CHAPTER 3
AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes existing site characteristics and resources that may be affected by the Otay River Estuary Restoration Project (ORERP or proposed action). The approximately 165.3-acre project site is located within the South San Diego Bay Unit of the San Diego Bay National Wildlife Refuge (NWR). The project site encompasses two separate, non-contiguous areas: the Otay River Floodplain Site and the Pond 15 Site. The 33.51-acre Otay River Floodplain Site consists of undeveloped land held in trust for the people of California by the State Lands Commission and leased to the U.S. Fish and Wildlife Service (Service) for management as a National Wildlife Refuge. The 90.90-acre Pond 15 Site is also leased to the Service from the State Lands Commission and is currently part of a component of the South Bay Salt Works, which operates on the San Diego Bay NWR under a Special Use Permit from the Service.

This chapter analyzes project-specific environmental effects, and is intended to tier from the programmatic Environmental Impact Statement and Record of Decision for the San Diego Bay NWR Comprehensive Conservation Plan. The Environmental Impact Statement for the San Diego Bay NWR is incorporated by reference (USFWS 2006).

3.1.1 Regional and Historical Setting

San Diego Bay and the San Diego Bay National Wildlife Refuge

San Diego Bay is a natural embayment located entirely in San Diego County, California, that originated from the alluvial plains of the Otay, Sweetwater, and San Diego Rivers. The entrance to the nearly enclosed water body is located approximately 9 miles northwest of the project site. San Diego Bay has a water surface area of approximately 17 square miles at mean lower low water and is approximately 15 miles in length.

San Diego Bay is located on the Southern California Bight, which is a 300-kilometer portion of the Southern California coastline that extends from Point Conception to just past the Mexico/United States border. The marine ecosystem and overall biodiversity surrounding the Southern California Bight are affected by this dramatic curve in the coastline, which creates a significant backwater eddy. This backwater eddy is created by the combined northern flow of equatorial waters along the shore and the southern flow of subarctic waters offshore. A biological transition zone occurs between these warm and cold waters, which supports approximately 500 marine fish species and more than 5,000 invertebrate species (Southern California Coastal Water Research Project 1998).

Freshwater input to San Diego Bay is primarily introduced by the Otay and Sweetwater Rivers, but there are other small tributaries that empty into San Diego Bay. Most of the dry-season inflows into San Diego Bay consist of runoff from urban sources of imported freshwater. Prior to human disturbance, the southern portion of the San Diego Bay consisted of salt marshes, intertidal mudflats, and shallow subtidal habitats. Very little natural habitat remains on the upland areas adjacent to San Diego Bay, and only scattered remnants of the coastal estuaries that once occupied the lower reaches of the Sweetwater and Otay Rivers have been preserved. A substantial portion of San Diego Bay's intertidal wetlands had been filled or dredged by the 1970s to accommodate various port developments and commercial and military ship operations. The majority of remaining natural habitat is protected within the boundaries of the San Diego Bay NWR (USFWS 2006).

The San Diego Bay NWR consists of the Sweetwater Marsh Unit and the South San Diego Bay Unit. The project site is located within the South San Diego Bay Unit, which is southeast of the Sweetwater Marsh Unit. Approximately 2,300 acres of the land and water is managed within the South San Diego Bay Unit. Of that expansive area, approximately 850 acres is open water within San Diego Bay, and the remaining 1,450 acres consists of solar salt ponds and intertidal, riparian, and upland habitats (USFWS 2006).

The South San Diego Bay Unit, located within the southern portion of San Diego Bay, has been managed by the Service since 1998. The wetlands conserved within this portion of the San Diego Bay NWR provide important foraging habitat for migratory shorebirds and other waterbirds. The qualities of the salt works located within the South San Diego Bay Unit, including limited human disturbance, isolation from human development, the availability of exposed or lightly vegetated open ground, and unrestricted visual access, make it an important nesting area for 16 bird species, including 6 species of terns. Of these species, California least tern (*Sternula antillarum browni*) is a Federally and State-listed endangered species, western snowy plover (*Charadrius nivosus nivosus*) is a Federally listed threatened species, and Belding's savannah sparrow (*Passerculus sandwichensis beldingi*) is a State-listed endangered species. The South San Diego Bay Unit of the San Diego Bay NWR protects a diversity of endangered, threatened, migratory, and native species.

The entire southern end of San Diego Bay, including the South San Diego Bay Unit, has been recognized as a Western Hemisphere Shorebird Reserve Network Site by the Western Hemisphere Shorebird Reserve Network. Specifically, the South San Diego Bay Unit provides nesting, foraging, and resting habitat for a diverse assembly of birds, including those that migrate along the Pacific Flyway. 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 numbers of nesting western gull-billed terns (*Gelochelidon nilotica vanrossemi*), and significant numbers of surf scoters (*Melanitta perspicillata*), Caspian terns (*Hydroprogne caspia*), and western

snowy plovers. Continued preservation of protected nesting areas contributes to the potential for reproductive success of the threatened western snowy plover, endangered California least tern, and an array of ground-nesting seabirds and shorebirds (USFWS 2006).

Along with the habitat availability for birds of conservation concern, San Diego Bay NWR wetlands provide high-quality habitat for a variety of fish; marine and terrestrial invertebrates; and a small number or amphibians, reptiles, and mammal species. The South San Diego Bay Unit includes areas of vegetated and non-vegetated shallow subtidal habitat, including eelgrass (*Zostera*) beds. These eelgrass beds provide highly productive microhabitats for a wide variety of invertebrates and small fish. San Diego Bay's small population of Federally threatened East Pacific green turtle (*Chelonia mydas*) relies on eelgrass as an important food source.

The natural environment within the southern section of San Diego Bay was altered more than 100 years ago to accommodate commercial solar salt evaporation ponds. The operation, which continues to operate today, consists of a series of diked open water ponds that facilitate the concentration and precipitation of salts. South Bay Salt Works once encompassed approximately 1,300 acres. A recent (2011) restoration of intertidal habitats occurred, including to subtidal channels, intertidal mudflat, and vegetated intertidal salt marsh, in the former salt ponds that were located west of the Otay River flood control channel. Currently, the commercial salt ponds occupy approximately 830 acres within the South San Diego Bay Unit, including 23 separate ponds, as shown in Figure 1-2 of Chapter 1, Introduction, of this document. This includes approximately 300 acres of primary ponds (Ponds 12 through 15), approximately 360 acres of secondary ponds (Ponds 20 through 27), and 170 acres of ponds used in the pickling and crystallizing process (Ponds 28 through 30 and 41 through 48). Although a historical part of the San Diego economy, salt produced from these ponds does not present a significant portion of the local or large-scale salt production market (City of San Diego 2008).

In addition to managing habitats and the wildlife it supports, the San Diego Bay NWR also provides the public with wildlife viewing opportunities of the natural resources protected within the San Diego Bay NWR. To achieve the purposes for which the San Diego Bay NWR was established, which include protecting, managing, and restoring habitats for Federally listed endangered and threatened species and migratory birds, and maintaining and enhancing the biological diversity of native plants and animals, portions of the San Diego Bay NWR, such as the salt ponds, are generally closed to public access. Occasionally, guided tours are provided along the outer salt pond levees to accommodate wildlife observation during the non-breeding season. Fishing and boating are permitted within the open waters of San Diego Bay, but not within or immediately adjacent to the salt ponds or the restored salt marsh habitat at the southwestern end of San Diego Bay. Passive recreational use, including wildlife observation, environmental education, photography, and interpretation, are all available within the San Diego Bay NWR. The Bayshore Bikeway, which extends along the north side of the Otay River

Floodplain Site, provides visual access for active recreational users. A narrow corridor of salt marsh and native riparian habitat is supported within the Otay River channel and portions of Nestor Creek on and adjacent to the Otay River Floodplain Site.

Prior to inclusion within the San Diego Bay NWR, the eastern portion of the Otay River Floodplain Site was subject to habitat disturbance from farming and construction and operation of a sewage treatment facility, and the western portion of the site was at one time part of the salt works complex. Most of the native upland and wetland habitat within the Otay River Floodplain Site was removed or significantly altered due to industrial, agricultural, or municipal activities dating back to 1916.

Salt Production

The history of solar salt production in the south San Diego Bay (South Bay) began in 1871 with development of La Punta Salt Works. This small-scale salt production facility was initially constructed on approximately 60 acres in the extreme southeast corner of San Diego Bay. This facility subsequently closed, and in 1902, Graham Babcock established the Western Salt Company approximately 0.25 miles northeast of the extant La Punta Salt Works. In 1911, when E.S. Babcock took over the Western Salt Company operation, he began purchasing much of the land along the south end of San Diego Bay to expand the facility. As the facility expanded, the historic salt marsh and intertidal mudflats were eliminated by the formation of diked evaporation ponds. By 1916, the facility extended across the entire end of the South Bay. A major flood severely damaged the facility in early 1916, but reconstruction began immediately and continued through 1918 (Appendix K).

In 1922, the salt works facility was purchased by H.G. Fenton and remained under the ownership of H.G. Fenton Company until the majority of the salt works was incorporated into the South San Diego Bay Unit in 1999. The southeasternmost bittern ponds, which were not included in the San Diego Bay NWR acquisition boundary, were retained by H.G. Fenton Company until the land was sold to the Charles Company. The salt ponds included in the San Diego Bay NWR, now operated by South Bay Salt Works, continue to produce salt through solar evaporation under a Special Use Permit issued by the Service. In 2011, the salt production operation was downsized when the western salt ponds were taken out of operation and restored to tidally influenced coastal wetlands (Appendix K).

Until 1986, the portion of the Otay River floodplain previously known as the MKEG/Fenton area was primarily used for the production of truck crops. The 146-acre parcel, located to the south of the salt works facility, included the 126-acre MKEG property owned by the Egger and Ghio Corporation and a 20-acre Fenton parcel purchased by the City of San Diego in the late 1990s (USFWS 2006). The area currently consists of a combination of fallow agricultural land, which

is regularly disked to control weed growth, and restored riparian habitat located to the east and west of the Otay River channel. To the west of Nestor Creek, the project site includes approximately 33.51 acres of Otay River floodplain. This area encompasses the northern one-third of what was previously referred to as Pond 20. Pond 20 was at one time part of the evaporative salt pond system operated by the Western Salt Company.

Additional information regarding existing and historical uses of the Otay River Floodplain Site is provided in Section 3.2, Physical Environment.

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3.2 PHYSICAL ENVIRONMENT

3.2.1 Topography/Visual Quality

The Otay River Estuary Restoration Project (ORERP or proposed action) is separated into two non-contiguous sites: the Otay River Floodplain Site and the Pond 15 Site. Both have a scenic aesthetic quality due to the open nature of the sites and their proximity to the coastline. The lack of significant topographic relief on Otay River Floodplain Site and Pond 15 Site and surrounding properties allows for broad views across the sites from the neighboring communities of National City, Chula Vista, Imperial Beach, and the Silver Strand (State Route 75 (SR-75)). The project sites are surrounded by scenic resources, including San Diego Bay and marshlands.

The portion of SR-75 that traverses the western perimeter of the San Diego Bay has expansive views of the Pacific Ocean to the west and San Diego Bay to the east. SR-75 is designated as an eligible scenic highway from the intersection with Interstate 5 (I-5) at Palm Avenue to its second intersection with I-5 at the east end of the Coronado Bay Bridge. Views of the project sites from this designated segment are distant from across the Bay.

According to the *San Diego Bay National Wildlife Refuge Final Comprehensive Conservation Plan and Environmental Impact Statement* (USFWS 2006), the predominant topographic features of the proposed action areas include the system of relatively low, earthen berm levees within the salt works complex and the vegetation communities and land covers of the Otay River floodplain. Due to their elevation within the depressed salt ponds and contrasts in color with salt pond waters, the levees are visible from open water areas of San Diego Bay, higher-elevation upland areas within the Otay River floodplain, and residences and public viewing areas located to the south of the South San Diego Bay Unit of the San Diego Bay National Wildlife Refuge (NWR). In addition to levees, sparsely vegetated soil stockpiles and occasional low-mounded, stark white salt piles are located along the eastern extent of Pond 20. A sparsely vegetated earthen berm lines the southeastern boundary of Pond 22 in the proposed action area. The waters of the salt ponds display various hues of color that vary with salinity levels, while vegetation within and adjacent to the salt ponds is generally lacking.

Otay River Floodplain Site

The 33.51-acre Otay River Floodplain Site is located within the uplands of the Otay River floodplain at the southeastern edge of San Diego Bay, as shown in Figure 1-2, Vicinity Map. The relatively flat floodplain gently slopes from southeast to northwest, ranging in elevation from approximately 9.5 to 18.5 feet above mean sea level (amsl). The flat elevation of the site and surrounding areas allows for direct views of the adjacent salt ponds and San Diego Bay to the north. These two features are the most prominent landforms in the general vicinity. The levees that form the salt ponds are visible from around the Bay and much of the developed upland areas

that border the Bay to the south (USFWS 2006). The San Ysidro Mountain Range, including Otay Mountain, which is the highest point in the mountain range, is located more than 12 miles from the project site and is visible on the horizon from the site.

The gently sloping Otay River Floodplain site supports a variety of vegetation communities and land covers that ultimately characterize the approximately 33.51-acre floodplain area. Low, spreading patches of *Isocoma* scrub dominated by the yellow flowering Menzies' goldenbush (*Isocoma menziesii*) are located west of Nestor Creek and occur in relatively close proximity to unvegetated tidal channels that display the visible effects of erosion and scouring caused by floods and/or regular tidal inundation. While portions of the floodplain area support low, grey-green pickleweed (*Salicornia* sp.) plants, flowering herbs, and relatively dense stands of California cordgrass (*Spartina foliosa*) within swaths of southern salt water marsh located along Nestor Creek, the area is also marked by unvegetated and disturbed habitat resulting from repeated occurrences of mechanical perturbation. Outside of the Otay River Floodplain Site and near the Otay Valley Regional Park hike/bike trail located west of I-5 and within the floodplain, the landscape is marked by dense vegetation within the Otay River channel and by dense linear plantings of moderately tall (approximately 6 feet tall and greater) and spreading light to dark green riparian shrubs located on the River Partners Restoration parcels.

Channelized water flows along the northern boundary of the site through the Otay River and through the center of the site in a north–south direction through Nestor Creek. The western portion of the site contains levees and basins that were constructed as part of the salt pond system. The eastern portion of the site was formerly used for sewage treatment facilities and agriculture, and is currently dominated by non-native plant species (USFWS 2006).

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 and SR-75. I-5, located to the east, is slightly higher than the adjacent floodplain, providing the opportunity for distant views of the Otay River Floodplain Site, primarily from the slower lanes of I-5 between Main Street and Palm Avenue. However, even these views are somewhat obscured by native trees and shrubs recently planted in the area of the Otay River floodplain to the west of I-5.

A portion of the Bayshore Bikeway, a 24-mile-long bicycle facility that will ultimately extend around San Diego Bay, travels along a thin strip of land between the Otay River floodplain and the Otay River channel, providing views of the project site. The bikeway in this location is separated from NWR lands by a 6-foot-high chain-link fence. The Otay River channel and locations of standing water, wetlands, and variations in coastal vegetation on the Otay River Floodplain Site are visible from the bikeway. The bike and pedestrian path that extends along the eastern side of the Otay River Floodplain Site north of Saturn Boulevard also provides a public

viewpoint for this site. The most unobstructed views of the Otay River Floodplain Site occur near the northern extent of 13th Street within the City of Imperial Beach.

Pond 15 Site

The Pond 15 Site is relatively flat, located directly along the southeastern edge of San Diego Bay, approximately 1.5 miles east of the Pacific Ocean. The water-filled salt pond has little to no vegetation around the water's edge or on the levees due to the high salinity. The levees and salt ponds, including the Pond 15 Site, are visible from the Bay and much of the developed upland area that borders the south Bay, including the industrially developed sites located east and northeast of the salt ponds.

The prominent visual features from the Pond 15 Site as viewed from outside the San Diego Bay NWR include the levee barrier system that separates the ponds from the tidal circulation of the surrounding Bay. Chula Vista Bayfront Park is located approximately 0.5 miles north of the Pond 15 Site. This area also has an uninterrupted distant view of the Pond 15 Site, with only the waters of the Bay and the access road to the Chula Vista Wildlife Reserve between the two areas. The Pond 15 Site is also visible from 1 to 2 miles across the Bay from the Bayshore Bikeway and the Silver Strand (SR-75).

3.2.2 Geology, Soils, and Agricultural Resources

The following five technical reports were reviewed in preparation of this section, and applicable information from each of these reports is incorporated into the discussion below.

- *Geotechnical Engineering Investigation for Western Salt Company Salt Ponds*, prepared by GEOCON Consultants Inc. (GEOCON) in 1985.
- *Limited Site Assessment for MKEG Property – Palm City Saturn Boulevard (19th Street)*, prepared by GEOCON in April 1989.
- *Geotechnical Engineering Investigation for Egger-Ghio Property*, prepared by GEOCON in October 1986.
- *Sediment Characterization Sampling and Analysis Report: South San Diego Salt Ponds 12, 13, 14, and 15*, prepared by Anchor QEA LP (Anchor QEA) in April 2013 (Appendix F1).
- *Sampling and Analysis Report: Otay River Estuary Restoration Soil Characterization Program* prepared by Anchor QEA in March 2013 (Appendix F2).

Seismicity

No known faults exist in the immediate vicinity of the project site. The closest mapped fault is the Rose Canyon Fault that traverses downtown San Diego, extends across Coronado, and then

continues south into the Pacific Ocean, approximately 4 miles 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). La Nacion Fault Zone, a quaternary fault, runs parallel to the Rose Canyon Fault Zone, approximately 6 miles to the east of the project sites (City of San Diego 2008a). 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 run approximately 10 to 25 miles west of the project sites. These fault zones are considered to be "potentially active," having produced a magnitude 4.6 (Richter) earthquake on June 29, 1983, approximately 10 miles west of San Diego (GEOCON 1986).

South San Diego Bay is generally underlain by alluvial bay deposits that consist of loose to moderately dense, silty sands and soft to firm sandy clays. The area is generally level and not prone to landslide. Due to the soils and groundwater, the area is at risk for liquefaction and settlement that may occur as a result of ground shaking from a nearby earthquake. 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 produced by earthquakes, and causes the water pressure in the pores of the soil to increase, decreasing soil strength.

The low elevation adjacent to the ocean also puts the area at risk for inundation during a tsunami associated with 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 time span, range from approximately 0.25 g to 0.32 g (California Geological Survey 2003).

Soils

Otay River Floodplain Site

The Otay River Floodplain Site is located at the western terminus of the Otay River within the Otay River floodplain. In general, the floodplain is characterized by soft alluvial bay deposits under 3 to 5 feet of uncompacted fill soils. As shown on Figure 3.2-1, Project Site Soils, the Otay River Floodplain Site is almost entirely composed of Grangeville fine sandy loam, with 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. The eastern edge of the site is composed of Visalia gravelly sandy loam, ranging from 2% to 5% slopes. Visalia gravelly sandy loam is also commonly found in alluvial fans and has a high capacity for transmitting water. However, this soil only contains moderate available water storage capacity compared to the soil on the majority of the 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 storage capacity (USDA 2016).

As outlined in the *Sampling and Analysis Report: Otay River Estuary Restoration Soil Characterization Program*, prepared by Anchor QEA (Appendix F2), the Otay River Floodplain was sampled for grain size, total organic carbon (TOC), metals, pesticides, total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), and semi-volatile organic carbons (SVOCs). Within the boundary of the Otay River Floodplain Site, contaminants were detected within soil samples. Detailed results of this analysis are outlined in Section 3.2.5, Hydrology and Water Quality, and Section 3.2.10, Contaminants.

Pond 15 Site

The Pond 15 Site is composed of 140 million gallons of water and underlain by Quaternary alluvium. This is silt, sand, clay, and gravel with minor cobbles and boulders generally found in river and stream bottom, valley fill, floodplain, fan, beach sand, swamp, and sand dune deposits. The Pond 15 Site is within a liquefaction hazard area—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 Update Environmental Impact Report* geologic maps (City of Chula Vista 2005, Figures 5.5-1 and 5.5-2).

In 1985, a series of exploratory borings were excavated within the salt ponds on the levees and adjacent upland areas (GEOCON 1985). Although this study did not provide any information about soil characteristics on the bottoms of the salt ponds, it did provide general information about soil characteristics below the ponds. The investigation revealed that the levees are overlain by 2 to 7 feet of fill soils composed of loose to moderately dense silty sand and sandy gravel. Underlying these fill soils are bay deposits, older alluvial bay deposits, and bay point formation. The majority of the salt ponds are underlain by bay deposits, which consist primarily of soft bay muds. The thickness of the bay deposits varies from approximately 23 feet near the center of the salt ponds to less than 5 feet at the eastern edges of the crystallizer ponds. Older bay deposits alluvium occurs below the bay deposits and immediately beneath the fill soils along the southeastern edge of the San Diego Bay NWR, and is composed of saturated, firm, silty sandy shallow bay deposits and/or older bay deposits alluvium. The soil characteristics of the bay point formation include stiff to hard sandy clays and dense to very dense silty sand (GEOCON 1985).

Geologic Hazards

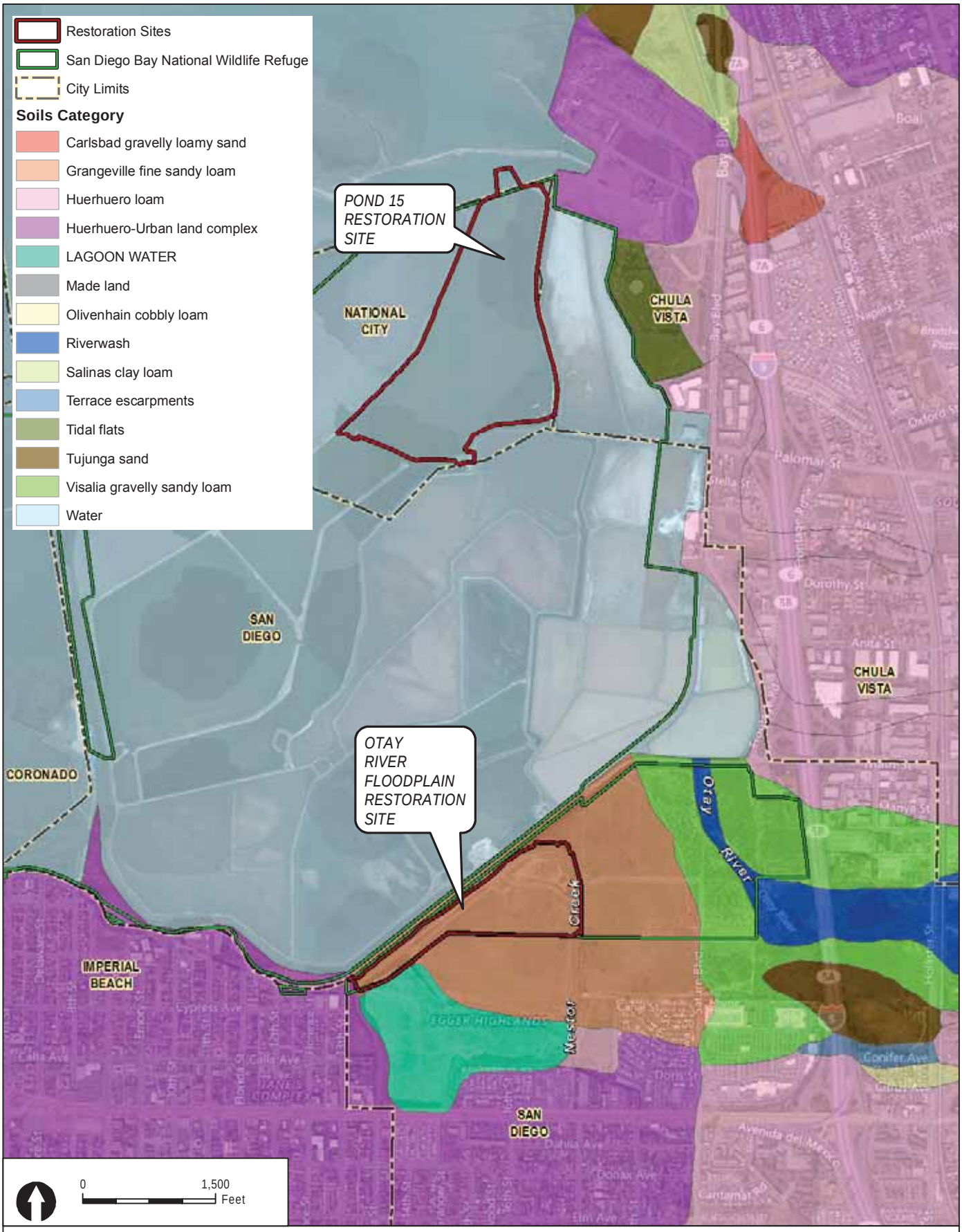
Otay River Floodplain Site

The Otay River Floodplain Site is located within Geologic Hazard Category 33 (Low Liquefaction Potential – fluctuating groundwater, minor drainages) on the City of San Diego (City) Seismic Safety Study, Geologic Hazards and Faults Grid Tile 6 (City of San Diego 2008a). The groundwater level exists within a range of 3 to 8 feet below the surface due to the local groundwater gradient (USFWS 2006). 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).

The Otay River Floodplain Site is not located within the tsunami inundation area on the California Emergency Management Agency Tsunami Inundation Map for Emergency Planning, Imperial Beach Quadrangle (CalEMA 2009).

Pond 15 Site

The Pond 15 Site is composed of approximately 140 million gallons of water; therefore, liquefaction hazard in this area is high. In addition, the Pond 15 Site is located within the tsunami inundation area on the California Emergency Management Agency Tsunami Inundation Map for Emergency Planning, Imperial Beach Quadrangle (CalEMA 2009). Additionally, project features 1, 9, 10, 11, 12, and 13 as shown on Figure 2-1a would be located within the tsunami inundation area (CalEMA 2009).



SOURCE: BING MAPPING SERVICE

FIGURE 3.2-1

Project Site Soils

Otay River Estuary Restoration Project EIS

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Agricultural Resources

Otay River Floodplain Site

Both the County of San Diego (County) and the City of San Diego have experienced a loss in available agricultural 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 on Figure 3.2-2, Farmland Mapping and Monitoring Program Designations. 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 more than 30% of the land use (City of San Diego 2008b).

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 for sustaining long-term production of agricultural crops (USFWS 2006). However, in 2008 these portions of the Otay River Floodplain were designated as Farmland of Local Importance. Farmland of Local Importance is defined as land that meets all of the characteristics of prime and State-wide importance, with the exception of irrigation, or farmlands that are of significant economic importance to the County, such as having a history of good production for locally adapted crops. 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 (CDOC 2013a).

The Otay River Floodplain Site is primarily composed 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 because of the small range of season and diurnal temperature changes and high humidity (USFWS 2006). The Otay River floodplain was used for agricultural purposes from the mid-1930s until 1988 for production of various crops, including bell peppers, beans, cucumbers, tomatoes, cabbage, and celery, with tomatoes as the principal crop. 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 2006). 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 (CDOC 2013a) in and around the site.

Pond 15 Site

Due to the high volume of water in this area, the Pond 15 Site is designated as "Other Land," not specified for agricultural use within the San Diego County Important Farmland Map (CDOC 2013b).

3.2.3 Mineral Resources

Otay River Floodplain Site

Mineral Resource Zones for the City of San Diego, which indicate the probability of an area having valuable mineral resources, are shown on Figure 3.2-3, Mineral Resource Zones. The Otay River Floodplain Site is classified by the City 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 2008b). No mineral resources of value are expected to occur on the Otay River Floodplain Site.

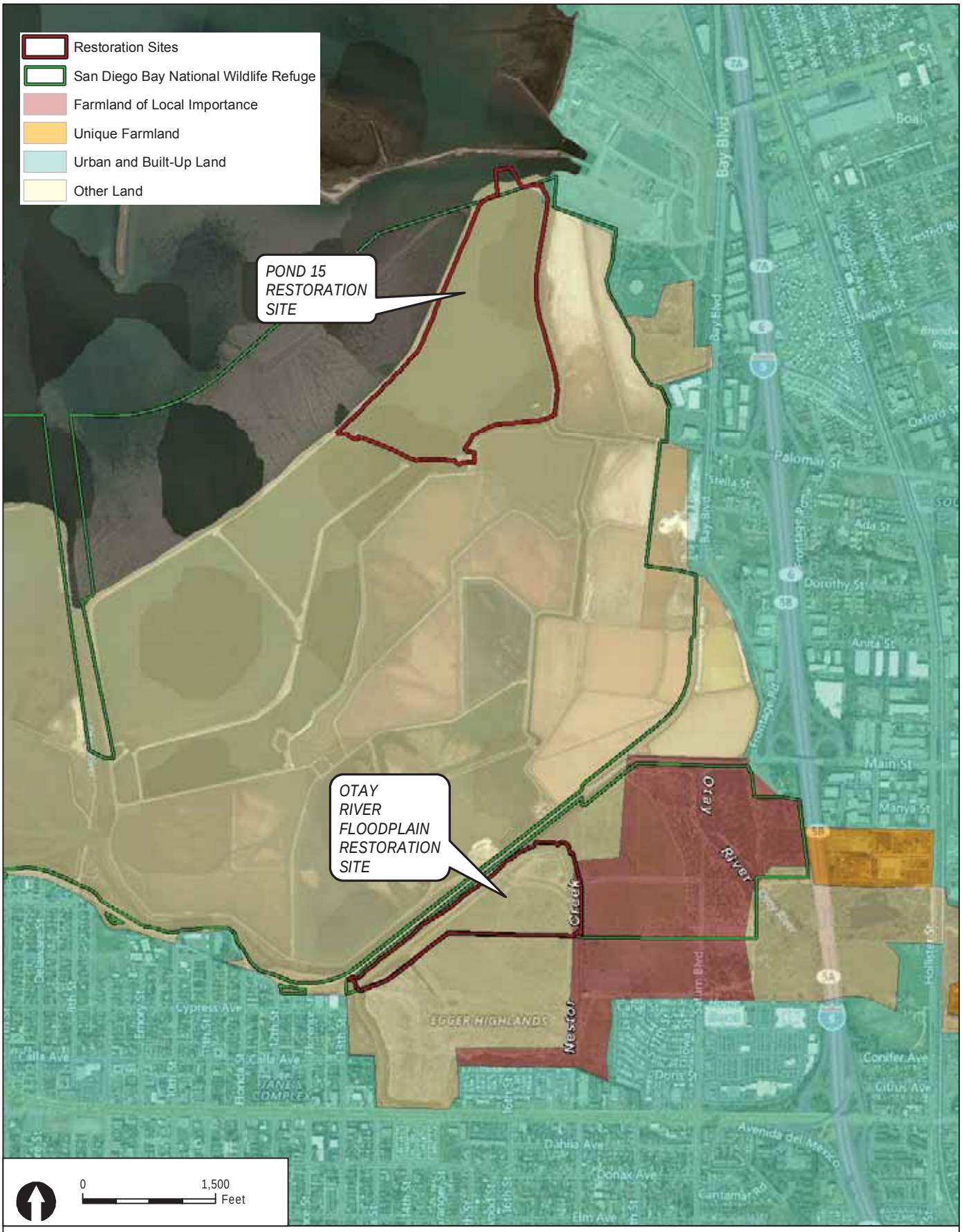
Pond 15 Site

Although the Pond 15 Site is a part of the salt production at the South Bay Salt Works, the area is classified as Mineral Resource Zone 1 (refer to Figure 3.2-3), with a portion of the site not classified at all. As mentioned for the Otay River Floodplain Site, Mineral Resource Zone 1 is an area where no significant mineral deposits are present or where it is judged that there is little likelihood for their presence. No mineral resources of value are expected to occur on the Pond 15 Site.

3.2.4 Paleontological Resources

Paleontological resources (fossils), defined as the remains, imprints, and/or traces of prehistoric plant and animal life exclusive of human remains or artifacts, represent a limited, non-renewable, sensitive scientific and educational resource. Fossil remains such as animal bones and teeth, shells, and wood are found in the geologic deposits (rock formations) in which they were originally buried and provide scientists with the opportunity to explore the history of life on earth.

The potential for fossil remains at a location can be predicted through previous correlations that have been established between the fossil occurrence and the geologic formations within which they are buried. For this reason, knowledge of the geology of a particular area and the paleontological resource sensitivity of particular rock formations makes it possible to predict where there is a high or low potential for fossils to be present in a given area. However, there are some formations in which the potential for fossils to be present is harder to predict.



SOURCE: BING MAPPING SERVICE

FIGURE 3.2-2

Farmland Mapping and Monitoring Program Designations

Otay River Estuary Restoration Project EIS

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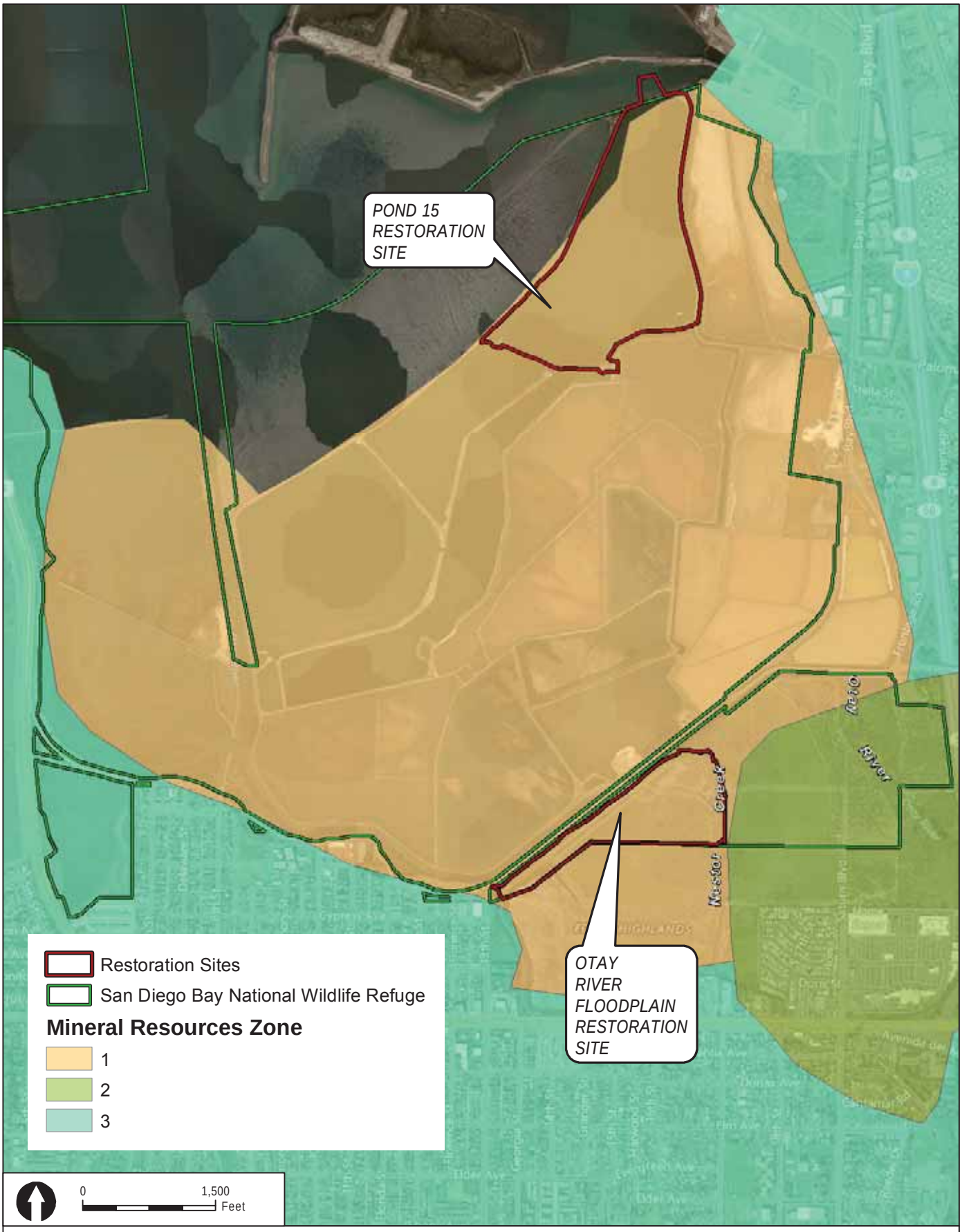

AERIAL SOURCE: BING MAPPING SERVICE

FIGURE 3.2-3

Mineral Resource Zones

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Otay River Floodplain Site

The Otay River Floodplain Site is located at the western terminus of the Otay River within the Otay River floodplain. In general, the floodplain is characterized by soft alluvial/bay deposits under 3 to 5 feet of uncompacted fill soils. As shown on Figure 3.2-1, the Otay River Floodplain Site is almost entirely composed of Grangeville fine sandy loam at slopes ranging from 0% to 2%. The eastern edge of the site is composed of Visalia gravelly sandy loam ranging from 2% to 5% slopes. 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 (USDA 2011). Surface mapped younger alluvium in this area overlies the bay point formation. The bay point formation has a high sensitivity rating for paleontological resources (City of San Diego 2007) and is known to produce Pleistocene age, scientifically significant paleontological resources throughout the South Bay.

Pond 15 Site

As noted above, the Pond 15 Site is composed of 140 million gallons of water and is underlain by Quaternary alluvium. According to the borings conducted on the Pond 15 Site during the 1985 exploration, the levees are overlain by 2 to 7 feet of fill soils and underlain by bay deposits including older alluvial bay deposits and bay point formation. The majority of the salt ponds are underlain by bay deposits, which consist primarily of soft bay muds. The thickness of the bay deposits varies from about 23 feet near the center of the salt ponds to less than 5 feet at the eastern edges of the crystallizer ponds. Older bay deposits/alluvium occurs below the bay deposits and is composed of saturated, firm, silty sandy, shallow bay deposits, and/or older bay deposits/alluvium, immediately beneath the fill soils along the southeastern edge of the San Diego Bay NWR (GEOCON 1985). As described previously, the bay point formation has a high sensitivity rating for paleontological resources (City of San Diego 2007) and is known to produce Pleistocene age, scientifically significant paleontological resources throughout the South Bay.

3.2.5 Hydrology and Water Quality

The following two technical reports were reviewed in preparation of this section, and applicable information from each of these reports is incorporated into the discussion that follows.

- *Tidal Hydraulics Analysis of the Otay River Estuary Restoration Plan* prepared by Dr. Scott A. Jenkins Consulting in September 2014 (Appendix G).
- *Otay River Estuary Restoration Project Fluvial Hydraulics Study*, prepared by Everest International Consultants Inc. in October 2014 (Appendix H).

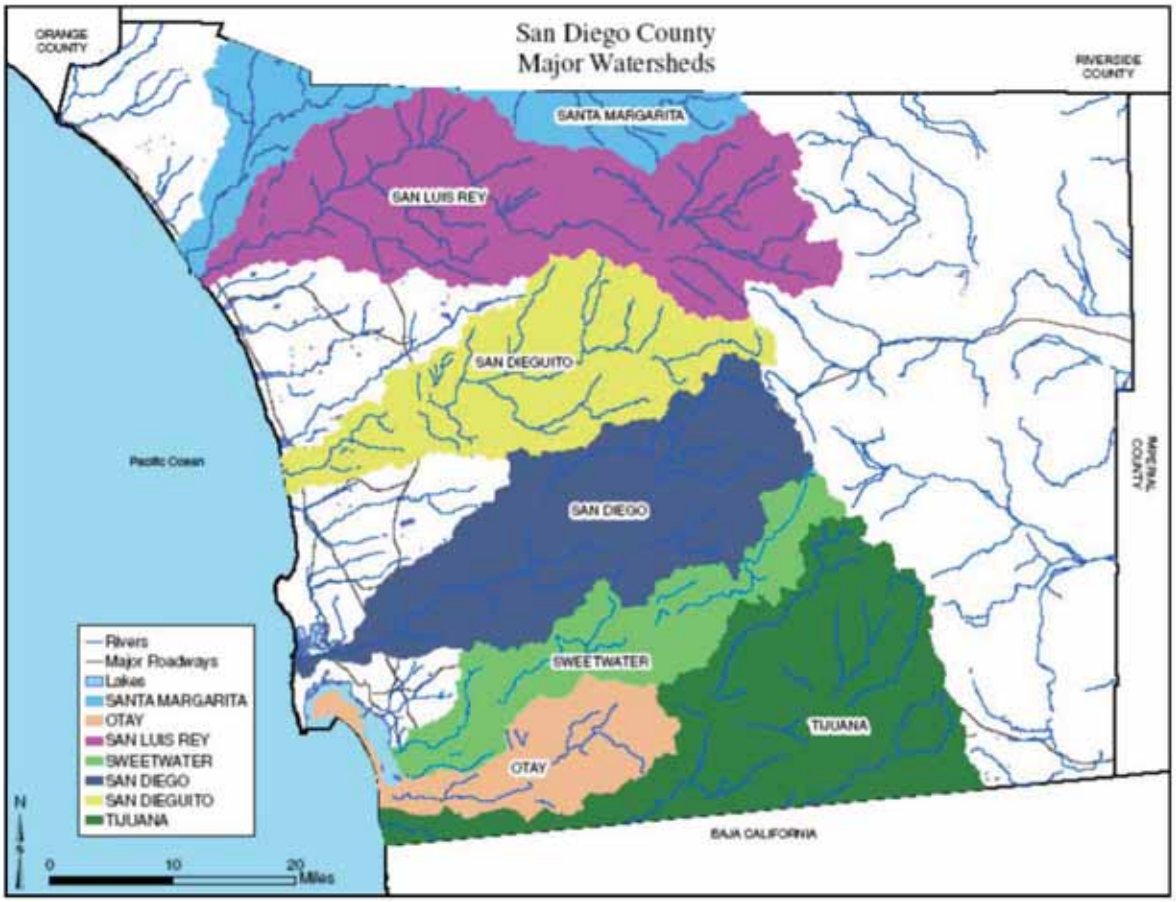
Hydrology

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 on Figure 3.2-4, Otay River Watershed. The Otay River originates in the Cleveland National Forest along Dulzura Creek, with several tributaries, including Hollenbeck Canyon Creek, Jamul Creek, and Proctor Valley Creek. Watershed flows are cut off by two reservoirs that are a part of the City's Water Supply System: the Upper Otay Reservoir and the Lower Otay Reservoir. The Otay River floodway 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 (Appendix H).

The Otay River conveys flows from the I-5 Bridge through the Otay River Floodplain and estuarine portion of the Otay River. On the west side of I-5, the river channel, which was modified more than 100 years ago, turns northwest toward South Bay Salt Works, then westward along the perimeter of Ponds 48, 20, and 22, specifically as shown on Figure 1-2,Vicinity Map. After its confluence with Nestor Creek, the Otay River continues along the northern edge of the Otay River Floodplain Site and along the western side of Ponds 23 and 12, finally discharging into the San Diego Bay (Appendix H).

Hydraulic conditions along the Otay River are affected by a combination of tidal exchange with San Diego Bay and watershed flows from the Otay River. Tidal influence extends from San Diego Bay toward the floodplain near Pond 48 at the northeastern corner of the Otay River Floodplain Site. Tidal processes have a major impact in the general vicinity of the project site, including tidal inundation as an essential part of the survival of coastal wetland habitats. Mixed semidiurnal tides[1] occur each day that circulate the Bay waters and produce currents that influence salinity and temperature throughout the San Diego Bay. Tidal conditions within the Bay are measured by a long-term primary tide gauge at the Navy Pier, operated and maintained since 1900 by the National Oceanographic and Atmospheric Administration (NOAA). In addition to tidal variance, the water levels in the Bay are also influenced by El Niño–Southern Oscillation events and long-term changes in sea level.

[1] An area has a mixed semidiurnal tidal cycle if it experiences two high and two low tides of different size every lunar day.



Source: County of San Diego 2007

FIGURE 3.2-4
Otay River Watershed

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Urban development and human disturbance have had a major impact on the natural hydrologic, geomorphic, and ecologic functions in the vicinity of the proposed action. Construction of the Upper and Lower Otay Reservoirs have significantly altered the historical hydrologic conditions downstream of the dams. These reservoirs control approximately 68% of the watershed, reduce the frequency of flows in the Otay River, and capture sediments that historically were carried downstream toward San Diego Bay (Appendix H). Additional human disturbances include construction of the salt ponds, previous agricultural operations, the realignment and construction of both the Otay River channel and the Nestor Creek drainage, the construction of the railroad along the south end of the salt ponds, and development and operation of a sewer treatment facility near the northeast corner of Pond 20A in the 1950s and 1960s.

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 the proximity of the Pacific Ocean, groundwater at the Otay River Floodplain Site is slightly brackish, limiting vegetation to species with salt tolerance (GEOCON 1986).

The Otay River Watershed has a semi-arid climate, with precipitation typically occurring during winter months (November through April), with infrequent (approximately 10%) precipitation during the summer. 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 San Miguel Mountain, the Jamul Mountains, Otay Mountain, and Lyons Peak (see Figure 3.2-5, Otay River Watershed Average Annual Precipitation). 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 thunderstorms, 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).

Flood hazards are identified by the Federal Emergency Management Agency (FEMA) Flood Insurance Study. The most recent Flood Insurance Study for San Diego County documents return period peak flows for the Otay River as summarized in Table 3.2-1. The initial hydrologic and hydraulic analyses for the Otay River were conducted in 1981 by the California Department of Water Resources for FEMA. Hydrologic and hydraulic analyses for the Otay River between Nestor Creek and San Diego Bay were updated by the U.S. Army Corps of Engineers, Los Angeles District in December 1989. There are no major flooding problems along the Otay River, although some areas downstream of Boulevard Avenue within the City of Imperial Beach 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 3.2-1
FEMA Return Period Peak Discharges for the Otay River

Otay River	Drainage Area (square miles)	Return Peak Discharges (cubic feet per second)			
		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.

Hydraulic conditions along the Otay River are affected by a combination of tidal exchange with San Diego Bay and watershed flows from the Otay River. In order to assess the potential for flooding during the 100-year storm event in the existing condition, a two-dimensional hydrodynamic model "TUFLOW" (Two-Dimensional Unsteady Flow) was used (Appendix H). This model accounts for tidal fluctuation, flood flow, grading changes, and water control structures. TUFLOW is a finite difference model designed for tidal and fluvial hydraulics in rivers, estuaries, coastal bays, floodplains, and urban areas. Using the TUFLOW model, flood conditions were simulated for existing conditions. In the event of a flood, flows would inundate the Otay River Floodplain, and then enter the South Bay Salt Works ponds from Ponds 51, 20, and 22. The salt ponds would be filled from primarily the west and east sides before overtopping the levees toward San Diego Bay. Although sediment delivery into the ponds from the floodwaters would be low, sediments within the ponds would likely be redistributed.

In addition to the 100-year storm event, flooding would occur along the Bayshore Bikeway during the 10- and 15-year storm events. The mobile home parks along Palm Avenue between 15th Street and Saturn Boulevard to the southwest of the project site, the parking lots within the commercial center to the east of Saturn Boulevard, Swiss Park, and other properties to the north of Main Street are all subject to flooding during storm events.

Currents in San Diego Bay are predominantly produced by tides (Wang et al. 1998). This tidal exchange between the ocean and San Diego Bay is a result of a phenomenon called "tidal pumping" (Chadwick et al. 1996). The "pumping" of water is due to the flow difference between the ebb tide and flood tide flows. Being located at mid-latitude, tides and currents within San Diego Bay are dominated by a mixed semidiurnal component (Peeling 1975). Typical tidal current speeds range between 0.3–0.5 meters per second (1–1.6 feet per second) near the inlet and 0.1–0.2 meters per second (0.3–0.7 feet per second) in the southern region of the Bay. The phase propagation suggests that the tides behave almost as standing waves, with typical lags between the inlet and southern region of the Bay of 10 minutes and an increase in tidal amplitude in the inner Bay compared to the outer Bay.

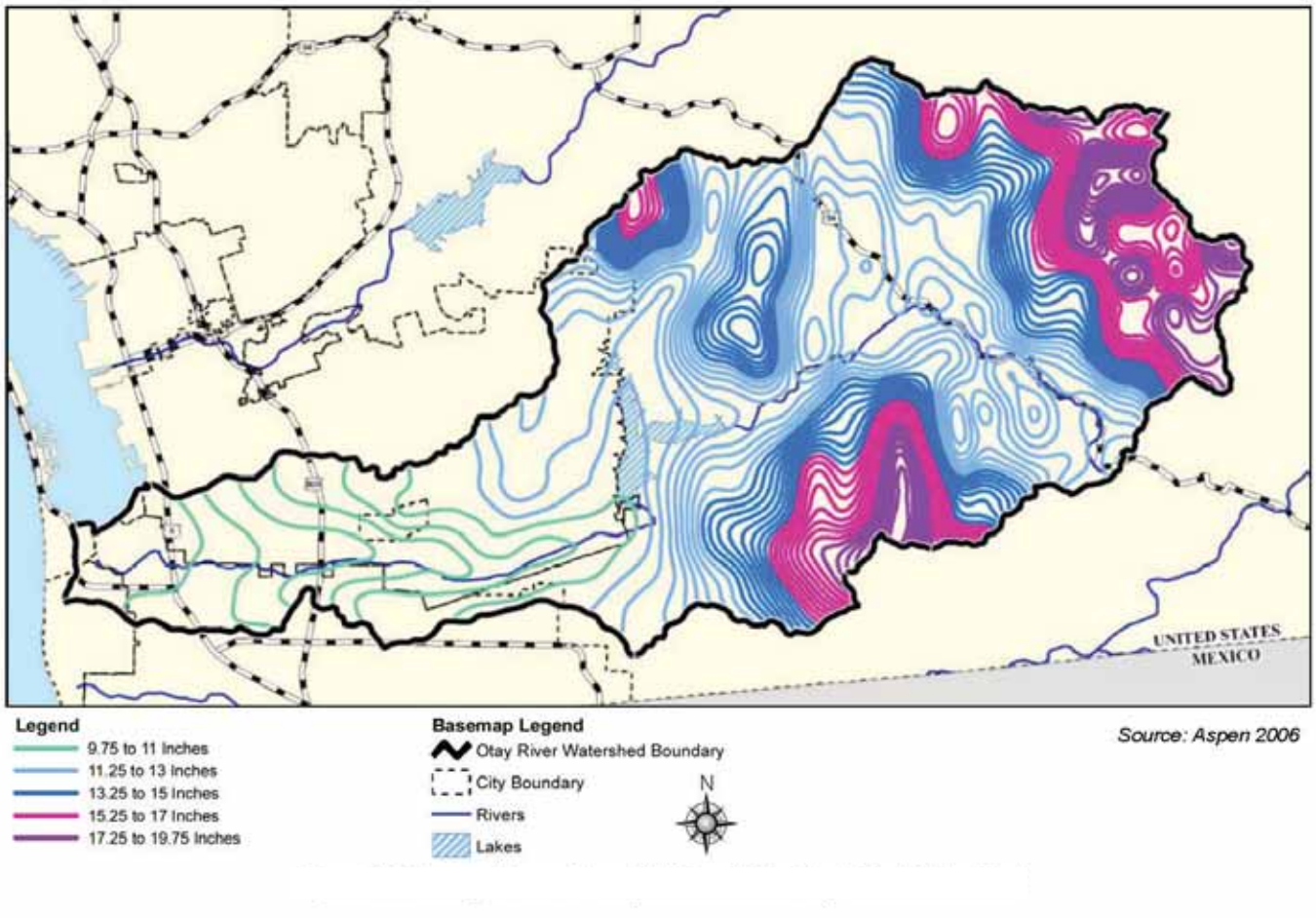

FIGURE 3.2-5

Otay River Watershed Average Annual Precipitation

Otay River Estuary Restoration Project EIS

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Water Quality

Water quality within the project site is regulated by the San Diego Regional Water Quality Control Board (Regional Board), through the Water Quality Control Plan for the San Diego Basin (Basin Plan). The Basin Plan designates beneficial uses for water bodies in the San Diego Region, and provides water quality objectives and implementation plans to protect those beneficial uses. The project site is located within the Otay Hydrologic Unit, specifically within the Otay Valley Hydrologic Area, designated 910.2 (Regional Board 2004). In addition, the Clean Water Act 303(d) list highlights any impaired surface water bodies within the region.

Historically, water quality in the San Diego Bay suffered serious degradation due to discharge of untreated municipal sewage and industrial wastes. Due to numerous surrounding jurisdictions and the number of separate agencies discharging to the Bay, the San Diego Bay Interagency Water Quality Panel was established in 1988 to address 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 its value and resources. Also in 1998, the Bay was included within the California Section 303(d) list as an impaired water body by the Regional Board due to benthic community degradation and toxicity. Currently, all of the San Diego Bay is listed on the 303(d) list, but only for PCBs; however, the Regional Board has proposed that the Bay be listed for arsenic, mercury (tissue) and polycyclic aromatic hydrocarbons (PAHs) (Regional Board 2016).

The Otay River Sonde is a self-recording water quality monitoring station located at the mouth of the Otay River between Ponds 11 and 12, operated by the Tijuana River National Estuarine Research Reserve and managed through the Southwest Wetland Interpretive Association. It recorded water level, salinity, and dissolved oxygen (DO) at 15-minute intervals from December 2007 to December 2011. The maximum salinity reached during the dry, evaporative summer months was recorded at 42.57 parts per thousand (ppt), while the minimum salinity during the wet winter periods reached as low as 0.2 ppt. The average salinity at the Otay River Sonde was 33.52 ppt, identical to the average salinity recorded on the open coast at the pier at Scripps Institute of Oceanography, approximately 10 miles north of the San Diego Bay. These salinity levels are suitable for a healthy, functioning tidal wetland (Appendix G). These DO readings show a maximum DO during wet winter months of 17.5 milligrams per liter (mg/L), while the minimum DO occurs during summer months, and can reach 0.0 mg/L. The average DO is 6.47 mg/L, which is similar to DO levels recorded in nearshore waters along the open coast, as measured at the pier at Scripps Institute of Oceanography. DO maximums occur during Otay River flooding events and the salinity is depressed to minimum values. Conversely, DO minimums occur during warm, evaporative months in the summer when the Bay waters turn hypersaline. This variability in salinity and DO are within the normal limits of a healthy, functioning tidal wetland (Appendix G).

3.2.6 Air Quality

San Diego Region

The weather of the San Diego region, as in most of Southern California, is influenced by the Pacific Ocean and its semi-permanent high-pressure systems that result in dry, warm summers and mild, occasionally wet winters. The average annual temperature ranges (in degrees Fahrenheit (°F)) from the mid-40s to the high 90s. Most of the region's precipitation falls November through April, with infrequent (approximately 10%) precipitation during the summer. Although total annual precipitation in the region can vary greatly from year to year, the average seasonal precipitation along the coast is approximately 10 to 11 inches; the amount increases with elevation as moist air is lifted over the mountains to the east.

The topography in the San Diego region varies greatly, from beaches on the west to mountains and desert on the east. Along with local meteorology, the topography influences the dispersal and movement of pollutants in the San Diego Air Basin (SDAB). The mountains to the east prevent dispersal of pollutants in that direction and help trap pollutants in inversion layers.

The interaction of ocean, land, and the Pacific High Pressure Zone maintains clear skies for much of the year and influences the direction of prevailing winds (westerly to northwesterly). Local terrain is often the dominant factor inland, and winds in inland mountainous areas tend to blow through the valleys during the day and down the hills and valleys at night.

Ambient Air Quality Standards

Under the Federal Clean Air Act passed in 1970 and last amended in 1990, the task of air quality management and regulation has been legislatively granted to the California Air Resources Board (CARB), with subsidiary responsibilities assigned to air quality management districts and air pollution control districts at the regional and county levels. CARB is responsible for ensuring implementation of the California Clean Air Act, responding to the Federal Clean Air Act, and regulating emissions from motor vehicles and consumer products. Pursuant to the authority granted to it, CARB has established California Ambient Air Quality Standards (CAAQS), which are generally more restrictive than the National Ambient Air Quality Standards (NAAQS).

The NAAQS and CAAQS are presented in Table 3.2-2.

Table 3.2-2
Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[a]	National Standards[b]	
		Concentration[c]	*Primary[c,d]*	*Secondary[c,e]*
O_3[f]	1-hour	0.09 ppm (180 μg/m³)	—	Same as Primary Standard
	8-hour	0.070 ppm (137 μg/m³)	0.070 ppm (137 μg/m³)	
CO	1-hour	20 ppm (23 mg/m³)	35 ppm (40 mg/m³)	—
	8-hour	9.0 ppm (10 mg/m³)	9 ppm (10 mg/m³)	
NO_2[g]	1-hour	0.18 ppm (339 μg/m³)	0.100 ppm (188 μg/m³)	Same as Primary Standard
	Annual Arithmetic Mean	0.030 ppm (57 μg/m³)	0.053 ppm (100 μg/m³)	
SO_2[h]	1-hour	0.25 ppm (655 μg/m³)	0.075 ppm (196 μg/m³)	—
	3-hour	—	—	0.5 ppm (1,300 μg/m³)
	24-hour	0.04 ppm (105 μg/m³)	0.14 ppm (for certain areas)[g]	—
	Annual Arithmetic Mean	—	0.030 ppm (for certain areas)[g]	—
PM_{10}[i]	24-hour	50 μg/m³	150 μg/m³	Same as Primary Standard
	Annual Arithmetic Mean	20 μg/m³	—	
$PM_{2.5}$[i]	24-hour	—	35 μg/m³	Same as Primary Standard
	Annual Arithmetic Mean	12 μg/m³	12.0 μg/m³	15.0 μg/m³
Lead[j,k]	30-day Average	1.5 μg/m³	—	—
	Calendar Quarter	—	1.5 μg/m³ (for certain areas)[j]	Same as Primary Standard
	Rolling 3-Month Average	—	0.15 μg/m³	
Hydrogen sulfide	1-hour	0.03 ppm (42 μg/m³)	—	—
Vinyl chloride[i]	24-hour	0.01 ppm (26 μg/m³)	—	—
Sulfates	24-hour	25 μg/m³	—	—
Visibility reducing particles[l]	8-hour	See footnote l	—	—

Source: CARB 2016a.

Notes: ppm = parts per million by volume; μg/m³ = micrograms per cubic meter; mg/m³ = milligrams per cubic meter; PST = Pacific Standard Time.

a California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

b National standards (other than O3, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The O3 standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. For PM10, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m3 is equal to or less than 1. For PM2.5, the 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard.

c Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25° Celsius (C) and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

d National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

e National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[f] On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.

[g] To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 parts per billion (ppb). Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

[h] On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until 1 year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

[i] On December 14, 2012, the national annual $PM_{2.5}$ primary standard was lowered from 15 µg/m^3 to 12 µg/m^3. The existing national 24-hour $PM_{2.5}$ standards (primary and secondary) were retained at 35 µg/m^3, as was the annual secondary standard of 15 µg/m^3. The existing 24-hour PM_{10} standards (primary and secondary) of 150 µg/m^3 also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

[j] CARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

[k] The national standard for lead was revised on October 15, 2008, to a rolling 3-month average. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[l] In 1989, CARB converted both the general State-wide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the State-wide and Lake Tahoe Air Basin standards, respectively.

An area is designated in attainment when it is in compliance with the NAAQS and/or CAAQS. These standards are set by the U.S. Environmental Protection Agency (EPA) and CARB, respectively, for the maximum level of a given air pollutant that can exist in the outdoor air without unacceptable impacts on human health or the public welfare.

The criteria pollutants of primary concern that are considered in this analysis are ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), coarse particulate matter (particulate matter less than or equal to 10 microns in diameter; PM_{10}), and fine particulate matter (particulate matter less than or equal to 2.5 microns in diameter; $PM_{2.5}$). Although there are no ambient standards for volatile organic compounds (VOCs) or oxides of nitrogen (NO_x), they are important as precursors to O_3.

The portion of the SDAB where the project site is located is designated by the EPA as an attainment area for the 1997 8-hour NAAQS for O_3 and as a moderate nonattainment area for the 2008 8-hour NAAQS for O_3.The SDAB is designated in attainment for all other criteria pollutants under the NAAQS with the exception of PM_{10}, which was determined to be unclassifiable.

The SDAB is currently designated nonattainment for O_3, PM_{10}, and $PM_{2.5}$, under the CAAQS. It is designated attainment for the CAAQS for CO, NO_2, SO_2, lead, and sulfates.

Table 3.2-3 summarizes the SDAB's Federal and State attainment designations for each of the criteria pollutants.

Table 3.2-3
San Diego Air Basin Attainment Classification

Pollutant	Federal Designation	State Designation
O_3 (1-hour)	Attainment[a]	Nonattainment
O_3 (8-hour – 1997) (8-hour – 2008)	Attainment (maintenance) Nonattainment (moderate)	Nonattainment
CO	Unclassifiable/attainment[b]	Attainment
PM_{10}	Unclassifiable[c]	Nonattainment
$PM_{2.5}$	Attainment	Nonattainment
NO_2	Unclassifiable/attainment	Attainment
SO_2	Attainment	Attainment
Lead	Attainment	Attainment
Sulfates	(No Federal standard)	Attainment
Hydrogen sulfide	(No Federal standard)	Unclassified
Visibility-reducing particles	(No Federal standard)	Unclassified

Sources: EPA 2014 (Federal); CARB 2014 (State).
Notes:
O_3 = ozone; CO = carbon monoxide; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide.
[a] The Federal 1-hour standard of 0.12 ppm was in effect from 1979 through June 15, 2005. The revoked standard is referenced here because it was employed for such a long period and because this benchmark is addressed in State Implementation Plans.
[b] The western and central portions of the SDAB are designated attainment, while the eastern portion is designated unclassifiable/attainment.
[c] At the time of designation, if the available data does not support a designation of attainment or nonattainment, the area is designated as unclassifiable.

Air Quality Monitoring Data

The San Diego Air Pollution Control District operates a network of 10 ambient air monitoring stations throughout San Diego County, which measure ambient concentrations of the pollutants and determine whether the ambient air quality meets the CAAQS and NAAQS. The Chula Vista monitoring station is the nearest location to the project site where criteria pollutant concentrations are monitored, except CO. CO values were taken from the El Cajon monitoring station.

Ambient concentrations of pollutants from 2011 through 2015 are presented in Table 3.2-4. The number of days exceeding the respective ambient air quality standards is shown in Table 3.2-5. Air quality within the project region is in compliance with both CAAQS and NAAQS for NO_2, CO, and SO_2.

Table 3.2-4
Ambient Air Quality Data

Pollutant	Averaging Time	2012	2013	2014	2015	Most Stringent Ambient Air Quality Standard	Monitoring Station
O_3	8-hour	0.079 ppm	0.063 ppm	0.072 ppm	0.067 ppm	0.070 ppm	Chula Vista[a]
	1-hour	0.085 ppm	0.073 ppm	0.093 ppm	0.088 ppm	0.09 ppm	
PM_{10}	Annual	21.5µg/m^3	23.7µg/m^3	23.4 µg/m^3	19.8 µg/m^3	20 µg/m^3	Chula Vista[a]
	24-hour	38.0 µg/m^3	40.0 µg/m^3	39.0 µg/m^3	45.0 µg/m^3	50 µg/m^3	
$PM_{2.5}$	Annual[b]	10.2 µg/m^3	9.5µg/m^3	9.2 µg/m^3	8.3 µg/m^3	12 µg/m^3	Chula Vista
	24-hour	34.3 µg/m^3	21.9µg/m^3	26.5 µg/m^3	33.5 µg/m^3	35 µg/m^3	
NO_2	Annual	0.011 ppm	0.011 ppm	0.011 ppm	0.010 ppm	0.030 ppm	Chula Vista
	1-hour	0.057 ppm	0.057 ppm	0.055 ppm	0.049 ppm	0.18[c] ppm	
CO	8-hour	1.85 ppm	1.20 ppm	1.40 ppm	1.10 ppm	9.0 ppm	El Cajon[d]
	1-hour[e]	2.20 ppm	1.90 ppm	1.50 ppm	1..40 ppm	20 ppm	
SO_2	Annual	0.16	0.14	0.10	0.11	0.030 ppm	Chula Vista
	24-hour	0.5	0.6	0.50	0.40	0.04 ppm	

Sources: CARB 2015; EPA 2015.
Notes: Data represent maximum values.
O_3 = ozone; PM_{10} = coarse particulate matter; µg/m^3 = micrograms per cubic meter; $PM_{2.5}$ = fine particulate matter; NO_2 = nitrogen dioxide; CO = carbon monoxide; SO_2 = sulfur dioxide; N/A = not applicable.
[a] Chula Vista Monitoring Station located at 80 E. J Street, Chula Vista, California.
[b] Annual data for 2010 and 2011 $PM_{2.5}$ taken from El Cajon Monitoring Station.
[c] A new 1-hour NAAQS for NO_2 became effective in April 2010. Data reflect compliance with the 1-hour CAAQS.
[d] El Cajon monitoring station is located at West Bradley Avenue and Floyd Smith Drive in El Cajon, California.
[e] Data were taken from EPA 2016a for 1-hour CO and 2013 8-hour CO.

Table 3.2-5
Frequency of Air Quality Standard Violations

Monitoring Site	Year	Number of Days Exceeding Standard					
		State 1-Hour Ozone	*State 8-Hour Ozone*	*National 8-Hour Ozone*	*State 24-Hour PM_{10}*	*National 24-Hour PM_{10}*	*National 24-Hour $PM_{2.5}$*
Chula Vista	2011	0	0	0	0	0	—
	2012	0	1	1	0	0	0
	2013	0	0	0	0	0	0
	2014	0	1	0	0	0	0
	2015	0	0	0	0	0	0

Source: CARB 2015.
Notes: PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter.
Measurements of PM_{10} and $PM_{2.5}$ are usually collected every 6 days and 3 days, respectively. "Number of days exceeding the standards" is a mathematical estimate of the number of days concentrations would have been greater than the level of the standard had each day been monitored.

Regional Emissions Inventory

As previously discussed, the portion of the SDAB where the project site is located is designated by the EPA as an attainment area for the 1997 8-hour NAAQS for O_3 and as a marginal nonattainment area for the 2008 8-hour NAAQS for O_3. The SDAB is designated in attainment for all other criteria pollutants under the NAAQS with the exception of PM_{10}, which was determined to be unclassifiable.

Table 3.2-6 shows the annual average daily emission rates for the estimated stationary sources, area-wide sources, and mobile regional emissions inventory for the SDAB (CARB 2012).

Table 3.2-6
Estimated 2012 Annual Average Regional Emissions Inventory for the SDAB

Source	Pollutant (tons/day)					
	VOCs	*CO*	*NO_x*	*SO_x*	*PM_{10}*	*$PM_{2.5}$*
Stationary sources	30.0	13.9	4.7	0.3	6.0	2.5
Area-wide sources	35.5	15.2	2.6	0.1	56.7	10.9
Mobile sources	60.5	496.4	98.4	0.9	9.7	6.6
Total	**126.0**	**525.5**	**105.7**	**1.3**	**72.4**	**20.0**

Source: CARB 2012.
Notes: SDAB = San Diego Air Basin; VOC = volatile organic compounds; CO = carbon monoxide; NO_x = oxides of nitrogen; SO_x = sulfur oxides; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter.

3.2.7 Noise

Noise, which can be defined as unwanted or undesired sound, is generally considered disturbing or annoying to humans because of its pitch or loudness. Pitch is the property of

sound that fluctuates with variation in the frequency of vibration. Higher-pitched signals sound louder to humans than sound with a lower pitch. Loudness is the intensity of sound waves combined with the reception characteristics of the ear. The impacts of noise on people can include general annoyance, interference with speech communication, sleep disturbance, and in the extreme, hearing impairment. The combination of noise from all sources near and far is defined as the ambient noise level.

Several noise measurement scales are used to describe noise in a particular location. The decibel (dB) is a unit of measurement that indicates the relative amplitude of a sound. Because the human ear is not equally sensitive to all frequencies within the sound spectrum, a method called "A-weighting" is used to filter noise frequencies that are not audible to the human ear. The A-weighted decibel (dBA) noise scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Noise-sensitive receptors generally include land uses associated with indoor and outdoor human activities that may be subject to stress and/or interference from noise. These include single and multiple-family residences and associated outdoor use areas; mobile homes; hotels and motels; hospitals, nursing homes, and other related medical care facilities; educational facilities; libraries; churches; parks; or other places where the public gathers. Wildlife protection areas can also be considered noise-sensitive receptors, especially during the breeding season.

A variety of noise sensitive receptors surround the general vicinity of the South San Diego Bay Unit of the San Diego Bay NWR, including the San Diego Bay NWR itself. Other receptors include a mobile home park located to the south of the Otay River floodplain within the City of San Diego, residential uses and an elementary school located along the south end of the San Diego Bay within the City of Imperial Beach, residential units scattered among small industrial uses to the east of Pond 15, and residential development located just to the west of the San Diego Bay NWR boundaries in the City of Coronado.

The State of California recognizes the relationship between noise and noise-sensitive land uses, and emphasizes the need to control noise at the local level through land use regulation. Section 65032(g) of the California Government Code requires that each city have a Noise Element as part of its General Plan. Grading activities associated with the three proposed alternatives would be subject to the noise standards and or guidelines adopted by the City of San Diego and the City of National City. These jurisdictions have both adopted construction noise standards that would be applicable, such as limitations on the hours when construction can occur, maximum allowable noise levels, or both. In addition to specific standards, these noise elements include restrictions on noise that is disturbing, excessive, offensive, and causes discomfort or annoyance to a reasonable person of normal sensitivity.

The City of San Diego's noise ordinance codified in the Municipal Code, Section 59.5.0404, states that it is unlawful to engage in construction activities between the hours of 7 p.m. of any day and 7 a.m. of the following day, or on legal holidays (City of San Diego 2010). Residential uses south of the San Diego Bay in the City of Imperial Beach have construction noise limits of 75 dBA for any use, and construction is prohibited from 10 p.m. to 7 a.m. Residential uses in the City of Coronado have a construction noise limit of 7 p.m. to 7 a.m. Noise levels within the Otay River Floodplain Site are influenced most heavily by aircraft activity, boating on the San Diego Bay, vehicular traffic on the I-5 and SR-75, and pedestrians and bicyclists using the Bayshore Bikeway. Noise levels on the Pond 15 Site are influenced by the South Bay Salt Works operation.

3.2.8 Climate Change and Sea-Level Rise

Climate Change

Climate change is defined as any change in climate over time, whether due to natural variability or as a result of human activity. Climate change results from the incremental addition of GHG emissions from millions of individual sources, which collectively have a large impact on a global scale (CEQ 2016). General scientific consensus acknowledges the evidence that measurable changes to the climate are occurring, as indicated by increases in global surface temperature, altered precipitation patterns, sea-level rise, more frequent and severe extreme weather events, and ocean acidification (CRC and IRG 2009). Changes in current climate patterns are likely to create irreparable consequences, especially along the vulnerable coastline, where the project site is located. Projected impacts include accelerated coastal erosion, flooding, shifts in abundance and distribution of marine habitat, loss of coastal ecosystems, degradation of species and biodiversity, and the accelerated spread of invasive species (CRC and IRG 2009).

Projections of mean sea-level rise to the year 2100 are characterized by high uncertainty because of the difficulty in modeling melting ice-sheet dynamics and other ocean processes. Global sea level has risen 1.8 millimeters per year (0.07 inches/year) between 1961 and 1993, and 3.1 millimeters per year (0.12 inches/year) since 1993 (IPCC 2007). Recent Southern California sea-level rise projections range from 44 to 166 centimeters (17 to 65 inches) by 2100, with a mean increase of 93 centimeters (37 inches) (NRC 2012).The U.S. Fish and Wildlife Service (Service) has a specific strategy for National Wildlife Refuge System planning with respect to climate change (Czech et. al. 2014). The Refuge System Policy 601 FW 3 requires the maintenance of historical conditions to maintain biological integrity, diversity, and environmental health. Historic conditions are defined as "composition, structure, and function of ecosystems resulting from natural processes that we believe, based on sound professional judgement, were present prior to substantial human related changes to the landscape" (Czech et. al 2014).

Executive Order S-13-08, signed by California Governor Edmund G. Brown Jr. on November 14, 2008, directs State agencies to consider a range of sea-level rise future scenarios for the years 2050 and 2100 in order to assess a proposed project's vulnerability, reduce expected risks, and increase project resiliency to sea-level rise.

The State of California Sea-Level Rise Guidance Document (State Guidance; State of California 2013) was developed by the Coastal and Ocean Working Group of the California Climate Action Team, with science support provided by the Ocean Protection Council's Science Advisory Team and the California Ocean Science Trust, and includes sea-level-rise scenarios for both 2050 and 2100. Sea-level-rise projections within the State Guidance, using a Year 2000 baseline, include a rise in ocean level of 4.68 to 24 inches for the area south of Cape Mendocino by 2050. In addition, in 2015, the California Coastal Commission adopted sea-level-rise policy guidance using these same projections, further validating this approach (Commission 2015).

A study of sea-level-rise adaptation strategies for the San Diego Bay by the International Council for Local Environmental Initiatives notes that the greatest cause for concern in the region is the increase in potential flooding due to waves, storm surge, El Niño events, and high tidal fluctuations. The study notes that the Bay has become more vulnerable to regularly occurring inundation, and planning efforts should take into account more common and more severe extreme weather events (ICLEI 2012).

Sea level has been documented in the San Diego Bay since 1906, showing a rise of 8.16 inches (0.67 feet) over the last century (NOAA 2013), which has created inundation in areas directly adjacent to rising water levels. Inundation refers to a condition when land that was once dry becomes permanently wet. Sea level inundation is anticipated to cause the landward migration of intertidal and upland natural environments, such as marshes, tidal flats, and dunes. However, if there is nowhere for these features to migrate due to adjacent development, then inundation could result in the complete loss or fracturing of these systems.

San Diego Climate

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 and rain generally occurs during the winter months, as summarized in Table 3.2-7.

Table 3.2-7
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

Table 3.2-7
Monthly Average Temperature and Precipitation for San Diego

Month	Monthly Average Temperature (°F)	Monthly Average Precipitation (inches)
March	58.9	1.63
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: WRCC 2012.

As outlined in Section 3.2.2, Geology, Soils, and Agricultural Resources, the Pacific Ocean is the main driver for climate in San Diego County. Local flooding is a result of intense thunderstorms or tropical storms traversing the Pacific Ocean. The average annual precipitation in the Otay River Watershed generally ranges from 10 to 20 inches per year, and the highest annual precipitation occurs in the mountain ranges in the eastern portion of the County (see Figure 3.2-5).

Differences in monthly and annual precipitation across the Otay River Watershed are shown in Table 3.2-8 for three regions: coastal, inland, and mountain. Based on gauge 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 gauge at the San Diego WSO Airport (COOP 047740), inland precipitation in the central portion of the watershed was characterized by the gauge at the Lower Otay Reservoir (COOP 045162), and precipitation in the mountain region was classified using the Barrett Dam gauge (COOP 040514). Elevations of these stations are approximately 10 feet, 520 feet, and 1,620 feet amsl, respectively.

Table 3.2-8
Monthly Precipitation by Region

Month	Coastal Precipitation[a] (inches)	Inland Precipitation[b] (inches)	Mountain Precipitation[c] (inches)
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

Table 3.2-8
Monthly Precipitation by Region

Month	Coastal Precipitation[a] (inches)	Inland Precipitation[b] (inches)	Mountain Precipitation[c] (inches)
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: WRCC 2012.
Notes:
[a] Data from San Diego WSO Airport – COOP 047740 (1914–2012).
[b] Data from Lower Otay Reservoir – COOP 045162 (1940–1956).
[c] Data from Barrett Dam – COOP 040514 (1913–1980).

Tidal Fluctuation

The flow of sea water into and out of the Otay River Channel, the South Bay Salt Works, and the proposed restoration tidal basins are driven by the tidal variation in the San Diego Bay's water level. The nearest NOAA tide gauge to the Otay River and South Bay Salt Works is located at the Navy Pier in San Diego Bay. This tide gauge (NOAA No. 941-0170) was last leveled using the 1983–2001 tidal epoch. Elevations of tidal datums, referenced to the North American Vertical Datum of 1988 (NAVD 88), are given in Table 3.2-9.

Table 3.2-9
Tidal Datums for San Diego Bay at NOAA No. 941-0170 Navy Pier

Category	Elevations
Highest Water Level (01/27/1983)	8.14 feet NAVD
Mean Higher High Water	5.73 feet NAVD
Mean High Water	4.98 feet NAVD
Mean Tide Level	2.96 feet NAVD
Mean Sea Level	2.94 feet NAVD
Mean Low Water	0.94 feet NAVD
North American Vertical Datum	0.433 feet NAVD
Mean Lower Low Water	−0.00 feet NAVD
Lowest Water Level (12/17/1937)	−3.09 feet NAVD

Source: Appendix G.

Mean diurnal tidal ranges are 5.73 feet, compared to 5.33 feet on the open coast, an increase of 0.4 inches of diurnal range in the San Diego Bay. The extreme water level range is 11.23 feet in

the San Diego Bay, compared to 10.51 feet on the open coast, an increase of 0.72 feet of extreme range in the Bay.

One additional monitoring station, the Otay River Sonde, has operated a self-recording water quality monitoring station since 2007 at the mouth of the Otay River. Along with salinity and dissolved oxygen, this self-recording device measured water level from December 2007 to December 2011. This monitoring station notes the same mean tide level but maximum and minimum levels are higher, indicating a low tide muting in the extreme southern end of the San Diego Bay.

3.2.9 Greenhouse Gases

The Greenhouse Effect

Climate change refers to any significant change in measures of climate, such as temperature, precipitation, or wind patterns, lasting for an extended period of time (decades or longer). A GHG is any gas that absorbs infrared radiation in the atmosphere; in other words, GHGs trap heat in the atmosphere. The greenhouse effect is the trapping and build-up of heat in the atmosphere (troposphere) near the Earth's surface. The greenhouse effect traps heat in the troposphere through a threefold process as follows: Short-wave radiation emitted by the Sun is absorbed by the Earth, the Earth emits a portion of this energy in the form of long-wave radiation, and GHGs in the upper atmosphere absorb this long-wave radiation and emit it into space and toward the Earth. The greenhouse effect is a natural process that contributes to regulating the Earth's temperature. Without it, the temperature of the Earth would be about 0°F (−18°C) instead of its present 57°F (14°C). If the atmospheric concentrations of GHGs rise, the average temperature of the lower atmosphere will gradually increase. Global climate change concerns are focused on whether human activities are leading to an enhancement of the greenhouse effect.

Greenhouse Gases

GHGs include, but are not limited to, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), O_3, water vapor, hydrofluorocarbons (HFCs), hydrochlorofluorocarbons (HCFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). Some GHGs, such as CO_2, CH_4, and N_2O, occur naturally and are emitted to the atmosphere through natural processes and human activities. Of these gases, CO_2 and CH_4 are emitted in the greatest quantities from human activities. Manufactured GHGs, which have a much greater heat-absorption potential than CO_2, include fluorinated gases, such as HFCs, HCFCs, PFCs, and SF_6, which are associated with certain industrial products and processes. A summary of the most common GHGs and their sources is included in the following text.

Carbon Dioxide. CO_2 is a naturally occurring gas and a by-product of human activities and is the principal anthropogenic GHG that affects the Earth's radiative balance. Natural sources of CO_2 include respiration of bacteria, plants, animals, and fungus; evaporation from oceans, volcanic out-gassing; and decomposition of dead organic matter. Human activities that generate CO_2 are from the combustion of coal, oil, natural gas, and wood.

Methane. CH_4 is a flammable gas and is the main component of natural gas. Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, flooded rice fields, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion.

Nitrous Oxide. Sources of N_2O include soil cultivation practices (microbial processes in soil and water), especially the use of commercial and organic fertilizers, manure management, industrial processes (such as in nitric acid production, nylon production, and fossil-fuel-fired power plants), vehicle emissions, and the use of N_2O as a propellant (such as in rockets, racecars, aerosol sprays).

Fluorinated Gases. Fluorinated gases are synthetic, powerful GHGs that are emitted from a variety of industrial processes. Several prevalent fluorinated gases include the following:

Hydrofluorocarbons. HFCs are compounds containing only hydrogen, fluorine, and carbon atoms. HFCs are synthetic chemicals that are used as alternatives to ozone-depleting substances in serving many industrial, commercial, and personal needs. HFCs are emitted as by-products of industrial processes and are used in manufacturing.

Hydrochlorofluorocarbons. HCFCs are compounds containing hydrogen, fluorine, chlorine, and carbon atoms. HFCs are synthetic chemicals that are used as alternatives to ozone depleting substances (chlorofluorocarbons).

Perfluorocarbons: PFCs are a group of human-made chemicals composed of carbon and fluorine only. These chemicals were introduced as alternatives, along with HFCs, to the ozone depleting substances. The two main sources of PFCs are primarily aluminum production and semiconductor manufacturing. Since PFCs have stable molecular structures and do not break down through the chemical processes in the lower atmosphere, these chemicals have long lifetimes, ranging between 10,000 and 50,000 years.

Sulfur Hexafluoride: SF_6 is a colorless gas that is soluble in alcohol and ether and slightly soluble in water. SF_6 is used for insulation in electric power transmission and distribution equipment, semiconductor manufacturing, the magnesium industry, and as a tracer gas for leak detection.

Global Warming Potential

Gases in the atmosphere can contribute to climate change both directly and indirectly. Direct effects occur when the gas itself absorbs radiation. Indirect radiative forcing occurs when chemical transformations of the substance produce other GHGs, when a gas influences the atmospheric lifetimes of other gases, and/or when a gas affects atmospheric processes that alter the radiative balance of the Earth (e.g., affect cloud formation or albedo) (EPA 2016b). The Intergovernmental Panel on Climate Change (IPCC) developed the global warming potential (GWP) concept to compare the ability of each GHG to trap heat in the atmosphere relative to another gas. The GWP of a GHG is defined as the ratio of the time-integrated radiative forcing from the instantaneous release of 1 kilogram of a trace substance relative to that of 1 kilogram of a reference gas (IPCC 2014). The reference gas used is CO_2; therefore, GWP-weighted emissions are measured in metric tons of CO_2 equivalent (MT CO_2E).

Potential Effects of Climate Change

Globally, climate change has the potential to affect numerous environmental resources through uncertain impacts related to future air temperatures and precipitation patterns. The 2014 *Intergovernmental Panel on Climate Change Synthesis Report* (IPCC 2014) indicated that warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. Signs that global climate change has occurred include warming of the atmosphere and ocean, diminished amounts of snow and ice, and rising sea levels (IPCC 2014).

In California, climate change impacts have the potential to affect sea-level rise, agriculture, snowpack and water supply, forestry, wildfire risk, public health, and electricity demand and supply (CCCC 2005). The primary effect of global climate change has been a 0.2°C rise in average global tropospheric temperature per decade, determined from meteorological measurements worldwide between 1990 and 2005. Scientific modeling predicts that continued emissions of GHGs at or above current rates would induce more extreme climate changes during the twenty-first century than were observed during the twentieth century. A warming of about 0.2°C (0.36°F) per decade is projected, and there are identifiable signs that global warming could be taking place.

Although climate change is driven by global atmospheric conditions, climate change impacts are felt locally. A scientific consensus confirms that climate change is already affecting California. The average temperatures in California have increased, leading to more extreme hot days and fewer cold nights. Shifts in the water cycle have been observed, with less winter precipitation falling as snow, and both snowmelt and rainwater running off earlier in the year. Sea levels have risen, and wildland fires are becoming more frequent and intense due to dry seasons that start earlier and end later (CAT 2010).

An increase in annual average temperature is a reasonably foreseeable effect of climate change. Observed changes over the last several decades across the western United States reveal clear signals of climate change. Statewide average temperatures increased by about 1.7°F from 1895 to 2011, and warming has been greatest in the Sierra Nevada (CCCC 2012). By 2050, California is projected to warm by approximately 2.7°F above 2000 averages, a threefold increase in the rate of warming over the last century. By 2100, average temperatures could increase by 4.1°F to 8.6°F, depending on emissions levels. Springtime warming—a critical influence on snowmelt—will be particularly pronounced. Summer temperatures will rise more than winter temperatures, and the increases will be greater in inland California, compared to the coast. Heat waves will be more frequent, hotter, and longer. There will be fewer extremely cold nights (CCCC 2012). A decline of Sierra Nevada snowpack, which accounts for approximately half of the surface water storage in California, by 30% to as much as 90% is predicted over the next 100 years (CAT 2006).

Model projections for precipitation over California continue to show the Mediterranean pattern of wet winters and dry summers with seasonal, year-to-year, and decade-to-decade variability. For the first time, however, several of the improved climate models shift toward drier conditions by the mid-to-late twenty-first century in central, and most notably, Southern California. By the late century, all projections show drying, and half of them suggest 30-year average precipitation will decline by more than 10% below the historical average (CCCC 2012).

Wildfire risk in California will increase as a result of climate change. Earlier snowmelt, higher temperatures, and longer dry periods over a longer fire season will directly increase wildfire risk. Indirectly, wildfire risk will also be influenced by potential climate-related changes in vegetation and ignition potential from lightning. However, human activities will continue to be the biggest factor in ignition risk. It is estimated that the long-term increase in fire occurrence associated with a higher emissions scenario is substantial, with increases in the number of large fires statewide ranging from 58% to 128% above historical levels by 2085. Under the same emissions scenario, estimated burned area will increase by 57% to 169%, depending on the location (CCCC 2012).

Reduction in the suitability of agricultural lands for traditional crop types may occur. While effects may occur, adaptation could allow farmers and ranchers to minimize potential negative effects on agricultural outcomes by adjusting timing of plantings or harvesting and changing crop types.

Public health-related effects of increased temperatures and prolonged temperature extremes, including heat stroke, heat exhaustion, and exacerbation of existing medical conditions, could be particular problems for the elderly, infants, and those who lack access to air conditioning or cooled spaces (CNRA 2009).

Contributions to GHG Emissions

Per the EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2014 (2016b), total United States GHG emissions were approximately 6,870.5 MMT CO_2E in 2014. The primary GHG emitted by human activities in the United States was CO_2, which represented approximately 80.9% of total GHG emissions (5,556.0 MMT CO_2E). The largest source of CO_2, and of overall GHG emissions, was fossil-fuel combustion, which accounted for approximately 93.7% of CO_2 emissions in 2014 (5,208.2 MMT CO_2E). Total United States GHG emissions have increased by 7.4% from 1990 to 2014, and emissions increased from 2013 to 2014 by 1.0% (70.5 MMT CO_2E). Since 1990, United States GHG emissions have increased at an average annual rate of 0.3%; however, overall, net emissions in 2014 were 8.6% below 2005 levels (EPA 2016b).

State of California

According to California's 2000–2014 GHG emissions inventory (2016 edition), California emitted 441.5 MMT CO_2E in 2014, including emissions resulting from out-of-state electrical generation (CARB 2016b). The sources of GHG emissions in California include transportation, industry, electric power production from both in-state and out-of-state sources, residential and commercial activities, agriculture, high global-warming potential substances, and recycling and waste. The California GHG emission source categories and their relative contributions in 2014 are presented in Table 3.2-10.

Table 3.2-10
GHG Sources in California

Source Category	Annual GHG Emissions (MMT CO_2E)	Percent of Total[a]
Transportation	159.53	36%
Industrial uses	93.32	21%
Electricity generation[b]	88.24	20%
Residential and commercial uses	38.34	9%
Agriculture	36.11	8%
High global-warming potential substances	17.15	4%
Recycling and waste	8.85	2%
Totals	**441.54**	**100%**

Source: CARB 2016b.
Notes: Emissions reflect the 2014 California GHG inventory.
MMT CO_2E = million metric tons of carbon dioxide equivalent per year
[a] Percentage of total has been rounded, and total may not sum due to rounding.
[b] Includes emissions associated with imported electricity, which account for 36.51 MMT CO2E annually.

During the 2000 to 2014 period, per capita GHG emissions in California have continued to drop from a peak in 2001 of 13.9 MT per person to 11.4 MT per person in 2014, representing an 18% decrease. In addition, total GHG emissions in 2014 were 2.8 MMT CO_2E less than 2013

emissions. The declining trend in GHG emissions, coupled with programs that will continue to provide additional GHG reductions going forward, demonstrates that California is on track to meet the 2020 target of 431 MMT CO_2E (CARB 2016b).

Port of San Diego Climate Action Plan

Due to a small amount of construction activity that would be conducted within the 0.79-acre portion of the Pond 15 Site for the inlet/outlet levee breach, the project would be subject to the Port of San Diego Climate Action Plan (CAP) (Port 2013). The Port's CAP serves as the long-range planning document for the reduction of GHG emissions within the Port's jurisdiction using 2006 as the baseline level from which to reduce future emission levels. Baseline and future projected GHG emission inventories as disclosed in the CAP show that primarily sources of GHG emissions resulting from Port activities include on-road transportation (e.g. passenger vehicles and trucks), off-road transportation (e.g. maritime operations including large marine vessels and smaller boats), electricity, natural gas and to a smaller extent, water use and solid waste. The CAP identifies emission projections for the years 2020, 2035, and 2050 and established emission reduction targets of 10% below 2006 baseline levels by 2020 and 25% below 2006 levels by 2035. To achieve these reduction targets, the CAP has established a number of policies and measures aimed at reducing emissions associated with the following categories: Transportation and Land Use, Energy Conservation and Efficiency, Water Conservation and Recycling, Alternative Energy Generation, Waste Reduction and Recycling and Miscellaneous (e.g. programs and outreach efforts).

3.2.10 Contaminants

The following technical reports were reviewed in preparation of this section, and applicable information from these reports is incorporated into the discussion that follows.

- *Sensitivity Analysis of Potential DDT Deposition in the Otay River Estuary Restoration Plan (ORERP) Post-100 Year and 50-Year Floods* prepared by S.A. Jenkins, PhD, Y. Poon, DSc, C. Zeeman, PhD, and C. Roberts in October 2015 (Appendix I).
- *Sediment Characterization Sampling and Analysis Report: South San Diego Salt Ponds 12, 13, 14, and 15* prepared by Anchor QEA (2013) (Appendix F1).
- *Sampling and Analysis Report: Otay River Estuary Restoration Soil Characterization Program* prepared by Anchor QEA (2013) (Appendix F2).

Contaminants are both anthropogenic (human caused) and naturally occurring substances that may be individually toxic or may trigger negative impacts to ecosystems by alteration of normal biochemical processes. Contaminants may include pesticides, such as dichlorodiphenyl-trichloroethane (DDT) and chlordane; industrial chemicals and byproducts, such as polycyclic

aromatic hydrocarbons (PAHs), PCBs, and dioxins; and metals and toxic elements, such as mercury and lead. Contaminants can alter reproductive system function in adult animals and affect early life stages of fish, mammals, and birds, along with a variety of other potential impacts.

The Otay River Floodplain Site receives urban and stormwater runoff from upstream industrial, commercial, and residential areas. In addition, past agricultural and industrial uses within the project site boundaries and ongoing land uses adjacent to the San Diego Bay NWR are known to have introduced contaminants. A sewage treatment plant, with associated sewage holding ponds, operated within the Otay River floodplain between the mid-1950s and early 1960s. In addition, farming occurred on the site at a time when it was legal to use DDT on crops to control pests. These uses are considered potential sources of various heavy metals and/or DDT and associated metabolites dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethylene (DDE) in the soil. In addition, activities associated with commercial solar salt pond production on and near the project site may have resulted in the introduction of various contaminants.

With respect to the Pond 15 Site, the commercial solar salt operation may also have resulted in the introduction and build-up of various contaminants, especially through the solar salt evaporation process. Another potential source of contaminants was the South Bay Power Plant, which discharged water directly from a test desalination unit into Pond 15 between the late 1960s and early 1970s.

The Service's contaminants specialists, in cooperation with the U.S. Geological Survey, Biological Resources Division's Biomonitoring of Environmental Status and Trends Program, have developed tools such as the Contaminants Assessment Process to evaluate threats of contamination to wildlife and vegetation communities on the National Wildlife Refuges as well as other Service lands. The Contaminants Assessment Process provides a standardized approach for documenting and assessing contaminant threats to land and biota and involves two primary components: a retrospective analysis of known and suspected contaminant sources and contaminated areas, and the investigation of existing or potential contaminant transport pathways. In 2004, a Contaminants Assessment Process was completed for the South San Diego Bay Unit of the San Diego Bay NWR, where both portions of the project site are located. The Contaminants Assessment Process recommended the development and implementation of a sampling plan to characterize (1) the nature and extent of contamination within the sediments, surface water, and brine invertebrates within the salt pond system and (2) the nature and extent of DDT and associated metabolites and TPH in surface and subsurface soils in the upland portions of the NWR.

Pursuant to California Water Code Section 13393, the California State Water Resources Control Board has developed the following sediment quality objectives for toxic pollutants for California's enclosed bays and estuaries:

- Pollutants in sediments shall not be present in quantities that, alone or in combination, are toxic to benthic communities in bays and estuaries of California. This narrative objective is to be implemented using the integration of multiple lines of evidence.
- Pollutants shall not be present in sediments at levels that will bioaccumulate in aquatic life to levels that are harmful to human health.

These objectives are relevant to the current project because restoration in accordance with the action alternatives would expand tidal and intertidal habitat in the San Diego Bay.

Anchor QEA, in coordination with the Service's Carlsbad Fish and Wildlife Office, Environmental Contaminants Division (Carlsbad Environmental Contaminants Division), prepared sampling and analysis plans to present the approach and methods for assessing the nature and extent of potential contamination within the project sites. Anchor QEA then implemented a soil characterization program, based on the sampling and analysis plans, to evaluate the magnitude, extent, and variability of physical and chemical soil and sediment properties throughout the area proposed for restoration. The final sampling and analysis reports are provided within Appendices F1 and F2 of this Environmental Impact Statement.

Additional contaminants information for the Pond 15 Site is provided in a preliminary sediment investigation report prepared by Tetra Tech (2012) for the Port of San Diego.

For the proposed action, soil is defined as geologically derived material (sand to boulders) that occurs in dry upland settings. Sediment is a mixture of soil and other particles that occurs in aquatic settings. This distinction is made because soil and sediment differ in physical and chemical characteristics that govern their suitability as substrate for biological communities and control the fate and effects of contaminants.

The information outlined below is a summary of the analysis and results presented within the technical reports included in Appendices F1, F2, and I, as well as in the Tetra Tech 2012 report. To help the reader better understand the terminology related to contaminants analysis, the following definitions have been provided.

Elevated: Concentrations of constituents observed in soils and sediment are determined to be elevated based on comparisons with ambient concentrations and/or risk-based screening levels.

Ambient: Ambient concentrations are those that are typical for the area, absent influences of known point sources. The term "ambient" refers to local ambient conditions, with some

influence from area-wide sources; for example, lead concentrations in soils from historic automobile emissions.

Risk-Based Screening Levels: Risk-based screening levels are conservatively derived, contaminant-specific concentrations below which there is little to no concern and above which further consideration may be needed, such as reevaluating risks using site-specific conditions. Risk-based screening levels are generic and do not consider background. Consequently, risk-based screening levels for some contaminants may be lower than local ambient or regional background concentrations.

It is important to note that concentrations of naturally occurring constituents, such as metals, may be considered elevated if they exceed ambient concentrations. Concentrations of human-made constituents, such as organochlorine pesticides, only need be detected to be considered elevated.

Otay River Floodplain Site

Sampling within the Otay River floodplain included areas within the San Diego Bay NWR located to the west and south of the Otay River Channel. The sampling program was divided into four site subareas, as shown on Figure 3.2-6, Soil Sampling Subareas – Otay River Floodplain Site: (1) the northern portion of former Salt Pond 20A (S1); (2) the former agricultural land to the east of Nestor Creek (S2, S5); (3) the site of a former agricultural storage and supply area (S3); and (4) the site of a former wastewater treatment pond (S6A and S6B). With the exception of the former agricultural storage and supply area, which was sampled to a depth of −6 feet NAVD 88, all upland areas in the Otay River Floodplain Site were sampled to a depth of −8 feet NAVD 88. All sampling points were located in compliance with the Service-approved Sampling and Analysis Plan (Appendix F1), with a few exceptions and deviations required to avoid potentially sensitive biological and cultural resources.

Specific sampling locations within the Otay River Floodplain Site are presented on Figure 3.2-7, Soil Sampling Locations – Otay River Floodplain Site. Soil and sediment composite samples were analyzed for grain size, total solids, TOC, metals, pesticides (i.e., DDT compounds (DDT, DDD, DDE), toxaphene, dieldrin), TPH, PCBs, and SVOCs.

Metals were detected in all surface and subsurface composite samples, with concentrations similar across all areas sampled (referred to as “Subarea 3” in the Sampling and Analysis Report (Appendix F2)), with the exception of composite samples from areas east of Nestor Creek (specifically, sample locations ORFP-7, -9, -10, -11, -12, and -13, as shown on Figure 3.2-7). Samples from this area contained elevated concentrations of metals, including copper, lead, and zinc, relative to ambient levels (Appendix F2). TPH and PAHs were not detected in any samples, and phenols were generally not detected.

No pesticides or PCBs were detected within composite samples from sample locations ORFP-1, -2, -3, -4, -5, and -6, all located to the west of Nestor Creek, as shown on Figure 3.2-7. Samples from the portion of the Otay River Floodplain Site located east of Nestor Creek had measurable concentrations of DDT, toxaphene, dieldrin, and PCBs. The highest concentrations of pesticides were detected within the top three depth intervals of composite samples from the area east of Nestor Creek, as well as in the samples taken from Nestor Creek. PCBs were detected in surface composite samples from sample locations ORFP-7, -9, -10, -11, -12, and -13, all east of Nestor Creek, as shown on Figure 3.2-7. Within the eastern portion of the Otay River Floodplain Site, concentrations of DDT were highest at the surface where detected and decreased with depth, with only a few exceptions. At sample location ORFP-13, as shown on Figure 3.2-7, concentrations of DDTs, chlordane, and toxaphene were highest in the third depth interval. At sample location ORFP-12, concentrations of DDT were similar across all three depth intervals. The highest concentrations of DDT and toxaphene within the Otay River Floodplain Site were detected in the surface of sample locations ORFP-8, -14, -15, and -16 (see Figure 3.2-7 for locations). Dieldrin was only detected at sample locations ORFP-8, -13, and -14.

Within Nestor Creek, concentrations of DDT, chlordane, and toxaphene were highest at the surface and decreased with depth. DDT was detected at both sampling stations; however, substantially higher concentrations were measured at location NC-2 (location shown on Figure 3.2-7). Chlordane and toxaphene were measured only at location NC-2. Samples taken from the Otay River channel detected DDT compounds between elevations of −4 and −6 feet mean lower low water (MLLW) closest to the Bay, and from the mudline to an elevation of −4 feet MLLW further upstream of the Bay near the project site (Appendix F2).

Within Subarea 3 (Figure 3.2-6), concentrations of DDT, chlordane, toxaphene, and dieldrin were highest at the surface and decreased with depth, with the exception of S3-4 (see Figure 3.2-7 for location). At this station, concentrations increased with depth and were highest in the third depth interval. DDT, chlordane, and toxaphene were detected in at least one depth interval of all stations, while dieldrin was detected at only four stations (S3-2, S3-3, S3-6, and S3-7). The highest dieldrin concentrations were measured at the surface at S3-2 and S3-3 (Appendix F2).

SOURCE: Anchor QEA, L.P., 2013

FIGURE 3.2-6

Soil Sampling Subareas–Otay River Floodplain Site

Otay River Estuary Restoration Project EIS

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SOURCES: BING MAPPING SERVICE; ANCHOR QEA, L.P., 2013

FIGURE 3.2-7

Soil Sampling Locations □Otay River Floodplain Site

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Based on sampling results, the pesticide concentrations in the top 1 foot of portions of the area to the east of Nestor Creek were determined to exceed the Title 22 (22 CCR 66700) Total Threshold Limit Concentration[2] (TTLC) for total DDTs.

Table 3.2-11 provides an estimate of the average total DDT concentrations within this area based on sampling performed by Anchor QEA (Appendix F2) and the Service's Carlsbad Environmental Contaminants Division.

Table 3.2-11
Average Total DDT Concentrations in the Eastern Portion of the Otay River Floodplain Site by Depth for Samples Analyzed

Depth from the Existing Ground Surface (feet)	Average Total DDT Concentration (µg/kg)
0–1	781
1–3	52.6
3–5	63.0

Source: Appendix I; Zeeman, pers. comm. 2015.
Notes: DDT = dichlorodiphenyltrichloroethane; µg/kg = micrograms per kilogram.

Elevated concentrations of PCBs were observed in surface soils from ORFP-7, -10, -11, and -12 and from a composite surface sample from ORFP-8, -14, -15, and -16. PCBs were also detected in the surface sediments of Nestor Creek.

Pond 15 Site

A broad-based, stratified-random-core sampling approach was used by Anchor QEA (Appendix F1) to characterize Ponds 12, 13, 14, and 15 and surrounding area. This approach, which was approved by the Service, was modeled after sediment characterization of Salt Ponds 10, 10a, and 11 completed by Everest International Consultants and Anchor QEA in 2009. Ten sampling locations were analyzed within the Pond 15 Site, as shown on Figure 3.2-8, Soil Sampling Locations – Pond 15 Site. The study by Anchor QEA (Appendix F1) specifically addressed potential contaminant-related issues for salt pond restoration. Consequently, the study was designed to provide data on the nature and extent of contaminants in the sediments of all four ponds.

Vertical composite samples of the entire core were collected for preliminary chemical analysis. Subsamples representing 1-foot intervals along the core were also collected and archived for

[2] A TTLC for total DDT is included in 22 CCR 66700 to provide a legal basis for determining the proper disposal of DDT-contaminated soils. Soils with total DDT greater than 1 ppm (1 mg/kg) exceed the TTLC for total DDT and are therefore considered a hazardous waste. If soils that exceed the TTLC for total DDT are to be removed from a site, the soil must be transported to a hazardous waste facility for disposal.

future analysis, if necessary. Samples were analyzed for metals (and metalloids), organochlorine pesticides, PCBs, and PAHs. Results of chemical analyses were compared on a sample-by-sample basis with a variety of ecological screening levels. Anchor QEA compared the results of chemical analyses to NOAA's effects range low (ERL) and effects range median (ERM) sediment quality guidelines. Effects range values are helpful in assessing the potential significance of elevated-sediment-associated contaminants of concern in conjunction with biological testing (Long et al. 1995).

The results of chemical analyses were also reviewed by the Service's Carlsbad Environmental Contaminants Division for potential ecological risks associated with sediments in aquatic habitat. The Carlsbad Environmental Contaminants Division has developed risk-based screening levels for multiple ecological receptors, including benthic invertebrates, benthic vegetation, fish, bottom-feeding birds (black scoter (*Melanitta americana*)), consumers of small fish (grebes (*Podiceps* sp., *Podilymbus podiceps*, *Aechmophorus occidentalis*), terns (*Sterna* sp., *Sternula antillarum*, *Thalasseus* sp., *Chlidonias niger*, *Hydroprogne caspia*), and black skimmer (*Rynchops niger*)), consumers of medium-size fish (e.g., pelicans (*Pelecanus* sp.) and sea lion (*Zalophus californianus*)), and herbivores (wigeons (*Anas penelope*, *A. americana*) and turtles (Testudines)) (Zeeman 2004).

The chemical analyses of the pond sediments detected organic analytes (i.e., pesticides, PCBs, PAHs) infrequently, if at all, and at low concentrations. Chemical analyses indicate that mean concentrations at most individual sampling stations and pond-wide means are below levels of concern for ecological risk and the ambient concentrations in sediments of the south San Diego Bay would not increase once Pond 15 is restored to tidal influence (Zeeman, pers. comm. 2015).

With respect to inorganic compounds, all metals sampled for were detected in the salt pond sediments, with chromium, selenium, silver, and zinc concentrations all less than screening levels in all samples. Arsenic, cadmium, copper, lead, mercury, and/or nickel were individually detected at concentrations greater than screening levels in one or more samples (Appendix F1).

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
- Pond 15 Site

SOURCE: Anchor QEA, L.P., 2013

FIGURE 3.2-8
Soil Sampling Locations - Pond 15 Site

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Arsenic and lead concentrations in nearly all samples exceeded the most conservative (lowest) screening levels used by Anchor QEA. The screening level exceeded by arsenic is a human cancer-risk-based value for soils, while the screening level exceeded by lead is a wildlife-risk-based value for sediments. These screening levels were also exceeded by pond-wide mean concentrations. Based on comparisons with screening levels, arsenic may be a contaminant of potential concern for humans exposed to arsenic in sediment used as soil in a residential setting, while lead may be a contaminant of potential concern for ecological receptors exposed to lead in sediment. However, the screening levels in question are conservative and the actual potential for adverse effects is probably much lower than screening level exceedances suggest (Zeeman, pers. comm. 2015). In addition, concentrations of arsenic and lead in pond sediments appear to be comparable to arsenic and lead concentrations in sediments located along the edge of the Bay adjacent to the salt ponds, and all concentrations of arsenic were less than the Southern California regional background level for soil of 12 mg/kg (Chernoff et al. 2008).

While arsenic and lead concentrations in pond sediments exceed the most conservative screening levels, arsenic is below levels of concern for aquatic and aquatic-dependent wildlife. The potential risks to aquatic organisms and aquatic-dependent wildlife associated with the observed concentrations of lead in Pond 15 sediments are probably not distinguishable from risks associated with lead in sediments from the broader south San Diego Bay (Zeeman, pers. comm. 2015).

Mercury concentrations exceeded the most conservative screening level, which are based on risk to California least terns (*Sternula antillarum browni*), in a few samples from Pond 15. Exceedances were small, with concentrations between 0.06 mg/kg and 0.12 mg/kg, as compared with the 0.05 mg/kg screening level. When considering Pond 15-wide mean concentrations of mercury in sediment, concentrations are below the most conservative screening level and as such are below levels of concern for aquatic organisms or aquatic-dependent wildlife (Zeeman, pers. comm. 2015).

Copper concentrations in samples from Ponds 12 through 14 were very near or below the most conservative screening levels, which are based on risks to benthic invertebrates. In Pond 15, copper concentrations exceeded the most conservative screening level at 6 of the 10 stations. Copper concentrations at 2 stations exceeded the ERL but not the ERM. The pond-wide mean concentration for copper in Pond 15 sediments is between the most conservative screening level and the ERL and is comparable to concentrations observed in neighboring mudflat sediments outside the salt ponds (Zeeman, pers. comm. 2015). While copper concentrations appear to be at levels of concern at a few individual stations in Pond 15, the pond-wide mean copper concentrations do not exceed levels of concern.

Nickel concentrations at 2 of the 10 stations sampled in Pond 15 exceeded more conservative screening levels (ERL and wildlife-risk-based values), but the mean nickel concentration did not. Consequently, nickel concentrations in Pond 15 sediments are below levels of concern.

The Service also considered summary information for Pond 15 provided in a preliminary sediment investigation report prepared by Tetra Tech (2012) for the Port of San Diego as part of a larger investigation of offshore sediments influenced by operations at the former South Bay Power Plant. Although sampling of Pond 15 for the Tetra Tech report only extended to depths of 12 inches, results suggest that copper and nickel may be at levels of concern in Pond 15 surface sediments near the former outfall from the test desalination plant. Concentration ranges reported for copper, lead, and nickel in three 10-centimeter-depth intervals at each of the four stations indicated that upper-end concentrations of all three analytes exceeded the more conservative screening levels (ERLs and wildlife-risk-based). Upper-end concentrations of copper and nickel also exceeded ERMs.

Using some conservative assumptions about reported concentration ranges and the depth of sediments represented by samples, a comparison was made of data from the Tetra Tech study (2012) with data from the Anchor QEA study (Appendix F1). Copper, lead, and nickel concentrations reported by Tetra Tech for the top 30 centimeters of sediment, representing an average value across three depth intervals, are comparable for lead and nickel and with only slightly higher maxima for copper than concentrations reported by Anchor QEA (Zeeman, pers. comm. 2015). Pond-wide mean concentrations estimated from Anchor QEA data (Appendix F1) are little affected by factoring in even upper-end values from the Tetra Tech report, and conclusions about mean copper, lead, and nickel concentrations in Pond 15 sediments remain unchanged from those described above.