4.3 MARINE WATER QUALITY

This section characterizes the ocean environment in the project vicinity and analyzes potential impacts of the Proposed Project and alternatives, with a focus on water clarity and turbidity, uncontrolled releases of pollutants from project operations, and impairment of water quality from release of seabed organic materials.

4.3.1 Description of Resource/Environmental Setting

Local weather patterns along this area of the Pacific coast follow a general onshore-offshore flow. The coastal mountain terrain, which roughly parallels the shore, directs precipitation runoff directly toward the shoreline.

Surrounding land uses in this coastal area include recreational use, open space, military training and operations, agriculture, and electrical power generation. San Onofre State Beach lies adjacent to the SONGS property on the northwest (upcoast) and southeast (downcoast), making the shoreline environment largely undisturbed by development. The beachfront along the SONGS complex is open to pedestrians and beachgoers.

Hydrology

SONGS is located within the San Juan Hydrologic Unit along the shoreline adjacent to MCB Camp Pendleton. The power plant is situated in San Onofre Hydrologic Area (HA) 901.5 in northwestern San Diego County (Figure 4.3-1). The San Onofre HA drains to the Pacific Ocean via the San Onofre, Las Flores, and Aliso Canyon subwatershed basins. San Mateo and San Onofre creeks drain to the ocean north of SONGS. The topography of the San Onofre HA ranges from coastal plains along the shore to the Santa Margarita Mountains (over 2,000 feet [610 m] above mean sea level).

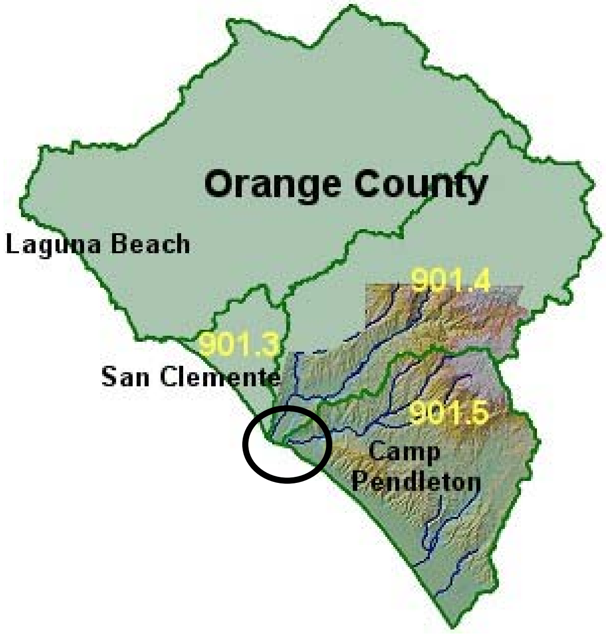

Figure 4.3-1. Hydrologic Areas Near San Onofre Nuclear Generating Station (Adapted from PCW 2004).

The current Clean Water Act Section 303(d) impaired water bodies list shows no waters within the San Onofre HA or along the Pacific Ocean shoreline that are currently impaired for water quality.

Water Quality

Because the Proposed Project is situated within the marine environment, it would have no significant issues relating to surface water quality. However, it should be noted that impacts to local marine waters in the project vicinity do occur from storm water and urban runoff, and that past water quality monitoring indicates the region's surface waters are high in total dissolved solids (TDS) from agricultural land uses, with elevated levels of nitrates, TDS, iron, sodium, and *E. coli* bacteria (PCW 2004).

Marine water quality offshore of SONGS has been studied for many years in accordance with monitoring program requirements of the NPDES permits issued by the State of California. In general, water quality in the coastal San Onofre area is considered good when compared to other subwatersheds associated with greater urbanization, runoff pollution, and municipal wastewater discharges. The kelp bed areas in the offshore vicinity of SONGS are frequently visited by commercial and recreational fishing fleets. The following paragraphs briefly describe the ocean water quality offshore of SONGS.

<u>Temperature</u>

Thermal conditions in the ocean are driven by insolation (sun intensity), seasonal atmospheric temperature and circulation, horizontal and vertical mixing within the water column, and water depth. Ocean temperature naturally decreases with depth. In southern California, summer insolation creates warmer surface temperatures, which in turn generate a thermocline—a sudden drop in temperature with depth. During thermoclinic conditions, vertical mixing between surface and bottom waters is limited because of the natural density barrier created by the sudden change in temperature. During peak winter, the temperature differential between surface and bottom water is essentially absent, creating an isothermal profile throughout the water column. When isothermal conditions exist, conditions for vertical mixing are optimal. Along the San Onofre coast, nearshore surface water temperatures generally range between 68^{o}F (20^{o}C) in peak summer and 52^{o}F (11^{o}C) in winter. Because SONGS uses the ocean as a cooling water source, temperature is routinely monitored offshore for regulatory compliance purposes.

Salinity

Derived largely from basalt sources deep in the ocean, the salt content of the sea along the southern California coast averages approximately 33 parts per thousand (ppt) throughout much of the year. Typical ranges in the nearshore environment are 33.2 ppt to 33.7 ppt, unless otherwise impacted by storm water surface runoff or regional upwelling. Salinity increases with depth (increasing salt content increases density), except during upwelling events when cooler, saline bottom waters rise toward the surface.

Density

Seawater density is driven by temperature and salinity. The density gradient (pycnocline) is created under warm surface water conditions during the summer/early-fall months. Under these conditions, the water column becomes distinctly stratified, which limits vertical mixing between surface and bottom waters. Examples of a stratified and unstratified water column are shown in Figure 4.3-2.

Hydrogen-ion Concentration (pH)

Unless otherwise influenced by planktonic activity, terrestrial runoff, or anthropogenic sources, the concentration of hydrogen ions in seawater (pH) remains fairly constant in the nearshore environment. Differentials between surface and bottom waters are greatest during stratified conditions, e.g., 0.5 units or less, in summer/fall and nearly absent in winter when isothermal conditions are common, e.g., varying less than 0.05 units. Because pH is relatively stable in the marine environment, the California Ocean Plan only allows for a maximum change of 0.2 units over ambient conditions; above this allowance the water quality could be viewed as impacted. Seawater pH in the coastal San Onofre marine environment normally ranges between 7.5 and 8.5 units, being slightly alkaline.

Dissolved Oxygen

Marine biological activity is completely reliant on the amount of dissolved oxygen (DO) in seawater. As denoted by the benchmark minimum in the Ocean Plan, an impact to DO in the water column could occur if ambient levels are depressed by more than 10 percent (SWRCB 2001). However, there are multiple factors that influence DO

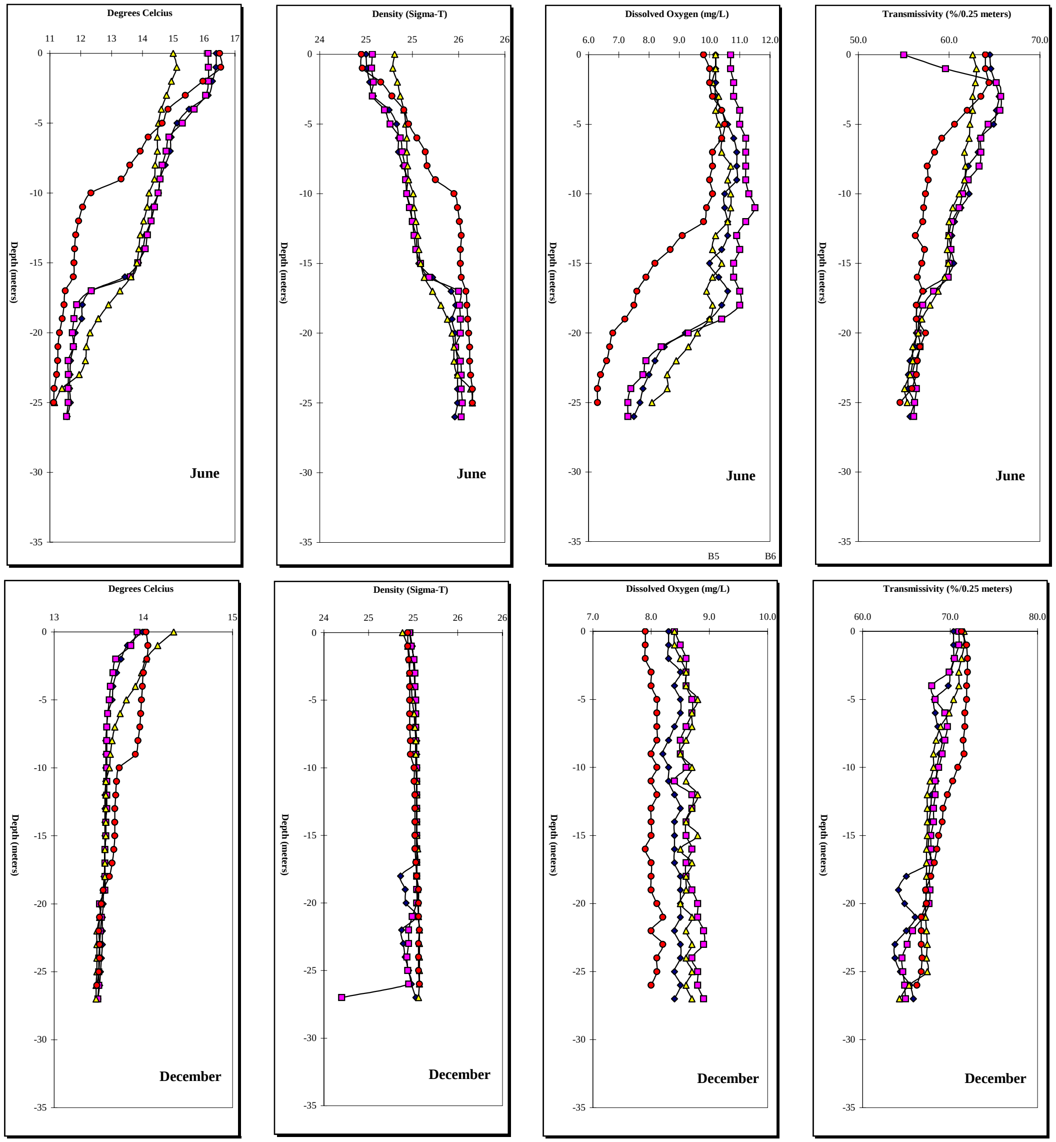

Figure 4.3-2. Example of Vertical Water Quality Profiles of Stratified (June) and Unstratified (December) Water Columns in Southern California Coastal Waters

naturally, including temperature, planktonic activity, upwelling, wind and wave action, current dynamics, water depth, and organic matter. DO decreases naturally with depth because the surface layer is most exposed to the atmosphere and experiences greater mixing and turbulence at the air-sea interface. Organic decomposition of plant and animal matter on the seafloor can decrease available DO from the oxygen demand of natural decay. In addition, instances where buried anoxic sediments are redistributed or otherwise entrained into the water column (either naturally from wave/current turbulence or mechanical disturbance) can also create significant DO drawdowns. DO concentration in seawater is generally between 8 and 9 milligrams per liter (mg/L) in the San Onofre nearshore zone.

Light Transmittance

Like DO, the availability of sunlight through the water column is essential to plant and animal life in the photic zone. The photic zone is the surface layer of the ocean where light intensity is sufficient for plant growth. Turbulence from storms and high wave action, turbidity introduced via terrestrial runoff, turbidity currents, and planktonic blooms are examples of natural conditions that cause an increase in suspended matter within the water column and significantly decrease available light. As suspended matter increases, water clarity (light transmittance) decreases. The depth of light penetration through the water column determines the vertical distribution of plant life and photosynthesis. Suspended matter generally increases closer to shore, where increasing wave action and turbulence are greater due to shallow water depths.

Seawater and Sediment Trace Metals

Most trace metals, i.e., cadmium, copper, cobalt, iron manganese, silver, and zinc, occur naturally in both seawater and marine sediments, and these metals are essential for biological productivity. Trace metals are introduced into coastal waters by terrestrial runoff (rock weathering), municipal and industrial effluent discharges, and atmospheric fallout, and they are distributed by ocean currents. Elevated concentrations of trace metals can cause negative impacts to marine organisms. The mean background concentrations of trace metals in sediments at 38 sites in the SCB ranging in depth from 98 feet (30 m) to 492 feet (150 m) are reported in Table 4.3-1.

Table 4.3-1. Mean Background Concentrations of Metals in Surface Sediments of the Southern California Bight

Metal	**Concentration (ppm)**
Silver	0.03
Cadmium	0.14
Chromium	25.4
Copper	10.4
Nickel	12.9
Lead	4.8
Zinc	48.0

Source: Dailey et al. 1993.

Nutrients

Marine plants, e.g., phytoplankton and kelp, rely on the availability of nutrients (nitrate, phosphate, and silicate) for survival and reproduction. These nutrients in coastal waters are largely derived from terrestrial runoff, upwelling events, current transport, sewage discharges, and sedimentary organic material. Nutrient concentrations vary seasonally in response to primary production (phytoplankton and zooplankton blooms). Within the SCB, typical ranges of nutrient concentrations in surface waters (less than 65 feet [20 m]) are 0.3 to 12 micrograms per liter (µg/L) for nitrate, 9.5 to 47.5 µg/L for phosphate, and less than 0.5 mg/L for silicate (Dailey et al. 1993).

Nitrogen is the principal nutrient limiting plant growth in the surface waters of the SCB (Dailey et al. 1993). Nitrogen compounds used by plants, especially nitrates, are present in very low concentrations in the photic zone. Below the photic zone, which averages approximately 66 feet (20 m) in depth near the coast, nitrate levels increase with water depth. Temperature-depth gradients closely parallel the nitrate gradients, and it has been found that nitrate levels are generally adequate or good for plant growth in water colder than 57^{o}F (14^{o}C), uncertain and variable in water between 57^{o}F (14^{o}C) and 61^{o}F (16^{o}C), and inadequate in water warmer than 61^{o}F (16^{o}C) (CSLC 1998).

Nitrate concentration gradients change as a result of waves, surface runoff, and upwelling and downwelling events. Waves cause turbulent mixing of deeper water layers within the photic zone, which can increase nitrate concentrations near the surface. Surface runoff is often associated with nutrient addition but is not a major contributor. Wind-induced upwelling along the San Onofre coastline has been recorded during sustained downcoast wind events. As sustained winds blow downcoast from the north-northwest, the Coriolis acceleration causes an offshore displacement of surface water along the shoreline. The natural forcing of surface water offshore creates an upward vertical circulation that brings cooler, nutrient-rich bottom water to the surface. Upwelling is typical during the regional intensification of wind patterns during spring.

El Niño

El Niño events are deep, persistent downwellings that occur at intervals of years in the eastern Pacific Ocean. During El Niños, warm, westerly winds cause downwellings along the coast of southern California and bring powerful winter storms. El Niños can lead to drastic reductions in plant production due to increased water temperatures and reduced nutrients, while frequent storms can remove benthic macroalgae. Storm waves also cause deep mixing and thus may reduce the time that phytoplankton reside in the photic zone.

Point-source Discharges

In 1989, point-source discharges (pipes and outfalls) accounted for a combined daily total of over 7 billion gallons (27 billion liters) of treated sewage, cooling water, and processing water pumped to the Pacific Ocean between Goleta and San Diego (Continental Shelf Associates 1993). Point sources for this waste included municipal wastewater plants, electrical generating stations, and petroleum refineries. Although the effluent volumes discharged through marine outfalls have increased 30 percent since 1973, emissions of solids have declined 70 percent due to source control and improved treatment methods (Continental Shelf Associates 1993). Federal, State, and local legislation that requires the application of discharge permits and the implementation of monitoring programs regulates point-source discharges, similar to the regulatory compliance program at SONGS.

Bathymetry

SONGS Unit 1 intake and discharge conduits extend perpendicular to the shoreline and extend 3,200 feet (975 m) and 2,600 feet (793 m) from the seawall to an approximate depth of 29 feet (9 m) and 24 feet (7 m) relative to MLLW, respectively. The seabed slope along the conduit alignments becomes gentler with depth (1:11 onshore; 1:60 from surf zone; and 1:100 beyond 12 feet [4 m] depth) (BGI 2003). Bathymetry contours are fairly regular and parallel to the shoreline beyond 12 feet (4 m), with larger variations closer to shore that are presumed to be hard bottom substrate of the San Mateo Formation (Elwany 2000).

Wave Climate

Based on wave-buoy data from the Coastal Data Information Program (CDIP) recorded at the Oceanside mooring, heave and direction data (Figures 4.3-3 and 4.3-4) indicate that the typical wave climate approaches the coast from the south-southwest at heights below 5 feet (2 m) with periods of 4 to 12 seconds (Elwany 2000; BGI 2003). The gentle sloping bathymetry described above provides for a gradual energy release as the waves approach the southwest-facing coastline. Although bathymetry in the San Onofre area would generally support a gentle surf break, winter storm conditions and offshore disturbances can affect wave train characteristics. Particularly in winter, the wave climate intensifies from storm-induced wind action and surge, which causes coastal scouring and the movement of beach material offshore.

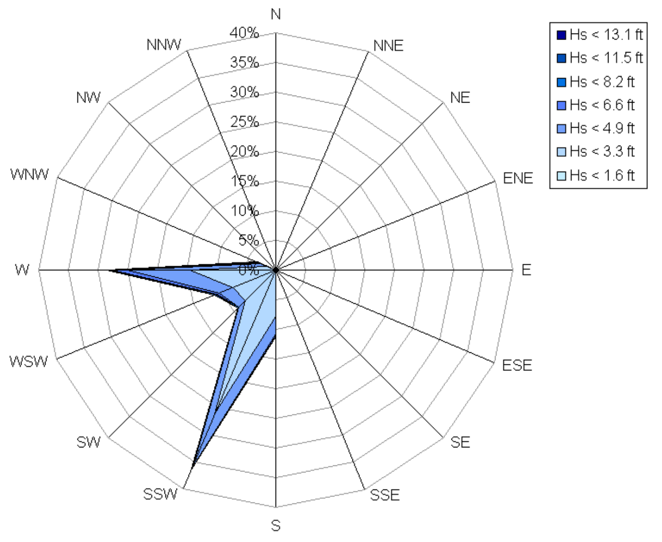

Figure 4.3-3. Wave Rose for Oceanside Buoy CA045 (May 1997 to July 2003). Adapted from BGI 2003.

Current Forcing

Physical oceanographic processes are principally driven by atmospheric pressures and stresses acting upon the sea surface, which induces current flow. Once these forces are applied, water parcels or masses are set into motion, thereby changing and distributing the chemical properties of the water body. The behavior of ocean currents is largely dependent on physical forces and the bathymetry native to the area. Water moving along the coast is guided by local bathymetric features

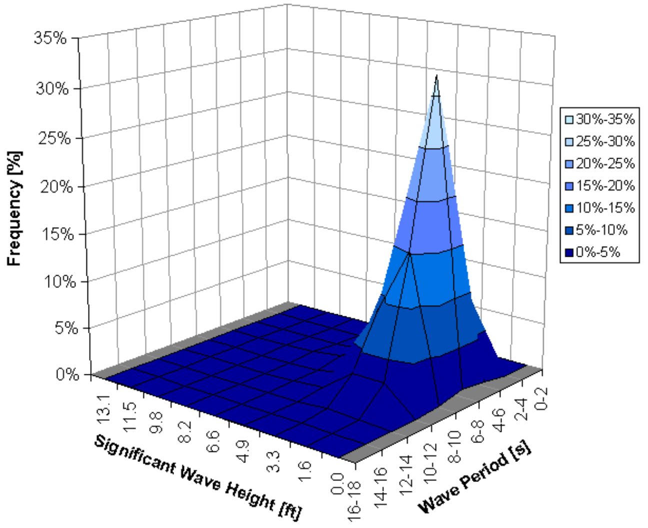

Figure 4.3-4 Wave Height, Period, and Frequency of Occurrence as Recorded at Oceanside Buoy CA045 (May 1997 to July 2003). Adapted from BGI 2003.

and can be substantially slowed by the roughness of underlying features due to increased friction. Nearshore currents typically follow the general alignment of bathymetric contours.

Nearshore Currents

Early oceanographic studies (1964-1965) conducted at San Onofre in connection with the siting of the power plant (Marine Advisers 1965a, 1965b) found currents to be strongly influenced by both winds and tides. Currents were generally parallel to the coast. Current speeds were rarely over 15 cm/sec (0.3 knots) and were usually below 10 cm/sec (0.2 knots). However, in 1965, strong currents (up to 34 cm/sec [0.7 knots]) were recorded during a period of calm winds and minimum tidal range, which was believed to be attributed to the California current system.

The SONGS engineering study (BGI 2003) provides a regional perspective of offshore currents. As shown in Figure 4.3-5, the shallowest currents measured offshore of Santa Barbara ranged between approximately 0.3 to 0.4 knots, with an average current velocity of approximately 0.37 knots. Therefore, the 1965 local data are consistent with the more recent regional data of the SONGS study.

In addition, work summarized by the USACE (CCSTWS 1986) states that mean nearshore currents in the Oceanside Littoral Cell, which includes San Onofre, are generally southward and weak (less than 10 cm/sec or 0.2 knots).

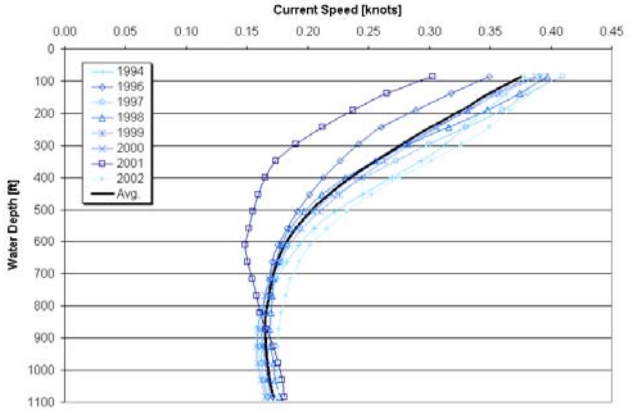

Figure 4.3-5. Average Annual Current Velocity Profiles For NOAA Buoy 46054, Santa Barbara. Adapted From BGI 2003.

Sediment Transport

Currents in the surf zone along the shoreline are created by the refractive energy from breaking waves as they strike the coast at oblique angles and by littoral currents. Nearshore currents and littoral transport will move suspended sediment alongshore and cross-shore until it settles. In the San Onofre area, sediment transported to the south or downcoast would be anticipated relative to the dominant downcoast current regime. However, current speeds are generally low (as described above) and the distance that particulates could be transported would largely be contingent on their mass, level of suspension within the water column, and physical turbulence at the time of suspension. The sediment of the seabed in the SONGS area consists of sand and shell fragments, with a mean grain size diameter of about 0.02 inches (0.05 cm) (medium-grained sand) (Elwany 2000).

As described in an earlier engineering report (BGI 2003), the typical width of the surf zone is approximately 150 to 600 feet (46 to 183 m), and the maximum depth at which sediment transport takes place is calculated at approximately 21 feet (6 m) of water depth, corresponding to a distance of roughly 1,970 to 2,140 feet (601 to 652 m) from the shore.

Tide

The tide along southern California is a mixed, semidiurnal tide, with two differing high tides and two differing low tides per day. As the tide rises and falls, tidal currents are created. These currents are most notable in nearshore, shallow areas, and tend to be dampened in deeper water. The daily tidal range is approximately 5 feet (2 m), and ranges from about -2 feet (-0.6 m) below MLLW to about 7 feet (2 m) above MLLW annually. These ranges, however, do not account for storm tides that may raise the sea level higher at unpredictable moments. The period of the tide varies from about 10 to 14 hours with the most common period being 11 hours. Tides reach their maximum ranges in December-January and June-July, corresponding to spring tide and neap tide conditions associated with peak gravitational forces of the sun and moon.

4.3.2 Regulatory Setting

Federal

Clean Water Act

The principal law that serves to protect the nation’s waters is the Federal Water Pollution Control Act, which was originally enacted in 1948. This legislation, which today is more commonly referred to as the Clean Water Act (CWA), underwent significant revision when Congress, in response to the public’s growing concern of widespread water pollution, passed the Federal Water Pollution Control Act Amendments of 1972.

The 1972 legislation established two fundamental, national goals: eliminate the discharge of pollutants into the nation’s waters and achieve water quality that is both “fishable” and “swimmable.” The 1972 amendments to the CWA also prohibited the discharge of any pollutant to waters of the United States from any point source, e.g., a discharge pipe, unless the discharge was authorized by an NPDES permit. CWA Section 402 prohibits the discharge of pollutants into waters of the United States from any point source without an NPDES permit.

State

Water Quality Control Plan for Ocean Waters of California

The 2001 *Water Quality Control Plan for Ocean Waters of California* (Ocean Plan) was created by the State Water Resources Control Board (SWRCB) to protect “the quality of the ocean waters for use and enjoyment by the people of the State.” The provisions of the Ocean Plan apply to both point source and non-point source discharges to the ocean waters of California. The Ocean Plan sets forth water quality objectives and effluent limitations for the oceans of the State. These objectives, as they apply to the SONGS project area, are:

Physical Characteristics

- Floating particulates and grease and oil shall not be visible.
- The discharge of waste shall not cause aesthetically undesirable discoloration of the ocean surface.
- Natural light shall not be significantly reduced at any point outside the initial dilution zone as the result of the discharge of waste.
- The rate of deposition of inert solids and the characteristics of inert solids in ocean sediments shall not be changed such that benthic communities are degraded.

Chemical Characteristics

- The dissolved oxygen concentration shall not at any time be depressed more than 10 percent from that which occurs naturally, as the result of the discharge of oxygen demanding waste materials.
- The pH shall not be changed at any time more than 0.2 units from that which occurs naturally.
- The dissolved sulfide concentration of waters in and near sediments shall not be significantly increased above that present under natural conditions.

- The concentration of substances set forth in Ocean Plan Chapter II, Table B, in marine sediments shall not be increased to levels which would degrade indigenous biota.
- The concentration of organic materials in marine sediments shall not be increased to levels that would degrade marine life.
- Nutrient materials shall not cause objectionable aquatic growths or degrade indigenous biota.
- Numerical Water Quality Objectives specified in Ocean Plan Table B shall not be exceeded.

Biological Characteristics

- Marine communities, including vertebrate, invertebrate, and plant species, shall not be degraded.
- The natural taste, odor, and color of fish, shellfish, or other marine resources used for human consumption shall not be altered.
- The concentration of organic materials in fish, shellfish, or other marine resources used for human consumption shall not bioaccumulate to levels that are harmful to human health.

Radioactivity

- Discharge of radioactive waste shall not degrade marine life.

Porter-Cologne Water Quality Control Act

Under the Porter-Cologne Water Quality Control Act (Porter-Cologne; California Water Code Section 13000), the SWRCB is provided with the ultimate authority over State water rights and water quality policy. However, Porter-Cologne also established nine RWQCBs to provide oversight on water quality issues at a regional and local level. San Onofre lies within the jurisdiction of the San Diego RWQCB.

Although the RWQCBs are responsible for a variety of water quality functions, one primary function is the preparation and updating of regional Basin Plans, which serve to control water quality within various hydrologic and geographic regions. Basin Plans establish:

- the beneficial uses of individual water bodies to be protected;
- water quality standards, commonly known as water quality objectives, for both surface water and groundwater; and
- actions necessary to maintain these standards such that non-point and point-source pollution in California waters is controlled.

To protect the beneficial uses of State waters, the Basin Plan requirements are incorporated into the State NPDES program described below.

California NPDES Permit Programs

In many states, the U.S. Environmental Protection Agency (EPA) has delegated administration of the NPDES permit program to the state water quality control authority. Therefore, in California, the SWRCB and the RWQCBs administer the NPDES permit program. Currently, discharges from construction, industrial, and municipal activities are regulated under the NPDES program, all of which are described further below.

Similar to that prescribed by the Ocean Plan, under the NPDES permit program described above, SCE complies with a number of environmental permit requirements for SONGS that serve to monitor, document, and mitigate potential impacts from:

- thermal discharge;
- water chemistry alterations;
- turbidity and light transmittance;
- sediment chemistry degradation or characterization changes by solids deposition or redistribution;
- pelagic and benthic habitat quality; and
- radioactivity.

Local

The California NPDES program provides for localized control over potential water quality impacts from SONGS through the regulatory oversight of the San Diego RWQCB. The San Diego RWQCB is responsible for NPDES compliance and the management of water resources and quality within the San Onofre HA.

4.3.3 Significance Criteria

The Porter-Cologne Act has established a comprehensive program for the protection of beneficial uses, as well as water quality objectives for waters of California (Ocean Plan). The significance of potential water quality impacts is determined by comparing predicted project effects to objectives and criteria established in the Ocean Plan.

An impact to marine water quality or sediment quality would be significant if the action would:

- Violate any water quality standards or waste discharge requirements or otherwise substantially degrade water quality;
- Result in water quality values that would exceed Ocean Plan criteria or would result in degradation of a beneficial use of area waters as defined in the Ocean Plan. In addition, water quality parameters that may have adverse biological effects would be considered significant even if thresholds would not result in a violation of established water quality standards;
- Introduce potentially toxic materials into the water column and onto the seafloor from resuspended sediment during disposition, which would expose aquatic organisms to contaminant concentrations with the potential for causing acute toxicity and/or bioaccumulation;
- Create turbidity, DO demand, biological/chemical oxygen demand, contaminants, or other conditions that would result in substantial mortality of aquatic organisms;
- Alter water circulation to the extent that persistent adverse effects on water quality would result; or
- Otherwise substantially degrade water or sediment quality, physically, chemically, or aesthetically.

4.3.4 Impact Analysis and Mitigation

With the exception of the No Project Alternative, any disposition of the SONGS Unit 1 intake and discharge components (for any of the alternatives proposed) would create impacts to marine water quality in the project area. The significance of these impacts would vary greatly depending on the approach to the dismantling, demolition, and removal of the offshore components of the Unit 1 cooling system. These impacts, and the significance of each, are described below.

Further, this impact analysis assumes that the Proposed Project and its alternatives will comply with all governing laws, ordinances, regulations, statues, and other Federal, state, and local requirements.

Impact WAT-1: Turbidity Plumes and Reduced Water Clarity

Turbidity impacts during operations would reduce water column light transmittance and clarity (Class II)

Impacts during project operations would increase turbidity, decrease light transmittance, and release sediment constituents into the water column. During activities, the placement of dredge spoil and concrete pieces at the excavation locations would temporarily disturb the fine sands (and likely silts) of the benthic environment, causing sediment resuspension and inducing localized turbidity plumes. Sand-sized particles would fall out of suspension quickly (within seconds or minutes) in the immediate vicinity, while silt-sized particles could remain in suspension for many hours or days before settling. These plumes of lighter particulates could therefore be transported farther downcoast into undisturbed areas beyond the project site.

Increased turbidity outside the immediate project area caused by the Proposed Project could reduce light transmissivity in the water column and affect surrounding biological resources. Because kelp and other primary producers in the project vicinity rely on sunlight, substantial increases in turbidity could negatively affect biological productivity by reducing available sunlight and nutrients, as well as potentially causing suffocation. Figure 4.3-6 illustrates the proximity of kelp resources relative to the SONGS Unit 1 conduits.

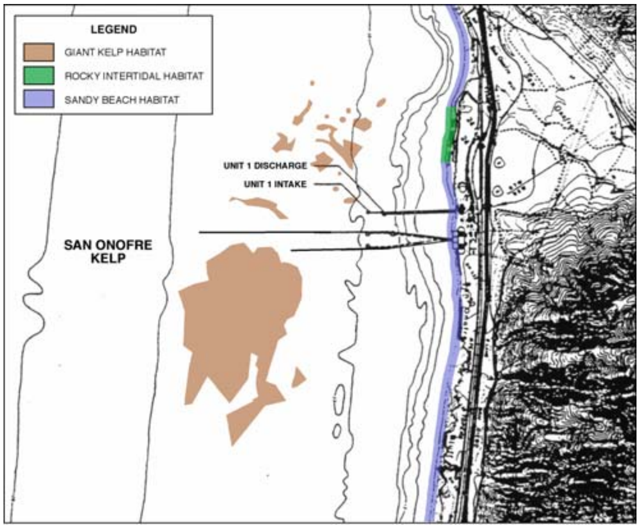

Figure 4.3-6. Kelp Bed Resources in the Vicinity of SONGS.

The Applicant's engineering study (BGI 2003) estimated a dredging footprint area of disturbance around the terminal structures of up to 250 feet by 250 feet (76 m by 76 m) for the intake structure and 300 feet by 250 feet (91m by 76 m) for the discharge structure. This would include the excavation trench as well as the area where dredged materials would be sidecast adjacent to the excavation. For the manhole risers, the footprint of direct dredging impact was estimated at 200 feet by 200 feet (61 m by 61 m). These “worst-case” areas of impact are shown in (Table 4.3.-2).

Table 4.3-2. Worst Case Estimates of Dredging Impacts, SONGS Unit 1 Disposition*

Item	Approx. Depth Contour	Estimated Disturbance Duration	Estimated Disturbed Area	Potential Downcurrent Area Affected
	(feet)		(sq. feet)	(sq. feet)
Intake	28	23 days	62,500	15,950
Discharge/ Manhole 26+00/27+04	24	25 days	75,000	19,140
Manhole 21+75	21**	7 days	40,000	12,760
Manhole 17+20	12	7 days	40,000	12,760
Manhole 12+14	10	7 days	40,000	12,760
Manhole 7+34	8	5 days	40,000	12,760
Total		**74 days**	**297,500**	**86,130**

* Source: Adapted from BGI 2003.
** Calculated depth at which nearshore sediment transport ceases (BGI 2003).

The more detailed Work Execution Plan (WEP) (APCI 2004) proposes a much smaller area of dredging impact. The excavation would be completed with a clamshell bucket to a depth of approximately 5 feet (2 m) around each terminal structure and offshore manhole riser, and the excavated material would be sidecast adjacent to the dredged area. The excavation trench would have a side slope of 1:1, and approximately 45 CY (34 m^3) of material would be excavated for each terminal structure. For the nearshore manhole risers, the SSV would be utilized, and the direct dredging impacts would be confined to the area within the cofferdam lowered from the SSV.

The WEP does not provide an estimate of the area of impact from dredging activities. However, the WEP would result in much smaller footprints of impact than those estimated in the original engineering study. Adherence to the WEP would lessen the “worst case” dredging and turbidity impacts depicted in Table 4.3-2.

Based on the Applicant’s engineering study (BGI 2003), the combined action of breaking waves and the longshore current is expected to mobilize disturbed sediment and redeposit it into the excavations created. This is based on an assumed net-downcoast transport of suspended sediment, an average 1.0-knot velocity, and an average grain size diameter of 0.02 inches (0.05 cm) (lower range of fine sand). Based on the estimated disturbed footprint for five separate manhole locations, plus the intake and discharge area footprints, a total of 286,000 square feet (26,570 m) of seafloor would be disrupted. These disruptions would cause six temporary turbidity plumes at varying times and locations through the project duration (Table 4.3-2).

As described in the engineering report (BGI 2003), an assessment of turbidity was calculated based on the above oceanic current conditions, grain size, and a 10-foot (3-m) sediment drop height above the seafloor. A settling velocity, sediment fall time, and horizontal settling distance were calculated, resulting in an estimated distance of 63.8 feet (19.5 m) that suspended sediment would travel before settling to the seabed. This distance was used in determining the potential downcurrent area affected in Table 4.3-2. It should be noted that the downcurrent areas affected in Table 4.3-2 reflect conservative estimates because they consider a littoral current velocity that is higher than actual conditions, i.e., 1 knot *vs*. 0.2 - 0.4 knots.

The engineering report (BGI 2003) proposes to leave dredge spoils in-place and allow ambient ocean currents to slowly “erode” sediment downcurrent and gradually refill the excavated areas. The analysis provided estimates that sediment transport and backfilling of excavations would occur much more slowly in deeper water, i.e., 21 feet (6 m) or greater. Although this approach would avoid the redisturbance of spoil material during final seafloor “grading,” it would rely on several years, i.e., as many as 5 years, of sediment movement by currents to refill excavations in the deepest areas, i.e., intake terminal structure. However, by allowing the sidecast dredge spoils to “erode” back into the excavations, the additional disturbance and turbidity caused by mechanically relocating the material would be avoided.

In addition to impacts associated with the physical disturbance and movement of seafloor sediments, the lifting of demolished concrete recycling materials and their placement on transport barges would also create isolated, temporary turbidity conditions.

Overall, the marine water quality impacts from project-induced turbidity would be significant (Class II).

<u>Mitigation Measures for Impact WAT-1: Turbidity Impacts</u>

MM WAT-1a. **Dredge-bucket Design.** The Applicant shall minimize turbidity by using a closed-cap bucket for mechanical dredging around the terminal structures. A closed-cap bucket dredge or similar device shall be employed to minimize turbidity at all excavation areas. Work in the nearshore zone is proposed via a surf sled vehicle to access the nearshore manhole access structures, while minimizing wave impacts to the work structure and the footprint on the seafloor.

MM WAT-1b. **Drop Height.** The Applicant shall minimize turbidity through best management practices for minimizing spill of sediment by minimizing horizontal and vertical travel while placing sediment spoils from excavated areas. Although a number of sediment drop heights were investigated, a maximum 10-foot (3-m) drop height shall be employed.

MM WAT-1c. **Spoil Management.** The creation of submarine dredge spoils shall be managed to minimize the footprint over the adjacent, existing benthic community. Spoils shall be placed as close to each excavated area as practicable. Spoil height shall be configured to take best advantage of natural infill by nearshore currents (without being overly obtrusive). All excavated material shall be placed upcurrent of each respective excavation. Excavations at depths greater than 21 feet (6 m) shall be partially filled by mechanical means to assist in the reestablishment of habitat without penetration into the preexisting benthic surface.

MM WAT-1d. **Anchoring.** The Applicant shall keep anchors suspended within the water column via a support vessel before being dropped at predetermined locations.

Rationale for Mitigation

Turbidity impacts can be greatly reduced by minimizing the drop height during sidecasting of dredged material. The horizontal extent of turbidity and dredge bucket spillage is a function of the longshore current, the sediment grain size distribution, and the drop height above the seabed. Reducing the vertical drop height and horizontal sidecasting distance would reduce turbidity plumes from the excavation activities.

Minimizing spoil footprint would reduce benthic environment impacts and require a heightened vertical spoil profile. Taller spoil profiles close to the excavation would help to promote the potential for slumping of stockpiled material into the excavated area.

Minimizing anchor dragging during multiple anchor-sets would reduce the disturbed area of the seafloor and the resuspension of sediment.

Impact WAT-2: Indirect Discharges to the Marine Environment

Uncontrolled releases of human-derived pollutants to the marine environment during project activities could impact local water quality and biota (Class III)

Shipborne systems on tugboats, barges, and other floating surfaces may discharge hydraulic oils or other contaminants from deck areas overboard. Sufficient planning would be required for spill prevention, control, and countermeasures to preempt impacts associated with an accidental release or spill. In order to minimize the potential for unanticipated release of pollutants due to inclement weather or rough sea conditions, the *Marine Safety Plan* (Appendix F) has been included in the project. One element of the Marine Safety Plan requires the project manager to shut down or not permit any operation when existing or forecast sea states or weather conditions would create unsafe working conditions for personnel or equipment.

In order to assure that personnel, equipment and procedures are in place to respond to accidental releases the *Oil Spill Response Plan* (Appendix G) has been included in the project. With these measures, the impact of indirect discharges would be less than significant (Class III). No mitigation is required.

Impact WAT-3: Nutrient Addition and Dissolved Oxygen Demand

Construction impacts during the Proposed Project could result in the release of seabed organics into the water column that would increase nutrients and reduce dissolved oxygen levels (Class III)

The Proposed Project has the potential to increase concentrations of organic matter within the water column, which could increase primary productivity and decrease DO concentration in the vicinity during operations. As a result of excavation, organic matter within the sediments would be redistributed into the water column via mechanical dredging. Large increases of organic matter in the water column could lead to a decrease in DO concentration. However, at each excavation, potential DO decreases would be highly localized and short term, and water conditions would be expected to quickly return to natural conditions following disturbance. In addition, because this Project is within the nearshore zone, terrestrial runoff in the immediate area can introduce nutrient concentrations (as well as turbidity and sedimentation) that would be orders of magnitude greater than those posed by the implementation of the Proposed Project. Early studies of turbidity in the SONGS area (Tekmarine 1980) documented significant natural turbidity plumes from upcoast sources, i.e., San Mateo and San Onofre creeks. As such, the water quality impacts associated with the Proposed

Project would be expected to be less severe than those caused by coastal runoff. Therefore, project-related disturbances to ambient water quality are expected to be minor and short-lived (Class III). No mitigation is required.

Table 4.3-3 summarizes the marine water quality mitigation measures.

Table 4.3-3. Summary of Water Quality Impacts and Mitigation Measures

Impact	Mitigation Measures
WAT-1: Turbidity Plumes and Reduced Water Clarity	**WAT-1a.** Use closed-cap dredge bucket and surf sled vehicle. **WAT-1b.** Minimize sediment drop height to 10 feet (3 m) maximum. **WAT-1c.** Minimize spoil placement distance from excavation; create heightened spoil profile. **WAT-1d.** Minimize anchor dragging.
WAT-2: Indirect Discharges to the Marine Environment	No mitigation required.
WAT-3: Nutrient Addition and Dissolved Oxygen Demand	No mitigation required.

4.3.5 Impacts of Alternatives

4.3.5.1 Complete Removal of Conduits Alternative

Impact WAT-ALT-1: Turbidity Plume and Reduced Water Clarity

Turbidity impacts during excavation and removal would reduce water column light transmittance and clarity (Class II)

In completely excavating, removing, and disposing the entire SONGS Unit 1 cooling water system (all structures, foundations, and other components), this project alternative would have greater consequence on the marine environment due to its duration (up to 1 year) and much larger impact footprint.

The onshore portion of this work would require as much as 2 acres (0.8 ha) of beachfront for construction staging and materials storage (see Figure 3.3-1) that could pose water quality impacts over a variety of seasons and surf conditions. The trestle required for removing the conduits and terminal structures (300-foot-long [91-m]) would also involve sheet-pile barriers extending 400 feet (122 m) from the beach along the north and south perimeters of the conduits. The placement of these structures, coupled with the clamshell dredging of approximately 15,000 CY (11,500 m^3) of seabed, pose a variety of significant water quality impacts. In addition, the removal of the pipe sections, the replacement of sidecast sediment seabed material back into the excavation voids, and the import/placement of 12,000 CY (9,175 m^3) of additional material would cause significant impacts to water quality and the marine environment.

Construction work in the offshore area would create similar impacts as those expected in the nearshore area.

Approximately 120,000 CY (91,746 m^3) of seabed material would be excavated and an additional 80,000 CY (61,164 m^3) of imported material would be required for backfill. The offshore operations would also require 12 months of construction, which would be conducted concurrently with the onshore activities. Overall, the marine water quality impacts from increased turbidity under the complete removal alternative would be significant (Class II).

Mitigation Measures for Impact WAT-ALT-1: Turbidity Plume and Reduced Water Clarity

MMs WAT-1a, WAT-1b, WAT-1c, and WAT-1d would apply to this impact.

Impact WAT-ALT-2: Indirect Discharges to the Marine Environment

Uncontrolled releases of human-derived pollutants to the marine environment during activities could impact local water quality and biota (Class III)

As with the Proposed Project, shipborne systems on tugboats, barges, and other floating surfaces may discharge hydraulic oils or other contaminants from deck areas overboard. The implementation of the Marine Safety Plan and the Oil Spill Response Plan would reduce the potential impact to less than significant (Class III). No mitigation is required.

Impact WAT-ALT-3: Nutrient Addition and Dissolved Oxygen Demand

Construction impacts during project implementation could result in the release of seabed organics into the water column that would increase nutrients and reduce dissolved oxygen levels (Class III)

The Complete Removal of Conduit Alternative has the potential to increase concentrations of organic matter within the water column, which could increase primary productivity and decrease DO concentrations in the vicinity during operations. There would be an increased amount of dredging due to the increase in the amount of excavation, which could result in a decrease in DO concentration. As with the Proposed Project, potential DO decreases would be highly localized and short term. Therefore, disturbances to ambient water quality related to this alternative are expected to be minor and short-lived (Class III) and no mitigation is required.

4.3.5.2 Removal of Nearshore Portions of Conduits

Similar to the onshore portion of the Complete Removal Alternative described above, this alternative would involve essentially the same scope of work, and impacts within the shoreline and nearshore area would be identical.

Impact WAT-ALT-4: Turbidity Plume and Reduced Water Clarity

Turbidity impacts during operations would reduce water column light transmittance and clarity (Class II)

Impacts to water column light transmittance would be the same for this alternative as for the Complete Removal of Conduit Alternative. While the duration of disposition activities is shorter with this alternative, construction-related impacts would still be significant (Class II).

Mitigation Measures for Impact WAT-ALT-4: Turbidity Plume and Reduced Water Clarity

MMs WAT-1a, WAT-1b, WAT-1c, and WAT-1d would apply to this impact.

Impact WAT-ALT-5: Indirect Discharges to the Marine Environment

Uncontrolled releases of human-derived pollutants to the marine environment during activities could impact local water quality and biota (Class III)

As with the Complete Removal of Conduit Alternative, shipborne systems on tugboats, barges, and other floating surfaces may discharge hydraulic oils or other contaminants from deck areas overboard. . The implementation of the Marine Safety Plan and the Oil Spill Response Plan would reduce the potential impact to less than significant (Class III). No mitigation is required.

Impact WAT-ALT-6: Nutrient Addition and Dissolved Oxygen Demand

Construction impacts could result in the release of seabed organics into the water column that would increase nutrients and reduce dissolved oxygen levels (Class III)

This alternative has the potential to increase concentrations of organic matter within the water column, which could increase primary productivity and decrease DO concentration in the vicinity during operations. There would be an increased amount of dredging due to the increase in the amount of excavation, which could result in a decrease in DO concentration. However, potential DO decreases would be highly localized and short term. Therefore, disturbances to ambient water quality related to this alternative are expected to be minor and short-lived (Class III), and no mitigation is required.

4.3.5.3 Crush Conduits and Remove Terminal Structures

This alternative would be identical to the onshore portion of the alternatives above, except the conduit would be crushed in place. This effort would employ a drop chisel-shaft to crush the conduits. The rubble would remain, eventually being buried over time by migrating sediments transported by local currents.

The intake and discharge vertical risers in the offshore area would be removed once the seabed around them was excavated. The remaining conduits and manhole risers would be crushed in place.

Impact WAT-ALT-7: Turbidity Plume and Reduced Water Clarity

Turbidity impacts during operations would reduce water column light transmittance and clarity (Class II)

This alternative, though less harmful to marine water quality than the Complete Removal Alternative, would cause greater impacts than the Proposed Project by increasing the disturbed area and inducing significant turbidity from the crushing operations. While the duration of disposition activities is shorter with this alternative than the Complete Removal of Conduit Alternative, construction related impacts would still be significant (Class II).

<u>Mitigation Measures for Impact WAT-ALT-7: Turbidity Plume and Reduced Water Clarity</u>

MMs WAT-1a, WAT-1b, WAT-1c, and WAT-1d would apply to this impact.

Impact WAT-ALT-8: Indirect Discharges to the Marine Environment

Uncontrolled releases of human-derived pollutants to the marine environment during activities could impact local water quality and biota (Class III)

As with the Complete Removal of Conduit Alternative, shipborne systems on tugboats, barges, and other floating surfaces may discharge hydraulic oils or other contaminants from deck areas overboard. . The implementation of the Marine Safety Plan and the Oil Spill Response Plan would reduce the potential impact to less than significant (Class III). No mitigation is required.

Impact WAT-ALT-9: Nutrient Addition and Dissolved Oxygen Demand

Construction impacts could result in the release of seabed organics into the water column that would increase nutrients and reduce dissolved oxygen levels (Class III)

This alternative has the potential to increase concentrations of organic matter within the water column, which could increase primary productivity and decrease DO concentration in the vicinity during operations. There would be an increased amount of dredging due to the increase in the amount of excavation, which could result in a decrease in DO concentration. However, potential DO decreases would be highly localized and short term. Therefore, disturbances to ambient water quality related to this alternative are expected to be minor and short-lived (Class III), and no mitigation is required.

4.3.5.4 Artificial Reef

The Artificial Reef Alternative would only dismantle the top two sections of the terminal structures and place a steel grill over the opening. The concrete sections would remain permanently on the seafloor around the existing rock riprap, creating a larger artificial reef, or the concrete sections could be removed and placed at another artificial reef in nearby coastal waters as an option.

Under this habitat-enhancement alternative, the need for dredging would be eliminated, the manhole risers would be left undisturbed, the marker buoys and anchors would be removed, and the onshore portions of the conduits would not be plugged.

Impact WAT-ALT-10: Turbidity Plume and Reduced Water Clarity

Turbidity impacts during operations would reduce water column light transmittance and clarity (Class III)

Impacts to water column light transmittance would be minimal for this alternative. Due to the elimination of dredging, there would be negligible turbidity impacts and no mitigation is required (Class III).

Impact WAT-ALT-11: Indirect Discharges to the Marine Environment

Uncontrolled releases of human-derived pollutants to the marine environment during activities could impact local water quality and biota (Class III)

As with the Complete Removal of Conduit Alternative, shipborne systems on tugboats, barges, and other floating surfaces may discharge hydraulic oils or other contaminants from deck areas overboard. . The implementation of the Marine Safety Plan and the Oil Spill Response Plan would reduce the potential impact to less than significant (Class III). No mitigation is required.

Impact WAT-ALT-12: Nutrient Addition and Dissolved Oxygen Demand

Construction impacts could result in the release of seabed organics into the water column that would increase nutrients and reduce dissolved oxygen levels (Class III)

The Artificial Reef Alternative would not significantly decrease DO levels. The lack of dredging associated with this alternative would result in less release of seabed organics into the water column than with the Proposed Project. Impacts would be less than significant and no mitigation is required (Class III).

4.3.5.5 No Project Alternative

Leaving the SONGS Unit 1 intake and discharge conduits in their existing state would avoid the potential short-term impacts to turbidity, water clarity, nutrient addition, oxygen demand, or other attributable water quality impacts. No significant impacts would occur (Class III), and no mitigation is required.

4.3.6 Cumulative Projects Impact Analysis

With the exception of the No Project Alternative, for the Proposed Project and any of the alternatives proposed, any modifications to the SONGS Unit 1 intake and discharge components would create impacts to marine water quality in the project area. The significance of these impacts would vary greatly depending on the approach to the dismantling, demolition, and removal of all or portions of the offshore components.

Project implementation, as proposed, would have few cumulative impacts associated with marine water quality. None of the other cumulative projects identified in Section 4.0 would have offshore activities that would affect marine water quality. All impacts associated with the disposition of the Unit 1 cooling system would be temporary, albeit of varying durations. None are viewed as creating a cumulative effect that would negatively impact marine water quality in the long term.

4.3.7 References

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