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Agency Secretary

State Water Resources Control Board

Division of Water Quality

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Arnold Schwarzenegger
Governor

MITIGATED
NEGATIVE DECLARATION
Pursuant to Section 21080(c)
Public Resources Code

To:	Office of Planning & Research State Clearinghouse 1400 Tenth Street Sacramento, CA 95814	From:	State Water Resources Control Board Division of Water Quality 1001 I Street Sacramento, CA 95814

Project Title: Exception to the California Ocean Plan for the University of Southern California Wrigley Marine Science Center Discharge into the Northwest Santa Catalina Island Area of Special Biological Significance (No. 25)

Applicant: University of Southern California
Wrigley Institute for Environmental Studies
AHF 232
Los Angeles, CA 90089-0371

Project Description: University of Southern California (USC) Wrigley Marine Science Center (WMSC) seeks an exception from the California Ocean Plan prohibition on discharges into Areas of Special Biological Significance (ASBS). The exception with conditions, if approved, would allow continued waste seawater and storm water discharges into the Northwest Santa Catalina Island ASBS.

Determination: The State Water Board has determined that the above-proposed project will have a less-than-significant effect on the environment for the reasons specified in the attached Initial Study.

Terms and Conditions:

1. The discharge must comply with all other applicable provisions, including water quality standards, of the Ocean Plan. Natural water quality conditions in the receiving water, seaward of the surf zone, must not be altered as a result of the discharge. The surf zone is defined as the area between the breaking waves and the shoreline at any one time. Natural water quality will be defined, based on a review of the monitoring data, by Regional Water Board staff in consultation with the Division of Water Quality of the State Water Board. For constituents other than indicator bacteria, natural water quality will be determined using the reference station in the ocean in the vicinity of Goat Harbor or Italian Gardens near Twin Rocks Point on the northern coast of Santa Catalina Island. For indicator bacteria, the Ocean Plan bacteria objectives will be used.

2. WMSC will not discharge chemical additives, including antibiotics, in the seawater system effluent. In addition and at a minimum, WMSC, for its waste seawater effluent, must comply with effluent limits implementing Table B water quality objectives as required in Section III.C. of the Ocean Plan.

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3. For metals analysis, waste seawater effluent, storm water effluent, reference samples, and receiving water samples must be analyzed by the approved analytical method with the lowest minimum detection limits (currently Inductively Coupled Plasma/Mass Spectrometry) described in the Ocean Plan.

4. Flows for the seawater discharge system and storm water runoff (by storm event) must be reported quarterly to the Regional Water Board.

5. WMSC must continue to prevent all discharges of non-storm water facility runoff (i.e., any discharge of facility runoff that reaches the ocean that is not composed entirely of storm water), except those associated with emergency fire fighting.

6. WMSC must specifically address the prohibition of non-storm water runoff and the reduction of pollutants in storm water discharges draining to the ASBS in a Storm Water Management Plan/Program (SWMP). WMSC is required to submit its final SWMP to the Regional Water Board.

7. The SWMP must include a map of surface drainage of storm water runoff, including areas of sheet runoff, and any structural Best Management Practices (BMPs) employed. The map must also show the storm water conveyances in relation to other facility features such as the laboratory seawater system and discharges, service areas, sewage treatment, and waste and hazardous materials storage areas. The SWMP must also include a procedure for updating the map and plan when other changes are made to the facilities.

8. The SWMP must describe the measures by which non-storm water discharges have been eliminated, how these measures will be maintained over time, and how these measures are monitored and documented.

9. The SWMP must also address storm water discharges, and how pollutants have been and will be reduced in storm water runoff into the ASBS through the implementation of BMPs. The SWMP must describe the BMPs currently employed and BMPs planned (including those for construction activities), and an implementation schedule. The BMPs and implementation schedule must be designed to ensure natural water quality conditions in the receiving water due to either a reduction in flows from impervious surfaces or reduction in pollutants, or some combination thereof. The implementation schedule must be developed to ensure that the BMPs are implemented within one year of the approval date of the SWMP by the Regional Water Board.

10. At least once every permit cycle (every five years), a quantitative survey of benthic marine life must be performed near the discharge and at a reference site. The Regional Water Board, in consultation with the State Water Board's Division of Water Quality, must approve the survey design. The results of the survey must be completed and submitted to the Regional Water Board within six months before the end of the permit cycle.

11. Once during the upcoming permit cycle, a bioaccumulation study using mussels (*Mytilus californianus*) must be conducted to determine the concentrations of metals near field (within Big Fisherman Cove) and far field (at the reference station). The Regional Water Board, in consultation with the Division of Water Quality, must approve the study design. The results of the survey must be completed and submitted to the Regional Water Board at least six months prior to the end of the permit cycle (permit expiration). Based on the study results, the Regional Water Board, in consultation with the Division of Water Quality, may adjust the study design in subsequent permits, or add additional test organisms.

12. During the first year of each permit cycle, two effluent samples must be collected from the waste seawater discharge (once during dry weather and once during wet weather, i.e. a storm event). In addition, samples must also be collected at the reference station, described in condition 1, along with the effluent samples. Samples

collected at the reference station will represent natural water quality for all Ocean Plan constituents except indicator bacteria and total chlorine residual. Samples at the reference station may be collected immediately following a storm event, but in no case more than 24 hours after, if sampling conditions are unsafe during the storm. All of these samples must be analyzed for all Ocean Plan Table B constituents, pH, salinity, and temperature, except that samples collected at the reference station do not require toxicity testing; instead, samples collected at the reference station must be analyzed for Ocean Plan indicator bacteria. Based on the results from the first year, the Regional Water Board will determine the frequency of sampling (at a minimum, annually during wet weather) and the constituents to be tested during the remainder of the permit cycle, except that ammonia nitrogen, pH, salinity, and temperature must be tested at least annually. Chronic toxicity (for at least one consistent invertebrate species) must be tested at least annually for the waste seawater effluent. In addition, samples collected at the reference station must be analyzed for indicator bacteria according to the requirements of condition 16.

13. Once annually, during wet weather (storm event), the storm water runoff effluent and the receiving water adjacent to the seawater and storm water discharge system must be sampled and analyzed for Ocean Plan Table B constituents. The receiving water in Big Fisherman Cove must also be monitored for Ocean Plan indicator bacteria water quality objectives. The sample location for the receiving water will be immediately seaward of the surf zone in Big Fisherman Cove adjacent to the outfall location. Storm water runoff and receiving water must be sampled at the same time as the seawater effluent and reference sampling described in condition 12 above. Based on the first year sample results, the Regional Water Board will determine specific constituents in the storm water runoff and receiving water to be tested during the remainder of the permit cycle, except that indicator bacteria and chronic toxicity (three species) for receiving water must be tested annually during a storm event.

14. Once annually, the subtidal sediment near the seawater discharge system and storm water outfall in Big Fisherman Cove must be sampled and analyzed for Ocean Plan Table B constituents. For sediment toxicity testing, only an acute toxicity test using the amphipod *Eohaustorius estuarius* must be performed. Based on the first year sample results, the Regional Water Board will determine specific constituents to be tested during the remainder of each permit cycle, except that acute toxicity for sediment must be tested annually.

15. In addition to the bacterial monitoring requirements described in conditions 12 and 13 above, samples must be collected at the seawater intake structure during a maximum of three storm events per year that result in runoff from the spray field hillside, and measured for Ocean Plan indicator bacteria. The station at the seawater intake structure is selected for this requirement because it is near the bluff below the WMSC sewage treatment plant spray field. This requirement along with the bacterial monitoring in conditions 12 and 13 is meant to satisfy in total the Ocean Plan bacteria monitoring requirements. This additional bacteria monitoring may be eliminated by the Regional Water Board if changes are made to WMSC's sewage plant or treated sewage effluent system that would absolutely eliminate the possibility of contaminants entering the ASBS.

16. If the results of receiving water monitoring indicate that the storm water runoff is causing or contributing to an alteration of natural water quality in the ASBS, as measured at the reference station, WMSC is required to submit a report to the Regional Water Board within 30 days of receiving the results. Those constituents in storm water that alter natural water quality or receiving water objectives must be identified in that report. The report must describe BMPs that are currently being implemented, BMPs that are planned for in the SWMP, and additional BMPs that may be added to the SWMP. The report shall include a new or modified implementation schedule. The Regional Water Board may require modifications to the report. Within 30 days following approval of the report by the Regional Water Board, WMSC must revise its SWMP to incorporate any new or modified BMPs that have been and will be implemented, the implementation schedule, and any additional

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monitoring required. As long as WMSC has complied with the procedures described above and is implementing the revised SWMP, then WMSC does not have to repeat the same procedure for continuing or recurring exceedances of the same constituent.

17. WMSC must pursue and implement a program for prevention of Biological Pollutants (non-native invasive species) in consultation with the California Department of Fish and Game Marine Resources Division.

18. WMSC must prepare a waterfront and marine operations non-point source management plan containing appropriate management practices to address non-point source pollutant discharges. Appropriate management measures will include those described in the State's Non-point Source Program Implementation Plan for marinas and recreational boating, as applicable. The Regional Water Board, in consultation with the State Water Board's Division of Water Quality, will review the plan. The Regional Water Board shall appropriately regulate non-point source discharges in accordance with the State Water Board's Policy for Implementation and Enforcement of the Non-point Source Pollution Control Program. The plan must be implemented within six months of its approval.

19. WMSC will notify the Regional Water Board within 180 days prior to any construction activity that could result in any discharge or habitat modification in the ASBS. Furthermore, WMSC must receive approval and appropriate conditions from the Regional Water Board prior to performing any significant modification, re-building, or renovation of the water front facilities, including the pier and dock, that could result in any discharge or habitat modification in the ASBS, according to the requirements of Section III.E.2 of the Ocean Plan.

20. The Regional Water Board will include these mitigating conditions in the National Pollutant Discharge Elimination System (NPDES) permit for the seawater effluent. Alternatively, the Regional Water Board may regulate the storm water discharge in a storm water NPDES permit and, in that case, would include those conditions relative to storm water in that storm water NPDES permit. In the latter case, all conditions would be included, in some combination, in the waste seawater effluent permit and the storm water permit.

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Adopted by the State Water Resources Control Board on February 15, 2006.

[signature]

Selica Potter
Acting Clerk to the Board

February 15, 2006
Date

STATE WATER RESOURCES CONTROL BOARD
DIVISION OF WATER QUALITY
P.O. BOX 100
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INITIAL STUDY

I. Background

Project Title: Exception to the California Ocean Plan for the University of Southern California Wrigley Marine Science Center Discharge into the Northwest Santa Catalina Island Area of Special Biological Significance (No. 25)

Applicant: University of Southern California
Wrigley Institute for Environmental Studies
AHF 232
Los Angeles, CA 90089-0371

Applicant's Contact Person: Dr. Anthony Michaels, (213) 740-6780

Introduction

The State Water Resources Control Board (State Water Board), under its Resolution No. 74-28, designated certain Areas of Special Biological Significance (ASBS) in the adoption of water quality control plans for the control of wastes discharged to ocean waters. To date, thirty-four coastal and offshore island sites have been designated ASBS. Among the ASBS designated was the Santa Catalina Island Subarea One ASBS. The name of this ASBS was changed by the State Water Board in April 2005 to the Northwest Santa Catalina Island ASBS (Resolution 2005-0035).

Since 1983, the California Ocean Plan (Ocean Plan) has prohibited waste discharges to ASBS (SWRCB 1983). Similar to previous versions of the Ocean Plan, the 2001 Ocean Plan (SWRCB 2001) states: "Waste shall not be discharged to areas designated as being of special biological significance. Discharges shall be located a sufficient distance from such designated areas to assure maintenance of natural water quality conditions in these areas."

The Northwest Santa Catalina Island ASBS, (from Isthmus Cove to Catalina Head), was included in this designation for the following reasons: 1. it has a diversity of habitat and biological assemblages; 2. it is possibly a transitional zone between subtidal areas containing predominantly northern and southern species; and 3. due to the proximity of the University of Southern California's Wrigley Marine Science Center, many scientific studies have yielded valuable information about the area.

Assembly Bill 2800 (Chapter 385, Statutes of 2000), the Marine Managed Areas Improvement Act, was approved by the Governor on September 8, 2000. This law added sections to the Public Resources Code (PRC) that are relevant to ASBS. Section 36700 (f) of the PRC defines a State Water Quality Protection Area (SWQPA) as "a nonterrestrial marine or estuarine area designated to protect marine species or biological communities from an undesirable alteration in natural water quality, including, but not limited to, areas of special biological significance that have been designated by the State Water Board through its water quality control planning process." Section 36710 (f) of the PRC stated: "In a state water quality protection area, point source waste and thermal discharges shall be prohibited or limited by special conditions. Nonpoint source pollution shall be controlled to the extent practicable. No other use is restricted." The classification of ASBS as SWQPAs went into effect on January 1, 2003 (without Board action) pursuant to Section 36750 of the PRC.

Senate Bill 512 (Chapter 854, Statutes of 2004) amended the marine managed areas portion of the PRC, effective January 1, 2005, to clarify that ASBS are a subset of SWQPAs and require special protection as determined by the State Water Board pursuant to the California Ocean Plan and the California Thermal Plan. Specifically, SB 512 amended the PRC section 36700 (f) definition of state water quality protection area to add the following: "'Areas of special biological significance' are a subset of state water quality protection areas, and require special protection as determined by the State Water Board pursuant to the California Ocean Plan adopted and reviewed pursuant to

Article 4 (commencing with Section 13160) of Chapter 3 of Division 7 of the Water Code and pursuant to the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (California Thermal Plan) adopted by the State Board."

Section 36710(f) of the PRC was also amended as follows: "In a State Water Quality Protection Area, waste discharges shall be prohibited or limited by the imposition of special conditions in accordance with the Porter-Cologne Water Quality Control Act (Division 7 (commencing with Section 13000) of the Water Code) and implementing regulations, including, but not limited to, the California Ocean Plan adopted and reviewed pursuant to Article 4 (commencing with Section 13160) of Chapter 3 of Division 7 of the Water Code and the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (California Thermal Plan) adopted by the state board. No other use is restricted." This language replaced the prior wording stating that point sources into ASBS must be prohibited or limited by special conditions, and that nonpoint sources must be controlled to the extent practicable. In other words, the absolute discharge prohibition in the Ocean Plan stands, unless of course an exception is granted. The classification of ASBS as a subset of SWQPAs does not change the ASBS designated use for these areas. Practically speaking, this means that waste discharges to ASBS are prohibited under the Ocean Plan and Thermal Plan unless an exception is granted. The terms and conditions in the mitigated negative declaration and in this initial study are special protections recommended by staff for the Northwest Santa Catalina Island ASBS, and constitute the special conditions referred to in Section 36710(f) of the PRC.

The University of Southern California (USC) Wrigley Marine Science Center (WMSC) is located on the coast adjacent to the Northwest Santa Catalina Island ASBS at Big Fisherman Cove. Wrigley Marine Science Center currently discharges waste seawater without the benefit of an exception from the California Ocean Plan. The Wrigley Marine Science Center was founded in 1965 through a deed of property from the Santa Catalina Island Company. WMSC discharges waste seawater into the ASBS/SWQPA under National Pollutant Discharge Elimination System (NPDES) Permit CA 0056661. The Regional Water Board issued USC its first Waste Discharge Requirements and NPDES permit in Order No. 79-59, on April 23, 1979 (RWQCB 1979). The Ocean Plan in effect at that time prohibited discharges into an ASBS that could alter natural water quality. The permit was re-issued in May 21, 1984, and again on October 12, 2000, expiring November 10, 2005. This discharge has never been issued an exception by the State Water Board and thus does not comply with the California Ocean Plan.

Section III (I)(1) of the 2001 Ocean Plan states: "The State Board may, in compliance with the California Environmental Quality Act, subsequent to a public hearing, and with the concurrence of the U.S. Environmental Protection Agency, grant exceptions where the Board determines: a. The exception will not compromise protection of ocean waters for beneficial uses, and, b. The public interest will be served."

Project Description

USC seeks an exception from the Ocean Plan's prohibition on discharges into ASBS. The exception with conditions, if approved, would allow their continued waste seawater and co-mingled storm water discharge into the Northwest Santa Catalina Island ASBS. This would provide additional protections for beneficial uses that are not currently provided.

Environmental Setting

Physical Description

Location and Size

Santa Catalina Island is located at 33° 22′ N Latitude, 118° 25′ W longitude and lies 20 miles offshore of the Palos Verdes Peninsula. The Island is 22 miles (35.4 km) long, 8 miles (12.9 km) across at its widest point and is oriented in a general NW-SE direction. The Northwest Santa Catalina Island ASBS is located at the western end of the Island. The shoreline bordering the ASBS is 20.9 miles (33.6 km) in length. The seaward boundary of the ASBS is one mile offshore, and the enclosed water surface is about 13,235 acres (20.68 square miles.) (State Water Board GIS data, at a scale of 1:24,000).

Santa Catalina Island is part of Los Angeles County. Avalon, the only city on the island, is approximately 13 miles (20.9 km) straight-line distance from the University of Southern California Wrigley Marine Science Center (26 miles by road). There is a community located between Catalina Harbor and Isthmus Cove, known as Two Harbors, operated by the Santa Catalina Island Company. Approximately 100 permanent residents of Two Harbors maintain the local recreational facility utilized by vacationers, the area's primary industry.

The State Water Board has legally defined ASBS No. 25, Northwest Santa Catalina Island Area of Special Biological Significance: "From Point 1 determined by the intersection of the mean high tide line and a line extending due west from USGS Triangulation Station "Channel" on Blue Cavern Point: thence due north to the 300-foot isobath or to one nautical mile offshore, whichever distance is greater; thence northerly and westerly, following the 300-foot isobath maintaining a distance of one nautical mile offshore, whichever is the greater distance, around the northwestern tip of the island and then southerly and easterly, maintaining the distance offshore described above, to a point due south of USGS Triangulation Station "Cone" on Catalina Head; thence due north to the intersection of the mean high tide line and a line extending due south from USGS Triangulation Station "Cone," thence returning around the northwestern tip of the island following the mean high tide line to Point 1."

Climate

Santa Catalina Island has a Mediterranean climate characterized by warm, sunny, and dry summer months and relatively little rainfall during the cooler months. Skies are generally clear; however, fog does occur during the cooler months. The mountainous land mass often limits the fog to the windward side of the island. The Isthmus is a break in this terrain and permits fog and wind to reach the leeward side (SWRCB 1979).

The average daily temperature ranges from the high 70's (°F) in late summer and the low 50's (°F) in the winter. Rainfall occurs primarily between October and April; the average annual precipitation is 11.4 inches, based on data from 1945 through 1967 (SWRCB 1979). More recent precipitation data from the Catalina Island Conservancy for Two Harbors, immediately southwest of WMSC is summarized in Appendix A. On average it rains 27 days per year in Two Harbors and the average rainfall per rain day is 0.40 inches (Mertes, et al. 2005). The northeast side of Catalina experiences greater rainfall than the southwest side. The northeast facing slopes (toward the mainland) are protected from the drying effects of the prevailing westerly winds and hot afternoon sun. Prevailing winds are from the west-northwest. However, during the summer and early fall, warm drying Santa Ana winds occasionally blow from the mainland (SWRCB 1979). These Santa Ana winds may extend into the early winter (Michaels 2005).

Geological Setting

Submarine Topography

Santa Catalina Island borders the San Pedro Basin on the north and Catalina Basin on the south. The Island is rimmed by a shelf extending to a water depth of 450 feet (140 m) approximately one mile offshore on the southern side and two miles on the northern side. The shelf is narrowest off Arrow Point. It has no prominent features and gradually rises to a near shore physiography of steep boulder slopes and cliffs that usually begin at a subtidal depth of approximately 100 feet (30m) (SWRCB 1979).

Above Shoreline Land Mass

The major exposed rock on Santa Catalina Island is generally Catalina schist, a low-grade layered metamorphic rock. Landslides commonly occur where it forms steep slopes (SWRCB 1979). The Isthmus is geologically very active, as indicated by frequent landslides.

The land adjacent to the ASBS is extremely rugged, consisting primarily of mountains with steep drop-offs to the ocean. The area is frequently intersected by narrow ravines (Catalina Head to West End) and by relatively wide stream valleys (West End to Blue Cavern Point). The highest peak adjacent to the ASBS is Silver Peak, reaching an elevation of 1,805 feet. The Isthmus is the land area with the lowest elevation (less than 20 feet) and also has the narrowest width of any portion of the Island (0.25 miles).

Above shoreline landmass adjacent to the ASBS in Big Fisherman is comprised of a gray, friable to unconsolidated, silty matrix of lithic and calcareous sediments. The basement outcropping is composed of andesite, as are numerous boulders (SWRCB 1979).

Oceanographic Conditions and Marine Water Quality

Currents

Northwest Santa Catalina Island ASBS is located in the Southern California Bight (SCB). The Bight is the 300 km of recessed coastline between Point Conception in Santa Barbara County and Cabo Colnett, south of Ensenada, Mexico. The dramatic change in the angle of the coastline creates a large backwater eddy in which equatorial waters flow north near shore and subartic waters flow south offshore. This unique oceanographic circulation pattern creates a biological transition zone between warm and cold waters that contains approximately 500 marine fish species and more than 5,000 invertebrate species (SWRCB 1979).

The principal geostrophic current in this area of Northwest Santa Catalina Island ASBS is the California Current, which flows southward along the coast, and a north-flowing gyre is created east of the California Current and is known as the Southern California Countercurrent. Santa Catalina Island is surrounded by the Southern California Countercurrent. On average, ocean water moves northwest along the WMSC portion of the ASBS (Michaels 2005).

The prevailing direction of swell in the California Bight is from the west. Consequently, intertidal areas on the southwest (windward) side of this ASBS are exposed to the most wave action. The swell bends around the west end and strikes north-facing beaches on the leeward side at an angle, reducing wave energy. Northeast-facing habitats on the leeward shore are the most protected. Only during northeast wind conditions (Santa Ana's) are these areas exposed to wave action. (SWRCB 1979).

Water Quality and Temperature, vicinity of WMSC

Water clarity data measurements were taken approximately daily from 1970-1978 at Bird Rock (surface and twenty meter depths). Though this station is located close to shore, the clarity is not indicative of those areas on the Island coastline subjected to extensive landslide runoff. For example, during the winter of 1977-78 heavy rains and subsequent runoff resulted in poor clarity in the nearshore waters. Clarity is usually greatest (about 25 m) between October and January and poorest (8 m) between April and July when plankton blooms occur (SWRCB 1979).

Surface water temperature measurements were taken approximately daily from 1970-1978 at Bird Rock. Ocean water temperatures for this period at Bird Rock ranged from 11°C in the winter to 20°C in September and October (SWRCB 1979).

Water quality in the ASBS was previously assessed in studies involving analyses of biological material for the presence of pollutants. Drs. Rudolf K. Zahn and Gertud Zahn-Daimler for the Physiologisch-Chemisches Institut der Johannes Gutenberg, Universtat Mainz, found no significant levels of pollutants in the sponge (*Tethya aurantia)* collected on the leeward side of the ASBS (SWRCB 1979).

In a study by Alexander and Young for the Southern California Coastal Water Research Project (1976), in which mussel tissue (*Mytilus californianus*) from the mainland and from Bird Rock was analyzed in 1971 for trace metals, the Bird Rock samples were lower in lead, copper, silver, and nickel, but higher in chromium and zinc, at 27 and 100 mg/kg dry weight respectively. Chen and Lu for the Bureau of Land Management (1974) tested the sediments at Blue Cavern Point and at the mainland shelf of Palos Verdes for synthetic chlorinated hydrocarbons (e.g., DDT), oil and grease, nutrients, total volatile substances, trace metals, and other constituents. They found that the sample from Blue Cavern Point was lower in all constituents except for oil and grease (2,480 ppm), total volatile substances (4.34%), organic and Kjeldahl nitrogen (both 448 ppm), and nickel (41.6 mg/kg dry weight). (SWRCB 1979).

State Mussel Watch results for metals organics from 1977 - 1994 for the west end of Santa Catalina Island are presented in Appendix E.

Subtidal Substrate

Sand and mud comprise the majority of the subtidal substrate from the outer boundary of the ASBS to within approximately 500 yards (457 m) offshore. Nearshore, the main subtidal substrates in the ASBS are boulder slopes and sandy slopes with a few rocky reefs. There are submerged reefs located off Emerald Bay, Starlight Beach, Howland's Landing and Isthmus Cove. Offshore rock formations, which break the surface, include Whale Rock, Eagle Rock, Indian Rock, Ship Rock and Bird Rock.

In general, the nearshore subtidal area of the ASBS is rimmed with boulder slopes to a depth of 50 to 100 feet (30 m). Boulder size varies with depth. Shallow sloped areas often have a narrow band of medium-sized boulders (1 m diameter) interspersed with course sand closer to shore. Sandy substrate is rare in water shallower than 40 feet (12 m). Isthmus Cove however has sandy subtidal substrate, enclosed by rock outcropping and boulders extending to a depth of approximately 40 feet (12 m). Sediments found in some of the coves from Emerald Bay to Big Fisherman Cove contain a large percentage of calcareous debris (SWRCB 1979).

Intertidal Substrate

The intertidal area of the ASBS is not extensive. The shoreline is extremely rugged, with the main landmass rising steeply out of the ocean. Consequently, intertidal habitats are quite restricted in vertical range. The windward side of the island is exposed to wave action and, in certain places, slightly well developed intertidal areas exist (for example, at Catalina Head). However, the leeward side does not benefit from significant wave activity, and the combination of steep slopes and low wave action result in generally poor intertidal habitats.

Approximately 40 percent of the ASBS intertidal area consists of solid rock walls, and about 45 percent consists of various sized boulders. The majority of the habitats are extremely steep in profile. The remaining 15 percent of the intertidal area consists of sandy or cobbly beaches. Virtually no beaches exist from Catalina Head to the West End, with the exception of Sandy Beach. Between Catalina Head and Arrow Point, most of the intertidal habitat is occupied by boulders. Many small coves and sandy beaches occur along the northeast (leeward) coast from Arrow Point to Blue Cavern Point adjacent to WMSC, although cliffs and boulder areas predominate in this region. The only relatively good intertidal habitat near WMSC, characterized by gently sloping solid substrate, may be found only at Ship Rock, Bird Rock, and Big Fisherman Cove Point.

Marine Biological Resources of the ASBS

Generalized Marine Ecosystem Considerations

Each marine biological community is a group of plant and animal populations that live together, interact with and influence each other. Communities tend to be associated with certain habitat depth ranges which can be described as: 1) Intertidal 2) Intertidal to 30m, 3) 30 to 100 m, 4) 100 to 200 m and 5) 200 m and deeper (NCCOS 2003). Marine habitats include ocean circulation features, because habitat is not simply defined by the substrate. Seawater characteristics are analogous to the climate of terrestrial habitats and include temperature, salinity, nutrients, current speed and direction. Organisms will also be affected by the circulation induced by tidal currents. For those living in shallow water habitats very close to shore, a dominant influence is also the circulation generated by breaking waves.

Rocky reefs, rocky intertidal zones and kelp forests are habitats that support distinct biological communities. In rocky reefs and intertidal zones, the type of rock that forms the reef greatly influences the species using the habitat. For example, granitic versus sedimentary rock reefs each may support different species assemblages.

Phytoplankton, which consists of single-celled algae suspended in the water column, comprises the base of most food chains in the Southern California Bight (Dailey, et al. 1993). The next pelagic trophic levels are composed of zooplankton, consisting of small holoplankton consumers, such as copepods, and meroplankton such as the larval stages of benthic macroinvertebrates and fish. Larger invertebrates and fish consume zooplankton and each other.

Benthic macro algae and vascular plants, including kelp and surf grass respectively, are also important primary producers along the coast of the Southern California Bight, including the ASBS. Benthic invertebrates and demersal fish, which live on the seafloor, graze on benthic algae, filter plankton from the water, and prey on other invertebrates and fishes. Many benthic organisms feed entirely on dead material that accumulates on the seafloor or is suspended in the water.

Marine mammals, birds, and turtles feed on algae, invertebrates, and fishes. Over 5,000 species of benthic invertebrates, 481 fish species, 200 bird species, and 40 species of marine mammals inhabit the SCB (Dailey, et al.

1993). The high diversity is due to a mixture of northern and southern fauna and flora that occurs in the SCB, and the wide range of habitats.

ASBS Intertidal Biota

Well-developed intertidal habitats are sparse at Catalina Island. Big Fisherman Cove Point, Bird Rock and Ship Rock have the only relatively extensive rocky intertidal communities found in the general vicinity of the WMSC within the ASBS. Bird Rock and Ship Rock are offshore rocks that have broad bases and rise from below sea level up to 50 or more feet (15m) above sea level with approaching angles of approximately 45° from the vertical.

A reconnaissance survey to identify marine life forms in the ASBS was performed in 1977 and 1978 (SWRCB 1979). According to this survey the highest rocky intertidal zone is inhabited by the periwinkle *(Littorina planaxis)*. In the ASBS, these individuals are usually of small size, never attaining the 10-15mm size of northern California specimens. The congeneric *(Littorina scutulata)* is much rarer than periwinkle. The rock louse *(Ligia occidentalis)* is also found here.

The limpets *(Collisella scabra* and *C. digitalis)* share high intertidal areas with the giant owl limpet *(Lottia gigantean)*. The giant owl limpet is not equally distributed over all rock types on Bird Rock but is usually restricted to basalt or other smooth surfaces. The barnacles *Balanus glandula, Chthamalus fissus,* and *Tetraclita squamosa* occur within a broad vertical band in the upper intertidal zone. Below this, California mussel *(Mytilus californianus)* can be found in scattered clumps, attaining the densest populations on the exposed western end of Bird Rock. Interspersed with California mussels is the gooseneck barnacle *(Pollicipes polymerus)*, again being most abundant in exposed areas of the substrate. A host of invertebrates is associated with the mussel beds, one of the more important being the predatory sea star *(Pisaster ochraceus)*.

Small numbers of the aggregate anemone *(Anthopleura elegantissima)* can be found on Bird Rock. The black turban *(Tegula funebralis)* can occasionally be found, although populations are not large. The lined shore crab *(Pachygrapsus crassipes)* is also encountered. The black abalone *(Haliotis cracherodii)* was locally abundant in crevices washed by wave surge; however withering foot syndrome has had a decimating impact on the black abalone since the Reconnaissance Survey was completed.

The California mussel zone grades into a zone dominated by the southern sea palm *(Eisenia arborea)* and the surf grass *(Phyllospadix torreyi)* on the south side of Bird Rock. Elsewhere, California mussels continue into subtidal areas to approximately –5 feet (e.g. Bird Rock, north wall). *Chama pellucida,* occasionally seen in intertidal areas, is most abundant just below the California mussel zone.

A band of the feather boa kelp *(Egregia laevigata)* is commonly found fringing the intertidal zone. Other algae common to this zone include the erect coralline *(Corallina officinalis)* the red alga *(Geldium purpurascens),* and the brown algae *(Pelvetia fastigiata* and *Hesperophycus harveyanus)* (SWRCB 1979).

ASBS Subtidal Biota

Within the ASBS, substrate type and topographical features are largely responsible for the creation of distinct subtidal habitats. Habitat types include sand, sand interspersed with small boulders, vertical walls, and large and medium boulder slopes. Algae form an additional habitat type that can be utilized by fauna and epiphytic algae. For example, the giant kelp (*Macrocystis pyrifera*) growing on boulders at 20- to 60-foot (18 m) depths, creates an aquatic forest habitat for many fishes and invertebrates.

Sand Substrate Biota

Sand is the major substrate within the boundaries of the ASBS. However, most sand bottom areas occur at depths beyond the reach of scuba divers. In a submarine survey completed in 1977 at Big Fisherman's Cove, the large anomuran crab (*Paralithoides tanneri)* was found to be relatively abundant along with some scattered holothurians and rockfish.

Four categories of organisms live in the nearshore sandy substrate habitats: 1) anchored; 2) mobile; 3) infaunal; and 4) epiphytic. The large bulb or elk kelp (*Pelagphycus* sp.) is an example of the first type of inhabitant (anchored) and is found attached to the substrate at 50- to 100-foot (30m) depths. Within the ASBS, it is known to occur at the mouth of Big Fisherman Cove, in Isthmus Cove, and at Black Point.

Mobile organisms found within the ASBS and at WMSC in sandy subtidal habitat include the extremely common detritus feeding sea cucumber (*Parastichopus parvimensis)*, the predatory sea star (*Astropecten brasiliensis)*, and the bat ray (*Myliobatis californica)*.

Some highly visible infaunal macroinvertebrates include the large tube dwelling polychaetes parchment worm (*Chaetopterus variopedatus)* and the ornate tube worm (*Diopatra ornate)*. The ornate tube worm was found near the outer edges of kelp beds and in other areas of organic debris accumulation, at depths of 60 to 90 feet (20 to 30 m). In some areas of the ASBS, the density of these worms can be as high as 500 individuals per square meter.

The tubes of these large polychaetes, which sometimes extend up to 5 cm above the sea floor, often provide substrate for small red algae and for the larger brown algae such as *Zonaria farlowii, Distopteris undulata* and *Pachydictyon coriaceum.*

The phoronoid worm (*Phoronopsis californica)*, the sea pens (*Stylatula elongate)* and *Acanthoptilum* spp., and several species of ceriantthid anemones are other sessile invertebrates visible in sandy subtidal portions of the ASBS. Brachiopods, in the genus *Glottidia*, were found in sand substrate at depths of 80 feet.

There is considerable species diversity in the sandy subtidal macrofaunal community. One hundred species of polychaete worms were identified from cores taken during survey dives (SWRCB 1979). *Spiochaetopterus costarum, Lumbrineris latreilli, Owenia collaris* and *Allia* sp. were the species found in greatest abundance. Numerous polychaetes *Schistomeringos longicornis* and *Lumbrineris zonata* were found in the sands of north facing coves. The remainder of the macrofaunal organisms is primarily small bivalve mollusks and crustaceans. The clam *Phacoides approximatus* and the gammarid amphipods *Ampelisca cristata* and *Photis sp.* were most abundant (SWRCB 1979).

Vertical Rock Walls Biota

The algal community found on vertical rock walls is subjected to heavy surge and surf action at the shallower depths. Red algae such as *Laurencia spetabilis, Gelidium robustum,* and *Sciadophycus stellatus* are usually found in this habitat along with the brown sea palm, *Eisenia arborea*. The giant kelp, *Macrocystis pyrifera*, may occur on horizontal reefs but is sparse in heavy surge regions. Large, broad bladed brown algae such as *Agarum fimbriatum* and *Laminaria farlowii* predominate at deeper depths (50 to 80 feet).

Subtidal faunal assemblages can be grouped into two general associations according to depth. The *Chama pellucida – Pisaster giganteus* assemblage occurs between 15 and 50 feet (15m) depths, the lower boundary being indistinct as *Chama* abundance gradually becomes less with increasing depth. The sea star *Pisaster giganteus* is the bivalve *Chama's* primary predator and reaches its maximum density within this zone (approximately $0.1/m^2$). A host of invertebrates is found associated with *Chama* beds, including the strawberry anemone *Corynactis californica*, the corals *Coenocyathus bowersi* and *Paracyathus stearnsi*, the tubed polychaete *Spirobranchus spinosus*, the rock scallop *Hinnites multirugosus*, the gastropods *Megathura crenulata* and *Serpulorbis squamigerus*, the sea urchins *Centrostephanus coronatus* and *Strongylocentrotus franciscanus*, the sea cucumbers *Parastichopus parvimensis* and *Cucumaria salma*, and the tunicate *Trididemnum opacum.*

The second major grouping found between 50 and 80 feet (24m) depths includes the two common gorgonians *Muricea fruiticosa* and *M. californica*. The gorgonian *Lophogorgia chilensis* is common at Bird Rock. Many sessile tunicate and sponge species grow on or near the base of these gorgonians, perhaps gaining some protection thereby. These include the sponges *Haliclona permollis* and *Vergongia aurea*, and the tunicate *Trididemnum opacum.* The corals *Coenocyathus bowersi, Paracyathus stearnsi,* and *Astrangia lajollaensis* can be found in the region also. Much rock surface is covered by encrusting bryozoans such as *Rhynchozoon rostratum* and *Parasmittina californica* (SWRCB 1979).

Subtidal Boulder Habitat Biota

Boulder habitats are much more three-dimensional than either soft substrates or solid rock walls. In addition to surface substrate, there is much under-rock area utilized by a whole community of organisms. Boulders in the ASBS range between 3 and 33feet (1-10 m) in diameter, with sand often interspersed between the smaller ones. In fact, the majority of subtidal reefs are of this type (SWRCB 1979).

Shallow boulder reefs (10 to 15 foot depths) support several species of common, large algae including *Eisenia arborea, Plocamium sp., Pterocladia capillacea*, and *Cystoseira neglecta.* The marine flowering plant surfgrass, *Phyllospadix torreyi*, is found on reefs exposed to heavy wave action. In slightly deeper water (20- to 40-foot depths), *M. pyrifera* becomes abundant. Extensive kelp forests have a reduced understory algal community. Otherwise, *Cystoseira neglecta*, *Dictyota flabellate*, and *Pachydictyon coriaceum* are locally common. The red algae *Gelidium nudifrons, G. purpurascens,* and *G. robustum* are also locally abundant. *Plocamium coccineum* and *Sargassum muticum* occur extensively in some boulder areas seasonally. Deeper boulder reefs (greater than 50-foot depths) support primarily *Laminaria farlowii, Agarum fimbriatum,* and occasionally *Cystoseira neglecta* and *Eisenia arborea* (SWRCB 1979).

The fauna of the boulder reefs can be conveniently grouped into three categories: 1) those sessile on rock surfaces; 2) those mobile over the rock surface; and 3) those dwelling under rocks. One major difference between boulder reefs and solid rock wall habitats is the reduced abundance of the attached bivalve *Chama pellucida* on the boulder reefs. Concomitant with this reduction is a lower density of the predator *Pisaster giganteus,* although it is still common here. Other large mobile predators are a common component of the subtidal boulder community and include the octopus *Octopus bimaculatus*; the lobster *Panulirus interruptus*; and the whelk *Kelletia kelletii*. The large keyhole limpet, *Megathura crenulata*, is a grazer commonly found on boulder reefs. Boulder areas often have large populations of the sea urchin *Strongylocentrotus franciscanus* and *Centrostephanus coronatus* (the latter being restricted to holes during daylight hours). In addition to urchin and limpet grazers, pink and green abalone *Haliotis corrugata* and *H. fulgens* are other common herbivores (although their populations may also have suffered from withering foot syndrome since the reconnaissance survey was conducted).

Attached fauna include the gorgonians *Muricea californica* and *M. fruiticosa* in deeper water. The sponges *Tethya aurantia* and *Vergonia aurea* are locally common. Abundant bryozoans include *Bugula neritina, Diaperoecia californica, Hippodiplosia inscuplta* and *Phidolopora pacifica.* The tunicates *Eutherdmania claviformis, Pyura haustor,* and *Trididemnum opacum* are locally abundant.

The encrusting coralline algae, *Lithothamnium giganteum* is common throughout the ASBS from 0 to 100-feet (30m) depths. Shallow-water rock substrate is often covered primarily by low-growing algae, especially in gently sloping boulder reef areas.

Under-rock habitats support a diverse fauna. Attached to the undersurfaces of rocks are several sponges, including *Hymanamphiastra cyanocrypta*. The polychaete *Chaetopterus variopedatus* is often found there, as is the terebellid polychaete *Neoamphitrite robusta.* Several brittle stars, including *Ophioderma panamensis* and *Ophiothrix spiculata,* utilize this habitat. *Strongylocentrotus purpuratus* is also found there, as the juveniles of both other urchin species. The predatory sea star, *Astrometis sertulifera*, is most often found under boulders (SWRCB 1979).

Fish Communities

Many diverse habitats are utilized by fishes in the shallow waters off Santa Catalina Island. Surfgrass beds, sandy/shelly debris bottoms, low algae/rocky rubble, and giant kelp beds are the major inshore habitats present, each with a distinct fish species composition.

The surfgrass beds off Bird Rock, 0.2 NM northerly of Big Fisherman Cove, are a haven for small benthic fishes. Within these beds, spotted kelpfish (*Gibbonsia elegans)*, pipefish (*Syngnathus* spp.), and juvenile California scorpionfish (*Scorpaena guttata),* are the dominant species. Reef finspot (*Paraclinus integripinnis)*, mussel blenny (*Hypsoblennius jenkinsi)*, cabezon (*Scorpaenichthys marmoratus),* and coralline sculpin (*Artedius corallinus)* are also present but in fewer numbers. Just outside the deeper margins of these beds, opaleye (*Girella nigricans)*, rock wrasse *(Halichoeres semicinctus)*, kelp bass (*Paralabrax clathratus)*, sheephead (*Pimelometopon pulchrum),* and señorita (*Oxyjulis californica)* are common, while kelp perch (*Barchyistius frenatus),* shiner (*Cymatogaster aggregate),* halfmoon (*Medialuna californiensis),* and black surfperch (*Embiotoca jacksoni)* occasionally frequent the area. Topsmelt (*Atherinops affinis)* and occasionally blacksmith (*Chromis punctipinnis)* are abundant in the upper water column.

In shallow sandy/shelly debris bottom habitats with seasonal fluctuations of small benthic algae, rock wrasse and sheephead are the most abundant fish, followed by small to medium-sized kelp bass. Present in fewer numbers are the C-O turbot *(Pleuronichthys coenosus)*, the lavender sculpin *(Leicottus hirundo)*, and the bat ray *(Myliobatis californica)*. Blackeye gobies (*Coryphopterus nicholsii)* occur in areas with small rocks or other structures for shelter. The upper water column is often dominated by large schools of blacksmith and topsmelt.

The low algae/rocky rubble habitat lying inshore of the giant kelp beds is dominated by large schools of opaleye. Schools of juvenile opaleye are more common in the intertidal or shallow subtidal zones, whereas adults are found in deeper waters and often range into other habitats. Rock wrasse, kelp bass, sheephead and spotted kelpfish are present in fewer numbers, while black surfperch, señorita, kelp perch, California scorpionfish, the giant kelpfish (*Heterostichus rostratus)*, and juvenile garibaldi (*Hypsypops rubicundus)* are observed here frequently. The wooly sculpin (*Clinocottus analis)* is only observed in the intertidal and very shallow subtidal regions. During certain times of the day, large schools of blacksmith and topsmelt are in the upper water column. Schools of reproductively active shiner perch are common during the fall.

The kelp beds are the most structurally complex of the ASBS subtidal habitats, and the diversity of fishes there is proportionately greater. These beds are divided vertically into a benthic zone and a middle-to-canopy zone. The most abundant benthic fishes are sheephead, rock wrasse, kelp bass, señorita, garibaldi, black perch, California scorpionfish, opaleye, kelp perch and pile perch (*Damalichtys vaca)*. Among the smaller benthic fishes, blue-banded goby (*Lythrypnus dalli)*, Blackeye goby, island kelpfish (*Alloclinus holderi)*, and spotted kelpfish are the most abundant, with zebra goby (*Lythrypnus zebra)* common in some areas. Benthic fish seen infrequently here include giant kelpfish, kelp rockfish (*Sebastes atrovirens)*, treefish (*Sebastes serriceps)*, California moray (*Gymnothorax mordax)*, horn shark (*Heterodontus francisci)*, and swell shark (*Cephaloscyllium ventriosum)*.

In the middle-to-canopy zone, señorita, kelp perch and blacksmith are dominant. Kelp bass and halfmoons occur in fewer numbers, followed by giant kelp fish, kelp rockfish, and in some areas, juvenile olive rockfish (*Sebastes serranoides)*. First-year juvenile kelp bass, señorita, giant kelp fish, kelp rockfish, and treefish are most prevalent in the middle-to-canopy zone.

At Bird Rock and Ship Rock, convict fish (*Oxylebius pictus)* are found along with other kelp bed fishes. Angel sharks (*Squatina californica)* are found in the deep sandy bottom areas near these rocks. Pelagic fish, such as yellowtail (*Seriola dorsalis)*, jack mackerel (*Trachurus symmetricus)*, California barracuda (*Sphyraena argentea)*, and common mola (*Mola mola)*, are occasionally abundant in the upper water column surrounding Bird Rock.

The scythe-marked butterfly fish (*Chaetodon falcifer)*, a southern species, is known to inhabit the ASBS.

There are diurnal differences in fish distribution in the ASBS. For example, at night sheephead, garibaldi, blacksmith, opaleye and kelp bass take shelter. At night kelp rockfish are active in the kelp forest, California morays forage in rocky areas, and sargo (*Anisotremus Davidsoni)* are active over shell debris or sand bottoms. (SWRCB 1979).

A complete listing of marine species known to occur in the ASBS may be found in the appendices of the SWRCB April 1979 Reconnaissance Survey Report.

Market Squid

Market squid (*Loligo opalescens)* are an important seasonal member of the community in the ASBS from December through March. Market squid aggregate in nearshore waters to spawn during the winter season.

White Abalone

White abalone (*Haliotus sorenseni*, Federally Endangered) was once common in the ASBS at depths of 60-100 feet (SWRCB 1979). White abalone may still occur within the Marine Reserve and ASBS.

Biota of Big Fisherman Cove

The above description of marine life in the ASBS is not specific to Big Fisherman Cove but is instead a description of the biota generally found in the ASBS by habitat type. Specific species recorded during surveys in Big Fisherman Cove are presented in Appendices B, C and D. These species records are limited to only certain survey dates and times, and do not represent exhaustive lists of all species inhabiting Big Fisherman Cove. Appendix B includes only algal species, and does not include marine vascular plants. It must be noted that the vascular plant surf grass (*Phyllospadix sp.*), an important community member, was identified in the summer of 1999 at Big Fisherman Cove by the author. An important fish species found in Big Fisherman Cove, and specifically the receiving water near the outfall, are leopard sharks (*Triakis semifasciata)*. Leopard sharks are not listed in the survey data presented in Appendix D but are abundant in Big Fisherman Cove during the summer. As another example flyingfish (*Cypselurus californicus)* have been observed by the author at night in Big Fisherman Cove, but this species is not found in the survey data in Appendix D.

Threatened, Endangered and Other Wildlife

Many of the following marine reptile, bird and mammal species are federally and/or state-listed as endangered (FE, SE), threatened (FT, ST), or species of special concern (SSC).

Marine Reptiles

Marine sea turtles occur in California waters, and have been observed in Santa Catalina Island waters. Four species of federally protected sea turtles may be found in Santa Catalina Island waters: green (*Chelonia mydas,* FE), leatherback (*Dermochelys coriacea* FE), loggerhead (*Caretta caretta* FE), and olive ridley sea turtles (*Lepidochelys olivacea* FE). These marine turtles are circum-global in distribution but breeding colonies have not been observed in California (Coastal Conservancy 2005).

Marine Birds

Seabirds found at Santa Catalina Island include Xantu's murrelet (*Synthliboramphus hypoleucus,* ST), California gull (*Larus californicus,* SSC), Heermann's gull *(Larus heermanni)*, western gull *(Larus occidentalis*), Royal tern (*Sterna maxima*), California brown pelican (*Pelecanus occidentalis*, FE, SE), ashy storm-petrel (*Oceanodroma homochroa,* SSC), Brandt's cormorant (*Phalacrocorax penicillatus*), and double-crested cormorant (*Phalacrocorax auritus,* SSC). (SWRCB 1979, PRBO 2005.) The California least tern (*Sterna antillarum*, FE, SE) and elegant tern (*Thalasseus elegans*, SSC) forage and nest along the California coast and may possibly frequent the project area.

Only western gulls were documented as nesting on the island in 1979. However, Brandt's cormorant historically bred on Ship and Bird Rocks (SWRCB 1979). In their 2005 California Current Marine Bird Conservation Plan, the Point Reyes Bird Observatory stated that breeding individuals of ashy storm-petrels, western gulls, and possibly Xantu's murrelets were observed on Santa Catalina Island (PRBO 2005).

The bald eagle *(Haliaeetus leucocephalus*, FT, SE*)* is also present on Santa Catalina Island. They were listed as an endangered species in 1967 when their population drastically diminished from exposure to the chemical pesticide DDT. Recovery efforts were made to repopulate this species and, after successful attempts, they were downgraded to threatened in 1995. As of July 6, 1999, they were recommended for delisting by the United States Fish and Wildlife Services due to the increase in numbers found to exist. (DFG 2001)

Marine Mammals

All marine mammals are protected under federal law (Marine Mammal Protection Act). Six species of threatened or endangered marine mammals occur within the Southern California Bight. Three are cetaceans: blue whales (*Balaenoptera musculus,* FE), sperm whales (*Physeter catodon,* FE), and humpback whales (*Megaptera novaeangliae,* FE). The blue whale feeds and migrates off the coast and may transiently venture into shallow (<100 ft) water. Sperm whales occur year-round offshore and may transiently venture into shallower waters. Humpback whales occur year-round and migrate off of the coast, and may venture into shallower water. (DFG 2001).

Two of the threatened listed species are pinnipeds: Steller sea lions (*Eumatopias jubatus,* FT) and Guadalupe fur seals (*Arctocephalus townsendi*, FT, ST), which migrate along the coast and offshore. The most common pinnipeds found in the ASBS are the California sea lion (*Zalophus californianus*) and the harbor seal (*Phoca vitulina*). (SWRCB 1979).

The southern sea otter (*Enhydra lutris neresis*, FT) was historically abundant in southern California waters but is no longer common there. While most of the sea otters are now found along the central California coast, a population was trans-located to San Nicolas Island, west of Santa Catalina Island.

The gray whale (*Eschrichtius robustus)* also appears in southern California. This species was formerly on the endangered species list, but was deemed recovered and delisted in 1994. They migrate yearly to the entire west coast of the United States, including the Santa Catalina Island area. Also present in this region are the bottlenose dolphin *(Tursiops truncates)*, common dolphin *(Delphinus delphis)*, and Pacific white-sided dolphin *(Lagenorhynchus obliquidens)*. These dolphin species are not on the Endangered Species List, yet they are protected through the Marine Mammal Protection Act. These dolphin species occur year-round in shallow waters among the Channel Islands and surrounding areas at shallow depths (less than approximately 180 m). (DFG 2001).

Fisheries, Marine Protected Areas and Prohibitions on the Take of Marine Life

The Northwest Santa Catalina Island ASBS encompasses, the western portion of the Catalina Marine Science Center State Marine Reserve, including Big Fisherman Cove. Fishing is not allowed in the Catalina Marine Science Center State Marine Reserve. All commercial and recreational take of marine life is prohibited in the Reserve (California Department of Fish and Game, Marine Region 2005).

Commercial and sport fishing occur in the waters off Catalina Island, including the ASBS outside of the Marine Reserve. Both activities are regulated and managed by either the California Department of Fish and Game, or the National Marine Fisheries. Important commercial fisheries include market squid, Pacific mackerel (*Scomber japonicus)*, jack mackerel *(Trachurus symmetricus)*, Pacific bonito *(Sarda chiliensis)*, northern anchovy *(Engraulis mordax)* and Pacific sardine *(Sardinops Sagax)*. The commercial catch of spiny lobster *(Panulirus interruptus)* is prohibited in the vicinity of Big Fisherman and Isthmus Coves (SWRCB 1979). Sport catch is via hook and line as well as scuba diving. Important sport fisheries include finfish such as halfmoon, California halibut *(Paralichthys californicus)*, scorpionfish, rockfish, California barracuda *(Sphyraena argentea)*, bonito, kelp bass, sheephead, and spiny lobster (SWRCB 1979). Abalone, once an important fishery, is now closed entirely in southern California.

Land Use

Between 1965 and 1970, the Santa Catalina Island Company deeded a total of 13.5 acres (5.5 ha) of land in Big Fisherman Cove to the University of Southern California, to support the building and later expansion of the Catalina Marine Science Center (now WMSC). Another 40 acres in the Big Fisherman Cove area is under long-term lease to USC by the Santa Catalina Island Company.

Except for the WMSC, which maintains a more-or-less seasonal enrollment of 50-100 people (Michaels 2005), the population of Catalina varies drastically with the tourist seasons. The "summer" runs roughly from Memorial Day in May through Labor Day in September. During that time, the City of Avalon, as well as other recreation areas and summer camps on the island are generally filled to capacity. During the remaining "winter" months, the population drops to a fairly constant level of permanent residents while other areas retain a minimum number of more-or-less permanent, maintenance-type personnel (Los Angeles County, Department of Regional Planning. 1983. Local Coastal Plan, Santa Catalina Island).

Scientific Study Uses

Infrastructure

In October 1995, the University of Southern California expanded the scope of WMSC at Big Fisherman Cove to include environmental sciences. The lab was renovated in 1996 and the dorms in 1997.

WMSC consists of a 30,000 square-foot laboratory building, a dormitory housing and cafeteria complex, a cluster of cottages, a hyperbaric chamber, an administration building, and a large waterfront staging area complete with dock, pier, helipad, and diving lockers. The facilities are used by USC students and scientists and for full-semester course programs in the Biology Department and Environmental Studies Program of the USC College of Letters, Arts and

Sciences. USC faculty, staff and students also conduct a wide range of research, education and outreach programs for broader audiences, form k-12 to adult learners. These facilities are also used by non-USC scientists, students and other education and outreach visitors from many other institutions. Programs range from day trips to full semester classes run by the California State University and other universities. Currently about half of the use of the facility is by non-USC participants. This facility also provides critical emergency care facilities for a remote region (Michaels 2005).

Dormitory housing and cafeteria facilities are located near the main laboratory building. Adjoining the dormitory-apartment complex is the cafeteria, which provides food service for up to 150 people. There are also outdoor barbecue and picnic facilities. New housing was added in 2002 and the facility has Los Angeles County Planning Commission approval for additional housing, a new educational building, and rebuilding of the waterfront facilities (Michaels 2005).

Laboratory Facilities

In October, 1995 USC expanded the scope of their Marine Science Center to include environmental sciences. Now Named the Philip K. Wrigley Marine Science Center (WMSC), it is the centerpiece of the USC Wrigley Institute for Environmental Studies. WMSC is a facility for marine, terrestrial and environmental science and education. The University of Southern California maintains a 30,000 square-foot marine laboratory that was renovated in the summer of 1996 and is used by faculty and students from USC and other regional universities. The laboratory is available for a broad range of research and educational activities (Michaels, 2005). The lab includes two teaching laboratories and six research laboratories, each with freshwater sinks and seawater aquaria. The facility also contains a library, a stockroom equipped with basic glassware, chemicals, small lab equipment, and a freezer storage space. An onsite machine shop stocked with tools and large equipment provides for repairs or fabrication.

Seawater System

Seawater flows into laboratory aquaria after being pumped from the sub-marine intake. The intake structure is located at Blue Cavern Point, immediately outside the ASBS. It consists of two 6-inch poly-vinyl chloride pipes submerged 15 feet below the water surface. This is a continuous-flow system, designed with a current pump rate of 180,000 GPD (Michaels 2004) available to the laboratory and to large holding tanks and experimental aquaria on the waterfront. The water is untreated except for a macro-screen located on the intake pipes designed to prevent the intake of kelp. This is a once-through system (no recirculation). Seawater is pumped into a 15,000-gallon holding tank on the hill above the facility and is then gravity fed to the laboratory and waterfront facilities. The waterfront holding tank(s) may be used to store fish, shellfish, or algae prior to removal to the laboratory for experimentation. Any sediment picked up at the intakes settles out in the 15,000-gallon storage tank on the hill (Michaels 2005). The sediment may eventually be discharged to Big Fisherman Cove during cleanout operations.

Waterfront Facilities

The waterfront facilities consist of a dock and pier, helipad, dive locker and diver staging area, and the USC Catalina Hyperbaric Chamber. Water depth beneath the two 20-by-60-foot floating dock is 24-40 feet at MLLW. The dock is attached to a 70- by 20-foot standing pier supplied with 110V electrical outlets, a freshwater spigot, and a 5-ton capacity jib crane.

The Center's fleet of small boats is available to students and researchers. The Center maintains 25 moorings for its fleet and private transient boats up to 70 feet in length. Subtidal scientific experiments are frequently staged in the same area as the moorings, often taking advantage of the mooring weights or simply using sand anchors (Michaels 2005).

As mentioned above WMSC has Los Angeles County Planning Commission approval for rebuilding of the waterfront facilities. Per the requirements of Section III.E.2 of the Ocean Plan WMSC must notify the Regional Water Board within 180 days prior to any construction activity that could result in any discharge or habitat modification in the ASBS. Furthermore, WMSC must receive approval and appropriate conditions from the Regional Water Board prior to performing any significant modification, re-building or renovation of the water front facilities, including the pier and dock.

In the vicinity of the waterfront is a helipad licensed by the State of California for day or night helicopter landings. It serves the Catalina Hyperbaric Chamber and is used during evacuation for other medical emergencies. It may also be used for routine transportation to the mainland by special arrangement with independent helicopter services. Medical and work trailers supporting the lab, chamber, and habitat programs surround the hangar. Two dive lockers provide locked storage for gear, showers and dressing rooms for up to 80 divers, and an air compressor fills standard steel tanks to 2300 psi. A diver staging area is located outside the diving lockers, and includes freshwater tubs for rinsing gear and equipment (Michaels 2005).

Existing Discharges

The Southern California Coastal Water Research Project (SCCWRP), under contract to the State Water Board, conducted a survey of all discharges into State Water Quality Protection Areas. SCCWRP's (2003) final report identified 58 drainages into the Northwest Santa Catalina Island ASBS, consisting of 38 discharges, 17 outlets (natural ephemeral streams), 1 intake line, and 2 potential sources that were not completely identified.

SCCWRP identified two discharges at Wrigley Marine Science Center and one seawater intake pipe for the laboratory aquaria. (It should be noted that the SCCWRP survey of the area of WMSC was conducted from a vessel and not from shore, and therefore had limitations.) Waste seawater drained from the laboratory and the holding tanks at the waterfront. The landscape's main natural drainage feature passes through a 60-inch metal outfall pipe (circa 1965) passing under the road and outfalls, and draining storm water runoff directly into the ASBS waters. Storm water runoff also drained from the laboratory and dormitory areas, co-mingling with return seawater effluent. At the time of the survey a portion of the seawater return from the holding tanks at the waterfront area, and the freshwater rinsing of dive equipment, flowed from a small bluff into Big Fisherman Cove adjacent to the facility's dock. Occasionally flows from tank cleaning operations and dive equipment rinsing eroded the bluff.

SCCWRP also identified discharges in the Two Harbors area, west of the WMSC. These drainages consisted mainly of small earthen channels and pipes that appeared to be used for storm water runoff (SCCWRP 2003). Storm water discharges from Two Harbors are not regulated under a Storm Water NPDES Permit. In addition, Two Harbors has marina facilities (mooring field and pier facilities) that were included in the survey as a nonpoint source. Two Harbors is served by a sewage treatment plant, the effluent from which is disposed of via spraying on a hillside (SWRCB 1979). See Figure 1 for the locations of discharges and other features in the general vicinity of Isthmus Cove (Two Harbors) and Big Fisherman Cove. See Figure 2 for the locations of discharges and other features at Big Fisherman Cove.

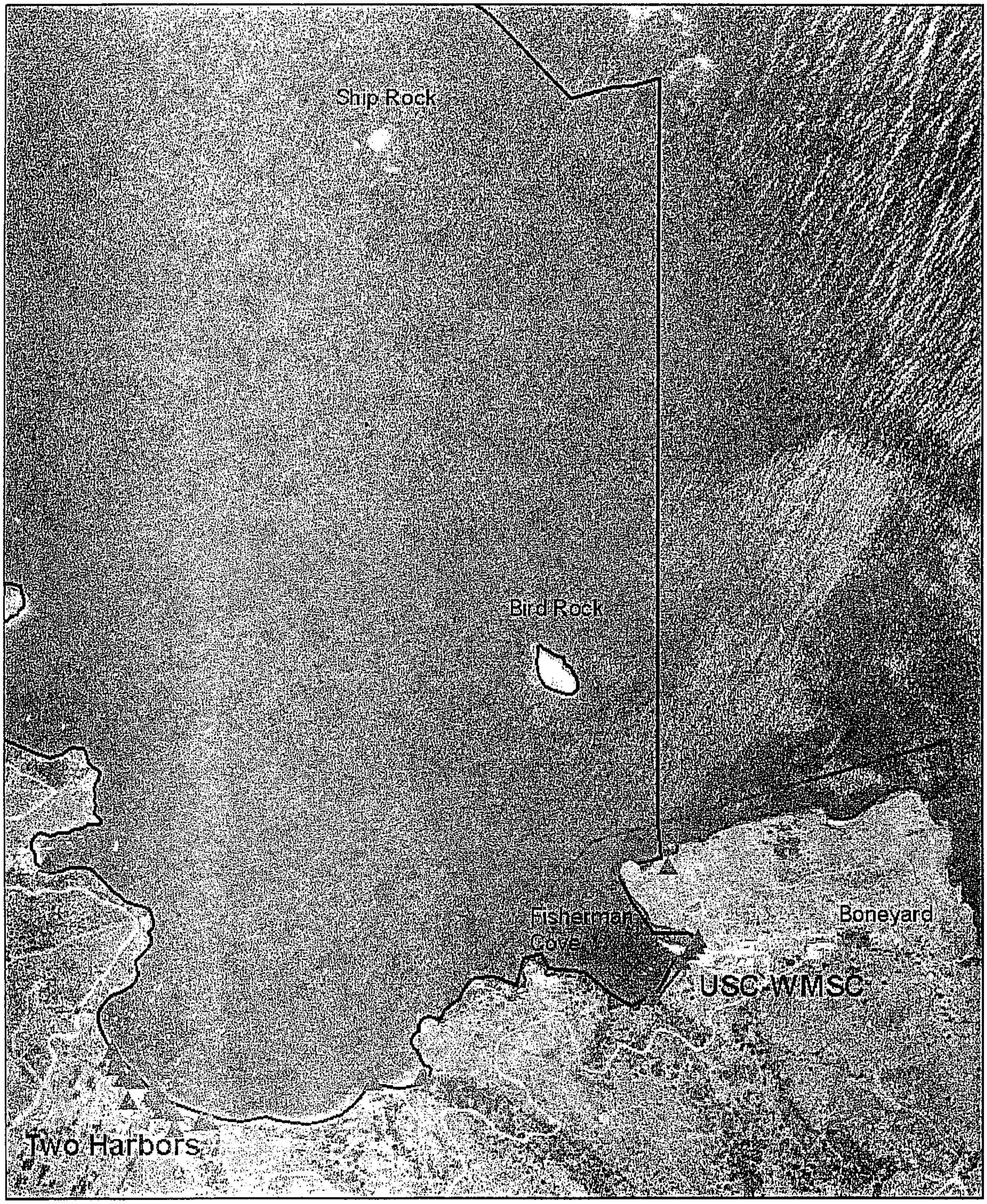
WMSC Waste Seawater Discharge

As mentioned above in the discussion regarding laboratory infrastructure WMSC operates a flow-through seawater system designed to supply the laboratory and waterfront with seawater for purposes of keeping marine animals and plants alive. The seawater is not heated, cooled, or filtered, being used strictly for maintenance of living organisms. All of the once-through seawater used in various parts of the facility are brought together and co-mingled at the waterfront and discharged to the north side of Big Fisherman Cove. The total flow during normal operations is about 180,000 GPD. In addition, as mentioned above, the discharge is covered under NPDES Permit (CA 0056661) issued by the Los Angeles Regional Water Board, re-issued most recently on October 12, 2000, and expiring on November 10, 2005. This discharge has never been issued an exception by the State Water Board and thus does not currently comply with the California Ocean Plan. However, the WMSC has committed to not discharging any chemicals, including chlorine bleach. Furthermore, since the system has no filtration, there will be no need to discharge filter backwash. Monitoring results for the seawater discharge are detailed in the Water Quality Section.

WMSC Sewage Treatment Plant

The wastewater treatment plant for Wrigley Marine Science Center (WMSC) went into operation in late 1967. Sewage treatment consists of an activated sludge digestion process, with extended aeration and provisions for chlorination. The holding pond has a ten-day capacity (per 1979 flows) and the effluent is ultimately sprayed onto a hillside in a fenced area. Capacity of the system is 15,000 GPD. The plant is owned by USC, operated and monitored by WMSC staff.

Isthmus Cove Area Figure 1



Seawater Intake

Discharges and outlets

ASBS

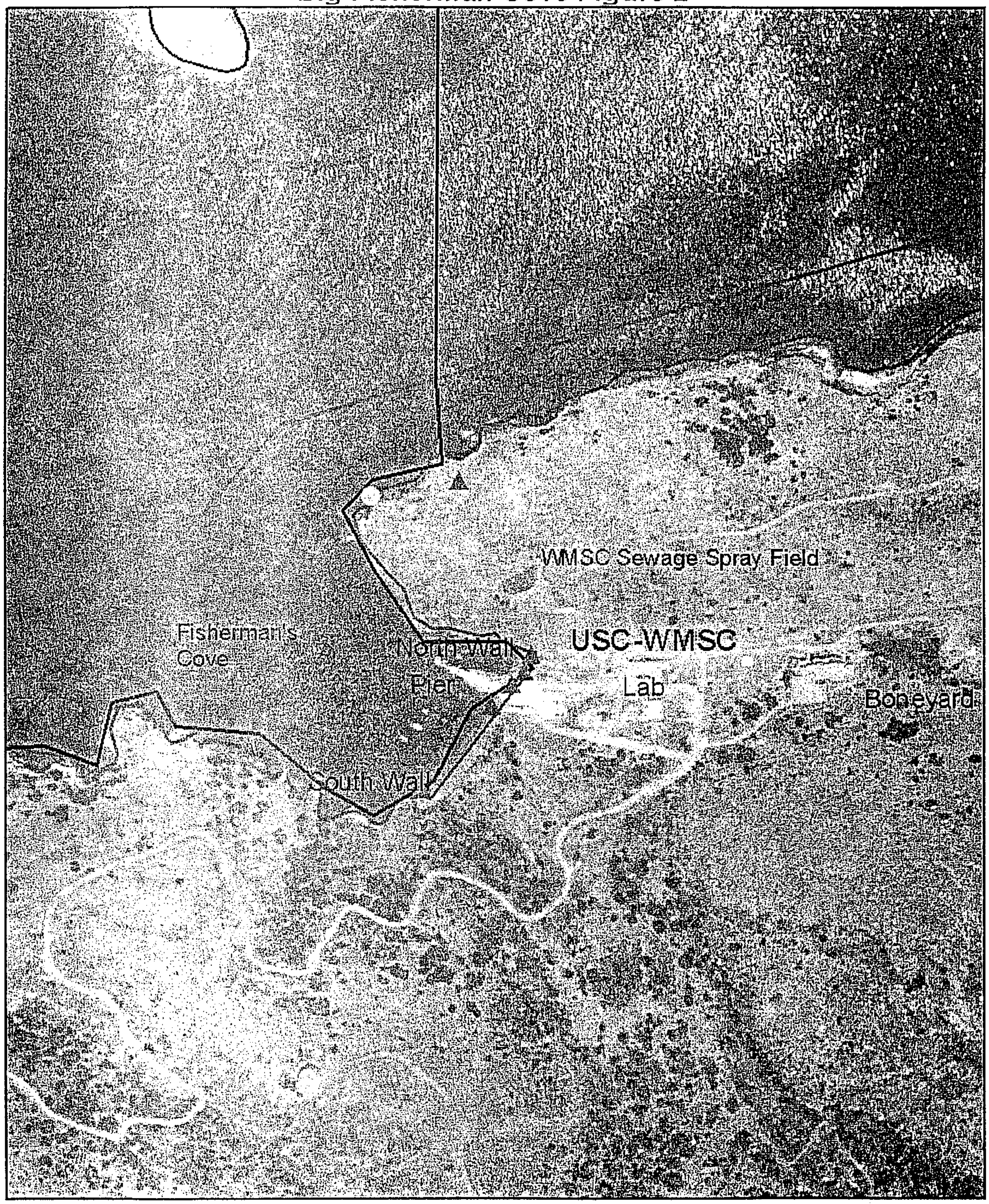
Catalina Marine Science Center Marine Life Refuge

0 0.125 0.25 0.5 Miles

Water Boards

Data Source: SCCRWP/SWRCB dishcarge survey 2000
Map Created October 19, 2005 State Water Resources Control Board

Big Fisherman Cove Figure 2



Seawater Intake

Discharges and outlets

ASBS

Catalina Marine Science Center Marine Life Refuge

0 45 90 180 Meters

Water Boards

Data Source: SCCRWP/SWRCB dishcarge survey 2000
Map Created October 19, 2005 State Water Resources Control Board

Storm runoff from this land disposal spray field may possibly enter the ASBS via ocean currents during large precipitation events.

In June 1966, the County of Los Angeles Health Department set criteria for the WMSC wastewater treatment plant, including requirements that only well-stabilized and disinfected effluent will be used for spray irrigation, that the effluent shall at all times be confined to property under the control of the discharger, that the plant, pond and spray area be fenced to exclude unauthorized persons, and that suitable warning signs will be provided on the fence.

Waste Discharge Requirements (WDR) were originally issued by the Los Angeles Regional Water Quality Control Board in 1966. The plant and discharge currently operate under WDR File No. 66-069, Order No. 94-114, CI No. 5215, most recently reissued in October 1994. The plant is allowed to discharge treated and disinfected (chlorinated) wastewater to land via a spray field. According to the WDR, the wastewater treatment plant effluent is limited to treated domestic and commercial wastewater, prohibiting all other discharge such as water softener regeneration brines, raw sewage, partially dried waste sludge or radioactivity. Wastewater effluent must also meet specific water quality criteria such as pH, total dissolved solids, sulfate, chloride, boron, oil & grease, suspended solids, biochemical oxygen demand and coliform bacteria prior to discharge by irrigation upon the spray field. Total dissolved solids and chloride levels are set above the Basin Plan water quality objectives, reflecting the high concentrations of the constituents in the supply water and the very limited groundwater resources underlying the area. Irrigated effluent must be controlled for both the rate and volume at which it is applied to prevent excess soil moisture conditions and the potential for runoff, and at a distance of 150 feet from any water well or mineral spring.

The Regional Board WDR Monitoring and Reporting Program requires sampling and analyzing the treated wastewater for a variety of constituents. All analyses shall be conducted at a State Department of Health Services approved facility. The quarterly monitoring reports shall contain an average and maximum daily waste flow for each month of the quarter; the estimated average population served during each month of the reporting period and the approximate acreage irrigated by the treated wastewater; a statement relative to compliance with discharge specifications during the reporting period; and results of at least weekly observations in the disposal area for any overflow or surfacing of waste.

II. Environmental Impacts

The environmental factors checked below could be potentially affected by this project. See the checklist on the following pages for more details.

☐	Land Use and Planning	☐	Transportation/Circulation	☐	Public Services
☐	Population and Housing	☑	Biological Resources	☐	Utilities and Service Systems
☐	Geological Problems /Soils	☐	Energy and Mineral Resources	☐	Aesthetics
☑	Hydrology/Water Quality	☐	Hazards	☐	Cultural Resources
☐	Air Quality	☐	Noise	☐	Recreation
☐	Agriculture Resources	☐	Mandatory Findings of Significance		

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
1. GEOLOGY and SOILS. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☑
i) Rupture of a known earthquake fault, as delineated in the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines & Geology Special Publication 42.	☐	☐	☐	☑
ii) Strong seismic ground shaking?	☐	☐	☐	☑
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☑
iv) Landslides?	☐	☐	☐	☑
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☑
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☑
d) Be located on expansive soils, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☑
e) Have soils incapable of adequately supporting the use of septic tanks or alternate wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☑
2. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☑
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☑
c) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☑
d) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☑
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☑

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
3. HYDROLOGY and WATER QUALITY. Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☑	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (*e.g.*, the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☑
c) Substantially alter the existing drainage pattern of the site, including through alteration of the course of a stream or river, or substantially increase the rate or volume of surface runoff in a manner that would:				
i) result in flooding on- or off-site	☐	☐	☐	☑
ii) create or contribute runoff water that would exceed the capacity of existing or planned stormwater discharge	☐	☐	☐	☑
iii) provide substantial additional sources of polluted runoff	☐	☐	☐	☑
iv) result in substantial erosion or siltation on-or off-site?	☐	☐	☐	☑
d) Otherwise substantially degrade water quality?	☐	☑	☐	☐
e) Place housing or other structures which would impede or re-direct flood flows within a 100-yr. flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☑
f) Expose people or structures to a significant risk of loss, injury, or death involving flooding:				
i) as a result of the failure of a dam or levee?	☐	☐	☐	☑
ii) from inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☑
g) Would the change in the water volume and/or the pattern of seasonal flows in the affected watercourse result in:				
i) a significant cumulative reduction in the water supply downstream of the diversion?	☐	☐	☐	☑
ii) a significant reduction in water supply, either on an annual or seasonal basis, to senior water right holders downstream of the diversion?	☐	☐	☐	☑
iii) a significant reduction in the available aquatic habitat or riparian habitat for native species of plants and animals?	☐	☐	☐	☑

iv) a significant change in seasonal water temperatures due to changes in the patterns of water flow in the stream?	☐	☐	☐	☑
v) a substantial increase or threat from invasive, non-native plants and wildlife	☐	☑	☐	☐
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☑

HYDROLOGY and WATER QUALITY

Storm Water and Non-Storm Water Runoff

At the time of the SCCWRP survey and initial review by State and Regional Water Board staff concerning the ASBS, storm water runoff (and in some cases non-storm water runoff) was co-mingled with the waste seawater prior to discharge. Major improvements have been made in terms of segregating waste streams, replacement of road materials (to reduce storm water pollutants) and in routing runoff into vegetated swales. The WMSC staff is commended for the work performed in advance of an exception.

The public touch tank area on the east side of the main lab building had originally been designed with seawater drains, which discharged into a concrete swale on the north side of the building. This swale continued down the hill parallel to the road and the surface flow discharged into the ocean near the seawater tanks and other effluent discharges on the waterfront. When it rained, this swale also collected storm water runoff and the two fluids co-mingled. The touch tank drains have since been re-routed and now connect through a four-inch PVC pipe to the existing seawater drainage system. Storm water runoff through the concrete swale is no longer co-mingled with the waste seawater.

In the loading dock area of the main lab building, (on the west side), there is a vent for the seawater drainage system from the lab building. The laboratory's outdoor aquaculture tanks are also located in this area and drain to that same portion of the waste seawater system. Originally this vent also collected runoff from parts of the loading dock, where among other things vehicle maintenance is performed, and the two waste streams co-mingled during storm events. USC WMSC has now segregated (as of February 2005) the storm water runoff from the loading dock and the waste seawater effluent into separate waste streams (Michaels 2005).

The majority of dry weather flows and wet weather flows during small precipitation events will likely be infiltrated in vegetated swales. Storm water runoff will still occur from the water front (dive locker area included), from a small portion of the laboratory building area, and from the main storm water culvert that drains a watershed area with abandoned silver mines, and a non-paved storage area, where old lab and marine equipment and construction wastes have been stored. Although a great deal of progress has already been made, storm water runoff may still contain constituents that are toxic to marine life as shown in Table 1.

The possibility exists that contamination of the ASBS may result due to storm water runoff from the sewage treatment spray field. Additional testing will be required to ensure that runoff from the spray field does not result in any contamination in the ASBS.

WMSC has not prepared and submitted a Storm Water Management Plan (SWMP) to the Regional Water Board that covers those drainage facilities that drain to the ASBS. A SWMP should be developed to identify pollutant sources, develop Best Management Practices (BMPs), and provide measurable goals to reduce the discharge of identified pollutants into the ASBS. The SWMP should include an implementation schedule for specific BMPs (e.g., maintenance area cleanup, spill prevention and control, elimination of non-storm flows, storm drain inspection/maintenance and for addressing storm water pollutant sources).

Metals

Table 1 includes the analytical results for Table B metals (marine aquatic life) for storm water and reference (intake) samples collected in 2004.

Table 1. Analysis of Intake, Seawater and Storm Water Effluents, and Receiving Water, November 2004.

Analyte µg/L	Ocean Plan 6 month median	Intake seawater	Big Fisherman Cove	Runoff from Lab	Main Storm Drain	Dive Locker Runoff	Detection limit
Arsenic	**8**	0.998	0.949	4.53	1.31	15.1	**0.015**
Cadmium	**1**	0.039	0.038	0.23	0.216	0.382	**0.01**
Copper	**3**	0.267	1.13	34.6	11.3	64.9	**0.01**
Lead	**2**	0.05	0.044	3.34	4.24	14.9	**0.01**
Nickel	**5**	0.019	0.275	11.4	11.8	41.8	**0.01**
Selenium	**15**	ND	ND	0.073	ND	ND	**0.015**
Silver	**0.7**	ND	ND	ND	0.287	0.18	**0.01**
Zinc	**20**	1.32	2.5	46.8	166.0	387.0	**0.01**

Non-detected constituents are listed as ND. (CRG Laboratories 2004).

Results for the dive locker storm runoff exceed California Ocean Plan six month median water quality objectives for arsenic, copper, lead, nickel and zinc.

The main storm drain exceeds the California Ocean Plan six month median water quality objectives for copper, lead, nickel, and zinc. The drainage area for this discharge includes a combination of natural watershed, abandoned silver mines from the nineteenth century, a storage area where old lab and marine equipment and construction wastes have been stored, and a long stretch of 60" pipe (possibly in poor repair) that carries runoff below the laboratory and other facilities.

Lab storm water drainage exceeds California Ocean Plan six month median water quality objectives for copper, lead, nickel, and zinc. In the loading dock area of the main lab building, (on the west side), there is a vent for the seawater drainage system from the lab building. At the time of the sampling in November 2004 this vent also collected runoff from parts of the loading dock, and the two waste streams co-mingled during storm events. USC WMSC has now segregated the two streams (Michaels, 2005).

The results of the intake seawater (reference) and the receiving water in Big Fisherman Cove were below Ocean Plan Table C background concentrations for arsenic, copper, silver, and zinc. The receiving water was noticeably elevated above the reference sample for copper, nickel, and zinc.

It must be noted that earlier samples were analyzed for metals but State and Regional Water Board staff determined that the procedures and quality assurance for that analysis were inadequate, providing faulty results. Those results are not presented here.

In December 2004, additional testing to screen for PAH's (by HPLC) was performed at the same three runoff sampling locations. Water samples were collected from the main storm water drainage, the lab storm water drainage and the dive locker storm water drainage sites. PAH's were not detected in any of these this samples at that time.

The following mitigating conditions will be required for the exception in relation to non-storm runoff and storm water management plans:

- *For metals analysis, waste seawater effluent, storm water effluent, reference samples, and receiving water samples must be analyzed by the approved analytical method with the lowest minimum detection limits (currently Inductively Coupled Plasma/ Mass Spectrometry) described in the Ocean Plan.*

- *Flows for the seawater discharge system and storm water runoff (by storm event) must be reported quarterly to the Regional Water Board.*

- *WMSC must continue to prevent all discharges of non-storm water facility runoff (i.e., any discharge of facility runoff that reaches the ocean that is not composed entirely of storm water), except those associated with emergency fire fighting.*

- *WMSC must specifically address the prohibition of non-storm water runoff and the reduction of pollutants in storm water discharges draining to the ASBS in a Storm Water Management Plan/Program (SWMP). WMSC is required to submit its final SWMP to the Regional Water Board.*

- *The SWMP must include a map of surface drainage of storm water runoff, including areas of sheet runoff, and any structural Best Management Practices (BMPs) employed. The map must also show the storm water conveyances in relation to other facility features such as the laboratory seawater system and discharges, service areas, sewage treatment, and waste and hazardous materials storage areas. The SWMP must also include a procedure for updating the map and plan when other changes are made to the facilities.*

- *The SWMP must describe the measures by which non-storm water discharges have been eliminated, how these measures will be maintained over time, and how these measures are monitored and documented.*

- *The SWMP must also address storm water discharges, and how pollutants have been and will be reduced in storm water runoff into the ASBS through the implementation of BMPs. The SWMP must describe the BMPs currently employed and BMPs planned (including those for construction activities), and an implementation schedule. The BMPs and implementation schedule must be designed to ensure natural water quality conditions in the receiving water due to either a reduction in flows from impervious surfaces or reduction in pollutants, or some combination thereof. The implementation schedule must be developed to ensure that the BMPs are implemented within one year of the approval date of the SWMP by the Regional Water Board.*

- *Once annually, during wet weather (storm event), the storm water runoff effluent and the receiving water adjacent to the seawater and storm water discharge system must be sampled and analyzed for Ocean Plan Table B constituents. The receiving water in Big Fisherman Cove must also be monitored for Ocean Plan indicator bacteria water quality objectives. The sample location for the receiving water will be immediately seaward of the surf zone in Big Fisherman Cove adjacent to the outfall location. Storm water runoff and receiving water must be sampled at the same time as the seawater effluent and reference sampling described in condition 12 above. Based on the first year sample results, the Regional Water Board will determine specific constituents in the storm water runoff and receiving water to be tested during the remainder of the permit cycle, except that indicator bacteria and chronic toxicity (three species) for receiving water must be tested annually during a storm event.*

- *Once annually, the subtidal sediment near the seawater discharge system and storm water outfall in Big Fisherman Cove must be sampled and analyzed for Ocean Plan Table B constituents. For sediment toxicity testing, only an acute toxicity test using the amphipod Eohaustorius estuarius must be performed. Based on the first year sample results, the Regional Water Board will determine specific constituents to be tested during the remainder of each permit cycle, except that acute toxicity for sediment must be tested annually.*

- *In addition to the bacterial monitoring requirements described in conditions 12 and 13 above, samples must be collected at the seawater intake structure during a maximum of three storm events per year that result in runoff from the spray field hillside, and measured for Ocean Plan indicator bacteria. The station at the seawater intake structure is not considered a reference station for indicator bacteria but instead is selected for this requirement because it is near the bluff below the WMSC sewage treatment plant spray field. This requirement along with the bacterial monitoring in conditions 12 and 13 is meant to satisfy in total the Ocean Plan bacteria monitoring requirements. This additional bacteria monitoring may be eliminated by the Regional Water Board if changes are made to WMSC's sewage plant or treated sewage effluent system that would absolutely eliminate the possibility of contaminants entering the ASBS.*

- *If the results of receiving water monitoring indicate that the storm water runoff is causing or contributing to an alteration of natural water quality in the ASBS, as measured at the reference station at the seawater intake, WMSC is required to submit a report to the Regional Water Board within 30 days of receiving the results. Those constituents in storm water that alter natural water quality or receiving water objectives must be identified in that report. The report must describe BMPs that are currently being implemented, BMPs that are* *planned for in the SWMP, and additional BMPs that may be added to the SWMP. The report shall include a new or modified implementation schedule. The Regional Water Board may require modifications to the report. Within 30 days following approval of the report by the Regional Water Board, WMSC must revise its SWMP to incorporate any new or modified BMPs that have been and will be implemented, the implementation schedule, and any additional monitoring required. As long as WMSC has complied with the procedures described above and is implementing the revised SWMP, then WMSC does not have to repeat the same procedure for continuing or recurring exceedances of the same constituent.*

Waterfront and Marine Nonpoint Source Pollution

The waterfront facilities include a dock and pier. The dock is attached to a 70 by 20 foot standing pier supplied with 110V electrical outlets, a freshwater spigot, and a 5-ton capacity jib crane. The pier and dock are planned for renovation and the construction activity has the potential to cause pollution in the ASBS.

WMSC maintains several small vessels and 25 moorings for this fleet and transient boats up to 70 feet in length. Some of the vessels are operated by WMSC staff and the transient vessels are operated either by research institutions or private parties. The potential exists for pollutants to enter the ASBS from these vessels and associated operations and facilities.

The following mitigating conditions will be required for the exception in relation to nonpoint source pollution from the waterfront and marine operations:

- *WMSC must prepare a waterfront and marine operations non-point source management plan containing appropriate management practices to address non-point source pollutant discharges. Appropriate management measures will include those described in the State's Non-point Source Program Implementation Plan for marinas and recreational boating, as applicable. The Regional Water Board, in consultation with the State Water Board's Division of Water Quality, will review the plan. The Regional Water Board shall appropriately regulate non-point source discharges in accordance with the State Water Board's Policy for Implementation and Enforcement of the Non-point Source Pollution Control Program. The plan must be implemented within six months of its approval.*

- *WMSC will notify the Regional Water Board within 180 days prior to any construction activity that could result in any discharge or habitat modification in the ASBS. Furthermore, WMSC must receive approval and appropriate conditions from the Regional Water Board prior to performing any significant modification, re-building or renovation of the water front facilities, including the pier and dock, according to the requirements of Section III.E.2 of the Ocean Plan.*

Waste Seawater Discharge

As mentioned above, there have been significant improvements in segregating storm water from waste seawater. All waste seawater is now routed through a dedicated drainage system to the outfall at the waterfront. Another improvement involves rinse water disposal at the dive locker/waterfront area. WMSC had originally located a pair of 40-gallon sinks near the seawater tables at the waterfront for the rinsing of dive gear. These sinks were filled with freshwater, but drained onto an earthen bluff and then into the drainage area that catches the discharge from the seawater tanks and tables. Thus, when divers rinsed their gear, they would discharge some amount between 20-60 gallons of waste freshwater onto the bluff and thence into the waste seawater that was running into the ocean. The divers shared these tanks, so they rarely were drained more that 6-10- times per day and most days, probably less than 1-2 times per day. This situation has since been corrected, The rinse tanks were recently relocated to a new location where the freshwater now drains into the sewer and is treated in their secondary treatment plant. Therefore the dive sink wastewater no longer co-mingles with the seawater discharge (Michaels 2004).

Chronic Toxicity Testing

The following are results of the chronic toxicity tests performed on the WMSC waste seawater effluent, and reference and receiving waters, for three samples in February 2004 and one sample in October 2004. Test procedures for the chronic toxicity testing followed the *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms,* EPA/600/R-95/136. *Atherinops affinis* (topsmelt) are a member of the fish community at Big Fisherman Cove and were utilized as the standard marine test organism for the chronic toxicity testing as shown in Table 2.

Table 2. Chronic Toxicity Testing Survival/Growth Results for *Atherinops affinis*

Sample date	**Sampling Station**		
	Intake Pipes	Big Fisherman Cove	Seawater System Effluent
February 2004	NOEC = 100%	NOEC = 100%	NOEC = 100%
October 2004	---	---	NOEC = 100%

Chronic toxicity tests evaluate the biological response of an organism to the effluent and measure the acceptability of waters for supporting a healthy marine biota. The No-Observed-Effect-Concentration (NOEC) is the highest concentration of toxicant to which organisms are exposed in a full life cycle or partial life-cycle (short-term) test that causes no observable adverse effects on the test organism. Test results from February and October 2004 seawater effluent and receiving water samples show a NOEC of 100%, in other words zero toxicity.

Chemical and Physical Characteristics

Monitoring data for conventional constituents, as required under the NPDES permit for the waste seawater effluent is presented in Table 3. Reported results from February 2004 to January 2005 were in compliance with the permitted effluent limits.

Table 3. Analysis of Waste Seawater Effluent Sampling Station 2004/2005

	Analyte					
Sample date	**pH**	**Total Suspended Solids (mg/L)**	**Settleable Solids (mg/L)**	**Oil & Grease (mg/L)**	**Turbidity (NTU)**	**Biochemical Oxygen Demand (mg/L)**
June 2005	7.94	---	---	---	---	---
May 2005	7.94	20	ND	ND	0.25	3
April 2005	7.96	---	---	---	---	---
March 2005	7.79	ND	ND	ND	0.31	ND
February 2005	7.72	---	---	---	---	---
January 2005	7.80	---	---	---	---	---
October 2004	8.05	ND	ND	ND	0.17	ND
February 2004	7.87	ND	ND	ND	0.25	ND

Results were reported in either mg/L or ug/L. Constituents that were not tested are indicated by dashed symbol in the column (---). Non-detected constituents are listed as ND.

Waste Seawater Effluent Thermal Impacts

WMSC regularly monitors the temperature of the ambient seawater and water entering the aquaria. Temperatures are taken with standard laboratory thermometers calibrated in degrees Celsius and are reported in those units to maintain accuracy. At the location of the seawater system intake pipe, continuously recording thermisters for recording ocean temperature are installed at the 15, 30, 60 and 100-foot depths. The intake pipe is at the 15-foot depth. Shallower temperatures are warmer than deeper waters with a difference of 2-6 degrees C between 15 ft (5m) and 100 ft (33m). (Michaels 2004).

The discharge temperatures during the period 1991 – 2004 varied from 12-23 degrees C with the same seasonality found in natural waters in this region. The average temperature of the discharge water tends to be only slightly warmer, about 0.2-0.3 degrees C, than the background seawater at the intake (15 ft.). Maximum differences of as much as 2 degrees C were observed.

WMSC also measured ambient surface water temperatures at the end of the pier feet in Big Fisherman Cove and the temperature of the seawater discharge, and reported this to the Regional Board in their quarterly monitoring reports. The mean monthly temperatures for the year 2004 differed by only 0.1° F between the discharge (64.3° F) and the Cove (64.4° F), with the Cove being only slightly warmer. This temperature data from January 2004 to June 2005 is given in Table 4.

On October 25, 2004 WMSC performed field temperature measurements within Big Fisherman Cove. The results of those measurements indicate that the receiving water near the discharge is slightly warmer than in the larger portion of the Cove further away from the discharge. However, the receiving water immediately near the discharge is much more shallow in depth than the majority of the Cove, which might account for some of this difference.

Table 4. Monthly Monitoring of Seawater Temperatures for WMSC 2004/2005.

Month	Big Fisherman Cove Ambient Seawater	Seawater System Discharge
January 2004	59.3° F (15.1° C)	59.3° F (16.1° C)
February 2004	58.4° F (14.6° C)	58.4° F (14.6° C)
March 2004	61.3° F (16.2° C)	61.3° F (16.2° C)
April 2004	62.4° F (16.8 °C)	62.4° F (16.8° C)
May 2004	68.4° F (20.2° C)	68.4° F (20.2° C)
June 2004	64.3° F (17.9° C)	64.3° F (17.9° C)
July 2004	71.2° F (21.7° C)	71.5° F (21.9° C)
August 2004	69.1° F (20.6° C)	69.8° F (21.0° C)
September 2004	69.1° F (20.6° C)	68.2° F (20.1° C)
October 2004	66.1° F (18.9° C)	66.4° F (19.1° C)
November 2004	61.3° F (16.27° C)	60.7° F (15.9° C)
December 2004	61.4° F (16.3° C)	61.4° F (16.3° C)
January 2005	61.3 °F (16.2° C)	62.7° F (15.9° C)
February 2005	60.3° F (15.7° C)	59.2° F (15.1° C)
March 2005	60.7° F (15.9° C)	60.8° F (16.0° C)
April 2005	58.2° F (15.1° C)	58.5° F (14.72° C)
May 2005	66.3° F (16.2° C)	66.5° F (19.1° C)
June 2005	68.4° F (20.2° C)	69.3° F (20.7° C)
Mean	63.8° F (17.6° C)	63.8° F (17.6° C)

Metals

The current permit is not consistent with the 2001 Ocean Plan requirements with regard to Table B constituents, including metals. However, in preparation for this environmental review, samples were collected during dry weather (October 2004) and wet weather (November 2004). Table 5 includes the analytical results of reference samples collected at the seawater intake, waste seawater effluent, and the ASBS receiving waters in Big Fisherman Cove, for Table B metals (marine aquatic life). The waste seawater and ASBS receiving waters were below California Ocean Plan's lowest water quality objectives (six month medians) for metals.

Table 5. Analysis of Waste Seawater, Reference and Receiving Water. October and November 2004.

		October (dry weather)			November (wet weather)			
Analyte µg/L	Ocean Plan 6 month median	Intake Seawater	Waste Seawater	Big Fisherman Cove	Intake Seawater	Waste Seawater	Big Fisherman Cove	Detection limit
Arsenic	8	ND	1.02	1.04	0.998	0.859	0.949	0.015
Cadmium	1	0.035	0.033	0.042	0.039	0.044	0.038	0.01
Copper	3	0.161	0.174	0.515	0.267	0.106	1.13	0.01
Lead	2	0.024	0.02	---	0.05	0.015	0.044	0.01
Nickel	5	0.21	0.249	0.304	0.019	0.278	0.275	0.01
Selenium	15	ND	ND	ND	ND	ND	ND	0.015
Silver	0.7	0.024	ND	ND	ND	ND	ND	0.01
Zinc	20	8.36	1.74	2.18	1.32	1.65	2.5	0.01

Constituents that were not tested are indicated by dashed symbol in the column (---). Non-detected constituents below the DLR are listed as ND. (CRG Laboratories 2004).

During dry weather the results of the intake seawater (reference) sample and the receiving water in Big Fisherman Cove were below Ocean Plan Table C background concentrations for arsenic (3 µg/L), copper (2 µg/L), and silver (0.16 µg/L). The receiving water was below Table C zinc levels as well. Zinc levels in the reference sample were virtually the same (within typical lab error) as the Table C level of 8.0 µg/L. The receiving water was slightly elevated above the reference sample for copper, but was much lower than the reference sample for zinc.

During wet weather the results of the intake seawater (reference) and the receiving water in Big Fisherman Cove were also below Ocean Plan Table C background concentrations for arsenic, copper, silver, and zinc. The receiving water was noticeably elevated above the reference sample for copper, nickel, and zinc, but this is likely related to storm water runoff (see storm water metals analyses in Table1).

It must be noted that earlier samples were analyzed for metals but State and Regional Water Board staff determined that the procedures and quality assurance for that analysis were inadequate, providing faulty results. Those results are not presented here.

The following mitigating conditions will be required for the exception in relation to the waste seawater effluent:

- *The discharge must comply with all other applicable provisions, including water quality standards, of the Ocean Plan. Natural water quality conditions in the receiving water, seaward of the surf zone, must not be altered as a result of the discharge. The surf zone is defined as the area between the breaking waves and the shoreline at any one time. Natural water quality will be defined, based on a review of the monitoring data, by Regional Water Board staff in consultation with the Division of Water Quality of the State Water Board. For constituents other than indicator bacteria, natural water quality will be determined using the reference station in the ocean near the seawater intake structure. For indicator bacteria, the Ocean Plan bacteria objectives will be used.*

- *WMSC will not discharge chemical additives, including antibiotics, in the seawater system effluent. In addition and at a minimum, WMSC, for its waste seawater effluent, must comply with effluent limits implementing Table B water quality objectives as required in Section III.C. of the Ocean Plan (2001).*

- *For metals analysis, waste seawater effluent, storm water effluent, reference samples, and receiving water samples must be analyzed by the approved analytical method with the lowest minimum detection limits (currently Inductively Coupled Plasma/Mass Spectrometry) described in the Ocean Plan.*

- *Flows for the seawater discharge system and storm water runoff (by storm event) must be reported quarterly to the Regional Water Board.*

- *Once during the upcoming permit cycle, a bioaccumulation study using mussels (Mytilus californianus) must be conducted to determine the concentrations of metals near field (within Big Fisherman Cove) and far field (near the seawater intake structure). The Regional Water Board, in consultation with the Division of Water Quality, must approve the study design. The results of the survey must be completed and submitted to the Regional Water Board at least six months prior to the end of the permit cycle (permit expiration). Based on the study results, the Regional Water Board, in consultation with the Division of Water Quality, may adjust the study design in subsequent permits, or add additional test organisms.*

- *During the first year of each permit cycle two effluent samples must be collected from the waste seawater discharge (once during dry weather and once during wet weather, i.e. a storm event). In addition, reference samples must also be collected along with the effluent samples. Reference samples will be collected in the ocean at a station at the seawater intake structure (prior to entering the intake). Samples collected at the seawater intake structure will represent natural water quality for all Ocean Plan constituents except indicator bacteria and total chlorine residual. Samples at the reference station may be collected immediately following a storm event, but in no case more than 24 hours after, if sampling conditions are unsafe during the storm. All of these samples must be analyzed for all Ocean Plan Table B constituents, pH, salinity, and temperature, except that samples collected at the seawater intake do not require toxicity testing; instead, samples collected at the seawater intake structure must be analyzed for Ocean Plan indicator bacteria. Based on the results from the first year, the Regional Water Board will determine the frequency of sampling (at a minimum, annually during wet weather) and the constituents to be tested during the remainder of the permit cycle, except that ammonia nitrogen, pH, salinity, and temperature must be tested at least annually. Chronic toxicity (for at least one consistent invertebrate species) must be tested at least annually for the waste seawater effluent. In addition, samples collected at the seawater intake must be analyzed for indicator bacteria according to the requirements of condition 16.*

- *Once annually, the subtidal sediment near the seawater discharge system and storm water outfall in Big Fisherman Cove must be sampled and analyzed for Ocean Plan Table B constituents. For sediment toxicity testing, only an acute toxicity test using the amphipod Eohaustorius estuarius must be performed. Based on the first year sample results the Regional Water Board will determine specific constituents to be tested during the remainder of each permit cycle, except that acute toxicity for sediment must be tested annually.*

- *The Regional Water Board will include these mitigating conditions in the National Pollutant Discharge Elimination System (NPDES) permit for the seawater effluent. Alternatively, the Regional Water Board may regulate the storm water discharge in a storm water NPDES permit, and, in that case, would include those conditions relative to storm water in that storm water NPDES permit. In the latter case, all conditions would be included, in some combination, in the waste seawater effluent permit and the storm water permit.*

Biological Pollutants (Invasive Species)

Any marine organism not indigenous to the Southern California Bight that may possibly be introduced through the laboratory or aquarium discharges is considered a biological pollutant. Currently available information (California Department of Fish and Game (DFG) 2005) indicates that there are no invasive species that would be associated with a possible introduction from the WMSC discharges. Still, the potential for such introductions of potentially invasive species or pathogenic organisms does exist, and such accidental introductions could alter the marine community in an undesirable way.

Examples of marine invasive species potentially found in the Southern California Bight include, but may not be limited to: *Caulerpa taxifolia*, a Mediterranean Sea green algae; *Terebrasabella heterouncinata,* a South African parasitic polychaete worm which parasitizes marine mollusks such as abalone; *Potamocorbula amurenis*, an Asian clam that is a highly efficient filter feeder; and *Carcinus maenas*, the European Green crab, a voracious predator on native invertebrates (CDFG 2005). There is no evidence that these invasive species are in Big Fisherman Cove at the time of preparing this document. *Sargassum muticans*, an invasive brown algae, is found in Big Fisherman Cove, but it is ubiquitous throughout the Southern California Bight. Another exotic brown algae (*Undaria pinnatifida*) have been found on Santa Catalina Island (Silva, et al. 2002).

Invasive species in the marine environment generally 'arrive' to a location by one of these methods: 1) they are discharged as part of the ballast water from a docked or passing ship; 2) they are inadvertently released; 3) they come in as a 'stowaway' on another species; or 4) they are deliberately released (CDFG 2001). The pathways that are most applicable to WMSC are inadvertent releases or "stowaways" on another species.

Before being introduced into the research laboratory tanks at WMSC, specimens are currently inspected for incidental invasive species. If a specimen is suspected of carrying or containing an invasive species, then it is quarantined. If this occurs, the waste seawater from the quarantine tank is discharged to the sewer, thereby attempting to protect against biological contamination of the ASBS from the research laboratories.

If during the biological surveys required as required by the exception, any of the above species or any other invasives that are not listed above are detected, WMSC must notify the State Water Board and the California Department of Fish and Game (Marine Division) immediately.

The following mitigating condition will be required for the exception as they relate to biological pollutants:

- *WMSC must pursue and implement a program for prevention of Biological Pollutants (non-native invasive species) in consultation with the California Department of Fish and Game Marine Resources Division.*

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
4. BIOLOGICAL RESOURCES. Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the DFG or USFWS?	☐	☑	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the DFG or USFWS?	☐	☑	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the federal Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, *etc.*) through direct removal, filling, hydrological interruption or other means?	☐	☐	☐	☑
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☑
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☑

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan? ☐ ☐ ☐ ☑

Impacts to Marine Biota

Four qualitative surveys were considered in this Initial Study. These surveys were performed by 1) Bob Givens, et al. 1965 prior to the construction of the lab and seawater system, 2) Bob Givens in 1977 prior to construction of the mole and new pier, 3) Bob Given and Jan Dykzeul for the SWRCB Reconnaissance Survey (1979), and 4) WMSC in 2004. It should be noted that the fieldwork for the SWRCB 1979 document was probably conducted during the period 1977-1978, but no record of exact field survey events is available; therefore we will refer to this data by the 1979 date of publication. In addition, the WMSC 2004 data included some quantitative data (population densities) for only certain species. Finally, a fifth source of information is quantitative measures (population densities) of selected species performed by the Catalina Conservancy Divers and provided by WMSC in its November 2004 letter to the Regional Board.

Benthic Macrophytes

The results of four surveys performed at Big Fisherman Cove are presented in Appendix B. Assemblage analysis in each survey was reported as binary data (presence/absence) that weighs all species the same, and is the only form of data collected. The number of algae species reported increased from four in 1965, to 11 in 1977, 15 in 1979, and 25 in 2004. In the authors' opinion, it is highly unlikely that this is a result of an actual increase in algal species present. Instead this may be a result of survey design, specifically more focus toward algae species in later surveys, algal identification expertise, etc. for the 1965, 1977, and 1979 surveys.

No data is available regarding density of the surf grass *Phyllospadix* in Big Fisherman Cove. This is an important habitat forming species and should be included in future quantitative surveys.

Benthic Invertebrates

The results of four surveys performed at Big Fisherman Cove are presented in Appendix C. Assemblage analysis in each survey was reported as binary data (presence/absence) that weighs all species the same, and is the only form of data collected. In 1965, seven species were reported and eight species were reported for 1977. In 1979, 30 species were observed. In 2004, WMSC identified 29 invertebrate species on the north wall of Big Fisherman Cove and 35 on the south wall; a total of 42 invertebrate species were identified in Big Fisherman Cove.

It is interesting that of the eight species reported in 1977, only one species overlapped with the 1965 listing. In 1979 the bulk of the species (24) inhabited the soft bottom substrate and only seven species were reported solely on rock substrate. In 2004, the opposite is true. Of the 42 species reported, 41 species were rock dwellers and only one species, a tube-dwelling anemone, dwells solely on the soft bottom substrate.

Just as in the algal survey data there is an apparent increase in invertebrate species over time. Again, in the authors' opinion this is highly unlikely. Furthermore, it is unlikely that there were huge shifts in habitat during the intervening years. Instead it is likely that the differences between the survey results are due to survey design/emphasis. For example, it appears that in 1979 the surveyors concentrated on the soft bottom substrate and in 2004 the surveyors concentrated on the rock substrate.

Comparison of Species Densities

Species densities have been consistently monitored by Catalina Conservancy Divers (CCD) in conjunction with the WMSC at established sampling sites since 1992. CCD collected data since 1992 at the seawater system intake pipe(s) for sea urchins and giant kelp. CCD also collected data since 1997 at their Pumpernickel Cove site, located 3000 feet from the seawater system discharge, for sea urchins, warty sea cucumber, southern sea palm and giant kelp. For the Initial Study we will consider the both Pumpernickel and the Intake sites as reference locations. For these reference sites the most recent data provided by WMSC was apparently for spring (May and June) 2003. This quantitative information was supplied by WMSC in their letter to the Regional Board of November 4, 2004 in the form of hard copy graphs. Raw data was not supplied by WMSC. Therefore it should be noted that the numbers presented in this report are interpretations/approximations from those graphs.

Giant kelp density data was collected at three stations at the Intake, at five, ten and twenty meters depth. The five and ten meter depths show similar patterns of kelp density during different years (i.e., oceanographic conditions). Kelp densities were lowest in the periods winter 1993 through spring 1994, winter 1997 through spring 1998, and the summer of 2000. At the Intake sites the highest density of juvenile giant kelp was recorded at five meters, at about $2.7/m^2$ in the fall of 1995. The five-meter site also had the highest density recorded for adult giant kelp plants at the Intake, about $1.2/m^2$ in the winter of 2000. The twenty-meter depth station did not exactly track kelp bed fluctuations at the other two Intake stations, but a similar dieback was apparent during the fall 97 – spring 98 period.

At Pumpernickel Cove the highest density of juvenile giant kelp was about $5.25/m^2$ in the fall of 1999 and for adult giant kelp plants was about $4.75/m^2$ in the winter of 2000. Giant kelp density for both Pumpernickel and the Intake, at five and ten meters, fluctuated similarly during different years (i.e., oceanographic conditions) during the period 1997-2003.

Sea urchin density data was collected for three species (purple, red and blacks) at three stations at the Intake, at five, ten and twenty meters depth. The density data was for the period 1992-2003. Purple urchins were most abundant at the five meter Intake station, which is expected since purple urchins are common in the intertidal zone and shallow waters. Purple urchins were nearly non-existent at ten and twenty meters, and black urchins clearly outnumbered red urchins at those depths. Total urchins (all three species combined) displayed the greatest density for the period 1992-2003 in 2001, with approximately $5/m^2$ at five meters, $3/m^2$ at ten meters, ands almost $6/m^2$ at twenty meters. Total urchins were least dense in 2002, with no urchins reported, but their numbers rebounded to levels of $2\text{-}5/m^2$ in 2003. Urchin densities were consistently lower at Pumpernickel Cove than at the Intake sites. The highest total urchin density there was just over $2.5/m^2$, but there was no apparent population crash in 2002 as shown for the Intake sites.

Density data for southern sea palms and warty sea cucumbers were collected during the period 1997-2003 at Pumpernickel Cove. The highest density of sea palms, about $0.35/m^2$ was recorded in the summer of 1997. No sea palms were found in 1999 and in the fall of 2001. The highest density of sea cucumbers, slightly over $0.8/m^2$ was recorded in the summer of 1997. No sea cucumbers were found in the fall of 1998.

WMSC conducted another quantitative survey of marine life in 2004 at the north wall of Big Fisherman Cove relatively closer to the discharge, at 510 feet away. Of the target invertebrates bat stars, purple urchins, and keyhole limpets were absent. Giant spined sea stars, spiny lobster, and yellow gorgonians were present but in very low densities. (Note, with regard to yellow gorgonians, the authors are unsure as to whether this is the same as the California golden gorgonian listed in Appendix C, since no scientific names were included in the quantitative data provided by WMSC). Southern sea palms were more abundant than adult giant kelp, and warty sea cucumbers were more abundant than black sea urchins (the most abundant sea urchin). Table 6 presents a comparison of the most recent density data for the Intake, Pumpernickel and the north wall of Big Fisherman Cove.

Table 6. Data from 2003 and 2004 surveys, density/m2

Sampling Site	Black sea urchin	Red sea urchin	Warty sea cucumber	Southern sea palm	Giant kelp juvenile	Giant kelp adult
Seawater Intake – 1350' @ 5m (2003)	0.90	0.90	*	*	0.30	0.65
Seawater Intake – 1350' @ 10m (2003)	2.80	0.20	*	*	<0.01	0.35
Seawater Intake – 1350' @ 20m (2003)	4.75	0.30	*	*	<0.01	0.02
Pumpernickel – 3000' (2003)	0.25	0.01	0.83	0.05	<0.01	3.10
North wall – 510' (2004)	0.10	0.01	0.21	0.83	2.70	5.80

*Note: * indicates no data provided*

Black sea urchins near the discharge were at relatively low densities when compared to Pumpernickel and the Intake Sites. Similarly, warty sea cucumbers were also at comparatively low densities. Conversely, sea palms and giant kelp were at high densities near the discharge than at the reference sites. Ultimately this data is severely limited because we are unable to compare to what the reference site densities were in 2004. Therefore, since the data from the reference sites is from a different year than the data from the site nearer the discharge, no direct comparison is legitimate.

Fish Community

Fish are motile and can swim in and out of an area in pursuit of prey, or even if water quality conditions temporarily degrade. Fishing pressures may also reduce their numbers locally. Therefore, fish community composition data may not reflect environmental perturbations as well as less motile species (such as benthic invertebrates or primary producers). However, since the WMSC waste seawater is relatively constant, and storm water discharges are all draining seasonally to the same location, it is still worth considering possible impacts to fish species assemblages.

The results of four surveys performed at Big Fisherman Cove are presented in Appendix D. Assemblage analysis in the 1965, 1977 and 1979 surveys was reported as binary data (presence/absence) that weighs all species the same, and was the only form of data collected. It is unknown (and unlikely) that the surveyors followed the exact same transects or strictly followed the same survey protocols. Three species were identified in 1965, nine species in 1977, and 13 species in 1979. Interestingly, all of the species recorded in the 1965 and 1977 surveys were also recorded in the 1979 survey, with additional species as well.

In the 2004 survey there were larger numbers of fish species present: 15 on the north wall nearer the discharge, 17 at the south wall away from the discharge, and a total of 21 for Big Fisherman Cove. For the 2004 survey most of the fish data is qualitative (presence/absence), but some fish species, black surfperch, blacksmith, garibaldi, kelp bass, rock wrasse, senorita, and sheephead, were quantitatively reported at the north wall of Big Fisherman Cove. Of these, the most abundant were kelp bass at about 0.85/m^2, adult blacksmith at about 0.64/m^2, juvenile blacksmith at about 0.32/m^2, adult senorita at about 0.57/m^2, and juvenile senorita 0.29/m^2.

Just as with the algal and invertebrate data there is an apparent increase in fish species over time. Once again, in the authors' opinion this is highly unlikely. Instead, it is likely that the differences between the survey results are due to survey design/emphasis.

Comparison of the North and South Walls of Big Fisherman Cove

In 2004 WMSC conducted a survey (presence/absence) of marine biota near the discharge (north wall) and a reference location away from the discharge (south wall). Twenty species of algae, 29 species of benthic invertebrates, and 15 fish species were recorded along the north wall. Sixteen species of algae, 35 species of benthic invertebrates, and 17 fish species were recorded along the south wall. More species of algae were found nearer the discharge, including the filamentous green algae *Chaetomorpha* sp. While slightly more fish species were recorded away from the discharge, the difference was consistent with natural temporal patchiness. The largest difference was with benthic invertebrate species, with six fewer species found nearer the discharge. However there does not appear to be a conclusive pattern consistent with a discharge impact. This qualitative data is limited in utility and is possibly not sensitive enough to detect impacts if they occur.

Limitations of existing data and recommendations for further work

While no gross impacts are obvious, it is very difficult to make absolute statements based on the data available. Data sets used here have several limitations. The surveys obviously varied in collection methods, effort, and spatio-temporal coverage, factors that can influence the number of taxa observed. Cryptic or very small species may be under-sampled. The life histories and movement potential of species should also be considered. Within species differences in movement characteristics during their juvenile and adult stages must be taken into account; different life stages may be affected differently by the discharges. Different species can have different patterns of movement, whether random dispersal or directed migration. For example, many fish species that occur in this type of habitat have high emigration and immigration rates, which contributes to the large amount of temporal and spatial patchiness.

Given the apparent inconsistencies in survey designs, and resulting limitations in the utility of the data, it is not possible to ascertain impacts from the discharge. Future study design should take into account the limitations described here, and a more robust quantitative study must be conducted near field (at the discharge in Big Fisherman Cove) and at some adequate reference location. Quantitative, consistent, and sensitive techniques must be utilized in order to better detect impacts if they occur. Future sampling should be conducted at all locations with the same amount of effort for species diversity and other measures to be comparable across the study area. Monitoring should be performed, on a more frequent basis, at least once every permit cycle. Surveys should be completed during the same season(s) and at approximately the same tidal height.

Quadrants should be established for algae, invertebrates and smaller or less motile fish species, at locations near the discharge and at a far-field reference location, and possessing the same habitat conditions. Density measurements, very near-the discharge and far-field over a larger habitat scale, for certain large macrophytes (e.g., *Macrocystis or Phyllospadix*) and large invertebrates. Finally, surveys for large, motile fish species, if performed, should employ established transects within the same season(s), time of day, and tidal height.

The following mitigating condition will be required to monitor the ongoing status and protection of marine aquatic life:

- *At least once every permit cycle (every five years), a quantitative survey of benthic marine life must be performed near the discharge and at a reference site. The Regional Water Board, in consultation with the State Water Board's Division of Water Quality, must approve the survey design. The results of the survey must be completed and submitted to the Regional Water Board within six months before the end of the permit cycle.*

- *Once during the upcoming permit cycle, a bioaccumulation study using mussels (Mytilus californianus) must be conducted to determine the concentrations of metals near field (within Big Fisherman Cove) and far field (near the seawater intake structure). The Regional Water Board, in consultation with the Division of Water Quality, must approve the study design. The results of the survey must be completed and submitted to the Regional Water Board at least six months prior to the end of the permit cycle (permit expiration). Based on the study results, the Regional Water Board, in consultation with the Division of Water Quality, may adjust the study design in subsequent permits, or add additional test organisms.*

5. AGRICULTURAL RESOURCES. In determining whether impacts to agricultural resources are significant environmental impacts, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping & Monitoring Program of the California Resources Agency, to non-agricultural uses?	☐	☐	☐	☑
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☑
c) Involve other changes in the existing environment that, due to their location or nature, could result in conversion of Farmland to non-agricultural use?	☐	☐	☐	☑

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
6. NOISE. Would the project result in:				
a) Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☑
b) Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☑
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☑
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☑
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing in or working in the project area to excessive noise levels?	☐	☐	☐	☑
f) For a project within the vicinity of a private airstrip, would the project expose people residing in or working in the project area to excessive noise levels?	☐	☐	☐	☑
7. LAND USE AND PLANNING. Would the project:				
a) Physically divide an established community?	☐	☐	☐	☑
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☑
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☑
8. MINERAL RESOURCES. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the State?	☐	☐	☐	☑
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☑
9. HAZARDS and HAZARDOUS MATERIALS. Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☑

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☑

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within ¼ mile of an existing or proposed school?	☐	☐	☐	☑
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code §65962.5 and, as a result, would it create a significant hazard to the public or to the environment?	☐	☐	☐	☑
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or a public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☑
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☑
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☑
h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wild lands are adjacent to urbanized areas or where residences are intermixed with wild lands?	☐	☐	☐	☑
10. POPULATION AND HOUSING. Would the project:				
a) Induce substantial population growth in an area either directly (*e.g.*, by proposing new homes and businesses) or indirectly (*e.g.*, through extension of roads or other infrastructure)?	☐	☐	☐	☑
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☑
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☑

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
11. TRANSPORTATION / CIRCULATION. Would the project:				
a) Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (*i.e.*, result in a substantial increase in either the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	☑
b) Substantially increase hazards due to a design feature (*e.g.*, sharp curves or dangerous intersections) or incompatible uses (*e.g.*, farm equipment)?	☐	☐	☐	☑
c) Result in inadequate emergency access?	☐	☐	☐	☑
d) Result in inadequate parking capacity?	☐	☐	☐	☑
e) Exceed, either individually or cumulatively, a level-of-service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☑
f) Conflict with adopted policies supporting alternative transportation (*e.g.*, bus turnouts, bicycle racks)?	☐	☐	☐	☑
g) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☑

12. PUBLIC SERVICES. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service rations, response times or other performance objectives for any of the public services:

a) Fire protection?	☐	☐	☐	☑
b) Police protection?	☐	☐	☐	☑
c) Schools?	☐	☐	☐	☑
d) Parks?	☐	☐	☐	☑
e) Other public facilities?	☐	☐	☐	☑
13. UTILITIES AND SERVICE SYSTEMS. Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☑
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental impacts?	☐	☐	☐	☑
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental impacts?	☐	☐	☐	☑

d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☑
e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☑
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☑

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☑
14. AESTHETICS. Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☑
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☑
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☑
d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?	☐	☐	☐	☑
15. CULTURAL RESOURCES. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☑
b) Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?	☐	☐	☐	☑
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☑
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☑
16. RECREATION. Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☑
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☑

17. MANDATORY FINDINGS OF SIGNIFICANCE.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☑	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)	☐	☑	☐	☐
c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☑

Under the less stringent and somewhat inadequate controls currently in force, WMSC discharges waste into the ASBS and is in violation of the ASBS prohibition. The project, granting an exception with special mitigating conditions (i.e. special protections), will allow the continued discharge of waste seawater and storm water runoff, and therefore has the potential to degrade water quality. However, under these special protections, the quality of the discharge will improve from current conditions, with an important reduction in the potential to degrade water quality. If all of the special protections designed to limit the discharge are met, as described in this Initial Study, the WMSC discharge will not compromise the protection of ocean waters of the ASBS for beneficial uses, and the public interest will be served.

Granting the conditional exception, likewise, will not violate federal antidegradation requirements because water quality will not be lowered, but rather will be improved. Further, allowance of the exception will not violate the State Water Board's antidegradation policy (SWRCB 1968) since water quality conditions will improve; the discharge will not unreasonably affect present and anticipated beneficial uses; the discharge will not result in water quality lower than that prescribed in the Ocean Plan; and, the people of California benefit from the research and education provided by WMSC while beneficial uses will still be protected.

DETERMINATION

Based on this initial evaluation, we find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because mitigation measures have been incorporated into the project. A MITIGATED NEGATIVE DECLARATION will be prepared.

Prepared By:

Reviewed by:

_______________________________________ Date
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Appendix A

Santa Catalina Island Rainfall, Two Harbors Collection Site

Total Rain Days	1201
Total Rainfall	482.97"
Average rain days per year	27
Average rainfall per rain day	0.40"
Minimum rain days	4 (1967)
Maximum rain days	64 (1997)
Maximum rainfall in 24 hours	5.25" (11/21/1967)

From: Catalina Island Conservancy. 2005. Rainfall Data for Two Harbors, Santa Catalina Island: October 1957 – June 2005. http://www.catalinaconservancy.org/ecology/weather/rainfall.cfm

Appendix B. Algal Species found at Big Fisherman Cove. Presence listed by survey.

Algal Group	Species Name	Common Name	Substrate	Givens et. al. 1965	Givens et. al. 1977	SWRCB 1979	WMSC 2004 (South Wall)	WMSC 2004 (North Wall)
Phaeophyta								
	Acinetospora nicholsoniae		Rock			X		
	Colpomenia sp.		Rock				X	X
	Cystoseira osmundacea		Rock				X	X
	Dictyopteris undulata		Rock			X		
	Dictyota sp.		Rock		X	X		
	Dictyota binghamiae		Rock				X	X
	Dictyota undulata		Rock		X			
	Egregia menziesii		Rock	X			X	X
	Eisenia arborea	Southern sea palm	Rock			X	X	X
	Hesperophycus harveyanus		Rock			X		
	Laminaria farlowii	"Kelp"	Rock					X
	Macrocystis pyrifera	Giant Kelp	Rock	X	X	X	X	X
	Pelvetia fastigiata	Brown rock weed	Rock			X		
	Sargassum muticans		Rock			X	X	X
	Zonaria farlowii		Rock			X	X	X
Chlorophyta								
	Chaetomorpha sp.		Rock					X
	Codium fragile	Sea staghorn	Rock		X	X	X	X
	Codium setchellii		Rock				X	X
	Ulva sp.	Sea lettuce	Rock		X	X		X
	Urospora penicilliformis		Rock		X	X		
Rhodophyta								
	Asparagopsis svensonii		Rock					X
	Callithamnion pikeanum		Rock					X
	Corallina sp.		Rock				X	X
	Corallina officinalis		Rock		X	X		
	Fauchea lacinata		Rock					X
	Gastroclonium subarticulatum		Rock				X	X
	Gellidium sp.		Rock				X	X
	Laurencia sp.		Rock		X			
	Lithophyllum spp.	encrusting coralline	Rock	X			X	X
	Lithothamnium sp.	encrusting coralline	Rock			X		
	Lithothamnium giganteum	encrusting coralline	Rock		X			
	Lithothris asperrgillum		Rock		X			
	Mazzaella affinis		Rock					X
	Microcladia coulteri		Rock					X
	Plocamium cartilagineum		Rock				X	X
	Pterocladia sp.		Rock		X			X
	Pterocladia capillacea		Rock			X		
	Rhodymenia californica		Rock	X			X	X

Appendix C. Invertebrate Species found at Big Fisherman Cove. Presence listed by survey.

Invertebrate Group	Species Name	Common Name	Substrate	Givens et. al. 1965	Givens et. al. 1977	SWRCB 1979	WMSC 2004 (South Wall)	WMSC 2004 (North Wall)
Poriferans								
	Lucetta losangelensis	Sponge	Rock					X
	Acarnus erithacus	Red volcano sponge	Rock				X	X
	Cliona sp.	Yellow sponge	Rock					X
	Hymenemphisastra cyanocrypta	Cobalt sponge	Rock				X	
	Ophilitaspongia penhata	Red sponge	Rock				X	X
	Unknown	Sponge	Rock	X				
Cnidarians Hydrozoans								
	Hydractinia milleri	Hedgehog Hydroid	Rock				X	
	Plumularia sp.	Hydroid	Rock	X			X	
Anthozoans								
	Alcyonium rudyi	Octocoral	Rock				X	
	Ballanophyilla elegans	Orange cup coral	Rock					X
	Corynactis californica	Club-tipped anemone	Rock	X			X	X
	Lophogorgia chilensis	Red gorgonian	Rock				X	X
	Muricea californica	California golden gorgonian	Rock				X	X
	Muricea fruticosa	Brown gorgonian	Rock				X	X
	Pachycerianthus fimbriatus	Tube-dwelling anemone	Sand	X			X	X
Ectoprocts								
	Bugula californica	Moss animal	Rock				X	X
	Diaperoecia californica	Southern staghorn bryozoan	Rock				X	
	Membranopora sp.	Encrusting bryozoan	Rock					X
Sipunculids								
	Golfingia sp.	Peanut worm	Sand			X		
Phoronids								
	Phoronopsis californica	Phoronid worm	Mud	X		X		
Annelids Polychaetes								
	Amaeana occidentalis	Polychaete	Sand			X		
	Ceratonereis paucidentate	Polychaete	Sand			X		
	Euclymeninae	Polychaete	Sand			X		
	Exogone lourei	Polychaete	Sand			X		
	Exogone molesta	Polychaete	Sand			X		
	Lumbrineris zonata	Polychaete	Sand			X		
	Minuspio cirrifera	Polychaete	Sand			X		
	Myxicola infundibulum	Terebellid worm	Rock, Sand					X
	Paraonides	Polychaete	Sand			X		
	Phragmatopoma californica	Colonial sand tube worm	Rock				X	
	Phylo felix	Polychaete	Sand			X		
	Praxillella affinis pacifica	Polychaete	Sand			X		
	Salmacina tribranchiata	Fragile tube worm	Rock				X	
	Scolelepis	Polychaete	Sand			X		

Invertebrate Group	Species Name	Common Name	Substrate	Givens et. al. 1965	Givens et. al. 1977	SWRCB 1979	WMSC 2004 (South Wall)	WMSC 2004 (North Wall)
	Serpula vermicularis	Serpullid worm	Rock				X	X
	Spiochaetopterus costarum	Polychaete	Sand			X		
	Spirobranchus spinosus	Christmas tree worm	Rock	X	X	X	X	
	Tharyx (unidentifiable)	Polychaete	Sand			X		
	Thelepus crispus	Sabellid worm	Rock, Sand				X	X
Molluscs Bivalves								
	Chaceia ovoidea	Wart-necked piddock	Rock				X	
	Crassedoma giganteum	Rock scallop	Rock				X	X
	Periploma	Clam	Sand			X		
	Phacoides approximatus	Clam	Sand			X		
	Solen rosaceus	Rosy jackknife clam	Sand			X		
	Tagelus californianus	Clam	Sand			X		
	Tellina	Clam	Sand			X		
Gastropods								
	Conus califoricus	California cone	Rock, Sand				X	X
	Cyprea spadicea	Chestnut cowry	Rock				X	
	Kelletia kelletii	Kellet's whelk	Rock					X
	Lithopoma undosum	Wavy turban snail	Rock				X	X
	Norrisa norrisi	Norris's top snail	Rock				X	X
	Olivella biplicata	Olive snail	Sand			X		
	Serpulorbis squamigerus	Scaled worm shell	Rock		X		X	X
	Tegula sp.	Turban snail	Rock				X	X
Arthropods Crustaceans								
	Ampelisca cristata	Amphipod	Sand			X		
	Janiridae (unidentifiable)	Isopod	Sand			X		
	Chthamalus fissus	Barnacle	Rock		X	X		
	Tetraclita squamosa elegans	Barnacle	Rock		X	X		
	Tetraclita squamosa rubescens	Barnacle	Rock		X	X		
	Pagurus sp.	Hermit crab	Rock				X	
	Panulirus interruptus	Spiny lobster	Rock				X	X
Echinoderms Asteroids								
	Linckia columbiae	Fragile star	Rock	X			X	X
	Ophiopsilla californica	Brittle star	Rock				X	
	Patiria miniata	Sea star	Rock		X	X		
	Pisaster giganteus	Giant spined sea star	Rock		X	X		X
Holothuroids								
	Parastichopus parvimensis	Warty sea cucumber	Rock, Sand		X	X	X	X
Echinoids								
	Lytechinus pictus	Urchin	Sand			X		
	Centrostephanus coronatus	Black sea urchin	Rock				X	X

Invertebrate Group	Species Name	Common Name	Substrate	Givens et. al. 1965	Givens et. al. 1977	SWRCB 1979	WMSC 2004 (South Wall)	WMSC 2004 (North Wall)
	Strongylocentrotus franciscanus	Red sea urchin	Rock				X	X
Chordates								
	Clavelina huntmani	Light bulb tunicate	Rock				X	X
	Didemnum carnulentum	Colonial tunicate	Rock				X	

Appendix D. Fish Species found at Big Fisherman Cove Presence listed by survey.

Fish Group	Species Name	Common Name	Substrate	Givens et. al. 1965	Givens et. al. 1977	SWRCB 1979	WMSC 2004 (South Wall)	WMSC 2004 (North Wall)
Clinidae								
	Gibbonsia elegans	Spotted kelpfish	Rock, Sand			X		
	Gibbonsia montereyensis	Crevice kelpfish	Rock					X
	Heterostichus rostratus	Giant kelpfish	Rock				X	
Embiotocidae								
	Brachyistius frenatus	Kelp perch	Pelagic				X	X
	Embiotoca jacksonii	Black perch	Pelagic					X
	Hyperprosopon argentum	Wall-eye perch	Pelagic				X	
	Hypsurus caryi	Rainbow perch	Pelagic				X	
	Rhacochilus toxotes	Rubberlip surfperch	Pelagic, Rock, Sand		X	X		
Gobidae								
	Lythrypnus dalii	Blue-banded goby	Rock			X	X	X
	Lythrypnus zebra	Zebra goby	Rock				X	X
	Rhinogobiops nicholsi (=Coryphopterus nicholsii)	Black-eyed goby	Rock, Sand	X	X	X	X	X
Haemulidae								
	Anisotremus davidsoni	Sargo	Rock				X	
Girellidae								
	Girella nigricans	Opaleye	Kelp, Rock, Sand		X	X	X	X
Scorpididae								
	Medialuna californiensis	Halfmoon	Pelagic		X	X		X
Labridae								
	Halichoeres semicinctus	Rock wrasse	Rock, Sand	X	X	X	X	X
	Oxyjulis californica	Señorita	Rock, Sand, Pelagic		X	X	X	X
	Semicossyphus (=Pimelometopon) pulchrum	California sheephead	Rock, Sand, Pelagic		X	X	X	X
Malacanthidae								
	Caulolatilus princeps	Ocean whitefish	Pelagic				X	
Muraenidae								
	Gymnothorax mordax	California moray	Rock		X	X		
Pomacentridae								
	Chromis punctipinnis	Blacksmith	Kelp, Rock, Sand			X	X	X
	Hypsypops rubicundus	Garibaldi	Kelp, Rock	X		X	X	X
Scorpaenidae								
	Sebastes serriceps	Treefish	Rock					X
Serranidae								
	Paralabrax clathratus	Kelp bass	Kelp, Rock, Sand		X	X	X	X
Urolophidae								
	Urolophus halleri	Round stingray	Sand				X	

Appendix E
Mussel Watch Data
Catalina Island West

Constituent	**Jul-77**	**Dec-77**	**Aug-78**	**Dec-78**	**Dec-79**	**May-80**	**Dec-80**	**Dec-80**	**Sep-91**	**Mar-94**	**N**	**Median**	**Mean**	**Standard Deviation**
Cadmium	1.01	1.4	1.02	1.26	1.04	3.49	1.25	1.36	0.8	1.2	10	1.23	1.38	0.763
Chromium	0.26	0.44	0.35	0.49	0.24	1.06	0.42	0.43	0.23	0.3	10	0.385	0.422	0.242
Copper	0.65	0.86	0.67	0.5	0.47	0.97	0.6	0.82	0.7	0.68	10	0.675	0.692	0.156
Mercury	0.013	0.025	0.042	0.039	0.046	0.040	0.030	0.034	0.02	0.031	10	0.033	0.032	0.010
Nickel	0.18	0.28	na	na	0.18	0.97	na	na	na	0.35	5	0.28	0.392	0.331
Lead	3.38	3.87	3.79	3.19	4.71	5.37	2.77	1.25	2.8	3.5	10	3.44	3.463	1.12
Selenium	na	na	na	na	na	na	na	na	na	0.36	1	0.36	0.36	-
Silver	0.118	0.387	0.237	0.246	0.201	0.115	0.318	0.067	0.17	0.15	10	0.186	0.201	0.099
Zinc	23.8	32.3	25	20.7	31.6	31.3	22.9	18.5	26	37	10	25.5	26.9	5.88
(units measured in ppm, wet weight)														
Total Chlordane	na	na	na	na	ns	ns	ns	ns	ns	nd	1	-	-	-
Total DDT	6.4	1.6	5.3	2.1	ns	ns	ns	ns	ns	2.0	5	2.1	3.48	2.21
Total of PCB arochlors	4.8	4.7	5.0	2.0	ns	ns	ns	ns	ns	5.0	5	4.8	4.30	1.42
Total of Endosulfan	na	na	na	na	ns	ns	ns	ns	ns	nd	1	-	-	-
(units measured in ppb, wet weight)														

nd=not detected (-8)
na=not analyzed (-9)
ns= not sampled