Title	Sediment Evolution Following Beach Fill Construction: A Literature Review and Technical Workshop
Administered by	Marine Minerals Program
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Procurement Type(s)	Competitive Cooperative Agreement
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PICOC Summary	
Problem	Where, how, and when is sediment moving during and following beach construction compared to natural conditions (including storm events) and how does this movement relate to valued habitat and sediment best management practices.
Intervention	In collaboration with partner agencies, develop a concept plan that identifies and prioritizes the key questions, appropriate data collection methods, numerical modeling, etc. to address this complex problem on a regional scale
Comparison	This study will consist of a literature and data synthesis and technical workshop that will promote collaboration and inform the construct of future field work initiatives
Outcome	A concept plan coordinated with national and regional planning groups to leverage multi-agency resources to holistically address the identified problem within a regional context
Context	Atlantic and GOM OCS and adjacent coasts

BOEM Information Need(s): The Bureau of Ocean Energy Management (BOEM) needs to better understand the dynamics of sediment dredged from the Outer Continental Shelf (OCS) and placed on beaches along the Gulf of Mexico and Atlantic coasts to inform future decisions related to non-competitive negotiated agreements (NNA) and support prudent management of the resource. This information will inform BOEM's environmental compliance responsibilities by helping to discern effects of beach fill sediments on adjacent habitat compared to an unnourished system. This information is needed to support ongoing Endangered Species Act Section 7 consultations (*e.g.*, protected coral species, green sea turtles, piping plovers) and will inform future project design specifications and mitigations. This information will also support the stewardship responsibility of the Marine Minerals Program (MMP) by optimizing use of OCS sediment, a valuable economic resource for coastal infrastructure and habitat restoration projects.

Background: BOEM's MMP science strategy is centered around responsible management and stewardship of finite sediment resources on the OCS. To date, BOEM has conveyed over 145 Million Cubic Yards (MCY) of sediment on Gulf and Atlantic coast beaches; however, its long-term fate is not clear. Understanding sediment

dispersal pathways following construction is a complex question that has been raised by multiple stakeholders to inform future coastal management decisions. However, a collaborative and comprehensive strategy has not yet been identified for how to best address this need.

To date, the Florida Department of Environmental Protection (FDEP) and other state and federal agencies have been formulating biological monitoring and mitigation requirements based on an engineering calculation to estimate the project's "Equilibration Toe of Fill" (ETOF) (Kosmynin et. al., 2016). ETOF is an empirically based calculated distance, incorporating local wave climate and sediment textural properties, to estimate the cross-shore project "footprint" and to quantify impacts to adjacent habitat. For project planning purposes it is currently assumed that habitat located inshore of the ETOF is negatively impacted due to direct burial or sedimentation impacts. However, the efficacy of using ETOF for quantifying impacts has been questioned by coastal managers.

A comprehensive analysis of sediment transport processes using empirical data collection (*e.g.*, geophysical surveys, geochemical tracers, sediment particle tracers) and numerical modeling is required to fill critical data gaps and answer the questions: "Where, how, and when is sediment moving following beach fill construction compared to natural conditions (including storm events) and how does this movement relate to valued habitat." However, robust field initiatives to appropriately study these questions are significant, costly, and require extensive collaboration to leverage data. Multi-agency collaboration is needed to develop a concept plan that identifies and prioritizes the key questions, appropriate field sampling methods, numerical modeling, *etc.* to address this complex problem. This study will build upon and leverage data from previously completed and ongoing BOEM study investments (*i.e.*, borrow area optimization [NT-15-03], sediment sorting [NT-15-05], *etc.*), and will inform short- and long-term MMP planning decisions.

Objectives: This study aims to develop a concept plan for how to:

1. Study nearshore sediment transport rates, processes, and inferred transport pathways
2. Monitor movement of sediment size fractions relative to metocean conditions
3. Collect empirical data for model calibration and/or validation

This concept plan will be shared with national and regional planning groups (*i.e.*, National Oceanographic Partnership Program [NOPP], Gulf of Mexico Alliance, *etc.*) to leverage multi-agency funds for future field work initiatives to: (1) gather empirical datasets to aid calibration and validation of predictive sediment transport models, (2) improve predictions on sediment budgets, (3) identify sources and sinks as well as the magnitude, and (4) rates and processes of overall sediment dynamics.

Methods: Supporting information relevant to the stated research questions will be gathered and synthesized from current BOEM documents and other ongoing research performed by external stakeholders. Following the literature and data synthesis, key

stakeholders and technical experts will be identified to participate in a technical workshop. The goals of the technical workshop will be to:

(1) document existing state of knowledge and available information from the synthesis and solicit input from technical stakeholders;
(2) determine key parameters that should be measured, monitored, and/or quantified for input to and validation of numerical models and to inform conceptual models;
(3) select appropriate numerical and statistical models and determine data inputs needed for those models; and
(4) develop a concept plan and identify/leverage existing project data where parameters have been or will be measured.

Specific Research Question(s): How does the addition of new sediment and altered shoreface geometry affect natural sediment dynamics and dispersal processes relative to adjacent habitat and over what period of time?

References:

Kosmynin, V., L. Edwards, J. Peterson, and B. Biggs. 2016. Standard Operation Procedures for Nearshore Hardbottom Monitoring of Beach Nourishment Projects. Florida Department of Environmental Protection, Division of Water Resource Management.

Managing Dredging Impacts by Optimizing the Use of Sand Resources: https://marinecadastre.gov/espis/#/search/study/100097

Sediment Sorting During Coastal Restoration Projects: Implications for Resource Management, Environmental Impacts, and Multiple Use Conflicts: https://marinecadastre.gov/espis/#/search/study/100165