and salt marsh-dependent species.

Goal 4: Provide opportunities for compatible wildlife-dependent recreation and interpretation that foster public appreciation of the unique natural and cultural heritage of South San Diego Bay.

In addition, the CCP was prepared using the following documents as guidance:

- All applicable Service threatened and endangered species recovery plans;
- Ecoregion Planning, as defined by the Service;
- Shorebird Conservation Planning, as defined by the U.S. Shorebird Conservation Plan;
- Waterbird Conservation, as defined by the North American Waterbird Conservation Plan;
- National Strategy for Coastal Restoration, as defined by Restore America's Estuaries and the National Oceanic and Atmospheric Administration
- Marine Protected Areas, as defined by Executive Order 13158;
- California Wildlife: Conservation Challenges, California's Wildlife Action Plan, as defined by the California department of Fish and Game; and, Regional restoration needs

g. Restoration design is that most likely to produce and support wetland-dependent resources;

As stated above, the major goals of the proposed restoration is to protect, manage, enhance and restore open water, coastal wetlands and native upland to benefit native fish, wildlife and plant species supported within the Refuge unit and to provide habitat for salt-marsh dependent species. The project has been designed to achieve the objective of producing and supporting wetland-dependent species.

h. Provides rare or endangered species habitat;

Goal 2, stated above, addresses the recovery and protection efforts for the federally and state listed threatened and endangered species and species of concern that occur within the South San Diego Bay Unit. The over-arching reason for the establishment of the South Bay unit was the preservation and recovery of threatened and endangered species, including the light-footed clapper rail, the California least tern and salt marsh bird's beak. The preferred restoration plan provides a diverse assemblage of wetland habitats, including cordgrass-dominated salt marsh – the preferred nesting and foraging habitat of

the light-footed clapper rail - fishery resources that support the California least tern, and shallow subtidal habitat that provides nursery grounds for California halibut.

The design of the project includes provision of nesting islands for use by California least tern and other sensitive shorebirds.

i. Provides for restoration of reproductively isolated populations of native California species;

As stated above, one of the primary reasons for acquiring the South San Diego Bay Unit was to preserve and restore habitat for the endangered light-footed clapper rail. Although these birds can fly, they rarely do so and migrate locally usually by walking or, occasionally, swimming. Thus, a clapper rail population within South San Diego Bay is essentially isolated from other southern California populations. As stated previously, restoration of the South San Diego Bay Unit will benefit the clapper rail and other threatened and endangered species. The restoration provides the opportunity to establish a population or populations of the endangered salt marsh bird's beak, a hemiparasitic plant that occurs in the upper elevations of salt marsh habitats. Populations of salt marsh bird's beak at other southern California wetlands are reproductively isolated from one another.

j. Results in an increase in the aggregate acreage of wetland in the Southern California Bight:

The proposed restoration of the Otay River Floodplain Site and Pond 15 Site will increase the aggregate acreage of tidal wetland in the Southern California Bight.

k. Requires minimum maintenance;

The proposed restoration of the former and existing solar evaporation ponds would be accomplished be creating elevations suitable for tidal wetland habitat. There are no hard structures needed, such as jetties, as the site is not subject to coastal erosion or deposition by wave action. The Otay River is dammed upstream of the Otay River Floodplain Site, and does not convey a sediment load that would be potentially damaging to a subtidal-intertidal wetland. Thus, maintenance dredging is not anticipated. Once vegetation has become established, there is no anticipated need for planting or maintenance of exotic weed species.

l. Restoration project can be accomplished in a reasonably timely fashion; and,

It is anticipated that restoration of the Otay River Floodplain Site and the Pond 15 Site can be accomplished within the timeframes set forth in the MLMP.

m. Site(s) in proximity to the Carlsbad desalination facility.

The Refuge is located approximately 35 miles south of Aqua Hedionda Lagoon, the site of the Carlsbad Desalination Plant.

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