

**Offshore Environmental Studies Program**

**Fiscal Years 2010–2012  
Studies Development Plan  
National**

**U.S. Department of the Interior  
Minerals Management Service  
Headquarters  
Herndon, Virginia  
2009**



# HEADQUARTERS TABLE OF CONTENTS

<b>SECTION 1.0</b>	<b>PROGRAMMATIC OVERVIEW .....</b>	<b>1</b>
<b>1.1</b>	<b>Introduction .....</b>	<b>1</b>
<b>1.2</b>	<b>Headquarters Research Components and National Oversight.....</b>	<b>3</b>
1.2.1	General Program Support and Quality Assurance .....	3
1.2.2	General Peer Review Planning.....	4
1.2.3	Information Management and Dissemination.....	4
1.2.4	Physical Sciences and Oil Spill Risk Analysis .....	5
1.2.5	OCS Alternative Energy .....	6
1.2.6	Global Climate Change .....	6
1.2.7	Partnership .....	6
1.2.8	Ecosystem-based Management .....	7
1.2.9	Marine Minerals Program .....	8
<b>1.3</b>	<b>New Starts for FY 2009 and Ongoing Studies.....</b>	<b>9</b>
	<b>Table 1.</b> Headquarters New Starts for FY 2009 and Ongoing Studies.....	9
<b>SECTION 2.0</b>	<b>PROPOSED STUDY PROFILES .....</b>	<b>13</b>
<b>2.1</b>	<b>Introduction.....</b>	<b>13</b>
<b>2.2</b>	<b>Profiles of Studies Proposed for the Fiscal Year 2010 NSL .....</b>	<b>13</b>
	<b>Table 2.</b> MMS Headquarters Studies Proposed for the Fiscal Year 2010 NSL .....	13
	Support for Interagency Working Group on Ocean Observations.....	15
	North Atlantic Ocean Model Skill Assessment .....	17
	South Atlantic Ocean Model Skill Assessment .....	19
	California Ocean Model Calculations.....	21
	Conducting the 10 <sup>th</sup> International Marine Environmental Modeling Seminar (IMEMS 2010).....	23
	Support for the Development of a Marine Mammal Data Archive .....	25
	Support for Development of a Web Site to Announce Upcoming Marine Mammals Research .....	27

Improving Emission Estimates and Understanding of Pollutant Dispersal for Impact Analysis of Beach Nourishment and Coastal Restoration Projects .....	29
Best Practices for Physical Process and Impact Assessment in Support of Beach Nourishment and Coastal Restoration Activities .....	33
Support for Second International Conference on the Effects of Noise on Aquatic Life	35
<b>2.3 Profiles of Studies Proposed for the Fiscal Year 2011 NSL .....</b>	<b>37</b>
<b>Table 3. MMS Headquarters Studies Proposed for the Fiscal Year 2011 NSL .....</b>	<b>37</b>
Updating the MMS Oil Spill Risk Assessment (OSRA) Model.....	39
Assessment of Long-Term Biological Recovery of MMP Sediment Borrow Sites .....	41
Evaluation Underwater Noise Produced During Sand and Gravel Related Dredging....	43
A Synthesis of the Results and Currency of Research Projects Completed for the Environmental Protection, Leasing, and Extraction of Offshore Sand.....	45
<b>SECTION 3.0 TOPICAL AREAS.....</b>	<b>47</b>
<b>3.1 Physical Oceanography .....</b>	<b>47</b>
<b>3.2 OCS Alternative Energy.....</b>	<b>47</b>
<b>SECTION 4.0 LITERATURE CITED .....</b>	<b>49</b>

## **SECTION 1.0 PROGRAMMATIC OVERVIEW**

### **1.1 Introduction**

The Minerals Management Service (MMS) serves as the steward for America's offshore energy and mineral resources on the Outer Continental Shelf (OCS) and is one of the top revenue collectors for the United States. The MMS plays a key role in America's energy supply by managing the mineral resources on 1.7 billion acres of the Outer Continental Shelf (OCS). The OCS is a significant source of oil and gas for the Nation's energy supply. The approximately 43 million leased OCS acres generally account for about 15 percent of America's domestic natural gas production and about 27 percent of America's domestic oil production. The MMS's oversight and regulatory frameworks ensure production and drilling are done in an environmentally responsible manner, and done safely. The MMS provides, on average, over \$8 billion in annual revenues for the Nation, States, and American Indians.

The offshore areas of the United States are estimated to contain significant quantities of resources in yet-to-be-discovered fields. The MMS estimates of oil and gas resources in undiscovered fields on the OCS (2006, mean estimates) total 86 billion barrels of oil and 420 trillion cubic feet of gas. These volumes represent about 60 percent of the oil and 40 percent of the natural gas resources estimated to be contained in remaining undiscovered fields in the United States.

The OCS Lands Act requires the Department of the Interior (DOI) to prepare a 5-year program that specifies the size, timing and location of areas to be assessed for Federal offshore natural gas and oil leasing. It is the role of DOI to ensure that the U.S. government receives fair market value for acreage made available for leasing and that any oil and gas activities conserve resources, operate safely, and take maximum steps to protect the environment.

The OCS oil and gas lease sales are currently held on an areawide basis with annual sales in the Central and Western Gulf of Mexico with less frequent sales held in the Eastern Gulf of Mexico and offshore Alaska. The program operates along all the coasts of the United States - with oil and gas production occurring on the Gulf of Mexico, Pacific, and Alaska OCS. The MMS is also responsible for other mineral production offshore, which currently includes using sand and gravel for coastal restoration projects.

As established oil- and gas-producing areas mature, America's energy industry is pushing into new frontiers (both in the Gulf of Mexico and in Alaska waters) in its search for hydrocarbon resources. This advance is critical to meeting the Nation's energy needs through production of domestic resources; but it also poses new risks in terms of the high reservoir pressures and temperatures faced during deep drilling operations, the cross-currents that affect deepwater operations, and the logistical challenges of operating in the Arctic environment. Additionally, the passage of the Energy Policy Act of 2005 gave MMS new responsibilities in not only new frontier "areas" but also in frontier "technologies." See the Renewable Energy component of the SDP for further discussion of this aspect of the program.

The MMS planning process links MMS activities to the Department of the Interior's Strategic Plan in two major mission component areas: Resource Use and Serving Communities. Careful planning ensures that goals and strategies are cascaded throughout the organization.

The major offshore program objectives linked to the Department's Strategic Plan include: Energy Access and Development, Responsible Use, Safety, Non-Energy/Alternative Use, Management, Improved Assessment and Information for Decisions, and Optimal Value. Within MMS, Offshore Energy and Minerals Management (OEMM)'s strategies guide development of budget documents and are used as input for planning and performance documents in support of ongoing efforts to build a Department-wide strategic plan.

The OEMM's ongoing work to oversee offshore energy and marine mineral exploration and development on the OCS, from lease offerings to lease abandonment, also addresses our multiple mandates to conserve our natural resources, provide energy for the Nation, protect people and marine life, and ensure a fair return for development of OCS minerals. This work includes ongoing critical research on the environment and safety-related technologies, and preparation of rigorous environmental assessments for proposed mineral development activities. The environmental research component is conducted through the Environmental Studies Program (ESP).

The ESP was initiated in 1973 as a means to gather and synthesize environmental science and socioeconomic information to support decision-making concerning the offshore oil and gas program. The Outer Continental Shelf Lands Act of 1953, (OCSLA), as amended in 1978, established policy for the management of the OCS oil and gas leasing program and for the protection of marine and coastal environments. Section 20 of the Act authorizes the ESP and establishes three general goals for the program:

- Establish the information needed for assessment and management of environmental impacts on the human, marine, and coastal environments of the OCS and the potentially affected coastal areas;
- Predict impacts on the marine biota which may result from chronic, low level pollution or large spills associated with OCS production, from drilling fluids and cuttings discharges, pipeline emplacement, or onshore facilities; and,
- Monitor human, marine, and coastal environments to provide time series and data trend information for identification of significant changes in the quality and productivity of these environments, and to identify the causes of these changes.

Early ESP efforts summarized and synthesized available information and early field studies were designed to provide a statistically valid baseline of the biological, geological, chemical, and physical characteristics of proposed leasing areas. Over the years many changes have occurred. Leasing and development activities are now focused predominantly in the Gulf of Mexico (GOM), with recent development and promising leasing activity in Alaska's Beaufort and Chukchi Seas and potentially new leasing in the North Aleutian Basin and offshore of Virginia, as well as some production in southern California. Studies conducted in these areas

are focused on characterizing environmental processes to address critical OCS information needs. In addition, the ESP has expanded its purview in selected areas to include environmental issues associated with renewable energy and marine mineral recovery (i.e., sand and gravel).

The ESP Headquarters component of the Studies Development Plan (SDP) provides the national “context” of the Program and the linkages between MMS’s diverse Regional needs. In contrast to the Plans prepared by our Regional Offices which focus on specific geographic areas or technologies, the Headquarters Office SDP emphasizes issues (and sometimes specific studies) which are more national in scope with program-wide application. ESP Headquarters provides leadership and general program support (quality assurance, information and data management and dissemination), integration of MMS’s physical oceanography studies to support oil spill risk assessment (OSRA); and, most recently issues pertaining to renewable energy alternatives.

## **1.2 Headquarters Research Components and National Oversight**

### **1.2.1 General Program Support and Quality Assurance**

Annual support for the activities of the OCS Scientific Committee will continue to be provided as a Headquarters Office function. The Scientific Committee was established to advise the Director of MMS on the feasibility, appropriateness, and scientific value of the proposed studies.

In recognition of the benefits of peer-review and to enhance dissemination of environmental information as widely as possible, the MMS routinely provides support to scientific conferences and symposia. In some cases, symposia may have a dedicated session on OCS research. Sometimes, OCS-sponsored research may be presented within the context of a wider scientific discipline. In other cases, MMS will support meetings which have topics with strong relevance to mission related information needs.

Another area of program support sponsored by the Headquarters office has been the archiving of biological specimens. The Smithsonian Institution’s National Museum of Natural History (NMNH) is the Nation’s most reliable and respected repository for biological collections. Since 1979 invertebrate specimens collected through the MMS Environmental Studies Program have been carefully maintained through the NMNH’s archiving standards and made available to taxonomists around the world.

In July 2008, MMS announced the intent to prepare a new leasing program beginning in 2010. The draft proposed program was published in January 2009. The proposed program included new areas to be offered for potential leasing. The offering of new areas is possible because of the lifting of the presidential moratoria and the expiration of the Congressional moratoria. The new program offers the North, Mid-, and South Atlantic Planning Areas and the Northern and Southern California Planning Areas.

More recently, there has been more national attention directed towards performance measures and accountability. During the FY 2004 budget cycle, the ESP underwent a program review by the Office of Management and Budget (OMB). Through the use of the OMB's Program Assessment Rating Tool (PART), the ESP received one of the highest scores in government. We are proud of this achievement but there is always room for improvement. To this end, working with guidance provided by OMB, we designed and implemented the Environmental Studies Program Performance Assessment Tool (*ESP-PAT*), an internal, online system to monitor the effectiveness of ESP products in fulfilling the Bureau's information needs and the efficiency of the program in delivering products on time. While designing performance measures for research programs has always been viewed as problematic, at best, the *ESP-PAT* has accomplished this task ensuring that the ESP fulfills its mission of providing the best possible scientific information for making decisions concerning our offshore resources.

### 1.2.2 General Peer Review Planning

Section V of OMB's Final Information Quality Bulletin for Peer Review requires that agencies "begin a systematic process of peer review planning" and publish a "web-accessible listing of forthcoming influential scientific disseminations (i.e., an agenda) that is regularly updated by the agency."

Numerous mechanisms that have been in place in the ESP identify and fulfill the requirement for scientific peer review. These existing mechanisms include:

- External review of proposals
- Review and critical input by Scientific Review Boards or Modeling Review Boards
- Review and critical input by scientific advisory committees under the Federal Advisory Committee Act
- Scientific peer review of final reports, and/or
- Publication in peer-reviewed technical and/or scientific journals.

These measures begin early in the development stages, and continue during the course of projects. In addition, projects are regularly presented at MMS Information Transfer Meetings and special workshops facilitating both scientific peer-review and public/stakeholder input.

### 1.2.3 Information Management and Dissemination

While the goal of the ESP is to gather and synthesize environmental science and socioeconomic information to support decision-making concerning the offshore program, the information must be available in a usable form and in a timely manner.

Rapid information dissemination is a key information management activity. The Environmental Studies Program Information System (ESPIS) has been designed to allow for easy access to ESP products. Full-text files, abstracts, and relational databases are searchable by the system. This allows users to easily search, identify, and select sections of text, or

bibliographic citations that relate directly to the desired subject. In addition, full text search capabilities were added. This system makes the ESP contracted research information directly available to the public and is available through the Internet at [www.gomr.mms.gov/homepg/espis/espisfront.asp](http://www.gomr.mms.gov/homepg/espis/espisfront.asp).

Information concerning ongoing research supported through the ESP is accessible at: [www.mms.gov/eppd/sciences/esp/profiles/index.htm](http://www.mms.gov/eppd/sciences/esp/profiles/index.htm). The web design is arranged by MMS OCS Region and discipline (e.g., biology, socioeconomics, physical oceanography, fates and effects, etc.). Information available for each study includes a complete description, status report, cost, and expected date of its final report. Affiliated web sites and presentation abstracts and papers are provided where applicable.

In some cases, the MMS supports the archiving of data collected as part of a study. Where appropriate, the data are required to be sent to the National Ocean Data Center (NODC). Other efforts that MMS has supported include the Census for Marine Life. One area that still has gaps is the archiving of data for Marine Mammals. A study is proposed to support the creation of an archive of Marine Mammal observations in cooperation with other Federal and International agencies.

#### 1.2.4 Physical Sciences and Oil Spill Risk Analysis

The Headquarters Office role in coordinating with regional physical oceanographic studies focuses on understanding and verifying general physical processes and features common to the OCS. The mechanisms of these processes and features in the ocean and atmosphere control the transport of materials and cause the mixing and redistribution of pollutants. The knowledge and information obtained from the physical oceanography and meteorology studies are used in assessing: 1) the transport of spilled oil, 2) the dispersion of discharge fluids and produced water, 3) the movement and spread of air pollutants, and 4) the effects on the migration of marine mammals, the distribution of fishes, and other biological resources. The MMS has sponsored and participated in the International Marine Environmental Modeling Seminar (IMEMS) and proposes to support the tenth meeting. These seminars gather together the world leaders in marine modeling to gain state of the art knowledge which is used to enhance internal modeling efforts.

The MMS is committed to the continuous improvement of its Oil Spill Risk Analysis (OSRA) estimations, and is using the results of field and modeling studies of ocean circulation to fulfill that commitment. The MMS is currently modernizing the software programs that are used to make the risk estimations. The fate of spilled oil is another area of focus. Laboratory analysis is conducted on the various types of oil as well as computer modeling of the behavior of an oil spill in the ocean environment. Furthermore, the ESB staff actively seek cooperative efforts with other agencies and private industries in such matters. These efforts leverage MMS's resources, while providing additional needed information and external review.

In response to the proposed lease sale off the coast of Virginia, the MMS contracted for a modeling study of the Mid-Atlantic area in January of 2009. Four additional studies covering

the North and South Atlantic Planning Areas and the planning areas off California are proposed to support future OSRA modeling efforts, should these areas be made available.

### 1.2.5 OCS Renewable Energy

The MMS faces a wide range of new and expanded responsibilities, with immediate and long-term implications, as a result of the enactment of the Energy Policy Act of 2005. Provisions of the Act place significant demands on the resources of the Minerals Management Service, affecting existing programs as well as authorizing the establishment of a comprehensive OCS Renewable Energy Program. The MMS has published proposed regulations to permit offshore renewable energy projects (wind, current, wave, solar, etc.). Since this is a new area, a separate studies plan was developed to identify and discuss the wide array of potential information needs.

### 1.2.6 Global Climate Change

The recognized changes in the global climate are of concern to MMS. The changing environment has resulted in shifts in the distribution of some marine species. These shifts, in turn, change the baseline conditions that are used to evaluate the potential impacts from oil and gas activities. Future studies, particularly if areas of the OCS are again made available, will need to take into account and evaluate any changes in the baseline. The Region where the most extensive changes have occurred is Alaska, where patterns of ice formation and melting have altered the environment.

### 1.2.7 Partnership

The ESP has been actively engaged in coordinating our efforts with programs such as the National Oceanographic Partnership Program (NOPP). As a charter member of NOPP, the ESP continues to explore options to increase its participation. Our NOPP investments have grown dramatically since 2002. A notable success in FY 2004 was the MMS award, with NOAA's Office of Ocean Exploration (OE) as a partner, of the study *The Archaeological and Biological Analysis of World War II Shipwrecks in the Gulf of Mexico: A Pilot Study of the Artificial Reef Effect in Deepwater*. This study (Church, et.al., 2007) was the recipient of the NOPP *Excellence in Partnering Award*. Also in FY 2004, the MMS Alaska OCS Region led the effort to support a NOPP-approved pilot project supporting the national effort to develop an ocean observing system. In FY 2005, MMS developed another major collaborative study with the NOAA-OE to investigate chemosynthetic communities on the lower continental slope of the Gulf of Mexico. In these efforts, MMS provided the funding for the science and NOAA-OE provided support for ship time including a manned submersible and deep sea capable ROV's and AUV's. In FY 2008, the MMS extended the deepwater *Lophelia* study (CSA International, Inc. 2007) in partnership with NOAA's Office of Ocean Exploration (OE) and the USGS. This new study will not only extend the depth and geographic range of our observations, but also incorporate new questions raised pertaining to a deep artificial reef effect during our award winning study *The Archaeological and Biological Analysis of World War II Shipwrecks in the Gulf of Mexico: A Pilot Study of the Artificial Reef Effect in Deepwater*.

We are also working through our Coastal Marine Institutes to develop ways in which our research can *include* educational components and we are exploring processes whereby ESP-sponsored projects can include Optional Tasks to produce “educational” materials using a process similar to that used by NOPP.

The MMS participates in the Interagency Working Group on Ocean Observations, which is currently supported by the Consortium for Ocean Leadership. The working group promotes interagency activities and is a mechanism for partnership opportunities. As part of the support for this effort, MMS contributes to a fund which is used to provide services for supporting the working group.

In partnership with the Marine Mammal Commission, the MMS is proposing to contribute to the development of a website that will include all Federal research opportunities addressing marine mammals. This website will allow for greater Federal partnership opportunities and will aid MMS in better focusing limited research funding.

#### 1.2.8 Ecosystem-based Management

We continue our efforts to integrate ecosystem management into the studies planning process. Generally speaking, MMS has a good track record in this arena. Looking back, early ESP planning in the Gulf of Mexico Region, for example, was generally ecosystem based. The coastal habitats were studied via Fish & Wildlife Service’s “coastal characterization” studies that were ecologically defined, and each included a standard suite of reports: habitat descriptions, species profiles, socioeconomic, mapping and GIS information, etc. The marine study areas reflected physiographic units that were either generally distinct, with boundaries where habitats changed (e.g., South Texas Shelf, Texas-Louisiana Shelf, Miss-Ala Shelf, West Florida Shelf, SW Florida Shelf) or were special habitats (Topographic Features, Deepwater). For each of these areas, a standard suite of studies was planned: baseline or benchmark studies (later, “marine ecosystem studies”) including some marine ecosystem modeling, to better understand marine ecosystem processes and to clarify information needs for subsequent studies. Later studies efforts included marine ecosystem modeling work and highly integrated interdisciplinary studies which continue today.

A characterization of the Gulf of Mexico deep-sea soft bottom ecosystem is being conducted through the MMS ongoing study *Deepwater Program: Northern Gulf of Mexico Continental Slope Habitats and Benthic Ecology*. This large ecosystem-based synthesis is the final product of a program designed to provide a better understanding of variations in the structure and function of animal assemblages in relation to water depth, geographic location, time, and overlying water mass. Biological data are integrated with measurements of physical and chemical hydrographic parameters, sediment geochemical properties, and geological characteristics that are known to influence benthic community distributions and dynamics. This synthesis provides the broad view of the deep GOM soft bottom benthic ecosystem in depths from 300 meters to 3700 meters. It incorporates new information collected through a cooperative effort with Mexico from the greatest depths of the GOM in Mexican waters. The MMS also has sponsored studies of other components of the GOM deep-sea ecosystem such

as the highly specialized chemosynthetic communities associated with natural hydrocarbon seeps and hard substrate communities including *Lophelia* coral. The MMS is planning an overall ecosystem-based synthesis incorporating all components of the GOM benthic environment when results from these ongoing projects are available.

#### 1.2.9 Marine Minerals Program

Loss of sediment from the Nation's beaches, dunes, barrier islands, and coastal marshes is a serious problem that affects the quality and sustainability of coastal ecosystems and economies. As relative sea level rise and seasonal storminess increase under the forcing of climate variability, the extent and magnitude of erosion are also increasing along the U.S. coastline. Beach nourishment and ecosystem restoration continue to be the preferred methods to curb loss and stall barrier island collapse. The availability of beach quality sand from proximal upland or environmentally-suitable state waters borrow areas continues to decline; in parallel, the demand for sand resources from the Outer Continental Shelf (OCS) is growing.

The MMS has jurisdiction over all marine mineral resources on the OCS. Public Law 103-426, enacted October 31, 1994, gave the MMS the authority to convey the rights to OCS sand, gravel, or shell resources for shore protection, beach or wetlands restoration projects, or for use in construction projects funded in whole or part or authorized by the Federal Government. The shore protection provisions of the Water Resource Development Act of 1999 (S. 507 as passed by Congress on August 4, 1999) amended that law, prohibiting the MMS from charging non-Federal interests a fee for using OCS sand. To date, the MMS has conveyed rights to over 30 million cubic yards of sand for 23 coastal restoration projects resulting in the restoration of over 125 miles of coastline. Yet, as the demand for OCS sand has increased, sand management issues and potential environmental conflicts have also become more complex.

The MMS conducts studies in support of the Marine Minerals Program to address three main requirements: (1) to comply with environmental regulations; (2) to support its responsibility to manage these public sand resources in an environmentally-sound manner; and (3) to identify long-term, cumulative impacts that are considered when making management decisions. Since 1993, over 50 environmental studies have been funded along three primary themes of research: (1) biological studies, which address the potential for adverse impacts on marine life as a consequence of dredging sand on the OCS; (2) physical oceanographic studies, which examine the potential for alteration of local wave fields from dredging sand at specific sites; and (3) impact studies, which evaluate the systemic effects of dredging on focused aspects of the physical, chemical, biological, and human environment and develop appropriate mitigation to alleviate or prevent adverse impacts.

Site-specific studies at existing or high-potential borrow areas offshore coastal states have been a cornerstone of past research. The biological aspect of these site characterization studies has concentrated on the potential effects on sessile benthic invertebrates, defining community structures/dynamics in context of sediment characteristics and impacted and non-impacted areas. Relatively fewer studies have documented mobile invertebrates or fishes, or food web and ecosystem dynamics. The physical aspect has generally focused on wave climate, wave transformation, and sediment transport and the potential for dredging operations to impact shallow coastal processes and shoreline change. Site specific studies in

support of future projects have been discontinued because of competing priorities and funding constraints. The project sponsors are now required to provide site-specific information traditionally obtained through MMS-sponsored research.

However, the MMS continues to support programmatic study of a wide range of cross-cutting topics, such as the protection of archaeological resources, modeling of turbidity plumes, and the physical process effects of deep borrow pit creation. These focus studies, which may be comprised of a combination of field observations, laboratory analyses, and numerical modeling, have broad application across diverse regions and projects. The topic-focused research is often state-of-the art, addressing highly uncertain impacts using or testing cutting-edge methodologies. Focus studies should target the resources, processes, and potential impacts that remain poorly documented and understood. Areas of immediate need include the effects of offshore dredging operations on air quality and noise pollution. Future research may also be along more traditional lines, such as the morphologic evolution of borrow areas following dredging, the ecological function and disturbance of unique bottom habitats for valuable benthic and fish resources, and the bioenergetic response of borrow areas to dredging events.

### 1.3 New Starts for FY 2009 and Ongoing Studies

**Table 1.** Headquarters New Starts for FY 2009 and Ongoing Studies

Program Lead	Planning Area	Start FY	Discipline	Study Title
<b>New Starts</b>				
MMS	NAT	09	HE	Estimation of Marine Productivity in MMS Planning Areas
MMS	NAT	09	PO	U.S. Arctic Coupled Ice Ocean Modeling
MMS	NAT	09	SE	OCS Renewable Energy and Space-Use Conflicts and Related Mitigation
MMS	NAT	09	SE	OCS EIM Modeling Review Board
MMS	NAT	09	HE	Archiving of Outer Continental Shelf Invertebrates by the Smithsonian Institution
MMS	NAT	09	MM	Characterization and Potential Impacts of Noise Producing Construction and Operation Activities on the OCS
MMS	ATL	09	HE	Surveying for Marine Birds in the Northwest Atlantic
MMS	ATL	09	HE	Determining Distributions and Movements of Long-tailed Ducks Using Satellite Telemetry
MMS	PAC	09	MM	Hearing in Sea Otters ( <i>Enhydra lutris</i> ): Measurement of Auditory Detection Thresholds for Tonal and Industry Sounds
MMS	NAT	09	SS	Offshore Economic Cost Model
MMS	NAT	09	PO	NAS Study: An Ocean Infrastructure Strategy

				for U.S. Ocean Research in 2030
<b>ONGOING STUDIES</b>				
<b><i>Fates &amp; Effects</i></b>				
MMS	NAT	08	FE	Effects of Pile Driving Sounds on Auditory and Non-auditory Tissues of Fish
MMS	NAT	03	FE	Analysis of Potential Biological and Physical Dredging Impacts on Offshore Ridge and Shoal Features/Engineering Alternatives and Options to Avoid Adverse Environmental Impacts
MMS	NAT	04	FE	Environmental Characterization of the Long Term Use of Ship Shoal Sand Resources for Large Scale Beach and Coastal Restoration in Louisiana
MMS	NAT	06	FE	Environmental Investigation of the Long-Term Use of Trinity and Tiger Shoals as Sand Resources for Large Scale Beach and Coastal Restoration in Louisiana
<b><i>Habitat &amp; Ecology</i></b>				
MMS	ATL	08	HE	Potential for Interactions between Endangered and Candidate Bird Species with Wind Facility Operations on the Atlantic OCS
MMS	ATL	08	HE	Compendium of Avian Information and Comprehensive GIS Geodatabase
MMS/BRD	NAT	03	HE	Investigation of Finfish Assemblages and Benthic Habitats Within Potential Borrow Areas in Federal Waters Offshore Southeastern Texas and Southwestern Louisiana
MMS/BRD	NAT	03	HE	Focused Analysis/ Review of Benthic Assemblages on Ridge and Shoal Features of the US East and Gulf of Mexico Coasts
MMS/BRD	NAT	04	HE	Utilization of Benthic Communities by Fish Populations on Shoals along the U.S. East Coast and Gulf of Mexico
<b><i>Physical Oceanography</i></b>				
MMS	NAT	08	PO	Extension of Ocean Model Calculations
MMS	ATL	09	PO	Mid-Atlantic Ocean Model Calculations
<b><i>Social &amp; Economic</i></b>				
MMS	NAT	08	SE	OCS EIM Modeling Review Board
<b><i>Information Management</i></b>				
MMS/BRD	NAT	07	IM	Synthesis of Available Information for the Florida East and West Coasts Relevant to

				Evaluating Potential Environmental Impacts Associated With Offshore Sand Dredging for Beach and Coastal Restoration
<b><i>Other (Research Partnerships)</i></b>				
MMS Technology Assessment and Research Program (TAR)				
USGS/Biological Resources Division (BRD)				
<b>Discipline Codes</b>				
AQ = Air Quality		FE = Fates & Effects		HE = Habitat & Ecology
IM = Information Management		MM = Marine Mammals and Protected Species		
PO = Physical Oceanography		SS = Social Sciences		
<b>Planning Area Codes</b>				
ATL = Atlantic		NAT = Nationwide		PAC = Pacific



## SECTION 2.0 PROPOSED STUDY PROFILES

### 2.1 Introduction

The following section focuses on the proposed studies for FY 2010 and beyond.

### 2.2 Profiles of Studies Proposed for the Fiscal Year 2010 NSL

**Table 2.** MMS Headquarters Studies Proposed for the Fiscal Year 2010 NSL

Page #	Discipline	Title	Rank
15	PO	Support for Interagency Working Group on Ocean Observations	1
17	PO	North Atlantic Ocean Model Skill Assessment	2
19	PO	South Atlantic Ocean Model Skill Assessment	3
21	PO	California Ocean Model Calculations	4
23	FE	Conducting the 10 <sup>th</sup> International Marine Environmental Modeling Seminar (IMEMS 2010)	5
25	MM	Support for the Development of a Marine Mammal Data Archive	6
27	MM	Development of a Web Site to Announce Upcoming Marine Mammals Research	7
29	FE	Improving Emission Estimates and Understanding of Pollutant Dispersal for Impact Analysis of Beach Nourishment and Coastal Restoration Projects	8
33	IM	Best Practices for Physical Process and Impact Assessment in Support of Beach Nourishment and Coastal Restoration Activities	9
35	IM	Support for Second International Conference on the Effects of Noise on Aquatic Life	10
AQ = Air Quality                      FE = Fates & Effects                      HE = Habitat & Ecology IM = Information Management      MM = Marine Mammals and Protected Species PO = Physical Oceanography      SS = Social Sciences			



## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010–2012**

**Region:** Headquarters

**Planning Area(s):** All

**Title:** Support for Interagency Working Group on Ocean Observations

**MMS Information Need(s) to be Addressed:** The Interagency Working Group on Ocean Observations (IWGOO) is a working group under the Joint Subcommittee for Ocean Science and Technology to address interagency communications and coordination. The MMS is a member of the working group and thus gains information about ongoing efforts by other Federal agencies, which facilitates partnership opportunities to leverage ESP funds.

**Cost Range:** (in thousands) \$20

**Period of Performance:** FY 2010-2011

### **Description:**

Background: The support for the interagency Integrated Ocean Observing System (IOOS) was provided by OCEAN.US, which was funded by Federal agencies, members of the IWGOO, to perform planning and development functions and interagency communications. In 2008, this office was closed, following the stand-up of the NOAA IOOS Office. The NOAA Office performs the NOAA-specific functions of the IOOS, but not the interagency functions. These interagency functions were returned to the IWGOO to perform. For fiscal year 2009, the Consortium for Ocean Leadership (COL) was designated as the host for the IWGOO Support Office. In this capacity, COL is responsible for providing meeting agendas, scheduling, logistics, meeting documentation and archiving of presentations. All documentation is stored on the Ocean Leadership computer network and distributed to meeting participants, as required. The support office assists with briefings on other ocean related committees as tasked by the IWGOO. The Support Office along with a contracted consultant is responsible for designing industry outreach efforts. This effort initially focuses on an Industry Workshop to be held April 14, 2009. As the current host of the IWGOO Support Office, COL manages all direct expenses associated with the IWGOO Support Office and is the only possible recipient of funds to assist with IWGOO activities during Fiscal Year 2009.

Objectives: The purpose of this study is to provide funding for services provided to the IWGOO by the Consortium for Ocean Leadership for interagency communications and cooperation.

Methods: MMS will provide a financial contribution to support the logistical and programmatic functions performed by the Consortium for Ocean Leadership.

**Revised Date:** March 6, 2009



## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010-2012**

**Region:** Headquarters (Gulf of Mexico)

**Planning Area(s):** North Atlantic (Gulf of Mexico)

**Title:** North Atlantic Ocean Model Skill Assessment

**MMS Information Need(s) to be Addressed:** The study is needed by MMS to create the OSRA estimates of oil spill trajectories. The ocean models have been shown to have skill in estimating the near surface currents. This study will result in an analysis of the time series of simulated currents developed by a previous study. These simulated currents will be compared to field projects that have been conducted in the North Atlantic, as well as the use in the OSRA calculations.

**Cost Range:** (in thousands) \$200–\$500

**Period of Performance:** FY 2010-2012

### **Description:**

Background: The circulation of the North Atlantic has been studied through previous observational programs, with funding by NSF, ONR, USCG, and others. The studies acquired observations of the coastal ocean, Georges Bank and the Gulf of Maine. Many field programs have also been conducted in this area.

Objectives: The objective is to perform analyses of the hindcast simulations of the circulation of the North Atlantic ocean model, to determine the skill in simulating the near-surface currents, compared to drifting buoy data, and other data sets. Simulations of the ocean current using the wind forcing in the time period (1995-2008) will provide comparison of the model to data, and would represent the time period of the model application to provide environmental variability in the Oil Spill Risk Analysis calculations.

Method: The method is to use observations to perform a skill assessment of the numerical ocean model that simulates the current fields in the North Atlantic. The ocean modeling results were derived from other studies. The analysis of the skill of the ocean simulation in the North Atlantic was past the scope of the original modeling contract. The wind forcing was derived from the products of an atmospheric model, at least for the period of 1993-2008. Skill assessment comparisons against field observations, i.e. current meters and drifting buoy velocities, will be performed.

**Revised Date:** February 9, 2009



## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010-2012**

**Region:** Headquarters (Gulf of Mexico)

**Planning Area(s):** South Atlantic (Gulf of Mexico)

**Title:** South Atlantic Ocean Model Skill Assessment

**MMS Information Need(s) to be Addressed:** The results of the study are needed by MMS to create the OSRA estimates of oil spill trajectories. The ocean models have been shown to have skill in estimating the near surface currents. This study will result in an analysis of the time series of simulated currents developed by a previous study. These simulated currents will be compared to field projects that have been conducted in the South Atlantic, as well as the use in the OSRA calculations.

**Cost Range:** (in thousands) \$200-\$500

**Period of Performance:** FY 2010-2012

### **Description:**

Background: The circulation of the South Atlantic has been studied through previous observational programs, with funding by NSF, ONR, USCG, and others. The studies acquired observations of the coastal ocean and Gulf Stream. Many field programs have also been conducted in this area.

Objectives: The objective is to perform analyses of the hindcast simulations of the circulation of the South Atlantic Ocean, to determine the skill in simulating the near-surface currents, compared to drifting buoy data, and other data sets. Simulations of the ocean current using the wind forcing in the time period (1995-2008) will provide comparison of the model to data, and would represent the time period of the model application to provide environmental variability in the Oil Spill Risk Analysis calculations.

Method: The method is to use observations to perform a skill assessment of the numerical ocean model that simulates the current fields in the South Atlantic. The ocean modeling results were derived from other studies. The analysis of the skill of the ocean simulation in the South Atlantic was past the scope of the original modeling contract. The wind forcing was derived from the products of an atmospheric model, at least for the period of 1993-2008. Skill assessment comparisons against field observations, i.e. current meters and drifting buoy velocities, will be performed.

**Revised Date:** February 9, 2009



## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010-2012**

**Region:** Headquarters (Pacific)

**Planning Area(s):** Northern and Southern California (Pacific)

**Title:** California Ocean Model Calculations

**MMS Information Need(s) to be Addressed:** The results of the study will be used by MMS to create the Oil Spill Risk Analysis (OSRA) estimates of oil spill trajectories. The OSRA results are used in the Lease Sale Environmental Impact Statements as a measure of the probability of oil spill occurrence and contact to environmental resources. The ocean models have been shown to have skill in estimating the near surface currents. This study will result in a time series of simulated currents. These simulated currents will be compared to other field projects that have been conducted in the Northern and Southern California Planning Areas, as well as the use in the OSRA calculations.

**Cost Range:** (in thousands) \$ 750-\$1,250

**Period of Performance:** FY 2010-2012

### **Description:**

Background: The ocean circulation of the Northern and Southern California Planning Areas have been studied through previous field and modeling programs, with funding by MMS, NSF, ONR, USCG, and others. The models were subjected to many sensitivity calculations and skill was assessed by teams of oceanographers. The conclusion of these studies was that the models have significant skill in simulating the ocean surface currents. Many field programs have been conducted in these areas.

Objectives: The objective is to acquire hindcast simulations of the circulation of the Northern and Southern California Planning Areas using an ocean model, including the entire California coast, which has significant skill in simulating the near-surface currents, compared to drifting buoy data, and other data sets. Simulations of the ocean current using the wind forcing in the time period (1993-2008) will provide comparison of the model to data, and would represent the time period of the model application to provide environmental variability in the OSRA calculations.

Method: The method is to use a numerical ocean model to simulate the current fields in the Northern and Southern California Planning Area. The wind forcing will be derived from the products of an atmospheric model, at least for the period of 1993-2008. Data assimilation of sea surface temperature and sea surface elevation will be employed. Statistical methods will be used to assess the sensitivity of the model to parameterizations. Skill assessment comparisons against field observations, i.e. current meters and drifting buoy velocities, will be performed.

**Revised Date:** February 11, 2009



## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010-2012**

**Region:** Headquarters

**Planning Area(s):** Nationwide

**Title:** Support for the 10<sup>th</sup> International Marine Environmental Modeling Seminar (IMEMS 2010)

**MMS Information Needs to be Addressed:** MMS needs to be aware of the most recent developments in oil-spill modeling; including new findings on oil-spill transport, oil weathering, dispersion, and sediment interaction. This information is used to improve the Oil Spill Risk Assessment model which is used in MMS environmental documents to estimate the probability of oil-spill contact to environmentally sensitive areas or areas of commercial or recreational value.

**Cost Range:** (in thousands) \$50-\$100

**Period of Performance:** FY 2010-2011

### **Description:**

Background: Co-founded by the MMS and SINTEF of Norway, the annual International Marine Environmental Modeling Seminar (IMEMS) brings together researchers and managers from governmental agencies, universities, and marine-related industries for the purpose of presenting and discussing the most recent developments in the modeling of environmental impacts to the marine environment. The transport, fates, and effects of oil spills in the ocean are among the dominant topics presented and discussed. The modeling of mitigation efforts are also featured in the seminars. Even the IMEMS topics not immediately related to oil spills contribute to MMS information needs by presenting modeling and model skill evaluation techniques that can be adapted to the problems of oil spills and other possible adverse impacts due to offshore oil and gas production.

Objective: The objective is to bring the oil spill research community together to present and discuss developments in modeling environmental impacts to the marine environment.

Method: The Coastal Response Research Center at the University of New Hampshire will host IMEMS 2010. MMS will make a financial contribution to co-sponsor the seminar.

**Revised Date:** March 2, 2009



## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010-2012**

**Region:** Headquarters

**Planning Area:** Nationwide

**Title:** Support for the Development of a Marine Mammal Data Archive

**MMS Information Need(s) to be Addressed:** Research results on observational data on marine mammals are scattered among the many organizations that collect this information. The results are also in a variety of formats. Easy access to a comprehensive collection of observations of marine mammals from research and monitoring projects conducted nationwide and, perhaps, internationally can be achieved through a marine mammal data archive. The archive would provide MMS with additional marine mammal observational data.

**Cost Range:** (in thousands) \$30-\$50

**Period of Performance:** FY 2010-2011

### **Description:**

**Background:** A great many scientific projects and monitoring efforts involve observing marine mammals in all aspects of their lives. Many research institutions and governmental agencies have accumulated this information, but, to date, there is no one repository for these observations from which interested groups could obtain the information for their needs. A report of the Joint Subcommittee on Ocean Science & Technology, an interagency task force on anthropogenic sound and the marine environment states "...agencies often have common science and technology needs on this issue that could be most quickly and economically through a coordinated program of effort." Further, the report recommends that government agencies "support the development, standardization, and integration of online data archives of marine mammal distribution, abundance, and movement for use in assessing potential risk to marine mammals from sound-producing activities" (Southall, et al., 2009).

Given the obvious usefulness of a marine mammal observations archive analogous to that of the National Oceanographic Data Center (NODC) of the National Oceanographic and Atmospheric Agency (NOAA), many people now working with marine mammals in various capacities want to proceed with the formation of such a repository. This idea has been evolving in the Interagency Coordinating Group on the Impact of Noise on Marine Mammals (ICG) and is now being seriously pursued. The Office of the Assistant Secretary of the Navy (Installations and Environment) has taken the lead and has had serious conversations with NOAA about the development of such an archive, likely to be housed somewhere in NOAA.

The development plan as it now stands calls for: the development of a common data format for observations of marine mammals through extensive discussion with marine mammal researchers and monitors nationwide; the acquisition of hardware, software, and maintenance personnel needed to receive, quality check, and store the observations; publicizing the existence of the data archive and encouraging researchers and monitors to contribute their past

and future marine mammal observations. After several years, the successfulness of the archive will be evaluated. If successful, a determination of the means of indefinitely sustaining the archive will be made.

Since this project arose from discussions and expressed interest among the federal agencies participating in the ICG (MMS, NOAA, the Marine Mammal Commission, the U. S. Navy, U. S. Coast Guard, the U. S. State Department, and the U. S. Department of Defense), these agencies will fund the start-up costs of the archive and a much smaller annual contribution to maintain the archive in the near future. If successful, and if NOAA funds permit, NOAA may officially adopt the archive and pay for its future costs.

Objectives: The objectives of this study are to:

- develop a common data format for observations of marine mammals and,
- produce a data archive to receive, store, and make publically available these observations.

Methods: MMS will make a financial contribution to support the start up of a marine mammal archive

**Revised Date:** March 3, 2009

## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010-2012**

**Region:** Headquarters

**Planning Area:** Nationwide

**Title:** Support for Development of a Web Site to Announce Upcoming Marine Mammals Research

**MMS Information Need(s) to be Addressed:** The MMS needs to be aware of upcoming marine mammal research activities in order to take advantage of partnering opportunities and to prevent duplication of effort.

**Cost Range:** (in thousands) \$30-\$50

**Period of Performance:** FY 2010-2011

### **Description:**

Background: Many federal agencies have interest in and responsibilities for marine resource protection and management. The interests and responsibilities of the agencies typically overlap, which could result in wasteful duplication of efforts. Several mechanisms have been put in place to facilitate interagency cooperation to share funding for research and other activities in the areas of overlap. One of these mechanisms is the National Oceanographic Partnership Program (NOPP), where governmental agencies and interested commercial companies jointly fund research on topics of mutual importance. Another is the Joint Industry Project (JIP), which maintains a dialog among industry and governmental “players” similar to the NOPP to foster joint funding of mutually needed research. Yet another is the Interagency Coordinating Group on the Impact of Noise on Marine Mammals (ICG), which meets regularly to discuss information sharing as well as joint research opportunities in areas of common interest.

There is, however, more that could be done to reduce redundancy in research funding, because the above mentioned efforts are not exhaustive in considering all agency and commercial research. This is especially true if the JIP terminates in the next few years. An opportunity exists to close this gap through a newly developing web site at the Marine Mammal Commission (MMC), designed to document all ongoing and completed research on the topic of marine mammals. The study proposed herein will add a component to the MMC’s web site that will announce upcoming research, planned or adopted for funding, for the purpose of attracting joint funding by other interested parties, governmental or commercial. It is essentially a kind of “Craig’s List” or research clearinghouse for federally funded or commercially funded research, which could be expanded to include research done by other governmental agencies or universities, including those in other countries.

The added component to the MMC’s web site will be password-protected, interactive web pages to announce upcoming research. The architecture will allow the posting of announcements by authorized entities (governmental or commercial) and for interested other parties to contact designated contact personnel for the purpose of discussing joint funding

opportunities. The existence of these web pages will be promoted through the IGC and at meetings and workshops commencing after the pages have been developed and reasonably debugged.

Objective: The objective of this study is to inform the marine mammal research community about upcoming research projects in order to facilitate joint funding of projects of mutual interest.

Methods: MMS contribute financial support for development of the web pages.

**Revised Date:** March 3, 2009

## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010-2012**

**Region:** Headquarters

**Planning Area(s):** All

**Title:** Improving Emission Estimates and Understanding of Pollutant Dispersal for Impact Analysis of Beach Nourishment and Coastal Restoration Projects

**MMS Information Need(s) to be Addressed:** The MMS needs improved estimates of horsepower, activity profiles, loading factors, and emission factors for dredge equipment, support vessels, and construction equipment and vehicles. A standardized template needs to be developed for use in generating projected emissions in order to improve environmental analyses and conformity determinations. Better estimates of potential emissions coupled to a pollutant dispersion model will provide the basis for effective mitigation and monitoring requirements if so needed.

**Cost Range:** (in thousands) \$75-\$150

**Period of Performance:** FY 2010-2011

### **Description:**

Background: The Clean Air Act (CAA) requires the MMS to ensure that any action authorizing the use of OCS sand resources in coastal restoration and beach nourishment projects does not cause or contribute to air quality violations in areas not meeting the National Ambient Air Quality Standards (NAAQS), or does not cause a violation of these standards in areas that meet the NAAQS. The MMS also evaluates the potential impacts to air quality under its National Environmental Policy Act (NEPA) mandate. Estimating a proposed activity's emissions and evaluating the degree of atmospheric dispersion of pollutants over the shallow inner shelf and coastal region are key elements of evaluating the potential effect on local air quality and determining appropriate mitigation.

The Marine Minerals Program (MMP) generally requires applicants to estimate potential emissions of criteria pollutants emitted by vessels, mobile non-road, and off-road sources. The diesel engines used in these projects often contribute to locally-elevated concentrations of nitrogen oxides, as well as increased concentrations of carbon monoxide, sulfur oxides, particulate matter, and volatile organic compounds. Emissions inventories are currently prepared from a very limited number of project-specific forecasts of volume requirements and activity duration, data on fuel consumption, equipment horsepower, estimated loading ratings (% power), and emission factors (mass of pollutant released per unit energy).

Past MMS research has pursued parallel themes, including the development of the Gulfwide Offshore Activities Data System (GOADS) and preparation of Gulfwide emission inventories. As is, GOADS cannot be used to develop complete project inventories for beach nourishment and coastal restoration projects since not all equipment types, activities, and necessary parameterizations are represented in the software. In particular, information needs to be

collected to refine the parameterizations and assumptions used to estimate emissions from dredge plants and tiered beach construction equipment. However, the methodology used to calculate the emissions of other non-oil and gas OCS sources in Gulfwide inventories may be relevant and should be incorporated into the proposed effort to avoid duplication and ensure consistency with regional inventories (Wilson et al., 2007).

Project-specific inventories have shown that the bulk of emissions are generated by the dredges' diesel engines used during propulsion, draghead/cutterhead operation, and pump-out. However, the relative contribution towards established limits ultimately depends on the volume requirements, length of the project, and the distance of the borrow area to state waters and the pump-out location(s). Past analyses have generally been done for projects that are proposed in attainment areas, and these have shown that potential emissions are relatively minor in context of regional point and mobile sources. Nonetheless, the majority of inventories still approach the threshold level for nitrogen oxides (NO<sub>x</sub>) that would require a conformity determination be prepared for proposed projects in maintenance and non-attainment areas. This study proposes to develop emission inventory templates reflecting a spectrum of dredge volume scenarios so that project-specific analysis is only required for maintenance and non-attainment areas.

Lastly, there is limited understanding about the nature of pollutant transport and dispersal from dredges operating offshore, besides that fact that it depends crucially on prevailing winds. The application of a simple and idealized overwater plume transport and dispersion model would greatly improve our current understanding of the relative distances over which pollutants are dispersed and the extent that offshore activity actually contributes to elevated pollutant concentrations over state waters, especially considering most dredging operations occur near the state/federal boundary.

Objectives: Objectives for this study include:

1. Develop (i) operational characteristics (ii) activity profiles, (iii) loading factors for each activity, and (iv) emission factors for equipment types not accurately or fully parameterized in GOADS or published elsewhere.
2. Develop a standardized approach to estimate emissions using a methodology and tool adaptable for use with regional inventories;
3. Develop emission inventory templates that can be used in NEPA analyses for proposed projects in attainment areas; and,
4. Provide generic information about plume transport and dispersion for use in future environmental analyses.

Methods: Methods for this study include:

1. Complete a literature/technical report review, including MMS-funded studies, to compile and refine information about operational characteristics, activity profiles, loading factors, and emission factors. Survey major dredge contractors in the U.S. and analyze representative dredge operation data (Silent Inspector/DredgePak) to compile and refine operational characteristics, activity profiles, loading factors, and emission factors for dredge plants.

2. Develop a function-specific input/output (I/O) spreadsheet model or module using accepted emission inventory practices (e.g., see GOADS manual).
3. Using the I/O spreadsheet model, prepare low-end and high-end emission inventory templates for a range of volume/distance requirements, or a equivalent spectrum of scenarios; and,
4. Using an EPA-recommended dispersion model, model the same low-end or high-end scenarios, or an equivalent idealized spectrum, to describe plume transport and dispersion using hypothetical conditions for various geographic areas (e.g., mid-Atlantic, Florida, Central Gulf of Mexico) adequately representing seasonal variations in meteorological conditions. Use existing meteorological datasets to the extent possible (i.e., 5-year meteorological dataset for the Gulf of Mexico Region)

**Revised Date:** March 12, 2009



## ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010-2012

**Region:** Headquarters

**Planning Area(s):** All

**Title:** Best Practices for Physical Process and Impact Assessment in Support of Beach Nourishment and Coastal Restoration Activities

**MMS Information Need(s) to be Addressed:** Environmental analyses require an improved understanding of the nature, extent, and duration of potential physical impacts related to offshore dredging. Past analyses, focusing on wave impacts, have generally predicted minor impacts related to dredging. As such, it is not clear if the current practice of site-specific physical process modeling is necessary for all projects that propose to use OCS sand resources. However, some of the key physical processes controlling impacts at the borrow area and in the nearshore zone have not been considered and are still poorly understood. The MMS needs to develop criteria and guidelines to support or redefine modeling efforts.

**Cost Range:** (in thousands) \$300-\$400

**Period of Performance:** FY 2010-2012

### **Description:**

Background: Numerical modeling can be a useful tool to help understand physical phenomena and evaluate potential near- and far-field impacts due to seafloor modification caused by offshore dredging (e.g., Bender et al., 2003; Work et al., 2004; Nairn et al., 2007; Benedet et al., 2008). Since 1995 the MMS has funded over 15 physical process studies that have considered the impacts of dredging offshore borrow areas, with a primary focus on changes in breaking wave conditions, radiation stress tensors, longshore sediment transport (LST) potential, and historical shoreline change. It is now common practice for applicants to treat the potential effects of proposed projects in the same way before rights to OCS sand are conveyed. A recent literature review, which included MMS-sponsored research, shows that relatively few projects are likely to cause discernible changes in context of natural variability, despite wide-ranging shelf slope and morphology, borrow area configurations, and meteorological forcing (USACE, 2007). The most significant impacts are realized during severe storms that occur relatively infrequently and introduce significant and variable coastal change regardless of the assumed impacts of dredging. Critics of the requirement have questioned the utility of modeling given the commonalities in results, the challenges of inter-comparison between models which rely on different physics and parameterizations, as well as the fact that adequate observational data is seldom available for proper calibration and skill assessment.

Since modeling is time consuming and expensive, continued use should be justified. Nonetheless, any modeling that is done should be state-of-the art in order to predict the most realistic effects. The same review discussed above shows that little consideration has been given to the importance of wave-current interaction and the effects that seafloor modification

may have on flow, water level fluctuations, and sediment transport. The parameters that potentially differentiate the extent and significance of impacts need to be evaluated and compared; key parameters may include the distance between shoreline and borrow area(s), relative water depths and complexity of shoreface bathymetry, incident wave conditions and flow, borrow area aspect ratios (width to depth ratio), and changes in shoreline orientation. State-of-the-art hydrostatic primitive equation models that can couple spectral wave transformation, hydrodynamic, and sediment transport/morphologic evolution modules are widely available and can produce more realistic 3-dimensional hindcast and prediction results (e.g., Newberger and Allen, 2007; Kobashi et al., 2007; Benedet et al., 2008). The application of these advanced tools may provide more accurate information about wave transformation, as well as much needed information about potential changes in nearshore and offshore circulation and morphologic evolution following dredging. From this improved understanding of processes, analysis criteria and general guidelines can be developed that would describe when and why site-specific modeling and higher-cost shoreline impact assessments would be required or could be precluded.

Objectives: Objectives for this study include:

- Improve the current understanding of near-field and far-field physical processes and potential impacts to those processes caused by modification of offshore bathymetry;
- Identify and rank the key factors for differentiating potential impacts; and,
- Preparation of generic guidelines that provide criteria for determining site-specific modeling.

Methods: Implement a state-of-the art hydrodynamic model using a spectrum of idealized bathymetric templates and forcing conditions. The model should be able to treat the effects of waves, circulation, and water levels on sediment transport and morphologic evolution over the appropriate spatial domain, duration, and time step. Experiments should be designed to adequately address the inherent variability of physical forcing and response. The hydrodynamic model should be nested in a regional model that provides realistic initial and boundary conditions for local fine grid model. Model runs should be completed and compared using waves only, currents only, and fully interacted modes.

A spectrum of pre- and post-dredging experiments, characterized by different distances to shore, aspect ratios, and water depths, should be designed and implemented, allowing for any necessary morphologic evolution. The experimental results should be compared using appropriate analytical and statistical techniques to determine and describe key physical processes and variability thereof, the relevant borrow area factors that affect those processes and in turn lead to morphologic changes, and the criteria that can be used to justify or preclude site-specific modeling requirements. Prepare generic guidelines that synopsise the study results and clearly communicate any proposed criteria.

**Revised Date:** March 12, 2009

## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010–2012**

**Region:** Headquarters

**Planning Area(s):** All

**Title:** Support for Second International Conference on the Effects of Noise on Aquatic Life

**MMS Information Need(s) to be Addressed:** The expansion of MMS activities into new geographic areas, such as the Atlantic coast and the Pacific Northwest, combined with a rising concern for the impacts of anthropogenic sound on the natural environment nationwide increases the need for information regarding the noise produced by MMS regulated activities. This conference provides an excellent access to the latest scientific information on the effects of noise on aquatic life. Results may identify specific research needs for MMS or suggest potential mitigations particularly relevant to upcoming renewable energy projects.

**Cost Range:** (in thousands) \$40-\$60

**Period of Performance:** FY 2010-2011

### **Description:**

Background: There has been an increasing interest and concern among scientists, regulators, and industry about the effects of noise on marine life. While emphasis has been on effects on marine mammals, recent concerns have arisen about effects of the same sounds on fish, and there is a smaller but growing concern about effects on invertebrates as well.

The issues revolving around effects of sounds on aquatic life are extensive and complex. They range from differences in the sources of sounds potentially affecting aquatic life, the diversity of species affected, the potential different effects on animals with different anatomy and physiology, and effects on animals living in different habitats. The complexity arises, in part, from current difficulties in extrapolating between sounds with different characteristics and between species with different body structures.

To alleviate the lack of contact between scientists working on different aspects of effects of sounds the first International Conference on the Effects of Noise on Aquatic Life was held in Nyborg, Denmark in August, 2007. It facilitated interaction between the scientists investigating these questions and the regulators and industrial users of sound who need the answers and created an ideal venue for the networking and brainstorming that advance the state of science. The goal of the first conference was to examine the current understanding of the effects of noise on marine organisms, especially mammals and invertebrates. It defined major research questions to be answered and brought together scientists, regulators and industry representatives to place the work into its full context. The conference was attended by representatives of more than 25 countries and resulted in a dedicated issue of the peer-reviewed journal *Bioacoustics* (McGregor 2008), wherein the collected papers from the conference are presented. Feedback from participants and supporters indicated a strong need

to repeat the conference, move the discussions and topics forward, continue the collaboration begun, and further the state of the science in this area. Indeed, to date, this conference is the best opportunity to bring together all the key individuals to share information, particularly on measuring and understanding the effects of sound on marine organisms.

As with the first meeting, the main emphasis of the conference will be on defining the current state of knowledge. However, the progress made in the three years since the first conference also will be presented and assessed. The second conference will place strong emphasis on research results, the sharing of ideas, discussion of experimental approaches, and analysis of regulatory issues.

The premise of these meetings is that sound is important for many aquatic organisms, including marine mammals, fish, and some invertebrates. Sound is used for communicating, navigating, seeking out prey and avoiding predators. Hearing is an everyday sense, detecting the many changes that are taking place around the animal. The goal of the conference is to draw together new knowledge on the importance of underwater sound to animals and to the effects of sounds upon them, whether those sounds occur naturally or result from human activities.

A wide range of sources of underwater sound will be considered at the second conference, including those generated by explosions, ships, seismic exploration, offshore construction, sonars of various types, acoustic deterrent devices and of course sounds made by aquatic animals themselves.

Objectives: The objective of the conference is to provide a venue for the collection and sharing of research related to the effects of noise on aquatic life. The event will provide an opportunity for networking among all attendees. The second conference will place strong emphasis on research results, the sharing of ideas, discussion of experimental approaches, and analysis of regulatory issues.

Methods: The venue for the conference will be in Ireland in August 2010. A standard general conference format will be followed with multiple sessions for presentations and a poster session. As with the first conference in 2007, an advisory board will be convened to guide the development of program topics and selection of presenters. MMS would have a seat on the board if desired. To ensure full coverage of costs, other supporting partners will be approached by the organizers, including NOAA, ONR, and NSF in the US, as well as potential partners in other countries.

**Revised Date:** March 24, 2009

### 2.3 Profiles of Studies Proposed for the Fiscal Year 2011 NSL

**Table 3.** MMS Headquarters Studies Proposed for the Fiscal Year 2011 NSL

<b>Page #</b>	<b>Discipline</b>	<b>Title</b>
39	PO	Updating the MMS Oil Spill Risk Assessment (OSRA) Model
41	HE	Assessment of Long-Term Biological Recovery of MMP Sediment Borrow Sites
43	FE	Evaluation Underwater Noise Produced During Sand and Gravel Related Dredging
45	IM	A Synthesis of the Results and Currency of Research Projects Completed for the Environmental Protection, Leasing, and Extraction of Offshore Sand
AQ = Air Quality                      FE = Fates & Effects                      HE = Habitat & Ecology IM = Information Management      MM = Marine Mammals and Protected Species PO = Physical Oceanography      SS = Social Sciences		



## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010-2012**

**Region:** Headquarters

**Planning Area:** Nationwide

**Title:** Updating the MMS Oil Spill Risk Assessment (OSRA) Model

**MMS Information Need(s) to be Addressed:** Improved methods for estimating the contact probabilities of oil spill trajectories for environmental analyses.

**Cost Range:** (in thousands) \$150-\$175

**Period of Performance:** FY 2011-2012

### **Description:**

Background: One of the primary issues addressed in the MMS environmental documents is the probability of oil-spill contact to environmentally sensitive areas or areas of commercial or recreational value. For many years, MMS has used an oil spill risk assessment (OSRA) model to estimate the likelihood that hypothetical spills from prospective oil and gas development will contact areas of known vulnerability to spilled oil. Over those years, the OSRA model has undergone improvements to enhance the probability estimates, including adopting recommendations from a National Research Council review of the model done in 1990. The regular enhancements are in keeping with the MMS policy of using the best available information for safe operations and environmental protection.

This study seeks to improve on the procedure the OSRA model uses to represent the breaking-apart of hypothetical oil spills into smaller oil spills and the subsequent horizontal dispersion of the smaller spills. The present procedure has reasonable physical realism but becomes less realistic for hypothetical spills persisting over many days. Developments by other oil-spill modelers over recent years should be evaluated and tested for incorporation into the OSRA model to improve its representation of spill break-down and subsequent dispersion.

Objective: The objective of this study is to improve the OSRA model in order to make better estimates of the probabilities of oil-spill contact to areas of sensitivity.

Method: This study will conduct a review of oil-spill modeling literature to ascertain what methods are in present use to theoretically represent the breaking-apart and subsequent dispersion of crude petroleum spilled on the sea surface. The study will give emphasis to theoretical treatments with some observational verification. The investigators performing the study will make use of their knowledge of hydrodynamics and surface transport to assess the various theoretical representations and either recommend one of them or develop an improvement to them for use in the OSRA model.

**Revised Date:** February 17, 2009



## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010–2012**

**Region:** Headquarters

**Planning Area(s):** Atlantic OCS, Gulf of Mexico, and Pacific OCS

**Title:** Assessment of Long-Term Biological Recovery of MMP Sediment Borrow Sites

**MMS Informational Need(s) to be Addressed:** MMS conducts studies at potential sand and gravel borrow sites to address three main requirements: 1) to comply with environmental regulations; 2) to support its responsibility to manage these public sand resources in an environmentally sound manner; and 3) to identify long-term, cumulative impacts that are then used in making current and future management decisions. This Study will collect data related to the long term recovery of borrow sites, data which is essential to correctly identifying the potential impacts of sediment removal activities.

**Cost Range:** (in thousands): \$250-\$300

**Period of Performance:** FY 2011–2012

### **Description:**

Background: The OCSLA mandates the MMS to act as a steward for sand, gravel and other non-energy mineral resources from the OCS. The Marine Minerals Program (MMP) provides policy direction for the development of marine mineral resources on the OCS for non-commercial purposes such as beach nourishment and wetlands protection projects as well as commercial purposes. While post-dredging monitoring may be required by a negotiated agreement, this monitoring is generally completed within a year of project completion. This short time frame for observation may not allow adequate time for the habitat and biological community to return to pre-dredge conditions and generally finds the benthic communities and associated pelagic species in the borrow areas “recovering. Observations of the borrow sites at time intervals from 7-10+ years from completion of the sediment removal would allow for MMS to determine the extent and nature of recovery, or if our rubric for measurement of impact and recovery time needs to be altered.

Objectives: The objectives for the study include:

- Assess the rate and nature of recovery of benthic habitats in previously dredged borrow sites on the OCS,
- Assess and compare recovery of borrow sites with differing primary substrate types,
- Fill in information gaps about the long-term ecological recovery of biological communities utilizing previously dredged borrow sites on the OCS, and
- Allow for a more accurate determination of acceptable frequency of borrow events from specific areas and sediment types.

Methods: Information may be gathered through a number of currently accepted sampling regimes, depending on the expected species composition of the study site (i.e. side scan sonar,

sediment samples, benthic video/camera, trawls, baited traps, gut content analysis, etc...). New ecological and biological data will be subject to statistical analysis comparing current results to legacy data for the borrow site, as reported in the original project EA/EIS, post-project monitoring report (when available), and grey/primary literature. Data would be collected from at least two borrow sites of varied "age" and type, over multiple seasons to match as closely as possible the sampling regimes used in previous assessments at those sites.

**Revised Date:** February 19, 2009

## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010-2012**

**Region:** Headquarters

**Planning Area(s)** Atlantic OCS, Gulf of Mexico, and Pacific OCS

**Title:** Evaluation Underwater Noise Produced During Sand and Gravel Related Dredging

**MMS Information Need(s) to be Addressed:** Offshore marine mineral dredging generates noise during operation. The MMS needs to understand the magnitude and zone of influence of the sound generated by the equipment in order to determine potential mitigation of impacts to marine mammals, sea turtles, and fish. This study would support the Environmental Compliance, NEPA, MMPA, ESA and MSFCMA needs for sand and gravel related projects

**Cost Range:** (in thousands) \$300-\$400

**Period of Performance:** FY 2011-2013

### **Description:**

**Background:** The OCSLA mandates MMS to act as a steward for sand, gravel and other non-energy mineral resources from OCS. The Marine Minerals Program provides policy direction for the development of marine mineral resources on the OCS for non-commercial purposes such as beach nourishment and wetlands protection projects as well as commercial purposes. At this time the impact of noise produced from dredge activities is largely unknown. These concerns are largely focused on sound introduced into the environment from hopper and cutterhead dredging and related activities (i.e., dredge pumps, dredge head, tug boats etc.) and the effects of this sound on marine life and resources. The issue of effects is further heightened by the lack of scientific certainty on the true impacts, the level of their significance, and the ever increasing public scrutiny over these concerns.

In 2007, the Joint Industry Programme on E&P Sound and Marine Life funded a study titled, Review of Existing and Future Potential Treatments for Reducing Underwater Sound from Oil and Gas Industry Activities (Spence et. al., 2007). This report had widespread involvement from many participants including the MMS. A portion of this report focused on sound introduced to the marine environment due to marine sediment dredging and several conclusions were made from the literature synthesis.

“From the literature it is seen that underwater noise levels are generally higher (or at least different) during the actual act of dredging. Dredges utilize large pumps and additional power sources that are used specifically for dredging, and are likely to be responsible for a significant amount of the underwater radiated noise. It is conceivable that at least some of the noise during dredging comes from the dredging head. The available literature, including Greene (1987), Sakhalin (2004), and Clarke, et. al. (2002), provides little to no information on the relative amplitudes of noises that come from the vessel

machinery relative to the dredging head for hopper and cutterhead dredge operations. The only practical information on this topic comes from Clarke (2002) who states (referring to a hopper dredge) “sounds of the draghead scraping across the sandy substrate could be discerned from propeller noise” for measurements where the vessel was 40 meters from the recording hydrophone. Additional study is necessary to better quantify the contributions from the dredge head relative to other sources. Ideally, this study would include comparisons of noise levels created during dredging of different materials (Spence, et. al., 2007).”

**Objectives:** The objectives of this study are to evaluate the potential levels of noise generation and sound propagation from sand and gravel dredge operations.

**Methods:** The methodology will consist of the review of existing information about the types and intensities of sound generated during the operation of a marine mineral dredge. Field work will include:

- The use of equipment such as passive acoustic monitoring to measure the generation of sound from an operation before, during, and after the project from both a cutterhead and trailing suction dredges,
- An analysis of noise produced from individual equipment (such as propeller cavitation, pump out, and pipeline conveyance) vs. the cumulative impact of all the equipment used during an operation (based on a range of material size, including fine, medium, and coarse grained material),
- Determination of the significance of noise radiated by the trailing suction and cutterhead dredges relative to on-board machinery/propellers, and
- The use of equipment such as passive acoustic monitoring to measure the propagation of sound to a pre-determined distance.

**Revised Date:** February 23, 2009

## **ENVIRONMENTAL STUDIES PROGRAM: Studies Development Plan FY 2010–2012**

**Region:** Headquarters

**Planning Area(s):** Atlantic OCS, Gulf of Mexico, and Pacific OCS

**Title:** A Synthesis of the Results and Currency of Research Projects Completed for the Environmental Protection, Leasing, and Extraction of Offshore Sand

**MMS Information Need(s) to be Addressed:** MMS conducts studies at potential sand and gravel borrow sites to 1) to comply with environmental regulations; 2) to support its responsibility to manage these public sand resources in an environmentally sound manner; and 3) to identify long-term, cumulative impacts that are then used in making current and future management decisions.

The information collected by these studies is used to prepare environmental analyses for EAs or EISs which are required before a lease can be issued. The studies identify impacts or potential impacts which may preclude issuing the lease or they recommend mitigation techniques that become part of the terms and conditions of the lease. For example, avoidance of pipelines is a significant issue in many parts of the Gulf of Mexico and MMS needed to determine a safe set-back distance when dredging sand. Based on the results of a study, MMS is now able to include a safe set-back distance as a term of a lease when a pipeline is close to a sand borrow site. Consolidation and synthesis of this large volume of work will enable more efficient use of the studies and identify areas of data omission.

**Cost Range:** (in thousands) \$50-\$100

**Period of Performance:** FY 2011-2012

### **Description:**

**Background:** Since 1993, 51 environmental studies have been completed for the Marine Minerals Program. The studies fall into 3 general areas of research: (1) biological studies, which address the potential for adverse impacts on marine life as a consequence of dredging sand on the OCS; (2) physical oceanographic studies, which examine the potential for alteration of local wave fields from dredging sand at specific sites; and (3) environmental impact studies, which evaluate the effects of particular types of dredging techniques on various aspects of the physical, chemical, and biological environments and develop appropriate mitigation techniques to alleviate or prevent adverse impacts. The studies have also included site-specific research at high-potential or existing sand borrow areas offshore of 10 states.

Although all of these studies are in the MMS database and are posted on the MMS website, the results of the studies have never been systematically summarized and analyzed for data

gaps, reviewed for currency, and compared to outside literature and its data gaps. This would be a companion to the 2007 study, “Critical technical review and evaluation of site-specific studies’ techniques for the MMS Marine Minerals Program” (Michel, et.al., 2007), which focused on the methodology of the studies of specific borrow areas off states that have requested OCS sand.

Objectives: The objectives of the study are to review and summarize all environmental studies done for the Marine Minerals Program and to determine which, if any, no longer reflect state-of-the-art of the subject and if recent non-MMS research has updated these studies and identify significant knowledge gaps that need to be addressed, particularly studies done overseas. Examples of subject areas in need of study include attenuation of noise from dredges and the entrainment of fish by both suction and cutterhead dredges. Additionally, a significant volume of research on sand dredging impacts has been done overseas in places such as the North Sea, Persian Gulf, and the far Pacific where large dredging projects have taken place. Environmental data from these projects needs to be summarized and incorporated into the MMS database.

Methods: Methods for this study are standard library research and summary preparation.

**Revised Date:** February 19, 2009

## **SECTION 3.0 TOPICAL AREAS**

This section describes program activities and emerging issues and concerns that are likely to lead to information needs and research in FY 2012 and beyond.

### **3.1 Physical Oceanography**

Future physical oceanographic studies are expected to be directed towards improving the oil spill risk analysis process by incorporating and assimilating observational data into the risk assessment methods and by improving ocean circulation current modeling. The ESP will continue to support programs that provide a better understanding of transporting spilled oil and other materials by ocean currents via simulation modeling and surface drifter observations. The ESP will also continue to develop integrated programs among physical, biological and chemical oceanography disciplines. Areas of study will include the western, central, and eastern Gulf of Mexico; the Santa Maria Basin/Santa Barbara Channel, California; near-shore Beaufort and Chukchi Seas, Cook Inlet, and now the North Aleutian Basin Alaska; and possibly areas off of the east coast, specifically the north and mid-Atlantic Areas.

### **3.2 OCS Renewable Energy**

The geographic range represented for the new activities for this program could include all coastal areas. Many energy projects are expected on the east coast, where the MMS Environmental Studies Program has not operated for many years. Some existing information may be out of date, and entirely new scientific techniques or discoveries demand new data collection and analysis. Studies have been undertaken to address immediate information needs for a proposed wind energy project and future efforts will be developed based on syntheses of information and assessments of proposed technologies. A workshop was held in June 2007 to identify information gaps and studies needs (Michel & Burkhard, 2007). As a result of the workshop, a separate studies development plan for presenting these future studies was prepared and is available on the Renewable Energy Program website: <http://www.mms.gov/offshore/AlternativeEnergy/Studies.htm>.



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