

BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Study

Region: Pacific

Planning Area(s): Southern California

Title: Assessing the Impact of Oil Spills Using Three-Dimensional Oil Spill Modeling (PC-16-03)

BOEM Information Need(s) to be Addressed: Currently the offshore oil and gas risk analysis conducted by the BOEM Pacific Region is based on a two-dimensional oil spill model, which only predicts surface transport of oil spills. However, oil spills can have significant impact to the subsurface. The impact of oil spills to the subsurface can only be predicted using three-dimensional oil spill modeling. The aim of this study is to implement a three-dimensional oil spill model in southern California and to assess the impact of oil spills to subsurface biota. This study will expand BOEM Pacific Region's capability to conduct oil spill risk analysis in southern California.

Total BOEM Cost: \$328,000 **Period of Performance:** FY 2016-2017

Conducting Organization: National Oceanic and Atmospheric Administration, Office of Response and Restoration

Principal Investigator: Dr. Christopher H. Barker and Dr. Amy Macfadyen

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Description:

Background: BOEM Pacific region currently uses the General NOAA Oil Modeling Environment (GNOME), which is a two-dimensional oil spill model, for oil and gas risk analysis. This model can only predict oil spill risk to surface biota and to habitats located on the beach and in the intertidal zone. However, oil spills transport oil and its by-products into the subsurface, both the water column and the sediments, posing a risk to pelagic and benthic biota. Through this study, the fate and transport of oil spills in southern California will be predicted using a high-resolution, three-dimensional oil spill model. Predicting the three-dimensional fate and transport of oil spills will allow BOEM to assess the risk to subsurface biota and meet the needs of the BOEM Pacific Region's offshore oil and gas program.

Objectives: There are two objectives to this study:

- 1) Implement three-dimensional oil spill modeling; and
- 2) Assess the oil spill risk to subsurface biota.

Methods:

The three-dimensional oil spill model will be based on a high-resolution (1 km) Regional Ocean Modeling System (ROMS) and will use particle tracking to simulate the fate and transport of the oil. Using particle tracking to simulate the fate and transport of oil spills is a widely used and

well-accepted practice. The ROMS predictions for 11 years from 2004-2014 are already under development by the University of California Los Angeles through an ongoing BOEM study, *Expansion of West Coast Oceanographic Modeling Capability* (BOEM 2014), which will be completed in FY 2016. The particle tracking for the proposed study will be modified so that the particles represent the physical properties of oil. Using realistic oil spill scenarios over a range of different oceanographic regimes (such as upwelling, relaxation, and eddy-driven flow), the three-dimensional fate and transport of the oil will be simulated. BOEM will supply realistic oil spill scenarios and a range of oil products to be modeled. By simulating these oil spill scenarios, areas of high risk in the subsurface, both the water column and benthos, can be identified. Using available geologic and marine habitat maps of the region, the impact of oil spills on these biota will be assessed.

Current Status: The BOEM-NOAA interagency agreement was awarded April 22, 2016, and initial work is underway.

Final Report Due: July 2018

Publications Completed: None

Affiliated WWW Sites: None

Revised Date: July 27, 2016

Reference:

BOEM. November 12, 2014. *Expansion of West Coast Oceanographic Modeling Capability*. Retrieved January 21, 2015 from Bureau of Ocean Energy Management, Current Environmental Studies - Pacific: <http://www.boem.gov/pc-14-01/>.