harvesting, they are generally localized and temporary in nature. Hence, impacts to kelp and commercial and recreational kelp harvesting operations are considered adverse but not significant (Class III).

As of 2006, more than 46 non-native species of marine plants and animals have been identified in the San Pedro Bay. Aquatic invasive species constitute a significant threat to biodiversity in the world's coastal waters because they often have no natural predators and may out-compete native species for food in their new environment. Once established, invasive species can cause major environmental and economic harm as they multiply and spread. They can be very difficult, if not impossible, to control or eradicate following introduction into the receiving waters. With the expected increase in the number of vessel calls (up to 15 more per year) to the Marine Terminal, the likelihood of impacts to the local marine environment from invasive or non-native species from hull fouling or ballast water discharge would increase over baseline conditions.

Ballast water discharge by cargo ships is one of the primary mechanisms of introduction of invasive species onto coastal and estuarine habitats as well as inland navigable waters. Ballast water is saline or fresh water that is held in the ballast tanks and cargo holds of ships to facilitate stability and maneuverability during a voyage. Ballast water is carried by vessels when they are not carrying cargo, are not carrying heavy enough cargo, when they require more stability due to rough seas, and when they need to ride lower in the water to pass under bridges and other structures. Generally, ballast water is taken onboard as cargo is unloaded, and discharged as cargo is loaded.

Ballast water is not the only way aquatic nuisance species are carried across the seas, however. Many organisms, including barnacles, mussels, sponges, algae and sea squirts, regularly attach themselves to the hulls of ships (hull fouling), thereby 'hitching a ride' between ports. Invasions can occur when these organisms come in contact with structures in a new port or release their larvae into its waters. Hull fouling is a particularly important vector for sessile species with brief larval phases.

Commercial ships are responsible for up to 80 percent of invasive species introductions into coastal habitats. Seaports in which ships exchange ballast water daily are at particularly severe risk of invasion, with approximately 7,000 different species transported around the world each day. Organisms transported to U.S. ports from foreign harbors with similar physiochemical characteristics (e.g., water temperatures, salinity regimes) pose an especially high risk of invasion. For example, if even a tiny

proportion of non-native species survive in new habitats, such as San Francisco Bay, Chesapeake Bay, or Boston Harbor, the actual number of successful invasive species can be very large.

Ballast water management (BWM) for vessels includes all measures that aim to prevent unwanted aquatic nuisance species from being transported from foreign ports to U.S. waters in ballast water. There are several different ways of managing ballast water. These include ballast water exchange, the use of biocides, and filtration of ballast water. Investigations into the use of heat, ultraviolet light, acoustics, and electric pulses, and even magnetic treatment to remove or destroy ballast organisms have also been explored.

Currently, the most widely used method of managing ballast water is that of ballast water exchange. Ballast water exchange means that ships, on their way to the next port, release the lower-salinity coastal water they brought aboard and replace it with higher-salinity open-ocean seawater before coming back into the nearshore coastal areas. This reduces the number of potentially invasive species that could be introduced because oceanic organisms are less likely to survive in the lower salinity near-shore waters of the ship's next port. However, organisms with a wide tolerance for differing salinities may survive ballast water exchange, especially any such organisms that could reside in the unpumpable residual water and sediments that remain in the tanks during the exchange. Open ocean ballast water exchange efficiency has been documented to range from 75 to 95 percent of tank water.

The principal U.S. legislation controlling the discharge of ballast water is the Nonindigenous Aquatic Nuisance and Prevention and Control Act of 1990 (NANPCA) as revised and reauthorized by the National Invasive Species Act of 1996 (NISA). The EPA's 2008 Final Vessel General Permit (VGP), which went into effect in February 2009, sets forth the requirements to be applied to most vessel discharges within U.S. waters. Specifically, the VGP regulates discharges incidental to the normal operation of vessels operating in a capacity as a means of transportation. These include general effluent limits applicable to all discharges; effluent limits applicable to 26 specific discharge streams; narrative water-quality based effluent limits; inspections, monitoring, recordkeeping, and reporting requirements; and additional requirements applicable to certain vessel types.

In addition to the updated Federal regulations, current State regulations require vessels coming from outside the U.S. Exclusive Economic Zone (EEZ) to perform mandatory

mid-ocean (200 nautical miles [370.4 km] or more from land and at least 1.2 miles [1.9 km] or 1,093 fathoms deep) exchange or retention of all ballast water for all qualifying vessels (all vessels over 300 gross register tons, U.S. and foreign, carrying ballast water into the waters of the state after operating outside the state waters). Vessels coming from other west coast ports are required to minimize ballast water discharges in state waters using one of several outlined best management practices. Additionally, all vessels are required to complete and submit a Ballast Water Report form by the vessel master, owner, operator, agent, or person in charge of the vessel at each port of call in California. The California Marine Invasive Species Act charged the CSLC with oversight of the State's program to prevent or minimize the introduction of non-indigenous species from commercial vessels (Falkner et al. 2009). Compliance with the requirement to submit this form consistently exceeds 95 percent.

From July 2006 through June 2008, more than 135 million metric tons of vessel-reported ballast water was carried into State waters, and 98 percent was managed in compliance with State law. Over 85 percent of the vessels operating in California achieve compliance with State requirements by retaining their ballast water onboard. Of the nearly 19 million metric tons of ballast water discharged into California between July 2006 and June 2008, 84.5 percent was appropriately managed through legal ballast water exchange and was compliant with State law.

Although BWM practices are effective at reducing the potential introduction of non-indigenous species from incoming tankers, tankers can potentially discharge far larger volumes of ballast water than most other vessel types. Moreover, tankers provide greater surface area for the support of fouling organisms than most other vessels. Thus, potential impacts from the introduction of non-indigenous species may be greater for tankers than would otherwise be predicted for all vessels based on number of arrivals alone.

Nevertheless, vessels calling on the marine terminal will be required to comply with current and future regulations that are effective at limiting the introduction of non-indigenous species (Falkner et al. 2009). Although there may be a slightly increased risk of introducing non-indigenous species from tanker ballast water and fouling organisms, the efficacy of required vector management practices will largely mitigate this risk. Moreover, limited numbers of non-indigenous species potentially introduced by vessels visiting the Terminal berths will rapidly disperse along a wide area of open-ocean coastline, where they are less likely to reproduce and establish sustainable populations of the kind historically observed in semi-enclosed harbors and bays.

Coastal organisms adapted to the conditions of bays, estuaries and shallow coasts are not expected to survive or be able to reproduce in the open ocean due to differences in biology and oceanography between the two regions (Cohen 1998).

As previously noted in Section 4.2, Water and Sediment Quality, limited amounts of ballast water are occasionally received at the Marine Terminal, however, in such cases, prearrangement by the owner or agent through Chevron is required (Chevron 2004). Ballast water received by the Marine Terminal is carried to shore in a pipeline where it is stored in a tank located on the Refinery property. The ballast water is then processed through the Refinery's wastewater treatment facility prior to discharge to the Santa Monica Bay. Effluent discharged from the Refinery's treatment facility is regulated under an existing NPDES permit. The permit also specifies monitoring and reporting requirements for the discharge. If the treated wastewater exceeds the water quality limits, then the wastewater cannot be discharged to the Santa Monica Bay. Any discharge violations are required to be corrected immediately and reported to the LARWQCB.

Pursuant to the California Marine Invasive Species Act, Chevron currently submits mandatory fees for qualified voyages to the State's Board of Equalization at the first port call in California, and prescribed ballast water management practices for ballast water carried into the waters of the state from areas outside the EEZ are employed to minimize the uptake and release of non-indigenous species. In addition, each vessel maintains a vessel-specific Ballast Water Management Plan and a Ballast Water Log outlining ballast water management activities for each tank on board. Ships also submit completed Ballast Water Report Forms to both the CSLC and the National Ballast Information Clearinghouse (USCG program), as applicable, for qualified voyages. The vessel master, person in charge, and crew receive training in the application of ballast water and sediment management and treatment procedures (Chevron 1997).

Because of the Terminal's open-coastal location, and the efficacy of current and proposed future vector management practices, the potential introduction of invasive species by additional vessels using the Terminal is considered less than significant (Class III).

Impact BIO-1: Oil Spill Impacts to Marine Biological Resources

Accidental discharge of petroleum hydrocarbons into marine waters would adversely affect biological resources (Significant, Class I).

Impact Discussion

The proposed Project has the potential for oil spills. Significant biological impacts would likely result from an oil spill, including increased exposure risks resulting from spilled oil and impacts to biota and habitats from both the spill, and cleanup and remediation activities. Oil spills to the marine environment have the potential to significantly impact many components of the ecosystems within Santa Monica Bay and the SCB, in part because they can spread rapidly over great distances, and are difficult to detect and cleanup. For example, as of mid-July 2010, estimates place the Deepwater Horizon spill at between 90 million and 180 million gallons, with the associated oil slick produced by the spill covering as much 28,958 square miles (75,000 square kilometers), an area about the size of South Carolina. Detailed information on the biological impacts associated with the Deepwater Horizon spill was not available at the time of the EIR preparation.

The extent to which an oil spill can inflict long-term damage on biological communities depends on a variety of factors including the size and location of the spill, and chemical composition of the material involved, as well as ambient environmental conditions like weather and sea state. Small leaks or spills that could be contained offshore and remediated quickly would likely have minor or negligible impacts on biological resources. In contrast, large spills, such as pipeline or vessel ruptures, would substantially increase the potential for long-term impacts on biological resources. Impacts to biological resources would be particularly significant if spills were to enter estuaries, or contact shorelines where wetland habitat or critical habitat for sensitive species occurs.

Spilled oil produces a variety of chemical and physical impacts to marine sediment and seawater that are explicitly addressed in the California Ocean Plan (See Section 4.2, Water and Sediment Quality). Many of these water-quality impacts also deleteriously affect marine biota and marine resources as a whole. For example, surface slicks limit equilibrium exchange of gases at the ocean-atmosphere interface. This reduces near-surface dissolved oxygen concentrations, particularly when combined with the increased biochemical oxygen demand of crude-oil emulsions.

Aquatic biota are primarily exposed to dissolved hydrocarbons from oil, although microdroplets of oil dispersed in the water may also affect organisms. The toxicity of oil depends on exposure; solutions of soluble aromatic compounds in crude oil (i.e., 1- to 3-ring aromatics) are generally toxic to marine organisms at concentrations of 0.005 to 100 parts per million (ppm), depending on the mixture of compounds in the source oil and dissolved into the water. Sensitivity to oil hydrocarbons varies by species and life history stages (French McCay 2002).

In this EIR, the relative risks to biological resources from contact with oil from a Project-related spill associated with the Marine Terminal were analyzed using computer modeling to simulate varying locations, spill sizes, oil types, weather conditions, flow directions, release rates, and spill sources. The results of this trajectory and fate modeling are detailed in Section 4.1, System Safety and Reliability, and Appendix C of this report, and are discussed below in relation to potential impacts to specific biological resources.

Benthos

Oil represents a physical as well as a chemical hazard to benthic organisms, with impacts occurring through both physical smothering and hydrocarbon toxicity. Sessile species, such as barnacles, may be smothered while mobile animals, such as amphipods, may be immobilized and glued to the substrate or trapped in surface slicks in tidepools. In addition the potential severity of oil spill impacts to benthic organisms also varies according to the degree of weathering of the oil. Fresh, unweathered oil contains higher amounts of the more-toxic aromatic hydrocarbons that may be readily accumulated by benthic organisms. Hence, the potential impacts of spilled oil to benthic communities are considered to be significant.

When spilled oil reaches the shoreline or intertidal zone, it becomes concentrated in a narrow zone. Because of the shallower water depth, hydrocarbon concentrations can reach toxic levels. Thus, intertidal biota are exposed to higher concentrations of oil for a longer period of time than most other marine organisms. Similarly, spilled oil that does not evaporate or wash ashore, is eventually incorporated into bottom sediments where it can be ingested by benthic organisms, or incorporated by contact with their gill membranes.

Oil reaches the seafloor through the formation of non-buoyant residues, adsorption onto particulate matter, or incorporation in the food chain by ingestion and subsequent sinking of fecal pellets (Jordan and Payne 1980). The large amounts of oil that settled

to the benthic environment following the Santa Barbara Channel oil spill in 1969, were attributed to the mixing and adsorption of oil into sediments (Kolpack 1971, McAuliffe et al. 1975). Mixing and absorption of oil into sediments also occurred during the *Amoco Cadiz* spill (1978) off the Brittany coast, the *Tsesis* spill (1980) in the Baltic Sea, the *IXTOC I* blowout (1979) in the Gulf of Mexico (Hess 1978, Boehm 1980, Boehm and Fiest 1980), and can be expected to be currently occurring as a result of the Deepwater Horizon spill in the Gulf of Mexico.

The likelihood of benthic sediments within the subtidal zone becoming contaminated is dependent upon wave/tidal action. If wave/tidal action is substantial, then contaminated sediments, including planktonic fecal pellets, are less likely to settle out. However, in estuaries or the semi-enclosed Ballona Lagoon, where there is limited wave/tidal action, it is more likely that contaminated sediments will accumulate and persist. Generally, impacts would be expected to be greatest in shallow waters (2 to 20 m), as exposure in deeper waters has been found to be minimal (e.g., the *North Cape* spill, French McCay 2003).

The severity and duration of impacts to the intertidal biota are, to a large part, functions of the biological and geomorphologic characteristic of the shoreline habitat. For example, Hancock hypothesized (1977) that organisms in the upper intertidal areas where the oil dries rapidly are more apt to be affected by physical effects of oil, such as smothering, whereas organisms in the lower intertidal are more exposed to the chemical toxic effects of the liquid petroleum and degradation compounds. For example, following the 1969 Santa Barbara oil spill, breeding rates in lower intertidal organisms *Pollicipes polymerus* (goosneck barnacle) and *Mytilus californianus* (a mussel) were reduced, while reproductive rates in upper intertidal barnacles *Chthamalus fissus* and *Balanus glandula* (white acorn barnacle) were unaffected (Straughan 1971, Foster et al. 1971, Anderson et al. 1993).

Documented impacts to other intertidal species from the 1969 spill included smothering of barnacles (*Chthalamus fissus*), and mortality of surfgrass (*Phyllospadix torreyi*) and algae (such as *Hesperophycus harveyanus)* (Straughan 1971). Following the September 28, 1997, Torch oil spill, large amounts of fresh oil and tar were observed on rocks throughout the middle and lower intertidal zone at Point Arguello. Raimondi et al. (1999) and OSPR (1999) noted that “Sticky globs of tar were seen on black abalone and seastars. Tar covered the respiratory pores of some abalone.”

The Torch pipeline spill of September 28, 1997, oiled approximately 40 miles (64 km) of coastline in Santa Barbara County. Approximately 100 acres (40 hectares) of sandy beach were disturbed by oiling and cleanup operations. In addition, another 263 acres (106 hectares) of sandy beach were very lightly oiled (less than or equal to 10 percent oiling by area), but were relatively undisturbed by heavy equipment during cleaning operations (OSPR 1999).

Based on the shoreline ranking system for oil spill sensitivity developed by Gundlach and Hayes (1978), shoreline habitats with a low-energy regime are characterized by high biological populations, high oil residence time, and high sensitivity to oil. Higher-energy coastlines, consisting of gravel and mixed sand/gravel beaches, have smaller biological populations, but oil impacting these habitats is resistant to cleaning. For example, despite intensive cleanup and remediation of gravel and cobble beaches oiled by the *Exxon Valdez* spill in Prince William Sound, oil remained in sediments for more than eight years after the spill (Hayes and Michel 1998). In contrast, following the 1969 Santa Barbara oil spill (that affected 29.8 miles [48] km of southern California coastline), recovery of the alga *Hesperophycus* and the surfgrass *Phyllospadix* had begun within seven months of the spill. During the 1967 *Torrey Canyon* spill (1967 tanker spill in the English Channel), much of the damage to rocky intertidal organisms was attributed to large amounts of chemical dispersants used during cleanup activities rather than the spill itself.

Shoreline types in the immediate Project area consist primarily of exposed medium to coarse-grained sand beaches with limited areas of rocky intertidal habitat. Wave-cut platforms occur along the coast from Point Dume to Malibu Point and in the southern portion of the Santa Monica Bay between Flat Rock and Point Fermin. Because wave-cut platforms often have tide pool areas that are exposed during low tides, this habitat also contains plants and animals common to exposed wave-cut cliff tide pools (CDFG OSPR 1993). The exposed rocky intertidal is characterized by strong waves that restrict the growth of plants.

Similarly, wave-cut cliffs or seawalls are found along the shoreline from Point Dume to Malibu Point and from King Harbor to Point Fermin. This type of habitat provides substrate for the complex intertidal and shallow subtidal algal and invertebrate communities that include abalone, limpets, mussels, and snails. Exposed beach piers are considered to have a low sensitivity to oiling, although biota would be damaged or killed under heavy accumulations of oil (CDFG OSPR 1993). Both these habitats have

high wave action that generally reduces the possibility of oil stranding and aids in its removal by natural processes.

Santa Monica Bay contains approximately 26 miles (41.8 km) of open sandy beaches, extending primarily from Malibu Point to Flat Rock Point near the Palos Verdes Peninsula (CDFG OSPR 1993). This habitat type is subject to tidal extremes, variable surf conditions, and seasonal differences in beach profiles and sediment grain size. In general, oil from a spill would be deposited as a band along the high-tide line, and penetrate into the sand up to 10 inches (25.4 cm). Some oil that reaches the shore will be become mixed with the sand, physically altering the sediment characteristics by clogging interstitial spaces and reducing water flow and potentially air supply. Species living on or in the sandy bottom, such as spiny mole crabs and *Diopatra splendidissima* (a tube-building annelid), would be expected to be impacted by an oil spill in nearshore waters (MBC 1990b).

Under heavy accumulations, oil might spread across the entire beach, although some oil would be lifted off the lower beach during the rising tide. Nevertheless, Gundlach and Hayes (1978) predicted that recovery of a sandy beach may occur within a year, depending on the extent and persistence of the oil. In contrast, fine-grained intertidal mudflat communities might be expected to retain the oil for a long time. The continued presence of oil in the sediments would prolong recovery of the benthos, which could also indirectly impact other organisms, such as foraging shore birds and fishes.

The subtidal benthos of nearshore areas in the Santa Monica Bay is dominated by small infaunal invertebrates, particularly polychaete worms and crustaceans. An oil spill that results in high concentrations of dissolved hydrocarbons in the water and/or the incorporation of oil into the sediments would likely result in a species composition shift to invasive and opportunistic benthic fauna. It is likely that an oil spill would selectively impact more sensitive benthic species, such as filter feeding amphipods. This was, in fact, observed in the 2003 *North Cape* spill (French McCay 2003). An oil spill within Santa Monica Bay nearshore and coastal wetlands, which would occur under most of the prevailing conditions evaluated, would have significant impacts (Class I) to the soft-bottom subtidal benthos.

Typically, impacts to benthos would be highest with diesel fuel oil, which has a low viscosity and is easily dispersed into the water column by breaking waves (white caps and along the shoreline). Impacts would be highest when winds are onshore and the diesel is concentrated in shallow water or if contamination occurred in or near kelp beds

where densities of fishes and invertebrates are commonly higher than in open water areas.

Plankton

Laboratory studies, field enclosure studies, and field studies conducted during oil spills have shown that oil spills have measurable effects upon marine phytoplankton and zooplankton. Impacts to phytoplankton include mortality, reduced growth, and reduced photosynthesis. In some instances, however, growth stimulation has occurred at low hydrocarbon concentrations (in the 0.01 to 0.03 ppm range) (Spies 1985). Additionally, early life stages, such as eggs, embryos, and larvae of zooplankton, are considered to be more susceptible than adults to oil spill impacts because of their higher sensitivity to toxicants and higher likelihood of exposure to oil at the surface of the ocean. The severity of effects on phytoplankton will vary with respect to species present in the water column, the time of the year, and the chemical composition of the oil spilled.

Both lethal and sublethal effects of oil on plankton depend on the persistence of sufficiently high concentrations of petroleum hydrocarbons in the water column. However, aromatic hydrocarbons, such as benzene and toluene, considered to be most toxic to marine life, would evaporate quickly as the spill weathers in the open marine environment. Other weathering processes, such as spreading, dissolution, dispersion, emulsification, photochemical oxidation, and microbial degradation, would further decrease the volume of spilled oil and increase the viscosity and specific gravity of the oil. Oil floats on the sea surface, and most of the components of crude oil are insoluble in seawater. As such, water column contamination would be highest for diesel and less so for the more viscous crude oils (and heavier fuels). Light crude oil has a low viscosity, however, approaching that of diesel, and is relatively easily mixed into the water if breaking waves are present after a spill. Therefore, large light crude oil spills could result in measurable concentrations of dissolved aromatics in the water column (Appendix C.6).

Impacts to plankton would likely be most severe if a spill occurred in the spring or summer months when zooplankton abundance in the SCB is highest, although the short generation time of plankton would generally preclude long-term effects. For example, concentrations of oil hydrocarbons in the water column following major spills have been measured at between three and 500 ppb but have been found to return to background levels within a few hours to two months following a spill (Gundlach et al. 1983, NRC 1985, French McCay 2003). Therefore, oil spill impacts to plankton on the open coast are expected to be adverse, but less than significant (Class III).

In contrast, more severe impacts to plankton would be expected if an oil spill entered an estuary or wetland area such as Ballona Lagoon, especially if the spill coincided with the spring or summer bloom in Santa Monica Bay. The Ballona Lagoon and wetlands area are a semi-enclosed system where wave and tidal action are more limited; resident phytoplankton there may be exposed to oil for a longer period of time than on the open coast. Additionally, recruitment from adjoining unoiled areas is less readily available than in the open ocean. If an oil spill suppressed the seasonal phytoplankton bloom, impacts on the entire estuarine Ballona Lagoon food web could occur. On the other hand, if an oil spill caused an enhancement in phytoplankton productivity either by direct stimulation from low levels of hydrocarbons or destruction of grazers, eutrophication could develop. In a worst-case scenario, eutrophication could lead to oxygen depletion and fish kills. Based on the trajectory modeling done for this EIR, spills associated with the Marine Terminal operations (including both tanker spills and pipeline spills) would likely reach the entrance to Marina del Rey within one to two days. Oil spill impacts to plankton in semi-enclosed systems, including estuaries and wetlands would be expected to be significant (Class I).

Fish

The majority of fish data regarding oil effects have been obtained in the laboratory. Field data generally consist of reports on fish kills and some measurements of sublethal effects. Field data regarding effects other than massive fish kills are extremely difficult to obtain because of the difficulty in quantitatively sampling fish populations. In laboratory studies, typical responses to toxic hydrocarbon concentrations include a brief period of increased activity, followed by reduced activity, twitching, narcosis, and eventual death (NRC 1985). Sublethal effects include histological (tissue and cell) damage, altered physiological and metabolic patterns, decreased growth and reproduction, and vulnerability to disease (NRC 1985). Among fishes, benthic species are more sensitive than pelagic species, and intertidal species are the most tolerant (Rice et al. 1979). In general, early life stages of fishes, such as embryos and larvae, are more sensitive to petroleum hydrocarbons than later life stages.

Although sensitivity is demonstrated in laboratory studies, only in a few instances have adverse effects been observed in fish following major oil spills. Examples include the *Florida* spill off West Falmouth, Massachusetts, and the *Amoco Cadiz* spill off the coast of Brittany. Sublethal effects were documented in both cases. In the *Florida* spill, killifishes from contaminated marshes had a lower rate of lipogenesis (lowered metabolism) than their counterparts from uncontaminated sites (Sabo and Stegeman

1977). In the *Amoco Cadiz* spill, a large number of histological abnormalities were noted in estuarine flatfish (*Pleuronectes platessa*) (Haensly et al. 1982). According to Straughan (1971), there were no indications of fish kills or other evidence of effects on fishes from the Santa Barbara Channel blowout in 1969.

Although damage to fish populations following oil spills has rarely been documented, several species were severely impacted from the 1989 *Exxon Valdez* spill. Larval stages are sensitive to lower concentrations of oil than those shown to affect adults. Juvenile pink (*Oncorhynchus gorbuscha*) and sockeye (*O. nerka*) salmon were directly affected by the spill in 1989, and their eggs may have been affected through 1993 (Spies et al. 1996). Exposure to oil was documented by oil in the stomachs of salmon fry, measurements of polynuclear aromatic hydrocarbons (PAH) in salmon fry, and by increases in P450 and bile hydrocarbon metabolites in Dolly Varden (*Salvelinus malva*) (Spies et al. 1996). Impacts on growth were shown for pink salmon, Dolly Varden, and cutthroat trout (*O. clarki*), even though changes in food availability were not detected (Spies et al. 1996).

An estimated 40 to 50 percent of the egg biomass of the Pacific herring (*Clupea pallasi*) deposited within Prince William Sound was exposed to oil during developmental stages (Brown et al. 1996). The resulting 1989 year class of herring showed sublethal effects, such as premature hatch, low weights, reduced growth, and increased morphologic (structural) and genetic abnormalities (Brown et al. 1996). The 1989 year class, recruiting as four-year-old adults in 1993, was one of the smallest cohorts (groups) observed in Prince William Sound, and it returned to spawn with an adult herring population that was reduced by approximately 75 percent (Brown et al. 1996).

Adult fish, due to their mobility, may be able to avoid or minimize exposure to spilled oil. However, there is no conclusive evidence that fish will avoid spilled oil (NRC 1985). Experiments with herring and cod larvae show that neither species actively avoided experimental surface slicks but instead reentered them (Wells 1982). Egg and larval stages would also not be able to avoid exposure to spilled oil. Because fish species can be economically important and because long-term loss can result from an oil spill, impacts to fish are considered to be significant (Class I).

The destruction of prey by a potential oil spill can also have significant impacts to fish productivity (Elmgren et al. 1983). For example, the Tsesis oil spill killed a substantial portion of the population of the amphipod *Pontoporeia* sp., which is an important food source for local fishes and preys on the spat of the clam *Macoma balthic*. In the

absence of these amphipods, the clam settled in great numbers, slowing recolonization by the amphipods. The resultant shift in species diversity persisted for many years. The amphipod is the preferred food of commercially important fishes in the area; investigators postulated that the delayed ecosystem effect would be a loss of some 100 tons of fish production.

Within the Project area, particularly vulnerable fish populations would be species that use estuaries or coastal wetlands, such as Ballona Lagoon, for part of their early life histories. These species, including game fishes, would be especially vulnerable because estuarine circulation tends to trap and recirculate pollutants at the sea water-fresh water interface.

Marine Birds

Oil spills pose a significant threat to marine birds. Bourne (1976), Holmes and Cronshaw (1977), Brown (1982), Hunt (1985), NRC (1985), and others have reviewed oil-spill effects on marine birds. Due to the migratory nature of many bird species, the severity of oil spill impacts on marine birds would depend on the time of the year, the species present, and their numbers. According to Holmes and Cronshaw (1977), these factors accounted for the relatively low number of marine birds (3,600) that were killed during the 1969 Santa Barbara oil spill.

Oil on a marine bird clogs and damages the fine structure of the feathers that is responsible for maintaining water repellency and heat insulation (Holmes and Cronshaw 1977). Oiling of feathers also leads to elevated metabolic rate and hypothermia (Stephenson 2002). In addition to coating by oil, marine birds are also subject to chronic, long-term effects from oil that remains in the environment. For example, small amounts of oil on a bird's plumage may be transferred to eggs during incubation. This contact has been shown to kill developing embryos (Albers 1978, Szaro et al. 1978). Birds can also consume oil through their diet or through preening, which results in physiological stress (Holmes and Cronshaw 1977, Brown 1982). Effects of ingested oil include acute irritation, difficulties in water absorption, and general pathological changes in some organs. Ingestion of oil can also affect reproductive success by degrading yolk structure, reducing clutch size, and decreasing egg viability.

Mortality of large numbers of birds following oil spills can affect the reproductive capacity of colonial species during the nesting season because there are fewer viable breeding birds. Reproductive capacity can remain reduced for several years in such cases.

An oil spill that affects bird habitat (e.g., shoreline and marshes) can pose long-term problems (Albers 1984). Indirect effects result principally from contamination of habitat where feeding occurs. These effects may be significant in shallow waters of bays, mudflats, and estuaries where waterfowl, rails, wading birds, and shorebirds feed. Observations of oil-streaked shorebirds are common immediately following oil spills, but carcasses are rarely recovered (Larsen and Richardson 1990). For these birds, loss or reduction in food resources can affect survival during migration and nesting efforts. Birds have been observed to leave an area that has been affected by a spill (Hope et al. 1978, Chapman 1981). Such movement away from their habitat could result in severe impacts should it occur during the breeding or nesting season (Albers 1984).

Seabirds, including shearwaters, storm-petrels, phalaropes, gulls, and terns, and coastal waterfowl, including sea ducks, loons and western grebes, constitute the greatest amount of avifauna biomass in the SCB (Baird 1993). A total of 43 seabird species and 37 waterfowl species use the SCB, with some species resident year-round and others seasonally abundant. Not surprisingly, bird species suffering the greatest mortality from past oil spills along the coast include alcids, cormorants, loons, grebes, and scoters.

Large migrant or wintering populations of loons, grebes, and scoters are found along the coast in the Santa Monica Bay or around the Channel Islands from about October through March. Additionally, loons, grebes, and scoters rest at night on nearshore waters where they can become oiled in large numbers should a spill occur.

Alcids (family Alcidae) are diving birds that swim underwater in pursuit of small fish and may repeatedly surface through an oil slick. The group includes murres, auklets, murrelets, puffins, and guillemots. These birds are especially vulnerable to oil spills due to their mode of foraging and because they frequently congregate on the water in very large flocks, particularly within approximately 12.4 miles (20.0 km) of their colonies (Briggs et al. 1983). During the late-spring nesting season, common murres and probably other alcids as well may spend 40 percent of their time on the water foraging (Ainley 1976, Sowls et al. 1980). After the nesting season, the entire population, including dependent chicks, leaves the colony and remains on the water until the next year.

Cormorants are another common seabird off the coast of the Project area. They have plumage that must be dried in the air every few hours to provide adequate insulation and buoyancy. Consequently, they frequently return to coastal roosts rather than rest

on the water. To some extent they are less vulnerable to oil spills than alcids and other species that remain on the water. Not only do they spend time on land, they also may relocate to other roosting sites if disturbed. Cormorants are most vulnerable during the spring-summer breeding season when they have strong ties to nesting colonies. Cormorants do not have the ability to store energy as fat and consequently must forage each day regardless of the presence of oil nearby. Approximately 85 percent of all cormorants on the water are found within 66.2 miles (106.5 km) of colonies (Briggs et al. 1983). Should a spill occur offshore, impacts to this and other marine bird species are considered to be significant (Class I).

The endangered California least tern and recently delisted California brown pelican could also be severely impacted by an oil spill. The brown pelican, an offshore forager, is highly susceptible to oil ingestion and fouling. Effects of oil contamination on the overall population could be significant, since the species continues to recover from the effects of DDT contamination. The California least tern is a coastal inhabitant but forages offshore. It also is highly susceptible to oil spills because it skims the ocean surface for prey, with occasional diving. Should a spill occur offshore, impacts to this species are considered to be significant (Class I).

A rupture in the Torch pipeline from Platform Irene to the shoreline occurred on September 28, 1997, releasing an estimated 162 to 1,242+ bbl (26 to 197+ m^3) of crude oil (Santa Barbara County 2001b). Surveys for dead or live oiled seabirds that were beached were conducted from September 29 to October 5, 1997. Of the 140 birds that were collected during the surveys, 122 were either dead or died after sampling. However, these numbers are conservative. For example, the surveys did not include birds that may have been missed by the surveyors, dead or oiled birds that were outside the survey area or did not reach the shoreline, or birds that reached the shoreline in the survey area, but were removed by scavengers or predators, such as vultures and coyotes. As evidence for heavy scavenging or predation at the spill site, 100 percent of bird carcasses (22 individuals) that were left overnight had been removed by the following morning. Coyote tracks were clearly visible near the markers that had been placed next to each of the carcasses (Ford Consulting 1998). Ford Consulting (1998) estimated that 353 birds died from oiling and were not recovered during the surveys.

The total number of birds impacted by the Torch spill has therefore been estimated at 635 to 815, a much higher number than that indicated by the survey results. Additionally, although deaths from oiling for the endangered brown pelican and snowy

plover were not reported from the spill, Ford Consulting (1998) estimated that 14 brown pelicans and 13 snowy plovers were fouled by oil from the pipeline rupture.

Based on the above data, impacts to marine birds from a large oil spill in the vicinity of the Project area are considered significant (Class I). Specifically, for the modeled Marine Terminal oil spill scenarios (Appendix C), spills to the California mainland could result in significant impacts to marine birds, because conditions are such that the oil sweeps along the shore in shallow waters where nearshore species such as gulls, loons, grebes, and scoters are abundant. Because of the widespread distribution of waterfowl, an oil spill from October through about April would probably contact some portion of the population. Santa Monica Bay nearshore areas and coastal wetlands are used as critical feeding ground by several thousand waterfowl from late fall through spring. Substantial mortality of wintering waterfowl or loss of essential habitat would likely result from oil spills and would be a significant impact.

Additionally, although spills at the Marine Terminal or along the transport routes that move across offshore waters in areas would initially impact fewer marine birds, spills that extend to the areas around the Channel Islands where colonial seabirds, including protected species such as Xantus' murrelets, are again more abundant, would also have significant impacts (Class I). Because lighter, less viscous oils would sweep a greater water surface area (with diesel sweeping the most and heavy crude the least area), more birds would potentially be oiled in diesel spills than for crude oils (and lighter crudes would oil more birds than heavy crudes).

Marine Mammals

Marine mammals that could be impacted by an oil spill include cetaceans (whales and dolphins), pinnipeds (seals), and fissipeds (sea otters). Animals that are unable to avoid contact with oil could be impacted by fouling, inhalation, or ingestion that could result in sublethal or lethal effects. Reviews on the effects of oil on marine mammals have been conducted by Geraci and St. Aubin (1982, 1985, 1988, and 1990), Englehardt (1983), and the NRC (1985).

It is unlikely that oil spills would substantially threaten cetaceans (NRC 1985). However, a massive oil spill could result in fouling of the baleen, toxicity from ingestion, respiratory difficulties, and irritation of membranes that contact oil. Although some observations suggest that cetaceans would avoid surfacing in oil slicks by staying submerged longer, other observations suggest that some cetaceans may not avoid oil-covered waters (NRC 1985). Toothed whales, which use echo-location to orient and

find prey, may be able to avoid oil slicks. In studies with captive animals, bottlenose dolphins were found to reliably detect oil in a slick 00.039 inches thick and avoid contact. However, oil does not tend to cling to cetacean skin as it does to the pelage (hair) of other marine mammal species. Geraci and St. Aubin (1982) suggest that oil fouling of cetacean skin and accidental ingestion would not reach toxic levels and that any irritation would likely be temporary. Etkins (1997) seems to concur that fouling of the skin would likely be a minor issue, but suggests that, in surface baleen feeders, ingestion of oils could have a negative impact greater than that posed to toothed whales. Should an oil spill occur in the Project area, the species that would most likely be impacted, depending on the time of year, are the gray, blue, humpback, and fin whales. Blue, humpback, and fin whales are presently listed as endangered species.

Although seals apparently have the ability to detect and avoid oil slicks, Cowell (1979) reported that breeding seals swam through oil to reach rookery beaches during the breeding season. Davis and Anderson (1976) found no differences in the growth and mortality of oiled and unoiled grey seal pups. LeBoeuf (1971) reported similar results from the 1969 Santa Barbara Channel blowout with regard to elephant seal pups. According to Brownell (1971) and Geraci and Smith (1977), no deaths to marine mammals could be linked to the 1969 spill. However, wildlife survey capabilities at that time were less extensive than they are today.

Geraci and Smith (1977) reported that surface contact with oil has a much greater impact on seals than absorption of the petroleum. In controlled experiments, seals that were exposed to floating oil developed reversible eye damage (in the wild, “reversible” eye damage could significantly affect an animal’s ability to function). The Project area is in a foraging area for pinnipeds, e.g., California sea lions. Oil-spill trajectory analyses indicate that oil released from a spill in the Project area will almost certainly come ashore, exposing adults and subadults to potentially long-term lethal and sublethal effects. Onshore cleanup activities would also be extremely disruptive to pinniped populations. DeLong (1975) reported that seals disturbed on San Miguel Island retreated into the sea and did not return for several days. Such impacts could result in significant behavior impacts should a spill occur during the breeding season (Davis and Anderson 1976).

A marine mammal (sea otters and pinnipeds) injury assessment survey was conducted during the Torch Point Pedernales pipeline spill that occurred on September 28, 1997. The purpose of the survey was to assess the degree of exposure and oil-related injuries to sea otters and pinnipeds from the spill. With respect to pinnipeds, it was concluded

that pinnipeds were exposed to oil from the spill, and that one female California sea lion likely died as a result of oil exposure (CDFG 1998). Additional pinnipeds in the vicinity of the spilled oil may also have been injured as a result of exposure to oil. CDFG (1998) concluded that pinnipeds in the proximity of the spill most likely were exposed to oil and suffered sub-lethal effects.

Sea otters, a threatened species, have steadily increased in numbers in the area from Purisima Point to Point Conception and have extended their range eastward. A breeding colony now also resides in the Purisima Point region. The 2007 spring census ascribed otter population increases due to the presence of otters in the Project area, particularly near Naples Reef. With the documented increase in the otter population along the mainland coast of the western Santa Barbara Channel, and anticipated range expansion over the foreseeable future, a Project-related oil spill, should one occur, has the potential to impact a high number of sea otters.

Oil spill impacts to sea otters are well documented (Costa and Kooyman 1982, Siniff et al. 1982, Davis et al. 1988). After sea otters' exposure to oil, death usually results from either an increase in metabolic rate, hypothermia, or inhalation of volatile vapors (Geraci and Williams 1990). An oil spill that occurs during the non-breeding season (November to May) could kill more sea otters than one that occurs during the breeding season (June to November). This is because during the non-breeding season, sea otters extend their range, and have been reported as far east as Carpinteria and Ventura in recent years. The range of this southernmost group, which consists mostly of young males, retracts to the center of the range north of Point Arguello during the breeding season. In any case, sea otters in the region from Purisima Point to Point Conception, as well as those that may travel south or east of Point Conception, are vulnerable to oil spills from the proposed Project. Of the 364 oiled otters that were processed at oiling centers following the *Exxon Valdez* oil spill, only 53 percent were rehabilitated (Geraci and Williams 1990).

No sea otter fatalities were reported from the September 1997 Torch spill from Platform Irene, although observations from the marine mammal injury assessment survey suggested possible oil exposure did occur. It is likely that sea otters in the proximity of the spill were exposed to oil and may have experienced sub-lethal effects (CDFG 1998).

In addition to sea otters, the harbor seal and the Steller sea lion were also impacted by the *Exxon Valdez* oil spill (Loughlin et al. 1996). Tissue from animals found dead in spill

areas contained elevated levels of hydrocarbons. Also, population declines for both species were noted in Prince William Sound after the oil spill (Loughlin et al. 1996).

In summary, the marine mammal species that occur in the Project area exhibit varying degrees of vulnerability to oil spills. Impacts can be caused either by oil contact or by ingestion. There is evidence that cetacean species may avoid contact with oil at sea; however, pinniped species and sea otters could potentially suffer lethal and long term sublethal effects resulting in significant impacts. Onshore cleanup activities, depending on location, could disrupt pinniped haul-out and rookery areas and could also result in significant impacts, particularly if a spill should reach the Channel Islands. As a result, impacts to marine mammals are considered to be significant (Class I).

Marine Turtles

Oil spills can adversely affect marine turtles by toxic external contact, toxic ingestion or blockage of the digestive tract, disruption of salt gland function, asphyxiation, and displacement from preferred habitats (Vargo et al. 1986, Lutz and Lutcavage 1989). Turtles may become entrapped by tar and oil slicks and rendered immobile (Witham 1978, Plotkin and Amos 1988). Small juvenile turtles are particularly vulnerable to contacting or ingesting oil because the currents that concentrate oil spills also form the debris mats in which they are found (Carr 1980, Collard and Ogren 1990). Contact with oil may not cause direct or immediate death, but cumulative sublethal effects, such as salt gland disruption or liver impairment, could impair a marine turtle's ability to function effectively in the marine environment (Vargo et al. 1986, Lutz and Lutcavage 1989).

Although marine turtles are not commonly encountered in the area of the proposed Project, oil spill impacts to marine turtles are considered to be adverse and potentially significant (Class II) because of their threatened and endangered status.

Areas of Special Biological Significance

Areas of Special Biological Significance (ASBS) are areas that have been recognized as biologically important and given a level of protection indicating that damage causing or contributinging to a measurable change in function in these areas represents a significant impact. Impacts that result in the oiling of the nearshore and shoreline habitat in these areas have the potential to change the functionality of these areas. In addition, other sensitive areas are known to occur throughout the SCB. Many, but not all, are included with the ASBS program or may be protected by State or local regulations. These areas may include specialized communities or habitat that supports

the presence of marine mammals, birds, or endangered species. Impacts to ASBS and other sensitive habitats from spills at the Marine Terminal are likely to be significant.

Nine ASBS, one within northern Santa Monica Bay, and eight located along nearshore habitats of San Miguel, Santa Rosa, Santa Cruz, Anacapa, Santa Barbara and San Nicolas Islands have a potential of incurring significant impacts from an oil spill at or in transit to/from the Marine Terminal. This impact within the ASBS would be significant. Similar impacts were determined for the worst case diesel spill scenario for the islands (Appendix C, Figure C.6-7), as well as impacts to areas in the southern Santa Monica Bay where kelp beds occur. For the worst case diesel spill scenario for the water column, the islands are not impacted; however, much of the coastline of southern Santa Monica Bay is estimated to be covered with oil that exceeds 100 g/m^2, the model shows impacts to the shoreline (Appendix C, Figure C.6-11). These impacts would be potentially significant.

Worst case spill impacts to the marine environment from both light crude and heavy crude spills (Appendix C, Figures C.6-15, C.6-18, C.6-24, and C.6-27) show that impacts to the ASBS in these scenarios would be significant (Class I).

Mitigation Measures

BIO-1a. Update the Oil Spill Contingency Plan to Reflect the Project Changes. The Applicant shall update the Oil Spill Contingency Plan to incorporate changes in activities that result from the proposed Project within one year of lease renewal and submit reports to CSLC annually thereafter. For example, the plan shall incorporate detailed response procedures for marine oil spills resulting from vessel groundings or collisions, as well as for pipeline failure and failures occurring during transfer of the oil to and from the barge. Worst-case discharge scenarios shall be updated accordingly. In addition, lessons learned from the cleanup of the 1997 Platform Irene or 2010 Deepwater Horizon oil spills shall be incorporated into the Response Plan. These lessons include operator training in recognizing the significance of deviations in pipeline operating parameters, inspections required to restarting equipment that automatically shuts down in response to a process deviation, and rapidly implementing surveillance activities following process deviations to determine if a spill has occurred.

The personnel and training sections of the Oil Spill Contingency Plan shall be updated and identify training requirements for all personnel that would be utilized to respond to oil spills. At a minimum, new personnel shall be trained immediately upon their hiring in the overall operational aspects of oil spill response, including the proper use of all equipment that would be utilized in oil spill response. Annual training for all personnel, which is a Federal requirement, shall also be included in the Oil Spill Contingency Plan to provide personnel with an understanding of their training responsibilities. The annual training shall include training in the operation of new equipment that may be utilized in oil spill response, retraining in the operation of existing equipment, and review of the oil spill response requirements that are identified in the Oil Spill Contingency Plan.

BIO-1b. Vessels That Call on the Terminal Shall Implement Their Own Oil Spill Response Plan. This plan shall comply with 33 Code of Federal Regulations 155, Subpart D and shall be submitted within one year of lease renewal and reports submitted to CSLC annually thereafter.

Rationale for Mitigation

Mitigation measures contained in the site Marine Terminal Operations Manual (MTO), the SPCC Plan and the Oil Spill Contingency Response Plan (OSCRP) (Chevron 2003) and the Area Contingency Plan (ACP) reduce the potential significant impacts on biological resources from a Marine Terminal operations oil spill by applying five levels of mitigation: (1) prevention; (2) containment; (3) avoidance of sensitive resources; (4) cleanup and rehabilitation of oiled areas; and, (5) restoration and/or compensation for damaged resources and habitat. **MM BIO-1a** addresses how the Applicant will be prepared to respond to all potential oil spills and spill scenarios that could be generated by the proposed Project, thereby minimizing potential adverse impacts. Timely detection and response to oil spills greatly affect the extent and severity of the environmental impacts of oil spills.

Similarly, measure **Impact SSR-2** presented in Section 4.1, System Safety and Reliability, provides improved oil spill detection, response, and containment measures. With implementation of that measure, the risk to the marine biological resources may be further reduced.

MM BIO-1b addresses the need for operators of the individual vessels utilizing the Marine Terminal to incorporate oil spill response measures to help reduce the extent and severity of the environmental impacts in the event of an oil spill during transit to and from the Marine Terminal.

Residual Impacts

Biological impacts associated with accidental oil spills related to the proposed Project are categorized as significant (Class I) because the proposed mitigation measures would not be completely effective in reducing the significant risk of a spill, nor would they adequately eliminate the significant effects of a spill on sensitive resources.

A large spill (greater than 100 bbl [15.9 m^3]) to marine waters would generate visible surface sheens, significantly reduce the penetration of natural light, reduce dissolved oxygen, degrade indigenous biota, and result in hydrocarbon contamination within the water column and marine sediments. The duration and area of the impact would be largely dictated by the size of the spill and sea and weather conditions at the time of the spill. Impacts would last from days to weeks and extend for tens of kilometers.

Although complete containment and cleanup of a large oil spill at sea is nearly impossible, mitigation of biological impacts from such a spill is largely a function of the efficacy of the spill-response measures and ambient conditions. The effectiveness of containment and spill cleanup measures is dependent on the response time, availability and type of equipment, type of oil spilled, volume of the spill, and the weather and sea state, e.g., swells, wind waves, chop, etc., during the spill. Only some of these aspects are within the control of the spill-response team. In addition, many oil spill response and cleanup measures, such as the use of dispersants or the pressure washing of shorelines, have impacts of their own. For example, pressure washing of intertidal areas following the Exxon Valdez spill resulted in alterations to the grainsize distribution within these sediments, which influenced the recovery of the intertidal benthic community. Similarly, the use of dispersants, although they may help to break up a spill, may result in their own toxicity impacts to biota; however such impacts are generally less than the impacts of oil itself.

As of July 12, 2010, more than 1.07 million gallons of surface dispersant were used and more than 735,000 gallons of subsea dispersant were used on the Deepwater Horizon oil spill, making it the largest application of dispersants in U.S. history. Appendix H contains additional information regarding dispersants, their use and impacts.

With respect to wind-wave conditions, the containment effectiveness of booms begins to decrease at a significant wave height of two feet (0.6 m). Above two feet (0.6 m), booms and skimmers are rendered ineffective, however, it is likely that in that sea state, a slick would be dispersed and mixed into the water column anyway. For long-period swell conditions, booms and skimmers can retain effectiveness in wave heights greater than two feet (0.6 m). High winds can cause some type of booms to lie over, allowing oil to splash and flow over the boom. High winds can also affect the deployment or shape of the deployment and, thus, the containment effectiveness of the boom.

Because there are limitations to thorough containment and cleanup of an offshore oil spill, significant impacts (Class I) remain for benthic organisms, intertidal communities, marine mammals, marine turtles, and marine and shore birds.

Impact BIO-2: Oil Spill Impacts to Commercial and Recreational Fishing

Accidental discharge of petroleum hydrocarbons into marine waters would adversely affect commercial and recreational fishing (Significant, Class I).

Impact Discussion

A wide variety of fish and shellfish species are commercially harvested in the Project area (Appendix G, Commercial and Recreational Fishing and Kelp Harvesting Resources). As described in Impact **BIO-1**, biota residing in the intertidal and shallow subtidal habitat are particularly vulnerable to oil spills. For example, mass mortalities of invertebrates, such as sea urchins, abalone, and lobsters, were reported following the *Tampico* spill in Baja California (North et al. 1964).

The degree of oiling and the oil spill impacts depend on several factors. These include the location of the spill, volume and type of oil, amount of weathering, evaporation, dispersion of oil into the water column or shoreline, and the amount of oil that is contained and cleaned immediately after a spill. Although large spills, e.g., greater than 2,000 bbl (318 m^3), are rare, the Santa Barbara oil spill of 1969 was estimated at 80,900 bbl (12,862 m^3) (MMS 2001). The spill from the rupture of the Torch Pedernales pipeline was estimated at 163 to 1,242+ bbl (26 to 197+ m^3) (Santa Barbara County 2001b). While the probability for oil contacting and fouling the shoreline or shallow subtidal areas where commercial or recreational species are harvested is low, it can occur nevertheless. Additionally, although contaminated shorelines may be cleaned, in some instances, depending on substrate type, oil may persist in sediments for several years.

A surface sheen in intertidal waters caused by the release of hydrocarbons from oiled sediments was noticeable eight years after the *Exxon Valdez* spill (Hayes and Michel 1998). In addition to direct oiling effects, impacts caused by sublethal effects and the cleanup methods, such as histological damage, altered physiological and metabolic patterns, decreased growth and reproduction, vulnerability to diseases, or even area closures, can continue for several years (NRC 1985, Coats et al. 1999). Oil spill impacts to commercial and recreational fisheries in the intertidal environment or shallow subtidal areas may be long lasting and can result in loss of areas for most, if not all, of a harvesting season. Hence, impacts to commercial or recreational fishing in intertidal or shallow subtidal areas from a major spill are considered to be significant (Class I).

Damage to fish populations was documented from the *Exxon Valdez* oil spill (Spies et al. 1996). Juvenile pink and sockeye salmon were directly affected by the spill in 1989, and their eggs may have been affected through 1993 (Spies et al. 1996). Other indications of exposure to oil included the presence of oil in the stomachs of salmon fry, measurements of polynuclear aromatic hydrocarbons (PAH) in salmon fry, and increases in P450 and bile hydrocarbon metabolites in Dolly Varden (Spies et al. 1996). Impacts to growth were also shown for pink salmon, Dolly Varden, and cutthroat trout, even though changes in food availability were not detected (Spies et al. 1996).

Brown et al. (1996) estimated that 40 to 50 percent of the egg biomass of Pacific herring in Prince William Sound was exposed to oil during developmental stages. The resulting 1989 year class showed sublethal effects, such as premature hatch, low weights, reduced growth, and increased morphologic and genetic abnormalities (Brown et al. 1996). The 1989 year class, recruiting as four-year old adults in 1993, was one of the smallest to return to spawn in Prince William Sound, with an adult population that had already been reduced by approximately 75 percent (Brown et al. 1996).

Adult fish, due to their mobility, may be able to avoid or minimize exposure to spilled oil. However, there is no conclusive evidence that fish will avoid spilled oil (NRC 1985). Egg and larval stages would also not be able to avoid exposure to spilled oil. Because losses to commercial and recreational fish resources and losses due to closure of fishing areas for most or all of a fishing season can occur, impacts to commercial and recreational fishing from oil spills are considered to be significant. Fish harvested from contaminated areas may also be reduced in value, and fishing gear can be damaged due to oil fouling, causing additional significant impacts.

Based on the above, impacts to commercial or recreational fishing from a major spill associated with the proposed Project are considered to be significant (Class I).

Mitigation Measures

In addition to **MM BIO-1a** and **BIO-1b**, implementing **MM SSR-2a** through **SSR-2k** identified in Section 4.1, System Safety and Reliabilty, would reduce the likelihood and consequences of a potential oil spill on fisheries. These mitigation measures should occur 60 days prior to the start of any construction and be ongoing during construction (as applicable).

Rationale for Mitigation

The measures presented in the above-mentioned sections provide improved oil spill prevention, detection and response capabilities. With implementation of these measures, the risk to the marine environment and impacts to commercial and recreational fishing may be reduced, but not eliminated.

Residual Impacts

Because there are limitations to thorough containment and cleanup of an offshore oil spill, significant impacts (Class I) remain for commercial and recreational fisheries.

Impact BIO-3: Vessel Traffic and Marine Construction Impacts to Biological Resources

Noise from vessel traffic can mask reception capabilities and startle or injure marine species while entanglement or collisions with vessels can injure or kill protected species (Potentially Significant but Mitigable, Class II).

Impact Discussion

Over the lifetime of the proposed Project, vessel calls to the Marine Terminal could potentially increase above current operating conditions. Although this increase would occur gradually over the length of the 30-year lease, the potential increase over baseline conditions would result in approximately 487 vessel calls per year to the Marine Terminal by the end of the lease period. Traffic increases would heighten the probability of vessel collisions with marine animals as well as result in an overall increase in background marine noise levels. If impacts to marine mammals or turtles occur from increases in vessel traffic, they would be significant because several marine mammal species and all four of the marine turtles known to inhabit the region are

protected under the Endangered Species Act, while all marine mammal species are granted additional protection under the Marine Mammal Protection Act of 1972 (Significant, Class I). Additionally, repair and replacement of pipelines to the Marine Terminal could impact foraging whales.

Noise

Noise produced by vessel traffic, such as tankers traveling to and from the Marine Terminal, represents one of the most pervasive forms of man-made noise in the ocean (McCauley 1994, Richardson et al. 1995) and, in areas of high shipping density, produces a nondescript low frequency noise (< 500 Hz). Vessel sound levels and frequency characteristics are roughly related to ship size and speed, wherein the dominant sound source is propeller cavitation.

Noise exposure may result in a range of effects on auditory and non-auditory systems. The degree of noise impacts would depend on the radiated sound level, the proximity of the emitted sound to the receptor, and the auditory and behavioral sensitivity of the receptor species. For example, noise may be detectable, but yet have no direct effect on an animal's behavior, hearing, or physiology. In other cases, signals of interest may be "masked" (or interfered with) by the presence of noise. Intense or prolonged exposure to noise may result in either temporary or permanent changes in hearing sensitivity, induce direct physical trauma to non-auditory structures and, in fish, increased egg mortality. For example, sound pressure levels (SPL) 100 decibels (dB) above the threshold for hearing are thought to be sufficient to damage the auditory system in many fishes. Short term exposure to peak SPL above 190 dB (re: 1uPa) are thought to cause physical harm to fish, while 155 dB (re: 1 uPa) may be enough to temporarily stun small fish.

Except for extremely busy shipping lanes or harbors, in which resident species could theoretically experience some hearing loss over long periods of exposure to industrial activity, the primary auditory effect of vessel noise on marine animals is considered to be the masking of biologically significant sounds. Because most of the acoustic energy radiated from large commercial vessels is below 1 kHz, the greatest potential for masking exists for groups of marine animals that produce and receive sounds in this range for critical biological functions (see Table 4.3-7). In terms of communication signals, this primarily includes the mysticetes, pinnipeds (particularly the phocids), and fish. For example, the dominant components of the "communication" calls of most marine mammals fall within the 20 Hz to 20 kHz range.

Auditory masking occurs in marine mammals in a similar manner to terrestrial species. The fundamental consideration with regards to the potential for masking is the frequency relationship between signal and noise. However, the literature indicates that while marine mammals hear sounds generated by vessel traffic such as tankers, there is little to no indication that they are affected deleteriously by the noise (Richardson et al. 1995).

In general, pinnipeds and odontocetes tend to be tolerant of vessels. The level of avoidance of baleen whales to vessels appears to be related to the speed and direction of approaching vessels (Richardson et al. 1995). Whales seem most responsive when the sound level is increasing or when a noise source first starts up, such as during a brief playback experiment or when migrating whales are swimming toward a noise source. The limited available data suggest that stationary industrial activities producing continuous noise result in less dramatic reactions by cetaceans than do moving sound sources, particularly ships. Some cetaceans may partially habituate to continuous noise.

Gray whales have been observed to change course at a distance of 650 to 1,000 feet (200 to 300 m) in order to move around a vessel in their paths. On the other hand, some gray whales have not been observed to react until a ship is within 50 to 100 feet (15 to 30 m). Humpback whales have been observed to avoid vessels and change behavior when a boat approached within a half mile.

Dolphin and whale species exposed to close physical approaches as well as noise from different vessels may alter motor behaviors (Janik and Thompson 1996, Nowacek et al. 2001, Williams et al. 2002, Hastie et al. 2003) as well as vocalization characteristics (Lesage et al. 1999, Au and Green 2000, Van Parijs and Corkeron 2001, Buckstaff 2004, Foote et al. 2004). These changes in behavior have both direct energetic costs and potential effects on foraging, navigation, and reproductive activities. Vessel traffic noise may elicit a startle reaction from marine turtles and produce temporary sublethal stress (NRC 1990).

Fishes could be also be impacted by routine activities such as ship traffic noise. It is believed that the sounds produced by large vessels could frighten fish schools or cause them to change their migration routes. Studies suggest that the noises produced by fishing and by underwater construction cause avoidance behaviors in fish (EPA 1980). However, the temporary nature of this activity at the Marine Terminal is not expected to significantly impact fishes.

Watkins (1986), Malme et al. (1989), and Richardson et al. (1991) have reported that noises from vessels elicit a startle reaction from gray whales and mask their reception capabilities. They also reported that avoidance and approach responses vary according to whale activity. Migrating gray whales have been observed to avoid the approach of vessels to within 656 to 984 feet (200 to 300 m) (Wyrick 1954) or to within 1,148 to 1,804 feet (350 to 550 m) (Bogoslovskaya et al. 1981). However, during recent acoustic tag and controlled exposure experiments with north Atlantic right whales, although five of six individuals tested were found to respond strongly (interrupted dive pattern and swam rapidly to the surface) to the presence of an artificial alarm stimulus, the whales did not respond likewise to playbacks of vessel noise (Nowacek et al. 2004b). Based upon the results of these studies, noise effects on whales from vessels can be expected to be limited to within 656 to 1,804 feet (200 to 550 m) of approaching vessels, to be sublethal, and temporary.

Collisions

Due to the proximity of various species migration routes to the nearshore marine traffic lanes, collisions between vessels and whales occur frequently off the California coast. The proposed increases in vessel traffic associated with the proposed Project would heighten the probability for collisions between vessels and protected marine species (e.g., marine mammals and turtles). Vessel speed has been implicated as a key factor in the frequency and severity of vessel strikes to large whales (Silber et al. 2009). As a result, vessel speed restrictions and advisories have become widely employed as means to reduce the likelihood and severity of whale ship strikes in U.S. waters.

Although there are currently no ship strike records associated with sei or sperm whales along the U.S. west coast, collisions for gray, fin, and blue whales have been documented in the SCB (Carretta et al. 2006). For example, 12 collisions resulting in six deaths of gray whales occurred off southern California between 1975 and 1980 (Patten et al. 1980). From 1990 to 1998 an additional seven gray whale deaths were attributed to ship strikes in U.S. waters. Most recently, in March 2009, the USCG received a report of a possible gray whale struck by a mariner in San Diego Bay. Young gray whales, especially, are more likely to be hit by moving vessels (Laist et al. 2001).

During the fall of 2007 there were five confirmed blue whale fatalities within the SCB within a two month period. At least two of these fatalities were attributed to ship strikes: a 15-foot (4.6-m) long bruise was found on the side of a juvenile whale that washed up in Ventura County in September 2007 after initially being sighted from a plane near San

Miguel Island; and a second whale thought to have been hit by a freighter was found floating in Long Beach Harbor a week earlier (LA Times 2007). This spate of fatalities was designated as an "unusual mortality event" by NOAA. Four additional fatalities have occurred to fin and blue whales in the region as a result of ship strikes since then. The most recent event, in April 2009, involved a 60-foot (18.3-m) fin whale that was struck and impaled upon the bow of a container ship en route from Santa Barbara to San Pedro. Since collisions between vessels and federally protected marine mammal species, can result in severe injury or death, collisions are considered to be a significant, but mitigable impact (Class II).

Laist et al. (2001) compiled descriptions of 58 collisions to assess contributing factors in vessel strikes to whales. They indicate that while all sizes and types of vessels can hit whales, most lethal or severe injuries are caused by ships 260 feet (80 m) or longer. Whales usually are not seen beforehand or are seen too late to be avoided, and most lethal or severe injuries involve ships traveling 16 mph (14 knots, 25.7 km per hour) or faster. In areas where special caution is needed to avoid such events, measures to reduce vessel speed below this threshold have been introduced.

Recent limitations within Pacific waters include the U.S. National Park Service's limit on both the number of cruise ships entering Glacier Bay National Park, and the requirement that ships travel at 13 knots or less in areas and times when humpback whales are present (Silber et al. 2009). Similarly, following the unusual mortality event in 2007, NMFS worked with NOAA's Channel Islands National Marine Sanctuary and Sanctuary Advisory Council to draft a response plan for large whale ship strikes in the Santa Barbara Channel which included an advisory to reduce ship speeds to 10 knots or less when whales are known to be present in the area (Bettridge and Silber 2008).

In 2008, the NMFS issued a vessel speed regulation in key port entrances and whale aggregation locations along the U.S. east coast to protect the Atlantic right whale. Similar vessel speed restrictions have been suggested to reduce the likelihood of collisions with fin whales in the Mediterranean Sea (Panigada et al. 2006) and manatees in Florida (Laist and Shaw 2006).

In addition to the larger cetacean species, Santa Monica Bay and the nearby waters are also inhabited year-round by three relatively abundant dolphin species (bottlenose dolphins, short-beaked common dolphins, and long-beaked common dolphins) and two species of pinniped (California sea lions and harbor seals) (Bearzi et al. 2008). Although no collision injuries from large vessels have been reported to these smaller, fast-

swimming marine mammal species, in many cases it would be unlikely that such collisions would be substantial enough to be noticed by large vessels in transit when they do occur.

Dolphins of many species tolerate or even approach vessels. Reactions to vessels often appear to be related to the dolphins' activity. Resting and foraging dolphins tend to avoid vessels, while socializing dolphins may approach them (Richardson et al. 1995).

Very little information describing pinniped responses to vessels is available. Johnson et al. (1989) reported that northern fur seals can be wary and show an avoidance reaction to vessels at distances of up to one mile (1.6 km), while Wickens (1994) reported that fur seals are often attracted to fishing vessels to feed. Sea lions in the water often tolerate close and frequent approaches by vessels, especially around fishing vessels.

Sea lions hauled-out on land are more responsive and react when vessels approach within 328 to 656 feet (100 to 200 m) (Peterson and Bartholomew 1967). Also, harbor seals often move into the water in response to vessels. Even small boats that approach within 328 feet (100 m) displace harbor seals from haul-out areas, and less severe disturbance can cause alert reactions without departure (Bowles and Stewart 1980, Allen et al. 1984, Osborn 1985).

Riedman (1983) reported that, while sea otters often allow close approaches by small boats, they tend to avoid high activity areas. He also noted that some rafting sea otters exhibit mild interest in vessels at distances of approximately 600 feet (183 m) and are not alarmed. Garshelis and Garshelis (1984) reported that sea otters in Alaska tend to avoid areas with frequent vessel traffic. Udevitz et al. (1995) reported that sea otters tend to move away from an approaching vessel.

Bartol & Musick (2003) suggest that sound and light are the primary cues used by marine turtles to detect an approaching vessel. As stated previously, noises from vessel traffic may elicit a startle reaction from marine turtles and produce a temporary sublethal stress (NRC 1990).

Although turtles are estimated to be at the sea surface for less than four percent of the time, vessels collisions are known to occur in the region (Byles 1989, Lohoefener et al. 1990). For example, in January 2004, an Olive Ridley with a cracked carapace was found stranded in Santa Barbara County following an apparent boat strike. Vessel strike

injuries are more common in the Gulf of Mexico, where nine percent of stranded turtles examined showed signs of vessel-related injuries (USDOC 1989).

Limpus et al. (1992 and 1994) found that green turtles are known to maintain long-term fidelity to their coastal foraging areas. This suggests that the cumulative risk of collision for an individual turtle in a foraging area that receives vessel traffic is high, since the risk of collision persists over decades.

Although marine turtles are uncommon in the immediate Project area, with the projected increase in vessel traffic over the lifetime of the Project the possibility that protected marine turtles could be harmed or killed by collisions with Project-related vessels remains, particularly during El Niño events when marine turtles (primarily loggerheads and green turtles) evince a heightened presence within the SCB.

Entanglement

Replacement of the pipelines to the two Marine Terminal berths, as discussed in Section 2.0, Project Description, could occur over the lifetime of the proposed Project. Of concern is the potential for marine mammals, especially whales, to become entangled in these subsea lines, both during and after installation. Although entanglements by whales have not been reported offshore California, Heezen (1957) describes 14 instances of sperm whale entanglements in other locations of the world. Ten were reported off the coast of Central and South America, two off the Atlantic coast of South America, one off Newfoundland, and one off the west coast of India. It is possible that the whales became entangled while feeding as their lower jaw skimmed through sediment surfaces or attacked it mistaking it for prey (Heezen 1957). Each of the recorded entanglement events occurred prior to 1955. Since the mid-1950s, however, no whales have been documented entangled in submarine cables, presumably due to advances in cable building and laying technology (Norman and Lopez 2002).

Because of their feeding behavior, gray whales also have the potential to come into contact with a bottom cable. Although feeding has been only occasionally observed off coastal California during migration, their more leisurely northbound return probably involves feeding (Leatherwood et al. 1987). When feeding on benthic infauna off British Columbia, Oliver et al. (1984) reported that excavations created during furrowing through sediments ranged from six to 10 inches (15 to 25 cm) in depth. Benthic suction feeding by gray whales has also been reported by others including Nerini (1984), Ray and Scheville (1974), Nelson et al. (1983), Nerini and Oliver (1983) and Thomson and

Morin (1984). Hence, during feeding on benthic infauna, entanglements with cable are possible, should cables or pipelines be exposed or buried to insufficient depths. Entanglement impacts to other marine mammals, such as pinnipeds and fissipeds, are not expected to occur.

Although entanglement with a single cable is unlikely, an unburied cable, or one that is suspended high off the seafloor would increase the likelihood of a collision and possible entanglement. A collision with a suspended or unburied cable is also possible during active feeding frenzies or other instances requiring quick maneuvers.

Mitigation Measures

In order to avoid causing disturbance, injury or death to protected marine species (e.g., endangered and threatened species, and marine mammals) the following measures should be taken when consistent with safe navigation:

BIO-3a **Marine Mammal and Turtle Contingency Plan.** The Applicant shall ensure that vessel operators develop and implement a contingency plan that focuses on recognition and avoidance procedures when marine mammals and turtles are encountered at sea. The plan shall be submitted within one year of lease renewal and reports submitted to CSLC annually thereafter. Minimum components of the plan include:

1. Existing and new vessel operators shall be trained by a marine mammal expert to recognize and avoid marine mammals prior to Project-related activities. Training sessions shall focus on the identification of marine mammal species, the specific behaviors of species common to the Project area and transport routes, and awareness of seasonal concentrations of marine mammal and turtle species. The operators shall be re-trained annually.

2. A minimum of two marine mammal observers shall be placed on all support vessels during the spring and fall gray whale migration periods (generally December through May), and during periods/seasons when other marine mammals, such as migrating fin, blue, and humpback whales (generally June through November), are known to be in the Project area in relatively large numbers. Observers can include the vessel operator and/or crew members, as well as any Project worker that has received proper training. Vessel operators and crews shall

maintain a vigilant watch for marine mammals and sea turtles to avoid striking sighted protected species.

3. Vessel operators will make every effort to maintain a distance of 1,000 feet (305 m) from sighted whales, and 150 feet (45.7 m) or greater from sea turtles or smaller cetaceans whenever possible.

4. When small cetaceans are sighted while a vessel is underway (e.g., bow-riding), vessel operators shall attempt to remain parallel to the animal's course. When paralleling whales, supply vessels will operate at a constant speed that is not faster than the whales' and shall avoid excessive speed or abrupt changes in direction until the cetacean has left the area.

5. Per NOAA recommendations, vessel speeds shall not exceed 11.5 mph (10 knots) when mother/calf pairs, groups, or large assemblages of cetaceans are observed near an underway vessel, when safety permits (i.e., excluding during poor sea and weather conditions, thereby ensuring safe vessel maneuverability under those special conditions). A single cetacean at the surface may indicate the presence of submerged animals in the vicinity; therefore, prudent precautionary measures should always be exercised. The vessel should attempt to route around the animals, maintaining a minimum distance of 300 feet (91.4 m) whenever possible.

6. Whales may surface in unpredictable locations or approach slowly moving vessels. When an animal is sighted in the vessel's path or in close proximity to a moving vessel and when safety permits, operators will reduce speed and shift the engine to neutral. Vessel operators will not engage the engines until the animals are clear of the area.

7. Support vessels shall not cross directly in front of migrating whales, other threatened or endangered marine mammals, or marine turtles.

8. Support vessels shall not separate female whales from their calves.

9. Vessel operators will not herd or drive whales.

10. If a whale engages in evasive or defensive action, support vessels will drop back until the animal moves out of the area.

11. Collisions with marine wildlife will be reported promptly to the Federal and state agencies listed below pursuant to each agency's reporting procedures.

Stranding Coordinator, Southeast Region (currently, Joe Cordaro)
National Marine Fisheries Service
Long Beach, CA 90802-4213
(310) 980-4017

Enforcement Dispatch Desk
California Department of Fish and Game
Long Beach, CA 90802
(562) 590-5132 or (562) 590-5133

California State Lands Commission
Environmental Planning and Management Division
Sacramento, CA 95825-8202
(916) 574-1900

BIO-3b **Burial of Pipelines.** Burial of subsea pipelines and cables to a depth of 3.28 feet (1 m) except where precluded by seafloor substrates. A 3.28 feet (1 m) burial depth would sufficiently protect gray whales foraging in bottom sediments on their northbound migration. It is understood that this burial depth may not be achieved in areas where there is localized, higher sediment resistance, or substantial variations in bottom slope or cable ship speed; however, such locations should be documented and monitored during regular inspection surveys. If, during inspection, sections of the cable or pipeline are found to be exposed contrary to the original as-built burial configurations, remedial actions will be taken within 60 days to re-bury the lines. Specific actions shall be pre-approved by CSLC staff. This mitigation measure shall occur 60 days prior to the start of any construction and shall be ongoing during construction (as applicable).

Rationale for Mitigation

Avoidance of marine mammals and turtles can be facilitated through training and education of vessel operators as to recognize, understand, and minimize conflict with marine species. Implementation of the marine mammal/turtle observer requirement and the proposed speed limitation would substantially reduce the potential for adverse impacts to marine mammals and turtles.

Residual Impacts

Implementation of **MM BIO-3a** and **BIO-3b** would substantially reduce the potential for adverse impacts to marine mammals and turtles. This would be a potentially significant impact (Class II).

Impact BIO-4: Vessel Traffic and Marine Construction Impacts to Commercial and Recreational Fishing

Vessel traffic to and from the Marine Terminal could cause loss or damage to commercial fishing gear in the Project area. Fishing preclusion zones during offshore construction activities could limit fishing activities (Potentially Significant but Mitigable, Class II).

Impact Discussion

With the potential increase in the number of vessel calls to the Marine Terminal, the likelihood of impacts to commercial fishing gear could increase over baseline conditions. Vessel traffic crosses nearshore fishing areas en route to the Marine Terminal. As tankers and barges traverse the shipping channel, fisherman cannot access the area and, thus, temporarily lose a small portion (one square mile [2.6 square kilometers]) of their fishing area. Additionally, if vessels hit or become entangled in fishing gear, damage to the gear could occur.

There are several recreational fisheries in the vicinity of the Marine Terminal including but not limited to all of the Channel Islands from San Miguel to San Clemente, all of the piers from the Los Angeles/Long Beach Harbor to Santa Barbara, nearshore kelp beds, and sheltered beaches that are popular for surf fishing. Ocean outfalls also are popular recreational fishery locations because some sport fishes are attracted to the warm, nutrient-laden effluent.

Within the Marine Terminal exclusion zone, maintenance of the pipelines may occur over a few weeks during the lease term. In future years, replacement of the pipeline will likely occur as discussed in Section 2.0, Project Description. Vessel collisions or entanglements where fishing gear could be damaged or lost could also occur during repair and construction activities. Replacement of the pipelines to the two Marine Terminal berths is likely to occur over the lifetime of the proposed Project.

To reduce vessel traffic conflicts en route between marine terminals and at the terminals themselves, various protocols have been developed. First, under the Ports and

Waterways Safety Act (PWSA) (33 U.S.C. 1223(c)), the Commandant of the Coast Guard may designate necessary fairways and traffic separation schemes (TSS) to provide safe access routes for vessels proceeding to and from U.S. ports. The PWSA provides for the paramount right of navigation over all other uses that within designated fairways and TSS, and allows the Coast Guard to adjust the location or limits of designated fairways or TSS. TSS have been established within the Santa Barbara and San Pedro Channels.

Vessel traffic approaching and departing the Marine Terminal is highly monitored. VTIS services use radar, radio, and visual inputs to gather real time vessel traffic information and broadcast traffic advisories and summaries to assist mariners.

Additionally, USCG rules (46 CFR 15) mandate pilots with Federal licenses on all vessels that call at offshore marine oil terminals in California. The effect of this rule is that tankers arriving early at the Marine Terminal anchor several miles offshore in Federal waters and wait for the opening of a berth since they must have licensed pilots when they are within three miles of the shore in Santa Monica Bay.

Beginning in 2006, Chevron also began the practice of requiring a tug boat to be present when any vessel is approaching, mooring at, or departing the Marine Terminal. The purpose of the tug is to assist vessels while they are in the vicinity of the terminal and to increase responsiveness in case of an accident.

Because vessels visiting the Marine Terminal will use designated vessel traffic corridors where applicable, as outlined in Section 2.0, Project Description, and the fact that the PSWA provides a legal standard for determining right of way in the event of a collision, this impact is considered potentially significant, but mitigable (Class II).

Similarly, any restrictions on fishing due to construction activities, such as for replacement of the pipelines to the berths, are likely to be localized and temporary. Pipeline replacements are expected to take approximately one to two months. However, the replacement of the pipelines to the berths does not currently indicate whether these lines will be buried or lie above the seafloor substrate. Unburied cable or pipelines have the potential to snag fishing gear in the Project area. In 1991, a mooring accident involving the tanker vessel *Omi Dynachem* occurred when a vessel anchor became hooked on a 26-inch (66.0-cm) undersea pipeline, severing it. The incident resulted in a spill of more than 27,000 gallons of oil to the marine environment.

Mitigation Measures

BIO-4. Use Designated Marine Traffic Corridors. Support and tankering vessels shall use designated traffic corridors where possible during the term of the 30-year lease.

Similarly, implementation of measure **MM BIO-3b** would minimize risks to fishing gear from snagging or entanglement.

Rationale for Mitigation

MM BIO-4 would minimize potential disputes over vessel right of way. **MM BIO-3b,** which requires burial of pipelines for the protection of foraging whales, would also minimize potential snagging by fishing gear. With implementation of these measures, the risk to the marine environment and impacts to commercial and recreational fishing would be potentially significant (Class II).

Impact BIO-5: Oil Spill Impacts to Onshore Biological Resources

Accidental discharge of petroleum hydrocarbons into the environment could adversely affect onshore biological resources (Significant, Class I).

Impact Discussion

The proposed Project has the potential for oil spills. The chances of a spill occurring are discussed in Section 4.1, System Safety and Reliability.

Under the various scenarios evaluated in Section 4.1, System Safety and Reliability (and described in detail in Appendix C), shorelines extending from Santa Barbara south to Long Beach, including portions of the Channel Islands, could potentially be impacted by spilled oil. The effects of spilled oil on onshore biological resources would depend on such factors as the physical and chemical properties of the oil, specific environmental conditions at the time of the spill, and the species present.

The loss or injury of Federal or State listed wildlife species and the loss or degradation of upland, wetland, aquatic habitats, or sensitive biological habitat, including stream and river mouth; salt, freshwater, or brackish marsh; coastal lagoons and estuaries; breeding habitat designated as critical for the western snowy plover; or the injury to plants and terrestrial and aquatic wildlife through direct toxicity, smothering, and entrapment, as well as through resultant cleanup efforts, would result in a potentially significant adverse impact that remains significant even after mitigation (Class I).

For any of the sensitive wildlife species, the level of impact would depend on the size and location of the spill, the amount of habitat affected, and the number of individuals and species affected, environmental conditions at the time, containment and cleanup measures taken, and length of time for habitat and species recovery.

Certain types of biological communities would be more severely affected by an oil spill than others. For example, oil spill impacts would be particularly significant if spills were to enter estuaries or wetland habitats (e.g., the Ballona Wetlands and Malibu Creek), or occur along shorelines where critical habitat for sensitive species was designated. Vegetated marshes and coastal estuaries are two of the habitats occurring in the proposed Project area that would be particularly sensitive to an oil spill because much of the biological activity is concentrated near the soil or water surface where oil would be stranded.

Salt marshes and coastal estuaries within the Santa Monica Bay area, as well as the species that utilize them, would suffer significant impacts if contacted by oil from a spill associated with the Marine Terminal. Although an oil spill may consist of a single occurrence, coastal marshes and estuaries can be subjected to repetitive applications of oil due to tidal oscillations and marsh/estuarine circulation. Marsh substrates can retain and concentrate oil through such repetitive contact. This may be intensified by marsh sediment porosity and interstitial absorption. The slow, chronic discharge of buried oil which contains toxic conformations and reaction products that are leached into the surface substrate causes continuous stress on plant regeneration and prevents ecosystem regeneration.

An oil spill would impact vegetation both directly and indirectly. Direct effects include smothering of plants that would reduce the availability of water, nutrients, and oxygen to the plant root system; this would potentially result in reduced growth or death of individual plants. Vegetation recovery would potentially be slow in areas of oiled soils because of lingering toxicity or altered soil characteristics.

Impacts on resident biota could be short- to long-term, depending on the amount of oil spilled, environmental conditions at the time, containment and cleanup measures taken, and length of time for habitat recovery. Direct impacts on wildlife from oil spills include physical contact with the oil, ingestion of oil, and loss of food, critical nesting and foraging habitats. Organisms can be affected physically through smothering, interference with movements, coating of external surfaces with black coloration (leading to increased solar heat gain), and fouling of insulating body coverings (birds and mammals). Toxicity can occur via absorption through the body surface (skin, gills, etc.)

or ingestion. Biological oxidation (through metabolism) can produce products more toxic than the original compounds. Sub-lethal effects include reduced reproductive success, narcosis, interference with movement, and disruption of chemosensory functions.

Spills or disturbances resulting from cleanup efforts within the sandy beach and foredune habitats have the potential to substantially affect a wide variety of wildlife. Aquatic invertebrates and reptiles, amphibians and birds would be the most vulnerable to oil spills. In particular, Santa Monica Bay is a critical feeding area along the Pacific flyway used by up to pne million shorebirds, including sandpipers, plovers, killdeer, oystercatchers, stilts, avocets and willets (Baird 1993). Shorebirds are generally most abundant in winter with 21 species seasonally occurring in the SCB. Most shorebirds feed in shallow waters and flats of bays and estuaries, while some prefer to feed along sandy beaches and rocky shores. Although shorebirds are able to avoid oiling to some extent by retreating from exposed habitat, both bay and open coast feeding habitats will potentially be impacted by an oil spill at the Marine Terminal.

Sensitive species, such as the globose dune beetle, sandy beach tiger beetle, western snowy plover, and least tern would also likely be affected if a spill or cleanup activities were to contact the shoreline near the Marine Terminal. The federally threatened western snowy plover utilizes beaches in the vicinity of the Marine Terminal and adjacent beaches to the west as both wintering and nesting sites. Designated critical habitat for the western snowy plover includes portions of the beach directly adjacent to the Marine Terminal. Effects of an oil spill in this area during the breeding season would potentially increase mortality of nesting plovers, chicks and fledglings, depending on the time of the spill. A spill that contacts the shoreline would also contaminate or increase mortality of invertebrates that are forage material for the plover and other shoreline-dependent species, therefore resulting in indirect impacts on individuals and/or breeding success.

The endangered California least tern currently uses the upper beach at Venice Beach for nesting, and may potentially utilize other nearby beaches, such as Dockweiler in the future. Substantial mortality of wintering shorebirds or loss of essential habitat would likely result from oil spills associated with the proposed Project. Cleanup activities could disturb the tern colony during the nesting season from April to July, as well as displacing overwintering snowy plovers. These impacts would be considered potentially significant and unavoidable (Class I)

Impacts of cleanup could be potentially more substantial than the effect of the spilled oil itself. Spill response and cleanup actions, including, but not limited to, the application of dispersants, pressure washing of intertidal areas, manual removal of oil from beaches and estuaries, could directly result in toxicity or fouling to biota, overland crushing of individual organisms, vegetation removal, and habitat degradation. Clearing or grading could potentially be required to remove and dispose of oiled vegetation and soils, thereby resulting in additional impacts to vegetation and seedbanks as well as loss of forage and nesting habitat. Additionally, soil disturbance would facilitate invasion by weeds. Cleanup activities that result in the removal of vegetation or excavation would require restoration of native habitat after the spill cleanup is complete. The level of impact would depend on the size of the spill, the amount of habitat affected, and the number of individuals and types of species affected.

Mitigation Measures

Chevron currently maintains an Emergency Action Plan that addresses response actions to be completed in the event of a "significant event." In addition, Chevron maintains an Oil Spill Contingency Plan (OSCP) to address spills that could potentially occur from the Marine Terminal and existing pipelines.

Where a spill or cleanup has the potential to result in impacts to sensitive biological resources or the loss of native vegetation, implementing the following measures would reduce impacts to onshore biological resources.

BIO-5. Update the Oil Spill Contingency Plan to Protect Sensitive Resources. The OSCP shall be revised and updated to address protection of sensitive biological resources and revegetation of any areas disturbed during an oil spill from the proposed pipeline or cleanup activities. The OSCP shall be submitted within one year of lease renewal and reports submitted to CSLC annually thereafter. The revised OSCP shall, at a minimum, include:

1. Specific measures to avoid impacts on Federal- and State-listed endangered and threatened species and Environmentally Sensitive Habitat Areas during response and cleanup operations. Where feasible, low-impact, site-specific techniques such as hand-cutting contaminated vegetation and using low-pressure water flushing from vessels to remove spilled material from particularly sensitive wildlife habitats, such as coastal estuaries, i.e., Ballona Wetlands, because

procedures such as shoveling, bulldozing, raking, and drag-lining can cause more damage to a sensitive habitat than the oil spill itself. The OSCP shall also evaluate the non-cleanup option for ecologically vulnerable habitats such as coastal estuaries.

2. Specific measures requiring spill response personnel to be adequately trained for response in terrestrial environments and spill containment and recovery equipment to be maintained in full readiness. Inspection of equipment and periodic drills shall be conducted at least annually and the results evaluated so that spill response personnel are familiar with the equipment and with the Project area including sensitive onshore biological resources.

3. When habitat disturbance cannot be avoided, stipulations for development and implementation of site-specific habitat restoration plans and other site-specific and species-specific measures appropriate for mitigating impacts on local populations of sensitive wildlife species and to restore native plant and animal communities to pre-spill conditions. Access and egress points, staging areas, and material stockpile areas that avoid sensitive habitat areas shall be identified. The OSCP shall include species- and site-specific procedures for collection, transportation and treatment of oiled wildlife, particularly for sensitive species.

4. Procedures for timely re-establishment of vegetation that replicates the habitats disturbed (or, in the case of disturbed habitats dominated by non-native species, replaces them with suitable native species) including: measures preventing invasion and/or spread of invasive or undesired plant species; restoration of wildlife habitat; restoration of native communities and native plant species propagated from local genetic sources including any sensitive plant species (such as the southern tarplant); and replacement of trees at the appropriate rate.

5. Monitoring procedures and success criteria to be satisfied for restoration areas. The success criteria shall consider the level of disturbance and condition of the adjacent habitats. Monitoring shall continue for three to five years, depending on habitat, or until the success criteria are met. Appropriate remedial measures, such as

replanting, erosion control or control of invasive plant species, shall be identified and implemented if it is determined that the success criteria are not being met.

MM BIO-5 would provide greater specificity to the OSCP by: identifying which species would require avoidance; describing how to remove spilled material from particularly sensitive wildlife habitats and affected animals; detailing how to develop and implement habitat restoration plans needed to effectively restore native plant and animal communities to pre-spill conditions; and providing monitoring effectiveness criteria. These measures would help reduce potential oil spill-induced impacts on biological resources including sensitive species and habitats such as the nearby Ballona Wetlands.

Revegetating with native species in areas where vegetation is removed or otherwise impacted by a spill or cleanup activities would potentially reduce significant impacts on native vegetation and wildlife habitats to below the significance criteria (Class II).

Residual Impacts

An oil spill that would potentially result in impacts on populations of Federal- or State-listed wildlife species, such as the western snowy plover and California least tern, cannot be reduced below the significance criteria. Although **MM BIO-5** proposes to reduce impacts on plant communities and common wildlife species, and could reduce impacts on Federal- and State-listed species and other sensitive wildlife species and their habitats, it cannot entirely eliminate the risk of substantial impacts to these and other biological resources. Revegetating with native species in areas where vegetation is removed or otherwise impacted by a spill or cleanup activities would potentially reduce significant impacts on native vegetation and wildlife habitats to below the significance criteria (Class II). However, large spills that result in impacts to designated (or proposed) critical habitat, wetland and aquatic habitats, and biota, including Federal- and State-listed species would remain significant (Class I) even after mitigation.

Table 4.3-12
Summary of Biological Resources Impacts and Mitigation Measures
Proposed Project

Impact	Mitigation Measures
BIO-1: Oil Spill Impacts to Marine Biological Resources	**BIO-1a.** Updating the Oil Spill Contingency Plan to Reflect the Project Changes **BIO-1b**. Vessels That Call on the Terminal Shall Implement Their Own Oil Spill Response Plan **SSR-2.**
BIO-2: Oil Spill Impacts to Commercial and Recreational Fishing	**BIO-1a**, **BIO-1b**, and **SSR-2 through SSR-2K.**
BIO-3: Vessel Traffic and Construction Impacts on Biological Resources	**BIO-3a.** Marine Mammal Contingency Plan **BIO-3b**. Burial of Pipelines
BIO-4: Vessel Traffic and Marine Construction Impacts on Commercial and Recreational Fishing.	**BIO 3b**. Burial of Pipelines **BIO 4.** Use Designated Marine Traffic Corridors
BIO-5: Oil spill Impacts to Onshore Biological Resources	**BIO-5.** Update the OSCP to Protect Sensitive Resources

4.3.8 Impacts of Alternatives

Alternatives to the proposed Project include the No Project Alternative, moving one of the berths farther offshore with a conventional buoy mooring (CBM) or a single point mooring (SPM), or requiring that very large crude carriers (VLCC) unload light crudes at the POLA (Pier 400). The impacts of each of these are discussed below.

No Project Alternative

The No Project Alternative would involve not renewing the Marine Terminal lease, which would cause the Marine Terminal to cease operation; no crude oils or products would be allowed through the Marine Terminal. Under this alternative, the Marine Terminal would no longer be operational and would eventually be decommissioned.

This alternative would eliminate the potential impact of possible oil spills at the Marine Terminal and surrounding area; however, the demand for crude oil by the Chevron El Segundo Refinery and the demand for refined product by end users would remain and would probably result in an increase in importation of crude oil and refined products

through the POLA or POLB and to the Refinery via pipeline, truck, and rail transport. Therefore, oil spill impacts to marine resources (**BIO-1**) would remain.

Several species of concern utilize habitat within the POLA and POLB. An example is the California least tern, a federal and state endangered species, which nests and feeds near Pier 400 in the POLA. In fact, with the exception of Venice Beach, the POLA harbors the only permanent California least tern nesting site in Los Angeles County. Nevertheless, adherence to shipboard, operational and Port required practices to reduce and contain spills, including booming of tankers while in port are already compulsory. In addition, response times to a spill in the Ports would be notably reduced compared to spills in Santa Monica Bay or in offshore waters. While the possibility of oil spills that impact biologically sensitive areas, including California least tern nesting and foraging areas, cannot be completely eliminated, the potential for significant impacts with vessel visits to the Ports is reduced over the proposed Project by adherence to Port preventative and proactive protective requirements.

Impacts **BIO-1** through **BIO-5** would remain significant; however, but they would be less severe than those under the proposed Project. **MM BIO-1b, BIO-3a, BIO-4** would still apply.

MM BIO-1a, BIO-3b, BIO-5 would no longer apply.

Impacts to marine biological resources from vessel traffic in transit to or from the Ports (Impacts **BIO-1** through **BIO-5**) would be the same as for the proposed Project. Spills from vessels approaching the POLA could have a greater impact on shoreline areas south of those potentially impacted by vessels visiting the Marine Terminal, depending on the spill location and subsequent transport. As a result, consequential impacts to kelp beds along the southern side of the Palos Verdes Peninsula could be more severe in the POLA alternative, but kelp beds located within Santa Monica Bay, such as those located along the Bay's northern reaches and along the north side of the Palos Verdes Peninsula are less likely to be impacted compared to the Project. Therefore, the increased use of the POLA under this alternative would only serve to change the geographic location of the sensitive receptors that may be impacted by the spill (see Figures 4.2-22 and 4.3-2).

Abandonment of the Marine Terminal would eliminate the adverse, but less than significant impacts to marine life from decreased water quality due to leaks, spills, and routine discharges associated with continued operation of the Marine Terminal. During pipeline removal, there would be a small risk of a spill that could be minimized by

adherence to a plan addressing spill prevention and response. If the entire Marine Terminal were removed, there would be an adverse, but less than significant impact on marine resources from short-term increases in turbidity associated with the removal process.

CBM Relocation in State Waters for Crude Only

Under the CBM Relocation Alternative, Chevron would relocate the CBM and navigational moorings to deeper waters further offshore. Relocation of the existing CBM would involve moving the existing buoys in deeper water, extending the existing pipelines that serve Berth 4, and replacing and modifying equipment associated with certain onshore Marine Terminal pumping facilities.

Impacts to marine and onshore biological resources would occur as a result of construction activities related to pipe installation and construction of onshore facilities for both these alternatives. Implementation of best management practices (BMP) during construction could reduce water impacts to a less than significant level while impacts to marine biological communities in the area of the pipeline extension are expected to be adverse in the short term but not significant.

Construction activities related to pipe installation and construction of onshore facilities would potentially result in localized and temporary reductions in water quality and soft-bottom habitat, including reduced photosynthetic potential as a result of increased turbidity. Likewise, suspension of contaminated sediments during construction could impact local plankton and infaunal populations. Following pipeline installation and sediment back-filling benthos and plankton populations are expected to reestablish in a relatively short time. Impacts would be temporary, and the ability of plankton and infauna to rapidly reoccupy and reproduce in combination with the implementation of BMP during construction will reduce long-term impacts to a less than significant level.

Similarly, water quality, and a potential for short-term avoidance of the area due to noise during construction could impact marine species. Implementation of BMP during construction will reduce water quality impacts to a less than significant level. Noise impacts may cause fish and shellfish avoidance of the area, resulting in a slight reduction in habitat available to fish and shellfish species during construction. Impacts to fish and shellfish communities in the area of the pipeline extension during construction are expected to adverse, but limited in extent and duration and not significant.

Placement of the berth 4 farther offshore would potentially increase impacts to biological resources located on the Channel Islands and reduce impacts to the mainland. In addition, the reduction in spill risks due to the reduction in vessel traffic to the Marine Terminal due to the elimination of Marine Terminal related lightering would reduce the severity of the impacts **BIO-1** through **BIO-5** from the proposed Project. However, impacts **BIO-1** through **BIO-5** would remain significant and all mitigation measures would apply.

SPM Replacement in State Waters for Crude Only

Similarly, under the Single Point Mooring Replacement Alternative, Chevron would establish an SPM system further offshore while continuing to operate the El Segundo Marine Terminal. The existing CBM Berth 4 would be decommissioned after operations were transferred to the new SPM. The existing CBM Berth 3 would continue to operate.

Impacts associated with this alternative would be similar to the CBM alternative discussed above. Placement of Berth 4 farther offshore would potentially increase impacts to biological resources located on the Channel Islands and reduce impacts to the mainland. However, impacts would remain significant. Impacts **BIO-1** through **BIO-5** would remain significant and all mitigation measures would apply.

VLCC Use of Pier 400

Under this alternative, Pier 400 would be utilized for the receiving of light crude oils in VLCC tankers. This would reduce the vessel traffic to the Marine Terminal. In addition, the use of VLCC offloading at the Pier 400 would reduce the vessel traffic in the area due to the elimination of Marine Terminal/El Segundo Refinery-related lightering.

Adherence to POLA required practices to reduce and contain spills, including booming of tankers while in port are already compulsory. In addition, response times to a spill in the Port would be notably reduced compared to spills in Santa Monica Bay or in offshore waters. While the possibility of oil spills that impact biologically sensitive areas cannot be completely eliminated for the VLCCs that visit Pier 400, the potential for significant impacts with vessel visits to Pier 400 is reduced over the proposed Project by adherence to Port preventative and proactive protective requirements. In addition, vessel visits would continue to the Marine Terminal. Impacts **BIO-1** through **BIO-5** would remain significant; however, they would be less severe than those under the proposed Project. **MM BIO-1b, BIO-3a, BIO-4** would still apply.

MM BIO-1a, BIO-3b, BIO-5 would still apply to vessels that visit the Marine Terminal.

Impacts to marine biological resources from vessel traffic in transit to or from the Marine Terminal or the Pier 400 (Impacts **BIO-1** through **BIO-5**) would be the same as for the proposed Project. Spills from vessels approaching the POLA could have a greater impact on shoreline areas south of those potentially impacted by vessels visiting the Marine Terminal, depending on the spill location and subsequent transport. As a result, consequential impacts to kelp beds along the southern side of the Palos Verdes Peninsula could be more severe in the POLA alternative, but kelp beds located within Santa Monica Bay, such as those located along the Bay's northern reaches and along the north side of the Palos Verdes Peninsula are less likely to be impacted compared to the Project. Therefore, the increased use of the POLA under this alternative would only serve to change the geographic location of the sensitive receptors that may be impacted by the spill (see Figures 4.2-22 and 4.3-2).

4.3.9 Cumulative Projects Impact Analysis

The cumulative geographic context for the evaluation of impacts on biological resources is regional coastal development, particularly within the Santa Monica Bay. Several of the projects included in the Cumulative Projects Impact Analysis would potentially benefit water quality and, therefore, biological resources in the Project area. These include:

- City of Los Angeles Hyperion projects, including both sewer outfall and sewer system upgrades;
- Santa Monica Bay Restoration Plan;
- Marina del Rey and Ballona Creek Sediment Control Management Plan; and
- Ballona Wetlands Restoration.

Conversely, other projects considered in the Cumulative Project Impact Analysis could potentially result in degradations to water quality and biological resources, either through small-scale releases of contaminants or large-scale spills. Projects that include the operation of offshore transport/storage vessels, such as the POLA Pacific Energy Crude Oil Marine Terminal and Pipelines Project (Pier 400), may also slightly increase the likelihood of collisions with marine mammals.

As discussed in Section 2.0, Project Description, and Section 4.1, System Safety and Reliability, the projected increase in traffic at the Marine Terminal through 2040, would be within the normal range of traffic variation associated with the POLA/POLB over the

last 10 years. Therefore, no cumulative impacts are expected. Furthermore, since no other marine terminals exist near the Marine Terminal in Santa Monica Bay, no cumulative impacts would occur from congestion of combined vessel traffic to and from the Marine Terminal and other terminals. Thus, cumulative impacts to biology are not considered to be significant.

The Pier 400 project is estimated to generate as much as 201 vessel calls per year by 2025 (POLA 2008). This would total an increase in vessel traffic at the POLA/POLB (note this does not account for the potential reduction in vessel traffic due to the use of large, VLCC tankers by the Pier 400 project). This would cumulatively contribute to biological impacts on resources that would experienced significant impacts from the renewal of the lease term and the potential increases in vessel traffic to/from the Marine Terminal. Although the combined increase in vessel traffic from the potential increases at the Marine Terminal over the lease term and the Pier 400 project would be within the range of historical vessel traffic at the POLA/POLB, it would still be considered cumulatively significant.