

OSRR Project #1165 Abstract: State-of-the-art on Modeling Interactions Between Spilled Oil and Shoreline Holding Capacity, short title: Shoreline Holding Capacity Modeling Study

This project aimed to enhance the regulatory and response capabilities of the Bureau of Safety and Environmental Enforcement (BSEE) and the Bureau of Ocean Energy Management (BOEM). This study collected and evaluated updated information on shoreline holding capacities and relevant models through a comprehensive literature review focused on oiled shoreline retention. The project provided BSEE with a review of the state-of-science and an updated modeling approach pertaining to shoreline holding capacities in the event of an oil spill. The study built off a project funded by the US. Department of the Interior Minerals Management Service (MMS) in 2007 to evaluate the state-of-science as it related to oil interactions with sediments on beaches (Etkin et al. 2007). Since the 2007 report was completed, there has been significant effort throughout the oil spill science and response community to better understand the interactions between oil and the nearshore environment. The objectives of this project included performing a literature review, evaluating current modeling practices, and developing an updated approach for modeling shoreline oil interactions. A multiphase approach was completed to address the objectives outlined above. The first phase included a comprehensive review of findings and research gaps outlined in Etkin et al. (2007-2008) as they are still exceptionally relevant today. The second phase required an updated literature review leveraged conference proceedings, peer-reviewed journal publications, guidance documents, technical reports, and oil spill related books. Given the focus on the response timeframe (~1-month) and application of findings to operational oil spill models, approximately 60 relevant documents, papers, and reports were reviewed and summarized. Although research to date provides qualitative information regarding the processes controlling shoreline oil retention, field and laboratory experiments have generally been designed to capture a limited number of mechanistic processes, such that the information cannot be used to inform algorithm development for application to operation oil spill models. This assessment analyzed data from 13 different historic spill events covering a range of shoreline types and spill conditions. Using field data to develop shoreline oil holding capacities inherently captures the complexities of oil retention on specific shoreline types (e.g., sediment composition) and environmental conditions (e.g., tidal fluctuations, wave energy). The oils included in this analysis were crude oils, emulsified oils, and intermediate-heavy fuel oils. Therefore, the results from this study can be applied to spills with those oil types as well as light crudes that have weathered or emulsified prior to reaching the shoreline (e.g., Deepwater Horizon). This study provides modelers with an updated oil loading capacity data set that can be applied in operation oil spill models depending on the spill-specific conditions and shoreline types.