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Southwest Region
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9/18/06

Mr. Pao-Tsin Kuo
Program Director
License Renewal and Environmental Impacts
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Kuo:

This letter transmits NOAA's National Marine Fisheries Service (NMFS) biological opinion based on our review of the effects of the Nuclear Regulatory Commission's (NRC) continued operation of the Diablo Canyon Power Plant (DCPP) and the San Onofre Nuclear Generating Station (SONGS) on federally listed green sea turtles (*Chelonia mydas*), leatherback sea turtles (*Dermochelys coriacea*), loggerhead sea turtles (*Caretta caretta*), and olive ridley sea turtles (*Lepidochelys olivacea*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). NMFS entered into formal consultation with the NRC on July 20, 2005.

This biological opinion is based on information provided in the Biological Assessment submitted by the NRC for the DCPP on May 10, 2005 and another on May 20, 2005, for SONGS. A complete administrative record of this consultation is on file at the NMFS Southwest Regional Office in Long Beach, CA.

Based on the best available scientific and commercial information, the biological opinion concludes that this project is not likely to jeopardize the species listed above. NMFS has also included an incidental take statement with reasonable and prudent measures and non-discretionary terms and conditions that are necessary and appropriate to minimize incidental take associated with the continued operation of the DCPP and SONGS.

If you have any questions regarding this correspondence please contact Jessica Kondel of my staff at (562) 980-3230 or at Jessica.Kondel@noaa.gov.

Sincerely,

Russell M Strach

for Rodney R. McInnis
Regional Administrator

SUNSI review completed

ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

Agency: Nuclear Regulatory Commission

Activity: Formal Consultation on the Continued Operation of the Diablo Canyon Nuclear Power Plant and San Onofre Nuclear Generating Station

Conducted by: NOAA's National Marine Fisheries Service, Southwest Regional Office

Date Issued: September 18, 2006

Approved by: Rodney M McInnis

I. INTRODUCTION

This constitutes NOAA's National Marine Fisheries Service's (NMFS) biological opinion (Opinion) on the effects of the Nuclear Regulatory Commission's (NRC) continued operation of the Diablo Canyon Power Plant (DCPP) and the San Onofre Nuclear Generating Station (SONGS) on threatened and endangered species in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended.

This Opinion is based on information provided in the May 10, 2005, Biological Assessment (BA) for the DCPP and the May 20, 2005, BA for SONGS. Additional information was provided through correspondence with Ms. Harriet Nash, NRC, and other sources of information. A complete administrative record of this consultation will be kept on file at the NMFS Southwest Regional Office, Long Beach, California.

II. CONSULTATION HISTORY

On September 14, 2000, NMFS conducted a meeting with coastal power plant representatives to discuss the incidental entrainment of marine mammals and sea turtles during plant operations. The NRC reviewed the status of issues regarding the ESA related to the operation of the cooling water system (CWS) for two nuclear plants, DCPP and SONGS, under its jurisdiction. On November 12, 2003, staff from the NRC met informally with NMFS staff to discuss issues related to ESA and the operation of the two plants. NMFS staff also conducted a site visit of the SONGS facility on November 13, 2003. The NRC formally requested a list of threatened or endangered species that could be present at the DCPP and SONGS sites on February 4, 2004. NMFS provided a response to this request on March 18, 2004. After review, the NRC submitted a BA for the DCPP on May 10, 2005 and another on May 20, 2005, for the SONGS and requested formal consultation. By July 20, 2005, NMFS reviewed the two BA's and found them to be sufficient for the purpose of initiating formal consultation. On December 1, 2005, NMFS requested an extension of time to complete the formal consultation process. The NRC agreed to this extension in a letter dated December 21, 2005. On March 21, 2006, NMFS again requested an extension of time to complete the formal consultation and Opinion for the DCPP and SONGS. The extension was granted on May 18, 2006.

III. DESCRIPTION OF THE PROPOSED ACTION

The NRC is responsible for licensing nuclear power plants in the United States including DCPP and SONGS. Because the NRC licenses these plants to operate, it is their responsibility under section 7 (a)(2) of the ESA to request consultation on the take of listed species during the operation of DCPP and SONGS. The proposed activity is the continued operation of the DCPP and SONGS until the end of their current operating licenses as described below in detail.

A. Diablo Canyon Power Plant (DCPP)

The DCPP is owned and operated by Pacific Gas and Electric (PG&E) and is a two-unit, nuclear-powered, steam-turbine power plant with a rated output of approximately 2,200 megawatts of electricity. Commercial operation of Unit 1 began in May 1985, and Unit 2 in March 1986. Operation is expected to continue until at least 2026, when the current operating license will expire. PG&E has the option of applying for a license renewal that could extend the operation of the plant for an additional 20 years. This consultation will cover the plant until the expiration of its existing operating license in 2026. DCPP is located on a coastal terrace along Diablo Cove, midway between the communities of Morro Bay and Avila Beach, in San Luis Obispo County.

DCPP has one intake cove which houses a common intake structure which provides cooling water to both Units for the cooling of the main condensers and other machinery necessary for operation of the plant. The intake for the DCPP is a shoreline structure that houses bar racks, vertical traveling screens, auxiliary CWSs, and main circulating water pumps. On the ocean side of the intake structure, a concrete curtain wall extends approximately 2.4 meters (m) below mean sea level to prevent floating debris from entering the intake structure. As sea water enters the intake structure, it passes through one of 16 sets of bar racks designed to exclude large debris from the forebays. The bar racks consist of vertical, inclined rows of steel bars spaced about 8 centimeters (cm) apart. The underwater portion of the bar rack is approximately 10 m high depending on the tide. The overall intake opening is approximately 10 m high by 52.6 m wide. Due to the large surface area of the intake opening, the flow velocity of sea water is relatively low at 0.3 m/s (or 0.5 knots). Sets of traveling screens with 0.95 cm stainless steel mesh screens are located behind the bar racks to remove smaller debris.

DCPP normally operates at full power unless shut down for scheduled maintenance or refueling, or for an unscheduled forced outage. During maintenance outages the circulating water pumps may be turned off for periods up to one month; however, usually one unit remains operational during these maintenance periods. During normal operations, four circulating water pumps (two for each unit), provide an average of 1,613 cubic meters per minute (m^3/min), for a total of 6,450 m^3/min of ocean cooling water.

The cooling water is returned to the ocean via stair-step weir structure that opens on the eastern end of Diablo Cove. At the discharge the water is usually 10 to 11°C warmer than the intake water. The maximum temperature rise allowed under the DCPP's National Pollutant Discharge Elimination System (NPDES) permit is 12°C.

To help control biofouling of the CWS, a combination of sodium hypochlorite and sodium bromide is injected into the water downstream of the traveling screens via a chlorine injection system. The chemicals are injected six times daily for 20 minutes per injection. The total residual oxidant (TRO) concentration in the discharge stream is usually between 20 and 60 parts per billion (ppb), which is below the permitted level of 200 ppb allowed under the NPDES permit. Heat treatments are not used at DCPP.

During the licensing of the DCPP in the 1970's, the design and environmental impact potential of the plant, including its CWS, were reviewed by the NRC, Environmental Protection Agency, and the Central Coast Regional Water Quality Control Board (Regional Board). The plant operates under a Clean Water Act National Pollution Discharge Elimination System (NPDES) permit (Permit # CA0003751) issued by the Regional Board (NRC 2005).

B. San Onofre Generating Station (SONGS)

The SONGS is operated by Southern California Edison (SCE). The owners of the plant include SCE, San Diego Gas & Electric Company and the cities of Anaheim and Riverside. SONGS Unit 1 began operation in 1964, was taken off-line in 1992, and it currently being decommissioned. Because Unit 1 has been out of operational since 1992, it will not be included in this consultation. Units 2 and 3 began commercial operation in 1983 and 1984 respectively. Both Units are expected to operate until 2022 when the current SONGS operating licenses expire. SCE does have the option of applying for a license renewal that, if approved, would extend the operating license for an additional 20 years. This consultation will cover the plant until the expiration of its existing operating license in 2022. SONGS Units 2 and 3 are located near the California coastal town of San Clemente, approximately 72 kilometers (km) north of San Diego and 97 km south of Los Angeles. Together these units generate approximately 2,150 megawatts of electric nuclear power.

Ocean cooling water is drawn into two offshore intake structures, which are located approximately 980 m offshore from the plant. The intake structures are 200 m apart and are located in water approximately 10 m deep. Each of the intake structures have velocity caps which allow for large volumes of ocean water to be drawn through the structure at relatively low speeds (about 0.5 m/s). The intake velocity caps are 15 m in diameter with a 2 m tall horizontal opening. The bottoms of the caps are 3 m above the ocean floor and the top of the caps are 3.7 m below the ocean's surface. The velocity caps draw ocean water inward in a horizontal direction and then redirect the flow downward through the intake tunnel. Once in the tunnel it takes 7.9 minutes for the water to reach the plant with a flow velocity of 2.2 m/s. The intake structures terminate at the plant into an open air forebay. If a marine mammal or sea turtle becomes entrained in the intake it would be discovered during one of the daily inspections and removed from the forebay. The forebay are also contains traveling screens which remove debris before the water enters the pump suction. The SONGS CWS is unique because it also includes a fish return system (FRS). The FRS is designed to return entrained fish and other organisms back to offshore waters in viable condition. The FRS system works by guiding fish and other marine life to a fish return elevator. The elevator lifts the organisms in a water filled bucket out of the water and empties them into a concrete conduit to be carried back to the ocean. While marine mammals and sea turtles are not returned to the ocean via the FRS, they are removed from the forebay via the fish elevator.

SONGS normally operates at full power unless shut down for scheduled maintenance or refueling, or for an unscheduled forced outage. SONG's maintenance and refueling outages occur approximately every 18 months and last anywhere from 40 to 120 days. Even during shutdowns, some systems may still operate, which still requires some operation of the CWS. During normal power operations, the CWS for Units 2 and 3 each provide approximately 3,142 m^3/min of ocean cooling water to the station.

The cooling water is discharged into the ocean via 5.5 m diameter pipes with 0.6 m diameter diffuser vents spaced at 12 m intervals over the last 760 m of each pipe. The pipe for Unit 2 is approximately 2,620 m long and the discharge pipe for Unit 3 approximately 1,860 m long. The normal temperature rise of the water after passing through the condenser is about 11°C, which is below the allowable level of 14°C under the facility's NPDES permit. Typically, the monthly average increase in surface water temperature is less than 2°C beyond 300 m of the discharge pipe.

To control biofouling of the CWS, SONGS uses heat treatments and chlorine injections. Heat treatments are performed every six weeks in the summer and every nine weeks during the winter. Water is slowly heated to a maximum temperature of 52°C and pumped throughout the CWS. The plant's NPDES permit provides for an exemption of the maximum water temperature discharged by the plant. Typically, the temperatures exceed 14°C for an hour with each heat treatment. In addition to heat treatments, fouling organism growth is controlled by chlorination using sodium hypochlorite. The chlorination injection point is located just downstream of the traveling screens. Injections occur four times a day for 25 minutes each time. The NPDES permit limits the residual chlorine levels to 22 micrograms per liter (μg/l) for a six-month median, 88 μg/l maximum daily average, and 200 μg/l maximum instantaneous reading. There have been no studies on the total residual chlorine levels in the discharge plume from the plant.

The design and environmental impact of SONGS, including its CWS, were reviewed by the NRC during licensing in the 1960's. Subsequent reviews conducted by the EPA and San Diego Regional Water Quality Board determined that the SONGS discharge was in compliance with its requirements under the Clean Water Act NPDES permits (Permit #'s CA0108073 and CA1018181).

C. Action Area

The direct and indirect effects of the DCPP and SONGS are associated with the plants themselves, along with the intake and discharge of water through the CWS. Therefore, the action area for this consultation includes the DCPP and SONGS facilities, the intake and discharge structures of the DCPP and SONGS CWS and the region where the discharge of warmed and chlorinated water extends. For the DCPP the plume of heated and treated water extends out to approximately 300 m out from the discharge structure. Studies at the SONGS has shown that the temperature 300 m from the discharge structure is only changed about one degree from the discharge. Because of the offshore location of the discharge structure, the water is subject to ocean currents which dissipate the discharged water fairly quickly.

IV. STATUS OF SPECIES AND CRITICAL HABITAT

No critical habitat has been designated for any species under NMFS' jurisdiction in the action area; therefore, no critical habitat will be affected by the proposed action.

Table 1. Listing of all threatened and endangered species under NMFS jurisdiction that may occur in the action area.

Common Name	Species	Status
Green turtle	*Chelonia mydas*	Endangered (Mexican nesting populations) Threatened (all other populations)
Leatherback turtle	*Dermochelys coriacea*	Endangered
Loggerhead turtle	*Caretta caretta*	Threatened
Olive Ridley turtle	*Lepidochelys olivacea*	Endangered (Mexican nesting populations) Threatened (all other populations
Blue whale	*Balaenoptera musculus*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
Humpback whale	*Megaptera novaeangliae*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Guadalupe fur seal	*Arctocephalus townsendi*	Threatened
Steller sea lion	*Eumetopias jubatus*	Threatened
White Abalone	*Haliotis sorenseni*	Endangered
Steelhead (Southern CA DPS and South Central CA Coast DPS)	*Oncorhynchus mykiss*	Endangered
Green sturgeon (Southern DPS)	*Acipenser medirostris*	Threatened

A. Species Not Likely to be Affected by the Proposed Action

A list of species likely to occur in the action area can be found in Table 1. Several of the species including all of the whale species, Guadalupe fur seal, steller sea lion, white abalone, and steelhead may be found in the action area for limited amounts of time, but in NMFS opinion are not likely to be adversely affected by the proposed action. Green sturgeon, like all sturgeon species, are anadromous, but also the most marine oriented of the sturgeon species. They are known to range in nearshore marine waters from Mexico to the Bering Sea, although their abundance gradually increases north of Point Conception (Moyle *et al.* 1992). Additionally, observer records show two green sturgeon have been caught in the set net fishery in waters offshore of San Pedro and Santa Barbara, California. The DCPP and SONGS facilities have not been known to have entrained any of these species. While many of these species are migratory in nature, their time spent in the area is likely to be limited. The movement of white abalone, on the other hand, is limited. There have not been any current reports of white abalone found within the action area, however historical data from the white abalone fishery show a small percentage of landings of white abalone harvested in shallow waters from Palos Verdes south to the Mexican border (Hobday and Tenger 2000). This would encompass the area around the SONGS CWS. Intense fishing pressure has lead to alarming declines of white abalone, although extremely low numbers of isolated survivors have been identified along the southern California coast and at some of the offshore islands.

The action area extends out from the discharge structures of the DCPP and SONGS to include the areas where the plume of warmed and chlorinated water extends. It is unlikely that the discharge of warmed and chlorinated water into the action area has affected any of these species because of their limited time in the action area. The action area also does not include any areas known to be major breeding or foraging areas for these species. Therefore, it is not likely that the plume of discharged water has any effect on the habitat or foraging activities of these species.

B. Species Likely to be Affected by the Proposed Action

Table 1 shows a list of all the threatened and endangered species under NMFS jurisdiction likely to occur in the action area. Species from Table 1 which are likely to occur in the action area and may be adversely affected by the proposed action area include green turtles, loggerhead turtles, leatherback turtles, and olive ridley turtles.

All listed sea turtle populations affected by the proposed action have been impacted by human-induced factors such as commercial fisheries, direct harvest of turtles and eggs, and modification or degradation of the turtle's terrestrial and marine habitats. Nesting beach habitat impacts have resulted in the loss of eggs and hatchlings as well as the deterrence of nesting females, resulting in decreased nesting success. In the marine environment, a significant anthropogenic impact is the incidental capture and mortality of subadult and adult sea turtles in various commercial fisheries. Generally, mortality resulting from the effects of marine pollution is important but less significant (NOAA Fisheries and USFWS 1998a-e). Increased mortality from these anthropogenic sources at the egg and early life history stages has impacted the species' ability to maintain or increase their numbers by limiting the number of individuals that survive to sexual maturity. In addition, the human-induced mortality of adult females results in the loss of their future reproductive output. The age at sexual maturity of loggerheads may be as high as 35 years, while green turtles may not reach maturity until 30-60 years (*in* Crouse 1999). Upon reaching maturity, female sea turtles generally lay between 100-130 eggs per clutch, minimally 2-3 clutches per year, every 2-4 years. Thus, in general, a female sea turtle will lay between 200-390 eggs per season over an average of 2-4 years.

The potential for an egg to develop into a hatchling, into a juvenile, and finally into a sexually mature adult sea turtle varies among species and populations, as well as the degree of threats faced during each life stage. Females killed prior to their first successful nesting will have contributed nothing to the overall maintenance or improvement of the species' status. Anthropogenic mortality and natural mortality of females (or males, for that matter) prior to the end of their reproductive life results in a serious loss of reproductive potential to the population.

While quantitative data do not yet exist to provide a precise understanding of the effects of the loss of reproductive potential, the status and trends of the turtles themselves are the best evidence that sea turtle populations cannot withstand current mortality rates. In the face of current levels of mortality and extent of habitat degradation, nesting aggregations of green, leatherback, olive ridley and loggerhead turtles have declined to levels that place them at a very high risk of extinction within the foreseeable future.

1. Green Turtles (*Chelonia mydas*)

Green turtles are found throughout the world, occurring primarily in tropical, and to a lesser extent, subtropical waters. They are globally listed as threatened under the ESA, except for breeding populations found in Florida and the Pacific coast of Mexico, which are listed as endangered. Using a precautionary approach, Seminoff (2002) estimates that the global green turtle population has declined by 34% to 58% over the last three generations (approximately 150 years) although actual declines may be closer to 70% to 80%. Causes for this decline include harvest of eggs, subadults and adults, incidental capture by fisheries, loss of habitat, and disease.

The genus *Chelonia* is composed of two taxonomic units at the subspecies/subspecific level: the east Pacific green turtle (also known as the "black turtle," *C. mydas agassizii*), which ranges (including nesting) from Baja California south to Peru and west to the Galapagos Islands, and the nominate *C. m. mydas* in the rest of the range (insular Pacific, including Hawaii).

Green turtles appear to prefer waters that usually remain around 20°C in the coldest month. During warm spells (e.g., El Niño), green turtles may be found considerably north of their normal distribution. Stinson (1984) found green turtles to appear most frequently in U.S. coastal waters with temperatures exceeding 18°C. Green turtles foraging in San Diego Bay and along the Pacific coast of Baja California originate primarily from rookeries of the Islas Revillagigedos (Dutton 2003).

Although most green turtles appear to have a nearly exclusive herbivorous diet, consisting primarily of sea grass and algae (Wetherall *et al.* 1993), those along some areas of the eastern Pacific coast seem to have a more carnivorous diet. The maximum recorded dive depth for an adult green turtle was 110 meters (Berkson 1967, *in* Lutcavage and Lutz, 1997), while subadults routinely dive 20 meters for 9-23 minutes, with a maximum recorded dive of 66 minutes (Brill *et al.* 1995, *in* Lutcavage and Lutz 1997).

The northernmost reported resident population of green turtles occurs in San Diego Bay, where about 50-60 mature and immature turtles concentrate in the warm water effluent discharged by a power plant (McDonald, *et al.* 1994). These turtles appear to have originated from east Pacific nesting beaches and the Revillagigedo Islands (west of Baja California), based on morphology, genetic analyses, and tagging data (*in* NMFS and USFWS, 1998a; P. Dutton, NMFS, personal communication March 2002). Because turtles in San Diego Bay have been found to have a haplotype common to both Hawaiian and Mexican nesting beaches, the possibility exists that some are from Hawaii (P. Dutton, NMFS, personal communication January 2001; R. Leroux, NMFS, personal communication August 2006).

a. *Central Pacific – Hawaii*

Green turtles in Hawaii are considered genetically distinct and geographically isolated although a nesting population at Islas Revillagigedos in Mexico appears to share the mtDNA haplotype that commonly occurs in Hawaii. In Hawaii, green turtles nest on six small sand islands at French Frigate Shoals, a crescent-shaped atoll situated in the middle of the Hawaiian Archipelago (Northwestern Hawaiian Islands) (Balazs 1995). Researchers have monitored East Island since 1973 and have collected information on numbers of females nesting annually, and have ~~conducted tagging studies (Balazs 2002). Since the establishment of the ESA in 1973, and~~ following years of exploitation, the nesting population of Hawaiian green turtles has shown a gradual but definite increase (Balazs 1996; Balazs and Chaloupka in press). In three decades the number of nesting females at East Island increased from 67 nesting females in 1973 to 467 nesting females in 2002.

Important resident areas of green turtles have been identified and are being monitored along the coastlines of Oahu, Molokai, Maui, Lanai, Hawaii, and at nesting areas in the reefs surrounding the French Frigate Shoals, Lisianski Island, and Pearl and Hermes Reef (Balazs 1982; Balazs *et al.* 1987). Unfortunately, the green turtle population in the Hawaiian Islands area is afflicted with a tumor disease, fibropapilloma, which is of an unknown etiology and often fatal, as well as spirochidiasis, both of which are the major causes of stranding of this species (G. Balazs, NMFS, personal communication 2000).

b. Mexico

In the Mexican Pacific, the two main nesting beaches for female green turtles occur in Michoacán and include Colola, which is responsible for 70% of total green turtle nesting in Michoacán (Delgado and Alverado 1999), and Maruata. These nesting beaches have showed a dramatic decline, particularly in the early 1980s (Eckert 1993).

Since their decline in the 1980s from about 5,500 nesting females per year, the number of nesting females arriving at Colola Beach in Mexico has fluctuated widely between lows of 171 and highs of 880, until recently when about 2,100 female turtles returned to nest in 2001. Although the increases in nesting females in 2000 and 2001 provide cause for optimism, historical numbers of this species nesting during the 1960s show that the population is still below its natural level (Alvarado-Diaz and Trejo 2003).

c. Ecuador

There are few historical records of abundance of green turtles from the Galapagos. Investigators documented nesting females during the period 1976-1982 and recorded an annual average of 1,400 nesting females. After nearly twenty years of limited data, a field study commenced in 2002 to assess the status of green turtles nesting in the main nesting sites of the Galapagos Archipelago. The most important nesting beaches are protected as either national parks, tourist sites, or are under military jurisdiction. During the season, a total of 2,756 females were tagged, with the highest numbers in Las Bachas (925 females). This total outnumbers the highest values recorded in previous studies (1,961 females tagged in 1982). Researchers observed few feral pigs and they were only observed in Qunita Playa. There were few documented beetle observations, although feral cats were observed predating on hatchlings as they emerged from the nest (Zàrate *et al.* 2003). Researchers monitored four beaches during the 2004-2005 nesting season. During the second half of the season (Feb. 16-April 16, 2005), 267 females were documented as marked (Quinta Playa: 105; Bahía Barahona: 96; Las Salinas: 23; and Las Bachas: 43) (Zárate 2005).

d. Costa Rica

Green turtles also nest sporadically on the south Pacific coast of Costa Rica, and have been monitored in Caña Blanca and Punta Banco. The total number of nests recorded in Caña Blanca from 1998-2001 ranged from 47 to 106 annually, while the total nests recorded in Punta Banco from 1996 to 2001 ranged from 73 to 233 nests (Lopez and Arauz 2003). At Playa Naranjo, the population of nesting green turtles was estimated to be between 125 and 175 (Cornelius 1976 *in* NMFS and USFWS 1998a).

2. Leatherback Turtles (*Dermochelys coriacea*)

The leatherback turtle is listed as endangered under the ESA throughout its global range. Spotila *et al.* (1996) estimated the *global* population of female leatherback turtles to be only 34,500 (confidence limits: 26,200 to 42,900) nesting females; however, the eastern Pacific population has continued to decline since that estimate, leading some researchers to conclude that the leatherback is now on the verge of extinction in the Pacific Ocean (e.g. Spotila, *et al.* 1996; Spotila, *et al.* 2000).

Leatherback turtles are the largest of the marine turtles, with a curved carapace length often exceeding 150 cm and front flippers that are proportionately larger than in other sea turtles and may span 270 cm in an adult (NMFS and USFWS 1998b). These large turtles have the most extensive range of any living reptile and have been reported circumglobally from 71°N to 47°S latitude in the pelagic Pacific and in all other major pelagic ocean habitats (NMFS and USFWS 1998b). They lead a completely pelagic existence, foraging widely in temperate waters except during the nesting season, when gravid females return to tropical beaches to lay eggs. Leatherbacks are also highly migratory, exploiting convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters (Morreale *et al.* 1994; Eckert 1998; Eckert 1999a).

Satellite telemetry studies indicate that adult leatherback turtles follow bathymetric contours over their long pelagic migrations and typically feed on cnidarians (jellyfish and siphonophores) and tunicates (pyrosomas and salps), and their commensals, parasites and prey (NMFS and USFWS 1998b). The maximum dive depths for post-nesting female leatherbacks in the Carribean have been recorded at 475 meters and over 1,000 meters, with routine dives recorded at between 50 and 84 meters. The maximum dive length recorded for such female leatherback turtles was 37.4 minutes, while routine dives ranged from 4-14.5 minutes (*in* Lutcavage and Lutz 1997). Migrating leatherback turtles also spend a majority of time at sea submerged, and they display a pattern of continual diving (Standora *et al.* 1984, *in* Southwood *et al.*, 1999).

Using a small sample size of leatherback sclerotic ossicles, analysis by Zug and Parham (1996) suggested that mean age at sexual maturity for leatherback turtles is around 13 to 14 years, giving them the highest juvenile growth rate of all sea turtle species. On the Pacific coast of Mexico, female leatherback turtles lay an average of 4 clutches per season, with clutch size averaging 64 yolked eggs per clutch (García and Sarti 2000). Each clutch is laid within a 9.3 day interval (García and Sarti 2000). Clutch sizes in Terengganu, Malaysia, and in Pacific Australia were larger, averaging around 85-95 yolked eggs and 83 yolked eggs, respectively (*in* Eckert 1993). Females are believed to migrate long distances between foraging and breeding grounds, at intervals of typically two or four years (García and Sarti 2000).

Migratory routes of leatherback turtles originating from eastern and western Pacific nesting beaches are not entirely known. However, satellite tracking of post-nesting females and foraging males and females, as well as genetic analyses of leatherback turtles caught in U.S. Pacific fisheries or stranded on the west coast of the U.S. present some strong insight into at least a portion of their routes and the importance of particular foraging areas. Aerial surveys conducted during the late summer and fall months of 1990-2001 reveal that leatherbacks forage off central California, generally at the end of the summer, when upwelling relaxes and sea surface temperatures increase. Leatherbacks were most often spotted off Point Reyes, south of Point Arena, in the Gulf of the Farallones, and in Monterey Bay. These areas are upwelling "shadows," regions where larval fish, crabs, and jellyfish are retained in the upper water column during relaxation of upwelling. Researchers estimated an average of 170 leatherbacks (95% CI = 130-222) were present between the coast and roughly the 50 fathom isobath off California. Abundance over the study period was variable between years, ranging from an estimated 20 leatherbacks (1995) to 366 leatherbacks (1990) (Benson *et al.* 2003).

In the last five years, researchers have discovered two important migratory corridors of leatherback turtles originating from western Pacific nesting beaches. Initially, genetic analyses of stranded leatherbacks found along the western U.S. mainland determined that the turtles had originated from western Pacific nesting beaches. Furthermore, genetic analysis of samples from leatherback turtles taken off California and Oregon by the CA/OR drift gillnet fishery and in the northern Pacific, taken by the California-based longline fishery, revealed that all originated from western Pacific nesting beaches (i.e. Indonesia/Solomon Islands/Malaysia; P. Dutton, NMFS, personal communication December 2003).

Observations of tracked leatherbacks captured and tagged off the west coast of the United States have revealed an important migratory corridor from central California, to south of the Hawaiian Islands, leading to western Pacific nesting beaches. Researchers have also begun to track female leatherbacks tagged on western Pacific nesting beaches, both from Jamursba-Medi and War-mon, in Papua, Indonesia, and from the Morobe coast of Papua New Guinea. Most of the females that have been tagged in Jamursba-Medi, Papua, which primarily nest during the late spring and summer, have been tracked heading on an easterly pathway, towards the western U.S. coast or heading north toward foraging areas off the Philippines and Japan. In addition, one female that was captured in central California in 2005 still had a tracking device that had been attached to her on Jamursba-Medi, confirming this trans-Pacific migration (P. Dutton, NMFS, personal communication 2005). Meanwhile, leatherbacks tagged off the nearby nesting beach of War-mon, which is primarily a winter-time nesting beach, have either continued to forage locally or began migrating in a southeasterly direction (i.e. not towards the California coast). In addition, all the leatherbacks tagged off Papua New Guinea have traveled on a southeasterly direction, in the south Pacific Ocean (S. Benson, NMFS, personal communication 2006). Leatherbacks nesting in PNG, the Solomon Islands, and Vanuatu exhibit peak nesting during the winter months (P. Dutton et al. in review, and P. Dutton, NMFS, personal communication 2006).

Based on this information, it can be concluded that female leatherbacks that forage off the west coast of the U.S. and that are likely to interact with the proposed action have originated from the Jamursba-Medi nesting beach.

Genetic markers in 16 of 17 leatherback turtles sampled from the central North Pacific (captured in the Hawaii-based longline fishery) have identified those turtles as originating from nesting populations in the southwestern Pacific; the other specimen, taken in the southern range of the Hawaii fishery, was from nesting beaches in the eastern Pacific (Dutton and Eckert 2005). All 3 leatherbacks taken in the California-based longline fishery were found to originate from western Pacific nesting beaches, based on genetic analyses. All leatherbacks captured off central California (n=40) have been found to originate from western Pacific nesting beaches (P. Dutton, NMFS, personal communication 2006).

Based on published estimates of nesting female abundance, leatherback populations are declining at all major Pacific basin nesting beaches, particularly in the last two decades (Spotila *et al.* 1996; NMFS and USFWS 1998b; Spotila *et al.* 2000). Declines in nesting populations have been documented through systematic beach counts or surveys in Malaysia (Rantau Abang, Terengganu), Mexico and Costa Rica. In other leatherback nesting areas, such as Papua New Guinea, Indonesia, and the Solomon Islands, there have been no systematic consistent nesting surveys, so it is difficult to assess the status and trends of leatherback turtles at these beaches. In all areas where leatherback nesting has been documented, however, current nesting populations are reported by scientists, government officials, and local observers to be well below abundance levels of several decades ago. The collapse of these nesting populations was most likely precipitated by a tremendous overharvest of eggs coupled with incidental mortality from fishing (Sarti *et al.* 1996; Eckert 1997).

a. Eastern Pacific Nesting Populations of Leatherbacks

Leatherback nesting populations are declining at a rapid rate along the Pacific coast of Mexico and Costa Rica. Three countries which are important to leatherbacks nesting in the eastern Pacific include Costa Rica, which has the highest abundance and density in this area, Mexico, with several important nesting beaches, and Nicaragua, with two important nesting areas. Leatherbacks have been documented nesting as far north as Baja California Sur and as far south as Panama, with few areas of high nesting (Sarti 2002).

i. <u>Costa Rica</u>

During the 1980s researchers realized that the beaches of Playa Grande, Playa Ventanas and Playa Langosta collectively hosted the largest remaining Pacific leatherback populations in Costa Rica. Since 1988, leatherback turtles have been studied at Playa Grande (in Las Baulas), the fourth largest leatherback nesting colony in the world. During the 1988-89 season (July-June), 1,367 leatherback turtles nested on this beach, and by the 1998-99 season, only 117 leatherback turtles nested (Spotila *et al.* 2000). The 1999-2000 and 2000-01 season showed increases in the number of adult females nesting here, with 224 and 397 leatherbacks nesting, respectively. The last four nesting seasons have shown continued declines, with only 69 nesting females during the 2001-02 season, and 55 nesting females during the 2002-03 season. Scientists speculate that the low turnout during 2002-03 may be due to the "better than expected season in 2000-01 which temporarily depleted the reproductive pool of adult females in reproductive condition following the El Niño/La Niña transition" (R. Reina, Drexel University, personal communication September 2003). The number of females nesting in 2003-04 was 159 turtles, while during 2004-05, only 49 females nested. As of February 3, 2006, 107 individual leatherbacks had nested at Playa Grande (P. Tomillo, Drexel University, personal communication 2006). There have also been anecdotal reports of leatherbacks nesting at Playa Caletas and Playa Coyote.

ii. Mexico

The decline of leatherback subpopulations is even more dramatic off the Pacific coast of Mexico. Surveys indicate that the eastern Pacific Mexican population of adult female leatherback turtles has declined from 70,000[3] in 1980 (Pritchard 1982b, *in* Spotila *et al.* 1996) to approximately 60 nesting females during the 2002-03 nesting season, the lowest seen in 20 years (L. Sarti, UNAM, personal communication June 2003). Monitoring of the nesting assemblage at Mexiquillo, Mexico has been continuous since 1982. During the mid-1980s, more than 5,000 nests per season were documented along 4 kilometers of this nesting beach. By the early 1990s (specifically 1993), less than 100 nests were counted along the entire beach (18 kilometers) (Sarti 2002). According to Sarti *et al.* (1996), nesting declined at this location at an annual rate of over 22 percent from 1984 to 1995. Censuses of four index beaches in Mexico during the 2000-2001 nesting season showed a slight increase in the numbers of females nesting compared to the all-time lows observed from 1996 through 1999 (Sarti *et al.* in prep). However, the number of nestings during 2002-03 seasons was the lowest ever recorded, as shown in Table 2.

Table 2. Annual number of estimated leatherback nestings (# nests) from 2000-2005 on index beaches and total nesting beaches.

Index beach	2000-01	2001-02[1]	2002-03[2]	2003-04[3]	2004-05[4]	2005-06[4]
Primary Nesting Beaches (40-50% of total nesting activity)						
Mexiquillo	624	20	36	528	42	190*
Tierra Colorada	535	49	8	532	57	292*
Cahuitan	539	52	73	349	31	230*
Barra de la Cruz	146	67	3	275	28	121*
Total - primary index beaches	**1,957**	**188**	**120**	**1,684**	**158**	**833***
Total - Mexican Pacific	**4,513**	**658**	**n/a**	**4,045**	**n/a**	**n/a**

[1]Source: Sarti, pers. comm, March, 2002 – index beaches; Sarti *et al.*, 2002 for totals;
[2]Source: Sarti, pers. comm, December, 2003 – index beaches, totals.
[3]Source: García *et al.* 2004.
[4]Source: Sarti, pers. comm., May, 2006 [*note that these numbers are preliminary]

A summary of total leatherback nestings counted and total females estimated to have nested along the Mexican coast from 1995 through 2004 is shown in Table 3.

[3]This estimate of 70,000 adult female leatherback turtles comes from a brief aerial survey of beaches by Pritchard (1982a), who has commented: "I probably chanced to hit an unusually good nesting year during my 1980 flight along the Mexican Pacific coast, the population estimates derived from which (Pritchard 1982b) have possibly been used as baseline data for subsequent estimates to a greater degree than the quality of the data would justify" (Pritchard 1996).

iii. Nicaragua

In Nicaragua, small numbers of leatherbacks nest on Playa El Mogote, and Playa Chacocente, both beaches within 5 kilometers of one another and located in the Rio Escalante Chacocente Wildlife Refuge. Similar to many of the leatherback nesting beaches along the eastern Pacific, the abundance of nesting females has decreased (Arauz 2002).

Table 3. Total leatherback nestings counted and total number of females estimated to nest along the Mexican Pacific coast per season.

Season	Nestings	Females
1995-1996	5,354	1,093
1996-1997	1,097	236
1997-1998	1,596	250
1998-1999[1]	799[1]	67[2]
1999-2000	1,125	225
2000-2001	4,513	991
2001-2002	658	109-120
2002-2003	n/a	n/a
2003-2004	4,045	608-628

[1]Value corrected for E1 (error due to track and bodypit aging) and E2 (error due to difficulty of observation from the air) only.

[2]Number of females only includes tagged females at the key beaches.

Source - Sarti *et al.* 2000 (1995-1999 data), Sarti *et al.,* 2002 (2001-02 data), Sarti, personal communication June 2003 (2002-03 data); García *et al.* 2004.

b. Western Pacific Nesting Populations of Leatherback Turtles

Similar to their eastern Pacific counterparts, leatherback turtles originating from the western Pacific are also threatened by poaching of eggs, killing of nesting females, human encroachment on nesting beaches, incidental capture in fishing gear, beach erosion, and egg predation by animals. In May, 2004, researchers, managers and tribal community members with extensive knowledge of local leatherback nesting beach populations and activities in Papua (Indonesia), Papua New Guinea, the Solomon Islands and Vanuatu assembled in Honolulu, Hawaii to identify nesting beach sites, and share abundance information based on monitoring and research, as well as anecdotal reports. Dutton *et al.* (in review and personal communication January 2006) report that there may be a minimum of 2,000 females nesting annually at 25 nesting sites in the western Pacific. Using a range of 875- 2,000 females nesting annually, and a renesting interval of approximately 2.5 years (Spotila *et al.* 1996), it is estimated that the number of nesting females in the western Pacific population is 2,000 to 5,000 (Dutton, NMFS, personal communication 2006).

Nesting female leatherbacks in the western Pacific exhibit varying seasonal, migratory, and behavioral differences, depending on the rookery. Therefore, a female leatherback found off the west coast of the United States likely did not originate from nesting beaches in Papua New Guinea, or even particular beaches in Papua (e.g. War Mon beach) (P. Dutton, NMFS, personal communication 2006). Most (if not all) of the female leatherbacks found off central California originate from the Jamursba-Medi nesting beach. The migratory routes of males are not as well known (S. Benson, NMFS, personal communication 2006).

i. Malaysia

The decline of leatherback turtles is severe at one of the most significant nesting sites in the western Pacific region - Terengganu, Malaysia, with current nesting representing less than 2 percent of the levels recorded in the 1950s, and the decline is continuing. The nesting population at this location has declined from 3,103 females estimated nesting in 1968 to 2 nesting females in 1994 (Chan and Liew 1996). With one or two females reportedly nesting each year, this population has essentially been eradicated (P. Dutton personal communication 2000).

ii. Indonesia

The largest leatherback rookery in Indonesia can be found on the north coast of Papua. Here, leatherback nesting generally takes place on two major beaches, located 30 km apart, on the north Vogelkop coast of the State of Papua: Jamursba-Medi (18 km) and War-Mon beach (6 km) (Starbird and Suarez 1994; Hitipeuw *et al.* in review). In 1984, the World Wildlife Fund (WWF) began a preliminary study to assess the status of the leatherback nesting population and found at least an estimated 13,000 nests on Jamursba Medi. A subsequent survey undertaken in 1992 reported a decline of nesting levels to 25% of the 1984 levels. Since then, the trend appears to be slightly declining; however, the number of nests estimated in 2004 is similar to the number estimated in surveys conducted in the early 1990's (Hitipeuw *et al.* in review). Commercial exploitation of turtle eggs on this beach was intense for a long time. Out of concern for the rapid declines in nestings, the WWF proposed the designation of five beaches as protected areas. These beaches are monitored for leatherback nesting activities and patrolled for potential poaching activities (Hitipeuw and Maturbongs 2002).

Leatherbacks nest on Jamursba-Medi during April through September, with a peak in June, July and August (Suarez *et al.* 2000; Hitipeuw, WWF, personal communication 2006). A summary of data collected from leatherback nesting surveys from 1981 to 2004 for Jamursba-Medi has been compiled, re-analyzed, and standardized and is shown in Table 4 (Hitipeuw and Maturbongs 2002; Hitipeuw 2003b; Hitipeuw *et al.* in review). The number of nests were adjusted to correct for the days or months of the survey missed during the nesting season, and the average number of nests per female is assumed to range between 4.4 to 5.8 (see footnotes in Table 4). Gaps in the data for the year 1998 and 2000 were due to lack of financial support and transition of management changes of WWF Indonesia, which has been helping to monitor the leatherback nesting populations at these beaches since the early 1980s. Current threats to this nesting population include egg predation by wild pigs (*Sus scrofa*), hatchling predation by ghost crabs, birds, sharks and fish, beach erosion, logging activities, and entanglement in fishing gear and marine debris (Hitipeuw *et al.* in review).

Table 4. Estimated numbers of female leatherback turtles nesting on Jamursba-Medi Beach along the north coast of the State of Papua (Summarized by Hitipeuw and Maturbongs 2002 and Hitipeuw 2003b; Hitipeuw *et al.* in review; T. Hitipeuw, WWF, personal communication 2006)

Survey Period	# of Nests	Adjusted # Nests	Estimated # of Females[3]
Jamursba-Medi Beach:			
September, 1981	4,000+	7,143[1]	1,232 - 1,623
April - Oct. 1984	13,360	13,360	2,303 - 3,036
April - Oct. 1985	3,000	3,000	658 - 731
June - Sept. 1993	3,247	4,091[2]	705 - 930
June - Sept. 1994	3,298	4,155[2]	716 - 944
June - Sept. 1995	3,382	4,228[2]	729 - 961
June - Sept., 1996	5,058	6,373[2]	1,099 -- 1,448
May - Aug., 1997	4,001	4,481[4]	773 -- 1,018
May - Sept. 1999	2,983	3,251	560 – 739
April - Dec., 2000	2,264	No	390 – 514
March - Oct., 2001	3,056	No	527 – 695
March - Aug., 2002	1,865	1,921	331 – 437
March – Nov., 2003	3,601	2,904	621 – 818
March – Aug., 2004	3,183	3,871	667 – 879
April – Sept., 2005	2,666	2,562	441 - 582

[1]The total number of nests reported during aerial surveys were adjusted to account for loss of nests prior to the survey. Based on data from other surveys on Jamursba-Medi, on average 44% of all nests are lost by the end of August.
[2]The total number of nests have been adjusted based on data from Bhaskar's surveys from 1984-85 from which it was determined that 26% of the total number of nests laid during the season (4/1-10/1) are laid between April and May.
[3]Based on Bhaskar's tagging data, an average number of nests laid by leatherback turtles on Jamursba-Medi in 1985 was 4.4 nests per female. This is consistent with estimates for the average number of nests by leatherback turtles during a season on beaches in Pacific Mexico, which range from 4.4 to 5.8 nests per female (Sarti *et al.* unpub. report). The range of the number of females is estimated using these data.
[4]Number adjusted from Bhaskar (1984), where percentage of nests laid in April and September is 9% and 3%, respectively, of the total nests laid during the season.

Nesting of leatherbacks on War-Mon beach primarily takes place during the winter months, but occurs throughout the year, from October through September, with a peak in December through March (Thebu and Hitipeuw 2005). In recent years, the beach has been monitored during much of the nesting season, including the peak period, and researchers have documented approximately 2,000 – 3,000 nests per year (Thebu and Hitipeuw 2005; Hitipeuw, WWF, personal communication 2006), which may equate to several hundred females nesting per year (given 4.4 to 5.8 nests per female). Given shorter monitoring periods in past studies, it is difficult to analyze any trends for this nesting beach (see Table 5).

Table 5. Number of leatherback turtle nests observed along War-Mon Beach

Monitoring Period	# nests	Source
Nov. 23-Dec. 20, 1984 and Jan. 1-24, 1985	1,012	Starbird and Suárez 1994; Suárez *et al.*, 2000
Dec. 6-22, 1993	406	Starbird and Suárez 1994; Suárez *et al.*, 2000
Nov., 2002 - June, 2003	1,442	Hitipeuw 2003b
Nov., 2003 – Sept., 2004	2,881	Thebu and Hitipeuw 2005
Oct. 2004 – Sept. 2005	1,980	Hitipeuw, WWF, pers. comm., 2006

iii. Papua New Guinea

In Papua New Guinea, leatherbacks nest primarily along the coast of the Morobe Province, mostly between November and March, with a peak of nesting in December. There are no current estimates of the number of nesting females in this area, but researchers are analyzing all known data to determine status and trends[1]. Based on data from surveys conducted during the 1980s, researchers estimated that between 200-300 females were estimated to nest annually in an area between the two villages of Labu Tali and Busama (approximately 19 kilometers along the Morobe Province; Quinn and Kojis (1985) and Bedding and Lockhart (1989), both *in* Hirth *et al.* 1993). While leatherback meat is not consumed in this area, leatherback eggs are an important source of protein for the local people, and eggs are also sold in towns such as Lae. In addition, when rivers break through a berm in the area, leatherback eggs are exposed and destroyed by inundation (Hirth *et al.* 1993). Egg collection continues in this country, although the extent is unknown (P. Dutton, NMFS, personal communication March 2002) but "significant" (M. Philip,

[1]Philip (2002) reports an estimated 1,000 to 1,500 females nesting (very approximate) along the Morobe coast between Labu Butu and Busama beach, but without an ongoing monitoring project in place, these numbers are very speculative and probably should not be used until a full study and analysis has been conducted. Researchers are currently analyzing the data to determine a trend, but so far there has not been a comprehensive analysis.

Office of Environment and Conservation, Papua New Guinea, personal communication December 2003).

The Kamiali nesting beach (also in the Morobe Province and within the Kamiali Wildlife Management Area (WMA)) is approximately 11 km long and is an important nesting area for leatherbacks. Leatherbacks use approximately 8 km of this area for laying eggs (Kisokau and Ambio 2005). While no long term trend data are available, locals report declines over generations (Benson *et al.* in review; Kisokau and Ambio 2005). Due to increasing awareness and concern about the local declines in nesting leatherbacks, the Kamiali community agreed to a 100 meter no-take (no harvest of meat or eggs) zone in 1999, increased to a 1 km no-take zone in 2000, and 0.5 km was added in 2001 (1.5 km total). For the entire 2003-2004 nesting season and beyond, the Kamiali community declared a complete ban on taking leatherback eggs or meat for all community members and outsiders, and the entire 8 km beach is now considered the Kamiali Wildlife Management Area (Kisokau and Ambio 2005). The no-take zone is effective from December to February (nesting season) (Rei *et al.* 2004).

The Kamiali community began monitoring leatherback nesting within 1 to 2 kilometers of the Kamiali WMA in 1999. The total number of nesting females from 1999-2004 ranged from 41 to 71 leatherbacks (Kisokau and Ambio 2005). Identified threats to the nesting beaches in this area include egg harvest in the areas outside of the Kamiali WMA and wave-induced erosion (Benson *et al.* in review). There is also a low hatchling success, calculated to be approximately 25 percent from a minimum data set (Kisokau and Ambio 2005). Natural predators that target leatherback nests include monitor lizards, local dogs, and sand crabs, while there have been unconfirmed reports of saltwater crocodiles attacking and killing adult females (Rei *et al.* 2003).

Aerial surveys in Papua New Guinea have been flown for the last three years (2004-2006) during the peak of the leatherback nesting season (January). The 2004 survey found that over 71 percent of all nests were found at beaches within the Huon Gulf coast. Within this region, 29 percent of the nests were recorded outside of the two index beaches: the Kamiali WMA and Maus Buang, which are both monitored (Benson 2005). Results from the January 2005 survey estimated 1,195 leatherback nests in an area covering 2,692 kilometers of coastline, including the Madang, Morobe and Oro provinces (north coast of mainland PNG), New Britain, Bougainville, Buka, and the southwestern coast of New Ireland (Benson 2005).

iv. Solomon Islands

In the Solomon Islands, the rookery size has been estimated to be less than 100 females nesting per year (D. Broderick personal communication; *in* Dutton, *et al.* 1999); however recent reports indicate considerable scattered nesting around the islands and that there may be on the order of hundreds of females, rather than tens of females (Dutton *et al.* in review). Past studies have identified four important nesting beaches in Isabel Province: Sasakolo, Lithoghahira, Lilika, and Katova. While Leary and Laumani (1989 *in* Ramohia *et al.* 2001) reported that leatherback nesting throughout Isabel Province doubled since 1980, there have been few monitoring studies to substantiate this reported trend. From November 28, 2000, through January 21, 2001, a monitoring study was conducted on one of the nesting beaches, located on Sasakolo Beach. This period represented approximately two-thirds of the known peak-breeding season. During this time, leatherbacks appeared 192 times, with 132 clutches laid. A total of 27 nesting turtles were encountered: 26 were new nesting individuals and 1 had been tagged in 1995. Egg harvest by humans has been reported in the past and recently (Dutton *et al* in review). In addition, lizards and iguanas have been documented predating on leatherback eggs (Rahomia *et al.* 2001), and wave erosion, and logging have also been identified as threats (Dutton *et al.* in review).

v. Vanuatu

There are very rare reports of leatherback nesting activities in Vanuatu; however, this country consists of over eighty islands, many remote, so there is still much to be learned regarding the importance of the beaches Vanuatu to western Pacific leatherbacks. A village-based monitoring system was initiated in 1995 with the support of the "Wan Smolbag" theatre group. Small nesting populations have been reported by residents of different islands, from Espirito Santo in the north, through Ambae, Aneityum and Efate to Tanna in the south. Locals report that nesting has declined significantly since the 1980s, primarily due to human encroachment and subsistence on nesting females and eggs. Currently, Epi Island has the largest number of nests, with approximately 20-30 nesting females on the southwestern beaches and a smaller number on the east coast. There is scattered nesting on the other islands, based on survey data and anecdotal reports. Leatherbacks are still consumed by locals (Petro *et al.* 2004).

3. Loggerhead Turtles (*Caretta caretta*)

The loggerhead turtle is listed as threatened under the ESA throughout its range, primarily due to direct take, incidental capture in various fisheries, and the alteration and destruction of its habitat. Loggerheads are circumglobal, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters. Major nesting grounds are generally located in temperate and subtropical regions, with scattered nesting in the tropics (*in* NMFS and USFWS 1998c). In the Pacific Ocean, loggerhead turtles are represented by a northwestern Pacific nesting aggregation (located in Japan) which may be comprised of separate nesting groups (Hatase *et al.* 2002) and a smaller southwestern nesting aggregation that occurs in Australia (Great Barrier Reef and Queensland), New Caledonia, New Zealand, Indonesia, and Papua New Guinea.

The loggerhead is characterized by a reddish brown, bony carapace, with a comparatively large head, up to 25 cm wide in some adults. Adults typically weigh between 80 and 150 kg, with average CCL measurements for adult females worldwide between 95-100 cm CCL (*in* Dodd 1988) and adult males in Australia averaging around 97 cm CCL (Limpus 1985; *in* Eckert, 1993). For their first years of life, loggerheads forage in open ocean pelagic habitats. Both juvenile and subadult loggerheads feed on pelagic crustaceans, mollusks, fish, and algae. The large aggregations of juveniles off Baja California have been observed foraging on dense concentrations of the pelagic red crab, *Pleuronocodes planipes* (Pitman 1990; Nichols *et al.* 2000). Data collected from stomach samples of turtles captured in North Pacific driftnets indicate a diet of gastropods (*Janthina* sp.), heteropods (*Carinaria* sp.), gooseneck barnacles (*Lepas* sp.), pelagic purple snails (*Janthina* sp.), medusae (*Vellela* sp.), and pyrosomas (tunicate zooids). Other common components include fish eggs, amphipods, and plastics (Parker *et al.* 2000). The maximum recorded dive depth for a post-nesting female was 211-233 meters, while mean dive depths for both a post-nesting female and a subadult were 9-22 meters. Routine dive times for a post-nesting female were between 15 and 30 minutes, and for a subadult, between 19 and 30 minutes (Sakamoto *et al.* 1990 *in* Lutcavage and Lutz 1997). A recent study (Polovina *et* *al.* 2004) found that tagged turtles spent 40 percent of their time at the surface and 90 percent of their time at depths shallower than 40 meters.

For loggerheads, the transition from hatchling to young juvenile occurs in the open sea, and evidence from genetic analyses and tracking studies show that this part of the loggerhead life cycle involves trans-Pacific developmental migration. In addition, large aggregations (numbering in the thousands) of mainly juveniles and subadult loggerheads are found off the southwestern coast of Baja California, over 10,000 km from the nearest significant nesting beaches (Pitman 1990; Nichols *et al.* 2000). Genetic studies have shown these animals originate from Japanese nesting subpopulation (Bowen *et al.* 1995), and their presence reflects a migration pattern probably related to their feeding habits (Cruz *et al.* 1991 *in* Eckert 1993). While these loggerheads are primarily juveniles, carapace length measurements indicate that some of them are 10 years old or older.

Based on skeletochronological and mark-recapture studies, mean age at sexual maturity for loggerheads ranges between 25 to 35 years of age, depending on the subpopulation (*in* Chaloupka and Musick 1997). Dobbs (2002) reports that loggerheads originating from Australian beaches mature at around age 25, although Frazer *et al.* (1994 *in* NMFS and USFWS 1998c) determined that maturity of loggerheads in Australia occurs between 34.3 and 37.4 years of age.

Upon reaching maturity, adult female loggerheads migrate long distances from resident foraging grounds to their preferred nesting beaches. Clutch size averages 110 to 130 eggs, and one to six clutches of eggs are deposited during the nesting season (Dodd 1988). The average re-migration interval is between 2.6 and 3.5 years (*in* NMFS and USFWS 1998c), and adults can breed up to 28 years (Dobbs 2002).

a. Distribution and Abundance of Nesting Females in the Pacific Ocean

In the Pacific Ocean, loggerhead turtles are represented by a northwestern Pacific nesting aggregation (located in Japan) and a smaller southwestern nesting aggregation that occurs in eastern Australia (Great Barrier Reef and Queensland) and New Caledonia (NMFS SEFSC 2001). There are no reported loggerhead nesting sites in the eastern or central Pacific Ocean basin.

i. Japan

In the western Pacific, the only major nesting beaches are in the southern part of Japan (Dodd 1988). From nesting data collected by the Sea Turtle Association of Japan since 1990, the latest estimates of nesting females on almost all of the rookeries are as follows: 1998 - 2,479 nests; 1999 - 2,255 nests; 2000 - 2,589 nests. Considering multiple nesting estimates, Kamezaki *et al.* (2003) estimates that approximately less than 1,000 female loggerheads return to Japanese beaches per nesting season. In general, during the last 50 years, loggerhead nesting populations have declined 50-90%. Recent genetic analyses on female loggerheads nesting in Japan suggest that this "subpopulation" is comprised of genetically distinct nesting colonies (Hatase, *et al.* 2002) with precise natal homing of individual females. As a result, Hatase, *et al.* (2002) indicate that loss of one of these colonies would decrease the genetic diversity of Japanese loggerheads; recolonization of the site would not be expected on an ecological time scale.

ii. Australia

In eastern Australia, Limpus and Riemer (1994) reported an estimated 3,500 loggerheads nesting annually in during the late 1970s. Since that time, there has been a substantial decline in nesting populations at all sites. Currently, less than 500 female loggerheads nest annually in eastern Australia, representing an 86% reduction within less than one generation (Limpus and Limpus 2003).

iii. New Caledonia

Although loggerheads are the most common nesting sea turtle in the Île de Pins area of southern New Caledonia, there is no quantitative information available, and surveys in the late 1990s failed to locate regular nesting. However, anecdotal information from locals indicate that there may be more substantial loggerhead nesting occurring on peripheral small coral cays offshore of the main island. Limpus and Limpus (2003) estimate that the annual nesting population in the Île de Pins area may be in the "tens or the low hundreds."

Loggerhead mortality from human activities in the Pacific Ocean is not well-documented except for estimates based on NMFS observer data in the Hawaii-based longline fishery, CA/OR drift gillnet fishery, and recent ongoing studies in Baja California, Mexico (Nichols *et al.* 2000; Nichols 2002). Mortality of loggerheads in the East China Sea and other benthic habitats of this population are a concern and thought to be "high," but have not been quantified (Kamezaki, personal communication *in* Tillman 2000).

Of the loggerheads taken in the California-based longline fishery and the CA/OR drift gillnet fishery, all were determined to have originated from Japanese nesting beaches, based on genetic analyses (P. Dutton, NMFS, personal communication December 2003).

4. Olive Ridley (*Lepidochelys olivacea*)

Although the olive ridley is regarded as the most abundant sea turtle in the world, olive ridley nesting populations on the Pacific coast of Mexico are listed as endangered under the ESA; all other populations are listed as threatened. Olive ridley turtles occur throughout the world, primarily in tropical and sub-tropical waters. Nesting aggregations in the Pacific Ocean are found in the Marianas Islands, Australia, Indonesia, Malaysia, and Japan (western Pacific), and Mexico, Costa Rica, Guatemala, and South America (eastern Pacific).

Olive ridleys feed on tunicates, salps, crustaceans, other invertebrates and small fish. Montenegro *et al.* 1986 (*in* NMFS and USFWS 1998d) found a wide variety of prey in olive ridleys from the eastern Pacific. Olive ridleys have been caught in trawls at depths of 80-110 meters (NMFS and USFWS 1998d), and a post-nesting female reportedly dove to a maximum depth of 290 meters. The average dive length for an adult female and adult male is reported to be 54.3 and 28.5 minutes, respectively (Plotkin, 1994 *in* Lutcavage and Lutz 1997).

The mean clutch size for females nesting on Mexican beaches is 105.3 eggs, in Costa Rica, clutch size averages between 100 and 107 eggs (*in* NMFS and USFWS 1998d). Females generally lay 1.6 clutches of eggs per season in Mexico (Salazar *et al.* 1998) and two clutches of eggs per season in Costa Rica (Eckert 1993). Data on the remigration intervals of olive ridleys in the eastern Pacific are scarce; however, in the western Pacific (Orissa, India), females showed an annual mean remigration interval of 1.1 years. Reproductive span in females of this area was shown to be up to 21 years (Pandav and Kar 2000).

Like leatherback turtles, most olive ridley turtles lead a primarily pelagic existence (Plotkin *et al.* 1993), migrating throughout the Pacific, from their nesting grounds in Mexico and Central America to the north Pacific. While olive ridleys generally have a tropical to subtropical range, with a distribution from Baja California, Mexico to Chile (Silva-Batiz *et al.* 1996), individuals do occasionally venture north, some as far as the Gulf of Alaska (Hodge and Wing 2000).

Declines in olive ridley populations have been documented in Playa Nancite, Costa Rica; however, other nesting populations along the Pacific coast of Mexico and Costa Rica appear to be stable or increasing, after an initial large decline due to harvesting of adults. Historically, an estimated 10 million olive ridleys inhabited the waters in the eastern Pacific off Mexico (Cliffton *et al.* 1982 *in* NMFS and USFWS 1998d). However, human-induced mortality led to declines in this population. In the Indian Ocean, Gahirmatha (Orissa, India) supports perhaps the largest nesting population; however, this population continues to be threatened by nearshore trawl fisheries. Direct harvest of adults and eggs, incidental capture in commercial fisheries, and loss of nesting habits are the main threats to the olive ridley's recovery.

a. Eastern Pacific Ocean

In the eastern Pacific Ocean, nesting occurs all along the Mexican and Central American coast, with large nesting aggregations occurring at a few select beaches located in Mexico and Costa Rica. Few turtles nest as far north as southern Baja California, Mexico (Fritts *et al.* 1982) or as far south as Peru (Brown and Brown 1982). The largest known arribada*s* in the eastern Pacific are off the coast of Costa Rica (~475,000 - 650,000 females estimated nesting annually) and in southern Mexico (~800,000+ nests/year at La Escobilla, in Oaxaca) (Millán 2000).

i. Mexico

The nationwide ban on commercial harvest of sea turtles in Mexico, enacted in 1990, has improved the situation for the olive ridley. Surveys of important olive ridley nesting beaches in Mexico indicate increasing numbers of nesting females in recent years (Marquez *et al.* 1995; Arenas *et al.* 2000). Annual nesting at the principal beach, Escobilla Beach, Oaxaca, Mexico, averaged 138,000 nests prior to the ban, and since the ban on harvest in 1990, annual nesting has increased to an average of 525,000 nests (Salazar *et al.* 1998). At a smaller olive ridley nesting beach in central Mexico, Playon de Mismalayo, nest and egg protection efforts have resulted in more hatchlings, but the population is still "seriously decremented and is threatened with extinction" (Silva-Batiz *et al.* 1996). Still, there is some discussion in Mexico that the species should be considered recovered (Arenas *et al.* 2000).

ii. Costa Rica

In Costa Rica, 25,000 to 50,000 olive ridleys nest at Playa Nancite and 450,000 to 600,000 turtles nest at Playa Ostional each year (NMFS and USFWS 1998d). In an 11-year review of the nesting at Playa Ostional, (Ballestero *et al.* 2000) report that the data on numbers of nests deposited is too limited for a statistically valid determination of a trend; however, there does appear to be a six-year decrease in the number of nesting turtles. Under a management plan, the community of Ostional is allowed to harvest a portion of eggs. Between 1988 and 1997, the average egg harvest from January to May ranged between 6.7 and 36%, and from June through December, the average harvest ranged from 5.4 to 20.9% (Ballestero *et al.* 2000). At Playa Nancite, concern has been raised about the vulnerability of offshore aggregations of reproductive individuals to "trawlers, longliners, turtle fishermen, collisions with boats, and the rapidly developing tourist industry" (Kalb *et al.* 1996). The greatest single cause of olive ridley egg loss comes from the nesting activity of conspecifics on *arribada* beaches, where nesting turtles destroy eggs by inadvertently digging up previously laid nests or causing them to become contaminated by bacteria and other pathogens from rotting nests nearby. At a nesting site in Costa Rica, an estimated 0.2 percent of 11.5 million eggs laid during a single *arribada* produced hatchlings (*in* NMFS and USFWS 1998d). In addition, some female olive ridleys nesting in Costa Rica have been found afflicted with fibropapilloma disease (Aguirre *et al.* 1999).

iii. <u>Guatemala</u>

In Guatemala, the number of nesting olive ridleys nesting along their Pacific coast has declined by 34% between 1981 and 1997. This is only based on two studies conducted 16 years apart, however: in 1981, the estimated production of olive ridley eggs was 6,320,000, while in 1997, only 4,300,000 eggs were estimated laid (*in* Muccio 1998). Villagers also report a decline in sea turtles; where collectors used to collect 2-3 nests per night during the nesting season 15 years prior, now collectors may find only 2-4 nests per year due to fewer turtles and more competition. This decline most certainly can be attributed to the collection of nearly 95% of eggs laid, and the incidental capture of adults in commercial fisheries (Muccio 1998).

iv. <u>Nicaragua</u>

In Nicaragua, there are two primary *arribada* beaches: Playa La Flor and Playa Chacocente, both in the southern Department of Rivas. At Playa La Flor, the second most important nesting beach for olive ridleys on Nicaragua, Ruiz (1994) documented 6 *arribadas* (defined as 50 or more females nesting simultaneously). The main egg predators were domestic dogs and vultures (*Coragyps atratus* and *Cathartes aura*). During the largest *arribada*, 12,960 females nested from October 13-18, 1994 at Playa La Flor (*in* NMFS and USFWS 1998d). Von Mutius and Berghe (2002) reported that management of this beach includes a six-month open season for egg collection, during a time when the *arribadas* is small. During this time, all eggs are taken by locals, and during the "closed period," approximately 10-20% of eggs are given to the locals to consume or sell. At Playa Chacocente, approximately 5,000 to 20,000 females may nest over the course of five days (Camacho y Cáceres 1994 *in* Arauz 2002). Here, the harvest and commercialization of sea turtle eggs is allowed and somewhat controlled. During a monitoring project conducted on nearby Playa El Mogote from October, 2001 through March, 2002, researchers documented olive ridleys nesting 327 times. Of these, 99.7% of the nests were poached (Arauz 2002).

b. Indian Ocean

In the eastern Indian Ocean, olive ridleys nest on the east coast of India, Sri Lanka, and Bangladesh.

i. <u>India</u>

In India, a few thousand olive ridleys nest in northern Tamil Nadu, Andhra Pradesh, and the Andaman and Nicobar Islands (*in* Shanker *et al.* 2003). However, the largest nesting aggregation of olive ridleys in the world occurs in the Indian Ocean along the northeast coast of India (Orissa). Not surprisingly then, olive ridleys are the most common sea turtle species found along the east coast of India, migrating every winter to nest en-masse at three major rookeries in the state of Orissa: Gahirmatha, Devi River mouth, and Rushikulya (Shanker *et al.* 2003). Sporadic nesting occurs between these mass nesting beaches.

The Gahirmatha rookery, located along the northern coast of Orissa, hosts the largest known nesting concentration of olive ridleys. Shanker *et al.* (2003) provide a comprehensive report on the status and trends of olive ridleys nesting in Orissa since monitoring began in 1975. Current population sizes are estimated to be between 150-200,000 nesting females per year. Based on analyses of the data, while there has been no drastic decline in the nesting population at Gahirmatha in the last 25 years, there are differences in trends between decades. For example, trend analyses suggest stability or increase in the size of the 1980s arribadas, which may be due to enforcement of legislation in the late 1970s, stopping the directed take of turtles. However, the 1990s data show that the population is declining or on the verge of a decline, which may be consistent with the recent increase in fishery related mortality and other threats (see below). No arribadas occurred on this nesting beach in 1997, 1998, and 2002, which is the highest documented incidence of failure since this rookery has been monitored (Shanker *et al.* 2003).

Uncontrolled mechanized fishing in areas of high sea turtle concentration, primarily illegally operated trawl fisheries, has resulted in large scale mortality of adults during the last two decades. Records of stranded sea turtles have been kept since 1993. Since that time, over 90,000 strandings (mortalities) of olive ridleys have been documented (*in* Shanker *et al.* 2003), and much of it is believed to be due to illegal gillnet and shrimp trawl fishing in the offshore waters. Threats to these sea turtles in this area also include artificial illumination from coastal development and unsuitable beach conditions, including reduction in beach width due to erosion (Pandav and Choudhury 1999). Genetic studies indicate that olive ridleys originating from the east coast of India are distinct from other ridleys worldwide, increasing the conservation importance of this particular population (Shanker *et al.* 2000 *in* Shanker *et al.* 2003).

c. *Western Pacific Ocean*

In the western Pacific, olive ridleys are not as well documented as in the eastern Pacific, nor do they appear to be recovering as well. There are a few sightings of olive ridleys from Japan, but no report of egg-laying. Similarly, there are no nesting records from China, Korea, the Philippines, or Taiwan. No information is available from Vietnam or Kampuchea (*in* Eckert 1993). There are small documented nesting sites in Indonesia, Thailand, and Malaysia. In Indonesia, extensive hunting and egg collection, in addition to rapid rural and urban development, have reduced nesting activities, and locals report daily trading and selling of sea turtles and their eggs in the local fish markets (Putrawidjaja 2000). The main threats to turtles in Thailand include egg poaching, harvest and subsequent consumption or trade of adults or their parts (i.e. carapace), indirect capture in fishing gear, and loss of nesting beaches through development (Aureggi *et al.* 1999).

Based on genetic analyses, an olive ridley taken in the CA/OR drift gillnet fishery originated from an eastern Pacific stock (i.e. Costa Rica or Mexico) (P. Dutton, NMFS, personal communication October 2002). The one olive ridley observed taken in the California-based longline fishery was found to originate from the eastern Pacific (P. Dutton, NMFS personal communication December 2003).

C. Summary of Sea Turtle Status

1. Green Sea Turtles

The eastern Pacific green turtle populations which most likely interact with the proposed action include the endangered Mexican nesting aggregations. Commercial exploitation and uncontrolled subsistence harvest of nesters and eggs has resulted in a dramatic decline of nesting females (Eckert 1993). This population is considered to be stable for now and mean estimated extinction probabilities indicate very low risks of quasi-extinction (defined as 50 adult females) over the next 100 years (Snover 2005).

The nesting population of Hawaiian green sea turtles has shown a steady increase and the stock is well on the way to recovery following more than 25 years of protection under the ESA (Balazs and Chaloupka 2004). This recovery is attributed to harvest prohibition and cessation of habitat damage at nesting beaches. Despite the occurrence of disease which has been a major cause of stranding of this species, nester abundance has continued to increase (Balazs and Chaloupka 2004).

Impacts occurring outside the action area that are known to incidentally take green sea turtles include fisheries, egg poaching, and nest destruction. Although some green sea turtle nesting populations are stable or increasing, it is estimated that the number of nesting females has declined globally by 48% to 67% over the past 150 years (Seminoff 2004).

2. Leatherback Sea Turtles

Although reporting of previously unknown nesting sites in the western Pacific estimated the number of nesting females to approximately 2,000 to 5,000 individuals, there are still indications of a long-term decline in nesting. Current analyses indicate this population is at low risk of quasi- and ultimate extinction over the next 100 years (Snover 2005).

Leatherback nesting populations are also declining at a rapid rate along the eastern Pacific coasts of Mexico and Costa Rica. A total of 1,224 adult females are estimated for the eastern Pacific (Snover 2005). The number of adult females in the eastern Pacific Mexican subpopulation has declined from 70,000 in 1980 (Pritchard 1982b, in Spotila et al.1996) to approximately 60 during the 2002/03 nesting season (L. Sarti, UNAM, personal communication June 2003). Population growth rate parameters calculated for the Playa Grande, Costa Rica nesting population indicate near certainty of quasi-extinction within 20-25 years and a high probability of ultimate extinction within 50-100 years (Snover 2005).

NMFS has undertaken several leatherback conservation projects. These include satellite tagging, aerial surveys, and nesting beach management. Although the results may not be immediately realized, these projects are anticipated to have beneficial effects on leatherback sea turtle populations in the long term.

Leatherback sea turtles have been taken in fisheries as bycatch world-wide. Estimates of the global population of leatherback sea turtles indicate that the species has declined by approximately 70% since 1980. In the Pacific, the eastern Pacific population has continued to decline, leading some researchers to conclude that the species is now on the verge of extinction in the Pacific Ocean (Spotila et al. 2000).

3. Loggerhead Sea Turtle

All subpopulations of loggerhead sea turtles are negatively affected by direct take, incidental capture in various fisheries, and alteration and destruction of nesting habitat. Loggerheads found off of the California coast originate from Japanese nesting beaches. Total abundance of nesting females from all Japanese subpopulations is approximately 1,000 nesting females (Kamezaki et al. 2003). During the last 50 years, these nesting populations have declined 50-90%. Current trends indicate a high probability of quasi-extinction of these subpopulations within 50 years (Snover 2005).

NMFS has initiated many conservation projects such as loggerhead nesting beach management, measures to reduce incidental capture by Mexico's halibut gillnet fishery, educational programs, and meetings and workshops regarding conservation planning and strategizing. These projects are anticipated to have beneficial effects on loggerhead sea turtle populations in the long term.

Limited information is known about the global population of loggerhead sea turtles. In the Atlantic Ocean, absolute population size is not known, but based on nesting information, loggerheads are likely much more numerous than in the Pacific Ocean. In the Indian Ocean basin the overall population status of loggerheads is essentially unknown.

4. Olive Ridley Sea Turtles

Olive ridley sea turtles are considered the most abundant sea turtle in the world (NMFS and USFWS 1998e). Although increasing numbers of nests and nesting females have been observed in Mexico in recent years, the decline of the species continues in the eastern Pacific countries of Costa Rica, Guatemala, and Nicaragua. Egg loss has occurred from both legal and illegal collection, as well as natural loss due to nesting turtles inadvertently digging up previously laid nests. Population growth rate parameters calculated for the primary nesting site of Escobilla Beach, Oaxaca, Mexico indicate a negligible risk of extinction over the next several decades, given that current conservation practices are continued (Snover 2005).

The largest known rookery in India is estimated to be between 150-200,000 nesting females. This subpopulation is being impacted by illegally operated trawl fisheries resulting in large scale mortality of adults. Despite mandatory requirements passed in 1997, none of the approximately 3,000 trawlers use turtle excluder devices (Pandav and Choudhury 1999).

Limited information is available on western Pacific subpopulations. Nesting has been observed in Indonesia, Malaysia, and Thailand. Reports indicate these subpopulations are rapidly declining in most areas due to egg poaching, harvest and trade or consumption of adults, nesting beach development, and indirect capture in fishing gear (Eckert 1993; Aureggi et al. 1999).

V. ENVIRONMENTAL BASELINE

A. Status of Species within the Action Area

There is limited information on the abundance and distribution of sea turtles in the action area. Because green turtles have been entrained in the intake structures of the DCPP and green, leatherback, and loggerhead turtles have been entrained in the SONGS intake structure, we know that they do occur in the action area. Also, information from the California Sea Turtle Stranding Network (CSTSN) provides evidence that these species of sea turtles, along with the olive ridley turtle, have been reported to have stranded in San Luis Obispo County and San Diego County and surrounding areas. Therefore, it is likely that all four species of sea turtles occur in the action area. Because we do not have detailed information on the turtles' occurrence in the action area, it is hard to determine when they may be present in the action area or how much time they may spend there (i.e. how important this area is to their biological requirements). Green sea turtles have been entrained at both DCPP and SONGS throughout the year, which means that these turtles occur in the action area throughout the year. The entrainment of the 2 loggerhead sea turtles at SONGS occurred in February and July, the 2 leatherback entrainments occurred in the late spring (May). Stranding reports from the CSTSN for San Luis Obispo County and San Diego County show that green, leatherback, loggerhead, and olive ridley turtles have stranded throughout the year. However, leatherback and loggerhead strandings are most often reported in the months of May through September.

B. Threats to ESA-listed Sea Turtles

The environmental baseline for this Opinion includes the effects of several activities both beneficial and detrimental that affect the survival and recovery of threatened and endangered species in the action area. Within the action area, sea turtles and their habitat are likely threatened by pollution, fisheries, and vessel collisions, although quantification of their threats is difficult due to the small action area and lack of data.

1. Pollution

Pollution may occur in the action area largely as a result of anthropogenic sources. Chemical contamination of the marine environment can occur as a result of sewage, agricultural runoff, pesticides, solvents, and industrial discharges. Many of these contaminants are widespread in coastal waters of Southern California particularly in areas which are heavily populated (NMFS and USFWS 1998d). The effects of environmental contaminants on functional aspects of sea turtle immune systems have not been fully addressed; however certain environmental contaminants have been shown to affect the immune functions of other animals exposed in a laboratory setting (Keller *et al.* 2006). When a sea turtles immune system is weakened it can also make the turtle more susceptible to disease. Several field studies have suggested that fibropapilloma in green turtles is associated with marine habitats which have been impacted by agricultural, industrial or urban development (Herbst and Klein 1995).

Marine debris found in the action area could also affect sea turtles. Refuse such as plastic bags, stryofoam and other debris can be ingested by sea turtles, causing death or debilitation from a blockage of the esophagus Furthermore, discarded or abandoned fishing gear can lead to entanglement which could prevent the sea turtle from diving to feed or from surfacing to breathe. Turtles may also end up losing a limb to tightly wrapped gear.

The DCPP is located on an uninhabited and undeveloped 10 mile stretch of land, midway between the communities of Morro Bay and Avila Beach. SONGS is located near the coastal town of San Clemente. It is likely that chemical contaminants from runoff as well as marine debris can be found in the action areas surrounding both facilities as a result of near-by communities. NMFS is unaware of any quantification of the amount of pollution found in the action area.

2. Fisheries

A variety of commercial and recreational fisheries occur off of the southern California coast. It is unlikely that commercial fishing will occur in the action area because of the close proximity to land and the shallow water depths. Some recreational fishing is likely to occur in the action area. This fishing would be hook and line type fishing and could have some affects to sea turtles in the area. There have been reports of sea turtles in southern California including San Diego County and San Luis Obispo County that have shown signs of interactions with fishing gear. According to the NMFS California Marine Mammal and Sea Turtle Stranding CSTSN, since 1983 there have been five reports of sea turtles entangled in fishing gear in San Diego County. Of these five turtles, four turtles were found dead and one turtle was found live and released from the fishing gear. In waters off of San Luis Obispo County, one sea turtle was found entangled in a buoy line. The turtle was disentangled and released. It is unknown if any of these interactions occurred within the action area.

3. Vessel Collisions

Commercial and recreational vessels likely pass through the action area especially, in the case of SONGS where the CWS extends directly offshore. As turtles may be in the area, the potential exists for collisions with vessels transiting through the action area. Sea turtles can be killed or injured when struck by a vessel, especially when coming into contact with an engaged propeller. There have been some reports of turtles in southern California, including San Diego County, with parallel cuts and a cracked or damaged carapace likely as a result of a collision with a vessel. According to the NMFS California Marine Mammal and Sea turtle Stranding CSTSN, there have been reports of eight turtles possibly involved in vessel collisions in the waters off of San Diego County. All eight of these turtles were found dead; however. there is no way of knowing whether the death was caused by the vessel strike or if the turtle was hit postmortem.

B. Reducing Threats to ESA-listed Sea Turtles

1. California Sea Turtle Stranding Network (CSTSN)

The CSTSN is an extensive group of participants which aid with the response and recovery of dead and live stranded marine mammals and sea turtles in California. Data collected by the CSTSN are used to monitor stranding levels and identify where unusual or elevated mortality is occurring. These data can be used to monitor incidences of disease, fishery interactions, and marine debris related impacts. When a live turtle strands, the condition of the turtle is assessed and the turtles are either released back into the ocean or taken to a rehabilitation facility. In some cases, including turtles entrained at SONGS, the live turtles are tagged. Tagging helps to provide a better understanding of sea turtle movements which can contribute to our ability to establish recovery goals for the species. On occasion, skin and tissue samples are taken from dead turtles, which provide genetic information and nesting beach origin information on the turtle.

2. Sea Turtle Handling and Resuscitation Techniques
NMFS developed and published a Final Rule in the *Federal Register* (70 FR 69282, November 15, 2005) which require specific sea turtle handling and resuscitation techniques for sea turtles incidentally caught during fishing activities. These techniques include releasing turtles found entangled in fishing gear. If a turtle appears to be comatose or dead, attempts to resuscitation the turtle should be made to for no less than 4 hours and no more than 24 hours. These techniques have been adopted by NMFS in an effort to reduce mortality of turtles that interact with fishing gear.

VI. EFFECTS OF THE ACTION

This Opinion assesses the effects of the continued operation of the CWS for the DCPP and SONGS. The purpose of this Opinion is to determine if it is reasonable to expect that the proposed activities will have direct or indirect effects on threatened and endangered sea turtle species that will appreciably reduce their likelihood of both survival and recovery in the wild through reductions in the numbers, reproduction, or distribution of the species [which is the "jeopardy standard" established by 50 CFR 402.02].

The proposed action is likely to adversely affect threatened and endangered sea turtles in three different ways: 1) entrainment in the CWS intake at the DCPP and SONGS, 2) impacts from thermal discharge, and 3) impacts from chlorine or other chemical biofouling treatments used by DCPP and SONGS.

A. Entrainment of Sea Turtles

Power plants with open CWS have the potential to entrain sea turtles in their intake structures, which could cause injury or mortality to the turtle. Live sea turtles have been found entrained between the bar racks and curtain wall of the intake of the DCPP CWS. Sea turtles, live and dead, have also traveled through the intake pipe of the SONGS and have been found in the plant's forebay. Entrainment can adversely affect a sea turtle as a result of stress and forcible submergence. In natural situations, turtles may remain submerged for several hours; however stress can decrease the amount of time a turtle can remain submerged and not drown (NRC 1990). A turtle which is forcibly submerged may suffer from a "wet" or "dry" drowning. During a wet drowning, water enters the lungs, causing damage to the organs and asphyxiation. In a dry drowning, a reflex spasm seals lungs off from air and water (NRC 1990). Typically before drowning, a turtle becomes comatose or unconscious.

During a forcible submergence, a turtle rapidly depletes its oxygen store, resulting in potentially harmful conditions. One such condition is metabolic acidosis, when blood lactate levels get too high as a result of the submergence. Other conditions that may result from forced submergence include, an increase in carbon dioxide in the blood and increases in epinephrine and other hormones associated with stress. The effects of metabolic stress due to forced submergence are also related to other factors such as the size of the turtle, water temperature, and biological and behavioral differences among species. For example, larger sea turtles are capable of longer voluntary dives, thus they may be more able to survive a forced submergence for a longer period of time (Gregory *et al.* 1996). Additionally, Gregory *et al.* (1996) notes that routine metabolic rates of turtles are higher during the warmer months, so the impacts of stress may be magnified. Sea turtles can also exhibit dynamic endocrine responses to stress. Studies on green turtles and loggerheads described below show the physiological effects of forced submergence. It is expected that other species of sea turtles would show similar effects.

Jessop (2002) studied the response of green turtles after interactions with fishing gear. His results demonstrate that male green turtles exhibit complex interactions in their endocrine responses to a capture/restraint stressor and that variation in these interactions is associated with differences in males' reproductive, energetic, and physical state. It is possible that the plasma hormone responses to stressors could have important consequences for male green turtle reproduction, including abandonment of breeding behavior. Female green turtles have also been studied to evaluate their stress response to capture/restraint. Studies showed that female green turtles during the breeding season exhibited a limited adrenocortical stress response when exposed to ecological stressors and when captured and restrained. Researchers speculate that the apparent adrenocortical modulation could function as a hormonal tactic to maximize maternal investment in reproductive behavior such as breeding and nesting (Jessop *et al.* 2002).

Stabenau and Vietti (2003) studied the physiological effects of multiple forced submergences in loggerhead turtles. The initial submergence produced severe and pronounced metabolic and respiratory acidosis in all turtles. As the number of submergences increased, the acid-base imbalance was substantially reduced; although successive submergences produced significant changes in blood pH, PCO_2, and lactate. Increasing the time interval between successive submergences resulted in greater recovery of blood homeostatis. Although it is not expected that a sea turtle entrained in a power plant would be subject to successive submergences, this study does show that sea turtles have the potential to survive after being forcibly submerged.

1. DCPP

The incidental entrainment of sea turtles occurs at the DCPP when the turtle enters the mouth of the cooling water intake structure and gets trapped between the bar racks and concrete curtain wall. Turtles likely enter the intake cove out of curiosity, in pursuit of prey, or in search of shelter. Once inside the intake cove, the incoming water flow may cause the sea turtle to be drawn towards one of the 16 sets of bar racks. The slope of the bar racks direct the water upward. This may disorient the animal and prevent it from effectively escaping. As a result, the animal could rise to the surface behind the curtain wall and may be unable to dive back under the wall to escape. Some turtles may be able to dive back under the curtain wall and escape before being detected by plant personnel. Some sea turtles have been observed swimming freely back and forth under the curtain wall. Others are found by DCPP personnel and removed.

The area between the curtain wall and bar racks is monitored once a day by DCPP personnel. Since 1988, seven sea turtles have been removed from the DCPP intake structure. All seven of the turtles were green turtles and were found alive and removed by plant personnel. These entrainments have been reported to the NRC and NMFS via NMFS Stranding Reports. Information on all seven turtles can be found in Appendix I. In order to remove the turtles, divers are deployed and dive under the curtain wall where they wrap the turtle in a large net. The net with the turtle is then lifted out of the water where the turtle is inspected for injuries. None of the seven turtles found at the DCPP had serious injuries. Several of the turtles had minor abrasions on the shell, head, or flippers, although none of the abrasions appeared to be fresh wounds. It is likely that the wounds on these turtle occurred prior to entering the DCPP intake structure. However, there is a potential that a turtle could be come injured when coming into contact with the concrete curtain wall, bar racks, or another part of the intake structure. Most likely, these injuries would be minor scrapes or abrasions. If the animal found is in need of veterinary care it would be transported to an appropriate animal care facility as specified by NMFS. Although all of the sea turtles found in the DCPP intake have been live and healthy, it is possible that an unhealthy or weakened animal could drown if it became pinned against the bar rack. Should this occur, the animal would be removed and disposed of, after notification to NMFS. Additionally, it is possible that a dead turtle drifting in the vicinity of the plant could get drawn into the intake and become pinned against the bar racks. If this were to occur, the carcass would be disposed of after notification to NMFS.

2. SONGS

The incidental entrainment of sea turtles at the SONGS occurs when a turtle enters one of the intake velocity caps and is drawn through one of the intake tunnels. Because the intake structures begin approximately 980 meters offshore, turtles are not actually observed entering the velocity caps. A sea turtle may swim into the space between the intake riser and velocity cap either out of curiosity, in search of prey, or for shelter. Once past the velocity caps, the horizontal flow velocity of 0.5 m/s into the intake structure is potentially strong enough to draw the turtles involuntarily into the intake pipe. The velocity capped intake structures draws cooling water inward in a horizontal direction and then redirects the flow downward through its cooling water intake tunnel. The flow rate increases as the turtle approaches the center vertical riser shaft which connects to the intake conduit. The increase in velocity and downward flow, along with the lack of light and confined space may cause the turtle to become disoriented and prevent it from swimming back out of the intake structure. Because the animal is unable to exit the intake structure, it is drawn through the intake tunnel and ends up in the plant's forebay.

Once the cooling water enters the intake tunnels, the flow velocity is approximately 2.2 m/s. It takes close to eight minutes for the water to reach the forebay once it enters the tunnel. While entrained in the intake tunnel the turtle is submerged and unable to breathe until it reaches the station's forebay. The amount of time a turtle is able to hold its breath depends on the size, condition and species of turtle. Typical dive times for turtles under normal conditions varies by species. For example, leatherback sea turtles routinely dive for 4 to 14 minutes while green turtles have common dive times averaging 9 to 23 minutes. Even under stressed conditions, a turtle would most likely be able to survive the eight minutes of submergence through the SONGS intake pipe.

Both of SONGS intake pipes terminate at a central forebay. The forebay is about eight meters deep and 20 m across, so the turtle is able to move about freely in this area. The forebay area contains traveling screens that prevent the turtle and other debris from progressing further into the facility.

When a live turtle is discovered inside the forebay by plant personnel, the animals are lured towards the FRS with the use of vanes and louvers to the fish return elevator. From there the turtle is retrieved with a large net. The turtle is then examined and reported via a NMFS Stranding Report. If the animal is healthy and uninjured, it is tagged on both front flippers with tags supplied by NMFS, and released back into the ocean. Animals with visible injuries are turned over to one of the animal rescue organizations in the CSTSN, as specified by NMFS. Dead sea turtles discovered in the SONGS forebay are disposed of after reporting them to NMFS and the NRC.

Since 1983, a total of 35 sea turtles have been entrained in the SONGS intake structure (Appendix I). Of the 35 turtles, 31 were alive and healthy enough to be released back into the ocean. Four of the turtles were in various stages of decomposition when discovered in the forebay. While it is possible that a turtle may drown or sustain fatal injuries while transiting the intake tunnel, the forebay is monitored daily for animals so it is unlikely that a dead animal could have remained in the forebay long enough to decompose to the extent they had when found. It is more probable that these four turtles were dead when they drifted past the SONGS intake structure and were entrained.

Of the 35 turtles discovered in the SONGS intake structure, there were 31 green turtles, 2 loggerhead turtles, and 2 leatherback turtles. Of those, 2 of the green turtles and the 2 leatherback turtles were found in varying stages of decomposition. There were no obvious signs of external trauma that might indicate whether the animal was injured or dead prior to being drawn into the intake structure. Both green turtle carcasses had been dead for at least a few days. Both of the leatherback carcasses discovered at SONGS were extremely decomposed and had probably been dead for weeks. Because it is unlikely that an animal would go undiscovered for such a long period, most likely these turtles were dead prior to entering the intake structure. Additionally, 2 green turtles were found with minor abrasions and turned over to an animal rescue organization for veterinary care and eventually released. A complete summary of the turtles entrained in the SONGS facility can be found in Appendix I.

B. Impacts of Thermal Discharge

Heated condenser cooling water is discharged from the CWS of both DCPP and SONGS. The heated discharge water mixes with the ambient water and elevates the normal water temperature. Sea turtles may be affected directly or indirectly by the elevated water temperatures. Sea turtles would not likely be harmed by the elevated water temperatures; however it is possible that the temperature increases could affect the turtle's normal distribution or foraging patterns. Since the 1960's, green sea turtles have been found to aggregate in the warm water effluent discharged from the San Diego Gas and Electric Company's power generating facility. This is the only area on the west coast of the United States where the green sea turtles are known to aggregate (Stinson 1984). Based on stranding and sighting data there have been no known cases of sea turtles aggregating near the DCPP or SONGS discharge area.

1. <u>DCPP</u>

After passing through the condensers of the DCPP, the cooling water is returned to the ocean via a stair step weir structure that opens on the eastern end of Diablo Cove. Heat treatments to control biofouling are no longer used at DCPP, therefore only cooling water is being discharged.

Typically, the monthly average increase in surface water temperature is approximately 10 to 11°C warmer than the intake water. DCPP's NPDES permit allows for a maximum temperature rise of 12°C. The increase in surface water temperature is not felt beyond 300 m from the discharge, and has not been measured at depth. The warmed water does not extend to the intake structure and therefore, probably does not modify sea turtle behavior near the intake structure.

2. SONGS

At SONGS the water is discharged to the ocean via two discharge pipes after passing through the condensers or the Salt Water Cooling System. The normal temperature rise after passing through the condensers is approximately 11°C. The NPDES permit for SONGS allows a temperature rise of up to 14°C. Typically, the monthly average increase in surface water temperature is less than 2°C beyond 300 m of the discharge. The discharge pipes extend into the ocean, approximately 2,620 m for Unit 2 and approximately 1,860 m for Unit 3. The pipes have diffuser vents spaced at 12-m intervals over the last 760 m of each pipe. The distance from the beginning of the diffuser section of the discharge to the intake is 880 m for Unit 2 and 120 m for Unit 3. An increase of 2°C can be detected up to 300 m from the discharge, therefore the warmed water from the Unit 3 discharge does extend to the intake. However, there have not been observations of sea turtles aggregating near the SONGS intake structure, therefore it is unlikely that the warmed discharge water is attracting sea turtles to the intake causing an increase in entrainment.

Additionally, SONGS uses periodic heat treatments to help minimize biofouling of the CWS. Heat treatments are performed at six-week intervals in the summer and at nine-week intervals in the winter. Before beginning a heat treatment the forebay area is checked for the presence marine mammals and sea turtles; if detected animals are removed via the FRS. During a heat treatment the water temperature is raised slowly taking several minutes for each degree Celsius. There are also several hold points during the treatment to allow for fish and other animals to be removed from the CWS by using the FRS. The slow temperature increase also allows for sea turtles detected after beginning the treatment to be removed from the forebay before the water gets too hot. Throughout the heat treatment, which can last for several hours, the forebay is monitored for sea turtles; if found, the heat treatment is delayed until the animals are removed. By manipulating several gates, heated water can be recirculated through the condenser, sent through the intake pipe, or sent out through the normal discharge pipe to allow for heat treatment of the entire CWS. The maximum temperature reached during a heat treatment is 52°C. The NPDES permit gives the SONGS facility an exemption on the discharge temperature limit during heat treatments. The temperature of the discharge water exceeds the typical 14°C temperature limit for approximately one hour during heat treatments.

Although there have not been any observations of sea turtles near the discharge structures of the DCPP or SONGS, green sea turtles have been known to aggregate near the discharge of a power plant in San Diego Bay. Therefore, it is possible that sea turtles may be attracted to the areas near the DCPP and SONGS discharge due to the warmer waters. Turtles tend to respond to high temperatures by becoming inactive. Heath and McGinnis (1980) found that green turtles from the Gulf of California became inactive at water temperatures of 25-28°C. In San Diego Bay, turtles tend to move out of the effluent channel when temperatures exceeded 32.2°C (Dutton and McDonald 1990 in McDonald *et al.* 1994). While the warmer waters will not cause death or injury to the turtles it could affect their normal distribution and foraging patterns. For instance, a turtle may end up staying in the areas around the discharge structures of DCPP and SONGS instead of making the normal migration to known foraging areas of importance or to their nesting beach sites. This is not expected since there have been no reported observations of turtles aggregating near the discharge structures of either facility. Additionally, if turtles are attracted to the warmer discharged water it is possible that they could become cold-stunned if they travel outside the thermal plume into colder waters. Cold stunning occurs when water temperatures drop quickly and the turtles become incapacitated. In this situation the turtles could lose their ability to swim and dive, or could lose control of buoyancy (Spotila *et al.* 1997). According to NMFS Stranding Reports there have been several olive ridley turtles which have exhibited signs of cold stunning such as lethargy or an inability to dive. These occurrences were recorded from Los Angeles County and north to San Francisco County.

C. Impacts of Chlorine Use

Since heat treatments are no longer used at the DCPP, the facility uses periodic chlorine/bromine treatments to help minimize biofouling of the CWS. The chemical treatment uses Acti-Brom, (a sodium bromide solution with an added biodispersant) in combination with sodium hypochlorite to control settlement and growth of biofouling organisms. The chemicals are injected just downstream of the traveling screens via a chlorine injection system. The program consists of six daily 20-minute injections (at four hour intervals) of a 1:1 ratio blend of Acti-Brom and sodium hypochlorite in all four of DCPP's intake conduits. Each injection attempts to achieve a target concentration of 200 parts per billion (ppb) total residual oxidant (TRO). The TRO concentration in the discharge stream is usually between 20 and 60 ppb, well below the NPDES limitation of 200 ppb.

In addition to the heat treatments performed at SONGS, fouling organism growth in the onshore portion of the CWS is also controlled by chlorination using sodium hypochlorite. The chlorination injection point is just downstream of the traveling screens. Injections occur four times each day, for a duration of 25 minutes per injection period. The SONGS system is monitored with an in-line chlorine analyzer, which has a trip alarm set at 150 micrograms per liter (μg/l). If the alarm is tripped, the chlorination is immediately terminated. The NPDES permit for SONGS limits the residual chlorine levels to 22 μg/l for a six-month median, 88 μg/l maximum for a daily average, and 200 μg/l maximum for an instantaneous reading.

There is no information currently available on the effects of chlorination on sea turtles. The Florida Fish and Wildlife Conservation Commission (2002) indicate that safe levels of chlorine for turtles being held in captivity are between 1000 and 1500 μg/l. The levels of residual chlorine in the discharged water from the DCPP and SONGS are significantly less than these values. The chlorine would also be further diluted once discharged water mixes with the surrounding water. Therefore, it is not expected that the chlorine found in the discharged waters of DCPP and SONGS will adversely affect sea turtles or their habitat

VII. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area considered in this biological Opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

The total number of sea turtles taken each year along the Pacific coast is not known, although NMFS does receive Stranding Reports on animals that strand along the California coast. Based on information known about sea turtles in the action area and provided on NMFS Stranding Reports and in recovery plans for each of the four sea turtle species (NMFS and USFWS 1998a-e), threats to sea turtles include: incidental take during fishing operations, vessel collisions, ingestion of debris, pollution, and natural disasters. Entrainment in a power plant's CWS is also acknowledged as having a potential adverse effect on sea turtles.

Commercial and recreational vessels will continue to operate in the action area in the future, and sea turtles will continue to be killed or injured from direct and indirect interactions. Although some direct vessel strikes may be postmortem, there is the potential for live healthy turtles to be struck by a moving vessel. In addition, noise levels associated with vessels may disturb sea turtles and directly or indirectly affect their normal foraging, breeding, or migratory behavior.

Though not attributable to any one particular action, marine debris and pollution poses a threat to sea turtles in the action area. Necropsy and CSTSN data demonstrate that sea turtles off the California coast become entangled in and ingest marine debris. CSTSN data has shown turtles have been affected by derelict fishing gear, plastics, wood, and paper. Additionally, chemical contaminants may have an effect on sea turtle reproduction and survival, but the impacts are still relatively unclear. Coastal communities and development near the DCPP and SONGS will continue to contribute to debris and contaminants entering the waters of the action area through stormwater runoff and other non-point sources.

VIII. INTEGRATION AND SYNTHESIS OF EFFECTS

Sea turtles are known to use California's coastal waters for migration and foraging. While green, leatherback, loggerhead, and olive ridley sea turtles are known to occur in the action area, there is no available information to determine the distribution or abundance of turtles in this area. Reports of sea turtles being entrained in the DCPP and SONGS has been recorded and reported to NMFS since 1988 and 1983, respectively. The continued operation of the DCPP and SONGS is likely to result in low levels of lethal and non-lethal entrainment of green, leatherback, loggerhead, and olive ridley sea turtles. The monitoring measures used by the personnel at the DCPP and SONGS will ensure that turtle entrainments are observed and reported. The diligent implementation of the procedures and prompt response to entrained turtles may help to ensure that the entrained sea turtles remain alive and are able to be released.

The thermal discharge from both facilities may also directly and indirectly impact sea turtles by attracting turtles to the heated discharge and modifying their normal foraging and migration behavior. A turtle could also potentially suffer from cold stunning when later moving into colder waters. In addition to the heated discharge, the DCPP and SONGS use chlorination treatments to control biofouling. Because of the low concentrations of chlorine discharged by DCPP and SONGS, it is unlikely to adversely affect sea turtles. Both facilities have a NPDES permit which sets the standards for the temperature and chemical concentrations of the discharged cooling water. As required, both plants monitor these parameters to ensure compliance with their NPDES permits.

The greatest risk to sea turtles from the continued operation of the DCPP and SONGS CWS is due to entrainment in the intake structure. Sea turtles that are entrained may drown if they have been previously injured, are diseased, or incapacitated. Sea turtles may also be injured from being entrained in the intake structure. Additionally, previously deceased turtles may also become entrained in the DCPP and SONGS intakes.

Although data on the sea turtles entrained by the DCPP and SONGS have been reported to NMFS via Stranding Reports, in most cases accurate information on the size, age class, or sex of the turtle was not available. Additionally, there have not been any skin and tissue samples taken from turtles found at the DCPP or SONGS which would provide information on the genetic population from which the turtle belongs. Due to this limited information, NMFS is basing its anticipated effects on the numbers, reproduction, and distribution of the species on the levels of previous entrainments and current information on the status of the species.

An unknown number of green, leatherback, loggerheads, and olive ridley turtles may be injured or killed by commercial or recreational fisheries, vessel collisions, ingestion or entanglement in debris, or chemical contamination in the action area. Since quantitative data on the extent of these impacts to turtle populations are lacking, a reliable cumulative assessment of these effects is not possible.

Based on the information provided in this Opinion, NMFS anticipates that the level of entrainment as a result of the continued operation of the DCPP and SONGS will be 49 green sea turtles, 6 leatherbacks, 9 loggerheads, and 6 olive ridleys over the current licensing period. In light of the current status and known trends for green, leatherback, loggerhead, and olive ridley sea turtles, as well as the potential effects caused by human activities described in the Environmental Baseline of this Opinion, the level of entrainment is not likely to appreciably reduce the likelihood of the survival and recovery of these sea turtle populations. The following sections document the analysis supporting this conclusion.

1. <u>Green sea turtles</u>

A total of seven green turtles have been entrained at the DCPP since 1988 (average of 0.4 turtles per year). All seven of the turtles were found alive and released without evidence of any injuries. The maximum number of turtles entrained in a year was 2 turtles in 1997 and in 1999. Of the turtles entrained, 2 were identified as females, 2 were males, and the sex of the remaining 3 turtles was undetermined. Because green sea turtles occur in the action area, it is likely that the incidental entrainment of green sea turtles may continue in the future. While there have been no incidents of mortality or serious injury of green turtles at DCPP, there have been reports of dead or injured sea turtles entrained at other facilities. Because it is anticipated that green turtles will continue to be entrained at the DCPP, it is also likely that there could be mortalities and injuries associated with the entrainment. Given the level of previous entrainment, the status and distribution of green sea turtles, and the continued operation of the DCPP CWS in the same manner, it is anticipated that the maximum number of green turtles entrained in association with the continued operation of the DCPP through 2026, is 15 green turtles; with not more than three mortalities and one serious injury.

At the SONGS, 31 green turtles have been entrained since 1983 (average of 1.3 turtles per year). Of these turtles, 27 were released uninjured, 2 had minor injuries and were treated and released, and 2 were dead. The sex was unable to be determined on any of these turtles. The maximum number entrained in one year was seven turtles, in 1992. There were also several years with no entrainment of green sea turtles. Most recently in 2004 and 2005, 2 and 3 sea turtles were entrained respectively. Based on previous information, it is evident that the incidental entrainment of green turtles will most likely continue at SONGS. NMFS anticipates that the maximum number of green turtles entrained in association with the continued operation of the SONGS through 2022, will be 34 turtles; with not more than 4 mortalities and 2 serious injuries.

While there is no exact population estimate for the green sea turtle, current estimates show that the global population may have declined as much as 70 to 80% over the last 150 years (Seminoff 2002). There are two subspecies of green turtles which may occur in eastern Pacific waters (i.e. in the action area); the eastern Pacific green turtle and the Central-Pacific Hawaiian green turtle. While both of these subspecies have shown an increase in the number of nesting females, levels are still below historical numbers.

There have been no genetic analyses conducted on the green turtles entrained by DCPP and SONGS; therefore it is impossible to definitively say from which subspecies the turtles originate. It is most likely that these turtles are coming from the eastern Pacific stock, possibly the Mexican nesting populations. This is assumed because these turtles have been observed in geographical proximity to the action area. The northernmost reported population of green turtles occurs in San Diego Bay. Green turtles that congregate in San Diego Bay have been studied extensively and appear to originate from the east Pacific nesting beaches and the Revillagigedo Islands west of Baja California. It is possible, however, that some of these green turtles may also be from Hawaii. There is also limited information on the number of females being entrained. Because we know that at least 2 female turtles have been entrained at DCPP it is assumed that entrainment of female turtles may also continue. However, because the majority of the green turtles entrained by these power plant facilities are released unharmed, the proposed action will not remove a high number of females from the population. NMFS anticipates that a total of 49 green sea turtles (7 mortalities and 3 serious injuries) will be entrained by the DCPP and SONGS plants over the next 20 and 16 years respectively. Because these injuries and mortalities will occur periodically over many years, they are not expected to result in a detectable impact on the numbers, reproduction, and distribution of green sea turtles. Therefore, the continued operation of the DCPP and SONGS is not expected to appreciably reduce the likelihood of survival and recovery of the species.

2. Leatherback sea turtles

No leatherbacks have been reported at the DCPP; however central California has been identified as an important foraging area for leatherback sea turtles from western Pacific nesting beaches. Leatherback sea turtles have also stranded in San Luis Obispo County primarily during the late summer/ early fall when an increase in sightings of leatherbacks off of central California occurs. Although there is a very low probability that leatherback turtles will be entrained by the DCPP, the possibility exists due to their occurrence in the area. Entrainment of sea turtles at power plants can also sometimes lead to mortality or serious injury, although the occurrences are rare. Therefore, NMFS estimates that a maximum of three leatherback sea turtles (one mortality and one serious injury) may be entrained by the DCPP during the duration of its operating license.

A total of 2 leatherback sea turtles have been entrained by the SONGS CWS since 1983 (an average of 0.087 turtles per year). These turtles were entrained in 1994 and 1996. Both of the turtles were in advance stages of decomposition, so it is likely that the turtles were deceased prior to entering the intake structure of SONGS. As previously described, leatherbacks have been observed foraging off of central California and reported stranding in San Diego County. NMFS anticipates that SONGS may entrain no more than three leatherback sea turtles (one mortality and one serious injury) during the duration of its operating license.

The global population of leatherback sea turtles is thought to be decreasing, mainly because the eastern Pacific population of leatherbacks has continued to decline. Leatherbacks are highly migratory. While the migratory routes of leatherback turtles originating from the eastern and western Pacific nesting beaches are not entirely known, satellite tracking of some of the turtles, as well as genetic analysis of leatherback sea turtles caught in U.S. Pacific fisheries or stranded on the west coast of the U.S. present some insight into their routes and foraging areas. Information on the migratory patterns as well as the genetic analysis of turtles found on the west coast of the U.S. determined that the turtles originated from the western Pacific nesting beaches (i.e. Indonesia/Solomon Islands/ Malaysia).

Based on the information above, it is likely that the leatherback sea turtles incidentally entrained by the DCPP and SONGS will be from the west Pacific nesting beaches. As discussed in the Status of the Species section, most (if not all) of the female leatherbacks found off central California originate from the Jamursba-Medi nesting populations. Using the minimum number of estimated female leatherbacks from the Jamursba-Medi population over the last ten years (331 to 437 females), the loss of two females from this subpopulation, in one year, would represent a loss of 0.6 to 0.46 percent of the nesting females. However, it is expected that this loss would occur over the length of the current operating licenses of the DCPP and SONGS (20 and 16 years, respectively). Estimates by Dutton (2006) and Spotila *et al.* (1996), report that the minimum number of nesting females in all of the nesting sites in the western Pacific to be between 2,000 to 5,000 animals. Should the two mortalities of leatherback sea turtles be females, and occur in one year, the takes would represent an annual loss of 0.1 to 0.04 percent of the total estimated western Pacific nesting population, depending on the minimum nesting female estimate used. However, based on historical mortality levels at DCPP and SONGS, NMFS does not expect that both mortalities will occur in a single year. Given the low numbers of anticipated entrainment, mortality, and injury, over the next 16 to 20 years, and the current estimates of leatherback populations sizes, the mortality of up to 2 turtles, is not expected to have a detectable effect on the numbers, reproduction, and distribution of leatherback sea turtles. As such, the continued operation of DCPP and SONGS and the mortality of 2 leatherback sea turtles is not expected to appreciably reduce the likelihood of survival and recovery of the species.

3. Loggerhead sea turtles

There have been no known entrainments of loggerhead sea turtles at the DCPP; however it is possible that they will occur in the action area and could be incidentally entrained as a result of the operations of the DCPP CWS. It is also possible that the entrained turtle could be found dead or with serious injuries, as have been reported with other sea turtle species. For this reason, NMFS anticipates that no more than three loggerhead sea turtles (one mortality and one serious injury) will be entrained during the operations of the DCPP through 2026.

SONGS has entrained a total of 2 loggerhead turtles, one per year, in 1993 and 1996. Both of these turtles were released alive. In both cases the sex of the turtle was not reported on the NMFS Stranding Report. Although both turtles were recovered alive, in rare occasions turtles are sometimes discovered dead or with serious injuries. Given the level of previous entrainment, the status and distribution of loggerhead sea turtles, and the continued operation of the SONGS CWS in the same manner, it is anticipated that the loggerhead turtle entrainment associated with the continued operation of the SONGS through the end of its existing operating license will not exceed 6 loggerhead turtles (two mortalities and one serious injury).

As described in the Status of the Species section, within the Pacific Ocean, loggerhead sea turtles are represented by a northwestern Pacific nesting aggregation (located in Japan) and a smaller southwestern nesting aggregation that occurs in Australia (Great Barrier Reef and Queensland), New Caledonia, New Zealand, Indonesia, and Papua New Guinea. Based on available information, the Japanese nesting aggregation is significantly larger than the southwest Pacific nesting aggregation. It has been estimated the Japanese nesting aggregation is approximately 1,000 female loggerhead turtles (Kamezaki *et al.* 2003). We have no recent, quantitative estimates of the size of the nesting aggregation in the southwest Pacific, but currently, less than 500 females nest annually in eastern Australia (Limpus and Limpus 2003).

There is no available genetic information on the loggerhead turtles entrained at the SONGS plant. However, based on information on loggerheads taken in the CA/OR drift gillnet fishery, and foraging loggerheads in Baja California, NMFS expects that these loggerheads would be originating from the slightly larger nesting population of Japan. It is projected that a total of 9 loggerhead turtles (with 3 mortalities and 2 serious injuries) may be entrained as a result of the continued operation of the DCPP and SONGS CWS over the next 16 to 20 years. If the mortalities are female loggerhead turtles, and occur in the same year, this would represent a loss of 0.3 percent of the estimated number of nesting females from the Japanese population based on the Kamezaki *et al.* (2003) nesting estimates. It is not expected that this would have a significant effect on the population and viability of the species. It is expected that the entrainment of loggerhead turtles would occur only during El Niño years when higher than average sea surface temperatures occur in the area. Loggerheads have been known to be caught by the CA/OR drift gillnet fishery during El Niño years (1992-93 and 1997-98), when unusually warm sea surface temperatures and northward flowing equatorial currents bring hundreds of thousands of pelagic red crabs from Baja California north up the coast of California. Loggerheads most likely migrate north from Baja California following their primary food source.

Given the low numbers of anticipated entrainment over the length of the current operating licenses for the DCPP and SONGS (20 years and 16 years respectively) and the current loggerhead population sizes, the entrainment of up to 9 turtles is not expected to have a detectable effect on the numbers, reproduction, and distribution of loggerhead sea turtles. As such, the continued operation of the DCPP and SONGS CWS and entrainment of 9 loggerhead turtles is not expected to appreciably reduce the likelihood of survival and recovery of the species.

4. Olive Ridley sea turtle

Neither DCPP nor SONGS have reported incidental entrainment of olive ridley sea turtles. However, olive ridleys have been known to migrate throughout the Pacific. Additionally, reports of olive ridley turtles stranding on beaches in California, including in San Luis Obispo County and San Diego County, provides evidence that olive ridleys may occur in the action area. On rare occasions, entrained sea turtles have been discovered dead or with injuries. For this reason, NMFS anticipates that DCPP may entrain three olive ridley sea turtles (one mortality and one serious injury) over the period of the plant's current operating license. NMFS also anticipates that SONGS will entrain three olive ridley sea turtles (one mortality and one serious injury) over the period of its current operating license

While olive ridleys are one of the most abundant sea turtles in the world, their populations in the Pacific are listed as endangered and threatened. In the eastern Pacific Ocean nesting occurs along the Mexican and Central American coast with a few large nesting aggregations of 475,000 to 800,000 nests per year. Because of the low numbers of anticipated entrainments by DCPP and SONGS and the large number of nesting females in the eastern Pacific Ocean, the entrainment of 6 turtles (2 mortalities and 2 serious injuries) is not expected to have a detectable effect on the numbers, reproduction, and distribution of olive ridley sea turtles. Furthermore, the continued operation of the DCPP and SONGS is not expected to appreciably reduce the likelihood of survival and recovery of the species.

IX. CONCLUSION

After reviewing the best available science and commercial information, the current status of the species, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is NMFS' biological Opinion that the proposed action is not likely to jeopardize the continued existence of endangered or threatened green, leatherback, loggerhead, or olive ridley sea turtles. No critical habitat has been designated in the action area; therefore, none will be affected.

X. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and protective regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. NMFS further defines "harm" as an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns including breeding, spawning, rearing, migrating, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the reasonable and prudent measures and terms and conditions of the Incidental Take Statement.

The measures described below are nondiscretionary, and must be undertaken by the NRC for the exemption in section 7(o)(2) to apply. The NRC has a continuing duty to regulate the activity covered by this incidental take statement. If the NRC fails to assume and implement these terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the NRC must monitor the progress of the action and its impact on the species, as specified in the incidental take statement. (50 CFR 402.14(i)(3)).

A. Amount or extent of take anticipated

NMFS anticipates that the continued operation of the DCPP and SONGS will result in the incidental entrainment, injury or mortality of green, leatherback, loggerhead, and olive ridley sea turtles. Based on previous levels of entrainment, the distribution of sea turtle species, and the operation of the facility, NMFS anticipates the following level of take of sea turtles for the remainder of the operating license for DCPP (2026) and SONGS (2022).

DCPP (level of estimated take through 2026)

Species	Total Entrainment	Mortality*	Serious Injury*
Green	15 turtles	3 turtles	1 turtles
Leatherback	3 turtles	1 turtles	1 turtles
Loggerhead	3 turtles	1 turtles	1 turtles
Olive Ridley	3 turtles	1 turtles	1 turtles

* Mortality and serious injury is a subset of the total entrainment.

SONGS (level of estimated take through 2022)

Species	Total Entrainment	Mortality*	Serious Injury*
Green	34 turtles	4 turtles	2 turtles
Leatherback	3 turtles	1 turtles	1 turtles
Loggerhead	3 turtles	1 turtles	1 turtles
Olive Ridley	3 turtles	1 turtles	1 turtles

* Mortality and serious injury is a subset of the total entrainment.

The take of sea turtles at DCPP and SONGS will be monitored through continued reporting via NMFS Stranding reports, tagging, and observations of sea turtles in the action area.

B. Effect of the take

In the accompanying biological Opinion, NMFS determined that the levels of anticipated take are not likely to result in jeopardy to green, leatherback, loggerhead, or olive ridley sea turtles.

C. Reasonable and Prudent Measures

NMFS believes that the following reasonable and prudent measures are necessary and appropriate to minimize the impacts of incidental takes of endangered and threatened sea turtles:

1. DCPP and SONGS shall implement a NMFS-approved program to prevent, monitor, and minimize the incidental take of sea turtles in the CWS.

2. All sea turtle entrainments associated with the DCPP and SONGS shall be reported to NMFS via the NMFS Stranding Reports.

3. Any sea turtle sighting by DCPP and SONGS personnel within the vicinity of the CWS shall also be reported to NMFS in a timely manner.

D. Terms and Conditions

In order to be exempt from prohibitions of section 9 of the ESA, the NRC must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. Inspection of the CWS (area between the curtain wall and bar racks at DCPP and forebay at SONGS) shall be conducted every twelve hours. Times of inspections, including those when no turtles were sighted, must be recorded.

2. Dip nets, cargo nets, and other equipment shall be available and shall be used to remove sea turtles from the DCPP and SONGS intake structures to reduce trauma.

3. Relevant plant personnel should attend a training session conducted by NMFS which will cover reporting requirements, safe handling and release requirements, resuscitation methods, and other relevant information.

4. If any (live or dead) sea turtles are taken at DCPP or SONGS, plant personnel shall notify NMFS within 48 hours of the take (Joe Cordaro, SWR Stranding Coordinator, 562-980-4017). A NMFS Stranding Report (Appendix II) must also be completed by plant personnel and sent to the SWR Stranding Coordinator via FAX (562-980-4027) within 48 hours of the take. Every sea turtle shall be photographed. NMFS may request that dead turtles be necropsied by CSTSN personnel listed in the Table below.

5. An attempt to resuscitate comatose sea turtles shall be made according to the procedures described in Appendix III. These procedures must be posted in appropriate areas.

6. Live sea turtles should be inspected for injuries. If a turtle appears to be sick or seriously injured, a CSTSN rehabilitation facility should be contacted immediately. Contact information is provided in the Table below. Appropriate transport methods must be employed following the stranding facilities' protocols to transport the animal to the rehabilitation facility for evaluation, veterinary care, tagging, and release at an appropriate location. If the turtle is uninjured, the turtle shall be tagged and released at an appropriate location.

	Dead sea turtles	Sick/ Seriously Injured sea turtles
DCPP	The Marine Mammal Center Shelbi Stoudt (415) 289-7350	The Marine Mammal Center Shelbi Stoudt (415) 289-7350
SONGS	NMFS Southwest Fisheries Science Center Robin LeRoux 858-546-5659	SeaWorld Carl Jantsch 619-226-3900 x 2410

7. Every effort should be made to observe the area around the CWS of the DCPP and SONGS facilities. Any sea turtle sighted in the vicinity of either plant should be reported to NMFS in an annual report.

8. An annual report of incidental takes shall be submitted to NMFS by February 1 of the following year. The report shall include copies of the incidental take reports, photographs (if not previously submitted), a record of all turtle sightings in the vicinity of DCPP and SONGS, and a record of when inspections of the CWS were conducted for 24 hours prior to any take. The report must also include any potential measures to reduce sea turtle entrainment or mortality by the DCPP and SONGS CWS. The report will be used to identify entrainment trends and further conservation measures necessary to minimize the incidental takes of sea turtles.

9. Plant personnel or the NRC shall notify NMFS when the DCPP or SONGS reaches 50% of the incidental take level for any species of sea turtle. At that time, the NRC and NMFS will determine if additional measures are needed to minimize the entrainment at the CWS intake structures.

NMFS anticipates that a total of 49 green sea turtles, 6 leatherbacks, 9 loggerheads, and 6 olive ridleys, will be taken as a result of the continued operation of the DCPP and SONGS over the next 16 to 20 years. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the potential for and impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. When the incidental take has been exceeded, the NRC must immediately provide an explanation of the causes of the taking and review with NMFS the need for possible modification of the reasonable and prudent measures.

XI. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or develop information. NMFS has determine that the continued operation of the DCPP and SONGS as proposed is not likely to jeopardize the continued existence of endangered and threatened sea turtles in the action area. To further reduce the adverse effects of the action on listed species, NMFS recommends that the NRC implement the following conservation measures.

1. The NRC should support and develop a research program to determine whether the DCPP and SONGS facilities provide features attractive to sea turtles (i.e. heated discharge, concentration of prey around intake structures). This program should investigate habitat use, diet, and local and long-term movements of sea turtles.

2. The NRC and DCPP and SONGS personnel should support and conduct investigations on the variable environmental conditions which may contribute to or result in increased sea turtle taking (i.e. temperature changes, influx of prey). Increased monitoring during favorable conditions for sea turtle presence near DCPP and SONGS should result from the investigations.

XII. REINITIATION OF CONSULATION

This concludes formal consultation on the continued operation of the DCPP and SONGS. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of the incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. If the amount or extent of incidental take identified in the incidental take statement that is enclosed in this biological Opinion is exceeded, the NRC should immediately reinitiate formal consultation.

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APPENDIX I.
Summary of sea turtle takes at DCPP and SONGS.

DCPP sea turtle takes (1988 through 2005)

Date	Species	Description and Disposition
4/27/94	Green	Healthy, no abrasions. Released 0.5 mi offshore.
1/10/97	Green	Healthy, minor abrasions on right front flipper. Released 0.25 mi offshore.
6/12/97	Green	Healthy, no abrasions. Released down coast from DCPP.
5/30/99	Green	Healthy, minor scrapes on the rear of the shell. Released 0.25 -0.75 mi southwest of DCPP.
8/24/99	Green	Healthy, small scrapes on top of shell and minor abrasions on front flippers. Released 0.5 -0.75 mi southwest of DCPP.
4/16/00	Green	Healthy, minor abrasions around edge of shell and right front flipper. Released 0.5 mi southwest of DCPP.
2/27/01	Green	Healthy, minor abrasions on sides, front of head, and ends of front flippers. Released 0.5 mi southwest of DCPP.

SONGS sea turtle takes (1983 through 2005)

Date	Species	Description and Disposition
7/16/83	Green	Released at Dana Point Harbor
1/11/84	Green	Released unharmed San Clemente State Beach
10/21/86	Green	Slight abrasions on head and right flipper. Released by Friends of the Sea Lion.
9/23/88	Green	Released unharmed at Dana Point Harbor
9/14/90	Green	Released at San Onofre beach.
9/26/90	Green	Released at Pendleton.
10/30/90	Green	Released at Pendleton.
10/31/90	Green	Dead. Delivered to NMFS.
2/21/91	Green	Released at Pendleton.
3/14/91	Green	Dead.
5/4/91	Green	Released at San Onofre State Beach.
10/6/91	Green	Released north of SONGS.
5/6/92	Green	Released with tag (#762).
6/3/92	Green	Released with tags (#763 and 764).
7/13/92	Green	Released south Laguna Beach.
7/30/92	Green	Released Pendleton.
8/13/92	Green	Released San Onofre State Beach.
9/9/92	Green	Released with tags (#767 and 768)
9/16/92	Green	Minor abrasions. Released with tags (#770 and 771).
2/27/93	Loggerhead	Released at San Onofre State Beach with tags (#179 and 180). Recovered in Mexico.
5/29/94	Leatherback	Decomposed carcass. Head collected.
9/9/94	Green	Released with tags (#181 and 182).
5/8/96	Green	Released with tags (#183 and 184).

5/22/96	Leatherback	Decomposed carcass. Long dead.
7/15/96	Loggerhead	Released at Dana Point with tags (#187 and 188).
11/24/97	Green	Released.
8/15/99	Green	Released with tag on left front flipper (#191).
6/19/00	Green	Released.
11/18/00	Green	Released at San Onofre State Beach with tags (#194 and 195).
8/15/02	Green	Released with tags (#196 and 197).
7/16/04	Green	Released.
9/13/04	Green	Released.
3/15/05	Green	Released with tags.
9/9/05	Green	Released at San Onofre State Beach with tags (#315 and 316).
10/8/05	Green	Released at San Onofre State Beach.

APPENDIX II

MARINE MAMMAL STRANDING REPORT - LEVEL A DATA

FIELD #: ____________ NMFS REGIONAL #: ____________ (NMFS USE) NATIONAL DATABASE#: ____________ (NMFS USE)

COMMON NAME: ____________ GENUS: ____________ SPECIES: ____________

EXAMINER Letterholder: ____________

Name: ____________ Affiliation: ____________

Address: ____________ Phone: ____________

LOCATION OF INITIAL OBSERVATION

State: ______ County: ____________
City: ____________
Body of Water: ____________
Locality Details: ____________

Latitude: ____________ N ☐ actual
Longitude: ____________ W ☐ estimated
How lat/long determined (Check ONE):
☐ GPS
☐ Map
☐ Internet/Software

OCCURRENCE DETAILS ☐ Restrand GE#: ____________ (NMFS USE)

Group Event: ☐ YES ☐ NO
If Yes, Type: ☐ Cow/Calf Pair ☐ Mass Stranding # Animals: ______ ☐ actual ☐ estimated

Findings of Human Interaction: ☐ YES ☐ NO ☐ Could not Be Determined (CBD)
If Yes, Check one or more: ☐ 1. Boat Collision ☐ 2. Shot ☐ 3. Fishery Interaction
☐ 4. Other Human Interaction: ____________
Describe How Determined: ____________
Gear Collected? ☐ YES ☐ NO Gear Disposition: ____________

Other Findings upon Level A: ☐ YES ☐ NO ☐ CBD
If Yes, Check one or more: ☐ 1. Illness ☐ 2. Injury
☐ 3. Other Findings: ____________
Describe How Determined: ____________

INITIAL OBSERVATION

Date: Year: _____ Month: ________ Day: ________
First Observed: ☐ Beach or Land ☐ Floating ☐ Swimming

CONDITION AT INITIAL OBSERVATION (Check ONE)
☐ 1. Alive
☐ 2. Fresh dead
☐ 3. Moderate decomposition
☐ 4. Advanced decomposition
☐ 5. Mummified/Skeletal
☐ 6. Unknown

LEVEL A EXAMINATION ☐ Not Able to Examine

Date: Year: _____ Month: ________ Day: ________

CONDITION AT EXAMINATION (Check ONE)
☐ 1. Alive
☐ 2. Fresh dead
☐ 3. Moderate decomposition
☐ 4. Advanced decomposition
☐ 5. Mummified/Skeletal

INITIAL LIVE ANIMAL DISPOSITION (Check one or more)
☐ 1. Left at Site
☐ 2. Immediate Release at Site
☐ 3. Relocated
☐ 4. Disentangled
☐ 5. Died at Site
☐ 6. Euthanized at Site
☐ 7. Transferred to Rehabilitation: Date: ______ Facility: ____________
☐ 8. Died during Transport
☐ 9. Euthanized during Transport
☐ 10. Other: ____________

CONDITION/DETERMINATION (Check one or more)
☐ 1. Sick
☐ 2. Injured
☐ 3. Out of Habitat
☐ 4. Deemed Healthy
☐ 5. Abandoned/Orphaned
☐ 6. Inaccessible
7. Location Hazardous: ☐ a. To animal ☐ b. To public
☐ 8. Unknown/CBD ☐ 9. Other: ____________
Comments: ____________

MORPHOLOGICAL DATA

SEX (Check ONE)
☐ 1. Male
☐ 2. Female
☐ 3. Unknown

AGE CLASS (Check ONE)
☐ 1. Adult
☐ 2. Subadult
☐ 3. Yearling
☐ 4. Pup/Calf
☐ 5. Unknown

Straight Length: ________ ☐ cm ☐ in ☐ actual ☐ estimated
Weight: ________ ☐ kg ☐ lb ☐ actual ☐ estimated

PHOTOS/VIDEOS TAKEN: ☐ YES ☐ NO
Photo/Video Disposition: ____________

TAG DATA

Tags Were:
Present at Time of Stranding (pre-existing): ☐ YES ☐ NO
Applied during Stranding Response: ☐ YES ☐ NO

ID #	Color	Type	Placement * (Circle ONE)	Applied	Present
			D DF L LF LR RF RR	☐	☐
			D DF L LF LR RF RR	☐	☐
			D DF L LF LR RF RR	☐	☐

* D = Dorsal; DF= Dorsal Fin; L = Lateral Body
LF=Left Front; LR = Left Rear; RF = Right Front; RR = Right Rear

WHOLE CARCASS STATUS (Check one or more)
☐ 1. Left at site
☐ 2. Buried
☐ 3. Rendered
☐ 4. Towed: Lat ______ Long ______
☐ 5. Sunk: Lat ______ Long ______
☐ 6. Frozen for Later Examination
☐ 7. Landfill
☐ 8. Unknown
☐ 9. Other: ____

SPECIMEN DISPOSITION (Check one or more)
☐ 1. Scientific collection
☐ 2. Educational collection
☐ 3. Other: ____________
Comments: ____________

NECROPSIED ☐ YES ☐ NO Date: ____________

NECROPSIED BY: ____________

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PLEASE USE THE BACK SIDE OF THIS FORM FOR ADDITIONAL REMARKS

ADDITIONAL REMARKS

ADDITIONAL IDENTIFIER: ______________________ (If animal is restranded, please indicate any previous field numbers here)

DISCLAIMER

THESE DATA SHOULD NOT BE USED OUT OF CONTEXT OR WITHOUT VERIFICATION. THIS SHOULD BE STRICTLY ENFORCED WHEN REPORTING SIGNS OF HUMAN INTERACTION DATA.

DATA ACCESS FOR LEVEL A DATA

UPON WRITTEN REQUEST, CERTAIN FIELDS OF THE LEVEL A DATA SHEET WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR CREDIT THE STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE. THE NATIONAL MARINE FISHERIES SERVICE WILL NOTIFY THE CONTRIBUTING STRANDING NETWORK MEMBERS THAT THESE DATA HAVE BEEN REQUESTED AND THE INTENT OF USE. ALL OTHER DATA WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR OBTAIN PERMISSION FROM THE CONTRIBUTING STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE.

PAPERWORK REDUCTION ACT INFORMATION:

PUBLIC REPORTING BURDEN FOR THE COLLECTION OF INFORMATION IS ESTIMATED TO AVERAGE 30 MINUTES PER RESPONSE, INCLUDING THE TIME FOR REVIEWING INSTRUCTIONS, SEARCHING EXISTING DATA SOURCES, GATHERING AND MAINTAINING THE DATA NEEDED, AND COMPLETING AND REVIEWING THE COLLECTION OF INFORMATION. SEND COMMENTS REGARDING THIS BURDEN ESTIMATE OR ANY OTHER ASPECT OF THE COLLECTION OF INFORMATION, INCLUDING SUGGESTIONS FOR REDUCING THE BURDEN TO: CHIEF, MARINE MAMMAL CONSERVATION DIVISION, OFFICE OF PROTECTED RESOURCES, NOAA FISHERIES, 1315 EAST-WEST HIGHWAY, SILVER SPRING, MARYLAND 20910. NOT WITHSTANDING ANY OTHER PROVISION OF THE LAW, NO PERSON IS REQUIRED TO RESPOND TO, NOR SHALL ANY PERSON BE SUBJECTED TO A PENALTY FOR FAILURE TO COMPLY WITH, A COLLECTION OF INFORMATION SUBJECT TO THE REQUIREMENTS OF THE PAPERWORK REDUCTION ACT, UNLESS THE COLLECTION OF INFORMATION DISPLAYS A CURRENTLY VALID OFFICE OF MANAGEMENT AND BUDGET (OMB) CONTROL NUMBER.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE

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APPENDIX III.
Sea Turtle Handling and Resuscitation Procedures

General Handling Guidelines:

- All sea turtles should be handled with care.
- Pick up sea turtles by the front and back of the top of the carapace or using the flippers. Do not pick up sea turtles by the head or tail.
- Dip nets, cargo nets, and other equipment should be used to lift and move turtles whenever possible.
- If a sea turtle is actively moving, it should be retained until it is released or picked up by the CSTSN.

Sea Turtle Resuscitation Regulations (50 CFR 223.206(d)(1)):

- If a turtle appears to be comatose, contact a CSTSN rehabilitation facility immediately. Once the rehabilitation facility has been contacted, attempts should be made to revive the turtle. Sea turtles have been known to revive up to 24 hours after resuscitation procedures have been followed.
  - Place the animal on its bottom shell (plastron) so that the turtle is right side up. Elevate the hindquarters at least 6 inches for a period no less than 4 hours and no more than 24 hours.
  - A reflex test, performed by gently touching the eye and pinching the tail, must be administered by a vessel operator at least every 3 hours to determine if the sea turtle is responsive.
  - Keep the turtle in a safe, contained place, shaded and moist (e.g., with a water-soaked towel over the eyes, carapace, and flippers). Observe the turtle for up to 24 hours.
  - If the turtle begins actively moving, retain the turtle until CSTSN can evaluate the animal.
  - If the turtle fails to move within 24 hours, it should be transported to a CSTSN facility for necropsy.