Agenda

Annual Public Workshop
San Onofre Nuclear Generating Station Artificial Reef Mitigation Project
Ocean Institute, Dana Point, CA
April 11, 2011

6:00 **Introduction – *Dan Reed***

6:15 **Status of the Wheeler North Reef: 2010 monitoring results - *Steve Schroeter***

6:45 **Performance of the Wheeler North Reef: 2010 monitoring results - *Dan Reed***

7:30 **Discussion**

8:00 **Adjourn**

Welcome to the annual review workshop for the SONGS kelp reef mitigation

Introduction

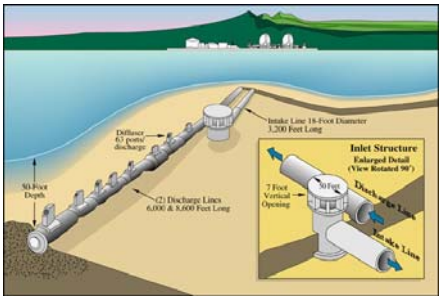
Annual Review Workshop for SONGS Reef Mitigation

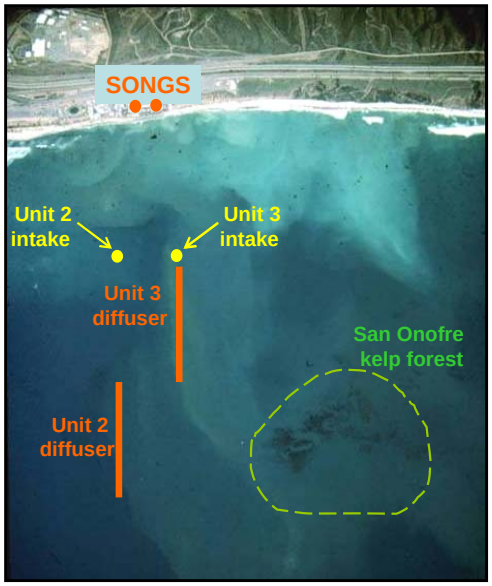
April 11, 2011

SONGS Mitigation Monitoring Project
Marine Science Institute, University of California Santa Barbara

Coastal Mitigation Linked to the Effects of the SONGS Cooling Water System

(San Onofre Nuclear Generating Station = SONGS)





Some background on the project is important for understanding the purpose and rationale for the SONGS artificial reef mitigation project.

•The SONGS reactors are cooled by a single pass seawater system.

•Units 2 and 3 have separate intake lines that are located in about 30 feet of water offshore of the power plant

•The volume of water taken in each day by these two intake lines when Units 2 and 3 are operating together measures about a square mile 12 ft deep.

•The water is elevated 19 deg F above ambient in the plant and then discharged through an extensive diffuser system designed to dissipate the heat

•The performance of the diffuser system in dissipating the heat relies on entraining 10 times the volume of water that is taken in.

•Mixing caused by the diffuser system results in the formation of a turbid plume in the vicinity of the San Onofre kelp forest which is located adjacent to the two diffuser lines.

•SONGS impacts to living marine resources result from both the intakes and the discharge of this single pass cooling system.

Adverse Effects Attributed to SONGS Cooling Water System Include:

- **Losses of immature fish in the cooling water intake system is projected to cause substantial reductions in populations of adult fish in the S. California Bight**
- **In-plant losses of juvenile and adult fish led to reductions in the local abundance of mid-water fish populations in near vicinity of SONGS**
- **The discharge plume caused a substantial reduction in size of the kelp forest community at San Onofre that resulted in losses of kelp, fish, & invertebrates**

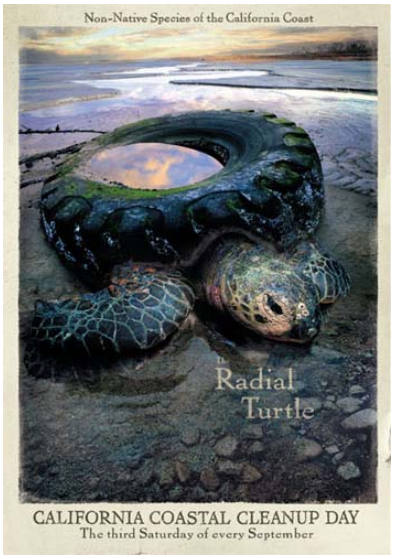
•After detailed studies the CCC concluded that the SONGS cooling water system for Units 2 and 3 had major adverse impacts to the coastal environment which included:

•Projected reductions in bight-wide populations of adult fish based on in-plant losses on immature fish.

•Measured reductions in local populations of adult fished caused by losses inside the power plant.

•A substantial reduction in the size of the giant kelp forest and associated community adjacent to the SONGS diffusers.

Adverse Impacts caused by SONGS is in violation of the California Coastal Act



California Coastal Act

- **Includes policies that address many coastal issues including "marine habitat protection"**
- **Enforcement resides with the California Coastal Commission (CCC)**
- **CCC is responsible for ensuring that the adverse impacts to the marine environment caused by SONGS are adequately mitigated**

•Adverse impacts caused by SONGS is in violation of the coastal act and thus requires mitigation.

•Enforcement of the Coastal Act resides with the California Coastal Commission (CCC).

•The CCC is responsible for ensuring that the adverse impacts to the marine environment caused by SONGS are adequately mitigated.

Mitigation required by the CCC for the impacts caused by SONGS cooling water system includes four conditions:

Condition A: Wetland Mitigation

Out-of-kind mitigation to compensate for in-plant losses of immature fish.

Condition B: Behavioral Barriers Mitigation

In-kind mitigation to reduce in-plant losses of juvenile & adult fish.

Condition C: Kelp Reef Mitigation

In-kind mitigation to compensate for losses of kelp and kelp bed fish and invertebrates.

Condition D: Administrative Structure

Provides for scientific oversight and monitoring of mitigation projects that is independent of SCE.

- The CCC determined that the adverse marine impacts caused by SONGS operations could be adequately compensated for by a mitigation package that included 4 conditions.
- Wetland mitigation to compensate for the losses of immature fish inside the power plant.
- Modifications in plant operations that alter the behavior of fish to minimize losses of adult fish inside the power plant.
- The construction of an artificial reef to compensate for the adverse effects on the San Onofre kelp forest.
- Performance monitoring of the mitigation projects that is done independently of SCE.

Condition D requires an annual public workshop be held to:

1) **Review the status of the mitigation projects.**

2) **Identify outstanding issues and make recommendations for addressing them.**

3) **Review next year's program.**

The focus of today's workshop is on Condition C: Kelp Reef Mitigation

An annual public workshop is one element of the mitigation requirement for SONGS.

Condition C: Kelp Reef Mitigation

Duties and Requirements

- **SCE to construct artificial reef that creates a minimum of 150 acres of kelp forest habitat**
- **CCC to provide scientific oversight and monitoring of the artificial reef project that is independent of SCE**

SCE and the CCC have clear distinct roles in the kelp reef mitigation.

Key Elements of the SONGS Artificial Reef Mitigation Project

Goal

In-kind compensation for the loss of kelp forest habitat and associated biota caused by the operation of SONGS Units 2 & 3.

Performance Criteria

Physical and biological standards established by which the performance of the artificial reef is judged.

Evaluation

Data from independent long-term monitoring used to determine:
(1) whether the performance standards are met
(2) the causes for any failures to meet the standards
(3) the most appropriate methods for remediation

It was decided that the goal of in-kind compensation for the marine resources lost due to SONGS operations will most likely be met if:

1. The artificial reef is built in the near vicinity of SONGS, but outside its influence. This will ensure that the compensation for the lost resources will occur locally rather than at a distant location far from the impacts
2. The artificial reef is configured to look like the natural reef at San Onofre, which is a low relief boulder field.

- Determining whether the project goal is met will be based on whether the mitigation reef meets certain well defined Performance Criteria that are based on the physical and biological attributes of the reef.
- Evaluation involves long-term independent monitoring to determine whether the performance standards are met.

Kelp Forest Mitigation in Two Phases

Phase 1: Experimental Reef

Short-term, small scale to test different reef designs

Phase 2: Mitigation Reef

Long-term, large scale to compensate for resources lost due to SONGS operations

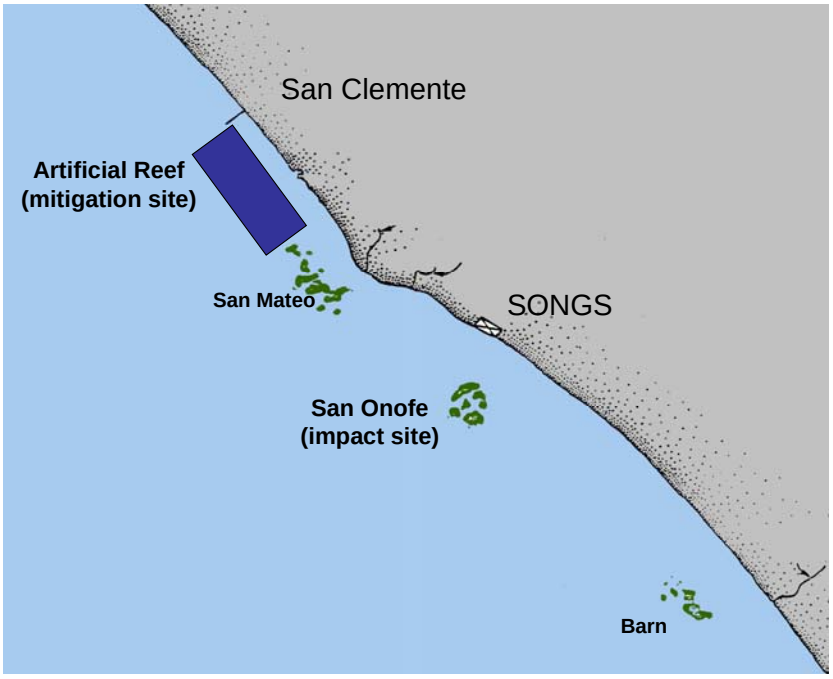
Information gained from the Experimental Reef used to design the Mitigation Reef

- Mitigation for SONGS impacts to the San Onofre kelp forest is being done in two phases:

1. A short-term, small-scale experimental phase for testing different reef designs, and
2. A longer-term, large-scale mitigation phase intended to compensate for the resources lost due to SONGS' operations.

- Information gained from the first phase was used to design the second phase.

Project site



•This map of the project site shows the location of the artificial reef in relation to the impact site at San Onofre.

•The green blotches indicate the locations of naturally occurring kelp beds at San Mateo and Barn.

•The artificial reef is located just south of San Clemente pier and extends south 3.5 km to near San Mateo Point.

Design of Phase 1 Experimental Reef

Constructed in summer 1999

22.4 acres

- ***56 uniformly sized modules***
- ***Module size = 40 m x 40 m***

Two types of material

- ***quarry rock boulders***
- ***recycled concrete rubble***

Three bottom coverages

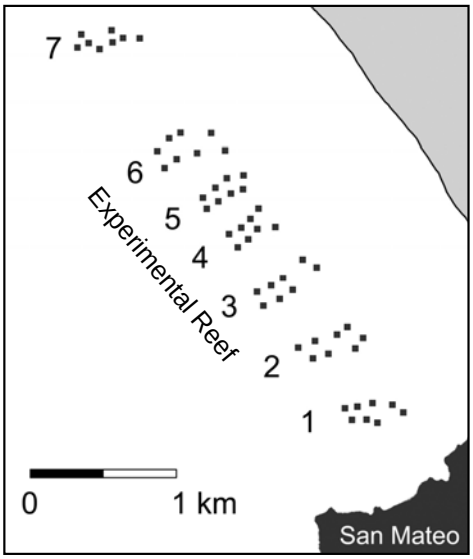
- ***low (~40%)***
- ***medium (~60%)***
- ***high (~80%)***

Stratified block design

- ***7 replicate blocks of 8 reef designs***

Duration of Experiment

- ***5 years***



The experimental phase of the kelp reef mitigation began in 1999 and lasted for 5 years.

Conclusions from Experimental Reef

All reef designs tested showed a near equally high tendency to meet the performance standards established for the mitigation reef

Final Report on the Findings and Recommendations of the Experimental Phase of the SONGS Artificial Reef Mitigation Project

PREPARED FOR THE CALIFORNIA COASTAL COMMISSION
AUGUST 1, 2005

Dan Reed, Steve Schroeter, and David Huang
Marine Science Institute
University of California, Santa Barbara

Recommendations for the Mitigation Reef

Reef Location
- **Near San Clemente, CA**

Reef Topogragphy
- **Low relief, < 1 m high**

Substrate Type
- **Quarry rock or rubble concrete boulders**

Substrate Coverage
- **At least 42%, but no more than 86%**

Design of Phase 2 Mitigation Reef

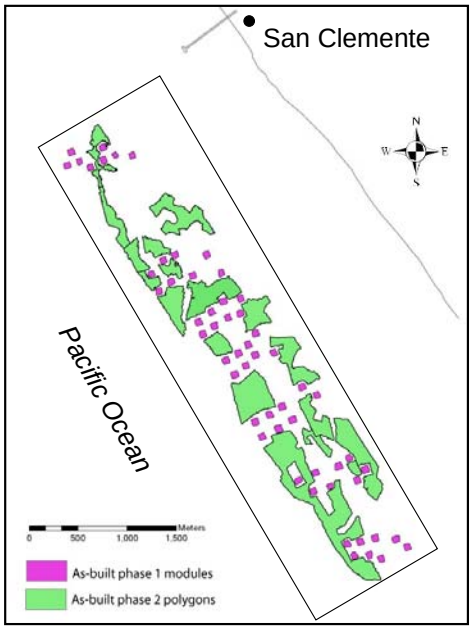
Constructed in Summer 2008

153 acres
- ***18 polygons of variable size***
- ***Covers 3.5 km of coast***
- ***Avoided Experimental modules***
- ***Avoided natural hard bottom***

One type of material
- ***quarry rock boulders***
- ***126,000 tons of rock***

One bottom coverage
- ***~42%***
- ***low relief < 1 tall***

Phase 1 + Phase 2 = Wheeler North Reef



•The second phase of the mitigation entails the construction and monitoring of the full mitigation reef.

•Construction of the Phase 2 Mitigation Reef was completed in October 2008.

• Together, the Phase 1 Experimental Reef and the Phase 2 Mitigation Reef comprise the Wheeler North Reef.

Monitoring Purpose

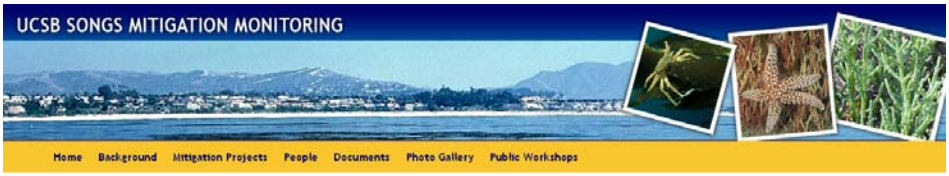
- **Annual evaluation of performance standards**

Monitoring Period

- **No less than the full operating life of SONGS Units 2 & 3**
- **The level of sampling can be reduced to annual site inspections after 10 years if the performance standards have been met for the preceding 3 years.**
- **The monitoring requirement will be fulfilled when all the performance standards are met for a period equal to the total years of operation of SONGS Units 2 & 3.**

For more information go to:

http://marinemitigation.msi.ucsb.edu/



UCSB SONGS Mitigation Monitoring

The San Onofre Nuclear Generating Station (SONGS) Mitigation Monitoring Program is based at the Marine Science Institute, University of California Santa Barbara. Long-term monitoring and evaluation of the SONGS mitigation projects is a condition of the coastal development permit issued by the California Coastal Commission (CCC) for the operation of SONGS Units 2 and 3. The Permit requires Southern California Edison (SCE) as majority owner and operating agent of SONGS to design and build mitigation projects that adequately compensate for the adverse effects of the power plant's once-through seawater cooling system on coastal marine resources. UCSB scientists working under the direction of the Executive Director of the CCC are responsible for designing and implementing monitoring programs aimed at determining the effectiveness of these mitigation projects. Funding for the SONGS Mitigation Monitoring Program is provided by SCE as a requirement of their coastal development permit for operating SONGS.

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