Agenda		
<b>Annual Public Workshop</b> San Onofre Nuclear Generating Station Artificial Reef Mitigation Project Monday, April 12, 2021		
1:30 – 1:45	Introduction to SONGS reef mitigation –Dan Reed, UCSB	
1:45 – 2:15	Results from the 2020 performance monitoring of the Wheeler North Reef – <i>Steve Schroeter, UCSB</i>	
2:15 - 2:30	Questions and comments on monitoring results	
2:30 – 3:00	Report on the expansion of Wheeler North Reef ➤ Final as-built construction – <i>Jenny McGee, SCE</i> ➤ Results of construction monitoring – <i>Dan Reed, UCSB</i>	
3:00 - 3:15	Questions and comments on reef expansion	
3:15 – 3:30	General Discussion	
UCSB SONGS MIT	IGATION MONITORING	
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- I want to provide you with a brief overview of the history and objectives of the SONGS reef mitigation project, which is one component of a comprehensive mitigation program that is designed to offset damages to living marine resources caused by the operations of SONGS units 2 and 3
- The other major component of the mitigation program is wetland restoration project that is being done at San Dieguito Lagoon.
- A separate workshop will be held May 4, 2021 to review the status and findings of the wetland restoration project.



- The operations of SONGS Units 2 and 3 relied on a single-pass seawater cooling system to cool their nuclear reactors
- Each unit has its own cooling system that includes an intake located in about 30 feet of water about 0.6 miles offshore of the power plant and an 18'diameter intake line that delivers seawater to the unit.
- The volume of water taken in each day by these two intake lines when Units 2 and 3 were fully operational was about 2.4 billion gallons, which is equivalent to the volume of water in a cube that covers one square mile and 12 feet deep.
- The seawater is elevated 19° F above ambient as it circulates through the plant and then it is delivered back to the ocean through separate discharge lines that extended 6,000 and 8,000 feet offshore
- The last 2,500 feet of each discharge line is equipped with 63 diffuser ports that are designed to rapidly mix the cooling water with the surrounding seawater.



- The SONGS artificial reef mitigation project is linked to the adverse effects of the SONGS seawater cooling system on the San Onofre kelp forest, which is located directly offshore of the power plant.
- The Marine Review Committee was commissioned to conduct extensive studies from the mid 1970s –1980s to determine the extent of the impacts associated with the SONGS seawater cooling system
- One of the impacts identified by these studies was that the mixing of the discharged cooling water with the surrounding seawater resulted in the formation of a turbid plume that caused a substantial reduction in area of the San Onofre kelp forest

# The California Coastal Act Requires Mitigation of Marine Impacts

The California Coastal Commission (CCC) is responsible for implementing the Coastal Act



To mitigate for the impacts to the San Onofre kelp forest caused by SONGS the CCC required SCE to:

- Construct an artificial reef large enough to support at least 28 tons of fish and 150 acres of kelp forest habitat to compensate for losses of kelp and kelp bed fish, invertebrates, and algae.
- 2. Provide funding for scientific oversight and monitoring of the mitigation project that is *independent* of SCE.
- The California Coastal Act requires mitigation for impacts to the marine environment such as those caused by SONGS
- Implementation 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
- As mitigation for the impacts to the San Onofre kelp forest caused by SONGS the CCC required SCE to:
  - (1) Construct of an artificial reef that is large enough to support 28 tons of reef fish and 150 acres of kelp forest habitat to compensate for losses of kelp and kelp bed fish and invertebrates, and
  - (2) Provide funding for scientific oversight and monitoring of mitigation projects that is *independent* of SCE
- Independent monitoring is done by a team of marine scientists at UCSB who report directly to the CCC

### **Project Objective**

Replace the marine resources that were damaged or lost in the San Onofre kelp forest due to the operations of SONGS Units 2 & 3

#### Approach

1. Build an artificial reef in sandy habitat that is:

- Low-relief with topography & depth similar to the San Onofre kelp forest
- · Located near SONGS, but outside the influence of its discharge
- 2. Build the artificial reef in two phases :
  - a small (22 acre) short-term (5 y) experimental phase to test different reef materials and designs
  - A large (> 150 acres) long-term (>30 y) mitigation phase to replace the kelp forest resources lost at San Onofre
- 3. Monitor the artificial reef to measure its success based on performance standards developed to ensure that project objective is met
- 4. Impose corrective measures to remediate the artificial reef if it fails to meet the performance standards
- 5. End project monitoring and oversight after mitigation requirement is met

The objective of the project is to replace the marine resources that were damaged or lost in the San Onfre kelp forest due to the operations of SONGS Units 2 & 3.

• While Units 2 and 3 are no longer producing energy, damages to the San Onofre kelp forest occurred throughout the 32 years of their operating life



- This map provides a general overview of the project site and shows the locations of the two phases of the artificial reef
- Construction of Phase 1 was completed in October 1999 and consisted of 56 modules that tested different bottom coverages of quarry rock and rubble concrete that total 24 acres
- Information obtained from the 5 year Phase 1 period was used to guide the design of the Phase 2
- Phase 2 was completed in September 2008 and consisted of 18 polygons of low relief quarry rock which totaled 150 acres
- The Phase 1 and Phase 2 reefs combined constitute the 174-acre Wheeler North Reef



- These underwater images taken from the Wheeler North Reef show the types of organisms that have colonized the reef, including::
- High densities of economically and ecologically important species such as spiny lobster and kelp bass
- Ecologically protected species such as the giant sea bass



- Performance monitoring of the Wheeler North Reef began in 2009.
- Although results from monitoring showed that the Wheeler North Reef was performing similar to natural reefs they also showed that its 174 acres were too small to consistently meet the performance standards requiring it to sustain a fish standing stock of 28 tons and 150 acres of medium to high density giant kelp
- As a result in 2016 the CCC required SCE to remediate the Wheeler North Reef by adding ~ 200 new acres of low-relief reef (referred to as the Phase 3 expansion)



- Phase 3 expansion shown in white.
- A portion of it was built inshore of the southern end of the Phase 1 & 2 reefs and the remainder built along a 4 km (2.5 mile) stretch of coast north of the Phase 1 & 2 reef
- 197. 5 acres of low relief boulder reef similar in design to the Phase 2 reef
- Construction completed in July 2020
- The phase 3 expansion increased the area of Wheeler North Reef to 373 acres of low relief reef with ~ 45% cover of rock

## **Performance Monitoring**



<u>Purpose</u>: to determine whether the Wheeler North Reef is meeting the required project goals

#### **Sampling Design**

- Sampling stations (50m x 20m) broadly distributed across all three phases
- A total of 92 stations for Phases 1 and 2, and 57 stations for Phase 3
- Each station defined by a differential GPS coordinate and a compass heading
- Each station sampled once per year in summer/fall



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